



National Spectrum Management

Workshop on National Spectrum Management and Spectrum Management System for Developing Countries (SMS4DC)

8 - 12 February 2016

Suva, Fiji

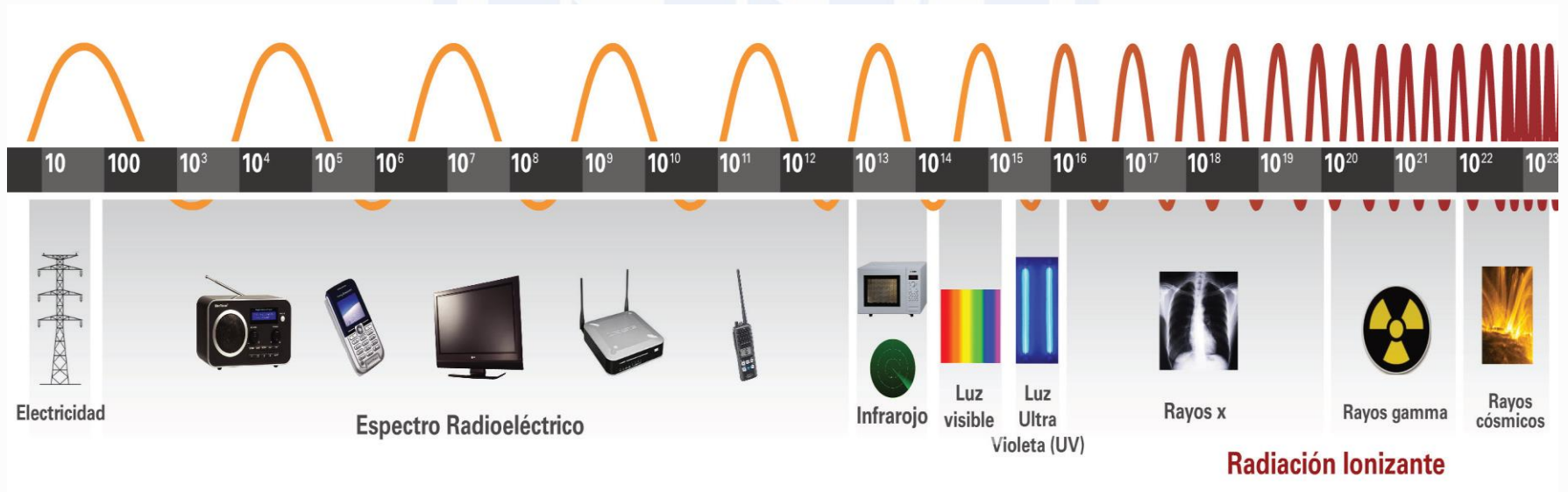
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Radio-Electric Spectrum

- Portion of Electromagnetic Waves, used for Communications
- Artificial boundary, based on technologic development



Spectrum as a National Resource



Features	Natural Resource			
	Spectrum	Land	Oil	Water
<i>Is the resource varied?</i>	YES	YES	Not very	Not very
<i>Is it scarce?</i>	YES	YES	YES	YES
<i>Can it be made more productive?</i>	YES	YES	YES	NO
<i>Is it renewable?</i>	YES	Partially	NO	YES
<i>Can it be stored for later use?</i>	NO	NO	YES	YES
<i>Can it be exported?</i>	NO	NO	YES	YES
<i>Can it be traded?</i>	YES	YES	YES	YES

National Spectrum Management



- **It is a government responsibility to develop spectrum management policies that conform to the international treaty obligations of the Radio Regulations while meeting national spectrum needs**

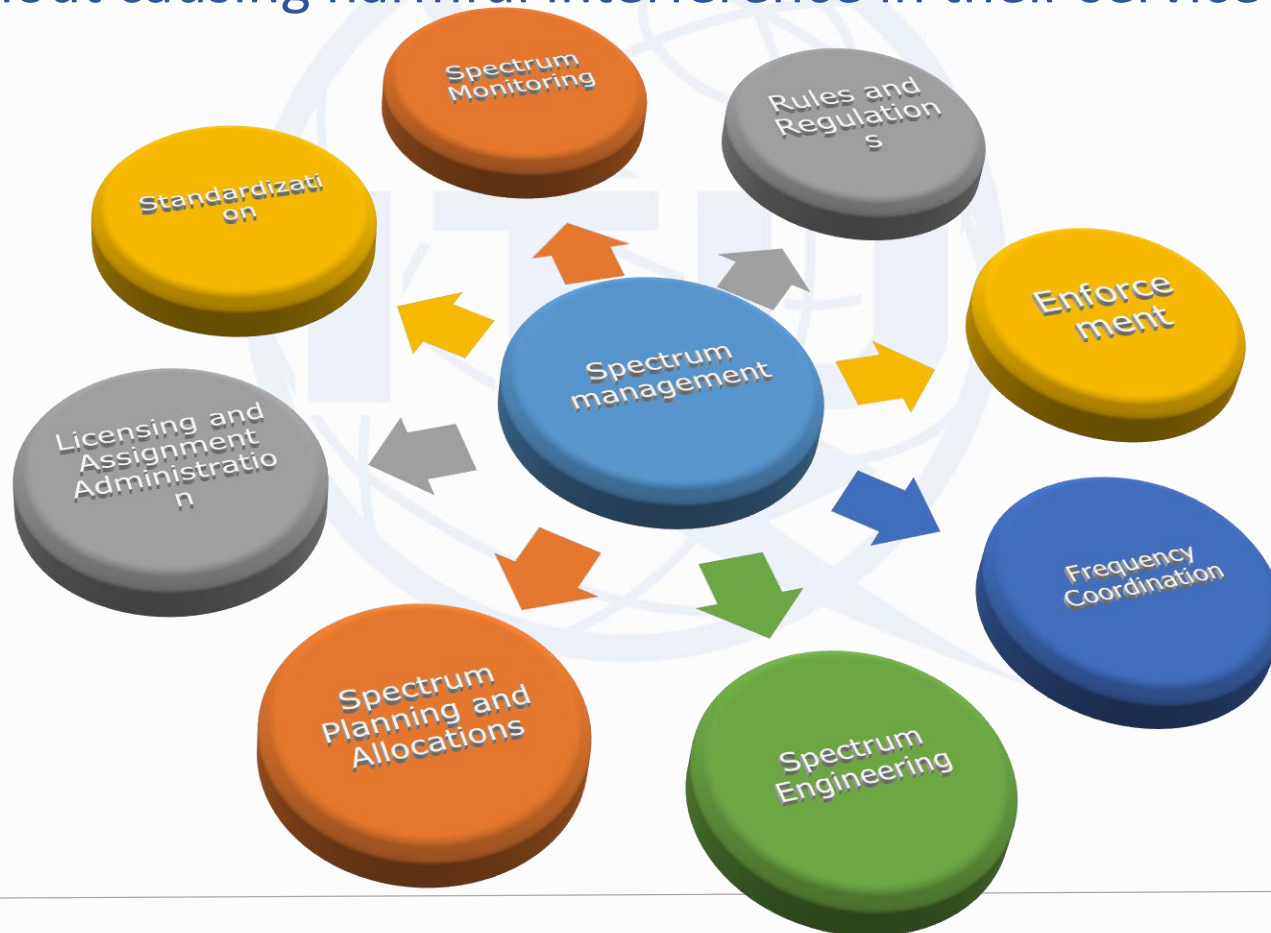
- **Within the national legal framework for telecommunications a spectrum management organisation has the delegated authority to prepare spectrum plans that meet government policies**
 - National spectrum plans should be reviewed regularly and, when necessary, be updated to keep pace with technology and changing demands

- **One of the most important tools for effective spectrum management is the National Table for Frequency Allocation Table (NTFA). This shows how the spectrum can be used in the country**

National Spectrum Management



Spectrum management is a combination of administrative and technical activities for efficient utilization of spectrum by users without causing harmful interference in their service area





National SM framework - Objectives

- **Maximizing the public benefits obtained from using of radio frequency spectrum**
- **Providing a framework to fulfil needs of national defence, national security, emergency services, governmental organizations and public services.**
- **Identifying responsible bodies to meeting the needs of spectrum users.**
- **Encouraging usage of those efficient technologies are able to deliver variety of services with good quality.**
- **Determination of a transparent and equitable frequency charging system, taking all effective parameters into account**
- **Providing enough regulatory obligations and facilities to maximize opportunity of domestic communications industry in domestic and international markets.**
- **Support national interests in international agreements, treaties and conventions relating to the radio-communications.**

National SM framework



Telecom ACT /Law

Spectrum Policy

**National Table of
Frequency Allocation**



National Spectrum Management

- **Telecommunication Act of the country**
 - Defines National goals, long term and short term policies of telecommunication sector
 - Responsibilities of organization dealing with Spectrum Issues

- **Spectrum Policy**
 - Spectrum Planning
 - Spectrum Economics
 - Spectrum Licensing
 - Interference Mitigation –counter harmful to and from inter or intra country users
 - Other issues related to spectrum Management

National SM Actions



➤ **Planning:**

- Defining the use of different bands (Allocations)

➤ **Licensing**

- Authorizing of emissions, and technical conditions (Assignments)

➤ **Enforcement**

- Verifying the use of spectrum in conformity with licensing

National Spectrum Planning



➤ Adherence to

- National Telecom ACT and Spectrum policy
- International Radio Regulations
- Regional frequency allotments and allocations

➤ Covers

- Current and Future demands of different category of users
- Telecommunication technology growth and trends

➤ Major National Document

- National Table of Frequency Allocation

➤ Requires

- Regular Update Especially after World (or Regional) Radiocommunication Conference (WRC/RRC)

National Table of Frequency Allocations (NTFA)



A national Level Document that:

- **Divides portion of all allocable spectrum into number of frequency bands for use and/or reservation for future use.**
 - **Defines Primary, Secondary, Co-Primary usages of band and the bands reserved for specific services**
 - **Details the national policy on preparation of band plans that are consistent with corresponding spectrum allocations and with existing national and international allotment plan.**
 - **Other parameters for frequency assignment;**
-

National Table of Frequency Allocations (NTFA)



➤ **Primary Basis:**

means that in accordance with the nature of a right granted to the assignee of a particular spectrum (band or spot frequency), the assignee is the only entity to use the identified spectrum and is entitled to protection from:

- harmful interference caused by any other spectrum user who may be authorized to use same spectrum on secondary basis; and
- claims of harmful interference by any such spectrum user

➤ **Secondary basis:**

means the nature of a right granted to the assignee of a particular spectrum (band or spot frequency), is subject to the condition that the entity does not cause any harmful interference to, or claim protection from any harmful interference caused by, other licensees who have been granted the right to use same frequency bands on primary or co primary basis.

National Table of Frequency Allocations (NTFA)



➤ Co-primary Basis:

means that nature of the right granted to the assignee of a particular spectrum (band or spot frequency), to use the specified frequency bands is subject to the condition that

- the entity must coordinate with other co-primary licensees in order to limit harmful interference to existing links and services operating in the relevant frequency bands, and to facilitate the introduction of additional links and services in the relevant frequency bands.
- Co-primary user must refrain from causing harmful interference to, and may not require protection from operations of other co-primary user in relevant band.
- Co-primary usage of band is subject to protection from:
 - *harmful interference caused by any other spectrum user that may be authorized to use the same spectrum on secondary basis,*
 - *claims of harmful interference by holders of licenses granting secondary status with respect to frequency bands covered*



Aspects of Frequency Assignment

➤ Regulatory aspects

- Radio Regulations, Frequency allocation table and agreements
- Spectrum Management department shall provide *provisions* and *decisions*

➤ Technical aspects

- Taking into account regulatory actions required for concerned service
- Seeking frequencies assignable to convince needs of applicant while protecting existing licensees from harmful interference

➤ Regulatory / Technical aspects

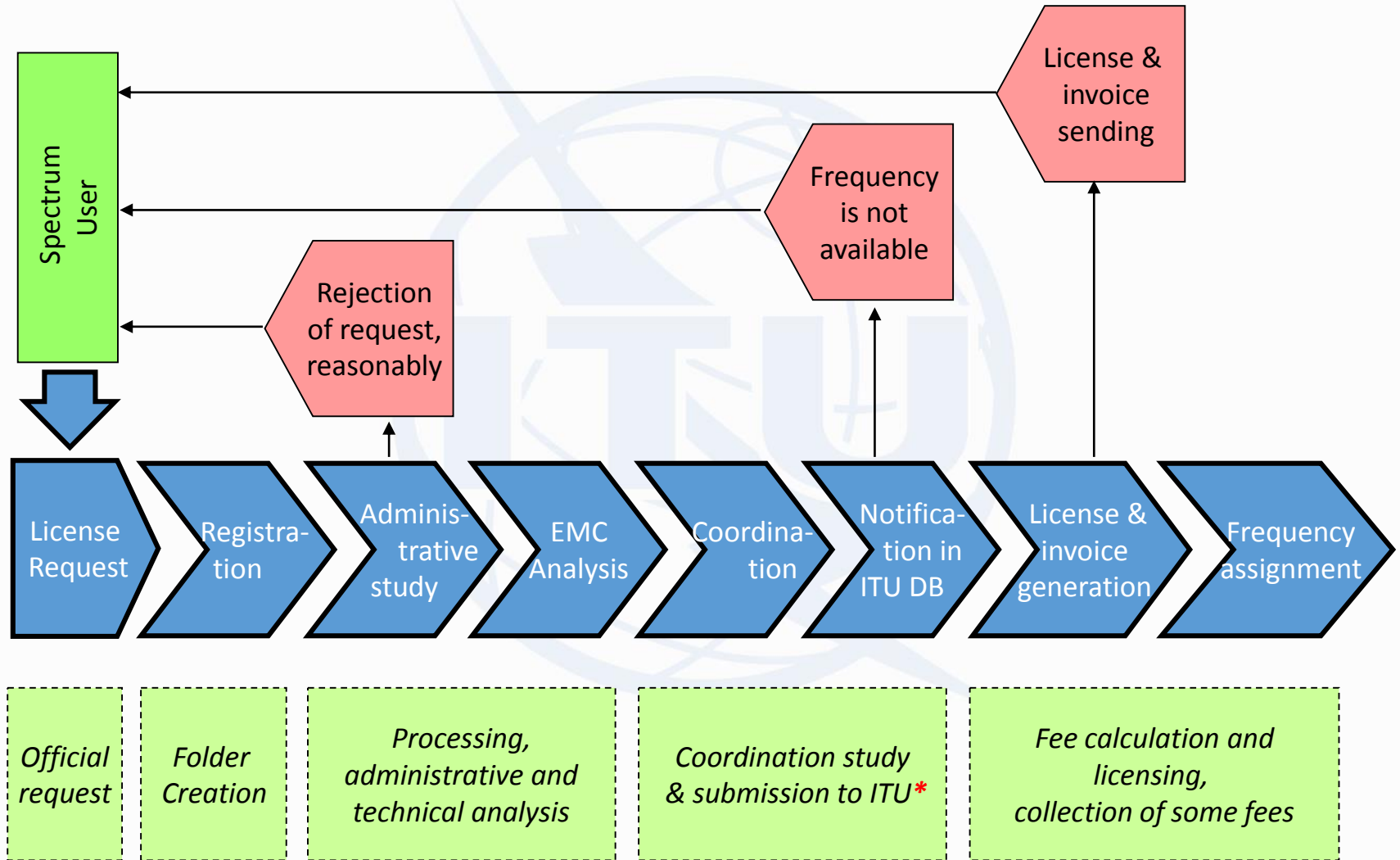
- Frequency coordination procedure between existing users and prospective users
- Achieving bilateral/multilateral agreements to divide frequency bands equitably/proportionally in borders

Frequency Assignment Procedure



- **Registration of administrative, geographical and technical information in an electronic database**
- **Comparison with frequency allocations table, frequency plans and other similar criteria**
- **Taking into account the key limitation of type approval**
- **Frequency coordination analysis**
- **EMC analysis to calculate coverage area, adjust emission characteristics and tune technical parameters**
- **Post-processing of results to find frequency fee, generate technical reports and license print out**

General Procedure for Licensing

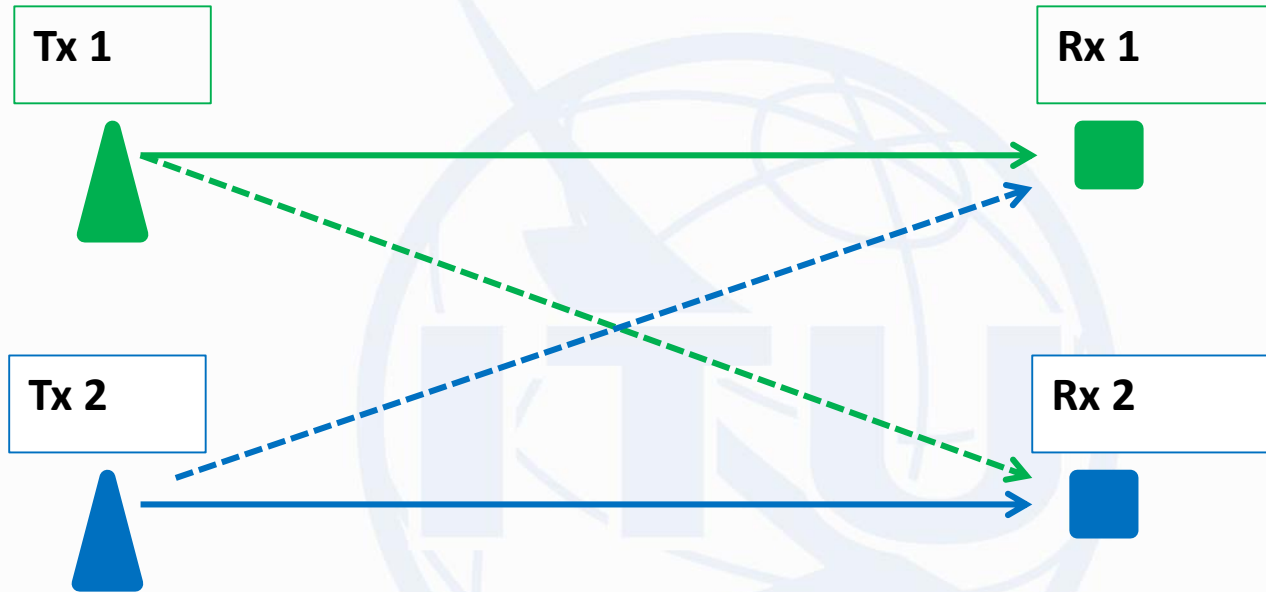


* ITU notification is not required for each cases, and that a bi/multilateral agreement is stronger than the RR (see Article 6 of the RR)

Income from Spectrum Management



- **Fees collected :**
 - License application (not refundable);
 - License issuing, renewing and amendment;
 - Periodically (on monthly/annual basis) from spectrum users proportional with the occupied bandwidth, service type, used frequency, covered location, service area, time duration and etc.;
 - Penalties imposed in effect of breaching of regulation;
 - Type approval fee;
 - Special technical assistance;
 - Auction;
- **Spectrum management authority could earn much more money than its administrative needs if a suitable spectrum pricing regulation developed**
- **Roughly, spectrum fee should not be more than **3~5%** of net revenue of licensee**



Interference:

Any signal received from Transmitter different than the intended one

It disturbs the capacity of any radiocommunication link to send information

International concept of Interference



➤ **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.

➤ **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.

International concept of Interference



➤ **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.

➤ **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).



Spectrum Monitoring

- To ensure spectrum utilization consistency with conditions of granted RF licensees
- To discover and to stop illegal and unlawful operation of Radiocomm. stations
- To resolve national and international interference complains,
- To investigate and proof qualification of licensees as well as given license,
- To conduct spectrum monitoring missions requested by different divisions of spectrum management authority,
- To measure spectrum occupancy, noise floor, propagation parameters and any other requested activities related to the physical activities in field,
- To confiscate and enforce radio equipments in operation without having an approved standard or a certificate,
- To manage remote manned/unmanned fixed spectrum monitoring sites and their connection to computerized spectrum management system, as well as mobile spectrum monitoring units



ICT Tools for Spectrum Management

- **Digital maps of country in different resolution,**
 - 100 meters rural and 10 meters for cities as well as databank (RF station Information) of spectrum management. Paper copies of map, additionally, would be helpful. Information should be stored in Server located in headquarter but would be used commonly by all elements of spectrum management; (elevation and clutters)
 - **Observation:** *Database has to be validated and cleaned (e.g. geographical coordinates very often are incorrect!)*
- **A software capable to handle data entering and licensing task, invoicing, interfaced to the electronic database and digital maps;**
- **Technical tool capable to calculate coverage area and interference using digital maps and standardized propagation models. This tool shall be able to use spectrum management database and reflect results to it.**
- **Fixed and mobile spectrum monitoring equipments including field strength meters, spectrum analyzers, direction finders, power meters, various antennas, GPS receivers, functional receivers, signal generators and etc.**



International roles of SM

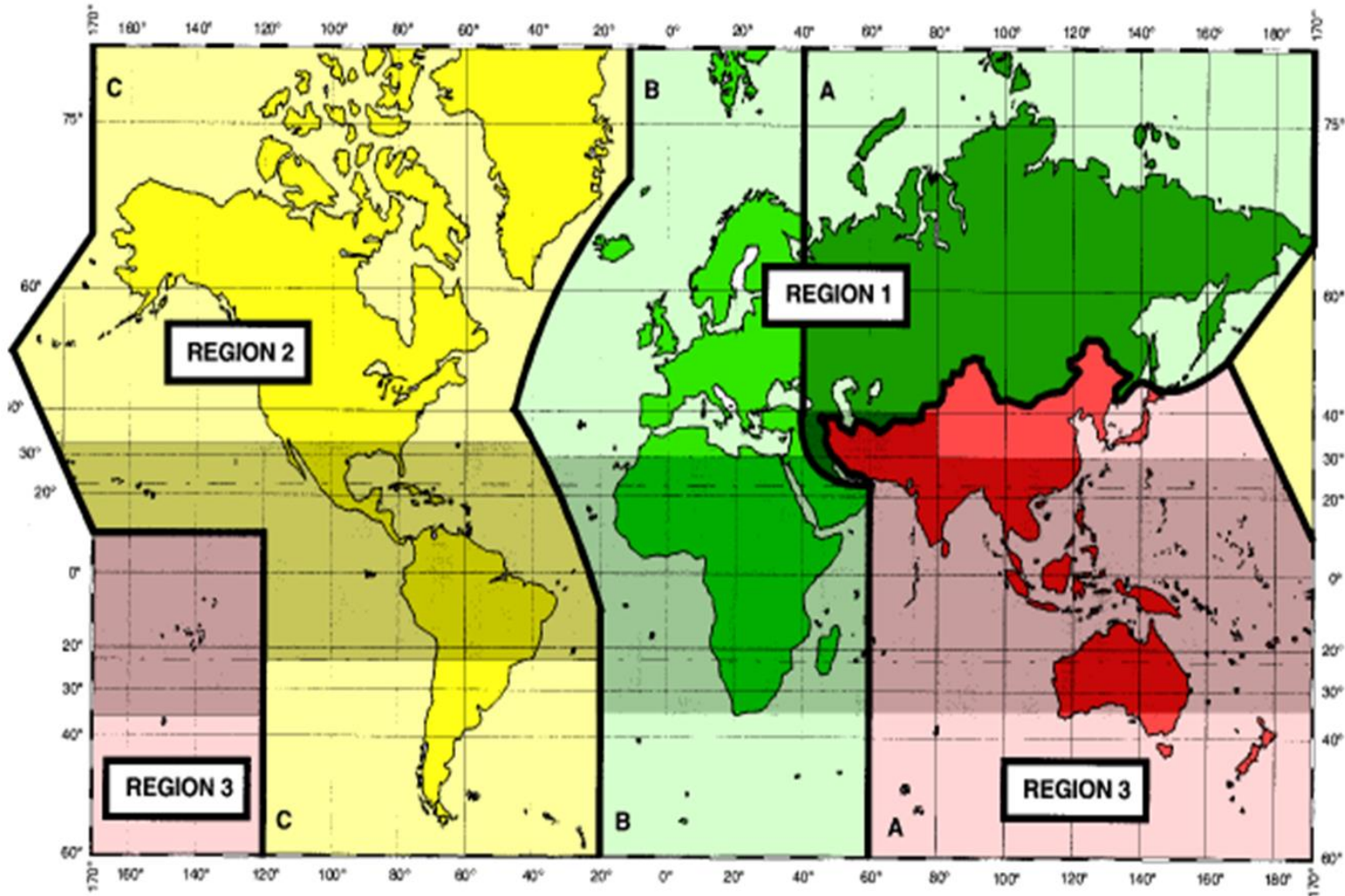
- Supporting harmonized global frequency allocations,
- Providing and supporting common standards to achieve the highest level of interoperability and to enable successful interconnection between various systems,
- Contribution and supporting regional agreements on utilization of specific frequency bands,
- Protection of governed national frequency assignments while recognizing frequency assignments of other governments,
- Protection of internationally assigned frequency from harmful interference,
- Encouraging new technologies to move toward industrial methods utilizing radio frequency spectrum and orbital positions more efficiently,
- Exchanging gained experience and profession to promote spectrum management activity of concerned administrations,
- To cooperate with international treaties with the aim of promotion of availability and reliability of radiocommunication anywhere anytime

ITU and Spectrum Management



- **The Radio Regulations govern the use of the radio-frequency spectrum and the geostationary satellite and non-geostationary-satellite orbits.**
- **Article 5 of the Radio Regulations deals with regulations for frequency allocation and contains the (international) Table of Frequency Allocations.**
- **The Table of Frequency Allocations reflects decisions made on the purpose or purposes to which particular frequencies will be put.**

International Frequency Allocations



The shaded part represents the Tropical Zones as defined in Nos. 5.16 to 5.20 and 5.21

Regional Organizations



Name	Official website
APT - Télécommunauté Asie-Pacifique - Asia-Pacific Telecommunity - Telecomunidad Asia-Pacífico, BANGKOK, Thailand	www.apr.int
ASMG- Arab Spectrum Management Group	http://asmg.ae
ATU - Union africaine des télécommunications - African Telecommunications Union - Unión Africana de Telecomunicaciones, NAIROBI, Kenya	www.atu-uat.org
CANTO - Association des entreprises nationales de télécommunications des Caraïbes - Caribbean Association of National Telecommunication Organizations - Asociación de Organizaciones Nacionales de Telecomunicaciones del Caribe, PORT OF SPAIN, Trinidad and Tobago	www.canto.org
CEPT - Conférence européenne des Administrations des postes et des télécommunications - European Conference of Postal and Telecommunications Administrations - Conferencia Europea de Administraciones de Correos y Telecomunicaciones, VALLETTA, Malta	www.cept.org
CITEL - Commission interaméricaine de télécommunications - Inter-American Telecommunication Commission - Comisión Interamericana de Telecomunicaciones, WASHINGTON, D.C., United States	www.citel.oas.org
COMTELCA - Commission technique régionale des télécommunications - Telecommunications Regional Technical Commission - Comisión Técnica Regional de Telecomunicaciones, TEGUCIGALPA, M.D.C., Honduras	www.comtelca.org
COPTAC - Conférence des Postes et Télécommunications de l'Afrique centrale - Conference of Posts and Telecommunications of Central Africa - Conferencia de Correos y Telecomunicaciones de África Central, YAOUNDE, Cameroon	n/a
CTU - Union des télécommunications des Caraïbes - Caribbean Telecommunications Union - Unión de Telecomunicaciones del Caribe, PORT-OF-SPAIN, Trinidad and Tobago	http://www.ctu.int/
ETSI - Institut européen des normes de télécommunication - European Telecommunications Standards Institute - Instituto Europeo de Normas de Telecomunicaciones, SOPHIA ANTIPOLIS CEDEX, France	www.etsi.org
LAS - Ligue des Etats Arabes - League of Arab States - Liga de los Estados Árabes, CAIRO, Egypt	www.arableagueonline.org
RCC - Communauté régionale des communications - Regional Commonwealth in the Field of Communications - Comunidad Regional de Comunicaciones, MOSCOW, Russian Federation	www.rcc.org.ru



I T hank U

**“Committed to
connecting the
WORLD”**

Major ITU SM Events in 2016



**ITU Study Group Meetings
ITU-D (Res. 9) and ITU-R SG1**

**ITU COE training workshop on
Spectrum Management and
Monitoring
Chengdu, China 16 – 21 May 2016**

**Economic Aspects of Spectrum
Management
Iran, Q3/4 2016**

**2nd Asia Pacific Spectrum Management
Conference
Bangkok, Thailand 25-29 April 2016**

Your active participation in and contribution to these events is most welcome!