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| U.S. Radiocommunications SectorFact Sheet |
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| **Document Title:** PDN Report ITU-R M.[SPACE-VHF], Space-based aeronautical VHF communications in the frequency band 117.975-137 MHz |
| **Author(s)/Contributors(s):**Chris TourignyFAA Spectrum Engineering ServicesSandra WrightFAA Spectrum Engineering ServicesAndrew RoyASRIMichael TranMITRE | Phone: 202-267-3071Email: chris.tourigny@faa.govPhone: 202-603-7094 Email: sandra.a.wright@faa.govPhone: 443-951-0340 Email: acr@asri.aeroPhone: 703-983-1295 Email: mtran@mitre.org |
| **Purpose/Objective:** This contribution provides updates to the PDN Report for WRC-23 AI 1.7 pursuant to Resolution **428 (WRC-19)**, on a possible new AMS(R)S allocation to accommodate the relay of VHF communications in frequency band 117.975-137 MHz. |
| **Abstract:** Pursuant to Resolution **428 (WRC-19)**, in preparation for Agenda Item 1.7 (**WRC-23**), this contribution proposes a pfd threshold in section 8.1 that could be used for coordination between AMS(R)S transmitting space stations and incumbent AM(R)S in-band systems under a relevant RR No. 9.11A coordination process. |

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| **Radiocommunication Study Groups** |  |
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| Preliminary draft new report ITU-r m.[space-vhf]**Space-based aeronautical VHF communications in thefrequency band 117.975-137 MHz** |
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**Introduction**

Pursuant to Resolution **428 (WRC-19)**, in preparation for Agenda Item 1.7 (**WRC-23**), this contribution proposes a pfd threshold in section 8.1 that could be used for coordination between AMS(R)S transmitting space stations and incumbent AM(R)S in-band systems under a relevant RR No. 9.11A coordination process.

Attachment: 1

ATTACHMENT

preliminary draft new report itu-R m.[space-vhf]

**Space-based aeronautical VHF communications in the
 frequency band 117.975-137 MHz**

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## 8.1 In-band sharing between systems operating in the aeronautical mobile satellite (route) and aeronautical mobile (route) services

ICAO has outlined that even though AM(R)S and AMS(R)S would represent two different ITU-R services within the frequency band 117.975-137 MHz, the same on-board cockpit avionics system (for VHF communications) would be used for ground and satellite communications. Indeed, AMS(R)S would not correspond to a new aeronautical service but would relay VHF communications operating under the AM(R)S over oceanic and remote areas, without modification to aircraft equipment. AMS(R)S would therefore not trigger new compatibility issue with aircraft system.

ICAO is of the position that if there is any potential interference between AM(R)S and AMS(R)S space stations, it would be resolved by the ICAO through conventional frequency planning exercise, assigning frequencies to the satellite system over interested regions, to ensure compatibility between ground and satellite facilities. Therefore, from an ICAO perspective there is no need to perform a comprehensive compatibility study within ITU-R between these two different services, that cover the same system on-board the aircraft. Both are technically similar services as the same on-board cockpit avionics system (for VHF communications) would be used for ground and satellite communications.

Terrestrial out of band and spurious limits exists to ensure that adjacent and near adjacent channels can coexist when a distant wanted channel is adjacent in the band to an unwanted channel and the unwanted transmitter is substantially nearer to the victim receiver than the wanted transmitter.

AMS(R)S signals will always be subject to a spreading loss in the range of 130-135 dB which exceeds the spreading loss of operation AM(R)S signals by at least 10-15 dB.

Therefore, terrestrial equipment standards intended to minimise the probability of adjacent and near adjacent channel interference are not needed for AMS(R)S equipment installed on a satellite as this form of interference will not occur as a result of an AMS(R)S signal.

The detailed ITU regulatory framework associated with AMS(R)S is outside the scope of this technical report. Article 9 coordination procedures may complement the ICAO framework in order to ensure full compatibility between AM(R)S and AMS(R)S systems.

A coordination process as defined in RR Article **9** could be considered for a new AMS(R)S allocation in all or part of the frequency band 117.975-137 MHz. An example of a pfd threshold that could be used for coordination between AMS(R)S transmitting space stations and AM(R)S under a relevant RR No. **9.11A** coordination process is provided in Table 12:

Table 12

Coordination Threshold to protect AM(R)S in all of part of the frequency band 117.975-137 MHz

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| Parameters | Units | Values | Remarks |
| Minimum AM(R)S desired power density | dBW/m2 | -120 | VDL: Sections 6.3.2 & 6.3.5.2, ICAO Annex 10 Volume III Part I~~VHF: Sections 2.3.1.2 & 2.2.2.2, ICAO Annex 10 Volume III Part II~~ |
| Channel bandwidth, Hz | kHz | 25 | VDL: Section 6.1.4.1, ICAO Annex 10 Volume III Part I~~VHF: 25 kHz channel bandwidth~~ |
| Minimum AM(R)S desired power density | dB(W/(m2 · 4 kHz)) | -128 | -120 – 10\*log(25kHz/4kHz) = -128Appendix 3 of Radio Regulations: #8 The reference bandwidth of all space service spurious domain emissions should be 4 kHz. (WRC-03)Hence, most Article 5 footnotes with pfd on Earth’s surface from space stations have 4 kHz reference bandwidth for frequency bands under 15 GHz, as well as in RR Article 21, Table 21-4. |
| Co-channel criteria, D/U | dB | 20 | Section 4.1.4.1, ICAO Annex 10 Vol V |
| Required AM~~S~~(R)S ~~space station~~ coordination level ~~threshold~~ | dB(W/(m2 · 4 kHz)) | -148 | Within the AM(R)S Designated Operational Coverage (DOC) |
| Additional path loss from the edge of AM(R)S DOC to a country’s border | dB | 2 | Using AM(R)S DOC of 480 km range and satellite slant range of 2831 km to a country’s border, 20\*log(2831/(2831-480)) = 1.6 dB, round-off to 2 dB. Note 1 |
| AMS(R)S space station coordination threshold | dB(W/(m2 · 4 kHz)) | -150 | Note 2 |

Note 1: The 480 km range is the Designated Operational Coverage (DOC) to be protected for the existing AM(R)S terrestrial stations. This is for aircraft operating at a range of 250 nautical miles from the AM(R)S ground stations and 40,000 feet above mean sea level as published by the current global Communication Service Providers.

Note 2: to be applied when the power flux density level of an aeronautical mobile-satellite (R) service space station exceeds −150~~48~~ dB(W/(m2 · 4 kHz)) on the Earth’s surface ~~and within 480 km~~ over the territory of a country~~’s border~~. This level is for coordination between ICAO systems operating in VHF AM(R)S and VHF AMS(R)S services.

~~The 480 km range is the AM(R)S Designated Operational Coverage (DOC), plus the 12 nautical miles of a country’s border extending to the sea~~..

*[Editor’s note : other ways to address the threshold for coordination are under consideration.]*

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