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| **US Radiocommunication Sector****FACT SHEET** |
| **Study Group:** USWP 7B | **Document No:** US7B\_27\_012NC |
| **Reference:** 7B/35-E Annex 9 | **Date:** 6 May 2024 |
| **Document Title:** Preliminary draft new recommendation containing characteristics of SRS and EESS systems in the 2025 – 2120 MHz band. |
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| **Purpose:** To document characteristics of SRS and EESS systems operating (s-s) and (E-s) links in the 2 025 – 2 110 MHz and 2 110 – 2 120 MHz bands for use in studies of compatibility with proposed MSS operations in the (s-E) and (E-s) directions in adjacent bands as part of WRC-27 agenda items 1.12 and 1.14.  |
| **Abstract:** WRC-27 agendaitem 1.12 calls for the consideration of possible allocations to the MSS and possible regulatory actions in frequency bands including the 2 010 – 2 025 MHz band in the (space-to-Earth) and (Earth-to-space) directions for the future development of low-data-rate non-geostationary mobile satellite systems. The adjacent 2 025 – 2 110 MHz band is allocated to the SRS and EESS in the (s-s) and (E-s) directions and is heavily utilized by international space agency missions. In addition, WRC-27 agenda item 1.14 calls for the consideration of possible allocations to the MSS in the (space-to-Earth) direction in the 2 120 – 2 160 MHz band in all regions, and in the 2 160 – 2 170 MHz band in Regions 1 and 3. The 2 110 – 2 120 MHz band is allocated to the SRS (deep space) service which features system characteristics and protection criteria which differ from those applicable to near-Earth SRS systems in the 2 025 – 2 110 MHz band. At the March 2024 WP 7B meeting, work was initiated on development of the preliminary draft new recommendation ITU-R SA.[2.0 GHZ SRS & EESS CHAR] to document the characteristics of SRS and EESS systems for use in adjacent band studies associated with WRC-27 agenda items 1.12 and 1.14. This contribution continues the development of the PDNR to support the required studies. |
| **Fact Sheet Preparer:** James Brase, Peraton for NASA |

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| PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R SA.[2.0 GHz SRS & EESS CHAR]  |
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WRC-27 agendaitem 1.12 calls for the consideration of possible allocations to the MSS and possible regulatory actions in multiple frequency bands including the 2 010 – 2 025 MHz band in the (space-to-Earth) and (Earth-to-space) directions for the future development of low-data-rate non-geostationary mobile satellite systems. The adjacent 2 025 – 2 110 MHz band is allocated to the SRS and EESS in the (s-s) and (E-s) directions and is heavily utilized by international space agency missions. WRC-27 agenda item 1.13 calls for studies on possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage in frequency ranges including the 2 110 – 2 200 MHz band.

In addition, WRC-27 agenda item 1.14 calls for the ur of possible allocations to the MSS in the (space-to-Earth) direction in the 2 120 – 2 160 MHz band in all regions, and in the 2 160 – 2 170 MHz band in Regions 1 and 3. The 2 110 – 2 120 MHz band is allocated to the SRS (deep space) service which features system characteristics and protection criteria which differ from those applicable to near-Earth SRS systems in the 2 025 – 2 110 MHz band.

At the March 2024 WP 7B meeting, work was initiated on development of the preliminary draft new recommendation ITU-R SA.[2.0 GHZ SRS & EESS CHAR] to document the characteristics of SRS and EESS systems for use in adjacent band studies associated with WRC-27 agenda items 1.12 and 1.14. This contribution continues the development of this WD PDNR.

Attachment 1 proposes updates to the subject Recommendation under development in WP 7B. Attachment 2 is a draft liaison statement to forward the PDNR draft to the concerned working parties for the associated agenda items.

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| ATTACHMENT 1 |
| PRELIMINARY DRAFT NEW RECOMMENDATION ITU-R SA.[2.0 GHz SRS & EESS CHAR] |
| Technical and operational characteristics of the space research service and Earth exploration-satellite service systems in the 2 025-2 120 MHz  frequency band to be used for assessing interference and for conducting sharing studies |

(202X)

Scope

This Recommendation provides technical and operational characteristics to be used in sharing studies for the space research service (SRS) and Earth exploration-satellite service (EESS) that use the 2 025-2 120 MHz (Earth-to-space) frequency band related to science missions.

Keywords

SRS, EESS, DRS

Related ITU-R Recommendations and Reports

Recommendation [ITU-R SA.363](https://www.itu.int/rec/R-REC-SA.363) – *Space operation systems*

Recommendation [ITU-R SA.609](https://www.itu.int/rec/R-REC-SA.609) – *Protection criteria for radiocommunication links for manned and unmanned near-Earth research satellites* (note: these criteria are applicable for SRS links in the (Earth-to-space) direction) to spacecraft at altitudes ≤ 2E6 km)

Recommendation [ITU-R SA.1018](https://www.itu.int/rec/R-REC-SA.1018) – *Hypothetical reference system for systems comprising data relay satellites in the geostationary orbit and user spacecraft in low Earth-orbits*

Recommendation [ITU-R SA.1020](https://www.itu.int/rec/R-REC-SA.1020) – *Hypothetical reference system for the Earth exploration-satellite and meteorological satellite services*

Recommendation [ITU-R SA.1014](https://www.itu.int/rec/R-REC-SA.1014/en) – *Radiocommunication requirements for manned and unmanned deep space research*

Recommendation [ITU-R SA.1155](https://www.itu.int/rec/R-REC-SA.1155) – *Protection criteria related to the operation of data relay satellite systems* (note: these criteria are applicable for SRS links in the (space-to-space) direction) to spacecraft at altitudes ≤ 2E6 km)

Recommendation [ITU-R SA.1157](https://www.itu.int/rec/R-REC-SA.1157) – *Protection criteria for deep space research* (note: these criteria are applicable for SRS links in the (Earth-to-Space) direction) to spacecraft at altitudes ≥ 2E6 km)

Recommendation [ITU-R SA.1160](https://www.itu.int/rec/R-REC-SA.1160) – *Aggregate interference criteria for data transmission systems in the Earth exploration-satellite and meteorological-satellite services using satellites in the geostationary orbit* (note: these criteria are applicable for EESS and MetSat links in the (Earth-to-space) direction) to spacecraft at altitudes ≤ 2E6 km)

Recommendation [ITU-R SA.1164](https://www.itu.int/rec/R-REC-SA.1164) – *Sharing and coordination criteria for service links in data collection systems using GSO satellites in the Earth exploration-satellite and meteorological-satellite services*

Recommendation [ITU-R SA.1414](https://www.itu.int/rec/R-REC-SA.1414) – *Characteristics of data relay satellite systems*

[The ITU Radiocommunication Assembly,

considering*a)* that the frequency band 2 025-2 110 MHz is allocated to the SRS and EESS on a primary basis among other services in the Earth-to-space and space-to-space directions;

*b)* that the frequency band 2 110-2 120 MHz is allocated to the SRS (deep space) on a primary basis among other services in the Earth-to-space direction;

*c)* that in order to carry out sharing studies, technical and operational characteristics of SRS and EESS systems for use in the frequency band 2 025-2 120 MHz are needed, where applicable;

*d)* that technical and operational characteristics of data relay satellite (DRS) systems are contained in Recommendation ITU-R SA.1414,

recommends

that the technical and operational system characteristics for the SRS and EESS operating in the 2 025-2 110 MHz (Earth-to-space) (space-to-space) and for the SRS (deep space) (Earth-to-space) operating in the 2 110-2 120 MHz frequency bands detailed in the annex should be used in sharing studies.

Annex

Technical and operational characteristics of the space research service
and Earth exploration-satellite service systems in the
2 025-2 120 MHz frequency band to be used
for assessing interference and for conducting sharing studies

This Recommendation provides the technical and operational characteristics of the SRS and EESS systems in the 2025-2120 MHz band.

The frequency band 2 025-2 110 MHz is allocated to the SRS and EESS (Earth-to-space) and the frequency band 2 110-2 120 MHz is allocated to the SRS (deep space) (Earth-to-space). Typical characteristics for systems in these frequency bands are listed below in Tables 1 through 4.

# 1 Earth-to-space links, 2 025-2 110 MHz band

Tables 1 and 2 list the transmit and receive parameters, respectively, for Earth-to-space (E-s) links in the 2 025-2 110 MHz band for SRS and EESS systems.

TABLE 1

E-s transmit links

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | System A | System B | System C |
| Earth station location |  | USA | USA |
| Transmit antenna gain | dBi | 45.4 | 45.7 | 49.7 |
| Transmit antenna pattern |  | RR Appendix **8**, Annex III | ITU-R S.465-5 |
| Transmit power | dBW | 23.0 | 23.0 | 33.0 |
| Max pwr spectral density | dBW/Hz | −15.3 | −25.1 | 6.6 |
| Transmit bandwidth | MHz | .036 | .128 | 1.0 |
| Modulation type |  | PSK/PM | BPSK | PCM/PSK/PM |
| Subcarrier | kHz | 4.0 | – | 16 |
| Range tone | kHz | – | – | 500 |
| Minimum elevation angle | deg | 5.0 | 5.0 | 5.0 |

Table 2

E-s receive links

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | System A | System B | System C |
| Altitude | km | 529 | 407 | 406094.1 |
| Eccentricity |  | 0.0 | 0.0 | .0549 |
| Inclination | deg | 97.9 | 65.0 | 18.28 – 26.58 |
| Sun Synchronous? (Y/N) |  | N | N | N |
| Receive antenna gain | dBi | 3.0 | 23.0 | 21.0 |
| Receive antenna temperature | k | 460 | 226 | 543 |
| Receive antenna pattern |  | Rec. ITU-R S.672 |

# 2 Space-to-space links, 2 025-2 110 MHz band

Tables 3 and 4 list the transmit and receive parameters, respectively, for Earth-to-space (E-s) links in the 2 025-2 110 MHz band for SRS and EESS systems.

TABLE 3

s-s transmit links

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | System A |
| Transmit S/C altitude | km | 35 786 |
| Transmit S/C location | deg. | See ITU-R SA.1275 |
| Transmit antenna gain | dBi | 36.0 |
| Transmit antenna pattern |  | Rec. ITU-R S.672 |
| Transmit power | dBW | 12.5 |
| Max pwr spectral density | dBW/Hz | -55.4 |
| Transmit bandwidth | MHz | 6.16 |

Table 4

s-s receive links

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | System A | System B | System C |
| Altitude | km | 573.3 | 350 | 400 |
| Eccentricity |  | 0.0 | 0.0 | 0.0 |
| Inclination | deg. | 28.47 | 51.6 | 51.6 |
| Sun Synchronous? (Y/N) |  | N | N | N |
| Receive antenna gain | dBi | 0.0 | 12.9 | 22.5 |
| Receive antenna temperature | k | 549.5 | 587 | 447 |
| Receive antenna pattern |  | ND-SPACE | Rec. ITU-R S.672 | Rec. ITU-R S.672 |

# 3 Earth-to-space links, 2 110-2 120 MHz band

Tables 5 and 6 list the transmit and receive parameters, respectively, for Earth-space (E-s) links in the 2 110-2 120 MHz band for SRS (deep space) systems.

TABLE 5

E-s transmit links

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | System DS-A | System DS-B | System DS-C |
| Earth station location | deg. | USA | Australia | India |
| Transmit antenna gain | dBi | 55.2 | 62.7 | 53.5 |
| Transmit antenna pattern |  | Rec. ITU-R SA.509-3 | Rec. ITU-R S.580-6 |
| Transmit power | dBW | 43 | 54.7 | 43 |
| Max pwr spectral density | dBW/Hz | 7 | 18.7 | 4 |
| Transmit bandwidth | MHz | 2.5 | 2.5 | 2.5 |
| Modulation type |  | PCM/PSK/PM | PCM/PSK/PM | PCM/PSK/PM |
| Subcarrier | kHz | 16 | 16 | 8 |
| Range tone | kHz | 1 033 | 1 033 | 1 033 |
| Minimum elevation angle | deg | 10 | 10 | 10 |

Table 6

E-s receive links

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | System DS-A | System DS-B | System DS-C |
| Minimum distance from Earth (Launch & Early Cruise, Earth flybys) | km | 200 | 3000 | 264 |
| Maximum distance from Earth | km | 4.01 × 108 | 1.52 × 109 | 4.01 × 108 |
| Receive antenna gain | dBi | −2 (LGA)28.7 (HGA) | 7 (LGA)34.6 (HGA) | 0 (LGA)32.5 (HGA) |
| Receive antenna temperature | deg K | 200 | 1 500 | 600 |
| Receive antenna pattern |  | Rec. ITU-R S.672 |

**A**TTACHMENT **2**

**Working Party 7B**

Draft Reply Liaison Statement to Working Party 4C

(COPY TO WORKING PARTIES 3L, 3M, 4B, 5A, 5B, 5C, 5D, 7C AND 7D)

**Technical and operational characteristics of the space research service and Earth exploration-satellite service systems in the 2 025-2 120 MHz frequency band**

Working Party (WP) 7B thanks WP 4C for its liaison statements in Documents 7B/43 and 7B/45 requesting information on the characteristics of space research service (SRS) and Earth-exploration satellite service (EESS) systems operating in the frequency bands relevant for studies under agenda items 1.12, 1.13, and 1.14 (**WRC-27**).

The 2 025 – 2 110 MHz and 2 110 – 2 120 MHz bands are adjacent to the frequency bands identified for study as part of these agenda items and are used extensively by the SRS and EESS for links in the (Earth-to-space) and (space-to-space) directions.

The Preliminary Draft New Recommendation (PDNR) found in Working Party 7B chair’s report (7B/XX) contains the characteristics of SRS and EESS systems in these frequency bands to support the studies under Agenda Items 1.12, 1.13, and 1.14 **(WRC-27).**

WP 7B appreciates being kept informed of the status of all sharing studies relating to agenda item 1.12, 1.13, and 1.14 (**WRC-27**).

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| **Status:** For action  |
| **Deadline:** For next ITU-R WP 7B meeting (31 March 2025) |  |
| **Contact:**  TBD | **E-mail:** TBD |