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INTERNATIONAL TELECOMMUNICATION UNION

PLENARY MEETING

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Member States of the Inter-American Telecommunication Commission (CITEL)

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 1.11

1.11 to 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.

Proposals:

ARTICLE 5

Frequency allocations

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

MOD IAP/1.11/1

~~7 145~~ 5 570-7 ~~235~~250 MHz

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Allocation to services		
Region 1	**Region 2**	**Region 3**

7 145-~~7 235~~7 190	FIXED MOBILE SPACE RESEARCH (deep space) (Earth-to-space) ~~5.460~~ 5.458 MOD 5.459
~~7 145~~7 190-7 235 **~~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 ~~MOD 5.460~~
7 235-7 250	FIXED MOBILE EARTH EXPLORATION-SATELLITE (Earth-to-space) ~~MOD 5.460~~ADD 5.A111 5.458 ~~5.459~~

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.

MOD IAP/ 1.11/2

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-~~97~~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.

MOD IAP/ 1.11/~~2~~3

5.460 ~~The use of the band 7 145-7 190 MHz by the space research service (Earth-to-space) is restricted to deep space; no~~ 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 ~~and geostationary satellites in the Earth exploration-satellite service in the 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-~~03~~15)

Reasons: Deletion of first sentence as 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. ~~Consequential change to the splitting of the Table of Allocations at 7 190 MHz.~~

ADD IAP/ 1.11/4

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).

MOD IAP/1.11/35

APPENDIX 7 (REV.WRC-~~12~~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-~~12~~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**		**Earth exploration-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		7.100-7.25~~035~~ [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 terrestrial service 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	p_0 (%)	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
	N_L (dB)	0						0	0	0	0	0	0	0	0	0	0	0		0	0
	M_S (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	G_X (dBi) [4]	49 [2]	6	10	6	6		46	46	46	46	46	46	50	50	52	52	36		48	48
	T_e (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)	4×10^3	150×10^3	37.5×10^3	150×10^3	10^6		4×10^3	10^6	4×10^3	10^6	4×10^3	10^6	4×10^3	10^6	4×10^3	10^6	10^7		10^6	10^6
Permissible interference power	$P_r(p)$ (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 G_X = 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.

~~6 Cx (dBi)= 56.5 for Earth exploration satellite service.~~

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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

~~**MOD IAP/ 1.11/4**~~

~~**Section II – Power limits for terrestrial stations**~~

~~TABLE **21-2** (Rev.WRC-12~~15~~)~~

~~Frequency band~~	~~Service~~	~~Limit as specified in Nos.~~
~~1 427-1 429 MHz~~ ~~1 610-1 645.5 MHz (No. **5.359**)~~ ~~1 646.5-1 660 MHz (No. **5.359**)~~ ~~1 980-2 010 MHz~~ ~~2 010-2 025 MHz (Region 2)~~ ~~2 025-2 110 MHz~~ ~~2 200-2 290 MHz~~ ~~2 655-2 670 MHz[5] (Regions 2 and 3)~~ ~~2 670-2 690 MHz[5] (Regions 2 and 3)~~ ~~5 670-5 725 MHz (Nos. **5.453** and **5.455**)~~ ~~5 725-5 755 MHz[5] (Region 1 countries listed in Nos. **5.453** and **5.455**)~~ ~~5 755-5 850 MHz[5] (Region 1 countries listed in Nos. **5.453**, **5.455** and **5.456**)~~ ~~5 850-7 075 MHz~~ ~~7 145-7 235~~ ~~250~~ ~~MHz~~ ~~7 900-8 400 MHz~~	~~Fixed satellite~~ ~~Meteorological satellite~~ ~~Space research~~ ~~Space operation~~ ~~Earth exploration satellite~~ ~~Mobile satellite~~	~~**21.2**, **21.3**, **21.4** and **21.5**~~

~~* For this frequency band only the limits of Nos. 21.3 and 21.5 apply.~~

~~** *Note by the Secretariat:* This Resolution was revised by WRC-07 and WRC-12.~~

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

Section III − Power limits for earth stations

MOD IAP/1.11/~~5~~6

TABLE **21-3** (Rev.WRC-~~12~~15)

Frequency band		Services
2 025-2 110 MHz		~~Fixed-satellite~~
5 670-5 725 MHz	(for the countries listed in No. **5.454** with respect to the countries listed in Nos. **5.453** and **5.455**)	Earth-exploration-satellite Fixed-satellite Meteorological-satellite
5 725-5 755 MHz[6]	(for Region 1 with respect to the countries listed in Nos. **5.453** and **5.455**)	Mobile-satellite Space operation
5 755-5 850 MHz[6]	(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-~~7 235~~7 250 MHz		
7 900-8 400 MHz		
10.7-11.7 GHz[6]	(for Region 1)	
12.5-12.75 GHz[6]	(for Region 1 with respect to the countries listed in No. **5.494**)	
12.7-12.75 GHz[6]	(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 in Nos. **5.505**, **5.508** and **5.509**)	
14.3-14.4 GHz[6]	(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 GHz[6]	(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/1.11/67

RESOLUTION 650 (WRC-12)

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

The World Radiocommunication Conference (Geneva, 2012),

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