August 12, 2022

RSPG Secretariat
Office BU33 7/65
European Commission
Directorate-General for Communication Networks, Content and Technology
1049 Bruxelles, BELGIQUE

Re: Radio Spectrum Policy Group Opinion on the ITU-R World Radiocommunication Conference 2023 [Draft] (RSPG22-014 Final)

Dear RSPG Secretariat,

Microsoft Corporation ('Microsoft') commends the Radio Spectrum Policy Group ('RSPG') for initiating a public inquiry on its Draft Opinion on the ITU World Radiocommunication Conference 2023 ('WRC-23'), including its draft recommendation of an appropriate course of action for agenda items which may affect existing or future common European Commission rules.[1] Microsoft welcomes the opportunity to provide comments to the RSPG on this important subject.

Microsoft believes in the importance of advancing the digital transformation in Europe and elsewhere. While a narrow definition of the digital transformation focuses only on the application of a range of digital technologies to transform various industries, we take a broader view. The digital transformation is how digital technologies are transforming the economy in general and society at large, through the digitization of almost everything, and it is important for the digital transformation to be carried out in a sustainable manner.

At its core, the digital transformation requires the availability of affordable and robust broadband internet connections and affordable devices. Additionally, to support the digital transformation of industries, cloud computing, big data, machine learning (ML), artificial intelligence (AI), data analytics and the Internet of Things (IoT) are also key components.

End-to-end connectivity underpins this all-encompassing digital transformation model, beyond the traditional telecom model that ends at the network termination point. End-to-end connectivity is required for the data generated from sensors and user devices at the network edge to be transported back to a data center, where ML, AI, and data analytics are applied, and the information and knowledge is returned back to the user. Today, the vast majority of data transmissions occur indoors, and there is no sign of this trend changing. Therefore, the RSPG

[1] *Opinion on the ITU-R World Radiocommunication Conference 2023 [DRAFT]*, Radio Spectrum Policy Group, Directorate-General for Communications Networks, Content and Technology, European Commission, RSPG22-014 FINAL (June 2022), RSPG22-014final-Draft_RSPG_Opinion_WRC23.pdf (rspg-spectrum.eu).

should recognize that as the Commission looks to 2030 and beyond, it should prioritize a forward-looking digital model that considers connectivity to the user device, rather than the more traditional model that only looks at connectivity that ends at the beginning of the premise.

Microsoft's spectrum interests are complex and do not fall neatly into one category. Microsoft's cloud ingests data transmitted over various wireline and wireless technologies. Examples of wireline technologies are optical fibre, coaxial cable, and copper (still). With respect to wireless technologies, our cloud ingests data transmitted from mobile devices, nomadic devices (license-exempt devices connected wirelessly to a fixed access point), and fixed (satellite and terrestrial) wireless devices.

Through Microsoft's Azure for Operators and Azure private Multi-Access Edge Compute (MEC) programs, we support 5G public and private (vertical) networks in certain frequency bands. Through Azure Orbital and Azure Space initiative, we support spectrum for Fixed Satellite Service, Earth Exploration Satellite Service, and Inter-Satellite Service in other frequency bands. And for the past two decades, based on how individual consumer and enterprise end user devices connect to our online services, Microsoft has been a strong advocate for license-exempt spectrum. Virtually all laptops and tablets include license-exempt Wi-Fi radios. With respect to mobile phones, virtually all include license-exempt radios, in addition to cellular radios operating in licensed frequency bands. Even the majority of data transmitted to and from mobile phones is over license-exempt spectrum rather than over licensed spectrum. We see Wi-Fi and 3GPP-based technologies as being complementary.[2] Based on actual usage and projections based on realistic assumptions going forward, there is a need for additional license-exempt spectrum for Wireless Access Systems / Radio Local Area Networks (WAS/RLANs), of which Wi-Fi is an example.

Microsoft provides the following comments on Agenda Items 1.2, 1.5 and 10.

Agenda Item 1.2

3300-3400 MHz Band

Microsoft recognizes that 3300-3400 MHz is a NATO band and is relevant to the Common Security and Defense Policy. At the same time, there is an effort underway by the regulator in at least one NATO country, the United States, to examine whether commercial 5G services can share the band with government (military) users. Ideally, the EU can keep an open mind on the potential of sharing the frequency range 3300-3400 MHz until more information about the possibility of sharing between these categories of users becomes available.

6425-7125 MHz Band

Of the two options presented, Microsoft recommends the RSPG and subsequently the EC proposal to the EU take a position of *no IMT identification for the 6425-7125 MHz band*. We understand that the ITU allocates spectrum, including the identification of applications within a

[2] Monica Paolini, "5G and Wi-Fi 6: Stronger together Two parallel paths to connect everybody and everything", Senza Fili Tech Brief, (September 2021). 5G and Wi-Fi 6: Stronger together (linkedin.com)

radio service, and that licensing is a national matter, but we are also familiar with the interplay between ITU actions and the signals it sends to national regulators. Microsoft sees licensed 5G and license-exempt Wi-Fi as complementary technologies, with most 5G data traffic offloaded onto Wi-Fi now and into the foreseeable future. We are also supportive of the use of 5G NR-U, where applicable. All broadband providers, mobile network operators and others, within an administration stand to benefit if the 6425-7125 MHz is made available for license-exempt use, as this extra-capacity can be shared. Critically, though, in Europe and elsewhere, the entire 5925-7125 MHz frequency range is required to meet the near-term demand for additional license-exempt spectrum for current generation Wi-Fi 6E devices and next generation Wi-Fi 7 devices. Reasons the entire 1200 MHz of the 6 GHz is required for Wi-Fi include:

(1) Enabling Wi-Fi Channel Diversity Indoors Within Enterprises and High-Density Venues

All 1200 megahertz of 6 GHz band spectrum is necessary to ensure that there is sufficient Wi-Fi channel diversity in enterprises and high-density deployments so that each device can operate at the IEEE 802.11 ax channel bandwidth limit – which is 160 MHz channels. With 500 MHz available, the frequency re-use pattern of a Wi-Fi network with seven cells will only allow each device to have a unique 40 MHz of spectrum. The seven cell Wi-Fi frequency reuse pattern is modeled after the seven-cell reuse pattern utilized in cellular macro cell deployments. Having only 500 MHz available for Wi-Fi will shortchange European industries and put it at a competitive disadvantage with other parts of the world that are already using the entire 1200 MHz band for Wi-Fi.

(2) Extends Europe's Digital Decade Objectives Indoor, Preventing Indoor Capacity Bottlenecks

One key objective of Europe's Digital Decade is making 1 Gbps available to every European household by 2030. As highlighted in the introduction, a digital transformation model based on cloud, AI and IOT requires changing the thinking from focusing on the speed to the network termination point at the residence and the enterprise to speed to the devices within the residence and the enterprise. One of the things we collectively learned from working from home and learning from home during COVID is that it is not only the broadband speed to the network termination point that matters, but also the speed from the network termination point to the multiple broadband devices operating indoors concurrently. Sufficient indoor capacity is required to avoid bottlenecks and fully take advantage of European efforts to bring high-speed capacity to each residence. Even if 1 Gbps becomes available to every European household, it doesn't mean 1 Gbps will be available to every resident's user device operating indoors at a given time. When all is said and done, consumers' expectations and their mobile (nomadic) experience will be based on the bit rate to her/his end user Wi-Fi enabled device. By declining to identify the 6425-7125 MHz band for IMT at WRC-23, the EC will be providing national regulators with flexibility in the future to authorize license-exempt use in the 6425-7125 MHz range, pending he results of the ongoing work in SE-45.

(3) Heightening Competition Between Broadband Access Technologies

For consumers, regardless of the broadband access and backhaul technologies used – fiber, coax cable, satellite, fixed wireless – adding a Wi-Fi radio at the end of the network results in a globally harmonized, high-bandwidth, more-energy efficient connection to a myriad of end user client devices. Any high-bandwidth broadband access technology can connect to client devices over the last 10 meters using a high-bandwidth Wi-Fi connection. With broadband providers using different access technologies, Wi-Fi allows for compatibility and supports competition between and among different broadband providers. In rural areas, Wi-Fi in combination with satellite and fixed wireless technologies can provide broadband in locations where it is too expensive to deploy optical fibre at the present time.

(4) The Next Generation, Wi-Fi 7, is Based on 320 MHz Channels and Requires all 1200 MHz

While Wi-Fi 6E requires multiple 80 MHz and 160 MHz channels, the next generation of IEEE 802.11 technology under development, Wi-Fi 7, relies on the availability of the 6425-7125 MHz band to provide multiple 160 MHz and 320 MHz-wide channels. The 500 megahertz of spectrum available for Wi-Fi in the 5925-6426 MHz band will support only one 320 MHz channel and three 160 MHz channels. The availability of only one 320 MHz channel limits the future potential of Wi-Fi as there are no other spectrum bands under consideration for large bandwidth license-exempt applications. On the other hand, with respect to IMT, there was a considerable amount of spectrum allocated at WRC-19 that can be used for 5G capacity, much of which has not yet licensed nationally and deployed. Looking ahead, IMT interests are discussing an Agenda Item 10 at WRC-23 that studies the 7-24 GHz band to meet 6G spectrum needs, once the spectrum needs of 6G are defined. While there are bound to be disagreements over which portions of this range should be studied for a possible IMT identification at WRC-27, one thing is for certain, the frequency range is not being discussed for WAS/RLANs.

(5) Wi-Fi spectrum in the 6425-7125 MHz band could benefit European residents and European businesses as soon as late 2024 or early 2025.

Today, there are a number of low power indoor license-exempt routers and client devices certified in other parts of the world that span the entire 5925-7125 MHz band. As license-exempt operations, Wi-Fi devices must protect both fixed service and fixed satellite service operations in the 6425-7125 MHz band. This means that if European national governments adopt rules similar to those adopted for the 5925-6425 MHz range based on the work underway in SE-45, Europeans could benefit from this additional Wi-Fi capacity in the near term. Alternatively, if the 6425-7125 MHz band is identified for IMT, it would limit the flexibility of national regulators in making the 6425-7125 MHz range available for license-exempt use. An IMT identification send a strong signal to national regulators that the band should be LICENSED and that the bands' incumbents need to be relocated to other spectrum bands. In the case of the 6425-7125 MHz, an IMT identification will require fixed service, fixed satellite service, and other users of the band to be relocated. Beyond the disruption to these operations, it typically takes years for the national regulations and resulting actions to

fully clear a band. It is not likely that 6425-7125 MHz would be available for IMT until around 2030. Presumably, 5G will be fully deployed by then and the world will be awaiting the rollout of 6G services.

A NOC decision for the 6425-7125 MHz band supports Europe connectivity objectives for the Digital Decade. A decision to identify 6425-7125 MHz for IMT will foreclose the possibility of 1200 MHz for Wi-Fi in the 6 GHz band, undermining European objectives for the digital transformation. Notions that high-power IMT systems operating outdoors in the 6425-7125 MHz can co-exist with low-power Wi-Fi systems operating indoors and very low power devices operating both indoors and outdoors is wishful thinking. WAS/RLAN devices are designed to share (co-channel) spectrum and employ a number of mechanisms and 'politeness' protocols for this purpose. 3GPP-based devices are not designed to share with WAS/RLAN devices on the co-channel. At the EIRP levels under consideration for 5G operations in the 6425-7125 MHz band, if 5G and WAS/RLAN Wi-Fi 6E (and future Wi-Fi 7) devices are operating co-channel in the same vicinity, the performance of the low power indoor Wi-Fi devices will be degraded. The same would hold true for very low power for Wi-Fi devices that are intended to operate both indoors and outdoors. While both 5G IMT and WAS/RAN devices are applications of the mobile service under the ITU Radio Regulation, at the national level, spectrum for 5G is licensed and WAS/RANs devices are not (as licensing is a national matter). We are not aware of administrations where there are rules in place requiring licensed services to share spectrum with license-exempt devices, where the license-exempt devices are afforded any measure of protection.

10.0-10.5 MHz Band

Microsoft believes that similar to the 3.3-3.4 GHz band, the EU should keep an open mind in regard to an IMT identification of the 10.0 -10.5 GHz band in ITU Region 2. The 10 GHz band is not a NATO band, and other spectrum bands are shared between military and non-military users successfully. For example, the 5250-5350 MHz and 5470-5725 MHz bands require Dynamic Frequency Selection to protect military radars from receiving harmful interference from RLANs. Microsoft also understands that there are earth monitoring satellites that are planned for the 10.0-10.4 GHz band (European Synthetic Aperture Radar - ESAP) and 10.6-10.7 GHz band (Copernicus Imaging Microwave Radiometer – CIMR). With respect to protecting CIMR, technical conditions can be placed on the IMT in the adjacent band. If there are concerns that high power IMT transmitters cannot share the same band as any satellite service with an uplink in the band, such as ESAP planned for the 10 GHz band, then the EU should be consistent in how it treats CIMR that will be operating in the 6425-7125 MHz range. If high-power IMT can't co-exist with ESAP in the 10 GHz band, there is no reason to believe that high-power IMT can coexist with CIMR in the 6425-7125 MHz band. It would mean a 'no IMT recommendation' for the 6425-7125 MHz band should be in order. If there are plans to move CIMR planned for the upper 6 GHz band to a different band, similarly ESAP in the 10 GHz band and the CIMR operating in the adjacent back can likewise be re-located to other spectrum bands.

Agenda Item 1.5

The frequency bands encompassing 470-698 MHz is allocated on a co-primary basis to the mobile service in ITU Region 3 and on a secondary basis in ITU Region 2 between 470-512 MHz and 614-694 MHz, although a number of countries in ITU Region 2 have allocated the mobile service on a primary basis in the 614-694 MHz band. In ITU Region 1, there is no mobile allocation for the mobile service in the 470-698 MHz range. Pending the outcome of the sharing and compatibility studies between broadcasting and mobile (except aeronautical mobile), Microsoft supports a mobile allocation on a primary basis in the 614-694 MHz portion of the 470-694 MHz band and a mobile allocation on a secondary basis in the 470-608 MHz portion of the 470-694 MHz band. Under the primary mobile allocation, European countries would have the flexibility to license the 614-694 MHz frequency range to provide low-band spectrum for 5G service, harmonized with other large economies. Under the secondary mobile allocation, European countries would have the flexibility to authorize IMT-based Fixed Wireless Access (FWA) in the 470-608 MHz band to provide broadband access and help close the digital divide.

Microsoft has long supported license-exempt operations in the television white spaces ("TVWS") as an affordable tool for closing the digital divide. TVWS is a fixed wireless access technology that operates over license-exempt spectrum rather than over licensed spectrum. The good propagation characteristics and penetration through foliage and common building materials at this frequency range allows for point-to-multipoint wide-area coverage. However, broadcasters have opposed sharing unused spectrum in the broadcast television bands with license-exempt Wireless Internet Service Providers at every turn.

Recently, mobile network operators have touted FWA as a means to close the digital divide. The physics indicate that licensed FWA in the broadcast TV bands can provide wide area coverage – much better than attempting FWA in higher frequency bands where there is considerably more signal attenuation from path loss alone. Operation in the broadcast TV bands will also make FWA in the UHF bands more energy efficient than FWA deployments in higher frequency bands. Similar to TVWS, IMT-based FWA can operate on unused TV channels to provide wide area broadband access. Operating on a secondary basis would mean that the IMT-based FWA would have to protect broadcasters and other incumbents operating in the band.

While we recognize the important role over-the-air broadcast television plays in certain countries for the next few years, the need for European mobile network operators to have low band spectrum available to deliver 5G services, particularly in less densely populated areas, is clear. A primary mobile allocation in 614-694 MHz will send the signal to European governments that it should start developing plans to relocate broadcasters from the 614-694 MHz band. It will take several years to relocate broadcasters from the 614-694 MHz band – beyond 2030, which starts running into the time frame for introducing 6G services. Overall, more Europeans will benefit from an IMT identification for the 614-694 MHz band, looking ahead to 2030 and beyond.

Agenda Item 10

It is premature for RSPG to make any recommendations for Agenda Item 10, in particular for 6G wireless services. First, 6G advocates have yet to put forward use cases and resulting spectrum needs. Second, once these use cases and spectrum needs are put forward, RSPG needs to perform due diligence to see whether it is within the scope of its criteria. Given the tight timelines for a recommendation and EU decision, the necessary information to make an informed proposal regarding a proposed new 6G agenda item for WRC-27 potential may not be available. Thus, while Microsoft believes there should be an Agenda Item 10 addressing 6G requirements, if appropriate, CEPT seems to be the better forum for such a proposal.

Respectfully submitted,



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