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| **World Radiocommunication Conference (WRC-15)Geneva, 2–27 November 2015** |  |
| **INTERNATIONAL TELECOMMUNICATION UNION** |  |
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| PLENARY MEETING | **Addendum 11 toDocument 7-E** |
|  | **29 September 2015** |
|  | **Original: English** |
|  |
| Member States of the Inter-American Telecommunication Commission (CITEL) |
| Proposals for the work of the conference |
|  |
| Agenda item 1.11 |

1.11to consider a primary allocation for the Earth exploration-satellite service (Earth-to-space) in the 7-8 GHz range, in accordance with Resolution **650 (WRC‑12)**;

Background

Many future Earth exploration-satellite service (EESS) missions will require large uplink bandwidth to accommodate the increasing amount of data needed for spacecraft operation plans and dynamic spacecraft software modifications. The only EESS (Earth-to-space) allocation that is currently available in Article 5 for telecommanding is 2 025-2 110 MHz. This 2 025-2 110 MHz band is of fundamental importance and cannot accommodate the bandwidth that is globally required in the future on the Earth-to-space link for these telecommanding functions. There are already as many as 1135 satellite networks filed with the ITU in this band and the ITU expects many new satellite networks to enter into this band, including many nanosatellites and picosatellites. Therefore it would be extremely difficult, if not impossible, to coordinate satellites with large bandwidth requirements within the band 2 025-2 110 MHz and another band is required.

An EESS (Earth-to-space) allocation in the 7-8 GHz range would help alleviate the problems posed by this new type of EESS mission. The telemetry, telecommand and control function could be implemented by pairing this new allocation with the already existing EESS (space-to-Earth) allocation in the band 8 025-8 400 MHz. This may also eventually lead to a simplified on-board architecture and operational concept for some future EESS missions.

ITU-R WP 7B has determined an approximate spectrum requirement of 56 MHz for EESS (Earth-to-space). The frequency range 7 145-7 250 MHz is currently allocated to the fixed, mobile and, space research (Earth-to-space) services on a primary basis, the band 7 145-7 235 MHz is subject to the conditions on the use of the space research service (SRS) in No. 5.460.

The ITU-R has developed various sharing and compatibility studies between transmitting EESS earth stations and stations of the space research, fixed, mobile and space operations services within the 7 145‑7 250 MHz range. These studies show that co‑existence of EESS and SRS (deep space) uplinks would not be practical within the same frequency band. Sharing in the 7 145-7 190 MHz band segment, where the use of the space research service is restricted by No. 5.460 to deep space, is not feasible. The studies show that sharing would be feasible with existing services in the 7 190‑7 250 MHz band segment.

ARTICLE 5

Frequency allocations

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

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5 570-7 250 MHz

|  |
| --- |
| Allocation to services |
| Region 1 | Region 2 | Region 3 |
| 7 145-7 190 FIXED MOBILE SPACE RESEARCH (deep space) (Earth-to-space) 5.458 MOD 5.459 |
| 7 190-7 235 EARTH EXPLORATION-SATELLITE (Earth-to-space) ADD 5.A111 FIXED MOBILE SPACE RESEARCH (Earth-to-space) MOD 5.460 5.458 MOD 5.459 |
| 7 235-7 250 EARTH EXPLORATION-SATELLITE (Earth-to-space) ADD 5.A111 FIXED MOBILE 5.458 |

**Reasons:** Studies have shown that sharing between the EESS (Earth-to-space) and other services in the 7 190-7 250 MHz band is feasible. Also splitting the Table of Allocations at 7 190 MHz clarifies the allocation of services within the Table.

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5.459 *Additional allocation:* in the Russian Federation, the frequency bands 7 100-7 155 MHz and 7 190-7 235 MHz are also allocated to the space operation service (Earth-to-space) on a primary basis, subject to agreement obtained under No. **9.21**. In the frequency band 7 190-7 235 MHz, the requirement to obtain agreement under No. **9.21** with respect to the Earth exploration-satellite service (Earth-to-space) does not apply.     (WRC-15)

**Reasons:** In the frequency band 7 190-7 235 MHz RR No. 9.21 is applied to the space operation service in order to provide protection for the existing radio services and shall not be applied with respect to a new service (the EESS) not to impose new constraints on the existing radio service.

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5.460 No emissions to spacecraft operating in deep space shall be effected in the frequency band 7 190-7 235 MHz. Geostationary satellites in the space research service operating in the frequency band 7 190-7 235 MHz shall not claim protection from existing and future stations of the fixed and mobile services and No. 5.43Adoes not apply.     (WRC-15)

**Reasons:** Deletion of first sentence is consequential change to splitting the 7 145-7 235 MHz range into two bands. Addition of words “spacecraft operating in” and “frequency” to be more precise.

ADD IAP/7A11/4

5.A111 The use of the frequency band 7 190-7 250 MHz by the Earth exploration-satellite service is limited to tracking, telemetry and command for the operation of the spacecraft. Geostationary satellites in the Earth exploration-satellite service operating in the frequency band 7 190-7 250 MHz shall not claim protection from existing and future stations of the fixed and mobile services and No. **5.43A** does not apply.     (WRC‑15)

**Reasons:** To provide a new allocation to the EESS (Earth-to-space) in the frequency band 7 190-7 250 MHz. The TT&C function could be implemented by pairing this new allocation with the already existing EESS (space-to-Earth) allocation in the frequency band 8 025-8 400 MHz. It restricts the usage of the frequency band 7 190-7 250 MHz to the operation of the EESS spacecraft, because the aim for the Resolution 650 (WRC-12) is to obtain a new allocation in the frequency range 7-8 GHz for the TT&C operations and no studies regarding other purpose except for TT&C function have been performed. If there were no restriction, this new allocation might be used for other purposes (e.g. data dissemination).

APPENDIX 7 (REV.WRC‑15)

Methods for the determination of the coordination area around an earth
station in frequency bands between 100 MHz and 105 GHz

ANNEX 7

System parameters and predetermined coordination distances for determination of the coordination area around an earth station

# 3 Horizon antenna gain for a receiving earth station with respect to a transmitting earth station

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TABLE 7b    (Rev.WRC‑15)

Parameters required for the determination of coordination distance for a transmitting earth station

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Transmitting space radiocommunication service designation | Fixed-satellite,mobile-satellite | Aero-nautical mobile-satellite (R) service | Aero-nautical mobile-satellite (R) service | Fixed-satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite | Earthexploration-satellite, space operation,space research | Fixed-satellite,mobile-satellite,meteorological- satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite | Fixed-satellite 3 | Fixed-satellite | Fixed-satellite 3 |
| Frequency bands (GHz) | 2.655-2.690 | 5.030-5.091 | 5.030-5.091 | 5.091-5.150 | 5.091-5.150 | 5.725-5.850 | 5.725-7.075 | 7.100-7 250 5 | 7.900-8.400 | 10.7-11.7 | 12.5-14.8 | 13.75-14.3 | 15.43-15.65 | 17.7-18.4 | 19.3-19.7 |
| Receiving terrestrialservice designations | Fixed,mobile | Aeronautical radio-navigation | Aeronautical mobile (R) | Aeronautical radio-navigation | Aeronautical mobile (R) | Radiolocation | Fixed, mobile | Fixed, mobile | Fixed, mobile | Fixed, mobile | Fixed, mobile | Radiolocation radionavigation (land only) | Aeronautical radionavigation | Fixed, mobile | Fixed, mobile |
| Method to be used | § 2.1 | § 2.1, § 2.2 | § 2.1, § 2.2 |  |  | § 2.1 | § 2.1 | § 2.1, § 2.2 | § 2.1 | § 2.1 | § 2.1, § 2.2 | § 2.1 |  | § 2.1, § 2.2 | § 2.2 |
| Modulation at terrestrial station 1 | A |  |  |  |  |  | A | N | A | N | A | N | A | N | A | N | − |  | N | N |
| Terrestrial station interference parameters and criteria | *p0* (%) | 0.01 |  |  |  |  |  | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 | 0.005 | 0.01 |  | 0.005 | 0.005 |
| *n* | 2 |  |  |  |  |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |  | 2 | 2 |
| *p* (%) | 0.005 |  |  |  |  |  | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.005 | 0.0025 | 0.01 |  | 0.0025 | 0.0025 |
| *NL* (dB) | 0 |  |  |  |  |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | 0 | 0 |
| *Ms* (dB) | 26 2 |  |  |  |  |  | 33 | 37 | 33 | 37 | 33 | 37 | 33 | 40 | 33 | 40 | 1 |  | 25 | 25 |
| *W* (dB) | 0 |  |  |  |  |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | 0 | 0 |
| Terrestrial station parameters | *Gx* (dBi) 4 | 49 2 | 6 | 10 | 6 | 6 |  | 46 | 46 | 46 | 46 | 46 | 46 | 50 | 50 | 52 | 52 | 36 |  | 48 | 48 |
| *Te* (K) | 500 2 |  |  |  |  |  | 750 | 750 | 750 | 750 | 750 | 750 | 1 500 | 1 100 | 1 500 | 1 100 | 2 636 |  | 1 100 | 1 100 |
| Reference bandwidth | *B* (Hz) | 4 × 103 | 150 × 103 | 37.5 × 103 | 150 × 103 | 106 |  | 4 × 103 | 106 | 4 × 103 | 106 | 4 × 103 | 106 | 4 × 103 | 106 | 4 × 103 | 106 | 107 |  | 106 | 106 |
| Permissible interference power | *Pr*( *p*) (dBW)in *B* | −140 | −160 | −157 | −160 | −143 |  | −131 | −103 | −131 | −103 | −131 | −103 | −128 | −98 | −128 | −98 | −131 |  | −113 | −113 |

1 A: analogue modulation; N: digital modulation.

2 The parameters for the terrestrial station associated with transhorizon systems have been used. Line-of-sight radio-relay parameters associated with the frequency band 5 725‑7 075 MHz may also be used to determine a supplementary contour with the exception that *Gx* = 37 dBi.

3 Feeder links of non-geostationary-satellite systems in the mobile‑satellite service.

4 Feeder losses are not included.

5 Actual frequency bands are 7 190-7 250 MHz for Earth exploration satellite service, 7 100-7 155 MHz and 7 190-7 235 MHz for the space operation service and 7 145-7 235 MHz for the space research service. (WRC-15)

**Reasons:** Consequential change of adding a primary EESS (Earth-to-space) allocation to the band 7 190-7 250 MHz.

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section III − Power limits for earth stations

MOD IAP/7A11/6

TABLE **21-3**     (Rev.WRC‑15)

|  |  |
| --- | --- |
| Frequency band | Services |
| 2 025-2 110 MHz5 670-5 725 MHz5 725-5 755 MHz6 | (for the countries listed in No. 5.454 with respect to the countries listed in Nos. 5.453 and 5.455)(for Region 1 with respect to the countries listed in Nos. 5.453 and 5.455) | Earth-exploration-satelliteFixed-satelliteMeteorological-satelliteMobile-satelliteSpace operation |
| 5 755-5 850 MHz6 | (for Region 1 with respect to the countries listed in Nos. 5.453, 5.455 and 5.456) | Space research |
| 5 850-7 075 MHz |  |  |
| 7 190-7 250 MHz |  |  |
| 7 900-8 400 MHz |  |  |
| 10.7-11.7 GHz6 | (for Region 1) |  |
| 12.5-12.75 GHz6 | (for Region 1 with respect to the countries listed in No. 5.494) |  |
| 12.7-12.75 GHz6  | (for Region 2) |  |
| 12.75-13.25 GHz |  |  |
| 14.0-14.25 GHz  | (with respect to the countries listed in No. 5.505) |  |
| 14.25-14.3 GHz  | (with respect to the countries listed inNos. 5.505, 5.508 and 5.509) |  |
| 14.3-14.4 GHz6 | (for Regions 1 and 3) |  |
| 14.4-14.8 GHz |  |  |
| 17.7-18.1 GHz |  | Fixed-satellite |
| 22.55-23.15 GHz |  | Earth exploration-satellite |
| 27.0-27.5 GHz6  | (for Regions 2 and 3) | Mobile-satellite |
| 27.5-29.5 GHz |  | Space research |
| 31.0-31.3 GHz | (for the countries listed in No. 5.545) |  |
| 34.2-35.2 GHz | (for the countries listed in No. 5.550 with respect to the countries listed in No. 5.549) |  |

**Reasons:** Consequential change of adding a primary EESS (Earth-to-space) allocation to the band 7 190-7 250 MHz.

SUP IAP/7A11/7

RESOLUTION 650 (WRC‑12)

Allocation for the Earth exploration-satellite service
(Earth-to-space) in the 7-8 GHz range

**Reasons:** ITU-R Working Party 7B completed required studies and this resolution is no longer needed.

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