



OUTCOME REPORT



ITU Regional Forum for Europe on 5G strategies, policies and implementation 22-23 October 2020

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Final Version

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In addition, ITU would like to express their gratitude to **panel moderators** (Mr. Jaroslaw Ponder, Head of ITU Office for Europe, ITU; Dr. Vadym Kaptur, Vice-Chairman of ITU-D Study Group 1, and co-Rapporteur on ITU-D Question 1/1; Mr. Istvan Bozsoki, Head of Telecommunication Networks and Spectrum Management Division, ITU; and Mr. Witold Tomaszewski, Social Education Specialist, National Institute of Telecommunications, Republic of Poland) for ensuring an excellent flow of proceedings.

Finally, ITU thanks all members of the **Programme Committee** who made this event possible: to Mr. Jaroslaw Ponder, Head of ITU Office for Europe for organizing and chairing the conference; to Mr. Bilel Jamoussi, Chief of Study Groups Department, Telecommunication Standardization Bureau, ITU; to Mr. Uwe Lowenstein, Counsellor, Study Group 5, Radiocommunication Bureau, ITU; to Mr. Istvan Bozsoki, Head of Telecommunication Networks and Spectrum Management Division, ITU; to Mr. Aleksander Sołtysik, Head of Unit, International Telecommunications Policy Unit, Telecommunications Department The Chancellery of the Prime Minister, Republic of Poland; and to Mr. Rafał Bartoszewski, Specialist, International Telecommunications Policy Unit, Telecommunications Department, The Chancellery of the Prime Minister, Republic of Poland for valuable input in the preparation of the conference; to Mr. Iago Bojczuk Camargo, Junior Policy Analyst, ITU Office for Europe, who is co-editor of this report; and to Mr. Julian McNeill, ITU Consultant, ITU Office for Europe, who coordinated the delivery of this event and is co-editor of this report.

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1. INTRODUCTION

The “[ITU Regional Forum for Europe: 5G Strategies, Policies and Implementation](#)” was held online on 22nd and 23rd October 2020. The conference was organised by the International Telecommunication Union (ITU) with the support of the Chancellery of the Prime Minister (KPRM), Republic of Poland.

The Regional Forum for Europe was conducted by the ITU Office for Europe, within the context of the European Regional Initiative 1 approved by WTDC-17 on “Broadband Infrastructure, Broadcasting and Spectrum Management”. The event was also supported by the ITU-D Telecommunication Networks and Spectrum Management Division, as well as Chairs of ITU-T and ITU-R study groups.

The event provided an opportunity to address the status of implementation of 5G strategies across Europe and the key challenges surrounding 5G implementation. Key topics covered by the workshop included:

- Session 1: Regional 5G Strategies and policies
- Session 2: National 5G Strategies and policies in EU countries
- Session 3: National 5G Strategies and policies in non-EU countries
- Session 4: 5G implementation: Private sector developments and commercialization
- Session 5: 5G implementation: EMF and other challenges

The Regional Seminar’s main outcomes are outlined in this report, which structures the key points emerged during each session.

2. PARTICIPATION

The Forum mainly targeted national administrations, national regulatory authorities (NRAs), national health authorities, regional organisations and intergovernmental organizations, as well as regional and sub-regional industry associations and private sector players, representing both ITU Members and non-Members. Over 50 eminent speakers presented and discussed during the sessions. Details about the [agenda](#) and [speakers](#) as well as all [presentations](#) delivered, can be found on the event’s website¹.

Over 260 registered participants from more than 70 countries took part in the conference and an average of around 100 participants was online during each session. Participants included high-level representatives of administrations and national regulators from the ITU Europe region including, delegates from the Chancellery of the Prime Minister of the Republic of Poland and delegates from the German Presidency of the Council of the European Union as well as representatives of relevant international and regional organisations such as EaPeReg, BEREC, WHO, ICNIRP.

¹ https://itu.int/go/EUR_5G_20



Figure 1 - Virtual Group Photo

3. DOCUMENTATION

The Regional Seminar was held virtually. Relevant documentation, was made available in electronic form on the event webpage: https://itu.int/go/EUR_5G_20

The workshop was supported with **captioning** facility and the edited caption text will be made available soon event page. **Video recordings** of the workshop, as well as this outcome report, are also made available on the website.

4. OPENING ADDRESSES AND KEYNOTE SPEECH

Opening Ceremony Addresses – Day 1

In her opening speech, **Ms. Doreen Bogdan-Martin**, Director of the Telecommunication Development Bureau, ITU, welcomed delegates by recalling Europe region’s leading position in field of mobile communications. Ms. Bogdan-Martin then proceeded by drawing attention to the importance of collaborative regulation supporting the digital transformation, which has been and continues to be ever more important in the age of the COVID-19 pandemic. Ms. Bogdan-Martin then proceeded to reiterating ITU’s commitment to making sure that digital technologies are leveraged to reduce the digital divide, further increased by the pandemic. In this context, 5G can create concrete benefits for industry and society and it must be ensured that no space is left for creating new divides. The Director also pointed at ITU’s recent study “Connecting Humanity” estimating that 33 billion USD are needed to connect the unconnected in the region by 2030, a figure that may be even higher considering the rapid expansion of 5G. Finally, Ms. Bogdan-Martin congratulated the Government of Poland for achievements in the field of 5G and for continued collaboration with the ITU and thanked the European Commission, BEREC, the Eastern Partnership and CEPT for their engagement with ITU.

Following Ms. Bogdan-Martin’s speech, **H.E. Mr. Marek Zagórski**, Secretary of State Government Plenipotentiary for Cybersecurity, Chancellery of the Prime Minister (KPRM), Republic of Poland, addressed the audience remarking these times of challenge also carry great opportunity to learn lessons for the future, one of which is the fundamental importance of connectivity. In this context, H.E. also mentioned how connecting the unconnected to bridge the digital divide is one of the most important SDGs to achieve across the globe. The Secretary of State then pointed at the achievements of the Polish government in this area, with particular attention connected schools and broad infrastructure availability. H.E. also reminded that implementing 5G is important for the economy and to achieve an Internet Society by 2025. Finally, the Secretary of State recognized the importance of collaboration among various stakeholders at the international level in implementation of 5G and officially opened the Regional Forum.

Keynote Speech – Day 2

Representing the Body of European Regulators for Electronic Communications, 2020 BEREC Vice-Chair, **Mr. Jeremy Godfrey**, focused the speech on 5G in a post-COVID world recalling the importance of connectivity and resilience of telecommunication networks as well as the equally important resilience of policymakers in addressing the challenges posed by shocks. In this context, Mr. Godfrey then proceeded in remarking that the focus should be on coverage and on making broadband universally available as this is socially and economically determinant in terms of inclusion. Secondly, BEREC Vice-Chair recalled that data is driving businesses both in terms of efficiency and sustainability

and just as it happened with 3G, devices will be critical to drive innovation in services that can create a virtuous circle in 5G.

Turning in particular to 5G, while spectrum is being made available, BEREC has identified a number of issues such as wholesale access to networks, adequate backhaul or numbering among which EMF disinformation stands out. Moreover, market failures, particularly in the 26 GHz band and creation of the business case for 5G may be handled by governments in three main ways, said Mr. Godfrey: i) either by accepting the slow pace of change, as done with 3G, ii) by funding a continent-wide deployment of small cells which would give clarity to the market, or iii) work on demand by focusing on smart cities or other public sector applications of 5G. Finally, Mr. Godfrey concluded by drawing attention to BEREC's three main activities in field of 5G, namely sharing the BEREC inventory on 5G issues, sharing 5G experiences amongst regulatory authorities, and collaborating with other stakeholders on how to deal with misinformation about the EMF health effects.

5. SETTING THE CONTEXT

Speakers: [Presentation 1](#), Dr. Bilel Jamoussi, Chief of Study Groups Department, Telecommunication Standardization Bureau, ITU; [Presentation 2](#), Mr. Uwe Lowenstein, Counsellor, Study Group 5, Radiocommunication Bureau, ITU; [Presentation 3](#), Mr. Jaroslaw Ponder, Head of ITU Regional Office for Europe, ITU

Key points:

- Discussions with industry executives undertaken within the ITU Telecommunication Standardization Bureau have highlighted that while enhanced mobile broadband can be achieved by industry, the other two characteristics of 5G, namely massive machine-type communication and ultralow latency, require more fundamental pieces of technology to be integrated in the network.
- Chief Technology Officers of the industry engaging with the ITU, highlighted the importance of real time network monitoring, artificial intelligence, machine learning, automation that will form the foundation of self-driving networks, the optimization of network management and orchestration.
- Almost 5 years ago, a focus group on 5G was established to analyse how 5G technologies would interact in future networks and this has led to a number of standards published by ITU among which are some pertaining to network programming, slicing and fixed/mobile convergence.
- One of the important factors underpinning 5G deployment is the importance of having a robust fibre optic infrastructure and innovation in fronthaul and backhaul, especially when it comes to ensuring ultralow latency.

- Challenges which may slow implementation of 5G are security concerns which may become exponentially higher in an environment of IoT devices, EMF which is being addressed in Study Group 5 and, finally, the quality of service.
- From the perspective of radiocommunications, the IMT-2020 (or 5G) process is split in two parts, the radio interface standardization process detailing technical performance requirements and the IMT-2020 spectrum allocation process detailing the physical frequency availability.
- The World Radiocommunication Conference 2019 (WRC-19) identified additional 17.25 GHz of spectrum available in the future for 5G, with other bands in the range between 4 and 20 GHz, currently not covered by bands made available for 5G. Looking forward, WRC-23 also decided to study and identify frequencies for new components of 5G as it will require new components, such as for example high altitude platforms.
- The 700 MHz and 3.6 GHz band are already available in many EU countries supported by regulatory measures at the European Commission and CEPT levels. This allows operators to address universal coverage in rural areas and in urban areas with commercial deployments already under way. Moreover, in case of hot spots coverage and fixed wireless access applications the 26 GHz band will come into play and in the future the 40 and 66 GHz band will also be discussed
- At the level of Europe region, covering 46 countries, there are many actions being undertaken by ITU in the context of the Regional initiative 1 on broadband infrastructure, broadcasting and spectrum management, which includes 5G. As part of this effort, ITU developed a series of 5G country profiles in non-EU countries seeking to draw the attention to the 5G implementation dynamics in these countries.
- The research shows that non-EU countries of Europe over the past 10 years have substantially reduced the gaps with the region average in I) percentage of the population with internet access (82.47% in 2019), II) number of mobile broadband subscriptions per 100 inhabitants (77.89 in 2019) and III) in percentage of population covered by 4G/LTE services (91.92% in 2019).
- In terms of 5G implementation, 12 out of the 18 countries have held 5G consultations, 10 have adopted ad hoc 5G strategies or included specific provisions in national broadband plans, and 7 have already allocated frequencies in the bands identifies for 5G. An area of particular attention in the region is that of the Western Balkans, composed by Albania, Bosnia & Herzegovina, Montenegro, North Macedonia and Serbia, where governments and regulators are working to towards the deployment of 5G.
- Another element analysed in the country profiles is the challenge posed by concerns around exposure to radio frequency electromagnetic fields (EMF). At least 8 countries follow the precautionary principle and adopted emission limits that are more restrictive than those recommended by ICNIRP and IEEE. Countries such as the UK, Serbia or Poland have taken a variety of actions to proactively address the concerns of the general public. In recognition of this challenge, ITU has developed a background paper titled "[Implementing 5G for Good: does](#)

[EMF matter?](#)” which has benefitted of inputs from all three sectors and seeks to provide a reference to all scientific evidence and recommendations as well as outline the key challenges surrounding the matter.

- Finally, studies have addressed the commercial aspect of 5G by focusing on trials, commercial launches. While in all 18 countries, 5G trials are being undertaken by operators, notable examples are digital-liechtenstein and the 5GTR Forum in Turkey. Another relevant case for international cooperation focusing on private sector dynamics is the [5G Techritory Forum](#) (11-12 November) within the framework of the Nordic-Baltic cooperation.

6. CONFERENCE SESSIONS

SESSION 1: REGIONAL 5G STRATEGIES AND POLICIES

Focus: Presenting the regional 5G landscape from the perspectives of the European Union and other regional and sub-regional organisations as well as regional industry associations from the broadcasting, satellite and mobile sectors.

Moderator: Mr. Jaroslaw Ponder, Head of ITU Office for Europe, ITU

Setting the Context - Presidency of the Council of the European Union: [Presentation](#), Mr. Wolfgang Crasemann, Head of Division, International Digital and Postal Policy, G7 and G20, Federal Ministry for Economic Affairs and Energy, Germany (on behalf of the Presidency of the Council of the European Union);

Speakers: [Presentation 1](#), Mr. Antonio Arcidiacono, Director of Technology and Innovation, European Broadcasting Union (EBU); [Presentation 2](#), Mr. Karol Krzywicki, EaPeReg Chair 2020, Eastern Partnership & Deputy President, Office of Electronic Communications (UKE), Poland; [Presentation 3](#), Mr. Morten Friis Møller, Senior Advisor and team leader on Digital Governance, Nordic Council of Ministers; [Presentation 4](#), Mr. Neils Kalnins, Director of Business Development, 5G Techritory & Office of Electronic Communications; [Presentation 5](#), Ms. Lise Fuhr, Director General, European Telecommunications Network Operators' Association (ETNO); [Presentation 6](#), Mr. Daniel Pataki, Vice President, Policy and Regulation & Head of Europe, Russia and CIS, GSMA; [Presentation 7](#), Mr. Luc Hindryckx, Director General, European Competitive Telecommunications Association (ECTA); [Presentation 8](#), Mr. Alberto Di Felice, Director for Infrastructure, Privacy and Security, DIGITALEUROPE; [Presentation 9](#), Ms. Aarti Holla-Maini, Secretary General, EMEA Satellite Operators Association (ESOA).

Key points:

- One of the priorities of the Presidency of the Council of the European Union has been the expansion toward an European digital sovereignty. At the moment, the region has a dependency on infrastructure and telecom services from stakeholders from countries out of the European region.

- Many rules and other ongoing topics such as privacy and data protection often slow down the deployment of new networks as compliance, regulation, and adequacy takes time to effectively implement them. Despite the fact that the region has a strong and competitive private telecom sector, coordinated regulation among European countries is key to deploying new technologies.
- Private telecom operators continue to focus their investment in mostly urban and well-populated areas while rural areas still lack telecommunication infrastructure, given that the latter often do not offer operators significant financial return. In Germany, the Federal Ministry for Economy Affairs and Energy has tried to impose coverage obligations for operators through the licensing process; however, the overall obligations did not cause significant change.
- European Broadcasting Union has been very active in proposing media-related solutions for 5G usage in regard to production and distribution of media content. In other words, 5G networks are set to enhance linear and nonlinear media across a variety of devices in a global market, which will require new deployment models for production, contribution and distribution that may rely on a more collaborative 5G infrastructure.
- Newsgathering, outdoor broadcasting, non-public networks, cloud production processes are some of the media-related activities to be impacted by 5G. For a seamless integration of 5G with the media, it is critical that involved parties ensure 5G meets the requirements defined by the media industry (e.g. engagement in 3GPP standardization), assess the business and deployment models, and enable the market for a successful implementation.
- The costs associated with 5G—as a multilayer support for IP distribution—and the power consumption required for the networks can be optimized by combining cellular base stations with broadcasting towers, covered by a satellite overlay. This may guarantee almost 100% of area coverage of a given territory.
- EaPeReg's signing of the regional spectrum agreement (RSA) plays an important role for 5G development in the member countries. RSA, in compliance with the EU recommendations, lays the foundations for coordinated release and reassignments of spectrum and next to the coordination of the 5G networks in the Eastern Partnership. The RSA is an expression of EaPeReg's willingness and readiness for 5G rollout, especially concerning the implementation of the technologies with the new standards and agreements.
- EaPeReg also reiterated the importance of making modifications to the frequency allocated to broadcasting services. It has done work to support the co-existence of systems operating in these frequencies 5G networks. Moreover, there is also the need of further expanding a cross-border coordination of the 700 MHz band, which is a political challenge in the region.
- EaPeReg also underscored the need to establish, on the basis of bilateral agreements, the use of C-band by taking into account the radio and other pre-existing regulations. Some of the

issues and challenges are being addressed in a document that EaPeReg is preparing for the relevant bodies in the member countries.

- The Nordic Council of Ministers has conducted a regional SWOT analysis and found out that all the member states are featuring 5G tests activated led by different driving forces. As of October 2020, there are at least 50 test beds with 5G or 4G operating in a variety of verticals such as manufacturing, fisheries, transportation, etc in the Nordic-Baltic region. Plus, there are several local 5G initiatives emerging from municipalities, universities, and industries (small to medium-sized enterprises), many with some level of relationship to socioeconomic and environmental sustainability.
- Some of the weaknesses identified by the Nordic Council of Ministers include the fact there is very little cross-regional collaboration on 5G—with countries tending to prioritize their national agenda with their own verticals. Moreover, the Council also identified that 5G revenue could cannibalize 4G investment, and that there are countries such as China, South Korea, and the United States that are investing more in 5G-related research and development.
- The three actions that the Nordic Council of Ministers emphasize for the next steps in the 5G development in the Nordic-Baltic region include: building a regional 5G ecosystem by supporting the 5G testing and facilitating policy dialogues with stakeholders from the ICT industry; develop monitoring and benchmarking tools; II) monitoring and benchmarking 5G rollout by providing analytical tools identifying driving forces and digital divides; III) promote regional 5G innovations by showing case innovations, best practices, and business models.
- ETNO's members represent 70% of the investment in telecom infrastructure in Europe. 5G requires a broader societal understanding for a clearer assessment of how its rollout is connected with issues pertinent not only to socioeconomic development, but also the environment. Alongside the deployment of 5G antennas, it is also necessary to consider the investment in fibre.
- ETNO believes that 5G also needs to be seen as a value creator and enabler of other emerging technologies such as robotics, internet of Things (IoT), remote control, virtual reality (VR), and so forth. At the moment ETNO is holding a series of workshops called "5G User Forums" that are aimed at illustrating the key applications of 5G and infrastructure to areas such as health care and transportation.
- By 2025, it is expected that Europe will have around 538 million 5G connections, while the American region will have around 642 million, and the Asia-Pacific Region will have about 1.7 billion. In terms of IoT, an ETNO report shows that IoT connections will jump from 95 million active connections in 2017 to a forecast of 740 million in 2026, with automation being the most advanced sector.
- ETNO believes that a regional 5G strategy must be forward looking, comprehensive, democratic, and informational. It also must recognize the sheer scale of the benefits 5G will

bring to the economy and overall society, while also addressing public concerns such as the ones surrounding EMF exposure and misinformation.

- Electronic Communications Office of Latvia (ECO) emphasized the work of the being done through the 5G Techritory Forum. ECO highlighted that a successful 5G rollout is not only a matter of spectrum. Instead, 5G deployment requires a cross-border, cross-sector and cross-level cooperation, which is the foundation of the work done by the 5G Techritory Forum as a platform for stakeholders in the region.
- ECO underscored the importance of pursuing practical cooperation between universities and other stakeholders, rather than solely focusing on high-level government-led agreements. An example of this work has been the recently established collaboration through the Nordic-Baltic 5G Partnership Platform, which requires a somewhat harmonized 5G strategy—given that the countries are small, and the market is well fragmented.
- One of the planned outcomes includes Digital Baltic Road. The project aims to connect the main Latvian, Estonian, and Finnish transport logistics corridors, synchronizing C-ITS (Corporate-Intelligent Transport Systems) operations and data exchange. That way, it is planned to optimize international logistics, mainly for large scale transport and production companies to improve their supply chain management. Other work on digital sea is currently underway.
- COVID-19 has impacted the way that the telecom industry is perceived by governments, showing that it not only is important but also essential from now onwards. Moreover, studies show that digital transformation can add up to 1.21.% of GDP growth in the European region, which foresees significant growth by 2030 that is yet to be greatly impacted by the development of 5G.
- In addition to the “connect everyone” objective that has been sought by regulators in the region, there is also a growing need now to “connect everything.” However, in so doing, it will require new ways to store data, and 5G will present stakeholders with a great potential for that—which will also require a keen balance between doing it efficiently while maintaining values and regulatory measures. In that sense, there are three areas that deserve further engagement on the side of policy makers: investment gap/capital incentive; challenge of data/digital sovereignty; and the issue of cybersecurity, which is a problem of today and the future.
- GSMA also reiterated the importance of making spectrum available at the right price and do not let free riders get that spectrum and making the 5G rollout easier by removing certain administrative burdens.
- European Competitive Telecommunications Association (ECTA) shows that fixed and mobile, investment reached 10.4 billion EUR by French telecom operators. Moreover, ECTA suggests that it is crucial that the private and public sectors take into account the experiences gained through the 4G rollout when planning the steps needed for 5G deployment (e.g. auctions in

France in April 2013 with NRA authorizing Bouygues Telecom to deploy 4G in 900 and 1800 MHz bands, which accelerated the 4G race).

- ECTA stated that stakeholders should not take competition for granted. More than ever, it is important to remain vigilant so that incentives for oligopolies and monopolies are cultivated. Policy makers must also ensure that competitive players remain part of the market share. Within the next years, it is expected that stakeholders will see a change in business approach, which will be characterized by a stronger focus on users across all industries and sectors— from start-ups to established conglomerates.
- There are important areas to help foster this new environment. In addition to fostering competition, non-discriminatory access to shared networks and co-investment agreements, as well as RAN sharing can serve as a strategy for accelerating the deployment. Additionally, a re-evaluation of access recommendations as well as the review of the cost reduction directive (Directive 2014/61/EU) can be done on the legislative side.
- In the context of the COVID-19 pandemic, the rollout of 5G is a crucial element of ensuring ubiquitous connectivity not only for consumers but precisely for economic recover—which will likely shape new business' relationships to other enterprises as they transition to more circular and sustainable economic models. 20.7% of 5G spectrum have been assigned throughout the EU. Particularly, while two thirds of EU countries have not assigned mid-band spectrum whereas South Korea, China and other Asian countries allocated 3.5 GHz bands starting in June of 2018.
- DIGITALEUROPE highlighted that that Member States shall proceed swiftly in ensuring harmonized spectrum availability for the bands identified, guaranteeing that there is no additional delays beyond those caused by the COVID-19 pandemic. In that sense, auction formats shall incentivize quick network rollout with ambitious coverage targets over inflated short-term revenue for the state.
- DIGITALEUROPE also points to the need to encouraging interoperable standards as an important vehicle to enable a broad range of use cases with positive spill-over effects in other network industries such as transport, energy, etc. Other challenges include security of networked applications, fact-based positions on EMF, and the need to deploy sustainable very high-capacity networks to contribute to the new EU climate objectives.
- About 3% of the European population remain unconnected, which corresponds to 6 million households. As the example of many countries have shown that rolling out fibre is cost-prohibitive (e.g. costing about 2,700 EUR per household). Factors such as economics (especially after COVID-19), inclusion, resilience, climate/environment, access to information, and secure communications underscore the growing of role of satellites in the present day and in the foreseeable future with the rollout of 5G.
- According to ESOA, satellite is providing pan-EU availability today and the rates are maximum 50 Mbps, while 100 Mbps is coming in late 2020/ early 2021 at competitive prices. Therefore,

ESOA stated that there will never be a one-size-fits-all solution and there is a very high-risk of a 5G divide. Ultimately, when it comes to rolling out 5G or 4G, closing the digital divide is not a question of spectrum but economics.

- 3GPP based on IoT/mMTC market is an important target for satellite services. In August 2020, Inmarsat & MediaTek trial confirmed the compatibility of existing terrestrial NB-IoT chipsets with geostationary satellites. A few months later, thanks to a partnership between the European Space Agency, O2 launched the first commercial 5G satellite lab in the UK to test autonomous vehicles in October 2020. Darwin SatCom Lab is open to companies to explore the next generation connectivity solutions for connected and autonomous vehicles (CAVs) using 5G and satcoms.
- ESOA recently started a cooperation with MGMN in 3GPP and beyond. MGMN assessed satellite performance for the following verticals: NGSO & GEO Direct Access for land Mobile, Pedestrian & Community WiFi; GEO for IoT; LEO Cellular Support for Community WiFi & Cellular Backhaul; Ku-Band GEO HTS for Maritime; and GEO HTS for Connected Cars. ESOA also highlighted the role of the 2018-2020 “Satellite for 5G Initiative,” which encompass harmonized 5G tests with the EC Action Plan shall aim to be integrated within the wider trial roadmap facilitated by the 5G Infrastructure Association.

Questions or Comments:

Comment from Mr. Graham MacDonald (Apple):

“5G is vital and important - no question - but there needs to be greater awareness/recognition on the importance of access to licence-exempt mid-band spectrum; 5G needs to be seen as broader than just one new air interface (IMT-2020) as noted by the GSMA. There are over 110 participants on this workshop and I would assume everyone is using Wi-Fi right now. It is important to ensure that access to new mid-band spectrum is available for Wi-Fi (and WAS/RLAN in general). It is therefore surprising that importance of Wi-Fi and access to new licence-exempt mid-band spectrum seems to be largely ignored in the future broader connectivity vision”

Comment from Ms. Aarti Holla-Maini (ESOA):

“I invite participants to read ESOA’s updated 5G brochure: <https://www.esoa.net/cms-data/positions/2202%20ESOA%205G%20Ecosystems%20LONG%20Final.pdf>”

SESSION 2: NATIONAL 5G STRATEGIES AND POLICIES IN EU COUNTRIES

Focus: Status of implementation of national 5G strategies in EU countries: challenges and opportunities

Moderator: Dr. Vadym Kaptur, Vice-Chairman of ITU-D Study Group 1, and co-Rapporteur on ITU-D Question 1/1

Setting the context: [Presentation](#), Mr. Frédéric Pujol, Head of Wireless technologies and spectrum, IDATE & focal point for the 5G Observatory

Speakers: [Presentation 1](#), Dr. Stelios Himonas, Permanent Secretary, Deputy Ministry of Research, Innovation and Digital Policy, Cyprus; [Presentation 2](#), Mr. Jeremy Godfrey, Commissioner, Commission for Communications Regulation, Ireland; [Presentation 3](#), Mr. Antonio Fernández-Paniagua Díaz-Flores, Deputy Director, Radio Spectrum Planning and Management, State Secretary of Telecommunications and Digital Infrastructure, Ministry of Economic Affairs and Digital Transformation, Spain; [Presentation 4](#), Mr. Darius Stravinskas, Adviser to the Minister, Ministry of Transport and Communications of the Republic of Lithuania; [Presentation 5](#), Mr. Domink Kopera, Acting Deputy Director in Telecommunications Department, Chancellery of the Prime Minister, Republic of Poland; [Presentation 6](#), Mr. Vilem Vesely, Deputy Director, Electronic Communications Department, Ministry of Industry and Trade, Czech Republic; [Presentation 7](#), Mr. Wolfgang Crasemann, Head of Division, International Digital and Postal Policy, G7 and G20, Federal Ministry for Economic Affairs and Energy, Germany; [Presentation 8](#), Mr. Ioannis Neokosmidis, CEO, INCITES consulting;

Key points

- The 5G Observatory files a 5G scoreboard for EU-27 + UK which, as of September 2019, has identified 199 5G trials, 282 future 5G-enabled cities, and 12 5G cross-border corridors. Moreover, 13 countries have published a national 5G roadmap and 26.4% of spectrum for IMT-2020 has been assigned throughout countries, up from 14.2% in June 2019.
- With regards to commercial launches 18 member states plus the UK enjoy 5G commercial services which have been launched over the past two years. Notably, in its 5G action plan, the European Commission seeks to launch 5G services in all member states by 2020.
- As there is no 5G killer app in the market, it is too early to define its development which most probably will be country specific. At the moment it is driven by demand of higher speeds or throughput, by eMBB services such as AR/VR, gaming or education, or by services the demand for which has been increasing due to the pandemic such as e-health
- In general, COVID-19 has delayed auctions in a number of countries, and has temporarily frozen relevant standardization work such as Release 16, with Release 17 likely to be postponed as well. Finally, deployments and investments were also delayed by the pandemic.
- Poland's National Broadband Plan determines that the country shall provide access for all places that are the main drivers of socio-economic development with high-speed Internet activity by the end of 2025. Therefore, stimulating the demand for fast access services to the internet through new services and commercial opportunities for the population is crucial.

- One area of focus in the regulatory context in Poland has to do with investment barriers suppression. In fact, a large part of investment barriers stem from legal regulations, thus blocking the development of broadband networks in the country. Barriers of this type are often the most important obstacle to the construction of the networks.
- Besides creating the institutional and legal environment for the timely implementation of the 5G network in Poland, the government recognizes the importance of the implementation of the 5G network, thus allowing the use of 5G pioneer bands in a timely manner. Along these lines, the Government of Poland is currently working on issues related to EMF and its very stringing EMF limits in the context of 5G. In particular, the country produced an [EMF White Paper](#), and plans to continue its annual international conference on 5G, EMF, and health.
- In March 2020, the Deputy Ministry of Research, Innovation and Digital Policy of Cyprus launched its strategy on Digital Policy with the goal to build a knowledge -based, digital economy and society, supported by modern, efficient and reliable structures, and driven by research, innovation and technological advancement, as enablers of: sustainable economic growth; social prosperity; and international competitiveness. Cyprus’s Digital Policy document has four main pillars: I) e-government and digital public services; II) electronic communications (e.g. boost of broadband infrastructure, satellite communications, etc.); III) enablers (e.g. AI, blockchain as well as digital skills, etc.): and IV) cybersecurity.
- In particular, 5G auction was announced in July 2020 for: Total of 460 MHz in the 700 MHz and 3.6 GHz bands; 6 lots (2x5MHz) in the 700 MHz band and 8 lots (50MHz) in the 3.6 GHz band; and a spectrum cap of 2x10MHz - 700 MHz band and 100MHz - 3.6 GHz band. By the end of January 2021, the government plans to grant 5G licenses to operators.
- Cyprus follows the recommendations of the competent international organizations (WHO, ICNIRP, European Parliament, etc.). The country recently co-signed a letter to the EU proposing to create a communication strategy that provides reliable information related to EMF. Other departments are working together to set national EMF exposure limits and other infrastructure issues related to 5G.
- Cyprus’ ICT strategic objectives for 2025 include I) fostering Gigabit connectivity for all main socio-economic drivers; II) All premises in organized communities to have access to Internet connectivity offering a download speed of speed of ≥ 100 Mbps (upgradable to 1 Gbps); III) 100% of the population & all major terrestrial transport paths to have uninterrupted 5G coverage with a download speed of ≥ 100 Mbps; and IV) 70% of households to have an internet connection (take-up) with a download speed of ≥ 100 Mbps.
- Ireland assigned the 3.6 GHz band in 2017, being the first EU member state to assign this band on a service and technology neutral basis. The Commission for Communications Regulation (COMREG) foresaw two quite different uses being made of the band: one was for fixed wireless access in rural area, as the country’s population in rural areas is significant. All three existing MNOs acquired spectrum, nationally, both urban and rurally. One the large of the rural broadband companies acquired just rural spectrum.

- In February 2020, 700 MHz was cleared from broadcasting. Ireland managed to re-purpose that spectrum within about six weeks of being vacated by the broadcasters and now is used in the country for 4G coverage and capacity. Moreover, some of the operators in Ireland had fairly recently deployed base stations for 800 megahertz and 900 megahertz that allowed Dynamic Spectrum Sharing (DSS).

In terms of coverage obligations, COMREG stated that the country have voice coverage obligation of 98% of the population combined with a data coverage obligation supporting 30 Mbps at the cell edge, within the next five years for 95% of the population —which the regulator anticipates might generate some kinds of “black spots” in the country. Moreover, Ireland has not yet assigned 26 GHz on licensed terms that could be used for 5G; the regulator is to begin a study of how it might proceed with this in the context of 5G.

- Spain is nowadays one of countries at the forefront of deployment of ultrafast networks, with LTE/4G being available for more than 99% of the population. Spain also has the widest European Fibre Network. 5G Public Consultations started in 2017, followed by call for the tender of the first frequency bands the launch of the 5G National Plan in 2018, and the deployment of pilot projects and use cases in 2019-20, and the 5G commercial deployment in 2020.
- The Ministry of Economic Affairs and Digital Transformation of Spain recently adopted the 2025 Digital Spain, which contains a collection of measures, reforms and investments, organized around ten strategic axes, aligned with the digital policies defined by the European Commission for the new period: digital connectivity; promoting 5G technology; digital skills; cybersecurity; digital transformation of the public sector; digital transformation of business and digital entrepreneurship; projects to drive sectoral digitalisation; investment and talent in the audio-visual sector; data economy and artificial intelligence; and digital rights. One of the strategy’s main goals is to cover 100% of the population with internet of 100 Mbps by 2025, thus closing the urban-rural digital divide in Spain.
- Accordingly, Digital Spain 2025 proposes a cross-cutting objective closely aligned with the Sustainable Development Goals (SDGs) and the 2030 Agenda: making a significant contribution to closing the various digital divides.
- The national strategy for promoting the deployment of 5G will renew the 5G National Plan (2018-2020), aligned with the European Commission communication “5G for Europe: An Action Plan”. At the national level, the policy for promoting 5G will be aligned, at an early stage, with the revised Union action plan envisaged in the communication “Shaping Europe’s digital future”. Some of the measures for 5G promotion include 5G transport corridors, pilot projects, regulatory proposals, and finalizing the second digital dividend, and allocated the remaining frequency bands required for 5G in 2021.

- In 2019, the Ministry of Transport and Communication of Lithuania initiated and formed a task force of more than 20 experts and stakeholders from public and private stakeholders which included the representatives from ministries. The task force defined and included 20 actions in the strategy, which was approved by the Lithuania government last June. One of the first issues addressed by the task force had to do with EMF exposure, which was ten times stricter than in other Member States or as recommended by the EU. As such, Lithuania started working on that issue and has successfully changed the EMF regulation, following EU recommendations.
- By the end of 2020, the Lithuanian regulator plans to assign 700 MHz and 3.5 GHz frequency bands. The country has already initiated public consultations for 26 GHz frequency bands as well. The preliminary decision for 5G rollout in the country anticipates that special areas of the country will be decided for the initial 5G transmission towers. The legal regulation will be toward installation of 5G infrastructure in public places and objects followed by state and municipalities (e.g. inside buildings or on the roofs and other engineering structures).
- In addition to 5G-related project such as Rail Baltica 5G Corridor (2022-2025), Lithuania seeks to have one largest city covered with commercial 5G services until 2022 and five largest cities until 2023 with 98% of households covered in the cities and 95% in towns, with not less than 100 Mbps of connectivity for each household. By the same year, the country's goal is to have more than 1400 kilometres in optical fibre, at least 50 transmission towers. In fact, With the new regulation in place 5G commercial services will cover all main roads and railways in 2025. The country also envisions that 5G services will be available in train and airport and bus and rail stations.
- In 2018, the consulting firm INCITES, drafted the 5G National Strategy for the government of Luxembourg which launched it in 2019 alongside a nationwide 5G call for projects. In 2020, the auction was performed, and licenses were awarded for 700 MHz and 3.6 GHz TDD, with four MNOs winning the auction and paying a total of 41.3 million EUR. The 5G implementation is expected to evolve during the 2020-2021 period, followed by an integration with the pan-European ecosystem for 5G dynamics.
- Licenses include coverage obligations in both bands: I) In 700 MHz frequencies (50% geographical coverage by year-end 2022, and 90% geographical coverage by year-end 2024; and II) In 3400-3800MHz frequencies: 10 5G sites by year-end 2020; 20 5G sites by year-end 2021; 40 5G sites by year-end 2022 and 80 5G sites by year-end 2024.
- According to INCITES, Luxembourg needs to leverage its strong digital assets to realise the potential of 5G. The forecast is that, by 2025, at least 39% of the population of the country will have a 5G subscription—with the possibility of having a penetration as high as 63% in the most optimistic scenario. The Government of Luxembourg has decided to provide 30 million Euros in order to co-fund pilot projects during the 2019-2021 period. Many projects on areas as vast as EMF, agriculture, health, security, construction, and media are being developed.

- The Czech Republic's strategic vision on 5G networks and development was prepared by the Ministry of Industry and Trade together with other relevant parts of state administration and approved by government resolution in January 2020. In fact, the 5G strategy is one of the strategic areas within the Digital Czechia framework, alongside with other areas such as artificial intelligence (AI), action plan 2.0, and the national NGA plan.
- In 2019, the country started the preparations of 5G Smart Cities project, calls for support the implementation of business innovation as well as the initial development of cross-border cooperation. In 2020, the regulator auctioned 700 MHz band frequency, and finalized both the amendment to the Radio Spectrum Utilization Plan for 26 GHz band and National Plan for the Development of Very-High-Capacity Networks.
- The strategy also set the coverage milestones for 5G network infrastructure development in Czech Republic. By 2025, it is expected that MNOs will provide 100% coverage of selected sections of railway and road corridors; 95% coverage of the territory of each city with more than 50,000 inhabitants; and 70% CZ residents' coverage. By 2030, the plan is to have 99% residents' and 90% area coverage in each CZ county/district.
- Other 5G-related developments include the "5G for 5 cities," which aims to test 5G technologies and Smart Cities concepts for both urban and rural areas in Bílina, Jeseník, Karlovy Vary, Plzeň, Ústí nad Labem; and the "5G Alliance," which was established in August 2020 and has five key areas of focus: industry, smart cities, cybersecurity; disinformation and education; and transport corridors.
- Germany had its 5G spectrum auction in 2019 and licenses were awarded with the following coverage obligations: I) Connectivity of 98% of all households by the end of 2022 (at least 100 Mbps); II) Connectivity of major roads, rail and waterways by the end of 2022 (at least 100 Mbps); III) Construction and operation of 1,000 new 5G base stations by the end of 2022; and IV) 5G connectivity for all citizens by 2025. The four winning MNOs include: Deutsche Telekom, Telefónica, Vodafone and 1&1 Drillisch, whose investments generated 6.6 billion EUR, which the government converted into digital investments in schools and municipalities.
- In addition to issues of security as well as of new users entering market, some of the present challenges for the regulator and operators involve the deployment of network infrastructure in rural areas-- low frequency bands of 700 to 900 MHz necessary, and satellite solution is yet to be checked. Moreover, 4G tower infrastructure has not yet been completely installed in all regions, and there is a new state aid programme of 1.1 billion EUR for the construction of 5,000 towers. 5G standalone has not yet been achieved as the country still needs 5G fibre backhauling and updates of core network technology.
- Germany raise the importance of international cooperation to reach a harmonized deployment of 5G in Europe and the importance of learning from each other's experiences in contexts such as this forum.

SESSION 3: NATIONAL 5G STRATEGIES AND POLICIES IN NON-EU COUNTRIES

Focus: Status of implementation of national 5G strategies in non-EU countries: challenges and opportunities

Moderator: Mr. Jaroslaw Ponder, Head of ITU Office for Europe, ITU

Introductory Remarks: [Presentation](#), Ms. Inga Popovici, Chair, IRB EWG, EaPeReg

Speakers: [Presentation 1](#), Dr. Irini Reljin, Assistant Minister for Electronic Communications and Postal Traffic, Ministry of Trade, Tourism and Telecommunications, Serbia; [Presentation 2](#), Mr. Andrei Gavrisi, Director of the National Service for the Radiofrequencies Management, Ministry of Economy and Infrastructure, Moldova; [Presentation 3](#), Mr. Boris Jevric, Deputy Executive Director, Head of Radiocommunication Department, Agency for Electronic Communications and Postal Services (EKIP), Montenegro; [Presentation 4](#), Mrs. Ketevan Rekhviashvili, Strategic Development Dept. Chief Specialist, Georgian National Communications Commission (GNCC), Georgia; [Presentation 5](#), Mr. Mohammad Lari, Head of Cross-Government and International Coordination, 5G Testbeds and Trials Programme, Department for Digital, Culture Media and Sport (DCMS), United Kingdom; [Presentation 6](#), Mr. Ramazan Yilmaz, Head of Technical Regulations Department, Information and Communication Technologies Authority (ICTA), Turkey

Key points:

- Although 5G has not been defined as a strategic priority in the Eastern Partnership (EaP) but has identified the 700 MHz band as a priority. Roadmaps to be implemented at the national level, listing the stakeholders responsible for coordination assignment and management of radio frequencies and also references international coordination to reduce risk of interference from the neighboring countries, have been completed.
- EMF is a sensitive matter in Eastern Partnership countries, most of which have stricter limits than those internationally recommended and those adopted in EU member states. In this regard, EaPeReg has conducted a workshop to analyze the situation and provide guidance.
- Moreover, the review of the current regulations, possibilities, and obstacles have been completed, and a spectrum regional agreement (RSA) which stipulates the intension to introduce IMT technology in 700MHz frequency range as well as in 3.4-3.8GHz range is ready to be signed. EaPeReg's next steps now include a workshop on 5G toolbox and a common roadmap/guideline toward implementation of the European Electronic Communications Code in EaP countries.
- 5G development in Serbia is articulated within the framework of the Strategy for "Development of New Generation Networks Until 2023" strategy adopted in 2018, which focuses on cloud computing, IoT, and 5G, but has the main goal to create the infrastructure for the digital single market.

- With regard to spectrum, both digital dividends (DD1 and DD2) are free in Serbia. Licenses for temporary 5G spectrum usage in 3.4-3.8GHz (100MHz; 3.45-3.55GHz) with LTE anchor in 2.6GHz (2x20MHz; 2.64-2.66GHz DL; 2.52-2.54GHz UL), has been issued by RATEL. In face of the challenges presented by the COVID-19 pandemic, the Serbian regulator plans to hold auction for 3400-3800 MHz planned for 2021. The government expects to impose only minimal requirements for the operators.
- The Ministry for Electronic Communications and Postal Services, in cooperation with the Organization for Security and Co-operation in Europe (OSCE), have organized workshops intended for local government representatives in Serbia. Workshops highlighted the importance of new technologies in broadband access and their impact on the development of industry. Representatives of Ministry, RATEL and academia introduced relevant data and challenges related to the setting up of base stations, as well as data on the limits of EMF exposure levels produced by mobile systems.
- OSCE has also initiated a study that is looking at major aspects of introduction to 5G, its regulation and exploitation. The goal of this OSCE-led study is also to inform the general public about 5G and provide more insights on possible obstacles.
- Ministry of Economy and Infrastructure of the Republic of Moldova, in partnership with experts from ITU (in coordination with the ITU Regional Office for Europe) and Korean Information Society Development Institute is developing the spectrum management program for the 2021-2025 years, which continues the spectrum management program for the 2013-2020 years, previously developed by the ministry.
- The focus of the program, which is developed transparently with all stakeholders involved, is on frequency band identified for the IMT, targeting 700 MHz, 3600 MHz and 26 GHz bands as well as 1500 MHz and 2300 MHz and spectrum in other bands. This will complement spectrum bands for mobile communication (800, 900, 1800, 2100 and 2600 MHz) currently licensed to three mobile operators following the principle of technology neutrality.

The government seeks to develop a long-term spectrum policy that ensures medium and long-term predictability of radio spectrum resources. The government expects that this will facilitate and accelerate a number of other objectives including: creating income in the state budget, ensure investment in modernization and infrastructure, reducing the digital divide, creating new jobs and increasing competition in broadband markets, among other.

- As of October 2020, there are five bands in use in Montenegro: 800 MHz, 900 MHz, 1800 MHz, 2 GHz and 2.6 GHz (last spectrum auction: 2016) for mobile communications. With regards to 5G, the Agency for Electronic Communications and Postal Services (EKIP) anticipates that the regulatory framework for spectrum will be completed in 2020.

The new National frequency allocation plan has been adopted. Adoption of channel arrangement and LRTC for bands 700 MHz, 3,5 GHz and 26 GHz is expected to occur by the

end of 2020. With preliminary consultation with MNOs already starting in 2020, the regulator anticipates that the next spectrum auction is planned for 2021 and 2022.

- The structure for implementation of 5G in Montenegro will identify technological, regulatory security, spectral and structural challenges to the constraints and barriers to the deployment of the 5G infrastructure, and to this end, guidelines will be developed by the end of 2022. This document will provide appropriate guidance and road map to enable the deployment of 5G mobile networks in Montenegro. By Q4, 2021 the government also expects to publish guidelines for the authorization of 5G base stations from the aspect of EMF exposure.
- The Communications Commission of Georgia (GNCC) reiterated that country's main targets by 2025 in terms of connectivity include ensuring that: I) Every household shall have access to 100 Mbps; II) Every entity to have access to 1 Gbps; III) 5G pilots in at least three municipalities; and IV) 99% of territory covered by 4G. The 5G strategy for the country deals with questions of spectrum availability; pricing; legal framework; obligations; cross-border coordination; and auction.
- Next multiband auction includes the 700MHz;800MHz;3400-3800MHz bands, which are expected by the end of 2021 although pricing and public consultations are already under development. It must be noticed that in the country the law does not allow the regulator to choose the licensing process (auctioning or beauty contest) and does not allow the regulator to provide frequencies for testing purposes.
- Within the framework of the Cross-border Coordination RSA (Regional Spectrum Agreement), the GNCC is has been actively working with communications administrations agree to follow individual national implementation plans, while endeavouring to meet common deadlines set in the EU decisions referenced in Article 2 of the Agreement, and in close cooperation with other Eastern Partnership countries.
- The UK government is driving the transition to 5G through collaboration between government, industry and academia, as detailed by the 5G strategy of 2017. The government is particularly focused in investing in R&D with the 5G testbed programme launched in 2019 which will continue to March 2022.
- The UK is primarily focused on building the business case for 5G to ensure the benefits of high-speed networks are enjoyed early in the country. To this end, the government has funded 24 testbeds across the UK and now over 100 towns and about 600 sites are connected to 5G networks by all four MNOs. The strategic objective is to cover the majority of the population with 5G by 2027.
- 5G will require a significant increase in the number of small radio cells deployed on street furniture, on the side of buildings, etc. DCMS is currently working with local authorities to repurpose and redevelop some of those planning regulations in the municipalities and enjoy that deployment meets the demand and the need for operators to access those facilities.

- DCMS stated that the 5G-related industry in the United Kingdom is shifting toward cloud-based services and thus more of a software environment with open RAN, allocation, usage of spectrum and the wider virtualization of network functions.
- In addition to the national broadband strategy and national plan aiming at expanding fibre-optical access networks and improving speed, Turkey has launched a White Paper on 5G and Beyond, and that included strategies, a roadmap for 5G and beyond technologies, and technical requirements for 5G rollout.
- According to the Information and Communication Technologies Authority (ICTA), Turkey's approach is to optimize the network before deploying it for commercial use. The country expressed the need to pay attention to vertical partners and comply with business-to-business and business-to-commerce models, alongside international cooperation.
- At the moment, ICTA reiterated that private stakeholders continue to develop test beds and 5G-related projects in the 5G Valley Open Test Area. ULAK, the domestic equipment vendor in Turkey, have 5G based stations and all the stations have been using the country's MNOs successfully. In an international level, the Turkish government has also signed a memorandum of understanding (MoU) with other forums such as 5GTR forum and Korea.

Questions or Comments:

Question from Dr. Haim Mazar:

"Question to her excellency Irini. Why not to oblige the operators in 3.5 GHz to first cover Remote areas, as done in Germany as example?"

Reply of H.E. Irini Reljin:

"We will oblige covering over the highways. We believe that rural areas have no interest for huge bandwidth in this moment, and that operators already have their interest to cover big cities."

SESSION 4: 5G IMPLEMENTATION: PRIVATE SECTOR DEVELOPMENTS AND COMMERCIALIZATION

Focus: 5G market development challenges and opportunities, including relevant examples of commercialization

Moderator: Mr. Istvan Bozsoki, Head of Telecommunication Networks and Spectrum Management Division, ITU

Speakers: [Presentation 1](#), Mr. Reinhard Scholl, Deputy Director, Telecommunication Standardization Bureau, ITU; [Presentation 2](#), Ms. Donna Bethea-Murphy, Senior Vice President, Global Regulatory,

Inmarsat; [Presentation 3](#), Mr. Alexander Geurtz, Vice President, 5G solutions, SES; [Presentation 4](#), Ms. Silvana Apicella, Head of Strategic Network Evolution Southern Europe, Ericsson; [Presentation 5](#), Mr. Zaheen Khan, Head of Wireless Marketing & Strategy, West Europe, Huawei; [Presentation 6](#), Ms. Francesca Sartori, Principal Solution Architect, Nokia Bell Labs; [Presentation 7](#), Mr. Juan Manuel Cambeiro, Head of the Telefónica Spain Innovation Project, Telefonica Spain; [Presentation 8](#), Mrs. Elif Yenihan Kaya, Director, Turkcell Access Network Capabilities.

- There are currently constraints that are worth mentioning in the context of applying Artificial Intelligence (AI) and Machine Learning (ML) in networks, which is different than other AI/ML-related applications such as image recognition as many parameters may change on a yearly, weekly or daily basis. Some of these challenges include computing resources, noisy and dynamic network environment, and the question of data and availability of domain-specific data set—with a limited amount of available data provided by network operators.
- As part of the ITU toolkit on machine learning for communication networks, which includes about 10 standards, ITU-T published the Y.3170-series “Requirements for machine learning-based quality of service assurance for the IMT-2020 network” with more than 30 use cases have been analysed by ITU-T. Moreover, ITU-T also published the Y.3172 “Architectural framework for machine learning in future networks including IMT-2020”, which provides a common language for managed ML in networks.
- ITU-T is also running the AI/ML 5G challenge for network use, which has focused on around 20 concrete problem statements, mostly provided by university. The most critical part of the challenge is data availability and some real data is being provided by network operators such as Turkcell.
- This challenge is undertaken with the sponsorship support from the Telecommunications Regulatory Authority of the United Arab Emirates, as well as financial support from Cisco and from ZTE. As of now, more than 500 participants from 60 countries have been engaged with the project.
- Satellite's ubiquitous availability helps accelerate global 5G deployment on the ground, at sea and in the air. SES is providing access to its owned and operated multi-orbit (GEO/MEO) and multi-band (C/X/Ku/Ka-band) satellite fleet, IP/MPLS global access teleport network, and satellite uplink/downlink facilities for 5G-VINNI live over-the-air demos and validation of the target 5G KPIs and use cases.
- SES highlighted that it is adding many network capabilities to ensure that they integrate seamlessly with telecom operators. With respect to the tools, it mentioned that it is adding a massive amount of capacity to that to help deploy those networks. For the foreseeable future, massive investments in satellite and ground infrastructure is undergoing to support new capabilities and requirements for 5G rollout.

- SES is currently strengthening partnerships with telecom operators in Africa and other parts of the world. In Greenland, the world's largest island, 10% of the population depends purely on satellite due to the rough geography or large distance between them and the incumbent terrestrial telecom network. SES established a partnership with Tele-Post (TP) will enable to respond to the Universal Service Obligation and bridge the digital divide starting in November 2020. With the new connectivity, TP plans to provide 4G services using ground infrastructure from Ericsson.
- Over the past two years and a half, Telefonica Spain has undertaken more than 60 projects, which provided the company with some consumer insights related to 5G rollout. Telefonica expects that a developed ecosystem in 5G applications will start occurring in 2021. By then, only companies that have tested 5G, studied transformation ROI and redesigned their business processes will be able to fully benefit from the new technology.
- The most active industry segments in 5G include V2X; Industry 4.0 and Logistics; TV, Media & Events; and Tourism and Entertainment. According to Telefónica Spain, although Smart Cities, utilities, eHealth, education, and others are interested in 5G as well, they have a longer way to go in digitalization, and hence, are still behind in introducing 5G in their models — 4G might be a necessary middle step.
- Current technologies are maximized to offer just one type of service which is pretty much broadband and person-to-person communications. However, within the context of 5G and massive IoT, there are many different consumer and industrial needs.
- Similar to other emerging technologies, 5G's academic and commercial aspects are different in overall scope. Turkcell noted that in the past ten years, the global market for telecom operators remained flat. On the other hand, Internet companies had an exponential growth in their value and market caps, and part of that success is enabled by broadband networks and their evolution within such a timeframe. 5G, however, is a use case-based technology, not coverage base, which presents policy makers with significant challenges when working with the private sector.
- Revenue growth in 5G requires operators to enrich their business; understand the requirements of 5G deployment; tailor made-network design for specific niches and a wider number of people; and promote a zero-touch network that is an AI-controlled and self-optimizing network.
- Turkcell started its 5G R&D in 2018, and some of the most active topics include AI/ML for telecom SON, automation, cellular V2X communications, network slicing edge computing, RAN: HTK & ULAK; network: local production; drone communications; industry 4.0; non-terrestrial network; and open networks.
- Turkcell underscored that the success of 5G deployment and commercialization is directly related to the operator's interests. While the private sector is yet to experience a disruptive

use cases for 5G ecosystem, great promises are underway. Therefore, operators should be encouraged to invest in 5G by simplifying the regulatory requirements.

- According to Ericsson, during the first 18 months after the first commercial launches, there are around 100 commercial networks around the world spread over 44 countries. There are already 200 different types of terminals supporting 5G and, if we look to the leading countries like South Korea, we see a very quick uptake of 5G with 8.7 million users making roughly 25% of the global operations on 5G. In terms of traffic, data from 5G users has grown significantly compared to 4G –2.6 times more traffic is being generated by 5G users.
- Many operators have already started to make a tailored offer for enterprise for industries based on private networks and vertical use cases. According to Ericsson, the business potential for communication service providers—which includes the industries support digitalisation—amounts to an expected 700 million USD in the next ten years.
- Ericsson is trialling with more than 100 enterprise and companies around the globe on how to implement their private network over 5G. The most interesting use case is that the company has more than 50 reference of different projects and partnerships with our customers, including MNOs, device manufacturers, members of the academic community, and so forth.
- The inherent architecture of a satellite due to its coverage, its security and its ubiquity allows for high-quality robust capabilities, of flexibility because of the coverage. In addition to traditional telecom services, 5G also play a role in the achievement of the UN’s SDGs (e.g. environmental issues, education, etc). Inmarsat believes that only a heterogeneous 5G network with multiple technologies will connect the excluded and allow them to participate in a world that is racing ahead with technological developments.
- In the context of agricultural technology, satellites can also play a significant role in rural areas, helping produce more with less. Terrestrial 5G in the C-Band or mmW bands will rely on denser network topographies of small cells. Infrastructure that may be too expensive to be profitable in some communities.
- Moreover, as the limitations concerning food production continue to rise, satellite-enabled IoT might enable better decision making and increased efficiency. Remote field environments, with no terrestrial connectivity or power – satellite is the cost effective, easy to deploy choice.
- Nokia highlights the importance of analysing digitalisation needs, spectrum ecosystem, and catalysing the user needs and vertical specifics—including topics such as size of network, deployment area, feature requirements, and so on. At the moment, the company is expanding its portfolio to expand diverse needs, including the development of endpoints, radio, backhaul transport, core, etc. which are mostly focused on business. Enterprises such as Lufthansa Technil, Sandvik, Toyota, and DB are some of the companies starting to rely on 5G for their operator.

- In terms of 5G equipment requirements, Nokia customers' needs spans a wide variety of topics related to machine connectivity, access system, remote drilling, sensors, FAN convergence and automation and so on.
- Huawei's vision for a cohesive integration for a 5GtoB to customers include the following components: network operation; network integration; 5G network; and 5G module; Cloud & AI SaaS; OT system integration; control system; OEM device. The 5G B2B trial Environment in the European Union by Huawei included 141 trials, being 51 dedicated for Industry 4.0.
- Huawei believes industrial digitalization relying on private 5G networks will be the main market driver for 5G and will be sustained by Release 17 which will be covering many new features.

Questions or comments:

Comment from Cecil Ameil:

"FYI, an informative White Paper on Satellite 5G is available from: <https://www.esoa.net/cms-data/positions/2202%20ESOA%205G%20Ecosystems%20LONG%20Final.pdf>"

Question from Fazlı Kaybal:

"Should administrations dedicate spectrum to private networks as already implemented in Germany (i.e, 3700-3800 MHz? What do satellite operators consider about using 3800-4200 MHz band locally for 5g private networks?"

[the question was addressed in the context of proceedings by Ms. Donna Bethea-Muphy and Mr Alexander Geurtz. Recordings of proceedings will be made available on the event website]

SESSION 5: 5G IMPLEMENTATION: EMF AND OTHER CHALLENGES

Focus: Main issues relating to the rollout of 5G networks: the EMF question and other challenges to 5G deployment.

Moderator: Mr. Witold Tomaszewski, National Institute of Telecommunications, Republic of Poland

Setting the context: [Presentation](#), Dr. Haim Mazar (Madjar), ITU Consultant and ITU inter-sector coordinator on RF-EMF and co-rapporteur ITU-D Question 7/2, vice-chair ITU-R Study Group 5 (terrestrial services)

Speakers: [Presentation 1](#), Dr. Emilie Van Deventer, Head of EMF Project, WHO; [Presentation 2](#), Dr. Rodney Croft, Chair, International Committee on Non-Ionizing Radiation Protection (ICNIRP); [Presentation 3](#), Mr. Kostantinos Masselos, President, Hellenic Telecommunications & Post Commission (EETT), Greece; [Presentation 4](#), Mr. Martin Fenton, Director of Spectrum Analysis, Office of Communications (Ofcom), United Kingdom; [Presentation 5](#), Mr. Rafał Pawlak, National Institute of Telecommunications, Republic of Poland & Mr. Jakub Kwiecień, National Institute of

Telecommunications, Republic of Poland; [Presentation 6](#), Mr. Goran Laovski, Chief Advisor for Fixed and Mobile Radio Communications & Mr. Nenad Radosavljević, Team Lead for the Quality of Service group, Regulatory Agency for Electronic Communications and Postal Services, Serbia; [Presentation 7](#), Dr. Antonio Capone, Full Professor, Polytechnic University of Milan, Italy; [Presentation 8](#), Mr. Henri Haxhiraj, Senior Manager Business Development and Government Relations, atene KOM; [Presentation 9](#), Mr. Uwe Baeder, Director of International Relations ITU/UN, Rohde Schwarz.

Key points

- There are more than 8 million base stations around the world, as it is possible to see from the background paper recently published by ITU and titled “[Implementing 5G for Good: Does EMF matter?](#)” This paper covers the ITU provisions related to 5G and EMF—ITU-R/D/T resources, drawing from the ITU-T K.series Recommendations and Supplements as well as ITU Workshops and Initiatives on EMF. The paper also covers the positioning of International organizations/ standardisation bodies related to 5G and EMF such as WHO, ICNIRP and IEEE.
- In addition to the technological dimensions, the ITU background paper also covers issues directly and indirectly to 5G rollout and EMF, including misinformation; delays in installing base-stations; economic cost for society; and the environment-related issues imposed by EMF-related hazards (e.g. animals and plants).
- There are three mitigation techniques available to decrease the radiation level: I) Maximize spectrum available to operators in order to decrease the number of sites; II) maximize sharing, including active frequencies sharing among cellular operators; III) close the Wi-fi access point when not in use. Moreover, the paper highlights that administrations are encouraged to follow the ICNIRP and IEEE guidelines or set by their own experts—in other words, the best practice for administrations is to use the international RF-EMF exposure limits is to follow the ICNIRP 2020.
- WHO’s engagement in the topic of radiation includes EMF (from 100 kHz to 300 GHz), but also the optical part of the radiation spectrum, infrared, visible spectrum and ultraviolet and many applications from the medical sector, natural sources of radiation and response to and preparedness to radiation emergencies such as nuclear power plants. There is nearly 70-years’ worth of data on EMF and the effects on the body. Since 1996, WHO has a project on the topic of EMF, as the wireless technologies skyrocketed around that time. However, the WHO does not set up the guidelines on EMF though it reviews the scientific evidence.
- The French Agency ANSES is currently performing a review of its measures on EMF and health. Moreover, the Dutch Health Council of the Netherlands has just published a report on the topic. Besides the scientific work, WHO highlighted its role in also communicating the risk or potential risk and explain what it knows, and it does not—the level of uncertainty that is normal in science. 5G represents a gradual extension of the wireless spectrum and what the WHO currently knows should be applicable. WHO will continue to gather more information

and monitor these exposures to EMF as the 5G networks continue to unfold in the region and beyond.

- ICNIRP mentioned that individuals often claim that the guidelines only protect against thermal effects. That is because a lot of numbers are based on the lowest exposure level that can cause harm, which is due to heating effects. However, the ICNIRP guidelines protect against all effects. If there is any effect at all, it has to be by definition well above the guideline restrictions themselves.
- Moreover, people often cite the IARC classification as “possibly carcinogenic” and they see that as evidence of RF and EMF causing cancer. However, ICNIRP has looked at the scientific literature and concluded there is no evidence that RF-EMF causes cancer. Moreover, ICNIRP defends that if evidence appeared in the future, then clearly the guidelines would have to set limits based on that—unless those levels were higher than the current guidelines levels. Moreover, the ICNIRP guidelines do not have a focus on only a particular age group, as there is currently no evidence that there is a differential effect of this on health as a function of such things like age, self-reported electro-hypersensitivity, and so on.
- ICNIRP does not believe that it needs more research specifically looking at each combination of frequency, frequency over time and so forth for 5G. This is because the organization already has a good mechanism in the understanding of what the change will be in terms of the effect of the RF on the body as a function of frequency.
- The Hellenic Telecommunications & Post Commission (EETT) of Greece identified that 5G requirements impose significant pressure on network architecture, especially in the access part. To overcome these challenges there is a need for increasing the total amount of spectrum used, larger continuous channels, use of new frequency bands above 6GHz; using active MIMO antennas and a vast increase in the number of access points; agile architecture so users can seamless handover between various types of access points (macro, small, picocells etc.); and flexible use of spectrum between different base stations—with a larger variety of transmissions per site.
- Concerning EMF, EETT lists the main implications of 5G on EMF in Greece: Increase in bandwidth can increase the total amount of EMF radiation transmitted (for constant dBm/MHz); usage of massive MIMO antennas in macro stations makes the evaluation of EMF limits a difficult task as the notion of effective radiated power is no more valid; the use of millimetre wave bands means that higher power is required to overcome the higher absorption in these frequencies; restrictions on mobile phone’s transmission levels will increase the need for a more dense network. All in all, the use of multiple bands can challenge the operation within EMF limits and denser networks can increase the public’s concerns.
- Greece has established a flexible legal framework for licensing different types of access points, (macro, small cells, etc.) which gives motivation for low emission antennas in the form of simpler licensing procedures. The EMF limits in the country are set at 70% of ICNIRP’s 1998

guidelines. Additionally, the EMF emissions from base stations currently observed in Greece are well below the recommended limits.

- Moreover, Greece also has established mechanism for EMF measurements and has published the results, which helps cultivate transparency for further licensing procedures as well as establish connections with the measuring campaigns with the broader society and the various stakeholders. After antenna license is granted, all information related to the antenna, including the EMF studies, are publicly available on the Internet. The online system facilitates citizens to find where the licensed antennas are located allowing also to query for any license antennas in their neighbourhood. The system is connected to the GIS system of the authority for EMF measurements so that all measurements that have been performed for specific antenna installations can be retrieved.
- Ofcom has been carrying out measurements near 5G-enabled mobile phone base stations in the UK. Before the COVID-19 emergency measures, the regulator measured EMF emissions at 22 locations in 10 cities across the UK, including Belfast, Cardiff, Edinburgh and London, focusing on areas where mobile use is likely to be highest, e.g. train stations, shopping centres, etc. It has restarted its measurements and expects to publish further results before the end of the year.
- In conjunction with the UK government, Ofcom recently published a guide to 5G technology for local counsellors and planning departments with the aim to provide information on 5G and EMF and rebutting claims linking 5G to the Coronavirus pandemic. In so doing, Ofcom has provided simple and accessible information to local counsellors and the planning authority departments to help them understand scientific facts from fiction.
- In February 2020, Ofcom published a consultation proposing to include a new condition in spectrum licences (for powers above 10W EIRP) to require compliance with the ICNIRP Guidelines. In October, Ofcom issued a statement setting out our decision to proceed with this proposal. The regulator is now consulting further on the detailed wording of the condition and guidance for licensees and plans to amend licences in the first half of 2021.
- Having 5G and EMF as the main object of its interests at the moment, the National Institute of Telecommunications of the Republic of Poland reiterated that role of education in promoting technology literacy and critical thinking so the population can understand the importance of 5G and ignore the non-scientific claims. Given that 5G requires some interdisciplinary knowledge, one must understand not only the technology but also its societal implications for economic growth and sustainable development.
- In partnership with the Ministry of Digital Affairs of Poland, the National Institute of Telecommunications of the Republic published a White Paper on the topic of EMF and health, which received inputs from specialists from a variety of areas such as biology, telecommunication, and policy.
- Serbia is establishing a 5G test environment that can be used by domestic and foreign

companies, start-up, students of relevant fields to develop technological solutions for the future. The first 5G test base stations in Serbia has been launched during in 2019 in Belgrade (Science Technology Park - Telenor and Belgrade Fair - Telekom).

- As 5G develops in Serbia, EMF-related measurements are in place, with special attention given to the RATEL EMF Project, launched in 2017. This is a nation-wide system for continuous monitoring of electromagnetic field levels in Serbia. As of now, there is a total of 57 sensors performing continuous measurements installed nationwide.
- RATEL EMF Project performs so-called broadband field level measurements and takes into account the contribution of all active electric field sources in the vicinity of the measuring stations. So far, the results obtained through measurements have been far below the allowed electromagnetic field level values. No field levels deviating from the prescribed values and applicable standards were recorded at any time.
- 700 MHz is the most valuable frequency band in Serbia, and it is expected to be ready for auctioning by the end of 2020 or during 2021, by the end of the transition period of digital television broadcasting. Recently, RATEL issued frequency licences for temporary 5G spectrum usage in 3,4-3,8GHz (100MHz) with LTE anchor in 2,6GHz (2x20MHz).
- It is worth mentioning that the Serbian government signed an agreement regarding the Smart City project that will benefit the cities of Belgrade, Novi Sad and Nis. The project will encompass the biggest cities in the country, and it implies the economic implementation of various services such as public lighting, parking spaces, etc. Serbia expects to join efforts with the future of the connected driving in Europe through an agreement with Bulgaria and Greece (Thessaloniki – Sofia – Belgrade) to develop an experimental 5G building of testing driverless cars.
- The Technical University of Milan (Politecnico di Milano), in collaboration with the Italian Association of Telecommunications Industry (Asstel), recently conducted a study on the impact of Italy's limits of EMF exposure on the development of the 5G infrastructure, which was presented in a public hearing to the Italian Parliament.
- The study revealed that without the use of non-upgradable sites, Italy would expect coverage holes, and this would make impossible the implementation of 5G use cases—which often requires coverage continuity and indoor coverage. Therefore, with the current EMF limits at 1/100 of ICNIRP, very bad quality of the network was discovered.
- On average, 62% of sites are non-upgradable at current limits, which translates to about 27.900 base stations at a national level. Such stations require re-engineering work (e.g. increasing the height of antennas) or adding new 5G sites. When using the ICNIRP limits on EMF, all sites are upgradable and sufficient to meet the coverage and quality targets for seamless connectivity. As for the 27.900 non-upgradable base station, the estimated costs will require an extra expenditure of about 4 billion EUR in total.

- In Germany, there are approximately 74,000 sites used for public communication. To meet the supply requirements, an increase in mobile networks is needed. As a result, thousands of new sites must be developed and established by MNOs. Additionally, Germany's National Mobile Strategy is set to invest 1.1 billion EUR for 5,000 new mobile masts through a funding program. atene KOM GmbH identifies the following major challenges for 5G implementation in Germany: mobile network coverage; location search; adaption of existing legislation on construction plans; and the lack of specialist staff and technical staff.
- At the moment, it is known that various permits must be obtained before putting the mast into service. Concerning mobile base stations, high-rise buildings along highways must be kept at a distance of 40 metres in the case of a federal highway and 30 metres in the case of a federal road. An approach-solution for this involves accelerating the installation by simplifying the current legislation.
- There are other infrastructure-related issues such as finding the appropriate public infrastructure for 5G. atene KOM GmbH's approach to tackle this challenge involves the following. First, it is important to identify the carrier infrastructure to be used. Second, operators can upgrade existing macro locations and also establish new macro locations. Third, it is also recommended to build small cells, which look more like WLAN access points than a cell phone.
- Moreover, a proposed solution is the development of 5G application for municipal decision-makers; that is, one platform to support the mobile network deployment and development in a given timetable that identifies stakeholders; finds funding; plans communication with citizens' initiatives; communicate information about health risks and electromagnetic combability.
- According to Rohde-Schwarz, influence of EMF on humans depends on frequency, field strength/power density, exposition time, and other ambient radio sources. In this context, there are various methods and aspects of EMF measurement in general and more complex with 5G due to its flexible nature. In 5G, one of the main things there that are different for 4G, it is the beam forming, a new antenna management technique and different frequency ranges.
- This makes EMF measurements more complex and requires substantial changes in the EMF test strategy such as a priori information on the site, knowledge about visible beams, knowledge about worst-case conditions (peak beam direction and maximum power) and obtaining information from data sheet.

Questions or Comments

Question from Mr. Manuel Marti:

“Scientific evidence is crystal clear; however, it seems these scientific messages do not work and do not build trust among citizens. How can the telecoms industry improve its communications strategies?”

Reply from Prof. Antonio Capone:

“Effective communication to general public and also to politicians who often don’t have a technical background is the key point here in my opinion. I will cover a bit this in my presentation where I will tell you my personal experience.”

Reply from Dr. Rodney Croft:

“Risk communication is particularly difficult, and there has been varying degrees of effort put into this endeavour. In essence, I would say that there is much more that can be done, but there are some industry organisations that have been very successful in this space (e.g. GSMA), and it might be worth having a look at their website to get an idea of the type of strategies that they have engaged.”

Question from Dr. Haim Mazar:

“If IEEE 95.1 2019 and ICNIRP 2020 above 450 MHz (relevant RF for starting 5G) are identical, and IEEE and ICNIRP met last year. So, why both standards are not merged? It will assist Administrations to adopt the compound standard.”

Reply from Dr. Rodney Croft:

“The main issue is that ICNIRP needs to remain independent from industry, or else it runs the risk of introducing bias in its guidelines, and it would also lose credibility with the public. Indeed, contrary to what you claimed, ICNIRP did not meet with IEEE last year. Rather, we were very fortunate to have received in-depth comments from IEEE as part of the draft guidelines' Public Consultation process, and certainly considered their comments very seriously. Personally, I think that this system is appropriate, and that it would be a step backward to dissolve the barrier between the organisations.”

Question from Mr. Manuel Marti:

“Thanks for your responses Antonio and Rodney. But don’t you think message is often too complex and intricate for the public to understand? Also, is the GSMA the best organisation to deliver such message, given their obvious interest? The anti-5G movement has been promoted by quite a few celebrities, politicians, and even supported by workers of telecoms firms.”

Reply from Dr. Rodney Croft:

“I agree with your comments, Manuel. In terms of complexity though, a major part of good risk communication is indeed to simplify the message, and in terms of that I was merely providing GSMA as an example of an organisation who have done this very well. In terms of a suitable organisation to do such communication, I agree that it would be much better for an independent group to do this. Unfortunately, though there doesn't seem to be an international, independent organisation tasked with this. Indeed, although I do a lot of risk communication research, and although I chair ICNIRP, it is

very difficult to find enough resource to engage seriously in risk communication and we tend to leave it primarily for others. As an outsider, I wonder if ITU would be the ideal organisation to push this important issue forward?”

CLOSING REMARKS

H.E. Mr. Marek Zagórski, Secretary of State Government Plenipotentiary for Cybersecurity, Chancellery of the Prime Minister (KPRM), Republic of Poland remarked that the event provided a good stage to discuss implementation of 5G in the spirit of collaboration among the variety of stakeholders.

After raising the attention particularly to the challenge of EMF disinformation and necessity to avoid incidents within countries, especially when the pandemic increases reliance on telecommunication networks, H.E. thanked delegates, participants and ITU and expressed wishes to gather in person in future occasions.

Mr. Jaroslaw Ponder, Head of Regional Office for Europe, ITU, and Chair of the event, thanked participants and panellists and briefly summarized the excellent content emerged through the various sessions. He emphasized the importance of leaving no country behind in the transition to 5G and the clear need of countries of more clarity and guidance on communications around the challenge of 5G and EMF.

Mr. Ponder finally invited participants to engage in upcoming events such as the [5G Techritory Forum](#) (11-12 November) and the [ITU Regional Regulatory Forum for Europe on Regulation Supporting the Digital Transformation](#) (30 November – 1 December) continuing the discussion on 5G, infrastructure and regulation.