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# NASA Procedural Requirements

**COMPLIANCE IS MANDATORY****NPR 2570.1C**Effective Date: September 22,  
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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 G: NTIA IRAC Spectrum Planning Subcommittee (SPS) and Space Systems Subcommittee (SSS) Procedures

### G.1 IRAC Spectrum Planning Subcommittee

G.1.1 The procedure consists of a four-stage review performed by NTIA's Systems Review Branch in the IRAC SPS. All four stages of review are not required. Normally, NASA space systems undergo review at Stages 2, 3, and 4 or Stages 2 and 4. This review process is mandatory for space systems except those that operate under Annex K of the NTIA Manual regarding low power non-licensed devices. Details of the NTIA Systems Review process can be found in the NTIA Manual Chapter 10. (Note also Section 1.2 of this NPR.)

G.1.2 All data will be submitted by the responsible Center/Facility Spectrum Manager to the NASA SPS Representative (in either EI-CID or the current successor) in accordance with Sections 10.7 and 10.8 of the NTIA Manual.

#### G.1.3 Stage 1 Conceptual

a. In Stage 1, the initial planning effort has been completed, including proposed frequency bands and other available characteristics.

b. The Stage 1 Systems Review addresses the certification of spectrum support for telecommunication systems or subsystems and provides guidance on the feasibility of obtaining certification of spectrum support at subsequent stages. Those systems or subsystems that have a major impact on spectrum usage as defined by user agencies, IRAC, or NTIA, should be submitted especially those that use new technological concepts or use existing technology in significantly new ways.. The guidance provided by NTIA will indicate any modification, including more suitable frequency bands necessary to ensure conformance with the Tables of Frequency Allocations and the provisions of Chapter 5, Spectrum Standards of the NTIA Manual.

c. In analyses performed by the Systems Review Branch leading to certification of spectrum support, only gross calculations may be achievable for a general evaluation of spectrum impact (as much system data will be estimated) and will be subject to adjustment during later stages. The system will be reviewed for conformance to International and National Allocation Tables. In addition, checks will be made against existing standards and sharing criteria, comparison will be made with known similar systems, and spectrum efficiency will be considered.

d. With Stage 1 approval, the Agency may not apply for a frequency assignment. Frequency assignments are only available after Stage 2 certification of spectrum support and above.

#### G.1.4 Stage 2 Experimental

a. The preliminary design has been completed, and radiation, using test equipment or preliminary models, may be required.

b. Information identified in the Stage 1 Systems Review should be enhanced to make it current. Additionally,

information required by Appendix 4 of the ITU RR will be furnished to the SSS in accordance with the instructions in the current NTIA Manual for the purposes of ITU-R Advance Publication. The Appendix 4 data should be provided to the SSS at the same time as the request for Stage 2 Systems Review.

c. The Advance Publication Information should be submitted not earlier than seven years and, preferably, not later than two years before bringing the frequency assignments into use. There is no minimum time period but, as a practical matter, if coordination and/or agreement are required, the information should be submitted at least two years before bringing the frequency assignments into use. Advanced publication may be waived by the NTIA on a case-by-case basis if the system will be operational for less than one year and the Agency requests a waiver from the SSS of the IRAC.

d. Certification of spectrum support for telecommunication systems or subsystems at Stage 2 is a prerequisite for NTIA authorization of radiation in support of experimentation for space systems. It also provides guidance for ensuring certification of spectrum support at subsequent stages. Certification, at Stage 2, may be requested for test equipment modified operational equipment or initial design models that can be used to determine which of several frequency bands or which of several proposed equipment configurations should be selected for continued investigation.

e. In the review leading to certification of spectrum support at Stage 2, an evaluation of the system conformance to NTIA Manual Chapter 5, Spectrum Standards, is performed along with an assessment of the system usage for war emergencies and verification that Appendix 4 of the ITU RR is satisfied. A general analysis will be applied by the Systems Review Branch, where appropriate, with more specific Electromagnetic Compatibility (EMC) analysis, against a typical environment, being added where experimental testing of technically defined equipment is involved. Recommendations for changes to equipment characteristics and contemplated operational employment and deployment will be provided when appropriate. Calculations required in connection with national and international space coordination procedures in accordance with the methods of Appendices 28 and 29 of the ITU RR will be performed to the extent practicable.

f. After the SPS Stage 2 review is approved, the Agency may forward a request to the FAS to obtain the necessary frequency assignment. (see Section 3.3 of this NPR.) At this stage, the frequency assignment request should be for a trial assignment for the location at which the system will be tested. A planning assignment may also be requested in anticipation of the operational (Stage 4) approval.

#### G.1.5 Stage 3 Developmental

a. Major design has been completed, and radiation may be required during testing. For the Stage 3 Systems Review, the Agency will update the information already provided and include as a minimum:

(1) For each Earth station transmitter and receiver site:

(a) Frequencies or frequency bands and satellites to be accessed.

(b) Coordinates.

(c) Emission designator for each frequency or frequency band.

(d) Maximum spectral power density and output power for each frequency or frequency band.

(e) Lowest equivalent satellite link noise temperature and associated value of transmission gain for each frequency or frequency band (geostationary satellites with simple frequency changing transponders only).

(f) Antenna gain and beamwidth.

(g) Minimum elevation angle of antenna main beam.

(h) Range of azimuth angles.

(i) Lowest total receiver noise temperature (when (e) is not appropriate).

(2) For each Space Station transmitter and receiver:

(a) Frequency or frequency bands and cooperating Earth stations.

(b) Satellite orbital information.

(c) Emission designator for each frequency or frequency band.

(d) Peak power and spectral power density for each frequency or frequency band for transmitters.

(e) Receiver noise temperature.

(f) Transmitter antenna patterns (only if power flux density limits are exceeded).

b. Following receipt of these data, the SPS will initiate the Stage 3 Systems Review. Certification of spectrum

support for telecommunication systems or subsystems at Stage 3 is a prerequisite for NTIA authorization of radiation in support of developmental testing for systems that are subject to these procedures. It also provides guidelines for assuring certification of spectrum support at Stage 4. At this point, the intended transmission frequencies will normally have been determined and certification at Stage 3 will be required for testing of proposed operational hardware and potential equipment configurations.

c. Detailed EMC analyses will be performed using test data and considering specific sites of equipment. A radiation hazard evaluation will be performed using IEEE C95.1 maximum permissible exposure limits as the standard by or with the Center/Facility Radiation Safety Officer and/or Non-Ionizing Radiation Safety Officer. Appropriate recommendations as to equipment characteristics or operational deployment will be developed. Calculations, in connection with national and international space system coordination procedures, will be performed or updated as appropriate.

d. After the Stage 3 approval, the Agency, through the FAS representative, should apply for or upgrade a temporary frequency assignment. This also applies to any planning assignments extant. G.1.6 Stage 4 Operational

a. Development has been essentially completed, and final operating constraints or restrictions required ensuring compatibility needs to be identified. All telemetry, tracking, and control equipment is required to have NTIA Stage 4 System Certification before their use.

b. When submitting a Stage 4 request for certification of spectrum support, NASA will update all previous information provided.

c. Certification of spectrum support for telecommunication systems or subsystems at Stage 4 is a prerequisite for an NTIA RFA for a station with an operational station class (i.e., other than experimental) for systems that are subject to these procedures. Both the Stage 4 Certification of Spectrum Support and the RFA may provide restrictions on the operation of the system or subsystems as may be necessary to prevent harmful interference. In analyses leading to certification of spectrum support at Stage 4, detailed EMC analyses will be updated by the submitting Center, as required, to include consideration of frequency assignments for specific system deployment. Appropriate recommendations as to equipment characteristics and/or operational limitations will be provided. Having completed the SPS review process, application may be made by the Agency, through the FAS Representative, for an operational frequency assignment.

## **G.2 IRAC Space Systems Subcommittee**

G.2.1 The SSS of the IRAC will review the information provided by the Agency prior to initiating the international Advance Publication, Coordination, and/or Notification process through the ITU-R. The SSS also provides a mechanism for NASA to provide comments at a national level back to foreign governments with respect to their planned operations.

G.2.2 For unclassified space systems that have not been waived from the requirements of international registration, information will be prepared in specific formats and submitted by the NASA SSS representative to the SSS in accordance with Articles 9 and 11 as well as Appendix 4 of the ITU Radio Regulations and according to the provisions of Chapter 10 of the NTIA Manual. The data usually used for developing the filing information submitted to the SSS are:

a. Stage 2 SPS request for Certification for the ITU-R Advance Publication.

b. Stage 4 SPS request for Certification for the ITU-R Coordination Request, if required, and Notification. When data from an existing Certification for a particular mission are insufficient for international filing requirements, the NASA SSS representative and/or alternate NASA SSS representative will work closely with Center/Facility Spectrum Managers to ensure any outstanding details may be provided, via the SSS, to the ITU-R in a timely and accurate manner.

G.2.3 It is recognized that the submission of information to the BR concerning Earth stations located outside the jurisdiction of the United States may be the responsibility of the country on whose territory the Earth station is located.

G.2.4 As a matter of policy, advance publication information and notices of frequency assignments relating to space systems will be submitted to the BR. Exceptions to this policy will be made only by the NTIA on a case-by-case basis.

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