Huawei response to the RSPG public consultation: Work programme for 2022 and beyond

Huawei Technologies welcomes the opportunity to provide feedback on this important consultation. We fully recognise the importance of the RSPG's Opinions in advising the European Commission and in helping to map out the longer-term spectrum management strategy of the EU. A well-defined and forward-looking RSPG work programme is essential in this respect. We address the various proposed RSPG work programme items below.

Peer review and Member States cooperation on authorisations and awards

In recent years we have observed non-uniform approaches across the EU in the award of individual licences for electronic communication systems (e.g. in terms of bandwidths assigned to mobile operators, pricing and timing). The RSPG peer review initiative represents an important opportunity to promote consistent approaches which will help deliver timely and high-quality services to European citizens, consumers and industries.

We understand that the RSPG peer review process involves Member States and is closed to industry stakeholders. We would like to emphasize the importance of transparency on the topic of spectrum awards and authorisations, and would encourage the RSPG to organise stakeholder workshops and to publish annual reports on awards experiences and best practices.

WRC-23

We agree that in 2022 the RSPG should finalize its opinion on the WRC-23 agenda items which are of importance to EU policies.

We welcome the RSPG's recognition of the importance of the mid-bands spectrum range for IMT networks in providing "a good compromise between capacity and coverage" and that "the band 6425-7125 MHz may respond to additional spectrum demand in mid-band since it has similar propagation conditions to the 5G pioneer band 3400-3800 MHz", both as stated in the RSPG Interim Opinion of June 2021 in relation to WRC-23 AI 1.2.

Specifically, we consider that the 6425-7125 MHz band is the only remaining spectrum of sufficient bandwidth in the mid-bands to meet the demands on macro-cellular mobile communication networks in the 2025-2030 timeframe for a variety of services (including enhanced mobile broadband and verticals use cases). WRC-23 is an important and critical opportunity to ensure that the 6425-7125 MHz band is harmonised for IMT to meet the spectrum needs for both wider-area and local deployments ("hetnets") via IMT 5G NR and its evolution.

Furthermore, we fully recognise the importance of existing services – the Fixed Satellite Service and others – in the 6425-7125 MHz band. Our compatibility studies indicate that

advanced technologies such as active antenna systems can allow macro-cellular IMT networks to operate in this band without causing harmful interference to the existing services.

Accordingly, we recommend that the RSPG adopts a positive Opinion in support of IMT identification of 6425-7125 MHz at WRC-23.

"Good offices" to assist in bilateral negotiations between Member States

Cross-border interference issues can influence the timely availability of spectrum for the roll-out of 5G mobile communication networks with negative consequences for European citizens and consumers. The "Good Offices" initiative will continue to be important as 5G frequency bands are released across Europe. We acknowledge and support the role which the RSPG plays in this area.

Mobile technology evolution – experiences and strategies

Phasing out of 2G/3G

We support the principle of technology neutrality, and the efficient use of spectrum enabled by the newest and more efficient mobile communication technologies where feasible. We consider that **expedited re-farming** from 2G/3G to 4G/5G with a focus on the 900 MHz band is an important element in this respect. We note that several operators in Europe have already announced the planned switch-off of their 2G and 3G networks.

We recommend that the RSPG considers issues relating to the migration of legacy services (including eCall) delivered via 2G/3G and the potential implications, as well as assuring that EU-wide regulations continue to be technology neutral to the greatest extent possible. We welcome the RSPG's plans to hold stakeholder workshop on this topic.

Evolution of 5G public macro cellular-networks

We note that in recent years there has been growing focus by the RSPG and the European Commission on the potential to make licensed spectrum directly available to users for the deployment of local/private networks for vertical use cases[1]. Such focus on spectrum availability for low/medium power local/private networks has been justified, to the extent that this is a new area of interest to some stakeholders and administrations.

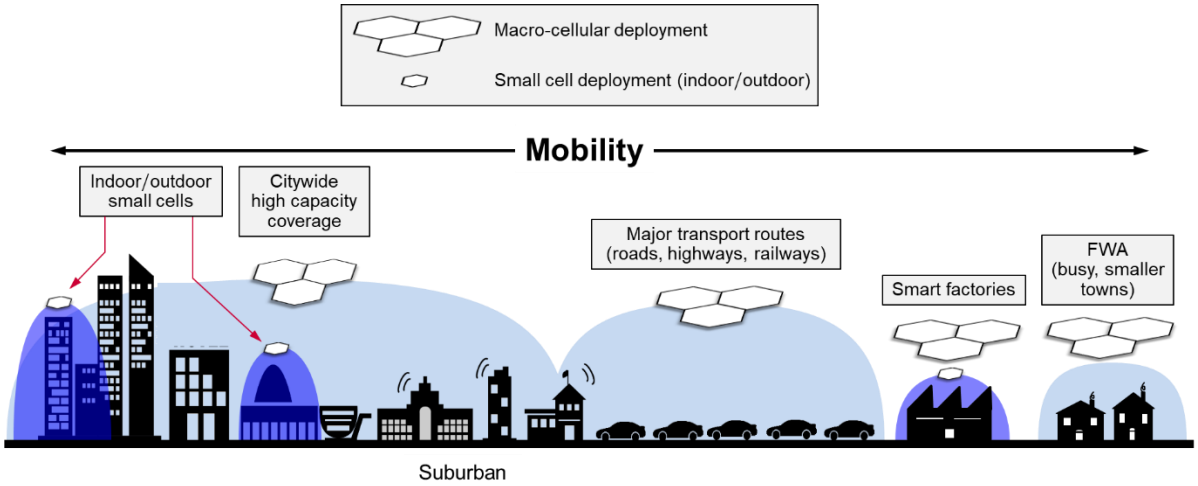
However, we consider that there is now an urgent need to re-focus on the spectrum needs of **macro-cellular** public mobile communication networks for the delivery of both high-capacity wide-area coverage and local-area connectivity in the EU over the 2025-2030 timeframe.

[1] This was expressed – for example – in the RSPG Opinion of June 2021 on Additional Spectrum Needs which recommended that "MS investigate the possible use of the band 3.8-4.2 GHz for local vertical applications". This was followed by a mandate from the European Commission for CEPT to undertake studies on the shared use of this band for low/medium power local-area network connectivity in the EU.

The importance of mid-bands

Mobile communication networks require access to spectrum at different frequency ranges, namely low-bands, mid-band, and high-bands.

Mid-bands typically refer to the frequency range 2-7 GHz and represent a sweet-spot between high bandwidths and favourable propagation conditions. As such, mid-bands can support a diverse variety of use cases, including high-capacity small cells in urban hot-spots, citywide urban/suburban high-capacity wide-area coverage, coverage along major transport routes, communications within industrial complexes, factories and campuses, and fixed wireless access households. This is illustrated below.



The versatility of mid-bands spectrum.

The **versatile nature** of mid-bands, and the key role which they play in the provision of services via mobile communication networks is well-recognised by the mobile industry and spectrum regulators.

The need for additional mid-bands

Considering the growing demand for connectivity by consumers, industries, and households, the GSMA has published a report[2] in 2021 which draws the following conclusion:

> "…in addition to building many more small cells, 1000 to 2000 MHz of additional mid-bands spectrum is required to deliver the 5G vision of downlink user experienced data rate of 100 Mbit/s across the city, i.e. citywide "speed coverage", and also to satisfy the 50 Mbit/s uplink target."

The report clarifies that this 1000 to 2000 MHz of spectrum is in addition to the spectrum bands that are available to mobile networks today (which the study assumed will eventually be re-farmed for use by 5G), and is necessary to achieve the **5G data rates** specified by **ITU-R** for the delivery of high-capacity coverage across cities and along major transport routes in the 2025-2030 timeframe in support of mobile broadband, smart city, automotive and industrial use cases.

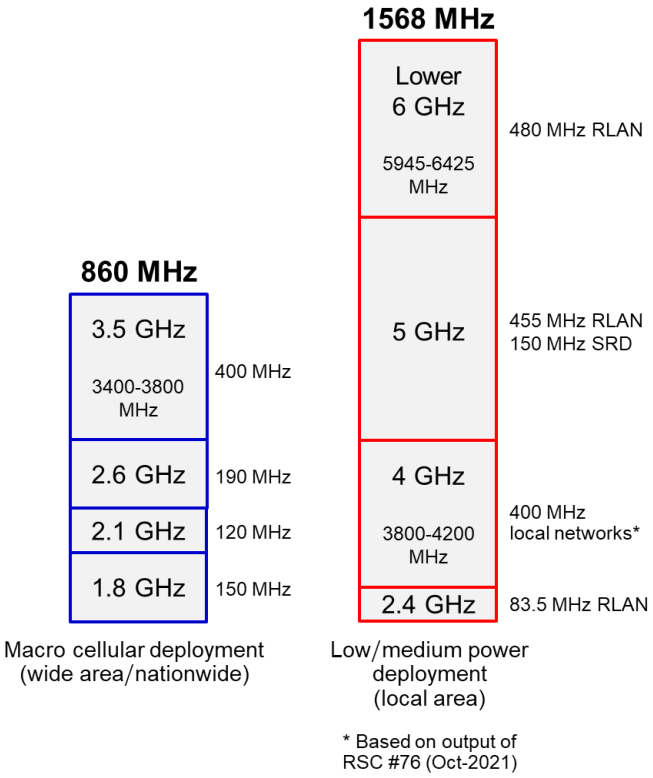
[2] GSMA, "5G mid-band spectrum needs – vision", July 2021.

Importantly, the report shows that in the absence of the required additional mid-band spectrum, the mobile radio networks would need to be **substantially densified** (numbers of base station sites increased) in order to deliver the 5G data rate targets, and that this would lead to a significant increase in energy consumption and radio network cost. Specifically, for a typical large European city, the implication would be a doubling of power consumption, and a four-fold increase in total network costs. This is in addition to the carbon footprint involved in the manufacture of the greater number of equipment.

Spectrum supply: 6 GHz

As described above, mid-bands are an essential element for cost-effective and economically viable provisioning of high-capacity wider-area mobile coverage across cities. Insufficient spectrum at mid-bands would imply extreme densification to meet mobile demand. Extreme densification imposes unsustainably high costs (ultimately borne by users) and increases overall power consumption, and may not even be feasible due to interference issues or site availability.

However, we observe that there is today a **substantial anomaly** in the way mid-bands are assigned for use in Europe. This is in the sense that there is significantly more mid-bands spectrum assigned for use by low/medium power equipment for **short-range** communications (including licensed or licence-exempt local networks), rather than for use by high-power licensed **macro-cellular** mobile networks using IMT technologies such as 4G/5G which can support both **wide-area** and **local** connectivity. This is illustrated in the figure below.



Mid-bands spectrum typically available for use in EU Member States for wide-area vs. short-range communications.

We certainly acknowledge that there is a need for short-range connectivity. However, it must be recognised that the assignment of large swathes of mid-band spectrum for low/medium power short-range connectivity is a mis-use of precious and limited spectrum resource[3], especially when viewed in terms of the high opportunity cost of the mid-bands not being used for wider-area connectivity. This is even more puzzling given that large amounts of spectrum are available at mm-waves for short-range communications (e.g., 26 GHz for licensed IMT equipment, or 60 GHz for licence-exempt equipment).

As we noted in an earlier section, a key mid-bands spectrum is the so-called "upper 6 GHz" band (6425-7125 MHz) which is currently subject to compatibility studies by ITU-R towards potential identification of the band for IMT under Agenda Item 1.2 of WRC-23. The upper 6 GHz band is the only remaining spectrum of sufficient bandwidth in the mid-bands range to meet the demands on mobile communication networks in the 2025-2030 timeframe.

The need for a European roadmap

Based on the above, we consider that it is important for the RSPG to **develop a roadmap** for the availability of additional **mid-bands** spectrum in support of **macro-cellular IMT** 5G NR networks and their evolution. We recommend that the RSPG considers the development of such a roadmap as part of its work programme.

Furthermore, we recognize the huge impact which the European Radio Spectrum Policy Programme (**RSPP**) of **2012** had in facilitating the availability of at least 1,200 MHz of suitable spectrum for MFCN/ECS by 2015. This created a solid baseline for the availability of the 5G primary band (3400-3800 MHz) in Europe. The forward-looking vision presented by the RSPP also allowed Europe to take the leading role in spectrum management globally. We recommend that the RSPG supports the European Commission in promoting a similar approach – e.g., via a **new RSPP** – in the context of the evolution of 5G in the 2025-2030 timeframe.

Digital decade 2030

We acknowledge the RSPG's important role in providing advice to the European Commission, the Council and the European Parliament in order to support the 2030 policy program "*path to the Digital Decade*".

We consider that 5G and its evolution can play an essential role to help the EU achieve its Digital Decade vision, including all European households being covered by a Gigabit network, in an economically viable and sustainable manner.

[3] Low/medium power deployments – whether using licensed or unlicensed spectrum – do not need as much mid-bands bandwidth as wider-area mobile networks. This is because low/medium power deployments with small cells capture fewer users and traffic per cell, and due to the shorter communication range, experience higher wanted signal power levels.

The development of 6G and possible implications for spectrum needs and guidance on the rollout of future wireless broadband networks

We consider that it is important for Europe to take a global leadership role in 6G research, standardisation and development, targeting around the year 2030 for commercial deployments. To this end, we are supportive of the RSPG's proposed work programme in relation to 6G.

While the deployment of 6G is still some time away, we consider that it is important to investigate the spectrum needs of 6G well in advance, accounting for the relatively long regulatory processes involved in spectrum management.

We consider that 6G will address a variety of communication profiles, from very wide-area long-range communications (via terrestrial and non-terrestrial platforms) across areas of low population, to high-capacity wide-area coverage across cities, down to short-range communications and sensing. As such, we consider that 6G will require access to low-bands, mid-bands, and high-bands extending to sub-THz frequencies.

Accordingly, **globally harmonised** spectrum is encouraged, as this facilitates the economies of scale and a global IMT eco-system. Furthermore, wider **contiguous blocks** of spectrum per operator are also encouraged, both from the perspective of system energy savings and support for various new 6G services/applications.

We are supportive of RSPG's proposed action to conduct an evaluation of 5G in Europe. This could help to

a) assess the spectrum needs – especially at mid-bands – of macro-cellular mobile communication networks in the 2025-2030 timeframe for delivery of mobile/fixed broadband and vertical services via IMT 5G NR and its evolution, and

b) identify lessons learnt as valuable input when defining future strategies for 6G.

We fully support the RSPG's proposal for stakeholder workshops on 6G, and we look forward to engaging with the European Commission, Member States and other stakeholders at these workshops.

Strategy on the future use of the frequency band 470-694 MHz beyond 2030 in the EU

It is important that the RSPG reflects on the future of the UHF band, in particular on the major elements of a strategic policy for the UHF band in the EU with the objective of ensuring a sustainable "win-win" situation for the sectors concerned, as well as benefits for consumers, while promoting the single market and strengthening the role of the EU in global developments.

Role of Radio Spectrum Policy to help combat Climate Change

We support RSPG's focus on sustainability and combatting Climate Change as key horizontal principles and high-level priorities.

Current discussions on Climate Change and communication networks are centred around the energy efficiency of wireless technologies, as well as the *enabling effect* of technologies such

as 5G in the digitalisation of industries and in making industrial processes more efficient. Huawei technologies is dedicated to improvements in both the above elements.

As we highlighted in our responses to the RSPG's Climate Change questionnaire and consultation in 2021, we recommend that Member States ensure the availability of large contiguous blocks of spectrum per operator of IMT networks. This would allow maximum spectral efficiencies and would minimise unnecessary radio emissions and power consumption which would otherwise occur as a result carrier aggregation needed to meet the demand for capacity from a variety of uses. Also importantly, mid-bands allow wide-area citywide coverage using existing macro-cellular base station sites, thereby mitigating the economic and environmental implications of widespread network densification.

On the matter of identifying methodologies to assess the energy efficiency of wireless technologies, we note that in recent years ETSI TC-EE and ITU-T SG5 have done many studies on the assessment of carbon emissions and energy efficiency. We propose to continue to rely on these two standards organisations and involve more experts to investigate Climate Change assessment methodologies based on existed standards. There are many factors that affect network energy efficiency in the field. It is necessary to classify scenarios during analysis. Energy efficiency is defined as the effective output of per unit energy usage. However, the definition of effective output varies in different scenarios, based on factors such as data volume, user equipment connections, coverage area, latency, user experience and others. To analyse the impact of different variables on Climate Change, a large amount of network field data needs to be collected and AI modelling and statistical methods are required.

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