

# FEDERAL LONG-RANGE SPECTRUM PLAN

Prepared by Working Group 7  
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Spectrum Planning Subcommittee

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**U.S. DEPARTMENT OF COMMERCE**  
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# FEDERAL LONG-RANGE SPECTRUM PLAN

## I. National Policy Regarding Use of the Spectrum by Federal Departments and Agencies

The United States is vitally dependent upon the use of the radio spectrum to carry out national policies and achieve national goals. Use of the spectrum is vital to the security and welfare of the Nation and to the conduct of its foreign affairs. This use exerts a powerful influence upon our everyday lives, in countless ways, annually contributing significantly to the Nation's growth and economy.

The radio spectrum is a limited natural resource which is accessible to all nations. It is imperative that we develop and administer our use of this resource wisely so as to maintain a free democratic society and to stimulate the healthy growth of the Nation, while ensuring its availability to serve future requirements in the best interest of the Nation. Therefore, consistent with our international treaty obligations and with due regard for the rights of other nations, the national objectives for the use of the radio spectrum are to make effective, efficient, and prudent use of the spectrum in the best interest of the Nation, with care to conserve it for uses where other means of communication are not available or feasible. Specifically, in support of national policies and the achievement of national goals, the primary objectives are:

- a) to enhance the conduct of foreign affairs;
- b) to serve the national security and defense;
- c) to safeguard life and property;
- d) to support crime prevention and law enforcement;
- e) to support the national and international transportation systems;
- f) to foster conservation of natural resources;
- g) to provide for the national and international dissemination of educational, general, and public interest information and entertainment;
- h) to make available rapid, efficient, nationwide, and worldwide radiocommunication services;
- i) to promote scientific research, development, and exploration;
- j) to stimulate social and economic progress; and
- k) in summary, to improve the well being of man.

In carrying out these objectives, the Government shall, in general, encourage the development and regulate the use of radio and wire communications subject to its control so as to meet the needs of national security, safety of life and property, international relations, and the business, social, educational, and political life of the Nation.

Specifically, the Government shall:

- a) aggressively foster the development, investigation, selection, and standardization of a worldwide system of radio and electronic aids for marine navigation and communication, since the national security, the Nation's sea commerce, and the assurance of adequate safety of life and property at sea for ships of all nations require such an efficient, integrated, and standardized system.
- b) aggressively foster the development, investigation, selection, and standardization of a worldwide system of radio and electronic aids for air navigation and communication, since the national security, the Nation's air commerce, and the assurance of adequate safety of life and property in flight require such an efficient, integrated, and standardized system.
- c) promote the development and use of radio for the protection of the lives and property of its citizens and of other national resources where other means of communication are not appropriate or available.
- d) foster such research and development activities in the telecommunication field as will permit and encourage the most beneficial use of the radio spectrum in the national interest.
- e) promote the development and use of radio to improve the efficiency and economy of Government operations where other means of communication are not appropriate or available.

In the procurement of telecommunications services, the Federal Government places heavy reliance on the private sector. In order to emphasize the Government's proper role as a user, rather than a telecommunications provider, any proposal which requires the Government to perform any "provider" functions, shall be adopted only if commercial service is:

- a) not available to the user during the time needed;
- b) not adequate from either a technical or operational standpoint; or
- c) significantly more costly.

Establishment of Federal telecommunications systems is acceptable only if such an approach will result in significant savings over an otherwise acceptable commercial service offering. To be considered significant the savings must exceed 10 percent of the cost of the commercial service. The cost estimate of the non-commercial approach must include, as a minimum, all of the factors called out by Office of Management and Budget Circular A-76. If the proposed approach involves heavy investment, rapid obsolescence, or uncertain requirements, the minimum savings threshold should be increased to reflect these factors.

The Government shall establish separate communication satellite systems only when they are required to meet unique governmental needs, or are otherwise required in the national interest. Therefore, within the jurisdiction of the U.S. Government, use of the radio frequency (RF) spectrum for radio transmissions by U.S. Government stations shall be made only as authorized by the Assistant Secretary.

The Government regards the radio frequency spectrum as a world resource in the public domain; consequently, its policies ensure that this resource is used in the best interest of the Nation, but with high regard to the needs and rights of other nations. In this regard, the Government considers the International Telecommunication Union (ITU) the principal competent and appropriate international organization for the purpose of formulating international regulations on telecommunication matters, and recognizes that other international bodies, such as the International Civil Aviation Organization, Intergovernmental Maritime Consultative Organization, and the World Meteorological Organization also provide appropriate international organizations for considering specialized telecommunication matters.

In view of the limitations of the usable radio frequency spectrum, and to ensure the best possible return from the use thereof, the Government in time of peace shall require all users to: a) justify any except an emergency request for radio frequencies prior to the assignment or use of such frequencies; b) confirm periodically the justification of continued use; c) employ up-to-date spectrum conserving techniques as a matter of normal procedure; and d) assure the ability to discontinue the electronic functioning of any emission system, including satellites, when required in the interest of communication efficiency and effectiveness.

The Federal Government, in its role of leadership in the application of advanced technology, shall foster the application of spectrum-conserving methods for radio communication systems used by the Federal Government. Spectrum-conserving systems are new or existing systems that make use of innovative designs or unique applications that result in efficient use of frequency, space, and time. Efficient use is a mission-oriented factor that combines the requirements of the mission with available techniques to provide the most effective solution. Federal agencies are encouraged to use spectrum-conserving technologies and methods where they will satisfy agency operational requirements and will enhance service, economy of operation, and the more efficient and effective use of the radio spectrum. However, where spectrum is readily available due to geographic considerations or other factors, or where mission requirements mandate, security, economics, or some technical or system performance criterion may be the determining factor in system selection.

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## **II. Current Federal Spectrum Use (Operational and Spectrum Requirements)**

### **Federal Government's Use of Telecommunications**

Telecommunications are vital to the functioning of government, whether it is local, state, or Federal. The workings of government require rapid and timely information to make informed decisions and to direct and control the governmental activities that are removed from the seat of government. The Federal Government depends on telecommunications in support of its operations in the discharging of its Constitutionally-mandated responsibilities. In its day-to-day activities, the Federal Government uses a vast array of telecommunications services, ranging from conventional wireline telephone service to secure worldwide satellite-borne data communications. The primary use of telecommunications by the Federal Government is in support of providing its services to the public.

As the U.S. population grows and migrates, Government operations tend to follow, establishing its presence in new locations throughout the Nation. Currently, more than 1 dollar out of every 10 spent on non-military telecommunications products is in support of the Federal civilian workforce, which accounts for only 2.8 percent of the total U.S. workforce. Telecommunications link together the expanding Government presence typified by the 20,000 buildings purchased by the Government since 1970, and the addition of 73,000 Federal workers. This expansion was necessary to serve the 44 million Americans added to our population since 1970.

Since 1970, Government consumption has grown by about four to five percent annually, compared to about three to four percent in the overall economy. This growth in Government is accompanied by a parallel growth in Federal Government services. Many of these services, such as law enforcement and air traffic control, depend on telecommunications for efficient accomplishment. Thus, the growth in Government services has produced increased telecommunications requirements.

The Federal Government is not, generally, a telecommunications provider, either to the public or to Government agencies. Except in those cases where commercial services are not available or otherwise suitable, telecommunications supporting Government activities are procured from the private sector. Thus, competition in the telecommunications industry impacts Government procurement of these services to at least the same degree, if not more, as that to private sector users.

Telecommunications services used by the Federal Government can be classified into two basic types: (1) those that are based on wireline systems, including those that have access to the public switched networks, and (2) those services based on spectrum-dependent radiocommunication systems.

## The Federal Government's Use of Radiocommunications

This section presents, in brief, the nature and scope of the Federal Government's use of radiocommunications, including the dominant factors which dictate such use. The investment in spectrum-dependent equipment is in excess of \$80 billion. This figure does not include the operating budgets required to support the equipment. Some 300,000 radio frequency authorizations are current for operation of Federal radiocommunications systems.

At the onset it should be recognized that "use of the radio frequency spectrum" covers a range of radiocommunication and electronic facilities far in excess of the "radio" of by-gone years which meant, for the public at least, primarily broadcasting and wireless communications to ships at sea. The Federal Government facilities involved include not only radio stations of many categories but a myriad of electronic devices whose uses are characterized by the term "radiocommunications".

In understanding the Federal Government's use of radiocommunications, one must appreciate the interplay with non-Federal Government use of radio systems, many of which share the same radio frequency spectrum. In addition to the shared use of spectrum, there is a substantial interface between Government and non-Government radio operations. Non-Government ships, aircraft, and vehicles are served by Government radio facilities; Federal law enforcement agencies have intercommunication with their state and local government counterparts; Federal electrical power systems interconnect with non-Federal, both domestic and international; Civil Air Patrol stations communicate with the military services-- and so forth.

In general, U.S. Government radio facilities, supported by a significant research and development complex, fall in the following categories:

1. Conventional terrestrial radiocommunication facilities - such as long-range high frequency (HF) circuits; radiocommunication services to ships and aircraft, including air traffic control, land-mobile, and microwave point-to-point communication facilities.
2. Space-based radiocommunications stations - used for relay of signals, Earth observation and weather forecasting, and nuclear detonation detection.
3. Radars - used for the location of aircraft or ships, missile detection, weapons control, and weather observation.
4. Radionavigation facilities - both terrestrial and space-based, used for determining position and as an aid in the safe navigation of ships and aircraft.
5. Telemetry - radio transmission of measured or sensed quantities or conditions of given physical properties such as hydro/meteorological or stress/strain data including the receipt of such information from spacecraft. Radio astronomy observations may be considered

as a form of telemetry in the broad sense where the transmitted signals are of natural origin.

6. Various radio frequency spectrum-dependent systems - systems used for security, inventory control, position locating, remote control of mobile devices, and low-powered devices not requiring specific National Telecommunications and Information Administration (NTIA) authorization for operation.

Two dominant themes are present in the Government's use of radio:

1. Requirements for telecommunication are placed upon the Federal Agencies by virtue of the missions and programs approved by the President consistent with Congressional legislative and funding support, and
2. The use of radio rather than other forms of communications as dictated by the inescapable restrictions imposed by time, geography, and the need for mobility.

The acquisition and use of radiocommunication facilities are essential to accomplish the wide variety of individual and interrelated missions of the Federal Agencies which serve the public in many ways. Further, the essentiality of the facilities themselves is established through the Government's budget and appropriation procedures pursuant to congressional approval and Presidential direction. Therefore, as long as spectrum regulatory agencies are not judgmental of the spectrum requirements, the basic management question is not whether the spectrum should be used to support these activities but how it may best be used to meet the requirements to which the agencies are committed—taking into account affected occupants of the same spectrum, present and future, national and international.

Since spectrum use has a low cost to Federal users, the use of spectrum-dependent systems as opposed to wireline systems is based on the relative cost of the equipment. As spectrum availability decreases, the economic equations may, of necessity, include an increased cost associated with spectrum use to ensure spectrum availability for those requirements that have no viable alternatives.

Increased demand for the spectrum resource, particularly by the private sector, is forcing an increased level of sharing, both among differing radio services in a common frequency band, and between Government and private-sector users. Systems using spread-spectrum modulation, and systems which operate in multiple radio services on the same frequency will become more prevalent, and present challenges for future spectrum managers.

## Radio Spectrum Management

The Communications Act of 1934 established the Federal Communications Commission (FCC) and provided the framework for telecommunications regulation within the United States. The Act, passed in 1934, succeeded the Radio Act of 1927 and established the division of authority for spectrum management between the Executive and Legislative branches of the Government, making them independent, co-equal authorities. Radio stations belonging to, and operated by the Federal Government do not come under FCC control.<sup>1</sup> The President's authority for assigning frequencies to Government stations, and certain other functions, were delegated to the Secretary of Commerce by Executive Order 12046 in 1977. Within the Department of Commerce, NTIA has been delegated these responsibilities, and works closely with the FCC in the regulation and planning of the radio frequency spectrum.

Radio frequency spectrum available for assignment to Federal Government stations is shown in the U.S. National Table of Frequency Allocations, and amplified by regulations contained in the Manual of Regulations and Procedures for Federal Radio Frequency Management. The U.S. Table is comprised of the Government Table of Frequency Allocations, and the FCC Table of Frequency Allocations as appears in Title 47, Code of Federal Regulations, Part 2. In the early 1940's, spurred by the rapid increase in Government requirements for radio systems, the FCC and the President's Interdepartment Radio Advisory Committee (IRAC) agreed to a national allocation table that contained some frequency bands allocated exclusively for Federal Government use, some exclusively for private sector use, and the rest shared between Government and non-Government users.

## Current Use of Radio Systems by the Executive Branch Agencies

### Use of The Radio Frequency Spectrum by The Military Services

The paramount requirement of military communications-electronics (C-E) is to provide telecommunications, navigation, and special purpose electronic systems that are responsive to the requirements of the National Command Authorities, the Joint Chiefs of Staff, the Commanders of Unified or Specified Commands, the Services, and defense agencies in the accomplishment of designated missions and functions in peacetime, contingency situations, and at all levels of conflict, including general nuclear warfare. Military C-E systems are developed and produced to perform functions that accommodate crisis management, support nuclear strategy, and meet other wartime requirements. These systems are designed to facilitate a rapid transition from peace to war as well as to satisfy peacetime needs. The nature of the systems and the functions to be performed make military tactical and strategic operations highly dependent on the usable radio frequency spectrum.

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<sup>1</sup> Communications Act of 1934, as amended, Section 305 (a).

The foregoing factors demand that sound engineering and administrative practices be applied by the military services toward ensuring efficiency in the management and use of the radio frequency spectrum to support operations. Under normal peacetime conditions, military service needs are satisfied while minimizing the impact on other users through efficiently exercised management. Service needs are met so that the primary uses of the spectrum are in conformity with the National and International Radio Regulations. Other needs are met on a noninterference basis. The management of the frequency resources required to support a balanced and operationally effective training/contingency program for the military force structure requires a constant effort to refine and improve management functioning. It is only through diligent and progressive management and continued technological advancement that the radio frequency spectrum requirements, incident to national readiness and security, can be adequately met.

A short description of each of the military services' dependence on radio frequencies is presented below.

### **Defense Information Systems Agency (DISA)**

DISA engineers, manages, and operationally directs the Defense Communications System (DCS) which provides the long-haul worldwide communications for the Department of Defense (DOD). In addition to land lines (including wire and fiber optic cables) and submarine cables, the DCS includes an extensive worldwide network of troposcatter, microwave, and HF systems, as well as the satellites and Earth terminals of the Defense Satellite Communications System (DSCS). The individual components of the DCS are provided by the Military Departments which are responsible for the operation and maintenance of the facilities. The frequency spectrum with which the DISA is concerned ranges from the lower portion of the HF band up through the extra high frequency (EHF) radio frequencies, and into laser frequencies used in the fiber optic cables.

### **Department of the Army**

The Office of the Director of Information Systems for Command, Control, Communications, and Computer is responsible for all electronic communication, computer and information management activities for the Department of the Army. The Army Spectrum Manager, who reports directly to the Director of Information Systems for Command, Control, Communications, and Computer, is responsible for ensuring unity of effort in frequency supportability and radio regulatory matters, and for providing policy guidance on any interdepartmental or host nation issues. He and his staff address objectives, policy, radio regulatory positions and resource management within the Army, including training of frequency personnel; and, interfaces spectrum matters with other DOD and Federal agencies and with the FCC.

Additionally, frequency assignments for Army use within the Continental United States (CONUS) are made by organizations under the direction of the Army Spectrum Manager. The Communications-Electronics Service Office provides national and international level support to

Army spectrum management activities including coordination of spectrum use with other government agencies, participation in national and international spectrum management forums, certification of spectrum-dependent equipment, and management of host nation agreements to support use of spectrum-dependent equipment. The Army Frequency Management Office CONUS and the Area Frequency Coordinators located at White Sands Missile Range and the Electronic Proving Grounds provide the vital link between national spectrum management and Army operations. These organizations directly respond to frequency action requests from operational tactical units, administrative support units, research and development organization, and other Army efforts.

Due to the high mobility of Army operations, the dispersal of Army units, and the wide range of Army spectrum-dependent systems, Army frequency use requires extraordinary planning. Army frequency management techniques and procedures will continue to change to support Army modernization efforts that require high data rate systems with related increases in bandwidth and real time frequency agile systems. This dynamic environment presents a unique challenge to Army frequency management offices and to those organizations with which the Army shares the radio frequency spectrum.

The trend in Army spectrum-dependent systems is towards embedded automation and signal processing techniques to improve information exchange. The emphasis in new design (e.g., software-defined radios) is to operate in a radio interfering environment, and to provide maximum tuning ranges to permit assignment flexibility in different ITU Regions and to solve local spectrum congestion problems. Experimental work continues at EHF in both equipment design and radio propagation sciences. Data transfer requirements placed upon tactical radio relay systems have increasingly driven bandwidth, interoperability and flexibility in supporting computer techniques, such as time division multiplexing and packet switching.

Training at individual and unit levels has increased radio spectrum requirements for communications, weapons systems, and countermeasure tactical systems. The Fort Irwin, California, and Fort Polk, Louisiana, National Training Centers (NTC) are instrumented for unit testing. Army forces are rotated through the NTCs as part of the annual testing and evaluation of training. The Army is reviewing its frequency management process to achieve the highest utilization and training capability while limiting potential interference.

Army aviation operates in the National Airspace with installed air navigation and radar systems, very high frequency (VHF) or ultra high frequency (UHF) equipment for aviation communications and tactical Army frequency modulation equipment for communications with tactical forces. In addition to its airborne activities, the Army provides personnel and operations for four air traffic control areas.. The Corps of Engineers (Civil Works) maintains 41,000 kilometers of navigable waterways, locks, and local traffic controls. In this role, nationally established maritime radio facilities and procedures are used. In addition, the Corps of Engineers operates a fleet to support its missions, which operate on Army channels.

In addition to its maritime activities, the Corps of Engineers operates radio sensing and remote controls for 66,000 dams with most of them producing electric power. This requires approximately 1,600 kilometers of microwave radio relay systems. The total number of radio frequencies used by the Corps of Engineers may be illustrated by the fact that one third of all Army frequency assignment actions in the conterminous United States are for Corps activities.

### **Department of the Navy**

The Department of the Navy includes the Executive Office of the Secretary of the Navy, the Office of the Chief of Naval Operations, the Headquarters U.S. Marine Corps, and other commands and activities located in Washington, D.C.; the entire operating forces of the Navy and Marine Corps, including reserve components; all shore and field activities under the control of the Secretary of the Navy; and, in time of war or when the President so directs, the U.S. Coast Guard (USCG). Navy and Marine Corps forces are organized, equipped, trained, and prepared to maintain a constant state of readiness for immediate and sustained offensive and defensive operations on and under the seas, on land, and in the air.

Since the end of the Cold War, the Navy has been redefining missions and concepts of operations, in recognition of the new military challenges presented by the post-Cold War world. The over-arching document, "*Forward...From the Sea*", offers a new vision based on revised strategy and military operational needs for regional conflicts in the world's littoral zones and on new technological capabilities for current and future use. The future warfighting environment will involve cooperative, long-range engagements and require a highly responsive command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) decision cycle. This projected future environment has moved information and the requirement for information superiority to center stage in all thinking about the conduct of naval warfare. Warfighters now require information superiority – the capability to collect, process and disseminate information, while denying an adversary's ability to do the same. The requirement for information superiority was a key element in the development of the naval vision for C4ISR, known as Copernicus. Copernicus is the initiative to gain information superiority and make C4ISR systems responsive to the warfighter; to field these systems quickly; to capitalize on advances in technology; and to shape doctrine to reflect these changes. Embodied in the Copernicus initiative is the naval concept of Network Centric Warfare (NCW) which is the vision for complete integration of C4ISR systems.

The Navy's overarching program for achieving the command and control elements of NCW is Information Technology for the 21<sup>st</sup> Century (IT21). As first steps toward implementing IT21 requirements and meeting NCW, the Navy has begun fielding several command, control, communications, computers, and intelligence (C4I) programs. While there are a number of programs under development, the following represent the thrust of IT21: The Global Command and Control System - Maritime program provides for the common operational picture and collaborative planning in the near term, Link 16 provides a portion of the Coherent Tactical Picture, and the Cooperative Engagement Capability (CEC) for air and missile defense. CEC

manifests the potential to increase combat effectiveness by linking geographically dispersed sensors, of differing capabilities, with all potential firing platforms.

Operational Maneuver From the Sea (OMFTS) is the Marine Corps' capstone operational concept "for maritime power projection." OMFTS was precipitated by two fundamental changes in the operational environment: (1) the prominence of the threat characterized by the phrase "chaos in the littorals" and, (2) enhanced tactical capabilities based on technical advances in information management, battlefield mobility, and lethality of conventional weapons. The concept presents a vision of what "operational maneuver from the sea" is and what capabilities naval forces of the near future should possess. Given the significantly greater distance from which movement ashore will begin, compared to current operations, and that there will be no intermediate pause on the way to the objective, OMFTS requires vastly greater C4ISR capabilities than those of today.

Operation of C-E equipment, systems, and subsystems is a necessity to support, coordinate, and control Marine Air/Ground Task Forces and other independently operating Fleet Marine Force units. The equipments and systems that require frequency spectrum are tactical radios, sensors, battlefield surveillance radars, air defense radars, tactical data link terminals, and satellite communications links. To meet the response requirements associated with the U.S. Marine Corps mission, amphibious training exercises are conducted routinely on a worldwide basis, often in conjunction with allied forces.

To achieve the coordination necessary to conduct joint operations, naval forces require the capability to 'train as you fight' within the United States and its Possessions (USP) and littoral waters. The radio frequency spectrum is the only medium that can support the Navy and Marine Corps' increased mobile communications requirements associated with NCW and OMFTS. Assured access to the electromagnetic spectrum is essential for the Department of the Navy strategic and tactical systems to fulfill their communications, intelligence, surveillance, reconnaissance, and weapons guidance missions both in times of peace and during conflict.

The operating forces of the Navy and Marine Corps are a primary means of force projection and peacekeeping in furtherance of national policy. Operations can be conducted unilaterally, jointly with forces of other U.S. military services, and with allied forces in combined operations. Such operations bring a heavy concentration of sophisticated electronics systems into a constrained area and place heavy demands on the electromagnetic spectrum to accommodate the necessary C4ISR flow without mutual electromagnetic interference. The sophisticated defensive and offensive detection, location, and weapon systems necessary to accomplish the mission also place heavy demands on management and use of the electromagnetic spectrum.

**Office of the Chief of Naval Operations (OPNAV) and the Director, Space Information Warfare, Command and Control Directorate (CNO N6)**

The Chief of Naval Operations (CNO) is the senior military officer in the Navy. A member of the Joint Chiefs of Staff, the CNO is the principal naval advisor to the President and to the Secretary of the Navy on the conduct of war, and is the principal advisor and naval executive to the Secretary on the conduct of naval activities of the Department of the Navy. Assistants are the Vice Chief of Naval Operations, the Deputy Chiefs of Naval Operations and a number of other ranking officers. These officers and their staffs are collectively known as the CNO N6 (OpNav).

The Director, Space Information Warfare, Command and Control, Office of the Chief of Naval Operations (CNO N6) provides Navy space and electronic warfare leadership, vision, policy resources and doctrine support of naval, joint and combined operating forces. CNO N6 has the responsibility to develop Navy communications systems and information networks, including strategic and space communications, and to act as the resource and program sponsor for those programs. The Director also exercises policy direction and control, administration and management of the Naval Telecommunications System (NTS). The paramount mission of OPNAV N6 is to ensure that the fleet is properly equipped with and trained to use the best possible Command, Control and Intelligence (C2I), space, information warfare and information technology communication networks that are affordable and that meet the warfighters requirements; and that the NTS is responsive to operational commanders, including Joint Commanders.

**Headquarters, United States Marine Corps, Command, Control, Communications, Computers and Intelligence (C4I)**

The Assistant Chief of Staff, Command, Control, Communications, and Computers (AC/S C4) is responsible for planning, directing, coordinating, and oversight of all Headquarters, Marine Corps matters which relate to C4. As the senior C4 proponent, the AC/S C4 is the center of C4 policy, oversight of standards, and systems integration within the Marine Corps. He provides C4 leadership, education and vision to the Marine Corps. The AC/S C4 monitors internal C4 systems as well as all DOD, national, and allied systems that impact on the Marine Corps C4 Architecture for both the Fleet Marine Force and the Supporting Establishment to ensure systems integration and interoperability.

**Naval Electromagnetic Spectrum Center (NAVEMSCEN)**

NAVEMSCEN manages the Department of the Navy's (DON) use of the radio frequency electromagnetic spectrum needed for the control and exploitation of sea, air, and space. NAVEMSCEN is the Navy's primary responsible organization for implementation of the CNO electromagnetic spectrum management policy and procedures. The NAVEMSCEN provides direct support to operational radio frequency spectrum users by obtaining and documenting all frequency assignments used to support Navy and Marine Corps operations worldwide. They also register Navy and Marine Corps HF and satellite frequency assignments with the Radiocommunications Bureau of the ITU. NAVEMSCEN's primary responsibilities are:

- Represent its Service C4I Chief (CNO N6) on spectrum management issues
- Coordinate spectrum management issues within joint, DOD, national, and international forums
- Partner with the acquisition and operational communities of the DON to actively assist them in identifying and following the spectrum management process.

### **Major Systems Commands (SYSCOMS)**

#### **Naval Sea Systems Command (NAVSEASYSKOM)**

The NAVSEASYSKOM is the Navy Department's central activity for designing, engineering, integrating, building and procuring U.S. Naval ships and shipboard weapons and combat systems. NAVSEASYSKOM's responsibilities also include the maintenance, repair, modernization and conversion of in-service ships and their weapons and combat systems. Additionally, it provides technical, industrial, and logistics support for naval ships, and ensures the proper design and development of the total ship, including contractor-furnished shipboard systems.

Other important NAVSEASYSKOM functions include introduction of ships to the Fleet; the Navy's salvage and diving operation; explosive ordnance safety and disposal; coordination of naval ship conversion and repair for both the DOD and the Military Sealift Command; and support of ship construction for the Maritime Administration. NAVSEASYSKOM manages 135 acquisition programs, which are assigned to the Command's 7 affiliated Program Executive Offices (PEOs) and various Headquarters elements. Organizationally, as of 1 June 1998, the Command had 38 subordinate shore activities and more than 150 detachments and on-site offices. These organizations are located all over the United States and a small number are overseas.

#### **Naval Air Systems Command (NAVAIRSYSKOM)**

The Naval Aviation Systems Team (TEAM) comprises:

- Program Executive Office, Air Anti-Submarine Warfare, Assault, and Special Mission Programs PEO(A)
- Program Executive Office, Strike Weapons and Unmanned Aviation PEO(W)
- Program Executive Office, Tactical Aircraft Programs PEO(T) and
- Program Executive Office, Joint Strike Fighter PEO(JSF)

Working with industry, the TEAM delivers high quality, affordable products and support to the operating forces. Products and services delivered on behalf of the customer include: aircraft, avionics, air-launched weapons, electronic warfare systems, cruise missiles, unmanned aerial vehicles, launch and arresting gear, training equipment and facilities, and all other equipment related to Navy and Marine Corps air power. Total life cycle support of all naval aviation weapons systems include: research, design, development, and engineering; acquisition; test and evaluation; training facilities and equipment; repair and modification; and in-service engineering and logistics support.

Ultimately, NAVAIRSYSCOM's goal parallels that of their customers - to reconstitute the Fleet's assets with new and modernized weapons systems, technically and functionally capable of responding to the demands of the 21st century.

### Space and Naval Warfare Systems Command (SPAWARSYSCOM)

SPAWARSYSCOM is responsible for directing the development, acquisition, and life cycle management of C4ISR systems for the U.S. Navy, and select Marine Corps and joint service programs. The majority of the frequencies within the DON are generated by the use of C4ISR systems under SPAWAR cognizance. The mission of SPAWAR is to provide Naval commanders a decisive warfare advantage through the development, acquisition, and life cycle management of effective and responsive:

- Undersea, terrestrial, and space sensors
- Battle management systems
- Information transfer systems
- Information management systems, and
- Systems for selective denial of these capabilities to opposing forces.

To implement this mission, SPAWAR is organized into six Program Directorates (PD) with a Chief Engineers Office that supports the entire command:

- Advanced Concepts and Technology PD
- Space Technology Systems PD
- Global Information and Network Systems PD
- Information Warfare Systems PD
- Communications System PD
- ISR Systems PD
- Office of Chief Engineer

In addition, there are three systems centers that provide engineering and technical support to the program directorates:

- SPAWAR Systems Center, Charleston
- SPAWAR Systems Center, Chesapeake

- SPAWAR Systems center, San Diego

## **Department of the Air Force**

The mission of the U.S. Air Force (USAF) is to defend the United States through the control and exploitation of air and space. To accomplish this mission, the Air Force uses several subsidiary organizations, the first level of which includes the Major Commands (MAJCOMs). The MAJCOMs are assigned specific duties and organized functionally within the conterminous United States and by geographic area overseas (to include Hawaii and Alaska). The Air Force also uses, at the same level as MAJCOMs, but separate from them and generally smaller in scope and size, Field Operating Agencies (FOAs) and Direct Reporting Units (DRUs). While MAJCOMs accomplish a broad, overall mission, FOAs and DRUs have a more specific mission. Nine MAJCOMs, two of which are outside the CONUS, exist. The following paragraphs discuss the ways in which the Air Force uses the radio frequency spectrum: first for the MAJCOMs; then one FOA: the Air Intelligence Agency; then two subordinate units: the Air Force Frequency Management Agency and the Air Force Communications Agency both of which are DRUs of the HQ Air Force Communications and Information Center; then one organization: the Air National Guard.

## **Major Commands**

**Air Combat Command (ACC).** The ACC operates combat-coded fighters, bombers, tankers and reconnaissance aircraft, and organizes trains, equips and maintains rapid-response, combat-ready forces. ACC is the Air Force component command for the U.S. Joint Forces Command (USJFC) and U.S. Strategic Command (USSTRATCOM), and provides nuclear-capable forces for the latter. ACC subordinate numbered air forces are the air component commands for U.S. Central Command (USCENTCOM) and U.S. Southern Command (USSOUTHCOM). ACC operates specific air mobility assets in support of U.S. Transportation Command. ACC also tests new combat equipment, monitors and intercepts illegal drug traffic, and provides air defense forces for North American Aerospace Defense Command. Additionally, ACC is the lead command for the Combat Air Forces (CAF), which is made up of ACC, Pacific Air Force (PACAF), U.S. Air Forces in Europe (USAFE), Air Force Space Command (AFSPC), Air Force Special Operations Command (AFSOC), Air Education and Training Command (AETC), Air National Guard (ANG), and Air Force Reserve (AFR).

ACC is the Air Force's largest user of the spectrum. It employs the entire range of electronic radio frequency radiating equipment including special weapon systems, navigation aids, radio location devices, and command and control systems. ACC provides aircraft and Theater Air Control System equipment to carry out close air support, air surveillance, air control, and communications connectivity within a combat zone. It also operates an extensive early warning system providing detection, identification, surveillance, and interception for national air defense. ACC is also responsible for the Air Force search and rescue and for unmanned aerial vehicle operations.

Data and communication systems used by ACC include: satellites, ground and airborne radar, Joint Surveillance System, Joint Tactical Information Distribution System, drone control and target scoring, tactical VHF and UHF air-to-ground and air-to-air systems, HF single sideband, electronic warfare and countermeasures, enemy threat simulators, navigational aids, air traffic control, and many land mobile radio systems. ACC also operates aircraft for the Airborne Battlefield Command Control Center, Airborne Warning and Control System, the Joint Surveillance Target Attack Radar System, and the National Airborne Operations Center.

ACC's worldwide mission requires extensive and continuous use of the radio frequency spectrum. The combination of ACC's unique mission requirements and complex operational systems places a heavy demand on the spectrum. As the force provider to the warfighters and the service proponent for fighter and bomber operations, ACC's mission of putting bombs on target could not be met without unencumbered use of the spectrum.

**Air Education and Training Command.** Known as the "First Command", AETC recruits, accesses, commissions, trains, and educates Air Force enlisted and officer personnel. AETC provides basic military training; basic and advanced technical training; flying training; and professional military and degree-granting professional continuing education for officer, enlisted, and civilian personnel. AETC conducts joint, medical service, and readiness training and Air Force security assistance training for allied and friendly foreign nations. AETC's charter is fostering an Expeditionary Air Force (EAF) culture in our recruits and officers. It also prepares mission-ready graduates, people who are ready to perform their mission and provide combat support to worldwide operations. AETC continues to contribute a major role in the development and evolution of our aerospace forces.

AETC spectrum usage is as diverse as the rest of the Air Force with the "train as you fight" concept. Communications systems used in operational support and training bases include VHF/UHF air-to-ground and air-to-air systems, navigational aids, air traffic control, land mobile radio, radar, microwave, HF, threat simulators, drone control, and target scoring and satellite communications.

**Air Force Materiel Command (AFMC).** Through integrated management of research, development, test, acquisition, and support, AFMC advances and uses technology to acquire and sustain superior systems in partnership with its customers. AFMC performs continuous product and process improvement throughout the life cycle. As an integrated part of the Air Force warfighting team, AFMC contributes to affordable combat superiority, readiness, and sustainability.

AFMC actively develops and acquires the most advanced systems for Air Force use, and its use of the radio frequency spectrum is as wide as that of the entire Air Force. Approximately one-fifth of the radio frequency assignments for Air Force operations are to satisfy AFMC requirements. Recognition of the radio frequency spectrum as a finite and vital resource requiring prudent use and management is intrinsic to the AFMC mission. The enhancement of

national defense would be diminished if new USAF equipment were not compatible with intended environments or were in frequency bands either overcrowded or allocated for different radio services. Research, development, test, and support activities conducted at AFMC laboratories, product centers, air logistics centers, base operating sites, test ranges, and those at the facilities of contractors rely heavily on the radio frequency spectrum.

**Air Force Space Command.** The AFSPC operates space and ballistic missile systems, including ballistic missile warning, space control, spacelift, and satellite operations. AFSPC supports terrestrial forces, and civil and commercial space activities. AFSPC supplies: Air Force Satellite Control Network, Ballistic Missile Warning System, Cobra Dane radar, Defense Meteorological Satellite Program, Defense Satellite Communications System, and other military satellite communications systems such as Military Strategic and Tactical Relay, Defense Support Program satellites, the Fleet Satellite Communications System, the Global Positioning System (GPS), Ground-based Electro-Optical Deep Space Surveillance System, North Atlantic Treaty Organization (NATO) III communications satellites, Passive Space Surveillance System, Pave Paws radars, and Perimeter Attack Characterization System.

AFSPC, which is responsible for all Air Force and many DOD, U.S., and NATO satellite systems, has an extensive need for radio frequency spectrum. Each satellite needs telemetry, command, and control, and many are used specifically for radio frequency communications. Since most satellite receivers are extremely sensitive, they must be protected from spurious emissions from other transmitters. The warfighter needs satellite communications during the entire conflict. Moreover, the DOD and our allies need the radio frequency spectrum for the safety and well-being of the warfighters in a hostile, foreign land.

**Air Force Special Operations Command.** The AFSOC is the Air Force component of U.S. Special Operations Command. AFSOC deploys specialized air power, delivering special operations combat power anywhere, anytime. AFSOC provides unconventional warfare, direct action, special reconnaissance, counter terrorism, and foreign internal defense support to the Unified Commands. AFSOC also provides humanitarian assistance and personnel recovery, and conducts psychological and counter-narcotics operations. AFSOC assets include fixed and vertical-lift transport, aerial tankers, fixed-wing gunships, and psychological operations support aircraft. In addition to the aircrews, AFSOC personnel include Special Tactics Teams (who provide combat control and pararescue functions); Special Operations Weather Teams; and Special Operations Communications Flights. To complete its various missions worldwide, AFSOC must have extremely versatile radiocommunication equipment to be compatible with that used by the forces with which it must cooperate. This includes other DOD Military Departments and foreign allies. AFSOC also needs communication and other radio frequency equipment that are interception- and jam-resistant.

**Air Mobility Command (AMC).** The AMC provides rapid global airlift and aerial refueling for U.S. armed forces. AMC is the USAF component of U.S. Transportation Command, and supports wartime tasking by providing forces to theater commands. AMC also

provides operational support aircraft, aeromedical evacuation missions, and visual documentation support.

There are three categories of AMC spectrum usage: fixed, tactical, and contingency or deployable. The fixed category consists of HF Automated Link Establishment for the AMC Command and Control (C2) and HF training networks. Combat Control Teams use the VHF band for tactical and joint operations for communications at drop zones/landing zones and training by the Air Mobility Warfare Center. AMC uses the VHF-AM frequency band for air traffic control operations. AMC also uses the VHF band for air-to-ground, ground-to-air, and land-mobile communications for contingency and deployable operations in support of tanker Airlift Control Elements. AMC manages the super high frequency (SHF) usage for all formation aircraft using station keeping equipment within the USP and several globally assigned SHF and UHF frequencies in support of the Tanker Airlift Control Center air-to-air refueling missions. Additionally, AMC uses this band to support daily flight and command post operations. The Air Mobility Operations Groups use UHF satellite communications extensively for fixed and contingency operations. AMC uses operating frequencies in the UHF band for land mobile operations at AMC bases and for communications during deployments.

**Air Force Reserve Command (AFRC).** The AFRC became a MAJCOM in accordance with the 1997 Defense Authorization Act. The Chief of Air Force Reserve also serves as commander of AFRC. HQ AFRC carries out the Chief of Staff's responsibility for command of Air Force Reserve forces. HQ AFRC participates in formulating plans for management, administration, and execution of programs affecting AFR units. The ARF provides trained units and qualified people for active duty in time of war or national emergency, or when required to maintain national security. It also performs peacetime missions compatible with training and mobilization readiness requirements. The AFR stands to meet any challenge to national defense by augmenting the active force in time of emergency.

**Pacific Air Forces.** The PACAF primary mission is to provide ready air and space power to promote U.S. interests in the Asia-Pacific region during peacetime, through crisis, and in war. PACAF plans, conducts and coordinates offensive and defensive air operations. PACAF organizes, trains, equips, and maintains resources to conduct air operations. PACAF's area of responsibility extends from the West Coast of the United States to the East Coast of Africa and from the Arctic to the Antarctic, more than 259 million square kilometers containing 44 countries. It operates in a multinational environment where it can interact with many different types of equipment and radio frequency standards. Alaskan and Hawaiian-based aircraft, as well as that of CONUS-based units deployed to the Pacific Theater, must interact with the equipment used in the Pacific and Asia.

Some data and communications systems used by PACAF include: satellite ground stations, ground and airborne radars, Joint Tactical Information Distribution System, tactical VHF and UHF air-to-ground and air-to air systems, HF single sideband, electronic warfare and

countermeasures, enemy threat simulators, navigational aids, air traffic control, and many land mobile radio systems.

**U.S. Air Forces in Europe.** The USAFE trains and equips units pledged to the NATO. USAFE plans, conducts, controls, coordinates, and supports air and space operations in Europe. It supports U.S. and NATO strategies in the European/Mediterranean area and is responsible for supporting U.S. military plans and operations in parts of Europe, the Mediterranean, the Middle East, and Africa as a component of U.S. European Command. In this role, USAFE maintains fixed and mobile operating systems which use a wide variety of radio frequencies. Additionally, numerous stateside-based units augment USAFE during contingency and humanitarian operations and exercises, and when Presidential and VIP missions includes, but is not limited to HF point-to-point, VHF air-to-ground and point-to-point, UHF air-to-ground and tactical satellite, all air traffic control services frequency bands, portions of the 1700–1850 MHz and 2300–2400 MHz ranges for air-to-air combat training, 5000–6000 MHz for the control of unmanned aerial vehicles and tactical weather radars, and, due to the high satellite links in the 12–14 GHz range. Since USAFE also has to interact with many different countries, its equipment must be compatible with many different types of equipment and radio frequency standards, including the United States.

### **Field Operating Agencies**

**Air Intelligence Agency (AIA).** The AIA provides direct intelligence security, electronic combat, foreign technology, and treaty monitoring support to national leaders and field air component commanders. The AIA provides combat commanders data that enables them to decide when to exploit, jam, deceive, or destroy hostile military communications. The AIA delivers human intelligence and scientific and technical intelligence. It provides measurement and signature intelligence data collection, analysis and exploitation support, and nuclear intelligence production support. In the age of information warfare, the AIA is extremely important since it not only helps gather information from possible and real enemies, but also keeps them from doing the same to the United States and its allies.

To be successful, AIA must have real-time data gathering from its units around the globe, and real-time data distribution to commanders in the field. To do this, AIA needs a large amount of radio frequency spectrum, as there is no other way to ensure global connectivity in a variable, unstable environment, such as an armed conflict or war. The AIA uses satellite communications for real-time global connectivity with all of its locations. Because of the sensitivity and essentiality of its communications, it is critical that these communications are not intercepted or corrupted. The AIA uses UHF air-to-ground communications with its airborne units, and has a worldwide UHF satellite intelligence network for data gathering and distribution. The AIA, in conjunction with the Department of Energy (DOE), also uses UHF satellite communications for verification of conformance with the Nuclear Proliferation and Consolidated Test Band Treaties.

### **Subordinate Units Under Direct Report Units**

**Air Force Communications Agency (AFCA).** The AFCA ensures command, control, communications, and computer (C4) systems across the Air Force are integrated and interoperable. They develop and validate C4 architectures, technical standards, requirements, policies, procedures, and technical solutions.

The AFCA does not itself have a large need for the radio frequency spectrum. Nevertheless, in conjunction with the Joint Technical Architecture-Air Force, it helps to ensure the Air Force's equipment uses the spectrum efficiently and productively and that the equipment is interoperable with the other equipment used in the Air Force and the DOD. The AFCA ensures that all Air Force C4 acquisitions are compatible and interoperable with other existing or proposed C4 systems. They extensively test new civil technologies being acquired for Air Force use to ensure compatibility.

**Air Force Frequency Management Agency (AFFMA).** The AFFMA serves as the Air Force executive agent for implementing Air Force use of the radio frequency spectrum. It provides the Air Force with global electromagnetic spectrum access anytime, anywhere. AFFMA develops and implements Air Force radio frequency spectrum management guidelines and instructions to support the Air Force mission. The AFFMA is directly responsible to the Commander, Air Force Communications and Information Center for all Air Force radio frequency spectrum management matters.

The AFFMA provides support to operational radio frequency spectrum users by obtaining and documenting frequency assignments used to support Air Force operations worldwide. They register Air Force HF and satellite frequency assignments with the Radiocommunications Bureau of the ITU. They represent, advocate, and defend Air Force interests in spectrum management matters on various DOD, national, and international committees, groups, and organizations to include the Technical Subcommittee, Frequency Assignment Subcommittee, and the Spectrum Planning Subcommittee of the IRAC as well as being the Air Force executive agent for the Air Force Electromagnetic Environmental Effects Program. They also coordinate assignment actions with Unified Commands for operations outside the USP. The AFFMA does not itself use the radio frequency spectrum.

### **Air Force Organization**

**Air National Guard.** The mission of the ANG is to enforce Federal authority, suppress insurrection and defend the Nation when mobilized by the President, Congress, or both. Commanded by the governors of the 50 States, Puerto Rico, Guam, the Virgin Islands, and the commanding general of the District of Columbia. Each governor is represented in the state or territory chain of command by an adjutant general.

The ANG has operational components of ACC, AETC, AFSOC, AMC and PACAF, and therefore has a need to have component equipment from all of these NWCMS. Equipment

used by these MAJCOMs might also be used by the ANG, so its radio frequency spectrum use is very wide. The ANG also operates during a time of national emergency or natural disaster, as well as during war or armed conflict, so they have a continuous need for the radio frequency spectrum.

### **National Test Ranges**

The national test ranges test missiles and other major weapons systems that are critical to the Nation's defense. All of the U.S. military services (Army, Navy, Air Force, and Marine Corps), conduct test programs for major weapons systems, and use of the radio frequency spectrum is critical to the operation of these test programs. The demand for radio frequency spectrum during land, sea, and air force weapons systems testing and training, in particular during joint exercises, is greater today than ever before.

At the lower end of the spectrum, ground-to-air, air-to-air, and ground-to-ground VHF/UHF for aircraft communications and land mobile radio systems are continually used to provide positive control of test range operations. Flight termination frequencies provide for safety concerns. Data links cover a wide range of operations including fixed microwave links, weapon and missile data links, telemetry for real-time data and video, and instrumentation control links starting and controlling tracking cameras, and various other event critical activities. Testing sophisticated vehicles (aircraft, land vehicles, sea craft, rockets, and missiles) require enormous amounts of performance data. Further uses of data links include remotely controlled explosive ordnance disposal systems, control of sub-scale and full-scale drone aircraft and other unmanned aerial vehicles, and command control and command destruct links.

Radar systems are vital for many aspects of testing. Uses include: missile and aircraft tracking radars with associated transponders, air traffic control radars, weapon scoring systems, weather radars for monitoring weather conditions that might affect a test mission, and missile guidance radars. Aircraft and missile testing require extensive communications linking tracking and data collection sites over large areas.

Finally, the development and testing of electronic countermeasures (ECM), electronic counter-countermeasures (ECCM), or Electronic Attack (EA) systems are major activities at many national test/training ranges. Many ranges are used for routine ECM/ECCM/EA training of combat aircrews. ECM/ECCM/EA systems are used to jam, confuse or otherwise render potential enemy radio frequency weapons systems (such as radar guided missiles, surveillance radars, and jammers) ineffective. ECM testing against simulated threat system radars is critical to development and testing of our advanced technology weapon systems electromagnetic countermeasures to find their capabilities, vulnerabilities, and weaknesses.

## **Reserve Components**

In addition to the regular Armed Forces, there are reserve units of the Army, Navy, Air Force, and Marine Corps, including the Army National Guard, Air National Guard, and the Coast Guard in the United States. The mission of the reserve is to provide trained units and qualified personnel to augment the active duty forces and to provide a combat-ready team during time of war, national emergency or when required to maintain national security. Reserve units perform peacetime missions that are compatible with training and mobilization readiness requirements. The reserve routinely conducts exercises with extensive use of C-E equipments and relies heavily on all parts of the radio frequency spectrum for its communications, command, and control capabilities. Since the reserve units must be combat ready at any time, they must train with the same equipment as active-duty personnel, and they have the same radio frequency spectrum requirements as their active duty counterparts throughout U.S. forces worldwide.

## **Department of Agriculture**

The majority of radio use within the Department of Agriculture (USDA) resides with the Forest Service (FS) supporting the protection and management of National Forests, National Grasslands, and Wilderness Areas, which comprise approximately 192 million acres. Forest Service radio systems, comprised of over 60,000 radios, are used in programs supporting incident communications such as wildfire firefighting, law enforcement, and emergency disaster control (earthquakes, volcanic eruptions, hurricanes, etc.). Wildland firefighting activities are supported with over 40 FS owned fixed-wing aircraft, over 40 contracted fixed-wing aircraft, and almost 500 contract helicopters. Law enforcement activities in drug control alone include over 300,000 petty offense violations and over 2,000 arrests annually. Other uses of these systems include the administrative and operational uses supporting timber production, recreation sites (almost 6,000 campgrounds), watershed and water supply, wildlife and grassland conservation, and forest research.

Some additional 6,500 additional pieces of radio equipment are devoted to the support of other agricultural, hydrologic, and research activities. The increasing communications needs of the Natural Resources Conservation Service (NRCS), the Animal and Plant Health Inspection Service (APHIS), and other USDA agencies have resulted in a rapid increase in the numbers of radios. Examples are the NRCS Meteor Burst Hydrologic system in the West and APHIS's border, airport, and port inspection, animal disease control, and plant protection and quarantine activities.

## **Department of Commerce**

In the Department of Commerce, the largest user of the radio spectrum is the *National Oceanic and Atmospheric Administration (NOAA)*, which manages, conserves and monitors marine resources, and predicts atmospheric and marine conditions for the protection of life and property. The *National Weather Service (NWS)*, with personnel located at 121 Weather Forecast

Offices throughout the United States, is charged with observing and reporting the weather, issuing forecasts and warning of weather and flood conditions affecting national safety, welfare, and economy. Its seven National Centers for Environmental Prediction are key centers in long range and regional forecasting for the World Meteorological Organization of the United Nations. Its Tropical Prediction Center also tracks hurricanes and forecasts their movement and intensity to provide early warnings to populated areas in the storm path.

NWS operates about 120 weather radars, 102 weather balloon stations, 503 NOAA Weather Radio Stations, and, together with state and local governments, 3,437 hydrological data collection and warning stations. It also operates many other radio stations serving the Geostationary Operational Environmental Satellite (GOES, platform station) Program, the hydrologic telemetry program, the fire-weather program, the hurricane backup communications program, the weather reconnaissance aircraft program, and other miscellaneous radio requirements.

The *National Environmental Satellite, Data, and Information Service (NESDIS)* operates remote sensing satellites which make day and night observations of weather (clouds, temperature, and winds), ocean state (sea surface temperature), geological and agricultural features over the entire Earth. These data and other environmental data are transmitted to ground stations by satellite transmitters using radio frequencies. The data are gathered at the ground and re-transmitted via commercial satellites to a central processing center. The meteorological satellite system also provides for the collection and radio relay of data from fixed and mobile environmental observing platforms (ships, aircraft, ocean buoys, and remote surface sites).

The NOAA Data Buoy Center develops and operates environmental data buoys for weather monitoring, prediction, and various other scientific programs. Data is sent from the buoys and platforms via UHF signals through the GOES and NOAA satellites to land via downlinks near 1700 MHz. There are over 10,000 data collection platforms currently using the data collection radio relay service of the meteorological satellites. These observation platforms are operated by NOAA, other government agencies, and private industry to obtain data on stream flow and water quality, snow depth, and rainfall in remote mountain areas, oceanic measurements from buoys and remote islands, and wind and temperature information from commercial aircraft.

The polar orbiting weather satellites of the NOAA include Search And Rescue Satellite (SARSAT) System packages that detect distress signals sent by radio to the satellite and provides location information with a 2–5 kilometers resolution. There are presently three ground stations in the United States, one in Canada, one in France, and three in Russia that receive the transmitted data from the SARSAT. In addition, NESDIS operates the National Geophysical Data Center collecting data from 33 worldwide ionospheric sounders (low frequency through HF bands).

The *National Marine Fisheries Service (NMFS)* conducts exploratory fishing as well as fish and marine mammal population research programs utilizing HF and VHF radio equipment to provide tracking and migration information as well as communications between major fishery centers and research ships of the NOAA Corps Fleet. NMFS also enforces Federal fish and

wildlife conservation laws relating to the living marine resources within the United States 320-kilometer jurisdictional fishery conservation zone. VHF radio communications is an essential factor during these operations.

The *National Ocean Service (NOS)* radiocommunication facilities are used to support some 23 ships and 18 mobile field parties engaged in oceanographic, marine and geodetic surveys, and NMFS activities. These programs, activities, and related radiocommunications are conducted by the NOS to measure the Earth's surface, its coastlines and its undersea structure, and to provide information on the marine environment and its resources for use by scientists and the public. NOS also publishes numerous nautical charts for use by mariners for improved safety of life at sea. Communications are principally for safety, control of navigation, operations, medical emergencies, and administrative messages between ships conducting joint operations and between ships and shore stations using NOS, NMFS, Navy, and USCG commercial communication circuits. The Charting and Geodetic Services, an office of NOS, also utilize radio frequencies in the visible and infrared spectrums for very precise distance measurements. The VHF frequency band is used for voice communications between field parties, including the Office of Oceanography and Marine Assessment who uses radiocommunications to coordinate clean-up teams and track movement of contamination when responding to oil and hazardous chemical spills.

The *National Institute of Standards and Technology (NIST)*, through its Boulder, Colorado facilities, is responsible for primary time and frequency standards, and dissemination of these data through radio stations WWV and WWVB in Colorado and WWVH in Hawaii to over 100,000 listeners throughout the world. Data is also disseminated through dial-up telephone service (2 million users per year) as well as GOES and GPS satellites. High precision time signals are sent and received from domestic communication satellites at 14 and 12 GHz. NIST also conducts extensive experimentation using the radio spectrum in such areas as testing instruments for earthquake calibration measurements. Specific areas of radio usage include communication, data telemetry, and satellite transfer of information.

## **The Department of Energy**

### **Mission**

The DOE was established under Public Law 95-91 of 1977, by consolidating energy functions within the Federal Government. Its mission is to provide information and the scientific and educational foundation for the technology, policy, and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense. In support of this mission, DOE has identified five business lines that most effectively use and integrate its unique scientific and technological assets, engineering expertise, and facilities for the benefit of the Nation. These five business lines are: economic productivity, energy resources, science and technology, national security, and environmental quality.

## **An Overview of Current Spectrum Use**

Although each of DOE's five business lines uses spectrum resources, the energy resources and national security business lines use the most. Land mobile systems primarily support the other business lines — economic productivity, science and technology, and environmental quality. Both conventional and trunked land mobile systems are deployed. The spectrum use for each DOE business line is discussed in the following paragraphs.

### **National Security**

This business line supports and maintains a safe, secure, reliable, and smaller nuclear weapons stockpile without nuclear testing; safely dismantles and disposes of excess weapons; and provides the technical leadership for national and global non-proliferation to reduce the continuing and new nuclear dangers in the world. Initiatives include the National Ignition Facility, the Advanced Strategic Computing Program, the Non-proliferation and Verification Research and Development Programs, and the Los Alamos Neutron Science Center. DOE places primary importance on safely dismantling nuclear warheads, ensuring the safety of operations, protecting the environment, managing our nuclear weapons complex, and cost-effectively consolidating our non-nuclear manufacturing activities.

### **Science and Technology**

The objective of this business line is to use the unique resources of the Department's \$30 billion laboratories and their 40,000 scientists and engineers to maintain world-class leadership in basic and applied research in support of the Department's other business lines. Fundamental research maintains the Nation's world leadership in science, mathematics, and engineering. Research in energy and environmental sciences is paving the way for a more sustainable energy future. Opening our scientific and technological resources to industry will improve the Nation's productivity and economic growth.

### **Energy Resources**

This business line develops and deploys energy efficient and renewable energy technologies; advances the efficient and environmentally responsible production, transportation, and use of conventional energy sources; promotes the development of sustainable energy technologies with high export potential; promotes an equitable system of energy supply and end use; and reduces U.S. vulnerability to energy supply disruptions. In carrying out the Energy Policy Act of 1992, DOE's programs are expected to save homeowners \$17 billion and businesses \$12.5 billion per year by 2005 and to create almost 310,000 jobs. Moreover, DOE's transportation technology programs are expected to reduce oil imports by 2.3 million barrels a day by 2000, creating a savings for drivers and improve the balance of trade by \$47 million per year.

**Power Marketing Administrations.** The five Power Marketing Administrations market electricity generated primarily by 125 Federal hydropower projects throughout 33 states from Alaska to the East Coast. The electrical energy is carried over more than 56,000 kilometers of

high voltage transmission lines to serve Federal, public bodies, and cooperatives. Revenues from selling electricity are used to repay annual operation and maintenance costs, repay the capital investments with interest, and assist capital repayment on irrigation features of certain projects.

The distribution of electrical energy from the generating plants to the load centers and the interconnection of bulk electrical power supply systems for reliability and adequacy have resulted in extremely complex national networks aimed at the optimum economic configuration. The systems have, as integral and critical parts, extensive administrative and operational telecommunications for voice and data transmissions to prevent brownouts and blackouts. These facilities must be of the highest reliability, economically and technically feasible, and must be instantly available for the successful operation of the Nation's electrical power systems. Some of these telecommunications facilities are shared with other Federal departments and agencies and some must interface with utilities of the private sector.

**Petroleum Reserves.** The Strategic Petroleum Reserve, created in 1975, gives the United States adequate strategic and economic protection against severe oil supply disruptions. The Strategic Petroleum Reserve program provides for the storage of 680 million barrels of crude oil in underground salt caverns at five sites in the Gulf Coast area and connected to major private sector distribution systems. The Naval Petroleum and Oil Shale Reserves were established by a series of Executive Orders between 1912 and 1924 to provide emergency liquid fuel supplies for national defense. Oil production at the three sites since they have been opened has been approximately 750 million barrels. Natural gas production at these sites has been about one billion cubic feet. Natural liquid gas production at these sites has been approximately two billion gallons.

### **Environmental Quality**

This business line protects public health and the environment by understanding and reducing the environmental, safety, and health risks and threats from DOE facilities and develops the technologies and institutions required for solving domestic and global problems.

### **Economic Productivity**

This business line promotes sustained U.S. economic growth by stimulating the creation of high-wage jobs and diversity in research and development collaborations with industry and universities. This growth further helps drive products into the domestic and international marketplace, helps industry become more competitive by cost-effectively shifting from waste management to resource efficiency and pollution prevention, and stimulates global DOE technology usage and exports. The DOE's vast technological and research resources can thus enhance industry's productivity and maximize the return on taxpayer investment in those resources by providing economic benefits to the Nation that go beyond the original mission of the laboratories.

## **Summary of DOE Spectrum Use**

The DOE, at an investment of almost \$1 billion, has about 9,600 frequency authorizations supporting mission, programmatic, and operational requirements. These systems include HF, land mobile, aeronautical and maritime mobile, microwave, satellites, radar, navigation, telemetry, and surveillance systems. In addition, DOE uses more than 1,000 power line carrier systems to manage and control the distribution of electrical energy.

The DOE's current radio systems operate at specific frequencies between 200 kHz and 35 GHz. About 60 percent of the Department's spectrum resources are used for land mobile systems followed by 25 percent for microwave systems and 10 percent for HF systems for emergency purposes. The remaining 5 percent is for radar, telemetry, and satellite services. DOE's power line carrier systems operate at selected frequencies between 8 kHz and 496 kHz.

## **Federal Emergency Management Agency**

The Federal Emergency Management Agency (FEMA) was established in the Executive Branch as an independent agency in 1979 to provide a single point of accountability for all Federal emergency preparedness, mitigation and response activities. FEMA develops, coordinates, and executes plans and programs providing for continuity and effective operation of the Federal Government during national emergencies; provides facilities and resources for management and coordination of emergency information; and provides centralized coordination and control and day-to-day management of the National Emergency Management System (NEMS). NEMS consists of the total telecommunications and data processing resources necessary for FEMA to accomplish its assigned peacetime and wartime functional responsibilities and meet all established operational requirements under the Integrated Emergency Management System umbrella. Current capabilities of NEMS include the National Warning System, the FEMA National Teletype System, the FEMA National Voice System, the FEMA National Radio System, and the capability to activate the Emergency Broadcast System at the direction of the President.

## **General Services Administration**

The General Services Administration (GSA) has the responsibility to protect Federal property under its charge and control and to ensure a safe, secure environment for conducting Government activities. Protection includes: 21,000 space assignments, housing 887,000 Federal employees in 6,800 government-owned and leased buildings. The primary use of GSA's radio systems are for law enforcement and buildings management operation. The radio frequency system includes portables and mobiles, base stations, paging, intrusion detection, access control and closed circuit television. The total GSA investment in radio frequency equipment is in excess of \$40 million.

## **Department of Health and Human Services**

The principal user of radio spectrum in the Department of Health and Human Services (DHHS) is the Public Health Service (PHS). The Indian Health Service (IHS), a PHS operating agency, is responsible for about 80 percent of the approximately 1,450 frequency assignments utilized by DHHS. The IHS supports the delivery of health care to Native Americans by using radio to communicate with emergency medical vehicles, remote health stations and mobile health units. Radio is also used extensively for paging systems to communicate with key medical personnel. In Alaska, the IHS uses both HF radio and common carrier satellite communications to provide "Doctor Call" assistance to village health aides at isolated locations. IHS radio base stations at 50 hospitals also communicate with 60 tribal government ambulance services for dispatch and control to respond to serious medical emergencies at remote Indian locations. Radio frequencies are used in remote areas in support of fresh water systems. The IHS participates in state emergency radio networks to coordinate the rendition or delivery of medical care using medical radio communications frequencies.

The Center for Devices and Radiological Health, Food and Drug Administration, the Lister Hill National Center for Biomedical Communications, and National Institute of Health (NIH) use frequencies for experimental purposes. The NIH also uses radio frequencies to support their campus operation with paging, maintenance, administration, law enforcement, fire and public safety. The PHS also uses radio frequencies for bio-medical telemetry to conduct medical research and for monitoring the treatment of patients. Radio frequencies are used by the Office of the Secretary and DHHS operation divisions for communications to control various security and administrative operations.

The DHHS Office of Emergency Preparedness uses radio frequencies to support their Disaster Medical Assistance Teams. These teams are deployed in times of natural and man-made disasters. Teams have served in areas hit by hurricanes, earthquakes, and bombs. Teams were deployed for Operation Desert Storm. Radio communication is critical for the deployment, operation, and logistical support of these teams.

## **Department of the Interior**

The Department of the Interior is custodian of 750 million acres of land and is charged with the conservation and development of the Nation's natural resources. It has a wide variety of radio operations throughout the spectrum distributed among nine operating bureaus with diverse missions serving the public and protecting the country's natural resources. The major activities using radio are for point-to-point fixed base station and mobile radios. These are used by the Bureau of Land Management, which manages one-fifth of the Nation's gross area — some 341 million acres, for land management and protection and development of natural resources; the National Park Service, which manages some 335 parks and monuments totaling about 80 million acres, hosting more than 350 million visitors annually; the Bureau of Indian Affairs, responsible for the welfare of some 500,000 Indians and Alaskan natives on 50 million acres; the U.S. Fish

and Wildlife Service, which manages over 400 National Wildlife Refuge areas, covering 90 million acres; the Geological Survey for earthquake studies, geologic and topographic mapping operations, and for the collection of hydrologic data by both terrestrial and satellite radio communication facilities; and the monitoring of off-shore oil fields by the Minerals Management Service. In all these areas of activity the primary use of radio is for the management, production and development of the Nation's natural resources, forest and range fire suppression, and protection of property and public safety.

Water management, control, and distribution by the Bureau of Reclamation is a major factor in the growth and economy of the West. Telemetry, land mobile, and point-to-point radios are essential to the operation of the Bureau's 320 water storage dams and reservoirs, 344 diversion dams, 82,000 kilometers of carriage and distribution channels and canals, and 145 very large pumping stations. These provide irrigation for more than 12 million acres of agricultural land, providing 30 million acre feet of water for the use and consumption of over 20 million people, and water for the operation of 51 hydroelectric generating plants.

### **Department of Justice**

The Department of Justice plays a key role in protection against criminals and subversion, in control of the country's borders, in ensuring healthy competition of business in our free enterprise system, in safeguarding the consumer, and in enforcing drug, immigration and naturalization laws. The Department also plays a significant role in protecting citizens through its efforts for effective law enforcement, crime prevention, crime detection, and the prosecution and rehabilitation of offenders.

Organized units of the Department of Justice which use or coordinate use of the radio frequency spectrum are:

The *Federal Bureau of Investigation (FBI)* investigates all violations of Federal laws with the exception of those which have been assigned to some other Federal agency. The FBI has jurisdiction over some 185 investigative matters including espionage, sabotage and other subversive activities; kidnaping, extortion; bank robbery; and the assault or killing of the President or other Federal Officers. The FBI uses a majority of the frequency assignments listed for the Department of Justice.

The *Immigration and Naturalization Service (INS)* administers the immigration and naturalization laws relating to the admission, exclusion, deportation, and naturalization of aliens. Through numerous enforcement activities, such as the Border Patrol, the INS protects the security of the United States' boundaries and the welfare of those legally residing in the United States.

The *Drug Enforcement Administration (DEA)* controls narcotic and dangerous drug abuse through enforcement and demand reduction programs. The primary responsibility of DEA is to

enforce U.S. laws and statutes relating to the illegal trafficking of narcotic drugs, marijuana, depressants, stimulants, and the hallucinogenic drugs. DEA conducts domestic and international investigations of major drug traffickers concentrating efforts towards the immobilization of clandestine manufacturers, international traffickers, and the origins of diversion from legitimate channels. In addition, DEA works cooperatively with other Federal, State and local agencies as well as independently to institute national drug abuse demand reduction programs.

The *Federal Bureau of Prisons (BOP)* supervises the operation of Federal correctional institutions and community treatment facilities; the commitment and management of Federal inmates; and the confinement and support of Federal prisoners. Correctional institutions have self-contained, dedicated communications and electronics systems to provide necessary safety and security measures.

The *U.S. Marshals Service (USMS)* provides personal security of Federal witnesses and their families, courtroom security, protection of Federal property, and special assignments at the direction of the Attorney General. The USMS maintains the custody of Federal prisoners from time of their arrest to their commitment or release and also transports Federal prisoners pursuant to lawful writs and direction from the BOP. The USMS maintains custody and control of evidence, as well as money and property, seized pursuant to Federal statutes.

Radio systems are used by the Department of Justice to serve the national security; to safeguard life and property; and to support crime prevention and law enforcement. The radio systems used to effect these responsibilities consist primarily of land mobile radio facilities. Tactical communications among investigative, protective and enforcement personnel in the field as well as liaison communications with cooperating law enforcement organizations are essential operational tools. Mission success as well as safety of life and property is frequently dependent upon the availability of radio communications systems.

### **National Aeronautics and Space Administration**

The National Aeronautics and Space Administration (NASA) conducts research and development in the areas of space science, astronautics, and aeronautics. With the implementation of an operational Space Transportation System — the Space Shuttle fleet — and the placing into orbit of several Tracking and Data Relay Satellites (TDRSS), NASA is forging ahead toward new horizons and the challenges that await. NASA is responsible for near and deep space exploration — using both manned and unmanned spaceflight. Also, NASA has an ongoing terrestrial and space applications program. All of NASA's research and development, and application programs are dependent on access to the radio spectrum resource.

The total NASA investment in low Earth orbit and deep space tracking facilities and other support functions — using various radio telecommunications devices and systems — is well over \$2.5 billion.

From an operational point of view, NASA is currently providing launch and tracking support for approximately 45 spaceflight vehicles. This includes NASA, other Federal agency(ies), commercial, and foreign government spacecraft or satellites. Low Earth orbiting satellites are supported by the TDRSS, providing 85 percent, instead of the previous 15 percent, visibility of all on-orbit space vehicles operating below 1,200 kilometers.

### **National Science Foundation**

The National Science Foundation (NSF) is responsible for promoting scientific knowledge, and to this end it initiates and supports fundamental and applied research in all scientific disciplines. The NSF sponsors major national and international science programs both of a special and a continuing nature throughout the Nation's academic and scientific communities, and it funds large research facilities at national centers which would be beyond the financial scope of individual institutions. Among the national centers are: the National Optical Astronomy Observatories (NOAO), the National Center for Atmospheric Research (NCAR), the National Atmosphere and Ionosphere Center (NAIC), and the National Radio Astronomy Observatory (NRAO).

NOAO operates the Cerro Tololo Inter-American Observatory in Chile, the Kitt Peak National Observatory near Tucson, Arizona, and the National Solar Observatory at Sacramento Peak, New Mexico, and is nearing completion of the two 8-meter class, new technology GEMINI telescopes, that are located in Hawaii and in Chile. NCAR operates ground and airborne radar facilities for weather research purposes. NAIC operates the Arecibo radio telescope and planetary radar, the world's largest and most sensitive single dish transit radio telescope, as well as an ionospheric heating facility.

NRAO operates the Robert C. Byrd Green Bank Telescope, Green Bank, West Virginia, that has just been completed and that is the largest moveable telescope in the world; the Very Large Array (VLA) near Socorro, New Mexico; and the Very Long Baseline Array (VLBA), which consists of 10 individual dishes distributed across the CONUS, Hawaii, and the U.S. Virgin Islands, is used to simulate a continent-wide radio telescope in terms of angular resolution. NRAO also has begun design and development of the Atacama Large Millimeter Array (ALMA), in collaboration with U.S. universities and international partners. The ALMA is going to be the world's most advanced millimeter telescope and is to be located in the High Plateau of the Andes in Chile.

The prime objective of radio spectrum management at the NSF is to ensure adequate access to the radio frequency spectrum for the scientific community's numerous research purposes. The spectrum plays a vital support role for experiments, with telemetry from remote sensing platforms such as balloons, meteorological sensors, ocean buoys, or transmitters attached to animals. Telecommunication links must be provided to coordinate experiments and to maintain contact with remote sites. While the magnitude of these activities is not comparable to

active spectrum usage at other Federal agencies, the failure to adequately plan for allocations or obtain frequency assignments can adversely affect scientific objectives.

Furthermore, the NSF is responsible for protecting frequency bands for passive spectrum users—particularly radio astronomers—a responsibility which most other agencies do not share. Since frequency assignments generally are not made for passive use of the radio spectrum, they do not appear in statistical usage tables. However, radio astronomy is a major user of facilities and research funds by the NSF. Including the Robert C. Byrd Green Bank Telescope and the ALMA, U.S. investment in radio astronomy facilities will approach \$1 billion. The NSF is deeply concerned with maintaining a suitable electromagnetic environment so that radio astronomy research may continue unabated.

### **Department of Transportation**

The Department of Transportation was established to develop national transportation programs conducive to the provision of safe, fast, efficient, and convenient transportation on land, sea, and in the air. The achievement of these objectives, particularly in the air and marine environments, is totally dependent upon the continuing availability of rapid and reliable radio communications and sufficient spectrum. Radio spectrum utilization by the several operating administrations of the Department serves numerous and diverse operational and technical functions. Nevertheless, these operations have a common purpose — the enhancement of the safety factor, or one or more of the other important aspects of transportation for the general public.

The mission of the *Federal Aviation Administration (FAA)* is to provide the safest, most efficient, and responsive aviation system in the world for the benefit of the public. The FAA's success in the development and operation of the National Airspace System (NAS) plays a tremendous role in the Nation's Gross Domestic Product — the total economic activity generated by aviation is over \$700 billion per year and over 8 million jobs.

To support the NAS, the FAA uses radio frequencies for communications, radionavigation, and surveillance (radar) systems. Over 50,000 radio frequencies are assigned for use at approximately 3,000 air/ground communications sites, 1,140 instrument landing facilities, over 1,000 omnidirectional ranges, and nearly 500 radar stations.

These facilities exist to serve the flying public and to provide for their safe and efficient transportation. This includes nearly 200,000 registered private aircraft flying over 24 million hours per year; approximately 528 million passengers carried in air carrier and commuter aircraft; and nearly 23 million military flights to support our Nation's defense.

FAA has an investment of approximately \$10 billion of electronic equipment to support communications, navigation, and surveillance systems operating throughout the radio spectrum.

In order to support the explosion in air travel in the past few years, expenditures for current and new facilities and equipment in 1996 alone will total approximately \$2 billion.

In addition, FAA has annual research and development programs in excess of \$500 million which are pursuing improvements in communications, navigation, and surveillance systems — nearly all of which use the radio frequency spectrum. Such programs include research and development efforts in air traffic control, navigation, precision approach and landing systems, en route and airport radars, airport surface movement, aircraft separation assurance, communications navigation and satellite initiatives, weather surveillance enhancements, and many others.

*U.S. Coast Guard* missions include: maritime and recreational boating safety, search and rescue services, maritime law enforcement, marine environmental protection, port safety and security, aids to navigation, marine science activities, enforcement of offshore fishery laws, suppression of smuggling and illicit drug trafficking, ice operations, both domestic and in the polar regions, maintaining a state of military readiness, and operating vessel traffic systems. The missions are carried out in behalf of the general maritime community and the use of the radio spectrum is essential in carrying out these tasks.

Radio frequencies are assigned for a variety of USCG operations including: a network of about 563 ship/shore radio stations for safety and distress communications, including maritime safety broadcasts, with the general maritime community and for command and control of its own fleet of about 255 vessels and 2,100 smaller, radio-equipped rescue craft; a network of 26 aeronautical radio stations for operational control of its fleet of about 200 aircraft; and a national network of differential GPS and long-range navigation (LORAN)-C radio navigation stations used by a variety of civil users. These operations are described in the world wide web site at: <http://www.navcen.uscg.mil>. The total USCG investment in C-E installations is about \$1 billion. Additionally, the investment in special equipment for use with USCG operated radio navigation systems is about \$600 million.

Other important uses of radio by the Department of Transportation include: a communication network of the St. Lawrence Seaway Development Corporation used to expedite and control the safe passage of U.S. and foreign vessels through the St. Lawrence Seaway; telemetering speed measurements, remote control and other technical operations carried out by the Federal Highway Administration in connection with the development of high speed rail equipment; vehicle location techniques in programs sponsored by the Urban Mass Transportation Administration; and communications supporting the rapidly developing Intelligent Transportation System.

## **U.S. Department of the Treasury**

The U.S. Department of the Treasury enforces Federal laws pertaining to protection of the President and other designees, as well as those dealing with counterfeiting, fraud (including credit and debit card fraud), forgery, smuggling, moonshining, explosives and gun law violations, and tax evasion. Treasury agents and officers protect our borders from drug traffickers and smuggling and continually strive to protect our citizens and property from the threat of bombs, arson, and gun violence.

The majority (approximately 60 percent) of the U.S. Department of Treasury's responsibilities relates to promoting prosperous and stable American and world economies and managing the Government's finances. The law enforcement arm of the department protects our financial systems and our Nation's leaders and seeks a safe and drug-free America. Use of wireless services and devices is critical to the department's accomplishing its core missions effectively and efficiently

The Secretary of the Treasury, as the chief financial officer of the United States, advises the President on financial and tax policy matters. He has a staff of 1,600 in the office of the Secretary and oversees 120,000 employees in Washington, D.C., and 1,800 field offices throughout the United States and abroad. The Secretary of the Treasury accomplishes 98 percent of his responsibilities through Treasury's subordinate bureaus:

The *Bureau of Alcohol, Tobacco and Firearms (BATF)* is a law enforcement organization within the U.S. Department of the Treasury with responsibilities dedicated to reducing violent crimes, collecting revenue and protecting the public. The BATF enforces the Federal laws and regulations relating to alcohol, tobacco, firearms, explosives, and arson.

The *Bureau of Engraving and Printing (BEP)* produces U.S. currency, postage stamps, and other government securities that satisfy the current and future needs of the American public and the government agencies that it serves. The Bureau designs, prints, and furnishes a large variety of security products including Federal Reserve Notes, most U.S. postage stamps, Treasury securities, identification cards, naturalization certificates, and other special security documents at its facilities in Washington, D.C., and Fort Worth, Texas. The Bureau also advises other Federal agencies on document security matters as well as processing claims for the redemption of mutilated currency. The BEP police is responsible for protecting and safeguarding its products from production through delivery.

The *U.S. Customs Service (USCS)* ensures that all goods and persons entering and exiting the United States do so in accordance with U.S. laws and regulations. The USCS uses a wide variety of spectrum-dependent equipment to accomplish its missions. The USCS operates the Customs Over-the-Horizon Enforcement Network which is designed to provide communications connectivity for air and land mobile users throughout the USP. The USCS also employs an extensive network of land mobile radio equipment to communicate among USCS personnel and between USCS personnel and other Federal, state, and local law enforcement agencies.

Surveillance equipment is used to covertly monitor/intercept conversations and radar is used to track aircraft and ships trying to enter or leave the country illegally.

The *Federal Law Enforcement Training Center (FLETC)* provides quality, cost-effective training for law enforcement professionals. FLETC is a partnership of Federal law enforcement organizations and faces the increasingly complex challenge of preparing Federal law enforcement officers for a demanding and hazardous environment. FLETC has been in operation for over 30 years and, currently, about 71 Federal agencies send their agents and officers to train at the main facility in Glynco, Georgia as well as facilities in Artesia, New Mexico, and Charleston, South Carolina.

Federal agents and officers across the country put their safety at risk each day performing their varied missions. It is essential that the FLETC properly prepare its students with the top-of-the-line resources to support their efforts and ensure their safety upon graduation. FLETC instructors provide training on the installation, operation, and maintenance of the wide array of devices employed by law enforcement personnel in the field. Access to the electromagnetic spectrum is fundamental to providing the training required to perform their missions once the students begin their law enforcement assignments.

The *U.S. Internal Revenue Service (IRS) Criminal Investigative Division (IRS-CID)* enforces the criminal statutes relative to tax administration and related financial crimes, in order to encourage and achieve voluntary compliance with the Internal Revenue laws. The IRS-CID plays an active role in collecting tax on all money earned, both legal and illegal. They are responsible for the investigation and prosecution of the serious tax, currency, and money-laundering offenders. Additionally, the agents pursue the assets of those offenders for criminal and tax asset forfeiture purposes.

Congress has expanded IRS-CID's statutory authority to encompass not only criminal violations of the Internal Revenue Code but also money laundering and currency reporting violations. IRS-CID agents fill a unique niche in the law enforcement community, that of Financial Investigators. These special agents' combination of accounting and law enforcement skills is essential to conducting investigations leading to the conviction of high profile criminals who commit increasingly sophisticated financial crimes.

The *U.S. Mint* is responsible for manufacturing and circulating, numismatic and bullion coins at the lowest possible cost and delivering those products in a timely and secure manner. The Mint expands U.S. markets through exceptional customer service, product development, and innovative marketing and sells numismatic and bullion products at a reasonable price and profit. The U.S. Mint Police are responsible for the protection of the Nation's stockpiles of gold bullion and other precious assets. Mint Police use wireless services to provide security over those assets entrusted to them and the facilities in which they are developed, produced and stored.

The *U.S. Secret Service (USSS)* is charged with protecting the President, Vice President, President- and Vice President-elect, Presidential candidates, former Presidents, and their immediate families. The Secret Service also protects visiting heads of foreign states and, at the direction of the President, official representatives of the United States performing special missions abroad. They also are charged with protecting the White House complex, the Treasury Building and Treasury Annex, buildings which house presidential offices, the Vice President's residence, and various foreign diplomatic missions in the Washington, D.C. metropolitan area or in other areas as designated by the President.

The Secret Service also detects and arrests persons committing offenses against the laws of the United States relating to coins, currency, stamps, Government bonds, checks, credit and debit card fraud, computer fraud, false identification crimes, and other obligations or securities of the United States. They also investigate crimes related to certain criminal violations of the Federal Deposit Insurance Act, the Federal Land Bank Act, and the Government Losses in Shipment Act.

There has been more emphasis on domestic anti- and counter-terrorism, cybercrimes and other technology threats that the Secret Service is directly involved in combating. The Secret Service was directed to design, plan and implement security for all Major Events, as defined by the National Security Council, through Presidential Decision Directive (PDD) 62. The Secret Service established the Major Event Division which must be capable of supporting two simultaneous Major Events. Another Presidential Decision Directive, PDD 63, directs the Secret Service to work with other Federal agencies and the private sector through the National Infrastructure Protection Center to increase information sharing among organizations and to identify and put in place measures to ensure the security of the Nation's critical infrastructure.

The Secret Service's mission has become significantly more complex due to the technologically sophisticated and ever-changing world environment. Secret Service special agents, uniformed officers and technical security personnel make extensive use of wireless sensors, body microphones, surveillance transceivers, detection devices, land mobile radios, and the advanced law enforcement response technology (ALERT) mobile response vehicle program to accomplish its investigative and protective missions.

The *Treasury Inspector General for Tax Administration (TIGTA)* was created on January 18, 1999 as a result of the Internal Revenue Service Reform and Restructuring Act of 1998. Congress believed there should be one independent organization solely devoted to oversight of the IRS and directed its creation through the law. The law transferred the former IRS Inspection Service to the newly formed TIGTA. TIGTA provides leadership and coordination and recommends policy for IRS activities designed to promote economy, efficiency, and effectiveness in the administration of the internal revenue laws and prevent and detect fraud and abuse in the programs and operations of the IRS and related entities. TIGTA auditors and investigators make extensive use of wireless devices to assure the integrity of the Nation's tax and revenue programs.

## **Tennessee Valley Authority**

The Tennessee Valley Authority is a multipurpose regional development agency involved in activities such as flood control, agriculture and environmental research, forestry, recreation, diversified industry and the largest electrical utility in the United States, with some 31,109 megawatts of power generating capacity in service and another 8,000 megawatts of capacity under construction to meet power demands in the 1980's, 27,200 kilometers of transmission line are used to serve 25 million people throughout the 205,000 square kilometer area. The Tennessee Valley Authority uses extensive microwave, land mobile, and point-to-point radio systems to aid in carrying out its responsibilities for the management and operation of a \$2 billion per year multipurpose activity which is essential to the socioeconomic well being of the South.

## **Broadcasting Board of Governors**

The Broadcasting Board of Governors (BBG) promotes understanding abroad for the United States, its policies, its people, and its culture. As the official voice of the U.S. Government, BBG plays a significant role in the achievement of long-range foreign policy objectives as it informs and explains — encouraging the maximum flow of ideas and information between the people of the United States and the people of other countries. Radio is the only means of communicating directly with peoples of other nations. BBG's global radio network, the Voice of America (VOA), consists of 107 shortwave and medium wave transmitters located in the United States and 10 foreign countries with a total transmitting power of over 22 million watts. A total of 960 hours of direct broadcast programming in 42 languages is transmitted overseas each week reaching an audience estimated to exceed 100 million listeners. All broadcasts originate from studios in Washington, D.C., and are transmitted simultaneously by microwave or leased satellite circuits to domestic relay stations operating a total of 75 transmitters, which receive all broadcast by leased satellite circuits or by shortwave from the relay stations. These broadcasts are then simultaneously rebroadcast on shortwave and medium wave frequencies to designated target areas. In addition to the direct broadcast, VOA operates a radio teletype network five days a week sending five regional transmissions of policy statements and interpretive material to over 100 BBG posts abroad.

## **U.S. Postal Service**

The U.S. Postal Service's (USPS) beginnings can be traced back to the birth of the Nation. The Continental Congress named Benjamin Franklin as the first Postmaster General in 1775. The postal system that the Congress created was to help bind the new Nation together, support the growth of commerce and ensure a free flow of ideas and information. Public Law 91-375, signed by President Richard M. Nixon on August 12, 1970, transformed the Post Office Department into the USPS.

The new Postal Service officially began operations on July 1, 1971, at which time the Postmaster General left the President's Cabinet. The USPS now operates under a Board of

Governors that approves postal rates and directs the exercise of the powers of the Postal Service. Members of the Board of Governors are appointed by the President.

The USPS operates 38,019 post offices around the country; delivers to 130 million addresses every day; handles 41 percent of the world's mail volume (630 million pieces every day); has 192,904 motor vehicles; is the Nation's largest civilian employer with more than 765,000 career employees; and has 2,990 frequency assignments.

The USPS utilizes radio communications for various purposes in order to deliver the mail to the Nation. The frequency assignments are used for mail processing activities, maintenance of property and mail processing equipment, transportation of mail, law enforcement, and maintaining the vehicle fleet.

The *Postal Inspection Service* is the law enforcement and audit arm of the USPS. Having investigated crimes involving the mails for more than 200 years, the U.S. Postal Inspection Service is one of the oldest investigative agencies of the U.S. Government. Postal Inspectors have statutory authority to serve federal warrants and subpoenas, and to make arrests for postal-related offenses. Presently, there are more than 2,000 Postal Inspectors stationed throughout the United States.

The U.S. Postal Inspection Service has three basic responsibilities:

- Investigation of violations of over 200 Federal statutes relating to Postal Service crimes.
- Protection of mail, postal funds and property, and postal employees;
- Conducting internal audits of many Postal Service financial and non-financial operations.

The U.S. Postal Inspection Service investigates, and seeks to prevent criminal assaults against the Postal Service or its employees and misuse of the Nation's postal system. Its responsibilities include investigation of offenses such as: armed robberies; murder of, or assault upon, postal employees; burglaries; theft of mail; mailings of obscene matter, child pornography, bombs, and drugs; and use of the mails to swindle the public.

Criminal investigations cover:

- Robbery--Robbery of mail, money or other property of the Postal Service from any person having custody or control thereof.
- Burglary--The forcible breaking into and entering (or attempting to do so) of any postal facility with intent to commit larceny.

- Assaults upon and murders of officers and employees of the Postal Service while in the performance of their duties or occurring as a result of such performance.
- Theft of mail or possession of stolen mail taken from postal custody or from authorized home and apartment mail receptacles.
- Bombs and explosives sent through the mails.
- Mail fraud--Use of the mails to obtain money or property by means of false or fraudulent pretenses, representations, or promises.
- Controlled Substances--Using the mails to distribute narcotics and other illegal controlled substances.
- Unlawful sale or possession of controlled substances by postal employees while on duty or on postal property.
- Misappropriation of postal funds by postal employees.
- Fraudulent Workers' Compensation claims filed by postal employees.
- Extortion--That portion of the extortion statute concerning a mailed threat to injure an individual's reputation or to accuse the individual of a crime.
- Obscenity--Use of the mail to distribute obscene material or unsolicited sexually-oriented advertisements.
- Prohibited matter in general--Mailing of poisons, switchblade knives, flammable materials and other hazardous material that can kill or injure an individual or injure the mail or other property.
- Counterfeiting of postmarks, postage stamps, postage meter stamps, postal cards, postal money orders and any dies, plates or engravings thereof. (Jurisdiction shared with U.S. Secret Service.)
- Revenue fraud against the Postal Service. Large postal mailers such as utility companies and retail stores whose operations generate high volumes of stamped mailing envelopes from their customers are potential targets of schemes which fraudulently reuse "washed" postage stamps. These "waste" envelopes are valuable to persons who may even claim to represent a charitable group. Instead of disposing or recycling this material, individuals remove the stamps, chemically "wash" the cancellation marks, and resell the end product at a discount.

- Theft of Postal Money Orders and/or the equipment used in the preparation of such orders or the fraudulent negotiation of such orders.
- Child Pornography--Use of the mails to produce and/or distribute.
- The U.S. Postal Inspection Service utilizes radio communications for investigative, protection, surveillance and other law enforcement activities to maintain the security of the mails and safety of personnel. They also conduct joint investigations with other federal law enforcement agencies.

### **Department of Veterans Affairs**

Executive Order 5398, signed by President Herbert Hoover on July 21, 1930, established the Department of Veterans Affairs (VA). Subsequently, President George H.W. Bush created the Cabinet-level Department of Veterans Affairs. VA brings together, under a single agency, responsibility for the various veterans programs passed by Congress over the years. The VA provides many benefits including health care, education, insurance, and mortgage benefits for our military veterans, widows, parents and orphans. To provide expeditious health care, the VA has over 3,500 frequency assignments for operation of radio paging, two-way radio, wireless microphone, cardiac telemetry, emergency medical service radio nets, citizen band radio, vehicular radar, microwave transmission systems, and a HF emergency contingency radio net.

### **U.S. Department of State**

In the conduct of foreign affairs, the U.S. Department of State (DOS) is dependent upon the continuing availability of rapid and reliable radio communications facilities that utilize the radio frequency spectrum. The Bureau of Diplomatic Security (DS) with its protective and law enforcement missions utilizes tactical radio communications networks at DOS headquarters and at 8 field offices and 14 resident agencies throughout the United States. Special operations at peace talks, the annual United Nations General Assembly in New York City, and other special events require that DS use additional facilities. DS's operations also include the special group that provides continuous security for the Secretary of State. Other networks at DOS headquarters include fire and safety, local protective service, and installation/repair of security devices.

Under Section 305(c) of the Communications Act of 1934, as amended, (47 USC 305(c)), DOS administers radio frequency authorizations for 26 foreign embassies in Washington, DC, for radio communications facilities that allow direct communications with their foreign capitals.

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### III. Future Federal Operational and Spectrum Requirements

#### Federal Use of Commercial Radiocommunications Providers

General. The Federal Government places heavy reliance on the private sector in providing telecommunications service for its own use. This means that all functions normally associated with providing the service shall be performed by the private sector. These functions include design, engineering, system management and operation, maintenance, and logistical support.

Federal requirements for commercial wireless services have been described by the Federal Wireless Policy Committee<sup>2</sup> (FWPC) as part of the on-going review of Federal wireless telecommunications requirements. The FWPC notes that “The Federal Government is not a single enterprise purchaser of wireless communication goods and services. Acquisition is done by many agencies each trying to support their unique missions. However, there are certain common issues and needs, some of them government unique....” The future applications of commercial wireless will be used by not only Federal civil agencies, but also by the military, as shown by the document *Joint Vision 2010*.<sup>3</sup> Mobile-satellite services (MSS), as well as government-owned personal communications service (PCS) and wireless local area networks will be deployable with military warfighting units.

Functionally, Federal wireless systems will be generally characterized as Digital, Ubiquitous, Interoperable, Transparent, and Secure (DUITS). The Federal Wireless Users Forum has addressed this concept for several years. The DUITS concept will be implemented by a mix of wireless services, such as mobile satellite, PCS, wireless private branch exchange, enhanced specialized mobile radio, and cellular telephone.

It is assumed that the majority of wireless services used by Federal agencies will operate in non-government bands. However, it is anticipated that some networks may be shared between Federal and commercial owners, and might operate in non-government, shared, or government bands. Any sharing of such networks would require that the networks accommodate Federal priority access schemes, such as the Government Emergency Telecommunications Service.

It is expected that Federal agencies will look for the economies of scale that accrue to commercial service providers, and perform cost/benefit analyses to determine if commercial services will be more economical, assuming that the commercial service satisfies the operational requirements. There will also be a mix of licensed and unlicensed systems in the Federal

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<sup>2</sup> The Federal Wireless Policy Committee (FWPC) is a multi-agency committee, chaired by NTIA, to develop policy on Federal use of wireless technologies. Information in this section was taken from the FWPC document *Federal Functional Requirements for Commercial Wireless Services, Draft Revision 1.1 of March, 1999*.

<sup>3</sup> *Joint Vision 2020* was recently published and builds on the foundation and maintains the momentum established with *Joint Vision 2010*. It confirms the direction of the ongoing DOD transformation, especially in the arena of communications operations.

inventory. Systems operating under the authorization of Annex K to the NTIA Manual will become more common, but will need to share with FCC Part 15 commercial/private systems.

## **Federal Spectrum Requirements for Government-Owned Systems**

Within the jurisdiction of the U.S. Government, Federal Government use of the radio frequency spectrum for telecommunications is authorized only by the Assistant Secretary for Communications and Information. In view of the limitations of the usable radio frequency spectrum, and to ensure the best possible return from that use, the Government in time of peace requires all Federal Government users to: a) justify any except an emergency request for radio frequencies prior to the assignment and use of these frequencies; b) confirm periodically the justification of continued use; c) employ up-to-date spectrum conserving techniques as a matter of normal procedure; and d) assure the ability to discontinue the functioning of any emitting radio system, including satellites, when required in the interest of communications efficiency and effectiveness.<sup>4</sup>

## **Federal Government Current and Projected Spectrum Requirements**

### **Mobile**

The Federal mobile requirements include military tactical and non-tactical systems, flight test telemetry, land, maritime and aeronautical mobile for law enforcement, search and rescue, drug interdiction, emergency response, and in support of other Federal services.

Land Mobile. The Federal non-military land mobile requirements are generally accommodated in the 162–174 MHz and 406–420 MHz bands. Although these bands are primarily for Federal civil agencies, the Military Departments have allotments, and have begun a program of large-scale trunked operations. These systems are limited to non-tactical operations. The new allotment plans call for 12.5 kHz channel spacing and a mandatory move to narrow-band operation by the year 2005 for the 162–174 MHz band, and 2008 for the 406–420 MHz band. New frequency assignments in the bands generally reflect the narrowband usage along with 25 kHz authorizations.

However, equipment availability has been limited for narrowband trunking operations, and funding for replacement mobile systems is a perennial problem. Frequency assignments are becoming more difficult to obtain in the metropolitan areas as the population increases and Federal services grow to meet the demand. It is expected that future requirements for non-military land mobile operations can be satisfied in the current allocations, assuming that 12.5 kHz equipment becomes readily available. Growth rates for the bands are about five

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<sup>4</sup> National Telecommunications and Information Administration, Manual of Regulations and Procedures for Federal Radio Frequency Management, §2.3.6, at 2-5 (Jan 2000).

percent per year. The increasing Federal use of commercial providers serves to relieve some pressure from these bands.

DOD Mobile Requirements. Other DOD mobile operations, including aeronautical, maritime, and land tactical uses, are currently conducted in the 30–88 MHz, 138–144 MHz, 225–400 MHz, and other bands as shown in Section V. The DOD projects a requirement for an additional 115 MHz of spectrum by the year 2015. Key uses for these mobile systems include combat net radios (voice and data), situational awareness (position location and reporting), and battlefield personal communications systems.

Aeronautical Mobile. Aeronautical mobile communications are used by the Federal agencies, and are generally accommodated in the 2–23 MHz, 118–137 MHz, and 225–400 MHz bands. The NTIA Spectrum Requirements Study determined that 108 kHz of Aeronautical Mobile (R) spectrum was needed, an additional 30 kHz of Aeronautical Mobile (OR) spectrum, and an additional 100 kHz of Mobile allocations to support aeronautical operations were needed.

Flight Test Telemetry. Military and commercial aircraft flight testing use the 1435–1535 MHz, 2200–2290 MHz, and 2310–2390 MHz bands. There is a growing concern for the lack of spectrum to accommodate the future flight test telemetry operations. NASA, DOD and commercial aircraft manufacturers have large investments in aeronautical flight research and flight test programs. Emerging future requirements will place significantly larger demands on the spectrum used for flight test telemetry. High-resolution digital video and the testing of unmanned aerospace vehicles will increase the demand for spectrum beyond that which can be satisfied by current allocations. It is estimated that an additional 300 MHz will be needed for future flight testing.

Paging. Several Federal agencies satisfy paging requirements in the 162–174 MHz and 406–420 MHz land mobile bands. Manufacturers are reluctant, however, to provide systems capable of narrowband (12.5 kHz) operation. Moving the paging operations out of the land mobile band may be desirable.

Maritime mobile. The NTIA Spectrum Requirements Study concluded that between 36–60 kHz of additional HF spectrum was required for maritime mobile operations.

## **Fixed**

All near-term Federal fixed service requirements can be satisfied under current spectrum allocations. The 42.5–43.5 GHz band, recently converted to exclusive Federal allocations, will serve as a primary band for terrestrial services to satisfy requirements that cannot be satisfied in the 37–38.6 GHz band. However, the DOD estimates that an additional 630 MHz of spectrum will be required for DOD fixed (point-to-point) systems by the year 2015. Key uses for these point-to-point systems will include area communications, data links, precision munitions, and common tactical picture.

## **Radio Astronomy**

Most radio astronomy requirements can be satisfied under current spectrum allocations. However, the NTIA Spectrum Requirements Study concluded that 9.6 MHz of additional allocated spectrum was required. Some radio astronomy allocations were revised in the bands above 50 GHz to use bands that were more conducive for observations.

## **Radiolocation**

Allocations for radiolocation are, in general, adequate for the near term. There may be unique applications, such as ultra-wideband systems, that cannot be accommodated by the current allocation structure. These systems will be authorized on a case-by-case basis. An NTIA report released May 2000 concluded the current allocations for radiolocation must remain intact for the next 20 years. However, research is continuing in such areas as detection of low observables, ballistic missile defense, and spaceborne systems that need spectrum in bands not presently allocated for radar. DOD projections of spectrum requirements include: 1) a heavy reliance but minimal growth in the low radar bands for critical DOD uses in space surveillance and warning, air defense, and detection of low observables; 2) a 35 percent growth in surveillance radar requirements for critical DOD uses in air surveillance and tracking, air traffic control, and air-to-air search; and 3) a 68 percent growth in radar requirements to support advanced weapons systems for critical DOD uses in missile defense, space-based radar, and target imaging.

## **Radionavigation**

Global Positioning System. In January 1999, Vice President Gore announced a \$400 million new initiative in the President's balanced budget that will modernize the GPS and will add two new civil signals to future GPS satellites, significantly enhancing the service provided to civil, commercial, and scientific users worldwide.

This initiative is only the most recent step in an ongoing public-private effort to make GPS more responsive to the needs of civilian users worldwide. National and regional GPS-based networks are now being created by governments and industry around the world to help guide everything from planes, trains, ships, and cars to tractors, snowplows, earthmovers, and mining equipment.

The second civil signal will be located at 1227.60 MHz along with the current military signal, and will be available for general use in non-safety-critical applications. The President's Budget supports implementing this new signal on the satellites scheduled for launch beginning in 2003.

Key to the overall modernization initiative was a recent decision on the frequency for a third civil signal that can meet the needs of critical safety-of-life applications such as civil aviation. The third civil signal will be located at 1176.45 MHz, within a portion of the spectrum that is allocated nationally and internationally for aeronautical radionavigation services, and will

be implemented beginning with a satellite scheduled for launch in 2005. This initiative will cost \$400 million over six years. The date that new services will be available to users will depend on the actual launch dates, orbiting sufficient numbers of satellites to provide useful services, and maintaining operational capabilities. Funding difficulties, however, may delay the implementation of additional GPS signals, and present obstacles to obtaining international recognition and protection of the new civil GPS signals.

### **Space Services**

Space Operations. The DOD has been supporting commercial space launches in the 2200–2290 MHz band. With the increase in the number of these commercial space launches, additional frequencies are required. Three of the space operations frequencies set aside for government/non-government in the 2310–2390 MHz band were lost when the FCC auctioned licenses in a portion of the band. Additional spectrum is now required, but no agency is taking the lead to define requirements and identify spectrum for this purpose.

Space Sciences. Generally, spectrum for space research is adequate for the present. There may be a need for additional space research allocations in the future. However, spectrum for space operations is very congested at space launch facilities.

Fixed- and Mobile-Satellite. Federal use of Fixed- and Mobile-Satellite systems is heavy, and is projected to increase. The 42.5–43.5 GHz band has been recently made available for possible expansion of DOD space communications operations (uplink), shared with Federal terrestrial services. A new Federal requirement for 1 GHz of downlink spectrum below 50 GHz was recently identified. Because of the difficulty of sharing Fixed-Satellite Service (FSS) and MSS operations with high-density fixed operations in the 39.5–40.0 GHz band, the United States gained allocations at the 2000 World Radiocommunication Conference (WRC–2000) for FSS in ITU Region 1, and MSS in Region 2 in the 40.5–41.0 GHz band. Federal allocations will be added to the 40.5–41.0 GHz band in the National Table. This now makes the 40–41 GHz band available for Fixed- and Mobile-Satellite operations. DOD projections conclude that: 1) an increase in spectrum requirements from 123 to 215 MHz for highly protected SATCOM systems for critical DOD uses in assured strategic and tactical connectivity, and 2) a many fold increase for wideband SATCOM for critical DOD uses in intelligence dissemination, imagery transmission, and high-speed data and networks.

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## IV. Federal Plan for Accommodating Unsupported Requirements

### Specific Frequency Allocations Needed

<u>Flight Test Telemetry</u>	Possible allocations in the 25.25–27.0 GHz band
<u>Radiolocation</u>	Pending the results of the radar workshop.
<u>Radio Astronomy</u>	See the NTIA Special Publication 94–31 for requested allocations.
<u>Paging</u>	[TBD]

### Strategy for Obtaining Allocations

#### Inputs for International Conferences

The Federal Government develops its inputs for international radio conferences with the participation of Federal agencies in the IRAC's *Radio Conference Subcommittee (RCS)*. The RCS develops the Federal position on revisions to the international *Radio Regulations*, including changes to the international Table of Frequency Allocations. The outputs of the RCS are sent to the IRAC for approval, and then, in consultation with the Department of State, are merged with similar proposals from the FCC, and are then considered official U.S. proposals for international conferences.

#### Inputs for International Study Groups

The international study groups, under the Radiocommunications Sector of the ITU, develop reports and recommendations regarding use of the spectrum. These documents are used to complement the Radio Regulations. NTIA and the Federal agencies contribute technical documents to the national study groups, which along with contributions from the private sector, are considered and sent to the U.S. National Committee for approval. Approved documents are forwarded to the ITU for consideration by the international study groups.

The following issues are being tracked and addressed in the national study groups:

#### **International Mobile Telecommunications (IMT) –2000.**

The International Mobile Telecommunications–2000 (IMT–2000) is an advanced mobile communications concept, and is considered as a third generation wireless system. Key features of the IMT–2000 include: a high degree of commonality of design worldwide, compatibility of services within IMT–2000 and other fixed networks, and high-quality worldwide use and roaming capability for multi-media applications (e.g., video-teleconferencing and high-speed internet access). The ITU established an agenda item for the WRC–2000 which considered the “review of spectrum and regulatory issues for advanced mobile applications in the context of

IMT-2000, noting that there is an urgent need to provide more spectrum for the terrestrial component of such applications and that priority should be given to terrestrial mobile needs, and adjustments to the Table of Frequency Allocations as necessary”.<sup>5</sup>

The 1755–1850 MHz and 2500–2690 MHz bands were some of the bands that WRC-2000 considered for IMT-2000 terrestrial systems. The U.S. position for this conference was negotiated by U.S. industry and government representatives, resulting in a proposal that the United States believed could be the basis for a compromise at the conference, given the conflicting positions of many of the other administrations. The United States suggested three possible bands for IMT-2000, including the 1710–1885 MHz band (favored by the Americas) and the 2500–2690 MHz band (favored by Europe), and the 698–960 MHz band. At the conference, the United States stated that it would study these bands domestically to (1) see if there are alternate bands to reaccommodate the existing systems, (2) determine the costs for such a relocation, (3) who would pay for relocation, and (4) how long the transition would take.

The United States proposed and the WRC-2000 adopted full regulatory flexibility, giving each administration the right to determine which of the three bands it may want to identify for IMT-2000, if it wants to do so at all. Administrations can identify these bands at any time. Also, the United States proposed to keep bands identified for IMT-2000 open to any technology that fits in the mobile service rather than specifying a technology or standard for use in the spectrum. The United States supports the development and implementation of advancing mobile telecommunications systems, such as IMT-2000, as critical components of the communications and information infrastructure of the future.

Subsequent to the WRC-2000, the Assistant Secretary of Commerce for Communications and Information, the Chairman of the FCC, and representatives of the State Department and the DOD met with White House staff to define the process by which spectrum would be identified for IMT-2000 in the United States. It was determined that studies would be performed by NTIA (on the 1755–1850 MHz band) and the FCC (on the 2500–2690 MHz band) to determine if either or both of these bands would be viable candidates for accommodation of future IMT-2000 systems. Because of the length of time required to evaluate costs for Federal systems, NTIA would issue an interim report, followed by a final report that included cost data. The 2700–2900 MHz band is also under consideration for IMT-2000, but will not be addressed until a later WRC. Therefore, NTIA and NOAA are discussing and developing a plan for the protection of the band 2700-2900 MHz. This band is a candidate band for the terrestrial component of IMT-2000. The band is used worldwide for meteorological radars and airport surveillance radars. The plan includes submission of U.S., Inter-American Telecommunications Commission, and World Meteorological Organization contributions into TG8/1 and the conference preparatory meeting regarding sharing studies and current worldwide usage in the band.

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<sup>5</sup> Resolution 721 (WRC-97) Agenda for the 1999 World Radiocommunication Conference, International Telecommunication Union Radio Regulations, Volume 3, (Geneva: ITU 1998) at 319.

**Proposed Changes to National Table of Frequency Allocations**

40.5–41.0 GHz      Add Federal Government *Fixed-satellite (space-to-Earth)*  
Add Federal Government *Mobile-Satellite (space-to-Earth)*  
Add footnote G117

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## V. Plan for Federal Use of the Radio Frequency Spectrum

Federal use of the spectrum is guided by the National Table of Frequency Allocations and, in particular, the spectrum allocated for use by the Federal agencies. As is current practice, there is and will be a limited amount of Federal use of non-government frequency bands, as well as non-government use of Federal frequency bands. The use of shared bands will continue to require coordination between NTIA and the FCC.

The Federal agencies plan to use the spectrum for purposes documented in Part II of this Plan, in accordance with the regulations promulgated by NTIA in the *Manual of Regulations & Procedures for Federal Radio Frequency Management* (NTIA Manual). In general, the Federal Government plans to maintain current spectrum allocations as shown in the NTIA Manual, and modified by the national implementation of revisions resulting from international radio conferences, as shown in this Part. Further, the Federal Government has long-term requirements for additional spectrum allocations as detailed in Part IV. The satisfaction of Federal telecommunications requirements is heavily dependent on commercial providers, and for that reason, there is a strong Federal interest in the various rulemakings of the FCC.

The following section is a planning version of the National Table consisting of current and planned Government allocations and usage above 30 MHz. The planned allocations are in accordance with the Report of the IRAC's Ad Hoc Group 206, implementing IRAC-approved revisions to the National Table as a result of the Final Acts of the 1992 World Administrative Radio Conference and the 1995 and 1997 World Radiocommunication Conferences.

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## UNITED STATES

Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
30– 30.56	FIXED MOBILE	None	<b>Military LMR.</b> Used by the military services for tactical and training operations to include tactical air-ground and air-air communications. <b>Non-Military LMR.</b> Other Federal agencies use this band for natural resource management and for wildlife telemetry.	No changes are planned. Use expected to continue.
30.56– 32	None	None	<b>Military LMR.</b> Used by the military services for tactical and training operations on a non-interference basis. <b>Non-Military LMR.</b> Other Federal agencies use this band for natural resource management and for forest fire fighting.	Use expected to continue.
32– 33	FIXED MOBILE	None	<b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications. <b>Non-Military LMR.</b> Other uses include land management and protection of natural resources.	No changes are planned. Use expected to continue.
33– 34	None	None	<b>Non-Military LMR.</b> Federal agencies are authorized to use this band as part of mutual aid response with local communities (fire, medical, etc.). <b>Military LMR.</b> Used by the military services for tactical and training operations on a non-interference basis.	Use expected to continue.
34– 35	FIXED MOBILE	None	<b>Military LMR.</b> This band is used primarily for tactical and training operations by the U.S. military for net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications. <b>Non-Military LMR.</b> Extensive use of frequencies in this band is for natural resource management, park security/law enforcement at national parks, forests, wildlife refuge areas, etc. Some other uses of this are for law enforcement and facilities security management.	No changes are planned. Use expected to continue.
35– 36	None	None	<b>Military LMR.</b> Used by the military services for tactical and training operations on a non-interference basis and for experimental testing.	Use expected to continue.
36– 37	FIXED MOBILE  US220	None	<b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications. <b>Non-Military LMR.</b> Other uses include national park management, law enforcement, public safety nets, contingencies, and natural resources management.	No changes are planned. Use expected to continue.
37– 37.5	None	None	<b>Non-Military LMR.</b> Some Federal agencies are authorized to use this band for mutual aid response to local communities. <b>Military LMR.</b> Military services have some usage for tactical and training operations on a non-interference basis.	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
37.5– 38	Radio Astronomy  S5.149	None	<b>Radio Astronomy.</b> Continuum observations are performed in this band that study electromagnetic radiation from the planet Jupiter and from the Sun.	Scientific research is expected to continue and increase in this band.
38– 38.25	FIXED MOBILE RADIO ASTRONOMY  S5.149 US81	None	<b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements, other tactical air-ground and air-air communications, and experimental testing. <b>Maritime Mobile.</b> U.S. Coast Guard ship-to-ship and ship-to-shore communications. <b>Radio Astronomy.</b> Continuum observations are performed in this band to study electromagnetic radiation from the Sun and the planet Jupiter.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
38.25– 39	FIXED MOBILE	None	<b>Non-Military LMR.</b> This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for reservation programs, law enforcement, public safety operations, control of power generation/transmission and water facilities, environmental data collection, fish management, and wildlife telemetry programs. <b>Military LMR.</b> However, this band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.	No changes are planned. Use expected to continue.
39– 40	None	None	<b>Non-Military LMR.</b> Some Federal usage is authorized in this band for mutual aid response to local communities (fire, medical, oil spills, etc.).	Use expected to continue.
40.0– 40.66	FIXED MOBILE	None	<b>Non-Military LMR.</b> This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for meteor-burst communications, reservation programs, public safety operations, environmental data collection, fish management, and wildlife telemetry programs. <b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
40.66– 40.7	FIXED MOBILE  S5.150 US210	ISM S5.150	<b>Non-Military LMR.</b> This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for fire suppression, reservation programs, environmental data collection, fish management, and wildlife telemetry programs. <b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications. <b>ISM.</b> The band 40.66-40.70 MHz (center frequency 40.68 MHz) is designated for industrial, scientific and medical (ISM) applications.	No changes are planned. Use expected to continue.
40.7– 42	FIXED MOBILE  US220	None	<b>Non-Military LMR.</b> This band is extensively used for land mobile radio communications in the operation, protection, and maintenance of national parks, forests, wildlife refuge areas, etc. Frequencies in this band are also used for meteor-burst communications, reservation programs, law enforcement, public safety operations, control of power generation/transmission and water facilities, environmental data collection, fish management, and wildlife telemetry programs. <b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.	No changes are planned. Use expected to continue.
42– 43.69	None	None	<b>Non-Military LMR.</b> Primarily used by Federal agencies for mutual aid response with local communities. <b>Military LMR.</b> Used by the military services for tactical and training operations on a non-interference basis.	Use expected to continue.
43.69– 46.6	None	None	<b>Non-Military LMR.</b> Primarily used by Federal agencies for mutual aid response with local communities. <b>Military LMR.</b> Used by the military services for tactical and training operations on a non-interference basis.	Use expected to continue.
46.6– 47	FIXED MOBILE	None	<b>Non-Military LMR.</b> Extensive use of this band is for contingency response to various national disasters. Others uses are for national resources management, law enforcement, tornado tracking, and various meteorological research support. <b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.	No changes are planned. Use expected to continue.
47– 49.6	None	None	<b>Experimental.</b> Used for experimental research to observe and measure currents in harbor areas in support of vessel safety. <b>Military LMR.</b> Used by the military services for tactical and training operations on a non-interference basis.	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
49.6– 50	FIXED MOBILE	None	<b>Non-Military LMR.</b> This band is used extensively to support contingencies or natural/ecological emergencies, some public safety requirements, MARS system, and air-quality measurements. <b>Experimental.</b> Research is performed in various regions of the atmosphere as well as experimental development of portable space orbital debris ground radars. <b>Military LMR.</b> This band is used primarily for tactical and training operations by U.S. military units for combat net radio operations that provide command and control for combat, combat support, and combat service support units. Frequencies also used for air-to-ground communications for military close air support requirements as well as some other tactical air-ground and air-air communications.	No changes are planned. Use expected to continue.
50– 54	None	None	<b>Military LMR.</b> Military units conduct tactical and training operations in this band on a non-interference basis.	Use expected to continue.
54– 72	None	None	<b>Experimental.</b> On a non-interference basis, used primarily for experimental testing and equipment checkout. <b>Broadcasting.</b> Some TV broadcast is performed in various Pacific island areas.	ATV is planned to use existing TV spectrum when transitioning from NTSC to ATV.  Use expected to continue.
72– 73	None	None	<b>Radio Astronomy.</b> Observations of the cosmos is done in this band. <b>Experimental.</b> Numerous RDT&E testing as well as telecommand testing is performed in this band on a non-interference basis. NASA NIB use at Wallops Flight Facility and Kennedy Space Center includes RPVs.	Use expected to continue.
73– 74.6	RADIO ASTRONOMY US74	None	<b>Radio Astronomy.</b> Preferred for continuum observations. These observations help identify characteristics of stars, planets, and gases such as their elemental composition, temperature, etc.	Scientific research is expected to continue and increase in this band.
74.6– 74.8	FIXED MOBILE US273	None	<b>Military LMR.</b> Usage range from administrative land mobile nets to ground communications for military aircraft crews. <b>Non-Military LMR.</b> Usage ranges from portable-to-portable communications to low-power communications inside power plant facilities to the remote control of devices.	No changes are planned. Use expected to continue.
74.8– 75.2	AERONAUTICAL RADIONAVIGATION S5.180	None	<b>Aero-Radionav.</b> Used for instrument landing system (ILS) marker beacons that provide guidance information during approach and landing.	As the U.S. transitions to satellite-based radionavigation, no future aeronautical uses are envisioned for this band after ILS has been fully decommissioned (1999 FRP).
75.2– 75.4	FIXED MOBILE US273	None	<b>Non-Military LMR.</b> Usage ranges from public safety operations to low power operations to the remote control of mechanical devices. <b>Military LMR.</b> Usage ranges from military runway light control systems to aircrew ground communications.	No changes are planned. Use expected to continue.
75.4– 76	None	None	<b>Broadcasting.</b> Educational TV broadcasts on various Pacific islands. <b>Experimental.</b> Equipment testing is performed on a NIB basis.	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
76– 88	None	None	<b>Broadcasting.</b> Government TV translator and educational TV broadcasts are licensed. <b>Military LMR.</b> Used primarily for military services tactical and training operations on a NIB basis.	ATV is planned to use existing TV spectrum when transitioning from NTSC to ATV.  Use expected to continue.
88– 108	None  US93	None	<b>Experimental.</b> Used by various Federal agencies for maintenance and calibration testing of aeronautical radionavigation equipment. <b>Broadcasting.</b> Some radio broadcasts are licensed for various Pacific islands.	Use expected to continue.
108– 117.975	AERONAUTICAL RADIONAVIGATION  G126 US93	None	<b>Aero-Radionav.</b> VOR operates in the 108–117.975 MHz band and it shares the 108–111.975 MHz portion of the band with ILS localizers. The FAA operates 1,012 VOR, VOR/DME, and VORTACs including 150 VOR-only stations. This number of stations is expected to remain stable until the VOR/DMEs begin to be decommissioned in 2008. The band 112–117.975 MHz is also being utilized to transmit differential GPS (DGPS) correction to aircraft using Special Category-1 (SCAT-1) stations. The military also operates stations in the U.S. and overseas which are available to all users.	As the U.S. transitions to satellite-based radionavigation, both VORs and ILSs are planned for partial or full decommissioning. Future aeronautical applications for this band include (1) expanded DGPS transmissions (SCAT-1 and/or LAAS), and (2) possible use as an expansion band for VHF A/G comm (117.975–137 MHz). VOR/DMEs begin to be decommissioned in 2008. Cat I ILS systems scheduled to be phased-down in 2008 while ILS Cat II and III will be needed beyond 2015. (See 1999 FRP).
117.975– 121.4125	AERONAUTICAL MOBILE (R)  US26 US 28 S5.111 S5.198 S5.200	Aeronautical Mobile-Satellite (R) S5.198	<b>ATC Comm.</b> Primarily 25 kHz channel, AM voice, air-ground communications used by the FAA for the air traffic control of commercial, private, and recreational aviation. Band includes the VHF emergency search and rescue guardband, and airport utility and ELT testing. Some air traffic control is provided to military aircraft equipped with VHF air-ground radios.	Use expected to continue. Next generation pilot-to-controller communications are being implemented (digital, TDMA technology).
121.4125– 121.5875	AERONAUTICAL MOBILE (R)  S5.111 S5.198 S5.199 S5.200	Aeronautical Mobile-Satellite (R) S5.198  Maritime Mobile S5.200	<b>ATC Comm.</b> Primarily 25 kHz channel, AM voice, air-ground communications used by the FAA for the air traffic control of commercial, private, and recreational aviation. Band includes the VHF emergency search and rescue frequency, 121.5 MHz (and its guardband), and airport utility and ELT testing. Some air traffic control is provided to military aircraft equipped with VHF air-ground radios.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
121.5875– 121.9375	AERONAUTICAL MOBILE (R)  US28 S5.198 S5.200	Aeronautical Mobile-Satellite (R) S5.198	<b>ATC Comm.</b> Primarily 25 kHz channel, AM voice, air-ground communications used by the FAA for the air traffic control of commercial, private, and recreational aviation. Band includes the VHF emergency search and rescue guardband, and airport utility and ELT testing. Some air traffic control is provided to military aircraft equipped with VHF air-ground radios.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
121.9375– 121.9625	None  US30 US31 US33 S5.198	Aeronautical Mobile-Satellite (R) S5.198	<b>ATC Comm.</b> Various Federal agencies are authorized to use this band for air-ground-air communications.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
121.9625–123.0875	None  US30 US31 US80 US102 US213 S5.198	Aeronautical Mobile-Satellite (R) S5.198	<b>ATC Comm.</b> Primarily used by the FAA for air traffic control. <b>VHF Comm.</b> Other Federal agencies use is for air/air and air/ground/air communications supporting natural resource protection and management programs.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
123.0875–123.5875	AERONAUTICAL MOBILE  US32 US33 US112 S5.198 S5.200	Aeronautical Mobile-Satellite (R) S5.198  Maritime Mobile S5.200	<b>VHF Comm.</b> Frequency 123.1 MHz for SAR scene-of action communications (See Section 7.5.4 of the NTIA Manual). Other channels in this band support operations flight testing and aviation instructional gliders.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
123.5875–128.8125	AERONAUTICAL MOBILE (R)  US26 S5.198	Aeronautical Mobile-Satellite (R) S5.198	<b>ATC Comm.</b> Primarily 25 kHz channel, AM voice, air-ground communications for the air traffic control of commercial, private, and recreational aviation. FSS Air Carrier Advisory is supported in this band as well as operational control (ARINC) functions. Some air traffic control is provided to military aircraft equipped with VHF air-ground radios.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
128.8125–132.0125	None  S5.198	Aeronautical Mobile-Satellite (R) S5.198	<b>Experimental.</b> Air/ground communications tests and equipment checkout.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
132.0125–136.00	AERONAUTICAL MOBILE (R)  US26 S5.198	Aeronautical Mobile-Satellite (R) S5.198	<b>ATC Comm.</b> Primarily 25 kHz channel, AM voice, air-ground communications for the air traffic control of commercial, private, and recreational aviation. This band also supports flight inspections and a channel is allocated for VHF military common. Some air traffic control is provided to military aircraft equipped with VHF air-ground radios.	Use expected to continue. Next generation pilot-to-controller communications are being investigated (digital, TDMA technology).
136–137	None  US244 S5.203	Aeronautical Mobile-Satellite (R) S5.203  Meteorological-Satellite (space-to-Earth) US244  Space Operations (space-to-Earth) US244  Space Research US244	<b>ATC Comm.</b> Air traffic control is conducted in this band. <b>WXD Satellite.</b> Data acquisition from meteorological satellite programs is supported in this band. <b>Space Research.</b> NASA supports the Interplanetary Monitoring Platform (IMP)-8 spacecraft by space tracking and telemetry operations in this band. <b>Space Ops.</b> Space telemetering and space station operations are conducted in this band. <b>Experimental.</b> Used by various Federal agencies for equipment checkout and testing.	No changes are planned. Use expected to continue.
137–137.025	SPACE OPERATION (space-to-Earth) METEOROLOGICAL SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)  US319 US320 S5.209 US318 S5.208	None	<b>Experimental.</b> Some equipment testing is done in this band.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
137.025–137.175	SPACE OPERATION (space-to-Earth) METEOROLOGICAL SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-earth) Mobile-Satellite (space-to-Earth)  US319 US320 S5.208A S5.209 US318 S5.208	None	<b>WXD Satellite.</b> METEOSAT-3, a temporary gapfiller for the GOES meteorological satellite project, operates a downlink during emergency situations. <b>Experimental.</b> Some equipment testing is performed by Federal agencies in this band.	No changes are planned. Use expected to continue.
137.175–137.825	SPACE OPERATION (space-to-Earth) METEOROLOGICAL SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)  US319 US320 S5.208A S5.209 US318 S5.208	None	<b>WXD Satellite.</b> The Federal government uses this band primarily for meteorological satellite space stations: picture transmission to public and direct sounding broadcasts. <b>Space Research.</b> NASA supports the Interplanetary Monitoring Platform (IMP)-8 spacecraft by space tracking and telemetry operations in this band. <b>Space Ops.</b> Use is also made for a space tracking and a space operation space station.	No changes are planned. Use expected to continue.
137.825–138	SPACE OPERATION (space-to-Earth) METEOROLOGICAL SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Mobile-Satellite (space-to-Earth)  US319 US320 S5.208A S5.209 US318 S5.208	None	<b>Space Research.</b> NASA and the NSF conduct various space research activities in this band to include: NASA: The High Energy Transient Experiment (HETE) that measures and collects data on ultraviolet, X-ray, and gamma ray radiation. NASA: The Interplanetary Monitoring Platform (IMP)-8 spacecraft by space tracking and telemetry operations in this band. NSF: Various scientific research projects in this band.	No changes are planned. Use expected to continue.
138– 144	FIXED MOBILE  US10 G30	None	<b>Military Comm.</b> This is one of the DOD primary military tactical and training bands for fixed, mobile, and aeronautical mobile communications. This band is also used by the Army, Navy, Air Force, U.S. Marines, and the U.S. Coast Guard for non-tactical land mobile radio networks that support military infrastructure functions (i.e., fire/crash, security, ambulance, fuels, disaster preparedness, commanders net, transportation, etc.) at and in the vicinity of military bases and numerous military training areas and national test ranges. Also, this band is essential to the activities of the Air Force Auxiliary (Civil Air Patrol) and USCG Auxiliary for support of search and rescue operations. Civil emergency communications and the Military Affiliate Radio System (MARS) are also supported in this band. Finally, the US Coast Guard also operates auxiliary nets supporting boating safety. <b>Space Ops.</b> NASA uses frequencies in this band to support the International Space Station (ISS) VHF Voice Communications Link (IVVCL) primarily when docking with space stations. <b>NASA.</b> This band is also used by NASA for LMR activities.	No changes are planned. Use expected to continue.
144– 146	None	None	None	No changes are planned.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
146– 148	None	None	<b>Experimental.</b> Some Federal agencies are authorized to have temporary assignments in this band that do not conform to the National Table of Frequency Allocations.	Use expected to continue.
148– 149.9	FIXED MOBILE MOBILE- SATELLITE(Earth-to-space) S5.209 US319 US320 US323 US325  S5.218 S5.219 US10 G30	SPACE OPERATIONS (Earth-to-space) S5.218	<b>Military Comm.</b> This is one of the DOD primary military tactical and training bands for fixed, mobile, and aeronautical mobile communications. This band is also used by the Army, Navy, and Air Force for non-tactical land mobile radio networks that maintain military infrastructure functions (i.e., fire/crash, security, ambulance, fuels, disaster preparedness, commanders net, transportation, etc.) at and in the vicinity of military bases and numerous military training areas and national test ranges. <b>Non-Military LMR.</b> The Interior Department's fish management program is supported in this band with USA-wide channels. This band is essential to the support of the Civil Air Patrol and the USCG boating safety and search and rescue operations. <b>Satellite Uplinks.</b> Satellite uplink operations are supported in this band by NASA, DOE, NSF, DOS. Most notable are the METEOSAT-3, IMP-8, Advanced Technology Satellite (ATS 1 and 3), and the NOAA 9/11/12 J-satellites.	No changes are planned. Use expected to continue.
149.9– 150.05	RADIONAVIGATION- SATELLITE MOBILE SATELLITE (Earth-to-space) S5.209 US319 US322  S5.220 S5.223	None	<b>Mobile Satellite.</b> Federal Government use of this band for mobile-satellite service is limited by US Footnote 319 to Earth stations operating with non-government satellites. (The TRANSIT-SAT ceased operation as a position and timing system on 12/31/96.)	No changes are planned. Use expected to continue.
150.05– 150.8	FIXED MOBILE  US216	None	<b>Military LMR.</b> Major users of this band are by the Army, Navy, and Air Force for non-tactical land mobile radio networks that maintain military infrastructure functions (i.e., fire/crash, security, ambulance, fuels, disaster preparedness, commanders net, transportation, etc.). <b>Non-Military LMR.</b> Other Federal use includes functions supporting national reservation management.	No changes are planned. Use expected to continue.
150.8– 152	None  S5.226 US316	None	<b>Non-Military LMR.</b> Some Federal agency usage is authorized for mutual aid response (fire fighting, forest fire fighting, medical, etc.) with local communities. Also used for protection and management of natural resources and wildlife.	Use expected to continue.
152– 152.255	None  US316	None	<b>Non-Military LMR.</b> Some Federal agencies' usage in this band is authorized for cooperative studies in the protection and management of natural resources. Some frequencies in this band are authorized for government/non-government medical radio communications systems, US216.	Use expected to continue.
152.255– 152.495	None	None	None	No changes are planned.
152.495– 152.855	None	None	<b>Experimental.</b> Some Federal agencies have temporary assignments in this band that do not conform to the National Table of Frequency Allocations.	Use expected to continue.
152.855– 154	None  S5.226 US316	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use this band for mutual aid response to local communities (fire fighting, forest fire fighting, medical, hazardous material incidents, etc.).	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
154–156.2475	None S5.226 US316	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use this band for mutual aid response to local communities (fire fighting, forest fire fighting, medical, etc.).	Use expected to continue. Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
156.2475–156.308	None US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> Intership use of 156.3 MHz and vessel traffic services under the control of the USCG on 156.25 MHz.	No changes are planned. Use expected to continue.
156.308–156.542	None S5.227 US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> On 156.375 MHz, government vessel bridge-to-bridge communications and government coast stations for navigational communications.	No changes are planned. Use expected to continue. Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
156.542–156.558	None US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> Vessel traffic services under the control of the USCG on 156.55 MHz,	No changes are planned. Use expected to continue.
156.558–156.592	None	None	None	No changes are planned.
156.592–156.608	None US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> On 156.6 MHz, port operations by government coast and ship stations. Vessel traffic services under the control of the USCG on 156.6 MHz.	No changes are planned. Use expected to continue.
156.608–156.692	None S5.227 US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> On 156.65 MHz, government vessel bridge-to-bridge communications and government coast stations for navigational communications.	No changes are planned. Use expected to continue. Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
156.692–156.708	None US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> On 156.7 MHz, port operations by government coast and ship stations. Vessel traffic services under the control of the USCG on 156.7 MHz.	No changes are planned. Use expected to continue.
156.708–156.742	None	None	None	No changes are planned.
156.742–156.758	None US106 US266	MARITIME MOBILE US106	<b>Maritime Mobile.</b> On 156.75 MHz, government coast and ship stations are authorized use in support of marine environmental protection operations.	No changes are planned. Use expected to continue.
156.758–156.7625	None	None	None	No changes are planned. Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
156.7625–156.8375	None S5.226 US107 US266	MARITIME MOBILE US107	<b>Maritime Mobile.</b> Frequency 156.8 MHz is for international distress, safety, and call and reply.	No changes are planned. Use expected to continue.
156.8375–156.992	None	None	None	No changes are planned.
156.992–157.008	None US77 US266	MARITIME MOBILE US77	<b>Maritime Mobile.</b> On 157.0 MHz, port operations by government coast and ship stations.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
157.008–157.0375	None	None	None	No changes are planned.
157.0375–157.1875	MARITIME MOBILE  US214 US266 S5.226 G109	None	<b>USCG.</b> Primary use of this band is for U.S. Coast Guard ship/shore radio station communications for safety and distress response functions, marine safety broadcasts, and command and control of USCG vessels, as well as communications with the general maritime community. <b>NOAA.</b> The Commerce Department/NOAA is a large user of this band for law enforcement matters, fishery research, oceanographic/fisheries activities, geodetic surveys, hydrographic programs, hydrologic surveys, marine pollution studies, and support of oil clean-ups. <b>EPA.</b> The EPA uses this band for ship-ship and ship-shore communications for environmental monitoring and assessment programs.	No changes are planned. Use expected to continue.  Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
157.1875–157.45	None  US223 US266 S5.226	None	<b>Maritime Mobile.</b> Various Federal agencies are authorized to use this band for marine communications (vessel traffic control, intership, ship-to-coast, port operations, harbor operations, etc.). Research. Other uses include environmental monitoring and research, scientific research, etc. <b>Non-Military LMR.</b> Mutual aid response to local communities (fire fighting, public safety, etc.) is also performed in this band.	Channels in this band are planned for spectrum auction for maritime and inland VHF Public Coast Stations.  Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.  Use expected to continue.
157.45–157.755	None  US266 S5.226	None	<b>Experimental.</b> Very little usage by Federal agencies other than for equipment testing and evaluation.	Use expected to continue.
157.755–158.115	None  S5.226	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use this band in response to contingency support requirements and is limited to non-government public correspondence.	Use expected to continue.
158.115–161.575	None  S5.226	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use this band for mutual aid response with local communities (fire fighting, forest fire fighting, natural resource protection, etc.)	Use expected to continue.
161.575–161.592	None  S5.226	None	None	No changes are planned.  Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
161.592–161.608	None  US77 S5.226	MARITIME MOBILE US77	<b>Maritime Mobile.</b> Used by various Federal agencies in support of port and harbor operations, inland waterway patrols, as well as for the protection and management of marine natural resources.	No changes are planned. Use expected to continue.
161.608–161.625	None  S5.226	None	None	No changes are planned.  Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.
161.625–161.775	None  S5.226	None	None	No changes are planned.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
161.775–162.0125	None  S5.226 US266	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use frequencies in this band in support of mutual aid response and for equipment testing.  <b>Maritime Mobile.</b> This band is also used for shipboard Automatic Identification System (AIS) transponders.	Channels in this band are planned for spectrum auction for maritime and inland VHF Public Coast Stations.  Per ITU Appendix S18, Administrations may apply 12.5 kHz channel interleaving in the VHF Maritime Mobile Band with restrictions stipulated.  Use expected to continue.
162.0125–162.0375	FIXED MOBILE  S5.226 US223 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.  <b>Maritime Mobile.</b> This band is also used for shipboard Automatic Identification System (AIS) transponders.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
162.0375–163.2375	FIXED MOBILE  S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
163.2375–163.2625	FIXED MOBILE  S5.226 US216 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
163.2625–166.2375	FIXED MOBILE  S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
166.2375–166.2625	FIXED MOBILE  S5.226 US11 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
166.2625–169.4125	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
169.4125–169.5375	FIXED MOBILE S5.226 US13 US300 G5	Mobile US300	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
169.5375–170.1375	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.1375–170.1625	FIXED MOBILE S5.226 US11 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.1625–170.2125	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.2125–170.3375	FIXED MOBILE S5.226 US13 US300 G5	Mobile US300	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.3375–170.4125	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
170.4125–170.4375	FIXED MOBILE S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.4375–170.4625	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.4625–170.4875	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.4875–170.5625	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.5625–170.5875	FIXED MOBILE S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
170.5875–171.0125	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.0125–171.1375	FIXED MOBILE S5.226 US13 US300 G5	Mobile US300	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue. After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
171.1375–171.4125	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.4125–171.4375	FIXED MOBILE S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.4375–171.4625	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.4625–171.4875	FIXED MOBILE S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.4875–171.5625	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.5625–171.5875	FIXED MOBILE S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.5875–171.8125	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
171.8125–171.9375	FIXED MOBILE  S5.226 US13 US300 G5	Mobile US300	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
171.9375–172.2125	FIXED MOBILE  S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
172.2125–172.2375	FIXED MOBILE  S5.226 US8G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
172.2375–172.2625	FIXED MOBILE  S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
172.2625–172.2875	FIXED MOBILE  S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
172.2875–172.3625	FIXED MOBILE  S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
172.3625–172.3875	FIXED MOBILE  S5.226 US8 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
172.3875–173.0625	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
173.0625–173.0875	FIXED MOBILE S5.226 US312 G5	MOBILE US312	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
173.0875–173.2	FIXED MOBILE S5.226 G5	None	<b>Non-Military LMR.</b> This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 1995, all new Federal systems, and after Jan 1, 2005, all Federal systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
173.2– 173.4	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use frequencies in this band for mutual aid response (forest fire fighting, etc.) to local communities and broadcast range safety warnings.	Use expected to continue.
173.4– 174	FIXED MOBILE G5	None	<b>Non-Military LMR.</b> This band is paired with the 162.0125– 173.2 MHz band above. This is the primary band for many Federal (non-military) fixed and land mobile operations essential to maintain Federal government's infrastructure-related functions. It is used extensively throughout the United States in support of safety in the air; safety at sea; protection of life, property, and national resources; research; and promotion of efficiency and economy of Federal government operations.	Use expected to continue.  After Jan 1, 2005, all systems in the 162– 174 MHz band must be capable of operating within a 12.5 kHz channel.
174– 216	None	None	<b>Broadcasting.</b> Various Federal agencies are authorized to use frequencies in this band to broadcast TV programming to Federal employees stationed at isolated U.S. sites and broadcast educational TV to certain Pacific Island communities, monitor wildlife telemetry, and use in the protection and management of natural resources.	FCC recently amended part 15 of its rules to permit unlicensed biomedical telemetry devices to operate on VHF TV channels 7– 13 (147– 216 MHz) and UHF TV channels 14– 46 (470– 668 MHz) within health care facilities.  ATV is planned to use existing TV spectrum when transitioning from NTSC to ATV.  Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
216– 220	MARITIME MOBILE Aeronautical Mobile Fixed Land Mobile Radiolocation  S5.241 US210 US229 US274 US317 G2	None	<b>Maritime.</b> Naval units use this band for ship sensor and navigational accuracy checks. <b>Telemetry.</b> Numerous Federal agencies conduct research using telemetry links for various test projects such as high speed trains, vehicles on test tracks, convective storm data telemetry, naval telecommand, NASA downlink telemetry, and wildlife management telemetry. <b>Military Usage.</b> The military uses this band for communications training, airborne beacon transmitter locator, test range timing systems, hazardous material suits (portable-to-portable) communications for air bases. USA-wide digital telemetry use for nuclear treaty verification. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	This band was identified for reallocation on a mixed-use basis with a scheduled availability date of Jan 1, 2002 per BBA-97. Use is TBD.  FCC is examining ways to maximize the efficient & effective use of 218– 219 MHz (formerly the Interactive Video & Data Service)– ET Doc # 98– 169  Use expected to continue.
220– 222	FIXED LAND MOBILE Radiolocation  S5.241 G2	None	<b>Military LMR.</b> DOD uses frequencies in this band for tactical and training communications on national and military test ranges. <b>Non-Military LMR.</b> Nationwide channels are used for various Department of Transportation support functions. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
222– 223	Radiolocation  S5.241 G2	None	<b>Radiobeacons.</b> NASA uses this band for radiobeacons on missiles to aid in payload recovery. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services. <b>Experimental.</b> Army conducts research, developmental, test and evaluation testing as well as tactical and training missions in this band. The Air Force had nationwide assignments for equipment testing.	No changes are planned. Use expected to continue.
223– 225	Radiolocation  S5.241 G2	None	<b>Radiobeacons.</b> NASA uses this band for radiobeacons on missiles to aid in payload recovery. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services. <b>Experimental.</b> Army conducts research, developmental, test and evaluation testing as well as tactical and training missions in this band. The Air Force had nationwide assignments for equipment testing.	No changes are planned. Use expected to continue.
225– 235	FIXED MOBILE  G27	None	<b>Military Comm.</b> Primarily used for A/G and A/A comm for the control of military aircraft. Further, the military conducts extensive fixed, multichannel radio relay training ops in this band. Major training center instrumentation systems for data links connecting battle simulation systems on participants' platforms (airborne, shipborne, or surface) to central data processing facilities. The military services also use this band to perform air and sea rescues. Rocket testing and other programs' telemetry systems also operate in this band. <b>FAA Usage.</b> The FAA provides ATC communications to military aircraft on selected frequencies in this band. <b>Test Ban Treaty.</b> Checkout of equipment used to remotely monitor declared nuclear facilities and identifying/characterizing undeclared and clandestine nuclear facilities in support of the limited test ban treaty.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
235– 267	FIXED MOBILE  S5.111 S5.199 S5.256 G27 G100	MOBILE SATELLITE G100	<b>Military Comm.</b> Primarily used for A/G and A/A comm for the control of military aircraft. Further, the military conducts extensive fixed, multichannel radio relay training ops in this band. The military services also use this band to perform air and sea rescues. <b>MILSATCOM.</b> Tactical and strategic military satellite communications providing command and control connectivity between ground, air, and surface/subsurface mobile platforms, are conducted in this band under G100. <b>FAA Usage.</b> The FAA provides ATC communications to military aircraft on selected frequencies in this band. <b>Seismic Ops.</b> Frequencies in this band are used in support of seismic data collection and transmission. <b>EVA.</b> NASA used this band for Shuttle Extra-Vehicular Activities (EVA). <b>Safety of Life and Property.</b> Frequency 243 MHz may be used by Federal survival craft stations and equipment for survival purposes.	No changes are planned. Use expected to continue.
267– 322	FIXED MOBILE  G27 G100	MOBILE SATELLITE G100	<b>Military Comm.</b> Primarily used for A/G and A/A comm for the control of military aircraft. Further, the military conducts extensive fixed, multichannel radio relay training ops in this band. The military services also use this band to perform air and sea rescues. <b>MILSATCOM.</b> Tactical and strategic military satellite communications providing command and control connectivity between ground, air, and surface/subsurface mobile platforms, are conducted in this band under G100. <b>FAA Usage.</b> The FAA provides ATC communications to military aircraft on selected frequencies in this band. <b>EVA.</b> NASA used this band for Shuttle Extra-Vehicular Activities (EVA).	No changes are planned. Use expected to continue.
322– 328.6	FIXED MOBILE  S5.149 G27	None	<b>Military Comm.</b> Primarily used for A/G and A/A comm for the control of military aircraft. Further, the military conducts extensive fixed, multichannel radio relay training ops in this band. <b>FAA Usage.</b> The FAA provides ATC communications to military aircraft on selected frequencies in this band. <b>Radio Astronomy.</b> The 1979 WARC provided an allocation for radio astronomy in the 322–328.6 MHz band. This band serves both line and continuum observations, since it includes the hyperfine transition from the cosmologically significant deuterium atom, and has become an important band for radio astronomers all over the world.	Use expected to continue.  The band is not allocated to radio astronomy in the United States, but it is planned to be used for VLBI and on the Very Large Array (VLA).
328.6– 335.4	AERONAUTICAL RADIONAVIGATION  S5.258	None	<b>Aero-Radionav.</b> In the United States, as well as worldwide, this band is allocated for aeronautical radionavigation where its use is for the instrument landing system's (ILS) glideslope.	As the U.S. transitions to satellite-based radionavigation, the ILS will be partially or completely decommissioned. The FAA and civil aviation community are investigating several potential aeronautical applications of this band for possible implementation after the ILS has been partially or completely decommissioned. (1999 FRP)

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
335.4– 399.9	FIXED MOBILE  G27 G100	MOBILE SATELLITE G100	<b>Military Comm.</b> Primarily used for A/G and A/A comm for the control of military aircraft. Further, the military conducts extensive fixed, multichannel radio relay training ops in this band. The military services also use this band to perform air and sea rescues. <b>MILSATCOM.</b> Tactical and strategic military satellite communications providing command and control connectivity between ground, air, and surface/subsurface mobile platforms, are conducted in this band under G100. <b>FAA Usage.</b> The FAA provides ATC communications to military aircraft on selected frequencies in this band.	No changes are planned. Use expected to continue.
399.9– 400.05	RADIONAVIGATION-SATELLITE MOBILE-SATELLITE (Earth-to-space) US319 US326  S5.260	None	<b>Mobile Satellite.</b> Government usage in this band is in the mobile-satellite service where government Earth stations operate with non-government satellites (per US319). <b>Pre-Launch Tests.</b> Usage is also for pre-launch checks for missile and satellite equipment.	The TRANSIT satellite use for radionavigation satellite operations was terminated December 1996 (see FRP at 1– 6).
400.05– 400.15	STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz)  S5.261	None	<b>WXD Data Collection.</b> Meteorological data collection and radiosonde operations are performed in this band. Doppler orbitography and radiopositioning integrated by satellite system operates in this band.	This space-to-Earth satellite allocation was made by the 1971 WARC and was originally intended as a satellite-based replacement for some terrestrial HF time and frequency services. However, the United States nor any other administration has implemented a service using this allocation.
400.15– 401	METEOROLOGICAL AIDS (radiosonde) METEOROLOGICAL SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) S5.263 MOBILE-SATELLITE (space-to-Earth) S5.209 US319 US320 US324 Space Operation (space-to-Earth)  S5.262 S5.264 US70	None	<b>WXD Data Collection.</b> Meteorological data collection and radiosonde operations are performed in this band. Doppler orbitography and radiopositioning integrated by satellite system operates in this band. <b>NASA Downlink.</b> NASA operates a downlink in support of the SIMPLESAT Satellite System. <b>NASA WVS.</b> The wireless video system is used on an NIB basis in this band. This system provides telemetry from wideband video helmet cameras for EVA operations.	No changes are planned. Use expected to continue.
401– 402	METEOROLOGICAL AIDS (Radiosonde) SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space)  US70	None	<b>WXD Satellite.</b> Numerous meteorological-satellite earth stations affiliated with the GOES system operate in this band. <b>WXD Data Collection.</b> Meteorological data collection and radiosonde operations are performed in this band. Doppler orbitography and radiopositioning integrated by satellite system operates in this band.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
402– 403	METEOROLOGICAL AIDS (Radiosonde) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space)  US70	None	<b>WXD Data Collection.</b> Various Federal agencies operate radiosondes in support of collecting meteorological data for weather forecasting. <b>Earth Stations.</b> Numerous Federal agencies operate meteorological-satellite earth stations and space research earth stations. <b>NASA Uplinks.</b> NASA operates a uplink in support of the SIMPLESAT Satellite System.	No changes are planned. Use expected to continue.
403– 406	METEOROLOGICAL AIDS (Radiosonde)  US70 G6	Fixed G6  Mobile G6	<b>WXD Data Collection.</b> Numerous Federal agencies operate radiosondes, rocketsondes, and dropsonde flights in this band. <b>Military LMR.</b> Military conducts tactical and training operations in this band on a secondary basis (G6).	No changes are planned. Use expected to continue.
406– 406.1	MOBILE-SATELLITE (Earth-to-space)  S5.266 S5.267	None	<b>SARSAT.</b> Primary frequency used by the NOAA search and rescue satellites (SARSAT) for reception of Emergency Position-Indicating Radio Beacon (EPIRB) transmitters owned by Federal and civilian entities. The SARSAT retransmits emergency transmitter signal on 1544.5 MHz to surface stations.	No changes are planned. Use expected to continue.
406.1– 406.1125	FIXED MOBILE RADIO ASTRONOMY  S5.149 US74 US117 G5 G6	None	<b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
406.1125– 406.1375	FIXED MOBILE RADIO ASTRONOMY  S5.149 US13 US74 US117 G5 G6	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
406.1375– 406.1625	FIXED MOBILE RADIO ASTRONOMY  S5.149 US74 US117 G5 G6	None	<b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
406.1625– 406.1875	FIXED MOBILE RADIO ASTRONOMY  S5.149 US13 US74 US117 G5 G6	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.

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406.1875–409.6625	FIXED MOBILE RADIO ASTRONOMY  S5.149 US74 US117 G5 G6	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
409.6625–409.6875	FIXED MOBILE RADIO ASTRONOMY  S5.149 US13 US74 US117 G5 G6	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
409.6875–409.7125	FIXED MOBILE RADIO ASTRONOMY  S5.149 US74 US117 G5 G6	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
409.7125–409.7375	FIXED MOBILE RADIO ASTRONOMY  S5.149 US13 US74 US117 G5 G6	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
409.7325–410	FIXED MOBILE RADIO ASTRONOMY  S5.149 US74 US117 G5 G6	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>Radio Astronomy.</b> One of the frequency bands allocated to the radio astronomy service that is preferred for continuum observations. <b>Military LMR.</b> Military conducts tactical fixed and mobile operations in this band on a secondary basis (G6).	Undergoing reallocation to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
410–412.6125	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  US213 G5	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
412.6125–412.6375	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  US13 G5	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>Trunked Systems.</b> This band supports Federal Government trunked radio systems. <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
412.6375–412.6625	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  G5	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
412.6625–412.6875	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  US13 G5	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
412.6875–412.7125	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268 G5	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
412.7125–412.7375	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268 US13 G5	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
412.7375–412.7625	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  G5	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
412.7625–412.7875	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  US13 G5	None	<b>Data Collection.</b> Various Federal agencies use this band for the automatic fixed station transmission of hydrologic or meteorological data (or both). <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
412.7875–420	FIXED MOBILE SPACE RESEARCH (space-to-space) MOD S5.268  G5	None	<b>Federal LMR.</b> This band is primarily used by Federal agencies for non-tactical land mobile radio networks that maintain and support their agency infrastructure functions at and in the vicinity of their stations and at ancillary locations. <b>NASA EVA.</b> Extra-vehicular activity communications for manned space program.	Undergoing re-allotment to Federal agencies to provide for restructuring of channels for use in two frequency simplex systems and in multichannel trunked system. This will provide increased spectrum efficiency.
420–422.1875	RADIOLOCATION  S5.282 US7 US217 US228 G2 G8	Fixed G8 Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	Flight termination systems to be moved to this band from the 406– 420 MHz band.  Use expected to continue.
422.1875–425.4875	RADIOLOCATION  US7 US217 US228 US230 S5.282 G2 G8	LAND MOBILE US230 Fixed G8 Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	Flight termination systems to be moved to this band from the 406– 420 MHz band.  Use expected to continue.
425.4875–427.1875	RADIOLOCATION  US7 US87 US217 US228 US230 S5.282 G2 G8	Fixed G8 Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	Flight termination systems to be moved to this band from the 406– 420 MHz band.  Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
427.1875–429.9875	RADIOLOCATION  US7 US87 US217 US228 US230 S5.282 G2 G8	LAND MOBILE US 217  Fixed G8  Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	Flight termination systems to be moved to this band from the 406– 420 MHz band.  Use expected to continue.
429.9875–430	RADIOLOCATION  US7 US217 US228 S5.282 G2 G8	Fixed G8  Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	Flight termination systems to be moved to this band from the 406– 420 MHz band.  Use expected to continue.
430– 435	RADIOLOCATION  US7 US217 US228 S5.282 G2 G8	Fixed G8  Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	<b>Active Remote Sensing.</b> The band 430–440 MHz is under consideration by NASA for new generation of active remote sensors.  Use expected to continue.
435– 438	RADIOLOCATION  S5.282 US7 US217 G2 G8	Fixed G8  Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	<b>Active Remote Sensing.</b> The band 430–440 MHz is under consideration by NASA for new generation of active remote sensors.  Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
438– 440	RADIOLOCATION  S5.282 US7 US217 G2 G8	Fixed G8  Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation operations are limited to the military services. This radiolocation band is also important for and is the only available radiolocation band for the detection of advanced technology systems. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	<b>Active Remote Sensing.</b> The band 430–440 MHz is under consideration by NASA for new generation of active remote sensors.  Use expected to continue.
440– 449.75	RADIOLOCATION  S5.282 US7 US217 G2 G8	Fixed G8  Mobile G8	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation use are limited to the military services and is important for it is the only available radiolocation band for the detection of advanced technology systems. <b>Wind Profiler Radar.</b> Frequency 449 MHz ± 1 MHz is authorized for Federal use for the wind profiler radar whose implementation for weather purposes is expected to be rapid. <b>Telemetry &amp; Telecommand.</b> Also in this band, NASA and military use of telemetry and telecommand is extensive.	Wind Profiling radars are planned at 449 MHz ± 1 MHz  Use expected to continue.
449.75– 450	RADIOLOCATION  S5.286 S5.282 US7 US87 US217 G2 G8	Fixed G8  Mobile G8  Space Operations (Earth-to-space) S5.286  Space Research (Earth-to-space) S5.286	<b>Long-Range Radars.</b> This band is used by various Federal agencies for ground, shipborne, and airborne long-range surveillance radars. These uses are essential to the nation's aerospace early warning defense capability, public safety functions, and the tracking of objects in space. These radar systems operate with very high power and wide bandwidths. <b>Radiolocation.</b> Radiolocation use are limited to the military services and is important for it is the only available radiolocation band for the detection of advanced technology systems. <b>Wind Profiler Radar.</b> Frequency 449 MHz ± 1 MHz is authorized for Federal use for the wind profiler radar whose implementation for weather purposes is expected to be rapid. <b>Telemetry and Telecommand.</b> NASA and the military use this band extensively for telemetry and telecommand.	Wind Profiling radars are planned at 449 MHz ± 1 MHz  Use expected to continue.
450– 450.25	None  S5.286 US87	Space Research (Earth-to-space) S5.286  Space Operations (Earth-to-space) S5.286	<b>Experimental.</b> Some Federal agencies have temporary assignments in this band that do not conform to the National Table of Frequency Allocations.	No changes are planned. Use expected to continue.  The 450-454 MHz band is under review by the FCC (WTB).
450.25– 451	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use frequencies in this band in support of mutual aid response to local communities.	Use expected to continue.  The 450-454 MHz band is under review by the FCC (WTB).
451– 454	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use frequencies in this band in support of mutual aid response (fire fighting, disaster preparedness, contingencies, etc.) to local communities.	Use expected to continue.  The 450-454 MHz band is under review by the FCC (WTB).

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
454– 455	None	None	<b>Experimental.</b> Equipment testing is performed on a NIB basis in this band.	Use expected to continue.
455– 456	None	None	None	FCC proposes to allocated the 455– 456 MHz and 459– 460 MHz bands to the Mobile Satellite Service (Earth-to-space) on a primary basis for non-voice, non-geostationary mobile satellite services (NVNGMSS), see ET Docket No. 97– 214.
456– 459	None MOD S5.287 S5.288	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to use frequencies in this band in support of mutual aid response (fire fighting, disaster preparedness, contingencies, etc.) to local communities.	Use expected to continue.
459– 460	None S5.287 S5.288	None	<b>Non-Military LMR.</b> Various Federal agencies have assignments in this band for non-government public correspondence that do not conform to the National Table of Frequency Allocations.	FCC proposes to allocated the 455– 456 MHz and 459– 460 MHz bands to the Mobile Satellite Service (Earth-to-space) on a primary basis for non-voice, non-geostationary mobile satellite services (NVNGMSS), see ET Docket No. 97– 214. Use expected to continue.
460– 462.5375	Meteorological-Satellite (space-to-Earth) S5.289 US201 US209	Earth Exploration-Satellite US201	<b>Non-Military LMR.</b> Various Federal agencies have assignments in this band for functions such as mutual aid response to local communities, ground telemetry for coronary care, etc., that do not conform to the National Table of Frequency Allocations.	No changes are planned. Use expected to continue.
462.5375– 462.7375	Meteorological-Satellite (space-to-Earth) S5.289 US201	Earth Exploration-Satellite US201	<b>Non-Military LMR.</b> Some Federal agencies have assignments in this band for mutual aid response to local communities that do not conform to the National Table of Frequency Allocations. <b>Part 95.</b> Military units use Family Radio Service radios for mobile operations in this band on a NIB basis.	No changes are planned. Use expected to continue.
462.7375– 467.5375	Meteorological-Satellite (space-to-Earth) S5.287 S5.289 US201 US209 US216	Earth Exploration-Satellite US201	<b>Non-Military LMR.</b> Primarily used by Federal agencies for medical surveillance telemetry. Other uses are fixed and mobile that do not conform to the National Table of Frequency Allocations. <b>NASA.</b> Used for differential GPS reference signal.	No changes are planned. Use expected to continue.
467.5375– 467.7375	Meteorological-Satellite (space-to-Earth) S5.287 S5.289 US201	Earth Exploration-Satellite US201	<b>Part 95.</b> Military units use Family Radio Service radios for mobile operations in this band on a NIB basis.	No changes are planned.
467.7375– 470	Meteorological-Satellite (space-to-Earth) S5.287 S5.289 US201 US216	Earth Exploration-Satellite US201	<b>WXD Satellite.</b> The GOES meteorological satellite operates in this band and interrogates data collection platforms at hundreds of locations. <b>Non-Military LMR.</b> Various Federal agencies operate medical surveillance telemetry systems. Other Federal agencies are authorized to operate land mobile radios in support of mutual aid response to local communities.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
470– 512	None	None	<b>Non-Military LMR.</b> Some Federal agencies have assignments in this band for mutual aid response (medical, fire suppression, etc.) to local communities that do not conform to the National Table of Frequency Allocations.	FCC recently amended part 15 of its rules to permit Unlicensed biomedical telemetry devices to operate on VHF TV channels 7– 13 (147– 216 MHz) and UHF TV channels 14– 46 (470– 668 MHz) within health care facilities.  ATV is planned to use existing TV spectrum when transitioning from NTSC to ATV.  Use expected to continue.
512– 608	None	None	<b>Experimental.</b> Some Federal agencies operate systems in this that are not in conformance with the National Table of Frequency Allocations: radio astronomy receiver (600– 620 MHz), aeronautical telemetering land stations, experimental testing stations, etc.	FCC recently amended part 15 of its rules to permit Unlicensed biomedical telemetry devices to operate on VHF TV channels 7– 13 (147– 216 MHz) and UHF TV channels 14– 46 (470– 668 MHz) within health care facilities.  ATV is planned to use existing TV spectrum when transitioning from NTSC to ATV.  Use expected to continue.
608– 614	RADIO ASTRONOMY  US74 US246	None	<b>Radio Astronomy.</b> One of the radio astronomy service’s preferred frequency bands for continuum observations. Research and studies are made of pulsars, the Sun, and the planet Jupiter that have enabled scientists to further study the whole of the Milky Way galaxy. <b>Medical Telemetry.</b> Various Federal agencies operate medical telemetry devices in this band throughout the United States. <b>Broadcast:</b> Military TV broadcast stations for AFCN.	Scientific research is expected to continue and increase in this band. Radio astronomers may seek access to an additional 100kHz to provide this band the required minimum of one percent bandwidth necessary for adequate radio astronomy receiver sensitivity.
614– 698	None	None	<b>Broadcast:</b> Military TV broadcast stations for AFCN. <b>Experimental.</b> Some Federal agencies conduct equipment RDT&E at various ranges and contractor facilities. <b>Radio Astronomy.</b> Radio astronomy observes in this band (600– 620 MHz)	Use expected to continue.
698– 746	None	None	<b>Broadcast:</b> Military TV broadcast stations for AFCN. <b>Experimental.</b> Some Federal agencies conduct equipment RDT&E at various ranges and contractor facilities.	Band is to be reallocated and auctioned by Sep 30, 2002.
746– 764	None		<b>Broadcast:</b> Military TV broadcast stations at very remote/isolated sites. <b>Experimental.</b> Some Federal agencies conduct equipment RDT&E at various ranges and contractor facilities.	Use expected to continue.
764– 776	None		<b>Broadcast:</b> Military TV broadcast stations at very remote/isolated sites.	Use expected to continue.
776– 794	None		<b>Experimental.</b> Some Federal agencies conduct equipment RDT&E at various ranges and contractor facilities.	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
794– 806	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to operate land mobile equipment in support of mutual aid response agreements with local communities. <b>Broadcast:</b> Military TV broadcast stations at very remote/isolated sites. <b>Experimental.</b> Some Federal agencies conduct equipment RDT&E at various ranges and contractor facilities.	Use expected to continue.
806– 821	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to operate land mobile equipment in support of mutual aid response agreements with local communities.	Use expected to continue.
821– 824	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to operate land mobile equipment in support of mutual aid response agreements with local communities.	Use expected to continue.
824– 849	None	None	<b>Experimental.</b> Some Federal agencies operate experimental testing stations in this band and others operate radio systems not in conformance with the National Table of Frequency Allocations.	Use expected to continue.
849– 851	None	None	None	No changes are planned.
851– 866	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to operate land mobile equipment in support of mutual aid response agreements with local communities.	Use expected to continue.
866– 869	None	None	<b>Non-Military LMR.</b> Various Federal agencies are authorized to operate land mobile equipment in support of mutual aid response agreements with local communities.	Use expected to continue.
869– 894	None US116 US268 G2	Radiolocation US268	<b>Training.</b> Personnel training is conducted in this band and the assignments are not in conformance with the National Table of Frequency Allocations. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
894– 896	None US116 US268 G2	Radiolocation US268	<b>Training.</b> Some Federal agencies operate experimental testing stations in this band. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
896– 901	None US116 US268 G2	Radiolocation US268	<b>Training.</b> Personnel training is conducted in this band and the assignments are not in conformance with the National Table of Frequency Allocations. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
901– 902	None US116 US268 G2	Radiolocation US268	<b>Military Radars.</b> Various radiolocation systems operate in this band. Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
902– 928	RADIOLOCATION S5.150 US215 US218 US267 US275 G11 G59	Fixed G11 Mobile G11 ISM S5.150	<b>Military Radars.</b> Various Federal agencies operate mobile and fixed radars in this band. <b>Wind Profiler Radar.</b> Frequency 915 MHz $\pm$ 13 MHz is authorized for Federal use for the wind profiler radar whose implementation for weather purposes is expected to be rapid. <b>Non-Military LMR.</b> Numerous fixed and mobile systems are supported in this band. <b>ISM.</b> The band 902-928 MHz (center frequency 915 MHz) is designated for industrial, scientific and medical (ISM) applications.	Spectrum auction for more Location and Monitoring Service licenses is planned by the FCC where the LMS will be on a secondary basis to Government radiolocation service..  No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
928– 929	None  US116 US215 US268 G2	Radiolocation US268	<b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
929– 930	None  US116 US215 US268 G2	Radiolocation US268	<b>Non-Military LMR.</b> Federal agency shares a paging frequency with local medical facility and the assignment is not in conformance the National Table of Frequency Allocations. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	Spectrum auction of 929 MHz for common and private carrier paging is planned.  Use expected to continue.
930– 931	None  US116 US215 US268 G2	Radiolocation US268	<b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
931– 932	None  US116 US215 US268 G2	Radiolocation US268	<b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	Spectrum auction of 931 MHz for common and private carrier paging is planned.  No changes are planned. Use expected to continue.
932– 935	FIXED  US215 US268 G2	Radiolocation US268	<b>Point-to-Point.</b> Various Federal agencies use this band primarily for point-to-point microwave systems (low density communications links– voice and/or data) and usually has a paired frequency in the 941– 944 MHz band. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
935– 940	None  US116 US215 US268 G2	Radiolocation US268	<b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
940– 941	None  US116 US268 G2	Radiolocation US268	<b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
941– 944	FIXED  US268 US301 US302 G2	Radiolocation US268	<b>Point-to-Point.</b> Various Federal agencies use this band primarily for point-to-point microwave systems (low density communications links– voice and/or data) and usually has a paired frequency in the 932– 935 MHz band. <b>Military Radars.</b> Radiolocation operations are permitted on an NIB basis and are limited to the military services.	No changes are planned. Use expected to continue.
944– 960	None	None	<b>Non-Military LMR.</b> Mutual aid support in response to local requirements and agreements is authorized in this band for some Federal agencies. <b>Experimental.</b> Experimental testing of radio systems is conducted in this band.	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
960– 1215	AERONAUTICAL RADIONAVIGATION  US224 S5.328	None	<p><b>Aero-Radionav.</b> This band is heavily used for safety-of-life services within the national and international airspace systems. Nearly all aspects of aircraft identification, tracking, control, navigation, collision avoidance, and landing guidance are carried out. Major aeronautical radionavigation systems in this band include the Distance Measuring Equipment (DME), Air Traffic Control Beacons (ATCRBS), Mode-S, the military's tactical air navigation system (TACAN) and IFF/SIF systems, and the Collision Avoidance System (TCAS). These aeronautical systems are not only essential to civil and military aircraft, but also to special users such as the U.S. Space Shuttle Program. Used throughout the world under International Civil Aviation Organization agreements.</p> <p><b>Under US224,</b> the Government is allowed to use this band for communications, navigation, and identification services on the condition that interference will not be caused to Aeronautical Radionavigation Services. These systems will be handled on a case-by-case basis. The military services use the Joint Tactical Information Distribution System (JTIDS) per US224.</p>	<p>Frequency 1176.45 MHz <math>\pm</math> 12 MHz is planned for the new civil GPS signal (L5). As the U.S. moves to satellite-based aeronautical radionavigation, land-based DME/TACAN will be reduced to a minimum operational or backbone network. Target phase-down start date is 2008. Sea-based TACAN will be required in the foreseeable future. (See 1999 FRP). The FAA has also targeted this band for future navigation, surveillance and data communications systems for ATC. A sub-band centered on 981 MHz is currently being utilized for initial trials of the Universal Access Transceiver (UAT).</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to add Footnote S5.328A.</p>
1215– 1240	RADIOLOCATION RADIONAVIGATION-SATELLITE(space-to-Earth) EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  S5.332 G56	None	<p><b>Surveillance Radars.</b> This band is jointly used by the FAA and DOD for radiolocation performing long-range air surveillance and safety-of-flight enroute air traffic control under Joint Surveillance System agreements. The military services make use of the band for high-power long-range surveillance radars on land and ships in support of national defense missions. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control.</p> <p><b>GPS.</b> The frequency 1227.6 MHz <math>\pm</math> 12 MHz is designated for the Global Positioning System (GPS) as part of the radionavigation satellite service. This is a 24– satellite constellation system with large numbers of U.S. and international users.</p> <p><b>Drug Interdiction.</b> In this application, radar equipment is mounted on tethered balloons along the southern border of the U.S. to detect low-flying aircraft entering U.S. airspace.</p> <p><b>NASA.</b> Space research and Earth exploration-satellite activities for active microwave sensor measurements of geological surfaces and ocean wave structure are performed by NASA.</p>	<p>Use expected to increase.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add ITU footnotes (S5.330 and S5.331); and 2) to add RADIONAVIGATION-SATELLITE (space-to-space).</p>

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
1240– 1260	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  S5.332 S5.334 S5.335 G56	AERONAUTICAL RADIONAVIGATION S5.334	<p><b>Surveillance Radars.</b> This band is jointly used by the FAA and DOD for radiolocation performing long-range air surveillance and safety-of-flight enroute air traffic control under Joint Surveillance System agreements. The military services make use of the band for high-power long-range surveillance radars on land and ships in support of national defense missions. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control.</p> <p><b>NASA Research.</b> Space research and Earth exploration-satellite studies of geological surfaces and ocean wave structures are done by NASA using active microwave sensor systems.</p>	Use expected to increase.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add ITU footnotes (S5.330 and S5.331); and 2) to add RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space).
1260– 1270	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  S5.332 S5.334 S5.335 G56	AERONAUTICAL RADIONAVIGATION S5.334	<p><b>Surveillance Radars.</b> This band is jointly used by the FAA and DOD for radiolocation performing long-range air surveillance and safety-of-flight enroute air traffic control under Joint Surveillance System agreements. The military services make use of the band for high-power long-range surveillance radars on land and ships in support of national defense missions. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control.</p> <p><b>NASA Research.</b> Space research and Earth exploration-satellite studies of geological surfaces and ocean wave structures are done by NASA using active microwave sensor systems.</p>	Use expected to increase.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add ITU footnotes (S5.330 and S5.331); and 2) to add RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space).
1270– 1300	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  S5.332 S5.334 S5.335 G56	AERONAUTICAL RADIONAVIGATION S5.334	<p><b>Surveillance Radars.</b> This band is jointly used by the FAA and DOD for radiolocation performing long-range air surveillance and safety-of-flight enroute air traffic control under Joint Surveillance System agreements. The military services make use of the band for high-power long-range surveillance radars on land and ships in support of national defense missions. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control.</p> <p><b>NASA Research.</b> Space research and Earth exploration-satellite studies of geological surfaces and ocean wave structures are done by NASA using active microwave sensor systems. Active sensor flight instruments include SAR (JERS-1 &amp; SICH), SIR-C, TRAV.SAR, and VSAR.</p>	Use expected to increase.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add ITU footnotes (S5.330 and S5.331); and 2) to add RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space).

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
1300– 1350	AERONAUTICAL RADIONAVIGATION Radiolocation  S5.149 S5.337 G2	None	<b>Aero-Radionav.</b> This band is used heavily for radiolocation and radionavigation performing long-range air surveillance and enroute air-traffic control functions. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control. <b>FAA Aero-Radionav.</b> The FAA and aviation users depend upon air-route surveillance radars (ARSRs) to obtain aircraft position information in support of enroute air-traffic control. <b>Military Aero-Radionav.</b> The Air Force and Navy make use of it for high-power long-range surveillance radars and air-traffic control radars, in support of national defense missions. <b>Drug Interdiction.</b> In this application, radar equipment is mounted on tethered balloons along the southern border of the U.S. to detect low-flying aircraft entering U.S. airspace. <b>Radio Astronomy.</b> Observations are made of highly redshifted hydrogen spectral lines that occur in the 1330– 1350 MHz band.	Use expected to increase.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to: 1) add footnote S5.337A; and 2) add RADIONAVIGATION-SATELLITE (Earth-to-space).
1350– 1369.05	FIXED MOBILE RADIOLOCATION  S5.149 S5.334 G2 US311 G27 G114	AERONAUTICAL RADIONAVIGATION S5.334	<b>Military Radars.</b> This band is heavily used for various military radiolocation applications for high-power long-range surveillance radars. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control. <b>Radio Astronomy.</b> Radio astronomy observations are made in this band of highly redshifted hydrogen spectral lines that occur in this band. Knowledge of other galaxies and the early universe comes from these observations. <b>Passive Research.</b> NASA performs passive space research and Earth exploration-satellite observations. <b>Fixed &amp; Mobile.</b> This band is seeing increased use for fixed links and mobile links since the Federal fixed and mobile service allocations were upgraded to primary in 1989.	No changes are planned. Use expected to increase.
1369.05– 1370	FIXED MOBILE RADIOLOCATION  S5.149 US311 S5.334 G2 G27 G114	FIXED SATELLITE G114  MOBILE SATELLITE G114  AERONAUTICAL RADIONAVIGATION S5.334	<b>Military Radars.</b> This band is heavily used for various military radiolocation applications for high-power long-range surveillance radars. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control. <b>Radio Astronomy.</b> Radio astronomy observations are made in this band of highly redshifted hydrogen spectral lines that occur in this band. Knowledge of other galaxies and the early universe comes from these observations. <b>Passive Research.</b> NASA performs passive space research and Earth exploration-satellite observations. <b>Fixed &amp; Mobile.</b> This band is seeing increased use for fixed links and mobile links since the Federal fixed and mobile service allocations were upgraded to primary in 1989. <b>Telecommand Ops.</b> DOD uses this band for drone telecommand at military test ranges.	No changes are planned. Use expected to increase.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
1370–1393.05	FIXED MOBILE RADIOLOCATION  S5.149 US311 S5.334 S5.339 G2 G27 G114	FIXED SATELLITE G114  MOBILE SATELLITE G114  Space Research (passive) S5.339  Earth Exploration-Satellite (passive) S5.339	<b>Military Radars.</b> This band is heavily used for various military radiolocation applications for high-power long-range surveillance radars. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control. <b>GPS.</b> GPS operates on 1381.05 to relay data on nuclear bursts detected by orbiting satellites. This specific requirement is limited to U.S. satellites. <b>Radio Astronomy.</b> Observations are made of highly redshifted hydrogen spectral lines that occur in this band. Knowledge of other galaxies and the early universe comes from these observations. <b>Passive Research.</b> NASA performs passive space research and Earth exploration-satellite observations. The band 1370–1400 MHz is used for remote sensing of salinity and soil moisture. <b>Fixed &amp; Mobile.</b> This band is seeing increased use for fixed links and mobile links, since the Federal fixed and mobile service allocations were upgraded to primary in 1989.	NTIA identified 1390–1400 MHz for reallocation under OBRA–93, and reallocated to the private sector on Jan 1, 1999.
1393.05–1400	FIXED MOBILE RADIOLOCATION  S5.149 US311 S5.334 S5.339 G2 G27	Space Research (passive) S5.339  Earth Exploration-Satellite (passive) S5.339	<b>Military Radars.</b> This band is used for various military radiolocation applications for high-power long-range surveillance radars. The DOD and FAA recently deployed a modernized Air-Route Surveillance Radar Model 4 (ARSR-4) in this band for air-defense, drug interdiction and air-traffic control. <b>Fixed &amp; Mobile.</b> This band is seeing increased use for fixed links and mobile links, since the Federal fixed and mobile service allocations were upgraded to primary in 1989. <b>Passive Research.</b> NASA performs passive space research and Earth exploration-satellite observations. The band 1370–1400 MHz is used for remote sensing of salinity and soil moisture. <b>Radio Astronomy.</b> Radio astronomy observations are made in this band of highly redshifted hydrogen spectral lines that occur in this band. Knowledge of other galaxies and the early universe comes from these observations. <b>Medical Telemetry.</b> Various Federal agencies operate medical telemetry devices in the 1395–1400 MHz band throughout the United States.	NTIA identified 1390–1400 MHz for reallocation under OBRA–93, and reallocated to the private sector on Jan 1, 1999; however, 17 Federal sites will continue to operate for 14 years (see NTIA Report SP 95-32). The band 1385-1390 MHz was returned per the Defense Authorization Act of 2000.
1400– 1427	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246 S5.341	None	<b>Passive Research.</b> Space-based observations and measurements to advance many areas of global change research such as sea salinity and temperature measurements, soil moisture, etc. are made in this band. <b>Radio Astronomy.</b> Hydrogen line observations are made in this band.	Scientific research is expected to continue and increase in this band.
1427– 1429	FIXED MOBILE except aeronautical mobile SPACE OPERATION (Earth-to-space)  S5.341 G30	None	None	Under the OBRA–93 and BBA–97, the band 1427–1435 MHz was identified for reallocation for exclusive non-Federal government use on January 1999; however, 14 sites were identified to allow essential Federal operations to continue until January 2004.

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1429– 1435	FIXED MOBILE  S5.341 G30	None	<b>Fixed &amp; Mobile.</b> Though this band was reallocated for exclusive non-Federal use, essential Federal operations will continue at 14 sites until January 2004. <b>Medical Telemetry.</b> Various Federal agencies operate medical telemetry devices in the 1429–1435 MHz band throughout the United States.	Under the OBRA–93 and BBA–97, the band 1427–1435 MHz was identified for reallocation for exclusive non-Federal government use on January 1999; however, 14 sites were identified to allow essential Federal operations to continue until January 2004.
1435– 1525	MOBILE (Aeronautical telemetry) S5.343  S5.341 US78	None	<b>Aeronautical Telemetry.</b> Vital and extensive use of the band 1435– 1535 MHz is for aeronautical telemetry and associated telecommand operations for flight testing of manned or unmanned aircraft and missiles, or their major components as well as for equipment development functions.	No changes are planned. Use expected to continue.
1525– 1530	MOBILE-SATELLITE (space-to-Earth) Earth Exploration- Satellite Fixed Mobile S5.343  S5.341 S5.351 S5.354 US78	None	<b>INMARSAT.</b> Naval and USCG ships and vessels use INMARSAT for distress and safety communications as well as for general communications services. <b>Aeronautical Telemetry.</b> Vital and extensive use of the band 1435– 1535 MHz is for aeronautical telemetry and associated telecommand operations for flight testing of manned or unmanned aircraft and missiles, or their major components as well as for equipment development functions.	No changes are planned. Use expected to continue.
1530– 1533	MOBILE-SATELLITE (space-to-Earth) Mobile (Aeronautical Telemetry)  S5.341 S5.351 S5.354 US78 US315	None	<b>INMARSAT.</b> Naval and Coast Guard ships and vessels use INMARSAT for distress and safety communications (1530– 1545 MHz, space-to-Earth) as well as for general communications services. <b>Aeronautical Telemetry.</b> Vital and extensive use of the band 1435– 1535 MHz is for aeronautical telemetry and associated telecommand operations for flight testing of manned or unmanned aircraft and missiles, or their major components as well as for equipment development functions.	No changes are planned. Use expected to continue.
1533– 1535	MOBILE-SATELLITE (space-to-Earth) Mobile (Aeronautical Telemetry)  S5.341 S5.351 S5.352 S5.354 US78 US315	None	<b>INMARSAT.</b> Naval and Coast Guard ships and vessels use INMARSAT for distress and safety communications (1530– 1545 MHz, space-to-Earth) as well as for general communications services. <b>Aeronautical Telemetry.</b> Vital and extensive use of the band 1435– 1535 MHz is for aeronautical telemetry and associated telecommand operations for flight testing of manned or unmanned aircraft and missiles, or their major components as well as for equipment development functions.	No changes are planned. Use expected to continue.
1535– 1544	MOBILE-SATELLITE (space-to-Earth)  S5.341 S5.351 S5.353A S5.354 S5.356 S5.357A US308 US309 US315	None	<b>INMARSAT.</b> INMARSAT downlinks to various Federal agencies' for operational use.	No changes are planned. Use expected to continue.
1544– 1545	MOBILE-SATELLITE (space-to-Earth)  S5.341 S5.351 S5.353A S5.354 S5.356 S5.357A US308 US309 US315	None	<b>SARSAT.</b> NOAA search and rescue satellites (SARSAT) retransmit emergency transmitter signal on 1544.5 MHz to surface stations.	No changes are planned. Use expected to continue.

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1545–1549.5	MOBILE-SATELLITE (space-to-Earth)  S5.341 S5.351 S5.353A S5.354 S5.356 S5.357A US308 US309 US315	None	<b>Mobile Satellite.</b> Federal government agencies are users of commercial mobile satellite services offered in this band. <b>FAA:</b> Uses INMARSAT for safety-related communications during enroute oceanic flights.	No changes are planned.  Satellite communications will continue for the foreseeable future.
1549.5–1555	MOBILE-SATELLITE (space-to-Earth)  S5.341 S5.351 S5.353A S5.354 S5.356 S5.357A US308 US309 US315	None	<b>Mobile Satellite.</b> Federal government agencies are users of commercial mobile satellite services offered in this band. <b>FAA:</b> Uses INMARSAT for safety-related communications during enroute oceanic flights.	No changes are planned.  Satellite communications will continue for the foreseeable future.
1555–1559	AERONAUTICAL MOBILE-SATELLITE (R) (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)  S5.341 S5.351 S5.353A S5.354 S5.356 S5.362A US308 US309 US315	None	<b>Mobile Satellite.</b> Federal government agencies are users of commercial mobile satellite services offered in this band. <b>FAA:</b> Uses INMARSAT for safety-related communications during enroute oceanic flights.	No changes are planned.  Satellite communications will continue for the foreseeable future.
1559–1610	AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth)  G126 US208 US260 S5.341	Aeronautical Mobile US260	<b>GPS.</b> The Global Positioning System operates on 1575.42 MHz ± 12 MHz (L1 link) as part of the radionavigation-satellite service. The GPS is a multisatellite system with large numbers of U.S. and international users. ICAO has recognized the GPS and GLONASS as the two principal candidates for the Global Navigation Satellite System. <b>NASA Research.</b> Operates active sensor flight instruments such as SAR (JERS-1 & SICH), SIR-C, TRAV.SAR, VSAR.	Use expected to continue.  As the U.S. transitions to satellite-base navigation, the FAA is developing a GPS wide area augmentation sys (WAAS) as a safety-critical sys for aviation users to support en route through precision approach navigation. The WAAS will operate as an overlay on the GPS L1 link in the 1559–1610 MHz band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to: 1) add RADIONAVIGATION-SATELLITE (space-to-space); and 2) add ITU footnotes (S5.330 and S5.331).
1610–1610.6	AERONAUTICAL RADIONAVIGATION US260 RADIO DETERMINATION-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) US319  US208 US319 S5.341 S5.364 S5.366 S5.367 S5.368 S5.372 S5.385	AERONAUTICAL MOBILE-SATELLITE (R) S5.367  Aeronautical Mobile US260  Radio Astronomy S5.385	<b>Radio Astronomy.</b> NASA operates a deep space system 70-meter antenna in support of radio astronomy observations. Radio Astronomy observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Use expected to continue.

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1610.6–1613.8	AERONAUTICAL RADIONAVIGATION US260 RADIO DETERMINATION- SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) US319 RADIO ASTRONOMY  US208 S5.149 S5.341 S5.364 S5.366 S5.367 S5.368 S5.372	AERONAUTICAL RADIONAVIGATION SATELLITE S5.366  Aeronautical Mobile US260  AERONAUTICAL MOBILE-SATELLITE (R) S5.367	<b>Radio Astronomy.</b> NASA operates a deep space system 70-meter antenna in support of radio astronomy observations. Radio Astronomy observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Scientific research is expected to continue and increase in this band.
1613.8–1626.5	AERONAUTICAL RADIONAVIGATION US260 RADIO DETERMINATION- SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) US319 Mobile-Satellite (space-to-Earth)  US208 S5.341 S5.364 S5.365 S5.366 S5.367 S5.372 S5.368	AERONAUTICAL RADIONAVIGATION-SATELLITE S5.366  Aeronautical Mobile US260  AERONAUTICAL MOBILE-SATELLITE (R) S5.367	<b>Mobile Satellite.</b> Federal government agencies are users of commercial mobile satellite services offered in this band supporting terrestrial, ship, and airborne scientific research experiments and missions.	No changes are planned. Use expected to continue.
1626.5–1645.5	MOBILE-SATELLITE (Earth-to-space)  S5.341 S5.351 S5.353 S5.354 S5.357A MOD S5.374 S5.375 S5.376 US308 US309 US315	None	<b>INMARSAT.</b> Federal government agencies are users of commercial INMARSAT mobile satellite services offered in this band in support of natural disasters and various contingencies.	No changes are planned. Use expected to continue.
1645.5–1646.5	MOBILE-SATELLITE (Earth-to-space)  S5.341 S5.351 S5.353 S5.354 S5.357A MOD S5.374 S5.375 S5.376 US308 US309 US315	None	<b>Distress &amp; Safety.</b> Transmission in this band by the MSS and ISS links is limited to distress and safety communications (S5.375).	No changes are planned. Use expected to continue.
1646.5–1656.5	MOBILE-SATELLITE (Earth-to-space)  S5.341 S5.351 S5.353 S5.354 S5.357A MOD S5.374 S5.375 S5.376 US308 US309 US315	None	<b>Radiosonde.</b> Federal agencies conduct radiosonde operations in this band. <b>FAA:</b> Uses INMARSAT for safety-related communications during enroute oceanic flights.	No changes are planned. Satellite communications will continue for the foreseeable future.
1656.5–1660	MOBILE-SATELLITE (Earth-to-space) AERONAUTICAL MOBILE-SATELLITE (R) (Earth-to-space) RADIO ASTRONOMY  S5.149 S5.341 S5.351 S5.354 S5.362A S5.375 MOD S5.374 S5.376 US308 US309 US315	None	<b>FAA:</b> Uses INMARSAT for safety-related communications during enroute oceanic flights. <b>NASA DSN Radio Astronomy.</b> NASA operates a deep space system 70-meter antenna in support of radio astronomy observations. Radio Astronomy observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Scientific research is expected to continue and increase in this band. Satellite communications will continue for the foreseeable future.

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1660–1660.5	MOBILE-SATELLITE (Earth-to-space) AERONAUTICAL MOBILE-SATELLITE (R) (Earth-to-space) RADIO ASTRONOMY  S5.149 S5.341 S5.351 S5.354 S5.362A S5.375 MOD S5.374 S5.376 US308 US309 US315	None	<b>FAA:</b> Uses INMARSAT for safety-related communications during enroute oceanic flights. <b>NASA DSN Radio Astronomy.</b> NASA operates a deep space system 70-meter antenna in support of radio astronomy observations. Radio Astronomy observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Scientific research is expected to continue and increase in this band.  Satellite communications will continue for the foreseeable future.
1660.5–1668.4	RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246 S5.341	None	<b>NASA DSN Radio Astronomy.</b> NASA operates a deep space system 70-meter antenna in support of radio astronomy observations. Radio Astronomy observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Scientific research is expected to continue and increase in this band.
1668.4–1670	METEOROLOGICAL AIDS (Radiosonde) RADIO ASTRONOMY  S5.149 US74 US99 S5.341	None	<b>NASA DSN Radio Astronomy.</b> NASA operates a deep space system 70-meter antenna in support of radio astronomy observations. Radio Astronomy observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Scientific research is expected to continue and increase in this band.
1670–1675	METEOROLOGICAL AIDS (Radiosonde) METEOROLOGICAL-SATELLITE (space-to-Earth)  US211 S5.341	None	<b>Radiosondes.</b> Numerous Federal agencies conduct radiosonde operations in the collection of meteorological data.	The 1670–1675 MHz band was identified for reallocation to the private sector on Jan 1, 1999 under OBRA–93. Use is TBD.
1675–1690	METEOROLOGICAL AIDS (Radiosonde) METEOROLOGICAL-SATELLITE (space-to-Earth)  US211 S5.341	None	<b>WXD Satellite.</b> NOAA operates the GOES I through M meteorological satellites in this band. NASA supports NOAA operations at the GSFC. <b>Radiosondes.</b> Numerous Federal agencies conduct radiosonde operations in the collection of meteorological data.	No changes are planned. Use expected to continue.
1690–1700	METEOROLOGICAL AIDS (Radiosonde) METEOROLOGICAL-SATELLITE (space-to-Earth)  S5.289 S5.341	Earth Exploration Satellite S5.289	<b>WXD Satellite.</b> NOAA operates the GOES I through M as well as the TIROS-N meteorological satellites in this band. NASA supports NOAA operations at the GSFC. <b>Radiosondes.</b> Numerous Federal agencies conduct radiosonde operations in the collection of meteorological data.	No changes are planned. Use expected to continue.
1700–1710	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth)  S5.289 S5.341 G118	Earth Exploration Satellite S5.289	<b>WXD Satellite.</b> NOAA operates the TIROS-N meteorological satellite in this band. NASA supports NOAA operations at the GSFC. <b>Point-to-Point.</b> Numerous Federal agencies operate fixed point-to-point microwave systems in this band.	No changes are planned. Use expected to continue.
1710–1718.8	FIXED MOBILE  S5.341	None	<b>Point-to-Point.</b> Numerous Federal agencies operate fixed point-to-point medium capacity microwave systems in this band for such purposes as hydropower and dam control, air traffic control communications, Federal law enforcement, natural resource management, tactical radio relay. <b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control.	Under the OBRA–93, the band 1710–1755 MHz was identified for reallocation to the private sector for mixed use on January 1999. Use is TBD. Also under OBRA–93, 16 Federal sites providing essential operations will be retained indefinitely in the band 1710–1755 MHz.

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1718.8–1722.2	FIXED MOBILE  US256 S5.341	Radio Astronomy US256	<b>Point-to-Point.</b> Numerous Federal agencies operate fixed point-to-point medium capacity microwave systems in this band for such purposes as hydropower and dam control, air traffic control communications, Federal law enforcement, natural resource management, tactical radio relay. <b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control. <b>Radio Astronomy.</b> Observations are performed in this band to study the hydroxyl radical spectral lines allowing study of stellar and expansion velocities, validate theories of the origins, and evolution of the Universe.	Under the OBRA–93, the band 1710– 1755 MHz was identified for reallocation to the private sector for mixed use on January 1999. Use is TBD. Approximately 16 Federal sites providing essential operations will be retained indefinitely in the band 1710– 1755 MHz.
1722.2–1761	FIXED MOBILE  S5.341	None	<b>Point-to-Point.</b> Numerous Federal agencies operate fixed point-to-point medium capacity microwave systems in this band for such purposes as hydropower and dam control, air traffic control communications, Federal law enforcement, natural resource management, tactical radio relay. <b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control. Additionally, some agencies are using WLANs and tactical point-to-point communications systems in the 1755–1850 MHz band.	Under the OBRA–93, the band 1710– 1755 MHz was identified for reallocation to the private sector for mixed use on January 1999. Use is TBD. Approximately 16 Federal sites providing essential operations will be retained indefinitely in the band 1710– 1755 MHz.
1761– 1842	FIXED MOBILE  S5.341 G42	SPACE OPERATIONS G42	<b>Space Ops.</b> The Air Force Satellite Control Network and Satellite Ground Link Subsystem users have uplink channels for the tracking and telecommand of various NGSO satellites. <b>NASA.</b> This band is used for Shuttle payload interrogation and for data air telemetry links. <b>Point-to-Point.</b> Numerous Federal agencies operate fixed point-to-point medium capacity microwave systems in this band for such purposes as hydropower and dam control, air traffic control communications, Federal law enforcement, natural resource management, tactical radio relay. <b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control. Additionally, some agencies are using WLANs and tactical point-to-point communications systems in the 1755–1850 MHz band.	Use expected to increase.
1842– 1850	FIXED MOBILE  S5.341	None	<b>Point-to-Point.</b> Numerous Federal agencies operate fixed point-to-point medium capacity microwave systems in this band for such purposes as hydropower and dam control, air traffic control communications, Federal law enforcement, natural resource management, tactical radio relay. <b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control. Additionally, some agencies are using WLANs and tactical point-to-point communications systems in the 1755–1850 MHz band.	Use expected to increase.
1850– 1930	None	None	None	No changes are planned.
1930– 1970	None	None	None	No changes are planned.
1970– 1980	None	None	None	No changes are planned.
1980– 1990	None	None	None	No changes are planned.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
1990– 2025	None	None	<b>Experimental.</b> Numerous experimental antenna test stations checkout frequency response of transmit and receive antennas.	Use expected to continue.
2025– 2035	SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) SPACE RESEARCH (Earth-to-space) (Space-to-space)  S5.392 MOD US90 US346 US374	None	<b>NASA.</b> The 2025–2110 MHz band is the primary telecommand band used for the control of Agency mission spacecraft. The band is used for uplinks direct from ground stations and for forward links via the TDRSS. <b>WXD Satellite.</b> The NOAA GOES (I through M) meteorological satellites operate in this band.	No changes are planned. Use expected to continue.
2035– 2110	SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) SPACE RESEARCH (Earth-to-space) (Space-to-space)  S5.391 S5.392 MOD US90 US336 US347	None	<b>TDRSS.</b> NASA GSO Tracking and Data Relay Satellite System (TDRSS) . <b>NASA Uplinks.</b> NASA telecommand uplinks supporting Hubble Space Telescope, NASA atmospheric research satellite, cosmic background explorer satellite, ERBS, NIMB US-7, LANDSAT 4 & 5, the space shuttle missions, High Energy Transient Experiment (HETE), SeaStar Ocean Color Project, Microlab-1 mission, Fast Auroral Snapshot Explorer (FAST), Submillimeter Wave Astronomy Satellite, Earth Observing Sys AM (EOS-AM), advanced composition explorer (ACE), AMPTE, Advanced X-ray Astrophysics Facility-Imaging Satellite Sys, Polar Plasma Laboratory Satellite Sys, Student Nitric Oxide Explorer (SNOE) Satellite Sys, Tomographic Experiment using Radioactive Recombinative Ionospheric EUV and Radio Sources (TERRIERS), Transition Region and Coronal Explorer (TRACE), Wide-Field Infrared Explorer (WIRE) Satellite Sys, METEOSAT-3, a temporary gapfiller for the GOES meteorological satellite.	No changes are planned. Use expected to continue.
2110– 2120	SPACE RESEARCH (deep space) (Earth-to-space) US252  US111	None	<b>NASA Deep Space.</b> NASA tracking and command of deep space probes Voyager 1 (Jupiter and beyond) ,Voyager 2 (Jupiter, Saturn, and beyond), Galileo (Jupiter), and the NASA/ESA cooperative Ulysses mission (formerly International Solar Polar Mission).	No changes are planned. Use expected to continue.
2120– 2130	None	None	<b>Experimental.</b> Experimental antenna test station evaluating antenna patterns is done in this band.	Use expected to continue.
2130– 2150	None	None	<b>Experimental.</b> Experimental antenna test station evaluating antenna patterns is done in this band.	Use expected to continue.
2150– 2160	None	None	<b>Experimental.</b> Experimental ground testing of transmitters.	Use expected to continue.
2160– 2165	None	None	None	No changes are planned.
2165– 2170	None	None	None	No changes are planned.
2170– 2200	None	None	<b>Experimental.</b> Various Federal experimental test stations operate in this band.	Use expected to continue.

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2200– 2285	FIXED (LOS* only) MOBILE (LOS only including aeronautical telemetering, but excluding flight testing of manned aircraft) SPACE RESEARCH (space-to-Earth) (space-to-space) SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to- space)  S5.392 MOD S5.391 US302	None	<b>TT&amp;C.</b> Primary tracking, telemetry, and control (TT&C) links for Federal Government and commercial expendable launch vehicles (ELV). Commercial launches are supported by DOD on a case-by-case basis. <b>Space Research.</b> NASA space research station supporting NASA'S tethered satellite system (TSS), High Energy Transient Experiment (HETE), NIMB US-7, Fast Auroral Snapshot Explorer (FAST), Submillimeter Wave Astronomy Satellite, Advanced X-ray Astrophysics Facility-Imaging Satellite System, Polar Plasma Laboratory Satellite System, Student Nitric Oxide Explorer (SNOE) Satellite System, Tomographic Experiment using Radioactive Recombinative Ionospheric EUV and Radio Sources (TERRIERS), Transition Region and Coronal Explorer (TRACE), Wide-Field Infrared Explorer (WIRE) Satellite Systems, and the Technology Experiment Augmenting Spartan (TEXAS), and its space research program DE-A in this band. <b>NASA Downlinks.</b> The 2200–2290 MHz band is the primary telemetry band used by Agency mission spacecraft. The band is used for direct downlinks to Earth stations and for return links via the TDRSS.	No changes are planned. Use expected to continue.
2285– 2290	FIXED (LOS* only) MOBILE (LOS only including aeronautical telemetering, but excluding flight testing of manned aircraft) SPACE RESEARCH (space-to-Earth) (space-to-space) SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to- space)  MOD S5.391 US303 S5.392	None	<b>TT&amp;C.</b> TT&C downlinks via TDRSS. <b>NASA Telemetry.</b> Telemetry data from Hubble Space Telescope <b>NASA Downlinks.</b> Earth Exploration-satellite downlink from NASA SeaStar Ocean Color Project, Earth Observing System AM (EOS-AM), and the X-ray Timing Explorer (XTE).	No changes are planned. Use expected to continue.
2290– 2300	FIXED MOBILE (except aeronautical mobile) SPACE RESEARCH (space-to-Earth) (Deep Space only)	None	<b>NASA Deep Space.</b> Space communications from NASA deep space probes Voyager 1 (Jupiter and beyond), Voyager 2 (Jupiter, Saturn, and beyond), Galileo (Jupiter), the NASA/ESA cooperative Ulysses mission (formerly International Solar Polar Mission), advanced composition explorer (ACE) spacecraft used in tracking, ranging, and command.	No changes are planned. Use expected to continue.
2300– 2305	None  G123	None	<b>Experimental.</b> Various experimental test stations operate in this band as well as other systems that are not in conformance with the National Table of Frequency Allocations.	Under OBRA–93, this band was reallocated to the private sector for exclusive non-government use on Aug 95.
2305– 2310	None  US338 G123	None	<b>Experimental.</b> Various experimental test stations operate in this band as well as other systems that are not in conformance with the National Table of Frequency Allocations.	Under OBRA–93, this band was reallocated to the private sector for exclusive non-government use on Aug 95.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
2310– 2320	Fixed Mobile US339 Radiolocation G2  S5.396 US327 US338 G120	None	<b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	No changes are planned. Use expected to continue.
2320– 2345	Fixed Mobile US276 Radiolocation G2  S5.396 US327 US328 G120	None	<b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground video telemetry, air combat training systems, guided weapons systems and robotics control. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	No changes are planned. Use expected to continue.
2345– 2360	Fixed Mobile US339 Radiolocation G2  S5.396 US327 G120	None	<b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground telemetry and robotics control. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	The wireless communications service will operate in this band and consists of fixed, mobile, satellite DARS, and radiolocation services.  Use expected to continue.
2360– 2390	MOBILE US276 RADIOLOCATION G2 Fixed  G120	None	<b>Fixed &amp; Mobile.</b> Mobile use both on ground and airborne are for air-to-ground telemetry and robotics control. <b>Telemetry.</b> The 2360–2385 MHz band is used for defense and commercial aerospace purposes for telemetry in the flight testing and operation of aircraft, spacecraft, missiles, and scientific balloons at military test ranges and NASA centers. <b>Radio Astronomy.</b> Arecibo operates a planetary radar system on 2380 MHz. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	The 2385– 2390 MHz band was identified for reallocation to the private sector on January 1, 2005 under the BBA–97. Use is expected for Unlicensed PCS.  Use expected to continue.
2390– 2400	None  G122	None	<b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	The 2390– 2450 MHz band was identified for reallocation to the private sector on January 1, 2005 under OBRA 93.  Use expected to continue.
2400– 2402	None  S5.150 G123	ISM S5.150	<b>NASA Downlinks.</b> NASA operates an RF modem link to provide internet connectivity for international support of Russia /US space missions. <b>Manned Flight.</b> Band to used on NIB basis for wireless LAN operations aboard the international space station. <b>ISM.</b> The band 2400-2500 MHz (center frequency 2450 MHz) is designated for industrial, scientific and medical (ISM) applications. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	The 2390– 2450 MHz band was identified for reallocation to the private sector on January 1, 2005 under OBRA 93.  Use expected to continue.
2402– 2417	None  S5.150 G122	ISM S5.150	<b>NASA Downlinks.</b> NASA operates an RF modem link to provide internet connectivity for international support of Russia /US space missions. <b>Manned Flight.</b> Band to used on NIB basis for wireless LAN operations aboard the international space station. <b>ISM.</b> The band 2400-2500 MHz (center frequency 2450 MHz) is designated for industrial, scientific and medical (ISM) applications. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	The 2390– 2450 MHz band was identified for reallocation to the private sector on January 1, 2005 under OBRA 93.  Use expected to continue.

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2417– 2450	Radiolocation G2  S5.150 S5.282 G124	ISM S5.150	<b>NASA Downlinks.</b> NASA operates an RF modem link to provide internet connectivity for international support of Russia / US space missions. <b>Manned Flight.</b> Band to used on NIB basis for wireless LAN operations aboard the international space station. <b>ISM.</b> The band 2400-2500 MHz (center frequency 2450 MHz) is designated for industrial, scientific and medical (ISM) applications. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	The 2390– 2450 MHz band was identified for reallocation to the private sector on January 1, 2005 under OBRA 93.  Use expected to increase.
2450– 2483.5	None  S5.150 US41	Radiolocation US41  ISM S5.150	<b>NASA Downlinks.</b> NASA operates an RF modem link to provide internet connectivity for international support of Russia / US space missions. <b>Manned Flight.</b> Band to used on NIB basis for wireless LAN operations aboard the international space station. <b>ISM.</b> The band 2400-2500 MHz (center frequency 2450 MHz) is designated for industrial, scientific and medical (ISM) applications. <b>Fixed.</b> Some point-to-point microwave systems support Federal operations in this band. <b>Experimental.</b> Various experimental test stations perform RDT&E activities in this band.	No changes are planned. Use expected to increase.
2483.5– 2500	MOBILE-SATELLITE (space-to-Earth) US319 RADIODETERMINATION-SATELLITE (space-to-Earth) S5.398  S5.150 US41 S5.402	Radiolocation US41  ISM S5.150	<b>Point-to-Point.</b> NASA also operates point-to-point microwave links at some of its centers to its outlying sites in support of space programs. <b>Manned Flight.</b> Band to used on NIB basis for wireless LAN operations aboard the international space station. <b>Tactical &amp; Training.</b> Various tactical and training operations are conducted in various military test ranges. <b>ISM.</b> The band 2400-2500 MHz (center frequency 2450 MHz) is designated for industrial, scientific and medical (ISM) applications. <b>Experimental.</b> NASA conducts experimental testing of satellite transmitters supporting the NASA Commercial Experimental Transporter (COMET).	No changes are planned. Use expected to continue.
2500– 2520	None  US205 US269	None	<b>Tactical &amp; Training.</b> Tactical and training operations are conducted at various military test ranges on an NIB basis.	Use expected to continue.
2520– 2640	None  US205 US269 S5.339	None	<b>Broadcasting.</b> An authorized mutual aid agreement is in effect for educational support to a local community. <b>Experimental.</b> Experimental testing of communications equipment is conducted. <b>Tactical &amp; Training.</b> Tactical and training operations are conducted at various military test ranges on an NIB basis.	Use expected to continue.
2640– 2655	None  US205 US269 S5.339	Space Research (Passive) S5.339  Earth Exploration-Satellite (Passive) S5.339	<b>Radio Astronomy.</b> Observations of the cosmos are made in the band 2640-2750 MHz to study the low galactic background radiation and both the ionized hydrogen clouds and general diffuse radiation of the Galaxy.	Scientific research is expected to continue and increase in this band.
2655– 2670	Earth Exploration Satellite (passive) Radio Astronomy Space Research (passive)  US205 US269	None	<b>Radio Astronomy.</b> Observations of the cosmos are made in the band 2640-2750 MHz to study the low galactic background radiation and both the ionized hydrogen clouds and general diffuse radiation of the Galaxy.	Scientific research is expected to continue and increase in this band.

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2670– 2690	Earth Exploration-Satellite (Passive) Radio Astronomy Space Research (passive)  US205 US269	None	<b>Space Research.</b> Space-based observations and measurements to advance many areas of global change research such as water salinity, soil moisture, etc. are made in this band. <b>Radio Astronomy.</b> Observations of the cosmos are made in the band 2640-2750 MHz to study the low galactic background radiation and both the ionized hydrogen clouds and general diffuse radiation of the Galaxy.	Scientific research is expected to continue and increase in this band.
2690– 2700	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246	None	<b>Space Research.</b> Space-based observations and measurements to advance many areas of global change research such as water salinity, soil moisture, etc. are made in this band. <b>Radio Astronomy.</b> Observations of the cosmos are made in the band 2640-2750 MHz to study the low galactic background radiation and both the ionized hydrogen clouds and general diffuse radiation of the Galaxy.	Scientific research is expected to continue and increase in this band.
2700– 2900	AERONAUTICAL RADIONAVIGATION METEOROLOGICAL AIDS Radiolocation  US18 S5.337 S5.423 G2 G15	None	<b>Surveillance Radars.</b> The FAA and military services operate airport surveillance radars in this band for the management and control of aircraft in at around airports and military installations. <b>WXD Radars.</b> Large numbers of weather radars, including NEXRAD, operate in this band. <b>Radio Astronomy.</b> Observations of the cosmos are made in the band 2640-2750 MHz to study the low galactic background radiation and both the ionized hydrogen clouds and general diffuse radiation of the Galaxy.	No changes are planned. Use expected to continue.
2900– 3000	MARITIME RADIONAVIGATION Radiolocation  US44 US316 S5.427 G56	METEOROLOGICAL AIDS US316	<b>Maritime Radionav.</b> The Coast Guard and, to a lesser degree, the Navy operate numerous radar beacons and radiolocation systems providing maritime radionavigation services. <b>Military Radars.</b> This band is used by the military services' radiolocation systems throughout the U.S. <b>WXD Radars.</b> The Federal government's NEXRAD weather radars operate in this band.	Use expected to continue. WRC-03 agenda item to pursue co-primary radiolocation allocation.
3000– 3100	MARITIME RADIONAVIGATION Radiolocation  US44 S5.427 G56	None	<b>Military Radars.</b> This band is extensively used by the military services' radiolocation systems throughout the U.S. <b>Maritime Radionav.</b> The Coast Guard and, to a lesser degree, the Navy operate maritime radionavigation systems in this band.	Use expected to continue. WRC-03 agenda item to pursue co-primary radiolocation allocation.
3100– 3300	RADIOLOCATION Earth Exploration-Satellite (active)  Space Research (active)  MOD S5.149 US110 G59	None	<b>Military Radars.</b> This band is extensively used by all the military services' radiolocation systems throughout the U.S. <b>Space Research.</b> NASA space-based measurements supporting geodetic and geologic sciences, etc., are made in this band.	No changes are planned. Use expected to increase.
3300– 3400	RADIOLOCATION  S5.149 US108 G31	None	<b>Military Radars.</b> This band is extensively used by the military services' radiolocation systems throughout the U.S.	No changes are planned. Use expected to increase.
3400– 3410	RADIOLOCATION  S5.149 US108 S5.282 G31	None	<b>Military Radars.</b> This is a critical radar band and is used extensively by all the military services.	No changes are planned. Use expected to increase.
3410– 3500	RADIOLOCATION  S5.149 US108 G31	None	<b>Military Radars.</b> This is a critical radar band and is used extensively by all the military services.	No changes are planned. Use expected to increase.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
3500– 3600	AERONAUTICAL RADIONAVIGATION (Ground-based) RADIOLOCATION US110 G59 G110	None	<b>Military Radars.</b> This is a critical radar band and is used extensively by all the military services. In particular, the U.S. Navy uses this band for surveillance and precision approach radars to support its naval air operations.	No changes are planned. Use expected to continue.
3600– 3700	AERONAUTICAL RADIONAVIGATION (Ground-based) RADIOLOCATION US110 US245 G59 G110	None	<b>Military Radars.</b> This is a critical radar band and is used extensively by all the military services. In particular, the military services operate fixed and mobile radionavigational systems in this band as well as performing sensor and navigational system calibrations. <b>Experimental.</b> Research, developmental, test and evaluation of various radiolocation devices are made in this band.	The 3650– 3700 MHz band was reallocated to the private sector on Jan 1, 1999 under OBRA–93. Use expected to continue.
3700– 4200	None	None	<b>Earth Stations.</b> The military services operate earth stations that receive voice, data, video signals from an international common carrier GSO satellite system. <b>Experimental.</b> Various Federal agencies operate test stations of radiolocation systems on an NIB basis.	Use expected to increase.
4200– 4204	AERONAUTICAL RADIONAVIGATION US261 S5.440	None	<b>Aero-Radionav.</b> Aircraft operate radio altimeters in this band. <b>Passive Sensing.</b> NASA conducts passive remote sensing of sea surface topography and sea temperature, currents, and wind speed.	No changes are planned. Use expected to continue.
4204– 4400	AERONAUTICAL RADIONAVIGATION US261 S5.440	None	<b>Aero-Radionav.</b> Aircraft operate radio altimeters in this band. <b>Passive Sensing.</b> NASA conducts passive remote sensing of sea surface topography and sea temperature, currents, and wind speed.	No changes are planned. Use expected to continue.
4400– 4500	FIXED MOBILE	None	<b>Tactical &amp; Training.</b> This band is heavily used for military tactical and training communications, both for line-of-sight, troposcatter and tactical data links. <b>NASA.</b> Used on NIB basis for development of aircraft video downlinks.	No changes are planned. Use expected to increase.
4500– 4635	FIXED MOBILE US245	None	<b>Tactical &amp; Training.</b> This band is heavily used for military tactical and training communications, both for line-of-sight and troposcatter. Additionally, the DOD operates tactical data links, drone command and control systems, and numerous other systems. <b>NASA.</b> Used on NIB basis for development of aircraft video downlinks. <b>Radio Astronomy.</b> Continuum observations are performed in this band.	No changes are planned. Use expected to increase.
4635– 4660	None US245 G125	None	<b>Fixed &amp; Mobile.</b> On an NIB basis, numerous Federal fixed operations use this band for point-to-point microwave, air combat training systems, tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> Continuum observations are performed in this band.	The 4635–4685 MHz band that was reclaimed and 4940–4990 MHz was substituted for reallocation under OBRA–93. Use expected to increase.
4660– 4685	None G122	None	<b>Fixed &amp; Mobile.</b> On an NIB basis, numerous Federal fixed operations use this band for point-to-point microwave, air combat training systems, tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> Continuum observations are performed in this band.	The 4635–4685 MHz band that was reclaimed and 4940–4990 MHz was substituted for reallocation under OBRA–93. Use expected to increase.

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4685– 4800	FIXED MOBILE US245	None	<b>Fixed &amp; Mobile.</b> On an NIB basis, numerous Federal fixed operations use this band for point-to-point microwave, air combat training systems, tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> Continuum observations are performed in this band.	No changes are planned. Use expected to increase.
4800– 4825	FIXED MOBILE S5.149	None	<b>Fixed &amp; Mobile.</b> Numerous Federal fixed operations use this band for point-to-point microwave, air combat training systems, tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> Continuum observations are performed in this band.	No changes are planned. Use expected to increase.
4825– 4835	FIXED MOBILE S5.149 US203	None	<b>Tactical &amp; Training.</b> This band is heavily used for military tactical and training communications, both for line-of-sight and troposcatter. Additionally, the DOD operates tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> Extremely useful in studying the brightness distributions of both galactic and extragalactic objects such as ionized hydrogen clouds and supernova remnants.	No changes are planned. Use expected to increase.
4835– 4950	FIXED MOBILE S5.149	None	<b>Tactical &amp; Training.</b> This band is heavily used for military tactical and training communications, both for line-of-sight and troposcatter. Additionally, the DOD operates tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> Continuum observations are performed in this band.	The 4940–4990 MHz band, in lieu of the 4635–4685 MHz band that was reclaimed, was reallocated to the private sector under OBRA–93.  Use expected to increase.
4950– 4990	FIXED MOBILE S5.149 S5.339 US257	Space Research (passive) S5.339  Earth Exploration-Satellite (passive) S5.339	<b>Fixed &amp; Mobile.</b> This band is heavily used for military tactical and training communications, both for line-of-sight and troposcatter. Additionally, the DOD operates tactical data links, drone command and control systems, and numerous other systems. <b>Radio Astronomy.</b> This band is extremely useful in studying the brightness distributions of both galactic and extragalactic objects such as ionized hydrogen clouds and supernova remnants.	The 4940–4990 MHz band, in lieu of the 4635–4685 MHz band that was reclaimed, was reallocated to the private sector under OBRA–93.  Use expected to increase.
4990– 5000	RADIO ASTRONOMY Space Research (passive)  S5.149 US74 US246	None	<b>Radio Astronomy.</b> This band is extremely useful in studying the brightness distributions of both galactic and extragalactic objects such as ionized hydrogen clouds and supernova remnants. <b>Passive Sensing.</b> Passive remote sensing of estuarine temperatures is done in this band. Passive sensing flight instruments include R–600.	Scientific research is expected to increase in this band.
5000– 5150	AERONAUTICAL RADIONAVIGATION  S5.367 S5.444 G126 US211 US260	AERONAUTICAL MOBILE-SATELLITE (R) S5.367  Aeronautical Mobile US260	<b>Aero-Radionav.</b> Microwave landing systems operate in this band.	As the U.S. transitions to satellite-based navigation, additional MLS development is not anticipated. MLS phase-down is expected to begin in 2008. FAA and the civil aviation community are investigating aeronautical applications in this band to include (1) an extension of the tuning range of the TDWR; and or (2) weather functions for a planned multipurpose terminal radar for around the year 2013.

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5150– 5250	AERONAUTICAL RADIONAVIGATION  US211 US260 US307	Aeronautical Mobile US260	<b>Experimental.</b> Numerous test and evaluations are being conducted on various radiocommunications systems in this band.	No changes are planned. Use expected to continue.
5250– 5255	RADIOLOCATION EARTH EXPLORATION- SATELLITE (active) SPACE RESEARCH  S5.447D US110 G59	None	<b>Military Radars.</b> The military services have various types of radars (missile detection, imaging, synthetic aperture radar, frequency agile, ship sensor, etc.) operating in this band. <b>Space Research.</b> NASA, in this band, participates in joint ventures with the ESA on space-based observations and measurements of surface topography, soil moisture, sea surface height, etc. (e.g., NASA TOPEX/Poseidon Mission). Active sensor flight instruments include: ALT/SSALT, SIR-C, SRTM, RADARSAT.	No changes are planned. Use expected to increase.
5255– 5350	RADIOLOCATION EARTH EXPLORATION- SATELLITE (active) SPACE RESEARCH (active)  US110 G59	None	<b>Military Radars.</b> The military services have various types of radars (missile detection, imaging, synthetic aperture radar, frequency agile, ship sensor, etc.) operating in this band. <b>Space Research.</b> NASA, in this band, participates in a joint venture with the ESA on space-based observations and measurements of surface topography, soil moisture, etc. (NASA TOPEX/Poseidon Mission). Active sensor flight instruments include: ALT/SSALT, SIR-C, SRTM, RADARSAT.	No changes are planned. Use expected to increase.
5350– 5460	EARTH EXPLORATION- SATELLITE (active) AERONAUTICAL RADIONAVIGATION RADIOLOCATION  S5.448B S5.449 US48 G56	None	<b>Airborne WXD Radars.</b> Aircraft employ airborne weather radars that operate in the 5350-5470 MHz band for storm avoidance. <b>Military Radars.</b> The military services employ transportable and mobile radars in this band. <b>WXD Radars.</b> Numerous Federal agencies employ ground weather radars in this band though they are not in conformance to the National Table of Frequency Allocations. <b>NASA.</b> This band is used for missile tracking via radar.	No changes are planned. Use expected to increase.
5460– 5470	RADIONAVIGATION Radiolocation  US49 US65 S5.449 G56	None	<b>Airborne WXD Radars.</b> Aircraft employ airborne weather radars that operate in the 5350-5470 MHz band for storm avoidance. <b>Radars.</b> Some radionavigational surveillance radars operate in this band along with numerous radiolocation radars. <b>NASA.</b> This band is used for missile tracking via radar. <b>Experimental.</b> Experimental RDT&E testing of radars occurs in this band.	No changes are planned. Use expected to increase.
5470– 5600	MARITIME RADIONAVIGATION Radiolocation  US50 US65 G56	None	<b>Maritime Radionav.</b> The USCG operates maritime radionavigation aids throughout the United States. <b>Radars.</b> This band is used extensively for transportable and mobile radars as well as for weather radars. <b>NASA.</b> This band is used for missile tracking via radar. <b>Experimental.</b> Experimental testing of radars occurs in this band for RDT&E.	No changes are planned. Use expected to increase.

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5600– 5650	MARITIME RADIONAVIGATION METEOROLOGICAL AIDS Radiolocation  US51 US65 S5.452 G56	None	<b>Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for weather radars, surveillance radars, test range instrumentation radars, and experimental radar testing. The Navy operates its primary surface search radar in this band. <b>Maritime Radionav.</b> Shipborne radars in this band provide coastal navigation information. <b>WXD Radars.</b> Some of the weather radars operating in this band are FAA terminal Doppler weather radars providing hazardous weather detection at airports. <b>NASA.</b> This band is used for missile tracking via radar.	No changes are planned. Use expected to increase.
5650– 5670	RADIOLOCATION  S5.282 G2	None	<b>Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for weather radars, surveillance radars, test range instrumentation radars, and experimental radar testing. <b>NASA.</b> This band is used for missile tracking via radar.	No changes are planned. Use expected to increase.
5670– 5725	RADIOLOCATION  G2	None	<b>Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for weather radars, surveillance radars, test range instrumentation radars, and experimental radar testing. <b>NASA.</b> This band is used for missile tracking via radar.	No changes are planned. Use expected to increase.
5725– 5830	RADIOLOCATION  S5.150 G2	ISM S5.150	<b>Military Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for surveillance radars, test range instrumentation radars, airborne transponders and experimental radar testing. Extensive use of these radars is in support of national and military test range operations in the tracking and control of manned and unmanned airborne vehicles. <b>NASA.</b> This band is used for missile tracking via radar. <b>ISM.</b> The band 5725-5875 MHz (center frequency 5800 MHz) is designated for industrial, scientific and medical (ISM) applications.	No changes are planned. Use expected to increase.
5830– 5850	RADIOLOCATION  S5.150 G2	ISM S5.150	<b>Military Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for surveillance radars, test range instrumentation radars, airborne transponders and experimental radar testing. Extensive use of these radars is in support of national and military test range operations in the tracking and control of manned and unmanned airborne vehicles. Other radars support missile and satellite tracking during launch and on-orbit. <b>NASA.</b> This band is used for missile tracking via radar. <b>ISM.</b> The band 5725-5875 MHz (center frequency 5800 MHz) is designated for industrial, scientific and medical (ISM) applications.	No changes are planned. Use expected to increase.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
5850– 5875	RADIOLOCATION  S5.150 US245 G2	ISM S5.150	<b>Military Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for surveillance radars, test range instrumentation radars, airborne transponders and experimental radar testing. Extensive use of these radars is in support of national and military test range operations in the tracking and control of manned and unmanned airborne vehicles. Other radars support missile and satellite tracking during launch and on-orbit. <b>NASA.</b> This band is used for missile tracking via radar. <b>ISM.</b> The band 5725-5875 MHz (center frequency 5800 MHz) is designated for industrial, scientific and medical (ISM) applications.	No changes are planned. Use expected to increase.
5875– 5925	RADIOLOCATION  US245 G2	None	<b>Military Radars.</b> This band contains fixed, transportable, and mobile radars whose purposes are used primarily for surveillance radars, test range instrumentation radars, airborne transponders and experimental radar testing. Extensive use of these radars is in support of national and military test range operations in the tracking and control of manned and unmanned airborne vehicles. <b>NASA.</b> This band is used for missile tracking via radar.	No changes are planned. Use expected to increase.
5925– 6425	None	None	<b>Earth Stations.</b> Federal agencies operate earth stations that transmit voice, data, video signals to an international common carrier GSO satellite system. Some of the users are BBG, FAA, and military services.	Use expected to increase.
6425– 6429	None  S5.440 S5.458	Standard Frequency-Satellite S5.440	<b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> RDT&E of radiocommunications equipment is performed on national and military test ranges as well as at contractor factories.	Use expected to continue.
6429– 6525	None  S5.458	None	<b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> RDT&E of radiocommunications equipment is performed on national and military test ranges as well as at contractor factories.	Use expected to continue.
6525– 6700	None  S5.149 S5.458	None	<b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> RDT&E of radiocommunications equipment is performed on national and military test ranges as well as at contractor factories.	Use expected to continue.
6700– 6875	None  S5.149 S5.458	None	<b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> RDT&E of radiocommunications equipment is performed on national and military test ranges as well as at contractor factories.	Use expected to continue.
6875– 7075	None  S5.149 S5.458	None	<b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> RDT&E of radiocommunications equipment is performed on national and military test ranges as well as at contractor factories.	Use expected to continue.
7075– 7125	None  S5.458	None	<b>Research.</b> <b>NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies research.</b> <b>Experimental.</b> Some RDT&E of radiocommunications equipment is performed in this band.	Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
7125– 7145	FIXED S5.458 G116	SPACE OPERATIONS G116	<b>Point-to-Point.</b> This band is used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's national and military test range communications, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> Some experimental test stations operate at national and military test ranges. Also, NASA is conducting development testing at the DSN 26m antenna in support of Mars Global Surveyor..	No changes are planned. Use expected to continue.
7145– 7155	FIXED SPACE RESEARCH (Earth-to-space) S5.458 US252 G116	SPACE OPERATIONS G116	<b>Point-to-Point.</b> This band is used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's national and military test range communications, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>NASA Deep Space.</b> Deep space command and control communications to Earth-launched vehicles. <b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Experimental.</b> Some experimental test stations operate at national and military test ranges.	No changes are planned. Use expected to continue.
7155– 7190	FIXED SPACE RESEARCH (Earth-to-space) S5.458 US252	None	<b>NASA Deep Space.</b> NASA tracking, ranging, and command uplinks to deep space probes Voyager 1 (Jupiter and beyond), Voyager 2 (Jupiter, Saturn, and beyond), Galileo (Jupiter), Near Earth Asteroid Rendezvous (NEAR), Mars Global Surveyor spacecrafts and others. <b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Point-to-Point.</b> This band is used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's national and military test range communications, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc.	No changes are planned. Use expected to continue.
7190– 7235	FIXED SPACE RESEARCH (Earth-to-space) S5.458	None	<b>NASA Near Earth.</b> NASA tracking, ranging, and command uplinks in support of various programs such as the Summer Undergraduate Research Fellowship Satellites I & II (SURFSAT), Space Program Wideband Data Collection System, international remote sensing satellites, etc. <b>Research.</b> NASA participates in remote microwave scanning measurements made over oceans for oceanographic studies/research. <b>Point-to-Point.</b> This band is used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's national and military test range communications, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc.	No changes are planned. Use expected to continue.
7235– 7250	FIXED S5.458	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc.	No changes are planned. Use expected to continue.

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Band MHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
7250– 7300	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Fixed  G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) downlinks for global voice and data communications as well as NATO SATCOM . <b>TT&amp;C.</b> Also, space tracking & telecommand of communications satellites is done in this band.	No changes are planned. Use expected to continue.
7300– 7450	FIXED FIXED-SATELLITE (space-to-Earth) Mobile-Satellite (space-to-Earth)  G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) downlinks for global voice and data communications as well as NATO SATCOM.	No changes are planned. Use expected to continue.
7450– 7550	FIXED FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) Mobile-Satellite (space-to-Earth)  G104 G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) downlinks for global voice and data communications as well as NATO SATCOM.	No changes are planned. Use expected to continue.
7550– 7750	FIXED FIXED-SATELLITE (space-to-Earth) Mobile-Satellite (space-to-Earth)  G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) downlinks for global voice and data communications as well as NATO SATCOM. <b>TT&amp;C.</b> Also, space tracking & telecommand of communications satellites is done in this band.	No changes are planned. Use expected to continue.
7750– 7850	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth)  S5.461B	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc.	No changes are planned. Use expected to continue.
7850– 7900	FIXED	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc.	No changes are planned. Use expected to continue.

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7900– 8025	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Fixed  G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) uplinks for global voice and data communications as well as NATO SATCOM. <b>TT&amp;C.</b> Also, space tracking & telecommand of SATCOMs are done in this band.	No changes are planned. Use expected to continue.
8025– 8175	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) Mobile-Satellite (Earth-to-space) (No Airborne Transmission)  US258 G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) uplinks for global voice and data communications as well as NATO SATCOM. <b>TT&amp;C.</b> Also, space tracking & telecommand of SATCOMs are done in this band. <b>Earth Exploration.</b> The 8025–8400 MHz band is the primary wideband data return for spaceborne sensors. <b>NASA Downlinks.</b> NASA's space-to-ground link for many Earth exploration-satellite systems operate in this band.	No changes are planned. Use expected to continue.
8175– 8215	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Mobile-Satellite (Earth-to-space) (No Airborne Transmissions)  US258 G104 G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) uplinks for global voice and data communications as well as NATO SATCOM. <b>TT&amp;C.</b> Also, space tracking & telecommand of SATCOMs are done in this band. <b>Earth Exploration.</b> The 8025–8400 MHz band is the primary wideband data return for spaceborne sensors. <b>NASA Downlinks.</b> NASA's space-to-ground link for many Earth exploration-satellite systems operate in this band.	No changes are planned. Use expected to continue.
8215– 8400	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) Mobile-Satellite (Earth-to-space) (No Airborne Transmissions)  US258 G117	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, power management, etc. <b>Military SATCOM.</b> In this band, the DOD uses the Defense Satellite Communications Systems (DSCS) uplinks for global voice and data communications. <b>TT&amp;C.</b> Also, space tracking & telecommand of SATCOMs are done in this band. <b>Earth Exploration.</b> The 8025–8400 MHz band is the primary wideband data return for spaceborne sensors. <b>NASA Downlinks.</b> NASA's space-to-ground link for many Earth exploration-satellite systems operate in this band.	No changes are planned. Use expected to continue.

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8400– 8450	FIXED SPACE RESEARCH (space-to-Earth) (Deep Space only)	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, etc. <b>NASA Deep Space.</b> Space communications in this band are used for tracking and command from NASA deep space probes Voyager 1 (Jupiter and beyond), Voyager 2 (Jupiter, Saturn, and beyond), Galileo (Jupiter), the NASA/ESA cooperative Ulysses mission (formerly International Solar Polar Mission), Near Earth Asteroid Rendezvous (NEAR), Mars Global Surveyor spacecrafts.	No changes are planned. Use expected to continue.
8450– 8500	FIXED SPACE RESEARCH (space-to-Earth)	None	<b>Point-to-Point.</b> This band is primarily used for fixed point-to-point microwave links associated with many Federal agencies' missions including the DOD's, and the remoting of data for such functions as air traffic control radar, weather, vessel traffic information, etc. <b>Space Research.</b> Some Federal agencies are conducting research and downlinking collected data from such activities as the measurement of Earth & space phenomena, seismic activity, etc. <b>NASA.</b> NASA use includes downlinks for remote sensing spacecraft including the EOS and the Surfsat. In Addition, the band is under consideration for the Next Generation Space Telescope.	No changes are planned. Use expected to continue.
8500– 8550	RADIOLOCATION US110 G59	None	<b>Radars.</b> Mobile and fixed radars operate in this band for RDT&E support, air and surface target tracking, and for NASA's planetary radar.	No changes are planned. Use expected to continue.
8550– 8650	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) US110 G59	None	<b>Military Radars.</b> Various military target tracking radars and experimental radars undergoing RDT&E use this band extensively. <b>Space Research.</b> Also in this band are synthetic aperture radars aboard space-borne vehicles studying Earth sciences.	No changes are planned. Use expected to continue.
8650– 8750	RADIOLOCATION US53 US110 G59	Aeronautical Radionavigation US53	<b>Military Radars.</b> This band is used by the military services for mobile and transportable target acquisition radars, radar RDT&E activities on national and military test ranges, and tactical and training exercises.	No changes are planned. Use expected to continue.
8750– 8850	RADIOLOCATION US53 US110 G59	Aeronautical Radionavigation US53	<b>Military Radars.</b> This band is used by the military services for mobile and transportable target acquisition radars, radar RDT&E activities on national and military test ranges, and tactical and training exercises.	No changes are planned. Use expected to continue.
8850– 9000	RADIOLOCATION US53 US110 G59	Aeronautical Radionavigation US53	<b>Military Radars.</b> This band is used by the military services for mobile and transportable target acquisition radars, radar RDT&E activities on national and military test ranges, and tactical and training exercises.	No changes are planned. Use expected to continue.
9000– 9200	AERONAUTICAL RADIONAVIGATION Radiolocation US48 US54 S5.337 G2 G19	None	<b>Aero-Radionav.</b> This band is used extensively by the military services for precision approach radars.	No changes are planned. Use expected to increase. The FAA has plans for ASDE-X radars.
9200– 9225	MARITIME RADIONAVIGATION Radiolocation US110 S5.472 S5.474 G59	None	<b>Military Radars.</b> This band is used by the military services for mobile and transportable target acquisition radars, radar RDT&E activities on national and military test ranges, and tactical and training exercises.	No changes are planned. Use expected to increase.

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9225– 9300	MARITIME RADIONAVIGATION Radiolocation  US110 S5.472 S5.474 G59	None	<b>Military Radars.</b> This band is used by the military services for mobile and transportable target acquisition radars, radar RDT&E activities on national and military test ranges, and tactical and training exercises.	No changes are planned. Use expected to increase.
9300– 9500	RADIONAVIGATION Meteorological Aids Radiolocation  US51 US66 US67 US71 S5.427 S5.474 S5.476 G56	None	<b>Maritime Radionav.</b> Used by the USCG for harbor surveillance radars in support of vessel traffic services. <b>WXD Radars.</b> Numerous Federal agencies have weather radars operating in this band. <b>Military Radars.</b> The military services use this band for their mobile and transportable radars.	No changes are planned. Use expected to increase.
9500– 9800	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  S5.479 US110	None	<b>Military Radars.</b> Used extensively for military tactical and training in the use of its various radar systems. Some Military RDT&E of radars systems is done in this band. <b>Research.</b> Supports NASA airborne radar in the research and experimentation of convective storm and mesoscale phenomena. Also used by NASA and collaborators for active microwave sensing of the Earth's surface.	No changes are planned. Use expected to increase.
9800– 9975	RADIOLOCATION  US110	None	<b>Military Radars.</b> Used extensively for military tactical and training in the use of its various radar systems. Some RDT&E of radars systems is done in this band.	No changes are planned. Use expected to increase.
9975– 10000	RADIOLOCATION  S5.479 US110	Meteorological-Satellite S5.479	<b>Military Radars.</b> Used for military tactical and training in the use of its various radar systems. Some RDT&E of radars systems is done in this band. <b>WXD Satellite.</b> NOAA meteorological satellite radar operates in this band.	No changes are planned. Use expected to increase.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
10– 10.025	RADIOLOCATION  US58 US108 S5.479 G32	Meteorological-Satellite S5.479	<b>Military Radars.</b> Used extensively for military tactical and training in the use of its various radar systems. Some RDT&E of radars systems is done in this band. This band is used for inland waterways radionavigational aids. Some agencies use this band to assist in surveying and mapping operations. <b>WXD Satellite.</b> NOAA meteorological satellite radar operates in this band.	No changes are planned. Use expected to continue.
10.025– 10.45	RADIOLOCATION  US58 US108 G32	None	<b>Military Radars.</b> Used primarily by the military in the operation of and in the tactical and training of various Doppler radars— fixed, mobile, and transportable. Also used for RDT&E of new radar systems.	No changes are planned. Use expected to continue.
10.45– 10.5	RADIOLOCATION  US58 US108 G32	None	<b>Military Radars.</b> Used primarily by the military in the operation of and in the tactical and training of various Doppler radars— fixed, mobile, and transportable. Also used for RDT&E of new radar systems.	No changes are planned. Use expected to continue.
10.5– 10.55	RADIOLOCATION  US59	None	<b>Doppler Radars.</b> Used primarily for traffic control speed guns and intrusion detection radars.	No changes are planned. Use expected to continue.
10.55– 10.6	None	None	None	No changes are planned.
10.6– 10.68	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive)  US265 US277	RADIO ASTRONOMY US277	<b>Radio Astronomy.</b> Continuum observations in this band allow cosmic microwave background studies. <b>Earth Exploration.</b> Satellite passive remote sensing studies of rain, snow, lake ice, sea topography, etc., is done in this band. Passive sensor instruments include AMSR, AMSR-E, AMSR-SMR, TMI.	Scientific research is expected to continue and increase in this band.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
10.68– 10.7	EARTH EXPLORATION-SATELLITE (passive)  RADIO ASTRONOMY  SPACE RESEARCH (passive)  US74 US246	None	<b>Radio Astronomy.</b> Continuum observations in this band allow cosmic microwave background studies. <b>Earth Exploration.</b> Satellite passive remote sensing studies of rain, snow, lake ice, sea topography, etc., is done in this band. Passive sensor instruments include AMSR, AMSR–E, AMSR–SMR, TMI.	Scientific research is expected to continue and increase in this band.
10.7– 11.7	None  US211	None	<b>Earth Stations.</b> In this band, some Federal agencies hold commercial satellite leases for common carrier service provided by a private sector domestic satellite system. These Federal agencies operate Earth stations that receive voice, data, and video signals. <b>Experimental.</b> Experimental testing is performed in this band for such studies as millimeter wave propagation studies, etc.	Use expected to increase.
11.7– 12.2	None  S5.486 S5.488	Fixed S5.486	<b>Earth Stations.</b> In this band, some Federal agencies hold commercial satellite leases for common carrier service provided by a private sector domestic satellite system. These Federal agencies operate Earth stations that transmit voice, data, and video signals. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to continue.
12.2– 12.7	None  S5.488 S5.490	None	<b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>Experimental.</b> Experimental test stations on national and military test ranges operate in this band.	Use expected to continue.
12.7– 12.75	None	None	<b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>Experimental.</b> Experimental test stations on national and military test ranges operate in this band.	Use expected to continue.
12.75– 13.25	None  US251	Space Research US251	<b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>Experimental.</b> Experimental test stations on national and military test ranges operate in this band.	No changes are planned. Use expected to continue.
13.25– 13.4	EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RAD-IONAVIGATION S5.497 SPACE RESEARCH (active)  S5.498A	None	<b>Aero-Radionav.</b> Airborne Doppler navigational radars operate in this band. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>NASA.</b> NASA operates active remote sensors in this band.	No changes are planned. Use expected to continue.
13.4– 13.75	RADIOLOCATION US110 G59 EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) US5.501A Standard Frequency and Time Signal-Satellite (Earth-to-space)  US5.501B	None	<b>Military Radars.</b> The military services operate shipborne radiolocation point defense weapon systems that include search radars, tracking radars, and missile & gunfire control radars. <b>Space Research.</b> NASA, in this band, participates in a joint venture with the ESA on space-based observations and measurements of surface topography, soil moisture, etc. (NASA TOPEX/Poseidon Mission). <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>TDRSS.</b> NASA operates the TDRS System in the 13.4–14.05 GHz band. Links supported include forward links to the Shuttle and other mission spacecraft and downlinks to White Sands, NM. <b>NASA.</b> NASA operates active remote sensors in this band.	Use expected to continue.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
13.75– 14	RADIOLOCATION US110 G59 Standard Frequency and Time Signal-Satellite (Earth-to-space) Space Research  S5.333 S5.502 S5.503 S5.503A US337	Earth Exploration- Satellite S5.333	<b>Earth Exploration.</b> This band supports NASA operations: ! NASA mission to Planet Earth tropical rainfall measuring mission (TRMM). ! Passive remote sensing studies of rain, snow, geodetic studies, etc. <b>TDRSS.</b> NASA operates the TDRS System in the 13.4–14.05 GHz band. Links supported include forward links to the Shuttle and other mission spacecraft and downlinks to White Sands, NM. <b>NASA Deep Space.</b> Uplinks and downlinks to/from NASA planetary spacecraft conducting radio science experiments as well as exchanging some command and ranging data. Mission is to investigate the Titan moon of the planet Saturn. Supports surface imaging and topographic mapping of Titan. <b>Experimental.</b> The military services perform RDT&E of new radar systems, techniques, tactics, etc., in this band. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to continue.
14– 14.2	RADIONAVIGATION US292 Space Research	None	<b>Data Uplinks.</b> Satellite uplinks for the transmissions of meteorological information as part of the automated weather distribution system (SAWDS). <b>Earth Stations.</b> In this band, some commercial satellite leases are held by Federal agencies (uplinks) for common carrier service provided by a private sector domestic satellite system. These Federal agencies operate Earth stations that transmit voice, data, and video signals. <b>Space Research.</b> NASA operates the SURFSAT-1 spacecraft VLBI phase downlinks. <b>TDRSS.</b> NASA operates the TDRS System in the 13.4–14.05 GHz band. Links supported include forward links to the Shuttle and other mission spacecraft and downlinks to White Sands, NM. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>Experimental.</b> Experimental RDT&E of radar systems are done in this band.	No changes are planned. Use expected to increase.
14.2– 14.25	None	None	<b>Aero-Radionav.</b> The FAA operates airport surface detection radars to monitor aircraft and vehicles on the ground. <b>ATC Comm.</b> The FAA operates satellite uplinks supporting ATC communications with Mexican air traffic controllers. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	Use expected to continue.
14.25– 14.3	None	None	<b>Uplink.</b> DOE operates an uplink supporting the National Technological University Network and Educational Satellite System. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	Use expected to continue.
14.3– 14.4	None	None	<b>Earth Stations.</b> In this band, some commercial satellite leases are held by Federal agencies (uplinks) for common carrier service provided by a private sector domestic satellite system. These Federal agencies operate Earth stations that transmit voice, data, and video signals. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	Use expected to increase.

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14.4– 14.47	Fixed Mobile	None	<p><b>Point-to-Point.</b> This band is used predominately by fixed, mobile, and transportable telemetry microwave systems that transmit communications in addition to other ATC video links, CCTV, range test data, etc. Mobile uses include airborne downlink data transmissions.</p> <p><b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.</p>	No changes are planned. Use expected to continue.
14.47– 14.50	Fixed Mobile  S5.149 US203	Radio Astronomy US203	<p><b>Point-to-Point.</b> Fixed and mobile microwave systems operate extensively in this band for various purposes that transmit video, audio, and data. Some uses are at the various national and military test ranges.</p> <p><b>Research.</b> NASA conducts extensive research and studies where they engage in ground-to-ground transmission of digital data, digital audio, and digital data to and from water mobile telemetry and precision tracking vans.</p> <p><b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. This band is one of radio astronomy's lines of greatest importance below 275 GHz for spectral-line observations.</p>	No changes are planned. Use expected to continue.
14.5– 14.7145	FIXED Mobile Space Research	None	<p><b>Point-to-Point.</b> Fixed and mobile microwave systems operate extensively in this band for various purposes that transmit video, audio, and data. Some uses include the support of various national and military test range operations, transmission of air traffic control radar video, power management.</p> <p><b>Fixed and Mobile.</b> The military operates fixed, mobile, and maritime mobile air-to-air and air-to-ground datalinks in this band (common data link).</p> <p><b>TDRSS.</b> NASA GSO Tracking and Data Relay Satellite System (TDRSS) single access uplinks use this band.</p> <p><b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.</p>	No changes are planned. Use expected to increase.
14.7145– 15.1365	MOBILE Fixed Space Research  US310	None	<p><b>Point-to-Point.</b> Fixed and mobile microwave systems operate extensively in this band for various purposes that transmit video, audio, and data. Some uses include the support of various national and military test range operations and the transmission of air traffic control radar video.</p> <p><b>Fixed and Mobile.</b> The military operates fixed, mobile, and maritime mobile air-to-air and air-to-ground datalinks in this band (common data link).</p> <p><b>TDRSS.</b> NASA GSO Tracking and Data Relay Satellite System (TDRSS) single access uplinks use this band.</p> <p><b>Research.</b> Space-to-space link for the NASA Earth Observing System AM (EOS-AM) space research station.</p> <p><b>Experimental.</b> RDT&amp;E of various systems and millimeter wave technology is performed in this band.</p> <p><b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.</p>	No changes are planned. Use expected to increase.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
15.1365–15.2	FIXED Mobile Space Research  US211		<b>Point-to-Point.</b> Fixed and mobile microwave systems operate extensively in this band for various purposes that transmit video, audio, and data. <b>Fixed and Mobile.</b> The military operates fixed, mobile, and maritime mobile air-to-air and air-to-ground datalinks in this band (common data link). <b>TDRSS.</b> NASA GSO Tracking and Data Relay Satellite System (TDRSS) single access uplinks use this band. <b>Research.</b> NASA conducts extensive research and studies where they engage in ground-to-ground transmission of digital data, digital audio, and digital data to and from water mobile telemetry and precision tracking vans. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to increase.
15.2– 15.35	FIXED Mobile Space Research  US211 S5.339	Space Research (passive) S5.339  Earth Exploration-Satellite (passive) S5.339	<b>Point-to-Point.</b> Fixed and mobile microwave systems operate extensively in this band for various purposes that transmit video, audio, and data. Some uses include the support of various national and military test range operations, transmission of air traffic control radar video, and power management. <b>Fixed and Mobile.</b> The military operates fixed, mobile, and maritime mobile air-to-air and air-to-ground datalinks in this band (common data link). <b>TDRSS.</b> NASA GSO Tracking and Data Relay Satellite System (TDRSS) single access uplinks use this band. <b>Space Research.</b> NASA operates spacecraft VLBI phase uplinks. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to increase.
15.35– 15.4	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246	None	<b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars. <b>Earth Exploration.</b> Passive remote sensing studies of rain, water vapor, etc., can be done in this band.	Scientific research is expected to continue and increase in this band.
15.4– 15.43	AERONAUTICAL RADIONAVIGATION  US260 US211	None	<b>Aero-Radionav.</b> This band is used primarily for mobile or transportable tactical aircraft landing systems– shore and shipborne. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to continue.
15.43– 15.63	AERONAUTICAL RADIONAVIGATION  US260 US211	None	<b>Aero-Radionav.</b> This band is used primarily for mobile or transportable tactical aircraft landing systems– shore and shipborne. <b>NASA Aero-Radionav.</b> NASA operates the space shuttle microwave scanning beam landing system in support of the STS. <b>Airborne WXD Radars.</b> Aircraft weather radars operate in this band. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to continue.
15.63– 15.7	AERONAUTICAL RADIONAVIGATION  US260 US211	None	<b>Aero-Radionav.</b> This band is primarily used throughout the United States for the FAA's airport surface detection equipment. <b>Tactical Aero-Radionav.</b> The military services employ transportable aircraft microwave landing systems in this band. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to continue.

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15.7– 16.6	RADIOLOCATION  US110 G59	None	<b>Aero-Radionav.</b> This band is primarily used throughout the United States for the FAA's airport surface detection equipment. <b>Airborne Military Radars.</b> The military services employ various airborne radars for such functions such as terrain following, forward looking radars, etc. <b>Radio Astronomy.</b> Spectral-line observations are performed in the band 12– 16 GHz for the study of the formaldehyde line and of quasars.	No changes are planned. Use expected to continue.
16.6– 17.1	RADIOLOCATION Space Research (Deep Space) (Earth-to-space)  US110 G59	None	<b>Airborne Military Radars.</b> The military services employ various airborne radars for such functions such as terrain following, forward looking radars, etc. <b>Experimental.</b> This band supports RDT&E of experimental radars, test range missile guidance radars, and target tracking radars.	No changes are planned. Use expected to continue.
17.1– 17.2	RADIOLOCATION  US110 G59	None	<b>Experimental.</b> Various radar RDT&E activities are supported in this band.	No changes are planned. Use expected to continue.
17.2– 17.3	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  US110 G59	None	<b>Earth Exploration.</b> This band can be used to conduct vegetation and snow studies in the EES and SR active microwave services. <b>Experimental.</b> Experimental testing and calibrations of sensor and navigational systems is performed in this band.	No changes are planned. Use expected to continue.
17.3– 17.7	Radiolocation  US259 US271 G59	None	<b>Experimental.</b> Experimental testing and calibrations of sensor and navigational systems is performed in this band. Also, this band supports RDT&E of experimental radars.	On 1 Apr 07, the BSS will have co-primary allocation with the FSS in the U.S. for non-government use (WARC-92). Military radars may have to be reaccommodated in another band. Use expected to continue.
17.7– 17.8	None  US271	None	None	Per IB Dkt 98– 172, FCC plans to reallocate 17.7– 18.3 GHz exclusively primary for the fixed service. Other services secondary.
17.8– 18.1	None  S5.519 US334 G117	FIXED-SATELLITE (space-to-Earth) US334	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117).	Per IB Dkt 98– 172, FCC plans to reallocate 17.7– 18.3 GHz exclusively primary for the fixed service. Other services secondary.
18.1– 18.3	None  S5.519 US334 G117	FIXED-SATELLITE (space-to-Earth) US334  METEOROLOGICAL-SATELLITE S5.519	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	Per IB Dkt 98– 172, FCC plans to reallocate 17.7– 18.3 GHz exclusively primary for the fixed service. Other services secondary.
18.3– 18.6	None  S5.519 US334 G117	FIXED-SATELLITE (space-to-Earth) US334	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	Per IB Dkt 98– 172, FCC plans to reallocate 18.3– 18.55 GHz exclusively primary for the GSO/FSS. Other services secondary.

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18.6– 18.8	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive)  US254 US255 US334 G117	FIXED-SATELLITE (space-to-Earth) US334	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies. <b>Earth Exploration.</b> Band is used for passive remote sensing of rain, sea state, ocean ice, and water vapor.	Per IB Dkt 98– 172, FCC plans to reallocate 18.55– 18.8 GHz exclusively primary for the GSO/FSS and fixed service. Other services secondary.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to implement footnote S5.522A.
18.8– 19.7	None  US334 G117	FIXED-SATELLITE (space-to-Earth) US334	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	Per IB Dkt 98– 172, FCC plans to reallocate 18.8– 19.3 GHz and 19.3– 19.7 GHz exclusively primary for the NGSO/FSS; and MSS/FL & fixed service, respectively. Other services secondary.
19.7– 20.1	None  US334 G117	FIXED-SATELLITE (space-to-Earth) US334	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	Per IB Dkt 98– 172, FCC plans to reallocate 19.7– 20.2 GHz exclusively primary for the GSO/FSS and fixed service. Other services secondary.
20.1– 20.2	None  US334 G117	FIXED-SATELLITE (space-to-Earth) US334	<b>Military SATCOM.</b> Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	Per IB Dkt 98– 172, FCC plans to reallocate 19.7– 20.2 GHz exclusively primary for the GSO/FSS and fixed service. Other services secondary.
20.2– 21.2	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard Frequency and Time Signal-Satellite (space-to-Earth)  G117	None	<b>Military SATCOM.</b> Military EHF satellite communications systems (GSO ) is supported in this band. Federal government fixed-satellite and mobile-satellite services is limited in this band to the military services (see G117). <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
21.2– 21.4	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)  US263	None	<b>Point-to-Point.</b> This band is extensively used for low density microwave radiocommunications links for voice, data, and video at various government laboratories, test ranges, and air traffic control facilities. <b>Earth Exploration.</b> Passive remote sensing studies of water vapor, rain, etc., is done in this band. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
21.4– 22	FIXED MOBILE	None	<b>Point-to-Point.</b> This band is extensively used for fixed and mobile low-density microwave radiocommunications links for voice, data, and video at various government laboratories, test ranges, and air traffic control facilities. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.

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22– 22.21	FIXED MOBILE except aeronautical mobile  S5.149	None	<b>Point-to-Point.</b> This band is extensively used for low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Radio Astronomy.</b> NASA supports radio astronomy observations in the 22.01–22.5 GHz band with its deep space station receivers.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
22.21– 22.5	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive)  S5.149 US263	None	<b>Point-to-Point.</b> This band is extensively used for fixed and mobile low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities <b>Radio Astronomy.</b> NASA supports radio astronomy observations in the 22.01–22.5 GHz band with its deep space station receivers. In addition, observations of redshifted H <sub>2</sub> O line (22.235GHz) are performed in this band. <b>Earth Exploration.</b> Some Earth Exploration-satellites study and measure water vapor line.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
22.5– 22.55	FIXED MOBILE  US211	None	<b>Point-to-Point.</b> This band is extensively used for low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities.	No changes are planned. Use expected to continue.
22.55– 22.81	FIXED INTER-SATELLITE MOBILE  S5.149 US278	None	<b>Point-to-Point.</b> This band is extensively used for fixed and mobile low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 22.55–23.55 GHz band to provide forward links to Earth orbiting spacecraft.	No changes are planned. Use expected to continue.
22.81– 22.86	FIXED INTER-SATELLITE MOBILE  S5.149 US278	None	<b>Point-to-Point.</b> This band is extensively used for low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 22.55–23.55 GHz band to provide forward links to Earth orbiting spacecraft. <b>Research.</b> NASA supports radio astronomy observations in the 22.81-22.86 GHz band with its deep space station receiver. <b>Radio Astronomy.</b> Observations of ammonia line and two lines of methyl formate are performed in this band that help deduce the temperature of interstellar mediums and concentrations of molecular hydrogen (H <sub>2</sub> ).	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
22.86– 23	FIXED INTER-SATELLITE MOBILE  S5.149 US278	None	<b>Point-to-Point.</b> This band is extensively used for low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 22.55–23.55 GHz band to provide forward links to Earth orbiting spacecraft. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.

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23– 23.07	FIXED INTER-SATELLITE MOBILE  S5.149 US278	None	<b>Point-to-Point.</b> This band is extensively used for fixed and mobile low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 22.55–23.55 GHz band to provide forward links to Earth orbiting spacecraft. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
23.07– 23.12	FIXED INTER-SATELLITE MOBILE  S5.149 US278	None	<b>Point-to-Point.</b> This band is extensively used for fixed and mobile low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 22.55–23.55 GHz band to provide forward links to Earth orbiting spacecraft. <b>Research.</b> NASA supports radio astronomy observations in the 23.07-23.12 GHz band with its deep space station receiver. <b>Radio Astronomy.</b> Observations of 3 major ammonia lines are performed in this band that help deduce the temperature of interstellar mediums.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
23.12– 23.55	FIXED INTER-SATELLITE MOBILE  S5.149 US278	None	<b>Point-to-Point.</b> This band is extensively used for fixed and mobile low density microwave radiocommunications links for voice, data, and video at various government facilities and laboratories, test ranges, and air traffic control facilities. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 22.55–23.55 GHz band to provide forward links to Earth orbiting spacecraft. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
23.55– 23.6	FIXED MOBILE	None	<b>Point-to-Point.</b> This band is extensively used for low density microwave radiocommunications links for voice, data, and video at various government facilities, laboratories, and test ranges. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
23.6– 24	EARTH EXPLORATION- SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246	None	<b>Aero-Radionav.</b> The FAA operates airport surface detection equipment in this band. <b>Earth Exploration.</b> NASA conducts passive remote sensing studies of water vapor, rain, etc., in this band. <b>Research.</b> NASA supports radio astronomy observations in the 23.6– 24 GHz band with its deep space station receiver. <b>Radio Astronomy.</b> Observations of 3 major ammonia lines are performed in this band that help deduce the temperature of interstellar mediums.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
24– 24.05	None  S5.150 US211	ISM S5.150	<b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies. <b>ISM.</b> The band 24-24.25 GHz (center frequency 24.125 GHz) is designated for industrial, scientific and medical (ISM) applications.	No changes are planned. Scientific research is expected to continue and increase in this band.

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24.05– 24.25	RADIOLOCATION Earth Exploration-Satellite (active)  S5.150 US110 G59	ISM S5.150	<b>Doppler Speed Guns.</b> Federal agencies operate radar speed guns in this band for vehicular speed control. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies. <b>Earth Exploration.</b> Remote sensing studies of water vapor, rain, etc., is done in this band. <b>ISM.</b> The band 24-24.25 GHz (center frequency 24.125 GHz) is designated for industrial, scientific and medical (ISM) applications.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
24.25– 24.45	None  US341	None	<b>Experimental.</b> Experimental testing and calibrations of sensor and navigational systems is performed in this band. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	This band was reallocated by the FCC to the Fixed Service to accommodate relocation of the DEMS Service from 18.82– 19.92 GHz and 19.16– 19.26 GHz to the 24.25– 24.45 GHz and 25.05– 25.25 GHz bands.
24.45– 24.65	INTER-SATELLITE RADIONAVIGATION  S5.533	None	<b>Experimental.</b> Experimental testing of radiocommunications systems is conducted in this band. <b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
24.65– 24.75	INTER-SATELLITE RADIOLOCATION-SATELLITE (Earth-to-space)	None	<b>Radio Astronomy.</b> Observations are made in the band 18.2-25.2 GHz for continuum measurements and spectral-line studies.	No changes are planned. Scientific research is expected to continue and increase in this band.
24.75– 25.05	RADIONAVIGATION	None	<b>Experimental.</b> Experimental testing and calibrations of sensor and navigational systems is performed in this band. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
25.05– 25.25	None	None	<b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	This band was reallocated by the FCC to the Fixed Service to accommodate relocation of the DEMS Service from 18.82– 19.92 GHz and 19.16– 19.26 GHz to the 24.25– 24.45 GHz and 25.05– 25.25 GHz bands.
25.25– 25.5	FIXED INTER-SATELLITE MOBILE Standard Frequency and Time Signal-Satellite (Earth-to-space)  S5.533	None	<b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 25.25–27.5 GHz band to provide return links to Earth orbiting spacecraft. <b>Proximity Ops.</b> NASA also uses the band 25.25–27.5 GHz for proximity link communications between orbiting spacecraft. <b>Experimental.</b> Experimental testing and calibrations of sensor and navigational systems is performed in this band. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	Possible future band for flight test telemetry.  Use expected to continue. Scientific research is expected to continue and increase in this band.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
25.5– 27	FIXED INTER-SATELLITE S5.536 MOBILE EARTH EXPLORATION- SATELLITE (space-to- Earth) S5.536A MOBILE Standard Frequency and Time Signal-Satellite (Earth-to-space)	None	<b>Point-to-Point.</b> This band is used for low density microwave radiocommunications links for voice, data, and video at government laboratories and test ranges. <b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 25.25–27.5 GHz band to provide return links to Earth orbiting spacecraft. <b>Proximity Ops.</b> NASA also uses the band 25.25–27.5 GHz for proximity link communications between orbiting spacecraft. <b>Earth Exploration.</b> The 25.5–27 GHz band is planned to be used for very wideband data return from spaceborne sensors. <b>Experimental.</b> Experimental testing and calibrations of sensor and navigational systems is performed in this band. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	Possible future band for flight test telemetry.  Use expected to continue. Scientific research is expected to continue and increase in this band.
27– 27.5	FIXED INTER-SATELLITE MOBILE S5.536  S5.533	None	<b>Intersatellite Links.</b> NASA operates the TDRS constellation data relay satellites in the 25.25–27.5 GHz band to provide return links to Earth orbiting spacecraft. <b>Proximity Ops.</b> NASA also uses the band 25.25–27.5 GHz for proximity link communications between orbiting spacecraft. <b>Experimental.</b> Experimental testing of radiocommunications systems such as the demonstration of millimeter wave radio links. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
27.5– 29.5	None	None	<b>Experimental.</b> Other Federal agencies are conducting experimental research on millimeter wave propagation. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	Use expected to continue. Scientific research is expected to continue and increase in this band.
29.5– 30	None	None	<b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
30– 31	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Standard Frequency and Time Signal-Satellite (space-to-Earth)  G117	None	<b>Military SATCOM.</b> In this band, the DOD operates uplinks to GSO and NGSO satellites for global voice and data communications. Also, space telecommand of SATCOMs are done in this band. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
31– 31.2	Standard Frequency and Time Signal-Satellite (space-to-Earth)  S5.149 US211	None	<b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2–37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects. Additional radio astronomy observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Scientific research is expected to continue and increase in this band.
31.2– 31.3	Standard Frequency and Time Signal-Satellite (space-to-Earth)  S5.149 US211	None	<b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2–37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects. Additional radio astronomy observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Scientific research is expected to continue and increase in this band.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
31.3– 31.8	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246	None	<b>Earth Exploration.</b> Passive remote sensing of terrestrial cloud water and precipitation, oil spills, and ocean ice is done in this band. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects. Additional radio astronomy observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
31.8– 32	RADIONAVIGATION  S5.548 US69 US211 US262	SPACE RESEARCH (deep space) (space-to-Earth) US262	<b>Military Radars.</b> Military airborne precision ground mapping radars operate in this band. <b>NASA Deep Space.</b> Transmissions in this band support the NASA Mars Global Surveyor spacecraft conducting radio science experiments as well as exchanging some command and ranging data. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	WRC-97 added a fixed service allocation to the band 31.8– 33.4 GHz and identified it via RR S5.547, as available for use by high-density systems. WRC-97 chose to delay until 2001 implementation of the allocation via RR S5.547A and Resolution 126 (COM 5– 11).  Use expected to continue.
32– 32.3	INTER-SATELLITE RADIONAVIGATION  S5.548 US69 US278 US262	SPACE RESEARCH (deep space) (space-to-Earth) US262	<b>NASA Deep Space.</b> Transmissions in this band support the NASA Mars Global Surveyor spacecrafts, and other deep space probes that are conducting radio science experiments as well as exchanging some command and ranging data. <b>Radionav.</b> The Navy operates an automatic aircraft carrier landing system in this band. <b>NASA Downlinks.</b> Further, this band supports a downlink from the NASA SURFSAT-1 (NGSO). <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	FCC deleted non-govt allocation for the radionavigation service (see AH 212– 69).  Use expected to continue.
32.3– 33	INTER-SATELLITE RADIONAVIGATION  S5.548 US69 US278 US262	None	<b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	WRC-97 added a fixed service allocation to the band 31.8– 33.4 GHz and identified it via RR S5.547, as available for use by high-density systems. WRC-97 chose to delay until 2001 implementation of the allocation via RR S5.547A and Resolution 126 (COM 5– 11).
33– 33.4	RADIONAVIGATION  US69	None	<b>Radionav.</b> The Navy operates an automatic aircraft carrier landing system in this band. <b>Experimental.</b> DOD RDT&E is conducted in this band to evaluate millimeter wave systems as well as the accuracy of sensor and navigational systems. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	WRC-97 added a fixed service allocation to the band 31.8– 33.4 GHz and identified it via RR S5.547, as available for use by high-density systems. WRC-97 chose to delay until 2001 implementation of the allocation via RR S5.547A and Resolution 126 (COM 5– 11).  Use expected to continue.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
33.4– 34.2	RADIOLOCATION US110 US252 G34	None	<b>Experimental.</b> DOD RDT&E is conducted in this band to evaluate new imaging radar systems as well as the accuracy of sensor and navigational systems. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
34.2– 34.4	RADIOLOCATION US110 SPACE RESEARCH (deep space) (Earth-to-space) US262 G34	None	<b>NASA Deep Space.</b> This band supports uplinks and downlinks to/from the NASA Cassini spacecraft that is conducting radio science experiments as well as exchanging some command and ranging data. Mission is to investigate the Titan moon of the planet Saturn. <b>Radars.</b> NASA is also operating an experimental Doppler radar tracking system (34.2-34.7 GHz) in this band. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
34.4– 34.5	RADIOLOCATION US110 SPACE RESEARCH (deep space) (Earth-to-space) US262 G34	None	<b>NASA Deep Space.</b> Deep space command and control communications to Earth-launched vehicles is conducted by NASA in this band. <b>Radars.</b> NASA is operating an experimental Doppler radar tracking system (34.2-34.7 GHz) and <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue.
34.5– 34.7	RADIOLOCATION US110 SPACE RESEARCH (deep space) (Earth-to-space) US262 G34	None	<b>Military Radars.</b> Military services in this band are operating vehicle speed guns, cloud height measuring radars as well as experimental research in radar techniques. <b>NASA Deep Space.</b> Deep space command and control communications to Earth-launched vehicles is conducted by NASA in this band. <b>Radars.</b> NASA is operating an experimental Doppler radar tracking system (34.2-34.7 GHz) and <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
34.7– 35.5	RADIOLOCATION  US110 G34	None	<b>Military Radars.</b> This band is used extensively for fixed and mobile radars supporting operational and experimental requirements. Military uses include employment of airborne side-looking radars, the experimental research of radars and radar techniques, and improving on the accuracy of sensor and navigational systems. <b>Radars.</b> Non-military applications include the NASA scientific investigation of aircraft vortices using radiolocation techniques, mobile cloud height measuring radars, and speed guns. <b>Experimental Research.</b> Research is being conducted for airborne enhanced vision systems. <b>Radio Astronomy.</b> Observations are made in the band 25-35 GHz for continuum measurements and spectral-line studies. Radio astronomy observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
35.5– 35.6	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  US110 G34	None	<b>Passive Sensing.</b> Remote sensing of snow is done in this band. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Scientific research is expected to continue and increase in this band.
35.6– 36	RADIOLOCATION EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active)  US110 G34	None	<b>Radars.</b> NASA conducts scientific investigations of aircraft vortices using radiolocation techniques. Testing of radar technology and antennas is done in this band. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
36– 36.43	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)  S5.149 US263	None	<b>Earth Exploration.</b> NASA conducts surface (land and water) mapping throughout the United States in this band. <b>Passive Sensing.</b> Passive remote sensing studies of terrestrial water vapor, rain, snow, ocean ice, oil spills, clouds, etc., is done in this band. <b>Experimental.</b> Experimental testing by some Federal agencies is conducted in this band towards improving the accuracy of sensor and navigational systems. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.
36.43– 36.5	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)  S5.149 US263	None	<b>Passive Sensing.</b> Passive remote sensing of terrestrial cloud water and precipitation is done in this band. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Scientific research is expected to continue and increase in this band.
36.5– 37	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)  S5.149 US263	None	<b>Point-to-Point.</b> Fixed microwave systems operate in military test ranges. <b>Passive Sensing.</b> Passive remote sensing studies of terrestrial water vapor, rain, snow, ocean ice, oil spills, clouds, etc., is done in this band. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	No changes are planned. Use expected to continue. Scientific research is expected to continue and increase in this band.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
37– 38	FIXED MOBILE SPACE RESEARCH (space-to-Earth)	None	<b>Point-to-Point.</b> On national and military test ranges, microwave systems support RDT&E activities as well as serve as range data links. This band is used extensively by the military services in the RDT&E of fixed and mobile theater deployable communications systems. <b>SPACE RESEARCH.</b> NASA plans to use this band for future manned exploration of the solar system and for wideband data return links to the very long baseline interferometer (VLBI). <b>Experimental.</b> Further, experimental testing is conducted in this band towards improving the accuracy of sensor and navigational systems. <b>Radio Astronomy.</b> Observations are made in this band because this is the first radio window (31.2– 37.5 GHz) in the millimeter wave region and also it provides studies of continuum spectrum of galactic and extragalactic objects.	FSS (space-to-Earth) allocation was added at 37.6– 38.6 GHz by the FCC (see IB Dkt 97– 95).  Use expected to continue.
38– 38.6	FIXED MOBILE	None	<b>Experimental.</b> NASA conducts experimental research in this band for improving techniques for measuring rainfall.	FSS (space-to-Earth) allocation added at 37.6– 38.6 GHz by the FCC (see IB Dkt 97– 95).  Use expected to continue.
38.6– 39.5	None  US291	None	<b>Point-to-Point.</b> This band is used by the military services in the RDT&E of fixed and mobile theater deployable communications systems. <b>Experimental.</b> Experimental testing is conducted in this band towards improving the accuracy of sensor and navigational systems.	The 38.6– 40 GHz band was auctioned on Apr 11, 2000.  Use expected to continue.
39.5– 40	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)  US291 G117	None	NONE	The 38.6– 40 GHz band was auctioned on Apr 11, 2000.  NATO Joint Freq Agreement identifies 39.5– 40.5 GHz for future military FSS and MSS reqmt for SATCOM downlinks. Paired with 50.4– 51.4 GHz.
40– 40.5	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth Exploration-Satellite (space-to-Earth)  G117	None	<b>Manned Exploration.</b> NASA is making plans to use this band for future manned exploration of the solar system.	Licensed millimeter wave service (ET Docket No. 95– 183), WTB pt 101.  NATO Joint Freq Agreement identifies 39.5– 40.5 GHz for future military FSS and MSS reqmt for SATCOM downlinks. Paired with 50.4– 51.4 GHz.
40.5– 42.5	None  US211	None	<b>Radio Astronomy.</b> Observations are made in this band for this band encompassing the vibrational transitions of the silicon monoxide line used to detect maser emissions from regions of mature-to-late type stars.	The Fixed-Satellite (space-to-Earth) and Mobile-Satellite (space-to-Earth) allocations are planned.
42.5– 43.5	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile RADIO ASTRONOMY  S5.149	None	<b>Research.</b> NASA supports radio astronomy observations in this band with its deep space station receiver. <b>Radio Astronomy.</b> Observations are made in this band for this band encompassing the vibrational transitions of the silicon monoxide line used to detect maser emissions from regions of mature-to-late type stars.	This band now allocated for exclusive government use (See IB Dkt 97– 95. See also the 47.2– 48.2 GHz band).  Expansion of Federal SATCOM and fixed and mobile ops is planned.

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43.5– 45.5	FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space)  G117	None	<b>Military SATCOM.</b> This band is used extensively by the DOD for EHF Satellite Communications System (GSO) uplinks.	No changes are planned. Use expected to continue.  NATO Joint Freq Agreement identifies 43.5– 45.5 GHz as essential military MSS reqmt for SATCOM uplinks.
45.5– 47	MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION RADIONAVIGATION-SATELLITE  S5.554	None	<b>Mobile Telemetry.</b> Mobile telemetering system operates in this band.	Under IB Dkt 97– 95, the FCC plans to add Fixed service (Primary) at 46.9– 47 GHz.  Use expected to continue.
47– 47.2	None	None	None	No changes are planned.
47.2– 48.2	None	None	None	NTIA proposed and FCC reallocated this band for exclusive non-government use (See IB Dkt 97– 95. See also 42.5– 43.2 GHz band).  Global Stratospheric Telecommunications Service (47.2– 47.5 GHz and 47.9– 48.2 GHz), ET Doc # 94– 124.  Licensed Millimeter Wave Service: ET Doc # 95– 183 (FCC 94– 273).  Unlicensed Vehicular Radar Sys: ET Doc # 95– 183
48.2– 48.94	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  MOD S5.149 S5.555 US264 US297	None	None	Global Stratospheric Telecommunications Service (47.2– 47.5 GHz and 47.9– 48.2 GHz), ET Doc # 94– 124.  Licensed Millimeter Wave Service: ET Doc # 95– 183 (FCC 94– 273).  Unlicensed Vehicular Radar Sys: ET Doc # 95– 183
48.94– 49.04	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  MOD S5.149 S5.555 US264 US297	RADIO ASTRONOMY S5.555	<b>Research.</b> NASA supports radio astronomy observations in this band with its deep space station receiver. <b>Radio Astronomy.</b> This band is useful for radio astronomy observations of the carbon monosulphide (CS) line and its isotopes. This line is extremely important for it is used as a diagnostic for the molecular material in other galaxies and active nuclei and starburst galaxies.	No changes are planned. Scientific research is expected to continue and increase in this band.
49.04– 50.2	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  MOD S5.149 US264 US297	None	<b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 50-55 GHz band.	No changes are planned. Use expected to continue.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
50.2– 50.4	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)  US263	None	<b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band. <b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 50-55 GHz band.	WRC-97 modified this band as follows and U.S. implementation is pending: Fixed and mobile services are deleted to protect passive operations. Use expected to continue.
50.4– 51.4	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space)  G117	None	<b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band. <b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 50-55 GHz band.	Scientific research is expected to continue and increase in this band.  NATO Joint Freq Agreement identifies 50.4– 51.4 GHz for future military FSS and MSS reqmt for SATCOM uplinks. Paired with 39.5– 40.5 GHz.
51.4– 54.25	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US246	None	<b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band. <b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 50-55 GHz band.	WRC-97 modified this band as follows and U.S. implementation is pending: Passive services are deleted from the 51.4– 52.6 GHz band and fixed mobile, and inter-satellite services are added.
54.25– 58.2	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE SPACE RESEARCH (passive)  US263 S5.558	None	<b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band is done in this band. <b>Research.</b> Experiment research of atmospheric anomalies on millimeter wave frequencies is done in this band. <b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 50-55 GHz band.	WRC-97 modified and U.S. approval is pending: Fixed and mobile services are deleted from the 54.25– 55.58 GHz portion to protect passive operations. Additionally, ISS allocations at 54.25– 59.3 GHz, excluding 56.9– 57 GHz, are limited to GSO-to-GSO comms with a PFD limit.  Awaiting IRAC approval of AH 206 recommended implementation of ITU footnotes S5.556 and S5.557.
58.2– 59	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US246	None	<b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band is done in this band.	Allocations planned for fixed and mobile services. Use expected to continue.
59– 61	FIXED INTER-SATELLITE MOBILE RADIOLOCATION  S5.558 S5.559	None	<b>Point-to-Point.</b> Fixed microwave links on various military test ranges support RDT&E activities. <b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band is done in the band 50–59.3 GHz. <b>Experimental.</b> Also, some RDT&E proof of concept of millimeter wave radiocommunication links are performed in this band.	Planned allocations for 59– 59.3 GHz: radiolocation, fixed, mobile, inter-satellite, Earth exploration-satellite (passive), and space research (passive).  Planned allocations for 59.3– 64 GHz: fixed, mobile, radiolocation, and inter-satellite.
61– 61.5	FIXED INTER-SATELLITE MOBILE RADIOLOCATION  S5.138 S5.558 S5.559	ISM S5.138	<b>ISM.</b> The band 61-61.5 GHz (center frequency 61.25 GHz) is designated for industrial, scientific and medical (ISM) applications.	Planned allocations for 59.3– 64 GHz: fixed, mobile, radiolocation, and inter-satellite. Use expected to continue.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
61.5– 64	FIXED INTER-SATELLITE MOBILE RADIOLOCATION  S5.558 S5.559	None	<b>Experimental.</b> Experimental testing of millimeter wave radio systems is performed in this band.	Planned allocations for 59.3– 64 GHz: fixed, mobile, radiolocation, and inter-satellite. Use expected to continue.
64– 65	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US246	None	<b>Passive Sensing.</b> Remote sensing used to measure atmospheric temperature profiles via oxygen absorption band is done in this band.	WRC-97 modified this band as follows and U.S. implementation is pending: Passive services are deleted from the 64– 65 GHz band and fixed mobile, and inter-satellite services (ISS Government only) are added.
65– 66	EARTH EXPLORATION-SATELLITE SPACE RESEARCH Fixed Mobile	None	None	WRC-97 modified this band as follows and U.S. implementation is pending: Adding the ISS allocation to the 65– 71 GHz band—the U.S. will make allocation for non-Govt.
66– 71	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE  S5.554	None	<b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 68.5-71.5 GHz band.	WRC-97 modified this band as follows and U.S. implementation is pending: Adding the ISS allocation to the 65– 71 GHz band—the U.S. will make allocation for non-Government.
71– 72.77	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space)	None	<b>Experimental.</b> RDT&E activities involving radar cross section measurements is performed in the 68.5-71.5 GHz band.	General Unlicensed devices: FCC, ET Dkt No. 95– 183 (FCC 94– 273), WTB pt 21. Licensed millimeter wave service (71– 71.5 GHz) (WTB pt 21)– see ET Dkt No. 94– 124 NATO Joint Freq Agreement identifies 71– 74 GHz for future military FSS and MSS reqmt for SATCOM uplinks.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change of the direction indicator of the FSS and MSS to space-to-Earth vice Earth-to-space.
72.77– 72.91	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space)  S5.149 US270	RADIO ASTRONOMY US270	<b>Radio Astronomy.</b> Spectral-line observations are made of the formaldehyde line (H <sub>2</sub> CO) at 72.409 GHz to include any spectral line shifts (blue line and red line).	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to the direction indicator of the FSS and MSS to space-to-Earth vice Earth-to-space; and 2) deletion of S5.149. As a result, US270 may be deleted as well as its RADIO ASTRONOMY allocation.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
72.91– 74	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space)	None	NONE	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change of the direction indicator of the FSS and MSS to space-to-Earth vice Earth-to-space.
74– 75.5	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Space Research (space-to-Earth)  US297	None	NONE	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to the direction indicator of the FSS to space-to-Earth vice Earth-to-space.
75.5– 76	Space Research (space-to-Earth)	None	NONE	
76– 77	RADIOLOCATION Space Research (space-to-Earth)	None	NONE	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to subdivide the 76–81 GHz band into 76–77.5, 77.5–78, 78–79, and 79–81 GHz segments; 2) to add RADIO ASTRONOMY in the 76–77.5 GHz band.
77– 81	Space Research (space-to-Earth)  S5.560	None	<b>Space Research.</b> Spaceborne radar measurements for cloud monitoring is done in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to subdivide the 76–81 GHz band into 76–77.5, 77.5–78, 78–79, and 79–81 GHz segments; 2) to add RADIO ASTRONOMY in the 76–77.5 GHz and 79–81 GHz bands; 3) to add Radio Astronomy in the 77.5–78 GHz and 78–79 GHz bands.
81– 84	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) Space Research (space-to-Earth)	None	<b>Research.</b> NASA conducts experimental research in this band for improving rainfall measurement techniques.	NATO Joint Freq Agreement identifies 81– 84 GHz for future military FSS and MSS reqmt for SATCOM downlinks.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to: 1) change the direction indicator of the FSS and MSS to Earth-to-space vice space-to-Earth; and 2) to add RADIO ASTRONOMY allocation and note S5.149 for 81–86 GHz.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
84– 86	FIXED MOBILE  US211 S5.561	None	None	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to add: 1) FSS (Earth-to-space); and 2) RADIO ASTRONOMY allocation and note S5.149.
86– 92	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246	None	<b>Passive Sensing.</b> In the EES and SR services, this band is used to measure reflected sunlight (daytime) and emitted thermal radiation (night). Measurements during the day allow for cloud/snow/ice/water/oil spill discrimination and studies; night measurements of sea surface temperatures, detection and monitoring of hot spots (volcanoes, forest fires, etc.).	Use expected to continue.
92– 93.07	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIOLOCATION  S5.149 S5.556	None	<b>Experimental.</b> RDT&E of various millimeter wave radar technologies is done in this band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add RADIO ASTRONOMY allocation; and 2) to delete the FSS.
93.07– 93.27	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIOLOCATION  S5.149 S5.556	None	<b>Experimental.</b> RDT&E of various millimeter wave radar technologies is done in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add RADIO ASTRONOMY allocation; and 2) to delete the FSS.
93.27– 94	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIOLOCATION  S5.149 S5.556	None	<b>Radars.</b> NASA conducts fixed and airborne radars for cloud monitoring measurements and environmental studies. <b>Experimental.</b> RDT&E of various millimeter wave radar technologies and antenna testing is done in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to add RADIO ASTRONOMY allocation; and 2) to delete the FSS.
94– 94.1	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active)  S5.562	None	<b>Radars.</b> NASA conducts fixed and airborne radars for cloud monitoring measurements and environmental studies. <b>Experimental.</b> RDT&E of various millimeter wave radar technologies and antenna testing is done in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 changes: 1) to add RADIO ASTRONOMY allocation; and 2) to add footnote S5.FFF.
94.1– 95	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIOLOCATION	None	<b>Radars.</b> NASA conducts fixed and airborne radars for cloud monitoring measurements and environmental studies. <b>Experimental.</b> RDT&E of various millimeter wave radar technologies and antenna testing is done in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 changes: 1) to add RADIO ASTRONOMY allocation; and 2) to add footnote S5.149.
95– 97.88	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE Radiolocation  S5.554	None	<b>Experimental.</b> Experiment research of atmospheric anomalies on millimeter wave frequencies is done in this band. Also, RDT&E activities involving radar cross section measurements and radar techniques is performed in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 changes: 1) to add RADIO ASTRONOMY allocation; 2) to add footnote S5.149; and 3) numerous other additions/deletions of allocations.

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97.88– 98.08	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE Radiolocation  S5.149 S5.554 S5.555	RADIO ASTRONOMY S5.555	<b>Radio Astronomy.</b> Spectral-line observations of carbon sulphide (CS) are studied in this band by radio astronomers.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 changes: 1) to add RADIO ASTRONOMY allocation; 2) to add footnote S5.149; and 3) numerous other additions/deletions of allocations.
98.08– 100	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE Radiolocation  S5.554	None	None	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 changes: 1) to add RADIO ASTRONOMY allocation; 2) to add footnote S5.149; and 3) numerous other additions/deletions of allocations.
100– 102	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive)  US246 S5.341	None	<b>Passive Sensing.</b> Remote sensing used to measure water vapor and other environmental conditions is done in this band.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to add the RADIO ASTRONOMY allocation.
102– 105	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE  S5.341 US211	None	<b>Radio Astronomy.</b> Spectral-line observations are made in this band by radio astronomers.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 changes: 1) to add RADIO ASTRONOMY allocation; 2) to add footnote S5.149; and 3) to delete other allocation(s).
105– 116	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US74 US246	None	<b>Radio Astronomy.</b> This is one of the most important bands in the RF spectrum because it contains many spectral lines that are essential in the study of cool cosmic clouds, regions of star formation, and the structure of galaxies including our own. <b>Passive Sensing.</b> In the EES service, observations are made of atmospheric temperature at various altitudes (such as the tridimensional sounding of atmospheric temperatures from GSO meteorological satellites).	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to subdivide the 105–116 GHz band into 105–109.5, 109.5–111.8, 111.8–114.25, and 114.25–116 GHz segments with accompanying changes; 2) to attach footnote S5.CCA to SPACE RESEARCH (passive) allocation in the 105–109.5 and 111.8–114.25 GHz segments.  Users: Future geostationary temperature sounding sensors, and AMSR2, MILES, MLS (future), SMILES.

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116– 119.98	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE S5.558 SPACE RESEARCH (passive)  S5.341 US211 US263	None	<b>Passive Sensing.</b> In the EES service, observations are made of atmospheric temperature at various altitudes (such as the tridimensional sounding of atmospheric temperatures from GSO meteorological satellites.	Use expected to continue.
119.98– 120.02	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE SPACE RESEARCH (passive)  US211 US263 S5.341 S5.558 S5.562	None	<b>Passive Sensing.</b> In the EES service, observations are made of atmospheric temperature at various altitudes (such as the tridimensional sounding of atmospheric temperatures from GSO meteorological satellites.	Use expected to continue.
120.02– 122	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE S5.558 SPACE RESEARCH (passive)  S5.138 S5.341 US211 US263	ISM S5.138	<b>Passive Sensing.</b> In the EES service, observations are made of atmospheric temperature at various altitudes (such as the tridimensional sounding of atmospheric temperatures from GSO meteorological satellites.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 120.02–123 GHz band into 120.02–122.25 and 122.25–123 GHz segments and its accompanying changes.
122– 123	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE S5.558 SPACE RESEARCH (passive)  S5.138 S5.341 US211 US263	ISM S5.138	<b>Passive Sensing.</b> In the EES service, observations are made of atmospheric temperature at various altitudes (such as the tridimensional sounding of atmospheric temperatures from GSO meteorological satellites. <b>ISM.</b> The band 122-123 GHz (center frequency 122.5 GHz) is designated for industrial, scientific and medical (ISM) applications.	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 120.02–123 GHz band into 120.02–122.25 and 122.25–123 GHz segments and its accompanying changes (deletion of EES and SR for the 122.25–123 GHz, etc.).
123– 126	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE S5.558 SPACE RESEARCH (passive)  S5.138 S5.341 US211 US263	ISM S5.138	None	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to delete and add allocations (delete EES and SR; add FSS; etc.)

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126– 134	FIXED INTER-SATELLITE MOBILE RADIOLOCATION  S5.558 S5.559	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 126–134 GHz band into 126–130 and 130–134 GHz segments and its accompanying changes (addition of Radio Astronomy and S5.QQQ to 126–130 GHz; addition of EES (active) and RADIO ASTRONOMY to 130–134 GHz; and etc.)
134– 140.69	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE Radiolocation  S5.149 S5.340 S5.553 S5.554	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of Radio Astronomy in 134–136 GHz; addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
140.69– 140.98	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE Radiolocation  S5.149 S5.340 S5.554 S5.555	RADIO ASTRONOMY S5.555	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
140.98– 142	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE Radiolocation  S5.149 S5.340 S5.554	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
142– 144	None	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
144– 144.68	RADIOLOCATION	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
144.68– 144.98	RADIOLOCATION  S5.149 S5.555	RADIO ASTRONOMY S5.555	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
144.98– 145.45	RADIOLOCATION	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).

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145.45–145.75	RADIOLOCATION  S5.149 S5.555	RADIO ASTRONOMY S5.555	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
145.75–146.82	RADIOLOCATION	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
146.82–147.12	RADIOLOCATION  S5.149 S5.555	RADIO ASTRONOMY S5.555	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; etc.).
147.12–149	RADIOLOCATION	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; addition of EES (passive) and SR (passive) to 148.5–151.5 GHz; etc.).

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149– 150	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; addition of EES (passive) and SR (passive) to 148.5–151.5 GHz; etc.).
150– 151	EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE SPACE RESEARCH (passive)  S5.149 S5.385 US263	RADIO ASTRONOMY S5.385	<b>Passive Sensing.</b> In the EES service, remote sensing to map geologic formations and soil boundaries help determine soil moisture. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; addition of EES (passive) and SR (passive) to 148.5–151.5 GHz; etc.).
151– 156	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE  US211	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; addition of EES (passive) and SR (passive) to both the 148.5–151.5 GHz and 155.5–158.5 GHz bands with accompanying footnotes; etc.).

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156– 158	EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE  US211	None	<b>Passive Sensing.</b> In the EES service, remote sensing studies of the Earth's surface and studies of cloud parameters is done in this band. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC-2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; addition of EES (passive) and SR (passive) to the 155.5–158.5 GHz band with accompanying footnotes; etc.).
158– 164	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE  US211	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC-2000 allocation changes to subdivide the 134–164 GHz band into 134–136, 136–141, 141–148.5, 148.5–151.5, 151.5–155.5, 155.5–158.5, 158.5–164 GHz segments and its accompanying changes (addition of RADIO ASTRONOMY in 136–158.5 GHz; addition of EES (passive) and SR (passive) to the 155.5–158.5 GHz band with accompanying footnotes; etc.).
164– 168	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US246	None	<b>Passive Sensing.</b> In the EES service, observation studies are made of vegetation, distinguishing clouds, snow, and ice. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC-2000 allocation changes to subdivide the 164–168 GHz band into 164–167 and 167–168 GHz segments and its accompanying changes (deletion of RA, EES, and SR from the 167–168 GHz segment and adding new radio services in their place; etc.).
168– 170	FIXED MOBILE	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various formaldehyde lines) and continuum observations in the 130-170 GHz band.	Use expected to continue.
170– 174.42	FIXED INTER-SATELLITE MOBILE S5.558	None	None	Awaiting IRAC approval of AH 206 recommended implementation of WRC-2000 allocation change to join the band segments from 170 GHz to 174.5 GHz.

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174.42–174.5	FIXED INTER-SATELLITE MOBILE S5.558  S5.149 S5.385	Radio Astronomy S5.385	None	Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to join the band segments from 170 GHz to 174.5 GHz.
174.5–175.02	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE S5.558 SPACE RESEARCH (passive)  S5.149 S5.385 US263	Radio Astronomy S5.385	<b>Passive Sensing.</b> In the EES service, observation studies are made of vegetation, distinguishing clouds, snow, and ice.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentations to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete the EES and SR allocations from 174.5–174.8 GHz and add them both to the 174.8–182 GHz segments; etc.).
175.02–176.5	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE MOBILE S5.558 SPACE RESEARCH (passive)  US263	None	<b>Passive Sensing.</b> In the EES service, observation studies are made of vegetation, distinguishing clouds, snow, and ice.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
176.5–177	FIXED INTER-SATELLITE MOBILE S5.558  US211	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).

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177– 177.4	FIXED INTER-SATELLITE MOBILE S5.558  US211	Radio Astronomy S5.385	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
177.4– 178.2	FIXED INTER-SATELLITE MOBILE S5.558  US211	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
178.2– 178.6	FIXED INTER-SATELLITE MOBILE S5.558  S5.149 S5.385 US211	Radio Astronomy S5.385	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
178.6– 181	FIXED INTER-SATELLITE MOBILE S5.558  US211	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).

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178.6– 181	FIXED INTER-SATELLITE MOBILE S5.558  US211	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
181– 181.46	FIXED INTER-SATELLITE MOBILE S5.558  S5.149 S5.385 US211	Radio Astronomy S5.385	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
181.46– 182	FIXED INTER-SATELLITE MOBILE S5.558  US211	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the 174.5–182 GHz segmentation to 174.5–174.8 and 174.8–182 GHz and its accompanying changes (delete some services and add the EES and SR to the 174.8–182 GHz segments; etc.).
182– 185	EARTH EXPLORATION- SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  US246	None	<b>Passive Sensing.</b> In the EES service, observation studies are made of vegetation, distinguishing clouds, snow, and ice.	No changes are planned. Use expected to continue.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
185– 186.2	FIXED INTER-SATELLITE MOBILE  US211 S5.558	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine all segments from 185 GHz to 190 GHz into one new segment: 185–190 GHz; and 2) to make its accompanying changes (addition of the EES (passive) and SR (passive) to the 185–190 GHz band; etc.).
186.2– 186.6	FIXED INTER-SATELLITE MOBILE  US211 S5.558	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine all segments from 185 GHz to 190 GHz into one new segment: 185–190 GHz; and 2) to make its accompanying changes (addition of the EES (passive) and SR (passive) to the 185–190 GHz band; etc.).
186.6– 190	FIXED INTER-SATELLITE MOBILE  US211 S5.558	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine all segments from 185 GHz to 190 GHz into one new segment: 185–190 GHz; and 2) to make its accompanying changes (addition of the EES (passive) and SR (passive) to the 185–190 GHz band; etc.).
190– 197	MOBILE MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE  S5.554 S5.553	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to change the segmentation from 190 GHz to 200 GHz to 190–191.8 and 191.8–200 GHz; and 2) to make its accompanying changes (addition of the EES (passive) and SR (passive) to the 190–191.8 GHz band; deletion of other services; etc.).

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
197– 200	MOBILE MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE  S5.554 S5.553	None	None	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to change the segmentation from 190 GHz to 200 GHz to 190–191.8 and 191.8–200 GHz; and 2) to add some new services in the 191.8–200 GHz band; etc.)
200– 202	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)  US263 S5.341	None	<b>Passive Sensing.</b> In the EES service, water vapor observations are made at low latitudes. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to add RADIO ASTRONOMY and accompanying footnote.
202– 217	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE  S5.341	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to change the segmentation to 202–209 and 209–217 GHz bands; 2) add EES (passive), RA, and SR (passive) to the 202–209 GHz segment and add RADIO ASTRONOMY to the 209–217 GHz segment; 3) and other accompanying changes.
217– 231	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)  S5.341 US74 US246	None	<b>Passive Sensing.</b> In the EES service, atmospheric measurements and water vapor analysis are performed in this band. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to change the segmentations from 217–235 GHz to 217–226, 226–231.5, 231.5–232, and 232–235 GHz bands; 2) add RA and SR (passive) to the 217–226 GHz segment; 3) add EES (passive), RA, and SR (passive) to the 226–231.5 GHz band; and 4) and other accompanying changes.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
231– 235	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation  US211	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to change the segmentations from 217–235 GHz to 217–226, 226–231.5, 231.5–232, and 232–235 GHz bands; 2) add EES (passive), RA, and SR (passive) to the 226–231.5 GHz band; and 3) and other accompanying changes.
235– 238	EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE SPACE RESEARCH (passive)  US263	None	<b>Passive Sensing.</b> In the EES service, ozone measurements and studies are made. <b>Cloud Radars.</b> The band 237.9–238 GHz will be used for spaceborne cloud radars. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to add footnote S5.NNN where the band 237.9–238 GHz is also allocated to the EES (active) and SR (active) for spaceborne radars only.
238– 241	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to change the band segmentation to 238–240 and 240–241 GHz
241– 244	RADIOLOCATION	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 241 GHz to 248 GHz into one segment; and 2) to add RA; and 3) other changes.
244– 246	RADIOLOCATION	ISM	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band. <b>ISM.</b> The band 244-246 GHz (center frequency 245 GHz) is designated for industrial, scientific and medical (ISM) applications.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 241 GHz to 248 GHz into one segment; and 2) to add RA; and 3) other changes.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
246– 248	RADIOLOCATION  S5.138	ISM S5.138	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 241 GHz to 248 GHz into one segment; and 2) to add RA; and 3) other changes.
248– 250	None	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation change to add Radio Astronomy to this band.
250– 251	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive)  S5.149 S5.555	RADIO ASTRONOMY S5.555	<b>Passive Sensing.</b> In the EES service, nitrous oxide line studies are performed. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 250 GHz to 252 GHz into one segment; 2) add RADIO ASTRONOMY and its accompanying footnote.
251– 252	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive)	None	<b>Passive Sensing.</b> In the EES service, nitrous oxide line studies are performed. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 250 GHz to 252 GHz into one segment; 2) add RADIO ASTRONOMY and its accompanying footnote.
252– 257.5	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE  S5.554 US211	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 252 GHz to 265 GHz into one segment; 2) add RADIO ASTRONOMY and its accompanying footnote.
257.5– 258	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE  S5.149 S5.385 S5.554 US211	Radio Astronomy S5.385	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 252 GHz to 265 GHz into one segment; 2) add RADIO ASTRONOMY and its accompanying footnote.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
258– 262.24	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE  S5.149 S5.554 US211	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 252 GHz to 265 GHz into one segment; 2) add RADIO ASTRONOMY and its accompanying footnote.
262.24– 262.76	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE  S5.149 S5.554 S5.555 US211	RADIO ASTRONOMY S5.555	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 252 GHz to 265 GHz into one segment; 2) add RADIO ASTRONOMY and its accompanying footnote.
262.76– 265	MOBILE S5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION- SATELLITE  S5.554 US211	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 252 GHz to 265 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.
265– 265.64	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.
265.64– 266.16	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
266.16–267.34	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.
267.34–267.86	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.
267.86–271.74	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.
271.74–272.26	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.
272.26–275	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY  S5.149	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Use expected to continue.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 allocation changes: 1) to combine segments from 265 GHz to 275 GHz into one segment; 2) to add RADIO ASTRONOMY and its accompanying footnote.

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275– 277	FIXED MOBILE  S5.565	Space Research S5.565  Earth Exploration- Satellite S5.565	<b>Passive Sensing.</b> In the EES service, vegetation discrimination, penetration of haze, water/land boundaries are mapped. <b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.
277– 278	FIXED MOBILE	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz.
278– 280	FIXED MOBILE  S5.565	Radio Astronomy S5.565	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz.

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280– 300	FIXED MOBILE	None	<p><b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.</p> <p><b>Passive Sensing.</b> Used by Earth Exploration-Satellite service for vegetation discrimination, penetration of haze, and water/land boundary mapping.</p>	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for:</p> <p>1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and</p> <p>2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>
300– 302	(Not allocated)  S5.565	Space Research S5.565  Earth Exploration-Satellite S5.565	<p><b>Passive Sensing.</b> In the EES service, vegetation health and biomass are analyzed.</p> <p><b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.</p>	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for:</p> <p>1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and</p> <p>2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
302– 324	(Not allocated)	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line (various carbon lines and its isotopes as well as hydrogen lines and its associated compound lines) and continuum observations in the 200-305 GHz band.	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for:</p> <p>1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and</p> <p>2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>
324– 326	(Not allocated) S5.565	Space Research S5.565 Earth Exploration-Satellite S5.565	None	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
326– 343	(Not allocated)	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line and continuum observations in the 330-360 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.
343– 345	(Not allocated) S5.565	Radio Astronomy S5.565	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line and continuum observations in the 330-360 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.

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345– 347	(Not allocated)  S5.565	Radio Astronomy S5.565  Space Research S5.565  Earth Exploration-Satellite S5.565	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line and continuum observations in the 330-360 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.
347– 348	(Not allocated)  S5.565	Radio Astronomy S5.565	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line and continuum observations in the 330-360 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.

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Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
348– 363	(Not allocated)	None	<b>Radio Astronomy.</b> Radio astronomy makes spectral-line and continuum observations in the 330-360 GHz band.	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.
363– 365	(Not allocated)  S5.565	Space Research S5.565  Earth Exploration-Satellite S5.565	None	Scientific research is expected to continue and increase in this band.  Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for: 1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and 2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.

## UNITED STATES

Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
365– 379	(Not allocated)	None	None	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for:</p> <p>1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and</p> <p>2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>
379– 381	(Not allocated) S5.565	<p>Space Research S5.565</p> <p>Earth Exploration-Satellite S5.565</p>	None	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>

## UNITED STATES

Band GHz	Government Allocation(s)	Government Allocation(s) by Footnote	Government Usage	Planned Usage
381– 400	(Not allocated)	None	None	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for:</p> <p>1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and</p> <p>2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>
400–1000	(Not allocated)	None.	None.	<p>Scientific research is expected to continue and increase in this band.</p> <p>Awaiting IRAC approval of AH 206 recommended implementation of WRC–2000 footnote modification (MOD S5.565) identifying the following spectrum for:</p> <p>1) Radio Astronomy (passive) measurements: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz; and</p> <p>2) Earth Exploration-Satellite (passive) and Space Research (passive) usage: 275-277 GHz, 294-306 GHz, 316-334 GHz, 342-349 GHz, 363-365 GHz, 371-389 GHz, 416-434 GHz, 442-444 GHz, 496-506 GHz, 546-568 GHz, 624-629 GHz, 634-654 GHz, 659-661 GHz, 684-692 GHz, 730-732 GHz, 851-853 GHz and 951-956 GHz.</p>

## Acronyms and Abbreviations

ACC	Air Combat Command
AC/S C4	Assistant Chief of Staff, Command, Control, Communications, and Computers
AETC	Air Education and Training Command
AFCA	Air Force Communications Agency
AFFMA	Air Force Frequency Management Agency
AFMC	Air Force Materiel Command
AFR	Air Force Reserve
AFRC	Air Force Reserve Command
AFSOC	Air Force Special Operations Command
AFSPC	Air Force Space Command
AIA	Air Intelligence Agency
ALERT	Advanced Law Enforcement Response Technology
ALMA	Atacama Large Millimeter Array
AMC	Air Mobility Command
ANG	Air National Guard
APHIS	Animal and Plant Health Inspection Service
BATF	Bureau of Alcohol, Tobacco and Firearms
BBG	Broadcasting Board of Governors
BEP	Bureau of Engraving and Printing
BOP	Bureau of Prisons
C2	Command and Control
C2I	Command, Control, and Intelligence
C4	Command, Control, Communications and Computer
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAF	Combat Air Forces
C-E	Communications-Electronics
CEC	Cooperative Engagement Capability
CNO	Chief of Naval Operations
CNO N6	Director, Space Information Warfare, Command and Control, Office of the Chief of Naval Operations
CONUS	Continental United States
DCS	Defense Communications System
DEA	Drug Enforcement Administration
DHHS	Department of Health and Human Services
DISA	Defense Information Systems Agency
DOD	Department of Defense
DOE	Department of Energy
DON	Department of Navy
DOS	Department of State
DRU	Direct Reporting Unit
DS	Diplomatic Security
DSCS	Defense Satellite Communications System
DUIITS	Digital, Ubiquitous, Interoperable, Transparent, and Secure

EA	Electronic Attack
EAF	Expeditionary Air Force
ECCM	Electronic Counter-Countermeasures
ECM	Electronic Countermeasures
EHF	Extra high frequency
EVA	Extra Vehicular Activity
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FLETC	Federal Law Enforcement Training Center
FOA	Field Operating Agencies
FS	Forest Service
FSS	Fixed-Satellite Service
FWPC	Federal Wireless Policy Committee
GHz	Gigahertz
GOES	Geostationary Operational Environmental Satellite
GPS	Global Positioning System
GSA	General Services Administration
HF	High Frequency
IHS	Indian Health Service
IMT	International Mobile Telecommunications
INS	Immigration and Naturalization Service
IRAC	Interdepartment Radio Advisory Committee
IRS	Immigration and Naturalization Service
IRS-CID	Immigration and Naturalization Service-Criminal Investigative Division
ITU	International Telecommunication Union
IT21	Information Technology for the 21 <sup>st</sup> Century
kHz	Kilohertz
MAJCOM	Major Command
MHz	Megahertz
MSS	Mobile-Satellite Service
NAIC	National Atmosphere and Ionosphere Center
NAS	National Airspace System
NASA	National Aeronautics And Space Administration
NATO	North Atlantic Treaty Organization
NAVAIRSYSCOM	Naval Air Systems Command
NAVEMSCEN	Naval Electromagnetic Spectrum Center
NAVSEASYSYSCOM	Naval Sea Systems Command
NCAR	National Center for Atmospheric Research
NCW	Network Centric Warfare
NEMS	National Emergency Management System
NESDIS	National Environmental Satellite, Data, and Information Service
NIH	National Institute of Health
NIST	National Institute of Standards and Technology
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAO	National Optical Astronomy Observatories

NOS	National Ocean Service
NRAO	National Radio Astronomy Observatory
NRCS	Natural Resources Conservation Service
NSF	National Science Foundation
NTC	National Training Center
NTIA	National Telecommunications and Information Administration
NTS	Naval Telecommunications System
NWS	National Weather Service
(OR)	Off Route
OMFTS	Operational Maneuver From the Sea
OPNAV	Office of the Chief of Naval Operations
PACAF	Pacific Air Force
PCS	Personal Communications Service
PD	Program Directorate
PDD	Presidential Decision Directive
PEO	Program Executive Office
PHS	Public Health Service
(R)	Route
RCS	Radio Conference Subcommittee
RF	Radio Frequency
SARSAT	Search And Rescue Satellite
SHF	Super High Frequency
SPAWARSSYSCOM	Space and Naval Warfare Systems Command
SYSCOMS	Systems
TDRSS	Tracking and Data Relay Satellites
TIGTA	Treasury Inspector General for Tax Administration
TT&C	Tracking, Telemetry and Command
UHF	Ultra High Frequency
USAF	U.S. Air Force
USAFE	U.S. Air Forces in Europe
USCENTCOM	U.S. Central Command
USCG	U.S. Coast Guard
USCS	U.S. Customs Service
USDA	U.S. Department of Agriculture
USJFC	U.S. Joint Forces Command
USMS	U.S. Marshals Service
USP	U.S. and its Possessions
USPS	U.S. Postal Service
USSOUTHCOM	U.S. Southern Command
USSS	U.S. Secret Service
USSTRATCOM	U.S. Strategic Command
VA	Department of Veterans Affairs
VHF	Very High Frequency
VLA	Very Large Array
VLBA	Very Long Baseline Array
VOA	Voice of America
WRC	World Radiocommunication Conference