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Navigating the Spectrum
An Overview of ITU's Regulatory Process for Small Satellites

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ABSTRACT

Originating from 1865, the International Telecommunication Union (ITU) has evolved into a diverse community comprising 193 member states, more than 1000 public and private sector companies, universities, research institutes as well as international and regional telecommunication entities. World Radiocommunication Conferences (WRC) are convened every four years, providing a crucial platform for updating the ITU Radio Regulations, ensuring that it continues to meet the demands of the industry.

The ITU regulations for frequency and orbit registration of satellites, particularly on the occupancy of the geostationary satellite orbits (GSO) for the traditional telecommunications satellites, have been well-known among operators with large satellites. In the past decade, with the rapid rise in the number of CubeSat and other small satellite projects and launches, the ITU has seen a dramatic increase in the number of registrations from small satellites in non-geostationary-satellite orbits (non-GSO). To cater for these satellites, with decisions taken by the WRC, the ITU Radio Regulations, a treaty document, has evolved to meet the short project life cycle and short duration missions. Notably, the processing time required for advance publication information (API) has been reduced from 3 to 2 months, and the earliest time required for the notification after the publication of the API has been reduced from 6 to 4 months. All submitted satellite networks as well as comments received from other administrations are now promptly made available online enhancing transparency, and at the same time, this streamlined process improved the efficiency of coordination between administrations and operators. For satellites with short mission duration, a specific regulatory procedure exists where some frequency bands are allocated for space operation service without having to go through the extensive coordination process typically required for larger, commercial satellites.

In addition, WRC-23 has issued a new Resolution **679** (**WRC-23**) considering that there is a need for non-GSO space stations to be able to relay data to the Earth, and that part of this need could be met by allowing such non-GSO space stations to communicate with inter-satellite service (ISS) space stations operating in the GSO and in the non-GSO in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, or parts thereof. This enables small satellites to gain significant advantages by enhancing their connectivity to ground stations through the inter-satellite service, even when the satellite is not within direct line of sight from the earth station.

The general process of recording a small satellite network in the ITU's Master International Frequency Register (MIFR) involves four steps: 1. Submission of the API; 2. Commenting and resolution of difficulties; 3. Notification for recording; 4. Bringing into use of the frequency assignments within the regulatory time limit.

This presentation will concentrate on essential aspects related to the ITU Legal Framework, WRC, Frequency Allocation and Regulatory Procedures. Details of these and many other useful contents can be found in the recently developed ITU-R Handbook on Small Satellite (free download from the ITU website).

INTRODUCTION TO THE ITU

On 17 May 1865, the first International Telegraph Convention was signed in Paris by its twenty founding members, and the International Telegraph Union (the first name of ITU) was established to supervise subsequent amendments to the agreement. That significant date '17 May' eventually became World Telecommunication and Information Society Day.

Since 1865, to promote cooperation among international telegraphy networks of the day, ITU has predated many other standardization bodies and its long and distinguished history contains a number of important "firsts", such as the standardization of the use of the Morse code and the world's first radiocommunication and fixed telecommunication networks.

In 1932 at a conference in Madrid, a new name was adopted to reflect the full range of ITU's responsibilities: International Telecommunication Union, which came into effect on 1 January 1934. At the same time, the International Telegraph Convention was combined with the International Radiotelegraph Convention to form the International Telecommunication Convention.

On 15 November 1947, an agreement between ITU and the newly created United Nations recognized ITU as the specialized agency for telecommunications. The agreement formally entered into force on 1 January 1949.

ITU fosters international cooperation and solidarity in the delivery of technical assistance and in the creation, development and improvement of telecommunication and Information and Communication Technology (ICT) equipment and networks in developing countries, so as to facilitate and enhance telecommunication / ICT development. It plays crucial roles in the field of telecommunications and information and communication technology (ICT), especially focusing on spectrum management, global telecommunication standardization, emergency telecommunications, developing policy and regulatory frameworks for telecommunications and ICT, bridging the digital divide, capacity building and technical assistance to its member states and serving as a platform for international cooperation and coordination.

ITU Membership

ITU membership includes 193 Member States, more than 1000 public and private sector companies, universities, research institutes as well as international and regional telecommunication entities, known as Sector Members and Associates, including Small and Medium Enterprises (SMEs) and Academia.

ITU members represent a diverse group of individuals and organizations from governments, small and large companies, academia, and international organizations worldwide. It varies in size, structure, nature, and purpose. However, what brings them together at ITU is a shared belief in the importance of technology as a force for good. They work together to shape the future of ICT, from big data, 5G and the Internet of Things to artificial intelligence, broadcast and multimedia, smart cities, quantum information technologies and intelligent transport systems. ITU sets international standards, harmonizes the use of radio-frequency spectrum and satellite orbits, and supports digital infrastructure development and policy and regulatory reform.

There are three Sectors in the ITU:

- Radiocommunication,
- Telecommunication Standardization, and
- Telecommunication Development.

Each "Sector Member" (private sector or academia) belongs to at least one of those three Sectors of ITU's work.

Sector Members can participate fully across broad areas of ITU work, as they are entitled to participate in all Study Groups within whichever ITU Sector they join. Some companies and organizations opt to join more than one ITU Sector.

Entities that have a specific focus, meanwhile, may choose to participate in a single Study Group by joining ITU as an Associate. Small and medium-sized enterprises (SMEs) can participate as an Associate in any given Study Group with reduced fees. Sector Members from developing countries also benefit from reduced rates.

Academia, universities, and their associated research establishments that join ITU can participate in all three Sectors based on a single fee with preferential rates.

More details are available at:
https://www.itu.int/hub/membership/our-members/

To become a member of ITU, please apply via the following webpage:

https://www.itu.int/hub/membership/become-a-member/

Please note that it is important to review the Benefits, Fees, Participation, and Membership Terms & Conditions listed on the webpage before applying.

ITU Legal Regime

The ITU legal regime, in the domain of international frequency management of the spectrum/orbit resources, is mainly incorporated in the Constitution (CS) and Convention (CV), as well as in the Radio Regulations (RR) and the related Rules of Procedures (RoP).

ITU's Administrative Regulations contain provisions of a technical nature governing international telecommunications. The purpose of the Regulations is to ensure the efficient operation of international telecommunication services. They complete the provisions of the Constitution and Convention and are binding on all Member States.

There are 2 Administrative Regulations of ITU:
- the Radio Regulations, and
- the International telecommunication Regulations.

The focus of this paper is on the Radio Regulations.

RADIO REGULATIONS (RR)

The ITU Radio Regulations are a comprehensive set of international treaties that govern the use of the radio-frequency spectrum and satellite orbits. Started in 1906 by the first International Radiotelegraph Conference in Berlin with the 'International Radiotelegraph Convention', it has involved into an internationally recognized regulations that have been revised and updated by various World Radiocommunication Conferences (WRC), generally every 4-5 years, including the most recently WRC-23 in Dubai, United Arab Emirates. More information on the WRC is provided in a later Section.

The Radio Regulations encapsulates these revisions and includes all relevant Appendices, Resolutions, Recommendations incorporated by reference. These regulations play a crucial role in ensuring efficient and interference-free use of the radio spectrum, which is essential for global communication systems.

It is available free of charge for personal use and can be accessed either via the publication website https://www.itu.int/pub/R-REG-RR/en. A new edition with the latest updates from the WRC-23 is expected by the Q3 2024.

As indicted in the Preamble to the Radio Regulations, the Regulations are founded on the following principles drawn from the ITU Constitution:

"No. 0.3 In using frequency bands for radio services, Members shall bear in mind that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of these Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries (No. 196 of the Constitution)."

"No. 0.4 All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of recognized operating agencies, or of other duly authorized operating agencies which carry on a radio service, and which operate in accordance with the provisions of these Regulations (No. 197 of the Constitution)."

Table of Frequency Allocation (RR Article 5)

The Table of Frequency Allocation (RR Article **5**) and associated principles represent a basis for the planning and implementation of radiocommunication services.

The regulated frequency band (8.3 kHz – 3 000 GHz) is segmented into smaller bands and allocated to over forty defined radiocommunication services (RR Article **1**) into three Regions of the world. The radio services are identified as primary or secondary (the latter shall not cause 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. Refer to RR Article **5** for more details.

Any new assignment shall be made in such a way as to avoid causing harmful interference to services rendered by stations using frequencies assigned in accordance with the Table of Frequency Allocations and which are recorded in the Master International Frequency Register.

One of the key issues to be considered in the early stages of a small satellite program is the selection of radio frequencies. All frequencies allocated for space services used by non-geostationary (non-GSO) satellites are equally applicable for use by small satellites.

The Bureau has made available a useful tool called the RR5 Table of Frequency Allocations (TFA) Software. This user-friendly program enables users to easily identify the frequency bands assigned to specific space services and vice versa across all ITU regions. For more information on accessing this software, please check the ITU Publication website and its Guideline.

Regulatory Procedures

Section II of Article **9** of the Radio Regulations lists the various coordination procedures. Therefore, when it is mentioned that a satellite network is subject to coordination, it means that the network is subject to a

specific coordination procedure listed in Section II of Article **9** of the Radio Regulations.

Geostationary satellite networks are generally subject to coordination. However, the use of inter-satellite links of a geostationary space station communicating with a non-geostationary space station which are not subject to the coordination procedure under Section II of Article **9**, will require the application of the advance publication procedure.

For non-geostationary satellite networks, some frequency bands/services are subject to coordination, others are not, and it is necessary to consult the detailed footnotes concerning the frequency bands and services. Most small satellite projects make use of frequency bands that are not subject to coordination.

The general ITU regulatory procedures for recording a satellite network in the ITU's Master International Frequency Register (MIFR) involves four steps, also see Figure 1 below:

1). Submission of Information

Submit the detailed characteristics of the satellite network in an Advance Publication Information (API) if the frequency band and services are not subject to coordination procedure or in a Request for Coordination (CR) if they are subject to coordination procedure.

2). Commenting and Resolution

Address and resolve any comments or difficulties that were submitted by other administrations that were provided within 4 months from the relevant publication.

3). Notification for Recording

Submit a Notification to notify for recording of the satellite network in the Master Register within 7-year regulatory time limit.

4). Bringing Into Use (BIU)

Ensure the frequency assignments are brought into use within 7-year regulatory time limit by a spacecraft capable of transmitting and receiving at least in one of the orbital planes. For some services, there is an additional requirement that the spacecraft should be maintained there for a continuous period of 90 days.

As can be seen in the figure 1, for those satellite networks that are not subject to coordination, the minimum time period from the submission of the API information to the time of submission of notification is 6 months. However, it is also very important to plan for sufficient time needed to resolve comments and difficulties expressed by other administrations.

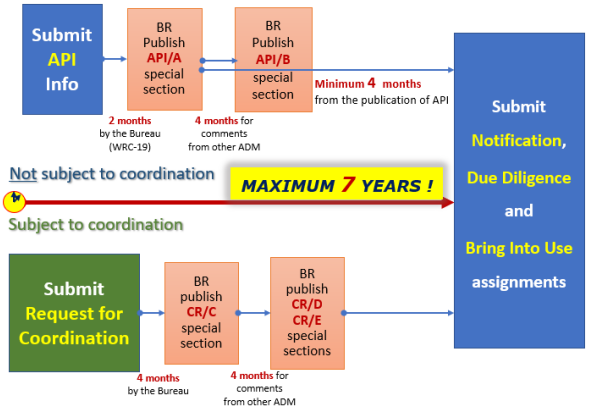

Figure 1: Overall ITU regulatory procedures

Considering the regulatory procedures with time constraints outlined above, it is imperative to submit the satellite filings to the ITU as early in the project timeline as feasible. Early submission not only allows ample time for regulatory review, enabling feedback on potential interference issues from the international community. This early submission also provides room for any necessary revisions or adjustments. By adopting this proactive approach to early submission and publication, operators can mitigate the risk of delay, ensuring a smoother regulatory process, facilitates early international recognition and ultimately expediting the path to achieving the objectives.

Only national administrations representing ITU Member States can request, either for their own benefit or on behalf of a satellite operator, the use of frequency spectrum and orbit resources to the ITU.

Submission Trends of Small Satellites

A. Submission trend for non-GSO API

In the past decade, with the rapid rise in the number of CubeSat and other small satellite projects and launches, the ITU has seen a dramatic increase in the number of API submissions for non-GSO satellites. This trend reflects the growing interest and investment in non-geostationary satellite systems across the globe.

As shown in Figure 2, there has been a significant surge in the number of API submissions for non-GSO satellite networks that are not subject to coordination procedures. While the number of such submissions has been moderately increasing since 2011, the rate of increase has accelerated since 2015, and currently, ITU BR is receiving 9 times the number it was receiving in 2011. This increase, from approximately 50 cases in 2011 to nearly 450 in 2023, indicates a continued upward trajectory.

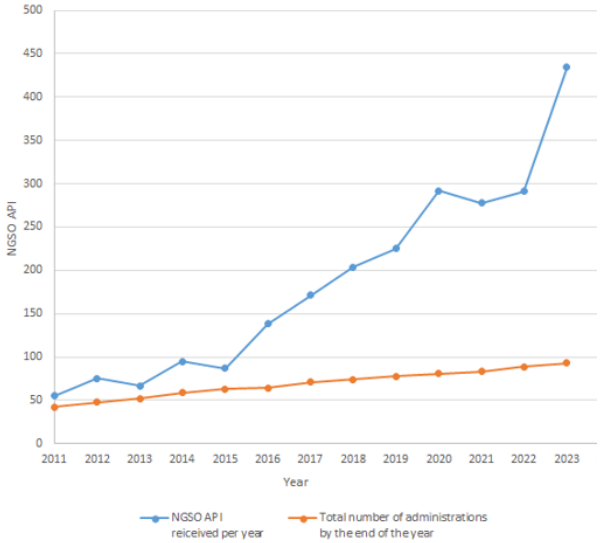

Figure 2: NGSO API submission to ITU BR for satellite networks not subject to coordination

In addition, the number of administrations submitting API information for non-GSO systems has also been steadily increasing. The number of administrations submitting non-GSO API has grown from 42 in 2011 to 93 by the end of 2023, more than doubling over this period. The 93 administrations demonstrate a broadening global engagement in the non-GSO satellite domain.

While most of the APIs are for satellite networks with less than 50 orbital planes, there are some with extraordinarily large number of orbits, with the maximum being 2 697. Similarly, most APIs are for satellite networks with less than 50 satellites, but the largest published so far contains 116 640 satellites.

B. Submission trend for non-GSO coordination request (CR)

Prior to 2011, the number of coordination requests for non-geostationary (non-GSO) satellite systems remained relatively constant and extremely low, with only a few cases per year, as very few administrations were submitting such requests. However, from 2011 onwards, the Bureau has observed a general upward trend in the number of coordination requests received.

As shown in Figure 3, there were 5 non-GSO coordination requests received by the Bureau in 2011. This number increased significantly to 95 requests in 2019 and further to 96 in 2023. Currently, the number of non-GSO coordination requests is approximately three times the amount submitted in 2014 and 2015.

In addition to the increase in coordination requests, the total number of administrations submitting NGSO coordination requests has also risen. In 2011, 25 administrations submitted such non-GSO CR, and by the end of 2023, this number had reached 42.

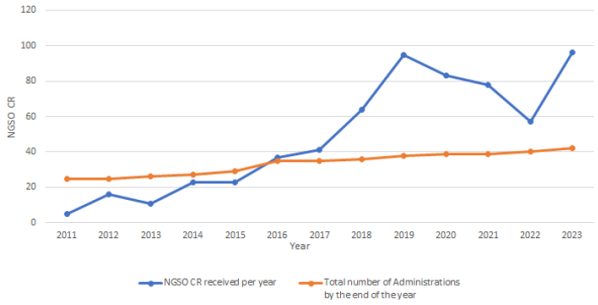

Figure 3: NGSO CR submission to ITU BR for satellite networks subject to coordination

C. Submission trend for non-GSO Notification

There has been a general increase in the number of non-GSO notification submissions over the last 10 years. Given the significant increase in API filing submissions over the past decades, it is expected that the number of notification submissions will also steadily increase, particularly for non-GSO notices that are not subject to the coordination procedure.

The number of non-GSO notification notices received by the Bureau each year is illustrated in Figure 4, which specifically focuses on the "First Submissions", rather than "Resubmissions" following notification notices returned due to non-completion of coordination.

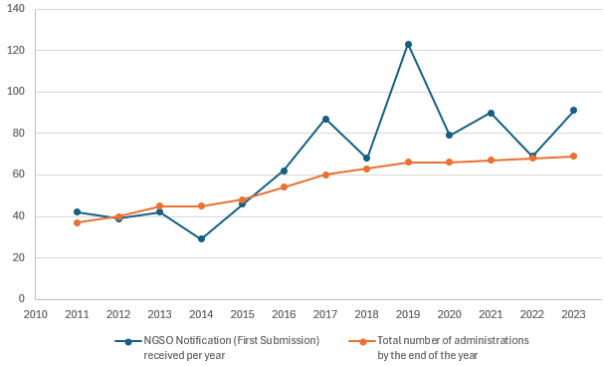

Figure 4: NGSO Notification (First submission) to ITU BR

Regulatory Circulars and The BR IFIC (Space Services)

When a satellite notice with complete information is received by the Radiocommunication Bureau, it will carry out technical and regulatory verification on the

notice as required in the Radio Regulations, and will issue a finding on the frequency assignments. The findings along with the detailed characteristics of the satellite network will be published in a bi-weekly circular known as the International Frequency Information Circular (BR IFIC). All administrations/operators consult the BR IFIC to check publications of their own filings, as well as check other filings and submit comments/objections to those satellite networks if needed.

The BR IFIC for the Space Services, traditionally delivered as a DVD, is available as an online service since January 2024.

Commenting, Resolution of Difficulties and Coordination

For satellite networks which are not subject to coordination procedure under Section II of Article **9** of the Radio Regulations, there is a commenting procedure and resolutions of difficulties specified under RR No. **9.3**.

After the publication of the API/A special section, any administration who believes that interference which may be unacceptable may be caused to its existing or planned satellite networks or systems, may submit a comment to the notifying Administration, with a copy to the Bureau, within 4 months from the date of publication of the special section. The Bureau makes these comments available "as-received" on the ITU website so that administrations can get together to resolve any issues immediately.

Both administrations shall endeavor to cooperate in joint efforts to resolve any difficulties and shall exchange any additional relevant information that may be available.

For satellite networks operating in the amateur-satellite service, the operator or notifying administration should contact the International Amateur Radio Union for assistance in the frequency coordination process (https://www.iaru.org/reference/satellites/).

For satellite networks subject to coordination procedures in Section II of Article **9** of the Radio Regulations, the notifying administration is required to carry out coordination with administrations of other satellite networks which had been submitted earlier and identified by the Bureau in its examination. The status of the completion of coordination are verified by the Bureau during the notification stage.

Verification of Compliance

As mentioned earlier, on receipt of the complete information, in particular for the coordination and notification notices, the Bureau will carry out verification of the satellite networks against the technical and regulatory requirements of the Radio Regulations. Such verification include checking that the use of the assignment is in accordance with the Table of Frequency Allocations, the compliance with EIRP and PFD limits etc. If the assignments are found to be compliant, they are given a favourable finding. If they are found to be non-compliant, they will be given unfavourable findings and returned to the administrations.

Master International Frequency Register (MIFR)

Getting a frequency assignment recorded in the Master Register with a favourable finding acquires the right for the assignment to international recognition. For such an assignment, this right means that other administrations shall take it into account when making their own assignments, in order to avoid harmful interference. The frequency assignments that are published in a Part II-S of a BRIFIC with a favourable findings are recorded in the MIFR and thereby enjoy international recognition. The Bureau makes available these frequency assignments in a database known as the SRS database which is updated and distributed in each BR IFIC.

WORLD RADIOCOMMUNICATION CONFERENCE

World Radiocommunication Conferences (WRC) are pivotal global events convened by the ITU every three to four years. These conferences serve as a platform for international collaboration and decision-making, aiming to ensure efficient and equitable use of the radio-frequency spectrum for various purposes, including telecommunications, broadcasting, satellite communications, and emerging technologies like 5G and Internet of Things (IoT). WRCs play a crucial role in harmonizing spectrum usage worldwide, facilitating innovation, and fostering global connectivity.

WRCs review the way radio spectrum is organized around the world, bringing together governments to negotiate and agree on the relevant modifications to the RR and commit to them. The preparatory process of WRCs involves extensive studies and preparatory discussions among all stakeholders (equipment makers, network operators, industry forums and users of spectrum) at national, regional and worldwide levels. Many of these stakeholders also serve as members of national delegations at the conference itself. This multi-stakeholder approach enables the necessary consensus to be built to ensure that WRCs maintain a stable, predictable and universally applied regulatory environment which secures long-term investments for a multi-trillion dollar industry. The conference attempts to cast a proper balance:

• between the need for worldwide harmonization (to benefit from economies of scale, connectivity, and interoperability) and the need for flexibility in spectrum allocations,

• between the need to accommodate new and innovative systems, applications and technologies as they arise and the need to protect existing radiocommunication services, including from non-radio equipment and appliances.

The frequency bands are allocated during a WRC, but the studies leading up to it is done in the respective study groups and working parties during the years prior up to that WRC. A key part of the studies includes the sharing scenarios with the incumbent services. Frequency is a scarce resource, and there is currently no practical usable frequency bands that are not already allocated to an existing service. For this reason, careful sharing studies with incumbent services on potential interference scenarios will determine whether the proposed service allocation can possibly coexist with these incumbent services. Often even if these studies reveal that there is a possibility for the proposed service to be used in a particular frequency band, there will be operating conditions imposed on it to protect incumbent services. Conditions such as power limits are often mandated for most frequency bands shared between various space and terrestrial services.

The results of these studies in the study groups and working parties are consolidated into a report by the Conference Preparatory Meeting (CPM), with options for considerations to satisfy the agenda items. The CPM report is considered as an input document to the following WRC, along with input documents from member states, the conference will deliberate on the agenda items on the basis of all these input documents and arrive at a decision. The decisions of the conference are published in a Final Acts of the Conference.

Some specific conclusions taken at recent WRCs that are relevant for small satellites are presented here.

Shortened Regulatory Timeline

As mentioned above, the Radio Regulations is regularly updated through the World Radiocommunication Conference to ensure that it is still relevant to the industry. The conference recognized the rapidly growing small satellite industry, and has taken a series of measures to improve the regulations to meet the shorter project implementation timeline as compared to traditional large satellite projects.

Notably, the processing time required for API has been reduced from 3 to 2 months, and the earliest time required for Notification after the publication of the API has been reduced from 6 to 4 months. All submitted satellite networks as well as comments received from other administrations are now promptly made available online enhancing transparency, and at the same time, this streamlined process facilitates improved the efficiency of coordination between administrations and operators.

With these changes, the minimum time required for a satellite network which is not subject to coordination procedure to be notified, counting from the date of submission of the API, was reduced from 10 to 6 months.

Non-GSO Short Duration Mission (NGSO-SDM)

To cater for the short project life cycle and short duration missions of small satellite projects, WRC-19 adopted Resolution **32** (**WRC-19**) "*Regulatory procedures for frequency assignments to non-geostationary-satellite networks or systems identified as short-duration mission not subject to the application of Section II of Article **9***".

For satellites with short mission duration, this specific regulatory procedure made available specific frequency bands (137.175-137.825 MHz and 148-149.9 MHz) for space operation service without having to go through the extensive coordination process typically required for larger, commercial satellites.

For a non-GSO network that is indicated as operating as short-duration mission (NGSO-SDM) in accordance with Resolution **32** (**WRC-19**), there are several additional conditions listed in the Resolution, including but not limited to the following:

• NGSO-SDM shall operate under any space radiocommunication service in the frequency bands that are not subject to the application of Section II of Article **9** of the Radio Regulations.

• NGSO-SDM shall comply with the conditions for use of the frequency band that is allocated to the service within which they operate. Operation under RR No.**4.4** is not permitted for the SDM network.

• The total number of satellites in NGSO-SDM shall not exceed 10 satellites.

• The maximum period of operation and validity of frequency assignments of the NGSO-SDM shall not exceed 3 years from the date of bringing into use of the frequency assignments, further extension is not allowed.

• The date of bringing into use of the frequency assignments of NGSO-SDM shall be defined as the launch date of the first satellite.

• The notification information can only be submitted after the launch of a first satellite, but not more than 2 months after the date of bringing into use of the frequency assignments.

• NGSO-SDM shall have the capability to cease transmitting immediately in order to eliminate harmful interference.

• An additional commitment (item **A.24.a** of RR Appendix **4**) is requested from the Administration that, in the case that unacceptable interference caused by NGSO-SDM is not resolved, the administration shall undertake steps to eliminate the interference or reduce it to an acceptable level.

The above conditions are in addition to others that normally apply to all satellite networks.

Inter-satellite Service (ISS)

WRC-23 has adopted new allocations for the inter-satellite service in the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz that facilitate data relay between non-GSO space stations, especially those in low earth orbits, and space stations in higher altitude such as those in the geostationary satellite orbit. Such use is limited to space research, space operation and/or Earth exploration-satellite applications, and also transmissions of data originating from industrial and medical activities in space and are not subject to a coordination procedure. However, there are some new conditions to be met, and these are spelt out in the new Resolution **679** (**WRC-23**).

This innovative new allocation enables small satellites to gain significant advantages by enhancing their connectivity to ground stations through the inter-satellite service, even when the satellite is not within direct line of sight from the Earth station, greatly benefiting from increased access to their earth stations.

WRC-23 recognized that this can be a useful feature for other frequency bands, and therefore has put in the agenda of the next conference a similar agenda item to extend it to some L and S-band allocations for the mobile-satellite service.

Agenda for the next WRC-27

There are several agenda items for the next WRC-27 that concerns space services, and may directly or indirectly impact small satellite projects. Some of these agenda items are highlighted as follows:

• to consider space-to-space links among non-geostationary and geostationary satellites in the frequency bands 1 518 - 1 544 MHz, 1 545 - 1 559 MHz, 1 610 - 1 645.5 MHz, 1 646.5 - 1 660 MHz, 1 670 - 1 675 MHz and 2 483.5 - 2 500 MHz allocated to the mobile-satellite service

• to consider possible new allocations to the mobile satellite service and possible regulatory actions in the frequency bands 1 427 - 1 432 MHz (space-to-Earth), 1 645.5 - 1 646.5 MHz (space-to-Earth)(Earth-to-space), 1 880 - 1 920 MHz (space-to-Earth) (Earth-to-space) and 2 010 - 2 025 MHz (space-to-Earth) (Earth-to-space) required for the future development of low-data-rate non-geostationary mobile satellite systems

• to consider possible new allocations to the mobile-satellite service for direct connectivity between space stations and International Mobile Telecommunications (IMT) user equipment to complement terrestrial IMT network coverage

• to consider possible additional allocations to the mobile-satellite service

• to consider possible new or modified space research service (space-to-space) allocations, for future development of communications on the lunar surface and between lunar orbit and the lunar surface

• to consider regulatory provisions for receive-only space weather sensors and their protection in the Radio Regulations, taking into account the results of ITU Radiocommunication Sector studies

• to consider possible regulatory measures regarding the protection of the Earth exploration-satellite service (passive) and the radio astronomy service in certain frequency bands above 76 GHz from unwanted emissions of active services

• to consider possible primary allocations to the Earth exploration-satellite service (passive) in the frequency bands 4 200 - 4 400 MHz and 8 400 - 8 500 MHz

These issues are currently being studied and addressed in various ITU-R study groups and working parties. All member states, ITU-R sector members, associates and academia members may participate in these deliberations where the conclusions will finally be reported to the next WRC.

ITU-R HANDBOOK FOR SMALL SATELLITES

The ITU-R Small Satellite Handbook serves several important purposes in the context of satellite communications and regulatory frameworks:

Guidance for Small Satellite Operators

Small satellite operators, especially those new to the industry, can benefit from the handbook's guidance on

regulatory requirements, spectrum allocation, and best practices for ensuring successful and compliant satellite operations.

Technical Guidelines and Recommendations

The handbook includes technical guidelines and recommendations specific to small satellite systems. These guidelines help ensure that small satellites operate efficiently, avoid interference with other systems, and comply with international regulations.

Spectrum Management

Small satellites often operate in limited frequency bands, and spectrum management is crucial to avoid interference and ensure reliable communications. The handbook provides insights into spectrum allocation, frequency coordination, and methods for optimizing spectrum use for small satellite missions.

Regulatory Compliance

Regulatory compliance is a significant aspect of satellite operations. The handbook can help operators understand the legal and regulatory frameworks governing small satellites, including licensing requirements, frequency coordination procedures, and international agreements.

Industry Best Practices

As the small satellite industry evolves, the handbook includes best practices, case studies, and lessons learned from past missions. This information aids operators and regulators in making decisions and promoting responsible and sustainable satellite operations.

Overall, the ITU-R Small Satellite Handbook serves as a comprehensive resource that bridges technical and regulatory aspects, promoting the development, deployment, and management of small satellite systems in a manner that aligns with international standards and promotes global cooperation in space activities. If you are interested in small satellite communications or involved in related activities, the ITU-R Small Satellite Handbook can offer valuable insights and guidance for your work or projects.

References

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