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29TH WORLD RADIOCOMMUNICATION SEMINAR

30 November – 11 December 2020

ITU Radio Regulations

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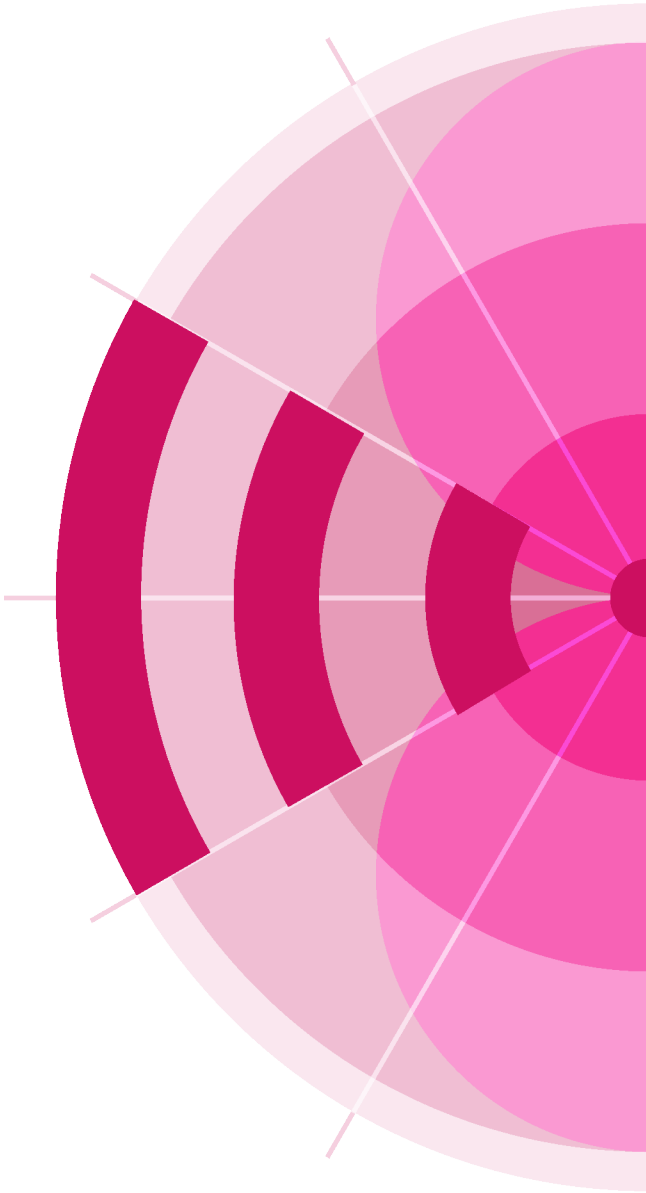
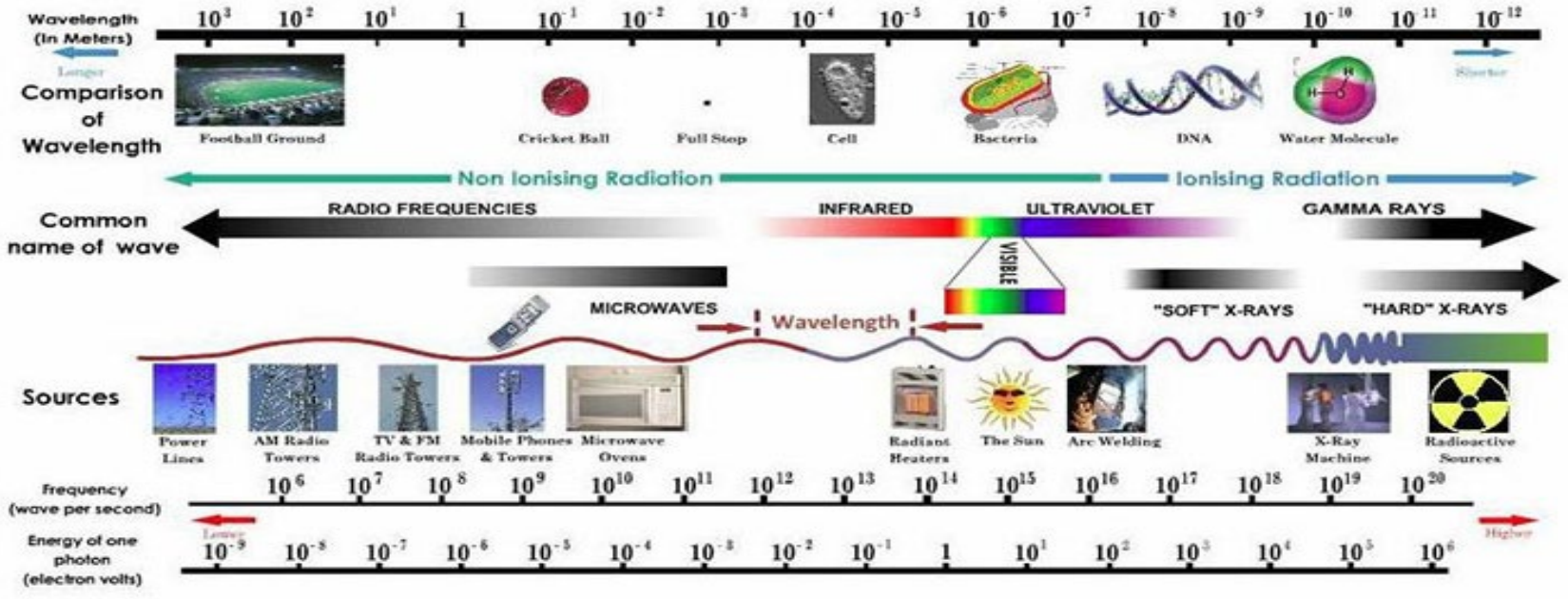


RADIOELECTRIC SPECTRUM

RR 1.3: Telecommunication: *Any transmission, emission or reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.*

RR 1.5: Radio waves (or hertzian waves): *Electromagnetic waves of frequencies arbitrarily lower than 3000 GHz, propagated in space without artificial guide." (usually refers as: "**radio**")*

RR. 1.6 Radiocommunication: *Telecommunication by means of radio waves*



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RADIOELECTRIC vs. ELECTROMAGNETIC SPECTRUM

- **Radioelectric Spectrum** is the lower part of Electromagnetic Spectrum, used for Telecommunications
- Expression: "***Spectrum***" refers by default to Radioelectric Spectrum
- Communications systems that DO NOT use Spectrum (in red) may be regulated (National/International); but their regulatory framework is different than *Spectrum R*egulations

	Frequencies < 3.000 GHz?	Free Propagation?	Radioelectric Spectrum?
Infra-red Wireless link	NO	YES	NO
Cable TV (Coaxial)	YES	NO	NO
Optical Fiber	NO	NO	NO
Broadcasting TV	YES	YES	YES

ITU RADIO REGULATIONS, RR

Spectrum cannot be limited to a given territory; international coordination is necessary

ITU Radio Regulations (RR) is an International Treaty, elaborated and revised by administrations and membership, during World Radio Conferences (WRC); RR has a binding nature for ITU Member states.

ITU acts as depositary of RR

Last version: RR-20 (as revised during WRC-19)

RR can be downloaded, free of charge, for the general public, in the 6 UN Languages, at: https://www.itu.int/pub/R-REG-RR-2020

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RR: KEY DEFINITIONS

***RR, No. 1.19 Radiocommunication service**: A service involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes.*

***RR, No. 1.61 Station**: One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service*

Terrestrial Services (NO satellite links)	
Fixed	
Broadcasting	
Mobile	Land mobile
	Aeronautical mobile
	Maritime mobile
Radiodetermination	Radionavigation
	Radiolocation

but also

Amateur
Standar Frequenct and Time
Meteorogical Aids
.
.

and more

Space Services (satellite links)	
Fixed-satellite	
Broadcasting-satellite	
Mobile-satellite	Land mobile-satellite
	Aeronautical mobile-satellite
	Maritime mobile-satellite
Radiodetermination-satellite	Radionavigation-satellite
	Radiolocation-satellite

but also

Amateur-satellite
Radio Astronomy
Space Research
.
.

and more

41 different types of Services (RR 1.20 to 1.60)

53 different types of Stations (RR 1.65 to 1.115)

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RR: ALLOCATIONS vs. ASSIGNMENTS

RR, No. 1.16 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 terrestrial or space radiocommunication services or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.*

RR, No. 1.17 allotment (of a radio frequency or radio frequency channel): *Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one or more identified countries or geographical areas and under specified conditions.*

RR 1.18 assignment (of a radio frequency or radio frequency channel): *Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.*

Frequency distribution to	French	English	Spanish	Arabic	Chinese	Russian
Services	Attribution (attribuer)	Allocation (to allocate)	Atribución (atribuir)	توزيع (يوزع)	划分	распределение (распределять)
Areas or countries	Allotissement (allotir)	Allotment (to allot)	Adjudicación (adjudicar)	تعيين (يعين)	分配	выделение (выделять)
Stations	Assignation (assigner)	Assignment (to assign)	Asignación (asignar)	تخصيص (يخصص)	指配	присвоение (присваивать)

Allocations are granted to Radiocommunications **Services**

Assignments are granted to Radiocommunications **Stations**

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NOTE: *Most of dictionaries display the expressions "**Allocation**" and "**Assignment**" as being **synonymous**; in the context of Spectrum Management and Regulation **they are different**.*

RR: OTHER CONCEPTS

Other concepts: although not explicitly defined, on the RR when dealing with band allocations (Art. 5), the use into footnotes of expressions: "*identified*" and "*designated*" express the interest/intention of some administrations on a future use of that band for a specific application; that in benefit of a mid- and long-term harmonization of the use of that band. Examples*:

RR, Nos. 5.138, 5.150,…: Bands ***designated*** for industrial, scientific and medical (**ISM**) applications.

RR, No. 5.552A…. : Bands ***designated*** for use by high Altitude Platform Stations (**HAPS**)

RR, No. 5.516B……: bands ***identified**** for use by High-Density applications in the fixed-satellite service *(also named: High Througput Satellites, **HTS**)*

RR, Nos. 5.286AA, 5.313.A,….: Bands ***identified**** for International Mobile Telecommunications (**IMT**)

*: Footnotes stated that: "*This identification does not preclude the use of this band by any application of the services to which it is allocated and does not establish priority in the Radio Regulations*".

RR: ALLOCATION PRINCIPLES

RR is technically neutral*, hence, it

1. Does allocate frequency bands to radiocommunication services
2. Does not allocate to specific applications
3. Does not allocate to particular technologies
4. Does not define user profiles (official, commercial, private, etc.)

e.g.: allocation can be made to: "*mobile*" (*service*; by default: terrestrial, land)

- not specifically to :

a) cellular networks (*application*)

b) GMS, LTE, Wimax, etc. (*technology*)

c) Official/commercial/particular (*user profile*)

** Administrations might go further (applications, technologies, profile, etc.) while being consistent with the RR*

RR: CATEGORIES OF SERVICES

5.25 a) services in "CAPITAL CASE" (example: FIXED) are "PRIMARY" category (primary basis)

5.26 b) services in "Normal cases" (example: Mobile) are "Secondary" category (secondary basis)

5.48 3) services are listed by category then in alphabetical order (French language). The order of listing does not indicate relative priority within each category.

Stations of secondary service: Non-Interference/Non-Protection (NI/NP) vs PRIMARY service

a) shall not 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;

b) cannot claim protection from harmful interference from stations of a primary service to which frequencies are already assigned or may be assigned at a later date;

*c) can claim protection, however, from harmful interference from stations of the same or other secondary service(s) to which frequencies may be assigned at a later date***

(**first in time, first in right)

* Arabic & Chinese versions, PRIMARY → bold characters:

PRIMARY: متنقلة بحرية 无线电定位

Secondary: متنقلة بحرية 无线电定位

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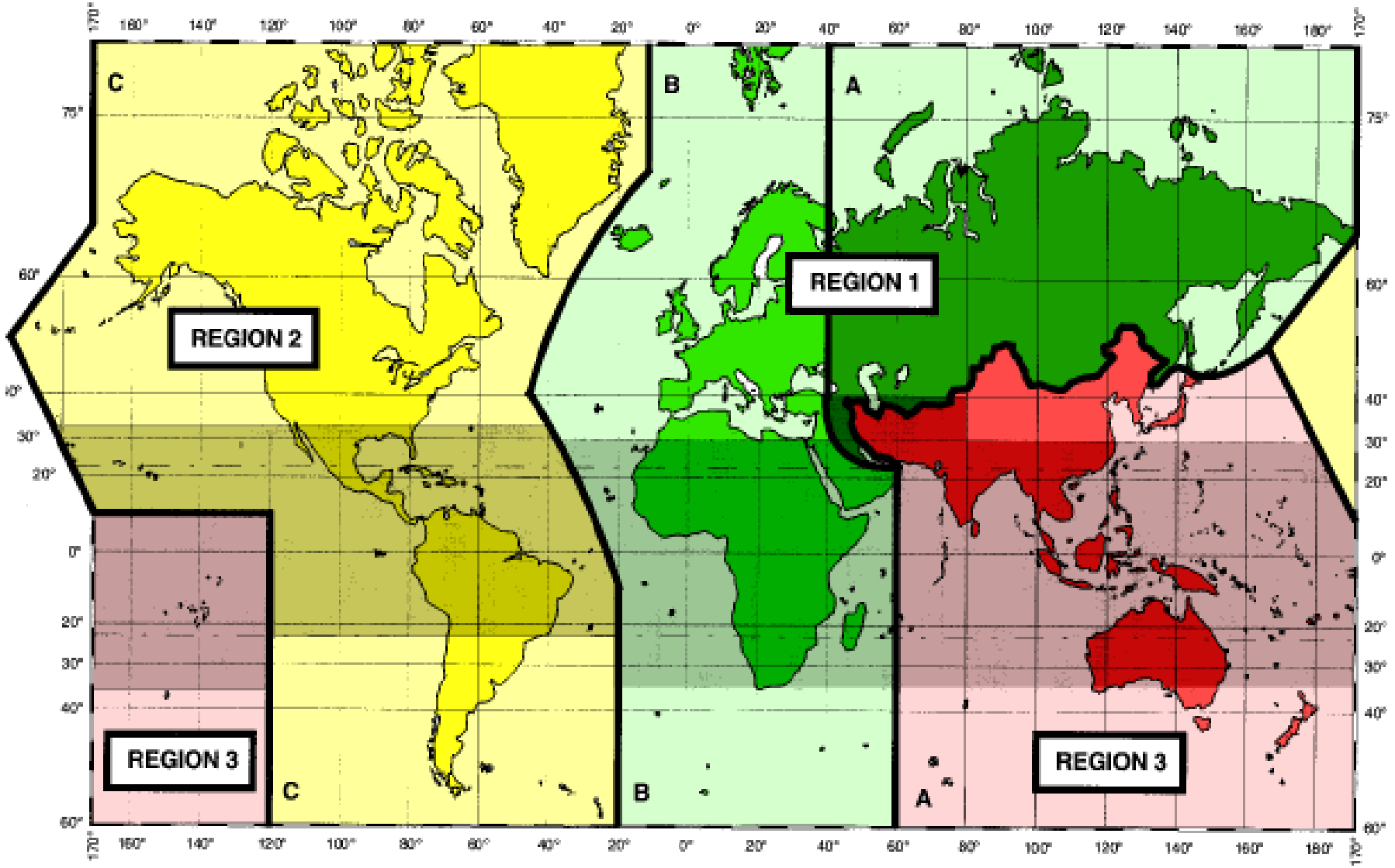
RR: WORLD REGIONS



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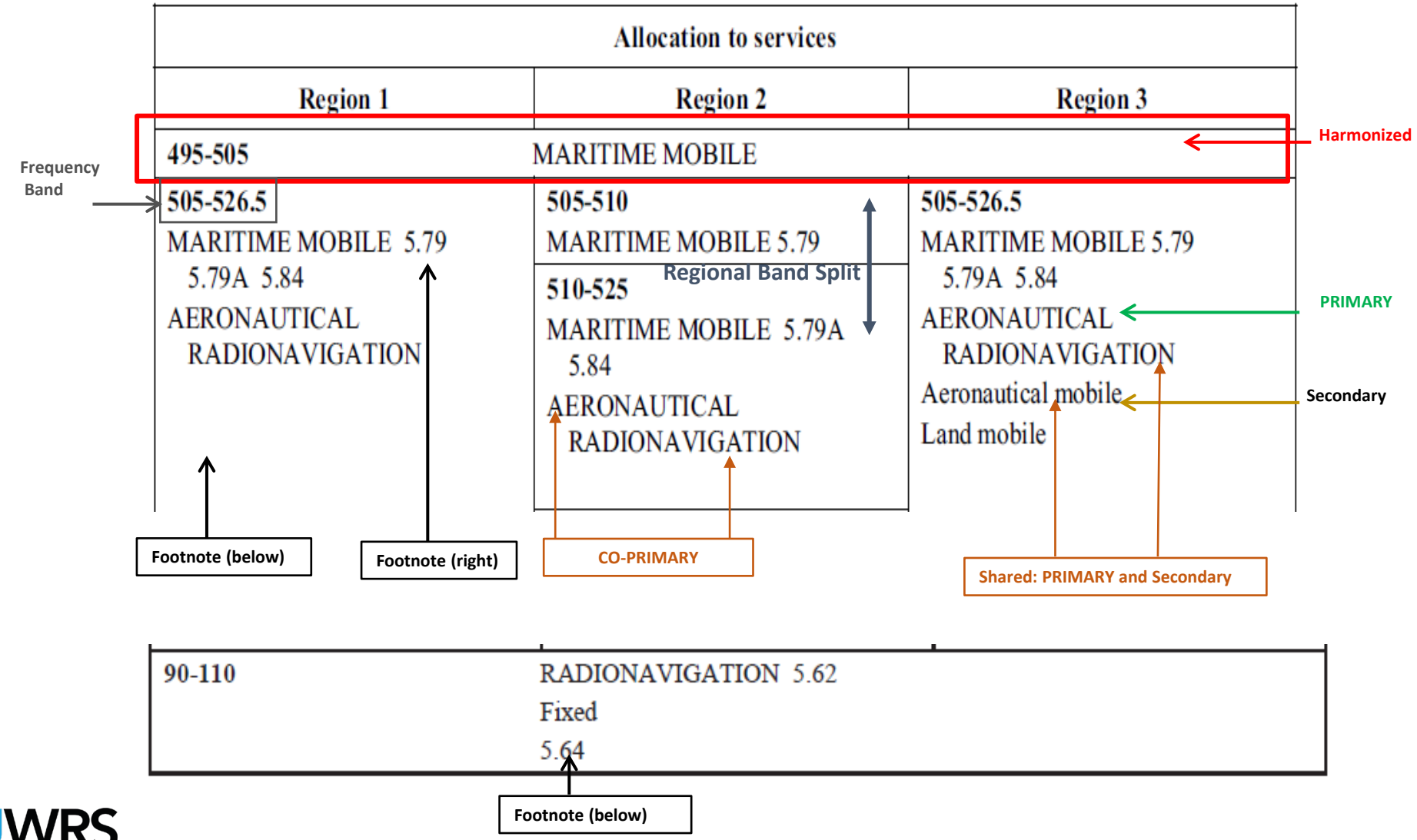
RR: TABLE OF FREQUENCY ALLOCATIONS (Art. 5)



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RR: COUNTRY(ies) FOOTNOTES (Examples*)

137-137.025	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208

FIXED
MOBILE

Different Category of Service:
Same Services
but
Different Categories

137-137.025	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) 5.208A 5.208B 5.209 SPACE RESEARCH (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208

+ BROADCASTING

Additional Allocation:
Same Services
+
More Services

137-137.025	SPACE OPERATION (space-to-Earth) METEOROLOGICAL-SATELLITE (spac MOBILE-SATE E (space-to-Earth) 5 SPACE RESEAR (space-to-Earth) Fixed Mobile except aeronautical mobile (R) 5.204 5.205 5.206 5.207 5.208

X

FIXED
MOBILE
BROADCASTING

ALTERNATIVE Allocation:
Replaces the allocations
indicated in the Table

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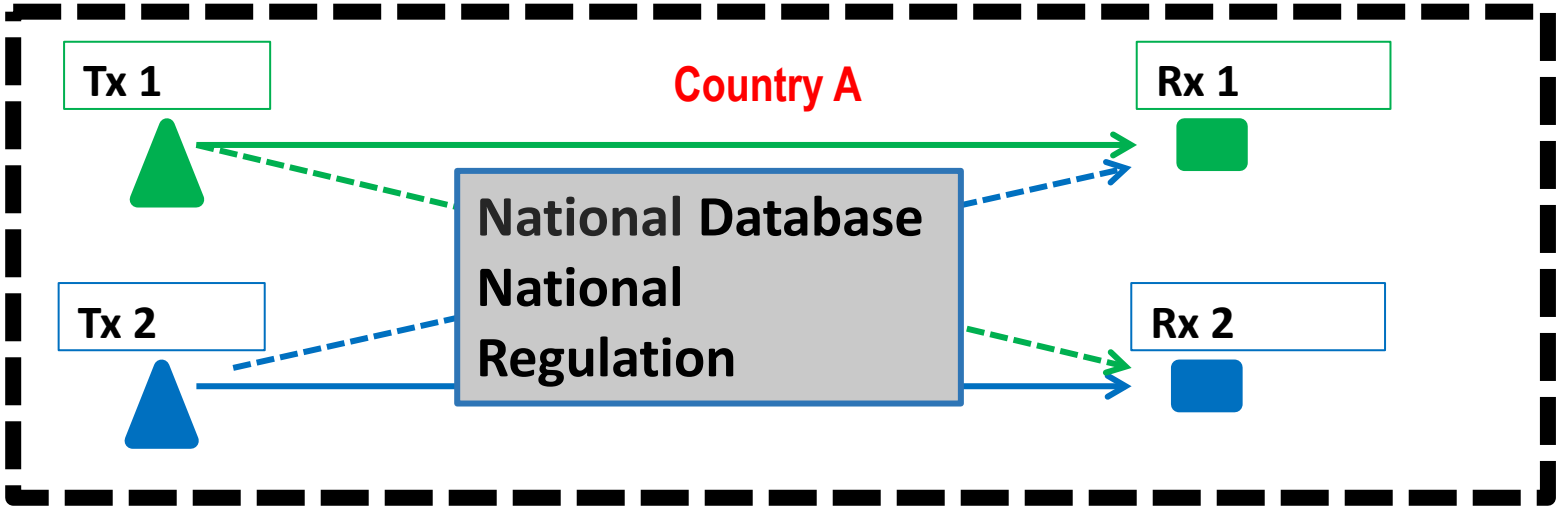
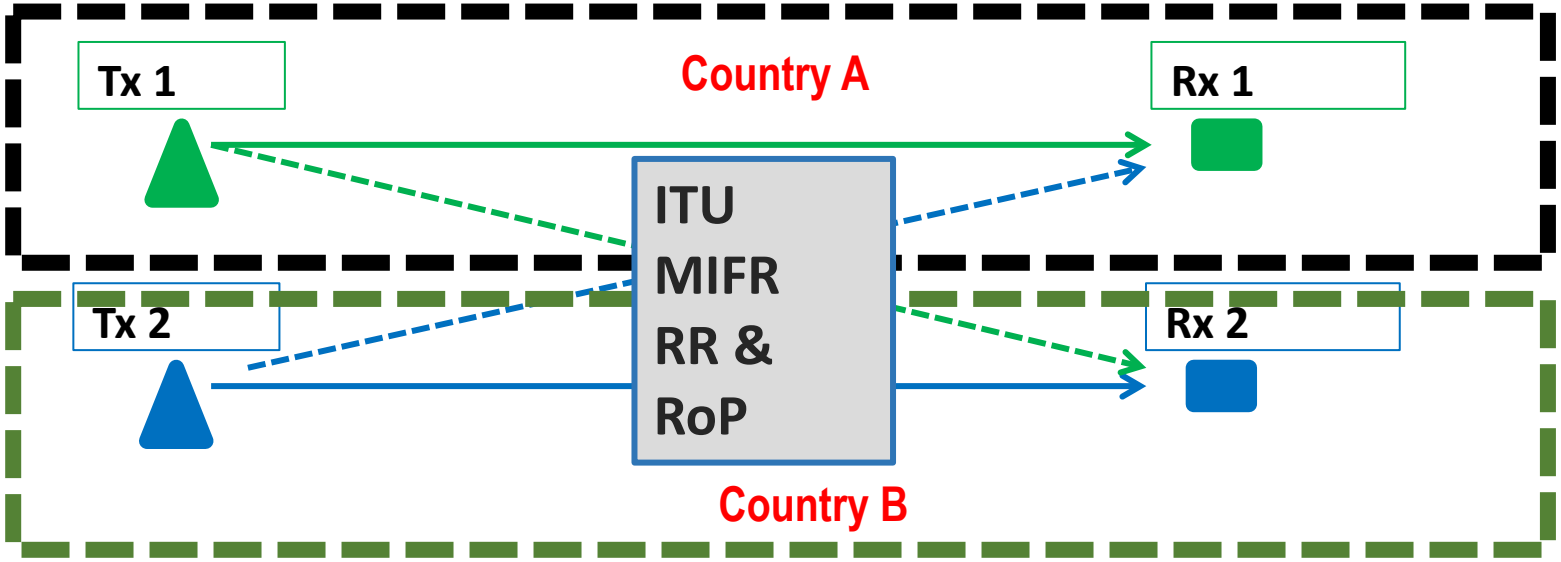
** No actual footnotes, for illustrative purpose only*

STATIONS COORDINATION





RR and Spectrum Management Layers

	National	International
Legal Framework	National Spectrum Laws	ITU Radio Regulations, RR
1. Planing	National table of Frequency Allocations, NFAT	International Table of Frequency Allocations, ITFA (RR, Art. 5)
2. Licensing	National Spectrun Users Database	Master International Frequency Register, MIFR (RR, Art. 8)
3.a. Monitoring	National Monitoring System	International Monitoring System (RR, Art. 16)
3.b. Enforcement	National Regulators	ITU Radiocommunications Bureaux, BR
	National Courts	ITU Radio Regulations Board, RRB

Every SM Layer has both a National and International facet

Every national Layer shall be consistent with the its International pair

ITU has not legal tools to force compliance of RRB decisions…

Thank you!

ITU – Radiocommunication Bureau

Questions to brmail@itu.int or jaquin.restrep0@itu.int

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SPECTRUM AS NATURAL RESOURCE

- Natural Resource: phenomena of nature
- Non-replicable: cannot be reproduced (as agriculture)
- Scarce: quantity of information (Mbps per MHz) that can be transmitted is limited
- Need to be "shared" by stations using same frequency
- Spectrum Management and Regulation aim to guarantee and efficient and rational use of Spectrum, both and national and international levels

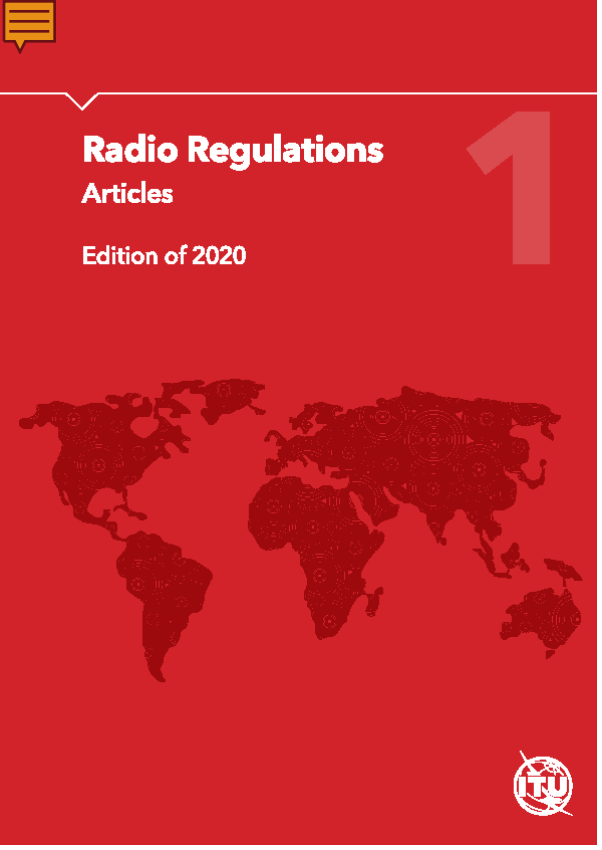
Main goal: prevent and control Interferences: maximize sharing while minimize prejudicing

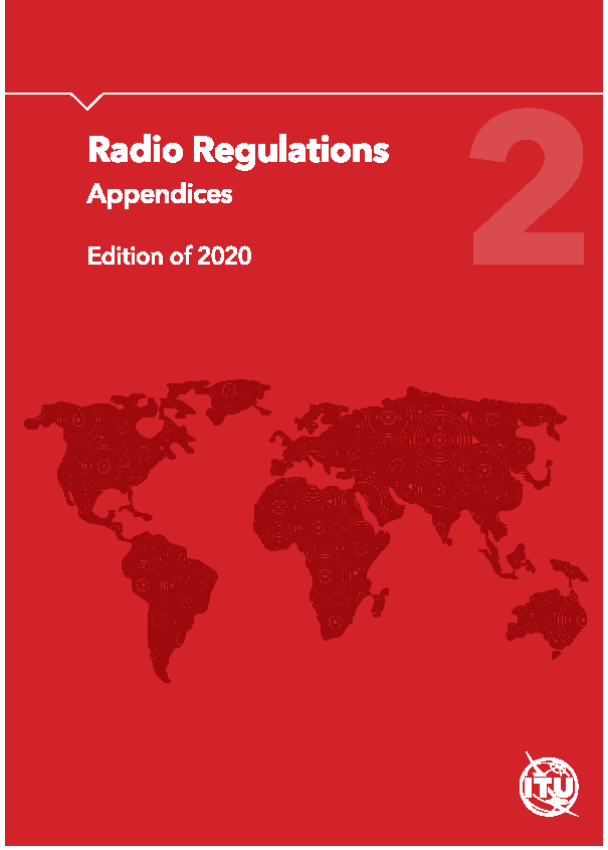
SPECTRUM AS NATURAL RESOURCE

Principles in the Preamble to the Radio Regulations:

"No. 0.3 In using frequency bands for radio services, Members shall bear in mind that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of these Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries (No. 196 of the Constitution)."

"No. 0.4 All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of these Regulations (No. 197 of the Constitution)."





VOLUME 1:
Articles
(59)

VOLUME 2:
Appendices
(23)*

VOLUME 3:
Resolutions (182)*
and
Recommendations (25)*

VOLUME 4:
ITU-R Recommendations
incorporated by reference
(40)*

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* Non-consecutive numbering, some with number and letters

RADIO REGULATIONS: VOLUME 1

CHAPTER I – Terminology and technical characteristics

CHAPTER II – Frequencies

CHAPTER III – Coordination, notification and recording of frequency assignments and Plan modifications

CHAPTER IV – Interferences

CHAPTER V – Administrative provisions

CHAPTER VI – Provisions for services and stations

CHAPTER VII – Distress and safety communications

CHAPTER VIII – Aeronautical services

CHAPTER IX – Maritime services

CHAPTER X – Provisions for entry into force of the Radio Regulations

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RADIO REGULATIONS: VOLUME 3 and 4

RR Resolutions	ITU-R Resolutions
from World Radio Conferences	from Radio Assemblies
Radio Regulations Volume 3 (last version: 2016)	**Book of ITU-R Resolutions (last version: 2016)**
RESOLUTION Number (WRC-year)	RESOLUTION ITU-R Number-Version (year)
RESOLUTION 763 (WRC-15): *Stations on board sub-orbital vehicles* **RESOLUTION 7 (REV. WRC-03):** *Development of national radio-frequency management*	**RESOLUTION ITU-R 69 (2015):** *Development and deployment of international public telecommunications via satellite in developing countries* **RESOLUTION ITU R 11-5 (2015):** *Further development of the Spectrum Management System for Developing Countries*
https://www.itu.int/pub/R-REG-RR-2016	https://www.itu.int/pub/R-VADM-RES/en

RR Recommendations	ITU-R Recommendations
from World Radio Conferences	from Study Groups
Radio Regulations Volume 3 (last version: 2016)	**ITU-R Study Groups**
RECOMMENDATION Number (WRC-year)	RECOMENDATION ITU-R Serie Number-Version (month/year)
RECOMMENDATION 724 (WRC-07): *Use by civil aviation of frequency allocations on a primary basis to the fixed-satellite service* **RECOMMENDATION 34 (REV.WRC-12):** *Principles for the allocation of frequency bands*	**RECOMMENDATION ITU-R SM.2103-0 (09/2017):** *Global harmonization of short-range devices categories* **RECOMMENDATION ITU-R SM.1723-2 (09/2011):** *Mobile spectrum monitoring unit*
https://www.itu.int/pub/R-REG-RR-2016	https://www.itu.int/pub/R-REC

Examples:

16.2 *The international monitoring system ..... in accordance with Resolution **ITU-R** 23 and the most recent version of Recommendation **ITU-R** SM.1139.....*

1.14 *Coordinated Universal Time (UTC): Time scale, based on the second (SI), as described in Resolution 655 (WRC-15).*

5.548 *In designing systems for the inter-satellite service in the band 32.3-33 GHz, ... bearing in mind the safety aspects of the radionavigation service (see Recommendation 707).*

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ITU-R Recommendations Incorporation

List and the end of Vol. 4 → **Cross-reference list of the regulatory provisions, including footnotes and Resolutions, incorporating ITU-R Recommendations by reference**

Recommendation ITU-R	Title of the Recommendation	RR provisions and footnotes with ITU-R Recommendations contained in RR Volume 4
TF.460-6	Standard-frequency and time-signal emissions	No. 1.14 (via Resolution 655 (WRC-15))
M.476-5	Direct-printing telegraph equipment in the maritime mobile service	Nos. 19.83, 19.96A, 51.41
M.489-2	Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz	Nos. 51.77, 52.231, Appendix 18 (*General notes e)*)
M.492-6	Operational procedures for the use of direct-printing telegraph equipment in the maritime mobile service	No. 56.2
P.525-2	Calculation of free-space attenuation	No. 5.444B (via Resolution 748 (Rev.WRC-15))

Compulsory (by incorporation):

- Linked by the expression: "*shall*"
- version explicitly indicated;
- No automatic update*;
- Solely applies to the pertinent item, otherwise, is voluntary

X

Voluntary:

- Linked by the expression: "*should*" or any other text than " shall"
- version is NOT indicated;
- Automatic update ("*most recent version of*")
- Apply to all Recommendations not explicitly cited on the list and item

- **TIP**: NO version = Reference; "-version" : incorporation

ITU-R Recommendations Incorporation: Examples

Voluntary:

16.6 *Administrative ….. of the international monitoring system **should** be in accordance with **the most recent version** of **Recommendation ITU-R SM.1139**.*

21.2.2 *Information on this subject is given in the **most recent version** of **Recommendation ITU-R SF.765***

Incorporated:

19.102 *3) The types of maritime mobile service identities **shall** be as described in Annex 1 of **Recommendation ITU-R M.585-7.***

Be careful!:

19.108A The maritime identification…… Furthermore, as **indicated** in the **most recent version** of **Recommendation ITU-R M.585,** some maritime….

M.585-7 (Annex 1)	Assignment and use of identities in the maritime mobile service	Nos. 19.99, 19.102, 19.111

25.6 *2) Administrations **shall** verify …… Guidance for standards of **competence may be found** in **the most recent version** of **Recommendation ITU-R M.1544**.*

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ITU-R Recommendations Incorporation

Recommendation P.525

Approved in 2016-11

Managed by R00-SG03

Main			
Number	**Title**	**Status**	**Questions**
P.525-3 (11/2016)	Calculation of free-space attenuation Note - A previous version of this Recommendation is incorporated by reference in the Radio Regulations.	In force **(Main)**	N/A
Previous versions			
Number	**Title**	**Status**	**Questions**
P.525-2 (08/94)	Calculation of free-space attenuation Note - This version of the Recommendation is incorporated by reference in the Radio Regulations.	Superseded	N/A

Updating of ITU-R Recs on Vol 4 shall be decided by WRCs (**no** automatic update!)

* WRC-19 a.i. 2: *to examine the revised ITU-R Recommendations incorporated by reference in the Radio Regulations communicated by the Radiocommunication Assembly, in accordance with Resolution 28 (Rev.WRC-15), and to decide whether or not to update the corresponding references in the Radio Regulations, in accordance with the principles contained in Annex 1 to Resolution 27 (Rev.WRC-12)*

RADIO REGULATIONS: KEY DEFINITIONS

Services and Stations:

RR, No. 1.3 Telecommunication: *Any transmission, emission or reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems*

RR , No. 1.4 radio: *A general term applied to the use of radio waves.*

RR, No. 1.5 Radio waves (or hertzian waves): *Electromagnetic waves of frequencies arbitrarily lower than 3000 GHz, propagated in space without artificial guide*

RR, No. 1.19 Radiocommunication service: *A service involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes.*

In these Regulations, unless otherwise stated, any radiocommunication service relates to terrestrial radiocommunication

RR, No. 1.61 Station: *One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service*

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RR: Radioelectric Services

***1.116* public correspondence:** *Any telecommunication which the offices and stations must, by reason of their being at the disposal of the public, accept for transmission (CS). [CS 1004]*

***1.7* terrestrial radiocommunication:** **Any** radiocommunication other than space radiocommunication or radio astronomy.

***1.8* space radiocommunication:** **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.

***1.20* fixed service:** A radiocommunication service between specified fixed points

***1.38* broadcasting service:** A radiocommunication 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 (CS). [CS 1010]

RR: Radioelectric Services

***1.24* mobile service:** A radiocommunication service between mobile and land stations, or between mobile stations (CV).)[CV 103] *

***1.26* land mobile service:** A mobile service between base stations and land mobile stations, or between land mobile stations.

***1.28* 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 radiobeacon stations may also participate in this service.

***1.32* 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 radiobeacon stations may also participate in this service on designated distress and emergency frequencies.

- The mobile service covers by default: land, aeronautical, maritime
- In general for maritime services: "*Messages which are of a public correspondence nature shall be excluded from this service*"
- (and aeronautical?: aeronautical mobile (R)* service: …reserved for communications relating to safety and regularity of flight, …

RR: Radio Stations and Systems

***1.61* station**: One or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service, or the radio astronomy service.

***1.64* space station:** A station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere.

1.62 terrestrial station: A station effecting terrestrial radiocommunication.
In these Regulations, unless otherwise stated, any station is a terrestrial station

***1.63* earth station:** A station located either on the Earth's surface or within the major portion of the Earth's atmosphere and intended for communication:
– with one or more space stations; or
– with one or more stations of the same kind by means of one or more reflecting satellites or other objects in space.

***1.69* land station:** A station in the mobile service not intended to be used while in motion.

RR	English	Français	Español	tip
1.62	Terrestrial Station	Station de Terre	Estación Terrenal	not Space
1.63	Earth Station	Station Terrienne	Estación Terrena	link Earth <--> Space
1.69	Land Station	Station Terrestre	Estación Terrestre	not Maritime nor Aeronautical

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RR: Radio Stations and Systems

***1.66* fixed station:** A station in the fixed service

***1.85* broadcasting station:** A station in the broadcasting service.

***1.67* mobile station:** A station in the mobile service intended to be used while in motion or during halts at unspecified points.

1.73 land mobile station: A mobile station in the land mobile service capable of surface movement within the geographical limits of a country or continent

***1.77* ship station:** A mobile station in the maritime mobile service located on board a vessel which is not permanently moored, other than a survival craft station.

***1.83* aircraft station:** A mobile station in the aeronautical mobile service, other than a survival craft station, located on board an aircraft

RR: Services and Stations

RR defines 41 radio services (Vol. I, Section III: 1.20 to 1.60). They can be grouped according to several parameters, such as:

1. **Link**: Earth (Earth-Earth), Space (Earth <--> Space, Space-Space)
2. **Service area**: land (land), sea (maritime), air (aeronautical)
3. **User Profiles**:

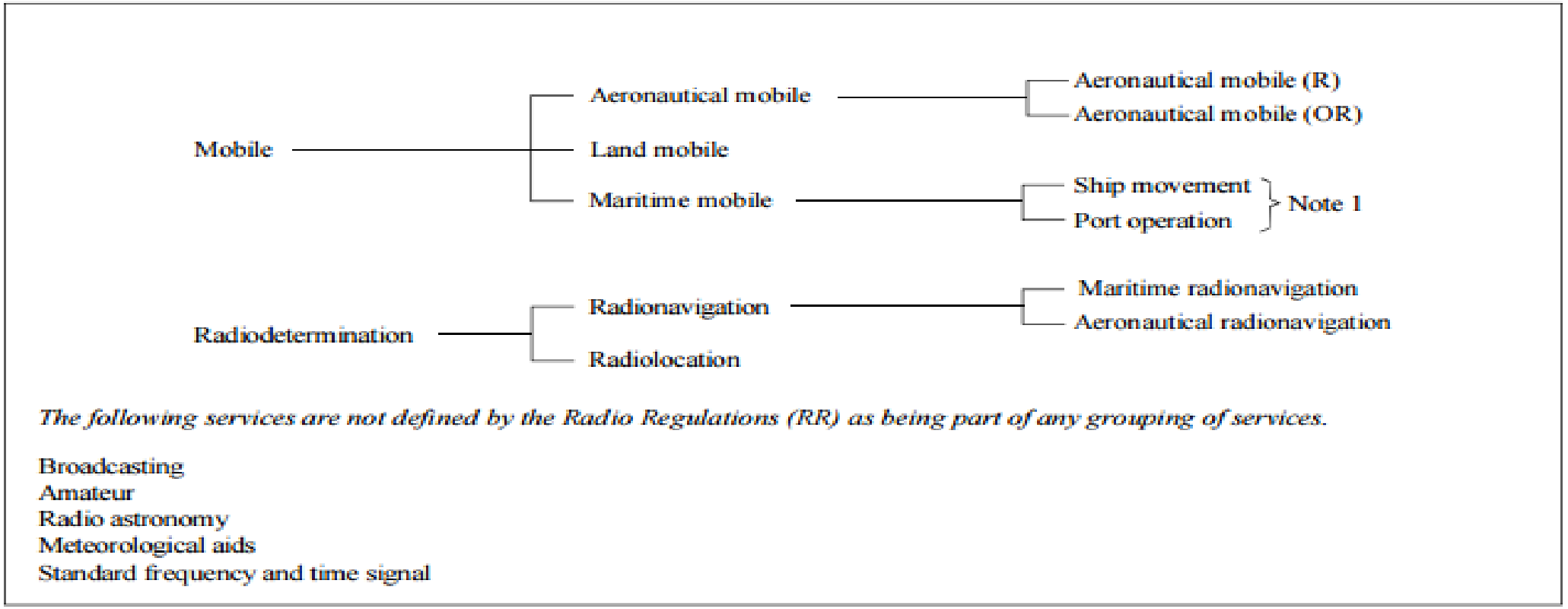
- Public Correspondence : fixed, mobile communications, broadcasting
- Specialized: aeronautics; maritime, meteorological; observation of the Earth; scientific time standard; astronomy; safety; specials etc

The RR defines 53 radio stations (Vol. I, Section IV: 1.61 to 1.115). They can be grouped according to the same parameters of the radio services

53 kinds of stations and 41 kinds of services: some stations simultaneously involve more than one service

RR: RADIO SERVICES

Terrestrial services



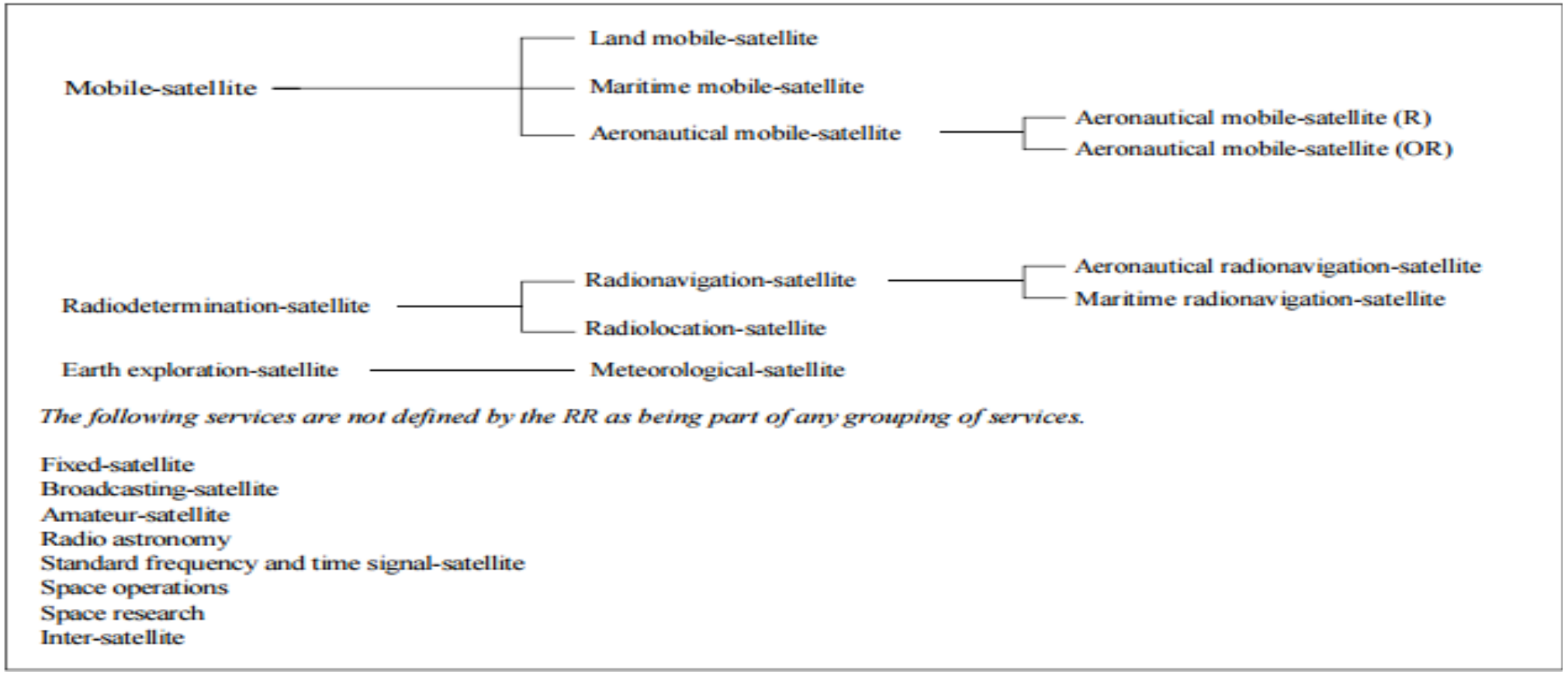
The following services are not defined by the Radio Regulations (RR) as being part of any grouping of services.

Broadcasting
Amateur
Radio astronomy
Meteorological aids
Standard frequency and time signal

Note 1 - The ship movement and port operation services are not subject to any table allocations. They are referred to in RR Appendix 18.

RR: RADIO SERVICES

Space services



RR: Other concepts

***1.60* special service:** A radiocommunication service, not otherwise defined in this Section, carried on exclusively for specific needs of general utility, and **not open** to public correspondence.

***1.15* industrial, scientific and medical (ISM) applications** (of radio frequency energy): 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 telecommunications.

ISMs are not defined as radio service; therefore they do not have frequency Allocations within the main Table (Art. 5); they rather have "*designations*" through footnotes, with their explicit associated restrictions

15.13 *Administrations shall take all practicable and necessary steps to ensure that radiation from equipment used for industrial, scientific and medical applications is minimal and that, outside the bands designated for use by this equipment, radiation from such equipment is at a level that does not cause harmful interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the provisions of these Regulations*

RR: CLASSES OF INTERFERENCES

RR, No. 1.167 permissible interference: *Observed or* ***predicted*** *interference which* ***complies*** *with quantitative interference and sharing criteria contained in these* ***Regulations or in ITU-R Recommendations*** *or in special agreements as provided for in these Regulations.*

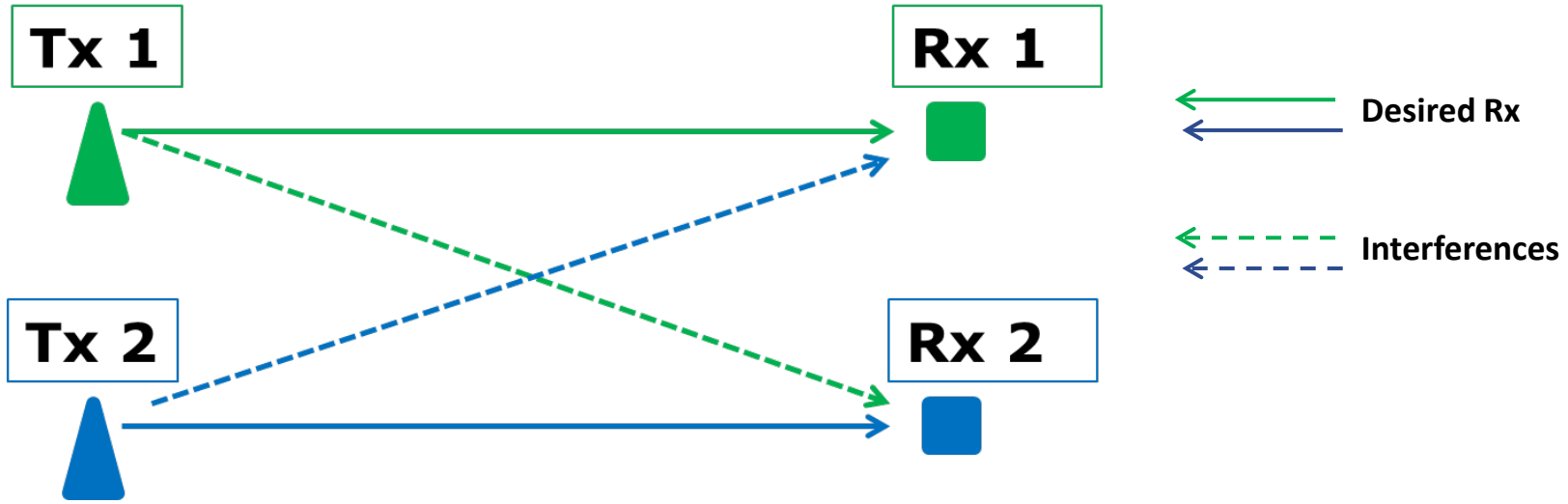
RR, No. 1.168 accepted interference: *Interference at a higher level than that defined as permissible interference and which has been* ***agreed upon*** *between two or more* ***administrations*** *without prejudice to other administrations.*

RR, No. 1.169 harmful interference: *Interference which* ***endangers*** *the functioning of a radionavigation service or of other safety services or seriously* ***degrades, obstructs, or repeatedly interrupts*** *a radiocommunication service operating in accordance with Radio Regulations (CS).*

In Spectrum Management and Regulation, the use of the expression: "Interference" refers by default to "harmful interference"

RR: INTERFERENCES

***RR, No. 1.166 interference**: The effect of unwanted energy due to one or a combination of emissions, radiations, or inductions upon reception in a radiocommunication system, manifested by any performance degradation, misinterpretation, or loss of information which could be extracted in the absence of such unwanted energy.*



A Rx may **face many interferences sources**: **intra-band** (same or other services); **adjacent bands**/services; permanent and intermittent; fixed or mobile source; **unintentional and intentional**; **current and futures**, etc.

CS: harmful interference (Art. 45)

197 1 *All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Member States or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of the Radio Regulations*.

198 2 *Each Member State undertakes to require the operating agencies which it recognizes and the other operating agencies duly authorized for this purpose to observe the provisions of No. 197 above.*

199 3 *Further, the Member States recognize the necessity of taking all practicable steps to prevent the operation of electrical apparatus and installations of all kinds from causing harmful interference to the radio services or communications mentioned in No. 197 above*

RR Art. 15: Interferences

Section I – Interference from Radio Stations
Section II – Interference from electrical apparatus and installations of any kind except equipment used for industrial, scientific and medical applications
Section III – Interference from equipment used for industrial, scientific and medical applications
Section IV – Tests
Section VI – Procedure in a case of harmful interference
Section V – Reports of Infringements

RR: FREQUENCY MANAGEMENT (Sect. II)

***RR, No. 1.16 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 terrestrial or space radiocommunication **services** or the radio astronomy service under specified conditions. This term shall also be applied to the frequency band concerned.*

RR, No. 1.17 allotment (of a radio frequency or radio frequency channel): Entry of a designated frequency channel in an agreed plan, adopted by a competent conference, for use by one or more administrations for a terrestrial or space radiocommunication service in one or more identified countries or geographical areas and under specified conditions.

* Regulators commonly refer to : International Table of Frequency Allocations, IFTA, to easily remind its links to their national counterpart: National Table of Frequency Allocations, NFTA

RR: FREQUENCY MANAGEMENT

RR, No. 1.18 assignment (of a radio frequency or radio frequency channel) *: Authorization given by an administration for a radio station to use a radio frequency or radio frequency channel under specified conditions.*

Allocations are granted to Radiocommunications **Services**

Assignments are granted to Radiocommunications **Stations**

RR in general does not deal with Assignments*, because it is an sovereign and autonomous right of administrations

However, national Station Assignments shall be consistent with its NTFA and also the RR (No. 4.4) e.g.: assignment of a TV Station, only into a band allocated to Broadcasting Services

* Due to their inherent international coverage nature, some services in some bands need that their allotment be also accompanied by an international assignment of their associated stations (so called: Planned Bands, contained on Vol. 2: Appendices)

RR: Allocations vs. Assigments

Art. 4.4: *Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations.*

Frequency distribution to	French	English	Spanish	Arabic	Chinese	Russian
Services	Attribution (attribuer)	Allocation (to allocate)	Atribución (atribuir)	توزيع (يوزع)	划分	распределение (распределять)
Areas or countries	Allotissement (allotir)	Allotment (to allot)	Adjudicación (adjudicar)	تعيين (يعين)	分配	выделение (выделять)
Stations	Assignation (assigner)	Assignment (to assign)	Asignación (asignar)	تخصيص (يخصص)	指配	присвоение (присваивать)

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NOTE: Most of dictionaries display the expressions "**Allocation**" and "**Assignment**" as being **synonymous**; in the context of Spectrum Management and Regulation **they are different**.

RR: Table of Frequency Allocations

5.25 a) services in "**CAPITAL CASE**" (example: FIXED) are **"primary"** category (primary basis)

5.26 b) services in **"**Normal cases**"** (example: Mobile) are "**secondary**" category (secondary basis)

5.48 3) services are listed by **category** then **in alphabetical order** according to the **French** language. **The order of listing does not indicate relative priority** within each category.

5.50 5) The footnote references which appear in the Table **below** the allocated service or services apply to **more than one of the allocated services**, or to the whole of the allocation concerned.

5.51 6) The footnote references which appear to the **right** of the name of a service are **applicable only to that particular service**.

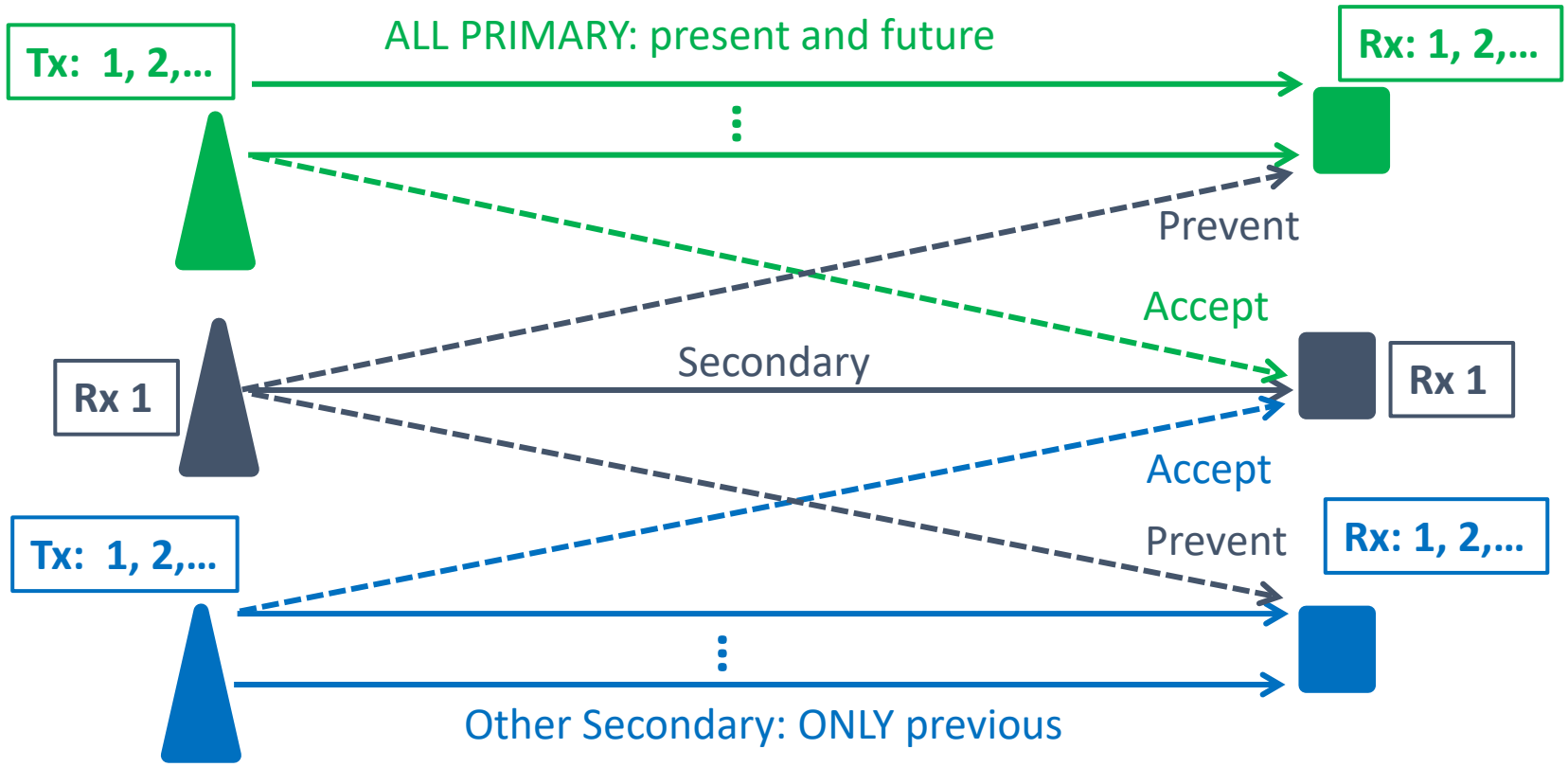
Frequency Bands

Band number	Symbols	Frequency range (lower limit exclusive, upper limit inclusive)	Corresponding metric subdivision
4	VLF	3 to 30 kHz	Myriametric waves
5	LF	30 to 300 kHz	Kilometric waves
6	MF	300 to 3 000 kHz	Hectometric waves
7	HF	3 to 30 MHz	Decametric waves
8	VHF	30 to 300 MHz	Metric waves
9	UHF	300 to 3 000 MHz	Decimetric waves
10	SHF	3 to 30 GHz	Centimetric waves
11	EHF	30 to 300 GHz	Millimetric waves
12		300 to 3 000 GHz	Decimillimetric waves

NOTE 1: "Band N" (N = band number) extends from 0.3×10^N Hz to 3×10^N Hz.

NOTE 2: Prefix: k = kilo (10^3), M = mega (10^6), G = giga (10^9).

RADIO REGULATIONS: CATEGORIES OF SERVICES



NI/NP: No interference to / No Protection from

Countries Footnotes format

Footnote shall indicate:

- Area or countries
- Frequency range (could be all or a part of concerned band)
- Type of allocation change (different category; additional; alternative)
- Services to modify
- Restriction?

Case 1: no restriction

5.88 Additional allocation: *in **China**, the band **526.5-535 kHz** is **also allocated** to the **aeronautical radionavigation** service on a **secondary basis***.

Case 2: with restriction

5.190 Additional allocation: in **Monaco**, the band **87.5-88 MHz** is **also allocated** to the **land mobile service** on a **primary basis**, **subject to agreement obtained under No. 9.21**.*

Footnotes Restriction

Sub-Section IIA – Requirement and request for coordination

9.6 Before an administration notifies to the Bureau or brings into use a frequency assignment in any of the cases listed below, it shall effect coordination, as required, with other administrations identified under No. 9.27:

……

9.21 p) for any station of a service for which the requirement to **seek the agreement of other administrations** is **included in a footnote** to the Table of Frequency Allocations referring to this provision.

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Different Category of Service

5.32 4) Where a band is indicated in a footnote of the Table as allocated to a service "on a secondary basis" in an area smaller than a Region, or in a particular country, this is a secondary service (see Nos. 5.28 to 5.31).

*5.33 5) Where a band is indicated in a footnote of the Table as allocated to a service "on a primary basis", in an area smaller than a Region, or in a particular country, this is a primary service **only** in that area or country.*

Additional Allocations

5.34 Additional allocations

5.35 1) Where a band is indicated in a footnote of the Table as "also allocated" to a service in an area smaller than a Region, or in a particular country, this is an "additional allocation", i..e. an allocation which is added in this area or in this country to the service or services which are indicated in the Table (see No. 5.36).

5.36 2) If the footnote does not include any restriction on the service or services concerned apart from the restriction to operate only in a particular area or country, stations of this service or these services shall have equality of right to operate with stations of the other primary service or services indicated in the Table.

5.37 3) If restrictions are imposed on an additional allocation in addition to the restriction to operate only in a particular area or country, this is indicated in the footnote of the Table

Alternative Allocations

5.38 Alternative allocations

5.39 1) *Where a band is indicated in a footnote of the Table as "allocated to" one or more services in an area smaller than a Region, or in a particular country, this is an "alternative allocation", i.e. an allocation which replaces, in this area or in this country, the allocation indicated in the Table (see No. 5.40).*

5.40 2) *If the footnote does not include any restriction on stations of the service or services concerned, apart from the restriction to operate only in a particular area or country, these stations of such a service or services shall have an equality of right to operate with stations of the primary service or services, indicated in the Table, to which the band is allocated in other areas or countries.*

5.41 3) *If restrictions are imposed on stations of a service to which an alternative allocation is made, in addition to restriction to operate only in a particular country or area, this is indicated in the footnote*.

Bands Harmonization

NOT HARMONIZED ALLOCATION:

1. **Different Services by Region:** not global scale for terminals; harder border coordination (Regions edges)

2. **Several Primary Services**: countries might adopt different primary services, harder border coordination intra RR Region

3. **Primary and Secondary Services**: countries might allocate services on a different basis onto his territory; international coordination becomes more complex

4. **National Footnotes**: national exemptions, with all the above inconvenient

Bands Harmonization

- Harmonized utilization of spectrum by different nations is an essential need to support international roaming, to facilitate interconnection and to provide more economical radiocommunication services,

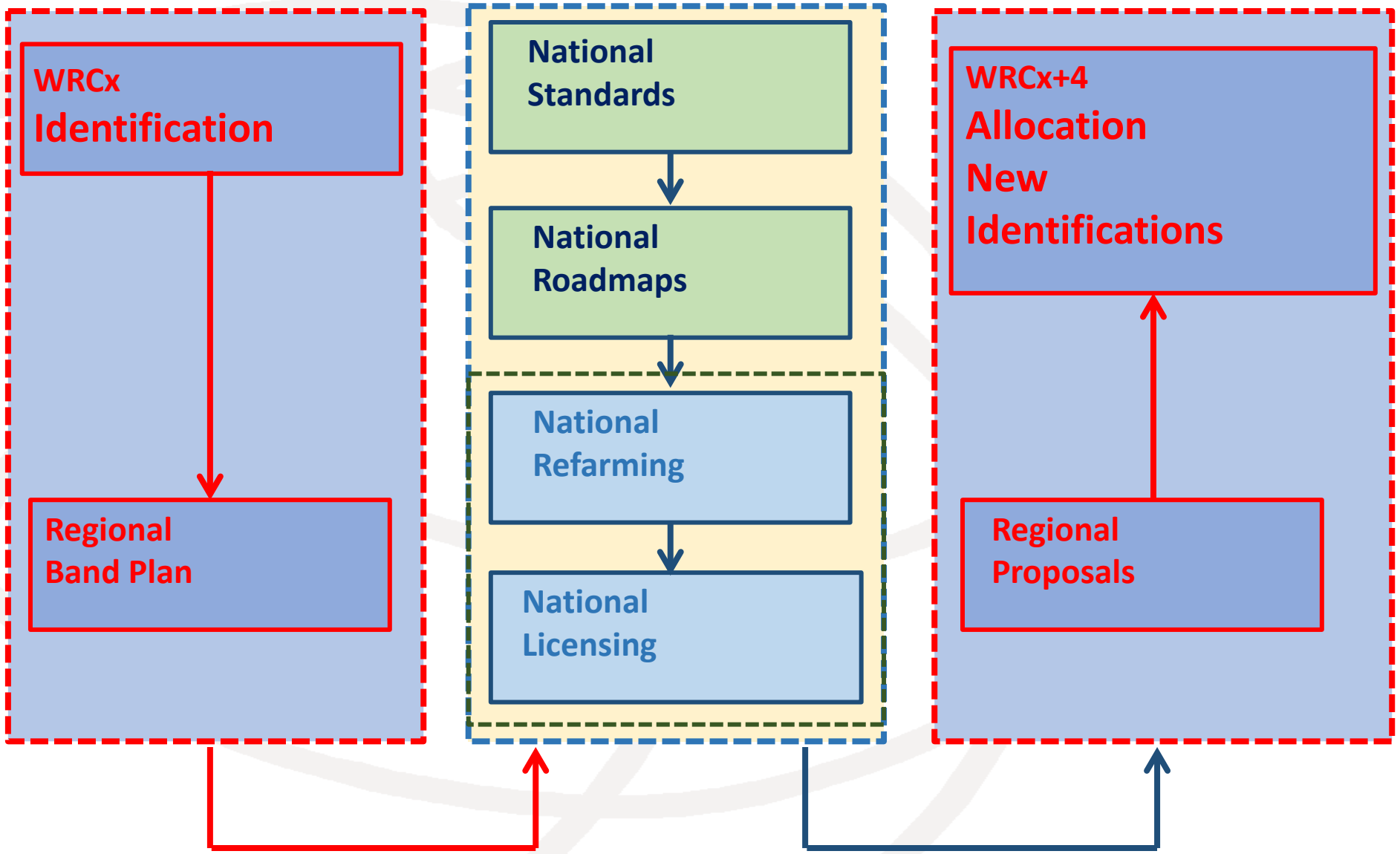
- Frequency bands can be utilized at same point, in same time, almost once while there could be more than one demand for utilization,

- Uncoordinated electromagnetic radiation of individual and independent spectrum users increase interferences matters

Global Harmonization: Ultimate goal (as possible); RR Recommendation 34: *recommends that future world radiocommunication conferences:*

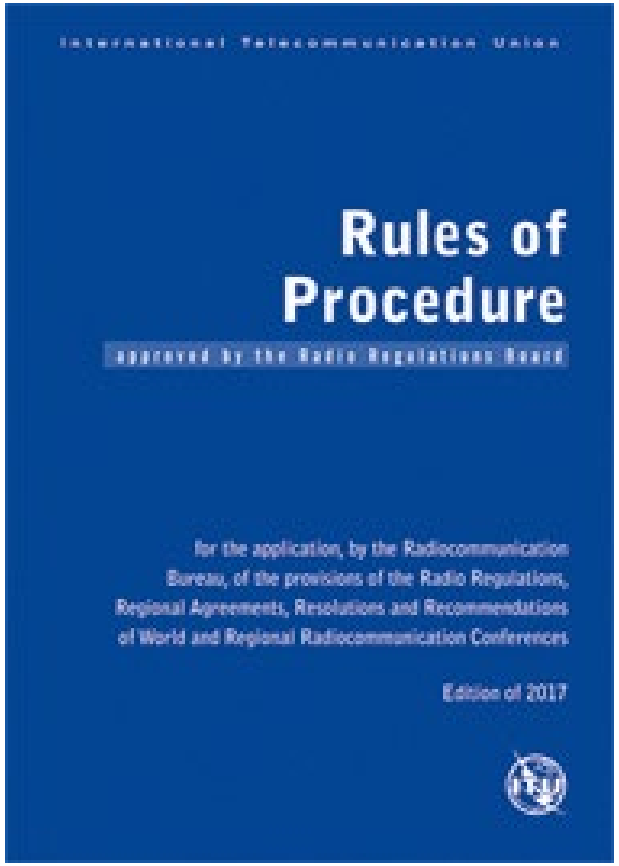
- *2. Should, wherever possible, allocate frequency bands on a worldwide basis (aligned services, categories of service and frequency band limits) taking into account safety, technical, operational, economic and other relevant factors;*
- *3. Should, wherever possible, keep the number of footnotes in Article 5 to a minimum when allocating frequency bands through footnotes, in line with the Resolution 26*

Spectrum Harmonization



ITU-R Rules of Procedure

The Rules of Procedure complement the Radio Regulations (RR) by providing clarification of the application of particular Regulations or establishing the necessary practical procedures that may not be provided for in the current Regulatory Provisions.



RoP are revised at RRB meetings

RoP are free of charge and are available at:

https://www.itu.int/pub/R-REG-ROP/en

RR : Rules of Procedure, RoP

The Rules of Procedure (RoP) complement the Radio Regulations (RR) by providing clarification of the application of particular Regulations or establishing the necessary practical procedures that may not be provided for in the current Regulatory Provisions.

Example:

In appliance of provision 4.5 (RR)

4.5 The frequency assigned to a station of a given service shall be separated from the limits of the band allocated to this service in such a way that, taking account of the frequency band assigned to a station, no harmful interference is caused to services to which frequency bands immediately adjoining are allocated.

it shall be followed the associated procedure (RoP)

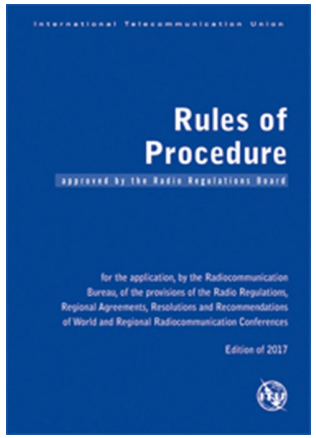
4.5

1 The application of this provision involves the case of an adjacent band not allocated to the service concerned as well as the case of an adjacent band allocated to the service concerned with a different category of allocation.

1.1 A frequency assignment, of which the assigned frequency band overlaps a band not allocated to the service concerned, shall receive an unfavourable regulatory finding under No. **11.31**.

1.2 A frequency assignment, of which the assigned frequency band overlaps a band allocated with a lower category of service will be considered as having the lower category of service and, when recorded, will bear a symbol to this effect. (See Symbols R and S in Table 13B, Column 13B2, of the Preface to the IFL.)

2 To resolve cases of harmful interference between services in adjacent bands it was decided that, irrespective of the phenomena at the origin of the interference (out-of-band emission, intermodulation products, etc.), the administration responsible for the emission overlapping a non-allocated band shall use appropriate means to eliminate the interference.



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ITU-R Rules of Procedure

RoP are to be used by administrations and the BR in applying the Radio Regulations. The RoP have three main parts:

- **Part A:** Rules relating to a provision of the **Radio Regulations**, or a limited number of them
- **Part B:** Rules relating to a process such as the technical examinations
- **Part C**: Rules relating to internal working methods of the Radio Regulations Board (RRB)

STATIONS REGISTRATION

Stations protection cannot be “in abstract”

Stations shall be duly registered, with their technical parameters, and other issues:

- Nationally: National Spectrum Users Database
- Internationally: ITU Master Innal. Frequency Register, MIFR

Interference situations need to be objectively analyzed, and measured

- Nationally: Application of Spectrum National Rules
- Internationally: Application of provisions on RR and RoP

Regulatory actions to prevent/cease Interference situations can only be conducted if alleged affected stations are duly registered (Stations protection cannot be “in abstract”)

MIFR provisions (RR Art. 8)

RR, No.8.1. *International rights and obligations of administrations in respect to frequency assignments shall be derived from the recording of those in the* ***Master International Frequency Register*** *(****Master Register****) or from their conformity, where appropriate, with a plan*

RR, No. 8.3. *Frequency assignments* ***recorded*** *in the Master Register with a favourable finding have the* ***right to international recognition***

RR, No. 8.4 *A frequency assignment shall be known as a non-conforming assignment when it is not in accordance with the Table of Frequency Allocations or the other provisions of these Regulations.*

RR, No. 8.5 *If harmful interference to the reception of any station whose assignment is in accordance with No. 11.31 is actually caused by the use of a frequency assignment which is not in conformity with No. 11.31, the station using the latter frequency assignment must, upon receipt of advice thereof, immediately eliminate this harmful interference*

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MIFR: what to notify?

1. Any frequency assignment (new entry or change of one recorded on the MIFR; **RR, No. 11.1**) relating to a transmitting station and to its associated receiving stations :

a) Capable of causing harmful interference to any service of another administration (RR, No. 11.3)

b) Used for International radiocommunication (RR, No. 11.4)

c) Subject to world or regional frequency allotment or assignment plan which does not have its own notification procedure (RR, No. 11.5)

d) Subject to the Art. 9 coordination procedure (RR, No. 11.6)

e) Requesting international recognition (RR, No. 11.7)

f) Non-conforming assignments: for information only* (RR, No. 11.8):

2. Receiving earth station or space station

3. Receiving HAPS stations in Fixed service in some Bands (RR, Nos. 5.543A & 5.52A)

4. Land station for reception from mobile stations
   - Involved Transmitting Stations: if apply any case from *a)* to *f)*
   - Involved Receiving Stations: if apply *b) c)* and *e)*

5. Used for reception of a radio astronomy station (if desired; RR, No. 11.12)

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**Its operation shall not cause harmful interference to, and not claim protection from* (RR, No. 8.4)

MIFR: what NOT to notify?

1. Assignments involving specific frequencies which are prescribed by RR for common use by terrestrial stations of a given service (RR, No. 11.13)*
2. Assignments to (RR, No. 11.14):
   a) Ship stations
   b) Mobile stations of other services
   c) Stations in amateur service
   d) Earth stations in amateur-satellite service
   e) Broadcasting Stations subject to a seasonal planning (Frequency range: 5900 to 26100 KHz; RR, Art. 12)

* Entered in MIFR directly by BR; consolidated table published in the Preface to the BR IFIC (RR, Chapter VI)

BRIFIC

The BR International Frequency information Circular (**BR IFIC**) is intended to provide information on the frequency assignments/allotments submitted by administrations to the BR for recording in the Master International Frequency Register (MIFR) and Plans.

The BR IFIC is published once every two weeks by the BR (RR, Nos. 20.1 to 20.6 and 20.15). The BR IFIC is issued in the 6 UN languages: Arabic, Chinese, English, French, Russian and Spanish.

Due to the large volume of data, the BR IFIC is published in two parts: Terrestrial Services and Space Services. BR IFIC web sites:

- Terrestrial: http://www.itu.int/en/ITU-R/terrestrial/brific/Pages/default.aspx
- Space: http://www.itu.int/en/ITU-R/space/Pages/brificMain.aspx

BRIFIC CONTENT

- Preface: It contains basic guidelines for it use
- The BR IFIC is a reference publication for Frequency Managers.
- List of Assignments recorded in the MIFR with a favourable finding have the right to international recognition (RR, No. 8.3).
- Acknowledgement of receipt for the notifying administration.
- Coordination with administrations of neighbouring countries.
- One copy of the BR IFIC is distributed free of charge to every administration
- It is essential to consult the BR IFIC regularly.

LICENSES

RR, Art 18: Licenses

***RR, No. 18.1*: *No transmitting station** may be established or operated by a private person or by any enterprise ***without a licence** issued in an appropriate form and in conformity with the provisions of ***these Regulations** by or on behalf of the government of the country to which the station in question is subject (however, see Nos. 18.2, 18.8 and 18.11).*

Central provision of the RR: enables **recognition** of spectrum uses and their **protection** against harmful interference, at **national** and **international** level.

The international recognition requires the entry into the MIFR.

"Unlicensed Devices"

Expressions: "*unlicensed*", "*license exempt*", "*blanket licenses*" etc., refer to radio devices with transmitting capabilities (emitting radio waves) that can be operated by any person, **without** obtaining previously a **particular authorization** for it (no particular assignment/license).

This waiving is possible because the operation of such "unlicensed devices" has been authorized to all public through a Generic Authorization, (also named General License, Blanket License, etc.) that includes the set of technical and operational specifications to be strictly obeyed when operating such devices, in order to guarantee their use without interfering to other services or similar devices.

Every "*unlicensed device*" shall be pre set-up to obey its ruling specifications, enabling to operate without adjustments performed by its final user; they are commonly labeled as "*X compliant*" to indicate to buyers its alignment with concerned ruling.

The expression "unlicensed" shall not be misinterpreted as permission to operating these devices in a free will fashion; its operation must strictly observe its ruling. Any alteration to exceed authorized pre setup parameters is an infringement of that ruling.

“Unlicensed Devices”

They shall share frequencies in a regime of “***non-interference/non-protection basis***”:

- With stations on allocated services (primary or secondary; present or future)
- other similar devices (all of them with equally rights, i.e., none of them having **any priority**)

Unlicensed devices DON’T operate on a secondary basis (no first come –first served protection)

Without a limit to the amount of devices operating simultaneously in a same area, a minimum bandwidth cannot be guaranteed (hence, neither QoS)

As they are not protected and shall not interfere, they are not registered on Spectrum Users Databases: National, or International (MIFR)

Microsatellites

They are space stations, and subject to international regulations

Radiocommunication space station:
Subject to the provisions of the ITU Radio Regulations

Object thrown into space:
Subject to the provisions of the Space Law Treaties of the Commission for the Peaceful Uses of Outer Space (COPUOS)

The monitoring of these standards allows these projects, and the states involved, their harmonious operation without causing, or being affected by, risks to other existing systems.

RR and Spectrum Management (SM)

Spectrum Management (SM) is a *combination of administrative and technical activities for efficient utilization of spectrum by users without causing harmful interference in their service area*. SM goals include:

- making the radio spectrum available for government and non-government uses to stimulate social and economic progress
- making efficient and effective use of the spectrum

SM has 3 main layers:

1. **Planning:** Defining the use of different bands: Allocations to services: National Table of Frequency Allocations, NTFA → should be coherent with ITFA (Art. 5 of RR)
2. **Licensing:** Authorizing of emissions, and technical conditions: Assignments to Stations (Licenses). Licenses are registered in a National Frequency Register → those requiring international recognition should be registered in ITU MIFR
3. **Monitoring & Enforcement:** Verifying the use of spectrum in conformity with licenses conditions; preventive and corrective measures: National Monitoring System

http://web.itu.int/dms_pay/itu-r/opb/hdb/R-HDB-21-2015-PDF-E.pdf

RR AND NATIONAL SPECTRUM MANAGEMENT

RR is applied on the international context; for national issues, each country should apply its national framework. National spectrum regulations use to "replicate" RR concepts provisions, adopting them into their legal framework, including:

- **Allocations**:

IFTA is based on "technologic neutrality basis".

NTFA, shall be consistent with ITFA in particular its Region, and footnotes including that country

NFTA may include channeling Plans. They are free to associate allocations to applications and/or technologies

- **Licenses(assignments):**

Authorizations to stations, fixing specific conditions, e.g., RF Power, coverage. Also regulatory and financial conditions, as: timeline terms, spectrum fees, etc.

A Spectrum Users Database shall storage and process Licensing information (duly tuned with NTFA); this Database shall be consistent with MIFR, in special with stations potentially interfering/being interfered to/from stations under jurisdiction of other countries

All stations shall be licensed prior to operate (RR, Art. 18)

RR Art 5 vs NFAT and NSDB

	International	National
Allocations:	RR Art. 5:	National Table of Frequency Allocations, NFAT
Allotments	RRS Vol. 2	National Technical Plans
Assignments	MIFR	National Frequency Register, NFR

What if:

1. **Services within RR** (including footnotes), **but not yet a National deployment:**

- Not allocated (not in NFAT; e.g., RR FIXED and MOBILE; NFAT: only FIXED)
- Allocated but not allotted (No Technical Plans)
- Allocated and Allotted, but not Licensed (Not in NFR)

1.a. Primary

No contradictions with RR, although it might be important *vis a vis* current primary and secondary services duly inform about the long-term plans of such primary services not yet implemented. Missing services at national level shall be recognized on international coordination matters.

RR Art 5 vs NFAT and NFR

1.b. Secondary

No contradictions with RR; as they shall operate in:

- NP/NI to Primary Stations
- 1st come 1st served vis a vis other secondary stations

No contradictions with RR; they can be implemented at any time without impact on primary stations (current, planned) nor current secondary ones.

2. Service in NFAT different than on the RR:

It shall be duly registered trough pertinent RR footnotes:

- Different category of service
- Additional services
- Alternative services

RR Art 5 vs NFAT and NFR

Example 1:

RR:	FIXED	MOBILE	Broadcasting	Mobile-Satellite
NFAT:	FIXED		Broadcasting	

No contradiction

Example 2:

RR:	FIXED	MOBILE	Broadcasting	Mobile-Satellite
NFAT:	FIXED		**BROADCASTING**	

Footnote: Different Category

Example 3:

RR:	FIXED	MOBILE	Broadcasting	Mobile-Satellite
NFAT:	FIXED	MOBILE	Broadcasting	Mobile-Satellite **Fixed-Satellite**

Footnote: Additional Allocation

Example 4:

RR:	FIXED	MOBILE	Broadcasting	Mobile-Satellite
NFAT:	FIXED		Broadcasting	**Fixed-Satellite**

Footnote: Alternative Allocation

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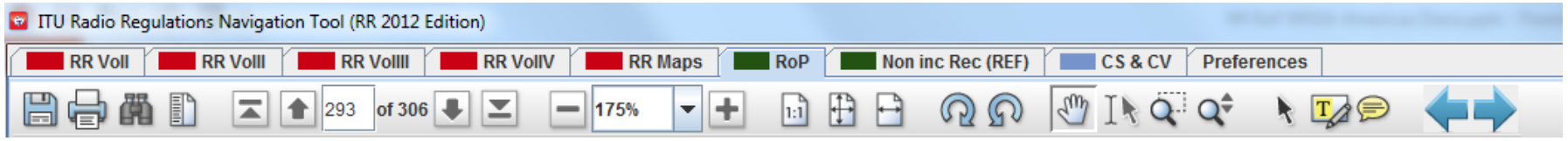
Radio Regulations (RR)

- Spectrum cannot be confined to a given territory
- RR is an international treaty and should be considered by national administrations
- Stations should be duly registered to be protected
- International harmonization brings many advantages for Administrations (facilitates coordination, roaming, allows for economies of scale)

Radio Regulations Navigation Tool

The Radio Regulations Navigation Tool is a Java application dedicated to the browsing among the provisions of the following set of documents:

- Volumes I to IV of the Radio Regulations (Edition 2020 from WRC-19)
- Rules of Procedures (Edition 2017, rev. 7)
- ITU Constitution and Convention (Edition 2018, from PP-18)
- Plenipotentiary Conference 2018 Resolutions,
- ITU-R Recommendations cited but not incorporated by reference in the Radio Regulations.



http://www.itu.int/pub/R-REG-RRX

The updated version of this Tool (RR 2020) will be available in 1Q21

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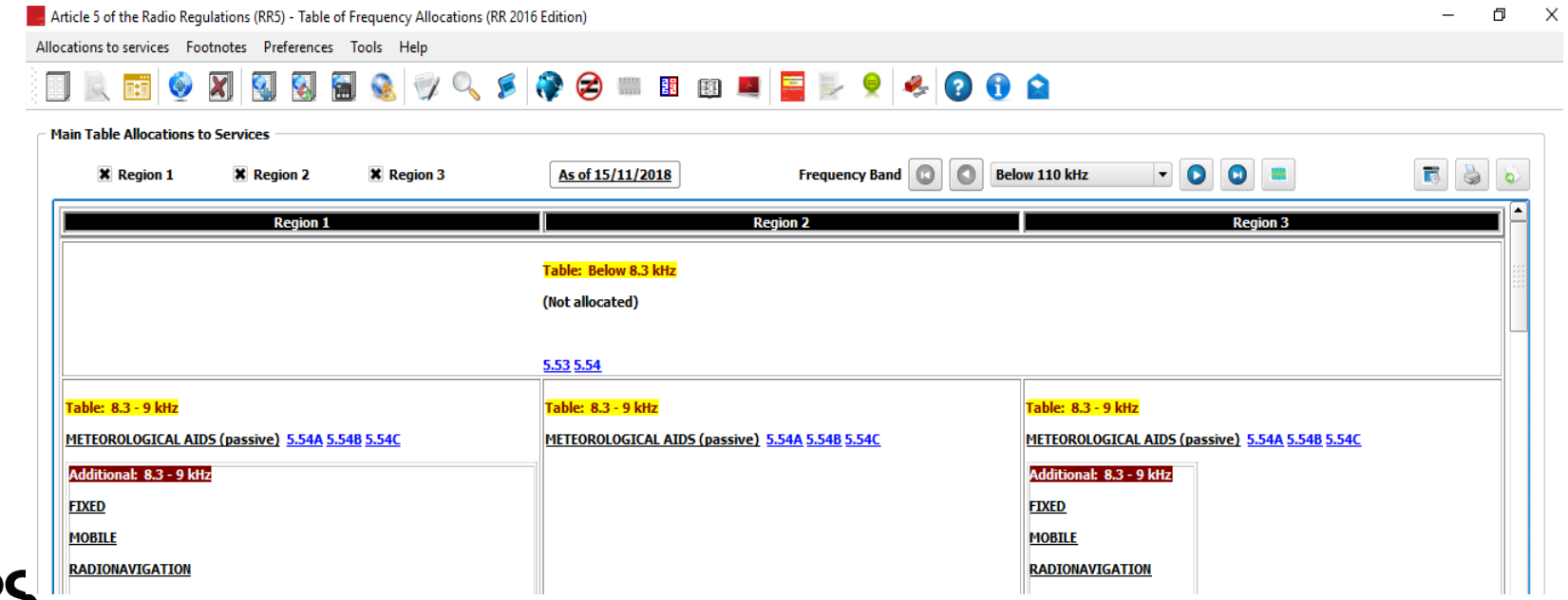
Art 5 Viewer

The Frequency Attribution Table Analyzer (RR5FATViewer) is an independent application (off line) that provides a mechanism to use, consult and analyze electronically the Frequency Attribution Table and its associated notes, as they appear in Article 5 of the Radio Regulations. The software is equipped with several tools and utilities that allow, among other things, to track and compare the evolution of the Main Table of Article 5 and its associated footnotes (since the 2001 edition) and for the extraction of the International Plan of Frequency Assignments. "for a specific geographical area (country).



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