



***Federal Spectrum Management
Processes Report***

Final (Revision 1)

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INTRODUCTION

Significant growth in wireless communications industries is driving efforts for increased spectrum efficiency and flexibility. Concurrent with this growth is competition for radio spectrum, which is inherently a limited resource. The federal government uses radio spectrum to perform many of its mandated missions. Although wireless communication is critical to Federal Government agencies to achieve their missions, only 1.4 percent of spectrum under 30 gigahertz (GHz) is allocated exclusively to the Federal Government.

National Telecommunications and Information Administration (NTIA) manages the Federal Government use of the radio spectrum.

Federal agencies with public safety responsibilities, as significant users of land mobile radio (LMR) systems, account for 18 percent of the use of the exclusive Federal Government bands.¹ Given the extensive use of federal bands for public safety functions, it is important to have an efficient and fair spectrum management process established. The **National Telecommunications and Information Administration (NTIA)**, an office within the U.S. Department of Commerce, is charged with managing Federal Government use of the radio spectrum. This office has established certain processes to allow for the flow of information between federal agencies with public safety responsibilities and NTIA. These processes provide NTIA with information it needs to make decisions about federal spectrum use and they enable NTIA to manage federal spectrum in an effective manner. The flow of information between users and their parent agencies concerning frequency management are unique to each agency.

This document is a **how-to guide** to understand frequency assignment, frequency administration, and spectrum allocation processes.

This guide is intended to serve as a “**how-to guide**” for federal agencies with public safety responsibilities to obtain frequencies. It explains the reasons why certain processes exist to manage federal spectrum. The objective of the guide is to provide, from a user’s perspective, the processes involved in obtaining a frequency assignment, administering the spectrum following assignment, and making spectrum allocations.

In addition, seven appendices are provided to lend further assistance and to expand general knowledge in this area. The appendices are:

Appendix A—Acronyms.

Appendix B—System Review Data Requirements for Trunked LMR Systems, which lists the specific data elements required for NTIA review.

Appendix C—Glossary, which defines frequently used terms.

Appendix D—Frequency Assignment Subcommittee Members, which lists subcommittee members and their point-of-contact information.

Appendix E—NTIA Forms, which includes NTIA Forms 33, 34, and 35.

¹ NTIA web page, <http://www.ntia.doc.gov/osmhome/roosa2.html>.

Appendix F—Frequency Assignment Data, which provides information extracted from the Government Master File (GMF).

Appendix G—Federal Agencies' Public Safety Responsibilities, which lists and briefly describes responsibilities for federal agencies with public safety responsibilities.

PROCESS OVERVIEW

The Communications Act of 1934 requires federal agencies to make effective, efficient, and prudent use of the radio spectrum in the best interest of the Nation, with care to reserve its use for when other means of communications are unavailable or infeasible. The Federal Government has created a series of processes to manage radio spectrum and achieve these goals. The processes associated with frequency assignment, frequency administration, and spectrum allocation help to ensure that Federal Government radio spectrum use is consistent with established spectrum policy. Federal agencies seeking to use radio frequencies must follow NTIA's established processes. Figure 1 illustrates the cyclical nature of the assignment, administration, and allocation processes. A brief overview of the cycle is first given, and then detailed treatments of each of its elements— frequency assignment, frequency administration, and spectrum allocation are provided.

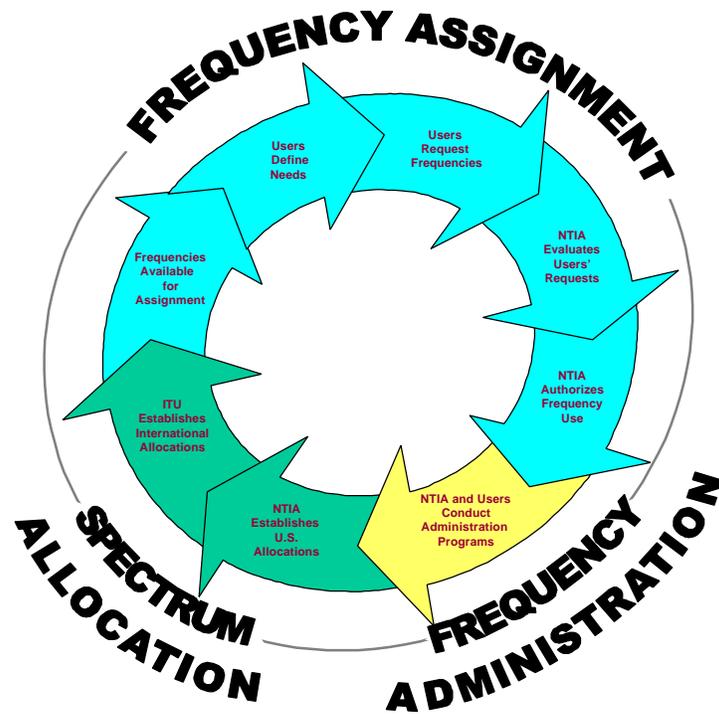


Figure 1
Cyclical Process of Spectrum Management

Frequency Assignment. From the user's perspective, one of the first steps in the process of developing an LMR system is to acquire radio frequencies. Users must define their communications needs and prepare the necessary data to apply for

frequencies from NTIA. Generally, NTIA requires users to provide justification for use of radio frequencies, details on the frequency request, and technical information on the proposed system. When a request is submitted, NTIA evaluates it to ensure that the proposed frequency usage meets spectrum use guidelines and the proposed technology does not cause or is not subject to receive interference in the existing electromagnetic environment. If the request meets NTIA standards, NTIA authorizes frequency use by granting a frequency assignment to the applicant.

Frequency Administration. Once assignments are made, both NTIA and federal agencies have responsibilities to manage frequency assignments. NTIA administers programs, including technical studies and spectrum measurements, to monitor federal use of the radio spectrum. These programs help to determine if frequency usage is in accordance with NTIA rules and if interference exists between NTIA-authorized users. To assist NTIA in ensuring that Federal Government frequency assignments are being used efficiently, users are required to keep their assignments current and their use consistent with NTIA rules.

Spectrum Allocation. The remaining parts of the circle in Figure 1 represent spectrum allocation, meaning the designation of a particular frequency range to a specified service. The Federal Communications Commission (FCC) and NTIA work with other executive branch agencies to allocate portions of the spectrum to specified services. International allocations are heavily considered in the decisions to allocate spectrum within the U.S. The interests of the Federal Government and commercial spectrum users, however, generally take precedence. U.S. and international spectrum allocations, therefore, do not always coincide. The U.S. Congress can also influence spectrum allocations through legislation. Once spectrum is allocated, the frequencies become available for assignment to federal users, and the process of frequency assignment begins again.

FREQUENCY ASSIGNMENT

Federal agencies with public safety responsibilities must follow certain procedures to obtain use of LMR radio frequencies. These processes have been established by the NTIA to assist agencies in meeting their mission requirements, preventing interference among communications, and making the most efficient use of the spectrum. The process of obtaining radio frequencies comprises two types of activities: those performed by the user and those performed by the NTIA. The frequency assignment section first provides brief descriptions of user and NTIA activities, followed by detailed treatments of each.

User Activities. To initiate the process as detailed in Figure 2, users must first determine their communications requirements and system needs. Once users determine the type of system that will meet their needs, the agencies must prepare and submit the relevant data to the NTIA and its subcommittees to justify its requirements and apply for a **frequency assignment**.

NTIA Activities. When the NTIA receives a frequency assignment request, it reviews the request and related data to determine if it can grant the assignment. Two NTIA processes exist to approve and regulate use of radio frequencies: the frequency application process and the system review process. The NTIA and its subcommittees review information submitted by the federal agencies applying for radio frequencies. In certain circumstances, the NTIA requires applicants to submit system information for the system review process.

Frequency Assignment An authorization to use a given radio frequency or radio frequency channel under specified conditions.

The **Interdepartment Radio Advisory Committee (IRAC)** advises the NTIA in carrying out its spectrum management activities. The IRAC comprises a main committee, four subcommittees, and an international group.

Frequency Assignment Subcommittee (FAS)— An IRAC subcommittee responsible for reviewing individual agency requests for frequency assignment. It analyzes individual frequency applications for electromagnetic

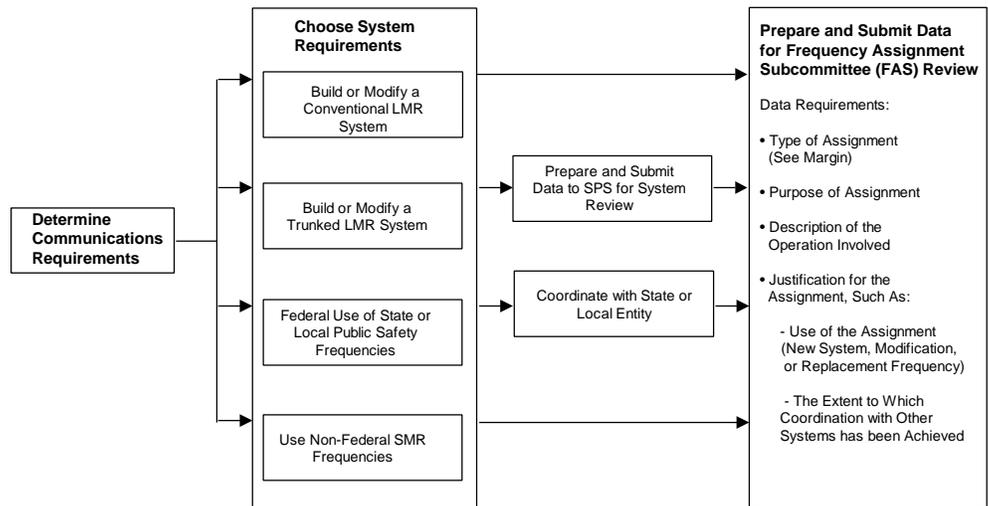


Figure 2
Frequency Assignment Activities

NTIA and the designated subcommittees review the data to make the appropriate recommendation. The **Frequency Assignment Subcommittee (FAS)**

compatibility with existing frequency authorizations.

Spectrum Planning Subcommittee—An IRAC subcommittee that reviews federal agency requests for new, or major modifications to, communications or space systems for electromagnetic compatibility and regulatory compliance.

There are **four types of frequency assignments** a user can choose from—

Regular- Made for an unspecified period of time.

Temporary- Made for a specified period of time not to exceed 5 years.

Trial- Made to select a suitable specific operating frequency for a regular assignment.

Group—Only for terrestrial stations for planning purposes; provides authority to operate but does not represent continuing operations.

reviews data for frequency requests, and in instances where a systems review is required, the **Spectrum Planning Subcommittee (SPS)** reviews the relevant system data. After SPS review, the NTIA issues a system certification and notifies the FAS of the certification. When the system is certified, the FAS reviews and approves the frequency request, and the NTIA issues a frequency assignment.

In the two sections that follow, greater details are provided for both the user and NTIA activities.

USER ACTIVITIES

Users planning to expand their LMR communications capabilities must define their needs, determine what type of system will meet their needs, and provide the required information to their agency to forward to the NTIA for review. The process that agencies must follow and the corresponding data that users must compile for submission to the NTIA to receive a frequency assignment are shown in Figure 3.

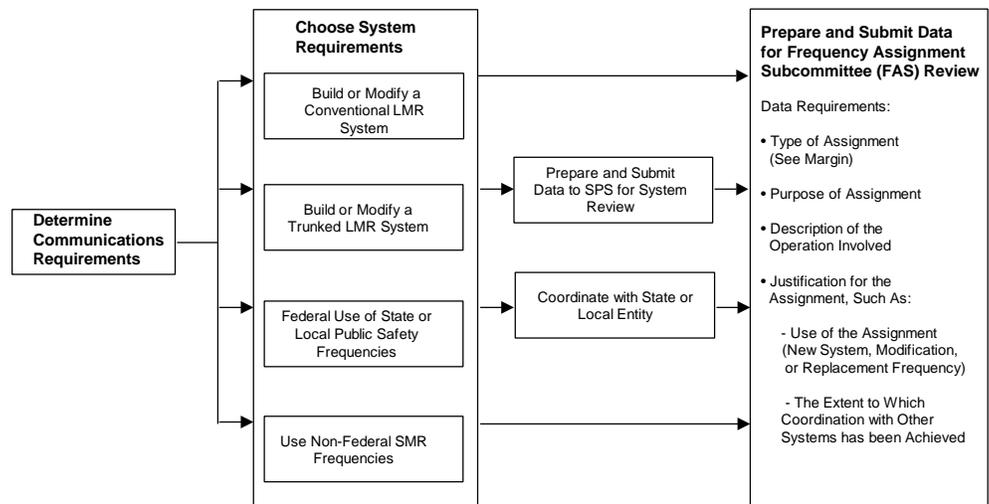


Figure 3
User Activities

Determine Communication Requirements. First, users must define some basic communications requirements, such as how many users need to communicate, how often the system will be used, the type of communication that is required, and the coverage requirements for the system. Normally, users, in conjunction with their parent agency’s frequency management office, define the communications requirements. Each federal agency compiles the required data from the users in different ways: some may take the request over the telephone, others may use a computer program or form to standardize the request, and others may collect the data in a face-to-face meeting with users.

Choose System Requirements. When the users determine their LMR communications requirements, they have a few different systems options to consider:

- Build or modify a conventional LMR system
- Build or modify a trunked LMR system
- Federal coordinated use of an LMR system licensed to a state or local entity on state or local frequencies
- Use commercial or private SMR frequencies.

The amount and type of information forwarded to the NTIA varies depending on the type of system being planned or installed.

Prepare and Submit Data for FAS review. To obtain a frequency assignment, the applicant must provide different types of data to the NTIA depending on the system type chosen. In every circumstance, however, the applicant must submit the frequency application data to the FAS for review. The frequency application data requirements are listed in Figure 3. An overview of the application process for each of the system types is provided in the paragraphs that follow.

Build or Modify a Conventional LMR System. Users proposing to build or modify a conventional LMR system must only submit frequency application data to the FAS, as mentioned above. No other review is required.

Build or Modify a Trunked LMR System. Users proposing to build or modify a trunked LMR system must submit data to the SPS for a system review in addition to the FAS frequency application review. The purpose of the system review is to certify the type of equipment and operation of the equipment to be used on the requested frequencies. Also, the **Office of Management and Budget (OMB) Circular A-11** states that funding for the system will not be released until the NTIA issues its system certification.

The SPS requires different types of information and varying levels of detail for each trunked LMR system option. For example, if an applicant is proposing to modify an existing trunked LMR system, the SPS requires information only on the details of the proposed modification to ensure that it is compliant with NTIA regulations, rather than extensive information on the entire system, because the system has already been certified. If an applicant is proposing to build a new trunked LMR system, the applicant must determine if the proposed LMR trunking technology has been **previously certified**. If the technology has been previously certified, the applicant must submit information to the SPS to certify the operation of the technology in the proposed environment. If the technology has not been previously certified, the applicant must submit technical and operational systems data to the SPS for review. Appendix B lists the data requirements for each trunked LMR system option.

OMB Circular A-11—
An OMB requirement that agencies should submit estimates for radio system funding only after the NTIA issues a certification of spectrum support.

Previously certified technology—Technology

that has already undergone the systems review process and has received certification of spectrum support from the NTIA.

All system review data is submitted to the applicant's SPS representative. Most federal agencies have their own SPS representative. In the event that an agency does not have an SPS representative, the NTIA acts as that agency's representative or assigns another SPS representative to do so.

Federal Coordinated Use of an LMR System Licensed to a State or Local Entity. Federal users proposing to use frequencies licensed to a state or local entity must submit frequency application data to the FAS, but first they must coordinate the terms and conditions of their frequency use with the state or local licensee. Upon agreement of the terms and conditions, the state or local licensee sends a letter (e.g., memorandum of agreement, memorandum of understanding) to the applicant's headquarters detailing the sharing arrangement and authorizing federal users to use their frequencies for necessary intercommunication. A copy of this letter along with the frequency application data listed in Figure 3 is submitted to the FCC for their approval. Concurrently, the frequency application data, including a reference to the letter, is submitted to the FAS for processing. The FCC responds to this action through the normal FAS voting process.

Use Commercial or Private SMR Frequencies. Federal agencies are authorized to use SMR frequencies. SMR systems are established by commercial or private carriers and licensed by the FCC in the following bands:

- 806-821 Megahertz (MHz) (state/local public safety and private SMR systems)
- 851-866 MHz (state/local public safety and private SMR systems)
- 896-901 MHz (commercial SMR systems)
- 935-940 MHz (commercial SMR systems).

An applicant requesting a frequency assignment within one of these bands must submit frequency application data to the NTIA requesting the assignment in the geographic area where the private carrier has been licensed. In addition to the data listed in Figure 3, the frequency application data should include the system name, the private carrier's name, and the exact number of mobile units that will be used.

The OSM Frequency Assignment and IRAC Administrative Support Division (FA&IASD)—The FA&IASD provides administrative and executive support to the IRAC. This includes processing federal agency frequency requests with the assistance of the FAS and recommending approval to the OSM Deputy Administrator.

The frequency application data must be transmitted electronically to the NTIA, **Office of Spectrum Management (OSM) Frequency Assignment and IRAC Administrative Support Division (FA&IASD)** via the applicant's FAS representative. Most federal agencies have their own FAS representative. If the applicant does not have its own FAS representative, either another agency's FAS representative is assigned or the NTIA acts as that agency's representative. Under special circumstances and by prior arrangement with the FAS Chairperson, applicants may physically deliver a magnetic disc to the OSM/FA&IASD. Sensitive information should be properly safeguarded and can be sent directly to the FAS Secretary.

NTIA ACTIVITIES

The **IRAC** is an interagency committee of federal radio frequency managers that develops policies, procedures, programs, and technical criteria related to spectrum allocation, management, and use.

After users define their communications requirements, prepare the data, and agencies submit the data, the NTIA review processes begin. The NTIA, in coordination with the **IRAC** and its subcommittees, reviews the submitted data to ensure the request is necessary for the applicant to meet its mission and that the equipment will not cause or receive interference in the proposed operating environment. NTIA's review processing time can vary in length depending on the type of request. Figure 4 provides an overview of NTIA's specific activities, which result in an applicant receiving a frequency assignment.

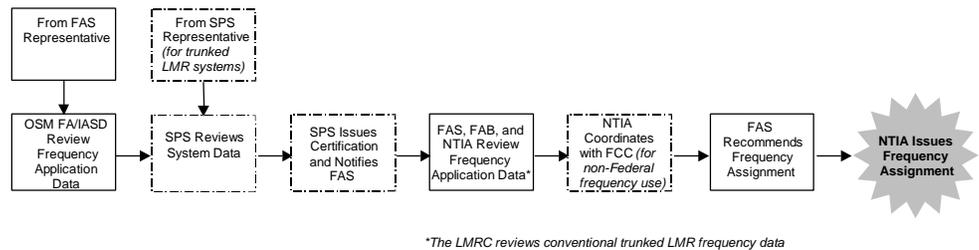


Figure 4
NTIA Frequency Assignment Activities

As federal users require additional frequencies to meet their missions, the limited amount of available frequencies and potential interference problems necessitate careful evaluation of frequency applications. NTIA requires all federal agencies requesting to use LMR systems, whether the system is conventional or trunked, apply for frequency assignments before using radio systems.

The appropriate committees and subcommittees review the frequency application data. The various committees provide a forum to extensively review frequency applications and identify potential interference problems with the existing electromagnetic environment. After all issues regarding frequency assignment are resolved, recommendations for frequency assignment are made to NTIA. NTIA acts upon recommendations, granting frequency assignments where appropriate.

OSM/FA&IASD Review. An agency's FAS representative begins the frequency assignment process by submitting the frequency application to the OSM/FA&IASD. The OSM/FA&IASD staff file the frequency application and perform an extensive review. The OSM/FA&IASD review is aided by an electronic check using a software application that further checks applications for accuracy, completeness, and compliance with NTIA rules and regulations.

Systems Review Process for Trunked LMR Systems. If an applicant is requesting to modify or build a new trunked LMR system, the system must be certified before the FAS will consider the frequency application. The SPS is

The SPS has four stages of review. Most LMR trunked systems enter the process at stage four.

Stage 4: Operational—Detailed testing of potential equipment configurations and consideration of frequency assignments for specific systems is conducted. The SPS provides restrictions on the operation of the system as necessary to prevent harmful interference to existing radio communications.

Frequency Assignment Branch (FAB)—A division of the FA&IASD responsible for reviewing the submitted frequency applications and comments from other representatives. The FAB refers the applications to the NTIA for approval, or the FAS for further consideration.

The **GMF** is a database of all of the Federal Government frequency assignments. It is updated daily. A snapshot of the GMF is created at the beginning of each month and distributed on CD-ROM.

Land Mobile Radio Committee (LMRC)—The LMRC examines all requests for frequency assignments for government-owned and operated conventional

responsible for performing system reviews and recommending system certification. The SPS receives the frequency application from the applicant's SPS representative. The SPS evaluates proposed systems for compliance with spectrum rules and regulations, as well as electromagnetic compatibility with the existing electromagnetic environment. The SPS has a **four-stage** process for systems review. However, because most trunking technology has been previously certified, most trunked LMR system applications enter the process at stage four.

SPS System Certification. If a proposed LMR system successfully completes the SPS system review process, the SPS recommends certification to NTIA. In doing so, the SPS recommends certification either without qualifications, with stated limitations, or with modification instructions. NTIA then reviews the SPS recommendation for system certification, resolves any existing disputes, and grants the certification.

FAS, FAB, and NTIA Review. Following the OSM/FA&IASD frequency application review, and the system review if necessary, the application is distributed to FAS representatives, the **Frequency Assignment Branch (FAB)**, and NTIA. These entities review applications based on content, technical compatibility, and administrative and regulatory issues. Their review also considers sharing of frequency bands by terrestrial and space services and potential signal interference issues. The FAS representatives are given 15 working days to register votes for application approval or provide comments that table the request. The FAB evaluates the comments received and registers votes recommending frequency assignment. If the frequency assignment request has unanimous support among the FAS representatives and NTIA, the frequency assignment is granted and the **GMF** is updated. If an FAS representative notes discrepancies with an application and registers comments that table the application, the submitting agency must resolve the discrepancies before an assignment can be made. Unresolved discrepancies become agenda items for discussion at FAS meetings.

The FAS hosts meetings every two months to discuss pending items on the agenda. If all issues regarding a specific frequency application are resolved, the FAS will recommend that NTIA grant the frequency assignment. However, if changes to an application or additional information is needed, the applicant must make the necessary modifications and re-submit the application for reevaluation by FAS representatives, the FAB, and NTIA. If the FAS cannot reach an agreement during its deliberations, frequency applications are referred to the IRAC. The IRAC provides additional policy guidance and will attempt to resolve any disputes that may be present. Matters that cannot be resolved by the IRAC are referred to the Deputy Associate Administrator of OSM, who resolves them or refers them to the Administrator of NTIA for decision. Frequency assignment decisions may be appealed to the Director of the Office of Management and Budget.

Agencies choosing to submit frequency applications for conventional systems must undergo additional evaluation by the **Land Mobile Radio Committee (LMRC)**. The LMRC reviews applicant justifications for why use of an existing NTIA authorized trunked LMR system could not meet agency requirements.

land mobile radio systems within 30 km of an existing NTIA authorized trunked land mobile system.

S160 A special record note applied to a Federal Government frequency assignment in the GMF that applies the conditions under which the Federal Government may obtain authorization to use a non-Federal Government frequency assignment.

Non-Federal Frequency Authorization. In the event an applicant wants to use non-federal public safety, private, or commercial frequencies, NTIA must coordinate with the FCC before a frequency assignment can be granted. The FCC verifies the license information and ensures that the license is current. Following FCC verification, the FCC liaison representative to the FAS votes to accept the frequency application and NTIA approves the frequency assignment. Federal public safety use of non-federal spectrum is recorded in the GMF with an **S160** record note designation. Specifically, a federal frequency assignment with record note S160 refers to conditions of operation. A federal radio station may use any frequency authorized to a non-federal radio station under Part 90 of the rules of the FCC where the use is—

- necessary for intercommunication with non-federal stations; or
- required for coordination with non-federal activities; and
- provided a mutually-approved arrangement has been concluded between the federal agency, the FCC, and the non-federal licensee.

NTIA Frequency Authorization. After NTIA receives the recommendation for the frequency assignment, it grants the assignment to the applicant.

FREQUENCY ADMINISTRATION

In addition to granting frequency assignments, NTIA is responsible for ensuring that federal spectrum is used in an efficient manner. NTIA has implemented various programs to assess federal compliance with NTIA spectrum rules and regulations and to resolve any technical issues that may arise. These programs allow NTIA to better manage and administer federal use of the spectrum. To ensure accuracy, the programs involve both the federal radio user community and NTIA.

Frequency Assignment Review Program^{3/4} An NTIA-sponsored program to help keep frequency assignments up to date.

User Activities. To help manage frequency assignments, federal agencies must take part in the **Frequency Assignment Review Program**. The purpose of the Frequency Assignment Review Program is to ensure that federal agency frequency assignments are still needed to meet the agencies original requirements. The FAS representative is responsible for maintaining its agency's frequency assignments.

This program requires federal agencies using both conventional and trunked LMR systems to update their frequency assignments in the GMF on a continual basis. Modifications to the GMF, including entering new assignments and deleting expired or unused assignments, should be made accordingly. Temporary frequency assignments must be renewed through the NTIA/FAS review process if agencies wish to continue to use the assignments beyond the temporary assignment expiration date.

NTIA Activities. NTIA administers three programs that help manage spectrum use. Through these programs, NTIA can identify, evaluate, and solve technical and operational problems that arise during conflicts in the use of spectrum between federal agencies.

Spectrum Measurement Program. NTIA conducts spectrum measurements using a van-mounted Radio Spectrum Measurement System (RSMS). The RSMS is operated by NTIA Institute for Telecommunication Sciences (ITS) and the OSM Spectrum Engineering and Analysis Division (SEAD). The RSMS is deployed on a case-by-case basis to measure the following—

Electromagnetic Compatibility (EMC)—Condition that prevails when telecommunications equipment is performing its individually designated function in a common electromagnetic environment without causing or suffering unacceptable degradation due to unintentional electromagnetic

- Spectrum usage
- Equipment characteristics
- Sources of interference
- **Electromagnetic compatibility.**

interference to or from other equipment in the same environment.

Spectrum Management Survey Program. NTIA conducts surveys on-site at system locations. The purpose of the surveys is to identify areas of improvement in spectrum management. The surveys provide a means to assess:

- The degree of implementation of applicable NTIA rules
- Whether or not frequency usage is in accordance with authorizations.

Spectrum Resource Assessment Program. NTIA conducts studies to assess spectrum use and to identify potential spectrum sharing problems within specific frequency bands allocated to the Federal Government. The data collected from these studies can be used to facilitate policy development, serve as background material for the system review process, and be available to federal frequency managers for various planning purposes.

SPECTRUM ALLOCATION

Spectrum allocation is an entry in the National Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more radio communication services under specified conditions.

A series of coordinating activities must occur at both the national and international level before radio frequencies can be assigned to a federal user. These activities constitute the **spectrum allocation** process of federal spectrum. To aid in understanding these processes, this section provides an overview of the allocation of spectrum to federal public safety users and introduces the roles and responsibilities of the key players in the federal spectrum allocation process.

NTIA is the principal entity responsible for allocating federal spectrum. Several factors, including United States spectrum policy, international spectrum policy, and congressional influence affect NTIA's ability to allocate spectrum. The relationship among these factors is shown in Figure 5 and described in detail in the following paragraphs.

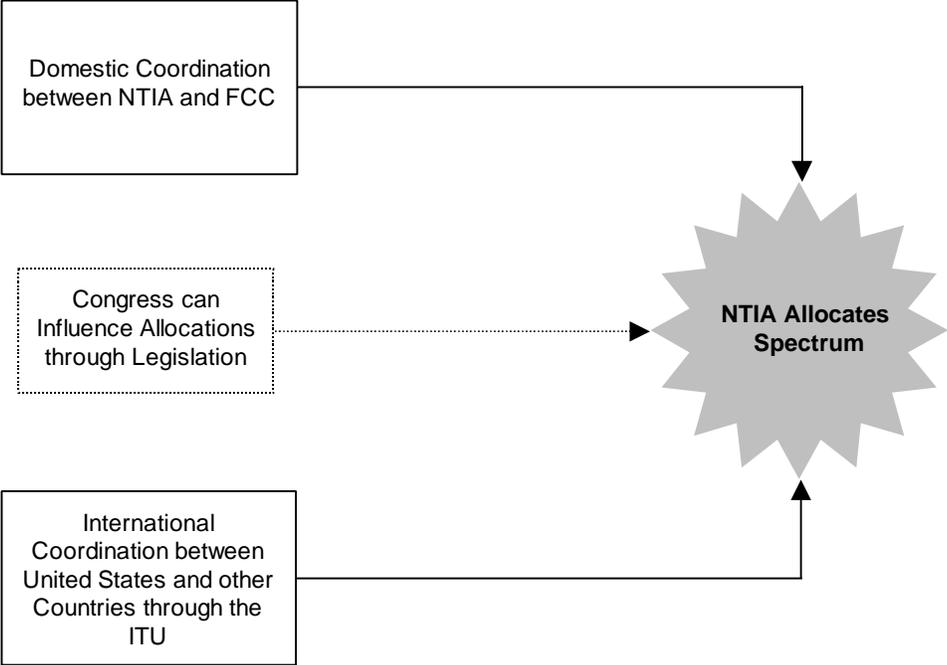


Figure 5
Spectrum Allocation Process

Domestic Coordination Between NTIA and the FCC. Perhaps the most critical role NTIA has is that of domestic spectrum coordination. NTIA has responsibility for managing Federal Government spectrum and the FCC has the responsibility for managing state and local government and commercial spectrum. Because radio spectrum is a shared resource between NTIA and the FCC, effective coordination between the two entities is crucial. Both NTIA and the FCC establish

their individual spectrum requirements and then coordinate their requirements with each other. If difficulties arise in the coordination process, the IRAC may be consulted to facilitate negotiation efforts. The coordination between NTIA and the FCC ultimately results in the division of the spectrum between government (defined as the Federal Government), non-government (defined as state and local government and commercial entities), and the portion designated for shared use.

International Telecommunication Union (ITU)—The international body responsible for international frequency allocations, worldwide telecommunications standards, and telecommunication development activities.

Radio Conference Subcommittee (RCS)—An IRAC subcommittee that formulates U.S. positions on international spectrum policy at the World Radiocommunication Conferences.

International Coordination Between the United States and Other Countries through the ITU. The broadest level of spectrum coordination occurs at the international level. The **International Telecommunication Union (ITU)** is the governing body for spectrum across the world. The group, which is based out of Geneva, Switzerland, holds conferences regarding world spectrum allocations. These conferences, formally known as World Radiocommunication Conferences (WRC), determine international spectrum allocations and international spectrum rules and regulations. International spectrum allocations are contained in the Table of Frequency Allocations located in the NTIA manual.

The IRAC **Radio Conference Subcommittee (RCS)** represents U.S. government interests in the development of proposals to the WRCs. The United States attempts to make domestic and international spectrum allocations coincide. Domestic allocations can and often differ from international allocations in order to meet specific national requirements as defined by NTIA and the FCC.

Congressional Influence. Although Congress cannot allocate spectrum, they can influence the process through legislation. Congress has the ability to legislate spectrum reallocation and the ability to control the funding for said reallocations.

NTIA Allocates Spectrum. Following the domestic and international coordination efforts and input from Congress, NTIA determines spectrum allocations for the Federal Government. NTIA allocates spectrum by radio service type (e.g., fixed, mobile, land mobile radio). These allocations are listed in the National Table of Frequency Allocations. Specifically, the Federal Government primarily uses five distinct bands for operating public safety land mobile radio communications systems. These bands are as follows: 30 to 50 MHz, 138 to 144 MHz, 148 to 150.8 MHz, 162 to 174 MHz, and 406.1 to 420 MHz.