

From WRC-23 to the next cycle: How to Make Everyone Happy? (Hint: You Can't)

1. An introduction to the World Radiocommunication Conference 2023

The World Radiocommunication Conference 2023 (WRC-23) was held from 20 November to 15 December



ITU WRC-23. Credit: ITU/D. Woldu

2023 in Dubai, UAE.ⁱ The WRC-23 tackled a number of contemporary and future issues related to spectrum management. **Spanning across terrestrial, maritime and space services**, dealing with a transition through a “new era of space development that poses a big challenge for ITU and the international community.”ⁱⁱ

The Conference gathered approximately 3,900 delegates from 163 Member States, including **88 participants at ministerial level**.ⁱⁱⁱ Participants also included delegates from ITU-R Sector Members, representing international organizations, manufacturers, network operators and industry associations, indicating the breadth of actors impacted by the decisions made.

The WRC is a treaty-making conference organised by ITU that brings together its Member States every three to four years and plays a key role in shaping technical and regulatory frameworks for the provision of radiocommunication services across the globe. Preparations for the WRC-23 included continuous work of the Study Groups of the ITU Radiocommunication Sector (ITU-R), leading to the 2nd Conference Preparatory Meetings (CPM), held from 27 March to 6 April 2023, and the CPM23-2 Report.^{iv} Among other tasks, the Conference adopts technical studies, revises the Radio Regulations, reviews the Rules of Procedure and appeals from the Radio Regulations Board. The amendments to the ITU Radio Regulations resulted in the WRC-23 Final Acts (an international treaty in its own right) signed by 151 Member States. The Final Acts included the new and revised provisions of the Radio Regulations, all Appendices, and the new and revised Resolutions and ITU-R Recommendations incorporated by reference into the treaty by the Conference. The new Radio Regulation will likely be available in the 4th quarter of 2024 and will enter into force on 1 January 2025.

2. RA 2023: a focus on space sustainability and gender equality

The WRC-23 was preceded by the Radiocommunication Assembly 2023 (RA-23), which took place in the same location as the Conference between the 13 and 17 November 2023.^v The Assembly aimed to further shape the future directions in radiocommunication systems. Among other outcomes, RA-23 resulted in the adoption of:^{vi}

- **Resolution 74 on “Activities related to the sustainable use of radio-frequency spectrum and associated satellite-orbit resources used by space services”**.^{vii} In 2022, the ITU Plenipotentiary Conference in Bucharest, adopted Resolution 219, directing the Radiocommunication Assembly “as a matter of urgency” to perform studies on “the issue of the increasing use of radio-frequency spectrum and associated orbit resources in non-GSO orbits and the long-term sustainability of these resources, as well as on equitable access to, and rational and compatible use of, the GSO and non-GSO orbit and spectrum resources, consistent with the objectives of Article 44 of the Constitution.” In response to Resolution 219, Resolution 74 facilitates the long-term sustainable use of radio-frequency spectrum and associated satellite orbit resources used by space services. In addition, in March 2024, the ITU Radiocommunication Bureau issued a Circular Letter requesting national administrations and operators of non-GSO satellite systems to provide information related to post-mission disposal strategies, de-orbit timetables, enabling technologies including manoeuvrability capabilities, and direct point-of-contact for operations.^{viii} The ITU committed to promote and share data on responsible behaviours for non-GSO space stations using frequency assignments currently recorded in the ITU MIFR, or under coordination or notification processes.^{ix}
- **Resolution 73 on “the use of International Mobile Telecommunications (IMT) technologies for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis”**.^x The

Resolution will guide the development of standards and radio interface technologies for the 6th Generation of mobile systems (6G). The resolution was combined with the publication of Recommendation ITU-R M. 2160 on the "IMT-2030 Framework", which sets the basis for the development of IMT-2030. The next phase will be the definition of relevant requirements and evaluation criteria for potential radio interface technologies (RIT). RA-23 also revised ITU-R Resolution 65, paving the way for studies on the compatibility of current regulations with potential 6G radio interface technologies for 2030 and beyond.^{xi} In this context, the rising need to better integrate space and terrestrial networks effectively, are demonstrated by the recent inclusion of non-terrestrial networks in standardisation documents for standards bodies such as the 3rd Generation Partnership Project (3GPP) and the ITU.^{xii}

- **Resolution 72, "Promoting gender equality and equity and bridging the contribution and participation gap between women and men in ITU-R activities".**^{xiii} Incentivised by the WRC-19's "Declaration on Promoting Gender Equality, Equity and Parity in the ITU Radiocommunication Sector",^{xiv} the Resolution focuses on gender equality "to strengthen, accelerate and widen the active involvement of women in the work of the ITU-R".^{xv} This year, women made up 22% of all delegates at WRC-23, an insufficient increase from 18% at WRC-19 in 2019. The Resolution was supported by the Network of Women for WRC-23 (NOW4WRC23), a forum for networking, mentoring, and knowledge sharing, launched during the ITU World Radiocommunication Seminar Online 2020 Plenary, in December 2020.
- **Conclusion of Recommendation ITU-R M.2164-0** on the protection of the radionavigation-satellite service (RNSS, space-to-Earth) from the use of some frequency by stations operating in the amateur and amateur-satellite service.^{xvi} WRC-23 participants agreed to mention the Recommendation in a new footnote for the allocation.^{xvii}



Ra-23. Credit: ITU/D.Woldu

3. A continued clash between terrestrial and space: Satellite services at WRC-23

WRC-23 approved 43 new resolutions, revised 56 existing ones, and suppressed 33. Among the 10 Agenda Items with over 20 subpoints and several topics, of which the following are deemed most relevant for the space community:^{xviii}

Allocation of spectrum for satellite services

The WRC-23 **allocated new frequencies (117.975-137 MHz) to the aviation sector for aeronautical mobile satellite services**, aiming to improve bi-directional communication via non-GSO satellite systems, especially over remote areas and the ocean.^{xix} In addition, frequencies ranging from 40-50 MHz have been allocated to the Earth exploration-satellite service (active) for spaceborne radar sounders to enable advanced ice cloud measurements for better weather forecasting and climate monitoring.^{xx} Moreover, **WRC-23 acknowledged space weather sensors** as integral to the meteorological aid service, facilitating the observation of space weather phenomena and events such as solar flares, solar radiation, and geomagnetic storms. These phenomena can disrupt radiocommunication services, including satellites, mobile phone services, and navigation systems, also in line with the newly introduced Article 29B of the Radio Regulations.^{xxi} Given that spectrum is a finite asset, these additional allocations will be pivotal in shaping space and satellite operations in the coming years.^{xxii} In addition, several countries replaced their assignment in the broadcasting satellite service with a new one offering better performances.^{xxiii}

The expansion of mobile services allocation at the expenses of satellite services

The Final Acts allocate frequencies for Mobile Service (MS 3 600-3 800 MHz) at the expense of Fixed Satellite Service (FSS) Earth stations, especially in African regions,^{xxiv} and explored the use of IMT system for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis.^{xxv} The Acts recognise spectrum as a crucial enabler for the development of mobile service and IMT (e.g., 4G, 5G and, in the future, 6G), including the 3 300-3 400 MHz and 3 600-3 800 MHz,^{xxvi} 4 800-4 990 MHz^{xxvii} and 6 425-7 125 MHz frequency bands in various countries and regions (6 425-7 125 MHz in Region 1 and 7 025-7 125 MHz in Region 3). WRC-23 also outlined the frequency bands (2 GHz and 2.6 GHz) for using "high-altitude platform stations as IMT base stations" (HIBS) and established provisions for their operations.^{xxviii} This technology presents a platform for providing mobile broadband with limited/minimal infrastructure, relying

on the same frequencies and devices as IMT mobile networks. Indeed, when deploying ground stations becomes challenging, inter-HIBS or HIBS-satellite links may be used for this purpose.

Upgrading satellite-to-satellite links

Following studies conducted in the WRC-19 study cycle pursuant to Resolution 773, WRC-23 also focused on the adoption of a regulatory framework for satellite-to-satellite links in Ka-band.^{xxxix} Indeed, leveraging satellites in higher orbits (GSO and MEO assets) as data relay links can provide space infrastructures and systems in LEO (e.g., space stations and EO) an alternative means to transmit the data to the ground. This advancement will enable the availability of data in near-real time, thereby enhancing the value of instrument data for low-latency applications, including scientific use, weather forecasting and disaster risk reduction. The participants of WRC-23 agreed on the use of the frequency bands 18.1-18.6 GHz, 18.8-20.2 GHz and 27.5-30 GHz, with a limited use for 'space research, space operation and/or Earth exploration-satellite applications, and also transmissions of data originating from industrial and medical activities in space'. They also included an extension to 29.5-30 GHz to ensure the protection of terrestrial services, with further considerations for NGSO systems with operational altitudes of 900 km and for GSOs used in the fixed-satellite service.^{xxx}

Regulation of earth stations in motion (ESIM) bands to enhance mobility

The growing need for connectivity of earth stations in motion (ESIM), especially in the aeronautical and maritime sectors, has been the core of the discussions regarding Agenda Items 1.15 and 1.16. WRC-23 adopted regulatory decisions for ESIM communicating with non-GSO satellite systems in the Ka-band as well as with GSO in parts of the Ku-band, **supporting ubiquitous connectivity via satellite frequencies to deliver high-speed broadband onboard aircraft, vessels, trains, and vehicles**. These services are decisive for disaster management purposes, especially in situations where terrestrial infrastructures are damaged or destroyed, and they could also play a significant role in enhancing the Global Maritime Distress and Safety System. The Conference took several regulatory actions in this regard, including the provisional recognition of the BeiDou Satellite Messaging Service System for GMDSS use,^{xxxi} contingent upon the accomplishment of coordination with existing networks.

Enhancement of satellite procedures and revision of planned bands

Based on Resolution 86 (Rev. Marrakesh, 2002), Agenda Item 7 aimed changes in advance publication, coordination, notification and recording procedures for frequency assignments of satellite networks to facilitate the rational, efficient, and economical use of radio frequencies and any associated orbits, including the GSO. A relevant point of discussion under this Agenda Item regarded **non-GSO tolerance, meaning how close non-GSO satellites should adhere to the orbital positions which are registered by their national regulators**. The parameters are important, especially for satellite operators attempting to navigate the increasingly congested space environment. Indeed, non-GSO satellites have been operational for decades, but they did not have similarly specified orbital tolerances limitation as GSO satellites do (0.5 degrees of an assigned orbital slot). The **WRC-23 regulated the tolerances on apogee/perigee and inclination parameters for frequency assignments with an orbital eccentricity less than 0.5, and an apogee altitude of less than 15,000 km notified as part of a non-GSO FSS, BSS, or MSS system** (WRC-23, Resolution 35).^{xxxii} The Resolution established a limit of 70 km above or below an assigned orbital slot during the deployment of the constellation, decreasing to 30 km thereafter.^{xxxiii}

Furthermore, an instance of these new complexity factors brought by large constellations in non-GSO can be found in WRC-23 discussions related to the limits on the **overall power that large constellations can emit when communicating with ground terminals (Equivalent Power Flux-Density, EPFD)**, so as to **protect GEO fixed-satellite and GSO broadcasting-satellite services from interference**. The matter was addressed under Agenda Item 7, topic J, with the aim of establishing a procedure for collaboration among administrations in ensuring the aggregated EPFD limits are not exceeded. The discussion was not conclusive; and highlighted a schism between non-GSO and GSO operators.

Indeed, non-GSO satellite operators put pressure on the participants to adopt a WRC-27 Agenda Item focused on studying and eventually updating the EPFD rules. On the contrary, GEO operators and some countries strongly opposed the adoption of such a future Agenda Item.^{xxxiv} As a consequence, EPFD limits (and modification of Article 22) are not an Agenda Item for WRC-27, however, technical studies will be conducted in the next four-year cycle, and the outcomes will be reported at WRC-27 (without regulatory actions).

4. On the road to WRC-27: an unprecedented number of proposals related to space

The WRC-23 tackled several critical issues shaping the future of spectrum management for space services, while an even broader analysis requires the identification of Agenda Items for WRC-27. Indeed, the WRC Agenda results from the decisions made by previous WRCs. Its final version is approved by the Council of the ITU. WRC-23 approved the Agenda Items for the next WRC-27 and the provisional Agenda for WRC-31. WRC-27 Agenda will have 19 items under Agenda Items 1, also for both WRC-27 and preliminary ones for WRC-31, with an unprecedented number of proposals related to the space domain:

Expand Q/V frequency bands for ESIMs (GSO/non-GSO)	Consideration for technical and operational conditions for the use of Q/V band by aeronautical and maritime ESIMs communicating with GSO and non-GSO space stations in the FSS and development of regulatory measures to facilitate their use with ESIMs on board unmanned aircraft. ^{xxxv}
Small Antennas in Ku frequency Band:	Consideration for revisions of sharing conditions in the frequency band 13.75-14 GHz to allow the use of uplink FSS earth stations with smaller antenna sizes. ^{xxxvi} Furthermore, the WRC-27 will consider the use of Q/V frequency band (51.4-52.4 GHz) to enable use by gateway earth stations transmitting to non-GSO satellite orbit systems in FSS (Earth-to-space). ^{xxxvii}
Ka-Band BSS/FSS Allocation in R3	Considerations for new primary allocation to FSS (space-to-Earth) in the frequency band 17.3-17.7 GHz and a possible new primary allocation to the BSS (space-to-Earth) in the frequency band 17.3-17.8 GHz in Region 3, while ensuring the protection of existing primary allocations in the same and adjacent frequency bands, and considering EPFD limits to be applied in Regions 1 and 3 to non-GSO systems in FSS (space-to-Earth) in the frequency band 17.3-17.7 GHz. ^{xxxviii}
Unauthorised Operation of non-GSO	Consideration for regulatory measures, and implementation thereof, to limit the unauthorized operations of non-GSO orbit earth stations in FSS and MSS and associated issues related to the service area of non-GSO orbit satellite systems in FSS and MSS. ^{xxxix}
Equitable Access in Q/V Bands	Consideration for technical and regulatory measures for FSS satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-to-space), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) to ensure equitable access. ^{xl}
Additional spectrum for IMT (inc. MSS)	Consideration for sharing and compatibility, as well as the development of technical conditions for the use of IMT in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz taking into account existing primary services operating in these, and adjacent, frequency bands. ^{xli} Furthermore, WRC-23 considered possible allocations to MSS for direct connectivity between space stations and IMT user equipment to complement terrestrial IMT network coverage. ^{xlii}
EPFD for FSS, MSS, and BSS	Consideration for developing power flux-density and equivalent isotropically radiated power limits for inclusion in RR Article 21 for FSS, MSS, and BSS to protect the fixed and mobile services in the frequency bands 71-76 GHz and 81-86 GHz. ^{xliii}
Space-to-space links among non-GSO and GSO	Consideration for technical and operational issues, and regulatory provisions, for space-to-space links among non-GSO and GSO 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 MSS. ^{xliv}
MSS low data rate in S-band	Considerations for possible allocations to MSS and 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-GSO MSS. WRC-27 also considers possible additional allocations to MSS in S-band. ^{xlv}
Lunar Spectrum allocation	Considerations for frequency-related matters, including 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. ^{xlvi}
Protection of Radio astronomy	Consideration for technical and regulatory provisions necessary to protect radio astronomy operating in specific Radio Quiet Zones and, in frequency bands allocated to the radio astronomy service on a primary basis globally, from aggregate

in Radio Quiet Zones	radio-frequency interference caused by non-GSO systems. ^{xlvii} Also, WRC-27 will 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. ^{xlviii}
Protection of space weather sensors	Considerations for 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. ^{xlix}
Frequencies for EESS	Considerations for possible primary allocations in all Regions to the Earth exploration-satellite service (EESS, passive) in the frequency bands 4 200-4 400 MHz and 8 400-8 500 MHz. ^l

Finally, the RA23 revised Resolution ITU-R 5-8 established the framework for the activities for the Radiocommunication Study Groups in the upcoming four-year study period (2024-2027).

5. What is at stake for space?

WRC-27 will likely bring a series of new frequency allocations and regulatory actions that would benefit the space domain, including, among many others, the future development of low-data rate non-GSO mobile-satellite systems.

The impending time for satellite direct-to-device communication

In conjunction with the WRC-23, the U.S. Federal Communications Commission (FCC) issued an experimental special temporary authorisation to SpaceX to test the direct-to-cell calls of the Starlink system. This six-month authorisation will enable SpaceX to transmit data to unmodified devices on Earth using T-Mobile's spectrum over the 1910-1915 and 1990-1995 MHz radio bands.^{li} Significant development is expected regarding direct connectivity between space stations and IMT user equipment, where new allocations to MSS could radically evolve direct-to-device communication, complementing terrestrial mobile services with space services. This indicates a contrasting trend in respect to the C-band relocation for 5G rollout in the United States. Inevitably, this trend poses challenges to the effectiveness of regulatory frameworks and underscores the necessity to timely consider an evolution of the Radio Regulations to keep up with technological innovation. As an instance of such an evolution, many administrations worldwide suggested the need to impose some restrictions on the increasing use of the provision under the Radio Regulation which permits limited operation for commercial applications of any radio station without completing the necessary procedures. RR Article 18.1 regarding unlicensed operation is reflected in the introduction of the new Agenda Item 1.5 for WRC-27. RR Article 4.4 related to uncoordinated operations is addressed under Agenda Item 7.

The coexistence and complementarity of space-based and terrestrial networks

On the contrary, the mobile community exerted its influence over the largest information technology companies, with WRC-23 identifying the 6 GHz band for IMT, expanding beyond the initial focus of the original Agenda Item on Region 1 to Regions 2 and 3. This decision hindered Big Tech's ambitions to secure 1,200 MHz of consistently harmonized spectrum in the Western regions (and potentially worldwide), for unlicensed use, primarily designated for Wi-Fi. In the upcoming WRC-27, IMT might be proposed as an initial step, as Agenda Item 1.7 examines bands that are generally less contentious.

Nevertheless, the ongoing study includes a segment of the Ku-band extensively utilised by satellites and the 7 GHz band, adjacent to the recently designated 6 GHz, which could lead to further debates involving the Wi-Fi community. In addition, national administrators (especially, from developing countries) increasingly acknowledged a role for them in the space domain, yet they must proactively secure their position, and their sovereign interest, ensuring space is not dominated by a select few public and private actors. This is reflected also in the debate on the need for equitable access to the relevant frequency bands, for which the discussion will start at WRC-27 under Agenda Item 1.6.

A way forward for space sustainability

Large non-GSO constellations are posing a number of unique challenges for the national regulatory processes, as well as for the international space regime at large. While many progresses have been made during WRC-27, achieving a sustainable space environment necessitates worldwide collaboration and resource sharing at the intergovernmental level under the auspices of the UN. UNOOSA, ITU, as well as bodies outside the UN system (e.g. the Inter-Agency Space Debris Coordination Committee - IADC) that

deal with space sustainability, while also taking advantage of civil society and advocacy groups as an integral part of this ecosystem. While these entities will continue to operate under different mandates and in different institutional setups, an effective space sustainability international coordination scheme and collaboration between different regulators can ensure some best practices being taken forward to enhance and reinforce the effectiveness of the respective regimes, and, more generally, the broader outer space governance. After several policy documents in this direction, including the UN Secretary-General Policy Brief N°7,^{lii} the ITU PP Resolution 219 and ITU-R Resolution 74 (RA 2023),^{liii} a clear opportunity to enhance outer space governance is provided by the UN Summit of the Future in 2024.^{liv}

A call for protection of national interests

National administration also raised concerns on situations where services are provided within their country without authorisation, controversial to the sovereign right to regulate telecommunications within their territory, and to their regulatory frameworks. This led the ITU Radio Regulations Board to request on 8 March that U.S. and Norwegian regulators “take immediate action to disable (authorised) Starlink terminals” in Iran, after multiple solicitations by Iran’s Communications Regulatory Authority.^{lv}

Finally, a focus on consolidating and strengthening national regulatory framework is highlighted by the release of the National Spectrum Strategy by the Department of Commerce,^{lvi} and the publication by the White House of its mission authorisation plan for novel space activities, simultaneously with the RA.23 and WRC-23.^{lvii} Developing countries also called the ITU to provide a supporting role for their national space laws, guaranteeing that operations are taking place with consensus and authorisation.^{lviii}

6. Europe within and beyond the WRC environment

WRC-23 tackled several critical issues shaping the future of spectrum management for space services, while an even broader analysis will be required in the next 4-years study cycle. Firstly, European Member states will need to deploy continued R&D support and future-driven regulatory frameworks for satellite direct-to-device communication, to ensure Europe doesn’t fall further behind in today’s fast paced connectivity race. In this context, it is also fundamental to establish a solid and balanced regulatory approach for complementing terrestrial with non-terrestrial networks, also in view of aspects related to European data sovereignty.

The 2023 edition also further established the WRC as a front where different industries vie for influence and economic power in future connectivity markets. With space-based connectivity poised to grow, operators as well as European space policy makers need to ensure more attention and resources are devoted to the decisions at the WRC and policy milestones in-between the conferences.

In this context, a crucial role will continue to be played by the Electronic Communications Committee (ECC), the European Conference of Postal and Telecommunications Administrations (CEPT), and the Radio Spectrum Policy Group (RSPG).

Finally, Member States will be increasingly challenged with establishing a consistent approach to space sustainability throughout relevant governmental and non-governmental fora as national actors sitting around the various platforms discussing and driving developments span across different governmental departments and ministries.

Additional information on these topics can be found in the ESPI Report “[Space Spectrum Management: Foundations for an informed policy discussion towards WRC-23 and beyond](#)”^{lix}.

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- ⁱ See ITU WRC-23, [\(Link\)](#).
- ⁱⁱ ITUPP, 2022. "Highlights: ITU Plenipotentiary Conference 2022". ITU [\(Link\)](#).
- ⁱⁱⁱ Press release ITU, 2023. "World Radiocommunication Conference revises the ITU Radio Regulations to support spectrum sharing and technological innovation" [\(Link\)](#).
- ^{iv} CPM23-2 [\(Link\)](#). Also, consolidated positions along regional approaches were reached by the six regional telecommunication organisations (RTOs).
- ^v See ITU RA-23, [\(Link\)](#).
- ^{vi} Press release ITU, 2023. "ITU Radiocommunication Assembly sets agenda for development of IMT-2030 for 6G and sustainable use of spectrum and orbital resources" [\(Link\)](#).
- ^{vii} Resolution ITU-R 74, 2023. "Activities related to the sustainable use of radio-frequency spectrum and associated satellite-orbit resources used by space services" [\(Link\)](#).
- ^{viii} BR Circular Letter [\(Link\)](#).
- ^{ix} LinkedIn, 2024. Jorge Ciccorossi [\(Link\)](#).
- ^x Resolution ITU-R 73, 2023. "Use of International Mobile Telecommunications technologies for fixed wireless broadband in the frequency bands allocated to the fixed service on a primary basis" [\(Link\)](#).
- ^{xi} Press release ITU, 2023. "ITU Radiocommunication Assembly sets agenda for development of IMT-2030 for 6G and sustainable use of spectrum and orbital resources" [\(Link\)](#).
- ^{xii} ITU, 2015. "Handbook on National Spectrum Management". ITU [\(Link\)](#).
- ^{xiii} Resolution ITU-R 72, 2023. "Promoting gender equality and equity and bridging the contribution and participation gap between women and men in ITU-R activities" [\(Link\)](#).
- ^{xiv} "Declaration on Promoting Gender Equality, Equity and Parity in the ITU Radiocommunication Sector of the World Radiocommunication Conference" (Sharm el-Sheikh, 2019) [\(Link\)](#).
- ^{xv} The duties and functions of the Radiocommunication Assembly are defined in Article 13 of the Constitution and Article 8 of the Convention [\(Link\)](#), while the working methods of the Assembly are described in § A1.2 of Resolution ITU-R 1-8 [\(Link\)](#).
- ^{xvi} Recommendation ITU-R M.2164-0 (11/2023) [\(Link\)](#).
- ^{xvii} International Amateur Radio Union, 2023. "WRC-23 Outcome" [\(Link\)](#).
- ^{xviii} Press release ITU, 2023. "World Radiocommunication Conference revises the ITU Radio Regulations to support spectrum sharing and technological innovation" [\(Link\)](#). The 10 Agenda Items (AI) were addressed by Commissions 4, 5 and 6 with 19 subpoints under AI 1, 11 topics under AI 7 and 3 subpoints under AI 9.
- ^{xix} Resolution 428, WRC-23, AI 1.7, 2023. [\(Link\)](#).
- ^{xx} Resolution COM5/6, WRC-23, AI 1.12, 2023. [\(Link\)](#).
- ^{xxi} Resolution COM5/1, WRC23 AI 9.1, 2023. [\(Link\)](#).
- ^{xxii} SpaceNews, "Spectrum for the Space and Satellite Industry" [\(Link\)](#).
- ^{xxiii} Resolution 559 (WRC-19), 2019. [\(Link\)](#).
- ^{xxiv} WRC-23, AI 1.3, 2023. [\(Link\)](#).
- ^{xxv} Resolution 175, WRC-23, AI 9.1-c, 2023. [\(Link\)](#).
- ^{xxvi} WRC-23, AI 1.2, 2023. [\(Link\)](#).
- ^{xxvii} WRC-23, AI 1.1, 2023. [\(Link\)](#).
- ^{xxviii} WRC-23, AI 1.4, 2023. [\(Link\)](#).
- ^{xxix} WRC-23, AI 1.17, 2023. [\(Link\)](#).
- ^{xxx} Resolution COM5/8, WRC-23, AI 1.17, 2023. [\(Link\)](#).
- ^{xxxi} Resolution COM4/5, WRC-23, AI 1.11, 2023. [\(Link\)](#).
- ^{xxxii} SpaceNews, 2024. "Orbital Spectrum Clash" [\(Link\)](#).
- ^{xxxiii} AccessPartnership, 2024. "The future of the ITU WRC cycle: Keeping pace with technological progress" [\(Link\)](#).
- ^{xxxiv} ViaSatellite, 2023. "Amazon and Think Tanks Launch Group Advocating for Power Flux Density Changes" [\(Link\)](#).
- ^{xxxv} Resolution 176, WRC.27 AI 11 (for 47.2-50.2 GHz and 50.4-51.4 GHz, Earth-to-space), 2023. [\(Link\)](#).
- ^{xxxvi} Resolution 129, WRC-27, AI 1.2, 2023. [\(Link\)](#).
- ^{xxxvii} Resolution 130, WRC-27, AI 1.3, 2023. [\(Link\)](#).
- ^{xxxviii} Resolution 726, WRC-27, AI 1.4, 2023. [\(Link\)](#).
- ^{xxxix} Resolution 14, WRC-27, AI 1.5, 2023. [\(Link\)](#).
- ^{xl} Resolution 131, WRC-27, AI 1.6, 2023. [\(Link\)](#).
- ^{xli} Resolution 256, WRC-27, AI 1.7, 2023. [\(Link\)](#).
- ^{xlii} Resolution 253, WRC-27, AI 1.13, 2023. [\(Link\)](#).
- ^{xliiii} Resolution 775, WRC-27, AI 1.10, 2023. [\(Link\)](#).
- ^{xliiv} Resolution 249, WRC-27, AI 1.11, 2023. [\(Link\)](#).
- ^{xli v} Resolution 252, WRC-27, AI 1.12, 2023. [\(Link\)](#).
- ^{xli vi} Resolution 680, WRC-27, AI 1.15, 2023. [\(Link\)](#).
- ^{xli vii} Resolution 681, WRC-27, AI 1.16, 2023. [\(Link\)](#).
- ^{xli viii} Resolution 712, WRC-27, AI 1.18, 2023. [\(Link\)](#).
- ^{xli ix} Resolution 682, WRC-27, AI 1.17, 2023. [\(Link\)](#).
- ^l Resolution 674 WRC-27, AI 1.19, 2023. [\(Link\)](#).
- ^{li} PCMag, 'FCC clears SpaceX to test cellular Starlink on phones', 2023. [\(Link\)](#).
- ^{lii} UN, 2023. "Our Common Agenda Policy Brief 7: For All Humanity – The Future of Outer Space Governance". [\(Link\)](#).
- ^{liii} Resolutions, RA-23 [\(Link\)](#).
- ^{li v} UN, 2023. "UN Summit of the Future in 2024". [\(Link\)](#).
- ^{li vi} Space Intel Report, 'ITU board rejects US, Norwegian claims that SpaceX Starlink cannot geolocate its terminals in Iran', 2024 [\(Link\)](#).
- ^{li vii} National Telecommunications and Information Administration, 2023. "National Spectrum Strategy" [\(Link\)](#).
- ^{li viii} White House, 2023. "United States Novel Space Activities Authorization and Supervision Framework" [\(Link\)](#).
- ^{li i x} ViaSatellite, 2023. "Satellite Issues Take Center-Stage at WRC-23" [\(Link\)](#).
- ^{li i x i} ESPI, 2023. "Space Spectrum Management: Foundations for an informed policy discussion towards WRC-23 and beyond" [\(Link\)](#).