

Consultation Title	The development of 6G and possible implications for spectrum needs and guidance on the rollout of future wireless broadband networks
Deadline	25 August 2023
Geographical Scope	European Union
Co-Signatories	Amazon Inc., Broadcom Inc., Cisco Systems Inc., Hewlett Packard Enterprise (HPE), Meta Platforms Ireland Limited
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Dear Colleagues,

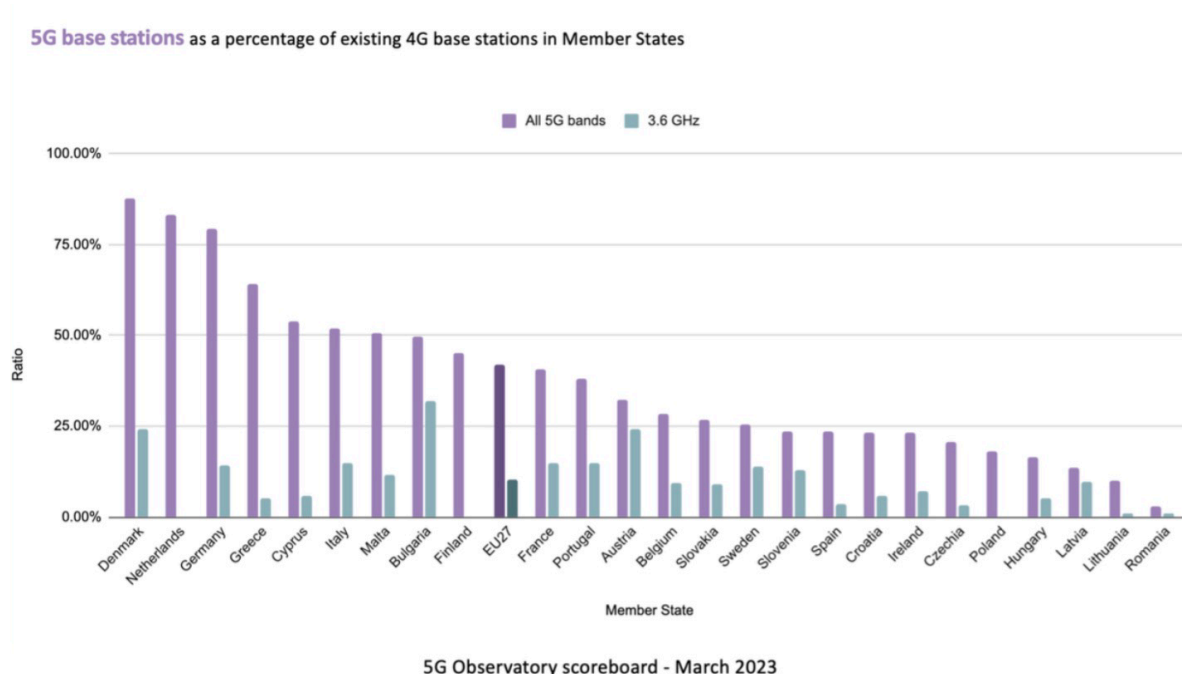
The undersigned companies, representing an important cross-section of the world's leading silicon vendors, system manufacturers, and application providers, welcome the opportunity to comment on the consultation issued by the Radio Spectrum Policy Group (RSPG) on the *DRAFT RSPG Opinion on the development of 6G and possible implications for spectrum needs* (the "Draft Opinion").

Comments on the RSPG opinion

Below are our brief comments on the points in Section 2 of the Draft Opinion.

Point 1 with respect to 5G implementation.

The EU needs to fully harness the capabilities of the spectrum bands that have already been made available for 5G. For example, the 700 MHz band provides excellent coverage (not just "good"), including outdoor to indoor connectivity. The 3.6 GHz band offers both good coverage and capacity. However, this band is under-utilised - deployments of 5G in this band in Europe are only a small portion of all 5G deployments, while the number of 5G base stations is a fraction of the number of 4G base stations (see the chart below from the 5G Observatory scorecard). In summary, the 3.6 GHz band still has a significant amount of spare capacity that can be used to meet potential future demand.



As the RSPG anticipates, 5G usage of mmWave bands is likely to increase, subject to device availability, either to address capacity issues in densely populated areas (i.e., for network densification) or to implement fixed wireless access solutions.

Point 2 on new solutions for more dynamic and shared use of spectrum.

As the draft opinion notes, more flexibility in spectrum access is needed to meet the rising demand for spectrum for wireless communications. Indeed, more dynamic and shared use of frequency bands will become increasingly important to find spectrum for new mobile services, including 6G.

Licence-exempt bands provide inherent flexibility and enable unparalleled dynamic use of spectrum while enabling stakeholders to control and design their own connectivity solutions tailored to their specific needs. Licence-exempt spectrum also supports a wide variety of business models to the benefit of end users.

We agree that dynamic spectrum sharing, leasing models, and inter-network sharing all have roles to play. Dynamic spectrum sharing, i.e., intra-network sharing as defined by 3GPP, is fast becoming an essential optimisation tool for mobile network operators. More broadly, in the case of inter-network spectrum sharing, the dynamicity of a sharing model depends on the types of services that are sharing a band and their geographic and temporal traffic demands. In some bands, dynamic may not mean real-time or quasi-real-time. Furthermore, in many cases, traffic demands and network operations are predictable, opening up opportunities to dramatically increase sharing capabilities beyond simple interference protection models.

Such opportunities could be exploited under current spectrum leasing regulations, where they exist, or could require additional frameworks to be introduced.

Point 3 on the increasing need for vertical and local spectrum.

As the RSPG notes, there is a growing need for vertical and local spectrum. As a number of European countries, including some EU Member States have recognised, the 3.8-4.2 GHz band¹, in particular, is well suited to support private networks and other local use cases; this band provides significant capacity for enterprise use. At the same time, we encourage Member States to continue working on harmonised technical conditions for low and medium-power terrestrial wireless broadband.

Point 4 on ways to meet the potential capacity needs of mobile networks this decade.

We agree with the RSPG that there is no need for additional EU harmonisation at this time; any need for additional capacity for mobile networks that may arise during this decade can be met at a national level by using the spectrum that has already been identified for IMT more efficiently.

Several recent studies have found that the growth of mobile data traffic has slowed down significantly and is well below what was originally anticipated for 5G. The annual growth in global cellular data traffic slowed from more than 90% in 2018 to 34% in 2021 and again to about 22% in 2022, according to research firm Analysys Mason². Data usage per mobile broadband subscription in OECD countries grew a modest 17% in 2022, compared to an average annual growth rate of 29% between 2017 and 2021, according to an OECD report published in July 2023³. The latest Ericsson Mobility Report⁴ shows global mobile data traffic grew 36% year-on-year in the first quarter of 2023 – the lowest figure for at least seven years. The same report revised the forecast on the number of global 5G subscriptions in 2028 downwards by 8%⁵.

In light of this new research, administrations should consider realistic projections of 5G mobile traffic and reassess the cost-benefit ratio of various strategies to meet current and future demand. If and when mobile capacity is exceeded in specific locations in Europe (at specific peak times), other strategies, such as network densification, can be more cost-effective and quicker to implement than deploying 5G in new

¹ We invite the RSPG to consider the [Mandate to CEPT](#) on technical conditions regarding the shared use of the 3.8-4.2 GHz frequency band for terrestrial wireless broadband systems providing local-area network connectivity in the Union.

² <https://www.analysysmason.com/research/content/articles/cellular-data-traffic-rdnt0/>

³ <https://www.oecd.org/digital/broadband/broadband-statistics/>

⁴ <https://www.ericsson.com/49dd9d/assets/local/reports-papers/mobility-report/documents/2023/ericsson-mobility-report-june-2023.pdf>

⁵ <https://www.lightreading.com/5g-and-beyond/ericsson-slashes-5g-outlook-by-400m-subscribers/a/d-id/785418>

frequency bands. Mobile data traffic in the most populated parts of European cities cannot be supported by continuously reserving new bands for IMT.

Specifically, the upper 6 GHz band (6425-7125 MHz) should not be part of the discussion for 6G as:

- The focus for 6G spectrum should be on bands that can be harmonised globally. Europe should not identify a band that has no hope of global harmonisation. The US, Canada, and many other countries have a large and growing number of fixed links in the upper 6 GHz band, which are used for important services beyond operator backhaul. There is no alternative spectrum to migrate these links to. Some countries, such as Japan, have important broadcasting services that do not have a readily available alternative frequency. Studies indicate that to protect fixed satellite services (FSS), any IMT deployment in the upper 6 GHz band would need to severely limit coverage (by reducing transmit power or the number of base stations). Such constraints mean it would not be practical to make the upper 6 GHz a core 6G band;
- The current Mobile allocation already provides the required flexibility to accommodate the needs of different Member States, including those that may want to deploy cellular wireless networks;
- The 6 GHz band will never provide wide area coverage. Identifying the upper 6 GHz as a 6G band in Europe would directly create a digital divide, where 6G would only be available in the densest urban areas and only in (parts of) Europe;
- It is unlikely that the upper 6 GHz band would be able to deliver on the still-to-be-defined 6G spectrum requirements;
- The 6 GHz band does not support services significantly different from 3.4-3.8 GHz. Limiting 6G to channels available in the upper 6 GHz band would prevent 6G from true differentiation with 5G. Note that 5G is struggling to attract customers, as 4G is sufficient for most end-users;⁶
- Designating any portion of the 6 GHz band for IMT jeopardises Europe's ability to achieve its digital decade targets, meet consumer expectations, and future-proof fibre networks;⁷
- The best use of this band is already under discussion within CEPT, and the band can be used intensively by WAS/RLANs far sooner than would be possible with 6G;
- There is an immediate demand for RLAN devices, supported by a large and fast-growing ecosystem, that can operate over the entire 6 GHz frequency range.⁸ An IMT identification would needlessly fragment the global market and increase costs for enterprises and consumers in Europe;⁹

⁶ During the CEPT workshop on 6G Mobile Communications held in June 2023, ETNO presented a graph by Analysys Mason (2022) showing that Europe lags behind in terms of share of 5G connections. ([link to slides](#))

⁷ <https://www.ftthcouncil.eu/committees/policy-regulation/6ghz-spectrum-usage>

⁸ <https://wifinowglobal.com/news-blog/intel-ecosystem-tracking-2064-wi-fi-6e-devices-now-available-wi-fi-7-reaches-67-devices/>

⁹ <https://www.delloro.com/news/enterprise-class-wi-fi-7-revenues-will-exceed-5-b-in-2027/>

- Wi-Fi 6E, Wi-Fi 7, and Wi-Fi 8 are all designed to operate in the entire 6 GHz frequency range. There are no alternative frequency bands that may accommodate expanding Wi-Fi spectrum requirements now or in the future.

That said, there is a significant lead time between the allocation of frequency bands to services by the ITU in the World Radiocommunication Conference cycle of meetings, the identification of spectrum for particular applications such as IMT, and the deployment of systems in those bands. As ‘6G’ will be better defined in the coming years, the spectrum requirements of 6G are likely to become clearer. As the timely availability of wide and contiguous blocks of spectrum is important to support the development of mobile services, WRC-27 would be the perfect time to identify new bands for IMT-2030 applications.

Regarding AI 10, we encourage RSPG not to consider bands in which there are significant commercial deployments of other wireless technologies that would be harmed by the introduction of IMT (such as UWB in the 7.7-9.3 GHz band).

Point 5 on the applicability of technology neutrality and spectrum sharing.

We fully agree that technology neutrality and spectrum sharing will remain important for 6G. These principles should extend to not favouring 6G over other systems (e.g., Wi-Fi, UWB or satellite) for services that multiple technologies and access networks can support. Administrations need to have the flexibility to develop regulatory frameworks that can allow more widespread spectrum sharing whilst ensuring technology neutrality in their particular countries. It will be important to review the suitability of current harmonised technical conditions before the introduction of 6G systems within Member States.

Point 6 on the role of licence-exempt or light-licensed spectrum.

Although the opinion acknowledges the role of licence-exempt and lightly-licensed spectrum, it takes a cellular-centric view of this role that is at odds with reality. Rather than being used to “offload” data from cellular networks, licence-exempt spectrum is end-users’ favourite means to access Internet services, and carries the vast majority of wireless traffic:

- 1) Most connected devices, including very advanced ones, such as smart TVs or devices for *spatial computing*, connect exclusively through licence-exempt spectrum; very few devices beyond smartphones, automobiles, tablets, special manufacturing equipment, and some wearables, even incorporate licensed connectivity, and the vast majority of these also incorporate technologies that use the licence-exempt bands.
- 2) Fixed networks (and RLANs) carry the great majority of data traffic. Across EU countries, only 5% to 10% of total data traffic is carried by mobile cellular networks. In the very few countries where

mobile traffic is more than 10%, mobile networks are being used for fixed wireless access, which will become less important as the EU proceeds towards its 2030 objective of having every household connected to gigabit networks (i.e. not mobile networks).

In brief, people mostly access the Internet via Wi-Fi/fixed networks and tend to only use mobile connectivity when Wi-Fi is not available (or easily available).

We respectfully hold a differing viewpoint from the RSPG's assertion that licence-exempt spectrum is inadequate in ensuring a consistent quality of service (QoS). Wi-Fi is widely used in enterprises, enabling access to resource-intensive applications that necessitate a reliable quality of service in terms of both throughput and latency. We kindly invite the RSPG to correct its stance on this matter to better resonate with the dynamics of the EU connectivity landscape.

Enterprise Wi-Fi infrastructure revenues are projected to continue growing and reach USD 14.5 billion in 2028¹⁰, driven by the emergence of 6 GHz Wi-Fi 6E and Wi-Fi 7 networks^{11,12}.

Unlike previous generations of Wi-Fi, Wi-Fi 6/6E and Wi-Fi 7 are built with reliability in mind by incorporating such features as OFDMA, and are thereby able to achieve very high QoS levels, particularly in managed networks. There are various other QoS-enhancing mechanisms and features, particularly in Wi-Fi 7, such as multi-link operation that will improve throughput by aggregating links, enhance reliability by transmitting multiple copies of the same frame in separated links, decrease channel access delay by selecting the first available link in terms of latency, and enable isolation of time-sensitive traffic from other network traffic.

The most recent generations of Wi-Fi will allow users to achieve deterministic levels of QoS, enabling cutting-edge applications with channels as large as 160 MHz for Wi-Fi 6/6E (and 320 MHz for Wi-Fi 7) and latency levels reaching 10 ms. European consumers and businesses are expected to take advantage of these capabilities, using Wi-Fi for advanced technologies like AR/VR, haptic technology, and 8K video in a wide variety of fields, including education, training, gaming, telehealth, and manufacturing.

Conversely, while licenced spectrum may bring some QoS predictability to the mobile network operator, it doesn't offer predictability for the end user who has to share a public cellular network with other users. For end users, public cellular connectivity is always best effort, with no way to predict or improve the QoS. By contrast, enterprises can fully control the Wi-Fi QoS on their premises.

¹⁰ <https://www.prnewswire.com/apac/news-releases/enterprise-wlan-infrastructure-revenues-will-reach-us14-5-billion-by-2028--driven-by-wi-fi-innovation-5gwi-fi-convergence-and-disruptive-business-models-301793665.html>

¹¹ <https://www.rcrwireless.com/20230802/wi-fi-2/enterprise-grade-wi-fi-7-revenues-to-exceed-5-billion-in-2027-delloro-group>

¹² <https://wifinowglobal.com/news-and-blog/enterprise-wi-fi-7-market-to-reach-us3-6-billion-in-2027-says-650-group/>

Point 7 on the role of non-terrestrial networks.

Does the RSPG consider non-terrestrial networks an integral part of 6G or merely a system in a supporting role? This same consideration, of course, applies to other technologies and may have an impact on the EU spectrum strategy for 6G.

If the RSPG regards 6G as a macro-cellular deployment, typically managed by national mobile network operators (MNOs), non-3GPP technologies will be considered to be supporting or adjacent to 6G, i.e., not 6G. In this case, spectrum policies should take into consideration the amount of spectrum that MNOs already have available and that only a small fraction of overall data traffic actually goes through their networks.

If, however, the RSPG regards 6G as an umbrella term for the wireless connectivity of the next decade (encompassing a variety of different technologies and operators), then this opinion should make it clear that 6G will not operate on the same terms as 5G.

Point 8 on the need for a proactive position for the development and deployment of 6G.

When assessing the spectrum requirements of 6G, it is important to evaluate the future needs of both existing applications and potential future applications. In the case of the latter, most of the use cases presented in report [ITU-R M.2516-0](#) are either for indoor use (where Wi-Fi is the technology of choice) or do not require macro-cellular networks.

While some 3GPP stakeholders argue that AR/VR, for example, would be one of the main 6G use cases, most AR/VR vendors and innovators see Wi-Fi as the most important connectivity link for the development of AR/VR, and all current AR/VR devices operate exclusively on Wi-Fi. As one recent report stated, “[e]ventually, metaverse use cases could involve vast numbers of customers, with cloud processing of fully immersive environments and services requiring very low latency and very high bandwidth. However, most of the usage will take place indoors where a combination of fibre and Wi-Fi seems much more suited to the service requirements.”¹³

Could the RSPG elaborate on what it means by “terminals being 6G-compatible”, which seems to suggest an equivalence between 6G and 3GPP? Given the implications for technology neutrality, the RSPG needs

¹³ Simon Sherrington, Analysys Mason, “Operators and Vendors Need to Plan for More Conservative Mobile Data Growth in the Near Future” at 4 (August 2023).

to provide a clear definition of 6G, so that Member States know whether they are investing in a specific solution or a connectivity strategy underpinned by technology-neutral KPIs.

Point 9 on the development of a strategy to facilitate the timely launch of 6G services.

A clear RSPG definition of 6G would greatly help stakeholders and Member States to assess the breadth and depth of the 6G strategy that the European Union needs, including public investments and to what extent administrations should intervene to facilitate the timely launch of 6G services, instead of leaving it to the market.

It is important for Europe to develop a 6G vision based on users' needs and on European priorities, including the green transition, rather than on a technology-driven push uncorrelated to market demand and user benefits.

Comments on Informative Annex 1

While there is some useful information in Annex 1, it appears to lack objectivity and balance, and it is unclear whether its content has been agreed by all RSPG members. In our view, there is a risk that reliance on the information in this Annex, particularly the incorrect depiction of Wi-Fi as not being suitable for enterprise use (see Point 6 above) and the unfounded claim that the spectrum needs of licence-exempt systems are covered already with the identified spectrum in Europe, will distort the RSPG's decision-making process.

Respectfully submitted,

/s/

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