TECHNICAL ARRANGEMENT

BETWEEN THE NATIONAL FREQUENCY MANAGEMENT AUTHORITIES OF

HUNGARY and ROMANIA

ON BORDER COORDINATION

FOR TERRESTRIAL SYSTEMS CAPABLE OF PROVIDING ELECTRONIC COMMUNICATIONS SERVICES

IN THE FREQUENCY BAND 2500-2690 MHz

agreed by correspondence in 2013

1 INTRODUCTION

The aim of this Technical Arrangement is to lay down the principles, the technical provisions and administrative procedure necessary to regulate the common deployment of terrestrial systems capable of providing electronic communications services that may use different technologies in the band 2500 – 2690 MHz in border areas.

In the framework of article 6 of ITU Radio Regulations, of bi- or multilateral agreements, arrangements or protocols dealing with frequency coordination in general (e.g. the "HCM Agreement"), the National Media and Infocommunications Authority (Hungary) and the National Authority for Management and Regulation in Communications (Romania) (hereinafter called Signatory Authorities) concluded this Technical Arrangement concerning the usage of the frequencies for terrestrial systems capable of providing electronic communications services in the band 2500 – 2690 MHz in border areas.

The Signatory Authorities have agreed on the following coordination procedures and rules detailed in the sections below in border areas.

2 PRINCIPLES OF FREQUENCY PLANNING AND FREQUENCY USAGE IN BORDER AREAS

2.1 Relevant regulations

From regulatory point of view, the following deliverables play an important role in the regulation of border coordination in the band 2500 – 2690 MHz:

- COMMISSION DECISION (2008/477/EC) of 13 June 2008 on

  the harmonisation of the 2500 – 2690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community *(notified under document number C(2008) 2625)*;

- ECC Decision (ECC/DEC/(05)05) of 18 March 2005 on

  harmonised utilisation of spectrum for IMT-2000/UMTS systems operating within the band 2500 – 2690 MHz;

- ECC RECOMMENDATION (ECC/REC/(11)05) adopted on 20 May 2011 on

  frequency planning and frequency coordination for terrestrial systems for mobile/fixed communication networks (MFCN) capable of providing electronic communications services in the frequency band 2500 - 2690 MHz.

2.2 Regulated bands

Within this Technical Arrangement, the whole band 2500 – 2690 MHz has

been regulated concerning the FDD and TDD utilisation except the FDD usage in the sub-band 2570 – 2620 MHz (see section 3).

If FDD operation is required in the band 2570 – 2620 MHz, a separate bi- or multilateral Technical Arrangement between administrations concerned or an Operator Arrangement (see also section 3.2) between operators concerned should be concluded.

2.3 FDD vs. TDD issue

TDD systems are allowed to operate in a paired band where FDD systems can be used. The consequence of this FDD vs. TDD or mixed scenario is that harmful interference can occur in some cases. The cases that particularly should be dealt with, because of the high probability of interference, are where a TDD system operates in the downlink or uplink band of a paired band used by an FDD system in a neighbouring country.

If the TDD usage in the downlink or uplink band of a paired band is not regulated properly, it places FDD systems at a disadvantage, making the deployment and coverage of FDD systems impossible in border areas. In addition, harmful interference and service degradation are expected in FDD systems. Therefore, it is necessary to redress the balance by regulating this mixed scenario so that harmful interference between FDD and TDD systems can be avoided, spectrum efficiency can be improved in border areas, and a certain balance of access to the frequency spectrum between the FDD and TDD systems can be achieved.

Taking into account the above-mentioned aspects of interference and the good balance between FDD and TDD access to the frequency spectrum, it is necessary to limit the interference signal coming from a TDD network operating in the downlink or uplink band of a paired band.

2.4 Access to the frequency spectrum in general

One of the most important aims of this Technical Arrangement is to give simple procedure and rules so that networks in border areas may be deployed easily ensuring proper access to the frequency spectrum. From this point of view, the coordination principle applied in this Technical Arrangement is that each country concerned has the same access to the frequency spectrum, i.e. they may use all the frequencies in the whole band 2500 – 2690 MHz.

Nevertheless, this kind of frequency usage in the border area is rather delicate and only viable if the field strength triggers given in this Technical Arrangement are kept and calculated using accurate radio wave propagation methods, and in addition, radio parameters of the systems are coordinated between neighbouring operators.

To apply the principle outlined above, the same interference field strength level is allowed for a home network and its opposite network in the neighbouring country,

ensuring a more or less equitable access to the frequency spectrum for the operators in the neighbouring countries.

It should be noted again that achieving equitable access to the frequency spectrum rather depends upon the radio wave propagation method applied to calculate the interference field strength since that method serves as a tool for enforcing the rules of this Technical Arrangement.

As a consequence of the above, traditional frequency coordination would disturb this delicate balance in the border area. Therefore, traditional frequency coordination will not be performed according to this Technical Arrangement. If higher field strength values are required, a so-called "Operator Arrangement" may be concluded (see section 6).

2.5 Coordination procedure

In general, neither coordination nor notification of stations is required except in cases of harmful interference.

Operators may diverge from the regulation given in this Technical Arrangement subject to the so-called Operator Arrangement (see section 6.).

3 GENERAL TECHNICAL PROVISIONS

In this section the general technical provisions are given while section 4 details the additional technical provisions for the values of interference field strength that shall be kept in border areas.

3.1 Channelling arrangement

The frequency band 2500 MHz – 2690 MHz is divided into three sub-bands. All the sub-bands below may be used as an unpaired band or as a part of a paired band (see also sections 3.2 and 3.3):

"a"	2500 – 2570 MHz	uplink band of the paired band of ***"a"*** and ***"c"***
"b"	2570 – 2620 MHz	unpaired band
"c"	2620 – 2690 MHz	downlink band of the paired band of ***"a"*** and ***"c"***

The assigned blocks shall be in multiple of 5.0 MHz with the first lower block edge starting at the frequency of 2500 MHz.

3.2 FDD systems

The bands ***"a"*** and ***"c"*** as a paired band may be used for FDD systems. The

duplex spacing for FDD operation shall be 120 MHz with terminal station transmission in the uplink band and base station transmission in the downlink band.

The band ***"b"*** may not be used for FDD operation with regulations laid down in this Technical Arrangement (see section 2.2).

3.3 TDD systems

All the bands ***"a"***, ***"b"*** and ***"c"*** may be used for TDD systems.

3.4 Radio parameters

Parameters of mobile and base stations such as power shall comply with the requirements given in COMMISION DECISION (2008/477/EC) of 13 June 2008.

In the case of IMT/LTE it is required to share the preferential physical-layer cell identities (PCI) according to ECC Recommendation ECC/REC/(11)05. The allocation of codes is given in Annex 1 to this Technical Arrangement.

In addition, it is also desirable for the operators to coordinate radio parameters of their systems to minimise the deteriorating effects of uplink interference in line with the above-mentioned Recommendation.

4 TECHNICAL PROVISIONS RELATED TO FIELD STRENGTH TRIGGERS

4.1 Basic rules

Field strength values or triggers given in section 4.2 to 4.4 refer to a reference frequency block of 5 MHz. The field strength triggers shall be modified according to the value of the bandwidth and the aggregated power correction factors given below. The modified field strength triggers shall be applied to each individual station.

a) Bandwidth correction factor

If the nominal channel spacing of a system is not equal to 5 MHz, the value of the bandwidth correction factor according to the following equation shall be added to the field strength triggers given in section 4.2 to 4.4:

$$10 * \log (Cs/5\ MHz) \quad (dB)$$

where

"Cs" nominal channel spacing (MHz).

b) Aggregated power correction factor

If there is more than one transmission in a respective reference frequency block, the field strength triggers shall be decreased by the value of the aggregated power correction factor according to the following equation in each antenna sector.

$$10 * \log n \qquad \text{(dB)}$$

where

"n" the number of the transmitters or transmissions in the respective antenna sector

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

4.2 Frequency utilisation in the case where FDD systems are used in the paired band *"a"* and *"c"*

This is the case where it is not necessary to examine whether TDD/FDD system or what technology is used in the neighbouring country.

Base stations of FDD systems used in the paired band "a" and "c" may be operated if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 65 dBμV/m/5MHz at a height of 3 m above ground at the border line, and does not exceed the value of 37 dBμV/m/5MHz at a line of 6 km beyond the border at a height of 3 m above ground.

In the case where LTE is deployed on both sides of the borderline, the field strength level at 6 km may be increased to 49 dBμV/m/5MHz. This field strength trigger may only be applied, if Simplified Operator Arrangement has been concluded for this regulation by the operators concerned (see section 6.2).

4.3 Frequency utilisation in the case where TDD systems are used in the unpaired band *"b"* on both sides of the borderline

4.3.1 Non-synchronised TDD networks in the unpaired band *"b"*

This is the case where it is not necessary to examine what technology is used in the neighbouring country.

Base stations of non-synchronised TDD systems used in the unpaired band "b" may be operated if the produced mean field strength at a height of 3 m above ground does not exceed the value of 21 dBμV/m/5 MHz at the border line.

These triggers shall be applied unless a Simplified Operator Arrangement has been concluded for synchronised TDD systems according to section 4.3.2.

4.3.2 Synchronised TDD networks in the unpaired band *"b"*

Base stations of synchronised TDD systems used in the unpaired band "b" may be operated if the produced mean field strength at a height of 3 m above ground does not exceed the value of 65 dBμV/m/5MHz at the border line, and does not exceed the value of 37 dBμV/m/5MHz at a line of 6 km beyond the border at a height of 3 m above ground.

In the case where LTE is deployed on both sides of the borderline, the field strength level at 6 km may be increased to 49 dBμV/m/5MHz.

These field strength triggers may only be applied, if a Simplified Operator Arrangement has been concluded for this regulation by the operators concerned (see section 6.2).

4.4 Frequency utilisation in the case where TDD systems operate in the paired bands *"a"* or *"c"*

Base stations and mobile stations of TDD systems using either the uplink band "a" or the downlink band "c" of the paired band may only be operated if the produced mean field strength at a height of 10 m above ground at the border line does not exceed the value of 21 dBμV/m/5MHz.

Higher field strength levels may only be applied if Operator Arrangements have been concluded.

5 HARMFUL INTERFERENCE

Concerning interference calculations a two-step procedure is described below.

As the first step, in the case of harmful interference, the characteristics of stations including the necessary geographical separation shall be adjusted based upon interference line calculations.

Field strength line calculations shall be carried out between the base/mobile stations and the receiver points of the border line/6 km line regarding trigger values in section 4.2 to 4.4, and depending on radio wave propagation paths the HCM model shall be used. Time probability in all calculations is 10 %.

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

6 OPERATOR ARRANGEMENTS

6.1 Operator Arrangements in general

To further improve the compatibility of terrestrial systems capable of providing electronic communications services, and to enhance the efficient use of frequency spectrum and coverage in border areas, operators may conclude so-called additional Operator Arrangements, using e.g.:

- preferential code division arrangements (e.g. according to ERC/REC(01)01);
- frequency carrier definitions (e.g. with LTE);
- synchronisation of networks concerned.

Such Operator Arrangements are subject to prior consent of the Signatory Authorities concerned.

6.2 Simplified Operator Arrangements

In some cases detailed below, operators may conclude special Operator Arrangements called "Simplified Operator Arrangements" to enhance the efficient use of the frequency spectrum and the coverage, and also to speed up the coordination procedure. This means that certain deviations from this Technical Arrangement are permitted with subsequent notification and consent of the Signatory Authorities concerned.

In general, Simplified Operator Arrangements may only be concluded for

a) a common frequency band or sub-band that has been allocated to all the operators concerned.

b) certain border areas determined by the operators concerned.

It is required to get the consent of all the operators concerned in the given border areas.

The issues for which Simplified Operator Arrangements may only be concluded are the following:

c) Increased field strength level at the borderline for FDD LTE systems according to the second paragraph of section 4.2.

d) Rules and trigger values for synchronised TDD networks in the unpaired band ***"b"*** according to section 4.3.2.

The Simplified Operator Arrangement shall contain the common frequency bands and the border areas affected where the higher trigger values will be applied and shall be forwarded to the administrations concerned within one month.

7 ADMINISTRATIVE PROCEDURE

Neither coordination nor notification of stations is required, in general. However, in the case of harmful interference, the data necessary to evaluate and treat the harmful interference shall be exchanged between Signatory Authorities concerned.

The information about bringing the frequency bands into use by the operators can be seen in EFIS (www.efis.dk, according to ECC/DEC/(01)03).Operators concerned may agree to deviate from the principles, the technical provisions and administrative procedure etc. given in this Technical Arrangement by mutual consent in an "Operator Arrangement".

The "Operator Arrangement" should be based on the relevant deliverables and shall be agreed by the Signatory Authorities of relevant countries.

8 REVISION OF THE TECHNICAL ARRANGEMENT

With the consent of the other Signatory Authorities, this Technical Arrangement may be reviewed or modified at the request of one or more Signatory Authorities where such modifications become necessary in the light of administrative, regulatory or technical developments, or if practical experience or the operation of terrestrial systems capable of providing electronic communications services require.

9 WITHDRAWAL FROM THE ARRANGEMENT

Any Authority may withdraw from this Technical Arrangement 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 all other Signatory Authorities.

10 LANGUAGE OF THE ARRANGEMENT

This Technical Arrangement has been concluded in English in two originals. A copy is submitted to the Managing Administration of the HCM Agreement.

11 DATE OF ENTRY INTO FORCE

This Technical Arrangement enters into force at the date of the last signature.

For Hungary
on 14./06./2013

Péter VÁRI

For Romania
on 03./07./2013

Marius Cătălin MARINESCU

Annex 1

PREFERENTIAL PHYSICAL-LAYER CELL IDENTITIES (PCI) FOR IMT-2000/LTE

PCI co-ordination is only needed when channel centre frequencies are aligned independent of the channel bandwidth.

3GPP TS 36.211 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.

Administrations should agree on a repartition of these 504 PCI 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 PCI's is equivalent. Each country can use all PCI groups away from the border areas.

As shown in the table below, the PCI's should be divided into 6 sub-sets containing each one sixth of the available PCI's. Each country is allocated three sets (half of the PCI's) in a bilateral case, and two sets (one third of the PCI's) in a trilateral case.

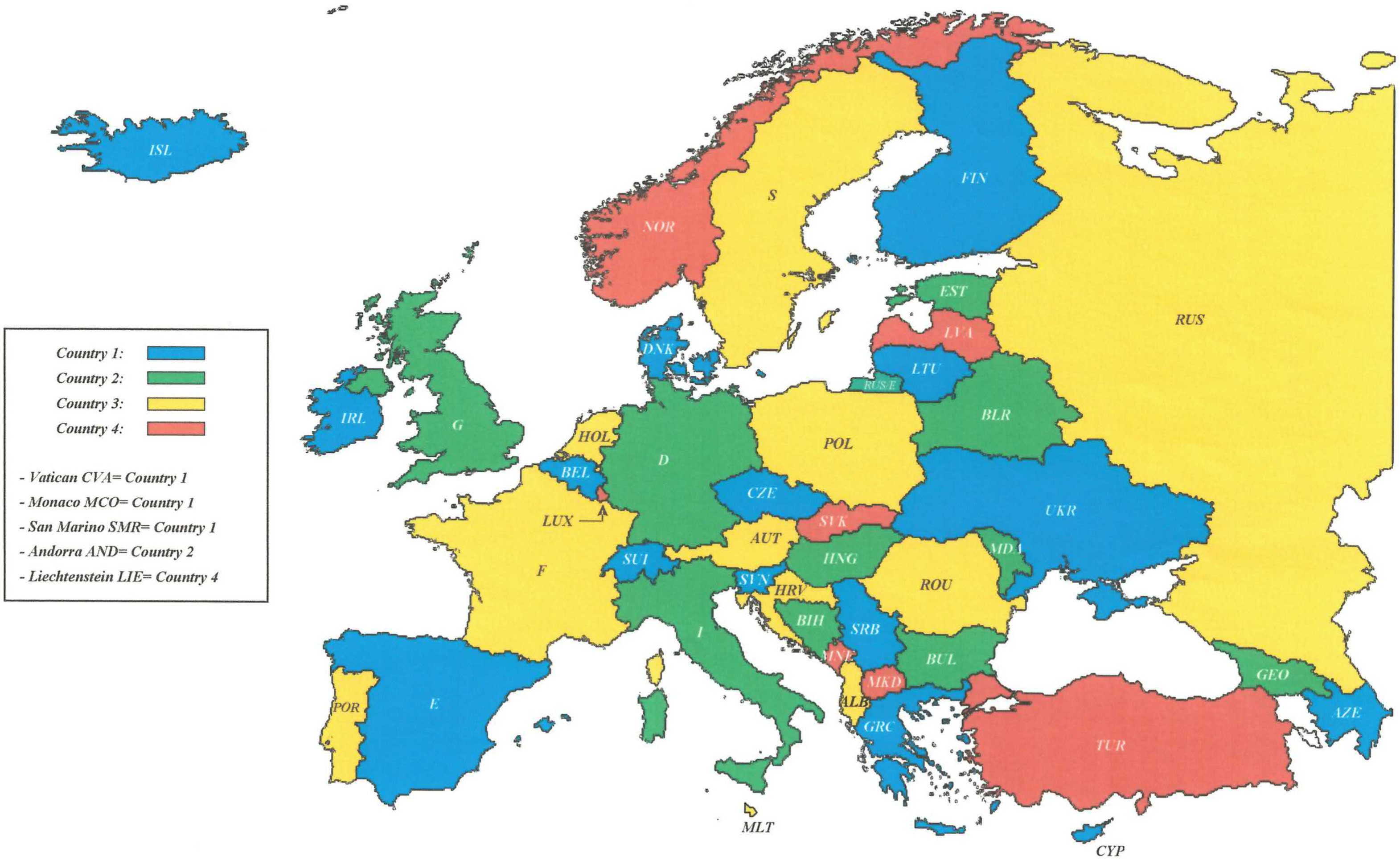
Four types of countries are defined in a way such that no country will use the same code set as any one of its neighbours. The following lists describe the distribution of European countries:

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, the following tables and figure describe the sharing of the PCI's with its neighbouring countries, with the following conventions of writing:

	Preferential PCI
	non-preferential PCI


Country 1:
Country 2:
Country 3:
Country 4:
- Vatican CVA= Country 1
- Monaco MCO= Country 1
- San Marino SMR= Country 1
- Andorra AND= Country 2
- Liechtenstein LIE= Country 4
ISL
NOR
S
FIN
RUS
EST
LVA
LTU
DNK
IRL
G
HOL
BEL
D
POL
BLR
CZE
SVK
UKR
LUX
AUT
HNG
MDA
F
SUI
SVN
HRV
ROU
BIH
SRB
I
MNE
BUL
MKD
GEO
ALB
AZE
POR
E
GRC
TUR
MLT
CYP

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

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						

Notes

1) All PCI's are available in areas away from the border.

2) 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 bi/multilateral coordination agreements as necessary, and may include further subdivision of the allocated codes in certain areas.