



National Spectrum Plan (2014 – 2017)

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1. INTRODUCTION

The Communications Act, 2009 (“Comms Act”) prescribes the law applicable to the Electronic Communications Sector, empowers the Utilities Regulation and Competition Authority (URCA) as the independent regulator of that sector, and charges URCA with the responsibility for implementing the Electronic Communications Sector Policy and enforcing the provisions of the Comms Act.

URCA has prepared this National Spectrum Plan which sets out the current allocation of services to particular frequency bands, as well as the proposed policies which URCA will use in the management of radio spectrum over the next three years. The Plan has been approved by the Prime Minister, as Minister with responsibility for the Electronic Communications Sector, in accordance with section 31 of the Comms Act.

1.1 Background

Under section 31(1) of the Comms Act, URCA is required “to publish a spectrum plan, which is consistent with any applicable international treaties, commitments or standards including without limitation those of the International Telecommunications Union and shall take into account relevant international recommendations.” In March 2010, URCA published the first National Spectrum Plan (ECS 06/2010). Under section 31(4) of the Act, “within three years of each publication of a spectrum plan, URCA shall formulate, in consultation with the Minister, and submit a revised spectrum plan to the Minister.”

This National Spectrum Plan has been formulated in fulfilment of that requirement and in support of the Government’s aim of ensuring that Bahamians have access to high quality communications services and fostering sustainable competition between operators. In developing this National Spectrum Plan, URCA seeks to:

- i. implement administrative cost recovery for spectrum management and administration;
- ii. conduct a systematic review of current spectrum license fees; and
- iii. establish information systems to cope with future spectrum management needs, improve business processes and enhance access to wireless electronic communications services.

Additionally, in Part II of the Comms Act, the Government of The Bahamas has outlined the policy objectives of the Electronic Communications Sector. URCA has sought to align the management of spectrum with those objectives.

1.2 Objectives of this National Spectrum Plan

This National Spectrum Plan guides URCA's practices with respect to spectrum management.

On 31st January 2014 URCA, in accordance with section 31 of the Comms Act, submitted the draft of this National Spectrum Plan for the final approval of the Prime Minister. The Prime Minister approved the draft National Spectrum Plan on 3 April 2014, and URCA has now published the approved plan, effective from the date of publication. This plan replaces and supersedes the previous National Spectrum Plan (ECS 06/2010), and will be reviewed after a period of three years in accordance with section 31 of the Comms Act.

1.3 Structure of the National Spectrum Plan

The remainder of this document is structured as follows:

- Section 2 provides an overview of the legal framework;
- Section 3 discusses URCA's approach to Spectrum Management;
- Section 4 provides the rationale for spectrum allocation;
- Section 5 outlines URCA's strategy for decision making;
- Section 6 provides information about the type of spectrum licences;
- Section 7 discusses potential approaches to pricing;
- Section 8 lists control mechanisms URCA will use to manage spectrum; and
- Section 9 provides the National Frequency Allocation Table and other industry information.

2. THE LEGAL FRAMEWORK FOR SPECTRUM MANAGEMENT

In 2009, the Government of The Bahamas enacted legislation granting URCA the exclusive right to manage the radio spectrum (subject to the reservation of certain specific powers to the Minister with responsibility for the Electronic Communication Sector). Those powers include the planning and allocation of frequency bands, the assignment of frequencies and individual licensing, spectrum monitoring, international co-ordination of frequencies, setting of spectrum fees, enforcement of licence conditions and the setting of standards for radio transmitting equipment. The legislative framework comprises:

- The Communications Act [“Comms Act”];
- The Utilities Regulation and Competition Authority Act, 2009 [“URCA Act”];
- Utilities Appeals Tribunal Act, 2009 [“Tribunal Act”]; and
- The Electronic Communications Sector Policy, 2009 [“ECSP”].

2.1 The Communications Act (Comms Act)

The statutory foundation for the Radio Spectrum Management in The Bahamas is outlined in Part V, sections 29 through 38 of the Comms Act. Sections 29 through 31 of the Comms Act (as amended) establishes URCA as having responsibility for the management, allocation and assignment of radio spectrum frequencies in The Bahamas, subject to specific rights and responsibilities reserved for the Minister. The contents of the mentioned sections are as follows:

- s.29 *“Subject to section 30, URCA has the exclusive right to manage allocate and assign all frequencies in radio spectrum in The Bahamas.*
- s.30 *(1) The Minister shall be responsible for deciding the method of allocating frequencies in the premium spectrum band of the spectrum band, including without limitation determining, or proposing to determine, by way of public consultation or otherwise –*
- (a) pre-qualification and eligibility criteria for applicants seeking allocation of one or more frequencies in the premium spectrum band of the spectrum plan;*
 - (b) procedures and time limits for making applications and for the award of premium spectrum licences; and*

(c) *criteria for evaluating applications and for the award of premium spectrum licences.*

(2) *The Minister shall set spectrum fees in accordance with section 93(1) or shall prescribe the method by which fees are set.*

(3) *No premium spectrum licence shall be issued by IJRCa before the Minister has decided the method of allocating frequencies in the premium spectrum band of the spectrum plan.*

s.31 (1) *URCA shall publish the spectrum plan approved in accordance with subsection (5) or subsection (6).*

(5) *The Minister may approve or amend the proposed spectrum plan within forty-five calendar days of submission by URCA.*

(6) *If the Minister does not approve or amend the spectrum plan within the time period specified in section (5), URCA will publish the spectrum plan for the purposes of subsection (1).*

Section 32 provides further guidance as to the principles which URCA and the Minister must apply when managing radio spectrum as follows:

s.32 (1) *In performing functions and duties and exercising powers under this Part, the Minister and URCA must ensure that radio spectrum is managed and used in a manner that —*

(a) is open, objective, transparent and non-discriminatory;

(b) is economically efficient and facilitates the evolution of new technologies and electronics communications services whilst taking into account, in particular, investment in existing equipment configured for specific radio spectrum and the cost of migration to other radio spectrum; and

(c) meets the needs of government departments and agencies referred to in section 34(1).

(2) *URCA may rely on voluntary, industry standards in lieu of regulations.*

(3) *URCA shall take enforcement action promptly to ensure effective protection of licensed radio spectrum bands from interference and where necessary the management and use of the radio spectrum.”*

These principles permeate this National Spectrum Plan and underscore the acknowledgement in section 4 of the Comms Act that “*electronic communications perform an essential role in promoting the*

*economic and social welfare of The Bahamas*¹. The incorporation of these principles therefore implies that one of the overarching objectives of spectrum policy is the promotion of a sustainable balance of the Electronic Communications Sector growth needs and social welfare through effective implementation of the Electronic Communication Sector Policy.

2.2 Electronic Communications Sector Policy (ECSP)

Section 5 of the Comms Act requires that all policy measures, decisions and laws to take effect in the electronic communication sector in The Bahamas, should be made with a view to implementing the electronic communications sector policy objectives set out in section 4 of the Comms Act, and the Electronic Communications Sector Policy (ECSP) made by the Government from time to time in accordance with section 6 of the Comms Act. The following are the electronic communications policy objectives as set out in section 4 of the Comms Act:

- a) The furtherance of the interests of consumers by promoting competition and in particular:
 - (i) to enhance the efficiency of the Bahamian electronic communications sector and the productivity of the Bahamian economy;
 - (ii) to promote investment and innovation in electronic communications networks and services;
 - (iii) to encourage, promote and enforce sustainable competition; and
 - (iv) to promote the optimal use of state assets, including radio spectrum; and
- b) The furtherance of the interests of persons in The Bahamas in relation to the electronic communications sector by —
 - (i) promoting affordable access to high quality networks and carriage services in all regions of The Bahamas;
 - (ii) maintaining public safety and security;
 - (iii) contributing to the protection of personal privacy;
 - (iv) limiting public nuisance through electronic communications;
 - (v) limiting any adverse impact of networks and carriage services on the environment; and

¹Communication Act, 2009. Part II Electronic Communications Policy Section 4. <http://www.urcabahamas.bs/download/088554800.pdf>

- (vi) promoting availability of a wide range of content services which are of high quality.

URCA will seek to achieve these objectives by aligning the national approach to spectrum management with international best obligations and best practices. The strategy URCA will employ to accomplish this alignment is outlined in Section 3 and elaborated upon in the subsequent Sections of this document.

3. NATIONAL SPECTRUM PLAN

3.1 Radio Spectrum

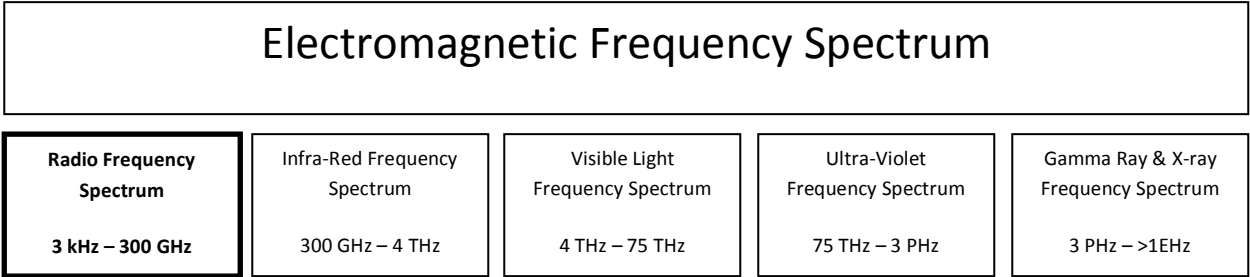


Figure 1: The Electromagnetic Frequency Spectrum

The radio frequency spectrum (RFS) is a small part of the electromagnetic frequency (EMF) spectrum which is currently used to provide electronic communications services. As shown in Figure 2 above, the radio frequency spectrum extends from 3 kilohertz (kHz) to 300 gigahertz (GHz). This proposed spectrum plan is designed to manage and identify provision allotments of spectrum within that range for delivery of fixed wireless and mobile electronic communications services.

RFS is a limited state resource/asset². It is an essential input for a multitude of services, including fixed and mobile communications, sound and television broadcasting services, data, voice and video services, aeronautical and maritime services, public safety and emergency services, medical electronics, remote control and monitoring devices, satellite and earth stations. Thousands of other applications, in almost every country in the world, make extensive use of this single resource: the radio frequency spectrum (“spectrum”). Hence, spectrum must be used efficiently and effectively so that it continues to be an accessible production input for wireless service providers.

Without effective planning or management, radio signals from different users and services would interfere with each other and radio could become useless as a means of communications. Further, radio waves are used world-wide and do not conveniently stop at the end of any particular jurisdiction, so there is a need for international planning and coordination of radio spectrum usage between neighbouring countries.

² See section 2 and 4(a)(iv) of the Comms Act

The management of radio spectrum is achieved through effective planning of frequency bands by URCA, and the issuance of licences to users of radio spectrum in accordance with those plans. Licensees are required to adhere to licence conditions which seek to maintain the quality of radiocommunications by ensuring that actual use reflects the planned and authorised use, and to ensure that authorised users are safeguarded against interference as far as possible.

3.2 Policy Objectives of Spectrum Management

The objective of this National Spectrum Plan is to amalgamate the international objectives and obligations of The Bahamas with the national legislation and policy objectives for spectrum management and spectrum utilization. The figure below illustrates how URCA's activities in The Bahamas fit into a cyclical flow of policies and actions by international and national bodies working to coordinate and harmonize radio frequency spectrum usage globally and to maximize its value over time.

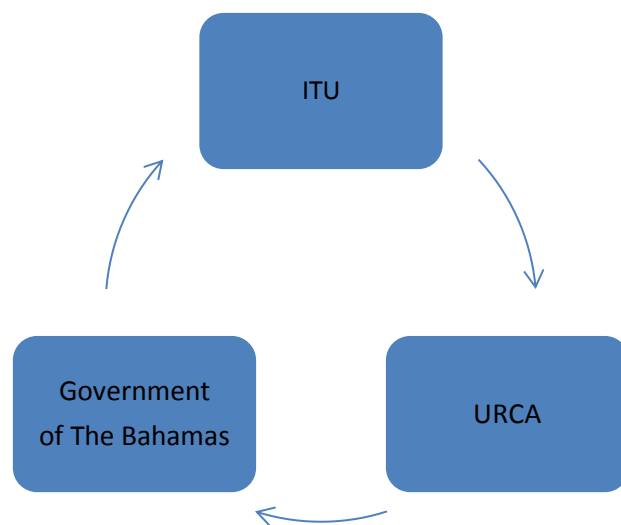


Figure 2: The interrelation of organizations with international and national spectrum management obligations and objectives

The international spectrum management obligations and objectives are enshrined in various ITU documents including the ITU Convention, the ITU Radio Regulations and other multinational agreements and standards, which combine with local legislation and policy to put in place a matrix of initiatives which collectively seek to harmonize the use of spectrum. The harmonization of spectrum use fosters

global accessibility and creates high level interoperability among modern wireless electronic communications services across the world.

3.3 Scope of the Plan

This plan sets out regulatory, technical, financial and geographical elements which have been proposed to effectively and efficiently plan, organize, direct and control the use of spectrum resources in The Bahamas in accordance with the policy objectives of the Comms Act.

3.3.1 Regulatory Scope

Having duly considered the legal, social, and technological change forces in the macroeconomic environment, URCA has taken into account international standards and commitments and national objectives, as specified in the sector policy, into this cohesive, unified, spectrum strategic plan. Consequently, implementation of this plan will enable URCA to coordinate and standardize the establishment, operation and maintenance of wireless electronic communications networks and services. This should effectively advance and facilitate the development and access to communications technology in The Bahamas. Also, implementation of the plan would support the Government of The Bahamas in fulfilling its social and economic policy objectives of obtaining maximum benefit from the use of the radio spectrum resources in The Bahamas, whilst simultaneously fulfilling its international obligations.

3.3.2 Technical Scope

In the previous National Spectrum Plan, URCA implemented strategies which made spectrum available for continuity of legacy terrestrial, maritime, aeronautical, extra-terrestrial services and technologies, as well as providing for services using IMT-2000 technologies³.

In this National Spectrum Plan, URCA ensures continuity of the services delivered via those pre-existing technologies and will further provide for the technologies defined by the ITU as International Mobile Telecommunications–Advance (IMT-Advance-). To date, only two technologies have been classified

³ International Mobile Telecommunications 2000, as defined by the ITU and including GSM (2G), GPRS (2.75G), EDGE (2.75), CDMA2000 (3G), WCDMA (3G), HSPA (3.5G), HSPA+ (3.75G), LTE (Pre-4G) and WiMAX (Pre-4G)

umbrellas IMT-Advanced, namely: Long-Term Evolution-Advanced (LTE-Advance), and Worldwide Interoperability for Microwave Access 2.0 (WiMAX2).

3.3.3 Financial Scope

Pursuant to section 93(2) of the Comms Act:

“URCA may, where radio spectrum other than spectrum in the premium band is to be allocated or used, impose charges to be paid to the Government which reflect the need to ensure the optimal use of radio spectrum.”

Accordingly, for non-premium spectrum bands URCA is responsible for the determination and imposition of charges to be paid for the use of that spectrum.

By contrast, section 93(1) provides that:

“the Minister may, where radio spectrum in the premium spectrum band is to be allocated or used, impose charges to be paid to the Government which reflects the need to ensure optimal use of that spectrum, or prescribe the methods by which such charges will be set.”

URCA is therefore not responsible for the setting of charges for premium spectrum, though it provides advice to the Minister upon request in relation to those charges.

Pursuant to section 91 of the Comms Act, URCA is also responsible for the collection, on behalf of the Treasurer, of all spectrum fees. Spectrum fees are therefore payable annually to URCA by licensees; however, those fees are remitted in their entirety by URCA to the Treasurer.

3.3.4 Geographical Scope

As URCA is the national regulator of spectrum, the geographical scope of URCA’s responsibility, as established by section 29 of the Comms Act, is The Bahamas which would include all lands, territorial waters and air space that constitute the Commonwealth of The Bahamas.

3.4 Radio Spectrum Management Strategy

URCA will address the regulatory, technical, financial and geographical elements, mentioned in previous Sections of this document, by implementing, and revising when necessary, five spectrum management

processes. The strategy includes spectrum allocation, band planning, spectrum pricing, spectrum authorization, and compliance monitoring and enforcement, and is outlined in Figure 3 below.

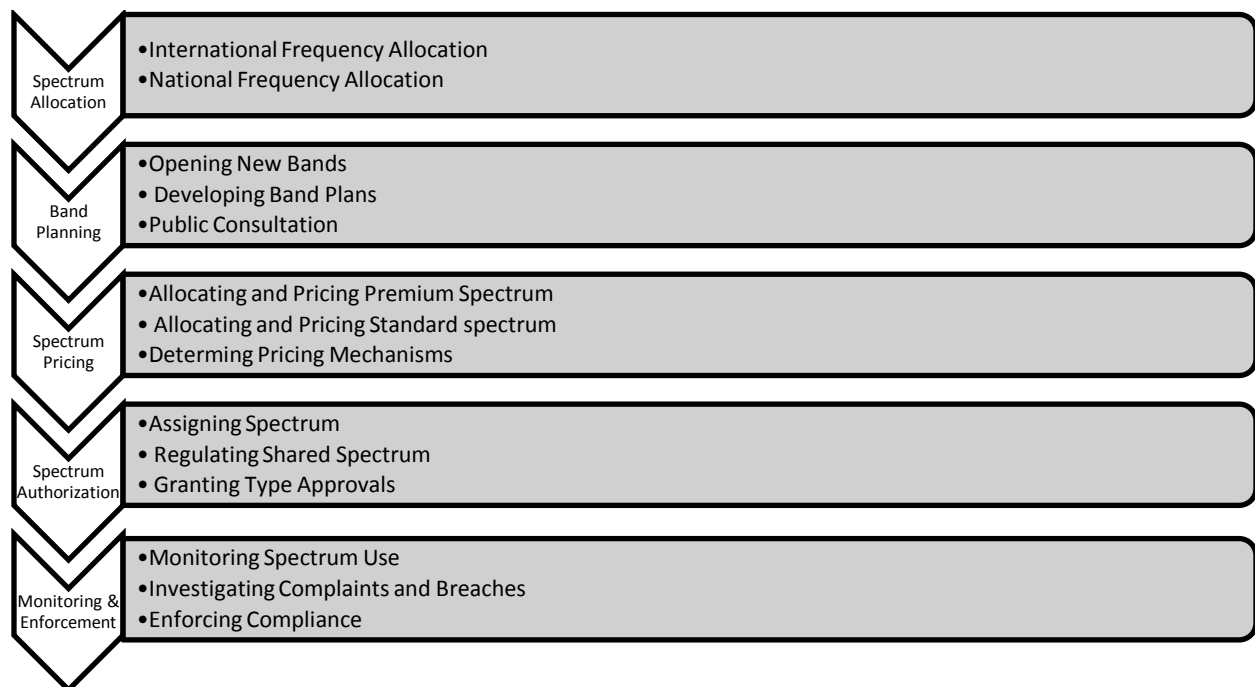


Figure 1: The Strategy for National Spectrum Management

The interworking of the five processes set out in Figure 3 is known to foster digital inclusion, technological innovation and sustainable competition in electronic communications markets around the world. According to the United Nations, the effect of such a strategy will be economic and social progress. That economic and social progress results from availing the public with electronic communications services resources that promote higher standards of living, lower the unemployment rate, develop domestic and global enterprises, improve access to modern education and medical health resources, and promote international, cultural and social exchange.⁴ These outcomes result naturally when spectrum allocation is aligned with the global community.

⁴ Dr Hamadoun I. Toure', "A year of great achievements," ITU News No.2 Mar. 2012: 1.

4. SPECTRUM ALLOCATION

4.1 Definition of Allocation

According to Article 1 of the ITU Radio Regulations (ITU-RR), a spectrum allocation is an entry in the Frequency Allocation Table (FAT) that specifies the type of terrestrial or extra-terrestrial-based radio communications service for which a given frequency band must be used. Spectrum allocation is harmonised internationally under the auspices of the ITU.

4.2 Introduction to Spectrum Allocation

All spectrum radio frequency ranges have been allocated to domestic and global electronic communications services. In keeping with best practices, URCA, in this National Spectrum Plan has formulated and issued a revised National Frequency Allocation Table (NFAT) which sets out the allocations which are applicable in The Bahamas. In doing so, URCA has sought to ensure that the allocations in the NFAT conform to the International Table of Frequency Allocations published in Article S5 of the most recent version of the ITU Radio Regulations (i.e., the 2012 Edition). This will result in the harmonisation of spectrum usage with adjacent countries and thereby foster effective coordination.

Coordination and harmonisation of spectrum usage with regional and international countries are necessary because radio signals will naturally propagate beyond national boundaries and infringe upon the sovereign rights of other nations. Radio signal propagation could also hinder the ability of other countries to access the radio frequency spectrum within their borders. Also, coordination is essential to ensure radio frequency transmissions emitted from locations within The Bahamas will not pose any danger to aircraft flying The Bahamas' airspace or to ships traversing its waters. It is therefore important for URCA, in conjunction with its regional and international counterparts, to coordinate radio frequency transmissions to achieve mutually beneficial and desired outcomes. As a result, the national radio frequency spectrum plan is designed with the objective of maintaining international peace and security, achieving conformity with regional and international treaties, commitments and standards, and developing friendly relations with other nations. URCA has therefore, in addition to developing allocations which are consistent with those in neighbouring countries, sought to build relationships with appropriate bodies in those countries which will enable effective harmonisation and coordination of spectrum usage.

4.3 Regional Allocation

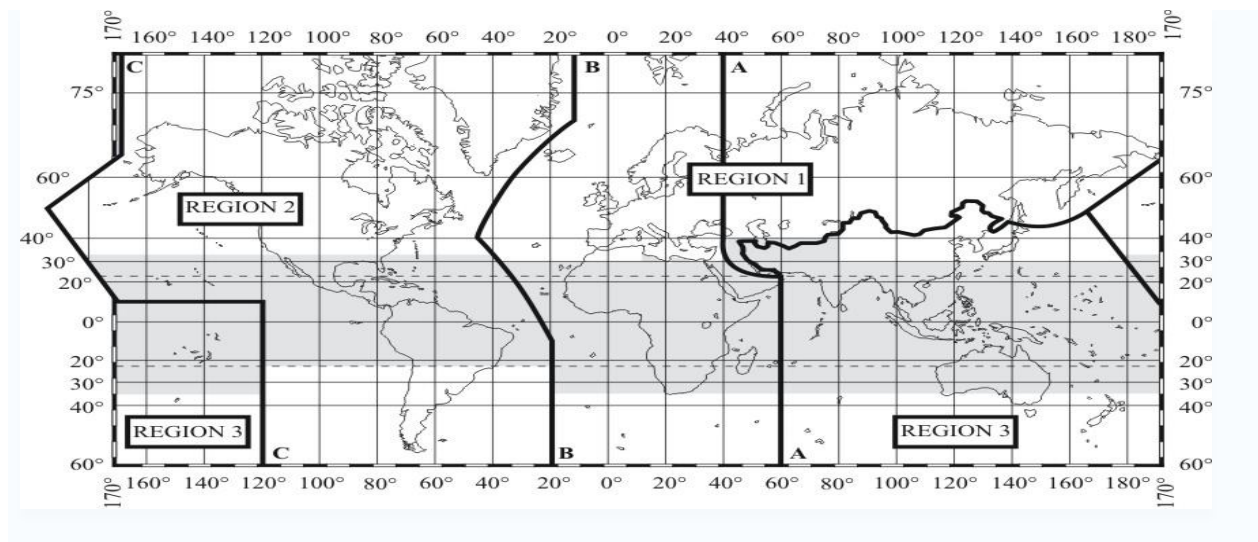


Figure 2: The Map of ITU Regions showing The Bahamas in Region 2⁵

For the purpose of harmonization, the ITU has divided the world into three regions. The Commonwealth of The Bahamas is located in Region 2, along with North America, Central America, South America, Canada, Greenland, Alaska, and the Pacific islands (i.e., those islands in the Pacific east of the International Date Line). Typically, the operating frequency and technical specifications of wireless electronic communications equipment manufactured for use in Region 2 will comply with the service allocation in the NFAT. However, equipment designed and manufactured for use in Region 1 or Region 3 may not conform to service allocation requirements in the NFAT. The use of such equipment could cause harmful interference to other users of the spectrum. Therefore, where equipment manufactured for use in Region 1 or Region 3 is proposed for use in The Bahamas, it will be subject to greater regulatory scrutiny by URCA so as to ensure compatibility with other electronic communications equipment operating in The Bahamas and other parts of Region 2.

4.4 National Frequency Allocation Table

Under the auspices of the ITU, world governments have determined that by the adaptation of common frequencies for similar services, greater convenience for users of the radio frequency spectrum is achieved. Additionally, standardisation helps to promote the efficient use of spectrum resources by

⁵ Withers, David. Radio Spectrum Management. United Kingdom: The Institute of Electrical Engineers, 1999. P.29

establishing a basis for harmonised use and establishing appropriate technical parameters, which ultimately reduce the price of services, increase the quality of service, expand the availability of service and reduce the occurrence of interference.

The services allocated to specific frequency bands are listed in the National Frequency Allocation Table (NFAT) in Appendix A, a summary of which is shown in Figure 5 below:

Radio Frequency Spectrum Allocation						
VLF	LF	MF	VHF	UHF	MICROWAVE	MILLIMETER WAVE
3 kHz-0.3 MHz	0.3-3MHz	3MHz-30MHz	30MHz-0.3GHz	0.3GHz-3GHz	3GHz-30GHz	30GHz-300GHz
Maritime mobile Maritime & Aeronautical Radionavigation	Broadcasting Navigation Beacons	Broadcasting Maritime Amateur Citizen band	FM Broadcasting Private & Public Land Base Radio Aeronautical Maritime	Broadcasting Mobile Telephone Fixed & Mobile Broadband Trunking	Fixed & Mobile Broadband Point to Point Links Satellite Fixed Wireless	Satellite Point to Point Links Multimedia Systems Amateur

Figure 3: A summarized version of the National Frequency Allocation Table

4.5 Amendments to the National Frequency Allocation Table

The previous National Spectrum Plan established a NFAT which was based upon the recommendations ratified at the World Radio Conferences (WRC) of 1995, 1997, 2003 and 2007, held by the ITU's Radiocommunications Bureau (ITU-R). Appendix A contains a revised NFAT, which in addition to the WRC recommendations taken into account in the previous National Spectrum Plan, also takes into account recommendations ratified at WRC 2012. The most notable amendments made to the NFAT include:

- The re-allocation of 698 MHz – 806 MHz allotment to fixed, mobile and broadcasting on a primary basis.
- The re-allocation of 960 – 1164 MHz allotment to aeronautical mobile and aeronautical radiolocation on a primary basis.

- The re-allocation of 1300 – 1350 MHz allotment to radiolocation, aeronautical radionavigation and radio-navigation satellite on a primary basis.
- The re-allocation of 9300 – 9500 MHz allotment to earth exploration- satellite, space research, radiolocation and radionavigation.

In the Final Acts WRC-12, the 698-960 MHz band was identified for use by International Mobile Telecommunication (IMT) in ITU Region 2 (Resolutions 224 and 749)⁶. Subsequent to the re-allocation of that band, on 23 March 2012, URCA published its *Policy for New Bands - 700 MHz, 11 GHz, 12 GHz and 40 GHz (ECS 09/2012)*, wherein it identified the IMT band as the 700 MHz Band and allocated it to fixed, mobile and public health and safety services. In this National Spectrum Plan, the 700 MHz Band is reclassified as Premium Spectrum pursuant to section 30 of the Comms Act. Premium spectrum bands are further discussed in Section 5.4 below. In regard to the 960-1164 MHz, 1300- 1350 MHz and 9300-9500 MHz bands, which were previously allocated to aeronautical radio-navigation and radio-location, it was determined by the WRC that those bands were under-utilised and that improved spectrum utility could result by allocating additional services, such as aeronautical mobile, radio-navigation satellite, earth exploration-satellite and space research, to those bands. Those changes were also ratified at the WRC 2012 and are reflected in this National Spectrum Plan.

The NFAT contains provisions for all radio services used globally, including some international regulatory provisions for non-domestic radiocommunications. It also lists sub-allocations designed to group similar technologies or users in a given frequency band, thereby affording greater spectrum efficiencies which result when users with similar technical parameters share the same frequency bands.

⁶ International Telecommunication Union, Final Acts WRC-12: World Radiocommunications Conference (Geneva: ITU, 2012) 23.

5. SPECTRUM BAND PLANNING

5.1 Definition of Spectrum Band Plan

The NFAT is designed to coordinate and harmonise the use of radio frequency spectrum in The Bahamas with other countries. Within the NFAT, spectrum is allotted to broadly defined services, such as maritime radio navigation, aeronautical radio navigation, broadcasting, fixed/mobile radio, amateur radio, and fixed/mobile satellite. As mentioned earlier, The Bahamas is in Region 2 for the purposes of ITU spectrum planning. Therefore, the service allocations are generally consistent with the allocations made throughout Region 2.

Within the NFAT allocations, URCA formulates and determines spectrum band plans, which are national in effect and are designed to coordinate and harmonise the use of the relevant band within national borders. In order to ensure coordinated and harmonised use of a spectrum band by multiple users, the spectrum band plan will also contain technical standards, which identify appropriate operating thresholds for the following parameters:

- Centre frequency
- Bandwidth
- Guard band
- Spectral mask
- Modulation

Decisions regarding the appropriate threshold for these parameters are made with due regard to national allocation of services, relevant international standards and the geographical characteristics of the territory covered by the applicable spectrum licences. URCA has designed and/or adopted spectrum band plans that conform to international standards for all open spectrum bands. URCA will grant spectrum assignments in The Bahamas in conformity with the relevant band plan.

5.3 Policy Considerations in Spectrum Band Planning

The catalyst for spectrum band planning and opening new spectrum bands is the growth in demand for new or existing wireless electronic communications services. URCA seeks to make available the spectrum needed to drive the evolution of legacy technologies and the emerging technologies defined in the ITU's IMT-Advanced.

The three main goals of spectrum band planning are (i) to ensure harmonized spectrum access conditions which enable interoperability and economies of scale for wireless equipment, (ii) to work towards more efficient use of the radio spectrum, and (iii) to improve the availability of information and communications technologies throughout The Bahamas. These goals will be achieved through focussing on the following main areas of activity:

- Establishment of policy priorities for assigning radio spectrum;
- Harmonization of spectrum usage in individual bands with relevant regional and international administrations;
- Coordination of spectrum assignments – including the monitoring of a wide range of policy areas which depend on radio spectrum, such as electronic communications, transport and public safety;
- Facilitation of access to radio spectrum to public and private users; and
- Driving sustainable innovation and competition.

The spectrum planning process is intended to support regulatory policy formulation and optimal spectrum use. Planning will involve tracking global industry trends and developments in technology, and assessing current and future demand of the radio frequency spectrum. For these purposes, URCA will make use of software-based tools to conduct frequency management, monitoring, and channel planning.

Planning will be undertaken to facilitate long-term, medium-term and short-term strategic objectives. These various degrees of planning are necessary to ensure that resources are efficiently deployed to address current demand and usage, forecast future spectrum demands and project the impact of evolving technologies.

The services permitted in the band will be consistent with the service allocated to the band in the NFAT. The relevance and effectiveness of the band plan depends on how accurately it maps the current trends in the ECS, whether it is provisioned to allow sufficient licences to promote competition and how well the technical standards work to achieve compatibility of services operating in the band. Spectrum band plans are designed to promote investment and innovation in electronic communications networks and

services, encourage, promote and enforce sustainable competition and to promote the optimal use of the radio spectrum.

It is important to note that, depending on the technologies and services to which a band is allocated, spectrum allotments are either exclusive or shared. In exclusive allotments, it is essential that URCA is aware of the technical parameters and planned activities of all existing users in order to effectively monitor and coordinate usage amongst licensees and to identify and develop new spectrum access options. Spectrum occupancy assessments are an essential source of regulatory information. URCA intends to conduct annual spectrum occupancy surveys which will determine the current usage of particular spectrum bands throughout The Bahamas. These surveys will identify spectrum bands that have low or no active utilisation and thus may be appropriate for allocation to emerging technologies, and will also assist URCA in its spectrum monitoring and enforcement activities.

5.3 Opening New Spectrums Bands

In order to promote *the “availability of a wide range of content services which are of high quality”*, URCA seeks to minimise barriers to market entry by granting accessibility to spectrum resources needed to satisfy consumer demand for connectivity, mobility, roaming, throughput, latency, efficiency and universality of services. Throughout 2013-2016, URCA will continue to make spectrum available for mobile electronic communications services - defined under the umbrellas of IMT-2000 and IMT-Advanced.

Section 32(1)(b) of the Comms Act requires the Government and URCA to ensure that spectrum use *“is economically efficient and facilitates the evolution of new technologies and electronics communications services.”* These dual objectives can be achieved by ensuring that the supply of RFS does not exceed market demand. Therefore, certain spectrum bands in the NFAT are defined as “closed” until such time as demand for available spectrum exceeds the supply. A “closed” band is reserved for future use. Spectrum in a “closed” band will not be assigned by URCA until the band has been “opened”.

A spectrum band which is “closed” may be opened following the process outlined in *The Guidelines for the Opening of New Spectrum Bands (ECS 11/2011)*, published May 27, 2012. Those guidelines describe the seven step procedure URCA will follow when opening new spectrum bands. That procedure is summarized below:

- Step 1: Submission of Expressions of Interest;
- Step 2: Assessment of Expressions of Interest;
- Step 3: URCA to prepare draft policy for that band;
- Step 4: Consultation on the draft policy;
- Step 5: Finalising the policy;
- Step 6: Implementation of the policy; and
- Step 7: Licence award.

The process of preparing the draft policy for a proposed band, undertaken in Step 3 above, will necessarily include spectrum band planning.

5.4 Premium and Standard Spectrum

The Comms Act contains provision for certain parts of the radio spectrum to be specified as Premium Spectrum and requires URCA to include in the Spectrum Plan those frequencies which are Premium. Any Spectrum Band which has not been classified as Premium is referred to by URCA as “Standard Spectrum”. The NFAT identifies whether each band is classified as Premium or Standard Spectrum.

5.4.2 Premium Spectrum Bands

In identifying spectrum bands which it considers should be classified as Premium Spectrum, URCA will consider the following broad characteristics of the spectrum band:

- Demand - Sufficient potential licensees have requested, or are likely to request, access to the spectrum, resulting in URCA being unable to fulfil its objective of allocating spectrum to meet the needs of all users.
- Technology - A specific technology deployed in the spectrum band which would offer new services to consumers in The Bahamas. Technological advances have resulted in the spectrum becoming newly suitable for additional services.
- Competitive Pressures- Use of the spectrum, perhaps in conjunction with technical advances, creates a significant commercial advantage. The spectrum could be used to quickly introduce competition to an existing service offering provided by another licensee.

- Award and Pricing Mechanism- Grants of the spectrum would be made more efficiently through some competitive process, rather than on a first-come, first-served basis with an administrative usage fee schedule.

The list of criteria should not be considered exhaustive and if it deems it appropriate, URCA may elect to use a number of additional characteristics as part of its specification process.

In the previous National Spectrum Plan, several spectrum bands identified by the International Telecommunication Union (ITU) as International Mobile Telecommunications-2000 (IMT-2000) spectrum were classified as Premium Spectrum. Electronic communication services utilising those bands continue to drive social and economic growth in The Bahamas. In this National Spectrum Plan, the 700 MHz Band, which has been identified in ITU's IMT-Advance as the RFS needed to drive the evolution of emerging technologies, is also categorized as Premium Spectrum. A list of Premium Spectrum bands is shown in Table 6.

Lower Frequency		Upper Frequency	Band	Availability	Allocation method
698 MHz	-	806 MHz	700 MHz Band	Open	To be determined
824 MHz	-	849 MHz	850 MHz Band Uplink	Open	To be determined
869 MHz	-	894 MHz	850 MHz Band Downlink	Open	To be determined
1710 MHz	-	1755 MHz	1700 MHz Band	Open	To be determined
1850 MHz	-	1915 MHz	1900 MHz Band Uplink	Open	To be determined
1930 MHz	-	1995 MHz	1900 MHz Band Downlink	Open	To be determined
2110 MHz	-	2155 MHz	2100 MHz Band	Open	To be determined
2305 MHz	-	2320 MHz	2300 MHz Band Uplink	Open	To be determined
2345 MHz	-	2360 MHz	2300 MHz Band Downlink	Open	To be determined

Figure 4: Premium Spectrum bands

Section 31(3) of the Comms Act requires URCA to identify in the National Spectrum Plan spectrum bands that have been classified as Premium Spectrum. However, it should be noted that determination of the method of allocation of spectrum in those bands to users, and the pricing of those bands, are matters to be determined by the Minister with responsibility for the ECS.

5.4.3 Re-classification of Spectrum Bands

Should demand for a Standard Spectrum band exceed supply during the lifecycle of this plan, URCA will give due consideration to such demands and may open new spectrum bands or reclassify existing Standard Spectrum bands as Premium Spectrum. Similarly, where appropriate in relation to the criteria stated in Section 5.4.2 above, subsequent to a consultative process, URCA may reclassify Premium bands as Standard Spectrum bands.

5.5 Technical Standards

Section 32 of the Comms Act gives URCA the flexibility to rely on voluntary industry standards in lieu of regulations, and requires URCA to take enforcement action promptly to ensure effective protection of licensed radio spectrum bands from interference. In electronic communications networks, harmonization, interoperability, coordination and economies of scale are achieved by standardization of band allocation and technical standards. With regard to the management of radio frequency spectrum, URCA will focus on specifying standards for the physical layer of network interfaces (e.g., transmitters, receives and modems) and the media control layer (i.e., the protocol that governs the secure and reliable transmission of packets across the radio spectrum (air interface)). This will ensure multi-vendor interoperability for data network applications.

In the Table below, URCA sets out current Quality of Services (QoS) standards for the aforementioned generations of technology. URCA will track and adopt standards from relevant telecommunication standardization bodies. URCA promotes technological neutrality and hence will not require licensees to adopt any particular technology. However, URCA will ensure that service providers do not misinform consumers with regard to their QoS.

GLOBAL QoS STANDARDS FOR INTERNATIONAL MOBILE TELECOMMUNICATIONS (IMT)					
Generation	Technology	Modulation	Characteristics	Typical Downlink Speed	Typical Uplink Speed
2.5G	GSM/GPRS	TDMA	Widely Deployed, Provides Voice And Data Service Via GPRS/ EDGE	32 kbps - 48 kbps	
2.75G	GSM/EDGE	TDMA	Intro Data Service For GSM Networks;	70 kbps - 135 kbps	70 kbps - 135 kbps

			Enhanced GPRS		
	GSM/EVOLVED EDGE	TDMA	Quadruple Edge Throughput Rates; Reduced Latency; Increased Spectral Efficiency	150 kbps - 300 kbps	176 - 350 kbps; 350 s - 700 kbps
3G	UMTS	CDMA	Provides Voice And Data;	200 kbps - 300 kbps	200 to 300 kbps
	W-CDMA	CDMA			
	EV-DO REV. A	CDMA			
3G	HSPA	CDMA	Enhanced UMTS data Service For UMTS Networks	1 Mbps - 4 Mbps	
3G	HSPA+	CDMA	Evolved HSPA; Increased Throughput; Lower Latency	1 Mbps - 4 Mbps In 5/5 MHz or 10/5 MHz	1.9 - 8.8 Mbps in 5/5 MHz; 3.8 - 17.6 Mbps in 10/5 MHz
PRE-4G	WiMAX	OFDMA			
PRE-4G	LTE	OFDMA	New Radio Interface; Wide Radio Channels; Extremely High Throughput; All IP Domain	6.5 - 26.3 Mbps in 10/10 MHz	6.0 - 13 Mbps in 10/10 MHz
4G	LTE-ADVANCED	OFDMA	Advanced Version of LTE	100 Mbps (Mobile); 1Gbps (Fixed)	60 Mbps
4G	WIMAX 2	OFDMA	Advanced Version Of WiMAX	100 Mbps (Mobile); 1 Gbps (Fixed)	60 Mbps

Figure 7: Global QoS Standards for International Mobile Telecommunications (ITU)

The relevant standardisation bodies will include:⁷

⁷ Institute of Electrical and Electronic Engineering (IEEE) Communications Society. A Guide to the Wireless engineering Body of Knowledge. New Jersey: John Wiley & Sons, Inc., Publication, 2012.

- *Alliance for industry solution (ATIS)*: services and systems, network reliability, interconnection with emergency services
- *European Telecommunication Standards Institute (ETSI)*: electromagnetic compatibility, emergency communications, reconfigurable radio systems
- *International Telecommunications Union (ITU)*: radio regulations, network standards, radio standards, interference standards, electromagnetic compatibility, emergency communications, security, management of radio frequency and satellite orbits
- *International Standards Organization (ISO)*: compatibility with medical devices, cabling for wireless points, radio frequency identification, device testing, performance testing methods
- *Institute of Electrical and Electronics Engineers (IEEE)*: wireless local area network (WLAN), quality and reliability, compatibility with hearing aids
- *Internet Engineering Task Force (IETF)*: mobility for IP, control and provisioning for wireless access points, mobile ad-hoc networks
- *Telecommunications Industry Association (TIA)*: terrestrial mobile multimedia multicast, steel antenna towers, vehicular telematics
- *The 3rd Generation Partnership Project (3GPP)*: a collaboration agreement among a number of communications standards bodies; its scope includes 3rd generation mobile systems, enhanced data rates for GSM and GPRS
- *The 3rd generation partnership Project 2 (3GPP2)*: a collaboration agreement among a number of communications standards bodies; its scope includes 3rd generation mobile systems, enhanced data rates for GSM and GPRS
- In relation to these technologies, the QoS standards listed in the Table 8 below are applicable

5.6 Refarming of Spectrum

As evolving electronic communications services result in increasing demand for spectrum, manufacturers worldwide are working with international standardisation bodies to produce mobile broadband systems and devices that operate in previously unused frequency bands and/or bands previously used for other services. The resulting new technological innovations are typically more

spectrally efficient and thus help to maximise the value of spectrum, which results in economic benefits that significantly outweigh the economic cost of provisioning radio frequency spectrum.

Currently, technological innovations are creating forces in the macroeconomic environment that resulted in changes to the international table of frequency allocations. Those changes may lead to the reallocation of services to other spectrum bands – known as re-farming.

National development, to some degree, will depend on URCA's ability to synchronise spectrum regulatory policy with the global agenda and global trends in mobile telecommunications. Therefore, URCA believes that at some point, perhaps during the lifecycle of this plan, it may be necessary to re-farm spectrum. These will be done whilst taking into account:

- The national interest;
- Stakeholder viewpoints;
- The level of private sector investment in existing wireless and mobile electronic communications networks;
- Equipment configuration for specific radio spectrum;
- The cost of migration to other radio spectrum bands; and
- The needs of government departments and agencies.

The central issues that may arise are who decides, and who will pay for the costs incurred by these users in transitioning to new frequencies. URCA will make this decision while considering several criteria and possible competing objectives such as: logical market structure, financial, socio-economic, and technical efficiency criteria. The analysis will include factors such as prices, costs, license conditions, withdrawal, and compensation.

5.7 Consultation

The Comms Act recognizes radio spectrum as a state asset. The Act places a specific obligation upon URCA to publicly consult in relation to matters of radio spectrum management, and to coordinate the use of radio spectrum with other countries and international users and organizations. In so doing, URCA will ensure that its management of the radio spectrum is open transparent and non-discriminatory, economically efficient and facilitates the evolution of new technologies and electronic communications services.

Therefore, when practicable, URCA will conduct public inquiries and consult with electronic communications service providers, network operators, and consumers regarding radio spectrum management issues. During the consultative process, URCA will allow associations or bodies representing groups of users to contribute. Prior to public consultations, URCA will supply the public with its proposals and recommendations. This inclusion is intended to encourage exchanges between URCA and stakeholders, and allows URCA to obtain stakeholder input. URCA will make every effort to ensure that the consultative process is characterized by transparency, fairness and openness.

6. PRICING

6.1 Introduction to Spectrum Pricing

Within the aforementioned overarching objectives of the electronic communications sector policy (section 4 of the Comms Act), specific provisions for management of radio spectrum are set out in Part V of the Act. Section 32 of the Comms Act provides that in performing its functions and duties and its exercising powers under Part V of the Act, URCA must ensure that radio spectrum is managed and used in a manner that –

- i. is open, transparent and non-discriminatory;
- ii. is economically efficient and facilitates the evolution of new technologies and electronic communications services whilst taking into account in particular investment in existing equipment configured for specific radio spectrum and the cost of migration to other radio spectrum; and
- iii. meets the needs of Government departments and agencies referred to in section 34(1) of the Comms Act.

Effective use of spectrum can make a significant difference to a country's prosperity, particularly because electronic communications is becoming more and more reliant upon wireless technologies.

Broadly the goals and objectives of spectrum pricing globally are:

- Covering the costs of spectrum management activity borne by the spectrum management authority or regulators;
- Ensuring the efficient use of spectrum resources;

- Maximising the economic benefits to the country from use of the spectrum resource;
- Ensuring that users benefiting from the use of the spectrum resource pay for the cost of using spectrum; and
- Providing revenue to the government or to the spectrum regulator.

Section 93 of the Comms Act authorises the Minister (in the case of Premium spectrum) and URCA (in respect of Standard spectrum) to impose charges for the allocation or use of spectrum which reflect the need to ensure efficient and optimal use of this scarce state resource. Such charges are in all cases payable to URCA on behalf of the Government.

URCA's objectives in its spectrum pricing activities are threefold:

1. To promote efficient and optimal use of the spectrum and thereby maximize the net benefits to the Bahamian society and economy;
2. To recover the administrative cost of managing spectrum; and
3. To administer fees in a non-discriminatory manner

6.2 Common Methods of Spectrum Pricing

The three most commonly used methods of setting spectrum prices are as follows:

Administrative fees and prices

The activities associated with issuing a licence impose direct costs on URCA; therefore, the administrative assignment of spectrum is presently supplemented by charges for spectrum use. These charges, which include the costs of issuing, maintaining data, spectrum monitoring and enforcing the conditions of individual licenses, must be set at a level sufficient to recover the costs of spectrum management. Some costs are common to a band or to a radio service (such as band planning), whereas others are common to a group of bands and some, such as management overheads, will straddle all licensees.

Currently, URCA imposes fees on a purely administrative basis for certain specific activities related to the processing of applications for spectrum licences, and other specific spectrum related activities. The fees levied include:

- Application fees; and
- Type Approval fees.

The fees represent an estimate of the approximate cost of the relevant activity.

Since all proceeds from spectrum fees are paid to the Public Treasury, URCA notes that its costs of spectrum management activities are not currently met from spectrum charges imposed under the Comms Act. Therefore, URCA proposes to conduct a spectrum valuation exercise to align spectrum pricing with the economic benefits of using the spectrum as well as the administrative costs associated with spectrum management in The Bahamas. This valuation exercise is scheduled for early 2013, and will encompass a comprehensive review of spectrum fees and all costs incurred by URCA in managing the spectrum.

6.3 Market-Based Prices

Market-based pricing involves setting prices which emerge through an authentic market transaction, such as an auction held by the regulator or secondary trading by licensees.

In an auction, it is normal for the bids to be made in monetary terms, with the bidder offering the largest monetary sum getting the licence. However, competition for spectrum may include non-monetary variables. For example, competitors can bid against one another over which of them will offer service over the largest geographical area. Alternatively, the competition may occur in terms of which operator will charge the lowest price for service. Once the rules are established, however, the winner is determined by the operation of the competitive process, not by an administrative decision.

In general, the key attractions of an auction process are that, it assigns the licence to the firm which bids the most, and that may, in certain conditions, be the most efficient firm; and ensures that any expected excess profits from providing communications services go to the Government, rather than the operator. Auctions are most effective in cases where:

- the spectrum band in question is scarce;
- there is significant competition between several firms for the spectrum; and,
- the monetary value of the spectrum is likely to be high.

6.4 Administered Incentive Prices

Administered incentive pricing involves approximating the prices (often flat rate charges) that might emerge in a market context. This method is referred to as ‘administered incentive pricing’ because:

- prices are set by the regulator reflecting the opportunity cost of spectrum while incorporating potential ‘incentive’ properties; and
- at a level reflecting the scarcity of spectrum while encouraging efficient use.

The economic rationale for administered incentive prices is twofold. Firstly, a licensee with unused spectrum is incentivised to return the unused spectrum rather than pay the charge. Secondly, because a licensee would pay a lower fee by using spectrum more efficiently, that user has the incentive to adopt more spectrum-efficient operations.

In the absence of market-based pricing for spectrum, it may be desirable to incentivise licensees to economise on spectrum use, thus discouraging inefficient use or hoarding. By setting an appropriate price for spectrum, steady pressure is imposed on users to economise, just as appropriate electricity tariffs may encourage conservation of electricity.

In URCA’s estimation, the appropriate level of price pressure could be created at a price that reflects opportunity cost. This can be found by estimating the other resources which would be saved if the same spectrum were redeployed to produce another service, or the extra costs which would be incurred if it were not available to provide the service for which it is currently employed, so service had to be produced with fewer spectrum.

6.5 URCA’s Proposals for Spectrum Pricing

The licence fees currently charged by URCA are a combination of historical charges and, in respect of recently opened bands, interim fees imposed by URCA in 2012 out of necessity. URCA proposes to conduct a review of radio spectrum pricing. In that evaluation, URCA will take into account the principles mentioned in section 6.1 of this document and any other factors which URCA considers to be

relevant. The review of radio spectrum pricing is scheduled for completion in the third quarter of 2013. Applicable spectrum pricing will be published annually in URCA's Fee Schedule.

7. SPECTRUM AUTHORISATION

7.1 Types of Spectrum Licences

URCA is empowered to authorise the use of spectrum under the following:

- Individual Spectrum Licence;
- Class Spectrum Licence Requiring Registration;
- Class Spectrum Licence Not Requiring Registration; and
- Spectrum Exemption.

The types of licenses and exemptions are discussed below and detailed information may be found in the "Guidance on the Licensing Regime under the Communications Act, 2009" (Guidelines ECS 15/2009) on the URCA website, www.urcabahamas.bs.

7.2 Individual Spectrum Licence

Under section 20(4) of the Comms Act, licence conditions may not unfairly discriminate between licensees and therefore individual licences for a specific type of electronic communications network or service will be in a standard form to the greatest extent possible. However, if a licensee has special rights or obligations the licence may need to have specific conditions. URCA may issue an Individual Spectrum Licence when the applicant requires exclusive use of the spectrum. The licence would be issued for a minimum of five years and may require the operator to hold a valid Individual Operating Licence. There may be specific sets of conditions attached to the right to use the spectrum related to the operation, technical standards, or the territory to be served. The quantity of Individual Spectrum Licences to be awarded will only be limited by the amount of spectrum available.

7.3 Class Licenses

URCA may issue Class Licences where it is necessary to impose conditions relating to the operation of electronic communications networks or the provision of electronic communications services, but all

licensees operating such networks or providing such services will be subject to the same conditions, provided there are no special reasons requiring that an Individual Licence be issued. The licence conditions for a Class Licence are published on the URCA website. Class Licences may either be registered or non-registered. There are two types of registered and non-registered class licences: Class Spectrum Licence and Class Operating Licence.

7.3.1 Class Spectrum Licence Requiring Registration

A Class Spectrum Licence Requiring Registration will be issued in cases where spectrum is shared. There are defined sets of conditions and technical specifications listed on URCA's website for the use of spectrum in this category. Generally, there would not be any limitation in the quantity of Class Spectrum Licences Requiring Registration to be awarded, except where there may be defined technical considerations. Breaches of the licence conditions may be enforced under Part XVII of the Comms Act. These Class Licence conditions may be found on URCA's website along with the ECS 15/2009 Guidelines that provides further clarification.

7.3.2 Class Spectrum Licence Not Requiring Registration

A Class Spectrum Licence Not Requiring Registration applies when an operator intends to use spectrum that is shared with others, and where URCA does not have any significant regulatory concerns. Persons using spectrum under this type of licence are required to adhere to a common set of conditions.

These conditions are similar to the Class Spectrum Licence Requiring Registration. Breaches of the licence conditions may be enforced under Part XVII of the Comms Act. These Class Licence conditions may be found on URCA's website along with the ECS 15/2009 Guidelines that provides further clarification.

7.4 Spectrum Exemptions

7.4.1 Statutory Exemptions

A Spectrum exemption would be issued when the spectrum to be used falls under section 17 of the Comms Act. The National Spectrum Plan provides statutory exemptions exist for services used by certain groups such as the Royal Bahamas Police Force, the Royal Bahamas Defense Force, providers of emergency services and some use of spectrum on board marine vessels and aircrafts.

7.4.2 URCA Exemptions

Other use of spectrum by certain low power, short-range devices may also be licence exempt. Such use includes various types of devices like toys, remote control devices, car garage openers, some Wi-Fi devices such as wireless routers intended for in-home use and Bluetooth devices. These exempt devices would generally be used for self-provision of services and must carry a certification from an approved jurisdiction. At this time, URCA only accepts the United States of America's Federal Communications Commission (FCC) Certificate of Authorization Grant for the Code of Federal Regulations (CFR) for Part 15 devices. URCA has adopted the position that certified devices are not to be modified and must be used in compliance with the FCC certification. Not all FCC certified low power devices are authorised for use in The Bahamas. Persons are required to verify that the frequency and technical specifications comply with URCA's technical standards which will be published and updated from time to time.

8. CONTROL, MONITORING AND COMPLIANCE ENFORCEMENT

8.1 Interference

A central objective of spectrum management is to control the level of harmful interference in the spectrum. The probability of harmful interference increases as the availability of wireless electronic communications services increases. To enable the co-existence of multiple electronic communications services in a particular allotment of the RFS, URCA will harmonise user conditions by applying and enforcing appropriate technical standards to control and limit the level of spurious emissions and reduce intermodulation interference that typically degrade the quality of service and usefulness of the RFS. High priority will be given to interference problems affecting public safety and security services such as ambulance, fire-fighting, police, and navigational services at airports and docks.

8.2 Licence Conditions

Spectrum licences granted by URCA will contain a set of conditions which ensure that spectrum usage is consistent with this National Spectrum Plan. In order to coordinate, harmonise and standardise with domestic and global best practices, the imposition of access control and technical conditions on spectrum users is necessary. These oversights will also work to ensure that wireless electronic communications networks and users' devices have sufficient interoperability to allow interconnectivity to multiple domestic and international telecommunications networks. By ensuring multi-network interoperability and interconnectivity, URCA will create positive market conditions where the benefits of spectrum usage significantly outweigh the cost. Interoperability and interconnectivity also lead to economies of scale that lower the cost of services and result in a higher level of utility for all stakeholders.

8.3 Spectrum Monitoring

The primary tool URCA uses to monitor and measure compliance is the National Spectrum Monitoring System (NSMS). The NSMS is a surveillance and spectrum analysis network used by URCA to aid in the task of spectrum management. The NSMS is comprised of two state-of-the-art spectrum management tools that include an Integrated Spectrum Observation Centre (ISOC) and a Technical Measurement and Reporting System (TMRS). ISOC is a system integration application that is capable of controlling multiple devices simultaneously and remotely, while TMRS is a data processing and database application.

The NSMS has a flexible software framework which provides a suite of applications that are used to conduct spectrum surveillance and engineering analysis. It is capable of scanning over 10,000 channels a second and will permit the real-time measuring and analysis of communication signals using a dynamic software radio approach. This allows the expeditious and accurate characterization of the radio frequency spectrum and scrutiny of individual wireless signals. The system allows URCA to build update databases of unlicensed and licensed radio frequency emissions and log channel usage information. Additionally, it is possible to identify communications system parameters in real time. The major features of the monitoring sites are:

- Spectrum engineering analysis;
- Statistical analysis of logged data;
- Channel occupancy determination;
- Verifying the presence of licensed users;
- Determining the existence of unlicensed or clandestine activity; and
- Geolocation of transmitters using direction finders and triangulation.

URCA uses this technology to organise, automate, and synchronise technical processes — principally spectrum utilisation, technical compliance and unlicensed use. The overall goals are to mitigate the effects of interference, improve the quality of service and reduce the costs of spectrum usage. Also, URCA monitors radio frequency spectrum to obtain information about the technical or operational characteristics of radio systems and to bring non-compliant system operations into conformity with applicable standards when needed.

The monitoring, measuring and spectrum engineering processes are key components of the strategy outline in this National Spectrum Plan. Those processes will be used to ensure electromagnetic compatibility (EMC) of electronic communications systems and usability of the radio frequency spectrum. Additionally, the information provided through those processes will aid in the decision making, policy planning and other regulatory processes.

8.4 Enforcement

URCA considers enforcement to be an on-going regulatory obligation and a necessary outflow of its spectrum monitoring exercise. When implementing enforcement measures, URCA will do so for the benefit of all stakeholders in order to enforce regulated sector laws, encourage competition, and to

ensure that licensees are compliant with the licence conditions and other technical rules and regulations published by URCA. Without effective regulations and enforcement procedures, the integrity of the spectrum management process may be compromised. The regulatory enforcement framework includes both proactive and retroactive mechanisms that allow URCA to effectively prevent, detect and investigate spectrum management issues.

8.5 Inspections

URCA, acting in accordance with section 10(2) of the Comms Act, may enter the premises of any person it believes to be acting in contravention of the Act and inspect radio equipment on those premises to determine statutory compliance and to enforce regulatory standards. This statutory provision provides URCA with a key tool to ensure that electronic communications systems are established, operated and maintained in a manner that is consistent with regulatory standards.

8.6 Investigations

URCA conducts investigations as appropriate to identify contraventions of the Comms Act, any other relevant law, any regulatory measure, or licence conditions. Conducting an investigation involves collecting information and evidence regarding an alleged or suspected contravention and interviewing complainants, witnesses, and subjects of complaints.

URCA seeks to ensure that investigations are carried out competently and impartially, and investigative methods will be transparent and well-documented.

8.7 Equipment Seizure and other Enforcement Actions

Should an inspection and/or investigation reveal that an electronic communications system or facility poses a danger to the public in any manner or causes harmful interference to another licensed electronic communications operator, URCA, acting in accordance with section 10(2) of the Comms Act, may seize the electronic communications system or equipment to prevent such endangerment or interference. When it is determined that harmful interference may be caused by any particular equipment, URCA may, by first informing the person in writing, direct the owner or user of that electrical, electronic or radiocommunications equipment to do, at their expense, any one or more of the following:

- Take suitable measures to eliminate or reduce the interference or disturbance;
- Remedy a fault in or the improper operation of the equipment;
- Modify or alter the equipment; or
- Disconnect the equipment.

Otherwise, the owner or user risks having the equipment seized by URCA.

Appendix A: National Frequency Allocation Table

The National Frequency Allocation Table is an important document for planning the use of the spectrum. This National Table of Frequency Allocations is consistent with the international table of frequency allocations set out in the ITU Radio Regulations. It covers a range of frequencies from 9 kHz to 275 GHz. Allocations are made on a primary or secondary basis. Stations of a secondary service cannot cause harmful interference to stations of primary services to which frequencies are already assigned or to which frequencies may be assigned at a later date. Neither can stations of a secondary service claim protection from other secondary service(s) to which frequencies may be assigned at a later date.

NATIONAL FREQUENCY ALLOCATION TABLE

National Frequency Allocation Table			
FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
Below 9	kHz	(Not allocated) 5.53 5.54	STANDARD SPECTRUM
9-14	kHz	RADIONAVIGATION	STANDARD SPECTRUM
14-19.95	kHz	FIXED MARITIME MOBILE	STANDARD SPECTRUM
19.95-20.05	kHz	STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)	STANDARD SPECTRUM
20.05-70	kHz	FIXED MARITIME MOBILE 5.57 5.56 5.58	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS		CLASSIFICATION
70-90	kHz	FIXED MARITIME MARITIME 5.60 Radiolocation	MOBILE 5.57 RADIONAVIGATION	STANDARD SPECTRUM
90-110	kHz	RADIONAVIGATION Fixed 5.64	5.62	STANDARD SPECTRUM
110-130	kHz	FIXED MARITIME MARITIME Radiolocation	MOBILE RADIONAVIGATION	STANDARD SPECTRUM
130-135.7	kHz	FIXED MARITIME MOBILE		STANDARD SPECTRUM
135.7-137.8	kHz	FIXED MARITIME MOBILE Amateur 5.67A		STANDARD SPECTRUM
137.8-160	kHz	FIXED MARITIME MOBILE		STANDARD SPECTRUM
160-190	kHz	FIXED		STANDARD SPECTRUM
190-200	kHz	AERONAUTICAL RADIONAVIGATION		STANDARD SPECTRUM
200-275	kHz	AERONAUTICAL Aeronautical mobile	RADIONAVIGATION	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS			CLASSIFICATION
275-285	kHz	AERONAUTICAL Aeronautical Maritime radionavigation (radiobeacons)	RADIONAVIGATION mobile		STANDARD SPECTRUM
285-315	kHz	AERONAUTICAL MARITIME RADIONAVIGATION (radiobeacons) 5.73	RADIONAVIGATION		STANDARD SPECTRUM
315-325	kHz	MARITIME RADIONAVIGATION (radiobeacons) 5.73 Aeronautical radionavigation			STANDARD SPECTRUM
325-335	kHz	AERONAUTICAL Aeronautical Maritime radionavigation (radiobeacons)	RADIONAVIGATION mobile		STANDARD SPECTRUM
335-405	kHz	AERONAUTICAL RADIONAVIGATION 5.72 Aeronautical mobile			STANDARD SPECTRUM
405-415	kHz	RADIONAVIGATION 5.76Aeronautical mobile			STANDARD SPECTRUM
415-495	kHz	MARITIME MOBILE 5.79 Aeronautical radionavigation 5.80	5.79A		STANDARD SPECTRUM
505-510	kHz	MARITIME MOBILE 5.79			STANDARD SPECTRUM
510-525	kHz	MOBILE 5.79A AERONAUTICAL RADIONAVIGATION	5.84		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
525-535	kHz	BROADCASTING AERONAUTICAL RADIONAVIGATION 5.86	STANDARD SPECTRUM
535-1605	kHz	BROADCASTING	STANDARD SPECTRUM
1605-1625	kHz	BROADCASTING 5.89	STANDARD SPECTRUM
1625-1705	kHz	FIXED MOBILE BROADCASTING Radiolocation 5.89	STANDARD SPECTRUM
1705-1800	kHz	FIXED MOBILE RADIOLOCATION AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
1800-1850	kHz	AMATEUR	STANDARD SPECTRUM
1850-2000	kHz	AMATEURFIXEDMOBILE except aeronautical mobileRADIOLOCATIONRADIONAVIGATION	STANDARD SPECTRUM
2000-2065	kHz	FIXED MOBILE	STANDARD SPECTRUM
2065-2107	kHz	MARITIME 5.106 MOBILE 5.105	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
2107-2170	kHz	FIXED MOBILE	STANDARD SPECTRUM
2170-2173.5	kHz	MARITIME MOBILE	STANDARD SPECTRUM
2173.5-2190.5	kHz	MOBILE (distress and calling)	STANDARD SPECTRUM
2190.5-2194	kHz	MARITIME MOBILE	STANDARD SPECTRUM
2194-2300	kHz	FIXED MOBILE	STANDARD SPECTRUM
2300-2495	kHz	FIXED MOBILE BROADCASTING 5.113	STANDARD SPECTRUM
2495-2501	kHz	STANDARD FREQUENCY AND TIME SIGNAL (2 500 kHz)	STANDARD SPECTRUM
2501-2502	kHz	STANDARD FREQUENCY AND TIME SIGNALSpace Research	STANDARD SPECTRUM
2505-2850	kHz	FIXED MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS			CLASSIFICATION
2505-3025	kHz	AERONAUTICAL 5.111 5.115	MOBILE	(R)	STANDARD SPECTRUM
3025-3155	kHz	AERONAUTICAL MOBILE (OR)			STANDARD SPECTRUM
3155-3200	kHz	FIXED MOBILE except aeronautical mobile 5.116 5.117		(R)	STANDARD SPECTRUM
3200-3230	kHz	FIXED MOBILE except aeronautical mobile BROADCASTING 5.116		(R) 5.113	STANDARD SPECTRUM
3230-3400	kHz	FIXED MOBILE except aeronautical mobile BROADCASTING 5.116 5.118		5.113	STANDARD SPECTRUM
3400-3500	kHz	AERONAUTICAL MOBILE ®			STANDARD SPECTRUM
3500-3750	kHz	AMATEUR			STANDARD SPECTRUM
3750-4000	kHz	AMATEUR FIXED MOBILE except aeronautical mobile (R)			STANDARD SPECTRUM
4000-4063	kHz	FIXEDMARITIME MOBILE 5.1275.126			STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
4063-4438	kHz	MARITIME MOBILE	STANDARD SPECTRUM
4438-4650	kHz	FIXED MOBILE except aeronautical mobile ®	STANDARD SPECTRUM
4650-4700	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
4700-4750	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
4750-4850	kHz	FIXED MOBILE except aeronautical mobile (R) BROADCASTING 5.113	STANDARD SPECTRUM
4850-4995	kHz	FIXED LAND MOBILE BROADCASTING 5.113	STANDARD SPECTRUM
4995-5003	kHz	STANDARD FREQUENCY AND TIME SIGNAL (5 000 kHz)	STANDARD SPECTRUM
5003-5005	kHz	STANDARD FREQUENCY AND TIME SIGNAL Space research	STANDARD SPECTRUM
5005-5060	kHz	FIXED BROADCASTING 5.113	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
5060-5250	kHz	FIXED Mobile except aeronautical mobile 5.133	STANDARD SPECTRUM
5250-5450	kHz	FIXED MOBILE except aeronautical mobile	STANDARD SPECTRUM
5450-5480	kHz	AERONAUTICAL MOBILE	STANDARD SPECTRUM
5480-5680	kHz	AERONAUTICAL MOBILE (R) 5.111 5.115	STANDARD SPECTRUM
5680-5730	kHz	AERONAUTICAL MOBILE (OR) 5.111 5.115	STANDARD SPECTRUM
5730-5900	kHz	AERONAUTICAL MOBILE (OR) 5.111 5.115	STANDARD SPECTRUM
5900-5950	kHz	BROADCASTING 5.134 5.136	STANDARD SPECTRUM
5 950-6 200	kHz	BROADCASTING	STANDARD SPECTRUM
6 200-6 525	kHz	MARITIME MOBILE 5.109 5.110 5.130 5.132	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
6 525-6 685	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
6 685-6 765	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
6 765-7 000	kHz	FIXED MOBILE except aeronautical mobile (R) 5.138 5.138A 5.139	STANDARD SPECTRUM
7 000-7 100	kHz	AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A	STANDARD SPECTRUM
7 100-7 200	kHz	AMATEUR	STANDARD SPECTRUM
7 200-7 300	kHz	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271	STANDARD SPECTRUM
7300-7400	kHz	BROADCASTING	STANDARD SPECTRUM
7 400-7 450	kHz	FIXED MOBILE except aeronautical mobile Radiolocation	STANDARD SPECTRUM
7 450-8 100	kHz	FIXED MOBILE except aeronautical mobile ®	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
8 100-8 195	kHz	FIXED MARITIME MOBILE	STANDARD SPECTRUM
8 195-8 815	kHz	MARITIME MOBILE 5.109 5.110 5.132 5.145	STANDARD SPECTRUM
8 815-8 965	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
8 965-9 040	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
9 040-9 400	kHz	FIXED	STANDARD SPECTRUM
9 400-9 500	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
9 500-9 900	kHz	BROADCASTING	STANDARD SPECTRUM
9 900-9 995	kHz	FIXED	STANDARD SPECTRUM
9 995-10 003	kHz	STANDARD FREQUENCY AND TIME SIGNAL (10 000 kHz)	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
10 003-10 005	kHz	STANDARD FREQUENCY AND TIME SIGNAL Space research	STANDARD SPECTRUM
10 005-10 100	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
10 100-10 150	kHz	FIXED Amateur	STANDARD SPECTRUM
10 150-11 175	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
11 175-11 275	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
11 275-11 400	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
11 400-11 600	kHz	FIXED	STANDARD SPECTRUM
11 600-11 650	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
11 650-12 050	kHz	BROADCASTING	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
12 050-12 100	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
12 100-12 230	kHz	FIXED	STANDARD SPECTRUM
12 230-13 200	kHz	MARITIME MOBILE 5.109 5.110 5.132 5.145	STANDARD SPECTRUM
13 200-13 260	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
13 260-13 360	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
13 360-13 410	kHz	FIXED RADIO 5.149 ASTRONOMY	STANDARD SPECTRUM
13 410-13 570	kHz	FIXED Mobile except aeronautical mobile (R) 5.150	STANDARD SPECTRUM
13 570-13 600	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
13 600-13 800	kHz	BROADCASTING	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
13 800-13 870	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
13 870-14 000	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
14 000-14 250	kHz	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
14 250-14 350	kHz	AMATEUR	STANDARD SPECTRUM
14 350-14 990	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
14 990-15 005	kHz	STANDARD FREQUENCY AND TIME SIGNAL (15 000 kHz)	STANDARD SPECTRUM
15 005-15 010	kHz	STANDARD FREQUENCY AND TIME SIGNAL Space research	STANDARD SPECTRUM
15 010-15 100	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
15 100-15 600	kHz	BROADCASTING	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
15 600-15 800	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
15 800-16 360	kHz	FIXED	STANDARD SPECTRUM
16 360-17 410	kHz	MARITIME MOBILE 5.109 5.110 5.132 5.145	STANDARD SPECTRUM
17 410-17 480	kHz	FIXED	STANDARD SPECTRUM
17 480-17 550	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
17 550-17 900	kHz	BROADCASTING	STANDARD SPECTRUM
17 900-17 970	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
17 970-18 030	kHz	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
18 030-18 052	kHz	FIXED	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
18 052-18 068	kHz	FIXED Space research	STANDARD SPECTRUM
18 068-18 168	kHz	AMATEUR AMATEUR-SATELLITE 5.154	STANDARD SPECTRUM
18 168-18 780	kHz	FIXED Mobile except aeronautical mobile	STANDARD SPECTRUM
18 780-18 900	kHz	MARITIME MOBILE	STANDARD SPECTRUM
18 900-19 020	kHz	BROADCASTING 5.134	STANDARD SPECTRUM
19 020-19 680	kHz	FIXED	STANDARD SPECTRUM
19 680-19 800	kHz	MARITIME MOBILE 5.132	STANDARD SPECTRUM
19 800-19 990	kHz	FIXED	STANDARD SPECTRUM
19 990-19 995	kHz	STANDARD FREQUENCY AND TIME SIGNAL Space research	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
19 995-20 010	kHz	STANDARD FREQUENCY AND TIME SIGNAL (20 000 kHz)	STANDARD SPECTRUM
20 010-21 000	kHz	FIXED Mobile	STANDARD SPECTRUM
21 000-21 450	kHz	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
21 450-21 850	kHz	BROADCASTING	STANDARD SPECTRUM
21 850-21 870	kHz	FIXED 5.155A	STANDARD SPECTRUM
21 870-21 924	kHz	FIXED 5.155B	STANDARD SPECTRUM
21 924-22 000	kHz	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
22 000-22 855	kHz	MARITIME MOBILE 5.132	STANDARD SPECTRUM
22 855-23 000	kHz	FIXED	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
23 000-23 200	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
23 200-23 350	kHz	FIXED AERONAUTICAL MOBILE (OR) 5.156A	STANDARD SPECTRUM
23 350-24 000	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
24 000-24 890	kHz	FIXED LAND MOBILE	STANDARD SPECTRUM
24 890-24 990	kHz	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
24 990-25 005	kHz	STANDARD FREQUENCY AND TIME SIGNAL (25 000 kHz)	STANDARD SPECTRUM
25 005-25 010	kHz	STANDARD FREQUENCY AND TIME SIGNAL Space research	STANDARD SPECTRUM
25 010-25 070	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
25 070-25 210	kHz	MARITIME MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
25 210-25 550	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
25 550-25 670	kHz	RADIO ASTRONOMY	STANDARD SPECTRUM
25 670-26 100	kHz	BROADCASTING	STANDARD SPECTRUM
26 100-26 175	kHz	MARITIME MOBILE 5.132	STANDARD SPECTRUM
26 175-27 500	kHz	FIXED Mobile except aeronautical mobile ®	STANDARD SPECTRUM
27.5-28	MHz	METEOROLOGICAL FIXED MOBILE	AIDS STANDARD SPECTRUM
28-29.7	MHz	METEOROLOGICAL FIXED MOBILE	AIDS STANDARD SPECTRUM
29.7-30.005	MHz	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
30.005-30.01	MHz	FIXED MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS				CLASSIFICATION
30.01-37.5	MHz	SPACE FIXED MOBILE SPACE RESEARCH	OPERATION	(satellite	identification)	STANDARD SPECTRUM
37.5-38.25	MHz	FIXEDMOBILE				STANDARD SPECTRUM
38.25-39.986	MHz	FIXED MOBILE Radio 5.149			astronomy	STANDARD SPECTRUM
39.986-40.02	MHz	FIXED MOBILE				STANDARD SPECTRUM
40.02-40.98	MHz	FIXED MOBILE Space research				STANDARD SPECTRUM
40.98-41.015	MHz	FIXED MOBILE 5.150				STANDARD SPECTRUM
41.015-44	MHz	FIXED MOBILE Space 5.160 5.161			research	STANDARD SPECTRUM
44-47	MHz	FIXED MOBILE 5.160 5.161				STANDARD SPECTRUM
47-50	MHz	FIXED MOBILE 5.162 5.162A				STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
50-54	MHz	AMATEUR	STANDARD SPECTRUM
54-68	MHz	BROADCASTING Mobile Fixed	STANDARD SPECTRUM
68-72	MHz	BROADCASTING Mobile Fixed	STANDARD SPECTRUM
72-73	MHz	FIXED MOBILE	STANDARD SPECTRUM
73-74.6	MHz	RADIO ASTRONOMY	STANDARD SPECTRUM
74.6-74.8	MHz	FIXED MOBILE	STANDARD SPECTRUM
74.8-75.2	MHz	AERONAUTICAL RADIONAVIGATION 5.180 5.181	STANDARD SPECTRUM
75.2-75.4	MHz	FIXED MOBILE	STANDARD SPECTRUM
75.4-76	MHz	FIXED MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
76-88	MHz	BROADCASTING Mobile	Fixed STANDARD SPECTRUM
88-100	MHz	BROADCASTING	STANDARD SPECTRUM
100-108	MHz	BROADCASTING	STANDARD SPECTRUM
108-117.975	MHz	AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
117.975-137	MHz	AERONAUTICAL MOBILE	STANDARD SPECTRUM
137-137.025	MHz	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208	STANDARD SPECTRUM
137.025-137.175	MHz	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Fixed Mobile-satellite (space-to-Earth) 5.208A 5.208B 5.209 Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208	STANDARD SPECTRUM
137.175-137.825	MHz	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS					CLASSIFICATION
137.825-138	MHz	SPACE METEOROLOGICAL-SATELLITE SPACE Fixed Mobile-satellite (space-to-Earth) Mobile except aeronautical 5.204 5.205 5.206 5.207 5.208	OPERATION (space-to-Earth) (space-to-Earth) (space-to-Earth) 5.208A 5.208B 5.209 mobile (R)			STANDARD SPECTRUM
138-143.6	MHz	FIXED MOBILE RADIOLOCATION Space research (space-to-Earth)				STANDARD SPECTRUM
143.6-143.65	MHz	FIXED MOBILE RADIOLOCATION SPACE (space-to-Earth)		RESEARCH		STANDARD SPECTRUM
143.65-144	MHz	FIXED MOBILE RADIOLOCATION Space research (space-to-Earth)				STANDARD SPECTRUM
144-146	MHz	AMATEUR AMATEUR-SATELLITE 5.216				STANDARD SPECTRUM
146-148	MHz	AMATEUR				STANDARD SPECTRUM
148-149.9	MHz	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.209				STANDARD SPECTRUM
149.9-150.05	MHz	MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.220 5.222 5.223	5.209 5.224A 5.224B			STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS		CLASSIFICATION
150.05-156.4875	MHz	150.05-156.4875 FIXED MOBILE	STANDARD SPECTRUM
156.5625-156.5625	MHz	MARITIME MOBILE (distress and calling via DSC) 5.111 5.226 5.227	STANDARD SPECTRUM
156.5625-156.7625	MHz	156.5625-156.7625 FIXED MOBILE	STANDARD SPECTRUM
156.7625-156.8375	MHz	MARITIME MOBILE (distress and calling)	STANDARD SPECTRUM
156.8375-174	MHz	FIXED MOBILE	STANDARD SPECTRUM
174-216	MHz	BROADCASTING Fixed Mobile	STANDARD SPECTRUM
216-220	MHz	FIXED MARITIME Radiolocation FIXED MARITIME Radiolocation FIXED MARITIME Radiolocation 5.242	MOBILE 5.241 MOBILE 5.241 MOBILE 5.241
220-225	MHz	AMATEURFIXEDMOBILERadiolocation 5.241	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS		CLASSIFICATION
225-235	MHz	FIXED MOBILE		STANDARD SPECTRUM
235-267	MHz	FIXED MOBILE 5.111 5.199 5.252 5.254 5.256 5.256A		STANDARD SPECTRUM
267-272	MHz	FIXED MOBILE Space 5.254 5.257	operation (space-to-Earth)	STANDARD SPECTRUM
272-273	MHz	SPACE FIXED MOBILE 5.254	OPERATION (space-to-Earth)	STANDARD SPECTRUM
273-312	MHz	FIXED MOBILE 5.254		STANDARD SPECTRUM
312-315	MHz	FIXED MOBILE Mobile-satellite (Earth-to-space) 5.254 5.255		STANDARD SPECTRUM
315-322	MHz	FIXED MOBILE 5.254		STANDARD SPECTRUM
322-328.6	MHz	FIXED MOBILE RADIO 5.149	ASTRONOMY	STANDARD SPECTRUM
328.6-335.4	MHz	AERONAUTICAL 5.259	RADIONAVIGATION 5.258	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
335.4-387	MHz	FIXEDMOBILE5.254	STANDARD SPECTRUM
387-390	MHz	FIXED MOBILE Mobile-satellite (space-to-Earth) 5.208A 5.208B 5.254 5.255	STANDARD SPECTRUM
390-399.9	MHz	FIXED MOBILE 5.254	STANDARD SPECTRUM
399.9-400.05	MHz	MOBILE-SATELLITE (Earth-to-space) 5.209 5.224A RADIONAVIGATION-SATELLITE 5.222 5.224B 5.260 5.220	STANDARD SPECTRUM
400.05-400.15	MHz	STANDARD FREQUENCY AND TIME SIGNALSATELLITE (400.1 MHz) 5.261 5.262	STANDARD SPECTRUM
400.15-401	MHz	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) 5.263 Space operation (space-to-Earth) 5.262 5.264	STANDARD SPECTRUM
401-402	MHz	METEOROLOGICAL AIDS SPACE OPERATION (space-to-Earth) EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile	STANDARD SPECTRUM
402-403	MHz	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) Fixed Mobile except aeronautical mobile	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS				CLASSIFICATION
403-406	MHz	METEOROLOGICAL Fixed Mobile except aeronautical mobile	AIDS		STANDARD SPECTRUM
406-406.1	MHz	MOBILE-SATELLITE 5.266 5.267	(Earth-to-space)		STANDARD SPECTRUM
406.1-410	MHz	FIXEDMOBILE except aeronautical mobile ASTRONOMY5.149	RADIO		STANDARD SPECTRUM
410-420	MHz	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-space) 5.268			STANDARD SPECTRUM
420-430	MHz	FIXED MOBILE except aeronautical mobile 5.269 5.270 5.271	Radiolocation		STANDARD SPECTRUM
430-432	MHz	RADIOLOCATION Amateur			STANDARD SPECTRUM
432-438	MHz	RADIOLOCATION Amateur Earth exploration-satellite (active) 5.279A			STANDARD SPECTRUM
438-440	MHz	RADIOLOCATION Amateur			STANDARD SPECTRUM
440-450	MHz	FIXED MOBILE except aeronautical mobile Radiolocation 5.269 5.270 5.271 5.284 5.285 5.286 MOBILE except aeronautical mobile Radiolocation			STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS		CLASSIFICATION
		5.269 5.270 5.271 5.284 5.285 5.286	
450-455	MHz	FIXED MOBILE 5.209 5.271 5.286 5.286A 5.286B 5.286C 5.286D 5.286E 5.286AA	STANDARD SPECTRUM
455-456	MHz	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.286B 5.286C 5.286AA 5.286A	STANDARD SPECTRUM
456-459	MHz	FIXED MOBILE 5.271 5.287 5.288 5.286AA	STANDARD SPECTRUM
459-460	MHz	459-460FIXEDMOBILE 5.286AAMOBILE-SATELLITE(Earth-to-space) 5.286A5.286B 5.286C	STANDARD SPECTRUM
460-470	MHz	FIXED MOBILE Meteorological-satellite 5.287 5.288 5.289 5.290 5.286AA (space-to-Earth)	STANDARD SPECTRUM
470-512	MHz	BROADCASTING Fixed Mobile 5.292 5.293	STANDARD SPECTRUM
512-608	MHz	BROADCASTING 5.297	STANDARD SPECTRUM
608-614	MHz	RADIO Mobile-satellite aeronautical (Earth-to-space) ASTRONOMY except mobile-satellite	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
614-698	MHz	BROADCASTING Fixed Mobile 5.293 5.309 5.311A	STANDARD SPECTRUM
698-806	MHz	698-806 BROADCASTING Fixed MOBILE 5.313B 5.317A	PREMIUM SPECTRUM
806-890	MHz	FIXED MOBILE BROADCASTING 5.317A	PARTIALLY PREMIUM SPECTRUM
890-902	MHz	MOBILE except aeronautical mobile Radiolocation 5.318 5.325 5.317A	PARTILLY PREMIUM SPECTRUM
902-928	MHz	FIXED Amateur Mobile except aeronautical mobile 5.325A Radiolocation 5.150 5.325 5.326	STANDARD SPECTRUM
928-942	MHz	FIXEDMOBILE except aeronautical mobile5.317ARadiolocation5.325	STANDARD SPECTRUM
942-960	MHz	FIXED MOBILE 5.317A	STANDARD SPECTRUM
960-1 164	MHz	AERONAUTICAL RADIONAVIGATION AERONAUTICAL MOBILE (R) 5.327A 5.328	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS			CLASSIFICATION
1 164-1 215	MHz	AERONAUTICAL RADIONAVIGATION-SATELLITE 5.328B 5.328A	RADIONAVIGATION (space-to-Earth)	5.328 (space-to- space)	STANDARD SPECTRUM
1 215-1 240	MHz	EARTH RADIOLOCATION RADIONAVIGATION-SATELLITE 5.328B SPACE 5.330 5.331 5.332	EXPLORATION-SATELLITE (space-to-Earth)	(active) (space-to- space) 5.329 RESEARCH (active)	STANDARD SPECTRUM
1 240-1 300	MHz	EARTH RADIOLOCATION RADIONAVIGATION-SATELLITE 5.328B SPACE Amateur 5.282 5.330 5.331 5.332 5.335 5.335A	EXPLORATION-SATELLITE (space-to-Earth)	(active) (space-to- space) 5.329 RESEARCH (active)	STANDARD SPECTRUM
1 300-1 350	MHz	AERONAUTICAL RADIOLOCATION RADIONAVIGATION-SATELLITE 5.149 5.337A	RADIONAVIGATION (Earth-to-space)	5.337	STANDARD SPECTRUM
1 350-1 400	MHz	RADIOLOCATION 5.338A			STANDARD SPECTRUM
1 400-1 427	MHz	EARTH RADIO SPACE 5.340 5.341	EXPLORATION-SATELLITE RESEARCH	(passive) ASTRONOMY (passive)	STANDARD SPECTRUM
1 427-1 429	MHz	SPACE OPERATION (Earth-to-space) FIXED MOBILE except aeronautical mobile 5.338A 5.341			STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS			CLASSIFICATION
1 429-1 452	MHz	FIXED MOBILE 5.338A 5.341	5.343		STANDARD SPECTRUM
1 452-1 492	MHz	FIXED MOBILE BROADCASTING BROADCASTING-SATELLITE 5.208B 5.345	5.343 5.345		STANDARD SPECTRUM
1 492-1 518	MHz	FIXED MOBILE 5.343			STANDARD SPECTRUM
1 518-1 525	MHz	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.348B 5.351A	5.343 5.348 5.348A		STANDARD SPECTRUM
1 525-1 530	MHz	SPACE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Earth Fixed Mobile 5.343	OPERATION 5.208B 5.351A exploration-satellite		STANDARD SPECTRUM
1 530-1 535	MHz	SPACE MOBILE-SATELLITE Earth Fixed Mobile 5.343	OPERATION (space-to-Earth) 5.208B 5.351A 5.353A exploration-satellite		STANDARD SPECTRUM
1 535-1 559	MHz	MOBILE-SATELLITE 5.341 5.351 5.353A 5.354 5.355 5.356 5.357 5.357A 5.359 5.362A	(space-to-Earth) 5.208B 5.351A		STANDARD SPECTRUM
1 559-1 610	MHz	AERONAUTICAL RADIONAVIGATION-SATELLITE 5.208B 5.341 5.362B 5.362C	RADIONAVIGATION (space-to-Earth) 5.328B 5.329A		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
1 610-1 610.6	MHz	MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATIONSATELLITE (Earth-to-space)	STANDARD SPECTRUM
1 610.6-1 613.8	MHz	MOBILE-SATELLITE(Earth-to-space) 5.351A ASTRONOMYAERONAUTICALRADIONAVIGATIONRADIODETERM INATIONSATELLITE(Earth-to-space)	STANDARD SPECTRUM
1 613.8-1 626.5	MHz	MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATIONSATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) 5.208B	STANDARD SPECTRUM
1 626.5-1 660	MHz	MOBILE-SATELLITE (Earth-to-space) 5.351A 5.341 5.351 5.353A 5.354 5.355 5.357A 5.359 5.362A 5.374 5.375 5.376	STANDARD SPECTRUM
1 660-1 660.5	MHz	MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY 5.149 5.341 5.351 5.354 5.362A 5.376A	STANDARD SPECTRUM
1 660.5-1 668	MHz	RADIO SPACE RESEARCH ASTRONOMY (passive) Fixed Mobile except aeronautical mobile 5.149 5.341 5.379 5.379A	STANDARD SPECTRUM
1 668-1 668.4	MHz	MOBILE-SATELLITE (Earth-to-space) 5.351A 5.379B 5.379C RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149 5.341 5.379 5.379A	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
1 668.4-1 670	MHz	METEOROLOGICAL FIXED MOBILE except aeronautical mobile MOBILE-SATELLITE (Earth-to-space) 5.351A 5.379B 5.379C RADIO ASTRONOMY 5.149 5.341 5.379D 5.379E	AIDS	STANDARD SPECTRUM
1 670-1 675	MHz	METEOROLOGICAL FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.379B 5.341 5.379D 5.379E 5.380A	AIDS	STANDARD SPECTRUM
1 675-1 690	MHz	METEOROLOGICAL FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.341	AIDS	STANDARD SPECTRUM
1 690-1 700	MHz	1 690-1 700 METEOROLOGICAL AIDS SATELLITE (space-to-Earth)		STANDARD SPECTRUM
1 700-1 710	MHz	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile		STANDARD SPECTRUM
1 710-1 930	MHz	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile		PREMIUM SPECTRUM
1 930-1 970	MHz	FIXED MOBILE 5.388A 5.388B Mobile-satellite (Earth-to-space)		PREMIUM SPECTRUM
1 970-1 980	MHz	FIXED MOBILE 5.388A 5.388B 5.388		PREMIUM SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
1 980-2 010	MHz	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A 5.389B 5.389F	PREMIUM SPECTRUM
2 010-2 025	MHz	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.388 5.389C 5.389E	STANDARD SPECTRUM
2 025-2 110	MHz	SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) 5.392	STANDARD SPECTRUM
2 110-2 120	MHz	FIXED MOBILE 5.388A 5.388B SPACE RESEARCH (deep space) (Earth-to-space) 5.388	PREMIUM SPECTRUM
2 120-2 160	MHz	FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth)	PREMIUM SPECTRUM
2 160-2 170	MHz	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.388 5.389C 5.389E	STANDARD SPECTRUM
2 170-2 200	MHz	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A 5.388 5.389A 5.389F	STANDARD SPECTRUM
2 200-2 290	MHz	SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
2 290-2 300	MHz	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)		STANDARD SPECTRUM
2 300-2 450	MHz	FIXED MOBILE RADIOLOCATION Amateur	5.384A	PARTIALLY PREMIUM SPECTRUM
2 450-2 483.5	MHz	FIXED MOBILE RADIOLOCATION		STANDARD SPECTRUM
2 483.5-2 500	MHz	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) RADIOLOCATION RADIODETERMINATIONSATELLITE (space-to-Earth) 5.398	5.351A	STANDARD SPECTRUM
2 500-2 520	MHz	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.384A	5.410 5.415	STANDARD SPECTRUM
2 520-2 655	MHz	FIXED 5.410 FIXED-SATELLITE(space-to-Earth) 5.415 MOBILE except aeronauticalmobile 5.384A BROADCASTING-SATELLITE5.413 5.416		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
2 655-2 670	MHz	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) MOBILE except aeronautical mobile BROADCASTING-SATELLITE 5.413 Earth exploration-satellite (passive) Radio astronomy Space research (passive)	5.410 5.415 5.384A 5.416	STANDARD SPECTRUM
2 670-2 690	MHz	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) MOBILE except aeronautical mobile Earth exploration-satellite (passive) Radio astronomy Space research (passive)	5.410 5.208B 5.415 5.384A 5.416	STANDARD SPECTRUM
2 690-2 700	MHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.422		STANDARD SPECTRUM
2 700-2 900	MHz	AERONAUTICAL RADIONAVIGATION Radiolocation 5.423 5.424	5.337	STANDARD SPECTRUM
2 900-3 100	MHz	RADIOLOCATION RADIONAVIGATION 5.425 5.427	5.424A 5.426	STANDARD SPECTRUM
3 100-3 300	MHz	RADIOLOCATION Earth exploration-satellite (active) Space research (active) 5.149 5.428		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
3 300-3 400	MHz	3 RADIOLOCATION Amateur Fixed Mobile	300-3 400	STANDARD SPECTRUM
3 400-3 500	MHz	FIXED FIXED-SATELLITE Earth) Amateur Mobile Radiolocation 5.282	(space-to- Earth) 5.431A 5.433	STANDARD SPECTRUM
3 500-3 700	MHz	FIXEDFIXED-SATELLITE aeronauticalmobileRadiolocation 5.433	(space-to-Earth)MOBILE except	STANDARD SPECTRUM
3 700-4 200	MHz	3 FIXED FIXED-SATELLITE MOBILE except aeronautical mobile	700-4 (space to-Earth)	200 STANDARD SPECTRUM
4 200-4 400	MHz	AERONAUTICAL 5.439 5.440	RADIONAVIGATION 5.438	STANDARD SPECTRUM
4 400-4 500	MHz	FIXED MOBILE 5.440A		STANDARD SPECTRUM
4 500-4 800	MHz	FIXED FIXED-SATELLITE MOBILE 5.440A	(space-to-Earth) 5.441	STANDARD SPECTRUM
4 800-4 990	MHz	FIXED MOBILE Radio 5.149 5.339 5.443	5.440A 5.442 astronomy	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
	MHz	FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive) 5.149		STANDARD SPECTRUM
	MHz	AERONAUTICAL RADIONAVIGATION-SATELLITE 5.367	RADIONAVIGATION (Earth-to-space)	STANDARD SPECTRUM
	MHz	AERONAUTICAL RADIONAVIGATION-SATELLITE (space-to-Earth) 5.328B 5.367	(space-to-space) 5.443B	STANDARD SPECTRUM
5 030-5 091	MHz	AERONAUTICAL 5.367 5.444	RADIONAVIGATION	STANDARD SPECTRUM
5 091-5 150	MHz	AERONAUTICAL RADIONAVIGATIONAERONAUTICAL MOBILE 5.444B5.367 5.444 5.444A		STANDARD SPECTRUM
5 150-5 250	MHz	AERONAUTICAL FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile 5.446 5.446C 5.447 5.447B 5.447C	RADIONAVIGATION 5.447A 5.446A 5.446B	STANDARD SPECTRUM
5 250-5 255	MHz	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH MOBILE except aeronautical mobile 5.446A 5.447F 5.447E 5.448 5.448A		STANDARD SPECTRUM
5 255-5 350	MHz	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) MOBILE except aeronautical mobile 5.446A 5.447F 5.447E 5.448 5.448A		STANDARD SPECTRUM
5 350-5 460	MHz	EARTH EXPLORATION-SATELLITE (active) SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION RADIOLOCATION 5.448D	5.448B 5.448C 5.449	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS				CLASSIFICATION
5 460-5 470	MHz	RADIONAVIGATION		5.449		STANDARD SPECTRUM
		EARTH EXPLORATION-SATELLITE		(active)		
	MHz	SPACE RESEARCH		(active)		STANDARD SPECTRUM
		RADIOLOCATION		5.448D		
	MHz	5.448B				STANDARD SPECTRUM
	MHz	MARITIME		RADIONAVIGATION		STANDARD SPECTRUM
		MOBILE except aeronautical mobile	5.446A	5.450A		
	MHz	EARTH EXPLORATION-SATELLITE		(active)		STANDARD SPECTRUM
		SPACE RESEARCH		(active)		
	MHz	RADIOLOCATION		5.450B		STANDARD SPECTRUM
		5.448B 5.450 5.451				
	MHz	MARITIME		RADIONAVIGATION		STANDARD SPECTRUM
		MOBILE except aeronautical mobile	5.446A	5.450A		
	MHz	RADIOLOCATION		5.450B		STANDARD SPECTRUM
		5.450 5.451 5.452				
	MHz	RADIOLOCATION				STANDARD SPECTRUM
		MOBILE except aeronautical mobile	5.446A	5.450A		
	MHz	Amateur				STANDARD SPECTRUM
		Space research (deep space)				
	MHz	5.282 5.451 5.453 5.454 5.455				STANDARD SPECTRUM
	MHz	5	725-5	830		STANDARD SPECTRUM
		RADIOLOCATION				
	MHz	Amateur				STANDARD SPECTRUM
	MHz	RADIOLOCATIONAmateurAmateur-satellite (space-to-Earth)				STANDARD SPECTRUM
	MHz	FIXED				STANDARD SPECTRUM
		FIXED-SATELLITE (Earth-to-space)				
	MHz	MOBILE				STANDARD SPECTRUM
		Amateur				
	MHz	Radiolocation				STANDARD SPECTRUM
	MHz	FIXED				STANDARD SPECTRUM
		FIXED-SATELLITE (Earth-to-space)	5.457A	5.457B		
	MHz	MOBILE		5.457C		STANDARD SPECTRUM
		5.149 5.440 5.458				

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
6 700-7 075	MHz	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B 5.458C	STANDARD SPECTRUM
7 075-7 145	MHz	FIXED MOBILE 5.458 5.459	STANDARD SPECTRUM
7 145-7 235	MHz	FIXED MOBILE SPACE RESEARCH (Earth-to-space) 5.460 5.458 5.459	STANDARD SPECTRUM
7 235-7 250	MHz	FIXED MOBILE 5.458	STANDARD SPECTRUM
7 250-7 300	MHz	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE 5.461	STANDARD SPECTRUM
7 300-7 450	MHz	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.461	STANDARD SPECTRUM
7 450-7 550	MHz	FIXED FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.461A	STANDARD SPECTRUM
7 550-7 750	MHz	FIXED FIXED-SATELLITE (space-to-Earth) aeronautical mobile MOBILE except	STANDARD SPECTRUM
7 750-7 850	MHz	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) 5.461B MOBILE except aeronautical mobile	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
7 850-7 900	MHz	FIXED MOBILE except aeronautical mobile	STANDARD SPECTRUM
7 900-8 025	MHz	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.461	STANDARD SPECTRUM
8 025-8 175	MHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A	STANDARD SPECTRUM
8 175-8 215	MHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) METEOROLOGICAL-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A	STANDARD SPECTRUM
8 215-8 400	MHz	EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.463 5.462A	STANDARD SPECTRUM
8 400-8 500	MHz	FIXED MOBILE except aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.465 5.466	STANDARD SPECTRUM
8 500-8 550	MHz	RADIOLOCATION 5.468 5.469	STANDARD SPECTRUM
8 550-8 650	MHz	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.468 5.469 5.469A	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
8 650-8 750	MHz	RADIOLOCATION 5.468 5.469	STANDARD SPECTRUM
8 750-8 850	MHz	RADIOLOCATION AERONAUTICAL 5.471 RADIONAVIGATION 5.470	STANDARD SPECTRUM
8 850-9 000	MHz	RADIOLOCATION MARITIME 5.473 RADIONAVIGATION 5.472	STANDARD SPECTRUM
9 000-9 200	MHz	AERONAUTICAL RADIOLOCATION 5.471 5.473A RADIONAVIGATION 5.337	STANDARD SPECTRUM
9 200-9 300	MHz	RADIOLOCATION MARITIME 5.473 5.474 RADIONAVIGATION 5.472	STANDARD SPECTRUM
9 300-9 500	MHz	RADIONAVIGATION EARTH SPACE RADIOLOCATION 5.427 5.474 5.475 5.475A 5.475B 5.476A EXPLORATION-SATELLITE RESEARCH (active) (active)	STANDARD SPECTRUM
9 500-9 800	MHz	EARTH RADIOLOCATION RADIONAVIGATION SPACE 5.476A EXPLORATION-SATELLITE RESEARCH (active) (active)	STANDARD SPECTRUM
9 800-9 900	MHz	RADIOLOCATION Earth Space Fixed 5.477 5.478 5.478A 5.478B exploration-satellite research (active) (active)	STANDARD SPECTRUM
9 900-10 000	MHz	RADIOLOCATION Fixed 5.477 5.478 5.479	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS				CLASSIFICATION
10-10.45	GHz	RADIOLOCATION Amateur			STANDARD SPECTRUM
10.45-10.5	GHz	RADIOLOCATIONAmateurAmateur-satellite			STANDARD SPECTRUM
10.5-10.55	GHz	FIXED MOBILE RADIOLOCATION			STANDARD SPECTRUM
10.55-10.6	GHz	FIXED MOBILE Radiolocation	except aeronautical	mobile	STANDARD SPECTRUM
10.6-10.68	GHz	EARTH FIXED MOBILE RADIO SPACE Radiolocation 5.149 5.482 5.482A	EXPLORATION-SATELLITE except aeronautical RESEARCH	(passive) mobile ASTRONOMY (passive)	STANDARD SPECTRUM
10.68-10.7	GHz	EARTH RADIO SPACE 5.340 5.483	EXPLORATION-SATELLITE RESEARCH	(passive) ASTRONOMY (passive)	STANDARD SPECTRUM
10.7-11.7	GHz	FIXED FIXED-SATELLITE MOBILE except aeronautical mobile	(space-to-Earth) 5.441	5.484A	STANDARD SPECTRUM
11.7-12.1	GHz	FIXED FIXED-SATELLITE (space-to-Earth) Mobile 5.485	except aeronautical	5.486 5.484A 5.488 mobile	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
12.1-12.2	GHz	12.1-12.2 FIXED-SATELLITE (space-to-Earth) 5.484A 5.488		STANDARD SPECTRUM
12.2-12.7	GHz	FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492		STANDARD SPECTRUM
12.7-12.75	GHz	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile		STANDARD SPECTRUM
12.75-13.25	GHz	FIXEDFIXED-SATELLITE (Earth-to-space) 5.441MOBILESpace research (deep space) (space-to-Earth)		STANDARD SPECTRUM
13.25-13.4	GHz	EARTH EXPLORATION-SATELLITE (active) AERONAUTICAL RADIONAVIGATION 5.497 SPACE RESEARCH (active) 5.498A 5.499		STANDARD SPECTRUM
13.4-13.75	GHz	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.501A Standard frequency and time signal-satellite (Earth-to-space) 5.499 5.500 5.501 5.501B		STANDARD SPECTRUM
13.75-14	GHz	FIXED-SATELLITE (Earth-to-space) 5.484A RADIOLOCATION Earth exploration-satellite Standard frequency and time signal-satellite (Earth-to-space) Space research 5.499 5.500 5.501 5.502 5.503		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS				CLASSIFICATION
14-14.25	GHz	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research 5.504A 5.505				STANDARD SPECTRUM
14.25-14.3	GHz	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.508A Space research 5.504A 5.505 5.508				STANDARD SPECTRUM
14.4-14.47	GHz	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth) 5.504A				STANDARD SPECTRUM
14.47-14.5	GHz	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A				STANDARD SPECTRUM
14.5-14.8	GHz	FIXED FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research				STANDARD SPECTRUM
14.8-15.35	GHz	FIXED MOBILESpace research 5.339				STANDARD SPECTRUM
15.35-15.4	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.511				STANDARD SPECTRUM
		AERONAUTICAL 5.511D		RADIONAVIGATION		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
15.43-15.63		FIXED-SATELLITE (Earth-to-space) 5.511A AERONAUTICAL RADIONAVIGATION 5.511C		STANDARD SPECTRUM
15.63-15.7		AERONAUTICAL RADIONAVIGATION 5.511D		STANDARD SPECTRUM
15.7-16.6		RADIOLOCATION 5.512 5.513		STANDARD SPECTRUM
16.6-17.1		RADIOLOCATION Space research (deep space) (Earth-to-space) 5.512 5.513		STANDARD SPECTRUM
17.1-17.2		RADIOLOCATION 5.512 5.513		STANDARD SPECTRUM
17.3-17.7		EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.512 5.513 5.513A		STANDARD SPECTRUM
17.3-17.7		FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation		STANDARD SPECTRUM
17.7-17.8		FIXEDFIXED-SATELLITE(space-to-Earth) 5.517(Earth-to-space) 5.516BROADCASTING-SATELLITEMobile		STANDARD SPECTRUM
17.8-18.1		FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516 MOBILE		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS				CLASSIFICATION
		5.519			
18.1-18.4		FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) MOBILE 5.519 5.521	5.484A	5.516B 5.520	STANDARD SPECTRUM
18.4-18.6		FIXED FIXED-SATELLITE (space-to-Earth) MOBILE	5.484A	5.516B	STANDARD SPECTRUM
18.6-18.8		EARTH (passive) FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except mobile SPACE RESEARCH (passive)	EXPLORATIONSATELLITE 5.516B aeronautical	5.522B	STANDARD SPECTRUM
18.8-19.3		FIXED FIXED-SATELLITE (space-to-Earth) MOBILE	5.516.B	5.523A	STANDARD SPECTRUM
19.3-19.7		FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523C 5.523D MOBILE	5.523B 5.523E		STANDARD SPECTRUM
19.7-20.1		FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)	5.484A	5.516B	STANDARD SPECTRUM
20.1-20.2		FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE 5.524 5.525 5.526 5.527 5.528	5.484A	5.516B (space-to-Earth)	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS		CLASSIFICATION
20.2-21.2		FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth)	STANDARD SPECTRUM
21.2-21.4		EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)	STANDARD SPECTRUM
21.4-22		FIXED MOBILE	STANDARD SPECTRUM
22-22.21	GHz	FIXED MOBILE except aeronautical mobile 5.149	STANDARD SPECTRUM
22.21-22.5	GHz	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive) 5.149 5.532	STANDARD SPECTRUM
22.5-22.55	GHz	FIXED MOBILE	STANDARD SPECTRUM
22.55-23.55	GHz	FIXED INTER-SATELLITE 5.338A MOBILE 5.149	STANDARD SPECTRUM
23.55-23.6	GHz	FIXED MOBILE	STANDARD SPECTRUM
23.6-24	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
24-24.05	GHz	AMATEUR AMATEUR-SATELLITE 5.150	STANDARD SPECTRUM
24.05-24.25	GHz	RADIOLOCATION Amateur Earth exploration-satellite (active) 5.150	STANDARD SPECTRUM
24.45-24.65	GHz	INTER-SATELLITE RADIONAVIGATION	STANDARD SPECTRUM
24.65-24.75	GHz	INTER-SATELLITE RADIOLOCATION-SATELITE	STANDARD SPECTRUM
29.9-30	GHz	FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542	STANDARD SPECTRUM
30-31	GHz	FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) 5.542	STANDARD SPECTRUM
31-31.3	GHz	FIXED 5.338A 5.543A MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149	STANDARD SPECTRUM
31.3-31.5	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
31.8-32	GHz	FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547B 5.548	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
32-32.3	GHz	FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547C 5.548		STANDARD SPECTRUM
32.3-33	GHz	FIXED 5.547A INTER-SATELLITE RADIONAVIGATION 5.547 5.547D 5.548		STANDARD SPECTRUM
33-33.4	GHz	FIXED 5.547A RADIONAVIGATION 5.547 5.547E		STANDARD SPECTRUM
33.4-34.2	GHz	RADIOLOCATION 5.549		STANDARD SPECTRUM
34.2-34.7	GHz	RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) 5.549		STANDARD SPECTRUM
34.7-35.2	GHz	RADIOLOCATION Space research 5.550 5.549		STANDARD SPECTRUM
35.2-35.5	GHz	METEOROLOGICAL AIDS RADIOLOCATION 5.549		STANDARD SPECTRUM
35.5-36	GHz	METEOROLOGICAL AIDS EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.549 5.549A		STANDARD SPECTRUM
36-37	GHz	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.149 5.550A		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS		CLASSIFICATION
37-37.5	GHz	FIXED SPACE RESEARCH (space-to-Earth) 5.547	MOBILE	STANDARD SPECTRUM
37.5-38	GHz	FIXED FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	MOBILE	STANDARD SPECTRUM
38-39.5	GHz	FIXED FIXED-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	MOBILE	STANDARD SPECTRUM
39.5-40	GHz	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	MOBILE	STANDARD SPECTRUM
		EARTH EXPLORATION-SATELLITE (Earth-to-space)FIXEDFIXED-SATELLITE (space-to-Earth) 5.516BMOBILEMOBILE-SATELLITE (space-to-Earth)SPACE RESEARCH (Earth-to-space)Earth exploration-satellite (space-to-Earth)		STANDARD SPECTRUM
40.5-41		FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547		STANDARD SPECTRUM
41-42.5		FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS				CLASSIFICATION
42.5-43.5		FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical RADIO 5.149 5.547	5.552 mobile ASTRONOMY		STANDARD SPECTRUM
43.5-47		MOBILE MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	5.553		STANDARD SPECTRUM
47-47.2		AMATEUR AMATEUR-SATELLITE			STANDARD SPECTRUM
40-47.5 GHz	GHz	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.552A	5.552		STANDARD SPECTRUM
		FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	5.552		STANDARD SPECTRUM
47.9-48.2		FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.552A	5.552		STANDARD SPECTRUM
48.2-50.2		FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.338A MOBILE 5.552			STANDARD SPECTRUM
50.2-50.4		EARTH EXPLORATION-SATELLITE (passive)SPACE RESEARCH (passive)5.340			STANDARD SPECTRUM
50.4-51.4		FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Mobile-satellite (Earth-to-space)	5.338A		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS			CLASSIFICATION
51.4-52.6	GHz	FIXED 5.547 5.556	5.338A	MOBILE	STANDARD SPECTRUM
52.6-54.25	GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 5.556			STANDARD SPECTRUM
54.25-55.78	GHz	EARTH EXPLORATION-SATELLITE (passive) 5.556A SPACE RESEARCH (passive) 5.556B	INTER-SATELLITE		STANDARD SPECTRUM
55.78-56.9	GHz	EARTH EXPLORATION-SATELLITE (passive) 5.556A INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.547 5.557	FIXED MOBILE	5.557A 5.558	STANDARD SPECTRUM
56.9-57	GHz	EARTH EXPLORATION-SATELLITE (passive) 5.558A INTER-SATELLITE 5.558A SPACE RESEARCH (passive) 5.547 5.557	FIXED MOBILE	5.558	STANDARD SPECTRUM
57-58.2	GHz	EARTH EXPLORATION-SATELLITE (passive) 5.556A INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.547 5.557	FIXED MOBILE	5.558	STANDARD SPECTRUM
58.2-59	GHz	EARTH EXPLORATION-SATELLITE (passive) MOBILE SPACE RESEARCH (passive) 5.547 5.556	FIXED		STANDARD SPECTRUM
59-59.3	GHz	EARTH EXPLORATION-SATELLITE (passive) 5.556A INTER-SATELLITE 5.556A RADIOLOCATION SPACE RESEARCH (passive)	FIXED MOBILE	5.558 5.559	STANDARD SPECTRUM
59.3-64	GHz	FIXEDINTER-SATELLITE 5.5595.138	MOBILE 5.558RADIOLOCATION		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
64-65	GHz	FIXED INTER-SATELLITE MOBILE except aeronautical mobile 5.547 5.556	STANDARD SPECTRUM
65-66	GHz	EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH 5.547	STANDARD SPECTRUM
66-71	GHz	INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	STANDARD SPECTRUM
71-74	GHz	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)	STANDARD SPECTRUM
74-76	GHz	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE Space research (space-to-Earth) 5.561	STANDARD SPECTRUM
76-77.5	GHz	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Amateur-satellite Space research (space-to-Earth) 5.149	STANDARD SPECTRUM
77.5-78	GHz	AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth) 5.149	STANDARD SPECTRUM
78-79	GHz	RADIOLOCATION Amateur Amateur-satellite Radio astronomy Space research (space-to-Earth) 5.149 5.560	STANDARD SPECTRUM
79-81	GHz	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
81-84	GHz	FIXEDFIXED-SATELLITE (Earth-to-space) MOBILEMOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMYSpace research (space-to-Earth) 5.149 5.561A	STANDARD SPECTRUM
84-86	GHz	FIXED FIXED-SATELLITE (Earth-to-space) 5.561B MOBILE RADIO ASTRONOMY 5.149	STANDARD SPECTRUM
86-92	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
92-94	GHz	FIXED RADIO ASTRONOMY RADIOLOCATION 5.149 MOBILE	STANDARD SPECTRUM
94-94.1	GHz	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) Radio astronomy 5.562 5.562A	STANDARD SPECTRUM
94.1-95	GHz	FIXED RADIO ASTRONOMY RADIOLOCATION 5.149 MOBILE	STANDARD SPECTRUM
95-100	GHz	FIXED RADIO ASTRONOMY RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554 MOBILE	STANDARD SPECTRUM
100-102	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341	STANDARD SPECTRUM
102-105	GHz	FIXED RADIO ASTRONOMY 5.149 5.341 MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
105-109.5	GHz	FIXED RADIO SPACE RESEARCH (passive) 5.562B 5.149 5.341 MOBILE ASTRONOMY	STANDARD SPECTRUM
109.5-111.8	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341	STANDARD SPECTRUM
111.8-114.25	GHz	FIXED RADIO SPACE RESEARCH (passive) 5.562B 5.149 5.341 MOBILE ASTRONOMY	STANDARD SPECTRUM
114.25-116	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341	STANDARD SPECTRUM
116-119.98	GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562C SPACE RESEARCH (passive) 5.341	STANDARD SPECTRUM
119.98-122.25	GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562C SPACE RESEARCH (passive) 5.138 5.341	STANDARD SPECTRUM
122.25-123	GHz	FIXED INTER-SATELLITE MOBILE Amateur 5.138 5.558	STANDARD SPECTRUM
123-130	GHz	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) RADIONAVIGATION RADIONAVIGATION-SATELLITE Radio astronomy 5.562D 5.149 5.554	STANDARD SPECTRUM
130-134	GHz	EARTH EXPLORATION-SATELLITE (active) 5.562E FIXED INTER-SATELLITE MOBILE 5.558 RADIO ASTRONOMY 5.149 5.562A	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
134-136	GHz	AMATEUR AMATEUR-SATELLITE Radio astronomy	STANDARD SPECTRUM
136-141	GHz	RADIO ASTRONOMY Amateur Amateur-satellite 5.149	STANDARD SPECTRUM
141-148.5	GHz	FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	STANDARD SPECTRUM
148.5-151.5	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
151.5-155.5	GHz	FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	STANDARD SPECTRUM
155.5-158.5	GHz	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.562F 5.562G	STANDARD SPECTRUM
158.5-164	GHz	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)	STANDARD SPECTRUM
164-167	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
167-174.5	GHz	FIXED FIXED-SATELLITE (space-to-Earth) INTER-SATELLITE MOBILE 5.558 5.149 5.562D	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
174.5-174.8	GHz	FIXED INTER-SATELLITE MOBILE 5.558	STANDARD SPECTRUM
174.8-182	GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562H SPACE RESEARCH (passive)	STANDARD SPECTRUM
182-185	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
185-190	GHz	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.562H SPACE RESEARCH (passive)	STANDARD SPECTRUM
190-191.8	GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
191.8-200	GHz	FIXED INTER-SATELLITE MOBILE 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.341 5.554	STANDARD SPECTRUM
200-202	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341 5.563A	STANDARD SPECTRUM
202-209	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341 5.563A	STANDARD SPECTRUM
209-217	GHz	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.149 5.341	STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY	SERVICE ALLOCATIONS			CLASSIFICATION
217-226	GHz	FIXED FIXED-SATELLITE (Earth-to-space) RADIO SPACE RESEARCH (passive) 5.562B 5.149 5.341	MOBILE ASTRONOMY	STANDARD SPECTRUM
226-231.5	GHz	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340	RADIO ASTRONOMY	STANDARD SPECTRUM
231.5-232	GHz	FIXED Radiolocation	MOBILE	STANDARD SPECTRUM
232-235	GHz	FIXED FIXED-SATELLITE (space-to-Earth) Radiolocation	MOBILE	STANDARD SPECTRUM
235-238	GHz	EARTH EXPLORATION-SATELLITE (passive) (space-to-Earth) SPACE RESEARCH (passive) 5.563B	FIXED-SATELLITE 5.563A	STANDARD SPECTRUM
238-240	GHz	FIXED FIXED-SATELLITE (space-to-Earth) RADIOLOCATION RADIONAVIGATION SATELLITE RADIONAVIGATION-SATELLITE	MOBILE	STANDARD SPECTRUM
240-241	GHz	FIXED RADIOLOCATION	MOBILE	STANDARD SPECTRUM
241-248	GHz	RADIO Amateur Amateur-satellite 5.138 5.149	ASTRONOMY RADIOLOCATION	STANDARD SPECTRUM
248-250	GHz	AMATEUR AMATEUR-SATELLITE Radio astronomy 5.149		STANDARD SPECTRUM

National Frequency Allocation Table

FREQUENCY		SERVICE ALLOCATIONS	CLASSIFICATION
250-252	GHz	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.563A	STANDARD SPECTRUM
252-265	GHz	FIXED MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554	STANDARD SPECTRUM
265-275	GHz	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.149 5.563A	STANDARD SPECTRUM
275-1 000	GHz	(Not allocated) 5.565	STANDARD SPECTRUM

Note: Amendments to the National Table of Allocations may lead to new assignments for services. Allocations and assignments are linked and will ultimately reflect local market structures and conditions. Allocating and assigning spectrum for various uses and users by URCA is a powerful tool with significant implications. Imposing or limiting restrictions on uses and users has a direct impact on spectrum access and efficiency. Knowing where and where not to impose restrictions requires information, building consensus and where consensus is lacking, the means to smooth out differences by way of an adjustment process such as compensation or arbitration.

Appendix B: Standardized Definitions of Terms and Services

The following definitions were extracted from the Annex to the Constitution, the Annex to the Convention of the International Telecommunication Union (Geneva, 1992) and the International Telecommunication Union (ITU) Radio Regulations Manual (Edition of 1998). These are the standardized terms and definitions used in the ITU Radio Regulations. In both the National Spectrum Plan and the ITU RR terms have the following meanings:

1. **Assigned Frequency:** The centre of the frequency band assigned to a station.
2. **Accepted Interference:** Interference at a higher level than that defined as permissible interference and which has been agreed upon between two or more administrations without prejudice to other administrations.
3. **Aeronautical Fixed Service:** A radiocommunications service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air transport.
4. **Aeronautical Mobile Service:** A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon station may also participate in this service on designed distress and emergency frequencies.
5. **Aeronautical Mobile (R)* Service:** An aeronautical mobile service reserved for communications relating to safety and regularity of flight, primarily along national or international civil air routes.
6. **Aeronautical Mobile (OR)*:** An aeronautical mobile service intended for communications, including those relating to flight coordination, primarily outside national or international civil air routes.
7. **Aeronautical Mobile Satellite Service:** A mobile service in which mobile earth stations are located on board aircraft; survival craft stations and Emergency Positioning-Indicating Radio Beacon may also participate in this service.
8. **Aeronautical Mobile Satellite (R)** Service:** An aeronautical mobile-satellite service reserved for communications relating to safety and regularity of flights, primarily along national and international civil air routes.

9. **Aeronautical Mobile-Satellite (OR)** Service:** An aeronautical mobile-satellite service intended for communications, including those relating to flight coordination, primarily outside national and international civil routes.
10. **Amateur Service:** A radiocommunications service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, duly authorized persons interested in radio techniques solely with a personal aim and without pecuniary interest.
11. **Amateur-Satellite Service:** A radiocommunications service using space stations on earth for the same purposes as those of the amateur service.
12. **Aeronautical Radionavigation:** A radionavigation service intended for the benefit and for the safe operation of aircraft.
13. **Broadcasting Service:** A radiocommunications service in which the transmissions are intended for direct reception by the general public. This service may include sound transmissions, television transmissions or other types of transmission.
14. **Broadcasting Satellite Service:** A radiocommunications service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public.
15. **Class of Emission:** The set of characteristics of an emission, designated by standard symbols, e.g. type of modulation of the main carrier, modulating signal, and type of information to be transmitted.
16. **Emission:** Radiation produced, or the production of radiation, by a radio transmitting station.
17. **Effective Isotropic Radiated Power (EIRP):** The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.
18. **Effective Radiated Power (ERP):** The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.
19. **Earth Exploration-Satellite Service:** A radiocommunications service between earth stations and one or more space stations' which may include links between space stations.
20. **Fixed Service:** A radiocommunications service between specific fixed points.
21. **Harmful Interference:** Interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunications service operating in accordance with the Regulations.

22. **Industrial Scientific and Medical (ISM):** Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunication.
23. **Inter-Satellite Service:** A radiocommunications service providing links between artificial earth satellites.
24. **Land Mobile Service:** A mobile service between a base station and a land-mobile station, or between land mobile stations.
25. **Land Mobile Satellite Service:** A mobile-satellite service in which mobile earth stations are located on land.
26. **Metrological-Satellite Service:** An earth exploration-satellite service for meteorological purposes.
27. **Maritime Radionavigation Service:** A mobile-satellite intended for the benefit and for safe operation of ships.
28. **Maritime Mobile-Satellite Service:** A mobile-satellite in which mobile earth stations are located on board ships; service survival craft stations and EPIRB's.
29. **Maritime Mobile Service:** A mobile service between coast stations and ship stations, or between ship stations, or between associated on-board communication stations; survival craft stations and emergency position-indicating radio beacon stations may also participate in this service.
30. **Mobile Satellite Service:** A radiocommunications service: between mobile earth stations and one or more space stations, or between stations used by this service; or between mobile earth stations by means of one of more space stations.
31. **Mobile Service:** A radiocommunications service between mobile and land stations, or between mobile stations.
32. **Maritime Radionavigation-Satellite Service:** A radionavigation-satellite service in which earth stations are located on board ships.
33. **Meteorological Aids Service:** A radiocommunications service used for meteorological, including hydrological, observations and exploration.
34. **Port Operations Service:** A maritime mobile service in or near a port, between coast stations and ship stations, or between ship stations, in which messages are restricted to those relating to the operational handling, the movement and the safety of ships and, in emergency, to the safety of persons.

35. **Radiocommunications:** Telecommunications by means of radio waves.
36. **Radio determination:** The determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves.
37. **Radionavigation:** Radio determination used for the purposes of navigation, including obstruction warning.
38. **Radiolocation:** Radio determination used for the purposes other than those of radionavigation.
39. **Radiation:** The outward flow of energy from any source in the form of radio waves.
40. **Radio Astronomy:** Astronomy based on the reception of radio waves of cosmic origin.
41. **Radionavigation Satellite Service:** A radiocommunications service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public.
42. **Standard Frequency and Time Signal Service:** A radiocommunications service for scientific, technical and other purposes, providing the transmission of specified frequencies, time signals, or both of stated high precision, intended for general reception.
43. **Standard Frequency and Time Signal-Satellite Service:** A radiocommunications service using space stations on earth satellites for the same purposes as those stated above.
44. **Space Research Service:** A radiocommunications service in which spacecraft or other objects in space are used for scientific or technological research purposes.
45. **Space Radiocommunications:** Any radiocommunication involving the use of one or more space stations or the use of one or more reflecting satellites or other objects in space.
46. **Terrestrial Radiocommunications:** Any radiocommunications other than space radiocommunications or radio astronomy.
47. **Telecommunications:** Any transmission, emission or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.
48. **Spectrum Allocation:** An allocation is an entry in a table of frequency allocations which sets out the use of a given frequency band for use by one or more radiocommunication services. The term allocation is also applied to the frequency band concerned. An allocation then is a distribution of frequencies to radio services.
49. **Spectrum Allotment:** An allotment is an entry of a designated channel in a plan for use by one or more countries in those countries or within designated areas for a radiocommunication

service under specified conditions. An allotment then is a distribution of frequencies to geographical areas or countries.

50. **Spectrum Assignment:** An assignment is an authorization given for a radio station to use a radio frequency or a radio frequency channel under specified conditions. An assignment then is a distribution of a frequency or frequencies to a given radio station.

Appendix C: Licensing Requirements Electronic Communications Services

Licensing Requirements Electronic Communications Services								
	Operating				Spectrum			
	Individual	Class		Exempt	Individual	Class		Exempt
		Requiring Registration	Not Requiring Registration			Requiring Registration	Not Requiring Registration	
Private Paging				x	x			
VSAT Licence:								
(a) Temporary				x		x		
(b) Permanent feeds		x				x		
(c) Fixed private networks (Closed Group)				x		x		
Private Trunking				x	x			
Public Trunking		x			x			
Public Paging		x		x	x			
Amateur Radio Station Licence:								
(i) Local				x		x		
(ii) Reciprocal				x		x		
Aircraft Radio Station Licence (Aircraft Based)				x			x	
Aeronautical Fixed Ground Station (Operational Staff)				x			x	
Private Land Base:								
(i) Private Dispatched Services				x	x			

Licensing Requirements Electronic Communications Services								
	Operating				Spectrum			
	Individual	Class		Exempt	Individual	Class		Exempt
		Requiring Registration	Not Requiring			Requiring Registration	Not Requiring	
(ii) Remote Broadcasts				x	x			
(iii) Studio to Transmitter Link (STL's)				x	x			
(iv) Narrow Band data transmissions e.g. Alarms, Telemetry				x	x			
Vessels Radiocomm Licences (Vessels Fitted With GMDSS Equipment)				x		x		
Vessels Radiocomm Licences (Vessels Without GMDSS Equipment)				x			x	
Private Port Stations (Marinas VHF)				x			x	
Public Broadcast Station Licence			X		x			
Low Power Devices (FCC type approved)				x				x
Public Fix Wireless Services	x				x			
Internet Service Providers (ISP's)		x			x			
Wi-Fi Networks:								

Licensing Requirements Electronic Communications Services								
	Operating				Spectrum			
	Individual	Class		Exempt	Individual	Class		Exempt
		Requiring Registration	Not Requiring			Requiring Registration	Not Requiring	
Private on premises. (Closed User Group) e.g. Hotels, Insurance companies etc.				x			x	
General Telecom munitions Services	x				x			
Transmission Capacity for Other Licenced Operators (OLO)	x							

Appendix D: Classification of Radio Frequency Spectrum

FREQUENCY (MHZ)			CLASSIFICATION OF SPECTRUM	AVAILABILITY	METHOD OF ALLOCATION
0.003	-	6.765	Standard	Open	First Come First Serve
6.765	-	6.795	Standard	Open	Shared Spectrum
13.553	-	13.567	Standard	Open	Shared Spectrum
26.957	-	27.283	Standard	Open	Shared Spectrum
41	-	40.7	Standard	Open	Shared Spectrum
380	-	400	Standard	Closed	Method Undetermined
400	-	470	Standard	Open	First Come First Served
470	-	698	Standard	Closed	Method Undetermined
698	-	806	Standard	Open	Ministerial Decision
806	-	824	Standard	Open	First Come First Served
824	-	849	Premium	Open	Ministerial Decision
849	-	869	Standard	Open	Competitive
851	-	869	Standard	Open	First Come First Served
869	-	894	Premium	Open	Ministerial Decision
894	-	902	Standard	Closed	Method Undetermined
902	-	928	Standard	Open	Shared Spectrum
928	-	960	Standard	Closed	Method Undetermined
960	-	1395	Standard	Closed	Method Undetermined
1395	-	1427	Standard	Close	Method Undetermined
1427	-	1500	Standard	Close	Method Undetermined
1500	-	1559	Standard	Close	Method Undetermined
1559	-	1625	Standard	Close	Method Undetermined
1625	-	1661	Standard	Close	Method Undetermined
1661	-	1710	Standard	Close	Method Undetermined
1710	-	1755	Premium	Open	Ministerial Decision
1755	-	1785	Standard	Open	Competitive
1785	-	1805	Standard	Closed	Method Undetermined
1805	-	1850	Standard	Closed	Method Undetermined
1850	-	1915	Premium	Open	Ministerial Decision
1915	-	1930	Premium	Open	Ministerial Decision
1930	-	1995	Premium	Open	Ministerial Decision
1995	-	2025	Standard	Closed	Method Undetermined
2025	-	2110	Standard	Closed	Method Undetermined
2110	-	2155	Premium	Open	Ministerial Decision
2155	-	2200	Standard	Closed	Method Undetermined
2200	-	2305	Standard	Closed	Method Undetermined

FREQUENCY (MHZ)			CLASSIFICATION OF SPECTRUM	AVAILABILITY	METHOD OF ALLOCATION
2305	-	2320	Premium	Open	Ministerial Decision
2320	-	2345	Standard	Closed	Method Undetermined
2345	-	2360	Premium	Open	Ministerial Decision
2360	-	2400	Standard	Closed	Method Undetermined
2400	-	2500	Standard	Open	Shared Spectrum
2496	-	2690	Standard	Open	Competitive
2500	-	2690	Standard	Open	Competitive
3400	-	3800	Standard	Open	Competitive
3800	-	5725	Standard	Close	Method Undetermined
5725	-	5875	Standard	Open	Shared Spectrum
5725	-	5875	Standard	Open	Shared Spectrum
5875	-	10700	Standard	Closed	Method Undetermined
10700	-	11700	Standard	Open	Competitive
11700	-	12700	Standard	Open	Competitive
12700	-	24000	Standard	Closed	Method Undetermined
24000	-	24250	Standard	Open	Shared Spectrum
24000	-	24250	Standard	Open	Shared Spectrum
24250	-	40500	Standard	Closed	Method Undetermined
40500	-	43500	Standard	Open	Competitive
43500	-	61000	Standard	Closed	Method Undetermined
61000	-	61500	Standard	Open	Shared Spectrum
61000	-	61500	Standard	Open	Shared Spectrum
122000	-	123000	Standard	Open	Shared Spectrum
122000	-	123000	Standard	Open	Shared Spectrum
244000	-	300000	Standard	Open	Shared Spectrum

Appendix E: Key Statistical Highlights

Mobile cellular

Total mobile-cellular subscriptions reached almost 6 billion by end 2011, corresponding to a global penetration of 86%. Growth was driven by developing countries, which accounted for more than 80% of the 660 million new mobile-cellular subscriptions added in 2011.

In 2011, 142 million mobile-cellular subscriptions were added in India, twice as many as in the whole Africa, and more than in the Arab States, CIS and Europe together.

By end 2011, there were 105 countries with more mobile-cellular subscriptions than inhabitants, including African countries such as Botswana, Gabon, Namibia, Seychelles and South Africa. Countries where mobile-cellular penetration increased the most in 2011 include Brazil, Costa Rica, Kazakhstan, Lao P.D.R. and Mali.

Mobile broadband

By end 2011, there were more than 1 billion mobile-broadband subscriptions worldwide. Mobile broadband has become the single most dynamic ICT service reaching a 40% annual subscription growth in 2011. Although developing countries are catching up in terms of 3G coverage, huge disparities remain between mobile-broadband penetration in the developing (8%) and the developed world (51%). In Africa there are less than 5 mobile-broadband subscriptions per 100 inhabitants, whereas all other regions have penetration levels above 10%.

By end 2011, there were more mobile-broadband subscriptions than inhabitants in the Republic of Korea and Singapore. In Japan and Sweden, active mobile-broadband penetration surpassed 90% by end 2011.

In 2011, 144 million mobile-broadband subscriptions were added in the BRICS (Brazil, the Russian Federation, India, China and South Africa), accounting for 45% of the world's total subscriptions added in 2011.

Fixed (wired) broadband:

By end 2011, there were 590 million fixed (wired) -broadband subscriptions worldwide. Fixed (wired) broadband growth in developed countries is slowing (5% increase in 2011), whereas developing

countries continue to experience high growth (18% in 2011). Fixed (wired) -broadband penetration remains low in some regions, such as Africa and the Arab States, with 0.2% and 2% respectively by end 2011.

In 2011, 30 million fixed (wired) -broadband subscriptions were added in China, about half of the total subscriptions added worldwide, and fixed (wired) -broadband penetration reached 12% in the country. Top performers – such as France, Denmark, the Netherlands, Norway, the Republic of Korea and Switzerland – had fixed (wired) -broadband penetrations above 35% by end 2011. Countries where fixed (wired) -broadband penetration increased the most in 2011 include Bahrain, Costa Rica, Ecuador, Mauritius and Uruguay. However, among these, only Bahrain and Uruguay surpassed the 10% fixed (wired) -broadband penetration by end 2011.

Internet

The percentage of individuals using the Internet (fixed and mobile) continues to grow worldwide and by end 2011, 2.3 billion people were online. In developing countries, the number of Internet users doubled between 2007 and 2011, but only a quarter of inhabitants in the developing world were online by end 2011. The percentage of individuals using the Internet in the developed world reached the 70% landmark by end 2011. In Iceland, the Netherlands, Norway and Sweden more than 90% of the population are online.

By end 2011, 70% of the total households in developed countries had Internet, whereas only 20% of households in developing countries had Internet access. Some outstanding exceptions include Lebanon and Malaysia with 62% and 61% of households with Internet respectively. Total international Internet bandwidth increased seven-fold over the last five years reaching 76'000 Gbit/s by end 2011. This equates to 34'000 bit/s per Internet user worldwide. Major differences in Internet bandwidth per Internet user persist between regions: on average, a user in Europe enjoys 25 times as much international Internet capacity as a user in Africa.

Source: ITU World Telecommunication/ICT Indicators Database. 2012 International Telecommunication Union.