



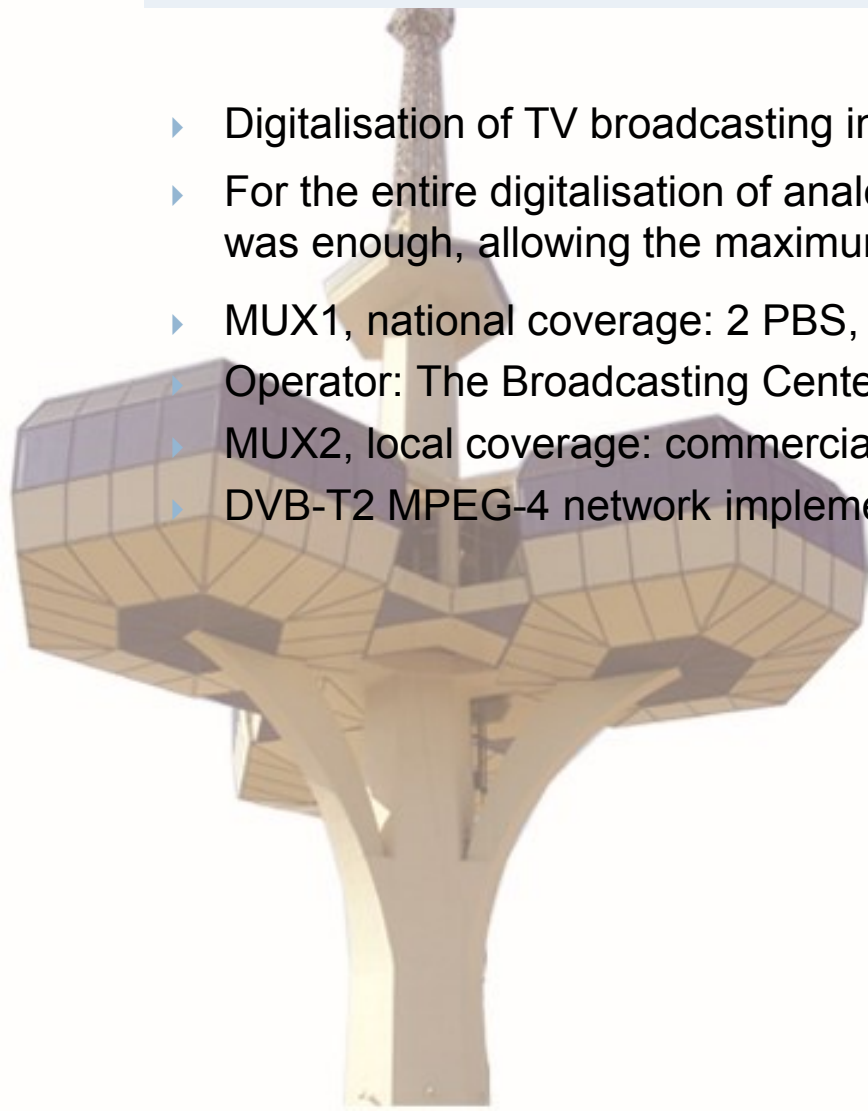
# **DIGITALISATION AND USAGE OF DIGITAL DIVIDEND IN MONTENEGRO**

**Vesna Popović, BScEE**  
[vesna.popovic@ekip.me](mailto:vesna.popovic@ekip.me)



## DIGITALISATION

- ▶ Digitalisation of TV broadcasting in Montenegro was completed by the 17. 06. 2015.
- ▶ For the entire digitalisation of analogue TV broadcasting in Montenegro one MUX was enough, allowing the maximum amount of spectrum to be free in 800 MHz band
- ▶ MUX1, national coverage: 2 PBS, 3 commercial programs
- ▶ Operator: The Broadcasting Center Ltd
- ▶ MUX2, local coverage: commercial programs
- ▶ DVB-T2 MPEG-4 network implemented





# DIGITALISATION

| Network parameters (MUX1) |                    |
|---------------------------|--------------------|
| Compression st.           | MPEG-4 (H.264/AVC) |
| Bandwidth                 | 8 MHz              |
| FFT Size                  | 32K                |
| Guard interval            | 1/16               |
| Network type              | SFN                |
| Pilot Pattern             | PP2                |
| Type of reception         | Stacionary         |
| Modulation                | 256-QAM            |
| Antena mode               | SISO               |
| Code Rate                 | 3/5                |
| PLP mode                  | Single             |
| Frequency mode            | Normal             |
| Network bit rate          | 31.1 Mbit/s        |

| Allotment area name | 174 - 230 MHz<br>(ch 5 - ch 12)<br>BROADCASTING | 470 - 694 MHz<br>(ch 21 - ch 48)<br>BROADCASTING | 694 - 790 MHz<br>(ch 49 - ch 60)<br>BROADCASTING | 790 - 862 MHz<br>(ch 61 - ch 69)<br>BROADCASTING |
|---------------------|---|--|--|--|
| BJELASICA           | 6<br>10A, 11A, 12A                              | 25, 29, 37, 43                                   | 60   | 62, 68   |
| LOVCEN              | 8<br>10B, 11C, 12C                              | 27, 31, 35                                       | 57   | 61, 64, 67                                       |
| TVRDAS              | 6<br>10A, 11A, 12A                              | 22, 26, 32, 46                                   | 49, 53, 55                                       |  |
| PODGORICA           |   | 21, 24, 30, 33, 38, 39, 44                       | 53   | 69   |






## **DIGITAL DIVIDEND**

- ▶ The **PUBLIC BIDDING PROCEDURE** for the awarding approvals for the use of available radio-frequencies in the bands 800 MHz, 900 MHz, 1800 MHz, 2 GHz and 2.6 GHz for the implementation of a public mobile electronic communication networks was conducted via **AUCTION in CCA format**
- ▶ Spectrum auction was conducted from 04. 07-02. 08. 2016
- ▶ Radio-frequencies bands offered: 800 MHz, 900MHz, 1800 MHz, 2 GHz i 2,6 GHz
- ▶ The amount of the initial fees for all radio-frequencies resources which were the subject of auction: 40.028.000,00€
- ▶ **Crnogorski Telekom: 27.331.000,00 €**
- ▶ **Telenor: 12.384.000,00 €**
- ▶ **MTEL: 10.935.000,00 €**
- ▶ Total: **50.650.000,00 €**
- ▶ Unassigned spectrum in the value of 8.305.000,00 €

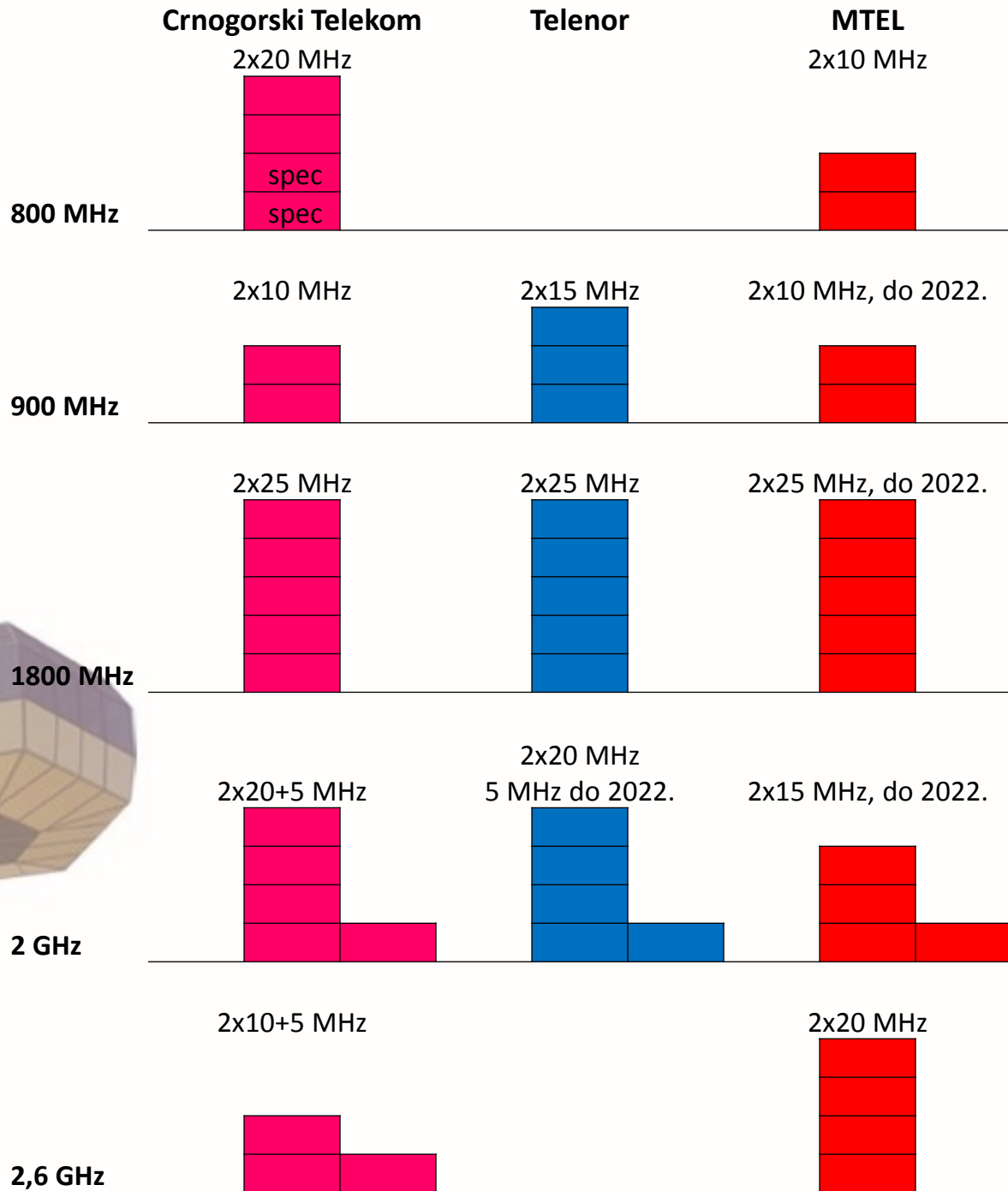
# Spectrum auction results - Awarded blocks & One-off fees

**Total reserved price  
40.028.000,00 Eur**

## One-off fees (Eur)

|   |                           |                 |                             |
|---|---------------------------|-----------------|-----------------------------|
|   | <b>Crnogorski Telekom</b> | <b>1800 MHz</b> | <b>27.331.000,00</b>        |
|   | <b>Telenor</b>            |                 | <b>12.384.000,00</b>        |
|  | <b>MTEL</b>               |                 | <b>10.935.000,00</b>        |
| <b>Total:</b>   |                           |                 | <b><u>50.650.000,00</u></b> |

**Unawarded spectrum reserved price  
8.305.000,00 Eur**





## **DIGITAL DIVIDEND**

### **▶ AUCTION RESULTS:**

- ▶ Provide rapid development of mobile broadband networks in rural and sparsely populated areas – in three years it is expected to be covered over 95% of the population of Montenegro with LTE signal (10 Mb/s to the user)
- ▶ Provide equal status for mobile operators in relation to problems with interference from non-standard DECT 6.0 devices
- ▶ The achieved income was 60% higher than starting price
- ▶ The average price range per MHz per capita (period of validity of the authorization of 15 years) is 0.225 Euro / MHz / pop, which puts Montenegro in the group of countries with the best valuated spectrum in Europe

### **▶ CHALLENGE:**



- ▶ On channels 61-69 (precisely: 62, 64, 67 and 69) harmful interference was identified, coming from Albanian digital broadcasters. In cooperation with Albanian relevant ministry and regulators Agency is trying to solve the problem and it is expected that it will be done by the end of June 2017





## COVERAGE MAPS



-  LTE 150 Mb/s (>90% of population)
-  LTE-Advanced 300 Mb/s (>50% of population)



HSPA+ 21 Mb/s (>97% of population)



## DIGITAL DIVIDEND II

| Allotment area name | 174 - 230 MHz<br>(ch 5 - ch 12)<br>BROADCASTING |               | 470 - 694 MHz<br>(ch 21 - ch 48)<br>BROADCASTING | 694 - 790 MHz<br>(ch 49 - ch 60)<br>BROADCASTING |
|---------------------|---|---------------|--|--|
| BJELASICA           | 6   | 10A, 11A, 12A | 25, 29, 37, 43                                   | 60   |
| LOVCEN              | 8   | 10B, 11C, 12C | 27, 31, 35                                       | 57   |
| TVRDAS              | 6   | 10A, 11A, 12A | 22, 26, 32, 46                                   | 49, 53, 55                                       |
| PODGORICA           |   |               | 21, 24, 30, 33, 38,<br>39, 44                    | 53   |

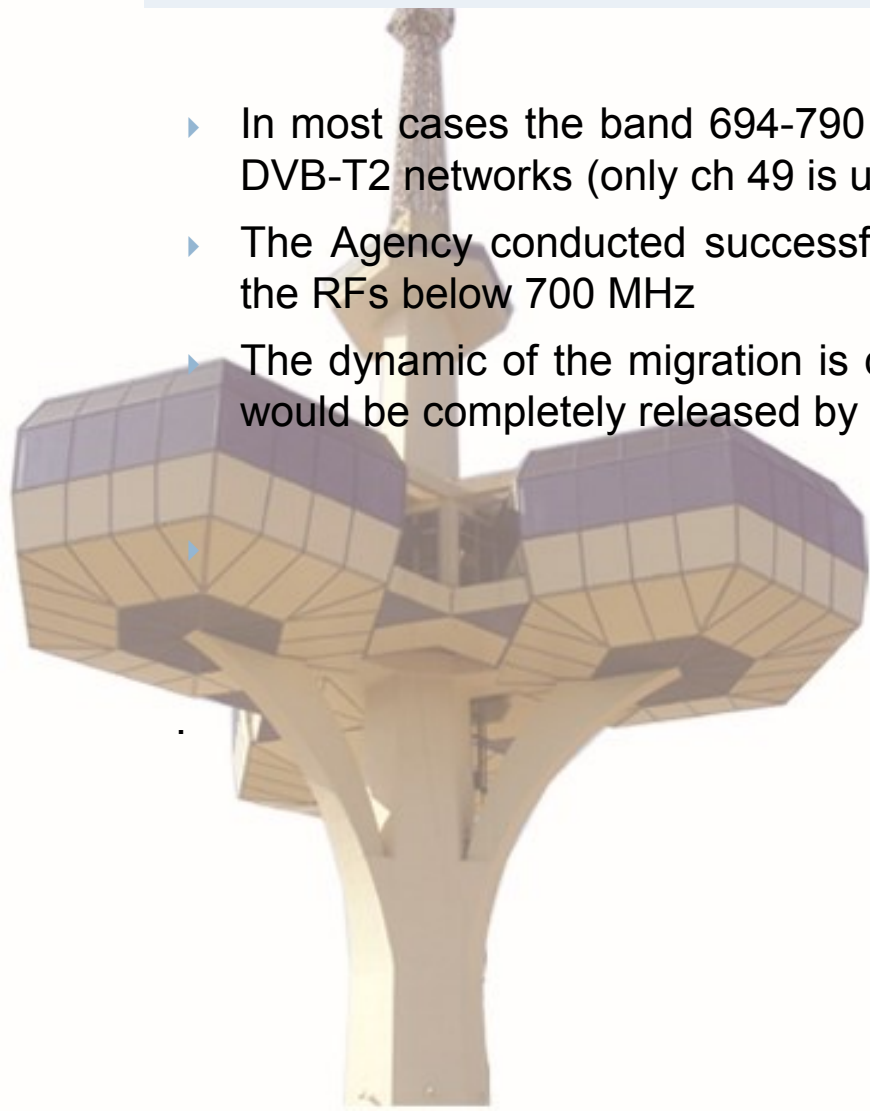
- ▶ According to the national plan of allocation:
  - ▶ 694-790 MHz: BROADCASTING, MOBILE





## **DIGITAL DIVIDEND II**

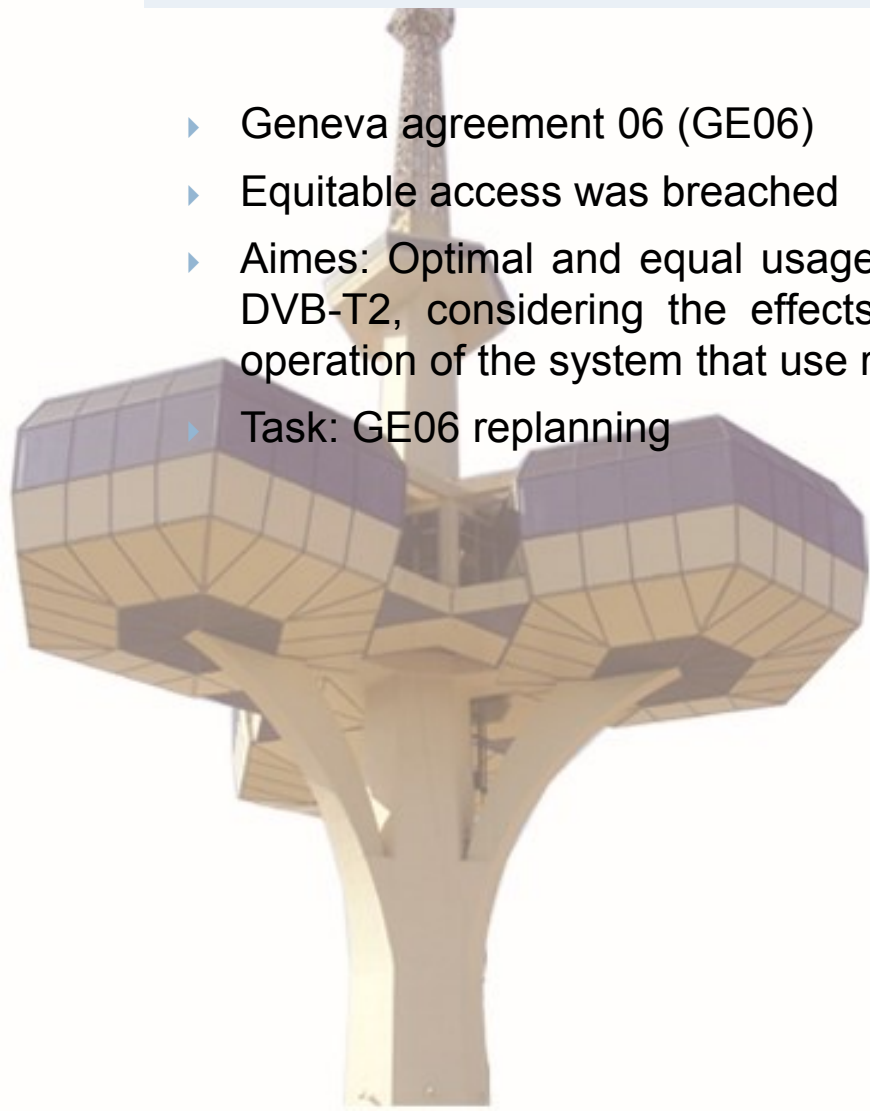
- ▶ In most cases the band 694-790 MHz has been avoided for the implementation of DVB-T2 networks (only ch 49 is used for AA Tvrđas, MUX1)
- ▶ The Agency conducted successful negotiations with MUX operator, to migrate on the RFs below 700 MHz
- ▶ The dynamic of the migration is determined and it is expected that 700 MHz band would be completely released by the end of 2017





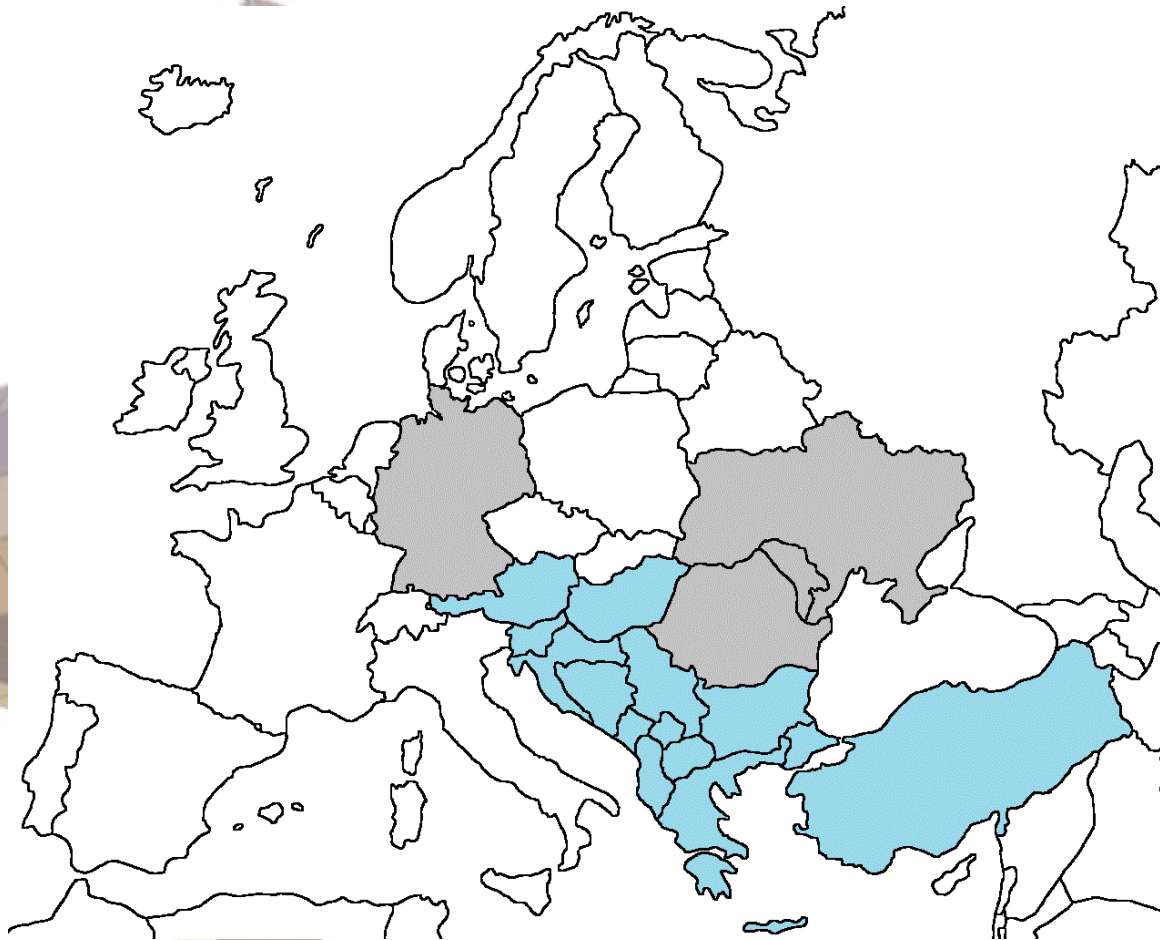
## COORDINATION

- ▶ Geneva agreement 06 (GE06)
- ▶ Equitable access was breached
- ▶ Aimes: Optimal and equal usage of 470-694 MHz band for the implementation of DVB-T2, considering the effects of DD I and II and the smooth, unobstructed operation of the system that use radio frequencies in the UHF band
- ▶ Task: GE06 replanning



# South European Digital Dividend Implementation Forum

## SEDDIF



### **MEMBERS**

Albania (ALB)  
Austria (AUT)  
Bosnia and Herzegovina (BIH)  
Bulgaria (BUL)  
Croatia (HRV)  
FYR Macedonia (MKD)  
Greece (GRC)  
Hungary (HNG)  
Montenegro (MNE)  
Serbia (SRB)  
Slovenia (SVN)  
Turkey (TUR)

### **OBSERVERS**

Germany (D)  
Moldavia (MDA)  
Romania (ROU)  
Ukraine (UKR)

### **ORGANIZATIONS**

ITU  
CEPT

# ADMINISTRATION TRANS ADRIATIC IONIAN GROUP



## **MEMBERS:**

Albania (ALB)

Croatia (HRV)

Greece (GRC)

Italy (I)

Montenegro (MNE)

San Marino (SMR)

Slovenia (SVN)

## **Meetings**

1. meeting in Rome, 21. 03. 2017

2. meeting in Rome, 27. 06. 2017



## **FUTURE PLANS**

- ▶ Apart from analysis of the possibilities of usage 694-790 MHz for mobile broadband, the Agency considers also the possibilities for usage of following radio-frequency bands: 1452-1492 MHz, 2300-2400 MHz, 3400-3600 MHz and 3600-3800 MHz also for IMT systems
- ▶ **Current usage:**
- ▶ **1452-1492 MHz** – three one-way fixed links, which could easily be migrated to other frequency bands
- ▶ **2300-2400 MHz** – mobile one-way point-to-point links on temporarily basis intended for transmission of TV signal together with accompanying audio signal intended for broadcasting - SAP/SAB applications
- ▶ **3400-3600 MHz** – one block assigned to one WIMAX operator until 2022
- ▶ **3600-3800 MHz** – no assignments
- ▶ Conducted monitoring measurements in all these bands and identified strong presence of signals in 700 MHz band coming from Albanian broadcasters in border area – Montenegro very interested to open discussion on this matter with our neighbour





**Thank you for your attention**

**[vesna.popovic@ekip.me](mailto:vesna.popovic@ekip.me)**

