University of Oulu's response to draft RSPG Report on "6G Strategic Vision"

University of Oulu thanks the RSPG for the opportunity to provide comments on the draft RSPG draft Report on 6G Strategic Vision. University of Oulu is very grateful to the RSPG for the invitation to the hearing event in September 2024 and is satisfied to see that the inputs from the presentation made at the hearing are well reflected in the draft report. Additionally, the inputs from the other research stakeholder in the hearing event, the Hexa-X-II project, where University of Oulu also participates, are well reflected in the draft report. This opportunity provided by the RSPG for the research community to impact European policy making is very much appreciated.

Detailed comments on Chapter 1 Executive summary

The bullet point list starting with "*According to stakeholders*" is a selection of statements from different stakeholders and not an agreement between all stakeholders. On the other hand, "researchers" are mentioned separately later to have proposed "*that spectrum sharing between MNOs and local/private networks needs to be incorporated into 6G spectrum discussions from the beginning of the technology development phase and not be a restriction posed afterwards*". Thus, it is not clear which parts of the executive summary statements are agreements, and which are by some involved stakeholders. This could be stated in the document using terms like "some stakeholders" to avoid giving the impression that all involved stakeholders agreed to all statements, when the spectrum sharing part is restricted to be only researchers' proposal. Regarding the statement on spectrum sharing, the original input from University of Oulu also highlighted the importance of spectrum sharing between 6G networks and incumbent spectrum users, which is omitted in sub-section 1.1 and could be added there.

University of Oulu supports the conclusions made by the RSPG in sub-section 1.2. Especially, the emphasis on spectrum sharing and the needed change in mindset regarding inter-service spectrum sharing are excellent conclusions. When sending the message to policy makers, spectrum managers, users and industry, it would be good to send a message to the research community as well to investigate spectrum sharing solutions in the context of 6G R&D with the goal of providing input that supports the RSPG's strategic 6G vision for Europe.

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Detailed comments on Chapter 2 5G development and lessons learnt

Chapter 2 provides a good summary of 5G spectrum implementation status in Europe including spectrum sharing. The statement "*Spectrum sharing between different services and technologies allows MNOs to dynamically allocate and share the same frequency spectrum between 4G and 5G.*" is confusing in terms of what is meant with "services". In sharing between 4G and 5G, the service remains the same. The concept of "dynamic spectrum sharing" is introduced later in the paragraph as a different spectrum sharing scheme to denote the same sharing arrangement between 4G and 5G, which is confusing.

Sub-section 2.4 on "Locals and verticals" emphasizes that "*the spectrum need for local and vertical use will still increase, which needs to be taken into account in future spectrum strategies*". University of Oulu is happy to see that the RSPG has recognized the important role of verticals and local networks and its implications on spectrum management and supports this development. However, this sub-section does not consider the case, where "locals" and "verticals" could locally use a frequency band assigned to an MNO but not in use by the MNO in the given location.

Detailed comments on Chapter 4 Drivers and enablers for 6G

Sub-section 4.1 on "recent technology trends" cites 3GPP work but does not say anything about the technology trends. When talking about technology trends for 6G, the main reference continues to be the ITU-R report on technology trends in Report ITU-R M.2516 "Future technology trends of terrestrial International Mobile Telecommunications systems towards 2030 and beyond" from 2022, which could be cited under this heading.

University of Oulu is happy to see that sustainability is included in the 6G strategic vision with its own Sub-section 4.3, emphasizing environmental, social and economic perspectives.

Detailed comments on Chapter 5 Spectrum sharing solutions

University of Oulu welcomes RSPG's latest statements on spectrum sharing. The draft report uses the concept of "interservice spectrum sharing", which is meant for "*spectrum sharing between different radiocommunication applications, either within one ITU Radio Service or involving different Services*". It would be good to provide examples of what falls under this spectrum sharing concept. It is not clear, how the current name "interservice sharing" is applicable to a situation, where sharing is within one radio service but between different applications, which requires more clarity. "Intra-service spectrum sharing" might be better suited for characterizing sharing between applications within the same radio service, following the terminology introduced in RSPG Report on Spectrum Sharing in 2021.

Sub-section 5.2.2 uses the term "intra MNO sharing" for an MNO to utilize the same frequency band between different mobile technology generations, which is a very good term for this. This brings the needed clarity into spectrum sharing discussions where the term "dynamic spectrum sharing" has been confusingly used for the intra MNO sharing by some stakeholders.

Sub-section 5.3.1 mentions the prior RSPG opinion on licensed shared access (LSA) concept. University of Oulu would like to remind that the LSA concept is not restricted to sharing between governmental and commercial usages and offers a lot of potential in the 6G context for sharing with different types of incumbents.

University of Oulu welcomes RSPG's observations in 5.3.3 about the need to understand and assess all practical performances and shortcomings of various spectrum sharing concepts and approaches and highlights the research community's role in doing so. University of Oulu also supports RSPG's consideration *"that 6G should include native features/enablers to assist in sharing with other spectrum usages, since new spectrum for mobile networks are expected not to be on an exclusive basis"* and welcomes RSPG's invitation to incorporate possible interservice spectrum management in R&D projects' scope. The draft report mentions Hexa-X project by name. However, the Hexa-X project has ended in 2023, and the Hexa-X-II project will end in June 2025.

Detailed comments on Chapter 8 Input from research and development

Chapter 8 includes inputs from the EU 6G Flagship project Hexa-X-II, where University of Oulu participates, and the Finnish 6G Flagship program from the University of Oulu, based on the presentations given at the hearing event in September 2024. University of Oulu is happy to see that inputs including text extracts from the hearing presentations are well reflected in the draft RSPG Report on 6G strategic vision.

Figure 5 is from Hexa-X-II project and an earlier version of the figure is presented in Hexa-X-II Deliverable D1.1, which is cited in the figure caption, but the exact figure cannot be found in D1.1. Thus, the reference in footnote 45 could be modified to reflect that "an earlier version is presented in Hexa-X-II D1.1".

University of Oulu is happy to see that our inputs on spectrum access option for local 5G/6G networks, spectrum sharing, sustainability, and security and resilience are well reflected in sub-sections of Chapter 8.

The security discussion in sub-section 8.13 could be further expanded to consider recent developments in Europe. Some European countries plan to phase out the Terrestrial Trunked Radio (TETRA) system, which was designed for Professional Mobile Radio (PMR) user organizations such as the police, rescue services, government, border control, and military. Instead, they will rely exclusively on commercial 4G and 5G networks. Consequently, it is crucial to implement measures that extend beyond the capabilities of current mobile networks to ensure the security and reliability of communications for critical services. In this development, security build-in and the openness of security design principles are crucial as well as taking into account already known vulnerabilities. This transition calls for new design paradigms aimed at resilient-by-design frameworks for 6G and beyond. Such planning must address multiple time scales, focusing on both immediate needs and long-term strategies.

Respectfully,

University of Oulu, Finland

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Essi Kiuru, Administrative director

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