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 17 October 2025

Edition 17 October 2025

INTRODUCTION

Compatibility between wireless broadband systems providing local-area (i.e. low/medium power) network connectivity (WBB LMP) and fixed service (FS) / fixed satellite service (FSS) operating in the frequency band 3800-4200 MHz can be achieved by appropriate coordination measures to be applied within coordination contours evaluated around the FS receivers and the FSS earth station receivers.

Coordination contours are defined as geographical areas within which coordination with FS and FSS is needed before activating a WBB LMP transmitter.

An administration may also consider adopting exclusion zones, in the same way as in ECC Report 254 [1]. Exclusion zones are defined as a geographical area, smaller than coordination contours, within which WBB LMP networks should not be deployed. They can be used if the band is shared with specific uses (e.g. military systems) and/or if the administration finds them beneficial to reduce the burden of coordination with FS links. Exclusion zones could similarly also be used around FSS stations.

In the coexistence studies between WBB LMP and FS in ECC Report 358 [2], both the separation distances and the exclusion zones around the FS receiver were evaluated. According to these studies, the separation distances in the direction of the FS main lobe could range up to more than 100 km. Case studies show the importance of considering real terrain data since this affects the required separation distances and exclusion zones to be applied to protect FS.

Similarly, coexistence studies between WBB LMP and FSS show separation distances that extend up to several tens of km and highlight the importance of considering site-specific terrain data.

The exact shape of the coordination contours and/or exclusion zones should be calculated on a case-by-case, and should consider the terrain profile around the specific FS/FSS system, and the type/characteristics of the specific FS/FSS system.

This Recommendation describes the methodology to be used by an administration when calculating these coordination contours and/or exclusion zones both for FS and FSS.

ECC RECOMMENDATION (25)03 OF 17 OCTOBER 2025 ON 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

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that the frequency band 3800-4200 MHz is allocated in the Radio Regulations on a primary basis to the fixed service and the fixed satellite service (space-to-Earth) and is used in some CEPT countries for both military and civil applications under those services;

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

c) that ECC Report 358 [2] provides coexistence studies between WBB LMP and FS/FSS;

d) that ECC Decision (24)01 [3] sets out the harmonised technical conditions for WBB LMP which have been developed assuming an authorisation regime where the location of WBB LMP networks or base stations is known, and that such authorisation would be for local area, and not nationwide deployment;

e) that, according to ECC Decision (24)01 CEPT administrations shall ensure the protection of the incumbent services within the frequency band 3800-4200 MHz (FSS receiving earth stations and FS links) where appropriate, taking into account their future evolution and development, assuming that their location is known;

f) that, the generic technical conditions defined in ECC Decision (24)01 do not ensure the protection of fixed service (FS) and fixed satellite service (FSS), and that there is a need to coordinate WBB LMP networks deployed in the frequency band 3800-4200 MHz on a case-by-case basis, with these systems;

g) that application of methodologies in line with those contained in this Recommendation by administrations would lead to a common coordination approach between WBB LMP and FS links and between WBB LMP and FSS earth stations;

recommends

1. that the methodology described in Annex 1 should be used to coordinate between WBB LMP networks and FS links operating in the frequency band 3800-4200 MHz;
2. that the methodology described in Annex 2 should be used to coordinate between WBB LMP networks and FSS earth stations operating in the frequency band 3800-4200 MHz;
3. that in case of higher *e.i.r.p.* levels for WBB LMP in-block power in exceptional and duly justified cases according to ECC Decision (24)01, annex 1 (Note 2 of Table 1), the system should be coordinated on a case-by-case basis;
4. that coordination in border areas should be based on bilateral or multilateral agreements/arrangements between administrations/operators[1] and that:
   a) same methodology as in *recommends 1* and *2* should be used;
   b) administrations may agree on other methods to trigger coordination, for example based on a coordination distance from the border, or a field strength threshold at the border.
5. that neighbouring administrations could agree to assign frequencies in different parts of the band for FS/FSS and WBB LMP, to take into account the future deployment of the respective systems;
6. that, as a part of a cross-border agreement, relevant technical characteristics of FS, FSS and WBB LMP systems required when applying the methodologies described in this Recommendation should be provided by concerned administrations in order to evaluate the need for coordination and ensure the protection of the incumbent services within the frequency band 3800-4200 MHz;
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.

[1] ECC Recommendation (15)01, annex 3 [11], may be used as a basis for an agreement on exchange of information.

ANNEX 1: METHODOLOGY FOR COORDINATION BETWEEN WBB LMP NETWORKS AND FS LINKS

A1.1 INTRODUCTION

The methodology described in this Annex should be applied to evaluate the **coordination contours** around FS receivers, defined as geographical areas within which coordination is needed before deploying WBB LMP transmitters, or deploying a new FS station. Outside the coordination contours, no coordination is required.

In addition to the coordination contours, administrations may also define **exclusion zones,** defined as geographical areas within which WBB LMP networks should not be deployed (according to ECC Report 254 [1]). Exclusion zones may be used by an administration to reduce the burden of coordination, and may also be needed for the protection of specific FS links, e.g. military usage.

As the user equipment is likely to operate either indoor or at low heights shielded by clutter, the methodology focusses on interference from the WBB LMP base station (BS). Interference from the UE equipment is not considered. The methodology only considers a single WBB LMP base station.

The methodology described in this Annex assumes that the locations and technical parameters of the FS links is known, in order to evaluate the coordination contours and/or the exclusion zones.

This Annex focuses on the coordination between WBB LMP base stations and FS links. The parameters and protection criteria defined for the coordination contours are also applicable for the exclusion zones.

A1.2 MINIMUM COUPLING LOSS (MCL) METHODOLOGY

The methodology to assess the coordination contour and/or the exclusion zone around the FS receiver is based on the Minimum Coupling Loss approach (MCL) taking into account I/N protection criteria:

$$PL(p) = P_t + G_t + G_r - N - I/N \qquad (1)$$

where:

- PL(p) is the minimum required path loss attenuation (dB) for a given percentage of time p;
- P_t is the transmitter power (dBm) of the interfering WBB LMP base station over a chosen reference bandwidth;
- G_t is the transmitter antenna gain (dBi) of the WBB LMP base station in the direction of the victim;
- G_r is the receiver antenna gain (dBi) of the FS station in the direction of the interferer;
- N is the noise level (dBm) of the victim FS receiver over the chosen reference bandwidth;
- I/N is the interference over noise ratio (dB).

The reference bandwidth should be the same for transmitted power (P_t) of the interferer transmitter and the noise level (N) of the victim receiver, assuming a full channel overlap.

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

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

where:

- *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).

A1.3 FS PARAMETERS AND PROTECTION CRITERION

For each FS receiver, the coordination contours should preferably be based on the real deployment parameters of the FS receiver.

The FS receiver parameters in Table 1 can be used by an administration in case real deployment parameters of FS link are not available. The parameters in Table 1 have been mainly derived from Recommendation ITU-R F.758-7 (excerpt from Table 17) [4].

The coordination contours should be based on a FS protection criterion of I/N equal −10 dB, not exceeded for more than 20% of time. This is the long-term protection criteria for FS receivers defined in Recommendation ITU-R F.758.

Table 1: FS receiver parameters

Frequency range (MHz)	3600-4200		3700-4200
Modulation	64-QAM	512-QAM	QPSK
Channel spacing and receiver noise bandwidth (MHz)	10, 30, 40, 60, 80, 90 (Recommendation ITU-R F.635 [5])		28, 29 (Recommendation ITU-R F.382 [6])
Minimum feeder/multiplexer loss (dB)	0	3	3
Maximum antenna gain (dBi)	42	40	37
Receiver Noise Figure (dB)	3	2	4
Receiver noise temperature (K)	290		
Antenna pattern	Recommendation ITU-R F.699 [7]		

In Figure 1 the antenna pattern is plotted for different values of the antenna diameters which correspond to different antenna gains.

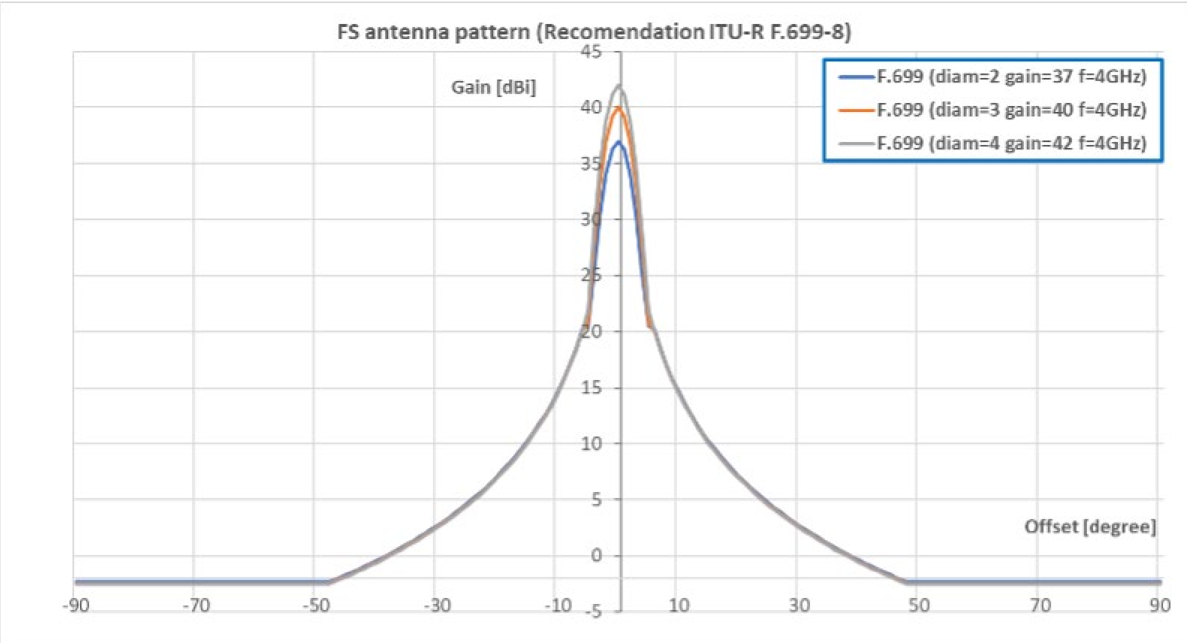

Figure 1: FS antenna pattern (Recommendation ITU-R F.699-8)

A1.4 WBB LMP PARAMETERS

In order to evaluate the coordination contour, the following WBB LMP base station parameters are recommended (as defined in the ECC Report 358 [2]).

Table 2: WBB LMP base station parameters

Parameter	Value
Antenna height	30 m for medium power BS 10 m for low power BS
Maximum in-block *e.i.r.p.* per cell	Medium power BS: 44 dBm/carrier for carriers ≤ 20 MHz or 38 dBm/5 MHz for carriers > 20 MHz Low power BS: 24 dBm/carrier for carriers ≤ 20 MHz or 18 dBm/5 MHz for carriers > 20 MHz

When evaluating the coordination contours the worst-case scenario is considered, where the WBB LMP BS always points towards the direction of the FS receiver (i.e. no antenna discrimination).

A1.5 PROPAGATION MODEL

An appropriate propagation model should be used for the evaluation of the coordination contours and/or the exclusion zones such as the one contained in the Recommendation ITU-R P.452 [8], including the terrain elevation, using the 20% of time associated with the long-term protection criteria of the victim receiver (see A1.3).

The terrain elevation model could be the 1-arcsec resolution terrain profile data of the Shuttle Radar Topography Mission (SRTM) or the Copernicus Digital Elevation Model (DEM). However more detailed terrain models, including clutter information and actual building heights, may be used. The terrain profiles can be sampled with an azimuth step of 1 degree around the station of interest, and a distance step of 25 m. The losses can then be computed around the station with an azimuth step of 1 degree and a distance step of 100 m.

A1.6 DETERMINATION OF THE COORDINATION CONTOUR

The actual antenna height of the FS station should be used. Other generic FS parameters are described in section A1.3, to be used where actual parameters are not available. WBB LMP base station parameters are given in section A1.4, possibly with higher antenna heights if expected in the surroundings of the given fixed station.

For each of the azimuth around the FS receiver and each of the distances from the FS receiver location the propagation loss is calculated using the propagation model described in section A1.5.

The separation distance required for the specific azimuth is then the maximum distance at which the propagation loss is just below the required minimum path loss (PL(p)), calculated using equation (1).

In cases where the coordination contour extends into a neighbouring country, it may be communicated either upon the request of the administration planning to deploy a WBB LMP network or in advance by the administration responsible for the FS link.

Figure 2 provides an example of the coordination contour obtained around an FS station in Italy for a low power WBB LMP base station with 10 m antenna height operating at 4000 MHz, and an *e.i.r.p.* of 18 dBm/5 MHz.

Figure 2: Example of the coordination contour around an FS receiver

A1.7 METHOLOGY TO ENSURE THE PROTECTION OF AN FS RECEIVER INSIDE THE COORDINATION CONTOUR

This section describes a methodology to ensure the protection of an FS receiver from planned WBB LMP base station within the coordination contour. Outside the coordination contours, no coordination is required as long as WBB LMP parameters are within the assumptions used in the calculation of the coordination contour.

The following parameters of the planned WBB LMP base stations are necessary to consider in order to evaluate coexistence with an FS receiver within the coordination contour:

- BS coordinates;
- BS transmit power and channel bandwidth;
- BS antenna gain and pattern;
- BS antenna height;
- BS antenna tilt;
- BS antenna azimuth.

The actual FS parameters such as antenna height and pointing angle should be used. Where other actual parameters are not available, generic FS parameters described in section A1.3 can be used. The coexistence assessment should use the same methodology as was used for calculating the coordination contour, while also taking into account the above parameters.

The use of a propagation model as described in section A1.5, including terrain data and clutter information (such as buildings and vegetation) is recommended. Alternatively, where clutter data is not available on national level the propagation model can be used in combination with statistical clutter loss, such as Recommendation ITU-R P.2108 [9]. When the WBB LMP base station operates indoors, building entry loss (BEL) should be taken into account. In ECC Report 358 [2], a BEL value of 12 dB was assumed.

Due to the expected deployment scenario for WBB LMP, the contribution from aggregated effect is expected to be low. A generic value for aggregated effect is therefore not proposed. In specific circumstances, the administrations may have to take into consideration also aggregated effect.

The channel bandwidths of the interferer and the victim may differ, and this would impact the amount of energy received by the victim. If the FS and WBB LMP channels are **partially overlapping,** or have no overlap **(adjacent channel case),** an interfering signal received will typically be much lower than one received in the full channel overlap case. Therefore, in addition to the parameters specified above, the following parameters are necessary in order to evaluate coexistence with an FS receiver within the coordination contour:

- BS central operating frequency and channel bandwidth;
- FS central operating frequency and channel bandwidth.

In case of full channel overlap where the bandwidth of the interferer and the victim are different, a bandwidth correction factor should be applied to take into account the amount of energy received by the victim.

The case where the victim and interferer channels partially overlap can be modelled in several different ways. A simplified method to estimate the signal energy from the interferer into the victim receiver could be used by applying a bandwidth overlap factor.

Attenuation for adjacent channels case can be modelled in a number of different ways. The simplest is to use a single number to calculate the interference as if they were co-frequency but then reduce the interference with an **adjustment factor**. This could be done via two factors: **ACS** – adjacent channel selectivity for the FS receiver and **ACLR** – adjacent channel leakage ratio for the WBB LMP BS. These two factors combined will give you the adjacent channel interference ratio (ACIR). The dominant factor for co-existence will typically be the WBB LMP base station unwanted emissions (rather than the FS receiver adjacent channel selectivity, ACS), and a simplified approach would be to only consider the WBB LMP base station ACLR.

ANNEX 2: METHODOLOGY FOR COORDINATION BETWEEN WBB LMP NETWORKS AND FSS EARTH STATIONS

A2.1 INTRODUCTION

The methodology described in this Annex applies to receiving FSS earth stations communicating with satellites in Geostationary Orbit (GSO), operating in the frequency band 3800-4200 MHz.

As the user equipment is likely to operate either indoor or at low heights shielded by clutter, the methodology focusses on interference from the WBB LMP base station. Interference from the UE equipment is not considered. The methodology only considers a single WBB LMP base station.

As a way to reduce the administrative burden, administrations can define a coordination contour around an earth station. A WBB LMP base station deployed inside this contour has to be coordinated, while outside this contour the licensing process can ignore the earth station. One methodology for establishing a coordination contour, including generic parameters, are shown in the following sections. If specific parameters are available for a specific earth station, the generic parameters can be exchanged for the real ones.

If a WBB LMP base station is planned to operate beyond the assumed parameters (e.g. antenna height) used to determine the contour, this case will have to be addressed specifically.

As an alternative to a more detailed coordination contour, an administration can use a simpler approach and define a generic coordination contour as circle, based on typical distances from previous studies. This approach is simpler, but the generic coordination contours will be larger which suggests more WBB LMP networks may need to be coordinated.

A2.2 MINIMUM COUPLING LOSS (MCL) METHODOLOGY

The methodology to assess the coordination contour around the GSO FSS earth station is based on the Minimum Coupling Loss approach (MCL) taking into account I/N protection criteria:

$$PL(p) = P_t + G_t + G_r - N - I/N \qquad (3)$$

where:

- PL(p) is minimum required path loss attenuation (dB), for a given percentage of time p;
- P_t is the transmitter power (dBm) of the interfering WBB LMP base station over a reference bandwidth of 1 MHz;
- G_t is the transmitter antenna gain (dBi) of the WBB LMP base station in the direction of the victim;
- G_r is the receiver antenna gain (dBi) of the FSS earth station in the direction of the interferer;
- N is the noise level (dBm) of the victim FSS earth station receiver over the reference bandwidth of 1 MHz;
- I/N is the interference over noise ratio (dB).

The reference bandwidth should be the same for transmitted power (Pt) of the interferer transmitter and the noise level (N) of the victim receiver, assuming a full channel overlap.

Equation (4) can be used to determine the noise level N:

$$N(\text{dBm}) = 10log_{10}(kTB)(\text{dBW}) + NF(\text{dB}) + 30\text{ dB} \qquad (4)$$

where:

- *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).

A2.3 FSS PARAMETERS AND PROTECTION CRITERIA

For each FSS earth station, the coordination contours should preferably be based on the real deployment parameters of the FSS earth station.

In cases where real deployment parameters are not available, the FSS parameters considered in ECC Report 358 [2] can be used, as shown below.

Table 3: Generic FSS earth station parameters

Parameter	Typical value
Antenna size (m)	2.4-12 m
Antenna reference pattern	Recommendation ITU-R S.465-6 [10]
Receiving system noise temperature (reference bandwidth: 1 MHz) (Note 1)	120 K for small antennas (1.2-3 m) 70 K for large antennas (4.5 m and more)
Minimum antenna elevation pointing	10 degrees
Antenna gain towards the horizon, given the minimum antenna elevation pointing above	12 dBi (Note 2)
Antenna centre height above ground	10 m
Note 1: Used in Equation 4 (T). It already takes into account the contribution of the receiving system noise. The Noise Figure (NF) is consequently set to 0 dB. Note 2: 12 dBi is the maximum possible antenna gain towards the horizon based on the other parameters given in the table, determined based on a 2.4 m antenna size, Recommendation ITU-R S.465-6 (Note 4, for earth stations deployed prior to 1993), and the 10 degrees minimum antenna elevation. 7 dBi is the appropriate value for earth stations deployed after 1993.	

For the purposes of this Recommendation, a middle ground of 100 K for the receiving system noise temperature is selected. Also, a full frequency overlap is assumed between interferer and victim.

Figure 3 and Figure 4 show the antenna gain for antenna diameter 2.4 m and 12 m, as used in the ECC Report 358 [2]. The GSO satellite is fixed at a given longitude on the GSO arc, at round 36000 km altitude. The minimum elevation is assumed to be 10 degrees or more. In special cases (e.g. the far north of Europe), where normal operations require that the earth station elevation is less than 10 degrees, a higher antenna gain may have to be assumed for that particular earth station.

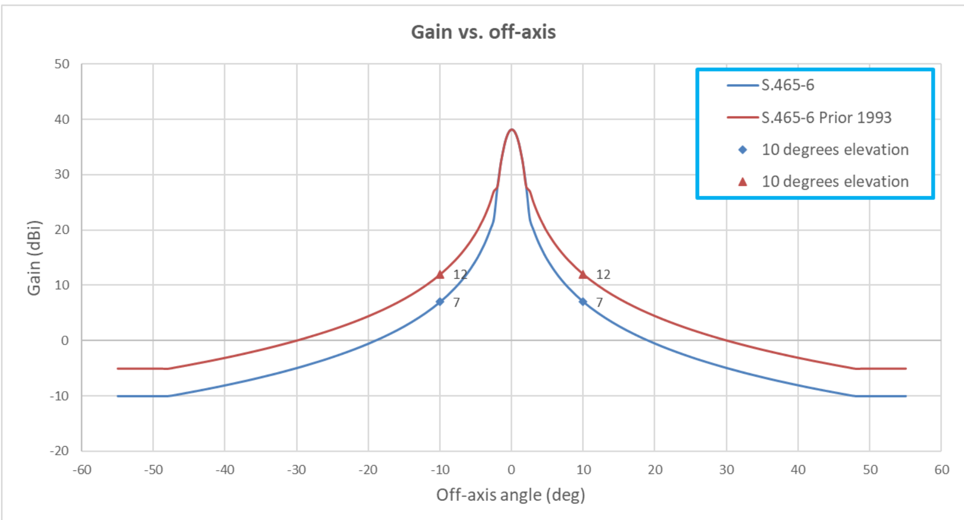

Figure 3: Antenna diagram in accordance with Recommendation ITU-R S.465-6 (2.4 m diameter, 38.1 dBi gain)

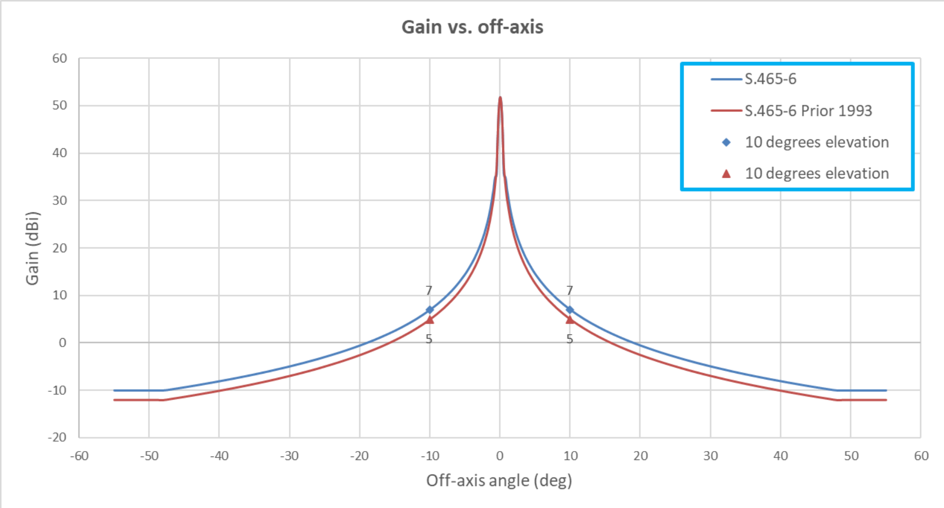

Figure 4: Antenna diagram in accordance with Recommendation ITU-R S.465-6 (12 m diameter, 51.8 dBi gain)

Table 4: Protection criteria for FSS earth stations (in-band)

Frequency range	Protection criteria	Percentage of time for which the I/N value could be exceeded (%)	I/N criteria (dB)
3800-4200 MHz	Long term Short term	20% 0.005% (Note)	−10.5 −1.3 (Note)
Note: Studies using short-term protection criteria could be assessed on the basis that these values were put forward by WP 4A to facilitate and complete the work for WRC-23 agenda items and these values may evolve in the future based on inputs to the ITU-R. In 2023 WP 4A had not completed its work in developing short-term protection criteria, however WP 5D was invited to consider these short-term protection criteria to the extent practicable.			

A2.4 WBB LMP PARAMETERS

In order to evaluate the coordination contour, the following WBB LMP base station parameters are recommended (as defined in the ECC Report 358 [2]).

Table 5: WBB LMP base station parameters

Parameter	Value
Antenna height	30 m for medium power BS 10 m for low power BS
Maximum in-block *e.i.r.p.* per cell	Medium power BS: 44 dBm/carrier for carriers ≤ 20 MHz or 38 dBm/5 MHz for carriers > 20 MHz Low power BS: 24 dBm/carrier for carriers ≤ 20 MHz or 18 dBm/5 MHz for carriers > 20 MHz

When evaluating the coordination contours the worst-case scenario is considered, where the WBB LMP BS always points towards the direction of the FSS earth station (i.e. no antenna discrimination).

A2.5 PROPAGATION MODEL

An appropriate propagation model should be used for the evaluation of the coordination contours such as the one contained in the Recommendation ITU-R P.452 [8], including the terrain elevation, using the 20% of time associated with the long-term protection criteria of the victim receiver (see section A2.3).

The terrain elevation model could be the 1-arcsec resolution terrain profile data of the Shuttle Radar Topography Mission (SRTM) or the Copernicus Digital Elevation Model (DEM). However more detailed terrain models, including clutter information and actual building heights, may be used. The terrain profiles can be sampled with an azimuth step of 1 degree around the earth station of interest, and a distance step of 25 m. The losses can then be computed around the station with an azimuth step of 1 degree and a distance step of 100 m.

A2.6 DETERMINATION OF THE COORDINATION CONTOUR

The actual antenna height of the FSS earth station may be used. Other generic FSS parameters are described in section A2.3, to be used where actual parameters are not available. WBB LMP base station parameters are given in section A2.4, possibly with higher antenna heights if expected in the surroundings of the given FSS earth station.

For each of the azimuth around the FSS earth station and each of the distances from the FSS earth station location the propagation loss is calculated using the propagation model described in section A2.5.

The separation distance required for the specific azimuth is then the maximum distance at which the propagation loss is just below the required minimum path loss (PL(p)), calculated using Equation (3).

In cases where the coordination contour extends into a neighbouring country, it may be communicated either upon the request of the administration planning to deploy a WBB LMP network or in advance by the administration responsible for the FSS earth station.

Assuming a receiving system noise temperature (T) of 100 K (which takes into account the contribution of the receiving system noise) and a reference bandwidth (B) of 1 MHz, the noise level (expressed in dBm) in Equation (3) equals:

$$N = 10\,log_{10}(1.38 \times 10^{-23} \times 100 \times 1 \times 10^{6}) + 30 = 10\,log_{10}(1.38 \times 10^{-15}) + 30 = \mathbf{-118.6}\ \text{dBm}$$

As an example, for medium power WBB LMP BS with an *e.i.r.p.* ($P_t + G_t$) of 38 dBm/5 MHz = 31 dBm/MHz, a long-term protection criterion of I/N = −10.5 dB (associated with 20% of time probability using Recommendation ITU-R P.452 [8]), 12 dBi effective antenna receiver gain (G_r), and the noise level (N) as calculated above, the following minimum path loss is required:

$$PL(20\%) = 31\ \text{dBm} + 12\ \text{dBi} - (-10.5\ \text{dB}) - (-118.6\ \text{dBm}) = \mathbf{172.1\ dB}$$

For the short-term protection criterion of I/N = −1.3 dB (associated with 0.005% of time probability using Recommendation ITU-R P.452), the following minimum path loss is required:

$$PL(0.005\%) = 31\ \text{dBm} + 12\ \text{dBi} - (-1.3\ \text{dB}) - (-118.6\ \text{dBm}) = \mathbf{162.9\ dB}$$

Similarly, the minimum required path loss can be calculated for other radiated output powers of WBB LMP.

In some tools, a coverage calculation using a power flux density (pfd) as a threshold may be more convenient.

Equation (5) can be used to determine the pfd.

$$pfd = 10\,log_{10}(kTB) + NF + \frac{I}{N} - G_r - 10\,log_{10}\left(\frac{\lambda^2}{4\pi}\right) \quad (5)$$

where:

- 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);
- I/N is the interference over noise ratio (dB);
- G_r is effective antenna gain (dBi);
- λ is the wavelength (m).

Wavelength for 4 GHz frequency:

$$\lambda = \frac{c\ \text{(m/s)}}{f\ \text{(Hz)}} = \frac{3\times10^{8}}{4\times10^{9}} = \frac{0.3}{4}\ \text{m}$$

As an example, with the same assumptions as above (with the NF accounted for in T), for the long-term criterion (not exceeded for more than 20% of time) the resulting pfd is:

$$pfd(20\%) = 10\,log_{10}(1.38\times10^{-23}\times100\times1\times10^{6}) + (-10.5) - 12 - 10\,log_{10}\left(\frac{\left(\frac{0.3}{4}\right)^{2}}{4\pi}\right)$$

$$pfd(20\%) = \mathbf{-137.6\ dBW/m^{2}/MHz}$$

Similarly, for the short-term criterion (not exceeded for more than 0.005% of time) the resulting pfd is:

$$pfd(0.005\%) = 10\,log_{10}(1.38\times10^{-23}\times100\times1\times10^{6}) + (-1.3) - 12\ - 10\,log_{10}\left(\frac{\left(\frac{0.3}{4}\right)^{2}}{4\pi}\right)$$

$$pfd(0.005\%) = \mathbf{-128.4\ dBW/m^{2}/MHz}$$

Note that these pfds includes the victim antenna receiver gain (G_r).

Figure 5 provides an example of the coordination contour obtained around an earth station at Rambouillet (France) for a medium power base station with 10 m antenna height, operating at 4000 MHz and an *e.i.r.p.* of 38 dBm/5 MHz.

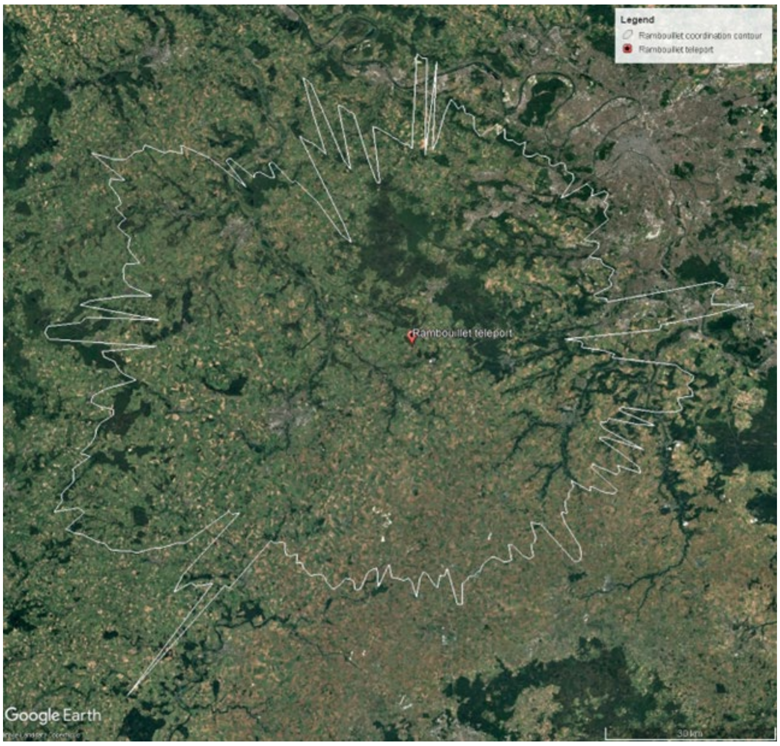

Figure 5: Example of the coordination contour around Rambouillet

A2.6.1 Generic coordination contour for FSS earth stations

An administration may also consider, as a simplification, to define a generic coordination contour without entering the previous calculation. Based on results of analyses performed in ECC Report 358 [2], a coordination distance around an FSS earth station location of 40 km was assessed to be a good compromise. This corresponds to results for medium power BS limited to 35 dBm/40 MHz conducted power (which corresponds to *e.i.r.p.* of 49 dBm/100 MHz with a 10 dBi antenna gain), propagation model Recommendation ITU-R P.452 [8], no clutter, FSS earth station antenna diameter of 4.5 m, azimuth antenna discrimination of 0 degrees, and FSS earth station elevation angle of 10 degrees.

While this value would include areas where deployment of WBB LMP may not be problematic if accurate terrain data was used with equations above, such an approach could reduce the burden for administrations, in particular when there is a limited number of FSS earth stations or when the expected locations of the WBB LMP networks are not in the immediate vicinity of the existing FSS earth stations. A coordination distance of 40 km may not exclude all possible cases of interference. Alternatively, a larger distance could be used, which may result in a larger number of WBB LMP networks that need to be individually coordinated.

In cases where the coordination contour extends into a neighbouring country, it may be communicated either upon the request of the administration planning to deploy a WBB LMP network or in advance by the administration responsible for the FSS earth station.

A2.7 METHODOLOGY TO ENSURE THE PROTECTION OF AN FSS EARTH STATION INSIDE THE COORDINATION CONTOUR

This section describes a methodology to ensure the protection of an FSS earth station from planned WBB LMP base stations within the coordination contour. Outside the coordination contours, no coordination is required as long as WBB LMP parameters are within the assumptions used in the calculation of coordination contour.

The following parameters of the planned WBB LMP base stations are necessary to consider in order to evaluate coexistence with FSS earth station within the coordination contour:

- BS coordinates;
- BS transmit power over the reference bandwidth;
- BS antenna gain and pattern;
- BS antenna height;
- BS antenna tilt;
- BS antenna azimuth.

The use of a propagation model as described in section A2.5, including terrain data and clutter information (such as buildings or vegetation) is recommended. Alternatively, where clutter data is not available on national level the propagation model can be used in combination with statistical clutter loss, such as Recommendation ITU-R P.2108 [9]. When the WBB LMP base station operates indoors, building entry loss (BEL) should be taken into account. In ECC Report 358 [2], a BEL value of 12 dB was assumed.

Due to the expected deployment scenario for WBB LMP, the contribution from aggregated effect is expected to be low. A generic value for aggregated effect is therefore not proposed. However, in specific circumstances the administrations may have to take into consideration also aggregated effect.

When the calculated propagation loss exceeds the minimum required path loss PL(p), as calculated in A2.6, the planned WBB LMP base stations will fulfil the established protection criteria for the FSS earth station.

Although FSS earth stations are typically aligned with a specific satellite on the GSO arc, it is recommended that they are provided with an operational flexibility to repoint to different satellites within the arc depending on service needs or contractual arrangements.

To ensure continued protection of the earth station across all potential operating conditions and spectrum usage (e.g. full 3800-4200 MHz), it is recommended to apply a representative earth station antenna gain in all azimuth directions where the earth station has line-of-sight visibility to the GSO arc using the minimum elevation angle of 10 degrees.

This approach ensures the earth station is protected across the entire GSO arc visibility region, regardless of the current or future satellite pointing. Additional off-axis discrimination can be considered from the FSS earth station towards the WBB LMP when the WBB LMP is deployed in azimuth ranges where the FSS earth station does not see the GSO arc. Figure 6 illustrates the concept of GSO arc visibility from the earth station, showing the azimuth range where the earth station can see satellites on the GSO arc considering a minimum elevation of 10 degrees.

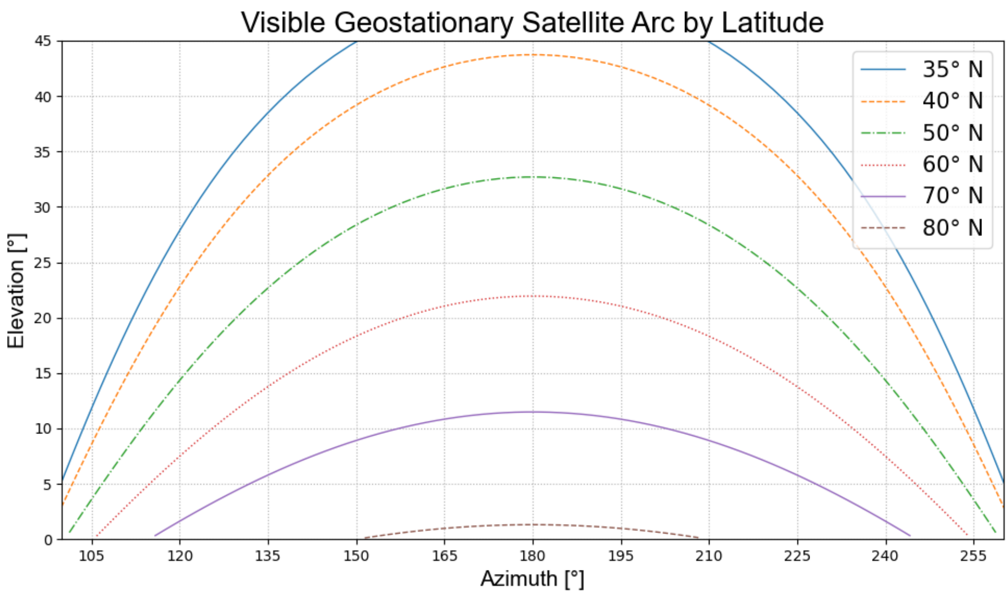

Figure 6: Earth station GSO arc visibility example at different latitudes looking south

ANNEX 3: LIST OF REFERENCES

[1] ECC Report 254: "Operational guidelines for spectrum sharing to support the implementation of the current ECC framework in the 3600-3800 MHz range", approved November 2016

[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", approved June 2024

[3] 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

[4] Recommendation ITU-R F.758: "System parameters and considerations in the development of criteria for sharing or compatibility between digital fixed wireless systems in the fixed service and systems in other services and other sources of interference"

[5] Recommendation ITU-R F.635: "Radio-frequency channel arrangements based on a homogeneous pattern for fixed wireless systems operating in the 4 GHz (3 400-4 200 MHz) band"

[6] Recommendation ITU-R F.382: "Radio-frequency channel arrangements for fixed wireless systems operating in the 2 and 4 GHz bands

[7] Recommendation ITU-R F.699: "Reference radiation patterns for fixed wireless system antennas for use in coordination studies and interference assessment in the frequency range from 100 MHz to 86 GHz"

[8] Recommendation ITU-R P.452: "Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 0.1 GHz"

[9] Recommendation ITU-R P.2108: "Prediction of Clutter Loss"

[10] Recommendation ITU-R S.465: "Reference radiation pattern for earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range from 2 to 31 GHz"

[11] 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", approved February 2015 and latest amended June 2022