TECHNICAL AGREEMENT

BETWEEN THE NATIONAL FREQUENCY MANAGEMENT AUTHORITIES OF

BOSNIA AND HERZEGOVINA, REPUBLIC OF NORTH MACEDONIA, MONTENEGRO AND REPUBLIC OF SERBIA

ON BORDER COORDINATION OF MOBILE/FIXED COMMUNICATIONS NETWORKS (MFCN)

IN THE FREQUENCY BANDS

880 - 915 MHz AND 925 - 960 MHz

Budva, September 2019

1. Introduction

In the framework of Article 6 of ITU Radio Regulations, the **Communications Regulatory Agency (CRA)** (The Administration of **Bosnia and Herzegovina**), the **Agency for Electronic Communications (AEC)** (The Administration of the **Republic of North Macedonia**), the **Agency for Electronic Communications and Postal Services (EKIP)** (The Administration of **Montenegro**) and the **Regulatory Agency for Electronic Communications and Postal Services (RATEL)** (The Administration of the **Republic of Serbia**) (hereinafter referred to as: **Signatory Authorities)** concluded this Technical Agreement on border coordination of Mobile/Fixed Communications Networks (MFCN) in the frequency bands 880-915 MHz and 925-960 MHz.

The frequency bands 880-915 MHz and 925-960 MHz are designated for GSM and MFCN systems (terrestrial UMTS, LTE, WiMAX and IoT cellular systems) according to relevant ECC decisions. This Technical Agreement is applicable to terrestrial UMTS (UTRA FDD) and LTE systems described in ECC Decision ECC/DEC/(06)13 (version being in force at the time of signing this Technical Agreement is attached for reference).

Coordination of GSM systems in border areas operating in the frequency bands 880-915 MHz and 925-960 MHz is not under the scope of this Technical Agreement.

2. Principles of coordination

Concerning usage of the frequency bands 880-915 MHz and 925-960 MHz in boarder areas for MFCN systems the relevant provisions of ECC Recommendation ERC/REC/(08)02 (version being in force at the time of signing this Technical Agreement is attached for reference) and this Technical Agreement shall be applied.

In order to assure equitable access to the spectrum and operations without harmful interference and to enhance the efficiency of spectrum usage in border areas the principles of field strength trigger values and preferential code groups shall be applicable.

Neither coordination nor notification of the MFCN base stations in boarder areas is required if the field strength trigger values given in Section 3.1 of this Technical Agreement are fulfilled. If the field strength trigger values are exceeded coordination is required and the procedure detailed in Annex 4 of ECC Recommendation ERC/REC/(08)02 should be applied.

Preferential use of frequencies as laid down in Annex 1 of ECC Recommendation ERC/REC/(08)02 shall not be the subject of this Technical Agreement but may be subject of Operator arrangements (see Section 7 of this Technical Agreement).

The relevant provisions of the bi- or multilateral agreements, arrangements or protocols dealing with frequency coordination in general (e.g. the "HCM Agreement"), previously approved by all Signatory Authorities, shall be applied unless otherwise laid down in this Technical Agreement.

3. Technical provisions

3.1. Field strength trigger values

Frequencies in the band 925-960 MHz for UMTS systems or LTE systems deployed on both sides of the borderline using non-preferential codes and with centre frequencies aligned may be used without coordination with a neighbouring country if the mean field strength of each carrier produced by the base station does not exceed a value of 35 dBµV/m/5MHz at a height of 3 m above ground level at and beyond the borderline between two countries.

Frequencies in the band 925-960 MHz for UMTS systems or LTE systems deployed on both sides of the borderline using preferential codes or when center frequencies are not aligned, including the cases when in one country is deployed UMTS system and in another country is deployed LTE system and when in one country is deployed UMTS system or LTE system and in another country is deployed GSM system, may be used without coordination with a neighbouring country if the mean field strength of each carrier produced by the base station does not exceed a value of 59 dBµV/m/5MHz at a height of 3 m above ground level at the borderline between two countries and a value of 35 dBµV/m/5MHz at a height of 3 m above ground level at a distance of 9 km inside the neighbouring country.

Correction factors

The field strength trigger values shall be modified according to the value of the bandwidth and the aggregated power correction factors given below. The modified field strength trigger values shall be applied to each individual base station.

a)   Bandwidth correction factor

The "mean field strength of each carrier" refers up to a frequency block of 5 MHz. If the bandwidth of the signal is larger than 5 MHz, above given field strength trigger values shall be increased by the value of the bandwidth correction factor (in dB) calculated according to the equation $10*\log(bandwidth/5MHz)$, where "*bandwidth*" is nominal bandwidth of the signal in MHz.

b)   Aggregated power correction factor

If there is more than one transmission in a respective reference frequency block, above given field strength trigger values shall be decreased by the value of the aggregated power correction factor (in dB) calculated according to the equation $10*\log(n)$ in each antenna sector, where "*n*" is the number of the transmitters or transmissions in the respective antenna sector.

If a transmission with nominal bandwidth of the signal falls into the respective reference frequency block (even partly), it shall be included in the value of "*n*".

3.2. Preferential codes

Code coordination is only needed when channel centre frequencies are aligned independent of the channel bandwidth.

The distribution of preferential codes among countries for use in border areas is based on Annex 3 and Annex 5 of the ECC Recommendation ERC/REC/(08)02.

A two countries code sharing should be applied or used by base stations that exceed the relevant field strength trigger values of only one neighbouring country. A three countries code sharing should be applied or used by base stations that exceed the relevant field strength trigger values of two neighbouring countries.

Each country should only use their own preferential codes in areas close to the border and can use all codes in areas away from the border.

The distribution of preferential scrambling codes for UMTS (UTRA FDD) is given in Annex 1 of this Technical Agreement.

The distribution of preferential physical-layer cell identities (PCI) for LTE is given in Annex 2 of this Technical Agreement.

4.   Calculation of the field strength

For field strength predictions to assess compliance with the trigger values set in Section 3.1 of this Technical Agreement or in case of reported harmful interference the calculations should be made based on the radio wave propagation methods described in Annex 2 of ECC Recommendation ERC/REC/(08)02.

5.   Exchange of information

In general, the exchange of data is not required for base stations. However, in the case of harmful interference, the data necessary to evaluate and treat the harmful interference shall be exchanged between the Signatory Authorities concerned (see Section 6 of this Technical Agreement).

The information about bringing the frequency bands into use by the operators is available and can be seen in EFIS (www.efis.dk).

In the case of withdrawal from the agreement (see Section 9 of this Technical Agreement), the list of the stations in operation shall be notified within two months taken from date of giving notice of the withdrawal.

6.   Procedure in case of harmful interference

In the case of harmful interference the data necessary to evaluate and treat the harmful interference given in Annex 4 of ECC Recommendation ERC/REC/(08)02 shall be exchanged between the Signatory Authorities concerned.

Concerning the interference calculations, a two-step procedure is described below:

As the first step, in case of harmful interference, field strength line calculations shall be carried out between the base stations causing harmful interference and the receiver points of the border line or 9 km line with regard to trigger values set in Section 3.1 of this Technical Agreement and the characteristics of the base stations shall be adjusted in such a way that trigger values are kept.

As the second step, if harmful interference is still experienced despite the above adjustment, measurements shall be carried out according to international/mutually agreed procedures.

7. Operator Arrangements

To further improve the coexistence of MFCN systems and to enhance the efficient use of frequency spectrum and coverage in border areas, operators may diverge from the regulation given in this Technical Agreement (including field strength trigger values, distribution of preferential codes, use of preferential frequencies, procedure in case of harmful interference...), based on an arrangements concluded between operators, so-called additional "Operator Arrangements".

In addition, for LTE it may be beneficial for the operators to coordinate other radio parameters besides PCIs in order to minimise deteriorating effects of uplink interference. Such coordination shall be based on Annex 6 of ECC Recommendation ERC/REC/(08)02.

Operators may negotiate arrangements which concern only the common part of those frequency bands in respect of which they have been granted licences, without affecting the rights of non-involved third parties, and are subject to prior approval of their respective administration.

8. Revision of the Technical Agreement

With the consent of the Signatory Authorities concerned, this Technical Agreement may be modified at the request of one of the Signatory Authorities when such a modification becomes necessary in the light of administrative, regulatory or technical developments.

9. Withdrawal from the Technical Agreement

Any Signatory Authority may withdraw from this Technical Agreement by the end of a calendar month by giving notice of its intention at least six months in advance. A declaration to that effect shall be addressed to the other Signatory Authorities.

Frequency assignments made within the framework of this Technical Agreement prior to the date of entry into force of the withdrawal shall remain valid and be protected according to their status.

10. Language of the Technical Agreement

The original text of this Technical Agreement exists in English in four originals, one for each Signatory Authority.

11. Date of entry into force of the Technical Agreement

This Technical Agreement shall enter into force on 01. 10. 2019.

12. Date of implementation of the Technical Agreement

The provisions of this Technical Agreement shall be implemented by licensed operators in countries of all Signatory Authorities not later than six mounts after the date of its signature.

Signed at Budva, 30. 09. 2019.

For the Administration
of Bosnia and Herzegovina
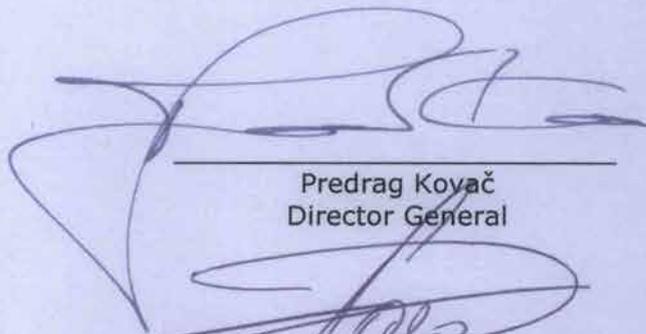
Predrag Kovač
Director General

For the Administration
of the Republic of North Macedonia

Sasho Dimitrijoski
Director

For the Administration
of Montenegro
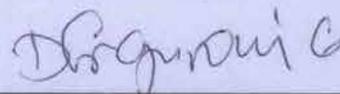
Darko Grgurović
Executive Director

For the Administration
of the Republic of Serbia
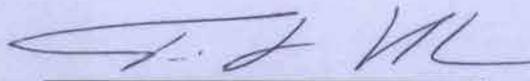
Vladica Tintor, PhD
Director

Preferential scrambling codes for UMTS (UTRA FDD)

For the UTRA FDD mode; 3GPP TS 25.213 defines 64 «scrambling code groups» in §5.2.3, numbered {0..63}, hereafter called «code groups».

The code groups defined for the FDD mode have no particular correlation properties and no particular organisation of the repartition is required.

Repartition of these code groups should be based on an equitable basis.

In border areas, the codes will be divided into 6 "code sets" containing each one sixth of the available code groups. Each country is allocated three code sets (half of the codes) in a bilateral case, and two code sets (one third of the codes) in a trilateral case.

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 and figure given in Appendix of this Technical Agreement 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, **SRB**.

Type country 2: AND, **BIH**, BLR, BUL, D, EST, G, HNG, I, MDA, RUS(Exclave), GEO.

Type country 3: ALB, AUT, F, HOL, HRV, POL, POR, ROU, RUS, S, MLT.

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

For each type of country, Table 1 shows the sharing of the codes with its neighbouring countries, with the following conventions of writing.

■ preferential code
□ non-preferential code

Table 1: *Code sets for use in border areas when the carrier frequencies are aligned*

Country 1	Set A 0..10	Set B 11..20	Set C 21..31	Set D 32..42	Set E 43..52	Set F 53..63
Border 1-2	■	■				■
Zone 1-2-3	■	■				
Border 1-3	■	■	■			
Zone 1-2-4	■					■
Border 1-4			■	■		
Zone 1-3-4			■	■		

Country 2	Set A 0..10	Set B 11..20	Set C 21..31	Set D 32..42	Set E 43..52	Set F 53..63
Border 2-1			■	■		■
Zone 2-3-1			■	■		
Border 2-3		■	■			
Zone 2-1-4				■		
Border 2-4				■	■	
Zone 2-3-4				■	■	

Country 3	Set A 0..10	Set B 11..20	Set C 21..31	Set D 32..42	Set E 43..52	Set F 53..63
Border 3-2	■				■	■
Zone 3-1-2					■	■
Border 3-1				■	■	
Zone 3-1-4				■	■	
Border 3-4			■	■		
Zone 3-2-4						

Country 4	Set A 0..10	Set B 11..20	Set C 21..31	Set D 32..42	Set E 43..52	Set F 53..63
Border 4-1		■				■
Zone 4-1-2		■				■
Border 4-2		■	■			
Zone 4-2-3		■	■			
Border 4-3					■	■
Zone 4-3-1						

Preferential PCIs for LTE

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

Repartition of these 504 PCIs should be based on an equitable basis when channel centre frequencies are aligned as shown in the table below. It has to be noted that dividing the PCI groups or PCIs is equivalent.

As shown in the table below, the PCIs should be 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.

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 and figure given in Appendix of this Technical Agreement 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, **SRB**.

Type country 2: AND, **BIH**, BLR, BUL, D, EST, G, HNG, I, MDA, RUS(Exclave), GEO.

Type country 3: ALB, AUT, F, HOL, HRV, POL, POR, ROU, RUS, S, MLT.

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

For each type of country, Table 2 shows the sharing of the PCIs with its neighbouring countries, with the following conventions of writing.

	preferential PCI
	non-preferential PSI

Table 2: *PCI sub-sets for use in border areas when the carrier frequencies are aligned*

PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 1	0..83	84..167	168..251	252..335	336..419	420..503
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	0..83	84..167	168..251	252..335	336..419	420..503
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	0..83	84..167	168..251	252..335	336..419	420..503
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	0..83	84..167	168..251	252..335	336..419	420..503
Border 4-1						
Zone 4-1-2						
Border 4-2						
Zone 4-2-3						
Border 4-3						
Zone 4-3-1						

Appendix: Country type map

Legend:
- Country 1: (blue)
- Country 2: (green)
- Country 3: (yellow)
- Country 4: (red)

- Vatican CVA= Country 1
- Monaco MCO= Country 1
- San Marino SMR= Country 1
- Andorra AND= Country 2
- Liechtenstein LIE= Country 4