# RSPG Opinion on the ITU-R World Radiocommunication Conference 2023

# Nokia's response to the Draft RSPG Opinion

Nokia welcomes the opportunity to comment the RSPG draft Opinion on the ITU-R World Radiocommunication Conference 2023 (WRC-23). This response is complementary to those provided via the industry association of which Nokia is member, namely GSA, ETNO and DIGITALEUROPE. It should also be considered in conjunction with the multi-company response[1] to this consultation focusing on the Agenda Item (AI) 1.2 on the upper 6 GHz band.

Nokia acknowledges that the RSPG Opinion represents a major step towards the definition of European Union consolidated position for WRC-23 agenda items and topics, and of a Council Decision towards WRC-23. The definition of these positions is therefore of extreme importance, and we take this opportunity to provide Nokia's views on matters of relevance for the mobile industry, noting that decisions of the WRC will be key to the further progress of the European digital society and of the future of the telecom industry. The outcomes of the Conference will set the direction in terms of performance and advance development of the IMT-2020 and in shaping of the IMT-2030. As such, RSPG position on the WRC-23 should be in line with the EU digital and spectrum policy goals for the next decade.

Spectrum needs of the mobile industry should be carefully and sufficiently forward-looking assessed and addressed to encompass ongoing and future technological developments, including the 5G and its evolution and 6G from 2030 onwards. As access to spectrum resources is expected to become even more relevant for many industries in the upcoming period, availability of sufficient spectrum in all spectrum ranges (low, medium, and high) with appropriate conditions is of paramount importance to ensure investments in public and private networks with increased coverage and capacity.

Nokia welcomes the opportunity to provide comments to the RSPG consultations on the draft RSPG opinion on WRC-23 and expresses hereinafter our views on specific topics of relevance to the wireless technologies and networks. We look forward to the industry opinions being considered in the final RSPG Opinion.

## WRC-23 Agenda Item 1.2 (IMT mid-band identifications)

The wireless broadband is the cornerstone of connectivity for citizens and businesses worldwide and in Europe and this tendency will continue in the coming years. Availability of affordable spectrum will play a key role in meeting the demand for ubiquitous coverage and capacity, in line

[1] (Multi-company) Response to the RSPG consultation on WRC-23 Opinion FINAL v1

with the Digital Decade 2030 targets for the European Union Member States. Additional IMT mid-bands spectrum identification is directly linked to this EU policy goal, making as such, the WRC-23 AI 1.2 one of the most important agenda items of the Conference for the mobile industry. Following, we address each of the bands under discussion under this AI:

### 3600-3800 MHz and 3300-3400 MHz (Region 2)

Nokia highlights the fact that both ranges 3300-3400 MHz and 3600-3800 MHz are part of the 3GPP harmonised bands n78/n77 (3300-3800MHz/3300-4200MHz) that benefit of the widest end-to-end ecosystem with more than 1000 end user devices[2] for the band n78 and 800 devices for the band n77. Moreover, bands n78/n77 – the European most important "pioneer band" – is the widest deployed band for 5G worldwide, with more than 280 networks[3] being deployed, licensed, or tested globally. Nokia is of view that:

- An IMT identification in the range 3300-3400 MHz in Region 2 will not affect Region 1, therefore RSPG position in relation to IMT identification in Region 2 should remain neutral.
- An IMT identification in the range 3600-3800 MHz in Region 2 will not affect Region 1. Again, we recommend a neutral position of RSPG in relation to IMT identification in Region 2.

Moreover, additional IMT identification of parts of the n78/n77 bands in Region 2 would further harmonize the usage of one of the 5G pioneer bands for Europe and thus, benefit the development of the ecosystem. Nokia therefore encourages Europe to welcome efforts for global harmonization and therefore is in favour of a primary mobile allocation and IMT identification of both ranges under discussion in bands n78/n77 in the Americas.

### 3300-3400 MHz (amend footnote in Region 1)

As previously, Nokia highlights the importance of a global ecosystem for the bands n78/n77 and promotes harmonisation as an overarching principle considering the overall benefits of economies of scale. As such, we support addition of Region 1 countries that wish to do so to the relevant footnote assuming compatibility matters are resolved. Nokia is of view that least restrictive conditions for the IMT/5G use in the band should be considered.

### 6425-7125 MHz band

On several occasions, including the latest RSPG public consultations of 2021-22, Nokia highlighted the importance of the mid-band spectrum discussed under AI 1.2, and more specifically the upper 6 GHz (6425-7125 MHz) band. As such, we are surprised to see that RSPG refrains from a clear position, citing only the two totally opposed options without giving a recommendation on this subject. Nevertheless, we expect that RSPG Final opinion will recommend the Option 1 on the band 6425-7125 MHz – "IMT identification".

Nokia supports Option 1 for IMT identification of the 6425-7125 MHz band as it represents the only remaining additional mid-band spectrum opportunity for 5G mobile networks in Europe in the foreseeable future. The multi-company response mentioned in the introduction provides

[2] See GSA "5G-Ecosystem" Member Report, July 2022
[3] See GSA "5G Market Snapshots", June 2022

adequate arguments for IMT identification of this spectrum for IMT, including technical and economical argumentation.

Moreover, as already stated in several consultations, meetings, and industry papers[4], achieving the Digital Decade targets require reliable, high capacity, low latency, wide-area 5G connectivity that relies on access to additional mid-band spectrum. The upper 6 GHz frequency range - thanks to its propagation characteristics and advancements in antenna technology - provides sufficient bandwidth for high-capacity macro deployments in dense urban environments using the 3.5 GHz infrastructure grid for outdoor mobile broadband connectivity.

Nokia agrees with RSPG's view that the future European policy strategy on 6425-7125 MHz should be based on the best spectrum use for Europe. IMT identification of the band for licensed use will be the best utilisation of the upper 6 GHz spectrum. It would also provide a fair balance and sharing of the overall 6 GHz spectrum in 5925-7125 MHz between license-exempt and licensed use.

While other services are sharing this band, including the Fixed Satellite Services (FSS) and Fixed Service (FS), an IMT identification will not preclude their protection. It goes without saying that it is Nokia's interest to ensure other incumbent services are protected, therefore, the technical conditions to protect the satellite services (e.g., FSS) needs to be considered based on the sharing studies and it needs to be proportionate. Defining undue limitations or being too descriptive on the antenna pattern (including sidelobes) will restrict innovation and in some cases prevent better coexistence with other applications or services. The majority of contributions submitted to ITU-R by Administrations and the industry have concluded that macro-cellular IMT (5G NR) deployments can coexist with the FSS uplink, while co-existence with FSS downlink and the Fixed Service (FS) is also feasible through coordination and/or geographic separation on a case-by-case basis. It is to note that by 2030 it is expected that around 70% of the satellites currently deployed in the Extended and Planned C-bands on the downlink and visible from ITU Region 1 will no longer be in operation[5]. Additionally, we highlight that industry shows a preference for coordinating FS links in upper 6 GHz with IMT networks as they are based on individual licensing and thus, coordination is more predictable. Finally, we also acknowledge that potential new spectrum allocation for CIMR, with adequate priority may solve the issues of interference, offering a more practical long-term solution for its development.

For the above reasons we recommend RSPG to support Option 1, the IMT identification of the 6425-7125 MHz in Region 1 with the appropriate conditions, including least restrictive technical conditions to protect FSS. Identification of the upper 6 GHz band for IMT is the only option for EU Member States to achieve in a reasonable and economical manner the 2030 Digital Decade connectivity objectives. Moreover, the EU Member States should not oppose or block countries from other ITU Regions to having an IMT identification of the 6425-7125 MHz if they wish so.

[4] See latest whitepaper "6 GHz opportunity: licensed spectrum for mobile networks", https://6ghzopportunity.com/wp-content/uploads/2022/06/22-06-09-Licensed-6-GHz-opportunity-v2.pdf

[5] https://www.euroconsult-ec.com/press-release/study-assesses-the-use-of-several-c-band-sub-frequencies-by-satellite-networks/

### 10000-10500 MHz (Region 2)

Nokia supports the primary mobile allocation and IMT identification of the 10-10.5 GHz spectrum in Region 2. As for the other mid-bands under this AI, subject to primary mobile allocation and IMT identification in Region 2, Nokia is of view that any decision concerning other regions should not be opposed by European Member States.

## WRC-23 Agenda Item 1.3 (MS 3600-3800 MHz)

As mentioned in the RSPG argumentation, the frequency range 3600-3800 MHz is part of one of the primary European pioneer bands for 5G (3400-3800 MHz band) and provisions to reorganise and allow the use of this spectrum for 5G deployments in all EU Member States by 31 December 2020 were considered in Article 54.1.(a) of the European Electronic Communication Code. Moreover, in 22 out of the 27 countries of the Union the 3400-3800 MHz band is already assigned to mobile operations and deployed to provide 5G services, and the remaining countries are preparing future assignments. The band is equally deployed in the rest of Region 1, especially in Middle East countries and, as recalled under the AI 1.2 response, bands n78/n77 are the widest deployed bands across the globe for 5G.

Nokia supports wider harmonisation and use of the bands n78/n77 for 5G roll-out and, as such, agrees with the RSPG recommendation of upgrading the 3600-3800 MHz frequency band to a primary mobile allocation in Region 1 without undue restrictions (allowing the existing IMT networks already deployed to continue operating under existing conditions that should not become stricter). Since 5G is currently being deployed by Member States in this frequency band, opposition to IMT identification to the rest of Region 1 would not project a positive image.

## WRC-23 Agenda Item 1.5 (UHF Review)

Nokia recognises the importance of the UHF spectrum for the current and future development of the mobile networks and the role that the low bands play in assuring broad and affordable connectivity, wide coverage, and deep in-building penetration. Moreover, access to additional low band spectrum can provide 5G speeds in rural areas, helping to provide a consistent 5G user data rate at the edge of cells with less dense, more efficient networks, enabling more efficient power consumption. Latest Coleago Consulting's report[6] quantifies the economic benefits of additional low band spectrum for both developed and less developed areas. An earlier Plum Consulting study[7] considers opportunities from additional mobile use in the 470-694 MHz band.

Nokia acknowledges that the scope of this AI is to review the spectrum use and needs of existing services in the 470-960 MHz band in Region 1 and – based on such review – to consider possible regulatory actions in the lower 470-694 MHz band. Moreover, any outcome of the WRC-23 on this AI will not preclude the protection of the broadcast services and PMSE in the 470-694 MHz in Europe at least until 2030 as per the EU decision 2017/899 (Article 4). However, the same article of the Decision also points towards flexibility for Member States to choose other uses of the sub-700 MHz band on their territory as long as they are "compatible with the national broadcasting needs in the relevant Member State and does not cause harmful interference to,

[6] https://www.coleago.com/app/uploads/2022/07/5G-Low-Band-Spectrum.pdf
[7] https://plumconsulting.co.uk/the-future-use-of-uhf-in-itu-region-1/

or claim protection from, the terrestrial provision of broadcasting services in a neighbouring Member State". Nokia had demonstrated[8] the co-existence feasibility of additional mobile use with, and in cooperation with, broadcast in the 700 MHz band before its re-purposing.

Nokia sees significant changes[9] in audio-visual (AV) consumption behaviour where even today ~50% of video watching is non-linear for all audiences, and close to 80% for younger audiences. With the ever-improving broadband connection to homes and the high shares of smart TVs, even linear video consumption is increasingly carried over broadband networks and IP. This reduces the importance of Digital Terrestrial Television (DTT) as a platform for fixed, linear reception over time while mobile use of AV content on mobile devices increases. 5G Broadcast technology is being developed to allow for convergence of linear and non-linear AV delivery on devices and networks.

Considering the above-mentioned aspects as well as the various interests at Region 1 level in this band, Nokia supports a primary allocation of the band 470-694 MHz to mobile services at WRC-23 for predictability and further evolutions of the use of the frequency band. A primary mobile allocation will provide options for EU Member States for the upcoming UHF review that should take place before 2025 (recital (12) of the EU Decision 2017/899). It can stir innovation and investment into improving both mobile networks and AV delivery platforms also opening opportunities for better mobile reach of public service media and private broadcasters. It will also allow countries in other sub-regions of the Region 1 to define the future development path in this spectrum. Any delays of a decision to a future WRC would limit Europe in developing such options and in its choices within the planned UHF review.

### WRC-23 RR Article 21

Article 21.5 specifies the limit to the power delivered by a transmitter to the antenna of a station in the fixed or mobile services. This provision was introduced way back by EARC-63 (below 10 GHz) and WARC-71 (above 10 GHz) in the effort to limit emissions from fixed and mobile services to satellite services.

There are two aspects highlighted by RSPG:

i. the notification of 26 GHz IMT AAS stations to the Radiocommunication Bureau of the ITU (BR), and
ii. the application of 5G/IMT AAS for 26 GHz as given in the scope by WRC-19 through document 550 (and the expansion of this scope to 42 GHz or 66 GHz, which could become relevant to the Electronic Communication and Connectivity EU policy area).

#### i. The notification of 26 GHz IMT AAS stations to the BR

Nokia understands that the BR does not check the compliance of 5G/IMT station against Article 21.5, but instead verifies the notification submitted by Administrations against the limit in Article 21.5. In our understanding, compliance is usually the matter for the national Administrations against ETSI standards and the role of ITU on this matter is to verify the

[8] https://yle.fi/aihe/artikkeli/2016/09/02/yle-qualcomm-and-nokia-announce-worlds-first-demonstration-lte-supplemental
[9] e.g., UK Media Nations Report provided by Ofcom UK, https://www.ofcom.org.uk/__data/assets/pdf_file/0023/222890/media-nations-report-2021.pdf

notification submitted to them before the inclusion of these terrestrial stations into the Master International Frequency Register (MIFR).

The antenna systems of these services have been well understood over the years and it has not been an issue to apply such limits especially when terrestrial stations are notified to the BR. The emergence of IMT AAS is thought to pose some difficulties to the notification procedure. However, the BR has already successfully verified a large number of notifications by some Administrations on IMT stations using AAS in the mmWave frequency band. The FXM Guidelines[10] has have provided guidance to Administrations on the notification and these guidelines contain examples of notification with multiple transmitting antennas like in the situation that WRC-19 requested to study, i.e., IMT AAS.

Therefore, we see no problems for the notification process to continue without posing any future issues.

#### ii. The application of 5G/IMT AAS

Nokia also understood that the scope of the work from WRC-19 was on the application of 5G/IMT AAS in the 26 GHz band, and consideration of the 42 GHz or 66 GHz is an expansion of the scope of the original task. It is Nokia's interest to protect other services (including satellite) and the sharing studies during the WRC-19 study cycle indicated that there is at least 12 dB protection margin against the most limiting satellite service (i.e., FSS). As the ECP for WRC-19 AI 1.13 part 1 on 26 GHz did not include any in-band power limit, no such restriction is required for the 5G/IMT.

It has been shown in some technical studies in ECC PT1 that limiting the power delivered to the antenna (understood to be the power limit defined in Article 21.5) does not directly relate to the interference towards the satellite. On the other hand, incorrect application of Article 21.5 to IMT AAS could stifle innovation and development of technology. It could also reduce coverage and the necessary data throughput that the 26 GHz IMT system can offer, and lead to a negative impact to the European Union's Digital Decade 2030 targets.

Nokia is of view that while protection of incumbents should be an important objective of the Administrations, such protection should be assured based on realistic scenarios rather than on worst case approaches. We encourage RSPG to avoid unnecessary restrictions that would hinder the development, innovation, and deployment of mmWaves 5G/IMT AAS in EU Member States.

### WRC-23 Topic 9.1c

Nokia is of the opinion that IMT technologies are an option for FS, especially in the context of Fixed Wireless Access and certain backhaul applications. In either case, the need to protect incumbent FS using other technologies is quite relevant. Nokia supports the exploration of IMT/FWA possibilities in bands allocated to fixed services while ensuring the adequate protection of the incumbent fixed services using other technologies. We are of view that the use of IMT technologies to provide fixed wireless broadband applications can be achieved under the existing RR framework.

[10] https://www.itu.int/en/ITU-R/terrestrial/tpr/Documents/FXM/FXM_Guidelines_English/FXM%20Guidelines_web.pdf

## WRC-23 Agenda Item 1.1

Nokia notes that the frequency range 4800-4990 MHz is part of the 3GPP harmonized band n79 that benefits of a growing ecosystem that count of more than 500 devices[11], out of which more than 50% are phones. The 4800-4990 MHz can be complementary to the already available 5G mid-bands, or, in countries where spectrum in the n78/n77 bands has limited availability or is not available yet, access to part of the n79 band is even more critical for the launch and development of 5G services.

Nokia supports efforts towards WRC-23 to facilitate and further expand the use of IMT in the 4800-4990 MHz band under AI 1.1, considering that the current pfd limit in RR No. 5.441B largely constraints nationwide IMT deployments for most countries in the footnote.

Nokia calls for removing restrictions of use and support amendments to footnote 5.441B for the band 4800-4990 MHz. Moreover, we are of view that countries that wish to use this band for IMT should be added to the respective footnote without undue restrictions for their IMT use.

## WRC-23 Agenda Item 1.4

Nokia as a founding member of the HAPS Alliance, is actively taking part in the ITU work on the AI 1.4 on High Altitude Platform Stations (HAPS) as IMT Base Stations (HIBS). We are supportive to establish a globally or regionally harmonized regulatory framework that allows extending the use of the terrestrial IMT spectrum in bands below 2.7 GHz, to assure the coverage of difficult to reach areas by means of high-altitude platform solutions.

HIBS may provide a future economically viable option for licensed mobile network operators to deliver coverage and capacity for underserved areas, while assuring the protection of ground-based IMT without any additional technical or regulatory constraints in their deployment.

## WRC-23 Agenda Item 10 (WRC-27)

Looking forward towards the 2030s and aligned with Nokia Bell Labs' vision on the future developments of the IMT technologies, Nokia acknowledges that new trends are emerging to shaping the 6G system requirements and technologies to transform the communication experience and the interaction with the physical world. Rapid advances in artificial intelligence are likely to become a key component for the 6G air interface and network. Other technological transformations in the 6G context include – but are not limited to – access to new spectrum bands, self-adaptive spectrum sharing methods, and extreme performance requirements on latency and reliability.

For Europe to keep a leadership role in the 6G era in terms of both vision and roadmap, RSPG should consider the necessary spectrum resources that will need to be made available for 6G. This includes the early definition of the EU objectives for WRC-27 to identify target bands for the evolution of next-generation wireless mobile networks.

[11] GSA GAMBOD database, June 2022

Nokia is already engaged[12] in identification of additional spectrum for IMT towards 2030 and beyond (6G), stressing the importance of considering additional spectrum for the future IMT development under the AI 10 for WRC-27. We also highlight that European Member States and governments have a key role in outlining plans to enable the 6G vision to materialise through ambitious roadmaps. The successful experience of identifying the European 5G pioneer bands lays the foundation for RSPG to further engage in the identification of 6G pioneer bands and their harmonisation at international level.

Nokia emphasizes the benefits of globally harmonised bands for IMT to achieve a healthy end-to-end network and end-user ecosystems, economies of scale, and facilitate global roaming. We see a role for RSPG in driving a forward-looking EU position supporting an AI for IMT identification of additional spectrum for 6G at WRC-27.

The development of 6G is expected to address the continuous mobile data traffic growth and enable new use-cases and applications. Additional spectrum availability will be fundamental to address future evolution and support the expansion of mobile networks' capabilities, while ensuring that all requirements in terms of coverage, capacity and latency demands will be attained.

As with 5G, 6G will make no exception and will require multiple frequencies from low to very high spectrum bands. Such combination of low-mid-high-very high frequency bands will be needed to respond the capacity and coverage requirements of the IMT systems. Moreover, 6G is expected to require availability of broad contiguous channel bandwidths to serve the emerging services and applications of the 2030s.

Initial analysis indicates additional spectrum from within the 7.125-24 GHz range to be essential to enable the 6G capacity-demanding use-cases in the 2030 timeframe. The lower the frequency bands available for 6G use, the better the coverage will be. To address some specific 6G use cases requiring extreme performance (Tbps data rates, extremely low latency capabilities), spectrum from the sub-THz band should complement the availability of the bands from within the 7.125-24 GHz range.

Considering the longtail process of securing additional spectrum through regulatory deliberations in ITU-R and/or regional groups, it is now the time to start such process with the goal to ensure timely availability of 6G spectrum and avoid delaying the initial 6G commercial deployments planned around 2030.

Nokia is therefore encouraging the RSPG and the EU Member States to consider the necessity to include under the AI 10 the study of additional spectrum for 6G and consider as essential spectrum from within the frequency ranges 7.125-24 GHz complemented by frequencies in the 92-275 GHz range for this purpose.

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[12] See recent contribution ECC PT1(22)141 to ECC PT1 #71, May 2022