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ANNEX

**ANNEX**

**to the**

**Commission Implementing Decision**

**on the harmonisation of the 40,5-43,5 GHz frequency band for terrestrial systems  
capable of providing wireless broadband electronic communications services in the  
Union**

## ANNEX

### TECHNICAL CONDITIONS REFERRED TO IN ARTICLES 2 AND 3

#### 1. DEFINITIONS

For the purposes of this Decision, the following definitions apply:

- (1) '*active antenna systems (AAS)*' means a base station and an 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. This excludes long-term beam shaping such as fixed electrical down tilt. In AAS base stations the antenna system is integrated as part of the base station system or product;
- (2) '*synchronised operation*' means operation of two or more different time division duplex (TDD) networks, where simultaneous uplink (UL) and downlink (DL) transmissions do not occur, that is at any given moment in time either all networks transmit in downlink or all networks transmit in uplink. This requires the alignment of all DL and UL transmissions for all TDD networks involved as well as synchronising the beginning of the frame across all networks;
- (3) '*unsynchronised operation*' means operation of two or more different TDD networks, where at any given moment in time at least one network transmits in DL while at least one network transmits in UL. This might happen if the TDD networks either do not align all DL and UL transmissions or do not synchronise at the beginning of the frame;
- (4) '*semi-synchronised operation*' means operation of two or more different TDD networks, where part of the frame is consistent with synchronised operation, while the remaining portion of the frame is consistent with unsynchronised operation. This requires the adoption of a frame structure for all TDD networks involved, including slots where the UL/DL direction is not specified, as well as synchronising the beginning of the frame across all networks;
- (5) '*equivalent isotropically radiated power (EIRP)*' is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);
- (6) '*total radiated power (TRP)*' is a measure of how much power a composite antenna radiates. It equals the total conducted power input into the antenna array system less any losses in the antenna array system. TRP means the integral of the power transmitted in different directions over the entire radiation sphere as shown in the formula:

$$TRP \stackrel{\text{def}}{=} \frac{1}{4\pi} \int_0^{2\pi} \int_0^{\pi} P(\theta, \varphi) \sin(\theta) d\theta d\varphi$$

where  $P(\theta, \varphi)$  is the power radiated by an antenna array system in direction  $(\theta, \varphi)$  given by the formula:

$$P(\theta, \varphi) = P_{Tx} g(\theta, \varphi)$$

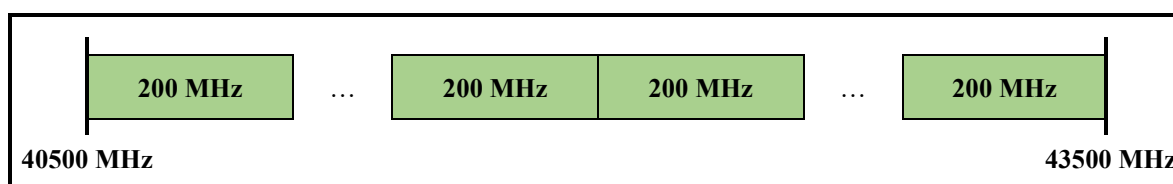
where  $P_{Tx}$  denotes the conducted power (measured in Watts), which is input to the array system, and  $g(\theta, \varphi)$  denotes the array systems directional gain along the  $(\theta, \varphi)$  direction.

## 2. GENERAL PARAMETERS

- (1) The duplex mode of operation in the 40,5-43,5 GHz frequency band shall be TDD.
- (2) The assigned block size shall be a multiple of 200 MHz. A smaller block size of 50 MHz or 100 MHz or 150 MHz, adjacent to the assigned block of another spectrum user, is also possible to ensure efficient use of the whole frequency band.
- (3) The technical conditions contained in this Annex are essential to address the mutual coexistence of terrestrial systems capable of providing wireless broadband electronic communications services (WBB ECS) and the coexistence of such systems with space station receivers in the Fixed Satellite Service (FSS) within the 42,5-43,5 GHz frequency band.
- (4) Base station and terminal station transmission within the 40,5-43,5 GHz frequency band shall be in compliance with the technical conditions set out in this Annex.
- (5) The harmonised technical conditions provided below are based on the assumption of hotspot deployment and an authorisation regime where the locations of the WBB ECS base stations (both transmitters and receivers) are known. In order to implement the necessary protection for systems referred to in Article 3, additional measures at national level may be required for an authorisation regime where the locations of WBB ECS base stations are not known in advance of an installation<sup>(1)</sup>, while still respecting the harmonised technical conditions for WBB ECS set out in this Annex.
- (6) Additional measures may be required at national level, in order to ensure appropriate protection of receiving satellite earth stations operating within the 40,5-42,5 GHz frequency band and, if needed, within the adjacent 39,5-40,5 GHz frequency band, and of systems in the Radio Astronomy Service (RAS) within the 42,5-43,5 GHz frequency band, as well as to ensure the coexistence of terrestrial systems capable of providing WBB ECS with terrestrial fixed links<sup>(2)</sup>.
- (7) For WBB ECS base stations, the protection of adjacent services below 40,5 GHz and above 43,5 GHz is provided through relevant out-of-band limits, which are derived in accordance with ETSI TS 138 104 V17.6.0 (table 9.7.4.3.3-2)<sup>(3)</sup>.
- (8) For terminal stations, the protection of adjacent services is provided by the requirements of ETSI TS 138.101-2 V.17.6.0 (table 6.5.2.1-1).

Figure 1 provides an example of a possible channelling arrangement.

Figure 1  
**Example of a channelling arrangement within the 40,5-43,5 GHz frequency band**



<sup>(1)</sup> The implementation of sharing conditions implies the need for prior information on the existing or planned location of the interfering and/or the interfered system or on the distance between them.

<sup>(2)</sup> Guidance on such measures is provided in the ECC Recommendations (22)01 and (22)02.

<sup>(3)</sup> The values for those limits are: TRP of -5 dBm/MHz ( $0 \leq \Delta f < 20$  MHz), -13 dBm/MHz ( $20 \text{ MHz} \leq \Delta f < 400$  MHz) and spurious limits for  $\Delta f > 400$  MHz.

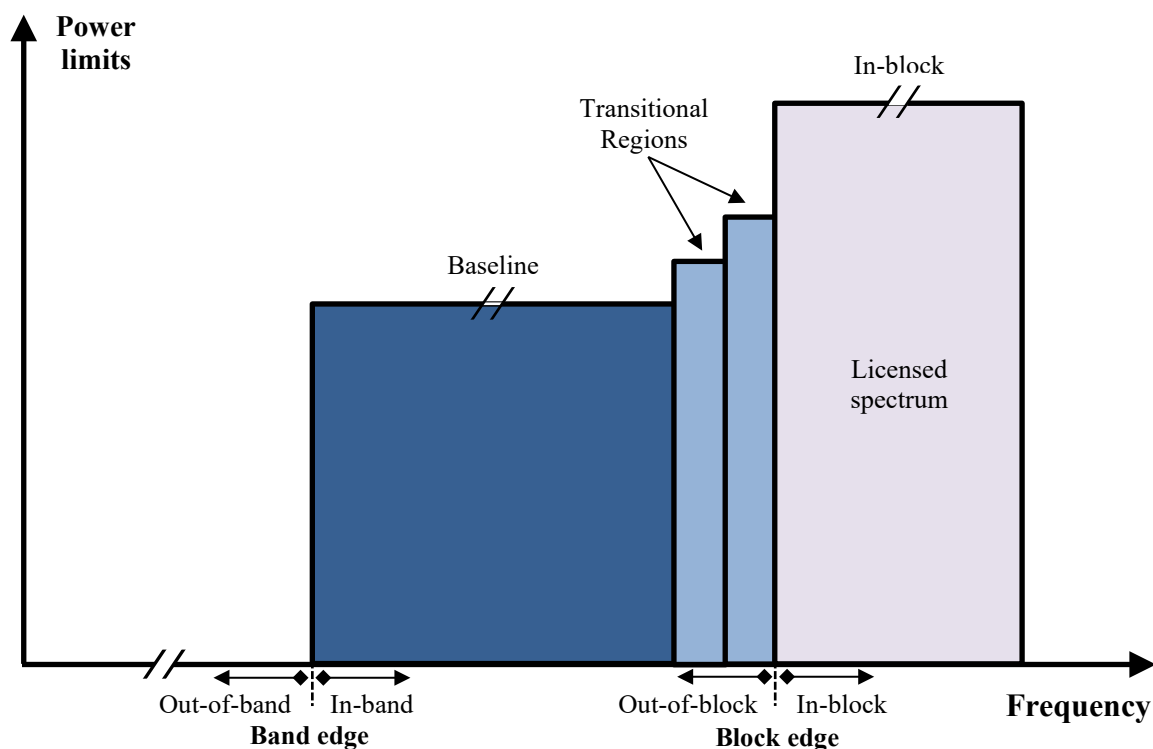
### 3. TECHNICAL CONDITIONS FOR BASE STATIONS - BLOCK EDGE MASK

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 capable of providing WBB ECS, in the absence of bilateral or multilateral agreements between operators of such neighbouring networks. Network operators of WBB ECS in the 40,5-43,5 GHz frequency band may agree bilaterally or multilaterally, on less stringent technical parameters, provided that they continue to comply with the technical conditions applicable for the protection of other services, applications or networks and with their obligations resulting from cross-border coordination. Member States shall ensure that those less stringent technical parameters can be used by agreement among all concerned parties.

A BEM is an emission mask that defines power levels as a function of frequency relative to the edge of a block of spectrum assigned to an operator. The BEM consists of several elements that are given in Table 1. The in-block power limit is applied to a block assigned to an operator. The baseline power limit ensures the protection of the spectrum of other operators within the 40,5-43,5 GHz frequency band. The transitional region power limit enables filter roll-off from the in-block to the baseline power limit in order to ensure coexistence with other operators in adjacent blocks. Both the baseline power limit and the transitional region power limit represent out-of-block BEM elements.

Figure 2 shows a general BEM applicable to the 40,5-43,5 GHz frequency band.

Figure 2  
Illustration of a block edge mask



No harmonised in-block power limit is specified. Tables 2 and 3 assume synchronised operation. Unsynchronised or semi-synchronised operation necessitates the geographical separation of neighbouring networks, while additional appropriate mitigation measures applicable at national level may also be applied. Table 4 provides an additional technical

condition for base stations to facilitate coexistence with satellite systems in the Earth-to-space FSS.

Table 1  
**Definition of BEM elements**

<b>BEM Element</b>	<b>Definition</b>
In-block	Assigned spectrum block for which the BEM is derived.
Baseline	Spectrum within the 40,5-43,5 GHz frequency band used for terrestrial systems capable of providing WBB ECS, not including the operator's block under consideration and the corresponding transitional regions.
Transitional region	Spectrum adjacent to an operator's block.

Table 2  
**Base station transitional region power limit for synchronised operation**

<b>Frequency range</b>	<b>Maximum TRP</b>	<b>Measurement bandwidth</b>
Up to 50 MHz below or above an operator's block	12 dBm	50 MHz

*Explanatory note*

This limit ensures coexistence between wireless broadband electronic communications networks in adjacent block(s) within the 40,5-43,5 GHz frequency band in synchronised operation. Appropriate mitigation measures may be applied at national level in case of unsynchronised or semi-synchronised operations<sup>(4)</sup>.

Table 3  
**Base station baseline power limit for synchronised operation**

<b>Frequency range</b>	<b>Maximum TRP</b>	<b>Measurement bandwidth</b>
Baseline	4 dBm	50 MHz

*Explanatory note*

This limit ensures coexistence between wireless broadband electronic communications networks in non-adjacent blocks within the 40,5-43,5 GHz frequency band in synchronised operation. Appropriate mitigation measures may be applied at national level in case of unsynchronised or semi-synchronised operations<sup>(4)</sup>.

<sup>(4)</sup> Relevant information is provided in ECC Report 307 "Toolbox for the most appropriate synchronisation regulatory framework including coexistence of MFCN in 24.25-27.5 GHz in unsynchronised and semi-synchronised mode", approved on 6 March 2020.

Table 4  
**Additional conditions applying to AAS outdoor base stations**

<b>Requirement on elevation of the main beam of AAS outdoor base stations</b>
When deploying such base stations, it shall be ensured that each antenna is normally transmitting only with the main beam pointing below the horizon and in addition the antenna shall have mechanical pointing below the horizon except when the base station is only receiving.

*Explanatory note*

The condition applies to the protection of space station receivers in the FSS (Earth-to-space).

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