



Immunity of integrated TV receivers, set top boxes and data modems connected to broadband cable and TV networks against radiation from LTE user equipment

Reiner Liebler, Head of Division Technical Regulation & EMC

Federal Network Agency

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Germany - Situation

- *Spectrum auction took place in April/May 2010*
- *Three mobile network operators, each 10 MHz in 832-862 MHz*
- *Mobile operators are expected, if necessary, to take appropriate measures to minimize interference to cable reception*
- *High numbers of interference cases are not expected due to the foreseeable roll-out of LTE and cable usage working in the same area on a co-channel basis in the range 832 – 862 MHz*
- *We expect improved immunity as quickly as possible through standardisation activities and already action of manufacturers/cable network operators being aware of the immunity issue now*



Germany – Measurement Campaign

- **Commissioned by ATRT**
(consulting group to Federal Network Agency)





Germany - Measurement Campaign and compatibility studies

- *The measurements campaign was commissioned in December 2009 at the EMC Lab of BNetzA to investigate the coexistence of LTE versus integrated TV receivers, set top boxes and data modems connected to TV networks*
- *The agreed measurement report includes technical results without any evaluation of compatibility issues*
- *The results of the measurements are one corner stone for compatibility studies by the ATRT. The final technical report of ATRT will reflect the specific German situation.*



Germany- Measurement Campaign

➤ *receivers*

- *5 TV sets with integrated DVB-C receiver (IDTV)*
- *2 DVB-C set top boxes (STB)*
- *7 EuroDOCSIS 2.0 modems*
- *1 TV set for analogue PAL (taken from the IDTV sets)*

➤ *different types of tuners*

- *CAN-type (6 tuners)*
- *Silicon (7 tuners)*



Germany – Measurement Campaign

➤ *Failure criteria*

DVB-C

- *More than one false block shows up within a time frame of 20s or*
- *The picture freezes or is blanked (sync loss)*

Analogue PAL

- *A subjective method (according ITU-R BT. 1368-8 Annex 5) was used. The interference just becomes visible.*

EuroDOCSIS

- *The failure point was defined as the first occurrence of data packets that could not be corrected. For this a special computer programme was used*



Germany – Technical Results of Measurement Campaign

- *The LTE field strength causing interference heavily depends on the receiver itself and the radiation direction. The minimum measured value was a field strength of 100 dB(μ V/m)*
- *The average immunity of the receivers tested ranges from 114 to 148 dB(μ V/m) average across all directions and polarisation for a single receiver*



Germany – Technical Results of Measurement Campaign

- *Receivers connected to the loop- through outputs are already disturbed at up to 30 dB lower LTE field strengths compared to direct connection (the loop-through output connects TV sets via set top box to the wall outlet of the HFC network)*
- *In case LTE signal is 40 MHz (N+5) or 72 MHz (N+9) above the tuned frequency range (oscillator and mirror frequency) the disturbance field strength is 8 dB higher as in the co-channel (can tuner).
The tested IDTV with Silicon type tuner does not show this effect at N+5 or N+9*



Germany

- *The disturbance field strength from LTE against modulated channels (DVB-C and EuroDOCSIS 2.0) is about equal for 64 QAM and 256 QAM. This presumes that the signal level of a 256 QAM is 6 dB higher compared to 64 QAM*
- *Analogue PAL reception is not more sensitive to LTE than DVB-C*
- *No direct relation between the wanted signal level and the LTE disturbance field strength could be observed*



Germany – Evaluation of Measurement Results and Further Work in ATRT

- *The evaluation of the measurement results and parameters is very complex and therefore the work is still going on*
- *Especially the description of the implementation scenarios of LTE and the actual frequency usage in HFC networks are under discussion*
- *The draft report of ATRT consists of commonly agreed points of view and differing views of the stakeholders*
- *There is still a great discrepancy concerning the relevant distance between an LTE-user equipment and equipment connected to CATV-networks for an interference-free scenario (above 8 m and below 1 m).*



Germany – Further Work in ATRT

- *Study of mitigation measures, time, frequency and location probabilities,*
- *Proposals for practical solutions for Germany will complete the work of the ATRT*



Europe – Support of Standardisation Activities

BNetzA supports the activities according to the EU Commission letter of 30 November 2009 to CENELEC and ETSI

- ***Development of appropriate mitigation measures***
- ***Equipment like e.g. TV-sets, set-top-boxes or cable modems to be connected to CATV-networks or being operated on a stand-alone basis shall withstand a disturbance field strength level of appr. 3.0 V/m (equal to 130 dB(μ V/m)).***



Europe – Support of Standardisation Activities

- *Screening effectiveness of the network shall be improved in such a manner that a high level a field strength of appr. 130 dB(μ V/m) can be withstand.*
- *HFC should use `Class A` active and passive components.*



Europe – Support of Standardisation Activities

Further need for standardisation within CENELEC

- ***TC 209: Cable networks for television signals, sound signals and interactive services***
 - ***EN 50083-2: Cable networks for television signals, sound signals and interactive services; Part 2: Electromagnetic compatibility of equipment***
 - ***EN 50083-8: Cable networks for television signals, sound signals and interactive services; Part 8: Electromagnetic compatibility of networks***



Europe – Support of Standardisation Activities

Further need for standardisation within CENELEC

- ***TC/46X: Communication cables***
- ***EN 50117-1: Coaxial cables – Part 1: Generic specification***
- ***EN 50117-2-x: Coaxial cables – Part 2-x: Sectional specification for cables used in cabled distribution networks***
- ***EN 50117-3-x: Coaxial cables – Part 3-x: Sectional specification for cables used in Telecom applications***
- ***EN 60966-1: Radio frequency and coaxial cable assemblies Part 1: Generic specification – General requirements and test methods***
- ***EN 60966-2-x: Radio frequency and coaxial cable assemblies Part 2-x Sectional specification***



World - Support of Standardisation Activities

- ***CISPR I /WG4 - Electromagnetic compatibility (EMC) – Multimedia immunity standard (CISPR 35)***
- ***October 2009: BNetzA proposed changes to CISPR35_2nd_CD_body_v_14 (previously: CISPR/I/270/CD) Electromagnetic compatibility (EMC)- Multimedia immunity standard***
- ***Amendment to Table 2: Immunity to common wireless communication devices - to include LTE-UE to be operated in the 800 MHz with 0,2 W power.***
- ***The multimedia equipment shall withstand a normative field strength of 3 V/m without degradation.***



World – Support of Standardisation Activities

- *The adoption of the new CISPR 35 standard in collaboration with CENELEC (due to the Dresden Agreement) could be expected in 2012*



Final Remarks

- *Cooperation measures between ETSI and CENELEC*
- *ETSI/CENELEC ----- CISPR*
- *One should learn from history..... Roll-out of cable TV-networks in the 80s.....EMC problems*



Thank you
for your attention!