



CEPT Report 29

Report from CEPT to the European Commission  
in response to the Mandate on

“Technical considerations regarding harmonisation options  
for the digital dividend in the European Union”

“Guideline on cross border coordination issues between mobile services in one  
country and broadcasting services in another country”

Final Report on 26 June 2009 by the



Electronic Communications Committee (ECC)  
within the European Conference of Postal and Telecommunications Administrations (CEPT)

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## 0 EXECUTIVE SUMMARY

### **Justification**

This CEPT Report is developed in the context of the second mandate of the EC on the digital dividend and is aimed to help administrations establish a common methodology for coordination in the case where one country at the border wishes to use the band 790-862 MHz for mobile applications while the other country wishes to retain this band for broadcasting applications.

### **Findings**

CEPT is of the opinion that the GE06 Agreement provides the necessary regulatory procedures to identify administrations to be involved in the coordination process between broadcasting service in one country and mobile service in another country. The identification is made by means of the coordination trigger field strength.

Noting that the report is developed on the basis of characteristics of mobile systems contained in the GE06 Agreement it is also noted that these are in practice worst case values, which are broadly technologically independent.

It is pointed out that incoming co-channel and overlapping channel interference from the broadcasting networks into mobile service base stations in areas adjacent to the border is likely to be the main issue. This should be taken into account during deployment of future mobile systems in the band 790-862 MHz. Different mitigation techniques need to be considered to the right degree when finding solutions in bi- and multilateral discussions.

CEPT further agrees that a detailed coordination methodology including a careful interference assessment may need to be developed by the administrations concerned during bilateral or multilateral discussions using the elements provided in this report for guidance.

**List of Abbreviations**

BS	Broadcasting Service
CEPT	European Conference of Postal and Telecommunications Administrations
DTT	Digital Terrestrial Television
DVB-T	Digital Video Broadcasting – Terrestrial
EC	European Commission
ECC	Electronic Communications Committee
ERP	Effective Radiated Power
FDD	Frequency Division Duplex
GE06	The Geneva 2006 Agreement and Plan
IMT	International Mobile Telecommunications
ITU-R	International Telecommunication Union - Radiocommunication Sector
MFN	Multiple Frequency Network
MS	Mobile Service
OFDMA	Orthogonal Frequency Division Multiple Access
RPC	Reference Planning Configuration (RRC-06)
RRC-06	Regional Radiocommunication Conference, Geneva 2006
SFN	Single Frequency Network
TDD	Time Division Duplex
UHF	Ultra High Frequency, within the context of this Report refers to 470 – 862 MHz as covered by the GE06 Agreement
UMTS	Universal Mobile Telecommunications System

## **Guideline on cross border coordination issues between mobile services in one country and broadcasting services in another country**

### **1 INTRODUCTION**

In the context of the second mandate of the EC on the digital dividend (see Annex A), it was decided to develop guidelines to help administrations establish a common methodology for coordination in the case where one country at the border wishes to use the band 790-862 MHz for mobile applications while the other country wishes to retain this band for broadcasting applications.

The case of cross-border coordination when countries on both sides are wishing to use this band for broadcasting applications is not covered in these guidelines since it corresponds to the situation which has taken place, before, during and after the GE06 conference. Practical coordination between broadcasting services may already take into account more realistic propagation models and a more precise terrain database, precise assignment characteristics (location of the transmitters, ERP, antenna pattern), DVB-T system variant and reception configuration, direction of the receiving antenna, C/I analysis, precise contour of the area of coverage. It uses solutions for improving compatibility such as the reduction of the ERP towards the border, the use of additional transmitters to compensate for interference or to limit the power of individual transmitters and the acceptance of a certain level of interference. These methods may also be applicable to the coordination between broadcasting and mobile applications.

In the case where neighbouring countries introduce mobile services in channels 61 – 69, the GE06 agreement does not specifically address coordination between mobile services since the GE06 Agreement [1] relates only to the planning of broadcasting. However, GE06 does cover the requirement to ensure that any entries for other services are compatible with the broadcasting plan. Therefore coordination of services other than broadcasting may proceed on a bilateral or multilateral basis.

Moreover, coordination methodologies between mobile services exist in other bands where mobile services are deployed within CEPT, and such methodologies have been included in various ERC/ECC Recommendations (see [2] [3] and [4]). Therefore, separate deliverable(s) are expected to be developed for cross border coordination between mobile services in the band 790-862 MHz similar to the ECC/REC/(08)02 [4] applicable to the 900 MHz band.

This report proposes a range of elements for coordination between mobile services in one country and broadcasting services in another country. These elements can be selectively used by administrations as a guideline towards establishing detailed coordination methodologies with neighbouring countries.

The response to the initial EC mandate on the digital dividend concluded that any introduction of the mobile service in the 800 MHz-band should be on a non-mandatory basis. This report is based on the same postulate.

### **2 WORKING ASSUMPTIONS**

Any conclusions drawn in this document or any proposals put forward are based on the following:

- One of two neighbouring administrations wishes to implement mobile services in the UHF channels 61-69 whilst the other wants to retain its broadcasting services in those particular channels.
- The regulatory framework given by the GE06 Agreement is retained.
- The rights associated to the GE06 Agreement shall be retained unless otherwise agreed by the concerned administrations.

The term “broadcasting” refers to digital terrestrial broadcasting as planned at the RRC06 resulting in the GE06 Agreement, any additions to this plan, and also analogue television during the transition period.

### **3 EQUITABLE ACCESS TO THE SPECTRUM**

Equitable access is the basic principle under which the GE06 Agreement was developed. It has to remain a principle when coordinating between mobile and broadcasting applications, taking into account that broadcasting and mobile networks are using spectrum differently, i.e. not constraining spectrum access for other administration in the same way.

## 4 CROSS-BORDER COORDINATION BETWEEN MOBILE AND BROADCASTING SERVICES

The GE06 Agreement covers all procedures for the coordination between broadcasting on one side and broadcasting or other primary services including mobile services on the other side.

After the application of the coordination trigger mechanism of GE06 resulting in a list of those countries with which coordination should be sought, detailed technical coordination is required to check and ensure compatibility between concerned assignments/allotments/stations. The methodology for this detailed coordination depends on the coordination scenario and should be developed on a bilateral or multilateral basis. The technical elements presented in this section can be used for this development.

### 4.1 Coordination trigger mechanism in GE06

The coordination trigger mechanism initiated as part of the GE06 Article 4 provides the identification of “affected” administrations, i.e. administrations with which it is necessary to coordinate when intending to change the GE06 Plan or to implement an assignment of another primary service. “Affected administrations” means at the same time administrations which may be interfered by or which may have constraints to protect the new GE06 entry, or the assignment to the other service. The GE06 trigger mechanism also applies if an administration intends to implement mobile services in the band 790 – 862 MHz.

In Chapter 1 (‘Definitions’) to Annex 2 of the GE06 Final Acts [1], “*coordination trigger field strength*” is defined as the

“field-strength level which, when exceeded, determines that coordination is required (also referred to as trigger field strength)”.

According to Section I of Annex 4 of the GE06 Final Acts (“Limits and methodology for determining when agreement with another administration is required”)

“If an administration proposes to modify the Plan or to coordinate an assignment to a station in another primary terrestrial service it is necessary to determine if any administration(s) from the planning area might be affected, i.e. identify the administration(s) with which agreement has to be sought. This annex contains the coordination limits and the appropriate technical methodology that shall be used to identify the administrations with which coordination is required.”

The methodology defines an area within which a trigger field-strength value is exceeded. By selecting the appropriate trigger field-strength value in the attached appendices, it is possible to identify the total area within which the relevant trigger field strength is exceeded for a range of services, and hence determine the administration(s) with which coordination is required.”

The GE06 Final Acts text goes on to state that

“... Although the determination of the area within which coordination is required is based on technical criteria, it is important to note that it represents a regulatory concept, for the purpose of identifying the area within which detailed evaluations of the interference potential needs to be performed. Hence, the coordination area is not an exclusion zone within which the sharing of frequencies is prohibited, but a means for determining the area within which more detailed calculations need to be performed...”

It is clear from the quoted texts of the GE06 Final Acts that the trigger field strength is to be used only for regulatory purposes to determine

- when and with which administrations’ “*coordination is required*” and
- for which coordination situations “*detailed evaluations of the interference potential needs to be performed*”, in other words for further protection calculations.
- The reference equations for calculations are provided for guidance to administrations within the GE06 texts. There are also several identified types of mobile services together with system parameters. Administrations can provide exact system parameters for use in bilateral discussions following regulatory identification based on the generic values.

Otherwise, the coordination area would turn out to be an “exclusion zone within which the sharing of frequencies is prohibited” which is not intended as this would lead to a very inefficient use of the spectrum.

## 4.2 Reference field strength trigger values as derived from the GE06 Agreement

When examining the cross-border coordination between the Broadcasting and the Mobile Services, two issues have to be considered:

- The impact of the Mobile Service on the Broadcasting Service
- The impact of the Broadcasting Service on the Mobile Service

This section lists the GE06 coordination trigger field strength values for the protection of the mobile service with respect to the broadcasting service and for the protection of the broadcasting service with respect to mobile service. These figures are for regulatory purposes only, i.e. in order to identify the Administrations, with which coordination has to be sought.

The GE06 Agreement contains the following coordination trigger field strength (see Annex B for calculation details):

Coordination trigger field strength for the protection of the Broadcasting Service	
Protection of the analogue TV	22 dB $\mu$ V/m/8 MHz at 10 m at the border
Protection of the digital TV	25 dB $\mu$ V/m/8 MHz at 10 m at the border
Coordination trigger field strength for the protection of the Mobile Service	
Protection of the mobile station	31,2 dB $\mu$ V/m/8 MHz (NB) at 1,5 m
Protection of the base station	18 dB $\mu$ V/m/8 MHz (NA) at 20 m 14,6 dB $\mu$ V/m/8 MHz (NB) at 20 m

NA and NB codes, as contained in the GE06 agreement, are the system types for mobile services which most closely correspond to likely mobile development in the band 790-862 MHz.

Recommendation ITU-R P.1546-3 [5] (Annex 5, section 9: Correction for receiving mobile antenna height) can be used to correct the field strength from 20 m to 10 m. From this recommendation, it can be concluded that:  $E_{10m} = E_{20m} - 6.4$  dB.

The height loss correction factor from 1.5 m to 10 m can be taken directly from the Final Acts of GE06. Section 3.2.2.1 of chapter 3 of Annex 2 (Considerations on height loss) states that "Since all field-strength calculations are for a receiving antenna height of 10 m, a height loss correction factor for an antenna height of 1.5 m shall be used in the calculation of minimum median field-strength levels". This factor depends on the frequency. For 800 MHz, this value is 18 dB. This value is consistent with the one given in Annex 5 of Recommendation ITU-R P.1546 [5].

With this information, coordination trigger values in the table can be adjusted for a common height of 10 m, as follows:

Coordination trigger field strength for the protection of the Broadcasting Service at 10m	
Protection of the analogue TV	22 dB $\mu$ V/m/8 MHz at the border
Protection of the digital TV	25 dB $\mu$ V/m/8 MHz at the border
Coordination trigger field strength for the protection of the Mobile Service at 10m	
Protection of the mobile stations	49,2 dB $\mu$ V/m/8 MHz (NB)
Protection of the base stations	11,6 dB $\mu$ V/m/8 MHz (NA) 8,2 dB $\mu$ V/m/8 MHz (NB)

## 4.3 Compatibility issues

An Administration must first assess potential outgoing interference using the equations in the GE06 Agreement (as discussed in Section 4.1) on a regulatory basis thus applying the trigger mechanism of the GE06 Agreement. These equations must first be used with the treaty standard values to establish if the trigger limit for coordination is exceeded (as given in Section 4.2). It should be noted that within this regulatory evaluation no terrain is taken into account and this evaluation is on a very simple basis.

Following this initial evaluation an Administration will then be either able to implement the planned network or there is an obligation to seek the agreement of the affected neighbouring administrations. If the trigger threshold is not exceeded the compatibility with GE06 is ensured and no further action is needed. If the trigger threshold is exceeded more refined

calculations are required implying that the concerned Administrations will need to take part in bilateral/multilateral discussions. It is in these bilateral/multilateral discussions that any necessary measures for the introduction of additional or modified services will be assessed.

**4.3.1 Summary of current situation following from the GE06 Agreement**

Countries contracting to the GE06 Agreement have entered into binding agreements with respect to incoming and outgoing interference. Entries in the GE06 Plan, with associated bilateral agreements, effectively set a range of interference thresholds (incoming and outgoing) that are not to be exceeded without further coordination for each channel in the frequency range 470-862 MHz. These thresholds have been developed with television services in mind, such that the levels of interference that the plan can tolerate are consistent with receiver protection requirements in digital television.

Mobile systems have different protection requirements due to their different technical and service characteristics, and so there is a requirement to consider the impact of incoming and outgoing interference thresholds on mobile network design, and in particular the constraints that might apply on network deployment to meet the internationally agreed conditions in the GE06 Agreement.

The transmit powers and antenna heights characterising broadcasting networks are considerably higher than those encountered within typical mobile networks and may create substantial interference over a wide area. Furthermore, as FDD operation requires two paired channels, the mobile network may in general be subject to two different coverage patterns of incoming DTT interference. Furthermore, broadcasting and mobile services are expected to have different channel widths which means that interference from multiple and partially overlapping channels will generally have to be taken into account.

Analysis conducted in the UK and France on the impact of the GE06 Plan on deployment of fixed/mobile services suggests that the limiting case for mobile network operation in the 790-862 MHz band will be mobile base station reception in the presence of incoming interference from digital television transmissions in neighbouring countries operating in this frequency band, rather than in meeting outgoing interference thresholds to protect digital television reception. Incoming (and outgoing) interference levels vary considerably on a channel-by-channel basis across the band 790-862 MHz.

Figure 1 illustrates the combined effect of incoming interference to channel 65 from all of the UK’s neighbouring countries (Ireland, France, Holland, and Belgium).

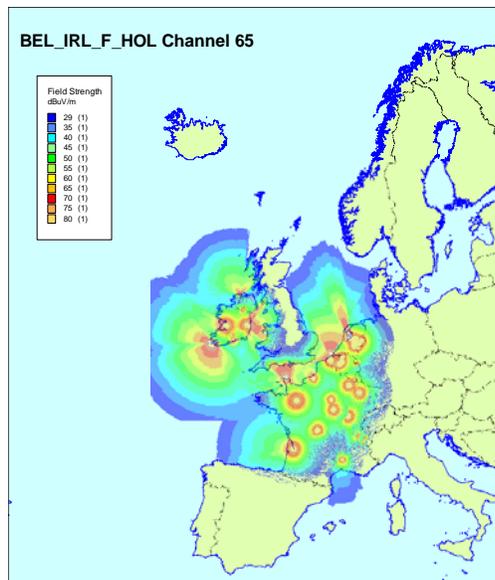


Figure 1. Incoming interference to UK from DTT transmissions in neighbouring countries on Channel 65

A country intending to implement fixed/mobile networks may be affected by incoming interference from countries continuing DVB-T operation. Under these conditions there is a need to consider practical measures within fixed/mobile network planning to enable such networks to mitigate against these effects. Possible mitigation techniques are discussed in Section 4.5.

The mobile unit is far less susceptible to interference than the base station because:

- The mobile unit receiver is less sensitive and designed to work with stronger signals than the base station
- The antenna gain is much lower
- The antenna height is much lower (1.5 m)
- Building clutter and building penetration (in case of indoor operation) reduces interference

Thus interference into the base station receive channel (uplink) is far more significant than interference into the mobile station receive channel (downlink).

#### 4.3.2 Basic parameters relevant for cross-border coordination discussions

Following any official regulatory notification, in bi- and multilateral discussions there is a need to agree on the technical parameters to be used for the compatibility calculations leading to coordination agreements. This can lead to the concept of a trigger level applied at the border such that stations that do not exceed the trigger may be operated without further coordination or assessment. Administrations are free to establish their working methods by mutual consent, either using the GE06 technical basis or establish alternatives using the following guidance list to aid the process:

##### a) Definition of Protection Criteria:

For broadcasting services (BS) the minimum field strength to be protected needs to be specified, as well as the protection ratio between BS and the mobile service (MS). Furthermore, the location probability is required for the particular broadcasting coverage under consideration.

In the case of MS the location of base stations can be specified together with the transmitting and receiving antenna patterns, heights, and powers. Handheld terminals are controlled in numbers and transmit only from the coverage area of each base station.

##### b) Network Topology:

Digital broadcasting networks can be deployed either as MFNs or SFNs. Other primary services usually rest on single transmitter/receiver stations. In any case the technical characteristics of the transmitters such as geographical location, antenna height and pattern and e.i.r.p. must be given.

In the case of MS many small cells each served by a single base station are employed to provide service throughout a large area. Macro cells for which base station e.i.r.p. and antenna height are higher have to be considered in priority in coordination discussions.

##### c) Wave Propagation Model:

Some examples of the models that could be used in bi- or multilateral coordination are Hata model and ITU-R Rec. P.1546, which are common, or at least agreed, models for the mobile and broadcasting services, respectively. These propagation models have limitations to their scope and are appropriate under specified conditions only and, therefore, have to be selected accordingly. This is because of the specificity of the intended coverage areas, which are also different for the broadcasting and mobile services. For cross-border coordination between the mobile and broadcasting an amalgamation of those models can be perhaps considered.

It should be noted that any coordination calculations on a regulatory basis under the GE06 Agreement must use the ITU-R P.1546 variant specified within the GE06 Final Acts. Following this regulatory baseline starting point, the propagation model used between administrations in coordination calculations may be established by mutual agreement.

##### d) Field Strength Aggregation Method:

When more than one transmitter has to be taken into account for an interference evaluation, methods are required to appropriately aggregate the different signal contributions at a given point of reception. Conceivable methods are the power sum method, Monte-Carlo-Simulation or approximation methods like the LNM-method.

#### 4.3.3 Field strength calculations

It is important to distinguish between coordination trigger field strengths which are defined in GE06 Agreement (see section 4.1) and which have a regulatory meaning and the field strength which may impact a broadcasting or mobile network in practice.

When one Administration implements mobile service and the other continues to use this frequency band in accordance with the GE06 Plan, compatibility scenarios involve situation when either:

- Mobile service is using a dedicated downlink, or
- Mobile service is using a dedicated uplink, or
- Mobile service is using a shared uplink and downlink (i.e, TDD)

**a) Protection of the broadcasting service**

For the protection of the broadcasting service, more precise determination of the interference field strength  $F_{int}$  can also be based on GE06 appendix 2 to Section 1 of annex 4. The formula which is used in this annex takes into account the protection ratio applicable to the coordination scenario and the planning field strength of the broadcasting service:

$$F_{int} = F_{med} + f_{corr} - PR - CF$$

where:

- $F_{med}$ : minimum median field strength (at 10 m height) of the relevant (victim) broadcasting system (e.g. 56 dB $\mu$ V/m for RPC 1, 78 dB $\mu$ V/m for RPC 2 and 88 dB $\mu$ V/m for RPC 3)
- $f_{corr}$ : frequency correction (for fixed reception,  $f_{corr} = 20 \log_{10} (f/fr)$ , where f is the actual frequency and fr = 650 MHz ; for portable reception and mobile reception,  $f_{corr} = 30 \log_{10} (f/fr)$ )
- $PR$ : relevant protection ratio
- $CF$ : relevant combined location correction factor (e.g.  $1.64 * \sqrt{\sigma_w^2 + \sigma_n^2}$ , where  $\sigma_w$  is the standard deviation of location variation for the wanted signal (dB) and  $\sigma_n$  the standard deviation of location variation for the nuisance signal (dB), and the number 1.64 is for 95% locations coverage with Recommendation ITU-R P.1546 standard deviation of 5.5dB [5])

In GE06, this formula is used to determine the coordination trigger field strength based on the most sensitive network. However it could also be used for determining the interference field strength for the protection of a particular network.

As shown in the table below, the value of the interference field strength ranges from 24 dB $\mu$ V/m for RPC-1 (i.e, the worst case that determines the coordination trigger field strength for digital television) to 49 or 58 dB $\mu$ V/m in the case of the protection of RPC-2 or RPC3-like broadcasting coverage.

Example of interference field strength values $F_{int}$ for DVB-T as interferer at 800 MHz, 10 m height					
Planning Configuration	$F_{med}$ (50% of time)	$f_{corr}$	$PR$	$CF$	$F_{int}$ (1% of time)
RPC-1	56.0	1.8	21.0	12.8	24.0
RPC-2	78.0	2.7	19.0	12.8	48.9
RPC-3	88.0	2.7	17.0	15.7	58.1

The protection ratios used here are those applicable to a DVB-T signal interfered with by a DVB-T signal. For other types of interfering signals, applicable protection ratios should be used (for a DVB-T signal interfered with by a mobile signal see working document towards CEPT Report on measurements of protection ratios for the protection of the broadcasting service from the mobile service in order to assist administrations in determining the precise situation in terms of compatibility). Particular attention should be paid to the use of mutually agreed realistic protection ratios during bilateral and multilateral negotiations taking into account the concerned DVB-T variant and reception mode.

Noting that the planning field strength of UMTS is of the order of 60 dB $\mu$ V/m at 1.5 m the protection of all DVB-T reception modes (fixed, portable, mobile) may in general be an issue for **a dedicated mobile service downlink**. It may, therefore, require careful planning of mobile base station locations in the vicinity of the border. There may be more freedom with regard to protection of portable/mobile DVB-T reception if the mobile network is carefully deployed, through adequate planning, within the territory of the country using the sub-band for the mobile service.

**For a dedicated mobile service uplink**, the interference scenario is more difficult to assess and should involve statistical consideration.

## b) Protection of the mobile service

**For the protection of the mobile service**, the coordination trigger values defined in GE06 are based on assignment characteristics rather than on the protection of the rights for any future deployment in the case of broadcasting. However, coordination trigger values are derived from worst case characteristics (noise figure, antenna gain) and in detailed coordination discussions real values for the deployed systems should be used.

**If the mobile service is a downlink**, then the coordination field strength trigger value is about 31 dB $\mu$ V/m in 8 MHz at 1.5 m for NA and NB systems considered in GE06 Agreement. However, it has to be noted that trigger field strength values used for coordination between IMT-2000/UMTS systems in 900 MHz band is 59 dB $\mu$ V/m/5MHz at a height of 3 m (i.e. 55 dB $\mu$ V/m at a height of 1.5 m) at the borderline between two countries (see [4]). Operators generally comply with this trigger in order to avoid additional coordination. This means that in the coordination process under the GE06 Agreement, there is a possibility for the two administrations wishing to implement mobile service and broadcasting service respectively to agree on interference values much higher than the GE06 coordination trigger value (in some cases up to 20 dB).

Nevertheless, the result of coordination may depend to a large extent on the broadcasting use. In the case of DVB-T fixed reception, careful broadcasting planning should enable the avoidance of excessive planning field strength beyond the border. In the case of portable reception, with planning broadcast field strengths of 78 dB $\mu$ V/m or 88 dB $\mu$ V/m, it will not be possible to ensure a full protection of mobile terminals if a frequency is used for broadcasting to cover an allotment adjacent to the border. However, statistical consideration may help in the assessment of compatibility together with specific mobile planning measures.

**If the mobile service is an uplink**, the interference scenario is particularly difficult since high power high tower broadcasting transmitters may be co-channel with highly sensitive base station receivers. The interference trigger field strength for base stations is about 10 dB $\mu$ V/m to be compared with the DVB-T planning field strength (> 56 dB $\mu$ V/m). In such a situation, interference may be unavoidable at the border if a frequency is used for broadcasting to cover an allotment adjacent to the border.

## 4.4 Mitigation techniques

Compatibility is likely to be an issue mainly for the case of protection of base stations in the mobile service from co-channel and overlapping channel broadcasting transmitters used to cover areas adjacent to the border.

Administrations may in bilateral discussions consider solutions to avoid this critical case (i.e. not using the same frequency for base station reception and broadcasting in adjacent areas). Such solutions should however fully respect administration rights as defined in GE06 and the principle of equitable access.

Coordinating administrations may also consider limiting the area of interference by ensuring that at a reasonable distance beyond the border, the field strength from broadcasting networks are as low as possible, i.e. minimising the interference that one administration generates in the territory of another administration.

A number of measures can be considered to reduce the impact of interference to mobile systems. Some of these relate to the way that mobile systems typically work (e.g. power control) and some require specific measures to be implemented at base station sites, such as antenna separation or filtering. Annex 5 of CEPT Report 22 [6] identified numerous mitigation techniques which can further increase the resilience of mobile networks to incoming interference, including:

- Use of adaptive antennas which can cancel incoming interference contributions
- Use of polarisation diversity
- Try to point mobile base station receive antennas away from the interferer
- Use of multiple access interference cancellation techniques
- Use of techniques such as OFDMA which can vary the interference immunity on individual sub-carriers to assist in providing interference protection when the incoming interference is fading in a frequency selective way or when the mobile channel straddles the boundary between two DTT channels.

## 5 CONCLUSION

Within this report CEPT reviews different elements in relation to cross-border coordination between mobile services in one country and broadcasting services in another country. The elements include considerations on a regulatory mechanism of

coordination as well as on different issues in relation to compatibility analysis between the broadcasting and mobile services. The elements may be used selectively by administrations when establishing coordination methodologies with neighbouring countries.

CEPT is of the opinion that the GE06 Agreement provides the necessary regulatory procedures to identify administrations to be involved in the coordination process between broadcasting service in one country and mobile service in another country. The identification is made by means of the coordination trigger field strength.

Noting that the report is developed on the basis of characteristics of mobile systems contained in the GE06 Agreement it is also noted that these are in practice worst case values, which are broadly technologically independent.

It is pointed out that incoming co-channel and overlapping channel interference from the broadcasting networks into mobile service base stations in areas adjacent to the border is likely to be the main issue. This should be taken into account during deployment of future mobile systems in the band 790-862 MHz. Different mitigation techniques need to be considered to the right degree when finding solutions in bi- and multilateral discussions.

CEPT further agrees that a detailed coordination methodology including a careful interference assessment may need to be developed by the administrations concerned during bilateral or multilateral discussions using the elements provided in this report for guidance.

## ANNEX A: SECOND EC MANDATE ON DIGITAL DIVIDEND



EUROPEAN COMMISSION  
Information Society and Media Directorate-General  
Electronic Communications Policy  
Radio Spectrum Policy

Brussels, 3 April 2008  
DG INFSO/B4

ADOPTED

### Second mandate to CEPT on technical considerations regarding harmonisation options for the digital dividend in the European Union

This mandate is issued to the CEPT without prejudice to the one-month right of scrutiny by the European Parliament, pursuant to Council Decision 1999/468/EC of 28 June 1999 (OJ L 184, 17.7.1999, p.23) on comitology procedure. This one-month period starts on 5 April 2008.

#### 1. PURPOSE

This mandate intends to be a **follow-up** to the initial mandate on the digital dividend<sup>1</sup>. The main objective of this additional work is to ensure the continuation and timely development of the **technical conditions and arrangements** required to pave the way for non-mandatory, non-exclusive coordinated use of the digital dividend in Europe.

This mandate should provide further technical input to the political process ongoing at EU level<sup>2</sup>. The common exploitation of the result of this mandate does not entail the development of a technical implementation measure under the Radio Spectrum Decision. Any common action will be guided by an eventual EU-level political agreement involving the Council and European Parliament and the work undertaken under this mandate should not prejudice the contents of any future European agreement.

<sup>1</sup> Mandate to CEPT on technical considerations regarding harmonisation options for the digital dividend, 30 January 2007 (RSCOM06-89).

<sup>2</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *Reaping the full benefits of the digital dividend in Europe: a common approach to the use of the spectrum released by the digital switchover*, COM(2007) 700, 13.11.2007.

## 2. JUSTIFICATION

Pursuant to Article 4 of the Radio Spectrum Decision<sup>3</sup>, the Commission may issue mandates to the CEPT for the development of technical implementing measures with a view to ensuring harmonised conditions for the availability and efficient use of radio spectrum. Such mandates shall set the task to be performed and the timetable therefor.

A number of results from related activities justify the need to address an additional EC mandate to CEPT.

CEPT has delivered its final reports to the WAPECS mandate<sup>4</sup> and to the **initial digital dividend mandate**<sup>5</sup>.

- The findings prepared under the **initial digital dividend mandate** (Report A) discuss two approaches to implement downlinks of mobile multimedia networks in the UHF-bands IV and V:
  - Approach 1: Implementation without a harmonized sub-band, based on the GE06 Plan entries
  - Approach 2: Implementation based on a harmonized sub-band

It is concluded that for the deployment of mobile multimedia applications Approach 1 minimises the impact on the current status of the GE-06 Plan. Since this plan may evolve continuously through the application of its modification procedure, it is possible for it to evolve towards a harmonised sub-band for mobile multimedia applications, i.e. Approach 2.

- The CEPT Report B and its supplement have retained the upper part of the UHF band allocated to the mobile service at WRC-07 (790-862 MHz) while noting that further work is needed for the development of detailed technical usage conditions, including compatibility studies. It concluded, with a reservation from some Administrations, that harmonisation of a sub-band of the UHF band is feasible from a technical, regulatory and administrative point of view provided that it is not made mandatory and any decision about the use of the harmonised sub-band is left to individual Administrations within the framework of the GE-06 Agreement.
- For the envisaged sub-band accommodating broadcasting networks as protected by the GE-06 agreement, it is assumed that the GE-06 agreement provides the necessary technical usage condition specifications, and no further work is required under this mandate.
- **The WAPECS Mandate** has developed a mechanism for applying least restrictive technical conditions in specific frequency bands taking into account the most likely use or targeted network type. Concerning the UHF band this mandate confirmed the general feasibility of flexible use, but did not finalise its work on actual least

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<sup>3</sup> Decision 676/2002/EC of the European Parliament and of the Council of 7 March 2002 on a regulatory framework for radio spectrum policy in the European Community, OJ L 108 of 24.4.2002.

<sup>4</sup> Mandate to CEPT to develop least restrictive technical conditions for frequency bands addressed in the context of WAPECS, 5 July 2006

<sup>5</sup> CEPT Reports parts A, B and C in response to the Commission mandate to CEPT on the digital dividend issued on 30 January 2007.

restrictive technical conditions, due to missing basic assumptions that only now have become available through the finalisation of the initial digital dividend mandate.

**In addition, WRC-07 allocated on a co-primary basis the upper part of the UHF band (790 – 862 MHz) to mobile services in Europe as from 2015, and allowed some EU countries to utilise this allocation before 2015, subject to technical coordination with other countries.**

The Commission considers that the results of the two mandates mentioned above as well as the outcome of WRC-07 are compatible with the proposals set out in the Commission Communication on the digital dividend. Consequently, **the detailed technical feasibility of these results and proposals** ought to be further examined in a new mandate.

### 3. MAIN EU POLICY OBJECTIVES

With this Mandate, the Commission issues guidance to the CEPT to continue developing technical conditions and studies serving policy objectives which the optimisation of the use of the digital dividend at EU level will contribute to, namely:

- strengthen the **Internal Market** dimension for potential mass-market services and equipment which will operate in the UHF band, including for applications related to broadcasting, broadband access, convergent services and "legacy" services such as Programme Making and Special Event (PMSE) applications. For these last applications, alternative common solutions outside the UHF band should be explored where needed;
- support the **development of the media sector** by promoting the emergence of new broadcasting and/or converging services taking advantage of the flexibility offered in the GE-06 agreement and by ensuring an appropriate level of protection of existing and innovative media services against interference from other spectrum uses;
- promote increased **broadband access** for all EU citizens as well as new services fostering growth and innovation, thereby supporting the objectives of the Lisbon agenda<sup>6</sup>;
- exploit the socio-economic and cultural benefit of the digital dividend to the full by applying enabling a more **flexible use of spectrum**.

### 4. TASK ORDER AND SCHEDULE

The Commission Communication has identified three clusters in relation to the digital dividend.

CEPT is mandated to carry out the technical investigations to define the technical conditions applicable for the sub-band 790-862 MHz optimised for, but not limited to,

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<sup>6</sup> Communication from the Commission to the Council and the European Parliament - Common Actions for Growth and Employment : The Community Lisbon Programme [SEC(2005) 981]. Full text available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52005DC0330:EN:NOT>

fixed/mobile **communications networks** (two-way). The CEPT is requested to study more specifically:

- (1) The identification of common and minimal (least restrictive)<sup>7</sup> technical conditions. These conditions should be sufficient to avoid interference and facilitate cross-border coordination noting that certain frequencies used for mobile multimedia networks may be used primarily for mobile (downlink) in one country and broadcasting networks in another country until further convergence takes place.
- (2) The development of the most appropriate channelling arrangement: in addition to (1), the CEPT is requested to develop channelling arrangements that are sufficiently precise for the development of EU-wide equipment, but at the same time allow Member States to adapt these to national circumstances and market demand. The overall aim of a coordinated European approach should be considered, implemented through detailed national decisions on frequency rearrangements, while complying with the GE-06 framework.
- (3) A recommendation on the best approach to ensure the continuation of existing Programme Making and Special Events (PMSE) services operating in the broadcasting band, including the assessment of the advantage of an EU-level approach as well as an outline of such an EU-level solution if appropriate.

The Commission may provide CEPT with further guidance on this mandate or issue a new mandate dealing with accommodation of one-way multimedia networks and the impact of national demands for fixed/mobile communications networks that require use of adjacent frequencies below 790-862 MHz on the basis of political agreements with the European Parliament and the Council on the digital dividend, as well as the socio-economic impact assessment it is planning to undertake via an independent study on the digital dividend to be launched in 2008.

The main deliverable for this Mandate will be additional reports, subject to the following delivery dates:

Delivery date	Deliverable
26 Sept. 2008	First progress report for the RSC#25
1 Dec. 2008	For RSC#26: Draft final report on Task (1), Progress report on Tasks (2)
13 March 2009	For RSC#27: Final report on Task (1), Draft final report on Task (2) and Progress report on Task (3).
June 2009	For RSC#28: Final report on Task (2) and Task (3)

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<sup>7</sup> Such as the definition of appropriate BEMs (Block Edge Masks)

In implementing this mandate, the CEPT shall, where relevant, take the utmost account of Community law applicable and support the principles of technological neutrality, non-discrimination and proportionality insofar as technically possible.

**ANNEX B: EXTRACT OF THE GE-06 AGREEMENT**

**Generic case in the mobile service**

For the generic case (type code NB) in the mobile service, i.e. when there is no value of protection ratio available, the following equation must be used:

$$F_{trigger} = -37 + F - G_i + L_F + 10 \log(B_i) + P_o + 20 \log f + I/N \quad (\text{A.1.1})$$

where:

- $F$ : receiver noise figure of the mobile service base or mobile station receivers (dB)
- $B_i$ : the bandwidth of the terrestrial broadcasting station (MHz)
- $G_i$ : the receiver antenna gain of the station in the mobile service (dBi)
- $L_F$ : antenna cable feeder loss (dB)
- $f$ : centre frequency of the interfering station (MHz)
- $P_o$ : man-made noise (dB) (typical value is 1 dB for the VHF band and 0 dB for the UHF band)
- $I/N$ : interference to noise ratio, which must not exceed the threshold (margin) applicable when developing the Plan ( $I/N = -6$  dB).

For the generic case of the land mobile service, the following typical values of  $F$ ,  $G_i$ ,  $L_F$  and  $P_o$  to be used (see Recommendation ITU-R M.1767 as an informative source) are provided in Tables AP1.4 and AP1.5 for the base stations and mobile stations respectively:

TABLE AP1.4

**Typical values of the parameters when applying equation (AP1.1) to derive coordination trigger field-strength values to protect the base stations for the generic case (type code NB) of the mobile service from DVB-T**

Frequency (MHz)	174	230	470	790	862
$F$ (dB)	8	8	4	3	3
$G_i$ (dBi)	6	8	12	17	17
$L_F$ (dB)	2	2	2	4	4
$P_o$ (dB)	1	1	0	0	0
$F - G_i + L_F + P_o$	5	3	-6	-10	-10

TABLE AP1.5

**Typical values of the parameters when applying equation (AP1.1) to derive coordination trigger field-strength values to protect the mobile stations for the generic case (type code NB) of the mobile service from DVB-T**

Frequency (MHz)	174	230	470	790	862
$F$ (dB)	11	11	7	7	7
$G_i$ (dBi)	0	0	0	0	0
$L_F$ (dB)	0	0	0	0	0
$P_o$ (dB)	1	1	0	0	0
$F - G_i + L_F + P_o$	12	12	7	7	7

**ANNEX C: LIST OF REFERENCES**

- [1] Finals acts of the Regional Radiocommunication Conference 2006 for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz (RRC-06) ([www.itu.int](http://www.itu.int))
- [2] ERC/REC/(01)01: Border coordination of UMTS (<http://www.erodocdb.dk>)
- [3] ECC/REC/(05)08: Frequency planning and frequency coordination for the GSM 900, GSM 1800, E-GSM and GSM-R Land Mobile Systems (<http://www.erodocdb.dk>)
- [4] ECC/REC/(08)02: Frequency planning and frequency coordination for the GSM 900 (including E-GSM)/UMTS 900, GSM 1800/UMTS 1800 Land Mobile Systems (<http://www.erodocdb.dk>)
- [5] Recommendation ITU-R P.1546-3: Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 3 000 MHz (<http://www.itu.int>)
- [6] CEPT Report 24: Technical considerations regarding harmonisation options for the digital dividend: Technical Feasibility of Harmonising a Sub-band of Bands IV and V for Fixed/Mobile Applications (including uplinks), minimising the Impact on GE06, July 2007 (<http://www.erodocdb.dk>)
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