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Radio Spectrum Policy Group

GSA¹ Response to the Public Consultation on the Draft RSPG Opinion on The development of 6G and possible implications for spectrum needs and guidance on the rollout of future wireless broadband networks

GSA appreciates the possibility to comment RSPG's draft Opinion on the development of 6G and the possible implications for spectrum needs for 6G future deployment.

If any additional clarifications are required for this response, please do not hesitate to contact: Sverker Magnusson (sverker.magnusson@ericsson.com), Chair GSA CEPT Spectrum Group.

Introduction

The GSA (www.gsacom.com) welcomes the opportunity to provide its comments on the "Draft RSPG Opinion on the development of 6G and possible implications for spectrum needs and guidance on the rollout of future wireless broadband networks".

The draft RSPG Opinion is comprehensive in collecting spectrum-related material from the EU Member States covering 5G deployments, state of play of the 5G primary and pioneer bands, spectrum for local area networks, as well as views on future developments and spectrum needs. While the Opinion provides a very valuable assessment on the 5G

¹ The GSA (Global mobile Suppliers Association, <https://gsacom.com>) develops strategies and plans, and contributes studies and technical analysis to international, regional and individual country policymakers and regulators to facilitate the timely availability of spectrum for use by mobile network operators. GSA has a focus group for spectrum topics for technical and regulatory matters of radio spectrum pertaining to the successful evolution of International Mobile Telecommunication (IMT) and associated radiocommunication systems and comprises a team made up of spectrum and regulatory affairs specialists from GSA Executive Member and GSA Member companies. In addition, GSA reports regularly on global spectrum developments.

development in Europe, it does not include a clear and proactive guidance regarding RSPG's strategic thinking for 6G nor initial considerations from a radio spectrum strategy perspective. WRC-23^{2,3} will lead to important decisions with respect to future spectrum which will require clear positioning, including from the European Union. The suggested "silence from the back seat" is not an appropriate option if Europe wishes to be at the forefront of, and benefit from, technological developments.

Below we provide our views on spectrum related aspects that need to be considered by RSPG in relation with 6G.

The Opinion fails to address the financial ability of the mobile network operators to make the massive investments required to enable the densification and roll out of mobile networks, including 6G. We see the financial investment ability as an essential part of the European 6G spectrum strategy. It would be ineffective strategy if the ecosystem – governments, regulators, operators, manufacturers, researchers, etc. – were to set up all the regulations needed to enable 6G if, at the end of the day, the mobile operators could not afford to roll out nationwide 6G networks. Therefore, the investment topic needs to be part of the 6G strategy. GSA suggests for the RSPG / European Commission to consider undertaking a comparative study on the financial aspects of operators in Europe and in other leading nations such as the US, Korea, Japan, etc. and propose options aimed at increasing the ability of the European operators to enable the significant investments required to help keeping Europe at the forefront of technological development and adoption.

Summary of GSA views

IMT-2030/6G activities are underway in various research, industry, and regulatory bodies. Spectrum remains a critical enabler and spectrum discussions have started in global, regional, and national groups. As with previous cellular generations, for the success of IMT-2030/6G, one essential component is the ability to provide high-capacity wide area continuous coverage, seamlessly serving both indoor and outdoor users and enabling mobility. From this perspective, working towards the availability of sufficiently large

² GSA position on WRC-23 AI 10:

GSA supports a new agenda item for IMT at WRC-27, with a focus on the following bands:

- 7.125-8.5 GHz
- 10.7-11.7 GHz
- 11.7-12.75 GHz
- 12.75-13.25 GHz
- 14-14.8 GHz
- 14.8-15.35 GHz

This list of bands is proposed in order to initiate a discussion on potential bands to be studied for WRC-27 noting that some (or parts) of the above bands may not be considered to be studied for IMT in some countries and regions.

For some of the bands listed above, some GSA members also have interests in other wireless technologies / applications.

³ GSA position on WRC AI 1.2:

- GSA supports the IMT identification of the 6425-7125 MHz band at WRC-23 under AI 1.2
- GSA supports the IMT identification of the 10-10.5 GHz band in Region 2 (provided regulatory/technical conditions allow commercially feasible deployments)

For some of the bands listed above, some GSA members also have interests in other wireless technologies / applications.

contiguous frequency bands is essential to accommodate the forecasted future traffic growth.

Our main comments are summarised as follows:

- ✓ GSA recommends that spectrum related aspects need to be addressed by Europe from an early stage, considering that identification and harmonization of spectrum for the initial 6G deployments can be a long process. The successful European mass-market roll-out of 6G will not be possible without timely identification and access to adequate harmonised spectrum that allows for sustainable deployment of networks. Europe will need to be part of the important decisions that will be taken in 2023 already and which will be fundamental in putting the pillars for the future 6G spectrum strategy.
- ✓ We understand the importance Europe is placing on the CSDP and space policies, but we cannot minimise the importance of identifying the relevant spectrum required to assure that 6G is timely implemented across Europe in 2030 and onward, in line with the objectives of the Digital Decade. We believe that there is scope for technical studies to determine if and how IMT-2030 could co-exist and be operated in some sub-bands of the range 7-15 GHz⁴ while not negatively impacting the CSDP and space policies.
- ✓ GSA welcomes the RSPG's commitment for an early assessment on the demands for IMT2030/6G, in particular regarding the need for additional spectrum resources. We concur that a proactive European position is essential for supporting the development and deployment of 6G. This includes early study/recognition of spectrum needs and early engagement to identify new suitable spectrum for 6G. To this extent, GSA performed some initial preliminary spectrum needs analysis for IMT-2030/6G based on straight-forward assessment methods that create a link between some of the most relevant 6G use cases and their corresponding spectrum implications. The estimated **additional wide-area spectrum need is ~500 to ~750 MHz per network** depending on the existing mid-bands spectrum available for IMT and on the number of networks in a specific country.
- ✓ Based on previous experience with 5G spectrum, including the identification and harmonization of primary and pioneer bands, we see scope for RSPG to apply similar efforts towards 6G. We encourage therefore the RSPG to consider similar plans to identify and make available primary and pioneer bands for 6G deployment in a timely manner.

⁴ GSA position on WRC-23 AI 10:

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- 7.125-8.5 GHz
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This list of bands is proposed in order to initiate a discussion on potential bands to be studied for WRC-27 noting that some (or parts) of the above bands may not be considered to be studied for IMT in some countries and regions.

For some of the bands listed above, some GSA members also have interests in other wireless technologies / applications.

- ✓ We also acknowledge the importance of coordinated 6G strategies across Europe that will be essential in determining efficiently the timeline for spectrum release.
- ✓ We recognise that spectrum demand for local networks – enterprise, campuses, communities – may continue to increase. Meanwhile it is also very important to carefully evaluate the real spectrum needs for vertical and local use, before designating more spectrum to such use.
- ✓ We recognise that the role of the licence-exempt and lightly licensed spectrum will continue to remain complementary to licensed spectrum.
- ✓ We expect NTN to play a complementary role in 6G such as providing coverage in case of emergency situations and in unpopulated areas with little/no mobile coverage, when necessary. Furthermore, we agree with RSPG 's assessment that latency requirement remains a constraint of the satellite communications and therefore satellite systems can be considered as interim solutions in case of disaster during the re-establishment of the terrestrial network capabilities.

Finally, we consider that continuous exchange of information and experience in this respect between RSPG and the industry stakeholders will help in increasing the understanding on the market requirements and technology evolution for making IMT-2030/6G a success for Europe and the individual European member states. To this end, GSA is of view that timing and harmonisation of suitable spectrum for 6G is of paramount importance for the successful launch and adoption of the technology in the early 2030s. Considering the long-tail process of identifying and making available spectrum for new usages, we consider the study cycle towards WRC-27 to be crucial to evaluate and identify the right spectrum bands in which 6G can be deployed from the very early roll-out stage. Decisions on spectrum for IMT-2030/6G at WRC-27 will allow for this spectrum conditions to be defined in due time for the initial deployments.

We would like to add that the mobile networks economic and environmental sustainability will equally need to be placed at the centre of the spectrum policy debate for 6G from the start.

GSA encourages the RSPG to commence its work on the 6G spectrum roadmap from 2023 and to publish it in 2024.

Detailed comments to specific sections

1. Introduction

As highlighted by the RSPG, the role of wireless broadband will continue to increase over the next decade and an early analysis to making harmonised spectrum available in a timely manner is necessary. The refarming of existing spectrum – under the technology and service neutrality framework – although important, is not sufficient to support the relevant 6G use-cases. Like all previous generations of mobile technology, 6G will require new initial harmonised spectrum – at least at European level – to start the efficient roll-out, enable effective mass market adoption, and to create economies of scale.

The RSPG also notes that making available harmonised spectrum may involve continuing the move further up to higher bands, thus enabling early exploratory work in the sub-THz

bands. While we recognise that sub-THz frequencies may be relevant in the future to enable extreme performance in specific local scenarios, it is important to note that this spectrum range will only be complementary and will not solve the spectrum shortage problem that is expected in the 6G timeframe.

While we agree that a combination of spectrum bands from the low, up to the high bands, including eventually sub-THz spectrum should be considered, the 5G experience shows that focus of investments shall be in the first place for networks that are economically sustainable and minimise the overall carbon footprint in terms of embodied costs (carbon emissions due to the raw material acquisition, manufacturing, distribution and installation of passive and active equipment at a 5G site, construction of the required site infrastructure), recurring costs (carbon emissions due to providing energy to operate and maintain the sites), and the enablement impact of mobile networks on other sectors (e.g. by enabling other sectors to improve the efficiency of their real-time or remote operations).

Furthermore, as for the previous generations of mobile technology, we believe that the frequency bands that are currently being used by mobile networks (including the 5G primary and pioneer bands) will not be sufficient to support the introduction and subsequent development of 6G. Those bands will be heavily used by 5G / 5G Advanced in the 2030 timeframe: they will certainly be refarmed towards 6G over time, and they will concur to meeting the future traffic demand but will not be sufficient by themselves.

Considering the above, we see the need to identify additional harmonised mid-band wide-area spectrum for 6G beyond 2030 that would enable high-capacity citywide coverage by reusing the existing base station grids.

Spectrum in low bands will be necessary to provide higher capacity “blanket coverage” mitigating digital divides and the existing spectrum will be gradually refarmed from legacy technologies to 6G.

The use of high bands such as 26 GHz and/or 40 GHz is expected to be complementary to mid-band wide area spectrum and will be for specific use cases or hot zone locations where such bands prove to be necessary and effectively used.

As highlighted by RSPG, the sub-THz spectrum is in exploratory phase, subject to research, and will eventually be of interest for specific localised uses such as sensing, device to device communications, etc. at a more advanced stage of 6G deployment.

Based on our initial assessments on the spectrum needs associated with future use cases⁵, the aggregated spectrum needs⁶ required to enable mobility and outdoor application of the analysed IMT-2030/6G use cases are estimated to be in the order of 1 GHz per network. If assuming typically 3-4 networks in a country, and that in the long term, existing mid-bands spectrum will be re-used for IMT-2030/6G wide area use cases, the overall additional spectrum needs will approximately be 2 to 3 GHz for the analysed wide-area use cases (corresponding respectively to the cases of 3 and 4 operators in a country). This

⁵ “XR” which includes Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) will heavily rely on the “cloud” connectivity to enable more practical end user devices and holographic communications

⁶ GSA contribution to the 5th Meeting of the APT Conference Preparatory Group for WRC-23 (APG23-5), Document No: APG23-5/INF-26, February 2023

estimation is based on the simplistic assumption that all existing mid-bands spectrum available for IMT (roughly ~1GHz) will solely be used to address the analysed IMT-2030/6G wide area use cases, i.e., not considering existing MBB usage. So based on above, the estimated additional wide-area spectrum need can be rounded to ~500 - 750 MHz per network depending on the existing mid-bands spectrum available for IMT and on the number of networks in a specific country.

To close this gap/shortfall, it is recommended that suitable spectrum should be considered in the closest proximity to mid-bands. This is where the 7.125–15.35 GHz range enters the picture, noting that there are propagation differences within this range, the closer to the mid-band range (below 7 GHz), the greater the possibility of reusing the existing base station grids and the lower the number of required new sites, costs, and power consumption for the delivery of services. Based on our assessment, the 7 – 15 GHz range offers the opportunity to meet such additional demand. It should be noted that the lower the frequency range the better from coverage and mobility perspectives as spectrum bands do not have the same propagation characteristics.

We agree that the unlicensed spectrum and NTN may play a role in the overall 6G, but in a manner that is complementary to mobile rollouts and not as substitutes.

We acknowledge that the RSPG Opinion on WRC-23 provides important recommendations with respect to the Member States positioning in relation to AI 10 and AI 1.2. These recommendations are of great importance while still leaving a certain degree of uncertainty which will need to be addressed during the Conference. It will be very important that the final CPG meeting in September allows CEPT to address some of the uncertainties though the final ECPs on these agenda items.

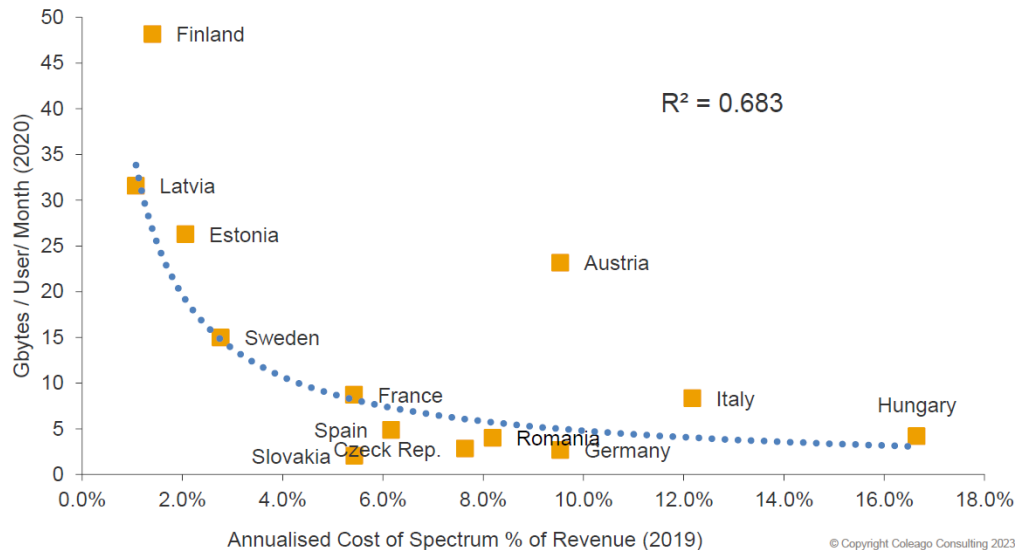
2. RSPG Opinion

2.1. 5G implementation ongoing in 5G primary (3.4-3.8 GHz) and pioneer (700 MHz, 26 GHz) bands

We agree with the RSPG that the deployment of 5G is ongoing, using a combination of the 5G primary/pioneer bands, and refarmed bands, especially in countries where primary/pioneer bands were not timely available. However, it is good to note that the 3.4-3.8 GHz is the most successfully deployed band for 5G and that the 700 MHz is increasingly deployed for coverage. A lesson learned with 5G deployments is that the reuse of existing infrastructure is preferred for optimization of resources.

On mmWave – implementation remains subject to use cases and demands in specific locations and as noted by the RSPG, initial commercial use has started and is expected to increase in the coming years.

5G deployments in some of the European markets have been harmed to some extent by high spectrum fees. Analysis from Coleago Consulting has shown how mobile data consumption per capita is a proxy for economic value for consumers. According to the data collected, 68% of the variation between countries in consumer value is explained by differences in the annualised cost of spectrum. Maximising the amount of spectrum available to mobile operators is another key factor.



New approaches should be considered for spectrum licensing for future mobile networks in order to allow sufficient financial resources for network investments: assignment of usage rights with unlimited time duration in exchange with coverage / capacity expansion commitments looks like a sensible approach⁷. As previously highlighted, GSA sees the investment topic inextricably linked to the 6G strategy. A comparative study evaluating the financial aspects of operators in Europe and in other leading nations such as the US, Korea, Japan, etc. should be considered in order to identify options to be considered to increase the ability of European operators to enable the required significant investments to help keep Europe at the forefront of technological development and adoption.

2.2. DSS usage by MNOs

Intra-operator spectrum sharing has been already used between different generations of mobile technology from 2G to 4G. DSS, as specified in 3GPP (Dynamic Spectrum Sharing between LTE-NR), introduces the dynamic aspect of in-band sharing between 4G and 5G proving that successful implementation of 5G has been enabled also by the possibility to reuse existing infrastructure and spectrum, in parallel/addition to accessing new spectrum with similar characteristics. We expect 5G and 6G to continue using 3GPP DSS-like techniques in the early stages of 6G. However, sharing of existing bands alone will not be sufficient for providing expected 6G services and additional bands as close as possible in frequency to mid-bands and with adequate bandwidth will be required.

2.3. Needs for vertical and local spectrum

We recognise that spectrum demand for local networks – enterprise, campuses, communities – may continue to increase. Meanwhile it is also very important to carefully evaluate the actual spectrum needs for vertical and local use, before designating more spectrum to such use. Besides, harmonised technical conditions including in bands like 3.8-4.2 GHz, 26 GHz, and 42 GHz, are important to allow additional growth of an end-to-end ecosystem. Technology- and service-neutral licensing condition for local use of spectrum will allow for their upgrade to the newest and more efficient technology over time, including to 6G and beyond.

⁷ See “[Le New Deal Mobile](#)” signed between the French government and the MNOs

It is equally important to consider the role the mobile operators play in addressing the connectivity needs of vertical industries (through network slicing and non-public as well as hybrid networks that use currently available spectrum).

Access to spectrum for local area use should not be limited to specific groups of potential licensees, but open to all interested parties in the country, including mobile network operators. MNOs access to the spectrum for local networks would accelerate the development of the ecosystem for the respective bands (e.g., parts or all of 3.8-4.2 GHz band) which local operators could then leverage and benefit from a wider choice of chipsets, devices, etc.

2.4. Additional need of spectrum before the end of the decade

Forecasts indicate a continuous year-by-year growth in mobile data traffic, and that this trend will continue. To effectively accommodate this traffic in the mobile networks before the end of the decade, the combination of several options is considered including technology upgrade, densification (including the use of mmWave in specific areas), etc. Technical solutions alone cannot respond to growing data traffic volumes and several studies indicate that additional spectrum in mid-bands will be required before the end of the decade to support 5G and its evolution.

We would like to underline the importance of economies of scale that can only be achieved through spectrum harmonization across large footprints (at global or at least regional level).

2.5. Technology neutrality and spectrum sharing

We agree on the fact that existing harmonised bands for ECS, licensed under technology and service neutrality conditions, will be refarmed in the future for 6G. We expect that these key EU technology and service neutrality principles will remain in place in the 6G era and beyond. However, the refarming of spectrum is highly dependent on the national market conditions and on the licensees' strategies and priorities. As was done in the case of 5G, we believe that all the frameworks for all harmonised bands in Europe will need to be reviewed to account for 6G. This effort will then allow operators to decide the best spectrum strategies based on local markets' dynamics.

2.6. The role and need of licence-exempt or light-licensed spectrum for offloading some of the 6G traffic and provide personal networks

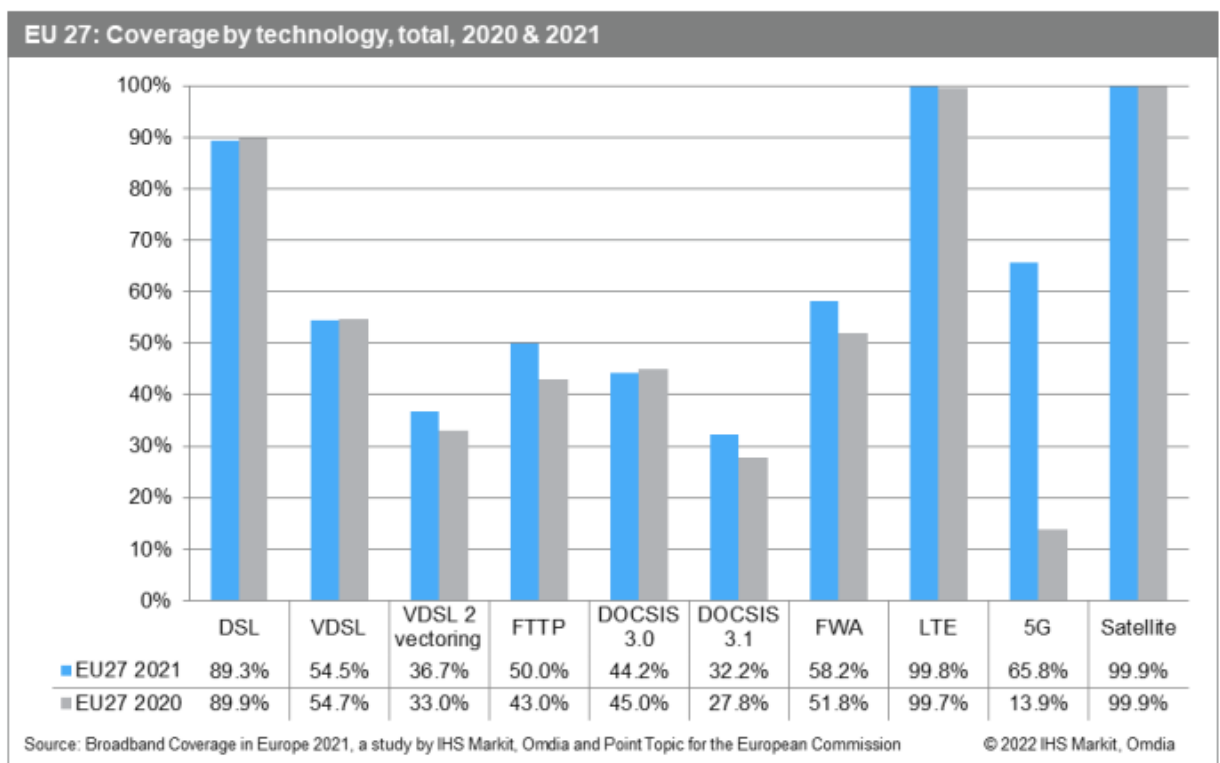
We recognise the role of offloading traffic from mobile networks. However, we note that licence-exempt spectrum is typically used – as highlighted also in this Opinion – for the last metres of the FTTH networks. Moreover, the role of licence-exempt and light-licensed spectrum will continue to remain complementary to licensed spectrum.

We fully agree on the need to assess the licence-exempt/unlicensed spectrum needs, accounting for the fact that indoor connectivity, including connectivity in residential homes, will need evolve to ensure ultra-high bandwidth and ultra-low latency in every corner of the premises. Such assessment will need to consider that the indoor connectivity evolution will follow several directions in parallel. As pointed in the Opinion additional frequencies for RLAN will be progressively exploited. More advanced RLAN standards and hardware, as well as smart RLAN software exploiting cloud-based artificial intelligence (AI)

data analytics to monitor and dynamically optimise the performance of the home network and densification of RLAN access points will also be essential to address the coverage challenges across walls. The progressive take-up of fibre to the homes and within the homes will also be a critical element to consider.

2.7. The role and need of the non-terrestrial networks

The non-terrestrial networks are estimated to provide complementary coverage to mobile networks in hard-to-reach areas with no coverage, or where the deployment of terrestrial networks is economically challenging. In Europe, according to the DESI index, the household coverage of the mobile (LTE) networks and of satellite is comparable (99.8% vs. 99.9%). We agree though that NTN can continue to play a role for the provision of backhaul, when/where necessary as well as in extreme situations of emergency/natural disaster and rescue missions in unpopulated areas.



2.8. Proactive role of RSPG to support the development and deployment of 6G

We concur that a proactive European strategic positioning is essential for supporting the introduction and future development of 6G. This includes early study/recognition of spectrum needs and early engagement to identify new suitable spectrum for 6G. We encourage RSPG to proactively support the European efforts towards this direction, noting that such effort will need to start already in 2023.

We acknowledge the success of the identification of the primary 5G band, the 3.4-3.8 GHz band, that assured the creation of a solid end-to-end ecosystem, assured the timely deployment of 5G by many Member States, and established a model that has then been adopted by many other markets globally. As for the case of 5G, a timely 6G spectrum roadmap with clear identification of the target frequency bands in line with the assessed

spectrum needs associated with the future use cases is necessary to guarantee effective roll-out of 6G across Europe.

2.9. EC to work with Member States towards a 6G strategy

We acknowledge the importance of coordinated 6G strategies across Europe that will be essential in determining efficiently the timeline for spectrum release and will help in consolidating demand for equipment and as such, the development and evolution of the ecosystem, including 6G terminals, to facilitate the timely and successful roll-out of 6G services across the EU Member States starting from 2030.

3. Spectrum for verticals and local networks

Additional comments on spectrum needs:

- Specific industries (PPDR, railways, utilities, etc.) have access to dedicated spectrum that should allow transformation and adoption of the newest and most spectrally efficient technologies.
- Harmonisation of 3.8-4.2 GHz band for low/medium power under the EC Mandate will favour faster development of equipment offering access to up to 400 MHz of spectrum for localised use. The technology agnostic approach to harmonisation and licensing will allow evolution from 5G to 6G. The European toolbox should consider regulatory flexibility to allow the member states to optimise the use of this spectrum by not restricting its usage to specific stakeholders but open it to all potential licensees. Equally, if national context allows, flexibility in the power levels should be considered.
- Spectrum at mmWaves allow for the deployment of specific use cases that require high bandwidth and targeted coverage. Ongoing trials can create confidence and determine a market take-up in the upcoming period.
- It is also very important to carefully evaluate the real spectrum needs for vertical and local use, before allocating more spectrum to such use. The role of public networks in providing solutions for the verticals based on 4G, 5G and in the future 6G technology is expected to continue.
- 6G, as 5G, will address and consider the needs of the public networks as well as the particular needs of industries in terms of specific characteristics (bandwidth, capacity, resilience, etc.) and the necessary spectrum demands. It is therefore important that licensing of the spectrum for local networks to continue to be done under a technology neutrality principle to allow transition from LTE, 5G, 5G-Adv to 6G in the future.

4. 6G research and development

RSPG provides a comprehensive and valuable summary of the ongoing European and national 6G related research projects.

We note that many research topics cover the 6G vision, possible use cases and technology enablers and solutions, while part of the research investigates the role of sub-THz spectrum, the role of Wi-Fi spectrum and of the non-terrestrial networks. No research

topics listed by RSPG seems to consider and evaluate the spectrum needs for the successful initial 6G rollouts, which, in our view, represents a disconnect between the R&D efforts from the deployment realities and goals.

In this regard, it is important for Europe not to waste this very substantial 6G research effort, and not to fall behind in securing enough spectrum resources for 6G. Spectrum remains a critical enabler, hence it is important for the ongoing European wide research initiatives to support studies for additional IMT-2030/6G spectrum. The timing aspect is critical, given that spectrum availability and harmonisation is a long-term process.

5. Licensing and regulatory aspects

5.1. Provision of WBB using unlicensed spectrum

Licence-exempt/unlicensed spectrum is used on a non-protection non-interference basis, and mainly for indoor coverage as extension of the fixed networks. We conclude – based on cases listed by RSPG – that the use of unlicensed spectrum for other services is complementary to the licensed spectrum. Experiences in some European countries show that for providing coverage in rural areas, the use of licensed spectrum is prevailing.

We expect unlicensed spectrum to continue to be used for RLAN and offloading mobile traffic on the fixed networks, and to continue to play a complementary role in the 6G era.

5.2. Spectrum sharing in licensed bands

The EECC enhances the role of the secondary market and sublicensing. Member States should encourage spectrum trading and leasing that is market driven, assuming that this does not cause market distortion. Voluntary and market-led spectrum trading, leasing, or sharing are preferred to those imposed by regulations.

Spectrum sharing/pooling among mobile operators in licensed bands is feasible via solutions like Multi-Operator Core Network (MOCN), and any regulatory barriers which might exist towards such market-led sharing/pooling should be addressed.

With the arrival of 5G and the estimated demand for industrial 5G use, conditions like ‘use it or lease it’ were introduced in some licensing conditions. Solutions like the club licensing in the mmWaves are yet to be proven in their efficiency and market adoption.

Licensing of the 3.8-4.2 GHz band for local area networks will consider additional spectrum sharing models and coexistence between systems of different services.

5.3. Addressing the potential capacity needs by 2025 and beyond

We agree that additional mid-band spectrum is required in the 2025-2030 period to respond to the mobile traffic growth. This calls for identification of such spectrum as of now, to ensure its harmonization in due time. As indicated before, mmWave spectrum and densification alone are not sufficient to efficiently respond to the traffic growth before the end of the decade.

On the other hand, the RSPG notes that if no additional harmonised resource can be made available by 2025, MNOs can densify their networks in existing harmonised bands and use additional new harmonised mmWave spectrum expected to be made available in the coming years (42 GHz). We would like to underline that such an approach would not address the spectrum needs in the 6G timeframe in an economically and environmentally

sustainable manner. In addition, 6G will require larger carrier bandwidths and access to spectrum for wide area that can be efficiently deployed using the existing urban base station grids. Further enhancements in antenna technology will allow the reuse of these grids with spectrum from the 7-15 GHz range, the technology upgrades compensating for any propagation disadvantage of these frequencies. The successful market introduction of 6G in Europe starting from 2030 requires identification of suitable spectrum bands from the 7-15 GHz range to be retained and studied for future IMT use in the ITU's WRC-23 to WRC-27 cycle. Hence, regarding the RSPG statement that the RSPG needs to consider the results of WRC23 on Agenda Items 1.2 and 10 to further determine the spectrum availability and the implementation strategies for 6G, we would like to note that such an approach would not allow for the proactivity that this Opinion is striving for and that we fully support. We believe that there is a value in starting the RSPG work already in 2023 and influencing the outcome of WRC-23 in a direction that supports 6G. We understand the importance Europe is placing on the CSDP and space policies, but we cannot minimise the importance of identifying the relevant spectrum required to assure that 6G is timely implemented across Europe in 2030 and onward. We believe that there is scope for technical studies to determine if and how IMT-2030 could be operated while not negatively impacting the CSDP and space policies.

Therefore, we believe that an alternative approach that would protect the CSDP and space policies while also ensuring efficient use of spectrum and additional spectrum resources for future networks is the following: "Candidate frequency bands between 7 and 15 GHz which would not jeopardise usages relevant to the Common Security and Defence Policy (CSDP) or to the space policy, may be considered for studies for IMT identification at WRC-27." In this way, Europe can have a stand that protects CSDP but at the same time supporting studies for IMT spectrum.

Without harmonised spectrum for 6G in Europe, deployment, and adoption of 6G in Member States will significantly slow down. We draw again the attention to the fact that European research projects seem to disconnect technology developments and the importance of identifying and having access to the necessary spectrum resources. It is therefore important for Europe to be part of the early engagement in evaluating the potential of the different spectrum bands in the 7-15 GHz range, and we consider the ITU process to be the most appropriate to assure all stakeholders are part of the studies.

5.4. Needs for regulatory models for spectrum sharing in the 6G era

Several spectrum sharing models are already available, evaluated or implemented in different regions. However, no single model is set to address all use case and situations.

Identifying the suitable spectrum for 6G in the early stage of the research will allow us to evaluate the right approach to spectrum management to ensure that sharing is done effectively and in a least restrictive manner while protecting all primary services, and that requirements are considered from the early stages of standardization and regulation. As 6G will be standardised over the next few years, there is a "window of opportunity" to influence its design to capture any co-existence / sharing requirements. It is therefore important that the co-existence studies are undertaken in a timely manner for their outcomes to be considered and incorporated in the 6G standards prior to the initial deployments.

6. Spectrum for 6G: preliminary analysis

Digitalisation of industries is expected to continue to grow with 5G and 5G-Advanced as new applications that use the mobile capabilities will continue to flourish and be adopted in many industrial domains, and the trend will continue with 6G.

6.1. Spectrum for the mass market launch in EU, paving initial 6G development

We agree that outcomes of WRC-23⁸ will allow to evaluate the future options regarding spectrum for 6G and we acknowledge the recommendations expressed in the RSPG Opinion on WRC-23 (December 2022).

We highlight the interest of the mobile industry to study – under AI 10 – the potential use for 6G of bands in the 7-15 GHz range, including sharing with existing primary services. We also note that other ITU regions propose and support the search for additional spectrum for 6G and future networks, either under AI 10 or on a national level.

We acknowledge that RSPG agrees that more spectrum in mid-bands is likely to be need for 6G for coverage and capacity. We concur with RSPG's comment that there is a need to assess spectrum requirements for an introduction of 6G mass market in EU and we will follow closely the further development of RSPG's work on spectrum needs for 6G.

We note that while technology neutrality will continue to be central to the European spectrum policies, spectrum refarming alone is not sufficient to assure early deployment of 6G as refarming depends on the individual licensees' strategies and the national context. We therefore expect RSPG to consider, based on its prior expertise with the 5G pioneer bands, similar plans to identify and make available primary and pioneer bands for 6G deployment in a timely manner.

6.2. The role of NTN in 5G and 6G and spectrum issues

We expect NTN to play a complementary role in 6G for providing coverage mainly in case of emergency situations and in low-populated/unpopulated areas with little/no mobile coverage, when necessary. However, as per BEREC studies, it seems that the role of satellite connectivity for universal service remains limited in 5G and 6G. Furthermore, we agree with RSPG 's assessment that latency requirement remains a constraint of the satellite communications and therefore satellite systems can be considered as interim solutions in case of disaster during the reestablishment of the terrestrial network capabilities.

We agree that additional role can be considered for worldwide services/applications in international waters and space and some form of commercial agreements with CSPs can be considered, but these are specific complementary contexts and roles that need to find/prove their economic models.

6.3. The role of licence-exempt spectrum use in 5G and 6G and spectrum issues

The use of licence-exempt spectrum will always rely, as explicitly highlighted by RSPG, on the fixed or mobile infrastructure to provide the end-to-end connectivity to the users. We

⁸ See footnotes 1,2 on GSA positions towards WRC-23 on AI 10 and 1.2

find that the use of such licence-exempt spectrum will remain complementary to the mobile networks in licensed spectrum.

Higher frequency bands used under licence-exempt framework may find their use for specific applications under 6G that will require high bandwidths, combining their characteristics of limited coverage and high capacity.

6.4. Use of current harmonised mobile bands for 6G

We agree with RSPG that 6G launch will require – as each new generation of mobile technology – its new spectrum for initial deployments and will reuse also existing bands. The technology neutrality principle applicable in EU will effectively allow the reuse of existing bands for 6G with the adequate harmonised technical conditions. RSPG will play a role to assure that such conditions are in place.

However, given the limited bandwidth of the existing spectrum and its distribution among licensees at national level, achieving the high bandwidths required by specific 6G use cases will be challenging or even impossible in some cases. Existing spectrum will need to complement new spectrum bands, from the range 7-15 GHz that can provide the necessary bandwidths that the wide-area applications of 2030 will need.

To conclude, we reiterate that GSA encourages the RSPG to commence its work on the 6G spectrum roadmap from 2023 and to publish it in 2024.

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