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Response on the public questionnaire for the long-term vision for the upper 6 GHz band from a research and education point of view

In response to the Radio Spectrum Policy Group questionnaire for the long-term vision for the upper 6 GHz band, research and education in EU would benefit significantly if this band were given to the Wi-Fi protocol (to license free utilisation). The European National Research and Education Networks (NRENs) rely very heavily on Wi-Fi to provide fast, reliable, and secure network connections to researchers and students on campuses all over Europe. Excellent connectivity is vital for the competitiveness of research and for student success. While IMT (International Mobile Telecommunications) are forced to treat end-users equally regardless of their location and current utilisation (business, leisure), Wi-Fi can serve business and remote working in an accurate and on-demand way exactly where high speed and reliability is required. In the rest of this document further details are listed to underline the statement presented above as answers to part A of the call for comments for the long-term vision of the 6GHz frequency, as published at: https://radio-spectrum-policy-group.ec.europa.eu/consultations-0_en

I) Demands for MFCN or WAS/RLAN in the upper 6GHz band

Researchers, students and staff on campuses solely use 802.11 based Wi-Fi (WAS/RLAN) to connect their devices to the campus network. Plugging in devices belongs to the past for most of them. If smartphones are excluded most devices only have Wi-Fi as their option for wireless connectivity so it's only natural the Wi-Fi becomes the standard. Another factor is economy were migrating from a Wi-Fi infrastructure to something IMT based like 5G based would be very expensive both on the infrastructure and the client device side. Test cases have shown that building similar infrastructure with indoor 5G technology would be at least 3 to 5 times more expensive and that doesn't include the client side.

Just to be clear 5G is a great complement to Wi-Fi, especially outdoors but indoors Wi-Fi is a clear winner when you consider cost/capacity.

Wi-Fi also facilitates mobility and NRENs under the EU funded GEANT project have developed the service eduroam, in which end-users easily and securely connect to the Wi-Fi network when they visit other campuses, creating roughly one single Wi-Fi network for the whole research and education world. Using eduroam is free-of-charge and available in more than 100 countries.

Neither NRENs nor university campuses have any monetary or business interest in either Wi-Fi or any other communication system (MFCN including IMT), but all campuses have chosen Wi-Fi for providing access to the campus network for their end users. The campus Wi-Fi networks are monitored constantly, and even small outages are not tolerated by researchers, students and staff managing their daily tasks. The Wi-Fi standard is regularly updated (Wi-Fi6e, Wi-Fi7, work on Wi-Fi8 has started) because the throughput and reliability demands are constantly growing. The fact that EU opened up the lower part of the 6GHz band for unlicensed use have been a great boost for Wi-Fi and does buy us some time but looking forward with increasing demand we will definitely hit the capacity wall in 2-3 years if additional spectrum (the upper 6GHz band) isn't also opened up for Wi-Fi use.

II) Sustainability of the above explained demand

1) Environmental impact assessment

Wi-Fi access points on campuses are extremely seldom replaced due to disfunction. Instead, Wi-Fi upgrades are done to meet the constantly growing demand for faster connections, which newer standards can provide. Most of the current 6GHz capable Wi-Fi access points being procured already have the hardware capacity to use the full 6GHz band. It's only a question of software and in some cases recertification.

Furthermore, campus Wi-Fi networks, as well as home Wi-Fi networks, are designed to cover relatively small areas where focus can be put on directing network resources only to areas in which it is certainly needed. In IMT, fine-tuning of the resources is not easily possible to the same extent. Also, the energy consumption on the IMT side's infrastructure have a tendency of being much higher when comparing with Wi-Fi^c.

2) Social economic impact

All university campuses in Sweden and across Europe have chosen to provide Wi-Fi to their end-users. The access points can be directly connected to their fixed network and the IT staff remains in control of network access. In case of Wi-Fi being replaced, how

could the IT staff respond to an end-user complaint? Would a nation-wide network operator care about first-class connectivity in all parts of a university campus? All research and education institutions have a long history of providing Wi-Fi access and they have developed a deep understanding of the technology, the maintenance required as well as proper procurement processes for cost-efficiency. Building a private 5G for indoor coverage has proven as stated before in this document as much more expensive in comparison to current use of Wi-Fi^b.

III) Information about

1) the possible role of the upper 6GHz band

Digitalisation and mobility require proper ICT infrastructure and for this reason the spectrum resources available must be utilized where it gives the best economic and social benefit. The frequency band in question is best suited for smaller cells, short-range communication and therefore extremely suitable for Wi-Fi. With more spectrum every system can deliver higher throughput and less error-prone connectivity. Wi-Fi and other systems utilising license free spectrum will provide the most efficient usage of this spectrum, given its characteristics. Wi-Fi on university campuses in the US, Canada, Brazil, Saudi Arabia, and South Korea can already benefit from additional spectrum resources, the EU university campuses should not be left behind!

Let's look at facts when debating whether the upper 6GHz band should be reserved for Wi-Fi (unlicensed) or IMT (licensed): Wi-Fi already have the ecosystem and the technology to avoid interfering with the incumbents of the upper 6GHz band. IMT don't and it would take a long time before it could be put in use.

There is also the question of who uses their currently allocated spectrum and where demand for more exist? (a)

Even devices with 5G capacity like smartphones typically uses 5 to 15 times more Wi-Fi data when usage is compared to 5G data^a.

2) use cases, expected deployments (e.g., number of BS for MFCN) and timeframe

University campuses are expected to continue offering Wi-Fi to their end-users as long as the technology remains competitive. There are no current plans to relinquish established and well proven practices and university campuses have been reluctant to even outsource their Wi-Fi networks. As a technology with which they can retain control over their own networks, university campuses are expected to continue investing in Wi-Fi networks.

IV) Information about standardization and technology impact

The NRENs and their corresponding university campuses only want to provide the most appropriate, secure and cost-efficient solution for end-user connectivity without any business interest in the technology behind it. Hence, some neutrality can be expected from this community. Over the years, Wi-Fi has proven to be the favoured solution but without the additional spectrum this cannot be expected to continue^b.

Changing technology would have cost and environmental effects and it could mean losing control over the network and not being able to serve the end-users as efficiently as with total insight in the packet flows. Over the last 10-20 years there have been times where new technologies like 4G and 5G have tried to replace the dominant Wi-Fi as the largest wireless access technology for indoor use but there are no signs of that happening, rather the opposite.

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References

- a) <https://www.wi-fi.org/file/6-ghz-wi-fi-connecting-the-future-2022>
- b) https://www.dynamicspectrumalliance.org/wp-content/uploads/2019/06/IMT-RLAN_6425-7125MHz-European_Union_Study-1.pdf
- c) <https://www.wi-fi.org/file/study-sustainability-benefits-of-6-ghz-spectrum-policy-2023>