CEPT ECC
Electronic Communications Committee

ECC Recommendation (26)03

Guidance on the coordination between low and medium power terrestrial wireless broadband systems (WBB LMP) in the frequency band 3800-4200 MHz and the protection of MFCN operating in the frequency band 3400-3800 MHz

approved 9 October 2026

Edition 9 October 2026

INTRODUCTION

With ECC Decision (24)01 [1], CEPT has harmonised the frequency band 3800−4200 MHz for the shared use of low/medium power terrestrial wireless broadband systems (WBB LMP) providing local-area network connectivity.

The harmonised technical conditions in ECC Decision (24)01 are defined to respect technology neutrality for the operation of WBB LMP. These technical conditions alone do not ensure the protection of incumbent services, nor interference free coexistence between different WBB LMP networks. This Recommendation provides guidance on the coordination of WBB LMP networks in the frequency band 3800−4200 MHz, and the protection of MFCN operating in the frequency band 3400−3800 MHz. The guidance in this Recommendation is based on the findings of ECC Report 358 [2], which contains sharing studies assessing the feasibility of the shared use of the 3800−4200 MHz frequency band.

This Recommendation forms part of a set of Recommendations[1] that provide guidance for administrations to develop national rules for the coexistence between WBB LMP networks in the frequency band 3800−4200 MHz whilst also ensuring in-band and adjacent band coexistence with the incumbent services.

0.1 COEXISTENCE WITH AND PROTECTION OF MFCN BELOW 3800 MHZ

The frequency band 3400−3800 MHz has been harmonised for MFCN in CEPT under ECC Decision (11)06 [3] and is recognised to be the primary 5G band in Europe. It is crucial that MFCN operations in the frequency band 3400−3800 MHz are adequately protected. It is also important that WBB LMP networks in the adjacent frequency band (3800−4200 MHz) do not suffer from harmful interference from MFCN.

Administrations may consider synchronisation as one possible measure to enable coexistence. If a WBB LMP network is synchronised with the national MFCN operations in the frequency band 3400−3800 MHz, the WBB LMP network can operate across the entire frequency band 3800−4200 MHz without the risk of interference to either network. However, synchronisation with the national MFCN operations is only possible for WBB LMP networks using a compatible technology and requires the WBB LMP networks to use a frame structure compatible with the national MFCN operations, which may involve certain trade-offs including flexibility in the uplink-to-downlink ratio of the WBB LMP network, as well as a common phase clock reference.

Unsynchronised operation of WBB LMP networks may require additional measures to protect MFCN operating in the frequency band 3400−3800 MHz from harmful interference. This Recommendation gives guidelines to the administrations on frequency arrangements and mitigation techniques.

This Recommendation also addresses the case where the WBB LMP network is semi-synchronised with MFCN, giving some flexibility to the WBB LMP network about the choice of the frame structure and therefore the uplink-to-downlink ratio, while still ensuring protection of the national MFCN operations. Semi-synchronised operation as defined in this Recommendation is a specific sub-case of the typical definition of semi-synchronised operation. In the definition used in this report, semi-synchronised operation is the case in which only DL to UL modifications are allowed for WBB LMP networks compared to the frame structure used by MFCN operations. In this case of semi-synchronised operation, WBB LMP base station receivers may experience interference from nearby MFCN base stations during some WBB LMP uplink slots.

0.2 IN-BAND COEXISTENCE BETWEEN WBB LMP NETWORKS

This Recommendation provides guidance for administrations to develop national measures to facilitate coexistence between WBB LMP networks and ensure efficient spectrum use of the frequency band 3800−4200 MHz.

[1] ECC Recommendation (25)03 [5] and ECC Recommendation (26)02 [6]

This Recommendation proposes two approaches:

1. Detailed coordination, where the applicant applies to the national administration, providing information on the proposed deployment location and the technical parameters (which may include output power, antenna configuration, antenna positioning, etc.), and the administration ensures coexistence with incumbent services, determines the spectrum available[2], and if available assigns the authorisation. In this case, the authorisation will include the deployment location and technical parameters in the licence conditions;

2. Minimum coordination, where the administration ensures coexistence by requiring synchronisation (or semi-synchronisation) and/or a maximum field strength level to be met at the border of an exclusive[3] licensed local area (area defined authorisation). This may reduce the need for administrative coordination. The area defined authorisation could allow for agreements between licensees to relax the field strength limit between them, provided that the authorisation also takes into account protection of third party users.

Administrations are free to decide, at national level, on the measures of protection and the implementation of sharing frameworks in accordance with their spectrum management policies and priorities.

Administrations may consider elements in their national measures where neighbouring licensees are given the flexibility to agree to exceed the protection requirements defined by the administration for their own protection, provided that they do not impact the protection provided to third party users.

[2] The administration may publicly provide information on the available spectrum, for example based on typical technical deployment parameters.
[3] Exclusive in this context means that the licensee has exclusive use of a defined frequency range in the defined area.

ECC RECOMMENDATION (26)03 OF 9 OCTOBER 2026 ON THE GUIDANCE ON THE COORDINATION BETWEEN LOW AND MEDIUM POWER TERRESTRIAL WIRELESS BROADBAND SYSTEMS (WBB LMP) IN THE FREQUENCY BAND 3800−4200 MHZ, AND THE PROTECTION OF MFCN OPERATING IN THE FREQUENCY BAND 3400−3800 MHZ

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that the frequency band 3800−4200 MHz is allocated in the Radio Regulations in Region 1 on a secondary basis to the mobile service;

b) that ECC Report 358 [2] provides coexistence studies between WBB LMP networks and MFCN, and between different WBB LMP networks;

c) that ECC Report 358 concludes that it is not possible to define generic technical conditions that ensure the protection of incumbent services, nor interference free coexistence between different WBB LMP networks, and administrations should consider additional measures to ensure coexistence;

d) that ECC Decision (24)01 [1] sets out the harmonised technical conditions for WBB LMP which have been derived on the basis that the location of WBB LMP networks or base stations is known, and which are used in a defined limited geographical area (no nationwide network);

e) that according to ECC Decision (24)01, CEPT administrations shall ensure the protection of the incumbent services within the adjacent frequency band 3400−3800 MHz (MFCN);

f) that the generic technical conditions defined in ECC Decision (24)01 assume individual licensing of the WBB LMP networks;

g) that ECC Decision (24)01 defines a base station as a fixed radio device providing the gateway between the back-end network, for example the gateway to the internet or the user's fixed infrastructure, and the WBB LMP radio network devices;

h) that this Recommendation may be applied to both permanent and temporary WBB LMP networks at a specific location;

recommends

1. that administrations should follow the definitions of synchronised, semi-synchronised and unsynchronised operation as described in Annex 1;

2. that administrations that wish to allow the deployment of WBB LMP networks in the frequency band 3800−4200 MHz that are synchronised or semi-synchronised with MFCN operating in the frequency band 3400−3800 MHz should follow the measures described in A2.1 and A2.2;

3. that administrations that wish to allow the deployment of WBB LMP networks in the frequency band 3800−4200 MHz that are unsynchronised with MFCN operating in the frequency band 3400−3800 MHz, should consider the potential coexistence challenges of such operation which may require measures to ensure the protection of MFCN, such as:
   - detailed interference assessments, including any necessary measures at national level, and/or
   - applying the recommended measures in A2.3;

4. that administrations should consider the in-band planning methodologies and coordination measures described in Annex 3 to facilitate coexistence between WBB LMP networks when issuing licences to WBB LMP networks in the frequency band 3800−4200 MHz;

5. that coordination in border areas should be based on bilateral or multilateral agreements/arrangements between administrations/operators[4];

6. that bilateral or multilateral agreements/arrangements should define coordination methods that:
   - use the same methodology as in recommends 2, 3 and 4,

     or
   - administrations may agree on other methods to trigger coordination, for example based on a coordination distance from the border;

7. that this Recommendation should be reviewed within 5 years of its adoption in the light of practical experience of its application and of the operation of WBB LMP networks."

Note:

Please check the ECO Documentation Database https://docdb.cept.org/ for the up-to-date position on the implementation of this and other ECC Recommendations.

[4] ECC Recommendation (15)01, annex 3 [4], may be used as a basis for an agreement on exchange of information.

ANNEX 1: SYNCHRONISED, SEMI-SYNCHRONISED AND UNSYNCHRONISED OPERATION

This annex defines, in the context of this Recommendation, synchronised, semi-synchronised and unsynchronised operation between WBB LMP networks and MFCN, as well as between WBB LMP networks.

A1.1 SYNCHRONISED OPERATION

The following conditions must be met for two networks to be synchronised:

- both networks use compatible technologies (e.g. both networks use 3GPP technologies);
- both networks use a common phase clock reference (typically GPS);
- both networks use compatible frame structures.

Synchronisation can enable coexistence between WBB LMP networks above 3800 MHz and MFCN below 3800 MHz, and between adjacent channel WBB LMP networks within 3800−4200 MHz, eliminating the need for coordination and frequency separation. Synchronisation will ease coexistence between co-channel (and partially overlapping channels) WBB LMP networks. Synchronisation may however involve certain trade-offs including less flexibility of the uplink-to-downlink ratio.

A1.2 SEMI-SYNCHRONISED OPERATION

Semi-synchronised operation, as defined in this Recommendation, primarily for the protection of MFCN, is a specific sub-case of semi-synchronised operation, in which only DL to UL modifications are allowed compared to the frame structure used by MFCN operations.

The following conditions to be met for the two networks to be semi-synchronised are:

- both networks use compatible technologies (e.g. both networks use 3GPP technologies);
- both networks use a common phase clock reference (typically GPS);
- no collision from WBB LMP DL frame to MFCN UL frame, as shown in Figure 1.

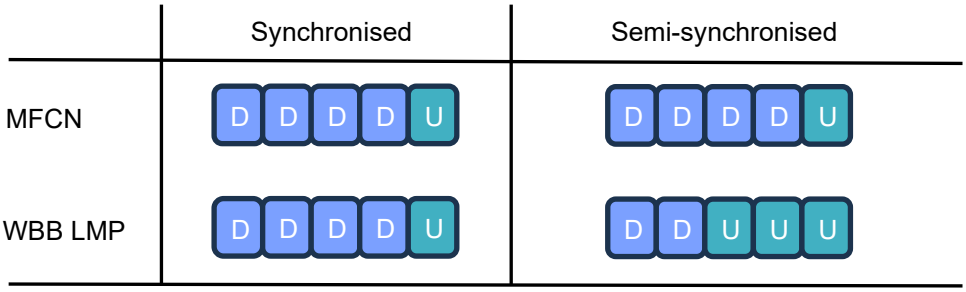


Figure 1: Example of frame structures for synchronised and semi-synchronised operations between WBB LMP and MFCN

It should be noted that, while semi-synchronised operation of WBB LMP with MFCN ensures the protection of MFCN, the WBB LMP network may experience interference during its uplink time slots that are time-aligned with MFCN downlink time slots[5].

Similarly, semi-synchronised operation can be used to facilitate the coexistence between WBB LMP networks, ensuring that one particular WBB LMP frame structure can operate without the risk of interference, while allowing the use of some alternative frame structures (only DL to UL modifications compared to the WBB LMP frame structure operating without the risk of interference). For the network using an alternative frame structure some uplink time slots may risk experiencing interference.

A1.3 UNSYNCHRONISED OPERATION

In this Recommendation cases that are not as described in A1.1 and A1.2 are considered as unsynchronised operation.

[5] The WBB LMP network uplink time slots that are time-aligned with MFCN uplink time slots should not experience interference.

ANNEX 2: MEASURES FOR COEXISTENCE OF WBB LMP WITH, AND PROTECTION OF, MFCN OPERATING IN THE FREQUENCY BAND 3400−3800 MHZ

A2.1 SYNCHRONISED OPERATION

If the WBB LMP networks are synchronised with MFCN (as described in A1.1) they can operate in the frequency band 3800−4200 MHz without coordination or risk of interference into or from MFCN operating in the frequency band 3400−3800 MHz.

A2.2 SEMI-SYNCHRONISED OPERATION

If the WBB LMP networks are semi-synchronised with MFCN (as described in A1.2), WBB LMP networks can operate in the frequency band 3800−4200 MHz without coordination or risk of interference into MFCN operating in the frequency band 3400−3800 MHz. Semi-synchronisation provides more flexibility when it comes to uplink-to-downlink ratio for the WBB LMP networks compared to synchronised operation.

The WBB LMP base station receivers may experience interference to some of its uplink time slots from MFCN downlink. Increasing the frequency separation between MFCN and WBB LMP networks will reduce but may not eliminate the risk of performance degradation in the WBB LMP network uplink (noting that MFCN spurious emissions domain starts at 3840 MHz) and additional mitigation may be required (measures in A2.3.3 may reduce this risk of interference).

A2.3 UNSYNCHRONISED OPERATION

A2.3.1 Unsynchronised 3GPP based WBB LMP networks

With unsynchronised operation of WBB LMP networks, there is a risk of base station to base station interference, making it more difficult to achieve protection of MFCN and to avoid interference from MFCN into WBB LMP networks. One or more measures, such as those described in this section, may be required to reduce this risk.

The improved base station transmitter and receiver characteristics provided in this section are based on a scenario assuming a minimum separation distance of 100 m between a WBB LMP base station and a nearby MFCN base station.

When a WBB LMP base station and a MFCN base station are closer (i.e. separated by less than 100 m) and are in line of sight, case-by-case considerations may be needed.

Figure 2 shows the characteristics of MFCN and WBB LMP base stations considered in deriving these measures. In Figure 2, a channel bandwidth greater than 20 MHz is assumed.

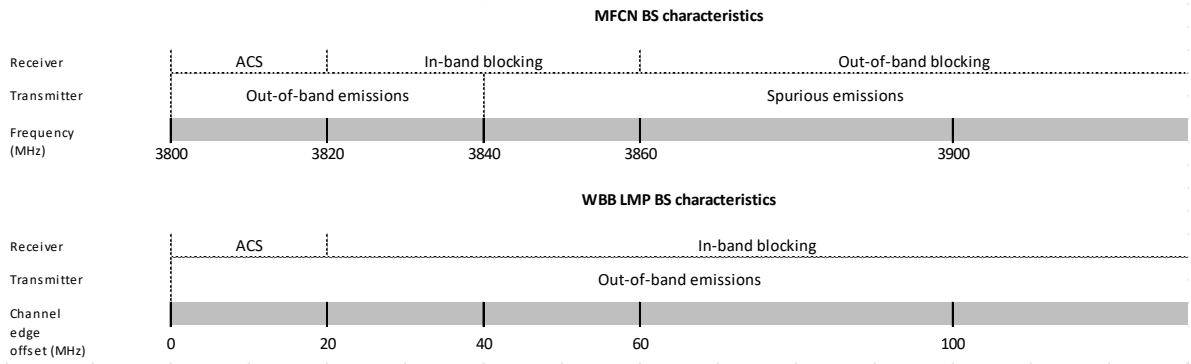


Figure 2: Characteristics of base stations taken into account in deriving measures for WBB LMP unsynchronised operation with MFCN (for channel bandwidths greater than 20 MHz)

A2.3.1.1 Measures to be considered to ensure protection of MFCN

In order to avoid WBB LMP base stations causing interference to nearby MFCN base stations, administrations are recommended:

- to only allow operation of unsynchronised WBB low power base stations in the frequency band 3820−4200 MHz;
- to only allow operation of unsynchronised WBB medium power base stations in the frequency band 3860−4200 MHz;
- to only allow operation of unsynchronised WBB LMP base stations in the frequency band 3800−4200 MHz that meet the following unwanted emissions requirements in the frequency range 3400−3800 MHz:
  - -33 dBm/(5 MHz) *e.i.r.p.* per cell for non-AAS WBB low and medium power base stations;
  - -40 dBm/(5 MHz) *t.r.p.* per cell for AAS WBB medium power base station.

A2.3.1.2 Measures to be considered to reduce interference due to WBB LMP base station receiver blocking

To reduce the effect of interference due to WBB LMP base station receiver blocking caused by MFCN base station in-band emissions in the frequency band 3400−3800 MHz, it is recommended that WBB LMP base stations operate above 3820 MHz. This frequency separation of at least 20 MHz avoids the 3GPP WBB LMP ACS frequency range overlapping with the MFCN base station in-band emissions.

WBB LMP base station receivers may also need to be more resilient to interference from these MFCN base station in-band emissions in the frequency range 3400−3800 MHz compared to the 3GPP technical specifications. Table 1 provides the recommended improved WBB LMP base station blocking level below 3800 MHz.

Table 1: Improved WBB LMP base station receiver blocking characteristics

Parameter	Value
Level of the wanted signal	RefSens +6 dB
5 MHz NR interfering signal in the frequency band 3400−3800 MHz	-15 dBm (Note 1)
The antenna connector of the non-AAS base station receiver or the transceiver array boundary (TAB) connector of the AAS base station receiver is the reference point. The reference sensitivity (RefSens) is the minimum mean power received at the antenna connector of the non-AAS base station or at the TAB connector of the AAS base station at which a specified minimum performance shall be met. Note 1: This blocking level provides an equivalent receiver rejection of 64.3 dB for medium power base station and 61.3 dB for low power base station.	

The improved receiver performance could be achieved by applying filters (non-AAS base stations).

In some cases, the above measures may not be sufficient, and additional mitigation techniques may be needed to deal with emissions from MFCN operating in 3400−3800 MHz.

A2.3.2 Unsynchronised DECT-2020 NR based WBB LMP networks (low-power)

DECT-2020 NR based WBB LMP networks operate with an *e.i.r.p.* of maximum 23 dBm in channel bandwidths of 1.728 MHz, 3.456 MHz and 6.912 MHz, and operate mandatory transmission power control (TPC). The ECC Report 358 [2] studies on DECT-2020 NR coexistence used the bandwidth option of 6.912 MHz, under the assumption that the 6.912 MHz channel is centred in a nominal 10 MHz frequency block. The studies show that the coexistence between MFCN operating in the frequency band 3400−3800 MHz and a DECT-2020 NR based WBB LMP network operating in the frequency band 3800−4200 MHz is feasible, although some additional measures (see A2.3.3) may be required.

To reduce the risk of interference from MFCN into a DECT-2020 NR based WBB LMP network, it is recommended to operate the WBB LMP network within the frequency band 3820−4200 MHz.

In cases where the DECT-2020 NR based WBB LMP base station and MFCN base station are close and in line of sight, case-by-case coordination may be required.

A2.3.3 Additional complementary mitigation measures for WBB LMP networks

Administrations may want to consider the complementary mitigation measures below in order to ease coordination and/or further improve the coexistence.

A2.3.3.1 WBB LMP operation with case-by-case coordination with MFCN

Where the location of the MFCN base stations is known, and case-by-case coordination between planned WBB LMP base stations and existing or planned future MFCN base stations is possible, a methodology described in A3.2) may be used to ensure coexistence. This also assumes that the WBB LMP network operators are able to implement adjustments (e.g. see A2.3.3.2) in order to ensure protection of future MFCN base station deployments.

A2.3.3.2 WBB LMP individual site engineering

Administrations may also want to consider individual site engineering involving the complementary mitigation measures listed below when planning new WBB LMP networks or to resolve reported interference cases:

- Reduce the transmit power;
- Adjust the antenna pointing;
- Adjust the antenna down tilt;
- Lower the antenna height;
- Change the antenna pattern;
- Change the antenna positioning in relation to the victim antenna;
- Apply a frequency separation from MFCN equal to or higher than the MFCN channel bandwidth in the upmost part of the frequency band 3400−3800 MHz[6].

A2.3.3.3 WBB LMP maximum field strength level outside the licensed area edge

In geographical areas where there are no existing or planned future MFCN base stations in the frequency band 3400−3800 MHz, the administrations may consider an approach where the WBB LMP network operators are given flexibility to operate within a licensed area provided that maximum field strength level requirements are fulfilled outside this area.

Under the condition that the WBB LMP base station unwanted emission levels defined in section A2.3.1.1 are respected, Table 2 specifies the recommended maximum field strength level outside the licensed area. Such field strength level is set to protect MFCN base station established outside the licensed area from interference due to blocking effect.

Table 2: Recommended WBB LMP base station maximum field strength level outside the licensed area

Frequency range	Maximum field strength level	Condition
3800−3860 MHz	77 dBµV/m (Note 1)	At specified MFCN base station antenna height(s) (Note 2)
3860−4200 MHz	92 dBµV/m (Note 1)	At specified MFCN base station antenna height(s) (Note 2)
Note 1: Over the WBB LMP channel bandwidth. Note 2: MFCN base station antenna height(s) to be defined by the administrations in the WBB LMP network licence.		

For the cross-border coordination, the values given in Table 2 can be converted to an equivalent field strength level at 3 m height using Recommendation ITU-R P.1546, annex 5, clause 9 [8], e.g. the delta between 25 m and 3 m height is 23.5 dB. The administrations may agree on a common propagation model to be used for the calculations.

[6] To manage the non-linearity of the Low Noise Amplifier in the WBB LMP base station receiver.

ANNEX 3: MEASURES FOR THE COEXISTENCE BETWEEN WBB LMP NETWORKS

There are different approaches that can be taken by the administrations when issuing licences for WBB LMP networks. Some approaches may reduce the need for administrative coordination when issuing licences, for example area defined authorisation, where the administration ensures coexistence by including in the licence a requirement to meet a maximum field strength level at the border of an exclusive licensed local area. Another approach is technically assigned authorisation, where the administration ensures coexistence based on the technical parameters given in the licence conditions (deployment specific parameters which may include output power, antenna configuration, antenna positioning, etc.), performing coordination with incumbents and determining spectrum available for applicants.

Recognising that different technologies may be used for WBB LMP networks, the different approaches may not be applicable to all technologies.

For all approaches set out in this Annex that includes options for synchronisation (or semi-synchronisation), an administration may consider the following licence principles (while keeping in mind protection of MFCN operating below 3800 MHz as described in Annex 2):

- **First come – first served**: The first WBB LMP operator in an area selects a preferred frame structure for their network. Any new WBB LMP operator applying for a licence in a nearby area, with a frame structure not synchronised with the incumbent networks, should either make use of possible mitigations to coexist with the incumbent networks or adapt the frame structure in order to synchronise (or semi-synchronise) with the incumbent WBB LMP networks;
- **Default Frame Structure**: The administration defines a default frame structure (e.g. the one used by national MFCN networks). If two or more WBB LMP networks need to be synchronised in order to coexist, they need to follow the default frame structure. Administrations may consider elements in their national measures where neighbouring licensees are given the flexibility to agree between them to deviate from the default frame structure.

A3.1 ASSIGNMENTS WITH MINIMUM COORDINATION BY THE ADMINISTRATIONS

This section provides some recommended approaches, which may be part of the licence conditions, to reduce the need for coordination between WBB LMP networks.

A3.1.1 Co-channel operation

A3.1.1.1 Co-channel synchronised operation

In case of co-channel operation, synchronised WBB LMP networks (as described in A1.1) may be used without additional coordination if the field strength of each base station cell does not exceed 61 dBµV/m/(5 MHz) at 3 m above ground at the edge of the exclusive licensed local area.

In border areas between countries, when WBB LMP networks on both sides of the borderline are co-channel and synchronised, coordination should be based on bilateral or multilateral agreements between administrations. Cross-border coordination between 3GPP based WBB LMP networks should be in accordance with the principles given in ECC Recommendation (15)01 [4] for synchronised MFCN TDD systems on both sides of the borderline in the frequency band 3400−3800 MHz including field strength levels and preferential PCIs.

A3.1.1.2 Co-channel semi-synchronised operation

Similar to synchronisation between WBB LMP networks, an approach based on semi-synchronisation (as described in A1.2) may be used. Semi-synchronisation allows a WBB LMP network to increase its UL ratio (implementing DL to UL modifications compared to the frame structure of the incumbent neighbouring networks), without the risk of causing harmful interference to uplink time slots of any incumbent neighbouring WBB LMP network. The operator that chooses to do so may however experience interference to some of its uplink time slots.

A3.1.1.3 Co-channel unsynchronised operation

Co-channel unsynchronised operation between WBB LMP networks in close proximity may require detailed coordination (see A3.2.2).

The spectrum management protocols in DECT-2020 NR do not fall within the definitions for synchronisation and semi-synchronisation in A1.1 and A1.2, and therefore, in the context of this Recommendation, is considered unsynchronised. For co-channel operation between DECT-2020 NR based WBB LMP networks, section A3.3 applies.

A3.1.2 Adjacent channel operation

A3.1.2.1 Adjacent channel synchronised operation

If adjacent channel WBB LMP networks are synchronised with each other (as described in A1.1) they can operate in the frequency band 3800−4200 MHz without additional coordination or risk of interference between them.

A3.1.2.2 Adjacent channel semi-synchronised operation

Similar to synchronisation between WBB LMP networks, an approach based on semi-synchronisation (as described in A1.2) may be used. Semi-synchronisation allows a WBB LMP operator to increase its UL ratio (implementing DL to UL modifications compared to the frame structure of the incumbent neighbouring networks), without the risk of causing harmful interference to uplink time slots any incumbent neighbouring WBB LMP network. The operator that chooses to do so may however experience interference to some of its uplink time slots.

A3.1.2.3 Adjacent channel unsynchronised operation

Unsynchronised WBB LMP networks operating in adjacent channels may be used without additional coordination if the field strength of each cell produced by the base station does not exceed the value of 26 dBµV/m/(5 MHz) at 3 m above ground at the exclusive licensed local area edge[7].

The spectrum management protocols in DECT-2020 NR do not fall within the definitions for synchronisation and semi-synchronisation in A1.1 and A1.2, and therefore, in the context of this Recommendation, is considered unsynchronised. For adjacent channel operation between DECT-2020 NR based WBB LMP networks, section A3.3 applies.

A3.2 ASSINGMENTS WITH DETAILED COORDINATION BY THE ADMINISTRATIONS

This section provides guidelines that may be used by administrations carrying out detailed coordination based on the deployment location and technical parameters given in the licence application.

Administrations should take into account deployment specific characteristics, which could include output power, antenna configuration (e.g. height, pattern, azimuth and elevation), deployment environment (e.g. indoor[8] or outdoor), etc., as well as terrain and clutter between deployments.

The guidelines given in this section assume that the following parameters for the planned WBB LMP base station are known in order to evaluate coexistence with existing WBB LMP networks:

- base station antenna coordinates (including indoor/outdoor);
- base station transmit power and channel bandwidth;
- base station antenna gain and pattern;
- base station antenna height;
- base station antenna tilt;
- base station antenna azimuth;
- WBB LMP network technology.

[7] It may be possible to apply a more relaxed limit in areas where only WBB LMP low power base stations are foreseen.
[8] When WBB LMP base station operates indoor building entry loss should be taken into account. In ECC Report 358 [2], a value of 12 dB was assumed.

Administrations could also use a coordination process to provide information to prospective licensees on the spectrum availability in a geographical area prior to submitting a licence application.

Using the technical details provided and a suitable path loss model, administrations can coordinate WBB LMP networks against adopted interference thresholds using the approaches set out below. The planning process should also consider reverse coordination, i.e. test whether the new WBB LMP frequency assignment is at risk of harmful interference from existing WBB LMP frequency assignments.

The guidelines given in this section describes an I/N based protection methodology. Administrations, at national level, can decide to use an alternative protection methodology if deemed appropriate.

A3.2.1 Co-channel synchronised operation - base station to terminal coordination

When neighbouring WBB LMP networks are synchronised, the remaining interference scenario for the co−channel or overlapping channels case is the downlink interference, where one network's base station transmissions may cause interference to another network's terminal receptions. In these cases, base station to terminal coordination may be used.

The maximum allowed interference I_{air} (dBm) within the victim coverage area[9] can be calculated with the equation (1):

$$I_{\text{air}}(\text{dBm}) = N(\text{dBm}) - G_{\text{r}}(\text{dBi}) + I/N(\text{dB}) \quad (1)$$

where:

- I_{air} is the maximum allowed interference within the victim coverage area (dBm);
- G_{r} is the terminal receiver antenna gain (dBi) (e.g. 0 dBi[10] or −4 dBi as defined in ECC Report 358 [2]);
- N is the noise level (dBm) of the victim terminal receiver over the reference bandwidth (e.g. per 5 MHz);
- I/N is the required interference-to-noise level (dB) (e.g. 0 dB[10] or −6 dB[11]).

To take into account different bandwidths of the interferer and the victim, a reference bandwidth should be chosen, e.g. 5 MHz.

Equation (2) can be used to determine the noise level N (dBm):

$$N(\text{dBm}) = 10\log_{10}(kTB)(\text{dBW}) + NF(\text{dB}) + 30\ \text{dB} \quad (2)$$

where:

- N is the noise level (dBm);
- k is Boltzmann's constant (1.38×10^{-23} J/K);
- T is the temperature (K);
- B is reference bandwidth (Hz);
- NF is the receiver noise figure (dB) of the terminal (e.g. 9 dB as defined in ECC Report 358 [2]).

Using the WBB LMP parameters provided in the application, together with the real terrain data, clutter and building entry loss if applicable, coordination is considered successful if the calculated signal strength level from the interfering base station does not exceed I_{air} anywhere within the victim WBB LMP networks coverage area. An example terminal height of 1.5 m above ground may be assumed, but other heights may also be used.

[9] Coverage is the area where the licensee is licensed to operate WBB LMP terminals.
[10] Ofcom UK, OfW 590 - Technical Frequency assignment Criteria for Shared Access Radio Services, https://www.ofcom.org.uk/spectrum/frequencies/shared-access.
[11] Report ITU-R M.2292, Characteristics of terrestrial IMT-Advanced systems for frequency sharing/interference analyses

A3.2.2 Co-channel unsynchronised operation - base station to base station coordination

Coordination between unsynchronised WBB LMP base stations, including between different technologies, is based on a maximum allowed interference level at the victim base station receiver. The minimum required pathloss *PL* (dB) between the interfering and victim base station antenna or transceiver array boundary (TAB) connectors can be calculated with the equation (3):

$$PL(\mathrm{dB}) = P_{\mathrm{t}}(\mathrm{dBm}) + G_{\mathrm{t}}(\mathrm{dBi}) + G_{\mathrm{r}}(\mathrm{dBi}) - I_{\max}(\mathrm{dBm}) \quad (3)$$

where:

- *PL* is the minimum required pathloss between the interfering and victim base station antenna or TAB connectors (dB);
- P_t is the output power (dBm) of the interfering base station over a chosen reference bandwidth;
- G_t is the antenna gain (dBi) of the interfering base station in the direction of the victim;
- G_r is the antenna gain (dBi) of the victim base station in the direction of the interferer. This gain needs to be considered, since the protection criterion is defined at the receiving connector of the victim base station;
- I_{max} is the maximum allowed interference power level (dBm) at the connector of the victim base station.

The maximum allowed interference I_{max} (dBm) at the connector of the victim base station can be calculated with the equation (4):

$$I_{\max}(\mathrm{dBm}) = N(\mathrm{dBm}) + I/N(\mathrm{dB}) \quad (4)$$

where:

- I_{max} is the maximum allowed interference power level (dBm) at the connector of the victim base station;
- *N* is the noise level (dBm) of the victim terminal receiver over the reference bandwidth (e.g. per 5 MHz);
- *I/N* is the required interference-to-noise level (dB) (e.g. −6 dB).

Equation (5) can be used to determine the noise level *N* (dBm):

$$N(\mathrm{dBm}) = 10\log_{10}(kTB)(\mathrm{dBW}) + NF(\mathrm{dB}) + 30\ \mathrm{dB} \quad (5)$$

where:

- *N* is the noise level (dBm);
- *k* is Boltzmann's constant (1.38×10^{-23} J/K);
- *T* is the temperature (K);
- *B* is reference bandwidth (Hz);
- *NF* is the receiver noise figure (dB) of the base station (e. g. 13 dB for 3GPP based low power base station, 10 dB for 3GPP based medium power base station and 9 dB for DECT-2020 NR based base station, as defined in ECC Report 358 [2]).

A3.2.3 Adjacent channel unsynchronised operation - base station to base station coordination

For adjacent channel coexistence, both unwanted emissions (e.g. adjacent channel leakage) and receiver selectivity impact from the interfering base station must be managed to protect the victim base station receiver.

To calculate minimum required path loss *PL* (dB) equation (6) can be used:

$$PL(\mathrm{dB}) = P_{\mathrm{t}}(\mathrm{dBm}) + G_{\mathrm{t}}(\mathrm{dBi}) + G_{\mathrm{r}}(\mathrm{dBi}) + 10\log_{10}\left(10^{\frac{-ACLR\ (\mathrm{dB})}{10}} + 10^{\frac{-Selectivity\ (\mathrm{dB})}{10}}\right) - I_{\max}(\mathrm{dBm}) \quad (6)$$

where:

- *PL* is the minimum required pathloss between the interfering and victim base station antenna or TAB connectors (dB);

- P_t (dBm), G_t (dBi), G_r (dBi) and I_{max} (dBm) are defined in section A3.2.2;
- *ACLR* is the Adjacent Channel Leakage Ratio (dB) of the interfering base station;
- *Selectivity* is the receiver filtering ratio (dB) of the victim base station.

Recommended values for ACLR and selectivity are derived from ETSI TS 138 104 [9] for 3GPP based WBB LMP base station and from ETSI TS 103 636-2 [10] for DECT-2020 NR based WBB LMP base station.

Table 3: ACLR values for WBB LMP base station

Base station type	ACLR
3GPP based low power base station (Note 1)	37 dB
3GPP based non-AAS medium power base station (Note 2)	40 dB
3GPP based AAS medium power base station (Note 3)	35.5 dB
DECT-2020 NR based base station	30 dB
Note: For 3GPP base station, values were calculated from the absolute basic limits. Note 1: 6 dBi total antenna gain assumed. Note 2: 16 dBi total antenna gain assumed. Note 3: 4x4 configuration, 18.5 dBi antenna gain and an absolute ACLR value corresponding to type 1-O AAS Local Area BS from 3GPP was assumed.	

For selectivity calculation 6 dB desensitisation is assumed as in ETSI TS 138 104.

Table 4: Selectivity values for 3GPP based WBB LMP base station

Channel bandwidth	Interferer channel separation	Selectivity
5 to 15 MHz (Note 1)	< 5 MHz	46 dB
	≥ 5 MHz	55 dB
20 MHz	< 5 MHz	39.5 dB
	≥ 5 MHz	48.5 dB
25 to 100 MHz	< 20 MHz	39.5 dB
	≥ 20 MHz	48.5 dB
Note 1: Derived from the 15 kHz SCS requirement defined in ETSI TS 138 104 [9].		

Table 5: Selectivity values for DECT-2020 NR based WBB LMP base station (low power)

Channel bandwidth	Adjacent channel	Selectivity
Any	1st adjacent	30 dB
	2nd adjacent	40 dB
	≥ 3rd adjacent	52 dB
A noise figure of 9 dB is assumed.		

These values were calculated as explained in ECC Report 191, annex 7 [11] and ECC Recommendation (24)01 [1].

In order to reduce blocking between adjacent unsynchronised 3GPP based WBB LMP networks, it is recommended to implement a frequency separation of 20 MHz (to avoid the ACS frequency range). Additional mitigation techniques may be needed to deal with WBB LMP networks out-of-band emissions and remaining blocking cases.

A3.3 COEXISTENCE BETWEEN DECT-2020 NR BASED WBB LMP NETWORKS (LOW POWER)

DECT-2020 NR technology is designed to operate in shared spectrum environments, building on the same core principles as previous generations of the DECT standard. DECT-2020 NR employs a number of spectrum management protocols that enable co-channel and adjacent channel WBB LMP networks to coexist in same geographical area. In addition, DECT-2020 NR devices employ transmission power control (TPC) in every node in the network to use the minimum transmit power required to meet the target block error rate.

For co-channel operation, DECT-2020 NR employs several spectrum management mechanisms as described in ETSI TS 103 636-2 [8]:

- Pre-transmit scanning. Pre-transmit scanning takes place before any frame transmission to prevent a device from initiating a transmission on top of another independent network's ongoing activity. It detects channel activity and local network timing to allow devices to align with existing transmissions and avoid collisions;
- Preamble-based detection. DECT-2020 NR nodes observe OFDM symbol timing, frame boundaries of active transmitters and repetition patterns of transmissions in the DECT slot structure. Thus, new nodes can use this timing information to maintain time-slot alignment and improve listen-before-talk efficiency;
- Listen-before-talk. DECT-2020 NR devices sense the channel immediately before transmission. If energy or preamble is detected it defers and initiates a scan after a random backoff period. This provides real-time arbitration between devices in independent networks;
- Autonomous Timing Alignment. When a device detects another networks preamble/timing it can align its slot timing, frame timing and transmission opportunities. Because of this predictable slot grid, multiple networks sharing a channel can align transmissions through passive listening and adaptive timing selection.

For adjacent channel operation, additional processes are also applied (examples):

- Optional Timing Alignment via Cross-Carrier Monitoring. Because DECT nodes can detect energy on adjacent carriers it allows them to:
  - Establish a general understanding of neighbouring network timing;
  - Avoid simultaneous cross-carrier bursts in time;
  - Reduce multi-carrier near-field interference;
  - Checks multiple carriers to avoid causing interference before selecting a transmit slot.
- Autonomous per-node modulation and timing. DECT-2020 NR supports flexible transmission parameters (modulation and coding selection, transmission power, bandwidth, timing), allowing nodes to adjust transmission opportunities to harmonise with active adjacent channel networks.

In a geographical area with multiple DECT-2020 NR based WBB LMP networks, an administration could choose to allocate the same extended frequency band (e.g. larger than the sum of bandwidths needed by the individual networks) to these networks. Using the spectrum management protocols inherent in DECT-2020 NR, these networks could, autonomously, organise themselves in the spectrum. However, performance characteristics of incumbent networks may be affected as the number of networks is increased.

A3.4 COMPLEMENTARY MITIGATION MEASURES

Administrations may also want to consider individual site engineering involving the complementary mitigation measures listed below when planning new WBB LMP networks or to resolve reported interference cases:

- Reduce the transmit power;
- Adjust the antenna pointing;
- Adjust the antenna down tilt;
- Lower the antenna height;
- Change the antenna pattern;
- Change the antenna positioning in relation to the victim antenna;
- Apply a frequency separation between two WBB LMP networks, in specific cases, equal to or higher than widest channel bandwidth of those networks[12].

[12] To manage the non-linearity of the Low Noise Amplifier in the WBB LMP base station receiver.

ANNEX 4: LIST OF REFERENCES

[1] ECC Decision (24)01: “Harmonised technical conditions for the shared use of the 3800−4200 MHz frequency band by low/medium power terrestrial wireless broadband systems (WBB LMP) providing local-area network connectivity”, approved November 2024

[2] ECC Report 358: “In-band and adjacent bands sharing studies to assess the feasibility of the shared use of the 3.8-4.2 GHz frequency band by terrestrial wireless broadband low/medium power (WBB LMP) systems providing local-area network connectivity”, latest corrected March 2025

[3] ECC Decision (11)06: “Harmonised frequency arrangements and least restrictive technical conditions (LRTC) for mobile/fixed communications networks (MFCN) operating in the band 3400−3800 MHz”, latest amended October 2018

[4] ECC Recommendation (15)01: “Cross-border coordination for Mobile/Fixed Communications Networks (MFCN) in the frequency bands: 694−790 MHz, 1427−1518 MHz and 3400−3800 MHz”, latest amended June 2022, latest amended on June 2022

[5] ECC Recommendation (25)03: “Guidelines for the protection of FS and FSS and their future deployment when introducing low and medium power terrestrial wireless broadband systems (WBB LMP) in the 3800−4200 MHz frequency band, also considering cross border situations”, approved October 2025

[6] ECC Recommendation (26)02: “Guidelines for the coexistence between low and medium power terrestrial wireless broadband systems (WBB LMP) in the 3800−4200 MHz band and radio altimeters in the 4200−4400 MHz band, and the protection of radio altimeters when deploying medium power AAS base stations in the 4100−4200 MHz band”, approved June 2026

[7] ETSI TS 138 211: “5G; NR; Physical channels and modulation”

[8] Recommendation ITU-R P.1546: “Method for point-to-area predictions for terrestrial services in the frequency range 30 MHz to 4 000 MHz”

[9] ETSI TS 138 104: “5G; NR; Base Station (BS) radio transmission and reception”

[10] ETSI TS 103 636-2: “DECT-2020 New Radio (NR); Part 2: Radio reception and transmission requirements”

[11] ECC Report 191: “Adjacent band compatibility between MFCN and PMSE audio applications in the 1785−1805 MHz frequency range”, approved September 2013

[12] ECC Recommendation (24)01: “Receiver resilience to transmission on adjacent frequency ranges”, approved May 2024, updated January 2026