SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF 5G, WI-FI 6E AND WIGIG

REVIEW OF SPECTRUM ASSIGNMENT STRATEGY - CRAN

Dr. Bienvenu AGBOKPONTO SOGLO
Director, Government Affairs Africa & EMEA CTO Liaison

intel®

07 October 2021

BRIEF INTRODUCTION TO INTEL

Business	Manufacturing	Supply Chain	Community	Sustainability
$77.9 BILLION total revenue in 2020	**10 BILLION** transistors produced every second	**$1 BILLION** annual spending with diverse-owned businesses.	**$60 MILLION** contributed to COVID-19 response	**93 PERCENT** non-hazardous waste recycling
110+ THOUSAND employees work in 46 countries	**100 MILLION** transistors are packed in each mm^2 of a chip	**800+** supplier audits in the past five years	**17+ MILLION** Hours of volunteer service since 1995	**44 BILLION** gallons of water conserved over the past decade
$13.6 BILLION invested in R&D in 2020	**$14.3 BILLION** in capital investments in 2020	**#1 RESPONSIBLE MINERALS RANKING** for past six years[1]	**30+ YEARS** of positive impact through Intel Foundation	**71 PERCENT** of our global power was green power at the end of 2019

[1]From the Responsible Sourcing Network

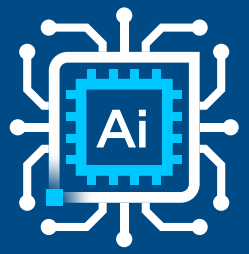
World-changing Technology

Our Purpose

We create world-changing technology
that enriches the lives of every person on Earth

Investing in Market Shifts

Cloud



Artificial Intelligence

5G/Network Transformation

Intelligent & Autonomous Edge

BRIEF INTRODUCTION TO INTEL: OUR END-TO-END PRODUCT PORTFOLIO

AUTONOMOUS DRIVING

mobileye
An Intel Company

moovit

5G NETWORK

intel. ATOM
intel. eASIC
intel. XEON BRONZE
intel. XEON SILVER
intel. XEON GOLD
intel. XEON PLATINUM
intel. AGILEX
intel. STRATIX 10

CLIENT CONNECTIVITY

THUNDERBOLT™

Connectivity

5G 6 Lte

Intel® Wireless Bluetooth®

Intel® Wi-Fi 6 solutions

CLOUD COMPUTING

BAREFOOT NETWORKS | an Intel company

intel. OPTANE PERSISTENT MEMORY
intel. OPTANE SSD
intel. XEON BRONZE
intel. XEON SILVER
intel. XEON GOLD
intel. XEON PLATINUM
intel. AGILEX
intel. STRATIX 10

IOT

OpenVINO

intel. MOVIDIUS
intel. XEON BRONZE
intel. XEON SILVER
intel. XEON GOLD
intel. XEON PLATINUM
intel. AGILEX
intel. STRATIX 10
intel. ARRIA 10

EDGE COMPUTING

intel. CORE i3
intel. CORE i5
intel. CORE i7
intel. CORE i9
intel. evo POWERED BY CORE vPRO i7
intel. evo POWERED BY CORE vPRO i5
intel. ATOM

AI AND ANALYTICS

habana® An Intel Company

intel. XEON BRONZE
intel. XEON SILVER
intel. XEON GOLD
intel. XEON PLATINUM
intel. AGILEX
intel. STRATIX 10
intel. iRIS Xe GRAPHICS
intel. iRIS Xe MAX GRAPHICS

Emerging Technologies Will Drive Economic Growth Back

5G : $ 10 Trillion Gain by 2030

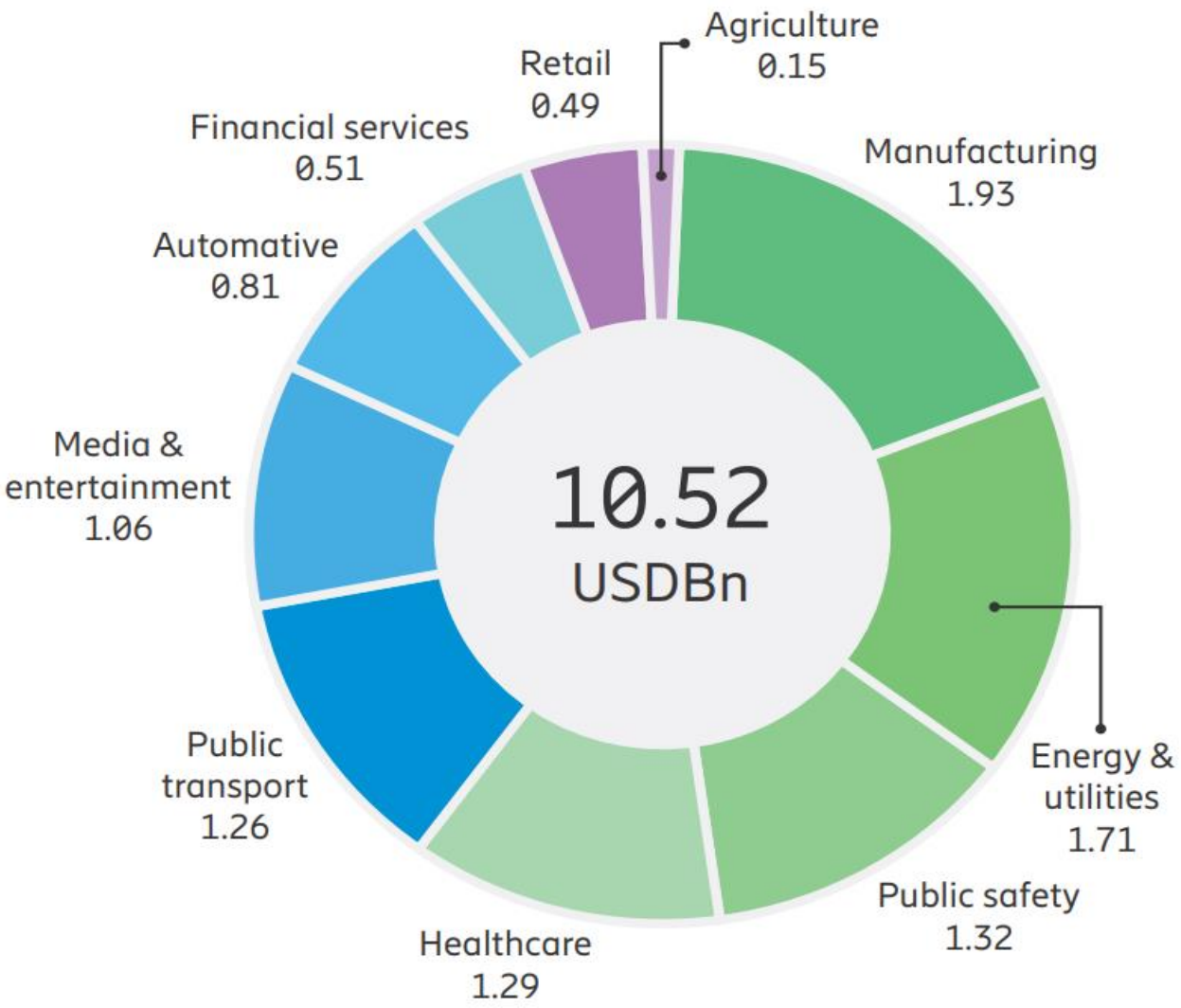
Artificial Intelligence: $ 15 Trillion Gain by 2030

Internet Of Things: $ 11 Trillion Gain by 2030

Cybersecurity: $ 5.7 Trillion Risk by 2023

Sources: (1) "Unlocking the Potential of the Internet of Things." McKinsey. 2015.; (2) Sizing the Price: PwC's Global Artificial Intelligence Study. 2017.; "Dark Side of Digitalization." World Economic Forum. 2020.; (3) "Everything You Need to Know about 5G" IEEE Spectrum. https://www.youtube.com/watch?v=GEx_d0SjvS0. 2017.; (4) "The Cost of Cybercrime" Accenture. 2019.

5G POTENTIAL ECONOMIC BENEFIT FOR AFRICA BY 2026®

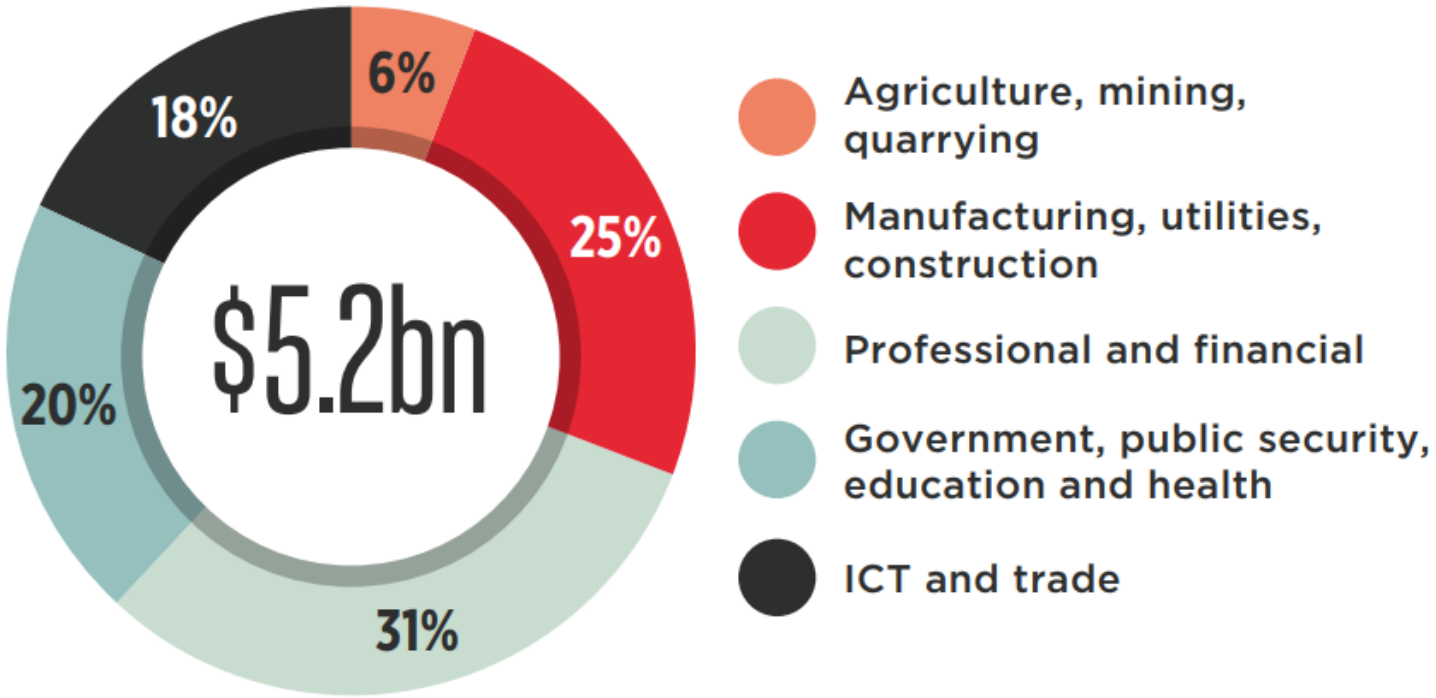


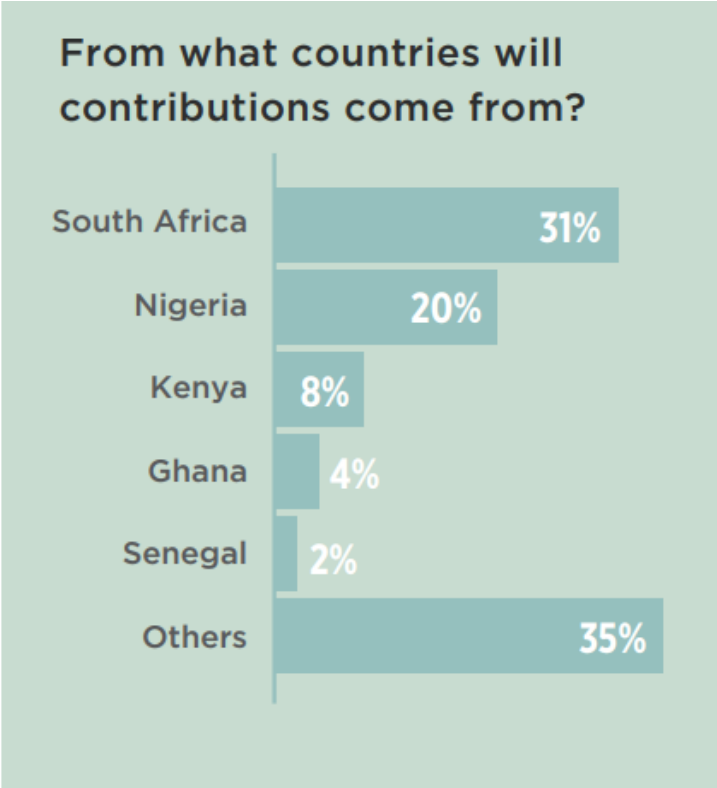
- Estimated 5G Business Potential for Africa is in the order of **10.52 Billion USD** by **2026**[1]

® Ericsson "The 5G Business Potential 2nd Edition" 2017, for Africa

intel.

GDP IMPACT OF MMWAVE 5G IN SUB-SAHARAN AFRICA BY 2034*





- The GDP impact (socio-economic benefits) of mmWave 5G in Sub-Saharan Africa is **around 5.2 billion USD by 2034**

* GSMA: The socio-economic benefits of mmWave 5G (2020-2034); Sub-Saharan Africa Edition

intel.

WI-FI POTENTIAL ECONOMIC BENEFIT FOR AFRICA

- License-exempt technologies (e.g., Wi-Fi) are also critical in complementing 5G services

- In 2021, the economic value provided by Wi-Fi is $3.3 trillion, and is expected to grow to $4.9 trillion by 2025

- Economic value is determined in terms of –
  - ✓ **Consumer surplus**: Total amount consumers are willing to pay for a product or service compared to going without it.
  - ✓ **Producer surplus**: Economic benefit producers earn from a product or service.
  - ✓ **GDP contribution**: Market value of all final goods and services produced in a period.

Global Value of Wi-Fi®

2021 $3.3 trillion | 2025 $4.9 trillion

	2021	2025
CAMEROON	$1 BILLION	$3 BILLION
DRC	$1 BILLION	$2 BILLION
GABON	$0.6 BILLION	$1.2 BILLION
KENYA	$12 BILLION	$16 BILLION
NIGERIA	$16 BILLION	$33 BILLION
SENEGAL	$1 BILLION	$3 BILLION
SOUTH AFRICA	$31 BILLION	$44 BILLION
UGANDA	$1 BILLION	$4 BILLION

5G: CONVERGENCE OF WIRELESS WITH COMPUTING AND THE CLOUD

Next Generation Of Wireless Networks

Higher Speeds, Greater Capacity And Lower Latency

Billions Of Connected Devices And Things

COMPUTE

PERSONAL COMPUTER ERA

BROADBAND INTERNET

MOBILE & CLOUD

COMMS

2G

3G

4G

Massive Machine Type Communications

Ultra Reliable Low Latency Communications

Enhanced Mobile Broadband

intel

BUILDING THE FOUNDATION FOR THE 5G ERA

5G wireless technologies

Devices/IoT

Access/Edge

Core

Cloud

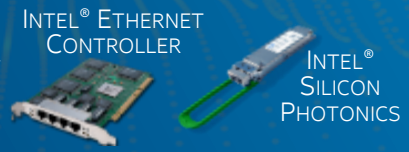
INTEL PORTFOLIO SPANNING DEVICES, NETWORK, AND CLOUD

PROCESSORS

ACCELERATORS

MEMORY

CONNECTIVITY



SOFTWARE

OpenVINO
OPENNESS

intel

SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF 5G

A diverse set of regulatory models & spectrum is required for 5G to fulfill its promise

WIDE AREA EXCLUSIVELY LICENSED

- Exclusive to MNOs
- Verticals supported by network slicing

SHARED LICENSED

- e.g. shared between govs/incumbents and MNOs/commercial

LICENSE-Exempt

- "Unlicensed" approaches (e.g. Wi-Fi 6 scheduling)

LOCAL AREA EXCLUSIVELY LICENSED

- For enterprise & industrial on-premise applications

SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF 5G – LICENSE SPECTRUM

- **Low-band spectrum – below ~1 GHz (e.g., 700 MHz / 800 MHz band)**

- 700 MHz band (3GPP Band 28/n28: UL- 703 – 733 MHz / DL- 758 – 788 MHz) and 800 MHz band (3GPP Band 20/n20: DL – 791 – 821 MHz / UL- 832 – 862 MHz)
- Excellent for wide area coverage of LTE and also 5G in regional and rural environments
- Provides coverage across a wide area including indoors and outdoors for low bandwidth uses
- 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

SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF 5G – LICENSE SPECTRUM

❑ Mid-band spectrum: between ~2 – 5 GHz

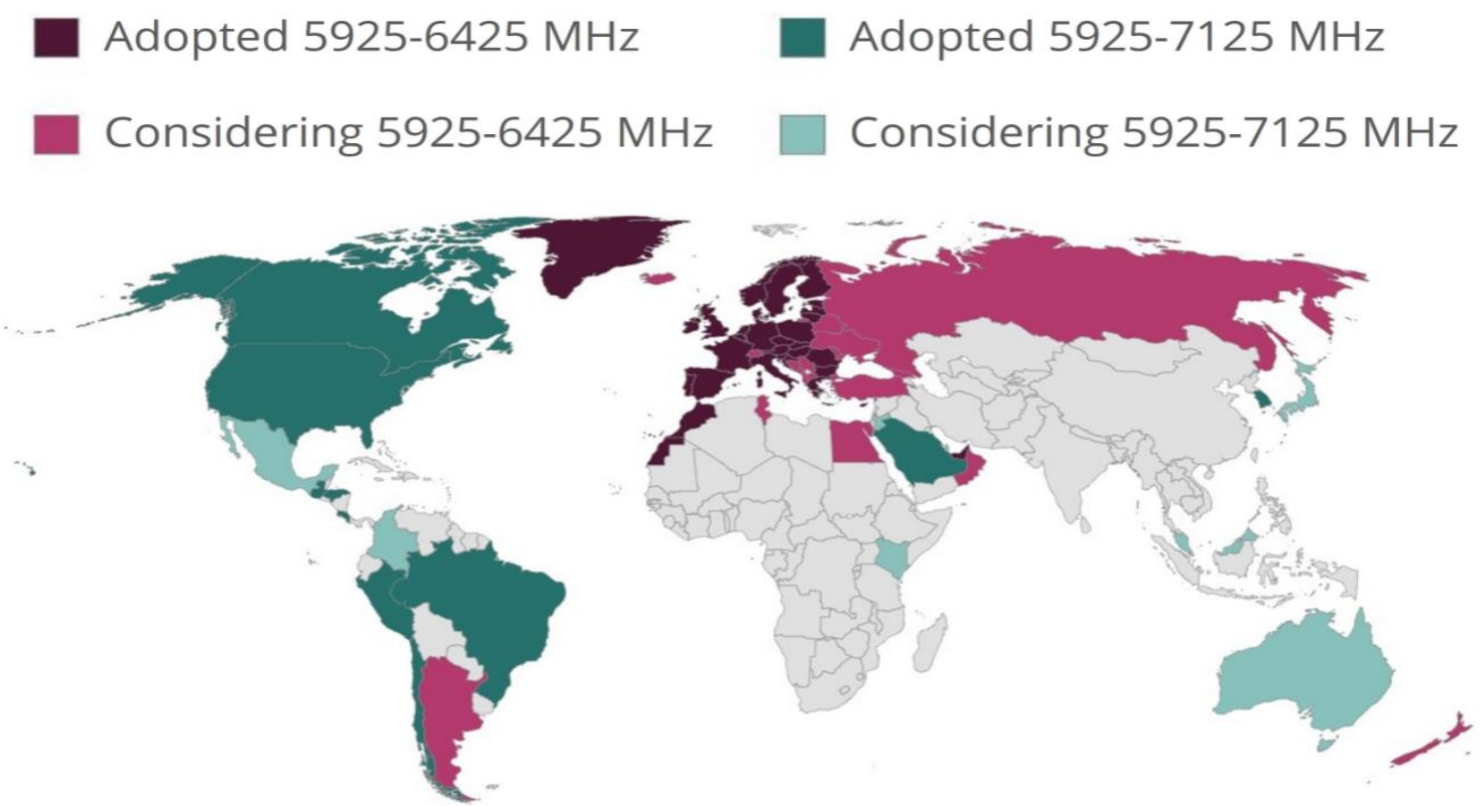
- The existing IMT bands e.g., **2.3 GHz and 2.6 GHz can** be used to enable large contiguous channels for 5G by migrating existing services through re-farming from 4G to 5G
- **3 300 – 3 400 MHz** band is adjacent to the near-globally harmonized 3 400 – 3 600 MHz band: provides the possibility for South Africa to implement IMT in the entire 3 300 - 3 600 MHz band (3GPP Band n78)
- 3 300 / 3 400 – 3 600 MHz band needs to be defragmented and streamlined
- The 4 800 – 4 990 MHz band with the 3GPP ecosystem of band n79 (4.4-5 GHz)
- From 5G 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 report

SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF 5G – LICENSE SPECTRUM

❑ High-band spectrum – above 24 GHz (e.g., within 24.25-29.5 GHz and 37-43.5 GHz)

- 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: Pioneer band for 5G/IMT-2020 deployment in the mmWave band in Europe
- 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) has also been identified for IMT globally.
- **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).

SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF WI-FI 6E - COUNTRIES ENABLING WI-FI 6E*



- In July 2021, ATU approved the ATU-R Recommendation 005-0® and recommends to its member states to designate the frequency band 5 925 – 6 425 MHz for use by WAS/RLAN equipment restricted to VLP (both outdoor and indoor use) and LPI use only on a non-exclusive, non-interference and non-protected basis.
- Recommend to CRAN to adopt the ATU-R Recommendation 005-0 on the use of Wi-Fi in the 5 925 – 6 425 MHz as described on page 92; including the technical and operating conditions as provided in Annex 3 of the ATU-R Recommendation 005-0 on page 104

* https://www.wi-fi.org/countries-enabling-wi-fi-6e

® https://www.atuuat.africa/wp-content/uploads/2021/08/En_ATU-R-Recommendation-005-0.pdf

intel.

SPECTRUM HARMONIZATION TO SUPPORT IMPLEMENTATION OF WIGIG

❑ Unlicensed spectrum accessed in the 60 GHz range (e.g., 57 – 71 GHz)

- The 60 GHz band (57 - 71 GHz) is important bands for license-exempt multiple-gigabit systems as part of the overall 5G 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.

- 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))
  - US, FCC decided to maintain the unlicensed use of the 64 - 71 GHz band and even to expand these operations on to aircraft in flight
  - UK Ofcom adopted regulations for license-exempt operations in the 57-71 GHz band
  - CEPT already made available the the 57-71 GHz band in 2019 under harmonized European conditions for unlicensed use

® 66 – 71 GHz was identified globally for IMT at WRC-19 with equal access between IMT and other types of wireless access services (WAS)

CONCLUSION

- **To support the implementation of 5G, Wi-Fi 6E and WiGig in Namibia, we recommend to CRAN to consider the following:**

- **Making 5G spectrum available in**: Low-band – below ~1 GHz (e.g., 700 / 800 MHz band); mid-band – between ~2 – 4 GHz (e.g. 2.3 – 2.4 GHz, 2.5 - 2.69 GHz, 3.3-3.6 GHz); and high-band – above 24 GHz (e.g., within 24.25-29.5 GHz and 37-43.5 GHz)

- **Making License-exempt spectrum available**: unlicensed spectrum in the 6 GHz band (within 5925 – 7125 MHz); and unlicensed spectrum accessed in the 60 GHz range (e.g., 57 – 66 GHz and 66 – 71 GHz)®
  - Recommend to the Authority CRAN to immediately open-up the frequency band 5 925 – 6 425 MHz for use by WAS/RLAN

- In developing its spectrum roadmap; CRAN should also include recommendations on timeline for the release of 5G, Wi-Fi 6E and WiGig spectrum in the short to mid-term.

- Namibia could also consider joining footnote 5.441B at WRC-23 in order to use the frequency band 4 800-4 990 MHz for the deployment of 5G in the future.

Thank you

bienvenu.agbokponto.soglo@intel.com