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| **The 5th Meeting of the APT Conference Preparatory****Group for WRC-23 (APG23-5)** | **APG23-5/OUT-13** |
| 20 – 25 February 2023, Busan, Republic of Korea | 24 February 2023 |

Working Party 2

**PRELIMINARY VIEWs on WRC-23 agenda item 1.7**

**Agenda Item 1.7:**

*To consider a new aeronautical mobile-satellite (R) service (AMS(R)S) allocation in accordance with Resolution* ***428 (WRC-19)*** *for both the Earth-to-space and space-to-Earth directions of aeronautical VHF communications in all or part of the frequency band 117.975-137 MHz, while preventing any undue constraints on existing VHF systems operating in the AM(R)S, the ARNS, and in adjacent frequency bands;*

**1. Background**

WRC-23 Agenda Item 1.7 was initiated by APT, CEPT and CITEL to consider a new AMS(R)S allocation that will enable satellite relay of existing aeronautical VHF communications to complement terrestrial infrastructures and extend the direct controller-pilot communications for aircraft operating in remote/oceanic region without having the need to change the existing aircraft equipage.

ITU-R has studied the architecture, parameters, and baseline link budgets of a reference AMS(R)S system for the provision of standardized communications for air traffic management, without modification to aircraft equipment. To support compatibility studies, examples of the link budgets for satellite-to-aircraft (downlink) and aircraft-to-satellite (uplink) VHF links have been developed, based on propagation considerations adopted by ITU-R. Compatibility studies of new AMS(R)S with existing primary services operating in-band/adjacent bands have been conducted with inputs from the relevant ITU-R Working Parties to ensure the protection of existing systems from possible interference resulting from the introduction of a new AMS(R)S.

*Relevant ITU-R Recommendations & Report:*

ITU-R [M.1231](https://www.itu.int/rec/R-REC-M.1231/en) Interference criteria for space-to-Earth links operating in the mobile-satellite service with non-geostationary satellites in the 137-138 MHz band

ITU-R [M.1232](https://www.itu.int/rec/R-REC-M.1232/en) Sharing criteria for space-to-Earth links operating in the mobile-satellite service with non-geostationary satellites in the 137-138 MHz band

ITU-R [M.2092](https://www.itu.int/rec/R-REC-M.2092/en) Technical characteristics for a VHF data exchange system in the VHF maritime mobile band

ITU-R [P.531](https://www.itu.int/rec/R-REC-P.531/en) Ionospheric propagation data and prediction methods required for the design of satellite networks and systems

ITU-R [SA.363](https://www.itu.int/rec/R-REC-SA.363/en) Space Operation Systems

ITU-R [SA.609](https://www.itu.int/rec/R-REC-SA.609/en) Protection criteria for radiocommunication links for manned and unmanned near-Earth research satellites

ITU-R [SA.1026](https://www.itu.int/rec/R-REC-SA.1026/en) Aggregate interference criteria for space-to-Earth data transmission systems operating in the Earth exploration-satellite and meteorological-satellite services using satellites in low-Earth orbit

ITU-R [SA.1027](https://www.itu.int/rec/R-REC-SA.1027/en) Sharing criteria for space-to-Earth data transmission systems in the Earth exploration-satellite and meteorological-satellite services using satellites in low‑Earth orbit

ITU-R [SA.1743](https://www.itu.int/rec/R-REC-SA.1743/en) Maximum allowable degradation to radiocommunication links of the space research and space operation services arising from interference from emissions and radiations from other radio sources

ITU-R [SA.2426](https://www.itu.int/rec/R-REP-SA.2426/en) Technical characteristics for telemetry, tracking and command in the space operation service below 1 GHz for non-GSO satellites with short duration missions

ITU-R [SA.2488](https://www.itu.int/rec/R-REP-SA.2488/en) Characteristics to be used for assessing interference to systems operating in the Earth exploration-satellite and meteorological-satellite services, and for conducting sharing studies

*Relevant ITU-R studies documents:*

* WP 5B, July 2022 - [Draft CPM text](https://www.itu.int/dms_ties/itu-r/md/19/wp5b/c/R19-WP5B-C-0649%21N02%21MSW-E.docx)
* WP 5B, November 2022 - [Preliminary Draft New Report](https://www.itu.int/dms_ties/itu-r/md/19/wp5b/c/R19-WP5B-C-0731%21N09%21MSW-E.docx)

Three methods were considered to address this agenda item:

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| Method A | No change to the Radio Regulations |
| Method B | New allocation to the AMS(R)S within the frequency band 117.975-137 MHz* Limited to non-geostationary satellite systems only
* Limited to internationally standardised aeronautical systems

*(Method B is not an independent and standalone Method, should be considered together with Methods B1 or B2)* |
| Method B1 | * Ensure protection of AM(OR)S service in the frequency band 132-137 MHz through frequency planning and coordination
* Ensure protection of services in adjacent bands and not constraining these services
* Ensure coexistence of In-band AM(R)S and adjacent-band ARNS below 117.975 MHz through frequency planning and coordination
* Ensure protection of adjacent band services operating above 137 MHz
* through the 1 MHz guard band in 136-137 MHz, as RR Appendix 3 provides appropriate limits for spurious emissions for AMS(R)S systems operating in 117.975-136 MHz
* through a limit of satellite pfd of -166.6 dB(W/(m² ‧ 14 kHz)) on the level of unwanted emissions above 137 MHz for AMS(R)S emissions from systems operating in 136-137 MHz
 |
| Method B2 | * Apply RR No. 9.11A coordination procedures (including RR No. 9.14) for AMS(R)S systems
* Apply coordination threshold (-140 dB(W/(m2 at 4 kHz)) at the Earth's surface for AMS(R)S space stations
* Adopt restrictions on unwanted emissions from AMS(R)S space stations with limits not worse than those specified in ICAO SARPs for AM(R)S aircraft transmitting stations in adjacent channels
* Not claim protection from interference from AM(R)S and AM(OR)S systems operating in band, as well as from ARNS, MSS (space- Earth), SOS (space-to-Earth), SRS (space-to-Earth) and MetSat (space-to-Earth) operating in adjacent bands
* Protect the radio astronomy service in the frequency band 150.05-153 MHz
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**2. Documents**

* Input Documents APG23-5/[INP-09](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-09_Thailand-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.6_1.7_1.8_and_1.11.docx) (THA), [INP-15](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-15_Japan-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.6_1.7_1.8_1.9_1.10_1.11_and_RES.427.docx) (J), [INP-27](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-27_India_WP2-Preliminary_Views_on_WRC_23_Agenda_Items_1.7_1.9_1.10_and_1.11.docx) (IND), [INP-33](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-33_Bangladesh_WP2-Preliminary_Views_on_WRC_23_Agenda_Items_1.7_1.9_1.10_and_1.11.docx) (BGD), [INP-37](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-37_Iran-WP2-Preliminary_Views_on_WRC_23_Agenda_Items_1.6_1.7_1.8_1.9_1.10_and_1.11.docx) (IRN), [INP-51](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-51_Multicountry-WP2-Preliminary_View_on_WRC-23_Agenda_Item_1.7.docx) (AUS, BRU, PNG, SNG), [INP-53](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-53_Viet_Nam-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.7_1.8_1.9_1.10_and_1.11.docx) (VTN), [INP-64](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-64_Rep_of_Korea-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.6_1.7_1.81.9_1.10_and_1.11.docx) (KOR), [INP-74](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-74_New_Zealand-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.7_1.8_1.9_and_1.11.docx) (NZL), [INP-79](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-79_Indonesia-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.7_1.8_1.9_and_1.11.docx) (INS), [INP-89](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-89_China-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.6_1.7_1.8_1.9_1.10_1.11_and_RES.427.docx) (CHN), [INP-96](https://www.apt.int/sites/default/files/2023/02/APG23-5-INP-96_Malaysia-WP2-Preliminary_Views_on_WRC-23_Agenda_Items_1.7_1.9_and_1.11.docx) (MLA)
* Information Documents APG23-5/[INF-18](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-18_Brief_on_AI1.7.docx) (DG Chair), [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), [INF-43](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-43_CITEL_preparation_for_WRC-23.pdf) (CITEL), [INF-45](https://www.apt.int/sites/default/files/2023/02/APG23-5-INF-45_Status_of_RCC_preparation_to_the_WRC-23.pdf) (RCC)

**3. Summary of discussions**

**3.1 Summary of APT Members’ views**

**3.1.1 Thailand (Kingdom of) – Document APG23-5/INP-09**

* Thailand supports Method B in the current draft CPM text, to allocate AMS(R)S on primary basis in the frequency band 117.975-137 MHz, or part thereof, while ensuring protection and not constraining the systems of the existing services in the same frequency band and adjacent frequency bands.

**3.1.2 Japan – Document APG23-5/INP-15**

* Japan supports continued studies to add a new allocation to the AMS(R)S for the Earth to space and space to Earth direction, as indicated in Method B. However, Japan is of the view that some aspects, such as frequency planning and coordination procedures for introducing the new satellite VHF systems as well as coordination procedures with terrestrial services, needs further clarification, and that careful discussions are needed in order to prevent undue constraints to the operation of the current VHF systems.

**3.1.3 India (Republic of) – Document APG23-5/INP-27**

* India supports a new co-primary allocation for the AMS (R)S in the band 117.975 MHz-137 MHz in the Earth-to-space and space-to-Earth directions limited to internationally standardized aeronautical systems operating in accordance with ICAO Standards and Recommended Practices (SARPs), while ensuring protection and not constraining the systems of the incumbent services in the band and adjacent bands. India also supports Method B2 for satisfying this Agenda Item.

**3.1.4 Bangladesh (People's Republic of) – Document APG23-5/INP-33**

* To satisfy this agenda item, Bangladesh administration prefers method B1 of the draft CPM report to WRC-2023. However, appropriate technical and regulatory measures is required in order to prevent constraints to the operation of the current VHF systems.

**3.1.5 Iran (Islamic Republic of) – Document APG23-5/INP-37**

* This Administration supports method A (NOC) at this point of time, however, should the difficulties, problems, inconsistencies, and protections of the incumbent service and adjacent band be properly addressed and resolved, we may consider either method B1 or B2. It is worth mentioning that Preferably, method B2 which provides more details of the coordination and protection of in-band and adjacent frequency bands would be preferable.

**3.1.6 Australia, Brunei Darussalam, Papua New Guinea and Singapore (Republic of) – Document APG23-5/INP-51**

* Australia, Brunei Darussalam, Papua New Guinea and Singapore support Method B1 in the current draft CPM text for a new primary allocation to the AMS(R)S in the frequency band 117.975-137 MHz, or part thereof, limited to non-geostationary satellite systems, limited to internationally standardized aeronautical systems and proposes to add a pfd limit, where appropriate, on AMS(R)S space stations unwanted emissions falling above 137 MHz, in order to ensure protection of adjacent band services above 137 MHz.
* Australia, Brunei Darussalam, Papua New Guinea and Singapore also support the ongoing ITU-R studies to update the PDNR ITU-R M.[SPACE-VHF], in accordance with Resolution **428 (WRC-19)**.

**3.1.7 Viet Nam (Socialist Republic of) – Document APG23-5/INP-53**

* Viet Nam supports the ITU-R studies to consider a possible primary allocation to AMS(R)S in the Earth-to-space and space-to-Earth directions in entire or portions of the frequency band 117.975-137 MHz while ensuring no adverse effect on the allocation of the existing services and their future development.
* Viet Nam is of the view that new AMS(R)S allocation is limited to implement internationally standardised aeronautical systems.
* Viet Nam supports Method B in the current draft CPM text for a new AMS(R)S allocation in accordance with Resolution 428 (WRC-19) for the Earth to space and space to Earth direction.

**3.1.8 Korea (Republic of) – Document APG23-5/INP-64**

* The Republic of Korea prefers Method B in the draft CPM Report that proposes to add a new allocation to AMS(R)S in the Earth-to-space and space-to-Earth directions in all or part of the frequency band 117.975-137 MHz, while ensuring protection of services in the same and adjacent bands and not constraining these existing services. For the protection of existing services, the Republic of Korea is of the view that supporting one of Options (i.e., Method B1 and B2) needs further consideration.

**3.1.9 New Zealand – Document APG23-5/INP-74**

* New Zealand supports measures that ensure existing primary services in that frequency band and in adjacent frequency bands remain protected while ensuring there is no adverse impact to systems in the Aeronautical Mobile (Route) Service (AM(R)S).
* New Zealand Supports Method B. However, we have no preference for method B1 or B2 at this stage.

**3.1.10 Indonesia (Republic of) – Document APG23-5/INP-79**

* Indonesia is of the view to consider the identification of a new AMS(R)S allocation for the Earth to space and space to Earth direction taking into account sharing and compatibility with other services including in the adjacent band is ensured the safety of and protection of existing and future stations, particularly for those countries, their frequency band 117.975-137 MHz is utilized by various stakeholders, inter alia for air to ground and ground to air communications.
* Furthermore, the new AMS(R)S allocation must not require modification to the aircraft equipment, to receive and transmit to standard VHF radio already installed on board aircraft, as well as the assurance that it shall not have harmful implications on the existing VHF ground segment.

**3.1.11 China (People’s Republic of) – Document APG23-5/INP-89**

* China supports the current ITU-R studies for the introduction of AMS(R)S in the frequency band 117.975-137 MHz mandated by Resolution 428 (WRC-19). The protection of existing services operating in the frequency band 117.975-137 MHz and adjacent frequency bands shall be ensured. In particular, to ensure the protection of MSS/SOS/MetSat/SRS above 137 MHz, an appropriate limit for AMS(R)S unwanted emissions above 137 MHz should be identified and applied. Considering the sharing and compatibility studies have not been completed yet, China supports method A, NoC, in current draft CPM text.

**3.1.12 Malaysia – Document APG23-5/INP-96**

* Malaysia supports new allocation to the aeronautical mobile-satellite (route) service (AMS(R)S) within the frequency band 117.975-137 MHz for supporting aeronautical VHF communications in the Earth-to-space and space-to-Earth directions while ensuring protection to existing VHF systems operating in the aeronautical mobile (route) service (AM(R)S) and the aeronautical radionavigation service (ARNS) in adjacent frequency band. The AMS(R)S system shall be operated in accordance with the International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs).
	1. **Summary of issues raised during the meeting**

None.

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

APT Members are considering Method B for this agenda item provided that the following issues are duly addressed.

* + ensuring protection of the existing services in the same frequency band and adjacent frequency bands including those of MSS/SOS/MetSat/SRS through an appropriate limit for AMS(R)S unwanted emissions above 137 MHz;
	+ limiting to internationally standardized aeronautical systems.

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

Some APT Members support Method B and await further clarifications in the result of ITU-R studies to develop further views on Method B1 or B2.

Some APT Members support Method B1.

Some APT Members support Method B2.

Some APT Members support Method A (NOC) at this point and may consider Method B if the protection of existing services operating in-band and in adjacent bands can be ensured.

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

APT Members are encouraged to contribute to the next APG meeting on agenda item 1.7, taking into account the outcome of APG23-5 and the results of ITU-R studies.

**7. Views from Other Organisations**

**7.1 Regional Groups**

**7.1.1 ASMG** - **Document APG23-4/INF-21**

* Support a new allocation to the aeronautical mobile-satellite service, in the frequency band 117.975 – 137 MHz, or portions thereof, according to the results of the ongoing studies, in order to support aeronautical systems operating in aeronautical very high frequency (VHF) bands, provided that incumbent in-band and adjacent band services are protected and no additional operational restrictions are imposed.

**7.1.2 ATU** - **Document APG23-4/INF-02**

* Support the ITU-R ongoing technical studies and regulatory procedures in order to improve/enhance the aeronautical communications in oceanic and remote areas, while ensuring the protection of the existing radio communication services, without imposing any operational constraints on existing VHF aeronautical systems or other services operating at the adjacent frequency bands.

**7.1.3 CEPT** - **Document APG23-5/INF-39**

* + CEPT supports a new primary allocation to AMS(R)S in all or part of the frequency band 117.975‐137 MHz while:
* limiting the use of the new AMS(R)S allocation to non‐geostationary and internationally standardised aeronautical systems;
* mandating that the use of this new primary allocation to AMS(R)S be subject to appropriate Article **9** coordination provisions, for example No. **9.11A**;
* ensuring protection of services in adjacent bands and not constraining these services.
	+ CEPT is of the view that in‐band coexistence between AM(R)S and AMS(R)S and adjacent‐band coexistence with ARNS below 117.975 MHz need to be ensured through frequency planning and coordination work, taking into account the current ICAO frequency management framework.
	+ CEPT is of the view that the provisions above will also ensure compatibility between AMS(R)S systems and AM(OR)S assignments in the band 132‐137 MHz of countries listed in RR Nos. **5.201** and **5.202**.
	+ CEPT is of the view that the protection of adjacent band services operating above 137 MHz from AMS(R)S emissions can be ensured:
* through the 1 MHz frequency separation in 136‐137 MHz and RR Appendix **3** limits for spurious emissions for AMS(R)S systems operating in 117.975‐136 MHz,
* through 62.5 kHz frequency separation and RR Appendix **3** limits for spurious emissions for the band 136‐136.9375 MHz and
* through a limit on the level of unwanted emissions above 137 MHz for AMS(R)S emissions from systems operating in 136.9375‐137 MHz.
	+ CEPT is of the view that the allocation to AMS(R)S should be protected as a safety service, recognizing that the required protection of AMS(R)S satellite receivers shall not adversely impact planned usage of MSS, SOS, SRS and MetSat systems above 137 MHz

**7.1.4 CITEL** - **Document APG23-5/INF-43**

* A number of Administrations provided Preliminary Proposals at recent CITEL meeting. Some specific elements of the proposals have support of more than one Administration. Work continues to align these proposals and develop common proposals at the next CITEL meeting.
* Proposals included:
* **MOD 5.201 5.202 5.209**
* **ADD 5.A17 5.B17 5.AA17**
* Proposals support new primary AMS(R)S service allocation in the frequency bands 117.975 - 136 MHz or 117.975 - 137 MHz and consider application of different coordination approaches at present
* **SUP RESOLUTION 428 (WRC 19)** - Consequential to the results of studies at ITU R in relation to this Resolution

**7.1.5 RCC** - **Document APG23-5/INF-45**

* Do not support allocation of the frequency band 117.975-137 MHz, or part thereof, to the AMS(R)S service on the primary basis to develop aeronautical VHF communications systems for E-s and s-E directions. Such allocation could be done subject to some regulatory and technical conditions, some of them are following:
	+ mechanism for ensuring compatibility in this and adjacent frequency bands between AMS(R)S systems of one Administration with AM(R)S, AM(OR)S, ARNS systems of another Administration, especially when such Administrations are located in different airspaces or different Regions;
	+ protective measures for the systems of SOS, SRS and MetSat in the frequency band 137-138 MHz;
	+ compatibility conditions between AMS(R)S systems of different administrations.
* Standardization and frequency planning carried out within the ICAO for AM(R)S systems are insufficient to ensure the compatibility of AM(R)S of one Administration with the above-mentioned radio services of other Administrations.
* Consider that the above conditions should be met without imposing regulatory or technical restrictions on the affected services within this band or adjacent bands.
* **Method В2** from the draft CPM Report is preferable.

**7.2 International Organisations**

**7.2.1 ICAO** - **Document APG23-3/INF-15**

* To support ITU-R studies and the definition of relevant technical characteristics as called for by Resolution 428 (WRC-19).
* To support a global allocation to the aeronautical mobile-satellite (route) service for both the Earth-to-space and space-to-Earth directions in the frequency band 117.975-137 MHz and that the use of the allocation be limited to the relaying of aeronautical VHF air traffic management communications.
* To support that those systems shall operate in accordance with international Standards and Recommended Practices and procedures established in accordance with the Convention on International Civil Aviation.
* To ensure that any change to the regulatory provisions and spectrum allocation resulting from this agenda item do not adversely impact the operation of existing VHF systems in the band 117.975-137 MHz operating in the AM(R)S, including regional usage of terrestrial VHF, nor require any changes to aircraft equipage or to existing installations.