The concise report of the CENELEC/ETSI Joint Working Group on the digital dividend

Contents

Foreword

This report has been prepared by the CENELEC/TC 210/WG 10 (JWG with ETSI). This report has been consequently approved by CENELEC TC 210/WG10 for CENELEC on the 12 August and ETSI TCERM/WG EMC for ETSI on 24 September 2010.

1 Scope

The present document is the concise report from the CENELEC/ETSI Joint Working Group on the Digital Dividend based on the analysis which is presented in the Technical Report on the Overview of the Coexistence Issues Stemming from the Current Digital Dividend Decisions.

This document does not consider the economic implications for consumers or industry stemming from the reallocation of the use of the 790 – 862 MHz band.

2 References

2.1 Informative references

The concise report on the Overview of the Coexistence Issues Stemming from the Current Digital Dividend Decisions.

3 Definitions, symbols and abbreviations

3.1 Symbols

For the purposes of the present document, the following symbols apply:

MHz	MegaHertz
GHz	GigaHertz
V/m	Volts per meter
dB	deciBel
dBm	deciBel relative to 1 mW

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

CENELEC	European Committee for Electrotechnical Standardization
ETSI	European Telecommunication Standards Institute
TR	Technical Report
JWG	Joint Working Group
LTE	Long Term Evolution
CPE	Customer Premises Equipment
ECN	Electronic Communications Network
CEPT FM	European Conference of Postal and Telecommunications administrations – Frequency Management
NTP	Network Termination Point
EN	European Norm
FDD	Frequency Division Duplex

4 Present and near future equipment characteristics

Equipment presently installed and equipment which will be manufactured over the next few years can be regarded as meeting the requirements stated in the relevant Harmonised Standards which are currently listed in the Official Journal and which do not address the new technical operating conditions which will apply as a result of the decision to reallocate the use of the frequency band 790 – 862 MHz.

As a result, two distinct issues need to be addressed:

- New requirements in the relevant standards to ensure the electromagnetic compatibility of future equipment need to be developed as a matter of urgency (within the next 12 months)
- Pragmatic mitigation measures need to be developed to deal with anticipated interference cases in existing and near future equipment.

5 The changed electromagnetic environment

The radio-frequency electromagnetic environment in the frequency range 470 – 862 MHz results primarily from the present terrestrial broadcast delivery platform which typically produces field strengths less than 1 V/m. The anticipated new environment will have field strengths up to 3 V/m in the frequency range 790 – 862 MHz. The degree of deployment of the future ECNs will significantly determine the changed electromagnetic environment.

The nature of the potentially interfering signals in the frequency range 790 – 862 MHz depends to an extent on the technology which will be deployed. The Commission Decision for this reallocation is technology neutral implying that a number of different technologies may be deployed with differing interference potentials.

6 Implications for future standards development

The relevant standards will need to be revised to cover the following aspects:

- The radiated immunity test level for equipment containing DVB tuners for the frequency range 790 – 862 MHz for the tuned channel is proposed as 1 V/m
- and for other than the tuned channel in the 790- 862 range 3 V/m is proposed.
- The present specifications for receiver parameters for CPE need revision due to the change in the ambient electromagnetic environment.
- Standards for coaxial networks need to be revised.
- Bandwidth requirements for terrestrial reception, antennas, head end and distribution amplifiers need to be revised appropriately.
- The immunity test requirements need to be revised to cover the frequency band 30 MHz to 1 GHz in some cases.
- Test methods, appropriate to the radiated electromagnetic environment, need to be reviewed to assess the screening performance of cables up to 1 GHz.
- A modulation specification for the test signal that will adequately represent the disturbing characteristics of the different radio technologies, which may be deployed, is needed. (Noting that the Commission decision is technology neutral.) At present, detailed technical information is only available on LTE and this has therefore been the basis of the work of the JWG.
- Further investigations are need to determine if the application of the present narrow band analogue test signal defined in EN 61000-4-3 is adequate to simulate the disturbing aspects of the radio technologies which may be deployed. In particular the time domain and bandwidth aspects need urgent investigation.
- Once the work of CEPT FM 22 on measuring Block Edge Masks is finalised, consideration should be given to convert this method of measurement into a standard.

7 Specific technical issues

7.1 Tuners

Tuners are present in a wide range of consumer multimedia equipment including television sets, digital video recorders, and set-top boxes. In many cases multiple tuners are present in such equipment and up to six tuners with distribution amplifiers can be found in some equipment. Tuners presently cover the frequency range up to 862 MHz which includes the future 790 – 862 MHz Electronic Communications Network (ECN) band.

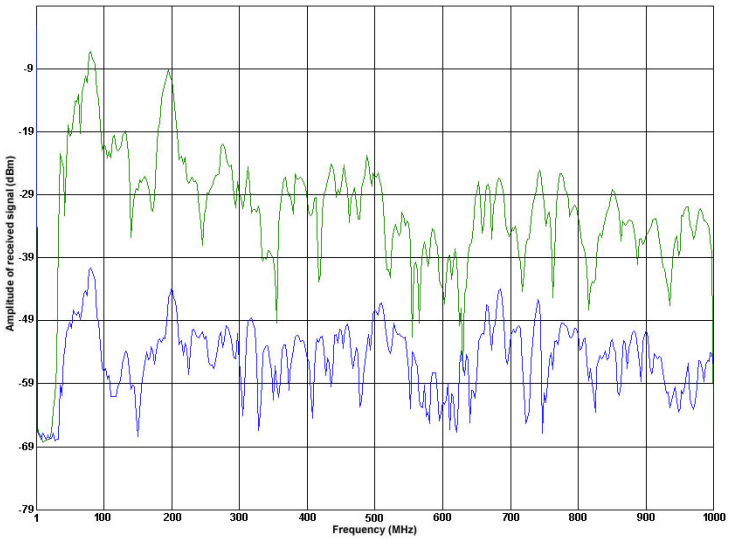
7.2 Loop-through or pass-through

Loop-through functionality is presently implemented in a range of Customer Premises Equipment (CPE). This functionality is made in a number of variants almost all of which show increased interference susceptibility and reduce the inherent immunity of set-top boxes. The techniques used will need further investigation to determine susceptibility to interference.

7.3 Interconnecting cables and connectors

It is important to note that the performance of interconnecting cables and associated connectors do not appear to be covered under any Directive. However, the characteristics of such cables and connectors are a vital part of a range of mitigation measures to minimise interference, and classification and labelling system needs to be agreed.

Figure 1 illustrates the difference in screening effectiveness of two different coaxial cables which is the order of 30 dB. Similar tests have shown differences of approximately 10 dB in the performance of different connectors fitted to the same type of coaxial cable.



Colour code	Market	Designation	Screen	F-type connectors
	Professional	RG59	triple screen	compression
	Consumer		single screen	screw-on

Figure1: colour-coded plot of coaxial cables with the most and least effective shielding.

The screening effectiveness of coaxial cable systems is degraded where impedance mismatches occur as in cases where outlets are not terminated in their characteristic impedance. The spread of the degradation is limited to the output of the nearest active component in the system feeding the network.

7.4 Communal and home distribution systems

These systems are considered to be part of the terrestrial reception network. The immunity of these systems varies tremendously, and most are a “fit and forget” installation with no ongoing maintenance. These may be extremely vulnerable to both base stations at the head end (especially where a number of antennas are pointing in different directions) and to terminal units at individual premises.

Head end and distribution amplifiers will often be more susceptible to blocking and overload, they are also often wide band (30 MHz to 862 MHz). The majority of antennas on the market today are broadband antennas with an intended reception frequency range of 470 MHz to 862 MHz.

Under some circumstances interference may occur for a separation distance of up to 400 m between the base station and the head end in the absence of mitigation measures.

These systems will often carry locally produced programs or information on non-broadcast channels.

There are no pan European trade associations for Communal Aerial and home distribution systems; therefore it is difficult to effectively communicate with this industry.

7.5 HFC Networks

Modern HFC core networks (from head end to NTP at customer site) are considered to be robust and not susceptible to interference from new services operating in the 790 -862 MHz band. However, some HFC networks feed distribution systems built to EN 50083-2 Class B, which is 10 dB below Class A screening levels.

7.6 Other equipment

It has been found that a number of short range devices operating in the adjacent 863 – 865 MHz band are affected by both ECN base stations and terminal units. These include items such as wireless headphones, baby alarms, wireless microphones and in-ear monitoring systems.

The extensive numbers of wireless microphones currently in use in the 790 – 862 MHz band will become unusable.

8 Measures to minimise interference

A number of measures have been identified which would reduce potential interference.

- Deploy the new ECN networks in rural areas first - this would meet the Commission’s objectives of delivering broadband services to rural areas and win time to allow the design and provision of immune CPE.
- Commission Decision 2010/627/EU notes the CEPT Report 31 conclusion that the preferred frequency arrangement for the 800 MHz band should be based on the FDD mode. The Decision encourages the Member States to use the preferred frequency arrangement which can be regarded as a suitable measure in ECN networks to minimise interference.
- Where HFC networks are not already using spectrum above 790 MHz a temporary restriction on the use of these frequencies may be possible while awaiting the availability of immune CPE.
- Consideration may be given to the feasibility of implementing a pilot tone transmitted by the CPE on the frequency of the channel being used within the frequency range 790 – 862 MHz at a suitable level to indicate to the ECN terminal that the channel is in use.

Other mitigation techniques have been proposed, however most of these appear to be either impractical or not economically viable.

9 Managing the transition

It is important that procedures are put in place to manage the transition from today's legacy equipment towards equipment with enhanced immunity that will appear on the market after some years.

Consumers will need to be informed of the possibility of interference arising as the ECN networks are deployed and on the importance of the use of correct in-home cabling to minimise interference.

10 Remaining concerns

The reallocation of the use of the 790 – 862 MHz band will have serious implications for the specification and future design of a wide range of consumer multimedia reception products and for the introduction of interference to existing equipment. Consideration of further reallocations of spectrum in the 470 – 790 MHz band should take into account the impact on the wide base of installed customer equipment, especially if the band is fragmented rather than reduced to a smaller consolidated band.

History

Document history		
	18/6/2010	Agreed by the late afternoon Friday JWG
	01/7/2010	Spell check & contents sheet updated
	12/8/2010	Approved for CENELEC by TC210/WG10
	24/9/2010	Approved for ETSI by TC ERM/WG EMC