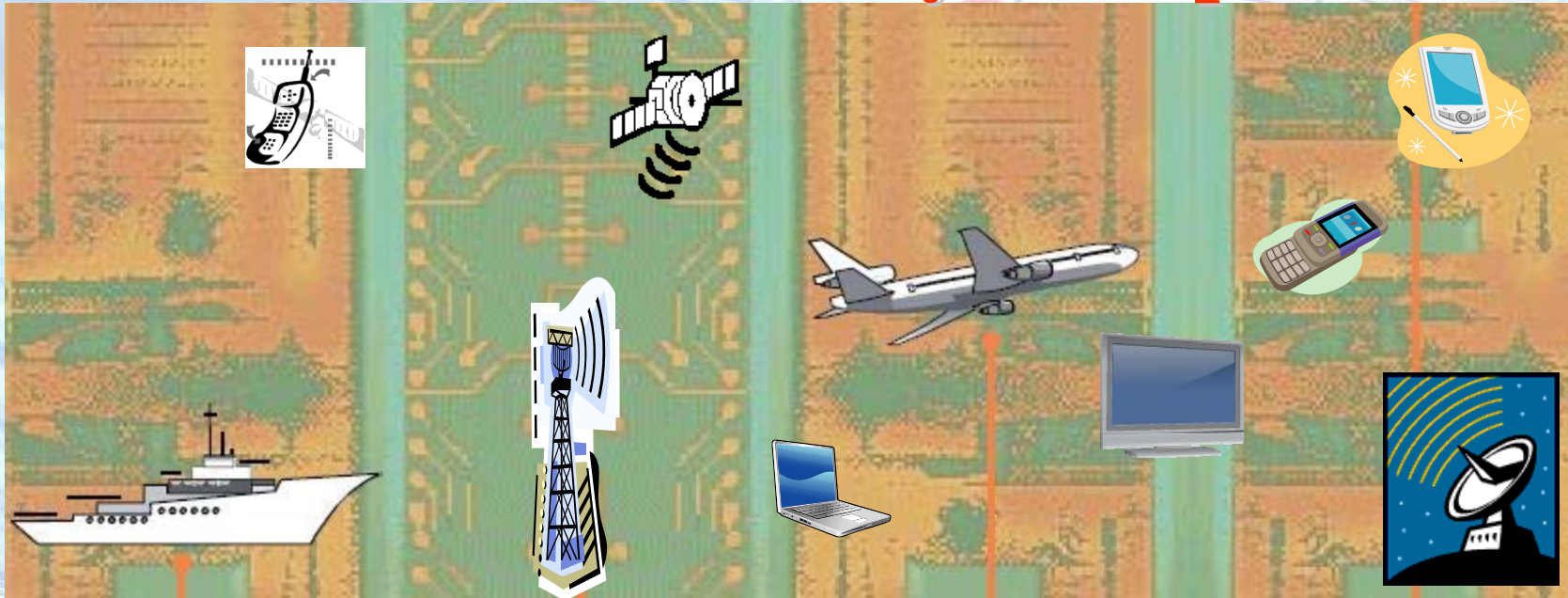# Radiocommunication Standardization: Radiocommunication Assembly (RA) and ITU-R Study Groups

Alexandre VASSILIEV

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Types of ITU Radiocommunication Standards

Two types of standards:

1) **mandatory – international treaty status:**
   - **decisions of World Radiocommunication Conferences (WRCs);**
   - **Decisions of ITU Regional Radiocommunication Conferences (RRCs) and associated Plans;**
   - **Radio Regulations (RR) – 4 volumes;**
   - **ITU-R Recommendations incorporated in RR by reference;**

2) **voluntary standards – other ITU-R Recommendations** *(currently published in electronic formats only: on CD and on Internet).*

http://www.itu.int/publications/publications.aspx?lang=en&parent=R-REC&selection=6&sector=1

ITU Arab Regional Development Forum 2008 "Bridging the ICT standardization gap in developing countries", Damascus, Syria, 20-22 June 2008

2

Radiocommunication Assembly

91 3 ... Radiocommunication assemblies shall provide the necessary technical bases for the work of the world radiocommunication conferences and respond to all requests from world radiocommunication conferences.

Article 13 of ITU Constitution

129 1   A radiocommunication assembly shall deal with and issue, as appropriate, recommendations on questions adopted pursuant to its own procedures or referred to it by the Plenipotentiary Conference, any other conference, the Council or the Radio Regulations Board.

Article 8 of ITU Convention

RA consider the reports of study groups and prepare a report to WRC. It adopts the Study Groups working methods, procedures, SGs structure and appoints their chairmen and vice-chairmen.
RA also approves programme of work, questions and recommendations.

Decisions of Radiocommunication Assembly

Radiocommunication Assembly approves ITU-R Resolutions, which are the management directive for the Radiocommunication Study Groups of the ITU Radiocommunication Sector (ITU-R).

Resolutions of the Radiocommunication Assembly 2007 (RA-07) in all ITU languages (including Arabic) are available (free of charge) on the ITU-R Web page at:
http://www.itu.int/publications/publications.aspx?lang=en&media=electronic&parent=R-VADM-RES-2007.
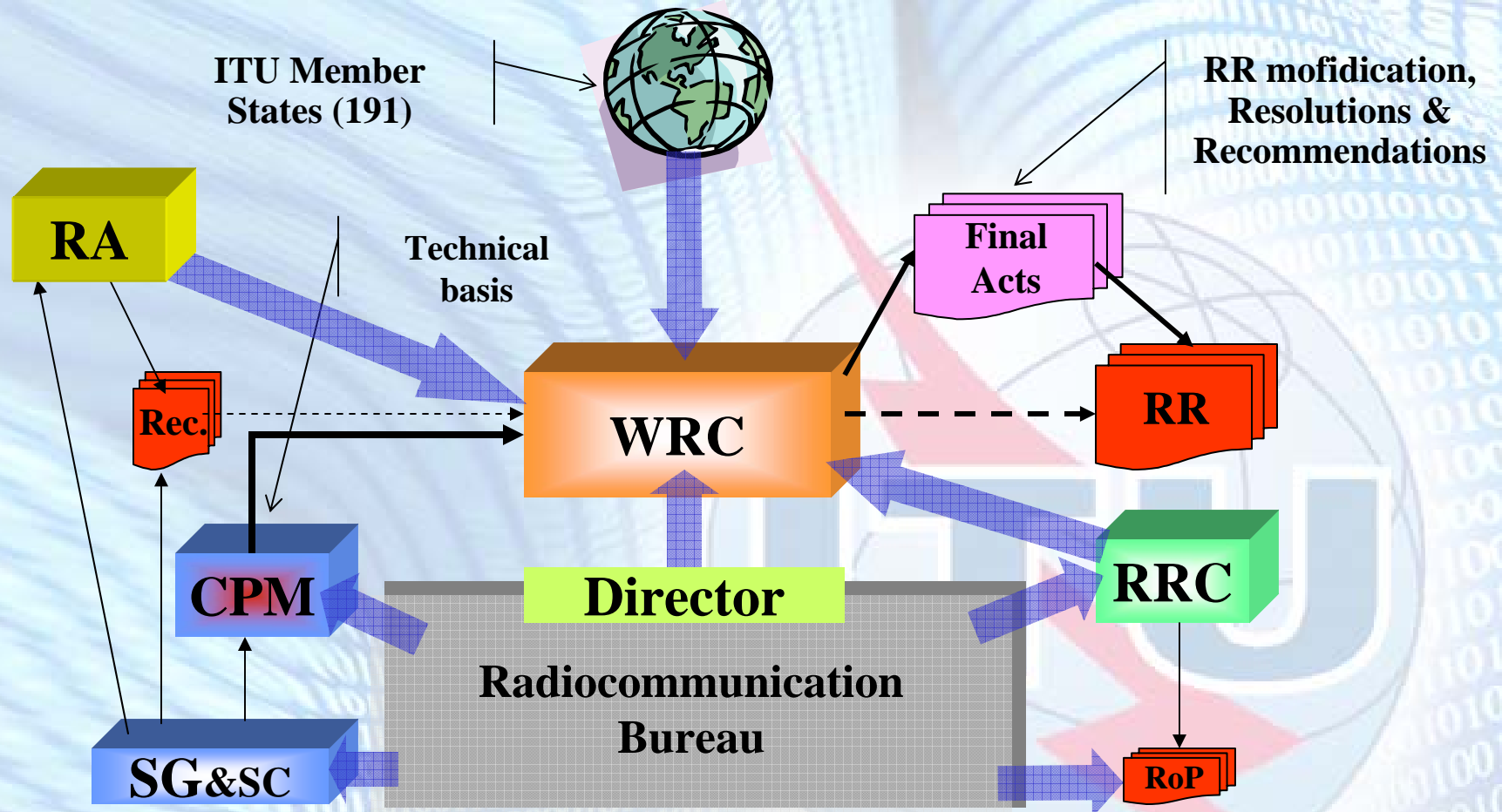
Development, Approval and Application of ITU-R Recommendations

ITU-R Recommendations:

➢ **are developed by experts from Administrations, operators and private companies (>1500 experts from most countries);**

➢ **are approved by the ITU Member States either by correspondence or at the Radiocommunication Assembly;**

➢ **are voluntary standards (except those incorporated in RR by reference). However, even voluntary ITU-R Recommendations are, in practice, applied everywhere;**

➢ **application of ITU-R Recommendations incorporated in RR is mandatory for spectrum management on the international level;**

➢ **applied by spectrum management specialist/planners, system designers, radiocommunication operators/engineers, etc.**

ITU-R Study Group prepare technical basis for WRC

ITU Member States (191)

RR mofidication, Resolutions & Recommendations

RA

Technical basis

Final Acts

Rec.

WRC

RR

CPM

Director

RRC

Radiocommunication Bureau

SG&SC

RoP

RoP:	Rules of Procedure	**CPM:**	Conference Preparatory Meeting
RR:	Radio Regulations (treaty status)	**MIFR:**	Master International Frequency Registry
RRB:	Radio Regulations Board	**RA:**	Radiocommunication Assembly
SGs:	Study Groups	**RAG:**	Radiocommunication Advisory Group
WRC:	World Radiocommunication Conference	**Rec:**	Recommendations (international voluntary standards)

Radiocommunication Study Groups

Res. ITU-R 4-5 of Radiocommunication Assembly 2007:
- 6 ITU-R Study Groups:

SG 1: Spectrum management

SG 3: Radiowave propagation

SG 4: Satellite services

SG 5: Terrestrial services

SG 6: Broadcasting service

SG 7: Science services

In addition:

CCV: Coordination Committee for Vocabulary

CPM: Conference Preparatory Meeting

SC: Special Committee on regulatory and procedural matters

See Web page at: http://www.itu.int/ITU-R/go/rsg

- ✓ >900 Recommendations
- ✓ "Standards" in areas of spectrum management and radio technology
- ✓ Result of consensus from meetings of world-wide experts
- ✓ Some referred to in RR
- ✓ Used by spectrum planners and system designers

Supported by Counsellors and Assistants in Study Group Department of BR

ITU-R Study Groups on Internet

Radiocommunication Sector (ITU-R) - Study Groups

Home : ITU-R : Study Groups

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Radiocommunication Sector (ITU-R)

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Study Groups

Scope

More than 1 500 specialists, from telecommunication organizations and administrations throughout the world, participate in the work of the Study Groups concerned with:

- drafting Technical bases for Radiocommunication Conferences
- developing Draft Recommendations
- compiling Handbooks

General Information

- Scope
- **Study Groups Structure**
- Brochure
- Chairmen and Vice-Chairmen
- Chairmen and Vice-Chairmen Meetings

Structure

- **Study Group 1 (SG 1) - Spectrum management**
- **Study Group 3 (SG 3) - Radiowave propagation**
- **Study Group 4 (SG 4) - Satellite services**
- **Study Group 5 (SG 5) - Terrestrial Services**
- **Study Group 6 (SG 6) - Broadcasting service**
- **Study Group 7 (SG 7) - Science services**
- **Coordination Committee for Vocabulary (CCV)**
- **Conference Preparatory Meeting (CPM)**
- **Special Committee (SC)**

Disbanded Groups

- Study Group 8 (SG 8) - Mobile, radiodetermination, amateur and related satellite services
- Study Group 9 (SG 9) - Fixed service

Адрес на Интернет: http://www.itu.int/ITU-R/go/rsg

SG Web Page Structure (using SG 1 as a sample)

Study Group 1 (SG 1) - Spectrum management

Scope

Spectrum management principles and techniques, general principles of sharing, spectrum monitoring, long-term strategies for spectrum utilization, economic approaches to national spectrum management, a...

More...

General Information

- Brochure 📄
- Chairmen and Vice-Chairmen
- Counsellor
- Contributions submission: rsg1@itu.int
- Mailing lists - FTP server [TIES]
- ITU-R Electronic facilities

Publications

- ITU-R Questions - SG 1
- Recommendations - ITU-R SM Series
- Reports - ITU-R SM Series

Next meeting

- Invitation

ITU-R Meetings schedule - Meeting sessions

Structure

- **Working Party 1A (WP 1A) - Spectrum engineering techniques**
- **Working Party 1B (WP 1B) - Spectrum management methodologies and economic strategies**
- **Working Party 1C (WP 1C) - Spectrum monitoring**

Documents

- Contributions [TIES] [XML] [?]
- Study Group 1 Summary Record (Meeting: 26-27/06/08) [TIES]
- Administrative Documents (ADM)
- Information Documents (INFO)
- Temporary Documents (DT) [TIES]
- Circular Letters (LCCE) [TIES] [XML] [?]
- Administrative Circulars (CA) [XML] [?]
- Administrative Circulars (CACE) [XML] [?]
- Administrative Circulars (CAR) [XML] [?]
- Archives

Study Group 1 "Spectrum management"

Next SG-1 Meeting

‣ 24–25/09/09
‣ Place : **Switzerland [Geneva]**

Scope

Spectrum management principles and techniques, general principles of sharing, **spectrum monitoring**, **long-term strategies** for spectrum utilization, **economic approaches to national spectrum management**, automated techniques and assistance to developing countries in **cooperation with** the Telecommunication **Development Sector**.

Mandate

- UWB, SRD, compatibility with active and passive services and RAS,
- Measurements of Radio noise, monitoring receivers/stations, DF …
- International spectrum regulatory framework
- National spectrum management aspects (regulatory, economic, strategic, planning, …)

Next Working Party Meetings - Place : Switzerland [Geneva]

WP 1A - **Spectrum engineering techniques**   ‣ 22.02–04/03/09
WP 1B - **Methodologies and economic strategies**   ‣ 25.02–04/03/09
WP 1C - **Spectrum monitoring**   ‣ 16.09–22/09/09

Study Group 3 "Radiowave propagation"

Next SG-3 Meeting

- 22–23/09/08
- Place : **Switzerland [Geneva]**

Scope

- Propagation in ionized and non-ionized media
- Development of prediction methods

Mandate

- Characteristics and mapping of propagation medium
- Propagation prediction methods for
  - terrestrial broadcasting,
  - slant path from satellites
  - mobile and personnel,
  - ionospheric propagation

Next Working Party Meetings - Place : United States [Boulder, Colorado]

WP 3J - Propagation fundamentals	05–13/06/08
WP 3K - Point-to-area propagation	06–13/06/08
WP 3L - Ionospheric propagation and radio noise	05–09/06/08
WP 3M - Point-to-point and Earth-space propagation	05–13/06/08

Study Group 4 "Satellite Services"

Next SG-4 Meeting

▸ 16–17/10/08
▸ Place : **Switzerland**
  [Geneva]

Scope

Systems and networks for Fixed, Broadcasting, Mobile and Radio-Determination Satellite Services

Mandate

- All technical and sharing issues related to non-plan space services and Appendices 30, 30A, 30B of the RR
- HEO, HIO (characteristics and interference calc. methods)
- HDFSS (definition and characteristics)
- IP, Global broadband Internet access via Satellite

Next Working Party Meetings - Place : Switzerland [Geneva]

WP 4A - Efficient orbit/spectrum utilization for FSS and BSS ▸ 01–10/10/08

WP 4B - Systems, air interfaces, performance and availability objectives
      for FSS, BSS and MSS, including IP-based applications and satellite
      news gathering ▸ 08–15/10/08

WP 4C - Efficient orbit/spectrum utilization for MSS and RDSS ▸ 13–22/10/08

Study Group 5 "Terrestrial Services"

Next SG-5 Meeting

- 10–11/11/08
- Place : **Switzerland [Geneva]**

Scope

Systems and networks for Fixed, Mobile, Radio-determination, Amateur and Amateur-satellite services.

Mandate

- IMT-2000, IMT-Advanced, maritime and aeronautical mobile services
- Fixed, mobile, portable and nomadic communications, including Broadband Wireless Access (BWA), RLANs, HAPS
- Adaptive systems at HF
- Software defined and cognitive radio systems (technical aspects)

Interim Structure (except WP 5B), Next WPs Meetings – Switzerland [Geneva] (not WP 5D)

WP 5A - **Land mobile service excluding IMT; amateur and amateur-satellite service**
▸ 01–10/10/08

WP 5B - **Maritime mobile service including Global Maritime Distress and Safety System; aeronautical mobile service and radiodetermination service**
▸ 08–15/10/08

WP 5C - **Fixed wireless systems; HF systems in the Fixed and Land Mobile Services**
▸ 13–22/10/08

WP 5D - **IMT Systems**
▸ 08/10–15/10/08 - **Place : outside Geneva**

Study Group 6 "Broadcasting Service"

Next SG-5 Meeting	Scope
▸ 30–31/10/08 ▸ Place : **Switzerland [Geneva]**	Programme production, Programme assembly, Delivery, Reception quality (incl. vision, sound, multimedia, data, etc.)

Mandate

- Protection criteria for digital TV and sound systems (RRC-06)
- Spectrum issues at HF
- Multimedia and data broadcasting for mobile reception
- Large Screen Digital Imagery (LSDI)
- Recording formats

Next Working Party Meetings - Place : Switzerland [Geneva]

WP 6A - **Terrestrial broadcasting delivery**	▸ 16–22/10/08
WP 6B - **Broadcast Service assembly and access**	▸ 20–24/10/08
WP 6C - **Programme production and quality assessment**	▸ 23–29/10/08

Study Group 7 "Science Services"

Next SG-5 Meeting

- 06 and 14/10/08
- Place : **Switzerland [Geneva]**

Scope

- Systems for space operation, space research, Earth exploration and meteorology
- Remote sensing (active/passive) systems on both ground and space-based platforms
- Radio and radar astronomy
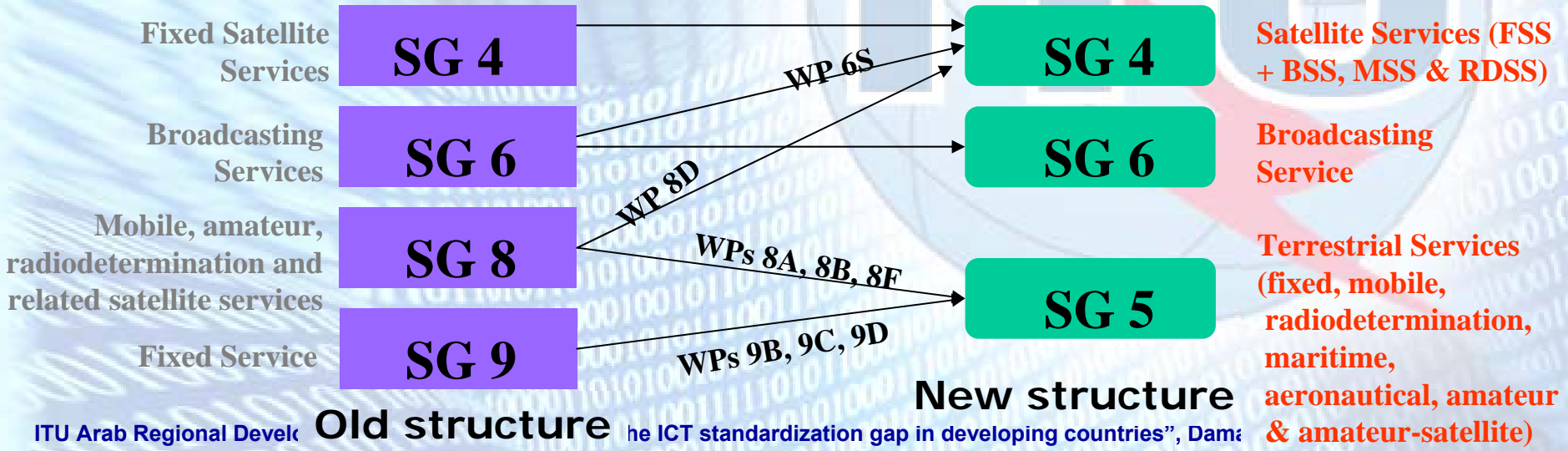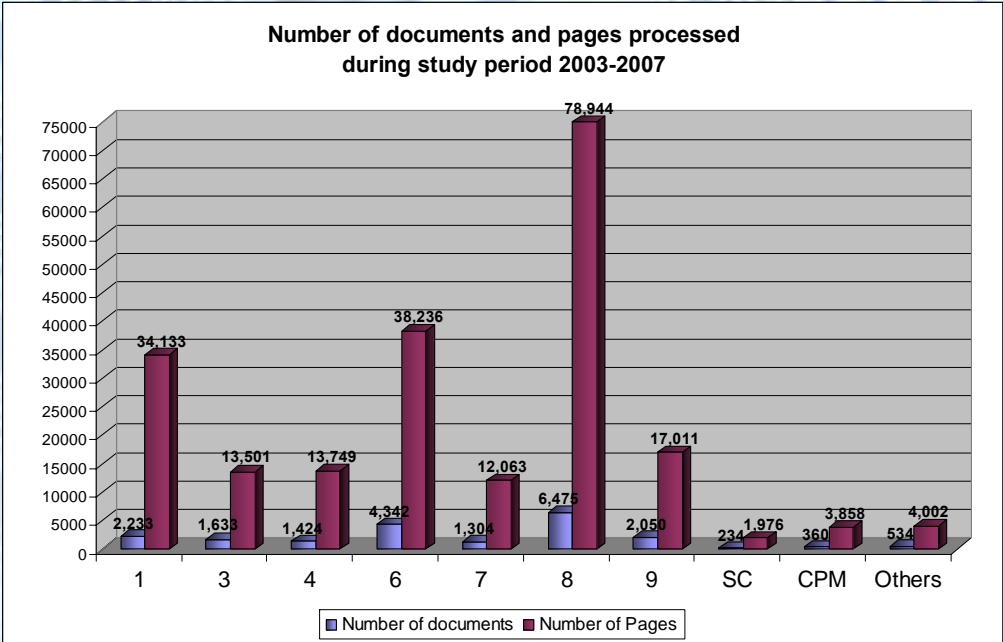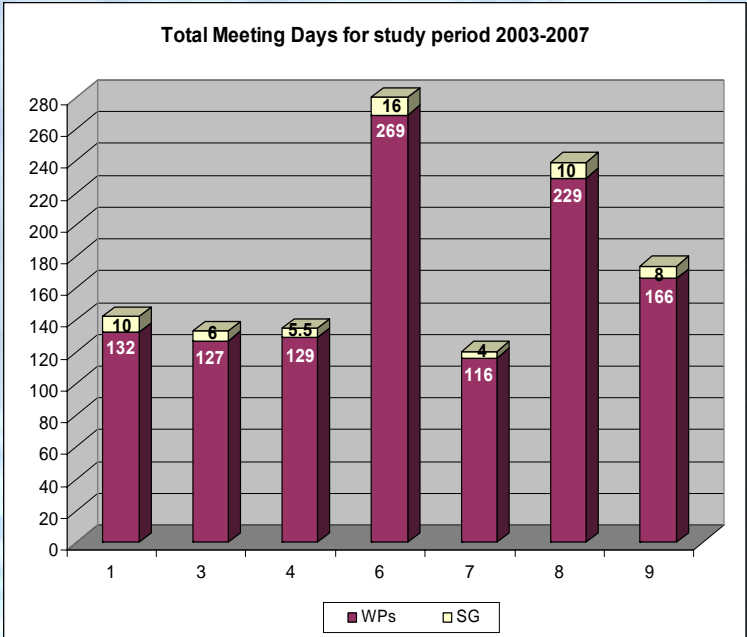- Standard frequency and time signals

Mandate

- EESS including meteorological satellite service for disaster prediction and detection
- Deep space research (e.g. Mars)
- Future of leap second
- Protection of the Radio astronomy service from other services

Next Working Party Meetings - Place : Switzerland [Geneva]

WP 7A - **Time signals & frequency standard emissions**	07–13/10/08
WP 7B - **Space radiocommunication applications**	07–13/10/08
WP 7C - **Remote sensing systems**	07–13/10/08
WP 7D - **Radio astronomy**	07–13/10/08

ITU-R Study Group meeting statistics

Total Meeting Days for study period 2003-2007

Number of documents and pages processed during study period 2003-2007

Fixed Satellite Services → **SG 4**	**SG 4** — **Satellite Services (FSS + BSS, MSS & RDSS)**
Broadcasting Services → **SG 6**	*WP 6S* → **SG 6** — **Broadcasting Service**
Mobile, amateur, radiodetermination and related satellite services → **SG 8**	*WP 8D*
Fixed Service → **SG 9**	*WPs 8A, 8B, 8F* / *WPs 9B, 9C, 9D* → **SG 5** — **Terrestrial Services (fixed, mobile, radiodetermination, maritime, aeronautical, amateur & amateur-satellite)**

Old structure

New structure

Some Important Directions in Radiocommunication Standardization

✓ **Mobile (cellular) communications**
- IMT (IMT-2000 & IMT-Advanced)

✓ **Broadband Wireless Access (BWA)**
- fixed & mobile (terrestrial) & satellite

✓ **Digital Broadcasting**
- Mobile TV

✓ **Spectrum management**
- Software-Defined/Cognitive Radios

✓ **Emergency communications**
- Use of radiocommunications in emergency situations

✓ **Environment monitoring**
- Climate Change

IMT-2000 Framework

✓ **Legal**

- Spectrum identification in the ITU Radio Regulations: lower (450-470 & 698-960 MHz), medium (1 710-1 885, 1 885-2 025, 2 110-2 200, 2 300-2 400, 2 500-2 690 MHz) plus satellite component global bands; higher (3 400-3 600 MHz, some countries & with sharing constraints)

✓ **Technical**

- Recommendation ITU-R M.1457 - Detailed specifications of the radio interfaces of IMT-2000
- Recommendations ITU-R M.1580 & ITU-R M.1581 - Generic unwanted emission characteristics of base & mobile stations using the terrestrial radio interfaces of IMT 2000

✓ **Operational**

- Recommendation ITU-R M.1308 – Evolution of land mobile systems towards IMT-2000
- Handbook - Migration to IMT-2000 Systems

Digital Broadcasting

Terrestrial digital broadcasting carries many advantages over the analogue system (similar for satellite):
- Expanded services
- Higher quality video and audio and lower power consumption
- Greater variety and faster rates of data transmission
- Consistency of data flows over long distances
- More spectrum efficiency - several programs in one channel
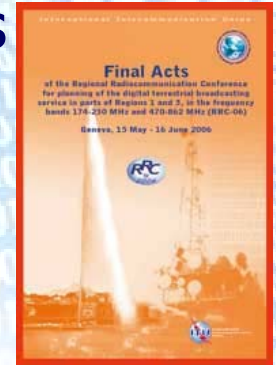
Video: **Rec. ITU-R BT.1306**   Audio: **Rec. ITU-R BS.1114**

Satellite: **Rec. ITU-R BO.1408**

ITU's Regional Radiocommunication Conference (RRC-06) established the GE06 treaty agreement heralding the development of 'all-digital' terrestrial broadcast services for sound and television. The digitalization of broadcasting in Europe, Africa, Middle East and the Islamic Republic of Iran by 2015 represents a major landmark towards establishing a more equitable, just and people-centred Information Society. The digital switchover will leapfrog existing technologies to connect the unconnected in underserved and remote communities and close the digital divide.

Reply to RRC-07 request: Rec. ITU-R P.1812 "A path-specific propagation prediction method for point-to-area terrestrial services in the VHF and UHF bands" – *higher precision of propagation prediction*

→ **Report ITU-R BT.XXX** (2008): Transition from analogue to digital terrestrial broadcasting (Overview of broadcasting technologies; application and implementation of digital broadcasting; transition issues; case studies)

Mobile TV

ITU-R studies:
- ✓ user requirements
- ✓ system characteristics
- ✓ data transmission mechanisms
- ✓ content formats
- ✓ interoperability

FIGURE 3

An example of enhanced handheld receivers for digital BSS (sound)

Rap 2049-03

Recommendation ITU-R BT.1833: Broadcasting of multimedia and data applications for mobile reception by handheld receivers

Current systems:
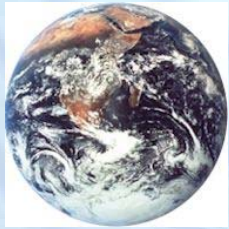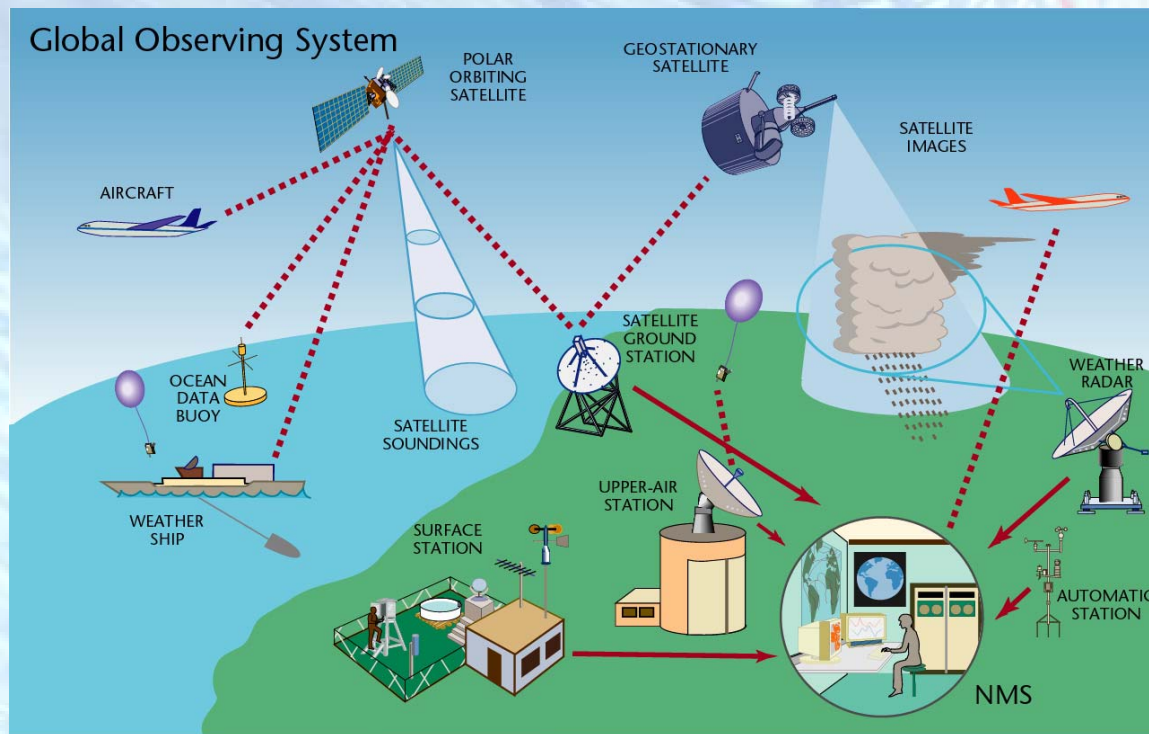- ISDB-T (Japan)
- T-DMB (Rep. Korea)
- DVB-H (Europe)
- FLO (US)

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Climate Monitoring, Radio Technologies and Remote Sensing

Global Observing System (World Meteorological Organization (WMO))

Spectrum

Non-interference operation
Computing

The backbone of the environment monitoring system built on the radio-based remote sensors (active and passive).

Remote sensing is the main component of the environment monitoring system. ITU-R standards for development and the use of remote sensing are contained in RS-Series of ITU-R Recommendations *(RS means Remote Sensing)* – ITU-R Study Group 7. ITU-D Study Group 2 develops report on the use of remote sensing for disaster prediction, detection and mitigation.
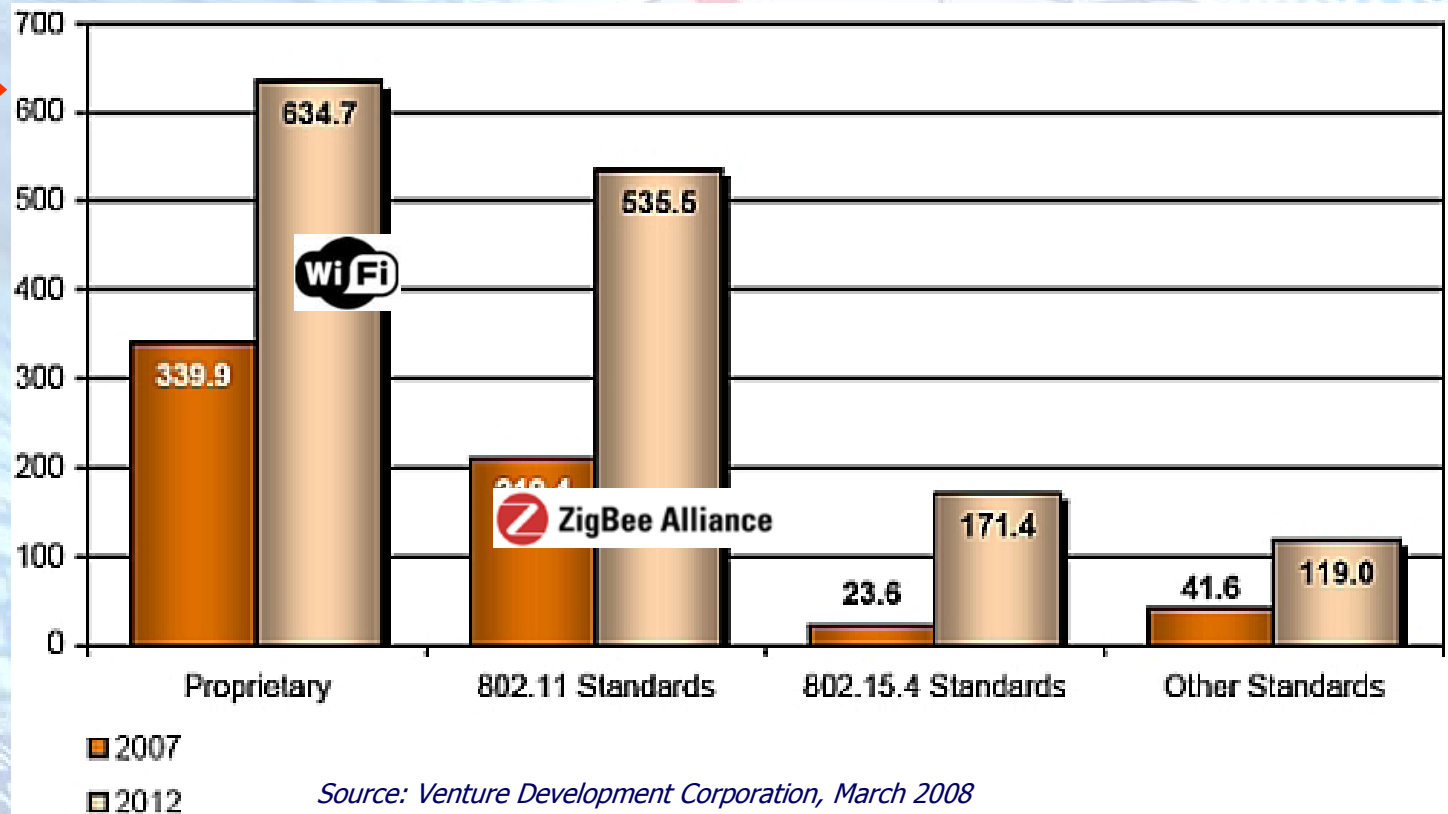
Wireless Standards

De facto

Industry

De jure

Bluetooth

IEEE 802

Wi Fi

WiMAX FORUM

Объём продаж
(миллионов $ США)

Wi Fi

ZigBee Alliance

	Proprietary	802.11 Standards	802.15.4 Standards	Other Standards
2007	339.9		23.6	41.6
2012	634.7	535.5	171.4	119.0

Source: Venture Development Corporation, March 2008

ITU-R Reports

ITU-R Report – "A technical, operational or procedural statement, prepared by a Study Group on a given subject related to a current Question or the results of studies..." (Resolution ITU-R 1-5)

Example of ITU-R Reports:

- **Guidance on the regulatory framework for national spectrum management (SM.2093)**
- **Economic aspects of spectrum management (SM.2012)**
- **Current and future use of the band near 13.5 GHz by spaceborne active sensors (RS.2068)**
- **Spectrum requirements for the future development of IMT-2000 and IMT-Advanced (M.2078)**
- **Digital satellite broadcasting system (television, sound and data) with flexible configuration (BO.2101)**
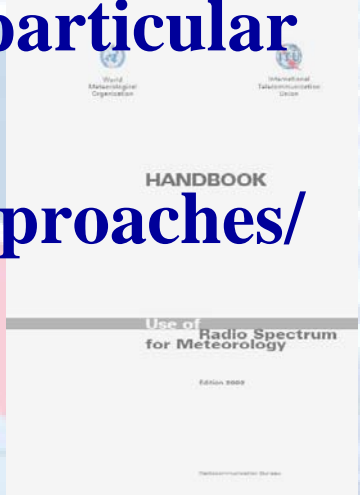
ITU-R Reports available (free of charge) from:
http://www.itu.int/publications/publications.aspx?lang=en&parent=R-REP&selection=7&sector=1

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ITU Arab Regional Development Forum 2008 "Bridging the ICT standardization gap in developing countries", Damascus, Syria, 20-22 June 2008

ITU-R Handbooks

Usually:

- contain the general description of the problem;
- ITU-R approved methods/approaches, which could be applied;
- could be used as guidelines for application of the ITU-R Recommendations for resolving a particular issue;
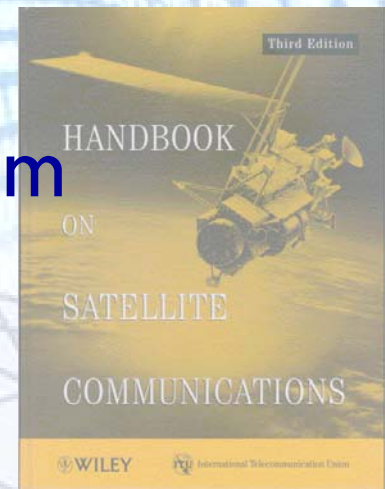- good starting point for studying ITU-R approaches/ methods/algorithms, etc.

See at: **http://www.itu.int/publications/publications.aspx?lang=en&parent=R-HDB&selection=8&sector=1**

Examples of ITU-R Handbooks

- National Spectrum Management
- Computer aided techniques for Spectrum Management
- Satellite Communications
- Propagation on Earth-space paths
- Use of radio spectrum for meteorology
- Digital terrestrial TV broadcasting
- Land mobile including wireless access
- Frequency adaptive systems
- **Etc.**

See at: **http://www.itu.int/publications/publications.aspx?lang=en&parent=R-HDB&selection=8&sector=1**

ITU Arab Regional Development Forum 2008 "Bridging the ICT standardization gap in developing countries", Damascus, Syria, 20-22 June 2008

Additional information

ITU Arab Regional Development Forum 2008 "Bridging the ICT standardization gap in developing countries", Damascus, Syria, 20-22 June 2008

ITU-R Recommendation series

BO: Satellite delivery
BR: Recording for production, archival and play-out; film for television
BS: Broadcasting service (sound)
BT: Broadcasting service (television)
F: Fixed service
M: Mobile, radiodetermination, amateur and related satellite services
P: Radiowave propagation
RA: Radio astronomy
RS: Remote sensing systems
S: Fixed-satellite service
SA: Space applications and meteorology
SF: Frequency sharing and coordination between fixed-satellite and fixed service systems
SM: Spectrum management
SNG: Satellite news gathering
TF: Time signals and frequency standards emissions
V: Vocabulary and related subjects

Some recent and future ITU-R Seminars

ITU-R seminar "Software Defined Radio and Cognitive Radio Systems" in Geneva:

- programme: http://www.itu.int/ITU-R/study-groups/docs/rwp5a-programme.pdf
- presentations: http://www.itu.int/ITU-R/study-groups/seminars/rwp5a-radio/

Regional BR seminar on spectrum management (Region 2) in Argentine - see at: http://www.itu.int/ITU-R/index.asp?category=conferences&rlink=buenos-aires-2008&lang=en.

Regional BR radiocommunication seminar for Arab region in the United Arab Emirates - see at: http://www.itu.int/ITU-R/index.asp?category=conferences&rlink=abu-dhabi-2007&lang=en.

BR Biennial Seminar 8-12 December 2008, Geneva – see at: http://www.itu.int/md/R00-CA-CIR-0174/en .