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| **World Radiocommunication Conference (WRC-19)Sharm el-Sheikh, Egypt, 28 October – 22 November 2019** |  |
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| PLENARY MEETING | **Document 65-E** |
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| Korea (Republic of)/Japan/Singapore (Republic of) |
| Proposals for the work of the conference |
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| Agenda item 1.5 |

1.5 to consider the use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion communicating with geostationary space stations in the fixed-satellite service and take appropriate action, in accordance with Resolution **158 (WRC-15)**;

Introduction

For use of the frequency bands 17.7-19.7 GHz (space-to-Earth) and 27.5-29.5 GHz (Earth-to-space) by earth stations in motion (ESIM) communicating with geostationary space stations in the fixed-satellite service, relevant draft new Resolution with regulatory and operational provisions was developed specially to protect space and terrestrial services already allocated in the same frequency bands.

First, the Korea (Rep. of), Japan and Singapore (Rep. of) support the APT Common Proposals (ACPs) regarding agenda item 1.5, which propose some modifications to the draft new Resolution **[A15] (WRC-19)** to establish technical, operational and regulatory provisions for ESIM operation.

In this contribution, Korea (Rep. of), Japan and Singapore (Rep. of) also propose additional modifications of draft new Resolution **[A15] (WRC-19)** and the technical, operational and regulatory provisions such as pfd limit, minimum elevation angle of transmission and altitude limitation of aeronautical ESIM (A-ESIM) in the Part 2 of Annex 2 to the draft new Resolution **[A15] (WRC-19)**.

Background

Since the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz have been used or planned to be used by the fixed-satellite service (FSS), the mobile service (MS) and the fixed service (FS) in the Republic of Korea (Rep. of), Japan and Singapore (Rep. of), the existing or planned FSS, MS and FS shall be protected appropriately from the interference by transmitting any types of ESIM (land, maritime and aeronautical) in the frequency bands, and additional constraints shall not be imposed on these services and their future development even if the Method B, which was proposed in the CPM Report is applied.

In the CPM Report, the provision of pfd mask is employed to protect terrestrial services (FS, MS) from the interference by A-ESIM in the draft new Resolution **[A15] (WRC-19)** while necessity of the minimum altitude was not agreed.

This approach based on the provision relying only on the pfd mask is not really enough for protecting the terrestrial services in the actual operation, since the specific mechanism to comply with the pfd mask is not well defined and it is unclear how to comply with the pfd mask for A-ESIM. The implementation of such a mechanism would involve the challenge and difficulty because of the following:

• Since if A-ESIM operates with the maximum e.i.r.p. below a certain altitude, the pfd level could exceed more than 20 dB the pfd mask, A-ESIM shall reduce its transmitting power greater than 20 dB to comply with the pfd mask. However, considering actual operational characteristics for A-ESIM and receivable power range of GSO FSS space station, its power control range for A-ESIM may not be greater than 20 dB.

• Radio horizon from A-ESIM at 6 km altitude would be greater than 300 km. It means that the radio wave visible area from A-ESIM would be greater than 280 000 km2. Taking into account pfd masks for arrival angles and the velocity of A-ESIM, it may be almost impossible to examine whether pfd values for all visible area from A-ESIM are met or not on real-time basis. Therefore, A-ESIM may not control its transmitting power to meet pfd masks for all visible area.

Taking into account the above, it is necessary for the Bureau to examine the information with respect to its conformity with the pfd limits in A-ESIM operations through the submitted technical characteristics which are required to calculate pfd value at the Earth’s surface as well as techniques to comply with the required pfd value, if it is relied only on the pfd mask. Such procedures for the examination by the Bureau should be implemented accordingly since they are not defined for A‑ESIM in the Radio Regulations.

In this contribution, it is proposed that the altitude limitation where A-ESIM shall cease its transmission for protecting the terrestrial services, shall be employed and be defined as well in the Part 2 of Annex 2 in the draft new Resolution **[KOR/J/SNG/A15] (WRC-19)** .

In addition, when considering off-axis e.i.r.p. spectral mask defined in Recommendation ITU‑R S.524-9 as the characteristics of ESIM, the off- axis angle between the GSO FSS space station with which an A-ESIM communicates and terrestrial stations at the A-ESIM plays very important role in determining the interference level from A-ESIM towards terrestrial services. Therefore, it is needed to establish minimum elevation angle of transmission for A-ESIM in order to ensure the protection of terrestrial services from the interference of A-ESIM. Taking into account both actual operation of A-ESIM and protection of terrestrial services, it is proposed that elevation angle for an A-ESIM to transmit towards GSO FSS space station with which the A-ESIM communicates shall be equal to or greater than 20 degrees elevation angle on the horizontal direction.

When considering the fundamental principal that ESIM shall not cause unacceptable interference to existing services, compliance with the requirements in Annex 2 to the draft new Resolution **[KOR/J/SNG/A15] (WRC-19)** will not release the notifying administration from its obligation not to cause unacceptable interference to any stations in the terrestrial service in accordance with the Radio Regulations. For example, even if the requirements in Annex 2 are met, there may be unexpected unacceptable interference into terrestrial stations. For this case, the notifying administration shall immediately eliminate this unacceptable interference or reduce interference to an acceptable level. Therefore, *resolves* 1.2.5 in the new Resolution should be removed.

Proposals

Taking into account the background above, proposals for WRC-19 agenda item 1.5 are as shown below.

ADD KOR/J/SNG/65/1#49993

draft new RESOLUTION [KOR/J/SNG/A15] (WRC-19)

Use of the frequency bands 17.7-19.7 GHz and 27.5-29.5 GHz by earth stations in motion (ESIM) communicating with geostationary space stations
in the fixed-satellite service

The World Radiocommunication Conference (Sharm el-Sheikh, 2019),

…

…Annex 2 to draft new Resolution [KOR/J/SNG/A15] (WRC-19)

Provisions for maritime and aeronautical ESIM to protect terrestrial services in the frequency band 27.5-29.5 GHz

…

Part 2: AERONAUTICAL ESIM

2 The notifying administration of the GSO FSS satellite network with which an aeronautical ESIM communicates shall ensure compliance of the aeronautical ESIM with the following conditions:

2.1 when within line-of-sight of the territory of an administration, the maximum pfd produced at the surface of the Earth on the territory of an administration by emissions from a single aeronautical ESIM shall not exceed:

 pfd(θ) = −122.7 (dBW/m2/1 MHz) for 0° ≤ θ ≤ 2°

 pfd(θ) = −122.7 + 2 \* (θ − 2) (dBW/m2/1 MHz) for 2° < θ ≤ 2.3°

 pfd(θ) = −122.6 + 1.5 \* (θ − 2) (dBW/m2/1 MHz) for 2.3° < θ ≤ 7.9°

 pfd(θ) = −113.9 (dBW/m2/1 MHz) for 7.9° < θ ≤ 90°

where θ is the angle of arrival of the radio-frequency wave (degrees above the horizon);

2.2 Elevation angle for an aeronautical ESIM to transmit towards GSO FSS space station with which the A-ESIM communicates shall be equal to or greater than 20 degrees elevation angle on the horizontal direction;

2.3 Unless agreement from concerned administrations, aeronautical ESIM shall not transmit below 6 km of altitude above the territory of the administration concerned;

2.4 Higher pfd levels than those provided in 2.1 within an administration produced by aeronautical ESIM on the surface of the Earth above shall be subject to the prior agreement of that administration;

2.5 within the territory under the jurisdiction of an administration where the ESIM operate, aeronautical ESIM shall comply with the bilateral or multilateral agreements of the concerned administrations.

**Reasons:** Proposed modifications of the draft new Resolution **[A15] (WRC-19)** should be needed to avoid unacceptable interference from ESIM and to ensure the protection with regard to the terrestrial services.

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