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 1920-1980 MHz and 2110-2170 MHz FREQUENCY BANDS

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 deployment of terrestrial systems capable of providing electronic communications services in the paired bands 1920-1980 MHz and 2110-2170 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 Federal Ministry for Transport, Innovation and Technology (Austria), the Croatian Regulatory Authority for Network Industries (Croatia), the National Media and Infocommunications Authority (Hungary), the National Authority for Management and Regulation in Communications of Romania (Romania), Regulatory Agency for Electronic Communications and Postal Services (Serbia), the Regulatory Authority for Electronic Communications and Postal Services (the Slovak Republic) and the Agency for Communication Networks and Services of the Republic of Slovenia (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 1920-1980 MHz and 2110-2170 MHz bands in border areas.

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

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 cross border coordination in the 1920-1980 MHz and 2110-2170 MHz bands:

- COMMISSION IMPLEMENTING DECISION (2012/688/EU) of 5 November 2012 on the harmonisation of the frequency bands 1 920-1 980 MHz and 2 110-2 170 MHz for terrestrial systems capable of providing electronic communications services in the Union (notified under document C(2012) 7697);
- ECC DECISION (ECC/DEC/(06)01) approved 24 March 2006, amended 02 November 2012 on the harmonised utilisation of the bands 1920-1980 MHz and 2110-2170 MHz for mobile/fixed communications networks (MFCN) including terrestrial IMT systems;
- ERC RECOMMENDATION (ERC/REC/(01)01) revised Dublin 2003, Helsinki 2007, Cluj-Napoca 2016 on cross-border coordination for mobile/fixed communications networks (MFCN) in the frequency bands: 1920-1980 MHz and 2110-2170 MHz;
- CEPT REPORT 39 - Report from CEPT to the European Commission in response to the Mandate to develop least restrictive technical conditions for 2 GHz bands (Final Report on 25 June 2010).

The versions of the above mentioned deliverables available at the time of signing this technical arrangement are attached for reference in Annex 2.

2.2 Regulated bands

This technical arrangement covers the harmonised frequency arrangement in the paired bands 1920-1980 MHz and 2110-2170 MHz according to COMMISSION IMPLEMENTING DECISION (2012/688/EU) and ECC Decision ECC/DEC/(06)01.

2.3 Access to the radio 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 in a fast and effective way, ensuring proper access to the radio spectrum.

In order to assure equitable access to the spectrum for the operators in neighbouring countries, the coordination principle applied in this Technical Arrangement is based on the concept of trigger field strength values applicable for all concerned operators in the border areas and the concept of preferential codes for UMTS systems and Preferential Physical-layer Cell Identities (PCI) for LTE systems as defined in ERC/REC/(01)01 (revision Cluj-Napoca 2016) and in this Technical Arrangement.

As a consequence, according to this Technical Arrangement, neither coordination nor notification of stations is required. Nevertheless, this kind of frequency usage in the border areas is only viable if the field strength trigger values given in this Technical Arrangement are fulfilled and the field strength values are calculated using accurate radio wave propagation methods. It is also beneficial if radio parameters of the systems are coordinated between neighbouring operators.

Preferential use of frequencies as laid down in Annex 1 of ERC/REC/(01)01 (revision Cluj-Napoca 2016) is not subject of this Technical Arrangement, but may be subject to arrangements between operators.

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

2.4 Radio wave propagation methods

Achieving equitable access to the 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.

2.4.1 Calculation of field strength for planning and effectuation

For the calculation of the field strength values to assess compliance with the triggers given in section 4.2 the method of the HCM Agreement shall be applied. Time probability for the calculation of field strength values for electronic communications services is 10%.

2.4.2 Calculations in the case of reported interference

As for interference field strength prediction, the following three methods are proposed to be considered by administrations in the relevant ERC/REC/(01)01 Recommendation:

- site general model with line calculations (hereinafter called "site general method");

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- 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.

3 GENERAL TECHNICAL PROVISIONS

In this section the general technical provisions are given while section 4 details the additional technical provisions for the coordination trigger field strength values of in border areas.

This Technical Arrangement applies only for the frequency usage by MFCN systems complying with the band arrangement in section 3.1 and radio parameters specified in section 3.2. In case of any other technology or radio service the Signatory Authorities concerned shall reach an agreement for properly modifying this Technical Arrangement before putting any station into operation.

3.1 Band arrangement

Subject to this Technical Arrangement the frequency arrangement shall be as follows:

- the duplex mode of operation shall be Frequency Division Duplex (FDD)
- the duplex spacing shall be 190 MHz with terminal station transmission (FDD uplink) located in the lower part of the band starting at 1920 MHz and finishing at 1980 MHz and base station transmission (FDD downlink) located in the upper part of the band starting at 2110 MHz and finishing at 2170 MHz.

3.2 Radio parameters

Radio parameters of mobile and base stations shall comply with the requirements given in COMMISSION IMPLEMENTING DECISION (2012/688/EU) of 5 November 2012 on the harmonisation of the frequency bands 1920-1980 MHz and 2110-2170 MHz for terrestrial systems capable of providing electronic communications services in the Union and ECC DECISION (ECC/DEC/(06)01) approved 24 March 2006, amended 2 November 2012 on the harmonised utilisation of the bands 1920-1980 MHz and 2110-2170 MHz for mobile/fixed communications networks (MFCN) including terrestrial IMT systems.

For UMTS systems it is required to share the preferential codes according to Annex 1 to this Technical Arrangement (Annex 3 of ERC/REC/(01)01 revised Cluj-Napoca 2016).

In the case of LTE it is required to share the preferential physical-layer cell identities (PCI) according to Annex 1 to this Technical Arrangement (Annex 5 of ERC/REC/(01)01 revised Cluj-Napoca 2016). In addition, for LTE it is also beneficial for the operators to coordinate radio parameters of their systems to minimise the deteriorating effects of uplink interference in line with Annex 4 of ERC/REC/(01)01 (revised Cluj-Napoca 2016).

If a new broadband system different from UMTS or LTE systems is intended to be introduced, the approval of the Signatory Authorities concerned shall be obtained before the introduction of a new broadband system.

4 TECHNICAL PROVISIONS RELATED TO COORDINATION TRIGGER FIELD STRENGTH VALUES

4.1 Basic rules

Coordination trigger field strength values given in section 4.2 refer to a reference frequency block of 5 MHz. The trigger field strength values shall be modified taking into consideration the value of the bandwidth and the aggregated power correction factor given below. The 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 formula shall be added to the field strength triggers given in section 4.2:

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

where

"Cs" nominal channel spacing (MHz).

b) Aggregated power correction factor

If there is more than one transmitter within the sector operating in a respective reference frequency block, in case of single entry interference calculation the trigger field strength values given in section 4.2 shall be decreased by the value of the aggregated power correction factor according to the following formula in each antenna sector:

$$10 * \log n \quad (dB)$$

where

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

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".

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4.2 Coordination trigger field strength values in border areas

The following field strength limits shall be applied for base stations of FDD systems operating in the downlink bands of the paired 1920-1980 MHz and 2110-2170 MHz bands:

4.2.1 Aligned usage with preferential code for UMTS vs. UMTS or with preferential PCI for LTE vs. LTE, or not aligned usage for UMTS vs. UMTS and LTE vs. LTE, or in general LTE vs. UMTS

Base stations of MFCN FDD systems using preferential codes/PCIs with centre frequencies aligned, or where centre frequencies are not aligned, may be operated if the predicted mean field strength produced by the cell (all transmitters within the sector) does not exceed a value of **37 dBμV/m/5MHz at a height of 3 m above ground at a distance of 6 km inside the neighbouring country and a value of 65 dBμV/m/5MHz at a height of 3 m above ground at the borderline between countries**.

4.2.2 Aligned usage with non-preferential code for UMTS vs. UMTS or with non-preferential PCI for LTE vs. LTE

Base stations of MFCN FDD systems using non preferential codes/PCIs with centre frequencies aligned operated if the predicted mean field strength produced by the cell (all transmitters within the sector) does not exceed a value of **37 dBμV/m/5MHz at a height of 3 m above ground at the border line between countries**.

4.2.3 Coordinated usage based on operator arrangements

The field strength levels defined under subsection 4.2.1 and 4.2.2 may be increased by concluding arrangements between operators within the conditions described in section 6.

In cases of frequency block sizes other than 5 MHz the correction factor according to 4.1.a) shall be used.

Sharing of preferential codes for UMTS and PCI-s for LTE is found in Annex 1.

5 PROCEDURE IN CASE OF HARMFUL INTERFERENCE

In the case of harmful interference the data necessary to evaluate and treat the harmful interference shall be exchanged between Signatory Authorities concerned. Administrations concerned shall endeavour to achieve a mutually satisfactory solution as soon as possible.

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, field strength line calculations shall be carried out between the base stations causing harmful interference and the points of the borderline and 6 km line with regard to trigger values in section 4.2 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 HCM model shall be used. Time probability in all calculations is 10 %. Operators

may also apply more accurate area calculations according to Annex 2 to ECC Recommendation ECC/REC/(01)01 (revised Cluj-Napoca 2016) for evaluation of interference based on commonly agreed methods in the "Operator Arrangements".

As the second step, if harmful interference is still experienced despite the above adjustment, measurements shall be carried out.

6 OPERATOR ARRANGEMENTS

To further improve the coexistence of terrestrial systems capable of providing electronic communications services, and to enhance the efficient use of radio spectrum and coverage in border areas, operators may diverge from the regulation given in this Technical Arrangement, except the cases given in section 3.1 (band arrangement) and in section 3.2 (radio parameters), based on an arrangement concluded between operators, so-called additional "Operator Arrangements".

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.

The "Operator Arrangements" shall be in line with the *"Agreements between administrations concerning the approval of arrangements between operators" for the administrations that have signed such agreement.*

The "Operator Arrangements" should be based on the relevant deliverables listed in section 2.1 and their subsequently revised versions.

7 STATUS OF EXISTING ARRANGEMENTS

Regarding the paired bands 1920-1980 MHz and 2110-2170 this Technical Arrangement replaces the existing Agreements between

- the Administrations of Hungary, Poland, the Slovak Republic and Ukraine (Bratislava, 5 September 2002) for the relation SVK/HNG
- the Administrations of Austria, Croatia, Hungary and Slovenia (Vienna, 5 February 2002)
- the Administrations of Romania and Hungary (Budapest, 3 September 2004)

on border coordination of UMTS/IMT-2000 systems.

With regard to the unpaired bands 1900-1920 MHz and 2010-2025 MHz these Agreements are valid until the expiry of the licenses in these bands.

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 requires it. Such revision requests shall be answered within 30 days of receipt of the modification request information.

9 WITHDRAWAL FROM THE TECHNICAL 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 TECHNICAL ARRANGEMENT

This Technical Arrangement has been concluded in English.
One original version of this Technical Arrangement is handed over to each Signatory Authority and a copy is submitted to the Managing Administration of the HCM Agreement.

11 DATE OF ENTRY INTO FORCE

This Technical Arrangement will enter into force on the date of its signature.

Done at Budapest, 14th February 2018

For Austria

Franz ZIEGELWANGER

For Croatia

Ivančica SAKAL

For Hungary

Peter VÁRI

For Romania

Bogdan Cristian IANA

For Serbia

Zoran BRANKOVIĆ

For the Slovak Republic

Milan MIZERA

For Slovenia

Meta PAVŠEK TAŠKOV

Annex 1

PREFERENTIAL CODES for UMTS FDD MODE and PREFERENTIAL PHYSICAL-LAYER CELL IDENTITIES (PCI) FOR LTE

1.A PREFERENTIAL CODES for UMTS FDD MODE

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:

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

1.B PREFERENTIAL PCIs for LTE

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

ETSI TS 136.211 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.

Repartition of these 504 PCI should be made 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. The 504 physical-layer cell-identities should be divided into 6 sub-sets when the carrier frequencies are aligned in border areas.

1.C SHARING OF CODES WITH NEIGHBOURING COUNTRIES

Type country 1: SVN, SRB
Type country 2: HNG
Type country 3: AUT, HRV, ROU
Type country 4: SVK

For each type of country, the following tables and figure describe the sharing of the codes/PCI with its neighbouring countries, with the following conventions of writing:

■	Preferential code
	non-preferential code

Country 1: SRB, SVN

	Set A	Set B	Set C	Set D	Set E	Set F
UMTS Codes	0..10	11..20	21..31	32..42	43..52	53..63
PCI for LTE	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						

Country 2: HNG

	Set A	Set B	Set C	Set D	Set E	Set F
UMTS Codes	0..10	11..20	21..31	32..42	43..52	53..63
PCI for LTE	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						

Country 3: AUT, HRV, ROU

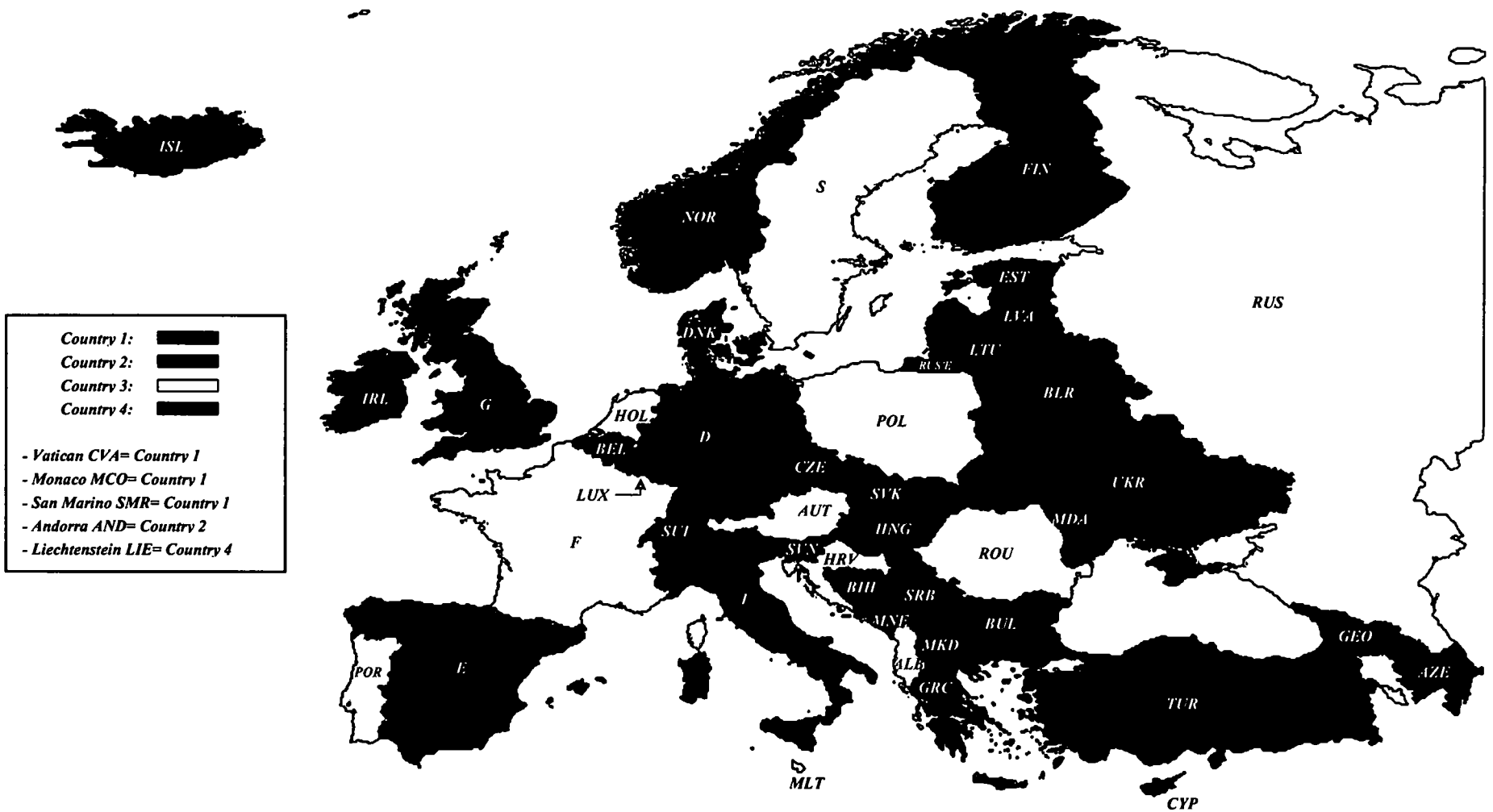
	Set A	Set B	Set C	Set D	Set E	Set F
UMTS Codes	0..10	11..20	21..31	32..42	43..52	53..63
PCI for LTE	0..83	84..167	168..251	252..335	336..419	420..503
Border 3-2						
Zone 3-1-2						
Border 3-1						
Zone 3-1-4						
Border 3-4						
Zone 3-2-4						

Country 4: SVK

	Set A	Set B	Set C	Set D	Set E	Set F
UMTS Codes	0..10	11..20	21..31	32..42	43..52	53..63
PCI for LTE	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 bilateral /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
ISL
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DNK
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ROU
BIH
SRB
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MNE
BUL
GEO
MKD
POR
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ALB
AZE
GRC
TUR
MLT
CYP

ANNEX 2

REFERENCES

The deliverables mentioned in the Agreement being in force at the time of signing this technical arrangement are attached for reference in pdf format in the electronic version.