TECHNICAL ARRANGEMENT

BETWEEN THE NATIONAL FREQUENCY MANAGEMENT AUTHORITIES OF

AUSTRIA, CROATIA, HUNGARY, ROMANIA, SERBIA, The SLOVAK REPUBLIC and SLOVENIA

ON BORDER COORDINATION

FOR

TERRESTRIAL SYSTEMS CAPABLE OF PROVIDING ELECTRONIC COMMUNICATIONS SERVICES

IN THE FREQUENCY BAND 790 - 862 MHz

Budapest, 14th February 2018

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 in the band 790 - 862 MHz in border areas. This frequency band is called as WRC-07 "Digital Dividend".

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 Federal Ministry for Transport, Innovation and Technology [BMVIT] (Austria), the Croatian Regulatory Authority for Network Industries [HAKOM] (Croatia), the National Media and Infocommunications Authority [NMHH] (Hungary), the National Authority for Management and Regulation in Communications of Romania [ANCOM] (Romania), the Regulatory Agency for Electronic Communications and Postal Services [RATEL] (Serbia), Regulatory Authority for Electronic Communications and Postal Services [RU] (The Slovak Republic) and Agency for Communication Networks and Services of the Republic of Slovenia [AKOS] (Slovenia) (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 790 - 862 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 790 - 862 MHz:

- COMMISSION DECISION (2010/267/EU) of 6 May 2010 on

  harmonised technical conditions of use in the 790 – 862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union *(notified under document number C(2010) 2923)*;

- ECC Decision (ECC/DEC/(09)03) of 30 October 2009 on

  harmonised conditions for mobile/fixed communications networks (MFCN) operating in the band 790 – 862 MHz (not amended first edition);

- ECC RECOMMENDATION (ECC/REC/(11)04) amended on 03 February 2017 on

  cross-border coordination for mobile/fixed communication networks (MFCN) in the frequency band 790 – 862 MHz (edition 3 February 2017);

- CEPT REPORT 29 of 26 June 2009 on

  technical considerations regarding harmonisation options for the digital dividend in the European Union. Guideline on cross border coordination issues between mobile services in one country and broadcasting services in another country (not amended first edition).

The versions of the above mentioned deliverables are sent with the covering letter or email on this Technical Arrangement (see Annex 2).

When referring to a deliverable in connection with this Technical Arrangement, the version mentioned above shall be considered to be valid.

2.2 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 bands 791 – 821 and 832 - 862 MHz with the repartition of PCI (physical-layer cell-identity) codes on an equitable basis.

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.

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. In order to achieve better control of interference, radio parameters of the systems may need to be coordinated at an operator level according to the so-called "Operator Arrangement" (see section 6).

As a consequence of the above, traditional frequency coordination (coordination and notification of stations) would disturb this delicate balance in the border area. Therefore, traditional frequency coordination will not be performed in this Technical Arrangement.

It is also important that the information about bringing the frequency bands into use by the operators is available for the interested Administrations and this information can be seen in EFIS (www.efis.dk).

2.3 Radio wave propagation

Achieving equitable access to the frequency spectrum rather depends upon the radio wave propagation method applied to calculate the field strength since that method serves as a tool for enforcing the rules of this Technical Arrangement.

2.3.1 Calculation for planning and effectuation

For the field strength calculations the method of the HCM Agreement shall be applied. Time probability for electronic communications services is 10%.

2.3.2 Calculations in the case of reported interference

As for interference field strength prediction, the following three methods have been mentioned in the relevant frequency coordination Recommendation ECC/REC/(11)04:

- site general model with line calculations (hereinafter called "site general method");
- path specific model with radial calculations from base stations (hereinafter called "radial calculations");
- area calculations with a path specific model (hereinafter called "area calculations").

Using a site general method (like "HCM" Agreement") for the assessment of interference cannot ensure proper protection against harmful interference for several cases and results in less efficiency in frequency usage in border areas.

Radial calculations can only give better result than site general methods if steps along paths are small enough and the number of radial directions is high enough. Still, there may be some cases causing harmful interference.

Area calculations, especially alongside using clutter data, can eliminate the mistakes of both site general methods and radial calculations and, in addition, important geographic areas can also be protected. Therefore, area calculations are preferable in the case where it is necessary to evaluate interference in detail. Thus, operators are expected to apply area calculations based on commonly agreed wave propagation model, trigger values and method used for evaluation of interference to protect their networks or a special part of the border area and to enhance spectrum efficiency in border areas.

2.4 Interference calculation

In this Technical Arrangement, special single entry interference calculation is prescribed as given in section 4.1 and 4.2 so that calculations can be performed by HCM Agreement.

2.5 Coordination procedure

In general, neither coordination nor notification of stations is required except in cases of harmful interference (see section 5).

2.6 Diversion from this Technical Arrangement

Operators may diverge from the principles, provisions and procedure given in this Technical Arrangement subject to the so-called "Operator Arrangement" (see section 6) except the cases given in section 3.1 (band usage) and in section 3.2 (technology and radio service).

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.

If band usage other than given in section 3.1 is required and other technology and radio service given in section 3.2 is introduced, the Signatory Authorities concerned shall enter into negotiation and reach an agreement for properly modifying this Technical Arrangement before putting any station into operation.

3.1 Band usage

In the bands 791 – 821 and 832 - 862 MHz only FDD systems may be used according to the preferred harmonised frequency arrangement.

According to ECC Decision ECC/DEC/(09)03 the preferred harmonised frequency arrangement shall be as follows:

"a"	790 – 791 MHz	guard band between broadcasting band edge at 790 MHz and the lower edge of FDD downlink band ***"b"***
"b"	791 – 821 MHz	downlink band of the paired band ***"b"*** and ***"d"***
"c"	821 – 832 MHz	guard band between the upper edge of FDD downlink band ***"b"*** and the lower edge of FDD uplink band ***"d"***
"d"	832 – 862 MHz	uplink band of the paired band ***"b"*** and ***"d"***

The assigned blocks shall be in multiple of 5.0 MHz with the first lower block edge starting at the frequency of 791 MHz.

The bands ***"b"*** and ***"d"*** as a paired band may be used for FDD systems. The duplex spacing for FDD operation shall be 41 MHz with terminal station transmission in the uplink band and base station transmission in the downlink band.

Guard bands may not be used in the preferred harmonised frequency arrangement.

3.2 Technology and radio service

All rules laid down in this Technical Arrangement refer to LTE technology and land mobile/fixed radio service. Parameters of mobile and base stations such as power shall comply with the requirements given in COMMISSION DECISION (2010/267/EU) of 6 May 2010.

3.3 PCI codes and border areas

Due to the fact that only the LTE technology is existent for land mobile/fixed service in the Digital Dividend it is required to share the preferential physical-layer cell identities (PCI) according to ECC Recommendation ECC/REC/(11)04. The allocation of codes in different border areas (or border zones) is given in Annex 1 to this Technical Arrangement.

All the regulation laid down in this Technical Arrangement refers to only the following border areas:

Hungarian-Slovakian (HNG-SVK) border area

Austrian-Hungarian-Slovakian (AUT-HNG-SVK) border area

Austrian-Slovakian (AUT-SVK) border area

Austrian-Hungarian (AUT-HNG) border area

Austrian-Hungarian-Slovenian (AUT-HNG-SVN) border area

Austrian-Slovenian (AUT-SVN) border area

Hungarian-Slovenian (HNG-SVN) border area

Croatian-Hungarian-Slovenian (HRV-HNG-SVN) border area

Croatian-Slovenian (HRV-SVN) border area

Croatian-Hungarian (HRV-HNG) border area

Croatian-Hungarian-Serbian (HRV-HNG-SRB) border area

Croatian-Serbian (HRV-SRB) border area

Hungarian-Serbian (HNG-SRB) border area

Hungarian-Romanian-Serbian (HNG-ROU-SRB) border area

Romanian-Serbian (ROU-SRB) border area

Hungarian-Romanian (HNG-ROU) border area

4 TECHNICAL PROVISIONS RELATED TO FIELD STRENGTH TRIGGERS

4.1 Basic rules

Field strength values or triggers given in section 4.2 refer to a reference frequency block of 5 MHz and only to preferential PCI given in Annex1. The field strength triggers shall be modified according to the value of the bandwidth and the aggregated power correction factor given below. This modified field strength triggers shall be applied to each individual base 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:

10 * log (Cs/5 MHz) (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 (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 Field strength triggers in the paired band *"b"* and *"d"*

The following field strength triggers shall be applied for base stations in the pair band of **"b"** and **"d"** given in section 3.1:

A base station of an FDD system with centre frequencies not aligned on both sides of the borderline or with centre frequencies aligned using preferential PCI codes given in Annex 1 may be operated if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 59 dBμV/m/5MHz at a height of 3 m above ground at the borderline between countries and does not exceed a value of 41 dBμV/m/5MHz at a height of 3 m above ground at a distance of 6 km (6 km line) inside the neighbouring country.

A base station of an FDD system with centre frequencies aligned on both sides of the borderline using non-preferential PCI codes given in Annex 1 may be operated if the mean field strength produced by the cell (all transmitters within the sector) does not exceed the value of 41 dBμV/m/5 MHz at a height of 3 m above ground at the borderline between countries.

5 PROCEDURE IN THE CASE OF HARMFUL INTERFERENCE

This section deals with harmful interference caused by base stations of FDD systems.

In the case of harmful interference the data necessary to evaluate and treat the harmful interference shall be exchanged between Signatory Authorities concerned.

Concerning interference calculations a two-step procedure is described below and based upon interference calculations operators shall adjust the characteristics of base stations.

As the first step, in the case of harmful interference, the characteristics of base stations shall be adjusted based upon interference calculations laid down in section 5.1. If the first step does not result in interference-free operation, the second step shall be taken.

As the second step, in the case of harmful interference, the characteristics of base stations shall be adjusted based upon interference calculations laid down in section 5.2. If the second step does not result in interference-free operation, the third step, i.e. measurements shall be carried out.

5.1 Step 1: Line calculations

If harmful interference occurs, field strength line calculations shall be carried out between the base station causing harmful interference and the points of the borderline / 6 km line and the characteristic of the base station shall be adjusted in such a way that the trigger values in section 4.2 are kept. For line calculations, taking into account the different type of radio wave propagation paths, the methods of HCM Agreement shall be used. Time probability in all calculations is 10 %.

5.2 Step 2: Area calculations

Operators are required to apply area calculations based on commonly agreed wave propagation models, commonly agreed trigger values and commonly agreed method used for evaluation of interference when interference is still experienced after Step 1, according to section "Area calculations" of Annex 3.3 to ECC Recommendation ECC/REC/(11)04 before measuring the interference field strength.

Area calculations including its elements detailed in the previous paragraph shall at this time be agreed by the Operators concerned.

5.3 Step 3: Interference measurements

If harmful interference is still experienced despite the adjustment detailed in Step 1 and Step 2, measurements shall be carried out according to internationally/mutually agreed procedures.

6 OPERATOR ARRANGEMENTS

To further improve the coexistence of terrestrial systems capable of providing electronic communications services, and to enhance the efficient use of spectrum and coverage in border areas, operators may diverge from the regulation given in this Technical Arrangement (see section 2.6) by concluding so-called additional "Operator Arrangements". The "Operator Arrangements" (type 1) shall be in line with the "*Agreement between administrations concerning the approval of arrangements between operators of radiocommunications network"* for the administrations that have signed such an agreement.

If there are no such Agreements concluded or these Agreements are not valid between administrations concerned for this 800 MHz Technical Arrangement, operators may negotiate Operator Arrangements (type 2) 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.

Both types of "Operator Arrangements" are subject to prior approval of their respective administration and should be based on the relevant deliverables listed in section 2.1 and their subsequently revised versions.

7 STATUS OF EXISTING ARRANGEMENTS

The "Technical Arrangement between the national frequency management authorities of Austria, Croatia, Hungary, the Slovak Republic and Slovenia on border coordination for terrestrial systems capable of providing electronic communications services in the frequency band 790–862 MHz (Vienna, 12th October 2011)" and the "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 790–862 MHz (agreed by correspondence 3 July 2013)" are repealed at the date of entry into force of this Technical Arrangement.

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 Signatory Authorities concerned.

10 LANGUAGE OF THE ARRANGEMENT

This Technical Arrangement has been concluded in English in seven 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 on the date of its signature.

Done at Budapest, 14th February 2018

For Austria

Franz ZIEGELWANGER

For Croatia

Ivančica SAKAL

For Hungary

Péter VÁRI

For Romania

Bogdan Cristian IANA

For Serbia

Zoran BRANKOVIĆ

For the Slovak Republic

Milan MIZERA

For Slovenia

Meta PAVŠEK TAŠKOV

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. .

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

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	■		■			

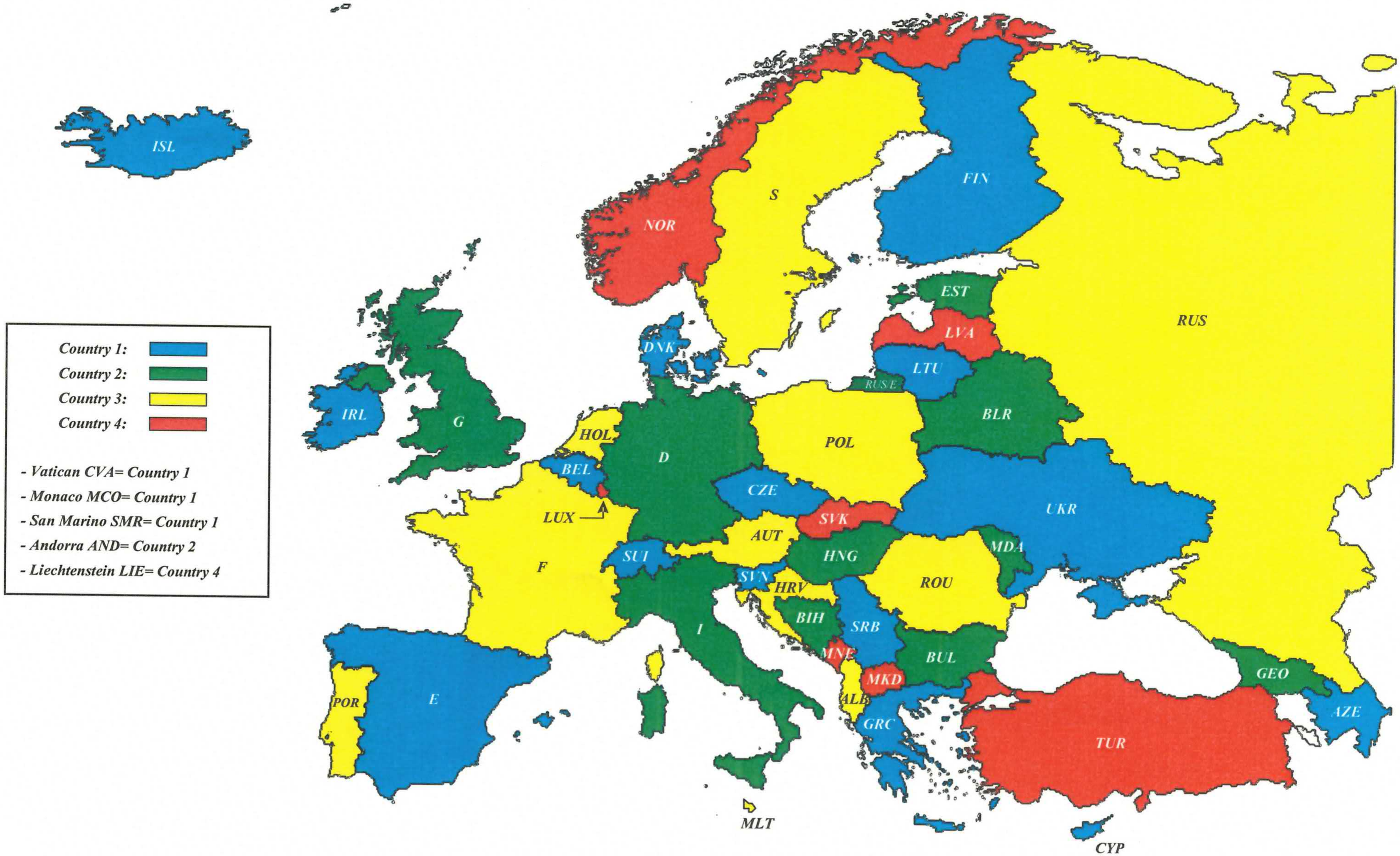
PCI	Set A	Set B	Set C	Set D	Set E	Set F
Country 2	0..83	**84..167**	168..251	252..335	336..419	420..503
Border 2-1			■	■	■	
Zone 2-3-1			■	■		
Border 2-3		■	■	■		
Zone 2-1-4			■	■		
Border 2-4			■	■		■
Zone 2-3-4			■	■		

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		■		■		

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


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
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NOR
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FIN
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EST
LVA
LTU
DNK
RUS E
BLR
IRL
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GRC
TUR
MLT
CYP

Annex2

The versions of the deliverables mentioned in section 2.1 are not attached to this Arrangement owing to their volume. Nevertheless, these versions are attached to the covering letter or email on this Technical Arrangement so that Signatory Authorities avoid confusion as to which version of a particular deliverable shall be used due to revisions made by e.g. CEPT after signing this Arrangement.