

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of)	
)	
Allocation of Spectrum for Non-Federal Space Launch Operations)	ET Docket No. 13-115
)	
Amendment of Part 2 of the Commission’s Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations; and)	RM-11341
)	
Federal Space Station Use of the 399.9-400.05 MHz Band)	

SECOND REPORT AND ORDER AND SECOND FURTHER NOTICE OF PROPOSED RULEMAKING

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By the Commission: Chairwoman Rosenworcel and Commissioner Starks issuing separate statements.

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I. INTRODUCTION

1. The United States has a long and proud history of space exploration and development. The Federal government took the lead, with the National Aeronautics and Space Administration (NASA) and other Federal agencies launching both manned and unmanned spaceflights to conduct various missions. However, the private sector now plays an increasingly vital role in these efforts, serving both commercial and government interests. To facilitate growth of the commercial space industry, the Commission has worked diligently to ensure commercial space launch companies have access to the necessary radio spectrum to communicate reliably with their launch vehicles before, during, and after takeoff. Yet there is still room for improvement, to enhance and streamline access to the necessary spectrum for commercial space launches.

2. Today, we take further steps towards establishing a spectrum allocation and licensing framework that will provide regulatory certainty and improved efficiency for commercial space launch operations. These steps will promote continued innovation and investment in the United States commercial space launch industry. Specifically, we adopt a new secondary allocation in the 2025-2110 MHz band for non-Federal space operations, remove the restriction on use of the 2200-2290 MHz secondary non-Federal space operation allocation to four specific sub-channels to make the entire 2200-2290 MHz band available, add a non-Federal secondary mobile allocation to the 2200-2290 MHz band, and adopt licensing and technical rules for space launch operations. Additionally, we amend the allocation for the 399.9-400.05 MHz band to permit the deployment of Federal space stations. We also seek further comment on whether to adopt licensing and operating rules for payload activities as well as on modifying our existing 2360-2395 MHz space launch rules and on possible additional licensing provisions for sub-orbital launch vehicles. These actions will encourage the continued development of a robust U.S. commercial space sector to the benefit of national interests in security, prosperity, and science.

II. BACKGROUND

3. Commercial space launch entities continue to proliferate and are increasingly involved in all aspects of U.S.-based space activities, including transportation of cargo and people into space, orbital launches to place satellites into space, and suborbital launches. Prior to 2017, the Federal Aviation Administration (FAA) had never licensed more than 20 launch and reentry operations within a given year, yet there were 74 such operations licensed in 2022 and there are projected to be over 100 launch and

reentry operations per year from 2024 onward.¹ Many of these launches will continue to utilize Federal spaceports, but commercial entities have also established non-Federal spaceports for the exclusive use of one launch provider or for any commercial launch licensed by the FAA.²

4. Five frequency bands have commonly been used for communications with and tracking of space launch vehicles: 420-430 MHz, 2025-2110 MHz, 2200-2290 MHz, 2360-2395 MHz, and 5650-5925 MHz.³ The 420-430 MHz band has been used for sending flight termination commands to the launch vehicle, if necessary, during the launch. The flight termination signal link must be extremely reliable to avoid endangering lives from a launch vehicle that has gone astray. The 2025-2110 MHz band has been used during some space launches to send control signals to guide the launch vehicle boosters to a controlled landing so that they may be reused. The 2200-2290 MHz band has been used to send telemetry data from the launch vehicle to the controllers on the ground. Telemetry is diagnostic information, transmitted from the launch vehicle to ground controller stations during the flight, which allows the ground controller station to track the performance of the launch vehicle. Three frequencies in the 2360-2395 MHz band are available for telemetering and associated telecommand operations of expendable and reusable launch vehicles.⁴ The 5650-5925 MHz band has been used to support launch vehicle radar tracking. Oftentimes, a transponder is placed on the launch vehicle that transmits a signal in this band in response to the radar tracking signal to allow more accurate tracking of the launch vehicle.

5. An allocation indicates an entry in the Table of Frequency Allocations⁵ of a given frequency band for the purpose of its use by one or more terrestrial or space communications services under certain conditions.⁶ Spectrum allocations in the U.S. Table may be established for Federal use, non-Federal use, or shared Federal/non-Federal use, and can be either primary or secondary. Stations of a service with a secondary allocation are entitled to protection from stations operating without an allocation but may not cause harmful interference to, and must accept interference from, stations of a primary service.⁷

6. Because several of the frequency bands used to support commercial space launches do not have provisions in the Table of Allocations for non-Federal access to the allocations, the Commission cannot license commercial entities to use these bands on an interference-protected basis during space launches.⁸ Instead, the Commission grants space launch providers special temporary authority (STA)

¹ See Federal Aviation Administration, *Licenses, Permits, and Approvals* (last visited July 28, 2023), <https://www.faa.gov/space/licenses>.

² See Federal Aviation Administration, *Active Licenses*, https://www.faa.gov/data_research/commercial_space_data/licenses/ (last visited July 28, 2023); Federal Aviation Administration, *U.S. Spaceports* (June 2020), https://www.faa.gov/space/additional_information/faq/media/Spaceport_Map_June_2020.pdf.

³ *Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations*, ET Docket No. 13-115, Notice of Proposed Rulemaking and Notice of Inquiry, 28 FCC Rcd 6698, 6727-28, 6730, paras. 76, 79, 85 (2013) (*NPRM*). Launch vehicles, commonly known as rockets, are used for delivering payloads, such as satellites and spacecraft, into space. The Commission's rules define spacecraft as "a man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere." 47 CFR § 2.1.

⁴ 47 CFR § 2.106 footnote US276; 47 CFR § 87.303(d)(1).

⁵ The Table of Frequency Allocations comprises the International Table and the United States Table of Frequency Allocations (U.S. Table). The International Table is described in 47 CFR § 2.104 and the U.S. Table is described in 47 CFR § 2.105.

⁶ See, e.g., ITU Radio Regulations, Vol. 1, No. 1.16 (2020); 47 CFR § 2.1.

⁷ 47 CFR § 2.105(c)(2).

⁸ NTIA regulates the use of spectrum with Federal allocations and the Commission regulates use of spectrum with non-Federal allocations. Generally, if there is no non-Federal radio service allocation for a frequency band, non-

(continued....)

under the Part 5 experimental licensing rules to use these frequencies.⁹ These STAs allow the space launch providers to use the spectrum allocated for Federal use on a non-interference basis. To enable successful coexistence during launches, the Commission coordinates use of the spectrum with the National Telecommunications and Information Administration (NTIA), which consults with affected Federal agencies. These experimental STAs are valid for a single launch and expire after six months. The STAs have included pre-launch communications operations and communications with the space launch vehicle and payload during orbital and reentry phases of the operations. These STAs are issued with the condition that any future launches by the grantees would be considered on a case-by-case basis and that there is no expectation that experimental STAs for future launches would be approved.

7. Seeking to improve this situation by providing greater clarity and predictability for commercial space launch providers, the Commission began this proceeding in 2013 with a Notice of Proposed Rulemaking (*NPRM*) and Notice of Inquiry (*NOI*).¹⁰ The *NPRM* proposed to provide a primary allocation of spectrum in the 420-430 MHz, 2200-2290 MHz, and 5650-5925 MHz bands for use during commercial space launches.¹¹ For the 420-430 MHz band, the *NPRM* sought comment on adding a primary non-Federal Aeronautical Mobile allocation to the U.S. Table to permit commercial entities to transmit self-destruct signals (*i.e.*, flight termination signals) from ground controllers to launch vehicles, when necessary.¹² For the 2200-2290 MHz band, the *NPRM* sought comment on alternative proposals to either add a primary non-Federal Space Operation allocation to the U.S. Table or add this allocation as a footnote to the U.S. Table.¹³ In both of these proposals, the allocation would restrict use of the band to the 2207-2219 MHz, 2270.5-2274.5 MHz, and 2285-2290 MHz portions of the band, and use of the band would be limited to channels with bandwidth of less than 5 MHz.¹⁴ For the 5650-5925 MHz band, the *NPRM* sought comment on alternative proposals to either add a primary Non-Federal Radiolocation allocation to the U.S. Table or add this allocation as a footnote to the U.S. Table.¹⁵ In both of these proposals, the allocation would restrict use of the band to transmission of radar signals to track launch vehicles.¹⁶

8. The *NPRM* also addressed a 2012 NTIA request to change a footnote in the U.S. Table to enable Federal space stations to operate in the 399.9-400.05 MHz Mobile Satellite Service (MSS) band.¹⁷ The footnote restricts Federal earth stations in the band to communicating only with non-Federal space stations. According to NTIA, removing this restriction will allow some applications to be shifted from

Federal stations may not operate in that band. However, the Commission may authorize non-Federal users to use Federal frequencies on a non-interference basis in bands with only Federal allocations after coordination with NTIA. *See* 47 CFR § 2.102(c).

⁹ 47 U.S.C. §§ 301, 303, 307, 308, 309.

¹⁰ *Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations*, ET Docket No. 13-115, Notice of Proposed Rulemaking and Notice of Inquiry, 28 FCC Rcd 6698 (2013) (*NPRM*).

¹¹ *NPRM*, 28 FCC Rcd at 6727-31, paras. 76-87 (2013).

¹² *NPRM*, 28 FCC Rcd at 6727-28, para. 78.

¹³ *NPRM*, 28 FCC Rcd at 6728, para. 79. The Space Operation Service is a radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry, and space telecommand. 47 CFR § 2.1.

¹⁴ *NPRM*, 28 FCC Rcd at 6728, para. 79.

¹⁵ *NPRM*, 28 FCC Rcd at 6731, para. 87.

¹⁶ *Id.*

¹⁷ *See* Letter from Karl B. Nebbia, Associate Administrator, Office of Spectrum Management, NTIA, U.S. Department of Commerce, to Julius P. Knapp, Chief, Office of Engineering and Technology, July 10, 2012, ET Docket 13-115 (*NTIA US319 Letter*).

the Argos satellite system operated by the National Oceanic and Atmospheric Administration (NOAA) to a new satellite network in the 399.9-400.05 MHz band.¹⁸

9. The *NOI* sought comment broadly on the future spectrum needs of the commercial space sector.¹⁹ The Commission received fifteen comments and four reply comments in response to the *NPRM* and *NOI*.²⁰

10. The Commission's next step in this proceeding was in 2021, when it issued a Report and Order (*R&O*) and Further Notice of Proposed Rulemaking (*FNPRM*).²¹ The *R&O* adopted a non-Federal allocation for the 2200-2290 MHz band for use during commercial space launches.²² As advised by NTIA, the allocation was made secondary rather than primary.²³ The allocation was added as a footnote to the U.S. Table, US96, that limits use of the allocation to pre-launch testing and space launch operations, requires coordination with NTIA prior to each launch, and limits non-Federal use to the 2208.5-2213.5 MHz, 2212.5-2217.5 MHz, 2270-2275 MHz, and 2285-2290 MHz portions of the 2200-2290 MHz band.²⁴ Use of the allocation is not restricted to Federal launch ranges.²⁵

11. The *FNPRM* sought comment on a number of proposals to clarify and enhance non-Federal access to the spectrum necessary for commercial space launches. The *FNPRM*:

- sought comment on the definition of space launch operations;²⁶
- sought comment to refresh the record on the allocations for the 420-430 MHz and 5650-5925 MHz bands that were proposed in the *NPRM*, given that the apparent need for access to these bands has diminished since the *NPRM* was issued in 2013;²⁷
- sought comment on whether to add a co-primary non-Federal space operation (Earth-to-space) allocation for the 2025-2110 MHz band to the U.S. Table without any restriction on where licensed launches may occur;²⁸
- sought comment on whether to enhance the allocation for the 2200-2290 MHz band by adding a secondary Mobile Service allocation as a footnote to the U.S. Table, removing the restriction limiting use of the band to the four identified subbands, and

¹⁸ *Id.*

¹⁹ *Space NPRM*, 28 FCC Rcd at 6731-32, paras. 88-90.

²⁰ We received comments from the Aerospace and Flight Test Radio Coordinating Council (AFTRCC), Aerospace Industries Association, Bigelow Aerospace, LLC (Bigelow), Boeing Company (Boeing), Commercial Spaceflight Federation (CSF), Comsearch, EchoStar Satellite Operating Corp. and Hughes Network Services, LLC (EchoStar), Fixed Wireless Communications Coalition (FWCC), Lockheed Martin Corp. (Lockheed), Marcus Spectrum Solutions (Marcus), New Mexico Spaceport Authority (NMSA), Orbital Sciences Corporation (now Northrop Grumman), Satellite Industry Association, Space Exploration Technologies (SpaceX), and XCOR Aerospace. We received reply comments from Boeing, Engineers for the Integrity of the Broadcast Auxiliary Services Spectrum, FWCC, and the Satellite Industry Association.

²¹ *Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations*, ET Docket No. 13-115, Report and Order and Further Notice of Proposed Rulemaking, 36 FCC Rcd 7764 (2021) (*R&O and FNPRM*).

²² *R&O and FNPRM*, 36 FCC Rcd at 7769-80, paras. 11-36.

²³ *Id.* at para. 20.

²⁴ *Id.* at para. 22.

²⁵ *Id.* at paras. 29-31.

²⁶ *Id.* at para. 60-65.

²⁷ *Id.* at paras. 38-41, 55-59.

²⁸ *Id.* at paras. 42-48.

upgrading the allocation from secondary to primary;²⁹

- sought comment on proposed service rules for the 420-430 MHz, 2025-2110 MHz, 2200-2290 MHz, and 5650-5925 MHz bands, including licensing and technical rules and coordination procedures, for use of the spectrum for commercial space launch operations;³⁰
- sought comment on authorizing communications between space launch vehicles and other space stations, including satellites;³¹
- sought comment on expanding Federal use of the non-Federal FSS and MSS bands;³²
- sought comment to refresh the record on enabling more robust Federal use of the 399.9-400.05 MHz band;³³ and
- sought comment broadly on the future needs of the commercial space industry.³⁴

12. The Commission received 29 comments and 21 reply comments in response to the *FNPRM*.³⁵

III. SECOND REPORT AND ORDER

A. Non-Federal Allocations for the 420-430 MHz, 2025-2110 MHz, 2200-2290 MHz, and 5650-5925 MHz Bands

13. In this Report and Order, we continue our efforts to provide regulatory certainty and additional spectrum to promote innovation and investment in the United States commercial space launch industry. Taking into account the record, we find sufficient support and justification for adopting an allocation for the 2025-2110 MHz band and expanding the previously adopted 2200-2290 MHz band allocation. Given that use of the 420-430 MHz, 2360-2395 MHz, and 5650-5925 MHz bands remains limited, we are not convinced there is need for new allocations for any of these bands at this time.

14. *Allocation for the 420-430 MHz band.* The 420-430 MHz band is used during launches from Federal launch sites to transmit a flight termination signal to a launch vehicle, resulting in its self-destruction if necessary.³⁶ The initial *NPRM* received minimal feedback, with most commenters

²⁹ *Id.* at paras. 49-54.

³⁰ *Id.* at paras. 60-138.

³¹ *Id.* at para. 145.

³² *Id.* at paras. 146-51.

³³ *Id.* at paras. 152-56.

³⁴ *Id.* at para. 157.

³⁵ We received comments from AFTRCC, Aerospace Industries Association, Astroscale U.S. Inc., Axiom Space Inc., Atmos Space, Sierra Space Corp., Scout Inc. (Industry Participants), Axiom Space, Inc. (Axiom), BlackSky Global LLC (BlackSky), Boeing, CTIA, Department of Commerce (DoC), Department of Defense (DoD), EchoStar, EIBASS, Industry Coalition Response (ICR), Iridium Communications Inc. (Iridium), Myriota PTY. LTD. (Myriota), NASA, National Association of Broadcasters (NAB), NCTA, NTIA, Relativity Space, Inc. (Relativity), Rocket Lab USA, Inc. (Rocket), Satellite Industry Association (SIA), Society of Broadcast Engineers, Inc. (SBE), Spaceflight Inc., SpaceX, T-Mobile USA, Inc. (T-Mobile), United Launch Alliance, LLC (ULA), Verizon, Virgin Galactic Holdings, Inc. (Virgin Galactic), and Wi-Fi Alliance. We received reply comments from AFTRCC, Astra Space, Inc., AT&T, Axiom, Boeing, Consortium for the Execution of Rendezvous and Servicing (CONFERS), CTIA, EIBASS, Fleet Space Technologies Pty. Ltd., Globalstar Inc., Industry Participants, Momentus Inc., Myriota, Northrop Grumman, Open Technology Institute at New America and Public Knowledge, Spaceflight Inc., SpaceX, TechFreedom, T-Mobile, ULA, and Verizon.

³⁶ This signal is sent if the launch vehicle strays off course and poses a danger to a populated area.

disagreeing that an allocation is necessary. However, commenters did highlight that the need for an allocation for the band may change as launches begin occurring outside Federal ranges. Therefore, the *FNPRM* sought further comment on whether to adopt a primary non-Federal Aeronautical Mobile allocation for this band.

15. While there was support on the record for adding this allocation, commenters differed in their suggested use of the band. Boeing suggest that the Commission restrict use of the band to only pre-launch testing and launches to prevent ancillary uses from interfering with safety-of-life transmissions.³⁷ The United Launch Alliance (ULA), the Aerospace Industries Association (AIA), and the Industry Coalition Response (ICR), however, support flexible use of the band beyond the proposed self-destruct transmissions.³⁸ Further, AIA suggests that the allocation maintain flexibility as operations change and coordinated use of the band be managed by a third-party.³⁹ ULA also claims that there are other flight-termination solutions that are already being put in place.

16. Federal incumbents in the band also had differing opinions on adding the allocation to the band. NASA supports the allocation, if use of the band is limited and Federal incumbents are properly protected.⁴⁰ The Department of Defense (DoD) does not oppose adopting such an allocation; however it recognizes that high power radar systems across the country could interfere with the reception of termination signals.⁴¹

17. We conclude not to adopt a primary non-Federal Aeronautical Mobile allocation for the 420-430 MHz band. The FCC has not received any STAs to use this band during space launches, as most current launch facilities have Federal systems in place for flight-termination purposes. Additionally, as ULA correctly observes, alternative flight-termination solutions for errant launches are already being implemented. For these reasons, and in light of the present and potential future limitations on use of the band raised by commenters, we are not adopting the proposed allocation.

18. *Allocation for the 2025-2110 MHz band.* The 2025-2110 MHz band is currently allocated for both Federal and non-Federal fixed and mobile uses. The Broadcast Auxiliary Services (BAS) make up most of the non-Federal use of the band and share the band with the Cable Television Relay Service (CARS) and the Local Television Transmission Service (LTTS). The band is also allocated on a primary basis for Federal space operation, Earth exploration satellite, and space research uses.⁴² While Federal use of the band is allocated on a co-primary basis, Federal use must not constrain BAS, CARS, and LTTS deployment.⁴³ The 2025-2110 MHz band also includes primary Federal fixed and mobile allocations with use restricted to the military services, in order to facilitate relocation of military operations from the 1755-1780 MHz band.⁴⁴ Federal use of the band has continued to increase, but coordination with non-Federal users has been successful. This success is due in large part to the memorandum of understanding (MOU) created by broadcast incumbents and the Federal users.⁴⁵ The Commission has issued many STAs in this band allowing space launch operations to transmit control signals to launch vehicles. The *FNPRM* sought comment on adding a co-primary non-Federal space

³⁷ Boeing Comments at 6.

³⁸ ULA Comments at 25; AIA Comments at 1-2; Northrop Reply at 13; ICR Comments at 2-3.

³⁹ AIA Comments at 1-2.

⁴⁰ NTIA/NASA Comments at 11.

⁴¹ NTIA/DoD Comments at 20.

⁴² 47 CFR § 2.106.

⁴³ 47 CFR § 2.106 footnotes US92, US346.

⁴⁴ 47 CFR § 2.106 footnote US92.

⁴⁵ See Society of Broadcast Engineers, *DoD, Broadcasters Agree on Spectrum Sharing Arrangement for Select Military Bases* (Nov. 21, 2022), <https://sbe.org/dod-spectrum-sharing/>.

operation (Earth-to-space) allocation to the 2025-2110 MHz band, in order to provide the space launch industry's increased use of the band with regulatory certainty.⁴⁶

19. In the *FNPRM*, we recognized that the 2200-2290 MHz band was allocated for Space Operations under restrictions intended to facilitate coordination with existing Federal users.⁴⁷ We therefore sought comment on the necessity for similar restrictions to be included in the proposed 2025-2110 MHz allocation.⁴⁸ There was overwhelming support on the record for adopting the proposed allocation.⁴⁹ While there was disagreement on the type of restrictions that should be adopted, all commenters were in agreement that any potential space launch operations in the band must be coordinated with all incumbents.⁵⁰ Boeing supports allocating operations to the entire band but suggests restricting those operations to only telecommand uplink transmissions from ground control stations to space launch vehicles.⁵¹ The National Association of Broadcasters (NAB), DoD, and NCTA also support allocating the band strictly for telecommand uplink transmissions from ground controller stations to space launch vehicles.⁵² NASA supports allowing space launch providers to transmit command signals to launch vehicles for recovery and retrieval purposes.⁵³ SpaceX claims that commercial launch operations need spectrum for uplink operations, which are generally performed in the 2025-2110 MHz band.⁵⁴ However, SpaceX also believes the allocation should be expanded to cover the recovery of vehicles and communications involving cargo and crew delivery to inhabitable space stations.⁵⁵ Companies such as Spaceflight, Axiom, Astroscale, and Sierra Space suggest that spacecraft engaged in rendezvous and proximity operations (RPO) and spacecraft whose primary purpose is to deploy other spacecraft (described as "payload deployment operations") be among the operations included in the allocation of the band. Spaceflight argues that an allocation for these services, which currently operate without any official allocation, would alleviate them from having to undergo the burdensome and repetitive STA process.⁵⁶ However, Boeing believes that a second *FNPRM* can better address the potential to expand the types of operations authorized under this proposed allocation.⁵⁷

20. Most of the proposed restrictions on use of the proposed allocation came from broadcast interests. NAB and the Society of Broadcast Engineers (SBE) express concern for further increasing use of a band that is crucial for broadcast auxiliary services.⁵⁸ To address these concerns, NAB, SBE, and the Engineers for the Integrity of Broadcast Auxiliary Services Spectrum (EIBASS) believe commercial space launch entities should be subject to the coordination criteria established in the SBE-DoD MOU.⁵⁹

⁴⁶ *FNPRM*, 36 FCC Rcd 7784, at para 48.

⁴⁷ *FNPRM*, 36 FCC Rcd 7784, at para 48.

⁴⁸ *Id.*

⁴⁹ ULA Comments at 26; Boeing Comments at 3; Relativity Comments at 3; ICR Comments at 1; Rocket Labs Comments at 1.

⁵⁰ ULA Comments at 26; SpaceX Comments at 4-5; Aerospace Industries Association Comments at 1; Society of Broadcast Engineers Comments at 15-16; NCTA Comments at 6.

⁵¹ Boeing Comments at 6.

⁵² NAB Comments at 6-7; NTIA/DoD Comments at 20-22; NCTA Comments at 6.

⁵³ NTIA Comments at 11.

⁵⁴ SpaceX Reply at 6-7.

⁵⁵ SpaceX Comments at 4-5.

⁵⁶ Spaceflight Comments at 8-9.

⁵⁷ Boeing Reply at 3-4.

⁵⁸ SBE Comments at 1; NAB Comments at 3.

⁵⁹ BAS Comments at 7; EIBASS Comments at 4-5; SBE Comments at 15-16.

As EIBASS points out, the MOU's 0.5 dB noise threshold degradation metric will require any newcomer to ensure they will not cause interference before operating.⁶⁰ SpaceX supports using this criterion, so long as it facilitates coordination efforts in the band.⁶¹ SBE claims that as part of this coordination, its frequency and local market coordinator should be involved in frequency coordination studies.⁶² NCTA supports using SBE's database of BAS facilities for frequency coordination studies.⁶³ EIBASS suggests that any space launch site within 100 miles of an ENG-RO site should require an engineering study and that this study be provided to the BAS licensee.⁶⁴ As part of this coordination, SBE and NAB propose for space launch operations in the band to be limited to specified geographic sites and pre-licensing coordination.⁶⁵ NCTA supports the limited site restriction, because a fixed site approach would simplify coordination.⁶⁶ EIBASS, however, believes an uplink licensee should be allowed to operate anywhere if it can meet the protection criteria.⁶⁷ SpaceX agrees that demonstrating protection of incumbents through MOU criteria undermines the need for specified launch sites or pre-licensing coordination, adding that a fixed site approach risks slowing down innovation without any clear benefit.⁶⁸ The ULA and Boeing claim that the dynamic nature of space launches renders pre-licensing coordination highly unlikely.⁶⁹ Comments from Federal users generally did not address a fixed site approach, but DoD recognized the nature of the congested band may result in such an approach being necessary.⁷⁰

21. According to NTIA, given the important missions of Federal agencies in the band it is important for all Federal users to maintain priority and for all commercial launches to remain subject to prior coordination.⁷¹ DoD notes that their operations for space and terrestrial systems operate with restrictions to protect BAS and CARS licensees and that the continuing relocation of DoD operations from the AWS-3 band will further increase the density of spectrum use in the band.⁷² DoD recommends that non-Federal space operations be established on a secondary basis instead of creating a primary allocation.⁷³ If a primary allocation for commercial space operations is adopted, DoD recommends that a footnote be adopted placing the same types of restrictions on these operations as apply to the Federal allocations in the band. NOAA states that limiting non-Federal allocations in the band to a secondary basis is critical to ensuring protection of existing Federal operations and NASA also does not support

⁶⁰ EIBASS Reply at 1-2.

⁶¹ SpaceX Reply at 4.

⁶² SBE Comments at 15-16.

⁶³ NCTA Comments at 6.

⁶⁴ EIBASS Reply at 3.

⁶⁵ SBE Comments at 17; NAB Comments at 5.

⁶⁶ NCTA Comments at 6.

⁶⁷ EIBASS Reply at 3.

⁶⁸ SpaceX Reply at 4.

⁶⁹ ULA Reply at 5-6; Boeing Comments at 18-19.

⁷⁰ NTIA/DoD Comments at 22.

⁷¹ NTIA Comments at 4.

⁷² NTIA/DoD Comments at 21. Federal operations in the AWS-3 uplink band (1755-1780 MHz) have been relocated and the band has been auctioned to make the band available for commercial services. *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695- 1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands*, Report and Order, 29 FCC Rcd 4610, 4629, para. 37 (2014); Auction 97: Advanced Wireless Services (AWS-3), <https://www.fcc.gov/auction/97>.

⁷³ NTIA/DoD Comments at 21.

providing a primary allocation for commercial space operations.⁷⁴

22. We conclude that adopting a non-Federal secondary allocation for space launch operations with the same coordination requirements that currently apply to Federal users will sufficiently address the regulatory needs of the commercial space launch industry while ensuring the protection of incumbents. This spectrum is regularly used by commercial space launch providers and granting regulatory certainty will boost investment and promote innovation in this industry. Adopting this allocation will eliminate the time and expense required for seeking STAs, which also often lapse due to the need to reschedule launches, thus requiring multiple STAs per launch.⁷⁵ Based on our experience with STAs in this band, we believe the existing coordination requirements, already proven to facilitate frequency re-use and coordination, will sufficiently protect incumbents and readily grant launch providers access to spectrum. We appreciate the concerns raised by the Federal agencies and are following their suggestion to adopt a secondary allocation instead of a primary allocation as proposed. While Federal space operations have primary allocation status, the restrictions on Federal operations to protect the long-established BAS and CARS licensees in the band in effect relegate the Federal space launch activities as secondary to these Commission licensees. As the commercial space launch providers will also have to coordinate with these terrestrial licensees, a secondary allocation appears to be more appropriate at this time.⁷⁶ The coordination framework currently in place for Federal space operations has permitted a high degree of spectrum efficiency and reuse for non-Federal and Federal operations.⁷⁷ Adopting a secondary non-Federal Space Operation allocation for the 2025-2110 MHz band will allow us to develop effective rules for the space launch industry, no longer requiring the lengthy experimental rules process. Hence, we are implementing this secondary non-Federal Space Operation (Earth-to-space) allocation to the 2025-2110 MHz band in the U.S. Table. This allocation will be limited to space launch telecommand transmissions and will require commercial space launch providers to coordinate with non-Federal terrestrial licensees (*i.e.*, BAS, LTTS, and CARS) and NTIA.

23. While there was support on the record for making the band available for use for on-orbit service (OOS) and RPO,⁷⁸ we agree with Boeing that the increased use of the band from the ongoing relocation of Federal operations provides reason to exercise caution in authorizing any additional non-Federal space operations.⁷⁹ We therefore will address these operations through separate action, taking into account also the record developed in response to our Notice of Inquiry on In-space Servicing, Assembly, and Manufacturing.⁸⁰ We also do not agree with NAB and SBE that space launch operations in the band should be limited to specified geographic sites because the coordination requirement we are adopting will ensure BAS, LTTS, CARS licensees in all geographic areas are protected from harmful interference.⁸¹

24. *Allocation for the 2200-2290 MHz Band.* The 2200-2290 MHz band is used for launch telemetry—*i.e.*, sending diagnostic information from the space launch vehicle to ground controller

⁷⁴ NTIA/NOAA Comments at 27; NTIA/NASA Comments at 11.

⁷⁵ ULA Comments at 13.

⁷⁶ While we are adopting a secondary non-Federal Space Operation allocation for this band at this time, we remain open to the possibility of upgrading the allocation to primary status at a later date as the commercial space launch industry continues to develop and we gain experience with the licensing framework and coordination process we are adopting.

⁷⁷ SBE Comments at 8-10.

⁷⁸ Axiom Comments at 3; Astroscale U.S. Inc., Axiom Space Inc., Atomos Space, Sierra Space Corp., Scout Inc. Comments at 6 (RPO Proponents); Momentus Inc. Reply at 1-2.

⁷⁹ Boeing Reply at 3-5.

⁸⁰ *Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing*, IB Docket No. 22-272, Notice of Inquiry, FCC 22-66 (2022).

⁸¹ SBE Comments at 17; NAB Comments at 5; EIBASS Reply at 4.

stations during the launch to allow tracking of the performance of the launch vehicle. The 2200-2290 MHz band is heavily used by DoD and other Federal agencies and has primary Federal Space Operation, Earth Exploration Satellite, Fixed, Mobile, and Space Research allocations.⁸² The *R&O* added a non-Federal secondary Space Operation (space-to-Earth) allocation to the band.⁸³ Use of this allocation is limited by an Allocation Table footnote to pre-launch testing and space launch operations and coordination with NTIA is required prior to each launch.⁸⁴ In addition, non-Federal space operations are restricted to the 2208.5-2213.5 MHz, 2212.5-2217.5 MHz, 2270-2275 MHz, and 2285-2290 MHz portions of the band.⁸⁵

25. The *FNPRM* proposed to remove the restriction on non-Federal use of the new Space Operation allocation to the four sub-bands.⁸⁶ The *FNPRM* noted that recent space launches that have accessed this band for telemetry using STAs have used different portions of the band than these four sub-bands. As these other channels had been successfully coordinated with NTIA, the *FNPRM* explained that it may be possible to offer additional flexibility to launch operators rather than maintaining this limitation. Because of the heavy use that Federal agencies make of this band, the *FNPRM* cautioned that use of this band for launches will still need to be coordinated with NTIA on a launch-by-launch basis. The *FNPRM* also sought comment on whether non-Federal use of the band should continue to be limited to channels with a necessary bandwidth of 5 megahertz.⁸⁷

26. The *FNPRM* also sought comment on upgrading the secondary Space Operations allocation to a primary allocation noting that this would place commercial launch operators on an equal footing with other users of the band and provide greater certainty to incentivize investment as the commercial space industry continues to expand with more frequent launches, privately developed launch facilities, and manned space flights.⁸⁸ The *FNPRM* explained that even if the primary allocation is adopted, individual launches would still have to be coordinated with NTIA because of the heavy existing Federal use of the band.

27. The *FNPRM* also sought comment on adding a secondary Mobile allocation to the 2200-2290 MHz band.⁸⁹ The *FNPRM* noted that both the International Table and the Federal Table include a Mobile Service allocation for this band allowing aeronautical mobile use. According to the *FNPRM*, adding a Mobile allocation would harmonize the allocation status and the applicable service rules of the 2200-2290 MHz and 2360-2395 MHz bands as three frequencies in the 2360-2395 MHz band are available for both Federal and non-Federal use for telemetry and telecommand of launch and reentry vehicles under a Mobile allocation and our Part 87 rules.⁹⁰ The *FNPRM* also asked whether use of the Mobile allocation should be subject to the same restrictions that apply to the non-Federal Space Operations allocation for the band and whether it should be subject to the same restrictions that apply to Federal users—*i.e.*, should it be restricted to line-of-sight use only, exclude flight testing of manned

⁸² 47 CFR § 2.106.

⁸³ *R&O and FNPRM*, 36 FCC Rcd at 7772-76, paras. 17-25; 47 CFR § 2.106, US96. Non-Federal space stations in the space research, space operations, and Earth exploration satellite service may use the band to transmit to NASA's Tracking and Data Relay Satellite System. 47 CFR § 2.106 footnote US303.

⁸⁴ 47 CFR § 2.106 footnote US96.

⁸⁵ *Id.*

⁸⁶ *R&O and FNPRM*, 36 FCC Rcd at 7786, paras. 52.

⁸⁷ *R&O and FNPRM*, 36 FCC Rcd at 7786, paras. 53.

⁸⁸ *R&O and FNPRM*, 36 FCC Rcd at 7787, paras. 54.

⁸⁹ *R&O and FNPRM*, 36 FCC Rcd at 7785, paras. 49-50.

⁹⁰ 47 CFR § 2.106 footnote US276; 47 CFR § 87.303(d)(1).

aircraft, and prohibit the introduction of high-density mobile systems.⁹¹

28. The *FNPRM* noted that use of the secondary Space Operation allocation for the band is limited compared to what would normally be permitted under a Space Operation allocation.⁹² The Space Operation Service is defined in the Commission's rules as being "concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry, and space telecommand."⁹³ The *FNPRM* sought comment on whether a greater range of non-Federal space operations should be permitted under the Space Operation allocation in this band. The *FNPRM* explained that expanding the scope of this allocation could be especially useful for some types of missions involving communication between spacecraft during orbital and suborbital missions.

29. Comments from the commercial space industry overwhelmingly support removal of the restrictions on non-Federal use of the band for launch operations. ULA and SpaceX claim removing the restrictions on access to the 2200-2290 MHz band will facilitate commercial space use and promote innovation in the industry without increasing the risk of harmful interference to Federal users.⁹⁴ Boeing explains that expanded access to the band will not lead to increased risk of interference, because non-Federal launches would still be required to coordinate with Federal operators.⁹⁵ ULA notes that space launch operations outside of the four sub-bands have been successfully coordinated with NTIA.⁹⁶ Further, ULA believes that the Commission should open the 2230-2235 MHz and 2253-2258 MHz sub-bands with at least one of the allocated sub-bands allowing for a contiguous 20 megahertz bandwidth.⁹⁷ Additionally, ULA claims its vehicles transmit on channels and with a bandwidth not included in the current allocation.⁹⁸ Similarly, SpaceX believes access to the entire band without any bandwidth limitations will facilitate use of the band by space launch providers. SpaceX claims to use only one of the four sub-bands for its launches because the rest do not fully support telemetry applications. Northrop Grumman claims its space launch and cargo delivery vehicles use spectrum outside the four sub-bands for critical operations with the International Space Station (ISS). These operations include space-to-space communications, rendezvous, and docking with the ISS. Therefore, Northrop Grumman believes the Commission should provide operators with unrestricted use of the 2200-2290 MHz band along with greater flexibility on the types of operations allowed in the band. Axiom urges that use of the allocation be expanded to include payload deployed from a launch vehicle because it plans to send TT&C to a module docking with the ISS.⁹⁹

30. While most of the commercial space industry commenters supported removing restrictions on use of the band, Boeing expressed some reservations. Boeing believes that additional space operations are best left to a second *FNPRM* for further consideration.¹⁰⁰ Boeing notes that extensive coordination and heavy use of the band has resulted in Federal agencies' apprehension towards permitting additional space operations in the non-Federal allocation.¹⁰¹ Boeing also does not believe a

⁹¹ *R&O and FNPRM*, 36 FCC Rcd at 7785, paras. 50; 47 CFR § 2.106 footnote 5.391.

⁹² *R&O and FNPRM*, 36 FCC Rcd at 7786, paras. 51.

⁹³ 47 CFR § 2.1.

⁹⁴ SpaceX Comments at 5-6; ULA Comments at 3.

⁹⁵ Boeing Comments at 4.

⁹⁶ ULA Reply at 4; ULA Comments at 28.

⁹⁷ ULA Comments at 29.

⁹⁸ ULA Comments at 27.

⁹⁹ Axiom Comments at 3.

¹⁰⁰ Boeing Reply at 5.

¹⁰¹ Boeing Comments at 3-4.

primary allocation is necessary citing the already intensive use of the band.¹⁰² Furthermore, Boeing believes the secondary allocation already provides the necessary interoperability with Federal operations and grants non-Federal launches full interference protection.¹⁰³

31. Federal agencies such as NASA, DoD, and the Department of Commerce (DoC) strongly oppose any changes to the restrictions on non-Federal use of the band. DoD and DoC highlight the heavy use and coordination already required by Federal operations as sufficient reason for rejecting any expansion of non-Federal use of the allocation.¹⁰⁴ DoD claims that limiting non-Federal use to the four sub-bands establishes predictable frequencies that facilitate coordination with non-Federal users.¹⁰⁵ NTIA states that expanding the scope of non-Federal use of the band would worsen coordination efforts in an already heavily congested band.¹⁰⁶ Additionally, many of these Federal agencies heavily oppose any of the expanded use cases that non-Federal users such as Northrop Grumman and Axiom support.¹⁰⁷ The Federal agencies also did not support upgrading the secondary non-Federal Space Operation allocation to primary status.¹⁰⁸ However, as Boeing and Northrop Grumman note, NTIA and NASA have acknowledged an exception can be made in the 2200.2-2206.2 MHz band for non-Federal communications supporting ISS operations.³⁸

32. We conclude that it is appropriate to provide commercial space launch operators with access to a greater portion of the 2200-2290 MHz band beyond the four sub-bands currently provided. As noted above, most of the STAs that the Commission has issued for space launch telemetry in this band have regularly included use of channels that are outside of these four sub-channels.¹⁰⁹ As all of these STAs have been coordinated with NTIA this indicates that coordination of use of channels outside of these sub-bands is achievable and that limiting use of 2200-2290 MHz for commercial space launches to these sub-bands does not fully meet the needs of the commercial space launch industry. Therefore, we are removing the restriction of use of the non-Federal space operation allocation to the four sub-bands.

33. However, we will not upgrade the secondary non-Federal Space Operation allocation for the 2200-2290 MHz band to a primary allocation. When we adopted the current secondary allocation for the band, we noted that this would accomplish many of the goals the Commission had sought to accomplish with the proposed primary allocation such as enabling the Commission to adopt service rules and issue spectrum authorizations, reduce the uncertainty of the launch-by-launch STA process, and permit the development of well-defined technical rules that licensees can design equipment to comply with.¹¹⁰ The Commission noted that even if it had adopted a primary non-Federal allocation for this band, individual launches would still need to be coordinated because of the heavy existing Federal use of the band. We continue to believe for these same reasons that the current secondary allocation will meet the needs of the commercial space industry. We are cognizant of the complications of sharing this band with the large number of Federal operations and the expressed preference of Federal agencies to maintain the

¹⁰² Boeing Reply at 6.

¹⁰³ Boeing Comments at 4.

¹⁰⁴ NTIA/DoD Comments at 22; NTIA/DoC Comments at 26-27.

¹⁰⁵ NTIA/DoD Comments at 22.

¹⁰⁶ NTIA Comments at 3-5.

¹⁰⁷ Axiom Comments at 3; Northrop Grumman Reply at 22-23.

¹⁰⁸ NTIA/NASA Comments at 9.

¹⁰⁹ See, e.g., Space Exploration Technologies Corp. Special Temporary Authorization, OET Experimental Licensing System File Nos. 0729-EX-ST-2023, 0673-EX-ST-2023, 0659-EX-ST-2023, 1895-EX-ST-2020, 0126-EX-ST-2021, 0249-EX-ST-2021; Rocket Lab USA Inc. Special Temporary Authorization, OET Experimental Licensing System File No. 1688-EX-ST-2022; Northrop Grumman Systems Corp. Special Temporary Authorization, OET Experimental Licensing System File No. 0916-EX-ST-2022.

¹¹⁰ *R&O and FNPRM*, 36 FCC Rcd at 7774, para. 20.

current secondary allocation. In recognition of the need to work closely with our Federal partners in managing the use of these band, we find that maintaining the current secondary allocation as advised by NTIA is appropriate at this time.

34. We will add a secondary Mobile allocation to the band. Providing this Mobile allocation will facilitate the Commission adopting technical rules for space launch telemetry that follow the same approach that NTIA applies to Federal launches. NTIA treats telemetry systems during the first stage of a launch as an aeronautical mobile system and the second and later stages as a space operation system.¹¹¹ Because many launch vehicles are used for both Federal and non-Federal launches and many non-Federal launches occur at Federal launch facilities, we believe it is important to have the flexibility to adopt technical rules that are in harmony with the technical standards applied to Federal launches. The secondary Mobile allocation we are adopting for this band will be subject to the same restrictions as the non-Federal Space Operation allocation in the band. The non-Federal Mobile allocation will be restricted to use during pre-launch testing and space launch operations and subject to coordination for each launch. The only opposition to adding a Mobile allocation to the band came from Boeing, who expressed concern that adopting the Mobile allocation would prompt interest in making the band available for 5G and other future mobile services.¹¹² Given the heavy restrictions on non-Federal use of this band we do not agree with Boeing that it will be considered a candidate for commercial mobile use.

35. We will not remove the current limitation on use of the non-Federal Space Operation allocation to pre-launch testing and space launch operations at this time. The heavy use of the band by Federal agencies necessitates that we take a cautious approach to making provisions for additional use cases of this band. While several commenters such as Northrup Grumman and Axiom expressed interest in using this band for on-orbit activities, the record is sparse as to the technical details of these types of operations. We do not currently have the information needed to reach a conclusion as to the impact of these operations on Federal users of the band

36. *Allocation for the 5650-5925 MHz Band.* The 5650-5925 MHz band is used for radar tracking of launch vehicles. During a launch, a radar transponder located on the launch vehicle is typically used to transmit tracking information down to the tracking station. A primary Federal allocation limits use of radiolocation services to military operations.¹¹³ Prior space launches that have used this band have relied on Federal facilities to provide tracking for launches occurring at Federal ranges. The band is also used by Unlicensed National Information Infrastructure (U-NII) devices operating under the Commission's Part 15 rules.¹¹⁴ The 5850-5925 MHz portion of the band has a primary non-Federal Mobile allocation limited to the Intelligent Transportation System radio service.¹¹⁵ While commercial use of the band remained limited at the time, the *FNPRM* sought comment on whether to adopt a non-Federal Radiolocation allocation for the 5650-5925 MHz band by adding a footnote to the U.S. Table.

37. Of the few comments addressing this topic, there was no consensus on the record for adopting this allocation. The few comments in support of the allocation did not address any of the *FNPRM*'s questions regarding the band, with most expressing their support in a blanket statement covering other proposed allocations.¹¹⁶ AIA suggests that operations authorized within the allocation remain flexible as the needs of the commercial space launch industry change.¹¹⁷ However, Boeing

¹¹¹ NTIA Manual § 8.2.44.

¹¹² Boeing Comments at 6.

¹¹³ 47 CFR § 2.106 footnote G2.

¹¹⁴ 47 CFR § 15.407.

¹¹⁵ 47 CFR § 2.106 footnote NG160.

¹¹⁶ Relativity Space Comments at 3; Industry Coalition Response Comments at 2; and Rocket Lab USA Comments at 1.

¹¹⁷ AIA Comments at 1.

believes that the band should be restricted to launch vehicle tracking.¹¹⁸ Further, it suggests that an *FNPRM* could seek comment if tracking vehicles that are in orbit for extended periods of time could be permitted.¹¹⁹ NASA and DoD support the allocation, with NASA suggesting operations be limited to tracking only and DoD suggesting any co-primary allocation be restricted to ensure new users do not constrain Federal users.¹²⁰ Northrop Grumman claims it relies on the band for critical tracking operations and support the allocation, regardless of the lack of interest on the record.¹²¹ The Wi-Fi Alliance opposes the allocation and believe the lack of interest on the record should result in its rejection.¹²² Additionally, Wi-Fi Alliance claims that expanding radar operations in the band would be complex and any potential allocation should heavily restrict operations to parallel current Federal use of the band.¹²³ The Wi-Fi Alliance also suggest that because the band is available to U-NII devices that currently detect and avoid radar patterns specified by Federal users, any allocation should ensure that non-Federal radar applications comply with Federal radar criteria that serves as the basis for U-NII devices' dynamic frequency selection capability.¹²⁴

38. Based on the record, we conclude not to adopt a non-Federal Radiolocation allocation for the 5650-5925 MHz band. While there was support for adding the allocation from some commercial space launch entities, interest in using the band remains low. Commenters failed to provide information on the number of launches likely to need access to this band in the future or other information requested in the *FNPRM*. In recent years only a small number of launches have obtained access to this band for radar transponders using STAs. As there has been limited use of this band in the past and we have no reason to believe this will change in the future, there is no clear need to adopt this allocation. If space launch operators need access to this band for radar transponders, they may continue to use the STA process.

B. Licensing and Technical Rules for Space Launch Operations

39. In this section, we adopt rules for the new commercial Space Launch Services. We establish rules that flexibly, efficiently, and effectively support the evolving spectrum requirements of commercial space launch operations while continuing to protect vital Federal operations in the 2025-2110 MHz and 2200-2290 MHz bands. We install a licensing framework that will grant nationwide, non-exclusive licenses to non-Federal entities that conduct space launch operations in the 2025-2110 MHz and 2200-2290 MHz bands. We also add a new Part 26 to the Commission's rules that codifies the rules we adopt today for space launch operations, as well as any related rules that we may adopt in the future for other types of space activities. In addition, we adopt rules defining the scope of the service we establish today, as well as the types of entities that will be eligible to hold licenses in the new commercial Space Launch Services. Finally, we adopt specific licensing rules governing shared frequency use, authorized bandwidth, license term and renewal, application processing rules, and coordination requirements, as well as technical rules that will foster interoperability of equipment used for non-Federal and Federal launches and rules regarding equipment authorization. In doing so, we recognize that licensee pre-launch coordination with NTIA may necessitate additional requirements and limitations on non-Federal launch operations in specific instances, in addition to those we establish here.

¹¹⁸ Boeing Comments at 6.

¹¹⁹ *Id.*

¹²⁰ NTIA/NASA Comments at 13; NTIA/DoD Comments at 23.

¹²¹ Northrop Grumman Reply at 12.

¹²² Wi-Fi Alliance Comments at 2.

¹²³ Wi-Fi Alliance Comments at 6.

¹²⁴ Wi-Fi Alliance Comments at 5-6. Dynamic Frequency Selection (DFS) is the process of detecting radar signals that must be protected against interference from 5 GHz (802.11a/n/ac/h) radios. DFS is required only in the 5650-5850 MHz portion of the band.

1. Licensing Rules for Space Launch Operations

a. Creation of New Rule Part 26

40. The Commission sought comment in the *FNPRM* on which rule parts should apply to different elements of space launch operations, and how to integrate provisions from those rule parts into a commercial space launch service.¹²⁵ The *FNPRM* identified Parts 87 (Aeronautical Mobile) and 25 (Satellite) as rule Parts that might be applicable to commercial space launch operations.¹²⁶ The Commission sought comment on whether to integrate all rules for commercial space launch operations into a new standalone rule part, or whether to integrate those rules into one or more subparts within existing rule parts.¹²⁷ We create a new rule Part 26 for the new commercial space launch service we adopt today. We agree with commenters who argue that a standalone rule part is more efficient and flexible than regulating commercial space launch operations under existing rule parts.¹²⁸

41. The record regarding the question of where to incorporate the rules for space launch operations is mixed, due largely to varying opinions as to the activities that should be included in a space launch operation. While Boeing and NASA advocate for organizing rules for commercial space launches into a new subpart under Part 87,¹²⁹ several other commenters do not support applying existing rule parts to space launch operations, instead preferring other approaches that would provide greater clarity and flexibility with respect to space-related operations. SpaceX, which supports licensing all space operations under a single authorization, argues for the creation of a single set of rules under a new Part 26.¹³⁰ TechFreedom also supports the creation of a new Part 26, arguing that placing space spectrum uses in a single rule part will ease coordination and spectrum choices by new entrants.¹³¹ Relativity argues that applying Part 87 and/or Part 25 rules to space launch or reentry activities would be overly burdensome and costly to the industry.¹³² Still others in the record note that there are space services that cannot be considered as part of a space launch and likely do not fall under either Part 87 or Part 25. These commenters argue that space-related services, such as OOS and RPO operations, as well as operations that transport passengers to space, have distinct licensing needs that should be accommodated.¹³³

42. We find that locating rules into a new part will provide greater clarity and ease of reference regarding commercial space launch operations. Establishing a rule part specific to these operations rather than placing rules in existing rule parts appears more appropriate given that launch operations, while having elements applicable to Parts 87 and 25 depending on the launch, do not fall

¹²⁵ *FNPRM*, 36 FCC Rcd at 7789-92, paras. 60-65.

¹²⁶ *FNPRM*, 36 FCC Rcd at 7790-92, paras. 61-64. The *FNPRM* also sought comment regarding whether Part 90 could serve as an appropriate location for rules regarding 5650-5925 MHz band radiolocation services. As we are not adopting rules for that band in this *2nd R&O*, we do not discuss the applicability of Part 90 here.

¹²⁷ *FNPRM*, 36 FCC Rcd at 7792, para. 65.

¹²⁸ SpaceX Comments at 7-9.

¹²⁹ Boeing Comments at 3; Boeing Reply at 10-11; NTIA/NASA Comments at 13.

¹³⁰ SpaceX Comments at 9-11 (asserting that although definitions appropriate for space launch are similar to those applicable to Part 25, launch activities go beyond those found in that rule part).

¹³¹ TechFreedom Reply at 9-10.

¹³² Relativity Comments at 4.

¹³³ Virgin Galactic Comments at 2 (asserting that its service offering—transporting humans to suborbital space—presents different spectrum needs and considerations than Part 87 commercial airlines, Part 25 space stations, and other types of space operations); SpaceFlight, Inc. Reply at 9 (asserting that OOS operations have distinct licensing needs from the kind of satellite operations that are licensed under Part 25 and that OOS can best be viewed and understood from a licensing perspective as a hybrid between traditional launch and satellite service); Industry Participants Comments at 5 (agreeing that OOS and RPO services should be viewed as a hybrid between traditional launch/reentry and satellite services).

completely under either one. Creating a new rule part is also forward-looking; as discussed *infra*, while the rules we are adopting here are specific to launch operations, we are seeking additional comment on measures that we can take to facilitate more routine licensing for certain payload and space operations.¹³⁴ The use of a standalone rule part therefore could be used to accommodate rules relating to other types of space activities to the extent the Commission adopts rules regarding such operations. Accordingly, we find it appropriate to establish a new Part 26.

43. *Issues Overlapping with ISAM Proceeding.* In the 2021 *FNPRM* the Commission asked multiple questions related to payload communications in the context of space launch operations.¹³⁵ For example, we sought comment on whether payload operations, currently addressed through experimental licensing, should be addressed in Part 25 of the Commission's rules.¹³⁶ Because these newer commercial operations were not considered when many of our rules were first adopted, we sought comment on any modifications to the current Part 25 rules (*e.g.*, default rules, bond requirements, fees, etc.) that may facilitate licensing and whether a streamlined process along the lines of the recently adopted process for small satellites would be appropriate for such operations. We also asked if there are other licensing models that can be better suited for the needs of these payload operations. In response many commenters in this proceeding raised issues related to space operations such as on-orbit servicing (OOS), rendezvous, proximity space operations (RPO), Earth-escape operations, and lunar orbit missions, to name a few.¹³⁷ Several of the leading industry operators for these types of activities, while urging the Commission to develop rules to better account for such space activities, suggested that these issues should be considered in a further notice of proposed rulemaking.¹³⁸

44. We note that many of the same operators that have commented on the need for spectrum allocation and licensing procedures for novel payload activities in this proceeding have also responded to our August 2022 Notice of Inquiry in the ISAM proceeding.¹³⁹ ISAM refers to a set of capabilities that are used on-orbit, in transit, or on the surface of space bodies. Within the category of ISAM, "servicing" includes activities such as use of one spacecraft to inspect another, to dock with other spacecraft and provide support such as maintaining the station in its orbital location in order to extend the period of operations, or to repair or modify a spacecraft after its initial launch. These activities typically include the process of maneuvering close to and operating in the near vicinity of the "client" spacecraft, a set of activities often referred to as rendezvous and proximity operations (RPO). "Servicing" also involves transport of a spacecraft from one orbit to another and debris collection and removal.¹⁴⁰ While we acknowledge that this industry is advancing rapidly, and we recognize the importance and benefit of in-space services that could extend the life of satellites, reduce orbital debris, and more, we agree with commenters that the Commission should not attempt to shoehorn these activities into a space launch licensing regime,¹⁴¹ nor is it necessarily appropriate to attempt to fit these operations into rules "designed for a previous space age."¹⁴² Accordingly, we will continue to expand the record on these in-space

¹³⁴ See *infra* Section IV.B (Space Operations).

¹³⁵ See *FNPRM*, 36 FCC Rcd at 7815-17, paras. 139-45.

¹³⁶ See *FNPRM*, 36 FCC Rcd at 7816, para. 142.

¹³⁷ See, *e.g.*, Rocket Lab Comments at 2; Axiom Space Comments at 2-3; Industry Participants Comments at 5; Industry Participants Reply at 4; Spaceflight Reply at 3-4; CONFERS Reply at 2; Momentus Reply at 1-2; BlackSky Comments at 2-4.

¹³⁸ See, *e.g.*, Industry Participants Reply at 3, 5-7; CONFERS Reply at 3; Spaceflight Comments at 8-9.

¹³⁹ See Comments filed in the FCC's Electronic Comments Filing System (ECFS) for Dockets 22-271, 22-272, <http://apps.fcc.gov/ecfs>.

¹⁴⁰ *ISAM NOI* at 2 para. 4.

¹⁴¹ See Industry Participants Reply at 6.

¹⁴² CONFERS Reply at 3.

operations through our ISAM proceeding and welcome continued comment and dialogue from the regulated community as we seek to develop short and long-term regulatory procedures for these operations.

b. Scope of Service

45. In the *FNPRM*, the Commission sought comment on how to define certain key terms for purposes of licensing commercial space launch operations, including “space launch operations,” “space launch vehicle,” and “reentry vehicle.”¹⁴³ The Commission also sought comment on an appropriate scope for the commercial use of the 2200-2290 MHz and 2025-2110 MHz bands.¹⁴⁴ Below, we first define the key elements of a space launch, and use those definitions to frame and articulate the applicable scope of the commercial space launch service.

46. *Space Launch-related Definitions.* In requesting comment on how to define non-Federal “space launch operations,” the *FNPRM* noted that the STAs that have previously been granted have included telemetry from the launch vehicle and the payload, during the initial space launch, recovery of the booster, and the orbital and re-entry phases for operations such as cargo and crew delivery to and from the ISS.¹⁴⁵ We asked whether it would serve the public interest to include all of these operations in the definition of “space launch operations,” and whether there is a need to either limit the definition or further expand the definition to other space operations.¹⁴⁶

47. Commenters are divided on whether “space launch operations” should encompass payload and expanded in-orbit operations, such as rendezvous and proximity operations, ISS docking, and space-to-space links. SpaceX advocates to include all operations that fall under our Part 2 definition of Space Operation Service.¹⁴⁷ A coalition of industry members recommend that we develop rules that would apply through every phase of space flight,¹⁴⁸ while Rocket Lab and ULA similarly ask us for regulations that apply consistently over all mission phases.¹⁴⁹ Further, Virgin Galactic supports the inclusion of a separate definition for spaceflight operations.¹⁵⁰ Conversely, Boeing believes that activities ancillary to a launch should not be included in the definition of “space launch operations.”¹⁵¹ NTIA likewise states that including in-orbit operations to a definition of “space launch operations” would put unacceptable strain on the bands at issue and advises that space launch operations are fundamentally for a short duration.¹⁵² Aerospace and Flight Test Radio Coordinating Council (AFTRCC) agrees with Boeing and NTIA on these points.¹⁵³

48. While we seek to implement rules that will provide greater certainty and streamline access and use of the 2200-2290 MHz and 2025-2110 MHz bands, we also remain cognizant that the two bands are already heavily encumbered and that there is a need to proceed cautiously regarding access to

¹⁴³ *FNPRM*, 36 FCC Rcd at 7789, para. 60.

¹⁴⁴ *FNPRM*, 36 FCC Rcd at 7792-93, paras. 66-71.

¹⁴⁵ *FNPRM*, 36 FCC Rcd at 7789, para. 60.

¹⁴⁶ *FNPRM*, 36 FCC Rcd at 7789, para. 60.

¹⁴⁷ SpaceX Comments at 6. Section 2.1 defines Space Operation Service as “[a] radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry, and space telecommand.” 47 CFR § 2.1(c).

¹⁴⁸ Astra et al. Comments at 2.

¹⁴⁹ Rocket Lab Comments at 2; ULA Reply at 6-7.

¹⁵⁰ Virgin Galactic Comments at 6-7.

¹⁵¹ Boeing Comments at 5.

¹⁵² NTIA Comments at 4.

¹⁵³ AFTRCC Reply at 9.

the bands for activities that go beyond the operations of a launch vehicle. Accordingly, we find that it is appropriate at this juncture to limit the definition of commercial space launch operations to activities associated only with the launch and recovery or reentry of a launch vehicle, and exclude payload and other on-orbit communications.¹⁵⁴ We conclude that the inclusion of payload and on-orbit operations, such as rendezvous and proximity operations, ISS docking, and space-to-space links, are outside of what can fairly be considered “space launch operations.” We agree with Boeing that such ancillary operations are outside the scope of the launch operations addressed in the *FNPRM*.¹⁵⁵ We therefore decline to extend the concept of commercial space launch beyond the operations of a launch vehicle itself.¹⁵⁶ Because it is not clear from the record that the bands at issue can support streamlined authorization and access for payload and on-orbit operations today, we are seeking further comment on these issues in the *Second Further Notice of Proposed Rulemaking (Second FNPRM)* and through our ISAM proceeding, noted above.¹⁵⁷

49. Instead, we find it appropriate to adopt a definition of “space launch operations” that is specific to launch vehicle operations. We define non-Federal “space launch operations” as any activity that places a launch vehicle, whether an expendable launch vehicle or a reusable launch vehicle or a reentry vehicle used for launch, and any payload or human being from Earth in a suborbital trajectory in Earth orbit, or otherwise in outer space, including pre-launch testing and recovery or reentry of the launch vehicle. We find it appropriate to broadly define “space launch operations” instead of including in the definition an exhaustive list of permissible operations or defining a launch by stages given that operations may vary from launch to launch. This definition is similar to the broad definition that the Commercial Space Launch Act, as amended, and the FAA’s commercial space transportation rules apply to “launch.”¹⁵⁸

50. Next, we adopt definitions for “launch vehicle” and its different forms as they apply to the “space launch operation” definition and describe the permissible scope of commercial space launch operations. In the *FNPRM*, the Commission sought comment on whether and how to define “launch vehicle” for space launch operations purposes.¹⁵⁹ SpaceX and TechFreedom advocate for the Commission to make use of its existing Part 2 definition of “spacecraft.”¹⁶⁰ NASA disagrees, arguing that a launch vehicle does not constitute a spacecraft, making the Commission’s Part 2 definition inapplicable.¹⁶¹

¹⁵⁴ However, as noted, we are seeking additional comment regarding certain in-orbit operations in Section IV.B (Space Operations) and have opened the ISAM proceeding through our NOI.

¹⁵⁵ See Boeing Comments at 5.

¹⁵⁶ The “Space Operation Service” definition includes “space tracking,” “space telemetry,” and “space telecommand,” all of which are defined terms that include on-orbit operations. See 47 CFR § 2.1(c).

¹⁵⁷ See *infra* Section III.B.1.a. We note that entities may continue to seek authorization for use of the 2200-2290 MHz and 2025-2110 MHz bands for such operations through the use of STAs.

¹⁵⁸ The Commercial Space Launch Act, as amended, provides that “...launch means to place or try to place a launch vehicle or reentry vehicle and any payload or human being from Earth—(A) in a suborbital trajectory; (B) in Earth orbit in outer space; or (C) otherwise in outer space, including activities involved in the preparation of a launch vehicle or payload for launch, when those activities take place at a launch site in the United States.” 14 U.S.C. § 50901(7). The Commercial Space Launch Act, which directs the Department of Transportation and, by delegation, the FAA to oversee launch and reentry of launch and reentry vehicles, is codified at 51 U.S.C. Chapter 509. The same definition is found in the FAA’s rules. See 14 CFR § 401.7.

¹⁵⁹ *FNPRM*, 36 FCC Rcd at 7789, para. 60.

¹⁶⁰ SpaceX Comments at 10; TechFreedom Reply at 8-10. “Spacecraft” is defined as “[a] man-made vehicle which is intended to go beyond the major portion of the Earth’s atmosphere.” 47 CFR § 2.1(c). See also 47 CFR § 25.103.

¹⁶¹ NTIA/NASA Comments at 13.

51. We agree with NASA that the term “spacecraft” is not appropriate.¹⁶² The term would not cover certain launch operations, such as first stages that do not go beyond the major portion of Earth’s atmosphere or suborbital launches, but yet would encompass other activities, such as on-orbit missions, that we are not including as part of a launch operation at this juncture. Instead, in line with our definition of “space launch operations,” we define “launch vehicle” more specifically as a vehicle built to place a payload or human beings from Earth in a suborbital trajectory, in Earth orbit, or otherwise in outer space.

52. In seeking comment regarding the appropriate definition for “launch vehicle,” the *FNPRM* asked whether we should draw on the definitions of “expendable launch vehicle” and “reusable launch vehicle” under Part 87,¹⁶³ and also sought comment on whether there should be any distinction between a “launch vehicle” and a “reentry vehicle” for space launch purposes.¹⁶⁴ Few commenters addressed these issues. SpaceX and Relativity urge the Commission to avoid drawing distinctions that may become technologically outdated,¹⁶⁵ while NASA states that the existing Part 87 definitions for “expendable launch vehicle” and “reusable launch vehicle” are appropriate.¹⁶⁶ As implied in our definition for “space launch operations,” we find that a launch vehicle could be an “expendable launch vehicle,” a “reusable launch vehicle,” or a “reentry vehicle” used for launch. Accordingly, it is necessary to define those terms. While section 87.5 of the Commission’s rules provides definitions for “expendable launch vehicle” and “reusable launch vehicle” in the context of launches administered under Part 87, these definitions describe such launch vehicles as “booster rockets.”¹⁶⁷ Because the Part 87 definitions may not adequately capture the launch vehicles that are in use today (or in the future), we instead find it appropriate to adapt definitions for launch vehicles using definitions from the FAA’s commercial space transportation rules.¹⁶⁸ We define “expendable launch vehicle” as a launch vehicle whose propulsive stages are used only once, and “reusable launch vehicle” as a launch vehicle that is designed to return to Earth substantially intact and may be launched more than one time or that contains vehicle stages that may be recovered by a launch operator for future use. Because it is feasible for commercial operators to conduct operations with a vehicle that cannot be solely described as a reusable launch vehicle (for example, the vehicle has the ability to be used for purposes other than launch), we find it appropriate to also include “reentry vehicle” and to adopt a definition similar to the FAA’s definition of “reentry vehicle” as a vehicle designed to return from Earth orbit or outer space to Earth substantially intact.¹⁶⁹ We note that because “reentry vehicle” under this definition could be applicable to either a launch vehicle or spacecraft designed to be capable of reentry, we specify that a reentry vehicle is regarded as a launch vehicle in the context of a space launch operation only to the extent that it is being used for launch

¹⁶² See NTIA/NASA Comments at 13.

¹⁶³ *FNPRM*, 36 FCC Rcd at 7789, para. 60 n.169.

¹⁶⁴ *FNPRM*, 36 FCC Rcd at 7789, para. 60.

¹⁶⁵ SpaceX Comments at 10; Relativity Comments at 4.

¹⁶⁶ NTIA/NASA Comments at 13.

¹⁶⁷ See 47 CFR § 87.5 (defining “expendable launch vehicle” as “[a] booster rocket that can be used only once to launch a payload, such as a missile or space vehicle” and “reusable launch vehicle” as “[a] booster rocket that can be recovered after launch, refurbished and re-launched”).

¹⁶⁸ See 14 CFR § 401.7 (defining “expendable launch vehicle” as “...a launch vehicle whose propulsive stages are flown only once” and “reusable launch vehicle” as “...a launch vehicle that is designed to return to Earth substantially intact and therefore may be launched more than one time or that contains vehicle stages that may be recovered by a launch operator for future use in the operation of a substantially similar launch vehicle”).

¹⁶⁹ See 14 CFR § 401.7 (defining “reentry vehicle” as “...a vehicle designed to return from Earth orbit or outer space to Earth substantially intact. A reusable launch vehicle that is designed to return from Earth orbit or outer space to Earth substantially intact is a reentry vehicle.”).

purposes.¹⁷⁰

53. *Permissible operations.* In the *FNPRM*, we noted that the *Report and Order* limited non-Federal use in the 2200-2290 MHz band to telemetry and tracking operations of launch vehicles during pre-launch testing and launch operations.¹⁷¹ Because the 2200-2290 MHz allocation was originally limited to the 2208.5-2213.5 MHz, 2212.5-2217.5 MHz, 2270-2275 MHz, and 2285-2290 MHz sub-bands, the *FNPRM* sought comment on whether we should remove any presumptive limitation to the four sub-bands in the service rules to the extent that we permit use beyond the original four sub-bands.¹⁷² Further, the *FNPRM* also proposed to restrict the commercial launch use of the 2025-2110 MHz band to telecommand uplink transmissions from the ground controller stations to the space launch vehicle.¹⁷³ Noting the heavy usage of this band by BAS, CARS, and LTTS operations, as well as by Federal entities for space operations, Earth exploration satellite, space research, fixed, and mobile uses, the *FNPRM* asked whether it is feasible to accommodate uses in addition to the space launch telecommand uses.¹⁷⁴

54. We will clarify in our service rules that the use of the entire 2200-2290 MHz band is permissible for all launch vehicle-to-ground communications associated with telemetry and tracking operations, and the 2025-2110 MHz band is available for all ground-to-launch vehicle telecommand uses necessary to support space launch operations. As discussed above in Section III.A., we are revising Footnote US96 to enable use of the entire 2200-2290 MHz band. Accordingly, we find that it is necessary to also make clear in our service rules, in addition to the changes made to Footnote US96, that space launch telemetry activities are permitted throughout the band.

55. Further, given that the 2025-2110 MHz band is heavily used, we find it necessary to limit the band to telecommand operations.¹⁷⁵ As noted, certain commenters advocate for a broad range of permissible uses in this band, including those that do not fall under the definition of “space launch operations” above.¹⁷⁶ NTIA, however, supports limiting commercial space launch use of the band to telecommand transmissions from the ground controller stations to the launch vehicle.¹⁷⁷ While other commenters, such as the Society of Broadcast Engineers (SBE) and Engineers for the Integrity of Broadcast Auxiliary Services Spectrum (EIBASS), do not speak specifically as to whether to permit uses beyond telecommand activities, they do warn of the difficulties with managing use and avoiding interference among the users of the band.¹⁷⁸ Given the increasingly heavy use of the 2025-2110 MHz band and the importance in ensuring that incumbent operations are adequately protected, we find that we should not expand space launch uses beyond telecommand for this band.

56. Permissible uses for the 2200-2290 MHz and 2025-2110 MHz bands, therefore, will be limited to telemetry, tracking, and command activities for space launch operations. Telemetry, tracking, and command necessary to support space launch operations may include, but are not limited to: (1) pre-launch testing, such as pre-flight checks, ground testing, and telemetry; (2) vehicle tracking, including the

¹⁷⁰ While there are no mentions in the record of reentry vehicles that are also used as launch vehicles, we seek to avoid adopting a “launch vehicle” definition that may be rendered obsolete by future industry developments. *See* Relativity Comments at 4.

¹⁷¹ *FNPRM*, 36 FCC Rcd at 7792, para. 67.

¹⁷² *FNPRM*, 36 FCC Rcd at 7792, para. 67.

¹⁷³ *FNPRM*, 36 FCC Rcd at 7793, para. 69.

¹⁷⁴ *FNPRM*, 36 FCC Rcd at 7793, para. 69.

¹⁷⁵ We note that as in the case with Federal space operations using this band, non-Federal space launch operations must protect BAS, CARS, and LTTS operations, as well as any previously granted Federal space launch operations.

¹⁷⁶ *See, e.g.*, SpaceX Comments at 6; Spaceflight Comments at 3.

¹⁷⁷ NTIA/NASA Comments at 13.

¹⁷⁸ *See generally* SBE Comments; EIBASS Comments.

transmission of parameter data from a launch vehicle to ground; (3) telecommand signals for propulsive maneuvering of a launch vehicle and separation of payload from launch vehicle; and (4) telecommand signals for propulsive maneuvering of a reentry vehicle for return and recovery.

57. We emphasize that these telemetry, tracking, and command communications are authorized only during space launch operations as we have defined above. This includes preparation for launch, launch of the launch vehicle, the launch vehicle's flight path, release of payload, and recovery or reentry of the launch vehicle.¹⁷⁹ On-orbit communications after a launch vehicle separates from its payload are outside the scope of the service we adopt today. We recognize that there may be circumstances where telemetry, tracking, or command activities may be necessary for the incidental orbital period of a launch vehicle before or after it has separated from its payload. We will allow such incidental use only to the extent necessary to successfully complete a launch operation. However, incidental use must be limited only to the extent necessary, and communications on these frequencies that are not related to space launch operations as defined are not permitted.

58. *Launch Vehicle-Satellite Communications.* In the April 2021 *FNPRM* we sought comment on the possibility of authorizing communications between space launch vehicles and satellite systems used for data relay, noting that radios designed as earth stations for communications with the Globalstar or Iridium satellite systems have been used on space launch vehicles in order to utilize those systems for data relay, including for TT&C purposes.¹⁸⁰ Given this, we asked whether these types of operations should continue to be licensed on an experimental basis. In response to these questions, Globalstar asserted that authorization for these types of operations in the L-band at 1610-1626 MHz should continue on an experimental basis only, given the limited number of launch vehicle customers and limited nature of the message traffic.¹⁸¹ Several other commenters generally voiced support for allowing such operations, while others noted concerns.¹⁸² We agree with Globalstar that currently the experimental licensing process serves as an adequate mechanism for licensing these types of communications. As Globalstar points out, current demand for these operations is limited.¹⁸³

c. Eligibility

59. In the *FNPRM*, the Commission sought comment about the appropriate eligibility criteria for holding commercial space launch licenses.¹⁸⁴ The Commission proposed to use the supplemental eligibility criteria for Part 87 flight test stations as a model for eligibility criteria.¹⁸⁵ Under that model, commercial space launch license applicants would need to qualify as either: (1) an operator or manufacturer of a commercial space launch or reentry vehicle or space launch or reentry vehicle components; (2) a parent corporation or its subsidiary if either corporation is an operator or manufacturer of a space launch or reentry vehicle or space launch or reentry vehicle components; or (3) an educational institution or a person primarily engaged in the design, development, modification, and flight test evaluation of a launch or reentry vehicle or launch or reentry vehicle components.¹⁸⁶

60. After reviewing the record, we adopt a modified version of the Part 87 model and *FNPRM* proposal. Specifically, in order to be eligible to hold a commercial space launch license, an applicant must qualify as one of the following: a non-Federal entity that conducts space launch

¹⁷⁹ Boeing Comments at 6.

¹⁸⁰ See *FNPRM*, 36 FCC Rcd at 7817, para. 145.

¹⁸¹ Globalstar Reply at 1-4.

¹⁸² See NASA Comments "Enclosure" at 5; SpaceX Comments 4-6; *but see, e.g.*, NAB Comments at 2.

¹⁸³ Globalstar Reply at 3.

¹⁸⁴ *FNPRM*, 36 FCC Rcd at 7793-94, paras. 72-73.

¹⁸⁵ *FNPRM*, 36 FCC Rcd at 7793, para. 72 (citing 47 CFR § 87.301).

¹⁸⁶ *FNPRM*, 36 FCC Rcd at 7793, para. 72 (citing 47 CFR § 87.301).

operations, or a parent of such entity or a subsidiary of such entity if either conducts space launch operations. Commenters expressed unanimous support for providing eligibility for commercial space launch licenses to those individuals and entities that conduct space launch operations.¹⁸⁷

61. We decline to extend eligibility at this time to educational institutions and persons engaged in the design, development, modification, and flight test evaluation of a launch or reentry vehicle or launch or reentry vehicle components, as proposed in the *FNPRM*.¹⁸⁸ Commenters expressed concerns over extending eligibility in this fashion, arguing, for example, that such operations would be difficult to monitor and control.¹⁸⁹ While NAB and Boeing do not object to allowing vehicle manufacturers eligibility, given the congested nature of the bands at issue, we opt to limit eligibility for permanent authorization at this time to only those entities that conduct commercial space launch operations, as recommended by NTIA/NASA. We may revisit our eligibility criteria in the future, if needed.

62. We also decline to require commercial space launch license applicants to include a separate certification with their application to establish eligibility.¹⁹⁰ As Boeing observed, license applicants using Form 601 already must certify as to their eligibility to hold the license for which they are applying.¹⁹¹ General Certification Statement 7 on Form 601 requires the applicant certify that “it has reviewed the appropriate Commission Rules defining eligibility to hold the requested license(s), and is eligible to hold the requested license(s).”¹⁹² We conclude that requiring a separate eligibility certification would be a superfluous requirement for license applicants.

d. Shared Frequency Use and Cooperative Use of Facilities

63. Consistent with our decision to allocate the 2025-2110 MHz band for commercial space launch operations on a secondary basis and modify our previous allocation of the 2200-2290 MHz band,¹⁹³ we adopt our proposal to provide non-Federal space launch operators access to both bands on a shared, non-exclusive basis.¹⁹⁴ We understand that these allocations will be used by space launch operators to conduct telemetry, tracking, and command operations of launch vehicles during pre-launch testing and space launch operations and that they will more than often be working with the same launch site operators given the finite number of suitable launch sites. As we noted in the *FNPRM*, given the potential for many different launch vehicle operators to use a given launch facility, authorizing commercial space operations on a shared and cooperative basis appears to be a reasonable approach for providing spectrum access to multiple space launch entities.¹⁹⁵ We find therefore that providing access on a shared, non-exclusive basis will offer the burgeoning commercial space launch industry a more predictable, collaborative, and flexible means of gaining access to spectrum, one that will provide greater regulatory certainty and foster continued growth in this sector.

64. Our decision is supported by the record in this proceeding as the majority of commenters filed in support of spectrum sharing on a non-exclusive basis through the use of coordination techniques.

¹⁸⁷ See, e.g., Boeing Comments at 9-10; NTIA/NASA Comments at 14; NAB Comments at 2.

¹⁸⁸ *FNPRM*, 36 FCC Rcd at 7793-94, para. 72.

¹⁸⁹ NTIA/NASA Comments at 14; NAB Comments at 2.

¹⁹⁰ *FNPRM*, 36 FCC Rcd at 7794, para. 73.

¹⁹¹ Boeing Comments at 9-10.

¹⁹² See FCC Form 601 at 6, available at <https://www.fcc.gov/sites/default/files/fcc-form-601-main-schedule-a.pdf>.

¹⁹³ See *supra* at Section III.A.

¹⁹⁴ See *FNPRM*, 36 FCC Rcd at 7794, para. 74.

¹⁹⁵ See *FNPRM*, 36 FCC Rcd at 7794, para. 74. We note that, in this context, shared use status, while non-exclusive, does not mean that a licensee will be required to accept interference as we will require licensees to submit their launch operations to post-license coordination to protect co-frequency Federal and non-Federal users against harmful interference.

SpaceX suggested that to promote and support commercial spectrum for space operations, the Commission should grant licenses on a shared, coordinated, non-exclusive, and nationwide basis.¹⁹⁶ Astra states that the intermittent nature of space launch operations facilitates spectrum sharing and promotes non-exclusive licenses.¹⁹⁷ SIA advocated for a licensing framework modeled after the former 3650-3700 MHz fixed operations licensing model where launch operators would obtain nationwide, non-exclusive licenses for shared spectrum use with spectrum deconfliction and third-party frequency coordination facilitating spectrum sharing in addition to mandatory post-licensing spectrum coordination with NTIA and other co-frequency non-launch operators.¹⁹⁸ ULA also advocates for the use of the 3650-3700 MHz licensing model to grant non-exclusive nationwide licenses to users who agree to share the spectrum and use a third-party frequency coordinator like AFTRCC, prior to registering and operating a given site, with coordination occurring with NTIA, government AFCs, and co-frequency non-launch operators.¹⁹⁹ Boeing supports non-Federal space launch licensees sharing spectrum on a non-exclusive basis and expects licensees to coordinate and to be protected from harmful interference from other users.²⁰⁰

65. We received few responses to the question raised in the *FNPRM* regarding whether the Commission should adopt a non-discrimination policy for all space launch operations similar to the rule imposed by the Part 87 rules on access to flight test facilities.²⁰¹ None of these commenters support imposing such a requirement. Boeing asserts that the non-discrimination rules for Part 87 flight test stations are irrelevant to space launch licenses because space launch communications equipment will not be shared unless various commercial entities contractually agree on sharing arrangements.²⁰² Boeing argues that this will be true regardless of whether the communications facilities are positioned at Federal

¹⁹⁶ SpaceX Comments at 12. SpaceX states that shared nationwide licensing can be achieved with post-licensing coordination and de-confliction. SpaceX Reply at 4. SpaceX asserts that this will remove the need for competitive bidding and facilitate launch operations. SpaceX Comments at 12.

¹⁹⁷ Astra Reply at 3-4.

¹⁹⁸ SIA Comments at 3-4, 8-9. SIA asserts that the use of non-exclusive licenses to permit spectrum sharing for launch and reentry operations meets the policy objectives of Section 309(j) of the Communications Act of promoting economic growth and enhancing telecommunication offerings just like 3650-3700 MHz where the Commission chose not to auction spectrum because it was in the public interest to share the spectrum. SIA Comments at 9-11; *see also discussion infra* at Section III.B.1.h (Application Process).

¹⁹⁹ ULA Comments at 2-4. ULA asserts that launches depend on a myriad of variable factors so pre-license grant coordination is unnecessary, but post-license grant deconfliction and coordination will be required. ULA Comments at 4-6.

²⁰⁰ Boeing Comments at 10. Several other commenters also suggested that coordination would facilitate spectrum sharing. Spaceflight indicated that coordination techniques (*i.e.*, low duty cycles, predictable transmission times, and location) will make sharing possible and that granting deployment service and launch service operators equal access to the bands will ensure deployment services remain viable. Spaceflight Comments at 5. AIA supports shared frequency slots, with wider bandwidths, on a temporary basis where sharing will last months not years. AIA Comments at 2.

²⁰¹ *See FNPRM*, 36 FCC Rcd at 7794-95, paras. 75-76. The *FNPRM* sought comment on the practices involving ground stations at Federal ranges and FAA-licensed sites and whether the Commission should adopt rules providing for non-discriminatory access to these facilities by non-Federal space launch entities to support the existing and future needs of commercial space launch entities. In the context of flight test operations, a Part 87 rule enables the shared use of facilities, which reduces costs to licensees and promotes efficient use and competition in the aviation industry. Specifically, under section 87.307, the Commission licenses only one flight test land station per airport, but it requires that these stations be made available without discrimination, on a cooperative maintenance basis, to anyone eligible for a flight test station license. 47 CFR § 87.307. Section 87.307 permits additional flight test land stations if an applicant can demonstrate that sharing of an existing flight test land station is not possible and that the addition of another land station will not result in significant degradation of the reliability of the existing station. *See* 47 CFR § 87.307(d).

²⁰² Boeing Comments at 10.

or non-Federal launch facilities and that therefore the Commission's non-discrimination rules for Part 87 flight test stations should not be adopted for space operations.²⁰³ We agree with Boeing that the cooperative use of space launch facilities are more appropriately addressed through the use of private contractual arrangements and will not impose a non-discrimination policy in this context. Moreover, because we grant licenses on a shared, non-exclusive basis at a nationwide level,²⁰⁴ we will not be issuing only a single site-based authorization per launch site, which, as SpaceX points out, obviates the need for the Commission to adopt a non-discrimination requirement because launch vehicle operators will have other sites around the country to choose from.²⁰⁵

e. Licensing

66. In the *FNPRM*, the Commission indicated that its goals in licensing space launch operations are two-fold: (1) to encourage innovations and investments in the U.S. space commerce; and (2) to ensure a regulatory environment conducive to the establishment of a competitive U.S. commercial space launch sector while protecting Federal and other users in the bands.²⁰⁶ To meet these goals and to facilitate the shared spectrum access approach discussed above, we will issue space launch licenses on a nationwide, non-exclusive basis.

67. The Commission sought comment on various licensing models with the aim of providing regulatory certainty in the marketplace while minimizing administrative burdens and duplicative regulations.²⁰⁷ Specifically, the Commission asked commenters whether it should consider applying a site-based licensing model in a shared use situation as fixed, well-defined areas of operation can simplify coordination during the application process for services requiring frequency coordination, and facilitate intensive spectrum sharing.²⁰⁸ The Commission also suggested that a site-based approach would enable stakeholders to identify quickly licensees in the band and their specific areas of operation in the event interference issues arise thus allowing parties to resolve such issues in the shortest timeframe practicable.²⁰⁹

68. The Commission also sought comment on other licensing models that may be suitable in the space launch operations context.²¹⁰ Among other things, the Commission asked whether it should consider a new approach combining various aspects of space-based services and aeronautical service licensing rules or whether it would be appropriate to license space launch vehicles similar to space stations and their communicating ground/earth stations on a single or multiple site basis.²¹¹ In addition to inquiring about conditioning ground/earth station operations on the filing of a certification that any required frequency coordination has been satisfactorily completed prior to a space launch, the Commission asked whether it could license space launch operations in a manner similar to previous licensing models applicable to certain wireless services such as the 3650-3700 MHz band.²¹² In doing so, the Commission sought to provide space launch operators access to various spectrum bands on a non-exclusive, yet protected, basis, subject to measures designed to promote shared use of spectrum, such as a

²⁰³ *Id.*

²⁰⁴ We discuss the granting of nationwide, non-exclusive licenses in further detail below. *See discussion infra* at Section III.B.1.e (Licensing).

²⁰⁵ SpaceX Comments at 12 n.27 with accompanying text.

²⁰⁶ *See FNPRM*, 36 FCC Rcd at 7795, para. 77.

²⁰⁷ *Id.*

²⁰⁸ *See FNPRM*, 36 FCC Rcd at 7795, para. 78.

²⁰⁹ *See FNPRM*, 36 FCC Rcd at 7795, para. 78.

²¹⁰ *See FNPRM*, 36 FCC Rcd at 7795-96, para. 79.

²¹¹ *See FNPRM*, 36 FCC Rcd at 7795-96, para. 79.

²¹² *See FNPRM*, 36 FCC Rcd at 7795-96, para. 79.

registration and frequency coordination requirement prior to each launch.²¹³ The *FNPRM* also considered ways to reduce potential administrative burdens and streamline the information that would be needed for initial licensing and then registration and coordination prior to a planned launch.²¹⁴

69. As discussed above, we find that space launch access to spectrum on a shared basis is appropriate and we find that permitting such access on a nationwide basis similar to the licensing mechanism established for the 3650-3700 MHz band is also warranted. There is wide support in the record for licensing commercial space launch operations on a nationwide, non-exclusive basis covering related launch vehicles across multiple launch sites.²¹⁵ We find that such an approach will give certainty to licensees and provide the efficiencies of scale and scope that will spur innovation, investment, and rapid deployment of space launch services.

70. We also agree with commenters who assert that a licensing framework based on nationwide, non-exclusive licenses offers a number of distinct advantages over a site-based licensing regime. As Boeing points out, a nationwide approach in parallel with a real time coordination database will provide the benefits of a site-based licensing scheme without the added complexity given that any changes in launch operations can be easily updated in the database and resolved after all other users are informed.²¹⁶ SpaceX advocates against a licensing scheme that grants only a single authorization per launch site because multiple providers may each need access to spectrum and a shared, non-exclusive nationwide authorization would cover all spectrum bands and all phases of a commercial space operation, including operations outside the United States.²¹⁷ While Astra suggests that a site-based licensing approach would be an improvement over the cumbersome STA licensing process, it also asserts that a site-based approach fails to acknowledge that space launch operations do not consist of a single “site” but instead use multiple sites, each of which is integral to a successful launch.²¹⁸ Astra argues therefore in favor of a single, nationwide license that will relieve the administrative burden on space launch operators by covering the full range of facilities used by a space launch operator, including all ground stations, radars for launch vehicle tracking, and the launch vehicle itself, as well as all the stages of launch and frequency bands to be used, with the expectation that the license will be valid for an unlimited number of launches during the license period.²¹⁹ Moreover, Astra asserts that maintaining all of an operator’s sites under a single nationwide license not only eases the administrative burden but would also enable other interested parties to understand all of the sites that are authorized for use by a particular launch operator.²²⁰ In short, the record shows that a single nationwide, non-exclusive license offers greater administrative and regulatory efficiencies than either a site-based licensing regime or the arduous STA

²¹³ See *FNPRM*, 36 FCC Rcd at 7796, para. 79.

²¹⁴ See *FNPRM*, 36 FCC Rcd at 7795-96, paras. 79-80.

²¹⁵ See ULA Comments at 1-2; Boeing Comments at 11-12; SpaceX Comments at 12; SIA Comments at 3-4; AIA Comments at 1; Northrop Grumman Reply at 6-8; Astra Reply at 3-4; Momentus Reply at 1-2. As discussed *infra* at Section III.B.1.h (Application Process), assigning spectrum through nationwide, non-exclusive licenses would not result in mutually exclusive applications and thus these spectrum licenses are not subject to the competitive bidding requirements of section 309(j) of the Communications Act.

²¹⁶ Boeing Comments at 12. Boeing also opposes issuing licenses specific to a particular launch vehicle or transmitting station because it would be cumbersome to apply this approach to launch vehicles that, for the most part, are not reusable. Boeing Comments at 12.

²¹⁷ SpaceX Comments at 12-13. To support the use of a single, comprehensive license, SpaceX pointed out that the Commission recognized that “not all operators will seek authorization for all of the bands at issue,” and “even where an applicant seeks multiple frequency bands, the applicant may not have the same site or area of operation for each of the bands.” SpaceX Comments at 13.

²¹⁸ Astra Reply at 3-4.

²¹⁹ Astra Reply at 3-4.

²²⁰ Astra Reply at 3-4.

process, particularly as the volume of commercial space launch activities continues to grow.

71. Nationwide licensing offers the advantages of a simpler, more streamlined application process that shifts the burden of information collection from the licensing stage to post-licensing site registration and per-launch coordination with the relevant Federal and non-Federal entities.²²¹ Moreover, nationwide, non-exclusive licensing offers space launch operators the benefit of only having to file a single license to cover a range of different launch sites shared by multiple co-frequency operators, a far more straightforward process than the site-by-site STA process. We agree with SpaceX that granting a series of authorizations by site, frequency band, and mission phase would create unnecessary burdens and that structuring the license in a comprehensive way enables each launch provider to have a “single, all-in-one authorization” to cover all of its activities thereby obviating the need for multiple licenses to cover different launch sites, different recovery sites, and different launch vehicles.²²²

72. From an operational standpoint, nationwide licensing offers space launch operators the flexibility to accommodate future expansion in the space launch industry as more launch sites (Federal or non-Federal) are constructed, new and improved launch vehicle technologies are introduced, and the number of licensees operating in the bands continues to grow. As ULA notes, nationwide licensing affords space launch operators the operational flexibility to launch from any U.S. launch site to account for the multitude of variables, including weather delays, payload changes, orbital-path and/or destination shifts, and other “uncontrollable” factors that can affect the location and timing of launches.²²³ Such flexibility is critical as launch vehicle operators are not always the same entity as the launch site operator, with variability from launch-to-launch in terms of the entities involved on any given launch on any given date and time.

73. Prospectively, nationwide, non-exclusive licensing also could provide us with a strong foundation to build upon as we develop a regulatory scheme that will accommodate space-to-space communications through the record being developed by the *Second FNPRM*.²²⁴ With the input of Federal and non-Federal stakeholders, we anticipate that we will develop a record to determine the best path forward for licensing on-orbit services, including RPO and OOS. As discussed in further detail below, we would pair a nationwide licensing scheme with post-licensing coordination to ensure cooperation with and avoid harmful interference to co-frequency entities.²²⁵ Post-licensing coordination under this framework would permit non-Federal licensees who are sharing the frequency bands to address specific areas of operation associated with each specific launch (launch site location and corresponding stations, launch vehicle, in-flight trajectories or coordinates, etc.) in a manner similar to existing coordination processes.

74. We conclude that the 3650-3700 MHz licensing framework that authorized nationwide, non-exclusive licenses for terrestrial operations on a cooperative shared basis offers a suitable template to license commercial space launch operations in a similar streamlined fashion.²²⁶ We base this conclusion on the unique nature of the service, including the variability of launches. We agree with SIA that a modified version of the 3650-3700 MHz licensing model would provide a good licensing framework for space launch operators to obtain nationwide, non-exclusive licenses for shared spectrum use.²²⁷ We also

²²¹ See SIA Comments at 8-9.

²²² SpaceX Comments at 13. Although SpaceX advocates for a single authorization that would cover all mission operations, such as launch, recovery, and orbital operations, the licensing mechanism we adopt here is limited to space launch activities at this juncture.

²²³ See ULA Comments at i, 2-4.

²²⁴ See discussion *infra* at Section IV.B (*Second FNPRM*).

²²⁵ See discussion *infra* at Section III.B.1.i (Frequency Coordination).

²²⁶ See SIA Comments at 3-4; ULA Comments at 2-4.

²²⁷ SIA Comments at 3-4.

agree with ULA that we should apply elements of the 3650-3700 MHz licensing framework, including the requirement that operators can obtain a nationwide license only if they agree to cooperate with and avoid harmful interference to co-frequency licensees and cannot commence operations until they register the sites affiliated with their launch service.²²⁸ In the 3650-3700 MHz proceeding, the Commission indicated that nationwide, non-exclusive licenses would serve as a prerequisite for registering individual fixed and base stations, *i.e.*, a licensee cannot operate a fixed or base station before registering it under its license and must delete registrations for unused fixed or base stations to facilitate proper coordination.²²⁹

75. Like the 3650-3700 MHz licensing regime, any space launch operator interested in obtaining a nationwide, non-exclusive license can do so on the condition that they agree to cooperate with and avoid harmful interference to co-frequency entities and complete coordination efforts to avoid in-band interference, including providing the information necessary to conduct coordination via site registration.²³⁰ All commercial space launch licensees in the band will have equal rights to the use of the spectrum as long as they comply with all applicable licensing, service, and operating rules but all the licensees will have a mutual obligation to cooperate and avoid causing harmful interference to other users in the band. Applicant qualification for non-exclusive nationwide wireless licenses in the space launch service will be assessed in accordance with FCC Form 601 and Commission rules.²³¹ There will be no limit to the number of non-exclusive nationwide wireless licenses that may be granted for the spectrum allocated to commercial space launch services, and these licenses will serve as a prerequisite for registering launch sites and operational parameters, space launch vehicle stations, individual ground/earth stations, and itinerant stations needed to support a launch.²³² We note that the registration process will be streamlined to the extent possible²³³ and will be done electronically through the Universal Licensing

²²⁸ ULA Comments at 2-4.

See Wireless Operations in the 3650-3700 MHz Band, ET Docket No. 04-151; *Rules for Wireless Broadband Services in the 3650-3700 MHz Band*, WT Docket No. 05-96; *Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band*, ET Docket No. 02-380; *Amendment of the Commission's Rules with Regard to the 3650-3700 MHz Government Transfer Band*, ET Docket No. 98-237, Report and Order and Memorandum Opinion and Order, 20 FCC Rcd 6502 (2005) (*3650-3700 MHz R&O*); *see also* 47 CFR § 90.1307 (Licensing).

²³⁰ *See 3650-3700 MHz R&O*, 20 FCC Rcd at 6512-13, para. 30.

²³¹ 47 CFR §§ 1.913-1.917. FCC Form 601 - *Application for Authorization in the Wireless Radio Service*.

²³² We will not require a space launch operator to obtain a construction permit before obtaining a space launch license. Given the variable nature of space launch operations and the fact that a space launch operator might not have ground facilities, we are not imposing a build-out or construction requirement. Space launch licensees will include both site owners/operators and launch vehicle operators, with the majority being commercial launch vehicle operators many of whom are using Federal launch facilities or FAA-certified sites that are already in existence. Moreover, like the 3650-3700 MHz model, we are allowing licensees to determine their individual business needs with respect to facility access, and by adopting a nationwide, non-exclusive licensing scheme instead of a site-based, exclusive licensing approach, we are providing launch vehicle operators, many of whom do not own their own launch sites, with operational flexibility and the ability to access a wide range of launch facilities around the country. With regard to the construction permit requirement of section 319(d) of the Communications Act, the radios on launch vehicles will be mobile stations so their operators will be exempt from needing a construction permit. *See* 47 U.S.C. § 319(d). To the extent that launch site operators are subject to Section 319(d) given their non-common carrier status, we find that a waiver of the construction permit requirement is warranted and would serve the public interest, convenience, and necessity by, among other things, expediting the provision of space launch communications services and promoting innovation and investment in the United States commercial space launch industry.

²³³ Licensees will be required to provide information necessary for identification and location of fixed, base, and itinerant stations (*e.g.*, latitude and longitude) as well as mobile stations associated with the launch vehicle and technical information on each station's operation to facilitate interference analysis (*e.g.*, bandwidth, frequency and antenna characteristics).

System (ULS) as suggested by several commenters.²³⁴ The initial filing date for these commercial space launch licenses, along with directions on how to use the ULS, will be announced in a future Wireless Telecommunications Bureau (WTB) Public Notice. We note that in order to keep the ULS licensing and registration database for space launch services accurate and up-to-date, we delegate to the WTB the authority to adopt rules regarding the reporting of database information including reporting of any license or secondary markets transactions. The WTB will issue a Public Notice seeking comment on these issues, as appropriate.²³⁵

76. As stated above, we are hereby creating a new rule Part 26 that will set forth the licensing, operation, and service rules for the space launch service. With respect to their regulatory status under the Communications Act, space launch service licensees operating in these shared use bands will be providing services on a non-common carrier basis²³⁶ after they obtain their licenses and register the launch site and corresponding fixed, base, and itinerant stations as well as mobile stations associated with the launch vehicle to comply with post-license grant coordination requirements. Consistent with the non-exclusive nature of the licensing scheme we are adopting here, we will not impose any spectrum aggregation limits, either in-band or out-of-band, or eligibility restrictions other than the eligibility criteria discussed above in section III.B.1.c above and statutory foreign ownership restrictions.²³⁷ All potential space launch service providers will have equal access to these bands and by opening this spectrum to as wide a range of eligible applicants as possible, we aim to encourage new entry and investment as well as entrepreneurial efforts to develop new launch-related technologies and services, while helping to ensure efficient spectrum use. We further believe that this approach will promote economic opportunity and competition in the subject bands. We will not impose a performance or build-out requirement because space launch sites and launch vehicles may vary from launch to launch, making specific construction requirements impractical. Of course, any interested party is free to, depending on the site, construct facilities and may operate according to its particular business plan at any time, as long as it has a valid wireless license, registers its stations, and complies with coordination requirements as well as other applicable rules. However, we strongly expect space launch service providers to consult with NTIA in advance of commencing construction on a new launch site. We conclude such a consultation is in the provider's best interest, as providers will have the information needed from NTIA to make an informed decision about whether to proceed with construction at a given site. Although we do not impose a performance requirement, we will require that space launch licensees delete registrations for unused sites and unused fixed, base, itinerant, and mobile stations in order to maintain ULS database integrity and facilitate efficient coordination between licensees.

77. Any eligible party may apply at any time for a license in these frequency bands regardless of the presence of other licensees in the geographic area where it intends to use the spectrum

²³⁴ See Boeing Comments at 9, 15; SBE Comments at 7; EIBASS Comments at 4; Boeing Reply at 10-11; EIBASS Reply at 1-2.

²³⁵ Any delegations in this Order to WTB to adopt rules or procedures are subject to the requirements of the Administrative Procedures Act. See, e.g., *infra* paras. 75, 98 and Appendix A (adopting 47 CFR § 0.331(g)).

²³⁶ Regulatory status as a common carrier or non-common carrier depends on the services provided pursuant to the Communications Act. Section 153 of the Communications Act defines the term "common carrier" as "any person engaged as a common carrier for hire, in interstate or foreign communication by wire or radio or in interstate or foreign radio transmission of energy, except where reference is made to common carriers not subject to this Act [47 USCS §§ 151 et seq.]; but a person engaged in radio broadcasting shall not, insofar as such person is so engaged, be deemed a common carrier." See 47 U.S.C. § 153.

²³⁷ Sections 310(a) and 310(b) of the Communications Act, as modified by the Telecommunications Act of 1996, impose foreign ownership and citizenship requirements that restrict the issuance of licenses to certain applicants. 47 U.S.C. § 310(a), (b). We note that under the Act, an applicant requesting authorization for services other than broadcast, common carrier, aeronautical en route, or aeronautical fixed services would be subject to only section 310(a), which states "[t]he station license required under this Act shall not be granted to or held by any foreign government or the representative thereof." 47 U.S.C. § 310(a).

and licensees may assign or transfer their non-exclusive nationwide authorizations, upon application to and prior approval from the Commission.²³⁸ However, our decision to license the space launch services on a non-exclusive nationwide basis obviates the need to adopt partitioning and disaggregation provisions because partitioning and disaggregation is only pertinent in geographic licensing settings where the licensee has *exclusive* use of a particular area. For similar reasons, we need not make our spectrum leasing rules applicable to licensees because the non-exclusive licensing scheme we employ here, coupled with the required post-license coordination, permits a high degree of access and spectrum re-use in these bands by multiple users, while minimizing the likelihood of harmful interference. Accordingly, the spectrum leasing arrangements described in the *Secondary Markets Report and Order* are not applicable,²³⁹ and we do not see a need to apply those spectrum leasing rules and policies to this spectrum at this time.

f. Authorized bandwidth

78. In the *FNPRM*, the Commission proposed to grant licenses for commercial space launch operations using a 5 megahertz bandwidth for the 2200-2290 MHz band and sought comment on the appropriate bandwidth for the 2025-2110 MHz band.²⁴⁰ The Commission also sought comment on whether to permit licensees to use larger bandwidths upon adequate justification, and also on whether to authorize operations using a range of bandwidths instead of a fixed bandwidth of 5 megahertz.²⁴¹ After reviewing the record, as well as the space launch operations the Commission has licensed on experimental bases to date, we will issue licenses of any bandwidth a licensee chooses, up to 5 megahertz, for both bands. In the event a licensee requires a bandwidth greater than 5 megahertz, we will authorize a bandwidth exceeding 5 megahertz upon adequate justification for why such bandwidth is necessary for space launch operations in a particular launch. For purposes of such requests, licensees must demonstrate that the bandwidth requested is that which is necessary to accomplish the specific telemetry, tracking, or command operation(s) at issue. This framework is similar to our licensing of the 2360-2395 MHz band space launch telemetry and telecommand operations, which are licensed on a range of bandwidths capped at 5 megahertz, with larger bandwidths available on a case-by-case basis.²⁴²

79. Given that the majority of requests for experimental licenses for the 2200-2290 MHz band to date have requested bandwidths smaller than 5 megahertz,²⁴³ we find it appropriate to impose a 5 megahertz maximum bandwidth limitation. In light of the existing usage of this band, we find it appropriate to limit the authorized bandwidth to only that which is generally necessary for a launch. We note that the limit for federal space launches using the 2200-2290 megahertz band is 5 megahertz,²⁴⁴ and NASA supports applying a 5 megahertz maximum bandwidth to non-federal launch operations as well.²⁴⁵ While there was limited discussion in the record regarding the appropriate bandwidth limit for the 2025-2110 MHz band, NOAA notes that federal entities are limited to a maximum bandwidth of 5 megahertz in both the 2025-2110 MHz and 2200-2290 MHz bands in order to reduce congestion and to ensure

²³⁸ See FCC Form 603.

²³⁹ See *Promoting Efficient Use of Spectrum through Elimination of Barriers to the Development of Secondary Markets*, WT Docket No. 00-230, Report and Order and Further Notice of Proposed Rulemaking, 18 FCC Rcd 20604, 20643-44 (2003) (*Secondary Markets Report and Order*) (spectrum leasing policies apply to services in which licensees hold exclusive use rights with respect to the spectrum).

²⁴⁰ *FNPRM*, 36 FCC Rcd at 7796-97, paras. 81-82.

²⁴¹ *FNPRM*, 36 FCC Rcd at 7796-97, para. 81.

²⁴² 47 CFR § 87.303(d)(3) (authorizing bandwidths of 1, 3, or 5 megahertz for the 2345-2395 MHz band, but permitting larger bandwidths on a case-by-case basis).

²⁴³ *FNPRM*, 36 FCC Rcd at 7796, para. 81.

²⁴⁴ See NTIA Manual § 8.2.41.

²⁴⁵ NTIA/NASA Comments at 9.

compatibility with existing operations.²⁴⁶ We conclude that it would be appropriate to apply a 5 megahertz limit to non-federal uses of the 2025-2110 MHz band for these reasons as well. While some industry commenters advocated for an authorized bandwidth exceeding 5 megahertz,²⁴⁷ we find that a 5 megahertz limit for both the 2025-2110 MHz band and the 2200-2290 MHz band will help to lessen impacts to other users in these bands, and put commercial space launch operators on par with federal entities as well as those using the 2360-2395 MHz band for launch operations. And as explained below, we are allowing licensees to exceed the 5 megahertz bandwidth to the extent they can demonstrate such additional bandwidth is necessary for a given launch.

80. Further, we find that allowing licensees to choose their own bandwidth, up to 5 megahertz, will provide licensees with the flexibility to undertake a variety of commercial space launch activities, including future industry developments. No commenters opposed this approach, while NASA supports allowing non-federal users to use any bandwidth up to and including 5 megahertz, noting that the narrower emissions will be easier to coordinate with existing Federal users.²⁴⁸ For those reasons, we will allow licensees to choose a bandwidth of any size, up to 5 megahertz.

81. While we find that we should impose a maximum bandwidth of 5 megahertz as a means to help lessen the impact of commercial space launch operations on these bands, we are aware that there may be instances when wider bandwidths may be necessary for a given launch. We therefore find it appropriate to permit commercial space launch operators to use bandwidths exceeding 5 megahertz on a case-by-case basis. Several commenters advocate for bandwidths exceeding 5 megahertz. United Launch Alliance states that allowing bandwidths greater than 5 megahertz will reduce operation costs and provide needed spectrum.²⁴⁹ Boeing argues that larger bandwidths will provide significant benefits to commercial space launch operators.²⁵⁰ The AIA also supports mechanisms that would permit access to wider bandwidths in certain circumstances.²⁵¹ Conversely, NASA argues that authorized bandwidth should be capped at 5 megahertz, arguing that the same restriction applies to Federal users in the 2200-2290 MHz range.²⁵² However, bandwidths exceeding 5 megahertz in the 2200-2290 MHz band are available to Federal users upon adequate justification.²⁵³ In addition, commercial launches in the 2200-2290 MHz range using bandwidths exceeding 5 megahertz have been successfully coordinated with NTIA in the past.²⁵⁴ Similarly, as noted, although launch operations in the 2360-2395 MHz band have a limit of 5 megahertz, our rules permit applicants to seek authorization for wider bandwidths.²⁵⁵

82. Accordingly, for those commercial space launch operators seeking authorizations for bandwidths exceeding 5 megahertz in the 2200-2290 MHz and 2025-2100 MHz bands, we will apply the NTIA framework for such requests.²⁵⁶ Specifically, the requesting space launch operator shall submit a

²⁴⁶ NTIA/NOAA Comments at 27.

²⁴⁷ ULA Comments at 28; SpaceX Comments at 16; AIA Comments at 1-2.

²⁴⁸ NTIA/NASA Comments at 9, 14.

²⁴⁹ ULA Comments at 28.

²⁵⁰ Boeing Comments at 20.

²⁵¹ AIA Comments at 2.

²⁵² NTIA/NASA Comments at 13.

²⁵³ See NTIA Manual § 8.2.4.1.

²⁵⁴ See, e.g., Space Exploration Technologies Corp., Special Temporary Authorization, Call Sign WG9XHP, ELS File Nos. 1895-EX-ST-2020, 0126-EX-ST-2021, 0249-EX-ST-2021.

²⁵⁵ 47 CFR § 87.303(d)(3). Applications for greater bandwidths are considered in accordance with the provisions of 47 CFR § 87.135.

²⁵⁶ See NTIA Manual § 8.2.41. Section 87.303(d)(3) provides that applications for bandwidths greater than 5 megahertz may be submitted for the 2360-2395 MHz band, but does not specify a framework for those requests.

justification as part of the registration process for a launch on why the requested bandwidth is necessary for the specific TT&C space launch operation, including an explanation of why the operator's requirements cannot be satisfied using a bandwidth of 5 megahertz or less. The applicant's justification will be carefully assessed to determine whether a request for bandwidth in excess of 5 megahertz for a given launch will be granted. Such requests will not be routinely granted given the goal of limiting impacts to other users in the band. As discussed below, all launch operations must be coordinated; we note that, given the heavy usage of these bands, it may be difficult to successfully coordinate operations involving requests for bandwidths greater than 5 megahertz.

g. License Term and Renewal

83. We adopt a ten-year license term for commercial space launch operations. In the *FNPRM*, the Commission tentatively concluded that a ten-year term would provide sufficient certainty and flexibility for space launch providers.²⁵⁷ The Commission has applied ten-year license terms to similar services, such as Part 87 aviation,²⁵⁸ Part 90 radiolocation,²⁵⁹ and Part 90 telemetry and remote control operations.²⁶⁰ More generally, ten-year license terms are common among the Commission's various wireless services.²⁶¹ Several commenters support our ten-year term proposal.²⁶² Boeing, for example, agrees that a ten-year license term would appropriately balance the need for continued Commission oversight with the goal of minimizing unnecessary administrative burdens.²⁶³

84. SpaceX and Astra advocate for 15-year license terms. More specifically, SpaceX advocates for parity with space stations and earth stations, which are licensed for up to 15-year terms, and argues that operations at a given launch site will take place for an extended period of time.²⁶⁴ Astra argues that a 15-year license term will provide space launch providers with greater operational certainty.²⁶⁵ We do not agree that a longer 15-year term is necessary for commercial space launch operations. Regarding space stations and earth stations, the operation of satellite communications under Part 25 presents a distinct set of factors from space launch considerations, including the scope and extent of deployment.²⁶⁶ Although the Commission has also adopted 15-year license terms under certain

²⁵⁷ *FNPRM*, 36 FCC Rcd at 7797, para. 83.

²⁵⁸ 47 CFR § 87.27.

²⁵⁹ 47 CFR § 90.149(a).

²⁶⁰ See 47 CFR § 90.20(d)(34), (91), (92) (authorizing telemetry and remote control operations on certain Public Safety Pool frequencies); 47 CFR § 90.149(a) (ten-year term for all services authorized under Part 90, including the Public Safety Pool).

²⁶¹ See, e.g., 47 CFR § 24.15 (ten-year term for Personal Communications Services); 47 CFR § 27.13(a) (ten-year term for Wireless Communications Services); 47 CFR § 27.13(b) (ten-year term for 700 MHz Services); 47 CFR § 27.13(g), (i), (j) (ten-year term for Advanced Wireless Services); 47 CFR § 95.1912 (ten-year term for 218-219 MHz Service); 47 CFR § 95.1705 (ten-year term for General Mobile Radio Service).

²⁶² ULA Comments at 13-14; Boeing Comments at 13; SIA Comments at 8-9.

²⁶³ Boeing Comments at 19.

²⁶⁴ SpaceX Comments at 16-17.

²⁶⁵ Astra Reply at 8.

²⁶⁶ For example, while the Commission agreed that a 15-year license term with respect to the 2 GHz Mobile Satellite Service band would provide increased certainty, the longer license term was largely adopted to allow operators to attract the extremely large amount of capital necessary to deploy a global system, and to also accommodate the lifespan of the satellites providing service—factors that are not applicable to a space launch operation. See *The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band*, IB Docket No. 99-81, Report and Order, 15 FCC Rcd 16127, 16175-16176, paras 101-103 (2000). The Commission also indicated that the longer license term in that instance could also serve to assure continuity of service to consumers, to reduce the burden associated with the grant of ad hoc extensions, and to acknowledge the great expense of procuring the initial license. *Id.* at 16177, para. 105.

circumstances for non-satellite wireless services, it has done so to address circumstances not present here, such as the complexities surrounding 5G deployment, relocation and repacking of incumbent operations, and support for network expansion and densification.²⁶⁷ We instead agree with SIA that a ten-year term is sufficient to provide launch operators with the certainty of a longer license term, and will encourage launch operators to make long-term investments.²⁶⁸ And while we seek to provide commercial space launch operators with as much certainty as possible, we also find it necessary to set timeframes that will enable us to adequately verify that licensees are operating within their authorized parameters. Given the congested nature of the bands at issue, we conclude that such review should take place after ten years, not 15.

85. Given the heavy use of these bands, we also find it appropriate to require space launch operators to demonstrate that they qualify for license renewal. In the *FNPRM*, the Commission sought comment on whether to require commercial space launch licensees to make a renewal showing, such as certifying that they are operating consistent with their initial application for authorization or that they have complied with the required coordination.²⁶⁹

86. In 2017, the Commission harmonized the renewal processes for numerous Wireless Radio Services (WRS).²⁷⁰ The Commission determined that a site-based WRS licensee would meet our renewal standard if it could certify that it is continuing to operate consistent with its most recently filed construction notification (or most recent authorization, when no construction notification is required), and make certifications regarding permanent discontinuance and substantial compliance with Commission rules and policies.²⁷¹ The Commission also provided that, for geographic-based licenses to qualify for renewal at the end of an initial license term, the licensee must show that it timely constructed to any level(s) required by the service-specific rules for either provision of service to the public or for the licensee's private and internal needs, and, thereafter, consistent with the Commission's permanent discontinuance rules, continuously provided service or operated at or above the required level(s) for the remainder of the license term.²⁷² The *WRS Order* does not apply to Wireless Radio Services that are licensed by rule or on a "personal" basis or that have no construction/performance obligation.²⁷³

87. Because launch operations are dissimilar to most other wireless services, we do not find it appropriate to apply to commercial space launch licensees the same renewal standards that are applied to geographic-based or site-based WRS licensees. Instead, a commercial space launch licensee will be entitled to renewal if it remains otherwise qualified and can certify that (1) it has operated and is continuing to operate consistent with Commission rules and the terms of its existing authorization, and (2)

²⁶⁷ See *Facilitating Shared Use in the 3100-3550 MHz Band*, WT Docket No. 19-348, Second Report and Order, Order on Reconsideration, and Order of Proposed Modification, 36 FCC Rcd 5987, 6029, paras. 116-17 (2021); *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Report and Order and Order of Proposed Modification, 35 FCC Rcd 2343, 2384-85, paras. 90-91 (2020).

²⁶⁸ SIA Comments at 8-9.

²⁶⁹ *FNPRM*, 36 FCC Rcd at 7798, para. 85.

²⁷⁰ See Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and JOI to Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Services, WT Docket No. 10-112, Second Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 8874 (2017) (WRS Renewal Reform 2nd R&O and *FNPRM*).

²⁷¹ *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd 8874, 8882, para. 19.

²⁷² *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd 8874, 8878, para. 10; 8883-86, paras. 19-24. For subsequent renewals, the licensee was required to demonstrate that it continuously provided service to the public or operated under the license to meet the licensee's private, internal communications needs, at or above the level required to meet the final construction requirement during the initial term of the license.

²⁷³ *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd 8874, 8880, para. 13.

it has complied with the required coordination throughout its license term.²⁷⁴ Given the nature of space launch operations (for example, there may be significant periods of time between launches), we will not apply discontinuance of operations rules.

88. Most of those commenting on this issue support a presumptive renewal expectancy and oppose renewal showings.²⁷⁵ Commenters that oppose the use of a renewal showing claim that one is not necessary given the non-exclusive nature of the band, which, commenters claim, prevents spectrum warehousing by itself.²⁷⁶ While we agree that a non-exclusive band presents different considerations from an exclusive licensing regime, we conclude that imposing this requirement will aid the Commission in verifying that space launch entities are operating within licensed parameters, thereby helping to manage use and prevent interference within congested bands. As noted in the *FNPRM*, we conclude that requiring a renewal showing from commercial space launch entities would facilitate efficient spectrum use by ensuring that licensees use the spectrum productively, collaboratively, and in compliance with Commission rules.²⁷⁷ For that reason, we adopt the aforementioned renewal standard.

h. Application Process

89. ***Background.*** The *FNPRM* sought comment on the application process to be used to assign commercial space launch licenses.²⁷⁸ The Commission also sought comment on whether assignment of space launch operations licenses is subject to Section 309(j) of the Communications Act²⁷⁹ but noted that the shared, non-exclusive licensing it was proposing for the spectrum bands at issue would not result in mutually exclusive applications and thus would not be subject to such competitive bidding requirements.²⁸⁰ The Commission stated that it aimed to establish an application framework that would increase the regulatory certainty while reducing the administrative burden on space launch operators and sought comment on whether applicants should seek authorizations by either filing an FCC Form 601 and applicable schedules through ULS or to use aspects of Form 312 and Schedule S through the International Communications Filing System (ICFS).²⁸¹

90. The *FNPRM* asked commenters to weigh in on the appropriate type of licensing scheme, including site-based licensing or a nationwide non-exclusive licensing application process that would be coupled with a planned launch coordination registration.²⁸² In addition to asking about the most efficient and effective way to license space launch operations that will provide operators with substantial benefits

²⁷⁴ Commercial space launch licenses will be subject to the standard electronic filing requirements applicable to renewal applications set forth in section 1.949(a) of the Commission's rules. See 47 CFR § 1.949(a).

²⁷⁵ Boeing Comments at 13 (advocating for presumptive renewal expectancy and no built out or minimum usage requirements); Northrop Grumman Reply at 17-18 (urging traditional, routine renewal process); Astra Reply at 8 (renewal showing not needed).

²⁷⁶ Northrop Grumman Reply at 17-18; Astra Reply at 8.

²⁷⁷ *FNPRM*, 36 FCC Rcd at 7798, para. 85.

²⁷⁸ See *FNPRM*, 36 FCC Rcd at 7798, para. 86.

²⁷⁹ Specifically, Section 309(j) of the Communications Act requires that the Commission assign initial licenses through the use of competitive bidding when mutually exclusive applications for such licenses are accepted for filing, except in the case of certain specific statutory exemptions. See 47 U.S.C. § 309(j)(1), (2). Section 765(f) of the Communications Act also states that “[n]otwithstanding any other provision of law, the Commission shall not have the authority to assign by competitive bidding orbital locations or spectrum used for the provision of international or global satellite communications services.” 47 U.S.C. § 765f. We note that the Commission's authority to assign licenses through competitive bidding expired on March 9, 2023.

²⁸⁰ See *Implementation of Section 309(j) of the Communications Act — Competitive Bidding*, PP Docket No. 93-253, Second Report and Order, 9 FCC Rcd 2348, 2351, para. 13 (1994).

²⁸¹ See *FNPRM*, 36 FCC Rcd at 7798-99, para. 87.

²⁸² See *FNPRM*, 36 FCC Rcd at 7799-7800, paras. 88-91.

in terms of flexibility and efficiency, and facilitate rapid implementation of the service, the Commission sought comment on how to allow applicants to request authorization covering all launches within their license terms.²⁸³

91. *ITU Process.* The *FNPRM* noted that the International Telecommunication Union (ITU) Radio Regulations are treaty provisions binding on the United States, and require that no transmitting station may be established or operated by a private person or by any enterprise without a license by or on behalf of the government of the country to which the station in question is subject.²⁸⁴ Because space launch operations could cause harmful interference in other countries, the Commission sought comment on its proposal to require applicants to submit appropriate draft documentation for submission to the ITU and whether there are other alternatives, including bi-lateral coordination with affected countries, to coordinate and minimize harmful interference from any FCC authorized space launch operation.²⁸⁵ The *FNPRM* also sought comment more generally on the ITU process as it relates to space launch vehicle licensing and operations.²⁸⁶

92. *Space Launch Vehicle Operations with Earth Stations Outside the United States.* In the *FNPRM* we noted that launch vehicle flight paths commonly extend downrange beyond the United States, which would require the launch vehicle to communicate with earth stations outside the U.S., particularly in the 2025-2110 MHz and 2200-2290 MHz bands. We sought comment on the best way to authorize the use of the relevant spectrum bands to account for these operations. We also sought comment on the role that ITU coordination should have in a licensing approach that would address the need for down-range communications during launch.

93. *Operations Inside the United States with non-United States Space Launch Vehicles.* We also sought comment on the inverse situation: how the Commission should authorize U.S.-licensed earth station operations communicating with space launch vehicles originating from a non-U.S. launch site and not otherwise licensed to communicate with earth stations in the United States.²⁸⁷ We sought comment on whether to adopt a process for ground station operators to request communications with these launch vehicles and noted the Part 25 rule allowing U.S.-based earth station operators to apply for authority to communicate with non-U.S.-licensed space stations.²⁸⁸

94. *Discussion.* As an initial matter, we conclude that it serves the public interest and the Commission's policy objectives to promote innovation and investment in the United States commercial space launch industry by assigning non-exclusive nationwide licenses for the space launch services which will not result in mutually exclusive applications and therefore will not be subject to the competitive bidding requirements of section 309(j) of the Communications Act.²⁸⁹ Consistent with our decision to

²⁸³ See *FNPRM*, 36 FCC Rcd at 7799-7800, para. 89.

²⁸⁴ See *FNPRM*, 36 FCC Rcd at 7800, para. 92, citing International Telecommunication Union (ITU) Radio Regulations, No. 18.1 (2015).

²⁸⁵ See *FNPRM*, 36 FCC Rcd at 7800, para. 92.

²⁸⁶ See *FNPRM*, 36 FCC Rcd at 7800-01, para. 93.

²⁸⁷ See *FNPRM*, 36 FCC Rcd at 7801-02, para. 96.

²⁸⁸ See, e.g., 47 CFR § 25.137. See also *Amendment of the Commission's Regulatory Policies to Allow Non-U.S. Licensed Space Stations to Provide Domestic and International Satellite Service in the United States*, IB Docket No. 96-111, Report and Order, 12 FCC Rcd 24094 (1997) (DISCO II).

²⁸⁹ Our decision herein to adopt a licensing scheme that avoids mutual exclusivity comports with the competitive bidding approach set forth in the Commission's Balanced Budget Act proceeding. In the *BBA Report and Order*, the Commission established a framework for exercise of the Commission's auction authority, as expanded by the Balanced Budget Act. See *Implementation of Section 309(j) and 337 of the Communications Act of 1934 as Amended*, WT Docket No. 99-87, Report and Order and Further Notice of Proposed Rulemaking, 15 FCC Rcd 22709, 22718-22723 (2000) (*BBA Report and Order*). The *BBA Report and Order* affirmed that, in identifying

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adopt a non-exclusive nationwide licensing scheme, we will adopt an application process modeled after the 3650-3700 MHz licensing framework to permit space launch operators access to various spectrum bands on a non-exclusive basis, subject to measures designed to promote shared use of spectrum, that will impose a post-license grant frequency coordination and registration requirement prior to each launch.

95. *Application Form and Licensing Database.* Building on our decision to utilize a modified version of the 3650-3700 MHz licensing model, we will require space launch operators to apply for and obtain a nationwide, non-exclusive license in ULS. Once licensed, space launch operators, working through a third-party coordinator, must coordinate each launch with NTIA and other non-Federal users, as discussed *infra*. After that per-launch, per-site coordination process has been successfully completed, space launch operators must then register in ULS the technical and operating parameters associated with the coordinated launches. Only after the final technical parameters of a given launch are registered under their license can space launch operators commence their launch service subject to the condition that they re-coordinate a launch if operational details change and agree to maintain and update those registered sites and stations, including deleting any unused or superceded launch site or station information to facilitate coordination. The information required for the application, coordination and registration processes will be identified in a Public Notice.²⁹⁰

96. A number of commenters weighed in on the use of a common database to receive applications for launch operators seeking authorization to provide commercial space launch services and to register terrestrial sites and associated stations.²⁹¹ Some suggested supplementing applications with an online registration portal to monitor the review of license applications.²⁹² Several commenters advocated for the use of the Commission's existing licensing databases, Universal Licensing System (ULS) or International Communications Filing System (ICFS), and their associated forms and schedules.²⁹³ We agree with Boeing that requiring applicants to file FCC Form 601 and its associated schedules through the ULS would be expedient and administratively efficient²⁹⁴ and note that the 3650-3700 MHz band upon which we are basing our licensing approach has been successfully administered through ULS. We

which classes of licenses should be subject to competitive bidding, the Commission must pursue the public interest objectives set forth in Section 309(j)(3). *Id.* Although the Balanced Budget Act did not amend Section 309(j)(3)'s directive to consider certain public interest objectives in identifying classes of licenses and permits to be issued by competitive bidding, pursuant to that statute, Section 309(j)(1) did include a reference to the Commission's obligation to avoid mutual exclusivity under Section 309(j)(6)(E), which directs the Commission to use engineering solutions, negotiation, threshold qualifications, service regulations, or other means to avoid mutual exclusivity where it is in the public interest to do so. *See* 47 U.S.C. §§ 309(j)(1), 309(j)(3), 309(j)(6)(E). Accordingly, the *BBA Report and Order* affirmed that the Commission has a continuing obligation to attempt to avoid mutual exclusivity by the methods prescribed in Section 309(j)(6) only when doing so furthers the public interest goals set forth in Section 309(j)(3). *See BBA Report and Order*, 15 FCC Rcd at 22718-22723.

As a general matter, in determining whether to assign licenses through the use of competitive bidding, the Commission consistently has concluded that its obligation to avoid mutual exclusivity does not preclude it from adopting licensing processes in the non-exempt services that result in the filing of mutually exclusive applications where it determines that such an approach would serve the public interest. *Id.* In adopting the appropriate licensing scheme for any particular spectrum band, the Commission has interpreted its statutory obligation in a manner consistent with the opinion of the U.S. Court of Appeals for the D.C. Circuit which stated, "Section 309(j)(6)(E) imposes an obligation only to minimize mutual exclusivity 'in the public interest' and 'within the framework of existing policies.'" *See Benkleman Telephone Co. et al v. FCC*, 220 F.3d 601,606 (D.C. Cir. 2000), petition for rehearing on other grounds pending (citing *DIRECTV, Inc. v. FCC*, 110 F.3d 816, 828 (D.C. Cir. 1997)).

²⁹⁰ *See discussion supra* at Section III.B.1.e (Licensing).

²⁹¹ *See* ULA Comments at 2-4; Boeing Comments at 15; ICR Comments at 3-4; SpaceX Comments at 13; Northrop Grumman Reply at 17-18; Boeing Reply at 10-11; Industry Participants Reply at 9; Spaceflight Reply at 10.

²⁹² *See* Boeing Reply at 10-11; ICR Comments at 3-4.

²⁹³ *See* Boeing Comments at 15; SpaceX Comments at 13.

²⁹⁴ *See* Boeing Comments at 15.

therefore decline to use Form 312 and Schedule S and ICFS at this time. While several commenters urged us to consider using FCC Form 312 and Schedule S in the ICFS system in line with Part 25 authorizations,²⁹⁵ we agree with Boeing that Form 312 and Schedule S would require significant revisions to accommodate space launch licenses, changes that would be difficult to implement with the older ICFS software.²⁹⁶ We also find using the ULS database to field applications is consistent with our decision to create a new rule Part 26 for the space launch service rather than shoehorning a unique and fast developing service into existing rule parts like Part 87, Part 90, or Part 25.

97. *Filing requirements and station registration to facilitate post-licensing coordination with frequency coordinators and NTIA/DoD.* Having identified the appropriate application intake process, we now turn to the information that applicants will have to provide to obtain a nationwide, non-exclusive license to operate space launch services in the frequency bands at issue. We received only a few comments regarding the information that applicants should provide in an application. Northrop Grumman suggested that a nationwide license application would require identification of all relevant frequencies, technical parameters, launch sites, and ground stations.²⁹⁷ Northrop Grumman also asserts that each application would be subject to FCC public notice and approval processes and requirements, along with NTIA coordination.²⁹⁸ SBE suggested that each applicant should demonstrate that it has previously coordinated its proposed operations with the SBE frequency coordinator; that it has ascertained that its proposal will not constrain, preclude, nor interfere with incumbents in the band; and that a technical showing shows that its proposed operation will not create more than 0.5 dB increase in the noise threshold of a receiver at a fixed or temporary fixed Electronic News Gathering (ENG) receive site.²⁹⁹ We find that these comments have merit, but that technical data such as frequencies would be most useful for coordinating and registering specific launches. For purposes of applying for the nationwide, non-exclusive license, we find that it is only necessary for launch providers to provide administrative information and later register data associated with a specific launch operation, such as the name of the launch sites and their latitude, longitude, address, corresponding stations, and area of operation for mobile stations. Indeed, data such as frequencies and technical parameters will vary from launch to launch and are not necessary for assessing an application for a nationwide, non-exclusive license.

98. We will delegate to the WTB the authority to further review and refine the filing process. As stated previously,³⁰⁰ the initial filing date for these commercial space launch applications, along with directions on how to use the ULS, will be announced in a future WTB Public Notice.³⁰¹ Correspondingly,

²⁹⁵ See SpaceX Comments at 13; Northrop Grumman Reply at 17-18.

²⁹⁶ See Boeing Comments at 15. Moreover, as Industry Participants and Spaceflight point out, operators of on-orbit servicing (OOS) and rendezvous and proximity operations (RPO) would face challenges using Schedule S because the form is outdated (operators often request waiver of the form) and it is difficult to accurately represent novel systems with the form, particularly since OOS and RPO use spectrum very differently than most satellite missions under Part 25. See Industry Participants Reply at 9; Spaceflight Reply at 10. While we acknowledge the concerns raised regarding the use of ICFS and its corresponding forms and schedules to cover authorizations for on-orbit services, we must reiterate that the licensing mechanism and application process we adopt here is limited to space launch activities at this juncture.

²⁹⁷ Northrop Grumman Reply at 8-9.

²⁹⁸ *Id.*

²⁹⁹ SBE Comments at 18.

³⁰⁰ See *discussion supra* at Section III.B.1.e (Licensing).

³⁰¹ We find space launch services to be a new wireless radio service that would be subject to existing application fees under the 3-tiered schedule found in Section 1.1102 of the Commission's rules. Specifically, we find that applications in this new wireless radio service are deemed "site-based" pursuant to Section 1.1102(b) for purposes of application fees. See 47 CFR § 1.1102(b). Section 1.1102(b) defines site-based licensed services as services for which an applicant's initial application for authorization generally provides the exact technical parameters of its planned operations (such as transmitter

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we also delegate to the WTB the authority to specify application information, to make any necessary modifications to the FCC Form 601 and its related schedules, including any reprogramming of the ULS software, to accommodate the application and post-license site and station registration and frequency coordination process prior to each launch. The WTB will issue a Public Notice, in consultation with the Space Bureau and Office of Engineering and Technology, seeking comment on these issues, as appropriate, to further refine our online application process and accommodate frequency coordination.³⁰²

99. As discussed *infra*, we will require space launch operators to coordinate every launch with applicable Federal and non-Federal entities. While the WTB after seeking comment will issue a Public Notice identifying information that will be required with respect to the application and coordination processes as well as post-license grant registrations, licensees will likely be expected to provide, at a minimum, the same operational and technical parameters currently required of applicants seeking special temporary authority for their space launches to facilitate post-licensing coordination.³⁰³ We anticipate that licensees will identify requisite site and station information, including the specific coordinates of fixed, base, and itinerant stations (e.g., latitude and longitude), frequency channels, launch trajectories, launch window or planned launch date, and any other technical and operational information (e.g., antenna characteristics, power levels, emission designators, launch vehicle trajectory) needed by a third-party frequency coordinator to submit the launch coordination request to the relevant non-Federal and Federal entities. Other information could include coordinates and operational parameters of the earth/ground stations launch operators will be using to provide service at a particular launch site, including whether the sites are Federal or FAA-licensed commercial spaceports or non-Federal launch sites (e.g., Spaceport America in New Mexico and Mojave Air and Space Port in California). Operators may also be asked to provide any coordination agreements that they have already entered into with co-frequency entities or successfully completed coordination conducted by the designated frequency coordinator. As part of this post-license grant coordination process, launch providers must consistent with our service rules comply with the continuing obligation to update their licenses to ensure proper coordination. As noted, the WTB Public Notice will seek comment on collection of this coordination data as well.³⁰⁴

100. *Space Launch Vehicle Operations with Earth Stations Outside the United States.* ULA and SpaceX suggest that the Commission forego restrictions on launch vehicle spectrum operations outside the U.S. And ULA, as well as SIA, question whether the Commission has jurisdiction to regulate foreign earth stations' communication with U.S. launch vehicles. SIA asserts that a launch operator with a launch path that extends into a foreign territory must comply with the licensing requirements of that country for those communication needs. Similarly, Boeing suggests that the Commission allow the foreign regulatory authority to handle the licensing for any communications from within its territory with a U.S.-launched vehicle. Finally, Astra Space suggests that if non-U.S. launch operators are authorized to communicate with U.S. ground stations, a similar authorization should be made for U.S.-based launch vehicles that communicate with non-U.S. earth stations.

location, area of operation, desired frequency(s)/band(s), power levels). Geographic-based licenses, on the other hand, authorize an applicant to construct anywhere within a particular geographic area's boundary and generally do not require applicants to submit additional applications for prior Commission approval of specific transmitter locations. Although space launch entities will be authorized on a nationwide basis, the site-based designation is better suited for the per-launch registration process.

³⁰² Until we begin accepting applications for space launch services, launch operators will continue to apply for authorization under the normal STA process.

³⁰³ See discussion *infra* at Section III.B.1.i (Frequency Coordination).

³⁰⁴ The WTB Public Notice will outline the process for coordination to be followed by space launch operators in detail. NTIA may also establish a mechanism to help facilitate the coordination between non-Federal launch operations and Federal incumbents in these bands. In the event an NTIA coordination mechanism is established, WTB will issue a Public Notice with instructions regarding that coordination mechanism.

101. We agree with commenters that any launch vehicle operator that requires communication with a foreign earth station must obtain the necessary approvals for operations of the earth station from the appropriate regulatory body in that country. However, this does not mean that the launch vehicle can be correctly viewed as licensed by that same regulatory body. We are unaware of any ITU Administration that views a U.S. launch vehicle upper stage as a station subject to its licensing (See Article 18.1) simply because it communicates with an earth station within its territory, and similarly this is not the approach taken for non-U.S. launch vehicles communicating with U.S. earth stations. More generally our current licensing of space stations, including under Parts 5, 25, and 97, accounts for space station operations with earth stations outside the United States. The conditions that the Commission places on a satellite license continue to be in effect for the duration of satellite operations regardless of whether the satellite communicates with non-U.S. licensed earth stations, and in some circumstances the space station authorization may involve communications exclusively with earth stations outside the United States.

102. *Operations Inside the United States with non-United States Space Launch Vehicles.* We received limited comments on this issue.³⁰⁵ We agree with Boeing that there may not be a current demand for these types of communications. We conclude that we can address any requests for these communications through the experimental licensing process for the time being. We believe this approach addresses Astra Space's comments as well by providing an avenue for operators to seek authorization.

103. *ITU Process.* Commenters generally oppose requiring submissions to the ITU related to space launch operations. ULA, Northrop Grumman, and SIA assert that an ITU filing is unnecessary to the space launch licensing process given that there is no existing ITU filing process requirement for such operations.³⁰⁶ ULA and Northrop Grumman both note that engaging in a lengthy ITU filing process would be burdensome and unrealistic with the nature of short-duration space launch operations and the fleeting potential for harmful interference.³⁰⁷ Similarly, Boeing argues that because space launches often occur over major oceans, there is little concern for interference with international spectrum users but suggests that any potential concern with neighboring nations could be addressed through bilateral agreements.³⁰⁸ Astra Space also supports the notion of bilateral agreements with any affected countries to address interference concerns instead of an ITU filing requirement.³⁰⁹

104. We agree with commenters that under current circumstances many U.S.-based space launches may not result in the realistic potential for international harmful interference, particularly with respect to the first stage of a launch vehicle or a single stage launch vehicle, for which radio operations may be limited to line-of-sight communications with ground stations in U.S. territory and occur while the launch vehicle is over oceanic areas. As such, engaging in a filing process with the ITU might be viewed as an unnecessary administrative hurdle, and any interference concerns can be addressed bilaterally with adjacent countries. However, we also recognize our duty to carry out the United States' treaty obligations as a ratifying member of the ITU convention, and that this includes an obligation to ensure that U.S.-licensed operations do not cause harmful interference on an international scale.³¹⁰ This concern is of greater significance for launch vehicle upper stage operations involving earth stations outside the United States, as those operations do present the potential for interference in multiple countries. These competing considerations must be taken into account in determining whether ITU filings should either be

³⁰⁵ See Boeing Comments at 16-17; NASA Comments "Enclosure" at 4; Astra Space Reply at 9.

³⁰⁶ ULA Comments at 22-23; SIA Comments at 14; Northrop Grumman Reply at 16.

³⁰⁷ ULA Comments at 22-23; Northrop Grumman Reply at 16.

³⁰⁸ Boeing Comments at 16-17.

³⁰⁹ Astra Space Reply at 8-9.

³¹⁰ See ITU Convention, Art. 45 "Harmful Interference" ("All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Member States...."); see also ITU Radio Regulations, Vol. 1, Nos. 0.4, 4.3, 4.4 (2020).

uniformly required for licensed Part 26 operations, or whether operators should be exempted from such requirements.

105. A third option is to require applicants to submit appropriate draft documentation for submission to the ITU on a case-by-case basis, as is the current practice, if the scope and nature of the space launch operations would have the potential to cause harmful interference in another country. For example, the Commission may consider requiring a filing if the upper stages of a launch vehicle will be communicating with earth stations outside the United States. This would align the U.S. with the practice of other countries that submit materials to the ITU for upper stage orbital operations.³¹¹ We conclude that this third option is preferable. We will not adopt a blanket requirement that all space launches require an ITU filing, yet we do not preclude our ability to require such a filing in the event the Commission deems that such a filing would be necessary and prudent in order to avoid harmful interference with other countries. The Commission has taken steps to create a flexible licensing regime for space launches under the new Part 26, including allowing one launch license to cover multiple launches and nation-wide launch locations, and a 10-year license duration. Particularly given the longer-term aspects of the licensing approach adopted, requiring an ITU submission as part of the license application process will not create an undue burden to operators in the event a filing is deemed necessary and appropriate. We also note that the Commission will be bound by any future ITU requirements related to space launch filings and so our current position is subject to change upon the issuing of new ITU regulations in this area.³¹²

i. Frequency Coordination

106. In the *FNPRM*, the Commission sought comment on the appropriate coordination process between Federal and non-Federal entities to be used prior to the grant of an application for space launch frequencies as well as a coordination process for the ongoing use of these frequencies by operators during their license terms.³¹³ Historically, the Commission and NTIA's shared licensing authority has been guided by an established set of procedures for developing regulations for radio services in the shared bands and for authorizing frequency use by Federal agencies and Commission licensees. These procedures implement the obligation of NTIA and the Commission under their Memorandum of Understanding (MOU) that the agencies endeavor to give notice to each other of "all proposed actions that could potentially cause interference" to non-Federal and Federal operations respectively.³¹⁴

107. The Commission sought comment on whether it should require applicants for a license in space launch frequencies to undergo a pre-application coordination requirement similar to that specified in section 87.305, or whether, in the alternative, the Commission should impose a different coordination process.³¹⁵ The Commission noted that Federal entities seeking to use the 2025-2110 MHz band must complete a similar coordination process prior to submitting an application for authorization to NTIA, must coordinate with all BAS and other non-Federal incumbents that may be affected by the Federal operation prior to submitting an application, and must engage the local BAS frequency coordinator(s),

³¹¹ See, e.g., French ITU filing under the ASV network name, for the upper stages of the launch vehicle, listing various launch vehicle trajectories for operations from French Guiana; New Zealand ITU filing under the APOG, ELECTRONNZ, APSS network names.

³¹² Additionally, the ITU is currently studying suborbital operations and considering possible appropriate modifications to the radio regulations to account for spectrum use for these types of operations. See ITU Resolution 772 (WRC-19).

³¹³ See *FNPRM*, 36 FCC Rcd at 7802, para. 98.

³¹⁴ See *FNPRM*, 36 FCC Rcd at 7802, paras. 99-100. NTIA coordinates with Federal spectrum users through the Interdepartment Radio Advisory Committee (IRAC), a committee that includes representation from different government agencies, and typically includes a review period of 20 business days. Memorandum of Understanding Between the Federal Communications Commission and the National Telecommunications and Information Administration (Aug. 1, 2022), <https://docs.fcc.gov/public/attachments/DOC-385867A1.pdf> (MOU).

³¹⁵ See *FNPRM*, 36 FCC Rcd at 7803-04, paras. 102-03.

where available, in support of achieving such coordination.³¹⁶ In the event the Commission adopts a non-Federal allocation in the 2025-2110 MHz band, the *FNPRM* sought comment on whether to require commercial space launch operators to follow the same pre-application coordination process to help ensure that launch operations will not cause harmful interference to applicable non-Federal and Federal incumbents in the band, or if a different pre-application coordination, such as the process identified in section 87.305, should be applied.³¹⁷ The *FNPRM* asked commenters whether the Commission should appoint a designated frequency coordinator to streamline such a pre-application coordination requirement and whether it would be in the public interest to designate the AFTRCC as the frequency coordinator.³¹⁸

108. Because license terms may span several years, the *FNPRM* sought comment on post-grant coordination between space launch licensees and other users of the respective bands for separate launch operations. Pointing to the complicated logistics entailed in a space launch operation, as well as changes in the operational environment on and around Federal ranges and other sites that are likely to occur over time, the Commission indicated that it did not believe that a one-time coordination would be effective to cover all launches that occur during an operator's license term but wanted to avoid imposing a coordination process that is overly burdensome or that injects uncertainty as to spectrum access and asked commenters to propose solutions.³¹⁹ Specifically, the Commission sought comment on other coordination processes that are streamlined and efficient for space launch operators but would also adequately protect Federal operations consistent with the provisions of the Commission and NTIA's MOU.³²⁰ Commenters were asked to include detailed coordination procedures in their proposals, as well as the cost and benefits of the proposed process.

109. As a general matter, all of the commenters in the record support the use of frequency coordination and spectrum deconfliction to prevent harmful interference to co-frequency non-Federal/Federal operations and ensure the efficient use of spectrum in these bands.³²¹ Where they differ is when the coordination process should take place. While a few commenters argue in favor of a pre-license grant coordination approach,³²² most commenters favor a post-license grant coordination and spectrum deconfliction process.³²³ ULA asserts that pre-license grant coordination is unnecessary because operators will be required to satisfy the service and technical rules and that post-license grant deconfliction and coordination through a third-party organization as has been done in the past will

³¹⁶ See *FNPRM*, 36 FCC Rcd at 7804, para. 104.

³¹⁷ See *FNPRM*, 36 FCC Rcd at 7802, para. 104.

³¹⁸ See *FNPRM*, 36 FCC Rcd at 7804, para. 105.

³¹⁹ See *FNPRM*, 36 FCC Rcd at 7804-05, para. 106.

³²⁰ See *FNPRM*, 36 FCC Rcd at 7805, para. 107.

³²¹ See, e.g., AIA Comments at 1; ICR Comments at 3-4; EIBASS Comments at 1-2, 7-8; Industry Participants Comments at 9; Axiom Comments at 3; Northrop Grumman Comments at 9-12, 17-18; NCTA Comments at 6.

³²² NAB believes that to ensure incumbent broadcasters are protected, the Commission should require frequency coordination in the 2025-2110 MHz band prior to granting an authorization. NAB Comments at 1. SBE asserts that there should be a coordination requirement prior to and during the license term in the 2025-2110 MHz band and that SBE's frequency coordination manager and local market coordinator should be involved. SBE Comments at 16. AFTRCC weighed in on both pre- and post-licensing coordination, stating that pre-application frequency coordination, along with service and technical rules, is an effective tool in preventing interference and conflict and that the telemetry downlink operations in the 2200-2290 MHz band would benefit the most from pre-application coordination, but that post-license coordination will be necessary because the bands are heavily used by Federal operators and space launches occur over a limited duration — it asserts that the post-license coordination should resemble the STA process in which applicants are required to coordinate and schedule operations directly with government area frequency coordinators (AFCs). AFTRCC Comments at 4-7.

³²³ See ULA Comments at 4-6; 10, ULA Reply at 5-6; Boeing Comments at 15, 18-19; Boeing Reply at 13; SpaceX Comments at 14-15; SpaceX Reply at 4; SIA Comments at 5; Astra Reply at 5-6.

provide the flexibility for space launch operations that require spectrum at similar times and locations.³²⁴ Boeing asserts that the multi-factored variability of space launches renders a pre-licensing coordination process ineffective and believes that specific approval for a launch is best addressed within the post-licensing coordination process which provides licensees the ability to amend their license if the technical parameters of a launch provider's operation change.³²⁵ SpaceX does not believe it would be feasible to pre-coordinate launch activities under a nationwide licensing scheme, asserting instead that post-licensing coordination would ease the burden on Commission staff by going through NTIA and/or a coordination entity, depending on the degree of Federal or non-Federal presence in the band.³²⁶ SpaceX notes that Boeing and ULA correctly observe that variable parameters in space launches render a pre-licensing coordination process inefficient and points out that in advocating for a pre-licensing approach, NAB and SBE are failing to realize that the current 0.5 dB degradation criterion already ensures sufficient coordination.³²⁷ SIA points out that space launch and reentry parameters are variable to several uncontrollable factors thus making pre-licensing coordination not feasible, and suggests instead that third-party coordination and deconfliction would be better executed post-license grant given that launch providers would still need to comply with FCC service and technical rules prior to being granted a license.³²⁸ Astra opposes requiring launch operators to file certifications to the FCC for every completed coordination because they present an unnecessary administrative burden and supports a post-licensing coordination approach, suggesting that showing compliance with FCC rules, including coordination, during the application process is sufficient.³²⁹

110. Comments submitted by Federal stakeholders emphasize the importance of coordinating on a case-by-case, launch-by-launch basis to ensure that Federal users in the bands are protected from harmful interference. NASA supports the need for post-license grant coordination on a launch-by-launch basis with the details of such coordination to be the subject of a NTIA/FCC MOU covering commercial space launch coordination with pre-launch coordination requests to be submitted no less than 30 days before launch and a required response to be provided no less than 15 days after receipt.³³⁰ DoD believes that due to the interference potential in these bands and significant congestion in the 2025-2110 MHz and 2200-2290 MHz bands, coordination of each use by non-Federal users is vital and required.³³¹ Through this coordination DoD receives specific technical and operational details of a planned launch which allows DoD to assess the potential for harmful interference and adjust its operations or suggest

³²⁴ ULA Comments at 4-6. ULA points out that there is precedent for post-license grant coordination, citing non-Federal fixed-satellite service (FSS) licensees who currently coordinate use of the spectrum they share with Federal operations after they receive their licenses but at least fourteen days before they deploy service. ULA Comments at 9-10. Commenting on SBE's request for pre-license coordination, ULA asserts that SBE is ignoring the dynamic nature of space launches and that the plethora of variable parameters for short-duration operations renders pre-license coordination highly unlikely. ULA Reply at 5-6. ULA argues that SBE is overlooking the fact that traditional satellite systems have generally static parameters for long-duration operations making pre-license coordination of those operations feasible. ULA Reply at 5-6.

³²⁵ Boeing Comments at 15, 18. Boeing asserts that a pre-licensing coordination with non-Federal users could also raise significant anti-competitive concerns, Boeing Comments at iv, 18, but adds that while it's against requiring pre-license coordination, it's not opposed to permitting it only on a voluntary basis because it could expedite the inter-agency coordination process. Boeing Reply at 13. Boeing agrees with NASA that a post-grant launch-by-launch coordination process grants commercial spectrum users *de facto* interference protection. Boeing Reply 6.

³²⁶ SpaceX Comments at 14-15.

³²⁷ SpaceX Reply at 4. SpaceX supports using this criterion if it facilitates coordination in the 2025-2110 MHz band. *Id.*

³²⁸ SIA Comments at 5.

³²⁹ Astra Reply at 5-6.

³³⁰ NTIA/NASA Comments at 11, 14.

³³¹ NTIA/DoD Comments at 18, 21.

mitigations such as having the non-Federal user alter its operating parameters to facilitate a successful coordination.³³² NOAA supports coordination in both the 2025-2110 MHz and 2200-2290 MHz frequency bands for each launch and notes that Federal agencies undertake extensive inter-agency coordination efforts to ensure compatibility within these congested frequency bands so a similar level of effort must be required from commercial launch operators to ensure compatibility with existing Federal users.³³³

111. Based on the record in this proceeding, we find that post-license grant coordination will ensure cooperation with and avoid harmful interference to co-frequency entities, both Federal and non-Federal, operating in the 2025-2110 MHz and 2200-2290 MHz bands. We believe that post-license grant coordination in concert with a comprehensive nationwide, non-exclusive licensing regime will provide space launch operators access to the spectrum they need and relief from the administrative burdens associated with either a site-based licensing approval process or the current launch-by-launch STA regime. Post-license grant coordination will also endow them with the operational flexibility to modify their launch parameters (*e.g.*, frequency channels, antenna height, trajectory, power level) closer in time to the launch event and the latitude to adjust their services to accommodate demand as it arises.

112. We reach this decision based on the length of the license term (10 years) and a record that demonstrates the complicated logistics surrounding space launch operations, including multi-factored variability of launch elements that are beyond the licensee's control, as well as changes in the operational environment on and around Federal ranges and other sites that are likely to occur over time. On balance, these factors suggest that a one-time pre-licensing coordination would be insufficient to protect co-frequency entities from harmful interference in spectrum bands that commenters suggest are already congested.³³⁴ Moreover, given the anticipated growth of space launch services, we find that a one-time pre-licensing coordination is unlikely to cover all the space launches that will occur over the life of an operator's license nor would it be able to anticipate the introduction of new launch sites, changes in launch vehicles, or technological innovations that are likely to occur during those ten years. For these reasons, we believe that third-party coordination and spectrum deconfliction would be better executed post-license grant.

113. Post-licensing coordination affords space launch operators who are sharing these frequency bands (and launch facilities) the opportunity and flexibility to adjust specific areas of operation (site location, launch vehicle, or in-flight trajectories, etc.) as they come up with each individual launch event, particularly as they get closer to the scheduled launch date. For space launch operators seeking launch clearance, it is critically important that their post-grant coordination requests cover the key elements of a launch so they can adequately complete the required per-launch coordination process. Consistent with our decision to adopt allocation and service rules for space launch services for two distinct bands, 2200-2290 MHz (space-to-earth) and 2025-2110 MHz (earth-to-space), we will adopt a post-license grant coordination approach that takes into account the unique characteristics of these bands. We will also approach coordination in a manner that reflects our decision to apply a modified 3650-3700 MHz licensing framework³³⁵ to grant space launch operators a nationwide, non-exclusive blanket license

³³² NTIA/DoD Comments at 18. DoD notes that coordination of each use of 2025-2110 MHz is required. While DoD does not propose specific limits upon locations from which commercial space launch operations may occur, DoD does note that locations close to major DoD test and training ranges (excluding specific space launch ranges such as Vandenberg Space Force Base and Cape Canaveral Space Force Stations) may result in more challenging coordination scenarios due to impacts to DoD terrestrial operations. NTIA/DoD Comments at 21-22. DoD also notes that commercial space launch operations can impact more than just spectrum use, citing examples such as restrictions on airspace used for DoD testing, training, and exercises or DoD's ability to operate in a Global Position System-denied environment due to its potential impact on space launch operations. NTIA/DoD Comments at 22.

³³³ NTIA/NOAA Comments at 27.

³³⁴ *See, e.g.*, NTIA/NASA Comments at 12; NTIA/DoD Comments at 18, 21; NTIA/NOAA Comments at 27.

³³⁵ *See discussion supra* at Section III.B.1.d (Licensing).

on the condition that they agree to cooperate with and avoid harmful interference to co-frequency entities and cannot operate launch sites and corresponding radio stations (earth/ground stations, stations on their launch vehicles, and any associated mobile stations on the ground) until they have first registered them under their license after completion of coordination through a third-party coordinator.³³⁶

114. We find significant efficiencies justifying the use of a third-party frequency coordinator in the bands at issue. Given the variety of non-Federal and Federal stakeholders sharing this spectrum, all with different operational and technical needs, and the administrative burdens licensees face in having to submit to different coordination processes, we find it prudent to designate a single entity that will serve as both a clearinghouse and as an intermediary in negotiating operational parameters with SBE, NTIA, government AFCs, and co-frequency operators.³³⁷ Currently, space launch operators are tasked with determining the impact of their services on non-Federal and Federal users whose operations may or may not have already been coordinated by SBE to protect BAS, CARS, and LTTS in the 2025-2110 MHz band as well as the effect on co-frequency operators and Federal incumbents that must be protected in both bands. We find that a single third-party coordinator armed with knowledge of the operational guidelines imposed by prior coordination can cross reference that data with new requests for coordination in real time and act as an intermediary with SBE and NTIA to speed up the review process and thus expedite deployment in the bands. Absent the assistance of a centralized coordinator familiar with the operational and protection needs of non-Federal operators and Federal incumbents as well as the terms of previously completed launch coordination, individual space launch operators will find it far more difficult to navigate the requisite layers of approval in a timely fashion, particularly considering the short turnaround times and multi-factored variability of space launches and the fluctuating needs of Federal users in these heavily trafficked bands. Having a third-party entity perform those duties on behalf of the operators will streamline the coordination process, offer greater flexibility to operators as they approach scheduled launch dates, and ensure protection for incumbent operations against harmful interference.

115. Accordingly, we hereby adopt a post-license grant coordination regime that will be facilitated by a third-party space launch frequency coordinator and require a two-part process: (1) for the

³³⁶ As stated previously, space launch licensees also have an obligation to delete registrations for unused fixed, base, itinerant, and mobile stations. *See discussion supra* at Section III.B.1.d (Licensing).

³³⁷ A number of commenters support the designation of a third-party organization to serve as a frequency coordinator. AIA supports the creation of a nationwide, non-exclusive license process requiring post-license grant spectrum de-confliction by a neutral third-party such as AFTRCC and requiring operators to coordinate in good faith, even if coordination is facilitated by a neutral third-party. AIA Comments at 1. Stating that the Commission has repeatedly recognized the effectiveness of third-party frequency coordination, and noting that such an approach would be suitable for launch and entry operation, SIA asserts that AFTRCC or another qualified third-party facilitator can effectively handle the coordination process by taking on processes and capabilities to track launch pad and launch window availability; allow launch operators to schedule slots in anticipation of coordination; and ensure they schedule slots in good faith. SIA Comments at 4-7, Letter from Tom Stroup, President, SIA, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-115, RM -11341, at 4 (filed Nov. 9, 2023) (SIA Ex Parte). Astra advocates modernizing the coordination process by adopting an automated system or bringing in a third-party entity if such an approach isn't feasible. Astra Reply at 6-7. Pointing out that SIA, ULA, and Boeing support its designation as the frequency coordinator, AFTRCC asserts that it is well qualified to serve as the frequency coordinator and while it does not oppose the idea of an automated portal, AFTRCC points out that a third-party entity would have to be designated to build and manage the portal. AFTRCC Reply at 4-8 (citing SIA Comments at 7, ULA Comments at 6, and Boeing Comments at 18-19). AFTRCC states a frequency coordinator would serve as a single point of contact for applicants to initiate frequency coordination and licensing; verify that the applicant is qualified for the frequencies and that the frequency request is compliant with the allocation; verify that the requested frequencies will not conflict with any other proposed or existing frequency assignments within a specified area; and seek written concurrence from the applicable AFCs and coordinator(s) for any other non-Federal users in the shared bands (e.g., SBE for the 2025-2110 MHz band); and respond to the applicant in writing with the results of coordination including any conditions or limitations. Letter from Stephen J. Rosen, Counsel to AFTRCC, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-115, RM -11341, at 12 (filed Dec. 13, 2021) (AFTRCC Ex Parte).

2025-2110 MHz band, a site-specific coordination of the operator's stations and launch parameters with BAS operations; and (2) for both bands, coordination on a per-launch basis with NTIA. In practice, as described in more detail below, coordination processes for the two bands will be different given the existing 2025-2110 MHz coordination process currently conducted by the Society of Broadcast Engineers, Inc. (SBE) to protect BAS, CARS, and LTTS operations and previously coordinated Federal incumbents in the band.

116. *2025-2110 MHz Post-license Coordination (Earth-to-Space)*. Once a launch operator registers its site and corresponding station information with the Commission in ULS and it is made available to the space launch frequency coordinator, the coordinator will verify that the operator is licensed and then contact the SBE Frequency Coordination Manager and the relevant SBE local market coordinator for the 2025-2110 MHz band to initiate coordination for the local launch site to protect non-Federal incumbents.

117. For this process, we adopt an approach that mirrors the coordination approach that Federal users in the band must follow. As noted in the *FNPRM*, Federal entities seeking to use the 2025-2110 MHz band for TT&C uplink purposes must coordinate with all BAS and other non-Federal incumbents that may be affected by the Federal operation prior to submitting an application, and must engage the local BAS frequency coordinator(s) in support of achieving such coordination.³³⁸ In the context of pre-license grant coordination, the Commission sought comment on whether to require commercial space launch operators seeking to use the band to follow the same coordination process to help ensure that launch operations will not cause harmful interference to applicable non-Federal and Federal incumbents in the band.³³⁹ In its comments, SBE described this Federal precedent and pointed out that the terms of a subsequent SBE-NAB-DoD Memorandum of Understanding (MOU) are currently being used to coordinate Federal entities seeking to use the 2025-2110 MHz band for TT&C uplink purposes.³⁴⁰ EIBASS, NAB, and SpaceX supported the use of the BAS coordination approach set forth in the SBE-NAB-DoD MOU.³⁴¹

118. Accordingly, we adopt the same site-specific BAS coordination process (and any re-coordination of the launch site) for commercial space launch services for our post-license grant coordination regime. We find merit in SBE's suggestion that this means that each space launch communications operator, through a third-party space launch frequency coordinator, should either complete BAS coordination for its identified sites or provide a showing to the space launch frequency coordinator (a) that it has previously coordinated its proposed operations with the SBE Frequency Coordination Manager; (b) that it has ascertained that its proposal will not constrain, preclude, nor interfere with incumbents in the band, including BAS, CARS and LTTS licensees; and (c) that it has demonstrated in a technical showing that its proposed operation will not create more than 0.5 dB increase in the noise threshold of a receiver at a fixed or temporary fixed electronic news gathering (ENG) receive site.³⁴²

119. We do not anticipate that there is a need for a subsequent per-launch coordination with BAS as long as the site operation for the proposed launch is consistent with the technical characteristics

³³⁸ See *FNPRM*, 36 FCC Rcd at 7802, para. 104.

³³⁹ *Id.*

³⁴⁰ SBE indicated that footnote US92 to the Table of Frequency Allocations established a mechanism by which displaced Federal operations would be accommodated in the 2 GHz band without interference, and without constraint on the current and future deployment of BAS operations in the band and that this process has been effectuated by SBE, NAB, and DoD in an MOU that is in the final stages of development. See SBE Comments at 8-10 (citing 47 CFR § 2.106 footnote US92).

³⁴¹ See EIBASS Comments at 1; NAB Comments at 1, 4-7; SpaceX Reply at 4; see also SBE Comments at 8-10, 15-17.

³⁴² See SBE Comments at 2-3, 6-12, 18.

and launch parameters that were successfully coordinated previously and complies with any conditions or agreements resulting from such prior coordination. In other words, there is no need to conduct a per-launch coordination with BAS if the operator/frequency coordinator can perform the technical calculations to show its proposed uplink operations will meet the SBE-NAB-DoD protection criteria.³⁴³ We find that this approach will streamline the coordination process with BAS, particularly for space launch operators who provide multiple launches over their license term with the same sites that were previously coordinated and retain the same technical and operational characteristics. We note, however, that if these conditions are not met then the site must be re-coordinated pursuant to the site-specific BAS coordination process outlined above.

120. With respect to protecting Federal users in the band, we will require coordination with NTIA on a post-grant, per-launch basis. This process will be initiated after the operator obtains its license and provides applicable launch site and corresponding station information to the Commission in ULS, and submits this data, along with its proposed operational parameters, in a coordination request to the third-party space launch frequency coordinator. Given the variability of space launches, per-launch coordination offers an effective means of protecting co-frequency Federal users in the 2025-2110 MHz band from any potentially harmful interference stemming from a particular launch. We note that per-launch coordination is particularly well suited for accommodating the changing nature of Federal spectrum use. As demonstrated by NTIA's Federal Government Spectrum Use Reports, Federal spectrum uses and needs continue to evolve over time.³⁴⁴ The timely nature of a per-launch coordination with NTIA, facilitated by a third-party frequency coordinator, would account for the fluctuating needs of Federal TT&C used to track mobile satellites and the shifting demands of Federal mobile users that tend to change locations over time. We contemplate a process that will be functionally similar to the current per-launch STA coordination procedures. As noted in the record, frequency coordination has been an effective tool in ensuring equitable spectrum sharing by co-frequency non-Federal and Federal users without causing harmful interference.³⁴⁵ While we adopt baseline power and emissions standards to facilitate spectrum sharing and interoperability among Federal and non-Federal operations, as explained in further detail below, per-launch coordination will be critical in determining additional technical and operational parameters necessary to permit space launch operators to carry out missions without causing harmful interference to other users of the spectrum. Given the intermittent nature of space launch operations as well as evolving Federal spectrum uses, this targeted per-launch approach ensures timely and accurate guidance closer to the launch date by affording parties the flexibility to make adjustments necessary to protect co-frequency Federal users.

121. *2200-2290 MHz Post-license Coordination (Space-to-Earth)*. Similarly, for the 2200-2290 MHz band, a space launch operator must identify applicable site and corresponding station information with the Commission in ULS and make it, along with its proposed operational details, available to the third-party space launch frequency coordinator, who verifies that the operator is licensed and that the request comports with rules, to initiate the coordination process with NTIA. Coordination with NTIA will be functionally similar to the current STA coordination process (i.e., site-specific and per-

³⁴³ See EIBASS Comments at 4-5; EIBASS Reply at 6.

³⁴⁴ See National Telecommunications and Information Administration, Federal Government Spectrum Use Reports 225 MHz – 7.125 GHz available on the NTIA webpage at <https://ntia.gov/page/federal-government-spectrum-use-reports-225-mhz-7125-ghz>.

³⁴⁵ For example, noting that coordination of each use by non-Federal users is vital, DoD asserts that coordination provides it with specific technical and operational details that it uses to assess the potential for interference and then decide whether to accept the risk of interference, adjust its operations accordingly, or suggest other mitigations including changing the parameters of the non-Federal operations to facilitate successful coordination. See NTIA/DoD Comments at 18.

launch coordination with NTIA and the relevant Federal offices).³⁴⁶ Similar to the 2025-2110 MHz band, the coordination process will enable any necessary adjustments regarding the operational and technical parameters on a per-launch basis to protect against harmful interference.

122. We direct WTB to seek further comment on the circumstances attending the designation of a third-party space launch coordinator, including a mechanism for selecting a frequency coordinator.³⁴⁷ As noted, WTB will issue a public notice regarding the coordination process after reviewing the record, which will include information regarding the third-party frequency coordinator.

2. Technical Rules for Space Launch Operations

123. As noted in the *FNPRM*, we seek to establish technical parameters for commercial space launch operations that will support the evolving interests and requirements of commercial space entities while minimizing harmful interference between Federal and non-Federal operations.³⁴⁸ We proposed that the current framework applicable to Federal operators would offer a predictable and tested model that facilitates the efficient use of spectrum while minimizing interference among users in these bands,³⁴⁹ and proposed to adopt a similar set of technical rules for non-Federal space launch operations in the 2200-2290 MHz and 2025-2110 MHz bands.³⁵⁰ We find that adopting baseline emissions and power limits similar to that which currently apply to Federal operations will facilitate interoperability and greater predictability regarding operations in these bands. As discussed previously, however, the variability of space launches and the changing needs of Federal operations may require additional or alternative technical requirements for a given launch as determined pursuant to the coordination process. We conclude that adopting a technical framework that relies on close coordination between Federal and non-Federal entities as well as the use of similar emissions and power limits will help users of the bands to avoid harmful interference while allowing commercial launch providers to benefit from the economies of scale inherent from using the same communications systems for both Federal agencies and commercial customers.³⁵¹

a. 2200-2290 MHz Band

124. For non-Federal space launch operations, the 2200-2290 MHz band typically is used for sending telemetry data from the launch vehicle to ground controllers. According to NTIA, Federal operations in the band primarily consist of tracking, telemetry, and control data communications for control of spacecraft, as well as foreign space agency mission spacecraft.³⁵² NTIA explains that the band is used by Federal agencies in space operation, space research and Earth exploration-satellite service

³⁴⁶ The *FNPRM* indicated that the Commission grants space launch providers special temporary authority (STA) under the Part 5 experimental licensing rules to use particular frequencies on a non-interference basis during their operations. The Commission coordinates use of the spectrum with the National Telecommunications and Information Administration (NTIA), which consults with affected Federal agencies in order to authorize a single launch with the STAs covering pre-launch communications operations and communications with the space launch vehicle and payload during orbital and reentry phases of the operations. The *FNPRM* noted that these STAs are issued with the condition that any future launches by the grantees would be considered on a case-by-case basis and that there is no expectation that experimental STAs for future launches would be approved. See *FNPRM*, 36 FCC Rcd at 7767-68, para. 6.

³⁴⁷ See *infra* Appendix A (adopting 47 CFR § 0.331(g)).

³⁴⁸ *FNPRM*, 36 FCC Rcd at 7805, para. 108.

³⁴⁹ *FNPRM*, 36 FCC Rcd at 7805, para. 108.

³⁵⁰ *FNPRM*, 36 FCC Rcd at 7805, para. 108.

³⁵¹ *FNPRM*, 36 FCC Rcd at 7805-06, para. 109.

³⁵² National Telecommunications and Information Administration, Federal Government Spectrum Use Reports, 2200-2290 MHz, at 1 (Dec. 1, 2015), https://www.ntia.doc.gov/files/ntia/publications/compendium/2200.00-2290.00_01DEC15.pdf.

(space-to-Earth) for communications with earth stations and return links via TDRSS (space-to-space), which provides links between low earth orbiting spacecraft and earth stations. Federal agencies and the military also use this band for terrestrial telemetry operations for aircraft, missile flight testing, land and maritime mobile communications, and fixed point-to-point microwave relay communications.³⁵³

125. The *FNPRM* noted that space launch operations may potentially operate under a dual regulatory approach, and sought comment on the appropriate technical requirements under both a space operations and aeronautical mobile allocation.³⁵⁴ We asked whether these technical rules align with NTIA’s requirements for both Federal and non-Federal space operations and how we might promote consistency between and among the various, similarly situated services authorized in the band.³⁵⁵

126. *Emission masks.* In the *FNPRM*, we sought comment on whether to apply NTIA rules that require that earth and space stations in the space operations service above 470 MHz comply with the emissions mask standard established in section 5.6.2 of the NTIA Manual.³⁵⁶ Section 5.6.2 provides that for frequencies offset from the assigned frequency less than the 50 percent of the necessary bandwidth, no attenuation is required.³⁵⁷ At a frequency offset equal to 50 percent of the necessary bandwidth, an attenuation of at least 8 dB is required,³⁵⁸ while frequencies offset more than 50 percent of the necessary bandwidth should be attenuated in accordance with a specified formula dependent on necessary bandwidth and frequency displaced from the center of the emission bandwidth.³⁵⁹

127. Further, we noted that section 5.3.9 of the NTIA Manual provides that aeronautical telemetry operations in the 2200-2290 MHz band must meet the emissions limits from Chapter 2 of the Inter-Range Instrumentation Group (IRIG) Standard 106-15, Part 1.³⁶⁰ Chapter 2 of IRIG Standard 106-15, Part 1 (hereinafter IRIG Standard 106-15), in turn, includes the following aeronautical telemetry spectral mask: all spectral components larger than $-[55 + 10 \times \log(P)]$ dBc (*i.e.*, larger than -25 dBm) at the transmitter output must be within the spectral mask calculated using the following equation:

$$M(f) = K + 90 \log(R) - 100 \log |f-f_c|; |f-f_c| \geq R/m$$

where $M(f)$ = power (dBc) at frequency f (MHz)

$K = -20$ for analog signals

$K = -28$ for binary signals

$K = -61$ for FQPSK-B, FQPSK-JR, SOQPSK-TG

³⁵³ National Telecommunications and Information Administration, Federal Government Spectrum Use Reports, 2200-2290 MHz, at 1 (Dec. 1, 2015), https://www.ntia.doc.gov/files/ntia/publications/compendium/2200.00-2290.00_01DEC15.pdf.

³⁵⁴ *FNPRM*, 36 FCC Rcd at 7807, 7808, paras. 114, 117.

³⁵⁵ *FNPRM*, 36 FCC Rcd at 7807, para. 114.

³⁵⁶ See NTIA Manual § 5.2.2.1.

³⁵⁷ See NTIA Manual § 5.6.2 (“Unwanted Emission Mask”). Necessary bandwidth is defined as follows: “For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.” See NTIA Manual § 6.1.1. Methods of calculating necessary bandwidth are provided in Annex J. See NTIA Manual, Annex J. We note that the Commission also applies the same definition for “necessary bandwidth.” See, *e.g.*, 47 CFR § 2.1.

³⁵⁸ See NTIA Manual § 5.6.2.

³⁵⁹ See NTIA Manual § 5.6.2.

³⁶⁰ *FNPRM*, 36 FCC Rcd at 7807-08, para. 116. See NTIA Manual, §§ 5.2.2.1, 5.3.9. See also Telemetry Standards, “Transmitter and Receiver Systems,” IRIG Standard 106-15 (Part 1), Chapter 2, (July 2015) (IRIG Standard 106-15), available at <http://www.irig106.org/docs/106-15/>. The NTIA Manual provides that “aeronautical telemetering” in the 2200-2290 MHz band includes “telemetry associated with launch vehicles[.]” NTIA Manual § 4.3.4(2).

$K = -73$ for ARTM CPM

f_c = transmitter center frequency (MHz)

R = bit rate (Mbps) for digital signals or $(\Delta f + f_{\max})$ (MHz) for analog FM signals

M = number of states in modulating signal ($m = 2$ for binary signals, $m = 4$ for quaternary signals and analog signals)

Δf = peak deviation

f_{\max} = maximum modulation frequency³⁶¹

128. The *FNPRM* also sought comment on alternative approaches, stating that, while the Commission seeks to align the technical parameters used by Federal and non-Federal operations to enable interoperability, we also seek to implement measures that will help licensees to simplify or streamline operations, while ensuring that other users in the band are protected.³⁶² Accordingly, we requested comment on the utility of using a single mask for non-Federal operations in the band rather than NTIA's dual emissions mask approach.³⁶³ We asked, for example, whether to apply the section 5.6.2 space operations emissions mask to all stages of flight, or whether alternatively to apply emissions limits set forth in the Commission's rules for space stations found in Part 25³⁶⁴ or an alternative mask found in section 87.139.³⁶⁵

129. There was limited comment regarding the emissions limit(s) that should be applied. Of the few commenting on this issue, SpaceX supports the use of a single mask over NTIA's dual emissions mask approach, arguing that "this will avoid artificial delineations and enable commercial launch providers to treat launch activities as a single continuum..."³⁶⁶ SpaceX, noting that the Commission and NTIA have previously utilized a "unitary approach," argues that we should adopt the NTIA emissions mask for space operations for the 2200-2290 MHz band.³⁶⁷

130. ULA, however, supports following the NTIA's dual mask approach with one for space emissions and the other for aeronautical mobile emissions, noting that launch operators build vehicle

³⁶¹ See IRIG Standard 106-15, § 2.4.6.

³⁶² *FNPRM*, 36 FCC Rcd at 7808, para. 117.

³⁶³ *FNPRM*, 36 FCC Rcd at 7808, para. 117. The *FNPRM* observed that similar launch telemetry services in other bands have been subject to a single aeronautical standard at all stages. For example, the NTIA Manual provides that the 1435-1525 MHz band's terrestrial mobile service includes launch telemetry at all stages, including all "telemetry associated with launching and reentry into the Earth's atmosphere as well as any incidental orbiting prior to reentry of manned objects[.]" See NTIA Manual § 4.3.4(1). The Commission has also administered launch telemetry at all stages as an aeronautical mobile service. See 47 CFR 2.106, Table of Frequency Allocations, U.S. Table, US343; 47 CFR § 87.303(d)(1) (providing that frequencies in the 1435-1525 MHz and 2360-2395 MHz bands, with non-Federal allocations of Mobile (aeronautical telemetry) and Mobile, respectively, are assigned in the mobile service primarily for aeronautical telemetry including "telemetry and associated telecommand operations associated with the launching and reentry into the Earth's atmosphere, as well as any incidental orbiting prior to reentry, of objects undergoing flight tests").

³⁶⁴ See 47 CFR § 25.202(f).

³⁶⁵ *FNPRM*, 36 FCC Rcd at 7808, para. 117. Section 87.139 specifies that: (1) on any frequency removed from the assigned frequency by more than 50 percent, up to and including 100 percent of the authorized bandwidth, at least 25 decibels attenuation; (2) on any frequency removed from the assigned frequency by more than 100 percent, up to and including 250 percent of the authorized bandwidth, at least 35 decibels attenuation; and (3) on any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth, at least $43 + 10 \log(pY)$ decibels or 80 decibels, whichever is the lesser attenuation. 47 CFR § 87.139.

³⁶⁶ SpaceX Comments at 18.

³⁶⁷ SpaceX Comments at 18 (referencing NTIA Manual § 4.3.4(1), 47 CFR §§ 2.106 footnote US343 and 87.303(d)(1)).

designs around this method for current NTIA authorizations.³⁶⁸ Alternatively, ULA states that, if we opt to establish a uniform mask, it opposes the use of the IRIG Standard 106-15 as it would not be able to satisfy that standard during the space operations phase of flight.³⁶⁹ It argues that the IRIG Standard 106-15 emissions mask—covering land and mobile telemetry links—is based on non-orbital, aeronautical telemetry systems that use spectrally efficient modulation methods.³⁷⁰ ULA asserts that the IRIG Standard 106-15 mask, therefore, does not account for orbital launch vehicle links that rely on government earth stations that cannot support these modulations and, as a result, cannot comply with the mask.³⁷¹ To the extent a single mask is adopted, ULA would instead support the use of the section 5.6.2 space operation emission mask, noting that it accommodates all launch vehicles during their orbital phase while protecting co-frequency spectrum users.³⁷²

131. We agree with ULA that we should adopt NTIA’s dual mask approach, and our adoption of a Mobile allocation for this band facilitates this approach.³⁷³ As noted, NTIA regards launch vehicles as undergoing two stages: an aeronautical mobile stage and a space operation stage. The NTIA rules treat the telemetry system during the first stage of a launch vehicle as an aeronautical mobile system.³⁷⁴ The NTIA rules provide that after the first stage (which it views as the first 15 minutes of flight), the launch vehicle operates as a space operation service during the second stage or higher stages of a launch.³⁷⁵ As we have noted, we seek to align the technical parameters used by Federal and non-Federal operations to facilitate interoperability with respect to use of the 2200-2290 MHz band, and to provide predictability regarding such operations for other users of the band. While we appreciate SpaceX’s desire to avoid “artificial delineations,” the application of the dual approach best accommodates operations in this band as it is the approach that is already being utilized and which has proven to be effective in protecting operations in the band. Accordingly, we will apply the dual aeronautical mobile and space operation emissions masks similar to those found in the NTIA rules.

132. *Power limits.* As noted in the *FNPRM*, the IRIG Standard 106-15 that NTIA applies to aeronautical telemetry in the 2200-2290 MHz band provides that the effective isotropic radiated power of a transmitter shall not exceed 25 watts and that the output power shall not exceed 25 watts.³⁷⁶ In contrast, NTIA’s requirements for space operations do not impose a power limit, and instead rely on a power flux-density limit established by the ITU.³⁷⁷ The *FNPRM* sought comment on whether, consistent with the

³⁶⁸ ULA Reply at 7-8.

³⁶⁹ ULA Comments at 30; ULA Reply at 8.

³⁷⁰ ULA Comments at 29-30.

³⁷¹ ULA Comments at 29-30. ULA notes that it has no ground station system of its own and relies on modulation-limited government earth stations.

³⁷² ULA Comments at 30.

³⁷³ *See supra* Section III.A.

³⁷⁴ NTIA Manual § 8.2.44 (stating that the telemetry system on the first stage of a launch vehicle is considered an aeronautical mobile system as it starts from the ground and ascends until the second stage and or any other upper stages of the rocket is engaged).

³⁷⁵ NTIA Manual § 8.2.44.

³⁷⁶ *See* IRIG Standard 106-15, Ch. 2 § 2.4.2.

³⁷⁷ *See* NTIA Manual § 8.2.36; *see also* NTIA Manual, Annex B, § B.1.3 (establishing procedures for assessing compliance with power flux-density limits). The ITU Radio Regulations establish power flux-density limits at the surface of the Earth from space research, space operation, and Earth exploration-satellite services in the 2200-2290 MHz band in order to protect the fixed and mobile services in the band. *See* No. 21.16 of Article 21 of the ITU Radio Regulations. No. 21.17 of the ITU Radio Regulations provides that these limits may be exceeded on the territory of any administration who has so agreed, thus providing individual administrations with some flexibility in how these limits are implemented. *See also* Recommendation ITU-R SA.1273, https://www.itu.int/dms_pubrec/itu-

NTIA rules, to limit first-stage operations to an effective isotropic radiated power³⁷⁸ of 25 watts and a transmitter output power of up to 25 watts, and sought comment on whether to apply a power flux-density limit on operations after the first stage.³⁷⁹ Alternatively, to the extent we adopt a power flux-density limit in the band, the *FNPRM* asked whether no further limit on power is necessary, or whether we should adopt an alternative to the power limit in IRIG Standard 106-15.³⁸⁰

133. As in the case of emissions masks, we received limited comment on this issue. ULA argues that these limits are appropriate for aeronautical applications, but not for orbital launches.³⁸¹ ULA asserts that, given real-world practicalities and what it states as NTIA's previous acceptance of higher power levels, we should adopt power levels of "340 watts for the transmitter's ERP and 55 watts for the transmitter's output power."³⁸² ULA argues that relaxing the power limits in this manner should conservatively serve the needs of all launch service providers and ensure commercial interoperability with Federal space operations requirements.³⁸³ SpaceX, on the other hand, supports the adoption of a single power flux-density limit for all aspects of launch operations rather than the use of power limits.³⁸⁴ Such a limit, SpaceX argues, would eliminate the need for any additional limitations on power or for adopting what it describes as artificial distinctions between various launch operations, greatly simplifying compliance for launch providers.³⁸⁵

134. Upon review, we find that it is in the public interest to apply the dual stage aeronautical mobile and space operations approach for power limits as specified in the NTIA rules. While we recognize that there may be individual launch operations that require the use of technical parameters outside of the norm, there is insufficient information in the record that would support deviation from limits currently used by NTIA during the first/ascent stage—either with respect to a power increase or to the use of a power flux-density limit. Neither would serve our goal of facilitating interoperability with Federal launch operations. With respect to ULA's request to adopt much higher power limits to support orbital launches, we conclude that any orbital flight phase would be better governed by established space operation requirements, i.e. the NTIA/ITU space operation power flux-density limit.³⁸⁶ Further, we do not find the use of the space operation power flux-density limit for all phases of a launch to be appropriate given that, as ULA notes, launch vehicles remain too close to the Earth's surface during the launch phase to comply with the limit.³⁸⁷ Moreover, neither commenter discusses the impact of their proposals on other users of the 2200-2290 MHz band. Absent support that these proposals would not adversely affect other operations in the band and provide advantages to commercial space launch entities that would exceed

[r/rec/sa/R-REC-SA.1273-0-199710-I!!PDF-E.pdf](#). Recommendation ITU-R SA.1273 recommends similar levels as in Article 21, except that the reference bandwidth is 1 megahertz instead of 4 kilohertz and the level for space-to-space links in the Space Operations Service is 3 dB higher.

³⁷⁸ We note that the *FNPRM* inadvertently specified the power limit as "effective radiated power" instead of "effective isotropic radiated power" at one point in paragraph 118 of the *FNPRM*. However, the intent of the paragraph was clear as the *FNPRM* sought comment on the IRIG Standard 106-15 limit, which specifies "effective isotropic radiated power."

³⁷⁹ *FNPRM*, 36 FCC Rcd at 7808-09, para. 118.

³⁸⁰ *FNPRM*, 36 FCC Rcd at 7808-09, para. 118.

³⁸¹ ULA Comments at 32.

³⁸² ULA Comments at 32-33. We note that ULA's comments specified "ERP" instead of "EIRP."

³⁸³ ULA Comments at 33.

³⁸⁴ Space X Comments at 18.

³⁸⁵ SpaceX Comments at 18.

³⁸⁶ We note that the scope of space launch operations adopted herein is limited to the launch and recovery/reentry operations and generally excludes longer term orbital operations.

³⁸⁷ See ULA Comments at 34.

those that result from being able to operate with both Federal and non-Federal launch systems, we find it appropriate to follow the NTIA dual stage approach.

135. The *FNPRM* sought comment regarding the point at which we should apply the ITU power-flux density limits in the event we adopt the dual aeronautical mobile and space operation service approach.³⁸⁸ We asked commenters whether the ITU power flux-density limits should apply when the launch vehicle is above a specified altitude, at a certain time after launch (such as after 15 minutes of flight), at a particular stage of operation, or based on some other launch operations criteria.³⁸⁹

136. ULA argues that power flux-density limits should apply only during the orbital flight phase.³⁹⁰ ULA argues that the ITU limits are aimed at satellite communications; because liftoff and ascent flight phases (first-stage) do not involve emissions from satellites, power flux-density limits do not apply and are exclusive to the orbital flight phase (second-stage). Therefore, ULA argues that applying the power flux-density limits to strictly orbital flight would align with the ITU's intent and better reflect technical realities.³⁹¹ Rocket Lab similarly supports applying the power flux-density limit only after a launch vehicle reaches an orbital trajectory, arguing that it would be inappropriate to apply the power flux-density limit either on a time-after-launch basis or launch vehicle stage number.³⁹² It argues that rapid innovation in recent years, such as non-traditional staging, re-entry and landing, means that the Commission risks applying a regulatory model that may be inflexible to new innovations if regulations are based on time or flight stage.³⁹³ Further, NASA notes that attempting to apply the power flux-density limits to even the second stage of a launch is problematic, and that given the short duration of telemetry transmissions from launch vehicles, application of these limits is not necessary.³⁹⁴

137. We find it appropriate to apply the NTIA aeronautical mobile power limits to first stage launch operations (first 15 minutes of flight) and ITU-derived space operation power flux-density limits to launch operations beyond the first stage. We will adopt the NTIA approach which regards the first stage of a launch as an aeronautical mobile operation and treats the second stage or higher stages of a launch as space operations. While Rocket Lab and NASA note the difficulties associated with defining the dividing line between aeronautical mobile operations and space operations according to launch stages, we find that doing so provides a predictable approach and permits the similar treatment of Federal and non-Federal space launch operations. To the extent that this approach presents technical issues for a given launch (for example, the approach would require the application of the power flux-density limit too early in a launch), operators may seek a waiver of this provision.³⁹⁵

b. 2025-2110 MHz Band

138. The 2025-2110 MHz band supports fixed and mobile services on a primary basis for non-Federal terrestrial use. As noted, the band is allocated to BAS and LTTS for fixed and mobile use and to CARS for mobile use only. Federal operations include communications with satellites or other space stations, as well as between satellites or spacecraft, occurring under primary allocations for space operations (Earth-to-space) (space-to-space), space research (Earth-to-space) (space-to-space), or Earth

³⁸⁸ *FNPRM*, 36 FCC Rcd at 7809, para. 119.

³⁸⁹ *FNPRM*, 36 FCC Rcd at 7809, para. 119.

³⁹⁰ ULA Comments at 33.

³⁹¹ ULA Comments at 34 (noting that during liftoff and early ascent phases of flight, launch vehicles remain close enough to the Earth such that free space propagation losses alone will not reduce received signal power within PFD limits).

³⁹² Rocket Lab Comments at 2-3.

³⁹³ Rocket Lab Comment at 2-3.

³⁹⁴ NTIA/NASA Comments at 14.

³⁹⁵ Such issues may potentially be resolved as part of the registration and coordination process for a given launch.

exploration-satellite service (Earth-to-space) (space-to-space).³⁹⁶ Federal agencies operate earth stations in this band for tracking and command of manned and unmanned Earth-orbiting satellites and space vehicles either for Earth-to-space links for satellites in all types of orbits or through space-to-space links using TDRSS. In addition, NOAA operates earth stations in this band to control the Geostationary Operational Environmental Satellite (GOES) and Polar Operational Environmental Satellite (POES) meteorological satellite systems.³⁹⁷ As a result of the relocation of military operations from the 1755-1780 MHz band, the 2025-2110 MHz band also includes a primary Federal allocation for fixed and mobile services, restricted to use by the military services and subject to certain provisions codified in footnote US92 of the U.S. Table.³⁹⁸

139. *Emissions Limits.* As discussed in the *FNPRM*, the most analogous authorized Federal operation in the 2025-2110 MHz band is earth station telecommand transmissions to spacecraft, which operate under space operations rules.³⁹⁹ As discussed above, NTIA requires that earth and space stations in the space operations service above 470 MHz comply with the emissions mask standards established in section 5.6.2 of the NTIA Manual. Section 5.6.2 provides that for frequencies offset from the assigned frequency less than the 50 percent of the necessary bandwidth, no attenuation is required.⁴⁰⁰ At a frequency offset equal to 50 percent of the necessary bandwidth, an attenuation of at least 8 dB is required, while frequencies offset more than 50 percent of the necessary bandwidth should be attenuated in accordance with a specified formula dependent on necessary bandwidth and frequency displaced from the center of the emission bandwidth.⁴⁰¹ The *FNPRM* proposed to adopt the NTIA's emissions mask for commercial space launch transmissions in the 2025-2110 MHz band, except that we proposed to apply attenuation requirements to the licensee's assigned frequencies rather than requiring a separate calculation of necessary bandwidth.⁴⁰²

140. SpaceX agrees that we should apply the emissions mask applicable to space operation service for operations in the 2025-2110 MHz band.⁴⁰³ Other than SpaceX, we received no other comment regarding the appropriate emissions limit for this band. Accordingly, in line with our overall approach for space launch technical rules, we will apply an emissions mask using the same limit as that set forth in section 5.6.2 of the NTIA Manual.

³⁹⁶ See National Telecommunications and Information Administration, 2025-2110 MHz, at 4 (March 1, 2014), https://www.ntia.doc.gov/files/ntia/publications/compendium/2025.00-2110.00_01MAR14.pdf (listing types of applications and the number of assignments by agency).

³⁹⁷ See National Telecommunications and Information Administration, 2025-2110 MHz, at 1 (March 1, 2014), https://www.ntia.doc.gov/files/ntia/publications/compendium/2025.00-2110.00_01MAR14.pdf (listing types of applications by agency).

³⁹⁸ See 47 CFR § 2.106 footnote US92; *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands*, GN Docket No. 13-185, Report and Order, 29 FCC Rcd 4610, 4689, para. 211 (2014). Footnote US92 includes, among other provisions, a requirement that military fixed and mobile operations in the 2025-2110 MHz band may not cause harmful interference to or constrain the deployment and use of the band by BAS, CARS, or LTTS, a requirement of coordination in accordance with a Memorandum of Understanding between Federal and non-Federal fixed and mobile operations, and a provision that Non-Federal licensees in the band shall make all reasonable efforts to accommodate military mobile and fixed operations but that the use of the band by the non-Federal fixed and mobile services has priority over military fixed and mobile operations. See 47 CFR § 2.106 footnote US92.

³⁹⁹ See *FNPRM*, 36 FCC Rcd at 7811, para. 127.

⁴⁰⁰ See NTIA Manual § 5.6.2. Methods of calculating necessary bandwidth are provided in Annex J. See NTIA Manual, Annex J.

⁴⁰¹ See NTIA Manual § 5.6.2.

⁴⁰² *FNPRM*, 36 FCC Rcd at 7812, para. 128.

⁴⁰³ SpaceX Comments at 18.

141. Further, we will retain the provision in section 5.6.2 which specifies attenuation requirements based on a separate calculation of necessary bandwidth. Although SpaceX supports the *FNPRM*'s proposal to apply attenuation requirements based on a licensee's assigned frequencies,⁴⁰⁴ we find that it is more appropriate to apply the same methodology that is used currently. Given that we seek to apply a technical framework that provides predictability and minimizes the risk of interference among users in the band, we find that applying the section 5.6.2 methodology will provide consistency and prevent confusion. Accordingly, we will not adopt our proposal to permit space launch operators to determine applicable attenuation requirements using the licensee's assigned frequencies.⁴⁰⁵

142. *Power limits.* Section 8.2.35 of the NTIA manual requires that the EIRP transmitted in any direction towards the horizon by a Federal earth station in bands between 1 GHz and 15 GHz that are shared with stations in the fixed or mobile service, which includes the 2025-2110 MHz band, shall not (with limited exceptions) exceed the following limits:

+40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+40+3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.⁴⁰⁶

143. As in the case with the 2200-2290 MHz band, SpaceX supports adoption of a single power flux-density limit for all aspects of launch operations in lieu of a specific power limit on the grounds that it would obviate the need for any additional limitations on power or for adopting artificial distinctions between various launch activities.⁴⁰⁷

144. As we noted with respect to SpaceX's proposal to apply a power flux-density limit to 2200-2290 MHz band operations, SpaceX does not provide sufficient information regarding the impact to other users of the 2025-2110 MHz band and provides no support as to whether using the space operation power flux-density limit will adequately protect other operations. Instead, SpaceX mainly argues that adopting a single flux-density limit for all aspects of a launch operation will simplify compliance for launch operators. While we seek to adopt rules that will help space launch entities to simplify or streamline operations, it is necessary that any measures that we take will also ensure that other users of the band are protected. Further, although SpaceX argues that ITU and NTIA regulations permit the use of the power flux-density limit for the 2025-2110 MHz band,⁴⁰⁸ the power limits above are the requirements that both ITU and NTIA specify for earth stations in bands that are shared with stations in the fixed or mobile service. Accordingly, we adopt the same power limits as those set forth in section 8.2.35 of the NTIA Manual.

145. *Compliance with technical specifications.* In its Reply Comments, Northrop Grumman

⁴⁰⁴ SpaceX Comments at 23.

⁴⁰⁵ Both SpaceX and ULA favor applying this method to the 2200-2290 MHz band as well. See SpaceX Comments at 18; ULA Comments at 30. In the *FNPRM*, however, we proposed to apply attenuation requirements using a licensee's assigned frequencies rather than requiring a separate calculation of necessary bandwidth only for the 2025-2110 MHz emissions mask.

⁴⁰⁶ NTIA Manual § 8.2.35; see also *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems*, ET Docket No. 00-258, Seventh Report and Order, 19 FCC Rcd 21350, para. 33 (2004) (noting that this provision of the NTIA Manual applies to Defense Department earth stations for tracking, telemetry, and commanding that operate in the 2025-2110 MHz band). We note that, under this standard, there is no power limit for angles of elevation above five degrees.

⁴⁰⁷ SpaceX Comments at 18-19.

⁴⁰⁸ SpaceX Comments at 18-19.

notes that because launch providers operate from Federal launch sites, launch vehicles and associated ground stations meet applicable Federal technical requirements, including emission limits, power limits, and power flux-density limits.⁴⁰⁹ Northrop Grumman recommends that, to ensure consistency and to avoid differing standards among launch sites, the Commission permit operators to demonstrate compliance with either 1) any new FCC requirements adopted in this proceeding or 2) existing Federal requirements serving the same purpose.⁴¹⁰ Northrop Grumman argues that the latter is necessary to ensure that any new rules that we apply to launch vehicle operators do not require that existing launch equipment be redesigned or modified or be subject to further regulatory requirements.⁴¹¹ Alternatively, Northrop Grumman argues that if we impose new technical standards, we should grandfather existing operators and exempt their current launch vehicles from these requirements. Northrop Grumman asserts that this flexibility is necessary to ensure that the application of any new technical standards does not delay or impact upcoming launches or require that existing launch vehicles be modified or subject to further regulatory requirements.⁴¹²

146. While we seek to adopt rules that will facilitate the continued growth of the commercial space launch sector, and avoid policies that will negatively impact launch operations, we are hesitant to grandfather operations that may not meet current required technical specifications. For example, Northrop Grumman notes that transmitters on its launch vehicles are designed to meet IRIG Standard 106-07, a previous IRIG Standard 106 version.⁴¹³ While that standard shares many of the specifications as IRIG Standard 106-15,⁴¹⁴ it is not clear that the use of IRIG Standard 106-07 or other standards meet all necessary technical specifications set forth here or in current NTIA requirements, and accordingly, we are not prepared at this juncture to grandfather all existing launch vehicles.⁴¹⁵

c. Equipment Authorization

147. In the *FNPRM*,⁴¹⁶ the Commission noted that, with certain limited exceptions, equipment containing Radio Frequency (RF) devices must be authorized in accordance with the appropriate procedures specified in 47 CFR Part 2, subpart J,⁴¹⁷ prior to being marketed or imported into the United States. Accordingly, in the *FNPRM*, the Commission asked whether it should require Part 2 equipment authorization for the RF devices that are being used to provide space launch operations and if so, which procedure. The Commission also asked if there any analogous authorization models found in other any

⁴⁰⁹ Northrop Grumman Reply at 14.

⁴¹⁰ Northrop Grumman Reply at 14.

⁴¹¹ Northrop Grumman Reply at 14.

⁴¹² Northrop Grumman Reply at 14.

⁴¹³ Northrop Grumman Reply at 14.

⁴¹⁴ For example, both IRIG Standard 106-15 and IRIG Standard 106-07 require that spurious emissions are to be within limits specified in Military Standard MIL-STD 461. See IRIG Standard 106-15, §2.4.4; Telemetry Standard RCC Document 106-07, “Transmitter and Receiver Systems,” IRIG Standard 106-07 (Part 1), Chapter 2, § 2.4.4 (Sept. 2007) (IRIG Standard 106-07), available at <http://www.irig106.org/docs/106-07/>.

⁴¹⁵ We note that launch operators have the option to submit waiver requests demonstrating that their launch operations are providing the same level of protection as those we are adopting here.

⁴¹⁶ *R&O and FNPRM*, 36 FCC Rcd at 7815, para. 138.

⁴¹⁷ 47 CFR Part 2, Subpart J. The Commission has two different approval procedures for equipment authorization—Certification and Supplier’s Declaration of Conformity (SDoC). See 47 CFR § 2.901. In some instances, a device may perform different functions under multiple rule parts, resulting in the device being subject to more than one type of approval procedure.

rule parts (specifically noting Parts 25, 87, and 90) that could provide additional or alternative compliance requirements that may be appropriate for space launch RF devices.⁴¹⁸

148. Few comments addressed the issue of equipment authorization. ULA and Boeing both oppose specific equipment authorization rules, citing, in part, the current Part 25 rules that do not include such requirements.⁴¹⁹ Northrop Grumman “takes no position” on such requirements, however it does ask for a 5 year grandfathered period should the Commission decide to adopt rules in this regard.⁴²⁰

149. We shall not require that equipment used for space launch telemetry and telecommand during space launches under the Part 26 rules be authorized under 47 CFR Part 2, subpart J. We expect that this equipment will be deployed by a limited number of licensees who will be responsible for ensuring that their transmitters comply with our rules. Given the small number of licensees we do not believe there is utility in implementing an authorization requirement. This decision is consistent with our Part 87 rules which exempt flight test transmitters used for limited periods from needing equipment certification.⁴²¹

C. Expanded Federal Use of the non-Federal FSS and MSS Bands

150. When this proceeding began in 2013, the Commission recognized that the spectrum needs of the space launch industry and the commercial satellite industry are “separate, but closely related portions of the commercial space sector.”⁴²² At that time, the Commission sought to address the needs of the space launch industry with new spectrum allocations and a licensing framework,⁴²³ and the needs of the commercial satellite industry’s government customers by providing for Federal earth station assignments in exclusively non-Federal FSS and MSS allocations.⁴²⁴

151. In the 2013 *NPRM* the Commission specifically sought comment on two proposals for expanding Federal use of non-Federal FSS and MSS satellites. One proposal was to add co-primary Federal FSS or MSS allocations to several bands together with a footnote that limits primary Federal use of the bands to earth stations communicating with non-Federal space stations.⁴²⁵ The other proposal was to add a footnote to the Table of Allocations outlining circumstances under which Federal earth stations operating with non-Federal space stations would be entitled to interference protection.⁴²⁶

152. In the *FNPRM*, the Commission sought to refresh the record on its proposals for expanding Federal use of non-Federal FSS and MSS satellites, noting that in the eight years since the *NPRM* was adopted “the spectrum landscape in non-Federal FSS and MSS allocations has changed significantly.”⁴²⁷ The Commission observed that some of the bands under consideration in the *NPRM*

⁴¹⁸ *R&O and FNPRM*, 36 FCC Rcd at 7815, para. 138. The requirements specifying whether such equipment must be authorized under SDoC or receive a grant of certification from a Telecommunication Certification Body are found in the Commission rule part governing the service under which the equipment operates. A device that performs different functions under multiple rule parts, may be subject to more than one type of approval procedure.

⁴¹⁹ ULA Comments at 21; Boeing Comments at 35.

⁴²⁰ Northrop Grumman Reply at 15.

⁴²¹ 47 CFR § 87.145(c)(1).

⁴²² *NPRM*, 28 FCC Rcd at 6699, para. 1.

⁴²³ *Id.* at paras. 65-87.

⁴²⁴ *Id.* at paras. 19-58.

⁴²⁵ *Id.* at paras. 36-46.

⁴²⁶ *Id.* at paras. 47-58.

⁴²⁷ *R&O and FNPRM*, 36 FCC Rcd at 7818, para. 148.

may no longer be appropriate candidates for expanded Federal FSS or MSS use, while other bands may support greater Federal use.⁴²⁸

153. We continue to believe that improvements to our policies and processes for communications between earth stations utilized by government agencies and commercial satellites are desirable and may ultimately serve the public interest. However, we believe that this issue, while related to space launch operations generally, implicates different licensing processes and ultimately would require implementation distinct from the changes to launch frequency licensing we are adopting here.⁴²⁹ Therefore, we conclude that Federal access would be better addressed through a separate proceeding specifically focused on communications between commercial satellites and Federal users. Accordingly, we will continue to examine the record on expanded Federal earth station access to non-Federal FSS and MSS satellites through a separate proceeding, and we welcome continued comment and dialogue from both Federal and non-Federal stakeholders as we seek to address this issue, incorporating by reference the record to date on this issue from this proceeding. We direct OET to issue a public notice opening a new docket for comments on this issue and provide additional context for interested parties to provide additional comments.⁴³⁰ After receiving additional comments on this issue, OET is directed to develop a recommendation so as to enable Commission consideration not later than one year from the release of this item.

D. Federal Space Stations in the 399.9-400.05 MHz MSS Band

154. As requested by NTIA the Commission will revise footnote US319 of the Allocation Table to permit Federal space stations (*i.e.*, satellites) to operate in the 399.9-400.05 MHz band.⁴³¹ Currently, U.S. Table footnote US319 prevents Federal space stations from operating in the 399.9-400.05 MHz band even though there is a primary Federal Mobile Satellite Service allocation for this band. NTIA requests that the footnote be modified to delete the 399.9 400.05 MHz band thereby allowing Federal satellites to operate in this band. Footnote US319 currently states:

US319: In the bands 137-138 MHz, 148-149.9 MHz, 149.9-150.05 MHz, 399.9-400.05 MHz, 400.15-401 MHz, 1610-1626.5 MHz, and 2483.5-2500 MHz, Federal stations in the mobile-satellite service shall be limited to earth stations operating with non-Federal space stations.⁴³²

155. NTIA made this request to allow the 399.9-400.05 MHz band to be used for a new satellite system that will assume some of the non-environmental traffic currently handled by the Argos satellite system. Argos is a satellite system that was established by the French Space Agency, NASA, and the National Oceanic and Atmospheric Administration (NOAA).⁴³³ Argos is used for a large number of applications such as monitoring the oceans at thousands of fixed and drifting buoys, tracking the movements of wildlife, relaying information by humanitarian agencies from remote areas, monitoring water resources, and tracking the locations of ships.⁴³⁴ The latest version of the Argos satellite system, the

⁴²⁸ *Id*

⁴²⁹ Additionally, we note that numerous commenters suggest that these questions would be better addressed in a separate rulemaking. *See, e.g.*, Verizon Comments at 1-4, CTIA Comments at 4-5; AT&T Reply Comments at 3; T-Mobile Comments at 6; *see also* Boeing Comments at 24 (suggesting that if the Commission cannot exempt Federal earth stations from Section 25.136, the question of UMFUS shared spectrum should be considered in a second FNPRM); Echostar Comments at 6-7 (arguing that any consideration of allocation in bands shared with UMFUS should be done in an FNPRM).

⁴³⁰ The OET Public Notice will be issued expeditiously, setting forth comment and reply comment deadlines for interested parties.

⁴³¹ *See NTIA US319 Letter* at footnote 17, *supra*.

⁴³² 47 CFR § 2.106 footnote US319.

⁴³³ Argos, *About Argos*, <https://www.argos-system.org/about-argos/> (last visited July 28, 2023).

⁴³⁴ Argos, *Argos Solutions*, <https://www.argos-system.org/solutions/> (last visited July 28, 2023).

Argos-4 was launched on October 7, 2022. According to NTIA, the newly established satellite system in the 399.9-400.05 MHz band would allow non-environmental applications to be removed from the Argos system which will result in lower interference, higher capacity, and improved reliability and service for both the environmental applications remaining on Argos and the non-environmental applications moved to the new system.⁴³⁵

156. The Commission first made the 399.9-400.05 MHz band along with three other frequency bands available for MSS in 1993 to allow deployment of non-geosynchronous low Earth orbit (LEO) satellite systems, called “Little LEO” systems, to provide non-voice services such as data messaging and position determination.⁴³⁶ In 2019, the Commission’s International Bureau initiated a processing round for non-voice non-geostationary systems in this band as well as the 400.15-401 MHz band. The Commission’s Space Bureau has granted market access for the 399.9-400.05 MHz band to three of these applicants while other applications remain pending or have been withdrawn.⁴³⁷ In the past two years other companies have filed applications to operate in the 399.9-400.05 MHz band.⁴³⁸

157. The Commission received four comments and two reply comments in response to the *FNPRM*.⁴³⁹ Myriota Pty Ltd. (Myriota) and Fleet Space Technologies Pty. Ltd. (Fleet) express concerns regarding the impact to Internet of Things (IoT) connectivity and the coordination requirements needed to ensure there will be no interference between non-Federal and Federal space stations in the 399.9-400.05 MHz band.⁴⁴⁰ According to Myriota, making this modification to US319 would permit an unidentified number of Federal satellites to operate in the band and leave commercial operators who have invested in the band without adequate safeguards to ensure their operations will not be constrained.⁴⁴¹ Myriota suggest that if the Commission makes this modification to US319 it should adhere to the stated purpose of the modification by permitting only a single Argos satellite and that NTIA and NOAA should consider

⁴³⁵ See *NTIA US319 Letter* at footnote 17, *supra*.

⁴³⁶ *Amendment of Section 2.106 of the Commission’s Rules to Allocate Spectrum to the Fixed-Satellite Service and the Mobile-Satellite service for Low-Earth Orbit Satellites*, ET Docket No. 91-280, Report and Order, 8 FCC Rcd 1812, 1813, paras. 7, 12 (1993). The Little LEO MSS is officially known as the non-voice, non-geostationary (NVNG) mobile-satellite service.

⁴³⁷ Kinéis was granted access to the U.S. market using frequencies of the NVNG MSS and earth exploration-satellite service (EESS) through a constellation of up to 25 small, low-Earth orbit (LEO) satellites authorized by France. ICFS File No. SAT-PDR-20191011-00113. Hiber’s application was granted on May 6, 2020. ICFS File No. SAT-PDR-20180910-00069, DA 20-491 (granted May 6, 2020). Hiber, however, subsequently surrendered its market access grant. See Letter from Bruce Henoch, General Counsel, Hiber Inc., to Marlene H. Dortch, Secretary, FCC (filed Sept. 24, 2021). Myriota’s application was granted on May 29, 2020. See Myriota, Pty. Ltd., ICFS File No. SAT-PDR-20190328-00020, DA 20-571 (granted May 29, 2020). Spire also requests use of the 399.9-400.05 MHz band for its system, which has to date been authorized for telecommand links with Spire’s non-U.S. licensed satellites in the 400.02-400.05 MHz band. See Spire Global Inc., ICFS File No. SAT-PDR-20190321-00018 (grant stamped Aug. 16, 2023). The 400 MHz Processing Round also included Astro Digital, which was subject to a separate public notice that did not initiate a processing round. Astro Digital’s application was granted in part and deferred in part. Astro Digital, ICFS File No. SAT-LOA-2017050800071 (grant stamped Aug. 1, 2018). Within the frequency ranges included in the processing round, Astro Digital was authorized to use a telemetry carrier (space-to-Earth) centered at 400.5 MHz (center frequency).

⁴³⁸ Fleet Space Technologies requests authority to provide NVNG MSS in the United States with four low-Earth orbit, non-U.S.-licensed small satellites using the 399.9–400.05 MHz, 400.15–401 MHz, and 2020-2025 MHz bands. ICFS File No. SAT-PDR-20220805-00077. See also Space Quest, ICFS File No. SAT-LOA-20210503-00058.

⁴³⁹ We received comments from BlackSky Global LLC (BlackSky), Department of Commerce (DoC), Myriota Pty. Ltd. (Myriota), and the National Telecommunications and Information Administration (NTIA). We received reply comments from Fleet Space Technologies Pty. Ltd. (Fleet Space) and Myriota Pty. Ltd. (Myriota).

⁴⁴⁰ Myriota, Pty. Ltd Comments at 3; Fleet Space Technologies Pty. Ltd at 2,4.

⁴⁴¹ Myriota, Pty. Ltd Reply at 1.

whether commercial satellite operators could meet their mission requirements rather than operating Federal satellites in the band.⁴⁴² Fleet points out that the 399.9-400.05 MHz band is the only globally harmonized UHF band for commercial smallsat MSS and claims that permitting Federal satellites in the band would disrupt the coordination among commercial satellite operators and delay deployment of innovative MSS applications.⁴⁴³ Blacksky Global supports amending footnote US319 and believes that allowing the band to assume some of the traffic currently handled by the Argos system would alleviate the pressure from Federal systems in adjacent bands and result in relaxation of the coordination conditions on non-Federal systems in the 401-402 MHz band.⁴⁴⁴ NTIA and DoC both emphasize the need to implement this modification of footnote US319 to ensure that the role of the United States in the Argos-4 program can proceed without any risk to its operation.⁴⁴⁵

158. We are revising US319 as NTIA requests to enable establishment of a new satellite system to supplement the Argos program to further the reliable provision of important services. We appreciate the concerns expressed by Myriota and Fleet that the use of this band by a Federal satellite system may complicate the interference environment and create coordination burdens. However, any Federal satellites that will operate in the band and the associated earth stations will be subject to coordination between NTIA and the Commission. During this coordination process any issues regarding coexistence between the Federal and non-Federal systems can be addressed. As applicants who filed during the processing round indicated that they are capable of sharing with current and future licensees in these bands,⁴⁴⁶ we are confident that at the conclusion of this coordination process the Federal satellites will be able to share the band with the existing systems without harmful interference occurring. As the demand for spectrum continues to increase we must continue to look for opportunities to more intensively use spectrum where possible. Therefore, we see no reason to reject NTIA's request to modify US319.

IV. SECOND FURTHER NOTICE OF PROPOSED RULEMAKING

A. NASA Footnotes

159. NTIA has requested that we add three footnotes to the Allocation Table to address the use of spectrum by manned and unmanned spacecraft during space missions.⁴⁴⁷ The text of these requested footnotes is as follows:

USxxx Use of the bands 2290-2293 MHz and 2297-2300 MHz by Federal and non-Federal space stations may be authorized on a primary basis for the specific purpose of emergency transmissions from manned spacecraft used in the exploration and use of outer space, including the Moon and other celestial bodies. This allocation is restricted to emergency transmissions from manned spacecraft when experiencing emergency situations. Additionally, the bands 2025-2110 MHz and 2110-2120 MHz may also be authorized on a primary basis for transmissions of related commands to the spacecraft. Such operations should be conducted in accordance with Recommendation ITU-R SA.1863.

USyyy In the band 2213.5-2218.5 MHz, non-Federal space stations operating in the space operation service providing transportation service of crew to and from the International Space Station, may be authorized on a primary basis to transmit in the space-to-Earth direction, to

⁴⁴² *Id.* at 3.

⁴⁴³ Fleet Space Technologies Pty. Ltd. at 2-4.

⁴⁴⁴ Blacksky Global LLC Comments at 4.

⁴⁴⁵ NTIA/DoC Comments at 28.

⁴⁴⁶ *Kinéis Petition for Declaratory Ruling to Access the U.S. Market Using a Low-Earth Orbit Satellite System*, ICFS File No. SAT-PDR-20191011-00113, Order and Declaratory Ruling, FCC 21-118 at 6, para. 12 (2021).

⁴⁴⁷ This request from Charles Cooper, Associate Administrator, Office of Spectrum Management, NTIA, to Ronald Repasi, Acting Chief, FCC Office of Engineering and Technology, was received via e-mail on August 8, 2021.

authorized receiving stations, subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to authorized Federal stations. The power flux-density at the Earth's surface from such emissions from these non-Federal stations shall not exceed -144 to -154 dBW/m²/4 kHz, depending on the angle of arrival, in accordance with ITU Radio Regulation No. 21.16.

USzzz (New) In the band 2200.2-2206.2 MHz, non-Federal space stations operating in the space operation service may be authorized on a primary basis to transmit to the International Space Station (ISS) while within 30 km of the ISS, subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to authorized Federal stations. The power-flux-density of such emissions at the Earth's surface from these non-Federal stations shall not exceed -144 to -154 dBW/m²/4 kHz, depending on the angle of arrival, in accordance with ITU Radio Regulation No. 21.16. ITU Radio Regulation No. 5.392 also applies.

160. Draft footnote USxxx applies to emergency transmissions to and from manned spacecraft in two portions of the 2200-2290 MHz band as well as the 2025-2110 MHz and 2110-2120 MHz bands. We propose to add this footnote to the allocations table recognizing the importance of emergency communications to safeguard human life during manned space missions. We seek comment on this proposal. Because emergency communications from manned spacecraft are likely to occur infrequently we tentatively conclude that making this spectrum available for this purpose will not present a significant interference risk to other users of these bands. As the 2200-2290 MHz band has a space operation allocation in the space-to-earth direction, permitting transmissions from spacecraft is appropriate.⁴⁴⁸ The 2025-2110 MHz band has a primary Federal space operations allocation in the Earth-to-space direction which is consistent with making transmissions to manned spacecraft.⁴⁴⁹ The 2110-2120 MHz band has a primary space research service (deep space) (Earth-to-space) allocation at Goldstone California. Given that use of the 2110-2120 MHz for space transmissions is currently limited to this one location, should USXXX have a similar limitation on use of this band? Should any other restrictions be placed on the use of these bands for emergency communications for manned spacecraft to avoid harmful interference from occurring to other users of these bands?

161. Draft footnote USyyy applies to transmissions to ground stations by non-Federal spacecraft transporting crew to and from the International Space Station (ISS). NASA currently has contracts with SpaceX and Boeing to shuttle crew members to the ISS. There is currently a federal Space Operation space-to-Earth allocation for the 2200-2290 MHz band, but the non-federal Space Operation allocation for this band is limited to use for pre-launch testing and space launch operations and therefore does not permit transmissions by crew transport spacecraft after the launch phase of the mission.⁴⁵⁰ Given the importance of reliable communications in safeguarding human life during manned space missions, we propose to add this footnote to the Allocation Table. We tentatively conclude that the power flux limits on these transmissions will prevent interference from occurring to receivers on the earth's surface from these transmissions. We seek comment on this proposal.

162. Draft footnote USzzz applies to spacecraft that are transmitting in portions of the 2200-2290 MHz band within 30 kilometers of the ISS. NASA has contracts with commercial companies to transport both supplies and crew to the ISS. These spacecraft need to communicate with the ISS when they are docking. As the Space Operation allocation for the 2200-2290 MHz band is limited to use for pre-launch testing and space launch operations, there is no allocation that permits these non-Federal spacecraft to communicate with the ISS in this band. We propose to add this footnote to the Allocation Table in recognition of the importance of these space missions as well as the limited number of such missions which should present a minimal risk of interference occurring to other users of the band. As with USyyy, we tentatively conclude that the power flux limits on these transmissions will prevent

⁴⁴⁸ This allocation is primary for federal use and secondary for non-federal use. 47 CFR § 2.106.

⁴⁴⁹ 47 CFR § 2.106.

⁴⁵⁰ 47 CFR § 2.106 footnote US96.

interference from occurring to receivers on the earth's surface from these transmissions. We seek comment on this proposal.

163. NASA has adopted a transition plan that envisions deorbiting the ISS in early 2031.⁴⁵¹ Prior to deorbiting the ISS, NASA intends to purchase crew time from at least two Commercial LEO Destinations (CLDs)—*i.e.*, private space stations.⁴⁵² As the projected lifetime of the ISS is now less than eight years, we seek comment on whether the new proposed footnotes USyyy and USzzz should be limited to spacecraft traveling to the ISS. Should these footnotes also apply to future manned space stations that are operated by commercial entities? Should they be limited to manned space stations only in low earth orbit or apply more generally to manned space stations anywhere beyond the Earth's atmosphere?

B. Space Operation

164. In this *FNPRM* we continue our efforts to support the expanding activities of the commercial space sector that benefit the public interest. Specifically, we focus on the question of spectrum allocation and licensing processes for certain post-space launch activities, particularly with respect to certain space operations communications currently addressed through experimental licensing, such as crew or cargo capsules destined for the International Space Station (ISS), or similar operations planned for the future, such as spectrum requirements for commercial crewed space stations. Commenters also raised a number of issues that overlap the topics currently being considered in the *Space Innovation; Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing* proceeding.⁴⁵³ This broader range of topics will be addressed separately and concurrently with that proceeding, as noted in the accompanying *Second Report and Order*.⁴⁵⁴

165. *Spectrum Allocation for Certain Post-Space Launch Payload Operations.* We seek further comment on whether to include new spectrum allocations in specific bands for communications with cargo and crew capsules and payload communications with the ISS and other crewed space stations. In the *FNPRM* we sought comment on whether there are improvements to the licensing process that could facilitate more routine licensing for certain payload activities currently addressed through experimental licensing. Specifically, we noted the current use by SpaceX of S-band frequencies for cargo and crew capsules and links with the ISS as well as use by Orbital Sciences Corporation, a Northrop Grumman Systems Corporation Affiliate, of 2287.5 MHz (space-to-Earth) as well as 2287.5 MHz for links between the Cygnus spacecraft and TDRSS, and 2203.2 MHz for links between the Cygnus and the ISS. We sought comment on whether any changes to the Table of Frequency Allocations being adopted or proposed for the 2025-2110 MHz and 2200-2290 MHz frequency bands were needed to provide for these cargo and crew capsule communications, what are the spectrum requirements for such operations, and if there are other frequency bands that the Commission should also consider for such uses.

166. In response, SpaceX noted that it has, through the STA process, used the 2025-2110 MHz band for its Dragon capsule to communicate with the ISS and TDRSS, and supports an expanded approach for 2200-2290 MHz band, which would alleviate the need for seeking an STA to cover communication between SpaceX's Dragon and the ISS and TDRSS. Northrop Grumman also noted its use of the 2200-2290 MHz band for ISS-related communications and supports the inclusion of payload operations in the allocation for this band, which is used by its Cygnus mission. Northrop Grumman also suggested that the Commission adopt a fleet licensing process for payload activities, in specific for ISS-

⁴⁵¹ *International Space Station Transition Report Pursuant to Section 303(c)(2) of the NASA Transition Authorization Act of 2017 (P.L. 115-10)*, NASA, at 11, https://www.nasa.gov/sites/default/files/atoms/files/2022_iss_transition_report-final_tagged.pdf.

⁴⁵² *Id.* at 6.

⁴⁵³ *Space Innovation; Facilitating Capabilities for In-space Servicing, Assembly, and Manufacturing*, IB Dockets 22-271, 22-272, Notice of Inquiry, FCC 22-66 at 4, para. 7 (2022) (ISAM NOI).

⁴⁵⁴ *See supra*, Section III.A., B.

related activities, such as its Cygnus mission.

167. Other commenters supported allocations in the S-band as well as the L-band and X-band for OOS and RPO operations generally. Industry Participants⁴⁵⁵ assert that slightly expanding the 2200-2290 MHz and 2025-2110 MHz allocations to include RPO alongside space launch and reentry “would provide a safer space environment for time-critical RPO communications, where failure can result in loss of spacecraft, termination of a mission, and potentially loss of human lives.”⁴⁵⁶ They also note that commercial operators have already invested into technology that supports OOS operations in the S-band.⁴⁵⁷ Black Sky suggests opening the band for all on-orbit missions to put the U.S. industry on an equal footing with international operators.⁴⁵⁸ Spaceflight recommended that the Commission consider 8025-8400 MHz (X-band) and 1610-1626.5 MHz (L-band) for secondary allocation for payload operations specifically.⁴⁵⁹ In response to Spaceflight’s suggestion for allocation in the L-band, Globalstar asserts that allocation for inter satellite links and space-to-space communication between a launch vehicle and satellites in the L-band is unnecessary and should continue to be authorized only on an experimental basis.⁴⁶⁰ In particular Globalstar focuses on the Big LEO band where Globalstar operates and has concerns of harmful interference.⁴⁶¹ Federal agencies were generally opposed to changing the status of the S-band for payload operations as discussed in the accompanying *Second Report and Order*, however NTIA, NASA, DOD, and DOC note that the 2360-2395 MHz band could be used as an alternative to expanding allocation in 2200-2290 MHz band.⁴⁶² We consider this alternative in further discussion below.⁴⁶³

168. As discussed in the accompanying *Second Report and Order*, we conclude that deliberations for providing S-band, or other possible bands (such as L-band and X-band suggestions by Spaceflight), allocation for OOS/RPO more generally be continued via the ongoing ISAM proceeding. However, we seek further comment on possible necessary changes to the Table of Frequency Allocations to account for space-to-space communications between a crew or cargo capsule and crewed space stations, including in bands outside the S-band. Do the three footnotes requested by NTIA meet this need?⁴⁶⁴ Should the Commission adopt an allocation for ISS-related space-to-space communications in this proceeding? Should the Commission expand such an allocation to account for future crewed space stations and operations not connected to the ISS? Should the rules addressing these operations be included in Part 25 of the FCC’s rules?

169. *Suborbital Spaceflight Operations.* Additionally, we seek further comment on spectrum allocation and licensing needs related to suborbital spaceflight. Are there aspects of suborbital commercial spaceflight that fall outside of the definition we have adopted for space launch operations that require further licensing and spectrum allocation considerations? In response to the *FNPRM*, Virgin Galactic noted its use, through experimental licensing, of the VHF band, L-band, and S-band for its suborbital flights and suggested that the Commission develop and adopt rules allowing allocation for

⁴⁵⁵ Industry Participants refers to Astroscale U.S. Inc., Axiom Space Inc., Atomos Space, Sierra Space Corp., and SCOUT Inc. who submitted comments jointly.

⁴⁵⁶ Industry Participants Comments at 6.

⁴⁵⁷ Industry Participants Reply at 3.

⁴⁵⁸ Black Sky Comments at 2-4.

⁴⁵⁹ Spaceflight Comments at 6.

⁴⁶⁰ Globalstar Reply at 3-4.

⁴⁶¹ *Id.*

⁴⁶² NTIA Comments at 5; NASA Comments at 2; DOD Comments at 2, 5; DOC Comments at 2.

⁴⁶³ *See infra* Section IV. C..

⁴⁶⁴ *See supra* Section IV. A..

commercial spaceflight operations in these bands.⁴⁶⁵ Specifically, Virgin Galactic has operated in the 123.225 MHz, 123.275 MHz, 123.375 MHz, 123.450 MHz, and 123.525 MHz (VHF) frequencies, the 1445.5 MHz, 1451.5 MHz, 1462.5 MHz, 1470.5 MHz 1480.5 MHz (L-band) frequencies, and the 2360-2390 MHz (S-band) frequencies.⁴⁶⁶ Communications in these bands have included telemetry as well as video and voice communications.⁴⁶⁷ The *Second Report and Order* we adopt today has limited use of the S-band to telemetry and tracking communications for launch under Part 26. Should the Commission establish allocations beyond experimental or STA licensing for voice or video communications for these types of crewed suborbital spaceflight operations?

170. In further considering communication related to crewed suborbital operations we note the importance of safety of life communications.⁴⁶⁸ Currently, operators who obtain experimental licensing approvals or STAs for these activities are communicating on a non-protected, non-interference basis and must cease operations in the event interference with a primary or secondary allocated operator occurs.⁴⁶⁹ We seek comment on how the Commission should ensure a more permanent level of protection for suborbital spaceflight operation communications, while recognizing the need to avoid harmful interference with other important operations in already encumbered bands. Should any of the portions of the VHF, L-band, or S-band that have been authorized experimentally for communications beyond telemetry be allocated for suborbital spaceflight operations on a primary or secondary basis? Are there other bands beyond those we are considering today that might be suitable for these operations?

C. Use of 2360-2395 MHz Band or Other Bands for Commercial Space Launch

171. Three frequencies in the 2360-2395 MHz band are available for both Federal and non-Federal telemetry and telecommand operations of launch vehicles.⁴⁷⁰ Beyond these three frequencies, the band is assigned primarily for aeronautical telemetry and telecommand operations for flight testing of aircraft and missiles.⁴⁷¹ In the *FNPRM*, we requested comment on changes that we could take in

⁴⁶⁵ See Virgin Galactic Comments at 2-8.

⁴⁶⁶ *Id.* at 2-3.

⁴⁶⁷ See Virgin Galactic *Ex Parte* (April 18, 2022); Virgin Galactic Comments at 5-6.

⁴⁶⁸ See, e.g., ITU Convention, Art. 40 “Priority of Telecommunications Concerning Safety of Life.”

⁴⁶⁹ See 47 CFR § 5.84.

⁴⁷⁰ See 47 CFR §§ 2.106 US276, 87.187(p), 87.303(d)(1). The three frequencies are 2364.5 MHz, 2370.5 MHz, and 2382.5 MHz. The 2.3 GHz allocation supporting non-Federal space launch telemetry and telecommand was adopted after national space policy changes in the 1980s, which shifted responsibility for launching non-Government payloads from Federal to non-Federal entities. With concurrence by NTIA, the Commission concluded that the 2310-2390 MHz band was the most suitable at the time to support space launch telemetry and telecommand use and it identified six channels for such use. Portions of the aeronautical mobile telemetry band were reallocated, which reduced the available commercial space launch spectrum to three frequencies in the 2360-2395 MHz band. See *Amendment of the Frequency Allocation & Aviation Servs. Rules (Parts 2 & 87) to Provide Frequencies for Use by Commercial Space Launch Vehicles*, GN Docket No. 89-16, Report and Order, 5 FCC Rcd 493, 493, para. 2 (1990); *Establishment of Rules and Policies for the Digital Audio Radio Service in the 2310-2360 MHz Frequency Band*, IB Docket No. 97-91, GN Docket No. 90-357, Report and Order, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking, 12 FCC Rcd 5754, 5805-06, paras. 124-26 (1997); *Amendment of Parts 2, 25, and 87 of the Commission’s Rules to Implement Decisions from World Radiocommunication Conferences Concerning Frequency Bands Between 28 MHz and 36 GHz and to Otherwise Update the Rules in this Frequency Range*, ET Docket No. 02-305, Report and Order, 18 FCC Rcd 23426, 23441-43, paras. 37-40 (2003); *Amendment of Parts 1, 2, 15, 25, 27, 74, 78, 80, 87, 90, 97, and 101 of the Commission’s Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference*, ET Docket Nos. 12-338 and 15-99, IB Docket No. 06-123, Report and Order, Order, and Notice of Proposed Rulemaking, 30 FCC Rcd 4183, 4210-11, paras. 62-65 (2015); The White House, Office of the Press Secretary, Presidential Directive on National Space Policy (Feb. 11, 1988), www.hq.nasa.gov/office/pao/History/policy88.html.

⁴⁷¹ 47 CFR § 87.303(d)(1).

administering the 2360-2395 MHz space launch rules.⁴⁷² For example, we sought comment on whether we should administer the 2360-2395 MHz space launch use, which is currently regulated under subpart J of the Commission's Part 87 rules, under the same rule part as the commercial space launch rules applicable to the 2200-2290 MHz band adopted in the *Second R&O* or retain the current Part 87 designation.⁴⁷³

172. In response to the *FNPRM*, certain commenters filed in support of expanding space launch use in the 2360-2395 MHz band. For example, SpaceX argues that uses of the band should extend to the full range of space operations,⁴⁷⁴ while Virgin Galactic encourages the Commission to ensure that any primary allocation of the band, as well as associated service and technical rules, facilitate telemetry and video downlink, which it states is consistent with Virgin Galactic's use of the spectrum to monitor the health and safety of its spaceflight participants and crew.⁴⁷⁵ NTIA, NASA, and DOD advocate the use of the 2360-2395 MHz band as an alternative to the 2200-2290 MHz and 2025-2110 MHz bands,⁴⁷⁶ arguing that the three existing frequencies in the 2360-2395 MHz band provide additional spectrum.⁴⁷⁷

173. AFTRCC, however, argues that there should not be an expansion of the band and urges the Commission to limit the allocation in that band to just the three channels already allocated for space launches, and avoid proposing allocations for space operations that include bands needed for flight testing and space launches.⁴⁷⁸ In support, AFTRCC asserts that space launches create large interference cones to flight test operations, and that even a few seconds of interference could disrupt the most critical portions of a flight test and would add a significant risk factor to aircraft flight tests in this band.⁴⁷⁹ Similarly, Boeing advises that the Commission should exercise caution with respect to the use of additional portions of the 2360-2395 MHz band for launch operations or in-orbit activities.⁴⁸⁰ Boeing asserts that the greater 2360-2395 MHz band is heavily used to support non-federal flight test operations in locations throughout the United States, and that use of the band by commercial aircraft manufacturers is intensive and increasing.⁴⁸¹

174. We seek further comment on expanding the use of the 2360-2395 MHz band, both in the context of additional uses to the band as well as expanding use in the band beyond the three frequencies currently designated. While we are aware that this band is heavily used for flight test purposes and agree that we should proceed cautiously with respect to measures that have the potential to introduce additional interference to operations in the band, we also recognize that the 2200-2290 MHz and 2025-2110 MHz bands may not accommodate the increasing numbers of operations in the future. While we find that providing space launch operators with increased certainty regarding access to the 2200-2290 MHz and 2025-2110 MHz band is in the public interest and that careful coordination will be effective in enabling use of these bands, the record supports further review of additional spectrum options. Accordingly, we seek to better understand the current use of the 2360-2395 MHz band. We seek information on how both

⁴⁷² *FNPRM*, 36 FCC Rcd at 7814-15, paras. 136-137.

⁴⁷³ *FNPRM*, 36 FCC Rcd at 7814, para. 136. Because the *FNPRM* proposed to incorporate the new commercial space launch rules under a new subpart in part 87, the *FNPRM* requested comment on whether to administer the 2360-2395 MHz band under the new part 87 subpart.

⁴⁷⁴ SpaceX Comments at 8.

⁴⁷⁵ Virgin Galactic Comments at 7, n.16.

⁴⁷⁶ NTIA/NASA/DOD Comments at 5, 9, 12, 18, 22.

⁴⁷⁷ NTIA/NOAA Comments at 27.

⁴⁷⁸ AFTRCC Reply at 9; AFTRCC Dec. 13, 2021 *Ex Parte* at 1.

⁴⁷⁹ AFTRCC Dec. 13, 2021 *Ex Parte* at 9.

⁴⁸⁰ Boeing Reply at 5.

⁴⁸¹ Boeing Reply at 5-6.

flight testing and launch operations in the band are coordinated and conducted,⁴⁸² and whether there are measures that could help increase use by space launch operations without increasing the risk of interference to flight test operations. For example, space launch operations in the band are subject to pre-grant frequency coordination, but do not have a coordination requirement once an authorization is granted. Would revising the 2360-2395 MHz band rules to apply provisions that are now applicable to the 2200-2290 MHz and 2025-2110 MHz band, including the per launch coordination requirement, help to facilitate increased use of space launch operations in the 2360-2395 MHz band?⁴⁸³

175. Further, we received limited comment on how to administer rules relating to the 2360-2395 MHz band, in particular comment regarding whether and how to harmonize existing 2360-2395 MHz licensing and technical rules with rules now applicable to the 2200-2290 MHz and 2025-2110 MHz band.⁴⁸⁴ Accordingly, we seek further comment on certain 2360-2395 MHz issues that were first raised in the *FNPRM*.⁴⁸⁵ We request additional comment on how best to administer the space launch rules for this band. Should we incorporate the 2360-2395 MHz space launch use into new Part 26 or should we retain the Part 87 designation? If we administer the 2360-2395 MHz space launch use under the new rule part, should we revise our rules to apply the same non-exclusive licensing scheme we adopt today or retain the existing licensing framework provided under the current Part 87 flight testing rules? In that event, should we continue to apply the technical rules currently applicable to these services? We also note that space launch telemetry and telecommand operations in the 2360-2395 MHz band occur under a Mobile allocation.⁴⁸⁶ We seek further comment on whether we should add a primary Space Operation allocation to the band, subject to the same restrictions as apply to such operations under the Mobile allocation as specified in footnote US276 of the U.S. Table.⁴⁸⁷ Further, Industry Participants state that, while they appreciate the suggestion of increased 2360-2395 MHz band use in light of congestion in the S-band, the International Table of Frequency Allocations reserves this band for Fixed Service, Mobile Service, Amateur, and Radiolocation services, and consequently it would be necessary to modify that allocation to permit use of that band at the international level.⁴⁸⁸ Industry Participants state that a failure to obtain such a modification would be a hardship for on-orbit operators seeking mission support from non-U.S. ground stations.⁴⁸⁹ We request comment regarding this issue.

176. With respect to additional spectrum options for space launch operations, Virgin Galactic suggests that we expand the use of the 1435-1525 MHz band for telemetry and safety of flight during

⁴⁸² For example, information on when and where flight testing generally occurs that may provide insight on technical measures that may help mitigate potential interference.

⁴⁸³ See AFTRCC Dec. 13, 2021 *Ex Parte* at 8 (suggesting measures, such as an enhanced scheduling mechanism, that would need to be implemented if expanded use is permitted).

⁴⁸⁴ See SpaceX Comments at 8 (arguing that the band should be incorporated into the new rule part); Rocket Lab Comments at 3 (recommending that the 2360-2395 MHz band be allocated to any new space launch operations regulatory framework). See also Relativity Space Comments at 3 (opposing changes to rules governing the 2360-2390 MHz band on the grounds that uses of the band, which are set out in footnote US276, are effectively coordinated through AFTRCC).

⁴⁸⁵ See *FNPRM*, 36 FCC Rcd at 7814, para. 136.

⁴⁸⁶ See 47 CFR § 2.106 footnote US276.

⁴⁸⁷ Footnote US276 provides: “Except as otherwise provided for herein, use of the band 2360-2395 MHz by the mobile service is limited to aeronautical telemetering and associated telecommand operations for flight testing of aircraft, missiles or major components thereof. The following three frequencies are shared on a co-equal basis by Federal and non-Federal stations for telemetering and associated telecommand operations of expendable and reusable launch vehicles, whether or not such operations involve flight testing: 2364.5 MHz, 2370.5 MHz, and 2382.5 MHz. All other mobile telemetering uses shall not cause harmful interference to, or claim protection from interference from, the above uses.”

⁴⁸⁸ Industry Participants Reply at 11.

⁴⁸⁹ Industry Participants Reply at 11.

spaceflight operations.⁴⁹⁰ As in the case of the 2360-2395 MHz band, the 1435-1525 MHz band is assigned primarily for aeronautical telemetry and telecommand functions associated with flight testing.⁴⁹¹ Space launch and reentry operations are permissible uses of the band.⁴⁹² AFTRCC, however, argues that this band is the “workhorse spectrum” for aeronautical flight testing, and that interference with sensitive flight test equipment risks pilot safety and the success of test maneuvers.⁴⁹³ Accordingly, says AFTRCC, this band should be reserved for aeronautical mobile telemetry uses.⁴⁹⁴ We seek comment on whether the 1435-1525 MHz band can effectively accommodate space launch operations, or whether such use should be discouraged despite being permissible under our rules. As in the case with the 2360-2395 MHz band above, we seek information regarding the current usage of this band, how operations are conducted and coordinated, and whether there are measures that may be taken to successfully integrate space launch use along with flight test operations. Would per launch coordination including an enhanced scheduling mechanism be helpful?⁴⁹⁵ To the extent that commenters agree that space launch activities can occur along with flight test operations, we request that commenters also speak to any changes—similar to those discussed above for the 2360-2395 MHz band—we should make to harmonize any space launch use in this band with rules applicable to the 2200-2290 MHz and 2025-2110 MHz bands. However, in the event that commenters believe that increased use of either of these bands for space launch uses should not be accommodated, we request comment on other spectrum bands that may be appropriate candidates.⁴⁹⁶

V. PROCEDURAL MATTERS

A. Ex Parte Presentations

177. These proceedings shall be treated as “permit-but-disclose” proceedings in accordance with the Commission’s *ex parte* rules.⁴⁹⁷ Persons making *ex parte* presentations must file a copy of any written presentation or a memorandum summarizing any oral presentation within two business days after the presentation (unless a different deadline applicable to the Sunshine period applies). Persons making oral *ex parte* presentations are reminded that memoranda summarizing the presentation must (1) list all persons attending or otherwise participating in the meeting at which the *ex parte* presentation was made, and (2) summarize all data presented and arguments made during the presentation. If the presentation consisted in whole or in part of the presentation of data or arguments already reflected in the presenter’s written comments, memoranda or other filings in the proceeding, the presenter may provide citations to such data or arguments in his or her prior comments, memoranda, or other filings (specifying the relevant page and/or paragraph numbers where such data or arguments can be found) in lieu of summarizing them in the memorandum. Documents shown or given to Commission staff during *ex parte* meetings are deemed to be written *ex parte* presentations and must be filed consistent with rule 1.1206(b). In proceedings governed by rule 1.49(f) or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (*e.g.*, .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission’s *ex parte* rules.

⁴⁹⁰ Virgin Galactic Comments at 7.

⁴⁹¹ 47 CFR §§ 87.187(p), 87.303(d)(1).

⁴⁹² 47 CFR §§ 87.187(p), 87.303(d)(1); *see also* 47 CFR § 2.106 footnote US78.

⁴⁹³ AFTRCC Dec. 13, 2021 *Ex Parte* at 8.

⁴⁹⁴ AFTRCC Dec. 13, 2021 *Ex Parte* at 8.

⁴⁹⁵ *See* AFTRCC Dec. 13, 2021 *Ex Parte* at 8.

⁴⁹⁶ For example, Virgin Galactic suggests the use of VHF frequencies telemetry and safety of flight during spaceflight operations. Virgin Galactic Comments at 7.

⁴⁹⁷ 47 CFR § 1.1200 *et seq.*

B. Comment Period and Filing Procedures

178. Pursuant to sections 1.415 and 1.419 of the Commission's rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. For comments regarding the *Second Further Notice*, comments must be filed in ET Docket No. 13-115. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). See *Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.
- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <https://www.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.
 - Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
 - U.S. Postal Service first-class, Express, and Priority mail must be addressed to 45 L Street, NE, Washington, DC 20554.
- Effective March 19, 2020, and until further notice, the Commission no longer accepts any hand or messenger delivered filings. This is a temporary measure taken to help protect the health and safety of individuals, and to mitigate the transmission of COVID-19. See *FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy*, Public Notice, DA 20-304 (March 19, 2020), <https://www.fcc.gov/document/fcc-closes-headquarters-open-window-and-changes-hand-delivery-policy>.
 - During the time the Commission's building is closed to the general public and until further notice, if more than one docket or rulemaking number appears in the caption of a proceeding, paper filers need not submit two additional copies for each additional docket or rulemaking number; an original and one copy are sufficient.
 - After COVID-19 restrictions are lifted, the Commission has established that hand-carried documents are to be filed at the Commission's office located at 9050 Junction Drive, Annapolis Junction, MD 20701. This will be the only location where hand-carried paper filings for the Commission will be accepted.⁴⁹⁸

C. People with Disabilities

179. To request materials in accessible formats (braille, large print, electronic files, audio format) for people with disabilities, send an e-mail to fcc504@fcc.gov or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (tty).

D. Regulatory Flexibility Act

180. *Final Regulatory Flexibility Analysis*. The Regulatory Flexibility Act of 1980 (RFA) requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."⁴⁹⁹ Accordingly, we have prepared a Final Regulatory Flexibility Analysis (FRFA) concerning the possible impact of the rule changes contained in this *Second Report and*

⁴⁹⁸ See *Amendment of the Commission's Rules of Practice and Procedure*, Order, DA 20-562 (OMD 2020).

⁴⁹⁹ See 5 U.S.C. § 605(b).

Order on small entities. The FRFA is set forth in Appendix B.

181. *Initial Regulatory Flexibility Analysis.* As required by the Regulatory Flexibility Act,⁵⁰⁰ the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities of the proposals addressed in this *Second Further Notice of Proposed Rulemaking*. The IRFA is set forth in Appendix E. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines for comments on the *Second Further Notice of Proposed Rulemaking*, and should have a separate and distinct heading designating them as responses to the IRFA.

E. Paperwork Reduction Act

182. The *Second Report and Order* contains new information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under Section 3507(d) of the PRA. OMB, the general public, and other Federal agencies will be invited to comment on the new or modified information collection requirements contained in this proceeding. In addition, we note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4), we previously sought specific comment on how the Commission might further reduce the information collection burden for small business concerns with fewer than 25 employees.

183. The *Second Further Notice of Proposed Rulemaking* may contain proposed modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget to comment on the information collection requirements contained in this document, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4)), we seek specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

F. Congressional Review Act

184. The Commission has determined, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, concurs, that this rule is non-major under the Congressional Review Act, 5 U.S.C. § 804(2). The Commission will send a copy of this *Second Report and Order* to Congress and the Government Accountability office, pursuant to 5 U.S.C. § 801(a)(1)(A).

G. Accessing Materials

185. The Office of Federal Register (OFR) regulations require that agencies must discuss in the preamble to the Federal Register summary of a final rule the ways that the materials incorporated by reference are reasonably available to interested parties and that interested parties can obtain the materials.⁵⁰¹ In addition, OFR regulations require that the preamble to the Federal Register summary of a final rule summarize the material incorporated by reference.⁵⁰²

186. Sections 26.302(a) and (b) of the rules adopted herein incorporate by reference Annex J, Guidance for Determination of Necessary Bandwidth, and Annex M, Measurement Standards, of the National Telecommunications and Information Administration, Manual of Regulations and Procedures for Federal Radio Frequency Management (NTIA Manual), January 2021 Edition (Rev. Jan. 2022). The information in these annexes provide guidance for determining the necessary bandwidth of space launch radiocommunication systems. Interested parties may inspect a copy of these regulations at the FCC's

⁵⁰⁰ 5 U.S.C. § 603.

⁵⁰¹ 1 CFR § 51.5(b)(2).

⁵⁰² 1 CFR § 51.5(b)(3).

main office. The text of the NTIA Manual is also available online at <https://www.ntia.gov/publications/redbook-manual>.

H. Further Information

187. For additional information on this proceeding, Nicholas Oros of the Office of Engineering and Technology, at Nicholas.Oros@fcc.gov or 202-418-0636; contact Linda Chang of the Wireless Telecommunications Bureau at Linda.Chang@fcc.gov or 202-418-1339; or Julia Malette of the Space Bureau, at Julia.Malette@fcc.gov or 202-418-2453.

VI. ORDERING CLAUSES

188. Accordingly, IT IS ORDERED that pursuant to Sections 1, 2, 4(i), 5(c), 301, 303(c), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C §§ 151, 152, 154(i), 155(c), 301, 303(c), 303(f), and 303(r), and section 1.411 of the Commission's rules, 47 CFR § 1.411, this *Second Report and Order and Second Further Notice of Proposed Rulemaking* IS HEREBY ADOPTED.

189. IT IS FURTHER ORDERED that the amendments of Parts 2 and 26 of the Commission's rules as set forth in Appendix A, ARE ADOPTED, effective thirty (30) days after publication in the Federal Register, with the exception of sections 26.106, 26.108, 26.202, and 26.301, which contain new or modified information collection requirements that require review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act. The Commission directs the Wireless Telecommunications Bureau to announce the effective date of those information collections in a document published in the Federal Register after the Commission receives OMB approval, and directs the Wireless Telecommunications Bureau to cause these rule sections to be revised accordingly.

190. IT IS FURTHER ORDERED that the Office of the Secretary, Reference Information Center, SHALL SEND a copy of the *Second Report and Order and Second Further Notice of Proposed Rulemaking* including the Final Regulatory Flexibility Analysis and the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

191. IT IS FURTHER ORDERED that the Commission SHALL SEND a copy of this *Second Report and Order* in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A**Final Rules**

For the reasons discussed in the document, the Federal Communications Commission amends 47 CFR parts 0, 1, and 2 and adds 47 CFR part 26 as follows:

PART 0 – COMMISSION ORGANIZATION

1. The authority citation for part 0 continues to read as follows:

Authority: 47 U.S.C. 151, 154(i), 154(j), 155, 225, and 409, unless otherwise noted.

2. Amend § 0.331 by adding paragraph (g) to read as follows:

§ 0.331 Authority delegated.

(g) The Chief of the Wireless Telecommunications Bureau is delegated authority to administer the Commission's space launch services programs (Part 26 of this chapter) and the issuing of space launch services licenses. The Chief is delegated authority to develop specific methods that will be used to develop an application filing procedure for initial authorization and subsequent station registration; to seek comment on the circumstances attending the designation of a third-party space launch frequency coordinator, including a mechanism for selecting a frequency coordinator; to develop procedures that the space launch frequency coordinator will use to ensure compliance with the coordination requirements for space launch operations; and to perform other functions as needed for the administration of the space launch services.

PART 1 – PRACTICE AND PROCEDURE

3. The authority citation for part 1 continues to read as follows:

Authority: 47 U.S.C. chs. 2, 5, 9, 13; 28 U.S.C. 2461 note, unless otherwise noted.

4. Revise § 1.901 to read as follows:

§ 1.901 Basis and purpose.

These rules are issued pursuant to the Communications Act of 1934, as amended, 47 U.S.C. 151 et seq. The purpose of these rules is to establish the requirements and conditions under which entities may be licensed in the Wireless Radio Services as described in this part and in Parts 13, 20, 22, 24, 26, 27, 74, 80, 87, 90, 95, 96, 97 and 101 of this chapter.

5. Revise § 1.902 to read as follows:

§ 1.902 Scope.

In case of any conflict between the rules set forth in this subpart and the rules set forth in Parts 13, 20, 22, 24, 26, 27, 74, 80, 87, 90, 95, 96, 97, and 101 of title 47, chapter I of the Code of Federal Regulations, the rules in Part 1 shall govern.

6. Amend § 1.907 by revising the definitions of “Covered geographic licenses” and “Wireless Radio Services” to read as follows:

§ 1.907 Definitions.

Covered geographic licenses. Covered geographic licenses consist of the following services: 1.4 GHz Service (Part 27, subpart I of this chapter); 1.6 GHz Service (Part 27, subpart J); 24 GHz Service and Digital Electronic Message Services (Part 101, subpart G of this chapter); 218-219 MHz Service (Part 95, subpart F, of this chapter); 220-222 MHz Service, excluding public safety licenses (Part 90, subpart T, of this chapter); 600 MHz Service (Part 27, subpart N); 700 MHz Commercial Services (Part 27, subparts F

and H); 700 MHz Guard Band Service (part 27, subpart G); 800 MHz Specialized Mobile Radio Service (Part 90, subpart S); 900 MHz Specialized Mobile Radio Service (Part 90, subpart S); 900 MHz Broadband Service (Part 27, subpart P); 3.45 GHz Service (Part 27, subpart Q); 3.7 GHz Service (Part 27, subpart O); Advanced Wireless Services (Part 27, subparts K and L); Air-Ground Radiotelephone Service (Commercial Aviation) (Part 22, subpart G, of this chapter); Broadband Personal Communications Service (Part 24, subpart E, of this chapter); Broadband Radio Service (Part 27, subpart M); Cellular Radiotelephone Service (Part 22, subpart H); Citizens Broadband Radio Service (Part 96, subpart C, of this chapter); Dedicated Short Range Communications Service, excluding public safety licenses (Part 90, subpart M); Educational Broadband Service (Part 27, subpart M); H Block Service (Part 27, subpart K); Local Multipoint Distribution Service (Part 101, subpart L); Multichannel Video Distribution and Data Service (Part 101, subpart P); Multilateration Location and Monitoring Service (Part 90, subpart M); Multiple Address Systems (EAs) (Part 101, subpart O); Narrowband Personal Communications Service (Part 24, subpart D); Paging and Radiotelephone Service (Part 22, subpart E; Part 90, subpart P); VHF Public Coast Stations, including Automated Maritime Telecommunications Systems (Part 80, subpart J, of this chapter); Space Launch Services (Part 26 of this chapter); Upper Microwave Flexible Use Service (Part 30 of this chapter); and Wireless Communications Service (Part 27, subpart D of this chapter).

Wireless Radio Services. All radio services authorized in Parts 13, 20, 22, 24, 26, 27, 74, 80, 87, 90, 95, 96, 97 and 101 of this chapter, whether commercial or private in nature.

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

1. The authority citation for part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Amend § 2.106(a) by revising the Table of Frequency Allocations, pages 26, 36, and 37 to read as follows:

§ 2.106 Table of Frequency Allocations.

(a) * * *

272-273 SPACE OPERATION (space-to-Earth) FIXED MOBILE			
5.254 273-312 FIXED MOBILE			
5.254 312-315 FIXED MOBILE Mobile-satellite (Earth-to-space) 5.254 5.255			
315-322 FIXED MOBILE			
5.254 322-328.6 FIXED MOBILE RADIO ASTRONOMY	G27 G100 322-328.6 FIXED MOBILE	322-328.6	
5.149 328.6-335.4 AERONAUTICAL RADIONAVIGATION 5.258	US342 G27 328.6-335.4 AERONAUTICAL RADIONAVIGATION 5.258	US342	Aviation (87)
5.259 335.4-387 FIXED MOBILE	335.4-399.9 FIXED MOBILE	335.4-399.9	
5.254 387-390 FIXED MOBILE Mobile-satellite (space-to-Earth) 5.208A 5.208B 5.254 5.255			
390-399.9 FIXED MOBILE			
5.254 399.9-400.05 MOBILE-SATELLITE (Earth-to-space) 5.209 5.220	G27 G100 399.9-400.05 MOBILE-SATELLITE (Earth-to-space) US319 US320 RADIONAVIGATION-SATELLITE		Satellite Communications (25)
400.05-400.15 STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz) 5.261 5.262	400.05-400.15 STANDARD FREQUENCY AND TIME SIGNAL-SATELLITE (400.1 MHz) 5.261		

1700-1710 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.289 5.341	1700-1710 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.289 5.341 5.384			
1710-1930 FIXED MOBILE 5.384A 5.388A 5.388B		1710-1761 5.341 US91 US378 US385 1761-1780 SPACE OPERATION (Earth-to-space) G42 US91	5.341 US88	1710-1780 FIXED MOBILE
		1780-1850 FIXED MOBILE SPACE OPERATION (Earth-to-space) G42		1780-1850
5.149 5.341 5.385 5.386 5.387 5.388		1850-2025		1850-2000 FIXED MOBILE
1930-1970 FIXED MOBILE 5.388A 5.388B 5.388	1930-1970 FIXED MOBILE 5.388A 5.388B Mobile-satellite (Earth-to-space) 5.388	1930-1970 FIXED MOBILE 5.388A 5.388B 5.388		RF Devices (15) Personal Communications (24) Wireless Communications (27) Fixed Microwave (101)
1970-1980 FIXED MOBILE 5.388A 5.388B 5.388				
1980-2010 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A 5.389B 5.389F				
2010-2025 FIXED MOBILE 5.388A 5.388B	2010-2025 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space)	2010-2025 FIXED MOBILE 5.388A 5.388B		2000-2020 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space)
5.388	5.388 5.389C 5.389E	5.388		2020-2025 FIXED MOBILE

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
2110-2120 FIXED MOBILE 5.388A 5.388B SPACE RESEARCH (deep space) (Earth-to-space) 5.388			2110-2120 US252	2110-2120 FIXED MOBILE US252	Public Mobile (22) Wireless Communications (27) Fixed Microwave (101)
2120-2170 FIXED MOBILE 5.388A 5.388B	2120-2160 FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth) 5.388	2120-2170 FIXED MOBILE 5.388A 5.388B	2120-2200	2120-2180 FIXED MOBILE	
5.388	2160-2170 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth)				
2170-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A 5.388 5.389A 5.389F	5.388 5.389C 5.389E	5.388		NG41 2180-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth)	Satellite Communications (25) Wireless Communications (27)
2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392			2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) US96 EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED (line-of-sight only) MOBILE (line-of-sight only including aeronautical telemetry, but excluding flight testing of manned aircraft) 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392 US303	2200-2290 US96 US303	Space Launch Services (26)
2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)			2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)	2290-2300 SPACE RESEARCH (deep space) (space-to-Earth)	
2300-2450 FIXED MOBILE 5.384A Amateur Radiolocation	2300-2450 FIXED MOBILE 5.384A RADIOLOCATION Amateur		2300-2305 G122	2300-2305 Amateur	Amateur Radio (97)
			2305-2310	2305-2310 FIXED MOBILE except aeronautical mobile	Wireless Communications (27) Amateur Radio (97)

		US97 G122	RADIOLOCATION Amateur US97	
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* * * * *

(b) * * *

7. Section 2.106 is amended by adding paragraph (c)(94) and by revising paragraphs (c)(96) and (c)(319) to read as follows:

(c) * * *

(94) US94 In the band 2025-2110 MHz, the non-Federal space operation service shall be subject to the following conditions:

- (i) transmissions are restricted to telecommand use for pre-launch testing and space launch operations.
- (ii) subject to coordination with NTIA prior to each launch.
- (iii) subject to coordination with non-federal fixed and mobile stations.

* * * * *

(96) US96 The band 2200-2290 MHz is allocated to the space operation service (space-to-Earth) and mobile service on a secondary basis for non-Federal use subject to the following conditions. Non-Federal stations shall be:

- (i) Restricted to use for pre-launch testing and space launch operations, except as provided under US303; and
- (ii) Subject to coordination with NTIA prior to each launch.

* * * * *

(319) US319 In the bands 137-138 MHz, 148-149.9 MHz, 149.9-150.05 MHz, 400.15-401 MHz, 1610-1626.5 MHz, and 2483.5-2500 MHz, Federal stations in the mobile-satellite service shall be limited to earth stations operating with non-Federal space stations.

* * * * *

3. Add part 26 to read as follows:

PART 26 – SPACE LAUNCH SERVICES

Authority: 47 U.S.C. 151, 152, 154, 301, 303, unless otherwise noted.

Subpart A – GENERAL INFORMATION

Sec.

- 26.1 Basis and purpose.
- 26.2 Frequencies.
- 26.3 Scope of Service.
- 26.4 Other applicable rule parts.
- 26.5 Terms and definitions.

Subpart B – APPLICATIONS AND LICENSES

Sec.

- 26.101 Eligibility.
- 26.102 License period; Renewal.
- 26.103 Licensing.
- 26.104 Regulatory Status.
- 26.105 Authorization required.
- 26.106 Submission and Filing of Applications.
- 26.107 Restrictions on the Operation of Stations.
- 26.108 Content of applications; Registration of Stations.
- 26.109 Assignment and Transfer.

Subpart C – FREQUENCY COORDINATION

Sec.

- 26.201 Policies governing the assignment of frequencies.
- 26.202 Frequency coordinator requirements.

Subpart D -- TECHNICAL STANDARDS

Sec.

- 26.301 Authorized Bandwidth.
- 26.302 Emission masks.
- 26.303 Power limits.
- 26.304 Antenna Structures; air navigation safety.
- 26.305 Incorporation by Reference.

Authority: 47 U.S.C. sections 154, 301, 302a, 303, 307, 309 and 332, unless otherwise noted.

Subpart A -- GENERAL INFORMATION

§ 26.1 Basis and purpose.

This section contains the statutory basis for this part of the rules and provides the purpose for which this part is issued.

(a) Basis. The rules for Space Launch Services in this part are promulgated under the provisions of the Communications Act of 1934, as amended, that vest authority in the Federal Communications Commission to regulate radio transmission and to issue licenses for radio stations. All rules in this part are in accordance with applicable treaties and agreements to which the United States is a party.

(b) Purpose. This part states the conditions under which spectrum is made available and licensed for the provision of Space Launch Services. These rules do not govern the licensing of radio systems belonging to and operated by the United States.

§ 26.2 Frequencies.

The following frequencies are available for assignment on a nationwide, non-exclusive basis for Space Launch Services:

- (a) 2025-2110 MHz; and
- (b) 2200-2290 MHz.

§ 26.3 Scope of Service.

(a) Space launch stations are restricted to the following uses:

(1) 2025-2110 MHz band. The use of Space Launch Services licenses in the 2025-2110 MHz band is restricted to ground-to-launch vehicle telecommand uses necessary to support space launch operations.

(2) 2200-2290 MHz band. The use of Space Launch Services licenses in the 2200-2290 MHz band is restricted to launch vehicle-to-ground communications associated with telemetry and tracking operations.

(b) Telemetry, tracking and telecommand functions permissible as space launch operations include, but are not limited to, (1) pre-launch testing, such as pre-flight checks, ground testing, and telemetry; (2) vehicle tracking, including the transmission of parameter data from a launch vehicle to ground; (3) telecommand signals for propulsive maneuvering of a launch vehicle and separation of payload from launch vehicle; and (4) telecommand signals for propulsive maneuvering of a reentry vehicle for return and recovery.

(c) The use of Space Launch Services licenses for on-orbit communications after a launch vehicle separates from its payload are not permitted, provided that a space launch station may be used for telemetry, tracking, and telecommand activities for the incidental orbiting of a launch vehicle before or after it has separated from its payload. The use of Space Launch Services licenses for such incidental orbiting are permitted only to the extent necessary for space launch operations.

§ 26.4 Other applicable rule parts.

Other FCC rule parts applicable to the Space Launch Services include the following:

(a) *Part 0*. This part describes the Commission's organization and delegations of authority. Part 0 of this chapter also lists available Commission publications, standards and procedures for access to Commission records, and location of Commission Field Offices.

(b) *Part 1*. This part includes rules of practice and procedure for license applications, adjudicatory proceedings, procedures for reconsideration and review of the Commission's actions; provisions concerning violation notices and forfeiture proceedings; competitive bidding procedures; and the environmental requirements that, together with the procedures specified in § 17.4(c) of this chapter, if applicable, must be complied with prior to the initiation of construction. Subpart F includes the rules for the Wireless Radio Services and the procedures for filing electronically via the Universal Licensing System (ULS).

(c) *Part 2*. This part contains the Table of Frequency Allocations and special requirements in international regulations, recommendations, agreements, and treaties. This part also contains standards and procedures concerning the marketing and importation of radio frequency devices, and for obtaining equipment authorization.

(d) *Part 5*. This part contains rules prescribing the manner in which parts of the radio frequency spectrum may be made available for experimentation.

(e) *Part 15*. This part sets forth the requirements and conditions applicable to certain radio frequency devices.

(f) *Part 17*. This part contains requirements for the construction, marking and lighting of antenna towers, and the environmental notification process that must be completed before filing certain antenna structure registration applications.

(g) *Part 25*. This part contains the requirements for satellite communications, including satellite DARS.

(i) *Part 74*. This part sets forth the requirements and conditions applicable to experimental radio, auxiliary, special broadcast and other program distributional services.

(j) *Part 87*. This part sets forth the requirements and conditions applicable to aviation services.

§ 26.5 Terms and definitions.

Base station. A station at a specified site authorized to communicate with mobile stations.

Equivalent Isotropically Radiated Power (EIRP). The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain).

Expendable launch vehicle. A launch vehicle whose propulsive stages are used only once.

First stage of a launch. The first 15 minutes of flight.

Fixed service. A radio communication service between specified fixed points.

Fixed station. A station in the fixed service.

Frequency coordination. The process of obtaining the recommendation of a frequency coordinator for a frequency(ies) that will most effectively meet the applicant's needs while minimizing interference to licensees already operating within a given frequency band.

Frequency coordinator. An entity or organization that has been certified by the Commission to recommend frequencies for use by licensees in the Space Launch Services.

Harmful interference. For the purposes of resolving conflicts between stations operating under this part, any emission, radiation, or induction which specifically degrades, obstructs, or interrupts the service provided by such stations.

Itinerant Operation. Operation of a radio station at unspecified locations for varying periods of time.

Launch vehicle. A vehicle built to place a payload or human beings from Earth in a suborbital trajectory, in Earth orbit, or otherwise in outer space.

Mobile service. A radio communication service between mobile and land stations, or between mobile stations.

Mobile station. A station in the mobile service intended to be used while in motion or during halts at unspecified points.

Reentry vehicle. A vehicle designed to return from Earth orbit or outer space to Earth substantially intact. A reentry vehicle is regarded as a launch vehicle in the context of a space launch operation only to the extent that it is being used for launch purposes.

Reusable launch vehicle. A launch vehicle that is designed to return to Earth substantially intact and may be launched more than one time or that contains vehicle stages that may be recovered by a launch operator for future use.

Space launch operations. Any activity that places a launch vehicle, whether an expendable launch vehicle or a reusable launch vehicle or reentry vehicle used for launch, and any payload or human being from Earth in a suborbital trajectory, in Earth orbit, or otherwise in outer space, including pre-launch testing and recovery or reentry of the launch vehicle.

Telecommand. The transmission of non-voice signals for the purpose of remotely controlling a device.

Telemetry. The transmission of non-voice signals for the purpose of automatically indicating or recording measurements at a distance from the measuring instrument. In the context of space launch operations, telemetry is diagnostic information, transmitted from the launch vehicle to ground controller stations during the flight, which allows the ground controller station to track the performance of the launch vehicle.

Universal Licensing System (ULS). The consolidated database, application filing system and processing system for all Wireless Telecommunications Services. The ULS offers Wireless Telecommunications Bureau (WTB) applicants and the general public electronic filing of all applications requests, and full public access to all WTB licensing data.

Subpart B -- APPLICATIONS AND LICENSES

§ 26.101 Eligibility.

(a) The following entities are eligible for Space Launch Services licenses:

- (1) A non-Federal entity that conducts space launch operations; or
- (2) A parent of such entity or a subsidiary of such entity if either conducts space launch operations.

§ 26.102 License period; Renewal.

Licenses for stations in the Space Launch Services will be issued for a term of ten years from the date of original issuance, or renewal. Prior to expiration of the term of a license, the space launch licensee shall submit to the Commission an application for the renewal in accordance with Part 1, subpart F of this chapter. Such renewal application shall certify that, during the preceding license term, the licensee operated and continues to operate consistent with Commission rules and the terms of its existing authorization, including the operation of stations consistent with the terms of frequency coordination performed during its license term.

§ 26.103 Licensing.

The 2025-2110 MHz and 2200-2290 MHz bands are authorized on a non-exclusive nationwide basis for Space Launch Services. Non-exclusive nationwide licenses will serve as a prerequisite for registering launch sites and individual fixed, base, itinerant and mobile stations, as well as individual coordinated launches. A Space Launch Services licensee cannot operate a launch site and corresponding fixed, base, itinerant or mobile stations before registering it under its license and may only operate a station after that station has been cleared to operate in a particular frequency band in connection with a particular launch pursuant to the post-grant frequency coordination process set forth in Subpart C of this part. Space Launch Services licensees must delete registrations for unused launch sites and unused fixed, base, itinerant and mobile stations to maintain database integrity and facilitate coordination with other users of the 2025-2110 MHz and 2200-2290 MHz bands.

§ 26.104 Regulatory Status.

Licensees are permitted to provide services on a non-common carrier basis. A licensee may render communications services consistent with the regulatory status in its license and with the Commission's rules applicable to the Space Launch Services.

§ 26.105 Authorization required.

(a) General rule. Stations in the Space Launch Services must be used and operated only in accordance with the service rules set forth in this part, including the terms of the frequency coordination performed pursuant to subpart C of this part, and with a valid authorization granted by the Commission under the provisions of this part, except as specified in paragraph (b) of this section.

(b) Restrictions. The holding of an authorization does not create any rights beyond the terms, conditions and period specified in the authorization. Authorizations may be granted upon proper application, provided that the Commission finds that the applicant is qualified in regard to citizenship, character, financial,

technical and other criteria, and that the public interest, convenience and necessity will be served. *See* 47 U.S.C. §§ 301, 308, 309, and 310.

§ 26.106 Submission and Filing of Applications.

(a) Applications for authorizations in the Space Launch Services must be filed in the Universal Licensing System (ULS) in accordance with Part 1, subpart F of this chapter. All modifications or renewals of licenses, assignments or transfers of control of licenses or any rights thereunder, and waiver requests associated with any of the foregoing shall be granted only upon an application filed pursuant to Part 1, subpart F as well. Applicants should also refer to the Commission rules regarding the payment of statutory charges (subpart G of Part 1) and the use of the FCC Registration Number (FRN) (*see* subpart W of Part 1).

(b) Electronic filing. All applications and other filings using the application and notification forms listed in Part 1, subpart F of this chapter or associated schedules must be filed electronically in accordance with the electronic filing instructions provided by ULS. The Commission will announce by public notice the deployment date of the service in ULS and provide corresponding filing instructions.

§ 26.107 Restrictions on the Operation of Stations.

Stations in the Space Launch Services may operate in a particular frequency band only if they have been registered pursuant to § 26.108 and cleared to operate in that frequency band by the space launch frequency coordinator using the frequency coordination process set forth in subpart C of this part.

§ 26.108 Content of Applications; Registration of stations.

(a) Application for authorization. Each application for authorization required by this part shall be specific and complete with regard to the information requested by the application forms in Part 1, subpart F of this chapter and associated public notice(s). Applicants must provide any additional information requested by NTIA or the frequency coordinator to complete the frequency coordination process set forth in subpart C of this part.

(b) Station Registration. Once authorization is granted, Space Launch Services licensees must register in ULS each launch site and each corresponding station (fixed, base, itinerant, or mobile) that will be used in their space launch operations, as well as each individual launch that has completed the frequency coordination process set forth in subpart C of this part.

(c) Space Launch Services licensees have a continuing obligation to update their licenses and corresponding site and station registration data as soon as the operational or technical details of a launch changes to ensure proper coordination.

§ 26.109 Assignment and Transfer.

Licensees may assign or transfer their non-exclusive nationwide licenses upon application to and prior approval from the Commission, and any stations registered under those licenses will remain associated with those licenses unless otherwise agreed upon by the parties to the assignment or transfer and approved by the Commission.

Subpart C – FREQUENCY COORDINATION

§ 26.201 Policies governing the assignment of frequencies.

(a) Frequencies assigned to Space Launch Services stations are available on a shared basis only and will not be assigned for the exclusive use of any licensee.

(b) Any base, fixed, itinerant, or mobile station operating in the band must comply with the frequency coordination requirements set forth in § 26.202.

(c) All applicants and licensees shall cooperate in the selection and use of frequencies for Space Launch Services and comply with the frequency coordination requirements in order to minimize the potential for interference and make the most effective use of the authorized facilities. Information regarding registered launch sites, stations and launches that have completed the frequency coordination process set forth in subpart C of this part will be available at <http://wireless.fcc.gov/uls>. Licensees should examine this information before registering individual launch operations, and make every effort to ensure that their planned launch operations will not interfere or conflict with previously registered operations. Licensees of stations suffering or causing harmful interference are expected to cooperate and resolve this problem by mutually satisfactory arrangements.

§ 26.202 Frequency coordinator requirements.

Once an application for a new Space Launch Services authorization is granted, each Space Launch Services licensee must submit, for each proposed launch operation, the applicable launch site and corresponding fixed, base, itinerant, and mobile stations consistent with § 26.108 and submit their technical and operational parameters to the space launch frequency coordinator to initiate post-grant frequency coordination. Any changes to the technical and operational parameters for a launch event that occur after completion of post-grant frequency coordination also require coordination, and these changes shall be provided to initiate an updated post-frequency grant coordination.

(a) The space launch frequency coordinator may request, and Space Launch Services licensees are required to provide, all appropriate technical information, system requirements, and justification for requested station parameters when such information is necessary to identify and recommend the most appropriate frequency.

(b) In the 2025-2110 MHz band:

(1) Site-based Local Coordination.

(A) The space launch frequency coordinator must initiate a post-grant coordination request for site-specific coordination with the local Broadcast Auxiliary Service (BAS) frequency coordinator, including the provision of all necessary technical and operational parameters for each space launch licensee, to protect BAS, Cable Television Relay Service (CARS), and Local Television Transmission Service (LTTS) operations, as well as Federal entities that have completed coordination with the BAS frequency coordinator.

(B) The space launch frequency coordinator is not required to initiate a post-grant coordination request for site-specific coordination with the local BAS frequency coordinator if the Space Launch Services licensee provides a showing to the space launch frequency coordinator that (a) it has previously coordinated its proposed launch operations with the appropriate local BAS frequency coordinator and continues to comply with any conditions or agreements resulting from such prior coordination, or that it has entered into applicable coordination agreements with co-frequency entities; (b) it has ascertained that its proposal will not constrain, preclude, nor interfere with incumbents in the band, including BAS, CARS and LTTS licensees and previously coordinated Federal operations; and (c) it has demonstrated in a technical showing that its proposed operation will not create more than 0.5 dB increase in the noise threshold of a receiver at a fixed or temporary fixed electronic news gathering (ENG) receive site.

(C) Upon request, the space launch frequency coordinator and/or the Space Launch Services licensee must provide any additional information requested by the local BAS frequency coordinator regarding a pending recommendation that it has processed but has not yet been granted.

(D) It is the responsibility of the space launch frequency coordinator to ensure that its frequency recommendations do not conflict with the frequency recommendations of the local BAS frequency coordinator. Should a conflict arise, the affected coordinators are jointly responsible for taking action to

resolve the conflict, up to and including notifying the Commission and NTIA that a launch request must be denied.

(2) Per-Launch Coordination with the National Telecommunications and Information Administration (NTIA).

(A) To protect Federal users in the band, the space launch frequency coordinator shall conduct a post-grant, per-launch coordination with NTIA by providing the Space Launch licensee's site and station registration with their corresponding technical and operational parameters to initiate the coordination process for each proposed launch.

(B) To assist NTIA's review, the space launch frequency coordinator may provide a showing that the operational and technical parameters of a proposed launch are consistent with a prior successful coordination and that the space launch licensee continues to comply with any conditions or agreements resulting from such prior coordination or that its proposed launch is covered by an applicable coordination agreement(s) with co-frequency entities.

(c) In the 2200-2290 MHz band:

(1) Per-Launch Coordination with NTIA.

(A) To protect Federal users in the band, the space launch frequency coordinator shall conduct a post-grant, per-launch coordination with NTIA by providing the Space Launch Services licensee's site and station registration with their corresponding technical and operational parameters to initiate the coordination process for each proposed launch.

(B) To assist NTIA's review, the space launch frequency coordinator may provide a showing that the operational and technical parameters of a proposed launch are consistent with a prior successful coordination and that the space launch licensee continues to comply with any conditions or agreements resulting from such prior coordination or that its proposed launch is covered by an applicable coordination agreement(s) with co-frequency entities.

Subpart D -- TECHNICAL STANDARDS

§ 26.301 Authorized Bandwidth.

The Commission shall issue licenses in the Space Launch Services with bandwidths up to and including 5 megahertz, provided that the Commission may issue licenses with a maximum bandwidth exceeding 5 megahertz upon adequate justification from a license applicant explaining why the requested bandwidth is necessary for specific space launch operations, including an explanation of why the applicant's operations cannot be satisfied using a bandwidth of 5 megahertz or less.

§ 26.302 Emission Masks.

(a) 2025-2110 MHz. For frequencies offset from the assigned frequency less than the 50 percent of the necessary bandwidth, no attenuation is required. At a frequency offset equal to 50 percent of the necessary bandwidth, an attenuation of at least 8 dB is required. Frequencies offset more than 50 percent of the necessary bandwidth shall be attenuated by the following mask:

$$40 \times \log \left(\frac{2 \times |f_d|}{B_n} \right) + 8 \text{ dBsd}$$

Where f_d is the frequency displaced from the center of the emission bandwidth.

Necessary bandwidth (B_n) is determined in accordance with Annex J of the NTIA Manual of Regulations and Procedures for Federal Radio Frequency Management (NTIA Manual) (incorporated by reference, see § 26.305).

dBsd is dB attenuation in a 4 kHz bandwidth, relative to the maximum power in any 4 kHz bandwidth within the necessary bandwidth (0 dBsd).

Attenuation in this sense refers to the reduction in level relative to the reference, 0 dBsd, unless otherwise specified.

The unwanted emission mask rolls off at 40 dB per decade to a maximum attenuation of 60 dBsd, at which point it continues on both sides of the carrier for all frequencies beyond this point. See Annex M of the NTIA Manual regarding measurement requirements (incorporated by reference, see § 26.305). For any narrowband or single frequency unwanted emission which is not spread by the modulation process, the required attenuation shall be at least 60 dBc, where dBc is attenuation below the mean transmit power, rather than the dBsd value determined above.

(b) 2200-2290 MHz.

(1) During the first stage of a launch, all spectral components larger than $-[55 + 10 \log(P)]$ dBc (i.e., larger than -25 dBm) at the transmitter output must be within the spectral mask calculated using the following equation:

$$M(f) = K + 90 \log(R) - 100 \log |f-f_c|; |f-f_c| \geq R/m$$

where $M(f)$ = power (dBc) at frequency f (MHz)

$K = -20$ for analog signals

$K = -28$ for binary signals

$K = -61$ for FQPSK-B, FQPSK-JR, SOQPSK-TG

$K = -73$ for ARTM CPM

f_c = transmitter center frequency (MHz)

R = bit rate (Mbps) for digital signals or $(\Delta f + f_{max})$ (MHz) for analog FM signals

M = number of states in modulating signal ($m = 2$ for binary signals, $m = 4$ for quaternary signals and analog signals)

f = peak deviation

f_{max} = maximum modulation frequency

(2) After the first stage of a launch, the emission mask set forth in paragraph (a) of this section shall apply.

§ 26.303 Power Limits.

(a) 2025-2110 MHz. The equivalent isotropically radiated power (EIRP) transmitted in any direction towards the horizon by an earth station in the 2025-2110 MHz band of the Space Launch Services shall not (with limited exceptions) exceed the following limits:

+40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+40+3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

(b) 2200-2290 MHz. During the first stage of a launch, the EIRP of any station in the 2200-2290 MHz band of the Space Launch Services shall not exceed 25 Watts and the transmitter output power shall not exceed 25 Watts. In addition, the power flux-density at the Earth's surface produced by emissions from a transmitter operating after the first stage of a launch for all conditions and for all methods of modulation shall not exceed the following limits:

- 154 dB(W/m²) in any 4 kHz for angles of arrival less than 5° above the horizontal plane;
- 154 + 0.5 (δ - 5) dB(W/m²) in any 4 kHz for angles of arrival δ (degrees) between 5° and 25° above the horizontal plane;
- 144 dB(W/m²) in any 4 kHz for angles of arrival between 25° and 90° above the horizontal plane.

§ 26.304 Antenna structures; air navigation safety.

A licensee that owns its antenna structure(s) must not allow such antenna structure(s) to become a hazard to air navigation. In general, antenna structure owners are responsible for registering antenna structures with the FCC if required by Part 17 of this chapter, and for installing and maintaining any required marking and lighting. However, in the event of default of this responsibility by an antenna structure owner, the FCC permittee or licensee authorized to use an affected antenna structure will be held responsible by the FCC for ensuring that the antenna structure continues to meet the requirements of Part 17 of this chapter. See § 17.6 of this chapter.

(a) Marking and lighting. Antenna structures must be marked, lighted and maintained in accordance with Part 17 of this chapter and all applicable rules and requirements of the Federal Aviation Administration. For any construction or alteration that would exceed the requirements of section 17.7 of this chapter, licensees must notify the appropriate Regional Office of the Federal Aviation Administration (FAA Form 7460-1) and file a request for antenna height clearance and obstruction marking and lighting specifications (FCC Form 854) with the FCC, WTB, 1270 Fairfield Road, Gettysburg, PA 17325.

(b) Maintenance contracts. Antenna structure owners (or licensees and permittees, in the event of default by an antenna structure owner) may enter into contracts with other entities to monitor and carry out necessary maintenance of antenna structures. Antenna structure owners (or licensees and permittees, in the event of default by an antenna structure owner) that make such contractual arrangements continue to be responsible for the maintenance of antenna structures in regard to air navigation safety.

§ 26.305 Incorporation by Reference.

Certain standards listed in this section are incorporated by reference into this part with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51. The approved material is available for inspection at the Federal Communications Commission (FCC), 45 L Street NE, Reference Information Center, Room 1.150, Washington, DC 20554, (202) 418-0270, and is available from the sources indicated below. It is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, email fedreg.legal@nara.gov. This material is available at www.archives.gov/federal-register/cfr/ibr-locations.html. The text of the National Telecommunications and Information Administration (NTIA) regulations is also available online at <https://www.ntia.gov/publications/redbook-manual>.

APPENDIX B

Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Further Notice of Proposed Rulemaking (FNPRM)* released in April 2021 in this proceeding.² The Federal Communications Commission (Commission) sought written public comment on the proposals in the *NPRM*, including comments on the IRFA. No comments were filed addressing the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

A. Need for, and Objectives of, the Second Report and Order

2. In the *Second Report and Order*, the Commission continued its efforts to reform and streamline regulation of U.S. space commerce in order to ensure commercial companies can continue to drive U.S. space leadership. In furtherance of these objectives, the Commission adopted a new rule Part 26 for commercial space launch services, added a secondary non-Federal Space Operation allocation to the 2025-2110 MHz band, added a secondary non-Federal Mobile allocation to the 2200-2290 MHz band, removed the restriction on use of the secondary non-Federal Space Operation allocation to four channels, adopted a ten-year license term for commercial space launch operation, and established an application process modeled after space launch services' licensing framework for the 3650-3700 MHz band.

3. The new Part 26 rules adopted by the Commission contain the licensing, operation and service rules for space launch services and serve to both clarify the rules as well as improve the ability of those seeking guidance in this regulatory area to more easily reference the applicable rules. The space launch licensees will receive non-exclusive nationwide licenses with a ten-year term, which will provide both certainty and flexibility for space launch providers. Upon receiving their licenses, licensees may register their launch site and corresponding fixed, base, and itinerant stations as well as their mobile stations associated with the launch vehicles. The newly adopted Part 26 technical rules are similar to the current framework applicable to Federal operators in these bands, and also include emission mask and power limits that are consistent with the National Telecommunications and Information Administration's (NTIA) rules applicable to these bands.

4. The addition of a secondary Space Operation allocation to the 2025-2110 MHz band enables the Commission to issue licenses for use of this band during commercial space launches. This spectrum, which is regularly used by commercial space launch providers for sending control signaling to launch vehicles, will be subject to the same coordination requirements that currently apply to Federal users and will also sufficiently address the regulatory needs of the commercial space launch industry while ensuring the protection of incumbents. This band requires coordination of its use, as it is utilized by Broadcast Auxiliary Service (BAS) and Cable Television Relay Service (CARS) licensees as well as Federal agencies.

5. The *Second Report and Order* also removes the current four channel restriction for secondary non-Federal Space Operation allocation for the 2200-2290 MHz band. This change enables the availability of the entire band for non-Federal space launch operations. However, the other restrictions regarding use of the band, such as limiting use to pre-launch testing and space launch operations and requiring coordination with NTIA prior to each launch, will remain in place.

6. Additionally, adopting the secondary Mobile allocation for the 2200-2290 MHz band will

¹ 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601-612, was amended by the Small Business Regulatory Enforcement Fairness Act of 1996, (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² *Allocation of Spectrum for Non-Federal Space Launch Operations*, ET Docket No. 13-115, Report and Order and Further Notice of Proposed Rulemaking, 36 FCC Rcd 7764 (11), Appendix E (2021).

³ 5 U.S.C. § 604.

facilitate the Commission's adoption of technical rules for space launch telemetry, which follows the same approach NTIA applies to Federal launches.⁴ The Commission has determined that it is important to have the flexibility to adopt technical rules that are in harmony with the technical standards applied to Federal launches, because many launch vehicles are used for both Federal and non-Federal launches and many non-Federal launches occur at Federal launch facilities. Further, the secondary Mobile allocation for the 2200-2290 MHz will be subject to the same restrictions as the non-Federal Space Operation allocation in the band. The non-Federal Mobile allocation will be restricted to use during pre-launch testing and space launch operations and are subject to coordination for each launch.

7. Lastly, space launch licensees will be required to comply with post-license grant coordination requirements for each launch. The post-license grant coordination regime will be facilitated by a third-party space launch frequency coordinator in a two-part process: (1) for the 2025-2110 MHz band, a site-specific coordination of the operator's stations and launch parameters with BAS operations that requires the operator to submit its registered sites and stations to a designated third-party coordinator to initiate a launch coordination request(s), and (2) for both the 2025-2110 MHz and 2200-2290 MHz bands, coordination on a per-launch basis with NTIA unless not required by applicable coordination agreements with co-frequency entities or prior coordination. This will protect BAS, CARS, and Local Television Transmission Service (LTTS) operations and previously coordinated Federal incumbents which share these bands. In short, the rules adopted in the *Second Report and Order* provide much-needed updates to spectrum allocation and licensing for commercial space launch operations that will enable the fostering of innovation, investment and growth in the United States commercial space launch industry.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

8. There were no comments filed that specifically addressed the rules and policies proposed in the IRFA.

C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration

9. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.⁵

10. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply

11. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the rules adopted herein.⁶ The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."⁷ In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.⁸ A small business concern is one that:

⁴ NTIA treats telemetry systems during the first stage of a launch as an aeronautical mobile system and the second and later stages as a space operation system. *See* NTIA Manual § 8.2.44.

⁵ 5 U.S.C. § 604(a)(3).

⁶ *Id.* at 604(a)(4).

⁷ 5 U.S.C. § 601(6).

⁸ *Id.* § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small business applies "unless an agency, after consultation with the Office of

(continued....)

(1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁹

12. *Satellite Telecommunications.* This industry comprises firms “primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications.”¹⁰ Satellite telecommunications service providers include satellite and earth station operators. The SBA small business size standard for this industry classifies a business with \$38.5 million or less in annual receipts as small.¹¹ U.S. Census Bureau data for 2017 show that 275 firms in this industry operated for the entire year.¹² Of this number, 242 firms had revenue of less than \$25 million.¹³ Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 65 providers that reported they were engaged in the provision of satellite telecommunications services.¹⁴ Of these providers, the Commission estimates that approximately 42 providers have 1,500 or fewer employees.¹⁵ Consequently, using the SBA’s small business size standard, a little more than half of these providers can be considered small entities.

13. *All Other Telecommunications.* This industry is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.¹⁶ This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.¹⁷ Providers of Internet services (e.g. dial-up ISPs) or Voice over Internet Protocol (VoIP) services, via client-supplied telecommunications connections are also included in this industry.¹⁸ The SBA small business size standard for this industry classifies firms with annual receipts of \$35 million or less as small.¹⁹ U.S. Census Bureau data for 2017 show that there were 1,079 firms in this industry that

Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.” 5 U.S.C. § 601(3).

⁹ Small Business Act, 15 U.S.C. § 632 (1996).

¹⁰ See U.S. Census Bureau, *2017 NAICS Definition, “517410 Satellite Telecommunications,”* <https://www.census.gov/naics/?input=517410&year=2017&details=517410>.

¹¹ See 13 CFR § 121.201, NAICS Code 517410.

¹² See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517410, <https://data.census.gov/cedsci/table?y=2017&n=517410&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

¹³ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

¹⁴ Federal-State Joint Board on Universal Service, Universal Service Monitoring Report at 26, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

¹⁵ *Id.*

¹⁶ See U.S. Census Bureau, *2017 NAICS Definition, “517919 All Other Telecommunications,”* <https://www.census.gov/naics/?input=517919&year=2017&details=517919>.

¹⁷ *Id.*

¹⁸ *Id.*

¹⁹ See 13 CFR § 121.201, NAICS Code 517919 (as of 10/1/22, NAICS Code 517810).

operated for the entire year.²⁰ Of those firms, 1,039 had revenue of less than \$25 million.²¹ Based on this data, the Commission estimates that the majority of “All Other Telecommunications” firms can be considered small.

14. *Commercial Space Transportation.* Neither the Commission nor the SBA have developed a small business size standard for commercial space transport. Nonscheduled Charter Passenger Air Transportation²² is the closest industry with a SBA small business size standard. This U.S. industry comprises establishments primarily engaged in providing air transportation of passengers or passengers and cargo with no regular routes and regular schedules.²³ This industry also includes air taxi services, aircraft charter passenger services and charter air passenger services which would encompass air space transportation.²⁴ The SBA small business size standard for this industry classifies a business as small if it has 1,500 employees or less.²⁵ U.S. Census Bureau data for 2017 indicates there were 1,148 firms in this industry that operated for the entire year.²⁶ Of this number 1,129 firms had less than 250 employees.²⁷ Thus, the major of Nonscheduled Charter Passenger Air Transportation firms can be considered small. We note however, that this category encompasses various types of commercial air transportation firms and does not exclusively represent the number of firms engaged in passenger space transport.

15. The FCC believes that the following business entities are the principle entities currently comprising the commercial space transportation launch operator industry in the United States: Blue Origin, Lockheed Martin Corporation, Northrup Grumman, Space Exploration Technologies (Space X), The Boeing Company, and Virgin Galactic. In May 2020, Space Exploration Technologies with NASA astronauts in a commercially built and operated spacecraft launched from American soil to the International Space Station for the first time in history.²⁸ More recently, in July 2021, Virgin Galactic and Blue Origin both successfully launched manned space flights.²⁹ Additionally, The Boeing Company has

²⁰ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517919, <https://data.census.gov/cedsci/table?y=2017&n=517919&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

²¹ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

²² See U.S. Census Bureau, *2017 NAICS Definition*, “481211 Nonscheduled Charter Passenger Air Transportation,” <https://www.census.gov/naics/?input=481211&year=2017&details=481211>.

²³ *Id.*

²⁴ *Id.*

²⁵ See 13 CFR § 121.201, NAICS Code 481211.

²⁶ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFFIRM, NAICS Code 481211, <https://data.census.gov/cedsci/table?y=2017&n=481211&tid=ECNSIZE2017.EC1700SIZEEMPFFIRM&hidePreview=false>.

²⁷ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

²⁸ See NASA Astronauts Launch from America in Historic Test Flight of SpaceX Crew Dragon (dated May 30, 2020), <https://www.nasa.gov/press-release/nasa-astronauts-launch-from-america-in-historic-test-flight-of-spacex-crew-dragon>.

²⁹ On July 11, 2021, Virgin Galactic completed the first test flight with a full crew onboard in the commercial space industry. See <https://www.space.com/virgin-galactic-spaceshiptwo-reservations-one-small-step.html>; On July 20, 2021, Blue Origin successfully launched the first commercial space flight with four private citizens onboard. See <https://www.blueorigin.com/news/first-human-flight-updates>.

been working with NASA on its commercial Starliner spacecraft to incorporate various lessons learned as it prepares for its second unmanned launch of the Starliner - Orbital Flight Test (OFT-2).³⁰

16. The commercial space industry is a nascent industry and the Commission does not have data on the size of these entities. We therefore cannot reach definite conclusions as to the number of small entities that will be affected by our actions in this proceeding, but we shall assume that a significant number of small entities will be affected. NASA has agreements with two companies to design and develop human space flight capabilities: Space Exploration Technologies, and The Boeing Company.³¹

E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

17. The rules adopted in the *Second Report and Order* will impose new or modified reporting, recordkeeping or other compliance requirements on certain small and other entities. We adopt a streamlined application framework for Space Launch Service licenses, thus reducing compliance burdens for small and other entities. For example, applications for licenses in the Space Launch Service must be filed electronically in the Universal Licensing System (ULS) at <http://wireless.fcc.gov/uls>. All modifications or renewals of licenses, assignments or transfers of control of licenses, and waiver requests associated will be granted only upon a filed application. Space Launch Service licensees have an obligation to update their license and corresponding site and station registration data as soon as the operational or technical details of a launch changes to ensure proper coordination.

18. Additionally, the adopted rules require Space Launch Service licensees to conduct a post-grant, per-launch coordination directly with NTIA by providing NTIA with its site and station registration along with their corresponding technical and operational parameters. In addition, for the 2025-2110 MHz band, the licensee must submit technical and operational parameters to a space launch frequency coordinator to initiate post-grant frequency coordination. The space launch frequency coordinator will then coordinate with the local BAS frequency coordinator.

19. The Commission does not have sufficient information on the record to determine whether the rules adopted in the *Second Report and Order* will require small entities to hire professionals to comply with its decisions or to quantify the cost of compliance for small entities. We note, however, that the Commission anticipates the approaches it has taken to implement the requirements should have minimal cost implications, as the adopted rules are largely implementing an application framework that utilizes elements of existing processes small entities are already familiar with, such as the 3650-3700 MHz licensing framework or use of FCC Form 601 for applicant qualification for non-exclusive nationwide wireless licenses.

F. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered

20. The RFA requires an agency to provide, “a description of the steps the agency has taken to minimize the significant economic impact on small entities...including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.”³²

21. The Commission has considered the economic impact on small entities in reaching its final conclusions and through the actions we have taken in this proceeding. For example, the *Second*

³⁰ See Starliner Program Manager Shares Team’s North Star (dated July 29, 2021), <https://www.boeing.com/features/2021/07/starliner-program-manager-shares-teams-north-star.page>.

³¹ See NASA Astronauts Launch from America in Historic Test Flight of SpaceX Crew Dragon (dated May 30, 2020), <https://www.nasa.gov/press-release/nasa-astronauts-launch-from-america-in-historic-test-flight-of-spacex-crew-dragon>; Boeing, CST-1000 Starliner, <https://www.boeing.com/space/starliner/> (last visited July 28, 2023).

³² 5 U.S.C. § 604(a)(6).

Report and Order adopted an allocation in the 2025-2110 MHz band and expanded the previous allocation for the 2200-2290 MHz band, as well as permitted the Commission to issue licenses for commercial space launches to use these bands. We considered proposed alternatives that would limit space launch operations for the use of the 2025-2210 MHz band to specified geographic sites and pre-licensing coordination.³³ However, the actions we have taken in this proceeding will provide more efficient use of spectrum in those ranges, create a more certain regulatory regime, protect incumbent users from harmful interference and provide economic growth opportunities to small and other launch providers utilizing the bands.

22. Additionally, the *Second Report and Order* adopted licensing and technical rules governing spectrum requirements for Space Launch Services. Prior to the adoption of these rules, the Commission had granted special temporary authority (STA) under the Part 5 experimental licensing rules for each individual launch. Rather than retaining a site-by-site STA process, which are only valid for a single launch and expire after six months, our decision to adopt a nationwide, non-exclusive licensing approach provides small and other space launch operators the efficiency of only having to file one license to cover a host of launch sites that are shared by multiple co-frequency operators. Further, small entities who manufacture and/or develop launch vehicles and spacecraft or conduct launches will benefit because they will be able to obtain licenses for spectrum to use during launches instead of being subject to the added burden and uncertainty of having to obtain STA licenses for each launch. Consequently, adopting these allocations will provide only a benefit to small entities and will have no significant harmful economic impact on any small entity.

23. Lastly, with the adoption of these rules, the Commission can now provide launch providers with ten-year term licenses, which serve the Commission's goals of minimizing administrative burdens to small and other entities and encouraging long-term investment in these services, while still allowing the Commission to retain proper oversight over commercial space launch operations. We gave consideration to comments suggesting a 15-year term; however, we rejected such an approach as inefficient, given the congested nature of the bands at issue. While coordination of each launch will still be required because of the other Federal and non-Federal operations in these bands, the adopted rules take the step of establishing a coordination process that should streamline the process of providing access to spectrum during space launches, which will provide an economic benefit to small entities with limited human and economic resources that would otherwise have to navigate a more inefficient approach to launch coordination.

G. Report to Congress

24. The Commission will send a copy of the *Second Report and Order*, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.³⁴ In addition, the Commission will send a copy of the *Second Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Second Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register.³⁵

³³ SBE Comments at 17; NAB Comments at 5.

³⁴ 5 U.S.C. § 801(a)(1)(A).

³⁵ 5 U.S.C. § 604(b).

APPENDIX C**List of Commenters**

FNPRM Comments

Aerospace and Flight Test Coordinating Radio Council (AFTRCC)
Aerospace Industries Association
Astroscale U.S. Inc.
Axiom Space Inc., Atmos Space, Sierra Space Corp., Scout Inc. (Industry Participants)
Axiom Space Inc.
BlackSky Global LLC
Boeing
CTIA
Department of Commerce
Department of Defense
EchoStar
EIBASS
Industry Coalition Response (ICR)
Iridium Communications inc.
Myriota PYT LTD
NASA
National Association of Broadcasters (NAB)
NCTA
NTIA
Relativity Space Inc.
Rocket Lab USA Inc.
Satellite Industry Association (SIA)
Society of Broadcast Engineers (SBE)
Spaceflight Inc.
SpaceX
T-Mobile USA Inc.
United Launch Alliance LLC (ULA)
Verizon
Virgin Galactic Holdings Inc.
Wi-Fi Alliance

FNPRM Reply Comments

AFTRCC

Astra Space Inc.

AT&T

Axiom

Boeing

Consortium for the Execution of Rendezvous and Servicing (CONFERS)

CTIA

EIBASS

Fleet Space Technologies PYT LTD

Globalstar Inc.

Industry Participants

Momentum Inc.

Myriota

Northrop Grumman

Open Technology Institute at New America and Public Knowledge

Spaceflight Inc.

SpaceX

TechFreedom

T-Mobile

ULA

Verizon

APPENDIX D**Proposed Rules**

For the reasons discussed in the document, the Federal Communications Commission proposes to amend 47 CFR part 2 as follows:

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

1. The authority citation for Part 2 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Amend § 2.106(a) by revising the Table of Frequency Allocations, pages 36 and 37 to read as follows:

§ 2.106 Table of Frequency Allocations.

(a) * * *

1700-1710 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.289 5.341		1700-1710 FIXED METEOROLOGICAL-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.289 5.341 5.384		5.341	5.341 US88	
1710-1930 FIXED MOBILE 5.384A 5.388A 5.388B			1710-1761 5.341 US91 US378 US385		1710-1780 FIXED MOBILE	
			1761-1780 SPACE OPERATION (Earth-to-space) G42 US91			5.341 US91 US378 US385
			1780-1850 FIXED MOBILE SPACE OPERATION (Earth-to-space) G42		1780-1850	
5.149 5.341 5.385 5.386 5.387 5.388			1850-2025		1850-2000 FIXED MOBILE	RF Devices (15) Personal Communications (24) Wireless Communications (27) Fixed Microwave (101)
1930-1970 FIXED MOBILE 5.388A 5.388B	1930-1970 FIXED MOBILE 5.388A 5.388B Mobile-satellite (Earth-to-space)	1930-1970 FIXED MOBILE 5.388A 5.388B	5.388			
5.388 1970-1980 FIXED MOBILE 5.388A 5.388B 5.388						
1980-2010 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) 5.351A 5.388 5.389A 5.389B 5.389F						
2010-2025 FIXED MOBILE 5.388A 5.388B	2010-2025 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space)	2010-2025 FIXED MOBILE 5.388A 5.388B			2000-2020 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space)	Satellite Communications (25) Wireless Communications (27)
5.388	5.388 5.389C 5.389E	5.388			2020-2025 FIXED MOBILE	

2025-2110 SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION-SATELLITE (Earth-to-space) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (Earth-to-space) (space-to-space) 5.392	2025-2110 SPACE OPERATION (Earth-to-space) (space-to-space) EARTH EXPLORATION- SATELLITE (Earth-to-space) (space-to-space) SPACE RESEARCH (Earth-to-space) (space-to-space) FIXED MOBILE 5.391 5.392 US90 US92 US222 US346 US347 USxxx	2025-2110 FIXED NG118 MOBILE 5.391 Space Operation (Earth-to-space) US94 5.392 US90 US92 US222 US346 US347 USxxx	Space Launch Services (26) TV Auxiliary Broadcasting (74F) Cable TV Relay (78) Local TV Transmission (101J)
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Table of Frequency Allocations

2110-2483.5 MHz (UHF)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
2110-2120 FIXED MOBILE 5.388A 5.388B SPACE RESEARCH (deep space) (Earth-to-space) 5.388			2110-2120 US252 USxxx	2110-2120 FIXED MOBILE US252 USxxx	Public Mobile (22) Wireless Communications (27) Fixed Microwave (101)
2120-2170 FIXED MOBILE 5.388A 5.388B 5.388	2120-2160 FIXED MOBILE 5.388A 5.388B Mobile-satellite (space-to-Earth) 5.388 2160-2170 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.388 5.389C 5.389E	2120-2170 FIXED MOBILE 5.388A 5.388B 5.388	2120-2200	2120-2180 FIXED MOBILE NG41	
2170-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth) 5.351A 5.388 5.389A 5.389F				2180-2200 FIXED MOBILE MOBILE-SATELLITE (space-to-Earth)	Satellite Communications (25) Wireless Communications (27)
2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED MOBILE 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392			2200-2290 SPACE OPERATION (space-to-Earth) (space-to-space) US96 EARTH EXPLORATION-SATELLITE (space-to-Earth) (space-to-space) FIXED (line-of-sight only) MOBILE (line-of-sight only including aeronautical telemetry, but excluding flight testing of manned aircraft) 5.391 SPACE RESEARCH (space-to-Earth) (space-to-space) 5.392 US303 USyyy USzzz	2200-2290 US96 US303 USyyy USzzz	
2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth)			2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (deep space) (space-to-Earth) USxxx	2290-2300 SPACE RESEARCH (deep space) (space-to-Earth) USxxx	
2300-2450 FIXED	2300-2450 FIXED		2300-2305 G122	2300-2305 Amateur	Amateur Radio (97)

MOBILE 5.384A Amateur Radiolocation	MOBILE 5.384A RADIOLOCATION Amateur	2305-2310 US97 G122	2305-2310 FIXED MOBILE except aeronautical mobile RADIOLOCATION Amateur US97	Wireless Communications (27) Amateur Radio (97)
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3. Amend § 2.106 by adding (c)(96)(i) through (iii) to read as follows:

(c) * * *

(96) * * *

(i) USxxx Use of the bands 2290-2293 MHz and 2297-2300 MHz by Federal and non-Federal space stations may be authorized on a primary basis for the specific purpose of emergency transmissions from manned spacecraft used in the exploration and use of outer space, including the Moon and other celestial bodies. This allocation is restricted to emergency transmissions from manned spacecraft when experiencing emergency situations. Additionally, the bands 2025-2110 MHz and 2110-2120 MHz may also be authorized on a primary basis for transmissions of related commands to the spacecraft. Such operations should be conducted in accordance with Recommendation ITU-R SA.1863.

(ii) USyyy In the band 2213.5-2218.5 MHz, non-Federal space stations operating in the space operation service providing transportation service of crew to and from the International Space Station, may be authorized on a primary basis to transmit in the space-to-Earth direction, to authorized receiving stations, subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to authorized Federal stations. The power flux-density at the Earth's surface from such emissions from these non-Federal stations shall not exceed -144 to -154 dBW/m²/4 kHz, depending on the angle of arrival, in accordance with ITU Radio Regulation No. 21.16.

(iii) USzzz In the band 2200.2-2206.2 MHz, non-Federal space stations operating in the space operation service may be authorized on a primary basis to transmit to the International Space Station (ISS) while within 30 km of the ISS, subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to authorized Federal stations. The power-flux-density of such emissions at the Earth's surface from these non-Federal stations shall not exceed -144 to -154 dBW/m²/4 kHz, depending on the angle of arrival, in accordance with ITU Radio Regulation No. 21.16. ITU Radio Regulation No. 5.392 also applies.

* * * * *

APPENDIX E

Initial Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ the Federal Communications Commission (Commission) has prepared this Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in the *Second Further Notice of Proposed Rulemaking (Second FNPRM)*. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments in the *Second FNPRM*. The Commission will send a copy of the *Second FNPRM*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).² In addition, the *Second FNPRM* and IRFA (or summaries thereof) will be published in the Federal Register.³

A. Need for, and Objectives of, the Proposed Rules

2. In the Second FNPRM, the Commission proposes to add three footnotes requested by NTIA to the Allocation Table. The footnotes, titled USxxx, USyyy and USZZZ, will address manned and unmanned spacecraft use of spectrum during space missions. Draft footnote USxxx addresses emergency transmissions involving manned spacecraft in two portions of the 2200-2290 MHz band as well as the 2025-2110 MHz and 2110-2120 MHz bands; draft footnote Uyyy is applicable to ground station transmissions by non-Federal spacecraft transporting crew to and from the International Space Station (ISS); and draft footnote USzzz is applicable to spacecraft that are transmitting in portions of the 2200-2290 MHz band within 30 kilometers of the ISS and serves to provide an allocation for commercial companies transporting supplies and crew to the ISS.

3. In addition to the proposed footnotes, the Commission also seeks comment on (1) whether to include new spectrum allocations in specific bands for communications with cargo and crew capsules and payload communications with the International Space Station (ISS) and other crewed space stations; (2) possible necessary changes to the Table of Frequency Allocations to account for space-to-space communications between a crew or cargo capsule and crewed space stations, including in bands outside the S-band; (3) allowing a spectrum allocation for commercial spaceflight operations and licensing needs related to suborbital spaceflight; (4) expanding the use of the 2360-2395 MHz band in the context of additional uses to the band as well as expanded beyond the three frequencies currently designated for use by launch vehicles; and (5) whether 2360-2395 MHz space launch use of 2360-2395 MHz should be incorporated into the new Part 26 or instead be retained in Part 87.

4. The Commission also seeks to gain information that would support our objectives of providing efficient spectrum allocation and licensing processes for the commercial space sector. Of particular interest to the Commission are comments relating to:

- *Spectrum Allocation for Certain Post-Space Launch Payload Operations*. Whether payload operations should include new spectrum allocation in specific bands for communications with cargo and crew capsules and payload communications with the ISS and other crewed space stations.
- *Suborbital Spaceflight Operations*. Specific spectrum allocation and licensing needs in relation to suborbital spaceflight.

¹ 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601–612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² 5 U.S.C. § 603(a).

³ *Id.*

5. The Commission also seeks further comment on expanding the use of the 2360-2395 MHz band, both in the context of additional uses to the band as well as in expanding use in the band beyond the three frequencies currently designated for Federal and non-Federal telemetry and telecommand operations of launch vehicles. Lastly, in the *Second FNPRM*, we seek comment as to whether the 1435-1525 MHz band can effectively accommodate space launch operations, or if such use should be discouraged despite being permissible under our rules. Of interest are comments discussing the current use of the band and what changes would be needed to harmonize space launch use of the band with the rules applicable to 2025-2110 MHz and 2200-2290 MHz.

B. Legal Basis

6. The proposed action is authorized pursuant to sections 1, 2, 4(i), 5(c), 301, 303(c), 303(f), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 155(c), 301, 303(c), 303(f), and 303(r), and section 1.411 of the Commission's rules, 47 CFR § 1.411.

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

7. The RFA directs agencies to provide a description of and, where feasible, an estimate of, the number of small entities that may be affected by the proposed rules, if adopted.⁴ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁵ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁶ A small business concern is one that: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁷

8. *Small Businesses, Small Organizations, Small Governmental Jurisdictions.* Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe, at the outset, three broad groups of small entities that could be directly affected herein.⁸ First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the Small Business Administration's (SBA) Office of Advocacy, in general a small business is an independent business having fewer than 500 employees.⁹ These types of small businesses represent 99.9% of all businesses in the United States, which translates to 33.2 million businesses.¹⁰

9. Next, the type of small entity described as a “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”¹¹ The Internal Revenue Service (IRS) uses a revenue benchmark of \$50,000 or less to delineate its annual

⁴ 5 U.S.C. § 603(b)(3).

⁵ 5 U.S.C. § 601(6).

⁶ *See id.* § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

⁷ 15 U.S.C. § 632.

⁸ *See* 5 U.S.C. § 601(3)-(6).

⁹ *See* SBA, Office of Advocacy, “What’s New With Small Business?,”

<https://advocacy.sba.gov/wp-content/uploads/2023/03/Whats-New-Infographic-March-2023-508c.pdf>. (Mar. 2023)

¹⁰ *Id.*

¹¹ *See* 5 U.S.C. § 601(4).

electronic filing requirements for small exempt organizations.¹² Nationwide, for tax year 2020, there were approximately 447,689 small exempt organizations in the U.S. reporting revenues of \$50,000 or less according to the registration and tax data for exempt organizations available from the IRS.¹³

10. Finally, the small entity described as a “small governmental jurisdiction” is defined generally as “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”¹⁴ U.S. Census Bureau data from the 2017 Census of Governments¹⁵ indicate there were 90,075 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.¹⁶ Of this number, there were 36,931 general purpose governments (county,¹⁷ municipal, and town or township¹⁸) with populations of less than 50,000 and 12,040 special purpose governments—independent school districts¹⁹ with enrollment

¹² The IRS benchmark is similar to the population of less than 50,000 benchmark in 5 U.S.C § 601(5) that is used to define a small governmental jurisdiction. Therefore, the IRS benchmark has been used to estimate the number of small organizations in this small entity description. See Annual Electronic Filing Requirement for Small Exempt Organizations – Form 990-N (e-Postcard), “Who must file,” <https://www.irs.gov/charities-non-profits/annual-electronic-filing-requirement-for-small-exempt-organizations-form-990-n-e-postcard>. We note that the IRS data does not provide information on whether a small exempt organization is independently owned and operated or dominant in its field.

¹³ See Exempt Organizations Business Master File Extract (EO BMF), “CSV Files by Region,” <https://www.irs.gov/charities-non-profits/exempt-organizations-business-master-file-extract-eo-bmf>. The IRS Exempt Organization Business Master File (EO BMF) Extract provides information on all registered tax-exempt/non-profit organizations. The data utilized for purposes of this description was extracted from the IRS EO BMF data for businesses for the tax year 2020 with revenue less than or equal to \$50,000 for Region 1-Northeast Area (58,577), Region 2-Mid-Atlantic and Great Lakes Areas (175,272), and Region 3-Gulf Coast and Pacific Coast Areas (213,840) that includes the continental U.S., Alaska, and Hawaii. This data does not include information for Puerto Rico.

¹⁴ See 5 U.S.C. § 601(5).

¹⁵ See 13 U.S.C. § 161. The Census of Governments survey is conducted every five (5) years compiling data for years ending with “2” and “7”. See also Census of Governments, <https://www.census.gov/programs-surveys/cog/about.html>.

¹⁶ See U.S. Census Bureau, 2017 Census of Governments – Organization Table 2. Local Governments by Type and State: 2017 [CG1700ORG02], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. Local governmental jurisdictions are made up of general purpose governments (county, municipal and town or township) and special purpose governments (special districts and independent school districts). See also tbl.2. CG1700ORG02 Table Notes Local Governments by Type and State_2017.

¹⁷ See *id.* at tbl.5. County Governments by Population-Size Group and State: 2017 [CG1700ORG05], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 2,105 county governments with populations less than 50,000. This category does not include subcounty (municipal and township) governments.

¹⁸ See *id.* at tbl.6. Subcounty General-Purpose Governments by Population-Size Group and State: 2017 [CG1700ORG06], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 18,729 municipal and 16,097 town and township governments with populations less than 50,000.

¹⁹ See *id.* at tbl.10. Elementary and Secondary School Systems by Enrollment-Size Group and State: 2017 [CG1700ORG10], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 12,040 independent school districts with enrollment populations less than 50,000. See also tbl.4. Special-Purpose Local Governments by State Census Years 1942 to 2017 [CG1700ORG04], CG1700ORG04 Table Notes Special Purpose Local Governments by State Census Years 1942 to 2017.

populations of less than 50,000.²⁰ Accordingly, based on the 2017 U.S. Census of Governments data, we estimate that at least 48,971 entities fall into the category of “small governmental jurisdictions.”²¹

11. *Satellite Telecommunications.* This industry comprises firms “primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications.”²² Satellite telecommunications service providers include satellite and earth station operators. The SBA small business size standard for this industry classifies a business with \$38.5 million or less in annual receipts as small.²³ U.S. Census Bureau data for 2017 show that 275 firms in this industry operated for the entire year.²⁴ Of this number, 242 firms had revenue of less than \$25 million.²⁵ Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 65 providers that reported they were engaged in the provision of satellite telecommunications services.²⁶ Of these providers, the Commission estimates that approximately 42 providers have 1,500 or fewer employees.²⁷ Consequently, using the SBA’s small business size standard, a little more than half of these providers can be considered small entities.

12. *All Other Telecommunications.* This industry is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.²⁸ This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.²⁹ Providers of Internet services (e.g. dial-up ISPs) or Voice over Internet Protocol (VoIP) services, via client-supplied telecommunications connections are also included in this industry.³⁰ The SBA small business size standard for this industry classifies firms with annual receipts of \$35 million

²⁰ While the special purpose governments category also includes local special district governments, the 2017 Census of Governments data does not provide data aggregated based on population size for the special purpose governments category. Therefore, only data from independent school districts is included in the special purpose governments category.

²¹ This total is derived from the sum of the number of general purpose governments (county, municipal and town or township) with populations of less than 50,000 (36,931) and the number of special purpose governments - independent school districts with enrollment populations of less than 50,000 (12,040), from the 2017 Census of Governments - Organizations tbls. 5, 6 & 10.

²² See U.S. Census Bureau, *2017 NAICS Definition*, “517410 Satellite Telecommunications,” <https://www.census.gov/naics/?input=517410&year=2017&details=517410>.

²³ See 13 CFR § 121.201, NAICS Code 517410.

²⁴ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517410, <https://data.census.gov/cedsci/table?y=2017&n=517410&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

²⁵ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

²⁶ Federal-State Joint Board on Universal Service, *Universal Service Monitoring Report at 26*, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

²⁷ *Id.*

²⁸ See U.S. Census Bureau, *2017 NAICS Definition*, “517919 All Other Telecommunications,” <https://www.census.gov/naics/?input=517919&year=2017&details=517919>.

²⁹ *Id.*

³⁰ *Id.*

or less as small.³¹ U.S. Census Bureau data for 2017 show that there were 1,079 firms in this industry that operated for the entire year.³² Of those firms, 1,039 had revenue of less than \$25 million.³³ Based on this data, the Commission estimates that the majority of “All Other Telecommunications” firms can be considered small.

13. *Commercial Space Transportation.* Neither the Commission nor the SBA have developed a small business size standard for commercial space transport. Nonscheduled Charter Passenger Air Transportation³⁴ is the closest industry with a SBA small business size standard. This U.S. industry comprises establishments primarily engaged in providing air transportation of passengers or passengers and cargo with no regular routes and regular schedules.³⁵ This industry also includes air taxi services, aircraft charter passenger services and charter air passenger services which would encompass air space transportation.³⁶ The SBA small business size standard for this industry classifies a business as small if it has 1,500 employees or less.³⁷ U.S. Census Bureau data for 2017 indicates there were 1,148 firms in this industry that operated for the entire year.³⁸ Of this number 1,129 firms had less than 250 employees.³⁹ Thus, the major of Nonscheduled Charter Passenger Air Transportation firms can be considered small. We note however, that this category encompasses various types of commercial air transportation firms and does not exclusively represent the number of firms engaged in passenger space transport.

14. The FCC believes that the following business entities are the principle entities currently comprising the commercial space transportation launch operator industry in the United States: Blue Origin, Lockheed Martin Corporation, Northrup Grumman, Space Exploration Technologies (Space X), The Boeing Company, and Virgin Galactic. In May 2020, Space Exploration Technologies with NASA astronauts in a commercially built and operated spacecraft launched from American soil to the International Space Station for the first time in history.⁴⁰ More recently, in July 2021, Virgin Galactic and

³¹ See 13 CFR § 121.201, NAICS Code 517919 (as of 10/1/22, NAICS Code 517810).

³² See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517919, <https://data.census.gov/cedsci/table?y=2017&n=517919&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

³³ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

³⁴ See U.S. Census Bureau, *2017 NAICS Definition*, “481211 Nonscheduled Charter Passenger Air Transportation,” <https://www.census.gov/naics/?input=481211&year=2017&details=481211>.

³⁵ *Id.*

³⁶ *Id.*

³⁷ See 13 CFR § 121.201, NAICS Code 481211.

³⁸ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 481211, <https://data.census.gov/cedsci/table?y=2017&n=481211&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

³⁹ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

⁴⁰ See NASA Astronauts Launch from America in Historic Test Flight of SpaceX Crew Dragon (dated May 30, 2020), <https://www.nasa.gov/press-release/nasa-astronauts-launch-from-america-in-historic-test-flight-of-spacex-crew-dragon>.

Blue Origin both successfully launched manned space flights.⁴¹ Additionally, The Boeing Company has been working with NASA on its commercial Starliner spacecraft to incorporate various lessons learned as it prepares for its second unmanned launch of the Starliner - Orbital Flight Test (OFT-2).⁴²

15. The commercial space industry is a nascent industry and the Commission does not have data on the size of these entities. We therefore cannot reach definite conclusions as to the number of small entities that will be affected by our actions in this proceeding, but we shall assume that a significant number of small entities will be affected. NASA has agreements with two companies to design and develop human space flight capabilities: Space Exploration Technologies, and The Boeing Company.⁴³

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

16. Many of the rule changes which the *Second FNPRM* proposes or seeks comment on would, if adopted, involve making changes to the table of frequency allocations for a number of different frequency bands. These particular proposed changes would not involve making changes to the licensing and technical rules for any of these bands, and do not involve any new reporting, recordkeeping, or other compliance requirements. However, the *Second FNPRM* seeks comment on expanding the use of the 2360-2395 MHz band for space launches and whether the 1435-1525 MHz band can be used for space launches. Either of these proposals, if adopted, could potentially impact current users of these bands because of the need to coordinate use with the space launch activities.

17. At this time, the Commission is not in a position to determine whether, if adopted, our proposals and the matters upon which we seek comment will require small entities to hire professionals to comply, and cannot quantify the cost of compliance with the potential rule changes discussed in the *Second FNPRM*. We anticipate the information we receive in comments including where requested, cost and benefit analyses, will help the Commission identify and evaluate relevant compliance matters for small entities, including compliance costs and other burdens that may result from the proposals and inquiries made in the *Second FNPRM*.

E. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered

18. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof for small entities.”⁴⁴

19. Through the proposals contained in the *Second FNPRM*, we have taken steps to encourage further development of the domestic commercial space launch sector, while protecting

⁴¹ On July 11, 2021, Virgin Galactic completed the first test flight with a full crew onboard in the commercial space industry. See <https://www.space.com/virgin-galactic-spaceshiptwo-reservations-one-small-step.html>; On July 20, 2021, Blue Origin successfully launched the first commercial space flight with four private citizens onboard. See <https://www.blueorigin.com/news/first-human-flight-updates>.

⁴² See Starliner Program Manager Shares Team’s North Star (dated July 29, 2021), https://www.boeing.com/features/2021/07/starliner-program-manager-shares-teams-north-star_page.

⁴³ See NASA Astronauts Launch from America in Historic Test Flight of SpaceX Crew Dragon (dated May 30, 2020), <https://www.nasa.gov/press-release/nasa-astronauts-launch-from-america-in-historic-test-flight-of-spacex-crew-dragon>; Boeing, CST-1000 Starliner, <https://www.boeing.com/space/starliner/> (last visited June 11, 2020).

⁴⁴ 5 U.S.C. § 603(c)(1)-(4).

incumbent users from harmful interference and minimizing significant economic impact to small entities. One way the Commission has sought to accomplish these objectives is to take the step of including proposals that provide a benefit to the industry, while causing minimal, if any, economic or regulatory burdens. For example, we propose to add three footnotes to the Allocation Table as well as make a number of other Allocation Table modifications. As none of these actions would involve changing the licensing and technical rules for these bands, these actions would not change the regulatory burdens on Commission licensees. Commission licensees will continue to follow the same licensing procedures and be subject to the existing technical rules when operating in these bands. Therefore, the proposed footnote additions would not have a significant economic impact on small entities.

20. In proposing an expansion of the use of the 2360-2395 MHz band for space launches or in making the 1435-1525 MHz band available for space launches as discussed in the *Second FNPRM*, we acknowledge that such an approach, if adopted, could impact current users of these bands, which are primarily used for flight testing of aircraft. Based on industry feedback, we have considered declining to expand the use of the band, due to potential concerns of interference during flight tests.⁴⁵ Alternatively, we also considered and seek comment on what actions could promote increased usage by space launch operations without increasing the risk of interference. Additionally, in developing these proposals, we have considered any significant economic impact relating to coordination of flight testing and launch operations. At present, use of these bands is on a shared coordinated basis—i.e. there are no exclusive rights to use of the bands. As use of the band currently requires coordination, having to coordinate with increased space launch activities is not expected to present a significant economic impact on other users of the band. We seek comment from small and other entities concerning this issue.

21. Further, the Commission seeks comment on alternatives to its proposals as well as consider any questions raised that can help identify whether small entities face any special or unique issues that would require certain accommodations or additional time to comply. The Commission also seeks comment on modifications that could be made to our rules regarding administrative processes in order to reduce the economic impacts of the proposed rule changes on small entities. By specifically targeting small entities, we hope to obtain the requisite data to allow it to evaluate the most cost-effective approach to minimize the economic impact for such entities, while achieving our statutory objectives.

22. Additionally, to assist with the Commission's evaluation of the economic impact on small entities that may result from the actions and alternatives that have been proposed in this proceeding, the *Second FNPRM* seeks alternative proposals and requests information on the potential costs of such alternatives to licensees. The Commission expects to consider more fully the economic impact on small entities following its review of comments filed in response to the *Second FNPRM*, including costs and benefits information. Alternative proposals and approaches from commenters could help the Commission further minimize the economic impact on small entities. The Commission's evaluation of the comments filed in this proceeding will shape the final conclusions it reaches, the final alternatives it considers, and the actions it ultimately takes in this proceeding to minimize any significant economic impact that may occur on small entities from the final rules that are ultimately adopted.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules

23. None.

⁴⁵ See AFTRCC Reply at 9; AFTRCC Dec. 13, 2021 Ex Parte at 1.

**STATEMENT OF
CHAIRWOMAN JESSICA ROSENWORCEL**

Re: *Allocation of Spectrum for Non-Federal Space Launch Operations, Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations, Federal Space Station Use of the 399.9-400.05 MHz Band*; ET Docket No. 13-115, RM-11341; Second Report and Order and Second Further Notice of Proposed Rulemaking (September 21, 2023)

Six weeks ago, I had the honor of visiting Kennedy Space Center. I met with NASA Administrator Bill Nelson and scientists throughout the complex. The highlight of the trip was meeting the Artemis II crew who will soon become the first people to visit the moon in over half a century—including, I should add, the first woman and the first person of color. The rush of this trip was unlike anything I had ever experienced.

Why did I feel that way? I think it is because space exploration reminds us of what is best in us. It reminds us that we are a Nation that pushes boundaries and pursues discoveries. We do this, as President Kennedy so famously said last week in 1962, not because it is easy, but because it is hard. Because the skies inspire us to push the limits of human achievement, communicate in new ways, and understand our own planet like never before. In this country we have done it before, and we are working to do it again.

What is so exciting about the future of United States space exploration is that the Artemis mission is far from the only major endeavor we are working on. Coming up, NASA will launch its Psyche mission with a commercial operator, sending a spacecraft to land on an asteroid orbiting the Sun between Mars and Jupiter. This kind of commercial space activity is multiplying. The number of space launches is growing—fast.

Our policies need to keep up. We need to ensure that providers have a more consistent and reliable way to get the bandwidth they need for communications during space launches. Historically, this agency provided access to airwaves for space launch activity using special temporary authority. But this cobbled-together approach is not well-suited to an era where commercial launches are happening with far greater frequency. So today we allocate airwaves specifically to support commercial space launch activity. It will make our process simpler and more open to new entrants. It will better facilitate coordination with our federal partners through the use of a frequency coordinator. Launches are nail-biting undertakings under ideal conditions, so this will help make them easier and also boost competition.

I want to thank our colleagues at the National Telecommunications and Information Administration and the Department of Defense working collaboratively with us on this effort. I know they join us in supporting United States leadership in the new space age.

Thank you to the staff responsible for this effort: Damian Ariza, David Duarte, Michael Ha, Nick Oros, Siobahn Philemon, Jamison Prime, Ronald Repasi, and Tom Struble from the Office of Engineering and Technology; Linda Chang, Mark DeSantis, David Hu, John Lockwood, Roger Noel, Paul Powell, Arpan Sura, Joel Taubenblatt, and Peter Trachtenberg from the Wireless Telecommunications Bureau; Joseph Hill, Julie Kearney, Karl Kensinger, Julia Malette, Kathryn Medley, and Merissa Velez from the Space Bureau; David Konczal, Chin Yoo, Deborah Broderson, David Senzel, Anjali Singh, and Jeffrey Steinberg from the Office of General Counsel; Nicolas Copeland, Patrick Sun, and Aleks Yankelevich from the Office of Economics and Analytics; Gregory Baker, Nese Guendelsberger, Dante Ibarra, and Ethan Lucarelli from the Office of International Affairs; Jeffrey Neumann from the Media Bureau; Jason Koslowsky, Jeremy Marcus, Paul Noone, Josh Zeldis from the Enforcement Bureau; Michael Gussow and

Joy Ragsdale from the Office of Communications Business Opportunities; and Nicole Ongele from the Office of Managing Director.

**STATEMENT OF
COMMISSIONER GEOFFREY STARKS**

Re: *Allocation of Spectrum for Non-Federal Space Launch Operations; Amendment of Part 2 of the Commission's Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations; and Federal Space Station Use of the 399.9-400.05 MHz Band, Second Report and Order in ET Docket No. 13-115 and RM Docket No. 11341, and Second Further Notice of Proposed Rulemaking, ET Docket No. 13-115 and RM Docket No. 11341*

Just moments ago, we voted an item to streamline our satellite licensing rules, and earlier this year, we adopted a spectrum framework to spur entry by new NGSO systems. Those were important steps that will drive innovation and competition in commercial space. But if we truly want to be successful, we can't just focus on what happens in orbit. We also need to account for the precious few minutes it takes to get an object *into* space. That means our efforts must start at the launch.

There's plenty of opportunity for progress. For years, launch providers have relied on cramped and uncertain spectrum access authorized piecemeal by special temporary authority. While that band-aid approach may once have proved adequate, it's no match for the new cadence of a frothy commercial space industry—where days, not weeks or months, now separate each launch on average. Remember that each launch costs millions to execute and carries many millions more in terms of the value of the payload. So if we want to make it attractive to invest in new and greater commercial space opportunities, a more efficient and more predictable launch clearance process is a great place to start.

In 2021, we made a downpayment on fixing the problem. Today, we reach for liftoff. Consistent with bipartisan legislation on the issue, we expand access to the 2200-2290 MHz band and identify additional launch spectrum in 2025-2110 MHz. We also stay ahead of a potential growth in demand by seeking comment on ways to free up the 2360-2395 MHz band, and on ways to support the spectrum needs of emerging endeavors like commercial crew and cargo missions. Equally important, we establish a predictable licensing regime that will move providers away from tedious launch-by-launch authorizations, while fully protecting other federal agencies and facilitating the process of coordinating with them. Combined with our larger space agenda, these efforts will help us eliminate unnecessary barriers that make it harder to get into space.

A special thanks belongs to leaders in Congress who created a blueprint for today's action with efforts like the Launch Communications Act. I'd especially like to thank Senators Hickenlooper and Schmitt, and Representatives Soto and Dunn, for their leadership on this issue. I'd also like to extend my thanks to the Chairwoman for bringing this item to the floor, and to our Office of Engineering and Technology for their hard work. This item has my full support.