



# ECC Decision (14)02

Harmonised technical and regulatory conditions for the use of the band 2300-2400 MHz for Mobile/Fixed Communications Networks (MFCN)

**Approved 27 June 2014**

## EXPLANATORY MEMORANDUM

### 1 INTRODUCTION

This ECC Decision aims at harmonising implementation measures for mobile/fixed communications networks (MFCN), including broadband wireless systems (BWS) in the frequency band 2300-2400 MHz. It includes the least restrictive technical conditions (LRTC), taking into account the existing standardisation framework and activities at the worldwide level, and an appropriate frequency arrangement.

For the purpose of this ECC Decision, Licensed Shared Access (LSA) is the recognised approach by CEPT for administrations wishing to introduce MFCN while maintaining the current incumbent use. Regulatory provisions based on LSA can ensure this long term incumbent use of the band.

### 2 BACKGROUND

The CEPT has recognised the importance of the availability of common and minimal (least restrictive) technical conditions for the band 2300-2400 MHz as well as the need to ensure a long term possibility for incumbent usage. These technical conditions will provide significant economies of scale and facilitate the introduction of new applications depending on national decisions.

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.

It should be noted that there may be a requirement of coordination between administrations implementing national frequency arrangements (see ECC/REC/(14)04 [1]).

When defining LRTC, the block edge mask (BEM) concept has been developed by CEPT to facilitate implementation of spectrum rights of use which are as technology neutral as possible.

In order to maintain the required flexibility for administrations regarding the non-mandatory introduction of MFCN in this band, a block edge mask has been developed, equally applying for full or partial implementation of the harmonised frequency arrangement.

In CEPT countries, the band 2300-2400 MHz is currently used by the following systems/services:

- 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);
- Amateur, as a secondary service.

LSA is the recognised approach by CEPT for administrations wishing to introduce MFCN 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.

LSA, as defined by RSPG in [2] is “A regulatory approach aiming to facilitate the introduction of radiocommunication systems operated by a limited number of licensees under an individual licensing regime in a frequency band already assigned or expected to be assigned to one or more incumbent users. Under the Licensed Shared Access (LSA) approach, the additional users are authorised to use the spectrum (or part of the spectrum) in accordance with sharing rules included in their rights of use of spectrum, thereby allowing all the authorised users, including incumbents, to provide a certain Quality of Service (QoS)”.

LSA is further described in ECC Report 205 [3]. It allows a detailed management of network deployment and effective control of the sharing arrangement, as opposed to licence-exempt regulatory approach. A key feature of LSA is that it allows offering a predictable quality of service for the incumbent as well as for the LSA licensee, each having exclusive access to that spectrum at a given location and at a given time.

LSA is considered to provide an alternative solution to access spectrum resources for MFCN when the classic approach of clearing and re-farming is not achievable.

The ECC has developed ECC Report 172 [4] which addresses sharing and adjacent band compatibility studies between broadband wireless systems (BWS) in the band 2300-2400 MHz and other services/systems. ECC Report 172 [4] 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 LSA. Therefore, administrations wishing to implement MFCN under LSA are strongly advised to conduct national studies in order to get a more efficient sharing and to consider in their studies the impact of MFCN topologies.

Examples of MFCN topologies and mobile broadband technologies that may be utilised in the 2300-2400 MHz band under a LSA framework are provided in ETSI Technical Report TR 103 113 [5].

### **3 REQUIREMENT FOR AN ECC DECISION**

The ECC recognises that implementation of MFCN, including IMT systems providing high data rate applications in the band 2300-2400 MHz based on a harmonised frequency arrangement, will maximise the opportunities and benefits for end users and society, will benefit capital expenditure for operators, reduce development and implementation costs of manufacturing equipment and will secure future long term investments by providing economies of scale. The opportunity to utilise larger channel bandwidths will assist the provision of high data rates for IMT (especially with IMT-Advanced).

Therefore, this ECC Decision is required in order to identify technical and regulatory conditions for harmonised use of MFCN in the band, while protecting the incumbent's usage in the countries that wish to maintain such use.

Furthermore, noting the above, the amount of spectrum available for MFCN may differ from country to country depending upon sovereign national decisions.

**ECC DECISION OF 27 JUNE 2014 ON HARMONISED TECHNICAL AND REGULATORY CONDITIONS FOR THE USE OF THE BAND 2300-2400 MHz FOR MOBILE/FIXED COMMUNICATIONS NETWORKS (MFCN) (ECC/DEC/(14)02)**

“The European Conference of Postal and Telecommunications Administrations,

*considering*

- a) that frequency band 2300-2400 MHz is allocated to the Mobile Service on a co-primary basis by ITU Radio Regulations [6] in all three ITU regions;
- b) that WRC-07 identified the band 2300-2400 MHz for IMT, see footnote RR 5.384A;
- c) that “mobile/fixed communications networks” (MFCN) for the purpose of this Decision include IMT and other communications networks in the mobile and fixed services;
- d) that detailed specifications of IMT radio interfaces are described in Recommendation ITU-R M.1457 [7] for IMT-2000 and Recommendation ITU-R M. 2012 [8] for IMT-Advanced;
- e) that this ECC Decision leaves flexibility to CEPT Administrations to determine the use of this frequency band at a national level;
- f) that some administrations may not make available all frequencies in the band 2300-2400 MHz for MFCN;
- g) that in some CEPT countries the band 2300-2400 MHz is used for Telemetry, PMSE (SAP/SAB video links) and other services/systems;
- h) that the use of the band 2300-2400 MHz by some incumbent users is generally limited to certain times or to specific geographical locations;
- i) that ensuring the long term incumbent’s use is a national decision;
- j) that the introduction of MFCN in the 2300-2400 MHz band in one country can have an impact on incumbent usage in neighbouring countries and thus may require the need for cross-border agreement;
- k) that harmonised frequency arrangements facilitate economies of scale and availability of low-cost equipment;
- l) that global roaming is facilitated by harmonised frequency arrangements and circulation arrangements for the use of MFCN terminals;
- m) that Recommendation ITU-R M.1036 [9] identifies the recommended frequency arrangement for the band 2300-2400 MHz for IMT systems;
- n) that some Administrations expressed their intention to introduce MFCN in the 2300-2400 MHz band under Licensed Shared Access (LSA), as defined by RSPG in [2] and as further described in ECC Report 205 [3], on a shared basis with the incumbent services;
- o) that LSA is to be implemented by administrations on a voluntary basis;
- p) that under LSA, spectrum is used by either the incumbent(s) or the LSA licensee(s), so that the latter has individual spectrum rights of use / access where and when the spectrum is made available by the incumbent(s), in accordance with the sharing framework defined beforehand;
- q) that the level of the service that can be delivered by a LSA licensee is dependent on the situation in the band, e.g. the usage scenarios of the incumbent(s) and the corresponding sharing framework established on the basis of the criteria identified in ECC Report 205 [3];
- r) that LSA provides a means for making the 2300-2400 MHz band available to MFCN in a timely manner;
- s) that in EU/EFTA countries the radio equipment that is under the scope of this Decision shall comply with the R&TTE Directive. Conformity with the essential requirements of the R&TTE Directive may be demonstrated by compliance with the applicable harmonised European standard(s) or by using the other conformity assessment procedures set out in the R&TTE Directive.

**DECIDES**

1. that 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), including broadband wireless systems;
2. that, subject to national considerations, the frequency band 2300-2400 MHz is made available for MFCN, while also enabling administrations to maintain the use of the band by incumbent services;
3. that the following technical and operational parameters apply to MFCN in the frequency band 2300-2400 MHz:
  - a) the harmonised frequency arrangement is given in Annex 1;
  - b) the least restrictive technical conditions (LRTC) are specified in Annex 2;
4. that, administrations wishing to introduce MFCN in the band, and maintain the long term incumbent use of the band in their territory implementing Licensed Shared Access (LSA), should develop appropriate sharing framework following the guidelines contained in Annex 3;
5. that this Decision **enters into force** on 27 June 2014;
6. that the preferred **date for implementation** of this Decision shall be 27 December 2014;
7. that CEPT administrations shall communicate the **national measures** implementing this Decision to the ECC Chairman and the Office when this ECC Decision is nationally implemented.”

**Note:**

Please check the Office documentation database <http://www.ecodocdb.dk> for the up to date position on the implementation of this and other ECC Decisions.

**ANNEX 1: HARMONISED FREQUENCY ARRANGEMENT**

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

TDD (MHz)																			
2300 MHz 2305 MHz	2305 MHz 2310 MHz	2310 MHz 2315 MHz	2315 MHz 2320 MHz	2320 MHz 2325 MHz	2325 MHz 2330 MHz	2330 MHz 2335 MHz	2335 MHz 2340 MHz	2340 MHz 2345 MHz	2345 MHz 2350 MHz	2350 MHz 2355 MHz	2355 MHz 2360 MHz	2360 MHz 2365 MHz	2365 MHz 2370 MHz	2370 MHz 2375 MHz	2375 MHz 2380 MHz	2380 MHz 2385 MHz	2385 MHz 2390 MHz	2390 MHz 2395 MHz	2395 MHz 2400 MHz
5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

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

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

## **ANNEX 2: LEAST RESTRICTIVE TECHNICAL CONDITIONS FOR MFCN IN THE 2300-2400 MHz BAND**

The least restrictive technical conditions (LRTC) defined in this annex are in the form of a block-edge mask (BEM) applicable to MFCN as derived from scenarios in ECC Report 203 [10].

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 an 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 BEM has been derived:

- that is intended to allow coexistence between MFCN applications in the 2300-2400 MHz band and to apply to the harmonised frequency arrangement as described in Annex 1;
- that is intended to ensure coexistence with the systems 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 [4].

The derived BEM does also not take into account coexistence with other incumbent services inside the band 2300-2400 MHz. Coexistence with incumbent services is handled in Annex 3.

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 MFCN 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.

The term block edge refers to the frequency boundary of spectrum licensed to a mobile/fixed communications networks 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 MFCN).

### **A2.1 TECHNICAL CONDITIONS FOR MFCN BASE STATIONS**

Technical conditions are applicable to MFCN 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 MFCN TDD, baseline power limits are used.

**Table 1: BEM elements for MFCN 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 <sup>1</sup> .
Transitional region	<p>Transitional regions apply for unwanted emissions into adjacent TDD blocks allocated to other operators if networks are synchronised.</p> <p>They also apply in-between TDD blocks with a frequency separation of 5 or 10 MHz between each block edge.</p> <p>For immediately adjacent unsynchronised TDD networks, there is no transitional region and the baseline levels apply outside the allocated block.</p> <p>The transitional regions do not apply below 2300 MHz or above 2400 MHz.</p>

Synchronised operation<sup>2</sup> 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 [11] (see also ECC Report 216 on ‘Practical guidance for TDD networks synchronisation’ [12]).

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

**A2.1.1 In-block requirements for MFCN 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 / 5 MHz e.i.r.p. per antenna may be applied.
- **2390-2400 MHz:** The in-block e.i.r.p.<sup>3</sup> limit shall not exceed 45 dBm / 5 MHz 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.

**A2.1.2 Baseline requirements for TDD base stations**

Table 2 shows the baseline requirements for unsynchronised and synchronised MFCN 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
Baseline	Unsynchronised TDD blocks (2300-2400 MHz)	-36 <sup>4</sup> dBm / 5 MHz e.i.r.p. <sup>3</sup>
Baseline	Synchronised TDD blocks (2300-2400 MHz)	Min( $P_{max}-43, 13$ ) dBm / 5 MHz e.i.r.p. per antenna

<sup>1</sup> 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.

<sup>2</sup> Synchronisation of TDD networks of different operators can be addressed at national level

<sup>3</sup> The e.i.r.p. is the total radiated power in any direction at a single location independent of any base station configuration.

<sup>4</sup> 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.



Table 3 shows the additional baseline requirements above 2400 MHz for unsynchronised and synchronised MFCN 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.<sup>3</sup> limits**

BEM element	BS e.i.r.p.	Power limit
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

### A2.1.3 Transitional region requirements for MFCN base stations

Table 4 shows the transitional region requirements for unsynchronised (when applicable) and synchronised MFCN base stations.

**Table 4: Transitional region requirements (when applicable)  
BS BEM out-of-block e.i.r.p. limits**

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

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.

### A2.1.4 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 / 5 MHz e.i.r.p.<sup>3</sup> 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.

### A2.1.5 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.

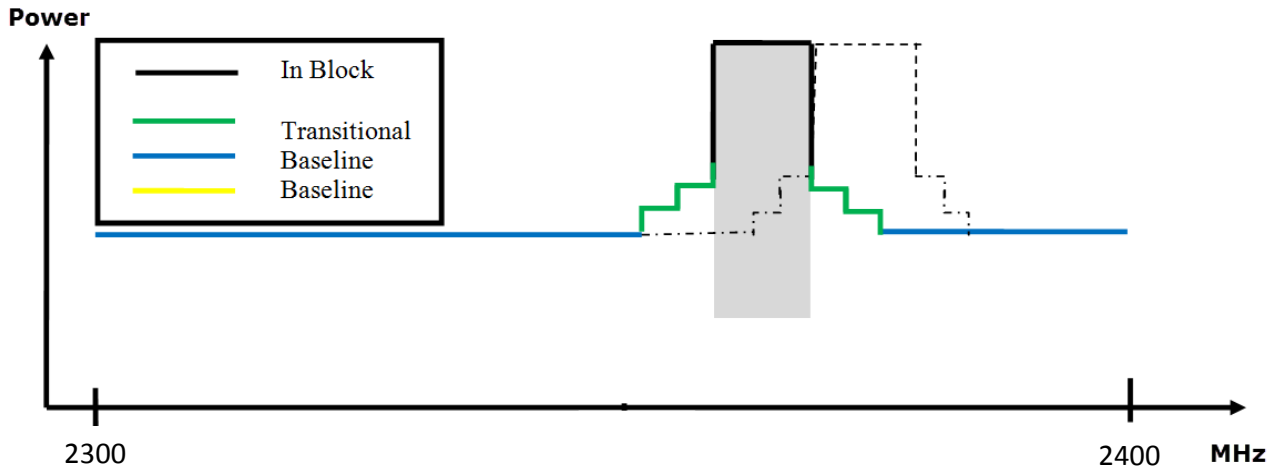


Figure 2: Combined BEM elements for adjacent blocks with synchronised TDD networks

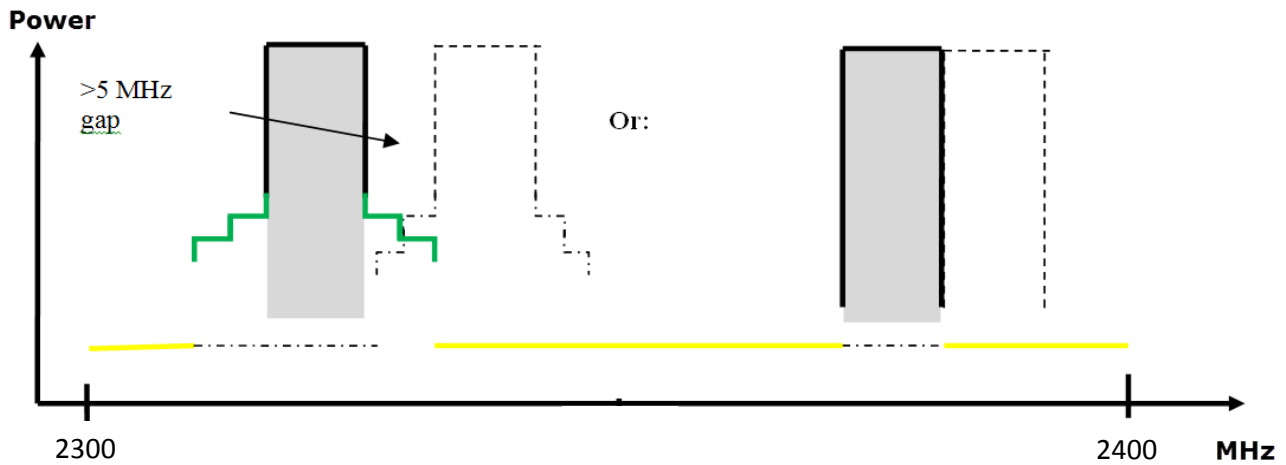


Figure 3: Combined BEM elements for adjacent blocks with unsynchronised TDD networks

## A2.2 TECHNICAL CONDITIONS FOR MFCN USER EQUIPMENT

### In-block requirements for all user equipment

This decision 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<sup>5</sup> for the UE designed to be mobile or nomadic.

<sup>5</sup> 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.

### **ANNEX 3: IMPLEMENTATION OF LSA IN THE 2300-2400 MHz BAND**

Administrations wishing to implement MFCN under LSA identify which existing applications need to be considered as incumbent and maintained in the long term.

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

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

Applications whose usage has to be maintained in the long term are then identified as incumbents.

Once the incumbent applications have been identified, sharing opportunities have to be assessed through studies to be performed. Sharing opportunities can be in time domain, frequency domain or by geographical separation. It is a principle of LSA that for any single location or geographic area, an incumbent and an LSA licensee will not make use of the spectrum at the same time.

#### **A3.1 MFCN UNDER LSA IN THE 2300-2400 MHz BAND**

CEPT has developed ECC Report 172 [4] which provides compatibility studies with respect to the potential use of the band 2300-2400 MHz by broadband wireless systems (BWS). ECC Report 172 studies were performed assuming worst case scenarios and not considering LSA.

Administrations wishing to implement MFCN under LSA are strongly advised to conduct national studies (e.g. defining an adapted propagation model, setting technical characteristics corresponding to the national situation) in order to get a more efficient sharing and to consider in their studies the impact of MFCN topologies.

In order to increase the spectrum usage, one of the technological aspects to be considered is the choice of the topology to be used for the network deployment in the 2300-2400 MHz band. LSA is indeed applicable in the entire HetNet (Heterogeneous Networks) context. This network topology might consist of:

- Macro, micro, pico and femto cell deployment,
- Or a combination of the above deployments,

to fulfil the needs of the operators.

ETSI TR 103 113 [5] provides examples of MFCN topologies in the 2300-2400 MHz band based on LSA.

For example, in complement to macro cell deployment, micro, pico, femto cell deployments would create the opportunity for sharing in areas where typical macro cell deployments would not be possible due to the need to protect the incumbent.

For the above mentioned topologies where LSA could be applied, the same LRTC as in Annex 2 could be applicable.

#### **A3.2 USAGE SCENARIOS FOR THE INCUMBENT SERVICES**

##### **A3.2.1 Usage scenarios for PMSE**

The main type of PMSE applications used in the 2300-2400 MHz band is related to temporary video links (portable, mobile with some allowance for airborne use) and cordless cameras as referred to in ERC/REC 25-10 [13] and ECC Report 204 [14].

PMSE use in this band may be characterised as having in many cases a high degree of locality and temporality, as it is in such cases confined to the limits of a defined area for an event limited in time. Sharing scenarios will have to be developed to address the several types of PMSE deployment.

### **A3.2.2 Usage scenarios for telemetry systems**

Both airborne and terrestrial telemetry applications are used in the band as described in ECC Report 172 [4]. These are expected to be scheduled activities often planned well in advance.

### **A3.2.3 Usage scenarios for Unmanned Aircraft Systems (UAS)**

UAS is composed with one or several UAV (Unmanned Aircraft Vehicle) and a ground station (GS). UAS uses telecommand (uplink) and telecontrol and video links (downlink). Some UAS uses symmetrical link between UAV and ground station (same bandwidth for the uplink and for the downlink, same modulation, etc.) as described in ECC Report 172 [4]. These are expected to be scheduled activities often planned well in advance.

### **A3.2.4 Usage scenarios for Amateur service**

The frequency band 2300-2400 MHz is allocated to the Amateur Service on a secondary basis by ITU Radio Regulations [6] in all three ITU regions.

The operational characteristics of amateur stations operating in the 2300-2400 MHz range vary significantly. However based on the IARU Region-1 VHF Managers Handbook [15] and studies for ECC Report 172 [4], they can be categorised as:

- Long range weak-signal reception of Narrowband Terrestrial (e.g. CW, SSB, digimodes) and EME (Earth-Moon-Earth - Moonbounce) operation - notably in the harmonised sub-band 2320-2322 MHz, including propagation beacons;
- Some additional narrowband activity in the 2300-2305 MHz range, including long range EME (Earth-Moon-Earth - Moonbounce) contacts with North America;
- Data, multimedia, and TV repeaters (point-to-point links and area systems) in other parts of the band.

Activity levels vary with propagation conditions and peak when national or international contests, or other activity events, are scheduled.

## **A3.3 SHARING SCENARIOS WITHIN THE 2300-2400 MHz UNDER LSA**

Sharing scenarios are summarised in the following sections based upon the sharing studies reported in ECC Report 172 [4]. LSA provides additional opportunities for geographic separation for co-frequency operation, or frequency separation for geographic co-location, depending on the incumbent use.

Administrations wishing to implement MFCN under LSA are strongly advised to conduct national studies in order to get a more efficient sharing and to consider in their studies the impact of MFCN topologies as coexistence between BWS and current users of the band has been studied in ECC Report 172 [4] in a worst-case analysis.

It is important to note that the level of the service that can be delivered by a LSA licensee is dependent on the situation in the band; it will be determined by the usage scenarios of the incumbent(s) and the corresponding sharing framework. QoS, in particular when it comes to coverage, can only be provided through licensed spectrum where LSA Licensees have full control/knowledge of the interference they face, and therefore have full understanding of the performance that will be delivered by their network equipment.

### **A3.3.1 Coexistence PMSE (SAP/SAB video links) with MFCN**

Incumbent PMSE applications (SAP/SAB video links) can coexist with MFCN applications at the same time through the use of either geographic separation if co-frequency operation is expected or a combination of separation distance and frequency separation if co-located operation is anticipated. However, the details of

such a sharing situation may depend on the particular national circumstances, namely the spectrum usage and the type of the authorisation granted by the corresponding administration for the existing applications. Special care may be given to the case of airborne use of PMSE, which may require large separation distances.

### **A3.3.2 Coexistence TELEMETRY SYSTEMS with MFCN**

Incumbent Telemetry applications can coexist with MFCN applications at the same time through the use of either geographic separation if co-frequency operation is expected or a combination of separation distance and frequency separation if co-located operation is anticipated.

### **A3.3.3 Coexistence UAS with MFCN**

Incumbent UAS applications can coexist with MFCN applications at the same time through the use of either geographic separation if co-frequency operation is expected or a combination of separation distance and frequency separation if co-located operation is anticipated.

### **A3.3.4 Coexistence AMATEUR SERVICE with MFCN**

ECC Report 172 [4] found that regarding Radio Amateur systems in the 2300-2400 MHz band, operating as a secondary service, it was shown that the required MCL (Minimum Coupling Loss) can be achieved by various mitigation techniques.

## ANNEX 4: LIST OF REFERENCE

This annex contains the list of relevant reference documents.

- [1] ECC Recommendation (14)04 on Cross-border coordination for MFCN and between MFCN and other systems in the frequency band 2300-2400 MHz
- [2] 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](https://circabc.europa.eu/sd/d/3958ecef-c25e-4e4f-8e3b-469d1db6bc07/RSPG13-538_RSPG-Opinion-on-LSA%20.pdf)
- [3] ECC Report 205: Licensed Shared Access (LSA)
- [4] ECC Report 172: Broadband Wireless Systems Usage in 2300-2400 MHz
- [5] ETSI TR 103 113: System Reference document; Mobile broadband services in the 2300 - 2400 MHz frequency band under Licensed Shared Access regime
- [6] ITU Radio Regulations
- [7] Recommendation ITU-R M.1457: Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)
- [8] Recommendation ITU-R M. 2012: Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)
- [9] 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)
- [10] 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
- [11] 3GPP TS 37.104 : E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception
- [12] ECC Report 216 on 'Practical guidance for TDD networks synchronisation'
- [13] ERC/REC 25-10: Frequency ranges for the use of temporary terrestrial audio and video SAP/SAB links (incl. ENG/OB)
- [14] ECC Report 204: Spectrum use and future requirements for PMSE
- [15] IARU Region-1 VHF Managers Handbook