Spectrum Management Framework

(Noumea, 11-15 April 2011)

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Contents

Contents

3

Rights and Obligations of ITU Member States

- ITU CS and RR are intergovernmental treaties ratified by governments of ITU Member States (MS)
- Governments of ITU MS undertake to
  - apply the provisions in their countries
  - adopt adequate national legislation including essential provisions of ITU international treaties
- ITU CS, CV and RR are oriented mainly towards global or regional matters
- Still in many areas, there is a place for making special arrangements on bi/multi-lateral basis

Radio Regulations: definitions of radio services

- RR Article 1 – Terms and definitions
  - ✓ *allocation* (of a frequency band) – Table of Freq. Alloc.
  - ✓ *allotment* (of frequency or channel) – Entry in an agreed Plan
  - ✓ *assignment* (of frequency or channel) – Authorization by ADM
- Definitions for more than 40 radio services, e.g.:

  ARS, ARSS, BS, BSS, FS, FSS, ISS, EESS/MetAids, MetSat, (L/M/A)MS, (L/M/A)MSS, RDS/RLS-(A/M)RNS, RDSS/RLSS-(A/M)RNSS, SOS, SRS

  (meaning of above abbreviations at the end of this presentation)
- Definitions of frequency sharing terminology, e.g.:
  - ✓ *Permissible / Accepted / Harmful interference (Nos. 1.166 to 1.169)*
  - ✓ *Coordination area / contour / distance (Nos. 1.171 to 1.173)*
- RR Article 1 contains also definitions for:

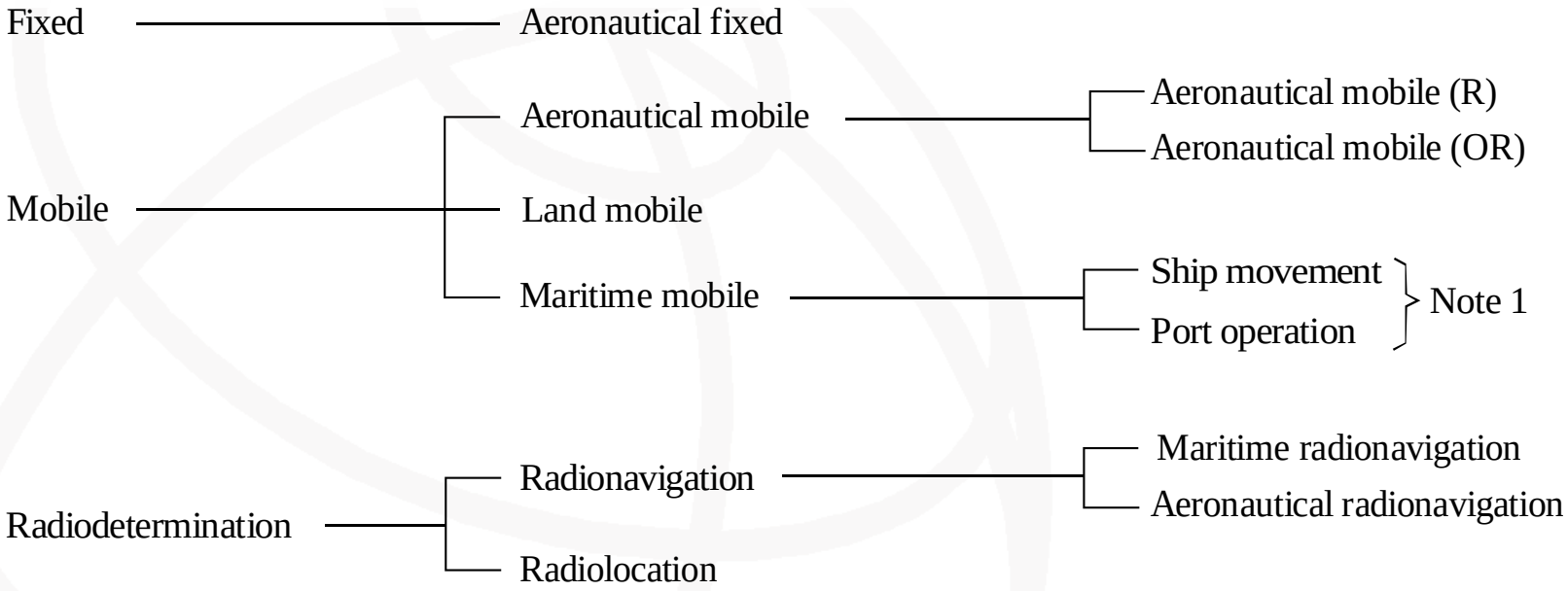
  √ *Radio stations and systems;* √ *Operational terms;*

  √ *Characteristics of emissions and radio equipment;*

  √ *Technical terms relating to space.*

Spectrum utilisation of broadly defined services (terrestrial)

- Rec. ITU-R SM.1133 provides useful guidance to the utilization of broadly defined services

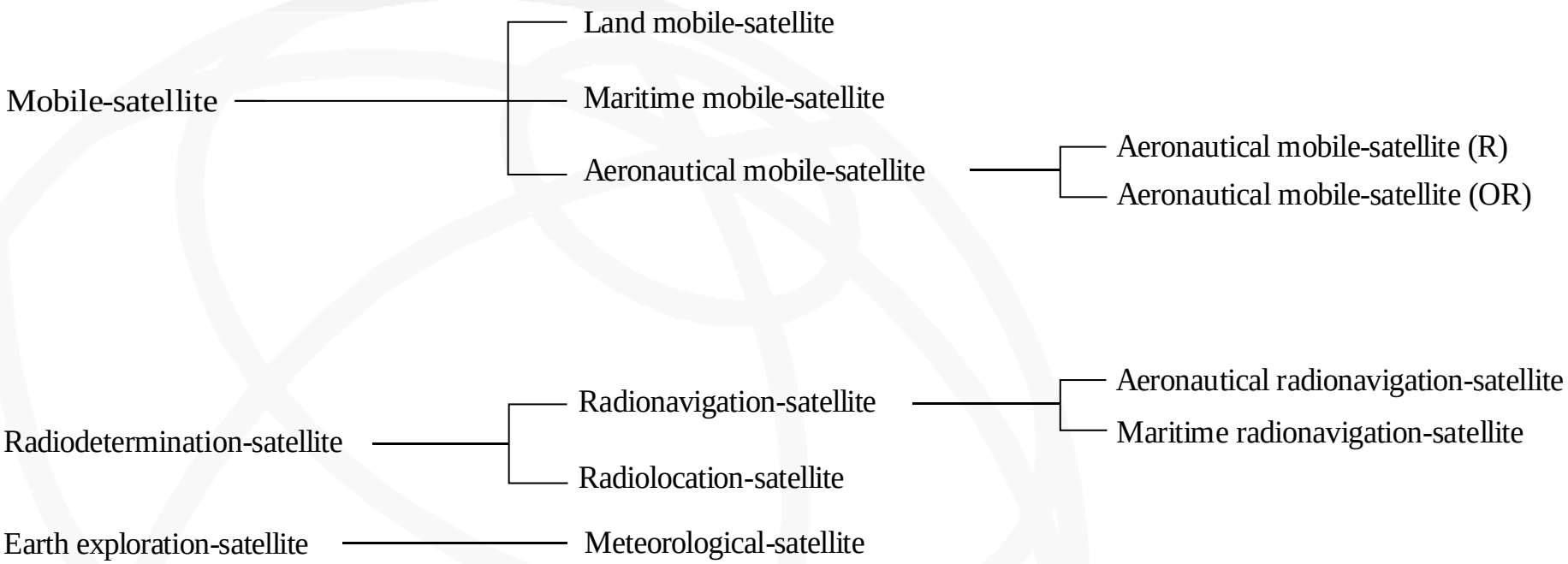


The following services are not defined by the Radio Regulations (RR) as being part of any grouping of services.

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.

Spectrum utilisation of broadly defined services (space)



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

Fixed-satellite
Broadcasting-satellite
Amateur-satellite
Radio astronomy
Standard frequency and time signal-satellite
Space operations
Space research
Inter-satellite

Spectrum utilisation of broadly defined services: advantages/ disadvantages

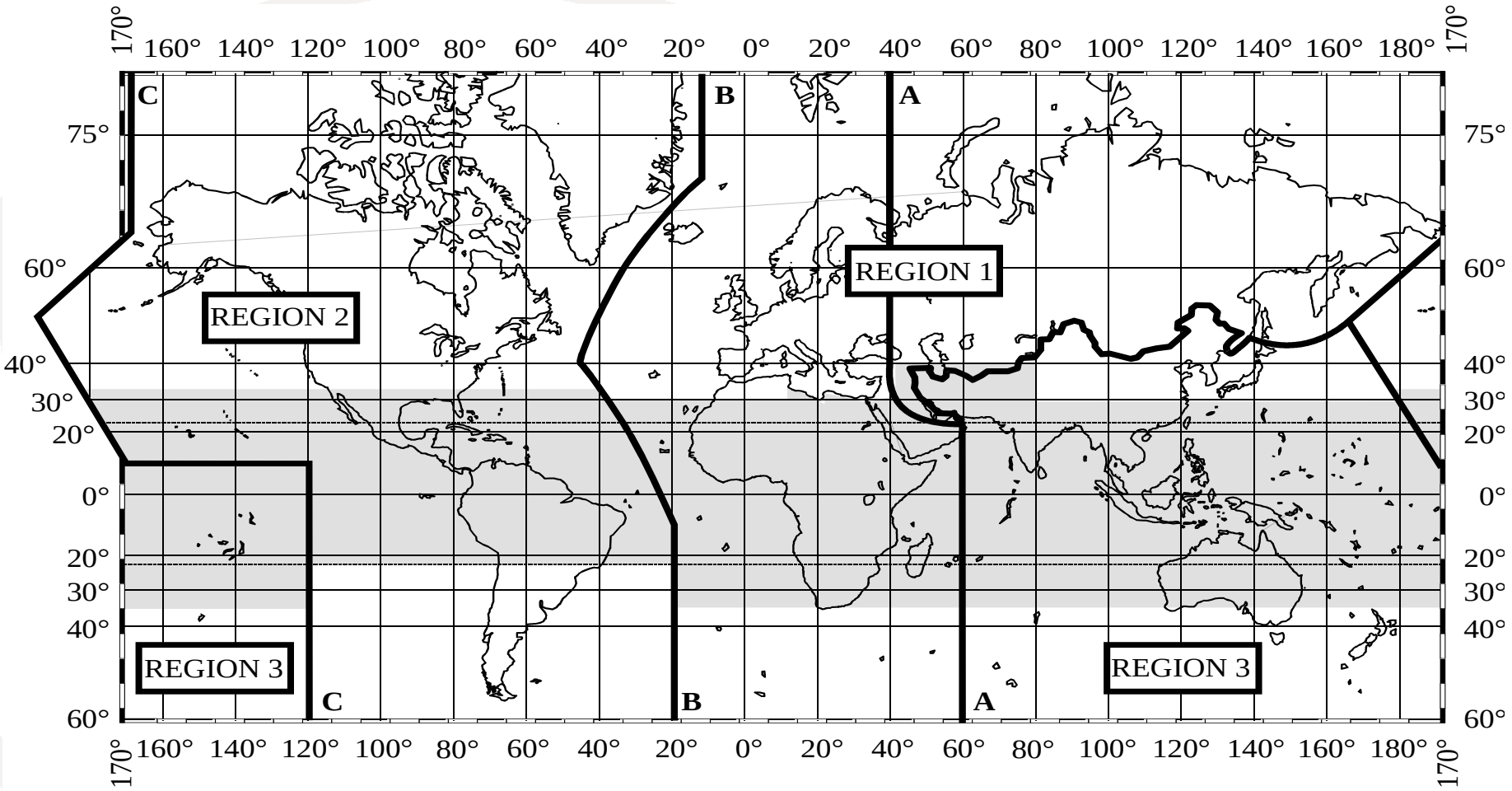
- Advantages:
  - \+ can provide a simpler allocation process
  - \+ can increase flexibility of allocation process
- Disadvantages:
  - \- complexity of sharing relates to number of services and kind of services subsets of a broadly defined service
  - \- may not result in higher spectrum efficiency (diff.parameters)
- Other considerations:
  - safety aspects of services should be considered
  - may be applicable in some bands and not in others
  - useful to identify services using "old" vs "new" technologies
  - economical, social, political, technical & operational factors
- See also Rec. ITU-R SM.1265 on National alternative allocation methods

- The **RR is the principal instrument** of the international radio regulatory arrangement
- It is based on the use of two main concepts:
  - ✓ Frequency block allocations intended for use by defined radio services = Table of Frequency Allocations as contained in RR Article 5 (from 9 kHz to 1 000 GHz)
    - generally provides common frequency allocations to mutually compatible services operating with similar technical characteristics in specific parts of the spectrum
    - is a stable planning environment for administrations, for equipment manufacturers and for users
  - ✓ Voluntary or obligatory regulatory procedures (for coordination, notification and recording of assignments) adapted to the allocation structure and vary from service to service
- Objective to obtain international recognition of recorded frequency assignments (RR Article 8)

Table of Frequency Allocations (Art.5)

Allocation to services		
Region 1	**Region 2**	**Region 3**
5 850-5 925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 5.150	**5 850-5 925** FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation 5.150	**5 850-5 925** FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 5.150
5 925-6 700	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B MOBILE 5.457C 5.149 5.440 5.458	
6 700-7 075	FIXED FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.441 MOBILE 5.458 5.458A 5.458B 5.458C	

World Regions Defined in the Radio Regulations (Art.5)



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

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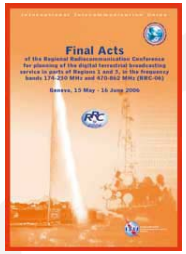
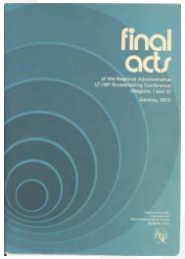
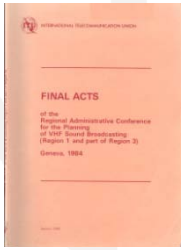
Planning the frequency bands







- Regional/sub-regional (Agreements concluded under the auspices of ITU)
  - BS: ST61, GE84, GE89, GE06
  - LF/MF BS: GE75
  - Maritime/aeronautical: GE85M, GE85N
- Plan modification procedures (all except AP 27)
- Seasonal planning HFBC: ART 12
- Other (outside ITU): i.e. ICAO

Contents

Part II – Needs for national spectrum management
a) reasons and key areas
b) spectrum monitoring
c) economic aspects

13

- See Report ITU-R SM.2093
  - ✓ Based on international principles to govern the spectrum use and on bi/multi-lateral agreements using ITU instruments (CS, CV, RR, ITU-R Recommendations, etc)
  - ✓ Need also for regional harmonization and standardization (APT, ASMG, ATU, CEPT, CITEL, RCC)
  - ✓ Linkage between international and national regulations (allocations, assignments, licensing, monitoring, interference) preserving States' rights and obligations
  - ✓ Need for national legal framework/regulation to take account of national specificities (geographical, geopolitical, cultural, social, economical, etc), especially when market forces influence Spectrum Management

Need for national spectrum management

- To ensure availability of the Radio Spectrum
- For an efficient and effective use of the Radio Spectrum in an interference-free environment
- To stimulate the social and economic progress
- Key subjects of Spectrum Management:

– Spectrum Management Fundamentals and Spectrum Engineering – Planning – Economics
– Frequency allotment/assignment (table) with licensing/authorization or license-exempt frequency bands
– Spectrum monitoring (use/efficiency), inspection & investigation
– Automation for Spectrum Management activities
– Use of ITU standard format for frequency assignment recording

Conclusions on the need for spectrum management

- Effective and efficient use of the spectrum requires both:
  - **National Regulations and**
  - **the Radio Regulations of the ITU**

- Taking advantage of the spectrum resource would depend on the ability of the Spectrum Management activities to facilitate the implementation of radio systems, while ensuring an interference-free environment.
- Each ADM will manage the spectrum in its own manner, but basic processes are fundamentally standard.

see at: http://www.itu.int/publ/R-HDB-21/en

- Observe the use of the spectrum, including the following main tasks, as appropriate (for the spectrum management activity of the administration)
  - ✓ Verification of the correct use of frequency assignments and of station characteristics
  - ✓ Preparation of data for use in the quantitative estimation of the spectrum utilization factor
  - ✓ Preparation of special reports:
    - on measurement of ambient radio noise;
    - for the international monitoring system (RR Art. 16)
    - to assist in standardizing various emission parameters
    - on steps & procedures for eliminating radio interference
- Further details in Recommendation ITU-R SM.1050

Spectrum Monitoring: ITU Handbook

- ✓ Complete new edition approved in September 2010 !!
- ➢ will be published soon in 2011
- ✓ Provides latest detailed information on all aspects:
- ➢ Monitoring service tasks, structure, operation & management
- ➢ Characteristics of monitoring antenna, receivers, Direction Finding (DF) and other peripheral equipments
- ➢ Measurements of Frequency, RF level, Field strength & PFD, Bandwidth, Modulation, DF and location, Transmitter identification, Signal analysis; as well as Spectrum occupancy, Pulse, Coverage and Unwanted emissions Measurements.
- ➢ Specific description of equipments and measurements for monitoring of Spacecraft emissions, Broadcasting and cellular systems, radar emissions, non-ionizing radiations and radio noise levels.
- ➢ Background fundamentals, System planning and Tender

ITU reports on Spectrum Monitoring

- Help establishing and operating monitoring facilities, an essential tool of efficient Spectrum Management activities for the performance of networks in an interference-free environment.

✓ Spectrum Monitoring in support of inspections (Report ITU-R SM.2130 and Report ITU-R SM.2156)

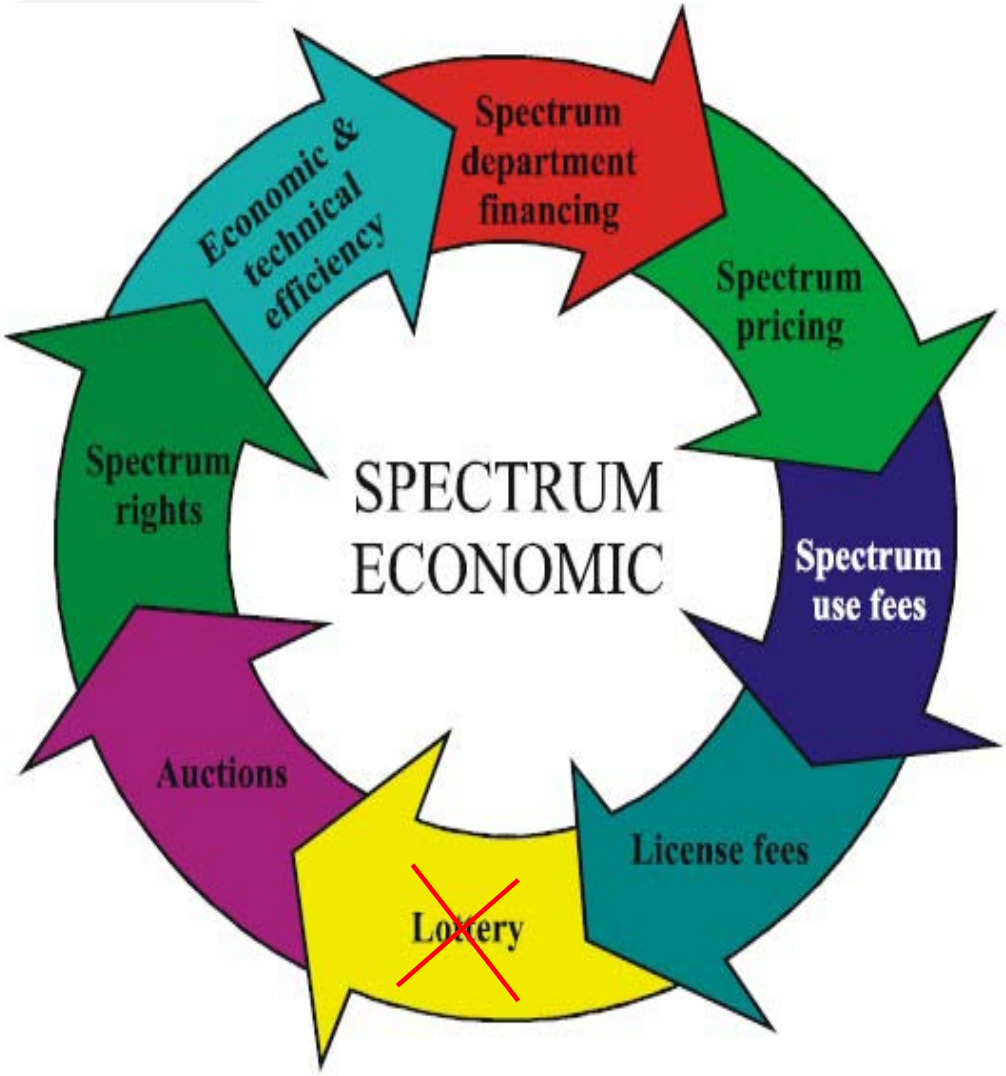
✓ Other Reports on more Specific types of measurements of:

- Radio noise (Report ITU-R SM.2055); SRD (Reports ITU-R SM.2154 and new Report ITU-R [SRD-MEAS]); PLT systems (Report ITU-R SM.2157) ; Man made noise in HF range (Report ITU-R SM.2155)

✓ New ITU-R Reports on Spectrum Monitoring of space emissions:

- Worldwide measurement facilities
- Information to be provided in reports of harmful interference

Economic aspects of Spectrum Management



20

Economic aspects of Spectrum Management

✓See Report ITU-R SM.2012 at http://www.itu.int/pub/R-REP-SM.2012
See also joint activities with ITU-D on WTDC Resolution 9 (Rev.Doha, 2006)

- New revision of this Report approved in September 2010!
- Include lists of legal, economic and reality principles for the establishment of any fee system (Chapter 2)
- Describe the factors which may be taken into account in an international comparison of fee levels (Chapter 3)
- Provide guidelines on methodologies for establishment of spectrum fees formula and system (Chapter 4)
- Provide new administrations' experience on this subject (see Chapter 5 & complete revision of Annex 1), such as on Auctions and Secondary Market

21

Economic aspects of Spectrum Management

- General use of market mechanism is systematically possible due to technical, economic and/or social reasons
- However, economic approaches (auctions, transferable and flexible spectrum rights, well designed spectrum fees)
  - are essential for efficient national spectrum management
  - can also help to fund national spectrum management programmes (e.g. spectrum monitoring, development of new services, international representation),
    to ensure operation of radio services on a non-interference basis
- Few frequency bands are used on a license-exempt basis (e.g. ISM bands for WiFi, Bluetooth, etc) due to power limitations and short-range transmissions, but without afforded protection

22

Economic aspects of Spectrum Management

- ✓ Auctions and transferable & flexible spectrum rights appear best-designed to promote and ensure efficient use of spectrum when there are several competing applicants
- ✓ Indeed, auctions may not be appropriate for
  - ➢ services in which there is limited competition
  - ➢ socially desirable services: safety of life, climate change, etc.
  - ➢ for services involving international relations / activities
- ✓ For some of these services, fees may be more appropriate. Fees can promote efficient use of the spectrum provided that they incorporate the correct economic incentives:
  - ➢ not set too low , so as to be negligible in the eyes of spectrum users, or
  - ➢ not set too high, so as to exceed what a market would set, in which case spectrum will sit idle and generate no benefits.

23

Spectrum Management: other ITU studies

- Limitation of radiation from ISM (Rec. ITU-R SM.1056, IEC-CISPR)
- Coordination area around Earth stations (Rec. ITU-R SM.1448)
- Use of Ultra Wide Band devices and technologies
  (Rec. ITU-R SM.1754, SM.1755, SM.1756, SM.1757, Rep. ITU-R SM.2057)
- Unwanted Emissions in Out of Band & spurious domains
  (Rec. ITU-R SM.329, SM.1535, SM.1539, SM.1540, SM.1541, SM.1542)
- Effect of new technologies on Radiocommunication Services:
  - SdR and Cognitive Radio Systems (Rep. ITU-R SM.2152)
  - PLT characteristics and impact (see Rep. ITU-R SM.2158)
  ⇨ Planned workshop on PLT issues: Geneva, 27 May 2011
  - ISM impact (new Rep. ITU-R SM.[ISM])
  - SRDs parameters and spectrum use (Rep. ITU-R SM.2153)
  - SRDs & RFIDs harmonization of frequency bands
  - etc.

Thank you…

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