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| **US Radiocommunication Sector****FACT SHEET** |
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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.  |
| **Abstract:** At the September 2024 WP 7B meeting, work continued 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. WP7B excerpted these characteristics and sent them to WP4C in a Liaison Statement. This contribution is intended to finalize the work on revising the Recommendation and sent it to SG7. |
| **Fact Sheet Preparer:** Ted Berman, Peraton for NASA |

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| DRAFT NEW RECOMMENDATION ITU-R SA.[2.0 GHz SRS & EESS CHAR]  |
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At the September 2024 WP 7B meeting, work continued 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. WP7B excerpted these characteristics and sent them to WP4C in a Liaison Statement. This contribution continues the development of this Recommendation and proposes to finalize it at the current WP7B meeting and submit it to Study Group 7.

Attachment 1 proposes updates to the subject Recommendation under development in WP 7B.

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| ATTACHMENT 1 |
| 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 and compatibility studies |

(2025)

Scope

This Recommendation provides technical and operational characteristics to be used in sharing and compatibility 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 and compatibility studies

This Recommendation provides the technical and operational characteristics of the SRS and EESS systems in the 2 025-2 120 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** | **System D** | **System E** | **System F** |
| Earth station location |   | USA |
| Transmit antenna gain | dBi | 45.4 | 45.7 | 49.7 | 49.6 | 55.79 | 61.5 |
| Transmit antenna pattern |   | RR Appendix **8**, Annex III | ITU-R S.465-5 | ITU-R S.465-5 | ITU-R S.465-5 | ITU-R S.465-5 |
| Transmit power | dBW | 23 | 23 | 33 | 28 | 33 | 43 |
| Max pwr spectral density | dBW/Hz | −15.3 | −25.1 | 6.6 | -34 | -18 | 3.5 |
| Transmit bandwidth | MHz | 0.036 | 0.128 | 1 | 1 | 0.128 | 2 |
| Modulation type |   | PSK/PM | BPSK | PCM/PSK/PM | PCM/PSK/PM | QPSK | QPSK |
| Subcarrier | kHz | 4 | – | 16 | 16 | - | - |
| Range tone | kHz | – | – | 500 | 500 | - | - |
| Minimum elevation angle | deg | 5 | 5 | 5 | 5 | 5 | 5 |

Table 2

E-s receive links

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **System A** | **System B** | **System C** | **System D** | **System E** | **System F** |
| Altitude | km | 529 | 407 | 406 094.1 | 35786 | 242350 | 1500000 |
| Eccentricity |   | 0 | 0 | 0.0549 | 0 | 0.539 | 0 |
| Inclination | deg | 97.9 | 65 | 18.28-26.58 | 0 | 47 | 0 |
| Sun Synchronous? (Y/N) |   | N | N | N | N | N | N |
| Receive antenna gain | dBi | 3 | 23 | 21 | 5 | 1.5 | 30 |
| Receive antenna temperature | k | 460 | 226 | 543 | 245 | 290 | 518 |
| 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. | Rec. 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 | System D | System E |
| Altitude | km | 573.3 | 350 | 400 | 400 | 835 |
| Eccentricity |  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Inclination | deg. | 28.47 | 51.6 | 51.6 | 96.8 | 98.85 |
| Sun Synchronous? (Y/N) |  | N | N | N | Y | Y |
| Receive antenna gain | dBi | 0.0 | 12.9 | 22.5 | ‒3/18 | ‒3 |
| Receive antenna temperature | k | 549.5 | 587 | 447 | 450 | 450 |
| Receive antenna pattern |  | ND-SPACE | Rec. ITU-R S.672 | Rec. ITU-R S.672 | ND-SPACE/ ITU-R S.672 | ND-SPACE |

# 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 |

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