

RESOLUTION 156 (REV.WRC-23)

Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations in motion communicating with geostationary space stations in the fixed-satellite service¹

The World Radiocommunication Conference (Dubai, 2023),

considering

- a)* that there is some regulatory ambiguity in the current No. **5.526** with respect to its scope of application;
- b)* that there is a need for global broadband mobile-satellite communications, and that some of this need could be met by allowing earth stations in motion (ESIMs) to communicate with space stations of the fixed-satellite service (FSS);
- c)* that the ITU Radiocommunication Sector (ITU-R) has studied certain aspects of the technical and operational use of ESIMs and that the result of these studies is contained in Reports ITU-R S.2223 and ITU-R S.2357;
- d)* that appropriate technical, regulatory and operational procedures are required for ESIMs;
- e)* that current regulatory provisions and their associated Rules of Procedure provide the possibility that an earth station operate within the envelope of coordination agreements established for the corresponding satellite network;
- f)* that there may be a need to clarify that ESIMs as referred to in this Resolution are not intended to be used or to be relied upon for the provision of safety-of-life applications,

recognizing

- a)* that the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz are globally allocated on a primary basis to the FSS and are used by geostationary-satellite orbit (GSO) FSS networks;
- b)* that, in the frequency band 29.5-30.0 GHz, there is an allocation to the fixed and mobile services on a secondary basis in a number of countries (see No. **5.542**) and, in the frequency band 19.7-20.2 GHz, there is an allocation to the fixed and mobile services on a primary basis in a number of countries (see No. **5.524**);
- c)* that there is a need to take actions to eliminate harmful interference which may be caused to terrestrial services of those administrations listed in No. **5.542**;

¹ As referred to in the Table of Frequency Allocations.

d) that, currently, there is no specific regulatory procedure for the coordination of ESIMs with regard to terrestrial services;

e) that WRC-15 adopted No. **5.527A** to clarify that ESIMs can communicate with GSO FSS space stations in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz under certain conditions specified in *resolves* 1-4 below;

f) that a class of station is defined in the Preface to the International Frequency Information Circular of the Radiocommunication Bureau (BR IFIC) for ESIMs communicating with GSO FSS space stations for the application of the provisions of No. **5.527A** for satellite network filings under Articles **9** and **11**;

g) that successful coordination does not in any way imply licensing authorization to provide a service within the territory of a Member State (see also *recognizing b*) of Resolution **25 (Rev.WRC-23)**),

resolves

1 that ESIMs communicating with the GSO FSS shall operate under the following conditions:

- 1.1 with respect to satellite networks of other administrations, the earth station shall remain within the envelope of the coordination agreements of the satellite networks with which this earth station is associated or, in the absence of such agreements, comply with the off-axis equivalent isotropically radiated power (e.i.r.p.) density levels given in the Annex;
- 1.2 with respect to terrestrial services of other administrations mentioned in No. **5.524**, the ESIM shall not claim protection from, or impose constraints on the development of, these services operating in the frequency band 19.7-20.1 GHz in Regions 1 and 3;
- 1.3 with respect to any terrestrial systems operating in the frequency band 29.5-29.9 GHz in Regions 1 and 3 in the countries listed in No. **5.542**, the notifying administrations operating maritime ESIMs operating in international waters and aeronautical ESIMs operating in international airspace shall ensure that such operations do not cause unacceptable interference;
- 1.4 in the case of interference, the administration responsible for the satellite network shall, upon receipt of a report of harmful interference with respect to any terrestrial systems operating in the countries listed in No. **5.542**, immediately cease the interference or reduce it to an acceptable level;
- 1.5 to this effect, that administration shall submit to the Bureau a commitment for implementation of *resolves* 1.4 above;
- 1.6 that these earth stations are to be subject to permanent monitoring and control by a network control and monitoring centre (NCMC) or equivalent facility and capable of receiving and acting upon at least “enable transmission” and “disable transmission” commands from the NCMC;
- 1.7 that these earth stations are not to be used or relied upon for safety-of-life applications;

2 that the administration responsible for the satellite network shall ensure that the ESIMs employ techniques to track the associated GSO FSS satellite and that they are resistant to capturing and tracking adjacent GSO satellites;

3 that the notifying administration for the satellite network within which the ESIMs operate by means of fixed, mobile or transportable terminals shall ensure that they have the capability to limit operations of such earth stations to the territory or territories of administrations having authorized those earth stations and to comply with Article 18;

4 that administrations authorizing ESIMs shall require the operators to provide a point of contact for the purpose of tracing any suspected cases of interference from ESIMs.

ANNEX TO RESOLUTION 156 (REV.WRC-23)

Off axis e.i.r.p. density levels for earth stations in motion communicating with geostationary space stations of the fixed-satellite service in the frequency band 29.5-30.0 GHz²

This annex provides a set of off-axis e.i.r.p. levels for earth stations in motion (ESIMs) operating in the frequency band 29.5-30.0 GHz.

ESIMs operating and communicating with geostationary space stations in the fixed-satellite service transmitting in the frequency band 29.5-30.0 GHz shall be designed in such a manner that at any angle, θ , which is 2° or more from the vector from the earth station antenna to the associated satellite (see Figure 1 below for the reference geometry of an ESIMs compared to an earth station at a fixed location), the e.i.r.p. density in any direction within 3° of the GSO, shall not exceed the following values:

Angle θ	Maximum e.i.r.p. per 40 kHz*
$2 \leq \theta \leq 7^\circ$	$(19 - 25 \log \theta)$ dB(W/40 kHz)
$7 < \theta \leq 9.2^\circ$	-2 dB(W/40 kHz)
$9.2 < \theta \leq 48^\circ$	$(22 - 25 \log \theta)$ dB(W/40 kHz)
$48 < \theta \leq 180^\circ$	-10 dB(W/40 kHz)

* Other levels may be coordinated and mutually agreed between affected administrations (see also *resolves* 1.1).

NOTE 1 – The values above are maximal values under clear-sky conditions. In the case of networks employing uplink power control, these levels should include any additional margins above the minimum clear-sky level necessary for the implementation of uplink power control. When attenuation by rain occurs and uplink power control is used, the levels stated above may be exceeded to compensate for that attenuation. When uplink power control is not used and the e.i.r.p. density levels given above are not met, different values could be used in compliance with the values agreed to through bilateral coordination of GSO FSS satellite networks.

² See also Report ITU-R S.2357 for ease of reference.

NOTE 2 – The e.i.r.p. density levels for angles of θ less than 2° may be determined from GSO FSS coordination agreements taking into account the specific parameters of the two GSO FSS satellite networks.

NOTE 3 – For geostationary space stations in the fixed-satellite service employing code division multiple access (CDMA) with which the ESIMs are expected to transmit simultaneously in the same 40 kHz band, the maximum e.i.r.p. density values should be decreased by $10 \log(N)$ dB, where N is the number of ESIMs that are in the receive satellite beam of the associated satellite and that are expected to transmit simultaneously on the same frequency. Alternative methods may be used if agreed between affected administrations.

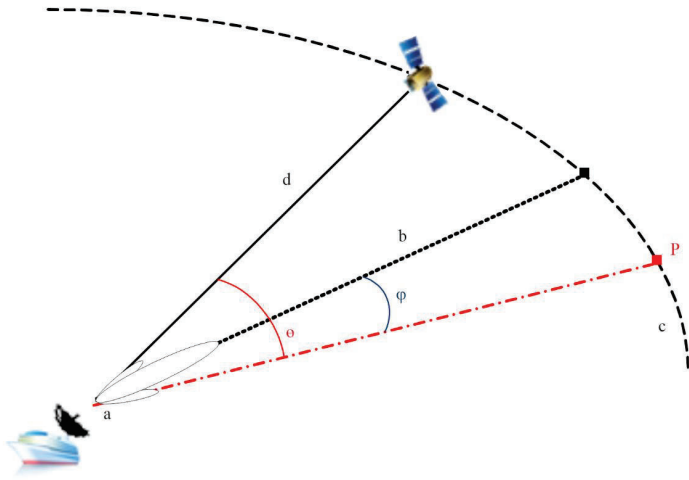
NOTE 4 – Potential aggregate interference from ESIMs operating within the fixed-satellite service using multi-spot frequency reuse technologies should be taken into account in coordination with respect to other GSO satellite networks.

NOTE 5 – ESIMs operating in the frequency band 29.5-30.0 GHz with low elevation angles to the GSO will require higher e.i.r.p. levels relative to the same terminals at high elevation angles to achieve the same power flux-densities (pfd) at the GSO due to the combined effect of increased distance and atmospheric absorption. Earth stations with low elevation angles may exceed the above levels by the following amount:

Elevation angle to GSO (ϵ)	Increase in e.i.r.p. spectral density (dB)
$\epsilon \leq 5^\circ$	2.5
$5^\circ < \epsilon \leq 30^\circ$	$3 - 0.1 \epsilon$

Figure 1 below illustrates the definition of angle θ^3 .

FIGURE 1



³ In Figure 1 proportions are illustrative and not to scale.

where:

- a represents the ESIM;
- b represents the boresight of the earth station antenna;
- c represents the geostationary-satellite orbit (GSO);
- d represents the vector from the ESIM to the associated GSO FSS satellite;
- φ represents the angle between the boresight of the earth station antenna and a point P on the GSO arc;
- θ represents the angle between the vector d and point P on the GSO arc;
- P represents a generic point on the GSO arc which angles θ and φ are referred to.