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| **World Radiocommunication Conference (WRC-15)Geneva, 2–27 November 2015** |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** |  |
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| PLENARY MEETING | **Addendum 2 toDocument 91(Add.23)-E** |
|  | **20 October 2015** |
|  | **Original: English** |
|  |
| Australia |
| Proposals for the work of the conference |
|  |
| Agenda item 9.2 |

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.2 on any difficulties or inconsistencies encountered in the application of the Radio Regulations; and

Background

WRC-15 agenda item 9.2, is to consider the report of the Director of the Radiocommunication Bureau on difficulties or inconsistencies encountered in the application of the Radio Regulations since WRC-12.

One of the issues raised in the Director’s Report is the application of RR No. 5.526, section 3.1.1 of the Addendum 2 of Document CMR15/4. The review the application of RR No. 5.526 has arisen from the use of the bands 19.7-20.2 GHz and 29.5-30 GHz by earth stations on mobile platforms (ESOMPs).

Certain technical, operational and regulatory requirements/guidelines for ESOMPs are included in Report [ITU-R S.2223](http://www.itu.int/pub/R-REP-S.2223) and Report [ITU-R S.2357](http://www.itu.int/pub/R-REP-S.2357-2015). The Reports reference the advancement in satellite technology where ESOMPs antennas can maintain a high degree of pointing accuracy under a wide range of conditions, and can be now considered as having performance similar to fixed earth stations.

In February 2014, the Radiocommunication Bureau (BR) published Circular Letter [CR/358](https://www.itu.int/md/R00-CR-CIR-0358/en) through which a new class of station (code UC) was created for an earth station while in motion associated with a space station in the fixed-satellite service (FSS) in the bands listed under provision RR No. 5.526 (i.e. the 19.7-20.2 GHz and 29.5-30.0 GHz bands in Region 2 and 20.1‑20.2 GHz and 29.9-30.0 GHz bands in Regions 1 and 3). Administrations are invited to use this class of station when submitting to the Bureau a notice for a satellite network which is both in the FSS and mobile-satellite service (MSS) with links between a space station in the FSS and an earth station while in motion.

The publication of Circular Letter CR/358 is a useful development for ESOMPs operations. However, noting the background to the adoption of RR Nos. 5.526 to 5.529 (as RR Nos. 8.873B to 8.873E at WARC-92), and the development of satellite technology to facilitate the operation of ESOMPs, the regulatory requirement to operate ESOMPs in both the FSS and the MSS simultaneously are cumbersome. In addition, RR No. 5.526 applies to only a portion of the 19.7‑20.2 GHz and 29.5-30.0 GHz bands in Regions 1 and 3. To better facilitate the use of ESOMPs in Regions 1 and 3 under RR. No 5.526, it is proposed that the Radio Regulations are accordingly revised in this respect at WRC-15.

Proposals

It is proposed to extend the applicability of RR No. 5.526 to the entire 19.7-20.2 GHz and 29.5‑30.0 GHz bands in Regions 1 and 3, without requiring that ESOMPs and their satellites operate in both FSS and MSS.

In light of the background provided above, and the creation of the code UC, satellite networks that contain the code UC would only need to be considered in the FSS. ESOMPs would need to operate within the technical conditions applicable to an FSS network but also subject to additional conditions that would ensure no unacceptable interference is caused by ESOMPs to existing and planned services in the 19.7-20.2 GHz and 29.5-30.0 GHz bands.

The proposed changes include technical, operational and regulatory provisions in a new Resolution (Resolution [AUS-A92] (WRC-15) as shown below) that is cross referenced in a modified RR No. 5.526. Such provisions are based in part on Report ITU-R S.2357 noting that while the conditions stipulated in the Report should be sufficient to provide a significant degree of protection from harmful interference to existing and planned FSS networks and systems sharing the same bands, additional measures need to be applied to protect more sensitive FSS networks, fixed services (FS) and mobile services (MS) in the same band.

Consequently, the definition of the earth station class of station UC needs to be revised subsequent to any changes resulting from these proposals.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See No. 2.1)

MOD AUS/91A23A2/1

18.4-22 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 19.7-20.1FIXED-SATELLITE(space-to-Earth) 5.484A 5.516BMobile-satellite (space-to-Earth) | 19.7-20.1FIXED-SATELLITE(space-to-Earth) 5.484A 5.516BMOBILE-SATELLITE(space-to-Earth) | 19.7-20.1FIXED-SATELLITE(space-to-Earth) 5.484A 5.516BMobile-satellite (space-to-Earth) |
| 5.524 ADD 5.526 | 5.524 5.525 MOD 5.526 5.527 5.528 5.529 | 5.524 ADD 5.526 |
| 20.1-20.2FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 MOD 5.526 5.527 5.528 |

**Reasons:** Adoption of this proposal would better facilitate the use of ESOMPs in the 19.7‑20.2 GHz and 29.5-30.0 GHz bands consistently in all three Regions. It would also facilitate the submission of notices relating to the earth station class of station UC to the BR and the registration of the link between a space station in the FSS and ESOMPs under the relevant coordination and notification procedures in conformity with the specific FSS bands and conditions specified in RR No. **5.526**.

MOD AUS/91A23A2/2

24.75-29.9 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 29.5-29.9FIXED-SATELLITE(Earth-to-space) 5.484A 5.516B 5.539Earth exploration-satellite(Earth-to-space) 5.541Mobile-satellite (Earth-to-space) | 29.5-29.9FIXED-SATELLITE(Earth-to-space) 5.484A 5.516B 5.539MOBILE-SATELLITE(Earth-to-space)Earth exploration-satellite(Earth-to-space) 5.541 | 29.5-29.9FIXED-SATELLITE(Earth-to-space) 5.484A 5.516B 5.539Earth exploration-satellite(Earth-to-space) 5.541Mobile-satellite (Earth-to-space)  |
| ADD 5.526 5.540 5.542 | 5.525 MOD 5.526 5.527 5.529 5.540  | ADD 5.526 5.540 5.542 |

**Reasons:** Adoption of this proposal would better facilitate the use of ESOMPs in the 19.7‑20.2 GHz and 29.5-30.0 GHz bands consistently in all three Regions. It would also facilitate the submission of notices relating to the earth station class of station UC to the BR and the registration of the link between a space station in the FSS and ESOMPs under the relevant coordination and notification procedures in conformity with the specific FSS bands and conditions specified in RR No. **5.526**.

MOD AUS/91A23A2/3

29.9-34.2 GHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 29.9-30 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 MOD 5.526 5.527 5.538 5.540 5.542 |

**Reasons:** Adoption of this proposal would better facilitate the use of ESOMPs in the 19.7‑20.2 GHz and 29.5-30.0 GHz bands consistently in all three Regions. It would also facilitate the submission of notices relating to the earth station class of station UC to the BR and the registration of the link between a space station in the FSS and ESOMPs under the relevant coordination and notification procedures in conformity with the specific FSS bands and conditions specified in RR No. **5.526**.

MOD AUS/91A23A2/4

5.526 In the bands 19.7-20.2 GHz and 29.5-30 GHz, networks which are in the fixed-satellite service may include links between earth stations at specified or unspecified points or while in motion, through one or more satellites for point-to-point and point-to-multipoint communications. Such use shall be in accordance with Resolution **[AUS-A92]**
**(WRC-15)**      (WRC-15)

**Reasons:** Adoption of this proposal would better facilitate the use of ESOMPs the 19.7‑20.2 GHz and 29.5-30.0 GHz bands consistently in all three Regions. It would also facilitate the submission of notices relating to the earth station class of station UC to the BR and the registration of the link between a space station in the FSS and ESOMPs under the relevant coordination and notification procedures in conformity with the specific FSS bands and conditions specified in RR No. **5.526**.

ADD AUS/91A23A2/5

draft new RESOLUTION [AUS-A92] (WRC-15)

Use of the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz by earth stations on mobile platforms communicating with geostationary space stations in the fixed-satellite service

The World Radiocommunication Conference (Geneva, 2015),

considering

*a)* that the bands 19.7-20.2 GHz and 29.5-30.0 GHz are globally allocated on a primary basis to the FSS and that there are a large number of geostationary FSS satellite networks operating in these frequency bands;

*b)* that there is an increasing need for mobile communications, including global broadband satellite services, and that some of this need can be met by allowing earth stations in motion on platforms (such as ships, aircraft and land vehicles) to communicate with space stations of the FSS operating in the frequency bands 19.7-20.2 GHz and 29.5-30.0 GHz;

*c)* that satellite technology has advanced to the stage where it is now feasible to operate ESOMPs while still maintaining a very high degree of pointing stability and accuracy, and that in this respect they can be considered as having similar performance to fixed earth stations;

*d)* that facilitating the use of ESOMPs as elements of FSS networks would increase the utility of those networks;

*e)* that it is desirable to formulate a regulatory solution that facilitates ESOMPs as elements of the FSS in a manner that avoids resorting to the provision of RR No. **4.4** in order to better manage the potential for unacceptable interference;

*f)* that specific measures need to be applied to ensure that the use of ESOMPs as elements of FSS networks will not lead to unacceptable interference into the FS, MS and FSS operating in conformity with the Radio Regulations;

*g)* that some administrations have already deployed, and plan to expand their use of ESOMPs with operational and future geostationary FSS networks;

*h)* that the ITU-R has studied certain aspects of the technical and operational use of ESOMPs and that the result of these studies are contained in ITU-R Reports;

*i)* that the Radiocommunication Bureau has advised administrations that a new class of station code (UC) can be used for ESOMPs when using the provisions of RR No. **5.526** for satellite network filings under Articles **9** and **11**,

noting

that administrations will be made aware of the planned operation of ESOMPs via the publication of UC class of station information by the Radiocommunication Bureau,

recognizing

*a)* that ESOMPs operating in accordance with No. **5.526** are not to be used for safety of life applications;

*b)* that the adoption of special regulatory measures to facilitate the operation of ESOMPs as elements of the FSS under specific technical and operational conditions is in no way intended to impact on the provisions contained in Article **1** of the Radio Regulations related to the definition of services;

*c)* that the adoption of these measures to facilitate ESOMPs is specifically limited to the 19.7-20.2 GHz and 29.5-30.0 GHz band;

*d)* that the adoption of these measures will facilitate the licensing process for ESOMPs in accordance with Article **18** of the Radio Regulations, while ensuring that transmission is kept to an acceptable level or ceased completely, should interference occur;

*e)* that in authorizing ESOMPs as elements of their networks, administrations cannot claim more protection and/or produce more interference than would beapplicable for the case where only fixed earth stations were authorized for the network,

considering further

*a)* that some administrations have addressed this matter nationally or regionally by adopting technical and operational criteria for the operation of these earth stations;

*b)* that a consistent approach to deployment of these earth stations will support this important and growing global communication requirements on an equal basis in all three Regions,

resolves

1 that when authorizing ESOMPs communicating with FSS networks in the bands 19.7-20.2 GHz and 29.5-30.0 GHz as elements of their networks under RR No **5.526**, administrations, *inter alia* taking into account the *recognizing*, shall require such earth stations to:

a)comply with the off-axis e.i.r.p. density levels given in Annex 1 or other levels mutually agreed with other satellite network operators and their administrations;

b)employ techniques that allow the tracking of the wanted satellite and that are resistant to capturing and tracking adjacent satellites;

c)immediately reduce or cease transmission when their antenna mis-pointing would result in exceeding the levels referred to in *resolves* *1*a);

d)be subject to permanent monitoring and control by a Network Control and Monitoring Center (NCMC) or equivalent facility and that these earth stations be capable to receive and act upon at least “enable transmission” and “disable transmission” commands from the NCMC,

further resolves that administrations

1 authorizing ESOMPs require the operators to provide a point of contact for the purpose of tracing any suspected cases of unacceptable interference from ESOMPs;

2 in the event of a report of unacceptable interference being caused to services in the bands 19.7-20.2 GHz and 29.5-30.0 GHz, the ESOMPs authorizing administration shall take immediate action to cease the cause of such interference.

Annex 1

Off-axis e.i.r.p. density levels for earth station on mobile platforms communicating with geostationary space stations in the fixed-satellite
service operating in the band 29.5-30.0 GHz

This Annex provides a set of off-axis e.i.r.p. levels for ESOMPs operating in the band 29.5-30.0 GHz. However, as stated in *resolves 1*a), other levels may be mutually agreed between satellite operators and administrations.

ESOMPs communicating with geostationary space stations in the fixed‑satellite service transmitting in the band 29.5-30.0 GHz should be designed in such a manner that at any angle[[1]](#footnote-1), θ, which is 2° or more from the vector from the earth station antenna to the wanted satellite (see Figure 1 below for the reference geometry of an ESOMP compared to an earth station at a fixed location), the e.i.r.p. density in any direction within 3° of the geostationary satellite orbit, should not exceed the following values:

|  |  |
| --- | --- |
| Angle θ | Maximum e.i.r.p. per 40 kHz |
| 2° ≤ θ ≤ 7° | (19 – 25 log θ) dB(W/40 kHz) |
| 7° < θ ≤ 9.2° | –2 dB(W/40 kHz) |
| 9.2° < θ ≤ 48° | (22 – 25 log θ) dB(W/40 kHz) |
| 48° < θ ≤ 180° | –10 dB(W/40 kHz) |

NOTE 1 – The values above should be maximal values under clear-sky conditions. In 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 uplink power control is used and rain fades makes it necessary, the levels stated above may be exceeded for the duration of that period. 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 geostationary FSS satellite networks.

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

NOTE 3 – For geostationary space stations in the fixed-satellite service with which the ESOMPs are expected to transmit simultaneously in the same 40 kHz band, e.g. employing code division multiple access (CDMA), the maximum e.i.r.p. density values should be decreased by 10 log(N) dB, where N is the number of ESOMPs that are in the receive satellite beam of the satellite with which these earth stations are communicating and that are expected to transmit simultaneously on the same frequency.

NOTE 4 – ESOMPs operating in the band 29.5-30.0 GHz that have lower elevation angles to the geostationary satellite orbit will require higher e.i.r.p. levels relative to the same terminals at higher elevation angles to achieve the same power flux-densities (pfd) at the geostationary satellite orbit 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) |
| ε < 5° | 2.5 |
| 5° < ε ≤30° | 3 – 0.1 ε |

Figure 1 below illustrates the definition of angle θ[[2]](#footnote-2).

FIGURE 1:

Definition of angle θ



where:

 a represents the ESOMP;

 b represents the boresight of the antenna;

 c represents the geostationary orbit (GSO);

 d represents the vector from the ESOMP to the wanted satellite;

 φ represents the angle between the boresight of the antenna and a point P on the GSO arc;

 Ɵ 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 Ɵ and φ are referred to.

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1. It should be noted that the definition of angle θ is different to that of angle φ contained in Recommendation ITU-R S.524-9. The angle θ is introduced to address possible mis-pointing from ESOMPs, which is not a consideration in Recommendation ITU-R S.524-9. [↑](#footnote-ref-1)
2. In Figure 1 proportions are illustrative and not to scale. [↑](#footnote-ref-2)