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| A close up of a sign  Description automatically generated | **World Radiocommunication Conference (WRC-23) Dubai, 20 November - 15 December 2023** | |  |
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| PLENARY MEETING | | **Addendum 12 to Document 44-E** | |
|  | | **13 October 2023** | |
|  | | **Original: English** | |
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| Member States of the Inter-American Telecommunication Commission (CITEL) | | | |
| PROPOSALS FOR THE WORK OF THE CONFERENCE | | | |
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| Agenda item 1.12 | | | |

1.12 to conduct, and complete in time for WRC‑23, studies for a possible new secondary allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders within the range of frequencies around 45 MHz, taking into account the protection of incumbent services, including in adjacent bands, in accordance with Resolution **656 (Rev.WRC‑19)**;

Background

This agenda item seeks a new secondary allocation to the Earth exploration-satellite service (EESS) (active) for spaceborne radar sounders within a range of frequencies around 45 MHz while taking into account the protection of incumbent services including those in adjacent frequency bands. The frequency range 40-50 MHz is currently allocated, and widely used by, the fixed, mobile, and broadcasting services on a primary basis, as well as being allocated on a primary basis in portions of the frequency band to the aeronautical radionavigation service (RR No.**5.160**) and radiolocation service limited to oceanographic radars (RR No. **5.161A**) in some countries. It is also adjacent to a primary allocation to the amateur service in Regions 2 and 3, and some countries in Region 1. Secondary allocations in portions of the 40-50 MHz frequency band include the space research service, radiolocation service (RR No. **5.161** and RR No. **5.162A** (limited to wind profiler radars)). Sharing studies have been conducted with those services operating on a primary and secondary basis (taking account RR No. **5.31**) in the frequency range 40-50 MHz, as well as primary amateur operations in the adjacent frequency band.

A secondary allocation around 45 MHz would provide the science community the ability to provide radar maps of subsurface scattering layers with the intent to locate water/ice deposits. The sounding radars are intended to be utilized only in either uninhabited or sparsely populated areas of the globe. The mission’s scientific objectives are: 1) to understand the global thickness, inner structure, and the thermal stability of the Earth’s ice sheets (e.g. in Greenland and Antarctica) as an observable parameter of Earth’s climate evolution, and 2) to understand the occurrence, distribution and dynamics of the Earth’s fossil aquifers in desert environments such as those in northern Africa and the Arabian Peninsula as key elements in understanding recent paleoclimatic changes.

Recommendation ITU-R RS.2042-1 provides technical and operating characteristics for space-borne radar sounder systems using the frequency band 40-50 MHz and Report ITU-R RS.2455-0 provides preliminary results of sharing studies between a 45 MHz radar sounder and incumbent fixed, mobile, broadcasting and space research services operating in the 40-50 MHz frequency range.

At the CPM23-2 meeting in March-April 2023 in Geneva, the CPM text for WRC-23 agenda item 1.12 was finalised. It consists of five Methods to satisfy the agenda item.

Proposals

ARTICLE 5

Frequency allocations

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

MOD IAP/44A12/1#1801

27.5-40.98 MHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 39.986-40  FIXED  MOBILE  Space research |  | 39.986-40  FIXED  MOBILE  RADIOLOCATION 5.132A  Space research |
| 40-40.02  FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  Space research | | 40-40.02  FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  Space research |
| 40.02-40.98 FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  5.150 | | |

**Reasons:** Provide a new global secondary allocation to the EESS (active) in the frequency band 40-50 MHz for the science community to provide radar maps of subsurface scattering layers with the intent to locate water/ice deposits.

MOD IAP/44A12/2#1810

40.98-47 MHz

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| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 40.98-41.015 FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  Space research  5.160 5.161 | | |
| 41.015-42 FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  5.160 5.161 5.161A | | |
| 42-42.5  FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  Radiolocation 5.132A | 42-42.5  FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112 |  |
| 5.160 5.161B | 5.161 |  |
| 42.5-44 FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  5.160 5.161 5.161A | | |
| 44-47 FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112  5.162 5.162A | | |

**Reasons:** Provide a new global secondary allocation to the EESS (active) in the frequency band 40-50 MHz for the science community to provide radar maps of subsurface scattering layers with the intent to locate water/ice deposits.

MOD IAP/44A12/3#1803

47-75.2 MHz

|  |  |  |
| --- | --- | --- |
| Allocation to services | | |
| Region 1 | Region 2 | Region 3 |
| 47-50  BROADCASTING  Earth exploration-satellite (active) ADD 5.A112  5.162A 5.163 5.164 5.165 | 47-50  FIXED  MOBILE  Earth exploration-satellite (active) ADD 5.A112 | 47-50  FIXED  MOBILE  BROADCASTING  Earth exploration-satellite (active) ADD 5.A112  5.162A |

**Reasons:** Provide a new global secondary allocation to the EESS (active) in the frequency band 40-50 MHz for the science community to provide radar maps of subsurface scattering layers with the intent to locate water/ice deposits.

ADD IAP/44A12/4#1804

5.A112-A1 The use of the frequency band 40-50 MHz by the Earth exploration-satellite service (active) shall be in accordance with Resolution **[A112‑METHOD‑A1] (WRC‑23)**.

The provisions of this footnote in no way diminish the obligation of the Earth exploration-satellite service (active) to operate as a secondary service in accordance with Nos. **5.29** and **5.30**.     (WRC‑23)

**Reasons:** A new WRC Resolution is required to protect incumbent services in-band and in adjacent-band.

SUP IAP/44A12/5#1814

RESOLUTION 656 (REV.WRC-19)

Possible secondary allocation to the Earth exploration-satellite service (active) for spaceborne radar sounders in the range of frequencies around 45 MHz

**Reasons:** Consequential action.

ADD IAP/44A12/6#1805

Draft New Resolution [A112-METHOD-A1] (WRC‑23)

Use of the frequency range 40-50 MHz allocated to the Earth exploration-satellite service (active) for spaceborne radar sounders

The World Radiocommunication Conference (Dubai, 2023),

considering

*a)* that spaceborne active sensors operating in the Earth exploration-satellite service (EESS) (active), described in Recommendation ITU‑R RS.2042‑1, can provide unique information on the physical properties of the Earth, such as characteristics of polar ice sheets and subterranean fossil aquifers in desertic environments;

*b)* that spaceborne active remote sensing requires specific frequency ranges depending on the physical phenomena to be observed;

*c)* that worldwide, periodic measurements of subsurface water/ice deposits require the use of spaceborne radar sounder active sensors;

*d)* that the measurement of reflectivity from subsurface scattering layers as deep as 10 m to 100 m for shallow aquifers and groundwater conduits, and on the order of 5 km for basal interface topography and ice-sheet thickness, is necessary;

*e)* that spaceborne radar sounders operating in the EESS (active) are intended to be operated from polar orbits, only in either uninhabited, sparsely populated or remote areas of the globe, with particular focus on deserts and polar ice fields;

*f)* that the 40-50 MHz frequency range is preferable to satisfy all operational requirements for such spaceborne radar sounder active sensors in accordance with Recommendation ITU‑R RS.2042-1;

*g)* that spaceborne radar sounders are intended to be operated only at night-time from 3 a.m. to 6 a.m. locally,

recognizing

*a)* that, given the complexity of the EESS (active) instruments implementation in these low frequencies, and the high investment costs associated with these observation missions, very few such platforms are expected to be in orbit at the same time; consequently, aggregate interference from multiple spaceborne radar sounders into incumbent services is not anticipated and could be mitigated by coordination between the operators of such instruments;

*b)* that measurements by these radar sounders are only possible when the total electron content of the ionosphere is near its daily minimum, which normally occurs in a few hours’ window centred approximately at 4 a.m. local time;

*c)* that coordination between operators of EESS (active) systems and operators of wind profiler radars in the 40-50 MHz band may be needed on a case-by-case basis to ensure coexistence between the corresponding stations,

resolves

1 that the use of the band 40-50 MHz by EESS (active) is limited to spaceborne radar sounders as described in Recommendation ITU‑R RS.2042;

2 that the following conditions shall apply to stations operating in the EESS (active) in the frequency band 40-50 MHz on a secondary basis:

2.1 not claim protection from stations operating in the radiolocation service in the frequency bands 42-42.5 MHz or 46-50 MHz. No. **5.43A** does not apply;

2.2 not claim protection from stations operating in the space research service in the frequency bands 40-40.02 MHz or 40.98-41.015 MHz. No. **5.43A** does not apply;

2.3 operations are permitted without limits to the pfd levels when the subsatellite[[1]](#footnote-1)1 point is located within any of the following areas:

a) the spherical cap formed by latitudes between 72 and 90 degrees North;

b) the spherical cap formed by latitudes between 60 and 90 degrees South;

c) the quadrangle formed by latitudes between 59 and 72 degrees North and longitudes between 25 and 55 degrees West;

2.4 shall transmit within the areas defined in *resolves* 2.3 for no more than a total of 30 minutes within a 24‑hour period;

3 that, if more than one system is in operation, administrations shall ensure collectively that the limits in *resolves*2.4 are not exceeded and shall have consultations accordingly. Until such consultations occur to ensure the compliance with these limits, each system shall ensure that the limits in *resolves*2.4 are not exceeded for more than 30/N minutes, where N is the number of systems in operation;

4 that for stations in the EESS (active) operating in areas outside of those provided in *resolves*2.3, for the purpose of providing protection to the in-band and adjacent-band services, the peak pfd level per spaceborne radar sounder produced at the surface of the Earth shall not exceed −170.6 dB(W/(m2 · 4 kHz)), under free-space propagation conditions, without prior agreement of affected administrations;

5 that if an administration authorizes a spaceborne radar sounder in the EESS (active) that operates above the peak pfd level specified in *resolves* 4 within the territory under its jurisdiction, such agreement shall not affect other countries that are not party to that agreement.

**Reasons:** A new WRC Resolution is required to protect incumbent services in-band and in adjacent-bands. This Resolution establishes operations areas in the polar regions, with no restriction on the radar sounder pfd, to support the measurement of the polar ice cap. Outside the areas defined in *resolves* 2.3 where atmospheric and ionospheric losses are less, a pfd limit is established that ensures protection of all incumbent services. This limit is based on the maximum amount of exceedance that occurs in the ITU-R studies and the radar sounder pfd used in the ITU-R studies. (See draft new Report ITU-R RS.[SPACEBORNE VHF RADAR SOUNDER]). This pfd limit will not allow for radar sounder data acquisition. An agreement with an administration to exceed that pfd limit within their territory can be used to support radar sounder data acquisition within that territory.

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1. 1 The subsatellite point is defined as the location of the projection of the satellite’s nadir-pointing vector onto the Earth’s surface. [↑](#footnote-ref-1)