



Spectrum Management Tools: Radio Regulations and Table of Frequency Allocations

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Topics to Be Covered

- International Framework of Spectrum Management
 - Sovereign right of states to manage spectrum use
 - Intergovernmental organizations & multilateral diplomacy
- Overview of the Radio Regulations
 - Instruments of the ITU
 - Guiding principle of RR
 - International recognition and protection from interference
- Table of Frequency Allocations
 - Spectrum apportionment definitions
 - Allocations hierarchy
 - Footnotes

IGOs & Multilateral Diplomacy

- Spectrum Knows No Borders
 - To avoid harmful interference, governments work through membership in inter-governmental organizations (IGOs).
- The ITU is the global expert agency for spectrum.
 - UN-affiliated agency; HQ in Geneva, Switzerland
 - Founded in 1865 (one of the world's oldest IGOs).
 - ITU's Radiocommunication Sector (ITU-R) carries out members' directions and implements the Radio Regulations (RR).
- Regional IGOs maintain their own telecom-related agencies:
 - APT, ATU, CEPT, CITELE, etc.

Sovereign Right of States to Manage Spectrum Use

- ITU recognizes sovereign right of States to manage the radio spectrum.
- RR allows each State the greatest possible flexibility with regard to spectrum use.
- Services allocated in the Table are not necessarily compatible locally; each State can select those it wishes to implement on its territory.
- However, exercise of sovereign right should not conflict with the principle of promoting efficient and economical use of the spectrum and should not result in barriers to trade in services.

Legal Instruments of the ITU

- Constitution
- Convention
- Administrative Regulations
 - Radio Regulations (RR)
 - International Telecommunication Regulations (ITRs)

Radio Regulations

- Principle regulatory framework within which States undertake to operate radio services and the basic tool for international spectrum use
- International treaty status and binding on all Member States
- Revised by World Radiocommunication Conferences (WRCs)
- Supplement the Constitution and Convention of the ITU

Radio Regulations Define:

- Frequency allocations to different categories of radiocommunication services
- Mandatory technical parameters to be observed by radio stations, especially transmitters
- Procedures for the **coordination** and **notification** of frequency assignments made to radio stations by national governments
 - Coordination: ensuring technical compatibility
 - Notification: formal recording and protection in the Master International Frequency Register (**MIFR**)
- Other procedures and operational provisions

RR Structure

Volume 1 – Articles

- Art 1: Terms and definitions
- Art 5: **Frequency allocations**

Volume 2 – Appendices

- App 7: coordination methods
- App 30: BSS Plan; App 30B: FSS Plan

Volume 3 – Resolutions and Recommendations

Volume 4 – ITU-R Recommendations **incorporated by reference**



Master International Frequency Register

- ITU-maintained database of satellite and terrestrial frequency assignments
- Recording in the MIFR is the final stage of the frequency coordination process
 - **Notifications** of frequency assignments from administrations are examined and published in the **BR IFIC**
- Confers international recognition and protection from interference



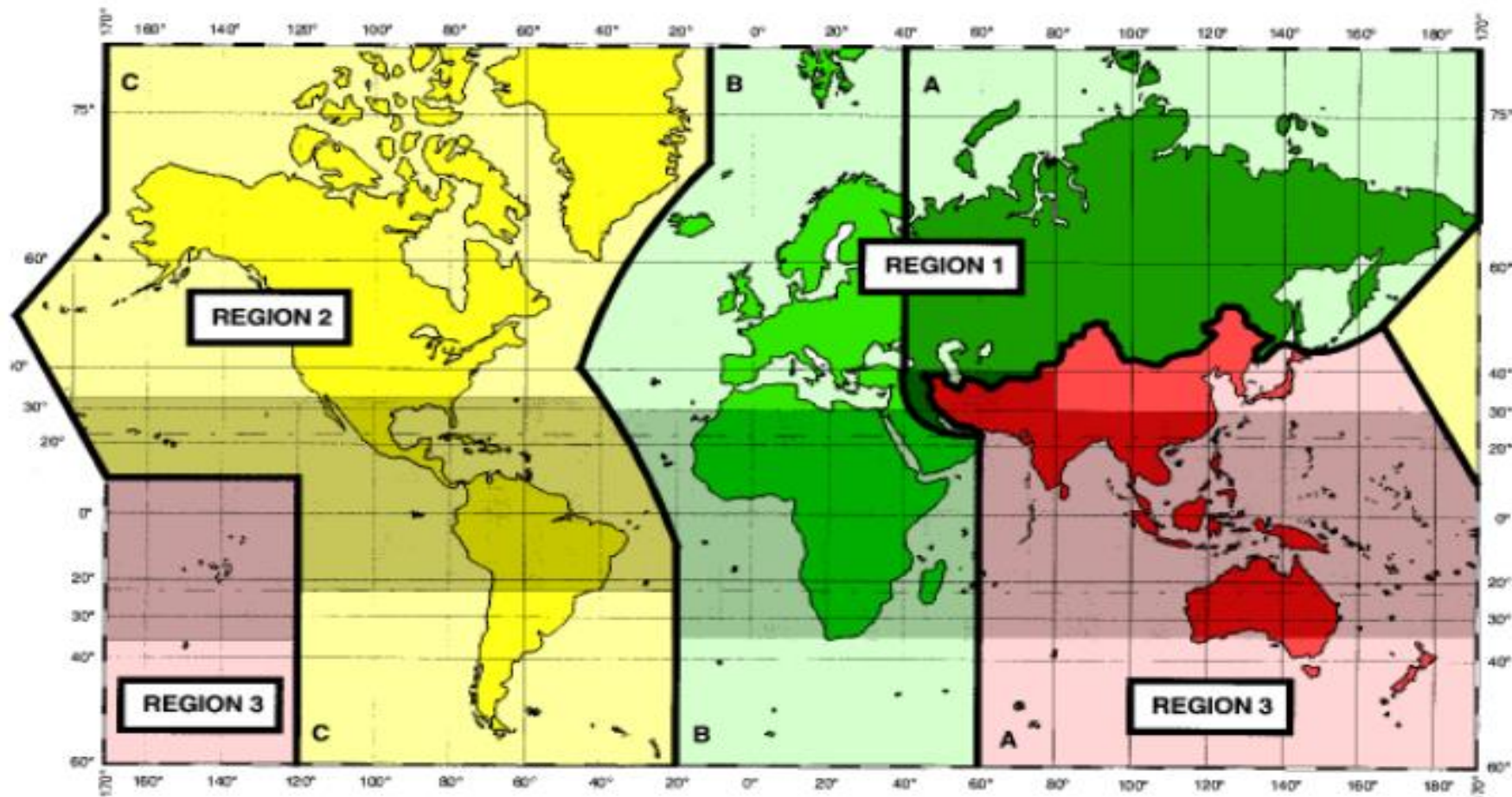
Spectrum Apportionment Definitions

- **Allocation** – (of a frequency band): Entry in the Table of Frequency Allocations of a given frequency band for the purpose of its use by one or more radiocommunication services. (RR)
- **Allotment** – (of a radio frequency or radio frequency channel): Entry of a designated frequency channel in an agreed plan. (RR)
- **Assignment** – (of a radio frequency or radio frequency channel): Authorization given for a radio station to use a radio frequency or a radio frequency channel under specified conditions. (RR)

Frequency Allocations

- Allocation and regulation of the radio frequency (RF) portion of the electromagnetic spectrum
 - RF ranges from 3 Hz to 3000 GHz (3 THz)
- Allocated radio spectrum: **8.3 kHz - 275 GHz**
 - Use of 275-1000 GHz is subject to No. **5.565**
- Allocations are made **to radiommunication services** defined in RR Article 1
- Frequency bands are allocated to different services either *worldwide* or *regionally*

ITU Regions



Principle of Precedence

New uses must avoid causing harmful interference to the services provided by stations using frequencies assigned to them in accordance with the RR and recorded favorably in the MIFR.

In other words, new uses should enter a band in a way that does not cause harmful interference to existing services that are operating in accordance with the RR.

Partial List of Radiocommunication Services

Amateur service (AS)
fixed service (FS)
fixed-satellite service (FSS)
inter-satellite service
space operation service (SRS)
mobile service (MS)
mobile-satellite service (MSS)
land mobile service (LMS)
land mobile-satellite service (LMSS)
maritime mobile service (MMS)
maritime mobile-satellite service (MMSS)
aeronautical mobile service (AMS)
aeronautical mobile (R) service (AM(R)S)
aeronautical mobile (OR) service (AM(OR)S)
broadcasting service (BS)
broadcasting-satellite service (BSS)

radiodetermination service (RDS)
radiodetermination-satellite service (RDSS)
radionavigation service (RNS)
radionavigation-satellite service (RNSS)
maritime radionavigation service (MRNS)
maritime radionavigation-satellite service (MRSS)
aeronautical radionavigation service (ARNS)
radiolocation service (RLS)
radiolocation-satellite service (RLSS)
meteorological aids service (MAS)
Earth exploration-satellite service (EESS)
meteorological-satellite service (MetSat)
space research service (SRS)

Allocations Hierarchy

- **Primary Service:** Printed in upper case
 - Receive highest priority and are designated as the principle authorized users of the band
- **Secondary service:** Printed in lower case
 - shall not cause harmful interference to current or future stations of the primary service(s) for the band;
 - shall not claim protection from harmful interference caused by current or future stations of the primary service(s) for the band.
 - can claim protection from harmful interference from stations of the same or other secondary service(s)
- **Non-Interference Basis (NIB)**
 - A condition of use relative to other specified uses that affords no protection from harmful interference, defined in Article 4.4

Table of Frequency Allocations

- Band allocations are set out in the **Table of Frequency Allocations**
- Each band may be allocated to one or more services, with equal or different rights
- Two categories of service:
PRIMARY and **Secondary**
- Exceptions or restrictions on allocations are covered in **footnotes** to the Table

Partial Page from Allocations Table

Allocation to services		
Region 1	Region 2	Region 3
	220-225	
223-230 BROADCASTING Fixed Mobile	AMATEUR FIXED MOBILE Radiolocation 5.241	223-230 FIXED MOBILE BROADCASTING
5.243 5.246 5.247	225-235 FIXED MOBILE	AERONAUTICAL RADIONAVIGATION Radiolocation 5.250
230-235 FIXED MOBILE		230-235 FIXED MOBILE AERONAUTICAL RADIONAVIGATION 5.250
5.247 5.251 5.252		
235-267	FIXED MOBILE	
	5.111 5.252 5.254 5.256 5.256A	

Primary

Secondary

Primary

Secondary

Primary

Footnotes

Footnotes

- **Have the same regulatory status as allocated services in the Table.**
- **Used to cover:**
 - Different category of service
 - Additional allocation
 - Alternative allocation
- **5. prefix**
 - Examples: 5.149, 5.282, 5.388

Footnote Examples

5.204 Different category of service: in Afghanistan, Saudi Arabia, Bahrain, Bangladesh, Brunei Darussalam, China, Cuba, the United Arab Emirates, India, Indonesia, Iran (Islamic Republic of), Iraq, Kuwait, Montenegro, Oman, Pakistan, the Philippines, Qatar, Serbia, Singapore, Thailand and Yemen, the band 137-138 MHz is allocated to the fixed and mobile, except aeronautical mobile (R), services on a primary basis (see No. **5.33**). **(WRC-07)**

5.176 Additional allocation: in Australia, China, Korea (Rep. of), the Philippines, the Dem. People's Rep. of Korea and Samoa, the band 68-74 MHz is also allocated to the broadcasting service on a primary basis. **(WRC-07)**

5.167 Alternative allocation: in Bangladesh, Brunei Darussalam, India, Iran (Islamic Republic of), Pakistan, Singapore and Thailand, the band 50-54 MHz is allocated to the fixed, mobile and broadcasting services on a primary basis. **(WRC-07)**

Frequency Bands Identification via Footnotes

- Spectrum is allocated to radio services, not technologies and applications.
- ITU uses frequency band **identification** or designation via footnotes to get around the limitation. Examples:
 - International Mobile Telecommunication (IMT)
 - Industrial, Science and Medical (ISM) applications

Examples of Footnote Identification

5.388 The frequency bands 1 885-2 025 MHz and 2 110-2 200 MHz are intended for use, on a worldwide basis, by administrations wishing to implement **International Mobile Telecommunications (IMT)**. Such use does not preclude the use of these frequency bands by other services to which they are allocated. The frequency bands should be made available for IMT in accordance with Resolution **212 (Rev.WRC-15)** (see also Resolution **223 (Rev.WRC-15)**). (WRC-15)

5.150 The following bands:

13 553-13 567 kHz (centre frequency 13 560 kHz),

26 957-27 283 kHz (centre frequency 27 120 kHz),

40.66-40.70 MHz (centre frequency 40.68 MHz),

902-928 MHz in Region 2 (centre frequency 915 MHz),

2 400-2 500 MHz (centre frequency 2 450 MHz),

5 725-5 875 MHz (centre frequency 5 800 MHz), and

24-24.25 GHz (centre frequency 24.125 GHz)

are also designated for **industrial, scientific and medical (ISM)** applications.

Radiocommunication services operating within these bands must accept harmful interference which may be caused by these applications. ISM equipment operating in these bands is subject to the provisions of No. **15.13**.

Sample of U.S. Frequency Allocations Table

ITU

NTIA

FCC

Table of Frequency Allocations			941-1525 MHz (UHF)		Page 31
International Table			United States Table		FCC Rule Part(s)
Region 1 Table (See previous page)	Region 2 Table (See previous page)	Region 3 Table (See previous page)	Federal Table	Non-Federal Table	
942-960 FIXED MOBILE except aeronautical mobile 5.317A BROADCASTING 5.322	942-960 FIXED MOBILE 5.317A	942-960 FIXED MOBILE 5.317A BROADCASTING	941-944 FIXED US268 US301 G2 944-960	941-944 FIXED US268 US301 NG30 NG120 944-960 FIXED NG120	Public Mobile (22) Aural Broadcast Auxiliary (74E) Fixed Microwave (101) Public Mobile (22) Aural Broadcast Auxiliary (74E) Low Power Auxiliary (74H) Fixed Microwave (101)
5.323 960-1164 AERONAUTICAL MOBILE (R) 5.327A AERONAUTICAL RADIONAVIGATION 5.328		5.320	960-1164 AERONAUTICAL RADIONAVIGATION 5.328 US224 US400		Aviation (87)
1164-1215 AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B			1164-1215 AERONAUTICAL RADIONAVIGATION 5.328 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space)		
5.328A 1215-1240 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active)			5.328A US224 1215-1240 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G56 RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) G132 SPACE RESEARCH (active)	1215-1240 Earth exploration-satellite (active) Space research (active)	
5.330 5.331 5.332 1240-1300 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION RADIONAVIGATION-SATELLITE (space-to-Earth) (space-to-space) 5.328B 5.329 5.329A SPACE RESEARCH (active) Amateur			5.332 1240-1300 EARTH EXPLORATION-SATELLITE (active) RADIOLOCATION G56 SPACE RESEARCH (active) AERONAUTICAL RADIONAVIGATION 5.332 5.335	1240-1300 AERONAUTICAL RADIONAVIGATION Amateur Earth exploration-satellite (active) Space research (active)	Amateur Radio (97)
5.282 5.330 5.331 5.332 5.335 5.335A 1300-1350 RADIOLOCATION AERONAUTICAL RADIONAVIGATION 5.337 RADIONAVIGATION-SATELLITE (Earth-to-space)			5.332 5.335 1300-1350 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation G2 US342	5.282 1300-1350 AERONAUTICAL RADIONAVIGATION 5.337	Aviation (87)
5.149 5.337A 1350-1400 FIXED MOBILE RADIOLOCATION	1350-1400 RADIOLOCATION 5.338A		1350-1390 FIXED MOBILE RADIOLOCATION G2 5.334 5.339 US342 US385 G27 G114	1350-1390 US342 5.334 5.339 US342 US385	

Sample of Japan Frequency Allocations Table

Frequency Allocation Table
Table-1 (8.3kHz-27500kHz)

INTERNATIONAL (MHz)			JAPAN (kHz)		Purpose of Radio Stations	Conditions for Use of Frequency
Region 1 (1)	Region 2 (2)	Region 3 (3)	(4)		(5)	(6)
Below 8.3	(Not allocated)		Below 8.3			
	5.53 5.54		21			
8.3-9	METEOROLOGICAL AIDS 5.54A 5.54B 5.54C		8.3-9	METEOROLOGICAL AIDS 22	Public Service General Service	
9-11.3	METEOROLOGICAL AIDS 5.54A RADIONAVIGATION		9-11.3	RADIONAVIGATION METEOROLOGICAL AIDS 22	Public Service General Service	
11.3-14	RADIONAVIGATION		11.3-14	RADIONAVIGATION	Public Service General Service	
14-19.95	FIXED MARITIME MOBILE 5.57		14-19.95	FIXED MARITIME MOBILE 23	Public Service General Service	
	5.55 5.56					
19.95-20.05	STANDARD FREQUENCY AND TIME SIGNAL (20kHz)		19.95-20.05	STANDARD FREQUENCY AND TIME SIGNAL	Public Service	Assignment is limited to 20kHz.
20.05-70	FIXED MARITIME MOBILE 5.57		20.05-39	FIXED MARITIME MOBILE 23	Public Service General Service	
			39-41	STANDARD FREQUENCY AND TIME SIGNAL	Public Service	Assignment is limited to 40kHz.
			41-59	FIXED MARITIME MOBILE 23	Public Service General Service	
			59-61	STANDARD FREQUENCY AND TIME SIGNAL	Public Service	Assignment is limited to 60kHz.
			61-70	FIXED MARITIME MOBILE 23	Public Service General Service	
	5.56 5.58					
70-72	RADIONAVIGATION 5.60	70-72 FIXED MARITIME MOBILE 5.57 MARITIME RADIONAVIGATION 5.60 Relocation	70-72	RADIONAVIGATION	Public Service	
72-84	FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60 5.56	72-84 FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60	72-84	FIXED MARITIME MOBILE 23	Public Service General Service	
84-86	RADIONAVIGATION 5.60	84-86 RADIONAVIGATION 5.60 Fixed Maritime Mobile 5.57 5.59	84-86	RADIONAVIGATION	Public Service	
86-90	FIXED MARITIME MOBILE 5.57 RADIONAVIGATION	86-90 FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60	86-90	FIXED MARITIME MOBILE 23	Public Service General Service	
	5.56					
90-110	RADIONAVIGATION 5.62 Fixed		90-110	RADIONAVIGATION	Public Service	Loran-C System shall be used.
	5.64					
110-112	FIXED MARITIME MOBILE RADIONAVIGATION	110-112 FIXED MARITIME MOBILE RADIONAVIGATION 5.60 Relocation	110-112	FIXED 25 MARITIME MOBILE 26	Public Service General Service	
	5.64	5.64				
112-115	RADIONAVIGATION 5.60	112-117.6 RADIONAVIGATION 5.60 Fixed	112-117.6	RADIONAVIGATION	Public Service	
115-117.6						

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Sample of Moldova Frequency Allocations Table

TABLE OF FREQUENCY ALLOCATIONS

Region 1	National allocation		
Frequency band – services - footnotes	Frequency band - services	Footnotes	Usage
Below 9 kHz (Not allocated) 5.53, 5.54	Below 9 kHz (Not allocated)	5.53, 5.54	
9 - 14 kHz RADIONAVIGATION	9 - 14 kHz RADIONAVIGATION	RN018, RN035	P
14 - 19.95 kHz FIXED MARITIME MOBILE 5.57 5.55, 5.56	14 - 19.95 kHz FIXED MARITIME MOBILE	5.57 RN018, RN035	P
19.95 - 20.05 kHz STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)	19.95 - 20.05 kHz STANDARD FREQUENCY AND TIME SIGNAL (20 kHz)	RN018, RN035	P
20.05 - 70 kHz FIXED MARITIME MOBILE 5.57 5.56, 5.58	20.05 - 70 kHz FIXED MARITIME MOBILE	5.57 RN018, RN035	P
70 - 72 kHz RADIONAVIGATION 5.60	70 - 72 kHz RADIONAVIGATION	5.60 RN018, RN035	P
72 - 84 kHz FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.60 5.56	72 - 84 kHz FIXED MARITIME MOBILE RADIONAVIGATION	5.57, 5.60 RN001, RN018, RN035	P
84 - 86 kHz RADIONAVIGATION 5.60	84 - 86 kHz RADIONAVIGATION	5.60 RN018, RN035	P
86 - 90 kHz FIXED MARITIME MOBILE 5.57 RADIONAVIGATION 5.56	86 - 90 kHz FIXED MARITIME MOBILE RADIONAVIGATION	5.57 RN018, RN035	P

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