THE NATIONAL SPECTRUM PLAN

(2019 – 2022)

Consultation Document

ECS 02/2019

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1. Introduction

This National Spectrum Plan shall be cited as The National Spectrum Plan (2019-2022) (the "Spectrum Plan" or "NSP"). It has been formulated by the Utilities Regulation and Competition Authority (URCA), in consultation with The Government of The Bahamas ("the Government"), in fulfilment of requirements set out in Part V of the Communications Act, 2009 (the "Comms Act" or " the Act") and is aimed to further the objectives of the Electronic Communications Sector Policy (ECSP).

1.1 Background

The Comms Act prescribes the law applicable to the Electronic Communications Sector (ECS) and empowers URCA as the independent regulator of that sector. The Act charges URCA with the responsibility for implementing the ECSP and grants URCA the exclusive right to manage, allocate and assign all frequencies (i.e., frequencies of electromagnetic energy) in the radio spectrum in The Bahamas excepting that the Minister shall decide the method of allocating frequencies in the premium spectrum bands identified in this NSP.

In April 2014, URCA published the second revision of the NSP (2014-2017) (ECS 03/2014). Section 31(4) of the Act stipulates that within three (3) years of each publication of a spectrum plan, URCA must formulate, in consultation with the Minister, a revised spectrum plan and submit the revised plan to the Minister for approval. URCA has revised the NSP and now submits it to the Minister for consultation and approval.

1.2 Objectives of this National Spectrum Plan

In accordance with section 32(1) of the Comms Act, this NSP:

i. establishes a framework for implementing the requirements of the Comms Act; and
ii. outlines the principles that URCA shall adhere to when:

a. relying on voluntary or industry standards in lieu of regulations; and

b. taking enforcement action to ensure adequate protection of licensed radio spectrum bands from interference.

In pursuit of these objectives, section 31(2) of the Comms Act requires URCA to ensure that the spectrum plan is consistent with any applicable international treaties, commitments or standards including, without limitation, those of the International Telecommunications Union (ITU), and shall take into account relevant international recommendations.

1.3 How to Respond to this Consultation Document

This consultation document does not contain structured consultation questions. Rather, respondents are encouraged to review this Plan as a whole and comment as necessary. Respondents should submit responses to this document to URCA by 5:00 p.m. on 26 April 2019. Persons may send their written responses or comments to URCA's Chief Executive Officer, either:

- By hand to URCA's office at Frederick House, Frederick Street, Nassau; or
- By mail to P.O. Box N-4860, Nassau, Bahamas;
- By fax to (242) 393-0153; or
- By email to info@urcabahamas.bs.

URCA reserves the right to make all responses available to the public by posting responses on its website at www.urcabahamas.bs. If a response is marked confidential, reasons should be given to facilitate URCA evaluating the request for confidentiality. URCA may publish or refrain from publishing any document or submission at its sole discretion. URCA will review the responses received on or before 26 April 2019 and issue a Statement of Results of the consultation within 30 calendar days thereafter.

1.4 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 plan for 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 mechanism URCA will use to manage spectrum; and
- The Appendices provide the National Frequency Allocation Table and a glossary of terms.

2. Legal Framework

Pursuant to the Comms Act, URCA has the exclusive right to manage the radio spectrum (subject to the reservation of certain specific powers to the Minister with responsibility for the electronic communications sector). URCA's responsibilities include the planning and allocation of frequency bands, the assignment of frequencies and individual licensing, spectrum monitoring, international coordination of frequencies, the setting of spectrum fees, enforcement of licence conditions and the setting of standards for radio transmitting equipment.

2.1 The Communications Act, 2009 (Comms Act)

The statutory foundation for radio spectrum management in The Bahamas is outlined in Part V of the Comms Act which focuses on Radio Spectrum Management.

Part V 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. Specifically, in relation to spectrum in premium spectrum bands, the Comms Act provides that the Minister shall be responsible for deciding the method of assigning frequencies and setting fees or prescribing the method of setting fees and for the approval of the National Spectrum Plan.

Section 32 of the Comms Act provides that in performing functions and duties and exercising powers under this Part V, the Minister and URCA must ensure that radio spectrum is managed and used in a manner that:

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

In pursuit of those objectives, sections 32(2) and (3) of the Comms Act provide that URCA may rely on voluntary, industry standards in lieu of regulations, and shall take enforcement action promptly to ensure adequate protection of licensed radio spectrum bands from interference and where necessary the management and use of the radio spectrum.

2.3 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 (ECS) 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.

2.4 International Telecommunications Union (ITU)

Section 31(2) of the Comms Act requires that the NSP shall be 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.

Member States are obliged to comply with the principles of the Administrative Regulations. Notwithstanding such obligation, according to the Charter and the resolutions of the United Nations, a Member State shall have the right to self-determination and to freely pursue its economic, social and cultural development.

Policy Objectives of Spectrum Management

A fundamental objective of the NSP is to align the international objectives and obligations of The Bahamas with the national legislation and policy objectives for spectrum management and spectrum utilisation. The ITU Radiocommunication Sector (ITU-R) plays a vital role in the achievement of that objective particularly in regard to the international coordination of the management of the radio-frequency spectrum and satellite orbits. The ITU-R produces update instruments for spectrum management through the meetings of the World Radiocommunication Conferences (WRC), which are held every four (4) years. The principal output of the WRC is the Radio Regulations (RR). These RR form an integral part of the administrative framework for spectrum management policy and regulations, globally. Through the efficient and timely implementation of the RRs, The Bahamas has been able to maximise the utility of the radio spectrum, minimises internal and cross-border interference and promotes competition in the ECS. Further, URCA aims to create economies of scope and scale through the harmonised use of the spectrum and radiocommunication systems.

The coordination of international spectrum policy objectives is a complex and diverse task, which requires the cooperation of countries and the global electronic communications sector. Figure 2 below shows the international bodies to which The Government of The Bahamas is a party and the specialised bodies that have been established by those bodies to address issues related to electronic communications and radiocommunications.

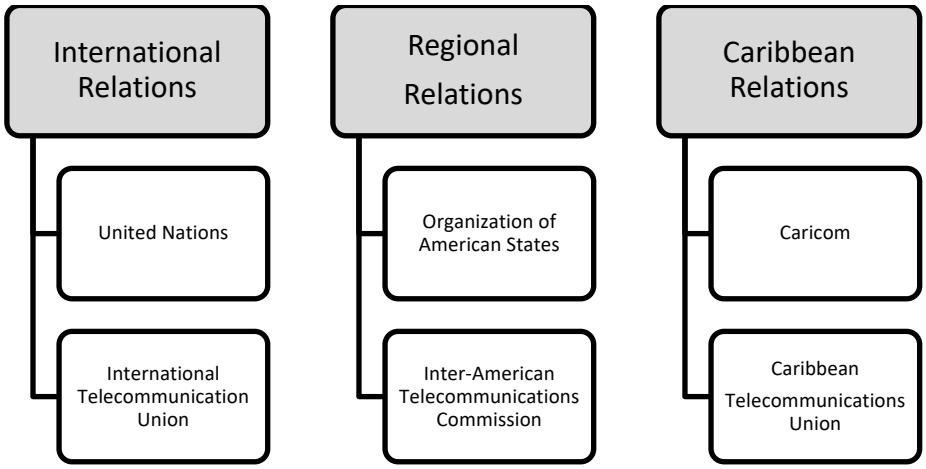

Figure 2: The interrelation of The Bahamas with international and regional spectrum management obligations and objectives

The Government has formally delegated to URCA its representation at the ITU and CITEL, and URCA assists the Government through the provision of technical assistance at the CTU. To further the aforementioned international initiatives and in keeping with its vision to be *"a globally respected regulator championing the interests of people in The Bahamas and of the sectors it regulates"*, URCA must continue to play an active role in the international community through active participation in spectrum management working groups, forums and conferences, through the various international bodies mentioned above.

3. National Spectrum Plan

3.1 Radio Spectrum

The NSP pertains to radiocommunications systems used in The Bahamas. Radiocommunications. is defined in the Comms Act as the transmission, emission or reception of messages, sound, visual images or signals using electromagnetic waves which are propagated in space and having frequencies of lower than 3,000 gigahertz (GHz) and the radio frequency spectrum (as referred to in this NSP as "spectrum" that enables radiocommunications which include all forms of wireless electronic communications systems and devices. The radio spectrum consists of the first

3,000 GHz of electromagnetic frequency (EMF). As shown in Figure 1 below, the radio frequency spectrum extends from 3 kilohertz (kHz) to 3,000 GHz, and service allocation begins at 9 kHz.

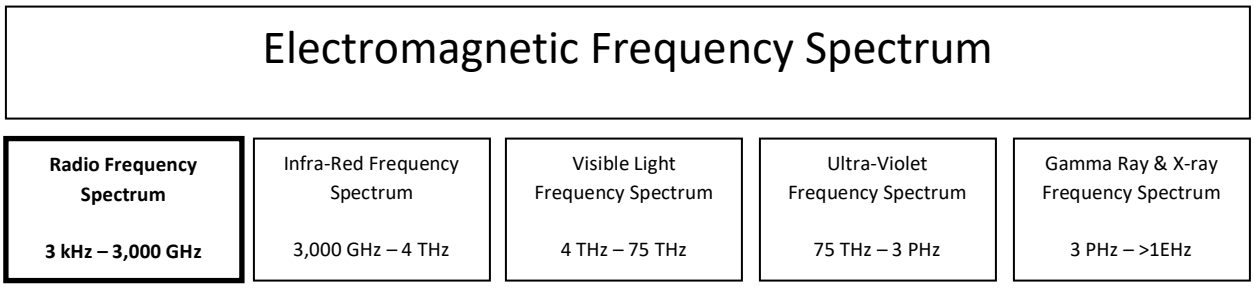

Figure 1: The Electromagnetic Frequency Spectrum

RFS is a limited state resource/asset[1]. 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 resource: spectrum. Hence, the spectrum must be used efficiently and effectively so that it continues to be an available production input for service providers.

Without adequate planning or management, radio signals from different users and services would interfere with each other, and the affected wireless communication service could become useless as a means of communications. Also, ineffective planning can also contribute to suboptimal spectrum utilisation and a shortage of resources for use by current and emerging technologies. Further, since radio waves do not conveniently stop at a country's borders, there is a need for international planning and coordination of radio spectrum usage between countries.

3.3 Scope of the Plan

This plan addresses the regulatory, technical, financial and geographical elements that must be taken into consideration to effectively allocate, plan, price, authorise, and monitor and enforce

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

the use of radio spectrum in The Bahamas in accordance with the policy objectives of the Comms Act.

3.3.1 Regulatory scope

URCA has reviewed the international standards, its international commitments and the national objectives and integrated them into this strategic spectrum plan. Consequently, implementation of this plan will enable URCA to continue to coordinate and standardise the establishment, operation and maintenance of wireless electronic communication networks and services. This has been proven to effectively advance ECSP objectives in The Bahamas while promoting the social and economic development of the country.

3.3.2 Technical scope

In the National Spectrum Plan (NSP) of 2010-2012, URCA implemented numerous strategies which made spectrum available to legacy terrestrial, maritime, aeronautical, satellite systems, services and technologies, as well as provisioned for services using IMT-2000 technologies[2]. Additionally, in the NSP of 2014-2017, URCA made provisions for services that were delivered using pre-existing technologies and for technologies defined by the ITU as International Mobile Telecommunications Advanced (IMT Advanced) such as Long-Term Evolution-Advanced (LTE-Advance), and Worldwide Interoperability for Microwave Access 2.0 (WiMAX2). The country has seen significant uptake of spectrum for wireless telecommunications and broadcasting service since 2010. In this NSP (2018 – 2021), in addition to the considerations made in the previous NSPs, URCA focuses on the facilitation of new technological innovations defined under the umbrella of International Mobile Telecommunications 2020 (IMT-2020 and beyond). According

[2] 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)

to the ITU, IMT-2020 and beyond is a standard that will underpin the next generations of mobile broadband including, inter alia, Internet of Things (IoT), 5G and other "Smart Cities" technologies.

To further the facilitation of IMT-2020, on 18 April 2018 URCA made a Final Determination URCA's *Proposal to Open the Standard Spectrum Bands Currently Specified as 'Closed' in the National Spectrum Plan 2014-2017 (ECS 03/ 2014)-ECS 04/2018*[3]. URCA is of the view that the opening of spectrum bands will serve as an enabler for The Bahamas to take advantage of opportunities that could lead to economic and social growth by developing the country's communications infrastructure and ecosystem.

This NSP also sets the framework for URCA's work on FM Broadcasting Technical Standards, ICTs for Disaster Management Regulations, ICTs for Disabled Citizens and the Digital Switchover Policy.

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 standard spectrum bands, URCA is responsible for the determination and imposition of charges to be paid for the use of that spectrum. For that purpose, on 28 January 2016 URCA published the Statement of Results and Final Decision on the *Review of Radio Frequency Spectrum Pricing* (*ECS 01/2016)*[4]. The Final Decision sets out the mechanism that URCA

[3] Utilities Regulation and Competition Authority. (2018). *A Proposal to Open the Standard Spectrum Bands Currently Specified as 'Closed' in the National Spectrum Plan 2014-2017 (ECS 03/ 2014)-ECS 04/2018. Retrieved from http://www.urcabahamas.bs/decisions/statement-results-final-determination-proposal-open-standard-spectrum-bands/*

[4] Utilities Regulation and Competition Authority. (2016). *Review of radio Frequency Spectrum Pricing. Retrieved from http://www.urcabahamas.bs/consultations/review-radio-frequency-spectrum-pricing/*

will use to determine the station-related fees and spectrum-related fees for radiocommunication systems. In the Statement of Results and Final Decision on the *Review of Radio Frequency Spectrum Pricing* (*ECS 01/2016),* URCA stated its intention to published the Final Determination on Recovery of Spectrum Management Costs at a later date. That issue is addressed in Section 6.7 of this Document. The publication of the document also helped to ensure that URCA's determination of fees was fair, transparent and non-discriminatory.

By contrast, section 93(1) of the Comms Act 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 as to how determining the charges set for premium spectrum are set, although it provides advice to the Minister upon request in relation to those charges. Pursuant to section 91 and 93 (4) of the Comms Act, URCA is responsible for the collection of all spectrum fees, on behalf of the Treasurer. 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

One of the tenets of management of the radio spectrum is the territorial sovereignty of all nations, including the right of nations to determine spectrum allocation, band plans, spectrum prices, spectrum authorisation, and methods of compliance monitoring and enforcement. In that regard, each member state has territorial sovereignty. Territorial sovereignty refers to the exclusive right of a state to exercise its laws and regulations within the boundaries of its territory, inclusive of all lands, territorial waters and airspace that constitute the Commonwealth of The Bahamas. The geographic scope of this NSP is, therefore, all lands, territorial waters and airspace that constitute the Commonwealth of The Bahamas.

3.4 Radio Spectrum Management Strategy

URCA intends to address the regulatory, technical, financial and geographical elements, mentioned above by implementing, and revising when and as necessary, the five spectrum management processes. The strategy includes spectrum allocation, band planning, spectrum pricing, spectrum authorisation, and compliance monitoring and enforcement, outlined in Figure 3 below.

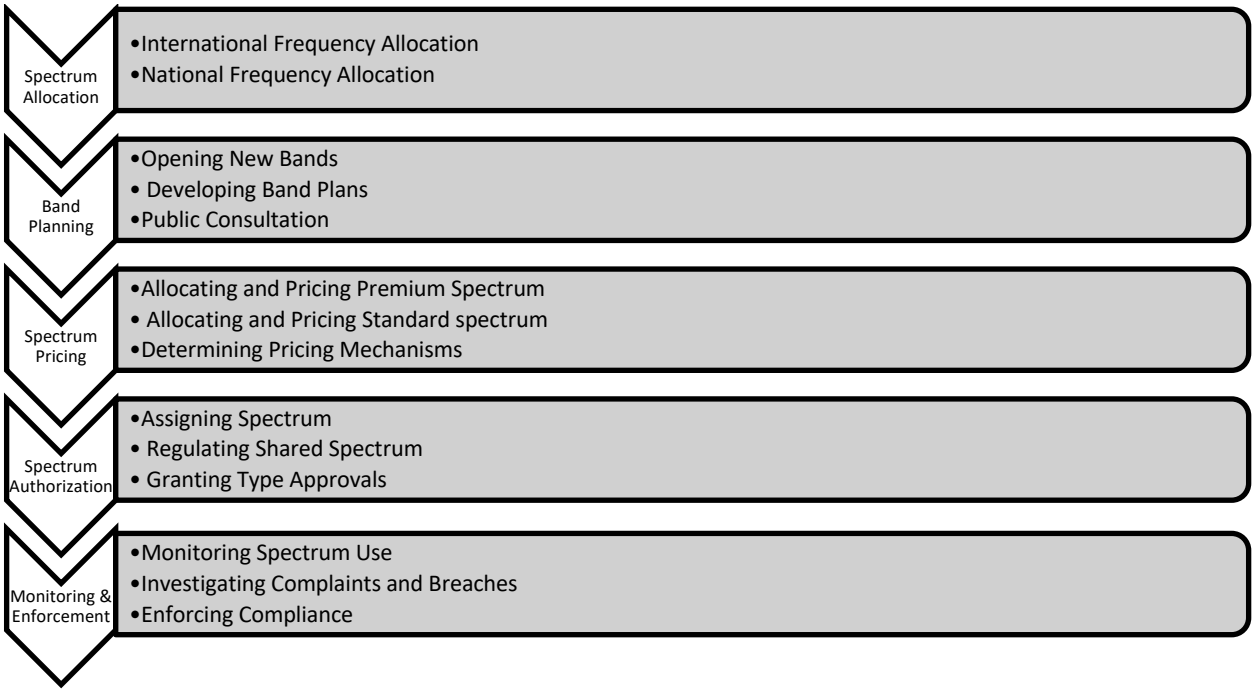

Figure 3: The Strategy Model for National Spectrum Management

The interworking of the five processes outlined 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. [5] These outcomes result naturally when spectrum allocation is aligned with the global community.

4. Spectrum Allocation

4.1 Definition of Allocation

According to Article 1 of the ITU Radio Regulations (ITU-RR), spectrum allocation is an entry in the Frequency Allocation Table that specifies the type of terrestrial or satellite 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 fixed and mobile maritime, aeronautical, land or satellite services. As previously stated, the frequency allocations to these services are reviewed by the WRC every four years. In keeping with best practices, in this NSP, URCA has revised National Frequency Allocation Table (NFAT) to ensure that the allocations in the NFAT conform to the International Table of Frequency Allocations (IFAT) published in Article S5 of the most recent version of the ITU Radio Regulations (i.e., the 2016 Edition)[6]. This will result in the harmonisation of spectrum usage with adjacent countries in Region 2 and thereby foster effective coordination.

URCA considers that the coordination of spectrum usage with regional and international countries minimises cross-border interference. Cross-border interference can hamper a country's ability to access the radio frequency spectrum within its borders. Furthermore, coordination is essential to ensure radio frequency transmissions emitted from and into The

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

[6] International Telecommunications Union. (2018). The Radio Regulations, edition of 2016. Retrieved from https://www.itu.int/pub/R-REG-RR.

Bahamas conform to international agreements. URCA also recognises that harmful interference can disrupt the critical communications systems on aircrafts in Bahamian flying airspace and ships traversing Bahamian waters. It is therefore essential for URCA, in conjunction with its regional and international partners, to coordinate radio frequency transmissions to ensure safe passage.

As a result of these concerns, the NSP is designed with the objective of ensuring conformity with regional and international treaties, commitments and standards, and with a view to respecting the rights of other nations and the international community. URCA has, therefore, in addition to developing allocations that are consistent with international standards, sought to build relationships with regulatory bodies in the region to assist in advancing the regional spectrum management agenda of harmonisation.

4.3 Regional Allocation

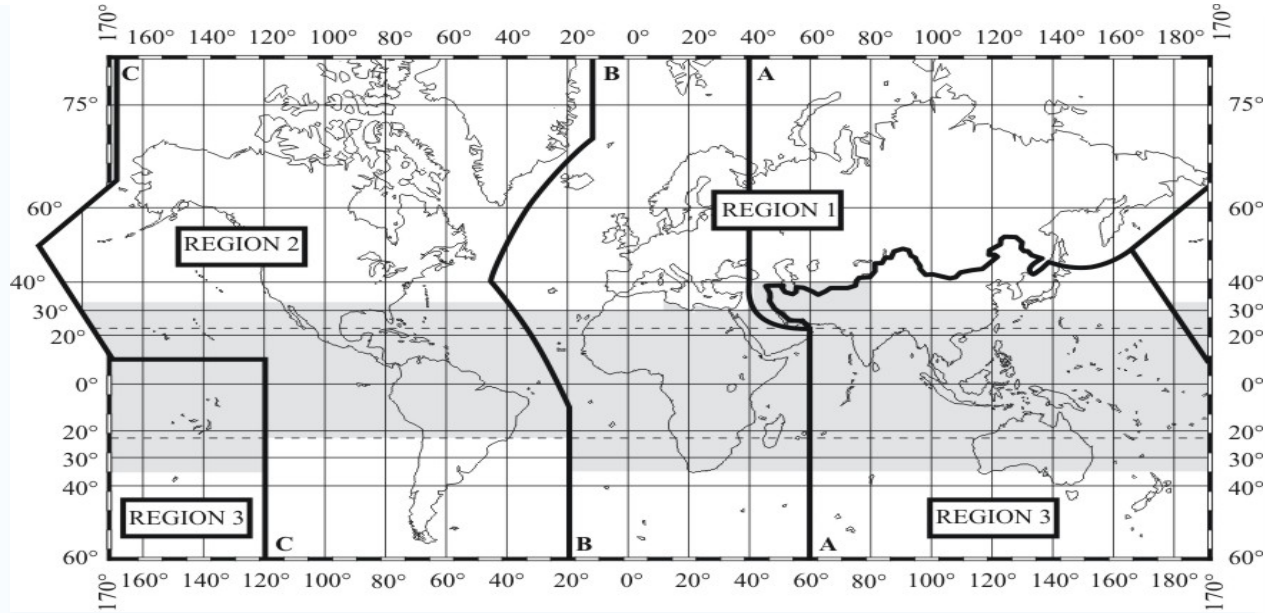

Figure 4: The Map of ITU Regions showing The Bahamas in Region 2[7]

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

For the purpose of harmonisation, the ITU has divided the world into three regions. The Commonwealth of the Bahamas is located in Region 2, along with thirty-five other countries located in 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 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 stricter regulatory scrutiny by URCA for the purpose of ensuring compatibility with other electronic communications equipment operating in The Bahamas.

4.4 National Frequency Allocation Table (NFAT)

The NFAT is designed to coordinate and harmonise the use of radio frequency spectrum in The Bahamas with that of other countries. Within the NFAT, the spectrum is allocated to broadly defined services, such as maritime radionavigation, aeronautical radionavigation, broadcasting, fixed/mobile radio, amateur radio, mobile broadband, and fixed/mobile satellite. The services allocated to specific frequency ranges 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 3 kHz-0.3 MHz	**LF** 0.3-3MHz	**MF** 3MHz-30MHz	**VHF** 30MHz-300MHz	**UHF** 300MHz-3GHz	**SHF** 3GHz-30GHz	**EHF** 30GHz-3000 GHz
Maritime mobile Maritime & Aeronautical Radio-navigation	Broadcasting Navigation Beacons Near-Field Comms	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

4.5 Amendments to the National Frequency Allocation Table

As required by section 31 of the Comms Act, this NSP ensures that The Bahamas complies fully with its international radio spectrum management obligations as enshrined in various ITU documents including the ITU Convention, the ITU Radio Regulations, and Final Acts from the World Radiocommunication Conferences and other multinational agreements and standards[8].

The National Spectrum Plan 2014-2017 was based on recommendations ratified at the World Radio Conference (WRC) of 1995, 1997, 2003, 2007 and 2012, held by the ITU's Radiocommunications Bureau (ITU-R). The National Spectrum Plan 2018-2021 will extend those provisions to include recommendations ratified at the World Radio Conference (WRC) of 2015.

In recognition of the revised international obligations subsequent to WRC-15 and the need to harmonise the country's spectrum management activities with international best practices, this NSP makes provision to implement the ITU recommendations for the assignment of:

- 1087.7-1092.3MHz band to aeronautical mobile-satellite service (Earth-to-space) for reception by space stations of Automatic Dependent Surveillance-Broadcast (ADS-B) emissions from aircraft transmitters which will facilitate global flight tracking of aircraft equipped with ADS-B anywhere in the world;
- additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) to facilitate the development of terrestrial mobile broadband applications;

[8] International Telecomunications Union. (2018). ITU Constitution and Conventions. Retrieved from https://www.itu.int/en/history/Pages/ConstitutionAndConvention.aspx

- spectrum allocations to the broadband public protection and disaster relief (PPDR) service, in accordance with Resolution 648;
- new allocation to the amateur service on a secondary basis within the band 5250 - 5450 kHz in accordance with Resolution 649;
- fixed-satellite service bands not subject to Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution 153;
- spectrum allocations for the mobile-satellite service in the Earth-to-space and space-to-Earth directions, including the satellite component of broadband applications;
-
- an allocation to fixed-satellite service (Earth-to-space) of 250 MHz in Region 2 within the range 13 - 17 GHz; and
- the band 5091 - 5150 MHz to fixed-satellite service (Earth-to-space) in accordance with Resolution 114.

In addition to the ITU Recommendations for service allocations, this NSP recognises agreements to consider important emerging technologies that currently enable wireless communications during onboard vessels and aircraft during various phases of the voyage. In particular, WRC-15 agreed to consider:

- a resolution to study earth stations located on board vessels (ESVs), based on studies conducted in accordance with Resolution 909;
- possible new allocations to the fixed-satellite service in the frequency bands 7150 - 7250 MHz (space-to-Earth) and 8400 - 8500 MHz (Earth-to-space), subject to appropriate sharing conditions;
- the possibility of allocating the bands 7375 - 7750 MHz and 8025 - 8400 MHz to the maritime-mobile satellite service and additional regulatory measures, depending on the results of appropriate studies;

- A study of the technical and operational characteristics for Earth Stations in Mobile (ESIM) that operate or plan to operate within geostationary FSS allocations in the frequency bands 17.7-19.7GHz and 27.5-29.5GHz, while studying the sharing and compatibility between ESIM with geostationary FSS networks and current and planned stations of existing services allocated in these frequency bands;

URCA has amended The Bahamas' NFAT to include the aforementioned revisions, or otherwise noted the mentioned important considerations which must be taken into account during spectrum planning and decision making. The NFAT is set out in Appendix A of this NSP.

5. Spectrum Band Planning

5.1 Definition of Spectrum Band Plan

To coordinate and harmonise the use of the numerous allotments of spectrum in the NFAT, URCA must formulate band plans. A band plan is a strategy for coordinating multiple assignments to avoid harmful in-band and out-of-band interference to users of the spectrum. The spectrum band plan will specify 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 the national allocation of services, relevant international standards and the geographical characteristics of the territory covered by the spectrum licenses. URCA will design and/or adopt

spectrum band plans that conform to international standards for all open spectrum bands. URCA will only grant spectrum assignments in The Bahamas in conformity with the relevant band plan.

5.2 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 communication services. In particular, in this NSP, URCA's primary objective is to make available the spectrum needed to drive the evolution of legacy technologies and the emerging technologies as defined in the ITU's IMT-2020[9].

The three primary goals of spectrum band planning objectives are:

(i) To ensure harmonised 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.

URCA will aim to achieve these goals by focusing on the following main areas of activity:

- Establishing policy priorities for assigning radio spectrum;
- Harmonising spectrum usage in individual bands with relevant regional and international administrations;
- Coordinating spectrum assignments – including the monitoring of a wide range of services that depend on the spectrum, such as mobile telecommunications, maritime, aeronautical transport services and public safety services;
- Facilitating access to spectrum by the public and private users; and
- Driving sustainable innovation and competition.

[9] International Telecommunications Union. (2018). ITU Toward IMT for 2020 and beyond. Retrieved from https://www.itu.int/en/ITU-R/study-groups/rsg5/rwp5d/imt-2020/Pages/default.aspx

The spectrum management planning process is intended to support regulatory policy formulation and implementation. This process involves tracking global industry trends, monitoring developments in technology, assessing the current and forecasting future user demand of the spectrum. For these purposes, URCA will make use of software-based tools to conduct frequency management, monitoring and channel planning. URCA's planning will be undertaken with the intention of facilitating 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 relevance and effectiveness of spectrum band plans depend 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. Therefore, spectrum band plans must be designed to promote investment and innovation in electronic communications networks and services, encourage, promote and enforce sustainable competition and promote the optimal use of the radio spectrum. Further, all services permitted in a band must be consistent with the service allocation specified in NFAT.

Spectrum assignments can be exclusive or shared. When a Licensee requires exclusive use of spectrum frequencies, URCA must establish technical compliance rules to coordinate usage amongst licensees and conduct spectrum occupancy assessments to ensure that licensees comply with the technical rules. Therefore, for compliance reasons URCA intends to conduct random spectrum occupancy surveys throughout The Bahamas.

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 will aim to minimise barriers to market entry by opening new spectrum bands to ensure that applicants seeking to introduce new services to satisfy consumer demand for connectivity and mobility will have access to the spectrum needed to deliver those services. This includes

making additional spectrum available for mobile electronic communications services for the expansion of IMT-2000, IMT-Advanced and IMT-2020 technology-based services throughout 2018-2021.

In preparation for that initiative, on 17 April 2018, subsequent to the public consultation, URCA published a *Final Determination On Proposal To Open Standard Spectrum Bands Currently Specified As 'Closed' In The National Spectrum Plan 2014- 2017 (ECS 03/2014)*, wherein URCA stated its intention to recommend to the Minister in the next revision of the National Spectrum Plan, the opening of the Standard Spectrum Bands Currently Specified As 'Closed' In The National Spectrum Plan 2014- 2017 (ECS 03/2014) in this NSP[10].

URCA hereby proposes to open the bands set out in Table 1 of the above mentioned *Final Determination*. URCA will provision those bands for use following an expression of interest in accordance with the steps and timelines set out below:

- Step 1: Preparation of a draft policy for that band (60 days);
- Step 2: Consultation on the draft policy (30 days);
- Step 3: Finalisation of the policy (30 days);
- Step 4: Implementation of the policy (7 days); and
- Step 5: Licence award (30 days).

5.3.1 Determination of Spectrum Band Plans

Any draft policy for the spectrum band plan proposed by URCA in fulfilment of Step 1 of the provisioning of Spectrum Bands shall conform to International Telecommunications Union

[10] Utilities Regulation and Competition Authority. (2018). *A Proposal to Open the Standard Spectrum Bands Currently Specified as 'Closed' in the National Spectrum Plan 2014-2017 (ECS 03/ 2014)-ECS 04/2018. Retrieved from http://www.urcabahamas.bs/decisions/statement-results-final-determination-proposal-open-standard-spectrum-bands/*

Radiocommunication Regulation (ITU-RR) and shall be harmonised with appropriate ITU Region 2 band plan, with a view of:

i. Ensuring harmonised spectrum access conditions which enable interoperability and economies of scale for wireless equipment;

ii. Working towards the more efficient use of the radio spectrum; and

iii. Improving the availability of information and communications technologies throughout The Bahamas.

In proposing a policy for any spectrum band plan, URCA shall take into account the costs and implications for spectrum users. In particular, URCA will aim to maximise the implicit and explicit economic benefits that can result by harmonising band plans with significant international markets. 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 the provision for certain parts of the radio spectrum to be specified as Premium Spectrum and requires URCA to include in the NSP those frequencies which are Premium. Any Spectrum Band which has not been classified as Premium Spectrum is referred to by URCA as "Standard Spectrum". The NFAT identifies those bands that are classified as Premium or Standard Spectrum.

5.4.1 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 consider additional characteristics as part of its specification process.

The spectrum bands identified by the ITU as International Mobile Telecommunications-2000 (IMT-2000) and International Mobile Telecommunications-Advanced (IMT-Advanced) spectrum were classified as Premium Spectrum in the National Spectrum Plan of 2014-2017. Electronic communication services utilising those bands continue to drive social and economic growth in The Bahamas. In this NSP, four bands were added to the list of Premium Spectrum Bands. The new Premium Spectrum Bands have been identified by the WRC and CITEL as the bands with the greatest potential for global harmonisation and implementation of emerging cellular mobile and broadband technologies. The list of Premium Spectrum bands, including both new and previous allotments, are shown in Table 6.

Lower Limit		Upper Limit	Band	Availability	Allocation method
470 MHz	**-**	**698MHz**	**Sub-700 MHz band**	**Open**	**Determined by the Minister**
698 MHz	-	806 MHz	700 MHz Band	Open	Determined by the Minister
824 MHz	-	849 MHz	850 MHz Band Uplink	Open	Determined by the Minister
869 MHz	-	894 MHz	850 MHz Band Downlink	Open	Determined by the Minister
1350 MHz	-	1400 MHz	L- Band	Open (new)	Determined by the Minister
1427 MHz	-	1518 MHz	L-Band	Open (new)	Determined by the Minister
1710 MHz	-	1755 MHz	1700 MHz Band	Open	Determined by the Minister
1850 MHz	-	1915 MHz	1900 MHz Band Uplink	Open	Determined by the Minister
1930 MHz	-	1995 MHz	1900 MHz Band Downlink	Open	Determined by the Minister
2110 MHz	-	2155 MHz	2100 MHz Band	Open	Determined by the Minister

2305 MHz	-	2320 MHz	2300 MHz Band Uplink	Open	Determined by the Minister
2345 MHz	-	2360 MHz	2300 MHz Band Downlink	Open	Determined by the Minister
2500 MHz	**-**	**2690 MHz**	**2600 MHz Band**	**Open (new)**	**Determined by the Minister**
3400 MHz	**-**	**4200 MHz**	**C-Band**	**Open (New)**	**Determined by the Minister**

Table 6: List of Premium Spectrum Bands

Consistent with sections 32(2) and 93(1) of the Comms Act 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.

5.4.2 Re-classification of Spectrum Bands

In the event the demand for spectrum in a Standard Spectrum band exceeds supply during the lifecycle of this plan, URCA will give due consideration to such demands and may reclassify existing Standard Spectrum bands as Premium Spectrum. Similarly, where appropriate in relation to the criteria stated in Section 5.4.1 above, URCA (after a consultative process) may declassify Premium Spectrum Bands as Standard Spectrum Bands.

5.5 Technical Standards

Under Section 32 of the Comms Act URCA may rely on voluntary industry standards in lieu of regulations and requires URCA to take enforcement action promptly to ensure adequate protection of licensed standard and premium radio spectrum bands from interference. In

electronic communications networks, harmonisation, interoperability, coordination and economies of scale are achieved by standardisation 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 the current Quality of Service (QoS) standards for the aforementioned generations of technology. URCA will track and adopt standards from relevant telecommunication standardisation 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; Enhanced GPRS	70 kbps - 135 kbps	70 kbps - 135 kbps

	GSM/EVOLVED EDGE	TDMA	Quadruple Edge Throughput Rates; Reduced Latency; Increased Spectral Efficiency	150 kbps - 300 kbps	176 - 350 kbps; 350 - 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	Advance Version of LTE	100 Mbps (Mobile); 1Gbps (Fixed)	60 Mbps

4G	WIMAX 2	OFDMA	Advance Version Of WiMAX	100 Mbps (Mobile); 1 Gbps (Fixed)	60 Mbps
5G	Unified combination of Broadband Technologies, LAN, WAN, WLAN and IP-based Technologies	TBD	Spectral Efficiency Environmental friendly Cost Effective Intelligent	1 Gbps	20-100 Mbps

Figure 6: Global QoS Standards for International Mobile Telecommunications (IMT)

5.6 Additional Technical Standards

Television Broadcasting Standards

Note that although the NFAT shows an allocation for broadcasting in the range 698 – 806 MHz, URCA previously allocated spectrum in the range 698 – 806 MHz to cellular mobile, fixed broadband, and public safety. As such, URCA will not make assignments in that range for broadcasting.

Television broadcasting services shall broadcast in digital format and shall broadcast using the Advanced Television Systems Committee (ATSC) broadcasting standard. For other fixed and mobile services operating in those bands, any technology or standard approved by URCA in accordance with industry best practise is permissible

5.7 Refarming of Spectrum

As evolving electronic communications services result in increasing demand for spectrum, manufacturers worldwide are working collaboratively 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 the 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 have contributed to 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 while taking into account:

- The national interest;
- The stakeholders' viewpoints;
- The level of private sector investment in existing wireless and mobile electronic communications networks;
- The costs and challenges associated with an equipment configuration for a specific radio spectrum;
- The costs 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 market structure, financial, socioeconomic, and technical efficiency criteria. The analysis will include, inter alia, factors such as prices, costs, license conditions, withdrawal, and compensation.

6. Spectrum Pricing

6.1 Introduction to Spectrum Pricing

The objectives of the Electronic Communications Sector Policy (section 4 of the Comms Act) and various provisions set out in the Act makes reference to spectrum pricing. An overarching objective of spectrum pricing as set out in section 32(1) of the Comms Act, is that in performing its functions and duties and in exercising powers under Part V of the Act, URCA must ensure that radio spectrum is managed and used in a manner that:

- Is open, objective, transparent and non-discriminatory;
- Is economically efficient and facilitates the evolution of new technologies and electronic communications services while taking into account in particular investment in existing equipment configured for specific radio spectrum and the cost of migration to another band; and
- Meets the needs of Government departments and agencies referred to in section 34 (1) of the Comms Act.

In pursuit of those objectives, spectrum prices should be set a level such that the revenue from spectrum:

- Covers the costs of spectrum management activity borne by URCA;
- Promotes the efficient use of spectrum resources;
- Maximises the economic benefits to the country from the use of the spectrum resource;

- Ensures Licensees benefitting from the use of the spectrum resource pay for the cost of using spectrum; and
- Provides revenue to the Government, and by extension the Bahamian people, in return for the use of this state asset.

6.2 Pricing for Premium Spectrum

The role of the Minister in relation to the pricing of the spectrum is set out in section 30 of the Comms Act and is specifically related to the bands designated as Premium Spectrum Bands in this NSP. The Minister's responsibility under section 30 of the Comms Act is to decide the method of allocating frequencies and either setting spectrum fees or prescribing the method of setting fees in the Premium Spectrum Bands. As it relates to the setting of fees, the Minister must do so in accordance with the requirements set out in section 93(1) of the Comms Act, which specifies that fees must reflect the need to ensure the optimal use of Premium Spectrum.

6.3 Pricing for Standard Spectrum

The spectrum bands that have not been designated as Premium Spectrum Band are, by default, Standard Spectrum Bands. Section 93 of the Comms Act authorises URCA to impose charges for the assignment or use of the Standard Spectrum Bands. As it relates to the setting of fees, URCA must also set fees with the objective of ensuring the optimal use of spectrum. Since the entire amount collected by URCA is paid to the Government, spectrum fees do not contribute to URCA's costs for spectrum management. Therefore, section 92(1)(d) of the Comms Act allows URCA to "… determine [i.e., in accordance with the procedures specified in sections 99 and 100 of the Communications Act] … fees and charges for the administration and allocation of state assets".

6.4 Principles of Spectrum Pricing

As demand for radio spectrum grows, it is vital that URCA ensures that the entire available spectrum is used in the most efficient and effective manner as mandated in section 32(1) of the Comms Act. Both Premium and Standard Spectrum Fees are to be set to ensure the optimal use

of spectrum[11]. In determining the mechanism for setting spectrum fees, URCA will follow the principles below.

6.4.1 Guiding Principles

The best practice regulation requires that spectrum fees be set in a fair, objective and transparent manner without incurring undue administrative costs while promoting efficient spectrum use. Those principles are echoed throughout the Comms Act. Further, as it relates to spectrum pricing those guiding principles may be interpreted as follows:

- Fairness and objectivity mean that fees should be based on objective factors and all licence holders in a given frequency band should be treated on an equitable basis. This would preclude, for example, preferential treatment to different users in a given frequency band.

- Transparency requires that the basis on which fees are calculated should be made clear in a published document. All fees should be set based on a published schedule.

These principles are reflected in the ITU Handbook on National Spectrum Management Edition of 2015[12] and European Union Authorisation Directive[13] which requires that administrative charges levied on spectrum licensees should recover spectrum management costs (Article 12), and that fees to ensure optimal use of spectrum should be objectively justified, transparent, non-discriminatory and proportionate (Article 13).

[11] The Utilities Regulation and Competition Authority (2018). Communications Act, 2009: Section 93 (1). Retrieved from http://www.urcabahamas.bs/wp-content/uploads/2016/08/Communications-Act-2009.pdf.
[12] International Telecommunication Union Handbook on National Spectrum Management. Edition of 2015 ITU-R
[13] Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services.
http://europa.eu/legislation_summaries/information_society/legislative_framework/l24164_en.htm

6.4.2 Incentive spectrum fees

URCA will use incentive fee pricing to achieve spectrum management objectives and encourage efficient spectrum use. Incentive fee formulas have the advantage of representing to some extent the scarcity and economic value of spectrum. Hence, in this approach, assignment fee levels are not dependent on cost-based limitations, and a fee structure is developed that approximates the market value of the spectrum. The overall aim of incentive fees is to encourage more efficient spectrum use, with the intention of bringing the demand for spectrum into equilibrium with its supply by:

- Encouraging users to use spectrally efficient technologies; and
- Relinquishing spectrum that they do use or cannot use efficiently.

URCA will determine the incentive fees using a formula which takes into account the critical factors of spectrum usage for different frequency bands and services in order to develop a flexible incentive fee structure.

6.5 Fees Structure for Standard Spectrum

In its approach to setting incentive fees, URCA will use the costs of spectrum management to set a floor fee level. Hence, for bands that are not congested, fees should broadly recover the costs of spectrum management. The reason for using the costs of spectrum management to set a floor fee level is that this ensures the benefits from spectrum use exceed the costs of making the spectrum available. For the purposes of setting fees, spectrum assignments can be characterised by three dimensions – bandwidth, geographic area, and time. When referring to the amount of spectrum assigned, the following measures are typically used:

- Bandwidth refers to the amount of spectrum assigned which is measured in units of kHz or MHz assigned;
- Geographic area means the island on which the assignment applies; and
- Time refers to the duration of use.

Those principles are currently replicated in URCA's fee structure for frequency-related assignments in Standard Spectrum Bands, which is set out below:

$Fee=C*BW*TF*CF*FBF$, where:

- ***C*** **= Constant value/MHz** that may (or may not) vary by frequency band or service to reflect a mix of commercial and social factors that depend on the services that may use the band
- ***BW*** **= Bandwidth** assigned in MHz
- ***TF*** **= Time factor** which is set to a fraction of a day, week or year that the frequencies are assigned
- ***FBF*** **= Frequency Band Factor,** which reflects the increased utility and more limited availability of spectrum in lower frequency bands and in some cases the higher spectrum management costs associated with those bands (due to an increased probability of interference)
- ***CF*** **= Coverage (Island) Factor**, which reflects the area in which the Licensee is authorised to operate. URCA has set this factor to vary by the size of the population served in the coverage area[14].

This general formula-based approach to setting fees assumes the use of a frequency is exclusive to the Licensee in a given location (i.e., access to the spectrum specified in the licensing is denied to others).

This formulaic approach is not applicable to radiocommunication systems that URCA has classified as stations to assess applicable fees. In the case of radiocommunication stations that use shared spectrum, such as radio communications systems that utilise technologies that do not

[14] The Utilities Regulation and Competition Authority. (2018). Statement of Results and final Decision: Review of Radio Frequency Spectrum Pricing (ECS 01/2016). Issue 28 January 2016. Retrieved from http://www.urcabahamas.bs/wp-content/uploads/2017/02/ECS-01-2016-REVIEW-OF-RADIO-FREQUENCY-SPECTRUM-PRICING.pdf

require exclusive access to spectrum and public service broadcasting television stations, a flat rate fee per station will be assigned, but rates will be subject to price reviews.

6.6 Market-Based Pricing

In case of Premium Spectrum or Standard Spectrum where the spectrum in question is scarce, there is significant competition between several firms for the spectrum or the monetary value of the spectrum is likely to be high, URCA may recommend or adopt a market-based approach to pricing the spectrum.

Market-based pricing involves setting prices through a market transaction, such as an auction. The principle behind spectrum auctions is that the firms place the highest values on the spectrum would be most incentivised to use the spectrum in a manner economically efficient and facilitates the evolution of new technologies and electronic communications services.

6.7 Recovery of Spectrum Management Cost

Currently, the costs for the administration and allocation of radio spectrum have previously been accounted for under the URCA Fee charged to holders of Individual Operating Licence and Class Operating Licences requiring registration. Best practice suggests that the costs of spectrum management activities by a regulator should be recovered directly from the spectrum users it licenses. These costs relate to the day to day administration of radio spectrum including URCA's monitoring of the use of spectrum, investigation of complaints of interference, and conduct of spectrum planning activities.

In keeping with Section 92(1)(d) of the Comms Act, URCA may determine fees and charges for the administration and allocation of state assets. URCA considers that it would be more consistent with the provisions of section 92(2) for those costs to be recovered from persons holding spectrum licences, as the costs directly pertain to those licensees. URCA addressed the issue of recovery of management costs as an administrative fee in its public consultation and

Final Decision on the Review of Spectrum Pricing, and URCA intends to address this issue in a determination process to be conducted in 2019.

7. Spectrum Authorization

The Comms Act stipulates that any person that provides an electronic communications service or establishes, maintains or operates an electronic communications network (including any such network that requires spectrum, such as a radio station) requires a Licence for URCA.

Spectrum authorisation or assignment is an authorisation given to 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.

7.1 Guideline of Spectrum Authorization

The guidelines for spectrum authorisation are set out in *Guidance On The Licensing Regime Under The Communications Act, 2009 - 2017 Revision (ECS 19/2017)*[15]. Section 1.4 of those guidelines inform interested persons about the licensing regime under the Comms Act, the different types of licenses, how to apply for a license, the payment of fees and how licenses may be amended or revoked. These guidelines demonstrate URCA's general thinking regarding the licensing regime established and implemented by URCA under the Comms Act.

8. Monitoring and Compliance

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 coexistence of multiple electronic

[15] [INSERT Link to document on Website]

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 degrades 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 draft 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 aims to promote the creation of favourable 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 software application.

The NSMS is controlled by a flexible software framework which includes 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 URCA to identify and perform compliance analysis on radio signals. The system allows URCA to update its databases of unlicensed and licensed radio frequency emissions and log channel usage information. Additionally, it is possible to identify communication 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 in order to obtain information about the technical and/or operational characteristics of radio systems and to bring non-compliant system operations in conformity with applicable standards when needed.

The monitoring, measuring and spectrum engineering processes are critical components of the strategy outlined in this NSP. These 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 the 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 adequate regulations and enforcement procedures, the integrity of the spectrum management process may be compromised. The regulatory enforcement framework includes both ex-ante and ex-post regulatory measures. The measures that allow URCA to 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 tool that helps 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 must seek to ensure that investigations are carried out competently and impartially, and ensure that 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 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 the user risks having the equipment seized by URCA.

Appendix A: National Frequency Allocation Table

The National Frequency Allocation Table (NFAT) has been revised in accordance with the 2016 edition Radio Regulations as revised, approved and adopted by the World Radiocommunication Conference (Geneva, 2015). This NFAT is consistent with the international table of frequency allocations set out in the ITU Radio Regulations. It covers a range of frequencies from 0 kHz to 1,000 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 another secondary service to which frequencies may be assigned at a later date.

NATIONAL FREQUENCY ALLOCATION TABLE

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
Below 8.3	**kHz**	(Not allocated) 5.53 5.54	STANDARD SPECTRUM
8.3-9	**kHz**	METEOROLOGICAL AIDS 5.54A 5.54B 5.54C	STANDARD SPECTRUM
9-11.3	**kHz**	METEOROLOGICAL AIDS 5.54A RADIONAVIGATION	STANDARD SPECTRUM
11.3-14		RADIONAVIGATION	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
14-19.95	**kHz**	FIXED MARITIME MOBILE 5.57 5.55 5.56	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
70-90	**kHz**	FIXED MARITIME MOBILE 5.57 MARITIME RADIONAVIGATION 5.60 Radiolocation 5.61	STANDARD SPECTRUM
90-110	**kHz**	RADIONAVIGATION 5.62 Fixed 5.64	STANDARD SPECTRUM
110-130	**kHz**	FIXED MARITIME MOBILE MARITIME RADIONAVIGATION 5.60 Radiolocation 5.61 5.64	STANDARD SPECTRUM
130-135.7	**kHz**	FIXED MARITIME MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		5.64	
135.7-137.8	**kHz**	FIXED MARITIME MOBILE Amateur 5.67A 5.64	STANDARD SPECTRUM
137.8-160	**kHz**	FIXED MARITIME MOBILE 5.64	STANDARD SPECTRUM
160-190	**kHz**	FIXED	STANDARD SPECTRUM
190-200	**kHz**	AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
200-275	**kHz**	AERONAUTICAL RADIONAVIGATION Aeronautical mobile	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
275-285	**kHz**	AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radio navigation (radio beacons)	STANDARD SPECTRUM
285-315	**kHz**	AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radio beacons) 5.73	STANDARD SPECTRUM
315-325	**kHz**	MARITIME RADIONAVIGATION (radio beacons) 5.73 Aeronautical radionavigation	STANDARD SPECTRUM
325-335	**kHz**	AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radionavigation (radio beacons)	STANDARD SPECTRUM
335-405	**kHz**	AERONAUTICAL RADIONAVIGATION Aeronautical mobile	STANDARD SPECTRUM
405-415	**kHz**	RADIONAVIGATION 5.76 Aeronautical mobile	STANDARD SPECTRUM
415-472	**kHz**	MARITIME MOBILE 5.79 Aeronautical radionavigation 5.77 5.80 5.78 5.82	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
472-479	**kHz**	MARITIME MOBILE 5.79 Amateur 5.80A Aeronautical radionavigation 5.77 5.80 5.80B 5.82	STANDARD SPECTRUM
479-495	kHz	MARITIME MOBILE 5.79 5.79A Aeronautical radionavigation 5.77 5.80 5.82	STANDARD SPECTRUM
495-505	**kHz**	MARITIME MOBILE	STANDARD SPECTRUM
505-510	**kHz**	MARITIME MOBILE 5.79	STANDARD SPECTRUM
510-525	**kHz**	MOBILE 5.79A 5.84 AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
525-535	**kHz**	BROADCASTING 5.86 AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
535-1 605	**kHz**	BROADCASTING	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
1 605-1 625	**kHz**	BROADCASTING 5.89 5.90	STANDARD SPECTRUM
1 625-1 705	**kHz**	FIXED MOBILE BROADCASTING 5.89 Radiolocation 5.90	STANDARD SPECTRUM
1 705-1 800	**kHz**	FIXED MOBILE RADIOLOCATION AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
1 800-1 850	**kHz**	AMATEUR	STANDARD SPECTRUM
1 850-2 000	**kHz**	AMATEUR FIXED MOBILE except aeronautical mobile RADIOLOCATION RADIONAVIGATION 5.102	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
2 000-2 065	**kHz**	FIXED MOBILE	STANDARD SPECTRUM
2 065-2 107	**kHz**	MARITIME MOBILE 5.105 5.106	STANDARD SPECTRUM
2 107-2 170	**kHz**	FIXED MOBILE	STANDARD SPECTRUM
2 170-2 173.5	**kHz**	MARITIME MOBILE	STANDARD SPECTRUM
2 173.5-2 190.5	**kHz**	MOBILE (distress and calling) 5.108 5.109 5.110 5.111	STANDARD SPECTRUM
2 190.5-2 194	**kHz**	MARITIME MOBILE	STANDARD SPECTRUM
2 194-2 300	**kHz**	FIXED MOBILE 5.112	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
2 300-2 495	**kHz**	FIXED MOBILE BROADCASTING 5.113	STANDARD SPECTRUM
2 495-2 501	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL (2 500 kHz)	STANDARD SPECTRUM
2 501-2 502	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL Space Research	STANDARD SPECTRUM
2 502-2 505	kHz	STANDARD FREQUENCY AND TIME SIGNAL	STANDARD SPECTRUM
2 505-2 850	**kHz**	FIXED MOBILE	STANDARD SPECTRUM
2 850-3 025	**kHz**	AERONAUTICAL MOBILE (R) 5.111 5.115	STANDARD SPECTRUM
3 025-3 155	**kHz**	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
3 155-3 200	**kHz**	FIXED MOBILE except aeronautical mobile (R) 5.116 5.117	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
3 200-3 230	**kHz**	FIXED MOBILE except aeronautical mobile (R) BROADCASTING 5.113 5.116	STANDARD SPECTRUM
3 230-3 400	**kHz**	FIXED MOBILE except aeronautical mobile BROADCASTING 5.113 5.116 5.118	STANDARD SPECTRUM
3 400-3 500	**kHz**	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
3 500-3 750	**kHz**	AMATEUR 5.119	STANDARD SPECTRUM
3 750-4 000	**kHz**	AMATEUR FIXED MOBILE except aeronautical mobile (R) 5.122 5.125	STANDARD SPECTRUM
4 000-4 063	**kHz**	FIXED MARITIME MOBILE 5.127 5.126	STANDARD SPECTRUM
4 063-4 438	**kHz**	MARITIME MOBILE 5.79A 5.109 5.110 5.130 5.131 5.132 5.128	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
4 438-4 488	**kHz**	FIXED MOBILE except aeronautical mobile (R) RADIOLOCATION 5.132A	STANDARD SPECTRUM
4 488-4 650	**KHz**	FIXED MOBILE except aeronautical mobile (R)	STANDARD SPECTRUM
4 650-4 700	**kHz**	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
4 700-4 750	**kHz**	AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
4 750-4 850	**kHz**	FIXED MOBILE except aeronautical mobile (R) BROADCASTING 5.113	STANDARD SPECTRUM
4 850-4 995	**kHz**	FIXED LAND MOBILE BROADCASTING 5.113	STANDARD SPECTRUM
4 995-5 003	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL (5 000 kHz)	STANDARD SPECTRUM
5 003-5 005	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL Space research	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
5 005-5 060	**kHz**	FIXED BROADCASTING 5.113	STANDARD SPECTRUM
5 060-5 250	**kHz**	FIXED Mobile except aeronautical mobile 5.133	STANDARD SPECTRUM
5 250-5 275	**kHz**	FIXED MOBILE except aeronautical mobile RADIOLOCATION 5.132A	STANDARD SPECTRUM
5 275-5 351.5	**kHz**	FIXED MOBILE except aeronautical mobile	STANDARD SPECTRUM
5 351.5-5 366.5	**kHz**	FIXED MOBILE except aeronautical mobile Amateur 5.133B	STANDARD SPECTRUM
5 366.5-5 450	**kHz**	FIXED MOBILE except aeronautical mobile	STANDARD SPECTRUM
5 450-5 480	**kHz**	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM
5 480-5 680	**kHz**	AERONAUTICAL MOBILE (R) 5.111 5.115	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
5 680-5 730	**kHz**	AERONAUTICAL MOBILE (OR) 5.111 5.115	STANDARD SPECTRUM
5 730-5 900	**kHz**	FIXED MOBILE except aeronautical mobile (R)	STANDARD SPECTRUM
5 900-5 950	**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 5.137	STANDARD SPECTRUM
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	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
7 000-7 100	**kHz**	AMATEUR AMATEUR-SATELLITE 5.140 5.141 5.141A	STANDARD SPECTRUM
7 100-7 200	**kHz**	AMATEUR 5.141A 5.141B	STANDARD SPECTRUM
7 200-7 300	**kHz**	AMATEUR 5.142	STANDARD SPECTRUM
7 300-7 400	**kHz**	BROADCASTING 5.134 5.143 5.143A 5.143B 5.143C 5.143D	STANDARD SPECTRUM
7 400-7 450	**kHz**	FIXED MOBILE except aeronautical mobile (R)	STANDARD SPECTRUM
7 450-8 100	**kHz**	FIXED MOBILE except aeronautical mobile (R) 5.144	STANDARD SPECTRUM
8 100-8 195	**kHz**	FIXED MARITIME MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
8 195-8 815	**kHz**	MARITIME MOBILE 5.109 5.110 5.132 5.145 5.111	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 5.146	STANDARD SPECTRUM
9 500-9 900	**kHz**	BROADCASTING 5.147	STANDARD SPECTRUM
9 900-9 995	**kHz**	FIXED	STANDARD SPECTRUM
9 995-10 003	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL (10 000 kHz) 5.111	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
10 003-10 005	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL Space research 5.111	STANDARD SPECTRUM
10 005-10 100	**kHz**	AERONAUTICAL MOBILE (R) 5.111	STANDARD SPECTRUM
10 100-10 150	**kHz**	FIXED Amateur	STANDARD SPECTRUM
10 150-11 175	**kHz**	FIXED Mobile except aeronautical mobile (R)	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 5.146	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
11 650-12 050	**kHz**	BROADCASTING 5.147	STANDARD SPECTRUM
12 050-12 100	**kHz**	BROADCASTING 5.134 5.146	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 ASTRONOMY 5.149	STANDARD SPECTRUM
13 410-13 450	**kHz**	FIXED Mobile except aeronautical mobile (R)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
13 450-13 550	**kHz**	FIXED Mobile except aeronautical mobile (R) Radiolocation 5.132A	STANDARD SPECTRUM
13 550-13 570	**kHz**	FIXED Mobile except aeronautical mobile (R) 5.150	STANDARD SPECTRUM
13 570-13 600	**kHz**	BROADCASTING 5.134 5.151	STANDARD SPECTRUM
13 600-13 800	**kHz**	BROADCASTING	STANDARD SPECTRUM
13 800-13 870	**kHz**	BROADCASTING 5.134 5.151	STANDARD SPECTRUM
13 870-14 000	**kHz**	FIXED Mobile except aeronautical mobile (R)	STANDARD SPECTRUM
14 000-14 250	**kHz**	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
14 250-14 350	**kHz**	AMATEUR 5.152	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
14 350-14 990	**kHz**	FIXED Mobile except aeronautical mobile (R)	STANDARD SPECTRUM
14 990-15 005	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL (15 000 kHz) 5.111	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
15 600-15 800	**kHz**	BROADCASTING 5.134 5.146	STANDARD SPECTRUM
15 800-16 100	**kHz**	FIXED 5.153	STANDARD SPECTRUM
16 100-16 200	**kHz**	FIXED RADIOLOCATION 5.145A	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
16 200-16 360	**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 5.146	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 5.146	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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
19 990-19 995	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL Space research 5.111	STANDARD SPECTRUM
19 995-20 010	**kHz**	STANDARD FREQUENCY AND TIME SIGNAL (20 000 kHz) 5.111	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 5.155	STANDARD SPECTRUM
21 870-21 924	**kHz**	FIXED 5.155B	STANDARD SPECTRUM
21 924-22 000	**kHz**	AERONAUTICAL MOBILE (R)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
22 000-22 855	**kHz**	MARITIME MOBILE 5.132 5.156	STANDARD SPECTRUM
22 855-23 000	**kHz**	FIXED 5.156	STANDARD SPECTRUM
23 000-23 200	**kHz**	FIXED Mobile except aeronautical mobile (R) 5.156	STANDARD SPECTRUM
23 200-23 350	**kHz**	FIXED 5.156A AERONAUTICAL MOBILE (OR)	STANDARD SPECTRUM
23 350-24 000	**kHz**	FIXED Mobile except aeronautical mobile 5.157	STANDARD SPECTRUM
24 000-24 450	**kHz**	FIXED LAND MOBILE	STANDARD SPECTRUM
24 450-24 650	**kHz**	FIXED LAND MOBILE RADIOLOCATION 5.132A	STANDARD SPECTRUM
24 650-24 890	**kHz**	FIXED LAND MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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
25 210-25 550	**kHz**	FIXED MOBILE except aeronautical mobile	STANDARD SPECTRUM
25 550-25 670	**kHz**	RADIO ASTRONOMY 5.149	STANDARD SPECTRUM
25 670-26 100	**kHz**	BROADCASTING	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
26 100-26 175	**kHz**	MARITIME MOBILE 5.132	STANDARD SPECTRUM
26 175-26 200	**kHz**	FIXED MOBILE except for aeronautical mobile	STANDARD SPECTRUM
26 200-26 420	**kHz**	FIXED MOBILE except aeronautical mobile RADIOLOCATION 5.132A	STANDARD SPECTRUM
26 420-27 500	**kHz**	FIXED MOBILE except aeronautical mobile 5.150	STANDARD SPECTRUM
27.5-28	**MHz**	METEOROLOGICAL AIDS FIXED MOBILE	STANDARD SPECTRUM
28-29.7	**MHz**	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
29.7-30.005	**MHz**	FIXED MOBILE	STANDARD SPECTRUM
30.005-30.01	**MHz**	SPACE OPERATION (satellite identification) FIXED MOBILE SPACE RESEARCH	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
30.01-37.5	**MHz**	FIXED MOBILE	STANDARD SPECTRUM
37.5-38.25	**MHz**	FIXED MOBILE Radio astronomy 5.149	STANDARD SPECTRUM
38.25-39.986	**MHz**	FIXED MOBILE	STANDARD SPECTRUM
39.986-40.02	**MHz**	FIXED MOBILE Space research	STANDARD SPECTRUM
40.02-40.98	**MHz**	FIXED MOBILE 5.150	STANDARD SPECTRUM
40.98-41.015	**MHz**	FIXED MOBILE Space research 5.160 5.161	STANDARD SPECTRUM
41.015-42	**MHz**	FIXED MOBILE 5.160 5.161 5.161A	STANDARD SPECTRUM
42-42.5	**MHz**	FIXED MOBILE 5.161	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
42.5-44	**MHz**	FIXED MOBILE 5.160 5.161 5.161A	STANDARD SPECTRUM
44-47	**MHz**	FIXED MOBILE 5.162 5.162A	STANDARD SPECTRUM
47-50	**MHz**	FIXED MOBILE	STANDARD SPECTRUM
50-54	**MHz**	AMATEUR 5.162A 5.167 5.167A 5.168 5.170	STANDARD SPECTRUM
54-68	**MHz**	BROADCASTING Fixed Mobile 5.172	STANDARD SPECTRUM
68-72	**MHz**	BROADCASTING Fixed Mobile 5.173	STANDARD SPECTRUM
72-73	**MHz**	FIXED MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
73-74.6	**MHz**	RADIO ASTRONOMY 5.178	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 5.179	STANDARD SPECTRUM
75.4-76	**MHz**	FIXED MOBILE	STANDARD SPECTRUM
76-88	**MHz**	BROADCASTING Fixed Mobile 5.185	STANDARD SPECTRUM
88-100	**MHz**	BROADCASTING	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
100-108	**MHz**	BROADCASTING 5.192 5.194	STANDARD SPECTRUM
108-117.975	**MHz**	AERONAUTICAL RADIONAVIGATION 5.197 5.197A	STANDARD SPECTRUM
117.975-137	**MHz**	AERONAUTICAL MOBILE (R) 5.111 5.200 5.201 5.202	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 for 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 for 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 for 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 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 for aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208	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 RESEARCH (space-to-Earth	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 5.217	STANDARD SPECTRUM
148-149.9	**MHz**	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.209 5.218 5.219 5.221	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
149.9-150.05	**MHz**	MOBILE-SATELLITE (Earth-to-space) 5.209 5.220	STANDARD SPECTRUM
150.05-154	**MHz**	FIXED MOBILE 5.225	STANDARD SPECTRUM
154-156.4875	**MHz**	FIXED MOBILE 5.226	STANDARD SPECTRUM
156.4875-156.5625	**MHz**	MARITIME MOBILE (distress and calling via DSC) 5.111 5.226 5.227	STANDARD SPECTRUM
156.5625-156.7625	**MHz**	FIXED MOBILE 5.226	STANDARD SPECTRUM
156.7625-156.7875	**MHz**	MARITIME MOBILE MOBILE-SATELLITE (Earth-to-space) 5.111 5.226 5.228	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
156.7875-156.8125	**MHz**	MARITIME MOBILE (distress and calling) 5.111 5.226	STANDARD SPECTRUM
156.8125-156.8375	**MHz**	MARITIME MOBILE MOBILE-SATELLITE (Earth-to-space) 5.111 5.226 5.228	STANDARD SPECTRUM
156.8375-161.9375	**MHz**	FIXED MOBILE 5.226	STANDARD SPECTRUM
161.9375-161.9625	**MHz**	FIXED MOBILE Maritime mobile-satellite (Earth-to-space) 5.228AA 5.226	STANDARD SPECTRUM
161.9625-161.9875	**MHz**	AERONAUTICAL MOBILE (OR) MARITIME MOBILE MOBILE-SATELLITE (Earth-to-space) 5.228C 5.228D	STANDARD SPECTRUM
161.9875-162.0125	**MHz**	FIXED MOBILE Maritime mobile-satellite (Earth-to-space) 5.228AA	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		5.226	
162.0125-162.0375	**MHz**	AERONAUTICAL MOBILE (OR) MARITIME MOBILE MOBILE-SATELLITE (Earth-to-space) 5.228C 5.228D	STANDARD SPECTRUM
162.0375-174	**MHz**	FIXED MOBILE 5.226 5.230 5.231	STANDARD SPECTRUM
174-216	**MHz**	BROADCASTING Fixed Mobile	STANDARD SPECTRUM
216-220	**MHz**	FIXED MARITIME MOBILE Radiolocation 5.241 5.242	STANDARD SPECTRUM
220-225	**MHz**	AMATEUR FIXED MOBILE Radiolocation 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 5.252 5.254 5.256 5.256A	STANDARD SPECTRUM
267-272	**MHz**	FIXED MOBILE Space operation (space-to-Earth) 5.254 5.257	STANDARD SPECTRUM
272-273	**MHz**	SPACE OPERATION (space-to-Earth) FIXED MOBILE 5.254	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 ASTRONOMY 5.149	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
328.6-335.4	**MHz**	AERONAUTICAL RADIONAVIGATION 5.258 5.259	STANDARD SPECTRUM
335.4-387	**MHz**	FIXED MOBILE 5.254	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 5.220	STANDARD SPECTRUM
400.05-400.15	**MHz**	STANDARD FREQUENCY AND TIME SIGNAL SATELLITE (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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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
403-406	**MHz**	METEOROLOGICAL AIDS Fixed Mobile except aeronautical mobile 5.265	STANDARD SPECTRUM
406-406.1	**MHz**	MOBILE-SATELLITE (Earth-to-space) 5.265 5.266 5.267	STANDARD SPECTRUM
406.1-410	**MHz**	FIXED MOBILE except for aeronautical mobile RADIO ASTRONOMY 5.149 5.265	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 Radiolocation 5.269 5.270 5.271	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
430-432	**MHz**	RADIOLOCATION Amateur 5.271 5.276 5.278 5.279	STANDARD SPECTRUM
432-438	**MHz**	RADIOLOCATION Amateur Earth exploration-satellite (active) 5.279A 5.271 5.276 5.278 5.279 5.281 5.282	STANDARD SPECTRUM
438-440	**MHz**	RADIOLOCATION Amateur 5.271 5.276 5.278 5.279	STANDARD SPECTRUM
440-450	**MHz**	FIXED MOBILE except for aeronautical mobile Radiolocation 5.269 5.270 5.271 5.284 5.285 5.286	STANDARD SPECTRUM
450-455	**MHz**	FIXED MOBILE 5.286AA 5.209 5.271 5.286 5.286A 5.286B 5.286C 5.286D 5.286E	STANDARD SPECTRUM
455-456	**MHz**	FIXED MOBILE 5.286AA MOBILE-SATELLITE (Earth-to-space) 5.209 5.286A 5.286B 5.286C	STANDARD SPECTRUM
456-459	**MHz**	FIXED MOBILE 5.286AA 5.271 5.287 5.288	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
459-460	**MHz**	FIXED MOBILE 5.286AA MOBILE-SATELLITE(Earth-to-space) 5.209 5.286A 5.286B 5.286C	STANDARD SPECTRUM
460-470	**MHz**	FIXED MOBILE 5.286AA Meteorological-satellite (space-to-Earth) 5.287 5.288 5.289 5.290	STANDARD SPECTRUM
470-512	**MHz**	BROADCASTING Fixed Mobile 5.292 5.293 5.295	PREMIUM SPECTRUM
512-608	**MHz**	BROADCASTING 5.295 5.297	PREMIUM SPECTRUM
608-614	**MHz**	RADIO ASTRONOMY Mobile-satellite except aeronautical mobile-satellite (Earth-to-space)	PREMIUM SPECTRUM
614-698	**MHz**	BROADCASTING Fixed Mobile 5.293 5.308 5.308A 5.309 5.311A	PREMIUM SPECTRUM
698-806	**MHz**	MOBILE 5.317A BROADCASTING Fixed 5.293 5.309 5.311A	PREMIUM SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
806-890	**MHz**	FIXED MOBILE 5.317A BROADCASTING 5.317 5.318	PREMIUM SPECTRUM
890-902	**MHz**	FIXED MOBILE except aeronautical mobile 5.317A Radiolocation 5.318 5.325	PREMIUM AND STANDARD SPECTRUM
902-928	**MHz**	FIXED Amateur Mobile except for aeronautical mobile 5.325A Radiolocation 5.150 5.325 5.326	PREMIUM AND STANDARD SPECTRUM
928-942	**MHz**	FIXED MOBILE except for aeronautical mobile 5.317A Radiolocation 5.325	STANDARD SPECTRUM
942-960	**MHz**	FIXED MOBILE 5.317A	STANDARD SPECTRUM
960-1 164	**MHz**	AERONAUTICAL MOBILE (R) 5.327A AERONAUTICAL RADIONAVIGATION 5.328 5.328AA	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
1 164-1 215	**MHz**	AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.328A	STANDARD SPECTRUM
1 215-1 240	**MHz**	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) 5.330 5.331 5.332	STANDARD SPECTRUM
1 240-1 300	**MHz**	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) Amateur 5.282 5.330 5.331 5.332 5.335 5.335A	STANDARD SPECTRUM
1 300-1 350	**MHz**	AERONAUTICAL RADIONAVIGATION 5.337 RADIOLOCATION RADIONAVIGATION-SATELLITE (Earth-to-space) 5.149 5.337A	STANDARD SPECTRUM
1 350-1 400	**MHz**	RADIOLOCATION 5.338A 5.149 5.334 5.339	STANDARD SPECTRUM
1 400-1 427	**MHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
1 427-1 429	**MHz**	SPACE OPERATION (Earth-to-space) FIXED MOBILE except for aeronautical mobile 5.341A 5.341B 5.341C 5.338A 5.341	PREMIUM/ STANDARD SPECTRUM
1 429-1 452	**MHz**	FIXED MOBILE 5.341B 5.341C 5.343 5.338A 5.341	PREMIUM/ STANDARD SPECTRUM
1 452-1 492	**MHz**	FIXED MOBILE 5.341B 5.343 5.346A BROADCASTING BROADCASTING-SATELLITE 5.208B 5.341 5344 5345	PREMIUM/ STANDARD SPECTRUM
1 492-1 518	**MHz**	FIXED MOBILE 5.341B 5.343 5.341 5.344	PREMIUM/ STANDARD SPECTRUM
1 518-1 525	**MHz**	FIXED MOBILE 5.343 MOBILE-SATELLITE (space-to-Earth) 5.348 5.348A 5.348B 5.351A 5.341 5.344	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
1 525-1 530	**MHz**	SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208B 5.351A Earth exploration-satellite Fixed Mobile 5.343 5.341 5.351 5.354	STANDARD SPECTRUM
1 530-1 535	**MHz**	SPACE OPERATION (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208B 5.351A 5.353A Earth exploration-satellite Fixed Mobile 5.343 5.341 5.351 5.354	STANDARD SPECTRUM
1 535-1 559	**MHz**	MOBILE-SATELLITE (space-to-Earth) 5.208B 5.351A 5.341 5.351 5.353A 5.354 5.355 5.356 5.357 5.357A 5.359 5.362A	STANDARD SPECTRUM
1 559-1 610	**MHz**	AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.208B 5.328B 5.329A 5.341	STANDARD SPECTRUM
1 610-1 610.6	**MHz**	MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION-SATELLITE (Earth-to-space) 5.341 5.364 5.366 5.367 5.368 5.370 5.372	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
1 610.6-1 613.8	**MHz**	MOBILE-SATELLITE (Earth-to-space) 5.351A RADIO ASTRONOMY AERONAUTICAL RADIONAVIGATION RADIODETERMINATION SATELLITE(Earth-to-space) 5.149 5.341 5.364 5.366 5.367 5.368 5.370 5.372	STANDARD SPECTRUM
1 613.8-1 626.5	**MHz**	MOBILE-SATELLITE (Earth-to-space) 5.351A AERONAUTICAL RADIONAVIGATION RADIODETERMINATION SATELLITE (Earth-to-space) Mobile-satellite (space-to-Earth) 5.208B 5.341 5.364 5.365 5.366 5.367 5.368 5.370 5.372	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 ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except for 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	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		Mobile except for aeronautical mobile 5.149 5.341 5.379 5.379A	
1 668.4-1 670	**MHz**	METEOROLOGICAL AIDS FIXED MOBILE except for aeronautical mobile MOBILE-SATELLITE (Earth-to-space) 5.351A 5.379B 5.379C RADIO ASTRONOMY 5.149 5.341 5.379D 5.379E	STANDARD SPECTRUM
1 670-1 675	**MHz**	METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.379B 5.341 5.379D 5.379E 5.380A	STANDARD SPECTRUM
1 675-1 690	**MHz**	METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except for aeronautical mobile 5.341	STANDARD SPECTRUM
1 690-1 700	**MHz**	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (space-to-Earth) 5.289 5.341 5.381	STANDARD SPECTRUM
1 700-1 710	**MHz**	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except for aeronautical mobile 5.289 5.341	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
1 710-1 930	**MHz**	FIXED MOBILE 5.384A 5.388A 5.388B 5.149 5.341 5.385 5.386 5.387 5.388	PREMIUM SPECTRUM
1 930-1 970	**MHz**	FIXED MOBILE 5.388A 5.388B Mobile-satellite (Earth-to-space) 5.388	PREMIUM SPECTRUM
1 970-1 980	**MHz**	FIXED MOBILE 5.388A 5.388B 5.388	PREMIUM SPECTRUM
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	PREMIUM 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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
2 120-2 160	**MHz**	FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth) 5.388	PREMIUM SPECTRUM
2 160-2 170	**MHz**	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.388 5.389C 5.389E	PREMIUM 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
2 290-2 300	**MHz**	FIXED MOBILE except for aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)	STANDARD SPECTRUM
2 300-2 450	**MHz**	FIXED MOBILE 5.384A RADIOLOCATION Amateur 5.150 5.282 5.393 5.394 5.396	PREMIUM/ STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
2 450-2 483.5	**MHz**	FIXED MOBILE RADIOLOCATION 5.150	STANDARD SPECTRUM
2 483.5-2 500	**MHz**	FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A RADIOLOCATION RADIODETERMINATION-SATELLITE (space-to-Earth) 5.398 5.150 5.402	STANDARD SPECTRUM
2 500-2 520	**MHz**	FIXED 5.410 FIXED-SATELLITE (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A	PREMIUM AND STANDARD SPECTRUM
2 520-2 655	**MHz**	FIXED 5.410 FIXED-SATELLITE(space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 5.339 5.418B 5.418C	PREMIUM AND STANDARD SPECTRUM
2 655-2 670	**MHz**	FIXED 5.410 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 Earth exploration-satellite (passive)	PREMIUM AND STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		Radio astronomy Space research (passive) 5.149 5.208B	
2 670-2 690	**MHz**	FIXED 5.410 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.208B 5.415 MOBILE except aeronautical mobile 5.384A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149	PREMIUM AND 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 5.337 Radiolocation 5.423 5.424	STANDARD SPECTRUM
2 900-3 100	**MHz**	RADIOLOCATION 5.424A RADIONAVIGATION 5.426 5.425 5.427	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**	RADIOLOCATION Amateur Fixed Mobile 5.149 5.429C 5.429D	STANDARD SPECTRUM
3 400-3 500	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.431A 5.431B Amateur Radiolocation 5.433 5.282	PREMIUM AND STANDARD SPECTRUM
3 500-3 600	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.431B Radiolocation 5.433	PREMIUM AND STANDARD SPECTRUM
3 600-3 700	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.434 Radiolocation 5.433	PREMIUM AND STANDARD SPECTRUM
3 700-4 200	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile	PREMIUM AND STANDARDS SPECTRUM
4 200-4 400	**MHz**	AERONAUTICAL MOBILE (R) 5.436 AERONAUTICAL RADIONAVIGATION 5.438 5.437 5.439 5.440	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
4 400-4 500	**MHz**	FIXED MOBILE 5.440A	STANDARD SPECTRUM
4 500-4 800	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE 5.440A	STANDARD SPECTRUM
4 800-4 990	**MHz**	FIXED MOBILE 5.440A 5.441A 5.441B 5.442 Radio astronomy 5.149 5.339 5.443	STANDARD SPECTRUM
4 990-5 000	**MHz**	FIXED MOBILE except for aeronautical mobile RADIO ASTRONOMY Space research (passive) 5.149	STANDARD SPECTRUM
5 000-5010	MHz	AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (Earth-to-space)	STANDARD SPECTRUM
5 010-5 030	MHz	AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA AERONAUTICAL RADIONAVIGATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.443B	STANDARD SPECTRUM
5 030-5 091	**MHz**	AERONAUTICAL MOBILE (R) 5.443C AERONAUTICAL MOBILE-SATELLITE (R) 5.443D AERONAUTICAL RADIONAVIGATION 5.444	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
5 091-5 150	**MHz**	FIXED-SATELLITE (Earth-to-space) 5.444A AERONAUTICAL MOBILE 5.444B AERONAUTICAL MOBILE-SATELLITE (R) 5.443AA AERONAUTICAL RADIONAVIGATION 5.444	STANDARD SPECTRUM
5 150-5 250	**MHz**	FIXED-SATELLITE (Earth-to-space) 5.447A MOBILE except aeronautical mobile 5.446A 5.446B AERONAUTICAL RADIONAVIGATION 5.446 5.446C 5.447 5.447B 5.447C	STANDARD SPECTRUM
5 250-5 255	**MHz**	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.447F RADIOLOCATION SPACE RESEARCH 5.447D 5.447E 5.448 5.448A	STANDARD SPECTRUM
5 255-5 350	**MHz**	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.447F RADIOLOCATION SPACE RESEARCH (active) 5.447E 5.448 5.448A	STANDARD SPECTRUM
5 350-5 460	**MHz**	EARTH EXPLORATION-SATELLITE (active) 5.448B SPACE RESEARCH (active) 5.448C AERONAUTICAL RADIONAVIGATION 5.449 RADIOLOCATION 5.448D	STANDARD SPECTRUM
5 460-5 470	**MHz**	RADIONAVIGATION 5.449 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION 5.448D SPACE RESEARCH (active) 5.448B	STANDARD SPECTRUM
5 470-5 570	MHz	EARTH EXPLORATION-SATELLITE (active) MOBILE except aeronautical mobile 5.446A 5.450A	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		RADIOLOCATION 5.450B MARITIME RADIONAVIGATION SPACE RESEARCH (active) 5.448B 5.450 5.451	
5 570-5 650	**MHz**	MARITIME RADIONAVIGATION MOBILE except aeronautical mobile 5.446A 5.450A RADIOLOCATION 5.450B 5.450 5.451 5.452	STANDARD SPECTRUM
5 650-5 725	**MHz**	RADIOLOCATION MOBILE except aeronautical mobile 5.446A 5.450A Amateur Space research (deep space) 5.282 5.451 5.453 5.454 5.455	STANDARD SPECTRUM
5 725-5 830	**MHz**	RADIOLOCATION Amateur 5.150 5.453 5.455	STANDARD SPECTRUM
5 830-5 850	**MHz**	RADIOLOCATION Amateur Amateur-satellite (space-to-Earth) 5.150 5.453 5.455	STANDARD SPECTRUM
5 850-5 925	**MHz**	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
5 925-6 700	**MHz**	FIXED 5.457 FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.457C 5.149 5.440 5.458	STANDARD SPECTRUM
6 700-7 075	**MHz**	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B	STANDARD SPECTRUM
7 075-7 145	**MHz**	FIXED MOBILE 5.458 5.459	STANDARD SPECTRUM
7 145-7 190	**MHz**	FIXED MOBILE SPACE RESEARCH (deep space) (Earth-to-space) 5.458 5.459	STANDARD SPECTRUM
7 190-7 235	**MHz**	EARTH EXPLORATION-SATELLITE (Earth-to-space) 5.460A 5.460B FIXED MOBILE SPACE RESEARCH (Earth-to-space) 5.460 5.458 5.459	STANDARD SPECTRUM
7 235-7 250	**MHz**	EARTH EXPLORATION-SATELLITE (Earth-to-space) 5.460A FIXED MOBILE 5.458	STANDARD SPECTRUM
7 250-7 300	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE 5.461	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
7 300-7 375	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.461	STANDARD SPECTRUM
7 375-7 450	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile MARITIME MOBILE-SATELLITE (space-to-earth) 5.461AA 5.461AB	STANDARD SPECTRUM
7 450-7 550	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile MARITIME MOBILE-SATELLITE (space-to-earth) 5.461AA 5.461AB 5.461A	STANDARD SPECTRUM
7 550-7 750	**MHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile MARITIME MOBILE-SATELLITE (space-to-earth) 5.461AA 5.461AB	STANDARD SPECTRUM
7 750-7 900	**MHz**	FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) 5.461B 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)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		MOBILE 5.463 5.462A	
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
8 650-8 750	**MHz**	RADIOLOCATION 5.468 5.469	STANDARD SPECTRUM
8 750-8 850	**MHz**	RADIOLOCATION AERONAUTICAL RADIONAVIGATION 5.470 5.471	STANDARD SPECTRUM

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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
10-10.4	**GHz**	EARTH EXPLORATION-SATELLITE (active) 5.474A 5.474B 5.474C RADIOLOCATION Amateur 5.474D 5.479 5.480	STANDARD SPECTRUM
10.4-10.45	**GHz**	RADIOLOCATION Amateur 5.480	STANDARD SPECTRUM
10.45-10.5	**GHz**	RADIOLOCATION Amateur Amateur-satellite 5.481	STANDARD SPECTRUM
10.5-10.55	**GHz**	FIXED MOBILE RADIOLOCATION	STANDARD SPECTRUM
10.55-10.6	**GHz**	FIXED MOBILE except aeronautical mobile Radiolocation	STANDARD SPECTRUM
10.6-10.68	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY SPACE RESEARCH (passive)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		Radiolocation 5.149 5.482 5.482A	
10.68-10.7	**GHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.483	STANDARD SPECTRUM
10.7-10.95	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE except for aeronautical mobile	STANDARD SPECTRUM
10.95-11.2	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B MOBILE except for aeronautical mobile	STANDARD SPECTRUM
11.2-11.45	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE except for aeronautical mobile	STANDARD SPECTRUM
11.45-11.7	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B MOBILE except for aeronautical mobile	STANDARD SPECTRUM
11.7-12.1	**GHz**	FIXED 5.486 FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.488 Mobile except for aeronautical mobile 5.485	STANDARD SPECTRUM
12.1-12.2	**GHz**	FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.488	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		5.485 5.489	
12.2-12.7	**GHz**	FIXED MOBILE except for aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 5.492 5.487A 5.488 5.490	STANDARD SPECTRUM
12.7-12.75	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile	STANDARD SPECTRUM
12.75-13.25	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.441 MOBILE Space 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
13.4-13.65	**GHz**	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH 5.499C 5.499D Standard frequency and time signal-satellite (Earth-to-space) 5.499 5.500 5.501 5.501B	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
13.65-13.75	**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	
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
14-14.25	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.484B 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 5.484B 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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
14.3-14.4	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.484B 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A Radionavigation-satellite 5.504A	STANDARD SPECTRUM
14.4-14.47	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.484B 5.506 5.506B MOBILE except for 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 for aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A	STANDARD SPECTRUM
14.5-14.75	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.509B 5.509C 5.509D 5.509E 5.509F 5.510 MOBILE Space research 5.509G	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
14.75-14.8	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research 5.509G	STANDARD SPECTRUM
14.8-15.35	**GHz**	FIXED MOBILE Space 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
15.4-15.43	**GHz**	RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
15.43-15.63	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.511A RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION 5.511C	STANDARD SPECTRUM
15.63-15.7	**GHz**	RADIOLOCATION 5.511E 5.511F AERONAUTICAL RADIONAVIGATION	STANDARD SPECTRUM
15.7-16.6	**GHz**	RADIOLOCATION 5.512 5.513	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
16.6-17.1	**GHz**	RADIOLOCATION Space research (deep space) (Earth-to-space) 5.512 5.513	STANDARD SPECTRUM
17.1-17.2	**GHz**	RADIOLOCATION 5.512 5.513	STANDARD SPECTRUM
17.2-17.3	**GHz**	EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION SPACE RESEARCH (active) 5.512 5.513 5.513A	STANDARD SPECTRUM
17.3-17.7	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.516 BROADCASTING-SATELLITE Radiolocation 5.514 5.515	STANDARD SPECTRUM
17.7-17.8	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.517 (Earth-to-space) 5.516 BROADCASTING-SATELLITE Mobile 5.515	STANDARD SPECTRUM
17.8-18.1	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A (Earth-to-space) 5.516	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		MOBILE 5.519	
18.1-18.4	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B (Earth-to-space) 5.520 MOBILE 5.519 5.521	STANDARD SPECTRUM
18.4-18.6	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.484A 5.516B MOBILE	STANDARD SPECTRUM
18.6-18.8	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.522B MOBILE except for aeronautical mobile SPACE RESEARCH (passive) 5.522A	STANDARD SPECTRUM
18.8-19.3	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B 5.523A MOBILE	STANDARD SPECTRUM
19.3-19.7	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) (Earth-to-space) 5.523B 5.523C 5.523D 5.523E MOBILE	STANDARD SPECTRUM
19.7-20.1	**GHz**	FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528 5.529	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
20.1-20.2	**GHz**	FIXED-SATELLITE (space-to-Earth) 5.484A 5.484B 5.516B 5.527A MOBILE-SATELLITE (space-to-Earth) 5.524 5.525 5.526 5.527 5.528	STANDARD SPECTRUM
20.2-21.2	**GHz**	FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) Standard frequency and time signal-satellite (space-to-Earth) 5.524	STANDARD SPECTRUM
21.2-21.4	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive)	STANDARD SPECTRUM
21.4-22	**GHz**	FIXED MOBILE 5.530A	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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
22.5-22.55	**GHz**	FIXED MOBILE	STANDARD SPECTRUM
22.55-23.15	**GHz**	FIXED INTER-SATELLITE 5.338A MOBILE SPACE RESEARCH (Earth-to-space) 5.532A 5.149	
23.15-23.55	**GHz**	FIXED INTER-SATELLITE 5.338A MOBILE	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
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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
24.25-24.45	**GHz**	RADIONAVIGATION	STANDARD SPECTRUM
24.45-24.65	**GHz**	INTER-SATELLITE RADIONAVIGATION 5.533	STANDARD SPECTRUM
24.65-24.75	**GHz**	INTER-SATELLITE RADIOLOCATION-SATELITE (Earth-to-space)	STANDARD SPECTRUM
24.75-25.25	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.535	STANDARD SPECTRUM
25.25-25.5	**GHz**	FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	STANDARD SPECTRUM
25.5-27	**GHz**	EARTH EXPLORATION-SATELLITE (space-to-Earth) 5.536B FIXED INTER-SATELLITE 5.536 MOBILE	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A	
27-27.5	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE	STANDARD SPECTRUM
27.5-28.5	**GHz**	FIXED 5.537A FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE 5.538 5.540	STANDARD SPECTRUM
28.5-29.1	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540	STANDARD SPECTRUM
29.1-29.5	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		5.535A 5.539 5.541A MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540	
29.5-29.9	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 5.539 MOBILE-SATELLITE(Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.525 5.526 5.527 5.529 5.540	STANDARD SPECTRUM
29.9-30	**GHz**	FIXED-SATELLITE (Earth-to-space) 5.484A 5.484B 5.516B 5.527A 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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
31.3-31.5	**GHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
31.5-31.8	**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
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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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
37-37.5	**GHz**	FIXED MOBILE except for aeronautical mobile SPACE RESEARCH (space-to-Earth) 5.547	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
37.5-38	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except for aeronautical mobile SPACE RESEARCH (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	STANDARD SPECTRUM
38-39.5	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Earth exploration-satellite (space-to-Earth) 5.547	STANDARD SPECTRUM
39.5-40	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) Earth exploration-satellite (space-to-Earth) 5.547	STANDARD SPECTRUM
40-40.5	**GHz**	EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
40.5-41	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	STANDARD SPECTRUM
41-42.5	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I	STANDARD SPECTRUM
42.5-43.5	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except for aeronautical mobile RADIO ASTRONOMY 5.149 5.547	STANDARD SPECTRUM
43.5-47	**GHz**	MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	STANDARD SPECTRUM
47-47.2	**GHz**	AMATEUR AMATEUR-SATELLITE	STANDARD SPECTRUM
47.2-47.5 GHz	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
47.5-47.9	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE	STANDARD SPECTRUM
47.9-48.2	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A	STANDARD SPECTRUM
48.2-50.2	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.338A 5.552 MOBILE 5.149 5.340 5.555	STANDARD SPECTRUM
50.2-50.4	**GHz**	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
50.4-51.4	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE Mobile-satellite (Earth-to-space)	STANDARD SPECTRUM
51.4-52.6	**GHz**	FIXED 5.338A MOBILE 5.547 5.556	STANDARD SPECTRUM
52.6-54.25	**GHz**	EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 5.556	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
54.25-55.78	**GHz**	EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.556B	STANDARD SPECTRUM
55.78-56.9	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED 5.557A INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	STANDARD SPECTRUM
56.9-57	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.558A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	STANDARD SPECTRUM
57-58.2	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	STANDARD SPECTRUM
58.2-59	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.547 5.556	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
59-59.3	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive)	STANDARD SPECTRUM
59.3-64	**GHz**	FIXED INTER-SATELLITE MOBILE 5.558 RADIOLOCATION 5.559 5.138	STANDARD SPECTRUM
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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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 Space research (space-to-Earth) 5.149	STANDARD SPECTRUM
77.5-78	**GHz**	AMATEUR AMATEUR-SATELLITE RADIOLOCATION 5.559B 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)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		5.149 5.560	
79-81	**GHz**	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth) 5.149	STANDARD SPECTRUM
81-84	**GHz**	FIXED 5.338A FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth) 5.149 5.561A	STANDARD SPECTRUM
84-86	**GHz**	FIXED 5.338A 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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
92-94	**GHz**	FIXED 5.338A MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	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 MOBILE RADIO ASTRONOMY RADIOLOCATION 5.149	STANDARD SPECTRUM
95-100	**GHz**	FIXED MOBILE RADIO ASTRONOMY RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554	STANDARD SPECTRUM
100-102	**GHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive)	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
		5.340 5.341	
102-105	**GHz**	FIXED MOBILE RADIO ASTRONOMY 5.149 5.341	STANDARD SPECTRUM
105-109.5	**GHz**	FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.341	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 MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.341	STANDARD SPECTRUM
114.25-116	**GHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.341	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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 5.558 Amateur 5.138	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 RADIOLOCATION 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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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
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

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
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
200-209	**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) MOBILE RADIO ASTRONOMY SPACE RESEARCH (passive) 5.562B 5.149 5.341	STANDARD SPECTRUM
226-231.5	**GHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	STANDARD SPECTRUM
231.5-232	**GHz**	FIXED MOBILE Radiolocation	STANDARD SPECTRUM
232-235	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Radiolocation	STANDARD SPECTRUM
235-238	**GHz**	EARTH EXPLORATION-SATELLITE (passive) FIXED-SATELLITE (space-to-Earth) SPACE RESEARCH (passive) 5.563A 5.563B	STANDARD SPECTRUM
238-240	**GHz**	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE RADIOLOCATION RADIONAVIGATION RADIONAVIGATION-SATELLITE	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
240-241	**GHz**	FIXED MOBILE RADIOLOCATION	STANDARD SPECTRUM
241-248	**GHz**	RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite 5.138 5.149	STANDARD SPECTRUM
248-250	**GHz**	AMATEUR AMATEUR-SATELLITE Radio astronomy 5.149	STANDARD SPECTRUM
250-252	**GHz**	EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.563A	STANDARD SPECTRUM
252-265	**GHz**	FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.149 5.554	STANDARD SPECTRUM

National Frequency Allocation Table			
FREQUENCY		**SERVICE ALLOCATIONS**	**CLASSIFICATION**
265-275	**GHz**	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY 5.149 5.563A	STANDARD SPECTRUM
275-3000	**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 standardised terms and definitions used in the ITU Radio Regulations. In both the National Spectrum Plan and the ITU RR terms have the following meanings:

Assigned Frequency: The centre of the frequency band assigned to a station.

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.

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.

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.

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.

Aeronautical Mobile (OR)*: An aeronautical mobile service intended for communications, including those relating to flight coordination, primarily outside national or international civil air routes.

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.

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.

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.

Amateur Service: A radiocommunications service for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, duly authorised persons interested in radio techniques solely with a personal aim and without pecuniary interest.

Amateur-Satellite Service: A radiocommunications service using space stations on earth for the same purposes as those of the amateur service.

Aeronautical Radionavigation: A radionavigation service intended for the benefit and for the safe operation of aircraft.

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.

Broadcasting Satellite Service: A radiocommunications service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public.

Class of Emission: The set of characteristics of an emission, designated by standard symbols, e.g. the type of modulation of the primary carrier, modulating the signal, and type of information to be transmitted.

Emission: Radiation produced, or the production of radiation, by a radio transmitting station.

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.

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.

Earth Exploration-Satellite Service: A radiocommunications service between earth stations and one or more space stations' which may include links between space stations.

Electronic communications: Any cognate terms mean the conveyance of signals of any description, by the use of optical, electrical, magnetic or electromagnetic energy and

Electronic communications sector: The economic sector encompassing the provision of all electronic communications, including broadcasting.

Fixed Service: A radiocommunications service between specified fixed points.

Harmful Interference: Interference which endangers the functioning of a radionavigation service or of other safety services or severely degrades, obstructs, or repeatedly interrupts a radiocommunications service operating in accordance with the Regulations.

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.

Inter-Satellite Service: A radiocommunications service providing links between artificial earth satellites.

Land Mobile Service: A mobile service between a base station and a land-mobile station, or between mobile land stations.

Land Mobile Satellite Service: A mobile-satellite service in which mobile earth stations are located on land.

Metrological-Satellite Service: An earth exploration-satellite service for meteorological purposes.

Maritime Radionavigation Service: A mobile-satellite intended for the benefit and for the safe operation of ships.

Maritime Mobile-Satellite Service: A mobile-satellite in which mobile earth stations are located on board ships; service survival craft stations and EPIRBs.

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.

Minister: The Minister charged with the responsibility for the electronic communications sector who shall be any minister other than the Minister for URCA and the Minister for the Corporation.

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 or more space stations.

Mobile Service: A radiocommunications service between mobile and land stations, or between mobile stations.

Maritime Radionavigation-Satellite Service: A radionavigation-satellite service in which earth stations are located on board ships.

Meteorological Aids Service: A radiocommunications service used for meteorological, including hydrological, observations and exploration.

Port Operations Service: A mobile maritime 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 an emergency, to the safety of persons.

Radiocommunications: Telecommunications by means of radio waves.

Radiodetermination: 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.

Radionavigation: Radiodetermination used for the purposes of navigation, including obstruction warning.

Radiolocation: Radiodetermination used for the purposes other than those of radionavigation.

Radiation: The outward flow of energy from any source in the form of radio waves.

Radio Astronomy: Astronomy based on the reception of radio waves of cosmic origin.

Radionavigation Satellite Service: A radiocommunications service in which signals transmitted or retransmitted by space stations are intended for direct reception by the general public.

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.

Standard Frequency and Time Signal-Satellite Service: A radiocommunications service using space stations on earth satellites for the same purposes as those stated above.

Space Research Service: A radiocommunications service in which spacecraft or other objects in space are used for scientific or technological research purposes.

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.

Terrestrial Radiocommunications: Any radiocommunications other than space radiocommunications or radio astronomy.

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.

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.

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.

Spectrum Assignment: An assignment is an authorisation given to 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.

Also, the following terms shall have the meaning ascribed to them in section 114 of the Comms Amendment Act:

i. "Cellular licence" means a licence which permits the licensee to provide cellular services;
ii. "Cellular service" means any radiocommunications service the functionality of which enables continuous communication across boundaries between the different areas of radio coverage, with no perceptible interruption of such communication and which includes a handover process between elements of its network; and
iii. "Radiocommunications" means the transmission emission or reception of messages, sound, visual images or signals using electromagnetic waves which are propagated in space and having frequencies of lower than 3,000 GHz.

The mentioned laws and recommendations undergird the strategies set out in this NSP