

Chapter 8

Procedures and Principles for the Assignment and Coordination of Frequencies

8.1 AUTHORIZING FREQUENCY USAGE

8.1.1 General Procedure for Authorizing Frequency Usage

1. Each federal agency decides, in the light of policies, rules, regulations, frequency allocations, and availability of frequencies, whether, what, and how many mission requirements can be fulfilled by using telecommunications systems. Each agency makes the necessary technical studies, selects potential frequencies, coordinates with other agencies involved, and prepares and files an application with the NTIA, Office of Spectrum Management (OSM), Spectrum Services Division (SSD), for consideration by the Frequency Assignment Subcommittee (FAS) of the IRAC.

2. The FCC FAS Representative submits frequency assignment applications for non-federal use of the spectrum in shared bands and other bands where there might be an impact on, or from, federal operations. The FCC, as a government entity, also submits frequency requests to the FAS for FCC spectrum requirements.

3. The OSM processes all applications through a series of automated routines to check them for completeness, accuracy, and compliance with regulations and procedures in so far as possible, then publishes these applications in an agenda for FAS review (FAS Agenda). The FAS agendas are distributed to each FAS member agency for study regarding the protection of their existing assignments. With assistance from the FAS member agencies, the OSM also performs a manual review of these applications to ensure adequate justification, compliance with policy and regulations, technical appropriateness, and whether or not NTIA, with the advice of the Spectrum Planning Subcommittee of the IRAC, has certified spectrum support for the system, if applicable. The OSM also reviews these applications to determine whether or not there is a conflict with the assignments of the FAS non-member agencies. FAS member agencies finding problems with applications listed in the FAS agendas may table these applications for further review, correction, or referral to a formal meeting of the FAS. Tabling action shall be limited to the categories listed previously in this paragraph describing manual review.

4. The FAS considers pending items on a daily basis and takes action within established policy guidelines. Applications are referred to the IRAC when additional policy guidance is needed, agreement cannot be reached, the IRAC has so directed, or an agency so requests. Matters that cannot be resolved with the IRAC, those that NTIA directs, or those requested by an agency, are referred to the Deputy Associate Administrator (DAA), OSM, NTIA, who resolves them or refers them to the NTIA Administrator for a decision. Federal frequency assignment decisions made by the NTIA Administrator may be appealed to the Director of the Office of Management and Budget (OMB) per paragraph 3-2 of Executive Order 12046.

5. Matters of considerable importance, such as changes to the National Tables of Frequency Allocations, significant federal use of non-federal frequency bands, and advice to the Department of State, are recommended to NTIA for consultation with the FCC or other appropriate agencies. Although federal applications are not heard in public for security reasons, the public is represented by the FCC who may object, concur, or give tacit approval.

6. The GMF will be updated weekly to reflect those frequency assignment actions agreed upon by the FAS and approved by the DAA, OSM, NTIA, and, for electromagnetic compatibility analysis purposes, those Canadian assignments along the U.S./Canada border that have been coordinated with the U.S. Government frequency management community under the provisions of the U.S./Canada Coordination Agreement (see Section 3.4).

a. Upon request, the GMF data, including extracts or the entire GMF on CD-ROM, will be distributed by NTIA to federal agencies. However, since the GMF data is classified CONFIDENTIAL, it shall be distributed only in accordance with the provisions of Executive Order 13526.

b. Upon request, NTIA will issue written authorization for those frequency assignment applications which are approved.

c. Requests for distribution of the GMF, extracts thereof, and other listings must be made through the agency's IRAC or FAS representative and directed to:

Chief, Frequency Assignment Branch
NTIA/OSM/SSD, Room 1982
U.S. Dept. of Commerce
1401 Constitution Ave, NW
Washington, DC 20230

8.1.2 Authorizing Frequency Assignments to Stations of Foreign Governments in Washington, DC

1. Public Law 87-795 amended the Communications Act of 1934 by adding subsection 305(d)¹ which vested in the President the authority to authorize a foreign government to construct and operate a radio station at the seat of government, where (1) he determines that the authorization is in the national interest of the U.S., and (2) where such foreign government has provided reciprocal privileges to the U.S. to construct and operate radio stations within territories subject to its jurisdiction. Under the President's Reorganization Plan No. 1 of 1977, this authority was delegated to the Secretary of Commerce by Executive Order 12046 of March 26, 1978.

2. The Secretary of Commerce has delegated this Presidential authority to the Assistant Secretary of Commerce for Communications and Information (Administrator, NTIA), by Department of Commerce Order 10-10 of May 9, 1978, which states in part, "... Authorization for the construction and operation of a radio station pursuant to this section and the assignment of a frequency for its use shall be made only upon recommendation of the Secretary of State and after consultation with the Attorney General and the Chairperson of the Federal Communications Commission."

3. Following the approval in principle by the Assistant Secretary of Commerce of the establishment of a radio station in Washington, DC, by a particular foreign government, the Department of State will sponsor the necessary frequency applications in the IRAC. IRAC shall review the applications and submit its recommendations to NTIA. The IRAC will be provided with the instruments of authorization as approved by the Deputy Associate Administrator, Office of Spectrum Management, NTIA.

4. The technical conditions and the procedures for IRAC consideration of these applications are as follows:

a. The Department of State representative to the IRAC will submit applications to the IRAC Executive Secretary for technical consideration by the FAS. Such application will indicate that the foreign administration involved has granted privileges to the U.S. for radio stations in the high frequency bands, antenna configuration and location, the hours of operation, and the name of the embassy, which will be included on the form. For radio stations operating as earth stations in the fixed-satellite service (FSS), the data specified in the applicable portion of Appendix 4 of the ITU Radio Regulations (RR) will be included as a minimum. However, when the earth station is proposed to operate in a band which is shared with terrestrial operations, the FAS shall not take action until the IRAC's Spectrum Planning Subcommittee (SPS) has indicated that coordination has been accomplished with the appropriate terrestrial operations.

b. For earth stations operating in a band which is shared with terrestrial operations, the Department of State IRAC representative will submit the data specified in the applicable portions of Appendix 4 of the RR to SPS for coordination with the appropriate terrestrial operations. Additionally, for earth stations in the FSS, the proposed frequency usage shall be coordinated as required by 25.203 of the FCC Rules and Regulations. The results of that coordination together with the data and interference analysis will be included as part of the submission to the SPS.

c. Any embassy obtaining an authorization for an earth station operating in bands allocated for the FSS must designate a representative to act in future coordination matters regarding terrestrial and satellite stations in the Washington, DC area.

d. A call sign or suitable designator will be furnished by the FCC.

e. Frequencies to be authorized shall be limited to those in bands allocated in the U.S. to the fixed service or the FSS, as appropriate.

f. The bandwidth of emission to be authorized will normally be limited to that associated with diplomatic communications.

g. The antenna to be authorized shall be limited to the minimum size and configuration that will support the diplomatic communications system.

¹ The Communications Act of 1934 was amended in 1996, this text is now contained in subsection 305(c).

h. Applications that clear the FAS shall be referred to the IRAC by the FAS with its recommendations. IRAC shall forward the applications together with its recommendations to NTIA. The Executive Secretary (IRAC) has discretionary power to act for IRAC except in the case of applications for new authorizations.

i. Approved assignments shall be recorded in the GMF of frequency assignments with an indication of (a) the embassy involved; (b) the fact that the assignment was made by the Assistant Secretary under Public Law 87-795; and (c) the fact that the Department of State is responsible for the assignment.

5. The following regulations have been established concerning the operation of these stations:

a. The characteristics of the transmitted signals and the conduct of the operation shall be such as to comply with the provisions of law and treaty that govern operation of other stations under the jurisdiction of the U.S. and with any other provisions that may be prescribed by the President.

b. The operation is subject to adjustment, including termination, in the event of harmful interference to other authorized operations having the right to protection.

c. The station will be operated upon reasonable request by the Department of State for the purpose of conducting brief technical monitoring observations.

d. In general, notification to the ITU of the authorized operation shall be affected by the U.S.

8.2 FREQUENCY ASSIGNMENT PRINCIPLES

8.2.1 Frequency Sharing

Sharing of frequencies is necessary for the fullest utilization of the radio spectrum. This may entail the acceptance of some interference but does not contemplate requiring the acceptance of harmful interference.

8.2.2 Planned Frequency Utilization

1. In the interest of planned and orderly utilization of the radio frequency spectrum, agencies are encouraged to inform the IRAC of planned frequency utilization.

2. This information normally should be furnished to the IRAC as a separate item of business. It may also be furnished to the IRAC or the FAS during the consideration of another agency's frequency assignment application when the proposed assignment has a bearing on the planned frequency utilization.

3. Whether such information will provide any prior rights for the operations concerned shall be determined by specific IRAC or FAS action on a case-by-case basis, taking into account all pertinent factors.

8.2.3 Consideration of Applications

Recognizing that the demand for radio frequencies greatly exceeds the supply, and to make the most efficient and orderly use of available frequencies in the national interest, frequency assignment action is predicated on consideration of all available data, including international regulations, national laws, established government policies, national interest, availability of other possible communication facilities, and technical aspects.

8.2.4 Justification for Frequency Assignments

1. Applications for authority to use radio frequencies must be justifiable for reasons such as:

Specific legislative directive

International commitments

To carry out the established mission of the applicant

2. Applications will indicate the purpose for which the frequency will be used, for example:

Broadcasting

Civil defense

Emergency communications (as when normal communication facilities are disrupted or are inadequate as a result of hurricane, fire, flood, earthquake, or similar disaster affecting safety of life or property)

Environmental data collection and dissemination

Law enforcement

Management and protection of federal property or personnel

National defense

National security
Protection of national resources (for example, forests and waterways)
Power transmission and distribution
Research and experimentation
Safety
Space exploration

3. Description of the operation involved, and the specific objective to be satisfied, should be supplied in each instance, in sufficient detail to facilitate consideration of the application.

4. Where the application is for a new assignment, or for the modification of an existing assignment, the justification shall contain information concerning such of the below listed items as are pertinent, together with such other data as may be appropriate to substantiate the application:

a. Name of project; if new, a brief description thereof.

b. If the requested assignment is for use in a new circuit, net or system, or for a significant expansion of an existing system.

c. If it is a replacement frequency.

d. If the frequency applied for is already authorized the applicant, sufficient data concerning the existing authorization(s) to enable an assessment to be made of the expected effect of the requested assignment on the electromagnetic environment.

e. If one or more basic characteristics are unusual for the frequency band or radio service² specified, the reason therefore.

f. If the application is for a multiple listing of a particular circuit or operation.

g. The extent to which coordination has been achieved.

5. Applications for authority to use a radio frequency for a service which duplicates adequate existing facilities shall not be approved in other than exceptional cases.

8.2.5 Withholding Funds Pending Availability of Frequency Support

1. The obligation of funds by federal agencies for the development or procurement of communication-electronic equipment, requiring the assignment and protection of radio frequencies for their use, should be withheld pending assurance of the availability of appropriate frequency assignment support. Requirements for obtaining frequency support for telecommunications systems or major modifications of an existing system are under Chapter 10. This includes the selection, procurement, and development of earth or terrestrial station sites and facilities as indicated in Section 8.2.8. This is particularly important in the selection of sites and frequencies for earth and terrestrial stations to be operated in the co-equally shared bands as indicated in Section 8.2.33 (see Sections 8.3.12-8.3.15) and in the bands where there are no federal allocations. In addition, in the case of a federal funded study, or a federal funded equipment procurement, by non-federal interests, wherein the use of radio frequencies is foreseen as a result of the study or procurement, the Federal Government agency concerned should, as far as practicable, apprise the contractor(s)/grantee(s) of the need for ensuring that radio frequency support appears feasible. In this regard, it may be necessary for the federal agency, the non-federal entity, or both, to coordinate with the FCC.

2. This subject is covered in Section 33.4 of OMB Circular No. A-11, as follows: "you must obtain a certification by the National Telecommunications and Information Administration, Department of Commerce that the radio frequency required is available before you submit estimates for the development or procurement of major radio spectrum dependent communications-electronics systems (including all systems employing space satellite techniques)".

3. Before procuring transportable Advanced Wireless Service (AWS), Cellular (Cell), or Personal Communications Service (PCS) systems, including Cell-On-Wheels (COW) and Cell-On-Light-Truck (COLT), operating in the bands 698-758, 775-788, 805-806, 824-849, 869-894, 901-902, 930-931, 940-941, 1710-1755, 1850-1990, and 2110-2155 MHz, federal agencies shall obtain a certification by NTIA.

² Stations operating in a radio service on a secondary basis shall comply with the provisions of this chapter with respect to stations operating in a radio service allocated on a primary basis.

8.2.6 Programs to Determine How the Spectrum is Used

Frequency Assignment Review Program

1. Each federal agency shall maintain a program of continuing review of frequency assignments to its radio stations and shall delete or amend such assignments as appropriate. The objectives of this program are a) to ensure that frequency assignments are in current use and are correctly reflected in the GMF, b) to ensure that frequency assignments are required for continued operations for the purpose stated in their justification, and c) to ensure that frequency assignments are still qualified for authorization under the provisions of the regulations contained in this Manual. Each assignment shall be reviewed in the manner specified in Annex F, unless by the terms of its authorization it is subject to review more frequently.

Spectrum Measurement Program

2. A spectrum measurement program was established in October 1973 under which a van-mounted Radio Spectrum Measurement System (RSMS), operated by the Department of Commerce under the direction of NTIA, is used

a. to determine whether radio installations operated by the Federal Government are utilizing authorized frequencies and are operating in accordance with applicable regulations,

b. to provide information to help determine whether additional uses can be made in a particular band at a particular location, and

c. to provide information to prevent or resolve cases of interference between two or more users.

3. The use of radio frequencies by federal agencies is subject to observation and measurement by the RSMS, in support of the spectrum management activities of NTIA. Notice of this was given to the applicable federal agencies in October 1973. Such agencies should ensure that their field personnel remain informed, as appropriate.

Spectrum Management Survey Program

4. A program to survey spectrum management activities within the Federal Government was established in February 1965. The objectives of this program are to determine at the operational level the degree of implementation of the applicable provisions of this Manual, whether frequency usage is in accordance with authorizations, and to exchange information with a view toward improving spectrum management in general. Surveys are conducted by NTIA personnel by means of on-site observation of communication-electronic facilities and discussions with local frequency managers. Surveys are initiated through coordination with headquarters personnel, who are encouraged to participate in the surveys if possible.

Spectrum Resource Assessment Program

5. NTIA manages a program to assess spectrum use and to identify potential spectrum sharing problems within specific frequency bands allocated to the Federal Government. The objectives of this program include:

a. the review and documentation of the characteristics and deployment of existing and proposed systems in specified bands,

b. the identification of potential band sharing problems which may impact on the efficient use of the spectrum,

c. the evaluation of any identified electromagnetic compatibility problems, and

d. the identification of alternative spectrum management approaches to resolving these problems.

6. The sources of data used in completing these studies include the GMF, system data submitted in accordance with Chapter 10 of this Manual, data collected during the spectrum measurement and survey programs, as well as direct contact with the user agencies. These studies may be used in the development of spectrum policy, as background material for the systems review process (Chapter 10 of this Manual), and are available to the frequency managers of the various federal agencies for planning purposes. Agencies are encouraged to cooperate and participate in the development of these spectrum resource assessments and make use of the spectrum resource assessment assistance which can be provided.

8.2.7 Notification of Discontinuance of Service

Assignment of a frequency to a particular station or class of station imposes upon the assignee the responsibility of duly notifying all interested agencies of proposed discontinuance of a station or a material change in character of service rendered, when other agencies are known to be dependent thereon or materially affected thereby.

8.2.8 Stations Located in Close Geographic Proximity

In general, the inherent right of the station first established is recognized as regards a proposed new station whether transmitting or receiving. Nevertheless, for stations located in close geographic proximity and particularly in the case of installations involving very high effective radiated powers (50 kW or greater), digital system receivers having high carrier to noise ratio requirements or receivers intended for reception of very low level radiation (-100 dBW or less), engineering solutions may require the cooperation of all agencies involved in the application of reasonable and practicable measures within the state of the art to avoid causing or being susceptible to harmful interference.

8.2.9 Authorized Area of Operations of Mobile Stations

For an assignment to a land station and one or more mobile stations, the area described under receiver ANTENNA LOCATION for the reception of transmissions from the land station by the mobile stations shall be considered also as the area in which transmissions from the mobile stations, associated with the land station, are authorized.

8.2.10 Relative Priority of Frequency Assignments

1. Priority, unless specifically qualified, is the right to occupy a specific frequency for authorized uses, free of harmful interference from stations of other agencies.
2. The relative status between radio services and between frequency assignments with respect to their conformity to the Table of Frequency Allocations is indicated in Section 4.1.
3. Unless specifically agreed otherwise at the time a frequency assignment is made, the relative priority between two frequency assignments which are substantially equal is determined by their dates of assignment. The frequency assignment with the earlier date has priority over the frequency assignment with the later date.
4. If a temporary or trial assignment is renewed or converted to a regular assignment, the applicable date of assignment for priority purposes is the original date from which continuous authorization has been in effect. If the particulars of an existing assignment are expanded (e.g., expansion of bandwidth, addition of new receiver antenna location, increase in power), but at a later date the assignment is changed back to the lesser particulars, the applicable date of assignment for priority purposes is the date on which the lesser particulars were first authorized.
5. The priority of a mobile station applies only in the geographical area designated in the particulars of the frequency assignment, as limited by the provisions of any limitation note which is part of the assignment.
6. The priority of a fixed station applies only at the geographical locality of the receiver antenna location designated in the frequency assignment, as limited by the provisions of any limitation note which is part of the assignment.
7. Priority notes shall not be applied to frequency assignments below 25000 kHz. Above 25000 kHz they shall be kept to a minimum.
8. Experimental classes of stations and classes of stations in support of experimental operations are on a secondary basis to stations of all other services.
9. Where, in adjacent regions or sub-regions, a band of frequencies is allocated to different services of the same category (i.e. both primary or both secondary), the basic principle is the equality of right to operate. Accordingly, the stations of each service in one region or sub-region must operate so as not to cause harmful interference to services in other regions or sub-regions.

8.2.11 Use of Radio Frequencies Below 30 MHz for Domestic Fixed Service

1. To insure that, insofar as practicable, sufficient high frequencies will be available for the operation of radio circuits essential to the national security and defense and to conserve frequencies below 30 MHz for services which

cannot be operated adequately without them, only in the following circumstances shall departments and agencies of the Executive Branch of the Government use frequencies below 30 MHz for domestic fixed service³ (within conterminous United States):

a. When it is indispensable to do so, and on the condition that the characteristics of the stations continue to conform to those in the U.S. list "GMF," a land station may communicate, on a secondary basis, with fixed stations or other land stations in the same category, using its assigned frequencies.

b. Where technical and operational requirements dictate, fixed stations may transmit to other fixed stations for the domestic haul of overseas traffic in transit, or destined for the U.S. Such domestic radio haul shall be a segment of the overall overseas radio system. (These assignments will bear record note S208--see Annex A)

c. When there is a need to provide instantaneous transmission of vital emergency, operational command and alerting traffic of such importance as to affect the immediate survival and defense of the Nation. (These assignments are Category 1 assignments and will bear record note S148--see Annex A)

(1) Circuits in this category will be maintained in operational status at all times, with on-the-air test transmissions to ensure the highest degree of readiness.

(2) Frequency assignments for such circuits shall be afforded protection commensurate with the importance of the communications for which the circuit is intended.

d. When required for use in an emergency jeopardizing life, public safety, or important property under conditions calling for immediate communication where other means of communication do not exist or are temporarily disrupted or inadequate. To ensure that radio equipment for emergency use is maintained in satisfactory operating condition, testing on frequencies in this category is permitted, provided that insofar as practicable transmitters shall be tested with a non-radiating load and the test use of a radiating antenna held to a minimum and provided further that such testing shall be restricted to test message traffic and shall not include operator training. (These assignments are Category 2 assignments and will bear record note L012 or L113--see Annex A)

e. When there is a need to provide for a communications system manned by fully qualified operators who are military reservists or affiliates. Except in emergencies, frequency assignments in this category shall not be used as a means for passing traffic that in the absence of such assignments would require delivery by other means. (These assignments are Category 3 assignments and will bear record note S012--see Annex A)

f. When other telecommunication facilities do not exist, are inadequate, or are impracticable of installation, and when the use of frequencies above 30 MHz is not practicable. (These assignments are Category 4 assignments and will bear record note S206--see Annex A)

g. In an emergency where it has not been feasible to make prior arrangements for alternate means of communications, it is permissible to operate temporarily on regularly assigned frequencies in a manner other than that specified in the terms of an existing assignment or on other appropriate frequencies under the following special circumstances:

(1) An emergency must actually exist or imminently threaten. An emergency for the purpose of this provision means a situation of temporary duration resulting directly or indirectly from a natural catastrophe or other occurrence which seriously affects the welfare of a community or of an area to the extent of endangering human life and property and in connection with which special communications facilities are required temporarily.

(2) Emergency operations shall be discontinued as soon as substantially normal communications facilities are restored.

2. With respect to subparagraphs 1c, 1d, 1e and 1f above, requests for the authorization of frequencies below 30 MHz for new systems, or in circumstances where the pressure on the radio spectrum would be increased materially, shall be referred by the FAS Chairman to NTIA for review prior to assignment action. Approved assignments will be recorded in the GMF, and will bear record note C078 (see Annex A).

a. In compliance with the foregoing, the FAS Chairman shall refer all applications that meet the following conditions:

(1) The frequency is below 30 MHz.

(2) The type of action is NEW, NOTIFICATION or MODIFICATION.

(3) The class of station is FX or AX.

(4) Record note S362 is not applicable.

(5) The transmitter and receiver ANTENNA LOCATIONS (XAL and RAL) are both located within the conterminous U.S.

³ Authorization in the fixed service with note S362 are not construed to come within the term "domestic fixed service".

- (6) The proposed frequency usage falls within category 1, 2, 3 or 4 above.
- b. However, referral to NTIA is not required for the following exceptions:
- (1) EXCEPTION 1--For a change in frequency of an existing station when an existing assignment for a frequency of the same general kilohertz order for that station is simultaneously deleted. (These assignments will bear Record note S358--see Annex A)
- (2) EXCEPTION 2--For the addition of a new station to an existing domestic fixed circuit or network, provided the addition would not result in an extension of the hours of use of the frequency because of wave propagation. (These assignments will bear Record note S359--see Annex A)
- (3) EXCEPTION 3--For the modification of an existing assignment, provided the modification would not increase materially the impact on the use of the radio spectrum below 30 MHz. (These assignments will bear Record note S360--see Annex A)
3. In order to establish adequate radio backup of wireline facilities in advance for use during an emergency, subparagraphs 1c and 1d above are interpreted to embrace the following elements:
- a. the predetermination of essential communication circuits which cannot tolerate disruption;
 - b. the installation of the necessary equipment;
 - c. the selection and assignment of frequencies to be employed on those circuits; and
 - d. necessary testing.

8.2.12 Explanation of the Term "Tactical and Training"

1. The descriptive term "tactical and training" has been used for many years in connection with the assignment of radio frequencies and their operational use by units of the U.S. Army (the field Army), Navy (Fleet and Marine Forces), and Air Force (Tactical and Strategic Air Forces).

a. The term "tactical" emphasizes the aspect of mobility and flexibility required by such units as components of a military force whose operations (and tactics) are directed by the responsible military commander. Organizational equipment, including all communications-electronics (C-E) equipment, issued to such military units is designed specifically to meet their peculiar needs under combat conditions. Such C-E equipment includes that required to effect communications internal to the particular unit and its components, as well as communication to the next higher/lower echelon of command and for other special-purpose C-E systems used for surveillance, weapons control, aeronautical and meteorological aids, etc.

b. "Training." In peacetime within the US&P, military operations are normally in connection with training and the obtaining of proficiency in all aspects of their ultimate employment as a military force in an emergency situation. The simulation of wartime operations in day-to-day use, field and fleet exercises and major maneuvers, is an essential requirement to assure immediate operational readiness.

2. The specific frequencies designated and authorized for military tactical and training purposes are primarily utilized as a group to meet the more essential needs, on a day-to-day basis, by operating forces throughout the US&P. Generally, all of these frequencies are assigned for use by major military commands. Where the source of frequencies is inadequate to meet special needs of these commands, e.g., in large exercises and major field and fleet maneuvers, they are supplemented by the use of frequencies in both federal and non-federal bands, subject to established procedures to insure the avoidance of harmful interference to the operations of the primary agencies and activities.

3. In addition to the principal use of such frequencies as set out in the preceding paragraphs, the following uses of a corollary nature, while not necessarily tactical and training, must be recognized where suitable frequencies such as those authorized for tactical and training purposes must be utilized:

a. In event of civil disturbances or other emergencies, military units may be required to assist in maintaining order and in safeguarding human life and property.

b. In the development, type acceptance, and compatibility testing or evaluation of C-E equipment intended for tactical purposes.

c. In effecting training of individuals and units at special service schools and test ranges.

d. In providing demonstrations of military weapons and C-E equipment at laboratories, proving grounds, and test ranges.

4. A further very important aspect which is associated with these tactical and training frequencies, is the fact that this group of frequencies constitutes the limited base to support military needs under initial mobilization conditions. Experience gained from peacetime utilization of the specific frequencies designated and authorized for military tactical and training purposes materially enhances their value and usability in the event of a mobilization situation, particularly during the initial transition phase.

5. Certain military C-E equipment includes both portable and transportable types. In any operational situation it assumes a radio service classification in accordance with the nature of its actual operation. A portable or transportable station may at one moment be operating with a station in the fixed service; alternatively, when communication is involved with an aircraft or a ship, the station may be operating in the aeronautical or maritime mobile service.

8.2.13 Guidance on Use of Frequencies by Stations in Certain HF Bands

1. WARC-79 and WARC-92 adopted a number of allocation changes in the 3000-27500 kHz portion of the radio frequency spectrum. The changes reduce the spectrum allocated for the fixed and mobile services and increase the spectrum allocated for HF broadcasting. The effective implementation dates for the expanded radio services will vary over a long period of time; due to the complex reaccommodation process and access restrictions that vary by band. WRC-95 made available for use the HF broadcasting spectrum allocated by WARC-79, effective January 1, 1996. The use of this spectrum is on the basis of Article 12 and taking into account the provisions of No. 5.148.

2. WARC-79 allocated the following HF Bands to the broadcasting service on a primary basis. Exceptionally, fixed service assignments in the bands 9775-9900, 11650-11700, and 11975-12050 kHz, meeting the criteria of RR 5.147, may be retained.

kHz	kHz
9775-9900	15450-15600
11650-11700	17550-17700
11975-12050	21750-21850

3. WARC-92 allocated the following HF bands to the broadcasting service on a primary basis, with an implementation date of 1 April 2007. In these bands, the broadcasting service is limited to single-sideband emissions and characteristics, specified in ITU RR Appendix 11, and subject to planning procedures contained in Article 12:

kHz	kHz
5900-5950	13570-13600
7300-7350	13800-13870
9400-9500	15600-15800
11600-11650	17480-17550
12050-12100	18900-19020

4. After 1 April 2007, continued use of these bands by the fixed and mobile services is internationally governed by the provisions of RR 5.136, 5.143, 5.146 and 5.151 as applicable. Additionally, Resolution 21 provides for implementation of these bands for broadcasting by a future WRC and the reaccommodation of "Class of Operation A" frequency assignments contained in the Master International Frequency Register as of 1 April 1992. Resolution 21 also provides for a transition period from 1 April 1992 to 1 April 2007. Federal agencies should, to the maximum extent feasible, adhere to the following principles when making fixed and mobile service assignments in these bands:

a. Avoid internationally notifying assignments to the fixed and mobile services. If assignments are notified they are subject to review by the BR on 1 April 2007 to determine if they are in conformity with the Table of Frequency Allocations and other provisions of the Radio Regulations.

b. Review assignments of "Class of Operation A" in order to determine if they can be downgraded to "Class of Operation B or C".

c. Identify "Class of Operation A" assignments during the transition period and move them to appropriate frequency bands with notification to the BR. In this regard if only the assigned frequency and no other characteristics of the assignment are changed, the assignment will retain its original date.

d. New frequency assignments that are only required for a short period of time or until 1 April 2007, not requiring international protection, should be made in these bands so that the remaining HF bands allocated to the fixed and mobile services can be used to accommodate "Class of Operation A" assignments.

8.2.14 Applications for Frequency Assignments in Bands Allocated to the Radio Astronomy Service

In the bands allocated to the Radio Astronomy Service by the Federal Table of Frequency Allocations, the FAS shall keep the IRAC informed of all applications for assignments that are not in accordance with that Table, including requests for renewals and modifications, except modifications that are of an administrative or non-technical nature.

8.2.15 Referral of Applications Related to the Space Service

In the bands allocated to the space service by the Federal Table of Frequency Allocations, the FAS shall refer to the IRAC all applications for assignments that are:

- a. not in accordance with the Table except when the application is for:
 - (1) the renewal of an existing assignment; or
 - (2) test, and operation of electronic threat simulators during military tactical and training exercises; or
- b. for experimental stations except when the application is for:
 - (1) the renewal of an existing assignment; or
 - (2) the static (ground-to-ground) test of a space system; or
 - (3) experimentation that is consistent with the use for which the band is allocated.

8.2.16 Assigning the Most Heavily Occupied Frequency Channel

In order to have the greatest possible spectrum support for future radiocommunication requirements available, each new frequency assignment should be made in such a way that the increase in the total spectrum space committed is as small as possible. Accordingly, it shall be the normal practice, where feasible and consistent with frequency allocation and assignment plans, to assign the most heavily occupied frequency channel before resorting to those less heavily occupied.

8.2.17 Determining Whether a Station is a Federal Station

1. The following guidelines are to assist in the determination of whether or not a station belongs to and is operated by the U.S. as specified in Section 305(a) of the Communications Act of 1934:

- a. The department or agency concerned should be able to exercise effective control over the radio equipment and its operation; and
- b. The department or agency concerned assumes responsibility for contractor compliance with Executive Branch, departmental, or agency instructions and limitations regarding use of the equipment and ensures that such instructions and limitations are met when operating under the authority of an Executive Branch frequency authorization to the department or agency; and
- c. The station should be operated by an employee of the department or agency or by a person who operates under the control of the department or agency on a contractual or cooperative agreement basis, and who is under supervision of the department or agency sufficient to ensure that Executive Branch, departmental, or agency instructions and limitations are met.

2. It is recognized that a federal agency may make a contract arrangement for maintenance or operation of a radio station under its control without diminishing the effective control of, or responsibility for, such station, provided the appropriate limitations or requirements are specified.

3. Since the foregoing may not cover every case, or where there may be doubt, the determination will be made by the department or agency concerned after consultation with the NTIA/FCC as appropriate.

8.2.18 Assignment of a Band of Frequencies to a Station

When a band of frequencies is assigned to a station, e.g., 400-406 MHz, the necessary bandwidth of the station shall be so located within the band that it does not extend beyond the upper or lower limits of the band.

8.2.19 Limitation of Radiated Power

Federal radio stations shall radiate only as much power as is necessary to ensure a satisfactory service.

8.2.20 Reserved

8.2.21 Use of Ionosphere Sounders

- 1. The use of ionosphere sounders for realtime selection of frequencies for operational communication circuits,

realtime monitoring of upper atmosphere phenomena, and for the predicting of propagation conditions will be authorized only under the following conditions:

- a. When it has been determined that no existing authorized ionosphere sounder transmitter is capable of meeting the requirement under a common user concept.
- b. Operations shall be on a secondary basis to authorized radio services.
- c. Transmissions in the bands 2495-2505, 4995-5005, 9995-10005, 13360-13410, 14990-15010, 19990-20010, 21850-21870, 24990-25010, 25550-25670 kHz and 38.00-38.25 MHz shall be avoided for sounders capable of frequency suppression.
- d. Transmissions shall be swept or stepped through the operating range of the equipment at a rate or time interval expected to avoid harmful interference.
- e. Transmitters shall be designed to eliminate emissions on any frequency channel where harmful interference is caused to authorized radio services.

2. Applications for frequency assignments to sounder network stations or sounder prediction stations shall include the following basic information in the SUPPLEMENTARY DETAILS (SUP) field:

Channeling plan(s) (required for all sounder network stations and, as applicable, for sounder prediction stations)⁴

- Pulse duration(s)
- Pulse repetition frequency(ies)
- Pulse per channel
- Scan rate(s)
- Scan interval(s) (time between scans)
- Antenna type(s)
- Antenna azimuth
- Antenna orientation(s) (If directional, indicate orientation of major lobe.)

3. All applications for sounders shall include a statement that the applicant has determined that no existing authorized ionosphere sounder transmitter is capable of meeting the requirement.

8.2.22 Use of Ionosphere Sounders for Purposes Other Than Those Mentioned in Section 8.2.21

The use of ionosphere sounders for purposes other than those mentioned in Section 8.2.21 shall be authorized only as experimental stations. The conditions to be applied shall be determined on a case-by-case basis.

8.2.23 Minimum Data Recommended for Inclusion on Applications for Antenna Testing Assignments Above 30 MHz

1. The following minimum data are recommended for inclusion, when applicable, on each application for frequency assignment for the testing of antennas above 30 MHz, in order to expedite action on the application and to enable present users of the frequencies to evaluate the potential interference.

- a. Frequency and Transmission Data
 - (1) Frequencies or Frequency Band Required

NOTE--The use of individual frequencies rather than a frequency band will greatly facilitate consideration of the request.

- b. Transmission Characteristics
 - (1) transmitter output power
 - (2) effective radiated power (if ERP is unknown, give a reasonable estimate)
 - (3) types of emission
 - (4) bandwidth for each type of emission
2. Supporting Information
 - a. Name of geographical location and latitude and longitude of antenna site to the nearest second.
 - b. Test Environment
 - (1) profile of terrain-by description, maps and/or other means

⁴ e.g.--First octave: 2.075 to 3.975 MHz, 20 channels spaced 100 kHz.

(2) if tests are to be conducted within shielded enclosures, so state, and give the attenuation (in dB) of the enclosure

c. Antenna Configuration

- (1) type of antenna
- (2) whether full scale or less than full scale
- (3) azimuth of the main lobe
- (4) gain
- (5) beam width in azimuth and elevation
- (6) height above ground
- (7) height above mean sea level

d. Period of Operation

- (1) duration of requirement, including the dates it will be required.
- (2) estimated hours of use, in local time; for example, 0800 to 1700 daily Monday through Friday; daytime only Monday through Friday.

3. Justification

a. Except in very extraordinary circumstances, applications should not be made for bands where regulations prohibit the granting of assignments, for example, the radio astronomy bands, the standard frequency bands, certain space bands. (See U.S. Table of Frequency Allocations.) If an assignment falling in a prohibited band is requested, a complete and adequate justification must be given as to why operation within the prohibited band is required.

b. The service should be specified for which the operational use of the antenna under test is intended, for example, radiolocation, radionavigation, fixed, space.

c. Unusual conditions should be justified, for example, high power for breakdown tests.

d. If the testing is being done under a Federal Government contract, the federal agency and contract number should be specified.

8.2.24 Use of Frequencies in the Bands Between 2850 and 22000 kHz Allocated Exclusively to the Aeronautical Mobile Service

1. The bands allocated exclusively to the aeronautical mobile service are subdivided into categories defined in Article **43** of the RR as follows:

a. Frequencies in any band allocated to the aeronautical mobile (R) service are reserved for communications related to safety and regularity of flight between any aircraft and those aeronautical stations primarily concerned with flight along national or international civil air routes.

b. Frequencies in any band allocated to the aeronautical mobile (OR) service are reserved for communications between any aircraft and aeronautical stations other than those primarily concerned with flight along national or international civil air routes.

2. National planning for the use of these bands is governed by the provisions of Article **43** and Appendices **20** and **27** of the RR. These appendices allot specific (R) channels for use in particular areas, allot specific (OR) channels for use by particular countries, and set forth technical and operational principles governing this usage. The use of these bands by federal stations is subject to the normal procedures for coordination and assignment, except as provided by Sections 7.5.3 and 7.5.4, and, in addition, such use shall comply with the pertinent international regulations and plans mentioned above and more specifically referenced below.

Aeronautical Mobile (R) Bands

3. Frequency assignments to stations in the aeronautical mobile (R) service, in the bands allocated exclusively to that service between 2850 and 22000 kHz, shall be assigned in conformity with the provisions and the allotment plan of Appendix **27** to the RR. Such assignments shall conform to the plan for the allotment of frequencies to (a) Major World Air Route Areas (MWARA), (b) Regional and Domestic Air Route Areas (RDARA's), (c) VOLMET Allotment Areas, and (d) Worldwide Allotment Areas contained in Appendix 27 or, to meet operational requirements not otherwise met by the Allotment Plan, comply with the provisions of Appendix **27** for the adaptation of allotment procedures (27/20, 27/21 and 27/22). Assignments in support of International Air Routes (MWARA and VOLMET allotments) are also within the purview of applicable ICAO frequency assignment plans that have been agreed internationally and are recognized in the ITU Radio Regulations.

4. Single sideband operations only are permitted in the bands allocated exclusively to the Aeronautical Mobile

(R) Service in accordance with the provisions of Appendix 27 Part I, Section II, C. This section of Appendix 27 also contains information on the use of several emissions subject to compliance with special provisions applicable to each use.

5. As a matter of general policy, high frequencies are not used for aeronautical mobile (R) communications in the domestic services within the conterminous U.S., the need for such frequencies having been generally eliminated through successful use of VHF communications. However, Appendix 27 Part II, Section I, Article 2 provides for the allotment of frequencies to the RDARAs, which include the conterminous U.S. (RDARA 27/151), and also Alaska (27/143), Hawaii (27/154), Puerto Rico and the Virgin Islands (27/157). This then affords for special and certain related aeronautical communication requirements, not conforming fully to the definition of the Aeronautical Mobile (R) Service, to be satisfied by use of frequencies from these allotments within the limitations of the following national criteria established jointly with the FCC:

a. Communications related to safety and regularity of flight between aircraft and those aeronautical stations primarily concerned with flight along national or international civil air routes shall have absolute priority over all other uses.

b. Use of (R) band high frequencies shall be limited to single sideband air/ground and incidental air/air communications beyond the range of VHF/ UHF facilities.

c. Users shall share to the maximum extent possible.

d. Requirements shall be handled on a case-by-case basis.

e. A showing must be made that the accommodation of the requirements in the bands other than aeronautical mobile (R), e.g., fixed bands, is not satisfactory for technical, operational, or economic reasons.

f. Only those requirements will be considered where the primary need for communications is for the safety of the aircraft and its passengers or for operational control communications, i.e. "communications required for exercising authority over initiation, continuation, diversion, or termination of a flight in accordance with the provisions of Annex 6" (ICAO).

g. Use of aeronautical mobile (R) high frequencies in accordance with the foregoing normally shall be limited to non-military.

h. If the aforementioned criteria are met, the stipulation that (R) bands are to be used only for flights along national and international civil air routes need not be met.

6. The following frequencies are available to all federal users as frequencies that may be used for operational control and safety of civil government aircraft in the specified areas:

Assigned Frequency (kHz)	Carrier Reference Frequency (kHz)	Available Area
2897.4	2896	AK, HI, CONUS
2948.4	2947	AK, HI, CONUS
3002.4	3001	AK, HI, CONUS
6539.4	6538	CONUS Only
8886.4	8885	CONUS Only
8910.4	8909	AK, HI, CONUS
10055.4	10054	HI Only
11307.4	11306	CONUS Only
17950.4	17949	AK, HI, CONUS
21926.4	21925	AK, HI, CONUS
21929.4	21928	AK, HI, CONUS
21935.4	21934	AK, HI, CONUS

7. These frequencies are intended for users in support of operations not exclusively enroute in nature. These frequencies were chosen so as to avoid those channels which might result in harmful interference to aeronautical stations dedicated to the safety and regularity of flight. The use of these channels by U.S. Federal Government stations with a maximum peak envelope power (PEP) of 6 KW for Aeronautical Terrestrial stations and 400 watts for aircraft stations is allowed under Provision 27/60 of Appendix 27 of the RR. (A list of additional frequencies available to designated agencies in specified areas is contained in the IRAC Supplement to this Manual.) It is assumed that the maximum peak envelope power specified above for aeronautical terrestrial stations will produce the mean effective radiated power of 1 KW used as a basis for the interference range contours.

8. Federal aeronautical stations that operate in the aeronautical mobile (R) service within US&P are normally authorized only for the FAA. Non-federal stations in this service are authorized by the FCC. Coordination is accomplished as appropriate for assignments to these stations, and to those fulfilling the joint national criteria, through established IRAC/FCC procedures.

Aeronautical Mobile (OR) Bands

9. Frequencies in bands allocated exclusively to the (OR) service are internationally allocated to countries by Appendix 26 of the RR, which also establishes sharing criteria, protection ratios, and other technical and operational principles. These principles recognize the possible necessity for the adaptation of the allotment plan to meet valid requirements of the various administrations, provided these adaptations do not decrease the protection to frequencies assigned in strict adherence to the plan.

10. Frequencies in the bands allocated exclusively to the (OR) service are nationally used primarily for the satisfaction of military aeronautical requirements. Assignment of frequencies in these bands is subject to coordination with the military departments through the IRAC mechanism.

Channels Common to the Aeronautical Mobile (R) and (OR) Services

11. Section 7.5.3 authorizes aircraft, ships, and survival craft stations to use the channels common to the (R) and (OR) services, carrier (reference) frequencies 3023 and 5680 kHz, provided such use is in accordance with Appendix 13 Part A2, Section I, D, §3 and Appendix 13 Part A2, Section I, F, § 5 of the RR, the appropriate provisions of Appendices 27. Section 7.5.4 authorizes additional uses by mobile stations engaged in coordinated search and rescue operations. Any use of these channels by land stations engaged in the coordination of search and rescue operations shall be in accordance with the same provisions, and shall be authorized by applications submitted and processed through normal assignment procedures.

8.2.25 Use of Frequency Diversity for LOS Transmissions in the Bands Allocated to the Fixed Service Above 1710 MHz

The necessity for employment of some form of diversity operation on selected LOS fixed radiosystems is recognized when such operation is required to provide acceptable levels of quality and reliability. However, in view of the growing demands on the frequency spectrum and the recognized effectiveness of space diversity techniques, the use of frequency diversity in the bands 1710-1850, 2200-2290, 4400-4990, 7125-7250, 7300-7975, and 8025-8400 MHz is limited as follows:

a. The use of frequency diversity for new federal LOS fixed radio systems shall be limited to those systems for which frequency diversity can be justified. Existing systems employing frequency diversity may continue until such time as frequency assignment congestion dictates the need for reevaluation.

b. The justification for the use of frequency diversity shall include a statement of the requirement for a high degree of systems reliability and another that an engineering evaluation has been made which demonstrates that the required reliability necessitates frequency diversity. The justification shall be submitted in accordance with the provisions of Section 9.8.2, paragraph 80e.

8.2.26 Use of Radio Frequencies to be in Accordance with ITU Provisions

Except as otherwise provided in this Manual or by the terms of a frequency authorization, present or future, the use of radio frequencies by federal radio stations within the US&P shall be in accordance with the provisions of the ITU Convention and Radio Regulations.

8.2.27 Experimental Use of Certain Radio Spectrum

Experimental use of any shared federal/non-federal frequency band or exclusive federal frequency band may be authorized so that non-federal developers may advance the state of technology. Experimental usage will be authorized for the period required subject to not exceeding five years, which may be extended with appropriate justification. However, in order to protect operations on frequencies assigned or required for operation of the National Airspace System, the frequency bands under the Aeronautical Assignments Group area of responsibility as defined in Section 1.3.2, and those bands designated in Section 8.3.16, will normally be authorized for a period not to exceed two years. Any use of these bands for experimental use beyond two years may be authorized on a case-by-case basis with appropriate justification.

8.2.28 Radio Frequency Electromagnetic Field Safety and Protection

1. Exposure to radio frequency (RF) electromagnetic fields may present potential health hazards. Federal agencies shall take actions consistent with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed federal regulations to ensure that people are protected from such emissions.

2. Federal agencies shall implement an RF safety program to protect exposed persons. RF safety programs may be individualized by agency and may be a part of an overall general safety program. Agencies may adopt recognized emission exposure standards/guidelines or portions of recognized standards/guidelines to develop an RF safety program most suitable for their facilities. Agencies should ensure that the most current versions of their chosen standard/guideline are used.

3. RF emitters licensed by the FCC but located on federal property must comply with the FCC's existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed federal regulations. NTIA-authorized emitters on non-federal property must comply with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed federal regulations used by the federal agency operating the emitter.

4. All RF emitters at or near a specific location must be taken into consideration in a complete RF safety evaluation. Agencies shall use the most current methodologies for the calculations and/or measurements to ensure compliance with existing safety and health standards/guidelines, applicable voluntary national standards/guidelines, and prescribed federal regulations.

8.2.29 Use of Frequencies by Stations in the Maritime Mobile Service

1. Stations in the maritime mobile service utilize bands allocated either exclusively to this service or on a shared basis with other services. Several international plans detail the specific uses of certain frequencies. The maritime mobile service is provided with detailed operational and frequency regulations contained in the ITU Radio Regulations. In addition, an abstracted manual which includes pertinent ITU Radio and Telegraph and Telephone Regulations entitled "Manual for Use by the Maritime Mobile Service," is issued by the ITU, and shall be carried by federal ships as required by and in accordance with regulations of the user agency (Appendix 16).⁵

2. National planning for the use of the maritime mobile bands closely follows the international use.

Maritime Mobile Telegraphy

3. Ship stations use working frequencies in the bands 415-490 kHz and 510-535 kHz, specified by No. **52.39**, for transmissions to coast stations. Coast stations transmit on other frequencies in these bands. Initial contact is usually established by calling on 500 kHz and shifting to appropriate working frequencies. Special provisions for Morse telegraphy calling allow the use of 512 kHz when 500 kHz is being used for distress (No. **52.41-52.44**). All ship stations equipped with NBDP to work in these bands shall be able to receive class F1B emissions on 518 kHz, if complying with the provisions of RR Chapter VII (GMDSS). (See No. **51.45** and **52.97**).

4. Frequencies in the bands between 4 and 27.5 MHz, allocated exclusively for this service, are used for several telegraphy modes. The frequency sub-bands available for assignment for each mode to coast and ship stations shall be as specified in No. **52.12**, **52.13**, and Appendix 17.

5. Several limitations apply to use of frequencies in the exclusive maritime mobile bands between 4 and 27.5 MHz:

a. Power limits for coast stations are:

(1) Single Channel A1A or F1B emissions (No. **52.56** and **52.104**):

⁵ References in this section to appendixes and footnotes listed as No. ### refer to ITU Radio Regulations.

Maximum Power (kW)		
Band (MHz)	A1A (pX)	F1B (pY)
4	10	5
6	10	5
8	20	10
12	30	15
16	30	15
18	No A1A	15
22	30	15
25	No A1A	15

(2) Multichannel telegraphy (No. **52.172**):

2.5 kW (mean) per 500 Hz bandwidth

(3) For digital selective calling and acknowledgement, and for types of transmissions other than those indicated in (1) or (2) above, the maximum mean power shall not exceed the power specified for F1B emission in (1) above.

b. Power limits for ship stations:

Except for transmissions, in the exclusive maritime mobile bands between 4 and 27.5 MHz, of digital selective calls and acknowledgements, which are limited to a mean power of 1.5 kW, international radio regulations have no power limit for ship stations (MS) operating in the radiotelegraphy mode. The power used should be the minimum power, consistent with transmitter capability, necessary to provide satisfactory communications.

c. Appendix **17** provides for ship and coast use in several functional allocations:

(1) Wideband telegraphy, facsimile and special transmission systems--Assignments to ship stations using wideband telegraphy, facsimile and special transmission systems may be adjusted to meet needs of systems using these bands provided they remain within the band limits (No. **52.170**). The shared use of certain ship station frequencies between federal and non-federal shall be in accordance with US296.

(2) A1A Morse calling--See Appendix **17** for frequencies available.

(3) Oceanographic data transmission--Use of these frequencies is limited to the transmission of oceanographic and meteorological data from ships and buoys. Oceanographic data interrogating stations may use these frequencies for interrogation of ships and buoys. The power of ship stations used for oceanographic data transmission (Station Class OD), including buoys or other sensor platforms, is limited to 100 watts. See Appendix **17** for frequencies available.

(4) Narrowband direct-printing telegraph and data transmission systems--See Appendix **17** for frequencies available.

(a) Narrowband direct-printing telegraph--International technical standards for narrowband direct printing telegraphy systems are contained in ITU-R M.476-5 and shall be used nationally.

(b) Data transmission systems--Standards for data transmission systems have not been established by the ITU.

(5) A1A Morse working--See Appendix **17** for frequencies available.

(6) Digital selective calling--See Appendix **17** for frequencies available.

Maritime Mobile Radiotelephony

6. Bands available to the maritime mobile service for radiotelephony are divided generally into exclusive maritime bands and bands shared with other services. The class of emission authorized in each band is described below. Where single sideband is specified, the authorized bandwidth is 2.8 kHz, upper sideband mode only is permitted, the assigned frequency must be 1.4 kHz above the carrier, and technical standards of ITU-R M.1173 shall be followed. Where FM is specified, technical standards of ITU-R M489-2 shall be followed. The principal bands within which maritime mobile radiotelephony may be authorized are:

a. 1605-3500 kHz--Portions of these bands are allocated to the Maritime Mobile Service exclusively, while other portions are shared with the fixed, mobile, and other services. Class J3E emission only may be authorized for U.S. ship and coast stations.

(1) Coast stations shall be limited to 5 kW (PEP) when located north of 32°N and 10 kW (PEP) when located south of 32°N.

(2) The use of J3E emission in U.S. waters is mandatory on carrier frequency 2182 kHz; however, H3E emission is also authorized for communications with foreign ship and coast stations (Appendix **13**, Part A2, Section

I, C'2). Class A3E emission on this frequency is no longer authorized except for such apparatus (at ship stations) provided solely for distress, urgency and safety purposes (51.53).

(3) Digital selective calling for distress and safety purposes shall be conducted on the frequency 2187.5 kHz. Digital selective calling for other than distress and safety purposes may be conducted on 2189.5 kHz (ship-to-shore) and 2177 kHz (ship-to-ship and shore-to-ship).

(4) Provisions for the use of the single sideband radiotelephone channels within the band 2170-2173.5 kHz and 2190.5-2194 kHz are:

(a) The assignable frequencies are 2171.9 and 2192.4 kHz.

(b) Emission is limited to J3E.

(c) Power is limited to 400 watts PEP.

b. 4.0-23.0 MHz--Nationally and internationally only single sideband class J3E emission may be authorized. The PEP of ship stations shall not exceed 1.5 kW. The PEP of coast stations shall not exceed 10 kW. Within these limitations, frequencies in certain cases, are available to the maritime mobile service in exclusive bands for duplex and simplex use as set forth below:

(1) Duplex--Both ship station and coast station single sideband frequencies are designated in Appendix 17, Annex 1, Part A, Section I, Subsection A, on a paired basis. In addition, Appendix 25 provides an international frequency allotment plan by areas for use of those frequencies designated in Appendix 17, Annex 1, Part A, Section I, Subsection A. In general, while ships normally do not transmit on coast station frequencies in certain cases, federal ship stations are authorized to do so by Section 7.5.5. International notification of allocated channels are made in accordance with the provisions of ITU Appendix 25 and Article 17. National requirements developed in IRAC Documents 18380 and 25934 provided the basis for such notifications.

(2) Simplex--The frequencies of Appendix 17, Annex 1, Part B, Section I, Sub-section B may be authorized for use on a simplex basis by coast and ship stations. Additionally, the assigned frequencies 4126.4, 4418.4 and 6517.4 kHz also may be so authorized. The use of 6517.4 kHz for this purpose should be limited to day-time operation. Simplex frequencies may be authorized for both ship/coast stations and intership communications. Intership operations may be on two frequencies if they are cross banded. Power for these simplex frequencies shall not exceed 1 kW peak, and emission is limited to class J3E. These frequencies are shared equally on a non-priority basis by both federal and non-federal coast and ship stations in a manner consistent with the provisions of US82.

c. 156-162 MHz--Within these limits, the band is divided into numbered channels which are listed in Appendix 18, along with recommended use. Assignments not in accordance with Appendix 18 are subject to adjustment to other frequencies in this band as long-term U.S. maritime VHF planning develops.

(1) The band 157.0375-157.1875 MHz is allocated to the federal for maritime mobile operations. The band is divided into six channels. Two of these channels have a specialized use associated with non-federal maritime mobile operations. Channel 22, 157.1 MHz, is the primary frequency for federal and non-federal liaison communications with the U.S. Coast Guard. Channel 81, 157.075 MHz, is primarily for environmental protection operations as outlined in Section 7.5.6.

(2) The remainder of the VHF channels in the band 156-162 MHz are allocated to non-federal use; however, channels are available to the Federal Government as outlined below:

(a) Channels 12 and 14, 156.6, 156.7 MHz, and the Channel 20 duplex pair, 157.0 and 161.6 MHz, may be authorized for port operations. Record note L283 applies for coast stations.

(b) Channel 6, 156.3 MHz, may be authorized for intership operations. It is already authorized for coordinated operations at the scene of a SAR incident as outlined in Section 7.5.4. Record Note S063 applies. Coast stations may use 156.3 MHz for exchange of traffic dealing with safety of life or property when other means of communication are not practicable. Record Note L330 applies.

(c) Channels 12, 14, 11 and 13, 156.6, 156.7, 156.55 and 156.65 MHz in priority order, may after coordination with the FCC, and be authorized for Vessel Traffic System (VTS) operation.

(d) Channel 13, 156.65 MHz, may be authorized for bridge-to-bridge operations according to provisions set forth hereafter.

(e) Channel 16, 156.8 MHz, is designated nationally and internationally for distress, safety and calling. Federal ship and coast stations, during their hours of service of VHF radiotelephony, shall maintain a watch for reception of 156.8 MHz whenever practicable. Federal ships transiting portions of the St. Lawrence Seaway or a U.S. Coast Guard operated VTS may terminate the listening watch on 156.8 MHz when directed by the Seaway or VTS authorities to call and work on a designated ship movement frequency. Assignments on 156.8 MHz shall include Record Note S035.

(f) For public correspondence purposes ship stations are authorized to communicate with public

correspondence coast stations. In these instances, the ship station shall transmit on the designated ship frequency appropriate to the public correspondence channel assigned to the coast station. Assignments for such use shall include Record Note L197. The specific receiving coast station shall be listed in Receiver Antenna Location field; however, if there are more than three receiver locations, list the area in which the receiving stations are located.

(g) Other authorized use of frequencies by mobile stations to communicate with non-government stations is contained in Section 7.5.2. Record Note S165 applies.

(3) Port operations channels may be used in lock and waterway operations in addition to operations at or near ports.

(4) Stations on board aircraft may communicate with stations of the maritime mobile service. The communications of an aircraft station shall be brief and limited to operations in which maritime mobile stations are primarily involved, and where direct communications between aircraft and the ship or coast station is required.

(a) The mean power of aircraft stations shall not exceed 5 watts, however, a power of 1 watt or less shall be used to the maximum extent possible.

(b) While using the frequency band the altitude of aircraft stations should not exceed 305 meters (1,000 feet) except for reconnaissance aircraft participating in ice-breaking operations where an altitude of 457 meters (1,500 feet) is allowed. The frequencies 156.3 and 156.8 MHz may be used by aircraft stations for safety purposes only.

(5) Stations operating in the maritime mobile service in the band 156-162 MHz are subject to the technical standards and power limitations of Sections 5.3.2 and 5.2.1.

(6) Stations on board federal vehicles used for towing trailered boats engaged in SAR operations, or SAR training exercises, are authorized to operate on VHF FM maritime mobile frequencies with stations in the maritime mobile service. Such stations are subject to the technical standards and power limitations applicable to the maritime mobile service.

Bridge-to-Bridge Communications and Navigational Communications on 156.65 MHz or 156.375 MHz

7. General. Public Law 92-63 (33 USCA, Sections 1201-1208), the Vessel Bridge-to-Bridge Radiotelephone Act, provides the statutory basis for the national designation of "a specific frequency or frequencies dedicated to the exchange of navigational information on navigable waters of the United States".

a. The primary purpose of the act, and for the designation of a navigational communications frequency pursuant thereto, is to "provide a positive means whereby the operators of approaching vessels can communicate their intentions to one another through voice radio." Thus, the primary use of the designated navigational communications frequency provided for by the act is ship-to-ship. However, it is clear from the act's regulatory history that limited use of this frequency by certain shore stations would be "clearly in the interest of navigational safety" and, therefore, permissible.⁶

b. The act applies to both U.S. Government vessels and non-federal vessels and, for obvious reasons, effective implementation requires that all vessels subject to its provisions operate under compatible requirements. The FCC has promulgated, in Part 80 of its rules, regulations governing non-federal vessels subject to the act. The regulations herein, effective for all U.S. Government vessels subject to the Act, are fully compatible with the FCC regulations.⁷

c. The Navigational Communications Frequencies. Pursuant to Section 2 of the aforementioned Act, and except for a limited area of the Southern Louisiana section of the Mississippi River System, the frequency 156.65 MHz, 16K0F3E emission, has been designated as the national "navigational communications frequency." The frequency 156.375 MHz has been designated as the "navigational communications frequency" in the lower Mississippi River. For the purpose of these regulations "navigational communications" are those communications between ship stations, or between coast stations and ship stations, in which messages are restricted to those relating to the maneuvering and the safety of ships and, in emergency, to the safety of persons.

d. Use of 156.65 or 156.375 MHz for navigational communications. The frequency 156.65 or 156.375 MHz, 16K0F3E emission, is available for assignment to:

(1) Bridge-to-bridge stations aboard federal vessels subject to the provisions of the Vessel Bridge-to-Bridge

⁶ Hearing before Merchant Marine Subcommittee, Committee on Commerce, U.S. Senate, Serial No. 91-98, p. 29.

⁷ For vessels navigating on those waters governed by navigation rules for the Great Lakes and their connecting and tributary waters, see the following sub-section entitled "Bridge-to-Bridge" Communications for Vessels Navigating on the Great Lakes.

Radiotelephone Act for use in conformity with the purpose of the Act and the definition of such stations in Section 6.1.3 of this Manual,⁸ and

(2) Federal coast stations for navigational communications with vessels.

e. Use of the frequency 156.65 or 156.375 MHz by any federal station shall be limited exclusively to navigational communications as defined herein or for necessary tests.

f. Since the navigational communication frequency necessarily will be shared by a large number of users, and in recognition of the safety of life aspect inherent in the operations involved, it is essential that the communication range of all stations using this frequency be restricted. Unless specifically authorized otherwise, a mean power not to exceed 1 watt shall normally be used. A maximum power of 25 watts for vessels and 10 watts for shore stations may be used in exceptional cases when communications cannot be established using one watt. Antenna height and gain limitations are under consideration; in the interim, heights should be limited to the minimum required for reliable communications over the distance involved.

g. Transmissions on the frequency 156.65 or 156.375 MHz shall be identified by the name of the vessel, or the facility in the case of a coast station, in lieu of a call sign.

h. All federal use of 156.65 or 156.375 MHz is subject to the technical standards in Chapter 5 of this Manual. Vessel bridge-to-bridge radiotelephone installations are, additionally, subject to the requirements of the following paragraphs.

i. Vessel Bridge-to-Bridge Radiotelephone Installation. Section 2 of the Act states that the purpose is "to provide a positive means whereby the operators of approaching vessels can communicate their intentions to one another through voice radio...." Thus, the Act clearly imposes a total system communications requirement which, necessarily, involves both transmitting and receiving capabilities, on all vessels subject to the Act.

j. It is considered that the basic operational objectives of the Act will be met by transmitting and receiving installations having the following minimum performance characteristics:

(1) Vessel transmitters--For navigational communications, transmitters should be capable of effective transmission of 16K0F3E emissions with at least 8 watts mean power into 50 ohms effective resistance in the case of non-portable transmitters and at least 0.75 watt in the case of portable transmitters. Each non-portable transmitter, and each portable transmitter of more than one watt, shall have provisions for readily reducing the power to a value not less than 0.75 watt and not more than 1 watt. After January 21, 1997, non-portable transmitters must automatically reduce the carrier power to 1 watt or less when tuned to the frequency 156.375 MHz or 156.650 MHz. A manual override device must be provided which when held by the operator will permit full carrier power operation on these channels. Transmitters should be adjusted so that the transmission of speech normally produces peak modulation within the limits 75-100%. (Note: Other applicable standards are in Chapter 5.)

(2) Vessel receivers--Receivers should be capable of effective reception of 16K0F3E emission on navigational communication frequencies and should comply with the following characteristics:

(a) Frequency stability within 0.001%.

(b) Usable sensitivity of 0.5 microvolt, maximum, for nonportable receivers and 1.0 microvolt, maximum, for portable receivers.

(c) Adjacent channel selectivity and desensitization of 70 dB, minimum, for non-portable receivers and 40 dB, minimum, for portable receivers.

(d) Modulation acceptance bandwidth of 7 kHz, minimum.

(e) Spurious response attenuation of 85 dB, minimum, for nonportable receivers and 50 dB, minimum, for portable receivers.

(3) Vessel Antenna--Antennas should be as non directional (horizontally) and as efficient as is practicable for the reception of ground waves at 156.65 MHz.

(4) Channel 22A Requirement--The radiotelephone installation required by this section must also be capable of transmitting and receiving on channel 22A (157.1 MHz).

(5) Channel 67 Requirement--While transiting any of the following waters, vessels subject to the Act also must have on board a radiotelephone capable of transmitting and receiving on channel 67 (156.375 MHz):

(a) The lower Mississippi River from the territorial sea boundary, and within either the Southwest Pass safety fairway or the South Pass safety fairway specified in 33 CFT 166.200, to mile 242.4 AHP (Above Head of Passes) near Baton Rouge,

⁸ Where the Act describes vessels in "gross tons," a useful conversion is: Each 100 cubic feet of enclosed space is equivalent to 1 gross ton.

(b) The Mississippi River-Gulf Outlet from the territorial sea boundary, and with the Mississippi River-Gulf Outlet safety fairway specified in 33 CFR 166.200, to that channel's junction with the Inner Harbor Navigation Canal; and,

(c) The full length of the Inner Harbor Navigation Canal from its junction with the Mississippi River to that canal's entry to Lake Pontchartrain at the New Seabrook vehicular bridge.

k. For operating regulations, maintenance requirements, and limitations on use of the bridge-to-bridge radiotelephone installation, see Title 33 CFR, Chapter 1, Part 26.

l. Exemptions of Vessels from Requirements of the Act. Applications for the exemption of vessels from the provisions of the Vessel Bridge-to-Bridge Radiotelephone Act should be forwarded directly to the Commandant, U.S. Coast Guard.

Bridge-to-Bridge Communications for Vessels Navigating On The Great Lakes

8. **General.** Each federal vessel navigating on the waters under the navigational rules for the Great Lakes and their connecting and tributary waters and to which the Vessel Bridge-to-Bridge Radiotelephone Act (33 USCA, Sections 1201-1208) applies, is exempt from the regulations of the act under Sections 26.03, 26.04, 26.05, 26.06, and 26.07 of Title 33, Code of Federal Regulations (CFR), Part 26. These exempted sections comprise those regulations pertaining to the type of radiotelephone required; the use of the designated frequency 156.65 MHz; the use, maintenance, and failure of the radiotelephone; and the use of the English language. Sections 26.01, 26.02, 26.08, 26.09 (a), and 26.10 of Title 33 CFR remain in effect. These sections deal with the purpose of the act, definitions, exemption procedures, and penalties.

9. Each of these vessels must comply with the appropriate provisions of "The Agreement between the United States and Canada for Promotion of Safety on the Great Lakes by means of Radio, 1973", outlined in the following paragraphs, that provide for a bridge-to-bridge communications capability considered to be in constructive compliance with the Vessel Bridge-to-Bridge Radiotelephone Act.⁹

10. Radiotelephone Installation. Each federal vessel shall be fitted with radiotelephone installations that are capable of effectively transmitting and receiving G3E emissions on at least the following VHF channels:

Channel 16--156.8 MHz (Distress, safety and calling)

Channel 6--156.3 MHz (Primary intership)

Channel 13--156.65 MHz (Navigational bridge-to-bridge)

Channel 12--156.6 MHz

Channel 14--156.7 MHz

a. Additionally, such other frequencies as required for the vessel's service and to include the capability to receive VHF-FM marine navigation warnings for the area of operation.

b. The radiotelephone station, exclusive of the antennas and source of electric energy, shall be located as high as practicable on the vessel, preferably on the bridge.

c. The principal operating position of the radiotelephone installation shall be on the bridge, convenient to the conning position.

d. Where the radiotelephone station is located elsewhere than on the bridge, provision shall be made for complete operational control of the equipment at that location and at the bridge operating position. However, provision shall be made to take immediate and complete control of the equipment at the bridge operating position.

e. Provision shall be made for illuminating the operating controls at the principal operating position.

f. Means shall be provided for charging any storage battery used in connection with the radiotelephone station.

g. The radiotelephone transmitter shall be capable of delivering at least 10 watts carrier power to the antenna. Provision shall be made to reduce this power readily to 1 watt.

h. The radiotelephone receiver shall have a sensitivity of at least 2 microvolts across 50 ohm or equivalent input terminals, for a 20 decibel signal-to-noise ratio.

i. The associated antennas shall be effective, vertically polarized, and located as high as practicable on the masts or superstructure of the vessel. The transmission line shall be effective and, to the extent practicable, shall impose a minimum loss.

j. The radiotelephone installation is subject to the technical standards in Chapter 5 of this Manual.

⁹ Reference 40 Federal Register 87 (May 5, 1975).

11. Vessel Bridge-to-Bridge Watch. Each federal vessel shall, when underway, maintain a continuous and effective watch on channel 13 (156.65 MHz). Vessels are exempt from this requirement while transiting the St. Lawrence Seaway and complying with the Joint Regulations of the St. Lawrence Seaway Authority and the Saint Lawrence Seaway Development Corporation between the lower exit of St. Lambert Lock at Montreal and Crossover Island, New York, and in the Welland Canal and approaches between calling-in points No. 15 and No. 16.

- a. Sequential monitoring techniques alone are not sufficient to meet this requirement.
- b. Portable VHF equipment may be used to meet this requirement.
- c. This watch shall be maintained by the master, or person designated by the master, who may perform other duties provided they do not interfere with the effectiveness of the watch.

12. The UHF frequencies and technical standards for on-board communication stations as provided by No. **5.287**, **5.288** and ITU-R M.1174, respectively are:

- a. The preferred two simplex (duplex) frequencies for use in the territorial waters of the U.S. for on-board communications are paired as follows:

On-Board Communications	
On-Board Repeater (Transmit) (MHz)	On-Board Mobile (Transmit) (MHz)
457.525	467.750
457.550	467.775
457.575	467.800
457.600	467.825

Use of these frequencies by government stations is subject to agreement with the FCC in the IRAC/FCC mechanism.

- b. Technical characteristics:

(1) Effective radiated power not to exceed 2 watts. Whenever practicable the equipment should include a device to readily reduce the power by at least 10 dB.

(2) In the case of equipment installed at a fixed point on the ship, the height of antenna shall not be more than 3.5 meters (approximately 10 feet) above the highest working deck.

(3) Only FM with a pre-emphasis of 6 dB/octave (phase modulation) shall be used.

(4) Deviation not to exceed 5 kHz.

(5) Tolerance shall be 5 parts in 106.

(6) The audio-frequency band shall be limited to 3000 Hz.

8.2.30 Procedure in a Case of Harmful Interference

1. When harmful interference is received to federal operations within the U.S., the following actions should be taken in the absence of agency instructions to the contrary:
 - a. Agency personnel should determine the source, if possible. If the source can be identified, agency personnel should try to eliminate the harmful interference by working directly with individuals located at the source.
 - b. If agency personnel determine that the source of the interference is a non-federal system or are unable to determine the source using only their agency's resources and they suspect that the source of the interference may be a non-federal user, agency personnel should notify the agency's Spectrum Management Office (SMO) and request support from the FCC through the Public Safety Interference Portal at https://fccprod.servicenowservices.com/psix-esix?id=psix_form or by contacting the FCC's Operations Center at 202-418-1122 or FCCOPS@fcc.gov. The Operations Center is staffed 24/7.
 - c. If the source of the interference is a federal system and the interference cannot be resolved satisfactorily at the agency level, the agency's SMO may refer the matter to the IRAC for assistance.
2. In reporting interference in any of the above cases, use the NTIA Interference Report Form, which can be downloaded at https://www.ntia.doc.gov/files/ntia/publications/section_8.2.30_form_for_interference_reporting.pdf. Please submit a copy of the report to InterferenceReport@ntia.gov.
3. In case of interference near the Canadian or Mexican borders, also use the procedures in the NTIA Manual

Sections 3.6 and 3.9.12, respectively.

4. In case of interference to federal operations outside the U.S. (where NTIA and the FCC do not have jurisdiction), please refer the matter to the agency's SMO.
5. For information on contacting your agency's SMO, contact the Chief of the Frequency Assignment Branch at 202-482-4483.

8.2.31 Conversion of Stations in the Aeronautical Mobile Service to Single Sideband or Independent Sideband Transmission

In the bands below 30 MHz, equipment procured for the aeronautical mobile service shall be capable of single sideband (SSB) or independent sideband (ISB) emission with suppressed or reduced carrier. In the case of stations in the aeronautical mobile (R) service, the use of SSB shall be determined by the international requirements pertaining to that service.

8.2.32 Control of Emissions from Space Stations

The use of frequencies by space stations will be authorized only in those cases where such stations are equipped so as to ensure the ability to turn on or to provide immediate cessation of emissions by telecommand.

8.2.33 Selection of Sites and Frequencies for Earth and Terrestrial Stations in the Bands Above 1 GHz Shared with Equal Rights by Terrestrial Radiocommunication and Space Radiocommunication Services

Sites and frequencies for terrestrial stations and earth stations, operating in frequency bands shared with equal rights between terrestrial radiocommunication and space radiocommunication services, shall be selected having regard to the relevant ITU-R Recommendations with respect to geographical separation between earth stations and terrestrial stations.

8.2.34 Power and Direction of Maximum Radiation of Stations in the Fixed or Mobile Service in Certain Bands Shared with Stations in the Space Radiocommunication Services (Earth-to-Space) on an Equal Rights Basis

1. As far as practicable, sites for transmitting stations, in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power (e.i.r.p.) exceeding the values given in Table 8.2.34-1 in the frequency bands indicated, should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit (GSO) by at least the angle in degrees shown in the Table, taking into account the effect of atmospheric refraction. Information on this subject is given in the most recent version of Recommendation ITU-R SF.765.

2. For their own protection receiving stations in the fixed or mobile service operating in bands shared with space radiocommunication services (space-to-Earth) should also avoid directing their antennas toward the GSO if their sensitivity is sufficiently high that interference from space station transmissions may be significant.

3. For frequency bands above 15 GHz (except 25.25-27.5 GHz), there is no restriction on the angular separation for transmitting stations of the fixed or mobile service. This matter is being studied, e.g., in the ITU-R.

Table: 8.2.34-1

Frequency Band (GHz)	E.i.r.p. Value (dBW) (See also Paragraphs 1 and 5)	Minimum Separation Angle with Respect to Geostationary-Satellite Orbit (Degrees)
1 - 10	+35	2
10 - 15	+45	1.5
25.25 - 27.5	+24 (in any 1 MHz band)	1.5
Other bands above 15GHz	+55	No limit

4. The maximum e.i.r.p. of a station in the fixed or mobile service shall not exceed the values contained in Section 5.3.3.2 (*Maximum Equivalent Isotropic Radiated Power (EIRP) Table*).

5. Where compliance with paragraph 1 for frequency bands between 1 GHz and 10 GHz is impracticable, the maximum e.i.r.p. of a station in the fixed or mobile service shall not exceed:

+47 dBW in any direction within 0.5° of the GSO; or

+47 dBW to +55 dBW, on a linear decibel scale (8 dB per degree), in any direction between 0.5° and 1.5° of the GSO, taking into account the effect of atmospheric refraction.

6. The power delivered by a transmitter to the antenna of a station in the fixed or mobile service shall not exceed +13 dBW in frequency bands between 1 GHz and 10 GHz or +10 dBW in frequency bands above 10 GHz.

7. The limits given in paragraphs 1, 5, 6, and 7 apply, where applicable, to the services and frequency bands indicated in Table 8.2.34-2 for reception by space stations where the frequency bands are shared with equal rights with the fixed or mobile service:

Table: 8.2.34-2

Frequency Band	Service	Limit as specified in paragraphs
2200-2290 MHz 7900-8025 MHz 8025-8400 MHz	Fixed-Satellite Meteorological-Satellite Space Research Space Operation Earth Exploration-Satellite Mobile-Satellite	1, 4, 5, and 6
14.4-14.5 GHz 14.5-14.7145 GHz 14.7145-14.8 GHz	Fixed-Satellite	1, 4, and 6
25.25-27.5 GHz	Inter-Satellite	1, 4, and 6

8. Trans-horizon systems in the 1700-1710 MHz band may exceed the limits given in paragraphs 4 and 6, but the provisions of paragraphs 1 and 5 should be observed. Considering the difficult sharing conditions with other services, the number of trans-horizon systems in these bands should be kept to a minimum.

9. A computer program is available in the NTIA for checking compliance of fixed stations with the foregoing provisions. One version of this program is used in checking frequency assignment applications. A separate version is used in support of the SPS in the system review process (see Chapter 10) and will be used by the NTIA upon request from agencies not having direct access to the NTIA computer. To provide more general assistance to agencies in the earlier stages of planning of fixed and mobile systems for operation in these bands, a table is provided in Annex B which identifies transmitter pointing angles that should be avoided under certain postulated conditions.

8.2.35 Power and Direction of Maximum Radiation of Earth Stations in Certain Bands Shared with Stations in the Fixed or Mobile Service

1. The e.i.r.p. transmitted in any direction towards the horizon by an earth station shall not exceed the following limits except as provided in paragraphs 3 or 4:

a. in frequency bands between 1 GHz and 15 GHz

+ 40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+ $40 + 3\theta$ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$; and

b. in frequency bands above 15 GHz

+ 64 dBW in any 1 MHz band for $\theta \leq 0^\circ$

+ $64 + 3\theta$ dBW in any 1 MHz band for $0^\circ < \theta \leq 5^\circ$;

where θ is the angle of elevation of the horizon viewed from the centre of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

2. For angles of elevation of the horizon greater than 5° there shall be no restriction as to the e.i.r.p. transmitted by an earth station towards the horizon.

3. As an exception to the limits given in paragraph 1, the e.i.r.p. towards the horizon for an earth station in the space research service (deep space) shall not exceed +55 dBW in any 4 kHz band in frequency bands between 1 GHz and 15 GHz, or +79 dBW in any 1 MHz band in frequency bands above 15 GHz.

4. The limits given in paragraphs 1 and 3, as applicable, may be exceeded by not more than 10 dB. However, when the resulting coordination area extends into the territory of another country, such increase shall be subject to

agreement by the administration of that country.

5. The limits given in paragraph 1 apply, where applicable, to the services and frequency bands indicated in Table 8.2.35 below for transmission by earth stations where the frequency bands are shared with equal rights with the fixed or mobile service:

Table: 8.2.35	
Frequency band	Services
1761-1842	Fixed-satellite
2 025-2 110 MHz	Earth-exploration-satellite
7 900-7 975 MHz	Meteorological-satellite
8 025-8 400 MHz	Mobile-satellite
	Space operation
	Space research

6. Earth Stations Operating in the 1610-1626.5 MHz Band

a. In accordance with No. 5.364 of the RR:

A mobile earth station operating in either the mobile-satellite service or radiodetermination-satellite service in the band 1610-1626.5 MHz shall not produce a peak e.i.r.p. density in excess of -15 dB(W/4 kHz) in the part of the band used by systems operating in accordance with the provisions of No. 5.366 (airborne electronic aids to air navigation and any directly associated ground-based or satellite-borne facilities) unless agreed by affected administrations.

In the part of the band where such systems are not operating, the mean e.i.r.p. density of a mobile earth station shall not exceed -3 dB(W/4 kHz).

b. The e.i.r.p. transmitted in any direction by an earth station in the radiodetermination-satellite service in the band 1610-1626.5 MHz shall not exceed -3 dBW in any 4 kHz band.

7. Earth station antennas shall not be employed for transmission at elevation angles of less than 3° measured from the horizontal plane to the direction of maximum radiation, except when agreed to by agencies or administrations concerned and those whose services may be affected. In case of reception by an earth station, the above value shall be used for coordination purposes if the operating angle of elevation is less than that value.

8. As an exception to paragraph 7, earth station antennas in the space research service (near Earth) shall not be employed for transmission at elevation angles of less than 5°, and earth station antennas in the space research service (deep space) shall not be employed for transmission at elevation angles of less than 10°, both angles being those measured from the horizontal plane to the direction of maximum radiation. In the case of reception by an earth station, the above values shall be used for coordination purposes if the operating angle of elevation is less than those values.

9. Earth Station Off-axis Power Limitations. The level of (e.i.r.p.) emitted by the earth station at angles in the direction the geostationary-satellite orbit off the mainbeam axis has a significant impact of interference caused to other geostationary satellite networks. Enhanced utilization of the geostationary-satellite orbit and easier coordination would be attained by minimizing such off-axis radiation and administrations are encouraged to achieve the lowest value practicable bearing in mind the latest studies, e.g, ITU-R Recommendations. Minimizing such levels is particularly important in intensively used uplink bands.

8.2.36 Power Flux-Density Limits

1. Limits at the Surface of the Earth from Space Stations

a. The power flux-density at the surface of the Earth produced by emissions from a space station, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limit given in Table 8.2.36. The limit relates to the power flux-density which would be obtained under assumed free-space propagation conditions and applies to emissions by a space station of the service indicated where the frequency bands are shared with equal rights with the fixed or mobile service, unless otherwise stated.

Table: 8.2.36 (Section 1)					
Frequency Band	Service	Limit in dB(W/m ²) for Angle of Arrival (δ) Above the Horizontal Plane			Reference Bandwidth
		0°- 5°	5°- 70°	70°- 90°	
410-420 MHz	Space Research (S-S) (Limited to communications)	-153	-153 + 0.077 (δ - 5)	-148	4 kHz

	within 5 km of an orbiting manned space vehicle, see No. 5.268)				
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Table: 8.2.36 (Section 2)

Frequency Band	Service	Limit in dB(W/m ²) for Angle of Arrival (δ) Above the Horizontal Plane			Reference Bandwidth
		0°- 5°	5°- 25°	25°- 90°	
460 - 470 MHz	Earth Exploration-Satellite (S-E) allocation, see US201)	-152			4 kHz
1670 - 1700 MHz	Earth Exploration-Satellite Meteorological-Satellite	-133 (Value based on sharing with meteorological aids service)			1.5 MHz
1670 - 1690 MHz ³⁾	Space Research (S-E)(S-S)	-154 ²⁾	-154 + 0.5 ($\delta - 5$) ²⁾	-144 ²⁾	4 kHz
1690 - 1700 MHz (Nos. 5.381 and 5.382)	Space Operation (S-E)(S-S)				
1700 - 1710 MHz	Earth Exploration-Satellite (S-E)(S-S)				
1761-1842 MHz ⁵⁾ (See G42)					
2025-2110 MHz ^{5),6)}					
2200-2300 MHz					
7250-7850 MHz	Fixed-Satellite (S-E) Meteorological-Satellite (S-E) Mobile-Satellite	-152	-152 + 0.5 ($\delta - 5$)	-142	4 kHz
8 025-8500 MHz	Earth Exploration-Satellite (S-E) Space Research (S-E)	-150	-150 + 0.5 ($\delta - 5$)	-140	4 kHz
13.4-14.05 GHz ⁵⁾	Space Research (Secondary allocation)	-152			4 kHz
14.5-15.35 GHz	Space Research (14.5-14.8 GHz is a secondary allocation)	-124	-124 + 0.5 ($\delta - 5$)	-114	1 MHz
17.8-19.7 GHz ¹⁾	Fixed-Satellite (S-E) (geostationary-satellite orbit and NGSO constellation of 50 or fewer satellites)	-115 ^{7) 8)}	-115 + 0.5 ($\delta - 5$) ^{7) 8)}	-105 ^{7) 8)}	1 MHz
17.8-19.3 GHz	Fixed-Satellite (S-E) (geostationary-satellite orbit and NGSO constellation of 51 or more satellites)	-115-X ^{4) 8)}	-115-X + ((10+X)/20) ($\delta - 5$) ^{4) 8)}	-105 ⁸⁾	1 MHz
18.6-18.8 GHz	Fixed-Satellite (S-E)	-95 This limit may be exceeded by up to 3 dB for no more than 5% of this time. (Value based on sharing with Earth exploration-satellite (passive) service and space research (passive) service. (See US255))			200 MHz
19.3 - 19.7 GHz ¹⁾ 22.55 - 23.55 GHz 24.45 - 24.75 GHz 25.25 - 27.5 GHz	Earth Exploration-Satellite (S-E) Inter-Satellite Space Research (S-E)	-115	-115 + 0.5 ($\delta - 5$)	-105	1 MHz
31.0-31.3 GHz	Space Research (see No. 5.544)	-115	-115 + 0.5($\delta - 5$)	-105	1 MHz
31.8-32.3 GHz	Space Research	-120 ⁹⁾	-120 + 0.75($\delta - 5$) ⁹⁾	-105 ⁹⁾	1 MHz

Table: 8.2.36 (Section 2)					
Frequency Band	Service	Limit in dB(W/m ²) for Angle of Arrival (δ) Above the Horizontal Plane			Reference Bandwidth
		0°- 5°	5°- 25°	25°- 90°	
35.5-36 GHz	Earth Exploration-Satellite (Active) Space Research (active) (see No. 5.549A)	The mean power flux-density at the Earth's surface, generated by any spaceborne sensor, for any angle greater than 0.8° from the beam centre shall not exceed -73.3 dB(W/m ²) in this band			
37.0-38.0 GHz	Space Research (non-geostationary-satellite orbit)	-120 ⁹⁾	-120 + 0.75 ($\delta - 5$) ⁹⁾	-105	1 MHz
37-38 GHz	Space research (geostationary-satellite orbit)	-125	-125 + ($\delta - 5$)	-105	1 MHz
39.5-40 GHz	Fixed-satellite (non-geostationary-satellite orbit) Mobile-satellite (non-geostationary-satellite orbit)	-120 ^{10) 11)}	-120 + 0.75($\delta - 5$) ^{10) 11)}	-105 ^{10) 11)}	1 MHz
39.5-40 GHz	Fixed-satellite (geostationary-satellite orbit) Mobile-satellite (geostationary-satellite orbit)	-127 ¹¹⁾	5°-20° -127 + (4/3) ($\delta - 5$) ¹¹⁾ 20°-25° -107 + 0.4 ($\delta - 20$) ¹¹⁾	-105 ¹¹⁾	1 MHz
40-40.5 GHz	Fixed-satellite	-115	-115 + 0.5 ($\delta - 5$)	-105	1 MHz
40.5-42 GHz	Fixed-satellite (non-geostationary-satellite orbit) Broadcasting-satellite (non-geostationary-satellite orbit)	-115 ^{10) 11)}	-115 + 0.5 ($\delta - 5$) ^{10) 11)}	-105 ^{10) 11)}	1 MHz
40.5-42 GHz	Fixed-satellite (geostationary-satellite orbit) Broadcasting-satellite (geostationary-satellite orbit)	-120 ¹⁰⁾	5°-15° -120 + ($\delta - 5$) ¹⁰⁾ 15°-25° -110 + 0.5 ($\delta - 15$) ¹⁰⁾	-105 ¹⁰⁾	1 MHz
48.2-48.54 GHz 49.44-50.2 GHz	Fixed-Satellite (geostationary-satellite orbit)	The power flux-density in the band 48.94-49.04 GHz produced by any geostationary space station in the fixed-satellite service (space-to-Earth) operating in the bands 48.2-48.54 GHz and 49.44-50.2 GHz shall not exceed -151.8 dB(W/m ²) in any 500 kHz band at the site of any radio astronomy station. (See No. 5.555B)			500 kHz
54.25-56.9 GHz 56.9-57 GHz 57-58.2 GHz 59-59.3 GHz	Inter-Satellite (geostationary-satellite orbit)	The single-entry power flux-density at all altitudes from 0 km to 1000 km above the Earth's surface produced by a space station, for all conditions and for all methods of modulation, shall not exceed -147 dB(W/(m ² · 100 MHz)) for all angles of arrival. (see No. 5.556A and G128) (Value based on sharing with NGSO space research (passive) and Earth exploration-satellite (passive) services)			100 MHz
116-122.25 GHz	Inter-Satellite (geostationary-satellite orbit)	The single-entry power flux-density produced by a space station, for all conditions and for all methods of modulation, at all altitudes from 0 km to 1000 km above the Earth's surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed -148 dB (W/m ² · MHz)) for all angles of arrival. (see No. 5.562C) (Value based on sharing with GSO and NGSO space research (passive) and Earth exploration-satellite (passive) services)			1 MHz

Table: 8.2.36 (Section 2)					
Frequency Band	Service	Limit in dB(W/m ²) for Angle of Arrival (δ) Above the Horizontal Plane			Reference Bandwidth
		0°- 5°	5°- 25°	25°- 90°	
174.8-182 GHz	Inter-Satellite (geostationary-satellite orbit)	The single-entry power flux-density produced by a space station, for all conditions and for all methods of modulation, at all altitudes from 0 to 1000 km above the Earth’s surface and in the vicinity of all geostationary orbital positions occupied by passive sensors, shall not exceed -144 dB(W/(m ² · MHz)) for all angles of arrival. (Value based on sharing with GSO and NGSO space research (passive) and Earth exploration-satellite (passive) services)			1 MHz

¹⁾ The equality of right to operate when a frequency band is allocated in different regions to different services of the same category is established in No. 4.8. Therefore, any limits concerning inter-regional interference which may appear in ITU-R Recommendations should, as far as practicable, be observed by administrations.

²⁾ These power flux-density values are derived on the basis of protecting the fixed service using line-of-sight techniques. Where a fixed service using tropospheric scatter operates in the bands listed in the first column and there is insufficient frequency separation, there must be sufficient angular separation between the direction to the space station and the direction of maximum radiation of the antenna of the receiving station of the fixed service using tropospheric scatter, in order to ensure that the interference power at the receiver input of the fixed-service station does not exceed -168 dBW in any 4 kHz band.

³⁾ These values are applicable where this band is shared with equal rights with meteorological aids service.

⁴⁾ X is defined as a function of the number of satellites, n, in an NGSO constellation as follows:

For $n \leq 288$, $X = (5/119) (n - 50)$ dB; and

For $n > 288$, $X = (1/69) (n + 402)$ dB.

⁵⁾ The limits set forth in this table are applicable to the Space Transportation System and the Tracking and Data Relay Satellite System or any satellites or spaceborne radiocommunication transmitters associated with these systems. See IRAC Doc. 22860.

⁶⁾ Limits may be exceeded by 3 dB in the U.S., see IRAC Doc. 22860.

⁷⁾ These limits apply to emissions of a geostationary space station in the meteorological-satellite service.

⁸⁾ See US334.

⁹⁾ During the launch and near-Earth operational phase of deep-space facilities, non-geostationary satellite systems in the space research service shall not exceed a power flux-density value of:

-115 dB(W/m²) for $\delta < 5^\circ$

-115 + 0.5 ($\delta - 5$) dB(W/m²) for $5^\circ \leq \delta \leq 25^\circ$

-105 dB(W/m²) for $\delta > 25^\circ$

in any 1 MHz band, where δ is the angle of arrival above the horizontal plane.

¹⁰⁾ The values given in this table entry shall apply to emissions of space stations of non-geostationary satellites in systems operating with 99 or fewer satellites. Further study concerning the applicability of these values is necessary in order to apply them to systems operating with 100 or more satellites.

¹¹⁾ When addressing the sharing conditions between the fixed service and the fixed-satellite service in the bands 39.5-40 GHz and 40.5-41 GHz, the power flux-density at the Earth's surface from any FSS satellite should be no greater than the level(s) required to meet the FSS link availability and performance objectives of the subject applications, taking into account the technical and operational requirements of the overall design of the satellite network. In any case, the levels shall not exceed the applicable power flux-density limits in Table 8.2.36.

b. The limits given in Table 8.2.36 may be exceeded on the territory of the US&P subject to NTIA approval or of any country whose administration has so agreed.

2. Radio Astronomy in the Shielded Zone of the Moon

a. The shielded zone of the Moon comprises the area of the surface of the Moon and an adjacent volume of space which are shielded from emissions originating within a distance of 100000 km from the center of the Earth.

b. In the shielded zone of the Moon emissions causing harmful interference to radio astronomy observations and to other users of passive services shall be prohibited in the entire frequency spectrum except in the following bands:

(1) the frequency bands allocated to the space research service using active sensors;

(2) the frequency bands allocated to the space operation service, the Earth exploration-satellite service using active sensors, and the radiolocation service using stations on spaceborne platforms, which are required for the support of space research, as well as for radiocommunications and space research transmissions within the lunar shielded zone.

c. The level of harmful interference is determined by agreement between the administrations concerned, with the guidance of the relevant ITU-R Recommendations.

d. In frequency bands in which emissions are not prohibited by sub-paragraphs (a)-(c), radio astronomy observations and passive space research in the shielded zone of the Moon may be protected from harmful interference by agreement between administrations concerned.

8.2.37 Control of Interference between Geostationary-Satellite Systems and Non-Synchronous Inclined Orbit-Satellite Systems

1. Non-geostationary space stations shall cease or reduce to a negligible level their emissions, and their associated earth stations shall not transmit to them, whenever there is unacceptable interference¹⁰ to geostationary-satellite space systems in the fixed-satellite service operating in accordance with these regulations.

2. Whenever the emissions from geostationary satellites in the inter-satellite service operating in the bands 22.55-23.55, 24.45-24.75, and 25.25-27.5 GHz are directed towards space stations at distances from Earth greater than that of the geostationary-satellite orbit, the boresight of the antenna mainbeam of the geostationary satellite shall not be pointed within 15° of any point on the geostationary-satellite orbit.

3. In the frequency band 8025-8400 MHz, which the Earth exploration-satellite service using non-geostationary satellites shares with the fixed-satellite service (Earth-to-space) or the meteorological-satellite service (Earth-to-space), the maximum power flux-density produced at the geostationary-satellite orbit by any Earth exploration-satellite service space station shall not exceed -174 dB(W/m²) in any 4 kHz band.

8.2.38 Station Keeping of Space Stations

1. Space stations on geostationary satellites shall have the capability of maintaining their positions within the tolerance specified. In the case of space stations on board geosynchronous satellites with circular orbits having an angle of inclination greater than 5 degrees, the positional tolerance shall relate to the nodal point.

2. Space stations on board geostationary satellites which use any frequency band allocated to the fixed-satellite service or the broadcasting-satellite service:¹¹

a. shall have the capability of maintaining their positions within 0.1 degrees of the longitude of their nominal positions;

b. shall maintain their positions within 0.1 degree of longitude of their normal positions; but

c. experimental stations on board geostationary satellites need not comply with a) or b) above, but shall maintain their positions within 0.5 degree of longitude of their nominal positions;

d. however, space stations need not comply with b) or c) above, as appropriate, as long as the satellite network to which the space station belongs does not cause unacceptable interference to any other satellite network whose space station complies with the limits given in b) and c) above.

3. Space stations on board geostationary satellites which do not use any frequency band allocated to the FSS or the broadcasting-satellite service:

a. shall have the capability of maintaining their positions within 0.5 degree of longitude of their nominal positions;

b. shall maintain their positions within 0.5 degree of longitude of their nominal positions; but

c. need not comply with b) above as long as the satellite network to which the space station belongs does not cause unacceptable interference to any other satellite network whose space station complies with the limits given in b) above.

4. Space stations¹² on board geostationary satellites which are put into service prior to 1 January 1987, with advance publication information for the network having been published before 1 January 1982, are exempted from

¹⁰ The level of accepted interference shall be fixed by agreement between the administrations/agencies concerned, using the relevant ITU-R Recommendations as a guide.

¹¹ Space stations in the broadcasting-satellite service on geostationary satellites operating in the band 11.7-12.7 GHz are exempted from these provisions but shall maintain their positions in accordance with Appendix 30 of the ITU Radio Regulations.

¹² Transmitting antennas of space stations in the broadcasting-satellite service operating in the band 11.7-12.7 GHz are not subject to these provisions but shall maintain their pointing accuracy in accordance with Section 3.14.1 of Annex 5 to Appendix 30 of the Radio Regulations.

provisions of paragraph 2 above; however, they:

- a. shall have the capability of maintaining their positions within 1 degree of the longitude of their nominal positions; but efforts should be made to achieve a capability of maintaining their positions at least within 0.5 degree of the longitude of their nominal positions;
- b. shall maintain their positions within ± 0.1 degree of the longitude of their nominal positions; but
- c. need not comply with b) above as long as the satellite network to which the space station belongs does not cause unacceptable interference to any other satellite network whose space station complies with the limits given in b) above.

8.2.39 Pointing Accuracy of Antennas on Geostationary Satellites

1. The pointing direction of maximum radiation of any earthward beam of antennas (intended for less than Earth coverage) on geostationary satellites shall be capable of being maintained within:
 - a. 10% of the half power beamwidth relative to the nominal pointing direction or
 - b. 0.3 degree relative to the nominal pointing direction, whichever is greater.¹²
2. In the event that the beam is not rotationally symmetrical about the axis of maximum radiation, the tolerance in any plane containing this axis shall be related to the half power beamwidth in that plane.
3. This accuracy shall be maintained only if it is required to avoid unacceptable interference¹² to the other systems.

8.2.40 Space Research in Bands Other Than Those Allocated to the Space Research Service

In carrying out space developmental responsibilities, it is necessary and desirable that NASA conduct research by and on space techniques, especially in bands allocated to the various space services. Thus NASA may find it necessary to propose satellite research in various federal and non-federal bands. In general, assignments to space research space and earth stations will be experimental, i.e., on a non-interference basis to operational systems in accordance with the Table of Frequency Allocations.

8.2.41 Space Systems Using Necessary Bandwidths Greater Than 5 MHz for Transmissions from Space in the Band 2200-2290 MHz

1. In the band 2200-2290 MHz, space-to-Earth and space-to-space operations should make use of transmissions that have necessary bandwidths constrained to no more than 5 MHz. For transmissions that require necessary bandwidths of greater than 5 MHz, the requesting agency shall submit justification on why a bandwidth exceeding 5 MHz is necessary; furthermore agencies are to explain why the radiocommunications requirement cannot be satisfied through use of transmissions using less bandwidth, i.e., 5 MHz or less, e.g., through use of more spectrally efficient modulation. Spread spectrum missions (e.g., space-to-Tracking and Data Relay Satellite, communications and lunar downlink, and lunar data relay satellite communications) that enable multiple users on the same channel and require a necessary bandwidth of approximately 6.16 MHz are exempt from this policy.

2. Agencies intending to use wide necessary bandwidths are to submit justification for the wide bandwidths to the Spectrum Planning Subcommittee, whenever the bandwidths of transmissions in the band 2200-2290 MHz from space stations exceed 5 MHz. The information will be subject to SPS review in association with requests for certification of spectrum support for such systems, in accordance with direction contained Chapter 10 of the NTIA Manual. Specific data requirements are contained in Section 10.8.2A of this manual.

8.2.42 Wildlife and Ocean Buoy Tracking and Telemetry

1. Pursuant to footnote US210 to the National Table of Frequency Allocations, the use of frequencies in the bands 40.66-40.70 and 216-220 MHz may be authorized to U.S. federal and non-federal stations on a secondary basis for the tracking of, and telemetry of scientific data from, ocean buoys and wildlife, subject to the following conditions:

- a. Airborne wildlife telemetry in the band 216-220 MHz will be authorized in only the 216.0-216.1 MHz portion of the band. After January 1, 2002, no new assignments shall be authorized in the band 216-217 MHz.
- b. All transmitters shall be FCC type accepted, or the equivalent, as specified in 47 CFR 90.248.
- c. Classes of emission shall be limited to N0N, A1D, A2D, F1D, F2D, F9D.

- d. Occupied bandwidth shall not exceed 1 kHz.
 - e. Maximum carrier power shall not exceed 1 milliwatt for airborne wildlife applications, 10 milliwatts for terrestrial wildlife applications, and 100 milliwatts for ocean buoys.
 - f. In the band 216-220 MHz, the carrier frequency shall be maintained within 0.005 percent of the assigned frequency.
 - g. In the band 40.66-40.70 MHz, the bandwidth required for frequency tolerance plus the occupied bandwidth of any emissions must be adjusted so as to be confined within this band, except as permitted by paragraph h below.
 - h. The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:
 - (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 decibels;
 - (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 decibels;
 - (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: at least 43 plus $10 \log_{10}$ (mean output power in watts) decibels or 80 decibels, whichever is the lesser attenuation.
2. Wildlife telemetry in the 162-174 MHz band are authorized on a unprotected, non-interfering basis for the tracking of, and the telemetering from, wildlife. Multiple agency operations will be conducted under a Memorandum of Agreement between cooperating agencies and subject to the following conditions:
- a. Radio frequency assignments on specific operational frequencies are maintained in the GMF.
 - b. Class of emission shall be limited to VID.
 - c. Authorized bandwidth shall not exceed 1 kHz.
 - d. Maximum carrier power shall not exceed 10 mW.
 - e. The carrier frequency shall be maintained within 0.003 percent of the assigned frequency.

8.2.43 Frequency Assignments to Transportable Earth Stations in the 7300-7750 and 8025-8400 MHz Bands

Frequency assignments to transportable earth stations in the bands 7300-7750 and 8025-8400 MHz will be on a temporary/renewable basis with an expiration date not to exceed five years. These assignments may be used over a small geographical area, normally this area will not be in excess of radius of 48 kilometers from the assignment location. Operations within the confines of this geographical area may be restricted if such operations are in conflict with existing uses in the band. These area assignments may be further restricted if new requirements for authorized services indicate such restrictions are required in order to provide for compatible operations. In addition, those assignments for transportable operations (Special Note S362) in the bands 7300-7750 and 8025-8400 MHz shall bear the Special Note S370 (See Annex A).

8.2.44 Launch Vehicles Telemetry

Launch vehicles are hybrid vehicles used to transport objects, including spacecraft, beyond the Earth's atmosphere, either into orbit around the Earth or to some other destination in outer space. The telemetry system on the first stage of a launch vehicle is considered an aeronautical mobile system as it starts from the ground and ascends until the second stage and or any other upper stages of the rocket is engaged. Launch vehicles,

1. During the first stage of a launch (first 15 minutes of the flight) operate in the aeronautical mobile service and with the MOEB (Flight Telemetry Mobile) station class subject to the telemetering plan in Section 4.3.4 of the NTIA Manual.
2. During the second stage or higher stages of a launch, operate in the space operation service with an ET (space) station class or an ER station class for space telemetering. In the band 2200-2290 MHz, such systems are also subject to Section 8.2.41 of the NTIA Manual.

8.2.45 Frequency Assignments to Mobile Stations in Certain Frequency Bands Shared with Passive Sensors

Remote sensing operations conducted in the Earth Exploration-Satellite Service (passive) and the Space Research Service (passive) can be disrupted if interference power level arriving at the sensor approaches the level

of natural radiation being measured by the sensor. Mobile systems have the potential for creating an interference environment which could make sharing with passive sensors difficult. Therefore, although US263 provisions apply, agencies requesting frequency assignments for mobile stations operating with transmitter powers in excess of 2 watts will consider other mobile bands to meet the required operation before assignments are requested in the following bands:

21.2-21.4 GHz 22.21-22.5 GHz 36-37 GHz 56.26-58.2 GHz

8.2.46 Radiolocation Operations in the Band 15.7-17.3 GHz

Airborne radars, except those authorized before January 1983, shall have the capability to cease operation in the 15.7 to 16.2 GHz band when within a minimum distance of the airport surface detection equipment (ASDE) determined for each new airborne radar system when NTIA certifies spectrum support for that system.

8.2.47 Shared Federal/Non-Federal Radio Systems

The term "shared system" as used in this section means a radio system using one or more frequencies authorized by the NTIA and one or more frequencies licensed by the FCC. "Agreement" or "Agreements," as specified in this section refer to Memorandums or Letters of Understanding or Agreement between federal agencies and non-federal partners. Shared systems may be authorized under the following conditions (Operations conducted under Section 7.3.6 or Section 7.12 of the Manual, which allow a federal radio station to utilize any frequency authorized to a non-federal radio station under specified conditions, are exempt from this policy.). The federal agencies signing the agreement shall:

a. prior to signing any agreement, submit to the IRAC, for information and planning purposes, a copy of any agreement which has been coordinated between the parties to the agreement. The Agreement shall state that it is contingent on NTIA's approval of any supporting certifications, authorizations, or modifications. The Agreement shall contain conditions for the return of frequencies authorized by NTIA in the event that NTIA determines that: the frequencies can no longer be made available for non-federal use, all federal participants withdraw from the shared system, or the return is required for convenience of the government.

b. obtain spectrum certification from NTIA prior to requesting authorization for frequency assignments from NTIA.

c. in accordance with the procedures specified in Chapter 10, submit a request for system review to the Spectrum Planning Subcommittee (SPS) for the proposed shared system and obtain NTIA Certification of Spectrum Support. The following information shall be submitted to the SPS: In accordance with Section 10.1.3 of this manual, a request for certification of spectrum support for the proposed system; a frequency plan for federal spectrum access requirements; and a copy of the signed agreement between the requesting federal agency and the non-federal system partner. If equipment to be used by the federal agencies has already been certified, it is sufficient to provide the SPS numbers of the certifications in lieu of detailed equipment characteristics. Upon receipt of NTIA certification, agencies may submit requests for permanent frequency assignments or modification to existing assignments to support the shared system.

d. apply for frequency authorizations in accordance with Chapter 9 of this Manual. In addition, federal agencies:

(1) shall obtain authorizations from NTIA for all frequencies (regardless of the frequency band) that will be used by federal stations;

(2) may request authorization for a band assignment vice discrete frequency assignments for spectrum used by the shared system and allocated for non-federal use, e.g., 150.8-162.0125 MHz;

(3) shall make the non-federal partner aware that, in order to have access to spectrum allocated to the Federal Government, the non-federal partner must obtain an FCC license through the normal FCC licensing process (this application will be coordinated by the FCC through the Frequency Assignment Subcommittee); and

(4) shall include in their proposals:

(i) Remarks line that shows the joint operations by the agency, non-federal, and other agencies:

Example: REM05 *JNT,I , NG , J , A , DHS

(ii) Information in the supplementary details identifying the agreement reached between the federal agency(ies) and non-federal partners:

Example: SUP01 DOI and Wyoming Agreement 6 Dec 2006

(iii) Special Note S402:

NTS01 S402

(iv) *NTS, M015 entry with the IRAC and SPS document numbers for this system:

Example: REM07 *NTS,M015,IRAC 33221/4,SPS 13928/4

(v) Paired frequency data referencing the system-wide FCC spectrum band assignment:

Example: REM03 *PRD,M150.8000,I 080001

(vi) Supplementary remarks listing each maritime frequency or two digit maritime channel number used, if maritime frequencies are included in a band assignment:

Example: SUP02 Marine Channel XX included in band assignment

(vii) When a band assignment is used for spectrum allocated for non-federal use, the assignment must list the individual frequencies in the supplementary details or reference an FAS document that contains the individual frequencies in the circuit remarks M001 entry:

Examples:

SUP01 FCC licensed frequencies in use, MXXX.XXXX,

REM05 *NTS, M001,FAS,XXXXXX

e. have (1) an assignment for each frequency which is allocated on a primary basis for federal use; and (2) individual assignments or a band assignment for operations allocated on a non-primary basis for federal use.

f. ensure that the non-federal partner has FCC licenses for operations on frequencies which are allocated on a primary basis for federal use.

8.2.48 Trunked Land-Mobile Radio Systems

1. Trunked land-mobile radio systems may be established in any frequency band allocated for federal use on a primary basis for the fixed and mobile services. Accommodating a trunked system requires consolidation of existing land mobile systems by the applicant(s) unless they present justification.

2. Trunked land-mobile radio systems may be established by an individual agency or cooperatively by several agencies. Innovative methods of using commercial entities to design and operate trunking systems under sponsorship of one or more federal agencies are encouraged. Frequency assignments for shared trunked land-mobile radiocommunication systems shall be obtained by the installing, sponsoring or lead agency which is responsible for managing the system. Individual user agencies are not required to obtain frequency assignments to share the system if operated in accordance with provisions of Paragraph 4, Section 9.1.2.

3. Trunked land mobile systems will be submitted to the Spectrum Planning Subcommittee for system review prior to application for frequency assignment. This system review is based on the need to consider the system as a whole, which is not possible with the unconnected and separate frequency proposals made to the FAS. Data requirements for SPS submission are contained in Section 10.9.

4. Federal agencies managing trunked systems shall allow access to the trunked systems by other agencies where such access is technically and operationally feasible.

8.2.48A Land Mobile Radio Communications

1. Federal Government agencies implementing new land mobile communication systems and replacing aging

ones should use available commercially offered land mobile services, or share land mobile services operated by other federal, state or local government agencies whenever possible. When commercial or shared systems are unavailable, their use would not meet mission requirements, would cause unacceptable delays or disruptions, or would cost more than operating their own system, federal agencies may operate their own spectrum-efficient, cost-effective systems.

2. The provisions in paragraphs 8.2.48A, 3 to 6 apply to land-mobile systems operating in frequency bands above 30 MHz. Systems defined as tactical and training as explained in Section 8.2.12 are not included, however, those supporting training operations are included.

3. Agencies seeking to operate their own new land-mobile radiocommunication systems shall, before obtaining frequency assignment authorizations, establish and document their requirements. Agencies should first conduct a requirements analysis commensurate with the size and complexity of their need. Using the results of the requirements analysis as the basis, agencies shall conduct an analysis of alternatives to operating their own land mobile system commensurate with the size and complexity of the requirement to identify the most advantageous alternative to the government. The analysis should address the use of NTIA-authorized trunked land mobile communication systems operated by other agencies or commercial services providers, and commercially offered land mobile radio services to determine their ability to meet mission requirements. This analysis shall be documented and retained by the submitting agency.

4. As a function of their oversight responsibility, NTIA will review authorization requests for selected land mobile systems prior to radio frequency authorization and may require the agency to submit the retained analysis documentation. On a case-by-case basis, NTIA may require additional information including written technical details on the analysis undertaken by the applicant agency.

5. All requests for frequency assignments to support federally owned and operated conventional or trunked land mobile radio systems within 30 km of an existing NTIA-authorized trunked land-mobile system, whether operated by a federal agency or a commercial vendor, shall be accompanied by a justification that indicates why use of the existing system could not meet agency requirements. The agency FAS representative will be the primary point of contact, unless another federal official is identified, for obtaining additional information regarding the selection of a separate system. Criteria for selecting a separate system include:

a. Communications services are required in areas where the existing system cannot provide service, its use would not meet mission requirements, would cause unacceptable delays or disruptions, or would cost more than operating a separate system.

b. The existing system cannot provide the type or quality of service required, its use would not meet mission requirements, would cause unacceptable delays or disruptions, or would cost more than operating a separate system.

c. A separate system is required to fill a gap in the existing system, which will be generally used to meet the applicant's requirements.

8.2.49 Reserved

8.2.50 Federal/Non-Federal Frequency Sharing in the 932-935 MHz and 941-944 MHz Bands

The bands 932-935 MHz and 941-944 MHz are shared by the federal and non-federal on a co-equal basis for the Fixed Service. Applications for assignments in these bands will be processed on a daily basis, and assignments will be made based on a first come, first-served basis. Therefore, if a non-federal application is filed one or more days before a federal application, the non-federal application will be granted. The converse therefore also applies. If a situation arises where federal and non-federal applications are filed on the same day for the same frequency to be used in the same geographic location (mutually exclusive applications), and agreements cannot be made to satisfy one or both applicants, then a joint lottery shall be held to determine whether the federal or non-federal entity shall be assigned the frequency.

8.2.51 Redeployment Requirement of Weather Radars

Within the bands 2700-2900 MHz and 5350-5650 MHz, conventional magnetron or coaxial magnetron output tubes used in WSR-57, WSR-74S, WSR-74C, AN/FPQ-21 and AN/FPS-77 weather radars have inherent spurious emission levels that may cause radio frequency interference to digital radio-relay microwave systems in the 3700-4200 MHz and 5925-6425 MHz range. Prior to redeployment of these weather radars by any federal agency, an RF waveguide filter which reduces the spurious emission levels by at least 40 dB shall be installed.

8.2.52 Federal Use of the Band 220-222 MHz

1. Frequencies in the 220-222 MHz band are available for land mobile use for both federal and non-federal operations. This section sets out the policies and procedures governing the authorization and use of federal systems operating in the 220-222 MHz band.

2. All federal systems operating in this band will be submitted to the Spectrum Planning Subcommittee for systems review under the provisions of Chapter 10 prior to submission of requests for frequency assignment.

3. As set forth in Section 4.3.15, 2 blocks of 5 contiguous channel pairs have been set aside for exclusive federal use in the development of nationwide systems and 140 channel pairs set aside for shared federal and non-federal local use.

4. Each application for review of a system using a nationwide block must certify that within 10 years of receiving Certification of Spectrum Support from NTIA, the system will be fully constructed and all proposed channels in use. The application shall include a schedule for implementation of the system. The user shall file a systems progress report with the FAS and the SPS 2, 4, 6 and 10 years from the date of certification of spectrum support demonstrating compliance with the schedule. Failure to comply with the schedule will lead to forfeiture of existing assignments or curtailment of the Certification of Spectrum Support for use of the nationwide block of channels unless sufficient justification as to why a progress report was not submitted or schedule was not met.

5. Each application for review of a non-nationwide system shall include a schedule for implementation. The period for implementation shall normally be one year but extensions up to 3 years may be authorized upon full justification. The user shall file a systems progress report with the FAS and the SPS at the end of the implementation period approved in the Certification of Spectrum Support demonstrating compliance with the schedule. Failure to submit a progress report or comply with the approved schedule will lead to forfeiture of existing assignments or curtailment of the Certification of Spectrum Support unless sufficient justification as to why a progress report was not submitted or schedule was not met.

8.2.53 Tracking, Telemetry and Telecommand Operations

The tracking, telemetry, and telecommand operations of a satellite network shall have Stage 4 NTIA spectrum certification and frequency assignments with operational station class(es) before the launch of the spacecraft. Agencies may request exemption from this requirement for small satellite systems used for experimental purposes. Requests for such an exemption should be submitted to the SPS for review when requesting Stage 2 Certification of Spectrum Support. Upon recommendation of the SPS, NTIA will consider requests to exempt satellite systems from the requirement to obtain Stage 4 spectrum certification on a case-by-case basis. In deciding whether to waive the requirement, NTIA will consider such factors as the cost of the system; the frequencies to be used for the tracking, telemetry, and telecommand functions, along with the frequency and duration of transmissions; orbital parameters; the concept of operations for the system; and the duration of the mission. Agencies should understand that satellites that are placed into orbit without receiving Stage 4 Certification of Spectrum Support for the tracking, telemetry, and telecommand operations will operate on an unprotected, noninterference basis and will be issued only experimental frequency assignments.

8.2.54 Policy on the Use of the Frequency Bands Between 420 and 450 MHz by Range Safety Operations

Agencies may request frequency authorizations for range safety operations in the band 420-450 MHz for use on federal test ranges only. These frequency assignments normally are limited to 1 kW of mean transmit power. Requests for additional power must be coordinated with and agreed to by the FCC. Range safety operations at Vandenberg AFB, CA (to include Pillar Point AFS, CA and Laguna Peak Tracking Station, CA); White Sands Missile Range, NM; and Cape Canaveral AFS, FL (to include Jonathan Dickinson Missile Tracking Annex (JDMTA), FL) may be authorized up to 10 kW transmit power without FCC coordination.

8.2.55 Wideband and Narrowband Emission Level and Temporal Measurements in the Navstar Global Positioning System Frequency Bands

1. Federal agencies requesting Stage 4 Spectrum Certification for systems operating in the 390-413 MHz, and 960-1710 MHz frequency bands must provide measurements of the emission levels generated in the frequency bands

used by the Navstar Global Positioning System. The measurements of the wideband emission levels expressed in units of dBW/MHz and narrowband emission levels expressed in units of dBW are required in the 1164-1240 MHz and 1559-1610 MHz frequency bands.

2. For pulsed systems operating in the 390-413 MHz, and 960-1710 MHz frequency bands, measurements of the temporal characteristics of the emissions in the 1164.45-1188.45 MHz, 1215.6-1239.6 MHz, and 1563.42-1587.42 MHz bands can also be provided.

3. For systems operating in the subject frequency bands, this requirement will become effective on July 1, 2009. Systems already operational, procured prior to July 1, 2009, or submitted for review by the SPS prior to July 1, 2009 will be exempt from this requirement.

8.2.56 Aeronautical Use by Mobile Stations of Frequencies in the Bands 162.05-173.2, 173.4-174, and 406.125-420 MHz on an Exceptional Basis

Aircraft operations using this exception are operated occasionally and are not the primary use of the radio frequency operations. If a land or maritime mobile system is only used by aircraft on an exceptional basis, the authorization for the station should have a station class in the land mobile (ML) or maritime mobile (MS) service and the following provisions shall apply:

a. For the bands 162.0500-173.2, 173.4-174, and 406.1250-420 MHz, the transmitter output power should be the minimum required to provide the service, but must not exceed 10 watts.

b. The station class MA will not be entered on the GMF application since the operations are on an exceptional basis and are not protected.

c. These stations can only be operated within the coverage area of the associated land mobile or maritime mobile system and at a minimum altitude required to achieve satisfactory communications which should not exceed 3500 feet above ground level. This is required in order to reduce the potential of harmful interference to other users.

d. If interference is experienced by an authorized land or maritime station, the aircraft will cease transmissions immediately upon notification. It is the responsibility of the agency operating the aeronautical station to resolve any harmful interference that may be caused to other users. The radio astronomy service uses the band 406.1–410 MHz and is particularly susceptible to interference from airborne stations.

8.3 COORDINATION OF FREQUENCY USAGE

It is the responsibility of the agency proposing a new frequency assignment or a new radio station (transmitting or receiving), for which protection is desired from the operation of the same or other radio services, to ascertain from other agencies that may be involved whether harmful interference is likely to be caused to or from such proposed operations as a result of the established operations of those agencies.

8.3.1 Basic Coordination Arrangement Between the IRAC and the FCC

The arrangement described in Section 2.4 includes cooperation with respect to the coordination of frequency authorizations which would tend to cause interference to stations operations under the jurisdiction of the other party. With respect to the time agreed for review of frequency assignments requests, time periods less than 15 working days may apply as determined by the FAS.

8.3.2 Coordination of the Policy and Economic Aspects of Certain Federal Proposals to Use Non-Federal and Amateur Frequency Bands

1. As stated in Section 4.1.2, a federal frequency assignment may be authorized in a non-federal band provided the assignment is coordinated with the FCC.

2. Federal use of non-federal frequency bands may involve policy and economic, as well as technical, considerations. In order that coordination of each of these aspects may be achieved in the assignment of frequencies to federal radio stations, within the US&P, which contemplate a) the use of a non-federal or amateur band above 25000 kHz, or b) the use of one or more frequencies below 25000 kHz which, because of probable impact upon assignments by the FCC, warrants special attention, the following procedures should be observed:

a. New uses not provided for by Chapter 7 and not covered by existing agreements with the FCC:

(1) The federal agency concerned may coordinate the proposed assignment informally with the FCC.

(2) If the matter can be readily resolved and if the FCC indicates that formal policy coordination with the Commission is not required, the agency desiring the assignment will submit an application to the IRAC for processing in accordance with established procedures.

(3) Should there be a problem which cannot be resolved informally, or should the FCC indicate that formal policy coordination with the Commission is necessary, the matter will be referred to NTIA by the federal agency concerned for appropriate action.

(4) Upon satisfactory completion of coordination with the FCC, NTIA will inform the federal agency concerned of the results and, upon acceptance by that agency of any conditions involved, instruct the IRAC to process the application, when filed by that agency, in accordance with established procedures.

3. Proposed assignments provided for by Chapter 7 or those which are within the scope of existing agreements with the FCC:

a. The federal agency concerned will submit an application to the IRAC for processing in accordance with established procedures, supplemented, if appropriate, by advance informal coordination with the FCC.

4. These procedures notwithstanding, any federal agency may refer any such matters to NTIA whenever the agency considers it desirable to do so.

8.3.3 Coordination of Frequencies Used for Communication with Non-Federal Stations Licensed Under Part 90 of the FCC Rules

1. Provision is made in Section 7.12 for a federal radio station to use any frequency authorized to a non-federal radio station under 47 CFR, Part 90 of the rules of the FCC where such utilization is necessary for intercommunication with non-federal stations or required for coordination with non-federal activities, provided that, in the case of frequencies other than the non-federal National Interoperability Channels, a mutually-approved arrangement has been concluded between the federal agency concerned, the FCC, and the non-federal licensee involved.

2. Two steps are required to conclude a mutually-approved arrangement. The federal agency must obtain from the non-federal licensee a written certification that the federal operation is necessary, and, after receipt of the certification, the federal agency must coordinate the proposed usage with the FCC.

8.3.4 Coordination of Military Use of Non-Federal Bands at Test Ranges and for Tactical and Training Operations

See section 7.15.3 and section 7.17.

8.3.5 Intra-Military Coordination of Frequency Applications

1. U.S. Army, Navy, and Air Force dockets for the FAS agenda will have had complete military coordination and will normally be concurred in by the three military services at the FAS meetings.

2. If, due to unforeseen circumstances, it becomes necessary for one of the military services to request tabling of another military service's docket that appears on the regular agenda, the docket will be tabled. If there is no resolution at the next regular FAS meeting, the docket will be withdrawn unless the applicant requests referral to IRAC.

8.3.6 Coordination for the Use of Hydrologic Channels in the Bands 162-174 and 406.1-420 MHz

1. The frequencies shown in paragraph 1 of Section 4.3.3 are primarily for hydrologic operations. Federal agencies may also use these frequencies for non-hydrologic purposes when all other possibilities (except AGA(4) channels) have been exhausted, and when such use will not conflict with present or probable future hydrologic operations. Validation of hydrologic use by the Hydrology Coordinator must be accomplished prior to the submission of any hydrologic proposal into the frequency assignment process.

a. The Hydrology Coordinator. The Hydrology Coordinator under the Subcommittee on Hydrology of the Federal Interagency Advisory Committee on Water Information is responsible for validating the hydrologic use.

b. Preparing Proposals for Submission to the Hydrology Coordinator. A federal agency having a requirement to use a hydrologic channel, whether for hydrologic or non-hydrologic purposes, shall prepare a proposal as outlined in subparagraph a below. Additionally, if the frequency will be used to support hydrologic operations, the applicant

shall comply with the special instructions in subparagraph b; if for non-hydrologic operations, the applicant shall comply with the provisions of subparagraph c.

(1) General Instructions. All proposals for the use of hydrologic channels shall consist of the following basic elements:

(a) An Application for Frequency Assignment Action, completed in accordance with Section 9.8 of this Manual. All such applicants shall bear Record Note C075.

(b) A cover letter containing (at a minimum) the name, mailing address, and telephone number of the applicant.

(2) Instructions for Hydrologic Proposals. If the frequency is to be used for hydrologic purposes, the applicant shall provide the following additional information in either the cover letter, the Agency Remarks (*AGN) or Supplementary Details (SUP) fields of the application, or in a separate attachment to the proposal package:

(a) Type of station (i.e. relay, command, or sensing).

(b) Kind of data to be transmitted (e.g. river stage, precipitation, etc.).

(c) Type of transmission (i.e. voice, data, combination of voice and data, etc.)

(d) Operation schedule (e.g. on call, automatic for 15 minutes each hour, etc.).

(e) Latitude and longitude of the station.

(f) The name of the federal agency sponsoring this application, along with supporting documentation.

(3) Instructions for Non-Hydrologic Proposals. If the frequency is to be used for non-hydrologic purposes, the following instructions apply:

(a) Before deciding to use a hydrologic channel, the applicant must first go through the standard frequency selection process as described in the IRAC Supplement to the NTIA Manual:

--First choice shall be given to those frequencies which bear the applicant's own symbol;

--Second choice to those bearing the symbol AGA, except AGA(4) and AGA(8);

--Third choice to those bearing the symbol of another agency;

--Fourth choice to those bearing the symbol of AGA(8); and

--Fifth choice to those bearing the symbol of AGA(4).

(b) If the frequency is to be used exclusively in a point-to-point configuration (i.e. no mobile stations, either transmitting or receiving, are involved), the applicant shall include in the proposal a simplified network diagram showing how the frequency will be employed.

(4) *Instructions for Federal Agencies Sponsoring Non-Federal Entities.* Federal agencies may sponsor non-federal entities who want to use federal hydrologic frequencies. Non-federal entities' use of federal hydrologic frequencies on a secondary basis:

(a) The federal agency sponsoring a non-federal entity will provide a letter of endorsement that supports the hydrologic frequency usage. Qualified agencies include the Department of Commerce (i.e. the National Weather Service), the Department of the Interior (i.e. the U.S. Geological Survey), the Department of Agriculture (i.e. Forest Service), the Tennessee Valley Authority, and the U.S. Army Corps of Engineers.

(b) Non-federal entities who desire to operate stations on these frequencies obtain authorization from the FCC.

c. *The Coordination Process*

(1) *Submitting Proposals to the Hydrology Coordinator.* Submit the proposal and all required supporting documents in Portable Document Format (PDF) format electronically to: hydro.radio.freq@noaa.gov.

(2) *Hydrology Coordinator Review.* The Hydrology Coordinator reviews the proposed use and verifies the use of the frequency for hydrological purposes. The Hydrology Coordinator will email the applicant a letter of validation. The applicant will submit the proposal, this letter of validation, and all supporting documents into the frequency assignment process.

d. *Submitting Applications by the Federal Agencies to the FAS.* The requesting agency submits its Application for Frequency Assignment Action to the FAS after receipt of the letter of validation from the Hydrology Coordinator. Federal agencies will use their standard method to submit their applications for frequency assignments. (include in circuit remarks the date of the letter of validation and reference number.) Supporting documents required by the Hydrology Coordinator, such as maps and network diagrams, need not be submitted to the FAS. If the application appears on the FAS agenda before receipt of Hydrology Coordinator comments by the FAS Secretariat, the request will be tabled until the coordination process has been completed.

(1) *Non-Federal Applications.* The FCC shall ensure non-federal applications submitted to the FAS include the name or abbreviation (Annex G) of the sponsoring federal agency in the Circuit Remarks (*AGN) or SUP field.

(2) *Routine Modifications and 5-Year Reviews*. If the modification will appear on the routine FAS agenda, it need not be sent to the Hydrology Coordinator for re-coordination.

(3) *Significant Modifications*. If the modification will appear on the regular FAS agenda, the applicant will submit an Application for Frequency Assignment Action to the Hydrologic Coordinator. According to the nature of the modification, the coordinator will effect whatever coordination is considered necessary.

(4) *Wireless Microphone Systems*. Coordination with the Hydrology Coordinator is not required for wireless microphone systems using the channels listed in Section 4.3.2.

8.3.7 Coordination of Meteorological Aids Operations in the Bands 400.15-406 and 1668.4-1700 MHz

1. The characteristic frequency drift of radiosonde equipment and the requirement for flexibility in the operation of radiosondes preclude effective suballocation, channeling, or the granting of authority to use specific frequencies in the bands 400.15-406 and 1668.4-1700 MHz. The shared use of these bands corresponds essentially, for interference considerations, to shared use of a single nominal center band frequency assignment.

2. Interference to the meteorological aids service that can result in spoiled observations is, by the nature of the service and the resources usually available, inherently difficult to identify and locate.

3. Mutual interference is possible between radiosondes operating simultaneously within 160 kilometers of each other. Line-of-sight distance to the horizon is greater than 480 kilometers from a radiosonde at an altitude of 15 kilometers.

4. Since these bands are available for the use of all federal agencies responsible for the conduct of meteorological observations, each agency shall take appropriate measures to avoid interference through local coordination of specific operations if interference is indicated.

5. In application of allocation footnote US99, whenever it is necessary to operate radiosondes in the band 1668.4-1670 MHz within the U.S., notification of the operations shall be sent, as far in advance as possible, to the Division of Astronomical Sciences, National Science Foundation, 4201 Wilson Boulevard, Room 1045, Arlington, VA 22230, with a copy to the Executive Secretary, IRAC.

8.3.7A Coordination of Geostationary Operational Environmental Satellite Terrestrial Data Collection Platforms

Use of a Geostationary Operational Environmental Satellites (GOES) terrestrial Data Collection Platforms (DCP) in the band 401.7-402.4 MHz shall be coordinated and registered with the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) office of National Environmental Satellite Data Information Service (NESDIS). There are two satellites in operation to receive data from DCP: GOES East at 75.2 degrees, which uses odd numbered channels; and GOES West at 137 degrees, which uses even number channels. The satellites collect data from the DCP at set time intervals and relays information to a central processing center. NESDIS controls all time slots and operating collection codes.

Since NESDIS controls all operations, codes, time slots and assigns the frequencies to be used to avoid interference, it has determined that collecting data on each location site is not necessary. Therefore, each agency may register the use of the GOES ground transmitters as an area assignment (US, USA, USP or a state) for large systems or spot locations for small systems on each frequency used. Each assignment must have an entry in the notes field of S594. For area assignments a circuit remark entry of *NRM to indicate approximately how many transmitters are in the system and an additional note of S361 will be needed to indicate multiple transmitting stations in the system.

Agencies wishing to register a GOES data collection platform should contact NESDIS at the following address:

NOAA/NESDIS Office of Satellite and Product Operations

NOAA Satellite Operations Facility

4231 Suitland Road, Room 1646

Suitland, MD 20746

E-Mail: GOES.DCS@NOAA.GOV

8.3.8 Coordination of Radio Operations in the Vicinity of Fort Huachuca, Arizona

1. In order to minimize possible mutual harmful interference between electronic tests of the U.S. Army

Electronic Proving Ground (USAEPG), Fort Huachuca, Arizona, and the transmissions of federal radio stations located in the vicinity of Fort Huachuca, each agency having radio operations in the coordination zone given below shall notify the Area Frequency Coordinator, Fort Huachuca, or the Army IRAC Representative, of the frequency, power, location, and type emission of the radio operations. In addition, the local address and telephone contact of the office or persons supervising or operating such stations should be reported if applicable. Transmissions of mobile stations located within 24 kilometers of Fort Huachuca (31°31'48"N, 110°21'05"W) shall be minimized to the extent feasible.

2. The coordination zone is the area bounded by connecting lines running along Highway 80 from Tucson to Bisbee, due south from Bisbee to the international border, west along the border to a point due south of Dateland, due north to Dateland, along Highway 80 from Dateland to Gila Bend, and along Highway 84 from Gila Bend to Tucson (traffic on Highways 80 and 84 excluded).

3. For the protection of the USAEPG, signal levels should not exceed the following limits within 24 kilometers of Fort Huachuca:

10-540 kHz	20 millivolts per meter
540-1600 kHz	50 millivolts per meter
1.6-20 MHz	20 millivolts per meter
20-54 MHz	50 millivolts per meter
54-148 MHz	20 millivolts per meter
above 148 MHz	50 microvolts per meter

8.3.9 Coordination of Assignments to Stations (Other than Mobile and Transportable) to be Located in the National Radio Quiet Zone

1. The National Radio Quiet Zone (NRQZ) was established in IRAC Document 3867/2, March 26, 1958, subparagraph (a), for the protection of radio astronomy observations. The NRQZ encompasses an area of approximately 33,700 square kilometers of Virginia and West Virginia as shown on the map, Figure 1. This area encloses:

- a. The National Radio Astronomy Observatory site at Green Bank, Pocahontas County, West Virginia, and
- b. The Sugar Grove Research Station site at Sugar Grove, Pendleton County, West Virginia. The mission of Sugar Grove Research Station is to conduct communications research and development for the National Security Agency and other DOD organizations.

2. In order to minimize harmful interference to operations at the sites designated above, all requests for frequency assignments to stations within the area:

South of 39°15'N
North of 37°30'N
West of 78°30'W
East of 80°30'W

shall be coordinated by the applicant, prior to submission to NTIA with:

Director (Attn: Interference Office)
National Radio Astronomy Observatory
P.O. Box 2
Green Bank, WV 24944
Telephone 304-456-2107

Send by email to nrqz@nrao.edu all new applications and GMF modifications that may increase the potential of interference.

The National Radio Quiet Zone coordinator will reply to all coordination requests in approximately 30 days or less. All applications submitted to NTIA shall include in the supplementary remarks "NRQZ" followed by the NRQZ coordination number provided by the NRQZ coordinator, and the date that the NRQZ coordinator provided concurrence for the proposal. This supplementary information shall be included in the GMF entry for the authorization.

This procedure applies to all stations except mobile and transportable stations.

The reference coordinates for Green Bank are:

North latitude 38d 25m 59.2s (NAD83)

West longitude 79d 50m 23.4s (NAD83)

Height above terrain: 139.6 m

Terrain elevation above mean sea level (NAVD88): 806 m

Additional information about NRQZ and coordination is available at URL <http://www.gb.nrao.edu/nrqz>.

3. The Record Note C081 will be inserted in the NOTES (NTS) field on all such assignment requests. These assignment requests shall not be approved until notice of successful coordination has been received from the NRQZ coordinator.

8.3.10 Coordination of Assignments to Stations Located in the Vicinity of the U.S./Canada Borders

1. The U.S./Canada Agreement relating to the Coordination and Use of Radio Frequencies above 30 MHz provides for the coordination by the IRAC with the Canadian Department of Communications of certain frequency assignments. The text of the applicable portion of the Agreement is given in Section 3.4. This agreement, in many cases, contains multiple coordination channels, e.g., assignments in the bands 1215-1400 MHz, 2700-3700 MHz, and 8500-10500 MHz are indicated in the Index of the Technical Annex to the agreement as being coordinated between the JCS on the U.S. side and CDS on also indicated as being coordinated by FAA with DOT, Canada. To ensure that comments concerning proposals received from Canada under the terms of the Agreement take into consideration the comments of other authorized U.S. coordination agencies, the agency receiving proposals from Canada will coordinate its reply to Canada with all U.S. agencies also indicated in the agreement as a coordination agency for the band or portion of the band in which the proposed frequency is located.

8.3.11 Coordination of Frequency Usage Outside the US&P

1. To avoid harmful interference, federal agencies shall coordinate the use of frequencies by their stations located outside the US&P with the IRAC. Coordination ordinarily shall be limited to stations likely to cause harmful interference to those authorized by NTIA or the FCC. Coordination of the use of frequencies by military stations shall be subject to the requirements of military urgency and security. All U.S. Federal Government radio station operations in the Republic of Palau, Federated States of Micronesia or the Republic of the Marshall Islands shall be harmonized (coordinated) by the U.S. Competent Authority in accordance with Annex L. For operations of more than 30 consecutive days, upon agreement by the respective nation, entry in the GMF is required.

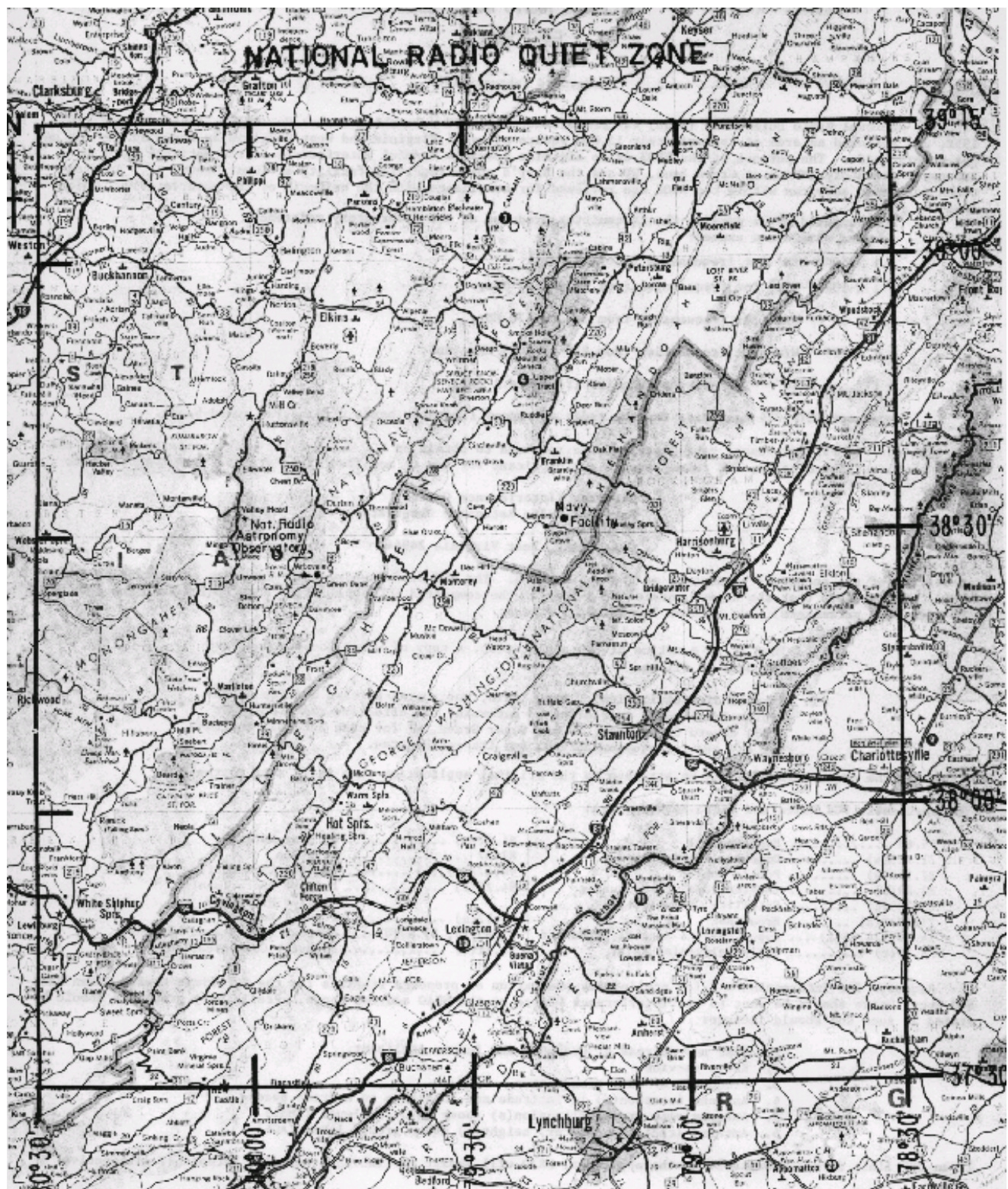
2. Other than those countries covered in Annex L, an agency initiating coordination in the FAS under this section may use either of these methods:

a. Use the procedures of Chapter 9 of the Manual with the Note S141 in the NOTES (NTS) field is desired when listing in the GMF; or

b. by memorandum providing the essential assignment details.

Enter any comments of the FAS in the FAS meeting minutes.

Figure 1: National Radio Quiet Zone



8.3.12 Coordination of Assignments for Transmissions by Terrestrial Stations Located Within the Coordination Area of a Receiving Earth Station

1. General Provisions

a. Before an assignment to a terrestrial station is brought into use within the coordination area of a receiving earth station of another country utilizing the same band above 1 GHz allocated internationally with equal rights to terrestrial and space radiocommunication services (space-to-Earth) and within the bands listed in 2 below, coordination must be effected with that country to ensure interference will not be caused to the receiving earth station. (See **9.18** of the RR).

b. Nationally, the ITU RR procedure for coordinating terrestrial stations also is followed to identify possible interference to receiving earth stations located within the US&P.

2. Frequency Bands

a. The coordination procedure specified in this Section applies in the following frequency bands:

1215-1260 MHz, 1559-1610 MHz, 1670-1710 MHz, 2200-2300 MHz

3600-3650 MHz, 4500-4635 MHz, 4685-4800 MHz, 5150-5216 MHz

7250-7750 MHz, 8025-8500 MHz, 15.43-15.63 GHz, 25.50-27.00 GHz

37.00-38.00 GHz, 71.00-74.00 GHz, 102.0-105.0 GHz, 134.0-142.0 GHz

158.5-164.0 GHz, 191.8-200.0 GHz, 232.0-235.0 GHz

b. The procedure for obtaining terrestrial station frequency assignments located within the coordination area of a receiving earth station along the U.S./Canada and U.S./Mexico Borders has not yet been established for the 3500-3600 MHz frequency band.

3. Specific Provisions

a. For major terrestrial systems, or major modifications of existing systems, national and international coordination will be initiated during the systems review procedure outlined in Chapter 10. The SPS shall initiate coordination, as appropriate, with the country having the receiving earth station.

b. For assignments to terrestrial stations in systems not considered under the systems review procedure, Chapter 10, and to be located within the coordination area of a U.S. receiving earth station listed in Section 8.3.15, the applicant shall effect prior coordination with the agency operating the receiving earth station. In cases where such terrestrial stations are within the coordination area of a receiving earth station of another country listed in Section 8.3.15, the applicant shall provide to the FAS, in addition to the application for frequency assignment, the data required by No. **9.31** of the ITU RR. The FAS, as appropriate, shall initiate the international coordination required.

c. Final assignment action shall not be taken in the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

d. The provisions of this section are equally applicable to any proposed change in the technical characteristics of a currently authorized frequency assignment for transmission by a terrestrial station, if the change increases the probability of harmful interference being caused by the terrestrial station.

e. Coordination pursuant to this section is not required for an experimental station or for a station whose frequency assignment would not be in accordance with the national or international Table of Frequency Allocations.

8.3.13 Coordination of Assignments for Transmission or Reception by Earth Stations

1. General Provisions

a. Before an assignment to an earth station, whether for transmitting or receiving, is brought into use in a particular band allocated with equal rights to space and terrestrial radiocommunication services in the spectrum above 1 GHz and in the bands listed in 2a below, coordination must be effected with any country whose territory lies within the coordination area of the earth station to ensure that interference will not be caused to or by terrestrial stations. (See **9.17** of the RR). The coordination area is determined in accordance with Appendices **5** and **7** of the RR.

b. Before an assignment to an earth station, whether for transmitting or receiving, is brought into use in a particular band allocated with equal rights to space radiocommunication services in both directions of transmission and in the bands listed in 2b below, coordination must be affected with any country whose territory lies within the coordination area of the earth station or the earth station is located within the coordination area of a coordinated earth station to ensure that interference will not be caused to or by earth stations operating in the opposite direction

of transmission. (See No. **9.17A** of the RR.) The coordination area is determined based on Recommendations ITU-R IS.847, IS.848, and IS.849.

c. Nationally, the ITU RR procedure for coordinating earth stations also is followed to identify possible interference between such earth stations and terrestrial stations located within the US&P.

d. Agencies requiring earth station assignments must submit coordination contour data to the SPS as part of the system review procedure outlined in Chapter 10. This action is required when submitting Notices of Frequency Assignment for earth stations for use in international coordination and registration activities. Prior to NTIA assignment approval, the contour data for U.S. Federal Government earth stations must be published or approved for publication in Section 8.3.15 of this manual.

e. Agencies that have earth stations that require international coordination should consider purchasing the electronic version of Appendix 7 from the ITU Radiocommunication Bureau. This program can be used to determine whether an administration has coordinated with all affected administrations. The ITU also offers an electronic version of Recommendation ITU-R IS.847.

2. Frequency Bands

a. (Earth Station/Terrestrial Station Coordination) The coordination procedure specified in sub-paragraph 1a of this section applies in the following frequency bands:

1215-1260 MHz, 1559-1610 MHz, 1610-1626.5 MHz, 1675-1710 MHz, 1761-1842 MHz, 2025-2120 MHz, 2200-2300 MHz, 7125-7235 MHz, 7250-7750 MHz*, 7900-8500 MHz*, 31.8-32.3 GHz, 34.2-34.7 GHz, 37-38 GHz, 39.5-40.0 GHz, 42.5-43.5 GHz, 45.5-47 GHz, 44.2-50.2 GHz, 50.4-51.4 GHz, 66-71 GHz, 71-76 GHz, 81-86 GHz, 95-100 GHz, 123-130 GHz, 158.5-164 GHz, 167-174.5 GHz, 191.8-200 GHz, 209-226 GHz, 232-235 GHz, 238-240 GHz, 252-275 GHz

* Nationally, coordination contours are not required in the bands 7250-7300 MHz and 7900-8025 MHz.

b. (Earth Station/Earth Station Coordination) The coordination procedure specified in sub-paragraph 1b of this section applies in the following frequency bands:

8025-8400 MHz, 19.3-19.7 GHz, 25.5-27 GHz, 40-40.5 GHz, 45.5-47 GHz, 66-71 GHz, 191.8-200 GHz, 238-240 GHz,

3. Specific Provisions

a. International coordination relating to earth stations will be initiated by the SSS outlined in Section 3.3.2.

b. Applications for frequency assignments to earth stations shall indicate the status of coordination with affected agencies and countries. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination initiated where it has been determined to be necessary.

c. The provisions of this section are equally applicable to any proposed change in the technical characteristics of a currently authorized frequency assignment, for transmission or reception by an earth station, if the change increases the probability of harmful interference being caused to or by a terrestrial station or earth station, as appropriate.

8.3.14 Coordination of Assignments to Earth and Space Stations Which Utilize Geostationary-Satellites Networks

1. General Provisions

a. Before bringing into use an assignment to an earth or space station in a satellite network using the geostationary-satellite orbit (GSO), coordination must be effected, in certain cases, with other countries operating or planning such networks in the same band to ensure compatibility between different satellite networks. (See No. **9.7**). Coordination is required if the proposed satellite network would cause or receive a 6% or greater increase in receiving system or equivalent satellite-link noise temperature, as appropriate, with respect to other geostationary-satellite networks. (See RR Appendix 8)

b. Additionally, in certain frequency bands to which Nos. **9.11A** and **9.21** of the RR apply, coordination of frequency assignments to geostationary-satellite networks may be required with assignments of non-geostationary-satellite networks or systems or terrestrial stations.

c. Nationally, coordination of assignments to stations in satellite networks using the GSO is affected through the IRAC, SPS, and FAS processes, as appropriate.

2. Specific Provisions

a. International coordination of satellite networks which utilize the GSO will be initiated by the SSS as outlined in Section 3.3.2.

b. For systems utilizing the GSO, which require international advance publication, under the provisions of No. 9.1, and coordination under the provisions of Nos. 9.7, 9.11A and 9.21, as appropriate, the SSS shall initiate advance publication and coordination with the Radiocommunication Bureau and the country(ies) involved.

c. Applications for frequency assignments to either earth or space stations in networks using the GSO shall indicate the status of coordination with agencies and countries having or planning space systems in the same band which employ the GSO. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

8.3.14A Coordination of Assignments to Stations of Non-geostationary-Satellite Networks in Accordance with No. 9.11A of the ITU Radio Regulations

1. General Provisions

a. Before bringing into use an assignment to an earth or space station in a geostationary or nongeostationary-satellite network, in bands subject to No. 9.11A, coordination must be affected, in certain cases, with other countries operating or planning geostationary-satellite networks, non-geostationary satellite networks or systems, or terrestrial stations, as appropriate, to ensure compatibility. The requirements for coordination are dependent on the frequency band concerned.

b. Nationally, coordination of assignments to stations of non-geostationary-satellite networks or systems is affected through the IRAC, SPS, and FAS processes, as appropriate.

2. Specific Provisions

a. International coordination of non-geostationary-satellite networks or systems will be initiated by the SSS as outlined in Section 3.3.2.

b. For non-geostationary-satellite networks or systems which require international advance publication and coordination under the provisions of Nos. 9.1 and 9.11A, respectively, the SSS shall initiate advance publication and coordination with the Radiocommunication Bureau and the country(ies) involved.

c. Determination of the need for coordination between space stations (space-to-Earth) and terrestrial services sharing the same frequency band below 1 GHz.

Coordination of space station assignments in the 137-138 MHz and 400.15-401 MHz bands is required only if the power flux-density produced by the space station exceeds -125 dB(W/m²/4kHz) at the surface of the Earth.

d. Method for the determination of the need for coordination between MSS space stations (space-to-Earth) and terrestrial services sharing the same frequency band in the 1 to 3 GHz range

Coordination of transmitting space station assignments of the mobile-satellite service with respect to terrestrial services is not required if the power flux-density produced at the surface of the Earth or the fractional degradation in performance (FDP) of a station in the fixed service does not exceed the threshold values shown in the following table.

Table: 8.3.14A						
Frequency Band (MHz)	Service to be Protected	Coordination Threshold Values				% FDP (in 1 MHz) (Note 1)
		Geostationary Space Stations		Non-Geostationay Space Stations		
		power flux desity (pfd) (per space station) calculation factors (Note 2)		pfd (per space station) calculation factors (Note 2)		
		$P\text{ dB}$ $(W/m2)\text{ in }4\text{ kHz}$	$r\text{ dB/deg}$	$P\text{ dB}$ $(W/m2)\text{ in }4\text{ kHz}$	$r\text{ dB/deg}$	
1525 - 1530	Analog FS	-152	0.5	-152	0.5	25
	Digital FS	-152	0.5			
	Other terrestrial services (Note 4)	-152	0.5	-152	0.5	
2483.5 - 2500	Fixed	-152	0.5	-150	0.65	
	Other terrestrial services (Note 4)	-152	0.5	-150	0.65	

NOTE 1: The calculation of FDP (fractional degradation in performance) is contained in Resolution 46 Section A2.1.2.2.1, using reference FS parameters contained in Sections A2.1.2.2.2.1 and A2.1.2.2.2.3.

NOTE 2: The following formula should be used for deriving the coordination threshold in terms of power flux-density:

$$\begin{aligned}
 &PdB(W / m^2 / 4kHz) \quad \text{for } \leq 0^\circ \delta \leq 5^\circ \\
 &P + r(\Delta - 5)dB(W / m^2 / 4kHz) \quad \text{for } \leq 5^\circ \delta \leq 25^\circ \\
 &P + 20dB(W / m^2 / 4kHz) \quad \text{for } \leq 25^\circ \delta \leq 90^\circ
 \end{aligned}$$

where δ is the angle of arrival (degrees).

The threshold values are obtained under assumed free-space propagation conditions.

NOTE 3: Not used

NOTE 4: The coordination threshold factors applicable to other terrestrial services may be reviewed at a future conference, as necessary.

e. Applications for frequency assignments to either earth or space stations in non-geostationary-satellite networks or systems shall indicate the status of coordination with affected agencies and countries. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

8.3.14B Coordination of Assignments to Stations of Non-geostationary-Satellite Networks in Accordance with No. 9.21 of the ITU Radio Regulations

1. General Provisions

a. Before bringing into use an assignment to an earth or space station in a non-geostationary-satellite network or system, in bands subject to No. 9.21, coordination must be affected, in certain cases, with other countries operating or planning geostationary-satellite networks, non-geostationary satellite networks or systems, or terrestrial stations, as appropriate, to ensure compatibility.

b. Nationally, coordination of assignments to stations of non-geostationary-satellite networks or systems is effected through the IRAC, SPS, and FAS processes, as appropriate.

2. Specific Provisions

a. International coordination of non-geostationary-satellite networks or systems will be initiated by the SSS as outlined in section 3.3.2.

b. For non-geostationary-satellite networks or systems which require international advance publication and coordination under the provisions of Nos. 9.1 and 9.21, respectively,; the SSS shall initiate advance publication and coordination with the Radiocommunication Bureau and the country(ies) involved.

c. Applications for frequency assignments to either earth or space stations in non-geostationary-satellite networks or systems shall indicate the status of coordination with affected agencies and countries. Final assignment action shall not be taken by the FAS until national coordination has been accomplished, and international coordination has been initiated, where it has been determined to be necessary.

8.3.15 List of Coordinated Earth Stations

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
1750-1850	CA, Camp Parks	374400N1215200W	1036	27198	Air Force
1750-1850	CO, Boulder	400010N1051600W	598	27198	Air Force
1760-1842	AK, Elmendorf AFB	611739N1494622W	446	44285	Air Force
1761-1842	CA, Azusa	341259N1175232W	525	33720	Air Force
1761-1842	CA, Huntington Beach	334506N1180214W	1046	40419	Air Force

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
1761-1842	CA, Huntington Beach	334450N1180204W	1172	43337	Air Force
1761-1842	CA, McClellan AFB	383959N1212333W	456	43337	Air Force
1761-1842	CA, Laguna Peak	340655N1190450W	913	28562	Navy
1761-1842	CA, McClellan AFB	383959N1212333W	400	40419	Air Force
1761-1842	CA, Vandenberg AFB	344924N1203154W	400	20037	Air Force
1761-1842	CA, Vandenberg AFB	344923N1203007W	1200	43333	Air Force
1761-1842	CA, Vandenberg VTS-A	344921N1203007W	1162	43335	Air Force
1761-1842	CA, Vandenberg VTS-B	344932N1203019W	1162	43335	Air Force
1761-1842	CO, Buckley AFB	3943XXN10446XXW	584	SPS-2916	Air Force
1761-1842	CO, Schriever AFB (Formerly Falcon AFB)	384754N1043128W	528	30274	Air Force
1761-1842	FL, Cape Canaveral	282909N0803430W	1012	28443	Air Force
1761-1842	FL, Key West	243239N0814817W	971	40419	Air Force
1761-1842	FL, Key West	243236N0814817W	1200	43337	Air Force
1761-1842	Guam, Andersen AFB	133648N1445112E	801	20037	Air Force
1761-1842	Guam, Anderson AFB	133654N1445122E	1200	43333	Air Force
1761-1842	Guam, Anderson GTS-A	133655N1445122E	1200	43335	Air Force
1761-1842	Guam, Anderson GTS-B	133657N1445130E	1200	43335	Air Force
1761-1842	Guam, Anderson GTS-C	133657N1445120E	1200	43335	Air Force
1761-1842	HI, Kaena Point	213418N1581634W	760	20037	Air Force
1761-1842	HI, Kaena Point	213343N1581431W	1200	43333	Air Force
1761-1842	HI, Kaena PA HTS-A	213342N1581426W	1200	43335	Air Force
1761-1842	HI, Kaena PA HTS-B	213408N1581544W	1200	43335	Air Force
1761-1842	MD, Blossom Point	382553N0770516W	997	29819	Navy
1761-1842	MD, Patuxent River NAS	381628N0762445W	880	40419	Air Force
1761-1842	MD, Patuxent River NAS	381628N0762445W	476	43337	Air Force
1761-1842	ME, Loring	4700XXN06810XXW	584	7321493	Air Force
1761-1842	ME, Prospect Harbor	442455N0680150W	992	28562	Navy
1761-1842	NC, Fort Bragg	350935N0785924W	415	40419	Air Force
1761-1842	NC, Fort Bragg	350904N0785913W	497	43337	Air Force
1761-1842	NH, New Boston	425654N0713824W	420	20037	Air Force
1761-1842	NH, New Boston	425646N0713744W	700	43333	Air Force
1761-1842	NH, New Boston NHS-A	425646N0713746W	670	43335	Air Force
1761-1842	NH, New Boston NHS-B	425652N0713736W	670	43335	Air Force
1761-1842	NH, New Boston NHS-C	425641N0713749W	670	43335	Air Force
1761-1842	NM, Kirtland AFB	350300N1062400W	426	30397	Air Force
1761-1842	NM, Kirtland AFB	345939N1063028W	428	40419	Air Force
1761-1842	TX, Fort Hood	310858N0974612W	400	40419	Air Force
1761-1842	TX, Fort Hood	310857N0974612W	456	43337	Air Force
1761-1842	VA, Fort Belvoir	384407N0770913W	900	37249	Air Force
1761-1842	VA, Quantico	382952N0772223W	1004	29819	Navy
1761-1842	WA, Fairchild	4734XXN11810XXW	584	7321494	Air Force
1761-1842	WA, Lewis-McChord	470611N1223311W	430	40419	Air Force
1761-1842	WA, Lewis-McChord	470611N1223311W	506	43337	Air Force
1763-1840	TX, Kelly AFB	294800N0983600W	1345	29873	Air Force
1766-1839	GA, Atlanta	335747N0840514W	400	36584	Air Force
1767	CA, Monterey	363600N1215324W	624	35566	Navy
1767	MD, Annapolis	385848N0792924W	504	35566	Navy
1780-1842	CA, Azusa	340733N1175538W	1024	41856	Air Force
1782.043- 1782.555	CA, Camp Parks	374357N1215250W	493	41856	Air Force
1782.043- 1782.555	Guam	133534N1445039E	746	41856	Air Force

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/EAS DOCUMENT	AGENCY/ COUNTRY
1782.043- 1782.555	Guam	133455N1445034E	746	42268	Air Force
1782.043- 1782.555	HI, Wahiawa	213113N1575953W	1200	41856	Air Force
1782.043- 1782.555	HI, Kaena Point	213405N1581539W	1117	41856	Air Force
1783.740	FL, Cape GA CCAFB	282903N0803421W	1200	43336	Air Force
1783.740	RMI, Kwajalein Island	084323N1674353E	1200	44285	Air Force
1791.748	CA, Redondo Beach	335351N1182225W	1200	41856	Air Force
2025-2110	AK, Barrow Point	711800N1563600W	900	39549	Commerce
2025-2110	AK, Fairbanks	644739N1473213W	431	43893	Air Force
2025-2110	AK, Fairbanks (NOAA CDAS)	645838N1473054W	500	20086	NASA
2025-2110	AK, Fairbanks	645123N1474917W	431	42215	Air Force
2025-2110	AK, Fairbanks	645131N1475127W	523	37751 34188	NASA
2025-2110	AK, Gilmore Creek	645826N1473007W	1375	39549	Commerce
2025-2110	AK, North Pole	644816N1473001W	514	44285	Air Force
2025-2110	AK, North Pole	644818N1473000W	500	30976	NASA
2025-2110	AK, Poker Flat	650700N1472742W	400	31927	NASA
2025-2110	AK, Poker Flat	650825N1473042W	500	29653 29585	NASA
2025-2110	AK, Poker Flat (Site 3)	650702N1472733W	400	31927	NASA
2025-2110	AL, Huntsville	344039N863645W	375	43940	Air Force
2025-2110	AL, Huntsville	344043N0863700W	375	43893	Air Force
2025-2110	Antarctica, McMurdo	775021S1664001E	1000	31927	NASA
2025-2110	CA, Berkeley	375248N1221438W	1000	31668	NASA
2025-2110	CA, Goldstone	352030N1165225W	700	20086	NASA
2025-2110	CA, Goldstone (DSS-14)	352533N1165322W	600	36182	NASA
2025-2110	CA, Goldstone (DSS-24)	352024N1165229W	600	36182	NASA
2025-2110	CA, Goldstone (DSS-27)	351418N1164636W	600	36182	NASA
2025-2110	CA, Huntington Beach	334446N1180200W	1150	42215	Air Force
2025-2110	CA, Monterey	363542N1215229W	1118	42215	Air Force
2025-2110	CA, Pasadena (JPL)	341206N1181027W	646	42268	NASA
2025-2110	CA, San Diego	325013N1170940W	1144	43940	Air Force
2025-2110	CA, Table Mountain	342256N1174056W	1000	30825	NASA
2025-2110	CT, New London	412233N0720602W	900	43893	Air Force
2025-2110	FL, Kennedy Uplink	283234N0803837W	1200	41547	NASA
2025-2110	FL, Kennedy Space Center (RFTS)	283507N0803855W	1200	44286	NASA
2025-2110	FL, Melbourne	280136N0803618W	1200	43940	Air Force
2025-2110	FL, Melbourne	280538N0804158W	1118	42215	Air Force
2025-2110	FL, Merritt Island	283030N0804137W	999	20086	NASA
2025-2110	FL, New Smyrna Beach	290300N0805300W	1375	30382 28561	NASA
2025-2110	FL, Palm Bay	280132N0804105W	1147	43893	Air Force
2025-2110	FL, Ponce de Leon (PDL)	290400N0805447W	1200	41547	NASA
2025-2110	FL, St. Petersburg	275230N0823853W	995	42268	Air Force
2025-2110	Guam, GRGT	133655N1445122E	1350	30038	NASA
2025-2110	HI, Oahu	211757N1574858W	1180	42215	Air Force
2025-2110	HI, Naalehu	190050N1553947W	1200	44285	Air Force
2025-2110	HI, Naalehu	190049N1553946W	1200	44285	Air Force
2025-2110	KY, Morehead	381130N0832620W	500	41045	NASA

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
2025-2110	MD, Annapolis	385906N0762906W	900	43893	Air Force
2025-2110	MD, Blossom Point	382550N0770512W	900	42215	Air Force
2025-2110	MD, Blossom Point	382553N0770516W	1000	32075	NASA
2025-2110	MD, Blossom Point (12W)	382544N0770502W	900	35933	NASA
2025-2110	MD, Blossom Point (41W)	382544N0770502W	900	35933	NASA
2025-2110	MD, Blossom Point (62W)	382544N0770502W	900	35933	NASA
2025-2110	MD, Blossom Point (46W)	382544N0770502W	900	41198	NASA
2025-2110	MD, Blossom Point (49W)	382544N0770502W	893	41198	NASA
2025-2210	MD, Blossom Point (62W)	382544N0770502W	858	41198	NASA
2025-2110	MD, Greenbelt	385955N0765034W	700	20086	NASA
2025-2110	MD, Laurel	391100N0765400W	1100	30536	NASA
2025-2110	MD, Laurel	391003N0765356W	912	36438	Navy
2025-2110	MD, Pomonkey	382548N0770512W	1001	28562	Navy
2025-2110	NM, Albuquerque	350314N1063710W	375	42215	Air Force
2025-2110	NM, Kirtland AFB	345939N1063028W	428	40419	Air Force
2025-2110	NM, Los Alamos	355218N1061941W	375	37391	Energy
2025-2110	NM, Los Alamos (LANL SOC)	355220N1061939W	375	42268	Air Force
2025-2110	NM, Los Alamos (LANL TA-33)	354618N1061508W	375	42268	Air Force
2025-2110	NM, White Sands (112W)	323224N1063636W	375	43940	NASA
2025-2110	NM, White Sands (STGT)	323240N1063648W	375	30038	NASA
2025-2110	NM, White Sands (WSGT)	322954N1063631W	375	37751 30038	NASA
2025-2110	OH, Dayton	394655N0840456W	454	42215	Air Force
2025-2110	OH, Cleveland	412450N0815153W	500	40420	NASA
2025-2110	OH, Cleveland	412450N0815153W	1770	40420	NASA
2025-2110	OH, Cleveland	412450N0815153W	1667	40420	NASA
2025-2110	OH, Killeville	400601N0831152W	460	44285	NASA
2025-2110	OR, Boardman	455117N1193755W	455	44285	NASA
2025-2110	SC, Columbia	345443N804820W	464	43940	Air Force
2025-2110	SD, Sioux Falls	434410N0963721W	360	39549	NASA
2025-2110	TX, Bryan (TAM)	303835N0962821W	461	44286	Air Force
2025-2110	TX, College Station	303716N0962025W	461	42215	Air Force
2025-2110	TX, Houston	293340N0950533W	1200	41547	NASA
2025-2110	UT, Logan	414547N1114920W	375	43893	Air Force
2025-2110	UT, Logan	414539N1114910W	375	42215	Air Force
2025-2110	VA, Quantico	382952N0772223W	995	29147	Navy
2025-2110	VA, Virginia Beach	364616N0755753W	989	42268	Air Force
2025-2110	VA, Wallops Island	375538N0752831W	1000	27266	NASA
2025-2110	VA, Wallops Island	375530N0752835W	1202	37751 34188 31927	NASA
2025-2110	VA, Wallops Island (Site 2)	375523N0752839W	1000	37751 31927	NASA
2025-2110	VA, Wallops Island (WG5 Antenna)	375535N752832W	1200	44285	NASA
2025-2120	AK, Fairbanks	645826N1473035W	370	39549	Commerce
2025-2120	CA, Goldstone (DSS-16)	352030N1165222W	1000	29585	NASA
2025-2120	CA, Goldstone (DSS-24)	352024N1165229W	1000	29585	NASA
2025-2120	CA, Goldstone (DSS-27)	351418N1164644W	925	29585	NASA
2025-2120	Ontario, Shirley Bay	452056N0755323W	520	SPS-893	Canada

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
2026.495- 2036.75	WV, Fairmont (60W)	392601N801136W	445	44284	Commerce
2026.495- 2036.75	WV, Fairmont (75W)	392601N801136W	445	44284	Commerce
2026.495- 2036.75	WV, Fairmont (89.5W)	392601N801136W	445	44284	Commerce
2026.495- 2036.75	WV, Fairmont (105W)	392601N801136W	445	44284	Commerce
2026.495- 2036.75	WV, Fairmont (137W)	392601N801136W	445	44284	Commerce
2026.495- 2036.75	VA, Wallops Island (60W)	375645N752744W	1196	44284	Commerce
2026.495- 2036.75	VA, Wallops Island (75W)	375645N752744W	1190	44284	Commerce
2026.495- 2036.75	VA, Wallops Island (89.5W)	375645N752744W	1186	44284	Commerce
2026.495- 2036.75	VA, Wallops Island (105W)	375645N752744W	1186	44284	Commerce
2026.495- 2036.75	VA, Wallops Island (137W)	375645N752744W	1186	44284	Commerce
2036.3	HI, Hawaii N.P.	192524N1551727W	675	36537	Commerce
2036.3	HI, Ahua Kilauea	192256N1551608W	760	36537	Commerce
2036.3	HI, Sandhill Kilauea	192345N1551739W	740	36537	Commerce
2039	RMI, Kwajalein	084301N1674301E	975	36536	Air Force
2040-2090	CO, Colorado Springs	385924N1045136W	375	40267	Air Force
2049.243- 2049.755	CA, Camp Parks	374357N1215250W	606	41856	Air Force
2049.243- 2049.755	Guam	133534N1445039E	849	41856	Air Force
2049.243- 2049.755	Guam	133455N1445034E	849	42268	Air Force
2049.243- 2049.755	HI, Wahiawa	213113N1575953W	1200	41856	Air Force
2049.243- 2049.755	HI, Kaena Point	213405N1581539W	1200	41856	Air Force
2093.068- 2093.132	AK, Fairbanks	645825N1473057W	375	42116	DOC
2093.068- 2093.132	VA, Wallops Island	375643N752742W	1163	42116	DOC
2097-2098	UT, Logan	414424N1115009W	350	43940	Air Force
2109.75	CO, Colorado Springs	385924N1045136W	375	43940	Air Force
2110-2120	HI, Kauai	220700N1594016W	1207	10782	NASA
2200-2285	FL, St. Petersburg	275230N0823853W	1200	42268	Air Force
2200-2285	NM, Los Alamos (LANL SOC)	355220N1061939W	375	42268	Air Force
2200-2285	NM, Los Alamos (LANL TA-33)	354618N1061508W	375	42268	Air Force
2200-2285	VA, Virginia Beach	364616N0755753W	1200	42268	Air Force
2200-2290	AZ, Scottsdale	332735N1115435W	350	29148	NASA
2200-2290	OH, Cleveland (41 W)	412450N0815153W	1667	40420	NASA
2200-2290	TX, Houston	293340N0950533W	950	35933	NASA
2200-2290	TX, Houston (41W)	293340N0950533W	800	35933	NASA
2200-2290	TX, Houston (171W)	293340N0950533W	645	35933	NASA
2285-2290	Guam, Finegayan	133519N1445027E	700	39133	NASA

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/EAS DOCUMENT	AGENCY/ COUNTRY
5925-6425	Nova Scotia, Mill Village	441119N0644012W	805	11804	Canada
5925-6425	Quebec, Bouchette	461318N0755230W	451	11804	Canada
7145-7190	CA, Goldstone (DSS-15)	352519N1165311W	1000	29979 29819	NASA
7145-7190	CA, Goldstone (DSS-25)	352016N1165231W	1000	29653 29979	NASA
7145-7190	CA, Goldstone (DSS-26)	352009N1165223W	1000	30825	NASA
7145-7190	CA, Goldstone (Deep Space)	352519N1165311W	1123	28298	NASA
7145-7235	CA, Goldstone (DSS-24)	352024N1165229W	1000	32866 33192	NASA
7145-7235	CA, Goldstone (DSS-25)	352015N1165231W	1000	32866 33192	NASA
7145-7235	CA, Goldstone (DSS-26)	352008N1165223W	1000	32866 33192	NASA
7145-7235	CA, Goldstone (DSS-14)	352533N1165319W	435	36470	NASA
7145-7235	CA, Goldstone (DSS-26)	352008N1165223W	1050	39549	NASA
7190-7235	CA, Goldstone (DSS-13)	351450N1164738W	875	29584	NASA
7190-7235	CA, Goldstone (DSS-23)	352024N1165220W	1025	37751 29584	NASA
7190-7235	CA, Pasadena (JPL)	341206N1181027W	453	41855	NASA
7190-7235	KY, Morehead	381131N0832620W	498	43334	NASA
7211.15- 7222.05	WV, Fairmont (60W)	392601N801136W	176	44284	Commerce
7211.15- 7222.05	WV, Fairmont (75W)	392601N801136W	176	44284	Commerce
7211.15- 7222.05	WV, Fairmont (89.5W)	392601N801136W	176	44284	Commerce
7211.15- 7222.05	WV, Fairmont (105W)	392601N801136W	176	44284	Commerce
7211.15- 7222.05	WV, Fairmont (137W)	392601N801136W	176	44284	Commerce
7211.15- 7222.05	VA, Wallops Island (60W)	375645N752744W	247	44284	Commerce
7211.15- 7222.05	VA, Wallops Island (75W)	375645N752744W	239	44284	Commerce
7211.15- 7222.05	VA, Wallops Island (89.5W)	375645N752744W	239	44284	Commerce
7211.15- 7222.05	VA, Wallops Island (105W)	375645N752744W	246	44284	Commerce
7211.15- 7222.05	VA, Wallops Island (137W)	375645N752744W	263	44284	Commerce
7900-8400	CO, Schriever (DSCS 3 W-ATL)	384754N1043128W	822	27569	Air Force
7900-8400	HI, Kunia	212847N1580316W	1372	27197	Army
7900-8400	IL, Scott AFB	383207N0895106W	369	27198	Air Force
7900-8400	MA, Hanscom AFB	422729N711627W	600	44285	Air Force
7900-8400	MD, Andrews AFB	384850N0765320W	150	37802	Air Force
7900-8400	MD Blossom Point	384301N0770859W	280	37993	Navy
7900-8400	NC, Rosman	351207N0825220W	153	27991	Army
7900-8400	NM, Kirtland AFB	350300N1062400W	228	30397	Air Force
7900-7975, 8025-8400	AK, Eareckson AFB	624342N1740539E	250	19807	Air Force
7900-7975,	AK, Elmendorf	611513N1494730W	200	19808	Air Force

TRANSMITTING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/EAS DOCUMENT	AGENCY/ COUNTRY
8025-8400					
7900-7975, 8025-8400	CA, Camp Roberts	354403N1204513W	225	19697	Army
7900-7975, 8025-8400	CA, Onizuka (Sunnyvale) AFS	372423N1220133W	175	19811/17378	Air Force
7900-7975, 8025-8400	GA, Fort Gordon	332520N0821058W	200	19759	Army
7900-7975, 8025-8400	Guam, Finegayan	133555N1445050E	300	19812	Navy
7900-7975, 8025-8400	HI, Wahiawa	212529N1580546W	225	19739	Navy
7900-7975, 8025-8400	MD, Brandywine	384040N0765042W	349	12997	Air Force
7900-7975, 8025-8400	MD, Fort Detrick	392636N0772453W	249	19698 19480 16632	Army
7900-7975, 8025-8400	NE, Offutt AFB	410809N0955454W	110	19527	Air Force
7900-7975, 8025-8400	NH, Manchester	425600N0713800W	200	19526	Air Force
7900-7975, 8025-8400	Ontario, Carp	452100N0760310W	412	15524	Canada
7900-7975, 8025-8400	VA, Northwest	363329N0761503W	475	19893	Navy
7900-7975, 8025-8400	CA, Camp Parks	374358N1215241W	1015	28443	Air Force
7900-7975, 8025-8400	CA, Camp Roberts	354403N1204513W	1013	28252	Army
7900-7975, 8025-8400	CO, Buckley ANGB	394255N1044629W	481	28252	Air Force
7900-7975, 8025-8400	GA, Fort Gordon	332520N0821058W	1004	28252	Army
7900-7975, 8025-8400	MA, Cape Cod AFS	414511N0703218W	1009	28252	Air Force
7900-7975, 8025-8400	MD, Fort Detrick	392636N0772453W	1030	28252	Army
7900-7975, 8025-8400	NJ, Fort Monmouth	401901N0740206W	1016	28252	Army
7900-7975, 8025-8400	PR, Cabre de Tierra	181300N0653700W	350	20042	Navy
7900-7975, 8025-8400	TX, Lackland AFB	292230N0983730W	1139	28252	Air Force
7900-7975, 8025-8400	VA, Northwest	363336N0761503W	972	28298	Navy
14600-15225	MD, Blossom Point (12W)	382544N0770502W	230	35933	NASA
14600-15225	MD, Blossom Point (41W)	382544N0770502W	152	35933	NASA
14600-15225	MD, Blossom Point (46 W)	382544N0770502W	101	41198	NASA
14600-15225	MD, Blossom Point (49 W)	382544N0770502W	101	41198	NASA
14600-15225	MD, Blossom Point (62 W)	382544N0770502W	101	41198	NASA
34200-34700	CA, Goldstone (DSS-25)	352015N1165231W	185	SPS-12658	NASA
* The nominal coordination distance shown is the maximum coordination distance derived from the coordination contour.					

RECEIVING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
1670-1690	MA, Hanscom Field	422800N0712800W	177	19251	Air Force
1670-1710	AK, Fairbanks	645835N1473119W	399	29584	Commerce
1670-1710	CO, Boulder	400750N1051422W	100	17183	Commerce
1670-1710	HI, Honolulu	212112N1575236W	100	17183	Commerce
1670-1710	MD, Greenbelt	390002N0765029W	975	29339	NASA
1670-1710	MD, Suitland	385106N0765554W	160	16761	Commerce
1670-1710	VA, Wallops Island	375644N0752742W	160	16761	Commerce
1670-1710	VA, Wallops Island	375734N0752817W	882	29584	Commerce
1670-1710	WA, Seattle	473415N1223310W	405	17183	Commerce
1679.7- 1694.705	WV, Fairmont (60W)	392601N801136W	553	44284	Commerce
1679.7- 1694.705	WV, Fairmont (75W)	392601N801136W	552	44284	Commerce
1679.7- 1694.705	WV, Fairmont (89.5W)	392601N801136W	552	44284	Commerce
1679.7- 1694.705	WV, Fairmont (105W)	392601N801136W	552	44284	Commerce
1679.7- 1694.705	WV, Fairmont (137W)	392601N801136W	552	44284	Commerce
2025-2110	VA, Virginia Beach	364616N0755753W	989	42268	Air Force
2103.4-2109.4	Guam, Finegayan	133519N1445027E	1225	39133	NASA
2200-2290	AK, Barrow Point	711800N1563600W	900	39549	Commerce
2200-2290	AK, Elmendorf AFB	611739N1494622W	498	44285	Air Force
2200-2290	AK, Fairbanks	644739N1473213W	460	43893	Air Force
2200-2290	AK, Fairbanks	645123N1474917W	460	42215	Air Force
2200-2290	AK, Fairbanks	645838N1473054W	1600	20086	NASA
2200-2290	AK, Fairbanks	645131N1475127W	523	34188	NASA
2200-2290	AK, Fairbanks	645833N1473119W	399	29584	Commerce
2200-2290	AK, Fairbanks	645826N1473035W	370	39549	Commerce
2200-2290	AK, Gilmore Creek	645826N1473007W	1375	39549	Commerce
2200-2290	AK, Gilmore Creek	645824N1473029W	396	42268	Commerce
2200-2290	AK, North Pole	644816N1473001W	489	44285	Air Force
2200-2290	AK, North Pole	644818N1473000W	400	30976	NASA
2200-2290	AK, North Pole	644800N1473000W	272	35566	NASA
2200-2290	AK, Poker Flat	650600N1470300W	440	28862	NASA
2200-2290	AK, Poker Flat	650825N1473042W	400	29585 29653	NASA
2200-2290	AL, Huntsville	344043N0863700W	375	43893	Air Force
2200-2290	CA, Azusa	341259N1175232W	475	33720	Air Force
2200-2290	CA, Azusa	340733N1175538W	1139	41856	Air Force
2200-2290	CA, Berkeley	375248N1221438W	1000	31668	NASA
2200-2290	CA, Camp Parks	374400N1215200W	1053	27198	Air Force
2200-2290	CA, Edwards AFB	345729N1175442W	925	28561 29148	NASA
2200-2290	CA, Edward AFB	345729N1175442W	925	28561	NASA
2200-2290	CA, Goldstone (DSS-14)	352533N1165322W	400	36182	NASA
2200-2290	CA, Goldstone (DSS-24)	352024N1165229W	400	36182	NASA
2200-2290	CA, Goldstone (DSS-27)	351418N1164636W	400	36182	NASA
2200-2290	CA, Huntington Beach	334506N1180214W	1076	40419	Air Force
2200-2290	CA, Huntington Beach	334450N1180204W	1200	43337	Air Force
2200-2290	CA, Huntington Beach	334446N1180200W	1200	42215	Air Force
2200-2290	CA, Laguna Peak	340655N1190450W	909	28562	Navy
2200-2290	CA, Long Beach (KSAT)	334924N1180847W	1200	44286	Air Force
2200-2290	CA, McClellan AFB	383959N1212333W	414	40419	Air Force

RECEIVING EARTH STATIONS					
BAND (MHz)	LOCATION	COORDINATES	NOMINAL COORDINATION DISTANCE* (KILOMETERS)	IRAC/ SPS/FAS DOCUMENT	AGENCY/ COUNTRY
2200-2290	CA, McClellan AFB	383959N1212333W	424	43337	Air Force
2200-2290	CA, Monterey	363542N1215229W	1200	42215	Air Force
2200-2290	CA, Table Mountain	342256N1174056W	875	30825	NASA
2200-2290	CA, Vandenberg AFB	344923N1203007W	1200	43333	Air Force
2200-2290	CA, Vandenberg VTS-A	344921N1203007W	1200	43335	Air Force
2200-2290	CA, Vandenberg VTS-B	344932N1203019W	1200	43335	Air Force
2200-2290	CA, Vandenberg AFB	344327N1203224W	1165	38574	Air Force
2200-2290	CT, New London	412233N0720602W	900	43893	Air Force
2200-2290	CO, Schriever AFB (Formerly Falcon AFB)	384754N1043128W	423	30274	Air Force
2200-2290	FL, Cape Canaveral	282909N0803430W	905	28443	Air Force
2200-2290	FL, Kennedy Space Center (RFTS)	283507N0803855W	1171	44286	NASA
2200-2290	FL, Key West	243239N0814817W	1000	40419	Air Force
2200-2290	FL, Key West	243236N0814817W	1200	43337	Air Force
2200-2290	FL, Melbourne	280136N0803618W	1200	43940	Air Force
2200-2290	FL, Melbourne	280538N0804158W	1200	42215	Air Force
2200-2290	FL, Merritt Island	283030N0804137W	3000	20086	NASA
2200-2290	FL, New Smyrna Beach	290300N0805300W	1225	30382	NASA
2200-2290	FL, Palm Bay	280132N0804105W	1200	43893	Air Force
2200-2290	GA, Atlanta	335747N0840514W	500	36584	Air Force
2200-2290	Guam, Anderson AFB	133654N1445122E	1200	43333	Air Force
2200-2290	Guam, Anderson GTS-A	133655N1445122E	1200	43335	Air Force
2200-2290	Guam, Anderson GTS-B	133657N1445130E	1200	43335	Air Force
2200-2290	Guam, Anderson GTS-C	133657N1445120E	1200	43335	Air Force
2200-2290	Guam, GRGT	133655N1445122E	1300	30038	NASA
2200-2290	Guam, NCTAMS WESTPAC	133455N1445050E	1207	28562	Navy
2200-2290	HI, Haleiwa	214007N1580159W	1200	43940	Air Force
2200-2290	HI, Kaena Point	213343N1581431W	1200	43333	Air Force
2200-2290	HI, Kaena PA HTS-A	213342N1581426W	1200	43335	Air Force
2200-2290	HI, Kaena PA HTS-B	213408N1581544W	1200	43335	Air Force
2200-2290	HI, Naalehu	190050N1553947W	1200	44285	Air Force
2200-2290	HI, Naalehu	190049N1553946W	1200	44285	Air Force
2200-2290	HI, Oahu	211757N1574858W	1200	42215	Air Force
2200-2290	HI, South Point	190048N1553947W	1225	30976	NASA
2200-2290	IN, Butlerville	390258N0853136W	470	43940	Air Force
2200-2290	KY, Morehead	381130N0832620W	471	41045	NASA
2200-2290	MD, Annapolis	385906N0762906W	900	43893	Air Force
2200-2290	MD, Blossom Point	382550N0770512W	900	42215	Air Force
2200-2290	MD, Blossom Point	382553N0770516W	900	32075	NASA
2200-2290	MD, Blossom Point (12W)	382544N0770502W	900	37751/35933	NASA
2200-2290	MD, Blossom Point (41W)	382544N0770502W	900	37751/35933	NASA
2200-2290	MD, Blossom Point (62W)	382544N0770502W	900	37751/35933	NASA
2200-2290	MD, Blossom Point (46 W)	382544N0770502W	751	41198	NASA
2200-2290	MD, Blossom Point (49 W)	382544N0770502W	741	41198	NASA
2200-2290	MD, Blossom Point (62 W)	382544N0770502W	703	41198	NASA
2200-2290	MD, Greenbelt	385955N0765034W	1850	20086	NASA
2200-2290	MD, Laurel	391100N0765400W	925	30536	NASA
2200-2290	MD, Laurel	391003N0765356W	900	36438	Navy
2200-2290	MD, Patuxent River NAS	381628N0762445W	880	40419	Air Force
2200-2290	MD, Patuxent River NAS	381628N0762445W	461	43337	Air Force
2200-2290	MD, Pomonkey	382548N0770512W	898	28562	Navy
2200-2290	ME, Prospect Harbor	442455N0680150W	893	28562	Navy

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2200-2290	NC, Fort Bragg	350935N0785924W	400	40419	Air Force
2200-2290	NC, Fort Bragg	350904N0785913W	464	43337	Air Force
2200-2290	NH, New Boston	425646N0713744W	700	43333	Air Force
2200-2290	NM, Albuquerque	350314N1063710W	375	42215	Air Force
2200-2290	NH, New Boston NHS-A	425646N0713746W	720	43335	Air Force
2200-2290	NH, New Boston NHS-B	425652N0713736W	720	43335	Air Force
2200-2290	NH, New Boston NHS-C	425641N0713749W	720	43335	Air Force
2200-2290	NM, Kirtland AFB	350300N1062400W	330	30397	Air Force
2200-2290	NM, Kirtland AFB	345939N1063028W	428	40419	Air Force
2200-2290	NM, Los Alamos	355218N1061941W	375	37391	Energy
2200-2290	NM, White Sands (112W)	323224N1063636W	375	43940	NASA
2200-2290	NM, White Sands (STGT)	323240N1063648W	375	30038	NASA
2200-2290	NM, White Sands (WSGT)	322954N1063631W	375	30038	NASA
2200-2290	OH, Cleveland	412450N0815153W	1770	40420	NASA
2200-2290	OH, Cleveland	412450N0815153W	810	40420	NASA
2200-2290	OH, Cleveland (41W)	412450N0815153W	500	40420	NASA
2200-2290	OH, Cleveland	412450N0815153W	500	40420	NASA
2200-2290	OH, Dayton	394655N0840456W	479	42215	Air Force
2200-2290	OH, Kileville	400601N0831152W	422	44285	NASA
2200-2290	OK, Norman	351048N0973357W	528	27685	Commerce
2200-2290	OR, Boardman	455117N1193755W	417	44285	NASA
2200-2290	Ontario, Shirley Bay	452056N0755323W	575	SPS-893	Canada
2200-2290	PTR, Mayaguez	181242N0670813W	1200	30710	NASA
2200-2290	SD, Sioux Falls	434410N0963721W	360	39549	NASA
2200-2290	TX, Bryan (TAM)	303835N0962821W	486	44286	Air Force
2200-2290	TX, College Station	303716N0962025W	486	42215	Air Force
2200-2290	TX, Fort Hood	310857N0974612W	425	43337	Air Force
2200-2290	TX, Kelly AFB	294800N0983600W	1193	29873	Air Force
2200-2290	UT, Logan	414547N1114920W	375	43893	Air Force
2200-2290	UT, Logan	414539N1114910W	375	42215	Air Force
2200-2290	VA, Fort Belvoir	384407N0770913W	900	37249	Air Force
2200-2290	VA, Herndon	385751N0772244W	900	43940	Air Force
2200-2290	VA, Quantico	382952N0772223W	1047	29147	Navy
2200-2290	VA, Wallops Island	375538N0752831W	900	27266	NASA
2200-2290	VA, Wallops Island (WG5 Antenna)	375535N752832W	1200	44286	NASA
2200-2290	VA, Wallops Island	375530N0752835W	747	34188	NASA
2200-2290	VA, Wallops Island	375734N0752817W	882	29584	Commerce
2200-2290	WA, Lewis-McChord	470557N1223331W	414	40419	Air Force
2200-2290	WA, Lewis-McChord	470611N1223311W	491	43337	Air Force
2200-2300	AK, Eareckson AFB	5243XXN017407E	409	SPS-2916	Air Force
2200-2300	CA, Goldstone (DSS-24)	352024N1165229W	925	29585	NASA
2200-2300	CA, Goldstone (DSS-27)	351418N1164644W	925	29585	NASA
2200-2300	CA, Vandenberg AFB	342924N1203154W	700	20037	Air Force
2200-2300	CO, Buckley AFB	3943XXN10446XXW	589	SPS-2916	Air Force
2200-2300	FL, Cape Kennedy	2824XXN08030XXW	589	SPS-2916	Air Force
2200-2300	FL, Kennedy Uplink Station (KUS)	283234N0803837W	1200	41547	NASA
2200-2300	FL, Ponce de Leon (PDL)	290400N0805447W	1200	41547	NASA
2200-2300	Guam, Andersen AFB	133648N1445112W	1300	20037	Air Force
2200-2300	HI, Kaena Point	213418N1581634W	1350	20037	Air Force
2200-2300	MD, Blossom Point	382553N0770516W	900	29819	Navy
2200-2300	ME, Loring AFB	4700XXN06801XXW	568	SPS-2916	Air Force
2200-2300	NH, New Boston	425654N0713824W	700	20037	Air Force

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2200-2300	TX, Houston	293340N0950533W	1200	41547	NASA
2200-2300	VA, Quantico	382952N0772223W	903	29819	Navy
2200-2300	WA, Fairchild AFB	4730XXN11810XXW	568	SPS-2916	Air Force
2208.575- 2213.505	WV, Fairmont (60W)	392601N801136W	375	44284	Commerce
2208.575- 2213.505	WV, Fairmont (75W)	392601N801136W	375	44284	Commerce
2208.575- 2213.505	WV, Fairmont (89.5W)	392601N801136W	375	44284	Commerce
2208.575- 2213.505	WV, Fairmont (105W)	392601N801136W	375	44284	Commerce
2208.575- 2213.505	WV, Fairmont (137W)	392601N801136W	375	44284	Commerce
2224.650- 2226.750	Guam	133533N1445039E	839	41856	Air Force
2224.650- 2226.750	Guam	133455N1445034E	839	42268	Air Force
2224.650- 2226.750	HI, Wahiawa	213 1 13N1575953W	1200	41856	Air Force
2224.650- 2226.750	HI, Kaena Point	213405N1581539W	1200	41856	Air Force
2227.500	FL, Cape GA CCAFB	282903N0803421W	1200	43336	Air Force
2227.5	RMI, Kwajalein Island	084323N1674353E	1200	44285	Air Force
2237.500	CA, Redondo Beach	335351N1182225W	1200	41856	Air Force
2240-2290	CO, Colorado Springs	385924N1045136W	375	41546	Air Force
2262-2266	Guam	133537N144553 JE	1200	42116	DOC
2262-2266	HI, Hickam AFB	211918N1575730W	1200	42116	DOC
2274-2278	UT, Logan	414424N1115009W	350	43940	Air Force
2290-2300	CA, Goldstone	352529N1165324W	1800	19906	NASA
2290-2300	CA, Goldstone (DSS-14)	352533N1165319W	650	37751 36470	NASA
3700-4200	Nova Scotia, Mill Village	441119N0644012W	756	11804	Canada
3700-4200	Quebec, Bouchette	461318N0755230W	475	11804	Canada
7250-7300	NC, Fort Bragg	351000N0790100W	823	26516	Army
7250-7300	VA, Fort Belvoir	384337N0770853W	1042	26971	Army
7250-7750	AK, Ft. Greely	635848N1454312W	376	40643	Army
7250-7750	CA, Vandenberg AFB (52.5W)	344405N1203251W	460	36889	Air Force
7250-7750	CA, Vandenberg AFB (135W)	344405N1203251W	460	36889	Air Force
7250-7750	CA, Vandenberg AFB (52.5W)	344406N1203253W	460	36889	Air Force
7250-7750	CA, Vandenberg AFB (135W)	344406N1203253W	460	36889	Air Force
7250-7750	CO, Colorado Springs	384834N1044036W	375	43940	Air Force
7250-7750	CO, Schriever (DSCS 3 E-PAC)	384754N1043128W	1344	27569	Air Force
7250-7750	CO, Schriever (DSCS 3 W-ATL)	384754N1043128W	453	27569	Air Force
7250-7750	HI, Kunia	212847N1580316W	1392	27197	Army
7250-7750	IL, Scott AFB	383207N0895106W	438	27198	Air Force
7250-7750	MA, Hanscom AFB	422729N711627W	600	44286	Air Force
7250-7750	MD, Andrews AFB	384850N0765320W	830	37802	Air Force
7250-7750	MD, Blossom Point	384301N0770859W	820	37993	Navy

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7250-7750	NC, Rosman	350245N0825233W	541	27991	Army
7250-7750	NM, Kirtland AFB	350300N1062400W	400	30397	Air Force
7300-7750	AK, Clear AFS	642039N1491113W	465	28252	Air Force
7300-7750	AK, Eareckson AFB	524342N1740539E	500	19807	Air Force
7300-7750	AK, Elmendorf	611513N1494730W	575	19808	Air Force
7300-7750	CA, Beale AFB	390815N1212647W	1042	28252	Air Force
7300-7750	CA, Camp Parks	374358N1215241W	1054	28443	Air Force
7300-7750	CA, Camp Roberts	354403N1204513W	1025	28252	Army
7300-7750	CA, Camp Roberts	354403N1204513W	400	19697	Army
7300-7750	CA, Onizuka (Sunnyvale) AFS	372423N1220133W	375	19811/17378	Air Force
7300-7750	CO, Buckley ANGB	394255N1044629W	483	28252	Air Force
7300-7750	CO, Peterson AFB	384831N1044235W	454	28252	Air Force
7300-7750	GA, Fort Gordon	332520N0821058W	1051	28252	Army
7300-7750	GA, Fort Gordon	332520N0821058W	650	19759	Army
7300-7750	GA, Robins AFB	323819N0833631W	620	28252	Air Force
7300-7750	Guam, Finegayan	133455N1445050E	575	19812	Navy
7300-7750	HI, Hickam AFB	211939N1575652W	1357	28252	Air Force
7300-7750	HI, Hilo	194300N1550328W	1500	28252	Air Force
7300-7750	HI, Wahiawa	212529N1580546W	775	19739	Navy
7300-7750	MA, Cape Cod AFS	414511N0703218W	1046	28252	Air Force
7300-7750	MD, Brandywine	384040N0765042W	169	12997	Air Force
7300-7750	MD, Fort Detrick	392636N0772453W	1045	28252	Army
7300-7750	MD, Fort Detrick	392636N0772453W	700	19698 19480 16632	Army
7300-7750	MD, Fort Meade	390614N0764526W	1102	28252	Army
7300-7750	MD, Fort Ritchie	394225N0772915W	490	28252	Army
7300-7750	ND, Cavalier AFS	484331N0975356W	403	28252	Air Force
7300-7750	NE, Offutt AFB	410809N0955454W	475	19527	Air Force
7300-7750	NH, Manchester	425600N0713800W	550	19526	Air Force
7300-7750	Ontario, Carp	452100N0760310W	550	15524	Canada
7300-7750	PR, Cabre de Tierra	1813XXN06537W	750	20042	Navy
7300-7750	TX, Eldorado AFS	311030N1003308W	470	28252	Air Force
7300-7750	TX, Lackland AFB	292230N0983730W	1117	28252	Air Force
7300-7750	VA, Northwest	364903N0763216W	650	19893	Navy
7300-7750	VA, Northwest	363336N0761503W	1051	28298	Navy
8025-8400	AK, Anchorage	610924N1495907W	821	40643	NASA
8025-8400	AK, North Pole	644818N1473000W	468	40643	NASA
8025-8400	AK, Poker Flat	650700N1472735W	375	40643	NASA
8025-8400	AK, Fairbanks (U of AK)	645137N1475050W	385	28561	NASA
8025-8400	AK, Gilmore Creek	645826N1473007W	1375	39549	Commerce
8025-8400	AL, Huntsville	344039N863645W	375	43940	Air Force
8025-8400	CA, La Jolla	325211N1171507W	945	40643	NASA
8025-8400	CA, Long Beach (KSAT)	334924N1180847W	784	44286	Air Force
8025-8400	CA, Poway	325618N1170242W	741	40643	NASA
8025-8400	CA, San Diego	325013N1170940W	1144	43940	Air Force
8025-8400	FL, St. Petersburg	274536N0823755W	954	40643	NASA
8025-8400	HI, Honolulu	211754N1574859W	969	40643	NASA
8025-8400	MD, Greenbelt	385957N0765118W	900	40643	NASA
8025-8400	HI, Nelha	190111N1554532W	875	30900	NASA
8025-8400	HI, South Point	190613N1553947W	600	33728/33411	NASA
8025-8400	PA, Horsham	401210N0751028W	725	30900	NASA

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8025-8400	SC, Columbia	345443N804820W	472	43940	Air Force
8025-8400	SD, Sioux Falls	434410N0963721W	360	39549	NASA
8025-8400	VA, Wallops Island	375528N0752835W	4000	40420	NASA
8025-8400	VA, Wallops Island (WG5 Antenna)	375535N752832W	1017	44286	NASA
8025-8400	WI, Madison	430415N0892424W	463	40643	NASA
8160-8280	WV, Fairmont (60W)	392601N801136W	330	44284	Commerce
8160-8280	WV, Fairmont (75W)	392601N801136W	330	44284	Commerce
8160-8280	WV, Fairmont (89.5W)	392601N801136W	330	44284	Commerce
8160-8280	WV, Fairmont (105W)	392601N801136W	330	44284	Commerce
8160-8280	WV, Fairmont (137W)	392601N801136W	330	44284	Commerce
8160-8280	VA, Wallops Island (60W)	375645N752744W	582	44284	Commerce
8160-8280	VA, Wallops Island (75W)	375645N752744W	575	44284	Commerce
8160-8280	VA, Wallops Island (89.5W)	375645N752744W	575	44284	Commerce
8160-8280	VA, Wallops Island (105W)	375645N752744W	575	44284	Commerce
8160-8280	VA, Wallops Island (137W)	375645N752744W	575	44284	Commerce
8400-8450	VA, Wallops Island (WG5 Antenna)	375535N752832W	1200	44286	NASA
8450-8500	AK, Fairbanks (ASF-10)	645135N1475050W	1875	40420	NASA
8450-8500	AK, Fairbanks (ASF-11)	645131N1475118W	1875	40420	NASA
8450-8500	CA, Goldstone (DSS-13)	351450N1164738W	975	29584	NASA
8450-8500	CA, Goldstone (DSS-26)	352008N1165223W	1155	39549	NASA
8450-8500	CA, Goldstone (DSS-26)	352008N1165223W	464	39549	NASA
8450-8500	KY, Morehead	381131N0832620W	500	43334	NASA
8450-8500	VA, Wallops Island	375528N0752835W	4000	40420	NASA
8450-8500	VA, Wallops Island (WG5 Antenna)	375535N752832W	1200	44286	NASA
8475	AK, North Pole	644816N1473001W	514	44285	Air Force
8475	HI, Naalehu	190050N1553947W	1200	44285	Air Force
8475	HI, Naalehu	190049N1553946W	1200	44285	Air Force
25500-27000	NM, White Sands	323002N1063616W	80	37751/33721	NASA
25500-27000	VA, Wallops Island (WG5 Antenna)	375535N752832W	263	44286	NASA
26703.4	AK, Gilmore Creek	645823N1473022W	100	42268	DOC
31800-32300	CA, Goldstone (DSS-13)	351450N1164740W	200	32075	NASA
31800-32300	CA, Goldstone (DSS-25)	352015N1165231W	185	SPS-12658	NASA

* The nominal coordination distance shown is the maximum coordination distance derived from the coordination contour.

8.3.16 Coordination Procedures for the Use of the Frequencies 1030 and 1090 MHz and Frequencies in the Bands 1215-1390, 2700-2900 and 9000-9200 MHz

1. Applicability--The following coordination procedures provide for the local selection of frequencies and minimize the possibility of harmful interference. These procedures are applicable for all frequency assignment actions for use by U.S. Federal Government radio stations within the US&P for the purposes indicated:

1030 MHz
1090 MHz
1215-1390 MHz--Radars
2700-2900 MHz--Radars
9000-9200 MHz--Radars

These procedures provide for coordination and selection of frequencies minimizing the possibility of harmful interference.

2. Coordination Procedures--The FAA, as the National Airspace System (NAS) manager and having primary responsibility for flight safety, has established a web-based frequency coordination request portal (See Annex D). This portal should be used for the coordination of UNCLASSIFIED frequency requests used for control of aeronautical operations within the NAS. Annex D provides a more detailed description of the FAA frequency coordination portal.

3. Procedures

a. General--All proposed UNCLASSIFIED frequency assignment actions as described above shall be coordinated by the applicant with the FAA via the web portal (See Annex D), or as otherwise prescribed by an FAA representative. The request will be automatically forwarded to the appropriate FAA personnel, who will recommend a frequency and pulse repetition rate (PRR) based on the applicant's requirements and the technical particulars furnished by the applicant. If an interference free frequency or PRR cannot be engineered, the FAA will inform the applicant of such and will recommend alternatives and/or restrictions to preclude such interference problems.

b. Interrogators (1030 MHz) and Transponders (1090 MHz)

(1) The concentration of usage for secondary surveillance radar (SSR) (IFF/SIF) systems on a single pair of frequencies, 1030 MHz and 1090 MHz, requires special measures to assure compatibility of operations. Strict control of operational parameters (i.e., power, pulse repetition rate, side lobe suppression, etc.) is necessary to prevent unacceptable degradation to the military mission and flight safety.

(2) Agencies shall cooperate with the FAA in the coordination, selection, and control of critical operational parameters to provide optimum sharing and maximum assurance of compatible operations within the limits of equipment availability and operational requirements. This cooperation shall include timely responses to FAA proposals for changes of PRRs, powers, SLS, etc., which may be required for relief of harmful interference, and submission of a modification or replacement action to the FAS to amend that frequency assignment record.

(3) Accordingly, all federal agencies requiring the use of 1030 MHz for interrogators or 1090 MHz for ground transponders, and either frequency for test equipment that radiate pulsed emissions, shall, prior to filing applications for new and modified requirements, coordinate the planned operational parameters for each new interrogator or ground transponder and every change of each existing interrogator with the FAA.

(4) Shipboard Interrogators--Operational agreements with the FAA are required when operations are within 185 kilometers of the U.S. Coast or its possessions or as modified by local agreement. Further coordination is not required when parameters are within guidelines established by operational agreements.

(5) Land-based Mobile Interrogators--Operational agreements with the FAA are required when an interrogator is to be operated at transient locations, such as during military maneuvers. Further coordination is not required when parameters are within guidelines established by operational agreements.

(6) Airborne Interrogators--FAA coordination is required and operational capabilities and parameters must be established when an interrogator is operated airborne. Further coordination is not required when parameters are within established guidelines.

(7) Airborne Transponders--Since transponders are safety systems, FAA coordination is required prior to transponder operations. Transponders requiring unrestricted operations in the US&P require either FAA Civil Certification or an NTIA Stage 4 Certification to apply for a US&P assignment. These certifications cover specific equipment, software load, airframe, and airframe configurations. Operations of uncertified transponders will be confined to specific restricted airspace(s); however, a temporary US&P assignment is allowed, for operational purposes, while awaiting the DOD AIMS Platform-Level and NTIA Stage 4 Certifications.

c. Radars (1215-1390, 2700-2900, 9000-9200 MHz)

(1) The concentration of usage for radar systems requires special measures to assure compatibility of operations. The planning, coordination, and control required to provide separation between frequencies and pulse repetition rates and operations within mutual interference range, are necessary to prevent unacceptable degradation where flight safety and meteorological radars are concerned.

(2) Agencies shall cooperate with the FAA in the coordination, selection, and control of power, frequencies and PRRs to provide optimum sharing and maximum assurance of compatible operations within the limits of equipment availability and operational requirements. This cooperation shall include timely responses to FAA proposals for changes of power, frequencies and PRRs which may be required for relief of harmful interference, and submission of a modification or replacement action to the FAS to amend that frequency assignment record.

(3) Accordingly, all federal agencies requiring the use of 1215-1390, 2700-2900, 9000-9200 MHz for radars and for test equipment that radiate pulsed emissions, shall, prior to filing applications for new and modified

requirements, coordinate the planned power, frequencies and PRRs for new radars and every change of existing radars the FAA.

(4) There are certain areas in the U.S. where it is difficult to accommodate additional radars in the 2700-2900 MHz band (see Annex D, Figure 1 and Table 1). Radar systems which comply with RSEC Criteria D, under Section 5.5 of this manual, have the capability of incorporating additional Electromagnetic Compatibility (EMC) provisions to enhance their accommodation in designated heavily used areas or for collocated operation. The FAA and the agency requesting the assignment will assess the requirement for these additional EMC provisions when coordinating frequency assignments in the 2700-2900 MHz band. Frequency assignments in designated heavily used areas or for collocated operation for radars which comply with RSEC Criteria D and do not have the additional EMC provisions installed, shall bear the Record Note S373 (see Annex A).

(5) Shipboard Radars--Operational agreements with the FAA are required when operations are within 100 Nautical Miles (NM) of the U.S. Coast or its possessions or as modified by local agreement. Further coordination is not required when parameters are within guidelines established by operational agreements.

(6) Land-based Mobile Radars--Operational agreements with the FAA are required when a radar is to be operated at transient locations, such as during military maneuvers. Further coordination is not required when parameters are within guidelines established by operational agreements.

(7) Airborne Radars--Prior national-level coordination is required and operational capabilities and parameters must be established when a radar is operated airborne. Further coordination is not required when parameters are within established guidelines.

4. Applicants shall ensure that the coordination comments of the FAA Regional Coordinator are included on all assignment actions submitted to the FAS. The FAS shall not recommend approval of assignment actions that do not bear the appropriate Coordination Note indicating completion of the coordination required by these procedures (see Annex A and Annex D).

5. The NTIA will inform FAA quarterly of all frequency assignment actions affecting the applicable frequencies and bands and areas specified in these procedures.

6. For classified requests, contact the FAA FAS representative and/or submit to FAA-Spectrum@faa.sgov.gov.

8.3.17 Procedures for Field Level Coordination, and Coordination with the Aerospace and Flight Test Radio Coordinating Council of the Frequency Bands 1435-1525, 2360-2395, and 5091-5150 MHz

1. Applicability--These procedures are applicable for all frequency assignment actions for use of frequencies in the bands 1435-1525, 2360-2395 and 5091-5150 MHz by U.S. Federal Government radio stations within the conterminous U.S., and are implemented to minimize, through local selection of frequencies and effective coordination, the possibility of harmful interference.

2. Field Level Coordinators.

a. Non-Federal: The Aerospace and Flight Test Radio Coordinating Council (AFTRCC) is comprised of representatives of the aerospace manufacturing industry using the federal/non-federal shared 1435-1525, 2360-2395 and 5091-5150 MHz bands during the research and development phases of manned and unmanned aircraft, missiles, booster rockets and other expendable vehicles, or their major components. In 1969 the FCC recognized the AFTRCC as the Frequency Coordinating Advisory Committee for non-federal flight test telemetry station assignments in the band 1435-1525 MHz, and in 2012 extended this recognition to the 2360-2395 and 5091-5150 MHz bands. The AFTRCC Coordinator (point of contact for coordination) is listed in Annex D, Table 3.

b. Federal: The military services, as major users of the radio frequency spectrum during research, development and testing of systems, have established Area Frequency Coordinators (AFC) that are responsible for coordination of frequency use within designated military ranges or geographical areas of the U.S. In 1971¹³ the IRAC agreed that certain military AFCs would be the principal federal entities responsible for field level coordination of all U.S. federal use of the band 1435-1525 MHz, and in 2012 extended this procedure to include the 2360-2395 MHz band. Annex D, Table 3 lists these AFCs and indicates their areas of responsibility and Figure 3 is a map depicting those areas. The FAA, as the Aeronautical Advisory Group (AAG) chair, is responsible for engineering and coordination within the 5091-5150 MHz band. In 2012, aeronautical mobile telemetry (AMT) transmissions were permitted in

¹³ The original agreement covered the band 1435-1535 MHz, which was later modified to 1435-1525 MHz.

accordance with World Radiocommunication Conference (WRC-15) Resolution 418.

3. Coordination.

a. All proposed frequency assignment actions shall be coordinated by the applicant with the appropriate AFC listed in Annex D, Table 3 and Figure 3. The procedures for coordination will be those mutually agreeable to the AFC and applicant concerned.

b. AFCs shall coordinate all proposed frequency assignment actions, except those in the Radiolocation Service, with the AFTRCC Coordinator. AFCs shall notify the AFTRCC Coordinator of all proposed frequency assignment actions in the Radiolocation Service in the 2360-2395 MHz band. The procedures for coordination and/or notification will be those mutually agreeable between the AFTRCC Coordinator and AFC concerned.

c. For the 5091-5150 MHz band, all proposed frequency assignments must be coordinated with and approved by the FAA per Annex D, prior to completing the AFTRCC coordination process. As a minimum, AMT operations in the 5091-5150 MHz band must meet the requirements of Resolution 418, including channelization and PFD, and will be restricted to flight testing range areas defined in footnote US111. Also, AMT testing will be limited to testing aircraft during non-commercial flights for development, evaluation, and/or certification of aircraft. AMT assignments approved by the FAA must have record note (C090).

d. AFCs will inform applicants of any probability of harmful interference involving proposed frequency assignment actions. If appropriate, the AFC will recommend alternatives and/or restrictions to preclude interference problems. If the applicant wishes, the AFC will recommend a frequency based on the applicant's requirements and the technical particulars furnished by the applicant. The AFC's comments and/or recommendations to the applicant will be based on authorized spectrum usage within the AFC's area of responsibility, coordination with the AFTRCC, and such additional coordination with other entities and activities which the AFC deems appropriate.

4. Applicants shall ensure that the coordination comments of the AFC are included on all frequency assignment actions submitted to the FAS. The FAS shall not recommend approval of assignment actions that do not bear the appropriate Coordination Note indicating completion of the coordination required by these procedures (see Annex A and Annex D, Table 3).

5. To ensure periodic re-evaluation, an expiration date not exceeding 5 years from the date of authorization or revision is required on each frequency assignment in the bands 1435-1525, 2360-2395 and 5091-5150 MHz, except those in the Radiolocation Service in the 2310-2390 MHz band.

6. The NTIA will inform each AFC monthly of all frequency assignment actions affecting the bands 1435-1525, 2360-2395 and 5091-5150 MHz in the areas specified in these procedures.

8.3.18 Coordination with or Notification to Non-Federal Advanced Wireless Service Licensees of Changes Involving Federal Satellite Earth Stations Operating in the 1761-1780 MHz Band

1. General Provisions

a. In accordance with paragraph (b)(3) of footnote US91 to the National Table of Frequency Allocations, federal earth stations in the space operation service (Earth-to-space) may transmit at 25 specified sites and non-federal base stations must accept harmful interference caused by the operation of these earth stations. In accordance with the Note to paragraph (b)(3), if required, successfully coordinated with all affected AWS licensees, and authorized by NTIA, reasonable modifications of these grandfathered federal systems beyond their current authorizations or the addition of new earth station locations may be permitted. This section sets forth coordination and notification requirements, unless otherwise specified in a coordination agreement with an affected licensee. Modification of a grandfathered federal earth station in the space operation service (Earth-to-space) in the 1761-1780 MHz band beyond its current authorization, or the addition of a new earth station in this band, will not be authorized by NTIA until compliance with the following procedures has been accomplished.

b. For purposes of this section and the following procedures,

(1) a "current authorization" includes any existing and effective (i) certification of spectrum support for a system that includes a grandfathered federal earth station or (ii) frequency assignment for one of the 25 grandfathered federal earth station sites;

(2) an "affected licensee" includes any Advanced Wireless Service (AWS) licensee in the 1761-1780 MHz band (or the FCC for any license not held by a licensee) whose license area is fully or partially within:

(a) the applicable US91-site coordination polygon set forth in Appendix C-2 of the 2014 FCC-NTIA

*Joint Public Notice*¹⁴; or

(b) a new -101.5 dBm received-signal-level contour generated under paragraph 3.a.(2)(i) below.

(3) a “US91-site area” is the applicable geographic area represented by the boundaries surrounding the 25 locations specified in footnote US91(b)(3) to the National Table of Frequency Allocations and as depicted in the shape files available at <https://www.ntia.doc.gov/other-publication/2015/aws-3-coordination-procedures>.

(4) “Commerce Spectrum Management Advisory Committee (CSMAC) WG-3 analysis” refers to Section 4.2.3.2 – Baseline scenario, 3 dB desensitization contour (-101.5 dBm) of the CSMAC Working Group 3 (WG-3) report dated July 19, 2013.¹⁵

c. Each applicable agency operating satellite earth stations in the 1761-1780 MHz band is strongly encouraged to establish an ongoing relationship and enter into an operator-to-operator coordination agreement, through the process established in the 2014 FCC-NTIA *Joint Public Notice*¹⁶ or through other means, with each affected licensee to facilitate ongoing exchanges of information and cooperation in matters subject to subsection (b) of footnote US91 to the National Table of Frequency Allocations and Section 27.1134(f) of the FCC rules.

2. Specific Coordination Provisions

a. Before an agency seeks NTIA authorization to (i) add an earth station location outside a US91-site area, or (ii) increase the EIRP of a current authorization within a US91-site area higher than the EIRP level set forth in Table 1 below, or (iii) add a new site within a US91-site area with a higher EIRP level than set forth in Table 1 below, the agency shall successfully coordinate with each affected licensee.

b. To document the requirements of paragraph (a) above, concurrent with any request for frequency assignment action or certification of spectrum support, the agency shall provide NTIA written evidence of the successful coordination with each affected licensee at US91@ntia.doc.gov.

3. Additional Notification Provisions

a. Before an agency seeks NTIA authorization for a request not covered by paragraph 2 above that involves a proposed change to a current authorization or certification for an earth station location or antenna feed elevation within a US91-site area, or a new earth station location within a US91-site area, the agency shall:

(1) notify each affected licensee at least 30 days prior to submitting the request to NTIA; and

(2) provide each affected licensee a -101.5 dBm received-signal-level contour plot in the form of a GIS object (e.g., shapefile or kml format) generated using the CSMAC WG-3 analysis methodology for both (i) the proposed operation and (ii) the original configuration modeled in the CSMAC analysis for that site.

(3) Work with the affected AWS-3 licensees in good faith to mitigate increases in potential interference (as defined by the CSMAC WG-3 analyses), to include possibly modifying the earth stations.

b. For all other new requests, or changes to frequency authorization or certification of spectrum support for earth stations operating in US91-site areas, an agency will notify each affected licensee of the details of the new request or change as it relates to the CSMAC WG-3 assumptions 30 days prior to submitting a request to NTIA.

c. Concurrent with any request for NTIA authorization under paragraph (3)(a), the agency shall provide NTIA documentation of:

(1) the initial notification(s) required under paragraph (3)(a) and any subsequent notifications; and

(2) the affected licensee’s acknowledgement of receipt of the initial or subsequent notification; or

(3) any correspondence necessary to establish that the notification was transmitted in good faith and that the receiving party did not acknowledge receipt.

(4) a copy of the -101.5 dBm received-signal-level contour plot in the form of a GIS object (e.g., shapefile or kml format) generated using the CSMAC WG-3 analysis methodology for both (i) the proposed operation and (ii) the original configuration modeled in the CSMAC analysis for that site as required under (3)(a).

¹⁴ See “FCC and NTIA: Coordination Procedures in the 1695-1710 MHz and 1755-1780 MHz Bands,” GN Docket No. 13-185, *Joint Public Notice*, 79 FR 54710, 54717-18 (Sept. 12, 2014), 29 FCC Rcd 8527, 8554 (2014) available at https://apps.fcc.gov/edocs_public/attachmatch/DA-14-1023A1_Rcd.pdf.

¹⁵ See CSMAC, “1755-1850 MHz Satellite Control and Electronic Warfare,” Final Report of Working Group 3 (July 19, 2013), available at http://www.ntia.doc.gov/files/ntia/Working_Group_3_Final.pdf.

¹⁶ See *Joint Public Notice*, 79 FR 54710, 54717-18 (Sept. 12, 2014); 29 FCC Rcd at 8541-42, 8567-69.

Table: Grandfathered US91-Site Area Earth Station Parameters

US91 Sites	Latitude	Longitude	Elevation above MSL (m)	Max Transmit Power (dBW)	Max Antenna Gain (dB)	EIRP (dBw)
Annapolis	38-59-26.93N	76-29-24.74W	24	14.8	36	50.8
Buckley	39-42-55N	104-46-29W	1726	32	43	75
Blossom Point	38-25-53.5N	77-05-06.4W	19	25	46	71
Cape GA,CCAFB	28-29-03N	80-34-21W	6	24	40	64
Camp Parks	37-43-51N	121-52-50W	300	30	42	72
Schriever AFB	38-48-21.6N	104-31-40.8W	1910	31.2	45	76.2
Cape Canaveral AFS	28-29-09N	080-34-33W	2	23	28	51
Fairbanks	64-58-26N	212-29-39E	385	25	43	68
Ft Bragg	35-09-04N	78-59-13W	89	24	26.8	50.8
Ft. Belvoir	38-44-04N	077-09-12.5W	61	25	40	65
Ft. Hood	31-08-57N	97-46-12W	300	24	26.8	50.8
NAVSOC Det. Charlie	13-34-57.6	144-50-31.6E	208	15	40	55
Andersen AFB	13-36-54N	144-51-21.6E	218	37.1	45.1	82.2
Huntington Beach	33-44-49.89N	118-2-3.84W	11	24	26.8	50.8
Kaena Point, Oahu	21-33-43.2N	158-14-31.2W	430	32.1	45.4	77.5
Joint Base Lewis-McChord	47-06-11N	122-33-11W	86	24	26.8	50.8
Kirtland AFB	34-59-46N*	106-30-28W	1600	28	38.4	66.4
JIATF-S Key West	24-32-36N	81-48-17W	2	24	26.8	50.8
Laguna Peak	34-06-31N	119-03-53W	439	31	43	74
Monterey	36-35-42N	121-52-28W	102	14.8	36	50.8
New Boston AFS	42-56-45.6N	71-37-44.4W	200	38.6	45	83.6
Prospect Harbor	44-24-16N	068-00-46W	6	31	38	69
Patuxent River NAS	38-16-28N	76-24-45W	6	24	26.8	50.8
Sacramento	38-39-59N	121-23-33W	23	24	26.8	50.8
Vandenberg AFB	34-49-22.8N	120-30-7.2W	269	37.1	45	82.1
* Corrected Kirtland AFB coordinates.						

8.3.19 Coordination of Assignments in the Band 406.1-410 MHz to Stations (Other Than Mobile) in the Vicinity of Certain Radio Astronomy Observatories

In order to minimize possible harmful interference to radio astronomy observations, all proposed frequency assignments in the band 406.1-410 MHz to stations (including stations to be established under group authority), other than mobile stations, within the following areas, shall be coordinated by the applicant through the National Science Foundation, 4201 Wilson Boulevard, Room 1030, Arlington, VA 22230, Telephone: 703-292-4896.

a. Arecibo Observatory

Rectangle between latitudes 17°30'N and 19°00'N and between longitudes 65°10'W and 68°00'W.

b. Owens Valley Radio Observatory

Two contiguous rectangles, one between latitudes 36°N and 37°N and longitudes 117°40'W and 118°30'W, and the second between latitudes 37°N and 38°N and longitudes 118°W and 118°50'W.

c. Sagamore Hill Radio Observatory

Rectangle between latitudes 42°10'N and 43°00'N and longitudes 70°31'W and 71°31'W.

d. Table Mountain Solar Observatory

(NOAA) Boulder, Colorado (407-409 MHz only) rectangle between latitudes 39°30'N and 40°30'N and longitudes 104°30'W and 106°00'W or the Continental Divide, whichever is farther east.

8.3.20 Coordination of Assignments to Stations (other than Mobile) to be located in the Vicinity of the Table Mountain Radio Receiving Site, Boulder, Colorado

1. In order to minimize possible harmful interference at the Table Mountain Receiving Site of the Department of Commerce Boulder Research Laboratories, Boulder County, Colorado, all proposed frequency assignments to

stations (including assignments to stations to be established under group authority), other than mobile stations, within specified conditions of power and radial distances from a central point on the Table Mountain Receiving Site (coordinates, 40°07'50"N latitude, 105°14'40"W longitude) as given below, shall be coordinated prior to authorization with the Radio Frequency Manager, Department of Commerce, 325 Broadway, Boulder, CO 80305. The contact information is phone: 720-626-0499, and E-mail: frequencymanager@ntia.gov.

2. The conditions of power and radial distances are:

- a. All stations within 2.4 kilometers.
- b. Stations with 50 W or more ERP within 4.8 kilometers.
- c. Stations with 1 kW or more ERP within 16 kilometers.
- d. Stations with 25 kW or more ERP within 80 kilometers.

3. Field strengths of any radiated signals (excluding reflected signals) received on this 1800 acre site resulting from the operation of radio stations authorized after January 1, 1973, or from the modification or relocation of stations authorized after that date, should not exceed the following instantaneous values:

Frequency Range	Field Strength (mV/m) in Authorized Bandwidth of Service	Power Flux Density* (dBWm5) in Authorized Band width of Service
Below 540 kHz	10	- 65.8
540-1600 kHz	20	- 59.8
1.6-470 MHz	10	- 65.8 **
470-890 MHz	30	- 56.2 **
Above 890 MHz	1	- 85.8 **

* Equivalent values of power flux-density are calculated assuming a free-space characteristic impedance of 20 (approximately 376.7) ohms.

** Space stations shall conform to the power flux-density limits at the Earth's surface specified in Section 8.2.36, but in no case should exceed the above levels in any 4 kHz band for all angles of arrival.

4. The field strengths as given above should be determined in accordance with current engineering standards and practices.

5. The foregoing is not intended to establish a policy of exclusion but each proposal will be considered on its merits, on a case-by-case basis.

8.3.21 Coordination of High Frequencies for Projects and Systems Involving Oceanographic Data Transmissions

1. Radio frequencies in the bands 4063.3-4064.8, 6261.3-6262.5, 8340.3-8341.5, 12420.3-12421.5, 16617.3-16618.5, and 22240.3-22241.5 kHz used for transmission and reception of oceanographic data require specialized coordination procedures.

2. Accordingly, any operational use of the Appendix 17 oceanographic data transmission frequencies should be in accord and/or compatible with the Plan(s) developed by the IOC/WMO, if international protection and BR registration are desired.

8.3.22 Use of Aeronautical Mobile (R) Service Channels in the 5000-5010 MHz Band

1. The band 5000-5010 MHz is allocated on a primary basis to the aeronautical radionavigation service, the aeronautical mobile satellite (R) service, the radionavigation satellite service (RNSS) (Earth-space) and the aeronautical mobile (R) service (AM(R)S). The allocation to the AM(R)S includes provisions to ensure that stations in the AM(R)S do not cause harmful interference to RNSS space station receivers.

2. The U.S. has approved plans for the next-generation Global Positioning System (GPS) use of the 5000-5010 MHz band for tracking, telemetry, and command (TT&C) functions. Per the allocation, AM(R)S stations in the 5000-5010 MHz band, limited to surface applications at airports, shall be restricted as necessary, including reducing throughput and/or precluding use of certain AM(R)S channels in certain geographic locations as necessary to ensure protection from harmful interference of the AM(R)S and the safe operation and development of RNSS stations operating in this band. Though all current GPS TT&C stations are fixed, it is possible that in the future: 1) GPS TT&C stations may be transportable and 2) TT&C stations may need to be located near an airport. If the required separation distances cannot be maintained, certain AM(R)S channels may not be useable at those geographic

locations.

a. Since the AM(R)S shall meet SARPs requirements published in Annex 10 of the ICAO Convention on International Civil Aviation and shall operate according to those characteristics and requirements, where SARPS are not in agreement with U.S. national regulations, U.S. national regulations will take precedence.

b. When RNSS TT&C frequency assignments are proposed for the 5000-5010 MHz band, the FAA and DOD will work cooperatively to, for that specific geographic location, determine necessary separation distances to ensure safe operation of the AM(R)S. Any AM(R)S operations in the band 5000-5010 MHz occurring within that separation distance will be precluded as necessary to ensure protection of the AM(R)S. Upon receipt of a complaint of harmful interference to the RNSS operating in that band, the AM(R)S shall take all necessary steps to immediately eliminate the interference, to include cease of operations in that band, and thereafter enter into discussions with NTIA and DOD, concerning permanent means to prevent any recurrence.

c. The FAA shall not use the requirement to vacate AM(R)S channels in the 5000-5010 MHz band as rationale for opposing RNSS TT&C frequency assignments in that band.

d. All AM(R)S stations proposed for operation in the 5000-5010 MHz band will be submitted to the SPS for systems review under the provisions of Chapter 10 prior to submission of requests for frequency assignment.

e. In requesting frequency assignments, the FAA shall attempt to first satisfy the spectrum requirements for the AM(R)S surface application systems in the band 5091-5150 MHz.

f. The maximum possible instantaneous effective isotropically radiated power from any single AM(R)S shall not exceed 40.6 dBm/10 MHz below 5 degrees elevation, or 37.1 dBm/10 MHz at or above 5 degrees elevation, which will ensure protection of RNSS systems operating in this band.

g. The coordination distance for AM(R)S stations operating in the band 5000-5010 MHz with respect to stations in the radio astronomy service operating in the band 4990-5000 MHz shall be 150 km.

8.3.23 Coordination of Assignments to Federal Broadcasting Stations (Other Than International Broadcasting)

1. Proposed assignments to federal broadcasting stations (AM, FM, and TV) within areas where the FCC exercises jurisdiction over non-federal radio services in the bands 535-1605 kHz (AM), 54-72 MHz (TV), 76-88 MHz (TV), 88-108 MHz (FM), 174-216 MHz (TV), and 470-806 MHz (TV), shall be coordinated with the FCC Liaison Representative, IRAC. General criteria applicable to such federal broadcasting are:

a. The use of a broadcasting frequency by a station licensed by the FCC, as prescribed in its rules and standards, shall not be restricted or precluded.

b. The station shall not provide service to civilian populations being served by non-federal broadcasting stations, except in emergencies.

c. The station shall not cause harmful interference, as determined under FCC rules, to FCC-licensed broadcasting stations or to stations in other countries in contravention of existing treaties or agreements.

d. Operation of the station shall be discontinued upon notification by the FCC that harmful interference is being caused to any authorized non-federal broadcasting station.

e. Concurrence by the FCC may be reconsidered if continued operation is judged to impede the orderly development of private broadcasting or otherwise contravene the public interest.

f. Proposals shall be coordinated with the FCC at least 80 days before the operation is expected to commence.

g. The following general limitations shall apply to federal broadcasting stations:

(1) Medium wave AM, TV, and FM stations (except for G2 below) will not be authorized within the conterminous U.S. This restriction does not apply to translators. (See II B below.)

(2) Federal low power educational FM stations in the conterminous U.S. will be limited to federal educational institutions offering curriculums similar to those of private or state supported colleges and universities.

2. Such request for coordination with the FCC shall contain the following information:

a. For all proposals:

(1) Frequency

(2) Transmitter power (rated)

(3) Name of transmitter location

(4) Antenna location (latitude/longitude)

(5) Bandwidth/emission

(6) Definition of the area to be served (preferably on a local map)

(7) Applicable IRAC record notes

(8) Letter of consent from the owner of commercial and educational stations if their programming is to be rebroadcast or retransmitted.

(9) Statement indicating why the service desired is not available from commercial or educational stations.

(10) Identity of broadcasting stations presently providing service to the area (AM, FM, and TV stations, including translators).

(11) Identity of broadcasting stations considered in electromagnetic interference or feasibility studies and the potential interference impact upon them from the proposed operation.

b. For FM and TV proposals, the following is also required:

(1) Effective radiated power

(2) Antenna type and gain

(3) Antenna height above mean sea level

(4) For translators furnish height above ground. For other operations provide antenna height above average terrain:

(a) Average elevation of terrain along each of 8 radials from 3.2 to 16 kilometers from antenna at 45 degree azimuth intervals starting at 0 degrees azimuth.

(b) Average elevation of all 8 radials.

(5) Plot of the horizontal and vertical field intensity radiation patterns if a directional antenna is used (including beam tilt).

c. For AM broadcast proposals for transmitters of 100 watts output power or more, the following additional information shall be supplied in order for the FCC to make its studies and to provide the required international notifications pursuant to applicable international broadcasting agreements (not related to ITU notifications):

(1) The power into the antenna feed point, if significantly different from the transmitter output power.

(2) Description of antenna system to include, but not limited to the following:

(a) Effective radiating height

(b) Diagram of top-loading or sectionalizing, if used

(c) Number of ground systems radials and radial length

(d) For omni-directional antennas--Predicted unattenuated radiated field (mV/m/kW)

(e) For directional antennas--The directional antenna radiation patterns; horizontal only for daytime and horizontal and vertical angles for nighttime operations at increments of 10° through and including 60° in the vertical. Also, the theoretical values for each tower of field ratio and current phase angle, and tower placement sketch showing spacing and orientation of towers.

8.3.24 Coordination of Frequencies Used for Communications with Non-Federal Citizens Band Stations

1. A federal radio station may utilize frequencies in the range 26960-27410 kHz which are allocated to the Citizens Band (CB) Radio Service under Part 95, Subpart D of the FCC Rules provided:

a. an appropriate showing can be made by the applicant that such an assignment is necessary for intercommunications with non-federal stations, and

b. the requirement is coordinated with and concurred in by the FCC.

2. All operations by federal stations under this provision shall be in accordance with FCC Rules and Regulations Part 95, Subpart D. Transmitters shall be operated only by employees of the Federal Government and only for the purpose of interfacing with non-federal licensees to coordinate essential and mutual activities. The authority shall be subject to being revoked by the FCC at its discretion at any time. These assignments shall include record note S348.

3. The specific channels are:

Channel	Frequency (kHz)	Channel	Frequency (kHz)
1	26965	21	27215
2	26975	22	27225
3	26985	23	27255
4	27005	24	27235
5	27015	25	27245
6	27025	26	27265
7	27035	27	27275
8	27055	28	27285

9	27065	29	27295
10	27075	30	27305
11	27085	31	27315
12	27105	32	27325
13	27115	33	27335
14	27125	34	27345
15	27135	35	27355
16	27155	36	27365
17	27165	37	27375
18	27175	38	27385
19	27185	39	27395
20	27205	40	27405

8.3.25 Coordination Procedures for the 932-935 MHz and 941-944 MHz Bands

1. The frequencies shown in Section 4.3.14 are shared by the federal and non-federal on a co-equal basis for the fixed service. Although coordination and frequency assignment procedures are unique to federal and non-federal users, these procedures are similar enough to allow for concurrent processing of applications.

a. For filing applications, federal and non-federal applicants will continue to use the existing procedures; i.e., federal applications will be submitted to the NTIA and non-federal applications will be submitted to the FCC.

b. Non-federal applications will be provided to the NTIA by the FCC through their FAS representative, and federal applications will be provided to the FCC's FAS representative by NTIA. To affect federal/non-federal coordination, both federal and non-federal applications will be placed on the FAS agenda and will be listed in a public notice to be released by the FCC.

c. The following data fields are identified as the minimum necessary for federal/non-federal coordination:

FAS docket number (DKT), frequency (FRQ), emission characteristics including bandwidth (EMS), output power (PWR), station class (STC), transmitter state/country (XSC), transmitter antenna latitude and longitude (XLA, XLG)^{17,18}, transmitter antenna dimensions (XAD)¹⁸, transmitter antenna polarization (XAP)¹⁸, transmitter antenna azimuth (XAZ)¹⁸, receiver state/country (RSC), receiver antenna latitude and longitude (RLA, RLG)^{17,18}, receiver antenna dimensions (RAD)¹⁸, receiver antenna polarization (RAP)¹⁸ and receiver antenna azimuth (RAZ)¹⁸.

8.3.26 Coordination of Federal Radio Operations With DOD Area Frequency Coordinators in Frequency Bands Above 420 MHz

1. The following policy applies to federal ground or airborne transmitters in the subject frequency range planned to operate within radio line-of-sight of, or close enough to cause interference to, the areas listed in Table 8.3.26. For the purpose of this procedure line-of-sight is defined by the formula $D = \sqrt{2h_r} + \sqrt{2h_t}$, where D is the radio line-of-sight distance in miles and ht is the height of the transmitter antenna in feet, and hr is the height of the receiver antenna in feet.

2. In order to minimize potential mutual electro-magnetic interactions in, near and within line-of-sight of, DoD test ranges, DoD Area Frequency Coordinator(s) (AFC) shall be notified of:

a. Pending actions (e.g., new, modifications, etc.) directly from the NTIA. AFCs must forward any comments to the appropriate MILDEP FAS representative within 10 working days of the initial processing date (IPD) indicated on each action.

b. Activation of approved USA/USP, wide area, band, and transportable assignments by representatives of federal government agencies, including DOD, prior to transmitting.

3. Notification for ground-based systems must include agency point-of-contact (POC), frequency, power, location, type emission including bandwidth, antenna gain, antenna information (height, elevation, azimuth) and any other information that will help to define, eliminate or manage any potential operational conflicts. In addition, airborne operations (other than for standard aircraft flight navigation and communication systems) require data such as flight profile, duration of mission, elevation, etc.

¹⁷ The degree of accuracy of all latitudes shall be to the nearest second.

¹⁸ For applications bearing special notes S361 or S362, the rules of Section 9.8.2 apply.

Table: 8.3.26 - DoD Test Ranges, Areas of Concern, and Applicable Coordination Note		
Activity	Area of Concern	Coordination Note
U.S. Air Force Weapons and Tactics Center Nellis AFB, NV DSN: 683-3417 (702) 652-3417	Entire State of Nevada plus Utah West of 111°W and Idaho South of 44°N.	C067
U.S. Air Force Eastern Test Range Patrick AFB, FL DSN: 854-5837 (407) 494-5837/5838	Area bounded by 24°N, 31°30'N, 77°W, and 83°W.	C004
U.S. Air Force Air Armament Center Eglin AFB, FL DSN: 875-7535 (850) 850-7535	Area bounded by 24°N, 33°30'N, 83°W and 90°W	C010
U.S. Naval Air Warfare Center Weapons Division China Lake, CA (NAWCWD) DSN: 437-6948 (760) 939-6948	Area enclosed within a 322 kilometer radius of 340649N1190654W and the area of California that lies south of 37°30'N.	C002
U.S. Army Electronics Proving Ground Ft. Huachuca, AZ DSN: 879-6423 (602) 538-6423	Entire State of Arizona	C008
CINCPAC (JFMOPAC) Military Ranges within the State of Hawaii (U.S. Air Force) DSN: 315-477-1054 (808) 477-1054	Area enclosed by a 322 kilometer radius of 211900N1575200W	C012
U.S. Navy Atlantic Fleet Weapons Training Facility, Roosevelt Roads, Puerto Rico (AFWTF) DSN: 831-5227/3270, (809) 865-5227/3270	Area within a 370 kilometer radius of 181500N0653800W	C093
U.S. Army White Sands Missile Range Las Cruces, NM (WSMR) DSN: 258-5417 (505) 678-5417	Entire State of New Mexico, Texas west of 104°W and the areas of Utah and Colorado between 108°W and 111°W.	C006
U.S. Navy, Naval Air Warfare Center Aircraft Division, Patuxent River, MD (NAWCAD) DSN: 342-1532/1194, (301) 342-1532/1194	Area enclosed by a 320 kilometer radius of 381718N0762500W	C094

8.3.27 Notification in the Bands 10-490 kHz

1. The frequencies 10-490 kHz are used to operate electric utility Power Line Carrier (PLC) systems on power transmissions lines for communications essential to the reliability and security of electric services to the public, in accordance with footnote US294 of the Table of Frequency Allocations and Part 15 of the FCC Rules. PLC systems in this band operate on a noninterference basis to radio systems assigned frequencies by NTIA or licensed by the FCC and are not protected from interference caused by these radio operations.

2. Any electric utility that generates, transmits, or distributes electrical energy for use by the general public by the member of a cooperative organization may operate PLC systems and shall supply, to the FCC/NTIA recognized industry-operated entity, information on all existing, changes to existing, and proposed systems for inclusion in a data base.

a. Such information shall include the frequency, power, location of transmitter(s), location of receivers and other technical and operational parameters, which would characterize the system's potential both to interfere with authorized radio users, and to receive harmful interference from these users.

b. In an agreed format, the industry-operated entity shall inform the NTIA and the FCC of these systems' characteristics prior to implementation of any proposed PLC system and shall provide monthly or periodic lists with supplements of PLC systems.

3. The FCC and NTIA will supply appropriate application and licensing information to the notification activity regarding authorized radio stations operating in the band.

8.3.28 Use of Fixed Devices That Re-Radiate Signals Received From the GPS

Except as otherwise authorized under Section 7.14, federal agencies and departments may, under the following conditions, operate fixed devices that re-radiate signals received from the GPS.

- a. Individual authorization is for indoor use only, and is required for each device at a specific site.
- b. Applications for frequency assignment should be applied for as an XT station class with a note indicating the device is to be used as an "Experimental RNSS Test Equipment for the purpose of testing GPS receivers" and describing how the device will be used.
- c. Approved applications for frequency assignment will be entered in the GMF.
- d. The maximum length of the assignment will be two years, with possible renewal.
- e. The area of potential interference to GPS reception (e.g., military or contractor facility) has to be under the control of the user. Areas beyond the range for potential interference are protected by the maximum power calculation described in f. below, and thus no further record notes are required for frequency assignments.
- f. The EIRP must be such that the emissions are no greater than -140 dBm/24 MHz as received by an isotropic antenna at a distance of 100 feet (30 meters) from the building where the test is being conducted. The calculation for maximum EIRP shall be based on free space propagation with no allowance for additional attenuation (e.g., building attenuation) as shown below.

$$P_{Tmax} = P_R + 20 \log_{10} f + 20 \log_{10} (30 + d) - 27.55$$

Where: P_{Tmax} is the maximum permissible EIRP in dBm

P_R is the power received at 30 meters from the building (i.e. -140 dBm/24 MHz)

f is frequency in MHz (i.e. 1575.42 for L1, 1227.60 for L2, 1176.45 for L5)

d is the distance between the radiator and the closest exterior wall of the building in meters.

P_{Tmax} can then be converted to picowatts by using the formula: $P_{Tmax(pW)} = 10^{\left(\frac{P_{Tmax}}{10} + 9\right)}$

Applications requesting power greater than the P_{Tmax} calculated at $d = 0$ meters (i.e. 39.3 pW for L1, 23.8 pW for L2, and 21.9 pW for L5) must provide the distance from the transmit antenna to the nearest exterior wall so that reviewing agencies can determine if the requested power meets the maximum EIRP described above.

- g. GPS users in the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.
- h. The use is limited to activity for the purpose of testing RNSS equipment/systems.
- i. A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS re-radiator operations..

8.3.29 Use of Land-Based Mobile Devices That Re-Radiate Signals Received From the GPS

Except as otherwise authorized under Section 7.14, federal agencies and departments may, under the following conditions, operate land-based mobile devices that re-radiate signals received from the GPS at 1575.42 ± 12 MHz (L1).

- a. Use is restricted to inside armored ground vehicles operating within a federal controlled range/facility/installation or cordoned zone.
- b. Applications for frequency assignment shall be applied for as an "NR" station class with a note describing how the device will be used.
- c. Approved applications for frequency assignment will be entered in the GMF.
- d. The maximum length of assignment will be two years, with possible renewal.
- e. The application for frequency assignment shall indicate the agency or department controlled range/facility/installation or cordoned zone of operation and the number of vehicles equipped with these devices.
- f. The entire area of potential interference to GPS reception (e.g., military/federal range/facility/installation or cordoned area) must be under the control of the federal user.
- g. The maximum EIRP must be such that the calculated emissions are no greater than -88 dBm/24 MHz at the output of GPS reradiator antenna (-144 dBm/24 MHz at 10 meters as received by an isotropic antenna) from an armored ground vehicle.
- h. GPS users within the area of potential interference to GPS reception must be notified that GPS information

may be impacted for periods of time.

i. A "Stop Buzzer" point of contact for the authorized device must be identified and available at all times during GPS reradiator operations.

j. These devices operate on a non-interference, unprotected basis.

8.3.30 Use Inside of Federal Owned Aircraft Devices That Re-Radiate Signals Received From the GPS

1. Except as otherwise authorized under Section 7.14, federal agencies and departments may, under the following conditions, operate inside an agency/department owned aircraft devices that re-radiate signals received from the Global Positioning System (GPS) at 1575.42 ± 12 MHz (L1) and 1227.6 ± 12 MHz (L2).

a. In the design of the re-radiator equipment, all practicable efforts shall be taken to attenuate the emissions outside the bands 1575.42 ± 12 MHz (L1) and 1227.6 ± 12 MHz (L2) as much as possible.

b. Use of the re-radiator is restricted to transmissions inside federal owned aircraft operating within a federal controlled range/facility/installation/cordoned zone. All locations using aircraft re-radiators are required to have a frequency assignment. System checks shall only be performed while the aircraft is on the ground at a federal controlled range/facility/installation/cordoned zone. In addition, operation of the re-radiator while in flight is limited to use during the final 20 minutes before planned deployment of assets.

c. Applications for frequency assignment shall be applied for as an "NR" station class with an explanation describing how the device will be used.

d. Approved applications for frequency assignment shall be entered in the GMF.

e. The maximum length of frequency assignment shall be two years, with possible renewal.

f. The application for frequency assignment shall indicate the agency or department, the federal controlled range/facility/installation/cordoned zone of operation and the number of aircraft equipped with these devices.

g. So as to not interfere with other aircraft, the maximum EIRP must be such that the calculated or measured emissions are no greater than -141 dBm/24 MHz as received by an isotropic antenna at a distance of 20 meters from the aircraft skin with all access doors open. The total GPS re-radiator system group delay shall not exceed 200 nanoseconds.¹⁹

h. When the re-radiator is being operating on the ground, GPS users within the area of potential interference to GPS reception must be notified that GPS information may be impacted for periods of time.

i. Federal-owned aircraft that use GPS re-radiators shall ensure proper operation of their avionics systems which operate in or near the GPS bands, with the re-radiator active, and should be tested with the aircraft doors open and closed.

j. A "Stop Buzzer" point-of-contact for the authorized device must be identified and available at all times during the GPS re-radiator operations.

k. These devices operate on a non-interference, unprotected basis.

8.3.31 Coordinated Use of Federal Fixed Ultrawideband Systems Not Intended for Operation under Parts 7.8 or 7.9

Federal agencies may, on a non-interference basis, operate fixed ultrawideband (UWB) systems that do not conform to Parts 7.8 or 7.9 provided that those systems receive spectrum support in accordance with the provisions of Chapter 10, which will identify the coordination requirements for each operating station, and an approved frequency assignment in accordance with the provisions of Chapter 9. This section is not applicable to mobile

¹⁹ An example of how to calculate the group delay:
RADAR System Interference Analysis

Component	Time Delay
GAS-1	6.0ns
Cable	24.9ns
Power divider	2.0ns
Amplifier	15.0ns
Total Delay	47.9 nanoseconds

systems.

8.3.32 Coordination of Special Temporary Authorization Assignments for Federal Agencies

1. The NTIA, in consultation with FAS of the IRAC, may provide short-term temporary authorizations (called a “Special Temporary Authorization” (STA) to federal users of the electromagnetic spectrum in the US&P. STAs may support requirements including, but not limited to exercises, short-term events, or equipment tests and evaluations of time periods of 30 days or less. Requests for periods slightly longer than 30 days will only be considered on a case-by-case basis by the Frequency Assignment Branch Chief. All other requests need to be submitted as an application for a temporary period (Section 9.6.3) or regular GMF assignment using the operational or experimental station class that is appropriate. The FCC will coordinate their STAs with NTIA in accordance with FCC rules and regulations as required.

2. The approval of an STA does not ensure the FAS will approve the permanent use of the frequency for a GMF assignment. No agency should make long-term decisions based on the short-term use of an STA. Agencies may approve STAs based on limitations of time/use, but require restrictions or object when the same request is for a permanent GMF assignment.

3. NTIA will provide a minimum of 5 business days (excluding holidays and weekends) to circulate non-emergency requests among the impacted users, as it deems appropriate. The submitting agency shall clearly identify STA requests for emergency situations, e.g., disasters, and NTIA will set the comment due date based on the time and dates of the proposed operation.

4. STA data is not entered into the GMF. Twenty-four hour/seven days per week stop buzzer contact information will be provided when requested by other agencies or the FCC when interference is anticipated in order to protect their operations.

5. Prior to requesting an STA, federal agencies need to use assets already registered in the GMF as long as the requirement does not exceed the parameters listed in the permanent authorization.

6. The minimum data required for federal agencies submitting a proposal to the FAS is as follows:

- a. CLA (Classification of the request)
- b. FOI: (If NTIA receives a Freedom of Information Act (FOIA) request for information concerning a STA, then NTIA will refer any responsive documents and provide a copy of the FOIA request to the FOIA contact of the relevant federal agency so that the agency can respond directly to the FOIA requester).
- c. TYP (Type is always “N”)
- d. SER (Serial number assigned by the requestor)
- e. FRQ (Specific frequency or frequency band)
- f. EXD (expiration date of the STA)
- g. STC (Station class)
- h. EMS (Emission)
- i. PWR (Power)
- j. XSC (Transmitter state code)
- k. XAL (Transmitter antenna location)
- l. XLA (Transmitter antenna latitude)
- m. XLG (Transmitter antenna longitude)
- n. XAD (as applicable)²⁰ (Transmitter antenna dimensions)
- o. XAZ (Antenna azimuth)
- p. XAP (as applicable) (Antenna polarization)
- q. RSC (Receive State code)
- r. RAL (Receive antenna Location)
- s. RLA (Receive antenna latitude)
- t. RLG (Receive antenna longitude)
- u. RAD (as applicable)¹⁵ (receive antenna dimensions)
- v. NTS (as applicable) (Record notes; e.g., S, P, M, or L)
- w. *RAD (Radius)

NOTE 1 - IF XAD and/or RAD are not provided, the proposed height above mean sea level (AMSL) is assumed to be at 6 meters or less.

- x. EQT (as applicable)¹⁵ (Transmitter equipment)
 - y. SUP, for explanation of operations to include start date.
 - z. *PRD (as applicable) (Paired-with another frequency)
 - aa. *FRB (as applicable) (Upper and lower limits of the requested band)
 - bb. *FBE (as applicable) (Excluded frequency band data)
 - cc. *PRR (as applicable) (Pulse repetition rate, for radar)
 - dd. *AGN (as applicable) (agency data pertinent to the proposed STA but not intended to be a part of the authority requested)
 - ee. *NTS (as applicable) (Used for “Minute” notes, only)
7. Processing of a federal STA proposal may be delayed or denied based on, but not limited to, the following criteria:
- a. Harmful interference is anticipated to existing, licensed agency operations. The serial number(s) of the potential victim assignment(s) shall be provided to NTIA by the agency objecting to the proposal.
 - b. If the STA proposal requests access to a specified frequency or band of frequencies without proper pre-coordination, approval may be delayed while coordination is completed.
 - c. If the information provided in the STA proposal is incomplete or inconsistent with the minimum data elements of paragraph 6.
8. The following paragraph will be placed at the bottom of all unclassified Special Temporary Authorization (STA) requests: “I _____ have checked the STA and attachments and certify that there is no classified information in this STA request.”

8.3.33 Coordination of Frequency Assignments for Unmanned Aircraft Systems

Federal agencies who have obtained a frequency assignment for Unmanned Aircraft Systems (UAS) operations outside of Restricted or Warning Areas designated for aviation activities must file a FAA Form 7711, Certificate of Waiver or Authorization with the FAA. The form will initiate a comprehensive safety review for the UAS operation and provide airspace coordination with air traffic control facilities. Special note S405 will be entered on all UAS frequency assignments operating outside of Restricted or Warning Areas designated for aviation. For UAS operations within Restricted and Warning Areas designated for aviation activities the specific airspace shall be identified in the frequency assignment and will preclude the submission of FAA Form 7711 and the addition of S405 to the assignment record.

8.3.34 Procedures for Coordinating Use of Federal Surface Defect Testing Systems for Low Observable Aircraft

1. Federal agencies desiring to deploy certified Surface Detection Testing Systems (SDTS) and associated components in a controlled environment to test for surface defects on low-observable (LO) aircraft shall follow the procedures outlined in DSO-CR-13-114, “Assessment of Compatibility between Low Observable (LO) Diagnostic Measurement Systems and Selected Systems” to ensure compatible operations. However, the coordination trigger distance for FAA primary radars that operate above 1 GHz is 25 nautical miles (46 kilometers). Coordination with the FAA will be required when LO systems operate at locations that are in the vicinity of FAA primary radars that operate in the following frequency bands: 1240-1370 MHz, 2700-2900 MHz, 5600-5650 MHz, 9000-9200 MHz, and 15.7-16.2 GHz.

2. LO systems operating at separation distances beyond 25 NM (46 kilometers) of primary radars will not require prior coordination with the FAA for frequency assignment requests with regards to primary radars. Additionally, when LO systems operate at locations in the vicinity of NOAA radars that operate above 1 GHz, 49 nautical miles (90 kilometers) will be used as the trigger distance within which prior coordination with the NTIA Frequency Assignment Subcommittee is required for frequency assignment requests.

3. Rigorous tests, measurements, and analyses in the GPS bands have been accomplished and outlined in reports submitted to the SPS. Users of current and future LO diagnostic radar systems will continue to ensure that GPS operations are protected in line with national policy.

4. Federal agencies desiring to deploy uncertified SDTS and associated components in a controlled environment to test for surface defects on low-observable aircraft shall follow the procedures outlined in Section 7.26 for submitting equipment certification applications to the SPS and frequency assignment requests to the FAS.

8.4 COGNITIVE RADIO, DYNAMIC SPECTRUM ACCESS, AND SOFTWARE DEFINED RADIO TECHNIQUES

Radiocommunication systems using Cognitive Radio, Dynamic Spectrum Access, or Software Defined techniques in any radiocommunications service shall operate in accordance with the provisions of NTIA rules governing those services.

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