

Nokia response to ICASA's Consultation on the Draft Radio Frequency Spectrum Assignment Plans for International Mobile Telecommunications (IMT)



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Disclaimer: This response is based on Nokia's current understanding of the market dynamics and various standards bodies; these dynamics are changing and hence our views may update with these changes

Nokia Position

Nokia welcomes the opportunity to respond to ICASA's Consultation on the draft Radio Frequency Spectrum Assignment Plans for International Mobile Telecommunications (IMT) that sets the direction of future developments of the telecommunication sector in South Africa in the upcoming period.

Nokia strongly encourages ICASA to further align in its technical decisions with the international trends and with global standards such as 3GPP. This allows the licensees to benefit from the associated global economies-of-scale and more diverse product ecosystem, hence supporting overall 5G deployment, while the entire society can take advantage of standardised equipment. Hereinafter, we provide Nokia's view on the specific frequency bands under consultation and our recommendations based on our global expertise.

450-470 MHz

Nokia agrees to ICASA's decision to implement IMT in the 450 MHz band using a 3GPP frequency arrangement.

The band offers the opportunity for high coverage, as its propagation characteristics provide wide coverage and good in-door penetration, resulting into an economic infrastructure deployment. From the 3GPP perspective, the 450-470 MHz band benefits of a growing ecosystem of LTE equipment (band 31, 72). Many countries are investigating the option of upgrading narrowband services to broadband services in different portions of the 400 MHz band (450-470 MHz, but also 410-430 MHz, and/or 380-400 MHz) using 3GPP LTE solutions, upgradable to 5G. Such spectrum below 1 GHz is attractive for implementing wide coverage mission- and business- critical services at lower costs and with benefits mentioned above: 3GPP standardized, wide coverage, good indoor penetration, and growing harmonised ecosystem of LTE equipment.

Globally, several industries and public services like utilities (energy, oil & gas), public safety and transportation, are looking to migrating from narrowband to broadband technologies using the 3GPP FD-LTE bands in the 400 MHz range (bands 31, 72, 73, 87, 88 in the 450 and 410 MHz range) as to adapt to the communication needs of their operations. From a technology perspective, as 3GPP technologies provide advanced modulation techniques, boosting spectrum efficiency and data transfer speeds, networks can take advantage of fast and reliable broadband data and real-time video services by switching for 3GPP-based solutions.

Regarding the preferred 3GPP arrangement in the 450 MHz band, Nokia agrees with ICASA views regarding the feasibility of the D13 (3GPP band 72) or D14 (3GPP band 31) options, with a preference, as underlined also by ICASA for the D14 arrangement. We also agree with the making of this band available as soon as possible and no later than 1st of April 2023, while continuing migrating services from this band.

The D14 arrangement (3GPP band 31), as defined in the 3GPP standards, has an FDD configuration of the maximum channel bandwidth of 2x5 MHz and the limited capacity of band 31 has an impact on its use. As such, we find that at the global level it is used either for limited groups of users (for example, critical activities or mobile data networks in rural areas), or for IoT-

type applications (a large number of devices connected, each requiring a limited amount of data). The trends of recent years indicate a growing interest in using this band for IoT applications as well as dedicated use by sector of activity (for example, the energy sector, as in Germany, the Netherlands, Poland and Ireland, or in the public service sector, such as in Brazil, Austria, Norway, Denmark and Sweden).

For the above reasons, Nokia sees benefits of using this frequency range for services that require extended coverage such as PLMR/PAMR to provide digital broadband services in a manner that is efficient from both operation and performance perspective. Such a network can be, for instance, shared between several services nation-wide to optimize its roll-out and usage.

With the growing interest and adoption of the band 31 for professional use, we are seeing an increase in the number of vendors of chipsets, modules, and devices for industrial use. The Global mobile Supplier Association (GSA) database (GAMBOD, <https://gambod.gsacom.com/dashboard>) has identified around 200 modules and devices available for band 31 and the numbers are steadily growing.

703-733MHz & 758-788MHz

Nokia sees benefits in assigning the 700 MHz band to IMT services. The 3GPP band 28 benefits of a wide and robust ecosystem and is used by many operators at global level. The sub-GHz spectrum provide large area coverage and good indoor penetration in an affordable manner, being key to enable availability of mobile services indoor and in rural areas. Additional spectrum below 1 GHz for IMT is required to provide increased capacity and performance of mobile networks in wide rural areas and in buildings where usage of higher frequencies is less efficient, but also to facilitating provision of affordable high-speed Internet access in underserved areas, and enabling better, more cost-effective mobile broadband solutions in sparsely populated rural areas, for the users to benefit of advanced mobile broadband and other services.

From this perspective we agree with ICASA's proposal of opening the frequency band 703-733/758-788 MHz for IMT services to improve 4G services, while revoking the broadcasting licences as of 1st April 2022. Possible cross border interferences between different technologies should be addressed as considered by ICASA, based on ITU-R recommendations which have had issued extensive studies.

Nokia would like to draw attention that the 3GPP band 28/n28 benefits of an important ecosystem for both LTE and 5G NR technologies, with more than 650 devices available. We would also want to highlight that while in the case of the ITU Region 1 the spectrum below 700 MHz is subject to the WRC-23 AI 1.5, countries in other regions of the globe – where clearing TV spectrum can be implemented – started or are considering starting using additional UHF spectrum for mobile broadband (e.g., the 600 MHz 3GPP band 71/n71).

Finally, considering that many actors see benefits of using mobile broadband and the potential of rolling out networks in lower bands because of their propagation characteristics. To this end, we recommend ICASA to also consider the potential of using the lower 2x5 MHz of the 3GPP band 68 (698-728/753-783 MHz) which has been identified by several administrations for potential use for mission critical applications. The 2x5 MHz of the band 68 (698-703/753-758 MHz), in combination with 2x3 MHz in the 733-736/788-791 MHz range are considered in several

countries, mainly in Europe, for mission critical solutions for PPDR. We see some growing interest for this spectrum (2x8 MHz) in Europe for vertical sectors as well as for governmental use (mission critical) and note that the ecosystem of this band is under development. We recommend therefore ICASA to consider the potential of this spectrum combination, 698-703/753-758 MHz + 733-736/788-791 MHz, for mission critical or other services like M2M or civil use.

IMT750 (733-758MHz)

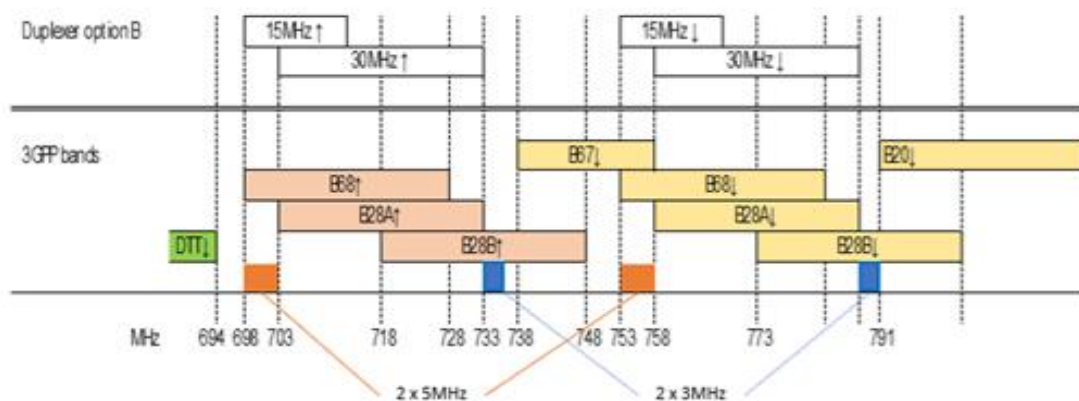
As suggested above, in the context of the overall 700 MHz band, Nokia sees potential for the 733-736 MHz portion of the 738-758 MHz to be used in the combination of 2x8 MHz (698-703/753-758 MHz + 733-736/788-791 MHz) for mission critical or other services like M2M or civil use.

The spectrum between 738-758 MHz is identified as the 3GPP supplementary downlink band 700 MHz (b67) aimed at providing additional downlink capacity for wide areas. As an SDL band, it requires carrier aggregation with other FDD spectrum in similar frequency range. The additional downlink capacity in combination with the 800 MHz band (CA configuration 20A-67A, Rel 13.2) for a maximum aggregated bandwidth of 40 MHz. Several countries in Region 1 (Europe) awarded parts of this spectrum to mobile operators; however, the interest of the operators in SDL bands is still limited.

Nokia would like to draw attention to ICASA that implementation of the 733-758 MHz range can be done in two options:

- Use of the overall 20 MHz of the SDL b67, 738-758 MHz. This will allow the use of 2x30 MHz in b28 + 20 MHz in b67.
- Efficiently combine in the overall band 700 MHz the b28, b67 and b68. In this case, the usable spectrum is 2x5 MHz in b68 + 2x30 MHz in b28 + 2x3 MHz (733-736/788-791 MHz) + 15 MHz in b67 (738-753 MHz). In this case the SDL spectrum available will be of only 15 MHz but will allow the optimal use of the overall 700 MHz band.

The figure below illustrates these options:



IMT800 (791-821MHz & 832-862MHz)

IMT800 band as proposed by ICASA, corresponding to the 3GPP band b20/n20, is widely deployed globally for IMT services and benefits of a solid ecosystem. As all other sub-GHz bands, it benefits of good propagation characteristics that allow wide area coverage and good in building penetration. As such, deployment of mobile broadband technologies in this band benefits of economic roll out that can be translated in affordable and spread mobile connectivity.

Nokia encourages ICASA to assign as proposed this band under technology neutral principle to allow operators to deploy the most spectral efficient technologies and upgrade their systems over the time of their licensees.

IMT850 (825-830MHz & 870-875MHz)

For IMT assignment either 3GPP Band 20 or 3GPP Band 5 is assigned. South Africa being part of ITU Region 1, the allocation of IMT800 3GPP band 20 is recommended for South Africa to benefit of the widespread of the IMT800 end-to-end robust ecosystem. The co-existence of IMT800 (3GPP band 20) and IMT850 (3GPP band 5) would in our view not be possible due to interference between these bands arising in reason of a too small guard band.

Nokia supports the possible migration of the incumbent to a different IMT band compatible with the ITU Region 1 options.

IMT900 (880-915MHz & 925-960MHz)

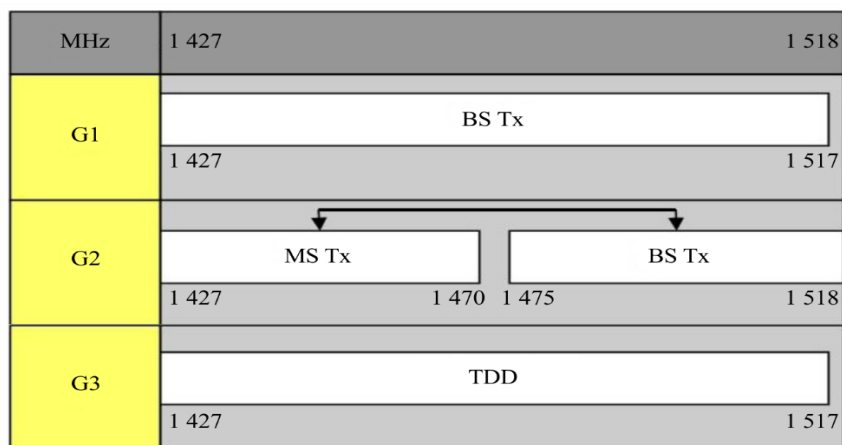
Nokia sees benefits in assigning the 900 MHz band to IMT services. The 3GPP band 8 benefits of a wide and robust ecosystem and is used by many operators at global level. The sub-GHz spectrum provide large area coverage and good indoor penetration in an affordable manner, being key to enable availability of mobile services indoor and in rural areas.

Nokia supports ICASA assignment of this band under technology neutral principle to allow operators to deploy the most spectral efficient technologies and upgrade their systems over the time of their licensees.

IMT1500 (1452-1492MHz)

Several options have been considered over the last years in L-band. For the 1452-1492 MHz range of this band, the 3GPP band 32 is considered for Supplemental Down link (SDL). Following the last ITU-R World Radio Conference in 2019 (WRC-19), additional options for the entire 1427-1517 MHz band started to be considered, including not only SDL, but also FDD option (e.g., in Japan) and an all TDD option (e.g., as adopted now in the MENA region).

Those options, as defined in the ITU-R Recommendation M.1036, are represented below:



M.1036-04

We equally note that corresponding 3GPP bands are available for all these arrangements for both LTE and 5G NR:

- SDL bands b32 (1452-1496 MHz), n75 (1432-1517 MHz), n76 (1427-1432 MHz);
- FDD bands b11 (1427.9-1447.9/1475.9-1495.9 MHz) and b12(1447.9-1462.9/1495.9-1510.9 MHz) in Japan, and the n74 (1427-1470/1475-1518 MHz) for EMEA;
- TDD bands b50/n51 (1432-1517 MHz) and b51/n51 (1427-1432 MHz).

If ICASA is to take a decision of the future use of the L-band, Nokia recommends considering the possibility to open the entire 90 MHz of the band 1427-1517 MHz. In case the decision is to proceed with opening only a part of the spectrum for IMT, decision of how to make best use of it should be taken in accordance with the market demand.

IMT2300 (2300-2400MHz)

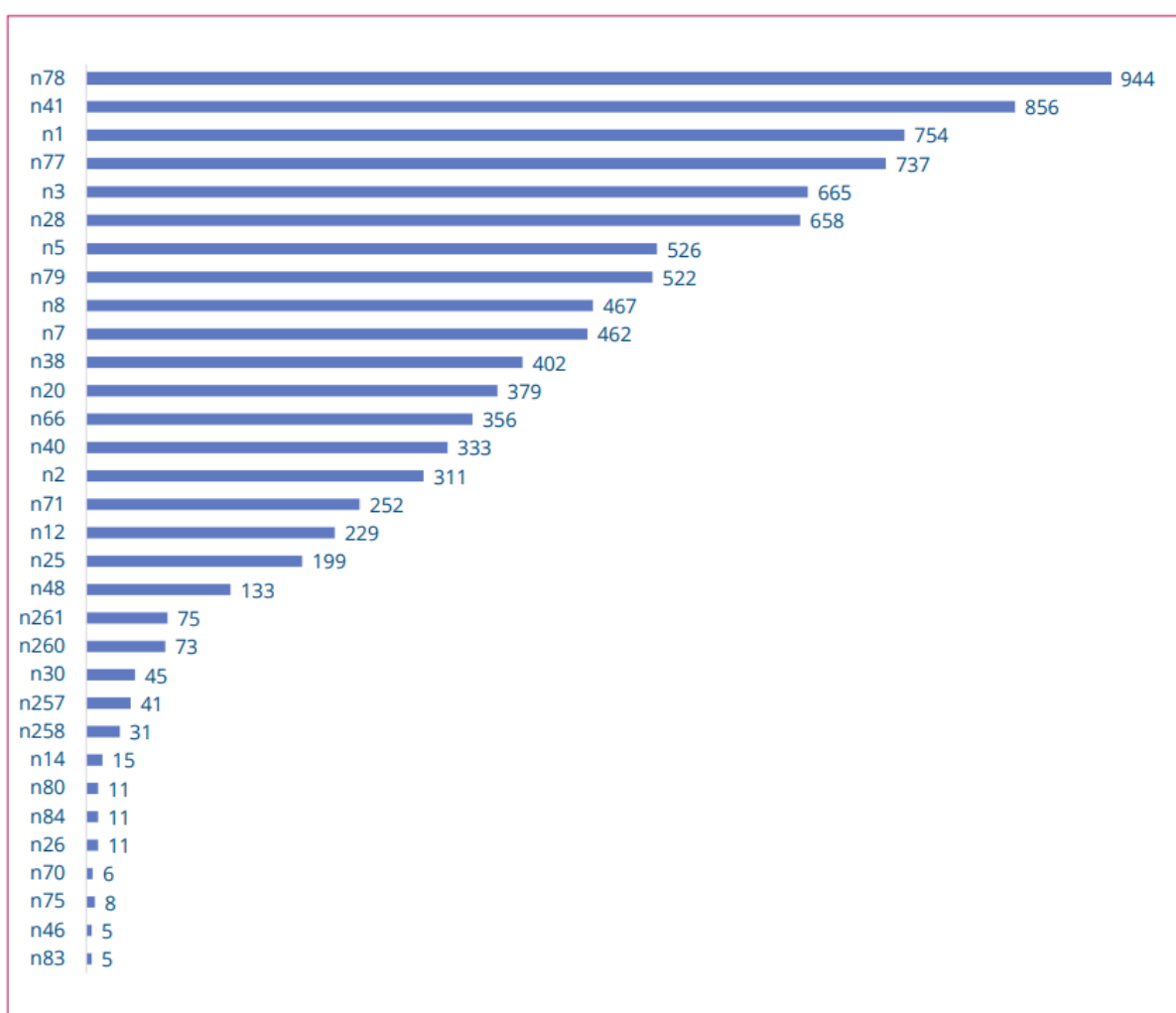
Nokia sees benefits in assigning the 3GPP band b40/n40 (2300-2400 MHz) for IMT services under technology neutral conditions. This band benefits of a steady ecosystem of equipment and devices for both 4G and 5G.

The band, used in TDD configuration, is used in several countries across the world, mostly in Asia and MEA regions. However, we note that recently Sweden also assigned and auctioned this band in complement to the C-band in order to allow operators to access between 80-100 MHz of contiguous spectrum in the TDD bands. We recommend ICASA to follow similar approach when auctioning the TDD spectrum bands, allowing contiguous spectrum per operator instead of small portions of spectrum in different bands that could be aggregated.

IMT3300 (3300-3400MHz)

The so-called C-Band that includes the 3300-4200 MHz range is recognized as being one of the key frequencies for the deployment of solutions providing mobile broadband, such as 4G and especially 5G.

The 3400-3600 MHz band has already been auctioned in South Africa; the 3300-3400 MHz provides 100 MHz of additional bandwidth valuable for 4G/5G deployments and equipment accommodates this portion of spectrum as supported by the 3GPP 5G NR n78 band. Moreover, there is already a steadily growing ecosystem support for the 3GPP 5G NR bands n78 and n77 which benefit of a strong device support (see figure below from the [GSA 5G Device report](#), May 2022).



South Africa and many other Sub Sahara administrations have already agreed at WRC-19 to the 5.429B footnote for the use of the 3300-3400 MHz for IMT.

We encourage ICASA to further proceed with the IMT allocation of this band in support to the faster and economical deployment of 5G.

IMT3500 (3400-3600MHz)

Band 3400-3600 MHz is an important mid-band for the 5G deployments. It is identified as part of the 3GPP band n77/n78 and benefits of a steady and growing ecosystem. The majority of the world's most important economies have made portions of the n77/n78 band available for 5G services. In Europe, the overall band 3.4-3.8 GHz has been identified as one of the 'pioneer' bands for 5G and widely deployed to enable 5G services.

Nokia agrees with the ICASA's position to opt for the F1 channelling arrangement (all TDD) in line with the 3GPP standardization of band n77/n78. Moreover, in the case of ICASA, a combination of the 3.4-3.6 GHz spectrum with the 2.3-2.4 GHz and 3.3-3.4 GHz bands would allow operators to acquire licences of 100 MHz of contiguous bandwidth necessary to enable the full potential of the 5G features and applications.

Other bands to be considered: 4800-4990 MHz, 6GHz and 26GHz

The combination of low, mid and high bands is required for the 5G developments and to enable in the future the 5G-Advanced and 6G developments. Beside the spectrum available or under consideration by ICASA for IMT in bands below 4 GHz, the higher mmWave bands have a role in providing the 5G speeds and extreme capacities. Among the mm bands identified at WRC-19, the 26 GHz band benefits of a growing ecosystem range and should be – in our view, in the short-term – subject to market consultation regarding its potential in terms of demand and timeline for release.

In the mid-term ICASA should consider the need of additional low and mid bands to support provision of adequate QoS and ubiquitous coverage of 5G networks. Considering that identifying and clearing such bands is a timely process, we recommend ICASA to continuously evaluate potential bands for IMT to allow for the mobile broadband and digitization to respond to the demands of the society. Making available enough spectrum in a timely manner in all bands – low, mid, and high – will allow not only the digitization of the society but also to avoid a digital fracture between the rural and urban populations.

Some bands in low and mid ranges are subject to studies towards WRC-23 (UHF band, upper 6 GHz, 4.8-4.99 GHz) and we recommend ICASA to consider their potential to respond to IMT demands in the future. Commercial deployments in these bands will provide additional capacity required in medium term to cope with the continuous demand for coverage capacity as well as urban capacity use cases. We invite ICASA to consider these bands for future use for IMT.

On a general note, Nokia is of view that in the mid bands, regulators should assign a minimum of 100 MHz contiguous blocks per MNO network by 2022 for initial 5G deployments. Further to this, additional mid-band spectrum for MNO networks will be required in the 2025-2030 timeframe (see GSMA report <https://www.gsma.com/spectrum/wp-content/uploads/2021/07/Estimating-Mid-Band-Spectrum-Needs.pdf>). It is for this reason that we encourage administrations to begin planning for additional mid-band spectrum accordingly.

The **4.8-4.99 MHz band** (part of the 3 GPP band n79), subject to WRC-23 AI 1.1 is a band of relevance for South Africa as the country already has an identification under the RR Footnote 5.441B. While the band has for now a limited deployment in R3, countries in R1 and R2 noted their interest to use it for IMT purposes. Nokia notes the current decision of Brazil to consult on the opening of 160 MHz of this band (4800-4960 MHz) for IMT services as of 2023. The growing interest in this band for IMT is reflected in its steadily growing ecosystem that already registered in March 2022 almost 500 devices, out of which half are mobile phones. In the case of South Africa, we see spectrum in this band as complementary to the already available/soon-to-be-available spectrum in the 5G mid-bands. Moreover, considering the limited availability of spectrum in the 3.3-4.2 GHz range, timely access to the 4.8-4.96 GHz band is even more critical for the successful launch and deployment of 5G networks.

The **upper 6 GHz band (6425-7125 MHz)** that is part of the WRC-23 AI 1.2 has the potential to offer in the future the capacity demanded for the advances in 5G and 6G.

Regarding the overall 6 GHz band (5925-7125 MHz), Nokia supports a balance approach in this frequency range between the licence- exempt and licensed use of the band. Allocating the range 5925-6425 MHz for license-exempt use and securing the 6425-7125 MHz for licensed use will allow satisfying all demands in the short and long term from both RLAN and IMT technologies.

As highlighted above, the 6425-7125 MHz band is under study for IMT identification, as part of the WRC-23 AI 1.2. Studies are also on-going in 3GPP for the use of the 6 GHz range for LTE and NR, as well as in ITU-R for a potential IMT identification at WRC-23 with the least restrictive conditions for the band usage (e.g., highest possible output power targeting macro cell usage). 3GPP has also started a new study on IMT parameters for 6425-7025 MHz.

Nokia is a proponent of IMT identification of the 6425-7125MHz spectrum at WRC-23 for IMT. Its availability will allow for advanced 5G use cases to be enabled and will provide necessary capacity further for 6G. Moreover, simulations performed by Nokia shows that coverage of the 6 GHz spectrum – thanks to advancements in the antenna technologies – allow the reuse of the 3.5 GHz infrastructure grids, making the deployment of this spectrum more economically efficient in the future.

Regarding the lower 5925-6425 MHz band, that is outside of the WRC-23 framework, one option is to consider opening the band and providing a level playing field to both 3GPP (5G NR-U) and IEEE (Wi-Fi) technologies to coexist in this spectrum. Therefore, adoption of technology neutral rules for this sub-band would allow deployments that respond to the market demand. However, when defining the technical rules for usage in the band, we reiterate the need to consider the protection of the incumbent users for the fixed links, in the entire band 5925-6425 MHz as well as in the 6425-7125 MHz.

Moreover, while a society often benefits from a mix of licensed and license-exempt usage, there is little argument that a license-exempt approach to the entire 6 GHz band will make the best use of this valuable spectrum. Technologies such as Wi-Fi is only a radio access technology and not a broadband network technology, and its benefits are circumscribed by the end-to-end capacity and penetration of the fixed/broadband FWA infrastructure – in particular, the availability of high-capacity connectivity. In countries where high-capacity fixed access/FWA penetration and Home Broadband (HBB) data plans are still limited, additional license exempt spectrum is unlikely to provide meaningful benefits with respect to higher data rates, as bottlenecks remains with the end-to-end infrastructure.

We invite ICASA to investigate means to incentivise the development, penetration, and adoption of fibre and broadband FWA connectivity as well as higher speed subscriptions that can make better use of the existing RLAN spectrum in 2.4 and 5 GHz bands (to which Wi-Fi 6 also apply) as well as any additional spectrum in the 5925-6425 MHz range in the coming years.

By contrast, technologies under licensed spectrum regime, like IMT technologies including IMT-2020 (5G NR), are designed and enabled with features and capabilities needed for diverse services and use cases – such as eMBB, FWA, V2X, and a variety of vertical use cases, including URLLC and mMTC. These services require a predictable QoS with different combinations of low latency, ultra-reliability, contiguous macro coverage, seamless indoor and outdoor experience, mobility, security, etc. Such performance characteristics that are built in the IMT-2020 standard cannot be matched by any technology (e.g., Wi-Fi/RLAN) operating in the license-exempt spectrum regime.

RLAN technologies like Wi-Fi provide – at best – nomadic connectivity while technologies of the IMT family offer real mobility. Mobility is more than mere connectivity: it is about policy-based sessions, real-time management and control of radio resources, provisioning of strong identity/security, offering service and network awareness, etc. IMT not only provides best user experience and all the value derived from global connectivity and scale, but also provides personalization, contextualization, ease of setting up sessions, and fast set up and tear down of sessions and services. All of these rich nuances of mobility are lost in a license-exempt Wi-Fi environment.

With a look into the future and on enabling the society to get most benefits out of the upper 6 GHz spectrum, Nokia encourages ICASA to support the studies under WRC-23 AI 1.2 towards identification of the upper 6425-7125 MHz for IMT.

Finally, as already mentioned, 5G requires also spectrum in the high frequencies. The 3GPP **n258 band (24.25-27.5 GHz)** is one of the harmonized mmWaves that are mainly intended for providing extreme capacity. One area of focus for 5G NR mmWave mobile deployments is in high-traffic urban areas in large global cities. Opening the mmWave bands to the IMT allows not only for the delivery of very high capacity when required but also open the opportunity for deploying localized networks.

Considering the extreme capacity that will be required for some 5G application (like augmented reality, virtual reality, real-time video upload, etc.), we recommend a bandwidth of at least 800 MHz per service provider to enable the full potential of mmWave 5G spectrum to be realized. In the case of private networks requirements can go down to 200 or 50 MHz per assignment.

Nokia is happy to continue to engage with ICASA for further discussions if required.

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