Tuesday, 15 January 2019

Attention:

Mr. Manyaapelo Richard Makgotlho
Independent Communications Authority of South Africa
350 Witch-Hazel Avenue, Eco Point Office Park,
Eco Park, Centurion, Gauteng

Via e-mail: rmakgotlho@icasa.org.za

Dear Mr. Makgotlho

RE: Intel Corporation submission on the "Draft International Mobile Telecommunications (IMT) Roadmap 2018"

Intel Corporation ("Intel") welcomes the opportunity to respond in writing to the invitation to submit written representations, and present our views on the "**Draft IMT Roadmap 2018"**.

Intel is a world leader in the design and manufacturing of essential technologies and platforms that power the cloud and an increasingly smart, connected world. Our technologies unlock the power of data so that we can ride in self driving cars, connect with each other over lightning fast mobile networks i.e. 5G, have artificial intelligence improve many aspects of our lives, and experience virtual worlds. 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 IMT Roadmap 2018"** are contained in the subsequent pages (page 2 to 9); and we hereby request for an opportunity to make oral representations at the scheduled public hearings, which is planned for 31 January to 1 February 2019.

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

Sincerely Yours;

Dr. Bienvenu AGBOKPONTO SOGLO
Government and Policy Director – Africa
Intel Corporation, the woodlands office park, building 14
2nd floor, western service road, woodmead, Johannesburg, 2052
Email: bienvenu.agbokponto.soglo@intel.com
Tel: +27 11 563 4601; Fax: +27 11 563 4656; Mobile: +27 60 976 9490

Submission to the Independent Communications Authority of South Africa - on the "Draft International Mobile Telecommunications (IMT) Roadmap 2018"

Contents

1. Introduction 3
2. IMT-2020 Proposed actions for identified IMT Frequency bands (Section 7.5) 3
   - 2.1 1.427 – 1.518 GHz (Section 7.5.1) 3
   - 2.2 3.3 – 3.6 GHz (Section 7.5.2) 4
   - 2.3 24.25 - 27.5 GHz (Section 7.5.3) 5
   - 2.4 37 – 43.5 GHz (Section 7.5.5 & 7.5.6) 6
   - 2.5 66 – 76 GHz (Section 7.5.12) 6
3. Considerations IMT Roadmap frequency bands for IMT-2020 Implementation (Section 10.2) 7
4. Conclusion 8

1. Introduction

The Independent Communications Authority of South Africa ("the Authority"), published on the 9th November 2018 (in Government Gazette No. 42021), the Draft International Mobile Telecommunications (IMT) Roadmap for consultation in terms of section 2 and 4, read with sections 30, 31(4), and 33 of the Electronic Communications Act (Act No. 36 of 2005).

Interested persons where invited to submit written representations, including an electronic version of the representation in Microsoft Word, of their views on the Draft IMT Roadmap by no later than 16h00 on Friday, 18 January 2019.

Furthermore, the Authority indicated that persons making representations are further invited to indicate whether they are requesting an opportunity to make oral representations, which will not exceed one hour; and that the public hearings will be held from the 24 to 25 January 2019.

On the 11th January 2019, ICASA published (in Government Gazette No. 42156) a notice (Notice 10 of 2019) to extend the closing date for receipt of written submissions to Monday, 28 January 2019, no later than 16h00.

As a result, of the above extension, the Authority will now hold public hearings from 31 January to 1 February 2019.

Intel Corporation's submission is mainly focused on 1) IMT-2020 Proposed actions for identified IMT Frequency bands and 2) Considerations IMT Roadmap frequency bands for IMT-2020 Implementation.

2. IMT-2020 Proposed actions for identified IMT Frequency bands (Section 7.5)

The fifth generation wireless technologies known as 5G, is more than just another step in the evolution of wireless. It is a new paradigm, where everything is smart, because everything is connected. 5G 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).

To enable 5G; current and next wave connectivity will be needed, and it will be integrating IMT (IMT-2000, IMT-Advanced, and IMT-2020), Wi-Fi, WiGig/mmWave and other wireless technologies.

5G will enable a diverse set of use cases and applications – each with different requirements in terms of spectrum. Therefore, to enable 5G, licensed, license shared and licensed exempt spectrum in low band (below 2 GHz), mid-band (between 2 – 6 GHz) and high bands (above 24 GHz) are needed.

2.1 1.427 – 1.518 GHz (Section 7.5.1)

Intel supports ICASA's proposed action to identify this band for IMT-2020 implementation; and the need for a study to be performed to determine if changes are required to rearrange the band usage.

The World Radiocommunication Conference 2015 (WRC-15) identified the frequency bands 1 427 – 1 452 MHz and 1 492 – 1 518 MHz for IMT in all three Regions and the frequency band 1 452 – 1 492

MHz for IMT in Region 2, Region 3 and 54 countries in Region 1 in accordance with Resolution 223 (Rev.WRC-15).

The development of harmonized frequency arrangements for the 1 427-1 518 MHz frequency range is currently underway in ITU-R Working Party 5D, and would take into account the results of sharing and compatibility studies as outlined in Resolution 223 (Rev.WRC-15). The main frequency arrangements under consideration in the revision of recommendation ITU-R M.1036 are G1 (Downlink only: 1427 – 1517 MHz); G2 (FDD: 1427 -1470 MHz UL/ 1475 – 1518 MHz DL) and G3 (TDD: 1427 – 1517 MHz)[1]; and the corresponding 5G/NR bands defined by 3GGP are n76/n75 for G1, n74 for G2 and n51/n50 for G3.

In Europe, frequency range 1427-1518 MHz is already designated for Mobile/Fixed Communications Networks (MFCN) Supplemental Downlink (SDL) as indicated in ECC Dec (13)03 and ECC Dec (17)06. CEPT report 65 approved on 17 November 2017 by the ECC indicated that CEPT supports 1427-1518 MHz for Wireless Broadband Electronic Communication Services (WBB ECS) for a one direction downlink service (DL WBB ECS)[2].

Discussions on compatibility studies between IMT and BSS (broadcast satellite service); and between IMT and MSS (mobile satellite service) in the adjacent band are currently underway in WP 5D, and additional information on sharing and compatibility studies with regards to this frequency range can be found in the following documents:

1) [Preliminary] draft new Report ITU-R M.[IMT&BSS COMPATIBILITY][3]: Compatibility studies between IMT systems and BSS (sound) systems in the band 1 452-1 492 MHz in different countries in Regions 1 and 3.

2) Working document towards a preliminary draft new Report ITU-R M.[REP.MSS & IMT L-BAND COMPATIBILITY][4]: Adjacent band compatibility studies of IMT-Advanced systems in the mobile service in the band below 1 518 MHz with respect to systems in the mobile-satellite service in the frequency band 1 518-1 525 MHz.

The 1 427 – 1 518 MHz frequency range provides an ideal mix of coverage and capacity. In total, up to 91 MHz of mobile broadband spectrum is available in this band, and will help mobile operators deploy mobile broadband services over wide areas.

2.2 3.3 – 3.6 GHz (Section 7.5.2)

Intel supports ICASA's action to identify the 3 300 – 3 600 MHz band for IMT-2020 implementation; and that consideration be given to an unpaired (TDD) arrangement covering the range 3 300 – 3 600 MHz.

At WRC-15, the frequency band 3 300 - 3 400 MHz was allocated to the Mobile, except aeronautical Service, through various footnotes, and is identified for IMT in forty-five (45) countries across the three

[1] WP5D-C-1110 Attach 4.2
[2] https://www.ecodocdb.dk/download/2a279732-4ab1/CEPTRep065.pdf
[3] WP5D-C-1110 Attach 4.5
[4] WP5D-C-1110 Attach 4.12

regions of the ITU, with thirty three (33) in Africa (Region 1), six (6) in the Americas (Region 2) and six (6) in Asia (Region 3).

The development of harmonized frequency arrangements for the 3 300 – 3 400 MHz frequency band is currently underway in ITU-R Working Party 5D, and would take into account the results of sharing and compatibility studies as outlined in Resolution 223 (Rev.WRC-15).

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 under consideration in the revision of recommendation ITU-R M.1036 is F3 (TDD: 3 300 – 3 700 MHz) which could provide the possibility for administrations to implement IMT in the whole or parts of the bands identified in the Radio Regulations (3 300 - 3 400 MHz, 3 400-3 600 MHz and 3 600 - 3 700 MHz).

From a 5G trial perspective, the 3.5 GHz band (3.3 – 3.8 GHz) is the second most used frequency band; and is emerging as a core 5G band. In Europe, the 3.4 - 3.8 GHz is identified as the first primary band for 5G; which can be used to provide high capacity and coverage.

The 3.5 GHz band is not identified for IMT in its entirety, but will benefit from harmonisation of equipment if TDD band plans are adopted globally. With the use of TDD technology, a single device will be able to operate in the entire range (3.3 - 3.8 GHz: 3GPP band n78) and adjust to portions of the band released in any given country. More information at Considerations for the 3.5 GHz IMT range.

South Africa could designate the 3 300 – 3 600 MHz TDD (3GPP band n78) as one of the core band for 5G.

2.3 24.25 - 27.5 GHz (Section 7.5.3)

Intel supports the Authority's proposed action to identify this band for IMT-2020 implementation; and the need for a study to determine if changes are required to rearrange the band usage.

The 26 GHz band (24.25 – 27.5 GHz) is one of the band under consideration for 5G under Agenda Item 1.13 for WRC-19. This band is identified as a key band to enable 5G; and is gaining momentum for IMT identification globally; and it has been designated as the pioneer band for 5G deployment in the mmWave band e.g. in Europe.

For the OOBE limit required from IMT-2020 to protect the Earth Exploration Satellite Services (EESS) in the 23.6 – 24 GHz band, the African Telecommunication Union has proposed limits of -32 to -37 dBW/200 MHz for the base station and -28 to -30 dBW/200 MHz for the user equipment. It is important to note that whilst Europe / CEPT has decided to implement more restrictive and very conservative limits to guarantee protection of their EESS applications, the Arab Spectrum Management Group (ASMG) has recently decided to implement more relaxed and realistic limits of -32 dBW/200 MHz for the base station and -28 dBW/200 MHz for the user equipment based on an assessment of the coexistence situation in their region.

3GPP has defined the frequency range 2 (FR2) above 24 GHz with 3GPP band n258 referring to the frequency range between 24.25 - 27.5 GHz (26 GHz) and 3GPP band n257 which refers to 26.5 - 29.5 GHz (28 GHz).

Taking into account the fact that there is a 1 GHz of overlap (26.5 – 27.5 GHz) between the 26 GHz and the 28 GHz band, South Africa could take advantage of the early ecosystem development and uptake in the 28 GHz band for future 5G deployments in the 26 GHz when the band becomes available; thanks to prospect of the 26/28 GHz tuning range approach which will include both 26 GHz and 28 GHz enabling terminals to select a sub-band for the region/country it is used in. For more information on new development on the 28 GHz please refer to: http://5g-28frontier.org/.

South Africa could designate the 26 GHz band (24.25 - 27.5 GHz: 3GPP band n258) as the pioneer band for 5G deployment in the mmWave band. And given the current utilization of the 26 GHz band (24.25 - 27.5 GHz) in South Africa, ICASA may consider making part of the band i.e. 26.5 – 27.5 GHz available for 5G in the near term e.g. in 2020, the time to plan for migration of existing services from the rest of the band.

Realistic OOBE limits of -32 dBW/200 MHz for the base station and -28 dBW/200 MHz as decided already by ASMG should also be considered as sufficient to ensure coexistence in South Africa.

2.4 37 – 43.5 GHz (Section 7.5.5 & 7.5.6)

The 37.0 – 43.5 GHz frequency range includes the following three bands under consideration for IMT-2020 under Agenda Item 1.13 for WRC-19: 37 - 40.5 GHz, 40.5 - 42.5 GHz and 42.5 - 43.5 GHz. The identification of the whole range of 37.0 - 43.5 GHz band for IMT at WRC-19 would enable South Africa to select the most appropriate part for the national implementation of IMT-2020, as the above three bands are part of the same tuning range, thus enabling widest possible harmonization. This would also allow for future adjustments regarding which parts of the frequency range will be used for IMT and FSS depending on the evolution of both services in South Africa without the need for further ITU / WRC action, and therefore provide flexibility to adjust the domestic spectrum regulatory situation as needed in the future.

The 40.5 - 43.5 GHz frequency range is a priority band for CEPT and is already identified for future harmonisation in Europe. CEPT considers that this band has good potential for future harmonisation in Europe. Furthermore, CEPT has recognized the harmonization potential of a global IMT tuning range across the 37- 43.5 GHz band at WRC-19 and, whilst CEPT has currently no intention to use the 37 - 40 GHz part for IMT, they would not oppose a global IMT identification of the entire 37 - 43.5 GHz frequency range. This will facilitate the recent decision of the African Telecommunication Union at the APM19-3 meeting to support the full 37- 43.5 GHz frequency range for IMT identification at WRC-19 becoming the globally preferred solution as we see similar trends also in the Asia-Pacific and Americas regions.

Therefore, Intel supports the Authority proposed action to identify the 37 – 43.5 GHz band for IMT-2020 implementation; and the need to perform a detailed study of the current usage of the band and the availability for IMT-2020 applications.

2.5 66 – 76 GHz (Section 7.5.12)

The 66 – 76 GHz frequency range includes the following two bands under consideration for IMT-2020 under Agenda Item 1.13 for WRC-19: 66 – 71 GHz and 71– 76 GHz.

The 66 – 71 GHz is an important band for license-exempt multiple-gigabit 5G systems as part of the overall 5G ecosystem, and the existing co-primary MOBILE allocation is sufficient to enable IMT and non-IMT technologies to develop on an equal basis. An IMT identification for 66 - 71 GHz will fragment the 57 - 71 GHz frequency range creating effectively a hard-border splitting of the 57 - 71 GHz frequency range where IEEE technologies will be disadvantaged.

- IEEE and 3GPP technologies can develop equally in 57 - 66 GHz
- 3GPP technologies are favoured in 66 - 71 GHz due to the IMT identification, restricting or even preventing IEEE technologies from accessing this band in an equal basis

Very few sharing and compatibility studies have been carried out on the 66 -71 GHz band.[5] Many countries have identified 57 – 71 GHz bands for implementation of license-exempt technologies (e.g. 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.[6] Similarly, the European Union's Radio Spectrum Policy Group (RSPG), expressed that "a general authorization" (i.e., license-exempt) regime in the 66 - 71 GHz band would be important for 5G implementation.[7] Similarly, ITU-R confirmed plans for implementation of the Multiple Gigabit Wireless Systems (MGWS) in this frequency band.[8]

The MGWS such as WiGig offer low-latency connectivity that expands the Wi-Fi experience for virtual reality, multimedia streaming, gaming, wireless docking, broadband mesh, p-p and enterprise applications requiring high speed, data-intensive connections. These systems need access to the uncongested 60 GHz frequency band with wide channels 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. Given nascent state of the 5G ecosystem in the 60 - 70 GHz frequency range, it is difficult to predict, prior to WRC-19, how technologies, spectrum needs, market demands and other factors will evolve, but an IMT identification in the 66 - 71 GHz band will be highly disruptive to the ongoing MGWS development and deployments. Such identification would create regulatory and market uncertainty, and, thereby, impede development of license-exempt (e.g., non-IMT) systems[9].

Therefore, Intel is of the view that the 66 – 71 GHz is an important band for 5G overall, but an IMT identification is not required for 5G success and to the contrary will cause significant disadvantages for IEEE-based technologies in accessing this important license-exempt band.

3. Considerations IMT Roadmap frequency bands for IMT-2020 Implementation (Section 10.2)

To enable 5G; current and next wave connectivity will be needed, and it will be integrating IMT (IMT-2000, IMT-Advanced, and IMT-2020), Wi-Fi, WiGig/mmWave and other wireless technologies.

In it recently published report - Spectrum for Terrestrial 5G Networks: Licensing Developments Worldwide, November 2018[10] - the GSA indicated that 45 countries/territories are formally considering introducing certain spectrum bands for terrestrial 5G services, are holding consultations regarding suitable spectrum allocations for 5G, have reserved spectrum for 5G, have announced plans to auction

[5] See Draft CPM 19-2 Report at Paragraph 2/1.13/3.2.9

[6] 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

[7] *See* RSPG Second Opinion on 5G Networks

[8] *See* ITU-R Doc. 5-1/32, Recommendation ITU-R M.2003-2 and Report ITU-R M.2227

[9] WiFi Alliance Info Doc. **APG19-4/INF-XX**

[10] Spectrum for Terrestrial 5G Networks: Licensing Developments Worldwide, November 2018

frequencies or have already allocated spectrum for 5G use. For example in Europe, six countries have already completed auctions of 5G spectrum and another four have recently completed auctions of spectrum that could potentially be used for 5G.

Taking into account South African situations, implementation of the bands identified for IMT as well as ITU Region 1 considerations; Intel is of the view that the Authority could consider to make the 3 300 – 3 600 MHz band and the 26 GHz band available for **5G deployments in 2020**. If it is not possible to make the full 26 GHz band available in the short term, parts of the band e.g. 26.5 - 27.5 GHz could be considered for early 5G deployments and commercial launches. ICASA also needs to consider license exempt spectrum access at 6 GHz (within 5925 – 7125 MHz) and 60 GHz (e.g. 57 – 66 GHz and 66 - 71GHz) bands for 5G, noting that 5G is much more than just IMT and will require a broad spectrum portfolio in low, mid and high bands (both licensed and license-exempt) in order to be able to address all the various 5G use cases and deployment scenarios.

Given the fact that, the first wave of 5G service deployments will use 5G frequencies for improved data throughput, leveraging existing 4G deployments for smoother migration to 5G; the Authority should consider making the 700 MHz/800 MHz and the 2600 MHz bands available for **LTE/LTE-Advanced deployment in 2019**. According to the GSA[11]; 13,117 LTE user devices are on the market globally from 687 manufacturers. For more information on the number of LTE devices identified per frequency bands supported, please refer to GSA report on "Status of the LTE Ecosystem, November 2018".

4. Conclusion

Intel welcomes this opportunity to present its views on the ICASA "**Draft IMT Roadmap 2018"**. Intel believes that 5G is much more than IMT; and to enable 5G, current and next wave connectivity will be needed, and it will be integrating IMT (IMT-2000, IMT-Advanced, and IMT-2020), Wi-Fi, WiGig/mmWave and other wireless technologies.

Intel supports ICASA's proposed action to identify the 1.427 – 1.518 GHz, the 3.3 – 3.6 GHz, the 26 GHz band (24.25 - 27.5 GHz) and the 37 – 43.5 GHz bands for IMT-2020 implementation. For the 66 – 71 GHz band, Intel is of the view that it is an important band for 5G, but an IMT identification is not required for 5G success and will cause significant disadvantages for IEEE-based technologies in accessing this important license-exempt band.

Taking into account South African situations, implementation of the bands identified for IMT as well as ITU Region 1 considerations; Intel believes that the Authority could consider to make the 3 300 – 3 600 MHz band and the 26 GHz band available for 5G deployments in 2020. If it is not possible to make the full 26 GHz band available in the short term, parts of the band e.g. 26.5 - 27.5 GHz could be considered for early 5G deployments and commercial launches.

In addition, given the fact that, the first wave of 5G service deployments will use 5G frequencies for improved data throughput, leveraging existing 4G deployments for smoother migration to 5G; the Authority should consider making the 700 MHz/800 MHz and the 2600 MHz bands available for LTE/LTE-Advanced deployment in 2019.

[11] Status of the LTE Ecosystem, November 2018

Finally, Intel is of the view that ICASA also needs to consider license exempt spectrum access at 6 GHz (within 5925 – 7125 MHz) and 60 GHz (e.g. 57 – 66 GHz and 66 - 71GHz) bands for 5G, noting that 5G is much more than just IMT and will require a broad spectrum portfolio in low, mid and high bands (both licensed and license-exempt) in order to be able to address all the various 5G use cases and deployment scenarios.