

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)	
)	
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
Allocation of Spectrum for Non-Federal Space Launch Operations;)	
)	RM-11341
and)	
)	
Federal Space Station Use of the 399.9-400.05 MHz Band)	

**COMMENTS OF THE
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION**

The National Telecommunications and Information Administration (“NTIA”), on behalf of the Executive Branch, hereby comments in response to the Commission’s recent Report and Order and Further Notice of Proposed Rulemaking (“FNPRM”) in the above-referenced proceeding.¹ The Commission’s proceeding addresses three seemingly separate but interrelated issues involving federal earth stations, launch spectrum, and operation of a new federal environmental sensing satellite. These issues are connected by the principle that the responsibilities of the Commission and NTIA to manage our respective spheres of spectrum use

¹ *Amendment of Part 2 of the Commission’s Rules for Federal Earth Stations Communicating with Non-Federal Fixed Satellite Service Space Stations; Allocation of Spectrum for Non-Federal Space Launch Operations; and Federal Space Station Use of the 399.9-400.05 MHz Band*, Report and Order and Further Notice of Proposed Rulemaking, ET Docket No. 13-115, RM-11341 (rel. Apr. 22, 2021) (*FNPRM*), available at <https://docs.fcc.gov/public/attachments/FCC-21-44A1.pdf>.

– non-federal use by the Commission and federal use by NTIA – require continued adjustment to reflect the realities of their interdependence. Here, it means (i) federal use of non-federal commercial satellite services should be recognized to have the same rights to protection as other users of those services; (ii) expectations to accommodate new non-federal use of federal launch spectrum must be tempered by recognition of the critical and growing uses of that spectrum by federal agencies in bands that are already congested, such that non-federal users should be encouraged to develop alternatives, particularly for in-orbit and payload communications; and (iii) recognition of the long-standing plans for the launch of Argos-4 as a federal satellite. Also attached hereto are related comments by key agencies affected by this proceeding: the National Aeronautics and Space Administration (“NASA”), the Department of Defense, and the National Oceanic and Atmospheric Administration (“NOAA”).²

I. Federal Use of Commercial Satellite Services Should Be Eligible for the Same Degree of Protection as Similar Non-Federal Use

As the FNPRM recognizes, greater parity and certainty is needed in the protections granted to communications between commercial satellites and Federal users.³ NTIA strongly

² See Letter from Mary W. Jackson, Assistant Deputy Associate Administrator, Space Communications and Navigation, NASA to Evelyn Remaley, Associate Administrator, NTIA dated August 28, 2021 (Attachment 1); Letter from Vernita D. Harris, Director, Spectrum Plans and Policy, Department of Defense to Charles Cooper, Associate Administrator, NTIA dated August 18, 2021 (Attachment 2); Letter from Zachary G. Goldstein, Chief Information Officer and Director, High Performance Computing and Communications, NOAA to Charles Cooper, Associate Administrator, NTIA dated August 5, 2021 (Attachment 3).

³ FNPRM at paras. 149-150.

supports resolving this issue consistent with its prior positions.⁴

With respect to the bands that should be included, NTIA recognizes the need to update the list the Commission originally proposed, to reflect the current allocations available for use by commercial satellite operators. To the extent the Commission has changed those allocations or takes future actions to change those allocations, the list should reflect those changes. The guiding principle should be that, in any band that is available for non-federal satellite operations (including what remains of the C-band FSS spectrum in both the uplink and downlink directions), federal earth station users should have the same opportunity for protected status as their non-federal counterparts.

II. Existing Federal Use of Key Spectrum Bands Requires Reasonable Limits on Expectations for Substantial Expansion of Non-Federal Use of Those Bands

NTIA strongly supports efforts to maintain United States leadership in space exploration and development, including supporting access to spectrum for the commercial space launch industry. Indeed, the Federal Government is a major beneficiary of the successful development of the commercial space launch industry. Since the inception of the commercial industry, NTIA and the federal agencies it represents have worked, successfully, with industry to accommodate its spectrum access. That accommodation to date, however, does not mean that coordination has been easy for any of the parties, federal or non-federal, or that it can be expected to get easier as demand increases. The two key bands raised in the FNPRM, the 2025-2110 MHz band and the

⁴ See *In the Matter of Amendment to the National Table of Frequency Allocations to Provide Allocation Status for Federal Earth Stations Communicating with Non-Federal Satellites*, NTIA Petition for Rulemaking, RM-11341 (Aug. 4, 2006) available at <https://ecfsapi.fcc.gov/file/6518424943.pdf>; see also *Letter from Larry E. Strickling, Assistant Secretary for Communications and Information, to Julius Genachowski, FCC Chairman*, ET Dkt. No. 13-155 (May 13, 2013) available at <https://ecfsapi.fcc.gov/file/7022314718.pdf> (Recognizing that federal users will be subject to FCC rules for the operation of those earth stations, including a process for public comment on any applications for protected status.).

2200-2290 MHz band, are heavily used today and require extensive coordination even among federal users.⁵ The band 2025-2110 MHz, in particular, has seen dramatically increased demand for federal use as federal operations have shifted from federal bands that were repurposed to accommodate new commercial wireless broadband operations. All users would like stable and reliable access to these bands. Such access is not the case now for federal users, however, and, with demand only increasing, it is not likely to be the case for the foreseeable future. Thus, given the important missions of federal agencies in the bands, including for national defense, it is important for those federal users to maintain priority and for all commercial launches to remain subject to prior coordination. It is also important, given the current extensive and varied demands on the spectrum, to limit the permissible operations. Expansion of the scope of “space launch operations” to include in-orbit operations, payload communications, or crosslinks is inappropriate for a rulemaking that is focused on “launch” and would greatly increase the non-federal demand for spectrum and put an unacceptable strain on federal use.⁶ While the FCC definition of space launch operations may need some refinement to provide greater certainty, space launch operations are fundamentally for a short duration. It is also important that non-

⁵ Pending review of comments filed by launch service providers, we do not focus here on the two other federal bands the Commission included in the FNPRM, 420-430 MHz and 5650-5925 MHz, since these bands do not appear to be of much interest to commercial users. We do note, however, the U.S. Department of Transportation’s concern with the need to consider the potential impact on Intelligent Transportation Systems in the band if radar operations are expanded to operate at additional sites. If there is interest in commercial radar systems in the band, this issue will need further study and consideration.

⁶ One exception to this may be for the use of 2203.2 MHz in the space-to-space direction to communicate for rendezvous and docking with the International Space Station (“ISS”). Another relates to the use of 2213.5-2218.5 MHz to transmit direct-to-ground for transporting crew to and from the ISS. NTIA anticipates the adoption of a proposal of its Interdepartment Radio Advisory Committee to formally permit such operations by non-federal entities. In light of the infrequent nature of such operations, coordination for non-federal operations of this type should be manageable in the absence of other alternatives.

federal operations in the 2200-2290 MHz band be limited to a maximum five megahertz bandwidth (as are federal operations) and to the four sub-bands that are currently available for coordination.

The expectations for continued growth in the spectrum needs of the commercial space industry (for launch and other activities) and its understandable need for stable and reliable spectrum access prompt NTIA to urge the Commission and non-federal users to focus on identifying alternatives to these federal bands. NTIA is prepared to assist with that effort. It appears that the 2360-2395 MHz band may be one alternative, in the sense that it may provide an additional option for some launch operators. While new equipment may need to be developed to use the band for space operations, the cost of such development and deployment may be minimal compared to the relative certainty and stability that would be provided. For the space-to-space and other communications links that the FNPRM mentions, the most promising alternative may be the use of inter-satellite links to communicate with commercial satellites.

III. Longstanding Plans for Argos Satellites Require Recognition

As the *FNPRM* recognizes, the Commission's 2013 Notice of Proposed Rulemaking in this proceeding proposed to modify U.S. Table Footnote US319 to permit federal space stations to operate 399.99-400.05 MHz.⁷ This modification was done with the expectation that the United States would operate satellites in the Argos series. A new Argos satellite has been built and NOAA expects it to be launched as soon as the end of this calendar year. The FNPRM mentions that other satellite systems were involved in a Commission processing round initiated in 2019.⁸ NTIA hopes that all the affected parties can successfully coordinate their operations,

⁷ *FNPRM* at para. 152.

⁸ *Id.* at para. 154.

but in the event they are unable or unwilling to do so, we urge the Commission to recognize the status of its 2013 proposal.

For the abovementioned reasons, NTIA respectfully recommends that the Commission adopt rules consistent with the foregoing principles.

Respectfully submitted,



Kathy Smith
Chief Counsel

Evelyn Remaley
Acting Assistant Secretary of Commerce
for Communications and Information

Charles Cooper, Associate Administrator
Bruce Jacobs, Senior Advisor
Office of Spectrum Management

Derek Khlopin, Senior Advisor

National Telecommunications
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September 1, 2021

ATTACHMENT 1

Letter from Mary W. Jackson, Assistant Deputy
Associate Administrator, Space
Communications and Navigation, NASA to
Evelyn Remaley, Associate Administrator, NTIA
dated August 28.



August, 28, 2021

Reply to Attn of: Human Exploration and Operations Mission Directorate

TO: Associate Administrator, National Telecommunications and Information Administration

FROM: Assistant Deputy Associate Administrator, Space Communications and Navigation

SUBJECT: NASA Review and Comments on the Federal Communications Commission Space Launch Report & Order and Further Notice of Proposed Rulemaking

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review the Federal Communications Commission (FCC) Commercial Space Launch Report & Order and Further Notice of Proposed Rulemaking (FNPRM) contained in FCC 21-44 (ET Docket No. 13-115) and provides the following overall comments. As discussions continue to establish additional spectrum access, policies, and procedures to meet the increasing demand to support commercial space missions, NASA values the FCC's measured and careful approach. This approach provides spectrum access to meet the commercial space industry's immediate requirement for access, while protecting existing Federal uses and providing opportunities for continued collaboration.

NASA wholeheartedly supports the U.S. National Space Policy and acknowledges that supporting and promoting the commercial space launch industry serves to promote a robust commercial space industry in general. NASA notes that such support needs to balance the needs of the commercial space industry with the needs of the Federal agencies and their respective missions of defense, national security, homeland security, law enforcement, weather forecasting, climate study, space research, and management of the national airspace system, amongst many others. NASA supports the FCC's Report & Order as contained in the subject document as an important step forward in this regard.

Regarding the FNPRM as contained in the same document, NASA respectfully submits the following comments, with more specific comments in the Enclosure.

Use of the 2025-2110 MHz band: NASA makes extensive use of this band (i.e., currently 382 assignments) for both transmissions from earth stations supporting NASA spacecraft (Earth-to-space) and transmissions from NASA's Tracking and Data Relay Satellite System (TDRSS) to user spacecraft (space-to-space), both of which are critical to NASA operations. Additionally, other Federal agencies also make extensive use of this band and that use is increasing due to the Advance Wireless Services (AWS)-3 transition of many Federal systems to other frequency bands.

Therefore, NASA does not support a co-primary allocation in the U.S. Table of Allocations in the 2025-2110 MHz band other than a footnote allocation for use by commercial launch providers to send commands to launch vehicles for recovery and retrieval purposes. Such use should be coordinated with Federal users through the National Telecommunications and Information Administration (NTIA) on a case-by-case basis. Without such coordination, significant interference will result to existing federal operations.

Use of the 2200-2290 MHz band: NASA makes extensive use of this band (i.e., currently 482 assignments) for both transmissions from NASA spacecraft to the ground (space-to-Earth) and transmissions from user spacecraft to TDRSS (space-to-space), both of which are critical to NASA operations. Additionally, other Federal agencies also make extensive use of this band (i.e., 11,130 assignments in addition to the NASA assignments) with the largest users being Army, Air Force, Navy, and Homeland Security. It should also be noted that dozens of new systems are being certified by NTIA for operation in this band each year further increasing the congestion in this band, many of those systems as a result of the AWS-3 transition activities. Currently, NASA opposes the expansion of the scope of the non-Federal space operation allocation in 2200-2290 MHz band to anything other than pre-launch testing and space launch operations. NASA supports retaining the limitation on this use to the four subbands given in US96 in the Report & Order. By limiting the commercial launch use to the four subbands, Federal users can plan their operations around those four subbands to some degree which ensures that the commercial launch providers will have reasonable access to the needed spectrum. NASA notes that the 2360-2395 MHz band could also be used to provide additional channels for commercial space launch operations.

At this time, NASA opposes the adoption of a primary non-Federal space operation allocation in the 2200-2290 MHz band.

NASA understands the need for some certainty (within the 2200-2290 MHz band, or another band) for on-orbit operations to support NASA's Commercial Cargo/Crew, and non-NASA commercial initiatives. For this reason, NASA worked with our colleagues at the Departments of Defense and Commerce to get agreement on the use of 2200.2-2206.2 MHz in the space-to-space direction to communicate for rendezvous and docking with the International Space Station (ISS) and the use of 2213.5-2218.5 MHz to transmit direct to ground (space-to-Earth) to authorized receiving stations for transporting crew and cargo to and from the ISS, as approved in the Interdepartment Radio Advisory Committee in April 2007. These footnotes are currently in process for consideration by the FCC and are intended for exclusive use of visiting vehicles to the ISS. NASA does not support exclusive commercial on-orbit use of the 2200-2290 MHz band.

NASA supports retaining the 5 MHz maximum necessary bandwidth limitation for non-Federal users in 2200-2290 MHz since this is the same restriction applied to Federal space systems using this band. NASA also supports allowing non-Federal users to use any emission bandwidth up to and including 5 MHz for commercial space launch operations; that is, there is no reason to limit all of the non-Federal launch vehicles to exactly a 5 MHz emission since narrower emissions are actually easier to coordinate with existing Federal users.

Finally, NASA recommends that the FCC, as the commercial regulator, establish long-term commercial spectrum requirements, and determine if regulatory, policy, or technical alternatives are needed to accommodate these needs. NASA looks forward to working with the NTIA, FCC, DoD, and commercial space partners to develop a consensus solution. Use of existing commercial spectrum allocated to the mobile-satellite and fixed-satellite services for on-orbit use for commercial space operations could be a solution in a future rulemaking to help alleviate possible conflicts with Federal usage.

Victor D. Sparrow

Enclosure

Enclosure
NASA Comments on FNPRM (FCC 21-44)

- **Paragraph #38-41:** NASA makes limited use of the 420-430 MHz band and has no objection to its use for flight safety/termination systems at non-federal launch facilities provided that federal use of the band is properly protected. NASA also does not object to making this aeronautical mobile allocation for flight termination signals co-primary with federal users. Additional investigation for interference protection should be considered given the existing very high power of flight termination transmitters. Also, Section 8.2.54 of the NTIA Manual provides for use of 420-450 MHz for Range Safety Operations. It does not specify which radiocommunication service or station class is to be used for this purpose.
- **Paragraph #42-47:** NASA makes extensive use of the 2025-2110 MHz band for both transmissions from Earth stations supporting NASA spacecraft (Earth-to-space) and transmissions from TDRSS to user spacecraft (space-to-space) which are both critical to NASA operations. Due to the extensive use of this band by various federal agencies, NASA, at present, does not support a co-primary allocation in the U.S. Table of Allocations in the 2025-2110 MHz band other than a footnote allocation for use by commercial launch providers to send commands to launch vehicles for recovery and retrieval purposes. Such use should be coordinated with federal users through NTIA on a case-by-case basis. Without such coordination, significant interference will result to existing federal operations. It should be noted that footnote US347¹ already provides for non-Federal use of this band for Earth-to-space and space-to-space directions in the space research and Earth exploration-satellite services.
- **Paragraph #48:** The FCC proposes to allow use of the entire 2025-2110 MHz band without restriction on where licensed launches may occur. NASA does not object to this proposal but notes that launching from some locations may result in launch trajectories over areas with large amounts of Federal activities therefore increasing the possibility of harmful interference to Federal operations. This may make use at some locations difficult, if not impossible, to coordinate. On the other hand, if use of the band is restricted to certain locations such as Federal ranges or FAA licensed launch sites, this may facilitate coordination between Federal and non-Federal users. Recognizing that the FCC is not placing such location restrictions on the US96 use of the 2200-2290 MHz band, the FCC should reconsider such a restriction for that band as well for the same reasons. The FCC also asks whether the same restrictions on Federal use of the 2025-2110 MHz band be placed on non-Federal users of the band. In order to allow for co-primary use by the non-Federal users for any space operation application, NASA supports extending the exact same restrictions that have been placed on the Federal users to non-Federal users of the band. Finally, since space operation use of the 2025-2110 MHz band by both Federal and future non-Federal users of the band would be for telecommand operations which are inherently fairly narrow bandwidth transmissions, NASA does not foresee a need to limit the non-Federal use to command launch vehicles to specific portions of the band. However, NASA supports the restriction that each use much be

¹ US347 In the band 2025-2110 MHz, non-Federal Earth-to-space and space-to-space transmissions may be authorized in the space research and Earth exploration-satellite services subject to such conditions as may be applied on a case-by-case basis. Such transmissions shall not cause harmful interference to Federal and non-Federal stations operating in accordance with the Table of Frequency Allocations.

coordinated on a case-by-case basis in order to maintain the protection of Federal use of the band.

- **Paragraph #49:** NASA does not object to the addition of a non-Federal aeronautical mobile allocation to the US96 footnote since the next revision to the NTIA Manual includes text indicating that the first stage of a launch vehicle is in effect an aeronautical mobile telemetry usage. This would alleviate concerns with dealing with the first stage of a launch vehicle as a space system. NASA notes that the payload of a launch vehicle should not be considered as part of the launch vehicle or the launch process, especially with respect to any on-orbit or space operation.
- **Paragraph #50:** NASA concurs that such a mobile allocation would have to have the exact same restrictions on its use as does the space operation allocation in footnote US96. The use of the band 2200-2290 MHz remains the same for Federal users; therefore, the same coordination for use of the mobile allocation for pre-launch testing and space launch operations would be necessary to protect the Federal users and ensure the success of the commercial launch operators.
- **Paragraph #51:** At this time, NASA opposes the expansion of the scope of the non-Federal space operation allocation in 2200-2290 MHz band to anything other than pre-launch testing and space launch operations. As stated previously, the use of the 2200-2290 MHz band is heavily congested with the existing Federal users. In fact, the use of both the 2025-2110 MHz and 2200-2290 MHz bands by Federal users has greatly increased since the advent of the AWS-3 auction and transition. Many Federal users have moved operations into these two bands as a result of vacating other former Federal spectrum resulting in a very congested and complex spectrum usage with which to coordinate additional non-Federal use. The FCC also provides the example of SpaceX Dragon spacecraft communicating with the International Space Station (ISS) for docking with the ISS. NASA has already proposed, and the IRAC approved, a possible US footnote allowing commercial visiting vehicles to transmit at 2203.2 MHz in the space-to-space direction to communicate for rendezvous and docking (approved by the IRAC on April 11, 2017). Such use could potentially be extended to commercial space station use as well. Therefore, limited use of a single frequency should suffice. However, it should be noted that such use is completely outside of the scope of launch activities and should be considered as on-orbit use.
- **Paragraph #52:** Currently, NASA does not support expanding US96 to cover the entire 2200-2290 MHz band and notes that by limiting non-Federal use to the four current subbands, coordination between Federal and non-Federal users is greatly enhanced. While it is true that other frequencies within the 2200-2290 MHz band have been successfully coordinated in the past, there is no assurance that they can be successfully coordinated in the future. However, by limiting the commercial launch use to the four subbands, Federal users can plan their operations around those four subbands to some degree which ensures that the commercial launch providers will have reasonable access to the needed spectrum. Furthermore, since the 2360-2395 MHz band is already allocated for use in both Federal and non-Federal launch vehicle telemetry operations, additional channels can be used in this band. NASA's Space Launch System (SLS) will be using a channel in this band as will the SpaceX Falcon-9 Heavy launch vehicle.

- **Paragraph #53:** NASA supports non-Federal users of the 2200-2290 MHz band retaining the restriction of no more than 5 MHz necessary bandwidth per channel. This is the same restriction that is applied to Federal space systems using the band. Congestion in the 2200-2290 MHz band makes it difficult if not impossible to coordinate use of more than 5 MHz necessary bandwidth per channel. The NTIA Spectrum Planning Subcommittee routinely puts such a statement on all certifications of spectrum support for airborne mobile telemetry systems in this band for this reason. With respect to the fact that some other frequencies in the 2200-2290 MHz band have been successfully coordinated in the past, as was previously stated, this does not imply that they can be successfully coordinated in the future. Therefore, at this time, NASA opposes adjusting the subbands in any way.
- **Paragraph #54:** At this time, NASA opposes the adoption of a primary space operation allocation in the 2200-2290 MHz band. Making such an allocation while still requiring launch-by-launch coordination will in no way assist or improve the certainty of operating in the band in the future. Furthermore, NASA strongly prefers to maintain the non-Federal operations as a secondary allocation so there is no danger in the future of the non-Federal operators constraining Federal operations. A primary allocation implies “equal rights” to the use of the allocation which could constrain the future Federal use of the band.
- **Paragraph #55-59:** NASA makes use of the 5650-5925 MHz band largely for range tracking radars. Given the limited number of launch sites, NASA supports a non-Federal allocation for similar purposes.
- **Paragraph #60:** NASA encourages additional dialog to converge on the description and definition of space launch operations. Space launch operations should only include pre-launch testing, telemetry from the launch vehicle itself during the launch (nominally the first and second stages), and return/recovery of the portions of the launch vehicle that can be reused such as the first stage boosters as demonstrated by SpaceX. Payload communications other than during the launch process are not part of the space launch sequence of events. Any on-orbit usage including docking, return and reentry of a space vehicle are also not part of the space launch. Once the payload/space vehicle separates from the upper stage of the launch vehicle, these operations should be considered on-orbit operations. Regarding definitions, NASA does not consider a launch vehicle to be a spacecraft; therefore, the definition of spacecraft is not applicable. The existing definitions in Part 87 for “expendable launch vehicle” and “reusable launch vehicle” are appropriate. The payload of a launch vehicle is either a satellite or a space vehicle being placed into space for on-orbit operations.
- **Paragraph #61-62:** Regarding the applicability of Part 87 (Aeronautical Mobile), NASA agrees that the Part 87 model would fit non-Federal space launch operations relatively well regarding telemetry and telecommand.
- **Paragraph #64:** NASA does not view Part 25 (Satellite) as being applicable to launch vehicles as the launch vehicle is not a spacecraft or satellite.
- **Paragraph #67:** NASA supports restricting the use of 2200-2290 MHz for space launch to the four sub-bands in the R&O for pre-launch testing, launch operations and recovery of reusable portions of the launch vehicle.
- **Paragraph #69:** NASA supports limiting the commercial launch use of 2025-2110 MHz to telecommand transmissions from the ground controller stations to the launch vehicle.

- **Paragraph #70:** NASA supports restricting the use of 5650-5925 MHz band to launch vehicle tracking.
- **Paragraph #72:** NASA supports a limitation on holding authorizations in the 2200-2290 MHz band as well as the proposed 420-430 MHz, 2025-2110 MHz, and 5650-5925 MHz bands to non-Federal entities that conduct space launch operations.
- **Paragraph #78-80:** NASA supports the concept of “Site-Based Licensing” for commercial launch operations as this would limit each coordination situation to fixed, well-defined areas of operation. However, NASA does not object to the consideration of other licensing concepts.
- **Paragraph #81:** From technical perspective for frequency coordination and deconfliction, it is unnecessary to be more specific about emission bandwidths since the launch vehicle telemetry radios can use various bandwidths up to 5 MHz and are often software-defined radios capable of many emission bandwidths and types. Therefore, NASA supports allowing commercial launch operators to use any necessary bandwidth up to and including 5 MHz.
- **Paragraph #82:** NASA use of 420-430 MHz for flight termination systems operate at 421, 423, 425 and 428 MHz with emission bandwidths ranging from 160 to 600 kHz.
- **Paragraph #83:** NASA has no specific comments on the license term and renewal for commercial space launch. NASA notes that the Federal licensing is for a 5-year term for all our frequency assignments, except for geostationary satellites which have 10-year terms before review and renewal.
- **Paragraph #85:** NASA supports the requirement to periodically renew commercial space launch licenses. This will allow Federal users to periodically review the situation for each site to ensure that the collaboration between Federal and non-Federal users is working correctly and efficiently.
- **Paragraph #96:** NASA does not support permitting launch vehicles from non-U.S. launch sites and not otherwise authorized by the United States to communicate with ground stations in the United States. This situation is especially critical with respect to the use of the 2200-2290 MHz band within the U.S. by Federal entities.
- **Paragraph #98-107:** NASA supports the need for post-grant coordination on a launch-by-launch basis. The details of such coordination should be the subject of an NTIA/FCC MOU covering commercial space launch coordination. NASA would prefer to receive such pre-launch coordination requests no less than 30 days before the planned launch event with a required response date of no less than 15 days after receipt.
- **Paragraph #112:** NASA supports applying technical requirements for Federal space launch operations to commercial space launch operations. Often the same launch vehicles are used for both Federal and non-Federal launches and having unified technical requirements would assist the commercial operators in meeting the needs of both Federal and non-Federal customers.
- **Paragraph #119:** NASA notes that attempting to apply the space system power flux density limits to even the second stage of a launch vehicle is problematic. Due to the short duration of the telemetry transmissions from launch vehicles, application of these PFD limits is not necessary.

- **Paragraph #124-125:** NASA supports a 1 kW power limit on the flight termination systems to operate in 420-430 MHz.
- **Paragraph #139-144:** Currently, NASA does not support making allocations in the 2200-2290 MHz band for commercial on-orbit use that does not support Federal space operations. NASA does support the addition of footnotes (approved by the IRAC on April 11, 2017) allowing the use of 2203.2 MHz for communications between commercial space vehicles and orbiting space stations such as ISS and the use of 2216 MHz for direct-to-ground communications by these same spacecraft, subject to such conditions as may be applied on a case-by-case basis, and noting that such transmissions shall not cause harmful interference to authorized Federal stations.
- **Paragraph #145:** NASA supports permitting commercial space launch vehicles to communicate directly with on-orbit satellites (space-to-space or air-to-space).

ATTACHMENT 2

Letter from Vernita D. Harris, Director,
Spectrum Plans and Policy, Department of
Defense to Charles Cooper, Associate
Administrator, NTIA dated August 18, 2021.



DEPARTMENT OF DEFENSE
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For Open Publication

Aug 18, 2021

Department of Defense
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

CHIEF INFORMATION OFFICER

Mr. Charles Cooper
Associate Administrator
National Telecommunications and Information Administration
1401 Constitution Ave. NW
Washington, DC 20230

Dear Mr. Cooper:

I am pleased to provide DoD comments on the FCC Report and Order (R&O) and Further Notice of Proposed Rulemaking (FNPRM FCC 21-44). The Department is supportive of changes to US spectrum regulations to improve spectrum access for commercial space launch activities and to provide protections to Federal Earth terminals operating with non-Federal space stations. The comments provided here are focused on ensuring the methods used to implement these changes are mutually beneficial to both DoD and the commercial space industry and will not result in unacceptable impacts to the many DoD critical uses of these bands.

On the fundamental point of what constitutes space launch operations, the Department believes this is limited to radar tracking of and communications with a space launch vehicle prior to and during launch operations and ends when the payload is placed into orbit and any reusable components not entering orbit complete their landing.

DoD has vital capabilities in each of the four bands (420 – 430 MHz, 2025 – 2110 MHz, 2200 – 2290 MHz, and 5650 – 5925 MHz) under consideration for commercial space launch operations and other uses. In each band, careful planning and coordination will be required to ensure harmful interference does not occur to either the non-Federal or DoD systems. DoD uses include but are not limited to:

- High power space tracking and missile warning radars in the 420 – 430 MHz band.
- Satellite uplinks (Earth-to-space), crosslinks (space-to-space) and terrestrial (fixed and mobile) uses in the 2025 – 2110 MHz band.
- Satellite downlinks (space-to-Earth), crosslinks, and terrestrial (fixed and mobile) uses in the 2200 – 2290 MHz band.
- Radar operations in the 5650 – 5925 MHz band.
- Electronic warfare testing, training, exercises and operations in bands as required by the threat.

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. Through this coordination, DoD receives specific technical and operational details of a planned launch. DoD can use this information to assess the potential for interference to its operations.

Based on these assessments, DoD can decide to accept the risk of interference to DoD systems, adjust DoD operations to avoid interference, or suggest other mitigations such as changing parameters of the non-Federal operations to facilitate a successful coordination.

While DoD anticipates being able to support reasonable changes to increase spectrum access for non-Federal space launch operations, the Department views on orbit uses of the 2025 – 2110 MHz and 2200 – 2290 MHz bands for uplinks, downlinks or crosslinks as untenable. These uses are not recognized as part of space launch operations.

DoD also recommends the commercial space launch industry expand their existing use of the 2360 – 2395 MHz band for additional capacity in a less congested band. Such use is already authorized through the US276 footnote which states *“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.”*

With regard to protections for Federal Earth terminals operating with non-Federal satellites, DoD strongly supports the establishment of a co-primary allocation restricted to use with non-Federal satellites. DoD also requests the remaining portion of commercial SATCOM C-band downlink (4000 – 4200 MHz) and uplink (5925 – 6425 MHz) spectrum be included in the final R&O.

Further detail on the topics above and our comments on the specific proposals and questions presented in the FNPRM are enclosed. Thank you for soliciting our feedback on this important national issue. We stand ready to work with the NTIA and FCC as appropriate to develop mutually acceptable solutions.

Please feel free to contact me directly if we can be of further assistance in this matter.

Sincerely,

Vernita D. Harris

Vernita D. Harris
Director
Spectrum Plans and Policy

Enclosure: DoD Comments to FCC Report and Order and Further Notice of Proposed Rulemaking 21-44

Definition of Space Launch Operations: In section 60, the FCC seeks comments on how to define non-Federal “space launch operations”. DoD addresses this topic prior to all others, as this answer is fundamental to subsequent DoD comments. Each time DoD refers to non-Federal space launch operations in the remainder of this document, it is based on the understanding presented below.

Non-Federal space launch operations may include both pre-launch testing, and the launch period itself. Space launch operations end when the payload is in orbit, even if that payload consists of the space launch vehicle itself, and any reusable components of the space launch vehicle not entering orbit complete their landing.

Space launch operations specifically includes:

- Flight termination commands sent from the ground to the launch vehicle.
- Communications from the ground to the space launch vehicle. The vehicle may include more than one segment, such as in the case of booster rockets which separate and require independent communications as part of the launch operations. Such use may continue until the landing of space launch vehicle or vehicle segments which did not enter orbit.
- Communications from the space launch vehicle to the ground. This may also include more than one segment and may also continue until the landing of space launch vehicle or launch vehicle segments which did not enter orbit.
- Radar tracking of the launch vehicle during the launch phase.

Space launch operations specifically excludes:

- The operation of uplinks to payloads or launch vehicles in orbit.
- The operation of downlinks from payloads or launch vehicles in orbit.
- The operation of crosslinks between payloads in orbit.
- Radar tracking of payloads or launch vehicles in orbit.
- Reentry of payloads or launch vehicles after they have been in orbit.
- Spectrum use by aircraft used to carry and release space launch vehicles.
- Spectrum use by sea launch platforms for space launch operations.

14 CFR § 401.7 provides a definition of launch which is consistent with the terms above: “*Launch means to place or try to place a launch vehicle or reentry vehicle and any payload or human being from Earth in a suborbital trajectory, in Earth orbit in outer space, or 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.*”

These definitions are vital to all other responses. Collectively, this definition will bound both the period of time the spectrum is in use and the geographic areas affected by each launch while accommodating commercial space launch operations requirements. This definition will also limit the risks of harmful interference, potential disruptions to DoD operations and scope of coordination efforts involved in supporting the commercial space launch activities.

420 – 430 MHz Band: While DoD does not oppose the creation of a non-Federal aeronautical mobile allocation, restricted to use for pre-launch testing and sending flight termination signal to space launch vehicles, we do note the considerable operation of radar systems, including very high power systems with high sensitivity used for space object surveillance, tracking and cataloguing. These high power (up to 5 MW) space tracking systems operate at multiple U.S. and global locations, with beams that scan from 5 to 85 degrees' elevation and a 240-degree azimuth, and could easily interfere with the receipt of flight termination commands in this band. Further, the systems' receivers are highly sensitive to pick up returns from distant space objects and must be protected from interference. ITU-R M.1462-1 provides further details on these radar systems.

DoD encourages the use of automated flight termination systems in lieu of commanded flight termination, negating the need to use this band for commercial space launch. DoD itself is working to self-terminate its own use of this band for flight termination purposes. If an allocation is created and the band is to be used for flight termination DoD seeks the following conditions and restrictions to facilitate successful shared use of the band:

- Commercial launch providers should carefully consider ITU-R M1462-1 in selecting launch locations.
- Coordination of each use is required. DoD may not be able to cease or modify operation of these radars to support commercial space launch and could refuse coordination of requested launch windows for launches/launch trajectories within interference range of DoD radar systems.
- The allocation should be secondary. If it cannot be secondary, at a minimum it must clearly state that DoD operations have priority and place restrictions on the non-Federal use stating they may not constrain or interfere with Federal uses of the band, similar to those restrictions placed upon DoD by footnotes US92 and US346.

DoD does not recommend expanding the allocation to the wider 420 – 450 MHz band as this provides no known benefit over that of the FCC's proposed 10 MHz allocation.

2025 – 2110 MHz Band: DoD supports access to this band for commercial space launch operations but has several concerns with the FCC further notice as written. The Department also notes that while section 42 of the FNPRM mentions only an Earth-to-space allocation, section 47 and the allocation table in appendix D show both Earth-to-space and space-to-space allocations, the latter of which is not supported by DoD.

DoD uses in this band include satellite uplinks, satellite crosslinks and a variety of terrestrial systems operating across the U. S. and Possessions.

Congestion in the band and preventing unintentional harmful interference to both incumbents and new entrants is a serious concern to DoD. This band is already shared by two primary user groups, non-Federal users of the Television Broadcast Auxiliary Service, the Cable Television Relay Service, or the Local Television Transmission Service (hereafter Electronic News Gathering or ENG users) and Federal users. The Federal users are further split between Federal space system operators and DoD terrestrial systems users relocating into the band to restore comparable

capability as a result of the Advanced Wireless Services 3 (AWS-3) rulemaking and auction. These systems affected by AWS-3 being modified to operate within the 2025 – 2110 MHz band include small unmanned aerial systems, tactical radio relay, and airborne tactical targeting network technology. Complex coordination procedures and establishing a Memorandum of Understanding (MOU) between ENG users and DoD to prevent harmful interference have been developed and continue to evolve as DoD uses of the band expand. The addition of another user group in the band will add complexity to the coordination steps necessary to prevent harmful interference to all parties. This is particularly challenging as the AWS-3 related relocation into this band remains in progress as DoD executes its approved transition plans.

The increasing number of commercial space launch locations and the frequency of launch activity also impact congestion in the band. The FAA Spaceport Map identifies a dozen FAA licensed sites, three non-FAA licensed sites, plus Federal ranges which support commercial space launch operations. These sites include locations from which aircraft carrying space launch vehicles operate. Additional sites are under consideration by commercial space launch companies, such as SpaceX proposing a launch site based in the Gulf of Mexico. As commercial services mature, the frequency of launch operations is anticipated to continue to accelerate, including both for placing payloads in orbit as well as orbital and sub-orbital space tourism.

When Federal users gained access to the 2025 – 2110 MHz band for space systems, increasing the density of use of the band, the FCC found it necessary to place significant restrictions (further described below) on the new Federal users to protect incumbent ENG users. Subsequently when DoD gained access to the band for terrestrial systems, again significant restrictions were placed to protect the incumbent ENG users. The continuing DoD AWS-3 related relocations into the 2025 – 2110 MHz band will further increase the density of spectrum use in the band. Adding growing non-Federal space launch operations will further this increase in the density of use in the band. To reduce the risk of harmful interference and protect incumbent operations and investment, DoD believes significant restrictions must be placed upon new allocations/users granted access in the band.

While DoD uses are based on primary allocations, they are significantly restricted by the terms on the US92 footnote for terrestrial systems, and the US346 footnote for space systems.

Specifically, US92 states, “Federal use shall not cause harmful interference to, nor constrain the deployment and use of the band by, the Television Broadcast Auxiliary Service, the Cable Television Relay Service, or the Local Television Transmission Service”. It also states, “... non-Federal fixed and mobile services has priority over military fixed and mobile operations.” Thus, while DoD use is co-primary in name, it is lower in priority than non-Federal primary uses.

US346 places similar “shall not constrain the deployment of ...” restrictions on DoD co-primary use for space related services (Earth-to-space), except at 11 locations where military stations operate on a “co-equal, primary basis” to non-Federal uses.

The DoD recommends establishing the non-Federal space operations allocation as a secondary vice a primary allocation as proposed by the FCC. Should the primary status be retained, DoD recommends establishing a new US footnote using language such as that used in US92 and US346 to make clear that incumbent Federal and non-Federal uses have priority over the new non-Federal space operations service use of the band. Lastly, coordination prior to each use is essential.

Further, due to the congestion, interference and coordination concerns, DoD views that uses beyond space launch operations as described above are not supportable. Usage for uplinks would greatly expand the locations from which commercial operations could occur and expand usage from the very short duration period of space launch operations and make it of indefinite duration. Likewise, usage for crosslinks would also expand the locations and time involved. Both uplinks and crosslinks are not part of space launch operations and create an impossible situation to coordinate each use.

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. This is especially important for high tempo commercial launch locations. DoD also notes commercial space launch operations can have impacts beyond the direct spectrum impact in these bands such as restriction on airspace used for DoD testing, training and exercises due to launch activities. Another example is the need to delay training events for operation in a Global Positioning System denied environment due to the potential impact to the space launch operations.

2200 – 2290 MHz Band: DoD supports access to this band for commercial space launch operations but again has several concerns with the FCC further notice as written.

DoD heavily uses this band for applications including but not limited to satellite downlinks, satellite crosslinks and numerous terrestrial systems. The terrestrial systems include weapons test telemetry functions used to monitor in real time the performance of DoD weapon systems under development and assessing performance in an operational environment.

As with the 2025 – 2110 MHz band, this is a congested band and preventing harmful interference is a primary DoD concern. The DoD, DOC (NOAA) and NASA pre-coordinate between the three agencies when planning new space systems operating in the band to ensure no unacceptable interference. The growing commercial space launch locations and tempo of commercial launch operations also increases the level of congestion in the 2200 – 2290 MHz band.

In the US96 footnote of the R&O, the FCC restricted use of this band to four specific 5-MHz channels. These channels are aligned to a 2015 Deputy Secretary of Defense policy, which would still allow consideration of other channels on a case-by-case special temporary authority (STA) basis. In the further notice, the FCC proposes to remove the four-channel limitation in US96. DoD opposes removal of this restriction. While DoD has successfully coordinated the use of other channels through the FCC STA process, retaining the restriction would promote commercial access to the band. Having predictable frequency bands in which non-Federal space launch operations provides benefits to spectrum sharing in this band. This includes predictability that allows advanced planning, including when selecting frequencies for future systems as well as improved coordination efforts by having a familiar set of systems which must be considered when coordinating use of the spectrum. The unpredictable nature of launch, and frequent reschedules due to weather, technical and other factors, often drives the coordination of multiple launch windows for each actual launch that occurs making this predictability even more important to the DoD. Should non-Federal space launch operations require spectrum outside these four channels,

the 2360 – 2395 MHz band is an option, as is continued use of the STA process on a case-by-case basis in the 2200 – 2290 MHz band.

The DoD supports a secondary status of the non-Federal space operations allocation in this band with a condition that non-Federal users (e.g., commercial space launch providers) require coordination of each use with authorized Federal users in the band. Should the status be changed to primary, DoD recommends establishing a new US footnote using language such as that used in US92 and US346 to make clear that incumbent Federal uses have priority over the new non-Federal space operations service use of the band. Coordination prior to each use is essential.

As is the case for the 2025 – 2110 MHz band, DoD views that uses beyond space launch operations as described earlier in this response are not supportable due to the expanded geography, time, and coordination complexity.

Location concerns for uses of this band also are comparable to the DoD views expressed above on the 2025 – 2110 MHz band.

In the event a non-Federal mobile service allocation is created in the band, it should be restricted to space launch operations on the first stage of a launch vehicle and to use for no more than 15 minutes after launch. Such an allocation should be of secondary status or include a restrictive footnote such as used in US92 and US346.

Finally, DoD supports the limited case of non-Federal spacecraft carrying crew to and or docking with the International Space Station on specific frequencies within the 2200 – 2290 MHz band. The Interdepartmental Radio Advisory Committee is addressing this topic and DoD supports its approval.

5650 – 5925 MHz Band: The DoD supports the establishment of a non-Federal radiolocation allocation in this band. The use should be restricted to space launch operations via a footnote. If the allocation is co-primary, DoD again requests a footnote to clearly delineate that its use cannot constrain Federal uses of the band.

Expanded Federal Use of the non-Federal FSS and MSS Bands: DoD welcomes the establishment of protection for Federal Earth terminals operating with commercial satellites in non-Federal MSS and FSS bands. This is vital to the increased use of commercial services called for in the National Space Policy. DoD offers comments upon the scope and method of providing these protections.

DoD supports co-primary allocations in the allocation table, paired with a footnote restricting the Federal use to Earth terminals operating with non-Federal satellites as the best method to clearly articulate the Federal authorization, and restrictions to that authorization, reflective of the considerable use of commercial space capabilities by Federal agencies.

DoD understands the need to adjust the list of bands included based on changes taking place over the last 8 years. However, the FCC further notice proposed to exclude the remaining portions of allocated commercial SATCOM C-Band spectrum from this change. DoD uses of C-band commercial services were affected in the C-Band auction, and only through strong cooperation between the DoD and commercial service providers were mission impacts averted. The inclusion

of the remaining portions of C-band is important to protecting the continuing and growing DoD operations. Therefore, DoD requests that the 4000 – 4200 MHz and 5925 – 6425 MHz bands be included in the new Federal co-primary allocation and footnote.

ATTACHMENT 3

Letter from Zachary G. Goldstein, Chief Information Officer and Director, High Performance Computing and Communications, NOAA to Charles Cooper, Associate Administrator, NTIA dated August 5, 2021.



August 5, 2021

MEMORANDUM FOR: Mr. Charles Cooper
National Telecommunications & Information Administration
U.S. Department of Commerce
1401 Constitution Ave., N.W.
Washington, D.C. 20230

FROM: Zachary G. Goldstein
Chief Information Officer and Director, High Performance
Computing and Communications
National Oceanic and Atmospheric Administration (NOAA)

SUBJECT: Department of Commerce Comments on FCC 21-44

The Radio Frequency Management Division within the NOAA Office of the Chief Information Officer, representing the Department of Commerce (DOC) operational spectrum requirements under DAO 201-39, has reviewed the FCC Report and Order and Further Proposed Rulemaking on the allocation of spectrum for non-federal space launch operations (FCC 21-44). We support regulatory changes to support commercialization of space launch activities while not placing operational constraints on federal agency satellite operations in the highly congested radio spectrum used for federal satellite operations. I request that NTIA take the following comments into consideration.

General Comment:

The Report and Order and Further Proposed Rulemaking is unclear on the definition of space launch operations that is applicable to the frequency bands under discussion. To minimize impact to Federal operations and on-orbit operations, spacecraft docking operations and payload communications must be clearly excluded from the licensing process. The use of 2025-2110 MHz and 2200-2290 MHz need to be clearly constrained to ground testing prior to launch, telemetry transmissions during the first and second stage of launch, and telemetry and command of the launch vehicle as it returns to the ground. Additionally, developmental testing should not be included under the licensing process. All operations outside of ground testing prior to launch, telemetry transmissions during the first and second stage of launch, and telemetry and command of the launch vehicle as it returns to the ground should be handled through the Special Transmit Authority (STA) process.

Comments on the Further Notice of Proposed Rulemaking:

- 1) DOC opposes expanding the licensing process to include more than four frequency ranges with the 2200-2290 MHz frequency band that were previously addressed in the Report and

Order (2208.5-2213.5 MHz, 2212.5-2217.5 MHz, 2270-2275 MHz, and 2285-2290 MHz). Limiting the licensing process to the four frequency ranges will enable federal agencies to better plan future federal operations and also more quickly respond to commercial launch operator coordination requests.

- 2) It is imperative that FCC licensed commercial launch operations in both the 2025-2210 MHz and 2200-2290 MHz frequency bands be subject to coordination with federal agencies for each launch. The federal agencies undertake extensive inter-agency coordination efforts to ensure compatibility within these congested frequency bands. A similar level of effort must be required from commercial launch operators to ensure compatibility with existing federal users.
- 3) Limiting non-federal allocations within 2200-2290 MHz and 2025-2110 MHz to a secondary basis is critical to ensuring protection of existing federal operations. DOC opposes creation of a non-federal primary allocation for commercial space launch operations in either frequency band.
- 4) The FCC mentions in several instances within the FNPRM that potential actions under consideration could provide “certainty” for commercial launch operators. Federal operations do not experience certainty in the 2025-2110 MHz and 2200-2290 MHz frequency bands due to spectrum congestion. Federal agency incompatibilities must be resolved through coordination and operational restrictions are often required for federal agency operations. The FCC should not expect certainty for commercial launch operators.
- 5) Federal agencies limit operations to a maximum 5 MHz bandwidth in the 2025-2110 MHz and 2200-2290 MHz frequency bands to reduce congestion and to ensure compatibility with existing operations. We oppose non-federal use of bandwidths greater than 5 MHz under the FCC licensing process.
- 6) The three existing frequencies in 2360-2395 should provide alternative frequencies for consideration when coordination issues occur with one or more of the four frequencies in 2200-2290 MHz.
- 7) DOC does not have concerns with the FCC approach of making the allocation to the mobile or aeronautical mobile service. However DOC requests that this allocation be constrained to launch operations as discussed in point #1 above, and not allow additional uses by the mobile or aeronautical mobile service.
- 8) DOC believes a site-based licensing approach should be implemented to limit variation in coordination requests so that federal agencies can better respond in a timely manner.
- 9) DOC takes no position on the designated entity to coordinate launches with Federal agencies as long as each launch is coordinated individually.
- 10) DOC takes no position with regard to 420-430 MHz or 5650-5925 MHz frequency bands.

- 11) DOC requests expedited action on 399.9-400.05 MHz so that the U.S. role in the Argos-4 program can proceed without risk. The Argos-4 program will provide benefits to both federal and non-federal users in the U.S. The US contribution to the Argos-4 program is scheduled for launch in the 4 th quarter 2021 or first quarter 2022 timeframe.
- 12) DOC requests that action be taken to address the federal agency requirements to procure commercial satellite service and operate earth stations associated with the space stations of the commercial satellite providers. DOC is working to assemble our requirements for commercial satellite service and will provide the information to NTIA at a later date.