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NASA Procedural Requirements

COMPLIANCE IS MANDATORY**NPR 2570.1C**
Effective Date: September 22,
2014
Expiration Date: September
22, 2019[Printable Format \(PDF\)](#)

Request Notification of Change (NASA Only)

Subject: NASA Radio Frequency (RF) Spectrum Management Manual

Responsible Office: Human Exploration and Operations Mission Directorate

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Appendix A: Glossary of Commonly Used Terms from the International Telecommunication Union (ITU) Radio Regulations (RR) Applicable to NASA RF EM Spectrum Management

A.1 General Terms

A.1.1 Experimental Station: A station utilizing radio waves in experiments with a view to the development of science or technique.

A.1.2 Frequency Allocation: Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more (terrestrial or space) radiocommunication services or the radio astronomy service under specified conditions. This term should also be applied to the frequency band concerned.

A.1.3 Frequency Allotment: Entry of a designated frequency channel in an agreed-upon plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one or more identified countries or geographical areas and under specific conditions.

A.1.4 Frequency Assignment: Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.

A.1.5 Frequency Coordination: Procedures established to provide portions of the RF spectrum or specific frequencies to two or more users that best accommodate the services required by each.

A.1.6 Harmful Interference: RF interference that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radio communications service.

A.1.7 Non-Interference Basis: Use of radio frequencies, not in accordance with all applicable Radio Regulations (RR), must not cause harmful interference to, or claim protection from stations of, other services operating in accordance with the RR.

A.1.8 Radio Astronomy: Astronomy based on the reception of RF waves of a cosmic origin.

A.1.9 Radio Frequency Spectrum Management: The control of radio frequency interference through the processes of frequency allocation and assignment, monitoring of equipment research and development, frequency records administration, engineering analysis, and international negotiations.

A.1.10 Radio Frequency Spectrum Support: The availability of authorized frequencies or portions of the RF spectrum to accommodate the operational requirements of particular electronic equipment.

A.1.11 Radio Waves: Electromagnetic waves of frequencies lower than 3000 GHz, propagated in space without artificial guides.

A.1.12 Radiocommunication: Telecommunication by means of radio signals.

A.1.13 Radiosonde: An automatic radio transmitter in the meteorological aids service usually carried on an aircraft, free balloon, kite or parachute, and which transmits meteorological data.

A.1.14 Telecommunication: Any transmission, emission or reception of signs, signals, writing, images and sound or intelligence of any nature by wire, radio, optical or other systems.

A.1.15 Terrestrial Service: Any radio service other than a space service or the radio astronomy service.

A.1.16 Tropospheric Scatter: The propagation of radio waves by scattering as a result of irregularities or discontinuities in the physical properties of the troposphere.

A.2 Space Systems, Services, And Stations

A.2.1 Active Satellite: An Earth satellite carrying a station intended to transmit or retransmit radio signals either for communications or remote-sensing purposes.

A.2.2 Active Sensing: The measurement on board a spacecraft of signals transmitted by the sensor and then reflected, refracted, or scattered by the Earth's or another planet's surface or its atmosphere.

A.2.3 Broadcasting-Satellite Service: A space service in which signals transmitted or retransmitted by space stations, or transmitted by reflection from objects in orbit around the Earth, are intended for direct reception by the general public.

A.2.4 Earth Exploration-Satellite Service: A radiocommunication service between Earth stations and one or more space stations, which may include links between space stations, in which:

- a. Information relating to the characteristics of the Earth and its natural phenomena including data relating to the state of the environment is obtained from active sensors or passive sensors on Earth stations.
- b. Similar information is collected from airborne or Earth-based platforms.
- c. Such information may be distributed to Earth stations within the system concerned.
- d. Platform interrogation may be included. Note: This service may also include feeder links necessary for its operations.

A.2.5 Earth Station: A station in the space service located either on the Earth's surface, including on board a ship, or on board an aircraft.

A.2.6 Fixed-Satellite Service: A radiocommunication service between Earth stations at specified fixed points when one or more satellites are used; in some cases this service includes satellite-to-satellite links, which may also be effected in the intersatellite service; the fixed-satellite service may also include feeder links for other space radiocommunication services.

A.2.7 Geostationary Satellite: A satellite, the circular orbit of which lies in the plane of the Earth's equator and which turns about the polar axis of the Earth in the same direction and with the same period as those of the Earth's rotation.

A.2.8 Mobile Satellite-Service: A radio communication service between mobile Earth stations and one or more space stations, or between space stations used by this service; or between mobile Earth stations by means of one or more space stations.

A.2.9 Passive Sensing: The measurement on board a spacecraft of the natural electromagnetic energy emitted and scattered by the Earth or another planet and constituents of its atmosphere.

A.2.10 Remote Sensing: The observation of the Earth and its atmosphere using active or passive sensing.

A.2.11 Satellite System: A space system using one or more artificial Earth satellites.

A.2.12 Space Research Service: A space service in which spacecraft or other objects in space are used for scientific or technological research purposes.

A.2.13 Space Service: A radiocommunication service (1) between Earth stations and space stations or (2) between space stations or (3) between Earth stations when the signals are retransmitted by space stations, or transmitted by reflection from objects in space, excluding reflection or scattering by the ionosphere or within the Earth's atmosphere.

A.2.14 Space Station: A station in the space service located on an object, which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere.

A.2.15 Space System: Any group of cooperating Earth and space stations providing a given space service and which, in certain cases, may use objects in space for the reflection of the radiocommunication signals.

A.2.16 Space Telecommand: The use of radiocommunication for the transmission of signals to a space station to initiate, modify, or terminate functions of the equipment on a space object, including the space station.

A.2.17 Space Telemetry: The use of telemetry for the transmission from a space station of results of measurements made in a spacecraft, including those relating to the functioning of the spacecraft.

A.2.18 Space Tracking: Determination of the orbit, velocity, or instantaneous position of an object in space by means of radiodetermination, excluding primary radar, for the purpose of following the movement of the object.

A.2.19 Spacecraft: Any type of space vehicle, including an Earth satellite or a deep-space probe, whether human-tended or robotic.

A.3 Space And Orbits Of Spacecraft

A.3.1 Apogee: Altitude above the surface of the Earth of the point on a closed orbit where a satellite is at its maximum distance from the center of the Earth.

A.3.2 Deep Space: Space at distances from the Earth equal to or greater than 2×10^6 km.

A.3.3 Geosynchronous: A location in space where a satellite's period of revolution is equal to the period of rotation of the Earth about its axis.

A.3.4 Geostationary: A location in space where a satellite's circular and direct orbit lies in the plane of the Earth's equator and which thus remains fixed relative to the Earth. This is a special case of geosynchronous where the orbit inclination is 0° .

A.3.5 Inclination: The acute angle between the plane containing an orbit and the plane of the Earth's equator.

A.3.6 Non-geostationary: A location in space where a satellite's orbit is not necessarily in the plane of the Earth's equator and has a period of revolution other than 24 hours.

A.3.7 Orbit: The path in space described by the center of mass of a satellite or other object in space.

A.3.8 Perigee: Altitude above the surface of the Earth of the point on a closed orbit where a satellite is at its minimum distance from the center of the Earth.

A.3.9 Period: The time elapsing between two consecutive passages of an object in space through the same point on its closed orbit.

A.3.10 Sun-Synchronous: An orbit in which the angle between the Sun-Earth vector and the intersection of the plane of a satellite's orbit and the Earth's equator is a constant and does not change with the season.

A.4 Technical Characteristics

A.4.1 Assigned Frequency: The center of the frequency band assigned to a station.

A.4.2 Assigned Frequency Band: The frequency band, the center of which coincides with the frequency assigned to the station and the width of which equals the necessary bandwidths plus twice the absolute value of the frequency tolerance.

A.4.3 Carrier Power of a Radio Transmitter: The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle under conditions of no modulation. This definition does not apply to pulse-modulated emissions.

A.4.4 Equivalent Isotropically Radiated Power: The product of the emitted power supplied to the antenna and the antenna gain relative to an isotropic antenna.

A.4.5 Frequency Tolerance: The maximum permissible departure by the center frequency of the frequency band occupied by an emission from the assigned frequency or, by the characteristic frequency of an emission from the reference frequency. The frequency tolerance is expressed in parts per million (ppm), or in percentage, or in Hz, kHz, or MHz.

A.4.6 Gain of an Antenna: The ratio of the power required at the input of a reference antenna to the power supplied to the input of the given antenna to produce, in a given direction, the same field at the same distance. When not specified otherwise, the figure expressing the gain of an antenna refers to the gain in the direction of the radiation main lobe.

A.4.7 Harmful Interference: Any emission, radiation, or induction which endangers the functioning of a radionavigation service or other safety service or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with ITU RR.

A.4.8 Isotropic or Absolute Gain of an Antenna: The gain of an antenna in a given direction when the reference antenna is an isotropic antenna isolated in space.

A.4.9 Mean Power of a Radio Transmitter: The power supplied to the antenna transmission line by a transmitter during normal operation, averaged over a time sufficiently long compared with the period of the lowest frequency encountered in the modulation. A time of 1/10 second during which the mean power is greatest will be selected normally.

A.4.10 Necessary Bandwidth: For a given class of emission, the minimum value of the occupied bandwidth sufficient to ensure the transmission of information at the rate and with the quality required for the system employed, under specific conditions. Emissions useful for the good functioning of the receiving equipment as, for example, the emission corresponding to the carrier of reduced carrier systems, are included in the necessary bandwidth. The necessary bandwidth for an emission is determined as prescribed in Annex J of the NTIA Manual.

A.4.11 Peak Envelope Power of a Radio Transmitter: The average power supplied to the antenna transmission line by a transmitter during one radio frequency cycle at the highest crest of the modulation envelope, taken under conditions of normal operation.

A.4.12 Relative Gain of an Antenna: The gain of an antenna in a given direction with reference to an antenna which is a half-wave, loss-free dipole isolated in space, and in the equatorial plane which contains the given direction.

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