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| **World Radiocommunication Conference (WRC-15)Geneva, 2–27 November 2015** |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** |  |
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| PLENARY MEETING | **Revision 1 toAddendum 3 toDocument 28(Add.23)(Add.2)-E** |
|  | **1 October 2015** |
|  | **Original: English** |
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| African Common Proposals |
| Proposals for the work of the conference |
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| 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

Introduction

Through WRC-15 agenda item 9.2, administrations may address difficulties or inconsistencies encountered in the application of the Radio Regulations. The preliminary draft of the Report of the Director of the Radiocommunication Bureau is available in document CPM15-2/41 and was presented to CPM.

One of the issues raised in the Director’ Report is the application of No. 5.526 of the RR, which is discussed in section 3.1.1 of the report (see Addendum 2 to document 4). In this section, the Director describes the action that has been taken by the BR in the application of No. 5.526, in particular to introduce a new class of station, “UC” for an earth station in motion (UC) associated with a space station in the FSS which in our view requires modification of footnote No. 5.526 to remove inconsistencies and harmonize the band in all three regions. It is important to bring the RR in line with available technology today. This issue was also discussed at the CPM meeting and inputs on this issue were made by several administrations.

The need to review the application of No. 5.526 has arisen from the use of the bands 19.7-20.2 GHz and 29.5-30 GHz by UCs. UCs operate within FSS networks, providing broadband communications to users on mobile platforms, including aircraft, ships, or land vehicles.

UCs use highly accurate pointing mechanisms not limited to gyros and antenna arrays which continuously and automatically adjust to the movement of the platform, maintaining the pointing of the earth station to within a fraction of a degree of the required elevation and azimuth, even on a moving platform. UCs therefore perform like fixed VSATs from the perspective of possible interference to FSS networks. The issue of UCs operating in the 29.5-30.0 GHz (Earth-to-space) and 19.7-20.2 GHz (space-to-Earth) bands has been discussed extensively in the ITU-R over the past three years. In 2012 the ITU-R Study Group 4 approved Report ITU-R S.2223 with the aim of setting a similar regulatory framework applicable globally. Since then, Working Party 4A has developed a new Report (Report ITU-R S.2357) which sets out technical and operational conditions for UCs, to ensure that they operate in a manner consistent with standard FSS earth stations from the interference perspective and that they do not cause interference to other services.

However, the regulatory situation applicable to ESOMPs in the bands 29.5-30.0 and 19.7-20.2 GHz requires review. Footnote No. 5.526 was developed at WARC-92 to address the use of earth stations on mobile platforms operating in FSS networks. Following recent approaches from several administrations to the BR in relation to this footnote, the BR clarified its interpretation of No. 5.526 in Circular Letter (CR/358). At the same time, the BR created a new class of station (code UC) 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. While this circular letter is a positive step towards clarifying the regulations for UCs, there remain some outstanding issues below:

1) Although RR No. 5.526 states that links between UCs and their associated satellites can be included only in networks which are both in the FSS and in the MSS, there seems to be no technical or regulatory reasons for requiring the network to be in both the MSS and FSS. On the contrary, it is the association with the FSS that is the only relevant factor, since this ensures that earth stations in motion are compatible with other FSS networks. It is noted that the new class of earth station (code UC) is explicitly associated with the fixed-satellite service (code EC) only.

2) Harmonization of bands between all the regions will remove inconsistencies and bring about continuity of service. Imagine an aircraft flying across regions and has to change bands due to this inconsistency. As a primary allocation in the FSS already exists in the 19.7-20.1 GHz and 29.5-29.9 GHz bands in Regions 1 and 3, there seems to be no technical and regulatory reasons for the provision No. 5.526 to be limited to the 20.1‑20.2 GHz and 29.9-30.0 GHz only, as long as ESOMPs operating in this band comply with technical and operational requirements which will ensure their compatibility with other FSS networks.

3) As a secondary allocation to the MSS already exists in the bands 19.7-20.1 GHz and 29.5-29.9 GHz in Regions 1 and 3, it is evident that the idea of mobility is already contemplated by the Radio Regulations in force.

It would be desirable for WRC-15 to take action to address these points, taking into account the advice in BR Circular Letter CR/358. This would ensure that a consistent regulatory framework is in place for the operation of UCs in the bands 19.7-20.2/29.5-30 GHz, to provide guidance to administrations on appropriate technical requirements for UCs and facilitate their deployment to the benefit of users worldwide. UCs are very vital to development plans of the African continent and provide socio-economic growth of various countries in Africa by provision of Internet connectivity and other telecommunication services to geographic areas and users not otherwise served, including users in remote locations as well as crew and travellers in ships and on aircraft. UCs enables mobility and easy of connectivity anywhere.

ATU supports action at WRC-15 to address this issue and the points above through revision of RR No. 5.526 and a new Resolution as shown below.

Proposals

ARTICLE 5

Frequency allocations

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

MOD AFCP/28A23A2A3/1

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 MOD 5.526 | 5.524 5.525 MOD 5.526 5.527 5.528 MOD 5.529 | 5.524 MOD 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 |

NOTE – This proposal relates to frequency range 19.7-20.2 GHz.

MOD AFCP/28A23A2A3/2

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 in accordance with Resolution **[AFCP-A92-ESOMPS] (WRC‑15)**.

**Reasons:** Adoption of this proposal would remove the inconsistency in application of RR No. 5.526 and bring out harmonization in all the regions of the 19.7-20.2 GHz and 29.5-30 GHz bands for UCs. 500 MHz of spectrum each in the uplink and downlink will be available to support important and growing global communication requirements on an equal basis. This would also allow the coordination, notification and recording of these earth stations will be done on an equal basis in all Regions.

MOD AFCP/28A23A2A3/3

5.529 The use of the bands 19.7-20.1 GHz and 29.5-29.9 GHz by the mobile-satellite service in Region 2 is limited to satellite networks which are both in the fixed-satellite service and in the mobile-satellite service.

**Reasons:** Consequential change. The proposed amendment to No. 5.526 removes the requirement for UCs to operate in networks which are both in the FSS and in the MSS, allowing UCs to operate in networks which are in the FSS only.

MOD AFCP/28A23A2A3/4

24.75-29.9 GHz

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| --- |
| 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)  |
| MOD 5.526 5.540 5.542 | 5.525 MOD 5.526 5.527 MOD 5.529 5.540  | MOD 5.526 5.540 5.542 |

NOTE – This proposal relates to frequency range 29.5-29.9 GHz.

MOD AFCP/28A23A2A3/5

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 |

NOTE – This proposal relates to frequency range 29.9-30 GHz.

ADD AFCP/28A23A2A3/6

Draft New Resolution [AFCP-A92-ESOMPS] (Wrc-15)

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 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 GSO FSS networks in the bands 19.7-20.2 GHz and 29.5-30.0 GHz, are required to be coordinated in accordance with the provisions of Articles **9** and **11** of the Radio Regulations, so as to address potential interference between networks and other services allocated in the band;

*d)* that some administrations have already deployed, and plan to expand their use of such earth stations with operational and future GSO FSS networks;

*e)* that the ITU‑R has studied the technical and operational use of these earth stations in motion and other services in the reference bands,

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 these important and growing global communication requirements on an equal basis in all three Regions;

*c)* that these earth stations will have to operate consistently with the coordination agreements to the GSO FSS networks with which they communicate,

resolves

1 that administrations authorizing earth stations in motion communicating with FSS networks in the band 29.5-30.0 GHz 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 mispointing 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 Centre (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. In addition, it should be possible for the NCMC to monitor the operation of an earth station in motion to determine if it is malfunctioning;

2 that administrations authorizing earth stations in motion may require the operators to provide a point of contact for the purpose of tracing any suspected cases of interference from earth stations in motion.

Annex 1

Off-axis e.i.r.p. density levels for earth stations in motion 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 earth stations in motion 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.

Earth stations in motion 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)1, θ, which is 2° or more from the vector from the earth station antenna to the wanted satellite (see Fig. 1 below for the reference geometry of an earth station in motion compared to an earth station at a fixed location), the e.i.r.p. density in any direction within 3° of the GSO, should not exceed the following values:

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| --- | --- |
| 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 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 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 GSO FSS satellite networks.

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 with which the earth stations in motion 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 earth stations in motion 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 – Potential aggregate interference from earth stations in motion operating with satellites using multi-spot frequency reuse technologies should be taken into account in agreements between the GSO FSS satellite operators and their administrations.

NOTE 5 – Earth stations in motion operating in the band 29.5-30.0 GHz that have lower elevation angles to the GSO 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 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) |
| ε < 5° | 2.5 |
| 5° ≤ ε ≤ 30° | 3 − 0.1 ε |

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

FIGURE 1

Definition of angle θ



where:

 a represents the earth station in motion;

 b represents the boresight of the antenna;

 c represents the geostationary orbit (GSO);

 d represents the vector from the earth station in motion to the wanted satellite;

 φ represents the angle between the boresight of the 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.

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1. 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 mispointing from earth stations in motion, which is not a consideration in Recommendation ITU-R S.524-9. [↑](#footnote-ref-1)
2. 2 In Figure 1 proportions are illustrative and not to scale. [↑](#footnote-ref-2)