



Goddard Procedural Requirements (GPR)

DIRECTIVE NO. GPR 2570.1B

APPROVED BY Signature:

Original Signed By

EFFECTIVE DATE: May 13, 2011

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EXPIRATION DATE: May 13, 2020

TITLE: Director of Flight Projects

COMPLIANCE IS MANDATORY

Responsible Office: 450 / Exploration and Space Communications (ESC) Projects Division

Title: Spectrum Management and Radio Frequency (RF) Equipment Licensing

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PREFACE

P.1 PURPOSE

This directive defines the Goddard Space Flight Center (GSFC) requirements for spectrum management and Radio Frequency (RF) equipment licensing, within the guidelines established by NPD 2570.5, Electromagnetic (EM) Spectrum Management.

This document:

- a. Provides an overview of RF spectrum governing organizations, regulations, and policies.
- b. Defines GSFC Spectrum Manager (SM) and Project Formulation/Project Manager responsibilities.
- c. Defines GSFC organizational responsibilities for Spectrum Management and RF licensing.
- d. Provides procedures for selecting operating frequencies for new GSFC RF equipment.
- e. Describes the frequency authorization application processes, and the process for obtaining temporary frequency authorization.
- f. Describes the role of spectrum management in operation of licensed RF equipment and requirements of GSFC RF users after commencement of equipment operations.
- g. Describes the requirement and process for obtaining authority to operate RF equipment on GSFC property.
- h. Describes the process for obtaining Tracking and Data Relay Satellite Systems (TDRSS) Pseudorandom Noise (PN) codes and Consultative Committee for Space Data Systems (CCSDS) Global Spacecraft Identification (GSCID) codes.

P.2 APPLICABILITY

These requirements apply to all GSFC organizations planning to design, develop, procure and/or operate transmitting or receiving RF equipment. These requirements apply to RF equipment that is intended for space flight; ground equipment in support of space flight RF equipment; any type of RF ground, space, or airborne RF equipment; low-power, non-licensed devices; passive and active sensors; and institutional support systems such as land mobile radio, radar and microwave links, and remote pickup equipment in support of Public Affairs.

P.3 AUTHORITIES

NPD 2570.5, NASA Electromagnetic (EM) Spectrum Management

P.4 APPLICABLE DOCUMENTS

- a. NPR 7120.5, NASA Space Flight Program and Project Management Requirements
- b. International Telecommunication Union (ITU) Radio Regulations
- c. National Telecommunications and Information Administration (NTIA) Manual of Regulations & Procedures for Federal Radio Frequency Management

P.5 CANCELLATION

GPR 2570.1A, Radio Frequency (RF) Equipment Licensing

P.6 SAFETY

None.

P.7 TRAINING

None.

P.8 RECORDS

| Record Title | Record Custodian | Retention |
|----------------------------|-------------------------|--|
| Radio Frequency Assignment | GSFC Spectrum Manager | *NRRS 2/20B. Destroy when superseded, obsolete, or no longer needed. |

*NRRS – NASA Records Retention Schedules ([NPR 1441.1](#))

P.9 MEASUREMENT/VERIFICATION

The GSFC SM shall review all RF-transmitting equipment frequency assignments under the purview of GSFC every five years to determine the need for continuation or termination.

PROCEDURES

In this document, a requirement is identified by “shall,” a good practice by “should,” permission by “may” or “can,” expectation by “will,” and descriptive material by “is.”

1. Roles and Responsibilities

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1.1 GSFC Spectrum Manager

The GSFC SM, located in the Exploration and Space Communications Projects Division, Code 450, is responsible for management of, and authorization for, all GSFC RF spectrum requirements including the equipment licensing process, and is the final authority on the selection of appropriate frequencies for all GSFC RF equipment. The GSFC SM shall:

- a. Provide internal and external coordination of RF spectrum requirements at GSFC.
- b. Ensure that communications and RF spectrum requirements for future GSFC missions are identified as early as possible in the equipment development/experimental/procurement process and reported to the National Aeronautics and Space Administration (NASA) Manager for Regulatory Affairs for inclusion in NASA long-range spectrum forecasts.
- c. Ensure the potential for interference is minimized to its lowest practical level at all GSFC locations by assisting in the selection and coordination of RF equipment frequencies, and by assisting in RF Interference (RFI) incident reporting and investigations.
- d. Participate in local, national, and international spectrum management coordination groups as appropriate to:
 - (1) Provide representation and cognizance of GSFC communications and RF spectrum requirements;
 - (2) Coordinate RF operations; and
 - (3) Protect the integrity of GSFC RF operations from harmful interference caused by RF systems of other agencies.
- e. Facilitate the licensing of GSFC RF equipment by coordinating, as needed, with GSFC organizations, other NASA centers, other federal government agencies, the Federal Communication Commission (FCC) and foreign space agencies in:
 - (1) making frequency selections;
 - (2) evaluating RF equipment against applicable national and international RF standards;
 - (3) performing RF analyses; and
 - (4) Completing and submitting frequency authorization applications to the NTIA.
- f. Ensure that GSFC RF equipment operating outside the United States and Possessions is reported to the NASA Manager for Regulatory Affairs to meet international requirements.
- g. Review GSFC frequency authorizations every five years and, in coordination with applicable GSFC organizations, determine if renewal or deletion is required.
- h. Assign TDRSS PN and CCSDS GSCID codes.

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1.2 Project Formulation/Product Manager Responsibilities

The Project Formulation Manager (or Project Manager, as appropriate), developing or procuring RF equipment, shall ensure the following efforts are accomplished:

- a. Contact the GSFC SM early in the formulation phase of the Project, or pre-development process of the product, to convey expected RF spectrum support requirements and obtain spectrum guidance on proper frequency bands and, where appropriate, maximum allowable bandwidths and effective isotropic radiated power levels.
- b. Obtain guidance from GSFC SM to ensure compliance with national and international radio spectrum use requirements prior to contract award during the development of equipment specifications and requests for proposals for projects leading to the design, development or procurement of RF equipment.
- c. Allocate funding to cover the costs of spectrum management support required by Office of Management and Budget (OMB) Circular A-11. Funding requirements should be coordinated with the GSFC SM at initiation of the formulation phase and again prior to the award of any contract for development or design of equipment.
- d. Provide sufficient technical data on equipment design to enable the GSFC SM to perform the following required work: 1) complete RF sharing analyses of potential interference with other band users, 2) evaluate RF equipment against applicable national and international RF standards, 3) make specific frequency selections, 4) complete frequency authorization applications to the NTIA, and 5) determine if RF equipment design is in compliance with NASA, national, and international regulations and requirements.
- e. If hosting another agency's or commercial entity's RF equipment, experiments, or payloads on a GSFC spacecraft (i.e., GSFC provides the spacecraft platform but does not control/or own the RF equipment), request from the agency or commercial entity supplying the RF payload a copy of the RF license for each RF transmitter and provide this information to the GSFC SM for review and approval prior to agreement to include such equipment on the flight manifest.
- f. Designate an operational Point-of-Contact to handle on-going operational coordination issues, and identify updates or modifications to authorizations as part of the five-year review process.

2. RF Spectrum Regulatory Structure and Policies

2.1 GSFC Spectrum Management Web Site

The GSFC Spectrum Allocation and Management Site (GSAMS), which is located on the World Wide Web at <http://classwww.gsfc.nasa.gov/GSAMS/>, provides regulatory background information and technical guidance for GSFC projects on national and international organizations involved in licensing RF equipment. GSAMS assists GSFC Projects in the process of filing for frequency authorization from

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the NTIA. GSFC projects can submit the technical and operational data required on NTIA frequency authorization applications through forms available on GSAMS. Alternately, the electronic format may be obtained from the GSFC SM.

2.2 Regulatory Structure

The roles and responsibilities of applicable regulatory organizations, such as the ITU, the FCC, the NTIA, and the Interdepartment Radio Advisory Committee (IRAC) and its subcommittees can be found on GSAMS.

2.3 Regulations and Policies

The NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management defines the regulations and policies pertaining to Government agency use of RF spectrum in the United States and Possessions. For use of RF spectrum outside the United States and Possessions, Government agencies comply with the regulations and policies defined by the ITU in the ITU Radio Regulations and by the authority of the host government, where applicable.

3. Frequency Selection

3.1 Compliance with Regulations and Recommendations

Selection of equipment operating frequencies shall comply with the regulatory provisions established by:

- a. The NASA Policy Directive on Radio Frequency Spectrum Management (NPD 2570.5, NASA Electromagnetic (EM) Spectrum Management).
- b. The National Table of Frequency Allocations as provided in the NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management.
- c. The International Table of Frequency Allocations as provided in the ITU Radio Regulations (applicable only for space operations and RF operations taking place outside the United States and Possessions).
- d. Applicable recommendations of the Space Frequency Coordination Group and the ITU. Applicable recommendations are available from the GSFC SM.

3.2 Interference Analyses

Because allocated radio frequency bands are heavily used, users seeking an RF assignment shall perform analyses to ensure that they will not cause harmful interference to existing NASA activities and others sharing the band.

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New users shall perform analyses to ensure that the emissions of the RF equipment adhere to protection criteria for existing users of shared bands established by the ITU Radio Regulations and ITU recommendations. The GSFC SM will usually perform these studies for the user when funding permits; otherwise, the GSFC SM will provide guidance in performing the appropriate analyses.

4. Frequency Authorization Application Processes

RF equipment that is subject to a System Review by NTIA is identified in the NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management. GSFC Project Offices developing systems that are subject to this national spectrum management process shall provide sufficient technical data to the SM to accomplish this review.

All GSFC major terrestrial systems and all space systems and associated earth stations shall be subject to this review. A major terrestrial system is one that may have a significant impact on existing or planned systems that operate in the same frequency band.

The decision on what constitutes a major terrestrial system shall be made by the GSFC SM, and may include coordination with the NASA Manager for Regulatory Affairs located within NASA Headquarters Spectrum Policy Office.

4.1 NTIA Spectrum Planning Subcommittee (SPS) System Review Process

The SPS of the IRAC is comprised of representatives from several Government departments and agencies, including NASA. The SPS supports the NTIA and the IRAC in managing efficient use of RF spectrum resources for the satisfaction of Government requirements and the overall national interest. In order to meet this responsibility, the SPS performs system reviews of designated new Government RF equipment to: 1) assess compliance with NTIA standards and operating procedures, 2) make recommendations as to potential electromagnetic compatibility problem areas and propose courses of action, and 3) make recommendations as to technical parameters necessary to facilitate sharing between systems.

Government agencies are responsible for preparing spectrum certification applications for RF equipment that require a system review. Spectrum certification applications shall be submitted to the SPS in different stages, based on the maturity of the RF system design.

The GSFC SM shall determine how many system review stages must be filed for a particular RF system. The SPS identifies four system review stages as described below.

Stage 1. Conceptual: Provides guidance on the feasibility of obtaining certification of spectrum support at subsequent stages. Those systems having a major impact on spectrum usage or those that use new technological concepts should be submitted at this stage. A Stage 1 review is usually performed after the initial planning effort has been completed, including proposed frequency bands and other available characteristics.

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- Stage 2. Experimental: A prerequisite for NTIA authorization of radiation in support of experimentation. Provides guidance for assuring certification of spectrum support at subsequent stages. A Stage 2 review is usually performed after the preliminary design has been completed, and radiation, using such things as test equipment or preliminary models, may be required.
- Stage 3. Developmental: A prerequisite for NTIA authorization of radiation in support of developmental testing. Provides guidelines for assuring certification of spectrum support at Stage 4. A Stage 3 review is usually performed after the major design has been completed, and radiation may be required during testing.
- Stage 4. Operational: A prerequisite for NTIA authorization of radiation from a station with an operational status. Restrictions on the operation of the system may be provided as necessary to prevent harmful interference. A Stage 4 review is usually performed after development has been essentially completed. The Stage 4 review will establish final operating constraints or restrictions that may be required to assure compatibility of the RF equipment in its intended operational environment.

A detailed description of these stages of review is found on GSAMS, along with instructions for completing the spectrum certification application. A flowchart of the system review process is provided in Figure 1. The NTIA forms 33, 34, and 35 mentioned in Figure 1 are templates in the NTIA Manual that are used for entering technical parameters for the transmitter, receiver and antenna. These forms can be obtained from the GSFC SM.

Spectrum certification applications for a Stage 4 review shall be referred to the SPS in sufficient time to permit completion of a system review and authorization prior to start of operations. SPS system reviews can normally be completed and authorization granted within nine to twelve months from the date of submission to the SPS.

Sharing a frequency allocation often requires coordination with other Federal Government agencies, beginning prior to submittal of the frequency authorization application to the NTIA. The GSFC SM shall work with potentially affected agencies as needed to perform required analyses and resolve operational concerns. Formal coordination with other Federal Government agencies and the FCC is handled through the appropriate channels during the SPS System Review process.

4.2 Process for Obtaining Temporary Radio Frequency Authorizations for Testing

A user shall obtain temporary frequency authorizations in order to perform hardware tests.

Requests for temporary authorizations shall be submitted to the GSFC SM and do not go through the SPS system review process.

To apply for temporary authorizations, the user shall supply detailed information regarding RF requirements, duration of tests, and test locations as specified in the NTIA Manual of Regulations & Procedures for Federal Radio Frequency Management.

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5. Operational Procedures

Once the equipment has begun operations, the user shall provide, to the SM, a point of contact for frequency authorization reviews and RFI resolution.

The GSFC SM shall review frequency authorizations every 5 years to determine if changes are necessary. Once the frequency authorization has been reviewed, it is submitted to the NTIA for approval.

In addition to the 5-year review process, it is sometimes necessary to confer with the user. This might occur when a frequency will be used temporarily that could affect other users, such as for the launch of new spacecraft. In such cases, the GSFC SM shall contact affected users to resolve any coordination issues.

6. Operation of RF Equipment on GSFC Property

Requirements for operation of RF transmitting or receiving equipment on GSFC property at Greenbelt shall be approved by the GSFC SM prior to installation. The exceptions to this requirement are tests that are conducted in closed loop mode, in a shielded room, or in an anechoic chamber. Additionally, operation of cell phones, pagers, and FCC-licensed amateur radio equipment are exempt from this requirement, but not cell phone repeaters. Plans for the installation of RF receive-only equipment for open loop receptions outside shielded enclosures shall be coordinated with the GSFC SM so he can determine if there is a need to obtain regulatory protection for these operations. Generally, short-term testing of receive-only equipment would not need or be entitled to regulatory protection.

Proposals for RF equipment operated by NASA, NASA contractors or other Federal Government agencies shall be subject to the procedures identified in Sections 1 through 6 unless such equipment or its planned operation satisfies the exceptions outlined in the above paragraph. Such proposals may require a detailed interference analysis to ensure no adverse impact to existing or planned GSFC operations. Cell phone repeaters are not exempt from these requirements. The NASA Headquarters Spectrum Policy Office has issued NASA-wide policy that states that NASA Centers are not to own and operate these devices. These devices can be allowed only if owned and operated by an FCC cell phone licensee.

Proposals for equipment operated on GSFC property at Greenbelt by non-Federal Government agencies or their contractors shall undergo an interference assessment and, if needed, tests should be conducted to demonstrate no adverse impact will be caused to GSFC RF operations. Non-Federal Government equipment includes equipment operated by state and local governments and commercial entities.

Based on the results of analysis and possible tests, the GSFC SM shall make recommendations to Code 220 regarding the RF compatibility of the proposed equipment and, if appropriate, provide RF authorization for "On-Center" use. RF authorization with NTIA is not required for cellular telephones

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and pagers, but the requirement for a compatibility analysis and possible tests is applicable to these systems.

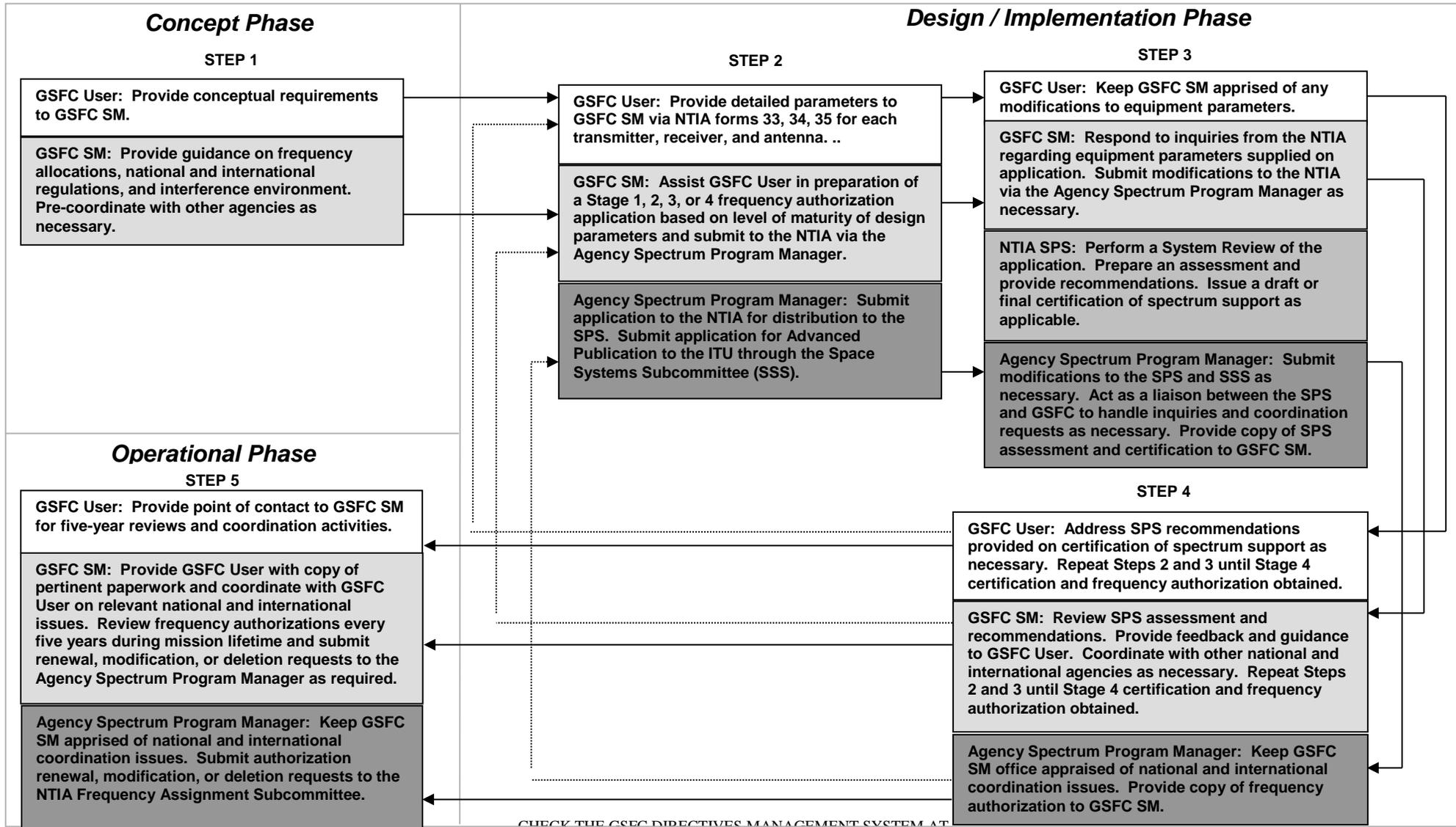
7. TDRSS PN Codes and CCSDS GSCID Codes

All spacecraft using the TDRSS Multiple Access service operate at the same frequency and receiving antenna polarization, and are discriminated by unique PN codes. Additionally, TDRSS Single Access user spacecraft requiring coherency also need PN codes. These codes are assigned by the GSFC SM.

All spacecraft that are CCSDS-compatible are assigned GSCID codes. GSCID codes are assigned by a single central authority, the World Data Center A for Rockets and Satellites, located at GSFC. Requests for GSCID code assignment shall be directed to the GSFC SM.

GSAMS allows users to request TDRSS PN codes and CCSDS GSCID codes through forms available on-line.

Figure 1 Stages of the NTIA System Review Process



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Appendix A – Definitions

- A.1 Certification of Spectrum Support – A certification, issued by the NTIA, for RF equipment that has successfully completed an NTIA Spectrum Planning Subcommittee System Review. The certification of spectrum support may identify mandatory constraints or recommendations for RF system operations. .
- A.2 Frequency Authorization – An authorization that grants permission for operation of an RF system on a specific frequency at a specific power and at specific locations in accordance with the terms specified on the authorization paperwork. To maintain agreement with external requirements, the term “frequency authorization” is used interchangeably with “licensing” and “authorization of radiation.”
- A.3 Major Terrestrial System – A major terrestrial system is a telecommunication system that does not involve the use of satellites or spacecraft, and which may have a significant impact on existing or potential future use of the portion of the radio frequency spectrum in which it is intended to operate. The GSFC SM, in coordination with NASA Headquarters Spectrum Policy, will make the final determination of which GSFC terrestrial systems may have a significant impact on other radio services that share the same frequency band.
- A.4 RF Equipment – Equipment that transmits and/or receives radio frequencies. Examples include RF equipment that is intended for space flight; ground equipment in support of space flight RF equipment; low-power, non-licensed devices; passive and active sensors, any type of RF ground, space, or airborne RF equipment; and institutional support systems such as land mobile radio, radar and microwave links, and remote pickup equipment in support of Public Affairs.

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Appendix B – Acronyms

| | |
|-------|--|
| CCSDS | Consultative Committee for Space Data Systems |
| ESC | Exploration and Space Communications Projects Division |
| FCC | Federal Communications Commission |
| GPR | Goddard Procedural Requirements |
| GSAMS | GSFC Spectrum Allocation and Management Site |
| GSCID | Global Spacecraft Identification |
| GSFC | Goddard Space Flight Center |
| IRAC | Interdepartment Radio Advisory Committee |
| ITU | International Telecommunication Union |
| NASA | National Aeronautics and Space Administration |
| NPD | NASA Policy Directive |
| NRRS | NASA Records Retention Schedules |
| NTIA | National Telecommunications and Information Administration |
| OMB | Office of Management and Budget |
| PN | Pseudorandom Noise |
| RF | Radio Frequency |
| RFI | Radio Frequency Interference |
| SM | Spectrum Manager |
| SPS | Spectrum Planning Subcommittee |
| SSS | ITU Space Systems Subcommittee |
| TDRSS | Tracking and Data Relay Satellite System |

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CHANGE HISTORY LOG

| Revision | Effective Date | Description of Changes |
|-----------------|-----------------------|--|
| Baseline | 08/14/00 | Initial Release |
| A | 01/05/05 | Put in new GPR format. Changed Sections P2, P4, P5, redefined Scope, updated responsibilities, and updated operational procedures. Updated organization and document references and clarified all requirements to clearly distinguish them from supporting text in accordance with the NASA rules review. |
| A | 09/22/09 | GPR extended through January 5, 2011. |
| B | 05/13/11 | Changed title to be more appropriate to subject matter and more responsible to GSFC offices making database searches for spectrum management guidelines. Updated names of NASA NPDs and Code 450 organization; clarified spectrum manager's responsibilities in accordance with latest NASA directives; added new requirement for GSFC Projects to perform economic analyses in accordance with OMB Circular A-11, NPD 2570.5, and NTIA Manual of Regulations. |
| | 04/25/16 | Administratively extended for 1 year. |
| | 05/11/17 | Administratively extended for 1 year. |
| | 05/02/18 | Administratively extended for 1 year. |
| | 05/08/19 | Administratively extended for 1 year. |
| | | |