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**ITU RADIO REGULATORY FRAMEWORK  
FOR SMALL SATELLITE DESIGN AND OPERATION**

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The rights and obligations of the Member States of ITU in the domain of international frequency management of the spectrum/orbit resource are incorporated in the Constitution (CS) and Convention (CV) of the ITU and in the Radio Regulations (RR) that complement them. These instruments contain the main principles and lay down the specific regulations governing the following major elements:

- frequency spectrum allocations to different categories of radiocommunication services;
- rights and obligations of member administrations in obtaining access to the spectrum/orbit resource-;
- international recognition of these rights by recording frequency assignments and, as appropriate, any associated orbits, including the geostationary-satellite orbits (GSO) used or intended to be used in the Master International Frequency Register (MIFR).

The above regulations are based on the main principles of efficient use of and equitable access to the spectrum/orbit resource- laid down in provision No. **196** of the ITU Constitution (Article **44**), which stipulates that "*In using frequency bands for radio services, Members States shall bear in mind that radio frequencies and any associated orbits, including the geostationary-satellite orbit, are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to those orbits and frequencies, taking into account the special needs of the developing countries and the geographical situation of particular countries*". As indicated in the above provision, further detailed regulations and procedures governing spectrum/orbit use are contained in the Radio Regulations, which is a binding international treaty (No. **31** of the ITU Constitution).

Specific procedures have been established to ensure international recognition of the frequencies used and to safeguard the rights of administrations when they comply with those procedures.

The fact that the ITU Constitution and Convention and the Radio Regulations that complement them are *intergovernmental treaties ratified by governments* - means that those governments undertake:

- to apply the provisions in their countries; and
- to adopt adequate national legislation that includes, as the basic minimum, the essential provisions of this international treaty.

The international Radio Regulations are nevertheless oriented mainly towards matters of a global or regional character, and in many areas there is scope for making special arrangements on a bilateral or multilateral basis.

*THIS PAPER DEALS WITH SOME OF THE MAJOR RADIO REGULATORY ASPECTS RELATED TO  
NON GEOSTATIONARY-SATELLITE NETWORKS  
AND NON-PLANNED FREQUENCY BANDS.*

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## I. INTRODUCTION

Over the last 30 years, the space regulatory framework has been constantly adapted to changing circumstances and has achieved the necessary flexibility in satisfying the two major, but not always compatible, requirements of *efficiency* and *equity*. The dramatic development of telecommunication services, has seen an increasing demand for spectrum/orbit usage for practically all space communication services. This increase is attributable to many factors. These include not only technological progress, but also political, social and structural changes around the world and their impact on the liberalization of telecommunication services, the introduction of non-geostationary-satellite orbit (non-GSO) satellite systems for commercial communications, growing market orientation, the change in the way this widening market is shared between private and state-owned service providers and the general globalization and commercialization of communication systems.

## II. THE ITU RADIO REGULATIONS

### II.1 Leading international radio regulatory instrument

The ITU Radio Regulations [1], as a leading instrument in the international radio regulatory set-up, are based on the use of two main concepts:

- The concept of block allocations of frequencies that are intended for use by defined radio services -Table of Frequency Allocations (Table) as contained in Article 5 of the RR. This concept generally provides common frequency allocations to mutually compatible services operating with similar technical characteristics in specific parts of the spectrum. It also provides a stable planning environment for administrations, equipment manufacturers and users.
- The concept of voluntary or mandatory regulatory procedures (for coordination, notification and recording) adapted to the allocation structure.

### II.2 Objectives

The Radio Regulations have the following objectives:

- to facilitate equitable access to and rational use of the natural resources of the radio-frequency spectrum and any associated orbits, including the GSO;
- to ensure the availability and protection from harmful interference of the frequencies provided for distress and safety purposes;
- to assist in the prevention and resolution of cases of harmful interference between the radio services of different administrations;
- to facilitate the efficient and effective operation of all radiocommunication services;
- to provide for and, where necessary, regulate new applications of radiocommunication technology.

## III. ALLOCATION STRUCTURE

### III.1 Allocation structure and principles

The allocation structure (Article 5 of the RR) and associated principles represent a basis for the planning and implementation of radiocommunication services. The current approach is based on a block allocation methodology with footnotes. The regulated frequency band (9 kHz - 1 000 GHz) is segmented into smaller bands and allocated to over forty defined radiocommunication services (Article 1 of the RR). The radio services are identified as *primary* or *secondary* (the latter shall cause no harmful interference to, or claim protection from, the former) and footnotes are used to further specify how the frequencies are to be assigned or used. The Table is organized into three Regions of the world (see Figure 1) and is supplemented by assignment and allotment Plans for some bands and services, and/or by mandatory coordination procedures.

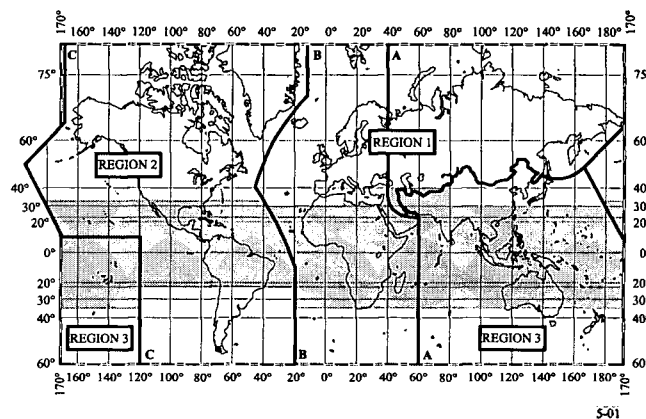


Fig. 1: Regions for purposes of frequency allocation of the RR  
The shaded part represents the Tropical Zones as defined in Nos. 5.16 to 5.20 and 5.21 of the RR.

### III.2 Type of allocation

Two types of allocation are made:

- *exclusive allocations*, which are favoured in cases that involve broad international use of equipment and practices which imply the need to harmonize relevant operational procedures and technical material in a larger

international context. In some cases, the exclusive allocations are subject to a Plan (e.g. in the broadcasting service, the maritime mobile service or the aeronautical mobile service);

- *shared frequency allocations*, which are applied to maximize the use of the available spectrum when two or more radiocommunication services can effectively utilize the same frequency band. The regulatory procedures which govern the use of bands that are allocated to several radiocommunication services, on a shared basis, are based on the use of technical criteria (usually threshold values) which are intended to identify the countries with which coordination is to be effected in order to obtain an acceptable sharing arrangement.

### III.III Basic principles related to use of the Table

Using the Table as a starting point, the frequency spectrum management authority of each country selects appropriate frequencies with a view to assigning them to stations of a given service. Before taking the final decision to assign a frequency to a station in a given radiocommunication service in a given frequency band and to issue an appropriate licence, the authority concerned should be aware of all other conditions regulating the use of frequencies in the band concerned, e.g.:

- Are there other mandatory RR provisions governing the use of the frequencies?
- Is the band concerned subject to a pre-established international assignment or allotment Plan? Are the characteristics of the assignment in accordance with the appropriate entry in the Plan? Is there a need to apply the Plan modification procedure prior to issuing a licence?
- Is there a need for effecting the coordination procedure prior to notification of the concerned assignment to the Radiocommunication Bureau (Bureau) or prior to its bringing into use?
- Is the procedure mandatory or voluntary? Is the procedure specified in the RR or in a special agreement?
- Is there a need to notify the frequency assignment to the Bureau, when should such notification be effected, which characteristics are to be notified, what action should be foreseen after the recording or otherwise of the frequency assignment concerned?

## IV. REGULATORY PRINCIPLES APPLICABLE TO THE USE OF FREQUENCIES AND SATELLITE ORBITS

### IV.I Major regulatory mechanism

The specific procedures setting out the rights and obligations of administrations in the domain of spectrum/orbit management and providing the means to achieve *interference-free radiocommunications* have been laid down by successive World Radiocommunication Conferences (WRCs) on the basis of the two main principles referred to above: *efficient use and equitable access*. In order to put these principles into effect, two major mechanisms for the sharing of orbit and spectrum resources have been developed and implemented:

### IV.II A priori planning of the frequency bands

Frequency allotment or frequency assignment Plans represent a key mechanism for preserving the rights of all Member States in the context of *equitable access* to the limited radio resources (the frequency spectrum and satellite orbit) for *future use*. This concern resulted in the establishment (and introduction into the ITU regulatory regime) of frequency/orbital position Plans in which a certain amount of frequency spectrum is set aside *for future use by all countries*, particularly those which are not in a position, at present, to make use of these resources. These Plans, in which each country has a predetermined orbital position associated with the free use, at any time, of a certain amount of frequency spectrum, together with the associated procedures, guarantee for all countries equitable access to the spectrum/orbit resource, thereby safeguarding their basic rights. Such Plans govern a considerable part of the frequency usage of the most resource-demanding radiocommunication services. Associated with these Plans are Plan modification and notification procedures that provide for the satisfaction of particular operational requirements that are not met by the Plans, while preserving the integrity of the Plans themselves.

### IV.III Efficient use of the non-planned frequency bands

Coordination procedures (aimed at *efficiency* in spectrum/orbit use and interference-free operation satisfying *actual requirements*), cover:

- GSO-satellite networks (in all services and frequency bands) and non-GSO-satellite networks in certain frequency bands governed by No. 9.11A of the RR, which are subject to Advance

Publication of Information (API) and coordination procedures;

- the majority of non-GSO satellite networks (all pertinent services and certain frequency bands), for which only the API procedure is required before notification.

## V. COORDINATION PROCEDURES APPLICABLE TO NON-PLANNED BANDS

### V.I The procedures for coordinating the use of frequencies

The procedures for coordinating the use of frequencies represent a basic component of the international radio regulatory set-up, as they enable the implementation of new radiocommunication systems while avoiding harmful interference with regard to other existing and planned users. In essence, coordination is a bilateral or multilateral process conducted between administrations comprising the following activities:

- identification of the administrations whose assignments are likely to be affected and with which coordination must be sought or agreement obtained;
- use of standardized methods for calculating the potential for interference;
- application of standardized steps in well-defined and transparent procedures of the RR comprising, *inter alia*, the exchange of data elements in a prescribed RR Appendix 4 format, communicating comments within a prescribed period, and, when appropriate, publication of the results of the coordination procedure in the special section of the Bureau's International Frequency Information Circular (BR IFIC).

These procedures are streamlined in Article 9 and linked to Article 11 of the RR. They are based on the principle of "*first come - first served*". The successful coordination of space networks or earth stations gives a recording in the MIFR and international recognition to the use of frequencies by those networks/stations as described in Article 11 of the RR.

The relevant procedures involve three basic steps:

- API (Section I, Article 9);
- Coordination (Section II of Article 9);
- Notification (Article 11).

### V.II Advance Publication of Information

The aim of the API procedure prescribed under Section I of Article 9 of the RR is to inform all administrations of any planned satellite system using a GSO or a non-GSO satellite and of its general description. This *mandatory* ("starting a clock") procedure provides a formal mechanism whereby any administration can make a preliminary assessment of the effect that a planned satellite network is likely to have on the stations of existing or planned satellite systems and their terrestrial stations in certain frequency bands and comment accordingly. To this end, the administration responsible for the planned satellite network has to submit to the Bureau, for API/A publication in the BR IFIC, the API data stipulated in Appendix 4 to the RR not sooner than seven years and preferably no later than two years before the planned date of bringing into use of the network or system.

If, upon receipt of the BR IFIC containing the API/A special section published under No. 9.2B of the RR, any administration considers its existing or planned satellite systems or networks or terrestrial stations to be affected, it may send its comments to the publishing administration, so that the latter may take those comments into consideration when initiating the coordination procedure. A copy of these comments may also be sent to the Bureau. Thereafter, both administrations shall endeavour to cooperate in joint efforts to resolve any difficulties, with the assistance of the Bureau if so requested by either of the parties, and shall exchange any additional relevant information that may be available.

### V.III Coordination procedure

Coordination is a further step in the process leading up to notification of the frequency assignments for recording in the MIFR. This procedure is a formal regulatory obligation both for an administration seeking to assign a frequency in its network and for an administration whose existing or planned services may be affected by that assignment. An agreement arising from this coordination confers certain rights and imposes certain obligations on the administrations concerned; as such, coordination must be effected in accordance with the relevant regulatory procedures laid down in the RR and on the basis of technical criteria either contained therein (Appendix 5) or otherwise agreed to by the administrations concerned.

In accordance with No. 9.6 of the RR, before an administration notifies to the Bureau under Article 11 or brings into use a frequency assignment to a space station, an earth station intended for communication with a space station, or a terrestrial station within the coordination area of an earth

station, it must effect coordination of the assignment, as required, with any other administration whose space, earth or terrestrial station frequency assignments are likely to be affected. The frequency assignments to be taken into account in effecting coordination or seeking an agreement are identified using the criteria in Appendix 5. The coordination may be undertaken on a "network basis" using the information relating to the space station, including its service area, and the parameters of one or more typical earth stations located in all or part of the service area; or on the basis of individual frequency assignments to a space station or an earth station.

In the above cases, the Article 9 procedure requires such coordination with any administration responsible for a frequency assignment to a space station, to an earth station that communicates with such a space station, or to a terrestrial station situated in the same frequency band as the planned assignment, pertaining to the same service or to another service to which the band is allocated with equal rights or a higher category of allocation, which:

- is in conformity with the Convention, the Table and the other provisions of the RR; and
- is recorded in the MIFR with a favourable finding; or
- is coordinated under the provision of Article 9; or
- is included in the coordination procedure with effect from the date of receipt by the Bureau of the characteristics specified in Appendix 4; or
- where appropriate, is in conformity with a world or regional allotment or assignment Plan and the associated provisions; or
- for terrestrial stations, is operating in accordance with the RR, or is to be so operated within the next three years from the date of publication of the coordination request,

and:

- is considered to affect or be affected, as appropriate, having regard to the threshold levels and conditions given in Tables 5-1 and 5-2 of Appendix 5.

The threshold levels and conditions given in Tables 5-1 and 5-2 of Appendix 5 differ according to the specific cases of coordination. For example:

- for non-GSO (Nos. 9.12 and 9.13), coordination is based on frequency overlap,

as for non-GSO/terrestrial stations for the frequency bands covered by No. 9.11A.

For frequency bands in the range 1 to 3 GHz (space-to-Earth) covered by No. 9.11A, in addition to the overlap condition, coordination of non-GSO systems is required with respect to terrestrial stations if the pfd produced at the Earth's surface (by non-GSO system) or the fractional degradation in performance (FDP) of a station in the fixed service exceeds the threshold values given in Annex 1 to Appendix 5.

Finally, the Bureau will publish the complete information (Appendix 4 information and, as appropriate, the names of identified administrations with which coordination may need to be effected), in a CR/C special section of its BR IFIC.

## VI. NOTIFICATION AND REGISTRATION PROCEDURES

### VI.I The Master International Frequency Register

The MIFR represents one of the pillars of the international radio regulatory set-up as it contains *all frequency usage notified to ITU*. It should be consulted before selecting a frequency for any new user. For these reasons, *notification of frequency assignments to the Bureau, with a view to their recording in the MIFR, represents an important obligation for administrations, especially in respect to those frequency assignments that have international implications.*

### VI.II Notification procedures

The process of notification of frequency assignments has been streamlined by the revisions of the RR by all recent WRCs, and the relevant provisions are contained in Article 11. In order to keep the process workable, the RR specify quite precisely what should be notified, when the notification information is to be submitted to the Bureau and what information has to be submitted.

According to these provisions, any frequency assignment liable to have an international implication has to be notified to the Bureau (*This notice shall reach the Bureau not earlier than three years before the assignments are brought into use*). In other words,

- if an assignment liable to cause interference to existing or future stations in another country or to suffer interference from such stations; or
- if that assignment is to be used for international radiocommunication; or

- if that assignment is subject to the Article 9 coordination procedure or is involved in such a case; or
- if it is desired to obtain international recognition for that assignment; or
- if it is a non-conforming assignment and if the administration wishes to have it recorded for information

it should normally be notified (submitting its relevant characteristics, as specified in Appendix 4 of the RR) to the Bureau. The Bureau shall publish the notice in PART I-S of the BR IFIC, thereby ensuring that all administrations are informed of the use of the assignments and that they are taken into account in any future planning conducted at the national, regional or international level.

#### VI.III Notification examination by the Bureau and recording in the MIFR

The subsequent processing of a notice varies according to the frequency band and service concerned. Each notice is first examined with respect to its conformity with the Table and the other provisions of the RR (regulatory examination); this examination consists in checking that the assignment (frequency, class of station, notified bandwidth) does indeed correspond to an allocation in the Table or the footnotes thereto and, where appropriate, that it complies with other technical or operating conditions laid down in other articles or appendices of the RR (power limits, authorized classes of emission, minimum elevation angle, etc.). If the result of this examination is *unfavourable* and the administration concerned has not explicitly undertaken that the assignment shall be operated subject to not causing interference to assignments operating in conformity with the RR, making reference to No. 4.4 of the RR, the examination stops there and the notice is returned to the notifying administration after publication of the finding in *PART III-S of the BR IFIC*.

When the result of the first examination (under No. 11.31 of the RR) is *favourable*, the assignment is *recorded in the MIFR*, or examined further, if appropriate, from the viewpoint of its conformity with the coordination procedures (No. 11.32 of the RR) or with a world or regional allotment or assignment Plan (No. 11.34 of the RR).

Following such examinations, the assignment is either recorded in the MIFR and published in *PART II-S of the BR IFIC* (if the finding is *favourable*), or is published in PART III-S of the BR IFIC and returned to the administration (if the finding is *unfavourable*). The administrations are

normally advised to complete the coordination procedure with the identified administrations, or to apply the relevant Plan modification procedure. However, in some specific cases an administration may resubmit the notice without completing the coordination or Plan modification procedure and the concerned assignment may be recorded in the MIFR under specific conditions.

#### VI.III Responsibilities of the notifying administration after recording in the MIFR

Recording in the MIFR does not mean the end of activities for the notifying administration as regards the concerned frequency assignment. The notifying administration should remain in close cooperation with the licensing authority and satellite operator and any change in the characteristics of the concerned assignment has to be notified to the Bureau so as to be reflected in the MIFR, if necessary following additional coordination with the administrations of other countries concerned.

Furthermore, the notifying administration should remain in close contact with the monitoring authority so as to check whether the concerned frequency assignment is operated in compliance with the notified characteristics and whether other elements (e.g. frequency tolerance) are kept within the limits prescribed by the RR. The notifying administration should also initiate appropriate monitoring programmes with a view to detecting any operational or technical irregularities in the operation of frequency assignments pertaining to other administrations, and to initiate appropriate actions in this regard, so as to *ensure interference-free operation* for stations under its jurisdiction.

### VII. ASSISTANCE TO ADMINISTRATIONS

The RR contains specific provisions in Article 13 relating to the provision of assistance to administrations in the application of the radio regulatory procedures, in particular to those administrations in need of special assistance concerning:

- application of the procedures of Articles 9 and 11;
- studies and recommendations in resolving a case of harmful interference;
- studies and recommendations in resolving a case of alleged contravention or non-observance of the RR.

## VIII. ACRONYMS

ITU - International Telecommunication Union - <http://www.itu.int/>

CS - Constitution of the ITU

CV - Convention of the ITU

RR – ITU Radio Regulations

administration - Any governmental department or service responsible for discharging the obligations undertaken in the CS and CV of the ITU and in the Administrative Regulations

Bureau - Radiocommunication Bureau of the ITU

WRC - World Radiocommunication Conference of the ITU

GSO - Geostationary-Satellite Orbit

Non-GSO – Non-Geostationary-Satellite Orbit

Table - Table of Frequency Allocations as contained in Article 5 of the RR

API - Advance Publication of Information as contained in Article 9 of the RR

MIFR - Master International Frequency Register of the Bureau

BR IFIC - International Frequency Information Circular of the Bureau

API/A – Special section of the BR IFIC, contains API on a planned satellite network, in accordance with the provisions of **9.2B** of the RR

CR/C - Special section of the BR IFIC, contains requests for coordination submitted under Nos. **9.7** to **9.14** and **9.21** of frequency assignments of a satellite network, published in accordance with the provision No. **9.38** of the RR

PART I-S - The Part I-S publication of the BR IFIC is to be considered the acknowledgement of receipt of the information published and contains particulars of frequency assignments for stations in the space radiocommunication services received by the Bureau for recording in the MIFR

PART II-S - The Part II-S publication of the BR IFIC concerns frequency assignments that will be recorded in the MIFR, following publication in PART I-S and after the detailed technical and regulatory examination has been completed. Generally, these are frequency assignments that have received *favourable* Findings as well as those that are to be recorded under No. **11.41** or for information only

PART III-S - The Part III-S publication of the BR IFIC concerns frequency assignments that are returned to the responsible administration following the PART I-S publication and after the detailed technical and regulatory examination has been completed. Generally, these are frequency assignments that have received *unfavourable* Findings as well as those that are found to be non-compliant with various provisions of the RR

## IX. REFERENCES

[1] ITU Radio Regulations, Edition of 2008, printed in Switzerland, Geneva, 2008, ISBN 92-61-12451-8