

ITU-EKIP Regional Regulatory Forum for Europe

Universal Connectivity in Europe:

The Current State and

the Future Prospects

5G in Montenegro

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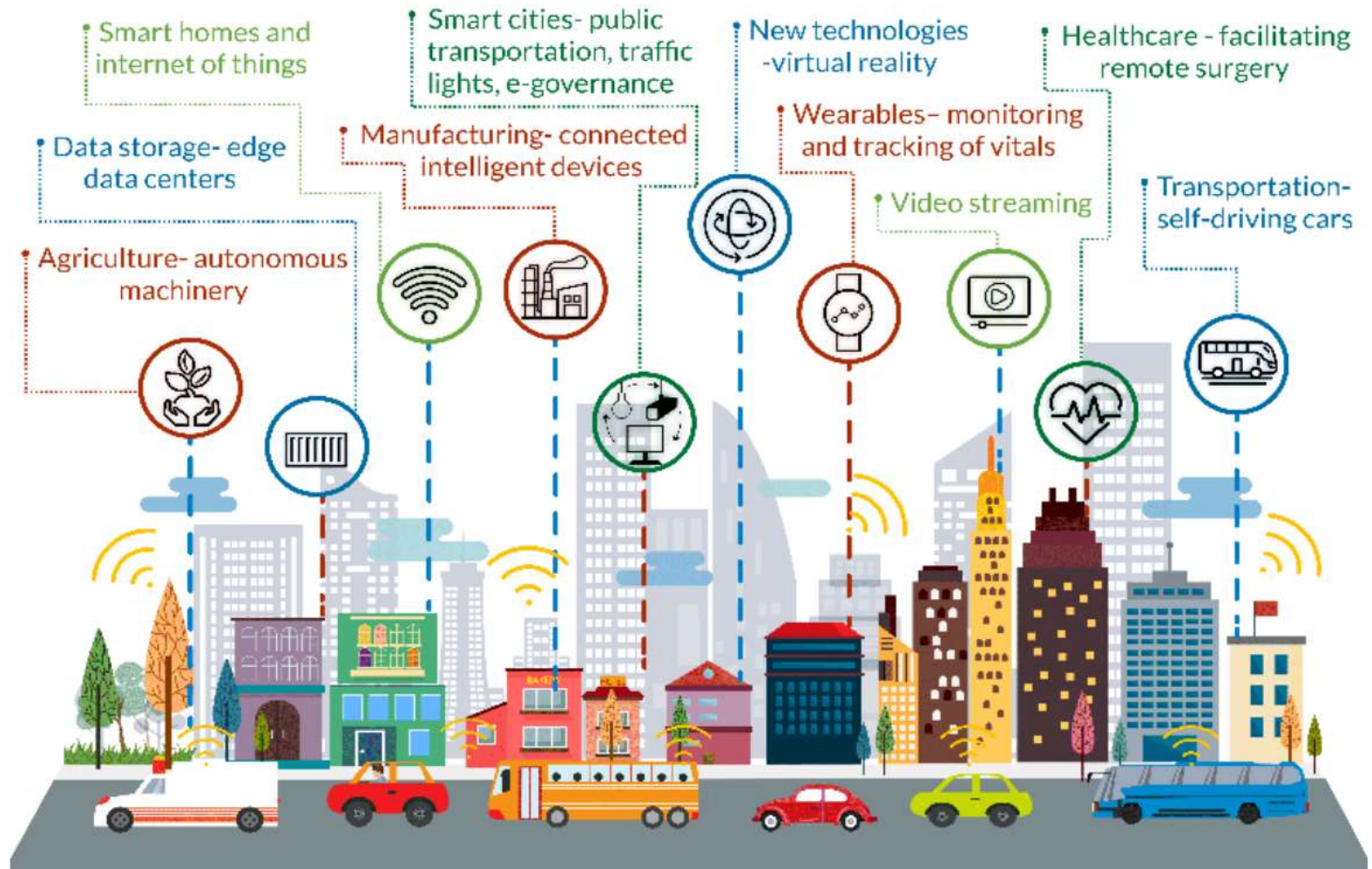
Content of the presentation

- 5G ecosystem in Montenegro
- Activities on developing 5G ecosystem
- Coverage obligations regarding 5G
- Current status
- Conclusions



5G ecosystem

5G ecosystem – a complex technological, business and regulatory environment that should enable the development and full valorization of 5G mobile networks in order to achieve maximum benefits for users, the economy and society as a whole





Who is responsible for development of 5G ecosystem?

- Regulators/Policy makers (government, NRA, EU, BEREC...)
- Companies/Organisations/Associations (ITU, GSMA, 3GPP, 5G-ACIA, 5G AA...)
- Service/Technology providers/enablers (network operators, network equipment manufacturers, software developers, device manufacturers, system integrators...)
- PPP (World Bank, UN, IMF, 5G-PPP, OECD...)
- For the full valorization of 5G networks, the synergy of the mobile and ICT industry on the one hand, and various stakeholders from the sphere of the public and industrial sectors, on the other hand, is necessary**



Challenges in developing 5G ecosystem

- Creating an efficient and effective regulatory framework (not only in the field of electronic communications)
- Provision of adequate RF resources for the implementation of 5G networks
- Development of 5G network infrastructure
- Development of attractive applications for different use cases
- Security of communications and protection of user data
- Protection of network integrity and critical infrastructure
- Environmental protection (energy efficiency and EMF)



Who makes 5G ecosystem in Montenegro

Regulator/ Policy makers:

- EKIP
- Gov of MNE
- MERT
- Municipalities

Organisations/ Associations:

- MNE Chamber of commerce
- MNE Chamber of Engineering
- University of Montenegro

Service/Technology providers/enablers

- Crnogorski Telekom
- One Crna Gora
- Mtel
- Roaming Networks
- CG Konsing
- IT Cortex



Activities in developing 5G ecosystem in Montenegro

2020-2021

- ❑ **Completed technical and regulatory framework for the use of radio-frequencies for 5G (included "Pioneer" 5G bands: 700 MHz, 3.6 GHz and 26 GHz) – Gov of MNE, EKIP**
- ❑ Study on the strategy for the introduction of 5G mobile networks in Montenegro – EKIP, University of Montenegro
- ❑ **Roadmap for introduction of 5G mobile communication networks in Montenegro - Gov of MNE, MERT**
- ❑ Spectrum auction for bands 2 GHz and 2.6 GHz – EKIP, mobile operators

2022-2023

- ❑ Start of 5G pilot projects using 3.6 GHz band in Podgorica and Tivat – Mobile operators, EKIP
- ❑ Start of commercial 5G (DSS) operations - Crnogorski Telekom, One Crna Gora
- ❑ **Spectrum auction for bands 700 MHz, 3.6 GHz and 26 GHz - EKIP, mobile operators**
- ❑ Start of commercial 5G services in the band 3.6 GHz - mobile operators
- ❑ **Strategy for development of 5G mobile communications networks in Montenegro for the period 2023-2027 - Gov of MNE, MERT, EKIP...**



Overview of the 5G spectrum auction

Subject of award

700 MHz FDD:	2x30 MHz (6 blocks of 2x5 MHz)
700 MHz SDL:	10 (+5) MHz (2 (+1) blocks of 5 MHz)
3.6 GHz:	380(+20) MHz (38 (+2) blocks of 10 MHz)
26 GHz:	1 000 MHz (5 blocks of 200 MHz)

Auction format

Principal stage:	Primary rounds in SCA format Supplementary round in SBA format
Assignment stage:	One round per band in SBA format

Electronic bidding supported by SPECURE

Whole bands 700 MHz FDD and 3.6 GHz awarded, while whole bands 700 MHz SDL and 26 GHz remained unawarded

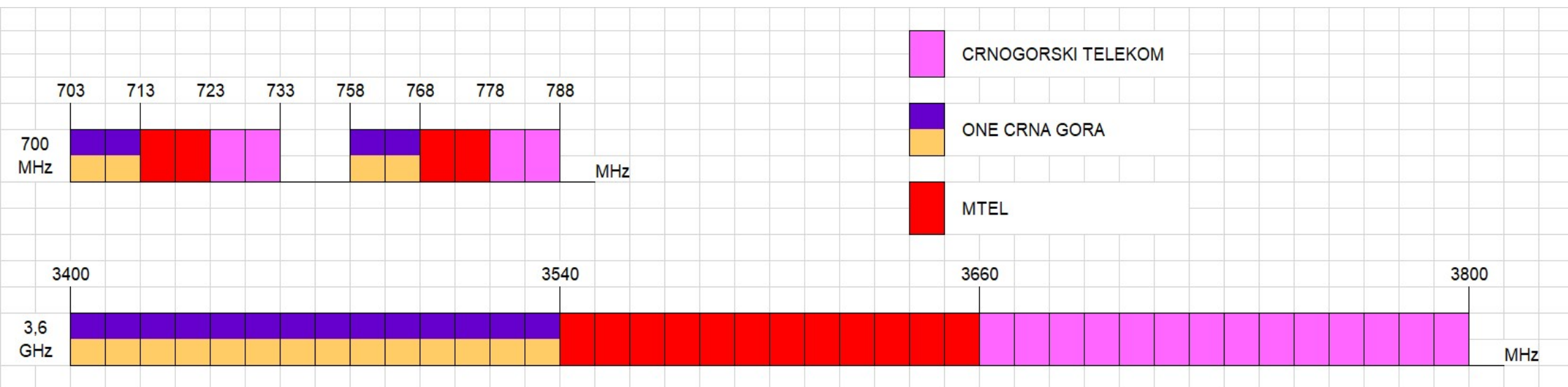
Public bidding procedure started on 26. October 2022

Spectrum auction conducted in the period 20-27. December 2022

Licences issued on 9. February 2023



Results of the 5G spectrum auction



- Total revenue: 8,836,146.00 €
- 1,086,146.00 € (14%) above reserve price for all awarded blocks
- Revenue from 700 MHz FDD: 4,192,142.00 €
- Revenue from 3.6 GHz: 4,644,004.00 €
- Unawarded blocks (reserve price): 640,000.00 €



Coverage requirements in 700 MHz and 3.6 GHz

By the end of 2024

700 MHz band

- ✓ At least 97% of the population (10/3 Mb/s)

3.6 GHz band

- ✓ 5G based on 3.6 GHz band in all cities

By the end of 2026

700 MHz band

- ✓ At least 98% of the population (10/3 Mb/s)
- ✓ Five selected uncovered rural areas
- ✓ At least 4G along all highways and intercity roads
- ✓ At least 4G in area of Skadar Lake (MNE part), Boka Bay and part of the territorial waters of MNE up to 1 nm from the coast

3.6 GHz band

- ✓ At least 75% of the population with at least 50% in each municipality (30/10 Mb/s)

By the end of 2030

700 MHz band

- ✓ At least 4G along all highways, intercity and regional roads
- ✓ At least 4G in parts of national parks with tourist infrastructure
- ✓ 5G in all populated areas
- ✓ 5G along all highways and intercity roads

3.6 GHz band

- ✓ At least 75% of the population with at least 50% in each municipality (100/30 Mb/s)



Strategy for development of 5G

- ❑ Adopted by Government of Montenegro on 3. August 2023
- ❑ Three groups of challenges identified:
 - Obstacles in construction of the 5G network infrastructure
 - Unawareness of 5G applications and benefits of them
 - Negative perception of the public regarding risks associated with 5G
- ❑ Three strategic objectives set:
 - Removing obstacles in construction of the 5G network infrastructure
 - Fostering 5G usage by individual users, industry and public sector
 - Objective information and education of the public regarding security in 5G networks and EMF exposure risks
- ❑ Eight operational goals set (ministries, EKIP, other institutions, operators...)



Status of 5G development in Montenegro

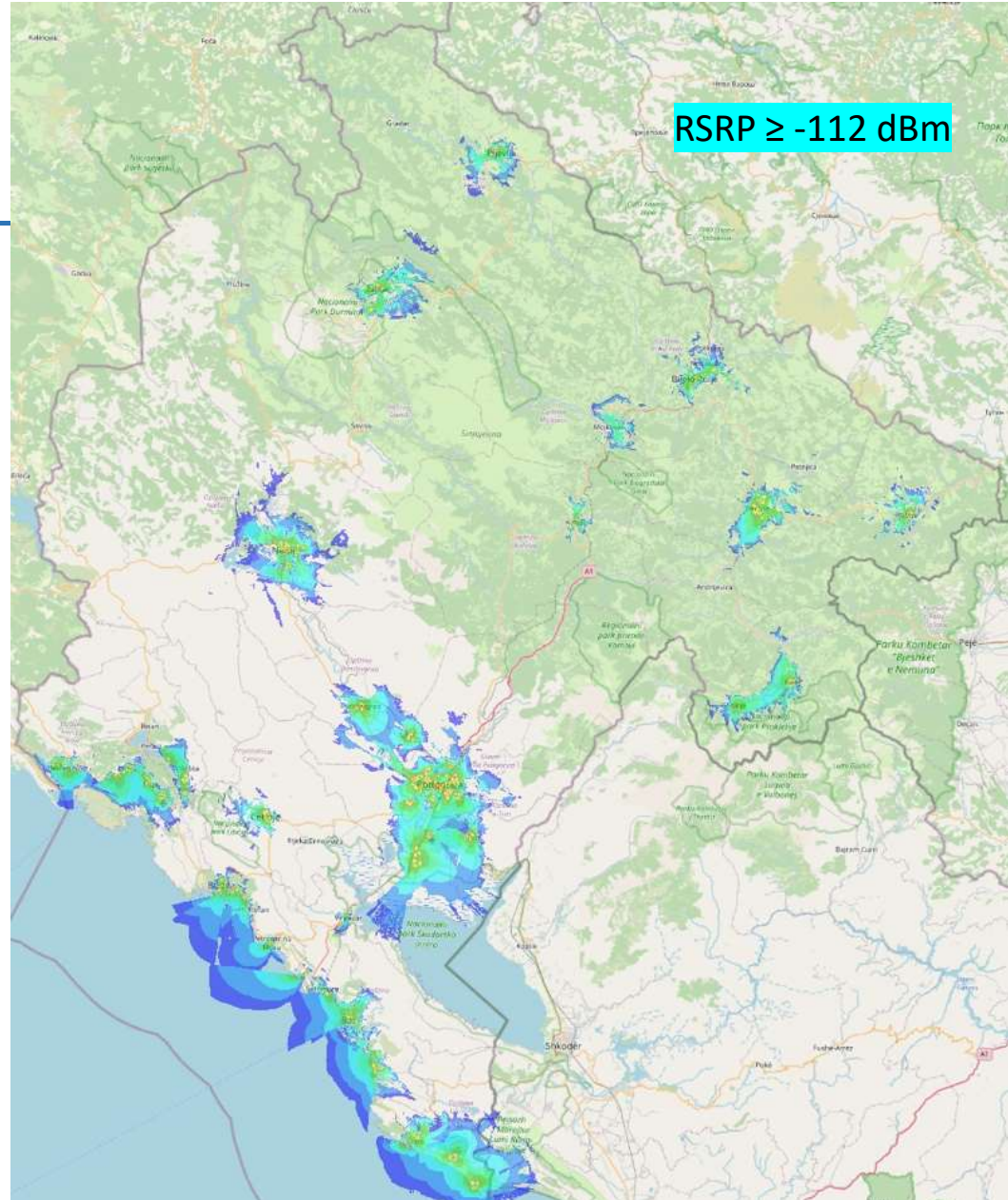
- 5G (DSS) services commercially available in networks of two MNOs from Q2-2022
- 5G based on 3.6 GHz band available from Q1-2023
- eMBB service with X * 100 Mb/s data rates (up to ~ 1 Gb/s)
- 5G (DSS) available in almost all municipalities (>100 e/gNB)
- 5G (based on 3.6 GHz) available in some urban locations in Podgorica, Bar, Budva, Herceg Novi, Kotor and Tivat
- 5G (DSS) available for >75% of total population
- No extra charge for 5G services
- 5G traffic increasing, penetration of 5G terminals still low





5G (DSS) coverage map

- ✓ 75.5% of population
- ✓ 21/25 municipalities
- ✓ 8.5% of territory
- ✓ > 100 e/gNB locations





Conclusions

- ❑ Activities on establishment and development of 5G ecosystem in Montenegro started in 2020 (Gov of MNE, MERT, EKIP) and going on...
- ❑ Availability of RF spectrum and regulatory and technical framework for usage of RF completed in Q1-2023
- ❑ 5G (based on DSS) available for 75% of population
- ❑ True 5G (based on 3.6 GHz band) available only in urban areas of Podgorica and seaside cities
- ❑ eMMB still only service offered
- ❑ Mobile operators obliged to provide 5G services for 75% of population by the end of 2026, and in all populated areas and main roads by the end of 2030
- ❑ 5G strategy should ensure further development of 5G in upcoming years
- ❑ **Synergy of regulator/policy makers, mobile operators, ICT sector, vertical industries and public sector needed to reach full potential of 5G**

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Thanks for your attention!!!

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