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| **US Radiocommunication Sector**  **FACT SHEET** | |
| **Working Party:** ITU-R WP 5B | **Document No:** USWP5B29-07 |
| **Reference:** 5B/531 Annex 5 | **Date:** 17 May 2022 |
| **Document Title:** Working document towards a draft CPM text for WRC-23 agenda item 1.10 | |
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| **Purpose/Objective:** The purpose of this document is to continue the development of a working document towards a draft CPM text for WRC-23 AI 1.10. | |
| **Abstract:** WRC-19 approved AI 1.10 for the WRC-23 study cycle to consider a possible introduction of new non-safety AMS applications in the 15.4-15.7 GHz and 22-22.21 GHz bands. This contribution continues the development of a working document towards a draft CPM text for WRC-23 AI 1.10. | |
| **Fact Sheet Preparer:** Ryan McDonough, Dominic Nguyen | |

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| **Radiocommunication Study Groups** | Logo  Description automatically generated |
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| Source: Document 5B/531 Annex 5  Subject: WRC-23 agenda item 1.10 | **Document 5B/XX** |
| **XX July 2022** |
| **English only** |
| |  | | --- | | United States of America | | Working document towards a draft CPM text for WRC-23 agenda item 1.10 |   **1 Introduction**  The United States of America would like to continue the development of a working document towards a draft CPM text for WRC-23 agenda item 1.10. The intent of this contribution is to aid Working Party (WP) 5B as the responsible group in progressing the work on draft CPM text and should not be viewed as the United States of America supporting one method over any other at this time.  Attachment: 1 | |

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| **Annex 5 to Working Party 5B Chairman’s Report** |
| draft CPM text for WRC-23 agenda item 1.10 |
|  |

**CHAPTER 2**

**Aeronautical and maritime issues**

(Agenda items 1.6, 1.7, 1.8, 1.9, 1.10, 1.11)

Agenda item 1.10

**(WP 5B / WP 3K, WP 3M, WP 4A, WP 5A, WP 5C, WP 7C, WP 7D)**

*1.10 to conduct studies on spectrum needs, coexistence with radiocommunication services and regulatory measures for possible new allocations for the aeronautical mobile service for the use of non-safety aeronautical mobile applications, in accordance with Resolution* ***430 (WRC‑19)****;*

Resolution **430 (WRC-19)** – *Studies on frequency-related matters, including possible additional allocations, for the possible introduction of new non-safety aeronautical mobile applications*

**2/1.10/1 Executive summary**

This agenda item seeks possible new aeronautical mobile service allocations for the use of non-safety aeronautical mobile applications. To address this agenda item, ITU-R has undertaken studies, pursuant to Resolution **430 (WRC-19)**, on frequency-related matters for the possible introduction of new non-safety aeronautical mobile applications, including consideration of possible additional allocations, (see section 2/1.10/3).

The following methods are considered to answer this agenda item:

– Method A: NOC

– Method B: AMS allocations in 15.4-15.7 GHz and 22-22.21 GHz

**2/1.10/2 Background**

Wideband line-of-sight data links operate in the aeronautical mobile service (AMS) and are not related to safety of life. They support applications such as search and rescue missions, earth sciences and land management*, Per the RR, stations in the AMS can support bi-directional communication links including those between aircraft stations or an aircraft station and an aeronautical station on the ground, on board a ship or on a platform at sea.*

The frequency range 15.4-15.7 GHz is used or partly used by the radiolocation service (RLS), aeronautical radionavigation service (ARNS) and fixed-satellite service (FSS) (earth-to-space). Adjacent frequency bands have allocations for the earth exploration-satellite service (EESS) (passive), radio astronomy service (RAS), space research service (SRS) (passive) and RLS. In the past, some ITU-R studies showed that sharing between RLS and AMS could be difficult. The sub-band 15.43-15.63 GHz is used by feeder links of non-geostationary systems. The ARNS in the 15.4-15.7 GHz band is used for landing systems and unmanned aircraft detect and avoid systems. An ITU-R Recommendation is currently being developed to provide characteristics and protection requirements for these ARNS systems (Document 5B/481 Annex 18). The sharing studies for the frequency band 15.4-15.7 GHz should take into account airborne mobile nature of the ARNS systems.

The frequency band 22-22.21 GHz under consideration is used by the fixed service (FS) for applications requiring the transport of large quantity of data between two fixed locations. Adjacent frequency bands have allocations to the FS, mobile service (MS), broadcasting-satellite service (BSS), RAS, SRS (passive) and EESS (passive). The frequency band 22.21-22.5 GHz allows for remote sensing observations near an H2O absorption line that is essential for measuring atmospheric water vapor, which in turn helps reducing error in other geophysical parameters due to the presence of water vapor. [Therefore, adjacent band studies are required to ensure protection of the EESS (passive) in the 22.21-22.5 GHz frequency band].

**2/1.10/3 Summary and Analysis of the results of ITU-R studies**

**2/1.10/3.1 Relevant ITU-R Recommendations and Reports**

The relevant ITU-R Recommendations are:

Characteristics and protection criteria: [F.758-7](https://www.itu.int/rec/R-REC-F.758-7-201911-I/en), [M.1730-1](https://www.itu.int/rec/R-REC-M.1730/en), [M.2089-0](https://www.itu.int/rec/R-REC-M.2089/_page.print), [M.2114-0](https://www.itu.int/rec/R-REC-M.2114/en), [M.2115-0](https://www.itu.int/rec/R-REC-M.2115/en), [M.2116-0](https://www.itu.int/rec/R-REC-M.2116/en), [M.2120-0](https://www.itu.int/rec/R-REC-M.2120/en), [RA.517-4](https://www.itu.int/rec/R-REC-RA.517/en), [RA.769-2](https://www.itu.int/rec/R-REC-RA.769/en), [RS.1028-2](https://www.itu.int/rec/R-REC-RS.1028/en), [RS.1029-2](https://www.itu.int/rec/R-REC-RS.1029), [RS.1861-0](https://www.itu.int/rec/R-REC-RS.1861/en), [RS.2017-0](https://www.itu.int/rec/R-REC-RS.2017/en), [S.1340-0](https://www.itu.int/dms_pubrec/itu-r/rec/s/R-REC-S.1340-0-199710-I!!PDF-E.pdf), and [S.1341-0](https://www.itu.int/rec/R-REC-S.1341/en).

Antenna patterns: [F.699-8](https://www.itu.int/rec/R-REC-F.699/en), [F.1245-3](https://www.itu.int/rec/R-REC-F.1245/en), [F.1336-5](https://www.itu.int/rec/R-REC-F.1336/en), [M.1851-1](https://www.itu.int/rec/R-REC-M.1851/en), [RA.1631-0](https://www.itu.int/rec/R-REC-RA.1631/en), [RS.1813-1](https://www.itu.int/rec/R-REC-RS.1813/en), [S.465-6](https://www.itu.int/rec/R-REC-S.465/_page.print), [S.580-6](https://www.itu.int/rec/R-REC-S.580/en), [S.732-1](https://www.itu.int/dms_pubrec/itu-r/rec/s/R-REC-S.732-1-201212-I!!PDF-E.pdf), and [SA.509-3](https://www.itu.int/rec/R-REC-SA.509/en).

Propagation models and others: [F.637-4](https://www.itu.int/rec/R-REC-F.637/en), [M.1461-2](https://www.itu.int/rec/R-REC-M.1461/en), [M.1825-0](https://www.itu.int/rec/R-REC-M.1825/en), [P.452-17](https://www.itu.int/rec/R-REC-P.452/en), [P.528-5](https://www.itu.int/rec/R-REC-P.528/en), [P.619-4](https://www.itu.int/rec/R-REC-P.619/en), [P.1409-2](https://www.itu.int/rec/R-REC-P.1409/en), [RA.1513-2](https://www.itu.int/rec/R-REC-RA.1513/en), [SA.510-3](https://www.itu.int/rec/R-REC-SA.510/en), [SM.337-6](https://www.itu.int/rec/R-REC-SM.337/en), and [SM.1541-6](https://www.itu.int/rec/R-REC-SM.1541).

The relevant sharing studies ITU-R Reports are: [M.2170-0](https://www.itu.int/pub/R-REP-M.2170), [M.2229-0](https://www.itu.int/pub/R-REP-M.2229/ar), [M.2230-0](https://www.itu.int/pub/R-REP-M.2230/ru), and [RA.2131-0](https://www.itu.int/pub/R-REP-RA.2131-2009).

[To perform studies required under agenda item 1.10 and Resolution **430 (WRC-19)**, developed] WD to PPDR ITU-R M.[NON-SAFETY AMS CHARACTERISTICS AND SHARING STUDIES].

**2/1.10/3.2 Summary of spectrum requirements**

*[Editor’s note: to be completed based on Section 5 of Report related to ai 1.10]*

The studies referred below are contained WD to PPDR ITU-R M.[NON-SAFETY AMS CHARACTERISTICS AND SHARING STUDIES]. (See 5B/XXX Annex YY)

**2/1.10/3.3 Summary of the sharing and compatibility studies**

**2/1.10/3.3.1 Radioastronomy operating in the frequency band 15.35-15.4 GHz**

Study A [TBD]

Study B is a Monte-Carlo study. It shows that the protection criterion of radioastronomy systems operating in the frequency band 15.35-15.4 GHz is exceeded less than 2% of the time, in all studied operational scenarios.

**2/1.10/3.3.2 Radiolocation operating in the frequency band 15.4-15.7 GHz**

Sharing in the frequency band 15.4-15.7 GHz should take into account the characteristics and protection requirements the RLS systems that operate in the frequency band 15.4-15.7 GHz.

Study B is a Monte-Carlo study. It shows that the protection criterion of systems operated in the RLS in the frequency band 15.4-15.7 GHz is exceeded less than 0.001% of the time, in all studied operational scenarios.

The current studies C show that sharing between non-safety AMS (using scenario of data networks above the clouds) and radiolocation systems is not feasible due to a high transmitted e.i.r.p. limit from the non-safety AMS resulting in a minimum separation distance of 885 km.

**2/1.10/3.3.3 Aeronautical Radionavigation operating in the frequency band 15.4-15.7 GHz**

Sharing in the frequency band 15.4-15.7 GHz should take into account the characteristics and protection requirements for these ARNS systems that operate in the frequency band 15.4-15.7 GHz.

Study is a Monte-Carlo study. It shows that the protection criterion of systems operated in the ARNS in the frequency band 15.4-15.7 GHz is exceeded less than 0.1% of the time, in all studied operational scenarios.

**2/1.10/3.3.4 Fixed-satellite operating in the frequency band 15.43-15.63 GHz**

Study is a Monte-Carlo study. It shows that the protection criterions of systems operated in the FSS in the frequency band 15.43-15.63 GHz is not exceeded, in any of the studied operational scenarios.

**2/1.10/3.3.5 Broadcasting-Satellite operating in the frequency band 21.4-22 GHz**

Study is a Monte-Carlo study. It shows that the protection criterions of systems operated in the FSS in the frequency band 21.4-22 GHz is not exceeded, in any of the studied operational scenarios.

**2/1.10/3.3.6 Fixed Service operating in the frequency band 22-22.21 GHz**

Study A [TBD]

Study B is a Monte-Carlo study. It shows that the long term and the short term criterions are not exceeded, in any of the studied operational scenarios.

**2/1.10/3.3.7 Mobile Service operating in the frequency band 22-22.21 GHz**

No characteristics were available regarding the mobile service. Hence, no study was performed.

**2/1.10/3.3.8 Radioastronomy operating in the frequency band 22.21-22.5 GHz**

Study A [TBD]

Study B is a Monte-Carlo study. It shows that the protection criterion of radioastronomy systems operating in the frequency band 22.21-22.5 GHz is exceeded less than 2% of the time, in all studied operational scenarios.

**2/1.10/3.3.9 Earth exploration-satellite service (passive) operating in the frequency band 22.21‑22.5 GHz**

Sharing in the frequency band 22.21-22.5 GHz should take into account the characteristics and protection requirements for these EESS (passive) systems that operate in the frequency band 22.21-22.5 GHz.

The current studies A in Document 5B/531 Annex 13 Section A14.1.2 indicate that the first configuration (operational scenario 4.2, wildfire observation) can not support without imposing harmful interference into the EESS (passive) not more than approximately 128 clusters, each defined by ground station platforms and their associated aeronautical users operating within the specially defined region, for the downlink transmission direction. Considering the uplink transmission direction, this upper limit is not met therefore emission limits or avoiding the adjacent band for uplink should be taken into account. Noting that the number of clusters defined in operational scenarios (see section 4 of Document 5B/XXX Annex YY, Table 5-1) are lower than these values for the downlink direction (but not the uplink).

The majority of the contribution to this harmful interference from wildfire observation comes from non-safety-of-life AMS uplink systems operating immediately adjacent to the EESS (passive) band specifically within 50 MHz of the band edge of the frequency band 22.21 GHz.

The current studies A in Document 5B/531 Annex 13 Section A14.1.2 indicate that the second configuration (operational scenario 4.3, search and rescue) can not support without imposing harmful interference into the EESS (passive) more than approximately 64 clusters, each defined by seven coordinated aeronautical users operating bi-directional air-air links within the specially defined region. Noting that the number of clusters defined in operational scenarios (see section 4 of Document 5B/XXX Annex YY, table 5-2) are lower than these values.

The majority of the contribution to this harmful interference from search and rescue operations comes from non-safety-of-life AMS air-air systems operating immediately adjacent to the EESS (passive) band specifically within 30 MHz of the band edge of the frequency band 22.21 GHz.

The current studies A in Document 5B/531 Annex 13 Section A14.1.2 indicate that the third configuration (operational scenario 4.4, border surveillance) can not support without imposing harmful interference into the EESS (passive), each defined by two coordinated aeronautical observation users operating in relay (air-air bidirectional links) with an additional aircraft which communicates (return link) with a single ground station located within the specially defined region. passive service.

The majority of the contribution to this harmful interference from border surveillance operations comes from non-safety-of-life AMS air-air relay return systems operating immediately adjacent to the EESS (passive) band specifically within 20 MHz of the band edge of the frequency band 22.21 GHz.

*[Note: The following text regards the sharing scenario 4.5 (Data networks above the clouds) but this study has not been finalized for consideration in the PDNR in section 4 of Document 5B/481, Annex 31.]*

The current studies A in Document 5B/481 Annex 31 section A2.3.3 show that sharing between non-safety AMS and EESS (passive) systems is not feasible for AMS scenarios such as described in section 4.5 (network above the cloud) due to the anticipated, out-of-band emission level from the non-safety AMS links operating in the frequency band 22.16-22.21 GHz region immediately adjacent to the EESS (passive) sensors operating in the frequency band 22.21-22.5 GHz (Return link).

The majority of the contribution to this harmful interference from data networks above the clouds operations comes from non-safety-of-life AMS air-air relay forward systems operating immediately adjacent to the EESS (passive) band specifically within 80 MHz of the band edge of the frequency band 22.21 GHz.

Taking into account all scenarios under consideration by the non-safety-of-life AMS configurations, it is necessary to limit the OOB emissions of the AMS to -37 dBW/100MHz for operations less than 100 MHz in offset to the band edge in order to ensure the protection of the EESS passive service.

Study B is a Monte-Carlo study. It shows that the protection criterion of EESS systems operating in 22.21-22.5 GHz is not exceeded, in any of the studied operational scenarios.

**2/1.10/3.3.10 Space Research service operating in the frequency band 22.21-22.5 GHz**

No characteristics were available regarding the Space Research Service. Hence, no study was performed.

**2/1.10/4 Methods to satisfy the agenda item**

**2/1.10/4.1 Method A: No change to Radio Regulations**

This method proposes no changes to the Radio Regulationsfor thefrequency bands 15.4-15.7 GHzand 22-22.21 GHz.

**2/1.10/4.2 Method B: New aeronautical mobile service allocation in the frequency bands 15.4-15.7 GHz and 22-22.21 GHz**

This method proposes to add an AMS allocation in the frequency band 15.4-15.7 GHz with an associated footnote, and to remove the exception to aeronautical mobile service of the MOBILE allocation in the frequency band 22-22.21 GHz, and to add an associated footnote.

**2/1.10/5 Regulatory and procedural considerations**

**2/1.10/5.1 For Method A: No change to Radio Regulations**

**NOC**

Articles

**NOC**

APPENDICIES

**2/1.10/5.2 For Method B: New aeronautical mobile service allocation in the frequency bands 15.4-15.7 GHz and 22-22.21 GHz**

ARTICLE 5

**Frequency allocations**

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

**MOD**

**15.4-18.4 GHz**

|  |  |  |
| --- | --- | --- |
| **Allocation to services** | | |
| **Region 1** | **Region 2** | **Region 3** |
| **15.4-15.43** RADIOLOCATION 5.511E 5.511F  AERONAUTICAL RADIONAVIGATION  AERONAUTICAL MOBILE ADD 5.A10.1 | | |
| **15.43-15.63** FIXED-SATELLITE (Earth-to-space) 5.511A  RADIOLOCATION 5.511E 5.511F  AERONAUTICAL RADIONAVIGATION  AERONAUTICAL MOBILE ADD 5.A10.1  5.511C | | |
| **15.63-15.7** RADIOLOCATION 5.511E 5.511F  AERONAUTICAL RADIONAVIGATION  AERONAUTICAL MOBILE ADD 5.A10.1 | | |
| **15.7-16.6** RADIOLOCATION  5.512 5.513 | | |
| **16.6-17.1** RADIOLOCATION  Space research (deep space) (Earth-to-space)  5.512 5.513 | | |
| **17.1-17.2** RADIOLOCATION  5.512 5.513 | | |
| **17.2-17.3** EARTH EXPLORATION-SATELLITE (active)  RADIOLOCATION  SPACE RESEARCH (active)  5.512 5.513 5.513A | | |
| **17.3-17.7**  FIXED-SATELLITE (Earth-to-space) 5.516 (space-to-Earth) 5.516A 5.516B  Radiolocation | **17.3-17.7**  FIXED-SATELLITE (Earth-to-space) 5.516  BROADCASTING-SATELLITE  Radiolocation | **17.3-17.7**  FIXED-SATELLITE (Earth-to-space) 5.516  Radiolocation |
| 5.514 | 5.514 5.515 | 5.514 |
| **17.7-18.1**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.517A (Earth-to-space) 5.516  MOBILE | **17.7-17.8**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.517 5.517A (Earth-to-space) 5.516  BROADCASTING-SATELLITE  Mobile  5.515 | **17.7-18.1**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.517A (Earth-to-space) 5.516  MOBILE |
|  | **17.8-18.1**  FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.517A (Earth-to-space) 5.516  MOBILE  5.519 |  |
| **18.1-18.4** FIXED  FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B 5.517A  (Earth-to-space) 5.520  MOBILE  5.519 5.521 | | |

**Reasons:** to provide a new allocation in the band 15.4-15.7 GHz to the aeronautical mobile service in response to agenda item 1.10

**ADD**

**5.A10.1** *[Editor’s note: this footnote is a placeholder to reflect the technical conditions which may be required based on the result of the technical studies]*

**MOD**

**22-24.75 GHz**

|  |  |  |
| --- | --- | --- |
| **Allocation to services** | | |
| **Region 1** | **Region 2** | **Region 3** |
| **22-22.21** FIXED  MOBILE ADD 5.A10.2  5.149 | | |
| **22.21-22.5** EARTH EXPLORATION-SATELLITE (passive)  FIXED  MOBILE except aeronautical mobile  RADIO ASTRONOMY  SPACE RESEARCH (passive)  5.149 5.532 | | |
| **22.5-22.55** FIXED  MOBILE | | |
| **22.55-23.15** FIXED  INTER-SATELLITE 5.338A  MOBILE  SPACE RESEARCH (Earth-to-space) 5.532A  5.149 | | |
| **23.15-23.55** FIXED  INTER-SATELLITE 5.338A  MOBILE | | |
| **23.55-23.6** FIXED  MOBILE | | |
| **23.6-24** EARTH EXPLORATION-SATELLITE (passive)  RADIO ASTRONOMY  SPACE RESEARCH (passive)  5.340 | | |
| **24-24.05** AMATEUR  AMATEUR-SATELLITE  5.150 | | |
| **24.05-24.25** RADIOLOCATION  Amateur  Earth exploration-satellite (active)  5.150 | | |
| **24.25-24.45**  FIXED  MOBILE except aeronautical mobile 5.338A 5.532AB | **24.25-24.45**  FIXED 5.532AA  MOBILE except aeronautical mobile 5.338A 5.532AB  RADIONAVIGATION | **24.25-24.45**  FIXED  MOBILE 5.338A 5.532AB  RADIONAVIGATION |
| **24.45-24.65**  FIXED  INTER-SATELLITE  MOBILE except aeronautical mobile 5.338A 5.532AB | **24.45-24.65**  FIXED 5.532AA  INTER-SATELLITE  MOBILE except aeronautical mobile 5.338A 5.532AB  RADIONAVIGATION | **24.45-24.65**  FIXED  INTER-SATELLITE  MOBILE 5.338A 5.532AB  RADIONAVIGATION |
|  | 5.533 | 5.533 |
| **24.65-24.75**  FIXED  FIXED-SATELLITE (Earth-to-space) 5.532B  INTER-SATELLITE  MOBILE except aeronautical mobile 5.338A 5.532AB | **24.65-24.75**  FIXED 5.532AA  INTER-SATELLITE  MOBILE except aeronautical mobile 5.338A 5.532AB  RADIOLOCATION- SATELLITE (Earth-to-space) | **24.65-24.75**  FIXED  FIXED-SATELLITE (Earth-to-space) 5.532B  INTER-SATELLITE  MOBILE 5.338A 5.532AB |

**Reasons:** to provide a new allocation in the band 22-22.21 GHz to the aeronautical mobile service in response to agenda item 1.10.

**ADD**

**5.A10.2** *[Editor’s note: this footnote is a placeholder to reflect the technical conditions which may be required based on the result of the technical studies]*

**2/1.10/5.3 For Methods A and B**

**SUP**

RESOLUTION 430 (WRC-19)

**Studies on frequency-related matters, including possible additional allocations, for the possible introduction of new non-safety aeronautical mobile applications**