

University of Oulu view on Draft RSPG Programme for 2022 and beyond



University of Oulu, Finland, thanks the RSPG for the opportunity to comment on the draft RSPG Work Programme for 2022 and beyond. The University of Oulu welcomes the actions proposed by the RSPG and provides the following comments on two of the topics, namely 6G and climate change.

1. The development of 6G and possible implications for spectrum needs and guidance on the rollout of future wireless broadband networks

The University of Oulu is gratified to see 6G in the draft RSPG work programme and makes the following detailed comments on the specific items:

- *“The technical developments are expected to bring new possibilities broadening the scope of wireless broadband to various areas, possibly including mitigating negative environmental impact and climate change as well as satisfying new operational needs and new services addressed to consumers and verticals. Some research initiatives are starting to consider spectrum issues and relevant needs in sub-THz spectrum but also in spectrum bands targeted for 5G including low and mid bands.”* University of Oulu welcomes the RSPG’s observations on the technical developments bringing a broader scope for wireless broadband addressing sustainability as well as new operational needs and services, which influence spectrum use. It is also a precise observation that there are research initiatives considering spectrum issues and relevant needs, and more importantly new innovative spectrum access techniques and models based on sharing. Spectrum sharing including both vertical sharing between entrant and incumbents as well as horizontal sharing between e.g., several local networks deployments play an important role in on-going 6G R&D. However, the role of spectrum sharing is not considered in the draft RSPG work plan but should be included. At high spectrum regime at sub-THz frequencies, novel spectrum sharing methodologies and models including e.g., dynamic local licensing, are a viable way in practical deployments. Because THz and upper mmWave bands will be increasingly used for different purposes including network connectivity, mobile positioning, environment sensing and wireless links among others, the resulting use cases and applications will vary in different locations. For example, the needs in a stadium or shopping mall differ from those of an industrial facility as well as indoors and outdoors. Spectrum sharing models considering the specifics of technologies and system deployments in the bands can make local spectrum sharing particularly feasible in practice with advanced capabilities to manage resulting interference.



- *“Within this work item, the RSPG will follow and investigate the research and development of 6G and study European 6G test plans and trials. The RSPG will further investigate and identify early indications of additional spectrum and harmonisation needs and/or potential implications on spectrum regulation in order to be prepared for the development of 6G roadmaps later on (beyond 2023).”* Additional spectrum needs for a new mobile communication system generation are the traditional way of looking at the mobile communication spectrum. More importantly, implications on spectrum regulation should be highlighted considering the wide range of frequency bands with different deployment characteristics, emphasizing the role of spectrum sharing. University of Oulu would like to point out that 6G research and development has taken spectrum sharing as an important topic, and global 6G visions¹ envisage large numbers of local 6G networks deployed by different stakeholders sharing the spectrum with incumbents, which directly impacts spectrum access. Currently, spectrum sharing and local spectrum usage are missing from the RSPG workplan and should be included there particularly when addressing 6G.
- *“The RSPG will conduct an evaluation of 5G in Europe (licensing strategies, auction design, deployment progress, etc.) with the aim to gain knowledge around what has been successful and what still needs to be addressed, thus providing valuable input when designing future 6G strategies.”* It is understandable that the RSPG focuses on the European spectrum landscape. However, when it comes to global communication system developments, like the 5G, there are significant spectrum related developments outside of Europe that are important to consider so that Europe is not left behind in the developments. For example, local 5G network developments with local spectrum licensing and other sharing-based developments are taking place outside of Europe. Restricting the focus only to Europe would leave out important developments and points of comparison in the global race towards 6G.
- *“Regarding the pivotal role of wireless broadband, the RSPG will consider early signals of demand for additional spectrum as well as the necessity to make a certain amount of harmonised spectrum available in a timely manner including in spectrum bands targeted for 5G including low and mid bands. This may involve continuing the move further up to higher bands, thus enabling early exploratory work in the sub-THz bands.”* Although making new spectrum available is discussed in the draft work plan, there is no mention of shared spectrum access or spectrum sharing, which was in the agenda of RSPG previously. It is important to consider and develop best practices and required enabling technologies in good time before the actual spectrum-related decisions are made. Therefore, the RSPG should take a pro-active role in this development and not only conduct comparisons afterwards.

Additionally, the University of Oulu would like to see prior RSPG work, particularly the RSPG Opinion on Spectrum Sharing, better reflected in RSPG’s upcoming work on 6G and take the role of spectrum sharing

¹ Key Drivers and Research Challenges for 6G Ubiquitous Wireless Intelligence. 6G Flagship, University of Oulu, Finland, Sept 2019. <http://urn.fi/urn:isbn:9789526223544>

explicitly into the scope of 6G, so that Europe does not fall behind in the global race. Technology development for spectrum sharing has advanced considerable in the past decade but their deployment depends on regulatory decisions that impose spectrum sharing. Sharing requirements defined by the regulators need to be included already in the technology development phase and not a restriction posed afterwards. The range of frequency bands has already increased for 5G and the same is expected towards 6G. Different technologies and models are suitable for different spectrum bands, which needs to be considered for 6G early on. Also, something that is not possible outdoors, should not restrict what can occur indoors, especially in the higher frequency bands, where potential interference can be limited to a local area.



2. Role of Radio Spectrum Policy to help combat Climate Change

University of Oulu welcomes RSPG's efforts to continue to address the combating of climate change. University of Oulu would like to highlight the importance of proper metrics and rapid access to spectrum for new innovative wireless solutions and services towards sustainability and makes the following detailed comments on the draft workplan:

- *"1) The need for a common set of methodologies in order to understand and assess the impact of ECS wireless technologies on climate change, involving ECS stakeholders and all interested parties, and with a particular focus on the ECS radio component."* The impact of electronic communication services on the climate change is a critical topic to address and needs to involve all relevant stakeholders. New ways of working with relevant stakeholders would be needed to engage academia, industry, operators and decisions makers to exchange knowledge, methods and actual measurement data.
- *"2) The importance of having accurate information on emissions and energy efficiency related to spectrum use on a national level (e.g. reports from network operators)."* It is important to consider different types of emissions of wireless systems as well as energy efficiency as noted in the draft workplan. However, energy efficiency over the air is not the only critical indicator; the overall energy consumption of the network also needs to be included into the draft workplan. Restriction to consider only environmental sustainability of the spectrum usage part leaves out important system deployment considerations.
- *"Identifying methodologies to assess the energy efficiency of wireless technologies, including the influence of variables such as the frequency band, type of access technology, etc. Input from stakeholders (e.g. through a workshop) may be required."* Energy efficiency of wireless technologies is important to be considered. Additionally, it is important to consider energy consumption. There is a need to develop new metrics and measurement methods to assess the sustainability of wireless technology solutions including the end-to-end energy consumption through different network configurations, not only energy efficiency.
- *"Collecting practices from Member States on how energy efficiency is measured and managed nationally in relation to the spectrum area,*

including how data to assess the energy efficiency is collected.” Measurement and management practices of energy efficiency are important, but they need to expand to cover also energy consumption.

The RSPG’s draft workplan regarding combating climate change addresses one aspect of sustainability, namely climate action, which is one of the 17 topics of the UN SDG framework. It would be important for RSPG to consider sustainability in the context of wireless communications more thoroughly from the triple bottom line of social, economic and environmental sustainability. Especially, the wireless communication systems’ enabling role to help combat climate change and the other 16 major sustainability challenges of the UN SDG framework would deserve to be addressed.



Finally, the current European spectrum regulatory framework does not support rapid access to spectrum for new innovative wireless services that address major sustainability challenges of the UN SDG framework. Their timely access to market could be particularly promoted via spectrum sharing. The on-going change from technology-driven wireless system development towards innovation and business-driven pull to solve global sustainability challenges requires more flexible and scalable spectrum access approaches that provide spectrum access opportunities varying from hyperlocal short duration to enabling global coverage. Examples of this include the serving of the underserved areas by different stakeholders by making spectrum available where and when it is not used by the existing holders of spectrum usage rights. Cyber-resilience, security, and trustworthiness are the prerequisites to assure the benefits of communications in the 2030s for society and the economy. From this, suitable spectrum regulatory enablers will be key a success factor for developing future wireless solutions via society pull with market impact to make Europe a forerunner in the global race towards 6G.

Respectfully,

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