

INTERNATIONAL SPECTRUM MANAGEMENT AND THE ITU "WRC-07 TO WRC-11"

Valery Timofeev ¹

¹Director, Radiocommunication Bureau, International Telecommunication Union (ITU),
Geneva, Switzerland, email: brmail@itu.int

Abstract: This text outlines the international spectrum regulatory framework, the role of the International Telecommunication Union through the World Radiocommunication Conferences providing main highlights of WRC-07 and main issues for discussion at forthcoming WRC-11.

Keywords: ITU Radio Regulations, World Radiocommunication Conference (WRC), WRC-07, WRC-11, radio-frequency spectrum management, international spectrum regulatory framework, Resolution 951 (Rev.WRC-07), Final Acts (WRC-07).

1. INTRODUCTION

The International Telecommunication Union (ITU) is a specialized agency of the United Nations, which is founded on the principle of cooperation between governments and the private sector. Based in Geneva, Switzerland, its membership includes 191 Member States and more than 700 telecommunication companies/operators and other private entities (referred to as Sector Members and Associates).

ITU is unique among international organizations as it is formally open to the private sector through our system of "Sector Membership". The private companies help ITU to guide and strengthen its work in standards harmonization, spectrum management and development.

ITU has traditionally provided a forum where equipment manufacturers, network operators, service and application providers can discuss together the development of new market opportunities and learn from each other's experience.

Being the leading United Nations agency for information and communication technology (ICT), the ITU is helping the world to communicate through the activity of its 3 core Sectors: Radiocommunication (ITU-R), Telecommunication Standardization (ITU-T) and Development (ITU-D) and the General Secretariat.

The history of the ITU is intimately linked to the development of radiocommunications. Today, we are witnessing a phenomenal increase in the use of wireless systems in a myriad of applications, like: WiFi, Bluetooth, 3G, WiMax, RFID, UWB and other mysterious mnemonics.

ITU's tasks in the radiocommunication/space sphere are carried out in the ITU-R Sector. Its aim is to achieve consensus for the rational use of a vast and growing range of wireless services, including those based on new space radiocommunication technologies and other related fields of activity.

The ITU plays a vital role in the global management of the radio-frequency spectrum and satellite orbits, limited natural resources which are increasingly in demand from a large number of services such as fixed, mobile, broadcasting, amateur, space research, meteorology, global positioning systems, environmental monitoring and communication services that ensure safety of life on land, at sea and in the skies.

The ITU manages the detailed coordination and recording procedures for space systems and earth stations. Its main role is to process and publish data and to carry out examination of frequency assignment notices submitted by administrations for inclusion in the formal coordination procedures or recording in the Master International Frequency Register.

The ITU also develops and manages the space-related assignment and allotment plans, which provide each country with suitable orbital slots, associated frequency bands and a national coverage.

Since the global use and management of frequencies require a high level of international cooperation, one of the principal tasks of the ITU Radiocommunication Bureau (being the secretariat of the ITU-R) is to facilitate the complex inter-governmental negotiations needed to develop legally binding agreements between sovereign states. These agreements are embodied in the

Radio Regulations and in world and regional plans adopted for different space and terrestrial services.

Today, the Radio Regulations apply to frequencies ranging from 9 kHz to 400 GHz, and now incorporate over 1 000 pages of information describing how the spectrum must be used and shared around the globe. In an increasingly 'unwired' world, some 40 different radio services now compete for allocations to provide the spectrum needed to extend applications or to support an increasing number of users.

The ITU World Radiocommunication Conference 2007 (WRC-07) that took place in Geneva on 22 October - 16 November 2007 considered the results of studies on options to improve the international spectrum regulatory framework based on the examination of the effectiveness, appropriateness and impact of the Radio Regulations with respect to the evolution of existing, emerging and future applications, systems and technologies.

Rapid technological developments and growth in the information and communication technologies (ICT) sector have fuelled the demand for radio-frequency spectrum. WRC-07 considered some 30 agenda items, dealing with almost all terrestrial and space radio services and applications. These included International Mobile Telecommunications (IMT) - the concept that embraces advanced broadband mobile technology for use on a global basis, systems in the fixed- and broadcasting-satellite services, aeronautical telemetry and telecommand systems, meteorological applications, maritime distress and safety signals, digital broadcasting, and the use of radio in the detection of natural disasters.

To prepare for a truly wireless future, the WRC-07 was mandated to decide the most rational and efficient ways to exploit the limited resource of radio-frequency spectrum and to manage satellite orbits. These are critical for achieving global connectivity goals in the 21st century. The role of WRC-07 was to "continue the development that has taken place through recent conferences to improve regulatory procedures and to provide frequency and orbit resources for new technologies, which are essential for the operation of all wireless services".

WRC-07 ended with the signing by 155 countries of revised and updated Radio Regulations, the international treaty governing the use of the radio-frequency spectrum and satellite orbits. Over 2 800 delegates, representing 164 Member States, and 104 Observers attended the four-week conference, which was marked by intense negotiations on the future of radiocommunications.

2. MAIN HIGHLIGHTS OF WRC-07

2.1. International Mobile Telecommunications (IMT)

Globally harmonized spectrum identified for use by International Mobile Telecommunications (IMT) represents an important step in the worldwide development of IMT systems:

- 450-470 MHz band
- 698-862 MHz band in Region 2 and nine countries of Region 3
- 790-862 MHz band in Regions 1 and 3
- 2.3-2.4 GHz band
- 3.4-3.6 GHz band (no global allocation, but accepted by many countries).

ITU and industry leaders saw the allocation changes and the identification of new IMT frequency bands as a major achievement of WRC-07 and an important step towards closing the digital divide.

2.2. Maritime procedures

WRC-07 successfully reviewed international regulations related to the maritime mobile service, bringing them in line with current maritime communications technology, including distress and safety transmissions within the Global Maritime Distress and Safety System (GMDSS).

2.3. Aeronautical services

Aimed at aeronautical security and modernization of civil aviation telecommunication systems:

- Upgrade radiolocation service to primary allocation status in the bands 9000–9200 MHz and 9300–9500 MHz
- allocate additional spectrum for aeronautical telecommand and high bit-rate aeronautical telemetry
- add new allocations for the aeronautical mobile (R) service.

2.4. Earth-exploration satellite service (EESS)

WRC-07 extended existing primary frequency allocations for EESS, facilitating research and exploration of Earth resources and environmental elements. This was linked to furthering the development of science services. EESS systems are global assets that provide key services to monitor the planet as well as to predict and monitor natural disasters, meteorology and climate change.

2.5. Worldwide Plan for fixed-satellite service (FSS)

WRC-07 revised the technical and regulatory provisions for fixed-satellite service in the 800 MHz bandwidth used in different regions under varying climatic conditions for applications such as communications, TV, internet, etc. The revised Plan, based on the latest technological achievements, improves effectiveness of the Plan and facilitates access to the spectrum for FSS systems.

2.6. Emergency and disaster relief

WRC-07 advocated the development of spectrum management guidelines for radiocommunication in emergency and disaster relief as well as the identification and maintenance of available frequencies for use in the very early stages of humanitarian assistance intervention in the aftermath of disaster. ITU will develop a database for frequency management in disaster situations.

2.7. WRC-07 calls for enhancement of radio services

- Enhancement of the international spectrum regulatory framework
- Spectrum harmonization for use by terrestrial electronic news gathering (ENG)
- Short Range Radio Devices, including devices using ultra-wideband (UWB) technologies, radio-frequency identification devices (RFID), and other similar applications that generate and use radio frequencies locally.

2.8. Other

WRC-07 also approved proposals concerning the use and further development of satellite systems using highly inclined orbits, high altitude platforms, as well as the compatibility and sharing between different space and terrestrial services.

3. WRC-07 TO WRC-11 – NEXT STEPS

The Agenda for the ITU World Radiocommunication Conference 2011 (WRC-11), contained in Resolution 805 (WRC-07), will be submitted for approval to ITU Council-08. The first session of the Conference Preparatory Meeting, CPM11-1, has initiated and organized the Preparatory Studies for WRC-11. These Preparatory Studies are carried out by ITU-R Study Groups and will continue until about 14 months prior to WRC-11, the results of which, including proposed methods to satisfy the WRC-11 agenda items, will be presented in the CPM Report to WRC-11 about 7 months prior to WRC-11. Final meetings of regional groups will end with Member States' proposals submitted to WRC-11.

Development of ITU-R standards through the Study Groups and Radiocommunication Assemblies prepare the technical ground for WRC's and for further improvement of spectrum management.

WRC-11 will consider 33 agenda items, again almost all terrestrial (RLS, AM(R)S, FS, BS, MS, Maritime MS, Amat.S) and space (AMS(R)S, SRS, BSS, MSS, MetAids, RDSS, MetSat) services as well as other issues (Resolution 951 (Rev. WRC-07), SRDs, Cognitive Radio) and many other applications systems (UAS, ENG, HAPS, oceanographic radar, ...)

The following are some of the main issues to be discussed at WRC-11:

3.1. Aeronautical issues

- Increase and high-priority of Aeronautical Route communications by satellite for safety and regularity of flights in civil air transportation
- Aeronautical community needs for safety-critical radiocommunication data links and new applications / concepts in air traffic management
- Unmanned Aircraft Systems: Increasing radiocommunications for UAS systems in same environment as manned aircrafts, as well as in specific environments not accessible to manned aircrafts

3.2. Maritime and Amateur issues

3.2.1 Maritime issues

- Introduction of new digital technologies better responding to emerging demand for new services capable of delivering maritime safety information
- Increasing need to enhance ship and cargo identification, tracking, surveillance and ship and port security and safety

3.2.2 Amateur issues

- Provide ultra-reliable regional communications to the Amateur Radio Service to enable it to serve in cases of natural emergency situations as a backup to public communication channels

3.3. Scientific issues

3.3.1 Radiolocation issues

- Emerging requirements for increased resolution of radars operations, enabling space object detection
- Use of HF oceanographic radars for environmental, oceanographic, meteorological, climatological, maritime and disaster mitigation operations

3.3.2 Science issues

- Protection of spectrum use by passive services for climatological and meteorological purposes as well as for Radio astronomy (in bands from 275 to 3 000 GHz)
- Needs for future high-resolution sensors at 8 GHz, for weather forecast, climate changes, hazard predictions.

3.4. Other Science and Satellite issues

3.4.1 Other science issues

- MetAids/Passive systems used for lightning detection and locations, and for Operational and safety-of-life services providing warnings of extreme weather events (systems using VLF bands)
- Growing interest in space exploration with both robotic and manned missions (particularly towards and around the Moon: examining terrain, environment and potential landing sites).

3.4.2 Satellite issues

- Need for worldwide spectrum allocation for position & time radio-determination by Satellite, offering great societal benefits.

3.5. IMT and other services issues

- Use of the digital dividend resulting from the analogue to digital television transition – Spectrum opportunities for new applications (IMT-Advanced, etc.)
- Need for additional spectrum allocation(s) to meet the requirements for satellite component of IMT as well as those of other mobile communications by satellite
- Development of high-speed data fixed wireless applications in spectrum above 70 GHz
- Use of high altitude platform stations (HAPS)
- Increase harmonization of spectrum use for coverage of international events (ENG), including emergencies, natural disasters, breaking news.

4. RESOLUTION 951 (REV.WRC-07) - ENHANCING THE INTERNATIONAL SPECTRUM REGULATORY FRAMEWORK

Particular mention should be made to Resolution 951 (Rev.WRC-07) that will take appropriate actions with a view to enhancing the international spectrum regulatory framework. In doing so, WRC-11 should assess how the Radio Regulations could accommodate:

- Increase and evolution in demand for spectrum and multiplicity of existing and future applications for radiocommunications
- Convergence of radio technologies for some applications combining elements of different radiocommunication services
- Interest in rational, efficient and economic use of spectrum:

ITU-R SG-1 Report to WRC-07 (Doc. 24) identified some required changes to accommodate converging services that could rely on a combination of service definitions, allocations and procedures. This implies need for additional studies, taking into account four possible options so far identified:

- current practice;
- review service definitions;
- enable service substitution;
- composite services.

These additional studies should be based on the following guidelines:

- evaluate options;
- develop concepts and procedures including sharing studies on a band-by-band basis;
- prepare technical and regulatory solutions for WRC-11 consideration.

Resolution 951 (Rev.WRC-07) is a very important agenda item since it would certainly have significant subsequent implications on spectrum management at the national level in terms of frequency assignment, licensing, as well as spectrum monitoring, inspection and last but not least, investigation of interference problems.

5. FURTHER REMARKS

In discussing aspects of space and terrestrial radio applications one must not forget the indispensable use of radio for various aspects of safety of life, including disaster prevention and relief operations and for monitoring climate change.

During his visit to ITU headquarters (June 2007), the United Nations Secretary-General, Mr. Ban Ki-moon remarked that "ITU is one of the most important stakeholders in terms of climate change". The United Nations Secretary-General also described climate change as the "moral challenge of our generation". ITU will join in the efforts of the UN system to "deliver as one" in addressing climate change and will act to enhance the global understanding of the relation between ICTs and climate change.

ITU work in general, and specifically the work of the Radiocommunication Sector (ITU-R) in the area of climate change, focuses on the use of ICT (different

radio and telecommunication technologies and equipment) for monitoring weather and climate change, as well as for the prediction, detection and mitigation of natural disasters such as hurricanes, typhoons, thunderstorms, earthquakes, tsunamis, man-made disasters, etc. and for providing essential communications for disaster relief.

In certain cases, when the “wired” and terrestrial telecommunication infrastructure is significantly or completely destroyed, space radiocommunication services can become one of the major means of communication due to its quick deployment for disaster relief operation.

The ITU Radiocommunication Sector studies possibilities for identification of suitable frequency bands that could be used on a global/regional basis for public protection and disaster relief, as well as on facilitating cross-border circulation of equipment intended for use in emergency and disaster relief situations, the second of these tasks being reinforced by the Tampere Convention on the provision of telecommunication resources for disaster mitigation and relief operations.

The crucial role wireless systems are playing in the efficient and timely deployment of communications infrastructure is also key factor in the efforts being undertaken by the global community to bridge the digital divide.

ICTs are omnipresent tools with profound implications for all economic sectors. We have all become familiar with e-Commerce, e- government, e-learning, and e-Health, e-community development. ICTs facilitate everything from a banking transaction to emergency and disaster relief through radiocommunications. In all such systems, satellites play a major role, in particular for rural telecommunications in remote areas, where earth stations may be the only means to communicate.

The digital divide is one of the global issues that will shape our common future in the 21st century. Our success in finding viable and sustainable solutions to bridging the digital divide will determine to what extent we are able to fulfill the World Summit on the Information Society (WSIS) vision of building an inclusive, people-centred and development-oriented information society open to all. World leaders have recognized information and communication technologies as key factors of economic and social development.

ACKNOWLEDGMENT

The author would like to thank the staff of the ITU Radiocommunication Bureau.

REFERENCES

- [1] Radio Regulations (Edition of 2004).
Available: <http://www.itu.int/publ/R-REG-RR-2004/en>
- [2] ITU-R SG1 Report to WRC-07 (Doc. 24):
Available: <http://www.itu.int/md/R07-WRC07-C-0024/>
- [3] Final Acts WRC-07 (Geneva, 27 October – 16 November 2007)
Available: <http://www.itu.int/publ/R-ACT-WRC.8-2007/en>

Valery Timofeev was elected by the ITU Plenipotentiary Conference in 2002 and re-elected in November, 2006 to the post of Director of the Radiocommunication Bureau (BR) of the International Telecommunication Union (ITU).

As Director, Mr. Timofeev is responsible for the management of the Radiocommunication Bureau which organises and co-ordinates the work of the Radiocommunication Sector whose aim is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum and the geostationary satellite orbit.

Previous to taking up his duties at the ITU in January, 2003, he was Deputy Minister for Communications and Informatization and Deputy Chairman of the State Radio-Frequency Commission of the Russian Federation. Since 1968, Mr. Timofeev has served as the head or deputy head for national delegations at several ITU conferences and meetings.

Mr. Timofeev is Doctor of Sciences and also holds Diplomas in Radio Engineering and in International Economics.

Complete biography for Mr. Valery Timofeev is available on <http://www.itu.int/net/ITU-SG/directors/timofeev.aspx>