Radio Spectrum Policy Group

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Answers to the Questionnaire on Long-term vision for the upper 6 GHz band

The Czech telecommunications cluster (Český telekomunikační klastr z.s.), the Committee of independent ICT Industry[1] (Výbor nezávislého ICT průmyslu, z.s.), the ISP Alliance (ISP Alliance a.s.), the National Chamber of Ethernet Communications (Krajowa Izba Komunikacji Ethernetowej) and the Telecommunications union of the Slovak Republic (Telekomunikačná únia Slovenskej republiky) are associations of internet service providers and telecommunications operators in the Czech Republic, Poland and Slovak Republic. As such the members of our associations provide internet and telecommunications services to a significant portion of end users in our respective member states.

The decision on the allocation of the upper 6 GHz band is of utmost importance to us and our members. The 6 GHz band – which includes the lower (5945-6425 MHz) and upper (6425-7125 MHz) portions – is one of the last bands still available to be used for the fixed wireless service, which critically needs additional spectrum.

The upper 6 GHz band, if fully opened to the WAS/RLAN technologies, could bring a lasting and tangible benefit to the end users across the EU and could significantly contribute to meeting the targets identified in the Digital Decade Policy Programme 2030 (DDPP).

A. Questions directed to the MFCN and the WAS/RLAN stakeholders:

I. Explain the demand for MFCN or WAS/RLAN in the upper 6GHz band before and beyond 2030

A significant part of end users in the EU presently accesses the internet through RLAN (Radio Local Area Networks) fixed wireless networks. These networks excel in speed and economy of their deployment while retaining a high quality of service. For this reason, they are essential especially in rural areas where they

[1] The association Výbor nezávislého ICT průmyslu, z.s. does not represent its member Vodafone Czech Republic a.s. in this matter

often represent the only available option of a high-quality internet connection – the deployment of fiber-optical networks to remote or sparsely populated locations often being economically unfeasible even with directed state aid. Wireless internet connection is however widespread also in urban areas where it offers favorable service pricing options to the customers. In countries with a large share of fixed wireless connections, such as the Czech Republic with more than 1 100 000 connections or the Slovak Republic with more than 280 000 connections, RLAN is a necessity.

These networks however need to be supported by the public sector primarily through radio frequency allocation. This is exactly the area where we can expect a significant bottleneck to form in the medium term unless relevant steps are taken. With the steadily increasing volumes of transmitted data, we can safely say that the radio spectrum available to fixed wireless networks today is insufficient. Although wireless networks experienced a rapid technological development in the last several years, the high intensity of utilization of the available spectrum makes the use of channels wider than 20 MHz impossible. This leads to limitations regarding connection speeds that can be provided to customers.

Allocation of the upper 6 GHz frequency band for both indoor and outdoor use would unlock the potential of the cutting-edge Wi-Fi 6E/ 7 technology (and its future evolution), which utilizes this band of radio spectrum, and decisively outperforms the 5G technology. Both the required standardization and the chips for Wi-Fi 6E/7 are ready and commercial devices from various manufacturers for indoor use are already available while those for outdoor use can enter the market very soon, if the necessary regulations allow it.

The rollout of the Wi-Fi 6E/7 technology should not be hindered by unnecessary delays. Considering that the 6 GHz frequency band has already been made available for license-exempt use in the USA, Canada and numerous other countries, we can reliably expect that the technology will be not only widespread, but also mature, when Europe develops regulatory frameworks that allow businesses and users to enjoy the benefits that this band can bring.

II. Provide information about the sustainability of the above explained demand, especially the:

1) Environmental impact assessment

A significant consideration that will be reflected also in the later parts of this document is the difference in network design and operation between WAS/RLAN on one side and mobile networks like 5G on the other, the latter being roughly comparable to the MFCN model. WAS/RLAN networks are designed and operated from the ground up as networks of small, low-transmission-power and low-consumption cells deployed in a relatively dense mesh. This allows for a precise design of the covered area with no extraneous coverage, where none is needed, while maintaining a low threat of interference with other systems, be it home Wi-Fi or outdoor incumbent services.

In outdoor scenarios, this model also usually requires a line of sight between the broadcasting and the receiving station, which is especially important if gigabit transmission speeds are sought. On the other hand, mobile networks are based on a smaller number of high-powered and high-consumption macro-cells, where unnecessary power expenditure is to be expected due to the cell necessarily covering also areas where no connection is necessary (e.g., fields and forests) because single cells service larger heterogeneous areas. For this reason, the difference in network density – which is based not only on current operators' choices but also on the complete divergence of the two device and chips ecosystems – means that the denser and lower-powered WAS/RLAN network consumes less energy while matching or even outperforming MFCN in the number of connected devices and volume of transferred data and is thus more sustainable.

2) Social economic impact

The difference in social economic impact between the two options (WAS/RLAN fixed wireless connectivity and MFCN) is twofold, as arguments can be made regarding gigabit connection availability and market competition.

As for the former, it is necessary to understand that a fiber-optic connection in certain areas – mostly remote or sparsely inhabited ones – is economically unfeasible. To benefit from the gigabit connection speeds envisioned by the DDPP, some households and offices will have to be connected to the internet via a fixed wireless connection, as indeed many currently are. For technical reasons connected to spectral efficiency using the Modulation Coding Scheme (MCS), a gigabit wireless connection speed strictly depends on line-of-sight between the base station and the end-user's receiver. Even a light obstacle, such as a tree, can significantly dampen the connection quality below a threshold where a gigabit connection speed can no longer be achieved. As previously mentioned, WAS/RLAN architecture consisting of a large number of small cells is much better suited to provide that than a macro-cell based MFCN infrastructure, and WAS/RLAN infrastructure can also be more easily expanded. Allocation of the band to WAS/RLAN would therefore increase the likelihood of meeting the target of providing every household with a gigabit connection by the year 2030, while a MFCN allocation could lead to exclusion of some areas from gigabit connectivity due to their lack of line-of-sight to the base station.

As for the competition aspect, the lower density and higher broadcasting power of the MFCN networks require a significantly higher degree of coordination between the individual broadcasting sites. This degree of coordination is practically only achievable through a licensed access to the radio spectrum. This, in turn, means that typically only a single operator – or very few of them – gains exclusive access to the frequency band in question, thereby achieving a monopoly (oligopoly) in the related field of services and dampening the positive effects of market competition, such as the incentive to lower prices for the end-users. Such an approach would also significantly increase the barriers for new operators to enter the market. Contrastingly, fixed wireless connectivity with WAS/RLAN is based on the principle of using significantly lower power base stations, which inherently do not require such a high degree of coordination. This principle allows for a more open and affordable license-exempt or light-licensed approach to the spectrum, where operators can invest more in providing high-quality connectivity to their customers. This also bypasses the aspect of exclusivity inherent in the mobile networks and allows for a market with a wide variety of operators, who compete on prices and quality of service to end users. Allocation of the spectrum in question for WAS/RLAN would therefore bring higher accessibility of high-speed internet services to households and businesses, meaning that more users – especially from economically disadvantaged groups – would be able to benefit from the digital transformation and avoid exclusion from the digital market. Lower barriers for market entry in case of WAS/RLAN allocation of the spectrum also means that it would be easier for new small enterprises to enter the telecommunications market, improving citizen engagement in economic activities. The difference between WAS/RLAN and MFCN could therefore be construed as the difference between a citizens' economy and a large corporation's one.

III. Provide information about:

1) The possible role of the upper 6GHz for MFCN or WAS/RLAN

As previously mentioned, WAS/RLAN is fully able to provide up to gigabit speeds due to the density of the existing infrastructure and a chip-and-device ecosystem designed towards small-cell network architecture. WAS/RLAN networks are also better suited to operate within line-of-sight to the receiving unit, making them more suitable for the task than MFCN based solutions.

Another important aspect to consider is the much higher suitability of WAS/RLAN networks for coexistence with other systems compared to MFCN. Data published by the company ASSIA[2] show, that more than 90% of data received through a fixed connection by the end user has been transferred to the end-user's device via an indoor Wi-Fi network, only less than 10% of data was received by other means such as an ethernet cable. This underlines the importance of home Wi-Fi connection in practically all personal use-cases of the internet in the EU. Similarly, up to 80% of user complaints towards internet connection quality are tied to a deficient home Wi-Fi network. If meeting the goals of the DDPP is to bring a real, tangible benefit to the end users in the Union, indoor Wi-Fi must not be neglected in terms of radio spectrum allocation. The lower radiated power of the denser outdoor WAS/RLAN network architecture makes it compatible with indoor home Wi-Fi solutions in the same frequency band, meaning that both the indoor and the outdoor network can utilize the upper 6 GHz frequency band efficiently without the threat of significant interference. The same cannot be said for high-power MFCN systems, which would present significant challenges when attempting to co-exist with indoor Wi-Fi in the same frequency band (and incumbents).

For all the same reasons, WAS/RLAN is far better suited than MFCN for co-existence also with other systems using the band such as satellite networks (as it was decisively described by the Global Satellite Operators Association, GSOA[3]) and incumbent fixed services.

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

While small-cell infrastructure in 5G mobile networks is practically non-existent, WAS/RLAN systems able to utilize the band in question are already available on the market. With the allocation of the whole 6 GHz band to license-exempt WAS/RLAN in the USA and Canada (and also in many other countries[4]), it can be expected that the chip and device manufacturers will be highly motivated to further develop and expand their portfolios of WAS/RLAN devices in this band as well. Nevertheless, as per our members' experience, the biggest hindrance to an efficient use of the spectrum by MFCN is not the unavailability of devices (be it as it may) but the long-term unpreparedness of physical infrastructure for line-of-sight rollout necessary for gigabit speeds on wireless connections. While the current WAS/RLAN operators already have a dense mesh of physical infrastructure that can be relatively easily and cheaply augmented to host also the upper 6 GHz technology, the mobile operators that could benefit from a MFCN allocation of the spectrum in question maintain a much smaller number of sites and compensate with high radiated power. If they were to attempt to densify their networks to efficiently use the 6 GHz band, they would face significant difficulty in acquiring the necessary rights to build on third-party properties (at least as things stand in the Czech Republic) and only after acquiring those, they would then have to actually build the sites. For the aforesaid reasons, the MFCN rollout would be much more problematic and take longer.

IV. Provide information about standardization and technology impact

The aforesaid divergence of approaches between the WAS/RLAN and the mobile technologies, such as 5G, is clearly visible in the ecosystem of devices offered by the manufacturers. 5G technology is currently very expensive and therefore it is economically unsuitable to be widely deployed via small-cell architecture. The 5G supply chain is heavily optimized towards the deployment of macro-cells and so developing small-cell deployments that could deliver gigabit speeds using the upper 6 GHz band would pose challenges hard to

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[2] How do Europeans connect to the internet 2022. Dynamic Spectrum Alliance, available at: https://6ghz.info/wp-content/uploads/2022/06/DSA-White-paper-How-do-Europeans-connect-to-the-Internet.pdf

[3] See https://gsoasatellite.com/news/2619

[4] See https://www.wi-fi.org/regulations-enabling-6-ghz-wi-fi for a full list

overcome. Commercial availability of cost-effective Wi-Fi 6E or Wi-Fi 7 devices, which would constitute the backbone of the WAS/RLAN rollout, can be expected to be much higher. It is even entirely possible that at the time of allocation a further technological successor (e.g. Wi-Fi 8) could already be available. The development of low-powered wireless devices for WAS/RLAN currently vastly outpaces the development of MFCN hardware. Widely used WiFi 6E standard supports already 1048/4096 QAM modulation with 8x8 MU-MIMO and 160MHz channels while its successor Wi-Fi 7 supports the 4096 QAM modulation with 16x16 MU-MIMO and especially 320 MHz channels and both are therefore fully capable of providing gigabit connection speeds. Even existing and readily available WAS/RLAN technology (e.g. by Cambium Networks, Tarana Wireless, Inc.) would be already technically capable of 1,6 -2 GHz speeds, if a robust enough regulatory framework would allow its use especially in the 6 GHz band, and even this can be expected to be surpassed by the time of allocation of the frequency band in question.

For all the aforesaid reasons, we deem it more advantageous for the EU and its citizens to allow WAS/RLAN technologies to use the upper 6 GHz frequency band indoors and outdoors.

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