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| **World Radiocommunication Conference (WRC-15) Geneva, 2–27 November 2015** |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** |  |
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| COMMITTEE 5 | **Document 146-E** |
|  | **2 November 2015** |
|  | **Original: Russian** |
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| Regional Commonwealth in the field of Communications Common Proposals | |
| Proposals for the work of the conference | |
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RR No. 5.526

Introduction

In February 2014, the Radiocommunication Bureau (BR) published Circular Letter CR/358 through which a new class of station (code UC) was created for an earth station in motion in the fixed-satellite service (FSS) in the bands listed under RR No. 5.526 (i.e. the bands 19.7-20.2 GHz and 29.5-30.0 GHz in Region 2, and the bands 20.1‑20.2 GHz and 29.9-30.0 GHz in Regions 1 and 3), which is proposed for use when submitting to BR 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 in motion.

ITU-R has carried out studies on the technical, operational and regulatory requirements for earth stations on mobile platforms (ESOMPs) operating in the FSS, the results of which are reflected in Reports ITU-R S.2223 and S.2357.

At the same time, however, there are no technical or regulatory reasons for networks within which ESOMPs operate to be in both the FSS and the MSS simultaneously. Furthermore, RR No. 5.526 applies to only a portion of the bands 19.7-20.2 GHz and 29.5-30.0 GHz in Regions 1 and 3.

Therefore, bearing in mind the increasing need for mobile communications, including global broadband satellite services, a modification to the Radio Regulations is proposed to clarify the regulatory provisions surrounding the use of ESOMPs in these frequency bands, and to extend the provisions to the bands 29.5-30.0 GHz and 19.7-20.2 GHz in all three Regions consistently, without requiring that earth stations in motion and their satellites operate in both the FSS and MSS.

The proposed changes include technical, operational and regulatory provisions in a Resolution incorporated by reference in No. 5.526, and are presented below.

Proposals

ARTICLE 5

Frequency allocations

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

MOD RCC/146/1

18.4-22 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 18.4-18.6 FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B  MOBILE | | |
| 18.6-18.8  EARTH EXPLORATION-SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.522B  MOBILE except aeronautical mobile  Space research (passive) | 18.6-18.8  EARTH EXPLORATION- SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B  MOBILE except aeronautical mobile  SPACE RESEARCH (passive) | 18.6-18.8  EARTH EXPLORATION-SATELLITE (passive)  FIXED  FIXED-SATELLITE (space-to-Earth) 5.522B  MOBILE except aeronautical mobile  Space research (passive) |
| 5.522A 5.522C | 5.522A | 5.522A |
| 18.8-19.3 FIXED  FIXED-SATELLITE (space-to-Earth) 5.516.B 5.523A  MOBILE | | |
| 19.3-19.7 FIXED  FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E  MOBILE | | |
| 19.7-20.1  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B  Mobile-satellite (space-to-Earth) | 19.7-20.1  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B  MOBILE-SATELLITE (space-to-Earth) | 19.7-20.1  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B  Mobile-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 | | |
| 20.2-21.2 FIXED-SATELLITE (space-to-Earth)  MOBILE-SATELLITE (space-to-Earth)  Standard frequency and time signal-satellite (space-to-Earth)  5.524 | | |
| 21.2-21.4 EARTH EXPLORATION-SATELLITE (passive)  FIXED  MOBILE  SPACE RESEARCH (passive) | | |
| 21.4-22  FIXED  MOBILE  BROADCASTING-SATELLITE 5.208B  5.530A 5.530B  5.530C 5.530D | 21.4-22  FIXED  MOBILE  5.530A 5.530C | 21.4-22  FIXED  MOBILE  BROADCASTING-SATELLITE 5.208B  5.530A 5.530B  5.530C 5.530D 5.531 |

MOD RCC/146/2

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. Such use shall be in accordance with Resolution **[RCC-ZZZ].**     (WRC‑15)

**Reasons:** Adoption of this proposal would provide the availability of 500 MHz each in the uplink and downlink to support important and growing global communication requirements on an equal basis in all three Regions and results in rational and efficient use of the radio frequencies. This would also allow the coordination, notification and recording of these earth stations on an equal basis in all three Regions.

MOD RCC/146/3

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.     (WRC‑15)

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

MOD RCC/146/4

24.75-29.9 GHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 24.75-25.25  FIXED  FIXED-SATELLITE (Earth-to-space) 5.532B | 24.75-25.25  FIXED-SATELLITE (Earth-to-space) 5.535 | 24.75-25.25  FIXED  FIXED-SATELLITE (Earth-to-space) 5.535  MOBILE |
| 25.25-25.5 FIXED  INTER-SATELLITE 5.536  MOBILE  Standard frequency and time signal-satellite (Earth-to-space) | | |
| 25.5-27EARTH EXPLORATION-SATELLITE (space-to Earth) 5.536B  FIXED  INTER-SATELLITE 5.536  MOBILE  SPACE RESEARCH (space-to-Earth) 5.536C  Standard frequency and time signal-satellite (Earth-to-space)  5.536A | | |
| 27-27.5  FIXED  INTER-SATELLITE 5.536  MOBILE | 27-27.5  FIXED  FIXED-SATELLITE (Earth-to-space)  INTER-SATELLITE 5.536 5.537  MOBILE | |
| 27.5-28.5 FIXED 5.537A  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539  MOBILE  5.538 5.540 | | |
| 28.5-29.1 FIXED  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |
| 29.1-29.5 FIXED  FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A  MOBILE  Earth exploration-satellite (Earth-to-space) 5.541  5.540 | | |
| 29.5-29.9  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539  Earth exploration-satellite (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space) | 29.5-29.9  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539  MOBILE-SATELLITE (Earth-to-space)  Earth exploration-satellite (Earth-to-space) 5.541 | 29.5-29.9  FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539  Earth exploration-satellite (Earth-to-space) 5.541  Mobile-satellite (Earth-to-space) |
| 5.540 5.542 MOD 5.526 | 5.525 MOD 5.526 5.527 MOD 5.529 5.540 | 5.540 5.542 MOD 5.526 |

MOD RCC/146/5

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 | | |
| 30-31 FIXED-SATELLITE (Earth-to-space) 5.338A  MOBILE-SATELLITE (Earth-to-space)  Standard frequency and time signal-satellite (space-to-Earth)  5.542 | | |
| 31-31.3 FIXED 5.338A 5.543A  MOBILE  Standard frequency and time signal-satellite (space-to-Earth)  Space research 5.544 5.545  5.149 | | |
| 31.3-31.5 EARTH EXPLORATION-SATELLITE (passive)  RADIO ASTRONOMY  SPACE RESEARCH (passive)  5.340 | | |
| 31.5-31.8  EARTH EXPLORATION- SATELLITE (passive)  RADIO ASTRONOMY  SPACE RESEARCH (passive)  Fixed  Mobile except aeronautical mobile | 31.5-31.8  EARTH EXPLORATION- SATELLITE (passive)  RADIO ASTRONOMY  SPACE RESEARCH (passive) | 31.5-31.8  EARTH EXPLORATION- SATELLITE (passive)  RADIO ASTRONOMY  SPACE RESEARCH (passive)  Fixed  Mobile except aeronautical mobile |
| 5.149 5.546 | 5.340 | 5.149 |
| 31.8-32FIXED 5.547A  RADIONAVIGATION  SPACE RESEARCH (deep space) (space-to-Earth)  5.547 5.547B 5.548 | | |
| 32-32.3FIXED 5.547A  RADIONAVIGATION  SPACE RESEARCH (deep space) (space-to-Earth)  5.547 5.547C 5.548 | | |
| 32.3-33 FIXED 5.547A  INTER-SATELLITE  RADIONAVIGATION  5.547 5.547D 5.548 | | |
| 33-33.4 FIXED 5.547A  RADIONAVIGATION  5.547 5.547E | | |
| 33.4-34.2 RADIOLOCATION  5.549 | | |

ADD RCC/146/6

Draft New Resolution [RCC-ZZZ] (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 fixed-satellite service (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 geostationary 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 geostationary FSS networks;

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

recognizing

that earth stations in motion operating in accordance with No. **5.526** are not to be used for safety of life applications,

considering further

*a)* 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;

*b)* that these earth stations will have to operate in accordance with the coordination agreements for the geostationary FSS networks with which they communicate,

resolves

1 that earth stations in motion operating in accordance with No. **5.526** shall not claim more protection and/or produce more interference than other earth stations in the same FSS network, *inter alia* taking into account the recognizing;

2 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 satellite and that are resistant to capturing and tracking adjacent satellites;

*c)* immediately reduce transmission power or cease transmission when their antenna mispointing would result in exceeding the levels referred to in *resolves*2*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 able to receive and act upon at least “enable transmission” and “disable transmission” commands from the NCMC;

3 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* 2*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 shall 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 geostationary satellite orbit, shall 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 are maximal values under clear-sky conditions. In case of networks employing uplink power control, these levels 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 fade 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 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 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 are 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 – Earth stations in motion 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)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 Fig. 1, proportions are illustrative and not to scale. [↑](#footnote-ref-2)