
PLENARY MEETING

**Addendum 9 to
Document 6388(Add.21)-
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9 September 2019
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Member States of the Inter-American Telecommunication Commission (CITEL)

PROPOSALS FOR THE WORK OF THE CONFERENCE

Agenda item 9.1(9.1.9)

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

9.1 on the activities of the Radiocommunication Sector since WRC-15;

9.1 (9.1.9) Resolution **162 (WRC-15)** - Studies relating to spectrum needs and possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (Earth-to-space)

INTRODUCTION

Satellite systems are increasingly being used to deliver broadband services with high data rates to accommodate user demand and service expectations worldwide. Next-generation satellite networks are expected to provide data rate services from 100 Mbit/s to greater than 1 Gbit/s on a single channel to all users regardless of location. Satellite systems enable the immediate connection of many subscribers, irrespective of their location, to broadband and Internet backbone networks with just one launch, compared to a point-by-point roll-out. By implementing advanced technologies such as spot-beam antennas and high frequency reuse factors, HTS reach many times the throughput of traditional satellites using the same amount of allocated spectrum, which leads to the reduction of Gigabits per second (Gbit/s) costs.

The limiting factor of HTS satellite networks is the amount of spectrum allocated to the forward link in the Earth-to-space segment (gateway-to-satellite link).

Current HTS systems are mainly operated in Ka-band and use the Earth-to-space allocations for both user links and gateway links, which leads to the scarcity of spectral resources in this frequency band. In order to achieve higher data rates and improve the services provided to end-users, it is proposed to use the allocation to FSS (Earth-to-space) in the 50/40 GHz frequency bands for the gateway uplink (from gateway to space station) and Ka-band allocations to FSS (Earth-to-space) for the user uplink (from user terminals to space station). Therefore, the consideration of new primary allocations to the FSS in the frequency band 51.4-52.4 GHz (Earth-to-space) limited to FSS gateway links is required.

The current frequency range of primary allocations to FSS (Earth-to-space) in the frequency bands 40/50 GHz in Regions 1, 2 and 3 is 42.5-43.5 GHz, 47.2-50.2 GHz and 50.4-51.4 GHz. The two FSS Earth-to-space allocations in the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz are almost contiguous, making these 4 GHz allocations suitable for operation of wideband carriers. The additional allocation of FSS (Earth-to-space) in the 51.4-52.4 GHz frequency band will allow access to 5 GHz of almost contiguous spectrum for the uplink communications; in addition, the 42.5-43.5 GHz allocation would enable a total of 6 GHz of spectrum for Earth-to-space communications. This situation will make it more suitable for the operation of FSS systems providing high data rate services worldwide with satisfactory availabilities.

The consideration of all these aspects indicate that the additional allocation to the FSS being considered would be beneficial to make reliable broadband connections more accessible to communities through satellite communication regardless of their geographical location, as achieved by HTS.

Background

In preparation for WRC-19, Working Group 4A (WP 4A) of the ITU-R has carried out the studies on spectrum requirements and the possible allocation of the frequency band 51.4-52.4 GHz to the fixed-satellite service (FSS) (Earth-to-space). In response to Resolution 162 (WRC-15), WP 4A developed two Reports; one on spectrum needs for development of the FSS and the second one on sharing and compatibility between FSS and existing services.

It is considered to make an allocation of the frequency band 51.4-52.4 GHz to the FSS (Earth-to-space), limited to FSS gateway links for geostationary orbit use while protecting currently allocated services in the same frequency band and in adjacent frequency bands.

CITEL Member States support the studies carried out at the ITU-R Working Party 4A on sharing and compatibility studies to allow new primary allocation to the FSS in the frequency band 51.4-52.4 GHz (Earth-to-space), considering the protection of fixed and mobile services already allocated in this band.

ARTICLE 5

Frequency allocations

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

MOD IAP/6388A21A9/1

51.4-55.78 GHz

Allocation to services		
Region 1	Region 2	Region 3
51.4-52.6 <u>52.4</u>	FIXED 5.338A <u>FIXED-SATELLITE (Earth-to-space)</u> <u>ADD 5.A919</u> <u>ADD 5.B919</u> MOBILE 5.547 5.556 <u>MOD 5.338A</u>	
51.4 <u>52.4</u> -52.6	FIXED <u>MOD 5.338A</u> MOBILE 5.547 5.556	

Reasons: Allocation to the FSS (Earth-to-space).

MOD IAP/6388A21A9/2

5.338A In the frequency bands 1 350-1 400 MHz, 1 427-1 452 MHz, 22.55-23.55 GHz, 30-31.3 GHz, 49.7-50.2 GHz, 50.4-50.9 GHz, 51.4-52.4 GHz, 52.4-52.6 GHz, 81-86 GHz and 92-94 GHz, Resolution **750 (Rev.WRC-19)** applies. (WRC-195)

Reasons: Application of the limits for FSS ES unwanted emissions as contained in the proposed revision to Resolution **750 (Rev.WRC-15)**.

ADD IAP/6388A21A9/3

5.A919 The use of the frequency band 51.4-52.4 GHz by the fixed-satellite service (Earth-to-space) is limited to geostationary satellite networks and the fixed-satellite service earth stations shall have a minimum antenna diameter of 4.5 metres. (WRC-19)

Reasons: To limit the new allocation to gateways operating in FSS GSO networks.

ADD IAP/6388A21A9/4

5.B919 An administration that has submitted a notice under No. 9.6 with frequency assignments in the FSS on a GSO space station shall seek the agreement of other administrations with regard to their notified frequency assignments on GSO EESS space stations in the frequency band 52.6-54.25 GHz within 2.5 degrees of the nominal orbital position of the GSO FSS space station. Both administrations should take reasonable steps to reach an agreement. (WRC-19)

Reasons: Suggested text to implement Option 1 of the CPM Text.

ARTICLE 21

Terrestrial and space services sharing frequency bands above 1 GHz

Section II – Power limits for terrestrial stations

MOD IAP/6388A21A9/5

TABLE 21-2 (Rev.WRC-15)

Frequency band	Service	Limit as specified in Nos.
10.7-11.7 GHz ⁵ (Region 1) 12.5-12.75 GHz ⁵ (Nos. 5.494 and 5.496) 12.7-12.75 GHz ⁵ (Region 2) 12.75-13.25 GHz 13.75-14 GHz (Nos. 5.499 and 5.500) 14.0-14.25 GHz (No. 5.505) 14.25-14.3 GHz (Nos. 5.505 and 5.508) 14.3-14.4 GHz ⁵ (Regions 1 and 3) 14.4-14.5 GHz 14.5-14.8 GHz 51.4-52.4 GHz	Fixed-satellite	21.2, 21.3 and 21.5

Reasons: Inclusion of the frequency band proposed for the new allocation to FSS (Earth-to-space) for applicability of the limits in RR Nos. **21.2, 21.3 and 21.5.**

Section III – Power limits for earth stations

MOD IAP/6388A21A9/6

TABLE 21-3 (Rev.WRC-15)

Frequency band	Services
2 025-2 110 MHz	Earth exploration-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)	Fixed-satellite
5 725-5 755 MHz ⁶ (for Region 1 with respect to the countries listed in Nos. 5.453 and 5.455)	Meteorological-satellite
5 755-5 850 MHz ⁶ (for Region 1 with respect to the countries listed in Nos. 5.453 and 5.455)	Mobile-satellite
5 850-7 075 MHz	Space operation
7 190-7 250 MHz	
7 900-8 400 MHz	
10.7-11.7 GHz ⁶ (for Region 1)	Space research
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 and 5.508)	
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)	
<u>51.4-52.4 GHz</u>		<u>Fixed-satellite</u>

Reasons: Inclusion of the frequency band proposed for the new allocation to FSS (Earth-to-space) for applicability of the limits in RR No. **21.8**.

APPENDIX 4 (REV.WRC-15)

Consolidated list and tables of characteristics for use in the application of the procedures of Chapter III

ANNEX 2

Characteristics of satellite networks, earth stations or radio astronomy stations² (Rev.WRC-12)

² The Radiocommunication Bureau shall develop and keep up-to-date forms of notice to meet fully the statutory provisions of this Appendix and related decisions of future conferences. Additional information on the items listed in this Annex together with an explanation of the symbols is to be found in the Preface to the BR IFIC (Space Services). (WRC-12)

Footnotes to Tables A, B, C and D

MOD IAP/6388A21A9/7

TABLE C
CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS
FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR
RADIO ASTRONOMY ANTENNA (Rev.WRC-15)

Items in Appendix	<i>C - CHARACTERISTICS TO BE PROVIDED FOR EACH GROUP OF FREQUENCY ASSIGNMENTS FOR A SATELLITE ANTENNA BEAM OR AN EARTH STATION OR RADIO ASTRONOMY ANTENNA</i>	Advance publication of a geostationary-	Advance publication of a non-geostationary-satellite network subject to	Advance publication of a non-geostationary-satellite network not subject to	Notification or coordination of a geostationary-satellite network (including space	Notification or coordination	Notification or coordination of an earth station (including	Notice for a satellite network in the broadcasting-satellite	Notice for a satellite network (feeder-link) under	Notice for a satellite network in the fixed-	Items in Appendix	Radio astronomy
...	...											
C.10. d.7	the antenna diameter, in metres In cases other than Appendix 30A, required for fixed-satellite service networks operating in the frequency bands 13.75-14 GHz, 14.5-14.75 GHz (in countries listed in Resolution 163 (WRC-15) not for feeder links for the broadcasting-satellite service), 14.5-14.8 GHz (in countries listed in Resolution 164 (WRC-15) not for feeder links for the broadcasting-satellite service), 24.65-25.25 GHz (Region 1) and 24.65-24.75 GHz (Region 3) <u>and 51.4-52.4 GHz</u> and for maritime mobile-satellite service networks operating in the frequency band 14-14.5 GHz				+	+			X		C.1 0.d. 7	
...	...											

Reasons: Limitations for antenna diameter for the frequency band 51.4-52.4 GHz is proposed in footnote RR No. **5.A919**

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

MOD IAP/6388A21A9/8

TABLE 7c (Rev.WRC-12)

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

Transmitting space radiocommunication service designation	Fixed-satellite	Fixed-satellite 2	Fixed-satellite 3	Space research	Earth exploration-satellite, space research	Fixed-satellite, mobile-satellite, radionavigation-satellite	Fixed-satellite	Fixed-satellite 2
Frequency bands (GHz)	24.65-25.25 27.0-29.5	28.6-29.1	29.1-29.5	34.2-34.7	40.0-40.5	42.5-47 47.2-50.2 50.4-51.4	51.4-52.4	47.2-50.2
Receiving terrestrial service designations	Fixed, mobile	Fixed, mobile	Fixed, mobile	Fixed, mobile, radiolocation	Fixed, mobile	Fixed, mobile, radionavigation	Fixed, mobile	Fixed, mobile
Method to be used	§ 2.1	§ 2.2	§ 2.2		§ 2.1, § 2.2	§ 2.1, § 2.2	§ 2.1	§ 2.2
Modulation at terrestrial station 1	N	N	N		N	N	N	N
Terrestrial station interference parameters and criteria	p_0 (%)	0.005	0.005	0.005		0.005	0.005	0.001
	N	1	2	1		1	1	1
	p (%)	0.005	0.0025	0.005		0.005	0.005	0.001
	NL (dB)	0	0	0		0	0	0
	M_s (dB)	25	25	25		25	25	25
	W (dB)	0	0	0		0	0	0
Terrestrial station parameters	G_x (dBi) 4	50	50	50		42	42	46
	T_e (K)	2 000	2 000	2 000		2 600	2 600	2 000
Reference bandwidth	B (Hz)	106	106	106		106	10 ⁶	106

Permissible interference power	$P_r(p)$ (dBW) in B	-111	-111	-111		-110	-110	<u>-110</u>	-111
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- 1 A: analogue modulation; N: digital modulation.
- 2 Non-geostationary satellites in the fixed-satellite service.
- 3 Feeder links to non-geostationary-satellite systems in the mobile-satellite service.
- 4 Feeder losses are not included.

Reasons:

MOD IAP/6388A21A9/9

RESOLUTION 750 (REV.WRC-195)

**Compatibility between the Earth exploration-satellite service (passive)
and relevant active services**

The World Radiocommunication Conference ([Sharm el-Sheikh, 2019](#)[Geneva, 2015](#)),

considering

- a) that primary allocations have been made to various space services such as the fixed-satellite service (Earth-to-space), the space operation service (Earth-to-space) and the inter-satellite service and/or to terrestrial services such as the fixed service, the mobile service and the radiolocation service, hereinafter referred to as “active services”, in frequency bands adjacent or nearby to frequency bands allocated to the Earth exploration-satellite service (EESS) (passive) subject to No. **5.340**;
- b) that unwanted emissions from active services have the potential to cause unacceptable interference to EESS (passive) sensors;
- c) that, for technical or operational reasons, the general limits in Appendix **3** may be insufficient in protecting the EESS (passive) in specific frequency bands;
- d) that, in many cases, the frequencies used by EESS (passive) sensors are chosen to study natural phenomena producing radio emissions at frequencies fixed by the laws of nature, and therefore shifting frequency to avoid or mitigate interference problems is not possible;
- e) that the frequency band 1 400-1 427 MHz is used for measuring soil moisture, and also for measuring sea-surface salinity and vegetation biomass;
- f) that long-term protection of the EESS in the frequency bands 23.6-24 GHz, 31.3-31.5 GHz, 50.2-50.4 GHz, 52.6-54.25 GHz and 86-92 GHz is vital to weather prediction and disaster management, and measurements at several frequencies must be made simultaneously in order to isolate and retrieve each individual contribution;
- g) that, in many cases, the frequency bands adjacent or nearby to passive service frequency bands are used and will continue to be used for various active service applications;
- h) that it is necessary to ensure equitable burden sharing for achieving compatibility between active and passive services operating in adjacent or nearby frequency bands,

noting

- a) that the compatibility studies between relevant active and passive services operating in adjacent and nearby frequency bands are documented in Report ITU-R SM.2092 [and in PDN Report ITU-R S.\[SPECTRUM_SHARING\]](#);
- b) that the compatibility studies between IMT systems in the frequency bands 1 375-1 400 MHz and 1 427-1 452 MHz and EESS (passive) systems in the frequency band 1 400-1 427 MHz are documented in Report ITU-R RS.2336;

c) that Report ITU-R F.2239 provides the results of studies covering various scenarios between the fixed service, operating in the frequency band 81-86 GHz and/or 92-94 GHz, and the Earth exploration-satellite service (passive), operating in the frequency band 86-92 GHz;

d) that Recommendation ~~ITU-R RS.2017~~~~ITU-R RS.1029~~ provides the interference criteria for satellite passive remote sensing,

noting further

that, for the purpose of this Resolution:

- point-to-point communication is defined as radiocommunication provided by a link, for example a radio-relay link, between two stations located at specified fixed points;
- point-to-multipoint communication is defined as radiocommunication provided by links between a single station located at a specified fixed point (also called “hub station”) and a number of stations located at specified fixed points (also called “customer stations”),

recognizing

a) that studies documented in Report ITU-R SM.2092 do not consider point-to-multipoint communication links in the fixed service in the frequency bands 1 350-1 400 MHz and 1 427-1 452 MHz;

b) that, in the frequency band 1 427-1 452 MHz, mitigation measures, such as channel arrangements, improved filters and/or guardbands, may be necessary in order to meet the limits of unwanted emission for IMT stations in the mobile service specified in Table 1-1 of this Resolution;

c) that, in the frequency band 1 427-1 452 MHz, IMT mobile stations typically perform better than the equipment specifications as stated by relevant standards organizations, which may be taken into account in meeting the limits specified in Table 1-1 (see also sections 4 and 5 of Report ITU-R RS.2336),

resolves

1 that unwanted emissions of stations brought into use in the frequency bands and services listed in Table 1-1 below shall not exceed the corresponding limits in that table, subject to the specified conditions;

2 to urge administrations to take all reasonable steps to ensure that unwanted emissions of active service stations in the frequency bands and services listed in Table 1-2 below do not exceed the recommended maximum levels contained in that table, noting that EESS (passive) sensors provide worldwide measurements that benefit all countries, even if these sensors are not operated by their country;

3 that the Radiocommunication Bureau shall not make any examination or finding with respect to compliance with this Resolution under either Article 9 or 11.

TABLE 1-1

EESS (passive) band	Active service band	Active service	Limits of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band ¹
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1 400-1 427 MHz	1 427-1 452 MHz	Mobile	-72 dBW in the 27 MHz of the EESS (passive) band for IMT base stations -62 dBW in the 27 MHz of the EESS (passive) band for IMT mobile stations ^{2,3}
23.6-24.0 GHz	22.55-23.55 GHz	Inter-satellite	-36 dBW in any 200 MHz of the EESS (passive) band for non-geostationary (non-GSO) inter-satellite service (ISS) systems for which complete advance publication information is received by the Bureau before 1 January 2020, and -46 dBW in any 200 MHz of the EESS (passive) band for non-GSO ISS systems for which complete advance publication information is received by the Bureau on or after 1 January 2020
31.3-31.5 GHz	31-31.3 GHz	Fixed (excluding HAPS)	For stations brought into use after 1 January 2012: -38 dBW in any 100 MHz of the EESS (passive) band. This limit does not apply to stations that have been authorized prior to 1 January 2012
50.2-50.4 GHz	49.7-50.2 GHz	Fixed-satellite (E-to-s) ⁴	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: -10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi -20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi
50.2-50.4 GHz	50.4-50.9 GHz	Fixed-satellite (E-to-s) ⁴	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: -10 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 57 dBi -20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 57 dBi
52.6-54.25 GHz	51.4-52.6 GHz	Fixed	For stations brought into use after the date of entry into force of the Final Acts of WRC-07: -33 dBW in any 100 MHz of the EESS (passive) band
<u>52.6-54.25 GHz</u>	<u>51.4-52.4 GHz</u>	<u>Fixed-satellite (E-to-s)</u>	<u>For stations brought into use after the date of entry into force of the Final Acts of WRC-19:</u> <u>-37 dBW in any 100 MHz of the EESS (passive) band for earth stations with antenna elevation angles lower than 75°</u> <u>-52 dBW in any 100 MHz of the EESS (passive) band for earth stations with antenna elevation angles equal or higher than 75°</u>

¹ The unwanted emission power level is to be understood here as the level measured at the antenna port.

² This limit does not apply to mobile stations in the IMT systems for which the notification information has been received by the Radiocommunication Bureau by 28 November 2015. For those systems, -60 dBW/27 MHz applies as the recommended value.

³ The unwanted emission power level is to be understood here as the level measured with the mobile station transmitting at an average output power of 15 dBm.

⁴ The limits apply under clear-sky conditions. During fading conditions, the limits may be exceeded by earth stations when using uplink power control.

TABLE 1-2

EESS (passive) band	Active service band	Active service	Recommended maximum level of unwanted emission power from active service stations in a specified bandwidth within the EESS (passive) band ¹
1 400-1 427 MHz	1 350-1 400 MHz	Radiolocation ²	-29 dBW in the 27 MHz of the EESS (passive) band
		Fixed	-45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
		Mobile	-60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except transportable radio-relay stations -45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations
	1 427-1 429 MHz	Space operation (E-to-s)	-36 dBW in the 27 MHz of the EESS (passive) band
	1 427-1 429 MHz	Mobile except aeronautical mobile	-60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except IMT stations and transportable radio-relay stations ³ -45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations
		Fixed	-45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
	1 429-1 452 MHz	Mobile	-60 dBW in the 27 MHz of the EESS (passive) band for mobile service stations except IMT stations, transportable radio-relay stations and aeronautical telemetry stations -45 dBW in the 27 MHz of the EESS (passive) band for transportable radio-relay stations -28 dBW in the 27 MHz of the EESS (passive) band for aeronautical telemetry stations ³
		Fixed	-45 dBW in the 27 MHz of the EESS (passive) band for point-to-point
31.3-31.5 GHz	30.0-31.0 GHz	Fixed-satellite (E-to-s) ⁴	-9 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain greater than or equal to 56 dBi -20 dBW into the 200 MHz of the EESS (passive) band for earth stations having an antenna gain less than 56 dBi
86-92 GHz ⁵	81-86 GHz	Fixed	-41 - 14(f - 86) dBW/100 MHz for 86.05 ≤ f ≤ 87 GHz -55 dBW/100 MHz for 87 ≤ f ≤ 91.95 GHz where f is the centre frequency of the 100 MHz reference bandwidth expressed in GHz
	92-94 GHz	Fixed	-41 - 14(92 - f) dBW/100 MHz for 91 ≤ f ≤ 91.95 GHz -55 dBW/100 MHz for 86.05 ≤ f ≤ 91 GHz where f is the centre frequency of the 100 MHz reference bandwidth expressed in GHz

Notes to Table 1-2:

- ¹ The unwanted emission power level is to be understood here as the level measured at the antenna port.
- ² The mean power is to be understood here as the total power measured at the antenna port (or an equivalent thereof) in the frequency band 1 400-1 427 MHz, averaged over a period of the order of 5 s.
- ³ The frequency band 1 429-1 435 MHz is also allocated to the aeronautical mobile service in eight Region 1 administrations on a primary basis exclusively for the purposes of aeronautical telemetry within their national territory (No. **5.342**).
- ⁴ The recommended maximum levels apply under clear-sky conditions. During fading conditions, these levels may be exceeded by earth stations when using uplink power control.
- ⁵ Other maximum unwanted emission levels may be developed based on different scenarios provided in Report ITU-R F.2239 for the frequency band 86-92 GHz.

Reasons: Conditions to limit the unwanted emissions from the FSS Earth stations falling in the frequency band 52.6-54.25 GHz to protect the EESS (passive).