CEPT ECC
Electronic Communications Committee

CEPT Report 55

Report A from CEPT to the European Commission in response to the Mandate on 'Harmonised technical conditions for the 2300-2400 MHz ('2.3 GHz') frequency band in the EU for the provision of wireless broadband electronic communications services'

Technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band

Report approved on 28 November 2014 by the ECC

0 EXECUTIVE SUMMARY

This CEPT Report is the first part of the response to the Mandate issued by the European Commission on harmonised technical conditions for the 2300-2400 MHz ('2.3 GHz') frequency band in the EU for the provision of wireless broadband (WBB) electronic communications services.

It provides common and minimal technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band based on the provisions developed by CEPT in ECC/DEC/(14)02 [1] as follows:

- Harmonised un-paired channelling arrangement (for TDD), consistent with ITU-R Recommendation M.1036 [2], based on 20 blocks of 5 MHz;
- Block-Edge Mask (BEM) applicable to WBB derived :
  - to allow coexistence between WBB applications in the 2300-2400 MHz band;
  - to ensure coexistence with the services and applications above 2400 MHz.

It also contains guidelines on the additional conditions to be applied on a case-by-case basis for the coexistence between WBB in the band 2300-2400 MHz and services below 2300 MHz.

Licensed Shared Access (LSA), as defined by RSPG in [3] and further described in ECC Report 205 [4], is the recognised approach on the CEPT level for administrations wishing to introduce WBB while maintaining the current incumbent use. Necessary requirements are to be established by the national regulators to share the band through LSA, assessing the protection of the incumbent use of the band. Depending upon the national circumstances, these requirements may have an impact on the conditions of introduction of WBB in the band 2300-2400 MHz and in particular on the amount of spectrum available for WBB.

The implementation of the LSA sharing framework on national level, which can lead to additional restrictions in concerned areas for WBB, will not have an impact on the common and minimal technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band as described in this CEPT Report. Those additional restrictions will be related to timely and/or geographical restrictions and will therefore not be in contradiction with the aim of getting European wide common technical conditions.

The development, where appropriate, of common technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and incumbent services/applications will be addressed in subsequent CEPT Reports responding to the task 2 of the EC Mandate. CEPT Report 56 addresses the tasks 2.1 and 2.2 of the EC Mandate.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Explanation
BEM	Block-Edge Mask
BS	Base station
BWS	Broadband wireless system
CEPT	European Conference of Postal and Telecommunications Administrations
ECC	Electronic Communications Committee
EESS	Earth Exploration Satellite Service
e.i.r.p.	Effective Isotropic Radiated Power
IMT	International Mobile Telecommunication
ITU-R	International Telecommunication Union - Radiocommunication
LRTC	Least restrictive technical conditions
LSA	Licensed Shared Access
LTE	Long Term Evolution
MFCN	Mobile/Fixed Communications Networks
MMDS	Multipoint Multichannel Distribution System
PMSE	Programme Making and Special Events
RLAN	Radio Local Area Network
RSPG	Radio Spectrum Policy Group
SAB	Services Ancillary to Broadcasting
SAP	Services Ancillary to Programme making
TDD	Time Division Duplex
TRP	Total Radiated Power
UAS	Unmanned Aircraft Systems
UE	User equipment
WBB	Wireless broadband
WRC	World Radiocommunication Conference

1 INTRODUCTION

This CEPT Report is the first part of the response to the Mandate issued by the European Commission on harmonised technical conditions for the 2300-2400 MHz ('2.3 GHz') frequency band in the EU for the provision of wireless broadband (WBB) electronic communications services. This EC Mandate (see ANNEX 1: for the full text of the EC Mandate) tasks CEPT to undertake work to develop technical harmonisation conditions for the use of the 2300-2400 MHz frequency band for the provision of WBB electronic communications services with a view to also ensuring the long term incumbent use of the band in the territory of those Member States that wish to maintain such use.

Specifically, this CEPT Report responds to the task 1 of the EC Mandate and aims at developing common and minimal (least restrictive) technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band.

This task includes:

1.1 Identify common and minimal (least restrictive) technical conditions for the introduction of wireless broadband use in the 2300-2400 MHz band for the provision of electronic communications services. These conditions should be sufficient to ensure coexistence between WBB services within the same band and with services in adjacent bands including use by Radio Local Area Networks (RLAN).

1.2 Develop channelling arrangements that are sufficiently precise for the development of EU-wide equipment and take into consideration the possibility of international harmonisation.

The development, where appropriate, of common technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and incumbent services/applications (task 2 of the EC Mandate) will be addressed in subsequent CEPT Reports.

2 BACKGROUND

The frequency band 2300-2400 MHz is allocated to the Mobile Service on a co-primary basis by ITU Radio Regulations [5] in all three ITU regions. WRC-07 identified the band 2300-2400 MHz for IMT, see footnote RR 5.384A.

However, after WRC-07, CEPT was not in a position to implement on a harmonised basis the band 2300-2400 MHz for IMT because of the need to maintain the long term incumbent use.

In March 2012, the ECC has published ECC Report 172 [6] which addresses sharing and compatibility studies between broadband wireless systems (BWS) in the band 2300-2400 MHz and other services/systems in the band and in adjacent bands. This ECC Report [6] concludes that the sharing between BWS and incumbent services in the 2300-2400 MHz band is feasible. In some cases, there is a requirement for mitigation techniques such as adjacent channel operation, geographical separation, time sharing or a combination of the previous. ECC Report 172 studies were performed assuming worst case scenarios and not considering sharing opportunities through Licensed Shared Access.

CEPT initiated activities on the Licensed Shared Access (LSA) approach and on the development of harmonisation measures for Mobile/Fixed Communications Networks (MFCN) under LSA in this band. This led to the publication of:

- ECC Report 205 [4] on 'Licensed shared access' (February 2014).The two main objectives of this Report are:
  - to provide a general analysis of LSA, taking into account initial RSPG working definition, how it fits with regulatory framework on the use of spectrum, current practices in terms of spectrum management and management of frequency authorisations;
  - to explain how LSA can be implemented in the mobile broadband application case/MFCN (for example in the band 2.3-2.4 GHz) and to clarify implications on the requirements to be included in a CEPT "harmonisation measure".

- ECC/DEC/(14)02 [1] on Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN) (June 2014). The purpose of this ECC Decision is to provide harmonised regulatory conditions for the use of the band 2300-2400 MHz for mobile/fixed communications networks (MFCN). It includes:
  - Harmonised frequency arrangements;
  - Least restrictive technical conditions defined as Block-Edge Mask;
  - Guidelines on the implementation of LSA for administrations wishing to introduce MFCN in the band, and maintain the long term incumbent use of the band in their territory.

  Harmonised frequency arrangements and least restrictive technical conditions defined for MFCN in ECC/DEC/(14)02 are the basis for the technical conditions for WBB presented in this CEPT Report (see sections 3.1 and 3.2 respectively).

- ECC/REC/(14)04 [7] on 'Cross-border coordination for MFCN and between MFCN and other systems in the frequency band 2300-2400 MHz' (30th May 2014). This Recommendation provides guidance to administrations on:
  - coordination between MFCN systems in border areas in the band 2300-2400 MHz,
  - and coordination between MFCN systems and other systems in neighbouring countries in the band 2300-2400 MHz.

3 TECHNICAL CONDITIONS FOR WBB USAGE OF THE 2300-2400 MHz BAND

3.1 HARMONISED CHANNELLING ARRANGEMENT

The following principles have been considered to define the frequency arrangement:

- a common frequency arrangement to facilitate roaming, border coordination and to achieve economies of scale for equipment, whilst maintaining the flexibility to adapt to national circumstances and market demand;
- careful consideration on block sizes for the band plan.

Taking into consideration the possibility of international harmonisation and the standardisation framework, it is proposed to implement the un-paired channelling arrangement (for TDD) consistent with Recommendation ITU-R M.1036 [2] as described below:

Frequency arrangement should be based on 20 blocks of 5 MHz.

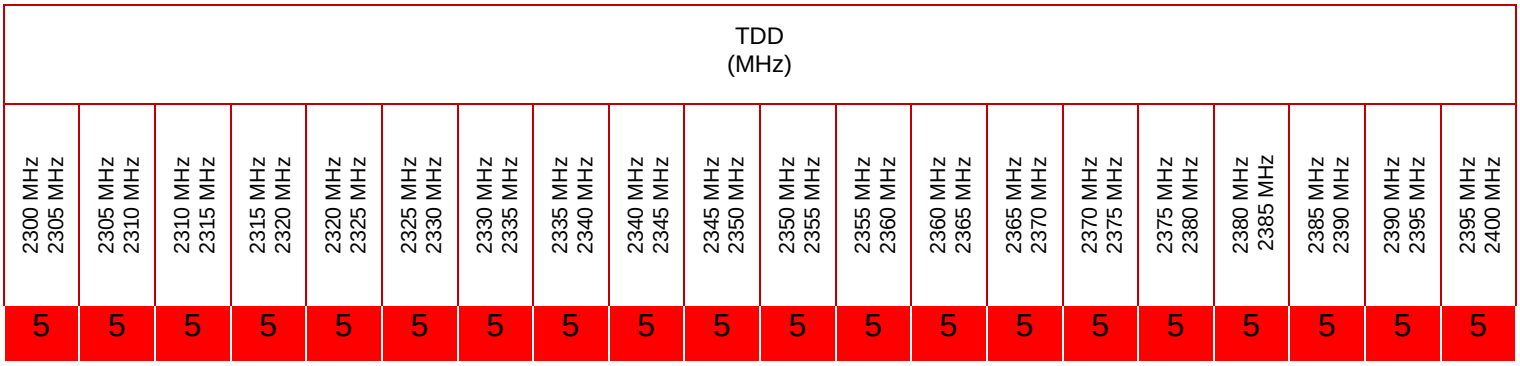

Figure 1: Harmonised frequency arrangement for WBB in the 2300-2400 MHz band

An operator can aggregate several channels of 5 MHz to obtain a new channel.

3.2 LEAST RESTRICTIVE TECHNICAL CONDITIONS FOR WBB SERVICES IN THE BAND 2300-2400 MHz

3.2.1 General principles

The least restrictive technical conditions (LRTC) defined in this Report are in the form of a block-edge mask (BEM) applicable to WBB. It has been derived using an approach similar to the one used for the 3400-3800 MHz band, as documented in CEPT Report 49 [8] and ECC Report 203 [9].

BEM is related to spectrum licensing and the avoidance of interference between users of spectrum.

A BEM is an emission mask that is defined, as a function of frequency, relative to the edge of a block of spectrum that is licensed to a WBB operator. It consists of in-block and out-of-block components which specify the permitted emission levels over frequencies inside and outside the licensed block of spectrum respectively. The term block edge refers to the frequency boundary of spectrum licensed to a WBB operator. The term band edge refers to the boundary of a range of frequencies allocated for a certain use (e.g. 2300 MHz is the lower band edge for WBB).

The BEM has been derived:

- that is intended to allow coexistence between WBB applications in the 2300-2400 MHz band and to apply to the harmonised frequency arrangement as described in section 3.1;
- that is intended to ensure coexistence with the applications above 2400 MHz.

The derived BEM does not take into account coexistence with adjacent services below 2300 MHz for which general guidance is provided in ECC Report 172 [6] and summarised in section 3.3.

The derived BEM does also not take into account coexistence with other incumbent services inside the band 2300-2400 MHz. This coexistence with incumbent services is addressed in section 3.5 and will be further detailed in a subsequent CEPT Report in response to this EC Mandate.

In addition to the BEM, further requirements may be needed in such instances. This can be done at a national level or through cross-border coordination developed by bilateral or multilateral agreements.

BEM shall be applied as an essential component of the technical conditions necessary to ensure coexistence between services at a national level. However, it should be understood that the derived BEM does not always provide the required level of protection of victim services and additional mitigation techniques would need to be applied in order to resolve any remaining cases of interference.

Operators of WBB in the 2300-2400 MHz band may agree, on a bilateral or multilateral basis, on less stringent technical parameters providing that they continue to comply with the technical conditions applicable for the protection of other services, applications or networks and with their cross-border obligations.

3.2.2 Technical conditions for WBB Base stations

Technical conditions are applicable to WBB base stations (BS) with different power levels (macro, micro, pico and femto BS).

To obtain a BEM for a specific block, the BEM elements that are defined in Table 1: are used as follows:

1. In-block power limit is used for the block assigned to the operator;
2. Transitional regions are determined, and corresponding power limits are used;
3. For remaining spectrum assigned to WBB TDD, baseline power limits are used.

Table 1: BEM elements for WBB Base stations

BEM element	
In-block	Block for which the BEM is derived.
Baseline	Spectrum used for TDD, except from the operator block in question and any corresponding transitional regions[1].
Transitional region	Transitional regions apply for unwanted emissions into adjacent TDD blocks allocated to other operators if networks are synchronised. They also apply in-between TDD blocks with a frequency separation of 5 or 10 MHz between each block edge. For immediately adjacent unsynchronised TDD networks, there is no transitional region and the baseline levels apply outside the allocated block. The transitional regions do not apply below 2300 MHz or above 2400 MHz.

Synchronised operation[2] as referred in the table above means “operation of TDD in two different systems, where no simultaneous uplink and downlink occur”, as defined by 3GPP in TS 37.104 section 3.1 [10] (see also ECC Report 216 on ‘Practical guidance for TDD networks synchronisation’ [11]).

[1] In case of unsynchronised adjacent blocks, one operator’s out-of-block signal level has to be reduced to the baseline level before entering into another operator’s block.

In the tables below, P_{Max} is the maximum carrier power for the base station in question, measured as e.i.r.p..

3.2.2.1 In-block requirements for WBB base stations

- **2300-2390 MHz:** An in-block e.i.r.p. limit is not obligatory. In case an upper limit is desired by an administration, a value which does not exceed 68 dBm/5MHz e.i.r.p. per antenna may be applied.
- **2390-2400 MHz:** The in-block e.i.r.p.[3] limit shall not exceed 45 dBm/5MHz to ensure coexistence with systems above 2400 MHz.
- For femto base stations, the use of power control is mandatory in order to minimise interference to adjacent channels.

3.2.2.2 Baseline requirements for WBB base stations

Table 2: shows the baseline requirements for unsynchronised and synchronised WBB base stations.

Table 2: Baseline requirements – BS BEM out-of-block e.i.r.p. limits over other TDD blocks within the band

BEM element	Frequency range	Power limit	Measurement bandwidth
Baseline	Unsynchronised TDD blocks (2300-2400MHz)	-36[4] dBm e.i.r.p. [3]	5 MHz
Baseline	Synchronised TDD blocks (2300-2400MHz)	Min(P_{Max} -43, 13) dBm e.i.r.p. per antenna	5 MHz

Table 3: shows the additional baseline requirements above 2400 MHz for unsynchronised and synchronised WBB base stations. Coexistence analysis showed that they need to apply at frequencies above 2403 MHz.

Table 3: Additional baseline requirements above 2403 MHz BS BEM out-of-band e.i.r.p. [3] limits

BEM element	BS e.i.r.p.	Power limit	Measurement bandwidth
Additional baseline	$P_{Max} > 42$ dBm	1 dBm	5 MHz
Additional baseline	24 dBm < $P_{Max} \leq 42$ dBm	(P_{Max} -41) dBm	5 MHz
Additional baseline	$P_{Max} \leq 24$ dBm	-17 dBm	5 MHz

[2] Synchronisation of TDD networks of different operators can be addressed at national level
[3] The e.i.r.p. is the total radiated power in any direction at a single location independent of any base station configuration.
[4] This value is based on a scenario including all base station classes (Macro, Micro, Pico and Femto). A more restrictive scenario may allow a more relaxed value for some BS classes.

3.2.2.3 *Transitional region requirements for WBB base stations*

Table 4: Transitional region requirements for unsynchronised (when applicable) and synchronised WBB base stations – BS BEM out-of-block e.i.r.p. limits

BEM element	Frequency range	Power limit	Measurement bandwidth
Transitional region	-5 to 0MHz offset from lower block edge 0 to 5MHz offset from upper block edge	Min(P_{Max} -40, 21) dBm e.i.r.p. per antenna	5 MHz
Transitional region	-10 to -5MHz offset from lower block edge 5 to 10MHz offset from upper block edge	Min(P_{Max} -43, 15) dBm e.i.r.p. per antenna	5 MHz

Note: The transitional region applies either in the case of synchronised adjacent blocks, or in-between unsynchronised TDD blocks that are separated by 5 or 10 MHz. The transition regions do not apply below 2300 MHz or above 2400 MHz.

3.2.2.4 *BEM implementation for synchronised or unsynchronised TDD networks*

For two adjacent operators using their systems under synchronised conditions, the defined BEM will normally allow direct adjacent operation of the operator's full-power blocks and the out-of-block region consists both of transitional region and baseline levels.

In the case of unsynchronised TDD networks, the compliance of two adjacent operators with the BEM requirements could be achieved by introducing frequency separation (e.g. through the authorisation process at national level) between the block edges of both operators.

Another option is for administrations to introduce so called restricted channels. Operators would then be required to limit the power used in the upper or lower part of their assigned spectrum, to limit the interference due to the selectivity of the adjacent operator's receiver. Assuming standard performance of the interfered receiver, an in-block level of 4 dBm/5MHz e.i.r.p. [3] may be used. This limit would be applied to the upper- or lowermost 5 MHz part of an operator's block to protect the adjacent operator, and may be relaxed in case of bilateral agreements between operators.

If the restricted channel solution is selected, the requirements of another operator's out-of-block emissions into this restricted channel may also be relaxed, e.g. so that the transitional level applies. If the requirements on emissions from other operators are not relaxed, the baseline requirement must be met already at the edge of the restricted channel. In this case an adjacent operator may need to apply an internal guard band for the filter roll-off.

3.2.2.5 *Combination of BEM elements*

The BEM elements as described above are combined to provide a BEM for a particular block following the three steps listed above. Figure 2: and Figure 3: provide examples of such combinations of BEM elements for TDD.

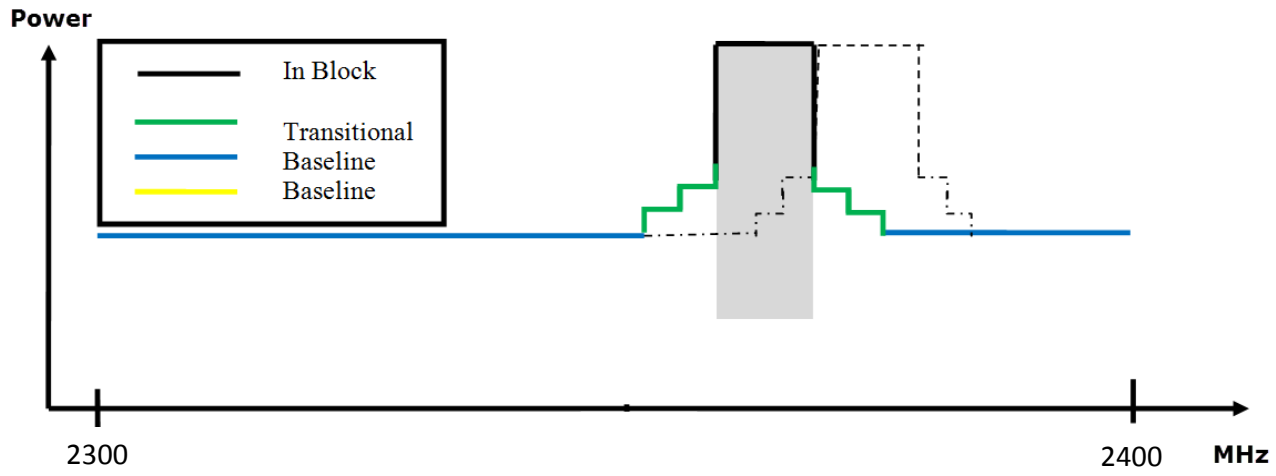

Figure 2: Combined BEM elements for adjacent blocks with synchronised TDD networks

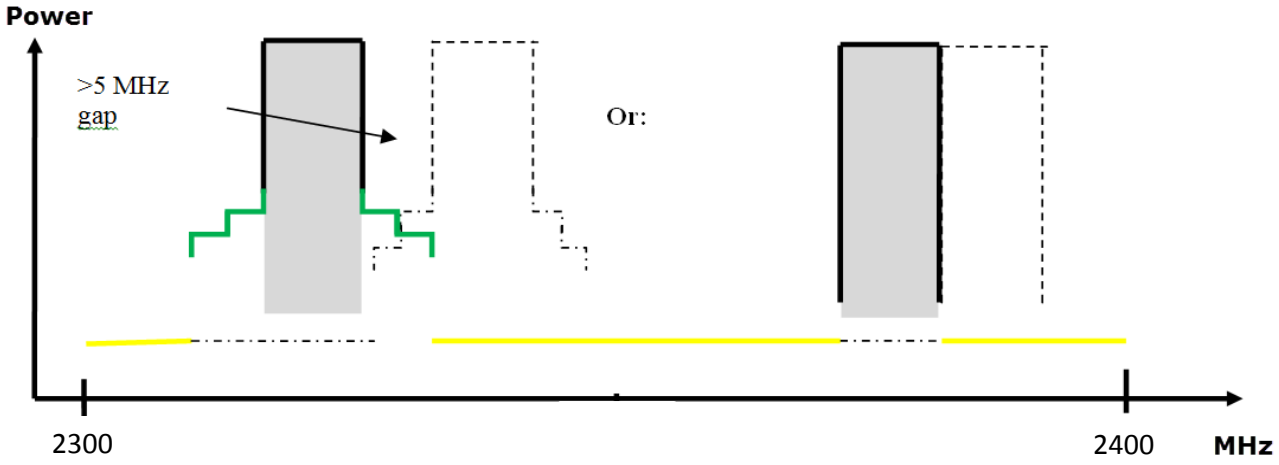

Figure 3: Combined BEM elements for adjacent blocks with unsynchronised TDD networks

3.2.3 Technical conditions for WBB user equipment

In-block requirements for all user equipment

This Report provides a recommended upper limit of 25 dBm for the in-block power of the user equipment (UE).

This power limit is specified as e.i.r.p. for UE designed to be fixed or installed and as TRP[5] for the UE designed to be mobile or nomadic.

[5] TRP is a measure of how much power the antenna actually radiates. The TRP is defined as the integral of the power transmitted in different directions over the entire radiation sphere. For an isotropic antenna radiation pattern, e.i.r.p. and TRP are equivalent. For a directional antenna radiation pattern, e.i.r.p. in the direction of the main beam is (by definition) greater than the TRP.

A tolerance of up to + 2 dB has been included in this limit, to reflect operation under extreme environmental conditions and production spread.

Administrations may relax this limit in certain situations, for example fixed UE in rural areas, providing that protection of other services, networks and applications is not compromised and cross-border obligations are fulfilled.

3.3 ADDITIONAL CONDITIONS FOR THE COEXISTENCE BETWEEN WBB IN THE BAND 2300-2400 MHz AND SERVICES BELOW 2300 MHz

Studies have been performed in ECC Report 172 [6] on the coexistence between WBB (assuming LTE TDD parameters) in the band 2300-2400 MHz and services below 2300 MHz. The results are summarized below:

The coexistence between a LTE TDD macro base station and an earth station satellite receiver (for both Earth Exploration Satellite Service and Space Research Service) at the 2290 MHz boundary has been investigated. The results indicate a feasible implementation of BWS with a geographical separation distance of 3-7 km. Furthermore, since the number of earth stations is limited and their location is known in many countries, and that LTE TDD base stations have better characteristics in reality than those taken into account in the studies (better spurious emission performance than those contained in the specifications, site engineering techniques and/or power restrictions), the adjacent band compatibility between LTE TDD operating within the band 2300-2400 MHz and space services operating below 2290 MHz is not expected to create difficulty. From the study between LTE TDD macro base stations operating in the 2300-2400 MHz band and a Deep Space service operating in the band 2290-2300 MHz band it can be concluded that a Deep Space earth station receiver installed close to a LTE TDD base station might require mitigation solutions including:

- Frequency separation;
- Additional filtering;
- Site engineering techniques such as transmitter antenna tilting, and antenna direction and careful deployment planning;
- A combination of the above.

Furthermore it is shown that there is no significant impact from LTE TDD base stations to receiving satellites in EESS (space to space).

Regarding compatibility with radio astronomy earth stations (receiving in the band 2200-2290 MHz), it was shown that protection of these stations can be achieved for example by a suitable co-ordination zone around the limited number of observatory stations.

Administrations wishing to license the 2300-2400 MHz band to BWS should be aware that there is a potential conflict with MMDS system that might operate below 2300 MHz. Administrations are encouraged to perform appropriate studies for this scenario if MMDS systems are present.

3.4 CONDITIONS FOR THE COEXISTENCE BETWEEN WBB IN THE BAND 2300-2400 MHz AND APPLICATIONS ABOVE 2400 MHz

The least restrictive technical conditions (LRTC), in the form of a block-edge mask (BEM) applicable to WBB as described in section 3.2, are also intended to ensure coexistence with the applications above 2400 MHz. The in-block e.i.r.p. has been limited for the range 2390-2400 MHz (see section 3.2.2.1) and additional baseline requirements above 2400 MHz for unsynchronised and synchronised WBB base stations have been defined (see Table 3 in section 3.2.2.2). These technical conditions were derived from calculations on the coexistence with RLANs above 2400 MHz and are also intended to ensure coexistence with other applications above 2400 MHz, such as Short Range Devices, including Assistive Listening Devices.

3.5 SOLUTIONS AND REGULATORY APPROACH FOR THE SHARED USE OF THE 2300-2400 MHz BAND BY WBB AND INCUMBENT SERVICES/APPLICATIONS

CEPT countries currently use all or parts of the band 2300-2400 MHz for a variety of applications including:

- Telemetry (both terrestrial and aeronautical telemetry);
- Other governmental use (e.g. Unmanned Aircraft Systems (UAS));
- Programme making and special events (PMSE) applications (SAP/SAB video links);
- Fixed Service;
- Amateur, as a secondary service.

Licensed Shared Access (LSA), as defined by RSPG in [3] and further described in ECC Report 205 [4], is the recognised approach on the CEPT level for administrations wishing to introduce WBB while maintaining the current incumbent use.

Necessary requirements are to be established by the national regulators to share the band through LSA, assessing the protection of the incumbent use of the band. Depending upon the national circumstances, these requirements may have an impact on the conditions of introduction of WBB in the band 2300-2400 MHz and in particular on the amount of spectrum available for WBB.

The implementation of the LSA sharing framework on national level, which can lead to additional restrictions in concerned areas for WBB, will not have an impact on the common and minimal technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band as described in this CEPT Report. Those additional restrictions will be related to timely and/or geographical restrictions and will therefore not be in contradiction with the aim of getting European wide common technical conditions.

The development, where appropriate, of common technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and incumbent services/applications will be addressed in subsequent CEPT Reports responding to the task 2 of the EC Mandate. CEPT Report 56 addresses the tasks 2.1 and 2.2 of the EC Mandate.

4 CONCLUSIONS

This CEPT Report is the first part of the response to the Mandate issued by the European Commission on harmonised technical conditions for the 2300-2400 MHz ('2.3 GHz') frequency band in the EU for the provision of wireless broadband (WBB) electronic communications services.

It provides common and minimal technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band based on the provisions developed by CEPT in ECC/DEC/(14)02 [1] as follows:

- Harmonised un-paired channelling arrangement (for TDD), consistent with ITU-R Recommendation M.1036 [2], based on 20 blocks of 5 MHz;
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ANNEX 1: MANDATE TO CEPT TO DEVELOP HARMONISED TECHNICAL CONDITIONS FOR THE 2300-2400 MHZ BAND ('2.3 GHZ') FOR THE PROVISION OF WBB ECS

MANDATE TO CEPT
TO DEVELOP HARMONISED TECHNICAL CONDITIONS FOR THE 2300-2400 MHZ ('2.3 GHZ') FREQUENCY BAND IN THE EU FOR THE PROVISION OF WIRELESS BROADBAND ELECTRONIC COMMUNICATIONS SERVICES

1 PURPOSE

This mandate aims at developing technical conditions for the introduction of wireless broadband (WBB) in the 2300-2400 MHz ('2.3 GHz') band which share with incumbent users. The technical conditions should enable the deployment of wireless broadband services while also ensuring the long term incumbent use of the band in the territory of those Member States that wish to maintain such use.

The results of this mandate should constitute a technical input to the EU-level political process of identifying 1200 MHz for WBB in accordance with the Radio Spectrum Policy Programme (RSPP)[6]. The spectrum inventory established by the RSPP involves assessment of spectrum supply and demand and will examine the efficiency of spectrum use in the range 400 MHz to 6 GHz. The inventory may earmark the 2.3 GHz band for Wireless Broadband use at an early stage in view of the suitability of the band and the scope for sharing with incumbent use.

The results of this mandate should serve as a basis for any Member State that may decide to proceed with WBB and related national sharing frameworks in the 2.3 GHz band at an early stage, so as to avoid fragmentation in the internal market and contribute to consistent national sharing frameworks.

Moreover, the mandate and its technical results should also complement the policy considerations of the European Commission with regard to shared use of spectrum[7] and of the Radio Spectrum Policy Group (RSPG) in the context of the RSPG Opinions on Wireless Broadband[8] and Licensed Shared Access[9].

2 EU POLICY OBJECTIVES

The Digital Agenda for Europe (DAE) has set ambitious broadband targets by 2020, namely ubiquitous fast broadband coverage in the EU of at least 30 Mbps as well as subscriptions to super-fast broadband of at least 100 Mbps for 50% of the EU households. WBB is expected to play an important role in achieving these objectives.

Corresponding to the Union policy objective of allocating sufficient and appropriate spectrum in a timely manner and to best meet the increasing demand for wireless broadband, the RSPP requires the Commission and Member States to make every effort to identify at least 1200 MHz of suitable spectrum by 2015. Furthermore, the RSPP establishes a spectrum inventory inter alia to help identify frequency bands that could be suitable for reallocation and spectrum-sharing opportunities. One of its objectives is to explore new ways for sharing spectrum, to the benefit of both private and public users, while taking into account the potential positive and negative impact of allocation or reallocation of such bands and of adjacent bands on existing users.

The Commission services take the view that spectrum sharing should become a mainstream mode of spectrum use in the internal market given the increasing scarcity of spectrum resources (at least at frequencies below 6 GHz) and in order to ensure efficient spectrum use. In its Communication on promoting

[6] Decision 243/2012/EU of the European Parliament and of the Council of 14 March 2012
[7] Commission Communication, "Promoting the shared use of radio spectrum resources in the internal market", COM(2012) 478 final, September 2012
[8] RSPG12-521(rev1) "RSPG Opinion on Strategic Challenges facing Europe in addressing the Growing Spectrum Demand for Wireless Broadband"
[9] RSPG13-538 "RSPG Opinion on Licensed Shared Access"

shared use of spectrum[10] the Commission has stated that, to foster the development of wireless innovations in the EU, it is necessary to continuously improve the opportunities for harmonised spectrum access in both licence-exempt bands and licensed spectrum and to establish new tools for more shared use of radio spectrum resources in the internal market. In particular the Commission stated that it sees the need in a common path in the EU towards enabling more sharing possibilities, based on contractual agreements between users.

In this context the RSPG stated in its Opinion on LSA that the continued promotion of the shared use of radio spectrum is a valuable means to leverage the unique capability to re-used spectrum resources. In this regard it stated that access to previously assigned spectrum could be facilitated through licensed usage, under a Licensed Shared Access (LSA) approach.

Therefore, within the tasks of this mandate as specified in the Section "

4 TASK ORDER **AND SCHEDULE**", the Commission requests CEPT to take into account that use of the 2.3 GHz band should contribute to several important EU policy objectives, namely:

- strengthen the Internal Market for potential mass market WBB services and equipment which will operate in the band both for legacy uses and potential new uses;

- contribute to the DAE broadband targets, which rely on a mix of technologies, including wireless broadband;

- meet spectrum demand in support of the RSPP spectrum target of 1200 MHz for wireless broadband;

- promote innovation and investment through enhanced flexibility in spectrum use;

- foster shared use of spectrum.

3 JUSTIFICATION

Pursuant to Article 4(2) of the Radio Spectrum Decision[11] 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 necessary for the functioning of the internal market. Such mandates shall set the tasks to be performed and their timetable.

In light of the EU policy objectives mentioned in the previous section the 2.3 GHz band has been identified by and by the Radio Spectrum Policy Group (RSPG) as a possible candidate band for the use by wireless broadband (WBB) services in the EU. In this regard the RSPG recommended[12] this frequency band to support WBB needs in the short term before 2015. Furthermore, the RSPG recommended the Commission to consider adopting complementary measures to further promote shared and flexible use of the 2.3 GHz band between wireless broadband applications and other services, based on LSA regulatory provisions, facilitating the long-term incumbent use of the band in the territory of those Member States that wish to maintain such use. Activities are already on-going in the framework of CEPT[13] to develop harmonisation measures for Mobile/Fixed Communications Networks (MFCN) under LSA in this band.

The band appears attractive for the use by WBB services, because it provides for a rather large bandwidth of 100 MHz, is suitable for providing WBB capacity with relatively low propagation and penetration loss, and has potential for global harmonisation having been identified globally for International Mobile Telecommunications (IMT) in the World Radiocommunications Conference in 2007 (WRC-07). Consequently, it is already planned to be used for WBB in several countries, e.g. in Asia. User equipment and base station equipment based on the TD-LTE standard are already commercially available and the

[10] Commission Communication, "Promoting the shared use of radio spectrum resources in the internal market", COM(2012) 478 final, September 2012

[11] 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, OJL 108 of 24.4.2002

[12] RSPG13-521(rev1) "RSPG Opinion on Strategic Challenges facing Europe in addressing the Growing Spectrum Demand for Wireless Broadband"

[13] CEPT has set up activities in September 2012, which are aimed at developing harmonised technical conditions for WBB in the 2.3 GHz band by the first half of 2014 (CEPT ECC WGs FM 52 on the 2300-2400 MHz band and FM 53 on RRS and LSA)

equipment market for this band is expected to significantly grow in the coming years driven by large deployments in some countries, especially in Asia.

Currently in EU Member States this band is used for strategic governmental applications such as aeronautical telemetry and closed-circuit television (CCTV, a security application) as well as Programme Making and Special Events (PMSE), specifically Services Ancillary to Broadcasting and Programme Making SAB/SAP (ERC/REC 25-10), e.g., as a core band for wireless cameras, and also at national level for various other applications.

In light of these current allocations that are expected to be maintained in some Member States, considerations have been given by Member States and stakeholders to the possibility to provide access to this band for WBB through an appropriate sharing approach such as Licensed Shared Access (LSA). Such an approach should ensure the long term incumbent use of the band in the territory of those Member States that wish to maintain such use, while providing legal certainty for the LSA licensees.

Therefore, the Commission considers that on-going international and national developments set in the context of consistent implementation of the RSPP objectives through the inventory process justify the need for technical studies to identify technical and regulatory conditions for the usage of WBB in the 2.3 GHz band.

4 TASK ORDER AND SCHEDULE

CEPT is herewith mandated to undertake work to develop technical harmonisation conditions for the use of the 2300-2400 MHz frequency band for the provision of WBB electronic communications services with a view to also ensuring the long term incumbent use of the band in the territory of those Member States that wish to maintain such use.
In the work carried out under the Mandate, the general and specific policy objectives of the RSPP, such as effective and efficient spectrum use and the support for specific Union policies shall be given utmost consideration. In implementing this mandate, CEPT shall, where relevant, take utmost account of EU law applicable and support the principles of service and technological neutrality, non-discrimination and proportionality insofar as technically possible. CEPT is also requested to collaborate actively with the European Telecommunications Standardisation Institute (ETSI) which develops harmonised standards for conformity under Directive 1999/5/EC.
In particular, CEPT is mandated to carry out technical studies intended to support the policy objectives presented above, in fulfilment of the following tasks:

Task 1: Develop common and minimal (least restrictive) technical conditions for wireless broadband usage of the 2300-2400 MHz frequency band.

This task includes:

1.1 Identify *common and minimal (least restrictive) technical conditions*[14] for the introduction of wireless broadband use in the 2300-2400 MHz band for the provision of electronic communications services. These conditions should be sufficient to ensure coexistence between WBB services within the same band and with services in adjacent bands including use by Radio Local Area Networks (RLAN).

1.2 Develop *channelling arrangements* that are sufficiently precise for the development of EU-wide equipment and take into consideration the possibility of international harmonisation.

Task 2: Where appropriate develop common technical sharing solutions for the shared use of the 2300-2400 MHz band for WBB and incumbent services/applications.

This task includes:

[14] Such as the definition of appropriate BEMs (Block Edge Masks)

2.1 For each of the *relevant incumbent services/applications* in the Member States including military use, PMSE, fixed links, and radio amateur services: (i) assess the *deployment assumptions and the operational footprint* and (ii) *take stock of the situation and future plans* in the Member States regarding the application of the LSA concept to enable the deployment of WBB.

2.2 For each incumbent service/application considered under 2.1: (i) identify *technological and regulatory options facilitating sharing* between WBB and the relevant incumbent service/application including mutual dynamic coordination mechanisms between WBB operators and incumbents; (ii) assess *the scope for harmonisation of technical sharing parameters and solutions* through standardisation and/or an implementing decision;

2.3 Depending on results for each relevant incumbent service/application under 2.2(ii) and without prejudice to national rules on data confidentiality define *technical and regulatory solutions* relevant for the technological and regulatory options identified under 2.2(i) that support consistent sharing frameworks defined at national level allowing for the development and efficient operation of EU-wide equipment.

The Commission may provide CEPT with further guidance on this mandate depending on future agreements at EU level (which may involve the European Parliament and the Council) concerning spectrum resources to be made available in the context of specific EU policies, as well as relevant impact assessments the Commission may undertake in this context. Also, the impact of spectrum demand assessments for different uses at national level may require to be taken into account during the work on the Mandate.

CEPT should provide deliverables under this Mandate according to the following schedule:

Delivery date	Deliverable	Subject
June 2014[15]	Final Draft Report A from CEPT to the Commission	Description of work undertaken for Task 1 and final results
November 2014	**Final** Report A from CEPT to the Commission, taking into account the outcome of the public consultation	Description of work undertaken for Task 1 and final results taking into account the results of the public consultation
November 2014[16]	Final Draft Report B.1 from CEPT to the Commission	Description of work undertaken for Task 2, final results for task 2.2(ii)[17]
March 2015	**Final** Report B.1 from CEPT to the Commission, taking into account the outcome of the public consultation	Final results for task 2.2(ii) taking into account the results of the public consultation
March 2015[18]	Final Draft Report B.2 from CEPT to the Commission	Description of work undertaken for Task 2 and final results
July 2015	**Final** Report B.2 from CEPT to the Commission, taking into account the outcome of the public consultation	Description of work undertaken for Task 2 and final results taking into account the results of the public consultation

[15] Subject to subsequent public consultation
[16] Subject to subsequent public consultation
[17] The final results under task 2.2(ii) will clarify the scope for technical and regulatory conditions that are relevant for a harmonisation decision. If such conditions are identified, the relevant results at this stage will serve as basis for a harmonisation decision. If not, and more work is required to identify relevant conditions within 2.2(ii), these will then be set out in an addendum to Report A submitted to the RSC no later than March 2015.
[18] Subject to subsequent public consultation

CEPT is requested to report on the progress of its work pursuant to this Mandate to all meetings of the Radio Spectrum Committee taking place during the course of the Mandate.

The Commission, with the assistance of the Radio Spectrum Committee and pursuant to the Radio Spectrum Decision, may consider applying the results of this mandate in the EU, pursuant to Article 4 of the Radio Spectrum Decision and subject to the results of the inventory process.

ANNEX 2: LIST OF REFERENCE

[1] ECC Decision(14)02: Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN)

[2] Recommendation ITU-R M.1036: Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR)

[3] RSPG Opinion on Licensed Shared Access, November 2013, https://circabc.europa.eu/sd/d/3958ecef-c25e-4e4f-8e3b-469d1db6bc07/RSPG13-538_RSPG-Opinion-on-LSA%20.pdf

[4] ECC Report 205: Licensed Shared Access (LSA)

[5] ITU Radio Regulations

[6] ECC Report 172: Broadband Wireless Systems Usage in 2300-2400 MHz

[7] ECC Recommendation (14)04 on Cross-border coordination for MFCN and between MFCN and other systems in the frequency band 2300-2400 MHz

[8] CEPT Report 49: Report from CEPT to the European Commission in response to the Mandate "Technical conditions regarding spectrum harmonisation for terrestrial wireless systems in the 3400-3800 MHz frequency band"

[9] ECC Report 203: Least Restrictive Technical Conditions suitable for Mobile/Fixed Communication Networks (MFCN), including IMT, in the frequency bands 3400-3600 MHz and 3600-3800 MHz

[10] 3GPP TS 37.104 : E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception

[11] ECC Report 216 on 'Practical guidance for TDD networks synchronisation'