CEPT ECC
Electronic Communications Committee

ERC Recommendation 01-01

Cross-border coordination for mobile/fixed communications networks (MFCN) in the frequency bands: 1920-1980 MHz and 2110-2170 MHz

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INTRODUCTION

This Recommendation contains provisions for cross-border coordination between Mobile/Fixed Communications Networks (MFCN) in border areas in the frequency bands 1920-1980 MHz and 2110-2170 MHz.

In this Recommendation, MFCN includes LTE and New Radio (NR) non-AAS and AAS base stations.

Only FDD mode of operation is considered.

ERC RECOMMENDATION 01-01 OF FEBRUARY 2001 ON CROSS-BORDER COORDINATION FOR MOBILE/FIXED COMMUNICATIONS NETWORKS (MFCN) IN THE FREQUENCY BANDS: 1920-1980 MHZ AND 2110-2170 MHZ, REVISED IN 2003, 2007 AND 2016, UPDATED 18 NOVEMBER 2022, AMENDED 26 JUNE 2026

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that the Radio Regulations (RR 5.388) [1] identify the bands 1885-2025 and 2110-2200 MHz for IMT;

b) that these frequency bands are allocated to the Mobile Service and the Fixed Service on a co-primary basis and also to the space research service in 2110-2120 MHz;

c) that ECC Decision (06)01 [2] provides the harmonised conditions for mobile/fixed communications networks (MFCN) operating in the bands 1920-1980 MHz and 2110-2170 MHz;

d) that in the implementation of MFCN it is necessary to take account of national policies for the use of the frequency bands in question;

e) that "mobile/fixed communications networks" (MFCN) for the purpose of this Recommendation includes IMT and other communications networks in the mobile and fixed services;

f) that in many CEPT member countries there may be multiple operators for MFCN systems;

g) that frequency planning of MCFN in border areas will be based on coordination between national administrations in cooperation with their operators;

h) that different administrations may wish to adopt different approaches to cross-border coordination;

i) that administrations may diverge from the technical parameters, propagation models and procedures described in this Recommendation subject to bilateral or multilateral agreements;

j) that coordination is necessary between countries operating different technologies and different channel bandwidths in the same frequency band;

k) that in the case of operator arrangements approved by national administrations it is possible to deviate from this Recommendation;

l) that Physical-layer Cell Identity (PCI) coordination is necessary for LTE/NR systems to avoid unnecessary signalling load and handover failures;

m) that other radio parameters may need to be coordinated for LTE/NR systems on a bi/multi-lateral basis.

recommends

1 that co-ordination between MFCN systems in border areas shall be based on bilateral or multilateral agreements between administrations;

2 that bilateral or multilateral agreements should define coordination methods which encompass all MFCN systems present on each side of the border;

3 that coordination between MFCN systems should be based on the principles and the field strength levels provided in Annex 1 and the PCIs provided in Annex 3:;

4 that if the levels in Annex 1 are exceeded coordination is required and the procedure detailed in Annex 4: should be used;

5 that interference field strength predictions should be made using one of the propagation models defined in Annex 2;

6 that coordination between neighbouring MFCN systems using LTE/NR technology in border areas should use the PCIs provided in Annex 3 when synchronisation signal centre frequencies are aligned;

7 that administrations should encourage and facilitate the establishment of arrangements between operators of different countries with the aim to enhance the efficient use of the spectrum and the coverage in the border areas,

8 that coordination in coastal areas is based on prediction of field strength levels at the coastline of the neighbouring country. Other principles for co-ordination in coastal areas may be agreed between the administrations concerned,

9 that administrations may diverge from the technical parameters and procedures described in this Recommendation subject to bilateral / multilateral agreements.

10 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 MFCN systems."

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.

ANNEX 1: PRINCIPLES AND FIELD STRENGTH LEVELS FOR THE CROSS-BORDER OPERATION WITHOUT COORDINATION BETWEEN FDD MFCN SYSTEMS IN THE FREQUENCY BAND 1920-1980 MHZ AND 2110-2170 MHZ

In this annex, field strength values are given for cross-border scenarios between MFCN FDD systems for non-AAS and AAS base stations on both sides of the borderline.

Preferential and non-preferential PCIs for LTE and NR are given in Annex 3.

Administrations/operators may agree on other values of field strength and preferential frequency usage based on bilateral/multilateral agreements/arrangements.

Synchronisation signal means Synchronisation Signal Block (SSB) for NR and Primary/Secondary Synchronisation Signal (PSS/SSS) for LTE.

For non-AAS base stations the field strength values are given for 5 MHz frequency block size. In cases of other frequency block sizes other than 5 MHz, a factor of 10 × $\log_{10}$ (channel bandwidth[1]/(5 MHz)) should be added to the field strength values. The data and control channels are fixed and therefore the same field strength values in dBµV/m/(5 MHz) apply to both channel types. The mean value is with respect to e.g. changing traffic load and downlink transmission time. The field strength values are upper bounds of each cell produced by the base station.

For AAS base stations the upper bound field strength for each cell of a base station is given as the median for a random beamforming data channel with 5 MHz frequency block size and for a static SSB field with SCS 30 kHz. In the case of a SCS other than 30 kHz, a correction factor of 10 × $\log_{10}$ (SCS in kHz/(30 kHz)) dB, should be added to the SSB field strength value.

A1.1 CROSS-BORDER OPERATION WITH NON-PREFERENTIAL FREQUENCY BLOCKS

1. Non-AAS and AAS base stations of MFCN FDD systems on both sides of the borderline in the frequency band 2110-2170 MHz with synchronisation signal centre frequencies not aligned for all PCIs or with synchronisation signal centre frequencies aligned and for preferential PCIs may be used without coordination with a neighbouring country if the field strength of each cell produced by base station does not exceed the values of:

   65 dB(µV/m)/5 MHz at a height of 3 m above ground at the borderline between countries and

   49 dB(µV/m)/5 MHz at a height of 3 m above ground at a distance of 6 km inside the neighbouring country.

2. Non-AAS and AAS base stations of MFCN FDD systems on both sides of the borderline in the frequency band 2110-2170 MHz with synchronisation signal centre frequencies aligned and for non-preferential PCIs may be used without coordination with a neighbouring country if the field strength of each cell produced by base station does not exceed the value of:

   49 dB(µV/m)/5 MHz at a height of 3 m above ground at the borderline between neighbouring countries.

The following table gives an overview of the trigger values of the field strength and the relevant sections of this Annex.

[1] not occupied bandwidth

Table 1: Field strength values at a height of 3 m above ground for MFCN FDD systems in case of non-preferential frequency usage

Non-Preferential frequency usage		
Synchronisation signal centre frequencies aligned		**Synchronisation signal centre frequencies not aligned**
Preferential PCIs	**Non-preferential PCIs**	**All PCIs**
65 dBµV/m/5 MHz@0 km and 49 dBµV/m/5 MHz@6 km	49 dBµV/m/5 MHz@0 km	65 dBµV/m/5 MHz@0 km and 49 dBµV/m/5 MHz@6 km
@ stands for “at a distance inside the neighbouring country” For NR base station the mean values in this table correspond to the following SSB values: 65 dB(µV/m)/5 MHz corresponds to 43 dB(µV/m)/30 kHz 49 dB(µV/m)/5 MHz corresponds to 27 dB(µV/m)/30 kHz		

ANNEX 2: PROPAGATION MODEL

The following methods are proposed for assessment of anticipated interference inside neighbouring country based on established trigger values. Due to the nature and the complexity of radio wave propagation different methods are proposed to be considered by administrations and are included here for guidance purposes only.

It should be noted that following methods provide theoretical predictions based on available terrain knowledge. It is practically impossible to recreate these methods with measurement procedures in the field. Therefore only some approximation of measurements could be used to check compliance with those methods based on practical measurement procedures. The details of such approximation are not included in this recommendation and should be negotiated between countries based on their radio monitoring practices.

A2.1 PATH SPECIFIC MODEL

Where appropriate detailed terrain data is available, the propagation model for interference field strength prediction is the latest version of Recommendation ITU-R P.452 [3]. For the relevant transmitting terminal, predictions of path loss would be made at x km steps along radials of y km at z degree intervals. The values for those receiver locations within the neighbouring country would be used to construct a histogram of path loss - and if 10% of predicted values exceed the threshold the station shall be required to be coordinated.

Values or x, y and z to be agreed between the administrations concerned.

A2.2 SITE GENERAL MODEL

If it is not desirable to utilise detailed terrain height data for the propagation modelling in the border area, the basic model to be used to trigger co-ordination between administrations and to decide, if co-ordination is necessary, is Recommendation ITU-R P.1546 [4]. This model is to be employed for 50% of the locations and 10% of time, and using a receiver height of 3 m.

For specific reception areas where terrain roughness adjustments for improved accuracy of field strength prediction are needed, administrations may use correction factors according to terrain irregularity and/or an averaged value of the TCA parameter in order to describe the roughness of the area on and around the coordination line.

Administrations and/or operators concerned may agree to deviate from the aforementioned model by mutual consent[2].

A2.3 AREA CALCULATIONS

In the case where greater accuracy is required, administrations and operators may use the area calculation below.

For calculations, all the pixels of a given geographical area to be agreed between the administrations concerned in a neighbouring country are taken into consideration.

For the relevant base station, predictions of path loss should be made for all the pixels of a given geographical area from a base station and at a receiver antenna height of 3 m above ground.

For evaluation,

- only 10 percent of geographical area between the borderline (including also the borderline) and the 6 km line itself inside the neighbouring country may be interfered by higher field strength than the trigger field strength value given for the borderline in Annex 1 at a height of 3 m above ground;

[2] e.g. as used by members of the HCM-Agreement [4]

- only 10 percent of the geographical area between the 6 km (including also 6 km line) and 12 km line inside the neighbouring country may be interfered by higher field strength than the trigger field strength value given for the 6 km line in Annex 1 at a height of 3 m above ground.

It is recommended that during area calculations not only detailed terrain data but also clutter data be taken into account. Use of correction factors for clutter is crucial in particular where the border area is ‘open’ or ‘quasi-open’ from the point of view of clutter or where the interfering base station is just a few kilometres from a borderline.

If the distance between a base station and a terrain point of a borderline is closer than or equal to 1 km, free space propagation model needs to be applied. Furthermore, if there is no terrain obstacle within the 1st Fresnel zone,” also the free space propagation model should be applied.

If clutter data is not available, it is proposed to extend the usage of free space propagation model to a few kilometres, depending on the clutter situation in border areas.

For area type interference calculations, propagation models with path specific terrain correction factors are recommended (e.g. Recommendation ITU-R P.1546 [4] with the terrain clearance angle correction factor TCA, HCM method with the terrain clearance angle correction factor or Recommendation ITU-R P.1812 [6]).

As to correction factors for clutters ‘open area’ and ‘quasi-open area’, 20 dB and 15 dB should be used respectively. Recommendation ITU-R P.1406 [7] should be used if a finer selection of clutter is required. It must be noted that terrain irregularity factor Δh is not recommended to be used in area calculations. Administrations and/or operators concerned may agree to deviate from the aforementioned models by mutual consent.

ANNEX 3: PHYSICAL-LAYER CELL IDENTITIES (PCI) FOR LTE AND NR

ETSI TS 136 211 [8] defines 168 “unique physical-layer cell-identity groups” in §6.11, numbered 0..167, hereafter called “PCI groups” for LTE. Within each PCI group there are three separate PCIs giving 504 PCIs in total.

For NR in ETSI TS 138 211 [9] (§7.4.2) the number of physical-layer cell-identity groups (different cell IDs) have been increased to 336, numbered 0..335, hereafter called “PCI groups” for NR. Within each PCI group there are three separate PCIs giving 1008 PCIs in total.

Administrations should apply sharing of PCIs in border areas, an equitable distribution of these PCIs when synchronisation signal centre frequencies are aligned as provided in Table 2.

Sharing of PCIs between operators of neighbouring countries should only be applied where synchronisation signal centre frequencies used in the neighbouring countries are aligned independent of the channel bandwidth or where it is not known whether or not the synchronisation signal centre frequencies used in the neighbouring countries are aligned, or where there is no network in operation in the neighbouring country unless otherwise stated in Annex 1 or administration/operator agreements/arrangements.

As shown in the table below, the PCIs for LTE and NR are divided into 6 sub-sets containing each one sixth of the available PCIs. Each country is allocated three sets (half of the PCIs) in a bilateral case and two sets (one third of the PCIs) in a trilateral case, therefore dividing the PCI groups or PCIs is equivalent.

The preferential PCIs of a two country PCI sharing should be applied for a base station if the level of field strength relating to non-preferential PCIs could be exceeded at the borderline of only one neighbouring country. The preferential PCIs of a three country PCI sharing should be applied for a base station if the level of field strength related to non-preferential PCIs could be exceeded at the borderline of only two neighbouring countries.

Four types of countries are defined in a way such that no country will use the same code set as any one of its neighbours. The following lists describe the distribution of European countries:

Type country 1: BEL, CVA, CYP, CZE, DNK, E, FIN, GRC, IRL, ISL, LTU, MCO, SMR, SUI, SVN, UKR, AZE and SRB;

Type country 2: AND, BIH, BUL, D, EST, G, HNG, I, MDA and GEO;

Type country 3: ALB, AUT, F, HOL, HRV, POL, POR, ROU, S and MLT;

Type country 4: LIE, LUX, LVA, MKD, MNE, NOR, SVK and TUR.

For each type of country, the Table 2 and Figure 1 describe the sharing of the PCIs with its neighbouring countries, with the following conventions of writing:

	Preferential PCI
	non-preferential PCI

The 504/1008 physical-layer cell-identities should be divided into the following 6 sub-sets when the synchronisation signal centre frequencies are aligned in border areas:

Table 2:PCI sub-sets for LTE and NR for use in border areas when the synchronisation signal centre frequencies are aligned

PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 1 LTE	0..83	84..167	168..251	252..335	336..419	420..503
Country 1 NR	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007
Border 1-2						
Zone 1-2-3						
Border 1-3						
Zone 1-2-4						
Border 1-4						
Zone 1-3-4						

PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 2 LTE	0..83	84..167	168..251	252..335	336..419	420..503
Country 2 NR	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007
Border 2-1						
Zone 2-3-1						
Border 2-3						
Zone 2-1-4						
Border 2-4						
Zone 2-3-4						

PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 3 LTE	0..83	84..167	168..251	252..335	336..419	420..503
Country 3 NR	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007
Border 3-2						
Zone 3-1-2						
Border 3-1						
Zone 3-1-4						
Border 3-4						
Zone 3-2-4						

PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 4 LTE	0..83	84..167	168..251	252..335	336..419	420..503
Country 4 NR	0..83 504-587	84..167 588..671	168..251 672..755	252..335 756..839	336..419 840..923	420..503 924..1007
Border 4-1						
Zone 4-1-2						
Border 4-2						
Zone 4-2-3						
Border 4-3						
Zone 4-3-1						

Note:

In certain specific cases (e.g. AUT/HRV) where the distance between two countries of the same type number is very small (< few 10s km), it may be necessary to address the situation in bilateral / multilateral coordination agreements as necessary, and may include further subdivision of the allocated PCIs in certain areas.



Figure 1: Country type map

ANNEX 4: COORDINATION PROCEDURE

When requesting coordination the relevant characteristics of the base station should be submitted to the administration affected. All of the following characteristics should be Included:

a) centre frequency (MHz);
b) synchronisation signal centre frequency (MHz), if differs from centre frequency;
c) channel bandwidth (MHz);
d) subcarrier spacing (kHz) (only for NR);
e) name of transmitter station;
f) country of location of transmitter station;
g) geographical coordinates (latitude, longitude);
h) effective antenna height (m);
i) antenna polarisation;
j) antenna azimuth (deg);
k) antenna gain (dBi);
l) effective radiated power (dBW);
m) expected coverage zone or cell range (km);
n) date of entry into service (month, year);
o) PCI numbers used (only for LTE and NR);
p) antenna tilt (electrical and mechanical) (deg);
q) antenna pattern or envelop;
r) AAS antenna configuration (number of arrays and number of column).

The administration affected shall evaluate the request for coordination and shall within 30 days notify the result of the evaluation to the administration requesting coordination.

If in the course of the coordination procedure the administration affected requires additional information, it may request such information.

If no reply is received by the administration requesting coordination within 30 days it may send a reminder to the administration affected. An administration not having responded within 30 days following communication of the reminder shall be deemed to have given its consent and the station may be put into use with the characteristics given in the request for coordination.

The periods mentioned above may be extended by common consent.

ANNEX 5: LIST OF REFERENCES

[1] ITU Radio Regulations, Edition of 2024

[2] ECC Decision (06)01: “Harmonised utilisation of the bands 1920-1980 MHz and 2110-2170 MHz for mobile/fixed communications networks (MFCN) including terrestrial IMT”, approved March 2006 and latest amended March 2019

[3] Recommendation ITU-R P.452: “Prediction procedure for the evaluation of interference between stations on the surface of the Earth at frequencies above about 100 MHz”

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

[5] HCM Agreement: https://hcm.bundesnetzagentur.de/

[6] Recommendation ITU-R P.1812: “A path-specific propagation prediction method for point-to-area terrestrial services in the VHF and UHF bands”

[7] Recommendation ITU-R P.1406: “Propagation effects relating to terrestrial land mobile and broadcasting services in the VHF and UHF bands”

[8] ETSI TS 136 211: “LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation”

[9] ETSI TS 138 211 V16.2.0 (2020-07): “5G; NR; Physical channels and modulation”