ESOA RESPONSE to ICASA CONSULTATION

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As a trade association, the EMEA Satellite Operator's Association (ESOA) welcomes the opportunity to comment on the ICASA Draft IMT Roadmap.[1]

ESOA is a non-profit organisation established with the objective of serving and promoting the common interests of EMEA satellite operators. The Association is the reference point for the European, Middle Eastern, and African satellite industry and today represents the interests of 34 members, including satellite operators who deliver information communication services across the globe as well as EMEA space industry stakeholders and insurance brokers.

ESOA welcomes ICASA's "primary objectives [are] to ensure spectrum efficiency, universal availability of broadband services as well as a vibrant and competitive telecommunications industry and promote investments." These priorities again underline the criticality of satellite communications in the country and elsewhere in Africa in contributing to the availability of broadband services to everyone. This role is to further increase with the deployment of fixed and mobile communications services of the 4G and 5G generations, which expansion and acceleration satellite do and will further support, as explained below.

ESOA notes that "this document builds on the draft Frequency Migration Plan" published in Gazette 41854 on August 24th, 2018. The roadmap hereby published by the Authority identifies the bands for IMT deployment and also identifies the migration of a number of current
licensees out of (or within) bands identified for IMT services. For bands where costs and benefits of the migration were not straightforward, the Authority conducted feasibility studies to determine the appropriateness of migration, details of which can be found in the appendix to this document."

ESOA is notably aware that it was proposed in the draft Radio Frequency Migration Plan 2018 to migrate VSAT systems operating in the 3600-4200 MHz band to the Ku-band. While this consultation is not looking for IMT or FWA above 3600 MHz, since the feasibility studies have not been conducted yet, ESOA wishes to remind that C-band has been a cornerstone of many satellite services for decades. In addition to its key function in providing connectivity within and to areas of high rain fall, where other available bands are

[1] Consultation document available from: https://www.icasa.org.za/news/2018/icasa-is-soliciting-comments-on-the-draft-international-mobile-telephony-imt-roadmap

inappropriate, C-band is extensively used for a number of other critical functions within South Africa. ESOA therefore urges ICASA to keep the current allocation of the 3600 – 4200 MHz band to FSS and in particular VSAT services, and to adopt measures that adequately protect existing and future satellite services in C-band.

ESOA also has specific comments to share with regards to the increasing importance of Ka and V frequency bands for satellite and the need to ensure IMT protection of satellite in L band, as detailed below.

Kind regards

Aarti Holla
Secretary General

1. Introduction - Satellite role in supporting IMT-2020 (5G)

ICASA Draft IMT Roadmap (in Section 3.1.3) is referencing the ITU IMT-2020 as background information and justification for IMT spectrum needs. IMT-2020, also known as 5G, is based on three key usage scenarios: enhanced mobile broadband (eMMB), massive machine-to-machine type communications (mMTC) and ultra-reliable, low-latency communications (uRLLC). As indicated, Recommendation ITU-R M.2083 “IMT Vision – Framework and overall objectives of the future development of IMT for 2020 and beyond” has subsequently defined the capabilities of 5G networks.

As highlighted by ICASA, “For an increasing number of South African consumers and businesses, mobile connectivity is now an everyday necessity. Our desire to get online wherever we are – and at ever-faster speeds – has helped fuel an explosion in mobile data.” The satellite community is playing a key role in facilitating such connectivity to everyone, everywhere. In particular, satellite backhaul is being used extensively today supporting MNO efforts to extend their network coverage, both for cellular and mobility applications. Given the technological and business options available for using satellite backhaul and recent technology innovations such as High Throughput Satellites and new constellations of lower orbit satellites**, there is good reason for MNOs to make more intensive use of satellite service for backhaul, including for 5G in the future**. For more information, please consult ESOA is pleased to refence its paper on Connectivity Through Backhaul:
https://esoa.net/Resources/Connectivity-through-Backhaul-GSC-version.pdf

ESOA also fully supports ICASA’s statement that “in the future, it is foreseen that new demands, such as more traffic volume, many more devices with diverse service requirements, better quality of user experience (QoE) and better affordability by further reducing costs, etc., will require an increasing number of innovative solutions (…) technological advancement and the corresponding user needs will promote innovation and accelerate the delivery of advanced communication applications to consumers.”

The satellite industry is massively innovating and growing at a rapid pace. Major satellite operators already are deploying new-generation satellites with high data throughputs to help deliver fast, flexible internet access services from anywhere in the world. Satellites are now being used in multiple Geostationary and Non-Geostationary orbits, with newer, more efficient throughput technics and more adapted ground terminals. In order to meet ever-growing customer demand for data, satellite operators and service providers are making substantial investments that considerably improve spectrum efficiencies and reduce latency, including the deployment of High Throughput Satellites (HTS) in geostationary orbit (GEO), the existing and forthcoming deployment of medium-earth orbit (MEO) and the future advent of low-earth orbit (LEO) systems.

GEO HTS today can deliver data directly to fixed locations and mobile users with speeds of up to 100 Mbit/sec and more. Existing MEO systems can provide trunking and backhaul capacity that rivals fibre, offering speeds up to 2 Gbps and latency below 150 ms round-trip to large end-users such as Fixed and Mobile Network Operators. Future MEO and LEO systems will later provide multi-terabit connectivity solutions. The MEO and LEO systems can also be used in conjunction with GEOs to meet a variety of user demands.

The inclusion of satellite technologies will be essential if the benefits of 5G are to extend to places not served or underserved by terrestrial technologies. ESOA members have thus taken a leading role and proactive interest in ensuring satellite is seamlessly integrated into the new 5G capabilities, working collaboratively with other industry players from the terrestrial and satellite realms to develop standards, technologies and best practices.

At the ITU level, Working Party 4B has drafted a report that identifies the **key elements for integration of satellite systems into Next Generation Access Technologies**, as part of 5G (See ITU Chairman Report 145 - Annex 5: Preliminary draft new Report ITU-R M.[NGAT_SAT] available from: https://www.itu.int/md/R15-WP4B-C-0145/en).

The ITU 4B draft report reminds that **from Recommendation ITU-R M.2083**, "interworking will be necessary among **various access technologies, which might include a combination of different fixed, terrestrial and satellite networks**. Each component should fulfil its own role, but should also be integrated or interoperable with other components to provide ubiquitous seamless coverage". The same draft report therefore identifies **4 main use cases for the integration of satellite-based solutions into Next Generation Access Technologies**: Trunking and Head-end Feed, Backhauling and Tower Feed, Communications on the Move and Hybrid Multiplay.

Use cases	Examples	Number of sites
Trunking and head-end feed	Service to remote areas; special events	Limited to unserved cells in a carrier's network
Backhauling and tower feed	Surge capacity to overloaded cells, plus content delivery (e.g. video) to local caches; efficient broadcast service to end users	Hundreds
Communications on move	In Flight Connectivity for Aircraft; connectivity to land vehicles; broadband to ships and trains	Thousands
Hybrid multiplay	Video and broadband connectivity to home or multi-tenant building with NGAT distribution in building	Millions

ESOA members will remain active in this group to support further development of this ITU document towards its final approval and publication.

ITU-T Study Group 13, which leads ITU's standardisation work on next generation networks, including IMT-2020, also has recognised the key role of satellite systems in 5G. The report of its Focus Group on IMT-2020 noted that "[t]he IMT-2020 network architecture is required to include multiple RAN technologies including satellite," and that "studies should focus on all aspects of the integration of satellite technologies into the IMT-2020 network architecture." (See FG IMT-2020 Chairman's Report 2016 available from: https://www.itu.int/en/ITU-T/focusgroups/imt-2020/Documents/FG_IMT-2020_Deliverables_2016.zip). Pursuant to this finding, Study Group 13 has continued to focus on the role of the satellite component of IMT-2020, and the internetworking of the multiple technologies that will make up the 5G system.

At the CEPT level, **ECC Report 280 "Satellite Solutions for 5G"** (https://www.ecodocdb.dk/document/2989) adopted in May 2018 presents the 4 main satellite use cases more in details (in Section 5) and informs that the relevance of each of the 5G capabilities identified in Recommendation ITU-R M.2083 may be significantly different, depending on the exact use cases/scenario. This is well illustrated by Figure 1 of the Report: **Bandwidth and latency requirements of potential 5G use cases (source: Nokia)**, replicated below.

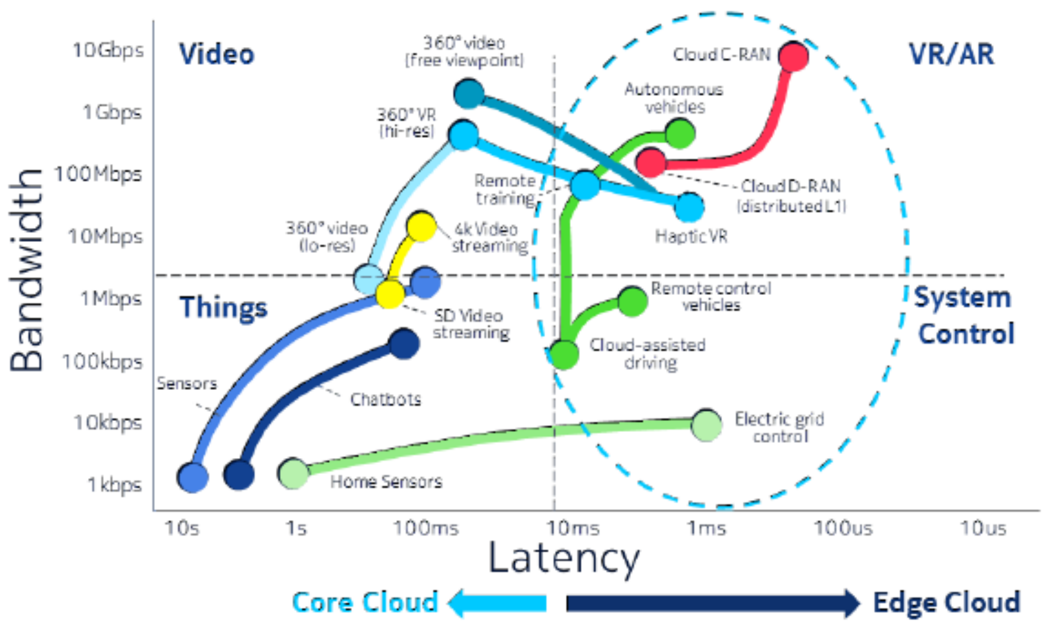

Figure 1: Bandwidth and latency requirements of potential 5G use cases (source: Nokia)

"Not all of the use cases identified in the figure have the extreme bandwidth and/or latency requirements that 5G technologies will enable. As a result, satellites – both geostationary and non-geostationary –could play important roles in supporting the key 5G usage scenarios, including emerging 5G applications", the ECC Report notes.

Last but not least, **there is high interest and participation in ETSI-3GPP from the satellite communication industry**, with companies and organizations convinced of the market potential for an integrated satellite and terrestrial network infrastructure in the context of 5G. ESOA last year became a market partner in 3GPP (http://www.3gpp.org/news-events/partners-news/1986-esoa_mrp). The roles and benefits of satellites in 5G have been studied in 3GPP Release 14, leading to specific service requirements to support satellite access, recognizing the added value that satellite coverage brings, as part of the mix of access technologies for 5G. As a further step, identification of use cases for the provision of services when considering the integration of 5G satellite-based access components in the 5G system is now being developed in ETSI as part of the preparatory work for Release 16.

It is clear that ESOA members are committed to ensure satellite will be fully integrated into the future 5G ecosystem, as expressed in our various deliverables on the topic. (see from: https://esoa.net/5g/)

2. Satellite spectrum needs for 5G

Some of the 5G performance expectations can already be met by today's HTS satellites (e.g. for a global reach of multicast or M2M services), whilst others will depend on the launch of a next generation of satellites. Very importantly, satellite operators need continued access to radio spectrum to make this performance tangible and sustainable.

The ITU Plenipotentiary Conference adopted in November 2018 amendments to Resolution 203 on Connectivity to Broadband Networks which now invites ITU Member States "to facilitate connectivity to satellite and terrestrial broadband networks, including enabling access to spectrum, as appropriate, as one important component of access to broadband services and applications, including to remote, underserved and unserved areas." (see page 317 from the Final Acts: https://www.itu.int/web/pp-18/en/page/61-documents)

Our key messages in relation to radio spectrum are as follows:

- Mobile industry should be (more) supportive of satellite integration into 5G, with respect to standards, products & services as well as the regulatory environment. This would immensely help avoiding spectrum-related frictions and contribute to achieve a win-win approach whereby each technology contributes to 5G achievements

- Satellite needs continued access to a range of frequencies. Terrestrial spectrum considerations should respect ITU/WRC-19 agenda and not push for frequency bands outside this scope, which could undermine a stable and internationally harmonized regulatory environment that is needed for satellite. In this respect, ESOA fully supports the selection made by the CEPT of the pioneer frequency bands for 5G initial deployments (i.e. 24.25-27.5 GHz, 40.5-43.5 GHz and 66-71 GHz), as reflected in their 5G Roadmap (www.cept.org/ecc/topics/spectrum-for-wireless-broadband-5g)

ESOA is therefore please to read from ICASA's Draft IMT Roadmap that WRC-19 agenda is considered a solid reference not to depart from (as per explicit reference to Resolution 238 in Section 3.3).

3. Satellite Usage of Ka and V band spectrum

ESOA has looked carefully at the IMT-2020 Frequencies for Consideration from Section 7.4 of the Draft IMT Roadmap, in view of existing South Africa national allocations in the 24.25-27.5 GHz (Section 7.4.3), 37-40.5 GHz (7.4.4), 42.5-43.5 (7.4.5) and 40.5-42.5 GHz (7.4.12) bands.

ESOA has first noted that several ITU allocations to FSS in these bands were not reflected in the national allocation table, e.g. in the 24.65-24.75 GHz, 37.5-38 GHz and 38-39.5 GHz bands. Even though these bands are not widely used by FSS at the moment, it is important to preserve access to this spectrum for future satellite systems, as well as in the 24.75-25.25 GHz band.

The whole 24.65-25.25 GHz band notably is foreseen for use primarily for BSS feeder links and the expected use is for a limited number of larger earth stations (teleports, pay TV providers and Broadcasters). The ability to provide uplinks from these earth stations needs to be safeguarded. In this band, the minimum earth station antenna diameter of 4.5m as per RR 5.532B (which ICASA references in their table) will facilitate co-existence between FSS and IMT 5G. Minimum separation distances and the limited number of FSS earth stations foreseen in the band 24.65-25.25 GHz makes sharing feasible between FSS and IMT.

However, to protect receiving space stations, 5G transmitters in this band will need to comply with reasonable TRP (total radiated power) levels and limit the elevation of the IMT base station antennas to below the horizon, as was assumed in the studies used to demonstrate compatibility between the services.

It is noted that in the frequency band 37-39.5 GHz, the typical application in the NRFP is Fixed Links. Further, based on the information in Section 7.5.5 of the Draft IMT Roadmap, there seem to be a large number of licensees in this band. Based on this, and given that other regions with ITU Region 1 (i.e. CEPT, ASMG and RCC) have no intention to make the band 37-40.5 GHz available for IMT, ESOA is of the view that ICASA should not make this band available for IMT.

Further, ESOA has noted that ICASA is considering that the 40.5-42.5 GHz band “may require additional allocation to the mobile service on a primary basis” (for now, Mobile is secondary in this band) together with the 31.8-33.4 GHz and 47-47.2 GHz bands.

It is essential to keep in mind that several frequencies of the Q/V-band spectrum are becoming critical to FSS systems. WRC-19 Agenda Item 1.6 seeks to develop a regulatory framework to allow NGSO (Non-Geostationary Orbital) satellites to operate efficiently in the V-band (37.5-39.5 GHz, 39.5-42.5 GHz, 47.2-50.2 GHz, and 50.4-51.4 GHz). In the US only, there are 8 V band filings for FSS that have been introduced to the FCC, based on the existing ITU allocation, in view of providing global satellite broadband services. Some authorizations have already been granted. (See notably: https://www.fcc.gov/document/fcc-grants-spacex-ngso-v-band-authorization). This spectrum is to be used, not only for receivers of HTS satellites signals and gateway feeder-links of next generation satellites, but also for HD-FSS terminals in the future.

4. Satellite Usage of L Band spectrum

Sections 7.4 and 7.5 of the Draft IMT Roadmap also include 1.427-1.518 GHz as potential frequencies for IMT-2020. ESOA notes that these considerations regarding compatibility between IMT in this band and adjacent mobile satellite services (MSS) in the 1.518-1.559 GHz band, taken together with the other issues related to the existing use of this band, may make deployment of IMT across the entirety of the 1.427-1.518 GHz band not feasible.

Section 7.5.1 of the Draft IMT Roadmap acknowledges the existence of incumbent fixed wireless licenses in portions of 1.427-1.518 GHz band, and notes additional studies are required to determine whether the current use of the band would need to be rearranged. However, the Draft IMT Roadmap does not address issues related to compatibility with existing and planned Mobile Satellite Services in the 1.5 GHz band.

The 1.427-1.518 GHz band is adjacent to the MSS allocation at 1.518-1.559 GHz. MSS in this frequency band provides critical communications for diverse government and industrial users throughout Africa, fulfilling important public safety goals, and supporting key, growing aspects of African economies. These MSS operations are particularly important in South Africa, where they support many important government functions. For example, land-based MSS terminals are used by the VIP Protection Unit of the South African Police, by the Army, and by the intelligence services for secure and reliable mobile communications. Maritime MSS communications are relied upon by the South African Navy and by the Department of Agriculture, Forestry and Fisheries to support fisheries protection activities. And aeronautical MSS operations are key to flight safety, including supporting the Aeronautical Mobile Satellite (Route) Service (AMS(R)S).

Studies conducted at the ITU, CEPT, and elsewhere have demonstrated that IMT deployment in the 1.427-1.518 GHz band poses a significant risk of harmful interference to these important MSS operations. Without appropriate protections, such as frequency separation and power restrictions placed on IMT operations, introduction of IMT into the 1.492-1.518 GHz band, directly adjacent to MSS operations, could jeopardize the continued reliability of these important satellite communications systems. This harmful interference could disrupt government operations, prevent the achievement of government objectives, require an untimely and expensive upgrade of government communications equipment, and ultimately cause substantial harm to the South African people and economy.

Given the significant challenges with deploying IMT in the upper portion of the 1.427-1.518 GHz band, and the large number of other frequency bands under consideration by ICASA, ESOA respectfully suggests that ICASA prioritise work on other frequency bands before looking to expand IMT use of the 1.427-1.518 GHz band. Additionally, should ICASA choose to turn its attention to this band, it would better adopt an approach that will ensure continued viability and growth of MSS services above 1.518 GHz. In particular, one approach ICASA might consider would be to focus first on deploying IMT in the portion of the band below 1.492 GHz, deferring consideration of the higher frequency ranges for the time being. Indeed, this is similar to an approach recently proposed by the French regulator ARCEP, in its ongoing examination of the same band. (See ARCEP, Consultation Publique, "Attribution de nouvelles fréquences pour la 5G" (26 Octobre 2018) - https://www.arcep.fr/actualites/les-consultations-publiques/p/gp/detail/attribution-de-nouvelles-frequences-pour-la-5g.html).