

Huawei response to the RSPG public consultation on the draft RSPG Report on “6G Strategic Vision”

We thank RSPG for the opportunity to provide feedback to this consultation on the draft RSPG Report on “6G Strategic vision”.

We focus our feedback on a limited number of issues which we consider of utmost importance to help Europe re-gain a leading position in the design and availability of high-performance mobile networks and the societal and economic benefits that come with these, while ensuring a sustainable business for the European mobile industry.

General principles

We first of all emphasise the importance of the link between European spectrum policy and the **higher-level policies of the Union** to ensure European competitiveness and to avoid the EU lagging behind in technology leadership.

Having in mind a **Single Market** that is open to competition, is investment-friendly and environmentally sustainable, the RSPG vision on 6G should carefully account for recent policy initiatives from the European Commission, and the recent reports by Enrico Letta¹ and Mario Draghi² which also call for urgent actions to ensure European competitiveness and investments through spectrum policy. The RSPG 6G spectrum roadmap should consider how to help create the environment whereby a European Digital Single Market would enhance European competitiveness globally.

Lessons learned from 5G

In terms of **lessons learned from the 5G experience**, we believe that the European 5G spectrum roadmap was very well developed and in a timely manner to give Europe an optimal portfolio of harmonised spectrum. But this excellent start was significantly impacted by the spectrum assignment procedures that followed the harmonisation process, and which were carried out in an inconsistent way with inconsistent timelines. This included some countries that decided to maximise the income from spectrum auction fees, thereby draining precious resources from the telecoms market with negative impacts on the services delivered to end users, while other countries implemented more investment-friendly approaches.

Need for a pragmatic and proactive European 6G roadmap

Similarly to what was done for 5G, the **6G spectrum roadmap** for Europe should define the primary and pioneer frequency band(s) that should be made available for the launch of 6G, as well as the future development of 6G, based on agreed connectivity targets.

Such roadmap should be **pragmatic and proactive** to ensure that Europe will influence decisions in other Regions that would then contribute to creating economies of scale that would, in turn, benefit Europe. Delays and ungrounded decisions would ultimately mean that Europe would have to follow roadmaps that have been optimised for other markets.

¹ “Much more than a Market,” Enrico Letta [report](#), April 2024

² “The future of European competitiveness – A competitiveness strategy for Europe,” Mario Draghi [report](#), September 2024.

The need for larger bandwidths per operator

Mobile data traffic volumes continue to grow, with an annual year-on-year growth rate which – despite having reduced in recent years – will still exceed a substantial level of 20% CAGR in most years to 2030^{3,4}. Notably, the absolute annual increase in mobile data traffic volume (which is what operators ultimately need to address) as recorded in 2023 was the highest ever, and is forecast to continue increasing.

While statistics on the amount of data consumed by end users are an interesting indicator of the steadily growing use of mobile networks, it is worth noting that it is actually the **data rate (or the speed) delivered to end users** which drives the design of mobile networks and the need for spectrum. Consumers are showing significant interest in the data rates delivered by mobile networks, and speed-tiered data services are becoming widely available in Europe: 31 operators from 19 countries in Europe are now offering tariffs that depend on the available data rates for end users (e.g. maximum achievable Mbit/s in downlink and uplink), with unlimited data volumes (unlimited number of Giga bytes/month per user)⁵. The market demand from residential end users and businesses will require more and more consistent high-quality services nationwide, beyond hotspots.

It is also worth noting that it is the **cell-edge performance** – rather than average performance across a cell – that is of critical importance in the planning of mobile networks today, and going forward, the quality of experience (QoE) across mobile networks will have increased market relevance and will drive the need for more spectrum.

Innovative uses and technologies will also drive demand for higher mobile data rates: **advanced XR** and its evolution to support holographic communications is expected to be the next step beyond the smartphone for the consumption of high-quality multimedia. Furthermore, **Generative Artificial Intelligence** (Gen AI) has already started to drive hyper-personalised content creation, along with increased use of video assistants and immersive interactions, and is expected to drive potential mobile traffic growth beyond baseline predictions.

Given the above context, studies undertaken by GSMA and Coleago⁶ have indicated that up to 2 GHz of mid-band licensed spectrum (averaged over 36 cities) is required to support the 5G/IMT-2020 user-experienced data rate requirements⁷ as specified by the ITU-R⁸ in urban environments of towns and cities globally. Although the performance requirements of 6G/IMT-2030 will not be specified by the ITU until 2026, it is expected that 6G/IMT-2030 will have higher user-experienced data rate requirements – and hence will need wider channel bandwidths – compared to 5G/IMT-2020.

The Global Mobile Suppliers Association (GSA) has also estimated in a study⁹ that an additional 500-750 MHz of wide-area spectrum per network (beyond existing harmonised spectrum) is needed to implement some of the anticipated 6G use cases.

The upper 6 GHz band (6425-7125 MHz): a key pillar for the European 6G spectrum roadmap

Considering the above, some operators – e.g., in regions where upper 6 GHz is assigned earlier and where there are no issues relating to incumbents – will deploy 5G-Advanced in the upper 6 GHz in the 2026-2030 timeframe, which will evolve to 6G over time. Whereas other operators will choose to deploy 6 GHz base stations directly with 6G from 2030. In both cases, operators will aim at deploying full-power macro-cellular base stations with at least 200 MHz of bandwidth per operator.

³ “Mobile evolution in 6 GHz - The impact of spectrum assignment options in 6.425–7.125 GHz,” GSMAi [report](#), September 2024.

⁴ “The importance of 6 GHz to mobile evolution,” [event](#) by GSMA, November 2024.

⁵ Source: Huawei research on European operators’ public websites.

⁶ “Vision 2030 - Insights for mid-band spectrum needs,” GSMA, July 2021. See [here](#). “Estimating the mid-band spectrum needs in the 2025-2030 time frame, global outlook,” Coleago Consulting, July 2021. See [here](#).

⁷ Requirements of 100 Mbit/s on the downlink and 50 Mbit/s on the uplink. The study assumes the use of the existing grid of urban base stations, complemented by some densification via small cells.

⁸ “Minimum requirements related to technical performance for IMT-2020 radio interface(s),” ITU-R M.2410 report, November 2017. See [here](#).

⁹ APG23-5/INF-26, “IMT-2030 (6G) spectrum needs analysis,” GSA, February 2023.

Having in mind the importance of the economic sustainability of mobile networks, when developing a 6G roadmap, Europe should focus on new bands which can most benefit European society, businesses, economy and environment with their ability to deliver high-capacity wide-area coverage while reusing the existing grid of mid-band base station sites. The upper 6 GHz band, with its 700 MHz of contiguous spectrum which can be used by full-power macro-cellular base stations while ensuring coexistence with incumbent primary services in the band (and other relevant services if needed) is the only new spectrum that can support the introduction of 6G in Europe while reusing the existing grid of 3.5 GHz base station sites in urban areas.

Since the WRC-23 identification of the upper 6 GHz band for IMT, countries have been taking concrete steps towards the launch of mobile networks in the upper 6 GHz band^{10,11}. Missing this opportunity in Europe would impede the successful introduction of 6G.

**Given the limited availability of frequency bands which can provide wide-area mobile coverage and capacity, the European Union should recognise that macro-cellular base stations operating with full power in the upper 6 GHz band are absolutely critical to support the introduction of competitive 6G networks in Europe.
Missing the upper 6 GHz band opportunity would place 6G at high risk in Europe.**

Spectrum in the 7125-8400 MHz range should not be disregarded (WRC-27 AI 1.7)

We consider that Europe needs to be proactive, and plan both for the launch of 6G as well as for the full potential of 6G, noting that the lifetime of each mobile generation spans over a decade. We therefore recommend RSPG to also include spectrum within 7125-8400 MHz as part of the 6G roadmap at this initial stage of the ITU-R WRC-27 study cycle, although we recognise the uncertainties in Europe regarding the future availability of spectrum in the 7250-8400 MHz range in particular.

We invite pragmatism when dealing with the growing importance of spectrum sharing

The **inter-service sharing** of spectrum between new users and incumbent users in *other* primary services is now a critical topic as spectrum is becoming more crowded, and research activities are on-going within the mobile industry in this area. While incumbents require solutions that will ensure their sufficient protection, mobile networks require robust/reliable spectrum availability and continuity. Collaboration across regulators, industry, and other stakeholders is critical to address potential interference and technical challenges.

Inter-service sharing scenarios differ band-by-band, and should therefore be considered on a case-by-case basis, while solutions for similar scenarios should apply globally. Therefore, an "EU mandatory regulatory requirement in ETSI", as envisaged in the draft RSPG Report, would not adequately address this matter.

Furthermore, we note that past experience has shown that regulatory mandates (formal or otherwise) for the development of spectrum sharing solutions – where these solutions are not aligned with market-led incentives, or where they are not aligned with the reality of technological capabilities in delivering QoE requirements – are rarely successful, and merely result in a drain on resources which could be better expended elsewhere.

Accordingly, we urge caution against the adoption of such regulatory mandates, and would recommend instead a focus on the development of market-led sharing mechanisms and solutions which industry considers as technically and commercially viable. We would highlight the example of the use of "expected EIRP" as an innovative means for enabling inter-service sharing between IMT (under the Mobile Service) and the Fixed Satellite Service in the upper 6 GHz band, as developed at WRC-23.

¹⁰ Hong Kong's 6 GHz spectrum auction. See [here](#).

¹¹ UAE TDRA announced the allocation of the 600 MHz and 6 GHz bands for International Mobile Telecommunications. See [here](#).

With regards to **intra-service sharing**, which in the context of 6G would apply to the sharing of spectrum across applications within the Mobile Service, we note that techniques based on sensing – including via cross-technology radio signalling – are usually not sufficiently reliable or robust in terms of mitigation of mutual interference. This is particularly relevant in relation to sharing across applications with technologies designed for different authorisation regimes, where, for example, licensed operation requires reliable access to spectrum to secure quality of experience (QoE), whereas licence-exempt operation relies on best effort access to spectrum and subject to an unpredictable amount of co-channel interference. We also consider that, as a fundamental guiding principle, any intra-service sharing solutions for 6G should be technology-neutral and enable full-power macro-cellular mobile network deployments with robust access to adequate amounts of spectrum for each operator.

The role of currently harmonised spectrum

The existing harmonised frequency bands in the low and mid-bands range are used to address current societal and enterprise demands. While these resources can still be exploited to address 5G/5G-Advanced capacity needs in the very near term, the spare capacity will not be sufficient to support the introduction of 6G. Over time, leveraging the well-established technology neutrality principle, and with the progressive migration of end users towards 6G, all existing harmonised spectrum will be upgraded to the latest technology, improving spectral and energy efficiency, along with other benefits. Spectrum in the high bands is also expected to become increasingly important for localised use as the device ecosystem grows, and will continue to complement wide-area spectrum, but will never replace the need for more mid-band spectrum.

Network densification will continue to some extent but cannot replace the need for more spectrum

The expectation of densification as expressed in the draft RSPG Report in the timeframe leading to 2030 – at which time new spectrum will be available – will happen in specific scenarios depending on traffic growth. However, operators will not be able to densify enough (i.e., extreme densification) to replace the needs for more mid-band spectrum. This is due to various well-known environmental, economic, and technical challenges. By solely relying on densification (without additional mid-band spectrum), Europe will no doubt fall behind in the 6G race.

The need for any additional locally licensed spectrum should be carefully assessed before deciding for additional spectrum to be assigned on a local basis for low/medium power deployments

We do not agree with the idea, emerging from the draft RSPG Report, that additional harmonised spectrum is needed for 6G (or even earlier) for use on a local basis by local/vertical use cases.

The 3.8-4.2 GHz band has only just been harmonised in Europe, and deployments are expected in the near term (well before 2030). Opportunities also exist within the mmWave harmonised bands (as per some Member States' decisions). These spectrum bands should be utilised first before concluding that "The spectrum need for local and vertical use will still increase", as stated by RSPG. Furthermore, as highlighted by the draft RSPG Report itself, the connectivity requirements of verticals are also being accommodated by public networks which can deliver network slicing when 5G is deployed in its "Standalone" version (5G SA).

Sub-1 GHz spectrum to strengthen 6G ubiquity

As recognised by the draft RSPG Report, sustainability will be at the heart of 6G. To enable sustainable and ubiquitous connectivity with 6G, and to avoid an increase in the digital divide between urban and rural areas, Europe needs to also think about sub-1GHz spectrum (i.e., UHF 470-694/8 MHz). We consider that this band should be included in the European 6G roadmap as a candidate band for 6G, noting the process achieved at WRC-23, and also the challenges with different usages across the European continent, and that potential usage by mobile networks may be difficult before 2031¹².

¹² As per DECISION (EU) 2017/ 899 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL. See [here](#).

Satellite usages including direct-to-device (D2D)

We note the references in the draft RSPG Report to satellite usages including D2D. While recognising that satellite direct to (3GPP mobile) device communication can potentially enable 100% geographical coverage, we stress the interference challenges and in particular the need to carefully analyse the protection of terrestrial services to safeguard the existing investments from mobile operators.

Need for more harmonisation of electromagnetic field (EMF) emission limits for 6G

While we recognise the important role that RSPG played in improving EMF regulatory frameworks across Europe, we recognise that this issue is not mentioned in the draft RSPG Report. The non-homogeneous EMF limits across Europe represent one of the factors which plays against the actual creation of a Single Digital Market. This situation should be improved for 6G.

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