

# ITU's Evolving Regulatory Regime for Satellite Registration: The Case of Large LEO Constellations

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## Abstract

This paper describes the role of the International Telecommunication Union (ITU) in the registration of satellite and other space systems with a focus on its response to the unprecedented surge of filings related to large satellite constellations. The paper will also discuss the upcoming World Radiocommunication Conference in late 2023 (WRC-23) which will amend the international Radio Regulations, a treaty addressing the use of radio spectrum and orbits, and ITU's Master International Frequency Register. The paper will compare key elements of the ITU's Master Register with the Register maintained by the United Nations (UN) Office of Outer Space Affairs pursuant to the Convention on Registration of Objects Launched into Outer Space. Finally, the paper will briefly explore opportunities for increased collaboration between these two UN organizations to address these shared challenges concerning registration of satellites.

## 1. Introduction

The International Telecommunication Union's (ITU) Radio Regulations were established in the early days of the twentieth century for the purpose of forging an international regime under which States would be able to attain regulatory protection for their radio station from harmful interference from the radio operations of other nations. This concept, which was urgently required for the reliable operations of early maritime radio systems, such as distress calls, led to the creation of a global registration system for radio stations, the Master International Frequency Register (Master Register), to record countries' radiofrequency assignments entitled to international recognition – *i.e.*, protection from harmful interference from others nations'

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radio operations – as long as the subject station is duly operating in accordance with the Radio Regulations.<sup>123</sup>

A century-and-a-half later, the advent of space systems requiring international recognition of their radio operations in outer space drove the creation of new chapters of the ITU's Radio Regulations, including processes for coordination, notification, and recording in the Master Register, by successive WRCs beginning in 1963. Indeed, this iterative process has been unceasing and is poised to be continued at the 2023 World Radiocommunication Conference (WRC-23) in Dubai, United Arab Emirates, 20 November - 15 December.<sup>4</sup> As new space services and applications are being designed and implemented at an increasing pace, they drive ongoing updates and expansion of the Radio Regulations, and the Master Register, to facilitate and protect these new operations while ensuring compatibility with and protection of incumbent operations.

An area of recent focus by the ITU and its WRCs is the management of the growing number of filings for large non-geostationary orbit (non-GSO) satellite constellations in Low Earth Orbit (LEO). Challenges include not only ensuring efficient, effective, and equitable use of spectrum and associated orbital resources while ensuring avoidance of harmful interference to other frequency assignments in the Master Register, but also preserving the integrity of the Master Register itself. This paper will briefly describe the role of the ITU's Master Register for frequency assignments to satellite and other space systems and recent activities in response to the unprecedented rise of large non-GSO constellations, including related preparations for WRC-23. The paper will identify key elements of the ITU and its Master Register for purposes of comparison with United Nations Office of Outer Space Affairs (UNOOSA) and its implementation of the Convention on Registration of Objects Launched into Outer Space (Registration Convention).<sup>5</sup> Finally, in light of this emerging era of accelerating commercial space activity coinciding with the installation of new leadership at both of these UN organizations, this paper will briefly consider the opportunity for increased collaboration between them to address these shared challenges.

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1 A.L. Allison, *The ITU and Managing Satellite Orbital and Spectrum Resources in the 21<sup>st</sup> Century*, Springer, Cham, 2014.

2 International Telecommunication Union. *Radio Regulations*, ITU, Geneva, 2020, <https://www.itu.int/pub/R-REG-RR/en> (accessed 09.12.2023).

3 Assignments are authorizations (such as licenses from the domestic telecommunications regulator) by a nation state's administration to use a radiofrequency under specified conditions. *Id.* at Nos. 1.18, 8.1.1.

4 International Telecommunication Union. *WRC-23 Website*, <https://www.itu.int/wrc-23/> (accessed 11.09.2023).

5 *Convention on Registration of Objects Launched into Outer Space*, 6 June 1975, 1023 UNTS 15 (entered into force 15 September 1976) [hereinafter *Registration Convention*].

## 2. ITU Overview

Although the ITU predates the United Nations by more than eighty years, it joined the UN as a specialized agency in 1947. Its headquarters are in Geneva, Switzerland, conveniently proximate to the UN's European headquarters at *Place des Nations*. As it was already a fully formed entity upon joining the UN, the ITU retained its structure, membership, and working methods, resulting in it having rather unique capabilities relative to its sibling organizations in the UN system, such as the UN Committee on Peaceful Uses of Outer Space (COPUOS). As an essentially freestanding intergovernmental organization, the ITU is able to manage its own mandate and self-determine its work statement and working methods, subject only to its own instruments and the approval of its Member States. This independent foundation enables the ITU to continuously generate binding international regulations responsive to technological changes.<sup>6</sup>

The ITU has nearly universal membership with 193 Member States, the same level of membership as the UN itself. Although each Member State has equal status with one vote per nation, the vast majority of the ITU's decisions are taken by consensus. The General Rules of Conferences, Assemblies and Meetings of the Union,<sup>7</sup> and the more detailed working methods adopted by each of the ITU's three working Sectors – Radiocommunication, Telecommunication Standardization, and Telecommunication Development – provide detailed guidance that facilitates the achievement of consensus in their respective areas of work, even where unanimity is not achieved.<sup>8</sup>

Another unique feature of the ITU, and a significant contributor to both its effectiveness and longevity, is the inclusion of the private sector in its work. Examples of these “Sector Members” are manufacturers of telecommunication equipment and aerospace vehicles and communication service providers, including satellite operators. Although these approximately 900 Sector Members may only participate as non-voting observers at the ITU's treaty conferences, they actively participate in the working levels of the ITU's Sectors where they are empowered to submit contributions, chair groups, and to participate in decision-making on non-mandatory outputs,

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6 A.L. Allison, D. Howard, D. Kendall, M. Skinner, A Modern Model of Space Law Creation: What Can COPUOS Learn from the ITU? IAC-21-E3.4.6, 72<sup>nd</sup> International Astronautical Congress, 2021 25-29 October.

7 International Telecommunication Union., Collection of the Basic Texts Adopted by the Plenipotentiary Conference, Edition 2023, (Geneva, Switzerland) <https://www.itu.int/pub/S-CONF-PLEN-2022> (accessed 11.09.2023) [hereinafter ITU Constitution].

8 International Telecommunication Union, ITU-R Resolution 1-8, Working Methods for the Radiocommunication Assembly, the Radiocommunication Study Groups, the Radiocommunication Advisory Group and other groups of the Radiocommunication Sector (2019), <https://www.itu.int/pub/R-RES-R.1-8-2019> (accessed 13.09.2023).

including technical standards and reports.<sup>9</sup> This hands-on, direct involvement by the actual innovators, inventors, and experts on telecommunications and aerospace technologies services goes far to inform and to drive the continuing relevance and pace of the ITU's work statement, ultimately informing both WRC agenda items and their ultimate conclusions.<sup>10</sup>

The ITU is represented and managed by an elected Secretary-General, currently Doreen Bogdan-Martin, but she does not serve as the Union's governing authority. The ITU is governed by the Plenipotentiary Conference, a treaty conference comprised of delegations of Member States that meets every four years. Thus, the Union's Member States retain ultimate authority over the ITU and its work.<sup>11</sup>

The ITU concludes three different sets of treaty instruments: a Constitution, a Convention, and the Administrative Regulations, including the Radio Regulations. The Constitution is adopted by the Plenipotentiary Conference and establishes the Union's mandate, purposes, structure, governance, and fundamental tenets. Among the Union's mandates are "to maintain and extend international cooperation among all its Member States for the improvement and rational use of telecommunications of all kinds" and "to promote the extension of the benefits of the new telecommunications technologies to all the world's inhabitants. Notably, it also promotes "fruitful and constructive cooperation and partnership between Member States and Sector Members."<sup>12</sup>

Of particular interest to the space community are the fundamental obligations of Member States to:

- Avoid causing harmful interference to the radio stations of different states operating in accordance with the Radio Regulations<sup>13</sup>
- Limit the number of frequencies and the spectrum used to the minimum essential to provide services and apply the latest technical advances as soon as possible,<sup>14</sup> and to
- Bear in mind that spectrum and associated orbital resources are "limited natural resources that must be used rationally, efficiently, and economically, in conformity with the provisions of the Radio Regulations, so that countries ... may have equitable access to those orbits and frequencies."<sup>15</sup>

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9 International Telecommunication Union, Membership, <https://www.itu.int/hub/membership/our-members/> (accessed 11.09.2023).

10 Allison, *supra* note 1, at 12-13.

11 ITU Constitution *supra* note 7. The ITU's structure and governance are elaborated in its Constitution and Convention.

12 *Id.* Article 1, Nos. 3, 6, 9.

13 *Id.* Article 45.

14 *Id.* Article 44, No. 145.

15 *Id.* Article 44, No. 146.

To carry out these ends, the Constitution establishes, *inter alia*, that the Union shall:

- Effect allocation of bands of the radio-frequency spectrum, the allotment of radio frequencies, and the registration of radio-frequency assignments and, for space services, of any associated orbital position in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, in order to avoid harmful interference between radio stations of different countries;
- Coordinate efforts to eliminate harmful interference between radio stations of different countries; and to improve the use made of the radio-frequency spectrum for radiocommunication services and of the geostationary-satellite and other satellite orbits; and
- Facilitate worldwide standardization of telecommunications, with a satisfactory quality of service.<sup>16</sup>

The Constitution is complemented by the Convention, also adopted by Plenipotentiary Conferences, that provides further detailed provisions concerning the Union's structure and operations.<sup>17</sup> The Union's third basic instrument, the Administrative Regulations, includes the Radio Regulations, which is adopted and amended by WRCs, and the International Telecommunication Regulations, which are rarely updated.

### 3. The Radio Regulations

The Radio Regulations implement the Constitution's above-described founding principles and provide detailed underpinnings for the implementation of the global framework for spectrum and orbit use, including protecting stations from harmful interference and promoting efficient use of these resources to enable deployment of the maximum number of services, as well as equitable access to these shared natural resources. The principle of managing the long-term sustainability of spectrum and orbital resources is reflected throughout the Radio Regulations.<sup>18</sup> The Radio Regulations also provide the ground rules for registration in the Master Register.

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<sup>16</sup> *Id.* Article 1, Nos.11-13.

<sup>17</sup> The ITU's Constitution and Convention are remarkably stable instruments that have not been amended since its 2010 Plenipotentiary Conference. The ITU has convened three Plenipotentiary Conferences since 2010.

<sup>18</sup> See Resolution 219 (Bucharest 2022), Sustainability of the Radio-Frequency Spectrum and Associated Satellite-Orbit Resources Used by Space Services, *supra* note 7 at 935.

The Radio Regulations are adopted and amended by World Radiocommunication Conferences which are convened by the ITU every three-to-four years.<sup>19</sup> WRCs are treaty-making Conferences. Following every WRC, a new edition of the Radio Regulations is published incorporating new and amended provisions. The most recent edition of the Radio Regulations was published (both physically and electronically) in 2020 to incorporate the amendments adopted by the 2019 WRC. The revised Radio Regulations entered into force on 1 January 2021 – the 37<sup>th</sup> time the Radio Regulations have been updated in their 117-year history.<sup>20</sup>

The Radio Regulations include the Table of Frequency Allocations, which indicates which radio services (plus radioastronomy) may be operated in particular frequency bands subject to the specified operating conditions. In its 2,000-plus pages, the Radio Regulations provide definitions, technical, operational, and regulatory sharing rules, plans, regulatory provisions for coordination of terrestrial and space radio services, and provisions on resolution of cases of interference.<sup>21</sup> The provisions provide a means by which administrations obtain international recognition of their operators' radio assignments (and thus protection from harmful interference from other nations' radio operations) derived from their recording in the Master International Frequency Register by the ITU's Radiocommunication Bureau.<sup>22</sup> Although this international regulatory status is important for all communications systems, it is mission critical for satellites and other space systems whose stations are designed for long-term missions operating at very distant locations.

#### **4. Regulation of Space Services**

The Radio Regulations enable a stable radio-driven global infrastructure under which nations may attain "international recognition" of their radio operations, including those operating from space. This refers to their ability to operate their radio stations free from harmful interference from the radio stations of other nations throughout the lifetime of their mission. In order to accomplish this end, the Radio Regulations set forth provisions to control interference: allocations of radio services to particular frequency bands; power limits to protect other services; regulatory protections; and provisions for coordination among Member States.

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19 ITU Constitution, *supra* note 7 No. 196. In modern times, WRCs are usually convened every four years consistent with the ITU's four-year financial planning cycle.

20 International Telecommunication Union, Final Acts of the World Radiocommunication Conference 2019, ITU, Geneva, 2019, <https://www.itu.int/pub/R-ACT-WRC.14-2019/en> (accessed 21.01.2024).

21 Radio Regulations, *supra* note 2.

22 *Id.* Article 8.

Before authorizing a radio station with the capability of causing harmful interference to stations of another country, the Member State is responsible to ensure that the station will operate in accordance with the Table of Frequency Allocations contained in Article 5 and other provisions of the Radio Regulations.<sup>23</sup> Moreover, coordination with other Administrations could also be required. The Master Register is to be consulted as an initial step for this analysis, much of which is available online.<sup>24</sup> Mission planners of space stations should, through their Notifying Administration, submit their plans to the ITU's Radiocommunication Bureau during the design stage prior to launch to ensure avoidance of any difficulties, including causation of harmful interference, so that their systems will ultimately be able to receive international recognition.<sup>25</sup>

The Radio Regulations provide regulatory procedures that Administrations must follow to have their operation's frequency assignment recorded in the ITU's Master Register with a favourable finding by its Radiocommunication Bureau. This is the means by which the frequency assignment achieves the status of international recognition:

Any frequency assignment recorded in the Master Register with a favourable finding under No. 11.31 shall have the right 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.<sup>26</sup>

Should a frequency assignment recorded with a favourable finding receive harmful interference from a station whose assignment is not in accordance with No. 11.31 of the Radio Regulations, then the latter must immediately eliminate this harmful interference.<sup>27</sup>

The Radio Regulations provide different regulatory approaches depending on the particular services and frequency bands in use. For example, some allocations in the Broadcasting-Satellite and Fixed-Satellite Services are subject to the Space Plans for the purpose of ensuring that sufficient spectrum and orbital resources will be available for all nations to develop national satellite systems in the indeterminate future (an important component of

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<sup>23</sup> *Id.* No. 4.2.

<sup>24</sup> International Telecommunication Union, BR International Frequency Information Circular, <https://www.itu.int/en/ITU-R/space/Pages/brificMain.aspx> (accessed 20.01.2024).

<sup>25</sup> International Telecommunication Union, Radiocommunication Study Groups, Draft New ITU-R Small Satellite Handbook, Document 4/90, 6 July, 2023, <https://www.itu.int/en/ITU-R/space/support/smallsat/sshandbook/Documents/R19-SG04-C-0090%21%21MSW-E.docx> (accessed 11.09.2023).

<sup>26</sup> Radio Regulations, No. 8.3, *supra* note 2.

<sup>27</sup> *Id.* No. 8.5.

equitable access). These Space Plans are contained in the Appendices to the Radio Regulations in Volume 2. But most of the resources are not subject to Plans and instead are available on a “first come first served” basis under Regulations under which rights are secured through coordination (Article 9), notification, and registration (Article 11).<sup>28</sup>

Under Articles 9 and 11 of the Radio Regulations, Administrations must submit Advance Publication Information and/or Coordination Requests, along with a great deal of required data elements describing their proposed frequency assignments, to the Radiocommunication Bureau.<sup>29</sup> The request is reviewed for conformity with the Radio Regulations and is published in a biweekly Circular available on the ITU’s website. Administrations review these publications for potential interference with existing or planned systems with higher regulatory status. Then coordination is concluded with potentially affected systems with assistance from the Bureau, if needed. This entire process must be completed within seven years from the receipt of the initial filing. By the end of this seven-year regulatory period, the Notifying Administration must submit a notification to the Bureau; ensure payment of any required ITU cost recovery fees; submit due diligence information; and brings its proposed operation into use (operating on the notified parameters). Under either the planned or unplanned procedures, the ultimate goal is the recording of the frequency assignments of any proposed system in the Master Register with a favourable finding.<sup>30</sup> Thus, status of international recognition may be secured. However, this protected status is not a permanent grant to perpetual use of these shared resources (which, indeed, would be contrary to the Outer Space Treaty).<sup>31,32</sup> An Administration must continuously maintain the operation as notified (utilizing the full range of the notified parameters). Any full or partial suspension of operation for six months or longer requires notification to the Bureau and returning into use within three years. Longer suspensions, or failure to operate as notified, may result in loss of international recognition and cancellation of the frequency assignment by the

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28 International Telecommunication Union, ITU Radio Regulatory Framework for Space Services, [https://www.itu.int/en/ITU-R/space/snl/Documents/ITU-Space\\_reg.pdf](https://www.itu.int/en/ITU-R/space/snl/Documents/ITU-Space_reg.pdf) (accessed 15.09.2023).

29 Radio Regulations, *supra* note 2, Volume 2, Appendix 4A, Annex 2, Characteristics of satellite networks, earth stations or radio astronomy stations.

30 *Id.* Article 11, Section II.

31 United Nations, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon, and other Celestial Bodies, *International Space Law: United Nations Instruments*, United Nations, Vienna, 2017, [https://www.unoosa.org/res/oosadoc/data/documents/2017/stspace/stspace61rev\\_2\\_0\\_html/V1605998-ENGLISH.pdf](https://www.unoosa.org/res/oosadoc/data/documents/2017/stspace/stspace61rev_2_0_html/V1605998-ENGLISH.pdf) (accessed 20.09.2023) [hereinafter Outer Space Treaty].

32 Radio Regulations, *supra* note 2, Volume 3, Resolution 4 (Rev. WRC-03), Period of Validity of Frequency Assignments to Space Stations using the Geostationary-Satellite and other Satellite Orbits.



Bureau. However, any such cancellation must be reviewed by the ITU's Radio Regulations Board and may be appealed to a subsequent WRC.<sup>33</sup>

The Radiocommunication Bureau is charged by the Radio Regulations to periodically review the Master Register with the aim of maintaining or improving its accuracy and making any necessary adjustments after changes to allocations made by a WRC.<sup>34</sup> In addition, Article 13 of the Radio Regulations provides instructions to the Bureau on maintenance of the Master Register. The Bureau is responsible, whenever it appears from reliable information and/or non-response from an Administration that a recorded assignment has not been brought into use, or is no longer in use, or continues to be in use, but not in accordance with the notified required characteristics, to consult with the Notifying Administration and to seek clarification. Based upon the response received (or no response at all), the Bureau may ultimately cancel the frequency assignment.<sup>35</sup>

The regulatory provisions establishing the coordination and notification of satellite networks are reviewed by every WRC in light of experience gained in their application and the accelerating evolution of space technologies and services. For example, the advent of filings of large non-GSO satellite systems required changes to the Radio Regulations at WRC-19), including defining "bringing into use" for frequency assignments to non-GSO systems, and a new regulatory mechanism to ensure that implementation as notified and the integrity of the Master Register.<sup>36</sup>

## 5. WRCs – Adapting to Change

As the space industry has grown prodigiously in recent years, the regulatory framework has had to be adapted to accommodate these innovations and to preserve the ability of the Radiocommunication Bureau to maintain the Master Register. The Radio Regulations are regularly revised about every four years by the World Radiocommunication Conferences. WRCs consider issues on a pre-set Agenda recommended by the previous WRC and approved by the ITU's Council, an elected board of Member States who manage the ITU's financial resources. On every WRC Agenda Item is a standing item:

to consider possible changes on advance publication, coordination, notification and recording procedures for frequency assignments pertaining to satellite networks . . . in order to facilitate the rational,

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<sup>33</sup> *Id.* No. 11.49.

<sup>34</sup> *Id.* No.11.50.

<sup>35</sup> *Id.* No. 13.6.

<sup>36</sup> A.L. Allison, *New Space Law Created to Enable Space Innovation While Preserving the RF Environment in Space; Notable Outcomes of the ITU's 2019 World Radio Conference, IAC-20-E7-7.9*, 71<sup>st</sup> International Astronautical Congress, CyberSpace Edition, 2020, 17-20, October.

efficient and economical use of radio frequencies and any associated orbits, including the geostationary-satellite orbit.<sup>37</sup>

WRC-19, convened in Sharm el-Sheikh, Egypt, squarely faced the challenge of the growing number of non-GSO constellations for communications services which threatened to overwhelm the Radiocommunication Bureau and the efficacy of the Master Register. In this case, the pace of technology had rapidly outstripped the Regulations (the previous conference, WRC-15, having decided that the issue was too nascent to regulate).<sup>38</sup> The Radio Regulations lacked a definition for the bringing into use of non-GSO systems and the seven-year regulatory period that applied to geostationary satellite networks would be unachievable in any event for fully deploying a very large system comprising hundreds or thousands of satellites. Moreover, how would these systems be successfully coordinated and how would they protect operations in the geostationary-satellite orbit? Thus, WRC-19 was a pivotal treaty conference for the ITU.

WRC-19 created a new regulatory framework for the Radio Regulations to address the implementation of large non-GSO systems in certain frequency ranges. Although it considered that deploying a single satellite of a much larger system might be too low a bar for establishing the bringing into use of frequency assignments of an entire large constellation, it was also apparent that the existing seven-year regulatory deadline was too short a timeframe in which to implement a large system in its entirety. However, a meaningful regulatory deadline was needed to ensure that these proposed large systems were implemented in good time and that the reserved spectrum and orbital resources were being utilized as indicated. WRC-19 thus adopted a new two-prong approach to resolve this dilemma. The first prong is to define the bringing into use deadline for non-GSO systems as deploying and maintaining a single satellite of that system having the capability of transmitting or receiving on all frequencies in the frequency assignment in one of the notified orbital planes.<sup>39</sup>

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37 International Telecommunication Union, Resolution 1399 (Council 2020), Agenda of the 2023 World Radiocommunication Conference (WRC-23), <https://www.itu.int/wrc-23/wpcontent/uploads/sites/12/2021/12/RESOLUTION-1399.pdf> (accessed 15.09.2023).

38 Allison, A.L. Satellite Spectrum Allocations and New Radio Regulations from WRC-15: Defending the Present and Provisioning the Future. In: Pelton, J., Madry, S., Camacho-Lara, S. (eds) Handbook of Satellite Applications. Springer, Cham, 2017.

39 Radio Regulations, *supra* note 2, No. 11.44C.

Table: Non-GSO System Milestones adopted by WRC-19

1 <sup>st</sup> Milestone	7 + 2 years	10%
2 <sup>nd</sup> Milestone	7 + 5 years	50%
3 <sup>rd</sup> Milestone	7 + 7 years	100%

The second prong, which applies only to large non-GSO systems in the services and allocations supporting large non-GSO communications systems (and thus not applicable to sensing, scientific, and navigation satellites) is a series of three performance milestones that apply after the seven-year bringing-into-use period. These milestones, shown in the Table, require that a percentage of the system be deployed by the additional time period for that milestone. The Radiocommunication Bureau would reduce the assignments of any system that fails to meet a milestone and this reduction would be recorded in the Master Register. Moreover, to provide transparency of milestone completions, the notifying administrations of these non-GSO systems would be required to provide deployment information including satellite system information, launch information and space station characteristics to the Radiocommunication Bureau. This information would then to be published on the ITU's website and in its regulatory publications.<sup>40</sup> Although WRC-19 made substantial progress on the new regulatory approach to managing the resources devoted to large non-GSO systems, future conferences will need to complete this effort and to assess and fine-tune the approach based on the experiences of its application and the progress of the industry. An additional area of work that was identified was the need to develop tolerances for certain orbital characteristics of these non-GSO systems and to account for differences in these values as notified and recorded in the Master Register from those characteristics as actually deployed. WRC-23 will consider adopting such orbital tolerances and other changes to the Radio Regulations, including further work on managing interference between non-GSO systems and GSO networks, and among non-GSO systems.<sup>41</sup>

The 2022 Plenipotentiary Conference (Bucharest, Romania) continued the discussion of the ongoing implementation of large non-GSO systems in terms of possible impacts on the long-term space sustainability, including

40 *Id.* No. 11.51, Resolution 35 (WRC-19), A Milestone-Based Approach for the Implementation of Frequency-Assignments to Space Stations in a Non-Geostationary-Satellite System in Specific Frequency Bands and Services.

41 Allison, A.L., Forging New Space Law to Support Innovation and Sustainability of Space Resources: Preview of the 2023 World Radiocommunication Conference, IAC-22-E7.7.6, 73<sup>rd</sup> International Astronautical Conference, Paris, France, 2022, 18-22 September.

protection of GSO networks from aggregate effects of the operations of these large new LEO constellations. The Conference adopted Resolution 219, “Sustainability of the radio-frequency spectrum and associated satellite-orbit resources used by space services” calling for the Radiocommunication Assembly (that oversees the radiocommunication study groups) perform studies, as a matter of urgency, to study the issue of increasing use of spectrum and associated orbital resources in non-GSO orbits and the long-term sustainability of these resources, as well as on equitable access, and the rational and compatible use of GSO and non-GSO orbit and spectrum resources. The Resolution also encouraged Member States to take action to avoid unacceptable interference to GSO and other non-GSO systems; to ensure the efficient use of the resources; and to develop the necessary regulatory frameworks to achieve these goals.<sup>42</sup> In its Report to WRC-23, the ITU’s Radio Regulations Board recommends that the Conference instruct the Radiocommunication Sector to carry out studies to identify additional information requirements for non-GSO systems and to develop ITU-R Recommendations (standards) and reports that address the long-term sustainability of non-GSO and spectrum resources and the equitable access to those resources.<sup>43</sup>

## 6. Registration Convention

The UN Registration Convention was adopted by the United Nations General Assembly in 1975<sup>44</sup> as part of the implementation of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon, and other Celestial Bodies (Outer Space Treaty).<sup>45</sup> Although more than seventy states are parties to the treaty, it may have also achieved the status of customary international law as even non-party States adhere to its provisions. The Registration Convention seeks to provide transparency over objects launched into outer space including the identity of the State who has responsibility for such object under the UN’s space governance framework. As such, the Registration Convention “plays a crucial role in the international space governance, including the maintenance of peace and security.”<sup>46</sup> With the accelerating levels of objects being launched into orbit; the rising concerns regarding space safety and space sustainability, and the sensitivities of the geopolitical environment, the

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42 Resolution 219, *supra* note 18.

43 International Telecommunications Union, Report by the Radio Regulations Board to WRC-23 on Resolution 80 (REV.WRC-07), Doc. WRC-23/50 (2023).

44 Registration Convention, *supra* note 5.

45 Outer Space Treaty, *supra* note 31.

46 Jakhu, R.S., Jasani, B., McDowell, J.C., Critical issues related to registration of space objects and transparency of space activities (2018) *Acta Astronautica*, 143, pp. 406-420.

efficacy of such a Registry is more important now than ever, as well as the development of new mechanisms for ensuring the long-term sustainability of space.

Although the Registration Convention continues to provide important data to the world about the growing population of space objects, it lacks much in terms of specificity and has not been improved or updated since its inception in 1975. Obviously, a lot has changed since then. Recurring areas of ambiguity include the identity of the launching state that is required to make the registration (there are several possibilities under the current definition); lack of a specific timeline for registration submissions (or for updating the registration later); lack of standard data elements to be included; absence of verification or consequences or recourse for failures to file or other insufficiencies. There are also ongoing challenges (which also challenge the ITU's Master Register) with registration of military satellites, small satellites, and satellites whose responsible State changes while in orbit.<sup>47</sup>

The ITU's experiences detailed above in creating, updating, and maintaining its Master Register of international frequency assignments offer deep insights as to the means and mechanisms that can be realistically developed and implemented by a UN organization to provide awareness of ongoing national space activities. Additionally, other models of international registries are also available for similar analysis to inform any future efforts to improve the Registration Convention—and/or to develop alternative or supplementary mechanisms to augment the much-needed transparency and timeliness of the growing population of space objects in the space environment.<sup>48</sup>

## 7. Conclusion

The 1975 Registration Convention remains an important tool for international space governance in the 2020s and beyond. However, more transparency, specificity, and deeper, timely insights are urgently needed to address the mounting global challenges of growing congestion, threats to space safety, and the need to determine global approaches to ensure the long-term space sustainability of the space environment. Updating and improving the Registration Convention is one measure that could usefully be addressed. The long history of the ITU and its Master Register of international frequency assignments, including those for space networks and systems, offers one example of a Register that is continuously updated to adapt to innovations in technologies and services in order to provide visibility of the actual use of the spectrum and orbital resources and to protect the ongoing

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<sup>47</sup> *Id.*

<sup>48</sup> See, e.g., Convention on International Interests in Mobile Equipment (2001), <https://web.archive.org/web/20180606114120/https://www.unidroit.org/instruments/security-interests/cape-town-convention> (accessed 25.09.2023).

integrity of the Register itself. The fact that this is accomplished by a UN organization at treaty conferences every four years is itself remarkable. Indeed, with new leadership now in place, ITU and UNOOSA have an unprecedented opportunity to increase their longstanding cooperation and collaboration to learn from each other, and to forge new ways of achieving progress on these shared challenges of space sustainability.