

Consultation Title	RSPG Work Programme for 2024 and Beyond
Deadline	15 December 2023
Geographical Scope	European Union
Co-Signatories	Amazon Inc., Broadcom Inc., Cisco Systems Inc., Meta Platforms Ireland Limited
Date	14 December 2023

Dear Colleagues,

The undersigned companies, representing an important cross-section of the world's leading silicon vendors, system manufacturers, and application providers, welcome the opportunity to respond to the Radio Spectrum Policy Group's draft on the Work Programme for 2024 and beyond.

1. Executive summary

Our response focuses on the following two proposed work areas: *Long-term vision for the upper 6 GHz band (2030 and beyond)* and *6G strategic vision*.

The undersigned companies respectfully ask the Radio Spectrum Policy Group (RSPG) to consider how the upper 6 GHz band (6425-7125 MHz) can best be harnessed to meet the strong demand for better connectivity in Europe in the period between 2024 and 2030, as well as the following decade. Given the differences in views within EU administrations and, more importantly, local variations in spectrum needs, the RSPG should consider developing a framework that would give individual countries near-term flexibility to allow access to the upper 6 GHz band by licence-exempt technologies whilst protecting incumbents.

Before identifying the spectrum needs of 6G, it is important to develop a clear definition of what 6G is and how it is likely to be used. Furthermore, any evaluation of the spectrum needs of 6G should be part of a broader vision that seeks to ensure that spectrum is used as efficiently and as flexibly as possible. To date, licence-exempt spectrum bands have been used far more efficiently than frequencies reserved exclusively for licensed IMT services (as further discussed below).

More detailed comments on the proposed Work Programme are contained in the following section.

2. Detailed comments

2.1. Regarding the vision for the upper 6 GHz band

In our opinion, the work area should not be confined to a long-term vision (2030 and beyond) for the upper 6 GHz band (6425-7125 MHz). The work should also look at the 2024-2030 period, particularly given that CEPT and national administrations are undertaking studies on the future use of this band.

Europe will need to harness the upper 6 GHz band in the near future to bolster Wi-Fi connectivity indoors where the vast majority of Internet traffic is being generated. If the full 6 GHz band were to be made licence-exempt, it would enable a step change in the capacity and performance of Wi-Fi 6E, which is suitable for both consumer and enterprise use cases. This is the approach being taken by advanced digital economies, such as Canada, South Korea and the US, which are also leading adopters of 5G.

In the US, Wi-Fi 6/6E client devices are entering the home at an unprecedented rate, surpassing 50% market share since these devices were introduced in 2019 (compared with four years for Wi-Fi 5 to have the same penetration), according to a new report¹ from the Wireless Broadband Alliance, which says there are now almost 20 Wi-Fi connected devices per household in developed markets.

Most Europeans are not satisfied with the reliability and cost of the connectivity they have today. To facilitate their daily use of digital technologies, 3 out of 4 Europeans stress the need for better connectivity, specifically better availability of a high-speed internet connection (76%) and greater affordability of these connections (75%), according to the Eurobarometer 2023 figures quoted in the EU's State of the Digital Decade report².

Meeting that demand will require more wireless capacity indoors. Whereas mobile data consumption per user in Europe is set to grow from approximately 15 GB/month in 2022 to 75 GB/month by 2030, fixed data consumption per household is set to grow from 225 GB/month in 2022 to 900 GB/month by 2030, according to a report by Arthur D Little³. If we assume that there are three times as many mobile connections as fixed connections in most European markets, that suggests the absolute growth in fixed data traffic will be 3.75x that of mobile data traffic in Europe between now and 2030.

¹ <https://wballiance.com/wba-industry-report-2024/>

² <https://digital-strategy.ec.europa.eu/en/library/2023-report-state-digital-decade>

³ <https://www.adlittle.com/en/insights/report/evolution-data-growth-europe>

Globally, mobile data traffic growth is set to be even more modest - average mobile data usage per smartphone is set to rise from 21 GB in 2023 to 56 GB in 2029, according to Ericsson⁴. Meanwhile, Openvault reports⁵ the monthly weighted average data consumed by US households in the second quarter of 2023 was 533.8 GB, up 9% from a year earlier.

As fixed traffic rises inexorably, Wi-Fi urgently needs more spectrum. Studies by Quotient, Qualcomm and ASSIA have each pointed to major spectrum shortfalls for licence-exempt technologies, with ASSIA highlighting how congestion in both the 2.4 GHz band and the 5 GHz band has been impacting quality of service. From these studies, it becomes obvious that even 480 MHz of licence-exempt spectrum in the 6 GHz band will not be sufficient to satisfy Europe's capacity needs.

Given the important role that Wi-Fi plays for the broadband ecosystem and its continuing growth, there is a need to make the full 1180 MHz in the 5945-7125 MHz (6 GHz) band available on a licence-exempt basis to support the ever-increasing demand and enable European nations to meet their broadband goals and objectives for a digital society.

In particular, Wi-Fi 6E, and the forthcoming Wi-Fi 7 standard, need access to 1180 MHz to utilize the full extent of their capabilities and support evolving and emerging innovative use cases. Opening only 480/500 MHz of the 6 GHz band would mean that Wi-Fi networks in dense deployments would have to continue employing small channel bandwidths, as only one 320 MHz channel or three 160 MHz channels would be available. With access to the full 1180 MHz, a larger number of these wide channels could be accommodated, significantly improving the performance available to each user.

In short, it is vital that Europe does not squander the near-term opportunity to employ the full 6 GHz band to improve Wi-Fi connectivity.

2.2. Enabling a technology-neutral gigabit society

As noted in the draft RSPG plan, a key objective of the European Digital Decade Policy Programme is that by 2030 *“all end users at a fixed location should be covered by a gigabit network up to the network termination point and all populated areas should be covered by a next-generation wireless high-speed network with performance at least equivalent to that of 5G.”*

As the performance of 5G networks varies widely, depending on a range of factors, this objective is somewhat vaguely defined. Still, the best way to deliver “next-generation wireless” coverage in

⁴ <https://www.ericsson.com/en/reports-and-papers/mobility-report/dataforecasts/mobile-traffic-forecast>

⁵ https://openvault.com/wp-content/uploads/2023/07/OVBI_2Q23_Report_v4_FINAL.pdf

populated areas, while safeguarding the principle of technology-neutrality will be to ensure that there is adequate licence-exempt spectrum available. Such spectrum can be used by many different technologies, enabling the user to select the best approach to meet their needs.

Tellingly, licence-exempt services are hugely popular with consumers, partly because they enable the end-user to decide how to connect to broadband in their homes or public spaces. They are also more efficient. Mobile networks in Germany delivered 6.7 million GB per MHz of spectrum allocated in 2022⁶. By comparison, Wi-Fi, operating predominantly over 2.4 GHz and 5 GHz during 2022, delivered approximately 108.9 million GB⁷ per MHz per year, i.e., Wi-Fi used the available spectrum 16 times more efficiently than mobile networks⁸.

To penetrate building walls, 5G services need to consume high levels of power⁹. As a result, connecting an indoor device to an outdoor base station will use a disproportionate amount of energy while also resulting in shorter recharge cycles, increased battery wear, and additional electronic waste.

It is also the case that low-power, mainly indoor, RLAN services, such as Wi-Fi, can share more easily (than outdoor 5G can) with other services, such as satellite earth-to-space links.

In short, licence-exempt spectrum should be at the heart of the EU's strategy to create a technology-neutral gigabit society.

2.3. Regarding the technical studies in CEPT

The proposed plan rightly notes the need to take into account the results of the (ongoing) technical studies in CEPT regarding the upper 6 GHz band. However, in some cases, it will be necessary to update the simulation parameters on the coexistence of mobile/fixed communications networks (MFCN) and WAS/RLAN with the incumbents in the band. In particular, it is important to use realistic assumptions about the power levels for MFCN in the sharing studies with WAS/RLAN, to accurately evaluate whether these services can coexist with incumbents.

⁶ Derived from data from Tätigkeitsberichte Telekommunikation and using the methodology used for the DSA paper "How do Europeans connect to the internet?"

⁷ This estimate assumes that 90% of the fixed-line traffic recorded by Bundesnetzagentur travels over Wi-Fi.

⁸ In the calculation we included the lower 6 GHz band although not really used by Wi-Fi as Germany opened the band only in July 2021.

⁹ Source: Evaluating The Interference Potential in 6 GHz: An Extensive Measurement Campaign of A Dense Indoor Wi-Fi 6E Network

2.4. On the continuous operation of Wi-Fi in the lower 6 GHz band

We strongly agree on the need to ensure continuous operation of WAS/RLANs in the adjacent lower 6 GHz band (5945-6425 MHz). European consumers and businesses will increasingly rely on Wi-Fi 6E, which depends on access to 6 GHz spectrum, to meet their indoor connectivity needs. By July 2023, there were almost 2,000 different types of Wi-Fi 6E devices available, a 58% increase since the start of the year, according to Intel's analysis of public information. Wi-Fi 7 devices, which also depend on the 6 GHz band, will also be available in commercial volumes from 2024.

As explained in section 2.1, both the lower and the upper 6 GHz band need to be licence-exempt for Europe to realise the full benefits of Wi-Fi 6E and Wi-Fi 7 and be competitive with other developed markets, such as North America and East Asia.

2.5. Preserving flexibility for administrations and letting the market pick winners

Given the differences in views within EU administrations and, more importantly, local variations in spectrum needs, the RSPG should work towards a framework that would give individual countries the flexibility to allow near-term access to the upper 6 GHz band by licence-exempt technology, whilst protecting incumbents. That would enable them to meet the specific demands for connectivity in their markets.

2.6. The role of indoor radio local area network (RLAN) networks and seamless handover between outdoor and indoor networks in meeting future sustainability goals.

Ubiquitous deployments of wireless communications based on Wi-Fi technologies are essential to enable the EU's sustainable development goals and achieve its Digital Decade vision. Several studies produced by, or for, European institutions have found that using Wi-Fi, in combination with wired backhaul over long distances, is the most energy-efficient form of connectivity^{10 11 12}. In addition, projects, such as open roaming standards from the Wireless Broadband Association, are looking to enable seamless roaming between cellular networks and public/enterprise Wi-Fi networks, which will help the EU meet its sustainable development goals and also give back some capacity to mobile network operators for use on their existing networks.

¹⁰ WIK-Consult and Ramboll, Final Study Report for EU BEREC "External Sustainability Study on Environmental impact of electronic communications," BoR (22) 34, 15 March 2022.

¹¹ The digital environmental footprint in France: ADEME and Arcep submit their first report to the Government, 19 January 2022. [Available online](#) [accessed: 7 December 2023].

¹² Radio Spectrum Policy Group RSPG21-0041-final, RSPG Opinion on the role of radio spectrum policy to help combat climate change. [Available online](#) [accessed: 7 December 2023]

2.7. Possible rollout of AFC-type deployments in the lower 6 GHz band.

Automated frequency coordination (AFC) system technology offers coverage/capacity improvements for RLAN operation outdoors and indoors and can be used to operate on both Wi-Fi and 3GPP-based license-exempt technologies (e.g. NR-U) in the 6 GHz band. AFC is in the last stages of certification in the US and Canada. Some other countries have expressed interest and are working on authorisation and enabling of AFC operation. There is a good level of confidence that the technology is ready for global adoption. The AFC system technology is flexibly designed and easily customised based on local regulatory and operational requirements. Effective enabling of the Standard Power mode under the supervision of the AFC system and scaling of the services depends heavily on the extension of the available spectrum in the upper 6 GHz band. Once AFC becomes standard in Wi-Fi chipsets and the concept has proven viable for the lower 6 GHz Wi-Fi bands, then it could be used or trialled in other bands or used by other wireless technologies in the future.

2.8. Regarding the 6G strategic vision

The development of a strategic vision for 6G needs to begin with a clear definition of what 6G is and how it is likely to be used. A full understanding of potential use cases for 6G is required to enable the spectrum needs to be properly evaluated and how these needs should be balanced with demand for licence-exempt spectrum to handle the fast-growing volume of Internet traffic being generated indoors.

We believe that suggestions that 6G will require additional IMT spectrum to support AR/VR applications are unfounded. At this stage, Wi-Fi is the only realistic wireless interface for remote AR/VR rendering, i.e. the processing of visual elements on a remote device to save power consumption on the AR/VR device. Remote rendering requires very high data rates and extremely low latency, and it is very unlikely to happen in a centralised manner at scale, especially within the time scales considered by this consultation. Indeed, remote rendering is likely to generate much more traffic at the edge of the network – i.e. between the VR headset and a local PC or between AR glasses and a user's smartphone – than the traffic actually transferred over the wide area network (either fibre or mobile). Further, specific QoS on the mobile broadband link is not a prerequisite for adoption of AR/VR applications for consumer devices. For professional AR/VR applications, dedicated deployment – through either Wi-Fi or private local mobile networks – should provide an adequate QoS level.

By 2030, widespread adoption of ultra high-definition video services and AR/VR applications will likely place very substantial demands on Wi-Fi connectivity inside homes, offices and other buildings. Any evaluation of the spectrum needs of 6G should be part of a broader vision that seeks to ensure that prime radio frequencies are used as efficiently and as flexibly as possible.

Respectfully submitted,

/s/

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