

University of Oulu view on Draft RSPG Opinion on Spectrum Sharing – Pioneer initiatives and bands



University of Oulu, Finland, welcomes the opportunity to comment on the Draft RSPG Opinion on Spectrum Sharing. Spectrum sharing is a topic that has been intensively studied in the research community for two decades, in close collaboration between stakeholders representing industry, academia and regulation.

The University of Oulu fully agrees with the RSPG's observation that spectrum sharing is so far implemented in the European Union in a rather static and conservative manner and needs to be developed to achieve more efficient use of radio spectrum, and to give incentives for innovation. Despite research and trials of spectrum sharing, documented in more than 25 000 research articles on cognitive radio alone, the wide-spread adoption of spectrum sharing in real-life wireless systems has not taken place.

1. Detailed comments on topics

Item 2: *“Some examples of possible options are represented by the Italian “club use” at 26 GHz, which follows the principle of “use-it-or-share-it”, the spectrum pooling approach in the IMT-Bands, the Licensed Shared Access or the geolocation functionalities/geolocation database solutions. The current models could develop and improve, and furthermore new sharing models will occur in the future. It is recommended that Member States keep track of future developments.”* The University of Oulu supports the new approaches following the “use-it-or-lose-it” principle. New developments and innovative ideas often arise from the research community, in close collaboration with the industry, and their adoption is dependent on the decisions taken by regulators. To promote the true adoption of spectrum sharing, the role of governments in merely keeping track of future developments is not sufficient. An active call for the development of sharing-based solutions, developed by the research and industry collaborations, is needed.

Item 4: *“The RSPG seeks to nudge a change of mindset: all considerations in the field of spectrum made by policy makers, spectrum managers, users and industry should be done by pursuing better spectrum efficiency through more spectrum sharing, including by following the principles of “use-it-or-share-it”.* The University of Oulu fully supports RSPG's desire to pursue better spectrum efficiency through more sharing and welcomes the introduction of the “use-it-or-share-it” principle into spectrum access.

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Item 11: “*Member States should favor spectrum sharing agreements, including those based on spectrum pooling among licensed operators, if necessary attaching conditions to those agreements, when they pursue public interest objectives such as more efficient use of spectrum, including enhanced coverage and/or capacity and network densification.*” The promotion of spectrum sharing should not be left to commercial agreements between by the holders of spectrum access rights themselves – the role of regulators to enforce sharing agreements is critical, especially when pursuing public interest options, such as rural area connectivity.

Item 12: “*Spectrum sharing should not be considered the answer to any shortage of frequencies when addressing conflicting demands by various spectrum users or sectoral needs.*” This statement contradicts with the other parts of the opinion, where spectrum sharing is promoted (see, e.g., 5: *When assigning new rights of use, Member states should consider sharing spectrum between incumbents and new users using innovative and more dynamic solutions.*)” Spectrum sharing aims at accommodating the conflicting demands of various spectrum users without the need for clearing a band by facilitating the operations of two or more wireless systems in the same band. There are many studies that consider the role of spectrum sharing in addressing the conflicting demands of various spectrum users.

Item 17: “*Free resources are hardly available, neither in time, nor in geography.*” The message given with this is highly confusing – why promote spectrum sharing if there is nothing to share? Research findings have concluded that there are plenty of free resources in different bands and locations, which spurred a whole research stream on cognitive radio techniques to allow spectrum sharing. Moreover, the draft opinion does not propose pioneering bands but concludes that “*This makes it difficult to identify specific pioneer initiatives or bands from a frequency management point of view within the scope of RSPG.*” For research, it would be fundamental to sketch those bands to spur specific studies by the research community. The spectrum bands have highly distinct propagation and deployment characteristics, and therefore a representative set of spectrum bands would be needed. These include low-band (such as the UHF band, for which there is an abundance of data from the research community on its shared use), mid-band, millimeter wave and terahertz bands. Work needs to be done to identify pioneering bands in each of them, to invite the wider community to explore sharing opportunities.

Item 22: “*In order to facilitate the introduction of new spectrum sharing options in a context of scarcity of frequencies, the way the sharing conditions are defined should be based on realistic scenarios, rather than worst-case, and take into account as far as possible results of measurements to better understand the impact of real case interference.*” This is very important and could be the catalyst for new research to bring the original principles from the cognitive radio related research into practice.

Item 24: “*Member States are encouraged to support the development of initial “proof of concept” systems in bands where advanced spectrum sharing systems, such as cognitive radio systems and other ICT or database assisted systems have been developed at least at the experimental level and are under the control of the regulator, and to devise how those systems can*

be reused and considered for sharing solutions in other frequency bands.” The University of Oulu fully supports the RSPG view to encourage the development of proof-of-concept systems.



Item 25 *“Where it seems sensible and possible and there is demand, Member States are encouraged to issue temporary “test&trial”/“innovation&trial” licences (sandboxes), including in a multi-country context, where appropriate in order to foster innovation. Those licenses should give users, including non-traditional operators, the possibility to get access to spectrum.”* The issuing of temporary licenses for trials and testing by the national regulators is of utmost importance and a pre-requisite for research. There are good examples of the success of this approach. In Finland, in an academia – industrial collaboration, the world’s first Licensed Shared Access (LSA) technologies were developed and successfully demonstrated in the trials in 2013. Additionally, other multi-tier sharing approaches emerging outside of Europe were successfully developed and trialed in Finland.

Item 27: *“In order to introduce ICT-assisted or database-assisted spectrum sharing solutions, Members States might foster work by CEPT and ETSI to support the implementation of such spectrum sharing approaches.”* Some clarity is needed on the terminology regarding “ICT-assisted” or “database-assisted” – database-assisted solutions fall under the generic category of ICT-assisted solutions.

Item 36: *“The RSPG recommends the European Commission to continue funding and give priority to EU research projects aimed at increasing the commercial development of technologies and network architectures that can make spectrum sharing more efficient and ease its development.”* It is very important that the promotion of spectrum sharing stays on the agenda of EC funding to research projects. Additionally, a feedback mechanism for using the research results produced in the EU-level and national-level research projects in regulation is urgently needed. At the time of the prior EC funded projects on cognitive radio there was no direct link between the research projects and on-going regulation. They evolved individually, only linked by a handful of stakeholders that participated in both domains.

37: *“The RSPG recommends Member States to take into account developments towards innovative spectrum sharing solutions and initiatives outside the Union.”* This is very important, especially noting that most single European countries are small markets and the adoption of different spectrum sharing solutions in different countries does not lead to wide-spread adoption. Additionally, new sharing-based approaches have emerged outside of Europe and it essential to explore key learnings and technology enablers from these dynamic spectrum sharing models.

2. Additional topics of consideration

Spectrum sharing is all about managing the conflicting views of different stakeholders starting from the high-level use of the band, all the way down to defining specific protection criteria and mechanisms for interference coordination. The role of the different stakeholders (incumbents, entrants, regulators, etc.) and the need for proper stakeholder analysis was not

discussed in the draft opinion although its role is critical in realizing any spectrum sharing arrangements between the different radio systems. To realize spectrum sharing envisaged in the draft opinion, it is time for proper stakeholder analysis¹, taking into account the conflicting claims of different existing and upcoming spectrum users to reach long-term compromises.

The draft opinion included several examples of spectrum sharing but did not consider the newly emerged local licensing models. It has become a novel spectrum assignment model recently adopted by regulators in several Member Countries and presents an actionable spectrum sharing model. In addition to licensed sharing models, more dynamic approaches with real-time spectrum access on the fly to accommodate varying levels of load are of interest.

The spectrum bands are different in terms of propagation characteristics and resulting deployment models. One spectrum sharing solution does not fit to all situations and therefore identification different types of pioneering bands is critical for the research community to develop useful solutions in close collaboration with industry and regulators.

The University of Oulu would like to draw attention to the future wireless systems emerging a decade from now – namely 6G. The research towards 6G has started, first in Finland and then globally, aiming at operating on a number of spectrum bands and also blurring the traditional roles of radiocommunication services. There the role of spectrum sharing is important and the developments by the RSPG are important steps towards realizing spectrum sharing.

To conclude, the University of Oulu supports the new RSPG Opinion on spectrum sharing that promotes a wide-spread adoption of spectrum sharing – a visionary path envisaged in the research community more than two decades ago.

Respectfully,

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¹ M. Matinmikko-Blue. Stakeholder analysis for the development of sharing-based spectrum governance models. 2018. University of Oulu.
<http://jultika.oulu.fi/files/isbn9789526220512.pdf>

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