SPACE AGENDA 2025

THE INVISIBLE LINK: KEY SPECTRUM ISSUES FOR SPACE

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Executive Summary

The radio-frequency spectrum is a finite resource whose value increases as the world's need for "always-on" connectivity grows. This has led to fierce competition, especially in the most attractive frequency ranges, between terrestrial and space services. Decisions on spectrum use can substantially impact incumbent users, particularly space-based services such as national security communications; positioning, navigation, and timing; space traffic management; weather forecasting; climate research; and emergency response. This chapter describes the complex world of domestic and international spectrum regulation and outstanding spectrum issues facing the U.S. space enterprise, including:

- Protection of critical spectrum allocations that power commercial and federal satellite systems
- Important spectrum issues in play for the next World Radiocommunication Conference (WRC) in 2027
- Decisions regarding key U.S. proposals and positions on WRC-27 agenda items needed early during the next administration

In preparation for WRC-27, work is underway on space issues needing early administration attention, such as:

- Protection of X-band space services
- Spectrum for lunar surface and lunar orbit communications
- Space-to-space links from geostationary orbit to other orbit regimes to enable multi-orbit services
- Spectrum for space weather receivers

Spectrum may be invisible, but assured access to it is mission critical for satellites and space services to enable a vast and growing array of essential capabilities. Planners and operators must educate and inform regulators and other government decisionmakers to fully recognize the value of spectrum and be vigilant about protecting the bands they need for essential missions.

Introduction

Although invisible and often overlooked, the radio-frequency spectrum is critical to all space missions for command and control, communications, and mission performance. Spectrum is also a crucial resource that enables wireless broadband content delivery to smartphones and supports many other uses around the world. Spectrum is a finite natural resource whose use must be carefully managed in order to avoid interference between radio signals that can prevent the reception of the desired transmission. Thus, spectrum use has historically been regulated to ensure that radio links of all desired services can be completed without harmful interference caused by other transmitters. Spectrum regulation has also included bilateral and global coordination to avoid interference from radio services of neighboring countries and to ensure that one's radio operations may successfully operate in blue waters, international air space, and outer space.

Radio-delivered services have proliferated as always-on connectivity has become a necessity for modern lifestyles and commerce. As a consequence, the most attractive ranges of spectrum have become increasingly congested.[*] With the value of spectrum on the rise, Congress has looked to the U.S. commercial spectrum regulatory agency, the Federal Communications Commission (FCC), to auction off frequency bands to wireless operators to enable new wireless broadband services, such as 5G.[†] These auctions have raised $233 billion for the U.S. Treasury, a significant revenue source to offset other congressional initiatives.[1] However, the most suitable frequency bands are all in use. Freeing up spectrum for new intensive uses, such as 5G, is difficult without substantially impacting incumbent users. Thus, there is fierce competition for spectrum resources in the United States and internationally. The 5G industry and its powerful trade associations are fully engaged in ongoing spectrum campaigns.[2]

In 2023, the White House issued a National Spectrum Strategy calling for the modernization of national spectrum policy to make the most efficient use of this vital national resource by creating a pipeline of spectrum resources to support private sector innovation while ensuring sufficient spectrum access to support federal agency missions. [3,4] The release of the Strategy coincided with the opening of the International Telecommunication Union's (ITU's) World Radiocommunication Conference (WRC) 2023 in Dubai, United Arab Emirates. During WRC-23, the United States and another 162 delegations negotiated a treaty on global spectrum use and the agenda for the next WRC, which will take place in 2027.[5]

In this highly competitive and economically driven spectrum arena, there is a slow-motion uphill battle facing some commercial, nonprofit, and governmental spectrum-dependent enterprises, including those that rely on space-based services. Some of the services under pressure include weather forecasting; climate change research; precision agriculture; wildfire monitoring; wildlife tracking and fish monitoring; search and rescue; emergency response and disaster relief; positioning, navigation, and timing; national security communications; and space traffic management.[6]

Thus, it is essential that lawmakers, regulators, and policymakers are informed on key spectrum issues and are cognizant of the significance of spectrum uses beyond the economic ambitions of commercial 5G interests—including vital services that enable the achievement of other societal goals, including U.S. national space policy goals.[7] This analysis introduces the complex world of national and international spectrum regulation and describes outstanding spectrum issues facing the U.S. space enterprise, including protection of critical spectrum allocations that empower commercial and federal satellite systems. This chapter further highlights important spectrum issues in play for the next WRC in 2027, including new spectrum allocations to support cislunar exploration. Although WRC-27 seems far in the future, preparations and disagreements between the wireless industry and space communities are already heating up.[8] Preparations of U.S.

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[*] Some wavelengths offer better characteristics for transmitting information through the atmosphere and buildings, higher throughput or data speeds, or longer reach (distance). The wireless industry is demanding additional "mid-band" spectrum as "it offers a good mixture of coverage and capacity for 5G." GSMA, 5G Mid-Band Spectrum Needs – Vision 2030 (2021), CTIA, America's Spectrum Policy: A Roadmap for Action in 2024.

[†] Congressional authority for FCC spectrum auctions expired in 2023 but is the subject of numerous congressional efforts for reinstatement (e.g., the Spectrum and National Security Act [S-4207]).

contributions relating to WRC-27 are already at issue and decisions on key U.S. proposals and positions will need to be made early during the next administration.

Regulation of Spectrum for Space Services

National Regulation: In the United States, radiocommunications are regulated pursuant to the Communications Act of 1934, as amended, which establishes a dual-agency regime of spectrum regulation, shown in Figure 1, based on whether the radio operator is the federal government.[9] Commercial radio services and all other radio services not operated by the federal government are regulated by the FCC, an independent agency created by Congress.[‡] All U.S. federal government radio services are managed by the National Telecommunications and Information Administration (NTIA), an executive branch agency located in the Department of Commerce. The NTIA's administrator, the Assistant Secretary of Commerce for Communications and Information, serves as the president's principal advisor on telecommunications policies and is responsible for "developing telecommunications policies pertaining to the Nation's economic and technological advancement and the regulation of the telecommunications industry."[10] Thus, the NTIA was a key contributor to the recent National Spectrum Strategy and is responsible for its implementation.

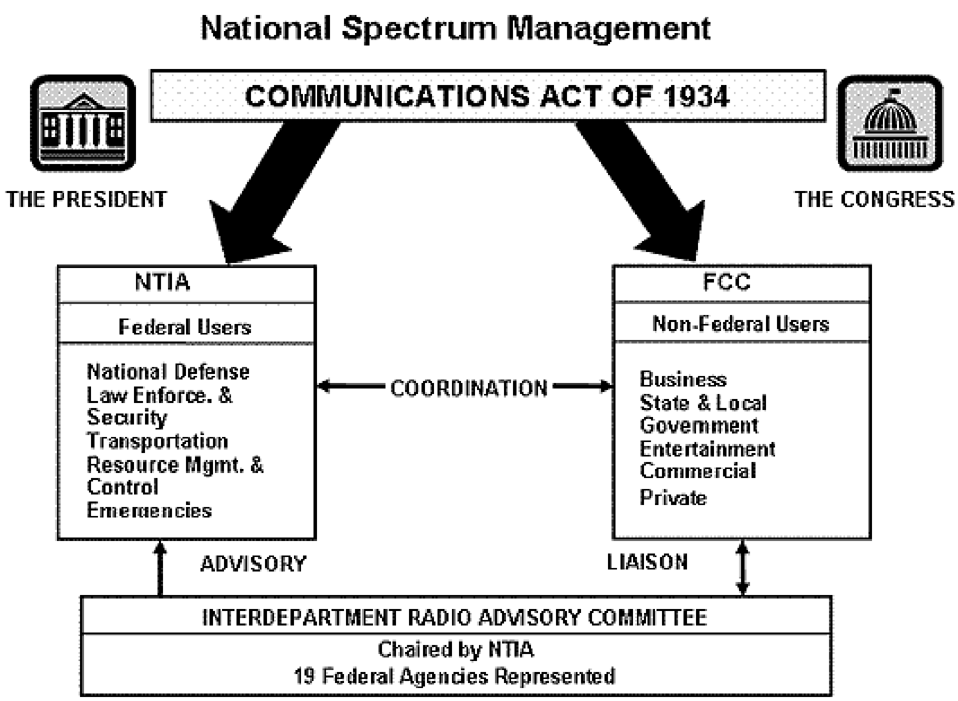

Figure 1: U.S. dual-agency spectrum regulation. *(Source: NTIA website (https://www.ntia.doc.gov/book-page/who-regulates-spectrum.)*

Structural Challenges: The dual-agency structure of U.S. spectrum regulation raises unique challenges. The NTIA is charged with serving both as the lead agency representing the interests of federal spectrum stakeholders and as the president's principal advisor on telecommunication policies. The NTIA must work carefully to ensure its actions do not compromise either of these important but possibly competing responsibilities, including when resolving spectrum issues with the independent FCC.[11]

[‡]The FCC also regulates radio use by state and local governments, including by their public safety agencies, amateur radio operators, educational institutions, and nonprofit organizations.

On the other hand, the FCC, which is charged to make decisions in the broader public interest, is viewed more as an advocate for the U.S. wireless industry that it regulates.[§] The FCC often finds that the public interest benefits afforded by awarding more spectrum for wireless services, such as 5G, outweigh the value of services provided by other spectrum uses, such as space services. These challenges notwithstanding, recent efforts to improve coordination between the NTIA and the FCC include a 2022 update to their longstanding memorandum of understanding[12] and the president's November 2023 Memorandum on Modernizing United States Spectrum Policy and Establishing a National Spectrum Strategy. This presidential memorandum establishes an interagency spectrum advisory council "to serve as the principal interagency forum for heads of agencies to advise NTIA on spectrum policy matters and to ensure that all decisions made by NTIA take into consideration the diverse missions of the federal government." [13]

National Table of Frequency Allocations: The FCC and the NTIA jointly develop the National Table of Frequency Allocations, the fundamental roadmap of spectrum use. The National Table, which tracks closely to the ITU's International Table of Frequency Allocations, indicates which radio services may assigned to operate in specific frequency bands (ranging from 9 kHz to 275 GHz).[14] The allocations are accompanied by special conditions on those operations designed to limit interference to other allocated services. The National Table also indicates whether the frequency bands are reserved exclusively for federal use, non-federal use, or shared use.[**] Based on the National Table, the FCC and the NTIA assign frequencies (and FCC issues licenses) to specific users, and thus authorize radio operations consistent with agency regulations.

In the National Table, radio services are allocated to frequency bands for either terrestrial or space services. Terrestrial services include broadcasting, fixed, and mobile services and services such as maritime, aeronautical, and radio determination (radar). Space services include satellite services, such as fixed-satellite, mobile-satellite, space research, Earth-exploration satellite, and space operations services, that may take place in Earth's orbit or in deep space. Forty-three radio services are defined by the ITU and incorporated into the U.S. regulations. The United States, as a Member State of the ITU and party to its constitution and other treaty instruments, must ensure that its radio operations do not cause harmful interference to the duly authorized operations of other Member States operating in accordance with the ITU's Radio Regulations.

Beyond National Boundaries—Signals from Space: Space services are inherently international radio systems as outer space is not subject to claims of national sovereignty.[15] In addition, radio signals from orbit are often capable of illuminating multiple national territories and may potentially cause harmful interference to radio operations in multiple nations or with other nations' satellites. From their position in orbit, satellites require assured access to spectrum resources that will be internationally recognized and protected from harmful interference throughout their mission lifetime. Associated ground network systems also require protection from harmful interference. Thus, space service allocations and the regulations for their use need to be harmonized. This harmonization of spectrum regulations around the world takes place through the ITU.

International Regulation: The ITU, a specialized agency of the United Nations (UN), is devoted to extending the benefits of new telecommunications technologies to all the world's inhabitants.[16] Based in Geneva, Switzerland, the ITU has a nearly universal membership with 194 Member States. Although each Member State has equal voice with one vote per

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[§]The FCC has long been characterized as having a revolving door with industry. (Jacob Plaza, "Unmasking FCC's Revolving Door with Telecom Giants. Revolving Door Project," August 1, 2024; Jon Brodkin, "FCC's Revolving Door: Former Chairman Leads Charge against Title II," ars Technica, 2015.) CTIA president and CEO, Meredith Atwell Baker, is a former FCC commissioner (2009–2011). Former FCC chairman Tom Wheeler (2013–2017) was CTIA president and CEO (1992–2004). In 2023, the FCC chairwoman's chief of staff became CTIA senior vice president for Spectrum and then General Counsel. (CTIA Press Release, "Tom Power to Retire; Umair Javed Named New CTIA General Counsel," July 24, 2024.)

[**]5.5 percent of spectrum below 30 GHz is reserved exclusively for federal government use and 1.4 percent exclusively for commercial use. Thus, 93.1 percent of spectrum in this range is shared among all commercial users. (NTIA website; https://www.ntia.doc.gov/book-page/who-regulates-spectrum accessed August 6, 2024.)

country, most decisions are reached by consensus. The ITU is largely funded by Member State contributions with the United States being the top contributor at 35 units or $12.8 million annually. The ITU's secretary-general is Doreen Bogdan-Martin, a U.S. citizen, who is currently serving her first four-year term in office.[††] The United States derives great benefit from its participation and investment in the Union, which has been one of the few UN bodies to consistently produce new agreements as technology and economic factors change.[17]

The International Radio Regulations: The ITU's Radio Regulations are a treaty document that provides the global framework for international management of spectrum and associated orbital resources. Established in 1906, this 2,000-page document includes the International Table of Frequency Allocations and the accompanying technical and operational rules to enable the most efficient use of spectrum while avoiding harmful interference among radio services operating within these allocations. The ITU's Radio Regulations also provide a registration process for obtaining international recognition for specific radio operations operating from specified locations, including orbital positions. This regulatory status is of particular importance for satellite systems whose stations are designed for long-term missions operating at very distant locations from space.

The ITU's Radio Regulations are adopted and updated by the WRCs, which the ITU convenes approximately every four years. The regular cadence of WRCs affords a means of keeping up with the rapid pace of technological change, including the development of new space systems. Following each WRC, Member States implement the changes to the ITU's Radio Regulations into their domestic telecommunication regulations.

WRCs: The marquee topic of the past several WRCs has been the award of additional spectrum resources to support growth of advanced mobile wireless technologies, such as 5G. The most recent conference, WRC-23, proved to be markedly different. Notably, most attention and excitement focused on the growth and innovation of space services, including issues related to the implementation of very large low Earth orbit (LEO) constellations, spectrum to support upcoming missions to the Moon, and consideration of additional spectrum to support satellite services, including those in the mobile-satellite service, which are developing capabilities to provide services directly to devices, such as personal cellphones or Internet-of-Things (IoT) terminals.[18] Even the agenda that WRC-23 developed for the next conference in 2027 is largely dedicated to space-related topics.

After four years of preparation and four weeks of exhaustive negotiations, WRC-23 concluded with Final Acts comprising 629 pages, including changes to the ITU's Radio Regulations to:

- Enable use of LEO constellations to deliver services to ships and aircraft.
- Allow multi-orbit operations between geostationary orbit and LEO in certain frequency bands.
- Improve due diligence measures for large LEO constellations, including adopting orbital tolerances.
- Identify new spectrum resources for satellite and wireless services.

Although these actions may seem like routine ITU accomplishments, they are nevertheless notable as they embody new provisions of space law responding to the need to develop emerging space missions and technologies to deliver benefits to the world. The ITU's ability to respond to the rapid rise of new technologies and applications has, to some degree, addressed concerns about its ability to keep up with an increasingly dynamic telecommunications sector. Indeed, the ITU's historic success in its incremental, process-driven, consensus-based approach to treaty-making stands as a model of space-law creation for this century.[19]

[††]The ITU's constitution limits the secretary-general to two 4-year terms in office. The United States is expected to run Bogdan-Martin for reelection in late 2026 at the ITU's next Plenipotentiary Conference.

Preparations for WRC-27 are already well underway. The United States is preparing its proposals through parallel commercial and federal processes: the FCC's WRC Advisory Committee for WRC-27 (WAC)[20] and a federal process to advise the NTIA through the Interdepartment Radio Advisory Committee (IRAC) and its Radio Conference Subcommittee.[‡‡] The draft proposals generated by these processes are "reconciled" by the FCC and the NTIA. The State Department has final authority over the U.S. proposals submitted offshore. The United States typically shares its proposals with its regional spectrum organization, the Inter-American Telecommunication Commission (CITEL), part of the Organization of American States (OAS).[21] The United States negotiates with fellow CITEL Member States to develop Inter-American Proposals, thus achieving regional consensus on joint proposals, which are then shared with other regional groups and ultimately with the world as WRC proposals.

Key Topics in Space Spectrum

Allocations and Harmonization: Space services have long benefited from harmonized spectrum allocations in the ITU's Radio Regulations as these services were foreseen to be inherently international, requiring major investments and long mission cycles, and vital to fulfilling the Union's mandate of extending universal connectivity. Global and regional satellite allocations are found in several frequency ranges, including the L-, S-, X-, Ku-, Ka-, and Q-/V-bands. As shown in Figure 2, the ITU Table of Frequency Allocations divides the world into three Radio Regions. Some allocations, such as Kuband downlinks, are allocated on a regional, rather than global basis. These international satellite allocations are largely reflected in the National Table of Frequency Allocations. Even in cases where the FCC has chosen to deviate from an international satellite allocation to make a domestic terrestrial allocation, the United States remains nevertheless tied by its treaty obligations to protect foreign satellite services operating within the international allocation from harmful interference due to the nonconforming domestic spectrum use.[22]

Over the years, these international space allocations have proven extremely attractive to commercial mobile equipment manufacturers aiming for global markets and economies of scale and to mobile service operators seeking to increase capacity to enable growth and international roaming. Additional spectrum resources enable increased capacity and revenues. The idea of tapping into these space allocations is also enormously popular with regulators as a means of extending connectivity to local citizens and businesses, helping to build local economies, and providing government revenues through tax and auction proceeds.[§§] Thus, many WRC cycles since the late 1990s have been characterized by the relentless pursuit of satellite allocations by terrestrial mobile proponents, in particular for enabling emerging "international mobile telecommunications" (IMT) technologies, the ITU parlance for 5G and its future iterations.[***]

These same international spectrum campaigns also take place in the United States. These debates occur not only in the preparation for ITU meetings, but in the advocacy of industry and trade associations; in Congress (highlighted in various "spectrum pipeline" bills); in FCC rulemakings and applications before the spectrum regulators; and at the White House, including the National Spectrum Strategy.

Spectrum Competition—Terrestrial versus Satellite Services: One of the most difficult negotiations at WRC-23 involved new spectrum resources to support IMT/5G. WRC-23 identified a modicum of additional spectrum for IMT

[‡‡]IRAC was established in 1922 "to assist the Assistant Secretary of Commerce in assigning frequencies to U.S. Government radio stations and in developing and executing policies, programs, procedures, and technical criteria pertaining to the allocation, management, and use of the electromagnetic spectrum." NTIA, Manual of Regulations and Procedures for Federal Radio Frequency Management (2023). Its membership is available at: https://www.ntia.gov/page/interdepartment-radio-advisory-committee-irac.

[§§]A developing country may see less tangible benefit in licensing a foreign satellite operator with very little local presence or other connection with the nation or community versus a wireless company building local cell towers and offering coverage on the ground in that country.

[***]Due to its attractive physical characteristics, the C-band (3,400 to 7,025 GHz) has been the hardest fought-over allocation during this time period, and the terrestrial industry has made incremental progress on obtaining access to this frequency range over the course of multiple conferences. It will continue this campaign at WRC-27.

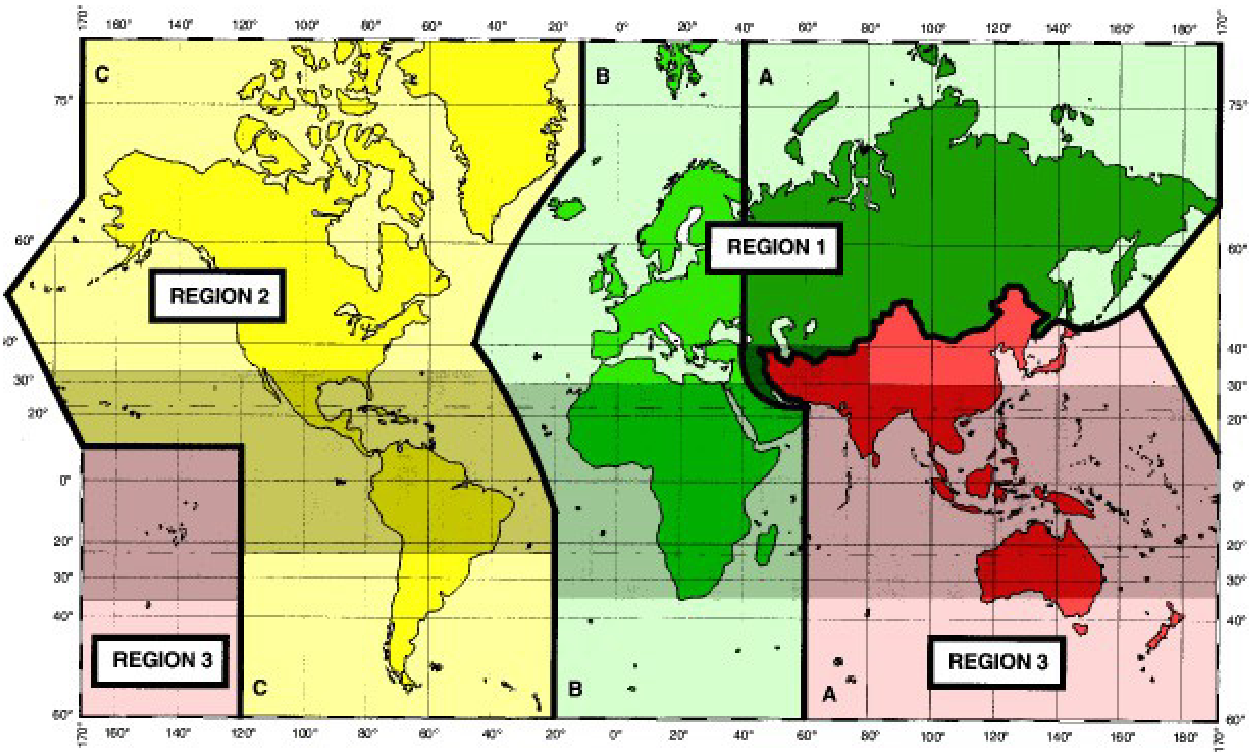

Figure 2: ITU Radio Regions: The ITU's Radio Regulations divide the world into three Radio Regions for its Table of Frequency Allocations (No. 5.2). *Some satellite allocations are global, while some differ by region (for example, Ku-band downlink allocations). This arrangement is also reflected in the National Table of Frequency Allocations. NTIA, Manual of Regulations for Federal Radio Frequency Management, 2023.*

limited to some countries and regions, but no broad swaths of frequency bands across the planet.[†††] The conference turned down a popular hard-fought proposal to identify the 10 to 10.5 GHz band for IMT. This band uniquely supports synthetic aperture radar (SAR) systems that provide high-resolution satellite images essential to early-warning networks and supporting a broad range of environmental monitoring, illegal fishing, sustainable agriculture, climate, and disaster management. These systems operate in the Earth Exploration Satellite Service (EESS) recently allocated by WRC-15.[23] This negotiation reflected the oft-repeated theme of whether to protect largely noncommercial spectrum uses that are of social or scientific value versus those that drive immense commercial value. At WRC-23, Aarti Holla-Maini, the new director of the UN Office of Outer Space Affairs (UNOOSA), addressed the Plenary, supported by the World Meteorological Organization (both observers to the conference), to plead for protection of space allocations that are essential to humanity, including 10 to 10.5 GHz.[24] The effort proved successful in terms of protecting SAR spectrum, at least for the time being.

The WRC-27 agenda includes yet another item to consider, which is additional spectrum for possible IMT/5G identification. Initial discussions considered studying the entire range of spectrum between 7 and 24 GHz.[25] The inclusion of such a broad range of frequency bands would have required a tremendous effort to be able to complete the necessary

[†††]WRC-23 identified portions of the C-band: 3,300 to 3,400 MHz, 3,600 to 3,800 MHz, 4,800 to 4,990 MHz, and 6,425 to 7,125 MHz for IMT limited to specific countries and regions. ITU, WRC revises the ITU Radio Regulations to support spectrum sharing and technological innovation, December 15, 2023), https://www.itu.int/en/mediacentre/Pages/PR-2023-12-15-WRC23-closing-ceremony.aspx.

sharing and compatibility studies for all the incumbent services in these allocations. Ultimately, WRC-23 decided to limit the scope of the study for WRC-27 to three bands: 4,400 to 4,800 MHz, 7,125 to 8,400 MHz (or parts thereof), and 14.8 to 15.35 GHz. The inclusion of the band known as the X-band (7,125 to 8,400 MHz) is a particular concern to the space industry and others who rely on the services provided in this band.[‡‡‡] Notably, in the United States, X-band spectrum was already targeted for study for possible repurposing for 5G.

Protection of a Quiet Neighborhood—X-Band Space Services: As illustrated in Figure 3, the X-band (7,125 to 8,400 MHz) is home to a diverse array of space services. It is a quiet spectrum neighborhood designed to allow sensitive systems to share with other space services and terrestrial fixed services on the ground under specified conditions. The X-band includes communications satellites in the Fixed-Satellite Service (FSS), Mobile-Satellite Service (MSS), and Maritime-Mobile-Satellite Service, and science services such Meteorological-Satellite Service (MetSat), Space Research Service (SRS) (including some designated for deep space), Earth Exploration Satellite Service (EESS), and Space

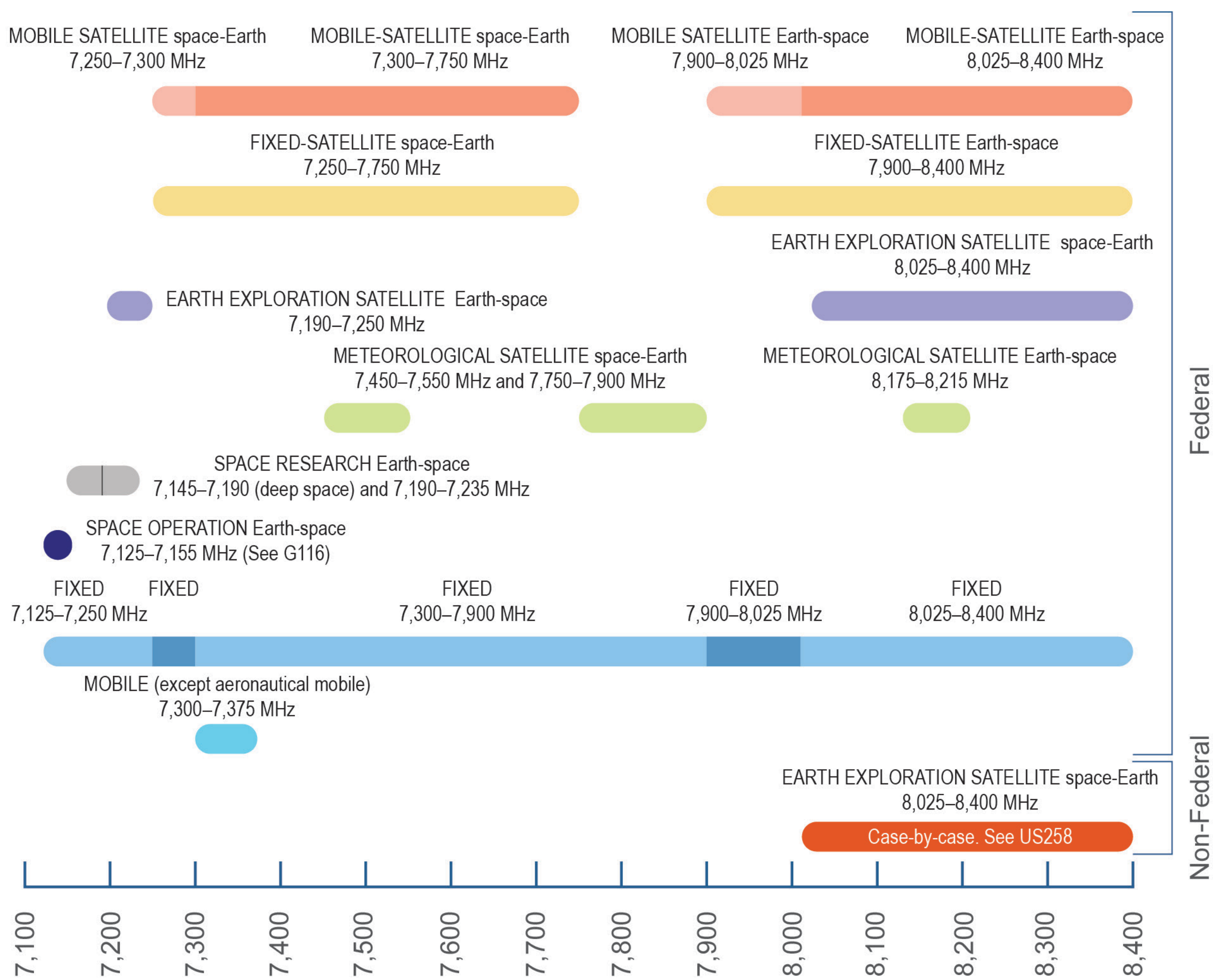

Figure 3: Frequency allocations from 7,125 to 8,400 MHz. *An illustration of radio services currently allocated to the X-band (7,125 to 8,400 MHz) in the United States. Radio services shown in uppercase are primary services and those in lowercase are secondary services that must protect operations in the primary services from harmful interference.*

‡‡‡There are also existing secondary allocations in the 14.8 to 15.35 GHz band to the SRS and, via footnote, to the EESS.

Operation Service (SOS) (in the National Table). The X-band has long supported U.S. military satellite systems, NASA's deep space program and current lunar operations plans, management of civil weather satellites, and a growing array of commercial and governmental remote-sensing satellite systems operating in the EESS. It is no surprise that the proposed addition of powerful terrestrial IMT/5G has raised serious concerns in these user communities.

Commercial Imaging Satellites Rely on X-Band: The commercial remote-sensing industry is taking off and growing. Approximately 1,200 remote-sensing satellites are now in orbit, which represents a sevenfold increase over the past five years.[26] These satellites offer an increasing diversity of sensor types delivering imagery solutions, including multispectral, hyperspectral, and radio frequency mapping. These satellites rely on X-band spectrum to support their imaging activities. The commercial remote-sensing industry provides vital support to U.S. military and intelligence operations with "imagery, analytics, and other data that enable enhanced global awareness and transparency, including most recently in Ukraine." [27] These capabilities also support scientific, civil, and commercial applications, such as gathering scientific data to support research, climate monitoring, environmental responsibility reporting, locating underwater oil and gas leaks, providing agricultural data, monitoring cargo and shipping lanes, and other supply chain activities.

National X-Band Repurposing Efforts. It is not only the ITU that is studying the X-band for possible repurposing for auction to 5G operators. Senate Bill (S-4207), the Spectrum and National Security Act, currently awaiting markup, would direct the NTIA and other agencies to perform a feasibility assessment of whether spectrum in X-band can be made available for other uses.[28] The National Spectrum Strategy also tees up the X-band, among four other frequency bands, for detailed study for possible repurposing to ensure that spectrum resources are made available to support private sector innovation. The Strategy, however, observes that the X-band's current "variety of mission-critical Federal operations will make it challenging to repurpose portions of the band while protecting incumbent users from harmful interference."[29] As part of the implementation of the Strategy, the NTIA launched a public multistakeholder process on the Strategy's spectrum studies in August 2024.[30]

The Strategy further calls for long-term strategic spectrum planning to include development of an evidence-based national spectrum decisionmaking methodology that will better reflect the public interest. This methodology will include assessing the societal value of spectrum based on the calculation of direct and indirect benefits of different uses to the nation. Although such a methodology may not be developed in time for these particular repurposing studies, national decisionmakers should act to ensure that the value of X-band services is broadly considered and fairly evaluated, including oversight of decisions on U.S. proposals to the ITU.

Other Spectrum Issues of Note. Eighty percent of the WRC-27 agenda items[§§§] addresses space services and technologies. Many of these agenda items are already being fought by the wireless community and their supporters in WRC preparatory activities. Included in these agenda items are:

- Expanded spectrum allocations (including possible expansion of the SRS [space to space]) to support future development of communications on the lunar surface and between lunar orbit and the lunar surface, as envisioned by NASA in Figure 4 (WRC-27 agenda item 1.15)
- Consideration of allowing space-to-space links between geostationary and non-geostationary satellites in additional frequency bands to enable multiorbit services (WRC-27 agenda item 1.11)
- Additional spectrum allocations to support satellite services: FSS (geostationary and nongeostationary), MSS (including direct to device), and EESS (multiple agenda items)

[§§§]The WRC-27 agenda is contained in Resolution 813 (WRC-23) and can be found at: https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A0000100036PDFE.pdf.

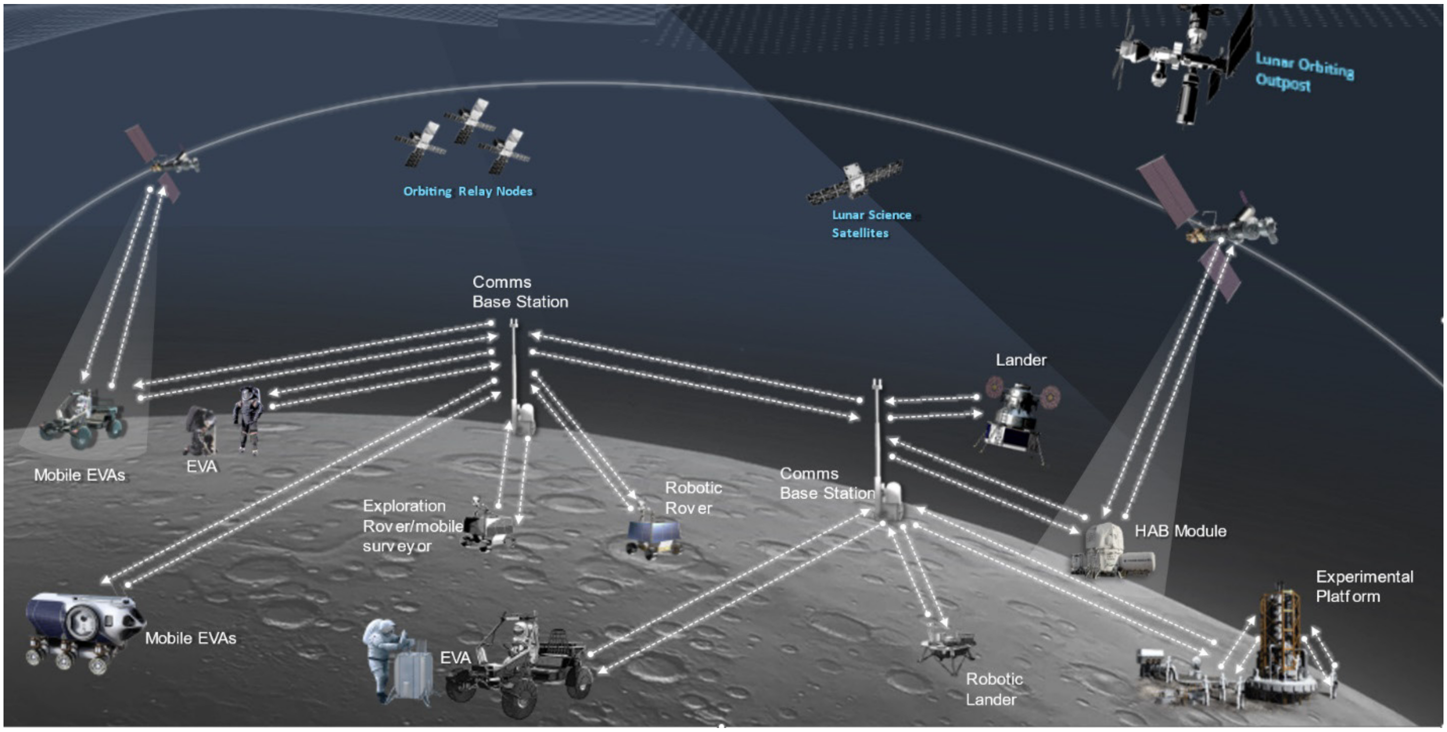

Figure 4: A NASA illustration of the concept of operations for communications in the vicinity of the Moon, including its surface and with lunar orbiting satellites. *These links may require new spectrum allocations. This information was submitted by the United States to the ITU-R Working Party 7B for the preparation of studies to support WRC-27 agenda item 1.15.*[31]

- Regulations to support extension of FSS to Earth Stations in Motion (maritime and aeronautical) in the Q-/V-band (WRC-27 agenda item 1.1)
- Regulatory provisions for space weather receive-only sensors and their regulatory protection (WRC-27 agenda item 1.17)
- Improvements to the satellite coordination, planning, and due diligence procedures for large constellations, and other regulatory/procedural matters (agenda item 7)

There were many more proposals for the WRC-27 agenda than could be accommodated due to limited resources available to conduct and complete the required studies. Although many of these items were included in the proposed preliminary agenda for WRC-31 (which will be revisited by WRC-27), this demonstrates not only the growing innovation and demands for spectrum and regulatory changes needed to bring in new telecommunications services (including space services), but the increasing numbers of engaged Member States and their regional organizations who are bringing their own proposals into the mix.

Conclusion

Spectrum may be invisible, but assured access to spectrum is mission critical to satellites and all other services delivered from space. In addition to commercial broadband connectivity, these services uniquely enable a vast and growing array of essential capabilities for national security, science, public safety, agriculture, resource management, and commerce, yet spectrum rights necessary to deliver these services are at risk. Thus it is essential that lawmakers, regulators, and policymakers become aware, informed, and engaged on spectrum issues, including oversight of the ongoing regulatory decisionmaking processes to ensure that societal goals are understood and fairly balanced and considered, both in national processes and international processes leading up to WRC-27 and beyond. Decisions on key U.S. proposals and positions for WRC-27 will need to be made early in the next administration.

At the same time, mission planners and operators of space systems should fully recognize the value of spectrum and be vigilant about protecting the bands that they need to perform their essential missions. They must educate and inform their government representatives and regulators of their spectrum needs and the benefits their services provide to help ward off potential reallocation of this vital, albeit invisible, natural resource.

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