Multi-company response to the Radio Spectrum Policy Group public consultation on the Draft "Opinion on the ITU-R World Radiocommunication Conference 2023" – Focusing on the IMT identification of 6425-7125 MHz under Agenda Item 1.2

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Summary

The companies and association listed above ("the Companies" hereafter) welcome the opportunity to provide their feedback on this important RSPG Opinion that will shape European Member States' positions and will be an opportunity to lead the decision making at WRC-23 driving the Digital Society.

This response complements the individual responses by the Companies and their relevant associations to the RSPG consultation.

The response herein focuses on the 6425-7125 MHz band ("the upper 6 GHz band" hereafter) which is in the scope of Agenda Item 1.2 of the WRC-23 and which represents the only possible additional mid-band spectrum opportunity to meet the 2 GHz average mid-bands spectrum demand estimated by the GSMA study [1] in Europe towards 2030.

Europe's society and economy need future-proof communications infrastructure to drive the Digital Decade. 5G is a key pillar of the digital transformation providing expected reliable performance (e.g. high capacity, low latency, wide-area connectivity) to citizens, enterprises, and industries. The European digitalisation targets, which will transform economies, social services, enterprises and industries, will not be met without strong and sustainable 5G networks.

It is therefore important to ensure mobile networks can also evolve their capability and contribute to Europe's digital transformation, by allocating the additional mid-band spectrum capacity needed to keep up with increasing traffic demand from users. The upper 6 GHz band will be critical to secure the future expansion and quality of 5G services. Licensed use of the 6425-7125 MHz band by public mobile network operators will achieve the best outcome for Europe's digital society.

Europe has already allocated the lower 500 MHz of the 6 GHz band to licence-exempt use by WAS/RLAN (e.g. Wi-Fi and NR-U), which guarantees users can make the most of their current and future fixed broadband gigabit connectivity.

A common position across the Member States supporting IMT identification of the upper 6 GHz band at WRC-23 would be of paramount importance for the European Union and the individual Member States to achieve their Digital Decade objectives. Therefore, the Companies support the adoption of RSPG "Option 1" on the band 6425-7125 MHz - "IMT identification" with appropriate technical conditions, and propose to delete RSPG "Option 2".

Further information on the importance and feasibility of 6 GHz for wide-area mobile networks can be found in the whitepaper "6 GHz opportunity: licensed spectrum for mobile networks", which is downloadable here. Other studies and reports are also available at: *www.6ghzopportunity.com.*

WRC-23 Agenda Item 1.2 (IMT mid-band identifications) - upper 6 GHz band

The RSPG draft Opinion states:

"The band 6425-7125 MHz may respond to additional spectrum demand in mid-band for IMT since it has similar propagation conditions to the band 3400-3800 MHz, noting in particular that the IMT family concept encompasses various mobile technologies (e.g. 4G, 5G and beyond)."

Feedback:

The Companies agree with the RSPG's Opinion. We are pleased to see that the need for additional mid-bands spectrum is recognized by the RSPG and that the upper 6 GHz band can respond to IMT spectrum demand. In fact, we expect that IMT networks in European cities will begin to experience service-impacting capacity limitations by the end of this decade.

The need for 5G spectrum is driven by the end users' traffic growth and their increasing demand for quality (e.g. lower latency and higher reliability). Based on the ITU-R specifications for IMT-2020, GSMA's mid-bands spectrum demand modelling [2][1] has estimated that an average of 2 GHz of mid-bands spectrum is needed to reliably deliver the IMT-2020 service requirements [3] in an economically feasible manner in urban areas in the 2025-2030 timeframe. This spectrum will serve citizens and machines, enabling, among others, sustainable smart cities. Beyond urban areas, the additional mid-bands spectrum will help address the digital divide, providing affordable high-speed fixed wireless access (FWA) broadband to small towns and villages, increase available capacity along major transport routes, and help to meet the connectivity needs of industrial use cases.

Moreover, based on their detailed network capacity forecasts, European network operators have also confirmed that, towards the end of the decade, 5G networks in cities will begin to experience service-impacting capacity limitations.

In the upcoming years, the adoption of new use cases, e.g. metaverse, will involve AR/VR/XR in both indoor and outdoor scenarios for consumers and enterprises, and will increase the traffic growth rate. High data-rate wide-area outdoor mobility will be an important enabler, supported by macro-cellular networks and relying on additional licensed mid-bands spectrum such as the upper 6 GHz band. Outdoors, smartphones will need to be connected to 5G macro-cellular mobile networks with sufficient bandwidth in order to provide connectivity to XR headsets. The short-range personal area connections between smartphones and headsets in Europe will rely on the licence-exempt 5 GHz band and the lower 6 GHz band as well as the high-bands (e.g. the 60 GHz band). Alternatively, XR headsets might themselves directly connect to 5G mobile networks (even indoors), avoiding the need for short-range communications.

The upper 6 GHz band offers the opportunity to help meet the identified need for additional mid-bands spectrum, providing wide contiguous mid-bands spectrum to enable enhanced performance and capacity towards 2030.

Mitigating the demand for spectrum by building additional sites (network densification) is practically and economically unfeasible for network operators. According to the GSMA spectrum needs evaluation [1], a deficit of 800-1000 MHz in the required mid-bands spectrum will increase the total cost of mobile network ownership by 3-5x over a ten year period, and the carbon footprint will become 1.8-2.9x greater, both as a result of the extreme densification needed to deliver the target performance levels. Note: the study does not address the practical restrictions in acquiring the additional sites required within an already dense network grid, nor

the technical challenges including management of harmful interference and mobility management, nor the economic feasibility in terms of both CAPEX and OPEX resulting from such extreme densification.

Accordingly, in the absence of additional mid-bands spectrum, and given the above technical and economic limits to extreme network densification, mobile network operators would not be able to deliver the IMT-2020 user experienced data rates of 100 Mbit/s downlink and 50 Mbit/s uplink. If additional mid-bands spectrum is not made available, governments would have to accept that their nations will not realise the full socioeconomic benefits of 5G.

The RSPG draft Opinion states:

"It appears from sharing studies that there is possible opportunity for sharing between IMT (including macro base stations) and fixed satellite service allocated to this band."

"The issue of coexistence with FS needs to be addressed in a medium term perspective."

Feedback:

The Companies agree with the RSPG's Opinion. Further details are provided in our comments on the RSPG views on coexistence with the Fixed Satellite Service and the Fixed Service.

Link with EU policies

The RSPG draft Opinion states:

"European Electronic Communication and Connectivity policy is aiming at ubiquitous ultra-high broadband connectivity for all European citizens and fostering innovative applications in the single market. 5G will be one of the most critical building blocks of the European digital economy and society in the next decade. Europe has taken significant steps to lead global developments towards this strategic technology. Europe´s 5G strategy is outlined in the RSPG Opinions on 5G, the EC Communication on the connectivity for a European Gigabit society, the EC Action Plan on 5G and EC Strategy "A Europe fit for the digital age", which encompasses the EC Digital Decade Communication."

Feedback:

We agree with the RSPG that 5G will be one of the most critical building blocks for the European digital economy and society.

Studies have shown the great socio-economic value associated with licensed use of mid-bands and of the upper 6 GHz band in particular.

We believe it is now the time to work towards a European spectrum strategy which recognizes the upper 6 GHz band as a primary band to support 5G evolution especially towards the end of the "Digital Decade".

The Companies consider that the availability of additional mid-bands spectrum will make a substantial contribution towards the fulfilment of the European Electronic Communication and Connectivity policy objectives.

Mid-bands are playing a key role for 5G: current mid-bands spectrum is already being used in 270 commercially launched 5G networks in more than 60 countries globally[1].

Additional mid-band spectrum will not only help Europe to improve connectivity within our societies but will add significant economic value. A study by GSMA Intelligence [4] estimates that 5G will generate $960 billion in gross domestic product (GDP) in 2030 on a global basis, given the availability of an adequate amount of mid-bands spectrum (2 GHz as per GSMA's estimation), with $610 billion of this being a result of deployments in mid-bands and representing almost 65% of the overall socio-economic value generated by 5G. However, up to 40% of the expected benefits of mid-bands 5G could be lost if no additional mid-bands spectrum is assigned to mobile services.

The upper 6 GHz band is the only remaining additional mid-band spectrum opportunity, enabling more wide/contiguous bandwidth in response to the steadily increasing broadband demand towards 2030. This portion of spectrum can play a fundamental role in meeting the Digital Compass target for 5G even across densely populated cities.

The upper 6 GHz band is important to ensure that IMT mobile networks will be able to deliver sufficient wide-area capacity in Europe in a sustainable way, accounting for the expected mobile traffic growth in the years leading to 2030. It is imperative to note the importance of ensuring that 5G not only reaches the population, but that it does so with a performance level which can benefit citizens. The mid-bands spectrum allows operators to deliver high data rates over a large area (typically a city) with a sustainable deployment effort while the high-bands will complement to address very high capacity in specific areas.

Focusing on 6 GHz, GSMA Intelligence has conducted a cost-benefit analysis [5] aiming at assisting policy makers in their decisions on different authorisation models for the 6 GHz band. When analysing the benefits of allocating the band to licensed mobile or licence-exempt use, the report concludes that:

- Allocating the full 6 GHz band (5945-7125 MHz) for licensed mobile use would drive the greatest economic benefit in most considered scenarios, however this is not an option in Europe;
- Allocating the upper 6 GHz band (6425-7125 MHz) for licensed mobile use when the lower 6 GHz band (5945-6425 MHz) is allocated for licence-exempt use would drive the greatest socio-economic benefits even with extremely high speed fixed broadband availability[2];
- Allocating the full 6 GHz band for licence-exempt use would not be the most beneficial option in any of the considered analyses.

Therefore, considering the current situation, allocating the upper 6 GHz for licensed mobile use is the most beneficial option in Europe.

The Companies appreciate previous efforts by the RSPG and European Commission on their early definition of the 5G primary band, which has played a central role in the development of the most effective spectrum strategy to support the introduction of 5G. EU recognized at an early stage that spectrum in the low, mid- and high-bands was critical for 5G and acted accordingly. With reference to mid-bands, effective work was done in EU to secure spectrum for the initial 5G deployments (400 MHz at 3400-3800 MHz), noting that in some Member States this spectrum is not yet available for large scale 5G deployments, and in some Member States awards do not include the complete 3400-3800 MHz.

[1] Data from GSA GAMBoD database for the 1700-5000 MHz range (n1, n3, n7, n38, n40, n41, n48, n70, n77, n78, n79) – July 2022

[2] For example, where there is high fibre/cable broadband adoption and very high fixed broadband speeds of 10 Gbit/s to all fibre/cable users

We believe it is now the time to work towards a European spectrum strategy which recognizes the upper 6 GHz band as a primary band to support 5G evolution especially towards the end of the "Digital Decade".

The RSPG draft Opinion states:

In terms of spectrum, the "mid-band" range enables a good compromise between capacity and coverage and RSPG recognises that there may be additional spectrum requirements in the "mid-band" for future development."

Feedback:

We agree with the RSPG. In particular, preliminary simulations and field tests with early prototype equipment have already shown that advances in radio technology allow the achievement of similar coverage performance with the upper 6 GHz as with the 3.5 GHz band.

Indeed, additional spectrum in the "mid-band" is needed for future development of mobile networks towards the end of the decade, with the upper 6 GHz being the only opportunity in Europe.

After the initial 5G deployments at 3400-3800 MHz, which we expect will continue to grow, the mobile industry is looking at new spectrum that would allow similar performance for the evolution of 5G. Advances in radio technology are expected to allow the achievement of similar coverage with the upper 6 GHz as with the 3.5 GHz band for both outdoor-to-outdoor and most outdoor-to-indoor communications. This has been confirmed by preliminary simulations and field tests with early prototype equipment. Mobile operators will therefore be able to minimize the need for additional sites by upgrading existing 3.5 GHz sites with upper 6 GHz radios.

Furthermore, the larger available bandwidth in the upper 6 GHz band will allow significantly greater capacity compared with what can be made available with the 3.5 GHz band. Further capacity field tests are planned, targeting the end of 2022.

The RSPG draft Opinion states:

"The RR provides options for radiocommunication services and applications and, even with an IMT identification, the EU remains flexible to exercise any relevant options in a future harmonisation decision on the 6425-7125 MHz frequency band."

Feedback:

We agree with the RSPG: the IMT identification at WRC-23 does not bind Europe in any way on the actual future use of the upper 6 GHz band.

However, the IMT identification remains an important signal on the interest around the future use of the band for 5G and its evolution and on the potential for economies of scale. This will also support the ecosystem build-up which has started already.

By supporting the IMT identification, Europe has the opportunity to drive the harmonization of the upper 6 GHz band well beyond the borders of the European Union, as previously done with the 3.5 GHz band.

The Companies recognize that IMT identification does not bind Europe in any way. IMT identification at WRC-23 will provide an additional element towards the final decision on how

the upper 6 GHz band should be harmonized in Europe. IMT identification will also help to harmonize at a regional level, benefiting economies of scale and the development of the device ecosystem.

Additionally, many countries outside Region 1 are following with interest the development of coexistence studies towards decisions at WRC-23. Such interest gives Europe the opportunity to drive the harmonization of the upper 6 GHz band well beyond the borders of the European Union, as previously done with the 3.5 GHz band.

The potential for economies of scale should also be considered when deciding on the future identification of the upper 6 GHz band for IMT. The international interest generated by this band among industry (operators and suppliers) and administrations is driving the rapid consolidation of the equipment ecosystem. 3GPP has concluded the technical specifications of 5G NR base stations and user equipment for 6425-7125 MHz [6] in 3GPP band n104, defining the band plan, system parameters including channel bandwidth, transmitter and receiver characteristics, as well as other technical requirements. Commercial 5G NR products in the 6 GHz band – both for the radio access network and user equipment – are expected to be available when national assignments of these frequencies occur.

The RSPG draft Opinion states:

"The RSPG is of the view, that a future European policy strategy on 6425-7125 MHz should be based on a consideration of a number of questions regarding the best spectrum use for Europe, the spectrum demand for IMT (including IMT-2030) and WAS/RLAN in the medium term perspective, possible sharing options between radiocommunication services and applications in the band, including between IMT and WAS/R LAN."

Feedback:

The 2 GHz average mid-bands spectrum demand estimated by the GSMA study [1] cannot be achieved in Europe without allocating the upper 6 GHz band for licensed mobile networks use.

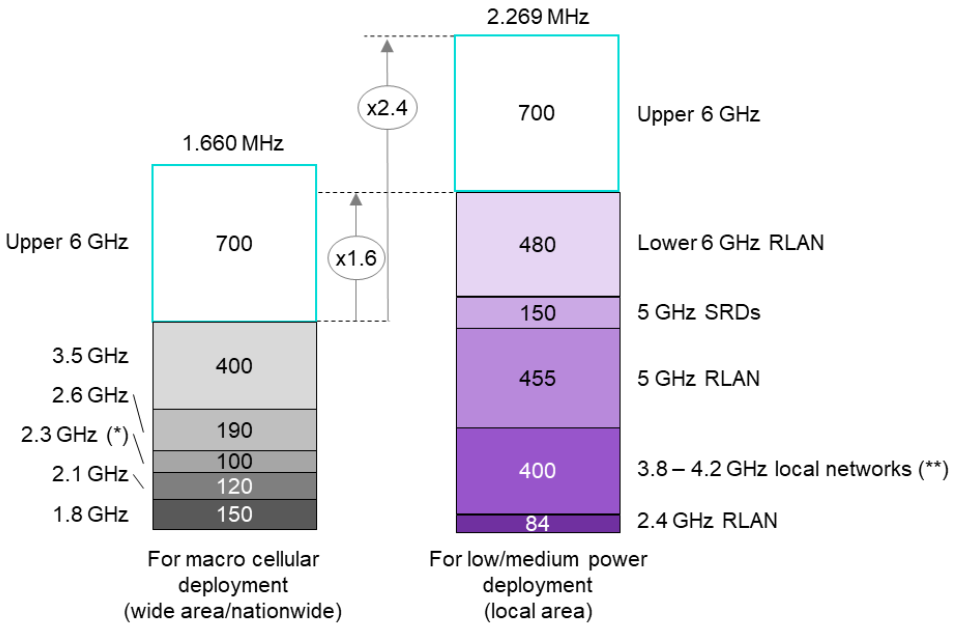
The currently available spectrum for WAS/RLAN, including the lower 6 GHz band, is sufficient to meet the capacity demand in the foreseeable future.

Co-channel operation of IMT networks (5G NR) and WAS/RLAN (Wi-Fi or NR-U) in the same geographic area is not feasible due to the harmful mutual interference.

Consideration of further spectrum demand for IMT, including IMT-2030, beyond the end of this decade should be addressed at a later stage as appropriate.

The Companies agree with the RSPG's Opinion. As indicated previously, GSMA has estimated that an average of 2 GHz of mid-band spectrum is needed in the 2025-2030 timeframe [1].

The mid-bands are not only of interest for mobile operators' wide-area networks. The alternative option of making the upper 6 GHz band available on a local basis (WAS/RLAN) must be carefully considered as no alternatives exist for wide-area mobile networks. We already see an imbalance appearing in Europe as the amount of mid-band spectrum for low/medium-power deployments is currently 1.6 times larger than for macro-cellular networks. The imbalance would grow to up to 2.4 times if the upper 6 GHz band is used for low/medium-power deployments (see figure below). A more reasonable balance, 0.9 times, can be achieved if the upper 6 GHz band is made available for macro-cellular networks.



(*) The band might not become widely available in all Member States

(**) Based on RSC #76 mtg. (Oct. '21)

Source: Deutsche Telekom presentation at the 2nd European 6 GHz webinar - December 2021

Mobile networks are complemented by radio local area networks (WAS/RLAN) and we expect this trend to continue going forward with the evolutions of 5G NR mobile networks and WAS/RLAN, respectively. Frequencies in mid-bands and high-bands are important for both 5G NR and Wi-Fi technologies, with mid-bands being essential for wider-area mobile use cases, whereas high-bands are more optimal where very high capacities over smaller areas are needed, such as for indoor or outdoor hotspots.

5G NR and WAS/RLAN need to operate in different bands

It is important to account for the fact that co-channel operation of IMT networks (5G NR) and WAS/RLAN (Wi-Fi or NR-U) in the same geographic area would result in harmful mutual interference, to the extent that they would not be able to perform at the levels for which they were designed: 5G NR's protocols for scheduled access to spectrum – specified for managed QoS in a controlled interference environment – would be severely disrupted, while Wi-Fi's / NR-U's protocols for shared access to spectrum – specified for managing unscheduled interference from other similar equipment – would fail to function.

Furthermore, it should be noted that NR-U, being a technology for low power license-exempt use, would not be able to help address the demand for wide-area high capacity communications.

Given that IMT networks (5G NR) and WAS/RLAN (Wi-Fi or NR-U) must operate in different frequencies, and the criticality of mid-bands for wider-area mobile communications, the question arises as to how much additional mid-bands spectrum should be allocated for use by IMT (5G NR) and WAS/RLAN (Wi-Fi or NR-U), respectively. We have previously referred to spectrum needs for IMT and we would now like to touch upon WAS/RLAN spectrum needs.

What can be achieved with existing WAS/RLAN mid-bands spectrum?

The maximum theoretical downlink data rate that can be delivered by Wi-Fi with a 160 MHz wide channel at 5 GHz or lower 6 GHz is about 9.6 Gbit/s. We note that commercially available Wi-Fi access points can already use the combination of a 40 MHz channel in the 2.4 GHz band and a 160 MHz channel in the 5 GHz band to achieve a data rate of 10.75 Gbit/s. As such, and in light of the fixed broadband speeds expected to be available to households over

the next decade, the assignment of additional mid-bands spectrum for use by Wi-Fi does not appear to be necessary.

Simulations [7] of a three-storey building with ten apartments per floor, and four rooms per apartment, have shown that, when using a 160 MHz channel in the 5 GHz or lower 6 GHz bands, each Wi-Fi 6/6E access point can deliver a downlink throughput in the order of 500 to 1000 Mbit/s depending on the number of available spatial streams and on the number of antennas available at the access points and stations. Wi-Fi performance today is quite limited by legacy capabilities: performance enhancing features provided by Wi-Fi 7 will significantly improve the capability of Wi-Fi within their existing mid-bands spectrum. We expect that more advanced access points will become available in the future supporting throughputs that will be in the order of 2 Gbit/s in a 160 MHz channel in such dense urban environments. This also supports the assertion that the assignment of additional mid-bands spectrum for use by Wi-Fi will not bring tremendous gains for Europe.

On the role of high-bands for WAS/RLAN

High-band spectrum is available on a licence-exempt basis in Europe, particularly within the 60 GHz band (57-71 GHz). A combination of the existing spectrum for license-exempt use in mid-bands as well as high-bands will relieve the pressure for WAS/RLAN to access additional mid-bands frequencies, as these latter frequencies are more suitable for high-capacity wider-area mobile communications. Similarly, mobile operators intend to deploy 5G in the high-bands, e.g. for very high capacity scenarios.

Considering the above, we believe that mid- and high-bands spectrum currently available for WAS/RLAN is sufficient to meet the capacity demand in the foreseeable future.

Future availability of fixed broadband connectivity

We highlight that while 5G NR mobile networks are end-to-end communication solutions, RLANs offer "last few metres" connectivity, with their most popular use being within business and residential premises. As such, the performance of Wi-Fi is ultimately constrained by the speed of the fixed broadband connectivity supplied to the Wi-Fi access points. For this reason, in deciding the amount of additional spectrum assigned for Wi-Fi, policy makers should account for fixed broadband penetration and speeds.

Fibre optic technologies behind FTTH and advanced modem solutions have seen rapid developments: 10G PON became available from 2017 and is expected to reach large-scale take-up by 2026, delivering up to around 1.3 Gbit/s on average to end users. 10G PON is being followed by 25G EPON and ITU-T 50G PON, which became available in 2020 and 2021, respectively, with the latter expected to deliver around 6.6 Gbit/s on average to end users. The first products for 50G PON are expected to be commercially available by 2023, and the technology is expected to have a large-scale market by 2029. Notably, should market demand materialise in the future, the next generation technology capable of delivering up to 10 Gbit/s to end users is unlikely to arrive until the next decade. Accordingly, the demand for spectrum to allow Wi-Fi access points to deliver speeds greater than 10 Gbit/s within this timeframe is questionable.

In addition, the IMT identification of the upper 6 GHz band at WRC-23 and its licensed use represents the best spectrum use for Europe, aiming in particular at fulfilling the IMT requirements and the capacity needs that will arise during the period leading to the end of this decade for 5G networks.

Hence, consideration of further spectrum demand for IMT (including IMT-2030 accounting for its associated new use cases and capabilities) beyond the end of this decade should be addressed at a later stage as appropriate.

The RSPG draft Opinion states:

"The frequency band 6425-7075 MHz is used for Fixed Satellite Service (FSS) in the uplink (6425-7075 MHz) and in the downlink (6700-7075 MHz) direction, noting that the protection of satellite uplink(s) is intrinsically of international nature. Although most satellites operating in the satellite "C-band" over Europe are using the core uplink FSS band 5925-6425 MHz paired with the downlink band 3700-4200 MHz, this does not relieve the RR obligation for IMT to protect satellite receivers in these bands, noting that wide coverage is an inherent characteristic and advantage of satellite C-band, and that the C-band is used for satellite connectivity outside of Europe. As for the 26 GHz band, protection of receiving earth stations (FSS downlink) from IMT may be ensured at national level and through bilateral cross-border coordination but there will be a need to ensure long term access to this band for Non-GSO feeder links in support of the objectives of EU space policy."

Feedback:

The usage of the Extended and Planned C-band for satellite systems in Europe is limited with little rationale for the replacement of satellites. Furthermore, by 2030, ~70% of the satellites currently deployed in ITU Region 1 in the Extended and Planned C-band are expected to end operation.

Nevertheless, we agree with the RSPG draft Opinion that the coexistence between IMT and FSS uplink, being intrinsically of international nature, should be studied by ITU-R. The vast majority of contributions submitted to ITU-R by administrations and industry have concluded that macro-cellular IMT deployments can coexist with the FSS uplink.

Studies have further indicated that co-existence with FSS downlink is also feasible on a national level through coordination and/or geographic separation on a case-by-case basis.

The Companies share the RSPG Opinion in that the frequencies 6425-6725 MHz used by satellites over Europe are lightly utilized. In fact, some European administrations in their feedback to the ECC Questionnaire [8] have stated that FSS uplink usage in the upper 6 GHz band is going to be affected by changes in the European regulation in the downlink band (3400–3800 MHz). Additionally, we note that the fact that the band 4500-4800 MHz is used by NATO, is reflected in the almost negligible usage of 6725-7025 MHz.

The usage across Region 1 is also limited. A recent study by Euroconsult [9] on the usage of the "Extended C-band" (3400-3700 / 6425-6725 MHz), "Planned C-band" (4500-4800/6725-7025 MHz) and 7025-7075 MHz in Region 1 concluded that:

- Use of Extended and Planned C-band capacity would currently represent around 2% of the total commercial satellite capacity leased;
- A total of 51 satellites exist with payloads in the Extended C-band downlink, among which only 21 satellites use uplink in the Extended C-band;
- Only three satellites include Planned C-band capacity in uplink and downlink;
- Demand for Extended C-band capacity at 3400-3700 MHz (and for the associated Extended C-band uplinks) is on a declining trend which seems likely to continue;
- The relatively low use rate of a majority of those satellites, combined with the limited prospects for capacity usage, results in a limited rationale for their replacement;
- The likelihood of investment in a new Planned C-band satellite appears low;

- Usage in Region 1 of 7025-7075 MHz is currently limited to downlinks (gateways and links and the command and control), to about four teleports in Russia, Turkey and France;
- Around ~70% of the satellites currently deployed in the Extended and Planned C-bands on the downlink and visible from ITU Region 1 are expected to no longer be in operation by 2030.

Nevertheless, we agree with the RSPG draft Opinion that the coexistence between IMT and FSS uplink should be studied by ITU-R. Although discussions are still on-going, the vast majority of contributions submitted to ITU-R by administrations and industry have concluded[3] that macro-cellular IMT (5G NR) deployments can coexist with the FSS uplink[4].

Studies have further indicated that co-existence with FSS downlink[5] and the Fixed Service (FS) is also feasible on a national level through coordination and/or geographic separation on a case-by-case basis.

The RSPG draft Opinion states:

"The band 6425-7250 MHz is planned to be used globally by Copernicus Imaging Microwave Radiometer (CIMR), one of the six high-priority candidate missions of the Copernicus programme16 that would increase its ability to serve as a tool for achieving the EU Green Deal (Climate change) objectives. The use of 6425-7250 MHz, relevant to EU Space Policy, is recognized under RR 5.458 without having an allocation status, with the information that "in the band 6425-7075 MHz passive microwave sensors measurements are carried out over the oceans". It is noted that studies are on-going reviewing the allocation situation for CIMR."

Feedback:

Administrations are now considering alternative frequency bands for Copernicus Imaging Microwave Radiometer, with the aim of a protected status in the ITU Radio Regulations. This approach seems reasonable considering that CIMR may potentially be interfered by any current or future service in the band and cannot claim protection.

Passive microwave satellite sensors for the measurement of sea surface temperature – including the European Copernicus project – have been considered for deployment in the 6925-7325 MHz band under the Earth Exploration Satellite Service (EESS). As stated by the RSPG, while EESS is recognized in this band under RR 5.458, there is no actual allocation in the RR; administrations are now considering alternative frequency bands for this purpose, with the aim of a protected status in the ITU Radio Regulations [10]. This approach seems reasonable considering that CIMR may potentially be interfered by any current or future service in the band and cannot claim protection.

[3] In line with the well-recognized need to exploit the scarce spectrum resources through more intensive sharing of spectrum, such studies are based on realistic assumptions on some key parameters including a) the realistic geographic density of IMT base stations, b) the clutter loss model applicable to 6 GHz macro deployment scenario and propagation environment, c) IMT base station active antenna systems (AAS) directing wanted signal towards desired directions (away from the incumbents), and d) realistic incumbent receiver antenna characteristics.

[4] Cameroon et al (5D/782, 996, 1231, 1299); Japan (5D/1021, 1082, 1303); France (5D/1042, 1138); China (5D/874, 1069); Senegal (5D/1323); Mali et al (5D/1224); Russian Federation (5D/1089, 1244, 1238); UAE et al (5D/1148, 1285); Ericsson (5D/1032, 1127, 1250); Reliance Jio et al (5D/1215); Huawei (5D/1322); Nokia (5D/1146, 1278). The contributions are available at https://www.itu.int/md/R19-WP5D-C/en

[5] Simulations presented at WP 5D show separation distances in the order of 13-15 km between FSS earth stations and IMT base stations for both long and short term protection criteria (5D/1017, Ericsson)

The RSPG draft Opinion states:

"It is further noted that the band 6425-7125 MHz is heavily used by long distance and high capacity fixed links in Europe such as for backhauling. The coexistence of outdoor standard power IMT/5G base stations with fixed links requires long separation distances. In some countries, several fixed links belong to critical infrastructure."

Feedback:

The Companies recognize that the fixed links usage is very different across Europe. Co-existence with the Fixed Service is a national matter and is to be addressed on a case-by-case basis relying on site-by-site coordination if IMT base stations and fixed links are deployed in the same or in adjacent geographical areas.

Notably, the individual licensing associated with IMT networks is always preferred for ensuring co-existence with the Fixed Service since the licensed approach for IMT allows administrations to identify potential sources of interference and to take mitigating actions in line with spectrum licence conditions.

Co-existence with the Fixed Service (FS) is a national matter and is to be addressed on a case-by-case basis due to different usage across Europe; a toolbox of solutions can help administrations address their specific circumstances[6]. Within the WRC-23 preparation, all studies have shown that coexistence between IMT and the fixed service can be achieved but would require site-by-site coordination if IMT and FS are deployed in the same or in adjacent geographical areas.

Notably, the individual licensing associated with IMT networks is always preferred for co-existence with the FS for two reasons: it allows coordination as the regulator knows the position of the fixed links, and it also greatly enhances the ability of administrations to identify potential sources of interference and to take mitigating action in line with licence conditions.

In fact, from a FS perspective, allocating the same band for both FS and licence-exempt WAS/RLAN use has not proven to be successful since the FS operator loses the certainty of interference-free operation which then leads to decreased willingness to invest. Even when technical conditions are developed with FS protection in mind, licence-exempt devices cannot be controlled. This is of particular importance to countries allocating the band to FS for critical infrastructure, such as public safety or broadcasting.

The RSPG draft Opinion states:

"Furthermore, there is a need for continued use of WAS/RLAN in the 5945-6425 MHz adjacent frequency band in accordance with harmonised technical conditions defined in a Commission Implementing Decision[7]."

Feedback:

With reference to the continued use of WAS/RLAN in the 5945-6425 MHz, we believe that Article 3 in the EC Decision 2021/1067/UE may require further clarification at national level.

[6] For example, see industry contribution to ECC PT1, ECC PT1(21)227r1 (Sept. 2021), or ECC PT1(22)073r1 (Jan. 2022)

[7] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021D1067&qid=1625031915478

The Companies would like to highlight that Article 3 in the EC Decision 2021/1067/UE states: "when introducing new applications… into the adjacent frequency bands… Member States shall not adopt technical and operational conditions applicable to any new application that unduly restrict the continued use of WAS/RLAN in the 5945-6425 MHz frequency band in accordance with this Decision". Whereas the same article also states "… Member States shall designate the 5945-6425 MHz frequency band and make it available on a non-exclusive, non-interference and non-protected basis, for the implementation of WAS/RLANs in accordance …". The above two statements may require further clarification at national level.

RSPG recommendation

The RSPG draft Opinion presents two options in relation to the upper 6 GHz band:

"Option 1 on the band 6425 - 7125 MHz - "IMT identification":

The RSPG recommends, that as a common policy approach the EU Member States should support the identification of the frequency band 6425-7125 MHz for IMT with appropriate conditions:

- *Technical conditions to protect FSS (e.g. power or antenna sidelobe limitations);*
- *Any proportionate measure, recognizing the absence of allocation status of such observation, to alleviate interference to the use of this band for CIMR observations;*
- *Provisions to guarantee long term access of NGSO receiving earth stations in this band.*

This is without prejudice of further measures which would be necessary at the EU level for other coexistence issues including the protection of existing and future fixed links.

Option 2 on the band 6425-7125 MHz - "No IMT identification":

The RSPG recommends, that as a common policy approach the EU Member States should not support identification for IMT of the frequency band 6425-7125 MHz."

Feedback:

The Companies recommend that only one option should be selected in the RSPG Final Opinion: the one based on the proposed "Option 1".

In terms of the appropriate conditions, we note that these are still under discussion, should be least restrictive and should be based on the outcome of the sharing studies.

"Option 2" should be disregarded as it would leave Europe behind in the technological connectivity race.

The Companies recommend that only one option should be selected in the RSPG Final Opinion: the one based on the proposed "Option 1".

"Option 2" proposing "No IMT identification" should be disregarded as it would leave Europe behind in the technological connectivity race and without any alternative for mobile expansion in mid-bands. Such approach would place the fulfillment of European connectivity goals at risk, leading to negative impacts on the European society.

The Companies agree with "Option 1" that supports IMT identification.

In terms of the appropriate conditions, we note that these are still under discussion and will have to be based on the outcome of the sharing studies. As per ECC general practice, any

condition should be “least restrictive” while ensuring co-existence with existing services. Based on sharing studies, co-existence with NGSO receiving earth stations and FS should be considered at a national level, e.g. leveraging on a toolbox. Lastly, Europe should consider potential new spectrum allocation for CIMR and if not possible, consider certain measures to mitigate potential of interference, keeping in mind that CIMR does not have an allocation in the band.

Based on the above, we would propose some modifications in the conditions proposed by RSPG:

- Least restrictive technical conditions to protect FSS (e.g. limiting radiation towards the satellites);
- Any proportionate and viable measure to alleviate interference to the use of this band for CIMR observations, recognizing the absence of allocation status of such observations in the RR;
- Provisions at a national level to guarantee long term access of NGSO receiving earth stations in this band (e.g. based on a respective toolbox).

This is without prejudice of further measures which would be necessary for coexistence with existing and future fixed links.

List of References

[1] "Estimating the mid-band spectrum needs in the 2025-2030 time frame; Global Outlook; A report by Coleago Consulting Ltd" (Jul. 2021), GSMA Report

[2] "Vision 2030 - Insights for Mid-band Spectrum Needs" (Jul. 2021), GSMA Report

[3] "Minimum requirements related to technical performance for IMT-2020 radio interface(s)" (Nov. 2017), ITU-R M.2410 Report

[4] "The socio-economic benefits of mid-band 5G services" (June 2022), GSMA Report,

[5] "The socioeconomic benefits of the 6 GHz band; Considering licensed and unlicensed options" (Jan. 2022), GSMA Intelligence Report

[6] 3GPP TS 38.104 V17.6.0 (2022-06) "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) radio transmission and reception (Release 17)"

[7] "A quantification of unlicensed spectrum needs" (2016), Qualcomm

[8] "Questionnaire on use of frequency bands 6425-7025 MHz and 7025-7125 MHz in relation to studies in CEPT on WRC-23 agenda item 1.2" ECC PT1(21)067rev2 (Jan. 2021), European Communications Office

[9] "The use of Extended C-band, Planned C-band and the 7025-7075 MHz band for satellite service" (Jun. 2022), Euroconsult

[10] Radio Regulations Article 5 "Frequency allocations" (2020), ITU-R

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