

## Input Contribution to EACO

Online, 28February 2022

### SES / Telesat

#### Agenda Item 1.16

##### *Part A: Description*

**1.16** to study and develop technical, operational and regulatory measures, as appropriate, to facilitate the use of the frequency bands 17.7-18.6 GHz and 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) by non-GSO FSS earth stations in motion, while ensuring due protection of existing services in those frequency bands, in accordance with Resolution **173 (WRC-19)**;

##### *Part B: Key Elements - the notables*

###### **Earlier ATU ESIM considerations in WRC contexts**

It is noted that ATU members have been already supporting establishing regulatory clarity and thereby efficiently allowing ESIM to operate with GSO FSS systems. To establish Agenda Item 1.16 was also supported by ATU as an AFCP at WRC-19.

###### **Final Report of APM23-2**

The Final Report of APM23-2 (Sep 2021) Recommended that ATU Members States to actively participate at the Working group meetings and contribute to studies on this agenda item to ensure all the pertinent aspects that are critical for the continent are taken into consideration and a satisfactory final position is achieved on this agenda item.

###### **Non-GSO Earth Stations In Motion (ESIM) User Requirements**

The development of ESIM is addressing the growing need for access to broadband connectivity, regardless of location. The rapid growth in demand for broadband applications on the move can be met by allowing ESIM to communicate with space stations of the fixed-satellite service operating in higher frequency bands such as Ka-band.

Operations of ESIM communicating with GSO space stations of the fixed-satellite service has already been addressed in Resolution **156 (WRC-15)** for the 19.7-20.2 GHz and 29.5-30.0 GHz frequency bands and in Resolution **169 (WRC-19)** for the 17.7-19.7 GHz and 27.5-29.5 GHz frequency bands. This latter resolution was successfully developed at WRC-19 with important support from ATU members.

A number of non-GSO constellations operating in the Ka-band are currently operating, in the process of being

deployed or being planned. These constellations are designed to meet the consumer, enterprise and governments demand for broadband connectivity, anywhere in the world, including Africa. One area of noticeable growth for non-GSO connectivity is for ESIM applications where low latency is critical and that can benefit from the typical lower altitude of non-GSO constellations compared to that of a GSO satellite. Also, through the use of frequency reuse schemes, flexible capacity routed to users through steerable and shapeable beams, as well as optical inter-satellite links, novel NGSO systems will offer unprecedented amounts of capacity, revolutionizing available bitrates and costs. The development of a non-GSO ESIM framework that satisfies the provisions of Resolution **173 (WRC-19)** and that is consistent with the GSO ESIM framework will support the growing need for ubiquitous broadband connectivity on the move while protecting existing services in the relevant frequency bands.

#### **Non-GSO ESIM Operational Characteristics**

The operational concepts of non-GSO ESIM are envisioned as being the same as for any other fixed non-GSO FSS user terminal (e.g. Very Small Aperture Terminals – VSAT), except that the terminal is installed on a moving platform. In general, all regulatory restrictions and conditions that currently apply to non-GSO FSS operation will also apply for the operation of non-GSO ESIM. Moreover, like in the case of GSO ESIM, additional technical, operational and regulatory provisions (e.g., Power-Flux Density limits) should also apply so that incumbent services are protected by those ESIM that operate in geometrical scenarios different from those of static VSAT terminals (e.g., ESIM operating from a moving ship or aircraft). These measures will ensure that other space and terrestrial service are adequately protected.

Most non-GSO ESIM manufacturers are building satellite terminals that are compatible with both non-GSO systems and GSO networks since their technical requirements are very similar. Even further, several ESIM terminals are designed to be able to support multi-orbit interoperability (i.e., they are able to switch from communicating with a GSO satellite to communicating with a non-GSO satellite, if required). This has already been demonstrated in recent years with test flights using an aeronautical ESIM showing that seamless switching between GEO and MEO satellites<sup>1</sup> or between GEO and LEO satellites<sup>2</sup> is possible. This similarity in the technical and operational characteristics of GSO and non-GSO ESIM should also be reflected in the sharing studies to be carried out as described in the examples in the section below and is expected to lead to technical, operational and regulatory measures for non-GSO ESIM similar to those that WRC-19 took for GSO ESIM (see Resolution **169 (WRC-15)**). It is important to note that a discriminatory (GSO vs NGSO) regulatory framework may lead to an “artificial” competitive disadvantage for NGSO, hindering the competition and potential benefits for customers.

It is also worth highlighting that, in the European region, NGSO ESIM have been successfully introduced since 2015, supported by the regulatory framework established by ECC/Decision(15)04<sup>3</sup>. Notably, the sharing conditions with terrestrial systems in the 28 GHz band are identical to the ones for GSO ESIM in the same frequency range (ECC/Decision(13)01)<sup>4</sup>.

#### **Outcomes for GSO ESIM and possible solution for non-GSO ESIM to protect incumbent services**

The following tables highlight the similarities in the sharing studies that supported the approval of Resolution **169 (WRC-19)** and that are currently (or planned to be) carried out under Resolution **173 (WRC-19)**. These tables also provide possible solutions that WRC-23 may endorse to enable the operation of non-GSO ESIM in those portions of the Ka-band studied under WRC-23 AI 1.16.

<sup>1</sup> <https://www.thinkom.com/first-in-flight-meo-geo-roaming-tests/>.

<sup>2</sup> <https://apex.aero/2018/10/23/global-eagle-telesat-leo-connectivity>.

<sup>3</sup> <https://docdb.cept.org/download/1496>

<sup>4</sup> <https://docdb.cept.org/download/1513>

In the 17.7 – 20.2 GHz, ESIM communicating with non-GSO satellites are not expected to cause interference as they are receiving in this frequency band.

#### ***Fixed-Satellite Service***

In the frequency bands 27.5 – 29.1 GHz and 29.5 – 30 GHz FSS (GSO and non-GSO) space services are incumbent services.

TABLE 1

#### **Outcomes for GSO ESIM and possible solution for non-GSO ESIM to protect FSS**

<b>Incumbent service</b>	<b>Regulations for GSO ESIMs approved at WRC-15 &amp; WRC-19</b>	<b>Proposed way forward for non-GSO ESIM</b>
GSO FSS (uplink)	Remain within characteristics and coordination “envelope”	<p>In the frequency bands 27.5 – 28.6 GHz and 29.5 – 30.0 GHz, non-GSO ESIM shall comply with epfd limit in Article 22 (Table 22-2) to protect GSO FSS.</p> <p>In the frequency band 28.6 – 29.1 GHz, non-GSO ESIM shall remain within the characteristics of typical non-GSO earth stations associated with the satellite network with which the ESIM communicate, and coordination will be based on RR No. <b>9.11A</b></p>
Non-GSO FSS (uplink)	Remain within characteristics and coordination “envelope” and within on-axis and off-axis EIRP spectral density limits (in 27.5-28.6 GHz)	Remain within characteristics and coordination “envelope” of non-GSO FSS networks and coordination under RR No. <b>9.12</b>

#### ***Earth Exploration Satellite Service***

In the frequency bands 28.5 – 30 GHz EESS is an incumbent service.

TABLE 2

**Outcomes for GSO ESIM and possible solution for non-GSO ESIM to protect EESS**

<b>Incumbent service</b>	<b>Regulations for GSO ESIMs approved at WRC-15 &amp; WRC-19</b>	<b>Proposed way forward for non-GSO ESIM</b>
EESS (Earth-to-space) in 28.5 – 30 GHz (secondary)	Remain within characteristics and coordination “envelope”	Remain within the envelope characteristics of typical non-GSO earth stations associated with the satellite network with which the ESIMs communicate.

**Terrestrial Services**

In the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 27.5 - 29.1 GHz, both FS and MS are incumbent services.

TABLE 3

**Outcomes for GSO ESIM and possible solution for non-GSO ESIM to protect FS and MS**

<b>Incumbent service</b>	<b>Regulations for GSO ESIMs approved at WRC-15 &amp; WRC-19</b>	<b>Proposed way forward for non-GSO ESIM</b>
Terrestrial services operating in the 17.7-18.6 GHz and 18.8-19.3 GHz	Receiving ESIM shall not claim protection	Receiving ESIM shall not claim protection
Terrestrial services operating in the 27.5-29.1 GHz	<p>Aeronautical ESIM shall meet a PFD mask on the ground as per ANNEX 3 to Resolution 169 (WRC-19).</p> <p>Maritime ESIM shall:</p> <ul style="list-style-type: none"> <li>(i) Stay 70 km away from the shore</li> <li>(ii) Limit EIRP spectral density towards the horizon as per ANNEX 3 to Resolution 169 (WRC-19)</li> </ul>	<p>Aeronautical ESIM: Studies to be conducted to determine the PFD mask to be met at any point on the ground by aeronautical non-GSO ESIM.</p> <p>Maritime ESIM: Studies to be conducted to determine the EIRP spectral density towards the horizon and the distance from shore to be complied by maritime non-GSO ESIM.</p>

**Part C: Current Status of Band or Issue**

17.7-18.6 GHz and 18.8-19.3 GHz – different segments of the bands are allocated to fixed, fixed-satellite, mobile, earth exploration satellite and space research services.

27.5 – 29.1 GHz – different segments of the band are allocated to fixed, inter-satellite, fixed satellite, mobile and earth exploration satellite services.

29.5-30 GHz and 19.7-20.2 GHz – these are satellite exclusive bands

Adequate protection to systems sharing the same band, including GSO systems, needs to be ensured.

#### *Part D: Conclusion of the results of studies, if any*

Working Party 4A (WP 4A) is the responsible ITU-R group for conducting the studies under Agenda Item 1.16. WP 4A has held five remote meetings so far this WRC-23 study cycle, the last took place 27 October – 4 November 2021. Several Correspondence Groups have also been held to advance progress.

At the last meeting of WP 4A several sharing studies between non-GSO Aeronautical and Maritime ESIM and stations of the Terrestrial service were submitted. Studies submitted so far are confirming that the same conditions as for GSO ESIM would also protect terrestrial services from non-GSO ESIM.

In parallel, the development of a draft CPM text and draft Resolution is progressing.

The draft Resolution contemplates resolves requiring two methodologies:

- for the examination of aeronautical non-GSO ESIM characteristics with respect to the conformity with the power flux-density (pfd) limits on the Earth's surface
- to verify that the non-GSO FSS systems operating in accordance with the resolution comply with the epfd limits specified in 22.5C, 22.5D and 22.5F.

The next meeting of the Correspondence Group on AI 1.16 is scheduled for 27 April 2022 while the next meeting of WP 4A is scheduled for 11-20 May 2022, and administrations are encouraged to participate actively to progress the work.

#### *Part F: Proposed EACO Common View and/or Position*

SES & Telesat are actively involved in the Agenda Item 1.16 deliberations and would, after careful study, like to further propose that EACO considers the following positions during this meeting with a view to propose them as EACO's input contributions to the next ATU WG4A meeting:

EACO supports the development of technical and regulatory provisions for the operation of ESIM with non-GSO FSS systems in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (space-to-Earth) and 27.5-29.1 GHz and 29.5-30 GHz (Earth-to-space) whilst ensuring the protection of existing services

- Non-GSO ESIM operating in the frequency bands 17.7-18.6 GHz, 18.8-19.3 GHz and 19.7-20.2 GHz (see No. 5.524) shall not claim protection from terrestrial services to which the frequency band is allocated and operating in accordance with the Radio Regulations
- for the protection of space services non-GSO ESIM characteristics shall remain within the envelope characteristics of typical earth stations associated with the non-GSO satellite system with which these ESIM communicate
- Support the development of a methodology regarding examination by the Bureau of compliance with pfd limits by non-GSO aeronautical ESIM and of adequate transitional measures in case WRC-23 could not finalise the methodology, as appropriate
- For the protection of GSO FSS networks operating in the 17.8-18.6 GHz, 19.7-20.2 GHz, 27.5-28.6 GHz and 29.5-30.0 GHz the relevant EPFD limits in Nos. 22.5C, 22.5D and 22.5F shall apply and the methodology included in Rec. ITU-R S.1503 for determination of compliance with epfd limits in Article 22 is applicable to ESIM communicating with non-GSO FSS systems
- For the protection of terrestrial services operating in the 27.5-29.1 GHz from non-GSO ESIM, technical conditions similar to Res.169 could be developed based on sharing studies (PFD limits for A-ESIM ; min distance from the coast and max EIRP spectral density towards the horizon for M-ESIM)
- For the protection of secondary allocation to terrestrial services (No. 5.542) in the 29.5-30 GHz the

conditions defined in the 27.5-29.1 GHz frequency range could apply as a guidance for the concerned administrations

***Part G: Recommendations and Way Forward***

SES & Telesat recommend that EACO considers the above proposed positions during this meeting with an opportunity to submit them as input contributions to the next ATU WG4A meeting.