|  |  |
| --- | --- |
| **U.S. Radiocommunications Sector**  **Fact Sheet** | |
| **Working Party:** ITU-R WP 4C | **Document No:**  US4C-06 |
| **Ref:** WRC-27 Agenda Item 1.13, Resolution **253 (WRC-23)** | **Date:** 23 February 2024 |
| **Document Title:** Considerations for studies under WRC-27 Agenda Item 1.13 regarding RNSS (space-to-Earth and space-to-space) frequency bands in the range 694/698 MHz to 2.7 GHz | |
| **Author(s)/Contributors:**  Rick Merchant  SSC/CGEP USSF  Los Angeles AFB, CA  Tiange (George) Fan, for GPS  The Aerospace Corporation  El Segundo, CA  Tom L. Hayden, for GPS  TLH Consulting  Seattle, WA  Stephen Baruch, for GPSIA  New Wave Spectrum Partners LLC  Dallas, TX  Mark Rentz, for GPSIA  John Deere  Torrance, CA | Phone: (310) 653-1871  Email: [rick.merchant.2@spaceforce.mil](mailto:rick.merchant.2@spaceforce.mil)  Phone: (310) 336-1252  Email: [Tiange.Fan@aero.org](mailto:Tiange.Fan@aero.org)  Phone: (425) 443-1837  Email: [Tom.Hayden@live.com](mailto:Tom.Hayden@comcast.net)  Phone: (240) 476-2600  Email: [sbaruch@newwavespectrum.com](mailto:sbaruch@newwavespectrum.com)  Phone: (310) 381-2607  Email: RentzMarkL@JohnDeere.com |
| **Purpose/Objective:** To indicate that the frequency bands allocated to the RNSS (space-to-Earth and space-to-space) in the frequency range covered in *resolves to invite the ITU Radiocommunication Sector to complete in time for the 2027 world radiocommunication conference* 1 from Resolution **253 (WRC-23)**, should be excluded from further study due to previous ITU-R studies showing no capability for sharing on a co-frequency basis between RNSS and MSS. | |
| **Abstract:** This contribution is intended to advance the studies under Resolution **253 (WRC-23)** by reminding participants that when the possibility of co-frequency sharing between RNSS and MSS has been studied in the ITU-R before, the conclusion was that such sharing is not possible. These results remain valid, and thus the frequency bands 1 164-1 215 MHz, 1 215-1300 MHz, and 1559-1610 MHz should not be viewed as potential candidate bands for new MSS allocations under WRC-27 Agenda Item 1.13. | |
| **Fact Sheet prepared by:** Steve Baruch | |

|  |  |
| --- | --- |
| **Radiocommunication Study Groups** | Logo  Description automatically generated |
| Received: \_\_ April 2024  Subject: WRC-27 Agenda Item 1.13, Resolution **253 (WRC-23)** | **Document 4C/\_\_\_-E** |
| **\_\_ April 2024** |
| **English only** |
| **United States of America** | |
| CONSIDERATIONS FOR STUDIES UNDER WRC-27 AGENDA ITEM 1.13 REGARDING RNSS (SPACE-TO-EARTH AND SPACE-TO-SPACE) FREQUENCY BANDS IN THE RANGE 694/698 MHZ TO 2.7 GHZ | |

**Introduction**

This contribution introduces some considerations regarding frequency bands allocated to and heavily used on a global basis by the radionavigation-satellite service (RNSS) in the range 694/698 MHz to 2.7 GHz that are to be studied in accordance with Resolution **253 (WRC-23)** under WRC-27 Agenda Item 1.13.

**Discussion**

Resolution **253 (WRC-23)** calls for studies on possible allocations to the mobile-satellite service (MSS) in the frequency range between 694/698 MHz and 2.7 GHz, taking into account the IMT frequency arrangements addressed in the most recent version of Recommendation ITU-R M.1036, including studies on sharing and compatibility between incumbent services (including in adjacent frequency bands), ensuring the protection of incumbent services in accordance with the Radio Regulations.

The three principal RNSS bands used globally for space-to-Earth and space-to-space service to billions of users in many different applications worldwide are the frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz, and 1 559-1 610 MHz. All three of these frequency bands (referred to as the “1-GHz RNSS bands”) are within the study range of Resolution **253 (WRC-23)**.

Recommendation ITU-R M.1787 provides descriptions of systems and networks in the radionavigation-satellite service (RNSS) and technical characteristics of transmitting space stations operating in the 1-GHz RNSS bands. Recommendations ITU-R M.1905, ITU-R M.1902, ITU-R M.1903 and ITU-R M.1904 provide technical and operational characteristics of, and protection criteria for, receiving stations in the RNSS (space-to-Earth and space-to-space) operating in the 1-GHz RNSS bands. For the purpose of providing protection criteria for RNSS systems, RNSS receiver types for particular applications were described in the above referenced M-Series Recommendations. While the RNSS continues to evolve as new systems come on line and additional applications are developed, Report ITU-R M.2458 provides information on the current and planned RNSS applications for the 1-GHz RNSS bands, including additional RNSS applications not addressed in the M-Series Recommendations noted above.

In the past, the ITU-R has had occasion to study the impact of potential new MSS allocations on RNSS in the 1-GHz RNSS bands. Most prominently, WRC-2000 evaluated the feasibility of an allocation to the MSS (space-to-Earth) in a portion of the 1 559‑1 567 MHz frequency range under WRC-2000 Agenda Item 1.9. After intensive study in the ITU-R, WRC-2000 decided not to add an MSS (space-to-Earth) allocation in any portion of the RNSS frequency band at 1559-1567 MHz. The reason for this determination was made clear by the unequivocal and universal conclusion in the CPM Report to WRC-2000. There, in Section 2.2.1.3 (Methods to satisfy the agenda item and their advantages and disadvantages), CPM2000-2 determined as follows:

Studies conducted in the ITU‑R indicate the incompatibility of the MSS (space-to-Earth) and ARNS/RNSS in any portion of the 1 559‑1 567 MHz band. Not only do MSS signals have the potential to cause significant interference to ARNS/RNSS, but GNSS pseudolites and proposed new RNSS systems also have the potential to cause significant interference to the MSS (space-to-Earth).

The RNSS is extensively used, and is continuing to undergo a tremendous expansion that drives further evolution. As a result of these factors, which have to be considered in conjunction with the many critical timing, positioning, and navigation uses of RNSS (including, but not limited to, aeronautical and maritime safety-of-life navigation), sharing of the 1 559‑1 610 MHz band - including any portion of the segment at 1 559‑1 567 MHz - with any co-frequency communication service is not recommended.

Although studies were not carried out on every different type of RNSS receiver used in all the numerous applications of RNSS, it was nevertheless possible to conclude that sharing between ARNS/RNSS and MSS (space-to-Earth) is not feasible in any portion of the 1 559‑1 567 MHz band.

CPM Report to WRC-2000, Section 2.2.1.3. The CPM Report, in Section 2.2.1.4, went on to note that “[n]o practically implementable regulatory or procedural mechanisms have been presented to the ITU‑R that could satisfy established fault monitoring and reporting requirements and ensure that MSS (space-to-Earth) signals would not have a negative effect on the continuity of flight operations.”

The conclusions of the studies done on the 1559-1567 MHz band for WRC-2000 remain equally applicable today. The number of RNSS systems operating worldwide in one of four broad categories – 1) Global Navigation Satellite Systems; 2) Regional RNSS Systems; 3) RNSS Satellite-Based Augmentation Systems; or 4) Assisted RNSS (A-RNSS) systems – has expanded in recent years well beyond what was envisioned in 2000. The number of GNSS devices installed worldwide was at 5.6 billion in 2023, and is expected to grow to almost 9 billion in the next decade.[[1]](#footnote-1) The conclusions from 2000 on the infeasibility of co-frequency MSS and RNSS also apply to the other 1-GHz RNSS bands encompassed in the study range of Resolution **253 (WRC-23)**. If anything, the heightened sensitivity of RNSS receivers in the 1 164-1 215 MHz and 1 215-1 300 MHz range to pulsed interference make the prospect of sharing with MSS even less likely in the lower 1-GHz RNSS bands than they were at 1 559-1 610 MHz.

Given that the general idea of WRC-27 Agenda Item 1.13 is to consider possible new allocations to the MSS for direct connectivity between space stations and IMT user equipment to complement terrestrial IMT network coverage, it must be mentioned that co-frequency MSS is not the only concern. In the run-up to WRC-15, frequency bands adjacent to the 1-GHz RNSS bands were studied as possible candidate bands for IMT under WRC-15 Agenda Item 1.1. The ITU-R studies showed that “if a higher-power, continuous-in-time signal in the same frequency band, or an adjacent band, is broadcast near an RNSS receiver, it could desensitize the RNSS receiver to the degree that the RNSS receiver is unable to extract the RNSS signal from space. As a result, frequency ranges near those used for the RNSS should not be identified for IMT.” CPM Report for WRC-15, at Section 1/1.1/4.1.2.1.

**Conclusion**

Resolution **253 (WRC-23)** encompasses all of the frequency spectrum between 694/698 MHz and 2.7 GHz in its search for possible new MSS allocations for direct connectivity between space stations and IMT user equipment. As the discussion above makes clear, the ITU-R has intensively looked at the prospect of co-frequency MSS (space-to-Earth) and RNSS operations. It determined during this examination that co-frequency sharing between RNSS and MSS (space-to-Earth) is not feasible. Moreover, the ITU-R has looked at the possibility of co-frequency or adjacent-band IMT and RNSS as recently as 2015, and concluded that frequencies near those used for RNSS should not be identified for IMT – and WRC-15 agreed.

On the basis of this document, the United States urges WP 4C to determine that the studies under Resolution **253 (WRC-23)** for possible MSS allocations for direct connectivity between space stations and IMT user equipment should not include the RNSS (space-to-Earth) and (space-to-space) frequency bands 1 164-1 215 MHz, 1 215-1 300 MHz, and 1 559-1 610 MHz. In addition, the studies should not include the possibility of transmitting IMT user equipment in either the 1-GHz RNSS bands or any frequency ranges adjacent to or near those used for RNSS.

1. EUSPA EO and GNS Market Report, January 2024, at 20 (available at <https://www.euspa.europa.eu/sites/default/files/euspa_market_report_2024.pdf>) [↑](#footnote-ref-1)