

Before the
National Telecommunications and Information Administration
Request for comments: **NTIA National Spectrum Strategy RFC**

A CALL FOR TT&C SPECTRUM ALLOCATIONS

I. Introduction

The world has recently experienced an unprecedented growth in the funding and buildout of satellite networks offering services like imaging, broadband, direct-to-device communications and in-space assembly and manufacturing (ISAM). The proliferation of satellite networks has led to an increasing demand for spectrum allocation for Telemetry, Tracking, and Command (TT&C) operations, which are essential for the operational support of all satellites, regardless of their payload or application. The Olin Satellite, Spectrum Technology and Policy (OSSTP) Group has recently focused its attention on the need for dedicated TT&C spectrum allocations, for non-Federal operators in the U.S.

The lack of identifiable spectrum allocations for TT&C poses a major challenge for commercial companies who design their system for their planned mission but realize there are no obvious bands if they'd like to connect their telemetry and command channels to earth stations in the United States. These entities have no choice but to move their stations and operations overseas. This is an issue of paramount importance to our nation that relies on these systems daily, posing a national security threat to the United States.

The satellite sector is not the only sector that has faced spectrum allocation challenges. The "Launch Communications Act," introduced by Representative Soto in the bipartisan Communication and Technology Subcommittee of the U.S. House Committee of Energy and Commerce addresses a similar problem in the launch sector.¹ This proposed legislation addressed the inefficient licensing process and lack of spectrum allocation for launch vehicle TT&C operations by creating dedicated frequency bands for this purpose.

¹ "H.R.682 – 118th Congress (2023-2024): Launch Communications Act." Congress.gov, Library of Congress, 31 January 2023, <https://www.congress.gov/bill/118th-congress/house-bill/682>.

Following this legislative step of the “Launch Communication Act,” it is crucial for the NTIA and legislators to consider allocations in parts of the UHF, S- and X-band frequencies for space operations. These three frequency bands are the backbone of TT&C operations internationally, with each having unique advantages.

II. TT&C Frequency Bands

The UHF band presents an attractive option for scientific small satellites and university missions due to its affordable hardware costs. However, the current frequency allocations in the UHF band in the 401-402 MHz and 450 MHz, poses a challenge for operators, as it requires two separate antenna systems for uplink and downlink communication. Identifying two neighboring frequency ranges would enable the academic and science communities of the United States to continue growing and make space-based research more accessible.

The S-band is the most widely used frequency for TT&C operations globally. In the United States, there are two available frequencies assigned for space operations, 2025 - 2110 MHz for uplink communications and 2200 - 2290 MHz for downlink communications. However, both of these frequencies are dedicated in the United States for federal use. Footnote US347 allows the use of the uplink frequency from non-federal networks on a case-by-case basis as long as they do not cause harmful interference to federal networks.² The footnote though applies only to systems in the EESS and Space Research service classes, making S-band not an option for satellites in other service classes.

The X-band frequency range is an alternative to the crowded S-band frequency range for operators aiming to achieve higher TT&C data rates. The federal nature of X-band allocations present similar challenges as with S-band and the increased number of federal and non-federal satellites can significantly increase the coordination process. X-band frequencies also have provisions restricting use to EESS and Space Research service classes, again making it infeasible for satellites in other service classes.

² United States. Federal Communications Commission. *FCC Online Table of Frequency Allocations*. GPO, 2022.

It is important to note that satellites for the emerging technologies of in-orbit servicing and in-space assembly and manufacturing are disproportionately affected by the lack of space operations allocations as they often don't fit under either of the service classes of space research or EESS.

Table 1 provides a summary of spectrum allocations in the U.S. in the UHF, L-, S-, C- and X-band that could be used for TT&C operations based on the FCC table of allocations. The table is divided into two columns for uplink and downlink allocation and follows the FCC format of designating primary allocations with capital letters and secondary with lowercase letters.

Table 1: Summary of Spectrum Allocations for Potential TT&C Use

Frequency	Uplink (MHz)	Downlink (MHz)
UHF	399.9 - 400.05 MOBILE SATELLITE RADIONAVIGATION SATELLITE 401 - 403 Federal EARTH EXPLORATION SATELLITE SERVICE (EESS) Federal METEOROLOGICAL SATELLITE Meteorological Satellite Earth Exploration Satellite Service 449.75 - 450.25 Space Operations (Subject to coordination) Space Research (Subject to coordination)	400.15 - 401.00 Federal METEOROLOGICAL SATELLITE MOBILE SATELLITE SPACE RESEARCH space operations 401 - 402 SPACE OPERATIONS 460 - 470 Meteorological Satellite Earth Exploration Satellite Service
L-band	No Allocations for TT&C	1164 - 1215 RADIONAVIGATION SATELLITE 1215 - 1240 Federal RADIONAVIGATION SATELLITE (subject to coordination)
S-band	2025 - 2110 Federal SPACE OPERATIONS Federal EARTH EXPLORATION	2180-2200 MOBILE-SATELLITE

	SATELLITE SERVICE (non-federal on a case-by-case basis) Federal SPACE RESEARCH (non-federal on a case-by-case basis) 2110 - 2120 Federal SPACE RESEARCH (NASA deep space network)	2200 - 2290 Federal SPACE OPERATIONS Federal EARTH EXPLORATION SATELLITE SERVICE Federal SPACE RESEARCH 2290 - 2300 SPACE RESEARCH (deep space)
C-band	5000 - 5010 RADIONAVIGATION SATELLITE	5010 - 5030 RADIONAVIGATION SATELLITE
X-band	7145 - 7190 Federal SPACE RESEARCH (deep space) non-Federal space research (deep space) 7190 - 7235 Federal EARTH EXPLORATION SATELLITE SERVICE TT&C Federal SPACE RESEARCH 7235 - 7250 Federal EARTH EXPLORATION SATELLITE SERVICE TT&C	8025 - 8400 Federal EARTH EXPLORATION SATELLITE SERVICE (non-federal on a case-by-case) (non-Federal authorizations are subject to a case-by-case electromagnetic compatibility analysis) 8400 - 8450 Federal SPACE RESEARCH (deep space) Space research (deep space) 8450 - 8500 SPACE RESEARCH

III. Conclusion

The lack of TT&C allocation for non-federal satellite operators poses a challenge to the growing satellite commercial sector with economical, technologies and national security consequences for the United States. Streamlining the UHF, S-band and X-band frequencies for TT&C frequency operations and repurposing some of the existing allocations will cater to all the stakeholders:

- i. Commercial companies will be able to keep their operations in the country and benefit from a straightforward licensing process

ii. The federal government will benefit from avoiding the inefficient and complex process of coordinating with each satellite operator, while also safeguarding the nation's access to satellites that provide essential daily services.

iii. Lastly, alignment of TT&C allocations with the rest of the world can lead to standardization in the communication hardware, benefiting U.S. manufacturers and lowering the costs to satellite operators.

Respectfully Submitted,

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