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Directorate-General for Communications Networks, Content and Technology

Electronic Communications Networks and Services
Radio Spectrum Policy

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RADIO SPECTRUM COMMITTEE

Working Document

Subject: **Draft Implementing Decision amending Decision 2008/411/EC on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community, as regards relevant technical conditions for next-generation (5G) terrestrial wireless systems**

DRAFT

COMMISSION IMPLEMENTING DECISION

of XXX

amending Implementing Decision 2008/411/EC on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community as regards relevant technical conditions for next-generation (5G) terrestrial wireless systems

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

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

Having regard to Decision No 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 (Radio Spectrum Decision)[1], and in particular Article 4(3) thereof,

Whereas:

(1) Commission Decision 2008/411/EC[2] harmonises the technical conditions for using the spectrum in the 3400-3800 MHz frequency band for the terrestrial provision of electronic communications services in the Community and was amended by Commission Decision 2014/276/EU[3].

(2) Article 6(3) of Decision No 243/2012/EU of the European Parliament and the Council[4] establishing a multiannual Radio Spectrum Policy Programme (RSPP), requires Member States to foster the ongoing upgrade of their networks to the latest, most efficient technology, in order to create their own spectrum dividends in the line with the principles of service and technological neutrality. The commercial deployment of next-generation (5G) terrestrial systems is expected as of 2020 on a global scale.

(3) The Commission's Communication "Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society"[5] sets out new connectivity targets for

[1] OJ L 108, 24.4.2002, p.1.

[2] Commission Decision 2008/411/EC of 21 May on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community (OJ L 144, 4.6.2008, p.77).

[3] Commission Decision 2014/276/EU of 2 May on amending Decision 2008/411/EC on the harmonisation of the 3400-3800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community (OJ L 139, 14.5.2014, p.18).

[4] Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme (OJ L 81, 21.3.2012, p. 7).

[5] Communication to the Council and the European Parliament "Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society" COM2016 (587) final.

the Union to be achieved through the widespread deployment and take-up of very high capacity networks. In this regard, the Commission's Communication "5G for Europe: An Action Plan"[6] puts forward action on the EU-level identification and harmonisation of spectrum for 5G based on the opinion of the Radio Spectrum Policy Group (RSPG).

(4) In its Opinion "Strategic roadmap towards 5G for Europe: Opinion on spectrum related aspects for next-generation wireless systems (5G)"[7], the Radio Spectrum Policy Group (RSPG) identifies the 3400-3800 MHz frequency band as the primary pioneer band for 5G use in the Union.

(5) In its complementary Opinion "Strategic roadmap towards 5G for Europe: RSPG second opinion on 5G networks"[8], the RSPG acknowledges that the availability of the primary 5G band, 3400-3800 MHz, will be key for the success of 5G in the Union and urges Member States to consider appropriate measures to defragment this band in time for authorising sufficiently large blocks of spectrum by 2020.

(6) The European Electronic Communications Code requires Member States to allow the use of 3400-3800 MHz band for terrestrial systems capable of providing wireless broadband electronic communication services by 31 December 2020, and requires Member States to take all appropriate measures to facilitate the roll-out of 5G, including the reorganisation of the 3400-3800 MHz band to allow sufficiently large blocks of spectrum. Therefore, timely amendment of the harmonised technical conditions is necessary.

(7) In December 2016, pursuant to Article 4(2) of the Radio Spectrum Decision, the Commission gave the European Conference of Postal and Telecommunications Administrations (CEPT) a mandate to develop harmonised technical conditions for spectrum use in support of the introduction of next-generation (5G) terrestrial wireless systems in the Union.

(8) In response to that mandate, on xx July 2018 the CEPT issued a report (CEPT Report 67) on the technical conditions for spectrum harmonisation in support of the introduction of next generation (5G) terrestrial wireless systems in the 3400-3800 MHz frequency band. CEPT Report 67 provides harmonised technical conditions for both non-Active Antenna Systems (non-AAS) and Active Antenna Systems terrestrial wireless systems capable of providing wireless broadband electronic communications services under synchronised, semi-synchronized and unsynchronised operations as well as for the co-existence of wireless broadband electronic communications services with services in adjacent bands (below 3400 MHz and above 3800 MHz).

(9) The results of the CEPT Report 67 should be applied across the Union and implemented by the Member States without delay, in order to foster the use of the entire 3400-3800 MHz frequency band with the aim to put the Union at the forefront of 5G deployment.

(10) In order to pave the way for commercial 5G deployment as of 2020, using the primary 3400-3800 MHz frequency band, Member States should ensure that existing rights of

[6] Communication to the Council and the European Parliament "5G for Europe: An Action Plan", COM(2016) 588 final.

[7] Document RSPG16-032 final of 9 November 2016, "Strategic roadmap towards 5G for Europe: Opinion on spectrum related aspects for next-generation wireless systems (5G)".

[8] Document RSPG18-05 final of 20 January 2018, "Strategic roadmap towards 5G for Europe: second opinion on 5G networks".

use of spectrum for terrestrial electronic communications networks, which are not compliant with the technical conditions pursuant to this Decision, are maintained only within a limited timeframe.

(11) Pursuant to evolving 5G standardisation, a contiguous bandwidth of 80-100 MHz per assignee would facilitate the deployment of innovative wireless broadband services. Therefore, Member States should provide at least 150 MHz of contiguous spectrum in line with the objective of defragmentation. While allowing for actual use of at least 3 blocks of 50 MHz each, such minimum overall contiguous spectrum of 150 MHz would also enable actual use of larger blocks of 80 to 100 MHz. Consistently with Article 53a of the European Electronic Communications Code, Member States should take the necessary steps to facilitate in their spectrum plans actual use by assignees of such larger block sizes.

(12) The legal framework for using the 3400-3800 MHz frequency band set by Decision 2008/411/EC should remain unchanged in terms of ensuring continued protection of other existing services within the band. In particular, fixed satellite systems (FSS) including earth stations would require continued protection through appropriate coordination between such systems and wireless broadband networks managed at the national level on a case-by-case basis.

(13) CEPT's Electronic Communications Committee (ECC) has issued the Report 254, which provides guidance to Member States for the coexistence between wireless broadband electronic communication services and FSS in the 3400-3800 MHz frequency band. CEPT plans to issue further guidance to operators and administrations for the operation of adjacent networks with view to synchronisation.

(14) Cross-border agreements may be necessary to ensure the implementation by Member States of the parameters set by this Decision so as to avoid harmful interference and improve spectrum efficiency and non-fragmentation in spectrum use.

(15) Decision 2008/411/EC should therefore be amended accordingly.

(16) The measures provided for this Decision are in accordance with the opinion of the Radio Spectrum Committee.

HAS ADOPTED THIS DECISION:

Article 1

Decision 2008/411/EC is amended as follows:

(1) Article 2.1 of Decision 2008/411/EC is replaced by the following:

'Article 2.1

Without prejudice to the protection and continued operation of other existing use in this band, by 30 June 2019 Member States shall designate and subsequently make available, on a non-exclusive basis the 3400-3800 MHz frequency band for terrestrial electronic communications networks in compliance with the parameters set out in the Annex.

Member States need not apply the parameters laid down in the Annex before 31 December 2021 to existing rights of use for terrestrial electronic communications networks in the 3400-3800 MHz frequency band to the extent that such rights do not prevent the use of that band according to the Annex.';

(2) Article 4a is replaced by the following:

'Article 4a

Member States shall report on the application of this Decision on 30 September 2019 at the latest.';

Article 2

The Annex to Decision 2008/411/EC is replaced by the text in the Annex to this Decision.

Article 3

This Decision is addressed to the Member States.

Done at Brussels,

For the Commission
Mariya Gabriel
Member of the Commission

DRAFT *ANNEX*

'ANNEX

PARAMETERES REFERRED TO IN ARTICLE 2

A. GENERAL PARAMETERS

Within the 3400-3800 MHz frequency band:

1. The duplex mode of operation within the 3400-3800 MHz frequency band shall be Time Division Duplex (TDD).
2. The assigned block sizes shall be in multiples of 5 MHz. The lower frequency limit of an assigned block shall be aligned with or spaced at multiples of 5 MHz from the lower band edge of 3400 MHz[9].
3. There shall be at least 150 MHz of contiguous spectrum for wireless broadband services.
4. Base stations and terminal stations transmission shall be in compliance with the Block Edge Mask in this Annex.

B. TECHNICAL CONDITIONS FOR BASE STATIONS – BLOCK EDGE MASK

The following technical parameters for base stations called block edge mask (BEM) are an essential component of conditions necessary to ensure coexistence between neighbouring networks, in the absence of bilateral or multilateral agreements between operators of such neighbouring networks. Less stringent technical parameters, if agreed among the operators of such networks, may also be used.

The BEM consists of several elements given in Table 1. The in-block power limit is applied to a block owned by an operator. The baseline power limit, designed to protect the spectrum of other operators, the transitional region power limit, enabling filter roll-off from the in-block to the baseline power limit, and the restricted baseline power limit applicable to cases of synchronised or semi-synchronised operation represent out-of-block elements. The additional baseline power limit is an out-of-band power limit which is used either for the protection of radar operation below 3400 MHz or for the protection of fixed satellite services (FSS) and fixed services (FS) above 3800 MHz.

Tables 2 to 7 contain the power limits for the different BEM elements for TDD networks providing wireless broadband (WBB) electronic communications services (ECS). Power limits are provided for synchronised, unsynchronised and semi-synchronised networks.

In Tables 3 and 4, the power level P_{Max} is the maximum carrier power in dBm for the base station in question. P_{Max} is defined and measured as the equivalent isotropically radiated power (e.i.r.p.) per antenna for base stations with non-active antenna systems (non-AAS). For active antenna systems (AAS) base stations P_{Max} is defined as the maximum mean carrier power in dBm for the base station and measured as the total radiated power (TRP) per carrier in a given cell.

In Tables 3, 4, and 7 the power limits are determined relative to a fixed upper limit by means of formula Min(P_{Max} - A, B), which sets the lower (or stricter) of two values: (1) (P_{Max} A) expressing the maximum carrier power P_{Max} minus a relative offset A, and (2) the fixed upper limit B.

[9] If assigned blocks need to be offset to accommodate other existent users, a raster of 100 kHz must be used. Narrower blocks can be defined adjacent to other users, to allow efficient use of spectrum.

The term *AAS* refers to a base station and antenna system where the amplitude and/or phase between antenna elements is continually adjusted resulting in an antenna pattern that varies in response to short term changes in the radio environment. In AAS base stations the antenna system is integrated as part of the base station system/product whereas in non-AAS base stations transmitters are manufactured and/or supplied separately to the antenna systems.

Synchronised operation means operation of TDD in several different networks, where no simultaneous uplink (UL) and downlink (DL) transmissions occur, i.e. at any given moment in time either all networks transmit in DL or all networks transmit in UL. This requires the alignment of all DL and UL transmissions for all TDD networks involved in a specific geographic area, as well as, synchronising the beginning of the frame across all networks.

Unsynchronised operation means TDD operation in different neighbouring networks, where at any given moment in time at least one network transmits in DL while at least one network transmits in UL in a specific geographic area. This might happen if networks either do not align all DL and UL transmissions or do not synchronise at the beginning of the frame.

Semi-synchronised operation corresponds to TDD operation of different neighbouring networks, where part of the frame is consistent with a synchronised operation, while the remaining portion of the frame is consistent with an unsynchronised operation. This requires the adoption of a frame structure for all networks involved, including slots where the transmission direction (UL or DL) is not specified, as well as synchronising the beginning of the frame across all networks.

The definitions above on synchronised, unsynchronised and semi-synchronised TDD operation of networks providing WBB ECS may not necessarily apply to an entire network. In particular, there are use cases where different base stations within a network may be unsynchronised or semi-synchronised.

To obtain a BEM for a specific block, the BEM elements that are defined in Table 1 are combined in the following steps:

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. Restricted baseline power limits are used for unsynchronised and semi-synchronised networks;
4. For spectrum below 3400 MHz the respective additional baseline power limit is used;
5. For spectrum above 3800 MHz the respective additional baseline power limit is used.

The Figure below provides an example of the combination of different BEM elements.

Figure

Example of base station BEM elements and power limits

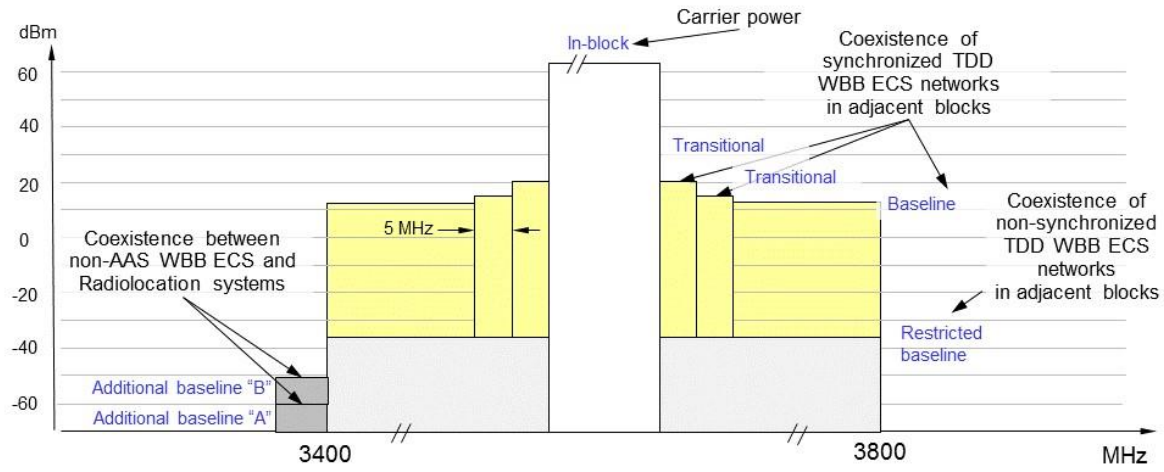

Table 1

Definition of BEM elements

BEM element	Definition
In-block	Refers to a block for which the BEM is derived.
Baseline	Spectrum used for WBB ECS, except from the operator block in question and corresponding transitional regions.
Transitional region	Spectrum within 0 to 10 MHz below and 0 to 10 MHz above the block assigned to the operator. Transitional regions do not apply to TDD blocks assigned to other operators, unless networks are synchronised. The transitional regions do not apply below 3400 MHz or above 3800 MHz
Additional baseline	Spectrum below 3400 MHz and above 3800 MHz
Restricted baseline	Spectrum used for WBB ECS by networks unsynchronised or semi-synchronised with the operator's block in question.

Explanatory note to Table 1

The BEM elements are applicable to base stations with different power levels, typically referred to as macro, micro, pico, and femto base stations[10].

Table 2

In-block power limit for non-AAS and AAS base stations

BEM element	Frequency range	Power limit for non-AAS and AAS base stations
In-block	Block assigned to the operator	Not obligatory.

[10] These terms are not uniquely defined and refer to cellular base stations with different power levels, which decrease in the following order: macro, micro, femto. In particular, femto cells are small base stations with the lowest power levels, which are typically used indoors.

Explanatory note to Table 2

For indoor base stations, power control shall be applied to minimize interference to adjacent channels. The requirement on power control for femto base stations results from the need to reduce interference from equipment that may be deployed by consumers and may thus not be coordinated with surrounding networks.

Table 3

Baseline power limits for non-AAS and AAS base stations with synchronised network operation

BEM element	Frequency range	Non-AAS e.i.r.p limit per antenna	AAS TRP limit per cell
Baseline	Below -10MHz offset from lower block edge Above 10 MHz offset from upper block edge Within 3400-3800 MHz	Min(P_{Max}-43, 13) dBm/ (5MHz) per antenna (*)	Min($P_{Max'}$-43, 1) dBm/(5MHz) per cell (**) (***)
(*) P_{Max} is the maximum mean carrier power in dBm for the base station measured as e.i.r.p. per carrier per antenna (**) $P_{Max'}$ is the maximum mean carrier power in dBm for the base station measured as TRP per carrier in a given cell (***) In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.			

Explanatory note to Table 3

The applied fixed upper limit (13 dBm/(5MHz) for non-AAS or 1 dBm/(5MHz) for AAS) provides an upper bound on the interference from a base station. When two TDD blocks are synchronised, there will be no interference between base stations.

Table 4

Transitional region power limits, for non-AAS and AAS base stations with synchronised network operation

BEM element	Frequency range	Non-AAS e.i.r.p power limit	AAS TRP power limit
Transitional region	-5 to 0 MHz offset from lower block edge or 0 to 5 MHz offset from upper block edge	Min(P_{Max}-40, 21) dBm/(5MHz) per antenna (*)	Min($P_{Max'}$-40, 16) dBm/(5MHz) per cell (**) (***)

Transitional region	-10 to -5 MHz offset from lower block edge or 5 to 10 MHz offset from upper block edge	Min(P_{Max}-43, 15) dBm/(5MHz) per antenna (*)	Min($P_{Max'}$-43, 12) dBm/(5MHz) per cell (**) (***)
(*) P_{Max} is the maximum mean carrier power in dBm for the base station measured as e.i.r.p. per carrier per antenna (**) $P_{Max'}$ is the maximum mean carrier power in dBm for the base station measured as TRP per carrier in a given cell (***) In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.			

Table 5

Restricted baseline power limits for non-AAS and AAS base stations with unsynchronised and semi-synchronised network operation

BEM element	Frequency range	Non AAS e.i.r.p power limit	AAS TRP power limit
Restricted baseline	Unsynchronised and semi synchronised blocks, below the lower block edge and above the upper block edge, within 3400-3800 MHz	-34 dBm/(5MHz) per cell (*)	-43 dBm/(5MHz) per cell (*)
(*) In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.			

Explanatory note to Table 5

These power limits are used for unsynchronised and semi-synchronised operations of base stations, if no geographic separation is available. In addition, depending on national circumstances, EU Member States may define a relaxed alternative restricted baseline power limit applying to specific implementation cases to ensure a more efficient usage of spectrum.

Table 6

Additional baseline power limits for non-AAS and AAS base stations (*) below 3400 MHz for country-specific cases

Case		BEM element	Frequency range	Non-AAS e.i.r.p power limit	AAS TRP power limit
A	Union countries with military radiolocation systems below 3400MHz	Additional baseline	Below 3400 MHz (**)	-59 dBm/MHz per antenna	-52 dBm/MHz per cell (***)
B	Union countries with military radiolocation systems below 3400MHz	Additional baseline	Below 3400 MHz (**)	-50 dBm/MHz per antenna	
C	Union countries	Additional	Below 3400	Not applicable	Not applicable

	without adjacent band usage or with usage that does not need extra protection	baseline	MHz		

(*) Alternative measures may be required on a case by case basis for indoor AAS base stations on a national basis.

(**) Member States may choose to have a guard band below 3400 MHz. In that case the power limit may apply below the guard band only. Member States may choose to apply the additional baseline only below 3390 MHz.

(***) In a multi-sector base station, the radiated power limit applies to each one of the individual sectors

Explanatory note to Table 6

The additional baseline power limit levels given are only applicable to outdoor cells and macrocells. In case of indoor cells and small cell deployments, the power limits can be relaxed on a case by case basis.

The additional baseline power limits reflect the need for protection of military radiolocation in some countries. They can be applied per geographic region or country so that the adjacent band may have different levels of protection in different geographical areas or countries, depending on the deployment of adjacent band systems. A coordination zone of up to 12 km around fixed terrestrial radars, based on AAS TRP limit of -52 dBm/MHz per cell, is required. Such coordination is under responsibility of the relevant Member State.

Other mitigation measures like geographical separation, coordination on a case-by-case basis or an additional guard band may be necessary. Member States may decide to introduce at national level an in-band power limit to ensure protection of radar systems from AAS base stations.

Table 7

Additional baseline power limits above 3800 MHz for base stations for coexistence with FSS/FS

BEM element	Frequency range	Non-AAS e.i.r.p limit	AAS TRP power limit
Additional baseline	3800-3805 MHz	Min(P_{Max}-40, 21) dBm/(5 MHz) per antenna (*)	Min($P_{Max'}$-40, 16) dBm/(5MHz) per cell (**) (***)
	3805-3810 MHz	Min(P_{Max}-43, 15) dBm/(5 MHz) per antenna (*)	Min($P_{Max'}$-43, 12) dBm/(5MHz) per cell (**) (***)
	3810-3840 MHz	Min(P_{Max}-43, 13) dBm/(5 MHz) per antenna (*)	Min($P_{Max'}$-43, 1) dBm/(5MHz) per cell (**) (***)
	Above 3840 MHz	-2 dBm/(5MHz) per antenna (*)	-14 dBm/(5MHz) per cell (***)

(*) P_{Max} is the maximum mean carrier power in dBm for the base station measured as e.i.r.p. per carrier per antenna

(**) $P_{Max'}$ is the maximum mean carrier power in dBm for the base station measured as TRP per carrier in a given cell

(***) In a multi-sector base station, the radiated power limit refers to the level corresponding to each one of the individual sectors

Explanatory note to Table 7

The additional baseline power limits are applied at the 3800 MHz band edge to support the coordination process to be carried out at national level.

C. TECHNICAL CONDITIONS FOR TERMINAL STATIONS

Table 8

In-block requirement — terminal station BEM in-block power limit

Maximum in-block power	28 dBm TRP

Explanatory note to Table 8

The in-block radiated power limit for fixed/nomadic terminal stations may exceed the limit in Table 8 provided cross-border obligations are fulfilled. For such terminal stations mitigation measures to protect radar below 3400 MHz may be necessary, for example, geographical separation or an additional guard band.’