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| **The 5th Meeting of the APT Conference Preparatory**  **Group for WRC-23 (APG23-5)** | **APG23-5/OUT-20** |
| 20 – 25 February 2023, Busan, Republic of Korea | 24 February 2023 |

Working Party 3

**PRELIMINARY VIEWs on WRC-23 agenda item 1.12**

**Agenda Item 1.12:**

*to conduct, and complete in time for WRC 23, studies for a possible new secondary allocation to the Earth exploration-satellite (active) service 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)****;*

**1. Background**

There is an interest among climate researchers in remote sensing of the Earth’s subsurface with the intent of locating water/ice/deposits and examining sub-ice glacial bed surfaces using active spaceborne sensors. This information can help to understand the global thickness, inner structure, and the thermal stability of the Earth’s ice sheets as an observable parameter of Earth climate evolution. The 40-50 MHz frequency range is preferable to satisfy all requirements for spaceborne radar sounders and a bandwidth of 10 MHz is sufficient for use.

ITU-R Recommendation [RS.2042-1](https://www.itu.int/rec/R-REC-RS.2042/en) titled “Typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz band” was completed during the WRC-19 study cycle. This recommendation indicates that:

* operations of spaceborne radar sounder with other primary and secondary services would be under RR No. **4.4**, non-interference basis and shall not cause harmful interference to, and shall not claim protection;
* that operational limitations have been identified to allow operation under RR No. **4.4** on a non-interference basis such as operating only in either uninhabited or sparsely populated areas of the ice sheets of Greenland and Antarctica and deserts of northern Africa and the Arabian Peninsula and operating the radar at night-time only from 3 a.m. to 6 a.m. locally

The spaceborne active sensor is expected to be carried on a low-Earth orbiting satellite at an altitude of 400 km, an inclination optimized for a sun synchronous orbit. The number of spaceborne radar sounder missions operating simultaneously is expected to remain very low; perhaps only one, or two.

The following is a summary of the status of ITU-R work currently ongoing in Working Party 7C (WP 7C, the responsible group) for this agenda item:

1. **Draft CPM Text** – A document containing draft CPM text for Agenda Item 1.12 is attached to the WP 7C Chair’s September/October 2022 meeting report (refer Annex 3 to ITU-R document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en)). The draft CPM text submitted to the CPM Management Team contains five proposed methods as follows:

**Method A1** proposes to establish a new global secondary allocation to the EESS for active emissions. This new secondary allocation is proposed to be limited, through a dedicated footnote, to the operation of spaceborne radar sounder systems, over the frequency band 40-50 MHz, in the Table of Frequency Allocations of RR Article 5. This footnote would reference a proposed new WRC Resolution to protect incumbent services in the frequency band 40-50 MHz and in the adjacent frequency bands.

**Method A2** proposes to establish a new global secondary allocation to the EESS for active emissions. This new secondary allocation is proposed to be limited, through a dedicated footnote, to the operation of spaceborne radar sounder systems, over the frequency band 40-50 MHz, in the Table of Frequency Allocations of RR Article 5. This footnote would also include relevant technical conditions, such as the power flux-density at the surface of the Earth, to address the protection of incumbent services in the frequency band 40-50 MHz.

**Method B** proposes to establish a new global secondary allocation to the EESS for active emissions. This new secondary allocation is proposed to be limited, through a dedicated footnote, to the operation of spaceborne radar sounder systems, over the frequency band 40-50 MHz, in the Table of Frequency Allocations of RR Article 5. In addition, this footnote would address the protection of the secondary radiolocation service in the frequency bands 42-42.5 MHz and 46-68 MHz.

**Method C** proposes to establish a global secondary allocation to the EESS for active emissions over the frequency band 40-50 MHz in the Table of Frequency Allocations of RR Article 5.

**Method D** proposes no change to the Radio Regulations (Articles and Appendices).

1. **Revision of ITU-R Report RS.2455** **(now Preliminary draft new report ITU-R RS.[Spaceborne VHF Radar Sounder])**– work continued at the September/October 2022 WP 7C meeting on the Preliminary draft revision of this report. The meeting agreed that as more than 90% of the proposed revisions to the report is new material it would be better to create a new report (and subsequently suppress the in-force version). The latest version of the new report is attached to the WP 7C Chair’s report (Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 2) and is now titled “Preliminary draft new Report ITU-R RS.[Spaceborne VHF Radar Sounder]”. As significant further work is required on the sharing studies a correspondence group was formed to progress this work. The Terms of Reference for this group are attached to the WP 7C Chair’s report (Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 4).
2. **Revision of ITU-R Recommendation RS.2042** – one contribution was received containing minor revisions to ensure the consistency between RS.2042 and the sharing studies performed under WRC-23 agenda item 1.12. The updated preliminary draft revision was carried forward as an annex to the WP 7C Chair’s report (refer Annex 1 to ITU-R document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en)).
3. **WP 7C Correspondence Group (CG) on WRC-23 agenda item 1.12** – a CG was formed (refer to Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 4 for the Terms of Reference) to advance the work on the sharing studies contained in Preliminary Draft New Report ITU-R RS.[Spaceborne VHF Radar Sounder].

The CG met virtually on the 1st and 2nd of February 2023. It became evident that given the substantial nature of the contributions received and the limited time available the group would not be able to provide an updated preliminary draft new report. Instead it was decided that the Chair of the correspondence group would submit to WP 7C a summary of the work of the group (refer document [7C/467](https://www.itu.int/md/R19-WP7C-C-0467/en)) which identifies a number of areas requiring further consideration, including:

* Different views on the appropriate metric for the radar sounder power (peak power or mean power).
* It was agreed to remove the previous analysis of critical elevation angle showing the interference exceedance level (IEL) as resulting exclusion zones regions are not implementable from a regulatory perspective.
* Static analysis should be updated to include all relevant losses, and consideration of victim receiver to interferer position elevation angle.
* Dynamic studies should be updated to consider the radar sounder operational cycle.
* Studies should reflect that the radar sounder only performs measurements in a few hours window around 4am local time.
* Need to better quantify potential interference events with timing considerations related to the radar sounder operational parameters.
* Compatibility between spaceborne radar sounders and wind profile radars requires further consideration.
* The section on the maximum permissible PFD level analysis to be further developed and clarified. The overall objective is that the determination of an appropriate generic PFD limit should address the protection of incumbent services and allow the operation of spaceborne radar sounders.

Relevant ITU-R documents:

1. ITU-R Recommendation [RS.2042-1](https://www.itu.int/rec/R-REC-RS.2042/en) - “Typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz band”.
2. ITU-R Report [RS.2455-0](https://www.itu.int/pub/R-REP-RS/publications.aspx?lang=en&parent=R-REP-RS.2455) – “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”.
3. ITU-R Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 1 – “Preliminary draft revised Recommendation ITU-R RS.2042-1 – Typical technical and operating characteristics for spaceborne radar sounder systems using the 40-50 MHz band”.
4. ITU-R Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 2 – “Preliminary draft new Report ITU-R RS.[SPACEBORNE VHF RADAR SOUNDER] - Results of sharing studies between a 45 MHz radar sounder and in-band and selected out-of-band incumbent services over the 40-50 MHz frequency range”.
5. ITU-R Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 3 – “Draft CPM text for WRC-23 agenda item 1.12”.
6. ITU-R Document [7C/459](https://www.itu.int/md/R19-WP7C-C-0459/en) Annex 4 – “Terms of reference for WP 7C Correspondence Group on studies related to WRC-23 agenda item 1.12”.
7. ITU-R Document [7C/467](https://www.itu.int/md/R19-WP7C-C-0467/en) – “Report of the activities of the Correspondence Group on studies related to WRC-23 agenda item 1.12”.

**2. Documents**

* Input Documents: APG23-5/ [INP-10(THA)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-10_Thailand-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_9.1_TOPIC_A_and_9.1_TOPIC_D.docx), [INP-16(J)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-16_Japan-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_9.1A_9.1D_and_RES.655WRC-15.docx), [INP-28(IND)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-28_India_WP3-Preliminary_Views_on_WRC_23_Agenda_Items_1.12_1.13_and_1.14.docx), [INP-38(IRN)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-38_Iran-WP3-Preliminary_Views_on_WRC_23_Agenda_Items_1.12_1.13_1.14_and_9.1Topic_a.docx),   
  [INP-58(AUS)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-58_Australia-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_9.1Topics_a_and_d.docx), [INP-65(KOR)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-65_Rep_of_Korea-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_and_9.1Topics_a_and_d.docx), [INP-80(INS)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-80_Indonesia-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_and_1.13.docx), [INP-90(CHN)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-90_China-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_and_9.1Topic_a.docx), [INP-97(MLA)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-97_Malaysia-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_and_9.1Topic_a.docx)
* Information Documents: APG23-5/ [INF-01(WMO)](https://www.apt.int/sites/default/files/2023/01/APG23-5-INF-01_WMO_Position_on_WRC-23_Agenda.docx), [INF-21(IARU)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-21_IARU_Views_on_WRC-23_Agenda_Items_1.2_1.12_1.14_1.18_and_9.1Topics_a_and_b.docx),   
  [INF-31(Chair, DG AI 1.12)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-31_Brief_on_AI_1.12.docx), [INF-39(CEPT)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-39_Status_of_CEPT_preparation_for_WRC-23_and_RA-23.pdf), [INF-43(CITEL)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-43_CITEL_preparation_for_WRC-23.pdf) , [INF-45(RCC)](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-45_Status_of_RCC_preparation_to_the_WRC-23.pdf)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Thailand (Kingdom of) - Document APG23-5/**[**INP-10**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-10_Thailand-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_9.1_TOPIC_A_and_9.1_TOPIC_D.docx)

Thailand is of the view that a new secondary allocation to the Earth exploration‐satellite service (active) for spaceborne radar sounders in the 40‐50 MHz band should provide protection to and not adversely affect the incumbent services in the 40-50 MHz and adjacent frequency bands.

**3.1.2 Japan - Document APG23-5/**[**INP-16**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-16_Japan-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_9.1A_9.1D_and_RES.655WRC-15.docx)

The Mobile and Radiodetermination services are allocated in the 40-50 MHz band and the Amateur service is allocated in the 50-54 MHz band in Japan. Japan is of the view that it is necessary that these services are adequately protected while are not imposed additional restrictions. Japan supports further ITU-R studies because it is not sufficient.

**3.1.3 India (Republic of)** - **Document APG23-5/**[**INP-28**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-28_India_WP3-Preliminary_Views_on_WRC_23_Agenda_Items_1.12_1.13_and_1.14.docx)

As the current sharing and compatibility studies have not fully demonstrated that incumbent services could be protected from potential harmful interference from the operation of spaceborne radar sounders in the frequency band 40-50 MHz, India supports Method D which proposes “No Change” to Radio Regulations.

**3.1.4 Iran (Islamic Republic of)** - **Document APG23-5/**[**INP-38**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-38_Iran-WP3-Preliminary_Views_on_WRC_23_Agenda_Items_1.12_1.13_1.14_and_9.1Topic_a.docx)

This Administration proposes to modify the preliminary view of APG23-04 with following amendments:

APT members are of the view that a new secondary allocation could be supported for the Earth exploration-satellite service (active) for spaceborne radar sounders in the 40 – 50 MHz frequency band if completed ITU-R studies show that the protection of in-band and adjacent band incumbent services would be ensured while not adversely affecting those services. Therefore, APT Members support the following essential elements:

* Earth exploration-satellite service (active) is limited to spaceborne radar sounder systems. Such systems are only intended to operate in either uninhabited or sparsely populated areas of the globe and only operate in a few hours window centered approximately at 4 a.m. local time.
* the power flux-density at the surface of the Earth produced by emissions from transmitting stations in the frequency band 40-50 MHz shall not exceed [TBD] / [-156 dBW/m2/4 kHz] for more than [TBD]/[0.0002%] of time [and the transmit peak power shall not exceed [TBD]/[20 dBW] ].
* Active spaceborne sensors in the Earth exploration-satellite service shall not cause harmful interference to, nor claim protection from stations in the radiolocation service operating in the frequency bands 42-42.5 MHz and 46 68 MHz.

**3.1.5 Australia** - **Document APG23-5/**[**INP-58**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-58_Australia-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_9.1Topics_a_and_d.docx)

Australia supports a secondary allocation to EESS (active) in the 40-50 MHz frequency range. Protection should be ensured for existing services, including in adjacent bands, while not imposing any additional restrictions onto those services.

**3.1.6 Korea (Republic of)** - **Document APG23-5/**[**INP-65**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-65_Rep_of_Korea-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_and_9.1Topics_a_and_d.docx)

The Republic of Korea supports that a possible new secondary allocation to the Earth exploration-satellite (active) service shall be limited to the operation of spaceborne radar sounder systems in the band 40-50 MHz, and specific protection method for incumbent services, including intended operational limitations, should be provided to a new allocation in a new Resolution.

**3.1.7 Indonesia (Republic of)** - **Document APG23-5/**[**INP-80**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-80_Indonesia-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_and_1.13.docx)

Indonesia is of the view that any changes to the allocation of EESS (active) services in the 40-50 MHz frequency band shall ensure protection for the operation of incumbent services both in-band as well as adjacent bands in the frequency range.

**3.1.8 China (People’s Republic of)** - **Document APG23-5/**[**INP-90**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-90_China-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_and_9.1Topic_a.docx)

China supports the new secondary allocation of the Earth exploration satellite service (active) of the Spaceborne Radar sounder system in the frequency range of about 45 MHz in accordance with resolution 656 (WRC-19)，if ITU-R studies show that the protection of in-band and adjacent band incumbent services could be ensured. Any change to the allocation of EESS (active) services within the 40-50 MHz frequency band should not restrict the operation of other primary and secondary incumbent services allocated within the frequency range.

**3.1.9 Malaysia** - **Document APG23-5/**[**INP-97**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-97_Malaysia-WP3-Preliminary_Views_on_WRC-23_Agenda_Items_1.12_1.13_1.14_and_9.1Topic_a.docx)

Malaysia supports the establishment of a new secondary allocation to the Earth exploration-satellite service (EESS) in the frequency band 40-50 MHz, while ensuring protection to incumbent services in the same and adjacent frequency band subject to the completion of the studies by ITU-R.

**3.2 Summary of issues raised during the meeting**

It was noted during the meeting that there will only be one more meeting of WP 7C prior to WRC-23 and concern was raised regarding the ability to complete studies on this agenda item.

The drafting group chair noted that an ITU-R WP 7C contribution (Document [7C/467](https://www.itu.int/md/R19-WP7C-C-0467/en)) is now available containing a report of the activities of the recent WP 7C Correspondence Group on studies related to WRC-23 agenda item 1.12.

**4. APT Preliminary View(s)**

APT Members are of the view that a new secondary allocation could be supported for the Earth exploration-satellite service (active) for spaceborne radar sounders in the 40-50 MHz frequency band if the current ITU-R studies, to be completed before WRC-23, show that appropriate protection of in-band and adjacent band incumbent services would be ensured while not adversely affecting those services.

APT Members support a possible solution including operational limitations and establishment of PFD limits in order that protection of in-band and adjacent band incumbent services could be ensured.

**5. Other View(s) from APT Members**

Some APT Members consider that a combination of Method A2 with some elements in Methods A1, and B may comply with the intent of this agenda item, as stipulated in Resolution **656** **(WRC-19)**.

Some APT Members support Method D (No Change) for this agenda item as the current sharing and compatibility studies have not yet fully demonstrated that incumbent services could be protected from potential harmful interference from the operation of spaceborne radar sounders in the frequency band 40-50 MHz.

**6. Issues for Consideration at Next APG Meeting**

A liaison statement (document APG23-5/[TMP-19](https://www.apt.int/sites/default/files/2023/02/APG23-5-TMP-19_Liaison_Statement_to_APG23_WP3.docx)) was received by WP3 from WP5 at APG23-5 regarding input document APG23-5/[INP-82](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-82_Indonesia-WP5-Preliminary_View_on_WRC-23_Agenda_Item_8.docx) (related to the addition of a country to footnote No. **5.162A** in the Radio Regulations). It was decided that this input document should be carried over for further consideration at the APG23-6 meeting under DG 1.12.

APT Members are encouraged to monitor the progress for this agenda item at the upcoming CPM23-2 meeting as well as the progress of studies under ITU-R WP 7C. APT Members are encouraged to review the resulting text and method(s) that could be supported and contribute to the next APG23-6 meeting where APT Members will finalise APT contributions to the WRC-23 meeting as appropriate.

**7. Views from Other Organisations** (as provided in the information documents to

APG23-5)

**7.1 Regional Groups**

**7.1.1** **CEPT - Document APG23-5/**[**INF-39**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-39_Status_of_CEPT_preparation_for_WRC-23_and_RA-23.pdf)

CEPT supports a new secondary allocation to the Earth exploration-satellite service (active) in the 40-50 MHz band while ensuring the protection of incumbent services already allocated to the 40-50 MHz band or adjacent frequency

ranges.

**7.1.2** **CITEL - Document APG23-5/**[**INF-43**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-43_CITEL_preparation_for_WRC-23.pdf)

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

An Administration is also of the view that consideration of a secondary allocation would need to take into account the results of studies on spectrum needs and sharing studies, and would not impose constraints on incumbent services in this frequency range and adjacent frequency bands.

**7.1.3** **RCC - Document APG23-5/**[**INF-45**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-45_Status_of_RCC_preparation_to_the_WRC-23.pdf)

The RCC Administrations do not oppose a new secondary allocation to the Earth exploration-satellite (active) service within the range of frequencies around 45 MHz provided protection of existing services in the 40-50 MHz band.

No specific Method from the draft CPM Report

**7.2 International Organisations**

**7.2.1 WMO** - **Document APG23-5/**[**INF-01**](https://www.apt.int/sites/default/files/2023/01/APG23-5-INF-01_WMO_Position_on_WRC-23_Agenda.docx)

WMO supports a new secondary allocation to EESS (active) in the 40-50 MHz frequency band with appropriate protection being provided to wind profiler radars under 5.162A.

**7.2.2 IARU** - **Document APG23-5/**[**INF-21**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-21_IARU_Views_on_WRC-23_Agenda_Items_1.2_1.12_1.14_1.18_and_9.1Topics_a_and_b.docx)

The IARU acknowledges that the studies for a possible new secondary allocation to the Earth exploration-satellite (active) service for spaceborne radar sounders within the range of frequencies around 45 MHz include the need to protect the incumbent amateur service in the adjacent 50-54 MHz band. The IARU will contribute to the studies to ensure adequate protection of the sensitive receivers used by stations in the amateur service in the 50-54 MHz band, especially the frequencies 50-50.5 MHz where the majority of amateur communications via the ionosphere is conducted, often with very low signal levels.

IARU prefers Method D (No change), but can support Method A2 in a draft CPM Report.

**7.2.2 SFCG** - **Document APG23-5/**[**INF-31(from Chair, DG AI 1.12)**](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-31_Brief_on_AI_1.12.docx)

SFCG supports a new secondary allocation to the EESS (active) in the 40-50 MHz band.

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