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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23) Dubai, 20 November - 15 December 2023** | |  |
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| PLENARY MEETING | | **Addendum 17 to Document 99-E** | |
|  | | **27 October 2023** | |
|  | | **Original: English** | |
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| Japan | | | |
| PROPOSALS FOR THE WORK OF THE CONFERENCE | | | |
|  | | | |
| Agenda item 1.17 | | | |

1.17 to determine and carry out, on the basis of ITU‑R studies in accordance with Resolution **773 (WRC‑19)**, the appropriate regulatory actions for the provision of inter-satellite links in specific frequency bands, or portions thereof, by adding an inter-satellite service allocation where appropriate;

# 1 Background

WRC-23 agenda item 1.17 stipulates to determine and carry out, on the basis of the ITU-R studies in accordance with Resolution **773 (WRC-19)**, the appropriate regulatory actions for the provision of inter-satellite links (ISL) in specific frequency bands, or portions thereof, by adding an inter-satellite service (ISS) allocation where appropriate.

Resolution **773 (WRC-19)** resolves to invite ITU-R to study in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz. Working Party 4A was assigned as the responsible group of this agenda item.

The content below is a part of section 4/1.17/1 of the [Report of the CPM to WRC-23](https://www.itu.int/md/R19-CPM23.2-R-0001/en).

#### *4/1.17/1 Executive summary*

*One method is proposed to satisfy the agenda item that includes alternative approaches. Satellite-to-satellite operations can be:*

*– allocated through a fixed-satellite service (FSS) allocation in RR Article* ***5****;*

*– allocated through an inter-satellite service (ISS) allocation in RR Article* ***5****;*

*– allowable only within the cone of coverage of the non-GSO and GSO FSS space station;*

*– allowable outside the cone of coverage of the GSO FSS space station.*

*Method A: No changes to the Radio Regulations and suppression of Resolution* ***773 (WRC-19)****.*

*Method B proposes a Resolution to address the regulatory mechanisms to operate the satellite-to-satellite links in 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz. This method also supports no change (NOC) for the band 11.7-12.7 GHz. Within Method B there are several options that should be considered within each of the alternatives pertaining to some of the regulatory mechanisms to ensure the protection of incumbent services.*

# 2 Views and proposals

Japan supports the APT common proposals for developing technical conditions and regulatory provisions for the use of satellite-to-satellite links operations in the 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz frequency bands in accordance with Resolution **773 (WRC-19)**.

In addition, Japan is also of the view that the technical conditions and regulatory provisions developed under WRC-23 agenda item 1.17 shall ensure not causing unacceptable interference to the terrestrial services operating in the frequency band 27.5-29.5 GHz.

Therefore, in the view of proper protection of terrestrial services, Japan proposes to support Option 2 as described the pfd mask in Annex 2 of draft new Resolution **[A117-B] (WRC-23)** in order to complement these APT common proposals.

The proposed portions (reason/Japan’s note part) are indicated with turquoise colour highlights in the relevant part of the draft new Resolution **[A117-B] (WRC-23)**.

ADD J/99A17/1#1901

draft new RESOLUTION [A117-B] (WRC‑23)

Use of the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz for satellite-to-satellite transmissions

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ANNEX 2 TO draft new RESOLUTION [A117-B] (WRC‑23)

Provisions for non-GSO space stations transmitting in the frequency   
bands 27.5-29.1 GHz and 29.1-29.5 GHz to protect terrestrial   
services in the frequency band 27.5-29.5 GHz

[Japan’s note: Original Option 1 pfd value which derived in Table **21-4** of Radio Regulations does not have values for 27.5-29.5 GHz in the first place (there is no study on it is appropriate to apply whether values below 27.5 GHz are appropriate). However, pfd value of original Option 2 which derived from Resolution **169 (WRC**‑**19)** is clearly shown appropriate protection for terrestrial service in the 27.5-29.5 GHz band.]

The maximum pfd produced at the surface of the Earth by emissions from a non-GSO space station transmitting in the frequency band 27.5-29.5 GHz shall not exceed:

pfd(δ) = −124.7 (dB(W/(m2 ⸱ 14 MHz))) for 0° ≤ δ ≤ 0.01°

pfd(δ) = −120.9 + 1.9 ∙ log δ (dB(W/(m2 ⸱ 14 MHz))) for 0.01° < δ ≤ 0.3°

pfd(δ) = −116.2 + 11 ∙ log δ (dB(W/(m2 ⸱ 14 MHz))) for 0.3° < δ ≤ 1°

pfd(δ) = −116.2 + 18 ∙ log δ (dB(W/(m2 ⸱ 14 MHz))) for 1° < δ ≤ 2°

pfd(δ) = −117.9 + 23.7 ∙ log δ (dB(W/(m2 ⸱ 14 MHz))) for 2° < δ ≤ 8°

pfd(δ) = −96.5 (dB(W/(m2 ⸱ 14 MHz))) for 8° < δ ≤ 90°

where δ is the angle of arrival of the radio-frequency wave (degrees above the horizon).

**Reasons:** It is the same absolute value between Options 2-1 and 2-2, but, for the consistency with Resolution **169 (WRC-19)**, Japan prefers Option 2-2.

APPENDIX

To check the compliance of the non-GSO emissions with the pfd mask described in Annex 2, the following procedures shall be followed:

1) Parameter*a* is the orbital altitude (km) of the non-GSO system identified in *resolves further* *1c)* or in *resolves further* 1*d)*, *PSD* is the power spectral density in the reference bandwidth associated with the pfd limit, and compute the off-axis gain pattern *Gtx*(φ), with φ being the off-axis angle in the direction of the terrestrial receiver. Assume the Earth is a sphere whose radius, *Re*, is 6 378 km.

2) Compute the angle, as seen from the non-GSO system transmitting in frequency range 27.5-29.5 GHz (the user space station), between the centre of the Earth and the GSO network or non-GSO systems receiving in the frequency range 27.5-29.5 GHz (the service provider space station) assuming that the user is at the edge of the cone of coverage with the formula:



3) Sweep angle of arrival to the terrestrial station, θ from 0 to 90 degrees in 0.1-degree increments.

4) Compute satellite angle .

5) Compute off-axis angle φ = 180 − δ − γ.

6) Compute the gain *Gtx* in dBi towards the Earth point for each of the angles from step 5, using the user space station transmit antenna pattern.

7) Compute slant range .

8) Compute the atmospheric attenuation *Aatm* in dB, for the corresponding angle of arrival, θ, using Recommendation ITU‑R P.676‑13 with the mean global standard atmosphere from Recommendation ITU‑R P.835‑6.

9) Compute the *PFD* on the ground as:



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