EUROPEAN COMMISSION
DG Competition

CASE M.8306-QUALCOMM / NXP SEMICONDUCTORS

(Only the English text is authentic)

MERGER PROCEDURE
REGULATION (EC) 139/2004

Article 8(2) Regulation (EC) 139/2004

Date: 18/01/2018

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COMMISSION DECISION

of 18.1.2018

declaring a concentration to be compatible with the internal market and the EEA agreement (Case M.8306 – Qualcomm / NXP Semiconductors)

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THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to the Agreement on the European Economic Area, and in particular Article 57 thereof,

Having regard to Council Regulation (EC) No 139/2004 of 20 January 2004 on the control of concentrations between undertakings[1], and in particular Article 8(2) thereof,

Having regard to the Commission's Decision of 9 June 2017 to initiate proceedings in this case,

Having regard to the opinion of the Advisory Committee on Concentrations[2],

Having regard to the final report of the Hearing Officer in this case [3],

Whereas:

(1) On 28 April 2017 the Commission received a notification of a proposed concentration pursuant to Article 4 of Council Regulation (EC) No 139/2004 ("the Merger Regulation") by which the undertaking Qualcomm Incorporated (United States of America), through its indirect wholly owned subsidiary Qualcomm River Holdings B.V. (the Netherlands) (together referred to as "Qualcomm" or the "Notifying Party") would acquire within the meaning of Article 3(1)(b) of the Merger Regulation control of NXP Semiconductors N.V. ("NXP", the Netherlands) by way of a purchase of shares (the "Transaction")[4]. Qualcomm and NXP are jointly referred to as the "Parties".

1. THE PARTIES

(2) Qualcomm is active in the development and sale of semiconductors and system software for use in voice and data communications, networking, application processing and multimedia. Qualcomm operates primarily through two business units, namely (i) Qualcomm CDMA Technologies (“QCT”) and; (ii) Qualcomm Technology Licensing (“QTL”).

(3) Qualcomm, through QCT, develops and supplies integrated circuits ("ICs") and system software based on Code Division Multiple Access ("CDMA"), Orthogonal Frequency-Division Multiple Access ("OFDMA") and other technologies for use in voice and data communications, networking, application processing, multimedia and global positioning system ("GPS") products. More specifically, Qualcomm develops and supplies ICs for mobile devices (such as smartphones and tablets), in particular baseband chipsets (both standalone and integrated) enabling the latest cellular telecommunication standards.

(4) Qualcomm, through QTL, operates an intellectual property ("IP") licensing programme, through which it grants licenses or otherwise provides rights to use portions of its IP portfolio. This portfolio includes, among others, patent rights essential to or useful in the manufacture and sale of certain wireless products or both.

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1 OJ L 24, 29.1.2004, p. 1 ("the Merger Regulation"). With effect from 1 December 2009, the Treaty on the Functioning of the European Union ("TFEU") has introduced certain changes, such as the replacement of "Community" by "Union" and "common market" by "internal market". The terminology of the TFEU will be used throughout this decision.

2 OJ C ...,...200. , p....

3 OJ C ...,...200. , p....

4 Publication in the Official Journal of the European Union No C 143, 06.05.2017, p. 6.

Qualcomm's IP portfolio includes thousands of standard essential patents ("SEPs") related to third generation ("3G") and fourth generation ("4G") cellular technology[5].

(5) NXP is active in the manufacturing and sale of semiconductors, in particular ICs and single unit (discrete) semiconductors. NXP sells High Performance Mixed Signal ("HPMS") devices, which comprise application-specific semiconductors and system solutions for the following segments, namely (i) Automotive; (ii) Secure Identification Solutions; (iii) Secure Connected Devices; and (iv) Secure Interfaces and Power.

2. THE OPERATION AND THE CONCENTRATION

(6) On 27 October 2016, Qualcomm Incorporated, through its indirect, wholly-owned Dutch subsidiary Qualcomm River Holdings B.V., entered into a purchase agreement with NXP, pursuant to which Qualcomm will commence a tender offer to acquire all of the issued and outstanding common shares of NXP, thus acquiring sole control of NXP.

(7) The Transaction therefore constitutes a concentration pursuant to Article 3(1)(b) of the Merger Regulation.

(8) The Notifying Party explains that the Transaction is a key step in its strategy to diversify away from the mobile device sector, where it holds particular expertise in cellular and connectivity technologies, to areas in which it currently has no or limited presence. The Notifying Party explains that the Transaction would accelerate the development of smart solutions in particular in the automotive, industrial, smart home and healthcare areas.

3. UNION DIMENSION

(9) The undertakings concerned have a combined aggregate world-wide turnover of more than EUR 5 000 million[6] (Qualcomm: EUR 21 200 million; NXP: EUR 8 650 million). Each of them has a Union-wide turnover of more than EUR 250 million (Qualcomm: EUR 712 million; NXP: EUR 1 520 million), but they do not achieve more than two-thirds of their aggregate Union-wide turnover within one and the same Member State. The notified operation therefore has a Union dimension.

4. PROCEDURE

(10) Based on the results of the phase I market investigation, the Commission raised serious doubts as to the compatibility of the Transaction with the internal market and adopted a decision to initiate proceedings pursuant to Article 6(1)(c) of the Merger Regulation on 9 June 2017.

(11) The Notifying Party submitted its written comments to the Article 6(1)(c) decision on 28 June 2017.

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5 Patents that are essential to a standard are those that cover technology to which a standard makes reference and that implementers of the standard must use in standard-compliant products. These patents are known as SEPs. SEPs differ from non-essential patents ("non-SEPs"), which can generally be designed around to comply with a standard.

6 Turnover calculated in accordance with Article 5 of the Merger Regulation and the Commission Consolidated Jurisdictional Notice (OJ C 95, 16.4.2008, p. 1).

(12) During the phase II investigation, the Commission sent several requests for information ("RFIs") to the Parties and to third party market participants. In particular, the Commission sent market investigation questionnaires to customers and competitors of semiconductors for the automotive industry, customers and competitors in the Internet of Things ("IoT") sector, device original equipment manufacturers ("OEMs"), to suppliers of baseband chipsets, of Near Field Communication ("NFC") and Secure Element ("SE") technology chips, to mobile network operators ("MNOs"), and to public transit authorities and reader infrastructure integrators. The Commission also sent targeted requests for information to device OEMs, to suppliers of baseband chipsets, and to suppliers of NFC and SE chips.

(13) On 28 June 2017, the Commission adopted a decision pursuant to Article 11(3) of the Merger Regulation, compelling the Notifying Party to supply the information which it had requested on 14 June 2017 with RFI 18 pursuant to Article 11(2) of the Merger Regulation, which the Notifying Party had failed to submit within the time limit fixed by the Commission. The decision also suspended the time limit laid down in Article 10(3) of the Merger Regulation until the end of the day the Commission would receive the required information.

(14) On 16 August 2017, the Notifying Party submitted a response to RFI 18 and the suspension of the time limit expired at the end of that day.

(15) On 5 September 2017, the Commission adopted a decision pursuant to Article 11(3) of the Merger Regulation, compelling the Notifying Party to supply the information which it had requested on 14 June 2017 with RFI 20 pursuant to Article 11(2) of the Merger Regulation, which the Notifying Party had failed to submit within the time limit fixed by the Commission. The decision also suspended the time limit referred to in Article 10(3) of the Merger Regulation as of 17 August 2017 until the end of the day the Commission would receive the required information.

(16) On 4 October 2017, the Commission adopted a decision pursuant to Article 11(3) and Article 15 of the Merger Regulation, compelling the Notifying Party to supply certain information and documents responsive to RFI 20, which had not yet been provided to the Commission and imposing a periodic penalty payment should the Notifying Party fail to supply the information requested within the period prescribed.

(17) On 5 October 2017, the Notifying Party proposed formal commitments to eliminate the Commission's findings that the Transaction would give rise to a significant impediment to effective competition. The Commission launched the market test for the commitments on 6 October 2017.

(18) On 17 November 2017, the Notifying Party completed its response to RFI 20 and the suspension of the time limit expired at the end of that day.

(19) Taking into account the Commission's comments and the feedback from the market test, the Notifying Party subsequently submitted a final set of commitments on 10 November 2017[7].

(20) The Advisory Committee discussed the draft of this Decision on 8 January 2018 and issued a favourable opinion[8].

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[7] On 15 November 2017, the Notifying Party submitted a slightly revised version of Schedule 3 to the final set of commitments, which replaced Schedule 3 as attached to the commitments on 10 November 2017. On 18 December 2017, the Notifying Party submitted a slightly revised version of the commitments, amending one definition to ensure consistency with other defined terms.

5. MARKET DEFINITION

5.1. Introduction

(21) The Transaction concerns the semiconductor industry.

(22) Semiconductors are materials, such as silicon, which can act as an insulator, but are also capable of conducting electricity. Semiconductors are at the heart of devices such as diodes, transistors and other electronic components, and can be found in virtually every electronic device today.

(23) Semiconductor devices are rarely bought as end-products by consumers. They are mainly bought by equipment manufacturers in virtually all sectors within the electronic equipment industry.

(24) The Transaction concerns different industry sectors, that can be broadly categorised in three macro areas, namely semiconductors for automotive applications, semiconductors for IoT applications, and semiconductors for mobile devices including in particular baseband chipsets, NFC and SE technology, and mobile audio products (speech enhancement software and smart amplifier chips). The Transaction also concerns transit service technology used for contactless public transport ticketing and fare collection by means of mobile devices and the IP related to baseband chipset and NFC technology.

5.2. Product market definition

5.2.1. Semiconductors for automotive applications

(25) In the automotive segment, Qualcomm is mainly active in repurposed chips primarily developed for the mobile segment, including the Snapdragon line of baseband processors. Qualcomm's automotive sales accounts for [0-5]% of Qualcomm's annual turnover. Qualcomm's product offerings in the automotive segment include the following product groups: infotainment, connectivity, and Advanced Driver Assistance Systems ("ADAS").

(26) NXP is a leading automotive semiconductor supplier; it has a sales share of approximately [10-20]% of the overall automotive semiconductor industry and its automotive sales account for a third of NXP's annual turnover. NXP provides solutions for applications such as infotainment, ADAS, chassis & safety and body and comfort (for example lighting).

5.2.1.1. Notifying Party's views

(27) The Notifying Party submits that there are very few overlaps in the Parties' activities in the automotive space and that the industry for semiconductors in the automotive space can be segmented by (i) semiconductor type; or (ii) by field of application/end-use.

(28) With regard to the segmentation by semiconductor type, in line with previous Commission decisions[9], four main categories of semiconductor devices can be identified: (i) ICs (also known as microchips or chips); (ii) discretes; (iii) optical semiconductors; and (iv) sensors and actuators. Furthermore, ICs can be distinguished on the basis of whether they incorporate digital or analog technology,

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[8] At the Advisory Committee all present Member States agreed that that the Transaction must be declared compatible with the internal market in accordance with Articles 2(2) and 8(2) of the Merger Regulation.

[9] Commission decision of 17 September 2015 in Case M.7585 – NXP Semiconductors/ Freescale Semiconductor.

or a combination of both. Digital ICs can be further segmented into three categories, microcomponents, memory ICs, and logic ICs. In turn, microcomponents can be further subdivided in three types, which are microprocessors ("MPUs"), microcontrollers ("MCUs") and Digital Signal Processors ("DSPs"). Analog ICs can be divided between general purpose analog ICs and application specific analog ICs, such as automotive analog ICs.

(29) The Notifying Party submits that the Parties' activities overlap in the digital application specific ICs market segment. However, the Parties do not consider that MPUs for the automotive sector constitute a separate product market and submit that any relevant market should include MPUs developed for/used in other applications, such as mobile devices.

(30) With regard to the segmentation by field of application, the Notifying Party believes that the following function blocks can be distinguished: (i) powertrain; (ii) chassis; (iii) safety; (iv) body and comfort; (v) infotainment[10], and (vi) security (for example, secure car access). The Notifying Party contends that the Parties' activities only overlap in the infotainment and safety market segments.

(31) With regard to semiconductors for automotive infotainment systems, the Notifying Party submits that "infotainment" or any related sub-segmentation[11] is not a relevant product market as such but a field of application in which different types of semiconductor devices are used.

(32) With regard to semiconductors for safety systems – ADAS ("Advanced Driver Assistance Systems")[12], the Notifying Party submits that automotive ADAS systems perform the following different functions: (i) Ultrasonic; (ii) Lidar; (iii) Radar; (iv) Camera; and (v) Vehicle-to-Everything ("V2X"). The Notifying Party submits that the Parties' activities overlap only in relation to V2X, a technology used to connect cars to various external stimuli (other cars, bikes, road works, infrastructure) and to provide the unique capability to see past other vehicles, as well as around corners, obstacles, or turns on the road. The Notifying Party further submits that V2X systems are based on two distinct types of wireless communications systems: (i) cellular, and (ii) non-cellular technology based on the IEEE[13] 802.11.p, also known in the United States as Dedicated Short Range Communications ("DSRC")[14]. However, the Parties' activities overlap only in relation to non-cellular V2X since NXP does not develop chips based on the cellular V2X technology. Moreover, in response to the

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10 Automotive infotainment is a collection of hardware and software in automobiles that provides audio and/or video entertainment.

11 Semiconductors for automotive infotainment systems could be further segmented in (i) radio/audio; (ii) connectivity (for example Wi-Fi, Bluetooth); (iii) cellular/modem; (iv) graphics, display and multimedia processing ("Infotainment MPU").

12 ADAS encompasses a broad range of features that enable a vehicle to "see," "sense" and "react" to the objects that surround it, through the use (and combination) of semiconductor-driven technologies. Over time, ADAS systems are expected to evolve into more sophisticated systems and eventually autonomous driving system. Therefore, for the purposes of this decision, the Commission refers to ADAS systems as the set of technologies that can perform from driving assistance (level 1 according to the Society of Automotive Engineers ("SAE")) to full autonomous driving (level 5 according to SAE).

13 IEEE stands for Institute of Electrical and Electronics Engineers

14 In the United States, the National Highway Traffic Safety Administration ("NHTSA") proposed the adoption of a safety standard requiring all new light vehicles sold on the U.S. market to be capable of vehicle-to-vehicle communications based on the DSRC communications standard. See NHTSA's Notice of Proposed Rulemaking on V2V Communications, 13 December 2016: https://www.nhtsa.gov/press-releases/us-dot-advances-deployment-connected-vehicle-technology-prevent-hundreds-thousands, [Doc ID 3293]

Article 6(1)(c) decision, the Notifying Party argues that non-cellular V2X systems are composed of different components, namely, non-cellular V2X radio, software, secure storage, processor and interface with the rest of the car (for example, BUS) and that the Parties overlap only in the provision of non-cellular V2X radio chip.

5.2.1.2. The results of the market investigation and the Commission's assessment

(33) The majority of respondents to the market investigation indicated that semiconductor devices can be categorised into four main distinct categories that are (i) integrated circuits ("ICs"); (ii) discretes; (iii) optical semiconductors; and (iv) sensors and actuators. All respondents further noted that ICs can be further distinguished between digital ICs and analog ICs, and that digital ICs belong to three categories that are (i) microcomponents ICs; (ii) memory ICs; and (iii) logic ICs[15]. The majority of the respondents further consider that there are three categories of microcomponents ICs, namely (i) microprocessors ("MPUs"); (ii) microcontrollers ("MCUs"); and digital signal processors ("DSPs")[16].

(34) With regard to a potential distinction between general purpose microcomponents ICs from application specific microcomponents ICs, the majority of respondents further believe that a distinction should be made since specific application needs specific microcomponents. Only two competitors note that it would be increasingly difficult to distinguish between the two. The majority of respondents further believe that there is no reason to depart from the Commission's previous assessment that application specific microcomponents ICs can be distinguished depending on their category of application and that application specific microcomponents ICs of one category, such as automotive, are likely not substitutable with those of another category (for example, automotive / wireless communications)[17].

(35) With regard to semiconductors used for automotive applications, the vast majority of customers responding to the market investigation consider that different products markets should be considered for specific end-use/application for which semiconductor products are used and that there should be a distinction between several function blocks that are (i) powertrain; (ii) chassis; (iii) safety; (iv) body and comfort; (v) infotainment; and (vi) security. From the competitors' side, while most of the respondents clearly agree with this segmentation, a few respondents note that a distinction should be made for specific function blocks. One respondent notes that the proposed classification is true only when considering ASSPs/ASICs[18] but not general purpose ICs. Another respondent considers that security technology is also applied in automotive semiconductors for body and comfort and not only in the security function block[19].

(36) With regard to automotive infotainment chips, the majority of the respondents to the market investigation consider that the market segment could be segmented in the

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15 See response to questions 5 and 6 of Q6 – automotive customers; responses to question 4 and 5 of Q5 – automotive competitors.

16 See response to question 7 of Q6 – automotive customers; responses to question 6 of Q5 – automotive competitors. Three automotive customers disagree with this classification, as they do not distinguish MPU and MCU.

17 See response to questions 8 and 9 of Q6 – automotive customers; responses to question 7 and 8 of Q5 – automotive competitors.

18 ASSPs stands for Application specific standard products; ASICs stands for Application Specific Standard Integrated Circuits.

19 See response to question 10 of Q6 – automotive customers; responses to question 9 of Q5 – automotive competitors.

following functions blocks: (i) radio / audio; (ii) connectivity; (iii) cellular / modem; and (iv) graphics, display and multimedia processing ("Infotainment MPUs"). One respondent, in particular, considers that those are very different devices for functionality, performance and price and substitution is impractical[20]. The majority of the respondents further notes that those products should be considered as complementary to each other rather than alternatives to each other[21] and that, to start providing semiconductors for a specific function block (for example infotainment MPUs) may require significant time and investments. Only one respondent considers the product of the different function blocks as substitutes; however, the same respondent highlights that it is not active in the market[22].

(37) With regard to infotainment MPUs, the majority of respondents consider that Infotainment MPU could be further distinguished into two tiers: (i) Entry/Display Audio ("DA") tier[23]; (ii) mid/premium-high tier[24]. Intel and Continental note that the two systems have different displays and audio requirements. Only one respondent pointed out that it may require a higher investment to create two versions[25]. The majority of respondents also note that to start providing semiconductors for another Infotainment MPU category would require significant time and investment. However, some customers explained that as both are built with the same architecture, less investment would be required. One competitor also said that because those products usually contain licensed processor cores from third party, license of a new core with greater capacity would be cost effective and quick[26]. Moreover, the majority of respondents consider the automotive infotainment MPU used for the different tiers (Entry/Display Audio ("DA") tier and mid/premium-high tier) as being complementary with each other rather than alternatives to each other[27].

(38) With regard to infotainment connectivity, the vast majority of respondents consider (i) Wi-Fi; (ii) Bluetooth ("BT"); (iii) Wi-Fi/BT Combo; (iv) cellular (including 3G, LTE and 5G); (v) 802.11p as being complementary with each other rather than alternatives to each other[28].

(39) For the purposes of this Decision, the exact product market definition with regard to chips for the infotainment automotive application can be left open as the Transaction

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20 See responses to question 11 of Q6 – automotive customers; responses to question 10 of Q5 – automotive competitors.

21 See responses to question 13 of Q6 – automotive customers; responses to question 12 of Q5 – automotive competitors.

22 See responses to question 12 of Q6 – automotive customers; responses to question 11 of Q5 – automotive competitors.

23 Infotainment MPU Entry / Display Audio refers to MPU capable to support basic functionalities as: (i) Car Radio – MA / FM; (ii) Hands Free Phone; (iii) Basic Navigation system; (iv) Operating Systems (for example Android Auto, Apple CarPlay); (v) 3"-4" display.

24 Infotainment MPU Mid/premium/high-tier refers to MPU capable to support more complex functionality as: (i) 6"-14" display; (ii) rear view camera; (iii) voice recognition; (iv) wireless modem; multi-channel audio; (v) Advanced navigation system.

25 See responses to question 14 of Q6 – automotive customers; responses to question 13 of Q5 – automotive competitors.

26 See responses to question 15 of Q6 – automotive customers; responses to question 14 of Q5 – automotive competitors.

27 See responses to question 16 of Q6 – automotive customers; responses to question 15 of Q5 – automotive competitors.

28 See responses to questions 17 and 18 of Q6 – automotive customers; responses to question 16 of Q5 – automotive competitors.

does not raise competition concerns as regards its compatibility with the internal market irrespective of precise product market definition.

(40) With regard to chips used in the safety function block, the majority of the respondents to the market investigation consider that they could be further distinguished between (i) passive safety; (ii) active safety – ADAS. In particular, one respondent notes that passive safety is a mature field with established supply chain, whereas ADAS is a new field with a much higher level of complexity to master. However two automotive customers disagree with this distinction, and explained that for the IC, the distinction does not matter[29].

(41) The majority of respondents further consider that the automotive ADAS chips in the following function blocks: (i) Ultrasonic; (ii) Lidar; (iii) Radar; (iv) camera; (v) V2X communication are complementary rather than alternatives to each other since they are different technologies used for different purposes and functions. However, one respondent notes that depending on the requirement and performance of the ADAS chips, or depending on the semiconductor used in the function block, they can be substitutable or complement each other[30].

(42) The majority of customers also consider the automotive V2X chips based on cellular and non-cellular (for example, 802.11.p) technology as complements rather than alternatives to each other. Around half of the competitors also agree with this[31]. In particular, some customers highlight how non-cellular is the only technology that could be used for vehicle-to-vehicle safety function in the next years, while cellular technology may be used when 5G will be developed for vehicle-to-individual safety functions. Amongst the competitors, while some consider that there are overlaps between the two technologies, around half believe that they can coexist in a vehicle[32]. However, both customers and competitors note that the two technologies have different deployment times since the non-cellular one is already available in the market and tested by several automotive manufacturers while the cellular one is at earlier stage of development and two-three years behind[33].

(43) Moreover, the majority of respondents note that in order to start providing chips based on a different communication standard (for example, from cellular V2X to non-cellular V2X), a company would incur significant time and investment. One respondent notes that this would not be possible since cellular communication uses completely different technologies that 802.11.p. In particular, it would be difficult to start providing 802.11.p technology due to its high development time. Only one competitor said that a company could switch easily, but gave no further explanation[34]. However, some respondents consider the investment for Wi-Fi chips

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29 See responses to question 19 of Q6 – automotive customers, responses to question 18 of Q5 – automotive competitors.

30 See responses to question 20 of Q6 – automotive customers, responses to question 19 of Q5 – automotive competitors. See also responses to question 5 of questionnaires Q15 – automotive competitors and Q16 – automotive customers.

31 See responses to question 21 of Q6 – automotive customers, responses to question 20 of Q5 – automotive competitors.

32 See responses to question 6 of questionnaires Q15 – automotive competitors and Q16 – automotive customers.

33 See responses to questions 9 and 10 of questionnaires Q15 – automotive competitors and Q16 – automotive customers.

34 See responses to question 22 of Q6 – automotive customers, responses to question 21 of Q5 – automotive competitors. See also responses to question 11 of questionnaire Q16 – automotive competitors.

suppliers to start developing 802.11.p technology chip to be relatively small. Others also note that Marvell, a Wi-Fi chips supplier, just launched its non-cellular radio offering[35].

(44) With regard to the different components of non-cellular V2X systems, the majority of respondents consider those components, namely non-cellular V2X radio, software, secure storage, processor and interface with the rest of the car (for example, BUS) to be complementary. Respondents note how all those technologies are needed to build an autonomous vehicle[36].

(45) For the purposes of this Decision, the exact product market definition with regard to chips for the safety function for automotive application can be left open as the Transaction does not raise competition concerns as regards its compatibility with the internal market irrespective of precise product market definition.

5.2.2. Semiconductors for Internet of Things applications

(46) The IoT refers to interconnected objects – wearables, appliances, industrial automation (or vehicles and infrastructure) – that have processing capabilities and that can transmit or receive data or both through different communications standards, such as Bluetooth, NFC, Wi-Fi, and cellular.

5.2.2.1. Notifying Party's views

(47) The Notifying Party submits that in the IoT space, the Parties have a highly complementary presence and the overlaps between the Parties' activities are very limited.

(48) Similar to semiconductors for automotive applications, the market for semiconductors for IoT applications can be segmented by (i) semiconductor type; or (ii) by field of application/end-use.

(49) As regards the possible segmentation by semiconductor type, the Notifying Party identifies, in line with previous Commission decisions[37], four main categories of semiconductor devices: (i) integrated circuits ("ICs"), (ii) discretes, (iii) optical semiconductors, and (iv) sensors and actuators. Furthermore, IC**s** can be distinguished on the basis of whether they incorporate digital or analog[38] technology, or a combination of both. Digital ICs can be further segmented into three categories, microcomponents, memory ICs, and logic ICs. In turn, microcomponents can be further subdivided in three types, namely microprocessors ("MPUs"), microcontrollers ("MCUs") and Digital Signal Processors ("DSPs"), each of which can be subdivided between general purpose and application specific. Those semiconductors provide processing and connectivity functions. In terms of connectivity, many IoT devices today use the lower band short range wireless standards (usually sub-GHz to 2.4 GHz frequencies) such as Bluetooth Classic ("BT"), Bluetooth low energy ("BTLE" or "BLE"), Radio Frequency Identification ("RFID"), NFC, and IEEE 802.15.4 (which includes ZigBee and Thread), and for some other IoT applications, Wi-Fi (802.11n/802.11ac) and cellular (for example,

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35 See responses to questions 12 of questionnaires Q15 – automotive competitors and Q16 – automotive customers.

36 See responses to question 7 of questionnaires Q15 – automotive competitors and Q16 – automotive customers.

37 Commission decision of 17 September 2015 in Case M.7585 – NXP Semiconductors/ Freescale Semiconductor.

38 Analog ICs can be divided between general purpose analog ICs and application specific analog ICs.

Code Division Multiple Access ("CDMA") or the Orthogonal Frequency Division Multiple Access ("OFDMA") family of technologies connectivity may also be used).

(50) In the IoT space, Qualcomm and NXP supply general purpose and application specific MPUs, application specific MCUs, and application specific DSPs[39].

(51) However, the Notifying Party submits that the overlaps between the Parties are limited. With regard to MPUs, the Notifying Party argues that only NXP is present in the segment for general purpose MPUs considering that Qualcomm has only recently released a general purpose MPU. In the segment for application specific MPUs, Qualcomm is active through its application processors ("AP") (Snapdragon product line) designed for mobile devices as well as repurposed Snapdragon APs intended for use in for example wearables. NXP supplies its '*i-MX*' line of MPUs in this segment. With regard to MCUs, there is an overlap for application specific MCUs, in particular connectivity chips, and more specifically connectivity chips implementing the Bluetooth low energy (BTLE) standard[40]. As for DSPs, the Notifying Party submits that the overlap is due to the DSP functionality of Qualcomm's baseband chips, while NXP supplies stand-alone DSPs, including Near Field Magnetic Induction ("NFMI") based chips used in IoT applications.

(52) As regards the field of application, the Notifying Party submits that semiconductors used in the IoT space can also be segmented by field of application/end-use, with one such categorisation being *hearables* (including true wireless stereo ("TWS") headphones/speakers), *wearables* (including smart glasses, smart watches, smart trackers, body sensors, wearable cameras), *smart homes* (including smart routers, home automation, entry management, white appliances, LED lighting, media devices), drones and smart cameras, and *smart cities* (energy & metering, infrastructure, industrial/building, transportation).

(53) The Notifying Party submits that both Parties provide solutions for TWS headphones, speakers, wearables, drones, smart lighting and smart appliances, but that their products serve different purposes within those categories.

5.2.2.2. The results of the market investigation and the Commission's assessment

(54) All respondents to the market investigation confirmed that semiconductors may be divided into the four main categories (ICs, discretes, optical semiconductors and sensors and actuators)[41]. Respondents also agreed that within ICs a distinction should be made between MPUs, MCUs and DSPs[42]. The vast majority of respondents

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39 Qualcomm supplies primarily connectivity chips supporting Bluetooth Classic and Wi-Fi standards; the Snapdragon MPU which has been repurposed for IoT, network processing chips packaged or integrated with Qualcomm's Wi-Fi chips, and Bluetooth low energy (BTLE) chips. NXP, in turn, supplies primarily low-power, general purpose 8/16/32-bit MCUs, 32-bit MPUs (known as i.MX application processors), connectivity MCUs supporting IEEE 802.15.4 and/or BTLE standards, and MCU/DSP using NFMI.

40 In relation to connectivity chips, the Notifying Party submits that these may be segmented by the type of wireless connectivity standard that they support in the following categories: cellular, Bluetooth ("BT") chips; Bluetooth Low Energy ("BTLE") chips; Wi-Fi chips (namely a wireless local area network (LAN) with a range of up to 100 meters); WIGig chips (namely a wireless LAN with a range of up to 50 meters); GPS chips; NFC chips; IEEE 802.15.4 chips (namely wireless personal area network with a range of up to 100 meters) and Ant+ chips (with a range of up to 30 meters).

41 See responses to question 4 of Q8 – Questionnaire to IoT customers; responses to question 4 of Q7 – Questionnaire to IoT competitors.

42 See responses to question 6 of Q8 – Questionnaire to IoT customers; responses to question 6 of Q7 – Questionnaire to IoT competitors.

consider that connectivity chips[43] have a distinct functionality from other semiconductors used in IoT (MCU, MPU)[44]. Furthermore, respondents note that connectivity chips may be further segmented in BT, BTLE, Wi-Fi, NFC and IEEE 802.15.4[45].

(55) Finally, overall, respondents to the market investigation also subscribe to the segmentation of the market by end-use proposed by the Notifying Party, although additional categories are also suggested. With regard to the segmentation by field use-application, the market investigation provided mixed results. While most of the customers consider that a distinction should, at least, be made for semiconductors used in the following function blocks: (i) hearables (including true wireless headsets), (ii) wearables (watches and fitness), (iii) drones and smart cameras, (iv) smart cities, and (v) smart home (including home entertainment), competitors' replies were mixed. In particular, Renesas and Nordic highlight that the market for standardised chips is generally a single market, and while customers can choose to put the chips in different end applications, the chips and the market for their sales is the same[46]. With regard to a potential segmentation of semiconductors in the hearables IoT space, the market investigation did not provide a clear indication on whether TWS headphones provide different functionalities respect to other semiconductors in the hearables IoT space[47].

(56) For the purposes of this Decision, the exact product market definition with regard to IoT semiconductors can be left open as the Transaction does not raise competition concerns as regards its compatibility with the internal market, irrespective of the precise product market definition.

5.2.3. Semiconductors for mobile devices

5.2.3.1. Baseband chipsets

(57) For the purpose of providing mobile cellular connectivity, mobile devices rely on a baseband processor, which enables the connection of mobile devices to mobile telecommunication networks[48].

(58) A baseband processor/modem is typically paired with two additional components to complete its functionality: the Radio Frequency ("RF") integrated circuit (or "RF transceiver")[49] and the Power Management ("PM") integrated circuit ("PMIC")[50]. All three functionalities (baseband processor/modem, RF transceiver and PMIC) are necessary for mobile cellular connectivity. Combined, the three components are

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43 Connectivity chips are ICs.

44 See responses to question 8 of Q8 – Questionnaire to IoT customers; responses to question 8 of Q7 – Questionnaire to IoT competitors.

45 See responses to question 9 of Q8 – Questionnaire to IoT customers; responses to question 9 of Q7 – Questionnaire to IoT competitors.

46 See responses to questions 10 of Q8 – Questionnaire to IoT customers; responses to questions 10 of Q7 – Questionnaire to IoT competitors.

47 See responses to questions 11 of Q8 – Questionnaire to IoT customers; responses to questions 11 of Q7 – Questionnaire to IoT competitors.

48 A baseband processor typically consists of both hardware and software. The hardware consists of an IC, made of semiconductor material, and packaged into a chip. The task of the IC is to perform the signal processing functionality according to communication protocols described by cellular standards, including GSM, UMTS, CDMA and LTE standards.

49 RF transceivers contain analogue circuitry which allows the operation of the device at the frequencies allocated to mobile communications.

50 The PMIC manages the power requirements of the mobile device.

referred to as a "baseband chipset" ("BC")[51]. Although each component can be sourced individually, they are usually sourced together.

(59) Baseband chipsets are sold either on a standalone basis ("standalone baseband chipset" or "standalone BC") or combined with an application processor ("AP") ("integrated baseband chipsets" or "integrated BC"). The AP runs the operating system and applications of mobile devices.

(60) Baseband chipsets, whether in standalone or integrated mode, implement one or multiple cellular standards from the same or from different technology families and generations. A baseband chipset might implement only one standard (so called single-mode baseband chipset), or a combination of several standards, with later generation baseband chipsets often being backward compatible with earlier standards (so-called multi-mode baseband chipsets)[52].

(61) Qualcomm supplies baseband chipsets. NXP does not. Qualcomm supplies both integrated and standalone baseband chipsets, and supplies the three components (baseband chip/modem, RF transceiver, and PMIC) both independently and combined.

A) Notifying Party's views

(62) The Notifying Party considers that the relevant baseband chipset market should include chipsets supporting all wireless communication standards, including cellular (for example, GMS, CDMA, UMTS, LTE) and non-cellular (for example, Wi-Fi, WiMAX) standards. The Notifying Party argues that cellular and non-cellular chipsets compete against each other, exert competitive constraints on each other and are substitutable both from a demand and supply side perspective.

(63) The Notifying Party considers that different iterations of the same standard constrain the pricing of other iterations of that same standard, and on the other hand, chipsets supporting other wireless standards constrain the pricing of chipsets supporting a particular cellular standard, and vice versa. The Notifying Party further argues that from the demand side, customers/end-users consider Wi-Fi and cellular wireless communication networks interchangeably, as Wi-Fi coverage is increasingly available in both public and private places, including through "hotspot" networks. On the supply side, and with particular reference to the standardised nature of the technologies incorporated in baseband chipsets, and specifications being publicly available, market entry is facilitated and companies active in a specific type of wireless communication standard are able to develop in the short/medium term solutions that extend or add other wireless communication standards to their product offering[53].

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[51] The three components are usually implemented on separate pieces of silicon and packaged into separate chips, but can also be packaged in the same chip as the baseband processor.

[52] The *Global System for Mobile Communications*, or GSM, is a cellular communication standard developed by the *European Telecommunication Standards Institute* (ETSI) to describe technologies for second generation (2G) digital cellular networks. The *Universal Mobile Telecommunications System*, or UMTS, is a third generation (3G) wireless and mobile communications standard developed by ETSI and the *3rd Generation Partnership Project* (3GPP) with capabilities going beyond 2G standards in supporting multimedia services. The UMTS standard has over time evolved to provide improved characteristics such as higher data rates of broadband connectivity. *Long-Term Evolution*, or LTE, was developed by 3GPP, further increasing the capacity and speed of data. It is commonly referred to as fourth generation (4G) standard.

[53] See the Notifying Party's response of 31 March 2017 to the Commission's request for information ("RFI") of 28 February 2017.

(64) The Notifying Party argues against a further segmentation of baseband chipsets based on the type of devices (smartphones versus other electronic devices such as tablets), by the type of smartphone (high-end versus low-end smartphones), by cellular technology (GSM, UMTS, CDMA, LTE)[54], and by functionality (distinguishing between stand-alone and integrated baseband chipsets). The Notifying Party considers that in any event, the exact product market definition can be left open, as the Transaction will not result in any affected market for baseband chipsets.

(65) In response to the Article 6(1)(c) decision the Notifying Party argues that while every iteration of a given standard and, more broadly, technology generation, paves the way for the next standard to allow for a phased evolution and elimination of possible performance issues, a segmentation of the market by standard results in an arbitrary distinction within a chain of substitution and groups together technologies with very different performance characteristics. There is furthermore a supply-side substitutability between suppliers of baseband chipsets implementing the UMTS standard and chipsets implementing the LTE standard with an overwhelming majority of suppliers that have both the technological know-how and do not require a license to produce chipsets compliant with the various technologies[55].

(66) The Notifying Party also considers that both "merchant" and "captive" sales should be included in the relevant product market for baseband chipsets; device OEMs' "captive" sales constrain "merchant" sales as vertically integrated customers are able to divert their demand to baseband chipsets developed in-house and to offer that capacity to third party customers.

(67) In response to the Article 6(1)(c) decision the Notifying Party further argues that the "captive" suppliers are given recurrent opportunities to enter the "merchant" market and such vertically integrated device OEMs can "toggle" between in-house and external supply from one device to another. The Notifying Party believes that in-house suppliers, such as Samsung, are neither capacity constrained, nor do their baseband chips lag behind technology-wise to those available on the merchant market, as evidenced by the fact that both Samsung and Huawei use their own production for some of their premium mobile devices. In addition, Samsung also supplies (limited volumes of) baseband chipsets on the merchant market, which is evidence supporting the notion that "merchant" and "captive" sales indeed form part of the same relevant market. The fact that the market analysis report by Linley Group[56] forecasts that both Samsung and Huawei will source approximately [40-50]% of their baseband chipset demand in-house shows that "captive" sales constitute a competitive constraint on "merchant" sales[57].

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54 The Notifying Party considers that instead of segmenting by cellular standard nomenclature, such as UMTS or LTE, a more appropriate segmentation would be by generation of standards, namely 2G, 2.5G, 3G, 4G, and 5G. This would also be more in line with the Commission's previous decisional practice where an analysis of the market for telecommunication network equipment was made with reference to cellular technology generations (see Commission decision of 24 July 2015 in case M.7632 – Nokia / Alcatel-Lucent).

55 See response by the Notifying Party of 28 June 2017 to the Commission decision of 9 June 2017 to initiate proceedings pursuant to Article 6(1)(c) of the Merger Regulation ('Article 6(1)(c) decision'), [Doc ID 1331].

56 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*"; Form CO, Annex 4.16 [Doc ID: 327].

57 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, [Doc ID 1331].

B) The results of the market investigation and the Commission's assessment

(68) The Commission considers that the relevant product market consists of standalone and integrated baseband chipsets, segmented by cellular standard (LTE, UMTS, CDMA, GSM) with a distinction between single-mode and multi-mode baseband chipsets. Single-mode chipsets support only one cellular standard, while multi-mode chipsets support two or more cellular standards, usually earlier generation cellular standards still in use. With regard to chipsets implementing the LTE cellular standard, a distinction is made between single-mode LTE chipsets and multi-mode LTE chipsets, where single-mode LTE chipsets do not form part of the same product market as multi-mode LTE chipsets.

a) Non-cellular v cellular connectivity

(69) Chipsets supporting non-cellular wireless communication standards such as Wi-Fi or WiMAX are not substitutable for cellular chipsets, in particular multi-mode LTE baseband chipsets[58], namely chipsets implementing the LTE cellular standard but also earlier generation standards (in particular UMTS and GSM).

(70) Wi-Fi access is not readily available to smartphone users wherever they are. This is because Wi-Fi is a wireless *local* area network (WLAN) and mostly limited to homes, work places and "hotspots". Users cannot, therefore, rely on Wi-Fi while on the move and outside "hotspot" areas. Users can connect with their smartphones to Wi-Fi and receive and send data whenever in such a local area network, but cannot rely on it elsewhere or as the primary connectivity technology for their smartphones.

(71) The argument by the Notifying Party that customers and end-users consider Wi-Fi and cellular networks to be interchangeable, giving the example of Apple marketing both a non-cellular (Wi-Fi-only) and a cellular/non-cellular (UMTS/LTE together with Wi-Fi) version of the *iPad* tablet computer as evidence of the demand-side substitutability of these technologies, is not convincing. Tablets with cellular connectivity represent only a small part of cellular mobile devices taken as a whole[59]. According to The Linley Group, voice-over-Wi-Fi has been […][60].

(72) Similarly for WiMAX, its coverage is limited and cannot, therefore, be relied upon by users for the purposes of connectivity. In 2015, less than 20% of Union households were covered by WiMAX for broadband access (with huge disparities by country, with a majority of Member States either having no WiMAX coverage or less than 5% in 2015), compared to approximately 86% coverage for the cellular LTE technology[61].

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58 "Multi-mode LTE baseband chipset" denotes a baseband chipset implementing LTE in combination with earlier generation cellular standards, in particular UMTS and GSM.

59 For example, The Linley Group indicates that smartphones count for a majority of all mobile devices shipped, with tablet shipments on the decline, especially high-end tablets such as the Apple iPad "falling rapidly". According to The Linley Group, tablets (both cellular and non-cellular versions, including e-readers) account for only some [5-10]% of the total amount of smartphones, mobile phones and tablets (including e-readers) shipped in 2017. The Linley Group estimates that by 2020, [30-40]% of tablets will have cellular baseband chips, up from [20-30]% in 2015; The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pp. 5-6, 13-14; Form CO, Annex 4.16 [Doc ID: 327].

60 See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 10; Form CO, Annex 4.16 [Doc ID: 327].

61 See for instance report published by the European Commission, *Broadband Coverage in Europe 2015: Mapping progress towards the coverage objectives of the Digital Agenda*, pp. 6, 21, 26, 27 available at: https://ec.europa.eu/digital-single-market/en/news/broadband-coverage-europe-2015.

(73) The market investigation indicates that non-cellular wireless connectivity standards (such as Wi-Fi, WiMAX) do not constitute viable alternatives to cellular connectivity standards (such as LTE, UMTS), and are not substitutable either from a demand or supply side perspective. Respondents consider that non-cellular and cellular connectivity standards have different characteristics, especially in coverage where cellular connectivity allows for wider coverage than non-cellular standards such as Wi-Fi; this is especially crucial for mobile phones where cellular technology remains the main connectivity technology[62]. Cellular connectivity has, as explained by one device OEM "*wide coverage and high mobility*" while non-cellular connectivity, such as Wi-Fi, has "*fast transmission speed and simple networking*"[63]. Sequans, a company founded "*to address the WiMAX market*" and becoming "*the acknowledged leader in WiMAX*", and currently refocused on single-mode LTE baseband chipsets mainly for IoT, confirms that the two types of technologies are not viable alternatives and "*[c]ellular technology can achieve/support application that non cellular could not like mobility, point to point access*"[64]. Hutchison summarises the distinction as follows: "*WiFi and WiMax cannot offer the same performance capabilities, coverage and, especially, mobility as cellular mobility*"[65].

b) Standalone v integrated baseband chipsets

(74) Smartphones require both a baseband processor (to send and receive cellular radio signals) and an application processor (to run the apps on a smartphone). Two main architectures can be deployed by a device OEM, namely one which is composed of standalone components (standalone baseband processors and standalone application processor) or alternatively an integrated architecture composed of a baseband processor and application processor on a single silicon die. The Commission considers that integrated and standalone baseband chipsets are substitutable.

(75) Baseband processors and other components, such as application processors, are distinct products based on product characteristics, price, intended use or application. There is no demand or supply-side substitutability between baseband processors and other stand-alone components in view of baseband processors' distinct technical characteristics and function.

(76) This is confirmed by the market investigation[66]. For instance, one device OEM respondent explained that from the demand side *"[w]hile the [application processor] and the baseband processor can be combined into a single integrated [System on Chip], the two components perform very different functions. The [application processor] cannot be used for cellular communication, and the baseband processor cannot be used to control and run the multitude of application programs and functionalities in today's complicated smartphones*". From the supply side, that same

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62 See responses to question 1 of Q9 – Questionnaire to device OEM; responses to question 1 of Q10 – Questionnaire to baseband competitors; responses to question 1 of Q11 – Questionnaire to NFC competitors; responses to question 5 of Q13 – Questionnaire to Mobile Network Operators.

63 See non-confidential response by ZTE to question 1 of Q9 – Questionnaire to device OEMs, [Doc ID: 2147].

64 See non-confidential response by Sequans to question 1.1 of Q10 – Questionnaire to baseband competitors, [Doc ID: 1672]; http://www.sequans.com/company/about-sequans/, [Doc ID 3290].

65 See non-confidential response by Hutchison to question 5.1 of Q13 – Questionnaire to Mobile Network Operators, [Doc ID: 1831].

66 See responses to question 4 of Q1 – Questionnaire to device OEMs; responses to question 5 of Q2 – Questionnaire to baseband competitors; responses to question 5 of Q3 – Questionnaire to NFC competitors; responses to question 5 of Q4 – Questionnaire to mobile audio competitors.

respondent indicated that *"[t]he [application processor] and baseband are on very different technology and process roadmaps."*[67].

(77) The market investigation indicates that, while both the baseband processor and application processor are essential for a smartphone, device OEMs would have the option of either adopting an integrated chipset, or implementing an architecture composed of a standalone baseband processor and a separate standalone application processor. One respondent among device OEMs explained that since […][68]. Another respondent explained that […][69].

(78) During the phase II market investigation, a majority of responding device OEMs confirm that the standalone and integrated solutions are viable alternatives for the provision of baseband and application processor functionalities in mobile devices[70]. Results were more varied when device OEMs considered the feasibility of replacing a discrete solution with an integrated solution (or vice versa) from a technical and commercial perspective, with respondents however indicating that technically such replacement would be possible during the design phase of a product[71]. The value of the mobile end-product does not appear a determining factor for whether one or the other architecture is chosen; in other words high-end mobiles can adopt either a standalone (AP+BC) or integrated (AP/BC) architecture[72]. Integrated baseband chipsets are in fact used in the majority of mobile devices[73]. The most important buyer of standalone chipsets is Apple that combines its own custom-made application processor with a third-party baseband chipset[74].

c) Segmentation by cellular standard

(79) The Commission considers, in line with the results of the market investigation, that baseband chipsets should be segmented by cellular standard.

(80) For a mobile device to communicate with a cellular network, the device must be equipped with a baseband chipset that complies with the cellular standard supported by that cellular network. Baseband chipsets of an earlier generation will not support a later generation cellular standard. Unless baseband chipsets are backward compatible (multi-mode chipsets), the later generation baseband chipset will also not work on networks supporting earlier generation cellular standards.

(81) As explained by Samsung, the various cellular standards are independent technologies not compatible with one another. Therefore, for a chipset to work on several networks, it must be multi-mode[75].

(82) In the European Economic Area ("EEA"), the second generation GSM, the third generation UMTS and the fourth generation LTE represent the most wide-spread cellular technologies and are used by MNOs in parallel. The CDMA standard, which

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67 See response by Samsung to question 4.1 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092].

68 See response by […] to question 5.1 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092].

69 See response by […] to question 5.1 of Q1 – Questionnaire to device OEMs, [Doc ID: 1009].

70 See responses to question 9 of Q9 – Questionnaire to device OEMs.

71 See responses to questions 10-11 of Q9 – Questionnaire to device OEMs.

72 See responses to question 12 of Q9 – Questionnaire to device OEMs.

73 See responses to question 5 of Q1 – Questionnaire to device OEMs; responses to question 6 of Q2 – Questionnaire to baseband competitors; responses to question 6 of Q3 – Questionnaire to NFC competitors; responses to question 6 of Q4 – Questionnaire to mobile audio competitors.

74 See The Linley Group: "[…]." (The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pages 33-34), Form CO, Annex 4.16 [Doc ID: 327]; see response by […] to question 5.1 of Q1 – Questionnaire to device OEMs, [Doc ID: 1009].

75 See response by Samsung to question 6.1 of Q1 – Questionnaire to device OEMs; [Doc ID: 1092].

is widely deployed in the US and China, is not used in Europe. More than [50-60]% of all new mobile phones sold in Europe now support LTE[76]. On a global level, chipsets supporting LTE are forecasted to reach [50-60]%, multi-mode UMTS chipsets [20-30]%, and GSM chipsets [20-30]% of industry shipments of baseband processors in 2017. By 2020, the chipsets supporting LTE will account for [60-70]% of basebands processors shipped[77].

(83) Earlier generation baseband chipsets do not exert competitive constraints on baseband chipsets supporting a later generation standard; the various cellular standards are not substitutable either from a demand or supply side perspective. More specifically, multi-mode LTE chipsets which are backwards compatible with earlier generation cellular standards still in use (namely UMTS and GSM) are not substitutable with single-mode GSM chipsets, multi-mode UMTS chipsets, or single-mode LTE chipsets[78]. The market investigation confirms the lack of substitutability between standards[79]. MNO respondents explain the need to continue supporting various cellular standards[80]. Telenor, for example, explains that while "[i]*n some EEA countries where Telenor operates, for instance in Denmark and Norway, UMTS and GSM is expected to be phased out and replaced with 4G and 5G only. However, due to a long transition period (years) and to support roaming networks with mainly GSM and UMTS technologies, multimode terminals from phone-manufacturers will be required for many years ahead*"[81].

(84) The data rates achieved by earlier generation cellular baseband chipsets, in particular GSM but also UMTS, are insufficient for today's smartphones, the applications running on them, and do not meet the expectations of smartphone users. LTE technology allows mobile devices, with an LTE baseband chipset, to receive and transmit large amounts of data over a LTE cellular network. As explained by Intel, chipsets supporting only 2G or 3G standards are not suitable to transfer such data volumes and are therefore not substitutes for LTE chipsets[82].

(85) Device OEMs therefore require chipsets supporting a specific (or several specific) standard(s), and may have limited demand for other standards, for example CDMA

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76 See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", p. 16; Form CO, Annex 4.16 [Doc ID: 327].

77 See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pp. 16-17; Form CO, Annex 4.16 [Doc ID: 327].

78 See responses to question 7 of Q1 – Questionnaire to device OEMs; responses to question 8 of Q2 – Questionnaire to baseband competitors; responses to question 8 of Q3 – Questionnaire to NFC competitors; responses to question 8 of Q4 – Questionnaire to mobile audio competitors; responses to question 2 of Q9 – Questionnaire to device OEMs; responses to question 2 of Q10 – Questionnaire to baseband competitors; responses to question 2 of Q11 – Questionnaire to NFC competitors; responses to question 6 of Q13 – Questionnaire to Mobile Network Operators.

79 See responses to question 6 of Q1 – Questionnaire to device OEMs; responses to question 7 of Q2 – Questionnaire to baseband competitors; responses to question 7 of Q3 – Questionnaire to NFC competitors; responses to question 7 of Q4 – Questionnaire to mobile audio competitors; responses to question 2 of Q10 – Questionnaire to baseband competitors; responses to question 2 of Q9 – Questionnaire to device OEMs; responses to question 2 of Q11 – Questionnaire to NFC competitors; responses to question 6 of Q13 – Questionnaire to Mobile Network Operators.

80 See responses to question 6 of Q13 – Questionnaire to Mobile Network Operators.

81 See non-confidential response by Telenor to question 6.1.1 of Q13 – Questionnaire to Mobile Network Operators, [Doc ID: 2221].

82 See response of Intel to question 8 of Q2 – Baseband competitors, [Doc ID: 767].

in view of its limited geographic deployment (including its absence in the EEA)[83]. In addition, according to the Linley Group, by now among smartphones "[…]"[84].

(86) Single-mode LTE chipsets are also not substitutable with earlier generation chipsets given that LTE coverage is still not ubiquitous and that voice communication is not supported by LTE mobile networks, which tend to be used for the transfer of data[85]. Although single-mode LTE cellular networks using LTE technology for both data and voice (namely "Voice over LTE" or "VoLTE" technology) exist[86], the Commission understands that MNOs mostly provide multi-mode network service on their limited bands; the LTE network is used for transferring data while GSM, UMTS and CDMA networks are used for voice communication, but also data transfer where LTE network coverage is not available[87]. MNO respondents to the market investigation confirm the need for multi-mode cellular coverage[88]. Among MNO respondents, most respondents do not see single-mode LTE chipsets as substitutable with earlier generation or multi-mode LTE chipsets[89]. Among those indicating substitutability, Iliad explains that they are substitutable only "[f]*or some (very limited) applications, like internet of things or datacom devices*" while Tele2 considers that with the introduction of VoLTE, LTE has "*a possibility to give the same coverage and voice services as GSM and UMTS and by then there is no need for GSM and UMTS*"[90].

(87) Suppliers of a baseband chipsets complying with specific cellular standards (especially earlier generation standards) are unable to switch to the supply of more recent cellular standards, in particular LTE, in a short timeframe and without incurring significant additional investments (in costs and time) or risks.

(88) The difficulty of switching is confirmed by the market investigation: most respondents consider it either difficult or very difficult for suppliers of single-mode GSM chipsets, single-mode LTE chipsets, or multi-mode chipsets compliant with both GSM and UMTS (but not LTE), to switch to the supply of multi-mode LTE

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83 See responses to questions 4-7 of Q9 – Questionnaire to device OEMs; responses to question 7 of Q13 – Questionnaire to Mobile Network Operators.

84 See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pp. 16-17; Form CO, Annex 4.16 [Doc ID: 327].

85 Intel, in response to the market investigation, indicates that "[a]*n LTE-only [baseband chipset] is not substitutable for a multi-mode [baseband chipset] because it does not offer backward compatibility and because it cannot be used for voice communications. Backward compatibility is needed because most carriers still have areas in their network that have not been upgraded to LTE. The voice issue arises because carriers have not yet implemented the VoLTE standard for enabling voice communications over the LTE networks*", see response by Intel to question 2.3.1 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307]; Pegatron explains that "*the chipset compliant with LTE standards only cannot support the functionality that end users need nowadays, e.g. in the place where LTE signal coverage is limited, it is essential for the mobile to switch UMTS mode in order to make/receive calls*.", see response by Pegatron to question 2.3 of Q9- Questionnaire to device OEMs, [Doc ID: 2054].

86 See response by LG Electronics to question 2.3.1 of Q9 – Questionnaire to device OEMs; [Doc ID: 2043].

87 See response by LG Electronics to question 2.1.1 of Q9 – Questionnaire to device OEMs, [Doc ID: 2043]; response by Samsung to question 7 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092].

88 See non-confidential responses to question 6 of Q13 – Questionnaire to Mobile Network Operators.

89 See responses to question 6.3 of Q13 – Questionnaire to mobile Network Operators.

90 See non-confidential response by Iliad and Tele2 to question 6.3 of Q13 – Questionnaire to Mobile Network Operators; [Doc ID: 1843, 1825].

chipsets[91]. One competing chipset supplier indicates that significant additional investments are needed to switch to supplying a newer generation chipset, explaining that when switching from GSM chipsets to GSM/UMTS chipsets "*little of the original GSM investment can be leveraged into UMTS development*", and similarly when switching from GSM/UMTS to GSM/UMTS/LTE "*the number of use cases that must be predicted and tested during the design process again increases exponentially. Therefore, just as the switch from GSM to GSM/UMTS requires significant time and investment as a result of increase complexity, so too does the switch to GSM/UMTS/LTE*". The respondent further explains that suppliers wishing to switch will also have to undertake "*significant additional investments in tangible assets*", including measurement systems and R&D equipment, production test equipment, development tools. In addition switching to GSM/UMTS/LTE entails "*that the certification and validation process become more complex […] and accordingly require greater resources*" and the chipset supplier will need to make additional investments in "*designing or licensing IP blocks*"[92]. With the market moving towards newer generation baseband chipsets, many leading baseband chipset suppliers in generation cellular standards have exited the market over the past decade.

(89) Switching from the supply of a single-mode LTE chipsets to multi-mode LTE chipset would also not be easy, and as one competing chipset supplier explains: "*it is likely that a supplier of single-mode LTE chipsets would have to invest significantly in both design and development costs, tangible assets in the form of measurement system and research and development equipment, testing costs, and additionally required certifications in order to switch from supplying an LTE-only chipset to a multimode LTE chipset*"[93].

(90) One device OEM respondent also indicates that not all suppliers have the technological know-how or required licences to produce chipsets compliant with the various technologies, giving Qualcomm's LTE chipsets compatible with CDMA as an example where competing suppliers of baseband chipsets may be unable to offer an alternative chipset supporting both LTE and CDMA. It is argued that this is the case because "*Qualcomm does not provide licenses to its proprietary CDMA SEPs to chip manufacturers, and Qualcomm is by far the largest owner of CD*[MA] *SEPs*"[94].

d) Merchant v captive sales

(91) For the purposes of this Decision, the Commission considers that captive sales of baseband chipsets should be excluded from the relevant product market as it is unlikely that such captive capacity could effectively constrain the merchant market.

(92) Although the Notifying Party argues that device OEMs' internal production of baseband chipsets should be included within the relevant product market, the Commission notes that only certain device OEMs (in particular Samsung and Huawei) have internal production capacity and appear to use that production

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91 See responses to question 3 of Q9 – Questionnaire to device OEMs; responses to question 3 of Q10 – Questionnaire to baseband competitors; responses to question 3 of Q11 – Questionnaire to NFC competitors.

92 See non-confidential response by Intel to question 3 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

93 See non-confidential response by Intel to question 3 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

94 See response by Samsung to question 6.1 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092]; response by Samsung to question 7 of Q2 – Questionnaire to baseband competitors, [Doc ID: 1089].

exclusively or almost exclusively for internal purposes and not to supply third party device OEMs[95]. While internal production of baseband chipsets allow an OEM to partially limit its dependence on third party baseband chipsets, the main device OEMs with in-house production, namely Samsung and Huawei, still source a significant part of their supply of baseband chipsets from the Notifying Party[96]. Samsung has indicated the existence of significant entry barriers and obstacles for a device OEM already manufacturing baseband chipsets for its internal demand to start selling them on the "merchant market" for baseband chipsets[97]. In explaining how "captive sales" by a device OEM influences the competitive parameters on the "merchant market" for baseband chipsets, Mediatek refers to captive sales being considered a "*separate market from merchant sales*"[98].

e) Conclusion

(93) The Commission considers that the relevant product market consists of both standalone and integrated baseband chipsets, segmented by cellular standard. In particular, chipsets compliant with LTE are not constrained by chipsets compliant with other cellular and non-cellular connectivity technologies. In addition, single-mode LTE baseband chipsets do not exert a constraint on multi-mode LTE chipsets that are also compliant with UMTS and GSM. In the following, unless specified, "LTE (baseband) chipsets" refers to multi-mode baseband chipsets that are compliant with LTE, UMTS and GSM. LTE baseband chipsets may or may not be compliant also with the CDMA cellular technology. Non-cellular wireless connectivity standards such as Wi-Fi and WiMAX do not constitute a competitive constraint on cellular baseband chipsets and are therefore excluded from the relevant product market. Finally, captive production of baseband chipsets, are excluded as captive capacity is not likely to effectively constrain the merchant market.

5.2.3.2. Near Field Communication/Secure Element technology

(94) NFC technology is a short-range wireless connectivity standard composed of circuitry and software that uses magnetic field induction to enable communications/exchange of data between devices when such devices touch or are brought within a few centimetres of each other. NFC generally operates in a frequency range of 13.56MHz +/- 7kHz and at a distance of ten centimetres or less.

(95) NFC chips are radio chips that support the NFC connectivity standard and enable devices to have: (i) a read/write mode (where one NFC-enabled device, interacting with another NFC-enabled device, can read in the second device or write data out to it); (ii) a card emulation mode, enabling the device to be used in a contactless

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95 See Strategy Analytics Report, September 2016, sheet 5, Form CO, Annex 4.10 [Doc ID: 327]; Strategy Analytics Report, December 2016, sheet 5, Form CO, Annex 2.3 [Doc ID: 327]; see non-confidential response by Samsung to questions 5d and 5e of RFI 28, [Doc ID: 2671].

96 See Strategy Analytics Report, September 2016, sheet 5, Form CO, Annex 4.10 [Doc ID: 327]; Strategy Analytics Report, December 2016, sheet 5, Form CO, Annex 2.3 [Doc ID: 327]. Moreover, the Commission notes that industry reports foresee that, going forward, Huawei and Samsung's internal production of baseband chipsets will not cover the entirety of their needs. See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pages 42-43, finding that Samsung will deploy its in-house technology for [30-40]% of its smartphones by 2020 and that Huawei will serve [40-50]% of its smartphones with its in-house baseband. The report also does not expect other device OEMs to develop their own LTE technology, which means that switching to internal production is not a viable option for all device OEMs, Form CO, Annex 4.16 [Doc ID: 327].

97 See non-confidential response by Samsung of 22 July 2017 to questions 5e) of RFI 28, [Doc ID: 2671].

98 See non-confidential response by MediaTek to question 9 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2628].

infrastructure to perform applications such as payments, ticketing, access control, transit, and so forth; and (iii) a peer-to-peer mode, to exchange larger sets of data (files between smartphones, receive loyalty points, and so forth).

(96) NFC technology is considered by device OEMs for mobile payments, mobile ticketing/fare collection and other uses in view of the level of security it provides and the ease of use between NFC-enabled devices.

(97) In order to ensure the security of NFC-based communications, NFC chips can be combined with various security technologies, in particular SE. SEs are tamper-resistant physical MCU chips that provide security and authentication in conjunction with NFC components to guarantee that data stored and data transmitted in an NFC communication are protected by an additional hardware-based layer of security. The SE stores payment information and authenticates transactions in a physical IC component. The SE microcontroller includes a secure operating system ("SE OS") that manages the functionality of the NFC MCU and runs the secure applications on the SE. The SE can be incorporated directly into a mobile device in the form of an "embedded" SE, or alternatively included on a mobile device's SIM card or Micro-SD card.

(98) In an SE-secured NFC solution, there are three distinctive elements: (i) the NFC controller/chip; (ii) the SE; and (iii) the SE OS.

(99) Such solutions on mobile devices can emulate multiple different types of protocols, including for instance EMV[99] and others, and enable a mobile device to interact with a variety of readers that utilise different protocols, to perform functions such as payment and transit.

(100) NXP is a leading supplier of NFC solutions, a technology it initially developed together with Sony. NXP holds a portfolio of NFC patents, both standard essential patents (SEPs) and non-SEPs.

(101) NXP develops and supplies both standalone NFC controllers/chips and integrated NFC/SE combined solutions ("NFC/SE combined solutions"). NXP supplies three types of NFC chips, namely NFC frontends, NFC controllers, and NFC tags[100]. Currently, NXP supplies only embedded SEs, integrated in the NFC/SE combined solution. NXP does not supply embedded SEs or SE OS as standalone products, but always in conjunction to an NXP NFC/SE combined solution[101]. The Notifying Party explains that such combined solutions can either be in the form of a monolithic integrated circuit in a single die incorporating both the NFC and SE component or in the form of a NFC/SE combined solution chip included in a single package as a stacked die comprising two separate dice per technology. NXP currently supplies a stacked die combined solution with all components developed in-house (including NFC, SE and SE OS), and is developing a single die combined version of this chip to

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99 EMV (Europay Mastercard Visa) is security standard for bank card payments and point of sale terminals, including mobile payment systems communicating with point of sale terminals.

100 The Notifying Party explains in the Form CO that NFC frontends are stand-alone connectivity/modem chips that process two-way communications between devices through the NFC communications protocol; NFC controllers combine an NFC frontend with an 32-bit MCU; and NFC tags are passive devices (that do not require a power source) combining NFC and MCU chips that store information and, when prompted by an NFC initiator, perform an exchange and storage of data.

101 Form CO, Annex 4.1, paragraphs 158-161 [Doc ID: 327]. In 2016, NXP had sales of NFC/SE combined solution chips (including the SE OS) for USD […] and sales for NFC standalone chips and NFC tags of USD […] and USD […] respectively. […] sales were made for standalone SE chip and SE OS.

be available for commercial launch by end 2018. The Notifying Party also explains that while STMicroelectronics has unveiled a "similar" stacked die solution as NXP, other suppliers follow a mix-and-match approach and develop one component in-house and then partner with suppliers of the other components to be able to offer a combined solution.

(102) Linked to its NFC technology, NXP has also developed MIFARE, a proprietary contactless security technology platform used in particular in transit ticketing/fare collection and similar applications (see Section 5.3.3). MIFARE can be used in connection with NFC on mobile devices, but also in other form factors, such as single-use passes, smartcards, ID badges, and fobs. On mobile devices with NFC capabilities, MIFARE can be included in the SE chip[102].

(103) Qualcomm has recently exited the NFC product space. It does not develop or sell NFC or SE chips, but holds a number of NFC patents in its portfolio. Qualcomm stopped its internal NFC development programme in […] and ceased the shipping of its NFC chips in […]. Instead of continuing to develop its own NXP solutions, Qualcomm partnered in 2015 with NXP to include NXP's NFC chips in so-called "reference designs" for Qualcomm's baseband chipsets, thus providing a "showcase" or "instruction set" for device OEM customers to follow, so as to ensure seamless integration between Qualcomm's baseband chipsets and NXP's NFC chips.

(104) In the following, the Commission will consider the product market definition for NFC chips (Section 5.2.3.2.A), for SE chips (Section 5.2.3.2.B), and for NFC/SE combined solution (Section 5.2.3.2.C) (all three including the underlying technology). The IP related to NFC technology and NXP's proprietary MIFARE technology will be assessed separately.

A) NFC chips

1. Notifying Party's views

(105) The Notifying Party considers that the precise product market definition in relation to NFC chips can be left open as the Transaction would not raise any competition concerns.

(106) The Notifying Party explains, however, that NFC is not the only secure mobile payment form but various alternative technologies exist that can perform similar functionalities to NFC chips. Such alternatives include Bluetooth Low Energy ("BTLE")[103], Quick Response ("QR") codes[104], and Samsung's proprietary Magnetic

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102 Devices with MIFARE embedded will only work with MIFARE enabled reader infrastructure. On mobile devices, it can be installed via replaceable SIM cards, embedded Universal Integrated Circuit Cards ("UICCs") and embedded SE chips.

103 The Notifying Party explains that BTLE is already used as an alternative technology to NFC, for example in the hospitality sector for the purposes of hotel room access, but is also an option for mobile payments in the retail sector. Compared to NFC, BTLE has a longer range, which the Notifying Party considers an advantage as it could "*reduce friction during the checkout process*" as consumers would not need to take their mobile device out and tap the reader to perform a mobile payment. NFC has been longer on the market than BTLE, which gives NFC an advantage, as this has resulted in more point of sales (PoS) terminals having NFC technology incorporated in view of EMV adoption. BTLE is, however, available on the majority of mobile phones, including the vast majority of iOS and Android devices (as well as emerging platforms).

104 The Notifying Party explains that QR codes are two-dimensional printed codes, similar to bar codes that interact with a smartphone or other mobile device through the camera (when the device is reading QR codes) or screen (when the device is generating readable QR codes). QR codes are being used widely for mobile payments and mobile transit applications and are garnering support from major banks that

Secure Transaction ("MST")[105] technology, "HotKnot" technology[106], and Wireless Magnetic Communication ("WMC")[107] technology.

(107) The Notifying Party submits that the use of mobile devices to execute secure mobile transactions is still nascent, with the demand for products enabling such transactions still developing and with no single technology having become ubiquitous. Rather, there is inter-technological competition, with NFC and SE solutions facing competitive constraints from such other technologies. Different players, such as ecosystem developers, banks and retailers, mobile operators, and device OEMs all have an interest in influencing and shaping the way how mobile payment transactions should be executed and may opt for one or the other technological solution.

(108) The Notifying Party argues in its reply to the Article 6(1)(c) decision that product characteristics such as the type of wireless connectivity, features, power consumption, perceived level of security, are important drivers of demand but functionality is what matters most, with the predominant purpose of NFC and SE chips the execution of mobile payments through mobile devices. To this end, there are, however, several competing technologies available, none of which has become predominant; any assumption that NFC and SE chips would become ubiquitous is therefore not grounded in facts[108].

(109) Specifically as regards NFC, the Notifying Party claims that technologies such as BTLE, QR codes and MST all share the same end use, namely of executing mobile payments, and the core functionality of enabling the communication between the seller and purchaser in a mobile payment transaction. BTLE, QR codes and MST all exert competitive constraints on NFC solutions and should be seen as substitutes rather than complements to NFC technology. Characteristics may differ in terms of the power efficiency of the technology, or required proximity to perform a communication, but the core functionality remains the same. Device OEMs might

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are promoting their own app-based digital wallets. QR code technology is a software-based mobile payment solution that can be easily deployed. In China it constitutes the primary mobile payment method.

105 The Notifying Party explains that MST was invented by Samsung and the technology mimics the magnetic strips on credit cards, allowing mobile devices to be used anywhere a magnetic strip reader is available at PoS terminals. MST technology functions in card emulation mode to act like a contactless smartcard, mainly used for payment applications. MST is more broadly deployed than NFC but is currently only used in Samsung's proprietary Samsung Pay ecosystem, which uses a combination of technologies, namely NFC, HCE, QR codes and MST, giving Samsung Pay the flexibility to work with a number of different PoS infrastructure systems. Samsung Pay works with PoS terminals in places where NFC is not available, and because any magnetic credit card reader can be used, MST is actually is more versatile than NFC. The Notifying Party concedes that the deployment of MST in the EEA is limited to four banks in Spain. The fact that the majority of PoS infrastructure in the EEA is chip and PIN based, rather than magnetic stripe-enabled PoS, poses a challenge for its success in the EEA.

106 The Notifying Party explains that HotKnot, a proprietary technology of MediaTek, using proximity and gravity sensors in conjunction with a mobile device's touchscreen. Devices featuring HotKnot use a touch sensor chip to send communication protocols, gravity sensor to ensure the actual contact between devices, and a proximity sensor to determine whether the two electronic devices are close enough to one another. As an advantage to NFC, HotKnot does not require an antenna or RF communication/NFC chip for data to be transferred, making it cheaper and easier to deploy in smartphones. The technology is used in China and included on OPPO, Joy and Yoyo smartphones.

107 The Notifying Party explains that WMC is a payment technology by LG and Dynamics Inc. which is similar to Samsung's MST, namely it allows for over-the-air transmission of data to PoS terminals with magnetic stripe readers.

108 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, [Doc ID 1331].

have specific preferences as to characteristics, but individual preferences are not representative of a whole industry[109].

2. The results of the market investigation and the Commission's assessment

(110) The Commission considers that NFC chips (and the underlying technology) constitute a separate product market, distinct from other technologies which can enable mobile payment and transport ticketing/fare collection transactions, in particular BTLE, QR codes, and MST.

(111) The Commission has previously assessed NFC based payment systems in the context of mobile payment platforms but left open the exact market definition for payment systems, including any solutions involving NFC and SE chips[110].

(112) The market investigation confirms that NFC chips are distinguishable from other technologies such as BTLE, QR codes and MST based on product characteristics, price and intended use or application[111].

(113) The market investigation also confirms that while other technologies besides NFC exist (in particular BTLE, QR codes, and MST) for the specific function of enabling a mobile payment/transport ticketing transaction, these are not viable alternatives. Such technologies have their distinct traits and are adopted by (or available to) device OEMs to varying degrees. There are also specific regional disparities in their adoption rate (for example, wide-spread use of QR codes for mobile payments in China, but insignificant deployment elsewhere).

(114) Although various technological solutions could be used to enable a mobile payment transaction, there are currently, in practice, no viable alternatives to NFC. As Gemalto explains, NFC, BTLE, QR codes and MST are all proximity contactless technologies, but NFC technology used for the purposes of mobile payment is the "*only fully backward compatible technology that enables users of mobile devices to benefit from existing services and offer a seamless user experience, with no compromise or restriction of service*"[112].

(115) NFC is also required for mobile transit ticketing solutions based on MIFARE, which is the leading transit service technology today. STMicroelectronics explains that MIFARE can "*only be addressed through NFC technology from a phone or a device*", Gemalto explains that "*if a device only had an eSE interfaced with a B[T]LE chipset, the device could not support services such as MIFARE that require a secure NFC environment*", whereas Giesecke & Devrient ("G&D") notes that currently, it is a requirement that "*ISO/IEC 14443 Type A standard is used as communication*

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109 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, [Doc ID 1331].

110 See Commission decision of 4.9.2012 in Case M.6314 – Telefonica UK/Vodafone UK/Everything Everywhere JV. In that decision, the Commission, when discussing "NFC technology" as an instrument for mobile payments, distinguished between a NFC device and a SE as distinct components, see recital 52 of that decision.

111 See response to question 10 of Q1 – Questionnaire to device OEMs; responses to question 12 of Q3 – Questionnaire to NFC competitors; responses to question 8 of Q1 – Questionnaire to device OEMs; responses to question 9 of Q2 – Questionnaire to baseband competitors; responses to question 9 of Q3 – Questionnaire to NFC competitors.

112 See non-confidential response by Gemalto to RFI 25, question 1.1, [Doc ID: 2152].

protocol, therefore it is not possible to implement MIFARE using different communication protocol other than NFC"[113].

(116) There is a distinct demand by device OEMs for NFC based solutions for mobile devices. NFC is quickly becoming a standard feature in most smartphones. According to market forecasts by the Linley Group, [80-90]% of all smartphones and [60-70]% of all handsets (up from [30-40]% in 2015) are expected to include NFC by 2020. The Linley group predicts that "[…]"[114].

(117) Market players perceive other technologies (in particular BTLE, QR codes and MST) as complements to NFC, rather than substitutes. Such technologies are not perceived as viable alternatives by most responding NFC competitors and baseband chipset suppliers, or by the main device OEMs[115].

(118) On the customer side, the largest device OEMs agree that NFC technology in smartphones is becoming a standard feature which is ultimately required by the market players further downstream, in particular network operators[116]. In light of the requirements imposed by downstream players, device OEMs cannot switch away from including NFC chips in their mobile devices. Samsung explains that "*[a]s long as Samsung's customers require NFC and SE, Samsung Mobile cannot substitute other technologies for those components. It is possible, where requested, to add any or all of the above-mentioned technologies; however, they are not alternatives to NFC/SE*"[117]. LG Electronics considers that the technology strategies of "*tier 1* OEMs" such as Apple and Samsung has an influence on the "*trend for mobile payment and/or fare collection*" and in that respect "*BTLE, QR Codes and MST do not yet constitute viable alternatives to NFC*"[118]. […][119].

(119) Some responding device OEMs indicate that while the various technologies (NFC, BTLE, QR codes, and MST) can all be used to perform mobile payment and fare collection transactions, not all have the same "traction" in the payment services industry, and have thus not reached the same adoption rate as NFC[120].

a) Substitutability between NFC and BTLE

(120) Compared to BTLE and other radio technologies, NFC with its limited range of a few centimetres, is […] than other technologies[121].

(121) The weakness of BTLE for the purposes of mobile payments and transport applications is also confirmed by NXP's internal documents. NXP lifts up, in

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113 See non-confidential response by STMicroelectronics to question 2.1 of RFI 30, [Doc ID: 2811]; non-confidential response by Gemalto to question 1.3 of RFI 25, [Doc ID: 2152]; non-confidential response by G&D to question 2.1 of RFI 26, [Doc ID: 1932].

114 See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pages 81-82; Form CO, Annex 4.16 [Doc ID: 327].

115 See for instance responses to question 5 of Q11 – Questionnaire to NFC competitors; responses to question 10 of Q10 – Questionnaire to baseband competitors; non-confidential response by Samsung to question 6 of RFI 28, [Doc ID: 2671].

116 See for instance non-confidential response of Samsung to question 2 of RFI 28, [Doc ID: 2671].

117 See non-confidential response of Samsung to question 2 of RFI 28, [Doc ID: 2671].

118 See non-confidential response of LG Electronics to question 15.1 of Q9- Questionnaire to device OEMs, [Doc ID: 2043].

119 See non-confidential response by […] to question 13 of RFI 31, [Doc ID: 2633].

120 See, for example, responses by LG Electronics, HTC Corporation, Avnet Holding, Pegatron to question 15 of Q9- Questionnaire to device OEMs, [Doc ID: 2043, 2106, 1705, 2054].

121 See The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 81; Form CO, Annex 4.16 [Doc ID: 327].

particular, the lack of infrastructure, security concerns, and weak user experience of BTLE for mobile payment and transit use cases[122].

(122) Contrary to NFC, BTLE is not perceived by the market as a well-suited technology for mobile payment transactions and lacks the security that NFC solutions allow for. BTLE is better adapted for other types of use cases, for example contactless speakers, earphones, car connection. Gemalto explains that BTLE, due to its "*functional distance range*", does not meet the requirement in payment and transit ticketing transactions for the individual user to explicitly *endorse* a transaction (for example by tapping the mobile to the POS reader)[123]. Infineon concurs, and explains how NFC was designed with security in mind and requires close proximity with the reader terminal to function, which constitutes a "*clear advantage*" of NFC over BTLE for the specific purposes of mobile payments and ticketing transactions. Infineon notes that "*bringing the device into the proximity of the terminal is considered both an element of security to ensure that only the device that is very close to the terminal is used for payment as well as an expression of user intent to pay. BTLE in the contrary is defined for longer distances between any two devices and would not meet those requirements*"[124]. Intel argues that due to the security and usability shortcomings of BTLE, it is a "*poor substitute for NFC*" for the purposes of mobile payment and fare collection[125]. Trustonic points out that BTLE being a long range technology, its usability for mobile payments might, in practice, create difficulties for the POS terminal to "*select the right nearby user for the payment transaction*"[126]. Samsung explains that BTLE, contrary to NFC, requires that the user manually sets up the connections between devices, a process which is likely to take more time compared to the almost instantaneous connection via NFC. Apart from being quicker, NFC also provides for more security, also in situations when there are multiple devices in within close proximity[127]. Another device OEM points out that "*[f]or mobile payments there are no real alternatives to NFC/SE*" with BTLE "*a solution better adapted for functionalities other than mobile payment transactions*".

(123) BTLE based mobile payment solutions cannot also benefit from the existing POS infrastructure in place which are increasingly NFC enabled, and the wider deployment of BTLE for mobile payment uses would necessitate important investments in such infrastructure[128].

(124) BTLE and NFC may have, though, complementary usages[129].

b) Substitutability between NFC and QR codes

(125) Similarly to BTLE, QR codes are also not equally well suited for enabling mobile payment transactions as NFC. Although QR codes are widely used for mobile payment in China (but also India), their use elsewhere is limited. The solution is deemed to suffer from low security. EMVCo, the technical body managing the EMV

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122 NXP internal document, "[…]", 7 April 2016, slide 3 [Doc ID 1457-24348].

123 See non-confidential response by Gemalto to question 1 of RFI 25, [Doc ID: 2152].

124 See non-confidential response by Infineon to question 1 of RFI 29, [Doc ID: 2955].

125 See non-confidential response by Intel to question 6 of Q11 – Questionnaire to NFC competitors, [Doc ID: 2303].

126 See non-confidential response by Trustonic to question 6 of Q11 – Questionnaire to NFC competitors, [Doc ID: 1725].

127 See responses by […] and Samsung to question 8 of Q1 – Questionnaire to device OEMs, [Doc ID: 1009 and 1092].

128 See for instance non-confidential response by Gemalto to question 1 of RFI 25, [Doc ID: 2152].

129 See https://nfc-forum.org/nfc-and-bluetooth-the-perfect-pair/, [Doc ID 3291]]

payment specifications, has recently, however, issued specifications also for QR code payments with its efforts "*focused on creating QR Code payment specifications that provide convenience, security and reliability in line with other EMV Specifications*"[130].

(126) The weaknesses of a QR code based mobile payment and transport ticketing solution is confirmed not only by market participants responding to the Commission's market investigation but also by NXP's internal documents. In a presentation of 2016, NXP lifts up, in particular, the security concerns of QR codes for mobile payment and transit use cases, the limited infrastructure in place and the weak user experience that QR codes offer in particular in transport applications[131]. In the market investigation, although some respondents saw QR codes and NFC as substitutes, others considered them as complementary to each other.

(127) Among the main market participants, the weaknesses of QR codes compared to NFC is confirmed by competing players such as Infineon[132], STMicroelectronics[133], and Gemalto[134]. One device OEM points to the very low security level that QR codes provide compared to NFC/SE, highlighting that while QR Codes are used in China for mobile payments, their use is limited to online payments with limitations also as to the number and size of daily/monthly transactions.

(128) Gemalto explains that QR codes, by its "*optical reading nature*" and the consequent weakness in "*reading accuracy*" and "*user experience*", are also badly adapted to ticketing and fare collection transactions that require high performance solutions to enable a "seamless flow of passengers". To function, the mobile device also needs to be powered up (it does not function in a battery-off mode) and online[135].

c) Substitutability between NFC and MST

(129) Although developed for enabling mobile payment transactions, MST technology is not a viable alternative to NFC, but rather a temporary solution, specific and limited to Samsung, to allow for backward compatibility with magnetic stripe card technology and infrastructure. Magnetic stripe technology used for payment transactions has increasingly been replaced by the EMV standard/chip card technology, especially in Europe and the Single Euro Payments Area ("SEPA"), thus limiting the relevance of MST in the EEA.

(130) MST is a proprietary Samsung technology, "*exclusive to Samsung*"[136], which is not made available to third parties, including other device OEMs. Samsung explains that while MST allows Samsung (and Samsung Pay) to connect with legacy (non-NFC) POS terminals with a magnetic stripe function, demand for MST is expected to decrease as more NFC-enabled POS terminals become available. Samsung expects this number to reach above 90% as a result of the requirement by Mastercard for POS terminals in Europe to support NFC by 2020[137].

(131) Samsung explains that MST is intended as a "*means to quickly penetrate the market by using existing magnetic card readers that are available at almost all retailers,*

130 See: https://www.emvco.com/emv-technologies/qrcodes/ , [Doc ID 3292]
131 NXP internal document: "[…]", 7 April 2016, slide 3 [Doc ID 1457-24348].
132 See non-confidential response by Infineon to question 1 of RFI 29, [Doc ID: 2955].
133 See non-confidential response by STMicroelectronics to question 1 of RFI 30, [Doc ID: 2811].
134 See non-confidential response by Gemalto to question 1 of RFI 25, [Doc ID: 2152].
135 See non-confidential response by Gemalto to question 1 of RFI 25, [Doc ID: 2152].
136 See non-confidential response by G&D to question 1 of RFI 26, [Doc ID: 1932].
137 See non-confidential response of Samsung to questions 7 and 12 of RFI 28, [Doc ID: 2671].

and is not intended to replace NFC, because most financial institutions have already established roadmaps for NFC-based payment. Some countries prohibit using MST for making payment. If Samsung adopts [a] new type of technology instead of NFC, then not only Samsung but also all stakeholders in the payment system need to replace their infrastructure (e.g., merchant POS terminals, acquirers'/issuers' spec changes, networks' spec change, service provider app changes)"[138].

(132) MST is therefore a temporary technology for backward compatibility, or as described by market participants, a "*bridging or transitional technology*" enabling mobile payment where there is a magnetic stripe infrastructure, but continuously diminishing in relevance[139].

(133) Gemalto explains that MST, due to its weak "*reading accuracy*" and "*user experience*", is also badly adapted to ticketing and fare collection transactions that require high performance solutions[140].

d) Installed base of POS terminals

(134) A key element differentiating NFC payment solutions from other available technologies for the enablement of a mobile payment transaction is the widely deployed installed base of NFC-enabled POS terminals within the EEA.

(135) Gemalto, a supplier of SE OS, notes that only NFC/SE solutions offer backward compatibility with existing commercial services for contactless cards (payment, ticketing and identity) , and thus constitute "*natural technologies to ensure business continuity for these legacy existing services when migrating from cards to mobile*" and benefit from the "*full ecosystem of readers*" already deployed. The existing reader infrastructure constitutes a significant investment, and switching away from it to equipment based on an alternative technology would be very costly. Gemalto points out that NFC proximity connectivity is the only option that can benefit from the legacy ISO/SEC 14443 reader installed base[141]. STMicroelectronics, a supplier of NFC and SE chips, explains that the ability to "*immediately comply with the existing Payment/Transport infrastructure deployed all over the world*" holds true to mobile devices integrating NFC but does not apply to other technologies, for example BTLE or QR codes[142]. The existing POS infrastructure in place in the EEA does not support such technologies[143].

(136) Interoperability of POS terminals and NFC is ensured through standardisation (ISO-14443 and NFC Forum specifications, also based on ISO-14443)[144]. Infineon explains that contrary to NFC enabled POS which exist already, there is no "*available infrastructure to support*" BTLE, MST and QR codes in the EEA[145].

(137) According to analyst firm Berg Insight, NFC-enabled points of sale terminals continue to show strong momentum in 2016 with more than 90% of new POS terminals shipped in 2016 in Europe and North America NFC-ready. Furthermore, on

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138 See non-confidential response by Samsung to question 14 of RFI 28, [Doc ID: 2671].
139 See non-confidential response by Infineon to question 1 of RFI 29, [Doc ID: 2955].
140 See non-confidential response by Gemalto to question 1 of RFI 25, [Doc ID: 2152].
141 See non-confidential response by Gemalto to question 1 of RFI 25, [Doc ID: 2152].
142 See non-confidential response by STMicroelectronics to question 1 of RFI 30, [Doc ID: 2811].
143 See for example non-confidential response of Infineon to question 1 of RFI 29, [Doc ID: 2955].
144 See response by Infineon to question 1.2. of RFI 29, [Doc ID: 2955].
145 See response by Infineon to question 1.2. of RFI 29, [Doc ID: 2955].

the global level the installed base of NFC-ready POS terminals is expected to grow from 45 million units in 2016 to 86.9 million units in 2020[146].

e) Merchant v captive sales

(138) For the purposes of this Decision, the Commission considers that captive sales of NFC chips should be excluded from the relevant product market as it is unlikely that such captive capacity can effectively constrain the merchant market beyond the ability of device OEMs with internal production to limit their reliance on third-party suppliers.

(139) The Commission notes that among device OEMs only Samsung has internal production capacity and appears to use that production exclusively or almost exclusively for internal purposes and not to supply third party device OEMs. While this internal production allows Samsung to partially limit its dependence on third party suppliers of NFC chips, the mobile device OEM still sources part of its supply of NFC chips on the merchant market from NXP[147].

(140) Captive sales do not constitute a competitive constraint on the merchant market, except to the extent that those device OEMs with in-house supply of NFC chips are able to limit their reliance on third party suppliers for those specific components.

f) Conclusion

(141) The Commission considers that other technologies which are available to enable a mobile payment or transit ticketing transaction such as BTLE, QR codes and MST are distinct from NFC and do not exert significant competitive pressure over NFC. NFC chips (including the underlying technology) should therefore be considered as a separate product market. Only NFC chips sold on the merchant market should be included in the relevant product market.

B) Secure Element

1. Notifying Party's views

(142) The Notifying Party considers that the precise product market definition for the SE functionality[148] can be left open as the Transaction would not raise any competition concerns.

(143) The Notifying Party argues, nonetheless, that there are alternative security technologies to the SE, both hardware and software based, that provide for secure authentication of mobile transactions and can facilitate mobile payment and other applications. SEs face inter-technological competition from a variety of technologies, including Host Card Emulation ("HCE")[149], Trusted Execution Environment

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146 https://www.nfcworld.com/2016/11/16/348537/nfc-ready-pos-terminals-to-hit-16m-units-worldwide-in-2016/, [Doc ID 3294]

147 See in particular The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 84, Form CO, Annex 4.16 [Doc ID: 327]; non-confidential responses by Samsung to questions 8 and 15 of RFI 28, [Doc ID: 2671].

148 The Notifying Party explains that there are different types of attach for SE chips (eSE, which stands for embedded SE in the smart mobile device and "UICC-based SE" Universal Integrated Circuit Card where the secure element resides in the SIM card).

149 The Notifying Party explains that HCE is a software-based solution which is compatible with the same PoS infrastructure as the SE. HCE is the most popular alternative to SE, and is employed in the Android Pay platform. HCE is a viable alternative to SE to carry out secure transactions. The Notifying Party explains that from a functionality perspective, both solutions can be applied to the same end-uses (including mobile payment, transport), although the two technologies function in their own manner,

("TEE")[150], and Trusted Platform Modules ("TPM")[151], the most popular solution for mobile payment authentication currently being HCE. The Notifying Party argues that many of those technologies will co-exist in the future, and that the choice of technology by the device OEMs will depend on various factors including security requirements, regional specificities, user experience, extent of use cases supported, and legacy infrastructure.

(144) According to the Notifying Party, those alternative technologies exert competitive pressure over SEs. The Notifying Party refers to a number of device OEMs (namely Huawei, Sony, LG) already using software-based security solutions instead of an SE chip and argues that mobile operating system suppliers (such as Apple, Microsoft) can similarly to Google (with its Android Pay) also implement a software solution on their mobile operating system instead of or in addition to a physical SE.

(145) As for the SE OS, the Notifying Party explains that the OS is always sold in combination with the secure hardware (for example an SE chip), with the integration of the software with the hardware taking place before shipping to the device OEM. NXP supplies the hardware and software (namely NXP's SE OS) components of its SE […]. NXP also […].

(146) Competing SE providers that do not have an SE OS developed in-house, source the SE OS from a third party supplier, such as Gemalto, Oberthur and G&D. It may therefore be possible, according to the Notifying Party, to distinguish a narrow market for the supply or licensing, or both, of SE OS to SE chip suppliers; there is no distinct demand for stand-alone SE OS from device OEMs.

(147) In response to the Article 6(1)(c) decision, the Notifying Party argues that the Commission's reasoning and the results of the phase I market investigation do not provide support for the claim that SE chips constitute a separate relevant product market. Rather, the Notifying Party puts forward arguments in support of a market definition encompassing at least HCE and SE. The Notifying Party claims, in

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different from the other. Performance wise, HCE and SE solutions are comparable but differ to the extent that a SE based solution, through its dedicated MPU, offers slightly faster transaction speeds, is always available, and requires less processing capability. The cloud-based HCE requires network connectivity, occupies more memory, and is more demanding from a processing perspective. But HCE is scalable and does not use additional physical space in the mobile device, which is an advantage in small/slim mobile devices. For OS vendors, HCE ensures that customers (device OEMs) can be offered the same payment security solution irrespective of the customers' hardware.

150 The Notifying Party explains that TEE is a secure area of the main processor in a smartphone (or any connected device) that ensures that sensitive data is stored, processed and protected in an isolated, trusted environment. TEE enables end-to-end security by enforcing protected execution of authenticated code, confidentiality, authenticity, privacy, system integrity and data access rights. Compared to other security environments on the device (like SE, HCE and TPM), TEE also offers high processing speeds and a large amount of accessible memory. TEE technology is used in mobile payments to protect payment credentials while a transaction is being authorised and offers a trusted user interface which ensures that the correct information is displayed to the user and that the information displayed on screen and entered by the user is secure. TEE technology can also be used for mobile public transport functions. TEE is a “tamper-resistant” function block in an AP, which can be programmed to ensure that sensitive data is stored, processed and protected in an isolated trusted environment. TEE resists against all software attacks as well as the physical attacks performed on the main memory of the system. TEE can be used in conjunction with HCE, in which case the HCE software is installed in the TEE.

151 The Notifying Party explains that TPM is a hardware based solution, namely a chip that provides security functions, found most commonly as a component on motherboards of laptops and desktops for corporate or government users. They can also be installed in consumer devices and are sold as independent components.

particular, that HCE as an alternative technology to SE cannot be ignored and refers to the "*strength of its proponents*", mentioning Google and Microsoft and to its wide use across mobile devices. The Notifying Party argues that HCE is supported as a security technology for mobile payment transactions by credit card providers such as Mastercard and used by Android Pay when executing a payment, "*even if that particular device includes an SE*". While HCE may provide a lower security level than SE, such level is, according to the Notifying Party, "*a choice, not a requirement, for mobile payments*" and not a sufficiently distinctive element to distinguish SE chips from other types of security technology solutions. Also, how different security technologies affect the speed of a payment transaction or whether the HCE technology requires specific software or cloud-based architecture only reflect the fact that HCE and SE are alternative technologies. Further, the Notifying Party argues that while HCE can be applied cumulatively with a SE it does not signify that the two technologies cannot be seen as alternatives to each other. Finally, the Notifying Party reaffirms its claim that the secure element space remains "*quite clearly nascent*"[152].

2. The results of the market investigation and the Commission's assessment

(148) The Commission considers that while NFC mobile transactions can be secured through the use of an SE, which currently allows for the highest level of securitisation of a mobile transaction, there are also other technologies available which may be (and are) used for the same purpose. Those other technologies include, in particular, HCE and TEE.

(149) In the Article 6(1)(c) decision the Commission took the preliminary view that SE chips, including the SE OS, would constitute a separate product market, distinct from HCE, TEE and TPM, and consequently carried out its competitive assessment on that basis. Following the phase II market investigation, the Commission considers that the product market for securing NFC based mobile payment transactions may, however, be wider than simply SE chips (including the SE OS), and include other security technologies such as in particular HCE and TEE.

(150) For the purposes of this Decision, the exact product market definition can be left open.

(151) The phase I market investigation indicated that SE chips should be distinguished from other types of security technologies used for payment and transport applications such as HCE, TEE, and TPM based on product characteristics, price, intended use or application, but responses were mixed when asked whether such technologies would be complementary or alternative to SE[153]. A mixed picture emerges also following the phase II market investigation[154]. In particular HCE and TEE are mentioned by respondents as viable alternatives to SE in securing an NFC transaction.[155] TPM, on the other hand, is seen as a technology developed for the PC world, and targeting use cases different from mobile payment and ticketing; it is not deemed an alternative

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152 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, [Doc ID 1331].

153 See responses to questions 9-10 of Q1 – Questionnaire to device OEMs; responses to question 11 of Q2 – Questionnaire to baseband competitors; responses to questions 11-12 of Q3 – Questionnaire to NFC competitors.

154 See responses to questions 17 and 19 of Q9 – Questionnaire to device OEMs; responses to questions 12 and 14 of Q10 – Questionnaire to baseband competitors; responses to questions 7 and 9 of Q11 – Questionnaire to NFC competitors.

155 See for instance the non-confidential response by Trustonic to questions 7 and 9 of Q11 – Questionnaire to NFC competitors, [Doc ID: 1725].

technology to secure NFC transactions; one respondent sees it as a "*function*" of the embedded SE[156].

(152) The main factors distinguishing SEs from other technologies are the high level of security and speed that SEs can provide to payment and ticketing transactions[157]. On the other hand, technologies such as HCE, TEE are "*easy to deploy and less cost*[ly], *but* [provide] *less security*", and in addition do not work without battery (HCE and TEE) or offline (HCE)[158].

(153) Overall, however, and despite the numerous claims of the technologies offering a lower level of security than SE, the responses to the market investigation give a certain degree of support[159] to the notion that alternative technologies, in particular TEE and HCE, may nonetheless provide a *sufficient* level of security for the purposes of mobile payment or fare collection transactions (or both) to constitute a competitive alternative to SEs[160]. A certain degree of substitutability may, therefore, exist between the various technologies, especially from a demand side.

(154) A distinguishing factor mentioned by market participants, which may, however, put SEs completely apart from other security technologies, is the proprietary NXP transit technology platform MIFARE, which is the leading transit service technology in the world today, and which currently only runs on the SE. To the extent that MIFARE is a required functionality on a mobile device, SEs would not be substitutable with any of the other security technologies for the purposes of NFC mobile transactions.

(155) Supporting the notion that the market is wider than simply SEs, is the fact that mobile device OEMs already today employ various security technology solutions to secure NFC transaction on their devices. Existing mobile payment solutions use alternative solutions: Android Pay uses HCE or a combination of HCE and TEE, while Samsung Pay and Apple Pay rely on SEs for securing the NFC transaction. Samsung Pay can also use HCE in combination with TEE; the choice of technology being dependent on network carriers. Samsung explains as follows "[s]*ome carriers (generally those with their own payment solutions which use the SE) prohibit Samsung Pay from using the SE, so in those cases, Samsung will be required to use TEE/HCE instead for Samsung Pay*"[161].

(156) In its internal documents, NXP lists "[…]" for HCE technology, in particular its suitability for the purposes of securing mobile payments, ticketing/fare collection and access.

(157) According an internal presentation of 7 April 2016, NXP explains that "[…]" and indicates that it provides a "[…]". According to NXP, the limitations that HCE

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156 See for instance non-confidential response by Gemalto to question 1.1b) of RFI 25, [Doc ID: 2152]; non-confidential response by Infineon to question 1.1b) of RFI 29, [Doc ID: 2955]; non-confidential response by STMicroelectronics to question 1.1b) of RFI 30, [Doc ID: 2811].

157 See responses to questions 19, 20 of Q9 – Questionnaire to device OEMs; responses to questions 14, 15 of Q10 – Questionnaire to baseband competitors; responses to questions 9, 10 of Q11 – Questionnaire to NFC competitors.

158 See for instance non-confidential response by ZTE to question 20 of Q9 – Questionnaire to device OEMs, [Doc ID: 2147]; non-confidential response by Gemalto to question 1.1 of RFI 25, [Doc ID: 2152].

159 Most respondents are not able to provide an answer to this question.

160 See responses to question 22 of Q9 – Questionnaire to device OEMs; responses to question 17 of Q10 – Questionnaire to baseband competitors; responses to question 12 of Q11 – Questionnaire to NFC competitors.

161 See non-confidential response by Samsung to question 12(b) of RFI 28, [Doc ID: 2671].

suffers from do not apply to SE technology: from a security perspective HCE is deemed to pose a financial risk and raises privacy concerns; from an infrastructure scalability perspective, HCE is weak for various reasons including its lack of support of offline POS readers, lack of MIFARE support; and from a user experience perspective, HCE is only suitable for low value payments, low value tickets (single trip tickets), and low security access. As a key limitation compared to SE, NXP highlights the fact that HCE cannot be used for mobile payment or ticketing if the mobile device is without battery or offline[162].

(158) In another internal presentation of June 2016, in the context of […], NXP lists the security and infrastructure limitations of HCE, claiming that […]. It also highlights the limitations of HCE for transit applications, namely […][163].

(159) The distinctiveness and superiority of SE compared to the other security technologies to be used with NFC is echoed by the main competitors in the NFC/SE space and customers/device OEMs[164]. Infineon, a supplier of embedded SEs, considers that NFC implementation based on SE will "*become the de-facto standard*", and technologies such as TEE and HCE provide a lower level of security[165]. STMicroelectronics, a supplier of both NFC and embedded SE chips, explains that for mobile payment, the embedded SE has a "*real advantage in term of intrinsic security and convenience of use*" compared to HCE/TEE. Likewise, in mobile ticketing, STMicroelectronics suggests that only the embedded SE can fulfil the security certification levels required by for example MIFARE[166]. Gemalto, a supplier of SE OS, also confirms the distinctiveness of the NFC/SE combination for the purposes of mobile payment, especially with MIFARE, by stating that although NFC could be combined with TEE and HCE, this would result in the provision of "*less secure services not suitable for all use cases (an in particular, not suitable for transit applications based on Mifare for instance)*"[167]. Finally, G&D, a supplier of SE OS,

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162 NXP internal document, "[…]", 7 April 2016, slides 4-5 [Doc ID 1457-24348].

163 NXP internal document, "[…]", June 2016, slide 3 [Doc ID 1457-24347].

164 See for instance non-confidential response by Infineon to question 1.1b) of RFI 29, [Doc ID: 2955]; non-confidential response by Gemalto to question 1.1b) of RFI 25, [Doc ID: 2152]; non-confidential response by G&D to question 1.1.b) of RFI 26, [Doc ID: 1932]; non-confidential response by G&D to question 1.1b) of RFI 26, [Doc ID: 1932]; non-confidential response by STMicroelectronics to question 1.1b) of RFI 30, [Doc ID: 2811]; non-confidential response by Samsung to questions 6, 10, 11 of RFI 28, [Doc ID: 2671]; response by Samsung to question 9 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092].

165 Infineon considers that TEE based implementations "*can be compromised and misused*"; HCE is described as a "*cloud-based alternative*" to SE for mobile payment use cases, albeit with "l*ower level of security*". Infineon explains that the payment tokens in a HCE solution are stored in the open memory of a mobile device, but can also be stored on an embedded SE. Although seen as a low-security alternative to SE for mobile payments, Infineon does not consider HCE a viable alternative for mobile transport/fare collection use cases, as it is unable to "*meet the speed requirements of transport applications*". TPM is described as unsuitable for mobile payment and fare collection use cases ("*The features and functions of a TPM product cannot be used to implement mobile payment and mobile ticketing applications*"); TPM is used to ensure the integrity of devices and ensuring/supporting data protection, for example protecting the pass-code of BitLocker hard disk drive encryption in personal computers; see non-confidential response by Infineon to question 1.1 of RFI 29, [Doc ID: 2955].

166 STMicroelectronics further deems TPM "*definitely not suitable to support use cases brought by NFC technology (such as payment and transport)*"; see non-confidential response by STMicroelectronics to question 1 of RFI 30, [Doc ID: 2811].

167 Gemalto indicates that a combined solution of TEE, HCE and tokenisation methods "*offers a valid option*" for mobile payments, but has its limitations to the extent that it provides less protection for off-line payments, it does not work when the mobile device is in a battery-off mode, and it "*requires an upgrade of the transaction processing backend*". For the use case of mobile ticketing, Gemalto

affirms that TPM is not an alternative technology to embedded SEs for securing an NFC mobile transaction, while HCE and TEE would necessitate "*additional provisions/investments in the infrastructure*" compared to an NFC solution based on the embedded SE. It admits that there is currently a "*mixed landscape of eSE/non-eSE based mobile payment solution*"[168].

(160) The distinctiveness of the SE compared to other technologies like HCE, TEE and TPM is supported also on the demand-side by device OEMs.

(161) Samsung does not see HCE, TEE and TPM as viable alternatives to SEs[169], and explains that from a demand-side perspective, cloud-based solutions such as HCE "*will continue to be viewed as providing inadequate security for most mainstream applications*"[170]. An NFC solution secured by HCE alone "is not sufficient" and would need to be complemented by other technologies, such as SE, for the purposes of high-security financial transactions[171]. Compared to hardware based security solutions such as TEE and TPM, Samsung considers the SE to have "*significant head start*", and the significant hardware investments already made by device OEMs with respect to SE "*will have a "lock-in" effect going forward, regardless of the features presented by competing technologies*". In explaining why the TEE is rather a complement to the SE, Samsung notes that the TEE is designed as a "*hidden/mini*" OS that "*boots simultaneously with Android and has priority over Android*", thus allowing it to "*take priority over input and then securely transmit that input to a secure area without the risk of any Android functions intercepting such input*." Samsung notes that because of this priority over Android, the TEE "*has been further developed by Samsung to act as a "tunnel" when a user inputs sensitive input so that TEE will securely tunnel that input straight into the SE*", thus complementing the function of a SE[172].

(162) […][173]. […][174].

(163) Another device OEM also confirms that TEE and HCE are not viable alternatives to the hardware based SE solution, not least because of lower security levels: TEE is more a software environment than a hardware solution (like SE) and it is also not possible to store data on TEE; HCE has not been very successful in Europe, one of the reasons being the much lower level of security it offers compared to SE.

(164) Similarly to NFC chips, there is a distinct demand by device OEMs for NFC based solutions combined with a SE. For device OEMs, there is little option to switch away from NFC solution which relies on the SE for its security. This is all the more the case when MIFARE is needed. As Samsung puts it: "*As long as Samsung's customers require NFC and SE, Samsung Mobile cannot substitute other technologies for those components. It is possible, where requested, to add any or all*

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considers that TEE could be used but would require "*a re-design of the application and would bring major limitations like longer transaction time and no battery-off mode*"; see non-confidential response by Gemalto to questions 1.1 and 1.3 of RFI 25, [Doc ID: 2152].

168 See non-confidential response by G&D to questions 1.1 and 1.4 of RFI 26, [Doc ID: 1932].

169 See non-confidential response by Samsung to questions 6 and 10 of RFI 28, [Doc ID: 2671].

170 See response by Samsung to question 9 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092].

171 See non-confidential response by Samsung to question 10 of RFI 28, [Doc ID: 2671].

172 See non-confidential response by Samsung to question 11 of RFI 28, [Doc ID: 2671]; non-confidential response by Samsung to question 9 of Q1 – Questionnaire to device OEMs, [Doc ID: 1092].

173 See non-confidential response by […] to question 11b. of RFI 31, [Doc ID: 2633]; non-confidential response by […] to questions 9-10 of Q1 – Questionnaire to device OEMs, [Doc ID: 1009].

174 See response by […] to question 9 of Q1 – Questionnaire to device OEMs, [Doc ID: 1009].

of the above-mentioned technologies; however, they are not alternatives to NFC/SE"[175]. […][176].

(165) On the supply side, most competing suppliers of NFC/SE solutions confirm the distinct demand for NFC combined with SE. Gemalto explains there is no switching by device OEMs from NFC solutions relying on the SE: Apple and Apple Pay make use of NFC and SEs, while Android devices, even where other security technologies than SEs are installed, those manufacturers "*also continue to install eSEs*". In fact securing NFC mobile transactions with a SE "*remain mandatory for usages such as mass transit ticketing* […]"[177]. STMicroelectronics argues that "*at this stage,* [STMicroelectronics] *see most of large OEMs strongly committed to the usage of embedded Secure Elements*" for the purpose of enabling mobile payment services[178]. Infineon also expects continued reliance by device OEMs on SEs for mobile payments, as switching away from SEs to HCE or TEE would imply that OEMs (namely Samsung and Apple) would decide to "*degrade security of their solutions*", and this is not seen as a likely prospect[179].

(166) Finally, as regards the SE OS, the market investigation has indicated that the SE OS should be distinguished from other types of software running on a smartphone due to its specific function and the applicable certification requirement[180]. While most respondents also thought that the SE OS could be distinguished as a separate product from the SE chip[181], device OEMs indicate that they purchase SE OS in combination with SE chips rather than on a stand-alone basis[182]. This confirms the Notifying Party's view that no distinct demand from device OEMs exist for standalone SE OS. NXP, in any event, does not license or sell its SE OS on a standalone basis to third parties, and is not, therefore, active on any (narrow) market for standalone SE OS.

a) Merchant v captive sales

(167) For the purposes of this Decision, the Commission considers that captive sales of SE chips should be excluded from the relevant product market as it is unlikely that such captive capacity can effectively constrain the merchant market.

(168) The Commission notes that among device OEMs only Samsung and, to a very limited extent, Huawei have internal production capacity and appear to use that production exclusively or almost exclusively for internal purposes and not to supply third party device OEMs. While this internal production allows Samsung and Huawei to partially limit their dependence on third party suppliers of SE chips, the mobile device OEMs still source part of their SE chips on the merchant market[183].

(169) Captive sales do not constitute a competitive constraint on the merchant market, except to the extent that those device OEMs with in-house supply of SE components are able to limit their reliance on third party suppliers for those specific components.

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175 See non-confidential response by Samsung to question 6 of RFI 28, [Doc ID: 2671].

176 See non-confidential response by […] to question 13 of RFI 31, [Doc ID: 2633].

177 See non-confidential response by Gemalto to question 1.4 of RFI 25, [Doc ID: 2152].

178 See non-confidential response by STMicroelectronics to question 1.4 of RFI 30, [Doc ID: 2811].

179 See non-confidential response by Infineon to question 1.4 of RFI 29, [Doc ID: 2955].

180 See responses to question 11 of Q1 – Questionnaire to device OEMs; responses to question 14 of Q2 – Questionnaire to baseband competitors; responses to question 14 of Q3 – Questionnaire to NFC competitors.

181 See responses to question 13 of Q2 – Questionnaire to baseband competitors; responses to question 13 of Q3 – Questionnaire to NFC competitors.

182 See responses to question 12 of Q1 – Questionnaire to device OEMs.

183 See non-confidential responses by Samsung to questions 8 and 15 of RFI 28, [Doc ID: 2671].

b) Conclusion

(170) The Commission considers that while there are a number of elements that support distinguishing SEs (including the SE OS) from other technologies, in particular HCE and TEE, the question as to whether the relevant product market should be wider than SEs to also include other technologies can be left open for the purposes of this Decision. The competitive assessment will be carried out on the possible product market of embedded SEs (including the SE OS), which is the market where NXP holds the most market power. Embedded SE is the only type of SEs currently supplied by NXP, and it supplies them only as part of the company's combined NFC/SE solution, and not as a standalone product[184]. Carrying out the competitive assessment by using a wider product market definition, namely one which would comprise not only SE but also alternative technologies, in particular HCE and TEE, would be unlikely to raise any additional concerns, considering in particular the more limited market position of NXP on such wider product market[185].

C) Combined NFC/SE solutions

(171) The Commission considers that the NFC/SE combined solution constitutes a distinct product market, separate from the market for standalone NFC chips and SE chips (including SE OS).

(172) The market investigation has shown that device OEMs have different procurement strategies with respect to the components required for the NFC solution included on their mobile devices. To the extent that the device OEM opts for an NFC solution secured with a SE (instead of for example a combination of NFC with HCE and TEE), it can either purchase standalone components or a NFC/SE combined solution[186].

(173) Device OEMs tend to opt for the combined solution, for which there is a distinct demand from device OEMs.

(174) Samsung explains that depending on use-case, device OEMs may opt to procure only standalone NFC chips (especially when an application does not require a SE), while in other cases, device OEMs decide to purchase either a combined NFC/SE solution, or a standalone NFC solution for some of its smartphones and a combined solution for other smartphones, especially those smartphones implementing a mobile payment system such as Samsung Pay or Apple Pay[187].

(175) G&D points out that while various approaches are used by device OEMs to obtain "*best of breed solutions*" which correspond to their respective preferences "*the continuous integration of the NFC and SE chips into a single package (SIP – System*

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184 See Form CO, paragraph 767; Annex 4.1 to the Form CO, paragraphs 156, 161.

185 In relation to alternative technologies such as TEE, HCE and others, the Notifying Party indicates in the Form CO, paragraph 822 "*To the best of the Parties' knowledge, there is no available share of supply data for these alternative technologies. However, NXP expects that its overall share of supply would* […]".

186 See responses to question 13 of Q1 – Questionnaire to device OEMs; responses to question 16 of Q3 – Questionnaire to NFC competitors; non-confidential response by Samsung to question 16c of RFI 28, [Doc ID: 2671].

187 See non-confidential response by Samsung to 16.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 1095]; non-confidential response by Samsung LSI to question 15.1 of Q2 – Questionnaire to baseband competitors, [Doc ID: 1089].

in Package) and even a single die (piece of silicon)" has led to the reduction of device OEMs' ability to combine standalone components by themselves[188].

(176) The combined solution can either be a single die or a stacked die solution. According to the Notifying Party, only stacked die solutions (or system-in-package; "SiP") are currently available on the market, with single die solutions are still in development, including by […][189].

(177) Combined solutions comprise, on the one hand, solutions where all three components (NFC, SE, SE OS) are supplied and developed in-house by one supplier (NXP being the only such supplier today), and, on the other hand, mix-and-match solutions with components supplied and developed by two or three separate suppliers. Such mix-and-match solutions are considered by most market participants that expressed a view on the matter as viable alternatives to NXP's combined solution[190].

(178) Component manufacturers comprise STMicroelectronics (which manufactures NFC and SE chips), Infineon (SE chips), Oberthur (SE OS), G&D (SE OS), and Gemalto (SE OS). Apart from its integrated NFC/SE chip, NXP also supplies stand-alone NFC chips (but does currently not sell stand-alone SE chips). In addition, as mentioned in recitals (139) and (168), each of Samsung and Huawei also has in-house supply capabilities for NFC and SE chips (Samsung) or SE chips (Huawei).

(179) Suppliers of stand-alone components can either integrate their components with those from other suppliers and subsequently sell the combined solution to device OEMs, or sell their own components to third parties for integration, with the combined solution subsequently sold to device OEMs by the integrator. Such a set-up may be one where the SE supplier sells chips to the SE OS supplier that in turn sells the combined SE and SE OS to a NFC chip supplier that ultimately sells the combined NFC/SE solution to device OEMs[191].

(180) Device OEMs can opt for a mix-and-match solution, comprising of the components from various suppliers; alternatively they can opt for the NXP's combined solution.

(181) Device OEMs may exclusively procure the combined NFC/SE solution from NXP; others may exclusively procure a mix-and-match solution. Yet other device OEMs procure both a combined solution from NXP and a mix-and-match solution from competing suppliers. In-house developed components may also be used by device OEMs in the mix-and-match solution they adopt.

(182) For the purposes of this Decision, the Commission considers that separately from the markets for stand-alone NFC chips and stand-alone SE chips (including the SE OS) a separate product market can be identified for combined NFC/SE (including the SE OS) solutions. The competitive assessment will also be carried out on this basis.

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188 See non-confidential response by G&D to question 16 of Q3 – Questionnaire to NFC competitors, [Doc ID: 742].

189 See Form CO, paragraph 870.

190 See non-confidential version of responses to question 29 of Q9 – Questionnaire to device OEMs; non-confidential replies to question 19 of Q11- Questionnaire to NFC competitors.

191 See for example non-confidential response by Gemalto to question 1.8 of RFI 25, [Doc ID: 2152]; non-confidential response by Gemalto to question 16 of Q3 – Questionnaire to NFC competitors, [Doc ID: 678].

5.2.3.3. Mobile Audio – speech enhancement software and smart amplifiers

(183) In the mobile audio segment, the Parties overlap in relation to speech enhancement software and smart amplifier chips. Those two products provide support to audio and voice functionalities within mainly smartphones and other mobile devices.

(184) Speech enhancement solutions are software-based solutions that provide calling enhancements for mobile devices. Such enhancements include noise suppression and echo cancellation. The software can be installed on the application processor, digital signal processor, Systems on a Chip ("SoC"), audio codecs, and baseband modems in mobile devices (and other products such as smart speakers, infotainment products and smart cameras).

(185) Smart amplifier chips are hardware-based discrete components that amplify a signal to allow for a better quality "speakerphone" audio transmission. Smart amplifier chips are placed between the application processor, the audio codec and the speaker in a mobile device.

(186) Qualcomm supplies its speech enhancement software product '*Fluence*' […]. Qualcomm's software is available for integration on the company's Snapdragon processors and some recent MDM baseband chipsets. Through its Hexagon Access Program ("HAP"), Qualcomm facilitates the use of rival suppliers' speech enhancement software solutions with its baseband chipsets.

(187) Since 2015, Qualcomm also supplies smart amplifier chips ('*Aqstic*') as part of its integrated baseband chipset business. Aqstic is not supplied on a stand-alone basis, and is only available with the latest generation Snapdragon processors (namely, Snapdragon 820 and later generations). Qualcomm explains that many of its high-end Snapdragon platforms use a smart amplifier chip from rival suppliers (namely Maxim or Texas Instruments).

(188) NXP supplies a stand-alone speech enhancement software solution named '*LifeVibes*', which is marketed to device OEMs, and is compatible with Qualcomm baseband chips.

(189) As for smart amplifier chips, NXP offers two different solutions for mobile devices, namely DSP-based turnkey solutions and DSP-less architecture smart amplifiers, which are sold on a stand-alone basis and can be integrated with other components of mobile devices, namely the speakers, audio codecs and baseband chips from third party suppliers, including Qualcomm.

A) Speech enhancement software

1. Notifying Party's views

(190) With regard to speech enhancement software, the Notifying Party refers to the Commission's previous decisions, in which it considered that software markets could be segmented on the basis of (i) the different functionalities of the software and the sector concerned, and (ii) the end uses offered by the particular software. With particular regard to functionality, the Commission considered a distinction between the following types of software[192]: (i) infrastructure software (that is to say, servers and databases), (ii) middleware (that is to say, integration platforms), (iii) application software and office software, and (iv) operating/browser software. The Commission

[192] See Commission decision of 15 December 2014 in case M.7458 – IBM / INF Business of Deutsche Lufthansa; Commission decision of 20 June 2011 in case M.6237 – Computer Sciences Corporation / iSOFT Group.

also made a further distinction between consumer and business software within the application software segment, and between high-end, mid-range and low-end software[193].

(191) The Notifying Party considers that, based on the Commission's previous decisions, speech enhancement software should be considered to be a type of application software for consumers as it provides a particular range of functionalities and a further distinction between high-, mid-, and low-end software could be made based on the technology and functionalities offered.

(192) The Notifying Party considers, however, that the precise product market definition in relation to speech enhancement software can be left open as the Transaction would not raise any competition concerns.

2. The results of the market investigation and the Commission's assessment

(193) With regard to speech enhancement software, the phase I market investigation supports the notion that speech enhancement software solutions are a distinct product and perform a distinct function from other components within a mobile device[194].

(194) The Commission therefore considers that speech enhancement software constitutes a separate product market, distinct from other components in a mobile device, including smart amplifier chips, and from other software products performing different functions. For the purposes of this Decision, a narrower product market consisting of speech enhancement software for mobile devices incorporating a Qualcomm baseband chipset can also be considered, but whether such further segmentation is warranted can be left open as the Transaction would not raise any concerns as to its compatibility with the internal market in either case.

B) Smart amplifiers

1. Notifying Party's views

(195) With regard to smart amplifier chips, the Notifying Party refers to the Commission's decisional practice to segment semiconductor devices by type of semiconductors[195], and argues that smart amplifier chips can be qualified as an analog or logic IC, which can further be categorised as an Application Specific Standard Product ("ASSP") for mobile/communication devices. The Notifying Party explains further that smart amplifiers may also include a digital signal processor.

(196) The Notifying Party considers, however, that the precise product market definition in relation to smart amplifiers can be left open as the Transaction would not raise any competition concerns.

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193 See Commission decision of 20 June 2011 in case M.6237 Computer Sciences Corporation/iSOFT Group; Commission decision of 26 January 2011 in case M.5984 Intel/McAfee; Commission decision of 20 July 2010 in case M.5904 SAP/Sybase.

194 See responses to question 16 of Q1- Questionnaire to device OEMs; responses to question 10 of Q4 – Questionnaire to mobile audio competitors.

195 See Commission decision of 17 September 2015 in Case M.7585 – NXP Semiconductors/ Freescale Semiconductor.

2. The results of the market investigation and the Commission's assessment

(197) The phase I market investigation indicated that smart amplifier chips constitute a distinct product performing a distinct function from other components within a mobile device[196].

(198) The Commission therefore considers that smart amplifier chips constitute a separate product market, distinct from other components in a mobile device, including speech enhancement software. For the purposes of this Decision, a narrower product market consisting of smart amplifier chips for mobile devices incorporating a Qualcomm baseband chipset could also be identified, but whether such further segmentation is warranted can be left open as the Transaction would not raise any concerns as to its compatibility with the internal market in either case.

5.2.4. Transit service technologies

(199) In the transit service technology segment, NXP is active with its proprietary contactless security technology platform MIFARE. This technology is compatible with NFC.

(200) Apart from transit ticketing and fare collection, MIFARE can be used in other (similar) applications such as in the hospitality sector (namely for hotel room doors), access cards in companies and governments, campus cards in higher education institutions. MIFARE products are used as credentials in more than 40 end-user applications.

(201) The Notifying Party explains that there are different version of MIFARE which are designed for different applications and security needs, the most important ones being MIFARE Classic, MIFARE Plus, and MIFARE DESFire[197]. All three versions can be used in connection with NFC in mobile devices. Other NFC compatible platforms are FeliCa and CIPURSE. On mobile devices, MIFARE can be installed on the embedded SE, but also on embedded Universal Integrated Circuit Cards ("UICCs") and via replaceable SIM cards[198].

(202) The Notifying Party explains that MIFARE operates on the ISO/IEC 14443 RF standard using 13.56 MHz frequency. This same frequency is used by NFC to communicate. Because of the use of this same RF standard, it is explained that

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196 See responses to question 15 of Q1- Questionnaire to device OEMs; responses to question 9 of Q4 – Questionnaire to mobile audio competitors.

197 The Notifying Party presents the three main versions of MIFARE as follows: *MIFARE Classic* is the first MIFARE version, introduced more than two decades ago. This first version of MIFARE has been compromised (its encryption can be broken and hacked) and is consequently not recommended for security-type applications, but is still used in legacy systems that rely on a MIFARE Classic infrastructure, like public transport and non-security type access applications (for example in hospitality), and occasionally in new systems with low security requirements; *MIFARE Plus* is a subsequent, more secure version of MIFARE that can run in two security modes, namely a standard security mode (compatible with MIFARE Classic), and a higher security mode; and *MIFARE DESFire* having the additional benefit of being able to perform more than one application on the same chip. It is designed for multi-application functionality in transport, micropayment, access management, and identification solutions. Another version is MIFARE Ultralight, designed for limited use, but high volume applications and described as "*ideal for low-cost, high-volume applications such as public transport, loyalty cards and event ticketing, serving as the perfect contactless replacement for magnetic stripe or barcode, addressing the trend of switching entire systems to purely contactless solutions*" and counting limited use tickets in public transport, event ticketing and loyalty and closed loop payment schemes as key applications; see Form CO, paragraph 770 and https://www.mifare net/en/products/chip-card-ics/mifare-ultralight/, [Doc ID 3282].

198 Devices with MIFARE embedded will only work with MIFARE enabled reader infrastructure.

"*MIFARE can be implemented in NFC-capable mobile devices by adding the appropriate encryption protocol to the SE component incorporated in the phone. Working together, the NFC and SE components emulate the functionality of a MIFARE contactless card and connect to reader/terminals using the same RF standards*"[199].

(203) For the purposes of public transport ticketing and fare collection, the Notifying Party explains that the infrastructure of a specific public transport system using MIFARE-enabled smartcards does not need to be adapted to be able to read a MIFARE-enabled mobile device as long as the same version of MIFARE is used. MIFARE, however, allows for a degree of customisation by the public transport authority or the system integrator, and this customisation must be mirrored in the MIFARE version on mobile devices (usually on the app developed by the public transport authority) to allow it to work. It is technically possible to also use a MIFARE-enabled mobile device for various different public transport systems, each transport system providing its own app for downloading on the mobile device. Competing schemes to the MIFARE, such as CIPURSE and FeliCa can also be installed on the same NFC-enabled mobile device.

(204) NXP licenses its MIFARE technology to competing suppliers of NFC/SE products and includes it on […] of the NFC/SE products it ships to customers[200].

(205) Qualcomm is not active in this market segment.

5.2.4.1. Notifying Party's views

(206) The Notifying Party does not provide an assessment of MIFARE for the purposes of product market definition. It does, however, indicate that apart from MIFARE, other transport ticketing technologies are also available for similar use cases, especially mobile ticketing and fare collection, in NFC compatible mobile devices. According to the Notifying Party, such other technologies comprise the CIPURSE[201] open securing standard, the FeliCa[202] technology by Sony, and the Calypso contactless ticketing system developed by a number of European transport operators and authorities[203]. In addition, the Notifying Party indicates QR Codes, or the "open loop" EMV based mobile wallets (such as Apple Pay, Android Pay, Samsung Pay) as alternatives to MIFARE, giving the London Underground as an example of the deployment of EMV in parallel to MIFARE[204].

(207) Furthermore, the Notifying Party explains that to date the utilisation of MIFARE on mobile devices has been low and that while it is expected that MIFARE in NFC-enabled mobile devices will eventually be used in applications for which MIFARE-enabled smartcards are currently used, such as transit and access control, and despite a large number of NFC/SE products currently shipped containing MIFARE, that capability is currently not being used by the main mobile device OEMs[205]. The

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199 See Form CO, paragraph 777.

200 The Notifying Party explains that in 2016, NXP shipped […] NFC/SE units which were MIFARE enabled; [40-50]% of NXP's NFC/SE shipments included a MIFARE implementation, including […] NFC/SE shipments intended for Android devices; see Form CO, paragraph 779.

201 See for instance: http://www.osptalliance.org/the_standard; [Doc ID 3283]

202 See for instance: https://www.sony net/Products/felica/about/index.html; [Doc ID 3284]

203 See for instance: https://www.calypsonet-asso.org/content/european-project; [Doc ID 3285]

204 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, paragraph 115, [Doc ID 1331].

205 See Form CO, paragraphs 779, 995; see response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, paragraph 105, [Doc ID 1331].

Notifying Party explains that while embedded SE chips may be MIFARE enabled, this does not mean that MIFARE is implemented in the mobile device. Currently no mobile devices containing MIFARE enabled embedded SEs can be used for mobile transit[206].

5.2.4.2. The results of the market investigation and the Commission's assessment

(208) The market investigation indicates the existence of alternative technologies to MIFARE for transit ticketing (including CIPURSE[207], Calypso). However, many amongst the respondents consider that MIFARE has specific advantages over other technologies employed for public transport. Respondents mention reliability, security, execution speed, and implementation and maintenance costs as key characteristics of MIFARE[208]. Key market players (namely Samsung, Gemalto, G&D) make reference to the wide deployment, installed base and high switching costs for transport authorities as elements distinguishing MIFARE from other competing technologies[209].

(209) Thales, a solution provider for fare collection in public transportation, summarises the various technologies as follows: "*Mifare and CiPurse are both designed for a compromise between security strength, cost effectiveness and speed performance, which are key requirements for mass transit markets. QR code is very cheap but has inherent security weakness and can sometimes be very slow to read. EMV is very secure, but pretty slow for mass transit. O[n] the top of that using EMV cards requires complying with banking security standards, which makes the overall cost of implementation high and the return on investment debatable for many transport operators*"[210].

(210) The responses to the market investigation also indicate that while mobile ticketing and fare collection via smartphone may still be limited today, transport companies are expecting such a move in the next few years[211]. Mobile devices are increasingly MIFARE enabled and the attach rate in respect of MIFARE is expected to increase, and more so than competing technologies such as Calypso or CIPURSE, in the next two to three years[212].

(211) When asked about expectations as to the development of usage and instalment of FeliCa, Calypso and other technologies on smartphones in the next two-to-three years, as compared to MIFARE technology, the responses by market participants suggest an increased importance for MIFARE[213]. Oberthur notes that "*MIFARE is de*

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206 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, paragraph 106, [Doc ID 1331].

207 According to ABI Research presentation "*Transportation Ticketing Technologies Market Update*" of 2 January 2015 CIPURSE "[…]", [Doc ID: 1334-6854].

208 See responses to Q12 – Questionnaire to Public transit authorities; responses to Q14 – Questionnaire to Reader infrastructure integrators.

209 See responses to question 51 of Q3 – Questionnaire to NFC competitors.

210 See non-confidential response by Thales to question 6.1 of Q14 – Questionnaire to reader infrastructure integrators, [Doc ID: 2037].

211 See non-confidential responses to question 9 of Q12 – Questionnaire to Public transport authorities.

212 See responses to question 49-51 of Q1 – Questionnaire to device OEMs; responses to 42-44 of Q2 – Questionnaire to baseband competitors; responses to questions 48-50 of Q3 – Questionnaire to NFC competitors.

213 See non-confidential responses to question 49 of Q1 – Questionnaire to device OEMs; non-confidential responses to question 42 of Q2 – Questionnaire to baseband competitors; non-confidential responses to question 48 of Q3 – Questionnaire to NFC competitors.

facto a dominant technology in transport"[214], G&D refers to the "[c]*lose to 80% market share in public transport*"[215], while Gemalto explains that MIFARE "*is and will remain the dominant technology while FELICA and Calypso will be fringe technologies used on very few public transport systems*"[216].

(212) Gemalto further explains the importance of MIFARE for smartphones as follows: "*[t]he fact that more and more consumers will want to use smartphones for contactless payment including for public transportation means that smartphone OEMs will want to ensure that their devices are NFC-enabled and will support MIFARE by including an MIFARE-enabled SE in their devices*"[217].

(213) Various technologies therefore exist in the transit service technology space, including MIFARE, Calypso, and CIPURSE. Those technologies may, however, not be fully substitutable from a demand-side perspective, neither at the level of device OEMs that incorporate such technologies on the mobile devices to allow for mobile ticketing, nor at the level of local transport authorities to the extent that such authorities have already opted for one technology for contactless ticketing in their network. Conversely, when a transit service system is set up, a transport authority would have various options to choose from, including MIFARE, Calypso, CIPURSE. Some market participants have argued, nonetheless, that MIFARE and other technologies such as FeliCa and Calypso may be complementary rather than substitutes from a device OEMs perspective[218]. Gemalto explains that device OEMs do "*want their smartphones to support contactless payment systems such as FELICA and Calypso that are used on some public transport systems, but this is always in addition to MIFARE*", whereas G&D notes that "*Felica, Calypso and other [t]echnologies are to be considered as complementary […] not resulting in the [s]ubstitution […] of the requirement for Mifare*"[219].

(214) The phase II market investigation has also shown that it is not common for transit authorities to change transit service technology given the significant switching costs[220].

(215) […][221].

(216) Gemalto […] notes that "*[t]he rollout of contactless payment to a city's transport system requires significant technology-specific investments. For travel[l]ers to be able to pay via their smartphones, readers need to be installed that are equipped with chips on which MIFARE is installed. In addition to the cost of readers; approval procedures, testing and other installation costs further contribute to the cost of setting up a contactless payment technology. As such, switching to an alternative technology would be very costly. Alternative technologies for contactless payment on*

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214 See non-confidential response by Oberthur to question 48.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 761].

215 See non-confidential response by G&D to question 48.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 742].

216 See non-confidential response of Gemalto to question 48.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 678].

217 See non-confidential response by Gemalto to question 46.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 678].

218 See responses to question 48 of Q1 – Questionnaire to device OEMs; responses to question 47 of Q3 – Questionnaire to NFC competitors.

219 See non-confidential responses by Gemalto and G&D to question 47.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 678, 742].

220 See responses to questions 7-8 of Q12 – Questionnaire to Public transit authorities.

221 See non-confidential response by […] to question 19m of RFI 31, [Doc ID: 2633].

public transportation exist and are used in some cites (e.g. Calypso, which is used in Brussels, Paris, Lisbon, Milan and certain other cities in Europe; or FeliCa which is used in Japan and Hong Kong). However the large technology-specific investments required to implement a contactless payment system (amounting to several tens of million Euros per city) mean that cities that have already opted for MIFARE are unlikely to switch to alternative contactless technologies any time soon."[222].

(217) Thales, a leading reader infrastructure integrator, notes however, that while MIFARE is a technology which it integrates in its solutions, it is only one such technology "*amongst other technologies*" and alternatives to it exist[223].

(218) Respondents to the market investigation, however, stress the importance for NFC/SE products for mobile devices to be MIFARE-enabled and consider that such importance is likely to further increase in the coming years[224]. Respondents also indicate that MIFARE is already today a particularly important "must have" technology for mobile ticketing, and device OEMs increasingly require NFC/SE technology to be MIFARE enabled[225].

(219) The Commission concludes, based on the phase I and phase II market investigation, that transit service technologies constitute a separate product market, comprising not only MIFARE, but also other technologies such as Calypso, FeliCa and CIPURSE. All those separate technologies can be installed on mobile devices for the purposes of allowing mobile ticketing using NFC. While there are indications of specific demand by device OEM for NFC/SE products which are MIFARE enabled, this is a function of MIFARE's very wide deployment/installed base across the EEA and globally and the resulting market power that its position entails.

5.2.5. Intellectual Property (SEPs and non-SEPs)

(220) Patents that are essential to a standard are those that cover technology to which a standard makes reference and that implementers of the standard cannot avoid using in standard-compliant products. Those patents are known as standard-essential patents (SEPs). SEPs are different from patents that are not essential to a standard ("non-SEPs"). This is because it is generally technically possible for an implementer to design around a non-SEP to comply with a standard. By contrast, an implementer typically has to use the technology protected by a SEP when manufacturing a standard-compliant product.

(221) In previous decisions[226], the Commission concluded that each SEP represents a separate relevant technology market, as it is necessary to comply with a standard and

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222 See non-confidential response by Gemalto to question 49.1 of Q3 – Questionnaire to NFC competitors, [Doc ID: 678].

223 See non-confidential response by Thales to question 13.1 of Q14 – Questionnaire to Reader infrastructure integrators, [Doc ID 2037].

224 See responses to question 47 of Q1 – Questionnaire to device OEMs; responses to question 41 of Q2 - Questionnaire to baseband competitors; responses to question 46 of Q3 – Questionnaire to NFC competitors.

225 See responses to questions 50-51 of Q1 – Questionnaire to device OEMs; responses to question 49 of Q3 – Questionnaire to NFC competitors; responses to question 50 of Q3 - Questionnaire to NFC competitors.

226 See Commission decision of 13 February 2012 in Case M.6381 – Google / Motorola Mobility; Commission decision of 4 December 2013 in Case M.7047 – Microsoft / Nokia; Commission decision of 29 April 2014 in Case AT.39939 – Samsung. Enforcement of UMTS standard essential patents; Commission decision of 29 April 2014 in Case AT.39985 – Motorola – enforcement of GPRS standard essential patents.

thus cannot be designed around. By definition, there is no alternative or substitute for a SEP. As explained in *Google / Motorola Mobility*, "[a] *company wishing to produce goods complying with a certain standard cannot do so without either a licence to the technology incorporated in that standard or by infringing the patents covering that technology. Prior to the adoption of a standard, multiple technologies may have competed. However, once a standard has been adopted and widely implemented by the industry and in the absence of competing standards, firms that use these technologies may be severely limited in their ability to use another technology. The very purpose of choosing a standard is that the industry coordinates on a specific technological solution at the expense of alternative technologies. Inter-technology competition that existed before is therefore impeded and any alternative technologies or technical solutions that may have had the same functionalities as the one chosen as the standard technology may have a significantly reduced value. In other words, once the standard is set, and in the absence of a competing standard, technology competition is largely eliminated. […] The specificity of SEPs is that they have to be implemented in order to comply with a standard and thus cannot be designed around, i.e. there is by definition no alternative or substitute for each such patent. Therefore, each SEP constitutes a separate relevant technology market on its own.*"[227].

(222) With regard to non-SEPs, the Commission's decision in *Google / Motorola Mobility* noted as follows: "*As regards non-SEPs, the commercial importance of these patents varies. Such patents are not part of a formal technical standard, the nature of many such patents may be incremental, and it is often easier to design around a patent falling in this category. Non-SEPs may relate to features used to differentiate competitors' products on the market, thus creating dimensions on which firms aggressively compete. This being said, non-SEPs could also potentially be the basis for foreclosure of rivals and possible abusive conduct. For example, in exceptional circumstances, notably where a technology has become an indispensable input for competitors, a refusal to grant access to that technology may be abusive*."[228].

5.2.5.1. Notifying Party's views

(223) The Notifying Party refers to point 22 of the Technology Transfer Guidelines for the purposes of product market definition in the context of patents and licensing, which reads: "*The relevant technology markets consist of the licensed technology rights and its substitutes, that is to say, other technologies which are regarded by the licensees as interchangeable with or substitutable for the licensed technology rights, by reason of the technologies' characteristics, their royalties and their intended use. Starting from the technology which is marketed by the licensor, it is necessary to identify those other technologies to which licensees could switch in response to a small but permanent increase in relative prices, that is to say, to the royalties. An alternative approach is to look at the market for products incorporating the licensed technology rights […].*" [229].

(224) The Notifying Party considers that on a general level and for market definition purposes, licensed patents should be considered as a family rather than as individual patents under national law. This is especially the case in sectors where both licensing

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227 See Commission decision of 13 February 2012 in Case M.6381 – Google / Motorola Mobility.

228 See Commission decision of 13 February 2012 in Case M.6381 – Google / Motorola Mobility.

229 Communication from the Commission – Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, Official Journal C89, 28.03.2014, p.3-50.

and competition in downstream product markets takes place at a supra-national level, which is the case in the semiconductor and mobile device industries. While recognising that a single invention can be patented under various different national systems, it nonetheless remains a single invention. This would not mean, however, that each patent family would form its own relevant product market[230].

(225) The Notifying Party refers to the Commission's decisions in relation to market definition of SEPs, namely that each SEP constitutes a separate product market, but refrains from endorsing such an approach. Instead, the Notifying Party puts forward observations on the implications that such an approach on market definition would necessarily have. The Notifying Party contends that if indeed each SEP constitutes a separate product market, the SEP holder will be a monopolist on those markets, and consequently a combination of SEPs cannot give rise to any horizontal overlaps: there is no increment of market share when the SEP holder is already a monopolist with 100% market share on the market. With reference to the Commission's previous decisions, the Notifying Party also pinpoints the alleged dominant position that each holder of a SEP would have in respect of the SEPs it holds, and to the significant market power that the mere fact of holding such SEPs may give rise to.

(226) The Notifying Party notes, however, that despite such decisions, NXP does not have market power in respect of NFC or NFC SEPs (as evidenced, according to the Notifying Party, by the responses to the phase I market investigation). According to the Notifying Party there is therefore a "*clear tension*" between the Commission's approach to market definition and the assessment on the market power of NXP in respect of its NFC IP, which leads to conclude that the Commission's approach to market definition in respect of SEPs may, in fact, be incorrect[231].

(227) If each SEP constitutes a separate market, this would exclude the possibility of there being a relevant market for all NFC patents or for an NFC patent portfolio to the extent such a portfolio would include SEPs (which is the case for NXP and Qualcomm).

(228) The Notifying Party suggests that the relevant product market could be wider, and include not only NFC patents but also patents reading on other technologies which are viable substitutes to NFC. This could be the case considering the strong inter-technological competition and the existence of viable substitutes to NFC technology and, by extension, viable substitutes to NFC patents including NFC SEPs.

(229) With regard to non-SEPs, the Notifying Party considers that while all non-essential NFC patents could hypothetically form a single product market, this would be a "*crude and meaningless classification*" which would not take account of substitutability or the lack thereof between patents and groups of patents. Alternatively, non-essential NFC patents could be categorised by "*their broad technological function*", namely "*Air interface (Inter-device)*", "*Device aspects (Intra-device)*", "*Use cases/services*", and "*Security*", but such categorisation would again not be meaningful as many patents within each category would be complements rather than substitutes[232]. The Notifying Party also considers the notion of competition between NFC portfolios as unconvincing, as portfolios of licensed IP including NFC patents, could be seen as complements rather than substitutes.

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230 See response by the Notifying Party to question 6 of RFI 34 [DOC ID 02333].

231 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, [Doc ID 1331]; response by the Notifying Party to question 6 of RFI 34 [DOC ID 02333].

232 See response by the Notifying Party to questions 1.c.i and 6 of RFI 34.

(230) The Notifying Party considers that the precise approach to product market definition in respect of NFC patents can be left open as no concerns arise under any plausible market definition[233].

5.2.5.2. The results of the market investigation and the Commission's assessment

(231) The results of the phase I and phase II market investigation indicate that the Commission's conclusions in its previous decisions are also valid for NXP's and Qualcomm's SEPs for NFC and cellular technologies respectively[234]. One respondent notes that […][235].

(232) With regard to other IP that does not qualify as SEPs, the Commission notes that both Qualcomm and NXP possess IP that is relevant for the purpose of NFC technology. Given that NFC technology can be viewed as a separate product market, the Commission considers that non-SEP IP related to NFC technology may be viewed as a distinct product market from non-SEP IP related to other technologies (as well as from SEP IP related to NFC). The Commission notes, however, that contrary to SEPs, a non-SEP for a given functionality/product may in theory be substitutable with another non-SEP which allows making that same functionality/product or even with another non-SEP which allows making a substitutable functionality/product.

(233) The phase I market investigation generated mixed responses to the question as to whether non-SEP IP related to NFC technology could be designed around or alternative technologies could be used to achieve the same functionality. Intel explains that "*[i]t is impossible to design around all NFC non-SEPs. One reason for this is that certain core legacy technologies that are part of NFC are covered by non-SEPs. These patents cover basic aspects of NFC technology that are so fundamental that it would be impossible to pass an NFC compliance test without infringing on at least some of them. For example, the manner in which an NFC chipset works with an SE chipset is a core aspect of NFC technology, and is patented but not necessarily standardized. […] In addition, it may be impossible to produce a competitive chip from the standpoint of power, performance, or form factor without infringing non-SEP differentiating patents.*"[236]. Conversely, Microsoft explains that non-SEPs in the software space can be worked around, and would "*only achieve market power by virtue of competition on the merits with other solutions*"[237].

(234) In any event, the market investigation did not provide any evidence that NXP's NFC non-SEPs are commercially essential.

(235) The Commission also notes that NXP licenses its NFC IP to third parties not as single patents but as a group of patents[238]. It has […][239]. In addition it has […][240]. NFC has also […][241].

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233 See response by the Notifying Party to question 6 of RFI 34 [DOC ID 02333].

234 See responses to question 14 of Q1 – Questionnaire to device OEMs; responses to question 16 of Q2 – Questionnaire to baseband competitors; responses to question 17 of Q3 – Questionnaire to NFC competitors.

235 See response by […] to question 14 of Q1 – Questionnaire to device OEMs, [Doc ID: 1009].

236 See non-confidential response by Intel to question 14.2 of Q11- Questionnaire to NFC competitors, [Doc ID: 2303].

237 See non-confidential response by Microsoft to question 14.1 of Q1 – Questionnaire to device OEMs, [Doc ID: 776].

238 See responses to question 16 of Q11 – Questionnaire to NFC Competitors.

(236) The Commission considers that, in line with its previous decisions, each SEP related to cellular and NFC technology should be considered as a separate market. The Commission also considers that non-SEP IP related to NFC technology may be viewed as a distinct product market from non-SEP IP related to other technologies. The exact product market definition for non-SEP IP relevant for the purpose of NFC technology is, however, left open.

5.3. Geographic market definition

5.3.1. All relevant semiconductor products (automotive semiconductors, IoT semiconductors, baseband chipsets, NFC, SE, and combined NFC/SE chips, smart amplifiers)

5.3.1.1. Notifying Party's views

(237) The Notifying Party recalls that the Commission has considered the geographic scope of semiconductor markets in its previous decisions and concluded that the markets may be at least EEA-wide, if not worldwide, although the precise geographic scope of those markets was left open[242].

(238) The Notifying Party submits that the geographic market definition in the Commission's previous cases, notably in *NXP/Freescale*, should also be retained in this Decision and that the relevant geographic market for all semiconductors should be considered as worldwide in scope. It is further argued that as market conditions in the semiconductor industry have not changed materially, there is no justification to define narrower markets than the worldwide market. In fact, suppliers of semiconductors conduct business on a worldwide basis, with recourse to manufacturing plants located around the world; suppliers compete on a worldwide level; customers have cross-border sourcing strategies and also compete on a worldwide level; no regulatory barriers to trade of semiconductors on a worldwide level exist, there are no quotas, tariffs, or technical specifications that could hinder cross-border trade; and transportation costs remain low, with minimal impact on pricing.

(239) The Notifying Party also notes that it is not aware of any EEA-specific variations in relevant product segments that would mean that shares of supply at the EEA level would differ materially from the Parties' and their competitors' worldwide shares of supply. Consequently, worldwide shares of supply could also be broadly representative of the market position of the Parties and their competitors at the EEA level[243].

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239 See copies of license agreements with […] provided as Annex 4.15.5 and Annex 4.15.6 to the Form CO.

240 See copies of license agreements with […] provided as Annex 4.15.3, Annex 4.15.1 and Annex 4.15.4 to the Form CO.

241 See copy of license agreement with […] provided as Annex 4.15.2 to the Form CO.

242 Commission decision of 24 June 2002 in Case M. 2820 - STMicroelectronics/AlcatelMicroelectronics; Commission decision of 3 July 2001 in Case M.2439 - Hitachi/STMicroelectronics/SuperH JV; Commission decision of 10 August 2007 in Case M. 4751- STM/Intel/JV; Commission decision of 27 June 2008 in Case M. 5173 - STM/NXP/JV; Commission decision of 25 November 2008 in Case M. 5332 - Ericson/STM/JV; Commission decision of 2 December 2009 in Case M.5535 - Renesas Technology/NEC Electronics; Commission decision of 23 November 2015 in Case M.7686 – Avago/Broadcom; and Commission decision of 17 September 2015 in Case M.7585 – NXP Semiconductors/ Freescale Semiconductor.

243 See response by the Notifying Party to questions 1-2 of RFI 54.

5.3.1.2. The results of the market investigation and the Commission's assessment

(240) In *NXP/Freescale*[244], based on the market investigation, the Commission found that the geographic scope of the semiconductor markets was likely to be worldwide in scope, as competition between suppliers is worldwide, transport costs are very low, and price differences among regions are small. The exact market definition was, however, ultimately left open.

(241) The market investigation in this Decision provides strong indications that the various possible semiconductor markets are likely to be worldwide in scope[245]. This is also in line with the Commission's previous decisions, in particular *NXP/Freescale*[246].

(242) For the purposes of this Decision, the Commission therefore concludes that the geographic scope of the semiconductor product markets relevant in this case, including semiconductors for automotive applications, semiconductors for IoT applications, and semiconductors for mobile devices (baseband chipsets, NFC, SE, and combined NFC/SE chips, and smart amplifiers) is likely worldwide.

5.3.2. Speech enhancement software

5.3.2.1. Notifying Party's views

(243) In its previous decisions[247], the Commission considered the market for software products and took the view that the geographic scope of the market was at least EEA-wide, but ultimately left the exact geographic market definition open.

(244) The Notifying Party agrees with that assessment and considers that the market for software (including speech enhancement software) is worldwide in scope based on the same justifications as for semiconductor devices, including the fact that software may be uploaded/downloaded anywhere in the world and transport costs are negligible or non-existent.

(245) The Notifying Party also notes that it is not aware of any EEA-specific variations that would mean that shares of supply at EEA level would differ materially from the Parties' and their competitors' worldwide shares of supply for speech enhancement software. Consequently, worldwide shares of supply could also be broadly representative of the market position of the Parties and their competitors at the EEA level[248].

5.3.2.2. The results of the market investigation and the Commission's assessment

(246) With regard to software products, the market investigation indicates that device OEMs source speech enhancement solutions from both vendors located in the EEA

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244 See Commission decision of 17 September 2015 in case M.7585 – NXP Semiconductors / Freescale Semiconductor.

245 See responses to question 18 of Q1 – Questionnaire to device OEMs; responses to question 17 of Q2 – Questionnaire to baseband competitors; responses to question 18 of Q3 – Questionnaire to NFC competitors; responses to question 12 of Q4 – Questionnaire to mobile audio competitors; responses to questions 22-23 of Q5 – automotive competitors; responses to questions 23-24 of Q6 – Questionnaire to automotive customers; responses to question 12 of Q7 – Questionnaire to IoT competitors; responses to question 12 of Q8 – Questionnaire to IoT customers.

246 See Commission decision of 17 September 2015 in case M.7585 – NXP Semiconductors / Freescale Semiconductor.

247 See Commission decision of 15 December 2014 in case M.7458 – IBM / INF Business of Deutsche Lufthansa; Commission decision of 20 July 2010 in case M.5904 SAP/Sybase.

248 See response by the Notifying Party to questions 1-2 of RFI 54.

and in the rest of the world[249]. Similarly, suppliers of speech enhancement software supply customers on a worldwide basis[250].

(247) The exact geographic market definition can, however, be left open as the Transaction does not raise competition concerns with respect to speech enhancement software irrespective of the exact geographic market definition.

5.3.3. Transit service technologies

5.3.3.1. Notifying Party's views

(248) The Notifying Party does not provide an assessment of MIFARE or transit service technologies for the purposes of geographic market definition. It notes, however, that competition takes place on a worldwide basis[251].

5.3.3.2. The results of the market investigation and the Commission's assessment

(249) The various leading transit service technologies such as MIFARE, FeliCa, and Calypso are offered on a worldwide basis, although deployed to various degrees in different regions. MIFARE is the leading worldwide transit service technology, deployed in 750 cities worldwide[252]. FeliCa is primarily used in Japan, but has also been deployed for transit systems elsewhere, including in Hong Kong, India, Indonesia, Singapore[253]. Calypso, initially developed by a number of European transit operators, is deployed across 125 cities in 25 countries, with primary focus on certain European countries (including France, Belgium, Italy) but also in Israel, Canada, Mexico, and several North African countries[254].

(250) Customers of transit system technologies comprise transit authorities worldwide, as well as device OEMs to the extent that such technologies are included on the mobile devices for mobile ticketing purposes. Similarly to other components, device OEMs procure transit system technologies, including in particular NFC/SE solutions that are MIFARE enabled, on a worldwide basis, while MIFARE enabled NFC/SE solution providers offer their MIFARE enabled products to customers worldwide[255].

(251) The Commission concludes, therefore, that the market for transit service technologies is likely worldwide.

5.3.4. Intellectual Property (SEPs and non-SEPs)

5.3.4.1. Notifying Party's views

(252) For the purposes of geographic market definition, the Notifying Party refers to Article 1(1)(l) of the Technology Transfer Block Exemption Regulation[256], and point 24 of the Technology Transfer Guidelines, which reads: "*The 'relevant geographic market' is defined in Article 1(1)(l) of the TTBER and comprises the area in which*

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249 See responses to question 18 of Q1 – Questionnaire to device OEMs.

250 See responses to question 12 of Q4 – Questionnaire to mobile audio competitors.

251 See response by the Notifying Party to questions 1-2 of RFI 54.

252 See for instance: https://www.mifare.net/en/; [Doc ID 3286].

253 See for instance: https://www.sony net/Products/felica/usecase/index html; [Doc ID 3287]

254 See for instance: https://www.calypsonet-asso.org/news/calypso-technology-worldwide-deployment, [Doc ID 3289]; https://www.calypsonet-asso.org/news/soon-all-smartphones-calypso-inside-france, [Doc ID 3288].

255 See responses to question 18 of Q1 – Questionnaire to Device OEMs; responses to question 18 of Q3 – Questionnaire to NFC competitors.

256 Commission Regulation 316/2014 on the application of Article 101(3) of the Treaty on the Functioning of the European Union to categories of technology transfer agreements, Official Journal L93, 28.03.2014, p.17-23.

the undertakings concerned are involved in the supply of and demand for products or the licensing of technology, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighbouring areas because the conditions of competition are appreciably different in those areas The geographic market of the relevant technology market(s) can differ from the geographic market of the relevant product market(s)"[257].

(253) The Notifying Party also refers to the Commission's decisional practice concerning the geographic scope of the market for the licensing of (cellular) SEPs, which the Commission has considered to be at least EEA wide.

(254) With regard to NFC chips, the Notifying Party argues that this technology is implemented throughout the EEA, but is also implemented to some extent in other jurisdictions around the world. Considering that it is common practice in the industry to grant worldwide licenses for patent portfolios, the Notifying Party concludes that the geographic scope of the relevant market for non-SEP IP related to NFC to be worldwide in scope.

(255) Nevertheless, the Notifying Party considers that the exact definition can be left open with respect to NFC patents as the Transaction would not raise any concerns under any plausible market definition[258].

5.3.4.2. The results of the market investigation and the Commission's assessment

(256) In its previous decisions, the Commission considered the market for the licensing of SEPs as being at least EEA-wide[259]. For the purposes of this decision, the Commission considers this conclusion to remain valid.

(257) Similarly to SEPs, also the market for the licensing of non-SEP IP relevant for the purpose of NFC technology is likely to be at least EEA-wide. The Commission notes, in this context, that NXP has entered into worldwide NFC IP licensing agreements with competitors ([…]) and customers ([…]) active in all parts of the world[260]. NXP's MIFARE licensing agreements have similarly also a worldwide scope and have been entered into with market players active in various parts of the world.

(258) For the purposes of this decision, the Commission considers that the geographic market definition for non-SEP IP relevant for the purpose of NFC technology can be left open.

6. COMPETITIVE ASSESSEMENT – HORIZONTAL NON-COORDINATED EFFECTS

6.1. Analytical framework

(259) The Horizontal Merger Guidelines describe horizontal non-coordinated effects as follows:

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257 Communication from the Commission – Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements, Official Journal C89, 28.03.2014, p.3-50.

258 See response by the Notifying Party to question 6 of RFI 34 [DOC ID 02333].

259 See Commission decision of 13 February 2012 in Case M.6381 – Google / Motorola Mobility.

260 See copies of license agreements provided as Annex 4.15.1 ([…]), Annex 4.15.2 ([…]), Annex 4.15.3 ([…]), Annex 4.15.4 ([…]), Annex 4.15.5 ([…]), and Annex 4.15.6 ([…]) to the Form CO.

"*A merger may significantly impede effective competition in a market by removing important competitive constraints on one or more sellers who consequently have increased market power. The most direct effect of the merger will be the loss of competition between the merging firms. For example, if prior to the merger one of the merging firms had raised its price, it would have lost some sales to the other merging firm. The merger removes this particular constraint. Non-merging firms in the same market can also benefit from the reduction of competitive pressure that results from the merger, since the merging firms' price increase may switch some demand to the rival firms, which, in turn, may find it profitable to increase their prices. The reduction in these competitive constraints could lead to significant price increases in the relevant market.*"[261].

(260) Therefore, a merger giving rise to such non-coordinated effects might significantly impede effective competition by creating or strengthening the dominant position of a single firm, one which, typically, would have an appreciably larger market share than the next competitor post-merger.

(261) However, under the substantive test set out in Article 2(2) and Article 2(3) of the Merger Regulation, also mergers that do not lead to the creation of or the strengthening of the dominant position of a single firm may create competition concerns. Indeed, the Merger Regulation recognises that in oligopolistic markets, it is all the more necessary to maintain effective competition[262]. This is in view of the more significant consequences that mergers may have on such markets. For this reason, the Merger Regulation clarifies that "*under certain circumstances, concentrations involving the elimination of important competitive constraints that the merging parties had exerted upon each other, as well as a reduction of competitive pressure on the remaining competitors, may, even in the absence of a likelihood of coordination between the members of the oligopoly, result in a significant impediment to effective competition*".[263].

(262) The Horizontal Merger Guidelines list a number of factors which may influence whether or not significant horizontal non-coordinated effects are likely to result from a merger, such as the large market shares of the merging firms, the fact that the merging firms are close competitors, the limited possibilities for customers to switch suppliers, or the fact that the merger would eliminate an important competitive force. That list of factors applies equally regardless of whether a merger would create or strengthen a dominant position, or would otherwise significantly impede effective competition due to non-coordinated effects. Furthermore, not all of those factors need to be present to make significant non-coordinated effects likely and it is not an exhaustive list[264]. Finally, the Horizontal Merger Guidelines describe a number of factors, which could counteract the harmful effects of the merger on competition, including the likelihood of buyer power, entry and efficiencies.

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261 Horizontal Merger Guidelines, paragraph 24.

262 Merger Regulation, recital 25.

263 Merger Regulation, recital 25. Similar wording is also found in paragraph 25 of the Horizontal Merger Guidelines. See also Commission decision of 2 July 2014 in case M.7018 – *Telefónica Deutschland/E-Plus*, recital 113; Commission decision of 28 May 2014 in case M.6992 – *Hutchison 3G UK/Telefónica Ireland*, recital 179; Commission decision of 12 December 2012 in case M.6497 – *Hutchison 3G Austria/Orange Austria*, recital 88.

264 Horizontal Merger Guidelines, paragraph 26.

6.2. Semiconductors for automotive applications

6.2.1. Introduction

(263) As described in section 5.2.1, both Qualcomm and NXP are active in the manufacture and supply of semiconductors for automotive applications. With regard to the segmentation by semiconductor type, the Transaction does not give rise to horizontally affected markets, as the Parties' combined market share is below 20% in each of these three product groups.

(264) With regard to the segmentation by field of application, the Transaction would lead to affected markets, where the Parties have a combined market share above 20%[265], in the following potential narrower markets: (i) Infotainment MPUs; (ii) Infotainment radio / audio; (iii) Infotainment connectivity chips; and (iv) automotive chips based on non-cellular V2X technology.

6.2.2. Infotainment MPUs

6.2.2.1. Notifying Party's views

(265) The Notifying Party argues that on both the overall market for Infotainment MPUs and on all narrower potential market segments, there would remain a significant number of competitors post-Transaction, leaving customers with ample opportunity to switch. Moreover, the Notifying Party considers to be a minor player in this potential market and that the Parties have complementary portfolios since the Notifying Party is mainly focused on the high-end of market offering powerful processors comparable to those used in high-end smartphones while NXP does not offer products of similar performance.

6.2.2.2. The results of the market investigation and the Commission's assessment

(266) When considering market share for Infotainment MPUs for automotive applications, Qualcomm and NXP would jointly have a combined market share above 20%.

Table 1 - Worldwide market shares for the supply of infotainment MPU (2013 - 2015) – share by revenues

	2013	2014	2015
NXP	[10-20]%	[10-20]%	[20-30]%
Qualcomm	[5-10]%	[0-5]%	[0-5]%
Combined	**[20-30]%**	**[20-30]%**	**[20-30]%**
Renesas	[30-40]%	[20-30]%	[20-30]%
NVidia	[5-10]%	[5-10]%	[10-20]%
Texas Instruments	[5-10]%	[5-10]%	[5-10]%
Others	[30-40]%	[30-40]%	[30-40]%

Source: Form CO – Table 1.15

(267) Based on the market shares illustrated in Table 1, the Parties would be […] supplier of Infotainment MPUs with a market share of [20-30]%. However, in this market segment, Qualcomm's market share over the last years is significantly declining and

[265] Notifying Party has confirmed that shares at the EEA level would not materially differ from their worldwide shares. See response by the Notifying Party to questions 1-2 of RFI 54.

the increment brought about by the Transaction would be minor (*that is to say*, approximately [0-5]%).

(268) Moreover, other competitors would remain in the market post-Transaction including established market players with high market shares, such as Renesas and Texas Instruments, and disruptive new entrants, such as Nvidia. The presence of alternative providers post-Transaction has been confirmed by the phase I market investigation. The majority of customers and competitors responding to the phase I market investigation confirm that a sufficient number of manufacturers and suppliers would remain active post-Transaction irrespective of a further segmentation of the market in entry and mid/high tiers. Continental highlights how Qualcomm and NXP have complimentary portfolios; while General Motors indicates that the number of suppliers would remain adequate since new players, such as Intel and NVidia have recently also started to offer their products in the market[266].

(269) The phase I market investigation also indicates that additional suppliers are expected to enter into this market over the coming years including players which are traditionally active in the supply of semiconductors for mobile handsets such as Samsung and Intel[267].

(270) The majority of respondents further believe that the Parties are not close competitors, irrespective of a further segmentation of the market in entry and mid/high tiers. Some customers note that within the overall Infotainment MPU category NXP is more present in the entry segment and Qualcomm in the premium segment and that today Qualcomm's market share in the market is low. This has been confirmed by certain competitors who consider Qualcomm as a limited market player with presence only in the high/premium segment[268].

(271) Finally, the majority of respondents do not consider that the Transaction would have an impact on the market for the manufacture and supply of Infotainment MPUs, irrespective of any further segmentation. Most of the competitors believe that enough choice would remain available to customers and that there was little overlap between the two companies. Only one respondent notes that Qualcomm, through a more complete offering, may be able to increase its position in the market and push traditional players out of the market. Among the customers responding to the phase I market investigation, the majority consider that the Transaction would have a positive impact on the market due to the complementarity of NXP and Qualcomm portfolios which will drive the market to a higher standard[269].

(272) The Commission therefore concludes that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market for the manufacture and supply of Infotainment MPUs for automotive applications and any potential narrower markets.

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266 See responses to question 22 of Q6 – automotive customers, responses to question 26 of Q5 – automotive competitors.

267 See responses to question 29 of Q6 – automotive customers, responses to question 28 of Q5 – automotive competitors.

268 See responses to question 22 of Q6 – automotive customers, responses to question 25 of Q5 – automotive competitors.

269 See responses to question 47 of Q6 – automotive customers, responses to question 46 of Q5 – automotive competitors.

6.2.3. Infotainment radio / audio

6.2.3.1. Notifying Party's views

(273) The Notifying Party submits that, while NXP offers a range of products of Infotainment radio / audio for automotive applications, the Notifying Party has no current or potential [significant offering] for this product category […]. The Notifying Party therefore concludes that there is no overlap in this market segment.

6.2.3.2. The results of the market investigation and the Commission's assessment

(274) When considering market share for Infotainment radio / audio chips for automotive applications, Qualcomm and NXP would have a combined market share above 20%.

Table 2- Worldwide market shares for the supply of infotainment radio / audio (2013 - 2015) – share by revenues

	2013	2014	2015
NXP	[50-60]%	[50-60]%	[50-60]%
Qualcomm	[0-5]%	[0-5]%	[0-5]%
Combined	**[50-60]%**	**[50-60]%**	**[60-70]%**
Renesas	[10-20]%	[10-20]%	[10-20]%
Analog Devices	[5-10]%	[5-10]%	[5-10]%
Socionext	[0-5]%	[0-5]%	[0-5]%
Others	[20-30]%	[20-30]%	[10-20]%

Source: Form CO – Table 1.14

(275) Based on the market shares illustrated in Table 2, the Parties would be the first supplier of Infotainment radio / audio chips with a market share of [60-70]%. However, in this market segment, Qualcomm's market share is negligible and so is the increment that would be brought about by the Transaction (*that is to say,* approximately [0-5]%).

(276) Moreover, other competitors would remain in the market post-Transaction including established market players, such as Renesas and Analog Devices with stable market shares of approximately [10-20]% and [5-10]% over the last three years. The presence of alternative providers post-Transaction has been confirmed by the phase I market investigation. The majority of respondents confirm that other manufacturers and suppliers would remain active post-Transaction. In particular, while most of the competitors note that several suppliers would remain available; customers believe that, in any case, the Transaction would not change the suppliers' landscape[270].

(277) Moreover, the large majority of respondents believe that the Parties are not close competitors. Most of the competitors and customers do not consider Qualcomm to be active on this market segment. They actually believe that there is no overlap between the Parties' product portfolios[271].

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[270] See responses to question 37 of Q6 – automotive customers, responses to question 36 of Q5 – automotive competitors.

[271] See responses to question 36 of Q6 – automotive customers, responses to question 35 of Q5 – automotive competitors.

(278) With regard to potential entry over the coming years, most of the respondents consider the market to be mature while some respondents indicate that additional suppliers could be expected to enter into over the coming years, in particular Asian suppliers[272].

(279) Finally, almost all of the respondents consider that the Transaction would not have any impact on the market for the manufacture and supply of Infotainment radio / audio chips. Many respondents, such as NVidia, indicate that there is very little overlap on this market segment due to Qualcomm's marginal presence. Avnet, one of the main Tier-1 customers, considers that the Transaction would have a positive impact as this market segment could attract a variety of manufacturers[273].

(280) The Commission therefore concludes that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market for the manufacture and supply of Infotainment radio / audio chips for automotive applications.

6.2.4. Infotainment connectivity

6.2.4.1. Notifying Party's views

(281) The Notifying Party considers that there is only a marginal overlap on the market for Infotainment connectivity, due to NXP's limited portfolio. The Notifying Party further argues that suppliers with capabilities in wireless communications standards could develop Infotainment connectivity chips for automotive applications. The Notifying Party therefore concludes that post-Transaction a significant number of competitors and potential competitors would remain, leaving customers with ample opportunity to switch.

6.2.4.2. The results of the market investigation and the Commission's assessment

(282) When considering market share for Infotainment connectivity for automotive applications, Qualcomm and NXP would have a combined market share above 20%.

Table 3 - Worldwide market shares for the supply of Infotainment Connectivity (2013 - 2015) – share by revenues

	2013	2014	2015
NXP	[0-5]%	[0-5]%	[0-5]%
Qualcomm	[20-30]%	[20-30]%	[20-30]%
Combined	**[20-30]%**	**[20-30]%**	**[20-30]%**
Toshiba	[10-20]%	[10-20]%	[10-20]%
Renesas	[10-20]%	[10-20]%	[10-20]%
Panasonic Corporation	[10-20]%	[10-20]%	[10-20]%
Others	[30-40]%	[30-40]%	[40-50]%

Source: Form CO – Table 1.20

[272] See responses to question 39 of Q6 – automotive customers, responses to question 38 of Q5 – automotive competitors.

[273] See responses to question 49 of Q6 – automotive customers, responses to question 48 of Q5 – automotive competitors.

(283) Based on the market shares illustrated in Table 3, the Parties would be the first supplier of Infotainment connectivity with a market share of [20-30]%. However, in this market segment, NXP's market share over the last years is negligible and so is the increment that would be brought about by the Transaction (*that is to say*, approximately [0-5]%).

(284) Moreover, other competitors would remain in the market post-Transaction including established market players, such as Toshiba, Renesas and Panasonic Corporation with all three players having relatively stable market shares of approximately [10-20]% over the last three years. The presence of alternative providers post-Transaction has been confirmed by the phase I market investigation. The large majority of respondents confirm that other manufacturers and suppliers would remain active post-Transaction. In particular, while most of the competitors note that several suppliers would remain available; customers note that, in any case, the Transaction would not change the supplier landscape[274].

(285) Moreover, the majority of respondents believe that the Parties are not close competitors on the market segment for Infotainment connectivity. While customers such as Valeo/Peiker, Fiat and BMV believe that the Parties' portfolios do not overlap, Renesas indicates that the Parties have complementary technology.

(286) With regard to potential new entrants on this market segment, some respondents indicate that other suppliers may enter the market, in particular Asian suppliers such as Samsung[275].

(287) Finally, the majority of respondents believe that the Transaction would not have any impact on the market for Infotainment connectivity for automotive applications[276].

(288) The Commission therefore concludes that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market for the manufacture and supply of Infotainment connectivity chips for automotive applications.

6.2.5. Automotive chips based on non-cellular V2X technology

(289) As described in the Linley report, the automotive industry has been investigating methods that allow vehicle-to-vehicle ("V2V"), vehicle-to-infrastructure ("V2I"), vehicle-to-pedestrian ("V2P"), vehicle-to-network communications also known as V2X.

(290) V2X communications are processed with recourse to a chip connected to the central ADAS processor. V2X is a technology used to connect cars to various external stimuli (other cars, bikes, road works, infrastructure) and to provide the unique capability to see past other vehicles, as well as around corners, obstacles, or turns on the road. V2X technology may become an important component for the securely connected, self-driving car of the future. Two types of cellular communications have emerged: cellular V2X and non-cellular (based on the 802.11.p technology).

(291) On 30 November 2016, the Commission adopted a European Strategy (COM (2016) 766) on Cooperative Intelligent Transport Systems ("C-ITS"), a milestone initiative

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274 See responses to question 32 of Q6 – automotive customers, responses to question 31 of Q5 – automotive competitors.

275 See responses to question 34 of Q6 – automotive customers, responses to question 33 of Q5 – automotive competitors.

276 See responses to question 48 Q6 – automotive customers, responses to question 47 of Q5 – automotive competitors.

towards cooperative, connected and automated mobility. Moreover, since 2014, the Commission is also consulting public and private stakeholders within the C-ITS platform[277], to develop a shared vision on the interoperable deployment of C-ITS in the EU. The Commission is advocating for C-ITS to be implemented through a combination of ETSI ITS-G5 and existing cellular networks, through standardisation and EU-wide deployment specifications. This view was supported by respondents to the public consultation who gave widespread support for the hybrid communication approach[278].

6.2.5.1. Notifying Party's views

(292) The Notifying Party believes that there is no risk that the Transaction would harm competition for several reasons. First, there are a number of alternative suppliers that are active in the market. The leading vendors of processors in the autonomous driving technology are Mobileye, Intel, Infineon, NVidia, Texas Instruments and Toshiba. Second, in relation to the V2X technology, the Parties note that the system is a nascent segment. It is still in its early adoption phase […].

(293) Third, the Parties further note that they are not close competitors on the market. NXP's development efforts in V2X systems have generally been directed at non-cellular based systems while, by contrast, Qualcomm focuses most of its investment on cellular based V2X technology. Moreover, other suppliers such as Autotalks or Renesas are closer competitors to NXP that Qualcomm is, while Qualcomm's closest competitors in the V2X segments are likely to be firms with cellular wireless expertise such as Intel or Huawei. Finally, the Notifying Party considers that other suppliers would start providing chips based on V2X technology in the coming years.

(294) Moreover, in response to the Article 6(1)(c) decision, the Notifying Party argues that the Transaction would not harm competition in the DSRC V2X market segment for several reasons. First, the overlap between the Parties is limited to the radio aspect of DSRC V2X solutions, meaning that the overlap is limited to a component of DSRC V2X solutions, itself a sub-segment of V2X, which is in turn a sub-segment of ADAS. Second, DSRC V2X will play a significant role, or indeed any role, in ADAS solutions in the foreseeable future. Third, barriers to entry in the supply of DSRC V2X solutions – in particular the segment in which there is an overlap – are low due to (i) the rudimentary nature of the technology involved; (ii) the numerous semiconductor players that supply 802.11-standard compliant products and have the necessary expertise to enter quickly the segment; and (iii) the standardisation context, meaning that the relevant technology is publicly available. Finally, the Transaction will not harm innovation competition.

6.2.5.2. The results of the market investigation and the Commission's assessment

(295) In the Article 6(1)(c) decision, while the Commission acknowledged that the V2X non-cellular is a nascent market segment, it also raised serious doubts as to the compatibility of the Transaction with the internal market on the grounds that the elimination of the competitive pressure between the Parties would have weakened competition in the market for the development of V2X chips based on the non-cellular technology. Moreover, the Commission also raised the question on whether

277 https://ec.europa.eu/transport/themes/its/c-its_en doc ID []

278 "A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility", COM(2016) 766, dated 30 November 2016, available at: https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v5.pdf. doc ID []

the Transaction may harm the future development of V2X chips based on non-cellular technology.

(296) Qualcomm is investing in ADAS technologies and it plans to achieve significant revenues in this market over the coming years[279]. In particular, with regard to V2X technologies, many respondents view Qualcomm as an important developer of both cellular and non-cellular V2X chips[280]. With regard to NXP, the market shares show that it is an important player in the overall ADAS market. NXP is also significantly investing in ADAS technologies in the next years[281] and plans to achieve significant revenues over the next years[282].

A) Non-cellular V2X technologies would be important for autonomous driving and advanced safety systems

(297) With regard to the importance of V2X technology for semiconductors for automotive application, the majority of respondents to the phase I market investigation submitted that, if V2X technology is relatively important today, it will become very important in the next five years. One respondent notes that certain big OEMs announced high volume market introduction of V2X in Europe in 2019. Others consider that, in the coming years, it is expected that transportation infrastructure will have the required connectivity and when the infrastructure will be ready, V2X will be the key feature to support safer driving[283]. Most of the respondents to the phase II market investigation confirm that V2X technology is important today and it would become very important in the next three years[284]. The phase II market investigation provided mixed results on whether it would not be possible to have full autonomous driving system without adopting V2X technologies. While most of the customers consider V2X technology to be essential, some of the competitors note that similar safety functionalities may be achieved through the use of sensors and artificial intelligence ("AI") technology[285].

(298) The growing relevance of V2X is also confirmed by documents provided by the Parties. NXP foresees V2X penetration to increase in […].

(299) Abi Research expects that by 2025, [70-80]% of the cars in Western Europe will be equipped with V2X[286]. NXP also foresees a strong increase in the penetration rate of cars equipped with V2X technology in the EU. Based on internal estimates, by 2029, all […] cars will include V2X chips[287].

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279 See Slide 66 - Annex 1.7, Form CO. In particular, Qualcomm plans to achieve revenue over […] and of approximately […] [DOC ID 327-25].

280 See responses to question 41 of Q6 – automotive customers, responses to question 40 of Q5 – automotive competitors.

281 See slides 21, 67 and 76, […] of 25 February 2016.

282 See slide 99, […] of 21-23 March 2016. Expected revenues to reach […].

283 See responses to question 40 of Q6 – automotive customers, responses to question 39 of Q5 – automotive competitors.

284 See responses to question 18 of Q16 – automotive customers and responses to question 13 of Q15 – automotive competitors.

285 See responses to question 17 of Q16 – automotive customers and responses to question 14 of Q15 – automotive competitors.

286 NXP internal document, "[…]" [Filename DOC-000004331.xlsx], dated 24 August 2016 [Doc ID 1453-4331].

287 NXP internal document, "[…]", dated 15 February 2016 [Filename DOC-000009284.xlsx] [Doc ID 1453-9284].

Figure 1: EU OEM V2X feature penetration

[…]

Source: NXP internal document […] [Doc ID 1453-9284].

(300) Therefore, the Commission considers that, while the market for the supply of V2X chips is nascent, its relevance in the semiconductor industry for automotive application would significantly increase over the next years.

B) Qualcomm and NXP are not close competitors and alternative operators will remain active

(301) First, while the majority of respondents to the market investigation indicate that both Qualcomm and NXP are active and competing on the market for automotive V2X chips, the market investigation shows that Qualcomm is mainly focused on cellular V2X, which relies on Qualcomm's cellular technology while NXP provides only non-cellular V2X, based on the 802.11.p technology[288]. Respondents indicate that there are differences among the solutions offered by the different suppliers, in particular in terms of security and performance. NXP and Autotalks are viewed as the only two suppliers with a complete V2X offering, including the V2X 802.11.p radio, the secure element and the application processor[289].

(302) Second, most of the respondents to the phase II market investigation do not believe that Qualcomm and NXP closely compete in relation to the development, manufacturing and sale of non-cellular V2X radio[290] and consider Autotalks as the closest competitor to NXP[291]. This has been further confirmed by the internal documents submitted by the Parties.

(303) NXP's documents confirm that Autotalks […][292]. […][293] […][294]. […][295].

(304) Qualcomm also considers […][296]. Moreover, Qualcomm notes that […][297].

(305) Third, most of the respondents to the phase II market investigation consider that a sufficient number of alternative providers of non-cellular V2X chips would remain available post-Transaction. Winstron, Nexty and Commsigina indicate Autotalks,

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288 See responses to questions 41 and 42 of Q6 – automotive customers, responses to questions 40 and 41 of Q5 – automotive competitors. See also responses to question 19 of Q16– automotive customers, responses to questions 15 of Q15 – automotive competitors.

289 Minutes of the conference call with Autotalks of 19 July 2017. [Doc ID 3264].

290 See responses to question 20 of Q16– automotive customers, responses to questions 16 of Q15 – automotive competitors.

291 See responses to question 19 of Q16– automotive customers, responses to questions 15 of Q15 – automotive competitors.

292 NXP internal documents, "[…]", dated 18 June 2015 [Filename DOC-000009829 msg] [Doc ID 1454-9829]. See also, "[…]", dated 23 July 2015 [Filename DOC-000021546 msg] [Doc ID 1454-21546].

293 NXP internal documents, "[…]", dated 8 December 2016 [Filename DOC-000005377 msg] [Doc ID 1453-5377].

294 NXP internal documents, "[…]", dated 28 November 2016 [Filename DOC-000056281 msg] [Doc ID 1452-56281].

295 NXP internal documents, "[…]", dated 28 November 2016 [Filename DOC-000056281 msg] [Doc ID 1452-56281].

296 Qualcomm internal document, "[…]", dated 8 March 2016 [Filename […].pptx] [Doc ID 1334-6849]. See also, " […]", dated 4 September 2016 [Filename QCRIVEREU_RFI20_1347360.pdf] [Doc ID 2511-35922].

297 Qualcomm internal document, "[…]", dated 22 September 2016 [Filename […].msg] [Doc ID 2387-54314].

Renesas[298], Redpine[299] and Marvell[300] as alternatives available on the market. Also the Parties' internal documents suggest that additional semiconductors suppliers are developing non-cellular V2X solutions. NXP's 2017 strategic plan, analysing the competitive landscape of the non-cellular V2X market, indicates […] as the main competing suppliers in the market[301]. This also confirmed in another document, presented in Figure 2, where it is highlighted that, while the non-cellular V2X market is gaining traction, competition is intensifying and additional players are expected to enter in this market[302].

Figure 2: EU OEM V2X feature penetration

[…]

Source: NXP internal document […] [Doc ID 1454-874].

(306) In internal correspondence, Qualcomm's employees note that […] *has become active in DSRC [non-cellular V2X] in the standards forums*" and that […] entry may be expected in the near future[303]. Moreover, also […][304] and […][305] are considered as actively competing for some specific customers.

(307) The Commission therefore considers that the responses to the market investigation and the available Parties' internal documents suggest that Qualcomm and NXP are not close competitors on the development of V2X chips based on non-cellular technology and that alternative providers would remain active post-Transaction.

C) Market entry

(308) With regard to potential new entry in the market, the phase I market investigation indicates that new suppliers should enter the market over the coming years[306]. However, based on those results, it further appears that market entry would require significant time and investment. Therefore, in the Article 6(1)(c) decision, the Commission noted that it would further investigate whether addition players would start developing V2X chips based on non-cellular technology over the next years and whether the development of such technology would require significant time and investment. In its response to the Article 6(1)(c) decision, the Notifying Party notes

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298 Renesas publicly announced the launch of non-cellular V2X solutions last year. See "Renesas Electronics Delivers Vehicle-to-Vehicle and Vehicle-to-Infrastructure Communication System Solutions for the Autonomous-Driving Era", dated 6 October 2016, available at: https://www.renesas.com/en-us/about/press-center/news/2016/news20161006 html [Doc ID 3267].

299 Redpine publicly announced the launch of non-cellular V2X solutions designed last year. See "Redpine Signals Launches Industry's First Multi-Protocol Wireless Solution for the Connected Car (V2X) Market", dated 6 June 2016, available at: http://www.redpinesignals.com/News_&_Events/PressReleases/Redpine_Signals_LaunchesIndustrys_First_Multi-Protocol_Wireless_Solution_for_the_Connected_Car_(V2X)_Market.php [Doc ID 3268].

300 Marvell recently publicly announced the launch of its non-cellular V2X solution. See "Marvell Introduces Industry's First Wi-Fi, Bluetooth 5 and 802.11p Combo Solutions for Vehicle-to-Everything (V2X) and In-Vehicle Infotainment (IVI)", dated 13 June 2017, available at: https://www.multivu.com/players/English/8119751-marvell-88w8987xa-automotive-wireless-combo-solutions/ [Doc ID 3269].

301 NXP internal document, "[…]", slide 47 dated 7 June 2017. [….pptx] [Doc ID 1452-53212].

302 NXP internal document "[…]", dated 13 March 2017 [….pptx] [Doc ID 1454-874].

303 Qualcomm internal document, "[…]", dated 26 January 2016 [[…] msg] [Doc ID 2387-51034].

304 […]. See Qualcomm internal document, "[…]", dated 24 February 2016 [[…].docx] [Doc ID 2511-35422].

305 NXP internal document, "[…]", dated 15 March 2016 [… msg] [Doc ID 1453-22481].

306 See responses to questions 45 of Q6 – automotive customers, responses to questions 44 of Q5 – automotive competitors.

that entry would be easier for suppliers already active in the supply of Wi-Fi chips based on 802.11.a technology, since the relevant know-how would facilitate entry.

(309) First, as confirmed by the phase II market investigation[307], R&D investment to develop non-cellular V2X is not relatively significant. Qualcomm[308] and NXP[309] allocate each year respectively USD […] and […] million on non-cellular V2X corresponding to […]% and […]% of annual R&D spending.

(310) Second, some respondents to the market investigation highlight how entry would be easier for suppliers already active in the supply of Wi-Fi chips based on 802.11.a technology since the relevant know-how would facilitate entry. ON Semiconductor notes that the R&D investment should be minimal for suppliers that have existing 802.11.a technology and experience in the automotive industry[310]. Marvell considers that any Wi-Fi vendor would potentially be an entrant on the non-cellular V2X market[311].

(311) Therefore, the Commission concludes that barriers to entry the market for the development of non-cellular V2X are not significant and that other suppliers, in particular other automotive suppliers of Wi-Fi chips, might enter the market over the coming years.

D) Qualcomm will continue to invest on both cellular and non-cellular V2X technologies, after the Transaction

(312) In the Article 6(1)(c) decision, the Commission also raised the question as to whether the Transaction would harm the future development of V2X chips based on non-cellular technology. In particular, post-Transaction Qualcomm might be incentivised to focus its investment on cellular V2X technology, where it can leverage its cellular patent portfolio, and remove NXP's non-cellular V2X market leading technology from the market. As a result of this strategy, Qualcomm would favour the development of cellular V2X chips and delay the deployment of non-cellular V2X chips in the market[312].

(313) The Commission does not consider that Qualcomm will have an incentive to implement such a strategy for the following reasons.

(314) First, should Qualcomm decide to remove NXP's offering from the market, it would mainly benefit NXP's competitors, such as Autotalks, who will profit from the increase in demand by automotive customers which are already requiring non-cellular V2X chips[313]. As described in recital (303), Autotalks is NXP's closest

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307 See responses to question 22 of Q15 – automotive competitors.

308 Qualcomm internal document, "[…]" dated 22 August 2017 [Filename […].pptx] [Doc ID 2360-12197]. See also response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, paragraph 241, [Doc ID 1331].

309 NXP internal document, "[…]", slide 7 dated 7 June 2017. [Filename […].pptx] [Doc ID 1452-53212]. See also response by the Notifying Party to the Article 6(1)(c) decision, paragraph 241, [Doc ID 1331].

310 See responses to question 22 of Q15 – automotive competitors.

311 Minutes of the conference call with Marvell of 22 September 2017, point 6 [Doc ID 3266].

312 See DG Move submission of 26 October 2017 "ITS G5 and LTE-V2X technologies for Cooperative Intelligent Transport Systems".

313 As described in recital (42), the market investigation shows that non-cellular V2X technology is already available in the market and deployed in cars by automotive customers, while cellular V2X technology is at earlier stage of development and two-three years behind. Moreover, as described in recital (305) above, alternative providers would remain available in the market.

competitor and it has a comparable product offering which could be able to attract the additional demand diverted from the Parties' customers.

(315) Second, Qualcomm expects that both technologies may coexist in the near future. Such coexistence would enable the support of the technology evolution to 5G while maintaining compatibility between different generations of V2X chips[314]. Qualcomm's future automotive connectivity chipset will include V2X capabilities by including a non-cellular V2X chip[315]. The coexistence of both technologies was also foreseen by NXP, which absent the Transaction, was […][316] by developing a product which will be "[…]"[317].

(316) Third, there is no evidence in the Commission file that Qualcomm will decide to stop supplying non-cellular V2X chips. To the contrary, Qualcomm's revenue synergy indicates that Qualcomm expects to achieve significant revenues in the non-cellular V2X market over the next years.

(317) Finally, internal documents further indicate that the deployment of non-cellular V2X technology is driven by regulation and governmental decisions[318].

6.2.5.3. Conclusion

(318) The Commission therefore concludes that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market for the manufacture and supply of automotive chips based on non-cellular V2X technology since the Parties are not the closest competitors, alternatives would remain available and new providers are expected to enter the market over the next years.

6.3. Semiconductors for IoT applications

6.3.1. Introduction

(319) As described in section 5.2.2, both Qualcomm and NXP are active in the manufacture and supply of semiconductors for IoT applications. With regard to the segmentation by semiconductor type, the Transaction gives rise to one horizontally affected market, where the Parties' combined market share is above 20%[319]: the market for the supply of Bluetooth connectivity chips.

(320) With regard to the segmentation by field of application, the Transaction does not give rise to any horizontally affected markets, as the Parties' combined market share is below 20% in each of those group products.

See "With the aim of increasing safety in road traffic, Volkswagen will enable vehicles to communicate with each other as from 2019", available at: https://www.volkswagenag.com/en/news/2017/06/pwlan html

314 Qualcomm internal document, "[…]", [Filename […].xlsx] [Doc ID 2386-68199].

315 Qualcomm internal document, "[…]", dated 14 November 2016, [Filename […].pptx] [Doc ID 2511-34396].

316 NXP internal document, "[…]", dated 1 April 2016 [Filename […].msg] [Doc ID 1452-44643]. See also, NXP internal document, "[…]" [Filename […].pptx] [Doc ID 1454-13929].

317 NXP internal document, "[…]", dated May 2017, slide 10 [Filename […].pptx] [Doc ID 1453-4115].

318 […]. See Qualcomm internal document, "[…]", dated 24 February 2016 [Filename […].docx] [Doc ID 2511-35422].

319 Notifying Party has confirmed that shares at the EEA level would not materially differ from their worldwide shares. See response by the Notifying Party to questions 1-2 of RFI 54.

6.3.2. Bluetooth

6.3.2.1. Notifying Party's views

(321) The Notifying Party argues that within the Bluetooth market segment, the Parties' portfolios only overlap for Bluetooth low energy ("BTLE") and specifically single-mode BTLE chips as NXP does not supply "classic" Bluetooth connectivity chips. Moreover, the Notifying Party submits that post-Transaction, on the market for Bluetooth connectivity chips there would remain a significant number of competitors, leaving customers with alternatives.

6.3.2.2. The results of the market investigation and the Commission's assessment

(322) When considering the market share for Bluetooth chips, Qualcomm and NXP would have a combined market share above 20%.

Table 4 - Worldwide market shares for the supply of Bluetooth chips (2014 - 2015) – share by revenues

	2014	2015
NXP	[0-5] %	[0-5]%
Qualcomm	[20-30]%	[20-30]%
Combined	**[20-30]%**	**[20-30]%**
Broadcom	[20-30]%	[20-30]%
MediaTek	[10-20]%	[10-20]%
Marvell	[0-5]%	[0-5]%
Others	[20-30]%	[30-40]%

Source: Form CO – Table 3.7

(323) Based on the market shares illustrated in Table 4, the Parties would be the first supplier of Bluetooth chips for IoT applications with a market share of [20-30]%. However, on this market segment, Qualcomm's market share over the last years has been declining and the increment that would be brought about by the Transaction is negligible (*that is to say,* less than [0-5]%). Moreover, other competitors would remain in the market post-Transaction including established market players with high market shares, such as Broadcom (approximately [20-30]%) and MediaTek (approximately [10-20]%).

(324) When considering the potential narrower market for supply of BTLE chips, Qualcomm and NXP would have a market share below 20%.

Table 5 - Worldwide market shares for the supply of BTLE chips (2014 - 2015) – share by revenues

	2014	2015
NXP	[0-5]%	[0-5]%
Qualcomm	[5-10]%	[0-5]%
Combined	**[5-10]%**	**[5-10]%**
Nordic	[60-70]%	[60-70]%
Texas Instruments	[20-30]%	[10-20]%
Dialog	[5-10]%	[10-20]%
Others	[5-10]%	[0-5]%

Source: Form CO – Table 3.8

(325) Based on the market shares illustrated in Table 5, the Parties would be the fourth supplier of BTLE chips for IoT applications with a market share of [5-10]%. Other competitors would remain in the market after the Transaction including well-established market players with high market shares, such as Nordic (approximatively [60-70]%), Texas Instruments (approximatively [10-20]%) and Dialog (approximatively [10-20]%). The presence of alternative providers post-Transaction has been further confirmed by the phase I market investigation. The majority of respondents consider that post-Transaction there will be a sufficient number of manufacturers and suppliers of both Bluetooth and BTLE chips for IoT applications[320]. Moreover, NXP's products could not be considered superior to the ones of its competitors. None of the respondents indicated NXP as the leading supplier of BT and BTLE IoT chips[321].

(326) Finally, the vast majority of respondents to the market investigation believe that the Transaction would not have an impact on the market for Bluetooth and BTLE connectivity chips, given the presence of several global players. Only one competitor considers that the Transaction could have a negative impact on the market for Bluetooth and BTLE chips[322]. According to this respondent, by offering NXP's product with its baseband chipsets, Qualcomm may leverage its large size to drive prices down in the markets. However, the Commission considers this concern would not be merger-specific since Qualcomm would already be able to implement this conduct absent the Transaction by offering its own IoT Bluetooth and BTLE chips. Moreover, the Transaction would not change Qualcomm's incentive to engage in such a strategy since NXP does not hold a significant presence in those markets, several alternatives would remain available and NXP's offering does not have superior functionalities compared to its competitors [323].

(327) The Commission therefore concludes that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market

320 See responses to question 20 of Q8 – IoT customers, responses to question 20 of Q7 – IoT competitors.

321 See responses to question 18 of Q8 – IoT customers, responses to question 18 of Q7 – IoT competitors.

322 See responses to questions 39 and 40 of Q8 – IoT customers, responses to questions 39 and 40 of Q7 – IoT competitors.

323 See responses to question 18 of Q8 – IoT customers, responses to question 18 of Q7 – IoT competitors.

for the manufacture and supply of Bluetooth chips for IoT applications and any potential narrower markets.

6.4. Mobile Audio

6.4.1. Introduction

(328) As described in section 5.2.3.3, both Qualcomm and NXP are active in the manufacture and supply of speech enhancement software and smart amplifier chips. Following the market investigation results, the Commission considers that speech enhancement software and smart amplifier chips are two separate product markets. On both markets, the Transaction gives rise to horizontally affected markets as the Parties' combined market share is above 20%.

6.4.2. Speech enhancement software

6.4.2.1. Notifying Party's views

(329) The Notifying Party argues that, on the market segment for speech enhancement software, product offerings by Qualcomm and NXP are different. While Qualcomm's solutions ("Fluence") are supplied to its baseband chipset customers as an integrated product, NXP's solutions ("LifeVibes") are only sold on a standalone basis.

(330) The Notifying Party indicates that there are various suppliers of speech enhancement solutions including companies (i) providing standalone solutions such as ForteMedia, Knowles/Audience, Cirrus Logic, Philips, Sensory, MightWorks, and Nuance; and, (ii) companies supplying integrated solutions, such as Apple, MediaTek, Microsoft Cortana, Google, and Xiaomi/Pine Cone. Artesis. Concerning the closeness of competition, the Notifying Party argues that there is no competition between "Fluence" and "LifeVibes" due their differences in nature (integrated vs. non-integrated solution), costs, performance, and strategic importance.

(331) Moreover, the Notifying Party indicated that competitors such as Cirrus and MediaTek should be considered as new entrants which would demonstrate the lack of competition concerns arising on the market segment for speech enhancement software.

6.4.2.2. The results of the market investigation and the Commission's assessment

(332) Qualcomm and NXP have a combined market share above 20% in speech enhancement software.

Table 6- Estimated worldwide shares of Supply for Speech Enhancement Software (2014 - 2016) – share by revenues and units

	2014		2015		2016	
	Unit shares	Share of supply	Unit shares	Share of supply	Unit shares	Share of supply
NXP	[5-10]%	[10-20]%	[5-10]%	[10-20]%	[5-10]%	[10-20]%
Qualcomm	[30-40]%	[10-20]%	[20-30]%	[10-20]%	[20-30]%	[10-20]%
Combined	**[40-50]%**	**[20-30]%**	**[30-40]%**	**[30-40]%**	**[20-30]%**	**[20-30]%**
Apple/Cirrus	-	-	-	-	[30-40]%	[30-40]%
ForteMedia	-	-	-	-	[10-20]%	[10-20]%
Knowles	-	-	-	-	[10-20]%	[10-20]%
Others	-	-	-	-	[10-20]%	[10-20]%

Source: Form CO – Tables 2.4 and 2.5

(333) Based on the estimated market shares illustrated in Table 6, the Parties would be the second largest supplier of speech enhancement software with a combined market share by value of [20-30]% behind Cirrus. Moreover, alternative providers such as ForteMedia and Knowles have market shares above 10% and higher than that of NXP pre-Transaction.

(334) Moreover, when considering market shares for the narrower market for the supply of speech enhancement software on devices equipped with a Qualcomm baseband chipset, Qualcomm and NXP would also have a combined market share by value of [30-40]%.

Table 7- Estimated worldwide shares of Supply for Speech Enhancement Software on Devices equipped with a Qualcomm Baseband Chipset (2014 - 2016) – share by revenues and units

	2014		2015		2016	
	Unit shares	Share of supply	Unit shares	Share of supply	Unit shares	Share of supply
NXP	[10-20]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%	[5-10]%
Qualcomm	[10-20]%	[20-30]%	[10-20]%	[20-30]%	[10-20]%	[20-30]%
Combined	**[20-30]%**	**[20-30]%**	**[10-20]%**	**[30-40]%**	**[20-30]%**	**[30-40]%**
Others (ForteMedia, Knowles/Audience)	[20-30]%	[30-40]%	[20-30]%	[30-40]%	[30-40]%	[40-50]%
Apple	[20-30]%	[30-40]%	[20-30]%	[30-40]%	[10-20]%	[20-30]%
No speech enhancement or QC free software	[20-30]%	[0-5]%	[20-30]%	[0-5]%	[30-40]%	[0-5]%

Source: Form CO – Table 2.8

(335) In this regard, the Commission notes the following:

(336) First, other competitors would remain in the market post-Transaction including established market players, such as Apple, with a market share of [20-30]%. The presence of alternative providers post-Transaction has been confirmed by the market investigation. The majority of respondents confirmed that other manufacturers and suppliers would remain active post-Transaction[324].

(337) Second, NXP's lower market share (approximately [5-10]%, [0-5] percentage points less than the market share presented in Table 6 above on the overall market for the supply of speech enhancement software) indicates that customers of Qualcomm's baseband chipsets do not particularly value NXP's offering. The majority of competitors also believe that NXP products are not superior to the ones of its competitors. Knowles indicates that the performance of the NXP product is not as good as Knowles' or Fortemedia's[325]. In addition, customers such as Microsoft would continue to consider alternatives even if Qualcomm were to bundle NXP's speech enhancement software with its baseband chipsets[326].

(338) Moreover, most of market respondents do not consider barriers to enter in this market to be high. Knowles and MediaTek believe that the barriers to entry are moderate[327]. Moreover, MediaTek's entry in the market indicates that alternative suppliers of baseband chipsets are able to enter the market in the short term.

(339) Finally, most of the respondents to the market investigation consider that the Transaction would not have an impact on the market for the supply of speech enhancement software[328]. For the sake of completeness, one respondent to the market investigation noted that the Transaction could have a negative impact in the Mobile Audio markets since Qualcomm would be able to bundle NXP's speech enhancement software and smart amplifiers with its baseband chipsets[329]. The Commission considers this concern as not merger-specific since Qualcomm already offers Mobile Audio products in the market and, therefore, it could already engage in such conduct pre-Transaction. The Transaction does not change Qualcomm's incentive to engage in such strategy since as described in recital (337) and (348), NXP does not hold a significant presence in those markets, several alternatives would remain available and NXP's offering does not have superior functionalities compared to its competitors.

(340) The Commission concludes that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market for the supply of speech enhancement software and the narrower potential market for the supply of speech enhancement software on devices equipped with a Qualcomm baseband chipset.

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324 See responses to question 85.2 of Q1 – Device OEMs, responses to question 18.2 of Q4 – Mobile Audio competitors.

325 See responses to question 84.2 of Q1 – Device OEMs, responses to question 15.2 of Q4 Q4 – Mobile Audio competitors.

326 See responses to question 89 of Q1 – Device OEMs.

327 See responses to question 16.1 of Q4 – Mobile Audio competitors.

328 See responses to question 94.4 of Q1 – Device OEMs, responses to question 35.2 of Q4 – Mobile Audio competitors.

329 See responses to question 34 of Q4 – Mobile Audio competitors.

6.4.3. Smart amplifiers

6.4.3.1. Notifying Party's views

(341) The Notifying Party argues that it is a minor player in the market segment for smart amplifiers; it has only recently entered the market and NXP does not view the Notifying Party as a significant competitor. Moreover, the Notifying Party believes that the Parties are not close competitors, as they offer different products.

(342) The Notifying Party indicates that, similar to speech enhancement software solutions, there are various suppliers of speech enhancement solutions including companies providing (i) integrated baseband chipsets; and, (ii) standalone, custom, turnkey smart amplifiers, such as Cirrus Logic, Maxim, Texas Instruments, Richtek/MediaTek.

6.4.3.2. The results of the market investigation and the Commission's assessment

(343) When considering market shares for smart amplifier chips, Qualcomm and NXP would have a combined market share above 20%.

Table 8- Estimated worldwide shares of Supply for Smart Amplifiers (2014 - 2016) – share by revenues and units

	2014		2015		2016	
	Unit shares	Share of supply	Unit shares	Share of supply	Unit shares	Share of supply
NXP	[20-30]%	[20-30]%	[20-30]%	[20-30]%	[10-20]%	[20-30]%
Qualcomm	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Combined	**[20-30]%**	**[20-30]%**	**[20-30]%**	**[20-30]%**	**[10-20]%**	**[20-30]%**
Cirrus Logic	-	-	-	-	[30-40]%	[30-40]%
Maxim	-	-	-	-	[10-20]%	[10-20]%
Texas Instruments	-	-	-	-	[10-20]%	[10-20]%
Yamaha	-	-	-	-	[5-10]%	[5-10]%
Others	-	-	-	-	[10-20]%	[10-20]%

Source: Form CO – Tables 2.9 and 2.10

(344) When considering market shares for smart amplifiers on devices equipped with a Qualcomm baseband chipset, Qualcomm and NXP would have a combined market share above 20%.

Table 9- Estimated worldwide shares of Supply for Smart Amplifiers on Devices Equipped with a Qualcomm Baseband chipset (2014 - 2016) – share by revenues and units

	2014		2015		2016	
	Unit shares	Share of supply	Unit shares	Share of supply	Unit shares	Share of supply
NXP	[10-20]%	[10-20]%	[10-20]%	[10-20]%	[10-20]%	[20-30]%
Qualcomm	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%
Combined	**[10-20]%**	**[10-20]%**	**[10-20]%**	**[10-20]%**	**[10-20]%**	**[20-30]%**
Other smart Amplifiers suppliers	[30-40]%	[40-50]%	[20-30]%	[40-50]%	[30-40]%	[40-50]%
Apple/Cirrus	[20-30]%	[30-40]%	[20-30]%	[40-50]%	[10-20]%	[20-30]%
No Smart Amplifier installed	[30-40]%	[0-5]%	[30-40]%	[0-5]%	[30-40]%	[0-5]%

Source: Form CO – Table 2.12

(345) Based on the market shares illustrated in

(346) Table 9, the Parties would have a combined market share of [20-30]%. However, on this market segment, Qualcomm has a market share of less than [0-5]% by value. When considering shares for the supply of smart amplifiers on devices equipped with a Qualcomm baseband chipset, the Parties would have a combined market share of [20-30]%. However, the increment brought by the Transaction would be minor (approximately [0-5]%).

(347) Moreover, while the Parties have a combined market share above 20%, other competitors would remain in the market post-Transaction including established market players such as Apple, with a market share of [20-30]%. The presence of alternative providers post-Transaction has been further confirmed by the phase I market investigation. The large majority of customers confirm that other manufacturers and suppliers would remain active post-Transaction. Samsung indicates that existing suppliers would expand capacity if the merged entity were to stop supplying its products post-Transaction. One competitor, Xiaomi/PineCone, believes that CirrusLogic, Maxim, Texas Instruments would be able to offer alternatives to customers post-Transaction[330]. Moreover, market respondents do not indicate high barriers to entry in this market segment[331].

(348) In addition, respondents to the phase I market investigation consider that NXP products are not superior to the ones of its competitors. One customer, HTC, indicates that products from other suppliers compete effectively with NXP solutions. MediaTek confirms that other providers, such as Texas Instruments, offer very good solutions[332].

(349) Finally, most of the respondents to the phase I market investigation consider that the Transaction would not have an impact on the market for the supply of smart amplifiers. In particular, although some customers, such as TCL mentioned the risk of product choices elimination due to bundling practices, others such as Microsoft believe it will be able to obtain supply from other competitors post-Transaction[333].

(350) The Commission considers that the Transaction would not raise competition concerns as to its compatibility with the internal market on the market for the manufacture and supply of smart amplifier chips and the narrower potential market for the supply of smart amplifier chips on devices equipped with a Qualcomm baseband chipset.

7. COMPETITIVE ASSESSMENT – CONGLOMERATE NON-COORDINATED EFFECTS

(351) Under Article 2(2) and (3) of the Merger Regulation, the Commission must assess whether a proposed concentration would significantly impede effective competition in the internal market or in a substantial part of it, in particular through the creation or strengthening of a dominant position.

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330 See responses to question 85.1 of Q1 – Device OEMs, responses to question 18.1 of Q4 – Mobile Audio competitors.

331 See responses to question 16.2 of Q4 – Mobile Audio competitors.

332 See responses to questions 84.1 and 87 of Q1 – device OEMs, responses to question 15.1 of Q4 – Mobile Audio competitors.

333 See responses to question 94.3 of Q1 – Device OEMs, responses to question 35.1 of Q4 – Mobile Audio competitors.

(352) In this respect, a merger may entail horizontal or non-horizontal effects, or both. Non-horizontal effects deriving from a concentration may be vertical or conglomerate.

(353) Vertical effects are those deriving from a concentration where the undertakings concerned are active on different or multiple levels of the supply chain. Conglomerate effects are those stemming from a concentration where the undertakings are active on closely related markets (for example, suppliers of complementary products or products that belong to the same product range). In case of a concentration giving rise to conglomerate effects, the Commission will assess the concentration in accordance to the framework set by the Non-Horizontal Merger Guidelines[334].

(354) Qualcomm is active in the manufacturing and sale of baseband chipsets to device OEMs, whereas NXP supplies NFC and SE chips to device OEMs. NXP also provides the MIFARE technology to device OEMs and licenses MIFARE to SE and SE OS manufacturers.

(355) Based on the information provided by the Notifying Party, the Parties have a common pool of customers: […][335], […][336]; […].

(356) Moreover, the results of the phase I market investigation indicate that device OEMs generally purchase both baseband chipsets and NFC and SE chips[337].

(357) Therefore, Qualcomm's baseband chipsets and NXP's NFC/SE products can be considered to be complementary within the meaning of paragraph 91 of the Non-Horizontal Merger Guidelines.

(358) Accordingly, in the following the Commission will examine whether the Transaction may give rise to conglomerate effects in relation to these products.

(359) As described in sections 6.4.2 and 6.4.3 above, Qualcomm and NXP are also active in the supply of smart amplifier chips and speech enhancement software to device OEMs. However, as explained in those sections, the Commission considers that the Transaction does not raise competition concerns as to its compatibility with the internal market on those markets. For the sake of completeness, the Commission notes that one respondent to the phase I market investigation noted that the Transaction could have a negative impact on those markets since Qualcomm could be able to offer NXP's speech enhancement software and smart amplifiers with its baseband chipsets[338]. The Commission however considers this concern as not merger-specific since Qualcomm already offers Mobile Audio products in the market and, therefore, it could already engage in such conduct pre-Transaction. Moreover, the Transaction does not change Qualcomm's incentive to engage in such strategy since as described in Sections 6.4.2 and 6.4.3 above, NXP does not hold a significant presence in those markets, several alternatives would remain available and NXP's offering does not have superior functionalities compared to its competitors.

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334 Guidelines on the assessment of non-horizontal mergers under the Council Regulation on the control of concentrations between undertakings ("Non-Horizontal Merger Guidelines"), OJ C 265, 18.10.2008, paragraph 7.

335 According to Qualcomm, Apple is an indirect Qualcomm baseband chipset customer in that its devices are made by contract manufacturers, which source chipsets from suppliers like Qualcomm and pass-on their costs to Apple.

336 Form CO, paragraph 918, Tables 4.4 and 4.5 [DOC ID 326].

337 See responses to question 3 of Q1 – Questionnaire to device OEMs.

338 See responses to question 34 of Q4 – Mobile Audio competitors.

(360) Section 7.1 below summarises the analytical framework applicable to conglomerate relationships. Section 7.2 sets out the Parties' and their competitors' market shares for the products relevant for the conglomerate assessment, namely baseband chipsets, NFC and SE chips. Section 7.3 assesses whether the merged entity would hold market power with respect to: LTE baseband chipsets (7.3.1); NFC chips, SE chips and combined NFC/SE solutions (7.3.2); transit service technologies (7.3.3); and IP (7.3.4). In Section 7.4, the Commission examines conglomerate effects in relation to Qualcomm's baseband chipsets, NXP's NFC and SE chips and MIFARE. Section 7.5 analyses conglomerate issues related to the changes the Transaction may bring to NXP's licensing of its IP for NFC technology. Finally, 7.6 Section discusses conglomerate concerns related to Qualcomm's baseband chipsets, NXP's NFC and SE chips as well as the licensing of the merged entity's IP.

7.1. Analytical framework

(361) Conglomerate mergers consist of mergers between companies that are active in closely related markets, for instance suppliers of complementary products or of products which belong to a range of products that is generally purchased by the same set of customers for the same end use[339].

(362) According to the Non-Horizontal Merger Guidelines, in most circumstances, conglomerate mergers do not lead to any competition problems[340].

(363) However, foreclosure effects may arise when the combination of products in related markets may confer on the merged entity the ability and incentive to leverage a strong market position from one market to another closely related market by means of tying or bundling or other exclusionary practices[341].

(364) The Non-Horizontal Merger Guidelines distinguish between bundling, which usually refers to the way products are offered and priced by the merged entity and tying, usually referring to situations where customers that purchase one good (the tying good) are required to also purchase another good from the producer (the tied good)[342].

(365) Within bundling practices, the distinction is also made between pure bundling and mixed bundling. In the case of pure bundling the products are only sold jointly in fixed proportions. With mixed bundling the products are also available separately, but the sum of the stand-alone prices is higher than the bundled price[343].

(366) Tying can take place on a technical or contractual basis. For instance, technical tying occurs when the tying product is designed in such a way that it only works with the tied product (and not with the alternatives offered by competitors). While tying and bundling have often no anticompetitive consequences, in certain circumstances such practices may lead to a reduction in actual or potential competitors' ability or incentive to compete. This may reduce the competitive pressure on the merged entity allowing it to increase prices[344].

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339 See Non-Horizontal Merger Guidelines, paragraph 91.
340 See Non-Horizontal Merger Guidelines, paragraph 92.
341 See Non-Horizontal Merger Guidelines, paragraph 93.
342 See Non-Horizontal Merger Guidelines, paragraph 97.
343 See Non-Horizontal Merger Guidelines, paragraph 96.
344 See Non-Horizontal Merger Guidelines, paragraphs 91 and 93.

(367) In assessing the likelihood of such a scenario, the Commission examines, first, whether the merged firm would have the ability to foreclose its rivals[345], second, whether it would have the economic incentive to do so[346] and, third, whether a foreclosure strategy would have a significant detrimental effect on competition, thus causing harm to consumers[347]. In practice, these factors are often examined together as they are closely intertwined.

7.2. Market shares

(368) The Notifying Party provided market shares on the basis of internal estimates and third party industry reports. In the following, the Commission analyses the market shares of Qualcomm and its competitors with regard to baseband chipsets and of NXP and its competitors for NFC and SE chips.

7.2.1. Market shares for baseband chipsets

(369) When considering market shares for baseband chipsets on the basis of the relevant cellular technology (in line with the product market definition discussed in Section 5.2.3.1. B) above), Qualcomm's market share would be substantial.

(370) Qualcomm's shares would be particularly significant in the market for LTE baseband chipsets[348] (equal to [60-70]% by revenue), as shown in Table 10 below[349]. The second largest player (MediaTek) holds a share of less than half of Qualcomm's and is the only competitor with a market share of more than 5%.

Table 10 - Worldwide market shares for the supply of LTE baseband chipsets, excluding captive sales by Samsung, HiSilicon and Texas Instruments (2014 – 2016)

	2014		2015		2016	
Company	**Share by units**	**Share by revenues**	**Share by units**	**Share by revenues**	**Share by units**	**Share by revenues**
Qualcomm	[80-90]%	[90-100]%	[70-80]%	[70-80]%	[50-60]%	[60-70]%
MediaTek	[5-10]%	[0-5]%	[10-20]%	[10-20]%	[20-30]%	[20-30]%

345 See Non-Horizontal Merger Guidelines, paragraphs 95 to 104.

346 See Non-Horizontal Merger Guidelines, paragraphs 105 to 110.

347 See Non-Horizontal Merger Guidelines, paragraphs 111 to 118.

348 As discussed above in Section 5.2.3.1. B), LTE single-mode chipsets do not constrain LTE chipsets that are also compliant with UMTS and GSM standards. The Notifying Party submitted that it was not possible to submit separate data for single-mode LTE baseband chipsets (See Annex 4.1 to the Form CO, paras 42-43 [DOC ID 326]). Therefore, below and in the following, market shares referring to "LTE baseband chipsets" should be understood as referring to all LTE baseband chipsets including those compatible with other cellular technology standards as well as single mode LTE baseband chipsets. Given that single-mode LTE chipsets constitute a negligible segment of LTE baseband chipsets, the inclusion of those chipsets in the market shares above does not alter the Commission's preliminary findings. As discussed in Section 5.2.3.1. B) above, the Commission concludes that captive sales are not in the same market as merchant sales of LTE chipsets.

349 Even if captive sales were to be included, in 2016 Qualcomm would still have a significant market share ([50-60]% by revenues and [50-60]% by units), well ahead of its closest competitor, Mediatek ([20-30]% by revenues and [20-30]% by units). Furthermore, the Commission notes that Qualcomm's market share for baseband chipsets would be particularly high even when considering an overall product market comprising baseband chipsets compliant with all cellular standards. When considering shares of baseband chipsets (inclusive of captive sales), Qualcomm's 2016 market share was of [50-60]% by revenues. The closest competitor was MediaTek, with a market share of [20-30]% by revenues. When excluding captive production by Samsung, HiSilicon and Texas Instruments. Qualcomm would have a market share of [50-60]% in terms of revenues, well ahead of the second largest player, MediaTek, with a market share of [20-30]% (See Annex 4.9 to the Form CO [DOC ID 327-113]).

Spreadtrum	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[5-10]%	[5-10]%
Intel	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%	[0-5]%

Source: Form CO – Annex 4.9

7.2.2. Market shares with regard to NFC chips and SE chips

(371) Table 11 and

(372) Table 12 below provide the 2016 market shares for NXP and its competitors with regard to NFC and SE chips respectively.

Table 11 - Worldwide market shares for the supply of NFC chips (2014 - 2016)

Company	2014 Share by revenue	2015 Share by revenue	2016 Share by revenue
NXP	[70-80]%	[70-80]%	[70-80]%
Qualcomm[350]	[0-5]%	[0-5]%	[0-5]%
Combined	[70-80]%	[70-80]%	[70-80]%
Samsung LSI	[5-10]%	[10-20]%	[10-20]%
Sony	[5-10]%	[5-10]%	[5-10]%
Broadcom	[5-10]%	[5-10]%	[0-5]%
MediaTek	[0-5]%	[0-5]%	[0-5]%
STMicroelectronics	[0-5]%	[0-5]%	[0-5]%

Source: NXP's internal estimates, Form CO – paragraph 876, Table 4.1 and 4.2

[350] Qualcomm abandoned its NFC development program in 2014 and ceased shipping NFC chips in 2016.

Table 12 - Worldwide market shares for the supply of SE chips (2014 - 2016)

Company	2014 Share by revenue	2015 Share by revenue	2016 Share by revenue
NXP	[60-70]%	[70-80]%	[60-70]%
Infineon	[5-10]%	[10-20]%	[10-20]%
Toshiba	[10-20]%	[10-20]%	[10-20]%
STMicroelectronics	[10-20]%	[0-5]%	[0-5]%
HiSilicon	[0-5]%	[0-5]%	[0-5]%
Renesas	[0-5]%	[0-5]%	[0-5]%

Source: NXP's internal estimates, Form CO – paragraph 876, Table 4.2

(373) As can be seen from Tables 11 and 12 above, NXP holds a significant market share with regard to both NFC and SE products, well ahead of its competitors. Moreover, the Commission notes that the market shares for NFC chips provided by the Notifying Party include those of Samsung LSI, which are mostly used for the internal purposes of Samsung. Therefore, should Samsung LSI's sales be excluded, NXP's market share would likely be higher with regard to NFC chips[351].

7.3. Market power

(374) According to the Non-Horizontal Merger Guidelines, the main concern stemming from conglomerate mergers is that the merged entity could leverage its strong market position from one market to the other by means of tying, bundling or other exclusionary practices[352]. In order to be able to foreclose competitors, the new entity must have a significant degree of market power, which does not necessarily amount to dominance, in one of the markets concerned[353].

(375) In this Section, the Commission assesses whether it can be concluded that the merged entity would have a significant degree of market power, possibly amounting to a dominant position, with respect to LTE baseband chipsets (where Qualcomm is active), NFC/SE chips (where NXP is active) and transit service technologies (in relation to NXP's MIFARE).

7.3.1. Market power of the merged entity with regard to baseband chipsets

7.3.1.1. Notifying Party's views

(376) The Notifying Party explains that post-Transaction the merged entity would not have significant market power in baseband chipsets. The Notifying Party argues that it faces competition from a number of strong and capable semiconductor suppliers and that its share of baseband chipsets has been declining in recent years. The Notifying Party further highlights that vertically integrated OEMs, such as Samsung and Huawei, in addition to developing baseband chipsets for internal use, also sell them to other device OEMs, exerting a competitive constraint on the Parties. In addition, the Notifying Party considers that those device OEMs' "captive" sales of baseband

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351 The Notifying Party argues that […](Form CO, paragraph 867-b. [DOC ID 326]). However, the Commission notes that Samsung LSI is not a supplier for NFC chips to any of the top ten device OEMs directly purchasing Qualcomm's baseband chipsets, with the exceptions of Samsung and HTC (Form CO, Table 4.4 [DOC ID 326]). However, in its response to the phase I market investigation, HTC indicated that it purchases NFC chips entirely from NXP (See HTC's response to question 3 of Q1 – Questionnaire to device OEMs, [Doc ID: 859]). Therefore, at this stage, […] presence on the merchant market for NFC chips is questionable.

352 See Non-Horizontal Merger Guidelines, paragraph 93.

353 See Non-Horizontal Merger Guidelines, paragraph 99.

chipsets constrain "merchant" sales as a result of the possibility held by vertically integrated customers of baseband chipsets to divert their demand to baseband chipsets developed in-house[354].

(377) In its response to Article 6.1(c) decision, the Notifying Party emphasizes that its declining market share provides strong evidence that it faces aggressive competition. Furthermore, it contests the reliability of a third party report's forecast of its market share in 2020. In addition, it points out that its rivals exert a strong competitive constraint, as indicated by the drop in its market share. Finally, it contests the importance of its position as supplier of CDMA chipsets because device OEMs choose to release the same model across all networks (but are not obliged to do so), CDMA is a disappearing technology and, in any event, CDMA chipsets represent a small portion of OEMs' chipset demand.

7.3.1.2. The results of the market investigation and the Commission's assessment

(378) At the outset, the Commission recalls that, according to the Non-Horizontal Merger Guidelines, market shares provide useful first indications of the market power and the competitive importance of both the merging parties and their competitors[355].

(379) Against this background, the Commission first notes that, based on the information presented in Section 7.2.1 above, Qualcomm has high market shares: based on the 2016 figures, Qualcomm's market share would be of [60-70]% by revenues with respect to LTE baseband chipsets Qualcomm's market share would remain high even when considering overall baseband chipsets ([50-60]% by revenues when considering the overall possible market, [50-60]% when excluding captive sales).

(380) Third party industry reports also confirm this. For instance, the Linley Group report "*Mobile Semiconductor Market Share Forecast 2015-2020*" (which takes into account captive sales by Samsung LSI and HiSilicon) attributes to Qualcomm a 2016 market share of [50-60]% by revenues, well ahead of MediaTek[356]. While the Linley Group report forecasts […], it still attributes to Qualcomm a market share in […] for LTE baseband processors of [40-50]% by unit shipments and of [50-60]% by revenues and states that the company […][357]. Qualcomm has contested the reliability of such forecast, without however offering any further explanation as to reasons why such figure should be disregarded or offering alternative predictions about the evolution or level of its market shares in the future.

(381) In any event, Qualcomm's 2016 market share in revenue terms is indicated as being close to [50-60]% with regard to all baseband chipsets, and above [50-60]% when considering only LTE baseband chipsets, also by other third party industry reports, such as Strategy Analytics[358].

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354 See Annex 4.1 to the Form CO [DOC ID 327-68].

355 See Non-Horizontal Merger Guidelines, paragraph 24.

356 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 39; Form CO, Annex 4.16 [Doc ID: 327].

357 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pages 42 - 44; Form CO, Annex 4.16 [Doc ID: 327].

358 See Strategy Analytics Report, September 2016, Annex 4.10 to the Form CO, and Strategy Analytics Report, December 2016, Annex 2.3 to the Form CO [DOC IDs 327-69 and 327-47]. According to the latter source, Qualcomm's provisional market share in terms of revenue on the overall market for baseband chipsets was [50-60]%, ahead of […] ([20-30]%). When considering LTE baseband chipsets, Qualcomm's provisional 2016 market share was [50-60]% by units and [50-60]% by revenue. It should be noted that Strategy Analytics included […]'s sales of baseband chipsets when calculating market

(382) As such, despite exhibiting a relative decline, Qualcomm's market share is still substantial and remains above [50-60]%. This provides a first indication that Qualcomm enjoys market power at the very least with respect to LTE baseband chipsets.

(383) The Commission also notes that respondents to the phase I market investigation generally emphasised that Qualcomm has a strong market position in baseband chipsets[359]. Qualcomm was indicated by device OEM customers and baseband competitors as the leading provider for baseband chipsets in terms of technology, quality, offering breadth, and integration[360]. Providers of NFC technology also commented that Qualcomm is a strong player as regards baseband chipsets[361].

(384) Furthermore, the phase I and phase II market investigation indicated that, contrary to the Notifying Party's assertions, there are no alternative providers of baseband chipsets that would be capable of constraining Qualcomm's market power. Respondents generally indicated that providers such as Spreadtrum, MediaTek and Intel do not exercise a strong competitive constraint on Qualcomm. Samsung LSI[362] and HiSilicon were also not viewed as viable alternative suppliers, as they are focused on non-merchant sales for their parent companies, Huawei and Samsung[363].

(385) As regards Spreadtrum, the Commission notes that its baseband production mainly […] and […][364].

(386) MediaTek began shipping LTE baseband chipsets only in 2014 and, while growing, it is still behind Qualcomm in terms of market share. In that regard, Intel commented that MediaTek is a supplier of "*mainstream baseband chipsets (i.e., non-premium LTE baseband chipsets)*"[365]. Indeed, MediaTek's offering appears to be focused on low to mid-range segments of LTE baseband chipsets and on sales in China[366].

(387) Research by ABI research from 17 February 2016 indicate that, while Qualcomm is […][367].

(388) Industry reports also note that […][368].

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shares. Therefore, should […]'s baseband chipset sales be excluded, Qualcomm's market share would likely be even higher.

359 See responses to questions 18-22 of Q1 – Questionnaire to device OEMs; responses to questions 18-21 of Q2 – Questionnaire to baseband competitors.

360 See responses to question 22 of Q1 – Questionnaire to device OEMs; responses to question 19 of Q2 – Questionnaire to baseband competitors; LG's response to question 50 of Q9 – Questionnaire to device OEMs, [Doc ID: 2043].

361 Responses to question 22 of Q3 – Questionnaire to NFC competitors.

362 Samsung LSI only sells baseband chipsets to a Chinese OEM (see Samsung's response to question 5 of Commission RFI 28, dated 22 July 2017, [Doc ID: 2671]).

363 See responses to questions 18-22 of Q1 – Questionnaire to device OEMs; responses to questions 18-21 of Q2 – Questionnaire to baseband competitors.

364 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pages 40, and 42; Form CO, Annex 4.16 [Doc ID: 327].

365 See Intel's response to question 18 of Q2 – Questionnaire to baseband competitors, [Doc ID: 767].

366 See Strategy Analytics' September 2016 baseband market share tracker, which indicated that "[…]" (Annex 4.10 to the Form CO).

367 "ABI Research Forecasts LTE Carrier Aggregation to Power 61% of Smartphones Shipped in 2020", from https://www.abiresearch.com/press/abi-research-forecasts-lte-carrier-aggregation-pow/, consulted on 25 October 2017 (Doc ID 3270). LTE CA stands for LTE-Advanced chipsets that form part of the (high-end) LTE chipsets market.

368 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 41; Form CO, Annex 4.16 [Doc ID: 327].

(389) With respect to Intel, the Commission notes that, to date, it supplies LTE standalone baseband chipsets only to one customer, Apple. Intel's entry in the market is recent, and it is yet to be seen whether Intel will develop an integrated baseband chipset offering.[369]

(390) In addition, in line with the results of the phase I and phase II market investigation[370], the Commission considers that the worldwide market for LTE chipsets is characterised by the existence of a number of barriers to entry and expansion, including in relation to (i) R&D activities; (ii) certification and relationships with OEMs and MNOs; and (iii) the importance for suppliers to supply chipsets supporting a variety of standards.

R&D activities

(391) A new supplier of LTE chipsets needs to undertake significant initial investments in R&D activities related to the design of LTE chipsets in order to launch its first product on the market.

(392) Indeed, the Notifying Party confirms that R&D plays an important role in the whole semiconductor industry, with new and improved products continuously being introduced[371].

(393) The Notifying Party itself has invested heavily into R&D: it has spent over USD 43 billion since its founding in 1985, and USD 5.5 billion, USD 5.5 billion and USD 5.2 billion in 2014, 2015 and 2016, respectively[372]. It further acknowledges that past R&D expenditure benefits current and future developments[373], thus having a compounding effect.

(394) Competing suppliers of LTE baseband chipsets also indicated that they invested heavily into R&D[374].

Certification and relationships with OEMs and MNOs

(395) Baseband chipsets need to be certified by MNOs on their networks and by OEMs in their devices. The process, which takes at least between 6 to 12 months[375], constitutes a barrier to entry because OEMs and MNOs are often reluctant to test offerings from new baseband chipset suppliers, in light of the significant time and resources required for such activity.[376] This heightens the risk for a new entrant of committing sunk costs to the development of a new baseband chipset[377].

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369 See Intel's response to question 3 of Q2 – Questionnaire to baseband competitors, [Doc ID: 767]. In 2016, "[…]" (The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 33; Form CO, Annex 4.16 [Doc ID: 327]).

370 See, for example, replies to question 30 of Q2 – Questionnaire to baseband competitors.

371 See Form CO, paragraphs 88-89 [DOC ID 326].

372 See Form CO, paragraphs 94 [DOC ID 326].

373 See response by the Notifying Party to question 6 of Commission RFI of 15 May 2017, dated 22 May 2017.

374 See, for example, replies to questions 25-27 of Q10 – Questionnaire to baseband competitors. This was also confirmed by device OEMs, see replies to question 50 of Q9 – Questionnaire to device OEMs.

375 See replies to question 32 of Q1 – Questionnaire to device OEMs.

376 See Intel's response to question 23 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

377 See Intel's response to questions 23 and 25 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

(396) In addition, established suppliers of baseband chipsets benefit from time savings in the certification by OEMs and MNOs due to similarities between older and newer chipset models of the same supplier, since testing can focus on new features[378].

(397) Furthermore, competitors point out that, in order to develop baseband chipsets, a potential supplier need to cooperate with a number of players, including equipment manufacturers[379] and MNOs "*to understand how the standards are implemented at the end product level*"[380] and align its offerings with their equipment and networks. Engagement with handset manufacturers is considered "*critical*"[381] because they provide feedback from deployment of chipsets in a diverse range of real world conditions. The baseband chipset manufacturers use this feedback to improve the reliability and performance of their chipsets.

Importance for suppliers to supply chipsets supporting a variety of standards

(398) OEMs often sell the same devices throughout the world and they expect that suppliers are able to provide baseband chipsets that support a variety of standards used across all geographic areas. In particular, two of the largest carriers in the USA (Verizon and Sprint) as well as several Chinese carriers own mobile networks based on the CDMA standard[382]. In this respect, the phase II market investigation confirmed the relevance of the CDMA standard also in near future[383].

(399) Accordingly, it is important that a supplier is able to supply LTE baseband chipsets that are also compliant with CDMA. This constitutes a barrier to entry since the inability to provide a uniform product globally may deter OEMs from sourcing baseband chipsets from suppliers not offering baseband chipsets compliant with CDMA, in light of the costs associated with developing separate products (for CDMA and non-CDMA baseband chipsets)[384].

(400) In this respect, until 2015, there were only two suppliers active in the production of CDMA baseband chipsets, Qualcomm and VIA Telecom. In 2015, Intel bought the CDMA assets of Via Telecom and has since integrated that technology to begin to develop a CDMA-enabled multimode LTE baseband chipset, which should reach the market only in 2018[385]. In 2015, MediaTek also started supplying CDMA chipsets. However, it addresses lower end segments of the market and its products do not constitute a viable alternative for OEMs requiring more premium features[386]. Therefore, Qualcomm is in practice the only viable supplier of baseband chipsets that are compatible with any CDMA standard[387].

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378 See Intel's response to question 24 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

379 See Samsung's response to question 1 of Commission RFI 28, dated 22 July 2017, [Doc ID: 2671]

380 See Intel's response to question 25 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

381 See Intel's response to question 25 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

382 See Intel's response to question 5 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

383 See Samsung's response to question 5 of Commission's RFI 28, dated 22 July 2017 [Doc ID: 2671]; Samsung's responses to questions 2 and 3 of Commission's questions on 31 July 2017, [Doc ID: 2487]; minutes of the call with Verizon on 3 August 2017, [Doc ID: 2621]; […] response to question 6 of Commission's RFI 31, dated 21 July 2017 [Doc ID: 2633]

384 See Intel's response to question 5 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307]. See Samsung's response to question 2 of Commission's RFI 28, dated 22 July 2017, [Doc ID: 2671].

385 See Intel's response to question 5 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

386 See Intel's response to question 5 of Q10 – Questionnaire to baseband competitors, [Doc ID: 2307].

387 See Samsung's response to question 4 of Commission's RFI 28, dated 22 July 2017 [Doc ID: 2671] and minutes of the call with Verizon on 3 August 2017. [Doc ID: 2621]

(401) The fact that major device OEMs (such as Samsung) need to continue sourcing from Qualcomm LTE chipsets compliant with the CDMA standard hampers their attempts to switch away from Qualcomm[388].

Conclusion

(402) Based on the above, the Commission considers that Qualcomm holds a dominant position in the worldwide market for LTE baseband chipsets.

(403) Additionally, the Commission notes that several respondents to the Commission's questionnaires raised the issue of Qualcomm's so-called "grant-back network"[389] constituting a barrier to entry. Given that the Commission concludes that Qualcomm holds a dominant position in the worldwide market for LTE baseband chipsets, there is no need to conclude on whether Qualcomm's so-called "grant-back network" constitutes an additional barrier to entry.

(404) Therefore, after the Transaction, the merged entity would hold a dominant position in the worldwide market for LTE baseband chipsets.

7.3.2. Market power of the merged entity with regard to NFC, SE chips and combined NFC/SE solutions

7.3.2.1. Notifying Party's views

(405) The Notifying Party acknowledges that NXP holds a high share in the supply of NFC and SE chips. However, such market shares are not indicative of market power for several reasons. In particular, NXP's position is largely attributable to sales to Apple and Samsung and, in light of its […] share of NXP's sales, Apple is aware of its importance for NXP's NFC and SE business. Furthermore, NXP faces intense competition from other credible players […]. In addition, the market for NFC and SE is nascent, which precludes the finding of market power.

(406) The Notifying Party further argues that these products are not essential to the functionality of a mobile device and face competition from competing technologies, such as BTLE, QR codes, MST, "HotKnot" technology and WMC technology (for NFC), HCE, TEE and TPM (for SE).

(407) In its response to the Article 6.1.(c) decision, the Notifying Party reiterates that NFC and SE do not have a "must have" nature, as evidenced by the fact that most of mobile devices are currently sold without such technologies. Furthermore, it points out that the attach rate of NFC and SE for mid-tier mobile devices in 2020 (respectively [40-50]% and [5-10]%) provide a good indication that competing technologies (for example, HCE) exert competitive pressure on either or both product segments.

7.3.2.2. The results of the market investigation and the Commission's assessment

(408) Based on the results of the phase I and phase II market investigation and on the review of the Parties' internal documents, the Commission considers that post-Transaction the merged entity would have a certain degree of market power as regards NFC and SE chips, as well as the combined NFC/SE solutions.

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388 See Samsung's response to question 1 of Commission's RFI 28, dated 22 July 2017, [Doc ID: 2671].

389 The "grant-back network" would be premised on the fact that, when Qualcomm agrees cross-licences with other holders of IPR in the UMTS and LTE standards, Qualcomm obtains the right of pass-through of the other party's IPR to Qualcomm's chipset customers.

Market shares

(409) NXP's market share is particularly high with regard to each of NFC and SE chips ([70-80]% and [60-70]% by revenue, respectively).

(410) With regard to NFC chips, the Linley Group report indicates that in 2016 NXP's market share was of [60-70]% by shipments and [60-70]% by revenues, well ahead of the closest competitor, […][390]. It should be noted that the Linley Group report includes in the NFC market the sales of Broadcom, which the Commission understands has exited the NFC space[391], and of Samsung LSI, which mostly sells internally to Samsung. Therefore, NXP's position in the NFC market is likely even stronger.

(411) However, NXP's high market shares may overestimate its market power since the phase II market investigation has revealed that NXP's sales are dependent on two large customers […], which together account for more than [80-90]% of NXP's NFC and SE sales by volume[392]. A decision by these customers to switch away from NXP and adopt a "mix-and-match" approach would dramatically reduce NXP's market share in NFC/SE.

(412) Apple and Samsung already "mix-and-match" NFC chips and SE chips from different suppliers: […][393]. Even if it continues to procure a share of its total demand for NFC/SE solutions from NXP, Samsung has increased its reliance on its in-house capacity of NFC and SE chips, mixed-and-matched with an SE OS from a third party player.

(413) Moreover, the fact that Apple represents a substantial part of NXP's NFC/SE sales is in the public domain. Therefore, Apple is aware of the relevance of its purchases for NXP's NFC and SE business. In this respect, in its economic submission, […][394].

Competitive pressure from suppliers of NFC chips, SE chips and "mix-and-match" solutions

(414) In the phase I market investigation, NXP was indicated by device OEM customers as the strongest market player in terms of all the relevant components of NFC technology (NFC chip, SE chip and SE OS). NXP was depicted as the market leader, with the most widely adopted and innovative solution on the market. The fact that NXP offers all three relevant components also was indicated as a point of strength[395]. Competitors also indicated NXP as the leading player and highlighted the strength of NXP's complete offering[396]. Some respondents also indicated that MediaTek is not active in the market, if not completely exiting it. Providers of single components were indicated as generally being less innovative or, such as Samsung LSI, mainly producing for its internal demand[397].

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390 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", pages 101 – 103; Form CO, Annex 4.16 [Doc ID: 327].

391 See non-confidential minutes of conference call with Broadcom on 11 July 2017.[DOC ID 1961]

392 See reply to Article 6.1.(c) decision, paragraphs 43-45.

393 See non-confidential version of the Notifying Party's presentation of 29 June 2017. [Doc ID: 1320]

394 See […] submission, "Economic model of Qualcomm's licensing practices", dated 1 September 2015, p. 13. [Doc ID: 2564]

395 See responses to questions 19-21 of Q1 – Questionnaire to device OEMs.

396 Responses to questions 19-21 of Q3 – Questionnaire to NFC competitors.

397 See Intel's response to question 48 of Q2 – Questionnaire to baseband competitors, [Doc ID: 767]; responses to questions 18-22 of Q1 – Questionnaire to device OEMs; responses to questions 19-22 of Q3 – Questionnaire to NFC competitors.

(415) However, the phase II market investigation provided indications that the "mix-and-match" solutions based on components from different suppliers do exercise a competitive pressure on NXP's NFC/SE solution.

(416) In particular, the majority of device OEMs as well as NXP's competitors have indicated that there are viable alternative to NXP for the supply of each of NFC chips (including STMicroelectronics, Samsung, Sony, HiSilicon, and Mediatek), SE chips (including STMicroelectronics, Samsung, and Infineon) and SE OS (including Gemalto, G&D, and Oberthur)[398]. Moreover, contrary to the opinion expressed by some respondents in the phase I investigation, MediaTek appears to be active in the market, by way of example having provided the NFC chip for a handset by Nokia released in September 2017[399].

(417) In addition, the majority of respondents consider that the resulting "mix-and-match" solutions constitute viable alternatives to NXP's combined solution and point out that manufacturers such as STMicroelectronics, Samsung LSI or Infineon provide these offerings[400].

(418) Moreover, some device OEMs have indicated that they multi-source for their demand of NFC and SE chips, usually for reasons of maintaining competitiveness in terms of quality and price[401], thus providing further support to the notion that NXP is faced with competition from other suppliers.

(419) Indeed, some device OEMs stated that in their negotiations with NXP they have been able to threaten to switch to an alternative provider and extract better terms[402]. According to a competitor, switching providers is common since, for each new device generation, device OEMs define their requirements and decide which components to integrate in any given product, which "*opens, in principle, for each device generation (almost every year) a design-in window at device OEMs*"[403].

(420) While the strength of NXP's product offering for NFC and SE is reflected in the Parties' internal documents[404], these documents also provide NXP's views on the existing competition on the NFC/SE markets.

(421) With respect to Samsung LSI, NXP's internal correspondence show that Samsung's use of a mix-and-match solution […] was seen as a […][405] and that Samsung LSI […] [406]. Moreover, internal documents also mention increasing competition with […][407]. Similarly, HiSilicon's […][408] […][409].

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398 See responses to questions 28 and 29 of Q9 – Questionnaire to device OEMs.

399 See report from Tech Insights entitled "Nokia 3 TA-1032 ID253167-AKd" (attached to the Notifying Party's email dated 15 September 2017). [Doc ID: 3331]

400 See responses to questions 28 and 29 of Q9 – Questionnaire to device OEMs.

401 See responses to question 51 of Q9 – Questionnaire to device OEMs.

402 See responses to question 58 of Q9 – Questionnaire to device OEMs.

403 See Infineon's response to question 27 of Q11 –Questionnaire to NXP competitors. [Doc ID: 2102]

404 NXP internal presentation entitled "[…]" of 14 October 2016, […]. That same presentation […] and that […]. NXP internal document, "[…]", dated 14 October 2016, slides 7, 128 and 140, submitted to the Commission on 13 December 2016. [Doc ID: 69]

405 See email by […] on 21 June 2016 (Annex 1 to submission of 18 July 2017). [Doc ID: 1684]

406 See document entitled "[…]" (Annex 2 to submission of 18 July 2017); NXP Internal documents: "[…]" dated November 2016 [doc ID: 1458-28218]; "[…]" dated 21 June 2016 [Doc ID: 1457-24362].

407 See email by […] dated 11 May 2017 (Annex 3 to submission of 18 July 2017). [Doc ID: 1686]

408 See email by […] dated 18 October 2016 (Annex 7 to submission of 18 July 2017). [Doc ID: 1690]

409 See presentation entitled "[…]", dated 13 December 2016 (Annex 8 to submission of 18 July 2017). [Doc ID: 1691]

(422) In this respect, the phase II market investigation has shown that there is also some degree of potential competition coming from players currently selling outside of Europe. In particular, one supplier of NFC chips active in Japan indicated that it intends to enter the European market[410].

(423) Finally, as discussed in Section 5.2.3.2 above, the phase II market investigation has shown that alternative technologies, in particular TEE and HCE, may constitute a competitive alternative to embedded SEs and that, therefore, a certain degree of substitutability may, therefore, exist between the various technologies, especially from a demand side.

(424) In light of the above findings, the Commission therefore considers that NXP holds a certain degree of market power in the markets for NFC chips, SE chips and combined NFC/SE solutions.

(425) The merged entity would thus hold a certain degree of market power in the markets for NFC chips, SE chips and combined NFC/SE solutions.

7.3.3. Market power of the merged entity in relation to transit services technologies

(426) In this Section, the Commission assesses whether the merged entity would hold market power within the market for transit service technologies and for the purpose of the deployment of transit services through mobile devices, as the merged entity would control MIFARE, NXP's proprietary technology for transit services. Other technologies within this market include Calypso, CIPURSE and FeliCa.

7.3.3.1. Notifying Party's views

(427) The Notifying Party acknowledges that MIFARE is the leading platform in the transit space today: however, the Notifying Party specifies that such is the case for card ticketing services, not for smartphone ticketing services. Moreover, in the Notifying Party's view, there are many competing alternatives to MIFARE that transit authorities could choose from as they upgrade their systems. Thus, solutions transit authorities may adopt as an alternative or in addition to MIFARE include CIPURSE[411], Calypso and FeliCa. Transit authorities may also adopt an "open loop" system that allows customers to pay directly from their credit cards or bank accounts as opposed to requiring customers to purchase "closed loop" transportation credit in a separate transaction.

(428) Furthermore, the Notifying Party submits that MIFARE is not a must-have product, particularly for the deployment of transit services through mobile devices. According to the Notifying Party, there is currently no transport ticketing implementation of MIFARE on smartphone devices supplied by […], or other major device OEMs, and only a small share of shipped SE chips are even MIFARE enabled[412].

(429) Moreover, the Notifying Party argues that there are limited prospects for generalized use of MIFARE on mobile phones because, MIFARE requires a different implementation for each transit system, and transit systems have or are likely to upgrade to EMV (contactless payment using banking card data) instead"[413].

(430) In the reply to the 6(1)(c) decision, as regards market power of MIFARE, the Notifying Party further argues that there is no actual implementation of MIFARE for

410 See non-confidential minutes of conference call on 21 August 2017. [Doc ID: 3334]

411 CIPURSE is an open ticketing standard created by the OSPT Alliance.

412 RBB Economics, "M.8306 – Qualcomm/NXP Response to the CRA theory of harm", 11 May 2017

413 RBB Economics, "Qualcomm/NXP, Response to CRA model", 08 May 2017, p. 12.

use on mobile devices, which undermines any finding of relevance or importance of MIFARE for device OEMs. In this respect, the Notifying Party contests that, to the extent that certain mobile devices include a MIFARE-enabled SE chip and are thus MIFARE-enabled, that does not amount to an implementation of MIFARE on the mobile device for actual use in transit services. Further, the Notifying Party submits that MIFARE would be important for device OEMs to the extent that contactless applications for transit are important for mobile devices, which is not the case.

(431) Furthermore, the Notifying Party submits that, while it is true that MIFARE has a [70-80]% market share as regards contactless ticketing, that share relates to smartcards, but not smartphones or mobile devices. Moreover, the Notifying Party explains that there are different types of MIFARE licence (Classic, DESFire, Plus), one of which (Classic) does not require a licence from NXP: a breakdown of MIFARE's share on the basis of those versions would reduce the actual share of MIFARE. In that regard, the Notifying Party also explains that implementation of MIFARE may not require a licence to MIFARE overall, but only to one type of MIFARE.

(432) Finally, the Notifying Party reiterates that there are existing alternative technologies to MIFARE, such as FeliCa and Calypso, which exert a competitive pressure.

7.3.3.2. The results of the market investigation and the Commission's assessment

(433) Based on the results of the phase I and phase II market investigation and on the review of the Parties' internal documents, the Commission considers that the merged entity would hold a dominant position in the market for transit service technologies given the importance of MIFARE, which is also important for the deployment of transit services for mobile devices.

(434) First, the Commission notes that NXP explains on its official website that MIFARE is present in 750 cities and estimates that it has a market share of 77%[414]. This share, which is above 50%, provides a first indication that MIFARE today enjoys market power for transit/ticketing/fare collection.

(435) The Commission also notes that MIFARE is particularly prevalent in Europe and in the United States today, with a large installed base in many large cities. To the contrary, alternative transit services have a more limited presence: FeliCa is only used in Japan, whereas Calypso is present in Europe, but only in certain countries and cities.

(436) Moreover, as was noted by respondents to the phase I market investigation, transit authorities seldom change their transit service technology, given that this entail significant difficulties and switching costs. […][415]. Samsung expressed the same view, stating that "*NXP's MIFARE technology already has become entrenched in contactless transit payment market by virtue of the significant hardware investments already made by transit merchants across the world. These hardware investments create a "lock-in" effect which heavily incentivizes the continued use and development of MIFARE technology, and deters the adoption of competing technologies which would require either abandonment of existing hardware or additional parallel investments in hardware compatible with other technologies*"[416]. Therefore, MIFARE benefits from the fact that it already has a significant and

414 See www.nxp.com/video/:MIFARE –HISTORY.

415 See response by […] to question 46.1. of Q1 - Questionnaire to device OEMs, [Doc ID: 1009].

416 See response by Samsung to question 50.1 of Q1 - Questionnaire to device OEMs, [Doc ID: 1092].

established installed base in the market, and that transit authorities are unlikely to change to a different technology, given the time and costs required.

(437) Second, during the phase I investigation, contrary to the Notifying Party's view, the majority of respondents among device OEMs, baseband providers and NFC/SE providers emphasised that, already today, it is important to offer MIFARE-enabled NFC and Se products and that MIFARE's importance is likely to increase in the next two to three years[417].

(438) For example, […][418].

(439) Most of those respondents also stated that, in their view, MIFARE is already today a "must have" feature for smartphone contactless applications for transit/ticketing/fare collection[419]. Device OEMs counting for a significant part of the market also indicated that they are already purchasing MIFARE-enabled NFC/SE and that they require NFC/SE technology to be MIFARE enabled (this was also confirmed by providers of NFC/SE products)[420].

(440) In that regard, […][421]. Samsung replied that "*MIFARE has become a de facto standard at a minimum in transit ticketing and payment industry. […] Given NXP's dominance in NFC and NFC+SE ICs, which could be compatible with MIFARE, MIFARE will likely achieve even greater penetration, including in the general contactless mobile payment industry*"[422]. Gemalto pointed out that "[m]*any device OEMs require MIFARE enabled NFC/SE.*", and Toshiba argued that "*MIFARE currently has a high share as a smartphone contactless application on a worldwide basis*"[423].

(441) The responses to the phase I market investigation also did not support the argument that other transit technologies, such as FeliCa and Calypso, are valid alternatives to device OEMs, for the purpose of mobile transit services. In that regard, it appears that OEMs do not purchase other technologies such as FeliCa and Calypso as alternatives to MIFARE, but rather as complements (FeliCa for use on smartphones mainly, if not exclusively, in Japan, while Calypso is used in Europe and the US)[424].

(442) […][425]. […][426].

(443) Moreover, when asked to estimate how the installation of MIFARE would develop in the next two to three years as compared to alternative technologies (Calypso, FeliCa), most devices OEMs responding to the phase I market investigation indicated that MIFARE would remain more important[427]. Competing NFC/SE providers were

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417 See responses to question 47 of Q1 – Questionnaire to device OEMs; responses to question 41 of Q2 - Questionnaire to baseband competitors; responses to question 46 of Q3 – Questionnaire to NFC competitors.

418 See response by […] to question 49.1. of Q1 - Questionnaire to device OEMs, [Doc ID: 1009].

419 See responses to question 50 of Q1 – Questionnaire to device OEMs; responses to question 49 of Q3 – Questionnaire to NFC competitors.

420 See responses to questions 46 and 51 of Q1 – Questionnaire to device OEMs; responses to question 50 of Q3 – Questionnaire to NFC competitors.

421 See response by […] to question 46 of Q1 - Questionnaire to device OEMs, [Doc ID: 1009].

422 See response by Samsung to question 50.1 of Q1 - Questionnaire to device OEMs, [Doc ID: 1092].

423 See Gemalto and Toshiba's responses to question 50.1. of Q3 – Questionnaire to NFC competitors, [Doc ID: 678, 745].

424 See responses to question 48 of Q1 – Questionnaire to device OEMs.

425 See response by […] to question 48.2 of Q1 - Questionnaire to device OEMs, [Doc ID: 1009].

426 See response by […] to question 49.1. of Q1 - Questionnaire to device OEMs, [Doc ID: 1009].

427 See responses to question 49 of Q1 – Questionnaire to device OEMs.

mostly of the view that MIFARE would become more relevant than FeliCa and Calypso[428].

(444) Third, in the course of its phase II investigation, the Commission further requested the feedback of market participants on the importance of MIFARE.

(445) The phase II market investigation confirmed that MIFARE is the most relevant transit service technology, and that existing alternative technologies, such as Calypso and FeliCa, have limited presence and reach.

(446) In particular, transit authorities responding to the Commission's phase II market investigation indicated that MIFARE presents advantages compared to other transit technologies, such as reliability, executions speed, implementation and maintenance costs, as well as broad market support[429]. Those respondents also indicated that they are not planning to change to another transit technology different from MIFARE[430].

(447) In that regard, one market player within the NFC/SE space explained that MIFARE has a high market share not only in terms of installed base, but also in terms of new shipments, pointing to the fact that in Europe, FeliCa is not present, Calypso has a share of 5% in terms of installed base and 1% in terms of shipments, with the rest of Europe being covered by MIFARE (which also counts for 97% of shipments)[431].

(448) […][432].

(449) With respect to the importance of MIFARE for device OEMs, […] and Samsung confirmed that they have MIFARE-enabled SEs installed in their latest mobile devices and require MIFARE as a necessary feature for SE chips. […][433]. […][434]. Samsung indicated that its latest devices sold in the European Union include MIFARE Classic and that "*Samsung requires MIFARE compatibility in all of Samsung's latest handset models that have SE*"[435].

(450) Other device OEMs also indicated that they consider MIFARE as an important feature for the selection of SE chips. For instance, LG commented that "*MIFARE support can be an important factor when considering SEs*" and HTC explained that "*the acquired SE must offer MIFARE*"[436]. Those devices OEMs that provided a meaningful response to the phase II market investigation also indicated that MIFARE is and will remain important for the purpose of transit services in the EEA[437].

(451) NFC and SE providers also submitted that, in their experience, device OEMs require SE chips to be MIFARE-enabled. For instance, Gemalto commented that in the last three years of tenders launched by device OEMs for SE chips, all required MIFARE implementation[438]. Gemalto further explained that "*[p]roposing a product without*

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428 See responses to question 48 of Q3 – Questionnaire to NFC competitors.

429 See responses to question 4 of Q12 – Questionnaire to public transit authorities.

430 See responses to question 7 of Q12 – Questionnaire to public transit authorities.

431 Minutes of the conference call with Infineon of 22 June 2017, point 4 [Doc ID 1425].

432 Minutes of conference call with […] of 26 June 2017 [Doc ID 1356].

433 See response by […] to Commission RFI 31 of 6 July 2017, question 19a [Doc ID: 2633].

434 Minutes of conference call with […] of 26 June 2017 [Doc ID 1356].

435 Samsung's reply to Commission RFI 28, dated 5 July 2017, question 18 a), [Doc ID 2671].

436 See responses to question 38 of Q9 – Questionnaire to device OEMs, [Doc ID: 2043, 2106].

437 See responses to questions 43-44 of Q9 – Questionnaire to device OEMs.

438 See Gemalto's reply to Commission RFI 25 of 4 July 2017 [Doc ID: 2152], question 2.2.1. See also reply to question 2.2.6, "*MIFARE is always required, explicitly (most of the time) or implicitly (you know you are out of the game without it)*". Furthermore, Gemalto also points to the fact that MIFARE is

MIFARE is perceived as lack of competitiveness and OEMs do not want to the risk of 'limiting' potentially their service reach. So not proposing MIFARE is not an option"[439]. STMicroelectronics also commented that *"MIFARE is an essential feature required by almost all OEMs*" and that "*[o]ffering MIFARE allows ST to meet the very minimum level of requirements of our customers. When starting the promotion of any products with our customers, MIFARE is a minimum threshold requirement highlighted by the customers to continue the discussion*"[440]. Infineon also stated that "*MIFARE is the most prevalent technology in tenders received in recent years*"[441].

(452) Furthermore, respondents to the phase II market investigation also indicated that mobile ticketing applications on mobile devices are currently being planned and are likely to be increasingly deployed in the next years. Those respondents indicated that MIFARE is particularly relevant to that end.

(453) For instance, respondents among NFC and SE providers cited deployment plans and initiatives in certain Member States, as well as the fact that transport authorities and services require MIFARE technology also for usage through mobile devices[442]. Infineon explained that "*all new tender or requests for information from Public Transport Authorities request solutions for Mobile Ticketing and due to the dominance of MIFARE in the infrastructure MIFARE needs to be considered. Examples are major cities such as Barcelona and Madrid, Los Angeles, (published in 2015)*"[443].

(454) Device OEMs also cited examples and initiatives. For instance, […][444]. […][445].

(455) The Commission also notes that NXP's own website provides an illustration of the launch of transit service functionalities through NFC, MIFARE and mobile devices. For instance, in a presentation entitled "MIFARE4MOBILE" from 2015, NXP listed examples of cities where the roll out of NFC mobile ticketing with MIFARE was under way[446].

(456) Fourth, the Parties' internal documents indicate that MIFARE is the most relevant technology for the purpose of transit services and mobile transit, and that both Parties attribute growing importance to the development of transit services through mobile devices, which includes MIFARE technology.

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also requested as a mandatory requirement by MNOs, see its reply to question 2.2.2. This is also confirmed by Qualcomm's internal document mentioned in recital (471) below, […].

439 See Gemalto's reply to Commission RFI 25 of 4 July 2017, question 2.2.5. See also Gemalto's reply to question 1.17, stating that MIFARE was a "*must have*", [Doc ID: 2152].

440 See STMicroelectronics' reply to Commission RFI 30 of 5 July 2017, questions 2.2.1 and 2.2.2 [Doc ID: 2811].

441 See Infineon's reply to Commission RFI 29 of 5 July 2017, question 2.2.5 [Doc ID: 2955].

442 See Gemalto's reply to Commission RFI 25 of 4 July 2017, questions 2.2.3 and 2.2.4 [Doc ID: 2152]; see G&D's reply to Commission RFI 26 of 4 July 2017, questions 2.2.3 and 2.2.4 [Doc ID: 1932]; see Infineon's reply to Commission RFI 29 of 5 July 2017, questions 2.2.3 and 2.2.4 [Doc ID: 2955].

443 See Infineon's reply to Commission RFI 29 of 5 July 2017, question 2.2.4 [Doc ID: 2955].

444 See […] response to Commission RFI 31 of 6 July 2017, question 19g [Doc ID 2633].

445 Minutes of conference call with […] of 26 June 2017 [Doc ID 1356].

446 NXP document, "MIFARE4MOBILE" slides 34 to 37, June 2015, [DOC ID 1458-856].

(457) In several internal documents, NXP acknowledges and presents MIFARE's primacy as transit service technology and its importance for the deployment of mobile transit services. In one presentation, […][447]. Another NXP document, […][448].

(458) NXP reiterates the importance of MIFARE in various other internal documents. […][449]. The document […] [450].

(459) In another internal email […][451]. This NXP exchange indicates the importance of MIFARE for transit services as well as for device OEMS seeking to deploy mobile transit services.

(460) In another presentation, NXP reiterates the predominance of the MIFARE standard against other transit technologies, as reproduced in Figure 3 below.

Figure 3: MIFARE worldwide presence for e-ticketing

[…]

Source: NXP internal document […], November 2013, slide 7 [DOC ID 2941]

(461) The same document also explains that MIFARE […][452].

(462) The Commission further notes that these NXP internal documents emphasise the importance and market presence of MIFARE as an overall technology, regardless of the specific type of MIFARE technology deployed or installed. Thus, contrary to the Notifying Party's argument that a breakdown of MIFARE by type or generation would dilute MIFARE's share, MIFARE appears to be considered by NXP itself as the dominant transit service solution, regardless of the specific MIFARE considered. Moreover, as can be seen from the market industry reports presented below in recital (477) and Figure 6, even in case of a breakdown of MIFARE per type of technology, MIFARE would still be the most deployed and installed transit protocol technology.

(463) With respect specifically to the Notifying Party's argument that it is not necessary for a competitor to hold a licence to MIFARE Classic (and the example that Infineon offers "MIFARE compatible" products for MIFARE Classic), the Commission notes that NXP internal documents discussing the implementation of […][453]. This NXP internal discussion therefore contradicts the Notifying Party's argument that it is not necessary to hold a licence from NXP to use MIFARE Classic.

(464) The Commission also notes that NXP's MIFARE4MOBILE technology enables the use of transit services through NFC and mobile devices regardless of the relevant type of MIFARE employed by a transit system. NXP explains that MIFARE4MOBILE "*provides mobile network operators, trusted services managers and service providers with a single, interoperable programming interface to*

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447 NXP internal document, presentation for "[…]", slide 10, attached to NXP email by […] of 24 January 2017, [DOC ID 1456-54560]

448 NXP internal document, "[…]", 14 October 2016, slide 42 [Doc ID 77].

449 NXP internal document, Email from […] titled "[…]", dated 2 September 2015, [DOC ID 1458-51968].

450 NXP internal document, "[…]", in particular slide 3-4 and 11-18; attachment to email from […] titled "[…]", dated 2 September 2015, [DOC ID 1458-51968].

451 NXP internal document, email by […], dated 1 September 2015, "[…]", [DOC ID 1458-16481].

452 NXP internal document "[…]", November 2013, slides 8 and 17 [DOC ID 2941].

453 "[…]". NXP internal document, email by […] dated 12 July 2016, "[…]", DOC ID 1457-25172.

remotely provision and manage MIFARE-based services"[454]. In particular, MIFARE4MOBILE can support both MIFARE Classic and Desfire[455].

(465) Therefore, through MIFARE4MOBILE, it is possible to develop transit services on mobile devices with MIFARE-enabled NFC/SE, which can interact with any transport infrastructures based on the various MIFARE standards, without the need for transit authorities to update their system or infrastructure to another MIFARE type. As explained in another NXP document, […] (emphasis added) and […][456].

(466) As regards the development of mobile transit services, NXP's internal documents highlight that, contrary to the Notifying Party's views, the deployment of transit services through mobile devices is not merely speculative. For instance, the notes to an internal NXP presentation from 2016 highlight that […] (emphasis added)[457].

(467) NXP's documents indicate that NXP has indeed taken steps to that end, and that MIFARE is crucial for the launch of mobile transit services. For instance, in a 2016 internal presentation discussing future goals, NXP identifies […] [458].

(468) In another document, prepared for a briefing on NXP's products, NXP indicates that it has entered into a partnership with the Chinese OEM Xiaomi for mobile transit payments and that […]. As regards Europe, the document explains that […][459].

(469) The same NXP document also explains that […][460].

(470) In its internal documents, Qualcomm also discusses the importance of MIFARE, for device OEMs, NFC/SE providers and in relation to the development of transit services through mobile devices.

(471) For instance, in a Qualcomm internal email exchange on the Transaction's synergies, MIFARE is qualified as a decisive factor for competing and as a […] as regards NFC and SE for mobile transit. In the discussion, Qualcomm's […] explains that in relation to MIFARE, […]. Further highlighting the importance of MIFARE, the email comments that […] (emphasis added)[461].

(472) The email is also illustrative of the established presence of MIFARE, as it includes a snapshot, reproduced in Figure 4 below, that visualises the reach of NXP's proprietary transit protocol.

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454 NXP document, "MIFARE4MOBILE", June 2015, [DOC ID 1458-856].

455 MIFARE4MOBILE 1.01 supports MIFARE classic, whereas MIFARE4MOBILE 2.1.1 supports MIFARE classic and Desfire, see NXP document, "MIFARE4MOBILE", June 2015, [DOC ID 1458-856].

456 NXP internal document, "[…]", February 2016, p.7 and p.48 [DOC ID 1457-22843]. Also "[…]" (p.7).

457 NXP internal document, note for the presentation "[…]", 22 April 2016, slide 20 [DOC ID 1412-14048].

458 NXP internal document, "[…]", 14 October 2016, slides 32 and 40 [Doc ID 77].

459 NXP internal document, "[…]", February 2016, p.51, [DOC ID 1457-22843]. For examples of MIFARE deployment on mobile, see also NXP internal document, "[…]", November 2013, slides 33 to 39 [DOC ID 2941] and NXP internal document, "[…]", 14 October 2016, slide 132 [Doc ID 77].

460 NXP internal document, "[…]", February 2016, p.51, [DOC ID 1457-22843].

461 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2476-882]. The Commission notes that NXP internal documents also point to the fact that various industry players were requesting MIFARE as a mandatory feature, see NXP internal document, email from […] dated 4 July 2014, "[…]", [DOC ID 1458-10207]: "[…]".

Figure 4: MIFARE's presence worldwide

[…]

Source: Qualcomm internal document, internal email exchange entitled […], email by […], dated 11 October 2016, [DOC ID 2476-882]

(473) Finally, the email also explains that the need for MIFARE is such to push device OEMs to purchase products that include it: […][462].

(474) It also be noted that in an earlier draft email discussing MIFARE, Qualcomm's […] explained that […][463]. This explanation is dismissive of the Notifying Party's argument of the existence of credible alternative transit service technologies, as FeliCa is qualified as specific to Japan, as opposed to MIFARE ("global"), whereas other transit technologies are not even mentioned.

(475) Qualcomm internally acknowledged the importance of MIFARE also prior to the Transaction, when it entered into negotiations with NXP over a "eSE partnership" in 2013. When commenting on the topic of MIFARE, Qualcomm personnel noted that […][464]. In fact, in an earlier presentation, discussing the strategy for SE products, Qualcomm identified as a […] the need to […][465]. In another email exchange with a device OEM customer regarding SE chips, Qualcomm indicated that […][466].

(476) More recently, in the context of the Transaction, in an email to Qualcomm's […] […] emphasised the importance of NXP's MIFARE technology for Qualcomm, commenting that […] (emphasis added)[467]. The presentation attached to the email also highlights the importance of MIFARE4MOBILE for Qualcomm's strategy, as Qualcomm's […] [468]. Figure 5 below also illustrates that Qualcomm attached value to MIFARE4MOBILE and to its use for transit mobile services.

Figure 5: MIFARE4MOBILE architecture for mobile transit services

[…]

*Source: Qualcomm internal document,[…] , October 2016, […]*slide 11, [DOC ID 2360-76456] presentation attached to Qualcomm internal email by […], 31 October 2017 [DOC ID2364-69862]

(477) Market analysis reports also emphasise that MIFARE is the leading transit protocol technology. For instance, an ABI research on "*Transportation Ticketing Technologies Market Update*" from January 2015 states that […], despite a small decrease, and that […][469]. MIFARE's importance is apparent from the current and forecasted high market share in terms of transit protocol competition, reproduced in Figure 6 below. The Commission also notes that in fact, MIFARE's success is not

462 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2476-882].

463 Qualcomm internal document, draft email by […] entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2364-7278].

464 Qualcomm internal document, internal email exchange entitled "[…]", email by […] to […], dated 1 April 2013, [DOC ID 2476-2507].

465 Qualcomm internal document, "[…]", slide 36, dated 11 February 2013 [DOC ID 2364-16303].

466 Qualcomm internal document, email by Qualcomm's […] to […], entitled "[…]", dated 16 May 2017, [DOC ID 2364-51626].

467 Qualcomm internal document, email by […] to […], 31 October 2017, [DOC ID 2364-69862].

468 Qualcomm internal document, "[…]", October 2016, presentation by Qualcomm's […] and […], slide 9, [DOC ID 2360-76456] presentation attached to Qualcomm internal email by […] to […], 31 October 2017 [DOC ID2364-69862].

469 NXP internal document, ABI research "Transportation Ticketing Technologies Market Update", dated 2 January 2015, slide 3 [DOC ID 1334-6854].

linked to solely MIFARE Classic (which is actually the oldest type of MIFARE technology), but to various subsequent versions, such as DESFire and Ultralight.

Figure 6: MIFARE's current and expected share in transit protocol competition

[…]

Source: NXP internal document, […], dated 2 January 2015, slides 1 and 3 [DOC ID 1334-6854]

(478) Another earlier ABI industry report also assessed that […][470].

(479) The same report also comments that it very hard for new transit technologies to establish themselves, as entry is difficult and entry switching between transit protocols is uncommon: […][471]. In that regard, the ABI report also notes that alternative transit technologies such as FeliCa and Calypso have a more limited geographic footprint[472].

(480) In light of the above findings, the Commission therefore considers that NXP holds a dominant position in the market for transit service technologies through MIFARE, and that thus the merged entity would hold a dominant position within such market. MIFARE is the most relevant and distributed technology for transit services, in terms of installed base and shipments. Moreover, MIFARE is of great importance for device OEMs and NFC/SE providers for the purpose of mobile transit services, which are in the process of being deployed and being developed, among others, by the Parties themselves. Alternative transit service technologies, such as FeliCa and Calypso, do not seem to have the same presence and importance as MIFARE.

7.3.4. Market power with regard to IP (SEPs and non-SEPs)

7.3.4.1. Notifying Party's views

(481) The Notifying Party has indicated that it holds […] NFC patents (individual families or technologies) and […] granted and pending counterparts[473]. Of these, the Notifying Party considers that it holds […] patent families that it believes to be potentially essential to the NFC standard.

(482) NXP holds owns approximately […] patent families, comprising […] individual patents and applications worldwide, that it believes to be relevant to NFC, SE, and SE OS[474]. Of these, NXP believes five patent families (a total of […] individual U.S. patents, and […] individual EU patents) to be potentially essential to the NFC standard[475].

(483) In its reply to the Article 6.1(c) decision, the Notifying Party contends that, with regard to SEPs, NXP does not hold significant market power, as confirmed by the reply by one respondent to the phase I market investigation and by the fact that Samsung LSI, a competing supplier of NFC chips, does not have a license to NXP's NFC IP.

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470 NXP internal document, ABI research report "*contactless ticketing for transportation*", p. 6, 4 May 2012 [DOC ID 1334-4022].

471 NXP internal document, ABI research report "*contactless ticketing for transportation*", p. 10, 4 May 2012 [DOC ID 1334-4022].

472 NXP internal document, ABI research report "*contactless ticketing for transportation*", pp. 15-17, 4 May 2012 [DOC ID 1334-4022].

473 See Qualcomm's reply to Commission's request for information of 14 July 2017, dated 15 August 2015.

474 Form CO, paragraph 961 [DOC ID 326].

475 See NXP's reply to Commission's request for information of 5 May 2017, dated 9 May 2017.

(484) As to non-SEPs, the Notifying Party notes that the IP portfolios of the Parties are complementary and do not give rise to horizontal concerns.

(485) In any event, the Notifying Party notes that the Parties have not carried out an estimate of their shares of the declared potential NFC SEPs or NFC SEPs and that the exact number of patents is not a meaningful basis for the assessment of market power[476].

7.3.4.2. The results of the market investigation and the Commission's assessment

(486) In line with its decisional practice mentioned in Section 5.2.5 above, the Commission considers that – in relation to NFC technology – each of NXP and Qualcomm hold market power with regard to their NFC SEPs since standard implementers in principle cannot design around them and thus "*a potential licensee* […] *cannot switch to another supplier*"[477]. The phase I and phase II market investigation has not revealed any reason for departing from the previous Commission's case practice[478].

(487) As to the Notifying Party's arguments, the Commission notes that Qualcomm mischaracterized the statement of the respondent to the phase I market investigation. First, the same respondent considered that NXP's NFC SEPs are necessary to comply with the NFC standard and cannot be designed around. Second, it indicated that the industry lacks a specific interest in NXP's NFC SEPs not because (as the Notifying Party claims) of their lack of importance, but because NXP does not require its customers buying NFC chips to take a patent license (described as "selling exhaustively"), which therefore has not solicited an interest to investigate NXP's patent portfolio[479].

(488) As to Samsung's absence of license to NXP's IP portfolio, […][480].

(489) As to NFC non-SEPs, a small number of respondents to the phase II market investigation provided an answer with regard to the importance of NFC non-SEPs, indicating that they are either important or very important[481]. However, the Commission considers that, for the purpose of the present Decision, it is not necessary to reach a conclusion as to whether NXP holds market power with regard to its NFC non-SEPs.

(490) The Commission therefore concludes that post-Transaction the merged entity would hold a significant degree of market power as regards the NFC SEPs of Qualcomm and NXP.

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476 Response by the Notifying Party to Commission request for information of 15 May 2017, dated 17 May 2017 and response by the Notifying Party to Commission's request for information of 14 July 2017, dated 15 August 2015.

477 Commission decision of 29 April 2014 in Case AT.39985 – Motorola – enforcement of GPRS standard essential patents, paragraph 242.

478 See responses to questions 14 and 37 of Q1 – Questionnaire to device OEMs.

479 See responses to Q38 of Q3 - Questionnaire to NFC competitors.

480 See NXP's response to Commission request for information of 4 July 2017, dated 14 July 2017.

481 See responses to question 36 of Q11 – Questionnaire to NFC competitors; responses to question 73 of Q9 – Questionnaire to Baseband competitors.

7.4. Conglomerate effects in relation to Qualcomm's baseband chipsets and NXP's NFC and SE chips

7.4.1. Introduction

(491) In Section 7.4, the Commission will analyse whether the Transaction would give rise to conglomerate concerns in relation to Qualcomm's LTE baseband chipsets[482] and NXP's NFC chips, SE chips, NFC/SE combined solutions and MIFARE.

(492) As explained in Section 7.1, the Non-Horizontal Merger Guidelines distinguish between bundling, which usually refers to the way products are offered and priced by the merged entity[483] and tying, usually referring to situations where customers that purchase one good (the tying good) are required to also purchase another good from the producer (the tied good). While tying and bundling have often no anticompetitive consequences, in certain circumstances such practices may lead to a reduction in actual or potential competitors' ability or incentive to compete. This may reduce the competitive pressure on the merged entity allowing it to increase prices[484].

(493) When conducting its analysis, the Commission examines first, whether the merged firm would have the ability to engage in a given conduct[485], second, whether it would have the economic incentive to do so[486] and, third, whether that conduct would have a significant detrimental effect on competition, thus causing harm to consumers[487]. In practice, these factors are often examined together as they are closely intertwined.

(494) In the Article 6(1)(c) decision, the Commission raised serious doubts as to the compatibility of the Transaction with the internal market on the grounds that the merged entity would have the ability and incentive to engage in technical and contractual tying, pure and mixed bundling and degradation of interoperability in relation to baseband chipsets, NFC and SE chips, which would have likely led to the foreclosure of standalone providers of those products.

(495) Following the phase II market investigation, the Commission considers that the merged entity would be likely to engage in mixed bundling with regard to Qualcomm's LTE baseband chipsets and NXP's NFC and (MIFARE-enabled) SE chips. The Commission however does not consider it likely that this conduct in itself would lead to significant anti-competitive effects.

(496) However, the Commission considers it likely that, in addition to engaging in a foreclosure strategy of mixed bundling, the merged entity would also have the ability and incentive to raise the licensing royalties for MIFARE or, in the extreme, to cease the licensing of MIFARE. This conduct, coupled with mixed bundling, would lead to foreclosure of third party providers of baseband chipsets and NFC and SE products.

(497) Following the phase II market investigation, the Commission also considers that the merged entity would have the ability and incentive to engage in a conduct of degradation of interoperability of third parties' baseband chipsets and NFC and SE

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482 For the definition of LTE baseband chipsets, see recital 0 above.

483 Within bundling practices, the distinction is also made between pure bundling and mixed bundling. In the case of pure bundling the products are only sold jointly in fixed proportions. With mixed bundling the products are also available separately, but the sum of the stand-alone prices is higher than the bundled price. See Non-Horizontal Merger Guidelines, paragraph 96.

484 See Non-Horizontal Merger Guidelines, paragraphs 91 and 93.

485 See Non-Horizontal Merger Guidelines, paragraphs 95 to 104.

486 See Non-Horizontal Merger Guidelines, paragraphs 105 to 110.

487 See Non-Horizontal Merger Guidelines, paragraphs 111 to 118.

products. This conduct would compound the foreclosure effects stemming from mixed bundling and increase in MIFARE royalties.

(498) Finally, following its phase II market investigation, the Commission considers that the merged entity would be unlikely to engage in conducts consisting of pure bundling or technical and contractual tying of its baseband, NFC and SE products or both. Furthermore, in the event that the merged entity were to engage in such conducts, the Commission considers that these conducts would be unlikely to lead to significant foreclosure effects.

(499) The Commission will first carry out its conglomerate assessment in relation to a potential mixed bundling conduct, including in relation to the licensing of MIFARE (Section 7.4.2), then in relation to potential pure bundling and tying conducts (Section 7.4.3), and finally in relation to a conduct of possible degradation of interoperability (Section 7.4.4).

7.4.2. Mixed bundling and raising MIFARE royalties

7.4.2.1. Background

(500) In Section 7.4.2, the Commission will assess conglomerate effects in relation to a mixed bundling conduct concerning NXP's NFC and SE products, including MIFARE, and Qualcomm's LTE baseband chipsets, and will consider what the likely impact on competition of such conduct would be.

(501) Bundling can take two forms, pure bundling and mixed bundling. In the case of pure bundling, the products are only sold jointly in fixed proportions. Under mixed bundling, the products are also available separately, but the sum of the stand-alone prices is higher than the bundled price[488].

(502) Therefore, for the assessment of the present case, in a mixed bundling scenario the merged entity would offer a bundle comprising those products at a discount compared to the sum of the prices of the standalone products. The merged entity would continue to offer the standalone products alongside the bundle, at a higher price than the bundle.

(503) At the outset, the Commission recalls that, as indicated in the Non-Horizontal Merger Guidelines, in order to be able to foreclose competitors, the new entity must have a significant degree of market power, which does not necessarily amount to dominance, in one of the markets concerned. The effects of (mixed) bundling can be expected to be substantial when at least one of the merging parties' products is viewed by many customers as particularly important and there are few relevant alternatives for that product[489].

(504) In this respect, with regard to market power of the merged entity, the Commission considers that the evidence on the file as presented in Section 7.3 shows that post-Transaction the merged entity would indeed hold a dominant position in the worldwide market for LTE baseband chipsets and in the market for transit service technologies, and a certain degree of market power in the markets for NFC, SE and NFC/SE combined solutions.

(505) With regard to the dominance of the merged entity within LTE baseband chipsets, reference is made to the arguments and findings of Section 7.3.1.2 in its entirety.

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488 See Non-Horizontal Merger Guidelines, paragraph 96.

489 See Non-Horizontal Merger Guidelines, paragraph 99.

(506) With regard to market power of the merged entity with respect to NFC chips, SE chips, and NFC/SE combined solutions reference is made to the arguments and findings of Section 7.3.2.2 in its entirety.

(507) With regard to the dominance of the merged entity with respect to transit service technologies, reference is made to the arguments and findings of Section 7.3.3.2 in its entirety.

(508) Based on the aforementioned findings, the Commission considers that the merged entity's products, in particular LTE baseband chipsets but also NFC/SE chips and MIFARE, would be important products for device OEM customers.

(509) Further, as stated in the Non-Horizontal Merger Guidelines, for a conduct that results in foreclosure to be of potential concern, it must be the case that there is a large common pool of customers for the individual products concerned. The more customers that tend to buy both products, the more demand for the individual products may be affected through bundling. Such a correspondence in purchasing behaviour is more likely to be significant when the products in question are complementary (emphasis added)[490].

(510) However, the Non-Horizontal Merger Guidelines also indicate that customers may have a strong incentive to buy the range of products concerned from a single source ("one-stop-shopping") rather than from many suppliers, for example because it saves on the transaction costs. The fact that post-Transaction the merged entity would have a broad range or portfolio of products does not, as such, raise competition concerns[491].

(511) As pointed out by the Non-Horizontal Merger Guidelines, the merged entity's incentive to foreclose rivals through bundling would depend on the degree to which such strategy is profitable for the merged entity[492].

(512) The Commission will assess mixed bundling against this backdrop.

7.4.2.2. Analysis of mixed bundling

(513) Based on the results of the phase II market investigation, the Commission considers that post-Transaction the merged entity would have the ability and incentive to engage in mixed bundling of its LTE baseband chipsets with NXP's NFC and SE products, but that this strategy in itself is unlikely to have significant anti-competitive effects.

(514) Yet, the Commission also considers that post-Transaction the merged entity would have the ability and incentive to add MIFARE[493] to the aforementioned mixed bundle and couple such mixed bundling with an increase in the royalty rate of MIFARE, or to refuse to license MIFARE altogether[494], and that this strategy would be likely to have significant anti-competitive effects.

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490 Non-Horizontal Merger Guidelines, paragraph 100.

491 Non-Horizontal Merger Guidelines, paragraph 104.

492 See Non-Horizontal Merger Guidelines, paragraph 105.

493 MIFARE can be understood as a proprietary layer of authentication protocols that communicates across the contactless radio frequency ("RF") standards used by other contactless ICs and also NFC. As such, on mobile devices with NFC capabilities, MIFARE can be included in the SE chip, and in the second step of the mixed bundling conduct, mentioned in recital (516), MIFARE could easily be included on the SE chips integrated with the LTE baseband chipset as well.

494 Refusal to license MIFARE would amount to pure bundling, insofar as MIFARE would only be available within the merged entity's bundle (enabled on the SE chips) and not as a standalone

(515) As a first step of this conduct, the merged entity would have the ability and incentive to engage in a mixed bundling strategy, thereby offering the Parties' products commercially bundled together at a discount compared to the sum of the prices of those stand-alone components[495]. The bundle would consist of the Qualcomm LTE baseband chipset, together with the NXP NFC/SE combined solution, enabled with MIFARE, and the price of such bundle would be lower than the sum of the prices of the respective standalone components.

(516) As a second step in its mixed bundling strategy, the merged entity would have the ability and incentive to technically integrate NXP's MIFARE-enabled SE on the LTE baseband chipset (the Snapdragon platform). Following such integration, Qualcomm would offer to device OEMs both a bundled product comprising the LTE baseband chipset (integrated with MIFARE enabled SE) and the NFC controller, and a set of standalone components, where the bundled product would sell at a discount compared to the sum of the prices of the stand-alone components.

(517) In parallel and in addition to the steps described above, the merged entity would have the ability and incentive to degrade the conditions of access to MIFARE for other NFC/SE suppliers, by raising the licensing royalties or in the extreme by ceasing the licensing of MIFARE altogether. Given the importance and relevance of MIFARE as a technology protocol for mobile transit services, this conduct would result in significant anticompetitive effects against the backdrop of a mixed bundling strategy. As will be discussed in recitals (668) et seq. below, should Qualcomm enable MIFARE on its own SEs and license it under terms which make it unprofitable to other competitors (or deny it completely), such conduct would increase the risk of foreclosure of both rival baseband and NFC/SE suppliers, as their products or bundles (without MIFARE or with an increased MIFARE royalty) would be less competitive against the merged entity and less attractive to device OEMs.

(518) Strong concerns that Qualcomm would pursue such bundling strategy coupled with a degrading of conditions to license MIFARE were raised during the market investigation, in particular by manufacturers of NFC/SE chips and by customer OEMs.

(519) The aforementioned conduct would likely result in decreased profitability and reduced market shares of the merged entity's competitors, leading to foreclosure effects, as standalone competitors' ability and incentive to compete would be reduced. Given that both the baseband chipset and NFC and SE markets are characterised by intensive R&D activity and investment in R&D, declining market shares and profits may therefore reduce prospects to grow and monetize innovations, which would discourage both its baseband and NFC and SE competitors to continue investing in developing the products.

(520) This conduct is discussed in more detail in what follows.

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component (whereas the baseband chipset, NFC and SE would be available standalone). Such possible conduct regarding MIFARE is nevertheless assessed in this Section, given that the effects of a refusal to license MIFARE, against the backdrop of a bundling strategy are analogous to a very large increase in MIFARE royalties.

495 Non-Horizontal Merger Guidelines, paragraph 117.

A) Notifying Party's views

(521) At the outset, the Notifying Party recalls that mixed bundling in itself is presumptively pro-competitive.

(522) As regards the ability to engage in a foreclosure strategy of mixed bundling, the Notifying Party argues the following.

(523) First, the Notifying Party submits that the merged entity would not hold market power in relation to LTE baseband chipsets and NFC and SE chips or MIFARE and that it would not have the ability to foreclose rival suppliers by engaging in a strategy of mixed bundling of sales of its LTE baseband chipsets with NXP's NFC or SE chips or both. As regards baseband chipsets, the Notifying Party faces competition from several manufacturers, including vertically integrated device OEMs such as Samsung and Huawei. With respect to NFC and SE, the merged entity would face competition from other providers of NFC and SE, as well as from providers of alternative technologies to NFC (such as BLE) and SE (such as HCE) post-Transaction. The Notifying Party also considers that mobile device OEMs can and do source baseband chipsets and NFC and SE chips from a variety of other suppliers and that the merged entity would be unable to foreclose rivals through bundling.

(524) Second, the Notifying Party considers that there are practical impediments to practices such as bundling: LTE baseband chipsets and NFC and SE chips are purchased through different procurement teams, and at different times. At a minimum, the fact that customers do not currently structure their tendering processes in a manner compatible with LTE baseband chipset and NFC/SE bundling poses an obstacle to the use of a bundling strategy by the merged entity and serves to make such a strategy less viable[496].

(525) Third, the Notifying Party notes that in analogous circumstances where it has acquired companies producing complementary chips, there is no evidence that a conglomerate strategy of bundling or combining products led to foreclosure. For instance, despite offering Wi-Fi and Bluetooth chips in combination with its baseband chipsets, there is no evidence that the Notifying Party has been able to dominate these markets or to foreclose competitors (the Notifying Party holds only [20-30]% and [20-30]% shares of Bluetooth and Wi-Fi supply respectively)[497].

(526) Fourth, in relation to MIFARE, the Notifying Party claims that MIFARE is not a "must have" product and that there is virtually no implementation of MIFARE for transit systems in mobile phones. Then, there are available alternatives to MIFARE, such as EMV or QR codes. Further, various rival suppliers of NXP have ongoing licenses for MIFARE, which are due to expire at the earliest in […]. This means that those suppliers are protected for a few more years from any conduct by the merged entity.

(527) The Notifying Party also submits that it does not have the incentive to engage in a mixed bundling strategy. Its incentive to engage in mixed bundling and to increase the price of standalone products is limited by the specific facts of the markets for LTE baseband chipsets and NFC/SE.

(528) First, the fact that NFC/SE and baseband chipsets account for a small proportion of handset input costs limits the scope of the "Cournot effect" between the two, which

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496 RBB economics, Response to theories of harm relating to product bundling and tying.[DOC ID: 1745]

497 RBB economics, Response to theories of harm relating to product bundling and tying.[DOC ID: 1745]

in turn would limit the incentive for the merged entity to reduce the price of the LTE baseband chipsets to drive increased usage of NFC/SE and vice versa.

(529) Thus, Cournot effects are unlikely to be material in respect of BC and NFC/SE supply. The extent to which a merged firm would be willing to reduce the price of component products (for example, BC) as a result of this effect is driven by two factors. First, the sensitivity of demand for BC to a change in the price of BC relative to the sensitivity of demand for BC (NFC/SE) to a change in the price of NFC/SE (BC). Second, the relative BC and NFC prices.

(530) In relation to the first point, BC and NFC/SE prices represent only a relatively small percentage of the total price of a mobile phone, and the price of NFC chips is even lower. This implies that it is unlikely that a 5-10% reduction in the price of BC (NFC) would result in a significant increase in mobile phone sales and a resulting expansion in NFC/SE (BC) sales. As such, it appears unlikely that the sensitivity of demand for the BC to a change in the price of the associated NFC will be significant (relative to its own price elasticity) and vice versa.

(531) Second, price negotiation is feasible without engaging in bundling: the use of detailed, individualised price negotiations with OEM customers means that the Parties would not be constrained by the need to offer a uniform price to all customers. This would reduce the importance of implicit price discrimination as a potential motivation for mixed bundling post-Transaction.

(532) Finally, the Notifying Party argues that even if it would have the ability and incentive to engage in such bundling practices post-Transaction , this would have no or only negligible effects on competition.

(533) First, the Notifying Party argues that the market is characterised by countervailing buyer power by large mobile device OEMs: the merged entity's customers are large, well informed OEMs, which are able to take a strategic view of the market. These customers will likely not accept a bundle that could be seen as lessening future competition in the NFC/SE and LTE baseband chipset markets. Furthermore, those OEMs may value purchasing standalone components from rival suppliers (following a "mix-and-match" approach) and would not see either of the Parties' components as unique or "must have", so that they would not choose the bundle.

(534) In that regard, large mobile device OEMs would find it rational to act strategically to protect competition, particularly where they have an existing relationship with a second supplier or in-house manufacturing capabilities. OEMs have sufficient strategic business insights and negotiating power to anticipate any future market trends, and continue purchasing the most cutting-edge technologies at the lowest prices.

(535) Second, the Notifying Party submits that, even if its current customers decided to purchase the products of the merged entity, there would still be a very large amount of new NFC demand: as NFC/SE products become cheaper and more pervasive, demand for such products will extend to those OEMs that do not purchase NFC/SE technology today. This expansion in demand would provide additional sales opportunities to the standalone competitors of the merged entity, which could address such demand, thus justifying their continued investments and presence in NCF/SE technology in the future. In fact, according to the Notifying Party, the anticipated growth in NFC demand will provide sufficient sales opportunities for those products, unrelated to Qualcomm’s BC supply, which will be sufficient to sustain rival NFC/SE suppliers and therefore effective competition.

(536) More specifically, the Notifying Party submits that its baseband chipsets are incorporated in [60-70]% of mobile phones which contain an NFC chip, but in only [20-30]% of mobile phones without an NFC chip. Volumes of mobile phones without NFC chips represents the potential demand growth for NFC chips once NFC becomes a standard feature on mobile phones of all tiers. For 2016, handset devices without NFC totalled […], of which […] did not incorporate a Qualcomm baseband chip, and would therefore not be affected by any bundling strategy of Qualcomm baseband chipsets with NFC chips after the Transaction.

(537) Furthermore, the Notifying Party submits that specific NFC/SE suppliers would be protected, limiting any anti-competitive effects brought by the Transaction.

(538) Samsung LSI is the second largest current supplier of NFC chips and supplies predominantly its own downstream arm, Samsung Mobile. Samsung would thus find it irrational to accept a bundle offered by the merged entity that would undermine its own business going forward. Therefore it can be expected that Samsung LSI would remain a competitor to Qualcomm, supported by ongoing sales to Samsung Mobile. It is unrealistic to expect that any mixed bundling discount would offset the benefit that Samsung obtains from purchasing NFC from its own upstream arm. Sony Semiconductors is the third largest current supplier of NFC and currently sells NFC to its downstream arm only. For similar reasons to those outlined for Samsung, the Notifying Party considers it implausible that NXP could encourage Sony to undermine its own in-house supply. The Notifying Party considers that the same argument holds for HiSilicon, a subsidiary of the device OEM Huawei, which currently produces and sells SE chips to Huawei.

(539) STMicroelectronics is becoming an increasingly important competitor having invested significantly in research and development following its acquisition of AMS in 2016. STMicroelectronics already supplies the SE that is used in the Apple SIM. This relationship with Apple is further likely to protect its competitive position in the future.

(540) Finally, the Notifying Party also considers that the issue that it would leverage MIFARE to exclude rival SE chips manufacturers is not specific to this merger, as both MIFARE and SE are existing NXP products, and NXP could already engage in a bundling and royalty-increasing conduct today.

B) Commission's assessment

1. Ability to engage in mixed bundling

(541) Following its phase II market investigation, the Commission considers that post-Transaction the merged entity would have the ability to engage in a mixed bundling strategy of Qualcomm's LTE baseband chipsets with NXP's NFC/SE combined solution, and MIFARE. In addition, Qualcomm would have the ability to raise the licensing royalties for MIFARE or cease to license MIFARE altogether to customers and competitors.

(542) More specifically, the Commission considers that, as a first step in its strategy, the merged entity would be clearly able to offer a commercial bundle consisting of its LTE baseband chipset and NXP's NFC/SE combined solution (with MIFARE) at a discount price compared to standalone LTE baseband chipsets, and standalone NFC/SE combined solutions (with MIFARE). The Commission considers that this conduct could be implemented immediately after the Transaction, as the merged entity would not face technological hurdles when offering the products commercially together.

(543) The merged entity would offer those products in this formula in the first few years after the Transaction, which would correspond to the period needed to integrate the NXP SE on the Qualcomm baseband chipset.

(544) As a second step, within the next two to three years after the Transaction, the merged entity would have the ability to technically integrate NXP's SE with the Qualcomm LTE baseband, and would have the ability to offer as a discounted bundle the integrated LTE baseband-SE product (implementing MIFARE) with the NFC chip, at the same time raising the price of the standalone integrated products. In parallel, Qualcomm would continue having the ability to ask for higher royalties for MIFARE in licensing negotiations or of no licensing altogether.

(545) Based on the findings of the phase II market investigation, the Commission considers that the merged entity would have the ability to engage in the aforementioned conduct for the following reasons.

(546) First, LTE baseband chipsets and NFC/SE chips and MIFARE are complementary products and are purchased by a common pool of customers which are the mobile device OEMs[498].

(547) Based on the information provided by the Notifying Party, the Parties have a common pool of customers: nine out of Qualcomm's top ten baseband chipset customers, as well as Apple[499], also purchase NFC and SE chips from NXP or other suppliers[500]; similarly, NXP's top ten NFC device OEM customers also source baseband chips from Qualcomm or other suppliers[501]. These customers can hence be addressed by a mixed bundling strategy.

(548) The Commission considers that Qualcomm's baseband chipsets and NXP's NFC/SE products can be considered complementary within the meaning of paragraph 91 of the Non-Horizontal Merger Guidelines. Device OEM customers buy these products as inputs for their mobile devices.

(549) The Commission notes that the merged entity would face no difficulty in promptly implementing the first step of the mixed bundling conduct after the Transaction, given that it would not face any technological hurdles to do so, since the commercial variant of mixed bundling does not require any physical modification of the products included in the bundle. To the contrary, the fact that LTE baseband chipsets and NFC and SE chips, as well as MIFARE, are complementary products that are purchased by a common pool of customers facilitates the adoption of a mixed bundling strategy. MIFARE could also be easily added to the bundle.

(550) Second, respondents to the Commission's phase I market investigation indicated that Qualcomm would have the ability to engage in mixed bundling of baseband and NFC/SE products. Those respondents also indicated that Qualcomm would have the means and ability to technically integrate NXP's products (in particular, the SE chip) on the Qualcomm baseband, and to refuse licensing MIFARE (or license MIFARE at increased royalties).

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498 See Non-Horizontal Merger Guidelines, paragraph 100.

499 According to Qualcomm, Apple is an indirect Qualcomm baseband chipset customer in that its devices are made by contract manufacturers, which source chipsets from suppliers like Qualcomm and pass-on their costs to Apple.

500 Form CO, paragraph 918, Tables 4.4 and 4.5 [DOC ID 326].

501 Form CO, paragraph 919, table 4.6 [DOC ID 326].

(551) When asked whether Qualcomm would have the ability to engage in mixed bundling by offering the commercial bundle of baseband chipsets and NFC/SE products at a lower price compared to the respective separate products, device OEM customers, and baseband chipset and NFC competitors responding to the market investigation confirmed that Qualcomm indeed has that ability[502]. […][503]. Microsoft refers to Qualcomm having an "*established practice of selling multiple chipsets together at a lower bundled price*" and indicates that it would "*presumably*" also have the ability to continue with such a practice in the case of NXP's NFC/SE products[504].

(552) Respondents to the phase II market investigation reiterated those views[505].

(553) For instance, Samsung also explained that "*Qualcomm offers "chipset solutions" or "mobile platforms" that consist of a MSM (which is usually a combination of the AP and modem) and other chips that comprise RFIC (Radio Frequency IC), PMIC (Power Management IC), WiFi, BT and GPS, among others. Sometimes (but not always) BT and WiFi are combined into a single chip, as are the RFIC and GPS* […] *For technical reasons, bundling permits faster deployment (as all of the chips in this solution are already integrated) and arguably has pricing advantages (as less time needs to be spent with integration of different solutions). The technical reasons for bundling also conveniently permit the chipset solution provider to price its chipset as a bundle, whether for better or for worse*"[506]. Samsung further explained that "*the components within the Qualcomm integrated solution are optimized to work together and are priced as a platform*"[507].

(554) As regards the way those products are procured by mobile device OEM customers, the Notifying Party submitted that there are practical impediments to practices such as bundling since BCs and NFC are purchased through different procurement teams, and at different times. On this point, the Commission notes that, according to a major customer, "*[t]he European customer procurement cycles for cellular communications chipsets and NFC chips are very similar (since the large majority of mobile devices require both functionalities*)"[508]. Moreover, even if the procurement of baseband chipsets and NFC/SE chips through device OEMs is currently undertaken by separate procurement teams, and possibly at different (though not very distant) points in time, the two components are acquired to be integrated in the same end devices, so that it would be possible for device OEMs to coordinate the purchase of the two components internally in such a way as to accommodate for bundled sales by the merged entity, in particular since the two components are acquired to be integrated in the same end devices.

(555) Indeed, this seems to be the approach adopted by some of the major customers for the procurement of their components from Qualcomm already pre-Transaction. For instance, Samsung explains that "*Samsung Mobile's Procurement Team negotiates*

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502 See responses to question 65 of Q1 – Questionnaire to device OEMs; responses to question 56 of Q2 – Questionnaire to baseband competitors; responses to question 62 of Q3 – Questionnaire to NFC competitors.

503 See response by […] to question 65 of Q1 – Questionnaire to device OEMs, [DOC ID: 1009].

504 See response by Microsoft to question 65 of Q1 – Questionnaire to device OEMs. [DOC ID: 776]

505 See for instance responses to question 3.2 of RFI 29 [DOC ID: 2955].

506 See response by Samsung to question 19 of RFI 28 [DOC ID 2671].

507 See response by Samsung to question 7 of the Commission's supplemental questions to RFI 28 [DOC ID: 2672].

508 Third party submission of 2 October 2017, page 9 [DOC ID 3138].

with Qualcomm with respect to the solution as a whole, and does not negotiate on a chip-by-chip basis"[509].

(556) Therefore, it appears that Qualcomm could implement a mixed bundling strategy of NFC/SE chips around the sale of the LTE baseband chipset.

(557) With regard to the second step in the mixed bundling strategy, namely the ability to technically integrate the SE chip on the LTE baseband, respondents to the phase I market investigation, both among customers and competitors, indicated that Qualcomm would have the technical ability to engage in product integration of the SE chip with the baseband chipset.

(558) The Commission recalls that, during the phase I investigation, respondents among customers and competitors indicated that in their view the merged entity would have the ability to engage in various types of product integration, notably not just the SE chip with the Qualcomm baseband, but also the NFC chip with the baseband chipset[510].

(559) Following the phase II market investigation, the Commission considers that, while it may be possible for the merged entity to also integrate the NFC chip with the Qualcomm baseband, this conduct does not appear to be one that the merged entity would most likely pursue in the near future. Rather, the most likely and feasible type of technical integration that the merged entity would be likely to pursue in the near future would be the integration of the SE chip with the Qualcomm baseband, as this conduct is the one that, in the view of respondents to the market investigation illustrated in the following recitals, is the most likely and achievable.

(560) Moreover, as is also evidenced by the Parties' internal documents further discussed below in this Section, the type of integration that the Parties mainly discussed and would consider implementing would be that of the SE chip on the Qualcomm baseband.

(561) Some respondents, such as Infineon, indicated that Qualcomm has already presented at the 2017 GSMA Congress in Barcelona a prototype integrating a baseband chipset and a secure element[511]. Although this prototype is focused on the integration of the secure iUICC within the Snapdragon baseband chipset, this shows that Qualcomm does pursue a similar integration strategy and would have the ability to integrate the SE on the Snapdragon.

(562) Gemalto submitted that Qualcomm is most likely to "*(a) cease licensing MIFARE and make MIFARE enabled SEs available bundled with their own basebands and /or AP chipsets; or (b) move to an approach where SEs are integrated with basebands and/or APs and where Qualcomm no longer offers MIFARE-enabled NXP SEs on a standalone basis*"[512].

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509 Samsung's reply to the Commission's RFI 28, question 19, [DOC ID 2671].

510 Integration of the NFC chip in the baseband chipset, integration of the SE in the application processor, integration of the SE in the baseband chipset. See Responses to question 52 of Q1 – Questionnaire to device OEMs; Responses to question 45 of Q2 – Questionnaire to baseband chipsets competitors and Responses to question 52 of Q3 – Questionnaire to NFC competitors.

511 https://www.gsma.com/rsp/wpcontent/uploads/2017/03/4.Qualcomm_iUICCDemo-for-MWC_Final_Feb02_2017.pdf.; [DOC ID: 3347].

512 See response by Gemalto to question 3.2 of RFI 25 [DOC ID: 2152].

(563) Among the customers, […] [513].

(564) Samsung also submitted that it may be possible for Qualcomm to technically integrate baseband chipsets and secure element, but could not speculate on the costs and time involved for such process[514].

(565) Respondents to the phase I market investigation also pointed out that the merged entity would have the ability to bundle a MIFARE-enabled SE with Qualcomm's BC and offer them to customers that would otherwise buy these products separately[515]. One customer OEM indicated that, in a situation where the merged entity would bundle these products, customers would not be able to turn to alternative technologies such as FeliCa or Calypso, as MIFARE is the dominant technology in contactless ticketing worldwide. The phase II market investigation confirms this view[516].

(566) Third, this mixed bundling approach of first offering the Parties' products (baseband, NFC/ (MIFARE enabled) SE) commercially together and subsequently offering them in a technically integrated mixed bundle (in particular, the SE on the Qualcomm baseband) is also reflected in the Parties' internal documents.

(567) As regards the commercial offering of the Parties' products together at a discount, an internal document of the Parties, related to the "go to market approach" of the merged entity, emphasises as key considerations to […]. The same internal document also indicates that […][517].

(568) Indeed, it appears that in the course of several integration summits, the Parties outlined plans to ensure […][518]. The internal documents prepared for those integration summits illustrate that the Parties aimed to ensure the feasibility of cross-selling of NXP's products to Qualcomm device OEM customers, in particular NFC products, as of day one after the Transaction as can be seen in Figure 7 below.

Figure 7: Parties' checklist of feasibility of cross-selling of NXP NFC products

[…]

Source: Qualcomm internal document, […] .

(569) Moreover, the Parties' internal documents also show that NXP's sales representatives for products to device OEMs were expected to be moved to Qualcomm's mobile sales teams dealing with the device OEMs. In an email exchange between the Parties' representatives and the external consultants of […], discussing the post-merger organisation of sales, it can be read that "[…]" (emphasis added)[519]. Therefore, under this sales structure (agreed between the Parties), contrary to the Notifying Party's argument mentioned in recital (554) above, it would not be

513 See responses by […] to question 53.1 of Q1- Questionnaire to device OEMs [DOC ID: 1009] and question 22 of RFI 31 of 21 July 2017 [DOC ID: 2633].

514 See response by Samsung to question 23 of RFI 28 of 22 July 2017, [DOC ID: 2671].

515 See Responses to question 72.1. of Q1 - Questionnaire to device OEMs; responses to question 72 of Q3 – Questionnaire to NFC competitors.

516 See for instance responses to RFI 28 to Samsung [DOC ID: 2671], RFI 31 to […] [DOC ID: 2633], RFI 25 to Gemalto [DOC ID: 2152], RFI 29 to Infineon, [DOC ID: 2955].

517 NXP internal document, "[…]", dated 21 February 2017, slides 10 and 13, presentation attached to Email sent by NXP's […] internally within NXP [Doc ID 1456-28230] [[…].msg].

518 Qualcomm internal document, "[…]", dated 26 April 2017, slide 17, [DOC ID 1456-15930] […].

519 NXP internal document, email exchange between Qualcomm's […] and NXP's […] forwarded by […] within NXP, email of 14 March 2017, [DOC ID 1456-18863] [[…] msg].

problematic for the merged entity to organize its product offerings to device OEM customers in a coordinated manner and make bundled offers.

(570) With respect to the second step of the likely mixed bundling strategy, namely technical integration, the Commission notes that the Parties discussed the opportunity to engage in technical integration of the SE chip within Qualcomm baseband chipsets, as is illustrated by the Parties' internal documents. As explained in more detail in Section 7.4.2.2 B) 2. below, those documents are illustrative of Qualcomm's plans to pursue technical integration of the SE within the LTE baseband chipset. Moreover, those internal documents also indicate that Qualcomm would have the ability to pursue technical integration of the SE and achieve it within two to maximum three years from the Transaction.

(571) Such technical integration would differ from the current, pre-Transaction collaboration between the Parties. Qualcomm's assessment of the feasibility of technical integration suggests that the merged entity would be able to integrate the SE within the baseband chipset. In an email exchange with NXP, Qualcomm's […] commented that […] (emphasis added)[520].

(572) In an internal Qualcomm discussion, one Qualcomm executive commented that […] and that, following a series of steps and internal processes, Qualcomm would […][521].

(573) Moreover, in the notes of the Parties' security workshop of 18-19 April 2017 (see recital (619) below) NXP's […] noted that […](emphasis added)[522].

(574) A subsequent email by NXPs' […] to NXP's […] indicated that "[…]" (emphasis added)[523].

(575) Moreover, the Commission notes that this strategy of the integration of components on the Qualcomm baseband chipset, using Qualcomm's mobile strength to expand in neighbouring markets and contemporaneously strengthen and protect the position in the baseband sector, is consistent with past Qualcomm conduct.

(576) Qualcomm offers baseband chipsets which are technically integrated with other chips such as GPS, WI-FI and Bluetooth chips. As early as 2000, Qualcomm introduced GPS functionality to its baseband chipset[524]. Following the acquisition of Atheros, a supplier of connectivity products including in particular WLAN and Bluetooth chipsets for mobile devices, in 2011, Qualcomm integrated WI-FI and Bluetooth chips on its Snapdragon platform[525]. The Linley report notes in relation to WI-FI that

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520 NXP internal document, "[…]", email sent by Qualcomm's […], dated 9 May 2017, [DOC ID 1458-30755] [[…] msg].

521 Qualcomm internal document, email by […], entitled "[…]", dated 4 November 2016, [DOC ID 2364-72772].

522 NXP internal document, "[…]", word document attached to email from […] to […], "[…]", 3 May 2017, [DOC ID 1456-52124] […].

523 NXP internal document, email from […] to […], "[…]", dated 26 May 2017, [DOC ID 1456-53926] […].

524 The Notifying Party's Response to Commission RFI 46 of 12 September 2017, question 1.

525 RBB Economics paper of 18 August 2017, "Assessment of Qualcomm's selling practices following the acquisition of Atheros."

Qualcomm introduced the integrated WI-FI as of 2012. The report notes that […][526]. The report also notes in relation to Bluetooth chips that […][527].

(577) Some market participants such as Samsung also pointed out that, over the years, Qualcomm has introduced numerous chipsets that provide different levels of integration[528].

(578) Therefore, a strategy of long term integration of the NFC/SE components, and in particular, based on evidence reviewed, of the SE chip, on the LTE baseband chipset, would be consistent with Qualcomm's past practices. However, the Commission notes that following the acquisition of Atheros, the Qualcomm continued to sell standalone WI-FI and Bluetooth chipsets. For those reasons the Commission takes the view that the merged entity would be more likely to engage in a mixed bundling strategy rather than a pure bundling or tying strategies.

(579) Based on internal documents of Qualcomm, it also appears that the merged entity would be able to include MIFARE on the SE chip of the mixed bundling strategy and offer such bundle at a discount. In an email entitled […] […] of Qualcomm wrote to other executives in Qualcomm: […] (emphasis added)[529]. As referred to in footnote 493, MIFARE can be included in the SE chip and could thus be easily included on the NFC/SE sold in a bundle with the LTE baseband chipset.

(580) Finally, as MIFARE is a NXP proprietary technology, the merged entity would have the ability to raise royalties or cease the licensing of MIFARE once the ongoing licenses expire. NXP has not taken any obligations with any standard setting organisation to license this technology on F(RAND) terms or to license it at all[530]. Outside the obligations taken as part of the ongoing licensing agreements[531], NXP, and post-Transaction, the merged entity, does not have an obligation to license MIFARE to other suppliers of NFC/SE solutions after the expiry of the ongoing licensing agreements. At the expiry date of these agreements, the merged entity could be the only provider of the MIFARE technology if it chooses so. Therefore, as of […], the merged entity (when current MIFARE agreements have ended) would have the ability to stop licensing MIFARE, once its current contractual obligations come to an end.

(581) In light of the above, the Commission therefore takes the view that the merged entity would have the ability to engage in a mixed bundling strategy of Qualcomm's LTE baseband chipsets with NXP's NFC and (MIFARE-enabled) SE chips and to degrade licensing conditions for MIFARE (or cease licensing MIFARE altogether). It would also have the ability to technically integrate at least the SE chip on its baseband chipset in the foreseeable future.

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526 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 50 and 53; Form CO, Annex 4.16 [DOC ID: 327].

527 The Linley Group: "*Mobile Semiconductor Market Share Forecast 2015-2020*", page 61; Form CO, Annex 4.16 [DOC ID: 327].

528 Samsung's reply to RFI 28 of 22 July 2017, question 19, [DOC ID: 2671].

529 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2476-882].

530 See the Notifying Party's response to Commission's RFI of 28 February 2017, question 22.

531 Gemalto, ST Microelectronics or G&D have ongoing MIFARE licensing agreements with NXP, these agreements will come to an end within […]; Gemalto and G&D have licensing agreements which are due to expire in […], and STMicroelectronics has an agreement which expires in […].

2. Incentive to engage in mixed bundling

(582) For the reasons set out in the following recitals, the Commission considers that post-Transaction the merged entity would have the incentive to engage in mixed bundling and to increase MIFARE royalties (or in the extreme refusal to license MIFARE), in the fashion outlined in recitals (513) and (517).

(583) With regard to the first step of the mixed bundling strategy, concerning the sale of LTE baseband chipsets together with NFC and (MIFARE-enabled) SE chips at a discount compared to sum of the prices of the relevant stand-alone components, the Commission considers that the merged entity would have the incentive to engage in such conduct for the following reasons.

(584) First, as explained in recitals (546) to (549) above, the Commission considers that Qualcomm's baseband chipsets and NXP's NFC/SE products can be considered complementary within the meaning of paragraph 91 of the Non-Horizontal Merger Guidelines: mobile device OEM customers tend to buy all those products for their end devices, with baseband chipsets clearly being indispensable for the functioning of mobile devices, and NFC/SE chips and MIFARE increasingly becoming more and more important for such devices.

(585) Second, the Commission notes that mixed bundling of complementary products would very likely be a profitable strategy for the merged entity even in the short run, irrespective of whether foreclosure occurs. The merged entity would have an incentive to engage in mixed bundling, setting the price of the bundle composed of its own products below the sum of the two standalone prices. This is because the merged entity now internalises the positive externality that a lower price of one component generates in terms of demand for other complementary components[532]. At the same time, post-Transaction the merged entity would also have an incentive to raise the price of its standalone components (that is, BCs or NFC/SE chips), thus making its competitors' products less attractive to those customers who want to "mix and match", that is to buy one component from the merged entity and the complementary component from a third-party producer. This price increase of the standalone components would divert demand away from such mix-and-match solutions towards the bundle offered by the merged entity. Optimising the pricing of the own bundle and of the stand-alone components in this manner could be expected to increase the sales of the merged entity, making mixed bundling a profitable strategy[533].

(586) Third, when asked whether Qualcomm would have the incentive to engage in mixed bundling by offering the bundle of baseband chipsets and NFC/SE products (including MIFARE) at lower prices than the standalone products, a majority of respondents to the phase I market investigation confirm that Qualcomm indeed has

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532 Before the Transaction, lowering the price of, say, the baseband chipset would have stimulated the demand for all complementary SEs, but the firm producing the baseband chipsets would not have benefitted from this additional demand for SE and corresponding profits, because it did not own any of the SE producers. The same reasoning applies vice versa for the price of SEs and their impact on the profits of baseband chipset producers. Thus, when setting their prices individually, producers of complementary goods tend to charge higher prices than would be optimal if they were to jointly maximise their joint profits (this is known as the "Cournot effect"). After the Transaction, the merged entity takes into account that if it lowers the price of a bundle, this increases demand both for its BCs and for its SEs. See also Non-Horizontal Merger Guidelines, paragraph 117.

533 See Choi, Jay Pil. "Mergers with bundling in complementary markets." The Journal of Industrial Economics 56.3 (2008): 553-577.

that incentive[534]. […][535]. Gemalto considers that in the event of mixed bundling Qualcomm could, rather than lowering the price of the bundle "*increase the price of the standalone products to expand its demand for the bundle*"[536]. Samsung explains that "[a]*ssuming that such bundled price is indeed cheaper than the prices of standalone products available from competitors, then OEM[s] most likely would buy the cheaper Qualcomm bundled product. However, such a price likely will not persist, if it occurs at all. The likely effect would be that Qualcomm would drive out competition from standalone product suppliers and then later raise the price after competitors are driven out of the relevant markets*"[537].

(587) Furthermore, most respondents to the phase I market investigation who expressed an opinion also considered that in a situation of mixed bundling, Qualcomm would have the incentive to charge higher prices for stand-alone products compared to pre-Transaction prices by Qualcomm and NXP respectively[538]. For instance, one respondent to the phase I market investigation submitted that the merged entity would […] "*substantially raise the price of the NXP chips, and offer a very significant discount to customers who also buy Qualcomm chips; and […] offer a very significant discount on Qualcomm chips to customers who also buy NXP chips*"[539]. Gemalto explains: "[i]*t is the possibility of bundling the two products that makes it profitable post-merger to increase the price of the separate products compared to the prices in the absence of the merger. This would increase demand for the bundle and margins on the standalone products*"[540].

(588) Some customers explained that they could not ignore the advantages of the bundled products. Samsung explained that to a certain degree it already uses some competing chipsets (baseband included) to the extent it this does not result in too large disadvantages. However, "*Samsung is continuously under pressure from network carriers, who are Samsung's direct customers, to lower the materials costs and the price of Samsung's handsets – even at the high-end and flagship tiers. Therefore, Samsung has minimal flexibility in how much it can divert business to other suppliers – assuming that it has that choice in a particular market – especially if the merged company would offer "a bundle at a cheaper price"*[541].

(589) Fourth, as mentioned in recitals (528) to (530), the Notifying Party argues that the fact that NFC/SE and baseband chipsets account for a small proportion of handset input costs limits the scope for discounts on the Parties' own bundle in a mixed bundling strategy after the Transaction. The Notifying Party claims that any such discount, even if sizable as a fraction of the value of the bundled products, would only lead to a small reduction (if any) in the final price of the mobile device

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534 See responses to question 66 of Q1 – Questionnaire to device OEMs; responses to question 57 of Q2 – Questionnaire to baseband competitors; responses to question 63 of Q3 – Questionnaire to NFC competitors.

535 See response by […] to questions 65-66 of Q1 – Questionnaire to device OEMs, [DOC ID: 1009].

536 See response by Gemalto to question 62 of Q3 – Questionnaire to NFC competitors, [DOC ID: 678].

537 See responses by Samsung to question 59 of Q2 – Questionnaire to baseband chipset competitors, [DOC ID: 1089]; response by Samsung to question 65 of Q3 – Questionnaire to NFC competitors, [DOC ID: 1095].

538 See responses to question 67 of Q1 – Questionnaire to device OEMs; responses to question 58 of Q2 – Questionnaire to baseband competitors; responses to question 64 of Q3 – Questionnaire to NFC competitors.

539 Third party submission of 2 October 2017, page 1. [DOC ID 3138].

540 See response by Gemalto to question 64 of Q3 – Questionnaire to NFC competitors, [DOC ID: 678].

541 See Samsung's response to RFI 28 of 22 July 2017, question 31, [DOC ID: 2671].

containing these bundled products, implying that final consumers are unlikely to switch mobile device brands as a result of such small changes in mobile device prices. The Notifying Party therefore concludes that mixed bundling would have a very small (or even no) impact on demand for their own bundle (or demand for the third parties' components), so that they would not have any incentive to engage in that pricing strategy in the first place.

(590) This claim is based on the mistaken premise that the impact of mixed bundling on the demand for the Parties' products operates through final consumers, and through their choice of mobile device brands. It may indeed be the case that consumers' demand for any given mobile device brand is insensitive to the wholesale price of mobile device components. However, the demand for LTE baseband chips and NFC/SE solutions that is relevant to the merged entity is the wholesale demand of device OEMs, who are the direct customers of the component producers, and not the retail demand of final consumers of the mobile devices. As pointed out by the Notifying Party, device OEMs are likely to carefully evaluate the procurement cost of any given mobile device component before placing their orders. Given the significant level of expenditure on LTE baseband chipsets and NFC/SE solutions in the total input cost of device OEMs, their demand for any given product is likely to be sensitive to its prices. It is therefore ingenious to claim that a mixed bundling strategy would have no impact on the demand for the Parties' products, and could therefore not be profitably pursued.

(591) Fifth, the Parties' internal documents suggest that the merged entity would have an incentive to engage in mixed bundling of LTE baseband chipsets with NFC and (MIFARE enabled) SE chips, and in the integration of the SE chip on the baseband chipset.

(592) In documents discussing the Transaction's synergies, the Notifying Party mentions the […] to Qualcomm and […], including […][542]. Another Qualcomm internal document discussing the […] of the Transaction mentions the […][543].

(593) Other internal documents discussing the "Go To Market" strategy of the merged entity illustrate the […], which includes among the mentioned product categories NXP's SMT ("Secure Mobile Transactions") line of business, which encompasses NXP's NFC and SE chips, as can be seen in Figure 8.

Figure 8: Parties' estimated revenues from cross-selling to mobile customers

[…]

Source: NXP internal document,[…] [544]

(594) Similarly, in another internal document the Parties clearly indicate among the […] the action to […] and to […][545]. Another internal document also indicates that Qualcomm's approach with regard to the mobile space is indeed to engage in cross selling, as reproduced in Figure 9. A subsequent slide of the same document acknowledges that there are […][546].

542 Qualcomm internal document, "[…]", 19 December 2016, slide 4, Annex 9.1 to the Form CO.

543 Qualcomm internal document, "[…]", 1 May 2016, slide 10, Annex .4.b.c.5 to the Form CO.

544 Presentation attached to Email sent by NXP's […] internally within NXP [Doc ID 1456-28230].

545 NXP internal document, "[…]", 19 January 2017, slide 4, presentation attached to Email sent by NXP's […] internally within NXP [Doc ID 1456-28230] [[…].msg].

546 Source: […], slide 10, dated 7 February 2017.

Figure 9: revenues from mobile cross-selling

[…]

Source: […][547]

(595) The internal documents of the Parties also provide strong indications that Qualcomm would have the incentive to leverage MIFARE in order to protect the core business of baseband chipsets. MIFARE is also the product which would give the merged entity an advantage over other NFC/SE suppliers. In an email entitled […] addressed to other executives in Qualcomm, Qualcomm's […] wrote: […]. To which Qualcomm's […] replied: […][548] (emphasis added).

(596) In another correspondence between NXP and Qualcomm, titled […], NXP pointed out that they also considered adding MIFARE as a potential cross sell with Qualcomm's mobile platform[549].

(597) In light of the findings in recitals (583) to (596), the Commission therefore considers that the merged entity would have the incentive to engage in mixed bundling of LTE baseband chipsets with NFC and (MIFARE enabled) SE chips immediately after the Transaction.

(598) With respect to the second step of the merged entity's mixed bundling strategy, that is integration of the MIFARE enabled SE within the LTE baseband chipsets and sale of the integrated product in a bundle with the NFC chip, the Commission considers that the merged entity would have the incentive to engage in such conduct.

(599) Respondents to the phase I market investigation stated that the merged entity would have the commercial incentive to pursue a strategy of technical integration in a second step of its mixed bundling strategy. In particular, device OEMs indicated that Qualcomm's business approach so far has been to pursue such integration[550].

(600) Furthermore, most OEM customers responding to the phase I market investigation declared that they would be interested in purchasing an integrated solution from the merged entity[551]. OEM customers also point out that Qualcomm's integrated solution would make it more difficult for third party NFC/SE providers to compete for customers, as such solution would "lock in" LTE baseband chipset customers[552]. Competitors of baseband chipsets and NFC and SE chips also indicated that device OEMs are likely to be interested in a technically integrated offer[553].

(601) Furthermore, the Commission notes that the Parties' internal documents indicate that the Parties have discussed the integration of the SE chip on the Qualcomm baseband chipset, and that each of Qualcomm and NXP expressed a commercial interest to pursue such integration through the Transaction, while maintaining a separate sales channel for the standalone components, consistently with a mixed bundling strategy.

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547 Presentation attached to Email sent by NXP's […] internally within NXP [DOC ID 1456-28230] [[…] msg].

548 Qualcomm's internal documents. "[…]", 11 October 2016, [DOC ID 2384-40936]

549 Qualcomm's internal documents, "[…]", 18 March 2017 [DOC ID 2364-52353].

550 See Responses to question 52 of Q1 – Questionnaire to device OEMs; Responses to question 45 of Q2 – Questionnaire to baseband chipsets competitors and Responses to question 52 of Q3 – Questionnaire to NFC competitors.

551 See Responses to question 54 of Q1 – Questionnaire to device OEMs.

552 See Responses to question 54.1 of Q1 – Questionnaire to device OEMs.

553 Responses to question 47 of Q2 – Questionnaire to baseband chipsets competitors and Responses to question 54 of Q3 – Questionnaire to NFC competitors.

(602) The Commission notes that, in the Article 6(1)(c) decision, based on the responses of the phase I market investigation, it found that the merged entity would likely have the incentive to pursue various types of technical integration, not limited to that of the SE on the Qualcomm baseband chipset, but also that of the NFC chip with the Qualcomm baseband.

(603) However, following the phase II market investigation and on the basis of the review of the Parties' internal documents discussed in the following recitals, the Commission considers that the merged entity would most likely have the incentive to pursue the specific integration of the SE chip with the Qualcomm baseband chip in the near future, as this is the type of integration that the Parties most extensively discussed in their internal documents.

(604) In the days of the due diligence process leading to the announcement of the Transaction[554], […], circulated internally within NXP a list of questions received from Qualcomm, concerning security and connectivity ("S&C"). Among the issues raised by Qualcomm appeared questions such as […][555]. This list of due diligence matters is indicative of the fact that Qualcomm was interested in the potential integration of NFC/SE with its baseband products, and sought to explore this option.

(605) After the announcement of the Transaction, NXP also considered the possibility of technical integration of its products with those of Qualcomm. In an email to […] commented that: […] (emphasis added)[556]. The email states that the possibility to integrate the SE within the Qualcomm Snapdragon should be discussed at a later stage down the road within the merged entity. Nevertheless, it is indicative of the fact that NXP internally evaluated this opportunity and had an interest in pursuing product integration.

(606) NXP's interest in such product integration, in particular of the SE and MIFARE, is reflected in other internal communications. For instance, in an email exchange concerning future discussions to be held with Qualcomm in relation to the security business, […] noted that […] (emphasis added). In reply to this, […] correspondent noted that […][557].

(607) The email referred to in recital (606) is also indicative of the fact that not only did the Parties each separately consider and evaluate product integration between the NXP SE and the Qualcomm baseband chipset, but that they also exchanged views on the matter between them.

(608) For instance, in an email to NXP's […], Qualcomm's […] commented that […] (emphasis added)[558]. In other emails, […] reiterates these views by stating that the […][559] and that […][560].

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554 27 October 2016, see https://www.qualcomm.com/news/releases/2016/10/27/qualcomm-acquire-nxp [DOC ID 3346].

555 NXP internal document, email from […] "[…]", dated 5 October 2016, [DOC ID 1457-21210] [[…]].

556 NXP internal document, email from […] "[…]", dated 5 January 2017, [DOC ID 1456-60344] [[…]].

557 NXP internal document, email from […] "[…]", dated 12 January 2017, [DOC ID 1456-12265] [[…]].

558 NXP internal document, email from Qualcomm's […] to NXP's […], "[…]", dated 8 February 2017, [DOC ID 1458-35882] [[…]].

559 NXP internal document, email from Qualcomm's […] to NXP's […], forwarding an email by Qualcomm's […], dated 22 December 2016, [DOC ID 1456-18229] [[…]].

560 Qualcomm internal document, email from Qualcomm's […] to […], "[…]", dated 7 January 2017, [DOC ID 2476-23071].

(609) These emails not only indicate a clear interest on the side of Qualcomm in product integration[561], but also show that the Parties actually discussed this possibility. Qualcomm in particular viewed the integration of the SE and the addition of MIFARE as a further means to pursue mixed bundling, as the SE would be included […] on the MSM, which would have allowed the sale of a MIFARE-enabled product to a broader set of customers, while maintaining a sales channel for the SE […].

(610) These conversations between the Parties over product integration (and more broadly on the synergies brought by the Transaction) were held, among others, through ad hoc meetings. For instance, on 23 February 2017, NXP's […] met with Qualcomm's […][562]. In preparation of the meeting, […] sent a synergies document entitled […], outlining the main areas of potential synergy between the Parties' businesses[563]. The document was prepared by NXP's […], who describes the document as consolidating […] and as explaining […][564].

(611) The NXP document mentions, among others, the synergy of […] and […] (emphasis added)[565]. Therefore, NXP itself identified integration of the SE as a commercially interesting option, which could be pursued in parallel to the standalone SE, consistently with a mixed bundling approach.

(612) In relation to this synergy, the Commission notes that an earlier draft of the same NXP document had slightly different language, which considered the leveraging of the Parties' respective market positions more explicitly, and viewed the option of SE integration as more direct […] (emphasis added)[566]. The NXP synergies document's final summary indicated the potential implication to […][567]. The aforementioned document suggests that the Parties considered the integration of the SE, which would be sold within the baseband, while a separate sales channel would be maintained.

(613) In commenting internally on the document prepared by […], and […], NXP's […] commented that the synergies for SMT ("Secure Mobile Transactions") were […][568].

(614) After the meeting of 23 February 2017, Qualcomm's [...] provided a mark-up to the NXP synergies document, emphasising Qualcomm's explicit interest in SE integration. Indeed, in the mark-up, […] wrote that […] (emphasis added)[569].

(615) Qualcomm's interest in product integration was also manifested in other iterations and meetings held with NXP. In this context, the Commission notes that the Parties' representatives met at an "integration summit 1", held in San Diego on 15-16

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561 To that regard, see also the Qualcomm internal discussions held in the email thread entitled "[…]", 3-5 November 2016, [DOC ID 2364-72772].

562 NXP internal document, email from […], "[…]" (stating that "[…]"), [DOC ID 1456-54652] [[…]].

563 NXP internal document, email from […] to Qualcomm's […], "[…]", dated 22 February 2017, [DOC ID 1452-11924] [[…]].

564 NXP internal document, email from […], "[…]", dated 17 February 2017, [DOC ID 1456-60495] [[…]].

565 NXP internal document, "[…]", pdf document attached to the email from […] to Qualcomm's […], "[…]", dated 22 February 2017, [DOC ID 1452-11924] [[…]].

566 NXP internal document, email from […], "[…]", dated 17 February 2017, [DOC ID 1456-60495] [[…]].

567 NXP internal document, "[…]", pdf document attached to the email from […] to Qualcomm's […], "[…]", dated 22 February 2017, [DOC ID 1452-11924] [[…]].

568 NXP internal document, email by […], "[…]", dated 23 February 2017, [DOC ID 1456-18680] [[…]].

569 NXP internal document, "[…]", word document attached to email by […] to […], "[…]", dated 27 February 2016, [DOC ID 1458-22459] [[…]].

February 2017. In summarising the content of those discussions to […], NXP's […] observed that […][570].

(616) Therefore, Qualcomm and NXP effectively discussed the possibility of integration of the SE chip, and Qualcomm attached commercial value to this strategy, as was made clear in the mark-up to the NXP synergies document.

(617) Moreover, following the meeting of 23 February between […] and […], the Parties prepared a follow-up document, entitled […]. The document's stated goal was […]. With regard to Secure Mobile Transactions, the document reiterates the objectives of the original NXP synergies document […], (emphasis added) and mentions as next steps […] and […][571].

(618) To that end, NXP prepared a […]. The attached workplan suggested the creation of a […][572].

(619) The first meeting of this security workshop was held on 18-19 April 2017. According to the notes of the meeting, circulated by NXP's […], […] (emphasis added)[573].

(620) In a subsequent email, NXP's […] explained to NXP's […] that […] (emphasis added)[574].

(621) The documents discussed in recitals (604) to (620) are indicative of the fact that Qualcomm indeed viewed product integration as the way ahead. Moreover, the Commission notes that NXP also was working on an integration project, Integrated Secure Element Family ("ISEF"), and viewed product integration as the way forward. In this respect, the Commission notes that other NXP internal documents also support such findings.

(622) In relation to Qualcomm's projects of security integration on the baseband chipset, the NXP notes to a meeting with Qualcomm stated that […]. In commenting on these notes, NXP's […] noted that […] [575].

(623) In relation to NXP's own considerations for SE integration, in an internal presentation entitled […], NXP observed that both Qualcomm and Huawei were developing SEs integrated in the baseband[576]. In an earlier email, in relation to this trend and to Huawei's SE integration specifically, NXP noted that […ˆ][577].

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570 NXP internal document, email from […] to […], "[…]", 18 February 2017, [DOC ID 1458-54773] [[…]].

571 NXP internal document, "[…]", word document attached to email sent by […] to Qualcomm's […], dated 15 March 2017, [DOC ID 1458-54816] [[…]].

572 NXP internal document, email from […] to […], dated 10 March 2017, "[…]", and attached presentation "[…]", [DOC ID 1458-55481] [[…]]. It should be noted that, in the email exchange, which included Qualcomm representatives, […] emphasised that the document should be sent back to the business line ("BL)" work stream leads, "[…]". Therefore, the Parties clearly agreed on the opportunity of integration of the SE into the Qualcomm baseband chipset, and to explore this strategy.

573 NXP internal document, "[…]", word document attached to email from […] to […], "[…]", 3 May 2017, [DOC ID 1456-52124] [[…]].

574 NXP internal document, email from […] to […], "[…]", dated 26 May 2017, [DOC ID 1456-53926] [[…]].

575 NXP internal document, email from […], "[…]", 11 May 2017, [DOC ID 1456-51261] [[…]].

576 NXP internal document, "[…]", slide 1 ("[…]") power point presentation attached to email from […] to […], "[…]", 3 April 2017, [DOC ID 1458-36014] [[…]].

577 NXP internal document, email from […] to […], "[…]", 5 December 2016, [DOC ID 1458-28265] [[…]].

(624) The Commission notes that the Parties actually attributed and calculated synergies related to the product integration. For instance, in a joint presentation dated 27 April 2017, the Parties noted that for Secure Mobile Transactions […][578].

(625) Based on the review of the Parties' internal documents, the Commission therefore notes the following. First, Qualcomm and NXP both had an interest in integrating security features on the Qualcomm LTE baseband chipsets, and had taken steps in that direction. Second, while the integration would require a time frame of one to two years, the Parties considered a transitional short term option, before achieving the integration, of bundled offers. Third, notwithstanding product integration, the Parties' intention was to maintain a parallel sales channel for standalone products, which is consistent with a mixed bundling strategy. Fourth, the integration and bundling strategy would have included MIFARE, to which the Parties attached value.

(626) This last point is made apparent by the email discussion mentioned in recital (579) above, where Qualcomm executives discussing the synergy importance of MIFARE for mobile transit services commented that […] (emphasis added)[579].

(627) Finally, the Commission considers that the merged entity would also find it profitable to either raise royalties for MIFARE or, in the extreme, cease licensing this technology to rival NFC and SE chips suppliers altogether, for the following reasons[580].

(628) First, both competitors and customers of the Parties pointed out that it would be profitable for the merged entity to adopt such a strategy.

(629) Infineon argued that: "*There is a very high incentive for QCOM to integrate eSE with MIFARE in basebands/apps processors and worsen the already-prohibitive licensing practices as well as technical maneuvers of NXP*"[581].

(630) […][582].

(631) Samsung considers that: "[s]*uch a policy would be in line with Qualcomm's current policy against licensing any chipset competitors at all. Given that Qualcomm refuses to license even its FRAND-encumbered SEPs to any chipset supplier, there is little reason to believe that Qualcomm would license MIFARE, which is NXP's proprietary technology even though it has become a de facto standard for at least transit payments*"[583]. Furthermore, the Notifying Party's internal documents reveal

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578 NXP internal document, "[…]", slide 2, power point presentation attached to email by […] to NXP's […], 28 April 2017, [DOC ID 1456-16025] [[…]]. While the document also notes that "[…]", the Commission notes that this statement acknowledges that the product integration achieved through the Transaction would still produce additional benefits to those pre-existing the Transaction.

579 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2476-882].

580 With respect to the possible dissuasive effect of Article 102 TFEU on the merged entity's incentive to engage in an increase in MIFARE royalties or refusal to license MIFARE (See paragraph 46 of the Non-Horizontal Guidelines), the Commission considers that the detection of the conduct at stake under Article 102 TFEU and its legal and economic assessment may be challenging. This is because the assessment of whether a royalty increase or refusal to license MIFARE would be in breach of Article 102 requires a complex analysis on the basis of various ex-post factors. This would make the timely detection of the conduct at stake uncertain. Therefore, it cannot be concluded that the possible applicability of Article 102 TFEU to the conduct at stake would constitute a sufficient deterrent in this case.

581 See Infineon's reply to Question 3.2. of RFI 29 of 5 July 2017, [DOC ID: 2955].

582 See response by […] to questions 76 and 77 of Q1 – Questionnaire to device OEMs, [DOC ID: 1009].

583 See Samsung LSI's response to question 75.1. of Q3- Questionnaire to NFC competitors, [DOC ID: 1095].

that Qualcomm is already contemplating how best to leverage MIFARE in order to limit the competitiveness of rival NFC/SE manufacturers. The correspondence internal to Qualcomm described below details how it would be best for the merged entity to leverage MIFARE, especially in relation to Samsung LSI.

(632) Some mobile device OEMs also point out that the merged entity would have the incentive to raise prices for MIFARE-enabled NFC/SE solutions when offered separately from Qualcomm's baseband chipsets. […] explains that: […][584].

(633) Qualcomm's internal documents also point to the fact that bundling MIFARE with the SE and LTE baseband chipsets and worsening MIFARE licensing terms of NFC and SE competitors would limit the competitiveness of those providers to Qualcomm's advantage. For instance, in the internal email mentioned in recitals (471) and (579) above, Qualcomm's […] commented on the implications for Samsung LSI on the lack of a MIFARE licence that […] (emphasis added)[585].

(634) As regards the Notifying Party's argument that Qualcomm leveraging MIFARE to exclude rival SE chips manufacturers is not merger-specific, as both MIFARE and SE are existing NXP products, and NXP could already engage in a bundling and royalty-increasing conduct today, the Commission considers that such an argument does not hold. First, pre-Transaction NXP does not have the ability to engage in mixed bundling of its MIFARE-enabled SEs (or technically integrate) with baseband chipsets. Second, the incentives of the merged entity to engage in a bundling strategy of these products and degrade the licensing terms for MIFARE are different from those of standalone NXP.

(635) Finally, in the course of its investigation, the Commission received economic submissions from Gemalto and Infineon, which discuss foreclosure concerns associated with bundling by the merged entity of LTE baseband chipsets with NFC/SE chips, in combination with the licensing of MIFARE to rival suppliers of NFC/SEs[586]. Those economic submissions explore three different modelling approaches, referred to as the "Bargaining Model"[587], the "Choi Plus" model, and the

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584 See […] response to question 72.3. of Q1- Questionnaire to device OEMs.

585 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2476-882].

586 Report submitted by CRA titled "Economic Modelling Confirms Risks to Competitors and Consumers" submitted on 14 August 2017. [DOC ID 2936]

587 The "bargaining model" studies a setup where an OEM negotiates separately with (i) two competing suppliers of NFC/SE chips (of whom one owns MIFARE, and the other takes a license to this technology), and (ii) with either one or two suppliers of baseband chipsets, depending on the outcome of a stochastic innovation game where either none, one, or both baseband chip suppliers were successful in developing a new generation of baseband chipsets which rendered the old generation obsolete. In this setup, the merged entity would have an incentive to refuse to license MIFARE, as this would give it a competitive advantage in the situation where both baseband suppliers were successful in developing the new generation baseband: In this case, if the OEM had access to an alternative MIFARE licensed NFC/SE supplier (who is not the merged party), the two baseband chipset suppliers would find themselves in neck-and-neck competition for the OEM's custom; but if there is only one available supplier of a MIFARE enabled NFC/SE, namely the merged entity, the latter can also monopolise the baseband chipset market, thus depriving the OEM of the potential benefits of competition in case both baseband suppliers are successful innovators. While this effect would stimulate investments into R&D by the merging party, none of the benefits of these additional investments would be passed on to consumers, who would thus be harmed by such a merger which induces a refusal to license MIFARE. The Commission notes that the predictions of this model appear to be entirely driven by the non-standard assumption that pre-merger the prices for different components are negotiated without taking into account the price of complementary components and that this is changed by the Transaction. The report however does not provide a strong justification or empirical support for why the negotiations on

"Choi and Stefanadis Plus" model. The "Choi and Stefanadis Plus" model considers a conduct of pure bundling and is therefore discussed in Section 7.5.2.2 below. The "Choi Plus" model instead builds on the basic principles on mixed bundling set out in paragraph 117 of the Non-Horizontal Merger Guidelines and is therefore directly relevant for the discussion of the merged entity's incentives to engage in mixed bundling and using MIFARE for leverage post-Transaction[588].

(636) The "Choi Plus" model submitted by Gemalto/Infineon builds on the general insight that a merger among producers of complementary goods induces the merged entity to lower the price of the bundle composed of its own components, and to raise the price of the stand-alone components. The incentive to offer a discount on the bundle derives from the coordination of pricing decisions of own products post-merger, which tends to lower prices compared to the independent pricing decisions pre-merger (the Cournot effect discussed in recitals (528) to (531) above)[589]. At the same time, the merged entity would also have the incentive to increase the price of its standalone components, thus diverting demand away from its rivals' products and towards its own products. The submission received from Gemalto/Infineon assumes in addition that the merged entity would own a must-have IP, namely MIFARE. The rival producers of NFC/SE chips can either license MIFARE from the merged entity before engaging in product market competition with them, or they can develop their own MIFARE compatible technology, which does not practice the merged entity's IP (so that no license to MIFARE is needed) but requires a fixed R&D spend.

(637) According to that model, under certain conditions (in particular if the cost of "inventing around" MIFARE falls within a certain range of values), the merged entity would have an incentive to raise the royalties for MIFARE post-Transaction, which would then translate into an overall increase in prices for all products.

(638) A similar result also occurs when, after the royalty level was determined, but before prices for final goods are chosen, the firms can invest in R&D which improves the quality level of a given component, and hence consumers' willingness-to-pay for any system that contains this particular component. The model shows that the merged entity's incentives to invest would unambiguously increase after the Transaction, while the third parties would reduce their investment, compared to the pre-Transaction scenario, but the net effect on overall investment would be positive[590]. However, even in the presence of such an investment boost, consumers may still be harmed by the impact of the Transaction on royalties and prices, because the merged entity would have less incentive to pass on the benefits of increased innovation to consumers.

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one component would pre-merger not be affected by the price for complementary components that are bought by the same buyer and that are needed to produce a given final good.

588 See also Choi, Jay Pil. "Mergers with bundling in complementary markets." The Journal of Industrial Economics 56.3 (2008): 553-577.

589 See Non-Horizontal Merger Guidelines, paragraph 117. This pricing externality is thus very similar to the problem of "double marginalisation" in the context of two vertically related firms charging linear prices, and analogously to a conglomerate merger, vertical integration is generally considered as resolving this problem, leading to lower overall margins than those that prevail under vertical separation.

590 This effect on investment therefore mirrors the impact of the "Cournot effect" at the final product level. The fact that the merging parties' final sales will expand due to their more competitively priced bundle, and due to the increase in the price of standalone components which diverts demand away from third party products, while the third parties' sales will instead fall as a result of the merged entity's mixed bundling strategy.

(639) The Notifying Party[591] submitted in response to this model that its results are very sensitive to the underlying parameter values, in particular to the exact R&D cost of "inventing around" MIFARE. Under certain parameter values, the merged entity may either lower (rather than increase) the royalty rate on MIFARE, and under other parameter values, it may even have an incentive to abandon mixed bundling altogether, it will stop offering any discount on its own bundle. This happens when the royalty revenue on MIFARE (which accrue when an NFC/SE rival makes a sale) becomes so important relative to the revenues from sales of its own NFC/SE chips that the merged entity would want to divert demand away from its own NFC/SE chips and towards the rivals' products so as to stimulate royalty revenues.

(640) The Commission considers that the results of the various versions of this model are driven by the assumption that "inventing around" MIFARE is feasible and the cost of inventing around MIFARE being in an intermediate range. The predictions are therefore sensitive to the assumed parameter values. Based on the available information the model cannot be properly calibrated and hence it cannot be reliably predicted whether the merged entity indeed has an incentive to significantly raise the MIFARE royalties. Therefore, the Commission is of the view that this model is inconclusive.

(641) In the light of the above, the Commission considers, notwithstanding the inconclusive economic predictions, based on the overall findings of the phase II market investigation, in particular the Parties' internal documents, that the merged entity would have the incentive to engage in a strategy of mixed bundling its LTE baseband chipsets with NXP's NFC and MIFARE enabled SE chips (first in a commercial bundle, subsequently in a commercial bundle where the SE has been integrated in the Qualcomm LTE baseband chipset), while at the same time raising the licensing royalties for MIFARE to competing NFC/SE solutions suppliers or, in the extreme refusing to license MIFARE.

3. Likely effects on competition

(642) The Non-Horizontal Merger Guidelines point out that bundling or tying may result in a significant reduction of sales prospects faced by single-component rivals in the market. While the reduction in sales of competitors is not a problem in itself, it may lead to a reduction in the rivals' ability or incentive to compete if the reduction is significant enough, which depends on the characteristics of the industry under consideration. This may allow the merged entity to subsequently acquire or maintain market power. Furthermore, foreclosure practices may also deter entry by possible competitors[592].

(643) According to the Non-Horizontal Merger Guidelines, in order to be able to foreclose competitors, the merged entity must have a significant degree of market power, which does not necessarily amount to dominance, in one of the markets concerned. The effects of bundling can be expected to be substantial when at least one of the merging parties' products is viewed by many customers as particularly important and there are few relevant alternatives for that product. Further, the Non-Horizontal Merger Guidelines state that for foreclosure to be a potential concern it must be the case that there is a large common pool of customers for the individual products concerned. The more customers tend to buy both products, the more demand for the individual products may be affected through bundling. Such a correspondence in

591 RBB Economics, "Qualcomm/NXP, Response to CRA model", 08 May 2017. [DOC ID: 1434].

592 Non-horizontal Merger Guidelines, paragraphs 111 and 112.

purchasing behaviour is more likely to be significant when the products in question are complementary (emphasis added)[593].

(644) The Non-Horizontal Merger Guidelines further state that the effects on competition need to be assessed in the light of countervailing factors such as the presence of countervailing power or the likelihood of entry which would maintain effective competition[594].

(645) With regard to the degree of market power held by the merged entity, reference is made to the findings outlined in Sections 7.3.1.2, 7.3.2.2, and 7.3.3.2 for LTE baseband chipsets, NFC and SE chips, and transit service technologies respectively. With regard to the common pool of customers and the incentives for customers to engage in one-stop shopping, reference is made to recitals (544) to (548) above, outlining the existence of a common pool of customers and the advantages for customers to buy a bundled product over a mix-and-match solution.

Effects of mixed bundling

(646) On the basis of its phase II market investigation, the Commission considers that a mixed bundling strategy concerning Qualcomm's LTE baseband chipsets and NXP's NFC and SE products (including mixed bundling with the integration of the SE on the baseband chipset), in this case, would appear to be unlikely to lead to foreclosure effects to the requisite standard of the Non-Horizontal Merger Guidelines with regard to providers of baseband chipsets, NFC and SE chips, for the following reasons.

(647) First, the phase II market investigation shows that mobile device OEMs carefully analyse several options on the market before engaging more firmly with one or two suppliers. For instance, […][595].

(648) Second, the Commission notes that, notwithstanding Qualcomm's mixed bundling of chips in past instances (including by way of integration, as referred to in recital (576), device OEMs have not always decided to purchase a bundled product from Qualcomm, rather favouring a standalone product, and have to date obtained from Qualcomm the necessary technical support for mix-and-matching Qualcomm's baseband chipsets with other products, such as the Wi-Fi and Bluetooth chipsets of other suppliers. While those past instances as such do not necessarily indicate that the same would occur in relation to NFC and SE chips, they do suggest that, in this context, a strategy of mixed bundling does not lead to customer device OEMs automatically choosing the mixed bundle, to the detriment of standalone competitors.

(649) For instance, Samsung explained that "*In rare cases (Galaxy S8), where Qualcomm's own offering (say, WiFi) has not met Samsung's technical requirements, Qualcomm has agreed to provide technical support for a substitution (in this case, with Broadcom's WiFi chip) and has not "penalized" Samsung by withholding the bundle pricing benefits.*" Apple also currently mix-and-matches Qualcomm's baseband chipsets with Broadcom's WI-FI and Bluetooth chipsets. […][596].

(650) In that respect, the Notifying Party has also submitted data showing that, while its market share and attach rate for WI-FI/Bluetooth chips has increased over time after the acquisition of the WI-FI producer Atheros (see recital (576) above), standalone providers of those chips (notably, Broadcom) are active and have the ability and

593 Non-Horizontal Merger Guidelines, paragraph 99.
594 Non-horizontal Merger Guidelines, paragraph 114.
595 See […] reply to question 2a of Commission RFI 31 of 21 July 2017 [DOC ID: 2633].
596 See […] reply to question 29 of Commission RFI 31 of 21 July 2017 [DOC ID 2633].

incentive to compete. According to those data, Qualcomm's attach rate of WI-FI/Bluetooth chips is low (10%) with respect to high-end OEM customers such as Apple and Samsung. This therefore suggests that OEMs do not necessarily wish to purchase the merged entity's bundled products and may prefer alternative standalone products[597].

(651) Third, customer behaviour appears to be inconsistent with foreclosure effects materialising as a result of a mixed bundling strategy of LTE baseband chipsets, NFC, and SE chips.

(652) Apple recently started multisourcing baseband chipsets, as of the iphone7, for which Apple relied on standalone LTE baseband chipsets from Qualcomm and Intel. Apple has confirmed this dual-sourcing approach also for the iphone8, whose LTE baseband chipsets are again supplied by Qualcomm and Intel[598]. With respect to NFC and SE chips, […][599].

(653) Apart from Qualcomm, Samsung also can, and does rely on Samsung LSI for the provision of LTE baseband chipsets. In terms of NFC and SE chips, Samsung uses both NXP's and Samsung LSI's products. For the latter case, to deliver a full solution, Samsung LSI produces the NFC chip and partners with Infineon or Gemalto (or both) to deliver the full NFC/SE solution. The Commission also notes that Samsung confirmed that Samsung LSI has also developed a commercially available SE chip (the S3FV9RRX and S3FV9RRP)[600]. Therefore, Samsung could rely on its in-house production of LTE baseband chipsets, NFC and SE chips.

(654) Huawei is also self-supplying LTE chipsets. In terms of NFC and SE chips, Huawei sources these from both NXP (NFC and SE chips) and HiSilicon (SE chips).

(655) Therefore, two of the three largest device OEM customers have in-house capabilities for both LTE baseband chips and NFC and SE chips (Samsung with regard to NFC, Huawei with regard to SE). Those options would remain available as possible alternative supply sources to those device OEMs post-Transaction. Apple has at present another supplier of LTE chipset in addition to Qualcomm (Intel).

(656) Fourth, in addition to demand side considerations and customers' possible counterstrategies, the phase I and phase II market investigation provided strong indications that suppliers of baseband, NFC and SE chips could work together in order to provide similar bundles to that offered by the merged entity (comprising baseband chipset, NFC and SE chips).

(657) Already in the past, where NXP used to be the only provider offering a full NFC/SE solution, other suppliers have worked together to provide a full NFC, SE and SE OS combined solution to mobile device OEMs. For example, in order to provide a full solution to Samsung Mobile, Samsung LSI (baseband and NFC chips supplier) worked with Gemalto (SE OS supplier) and Infineon (SE chips supplier).

(658) These "mix-and-match" options, which device OEMs rely upon today, would remain available after the Transaction. Standalone providers of NFC and SE (such as

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597 See submission of 18 August 2017 by RBB for the Notifying Party, "Assessment of Qualcomm's selling practices following the acquisition of Atheros".

598 See the Notifying Party's reply to the Commission RFI 51, question 7 [DOC ID 881].

599 See […] reply to RFI 31, question 2a [DOC ID: 2633], Notifying Party's reply to RFI 51, questions 9-10, and STMicroelectronics' reply to RFI 53, questions 1-3, [DOC ID: 3281].

600 See Samsung's reply to the Commission's RFI 28, question 15 c) [DOC ID: 2671].

Gemalto, G&D and Infineon) would maintain the ability and incentive to compete through this mix-and-match approach.

(659) Fifth, in the phase II market investigation the Commission collected information from rival baseband and NFC/SE suppliers regarding the R&D spend, lifetime revenues (including IP revenue, where applicable), lifetime costs (other than R&D) and operating margins for the respondent's five most successful products marketed in the last years. The Commission notes that demand for NFC/SE chips appears to be lumpy, in the sense that if a chip producer wins a socket of a high-volume smartphone, this often entails very large quantities. As regards NFC/SE, based on the feedback to the market investigation, the Commission considers that once a firm is active in the NFC/SE market, even winning one socket of a high-volume smartphone can be sufficient to recoup R&D investments and to achieve minimum viable scale[601].

(660) Sixth, in relation to the merged entity's plans to pursue technical integration, the Commission notes that certain market players among chip suppliers (and device OEMs) also have the capability to technically integrate their products, potentially matching the offering of the merged entity.

(661) Recently, MediaTek (which provides baseband chipsets) announced that it was working with STMicroelectronics to integrate its NFC technology on MediaTek's baseband chipset mobile platform[602]. This collaboration, which already won a socket at Nokia, offers a complete mobile payment solution. Additionally, ST Microelectronics also indicated it will start to offer a complete NFC/SE solution[603].

(662) In addition to the example of MediaTek and STMicroelectronics, the Commission takes note that Samsung also pointed out that, should the market go in the direction of integration, this would not be beyond Samsung LSI and other suppliers' capabilities: "*While we cannot say that SLSI (Samsung LSI) or other third parties could not provide an integrated baseband and NFC/SE solution, such a company would have to have the technological base and manufacturing capability to provide such an integrated solution on a cost-competitive basis, and on a reasonable schedule that would permit customers such as Samsung to conduct all necessary testing and certification*"[604].

(663) Some of the respondents to the phase II market investigation also pointed out that they would probably work with a baseband chipset supplier to offer a similar bundle or integrated product to that of Qualcomm should competition take place more on bundles or integrated products than on standalone products. For example, Gemalto explained that "*If it happens and to position a competitive offer, then we would need to do it by partnering with Qualcomm competition (MediaTek, Hisilicon, Samsung LSI etc) according to whether they can get access to NFC patent pool and MIFARE license to propose such offer*"[605]. As mentioned above in recital (661), some baseband providers, such as MediaTek, have already entered into such collaboration with NFC/SE chips providers.

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601 See Non-Horizontal Merger Guidelines, paragraph 112.

602 See http://www.st.com/content/st_com/en/about/media-center/press-item.html/t3915.html , [DOC ID 3348].

603 See minutes of the conference call with St Microelectronics, of 20 June 2017. [DOC ID: 1597].

604 See Samsung's response to question 35 of RFI 28 of 22 July 2017, [DOC ID: 2671].

605 See Gemalto's response to question 3.3. of RFI 25 of 21 July 2017 [DOC ID: 2152].

(664) The Commission notes that this has been the case also where other chips, such as WI-FI and Bluetooth, were integrated on the Qualcomm baseband chipset, that is, in addition to purchasing standalone solutions, device OEMs could also rely on other suppliers that also developed and offered integrated products. For instance, Samsung explained that it purchases "chipset solutions" from "*Qualcomm, S.LSI, Spreadtrum, and Mediatek. Where any part of the chipset solution does not meet the technical requirements of Samsung Mobile, individual chips from Broadcom and/or Qualcomm have been used*"[606].

(665) Seventh, the Commission notes that, based on the information provided by the Notifying Party, to the extent that the merged entity would engage in mixed bundling of its baseband chipsets with the NFC and SE, there would still remain a portion of device OEM demand for NFC and SE chips on non-Qualcomm baseband chipsets, (see recital (536) above). This remaining available demand for NFC and SE chips could be addressed by third party providers.

(666) The Commission also considers that technical integration of the SE and baseband chipset in itself would not have significant foreclosure effects, given that in the described scenario of mixed bundling the stand-alone components would be still available. To the extent customers decide to buy the integrated product despite the option to mix-and-match with components of the merged entity or of third party providers, this could be due to advantages implied by technical integration.

(667) Therefore, for the reasons outlined above, the Commission takes the view that baseband, NFC and SE competitors of the merged entity would likely not be foreclosed, even if the merged entity were to offer a bundled (and subsequently integrated) offer of LTE baseband chipsets with NFC and SE chips at a lower price than the standalone components, and would maintain the ability and incentive to compete. This finding would be independent of whether the SE chip in the bundle (initially in a commercial bundle, subsequently integrated with the baseband chipset) would be MIFARE-enabled or not.

Effects of increased royalties for MIFARE in addition to mixed bundling

(668) Notwithstanding the assessment in recitals (646) to (667) above, the Commission also considers that, as shown in Sections 1 and 2 above, the merged entity has the ability and incentive to not only equip its own products with MIFARE, but also to raise royalties for MIFARE to competing NFC and SE suppliers (or cease licensing of MIFARE altogether).

(669) As explained in Section 7.3.3.2 above, with MIFARE the merged entity would have a dominant position in the market for transit service technologies, as MIFARE is the leading transit service technology and is a particularly important and required technology by device OEMs.

(670) In this context, respondents to the phase II market investigation emphasised the importance of MIFARE, and argued that an increase in royalty fees for MIFARE or a refusal to license MIFARE to standalone NFC and SE producers would seriously impact the competitiveness of their products in the near future, when device OEMs are expected to require all SEs to be MIFARE certified (this has been mandatory only for high-end phones until recently).

606 See Samsung's reply to question 19g of Commission RFI 28 to Samsung, [DOC ID: 2671].

(671) Almost all NFC and SE chipset competitors considered that, if they were unable to offer MIFARE-enabled products because of increased royalties or a refusal to license MIFARE, it is unlikely that OEM customers would consider them as an alternative to the merged entity's products[607].

(672) Gemalto argued that should Qualcomm bundle or tie MIFARE to its LTE baseband chipsets, and cease the licensing of MIFARE to competitors, then "*in both cases the result would be a foreclosure for both NFC/SE solutions and baseband/AP chipsets, MIFARE being a mandatory features in more and more smartphones*"[608].

(673) Infineon argued that: "*The potential impact of anti-competitive behaviours have a high level with MIFARE. QCOM will be uniquely positioned to benefit from this widely-deployed but proprietary technology – leaving out other industry players who do not have a MIFARE license. The anti-competitive effects arise from the fact that smartphone OEMs will have a very limited set of suppliers to choose from while implementing mobile ticketing in their smartphone models*."[609]

(674) Device OEMs confirmed this view. […][610]. Samsung also pointed out that MIFARE is a mandatory requirement for its smartphones[611].

(675) Furthermore, it appears that the MIFARE requirement may not be circumvented by offering "MIFARE compatible" SEs. When asked whether they could develop and offer "MIFARE-compatible" products without a MIFARE license from the merged entity, suppliers of NFC and SE chips pointed out that they would encounter obstacles that they consider almost impossible to overcome.

(676) Infineon explained that one of those obstacles are the MIFARE trademarks, and that inventing around the MIFARE trademarks is impossible; another major obstacle would be certification: even in the hypothetical event of successful development of a MIFARE compliant eSE without MIFARE license, competitors believe that it would be impossible to get a MIFARE certification as the certification bodies like UL or Arsenal would not be willing to certify products without NXP license. Infineon pointed out that in any case any "MIFARE compatible" product would have a lower value for the customers than a licensed product, even if it could be called "MIFARE compatible". Customers insist on certifications, while such unlicensed solutions are unlikely to be certified by the certification partners of NXP[612].

(677) Gemalto also pointed out another major obstacle in case access to MIFARE cannot be obtained, which are the expected costs to develop MIFARE compliant products which do not infringe NXP's MIFARE IP[613].

(678) Therefore, should the merged entity, in addition to bundling baseband, NFC and (MIFARE-enabled) SE, raise MIFARE royalties to competitors or cease the licensing of MIFARE altogether, this would change the competitive conditions in the markets for baseband chipsets and NFC and SE chips.

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607 See for instance response by Gemalto to question 76 of Q3 – Questionnaire to NFC competitors, [DOC ID: 678].

608 See Gemalto's response to question 3.2. of RFI 25 of 21 July 2017 [DOC ID: 2152].

609 See Infineon's response to question 3.2. of RFI 29 of 5 July 2017 [DOC ID: 2955].

610 See response by […] to question 76.1. of Q1 - Questionnaire to device OEMs, [DOC ID: 1009].

611 See Samsung's response to question 18a of RFI 28 of 22 July 2017, [DOC ID: 2671].

612 See Infineon's response to question 2.3. of RFI 29 of 5 July 2017, [DOC ID: 2955].

613 See Gemalto's response to question 2.3. of RFI 25 of 21 July 2017, [DOC ID: 2152].

(679) In particular, the Commission considers that, as a consequence of this conduct, competitors of the merged entity would not be able to react to the merged entity by offering a bundle comprising MIFARE-enabled SE or would only be able to offer it at unattractive prices compared to that of the merged entity.

(680) An increase in MIFARE royalties would be likely to (i) directly raise rivals' costs in the NFC/SE segment (Gemalto, Infineon) because a crucial input for these rivals, namely the MIFARE license, would become more expensive, and (ii) divert demand away from rival baseband chipset (MediaTek, Intel) suppliers, because the complementary components to these basebands, the MIFARE enabled NFC/SE chips (both the merged entity's and the rival NFC/SE suppliers' products), would become more expensive.

(681) In the extreme, should Qualcomm enable MIFARE on its own SEs and deny it (or license it under terms which make it unprofitable) to other competitors, competing NFC/SE suppliers could not offer MIFARE enabled NFC/SE chips any more. In that case, mobile device OEMs would prefer the Qualcomm offering, given the importance of the MIFARE requirement for the mobile device OEMs, which would make the Qualcomm bundle more attractive. In the absence of alternative MIFARE-licensed products, supplier options for device OEM customers, and their ability to mix-and-match the products of the Notifying Party with those of other suppliers, would be more limited than in a scenario where MIFARE remains accessible at the current terms to competing NFC/SE producers.

(682) The expected anti-competitive effects of deteriorating the licensing terms of MIFARE (or withholding it altogether) appear to be particularly pronounced because alternative transit service technologies appear to be poor substitutes from the point of view of mobile OEMs (see section 7.3.3.2) as is evident from the requirement often imposed by mobile OEMs for NFC/SE products to be MIFARE-enabled. Therefore, if the access terms for MIFARE of competing NFC/SE chip producers deteriorate, this has a direct negative effect on their ability to compete with the merged entity on the relevant NFC/SE market.

(683) The Commission notes in this context that the economic submission referred to as the "Choi Plus" Model also concludes that, to the extent that the Transaction leads to (i) mixed bundling by the merged entity, and (ii) an increase in the royalty rates for MIFARE, rival producers of both NFC/SE chips and of LTE baseband chips are unambiguously weakened[614].

(684) Even if the royalty increase on MIFARE were not prohibitive, so that rival NFC/SE producers would still be viable even under the new level of royalties, such an increase would still have a potentially negative impact, because the MIFARE royalties represent a variable cost to third party producers, which will therefore be at least partially passed on to mobile OEMs through higher product prices. As a result, the competitive constraint exerted by third parties on the merged entity would diminish.

(685) Further, the Commission considers that, as a result of this conduct of increased MIFARE royalties (or refusal to license) and mixed bundling, the profitability of the merged entity’s competitors is likely to decrease. Those competitors may thus find it more difficult to invest in the further development of their products. In this respect,

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614 Report submitted by CRA titled "Economic Modelling Confirms Risks to Competitors and Consumers" submitted on 14 August 2017. [DOC ID 2936]

the phase II market investigation provided strong indications that the markets for LTE baseband chipsets, NFC and SE chips and MIFARE are R&D intensive and upfront substantial investments in the development of the products are essential to remain competitive on these markets. Eventually, lower incentives to invest in R&D may therefore weaken the competitive constraint imposed by the Notifying Party's rivals, in the foreseeable future[615].

(686) Gemalto explained that the market for NFC, SE and SE OS are R&D expenditure driven: *"NFC front end can now be considered as a stable technology as most of the functions are standardized (RF, NCI interface to AP etc) and follow a type approval process. But it still requires some level of R&D investments as with any silicon component requiring to be redesigned in more and more advanced nodes. The need for continuing R&D is even more the case with the eSE IC (HW silicon) as it also follows the regular silicon life cycle towards more advanced nodes (a new node is introduced about every two years) but also requires regular security improvements. For the eSE OS, the objective is to contribute to the OEM competitiveness, differentiating on its secure services strategy thanks to the eSE OS. As such, first investment is to integrate with the selected NFC controller front end, then raise the OS to support existing secure service, integrate new ones according to an agreed upon roadmap and do porting on new eSE IC technology to remain competitive. This is for the sole part of the eSE product as in addition, it must be accompanied by support for integration on the different phone models and service set as well as continuous quality monitoring and defect analysis. This is to be multiplied by the number of phone models and is cumulative over the years. This is an R&D expenditure driven market*"[616]. Infineon also argued that: "*The majority (>90%) of the R&D expenses are typically invested before any device is selected by an OEM, which includes agreeing on the unit price*"[617].

(687) G&D also stated that: "*In G+D's view the products continuously evolve to provide better user experience in regards of performance, security or supporting new use cases as well as cost and space opmitizations for OEMs or to cope new requirements from standardisation bodies. G+D considers these investments as significant since it comprises e.g. development of new technologies for the NFC controller (e.g. booster for the RF), functional and technological enhancements of the eSE. The SE OS needs to reflect new HW, security and use case requirements which results in high efforts to further optimize performance and implement new features. For the latter two expenditures for the certification of the respective products is due*".[618]

(688) Therefore, before committing to significant R&D expenditures, suppliers would need to ensure that their product or bundle responds to at least the mandatory technical requirements requested by mobile device OEMs. One of these requirements is MIFARE. As a consequence of the Transaction, NFC/SE suppliers would either have to face increased costs (in case of an increase in MIFARE royalties) or would not be able any more to comply any more with this requirement (in case the merged entity stops licencing MIFARE).

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615 See question 31 of Questionnaire 11 to Competitors of NFC and question 1.14 of RFI 25 to Gemalto of 21 July 2017[Doc ID: 2152], question 1.13.3 and 1.16 of RFI 29 to Infineon of 5 July 2017 [DOC ID: 2955] and question 1.14 of RFI 26 to G&D of 4 July 2017 [DOC ID: 1932].

616 See Gemalto's response to RFI 25 of 21 July 2017, question 1.14. [DOC ID: 2152].

617 See Infineon's response to RFI 29 of 5 July 2017, questions 1.13.3, [DOC ID: 2955]

618 See G&D's response to RFI 26 of 4 July 2017, question 1.14, [DOC ID: 1932].

(689) Based on the results of the market investigation, the Commission therefore takes the view that increasing royalties for MIFARE or ceasing the licensing of MIFARE altogether to competitors against the backdrop of the merged entity's strategy of mixed bundling of LTE baseband chipsets, NFC SE chips and MIFARE would have the effect of foreclosing competitors of baseband chipsets and NFC and SE chips who would not be able to engage in timely counterstrategies and overcome obstacles related to the more restrictive conditions regarding the licensing of MIFARE.

7.4.3. Pure bundling and tying

7.4.3.1. Background

(690) In this section, the Commission will assess whether the merged entity would engage in a strategy to foreclose competitors through pure bundling or (commercial/technical) tying of its LTE baseband chipsets with NXP's NFC and SE products.

(691) At the outset, the Commission recalls that, based on the results of the phase II market investigation, illustrated in Sections 7.3.1.2, 7.3.2.2 and 7.3.3.2 above, the Commission considers that the merged entity would hold a dominant position in the worldwide market for LTE baseband chipsets and in the market for transit service technologies, as well as a certain degree of market power in the markets for NFC and SE chips. Furthermore, these products are particularly important for device OEM customers and they are complementary products, purchased by a common pool of customers.

(692) With regard to pure bundling, the merged entity's products would be only sold jointly in fixed proportions, and not available separately. For the assessment of the present case, in a pure bundling scenario the merged entity would no longer offer standalone LTE baseband chipsets and NFC, SE chips (enabled with MIFARE) standalone, but only together in a bundle comprising those products.

(693) With regards to tying, as explained in Section 7.1 and 7.4 above, according to the Non-horizontal Merger Guidelines, tying refers to a situation where customers that purchase one good (the tying good) are also required to purchase another good (the tied good). Tying can take place on a technical or commercial (contractual) basis.

(694) For instance, technical tying occurs when the tying product is designed in such a way that it only works with the tied product (and not with alternatives offered by competitors). Contractual tying entails that the customer when purchasing the tying good undertakes only to purchase the tied product (and not the alternatives offered by competitors)[619].

(695) In the phase I market investigation, the Commission investigated whether the Notifying Party would have the ability and incentive to engage in a foreclosure strategy by either: (i) technically integrating NXP's NFC and/or MIFARE-enabled SE chips to Qualcomm's LTE baseband chips and no longer providing these products standalone; (ii) commercially tying NXP's NFC and/or MIFARE-enabled SE chips to Qualcomm's LTE baseband chips and no longer making available to customers LTE baseband chipsets standalone and (iii) commercially tying Qualcomm's LTE baseband chipsets to NXP's NFC and/or MIFARE-enabled SE chips and no longer making available those NXP chips standalone.

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619 Non-Horizontal Merger Guidelines, paragraph 97.

(696) The Commission will analyse the potential conducts of pure bundling and tying together referred to in the following Section, given the similarities between the two possible behaviours, which both presuppose that the merged entity would commercially or technically bind its products, foregoing the sale of the relevant standalone components.

(697) With regard to a possible tying or pure bundling conduct that would be inclusive of MIFARE (that is to say, MIFARE would only be available in a pure bundle or with a tying product), the analysis remains the same irrespective of whether the SE chip would be MIFARE-enabled. The Commission notes that, should the merged entity also withhold MIFARE entirely by refusing to license it, such conduct has already been analysed under Section 7.4.2.2 above. Moreover, the commitments submitted by the Notifying Party to address the competition concerns identified by the Commission in relation to mixed bundling together with increased royalties of MIFARE, also remove any possible competition concerns arising from a conduct of tying or pure bundling that would include an increase of royalties or refusal to license MIFARE.

7.4.3.2. Analysis of pure bundling and tying

(698) Following the phase II market investigation, the Commission considers that the merged entity would lack the incentive to engage in the conducts of pure bundling and tying of LTE baseband chipsets and NFC/SE chips.

(699) Moreover, should the merged entity have the incentive to engage in a conduct of pure bundling or tying, the Commission notes that in any event such conducts, if implemented, would be unlikely to lead to significant foreclosure effects.

A) The Notifying Party's view

1. Ability

(700) With regard to pure bundling, the Notifying Party reiterates the arguments made with respect to mixed bundling illustrated in Section 7.4.2.2 A) above, that is to say, the Parties do not have market power with respect to LTE baseband chipsets or NFC and SE chips, their products do not have a “must have” status, and device OEMs exert countervailing buyer power and can rely on alternative product offerings from competing suppliers of standalone LTE baseband chipsets and NFC/SE chips.

(701) With respect to the ability to coerce customers into accepting a pure bundle of LTE baseband chipset with an NFC and SE solution (and MIFARE), the Notifying Party submits that it is not plausible to suppose that a customer mobile device OEM would base its choice of baseband chipsets on the specific NFC or SE chip that may be offered with that baseband chipset. NFC and SE chips support peripheral systems that are "good to have" rather than "must have" inputs like baseband chipsets. Given the importance of baseband chipsets, a customer would make its choice on the basis of the baseband chipset, regardless of the inclusion of NFC and SE in a pure bundle. The Notifying Party also claims that a pure commercial bundle would be the equivalent of a price increase of all units, affecting a substantial part of the demand of those device OEMs that do not wish to incorporate NFC functionality in their mobile devices. Such price increase would cause the diversion of substantial sales to rival chip suppliers selling standalone baseband chipset.

(702) Moreover, the Notifying Party submits that there are also practical impediments to practices such as pure bundling or tying: baseband chipsets and NFC and/or SE are purchased through different procurement teams, and at different times. At a minimum, the fact that customers do not currently structure their tendering processes

in a manner compatible with BC and NFC/SE bundling poses an obstacle to the use of a bundling strategy by the merged entity and serves to make such a strategy less viable[620].

(703) With regard to Apple specifically, the Notifying Party considers that it would not have the ability to coerce Apple to accept a bundled offer for the following reasons: (i) Apple intends to continue using an NFC/SE combined solution chip in its future mobile devices, and more specifically one that resides on a single chip (according to NXP's roadmap, NXP plans to develop such a combined chip for Apple); and (ii) Apple alone accounted for 67% of the revenues NXP derived from its mobile transactions product line in 2016 (which includes NFC/SE sales), therefore a decision on Apple's part to switch away from NXP would mean that its share of supply would decrease substantially.

(704) With regard to Samsung, the Notifying Party submits that it would not have the ability to coerce Samsung to accept a bundled offer either for the following reasons: (i) Samsung currently dual-sources integrated baseband chipsets from the Notifying Party and from its own subsidiary, Samsung LSI, and in the past has chosen to use both non-integrated and integrated BC solutions; and (ii) Samsung has several alternatives to NXP's secure mobile payment solutions at its disposal: it has developed Samsung Pay which relies on NFC, HCE and Samsung's own MST technology. Samsung LSI has also developed its own NFC chip which is now used in Samsung smartphones.

(705) With respect to tying, the Notifying Party submits that it does not have the ability to engage into a commercial or technical tying (that is to say integration of NXP's NFC and SE chips into the Notifying Party's baseband chipsets) strategy with respect to Qualcomm's LTE baseband chipsets and NXP's NFC/SE chips with the purpose of foreclosing its competitors.

(706) In relation to the possible integration of the NFC controller into the MSM and/ or MDM, the Notifying Party claims that it does not have extant such plans because: (i) the current and expected adoption rate of the NFC functionality is insufficient to justify the investment in such integration work; (ii) the average price of NXP's NFC controllers is merely between […] to […] and (iii) the integration of the NFC functionality would carry certain integration risks, namely the complexity of the certification process relative to other technologies (Wi-Fi, Bluetooth, FM) that could negatively impact the time to market of an integrated solution.

(707) Further, as regards the possible integration of the SE into the MSM and/or the MDM, the Notifying Party argues that it has already partially integrated SE features in one of its MSMs and it is indeed considering incorporating a fully-functioning SE chip into the application processor part of the MSM. The full integration would most likely occur in the near future, […], because it would require developing the requisite software to run on Qualcomm's hardware, and obtaining carrier aggregation.

(708) The Notifying Party also submits that it would integrate the SE in its MDMs provided that there is a business case for this. As Apple is the main user of the Notifying Party's MDMs and by far the main purchaser of NXP's SE and Apple only sources standalone BCs, there does not appear to be such business case.

(709) As regards the possible integration of the NFC/SE combined solution chip into MSM and/or MDM, the Notifying Party considers that such integration would be

620 RBB economics, Response to theories of harm relating to product bundling and tying. [DOC ID: 1745].

challenging and submits that currently it has no current plans to do so. Even if the Notifying Party were able to technically integrate NXP's secure mobile payment products into the baseband chipset at some point, integration would only concern NXP's SE chips, and commercial penetration of such a solution would be very limited. Therefore it would be in the Notifying Party's financial interest to continue offering those products on a standalone basis, and in the foreseeable future, sales by the merged entity of standalone NFC and SE chips would remain far larger than sales of integrated products[621].

(710) Even if the merged entity were to proceed with integration of the SE into the MSM and/or MDM, the Notifying Party submits that such technical integration would occur only in respect of newly developed and released baseband chipsets and could therefore only meet the requirements of a certain portion of demand. The Notifying Party estimates that any hypothetical technical integration would be incorporated in […] of those Qualcomm baseband chipsets sold in 2019-2020[622].

2. Incentive

(711) As regards pure bundling, in terms of incentive, according to the Notifying Party, bundling would make no commercial sense as NFC/SE chips are not considered "must have". Contrary to baseband chipsets that drive the core functionality of the smartphone, NFC and SE chips are not essential to the functionality of mobile devices. They only have a high penetration as regards high-end phones and the NFC/SE functionality can be achieved through the use of a variety of rival technologies. Qualcomm would thus be unable to leverage NXP's position in NFC and SE chips to coerce OEMs into buying baseband chipsets. This would greatly limit the merged entity's incentive to offer those products in a pure bundle.

(712) Furthermore, the Notifying Party submits that the price differences of baseband chipsets and NFC and SE chips render pure bundling (or commercial tying) unlikely. The Notifying Party explains that the profitability of a pure bundling strategy depends on two key factors: the profit margins earned on each product in the bundle and the reactions of affected customers. More formally, the relevant profit margins will imply a "critical switching level", the percentage of Qualcomm baseband chipsets sales that would need to be lost as a result of the tying strategy to render that strategy unprofitable. Evidence on how affected consumers would react then allows us to determine whether "actual switching levels" can be expected to exceed this critical level, and as such whether this strategy is indeed likely to be unprofitable.

(713) According to the Notifying Party, NXP earns an average margin of […] per unit on standalone NFC sales and […] per unit on sales of NFC/SE combinations. Further, NXP estimates that […] of rival NFC sales are of standalone NFC units, while […] are sales of NFC/SE combinations. On that basis, and assuming any customers who switch to NXP would utilise standalone NFC and NFC/SE combinations in similar proportions, the merged entity might be expected to earn an average margin of around […] per unit after the Transaction on any additional NFC sales captured as a result of the tie. In comparison, Qualcomm currently earns an average BC margin of […] on supply to its eight largest OEM customers.

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621 Form CO, paragraphs 891 and following [DOC ID 326].

622 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, paragraph 84, [DOC ID 1331].

(714) Taking the overall weighted average, the critical switching level is […], equal to […]. Thus, if more than […] of relevant purchases of Qualcomm BC that would be combined with non-NXP NFC absent the tie would switch to other sources of BC in response to the tie, then the tying strategy would be unprofitable[623].

(715) Therefore, even if a small percentage of customers switched away from the merged entity's baseband chipsets, that would be enough to render the merged entity pure bundling strategy unprofitable.

(716) Then, a foreclosure strategy based on bundling or tying of Qualcomm's BCs with NXP's NFC and/or SE solutions (or vice versa) would not be profitable for the merged entity as certain key customers who would otherwise have chosen to purchase one of the products from the merged entity on a standalone basis may switch to the merged entity's rivals in response to such a hypothetical tying/bundling foreclosure strategy. Given that the two main purchasers of NXP's NFC chips are Apple and Samsung, with the former exclusively using its own AP, and the latter having in-house baseband chipset, application processor and NFC capabilities, a hypothetical tying strategy by the merged entity aimed at foreclosing rivals from supplying these extremely powerful customers would most certainly fail, and would instead lead them to shift their purchases of NFC products away from the merged entity, in part or in full. In such a scenario, the merged entity would forego significant profits.

(717) In particular in the case of a hypothetical foreclosure strategy whereby NXP's NFC/SE is the tied product, it would be in the interest of the merged entity to encourage the widest possible adoption of NFC/SE technology, given its use in mobile devices is still at an incipient stage and that it faces competition from a range of alternative technologies that could displace it at any moment. Therefore, the merged entity will have an incentive to continue to market NFC chips on a standalone basis, as tying them to BCs is likely to restrict adoption of NFC technology.

3. Effects

(718) The Notifying Party submits that a pure bundling conduct would not lead to any foreclosure effects, as device OEMs are sophisticated buyers, which can and are willing to source from multiple available options. In that regard, the Notifying Party refers to the "mix-and-match" solutions that are available from standalone suppliers of NFC and SE chips. The Notifying Party further notes that there will be an increasing amount of non-Qualcomm baseband chipsets in the coming years, that would be available to third party NFC and SE suppliers, which thus would not be foreclosed by a pure bundling conduct (see recital (536) above). The Notifying Party claims that it has not previously impaired competition in other markets adjacent to baseband chipsets supply, such as Wi-Fi and Bluetooth chips after the acquisition of Atheros in 2011[624].

(719) As regards tying, the Notifying Party submits that even assuming that the merged entity would have the ability and incentive to engage in a foreclosure strategy through the tying of Qualcomm's BCs with NXP's NFC and MIFARE-enabled SE

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623 See response by the Notifying Party of 28 June 2017 to Article (6)(1)(c) decision, paragraphs 64 to 68, [DOC ID 1331].

624 RBB economics, Response to theories of harm relating to product bundling and tying. [DOC ID: 1745].

chips (or vice versa), such practices would have no anticompetitive effects on either of those product areas.

(720) A hypothetical bundling or tying strategy by the merged entity would not significantly reduce the incentives and ability to compete of single-component rivals. In the Notifying Party's view, large processor manufacturers such as MediaTek will continue to sell best-of-breed baseband chipsets on a standalone basis, in direct competition with the merged entity. Similarly, suppliers such as STMicroelectronics will continue to sell NFC and SE products on a standalone basis due to the purchasing strategies of large customers such as Samsung and Apple. In addition, large chipset suppliers such as Samsung LSI will continue innovating and offering NFC and SE chips, and baseband chipsets, both on a standalone and integrated basis.

(721) Furthermore, device OEM customers have sufficient countervailing buyer power to prevent the combined company from attempting any foreclosure strategy. Customers value cross-technology interoperability and the ability to mix-and-match solutions from different suppliers so as to better meet their technical requirements and differentiate their products. Customers will therefore prevent suppliers from attempting to put in place bundling strategies that do not enable them to realise their commercial strategy.

(722) For those reasons, in the Notifying Party's view the Transaction would not result in anticompetitive effects from a possible combination of Qualcomm's BCs with NXP's NFC and/or SE.

B) Commission's assessment

1. Ability to engage in pure bundling or tying

(723) With respect to the merged entity's ability to engage in pure bundling or tying of LTE baseband chipsets, NFC and SE chips, and MIFARE, the Commission notes the following.

(724) First, the Commission recalls that baseband chipsets represent an indispensable component for any mobile device and NFC/SE technology is expected to increase in importance and attach rate in the next two to three years (see recital (872) below).

(725) Second, as mentioned in recitals (546) to (548) to above, LTE baseband chipsets, NFC and SE chips, and MIFARE are complementary products and are purchased by the same customers, namely device OEMs.

(726) Third, with regard to the Notifying Party's argument that a pure bundling or tying conduct could not be implemented, given that device OEMs have different procurement teams operating at different times, the Commission recalls that, as explained in recitals above (554) to (555) and (567) to (569) above, the merged entity would be able to sell the products jointly to device OEMs, and indeed Qualcomm's plan was to combine the Parties' sales teams to offer products to device OEMs under the same sales account. Therefore, device OEMs' procurement processes would not be an impediment to a pure bundling conduct.

(727) Fourth, when asked whether Qualcomm would have the ability to engage in pure bundling, namely to offer its baseband chipsets exclusively together with NXP's NFC/SE and no longer making those products available separately to customers,

device OEM customers, and baseband chipset and NFC competitors responding to the phase I market investigation indicate that Qualcomm has that ability[625].

(728) For instance, […][626].

(729) In that regard, the Commission notes that there would be no technical impediments for the merged entity to sell LTE baseband chipsets and NFC and SE chips bundled together to device OEMs. This approach of selling products as a "platform" is also consistent with Qualcomm's past behaviour. For instance, Samsung explained that "*Qualcomm offers "chipset solutions" or "mobile platforms" that consist of a MSM (which is usually a combination of the AP and modem) and other chips that comprise RFIC (Radio Frequency IC), PMIC (Power Management IC), WiFi, BT and GPS, among others. Sometimes (but not always) BT and WiFi are combined into a single chip, as are the RFIC and GPS* […] *For technical reasons, bundling permits faster deployment (as all of the chips in this solution are already integrated) and arguably has pricing advantages (as less time needs to be spent with integration of different solutions). The technical reasons for bundling also conveniently permit the chipset solution provider to price its chipset as a bundle, whether for better or for worse*"[627]. Samsung further explained that "*the components within the Qualcomm integrated solution are optimized to work together and are priced as a platform*"[628].

(730) Fifth, despite the Notifying Party's assurances that the merged entity would not proceed in technical integration, the Commission recalls that, as illustrated in recitals (557) to (579), based on the results of the phase I and phase II market investigations and the analysis of the internal documents of the Parties, the merged entity would have the ability to technically integrate NXP's MIFARE-enabled SE chip on Qualcomm's LTE baseband chipset. The vast majority of the respondents to the phase I and phase II market investigations consider that Qualcomm has the technical know-how and resources to implement such a technical integration of NFC and SE chips on the baseband chipset.

(731) Furthermore, some of the respondents pointed out that Qualcomm has a history of integrating various components onto its Snapdragon SoC and provided such examples. As shown in recitals (601) to (626), the Parties' internal documents provide proof that Qualcomm has already extant plans with regard to integrating NXP's NFC and MIFARE – enabled SE chips on Qualcomm's baseband chipsets.

(732) The Commission further notes that, as mentioned in recital (576) above, in previous instances, Qualcomm has proceeded to integrate other components, such as Wi-Fi and Bluetooth, on its baseband chipset, and to sell those products together. However, in those past instances, Qualcomm has also made available standalone solutions for customers[629].

(733) Sixth, as regards the merged entity's ability to engage into a strategy of commercial tying, the Commission takes the view that the merged entity would have the ability to

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625 See responses to question 70 of Q1 – Questionnaire to device OEMs; responses to question 62 of Q2 – Questionnaire to baseband competitors; responses to question 68 of Q3 – Questionnaire to NFC competitors.

626 See response by […] to question of 57.1. of Q1 – Questionnaire to device OEMs, [DOC ID: 1009]

627 See response by Samsung to question 19 of RFI 28 [DOC ID: 2671].

628 See response by Samsung to question 7 of the Commission's supplemental questions to RFI 28 [DOC ID: 2672].

629 RBB Economics paper of 18 August 2017, "Assessment of Qualcomm's selling practices following the acquisition of Atheros", pp 9-10.

engage in such a strategy. In fact, in implementing such commercial tying strategy immediately after the Transaction, the merged entity would not encounter any technological hurdles, and the products involved are purchased by common pool of devices OEM customers, which facilitates the implementation of a commercial tying strategy. Furthermore, respondents to the phase I market investigation consider that the merged entity would have the ability to engage in such strategy[630].

(734) Overall, based on the above the Commission takes the view that the merged entity would have the ability to engage in possible conducts of pure bundling or tying of LTE baseband chipsets, NFC and SE chips.

2. Incentive to engage in pure bundling or tying

(735) As the Non-Horizontal Merger Guidelines point out, the merged entity's incentive to engage in tying or bundling depends on the degree to which such strategy is profitable for the merged entity[631].

(736) When asked whether Qualcomm would have the commercial incentive to engage in pure bundling, namely by offering its baseband chipsets exclusively together with NXP's NFC/SE and no longer making those products available separately to customers, most respondents to the phase I investigation indicated that Qualcomm has that incentive[632]. […][633].

(737) During the phase I market investigation, respondents also indicated that Qualcomm would have the incentive to engage into a strategy of technical or commercial tying of Qualcomm's LTE baseband chipsets with NXP's NFC and MIFARE-enabled SEs with the purpose of foreclosing its competitors in both markets[634].

(738) One mobile OEM argued that the merged entity would find it profitable to engage in commercial tying whereby it would tie Qualcomm's LTE baseband chipset (tied product) to NXP's NFC and MIFARE-enabled SE chips to its LTE baseband chipset (tying products)[635]. The respondent argues that taking into account the respective prices of baseband chipsets and NFC and SE chips, even if a small proportion of NXP's existing customers who do not purchase Qualcomm baseband chipsets today were to switch to Qualcomm as a result of the commercial tying strategy, such strategy would be profitable.

(739) The Commission considers that (especially compared to engaging in mixed bundling) pure bundling or tying often entails to sacrifice some profitable sales of

630 See responses to question 57 of Q1 – Questionnaire to device OEMs; responses to question 51 of Q2 – Questionnaire to baseband competitors; responses to question 57 of Q3 – Questionnaire to NFC competitors. See also responses during the Phase II market investigation by Gemalto, to RFI 25 of 4 July 2017, questions 3.2 and 3.3. [DOC ID: 2152] and Infineon, to RFI 29 of 5 July 2017, question 3.2, [DOC ID: 2955].

631 See Non-Horizontal Merger Guidelines, paragraph 105.

632 See responses to question 70 of Q1 – Questionnaire to device OEMs; responses to question 62 of Q2 – Questionnaire to baseband competitors; responses to question 68 of Q3 – Questionnaire to NFC competitors.

633 See response by […] to questions 57-58 and 70 of Q1 – Questionnaire to device OEMs, [DOC ID: 1009].

634 See responses to question 58 of Q1 - Questionnaire to device OEMs, and question 52 of Q2 - Questionnaire to baseband chipset manufacturers and question 58 of Q3 – Questionnaire to NFC Competitors.

635 See Third Party submission of 2 October 2017, page 9. [DOC ID 3138].

standalone components the merged entity would otherwise have made[636]. On the other hand, especially when competitors are foreclosed, the merged entity may be able to raise price in the concerned market(s) due to increased market power[637]. The merged entity thus faces a trade-off between the possible costs associated with bundling or tying its products and the possible gains from foreclosing competitors in the concerned market(s)[638]. The incentives to engage in bundling/tying therefore depend on the prospect of being able to foreclose competitors.

(740) For the reasons set out in recitals (761) to (766), the Commission however considers that even in the event that the merged entity pursued a bundling/tying strategy, foreclosure effects would be unlikely. Therefore, the possible gains for the merged entity from implementing a bundling/tying strategy with a view to foreclosing competitors are limited.

(741) The Commission further notes that, while NFC and SE chips are important for smartphones and are likely to become even more important in the future, the choice of the baseband chipset vendor is a much more significant decision for a device OEM customer than the choice of its NFC and SE provider. Therefore the Commission takes the view that device OEM customers are unlikely to make their choice of baseband chipset provider dependent on the choice of the NFC and/or SE chipset provider.

(742) As regards the Notifying Party's argument that even if a small percentage of customers switched away from the merged entity's baseband chipset, that would be enough to render the merged entity's tying or pure bundling strategy unprofitable (see recitals (712) to (715) above), the Commission notes that this argument is flawed for at least two reasons.

(743) First, the Notifying Party's calculations are based on the assumption that post-Transaction, the margin on the bundled product will remain unchanged relative to the pre-merger level of the joint margins of the separately sold products, which is unlikely in particular if the pure bundling strategy were indeed effective at foreclosing rival suppliers. In this case, the merged entity could profitably increase the price for its bundled product, thus leading to higher margins than prevailed pre-merger.

(744) Second, the Notifying Party limits itself to explaining the costs of pure bundling in terms of business lost on the baseband chipset side; but if there is indeed such a strong difference between LTE baseband chipsets and NFC/SE chips in terms of price and importance for the customer as claimed by the Notifying Party, then it is likely that only very few, if any, customers will switch away from the merged entity's LTE baseband chipsets just because they are obliged to buy the merged entity's NFC/SE chip as well.

(745) Those considerations suggest that the incentives of the merged entity to engage in bundling/tying are rather limited, as this would entail the prospect of losing profits from not serving customers that want to mix-and-match anymore, whereas

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636 Ceasing to supply stand-alone products may also be profitable for the merged entity (even when ignoring potential gains from foreclosing competitors) if maintaining the stand-alone products would entail large additional fixed costs, for example for R&D or marketing.

637 Compared to mixed bundling, depending on the circumstances, pure bundling/tying may allow the merged entity to divert more demand away from competitors compared to mixed bundling, so that potentially there may be a more pronounced foreclosure effect.

638 See Non-Horizontal Merger Guidelines, paragraph 105.

foreclosure would be difficult to achieve. In the course of its investigation, one of the economic submissions received by Gemalto/Infineon, namely the "Choi and Stefanadis Plus" model, outlines why merged entity could have an incentive to engage in pure bundling. The model relies on the idea that rival suppliers of either LTE baseband chipsets or NFC/SEs in light of the weaker market position compared to Qualcomm/NXP have to invest into product development first, before being able to compete (with possibly better products) against Qualcomm/NXP. After the Transaction, the merged entity may have an incentive to technically integrate its products[639] so that the potential rivals can recover their investment costs only in the (less likely) case that both of them innovate successfully, but not when only one of them is successful (in which case the innovator can only make money if mix-and-match with the complementary product of the merged entity was possible, but this is exactly what is prevented by technical integration); this makes the rivals' investment riskier and less profitable, thus discouraging rival innovations and reducing competitive pressure on prices.

(746) According to the model, whenever this bundling strategy is profitable, it is also harmful to consumers. The model also shows that the Transaction may be harmful to consumers even absent bundling; this follows from the fact that the Transaction allows the merged entity to coordinate the investment decisions on the two complementary products (which the individual firms were presumably not able to do pre-merger), and this will boost the merged entity's investments compared to the pre-merger scenario. This will necessarily discourage investment by their potential rivals, and whether or not this is harmful to consumers will depend on how large the investment post-merger will be in the aggregate (meaning the sum of the increased investment by the merged entity and the reduced investment by the outsiders), and how much of the benefits created by these additional benefits will be passed on to consumers.

(747) The Notifying Party observes that that model does not take into account the element of technology licensing, and that it ignores the fact that there are already rival suppliers of both LTE baseband chipsets and of NFC/SE chips active in the market. The presence of those alternative suppliers ensures that any entrant into either of the two component markets would be able to realise sales, because the necessary complementary component would be readily available, even if the merging party were to engage in pure bundling of its own products. Moreover, as far as the next generation baseband technology is concerned, the Notifying Party submits that numerous incumbents active in the LTE baseband chipsets market have already made major investments into these new technologies, so that there could be no deterrence effect on these already sunk investments from any pure bundling by the merging party[640].

(748) The Commission considers that the model confirms that pure bundling is an inherently costly strategy, because the firm engaging in this strategy has to sacrifice some profitable sales of standalone components it would otherwise have made, and this can only be profitable if bundling allows the bundling firm to compensate for these lost profits in some other way, for instance by increasing its chances to foreclose competitors. The Commission furthermore notes that the submitted model

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639 Technical integration is one way in which a firm may render a strategy of pure bundling "credible", in the sense that it prevents itself from unbundling the two products later on, even if it were in the merged entity's interest to do so.

640 See "RBB response to further CRA submissions" of 06 September 2017. [DOC ID: 2559].

does not incorporate that some mobile OEMs have the possibility to source BCs or NFC/SE products internally, in which case bundling can be expected to be even less effective in deterring rivals from innovating. This would, in the first place, further reduce the incentives of the merged entity to engage in pure bundling. Furthermore, the profitability of bundling depends critically on the fraction of the value of its innovation which any single innovator can appropriate absent bundling, which is difficult to measure and to assess in practice.

(749) The submissions do not provide arguments to substantiate the key conditions that must hold for pure bundling to be a profitable exclusionary strategy, namely: (2) the third parties have not yet developed a product (and they may fail to do so even if they invest considerable resources into such product development), while the merged entity has its products already fully developed, so that its presence in the product market is to be taken for granted, and can invest at most in a marginal quality improvement; based on the available evidence the Commission considers that any asymmetry between the merged entity and third party rivals is less pronounced than assumed in the model. There appear to be alternative suppliers (including in-house supply for some OEMs) that could supply both BCs and NFC/SE chips. Moreover, the merged entity must be able to credibly commit to tying, which means designing its product in a way that makes it impossible to unbundle the product later on. In this respect, it could be possible for the merged entity, even in case of technical integration of the relevant components, to feature its integrated product in a way that would allow customers to use it in connection with a third-party component.

(750) Therefore, the Commission concludes that the economic submissions received do not suggest that post-Transaction, the merged entity would have the incentive to engage in pure bundling of LTE baseband chipsets, NFC and SE chips.

(751) In the in-depth investigation, the Commission also reviewed the Parties' internal documents. As illustrated by the internal documents discussed in recitals (608), (609), (611), (612) and (617) above, the Parties in several instances discussed the integration of NXP's products with the Qualcomm LTE baseband chipset, in particular the SE chip on the baseband chipset.

(752) From the content of those discussions, it appears that, while planning component integration, the Parties aimed to maintain open a parallel sales channel for a standalone solution, as discrete products would still play a role for device OEM customers. Those discussions therefore suggest that the merged would be unlikely to have the incentive to engage in either conducts of tying or pure bundling.

(753) In that regard, Qualcomm's […] raised the opportunity of SE integration and selling the bundled product including MIFARE, but added to […] (emphasis added)[641].

(754) The same consideration for maintaining a sale of discrete components is reflected in NXP's document […] which outlined the main areas of potential synergy between the Parties' businesses[642]. With respect to NFC and SE and LTE baseband chipsets, the document mentioned the plan to […] " (emphasis added)[643].

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641 NXP internal document, email from Qualcomm's […] to NXP's […], "[…]", dated 8 February 2017, [DOC ID 1458-35882] [[…]].

642 NXP internal document, email from […] to Qualcomm's […], "[…]", dated 22 February 2017, [DOC ID 1452-11924] [[…]].

643 NXP internal document, "[…]", pdf document attached to the email from […] to Qualcomm's […], "[…]", dated 22 February 2017, [DOC ID 1452-11924] [[…]].

(755) From other internal discussions, it also appears that Qualcomm was wary of the consequences of no longer selling components standalone. For instance, in a discussion over post-merger strategies on offering an integrated product consisting of the Qualcomm LTE baseband, the SE chip and MIFARE, Qualcomm's […] noted that […][644]. This comment further highlights that, whereas Qualcomm would likely integrate, it would not be willing to entirely forego the sale of discrete standalone products.

(756) Similarly, Qualcomm's […] commented that […] (emphasis added)[645].

(757) Internally, NXP also commented that […] among others because […] (emphasis added)[646].

(758) Accordingly, the Commission notes that, as already explained in Section 7.4.2.2 B) 2. above, the Parties' internal documents suggest that Qualcomm and NXP would have the incentive to engage in mixed bundling conduct (including with the technical integration of the SE on the LTE baseband chipset), but not of pure bundling nor of commercial or technical tying, given that the Parties acknowledged that discrete components would still play a role and a separate sales channel for standalone components would be maintained.

(759) Furthermore, the Commission notes that following its acquisitions of other chipset manufacturers, Qualcomm did not engage into tying or pure bundling and continued to offer standalone products. For instance, following the acquisition of chipset manufacturer Atheros in 2011, Qualcomm continued to offer standalone WI-FI and Bluetooth chips[647].

(760) Therefore, based on the overall findings of the in-depth investigation, notwithstanding the feedback from market participants, the Commission concludes that the merged entity would be unlikely to have an incentive to engage in conducts of tying or pure bundling, given the lack of economic evidence and the findings in the Parties' internal documents[648].

3. Likely effects on competition

(761) Notwithstanding the finding that post-Transaction, it is unlikely that the merged entity would have the incentive to engage in conducts of tying or pure bundling, the Commission notes that in any event such conduct, if implemented, would be unlikely to lead to significant foreclosure effects.

(762) In this Decision, in light of continuous technological improvements, the Commission considers that BC and NFC/SE suppliers need to continuously invest in R&D in order to be able to offer competitive products. Therefore, the Commission has in particular assessed whether bundling/tying would entail a significant risk that

644 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 11 October 2016, [DOC ID 2476-882].

645 Qualcomm internal document, internal email exchange entitled "[…]", email by […], dated 5 November 2016, [DOC ID 2364-72772].

646 NXP internal document, internal email exchange, email sent by […] on 20 February 2017, "[…]", [DOC ID 1456-51159].

647 RBB Economics paper of 18 August 2017, "Assessment of Qualcomm's selling practices following the acquisition of Atheros", pp 9-10, explaining that Qualcomm sells WCN connectivity chips (semi-integrated with the Qualcomm baseband chipset) and QCA connectivity chips, sold standalone.

648 For the sake of clarity, antitrust rules, in particular article 102 TFEU will continue to apply to the merged entity after the closing of the Transaction, regardless of the outcome of the present assessment under the Merger Regulation.

competing BC or NFC/SE producers would be hampered in their incentives or ability to invest in R&D and eventually could be foreclosed of the respective markets.

(763) In this context, the Commission notes that a number of market characteristics already set out in the context of mixed bundling suggest that foreclosing competitors is difficult in the concerned markets. The Commission considers that the findings made in Section 7.4.2.2 B) 3., in relation to mixed bundling of LTE baseband chipsets, NFC chips and SE chips, apply, *mutatis mutandis,* also in the context of a tying or pure bundling scenario by the merged entity.

(764) As mentioned in Section 7.4.2.2 B) 3. , device OEMs have not always decided to purchase a bundled product from Qualcomm, rather favouring a standalone product, and have obtained from Qualcomm the necessary technical support for mix-and-matching Qualcomm's baseband chipsets with other products, such as the Wi-Fi and Bluetooth chipsets of other suppliers. In the context of pure bundling, where the merged entity would cease to provide its components standalone, device OEMs would still have an interest to buy standalone components, rather than purchasing the merged entity's bundle.

(765) Moreover, as recalled in recitals (651) to (658), customer behaviour appears to be inconsistent with foreclosure effects materialising as a result of a mixed bundling strategy of LTE baseband chipsets, NFC, and SE chips and standalone competitors can also have recourse to "mix and match" solutions.

(766) Finally, as recalled in recitals (536) and (665), based on the data submitted by the Notifying Party, the growth in the near future of NFC and SE on mobile devices with a non-Qualcomm baseband chipset will also contribute to standalone competitors of the merged entity having viable options to remain active.

(767) Therefore, the Commission considers that, even if the merged entity were to have the incentive to engage in tying or pure bundling, there is no sufficient evidence in the Commission's file to conclude that such conducts would likely lead to significant foreclosure effects[649].

7.4.4. Degradation of interoperability

(768) Concerns were raised during the phase I market investigation by several respondents, both competitors and customers, that the merged entity would have the ability and the incentive of degrading the interoperability of Qualcomm's LTE baseband chipsets and of NXP's NFC and SE chips with rival suppliers' standalone components[650]. The effect of such a strategy would be that device OEMs' customers would prefer the merged entity's product over those of rival suppliers. These suppliers would be eventually foreclosed from the market.

(769) As a general principle, for interoperability to work seamlessly, support by both sides is required both at the physical (hardware) level and at the protocol stack level (that is to say, the software implementation of the communication protocols). Therefore, interoperability support is require from both the baseband chipset supplier, as well as from the NFC and SE chips supplier.

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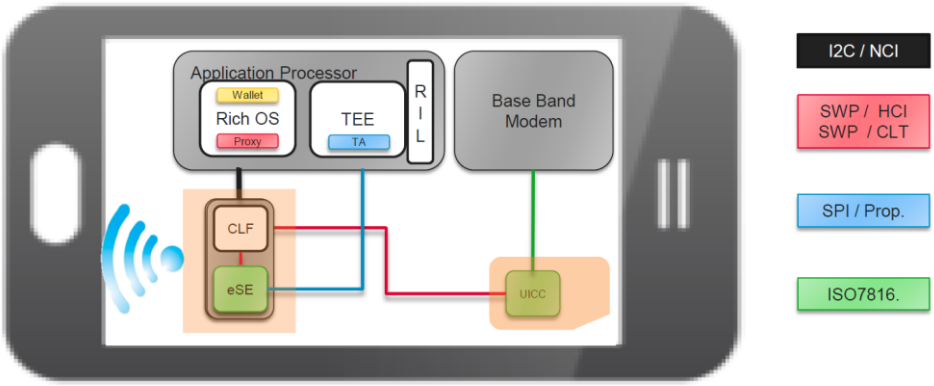
649 For the sake of clarity, antitrust rules, in particular article 102 TFEU will continue to apply to the merged entity after the closing of the Transaction, regardless of the outcome of the present assessment under the Merger Regulation.

650 See response to question 56 of Q1 - Questionnaire to device OEMs; responses to question 49 of Q2 – Questionnaire to baseband chipsets competitors; and responses to question 56 of Q3 – Questionnaire to NFC competitors.

(770) Interoperability between the NFC controller (referred to as CLF (contactless frontend) in Figure 10 below) and the embedded SE is ensured via the Single Wire Protocol (SWP) interface, and between the (integrated) baseband chipset and the NFC/SE solution via the I²C interface[651] and the Serial Peripheral Interface (SPI).

Figure 10 - Interoperability between the NFC and SE chips and BC/AP



(771) Some smartphones also have the Trusted Execution Environment (TEE) which is a secure execution area of the application processor, separate from the Rich OS (the operating system of the smartphone for example Android). One respondent[652] to the phase II market investigation argued that TEE represents a viable alternative to SE and that post-Transaction the merged entity would have the incentive to foreclose TEE providers[653].

7.4.4.1. The Notifying Party's views

(772) The Notifying Party submits that the merged entity would not degrade interoperability between its baseband chipsets and the NFC and SE chips of other suppliers, or vice versa.

(773) First, the Notifying Party explains that the NFC/SE chip is linked to the baseband chip through generic buses (I²C & SPI). These buses are based on worldwide standards, and as such, cannot be degraded for rival NFC and SE chips. This link is just a transport layer which has no effect on performance.

(774) Second, the Notifying Party claims that there are no past instances where it degraded interoperability for competing products.

(775) Third, the Notifying Party submits that degrading interoperability would be immediately visible to customers. This would be untenable commercially. Customers have sufficient countervailing buyer power to prevent the combined company from attempting any foreclosure strategy. As explained, customers value cross-technology interoperability and the ability to mix-and-match solutions from different suppliers so as to better meet their technical requirements and differentiate their products.

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651 The Inter-integrated Circuit (I²C) Protocol is a protocol intended to allow multiple "slave" digital integrated circuits ("chips") to communicate with one or more "master" chips. Like the Serial Peripheral Interface (SPI), it is only intended for short distance communications within a single device.

652 See submission to the Commission by […], of 23 October 2017. [DOC ID: 3209].

653 Having examined the complaint, the Commission considers that the theories of harm put forward are not specific to the Transaction. Pre-merger, NXP does not provide access to its NFC chips to TEE providers and Qualcomm does allow access to its chipsets other TEE providers. The situation would therefore remain unchanged with the Transaction, should the merged entity refuse access to its NFC chips in the future.

7.4.4.2. Commission's assessment

A) Ability to engage in degradation of interoperability

(776) The Commission first notes that, based on the results of the phase I and phase II market investigations, while the SPI and SWP are standardised interfaces, this only applies to the physical (hardware) layer (how to get the data from one place to the other).

(777) Past this layer, on the transport layer, the technology is proprietary (for example, the formatting of the data is not standard). The commands that are sent through the SPI interface are not standardised (but proprietary) and need to be exchanged between the suppliers of the processor and the NFC/SE for the components to communicate with each other. The availability of the commands to the suppliers of the NFC/SE components is a pre-condition for the components to work together. Also, SE/OS products are offered together with a driver (software code) that needs to be implemented on the baseband chipset or the application processor and the SE/OS. The command set provided by the eSE/OS to the baseband or application processor then needs to be implemented on the baseband or application processor side. This requires interaction between the two parties: either the mobile device OEM using a specific baseband or application processor or the baseband/application processor vendor and the eSE/OS supplier. This interaction usually takes place during the design-in cycle of a mobile device[654]. Interoperability between the components is ensured by exchanging command and data structure information as well as by joint bring-up or test sessions (collaboration between the suppliers)[655].

(778) Therefore interoperability information and support is necessary from both the baseband chipset manufacturer's side, as well as from the NFC and SE chips manufacturer's side.

(779) Therefore, despite the Notifying Party's claims that those interfaces are standardised, the Commission notes, based on the responses to the phase I and phase II market investigations, that past the transport layer, the technology is proprietary. It would be thus necessary for the merged entity to provide interface related proprietary information and integration support for its baseband chipsets and NFC and SE chips which it sells standalone and which customer OEMs would like to mix-and-match with other suppliers' products.

(780) The Commission also considers that in the next couple of years when the merged entity would be expected to integrate NXP's SE chip on the baseband chipset, such integration process may result in some changes to the current interfaces between the baseband chipsets and the NFC and SE chips. Respondents to the phase II market investigation expect that the merged entity would reengineer those interfaces. Some respondents pointed out that there is no guarantee that he SPI and I²C interface would be maintained for the merged entity's integrated product. It is also possible that the SWP interface may have a different configuration. These respondents expect that for discrete mix-and-match solutions combining a third party NFC/SE solution with Qualcomm's integrated chipset, the existing difficulties in ensuring seamless communication and interoperability through the SPI may worsen.

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654 See Infineon's response to RFI 29 of 5 July 2017, question 1.27, [DOC ID: 2955].

655 See minutes of the conference call with Infineon, of 11 September 2017. [DOC ID:2734].See also Minutes of the conference call with Gemalto, of 15 September 2017. [DOC ID:2835].

(781) Second, respondents to the phase II market investigation explained that the merged entity could degrade interoperability in more than one way. For example Infineon explained that: "*Even without integration, Qualcomm would be able to degrade interoperability between the Qualcomm processor and third party NFC/SE as Qualcomm controls the interfaces and to the benefit of their solution both the processor and the NFC/SE. This could be done, for example, by ensuring that the Qualcomm processor performs transactions with a Qualcomm SE, i.e. responding to a "call" from the Qualcomm SE to the processor, at a frequency of every clock cycle but limiting that frequency of responding to a "call" from a third party SE to every other clock cycle, thus limiting the performance of mix-and-match solutions. This could be done by creating such software barriers on the processor side and could be done even if the necessary commands for interoperability are provided. This conduct can be detected only at a very late stage for example by measuring the answering speed to "calls" from a third party SE vs. "calls" from Qualcomm own SE. While a third party supplier would be able to detect such performance degradation, it is not able to prevent Qualcomm from doing so or to provide an alternative implementation without such performance degradation*"[656]. Gemalto argued that: "*There are several ways in which Qualcomm could degrade interoperability between their baseband/AP chipsets and other NFC/SE solutions. The most extreme one would be for Qualcomm to integrate the NFC front end and the SE in a single baseband or application processor chip without providing for any interface to external NFC/SE solution, thus making it impossible for any NFC/SE solution provider to compete anymore on this market*"[657]. However, there could also be more subtle ways to degrade interoperability: "*The merged entity would prioritise improving the user experience for its integrated solution which would offer a better user experience (through e.g. improved timing and performance), and de-prioritise third party discrete mix-and-match solutions. Third party NFC/SE solutions could be further disadvantaged by Qualcomm further tightening the already very challenging timing and performance requirements imposed on embedded SE suppliers wishing to ensure communication with the Snapdragon via the SPI interface*[658]." Another chipset manufacturer indicated that degradation of interoperability could take the form of technical integration: "*Qualcomm would make efforts to integrate NFC/SE more tightly with baseband chipset and claim it as total solution to smart phone OEMs*"[659].

(782) Third, the Commission considers degradation of interoperability could be the result not only of Qualcomm intentionally reengineering interfaces in such a manner as to degrade the performance of third party products, but also by not providing necessary information and support to ensure interoperability in the first place. Seamless interoperability between the merged entity's baseband chipsets/application processors and other suppliers' NFC and SE chips and vice versa would involve close cooperation between the merged entity and these third party suppliers. One respondent to the phase II market investigation explained how the merged entity would need to cooperate should a mobile device customer prefer a "mix-and-match" solution. Infineon explained that: "*Qualcomm would need to make available to third party NFC/SE suppliers the necessary interface specifications and commands at an early stage of product development. Towards the end of the development stage, Qualcomm would also have to cooperate and provide support in the integration*

656 See minutes of the conference call with Infineon, of 11 September 2017. [DOC ID: 2734]
657 See Gemalto's response to question 3.1 of RFI 25 of 4 July 2017. [DOC ID: 2152].
658 Minutes of the conference call with Gemalto, of 15 September 2017. [DOC ID:2835].
659 See Responses to Questionnaire Q3 to NFC Competitors, question 56.3.

testing phase to ensure that the products communicate seamlessly (e.g., through ad-hoc meetings). Some large mobile device OEMs may be able to ensure interoperability testing by themselves, however the technical risks, the risk of delays in the time to market as well as the additional costs would be high"[660]. Therefore, the Commission considers that the merged entity would also have the ability to hamper with the mix-and-match choices of mobile device OEMs if not only by refraining from providing the necessary interoperability information and commands to third party suppliers. Since such information and commands are proprietary to Qualcomm, the merged entity could simply refuse to provide such information and commands, thus discouraging the OEMs to mix-and-match and instead prefer the merged entity's integrated or bundled product.

(783) Fourth, the Commission also notes that during the phase I market investigation not only third party suppliers, but also some mobile device mobile OEM customers raised concerns that the merged entity would have the ability to engage in degradation of interoperability between its baseband chipsets and third party suppliers' NFC and SE chips and vice versa[661]. One mobile device OEM customer argued that the merged entity could change interoperability between the software on the application processor, which manages SE chips and reads storage data in SE chips, so as to hamper the use of third party SE chips[662].

(784) The Commission thus considers, based on the results of the phase I and phase II market investigations, that the merged entity would have the ability to degrade interoperability between Qualcomm's baseband chipsets and other suppliers' NFC and SE chips or between other suppliers' baseband chipsets and NXP's NFC and SE chips.

B) Incentive to engage in degradation of interoperability

(785) For the reasons indicated in the following recitals, the Commission also considers that the merged entity would have the incentive to engage in interoperability degradation with a view to redirecting demand for third party standalone baseband chipsets and NFC/SE products to its own LTE baseband/NFC/SE bundle.

(786) First, respondents to the phase I and phase II market investigations, both competitors and customers pointed out that the merged entity would have incentive to engage in such a strategy[663].

(787) Thus, several NFC and SE chips suppliers argued that the merged entity would have such incentive. G&D submitted that: "*There could be a motivation to degrade interoperability to impede or slow down integration components from other suppliers resulting in a competitive advantage as other suppliers may miss design-in Windows. A complete abundance of interoperability is not expected as OEMs would urge for alternatives. Notwithstanding, there could be undocumented optimizations which would make Qualcomm's solution superior while maintaining compatibility for*

660 See minutes of the conference call with Infineon, of 11 September 2017. [DOC ID: 2734].

661 See responses to question 56 of Q1 - Questionnaire to device OEMs.

662 See submission by a mobile device OEM, of 2 October 2017, page 11. [DOC ID: 3138].

663 See response to question 56 of Q1 - Questionnaire to device OEMs; responses to question 49 of Q2 – Questionnaire to baseband chipsets competitors; and responses to question 56 of Q3 – Questionnaire to NFC competitors. See also RFIs 25 and 29 to Gemalto [DOC ID: 2152] and Infineon [DOC ID: 2955], as well as minutes of the conference calls with Gemalto, of 15 September 2017 [DOC ID: 2835] and Infineon, of 11 September 2017 [DOC ID:2734].

others"[664]. Gemalto considered that: "*Should Qualcomm integrate the NFC/SE on its application processor post-merger, Qualcomm could reengineer these interfaces. There is no guarantee that the SPI and I²C interface will be maintained for Qualcomm's integrated product. It is also possible that the SWP interface may have a different configuration. However, for discrete mix-and-match solutions combining a third party NFC/SE solution with Qualcomm's integrated chipset, the existing difficulties in ensuring seamless communication and interoperability through the SPI may worsen. The merged entity would prioritise improving the user experience for its integrated solution which would offer a better user experience (through e.g. improved timing and performance), and de-prioritise third party discrete mix-and-match solutions. Third party NFC/SE solutions could be further disadvantaged by Qualcomm further tightening the already very challenging timing and performance requirements imposed on embedded SE suppliers wishing to ensure communication with the Snapdragon via the SPI interface*"[665].

(788) Infineon argued that the merged entity could degrade interoperability so that such strategy would be to the benefit of the merged entity's baseband chipset and own NFC/SE solution[666].

(789) Among the device mobile OEM customers, […] argued that: […][667].

(790) Second, the phase I and phase II market investigations provided some indications that do not support the Notifying Party's claims that it had never tried degrading interoperability or refuse to provide necessary support and information to other integrated third party products with its baseband chipsets and application processors in the past. Some suppliers did point out from their past experience with Qualcomm that it does not typically support OEMs in changing the reference design of its chips to support third party components[668]. […] argued that […][669].

(791) As explained in recital (57), the baseband chipset is one of the essential components of smartphones, as it ensures the connection of mobile devices to mobile telecommunication. Therefore it represents one of the most important choices that the OEM has to make when designing a new smartphone. This is also reflected by the price of the baseband chipset which is much more significant than that of the NFC or SE element. As a result, customers who choose Qualcomm's baseband chipset would be less inclined to purchase the NFC/SE solution of another supplier in a situation where the merged entity would degrade interoperability or not ensure the same level of interoperability between its baseband chipsets and the NFC/SE solutions of third party suppliers. Moreover, the importance of the baseband chipset, relative to the NFC/SE chip, makes it unlikely that a customer would entirely switch away from the merged entity's product, and in particular would start buying third party baseband chipsets, just to be able to combine it with its preferred third party NFC/SE chips.

(792) Fourth, as explained in recital (777), ensuring interoperability also means that the merged entity would need to provide the necessary information, commands support and cooperation to third party suppliers of standalone products. To the extent that

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664 See Responses to Questionnaire Q3 to NFC Competitors, question 56.3.

665 See Minutes of the conference call with Gemalto, of 15 September 2017 [DOC ID 2835].

666 See Minutes of the conference call with Infineon, of 11 September 2017. [DOC ID: 2734].

667 See […] response to question 56.3 of Q1 - Questionnaire to device OEMs, [DOC ID: 1009].

668 See Minutes of the meeting with Infineon, of 22 June 2017. [DOC ID: 1425].

669 See […] response to question 56.3 of Q1 - Questionnaire to device OEMs, [DOC ID: 1009]

providing such information and support to third party suppliers is costly to the merged entity, the merged entity would have less of an incentive to bear these costs. This is because as a consequence of the Transaction, the merged entity would also have in-house production of NFC/SE chips, and therefore internalise any profit gains from diverting BC customers from third party suppliers to its own NFC/SE products. The same reasoning also holds for diverting NFC/SE customers from buying third party BCs to buying BCs of the merged entity. Therefore, the merged entity would benefit post-Transaction, if, as a consequence of poor interoperability with third party suppliers, BC customers would also buy NFC/SE chips from the merged entity (and similarly for NFC/SE customers). The Commission therefore considers that the merged entity would find it less profitable to invest in supporting third parties' products to successfully interact with its LTE baseband chipsets and its NFC/SE chips respectively, compared to the pre-merger situation, where the Notifying Party did not have any in-house production of NFC/SE chips.

(793) For these reasons, the Commission takes the view that the merged entity would have the incentive to degrade the interoperability or not ensure the same level of interoperability between its baseband chipsets and the NFC/SE chips of third party suppliers and viceversa.

C) Likely effects on competition

(794) Based on the results of the phase I and phase II market investigations, the Commission considers that the merged entity's strategy of degrading interoperability would likely compound the foreclosure effects of the merged entity's strategy of increasing royalties for MIFARE or ceasing the licensing of MIFARE altogether to competitors, against the backdrop of mixed bundling of LTE baseband chipsets and NFC/SE chips, as described in Section 7.4.2 above. The refusal to provide the necessary information or commands to third party suppliers of standalone NFC/SE chips or baseband chipsets would have a similar effect on third party suppliers as degradation of interoperability.

(795) First, the Commission notes that during the phase I market investigation respondents among both competitors and customers emphasised that a strategy of degrading interoperability would have a negative impact on the ability to compete of rival suppliers of baseband chipsets and NFC/SE solutions, eventually foreclosing them from the market[670].

(796) Intel states that "*[d]egradation of Qualcomm's baseband chipsets with competitors' products such as NFC/SE chips, would likely harm the competitiveness of the remaining NFC/SE chip suppliers, which Intel understands account for a small share of the business*"[671].

(797) […] indicates that: […][672].

(798) Samsung LSI points out that: "*Given that Qualcomm would have a dominant position in multiple relevant markets, if Qualcomm did pursue a strategy to degrade interoperability with its own components, then such a strategy will have an exclusionary effect on SLSI and other competitors in the market for the other*

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670 See responses to question 50 of Q2 – Questionnaire Q2 to baseband chipsets competitors and Responses to question 56.4 of Q3 – Questionnaire to NFC competitors.

671 See Intel's response to question 50.1. of Q2 – Questionnaire to baseband chipsets competitors, [DOC ID: 767].

672 See […] response to question 56.4 of Q1 - Questionnaire to device OEMs, [DOC ID: 1009].

components even if Qualcomm did not in parallel pursue an integration strategy. That is because the various components (say AP and baseband or NFC and baseband) need to interoperate and communicate to some degree. If Qualcomm's baseband would not work and communicate with an SLSI NFC, then customers who use Qualcomm basebands could not use SLSI NFC"[673].

(799) G&D considers: "*In such a scenario and in case Qualcomm does not make available the development environment to bring up solutions on Qualcomm's products we would be limited to work alternate platforms under the conditions […]. Depending on the degree this can be either detrimental to the capability to offer competitive solutions (technical, timeline) to the market with a potential to step out of this market*"[674].

(800) Toshiba argued that: "*A degradation of interoperability with Qualcomm's products may have a negative effect for us as our opportunities to sell our NFC/SE products might be reduced*"[675].

(801) Gemalto also considered that demand for its NFC/SE products would be artificially reduced if the interaction between its products and Qualcomm basebands and/or application processors was degraded[676].

(802) Another chipset manufacturer argued that "*Qualcomm could set up substantial technical barriers in the interoperability between Qualcomm's own chipsets (including NXP) and the chipsets of other companies, this will cause competitors' NFC/SE chipsets or baseband chipsets performance lags far behind Qualcomm's NFC/SE chipsets or baseband chipsets, and therefore exclude other competitors entering into the NFC market and harm the competition*"[677].

(803) Second, the Commission considers, based on the phase I and phase II market investigations, that neither third party suppliers, nor mobile customer OEMs would be able to thwart a strategy of interoperability degradation by the merged entity. On the one hand, third party suppliers of standalone baseband chipsets and NFC/SE chips would need the information and commands to be provided by the merged entity in order to successfully integrate their products together with those of the merged entity. As explained in recitals (776) to (779), the interfaces ensuring interoperability are standardised only to a certain degree, which would thus leave the merged entity with enough leeway to frustrate interoperability with third party products, either by not providing the necessary information and commands to ensure interoperability or by implementing these interfaces in a way that make the products of the merged entity work better than those of third party supplier (for instance the products of third party would work slower than those of the merged entity). While a third party supplier would be able to detect such performance degradation, it is not able to prevent Qualcomm from doing so or to provide an alternative implementation without such performance degradation[678]. Further, in the situation where customer OEMs would like to mix-and-match, they cannot overcome interoperability impediments themselves, should the merged entity refuse to ensure interoperability.

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673 See Samsung LSI's response to question 56.5 of Q3 – Questionnaire to NFC competitors, [DOC ID: 1095].

674 See G&D's response to question 56.5 of Questionnaire Q3 to NFC Competitors. [DOC ID742].

675 See Toshiba's response to question 56.5 of Questionnaire Q3 to NFC Competitors. [DOC ID: 745].

676 See Gemalto's response to question 56.5 of Q3 - Questionnaire to NFC competitors. [DOC ID: 678].

677 See NFC/SE manufacturer's response to question 56.4 of Questionnaire Q3 to NFC Competitors.

678 See Minutes of the conference call with Infineon, of 11 September 2017. [DOC ID: 2734].

One respondent indicated that: "*Some large mobile device OEMs may be able to ensure interoperability testing by themselves, however the technical risks, the risk of delays in the time to market as well as the additional costs would be high*"[679]. Therefore, contrary to the claim put forward by the Notifying Party, it cannot be assumed that either third party suppliers or device customer OEMs would be able thwart attempts by the Merged Entity to degrade interoperability.

(804) Therefore, the Commission considers that such a strategy on the part of the merged entity to degrade interoperability of third party baseband chipsets and NFC and SE chips would compound the foreclosure effects stemming from an increase of MIFARE royalties (or a denial to license MIFARE), on top of a conduct of mixed bundling, as described in Section 7.4.2 above.

7.4.5. Conclusion on conglomerate effects in relation to Qualcomm's baseband chipsets and NXP's NFC and SE chips

(805) Based on its assessment in section 7.4.2, the Commission therefore takes the view that the merged entity's conduct of increasing royalties for MIFARE or ceasing the licensing of MIFARE altogether to competitors, applied in addition to mixed bundling of LTE baseband chipsets, NFC and SE chips, would have the likely effect of foreclosing competitors of baseband chipsets and NFC and SE chips.

(806) Furthermore, based on its assessment in section 7.4.4, the Commission takes the view that the merged entity's strategy of degrading interoperability would likely compound the anti-competitive effects of the merged entity's strategy of an increase of MIFARE royalties (or a denial to license MIFARE) with mixed bundling.

(807) In light of these conglomerate effects, the Commission considers that the Transaction as originally notified would give rise to a significant impediment of effective competition in relation to the markets for LTE baseband chipsets and NFC and SE chips.

7.5. Conglomerate effects related to IP licensing of NFC technology

(808) The Parties hold significant IP rights in particular in NFC technology[680]. In light of the complementary nature of the technology involved and the manner in which IP licenses are negotiated with potential licensees, the combination of Qualcomm's and NXP's NFC patent portfolios could, absent suitable commitments, raises competition concerns relating to a disproportionate increase in bargaining power and the negotiated royalties.

(809) In the following Sections, the Commission will provide preliminary remarks on the patent licensing and on the Parties' pre-merger licensing practices before summarising the results of the phase I and phase II market investigations and the Notifying Party's view. The last Section provides the Commission's assessment. The Commission will analyse whether as a consequence of the Transaction, the merged

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679 See Minutes of the conference call with Infineon, of 11 September 2017. [DOC ID: 2734].

680 NXP also holds […] SE-related patents and […] SE OS-related patents. NXP does not license its SE patents and monetizes its SE technology solely through the sale of chips. Qualcomm, to the best of its knowledge, does not hold any patents pertaining specifically to the SE of an NFC/SE chips solution (Notifying Party's Response to RFI 34 of 14 July 2017, question 8 [DOC ID 2333]). Therefore, the Transaction will not combine patents on SE technology. Moreover, the Commission notes that that NXP's SE patents are not a source of revenue in and out of themselves as the value of SE patents is reflected in NXP's sales of SE chips and its patents are not subject to licensing agreements (see NXP's Response to RFI 35 of 18 July 2017, paragraph 20 [DOC ID 2009]). The following theory of harm therefore does not extend to SE patents.

entity would charge higher royalties for the combined NFC patent portfolio than the Parties would have charged in total for the same patents licensed separately.

7.5.1. Preliminary remarks

(810) The specific subject-matter of a patent right is to guarantee the reward of the inventive effort of the inventor, who has "*the exclusive right to use an invention with a view to manufacturing industrial products and putting them into circulation for the first time, either directly or by the grant of licences to third parties, as well as the right to oppose infringements*"[681].

(811) Implementers who develop, produce or sell products may obtain licences from patent holders that permit the implementer to use a patented invention. In return for granting a license, patent holders typically charge royalties. The Commission's present concerns relate to the level of royalties that may be set by the merged entity for certain patents. It therefore requires explaining how royalties are generally negotiated and possible practices which, in the present case, could lead to conglomerate effects.

(812) In case no mutually acceptable licensing terms can be found, IP holders can remedy IP infringements by initiating court proceedings. At the request of the IP right holder, a court may order that appropriate measures be taken with regard to goods found to be infringing an IP right[682]. Those corrective measures include injunctions banning the infringing products from the market. Moreover, courts can order damages against an infringer. In the context of a patent infringement suit, the court must also determine whether the relevant patents were actually infringed. Moreover, implementers involved in such litigation usually challenge the validity of patents allegedly infringed. Litigation costs as well as the resources needed to carry out infringement suits can be considerable.

(813) Licensing negotiations are usually done in the "shadow of litigation", that is, the licensing terms typically depend on the chances that at least one patent under negotiation will be found to be valid and infringed, as well as remedies imposed by a court. The chances for an infringement to be found in turn are a function of the strength and the number of infringed patents. For example, if a patent holder owns few contestable patents that might be found invalid, the chances for at least one patent to be found infringed may be small. In case of an infringement, a patent holder can be entitled to collect damages. In addition, depending on the circumstances, courts may issue injunctions to prevent further infringement. In case of an injunction, infringers should cease to sell infringing products and remove them from the market, thus losing any related profit.

(814) In the case of standard-essential patents (SEPs), once a standard incorporating proprietary technology is adopted, the potential exists for opportunistic patent holders to insist on patent licensing terms that capture not just the value of the underlying technology, but also the value of standardisation itself. To address this "hold-up" risk, the IP policies of standard setting organisations (SSOs) generally require patent holders to disclose their patents and commit to license SEPs on fair, reasonable, and non-discriminatory ("FRAND") terms[683]. SEP-holders' ability to

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681 Case 187/80 *Merck & Co Inc. v Stephar BV and Petrus Stephanus Exler* [1981] ECR 2063, paragraph 4.

682 Case AT.39985 - Motorola - Enforcement of GPRS standard essential patents, Section 4.1.

683 See also the Commission Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal co-operation agreements (the "Horizontal Cooperation

seek injunctions is further regulated under the judgment of the Court of Justice in *Huawei v. ZTE*, under which SEP-holders cannot bring an action for a prohibitory injunction prior to alerting an alleged infringer about its SEPs and the way in which they are infringed without running afoul of Article 102 of the TFEU[684]. The judgment further sets out which steps SEP holders and potential licensees should comply with in negotiations prior to bringing legal action[685]. The Commission recently issued a Communication in which it set out recommendations with respect to transparency, FRAND principles and SEP enforcement[686].

(815) It follows that several factors affect the bargaining position of the parties in licensing negotiations and the ensuing licensing terms. These include the value of the infringing products or, in case an infringement can be avoided by redesigning or removing certain features, the incremental value that is added by the infringed technology. Furthermore, the number and strength of infringed patents is relevant, as these impact the likelihood of an infringement being found in the first place.

(816) Moreover, litigation-related factors may have an impact on the negotiated licensing terms. Specifically, an infringer may doubt in the first place that an IP holder will initiate litigation, for example due to the low chances of being awarded any remedy, litigation costs, lack of resources to (successfully) carry out such litigation, or likely significant negative consequences, such as counter-suits or loss of valuable other business. Therefore, the relative litigation strength of the two parties can influence their bargaining position and the agreed royalty level.

(817) Therefore, for the purposes of this Decision, the Commission considers that royalty levels set in patent licensing negotiations depend not only on the strength and the number of patents, but also on additional factors affecting the credibility of threats to initiate patent litigation.

(818) Against this background, the Commission examined whether the Transaction could give rise to conglomerate effects resulting from the combination of the Parties' respective NFC patents. In this respect, it should be noted that NXP does not grant NFC licenses on a patent-by-patent basis, but generally licenses third parties to a patent portfolio. From the perspective of prospective licensees, such licenses bundle together largely complementary patents necessary to implement NFC technology without infringing NXP's patents.

(819) By combining the Parties' respective NFC portfolios, the Transaction would enable the merged entity to offer licenses covering a broader portfolio of NFC patents. The mere combination of patents, even for licensing purposes, does not in itself raise competition concerns in principle[687]; nor does a patent holder's use of factors contributing to its credibility in licensing negotiations. Stated differently, the mere combination of two previously separate patent portfolios, depending on the circumstances, may lead to an increase in bargaining power and royalties to the benefit of the acquiring patent holder, in the sense that the latter would largely equal

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Guidelines"), paragraphs 285-286, OJ C 11, 14.1.2011, p.1. SSOs sometimes refer to "reasonable and non-discriminatory" terms. The present decision will refer to FRAND or (F)RAND terms.

684 Judgement of the Court of Justice of 16 July 2015, Huawei v. ZTE, C-170/13, ECLI:EU:C:2015:477, paragraphs 60-61.

685 Id., paragraphs 63 et seq.

686 See Communication on Setting out the EU approach to Standard Essential Patents, COM(2017)712.

687 This is without prejudice of the assessment of certain forms of portfolio under Article 102 TFEU.

the sum of the relevant patent holders' respective royalties pre-merger. Such change would not induce competition concerns.

(820) However, the Commission is concerned that, in the particular circumstances of this Decision, bundling the Parties' NFC patents as a result of the Transaction would enable the merged entity to profitably increase royalties above levels which the Parties could have charged absent the Transaction for the same patents.

(821) Whereas the Commission recognises that the combination of patent portfolios, depending on the circumstances, can have pro-competitive effects[688], the Notifying Party has not advanced any substantiated case-specific arguments relating to such potential efficiencies.

(822) In the following Sections, the Commission will examine whether the combination of the Parties' NFC patent portfolios may, in the particular circumstances of this Transaction, lead to a disproportionate increase of bargaining power and royalties, in the sense that it would significantly surpass the sum of the royalties charged by each Party for the same patents in a standalone scenario, absent the Transaction.

(823) In this context, it is relevant to note, at the outset, that neither Party has set a pre-determined NFC royalty rate. In certain internal documents, NXP's current NFC royalty rate on the basis of current licensing agreement is estimated to amount to […] per device[689], although that estimate was derived from fully paid-up agreements[690]. Qualcomm, for its part, does not license its NFC patents on a standalone basis pre-merger. Although it does license its NFC patents as part of its broader portfolio license, Qualcomm's implied royalty rate for NFC cannot be observed. This is all the more true that, as the Notifying Party explained, it uses "*no precise methodology* (...) *to arrive at* (...) [royalty] *rates agreed between Qualcomm and its licensees*" and that it "*does not license distinct, neatly defined, mutually independent categories of technology with a given pre-determined value. Similarly, the "price" of the license cannot be arrived at by summing the "price" of each category of licensed technology*"[691]. Nonetheless, despite being unable to quantify its implied royalty rate for NFC patents included in its portfolio pre-merger, Qualcomm has explained that "[t]*he amount actually charged by Qualcomm for the NFC IP included in Qualcomm's portfolio would, however, be trivial or non-existent*"[692].

7.5.2. The Parties' pre-merger IP licensing practices

(824) The Parties' respective IP licensing practices differs in several respects, including in particular in respect to the levels of the value chain at which they grant patent licenses and the scope of IP rights that are attached to the sale of the components that they supply to their customers. As the Transaction may induce a change in the

688 See for example Guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union to technology transfer agreements (2014/C 89/03), Section 4.4. ("Technology pools").

689 Qualcomm internal document, […] dated 18 March 2016, p. 2 [DOC ID 1311-3].

690 "Fully paid up", in the present context, means that the relevant agreements did not include running royalties but instead required the licensee to pay an up-front "lump sum" fee. A notional royalty rate can be derived from a "lump sum" payment by treating the lump sum as the net present value of an income stream from running royalties (see, for example, *Unwired Planet v. Huawei* [2017] EWHC 711 (Pat), at paragraphs 188).

691 Notifying Party's Response to RFI 42 of 17 August 2017, paragraphs 17 and 10 [DOC ID 2374].

692 Minutes of 12 May 2017 meeting with […], p. 6 [DOC ID 1062].

Parties' licensing practices, their respective pre-merger conduct is explained in detail below in recitals (825) et seq.[693].

7.5.2.1. NFC's licensing practices

(825) NXP holds […] NFC patents, including […] SEPs, […] chip-level patents, […] system-level patents and […] NFC security related patents. NFC "chip-level" patents cover inventions that are embodied in an NFC chip. NFC "system-level" patents read on different system-level inventions combining multiple chips, systems and/or software to make NFC-enabled end products.

(826) NXP sells NFC chips to its mobile device OEMs exhaustively. This means that the sale of its chips "exhausts" its IP claims relating to patents reading on chips vis-à-vis its customers. NXP also licenses its NFC patents to rival component manufacturers and has concluded NFC patent licensing agreements with STMicroelectronics, Sony and Broadcom[694]. These agreements grant licensees long term rights to the relevant NFC patents, including SEPs[695].

(827) NXP also concluded licensing agreements with end-device manufacturers, namely Acer, Dell and Apple. With respect to Apple, in 2013 NXP licensed all its NFC patents, including SEPs, in the context of a wider arrangement that also involved the assignment of certain patent families to Apple and a license to software running on NXP's SE products (including MIFARE). Apple's patent license goes beyond the mere use of NFC chips and does not involve the ongoing payment of royalties on device sales.

7.5.2.2. Qualcomm's licensing practices

(828) The following Sections discuss the content of the Parties' relevant patent portfolios and their respective licensing practices.

A) Qualcomm's wireless patent portfolio

(829) As of July 2017, Qualcomm's portfolio includes […] patents worldwide, including […] granted patents and […] pending. Patents included in the portfolio concern different technologies. 3G/4G/5G cellular technology patents ("cellular patents") represent […]. Other significant portions of the portfolio concern inventions in different fields, including, for example, processing […], multimedia […], Wi-Fi […] and "*other communications technology*" […] [696]. The latter category includes […] NFC patents (including […] potential SEPs).

(830) Qualcomm's IP portfolio "*changes every day with newly developed or acquired patents or patents that have expired or were sold*"[697]. The size of the portfolio is

693 The present decision is without prejudice to assessments of the compatibility of the Parties' IP licensing conduct under Articles 101 and 102 of the TFEU, and/or under any potentially applicable (F)RAND obligations.

694 However, Broadcom sold its SE business to NXP in 2016 and granted NXP the right to acquire Broadcom NFC IP within two years of the transaction, a right which NXP has since exercised (From CO, paragraph 867).

695 Licenses are for the lifetime of the patents owned or controlled by NXP during the term covered by each licensing agreement.

696 Percentages based on the Notifying Party's estimates provided on 16 July 2017 (Response to Commission RFI 23 of 28 June 2017, figure 1) [DOC ID 1646].

697 Minutes of 12 May 2017 meeting with […], p. 4 [DOC ID 1062].

growing over time. Qualcomm currently owns approximately […] times the number of patents it held in 2008[698].

(831) According to the Notifying Party, despite its diversity, the value of this portfolio principally lies principally in cellular technology patents. The Notifying party explained that "*Qualcomm's licensing business still today is centered on Qualcomm's cellular technology and the development of cellular patents*" and that, after the Transaction, "*the amount actually charged by Qualcomm for the NFC IP included in Qualcomm's portfolio would* (…) *be trivial or non-existent* (…). *The main technology included in the license is the cellular technology, and these patents dwarf any other non-cellular patents*"[699].

B) Qualcomm's licensing model

1. Qualcomm's device-level licensing and "no license-no chip" practices

(832) Qualcomm does not license its cellular patent portfolio to competing chip manufacturers. Instead Qualcomm only licenses its cellular IP to end-device manufacturers which purchase BCs from Qualcomm or its competitors. That practice is called "device-level licensing"[700].

(833) Qualcomm does not sell BCs to device OEMs exhaustively. Instead, Qualcomm requires OEMs who wish to purchase its BCs to take a license to Qualcomm's cellular SEPs. According to Qualcomm, the reason for that practice is to avoid the risk inherent in selling BCs to unlicensed customers that such sales be found to exhaust the Qualcomm's IP that is incorporated into Qualcomm's BCs[701]. That practice has been called the "no license-no chip" policy by the US FTC and Apple in pending litigation against Qualcomm in the United States.

(834) According to the Notifying Party, that practice is reserved to BCs. For non-cellular products, Qualcomm explained that it does not condition product sales on customers being licensed to the relevant IP. According to Qualcomm, non-cellular products do not require the same licensing practice as BCs because, in many instances, the importance of the IP for the development of such product is much less than in relation to BCs.

2. Qualcomm's portfolio-based license and royalty

(835) Qualcomm licenses its IP on a portfolio basis rather than patent-by-patent. Qualcomm's patent portfolio includes "*technically essential IPR*" and "*other IPR*." The first category includes cellular SEPs and the second category all non-cellular essential IP as well as non-SEPs[702].

(836) Qualcomm's licensing practice in this respect expressly set out in its marketing presentations. For example, in a QTL presentation of June 2017, one of the main tenets of "*Qualcomm's licensing model*" is the fact that […][703].

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698 See response by the Notifying Party of 28 June 2017 to the Article 6(1)(c) decision, figure 1, [Doc ID 1331].

699 Minutes of 12 May 2017 meeting with […], p. 1 and p. 6 [DOC ID 1062].

700 See 3 May 2017 Qualcomm White Paper on NFC and Licensing, p. 4: "*Qualcomm typically neither asserts SEPs upstream of its licensees against, nor collects royalties from, competing chip makers*" [DOC ID 881].

701 Notifying Party's Response to RFI of 28 February 2017, question 43; minutes of 12 May 2017 meeting with […], p. 2 [DOC ID 1062].

702 Notifying Party's Response to RFI of 28 April 2017, question 3 [DOC ID 691].

703 Notifying Party's Response to RFI 23 of 28 June 2017, Annex 2.5, p. 28 [DOC ID 1660].

(837) According to the Notifying Party, […][704]. […][705].

(838) Qualcomm's licensing agreements grant licenses under Qualcomm's patents for the supply of certain mobile devices […] by Qualcomm's licensees. Qualcomm's patent license agreements are thus typically called […].

(839) The Notifying Party estimates that over […], which predominantly include mobile handsets, hold full portfolio licenses[706]. […] account for more than […] of Qualcomm's total IP revenues[707].

(840) […][708]. […][709].

(841) For patent license negotiations, […][710]. The royalty rate provided in […] is 5% of the Net Selling Price ("NSP") of CDMA-enabled terminals. […][711]. According to Qualcomm, these rates were set as the result of arm's length negotiations […][712].

(842) Qualcomm's royalties are calculated as a percentage of the NSP of handheld devices […]. […]. The royalty is due by licensees regardless of whether their devices are manufactured using a Qualcomm BC or any other component[713].

(843) The Notifying Party submits that effective royalty rates concluded with licensees may differ from the standard 5% rate, depending on the outcome of licensing negotiations. In addition, the royalty only constitute partial consideration for its license grant. Other consideration may include cross-licenses or other rights.

3. Qualcomm's licensees

(844) Because Qualcomm refuses to sell BCs to unlicensed customers, most device OEMs have a license to Qualcomm's patents. However, different categories of licensees must be distinguished for the purpose of the present assessment.

(845) First, in compliance with commitments given by Qualcomm to China's National Development and Reform Commission ("NDRC") in 2015, Qualcomm licenses 3G and 4G essential Chinese patents separately from licenses to its other patents and charges lower royalties than its standard rate for devices sold in China[714]. […].

(846) Second, […], Apple, does not hold a license to Qualcomm's patents. Apple outsources the manufacturing of handheld devices to so-called "contract manufacturers" (Hon Hai (Foxconn), Pegatron, Wistron and Compal) who have signed full portfolio license agreements with Qualcomm. Apple's contract

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704 Minutes of 12 May 2017 meeting with […], p. 2 [DOC ID 1062].

705 Id., p. 4.

706 Notifying Party's Response to RFI 23 of 28 June 2017, question 9 [DOC ID 01646]. A "Subscriber Unit" or a "Complete Terminal" is likely to be a defined term in license agreements and typically includes complete terminal handsets.

707 Notifying Party's Response to RFI 36 of 26 July 2017, question 11(b) [DOC ID 2367].

708 Notifying Party's Response to RFI 23 of 28 June 2017, question 4(c) [DOC ID 1951].

709 Notifying Party's Response to RFI 23 of 28 June 2017, question 6 [DOC ID 1646].

710 Notifying Party's Response to RFI 23 of 28 June 2017, question 1 [DOC ID 1646].

711 The Motorola and AT&T's agreements provided that their royalty rates would not exceed 80% of the rate charged to subsequent licensees. Notifying Party's Response to RFI 23 of 28 June 2017, question 4(a) [DOC ID 1951].

712 Notifying Party's Response to RFI 42, question 1 [DOC ID 2374].

713 Notifying Party's Response to RFI 23 of 28 June 2017, question 4(b) [DOC ID 1951].

714 Qualcomm's royalty rates under the NDRC commitments are 5% for 3G devices and 3.5% for 4G devices that do not implement CDMA or WCDMA using a royalty base of 65% of the NSP of the device.

manufacturers therefore pay royalties to Qualcomm which Apple then reimburses to them.

(847) […].

(848) […] Apple subsequently initiated litigation against Qualcomm in the UK, US and China, claiming that Qualcomm's IP licensing is anticompetitive and contravenes its FRAND obligations. At the same time, four contract manufacturers for Apple have ceased paying royalties and are being sued by Qualcomm.

4. Renegotiations of licensing terms

(849) Qualcomm has agreed from time to time […]

(850) […][715].[…][716].

7.5.3. The Notifying Party's view

(851) The Notifying Party considers that the inclusion of NXP's NFC IP in its portfolio would not result in increased royalties or would avoid a decrease that would otherwise have occurred.

(852) First, the Notifying Party claims that NXP's NFC patents are immaterial in the context of the Notifying Party's pre-existing portfolio. Therefore, the Notifying Party considers that the notion that adding those patents to its portfolio would impact licensing terms "*in a way that other IP added over the years would not*"[717].

(853) Second, the Notifying Party explains that on-going licensees would not be impacted because NXP's NFC patents would be added at no additional cost to them.

(854) Third, the Notifying Party asserts that, after the Transaction, future licensees and existing licensees negotiating new licenses would be free to negotiate a license carving out any NFC IP. Regardless, the Notifying Party considers that integrating NXP's NFC patents into its portfolio will be efficient as portfolio-based licensing minimises transaction costs, whereas licensing discrete patents separately "*is simply not practical or indeed feasible*"[718]. Accordingly, the Notifying Party argues that the Transaction would raise no merger-specific concern as to Qualcomm's ability to circumvent FRAND terms for licensing SEPs because it already licenses "*its very extensive range of SEPs and non-SEPs*"[719] as a single portfolio.

(855) Fourth, according to the Notifying Party, it is unclear how the combination of the Parties' respective IP in a single portfolio would improve the merged entity's bargaining position. The Notifying Party argues that to the extent the value of NFC patents will increase in the future, this would also have improved NXP's bargaining position absent the Transaction. Thus that factor alone would not support a finding that the Notifying Party's bargaining position would disproportionately increase as a result of the Transaction.

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715 Qualcomm internal document, internal PowerPoint presentation entitled "[…]", undated but containing data analysis up until the end of the year 2016 [DOC ID 2360-80747].

716 Notifying Party's Response to RFI 43 of 18 August 2017, questions 2 and 4 [DOC ID 2481]; RFI 45 of 1 September 2017, question 4 [DOC ID 2722].

717 Notifying Party's Response of 28 June 2017 to the Article 6(1)(c) decision, paragraph 178 [Doc ID 1331].

718 Id., paragraph 181.

719 Id., paragraph 188.

7.5.4. Results of the phase I and phase II market investigations

(856) Respondents to the phase I and phase II market investigations consider that the merged entity would have the ability and incentive to change the Parties' licensing practices in several ways that they claim would lead to anti-competitive effects.

(857) First, market participants consider that the merged entity will extend to NFC chips and IP Qualcomm's policy of requiring its BC customers to obtain a license to the relevant IP before being allowed to purchase a BC from Qualcomm. That concern will be addressed in Section 7.6 below.

(858) Second, market participants consider that the merged entity would have the ability and incentive to bundle NXP's NFC IP with Qualcomm's cellular (and non-cellular) SEPs and non-SEPs. Respondents consider that Qualcomm's incentives to bundle the acquired IP to other rights within its portfolio are integral to its current business model. They are concerned that, by bundling the acquired NFC patents into Qualcomm's portfolio, the merged entity would set royalty rates for its patent portfolio higher than what the Parties would have been able to obtain in the absence of the Transaction, to the detriment of customers.

7.5.5. The Commission's assessment

(859) In the following Sections, the Commission will analyse whether the Transaction would be likely to result in endowing the merged entity with disproportionate bargaining power and thus to a risk that significantly higher royalties for the same patents could be negotiated as a result of the Transaction.

(860) The Commission will analyse whether aggregating NXP's and Qualcomm's patents in one NFC portfolio would disproportionately increase the merged entity's bargaining strength in licence negotiations in section 7.5.5.1. The Notifying Party's counterarguments are assessed in section 7.5.5.2 before the Commission concludes on conglomerate effects in relation to the merged entity's NFC patents in section 7.5.6.

7.5.5.1. Impact of the Transaction on the merged entity's bargaining power and resulting royalties

(861) The integration of NXP's NFC IP into Qualcomm's portfolio would enable the merged entity to combine both Parties' NFC patents into a single, stronger NFC portfolio. This would disproportionally improve the merged entity's bargaining power in a manner that would surpass the mere addition of the Parties' respective pre-merger bargaining power.

(862) In particular, through the combination of the Parties' IP rights, the merged entity would achieve a leading NFC patent position and would obtain a "critical mass" of patents (A). This would disproportionately strengthen Qualcomm's existing bargaining position, including litigation capability, which would allow the merged entity to charge significantly higher royalties (B). Finally, the Commission notes that the disproportionate increase in the merged entity's bargaining position would be likely to affect licensees irrespective of whether the merged entity's NFC patent portfolio is licensed separately or whether the acquired NFC patents are included in Qualcomm's broader patent portfolio licenses (C).

A) The merged entity's IP position

(863) The integration of NXP's NFC IP into Qualcomm's portfolio would enable the merged entity to combine both Parties' NFC patents into a single portfolio.

(864) The proportion of all NFC patents which the merged entity would hold as a result of the Transaction provides a first indication of the strength of its NFC patent portfolio. NXP's marketing documents rely on NXP's patent position (expressed as the percentage of total existing NFC patents) to convey its importance to prospective licensees[720]. This statistic is therefore relevant for prospective NFC licensees. The Notifying Party has been unable to provide an estimate of the total number of NFC patents on a worldwide basis. However, the Parties' internal documents credit NXP with approximately [20-30]% of all NFC patents[721]. On that basis, the total number of NFC patents on a worldwide basis can be estimated at approximately […]. Qualcomm thus holds approximately [10-20]% of all NFC patents and the merged entity would hold about a third of all NFC patents.

(865) Other significant NFC patent holders include Sony ([20-30]%), Nokia ([10-20]%), Microsoft [10-20]%) and Samsung ([10-20]%)[722]. The merged entity would therefore gain a leader position in terms of NFC portfolio size, with a patent portfolio three times as important as all other significant NFC patent holders, except Sony.

(866) Holding the largest number of NFC patents on a worldwide basis would enable the merged entity to impose high royalties. […][723]. It follows that the credibility of an NFC licensor such as NXP in negotiating royalty rates relies partly on the volume of NFC patents that they hold[724].

(867) As a result, the sheer size and quality of the Parties' combined NFC patent portfolio after the Transaction would significantly contribute to increasing the likelihood that infringement is found in court and the scope of remedies being imposed. Moreover, overall royalty amounts awarded by courts generally increase with the value of the SEP portfolio held by a certain IP holder[725]. Therefore, all else remaining equal, the negotiating parties would also expect higher awarded damages in case of litigation. With respect to non-SEPs, the likelihood that an NFC product infringes any of the patents increases with the number of patents held by the merged entity. In addition, in light of the larger number of non-SEPs, "inventing around" the combined NFC portfolio will generally become increasingly difficult for competitors, as a wider range of aspects or developments of the relevant technologies are covered by the merged entity's portfolio. In this context, the Commission considers that any impact of the Transaction on the potential outcome of litigation in itself does not form part of potential effects. However, the merged entity's bargaining position would be disproportionately strengthened by the Transaction, as explained in section B) below.

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720 NXP internal documents "[…]" presentation to Apple dated 11 March 2013 [DOC ID 1621-8]; presentation "[…]" dated 10 October 2012 ([…]), p. 3 [DOC ID 1621-110].

721 NXP internal document, […] presentation dated August 2016, p. 5 [DOC ID 1290-1167]; Qualcomm internal document, […] dated 18 March 2016, p. 2 [DOC ID 1311-3].

722 See, for example, NXP internal documents "[…]" presentation to Apple dated 11 March 2013, p. 7 [DOC ID 1621-8].

723 Other factors relevant to this assessment related to the risk that customer resistance to licensing and litigation costs would […] (id., p. 17). These factors will be assessed below.

724 Similarly, in internal discussions regarding the sale of certain NFC patents to Apple in 2013, NXP referred to previous sales in order to assess the best value it could obtain from Apple. NXP's internal analysis thus referred to a comparable prior sale to France Brevets. NXP nonetheless factored into its estimates the fact that France Brevets […] (NXP internal document, email from […] of 14 October 2013 entitled […] [DOC ID 1621-76]).

725 See, for example, *Unwired Planet v. Huawei* [2017] EWHC 711 (Pat), at paragraphs 178 et seq., describing approaches used to calculate FRAND rates, including allocating a share out of the total aggregate royalty burden for a given standard across licensors in proportion to the value of each licensor's patent portfolio.

(868) Finally, not all patents are equal in terms of their respective contributions to a technology and relative difficulty to invent around. As a result, the importance of the patents' underlying inventions is a crucial factor in their valuation[726]. In that respect, NXP is deemed by Qualcomm to be the […] in NFC along with […][727]. NXP recognises that its IP position […]. Therefore, in view of the combination of both Parties' patent portfolios and NXP's particular contributions to NFC technology, the likelihood that an injunction would be awarded in the event of an infringement suit would increase significantly after the Transaction.

B) Impact on the merged entity's bargaining position and royalties or licensing fees

(869) Holding the largest existing NFC portfolio worldwide is likely to disproportionately increase the merged entity's bargaining position vis-à-vis prospective licensees. In particular, the Transaction will endow Qualcomm with a "critical mass" of NFC patents, which would disproportionately increase its existing bargaining position in licensing negotiations, allowing it to negotiate significantly higher royalties than absent of the Transaction. Specifically, given that both the chances of finding an infringement as well as the likelihood of an injunction being granted and the level of any awarded damages or FRAND rates will increase as set out in recital (867), the prospective value of initiating infringement proceedings would increase for the merged entity. This in turn would increase the credibility of threats to initiate litigation if NFC patents are deemed to be infringed during licensing negotiations and will allow the merged entity to disproportionately increase its bargaining position and to extract significantly higher royalties for the same NFC patents compared to a stand-alone scenario (see recital (822)).

(870) As it currently stands, before the Transaction, it is mainly Qualcomm which enjoys a strong licensing position. This position relies on several factors, including litigation means and a thriving licensing business. Qualcomm's business structure is designed in order to support its licensing business and litigation efforts. As explained in recital (4), Qualcomm's activities are mainly conducted by two business entities, one of which, QTL, is devoted to operating Qualcomm's IP licensing programme. QTL generates the majority of Qualcomm's revenue and is endowed with considerable resources. In 2016, QTL's earned USD 6.5 billion in 2016 and its litigation and other legal expenses reached USD 65 million[728]. The merged entity will therefore hold ample resources to finance litigation efforts if needed. The merged entity would equally be able to leverage the extensive litigation experience that Qualcomm has gained in the past when litigating the joint NFC portfolio.

(871) The merged entity's bargaining position in NFC patent negotiations would be impacted accordingly. The merged entity's stronger bargaining position would be compounded by Qualcomm's litigation capabilities, which would lend further support to the merged entity's credibility as a prospective litigator. The merged entity's ability to leverage Qualcomm's litigation capabilities would therefore contribute to enabling it to extract higher NFC royalties.

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726 NXP's cover email dated 28 July 2017 for NXP's Response to RFI 35 of 18 July 2017 (in order to ascertain the quality of patents, NXP explains that several factors are examined, including "*the prior art, the importance of the patent's underlying invention (transformative or incremental), whether the patent captures and protects the value of the invention* (...), *the likelihood of a patent surviving an infringement action* (...)") [DOC ID 2008].

727 Qualcomm internal document, […] dated 18 March 2016, p. 2 [DOC ID 1311-3].

728 Qualcomm Inc.'s Form 10K for the fiscal year ended 25 September 2016, p. 44 and consolidated balance sheets, p. F-29.

(872) Notwithstanding the size of the merged entity's NFC patent portfolio, NXP considers that "*as with any intellectual property, the value of the IP depends on the demand for products reading on the technology*"[729]. In this respect, the importance of NFC and SE technologies is expected to increase significantly in the next few years. The Parties and market participants' estimates converge in expecting very significant demand growth for NFC products and services. Market participants have indicated that NFC/SE's penetration in mobile devices is expected to increase in the next 2-3 years. France Brevets submitted data from third party studies forecasting a steady increase in NFC penetration rate in smartphone shipments, reaching approximately […][730]. NXP's internal documents confirm that the attach rate of NFC is expected to […] (all types of devices included) between 2015 and 2019[731]. NXP's internal documents also estimate that […]. Therefore, as the demand for products and services reading on NFC patents grows in the next few years, the merged entity's NFC patent advantage would therefore increase accordingly.

(873) The Notifying Party argued that "*such changes would be expected to affect the NXP IP portfolio on a standalone basis too, potentially also increasing NXP's standalone bargaining power over time*"[732]. However, whereas any increase in NFC royalties due to an increased attach rate of NFC in itself would not be merger-specific, the increased prevalence of NFC technology will translate into an increased value of NFC patents and is thus likely to compound any royalty increasing effect from combining the Parties' patent portfolios.

(874) In addition, plans for a similar transaction also suggest that the present Transaction would give rise to significant royalty increasing effects. […]. That […] is informative of each of the Parties' assessment of its own, standalone bargaining power in negotiating NFC licensing agreements with device OEMs and how to disproportionately strengthen the merged entity's bargaining position vis-à-vis licensees to receive significantly higher royalties.

(875) […][733]. […][734].

(876) […][735]. […] Those results would have represented an exponential increase of the Parties' respective standalone NFC licensing revenues had […], as set forth in recital (823).

(877) The Transaction would enable the Parties to achieve a similar royalty-increasing result. First, as explained above in recital (864) et seq., despite not adding Sony's own NFC patents, the merged entity's combined NFC portfolio would represent a third of all existing NFC patents and would be unmatched by any other NFC patent holder, thus reaching a "critical mass" of patents and improving its credibility as an NFC licensor.

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729 NXP Response to RFI 35 of 18 July 2017, paragraph 17 [DOC ID 2009].

730 France Brevets's Response to RFI 33 of 11 July 2017, data on *Smartphone Shipments and NFC penetration rate into smartphone* sourced from *Gartner – Devices – Forecasts 2017 Q1, HIS Near Field Communications report – May 2015* [DOC ID 1929].

731 Form CO, Annex 5.4bc.14, NXP internal document, "[…]", slide 23, dated 22 August 2016 [DOC ID 327-141].

732 Notifying Party's response of 28 June 2017 to the Article 6(1)(c) decision, paragraph 196, [Doc ID 1331].

733 NXP internal document, presentation entitled […], dated April 2016, p. 8 [DOC ID 1290-1214].

734 Id., p. 31.

735 Qualcomm internal document, presentation entitled […], dated 18 May 2016, p. 8 [DOC ID 1311-3].

(878) Second, the merged entity would be able to increase royalties for its combined NFC portfolio by leveraging Qualcomm's considerable litigation capacity (see recital (870)), […].

(879) Third, Qualcomm's licensing business structure is designed to separate licensing activities from the sale of components. As explained in recital (2) above, Qualcomm operates primarily through two business units, one of which, QTL, is devoted to technology licensing. This allows Qualcomm to conduct negotiations for product supplies and patent licenses independently, thus protecting its bargaining position when discussing patent license agreements[736]. After the Transaction, the merged entity would fit in this structure.

(880) It follows that, by enabling the merged entity to aggregate the leading NFC patent position worldwide, the Transaction would disproportionately increase the merged entity`s bargaining position in a manner would be likely to result in significantly higher royalties for NFC patents than absent the Transaction..

C) Impact on royalties in the context of Qualcomm's broad portfolio licenses

(881) The Commission considers that the royalty increasing effect concerning NFC patents would spill over to broad portfolio licenses post-merger for a number of reasons.

(882) As set out in recitals (835) *et seq.*, Qualcomm offers portfolio based licensing and not patent-by-patent licensing. Those patents concern several different technologies, such as cellular, processing, multimedia, or Wi-Fi. After the Transaction, NXP's NFC patents would be added to this portfolio […]. […]. In any event, the Notifying Party confirmed that it intends to add the acquired NFC IP to its patent portfolio license and indicated that it is "*not aware of there being any "legal or contractual provision or rule" that would prevent or hinder* [Qualcomm's ability to include the NFC SEPs acquired from NXP in its licensing portfolio]"[737]. No such impediment has been otherwise identified in the course of the investigation.

(883) The Notifying Parts submits […]. Rather, according to the Notifying Party's approach, all patents held by the Notifying Party contribute to the value of its portfolio. Accordingly, the Notifying Party […][738].

(884) However, […], the merged entity's increased NFC IP position would translate into an (disproportionally) increased royalty rate for any broader patent portfolio which includes NFC.

(885) This is because the value of the patent portfolio is determined by the strength and quantity of all patents included in a given portfolio. In particular, mobile devices with NFC functionality will be likely to infringe the merged entity's NFC patent portfolio. Therefore, mobile OEMs facing a decision whether to take a broad license to Qualcomm's IP that includes NFC patents or opt for carving out NFC patents will anticipate that the latter may result in NFC patent infringement litigation and, ultimately, in risking that its infringing products can no longer be sold even if a license to the merged entity's remaining IP has been taken. OEMs producing devices with NFC functionality will thus have an interest in including the NFC portfolio into

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736 As submitted by the Notifying Party, QTL's IP licensing agreements and are unrelated to the sale of components by Qualcomm to licensees (see, for example, Notifying Party's Response to RFI 23 of 28 June 2017, paragraph 18) [DOC ID 1951].

737 Notifying Party's Response to RFI of 28 April 2017, paragraph 21 [DOC ID 691].

738 Notifying Party's Response to RFI 42 of 17 August 2017, paragraphs 17 and 10 [DOC ID 2374].

any patent license and will be willing to pay a higher royalty for such a license. For the reasons already set out above in part A) of Section 7.5.5.1, to the extent that the Transaction would increase the likelihood that remedies will be imposed as a consequence of patent litigation upon infringement of the merged entity's NFC patents, this would also result in higher royalties for the entire patent portfolio than absent the Transaction.

(886) This is supported by the fact that, currently, […][739]. […][740]. […][741]. It follows that, after the Transaction, the merged entity will similarly be able to rely on the combined NFC patents to support royalty demands for Qualcomm's entire portfolio. That strategy is all the more likely, in the present case, that the relevance and attach rate of NFC technology is expected to increase in the near future.

(887) Therefore, the Commission is of the view that the disproportionate increase in the merged entity's bargaining position would trigger harm to licensees irrespective of whether the merged entity's NFC patent portfolio is licensed separately or whether its NFC patents are included in broader patent licenses.

7.5.5.2. The counterarguments put forward by the Notifying Party do not alter the Commission's findings

A) The merged entity would be able to charge higher royalties in the long run despite Qualcomm's pre-existing portfolio licenses

(888) As explained above in recitals (881) et seq., the Commission considers that even in the event that the acquired NFC patents were added to Qualcomm's existing portfolio license, the merged entity would be able to charge higher (implied) royalties for its NFC patents in the long run.

(889) In this context, the Notifying Party explained that, […] .

(890) With respect to new license agreements entered into post-merger, the Notifying Party explained that it intends to include NXP's NFC patents (SEPs and non-SEPs) as part of its offer to license the entire Notifying Party's patent portfolio[742].

(891) However, the Commission notes that portfolio licenses are periodically re-negotiated, either upon expiry of a given license agreement or when settling a dispute on the royalty terms of an ongoing license or at the request of licensees. For example, […][743][…]. Therefore, regardless of termination dates provided for in currently applicable Qualcomm portfolio licenses[744], current licensing terms are not stable or immune to renegotiations initiated by licensees from time to time.

(892) It follows that the Notifying Party's claim that patent additions to its portfolio induce no additional cost to current licensees omits the fact that licensees renegotiate their patent license agreements in order to obtain better terms from time to time. In case of

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739 Notifying Party's Response to RFI 43 of 18 August 2017, question 4, Annex 4.6, Qualcomm Patent Position presentation dated 6 August 2014, p. 24 et seq. [DOC IDs 2481 and 2482-11].

740 Id., p. 49.

741 Notifying Party's Response to RFI 43 of 18 August 2017, question 2, Annex 2.1, 3GPP Patent […] dated 30 April 2008, p. 24 [DOC IDs 2481 and 2482-3].

742 Notifying Party's Response to RFI of 28 April 2017, paragraphs 21-23 [DOC ID 691].

743 Although, as explained above in recital (846), Apple is not a direct Qualcomm licensee, Apple entered into various agreements that influences the net royalties payable in respect of Apple devices (see Notifying Party's Response to RFI 36 of 26 July 2017, paragraph 22 [DOC ID 2367]).

744 On the basis of data concerning Qualcomm's top ten BC customers, […] and as of the date of termination by the parties or the date that the last of the licensed patent expires.

re-negotiation, the merged entity's ability to rely on the acquired NFC patents to justify its royalty demands would therefore increase the merged entity's bargaining power in this context, ultimately likely resulting in higher royalty rates than what it would have been able to obtain absent the Transaction.

(893) It follows that even current licensees would be impacted by the inclusion of NXP's NFC patents which Qualcomm would leverage by asserting them in the context of portfolio negotiations after the Transaction.

(894) Moreover, several market players are not licensed under Qualcomm's full portfolio. First, […], a number of OEMs are not yet licensed to Qualcomm's (entire) patent portfolio and may seek to conclude new (or broader) license agreements in the future.

(895) Second, under the NFC Forum IPR policy, the merged entity will required to license its NFC SEPs to any willing licensees implementing the NFC standard (under the terms and conditions set by the NFC Forum)[745] on (F)RAND terms. As the Notifying Party confirmed, this obligation extends to all implementers, including rival chip suppliers[746]. These include NFC chipset suppliers who will not be automatically licensed to the merged entity's entire NFC portfolio after the Transaction.

B) The increase in royalties for NFC patents is likely to be significant

(896) The Notifying Party claims that NXP's NFC patents are immaterial in the context of the Notifying Party's pre-existing portfolio. Therefore, the Notifying Party considers that one cannot credibly suggest that the addition of those patents would have a material impact on licensing terms for Qualcomm's portfolio "*in a way that other IP added over the years would not*"[747].

(897) However, the Commission considers that the predicted increase in the royalty rate for NFC patents must not be assessed in relation to the rate that Qualcomm charges for cellular patents, despite the existence of several broad portfolio licenses that cover the entire (or a substantial part of) Qualcomm's patent portfolio. Likewise, contrary to the Notifying Party's argument, the issue is not whether the value of NXP's NFC patents is comparable to its cellular patents or superior to the value of patents added to its portfolio in prior acquisitions.

(898) Instead, the Decision focuses on the extent to which the total royalties for the Parties' NFC patents would increase when compared to the sum of royalties which the Parties could have charged absent the Transaction, for two main reasons.

(899) First, from a legal perspective, the Commission needs to determine whether the Transaction would significantly impede effective competition in one or more relevant markets. As set out in recital (236), in line with its decisional practice, the Commission considers that each SEP should be considered as a separate market. Although the precise market definition is left open, the Commission is of the view that non-SEPs related to NFC technology may be viewed as a distinct product market from non-SEPs related to other technologies. Even if due to portfolio licensing practices the royalty level of each individual NFC SEP or non-standard essential patent cannot be directly observed, the anti-competitive effects on any of those

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745 Under the NFC Forum IPR Policy, licenses must be granted "*to all Implementers solely for the purpose of implementing such approved Specification or a part thereof and subject to Reciprocity*" (http://nfc-forum.org/wp-content/uploads/2013/11/NFC-Forum-IPR-Policy.pdf).

746 Notifying Party's Response to RFI of 28 April 2017, paragraph 10 [DOC ID 691].

747 Notifying Party's response of 28 June 2017 to Article 6(1)(c) decision, paragraph 178, [Doc ID: 1331].

(potential) markets, and hence the implicit royalty increase is relevant for assessing whether the Transaction would significantly impede effective competition.

(900) Second, from an economic perspective, the focus of the present assessment is whether the merged entity's bargaining power and, ultimately, its (implicit) royalty for NFC patents would significantly increase as a result of the Transaction. However, especially when combined with valuable cellular patents in Qualcomm's full portfolio licenses, only a fraction of the total portfolio royalty rate will account for NFC patents. This does not mean that the royalty increasing effect of the Transaction *on NFC patents* would be insignificant. On the contrary, even a small increase in the royalty rate for Qualcomm's full portfolio could reflect a very significant inflation of the implicit NFC royalty rate[748]. Moreover, as explained in part C) below, even a significant increase of the implicit NFC royalty rate may not be directly visible in the royalty charged by Qualcomm for its entire portfolio, as other patents included therein might expire or depreciate at the same time.

(901) In this context, the Commission notes that the materiality of the addition of NXP's NFC patents to Qualcomm's portfolio does not turn on their relative number compared to that of the multitude of other patents held by the Notifying Party. For the purposes of this Decision, a more relevant factor for assessing the acquisition's materiality is that the merged entity would become the largest holder of NFC patents, with about a third of all patents on a worldwide basis as a result of the Transaction. In addition, as noted above in recital (871), that patent position relates to a technology of increasing prevalence, which will translate into an increased value of NFC IP and may thus compound the royalty increasing effect induced by combining the Parties' patent portfolios. Therefore, in light of the prospective importance of NFC technology and the significant share of NFC patents which the merged entity would combine, the allegedly low number of NFC patents acquired from NXP relative to the size of Qualcomm's pre-existing portfolio does not negate their materiality to Qualcomm's bargaining power in the context of this Decision.

C) The alleged historic nominally stable royalty rate does not alter the Commission's findings

(902) The Notifying Party explains that "[t]*hroughout its entire history* [that is to say, for almost 30 years since 1990], *Qualcomm has maintained stable licensing terms overall and has not raised royalties even when many thousands of new mobile communication patents have been added to its portfolio* (…)"[749]. The Notifying Party further explains that "*when a portfolio of licensed patents increases in size and royalty terms remain stable, the hypothetical "per patent" royalty necessarily falls*"[750].

(903) Qualcomm often acquires patents from third parties. In the past five years, Qualcomm acquired […] patent families, including SEPs and non-SEPs, by way of portfolio, patent or company acquisitions. As explained in recital (829), the size of Qualcomm's portfolio has grown exponentially since the early 1990s. As of July 2017, its portfolio includes […] patents. Those patents concern many different technologies and standards, cellular technology patents representing both the largest

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748 The "implicit" royalty rate being the share of the total portfolio license royalty attributable to NFC patents.

749 Notifying Party's 3 May 2017 White paper on NFC and Licensing, p. 2 [DOC ID 881].

750 Notifying Party's Response to RFI 36 of 26 July 2017, paragraph 51 [DOC ID 2367].

portion of Qualcomm's portfolio […] of all Qualcomm's patents and the main value driver according to QTL's Executive Vice President[751].

(904) […][752]. […].

(905) This explanation, however, does not suggest that Qualcomm voluntarily foregoes royalties that it could have charged otherwise. Rather, the Commission considers that without patent acquisitions, Qualcomm's standard royalty rate for its patent portfolio license would have decreased over time, mainly for two reasons.

(906) First, the value of certain Qualcomm cellular patents decreases over time. The position of other cellular patent holders improves over time which implies that Qualcomm's patent share of relevant technologies diminishes. In this context, Qualcomm's SEP position in more recent 4G-related standards appears lower than its position in CDMA SEPs. According to NXP's internal assessment, […][753].

(907) This assessment is supported by other sources. According to a study on the strength of different companies' LTE SEP portfolios, as of 30 September 2011, although Qualcomm made the most declarations of LTE SEPs to ETSI, it held […] of high novelty LTE patents, behind Nokia and on par with Samsung[754]. Similarly, a 2013 study on the evaluation of LTE essential patents credited Qualcomm with […] of all LTE SEPs declared to ETSI, […][755].

(908) The Notifying Party confirmed that, since its early patent licensing agreements, "*the value of Qualcomm's licensed patents portfolio has shifted away from the originally licensed patented CDMA technology* [which "*long since have expired*"] *to other patented technologies*". According to Qualcomm, however, "*it is not possible to identify individual patents that have "contributed to protecting the value of Qualcomm's portfolio* [over] *time". (...) Qualcomm also recalls that as of May 2017, Qualcomm holds […] granted and pending individual patents that Qualcomm believed to be essential to one or more wireless standards, and that Qualcomm's patents cover a range of technologies and standards, including 2G/3G/4G, Wi-Fi, Bluetooth, H.264/265 and JEDEC. These patents* (...), *as well as tens of thousands of other patents and patent applications held by Qualcomm, contribute to the value of Qualcomm's portfolio*"[756].

(909) Second, Qualcomm's own patents expire over time or are sold. Therefore, in order to maintain the value of its overall portfolio as valuable patents depreciate or expire, Qualcomm must add other valuable patents. Indeed, as the Notifying Party explained, its patent portfolio "*changes every day with newly developed or acquired patents or patents that have expired or were sold*"[757].

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751 Minutes of 12 May 2017 meeting with […], p. 6 [DOC ID 01062].

752 In 2008, Qualcomm and Nokia entered into an agreement to settle litigation, involving, *inter alia*, the assignment by Nokia of the ownership of several patents to Qualcomm, including WCDMA, GSM and OFDMA SEPs. See https://www.qualcomm.com/news/releases/2008/07/23/nokia-and-qualcomm-enter-new-agreement.

753 NXP internal document, NXP Strategy's Office […] dated December 2015, p. 7 and 8 [DOC ID 1456-2839].

754 Article One Partners study on LTE Standard Essential Patents Now and in the Future, p. 5 [DOC ID 2286].

755 Cyber Creative Institute Co. Ltd. June 2013 study on the Evaluation of LTE essential patents declared to ETSI, p. 9 [DOC ID 2287].

756 Notifying Party's Response to RFI 42 of 17 August 2017, paragraph 26 [DOC ID 2374].

757 Minutes of 12 May 2017 meeting with […], p. 4 [DOC ID 1062].

(910) It follows that the inclusion of new patents into Qualcomm's portfolio, including patents unrelated to cellular standards[758], has enabled Qualcomm to maintain the standard rate charged for its entire portfolio despite the depreciation or expiry of other valuable patents. Prior Qualcomm acquisitions thus contributed to this strategy. Qualcomm's ability to maintain stable portfolio royalty terms since the early 1990s demonstrates that the continued addition of patents to its portfolio is instrumental to preserve the level of its royalty.

(911) For instance, in 2013, Qualcomm assessed the merits and risks inherent in splitting Qualcomm into two separate entities, one endowed with its product business and the other in charge of IP licensing, instead of allocating these activities internally to two subsidiaries (respectively QCT and QTL). Qualcomm however estimated that QTL's reduced ability to benefit from QCT's patent contributions would create a risk to the value of its patent portfolio, because the Notifying Party's royalty rates are justified by its patent portfolio's constant growth and diversification.

(912) QTL's constant standard royalty rate thus relies on licensing a patent portfolio that is both growing and diversifying. This strategy is supported internally as well as externally, by way of patent acquisitions or mergers. The present Transaction will thus fit into that strategy by adding NXP's patents into its portfolio, contributing significantly to its growth and diversification, as prior Qualcomm acquisitions did in the past.

(913) For the same reasons, were Qualcomm unable to add a substantial number of (high quality) patents to its portfolio[759], its standard rate would likely diminish in the future. In this respect, in a prospective analysis, […] of Qualcomm's granted cellular SEPs currently included in its portfolio will expire in the next […] (at the end of […])[760]. Although the Notifying Party provided data that does not distinguish different cellular standards, the bulk of Qualcomm's oldest patents are likely CDMA patents given that technology's earlier development. It therefore follows that, under the current composition of Qualcomm's portfolio, Qualcomm's CDMA SEPs portfolio is aging and will significantly decrease in the next five years.

(914) Therefore, the Commission considers that a suitable basis for assessing this Transaction is that Qualcomm's standard royalty rate for its patent portfolio is likely to decrease unless new patents are constantly added or unless the merged entity's bargaining position increases as a consequence of combining the Parties' NFC portfolios. Hence, even in the event that the standard royalty rate would remain unchanged post-merger, this does not contradict anti-competitive effects, as in the absence of the Transaction Qualcomm may have been forced to reduce its standard rate.

(915) Moreover, the Commission recalls that Qualcomm's effective royalty rate (that is, the rate actually paid by the licensees; see recital (843)) differs on average from Qualcomm's standard rate. As set out in recital (849), Qualcomm has agreed from time to time to limit or reduce patent licensing-related payments. Those agreements take various forms, including royalty caps, settlements with licensees following disagreements on royalty amounts owed to Qualcomm and contract renegotiations. Indeed, Qualcomm's effective royalty rate has decreased between 2007 and 2016, in particular when license renegotiations took place, as explained in recital (850). The

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758 […] of patents included in Qualcomm's portfolio are not cellular patents.

759 Notwithstanding Qualcomm current contribution to wireless standardisation.

760 Notifying Party's Response to RFI 23 of 28 June 2017, Annex 3 [DOC ID 1650].

effective royalty rate is the outcome of negotiations and determined by the bargaining position of the negotiating parties.

(916) Accordingly, even if Qualcomm's nominal standard rate were to remain stable, the Transaction would (disproportionately) improve the merged entity's bargaining position and hence result in a higher effective royalty rate than that which Qualcomm would have been able to obtain absent the Transaction.

(917) The Commission therefore considers that even if Qualcomm's nominal royalty remained stable despite significant additions to the portfolio, this does not suggest that in the long run, the royalties for the merged entity's NFC patents would not increase compared to a stand-alone scenario.

7.5.6. Conclusion on IP licensing of NFC technology

(918) The Commission therefore takes the view that the Transaction would combine a critical mass of patents in the hands of the merged entity, which would be in a position to disproportionately increase its existing bargaining position vis-à-vis licensees. The merged entity would likely leverage the combined NFC IP portfolio in order to impose significantly increased royalty rates for the merged entity's NFC patents compared to total royalties which the Parties could have extracted for the relevant patents absent the Transaction and give rise to a significant impediment of effective competition in the relevant technology markets.

7.6. Conglomerate effects in relation to Qualcomm's baseband chipsets, NXP's NFC and SE chips as well as licensing of the merged entity's IP

7.6.1. Introduction

(919) In the following sections, the Commission would analyse whether the Transaction gives rise to conglomerate anti-competitive effects as a result of the possible extension of Qualcomm's policy whereby in particular Qualcomm BCs are sold exclusively to customers that have taken a license to its (cellular) IP portfolio[761]. In the following analysis, the Commission will refer to such conduct as "No license - no chips strategy" ("NLNC strategy"). Such reference should not be interpreted as the Commission taking any view as to whether such conduct is either aimed at limiting the infringement of Qualcomm's IP (as claimed by Qualcomm) nor at excluding (potential) rivals in the respective chip markets (as claimed by some third parties). The US FTC, the Korea Fair Trade Commission ("KFTC") and the Chinese National Development and Reform Commission ("NDRC") have opened proceedings or issued decisions on Qualcomm's NLNC strategy[762]. Apple also raised concerns on Qualcomm's NLNC strategy in private litigation against Qualcomm[763].

(920) According to certain mobile OEMs, as a result of the Transaction, the merged entity could extend the NLNC strategy by conditioning the sale of any of NXP's NFC or SE products on the customer having taken a license to any Qualcomm IP and/or

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761 According to its standard component supply agreement, Qualcomm has the right to terminate the agreement in case the purchaser is in default with Qualcomm's Subscriber Unit License Agreement ("SULA"). The SULA typically includes SEPs and non-SEPs.

762 FTC Complaint, FTC v Qualcomm Incorporated, Case 5:17-cv-00220; Decision of the KFTC of January 20, 2017, p. 32, available at http://www.theamericanconsumer.org/wp-content/uploads/2017/03/2017-01-20_KFTC-Decision_2017-0-25.pdf; NDRC Administrative Sanction Decision No. 1 [2015] (Mar. 2, 2015), available at http://www.ndrc.gov.cn/gzdt/201503/t20150302_666209.html.

763 Apple Inc. v. Qualcomm Incorporated, Case 3:17-cv-00108-GPC-MDD.

conditioning the sale of any of NXP's NFC or SE products on the customer having taken a license to any NXP NFC IP. Moreover, in principle the merged entity could make the sale of any of Qualcomm's products conditional upon the customer having taken a license to any NFC IP of NXP (including SEPs and non-SEPs).

7.6.2. Notifying Party's views

(921) The Notifying Party submits that its NLNC practice is simple and unique to cellular SEPs[764]. The Notifying Party sells its cellular BCs only to OEMs that have a license to its cellular SEPs, and not to known infringers of its core cellular IP who have no such license. The Notifying Party follows that practice to avoid facilitating the infringement of its own core cellular IP and to avoid the risk that sales of BCs to unlicensed OEMs would exhaust some portion of its valuable cellular patent portfolio and deprive the Notifying Party of compensation for the use of that IP.

(922) According to the Notifying Party, this practice would not affect NFC chip sales because: (i) the Notifying Party's core cellular IP is entirely unrelated to NFC technologies as implemented in NXP's NFC solutions; and (ii) the sale of NFC chips does not risk exhausting the Notifying Party's core cellular IP, that is to say, any exhaustion claim would be limited to patents related to NFC chips. As a result, the Notifying Party does not have the same concerns or incentives with respect to the sale of NFC chips as it has with respect to the sale of BCs. During the Commission's investigation, the Notifying Party submitted and confirmed on several occasions that, post-Transaction, the merged entity would continue to sell its NFC chips exhaustively, including to customers that do not have a license to any of its IP[765].

(923) The merged entity would have neither the ability nor the incentive to condition the sale of NXP's NFC chips to OEMs on anything, let alone on their taking a license to NXP's NFC patents on supra-(F)RAND terms for several reasons[766]:

(1) NXP does not have market power in NFC chips;

(2) NFC chips simply are not a "must-have" component for mobile device OEMs;

(3) NXP has committed to license its patents that are essential to the NFC standards to any willing licensee on (F)RAND terms, including competing chip makers and mobile phone OEMs, and the merged entity will continue to abide by such (F)RAND commitments following the Transaction[767];

(4) Qualcomm is not active in the licensing of NFC or SE technology, and the Transaction would not change the competitive dynamics or the merged entity's incentives *vis-à-vis* potential willing licensees;

(5) In past acquisitions, Qualcomm did not change the acquired entities' licensing practices for its SEPs post-transaction, and continued to sell non-cellular chips to non-licensees;

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764 Qualcomm NXP White Paper of 3 May 2017 [DOC ID 881].

765 Response by the Notifying Party to RFI 51, Qualcomm preliminary observations [DOC ID 3235].

766 Response by the Notifying Party to RFI 51 [DOC ID 3235], Qualcomm White Paper on NFC and Licensing of 3 May 2017 [DOC ID 881].

767 NXP response to RFI 9, question 5, where NXP submitted in relation to the term "Implementers" under the NFC Forum IPR licensing policy, that in "*the Parties' view, this term refers to any third party that wants to use or implement NFC SEPs, including chip suppliers and mobile device OEMs*" [DOC ID 691].

(6) The addition of NXP's NFC SEPs (or any other IP acquired in the context of the transaction) would not lead to an increase in the royalties for Qualcomm's patent portfolio;

(7) This potential theory of harm is not merger-specific. If the merged entity could use NFC chip supply to obtain non-(F)RAND royalties for NXP's NFC IP, so could NXP;

(8) Most major mobile device suppliers already have a license to Qualcomm's full patent portfolio. Post-transaction, those device suppliers will become licensed under any acquired NFC SEPs;

(9) NFC SEPs would be within the scope of the IPR licensed by Qualcomm to anyone taking a full portfolio license;

(10) Any mobile device supplier who (i) does not use an NFC chip in the devices it sells; or (ii) purchases such NFC chips from a supplier licensed under NXP's patents such as STMicroelectronics would not need a license to NXP's NFC SEPs and would thus be immune to such a strategy;

(11) The addition of NXP's […] patents to Qualcomm's portfolio of over […] granted and pending patents that Qualcomm believes to be essential to one or more wireless standards will have no effect on Qualcomm's licensing revenues;

(12) Qualcomm does not have an NFC-specific outbound patent licensing programme, even though it holds NFC patents;

(13) In relation to the fact that Apple that has not entered into a direct license with Qualcomm, there is no reason to think that Qualcomm would require Apple to enter into a direct license with Qualcomm for Qualcomm's (cellular) IP as a condition for Qualcomm to supply NFC chips for use in Apple devices when […].

(924) The Notifying Party furthermore submits a number of reasons why, in its view, it would not be able use alleged market power in BCs to extract supra-(F)RAND royalties for NXP's NFC SEPs. In particular, if the Notifying Party were dominant in BCs it could also simply increase the price of its BCs rather than attempting to leverage that alleged dominance to increase the royalties of its licenses – in respect of which it is constrained by (F)RAND commitments[768].

(925) The Notifying Party also argues that the assessment of a party's "ability and incentive" relates to more than the simple ability and incentive to engage in certain types of conduct. Instead, the Commission's Non-Horizontal Merger Guidelines (for example, recital 93) require an assessment of the ability and incentive to foreclose competitors[769].

(926) Further, the practice of not facilitating the infringement of its own core cellular IP by selling BCs to unlicensed OEMs, referred to pejoratively by certain parties as a "no license-no chips" policy, is procompetitive, efficient and in full compliance with the relevant FRAND commitment as well as Union competition law.

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768 Qualcomm White Paper on NFC and Licensing of 3 May 2017 [DOC ID 881].

769 Response by the Notifying Party to RFI 51 [DOC ID 3235], Qualcomm preliminary observations and submission by RBB Economics titled "An economic assessment of IP licensing concerns," 13 July 2017 [Doc ID 1746], Section 3.

7.6.3. Third parties' views

(927) […].

(928) […][770]. […].

(929) […].

(930) […].

(931) One other mobile OEM submitted that Qualcomm can be expected post-merger to leverage NXP's existing NFC chipset supply monopoly to force downstream product makers into highly anticompetitive NFC SEP licenses as a condition precedent to obtaining NFC chip supply from Qualcomm.

(932) Another mobile OEM submitted in relation to NLNC that the merged entity would refuse to sell chips to mobile device makers who have not signed a separate patent license with the merged entity including NXP's patents; and will incorporate non-FRAND terms in these licenses including high royalties and exclusionary terms such as royalty-free cross-license provisions.

(933) Specifically, this mobile OEM claims that the merged entity would have the ability to extend Qualcomm's NLNC strategy to the NXP patents and chips, or otherwise impose exploitative and exclusionary terms and conditions on licensees of NXP patents, in order to favour the sale of the range of chips sold by the merged entity. In terms of incentives, this OEM argues that the merged entity will have the incentive to extend its NLNC strategy as Qualcomm's business model of segregating the licensing from the sale of its chipsets, and exploiting these activities to reinforce its dominant position in both the upstream patent and downstream chipset markets, is deeply entrenched. This OEM goes on to contend that extending this NLNC strategy would have anti-competitive effects, including that competing chip producers will be foreclosed and that and that mobile OEMs would be coerced into accepting onerous licensing terms.

7.6.4. Commission's assessment

7.6.4.1. Preliminary remarks

(934) The Commission considers that it is not necessary to conclude as to whether the merged entity would have any ability or incentive to include NXP's NFC IP (including the NFC SEPs) into any NLNC strategy. This is because the Final Commitments (see Sections 8.3 and 8.4 for a description) that were submitted by the Notifying Party to address the Commission's competition concerns set out in Section 7.5 provide that NXP's NFC SEPs and certain other NFC patents will be carved out from the Transaction and hence not be acquired by the Notifying Party and the merged entity will not-assert or grant a royalty-free licence upon request to the NXP NFC patents that are acquired for as long as it holds such patents. Moreover, a three year standalone worldwide royalty-free license to the carved-out NXP NFC IP will be granted to third parties upon request. Hence, in light of those commitments, the merged entity would not have the ability to coerce third parties into licenses to NXP's NFC IP on onerous terms. Similarly, access to MIFARE will be granted at least at the current terms. For this reason, the Commission considers that NXP's NFC IP (or any IP related to MIFARE) will not be included in any NLNC strategy.

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[770] Economic model of […] of 1 November 2017 [Doc ID 3172].

(935) Moreover, as noted, the Notifying Party has repeatedly submitted to the Commission during the review of the Transaction that, post-merger, it would continue to: (1) sell NFC's chips exhaustively, that is without requiring mobile OEMs to take a separate licence to the NFC IPs; and (2) abide by the (F)RAND commitments attached to the NFC SEPs (including those that Qualcomm owned pre-merger), which Qualcomm itself interprets as requiring the IP holder to license such IPs to all willing licensees, including chipmakers, next to mobile OEMs[771].

(936) Therefore, in light of the relevant combinations as to how to extend the NLNC strategy set out in recital (920), it remains to assess whether the merged entity would have the ability and the incentive to condition the sale of NXP's NFC/SE chips on mobile OEMs having taken a license to any Qualcomm IP.

(937) In this regard, the Commission considers that, while Qualcomm would have the ability to condition the sale of NXP's NFC/SE chips on mobile OEMs having taken a license to any Qualcomm IP, it would likely not have the incentive to engage in such conduct and, even if it did, the likely effects of such conduct on competition are both very difficult to predict, given the complexity of the chain of events on which they are predicated and, in any event, likely to be limited to the markets concerned.

(938) As a result, for the purposes of this Decision, the Commission does not need to take a view as to whether the claims put forward by some third parties on Qualcomm's pre-merger NLNC strategy are founded, whether factually or in terms of possible anti-competitive effects[772].

7.6.4.2. Ability to extend the NLNC strategy to NXP's NFC/SE chips

(939) In terms of ability, the merged entity could in principle include in its supply contracts for NFC products provisions which condition the supply of NXP's NFC/SE on a valid license to the merged entity's (cellular) IP being in place.

(940) In this respect, the Commission notes that such provisions are commonly included in Qualcomm's contracts for the sale of BCs. Moreover, the Notifying Party states that it is not aware of any legal restrictions precluding a chip supplier from conditioning the supply of chips to a customer on the customer having taken a license to the IP necessary to use or sell the products in which the chip will be incorporated.

(941) Therefore, the Commission concludes that the merged entity would have the ability to include NXP's NFC/SE chips in a NLNC strategy.

7.6.4.3. Incentive to extend the NLNC strategy to NXP's NFC/SE chips

(942) The Commission notes that the Notifying Party submits that it does not have any plans to condition the sale or the price of NFC or SE chips post-merger in any manner on whether a purchaser has a valid license to Qualcomm's cellular IP[773].

(943) Based on the Notifying Party's submissions, the Commission understands that Qualcomm's core cellular IP is unrelated to NFC technologies as implemented in NXP's NFC solutions and that (especially when contractually clarified) the sale of NFC chips is unlikely to exhaust Qualcomm's core cellular IP.

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771 Notifying Party's Response to RFI 9, paragraph 10 [DOC ID 691] and Notifying Party's Response to RFI 51, question 1 [DOC ID 3235].

772 This is without prejudice to whether or not Qualcomm's non-merger specific NLNC strategy is compatible with Article 102 TFEU.

773 Response by the Notifying Party to RFI 51, question 6 [DOC ID 3235].

(944) Therefore, the merged entity would not have an incentive to condition the sale of NXP's NFC and SE products on a valid license to Qualcomm's cellular IP in order to avoid the risk of unintended exhaustion of cellular IP.

(945) The Commission further assessed whether the merged entity may have an incentive to condition the sale of NXP's NFC and SE chips on the purchaser having a valid license to the merged entity's (cellular) IP in order to extract elevated royalty rates in particular for its FRAND encumbered cellular SEPs and to facilitate exclusionary practices on the relevant NFC and SE markets as submitted by mobile OEMs (see in particular recital (927) above).

(946) However, the Commission notes that in order to implement the NLNC strategy with a view to extracting higher royalties and hindering entry, the merged entity needs to have a very strong market position in the relevant product market(s). This is because customers of NFC or SE chips would only feel compelled to accept and not to legally challenge onerous royalty terms for the merged entity's cellular patents, if not being supplied with NXP's NFC or SE chips results in a significant profit loss. However, if NFC or SE chips of acceptable quality can be sourced from competing NFC/SE producers (or produced in-house), then not being able to purchase NFC or SE chips from the merged entity does not result in such a profit loss. Put differently, if viable alternatives to supply NFC or SE chips are available, the threat of disrupted supply is not credible. An empty threat in turn would not be suited to coercing mobile OEMs into accepting onerous licensing terms.

(947) The Commission further considers that the current market position of NXP is not strong enough to support such a credible threat. As set out in Section 7.3.2, NXP currently holds a significant market share with regard to both NFC and SE products. However, NXP's high market shares may overestimate its market power since […]. A decision by those customers to switch away (some part of their demand) from NXP could dramatically reduce NXP's market share in NFC/SE. Moreover, both Apple and Samsung as well as other mobile OEMs already "mix-and-match" NFC chips and SE chips from different suppliers. This, as well as NXP's internal documents suggest that alternative products are viable alternatives. This view is consistent with […].

(948) The Commission however does not consider that competing NFC or SE chipmakers are likely to be excluded by the merged entity post-merger for a number of reasons that are set out in detail in recitals (951) - (954) below.

(949) The Commission also notes that Qualcomm does not condition the supply of several non-cellular chips on having a valid license to its cellular portfolio. In particular, Qualcomm's RF360 joint venture has assumed pre-existing supply agreements with various customers, […]. Likewise, concerning Qualcomm Technologies International, Ltd (QTIL, formerly CSR) and Bluetooth chips, QTIL does not condition the supply of its (Bluetooth) chips on its customers (or distributors) having taken a license to any Qualcomm IP (whether cellular or non-cellular).

(950) Therefore, the Commission concludes that the merged entity would not have the incentive to extend the NLNC strategy to NXP's NFC/SE chips with a view to excluding rivals in the relevant NFC/SE chip markets[774].

[774] The Commission does not take a view on whether the merged entity may have an incentive to extend the NLNC strategy for reasons other than excluding NFC/SE rivals, such as, for example to limit

7.6.4.4. Likely effects of extending the NLNC strategy to NXP's NFC/SE chips

(951) The Commission does not consider that competing NFC or SE chipmakers are likely to be excluded by the merged entity post-merger in the event that the NLNC strategy were extended to NFC/SE chips for the following reasons:

(1) First, in light of the Notifying Party's commitments, competing NFC and SE producers will have access to NXP's NFC IP. Therefore, they cannot be foreclosed by licensing NXP's NFC IP exclusively to OEMs or by demanding onerous licensing terms as suggested by Apple. Similarly, the commitments also ensure access to MIFARE (section 8.4.2.3);

(2) Second, even in the absence of the commitments, NXP's NFC essential patents (as well as those of Qualcomm) are subject to the IPR Policy of NFC Forum, which is the main SSO that develops NFC standards. The NFC Forum requires a commitment that SEP holders will license their NFC SEPs on a FRAND basis, to all implementers, which includes NFC or SE chipmakers;

(3) Third, given that several NFC and SE producers already offer viable alternatives to NXP's NFC and SE chips, especially large mobile OEMs such as Apple can sponsor expansion or implement contractual solutions to induce these chip producers to remain in the market, for example, by cooperating to develop or committing to purchase new generations of NFC or SE chips.

(952) In addition, cooperation between NFC producers and BC producers as set out in recitals (660) to (663) allow those chipmakers to (jointly) offer products which cover a larger variety of products demanded by mobile OEMs and may help to defeat attempts by the merged entity to exclude competing chipmakers by exploiting potential mis-coordination among NFC and BC producers.

(953) Moreover, several mobile OEMs (such as Samsung and Huawei) are vertically integrated and can source NFC chips internally. Even if these OEMs currently do not source their entire demand internally, they could switch to internal supply if NFC producers would be excluded from the market.

(954) Finally, NFC/SE is not yet a "must-have" technology and therefore any potential leverage and effect from withholding NFC/SE products would be more limited compared to those linked to withholding BCs.

(955) Therefore, in relation to a potential extension of the NLNC strategy to NFC/SE products, the Commission concludes that it cannot be shown to the requisite standard of proof required for establishing conglomerate theories of harm that significant anti-competitive effects are likely to occur as a result of the Transaction.

7.6.5. Conclusion on conglomerate effects in relation to Qualcomm's baseband chipsets, NXP's NFC and SE chips as well as licensing of the merged entity's IP

(956) For the above-mentioned reasons, the Commission concludes that it cannot be established to the requisite standard of proof that a significant impediment to competition would occur in relation to a potential extension of the NLNC strategy to either NXP's NFC IP or NXP's NFC or SE products.

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infringement of its IP. However, even in that case excluding (potential) rivals is unlikely to be achieved, so that anti-competitive effects would be limited.

8. COMMITMENTS

8.1. Analytical framework

(957) When a concentration raises competition concerns, the merging parties may seek to modify the concentration in order to resolve those competition concerns and thereby obtain clearance for the Transaction[775].

(958) Under the Merger Regulation, the Commission must show that a concentration would significantly impede effective competition in the internal market, or in a substantial part of it. In contrast, it is for the notifying party/parties to the concentration to propose appropriate commitments[776]. The Commission only has the power to accept commitments that are deemed capable of rendering the concentration compatible with the internal market so that they will prevent a significant impediment to effective competition in all relevant markets in which competition concerns were identified[777].

(959) The commitments must eliminate the competition concerns entirely and must be comprehensive and effective in all respects. The commitments must also be proportionate to the competition concerns identified[778]. Furthermore, the commitments must be capable of being implemented effectively within a short period of time as the conditions of competition on the market will not be maintained until the commitments have been fulfilled[779].

(960) The Commission also recalls that the Remedies Notice sets out that: "*commitments which are structural in nature, such as the commitment to sell a business unit, are, as a rule, preferable from the point of view of the Merger Regulation's objective, inasmuch as such commitments prevent, durably, the competition concerns which would be raised by the merger as notified, and do not, moreover, require medium or long-term monitoring measures*"[780].

(961) The Remedies Notice further explains that: "*the question of whether a remedy and, more specifically, which type of remedy is suitable to eliminate the competition concerns identified, has to be examined on a case-by-case basis. Nevertheless, a general distinction can be made between divestitures, other structural remedies, such as granting access to key infrastructure or inputs on non-discriminatory terms, and commitments relating to the future behaviour of the merged entity. Divestiture commitments are the best way to eliminate competition concerns resulting from horizontal overlaps, and may also be the best means of resolving problems resulting from vertical or conglomerate concerns. Other structural commitments may be suitable to resolve all types of concerns if those remedies are equivalent to divestitures in their effects ... Commitments relating to the future behaviour of the*

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775 Remedies Notice, paragraph 5.

776 Remedies Notice, paragraph 6.

777 Remedies Notice, paragraph 9.

778 Recital 30 of the Merger Regulation. The General Court set out the requirements of proportionality as follows: "*the principle of proportionality requires measures adopted by Community institutions not to exceed the limits of what is appropriate and necessary in order to attain the objectives pursued; when there is a choice between several appropriate measures recourse must be had to the least onerous, and the disadvantages caused must not be disproportionate to the aims pursued*" (judgement of the General Court of 4 July 2006, easyJet v Commission, T-177/04, ECLI:EU:T:2006:187, paragraph 133).

779 Paragraphs 9, 10, 11, 63 and 64 of the Commission Notice on remedies acceptable under the Regulation (EC) No 139/2004 and under Commission Regulation (EC) No 802/2004 (OJ C 267, 22.10.2008, p. 1-27), (the "Remedies Notice").

780 See Remedies Notice, paragraph 15.

merged entity may be acceptable only exceptionally in very specific circumstances"[781].

(962) Moreover, the Remedies Notice sets out that: "*the Commission therefore may accept other types of commitments, but only in circumstances where the other remedy proposed is at least equivalent in its effects to a divestiture*"[782], and other structural commitments: "*may be suitable to resolve all types of concerns if those remedies are equivalent to divestitures in their effects"* whilst behavioural commitments *"may be acceptable only exceptionally in very specific circumstances*"[783].

(963) The Commission also recalls that when assessing the remedies proposed by the merging parties, it has the legal duty to ensure that such remedies are effective. Paragraph 13 of the Remedies Notices states that in order for the commitments to remove the competition concerns entirely and be comprehensive and effective, there has to be an effective implementation and ability to monitor the commitments. Whereas divestitures once implemented do not require any further monitoring measures, other types of commitments require effective monitoring mechanisms in order to ensure that their effect is not reduced or even eliminated by the parties. Otherwise such commitments would have to be considered as mere declarations of intentions by the parties and would not amount to any binding obligations, as, due to the lack of effective monitoring mechanisms, any breach of them could not result in the revocation of the decision according to the provision of the Merger Regulation.

(964) Based on those principles as well on the principles related to the implementation and effectiveness of all type of commitments set out by paragraphs 13 and 14 of the Remedies Notice, the Commission assessed the Commitments put forward by the Parties in the present case.

8.2. Procedure

(965) In order to address the competition concerns identified by the Commission in its in-depth investigation, the Notifying Party submitted a set of commitments (the "First Commitments") on 5 October 2017.

(966) The Commission market tested the First Commitments on 6 October 2017. The Commission provided feedback on the basis of the market test to the Notifying Party.

(967) Based on the Commission's feedback, the Notifying Party submitted a revised set of commitments (the "Final Commitments") on 10 November 2017[784].

8.3. Commission's assessment of the First Commitments

8.3.1. Description of the First Commitments

(968) The First Commitments consisted of four elements. The first two elements aimed to address the competition concerns raised by the Transaction in relation to the licensing of NXP's NFC patents. The third element aimed to address the

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781 See Remedies Notice, paragraphs 16 to 17.

782 See Remedies Notice, paragraph 61.

783 See Remedies Notice, paragraph 17.

784 On 15 November 2017, the Notifying Party submitted a slightly revised version of Schedule 3 to the Final Commitments, which replaced the Schedule 3 as attached to the Final Commitments submitted on 10 November 2017. Subsequently, on 12 December 2017, the Notifying Party submitted a further revised version of the Final Commitments, which updated the Schedules 1 and 2 of the Final Commitments and incorporated the revised version of Schedule 3 submitted on 15 November 2017. Furthermore, on 18 December 2017, the Notifying Party submitted a slightly revised version of the Final Commitments, amending one definition to ensure consistency with other defined terms.

interoperability concerns in relation to LTE baseband chipsets, NFC chips and SE chips. The fourth element aims to address the concerns in relation to the conduct of licensing at higher royalties (or refusing to license) MIFARE, performed in addition to the mixed bundling of LTE baseband chipsets, NFC and SE chips, and MIFARE.

(969) First, the Notifying Party proposed to commit to not acquire, through the Transaction, NXP's NFC SEPs and certain other NFC patents (the "carve-out remedy"). Those patents would be excluded from the scope of the Transaction. The carved-out NFC patents are listed in Schedule 2 of the First Commitments. They include all NXP patents that have been declared or represented as essential to the NFC standard and patents that do not read on NXP's NFC chips and therefore are not necessarily included in these components (so-called "system-level patents" reading on different, unique system-level inventions combining multiple chips, systems and/or software to make different end products that may have NFC connectivity as an enabling element but are not fully embodied in the NFC chip itself).

(970) Under the carve-out remedy, the Notifying Party would also refrain from acquiring the NXP NFC patents listed in Schedule 2 for a period of 10 years after the closing of the Transaction, unless the Commission finds that the structure of the market has changed to such an extent that the absence of direct or indirect ownership of the patents listed in Schedule 2 is no longer necessary.

(971) The Notifying Party would acquire NXP's remaining NFC patents (as well as all of NXP's remaining non-NFC patents), as listed in Schedule 1 of the First Commitments. The Notifying Party would thus acquire all of NXP's so-called NFC "chip-level" patents, which cover inventions fully embodied on an NFC chip, and "NFC security" patents, which cover security inventions that are specifically related to NFC and include, for instance, identification and authentication function implementations.

(972) Second, the Notifying Party proposed to commit that, from the closing date of the Transaction and as long as it holds the NFC patents acquired from NXP (listed in Schedule 1 to the First Commitments), it would not assert (for example, litigate or bring enforcement proceedings) those patents against any Third Parties for manufacturing, using, selling, offering for sale, importing or otherwise disposing of NFC chips, SE chips, NFC/SE, and/or mobile phones (defined as including legacy mobile phones, smartphones, and phablets) (the "non-assert remedy").

(973) Under the First Commitments, "Third Party" meant any of either Third Party Customers or Third Party Suppliers. A "Third Party Customer" referred to any actual or potential supplier of Mobile Phones that incorporate Baseband Chipsets and/or NFC Chips, Secure Element Chips, or NFC/SE. A "Third Party Supplier" meant any actual or potential supplier of Baseband Chipsets and/or NFC Chips, Secure Element Chips, or NFC/SE. "Mobile Phone" was defined as referring to "any handheld mobile device, including legacy mobile phones, smartphones, and phablets".

(974) In addition to committing to not assert the Schedule 1 patents, the Notifying Party also committed that if a Third Party requested a licence to the Schedule 1 patents, it would grant such a licence royalty-free and without any other consideration (such as cross-licensing).

(975) Under the First Commitments, the non-assert remedy is subject to an exception for "defensive purposes". On that basis, the Notifying Party would be able to assert the Schedule 1 NFC patents, or terminate a licence to these patents, in the event that a Third Party "*brings any proceeding against: (a) Qualcomm; (b) any Qualcomm customer; and/or (c) any Qualcomm supplier, including any semiconductor*

fabrication plant, in relation to any Qualcomm NFC/SE Products, alleging that their manufacture, use, sale, offer for sale, importation and/or other disposition infringes any of the Third Party's intellectual property rights related to NFC and/or SE technology".

(976) Third, the Notifying Party committed to ensuring that the same level of interoperability exists between (i) Qualcomm's baseband chipsets and Qualcomm's NXP Products, and a Third Party's NFC Chips, Secure Element Chips, or NFC/SE and (ii) Third Party baseband chipsets and NXP's or Qualcomm's NFC/SE products, as will exist at any point in time between Qualcomm's baseband chipsets and NXP's or Qualcomm's NFC/SE products (the "interoperability remedy"). "Third Party" for the purpose of the interoperability remedy was defined as explained in recital (973) above.

(977) In this context, "interoperability" was defined as the possibility of Qualcomm Baseband Chipsets and NXP Products to interacting by successfully and reliably exchanging information and mutually using the information that has been successfully and reliably exchanged to enable a useful and fully-functional combined system with the Third Party's NFC Chips, Secure Element Chips, or NFC/SE, or Baseband Chipset. The Notifying Party would not be subject to the interoperability remedy if it could demonstrate that technical characteristics of a Third Party's products would not allow it to achieve the same level of Interoperability (such as generational differences between Qualcomm's and the Third Party's respective chips).

(978) "NXP Products" meant NXP's NFC Chips and NFC/SE that are currently commercially available and/or any future NFC Chip, Secure Element Chip, or NFC/SE that Qualcomm and/or NXP may commercialise for use in Mobile Phones (including legacy mobile phones, smartphones, and phablets) while the First Commitments remain in force.

(979) Under the interoperability remedy, the Notifying Party also committed to undertaking all the necessary steps to achieve interoperability between the components including, but not limited to providing all necessary information, documentation and commands, support for bug fixes, and technical guidance during the testing phase of third party products.

(980) Furthermore, the Notifying Party committed that if it were to integrate the functionalities of NFC chips and/or SE chips in the same silicon as its baseband chipset, partly or fully, it would disclose technological means by which such functionalities may be disabled so that they do not interfere with Third Party NFC or SE chips[785].

(981) In addition, the Notifying Party would refrain from implementing any changes to its baseband chipsets, NFC chips, secure element Chips, and/or NFC/SE or to the way in which those chips interoperate with a Third Party's baseband chipsets, NFC chips, secure element chips, or NFC/SE in a way that is designed to negatively affect the

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785 The Commission notes that such commitment to disable the integrated NFC or SE does not include any provision on pricing of that component. That is, Qualcomm could disable the integrated SE to ensure interoperability of its baseband chipset with a Third Party standalone SE, but could still sell its product to the device OEM at the full price, including the disabled integrated SE. In this respect, the Commission considers that such conduct would amount to a form of mixed bundling. For the reasons explained in Section 7.4.2.2 B) 3. above, the Commission considers that such a mixed bundling conduct would not lead to foreclosure effects of standalone SE competitors.

performance of the Third Party's baseband chipsets, NFC chips, secure element chips, or NFC/SE. However, under the interoperability remedy, the Notifying Party would not be obliged to engineer its products in a way to optimise the performance of a Third Party product.

(982) Furthermore, the interoperability remedy would not apply to those Qualcomm baseband chipsets and NXP products at the end of their product life cycle and to those not designed to interoperate with NFC chips, secure element chips, or NFC/SE.

(983) The interoperability remedy would apply for a period of five years from the closing of the Transaction to the baseband chipsets and NFC/SE products of Qualcomm and NXP insofar as they are for use in a "mobile phone" (as defined in recital (973)).

(984) Fourth, the Notifying Party committed to grant, upon written request by any Third Party, non-exclusive and non-transferable worldwide MIFARE licences and MIFARE Trademark licences, without any right to sublicense, on commercial terms (including with regard to the fee, scope and duration of the licence) which are at least as advantageous as those offered by NXP in existing MIFARE Licences on the date of adoption of the Commission's decision (the "MIFARE remedy").

(985) That licence would grant a Third Party the right to use MIFARE licensed materials to develop a MIFARE implementation and include and/or load it into a Common Criteria EAL5+ (or higher) banking level security industry certified secure element chip, and sell such MIFARE implementation as being included with the secure element chip.

(986) MIFARE implementation was defined as the specific hardware and software part of a SE chip or integrated secure element compliant with the MIFARE licensed materials (the specifications, documentations and other materials specifying functionalities, key elements and requirements for a MIFARE implementation).

(987) In this context, "Third Party" meant any of either Third Party Customers or Third Party Suppliers, as defined in recital (973). For the purpose of the MIFARE remedy only, "Third Party Supplier" also included any actual or potential supplier of SE operating systems.

(988) MIFARE was defined as MIFARE Classic, MIFARE Plus, MIFARE DESFire, and, any other MIFARE version developed by NXP and/or Qualcomm and any other MIFARE version, which would be developed by NXP and/or Qualcomm while the Commitments remained in force.

(989) The Commitment to licensing MIFARE would apply for a period of five years from the closing of the Transaction.

(990) Finally the First Commitments included a Monitoring Trustee for the monitoring of Qualcomm's compliance with the First Commitments, and an arbitration mechanism for disputes arising under the Final Commitments.

8.3.2. Results of the market test of the First Commitments

(991) The market test of the First Commitments yielded mixed results. Most respondents did not question the concept of the carve-out, non-assert, interoperability and MIFARE remedy as such, but criticised several aspects of each of those remedies which, in their view, required improvement.

(992) With respect to the carve-out remedy, certain respondents explained that carving out the Schedule 2 patents would entail the risk that those patents be purchased by an entity related to Qualcomm. That entity could favour Qualcomm over its customers and/or competitors, for instance by granting more favourable licensing terms to the

Notifying Party. Certain respondents were also concerned that the purchaser would seek to exercise those patents in order to extract high royalties. Those respondents therefore suggested that, to avoid such risk, the Schedule 2 patents should be subject either to a standard divestiture commitment, with the Commission reviewing and approving the buyer in the process, or to a licensing commitment, such as that provided for the Schedule 1 patents[786].

(993) With respect to the non-assert remedy, respondents to the market test highlighted several aspects which, in their view, required modifications.

(994) First, respondents commented that the non-assert remedy would bind Qualcomm, but would not preclude it from selling the relevant patents to a third party purchaser, which would not be bound by the First Commitments, and could thus use the patents to pursue those same conducts that the non-assert remedy aimed to prevent[787].

(995) Second, some respondents commented that the "defensive purposes" clause should be triggered in those cases where a Third Party would act against Qualcomm only on the basis of a "patent right", rather than "intellectual property rights". Given that the non-assert remedy concerns the NXP patents of Schedule 1 (but not broader IP rights), certain respondents submitted that the "defensive purposes" exception should match and mirror the scope of the non-assert remedy[788].

(996) Third, some respondents explained that, Qualcomm could trigger the "defensive purposes" mechanism by seeking litigation on the basis of one of its own patents (rather than the Schedule 1 patents of NXP), which could force a Third Party to bring proceedings against Qualcomm. This would enable Qualcomm to rely on the "defensive purposes" exception and enforce the Schedule 1 patents and/or withdraw any granted licences[789].

(997) Fourth, respondents argued that scope of the non-assert remedy should be expanded, in various manners. In this regard, respondents commented that the notion of "Third Parties" entitled to benefit from the non-assert remedy should be expanded to include a broader set of industry players. Respondents mentioned manufacturers of NFC readers, POS terminals, IoT products, wearables, tablet manufacturers, and SE OS providers. One respondent commented that the non-assert remedy should be expanded and also apply to NXP's patents concerning SE technology. Other respondents highlighted that the definition of "mobile phones" should be broadened to also cover tablets, wearables, and other IoT products. Finally, certain respondents noted that the remedy should also be extended to customers of Third Party Customers against which Qualcomm could otherwise freely assert the relevant patents, thus circumventing its commitment[790].

(998) With respect to the interoperability remedy, respondents pointed to the following elements of that the remedy, which in their view were defective.

(999) First, respondents commented that the type of information (as well as its scope and content) that would be made available by Qualcomm for the purpose of interoperability was unclear and insufficient to ensure the same level of interoperability between products of Third Parties and those of the merged entity. For

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786 See responses to question 3.1 of Q17 – Market Test.

787 See responses to questions 7.1 and 9.1 of Q17 – Market Test.

788 See responses to questions 7.1 and 9.1 of Q17 – Market Test.

789 See responses to questions 7.1 and 9.1 of Q17 – Market Test.

790 See responses to questions 7-12 of Q17 – Market Test.

instance, some respondents commented that it wasn't clear whether the information consisted of only information for physical interconnection, or also software and application layers. Some respondents also stated that there were no assurances on the completeness or accuracy of the interoperability information. Other respondents commented that the notion of "interoperability" should also include references to performance levels[791]. One respondent commented that to ensure interoperability, Qualcomm should also "*commit integration of SPI drivers and libraries in its Application Processor and Trusted Execution Environment (TEE) whether integrated in the Baseband chipset or not*"[792].

(1000) Second, respondents commented that the interoperability information should be made available within a specified timing, to ensure that Third Parties could act promptly to use it to ensure interoperability of their products. Respondents noted that the First Commitments did not give any indication or timeframe to that end[793].

(1001) Third, some respondents indicated that the "technical characteristics" exception that Qualcomm could invoke as a reason to not ensure interoperability with a Third Party's products (see recital (977)) was rather vague, and would leave Qualcomm leeway to not comply with the interoperability remedy. Some respondents commented that the provision appeared to allow Qualcomm to invoke the exception, leaving it to Third Parties to prove that there were no "technical characteristics" impeding the same level of interoperability[794]. Other respondents also commented that the provision by which Qualcomm would not implement "changes" to its products (see recital (981)) was not sufficiently stringent. Some respondents also pointed to the fact that the "end of product life cycle" exemption from the interoperability remedy could also leave room to Qualcomm to escape the interoperability remedy in the future[795].

(1002) Fourth, some respondents mentioned that the fact that Third Parties would have to first enter into a confidentiality agreement with Qualcomm before any disclosure of the relevant interoperability information could slow down the process for the disclosure of the requested information[796].

(1003) Fifth, certain respondents noted that providers of TEE technology and SE OS were not included in the definition of "Third Party Supplier" for the purpose of the interoperability remedy and that the interoperability remedy should also cover a Third Party's application processor and integrated secure element as well. Some respondents also suggested extending the interoperability remedy to products beyond those included in mobile phones, such as tablets and reader ICs[797].

(1004) Sixth, respondents commented that the duration of five years of the interoperability remedy was too short, and should be extended. Some respondents explained that the development, design and certification process for new NFC and SE products is particularly lengthy, hence the five year duration of the interoperability remedy would be insufficient to justify for a Third Party the time and investment costs needed to develop those products, as the remedy would only cover a few generations

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791 See responses to questions 13-18 of Q17 – Market Test.

792 See Gemalto's response to question 13.1 of Q17 – Market Test [Doc ID 2984], as well as replies to questions 16.1 and 21.1.

793 See responses to questions 13-19 of Q17 – Market Test.

794 See responses to questions 13-21 of Q17 – Market Test.

795 See responses to question 20.2 of Q17 – Market Test.

796 See responses to questions 13-21 of Q17 – Market Test.

797 See responses to questions 13-21 of Q17 – Market Test.

of products. Respondents also raised the issue that Qualcomm could benefit from shortening of the interoperability remedy's duration after three years, following the Commission's review[798].

(1005) As regards the MIFARE remedy, respondents to the market test highlighted the following shortcomings.

(1006) First, respondents commented that the mechanism by which a Third Party could rely on commercial terms "*at least as advantageous as those offered by NXP*" in MIFARE licenses existing at the time of the Commission's decision, for the purpose of obtaining a MIFARE licence, was unclear and lacked transparency, as the commercial terms of those MIFARE licences would be unknown, inaccessible, and generally differ and vary. Therefore, a Third Party would be unable to rely on them for the purpose of obtaining a favourable MIFARE licence[799].

(1007) Second, some respondents commented that the notion of MIFARE licence would not cover all the relevant MIFARE IP or all instances of usage of MIFARE. Respondents noted that the licence was limited to the right to "*to develop a MIFARE Implementation and include and/or load it*" into a secure element chip. This would not cover instances of a third party provider having MIFARE loaded by another provider. Respondents also noted that the MIFARE licence of the First Commitments would entitle to develop a MIFARE implementation secure element satisfying the banking-level security industry common criteria EAL5+ (or higher), whereas current MIFARE security levels require a lower standard of EAL4+[800].

(1008) Third, respondents commented that the MIFARE remedy should also include access to MIFARE Ultralight, to MIFARE4MOBILE, and should apply also to the case of an integrated SE, wearables and IoT products[801].

(1009) Fourth, respondents commented that the five year duration of the MIFARE remedy was too short[802]. One respondent explained that, given the time and costs that providers face to develop, implement, certify and finally sell a MIFARE-enabled product, a five year duration of the MIFARE remedy would barely cover the actual development and sale of those products, and would not give a Third Party sufficient guarantees to justify the time and investment needed[803]. Respondents also raised the

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798 See responses to question 24 of Q17 – Market Test.

799 See responses to questions 25 and 28 of Q17 – Market Test.

800 See responses to questions 25 - 27 of Q17 – Market Test. See for instance reply of Gemalto to question 27.1: "[the MIFARE remedy] *includes only the right to "develop" (i.e. the developing right cannot be subcontracted and would need additional wording like "have developed by a third party") and the right to "include and/or load it" (i.e. the loading right cannot be subcontracted and would need additional wording like "have loaded by a third party"). This limits the license applicability to only those companies that both develop the software by themselves and load the software in the chips by themselves in their factories*". See reply of Oberthur to question 26: "*MIFARE Classic does not need either EAL5+ or EAL4+ component*". See reply of Intel to question 27.1.

801 See responses to questions 25 - 29 of Q17 – Market Test.

802 See responses to question 30 of Q17 – Market Test.

803 See Gemalto's response to question 30 of Q17 - Market Test, [Doc ID 2984]: "*It takes time (approximately 18 months) for SE suppliers to develop a new SE, allowing for the time required for development, certification and testing compliance. It will then take additional time for sales to OEMs to ramp up. A new SE will tend to go into new smartphone models (or other devices using an SE) rather than existing models; as a result, OEMs can be expected to demand the new SE for only the portion of their sales accounted for by newer models. This means that sales of the new SE will be linked to the time it takes OEM sales to shift towards new OEM models. The need for OEMs to pass tests confirming that smartphone (and other devices) using the new SE operate satisfactorily on network infrastructure also lengthens the roll-out schedule. The time that it takes to develop new SEs and the OEM roll-out*

issue that Qualcomm would be entitled to request a shortening of the MIFARE remedy's duration after three years[804].

(1010) At a more general level, certain respondents also noted that, while the interoperability and MIFARE remedy would address the competition concerns related to degradation of interoperability and access to MIFARE, there was nothing in the First Commitments addressing the merged entity's ability to engage in conducts such as bundling and tying, or the possible extension of Qualcomm's alleged "no licence no chip" policy to NFC after the Transaction[805].

(1011) Finally, respondents to the market test also criticised the fact that the seat of arbitration for any disputes under the arbitration mechanism of the First Commitments was San Diego, California[806].

8.3.3. Assessment of the First Commitments

(1012) The Commission assessed the appropriateness of the First Commitment proposal in light of the principles underlying its commitments policy and the results of the market test.

(1013) At the outset, the Commission recalls that to be acceptable, the proposed commitments must be capable of rendering a concentration compatible with the internal market as they prevent a significant impediment to effective competition in all relevant markets in which competition concerns were identified.

(1014) In accordance with the results of the market test, the First Commitments proposal can be considered to partially address the competition concerns identified by the Commission in relation to the mixed bundling of LTE baseband chipsets, NFC and SE chips and MIFARE, the degradation of interoperability, and the licensing of IP rights related to NFC technology.

(1015) However, as indicated by a number of respondents to the market test, the First Commitments proposal would not fully remove the concerns for the following reasons.

8.3.3.1. Carve-out and non-assert remedies

(1016) The Commission recalls at the outset that the competition concerns that the commitments aim to prevent in relation to the licensing of NFC patents consist in the disproportionate increase of bargaining power that Qualcomm will obtain after the Transaction, resulting in higher royalties than absent the combination of the Parties' patents. The First Commitments proposal in this respect includes a dual set of measures: (i) carving-out NFC SEPs and system-level patents and (ii) not asserting NFC chip-level and security patents which Qualcomm will acquire from NXP.

(1017) With respect to the carve-out remedy, in light of the particular circumstances of this Decision, the remedy's effectiveness to prevent Qualcomm from using NXP's NFC

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schedule mean that an SE supplier must anticipate selling a new SE for a reasonable length of time to justify incurring the costs of development. Yet if Qualcomm were not required to license MIFARE for more than 5 years, an SE supplier would face the risk that OEMs would no longer be interested in any new SE in just 5 years from now – if, after just 5 years, the SE supplier had to "de-activate" the support for MIFARE that had been built into the new SE. This truncation of the expected product life of new SEs would have serious negative effects on SE investment incentives. This is thus another reason why Qualcomm needs to commit to license MIFARE for at least 10 years".

804 See response to question 30 of Q17 – Market Test.

805 See submission of a device OEM in response to the Commission's market test, DOC ID 3221, p.29.

806 See responses to question 31.1 of Q17 – Market Test.

patents to support disproportionate royalty demands does not require divesting these patents. This is because, in contrast with a divestiture remedy aiming at restoring a competitive constraint eliminated by a merger, the present commitment aims at neutralising the Notifying Party's ability to leverage NXP's NFC patents in licensing negotiations in order to obtain disproportionate licensing terms. Therefore, contrary to a divestiture remedy, which calls upon the Commission to assess whether the purchaser of the divested assets will be suitable to replace the competitive constraint lost as a result of the transaction, as well as the viability of the divested business in the hands of such purchaser, the present commitment do not require assessing the purchaser's ability to compete with the merged entity so long as Qualcomm can no longer rely on the relevant patents to extract royalties from its licensees. It follows that, in principle, carving-out a number of NFC patents from Qualcomm's acquisition constitutes an appropriate remedy in the present case.

(1018) However, in order to be effective, the remedy should not risk leading to distorting effects on competition. The Commission considered that there were doubts that the carve-out remedy, as designed in the First Commitments, could have led to such effects. As mentioned by a number of respondents to the Commission's market test, the carve-out remedy risked leading the relevant patents to be ultimately purchased by a company related to Qualcomm or seeking to increase royalties for the relevant patents.

(1019) With respect to the non-assert remedy, considerations set forth above in recital (1017) concerning the adequacy of a non-divestiture remedy, similarly apply to the Notifying Party's commitment. By committing to not asserting the NFC patents that it will acquire from NXP, the Notifying Party effectively forgoes the possibility to use them in order to extract disproportionate royalties from licensees for its IP portfolio, a remedy proportionate to the Commission's concerns.

(1020) Nevertheless, the Notifying Party attached an exception to its commitment which, although suitable in principle, could render the Notifying Party's commitment ineffective if insufficiently limited in scope. As mentioned by several respondents to the market test, the scope of the First Commitments' definition of "defensive purposes" was such that it allowed Qualcomm to assert the NFC patents which it will acquire from NXP against a Third Party even in cases in which Qualcomm initiated proceedings on the basis of its own patents, or in cases in which a Third Party would act against Qualcomm on the basis of IP rights other than patents.

(1021) In addition, the First Commitments did not prevent the Notifying Party from asserting the relevant patents against customers of Third Parties, thus potentially circumventing its commitment. Accordingly, the Commission considered that there were doubts that the non-assert remedy effectively entirely removed its competition concerns.

(1022) Other concerns expressed by respondents to the Commission's market test with respect to the allegedly insufficient scope of the non-assert remedy do not appear well founded. First, the scope of the Commission's concerns does not extend beyond mobile device OEMs. Extending Qualcomm's obligations to other industry players is not warranted and would prove disproportionate in the present case[807]. In addition, although certain respondents requested that the Notifying Party's non-assert remedy

[807] As far as SE OS providers are concerned, the Commission notes that these players supply software for integration on NFC chips which are then implemented on mobile phones and would, as such, be covered by the Notifying Party's commitment.

also extended to SEPs related to SE technology, none of NXP's SE-related patents have been identified as potential SEPs as the SE technology is not based on a standard[808].

(1023) Lastly, the Commission notes that the Notifying Party wishes to retain ownership of certain patents practiced on NFC chips so as to support NXP's NFC/SE chip business, which it intends to continue after the Transaction. As a consequence, the Notifying Party has no plans to dispose of the relevant patents in the foreseeable future as these will be relevant to its NFC chips business[809]. Therefore, concerns related to the Notifying Party's future sale of NFC chip-level and security patents do not appear warranted.

8.3.3.2. Interoperability remedy

(1024) With respect to the interoperability remedy, the Commission recalls that this remedy aims to address the competition concerns identified in Section 7.4.4 above, that is, that the merged would degrade the interoperability of third parties' products with the LTE baseband chipsets, NFC and SE chips of the merged entity. That conduct would compound the foreclosure effects engendered by the conduct illustrated in Section 7.4.2.2 above.

(1025) The Commission considers that the interoperability remedy would be capable, in principle, of removing the competition concerns identified in the in-depth investigation.

(1026) The interoperability remedy would enable third party suppliers to offer standalone products that would interoperate with the products of the merged entity, and that device OEMS would thus be able to consider as viable and functioning alternative options to the products of the merged entity.

(1027) Nevertheless, the Commission also notes that the interoperability remedy, as formulated in the First Commitments, presents various shortcomings, as also evidenced by the results of the market test. The Commission considers that those shortcomings, as illustrated below, made the remedy unable to fully remove the competition concerns related interoperability.

(1028) With respect to the interoperability remedy, the Commission notes the following.

(1029) First, under the First Commitments, the interoperability remedy does not specify any timeframe or timing under which the Notifying Party would have to make available the requested interoperability information. Given the importance of a timely delivery of the relevant information to enable a Third Party to use the requested information to ensure interoperability, the absence of any indication in that sense limits the effectiveness and timeliness of the delivery of the interoperability information, and could entail delays for a requesting Third Party. Analogously, the First Commitments specify that "*[p]rior to any disclosure of Interoperability Information to a Third Party, such Third Party shall enter into an agreement with Qualcomm as regards confidentiality*". The Commission notes that this disposition adds further uncertainty to the timing of the delivery of interoperability information, given that negotiations between Qualcomm and a Third Party over confidentiality could be protracted, with no deadlines or timeframe being indicated. This would further risk slowing done the actual functioning and timeliness of the interoperability remedy.

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808 NXP's response to RFI 35 of 18 July 2017, paragraph 7 [DOC ID 2009].

809 Notifying Party's Response to RFI 51 of 16 November 2017, paragraph 50 [DOC ID 881].

(1030) Second, as evidenced by several respondents to the market test, the type of interoperability information that would be made available remained vague and undefined, and would not cover all instances of information necessary for the purpose of ensuring interoperability.

(1031) Third, the interoperability remedy would not cover a Third Party integrated secure element or application processor. The Commission considers that the non-inclusion of those components would risk limiting the scope of the interoperability remedy. Should a Third Party develop such an integrated secure element in the near future, this product would not be guaranteed interoperability with the products of the merged entity. With regard to the application processor, the Commission notes that one of the largest device OEMs, Apple, uses a standalone baseband chipset and an application processor. The fact that the latter is not covered by the interoperability remedy would thus limit the remedy vis-à-vis a device OEM customer.

(1032) Fourth, as pointed out by certain respondents of the market test, Qualcomm would not be subject to the interoperability remedy if it could demonstrate that technical characteristics of a Third Party's products would not allow it to achieve the same level of interoperability. This exception, as formulated in the First Commitments, would be triggered by Qualcomm itself. However, there is no indication of the type of demonstration that Qualcomm would need to provide, not of how the invocation of this exception would practically operate vis-à-vis a Third Party. As such, this exception could lead to further discussions and negotiations, which would generate uncertainty and risk undermining the interoperability remedy.

(1033) Finally, the Commission notes that the duration of five years of the interoperability remedy would likely be too short, given the timing of the R&D and development process of these products, as well as their lifespan.

8.3.3.3. MIFARE remedy

(1034) With respect to the MIFARE remedy, the Commission recalls that this remedy aims to address the competition concerns identified in Section 7.4.2.2 above, that is, that the merged entity would raise the MIFARE licensing royalties or cease the licensing of MIFARE, in addition to engaging in the mixed bundling of LTE baseband chipsets with NFC and SE chips.

(1035) The Commission recalls that a mixed bundling conduct applied to LTE baseband chipsets, NFC and SE chips (enabled with MIFARE) as such would likely not lead to the foreclosure of competitors, for the reason set out in recitals (645) to (665) above. Therefore, no specific remedy is required to address competition concerns arising from mixed bundling. With regard to pure bundling and tying, as explained in Section 7.4.3 above, such conducts also do not raise competition concerns and therefore do not require an *ad hoc* remedy.

(1036) However, the increase of licensing royalties for MIFARE (or the refusal to license MIFARE) to third party NFC/SE chip producers by the merged entity would likely lead to anti-competitive effects, given the current and growing importance of MIFARE. Should competitors of the merged entity be unable to offer MIFARE-enabled products at competitive conditions, this would materially deteriorate their ability to compete and may result in foreclosure.

(1037) The Commission considers that the MIFARE remedy would be able, in principle, to remove the competition concerns identified in the in-depth investigation.

(1038) In particular, the MIFARE remedy has the potential to enable interested third party competitors to request and obtain from the merged entity a MIFARE licence, which

would enable them to offer MIFARE-compatible SE chips and thus compete with a product offering matching that of the merged entity.

(1039) However, based on the feedback of the market test, the Commission considers that the MIFARE remedy, as formulated in the First Commitments, presents certain shortcomings that limit its effectiveness and render it unable to fully address the competition concerns identified in relation to MIFARE.

(1040) The Commission notes that the main flaw of the MIFARE remedy as formulated in the First Commitments concerns that, while Third Parties would be entitled to commercial terms for a MIFARE licence at least as favourable as those included in existing NXP MIFARE licences, the First Commitments do not provide any transparent benchmark or reference for viewing or accessing such existing MIFARE licences. A Third Party would be entitled to such "as advantageous" commercial terms, but would be in no position to review and assess whether the terms it is being offered by Qualcomm are indeed comparable to those already granted by NXP. This lack of transparency concerning existing NXP MIFARE licences seriously undermines the functioning and effectiveness of the MIFARE remedy.

(1041) Moreover, the reference to existing NXP MIFARE licences would be a benchmark for existing types of MIFARE requested by a Third Party, but not for future types of MIFARE that could be developed after the Transaction. Should the merged entity develop a new type of MIFARE, under the First Commitments, a Third Party would be granted a licence to such new MIFARE, but could not rely on any benchmark to ensure "as advantageous" commercial terms for a licence.

(1042) Furthermore, the notion of MIFARE licence included in the First Commitments would be unduly restrictive, as it would not entitle a Third Party to have MIFARE installed/uploaded by another Third Party, and MIFARE implementation would require compliance with the EAL5+ standard, which, as noted by respondents to the market test, is a higher requisite than what is currently needed.

(1043) Additionally, the Commission notes that the MIFARE remedy would not apply to an integrated secure element, which would limit the remedy's scope going forward.

(1044) Moreover, the exclusion of MIFARE ultralight from the definition of MIFARE also limits the effectiveness of the remedy. The Commission also notes that, while the notion of MIFARE would cover future versions of MIFARE, the definition of "MIFARE trademark" would be limited to the MIFARE technologies existing at the time of the decision.

(1045) The Commission further notes that, as pointed out by certain respondents to the market test, MIFARE4MOBILE is not explicitly mentioned in the MIFARE remedy. The Commission understands that the specific MIFARE4MOBILE technology is under the control of the MIFARE4MOBILE Group (the "M4M Group"), which consists of STMicroelectronics, Gemalto, Oberthur, G&D and NXP itself[810].

(1046) Under the rules of the M4M Group, a Third Party interested in obtaining a MIFARE4MOBILE licence would need to make a request to the M4M Group. A precondition to obtaining a MIFARE4MOBILE licence is having a MIFARE licence from NXP[811]. The Commission notes that the MIFARE remedy therefore ensures

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[810] See the Notifying Party's reply to the Commission's RFI 50, point 12 [DOC 3111].

[811] See the Notifying Party's reply to the Commission's RFI 50, points 15 to 17 [DOC 3111].

that an interested Third Party will be in a condition to satisfy this requirement, and thus apply for a MIFARE4MOBILE licence.

(1047) The Commission also understands that, in order to obtain a MIFARE4MOBILE licence, a Third Party (having a MIFARE licence) must sign a set of agreements[812] with the M4M Group, and submit its product to a certification process by an independent body chosen by the M4M Group. With regard to the entering into of these agreements, the Commission understands that an interested third party needs to agree to the relevant license agreements and that no member of the M4M Group, including NXP, can refuse or hinder the grant of an M4M license to an eligible applicant holding a MIFARE licence. Furthermore, none of the five M4M Group members, including NXP, can act unilaterally to modify the terms of the M4M standard license documents[813].

(1048) Therefore, it would not be possible for the merged entity to modify the M4M standard license documents or deny access to MIFARE4MOBILE. In that respect, it is not necessary that the MIFARE remedy also include a reference to MIFARE4MOBILE, as access to the other MIFARE licences under the MIFARE remedy and the governing rules of the M4M group ensure that interested Third Parties fulfil the requirements to apply for a MIFARE4MOBILE licence.

(1049) However, upon signing the licence agreements, a third party can access the relevant MIFARE4MOBILE specifications and must then request a certification of its MIFARE4MOBILE product with UL, an independent entity commissioned by the M4M Group to perform certifications to meet the MIFARE4Mobile Compliance and Robustness Rules[814].

(1050) In this regard, the First Commitments include no provisions ensuring that Qualcomm would not interfere with the functioning of the UL certification body for the purpose of granting MIFARE4MOBILE licences. This would risk depriving Third Parties from access to MIFARE4MOBILE.

(1051) Furthermore the Commission notes that NXP is the owner of the MIFARE4MOBILE trademark, and it is for NXP to arrange for the granting of the trademark to the other M4M Group members as well as interested MIFARE4MOBILE licensees. Therefore, after the Transaction, Qualcomm could withhold the relevant trademark[815].

(1052) Finally, the Commission notes that the five year duration of the MIFARE remedy is overly short. Given the time and investment that a Third Party would have to incur to develop a SE product, certify and finally exploit it (in addition to any time possibly needed to negotiate a MIFARE licence with Qualcomm), the five year duration of the MIFARE remedy would be unlikely to encourage a Third Party to make such investment and efforts.

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812 Specifically, the M4M license and non-assertion agreement, the trademark license agreement, and/or the agreement to adhere to any M4M Group compliance and robustness rule. See the Notifying Party's reply to the Commission's RFI 50, point 16 [DOC 3111].

813 See the Notifying Party's submission of 9 November 2017 concerning the M4M Group, DOC ID 3326. In particular, clause 3.3 of the M4M cooperation agreement stipulates that "*[t]he change of the Intellectual Property Rights rules, licensing conditions of the Specifications as well as amendment of this Agreement is subject to unanimous consent of the Steering Committee*".

814 See the Notifying Party's reply to the Commission's RFI 50, points 15, 16 and 17 [DOC 3111].

815 See the Notifying Party's submission of 9 November 2017 concerning the M4M Group, DOC ID 3326.

8.3.3.4. Conclusion

(1053) In light of the above, the Commission concludes that the First Commitments would not be sufficient to entirely remove the competition concerns raised by the Transaction with respect to the mixed bundling of LTE baseband chipsets, NFC and SE chips and MIFARE, the degradation of interoperability, and the licensing of IP rights related to NFC technology.

8.4. Commission's assessment of the Final Commitments

8.4.1. Description of the Final Commitments

(1054) The Final Commitments include the following changes to the First Commitments.

(1055) With respect to the carve-out remedy, the Notifying Party extended its commitment to include several additional measures.

(1056) First, the Notifying Party committed to procure from NXP that a three year, standalone, worldwide royalty-free license would be granted to any and all Third Parties and customers of any Third Party customer (the "Schedule 2 License"). That license would be granted without the provision by the licensee of any other consideration. The Notifying Party further committed to make the terms and conditions of such license publicly available and advertised on its documentation and on its website in an easily visible position, and procure as much from NXP.

(1057) Second, the Notifying Party committed to procure from NXP that it would not sell the carved-out patents unless the purchaser was independent and unrelated to the Notifying Party and agreed to be contractually bound to comply with the Schedule 2 License.

(1058) Third, the Notifying Party committed to procure from NXP that it would not sell the carved-out patents before the Commission reviewed and approved the terms and conditions of the Schedule 2 License and the transaction documents binding the purchaser to its terms.

(1059) As regards the non-assert remedy, the Notifying Party extended the scope of the remedy. First, the Notifying Party committed that non-assertion would also encompass the threat to litigate or bring enforcement proceedings. Second, the Notifying Party further committed that it would not assert the Schedule 1 patents against “customers of a Third Party Customer”. Third, the standalone licence for the Schedule 1 patents would also cover the manufacture and sale of an integrated SE.

(1060) Furthermore, the Notifying Party restricted the scope of the defensive purposes exception. First, the defensive purposes exception would be triggered only where a Third Party brought proceedings claiming infringement of its own patents related to NFC and SE technology, instead of the previous broader notion IP rights. Second, the Notifying Party would not be entitled to rely on the defensive purposes exception against a Third Party if, prior to the Third Party bringing any proceedings, the Notifying Party initiated proceedings against that same Third Party on the basis of the patents related to NFC and/or SE technology that Qualcomm (and/or its affiliated undertakings) holds prior to the Commission’s decision.

(1061) With respect to the interoperability remedy, the Notifying Party introduced the following modifications.

(1062) First, the notion of “same level of interoperability” was clarified as referring to include (but not be limited to) functionality and performance.

(1063) Second, a precise timeframe for the provision of the interoperability information was added in the Final Commitments. In particular, the Notifying Party commits to

providing the interoperability information to the requesting Third Party "*no later than 30 calendar days*" from the Third Party's written request.

(1064) Third, the Final Commitments contain a more precise description of the interoperability information that the Notifying Party must provide. In particular, the Final Commitments specify that such information includes the information and data required to achieve interoperability, "*such as […]* "*necessary hardware specifications including wave-tables and electrical characteristics of the interfaces, software protocol specifications, including protocol and command details of the interfaces, driver software for the interfaces, power supply concept description, documentation describing interoperability testing, description of the software accessing the Secure Element Chip, including protocol and command details*."

(1065) Fourth, under the Final Commitments, the Notifying Party remains entitled to not provide interoperability information in case that it can demonstrate that technical characteristics of a Third Party's products would not allow it to achieve the same level of interoperability. However, such demonstration must be done to the Commission by means of a reasoned and documented submission to the Trustee.

(1066) Fifth, the Notifying Party amended the provisions concerning changes to the merged entity's products (see recital (981)). Under the Final Commitments, the Notifying Party would "*refrain from implementing any features or functions (including but not limited to interface technologies)*" to the merged entity's products or the way in which those products interoperate with Third Party products, "*in a way that is designed to negatively affect the performance*" of the Third Party's products, "*unless Qualcomm demonstrates that the negative effect is a necessary unavoidable consequence of a performance improvement in Qualcomm's products of such magnitude that the negative effect is objectively justified*." The reference to the Notifying Party not being obliged to engineer its products in a way to optimise the performance of a Third Party product was removed.

(1067) Sixth, the Notifying Party attached to the Final Commitments a standard Non-Disclosure Agreement ("NDA") to be used by Third Parties requesting interoperability information from the Notifying Party. This NDA was enclosed as Schedule 3 to the Final Commitments[816].

(1068) Seventh, the interoperability remedy was amended so to ensure interoperability of the merged entity's products also with a Third Party's application processor and integrated secure element.

(1069) Finally, the duration of the interoperability remedy was extended to eight years.

(1070) With respect to the MIFARE remedy, the Notifying Party maintained that it would offer MIFARE licences on "*commercial terms (including with regard to the fee, scope and duration of the license) which are at least as advantageous as those offered by NXP in existing MIFARE Licenses*" on the date of the Commission's decision.

(1071) In order to ensure accessibility and visibility to the Third Parties of those existing MIFARE licences, under the Final Commitments the Notifying Party commits to making available to Third Parties the key commercial terms of each equivalent NXP

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816 As mentioned in footnote 784 above, the Notifying Party submitted an amended version of the NDA on 15 November 2017, which was incorporated in the revised Final Commitments submitted on 12 December 2017.

MIFARE Licenses existing on the date of the Commission's decision. A Third Party would be entitled to review those key commercial terms (which include product and geographic scope, field of use of the license, duration, and consideration[817]) after agreeing to the non-disclosure agreement (NDA) attached to the Final Commitments for the purpose of the interoperability remedy.

(1072) Furthermore, under the Final Commitments, in addition to being able to negotiate a MIFARE licence commercially negotiated contractual terms with the Notifying Party, a Third Party will have the right to obtain a MIFARE License from the Notifying Party that replicates all of the key commercial terms of any one of the equivalent existing NXP MIFARE licenses.

(1073) The Final Commitments also specify that the existing NXP MIFARE licenses also form the benchmark for the determination of the applicable commercial terms in relation to MIFARE licenses for future versions of MIFARE which are not yet licensed at the time of the Commission's decision.

(1074) The Notifying Party also modified the scope of the MIFARE licence. First, a MIFARE licensee has the right to develop a MIFARE implementation and include or load it on a secure element, but also to have it included or loaded by a Third Party. Second the MIFARE remedy is extended to also include an integrated secure element. Third, MIFARE licensees will also have the right to load remotely the MIFARE implementation on Single Wire Protocol removable SIM/UICC cards, embedded SIM/UICC, as well as the secure environment on an integrated secure element of baseband chipsets and applications processors. Fourth, the Notifying Party removed the reference to the Common Criteria EAL5+ (or higher) standard for upload of MIFARE. Therefore, a MIFARE licensee has the right to develop a MIFARE implementation and include/load it (or have it included/loaded) onto a banking level security industry certified secure element chip or integrated secure element, regardless of the EAL level. Finally, the definition of MIFARE was extended to cover also MIFARE Ultralight.

(1075) With regard to the MIFARE trademark, the definition was amended to cover new trademarks for any other MIFARE version developed by NXP and/or Qualcomm and to any other MIFARE version, which will be developed by NXP and/or Qualcomm while the Final Commitments remain in force.

(1076) With respect to MIFARE4MOBILE, under the Final Commitments, the Notifying Party commits to the following.

(1077) First, the Notifying Party commits to granting a royalty-free license to the M4M trademark to any Third Party which has entered into the M4M standard license agreements with the M4M Group, namely the specification license, non-assertion agreement, and the compliance and robustness rules, and/or any other agreements that may be required from time to time to allow a Third Party to implement M4M. The M4M trademark license shall remain valid for as long as the M4M standard license agreements are effective.

(1078) Second, the Notifying Party commits not to exercise any direct or indirect influence over the independent entity appointed by the M4M Group to conduct compliance certification, including but not limited to, the independent entity's assessment of a

[817] Under the Final Commitments, additional commercial terms may be included at the request of the Monitoring Trustee after consulting with the Commission.

Third Party's M4M implementation of the applicable M4M Group's compliance and robustness rules.

(1079) Finally, the duration of the MIFARE remedy was also extended to 8 years.

8.4.2. Assessment of the Final Commitments

8.4.2.1. Carve-out and non-assert remedies

(1080) In the Final Commitments, the carve-out was amended in order to prevent any sale or transfer of the carved-out patents to an entity related to Qualcomm. It also added remedial measures so as to prevent an increase of royalties for the relevant patents following such a sale.

(1081) First, the Notifying Party commits to procure from NXP that, prior to the Transaction's closing, NXP will grant to all interested parties an irrevocable, non-exclusive, worldwide and royalty-free license (the "Schedule 2 License"[818]) under NXP's NFC SEPs and system-level patents, expressly stating that such a license would encumber these patents in the event of a sale or transfer, which means that they would continue to apply even in the event that NXP or the entity holding assets not purchased by the Notifying Party in the context of the Transaction (the "RemainCo") subsequently divested those patents. The Schedule 2 License will remain in effect for three years.

(1082) In order to ensure the publicity of such a license, the Notifying Party commits to making its terms and conditions available on its documentation and on its website in an easily visible position. The Notifying Party also procures that NXP will do the same.

(1083) Second, the Notifying Party commits not to sell, convey, assign or transfer of the relevant patents to a third party unless the purchaser agrees to be contractually bound to comply with the Schedule 2 License and is independent and unconnected to the Notifying Party. The Notifying Party also commits to procure that NXP will endorse the same obligation.

(1084) Third, the Notifying Party commits to submit the Schedule 2 License as well as the relevant transaction documents to the Commission, for review and approval. On 16 November 2017, the Notifying Party submitted a draft Schedule 2 License and Side Letter Agreement.

(1085) The draft Schedule 2 License terms reflect the Notifying Party's commitments. It mainly provides that:

(1) the license is provided on an irrevocable, worldwide, non-exclusive and royalty-free basis without the provision of any other consideration, for manufacturing, using, selling, offering for sale, importing or otherwise disposing of NFC chips, SE chips, integrated SE, NFC/SE, and/or mobile phones;

(2) the license will be received by any and all Third Parties and customers of any Third Party Customer with automatic effect on the day prior to the Transaction's closing, without any requirement to execute any document or take legal action;

(3) The license will remain in effect for a period of three years.

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[818] The license will cover all patents listed under Schedule 2 to the Notifying Party's commitments.

(1086) Those terms are compatible with the Notifying Party's Final Commitments. They will effectively encumber the carved-out patents with a broad royalty-free license, thus preventing any indirect distortions of competition resulting from an immediate increase of royalties following their sale. Its duration, which reflects that provided for under Qualcomm's commitment, will be sufficient to prevent any risk in the foreseeable future.

(1087) In particular, with respect to non-standard essential patents, the Commission cannot assume that the legitimate exercise of IP rights by their owner after the three-year Schedule 2 License expires would likely result in anticompetitive effects, absent other elements or circumstances justifying such assumption. Therefore, under the present circumstances, the Schedule 2 License's duration is sufficient to ensure that prospective licensees are provided effective access to the relevant patents for a transitional period after the Transaction.

(1088) With respect to SEPs, the Commission notes that the carved-out patents will remain (F)RAND-encumbered under the terms of the NFC Forum Intellectual Property Rights Policy regardless of the identity of their owner, for the life of the patents. Prospective licensees will thus be able to rely on (F)RAND obligations relating to future licensing terms once the three-year transitional period provided for under the present commitments has expired.

(1089) The draft Side Letter Agreement will be included in the relevant transaction agreements should NXP or the RemainCo sell or transfer the relevant NFC patents to a third party purchaser. It provides that the purchaser acknowledges that the patents are encumbered by the Schedule 2 License and contractually agrees to comply with its terms and conditions at all times as long as it remains in effect. It also provides that, in the event of a subsequent sale or transfer of the carved-out NFC patents, any subsequent purchaser will also be subject to the terms and conditions of the Schedule 2 License.

(1090) Those terms reflect the Final Commitments as they will expressly bind any third party purchaser of the carved-out patents to comply with the Schedule 2 License for the entirety of its duration.

(1091) It follows that the terms of the draft Schedule 2 License and Side Letter Agreement comply with the Notifying Party's Final Commitments and can be approved by the Commission.

(1092) The Commission notes that Qualcomm also intends to secure a license under the carved-out patents. Qualcomm's intended terms for that license were communicated to the Commission on 16 November 2017. Under those terms, Qualcomm would benefit from a fully-paid, royalty-free license for the life of the carved-out patents.

(1093) The purpose of this license will be to provide the merged entity with "freedom to operate" post-merger, with rights under patents that used to belong to the NXP business. It will include sublicensing rights to ensure that the future owner of the carved-out patents will not assert them against the merged entity's manufacturers, suppliers or distributors. However, Qualcomm's sublicensing rights will not allow Qualcomm to license or otherwise assert the relevant patents against mobile device OEMs[819].

[819] Notifying Party's 19 November 2017 Response to request of 17 November 2017.

(1094) Given the intended duration of Qualcomm's license, those terms will remain in effect after the termination of the license which third parties will obtain under the same NFC patents under the Final Commitments. Nevertheless, as explained, past this period, NXP's NFC SEPs will remain (F)RAND-encumbered under the terms of the NFC Forum Intellectual Property Rights Policy, thus providing competitors with additional remedies relating to future licensing terms capable of preventing discriminatory licensing terms. As far as non-SEPs are concerned (none of which the Commission is able to qualify as "commercially essential" based on the information available to it), the Commission considers that the Schedule 2 License duration will be sufficient to prevent anticompetitive effects arising in the foreseeable future. Past that period, absent other factors, the Commission cannot assume that prospective licensees will receive discriminatory or otherwise anticompetitive terms in light of the mere fact that Qualcomm itself may benefit from favourable licensing terms at this later point on time.

(1095) With respect to the non-assert remedy, the Notifying Party amended its initial proposal to extend the scope of its non-assert commitment and restrict the scope of the "defensive purposes" exception.

(1096) First, under the Final Commitments, Qualcomm will not assert the NFC patents acquired from NXP against both Third Parties and customers of Third Party Customers. Therefore, the merged entity's competitors, OEMs and OEMs' customers will be able to incorporate in their products NXP's NFC chip and security level patents without needing to obtain any license from Qualcomm or to pay any compensation to that effect. Nevertheless, should third parties request a license to the relevant patents, the Notifying Party commits to granting such a license on a royalty-free basis and without the provision of any other consideration. The scope of the commitment is therefore appropriate.

(1097) Second, the Final Commitments clarify that the Notifying Party may only assert the NFC patents acquired from NXP against third parties bringing proceedings alleging that the Notifying Party infringes their *patents* related to NFC and/or SE technology, thus preventing Qualcomm to assert its patents defensively in proceeding related to other IP. In addition, the Notifying Party clarified that it would not be able to assert NXP's NFC patents in circumstances where, prior to a third party bringing any proceeding, the Notifying Party initiated proceedings against that same third party alleging an infringement of Qualcomm's own pre-merger NFC and/or SE patents. The Notifying Party thus adequately limited the scope of the defensive purpose exception.

8.4.2.2. Interoperability remedy

(1098) The Commission considers that the interoperability remedy, as modified in the Final Commitments, addresses all the shortcomings identified by the Commission following the market test.

(1099) First, the Notifying Party has introduced a specific timeframe for responding to Third Party requests to access interoperability information. Under the Final Commitments, the Notifying Party must provide the interoperability information "*no later than 30 calendar days*" from the Third Party's initial written request. Additionally, a standard NDA for the exchange of interoperability information has been attached to the Final Commitments.

(1100) Therefore, in order to receive the necessary information for ensuring interoperability of its products with those of the merged entity, a Third Party must make a written request and sign a standard NDA, following which Qualcomm must react within 30

calendar days. The Commission considers that this specified timeframe and the standard NDA remove the uncertainty as regards the timeliness of the functioning of the interoperability remedy, given that Qualcomm cannot stall the process with respect to the signing of a confidentiality agreement, and that upon written request, Qualcomm must respond within a 30 day deadline. Moreover, the 30 calendar day window is sufficiently short to ensure that Third Parties can ensure interoperability of its products in a timely manner.

(1101) Second, the Notifying Party has expanded the scope of the interoperability remedy. In this respect, the Final Commitments specify that the same level of interoperability between a Third Party's products and those of the merged entity includes, but is not limited to, "functionality and performance". Moreover, the Final Commitments contain a broader listing of the type of information that a Third Party is entitled to obtain for the purpose of ensuring interoperability, which covers the shortcomings identified by the market test.

(1102) Additionally, the Final Commitments have been amended so that the interoperability remedy also covers a Third Party integrated secure element and application processor. These modifications ensure that interoperability will also be available for those Third Party suppliers that develop an integrated secure element, and for device OEM customers that rely on an application processor.

(1103) The interoperability remedy applies to Third Party Suppliers, defined as "*any actual or potential supplier of Baseband Chipsets and/or Applications Processor and/or NFC Chips, Secure Element Chips, Integrated Secure Elements NFC/SE*". During the market test, certain respondents voiced that the interoperability remedy should be extended to other providers, including providers of SE OS.

(1104) In that regard, the Commission notes that, given the dynamics of cooperation between Qualcomm and NXP and Third Party suppliers, it is not necessary to also extend the interoperability remedy to providers of SE OS. Given that a provider of SE chips (which is a beneficiary of the remedy) can interact with the merged entity for the purpose of ensuring interoperability of the SE chip with the merged entity's products, such SE chip provider will also ensure the correct functioning of the SE OS installed on the SE chip with the relevant products of the merged entity[820]. In this context, the Commission notes that the standard NDA attached to the Final Commitments entitles the requesting Third Party to share and use the relevant interoperability information also with "any third party identified in the Written Request". Therefore, a provider of SE chips may request to the merged entity the necessary interoperability information, including for the purpose of using and sharing it with a SE OS supplier, whose OS must be installed on the SE chip.

(1105) The Final Commitments also do not cover interoperability between the merged entity's products and a third party TEE. However, for the reasons explained in recital (771) and footnote 653 above, concerns related to denial of interoperability by Qualcomm to TEE providers are not merger-specific.

(1106) The Final Commitments also do not concern access to Qualcomm's own TEE for the purpose of interoperability with Third Party NFC and SE products. In that regard, the Commission takes note of the fact that it would not be necessary for an NFC or SE supplier (including a SE OS supplier) to have access to the TEE of Qualcomm's baseband chipsets to ensure the same level of interoperability between a third party

820 See the Notifying Party's response to the Commission's RFI 51, question 12 [DOC ID 3235].

NFC/SE product and the Qualcomm baseband chipset. Moreover, already pre-merger Qualcomm limited third party access to the TEE in its baseband chipset, including to NXP itself[821]. Further, as explained by the Notifying Party, Qualcomm provides some access to its TEE to mobile OEMs – in a binary format, to ensure that security is preserved. Should access become required, the Notifying Party indicated that OEMs would be allowed to share this information with NFC/SE suppliers (including SE OS providers) by being included as subcontractors under Qualcomm's standard agreements with mobile OEMs[822]. The Commission therefore does not consider it necessary that the interoperability remedy included in the Final Commitments cover also the Qualcomm TEE, to the extent that access to such TEE is not required to ensure that a Third Party's NFC and SE products achieve the same level of interoperability as the merged entity's NFC and SE products with the Qualcomm baseband.

(1107) With respect to extending the scope of the interoperability remedy to products beyond "Mobile Phones", the Commission notes that, first, its concerns in relation to interoperability are specific to baseband chipsets and NFC and SE chips for mobile phones. As such, an extension of the interoperability remedy to other products, such as tablets, IoT and wearables, is not warranted or proportionate. With respect to tablets specifically, the Commission notes that, while some respondents to the market test suggested that tablets should also be included within the definition of "Mobile Phones", others indicated that, based on market intelligence information, the presence of NFC and SE on tablets is still limited and is not likely to increase in the near future[823].

(1108) Third, in order to be exempted from the interoperability remedy, Qualcomm must substantiate the "technical characteristics" exception to the Commission, by means of reasoned and documented submission to the Trustee. This mechanism removes the risk that Qualcomm could arbitrarily invoke the technical characteristics of a Third Party's products to derogate from the interoperability remedy, given that Qualcomm must first properly demonstrate the existence of those technical limitations, and submit such demonstration to the Trustee and the Commission. This ensures that the Commission can verify whether Qualcomm's reliance on such exception is properly substantiated.

(1109) Fourth, the Commission considers that the revised language concerning modifications to the merged entity's products that would negatively affect a Third Party's product (see recital (1066)) is sufficiently stringent. Moreover, to the extent Qualcomm would introduce any modifications, it must prove that any negative effect is "*necessary unavoidable consequence of a performance improvement in Qualcomm's products of such magnitude that the negative effect is objectively justified*".

(1110) Under the Final Commitments, the Notifying Party remains exempted from having to ensure interoperability for products at the end of their product life cycle. The Commission considers that this limitation to be proportionate, as it would only concern the Notifying Party's products to the extent that they are exiting the market.

(1111) Finally, under the Final Commitments, the interoperability remedy has a duration of eight years. The Commission considers that this duration is appropriate, as it ensures

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821 See the Notifying Party's response to the Commission's RFI 53, question 6 [DOC ID 3258].

822 See the Notifying Party's response to the Commission's RFI 53, question 6 [DOC ID 3258].

823 See responses to question 23 of Q17 – Market Test.

that Third Parties will be enable to benefit from the interoperability remedy for an amount of time that is more in line with the development, R&D and lifespan of the products concerned. Such an eight-year time period may be shortened, after three years from the closing of the Transaction, following a review by the Commission. The Commission notes that this possibility is subject to the Commission's assessment and discretion, which will include an evaluation of the appropriateness of shortening the remedy.

8.4.2.3. MIFARE remedy

(1112) As explained in Section 8.4.1 above, the main modification to the MIFARE remedy consists in the fact that Qualcomm will make available to Third Parties (subject to the standard NDA to the Final Commitments) the key commercial terms of each equivalent NXP MIFARE Licenses existing at the time of the Commission decision.

(1113) The Commission considers that this process will enable Third Parties to view and ascertain the key commercial terms of existing NXP MIFARE licences, and therefore to make an informed choice and assessment on those key commercial terms for the purpose of obtaining a MIFARE licence under the Final Commitments on commercial terms "*at least as advantageous*" as those of existing NXP MIFARE licences.

(1114) Under the Final Commitments, a Third Party seeking a MIFARE licence will be able, to obtain a MIFARE License from Qualcomm that replicates all of the key commercial terms of any one of the equivalent existing NXP MIFARE licenses. Moreover, a Third Party has the freedom to negotiate a MIFARE licence with Qualcomm on different commercial terms. Given that the Third Party always has the fall-back option to obtain the key commercial terms of any existing NXP MIFARE license, it will only accept different commercial term if they are at least as advantageous as those of existing NXP MIFARE licences.

(1115) Those amendments to the MIFARE remedy thus address the lack of transparency concerning the existing NXP MIFARE licences and ensure that those licences are available to Third Parties, and can be relied upon as benchmark for the purpose of obtaining a MIFARE licence.

(1116) As such, the MIFARE remedy ensures that Third Parties can have access to a MIFARE licence on commercial terms in line with those that were available pre-Transaction.

(1117) As mentioned in recital (580), the Commission recalls that MIFARE is NXP's proprietary technology, and as such was not the subject to any (F)RAND obligations pre-merger. As such, introducing as a remedy a (F)RAND obligation with regard to MIFARE would be disproportionate: guaranteeing access to MIFARE on the basis of commercial terms "at least as advantageous" as those of existing NXP MIFARE licences maintains the pre-merger market situation.

(1118) Additionally, the Final Commitments specify that the existing NXP MIFARE licenses also form the benchmark for the determination of the applicable commercial terms in relation to MIFARE licenses concerning future versions of MIFARE. This ensures that Third Parties would be able to rely on the commercial terms of existing MIFARE licences as a benchmark also in case of future MIFARE products.

(1119) Moreover, the Final Commitments have also modified the definition of "MIFARE licence", as explained in recital (1074). In particular, under the Final Commitments, a Third Party will also have the right to have a MIFARE implementation included or loaded by a Third Party; the MIFARE licence also extends to integrated secure

element; and the reference to the EAL5+ criteria has been removed. The Final Commitments also specify that "MIFARE trademark" extends to future versions of MIFARE, and include MIFARE Ultralight within the definition of MIFARE.

(1120) The Commission considers that these amendments to the terms of the MIFARE licence and to the notion of MIFARE trademark remove the limitations of the MIFARE remedy of the First Commitments, as Third Parties will be granted broader licence rights to use and implement MIFARE, without the limitations existing in the First Commitments explained in recitals (1042) to (1044).

(1121) With respect to MIFARE4MOBILE, the Commission recalls that one of the requirements to obtain a MIFARE4MOBILE licence is securing a MIFARE licence from NXP. In that regard, the Final Commitments ensure that a Third Party can secure such requirement and apply for a MIFARE4MOBILE licence.

(1122) The provisions inserted in the Final Commitments, regarding Qualcomm's involvement in the M4M Group, as illustrated in recitals (1076) to (1078), also remove any risk, as explained in recitals (1049) to (1051) above, that Qualcomm would use NXP's position in the M4M Group to hinder Third Parties from obtaining a MIFARE4MOBILE licence, given that Qualcomm commits to grant the necessary M4M trademark owned by NXP and will not exercise any direct or indirect influence over the independent entity appointed by the M4M Group to conduct compliance certification.

(1123) Some respondents to the market test emphasised that MIFARE4MOBILE should be included among the MIFARE technologies covered by the MIFARE remedy. However, as mentioned in recitals (1045) and (1046) above, the MIFARE4MOBILE technology as such is under the control of the M4M group, which grants licences for use of MIFARE4MOBILE and its trademark to any interested third party that has a MIFARE licence, agrees to the relevant licensing agreements, and successfully undergoes the MIFARE4MOBILE certification process. Therefore, given that the MIFARE remedy ensures that Third Parties can obtain a MIFARE licence, and that Qualcomm will agree to granting the relevant MIFARE4MOBILE trademark licence and not interfere with the certification process of the M4M Group, those provisions are sufficient to ensure that Third Parties can access MIFARE4MOBILE, without it being necessary that MIFARE4MOBILE as such is included under the Final Commitments.

(1124) Respondents to the market test also commented that the MIFARE remedy should also cover products other than Mobile Phones, such as IoT and wearables. In that regard, the Commission notes that the findings of its in-depth investigation in relation to the increase in MIFARE royalties and mixed bundling are specific to mobile transit services implemented on mobile devices such as smartphones. Therefore, given that the MIFARE remedy covers mobile phones, such scope is appropriate to address the identified competition concerns.

(1125) Finally, the Commission notes that under the Final Commitments the MIFARE remedy's duration has been extended to eight years. The Commission considers that such duration is appropriate, as it is sufficiently long to ensure that Third Parties have enough time to justify incurring the time and cost investments necessary to develop, certify and exploit MIFARE-enabled SE products.

8.4.2.4. Conclusion

(1126) In light of the above considerations, the Commission considers that the carve-out, non-assert, interoperability and MIFARE remedy, as modified by the Final Commitments, address the shortcomings identified by the Commission in the First

Commitments, and as such are capable of entirely removing the competition concerns raised by the Transaction with respect to the mixed bundling of LTE baseband chipsets, NFC and SE chips and MIFARE, the degradation of interoperability, and the licensing of IP rights related to NFC technology.

8.5. Conclusion

(1127) The Commission considers that the Final Commitments submitted by the Notifying Party are capable of entirely removing the competition concerns raised by the Transaction with respect to the conduct of licensing at higher royalties (or refusing to license) MIFARE (performed on top of mixed bundling), to the conduct of degradation of interoperability, and to the licensing of IP rights related to NFC technology.

9. CONDITIONS AND OBLIGATIONS

(1128) Pursuant to the second subparagraph of Article 8(2) of the Merger Regulation, the Commission may attach to its decision conditions and obligations intended to ensure that the undertakings concerned comply with the commitments they have entered into vis-à-vis the Commission with a view to rendering the concentration compatible with the internal market.

(1129) The fulfilment of a measure that gives rise to a structural change of the market is a condition, whereas the implementing steps which are necessary to achieve that result are generally obligations on the parties. Where a condition is not fulfilled, the Commission's decision declaring the concentration compatible with the internal market is no longer applicable. Where the undertakings concerned commit a breach of an obligation, the Commission may revoke the clearance decision in accordance with Article 8(6)(b) of the Merger Regulation. The undertakings concerned may also be subject to fines and periodic penalty payments under Articles 14(2) and 15(1) of the Merger Regulation.

(1130) In accordance with the basic distinction described in recital (1128) as regards conditions and obligations, in the present case, the carve-out remedy in Section B, the non-assert remedy in Section C, and the MIFARE remedy in Section E of the Final Commitments submitted by the Notifying Party should be conditions within the meaning of Article 8(2) of the Merger Regulation. The remaining sections of the Final Commitments submitted by the Notifying Party should be obligations within the meaning of Article 8(2) of the Merger Regulation. The full text of the commitments is attached as Annex 1 to this Decision and forms an integral part thereof.

HAS ADOPTED THIS DECISION:

Article 1

The notified concentration whereby Qualcomm Incorporated acquires sole control of NXP Semiconductors N.V. within the meaning of Article 3(1)(b) of Regulation (EC) No 139/2004 is hereby declared compatible with the internal market and the EEA Agreement.

Article 2

Article 1 is subject to the conditions set out in Sections B, C and E of Annex 1.

Article 3

Qualcomm Incorporated shall comply with the obligations set out in Sections A, D, F, G and H of Annex 1.

Article 4

This Decision is addressed to:

Qualcomm Incorporated
5775 Morehouse Dr. San Diego, CA 92121
USA

Done at Brussels, 18.1.2018

For the Commission

(Signed)

Margrethe VESTAGER
Member of the Commission

ANNEX 1

Case COMP/M.8306 – QUALCOMM / NXP

COMMITMENTS TO THE EUROPEAN COMMISSION

1. Pursuant to Articles 8(2) and 10(2) of Council Regulation (EC) No 139/2004 (the "Merger Regulation"), Qualcomm Incorporated ("Qualcomm") hereby enters into the following Commitments (the "Commitments") vis-à-vis the European Commission (the "Commission") with a view to rendering the proposed acquisition of NXP Semiconductors N.V. ("NXP") by Qualcomm (the "Concentration") (jointly referred to as the "Parties") compatible with the internal market and the functioning of the EEA Agreement.

2. This text shall be interpreted in light of the Commission's decision pursuant to Article 8(2) of the Merger Regulation to declare the Concentration compatible with the internal market and the functioning of the EEA Agreement (the "Decision"), in the general framework of European Union law, in particular in light of the Merger Regulation, and by reference to the Commission Notice on remedies acceptable under Council Regulation (EC) No 139/2004 and under Commission Regulation (EC) No 802/2004 (the "Remedies Notice").

A. DEFINITIONS

3. For the purpose of the Commitments, the following terms shall have the following meaning:

Affiliated Undertakings: undertakings controlled by the Parties and/or by the ultimate parents of the Parties, whereby the notion of control shall be interpreted pursuant to Article 3 of the Merger Regulation and in light of the Commission Consolidated Jurisdictional Notice under Council Regulation (EC) No 139/2004 on the control of concentrations between undertakings (the "Consolidated Jurisdictional Notice").

Applications Processor: means a processor supporting applications and/or the operating system of a Mobile Phone, including any other components in the same silicon die. An Applications Processor may include an Integrated Secure Element.

Baseband Chipset: means a combination of chips typically comprising a cellular baseband modem that may include an Applications Processor in the same silicon die, a Radio Frequency Chip, and a Power Management Integrated Circuit.

Closing Date: means the Closing Date as defined in the Purchase Agreement.

Conflict of Interest: any conflict of interest that impairs the Trustee's objectivity and independence in discharging its duties under the Commitments.

Defensive Purposes: means in the event that a Third Party brings any proceeding against: (a) Qualcomm; (b) any Qualcomm customer; and/or (c) any Qualcomm supplier, including any semiconductor fabrication plant, in relation to the implementation of NFC and/or Secure Element Technology in any NXP Products, alleging that their manufacture, use, sale, offer for sale, importation and/or other disposition infringes any of the Third Party's patents related to NFC and/or SE technology. The Defensive Purposes exception does not apply in circumstances

where prior to the Third Party bringing any proceedings, Qualcomm initiated proceedings against that same Third Party in relation to the implementation of NFC and/or Secure Element Technology alleging that in relation to the Third Party's products, the manufacture, use, sale, offer for sale, importation and/or other disposition infringes Qualcomm's and/or its Affiliated Undertakings' patents related to NFC and/or SE technology that Qualcomm's and/or its Affiliated Undertakings holds prior to the Effective Date.

Effective Date: the date of adoption of the Decision.

Integrated Secure Element: the portion of a Baseband Chipset or an Applications Processor that is compliant with a certified Secure Element Technology whereby such portion is an integral part of the Baseband Chipset or Applications Processor, and whereby such Baseband Chipset or Applications Processor is used in combination with an NFC Chip.

Intellectual Property Rights: means patents, utility models, copyrights, trade secrets, mask work rights and any other form of intellectual property right protection afforded under applicable laws.

Interoperability: means the interaction of products to enable the products to work together such that each product fully achieves the purposes for which it was designed. For the purpose of these Commitments, Interoperability refers to the possibility of Qualcomm Baseband Chipsets or NXP Products, as applicable, to interact, including by successfully and reliably exchanging information and mutually using the information that has been successfully and reliably exchanged to enable a useful and fully-functional combined system with the Third Party's NFC Chips, Secure Element Chips, or NFC/SE, Applications Processor, or Baseband Chipset.

Interoperability Information: means the information and data required to enable Third Parties NFC Chips, Secure Element Chips, NFC/SE, Applications Processors, or Baseband Chipsets as applicable, to achieve Interoperability with a Qualcomm Baseband Chipset or an NXP Product, such as where necessary hardware specifications including wave-tables and electrical characteristics of the interfaces, software protocol specifications, including protocol and command details of the interfaces, driver software for the interfaces, power supply concept description, documentation describing interoperability testing, description of the software accessing the Secure Element Chip, including protocol and command details.

MIFARE: contactless security technology platform owned by NXP. For avoidance of doubt, MIFARE includes MIFARE Classic, MIFARE Plus, MIFARE DESFire, MIFARE Ultralight, any other MIFARE version developed by NXP and/or Qualcomm and any other MIFARE version, which will be developed by NXP and/or Qualcomm while these Commitments remain in force.

MIFARE Implementation: means that specific hardware and/or software part of a Secure Element Chip or Integrated Secure Element that is compliant with the MIFARE Licensed Materials.

MIFARE IP Rights: any patent, copyright, know-how and other IP rights owned or controlled by NXP and/or its Affiliated Undertakings that are necessarily infringed by a MIFARE Implementation other than the MIFARE Trademark.

MIFARE License: in accordance with NXP's past practice, a non-exclusive and non-transferable worldwide license, without any right to sublicense, for Mobile Phones, under the MIFARE IP Rights, to use the MIFARE Licensed Materials to develop a MIFARE Implementation and include and/or load it (or have it included or loaded by a Third Party) into a banking level security industry certified Secure Element Chip or Integrated Secure Element, and sell such MIFARE Implementation as being included with the Secure Element Chip or the Integrated Secure Element Chip. In accordance with past practice, the licensee shall also be able to load remotely the MIFARE implementation on Single Wire Protocol removable SIM/UICC cards, embedded SIM/UICC, as well as the secure environment on an Integrated Secure Element of Baseband Chipsets and Applications Processors.

MIFARE Licensed Materials: the specifications, requirements, documentations and other materials specifying functionalities, key elements and requirements for a MIFARE Implementation.

MIFARE Trademark: means MIFARE related trademarks, including but not limited to MIFARE, MIFARE DESFire, MIFARE Plus, MIFARE Ultralight, and MIFARE Classic, as well as new trademarks for any other MIFARE version developed by NXP and/or Qualcomm and to any other MIFARE version, which will be developed by NXP and/or Qualcomm while these Commitments remain in force.[1]

MIFARE4MOBILE ("M4M"): means the technology optionally used to manage MIFARE-based services in NFC mobile devices, consisting of the single, interoperable application programming interface which sits above a MIFARE Implementation and eases the management of the MIFARE-based applications and services in an interoperable way in secure elements of NFC devices.

M4M Group: means the industry group, currently composed of NXP, STMicroelectronics, Gemalto, Oberthur Technologies, and Giesecke & Devrient, for the development of M4M interface specification, trademark rules (including the trademark "MIFARE4Mobile"), and the M4M compliance and robustness rules.

Mobile Phone: a hand-held mobile device with access to a cellular radio network that can be used without a physical connection to a network over a wide area to initiate or receive cellular telecommunication transmissions and which includes a Baseband Chipset. For the avoidance of doubt, Mobile Phones comprise any handheld mobile device with the above characteristics, including legacy mobile phones, smartphones, and phablets.

Monitoring Trustee: one or more natural or legal person(s) who is/are approved by the Commission and appointed by Qualcomm, and who has/have the duty to monitor Qualcomm's compliance with the obligations attached to this Decision.

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[1] See the MIFARE Branding and Trademark Guidelines *available at* https://www mifare.net/wp-content/uploads/2015/04/MIFARE-Branding-and-Trademark-Guidelines-Basic-Elements-January-2016.pdf. MIFARE Trademarks shall be used according to the MIFARE Trademark Usage Guidelines *available at* https://www mifare.net/wp-content/uploads/2015/04/MIFARE-Trademark-and-Branding-Usage-Guidelines-rev.4.5_Apr2016_English.pdf.

Near Field Communication ("NFC"): circuitry and software which provides wireless communication functionality and generally operates in a frequency range of 13.56MHz +/- 7kHz and at a distance of less than ten centimetres in accordance with established NFC-related standards and future generations thereof. For the avoidance of doubt, NFC is distinct from other wireless connectivity standards such as Bluetooth (including Bluetooth Low Energy), Near Field Magnetic Induction, Wi-Fi and cellular connectivity standards (such as W-CDMA/UMTS and LTE).

NFC/SE: an integrated circuit in a single die or stacked silicon dies that supports NFC technology, and a microcontroller performing the functions of a Secure Element Chip for use in Mobile Phones.

NFC Chip: a standalone radio chip that supports the NFC wireless communications standards for use in Mobile Phones.

NXP NFC Patents: means the NXP Patents listed in Schedule 1, including all reissues, divisions, continuations, continuations-in-part, extensions and re-examinations of those Patents.

NXP Products: means NXP's NFC Chips and NFC/SE that are currently commercially available and/or any future NFC Chip, Secure Element Chip (including Integrated Secure Element), or NFC/SE that Qualcomm and/or NXP and/or their Affiliated Undertakings may commercialise for use in Mobile Phones while these Commitments remain in force.

Patent: a government authority of licence conferring a right or title for a set period, especially the sole right to exclude others from making, using or selling an invention. Patents refers to all national and multinational patents, patent registrations, patent applications, provisional patent applications, utility models and petty patents, whether published or unpublished, including all reissues, divisions, continuations, continuations-in-part, extensions and re-examinations of any of the foregoing, and all rights therein provided by multinational treaties or conventions and all improvements to the inventions disclosed in each such registration, patent or application.

Power Management Integrated Circuit: a chip which optimizes power consumption across a Mobile Phone.

Purchase Agreement: the Purchase Agreement dated as of October 27, 2016 by and between NXP and Qualcomm.

Qualcomm Baseband Chipset: any Baseband Chipset that is currently commercially available from Qualcomm and/or its Affiliated Undertakings and/or any future Baseband Chipset that Qualcomm and/or its Affiliated Undertakings may commercialise for use in Mobile Phones while these Commitments remain in force.

Radio Frequency Chip: a chip that transmits and receives radio signals utilizing one or more frequencies.

Schedule 1: Schedule 1 to these Commitments.

Schedule 2: Schedule 2 to these Commitments.

Schedule 3: Schedule 3 to these Commitments.

Secure Element Chip: a standalone tamper-resistant microcontroller chip that is used in combination with an NFC Chip and that includes a dedicated security hardened processing core for use in Mobile Phones. A secure element chip includes a secure operating system that manages the functionality of such a microcontroller.

Secure Element Operating System: means a secure operating system that manages the functionality of a microcontroller performing the functions of a Secure Element Chip for use in Mobile Phones.

Secure Element Technology: means the technology of the security measures of a Secure Element Chip or of an Integrated Secure Element.

Third Party: means any of either Third Party Customers or Third Party Suppliers.

Third Party Customer: means any actual or potential supplier of Mobile Phones that incorporate Baseband Chipsets and/or NFC Chips, Secure Element Chips, or NFC/SE.

Third Party Supplier: means any actual or potential supplier of Baseband Chipsets and/or Applications Processor and/or NFC Chips, Secure Element Chips, Integrated Secure Elements, NFC/SE or, solely for the purposes of paragraph 14, Secure Element Operating Systems.

In these Commitments, words importing the singular number include the plural and vice versa.

B. EXCLUSION OF PATENTS LISTED IN SCHEDULE 2 FROM THE PROPOSED TRANSACTION AND LICENSE

4. Qualcomm undertakes not to acquire the Patents listed in Schedule 2.

5. In addition, Qualcomm shall also procure from NXP that NXP will grant, an irrevocable, non-exclusive license under the Patents listed in Schedule 2 to any and all Third Parties and customers of any Third Party Customer, on a worldwide basis, for manufacturing, using, selling, offering for sale, importing or otherwise disposing of NFC Chips, Secure Element Chips, Integrated Secure Element, NFC/SE, and/or Mobile Phones (the "Schedule 2 License"), prior to the Closing Date, with the following terms:

   (a) The Schedule 2 License will be granted prior to the Closing Date and continue until automatically terminated upon the date that is three (3) years from the Closing Date;

   (b) The Schedule 2 License will be granted on a standalone, worldwide and royalty-free basis and without the provision by the licensee of any other consideration (e.g. cross licensing, grant-back, and non-assertion); and

   (c) The Schedule 2 License shall expressly state that the rights granted thereunder survive the assignment of any or all of the Patents in Schedule 2.

   Qualcomm shall, and Qualcomm shall procure from NXP that NXP or its Affiliated Undertakings will, make the terms and conditions of the license granted pursuant to paragraph 5

of these Commitments publicly available and advertised in the Parties' respective documentation and on their websites in an easily visible position.

6. Qualcomm shall not, and Qualcomm shall procure from NXP or its Affiliated Undertakings prior to the Closing Date that they shall not, sell, convey, assign, and/or transfer the Patents listed in Schedule 2 to any third party unless that third party:

   (a) agrees to be contractually bound to comply with the commitments made by Qualcomm in paragraph 5 of these Commitments; and

   (b) is independent of, and unconnected to, Qualcomm and its Affiliated Undertakings (this being assessed having regard to the situation following any sale, conveyance, assignment, and/or transfer of the Patents listed in Schedule 2 to any party).

7. Qualcomm shall procure from NXP and/or its Affiliated Undertakings that prior to closing any transaction selling, conveying, assigning, and/or transferring the Patents listed in Schedule 2 to any third party, NXP and/or its Affiliated Undertakings shall provide to the Commission a copy of: (a) the relevant transaction documents that acknowledge that the Patents listed in Schedule 2 are subject to the Schedule 2 License; and (b) the Schedule 2 License. The Commission shall verify and approve that these documents comply with the commitments made by Qualcomm in paragraph 5 of these Commitments prior to the closing of the transaction selling, conveying, assigning, and/or transferring the Patents listed in Schedule 2.

8. In order to maintain the structural effect of the Commitments, for a period of ten (10) years after the Closing Date, Qualcomm commits not to acquire, whether directly or indirectly, the whole or part of the Patents listed in Schedule 2 unless, following the submission to the Monitoring Trustee of a reasoned request from Qualcomm showing good cause and accompanied by a report from the Monitoring Trustee, the Commission finds that the structure of the market has changed to such an extent that the absence of direct or indirect ownership of the Patents listed in Schedule 2 is no longer necessary to render the proposed concentration compatible with the internal market.

C. NON-ASSERTION OF THE NXP NFC PATENTS

9. As long as Qualcomm owns the NXP NFC Patents, Qualcomm and its Affiliated Undertakings commit that from the Closing Date it will not assert (e.g. litigate or bring enforcement proceedings or threaten to litigate or to bring enforcement proceedings) the NXP NFC Patents against any Third Party or a customer of a Third Party Customer, on a worldwide basis, for manufacturing, using, selling, offering for sale, importing or otherwise disposing of NFC Chips, Secure Element Chips, Integrated Secure Element, NFC/SE, and/or Mobile Phones, except for Defensive Purposes. If, during the period in which Qualcomm owns the NXP NFC Patents, a Third Party requests in writing for Qualcomm or its Affiliated Undertakings to grant a license under the NXP NFC Patents for that Third Party to manufacture, use, sell, offer for sale, import or otherwise dispose of NFC Chips, Secure Element Chips, Integrated Secure Element, NFC/SE, and/or Mobile Phones, Qualcomm or its Affiliated Undertakings will grant such license on a stand-alone worldwide and royalty free basis and without the provision by that Third Party of any other consideration (e.g. cross licensing, grant-back, and non-assertion), subject to its termination by Qualcomm for Defensive Purposes.

D. INTEROPERABILITY COMMITMENT

10. Qualcomm also undertakes that from the Closing Date, on a worldwide basis and for a period of eight (8) years thereafter Qualcomm shall ensure the same level of Interoperability, including, but not limited to, functionality and performance, between: (a) Qualcomm Baseband Chipsets and NXP Products, and the Third Party's NFC Chips, Secure Element Chips, Integrated Secure Element or NFC/SE or Secure Element Technology; and (b) NXP Products and the Third Party's Baseband Chipset or Applications Processor as will exist at any point in time between Qualcomm's Baseband Chipsets and NXP's Products, unless Qualcomm demonstrates to the Commission by means of a reasoned and documented submission to the Trustee that there are technical characteristics of the Third Party's products that do not allow Qualcomm to achieve the same level of Interoperability, such as generational differences between Qualcomm's and the Third Party's respective chips.

11. Qualcomm shall take all the steps that are necessary and/or reasonably requested by a Third Party to achieve the Interoperability as described in paragraph 10 above, including but not limited to the following:

(a) Upon written request, Qualcomm shall, no later than 30 calendar days from such written request, without charge or any form of consideration, and without any other conditions:

(i) Provide a Third Party Supplier with the necessary information, documentation, commands and support to enable host interface connections to pair NFC Chips, Secure Element Chips, or NFC/SE to Qualcomm Applications Processor and Baseband Chipsets or NXP Products, including but not limited to Single Wire Protocol ("SWP"), Serial Peripheral Interface ("SPI"), I^2C interfaces, and any applicable device drivers. Qualcomm shall also provide timely support, without charge, for bug fixes related to Interoperability. Qualcomm shall also provide Third Party Suppliers of NFC Chips, Secure Element Chips, or NFC/SE in a timely fashion the necessary feedback and technical guidance.

(ii) Provide a Third Party Supplier with the necessary information, documentation, commands and support to enable host interface connections to pair the Third Party's Baseband Chipsets or Applications Processor to NXP Products, including but not limited to SPI or I^2C interfaces and any applicable device drivers. Qualcomm shall also provide timely support, without charge, for bug fixes related to related to Interoperability. Qualcomm shall also provide Third Party Suppliers of Baseband Chipsets and Applications Processor in a timely fashion the necessary feedback and technical guidance; and

(iii) Disclose to Third Parties Interoperability Information without undue delay.

Points (i) to (iii) immediately above also apply in the event that Qualcomm integrates in the same silicon of the Qualcomm Baseband Chipset, partly or fully, the functionalities of NFC Chips and/or Secure Element Chips. For the avoidance of doubt, Qualcomm shall not be obliged to provide confidential information specific to a Third Party if such disclosure would violate an existing confidentiality obligation between Qualcomm and another Third Party.

(b) Prior to any disclosure of Interoperability Information to a Third Party, such Third Party shall enter into an agreement with Qualcomm as regards confidentiality in the form attached as Schedule 3.

(c) If Qualcomm integrates in the same silicon of the Qualcomm Baseband Chipset, partly or fully, the functionalities of NFC Chips and/or Secure Element Chips, it shall disclose technological means by which such functionalities may be disabled so that they do not interfere with NFC Chips, Secure Element Chip, NFC/SE or Integrated Secure Elements provided by a Third Party. Nothing herein shall prevent Qualcomm from engineering or designing Qualcomm Applications Processor or Baseband Chipsets that integrate in the same silicon the functionalities of NFC Chips and Secure Element Chips.

(d) Qualcomm shall refrain from implementing any features or functions (including but not limited to interface technologies) to the merged entity's existing or future Baseband Chipsets, NFC Chips, Secure Element Chips, Integrated Secure Element or Secure Element Technology and/or NFC/SE or to the way in which those chips Interoperate with the Third Party's Baseband Chipsets, Applications Processor, NFC Chips, Secure Element Chips, Integrated Secure Element or Secure Element Technology or NFC/SE in a way that is designed to negatively affect the performance of the Third Party's Baseband Chipsets, NFC Chips, Secure Element Chips, or NFC/SE unless Qualcomm demonstrates that the negative effect is a necessary unavoidable consequence of a performance improvement in Qualcomm's products of such magnitude that the negative effect is objectively justified.

(e) Qualcomm shall provide Third Party Customers with at least the same level of support for bug fixes regarding the Interoperability of Third Party Suppliers' Baseband Chipsets, Applications Processors, and/or NFC Chips, Secure Element Chips, or NFC/SE or Secure Element Technology as for the Interoperability of Qualcomm Baseband Chipsets and NXP Products.

12. Qualcomm's obligations under this Commitment: (a) are subject to the Third Party providing to Qualcomm all required information to undertake bug fixes, workarounds or to provide Interoperability Information, including technical clarifications and assistance under the same conditions as Qualcomm; and (b) do not apply to Qualcomm Baseband Chipsets and NXP Products that are at the end of their product life cycle and to Qualcomm Baseband Chipsets that have not been designed to interoperate with NFC Chips, Secure Element Chips, or NFC/SE.

13. Contact details for the provision of Interoperability Information pursuant to this Commitment shall be advertised in Qualcomm's documentation and on its website in an easily visible position.

E. MIFARE LICENSE

14. Qualcomm undertakes that from the Closing Date and for a period of eight (8) years thereafter, Qualcomm will, upon written request by any Third Party, grant any such Third Party a non-exclusive MIFARE License also involving the use of MIFARE Trademarks on commercial terms (including with regard to the fee, scope and duration of the license) which are at least as

advantageous as those offered by NXP in existing MIFARE Licenses on the Effective Date. Qualcomm commits to offer to MIFARE Licensees, on commercially reasonable and non-discriminatory terms, the extension of the MIFARE Licenses for MIFARE Implementation in an Integrated Secure Element.

15. In order to implement paragraph 14 Qualcomm shall make available to Third Parties (subject to the terms of the confidentiality agreement attached as Schedule 3 to these Commitments) the key commercial terms of each equivalent NXP MIFARE Licenses existing on the Effective Date. Such key commercial terms shall include product and geographic scope, field of use of the license, duration, and consideration. Additional terms may be included at the request of the Monitoring Trustee after consulting with the Commission.

16. Without prejudice to any Third Party's ability to obtain a MIFARE License from Qualcomm at different commercially negotiated contractual terms, any Third Party shall have the right to obtain a MIFARE License from Qualcomm that replicates all of the key commercial terms of any one of the equivalent NXP MIFARE Licenses that exist on the Effective Date. Such commercial terms shall be at least as advantageous as those offered by NXP in existing equivalent MIFARE Licenses on the Effective Date.

17. The existing NXP MIFARE Licenses as of the Effective Date shall also form the benchmark for the determination of the applicable commercial terms in relation to MIFARE Licenses concerning future versions of MIFARE which are not yet licensed as of the Effective Date.

18. As of the Closing Date, Qualcomm commits:

    (a) to grant a royalty-free license to the M4M trademark to any Third Party which has entered into the M4M standard license agreements with the M4M Group, namely the specification license, non-assertion agreement, and the compliance and robustness rules, and/or any other agreements that may be required from time to time to allow a Third Party to implement M4M. The M4M trademark license shall remain valid for as long as the M4M standard license agreements are effective; and

    (b) not to exercise any direct or indirect influence over the independent entity appointed by the M4M Group to conduct compliance certification, including but not limited to, the independent entity's assessment of a Third Party's M4M implementation of the applicable M4M Group's compliance and robustness rules.

F. TRUSTEE

I. APPOINTMENT PROCEDURE

19. Qualcomm shall appoint a Monitoring Trustee to carry out the functions specified in these Commitments for a Monitoring Trustee. Qualcomm commits not to close the Concentration before the appointment of a Monitoring Trustee.

20. The Trustee shall:

    (a) at the time of appointment, be independent of the Qualcomm and its Affiliated Undertakings;

(b) possess the necessary qualifications to carry out its mandate; and

(c) neither have nor become exposed to a Conflict of Interest.

21. The Trustee shall be remunerated by Qualcomm in a way that does not impede the independent and effective fulfilment of its mandate.

Proposal by Qualcomm

22. No later than two weeks after the Effective Date, Qualcomm shall submit the name or names of one or more natural or legal persons whom Qualcomm proposes to appoint as the Monitoring Trustee to the Commission for approval. The proposal shall contain sufficient information for the Commission to verify that the person or persons proposed as Trustee fulfil the requirements set out in paragraph 18 and shall include:

(a) the full terms of the proposed mandate, which shall include all provisions necessary to enable the Trustee to fulfil its duties under the Commitments; and

(b) the outline of a work plan which describes how the Trustee intends to carry out its assigned tasks.

Approval or rejection by the Commission

23. The Commission shall have the discretion to approve or reject the proposed Trustee(s) and to approve the proposed mandate subject to any modifications it deems necessary for the Trustee to fulfil its obligations. If only one name is approved, Qualcomm shall appoint or cause to be appointed the person or persons concerned as Trustee, in accordance with the mandate approved by the Commission. If more than one name is approved, Qualcomm shall be free to choose the Trustee to be appointed from among the names approved. The Trustee shall be appointed within one week of the Commission's approval, in accordance with the mandate approved by the Commission.

New proposal by Qualcomm

24. If all the proposed Trustees are rejected, Qualcomm shall submit the names of at least two more natural or legal persons within one week of being informed of the rejection, in accordance with paragraphs 19 and 22 of the Commitments.

Trustee nominated by the Commission

25. If all further proposed Trustees are rejected by the Commission, the Commission shall nominate a Trustee, whom Qualcomm shall appoint, or cause to be appointed, in accordance with a trustee mandate approved by the Commission.

II. Functions of the Trustee

26. The Trustee shall assume its specified duties and obligations in order to ensure compliance with the Commitments. The Commission may, on its own initiative or at the request of the Trustee or Qualcomm, give any orders or instructions to the Trustee in order to ensure compliance with the conditions and obligations attached to the Decision.

Duties and obligations of the Monitoring Trustee

27. The Monitoring Trustee shall:

(a) propose in its first report to the Commission a detailed work plan describing how it intends to monitor compliance with the obligations and conditions attached to the Decision;

(b) monitor compliance by Qualcomm with the conditions and obligations attached to the Decision;

(c) propose to Qualcomm such measures as the Monitoring Trustee considers necessary to ensure Qualcomm's compliance with the conditions and obligations attached to the Decision;

(d) act as a contact point for any requests by third parties, in relation to the Commitments;

(e) provide to the Commission, sending Qualcomm a non-confidential copy at the same time, a written report within fifteen (15) working days after the end of every quarter of the Effective Date for the first five (5) years and every six (6) months thereafter, so that the Commission can assess whether the commitments are being correctly implemented;

(f) promptly report in writing to the Commission, sending Qualcomm a non-confidential copy at the same time, if it concludes on reasonable grounds that Qualcomm is failing to comply with the Commitments; and

(g) assume the other functions assigned to the Monitoring Trustee under the conditions and obligations attached to the Decision.

III. Duties and obligations of the Parties

28. Qualcomm shall provide and shall cause its advisors to provide the Trustee with all such cooperation, assistance and information as the Trustee may reasonably require to perform its tasks. The Trustee shall have full and complete access to Qualcomm's books, records, documents, management or other personnel, facilities, sites and technical information necessary for fulfilling its duties under the Commitments and Qualcomm shall provide the Trustee upon request with copies of any document. Qualcomm shall make available to the Trustee one or more offices on their premises and shall be available for meetings in order to provide the Trustee with all information necessary for the performance of its tasks.

29. Qualcomm shall provide the Monitoring Trustee with all managerial and administrative support that it may reasonably request to monitor the Commitments.

30. Qualcomm shall provide the Monitoring Trustee with copies of all agreements entered into under these Commitments promptly following the execution thereof, in each case subject to the Monitoring Trustee's obligations of professional secrecy.

31. Qualcomm shall indemnify the Trustee and its employees and agents (each an "Indemnified Party") and hold each Indemnified Party harmless against, and hereby agrees that an Indemnified Party shall have no liability to Qualcomm for, any liabilities arising out of the

performance of the Trustee's duties under the Commitments, except to the extent that such liabilities result from the wilful default, recklessness, gross negligence or bad faith of the Trustee, its employees, agents or advisors.

32. At the expense of Qualcomm, the Trustee may appoint advisors (in particular for legal advice), subject to Qualcomm's approval (this approval not to be unreasonably withheld or delayed) if the Trustee considers the appointment of such advisors necessary or appropriate for the performance of its duties and obligations under the mandate, provided that any fees and other expenses incurred by the Trustee are reasonable. Should Qualcomm refuse to approve the advisors proposed by the Trustee the Commission may approve the appointment of such advisors instead, after having heard Qualcomm. Only the Trustee shall be entitled to issue instructions to the advisors. Paragraph 28 of these Commitments shall apply *mutatis mutandis*.

33. Qualcomm agrees that the Commission may share confidential information proprietary to Qualcomm with the Trustee. The Trustee shall not disclose such information and the principles contained in Articles 17(1) and (2) of the Merger Regulation apply *mutatis mutandis*.

34. Qualcomm agrees that the contact details of the Monitoring Trustee are published on the website of the Commission's Directorate-General for Competition and they shall inform interested third parties, in particular any potential purchasers, of the identity and the tasks of the Monitoring Trustee.

35. For a period of ten (10) years from the Effective Date the Commission may request all information from the Parties that is reasonably necessary to monitor the effective implementation of these Commitments.

IV. Replacement, discharge and reappointment of the Trustee

36. If the Trustee ceases to perform its functions under the Commitment or for any other good cause, including the exposure of the Trustee to a Conflict of Interest:

    (a) the Commission may, after hearing the Trustee and Qualcomm, require Qualcomm to replace the Trustee; or

    (b) Qualcomm may, with the prior approval of the Commission, replace the Trustee.

37. If the Trustee is removed according to paragraph 36 of the Commitments, the Trustee may be required to continue in its function until a new Trustee is in place to whom the Trustee has effected a full hand over of all relevant information. The new Trustee shall be appointed in accordance with the procedure referred to in paragraphs 19-25 of the Commitments.

38. Unless removed according to paragraph 36 of the Commitments, the Trustee shall cease to act as Trustee only after the Commission has discharged it from its duties after all the Commitments with which the Trustee has been entrusted have been implemented. However, the Commission may at any time require the reappointment of the Monitoring Trustee if it subsequently appears that the relevant remedies might not have been fully and properly implemented.

G. FAST TRACK DISPUTE RESOLUTION

39. In the event that a Third Party, showing a sufficient legitimate interest (the "***Requesting Party***"), claims that Qualcomm and/or its Affiliated Undertakings is failing to comply with its obligations arising from these Commitments, the fast track dispute resolution procedure as described herein shall apply.

40. The Requesting Party shall notify Qualcomm and the Monitoring Trustee of its request and specify the reasons why it believes that Qualcomm is failing to comply with the Commitments. The Requesting Party and Qualcomm shall use their best efforts to resolve all differences of opinion and to settle all disputes that may arise through co-operation and consultation within a reasonable period of time not to exceed fifteen (15) working days after receipt of the request.

41. The Monitoring Trustee shall present its own proposal for resolving the dispute within eight (8) working days to Qualcomm, the Requesting Party and the Commission, specifying in writing the action, if any, to be taken by Qualcomm or Affiliated Undertakings in order to ensure compliance with the Commitments vis-à-vis the Requesting Party, and be prepared, if requested, to facilitate the settlement of the dispute.

42. Should Qualcomm and the Requesting Party fail to resolve their differences of opinion through cooperation and consultation, the Requesting Party may initiate the arbitration process described below. The arbitration process shall be used only to resolve disputes regarding compliance with the Commitments.

43. To initiate the arbitration process, the Requesting Party shall serve a notice (the "Notice"), in the sense of a request for arbitration, to the International Chamber of Commerce ("ICC", hereinafter the "Arbitral Institution"), with a copy of such Notice and request for arbitration to Qualcomm. The arbitrators shall have experience and expertise in the area of intellectual property, information and communications technology, and semiconductors.

44. The Notice shall set out in detail the dispute, difference or claim (the "Dispute") and shall contain, *inter alia*, all issues of both fact and law, including any suggestions as to the procedure, and all documents relied upon shall be attached, e.g. documents, agreements, expert reports, and witness statements. The Notice shall also contain a detailed description of what is required of Qualcomm to resolve the dispute.

45. Qualcomm shall, within 20 (twenty) calendar days from receipt of the Notice, submit its response (the "Response"). The Response shall provide detailed reasons for its conduct and set out, *inter alia*, all issues of both fact and law, including any suggestions as to the procedure, and all documents relied upon, e.g. documents, agreements, expert reports, and witness statements. The Response shall, if appropriate, contain a detailed description of the action that Qualcomm proposes to undertake vis-à-vis the Requesting Party.

46. The Arbitral Tribunal shall consist of three persons. The Requesting Party shall nominate its arbitrator in the Notice; Qualcomm shall nominate its arbitrator in the Response. The arbitrator nominated by the Requesting Party and by Qualcomm shall, within five (5) working days of the nomination of the latter, nominate the chairman, making such nomination known to the Requesting Party and Qualcomm and the Arbitral Institution, which shall confirm the appointment of all three arbitrators.

47. Should the Requesting Party wish to have the Dispute decided by a sole arbitrator it shall indicate this in the Notice. In this case, the Requesting Party and Qualcomm shall agree on the nomination of a sole arbitrator within five (5) working days from the communication of the Response, communicating this to the Arbitral Institution.

48. Should Qualcomm fail to nominate an arbitrator, or if the two arbitrators fail to agree on the chairman, or should the Requesting Party and/or Qualcomm fail to agree on a sole arbitrator, the default appointment(s) shall be made by the Arbitral Institution.

49. The three-person arbitral tribunal or, as the case may be, the sole arbitrator, are herein referred to as the "Arbitral Tribunal".

50. The Dispute shall be finally resolved by arbitration under the ICC Rules of Arbitration, with such modifications or adaptations as foreseen herein or necessary under the circumstances (the "Rules"). The arbitration shall be conducted in New York, New York, United States of America, in the English language.

51. The procedure shall be a fast-track procedure. For this purpose, the Arbitral Tribunal shall shorten all applicable procedural time-limits under the Rules as far as appropriate in the circumstances. The Requesting Party and Qualcomm shall consent to the use of e-mail for the exchange of documents.

52. The Arbitral Tribunal shall, as soon as practical after the confirmation of the Arbitral Tribunal, hold an organisational conference to discuss any procedural issues with the parties to the arbitration. Terms of reference shall be drawn up and signed by the parties to the arbitration and the Arbitral Tribunal at the organisational meeting or thereafter and a procedural timetable shall be established by the Arbitral Tribunal. An oral hearing shall, as a rule, be established within two (2) months of the confirmation of the Arbitral Tribunal.

53. In order to enable the Arbitral Tribunal to reach a decision, it shall be entitled to request any relevant information from Qualcomm or Affiliated Undertakings or the Requesting Party, to appoint experts and to examine them at the hearing, and to establish the facts by all appropriate means. The Arbitral Tribunal is also entitled to ask for assistance by the Trustee in all stages of the procedure if the Requesting Party and/or Qualcomm agree.

54. The arbitrators shall not disclose confidential information and shall apply the legal standards covering the treatment of confidential information under the Merger Regulation and the Treaty of the Functioning of the European Union. The Arbitral Tribunal may take the measures necessary for protecting confidential information in particular by restricting access to confidential information to the Arbitral Tribunal, the Trustee and outside counsel and experts of the opposing party.

55. The burden of proof in any dispute governed under the Rules shall be borne as follows: (i) the Requesting Party must produce evidence of a *prima facie* case; (ii) if the Requesting Party does so, the Arbitral Tribunal must find in favour of the Requesting Party unless Qualcomm can produce evidence to the contrary.

56. The Commission shall be allowed and enabled to participate in all stages of the procedure by:

(a) receiving all written submissions (including documents and reports, etc.) made by the parties to the arbitration;

(b) receiving all orders, interim and final awards and other documents exchanged by the Arbitral Tribunal with the parties to the arbitration (including the terms of reference and procedural timetable);

(c) filing any Commission amicus curiae briefs; and

(d) being present at the hearing(s) and being allowed to ask questions to parties, witnesses and experts.

57. The Arbitral Tribunal shall forward, or shall order the parties to the arbitration to forward, the documents mentioned to the Commission without delay.

58. In the event of disagreement between the parties to the arbitration regarding the interpretation of the Commitments, the Arbitral Tribunal shall inform the Commission and may seek the Commission's interpretation of the Commitments before finding in favour of any party to the arbitration and shall be bound by the interpretation.

59. The Arbitral Tribunal shall decide the dispute on the basis of the Commitments and the Decision. The Commitments shall be construed in accordance with the Merger Regulation, EU law and general principles of law common to the legal orders of the Member States without a requirement to apply a particular national system. The Arbitral Tribunal shall take all decisions by majority vote.

60. Upon the request of the Requesting Party, the Arbitral Tribunal may make a preliminary ruling on the Dispute. The preliminary ruling shall be rendered within one (1) month after the confirmation of the Arbitral Tribunal, shall be applicable immediately and, as a rule, remain in force until a final decision is rendered.

61. The Arbitral Tribunal shall, in the preliminary ruling as well as in the final award, specify the action, if any, to be taken by Qualcomm or its Affiliated Undertakings in order to comply with the Commitments vis-à-vis the Requesting Party (e.g. specify a contract including all relevant terms and conditions).

62. The final award shall be final and binding on the parties to the arbitration and shall resolve the dispute and determine any and all claims, motions or requests submitted to the Arbitral Tribunal. The arbitral award shall also determine the reimbursement of the costs of the successful party and the allocation of the arbitration costs. In case of granting a preliminary ruling or if otherwise appropriate, the Arbitral Tribunal shall specify that terms and conditions determined in the final award apply retroactively.

63. The final award shall, as a rule, be rendered within six (6) months after the confirmation of the Arbitral Tribunal. The timeframe shall, in any case, be extended by the time the Commission takes to submit an interpretation of the Commitments if asked by the Arbitral Tribunal.

64. The parties to the arbitration shall prepare a non-confidential version of the final award, without business secrets. The Commission may publish the non-confidential version of the award.

65. Nothing in the above-described arbitration procedure shall affect the powers of the Commission to take decisions in relation to the Commitments in accordance with its powers under the Merger Regulation and the Treaty on the Functioning of the European Union.

H. THE REVIEW CLAUSE

66. The Commission may extend the time period foreseen in the Commitments in response to a request from Qualcomm or, in appropriate cases, on its own initiative. Where Qualcomm requests an extension of the time period, it shall submit a reasoned request to the Commission no later than one (1) month before the expiry of that period, showing good cause. This request shall be accompanied by a report from the Monitoring Trustee, who shall, at the same time send a non-confidential copy of the report to Qualcomm. Only in exceptional circumstances shall Qualcomm be entitled to request an extension within the last month of that period.

67. The Interoperability commitment contained in paragraphs 10 to 13 and the MIFARE commitment contained in paragraphs 14 to 17 are subject to the possibility of a shortening of the respective time periods following a review by the Commission after three (3) years from the Closing Date in the light of technological and/or market developments.

68. The Commission may, where appropriate, in response to a reasoned request from Qualcomm showing good cause, waive, modify or substitute, in exceptional circumstances, one or more of the undertakings in the Commitments. This request shall be accompanied by a report from the Monitoring Trustee, who shall, at the same time, send a non-confidential copy of the report to Qualcomm. The request shall not have the effect of suspending the application of the undertaking and, in particular, of suspending the expiry of any time period in which the undertaking has to be complied with.

I. ENTRY INTO FORCE

69. The Commitments shall take effect upon the date of adoption of the Decision.

Brussels, 10 January 2018

Duly authorised for and on behalf of
Qualcomm Incorporated

Schedule 1

Acquired non-SEP NXP NFC Patents

Patent Number / Publication Number / Application Number	Region	Status	Espacenet Reference
CN200680021088	CN	Granted	CN101198971
CN200680017348	CN	Granted	CN101198970
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KR1130003	KR	Granted	KR1130003
KR1143785	KR	Granted	KR1143785
KR0981143	KR	Granted	KR0981143
KR0975548	KR	Granted	KR0975548
KR1296304	KR	Granted	KR1296304
KR1469823	KR	Granted	KR1469823
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KR1524861	KR	Granted	KR1524861
KR1519128	KR	Granted	KR1519128
KR0697489	KR	Granted	KR0697489
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US7786870	US	Granted	US7786870
US7929456	US	Granted	US7929456
US8441534	US	Granted	US8441534
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US7663567	US	Granted	US7663567
US9280692	US	Granted	US9280692
US8151319	US	Granted	US8151319
US8769616	US	Granted	US8769616
US9268932	US	Granted	US9268932
US8280304	US	Granted	US8280304
US8447233	US	Granted	US8447233
US8824963	US	Granted	US8824963
US9241237	US	Granted	US9241237
US7907057	US	Granted	US7907057
US20160104148	US	Published	US20160104148
US8395488	US	Granted	US8395488
US8341361	US	Granted	US8341361
US8688929	US	Granted	US8688929
US9003133	US	Granted	US9003133
US8362881	US	Granted	US8362881
US9342776	US	Granted	US9342776
US7907005	US	Granted	US7907005
US8203431	US	Granted	US8203431
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US8261997	US	Granted	US8261997
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US8660485	US	Granted	US8660485
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US9357316	US	Granted	US9357316

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US9298955	US	Granted	US9298955
US20130159124	US	Granted	US9743217
US8706036	US	Granted	US8706036
US8923769	US	Granted	US8923769
US9252845	US	Granted	US9252845
US9673870	US	Granted	US9673870
US20130325711	US	Published	US20130325711
US9407329	US	Granted	US9407329
US20160337004	US	Granted	US9813116
US8929812	US	Granted	US8929812
US9633242	US	Granted	US9633242
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US20160072629	US	Published	US20160072629
US20140207660	US	Published	US20140207660
US9236914	US	Granted	US9236914
US20140172700	US	Published	US20140172700
US9014323	US	Granted	US9014323
US20140291392	US	Published	US20140291392
US20150105021	US	Granted	US9820081
US8964904	US	Granted	US8964904
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US9264899	US	Granted	US9264899
US9584514	US	Granted	US9584514
US20140340195	US	Granted	US9806689
14/527680	US	Published	US20150121499
US20150371453	US	Published	US20150371453
US9634727	US	Granted	US9634727
US20150199509	US	Published	US20150199509
US20150235203	US	Published	US20150235203
US20150278548	US	Published	US20150278548
US20150244257	US	Published	US20150244257
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US9379884	US	Granted	US9379884
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US9450306	US	Granted	US9450306
US20160260073	US	Published	US20160260073
US20170091497	US	Published	US20170091497
US20160301523	US	Granted	US9838197
US20170104468	US	Published	US20170104468

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US20160359648	US	Granted	US9825788
US20170070245	US	Granted	US9742443
US9654181	US	Granted	US9654181
15/411955	US	Published	US20170206386
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US9256734	US	Granted	US9256734
US20160117506	US	Published	US20160117506
US9224013	US	Granted	US9224013
US20160078223	US	Published	US20160078223
US9258287	US	Granted	US9258287
US20150304851	US	Published	US20150304851
US9661015	US	Granted	US9661015
US7583179	US	Granted	US7583179
US7689195	US	Granted	US7689195
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US8116401	US	Granted	US8116401
US8428512	US	Granted	US8428512
US8503929	US	Granted	US8503929
US8811468	US	Granted	US8811468
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US8674888	US	Granted	US8674888
US8709872	US	Granted	US8709872
US7586458	US	Granted	US7586458

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US7825871	US	Granted	US7825871
US7564302	US	Granted	US7564302
US7933568	US	Granted	US7933568
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US7885683	US	Granted	US7885683
US7920893	US	Granted	US7920893
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US8005436	US	Granted	US8005436
US8032175	US	Granted	US8032175
US8175543	US	Granted	US8175543
US8600315	US	Granted	US8600315
US8509356	US	Granted	US8509356
US8018393	US	Granted	US8018393
US7990333	US	Granted	US7990333
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US8929808	US	Granted	US8929808
US8879985	US	Granted	US8879985
US9280499	US	Granted	US9280499
US8855556	US	Granted	US8855556
US8831512	US	Granted	US8831512

Patent Number / Publication Number / Application Number	Region	Status	Espacenet Reference
US9119160	US	Granted	US9119160
US20150334518	US	Published	US20150334518
US8188787	US	Granted	US8188787
US8588682	US	Granted	US8588682
US9197059	US	Granted	US9197059
US8326224	US	Granted	US8326224
US8559872	US	Granted	US8559872
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US8934836	US	Granted	US8934836

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US9281874	US	Granted	US9281874
US6710619	US	Granted	US6710619
US6594746	US	Granted	US6594746
US6754794	US	Granted	US6754794
US6996726	US	Granted	US6996726
US6735697	US	Granted	US6735697
US6944295	US	Granted	US6944295
US6801956	US	Granted	US6801956
US7330455	US	Granted	US7330455
US7801486	US	Granted	US7801486
US6185682	US	Granted	US6185682
US8168524	US	Granted	US8168524
US6294980	US	Granted	US6294980

Schedule 2

Patents excluded from the Proposed Transaction

[…]

Schedule 3

Model Confidentiality Agreement

This Mutual Non-Disclosure Agreement (the "Agreement") is made and entered into effective [DATE] by and between QUALCOMM Incorporated ("QUALCOMM"), with offices located at 5775 Morehouse Drive, San Diego, California 92121, and [Full Legal Name], with offices located at [Street address, city, postcode and country], with regard to the following facts:

WHEREAS, each party to this Agreement possesses confidential, proprietary and/or trade secret information including, without limitation, information in tangible or intangible form relating to or including: business, product, marketing, licensing or sales activities, policies, practices, outlooks, studies, reports, analyses, strategies or forecasts, finances, revenue, pricing, costs or profits, released or unreleased products including, but not limited to, software, hardware, development, research, designs, specifications, performance characteristics, code, formulas, algorithms, data, techniques, processes, inventions, testing strategies, industry, customer or consumer information and third party confidential information (the "INFORMATION"); and

WHEREAS, each party in possession of INFORMATION (the "Disclosing Party") desires to disclose some of its INFORMATION to the other party (the "Receiving Party") subject to the terms and conditions of this Agreement;

NOW, THEREFORE, in consideration of the promises made herein, the receipt of certain INFORMATION and good and other valuable consideration, the receipt of which is hereby acknowledged, the parties hereto agree as follows:

1. Permitted Use. The Receiving Party shall handle, use, treat and utilize such INFORMATION as follows: (a) hold all INFORMATION received from the Disclosing Party in strict confidence; (b) use such INFORMATION only for the purposes identified in the written request addressed to QUALCOMM for the purposes identified in paragraphs 11 or 14 of the Commitments in Case M.8306 – Qualcomm / NXP (the "Written Request"); (c) reproduce such INFORMATION only to the extent necessary for such purpose; (d) restrict disclosure of such INFORMATION to its employees with a need to know (and advise such employees of the obligations assumed herein); and (e) except as set forth in Section 3 herein, not disclose such INFORMATION to any third party, including but not limited to any vendor, customer, manufacturer or independent contractor, without prior written approval of such Disclosing Party. In addition, with respect to any equipment, component, software, or other items delivered to the Receiving Party by the Disclosing Party, the Receiving Party shall not reverse engineer, disassemble, decompile, or otherwise analyze the physical construction of, any such items.

   The restrictions on the Receiving Party's use and disclosure of INFORMATION as set forth above shall not apply to any INFORMATION which the Receiving Party can demonstrate:

   (a) is wholly and independently developed by the Receiving Party without the use of INFORMATION of the Disclosing Party; or

   (b) is or has become generally known to the public from a source having the right to disclose such INFORMATION; or

   (c) at the time of disclosure to the Receiving Party, was known to such Receiving Party free of restriction and evidenced by documentation in the Receiving Party's possession; or

   (d) is approved for release by written authorization of the Disclosing Party, but only to the extent of and subject to such conditions as may be imposed in such written authorization; or

(e) is disclosed in response to a valid order of a court or other relevant governmental body or any political subdivision thereof, but only to the extent of and for the purposes of such order; provided, however, that if the Receiving Party receives an order or request to disclose any INFORMATION by a court of competent jurisdiction or a governmental body, then the Receiving Party agrees:

(i) if not prohibited by the request or order, immediately to inform the Disclosing Party in writing of the existence, terms, and circumstances surrounding the request or order;

(ii) to consult with the Disclosing Party on what steps should be taken to avoid or restrict the disclosure of INFORMATION;

(iii) to give the Disclosing Party the chance to defend, limit or protect against the disclosure; and

(iv) if disclosure of INFORMATION is lawfully required, to supply only that portion of the INFORMATION which is legally necessary and try to obtain confidential treatment for any INFORMATION required to be disclosed.

2. Designation. INFORMATION shall be subject to the restrictions of Section 1 if it is in writing or other tangible form and clearly marked as proprietary or confidential when disclosed to the Receiving Party or, if not disclosed in tangible form, if clearly identified as confidential or proprietary at the time of disclosure. The parties agree to use reasonable efforts to summarize the content of oral disclosures which are proprietary or confidential but failure to provide such summary shall not affect the nature of the INFORMATION disclosed or detract from the protection afforded under this Agreement if such INFORMATION was identified as confidential or proprietary when orally disclosed.

3. Affiliates and other Third Parties with a Need to Know. This Agreement does not permit either party to disclose INFORMATION to any third party (including, without limitation, that party's affiliates). Notwithstanding the foregoing, either party may re-disclose INFORMATION to its Affiliates or any third party identified in the Written Request, and solely to the extent stated in this written request, who have a need to know and shall treat such INFORMATION in a manner that is consistent with the confidentiality obligations of the Receiving Party in this Agreement and such Affiliates may re-disclose INFORMATION to other such Affiliates and to a party hereto. Either party's Affiliates may also disclose INFORMATION to the other party hereto and to such other party's Affiliates. In such event, the other party hereto, and such other party's Affiliates, shall treat such INFORMATION in accordance with the provisions of this Agreement as if such INFORMATION was disclosed directly by the Disclosing Party, and the Disclosing Party and/or its Affiliates shall have the right to enforce the provisions of this Agreement against the other party hereto and against such other party's Affiliates in connection with any and all breaches or violations of this Agreement with respect to such INFORMATION by the other party hereto and by such other party's Affiliates. Either party's Affiliates may also receive INFORMATION from the other party hereto and from such other party's Affiliates. In such event, the Affiliate receiving such INFORMATION shall be responsible to treat such INFORMATION in accordance with the confidentiality obligations set forth in this Agreement. The parties hereto shall be responsible for any improper disclosure or use by its Affiliates or by any third party identified in the Written Request of such INFORMATION to the same extent as if that party had received such INFORMATION directly and made the same disclosure or use of such INFORMATION as did its Affiliates. The term "Affiliate" shall mean any entity with respect to which either party owns or controls, directly or indirectly, greater than fifty percent (>50%) of the outstanding voting securities (but an entity shall remain an Affiliate only so long as it meets such

ownership requirements). The term "INFORMATION" shall also include information that is under the ownership, possession or control of an Affiliate but otherwise meets the definition of INFORMATION.

4. No License or Representations. No license to a party of any trademark, patent, copyright, mask work protection right or any other intellectual property right is either granted or implied by this Agreement or any disclosure hereunder, including, but not limited to, any license to make, use, import or sell any product embodying any INFORMATION. No representation, warranty or assurance is made by either party with respect to the non-infringement of trademarks, patents, copyrights, mask protection rights or any other intellectual property rights or other rights of third persons.

5. No Obligation. Neither this Agreement nor the disclosure or receipt of INFORMATION shall be construed as creating any obligation of a party to furnish INFORMATION to the other party other than Qualcomm's obligations contained in the Commitments or to enter into any agreement or relationship with the other party with respect to mutual business.

6. Return of Information. All INFORMATION shall remain the sole property of the Disclosing Party which originally disclosed such INFORMATION. Except as may be otherwise required by applicable law, regulation, legal or judicial process, the Receiving Party shall make all reasonable efforts to promptly destroy or return all materials containing any such INFORMATION (including all copies made by the Receiving Party), upon request following termination or expiration of this Agreement or the Receiving Party's determination that it no longer has a need for such INFORMATION. Upon request of the Disclosing Party, the Receiving Party shall certify in writing that all such materials have been returned to the Disclosing Party or destroyed. Notwithstanding the above, the Receiving Party may retain copies of INFORMATION stored on backup disks or in backup storage facilities automatically produced in the ordinary course of business. Any INFORMATION so retained will be held subject to the confidentiality and use limitations of this Agreement.

7. Export Compliance Assurance. The Receiving Party acknowledges that all hardware, software, source code and technology (collectively, "Products") obtained from the Disclosing Party are subject to the United States ("US") government export control and economic sanctions laws. The Receiving Party assures that it, its subsidiaries and affiliates will not directly or indirectly export, re-export, transfer or release any Products or direct product thereof to any destination, person, entity or end-use prohibited or restricted under US laws without prior US government authorization to the extent required by applicable regulation. The Receiving Party acknowledges that other countries may have trade laws pertaining to the export, import, use, or distribution of Products, and that compliance with the same is the responsibility of the Receiving Party. This requirement shall survive any termination or expiration of this Agreement.

8. Term and Termination. This Agreement shall become effective on the date first set forth above and shall terminate upon the happening of the earlier of:

   (a) The written notice of either party to the other of its election, with or without cause, to terminate this Agreement; or

   (b) The expiration of sixty (60) months from the date first set forth above.

9. Notice. Any notice or other communication made or given by either party in connection with this Agreement shall be sent by registered or certified mail, postage prepaid, return receipt requested, or by courier service addressed to the other party at its address set forth below:

QUALCOMM Incorporated
5775 Morehouse Drive
San Diego, California 92121
USA
Attn: Legal Department

[Full Legal Name]
[Full Address]
[Country]
Attn: Legal Department

10. Survivability. Each party agrees that all of its obligations undertaken herein as a Receiving Party shall survive and continue after any termination or expiration of this Agreement.

11. Governing Law and Arbitration. This Agreement shall be governed in all respects solely and exclusively by the laws of the State of California, U.S.A. without regard to conflict of laws principles. All disputes, controversies, or claims arising out of, relating to or in connection with this Agreement shall be resolved by the Fast Track Dispute Resolution Procedure contained in the Commitments.

12. Independent Development. Nothing in this Agreement shall be construed as a representation or agreement that the Receiving Party is not currently developing, shall not develop, or have developed for it, products, concepts, systems, technologies, or techniques that are similar to or compete with the products, concepts, systems, technologies, or techniques contemplated by the purpose or embodied in the INFORMATION, or explore such similar opportunities with other parties, provided that the Receiving Party does not violate any of its obligations under this Agreement in connection therewith. Furthermore, neither party shall have any obligation to limit or restrict the assignment of its employees as a result of their having had access to INFORMATION.

13. Information provided in accordance with QUALCOMM's Commitments in Case M.8306 – Qualcomm / NXP. INFORMATION disclosed under this Agreement is provided pursuant to and according with paragraphs 11 and 14 of the Commitments in Case M.8306 – Qualcomm / NXP. Except as expressly set forth in this Section 13, neither party makes any warranty, express or implied, as to the value, accuracy or completeness of INFORMATION disclosed hereunder.

14. Miscellaneous. This Agreement constitutes the entire understanding among the parties hereto as to the INFORMATION and supersedes all prior discussions between them relating thereto. No amendment or modification of this Agreement shall be valid or binding on the parties unless made in writing and signed on behalf of each of the parties by its authorized officer or representative. No party may assign or transfer, in whole or in part, any of its rights, obligations or duties under this Agreement. The failure or delay of any party to enforce at any time any provision of this Agreement shall not constitute a waiver of such party's right thereafter to enforce each and every provision of this Agreement. In the event that any of the terms, conditions or provisions of this Agreement are held to be illegal, unenforceable or invalid by any court of competent jurisdiction, the remaining terms, conditions or provisions hereof shall remain in full force and effect.

15. Counterparts, Electronic and Facsimile Delivery. This Agreement may be executed in two or more identical counterparts, each of which shall be deemed to be an original and all of which taken together shall be deemed to constitute the Agreement when a duly authorized representative of each party has signed a counterpart. The parties may deliver this signed Agreement by electronic (including email or facsimile) transmission. Each party agrees that such electronic transmission shall have the same force and effect as delivery of original signatures and that each party may use such electronically-transmitted copies as evidence of

the execution and delivery of the Agreement by all parties to the same extent that an original signature could be used.

IN WITNESS WHEREOF, this Agreement shall become effective on the date set forth above.

Qualcomm Incorporated

By:
Print Name:
Title:

[Full legal name]

By:
Print Name:
Title: