



Recommendation ITU-R SA.2156-0
(12/2022)

**Guidelines on the use of
the frequency band 2 025-2 110 MHz by
Earth exploration-satellite service/space
research service/space operation service
satellite networks or systems that are not
using spread-spectrum modulation**

SA Series
Space applications and meteorology

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

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Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R SA.2156-0

Guidelines on the use of the frequency band 2 025-2 110 MHz by Earth exploration-satellite service/space research service/space operation service satellite networks or systems that are not using spread-spectrum modulation

(2022)

Scope

This Recommendation provides guidelines for the use of the frequency band 2 025-2 110 MHz by the space research service (SRS), Earth exploration-satellite service (EESS), and space operation service (SOS) networks or systems. The aim is to optimize the use of the band by promoting practices that allow the maximum number of satellite networks and systems sharing the band, including techniques that would reduce the bandwidth within the Advance Publication Information (API) filing. This Recommendation addresses EESS/SRS/SOS satellite networks or systems that are not using spread-spectrum modulation.

Keywords

Tracking, telemetry, command, Earth exploration-satellite, space research, space operation, TT&C, EESS, SRS, SOS

Related ITU-R Recommendations and Reports

Recommendation ITU-R SA.363 – Space operation systems

Recommendation ITU-R SA.1024 – Necessary bandwidths and preferred frequency bands for data transmission from Earth exploration satellites (not including meteorological satellites)

Recommendation ITU-R SA.1273 – Power flux-density levels from the space research, space operation and Earth exploration-satellite services at the surface of the Earth required to protect the fixed service in the bands 2 025-2 110 MHz and 2 200-2 290 MHz

Recommendation ITU-R S.1716 – Performance and availability objectives for fixed-satellite service telemetry, tracking and command systems

Recommendation ITU-R F.1777 – System characteristics of television outside broadcast, electronic news gathering and electronic field production in the fixed service for use in sharing studies

Recommendation ITU-R SA.1863 – Radiocommunications used for emergency in manned space flight

Report ITU-R SA.2325 – Sharing between space-to-space links in space research, space operation and Earth exploration-satellite services and IMT systems in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz

The ITU Radiocommunication Assembly,

considering

- a)* that the frequency band 2 025-2 110 MHz is allocated, among other services, to the space research service (SRS), Earth exploration-satellite service (EESS) and space operation service (SOS) in the Earth-to-space and space-to-space directions;
- b)* that the frequency band 2 025-2 110 MHz is presently congested and interference among satellite networks and systems may exceed the protection levels in relevant ITU-R Recommendations;
- c)* that the number of satellite links using the frequency band 2 025-2 110 MHz is expected to continue to increase in the future and, as a result, may potentially increase the interference levels;

- d) that most space-to-space satellite links currently operating in the frequency band 2 025-2 110 MHz typically use an emission bandwidth of no more than 6.2 MHz;
- e) that most Earth-to-space satellite links currently operating in the frequency band 2 025-2 110 MHz typically use an emission bandwidth no more than 2 MHz;
- f) that the use of larger emission bandwidths than referenced above may for non-spread spectrum signals under certain circumstances, make it more difficult to coordinate;
- g) that the frequency band 2 025-2 110 MHz is traditionally used for tracking, telemetry, and command (TT&C) for the operation of spacecraft;
- h) that higher frequency bands are available as alternatives to the frequency band 2 025-2 110 MHz as they provide adequate bandwidths for relatively high data-rate payload data transmission;
- i) that congestion in the band can be reduced by selection of the minimum bandwidth necessary to accomplish the intended mission;
- j) that the use of large earth station antennas with high gains and low sidelobe levels reduces the impact of potential interference;
- k) that interference in the band resulting from earth-to-space transmissions can also be reduced by ensuring that earth stations transmit only when in visibility of their associated space station;
- l) that interference in the band resulting from space-to-space transmissions can also be reduced by ensuring that space stations transmit only when in visibility of their associated space station;
- m) that precise information relating to the number of carriers and their associated bandwidths, number of specific earth stations, and service area could facilitate the coordination process;
- n) that for the case of satellite systems containing multiple satellites, frequency reuse would improve spectrum efficiency, therefore reducing the total necessary bandwidth of such systems,

recognizing

- a) that frequency assignments to non-GSO satellite networks and systems in the 2 025-2 110 MHz frequency band are not subject to the coordination procedure under Section II of the Radio Regulations (RR) Article 9;
- b) that ITU-R Circular Letter CR/420 states that these bands are in fact the most common bands for space operation of non-GSO satellites networks and systems and submitting a more realistic frequency bands as part of the Advance Publication Information (API) will facilitate the procedure under Section 1A of RR Article 9 and minimize correspondence exchange between various involved administrations,

noting

- a) that, according to RR No. **1.111**, a *satellite system* is defined as a *space system* using one or more artificial *earth satellites*;
- b) that, according to RR No. **1.112**, a *satellite network* is defined as *satellite system* or a part of a *satellite system*, consisting of only one satellite and the cooperating *earth stations*;
- c) that according to RR No. **5.392**, administrations are urged to take all practicable measures to ensure that space-to-space transmissions between two or more non-geostationary satellites, in the space research, space operations, and Earth exploration-satellite services in the frequency bands 2 025-2 110 MHz and 2 200-2 290 MHz, shall not impose any constraints on Earth-to-space space-to-Earth and other space-to-space transmissions of those services and in those bands between geostationary and non-geostationary satellites,

recommends

1 that EESS/SRS/SOS satellite networks or systems that are not using spread spectrum modulation and are planning to use the frequency band 2 025-2 110 MHz should consider reducing their bandwidth to the operational minimum required by their satellite network or system in order to minimize congestion and the potential for interference to other systems and services operating in this frequency band;

2 that, for Earth-to-space operations in the frequency band 2 025-2 110 MHz, administrations operating EESS/SRS/SOS satellite networks or systems that are not using spread spectrum modulation, should consider using an operational bandwidth of no more than 2.0 MHz;

3 that, for space-to-space operations in the frequency band 2 025-2 110 MHz, administrations operating EESS/SRS/SOS satellite networks or systems that are not using spread spectrum modulation, should consider using an operational bandwidth of no more than 6.2 MHz;

4 that Earth-to-space and space-to-space operations in the frequency band 2 025-2 110 MHz should only transmit when in view of their receiving space stations;

5 that for Earth-to-space operations in the frequency band 2 025-2 110 MHz, due consideration should be given to interference mitigation techniques which may include:

- i) earth station geographical diversity;
- ii) increased earth station antenna gain enhancing the link margin;
- iii) reduced earth station antenna sidelobe levels;
- iv) use of data relay satellites, if available, to augment and/or replace earth stations;
- v) the use of CDMA spread-spectrum signals or suppressed carrier modulation schemes for non-spread-spectrum signals;
- vi) steerable beams with reduced space station antenna sidelobe levels for space-space links; and
- vii) earth station isolation from mobile links;

6 that when submitting RR Appendix 4 information to the Radiocommunication Bureau for EESS/SRS/SOS satellite networks or systems intended to operate in the Earth-to-space direction in the frequency band 2025-2110 MHz, administrations should:

- refrain, whenever possible, from using generic parameters, such as typical earth stations with the service area over the whole Earth surface, and large ranges of power/e.i.r.p. and signal bandwidths;
- consider specifying the carrier frequency and the bandwidth, and as far as possible, the number of specific earth stations, and their associated geographic coordinates, consistent with the required actual operations.

NOTE – *recommends* 2 and 3 may not be applied during launch operations.
