RADIO RESEARCH AND DEVELOPMENT INSTITUTE (NIIR)

ITU REGIONAL SEMINAR ON

5G IMPLEMENTATION IN EUROPE AND CIS

Strategies and Policies Enabling New Growth Opportunities

5G NETWORKS DEVELOPMENT IN THE RUSSIA: EXPERIENCE AND PLANS

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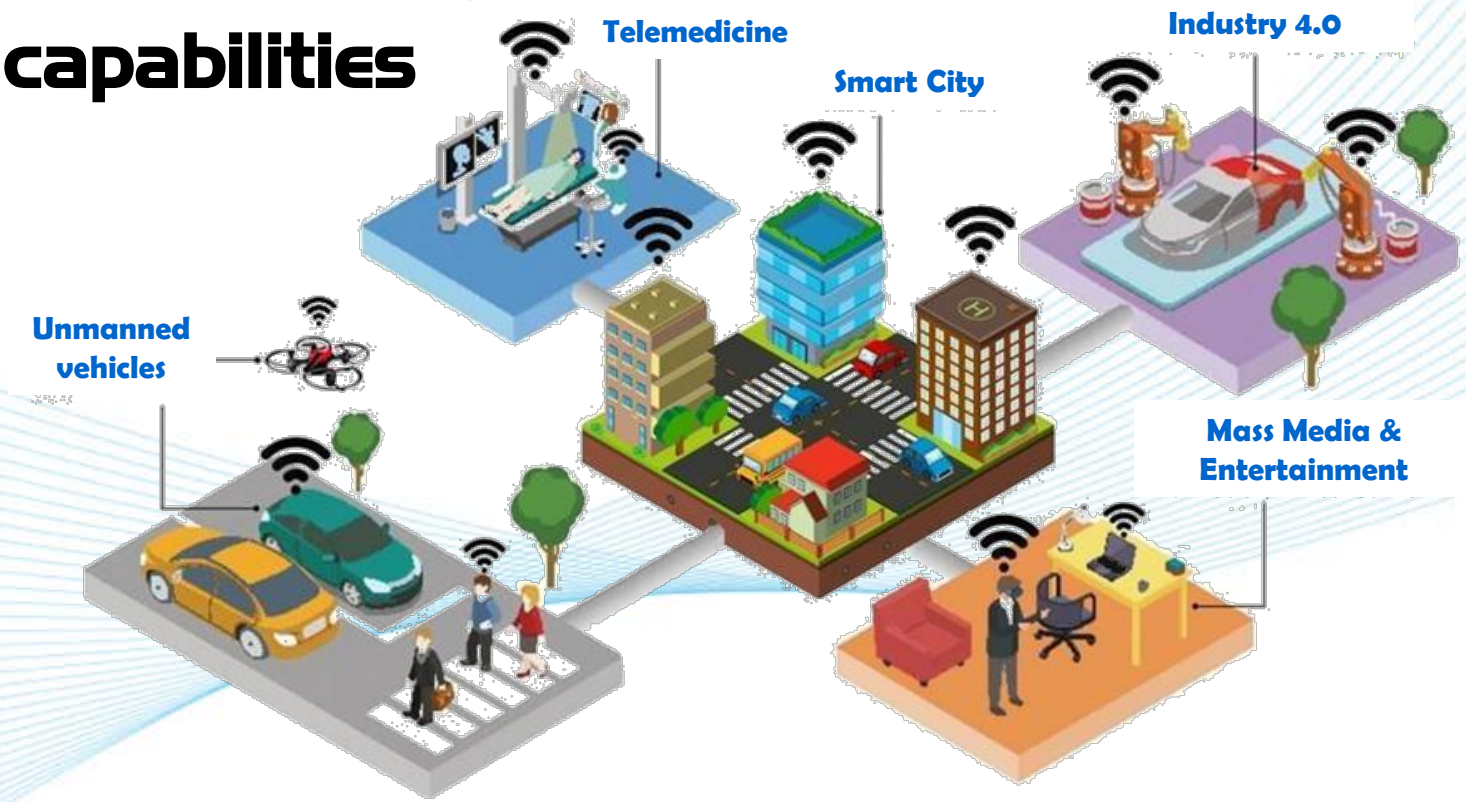
Budapest, Hungary, 3-5 July 2018.

DIGITALIZATION. INFRASTRUCTURE. TECHNOLOGIES.

5G network capabilities



INFORMATION INFRASTRUCTURE'S DEVELOPMENT

COMMUNICATION NETWORK, 5G, WIRED INTERNET

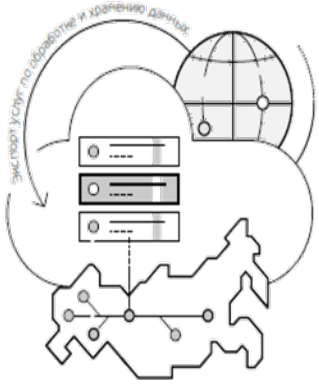
97% of households have broadband **access** to the internet

100% of the publicly significant objects should be connected to the Internet, including

- treatment-and-prophylactic institutions
- federal bodies of executive power
- regional authorities

Ensuring the covering by communication networks of **transport infrastructure facilities**, including federal highways

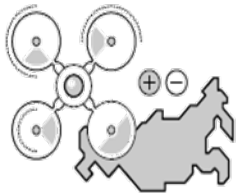
5G networks should **be implemented and work** in at least 5 economic sectors, and at least in 1 city with a population of more than 1 million people



DATA PROCESSING CENTER AND CLOUD STORAGE

- Creation of an infrastructure to ensure the data storage, processing, and usage within all federal districts of the Russian Federation
- Development of Russian certification system of the Datacenter to ensure the security of the data storage and processing infrastructure
- Creation of common state cloud platform
- Export of services for data processing and storing

GEODATA



Creation of state information systems using:

- common cartography database
- seamless multilayer data coverage

DIGITAL PLATFORMS

BIOMETRICS PLATFORM

INDUSTRIAL INTERNET PLATFORM

GEO DATA PLATFORM

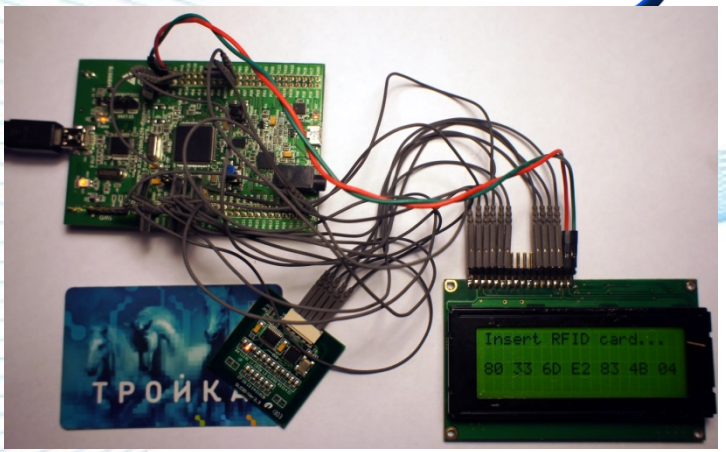
TEXT PROCESSING PLATFORM

- Implementation of digital platforms in economy key areas
- Development and implementation of a master data management system, incl. public authorities
- Creation of a common electronic cartographic basis and state information system

COMMUNICATION NETWORKS' DEVELOPMENT

IMPLEMENTATION OF 5G TECHNOLOGY IN MOBILE AND FIXED COMMUNICATION

COVERING BY SATELLITE COMMUNICATION



MACHINE-TO-MACHINE COMMUNICATION(M2M) AND LPWAN TECHNOLOGY IMPLEMENTATION

PERSONAL COMMUNICATIONS AND INTERNET ACCESS

ACTION PLAN

2018

List of telecom equipment for mobile and fixed radio 5G has been determined and an assessment of the national industry's capabilities for its producing has been done.

The Concept of creation and development of 5G/IMT-2020 networks in the Russian Federation.

The Concept of construction and development of narrowband wireless networks for IoT over the Russian Federation.

All state and municipal medical organizations have broadband access to the Internet.

2019

THE GENERAL SCHEME OF COMMUNICATION NETWORKS' DEVELOPMENT OF THE RUSSIAN FEDERATION FOR THE PERIOD 2018-2024.

The Concept and Technical requirements for covering the transport infrastructure by communication networks for data transmission systems.

Spectrum are determined (chosen) for the creation of 5G radio communication networks in Russia

A roadmap for implementing additional measures to stimulate the investment activity of operators for the communication networks' development.

A regulatory framework for creating a Wi-Fi network, including simplifying the procedure for registering access points with low power (up to 100 mW)

Pilot projects for the 5G communication networks' creation in 5 sectors of the economy (including at least 1 city with a population of more than 1 million people)

Necessary regulatory and legislative framework to ensure the 5G technology's usage in the Russian Federation have been adopted

2020

Pilot project for covering communication networks with the possibility of wireless data transmission of transport infrastructure's priority objects.

Pilot projects on the construction and implementation of narrowband wireless communication networks for IoT in key sectors of the economy.

LPWAN technology-based communication networks (using own technology) are deployed over priority objects of transport infrastructure.

10 399 settlements, having a population from 250 to 500 people, are provided with Internet access.

(within the framework of the project "Digital Gap Elimination from 2018 to 2020")

Radio spectrum for 5G communication networks is available for operators in Russia.

National frequency allocation table has been changed accordingly.

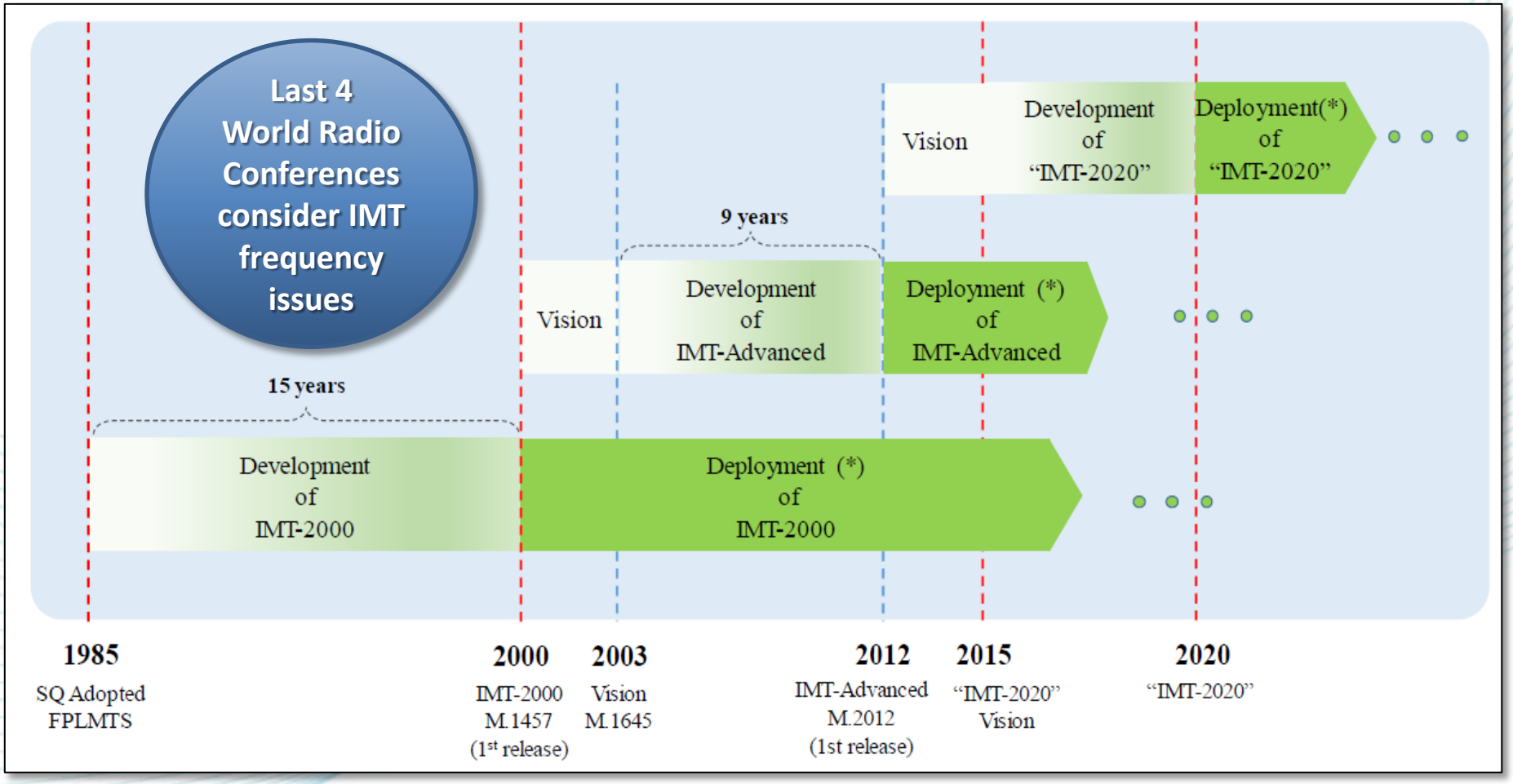
...2024

The government's bodies and local self-government have broadband access to the Internet network.

The transport infrastructure's priority objects are covered by communication networks.

The functionality of wireless data transmission as a key element of the development of modern intelligent logistics and transport technologies.

FREQUENCIES AND TECHNOLOGIES. HISTORY

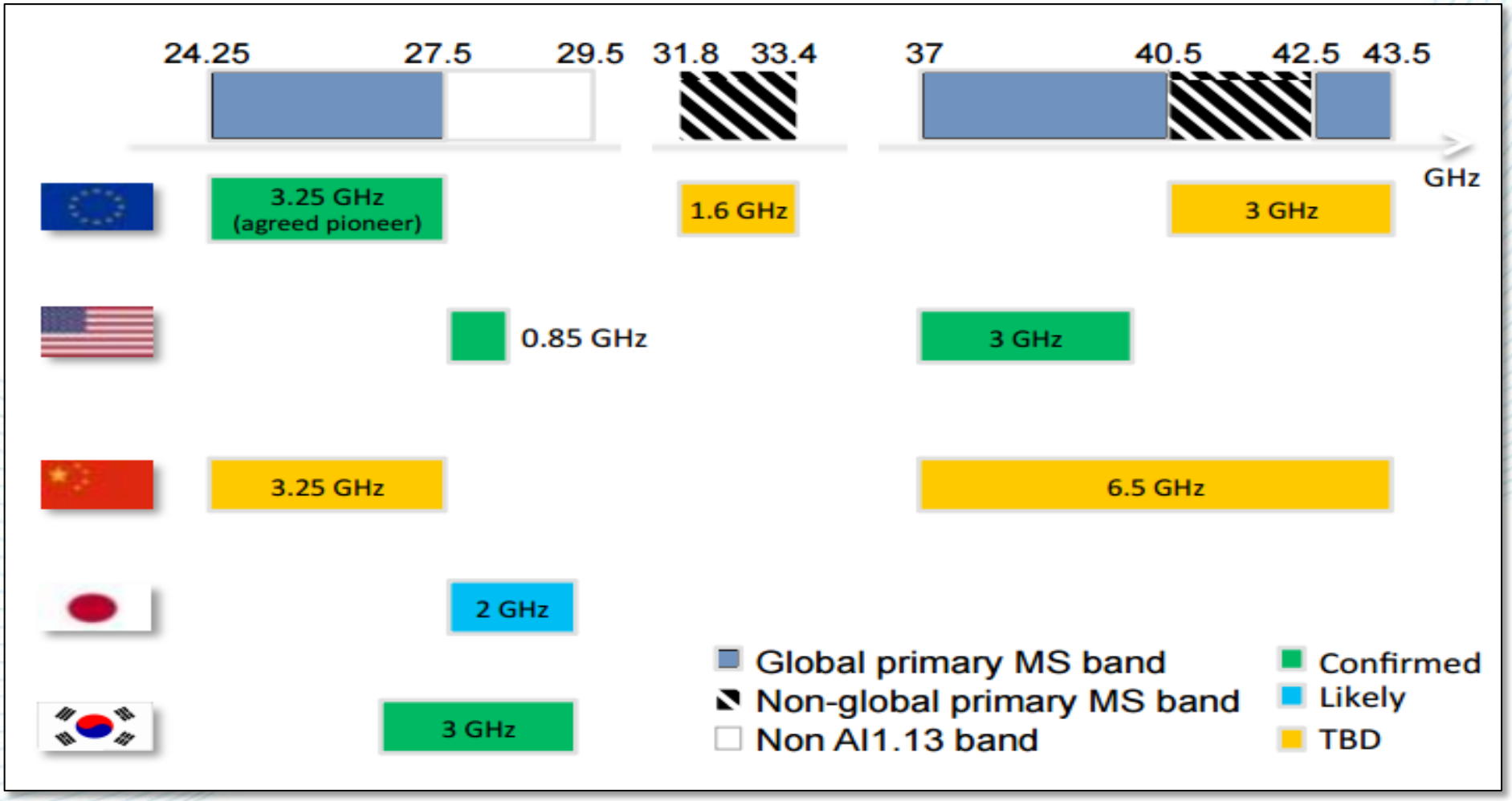


In the Radio Regulations, **more than 1500 MHz** as a total of radio frequency bands have been **identified for the application of IMT** in the range below 5 GHz.
35 frequencies plans are recommended within the identified radio frequency bands, which takes into account the features of spectrum use in various countries of the world.

RADIO FREQUENCY SPECTRUM FOR 5G (BELOW 6 GHZ)

5G technology	Frequency bands	View form Russia
LTE-Advanced Pro		
Broadband public access	Bands for IMT identified by WRC-15: • 694-790 MHz, 3400-3600 - practically globally • 3300 -3400 MHz – Asia and Africa regions • 3600 -3700 MHz – Europa, some Asian countries and partially in US • 3700-3800 MHz – Europa, some Asian countries	Problematic implementation in band 694 -790 MHz due to using by TV broadcasting. TV channels re-arrangements is required. Bands 3.3 – 3.4 GHz are used by different radiolocation systems. Bands 3.4 – 3.8 GHz are intensively used by FSS. Difficulty to share these bands with 5G
Specific application	NB-IoT: 450, 700, 800 and 900 MHz bands. LTE V2X: 3.5 and 5.9 GHz. LTE PPDR: 450 and 700 MHz	Currently, 450 and 900 MHz could be used in Russia for narrowband application, as well as 5.9 GHz. Implementation of broadband LTE based system in the 900 MHz band may be problematic
New Radio below 6 GHz		
	3400 – 3800 MHz – Europe and some Asian countries 4400 - 4500, 4500 - 4800, 4800 – 4990 MHz – some Asian countries	Russia consider possibility of implementation of New Radio in frequency bands 4400-4500 and 4800-4990 MHz. 5G systems may have a restriction in 4400-4500 MHz band. The 4500 - 4800 MHz band is used by Plan's FSS networks in accordance with RR. It not compatible with 5G systems. 5G in 4800-4990 MHz may be implemented without restrictions

NEW FREQUENCY BANDS (ABOVE 24 GHZ): PROSPECTS AND EXPECTATIONS



Radio frequency bands: **26.5-27.5 GHz, 37-43.5 GHz** will be identified most likely.
The **70/80 GHz** bands can also be agreed by WRC-19

RADIO FREQUENCY SPECTRUM FOR 5G (ABOVE 24 GHZ)

5G technology	Frequency bands	View form Russia
New Radio above 24 GHz		
	There are following bands under WRC-19 consideration : 24.25-27.5, 31.8-33.4, 37-40.5, 40.5-42.5, 42,5-43.5, 45.5-47, 47-47.2, 47.2-50.2, 50.4-52.6, 66-76 and 81-85 GHz	Russia considers bands 24,25 – 27,5 GHz for 5G implementation after establishing relevant condition by WRC-19 to protect existing systems. Compatibility problems aren't expected in 40.5-42.5 and 66-71 GHz with existing systems in Russia. Sharing and compatibility in the bands 31.8-33.4 GHz and 42.5-43.5 GHz seems to be unreachable. Other bands are used either radio-relay systems or different satellite services including passive which may be protected only with considerable restrictions on 5G.

5G ON THE MAP OF RUSSIA: TESTS AND PILOT PROJECTS

Ростелеком NOKIA

Launch of the first experimental zone 5G in **Skolkovo**

March 2018

Ростелеком ERICSSON ГОСУДАРСТВЕННЫЙ ЭРМИТАЖ The State Hermitage Museum

Experimental zone 5G on the territory of the General Staff of the **Hermitage**

May 2018

Ростелеком

Experimental zone of 5G network in **Innopolis**

May 2018

МТС ERICSSON

Testing of the prototype 5G in 14.5-15.3 GHz

April 2017

МЕГАФОН

License for 5G testing in 3.4-3.8 GHz and 24.25-29.5 GHz

July 2017

МТС NOKIA

ПThe first test of 5G is mobile data transfer

End of 2016

МЕГАФОН

The first live broadcast of a football match in VR format using 5G

July 2018

FIFA WORLD CUP RUSSIA 2018

CONCLUSION

- The new generation communication networks in general and networks based on 5G mobile communication technology in the mobile segment should become an infrastructural background for the digitalization of Russia (and the world) as the most relevant to current challenges and opportunities of the industrial business processes' transformation.

- The task of the digital transformation of infrastructure based on the latest innovations and technology, it is advisable to solve together with the maximum participation of private business.

- To implement it, it is planned to build and develop a new generation of communication networks, satisfying the needs of the industry and economy. In Russia, Such efforts will require a significant amount of radio frequency resources and complicated work to realize it.

- The maximum effective implementation of digital technologies in all sectors of the economy in the coming years should bring us increased competition, economic growth, lower prices for products and services.

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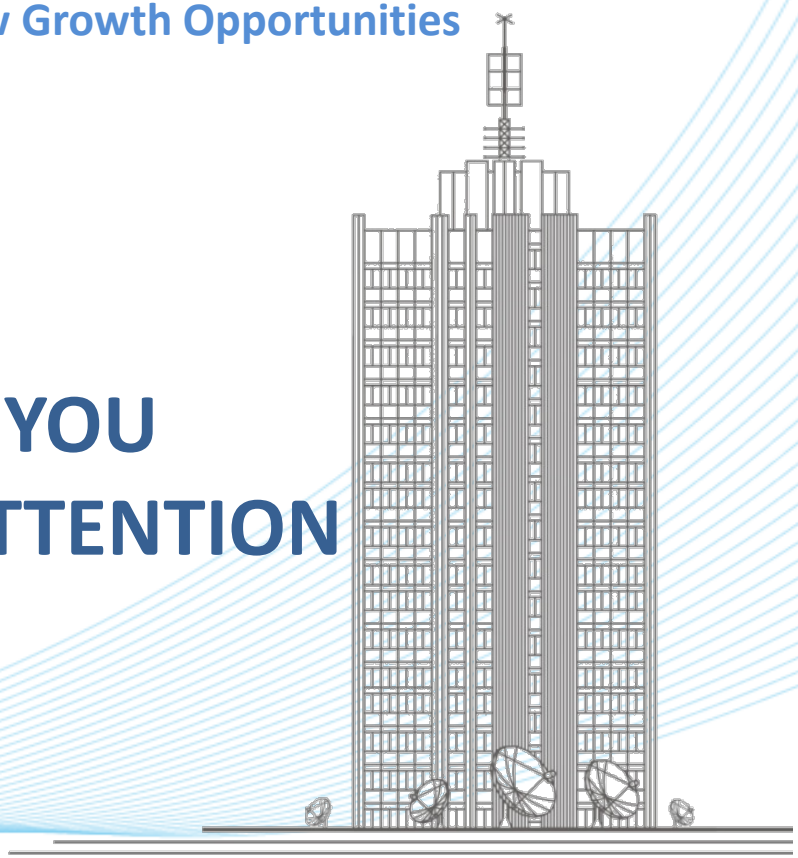

THANK YOU
FOR YOUR ATTENTION

Budapest, Hungary, 3-5 July 2018.