



Thursday, 26 August 2021

To:

Dr Keabetswe Modimoeng, Chairperson
Independent Communications Authority of South Africa (ICASA)
350 Witch-Hazel Ave, Eco-Park Estate
Centurion, 0144
South Africa

Attention: Mr Manyapelo Richard Makgotlho
Via Email : rmakgotlho@icasa.org.za

RE: Intel Corporation submission on the ICASA "Draft National Radio Frequency Plan 2021"

Dear Dr Modimoeng,

Intel Corporation ("Intel") commends the Authority for issuing the Draft National Radio Frequency Plan 2021 in Government Gazette number 44803 of 9 July 2021 for public consultation. We also welcome the opportunity to respond in writing to the invitation to submit written representations on the "**Draft National Radio Frequency Plan 2021**".

Intel Corporation designs and manufactures advanced integrated digital technology platforms that power an increasingly connected world. At Intel our purpose is to create world-changing technology that enriches the lives of every person on earth. Intel put the silicon in Silicon Valley and today we are applying our reach, scale, and resources to deliver on bold goals. In an era where all the data that are generated by retail stores, hospitals, manufacturing plants, and even cars must be moved, stored, and processed faster and more securely than ever before, Intel is investing in what our CEO Pat Gelsinger calls the four "superpowers": Cloud, 5G and Broadband Connectivity, AI, and the intelligent and autonomous edge. These will help our customers capitalize on these fastest-growing opportunities.

Intel works with Governments, policy makers and industries around the world to advocate policies that encourage new ideas, promote faire commerce, and protect resources. By promoting innovation and competition worldwide, and advancing leading governance and corporate responsibility practices, Intel seeks to help people and businesses thrive in an increasingly global economy.

Intel's views on the "**Draft National Radio Frequency Plan 2021**" are contained in the subsequent pages (page 3 to 8).

Please do not hesitate to contact me, should you require any additional information.

Sincerely Yours;

Dr Bienvenu AGBOKPONTO SOGLO

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Submission to the ICASA “Draft National Radio Frequency Plan 2021”

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1. Introduction

The continued reality in managing the pandemic and the post COVID-19 recovery, show that accelerating access to digital infrastructure can critically help combat the pandemic, enable access to education, healthcare, new technology and scientific discovery that better prepares South Africa for future crises, and support the rebuilding of the South African economy in the short and long term; and also spur innovation across the country.

Broadband infrastructure especially 5G/IMT-2020 is a critical component of the overall digital infrastructure. The fifth-generation wireless technologies, referred to as 5G/IMT-2020, represent more than just another step in the evolution of wireless. It is the convergence of wireless with computing and the cloud. 5G/IMT-2020 is a new paradigm, enabling everything to be “smart”, because everything is connected.

5G/IMT-2020 is expected to support billions of connected devices with differing requirements and expand flexibility and agility beyond purpose-built LTE/IMT-Advanced Networks. It will also provide the infrastructure for much Artificial Intelligence (AI) especially real time analytics through edge compute. In addition, 5G/IMT-2020 will facilitate rapid access to cloud resources and therefore the cloudification of the telecom network.

5G/IMT-2020 addresses existing, emerging, and future uses delivering diverse services with usage scenarios such as 1) Enhanced Mobile Broadband (eMBB) with immersive experiences (Virtual Reality, Augmented Reality); 2) Internet of Things (IoT) with applications such as Massive Machine Type Communication (Smart home, smart cities, sensors) and 3) Ultra Reliable Low Latency Communications (URLLC) with applications such as Mission Critical Type Communication (Autonomous driving, Industrial).

Talking about 5G/IMT-2020 infrastructure, Intel is becoming part of the fabric of the 5G/IMT-2020 network in the same way that it's the backbone of the data centre. The breadth of our portfolio spans across processors, memory, connectivity, accelerators, and software that can be used to create industry leading solutions (Please see Figure 1 below).



Figure 1: Building the Foundation for the 5G Era

From the 5G/IMT-2020 wireless technology aspect, Intel believes that both 3GPP-based and IEEE-based technologies play an important role in 5G. 3GPP standards (e.g., Release 15 and beyond, IMT-

2020) and IEEE-based technologies (Wi-Fi 6/6E based on 802.11ax and beyond, and WiGig based on IEEE 802.11ad/ay) will complement each other and will both be required to deliver wireless broadband to consumers and businesses worldwide including in South Africa.

Wi-Fi is critical and complementary to licensed 5G/IMT-2020 services. According to Cisco, 50% of all global IP traffic in 2020 will be delivered over Wi-Fi¹; and forecasts suggest that with the introduction of 5G and gigabit wireless technologies, the demand will continue to grow rapidly in the coming years. “CISCO estimates that 71 percent of the 5G/IMT-2020 traffic will be offloaded onto Wi-Fi by 2022 globally²”.

5G/IMT-2020 enables a diverse set of use cases and applications – each with different requirements in terms of spectrum. Therefore, to enable 5G/IMT-2020 and unlock the full potential of broadband in South Africa, there is a need to have access to licensed spectrum as well as license-exempt spectrum as follows:

- 1) **Licensed spectrum:** in low-band – below ~1 GHz (e.g., 700 / 800 MHz band); mid-band – between ~ 2 – 5 GHz (e.g. 2.3 – 2.4 GHz, 2.5 – 2.69 GHz, 3.3 – 3.6 GHz, 4.8 – 4.99 GHz); and high-band – above 24 GHz (e.g., within 26 GHz and 40 GHz)
- 2) **License-exempt spectrum:** unlicensed spectrum in the 6 GHz band (within 5 925 – 7 125 MHz); and unlicensed spectrum accessed in the 60 GHz range (e.g., 57 – 71 GHz). We would suggest that ICASA open up the lower part of the 6 GHz band (5 925 – 6 425 MHz) for license-exempt low power indoor (LPI) and very low power (VLP) outdoor and indoor use, as extensive technical studies have already shown that wireless access systems (WAS) and radio local area networks (RLANs) can operate in the entire 6 GHz band (5 925 – 7 125 MHz) without adversely impacting incumbents' operations.

Intel Corporation's submission is mainly focused on 700 / 800 MHz Band; Mid-band spectrum (~ 2 – 5 GHz); High- band spectrum (above 24 GHz) and Lower 6 GHz Band (5 925 – 6 425 MHz) of the Draft National Radio Frequency Plan 2021.

2. 700 / 800 MHz Band (page 127 – 132)

Low-band spectrum (below ~1GHz) provides coverage across a wide area including indoors and outdoors for low bandwidth uses. The 700 MHz band (3GPP Band 28/n28: UL- 703 – 733 MHz / DL- 758 – 788 MHz) and the 800 MHz band (3GPP Band 20/n20: DL – 791 – 821 MHz / UL- 832 – 862 MHz) are excellent for wide area coverage of 4G/IMT-Advanced and 5G/IMT-2020 in regional and rural environments, for in-building coverage, and represent an important digital dividend arising from the shift by TV broadcasters to digital transmissions. According to the GSA GAMBoD (June 2021), there are around 501 4G/5G user devices in the 700 MHz band; and 463 4G/5G user devices in the 800 MHz band.

3. Mid-band spectrum: between ~2 – 5 GHz (page 162 – 167, 169, 172 - 173)

The existing IMT bands 2 300 – 2 400 MHz and 2 500 – 2 690 MHz (2.6 GHz band) can be used to enable large contiguous channels for 5G/IMT-2020 by migrating existing services through re-farming from 4G/LTE/WiMAX (IMT-Advanced) to 5G/IMT-2020, benefiting from the current 3GPP ecosystem and favourable propagation conditions compared to higher bands, which is a particularly important aspect for broadband connectivity in rural areas.

¹ https://www.cisco.com/c/dam/m/en_us/solutions/service-provider/vni-forecast-highlights/pdf/Global_2020_Forecast_Highlights.pdf

² <https://s3.amazonaws.com/media.mediapost.com/uploads/CiscoForecast.pdf>

Considering that the 3 300 – 3 400 MHz band is adjacent to the near-globally harmonised 3 400 – 3 600 MHz band, the frequency arrangement F3 (TDD: 3 300 – 3 700 MHz) described in recommendation ITU-R M.1036-6 provides the possibility for South Africa to implement IMT in the entire 3 300 - 3 600 MHz band (3GPP Band n78). Furthermore, at the WRC-19, several African countries including South Africa added their names to the footnote No. 5.441B resulting in more than half of all ATU member countries (27 out of 45) now having identified the 4 800 – 4 990 MHz band for IMT, benefiting from the ecosystem that has already developed for the use of 5G/IMT-2020 in the 4 800 – 4 990 MHz band.

The 3.5 GHz band is vital for 5G/IMT-2020 deployment in South Africa. In Europe for example, the 3 400 – 3 800 MHz band is identified as the first primary band for 5G/IMT-2020, which can be used to provide high capacity and coverage. According to the GSA, since end of 2015, 34 countries have auctioned/assigned the C-Band spectrum (within 3 300 – 4 200 MHz) for mobile broadband³. For example, China already made the 3 400 – 3 600 MHz band (as well as additional spectrum within 2 GHz and 4 GHz) available for 5G/IMT-2020, and commercial services were launched by two operators in November 2019; Japan issued licenses for 5G in 3 600 – 4 100 MHz in April 2019. Korea auctioned the 3 420 – 3 700 MHz band (as well as 26.5-28.9 GHz) in June 2018. In January 2021, the United States completed Phase 1 of the auction of the 3 700 - 3 980 MHz to enable next-generation wireless services (e.g.,5G)⁴.

These various frequencies being made available for 5G/IMT-2020 in leading markets will be supported by a 5G/IMT-2020 “tuning range” which will cover the 3 300 - 5 000 MHz frequency range.

The relevant 3GPP band classes are as follows:

- n77	- 3300 MHz – 4200 MHz
- n78	- 3300 MHz – 3800 MHz
- n79	- 4400 MHz – 5000 MHz

From 5G/IMT-2020 trials, deployments and launches perspectives, there is a clear pattern of investment in bands n77 and n78 (3 300 – 3 800 MHz) according to a GSA report⁵.

In addition, for mobile operators to cost-effectively fulfil the market demand for 5G/IMT-2020 services; it is suggested that wide and contiguous frequency blocks of at least 40 MHz (2x20 MHz FDD or 40 MHz TDD or through aggregation of FDD & TDD bands) be made available for 5G/IMT-2020 within the 2 300 – 2 400 MHz and the 2 600 – 2 690 MHz per operator; and for the 3 300 – 3 600 MHz and the 4 800 – 4 990 MHz band contiguous frequency blocks of 80 to 100 MHz be made available for 5G/IMT-2020 per operator.

4. High-band spectrum: above 24 GHz

4.1 26 GHz and 40 GHz Band (page 218 – 221 & 232 - 236)

High-band spectrum (above 24 GHz) transmits massive amounts of data. New advancements will allow extended reach for outdoor coverage e.g., TDD 26 GHz and 40 GHz bands.

The 26 GHz band (24.25 - 27.5 GHz) is identified as a key band to enable 5G/IMT-2020 and is identified for IMT globally at WRC-19. It has been designated as the pioneer band for 5G/IMT-2020 deployment in the mmWave band in Europe. Initial 5G/IMT-2020 deployments are occurring within the 28 GHz band (26.5-29.5 GHz). The 26/28 GHz tuning range approach, which will include both the

³ GSA Snapshot - H1 2021 Review: 5G Spectrum, Networks and Devices; June 2021

⁴ [C-Band Auction Sets Record, Grossing \\$81B in Phase One - Via Satellite - \(satellitetoday.com\); https://docs.fcc.gov/public/attachments/FCC-20-110A1.pdf](https://docs.fcc.gov/public/attachments/FCC-20-110A1.pdf)

⁵ GSA NTS Snapshot, July 2021

26 GHz and the 28 GHz bands, will enable terminals to select any sub-band within this frequency range which is available in the country it is used in e.g., in South Africa.

The 40 GHz band (37.0 - 43.5 GHz) is also an important band for 5G/IMT-2020. The entire 37.0 - 43.5 GHz frequency range (37 - 40.5 GHz, 40.5 - 42.5 GHz and 42.5 - 43.5 GHz) i.e., 40 GHz band has also been identified for IMT globally at WRC-19. As these three bands are part of the same tuning range, they enable the widest possible harmonization.

According to section 5.3.2 of TS 38.104, different bandwidths are supported for a component carrier at given sub-carrier spacing (SCS). Accordingly, the bandwidth scalability capability of NR Rel-15 supports up to 4 different bandwidths (50 MHz, 100 MHz, 200 MHz and 400 MHz) for FR2. Bandwidths of around 800 - 1000 MHz contiguous spectrum are recommended per operator in 5G/IMT-2020 high band (e.g., millimetre wave)⁶.

4.2 66 - 71 GHz Band (page 243 - 244)

The 66 -71 GHz band was identified globally for IMT at WRC-19, but with the condition of equal access between IMT and other types of wireless access services (WAS) based on coexistence mechanisms to be developed by ITU together with SDOs like ETSI and IEEE.

The 57 - 66 GHz and 66 - 71 GHz bands are important bands for license-exempt multiple-gigabit systems as part of the overall 5G/IMT-2020 ecosystem. Today, the MGWS such as WiGig offer low-latency connectivity that expands the Wi-Fi experience for virtual reality, multimedia streaming, gaming, wireless docking, and enterprise applications requiring high speed, data-intensive connections.

These systems need access to the uncongested 60 GHz frequency band with wide channels (2160 MHz) to transmit data efficiently at multi-gigabit per second speeds. Users benefit from expanded capacity and focused transmission between devices to reduce interference, even in crowded environments. A recent study projects that by the year 2022, annual chipset shipments based on IEEE 802.11ad/ay protocols would exceed 1.5 billion.

Many countries have identified the 57 – 71 GHz band or part thereof for implementation of license-exempt technologies (e.g., IEEE 802.11ad/ay (WiGig)). In the United States, for example, the FCC decided to maintain the unlicensed use of the 64 - 71 GHz band and even to expand these operations on to aircraft in flight.⁷ Similarly, UK Ofcom adopted [regulations](#) for license-exempt operations in the 57-71 GHz band. License-exempt mmWave spectrum in the 57-71 GHz range is also an important element of the European Short-Range Device (SRD) regulation and CEPT has already made available the entire band in 2019 under harmonized European conditions for unlicensed use⁸. The use of the 57-71 GHz band is harmonized through Recommendation ITU-R M.2003. Please refer to Annex 1 for more information on the IEEE 60 GHz band plan.

5. Lower 6 GHz Band: 5 925 – 6 425 MHz (Page 181 – 182)

Wi-Fi is critical and complementary to licensed 5G/IMT-2020 services. According to Cisco, 50% of all global IP traffic in 2020 will be delivered over Wi-Fi⁹; and forecasts suggest that with the introduction of 5G/IMT-2020 and gigabit wireless technologies, the demand will continue to grow rapidly in the

⁶ <https://www.gsma.com/spectrum/5g-spectrum-guide/>

⁷ [Use of Spectrum Bands Above 24 GHz for Mobile Radio Services Second Report and Order](#), Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, GN Docket No. 14-177

⁸ <https://www.ecodocdb.dk/download/25c41779-cd6e/Rec7003e.pdf>

⁹ https://www.cisco.com/c/dam/m/en_us/solutions/service-provider/vni-forecast-highlights/pdf/Global_2020_Forecast_Highlights.pdf

coming years. "CISCO estimates that 71 percent of the 5G traffic will be offloaded onto Wi-Fi by 2022 globally" ¹⁰.

Many countries around the world are making or planning to make the 6 GHz band available for license-exempt use. For example, Saudi Arabia, US, South Korea, Brazil, Chile, Costa Rica, Canada, Peru, and Guatemala have already made the entire range from 5 925 to 7 125 MHz available on a license exempt basis. Other countries, including Qatar, Taiwan, Mexico, are expected to follow the US lead soon. Many other countries, such as Egypt, Kenya, Argentina, Jordan, Japan, India, Australia, Singapore, Hong Kong, Honduras, and Columbia have either initiated consultation on the band or considering it.

Ofcom in the UK has decided to open the lower part of the band from 5 925 to 6 425 MHz on a license-exempt basis for low power indoor and very low power outdoor use. At the European level, CEPT has already designated 5 945 – 6 425 MHz for license-exempt use and European Commission has published their decision that all EU member states shall make the band available for the implementation of WAS/RLANs by 1st December 2021¹¹.

UAE already authorized 5 925 – 6 425 MHz band for indoor unlicensed operation. In addition, Morocco also authorized 5 925 – 6 425 MHz band for license-exempt low power indoor (LPI) and very low power (VLP) for outdoor/indoor use¹².

For more information on countries enabling Wi-Fi 6E please see <https://www.wi-fi.org/countries-enabling-wi-fi-6e>. Additional information on the "Wi-Fi Alliance's Wi-Fi 6E Certification Program" can be found at <https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-delivers-wi-fi-6e-certification-program>

The African Telecommunications Union has approved in July 2021, the ATU-R Recommendation 005-0 on the Implementation of Emerging ICT Technologies in Africa indicating that in order to foster harmonised use of the band 5 925 – 6 425 GHz by WAS/RLANS on a licence-exempt basis in Africa, ATU recommends that Member States designate the frequency band 5 925 – 6 425 MHz for use by WAS/RLAN equipment restricted to very low power (VLP) (both outdoor and indoor use) and low power indoor (LPI) use only on a non-exclusive, non-interference and non-protected basis.

Given the information above; we would therefore recommend to the Authority ICASA, as part of its effort on the Draft National Radio Frequency Plan 2021 to add WAS/RLAN as typical application to immediately open up the lower part of the 6 GHz band (5 925 – 6 425 MHz) for license-exempt low power indoor (LPI) and very low power (VLP) for outdoor/indoor use, as extensive technical studies have already shown that wireless access systems (WAS) and radio local area networks (RLANs) can operate in the entire 6 GHz band (5 925 – 7 125 MHz) without adversely impacting incumbents' operations. Please refer to Annex 2 for more information on the IEEE 6 GHz band plan.

¹⁰ <https://s3.amazonaws.com/media.mediapost.com/uploads/CiscoForecast.pdf>

¹¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2021:232:FULL&from=EN>

¹² [Wi-Fi 6E is now authorized in Morocco | Morocco - National Telecommunications Regulatory Agency \(anrt.ma\)](#)

Annex 1. IEEE Band Plan for 60 GHz

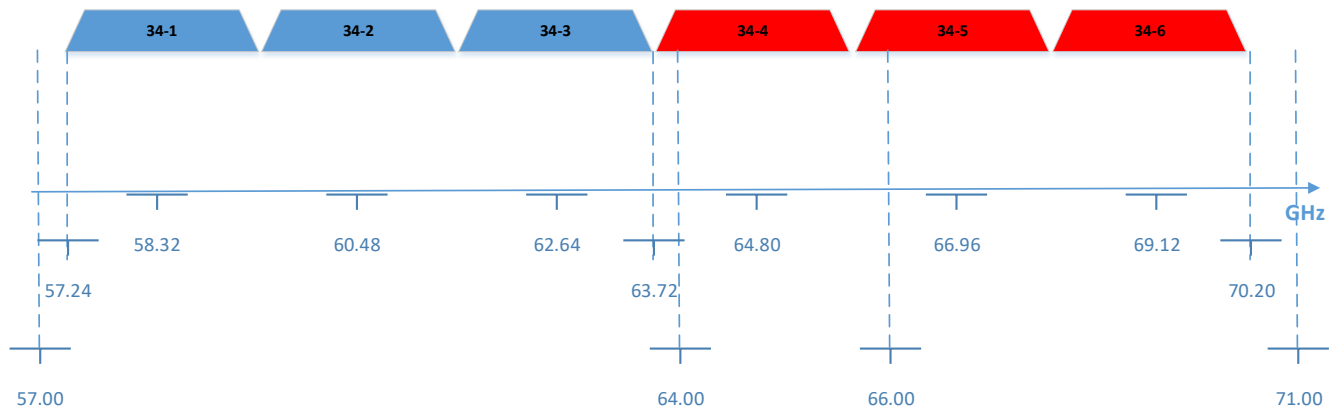


Figure 2. IEEE 802.11 Global Operating Classes (Channel Plan) for 60 GHz

For more information, please refer to IEEE 802.11-2020 Standard for Information technology— Telecommunications and information exchange between systems Local and metropolitan area networks— Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, IEEE Computer Society, Developed by the LAN/MAN Standards Committee IEEE Std 802.11™-2020 (Revision of IEEE Std 802.11-2016)

Annex 2. IEEE Band Plan for 6 GHz

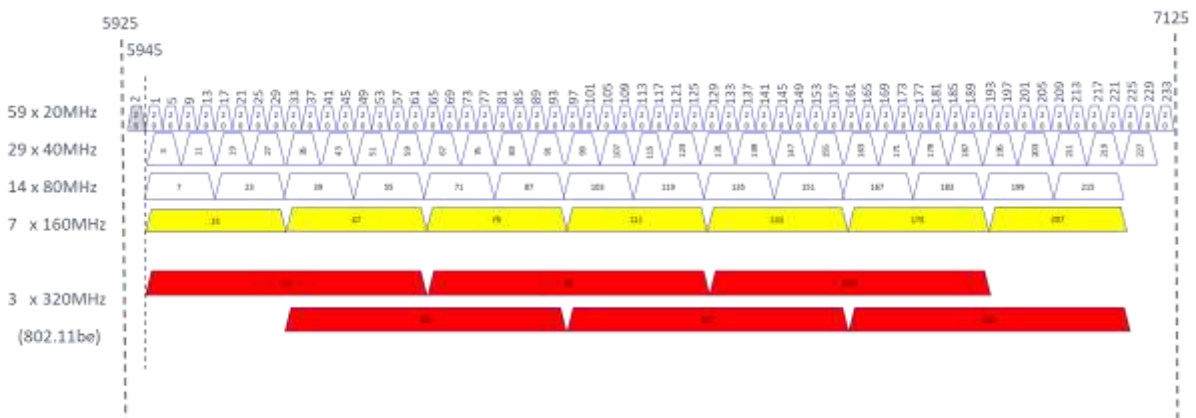


Figure 3. Global 6GHz (5 925 MHz – 7 125 MHz) Band Plan IEEE 802.11ax (Wi-Fi 6E) and 802.11be (Wi-Fi 7)

For more information, please refer to IEEE 802.11ax™-2021, IEEE Standard for Information technology— Telecommunications and information exchange between systems Local and metropolitan area networks— Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, Amendment 1: Enhancements for High Efficiency, May 2021