SUMMARY: The Environmental Protection Agency (EPA) is proposing to approve Missouri State Implementation Plan (SIP) revisions submitted on November 10, 2020, by the Missouri Department of Natural Resources (MoDNR). This proposed action will amend the SIP to address administrative changes to the State rule in the Missouri Code of State Regulations (CSR). Revisions include removal of references to a revoked state regulation and other minor administrative changes. The EPA is proposing to approve these changes because they are consistent with the Clean Air Act (CAA) and applicable EPA regulations. In the ''Rules and Regulations'' section of this **Federal Register**, we are approving the State's SIP revisions as a direct final rule without a prior proposed rule. If we receive no adverse comment, we will not take further action on this proposed rule.

DATES: Comments must be received by May 11, 2026.

ADDRESSES: Submit your comments, identified by Docket ID No. EPA–R07–OAR–2026–1785 to *https://www.regulations.gov.* Follow the online instructions for submitting comments. Once submitted, comments cannot be edited or removed from *Regulations.gov*. The EPA may publish any comment received to its public docket. Do not submit electronically any information you consider to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Multimedia submissions (audio, video, etc.) must be accompanied by a written comment. The written comment is considered the official comment and should include discussion of all points you wish to make. The EPA generally will not consider comments or comment contents located outside of the primary submission (*i.e.,* on the web, cloud, or other file sharing system). For additional submission methods, the full EPA public comment policy, information about CBI or multimedia submissions, and general guidance on making effective comments, please visit *https://www.epa.gov/dockets/commenting-epa-dockets.*

FOR FURTHER INFORMATION CONTACT: Ashley Eichman, Environmental Protection Agency, Region 7 Office, Air and Radiation Division, 11201 Renner Boulevard, Lenexa, Kansas 66219; telephone number: (913) 551–7762; email address: *eichman.ashley@epa.gov.*

SUPPLEMENTARY INFORMATION: This document proposes to take action on changes to the State rule at Title 10, Division 10 of the Code of State Regulations (CSR) 5.570, Control of Sulfur Emissions From Stationary Boilers, as revisions to the SIP previously approved at 40 CFR 52.1320(c). Revisions include removal of references to a revoked State regulation and other minor administrative changes. We have published a direct final rule approving the State's SIP revision in the ''Rules and Regulations'' section of this **Federal Register**, because we view this as a noncontroversial action and anticipate no relevant adverse comment. We have explained our reasons for this action in the preamble to the direct final rule. If we receive no adverse comment, we will not take further action on this proposed rule. If we receive adverse comment, we will withdraw the direct final rule and it will not take effect. We would address all public comments in any subsequent final rule based on this proposed rule. We do not intend to institute a second comment period on this action. Any parties interested in commenting must do so at this time. For further information, please see the information provided in the **ADDRESSES** section of this document.

List of Subjects in 40 CFR Part 52

Environmental protection, Air pollution control, Carbon monoxide, Incorporation by reference, Intergovernmental relations, Lead, Nitrogen dioxide, Ozone, Particulate matter, Reporting and recordkeeping requirements, Sulfur oxides, Volatile organic compounds.

Dated: March 31, 2026.

James Macy,

Regional Administrator, Region 7.

[FR Doc. 2026–06831 Filed 4–8–26; 8:45 am]

BILLING CODE 6560–50–P

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2 and 25

[SB Docket No. 26–54; FCC 26–13; FR ID 338749]

Spectrum Abundance for Weird Space Stuff

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: In this document, the Federal Communications Commission (Commission or we) looks to bring spectrum abundance for emergent space activities. ''Emergent'' or ''emergent space operations'' are those spacecraft or commercial operations in space that use radio spectrum for control of, or communications with, a spacecraft, but which are not communications satellites. Currently there is an acute shortage of usable and readily accessible spectrum for telemetry, tracking and command (TT&C) functions that are essential for operating emergent spacecraft. Accordingly, this document seeks to clarify and expand the Commission's traditional regulatory classifications so that emergent space operations have more predictable access to spectrum. Additionally, this document proposes to add a secondary allocation for the Space Operation Service (SOS) in spectrum bands that could support emergent space activities, particularly in frequency bands allocated for non-Federal use that may be lightly used in certain geographic areas. This document also proposes to allow existing licensees to lease their spectrum to earth station licensees to provide SOS in connection with emergent spacecraft.

DATES: Comments are due on or before May 11, 2026. Reply Comments are due on or before June 8, 2026.

ADDRESSES: Interested parties may file comments and reply comments on or before the dates indicated in the **DATES** section above. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). You may submit comments, identified by SB Docket No. 26–54, by any of the following methods:

- *Electronic Filers.* Comments may be filed electronically using the internet by accessing the ECFS: *https://www.fcc.gov/ecfs.*
- *Paper Filers.* Parties who file by paper must include an original and one copy of each filing.
- Filings can be sent by hand or messenger delivery, by commercial courier, or by the U.S. Postal Service. *All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.*
- Hand-delivered or messenger-delivered paper filings for the Commission's Secretary are accepted between 8:00 a.m. and 4:00 p.m. by the FCC's mailing contractor at 9050 Junction Drive, Annapolis Junction, MD 20701. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of before entering the building.
- Commercial courier deliveries (any deliveries not by the U.S. Postal Service) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
- Filings sent by U.S. Postal Service First-Class Mail, Priority Mail, and

Priority Mail Express, must be sent to 45 L Street NE, Washington, DC 20554.

• *People with Disabilities.* To request materials in accessible formats for people with disabilities (Braille, large print, electronic files, audio format), send an email to *fcc504@fcc.gov* or call the Consumer & Governmental Affairs Bureau at 202–418–0530.

FOR FURTHER INFORMATION CONTACT: Stephen Duall, 202–418–1103, *stephen.duall@fcc.gov* or Brandon Padgett, 202–418–1377, *brandon.padgett@fcc.gov.*

SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Notice of Proposed Rulemaking (*NPRM*), in SB Docket No. 26–54; FCC 26–13, adopted on March 26, 2026, and released on March 27, 2026. The full text of this document is available for public inspection online at *https://docs.fcc.gov/public/attachments/FCC-26-13A1.pdf.* The full text of this document is also available for inspection and copying during business hours in the FCC Reference Center, 45 L Street NE, Washington, DC 20554. To request materials in accessible formats for people with disabilities, send an email to *FCC504@fcc.gov* or call the Consumer & Governmental Affairs Bureau at 202–418–0530 (voice), 202–418–0432 (TTY).

Ex Parte Presentations. This proceeding shall be treated as a ''permit-but-disclose'' proceeding in accordance with the Commission's *ex parte* rules. 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 § 1.1206(b). Participants in this proceeding should familiarize themselves with the Commission's *ex parte* rules.

Regulatory Flexibility Analysis. The Regulatory Flexibility Act of 1980, as amended (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.'' Accordingly, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) concerning the possible impact of the rule and policy changes contained in the *NPRM* on small entities. The IRFA is set forth in Appendix A of the Commission document, *https://docs.fcc.gov/public/attachments/FCC-26-13A1.pdf.* The Commission invites the general public, in particular small businesses, to comment on the IRFA. Comments must be filed by the deadlines for comments indicated on the first page of this document and must have a separate and distinct heading designating them as responses to the IRFA.

Paperwork Reduction Act. The *NPRM* may contain new or proposed modified information collections. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on any information collections contained in this document, as required by the Paperwork Reduction Act of 1995, 44 U.S.C. 3501–3521. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, 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.

OPEN Government Data Act. The OPEN Government Data Act requires agencies to make ''public data assets'' available under an open license and as ''open Government data assets,'' *i.e.,* in machine readable, open format, unencumbered by use restrictions other than intellectual property rights, and based on an open standard that is maintained by a standards organization. This requirement is to be implemented ''in accordance with guidance by the Director'' of the OMB. The term ''public data asset'' means ''a data asset, or part thereof, maintained by the federal government that has been, or may be, released to the public, including any data asset, or part thereof, subject to disclosure under the Freedom of Information Act (FOIA).'' A ''data asset'' is ''a collection of data elements or data sets that may be grouped together,'' and ''data'' is ''recorded information, regardless of form or the media on which the data is recorded.''

Providing Accountability Through Transparency Act. Consistent with the Providing Accountability Through Transparency Act, Public Law 118–9, a summary of the *NPRM* will be available on *https://www.fcc.gov/proposed-rulemakings.*

Synopsis

Introduction

1. In the geopolitical race to commercialize and dominate the Final Frontier, historic levels of private investment have paved the way for the engineering marvels and daring endeavors that now take place in outer space. Once the province of science fiction, American companies are now upgrading, relocating, and servicing satellites; manufacturing pharmaceuticals in space; building private inhabitable spacecraft; and conducting private robotic missions to the surface of the Moon. Emergent space operations like these depend on the use of radiocommunications for their spacecraft, but they are not the type of communications satellites that have traditionally commanded much of the Commission's regulatory attention.

2. Spectrum is a critical component of all space operations. Even for spacecraft that do not provide radiocommunications services to the public, reliable spectrum access is mandatory for safety functions like telemetry, tracking, and command (TT&C) to control spacecraft in orbit. American innovators, however, currently face an acute shortage of usable and readily accessible spectrum for TT&C, and that spectrum crunch threatens to delay—or even prevent—the growth of domestic space technologies and jeopardize U.S. leadership in the booming global space economy.

3. This shortage of spectrum is the product of several interlocking factors. For one, spectrum for TT&C is largely unavailable on a standalone basis, absent a separately authorized radiocommunications service. Emergent space innovations like inhabitable spacecraft and orbital laboratories, however, do not typically provide a separately authorized radiocommunications service. For another, the spectrum bands where TT&C may be available on a standalone basis tend to be congested and occupied

primarily by Federal users. And for another, even when the Commission does authorize a company's use of spectrum for standalone TT&C, it occurs under a case-by-case review process that may involve extensive coordination and delay.

4. The Commission is aggressively pursuing a policy of spectrum abundance in outer space. Earlier this year, we launched a proceeding to release up to 20,000 megahertz of spectrum for traditional connectivity services, including high-speed broadband from constellations in low-Earth orbit. The Commission has also begun a comprehensive revisiting its licensing and regulatory framework for space communications in the *Space Modernization NPRM.*

5. Now, with this Notice of Proposed Rulemaking (*NPRM*), we focus on bringing spectrum abundance to support cutting-edge, emergent ventures in space. The *NPRM* pursues two paths towards abundance. *First,* we seek to clarify and expand our traditional regulatory classifications so that emergent operations have more predictable spectrum access. *Second,* we explore new spectrum bands that could support new use cases on a dedicated basis. In each path, our goal remains the same: provide a clear, reliable, and expeditious path to support the groundbreaking technologies and services that companies are developing in space. With the proposals in the *NPRM,* we look to find ways to use market-based principles to see spectrum resources put to more intensive use in the service of the space economy. By thinking creatively and expansively, we have the opportunity to go from zero non-Federal spectrum available today to support emergent space operations to at least 25 megahertz of such spectrum, and potentially much, much more, if all the proposals in the *NPRM* are ultimately adopted.

Background

A. Important Terminology and Definitions

6. To facilitate a precise discussion why emergent space operations may not have sufficient spectrum availability, we first clarify key terms and definitions currently used in our rules governing space communications.

7. Under the Communications Act of 1934, as amended (Act), ''[n]o person shall use or operate any apparatus for the transmission of energy or communications or signals by radio'' from or within the areas specified in section 301 or on a mobile station within the jurisdiction of the United States without a license issued by the Commission. Although the Act does not define the term ''signals,'' it defines ''communication by radio'' as ''the transmission by radio of writing, signs, signals, pictures, and sounds of all kinds, including all instrumentalities, facilities, apparatus, and services (among other things, the receipt, forwarding, and delivery of communications) incidental to such transmission.''

8. Consistent with the Act, our rules state that ''[n]o person shall use or operate apparatus for the transmission of energy or communications or signals by space or earth stations except under, and in accordance with, an appropriate authorization granted by the Federal Communications Commission.'' Under our rules, a ''space station'' is a ''station located on an object which is beyond, is intended to go beyond, or has been beyond, the major portion of the Earth's atmosphere.'' An ''earth station'' is a ''station located either on the Earth's surface or within the major portion of Earth's atmosphere and intended for communication: (1) With one or more space stations; or (2) With one or more stations of the same kind by means of one or more reflecting satellites or other objects in space.'' Our rules define ''radiocommunication'' as ''telecommunication by means of radio waves'' and ''telecommunication'' as ''any transmission, emission or reception of signs, signals, writings, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems.'' Section 301 of the Act states that ''[n]o person shall use or operate any apparatus for the transmission of energy or communications or signals by radio . . . except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act.'' Accordingly, the transmission or reception of intelligence of any nature to or from a station beyond the majority of the Earth's atmosphere via radio waves is a space radiocommunication and, pursuant to our rules, requires an authorization by the Commission.

9. Radiocommunications are classified and regulated as distinct kinds of ''radiocommunication service,'' defined as ''a service . . . involving the transmission, emission and/or reception of radio waves for specific telecommunication purposes.'' Those specific purposes are reflected in the radiocommunication services defined by our rules, such as the fixed-satellite service (FSS), mobile-satellite service (MSS), or broadcasting-satellite service (BSS). Whereas FSS, MSS, and BSS licensees use radio waves to provide voice, video, or data to consumers and businesses, other radiocommunication services do not. For example, the Earth exploration-satellite service (EESS) uses radio waves to obtain information about the Earth through active or passive sensors, as well as to collect and distribute that information.

10. Some radiocommunication services, in particular, are critical for the operation of a spacecraft, but do not provide a service to the public. For example, the space operation service (SOS) is defined as ''[a] radiocommunication service concerned exclusively with the operation of spacecraft, in particular space tracking, space telemetry, and space telecommand'' and uses radio waves for the operation of spacecraft. Similarly, the space research service (SRS) is defined as ''[a] radiocommunication service in which spacecraft or other objects in space are used for scientific or technological research purposes.'' In both instances, the radiocommunication services are used to control and operate spacecraft, but are not themselves the services offered to the public. Space telemetry is defined as ''[t]he use of telemetry for transmission for a space station of results of measurements made in a spacecraft, including those relating to the functioning of the spacecraft.'' Space tracking is defined as the ''[d]etermination of the orbit, velocity or instantaneous position of an object in space by means of radiodetermination, excluding primary radar, for the purpose of following the movement of the object.'' Space telecommand is defined as ''[t]he use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate functions of equipment on a space object, including the space station.''

11. Thus, there are numerous space radiocommunication services provided for under our rules, some of which use radiocommunications to provide service directly to the public, and some of which are used to support operations of spacecraft. All of these services involve transmissions of signals and thus require authorization from the Commission under the Act, provided that the station at issue does not belong to and is not controlled by the United States government.

12. Another important point of terminology is the distinction between Federal and non-Federal operations and the effects of this distinction on allocations of radio spectrum. The Commission authorizes non-Federal operations, which include those by private commercial entities. Operations

conducted by agencies or entities of the U.S. federal government are Federal, and Congress has assigned the National Telecommunications and Information Administration (NTIA), which is part of the U.S. Department of Commerce, oversight of such operations. Together, the FCC and NTIA jointly manage the nation's radio spectrum resources in the public interest. The United States Table of Frequency Allocations (United States Table) contains allocations for both Federal (that is, U.S. federal government) and non-Federal (for example, private entities) use of radiocommunication services and is codified in § 2.106 of our rules. An ''allocation'' is an entry in the Table of Frequency Allocations (Allocation Table) of a given frequency band for the purpose of its use by one or more terrestrial or space radiocommunication services (or the radio astronomy service) under specified conditions. Any segment of the radio spectrum may be allocated to the federal and/or non-federal sectors either on an exclusive or shared basis for use by one or more radio services. Services may be allocated on a primary or secondary basis, and operations on a secondary basis must not cause harmful interference to operations on a primary basis and cannot claim protection from harmful interference from operations of a primary service.

13. Non-federal operators may be authorized to use Federal frequency allocations, subject to coordination with the appropriate federal agency or agencies and conditions agreed upon by the Commission and NTIA, provided that such operations shall not cause harmful interference to Federal stations and that operations shall terminate should harmful interference occur. Thus, applications to operate non-Federal radiocommunication services in frequency bands that are allocated to Federal operations must first be coordinated with federal agencies and must not cause harmful interference to Federal operations.

14. Lastly, there are important differences in the terms ''spacecraft,'' ''satellite,'' and ''space station'' under our rules. A ''spacecraft'' is defined as a ''man-made vehicle which is intended to go beyond the major portion of the Earth's atmosphere.'' Although ''satellite'' is defined as a spacecraft in orbit, it is often used informally to refer to the physical apparatus in space. A ''space station'' is essentially a station on a spacecraft, and a ''station'' is the transmitters or receivers (or combination thereof) on the spacecraft necessary for carrying on a radiocommunication service. Furthermore, a station is classified by the service in which it operates, so a space station operating in the fixed-satellite service is classified as an ''FSS space station.'' Thus, a spacecraft can be a satellite, and a satellite is a spacecraft, and there can be one or more space stations on a satellite or spacecraft. But under our rules, it is the transmitters and receivers that make up a space station that must be authorized by the Commission.

B. The Spectrum Crunch for Emergent Space Operations

15. The Commission has observed a significant expansion in the commercial space industry in recent years, as well as the need for additional spectrum resources to conduct operations in space. Although the Commission has initiated proceedings to make spectrum abundant for satellites that provide radiocommunications services to the public, such as FSS, longstanding regulatory gaps currently constrain the availability of spectrum for new use cases. This ''spectrum crunch'' arises from several interlocking factors, discussed below.

16. Spectrum used for emergent space operations may not clearly fall within an existing radiocommunication service. The Commission has received a growing number of applications to transmit or receive radiocommunications that do not involve the provision of radiocommunication services to the public. In each of these instances, the spacecraft is intended to provide services or engage in activities that are not radiocommunication services, such as in-space servicing, assembly, and manufacturing (ISAM), commercial habitable space stations, and lunar orbiters and landers. The spectrum needs of such applications are usually limited to radiocommunication services to conduct TT&C functions necessary to command and control the spacecraft.

17. Under our current rules and the International Telecommunication Union (ITU) Radio Regulations, spacecraft conduct TT&C functions within the same frequency bands in which they are authorized to provide other radiocommunication services, such as FSS, MSS, BSS, or EESS. For this reason, licensees are generally authorized by the Commission to conduct TT&C functions within frequency bands authorized for another allocated radiocommunications service. Because spacecraft used for emergent purposes such as lunar missions generally do not otherwise provide radiocommunication services, applicants seeking an FCC license to use spectrum to conduct TT&C to control these spacecraft cannot clearly rely on the use of existing spectrum resources allocated for FSS, MSS, or EESS to command and control their spacecraft.

18. Spectrum available for emergent space operations may be prioritized for Federal operations and can be difficult to access. In the past, activities in space were often conducted by governments, rather than private entities. In the United States, space activities that did not provide radiocommunication services to the public were typically conducted through government agencies, such as the National Aeronautical and Space Administration (NASA) or the Department of War (DoW). As observed in our discussion of terminology and definitions above, the Commission did not license these operations because these operations were controlled by federal agencies. Accordingly, these operations relied largely on spectrum allocated for Federal users in the United States Table.

19. Today, as the American commercial space industry expands, there is an increasing reliance on private entities to conduct activities in space that in the past may have been conducted through government agencies. These activities are increasingly conducted either independently of government agencies, or under contractual arrangements with, or with funding from, government agencies. Because these activities are ultimately controlled by private entities, rather than government agencies, applicants are seeking licenses from the Commission for their use of radiofrequencies, particularly for radiocommunications to command and control their spacecraft. In doing so, the operations are categorized as non-Federal operations.

20. Because of the past reliance on the use of other allocated radiocommunication services, such as FSS, for the conduct of TT&C functions for private entities, there are few explicit separate allocations for conducting command and control of spacecraft by non-Federal operators in the United States Table. The Commission's rules and the ITU Radio Regulations provide SOS and SRS allocations that support command and control of spacecraft. Current spectrum allocations for these services, however, are primarily for Federal use in the United States Table and are heavily used by Federal operations, including portions of the S-band allocated for Federal SOS operations in the 2025–2110 MHz (Earth-to-space), 2200–2290 MHz (space-to-Earth) bands, and portions of the X-band allocated for Federal SRS in the 8400–8450 MHz

(space-to-Earth) and 8450–8500 MHz (space-to-Earth) bands.

21. Many of the applications for Commission authority to operate radiocommunications to support ISAM and lunar operations have requested to operate in the same S-band and X-band allocations for SOS and SRS that are primarily and heavily used by Federal operators, as these bands support readily available, ''off-the-shelf'' antenna systems that are significantly more cost effective than designing and building customized antenna systems in-house. Access to these allocations by non-Federal operators, however, is subject to coordination and sharing requirements with Federal users, which can often take substantial time and effort to complete. In addition, the absence of a clearly defined regulatory path for access to SOS and SRS allocations used by Federal operations on a primary basis has led to a case-by-case licensing approach and to regulatory uncertainty.

22. Non-Federal spectrum bands that could support emergent operations are also congested. To address and facilitate the development of ISAM, the Commission previously sought comment in a notice of inquiry (*ISAM NOI*) and a notice of proposed rulemaking (*ISAM NPRM*) on the needs of ISAM operators and proposed a potential streamlined regulatory framework for supporting such missions. The Commission has previously acknowledged the increasing variety of space missions and the need to modernize spectrum policies to accommodate these operations. Furthermore, in the *ISAM NPRM,* the Commission tentatively concluded that various communication activities in support of ISAM could potentially operate within several existing service allocations and proposed to continue to review ISAM operators' requests for frequency use on a case-by-case basis. Although comments in response to the *ISAM NPRM* support this tentative conclusion, they also indicate that existing service allocations may not be sufficient for ISAM, and that additional spectrum resources are needed, particularly in frequency bands that are allocated for use by non-Federal operations and that do not require extensive coordination with other spectrum users.

23. Commenters have identified multiple frequency bands that might be used to conduct TT&C functions for spacecraft that do not also operate in other radiocommunication services, such as FSS or EESS. Almost all of the identified frequency bands, however, are currently used by a diverse range of existing non-Federal spectrum users, or are shared with or primarily used by Federal operations, which would still require extensive coordination with multiple spectrum users and would not provide a clear and reliable path for licensing by the Commission. We therefore focus the *NPRM* on proposals and alternatives that could provide a clear and reliable path in the near future for accessing additional spectrum resources for conducting TT&C operations for spacecraft that are unable to conduct such operations under allocations for other radiocommunication services.

Discussion

24. We seek comment on steps that the Commission can take to make spectrum abundant for emergent space operations. These steps include providing regulatory clarity and leveraging existing spectrum allocations to support such operations. They also include unlocking new sources of usable spectrum by allowing existing Commission spectrum licensees to make their spectrum resources available in ways that are not currently permitted under our rules. Although we recognize that these are initial steps towards making spectrum abundant to support innovative new endeavors in space, we seek comment on the extent to which they may alleviate spectrum shortcomings, expedite the Commission's licensing, and facilitate innovation.

25. We seek comment on a variety of proposals and ideas in the *NPRM.* Building upon the record in the ISAM proceeding, we propose to codify the potential use of frequency piggybacking. Another proposal herein is to review requests to operate space stations within specific service allocations on a case-by-case basis. Next, we seek comment on conducting TT&C to support emergent operations in FSS bands on an unprotected, non-interference basis subject to coordination with other spectrum users, as well as what operations fall within our definition of TT&C. We also seek comment on the types of applications that may seek to operate within the SRS allocation. We also propose to add a secondary allocation for SOS in the 2320–2345 MHz band for command uplink and permit a version of *de facto* spectrum leasing of that band to earth station licensees. We seek comment on alternatives to these proposals and whether to extend this proposed leasing framework to other frequency bands. Lastly, we seek comment on whether licensed satellite operators should be authorized by rule to use their FCC-licensed satellites and intersatellite links to provide TT&C and data downlinks to support emergent operations. We also seek comment on any alternatives that would be less burdensome for small entities.

26. As observed above, the Commission has previously sought comment on radiofrequency use for non-communications satellites in the *ISAM NOI* and *NPRM.* In this proceeding, we seek comment on proposals to make available additional spectrum resources not only in support of ISAM missions, but also for all emergent space operations. Because we are not proposing here to create spectrum allocations specifically and solely for use by ISAM or for lunar missions, we seek comment on proposals to allow increased and more efficient use of spectrum to support all space operations that do not otherwise provide radiocommunication services to the public. Accordingly, we make alternative proposals regarding spectrum availability for ISAM and propose to no longer address spectrum use issues in the ISAM proceeding. Rather, we seek comment on whether to address the issues of spectrum availability to support ISAM missions through the proposals of this proceeding, rather than as part of the *ISAM NPRM.* We are not seeking comment in this proceeding on potential changes to how we process applications for authority to provide radiocommunication services or on other potential changes to our rules specific to the needs of ISAM operations. Although the *ISAM NPRM* sought comment on possible modifications to our rules in order to facilitate the licensing and regulation of radiocommunications in support of ISAM missions, our focus today is on proposals and alternatives related to spectrum availability for all emergent space operations.

A. Establishing Regulatory Clarity for the Use of Existing Spectrum Allocations

27. There is currently no radiocommunication service specifically dedicated for use by emergent space operations domestically or internationally. Accordingly, there is the need for clarity and certainty in the ability of operators to access other radiocommunication service allocations necessary to conduct their emergent operations in space. To that end, in addition to the proposals in the *NPRM* for specific frequency bands that might be utilized more intensively to support TT&C functions for emergent space operations, we propose to codify several

Commission policies to provide additional regulatory clarity for these operators using existing radiocommunication service allocations.

1. Authorizing by Rule Spectrum ''Piggybacking'' for Emergent Space Operations

28. In the *ISAM NPRM,* the Commission recognized commenters' interest in allowing ISAM spacecraft to communicate in frequency bands already authorized for use by another spacecraft while the two spacecraft are connected or working together in close proximity to each other, also known as frequency ''piggybacking.'' Additionally the *ISAM NPRM* noted that the piggybacking option has been authorized under existing part 25 rules in the past. There is unanimous support in response to the *ISAM NPRM* for allowing frequency piggybacking for radiocommunications in support of ISAM operations, and frequency piggybacking has previously been authorized as an option for ISAM operators on a case-by-case basis.

29. Accordingly, we propose to codify the potential use of frequency piggybacking in our rules in order to provide regulatory clarity. We seek comment on how to codify the potential use of frequency piggybacking that provides regulatory clarity and certainty, but also recognizes that piggybacking may not be suitable for all types of operations. Furthermore, we seek comment on how such codification could be worded to address a wide-range of potential scenarios for frequency piggybacking, in order to provide both certainty and flexibility. As an example, comments have asked the Commission to clarify whether frequency piggybacking may be permissible for an operator whose client is an EESS operator. We tentatively conclude that this would be an acceptable scenario for frequency piggybacking. We seek comment on this tentative conclusion.

30. We propose to codify that the Commission may authorize a space station to use the same frequencies as a separate, consenting spacecraft (that is, a ''client'' spacecraft) that is also authorized by the Commission or has obtained a grant of U.S. market access, provided that the applicant for the space station authorization certifies that the space station will be used for servicing, monitoring, or collaborating with the client spacecraft and that the operations will conform with the client spacecraft's ITU filings and licensed frequency parameters. We seek comment on this proposal. Specifically, we seek comment on how to define a client spacecraft and whether there are other instances in which we should allow piggybacking in addition to servicing, monitoring, or collaborating with a client spacecraft. Additionally, should licensees or grantees of U.S. market access engaged in spectrum piggybacking be required to provide the specific frequency information required by our rules to allow Space Bureau staff to confirm the operations are in conformance with the client's license or market access grant and ITU filings? Or would certification be sufficient? Similarly, should licensees or grantees be required to provide evidence of the other space station operator's consent to piggybacking operations, or is certification again sufficient? Is there anything else we should consider requiring from operators proposing to conduct piggybacking operations? We recognize there may also be additional considerations for operators seeking FCC authorization to conduct spectrum piggybacking with a non-U.S. licensed client that has not sought U.S. market access, and we seek comment on what certifications or demonstrations we should require in such instances in order to fulfill our international obligations, protect national security, and promote American innovation in space.

2. Authorizing Standalone TT&C Within Existing FSS Allocations

31. We also seek comment on permitting licensees and market access grantees for emergent space operations to conduct TT&C in FSS bands where TT&C may already be provided within the radiocommunication service. As observed above, the Space Bureau routinely authorizes FSS space station licensees to conduct TT&C in the same frequency bands that are allocated for FSS. Thus, we are confident that it is technically feasible to conduct TT&C in frequency bands that are already allocated for FSS by non-Federal operators, and that there is likely to be readily-available earth station facilities and equipment to support TT&C in these frequency bands. TT&C operations licensed outside of our processing procedures for GSO or NGSO FSS are unable to claim protection from interference from, and are not permitted to cause harmful interference to, other licensed operators that are authorized within our processing procedures. Accordingly, we envision permission for such TT&C operations licensed outside of processing procedures would be on an unprotected, non-interference basis, subject to coordination with other authorized spectrum users. We seek comment on the appropriate status of such TT&C operations and whether such TT&C operations can, in fact, be successfully coordinated with other authorized spectrum users to avoid harmful interference. We also seek comment on whether TT&C for emergent space operations could be provided in frequency bands allocated for radiocommunication services such as MSS or BSS, which often require use of frequency division or planned bands in order to avoid interference among spectrum users. Would such frequency bands also be able to accommodate TT&C for emergent space operations on an unprotected, non-interference basis?

32. In addition, we seek comment on whether applicants could be granted authority to provide TT&C as a form of FSS in bands allocated for non-Federal FSS. We observe that FSS is defined as a ''radiocommunication service between earth stations at given positions, when one or more satellites are used; the given position may be a specified fixed point or any fixed point within specified areas; in some cases this service includes satellite-to-satellite links, which may also be operated in the inter-satellite service; the FSS may also include feeder links of other space radiocommunication services.'' Is the ability to provide TT&C within the definition of FSS analogous to the ability to provide feeder links in such an allocation (that is, one way uplinks that are not between earth stations)? We expect, however, that TT&C provided as FSS would be limited to the provision of TT&C on an unprotected, non-interference basis, subject to coordination with other spectrum users, outside of a first-come, first service procedure or a processing round. We seek comment on this expectation.

33. We also seek comment to what extent operations on an unprotected, non-interference basis are suitable for TT&C functions, which may be critical to the command and control of a spacecraft. What level of availability and reliability is needed for command and control? Would it be in the public interest to facilitate TT&C operations without providing absolute certainty of non-interference? As an example, would TT&C on an unprotected, non-interference basis be sufficient for certain operators, such as those conducting rendezvous and proximity operations (RPO) and docking, or those operating inhabitable spacecraft?

3. Refining the Definition of TT&C

34. Section 2.1 of our rules defines space telecommand as ''[t]he use of radiocommunication for the transmission of signals to a space station to initiate, modify or terminate

functions of equipment on a space object, including the space station.'' And space telemetry is defined as ''[t]he use of telemetry for transmission for a space station of results of measurements made in a spacecraft, including those relating to the functioning of the spacecraft.'' The Commission has previously recognized that service allocations for TT&C, may not be sufficient for certain operators, such as those conducting RPO and docking, or those operating inhabitable spacecraft. The Commission also tentatively concluded that the definition of TT&C need not be so narrowly construed as to exclude data downlink operations. We seek comment on a potential Commission interpretation of the definitions of space telecommand and space telemetry to include downlink of video and other data during maneuvers such as RPO or docking with other spacecraft. Can such operations be accommodated within the existing typical narrowband parameters of TT&C bands? Can operations for inhabitable spacecraft be accommodated in TT&C bands? What other operations besides RPO and docking could function in TT&C bands? If the Commission adopts an interpretation of the definitions of TT&C to include data downlink for RPO, docking, and/or other operations, should we specifically modify the definitions in our rules or add footnotes to the United States Table? We also seek comment on whether explicitly permitting video and other wideband data communications in allocations used for TT&C could crowd out existing narrowband TT&C operations or make it more difficult to permit TT&C operations on an unprotected, non-interference basis. We seek comment on these questions.

4. Clarifying That Spectrum Use Supporting Emergent Space Operations May Fall Within Existing Service Allocations

35. The Commission tentatively concluded in the *ISAM NPRM* that radiocommunications in support of various ISAM operations could fit within numerous existing service allocation definitions and that Commission staff would assess whether an applicant's proposed communications fall within the applicant's desired service allocation(s) on a case-by-case basis. Our rules define service allocations according to the ITU definitions, and we rely on these definitions when we consider requests for frequency authorization as part of our licensing process. Commenters were generally supportive of permitting the use of any service allocation for communications in support of ISAM operations so long as the operator can demonstrate that the communications justifiably fit within the existing service allocation definition.

36. Although we propose to continue to review requests to operate space stations within specific service allocations on a case-by-case basis to assess whether the proposed communications can justifiably fit within the definition of the service allocation, we observe the record has generated a number of comments that support the need for greater regulatory clarity to spur innovation in this space. For example, some commenters raise concerns that without affirmative signals from the Commission, some radiocommunication allocations, including the space research service, may not be accessible to ISAM operators due to uncertainty regarding the scope of the allocation definitions and challenges coordinating use of this spectrum with Federal operators. Other commenters disagree whether EESS should be expressly excluded from case-by-case consideration for ISAM missions. Commenters are chiefly concerned with the potential for interference to the important services provided through EESS passive and active remote sensing, especially in the EESS passive bands where ''the signals emitted by EESS (passive) sensors are very weak compared to those emitted by active communication services.''

37. We recognize that interference protection is very important for the EESS operations that commenters highlight, and that EESS passive operations can be particularly vulnerable to interference. Allowing operators to request the use of a particular existing service allocation for communications, however, does not permit unfettered access to all frequency bands. The ITU has established stringent recommendations for the protection of passive sensors from interference through ITU–R Recommendation RS.2017 ''Performance and interference criteria for satellite remote sensing.'' Additionally, our rules require applicants proposing to use specific frequencies to demonstrate compliance with ITU rules and recommendations. It is not our view that merely allowing operators to apply for frequency authorization using frequency bands that are allocated for passive use would make such bands available only to operators engaging in active use. Additionally, we observe that many EESS active operations have demonstrated an ability to share spectrum without the creation of harmful interference to other operators through our small satellite licensing process, which numerous EESS providers have used since its introduction in 2019. We seek comment on this view and observation. Although we certainly take seriously any potential for harmful interference to existing users, we tentatively conclude that we need not preemptively exclude the EESS allocations from case-by-case consideration altogether at this time. We seek comment on this tentative conclusion.

38. In addition to our tentative conclusion not to exclude operators from applying to use frequencies in any service allocation in which their operations could justifiably fit, we specifically seek comment on applicants seeking to operate within the SRS allocation. Given the nascent stage of many emergent space operations, we propose to consider communications supporting them, particularly when funded by NASA or other federal research agencies, as falling within the definition of SRS. We seek comment on this proposed approach and specifically on what other steps the Commission could take to promote regulatory certainty for these operators. For example, could the uncertainty be resolved by adding a footnote to the United States Table in frequency bands allocated for Federal SRS specifically to permit operations of non-Federal operations funded or contracted by NASA or other federal research agencies? We also seek comment on the language of any such footnote and what additional conditions on such operations may be needed to protect Federal SRS operators from harmful interference.

B. Unlocking More Spectrum for Emergent Space Operations

39. We seek comments on ways that spectrum that is already allocated for non-Federal use could be made available to address the need for spectrum to support emergent space operations. In particular, we seek comment whether such spectrum can be identified in frequency bands that may currently be used intensively by non-Federal spectrum users in certain geographic areas (such as urban, high-population areas, particularly in the contiguous 48 states (CONUS), but that may not be used in other geographic areas (such as rural areas in CONUS, or outside of CONUS and in U.S. Territories and Possessions). In order to avoid the challenges of coordinating non-Federal use of spectrum bands that are allocated primarily to Federal use, we are particularly interested in

identifying spectrum bands that either are not shared with Federal users, or that are shared with, but not used intensively by, Federal users and are allocated on a secondary basis for Federal use.

40. Although our focus is on the specific frequency bands discussed below, we also seek comment on whether there are any additional bands that could satisfy the criteria identified above and that could potentially be used more intensively to provide TT&C for emergent space operations. In all cases, our objective is to allow more intensive and flexible use of spectrum in a way that avoids interference or economic harm to existing spectrum users.

41. As part of this process, we seek comment generally on what changes to the United States Table and our rules would need to be made to effectuate such more intensive use domestically, and the specific manner in which those changes could be effectuated (for example, by creation of an allocation or through a footnote to the United States Table). In addition, we seek comment on whether the flexible use, leasing/secondary markets, and competitive bidding proposals discussed in the specific frequency bands below could also be applied to other frequency bands in order to make additional spectrum resources available for emergent space operations. We also generally seek comment on what, if any changes, are needed internationally to effectuate these changes, either through the ITU or through bi-lateral or multi-lateral agreements with other countries.

1. 2320–2345 MHz Band

42. As an example of the type of more intensive spectrum use discussed above, we propose to add a secondary allocation for SOS (Earth-to-space) in the 2320–2345 MHz band in the non-Federal column of the United States Table, and to permit the existing exclusive licensee within this frequency band in the United States, SiriusXM, to lease portions of its spectrum to earth station licensees for command of spacecraft that do not otherwise provide radiocommunication services to the public. We discuss the history and current use of the 2320–2345 MHz band below, as well as the specifics of the proposal and possible alternatives.

a. History and Current Use

43. The history and current use of the 2320–2345 MHz band are important factors in proposing to make this spectrum available to address the needs of emergent space operations. The 2320–2345 MHz band occupies 25 megahertz of spectrum and is used to provide Satellite Digital Audio Radio Service (SDARS) in the United States, as well as parts of Canada. It is divided equally between two separate, but co-owned, SDARS networks, Sirius and XM. The Commission's rules define SDARS—commonly known as ''satellite radio''—as ''[a]radiocommunication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations, and which may involve complementary repeating terrestrial transmitters, telemetry, tracking and control facilities.'' Thus, SDARS is primarily a satellite-delivered service in which programming is sent directly from satellites to subscriber receivers either at a fixed location or in motion.

44. The Commission awarded licenses to provide SDARS within the United States by auction in 1997. XM and Sirius launched initial satellites and began commercial operations in 2001 and 2002, respectively. The two companies merged in 2008 to form a single company—Sirius XM Radio, Inc. (SiriusXM)—but the merged entity continues to operate the Sirius and XM systems as separate networks and there are still separate licenses for each system. Currently, SiriusXM and its subsidiary companies have licenses for geostationary-satellite orbit (GSO) space stations operating at the nominal 85° West Longitude (W.L.) and 115° W.L. orbital locations, which transmit in the space-to-Earth direction to subscriber terminals in the 2320–2345 MHz band, with fixed earth stations providing uplinks in the 7.025–7.075 GHz band. On-station TT&C for SiriusXM's satellites is provided in the X-band for command uplinks and S-band for telemetry downlinks. SiriusXM reported it had approximately 32.8 million subscribers as of June 30, 2025.

45. The 2320–2345 MHz band is part of a larger block of spectrum from 2305–2360 MHz that is divided between SDARS and Wireless Communications Services (WCS) licensees. In 1996, Congress directed that this block of spectrum be reallocated from Federal to non-Federal use and auctioned.

46. Within the 2320–2345 MHz band, SiriusXM operates a network of terrestrial repeaters in the center portion of each of the two 12.5 megahertz assigned to Sirius and XM (2320.0–2332.5 MHz and 2332.5–2345 MHz). Because a direct line of sight is generally required to receive an acceptable satellite signal, ground-based terrestrial repeaters are used in many areas to re-transmit the same signals provided by satellites directly to subscribers in order to maintain adequate signal power. SiriusXM may also provide telemetry beacons in each of these assignments.

47. Domestically, the 2320–2345 MHz band is allocated on a primary basis for non-Federal BSS, which includes SDARS. Footnote US327 to the United States Table states that the band is allocated to BSS (sound) and complementary terrestrial repeaters on a primary basis, and such use is limited to digital audio broadcasting. The United States Table provides Federal allocations for fixed service and radiolocation service on a secondary basis, subject to a footnote that recognizes the primary allocation for BSS (sound) and restricts radiolocation service in this band to the military services.

48. Internationally, the 2300–2450 MHz band is allocated in ITU Regions 2 & 3 to radiolocation services and fixed and mobile terrestrial services on a primary basis, and to the amateur service on a secondary basis. In ITU Region 1, the 2300–2450 MHz band is allocated to fixed and mobile services on a primary basis, and amateur and radiolocation services on a secondary basis. There are no allocations for satellite services internationally in the 2300–2450 MHz band in any of the three ITU regions, but international footnote 5.393 does allocate the 2310–2360 MHz band to BSS (sound) on a primary basis in Canada, the United States, and India. Currently, BSS (sound) in the 2310–2360 MHz band is being provided solely in the United States and parts of Canada through SiriusXM. The United States entered into bilateral agreements with Canada and Mexico regarding the provision of SDARS, which remain in force.

b. Suitability for Space Ops

49. We tentatively find that three factors make the 2320–2345 MHz band particularly well suited for more intensive use for TT&C in support of emergent space operations. First, the 2320–2345 MHz band is located within the S-band and is in relatively close spectrum proximity to the 2025–2110 MHz (Earth-to-space) and 2200–2290 MHz (space-to-Earth) bands already used for Federal space operations. As observed above, these two bands are frequently requested for TT&C operations in support of ISAM and other spacecraft that do not otherwise provide radiocommunication services. Although there is significant separation between these Federal S-bands and the 2320–2345 MHz band, the propagation characteristics of the spectrum and the antennas and radios used to transmit and receive are expected to be similar

for both the Federal S-bands and the 2320–2345 MHz band. Accordingly, we have reason to expect that, from a technical perspective, the 2320–2345 MHz could be readily used to provide space operation services in a manner adequately equivalent to the Federal S-bands. We seek comment on these observations and expectations.

50. Second, there are very few spectrum users of the 2320–2345 MHz band in the United States. SiriusXM acquired exclusive use of the 2320–2345 MHz band at auction in 1997. No other non-Federal operators are licensed to operate in the 2320–2345 MHz band in the United States. Likewise, there are no primary allocations for Federal operations in the 2320–2345 MHz band. As such, we expect that the ability of new spectrum users to operate within the 2320–2345 MHz band in the United States are not heavily constrained by incumbent operations, other than the operations of SiriusXM and incumbent WCS operations in adjacent spectrum blocks. We seek comment on this expectation.

51. Third, SiriusXM does not use the 2320–2345 MHz band uniformly throughout the United States. Because of the location of its satellites in geostationary orbit at the nominal 85° and 115° W.L. orbital locations, none of the existing SiriusXM satellites provide service to subscribers in Hawaii, or in the northern portions of Alaska, which we characterize as being north of Anchorage. For example, a review of the coverage footprints presented in the 2320–2345 MHz band downlinks for the newest SiriusXM satellites shows that neither satellite intends to use those downlinks in northern Alaska. This is not surprising given that satellites located on the equatorial plane, such as GSO satellites, appear very low on the horizon to earth stations located in far northern and southern latitudes and are susceptible to increased signal blockage and attenuation from such a low angle on the horizon. Similarly, SiriusXM satellites do not provide downlinks in the 2320–2345 MHz band to Hawaii or to U.S. Territories and Possessions in the Pacific, since the footprints of the service areas of existing SDARS satellites are focused on CONUS. Although SiriusXM may elect to provide service into northern Alaska, Hawaii, and U.S. Territories and Possessions in the future, currently it has not proven feasible to do so under its existing deployment of satellites. We seek comment on these observations.

52. In addition, although the 25 megahertz of spectrum in the 2320–2345 MHz band is less than the spectrum available in the 2025–2110 MHz and 2200–2290 MHz bands, 25 megahertz could nonetheless provide meaningful additional spectrum resources for space operations. Currently, non-Federal operations do not have access to the full 85 megahertz of spectrum in the 2025–2110 MHz band due to its heavy use by Federal operations and the need to avoid particular frequencies within the Federal S-band altogether. As a result, only a portion of the Federal S-band is able to be coordinated for non-Federal use. Because TT&C functions are not always transmitting and employ narrowband signals, often 100 kilohertz in bandwidth or less, we anticipate that a large number of TT&C communications can be accommodated in the 25 megahertz of the 2320–2345 MHz band, particularly if multiple earth station uplink sites can be coordinated with SiriusXM. Accordingly, we tentatively conclude that making the 2320–2345 MHz band accessible for TT&C could meaningfully supplement or replace, at least in part, the requested use for non-Federal operations in the Federal S-bands. We seek comment on this tentative conclusion and the reasoning that underlies it.

c. Proposal for Secondary Allocation for SOS in 2320–2345 MHz Band

53. We propose to create a secondary allocation for SOS in the 2320–2345 MHz band in the non-Federal column of the United States Table in the Earth-to-space direction. We propose a new allocation because the current allocations in the band in the United States Table do not provide for satellite communications other than BSS (sound) in the space-to-Earth direction. We also propose to add this allocation on a secondary basis to provide status for the TT&C operations, but to make clear that they are secondary to the primary use of the band for BSS (sound) in the space-to-Earth direction. These two proposals balance the desire for more intensive use of the band for satellite communications with the need to protect the operations of SiriusXM in a band from harmful interference in which it is exclusively authorized to operate throughout the United States. We seek comment on these two proposals and on our objective in balancing the interests of more intensive spectrum use and the need to protect SiriusXM's use of the band.

54. We tentatively conclude that an SOS allocation in the Earth-to-space direction is less likely to cause interference to SiriusXM's operations in the 2320–2345 MHz band than an allocation in the space-to-Earth direction. SiriusXM provides sensitive service links to subscribers in the 2320–2345 MHz band in the space-to-Earth direction. We observe that allowing other space stations to transmit in the 2320–2345 MHz band could risk causing harmful signal degradation to those service links, which could in turn cause subscribers to become dissatisfied with their service and to cancel their subscriptions to SiriusXM, causing significant economic harm to SiriusXM. Even if space stations were restricted by rule to transmitting solely into a particular geographic area where there are unlikely to be SiriusXM subscribers, such as northern Alaska, there remains the risk of disruption to SiriusXM's subscribers if a space station, even inadvertently, does not comply with that restriction and transmits over CONUS in the 2320–2345 MHz band. Earth-to-space operations in the 2320–2345 MHz bands can be more easily and reliably geographically restricted, with terrain and distance attenuating the risk of any interference from Earth-to-space use of the 2320–2345 MHz band into SiriusXM's downlink operations in the same band in CONUS. We seek comment on this tentative conclusion and the observations underlying it, as well as whether it may be possible to allow downlinks in the 2320–2345 MHz band through a secondary SOS allocation or footnote to the United States Table, without causing interference or economic harm to SiriusXM. We also propose that any applicant seeking Commission authority to operate an earth station in the 2320–2345 MHz band under this secondary allocation must certify that the proposed operations in the band have been coordinated with and approved by SiriusXM to ensure that SiriusXM's operations in the 2320–2345 MHz band are strongly safeguarded from interference. We seek comment on this certification proposal.

55. We also seek comment on whether any technical or legal requirements need to be adopted by the Commission and codified in our rules in order to provide reasonable certainty as to what kind of operations are permitted under this secondary allocation. For example, would power limits, antenna elevation angle restrictions, or further geographical limitations help to protect SiriusXM and spectrum users outside of the 2320–2345 MHz band from potential harmful interference from earth stations transmitting in the 2320–2345 MHz band? Would such limits and restrictions also provide certainty to potential spectrum lessees as to the parameters of what operations could be provided? We observe that our rules place power limits and out of band

emission limits on SiriusXM terrestrial repeaters in the 2320–2345 MHz band in order to protect WCS licensees in adjacent bands from harmful interference. Could such power and out of band emission limitations be extrapolated to earth station operations in a way that provides similar protection to WCS licensees from earth station uplink transmissions in the 2320–2345 MHz band? Would limiting operations of earth stations to areas of northern Alaska mitigate the risk of harmful interference to spectrum users, particularly WCS licensees, in adjacent and nearby bands, given the sparse population density and rugged geography of northern Alaska? If so, how would we define these areas in a way that is objective and clear? We seek comment on these questions.

d. Proposal To Permit Leased Spectrum in 2320–2345 MHz Band

56. We propose to permit SiriusXM to lease use of the 2320–2345 MHz band spectrum to earth station licensees that will use the frequencies to provide command uplinks in support of emergent space operations. This proposal aligns with, but is not identical to, the ability of wireless radio service licensees to lease spectrum under our existing secondary markets policy and rules. We seek comment on how the leasing proposal for the 2320–2345 MHz band aligns generally with our secondary markets policy and rules.

57. In 2000, the Commission adopted a policy statement setting forth the Commission's plans for facilitating secondary markets for radio spectrum to allow and encourage licensees to make all or portions of their assigned frequencies and/or service areas available to other entities and uses. The Commission found that such secondary market transactions would complement the primary assignment function performed by the Commission through its spectrum auctions and licensing processes. It also found that, while secondary markets are not a substitute for finding additional spectrum when needed, and should not supplant spectrum allocation processes, a robust and effective secondary market for spectrum usage rights could help alleviate spectrum shortages by making unused or underutilized spectrum held by existing licensees more readily available to other users and uses and help to promote the development of new, spectrum efficient technologies.

58. The Commission first adopted rules to implement the secondary markets policy in 2003. Although the Commission expressly declined to adopt secondary market rules for satellite services at that time, it did establish rules whereby certain wireless radio service licensees could lease their spectrum to other entities under arrangements that are suited to the parties' respective needs. Under our existing secondary market rules, terrestrial wireless licensee lessors and their lessees have two spectrum leasing options that each provide different rights and responsibilities for the wireless licensee and lessee: *de facto* transfer leasing arrangements; and spectrum manager leasing arrangements. Under either leasing option, the lessor and the lessee may choose to enter into a long-term (more than one year) or short-term (one year or less) arrangement. Spectrum manager leasing arrangements generally do not require prior Commission approval; rather, the licensee/lessor must notify the Commission in advance of commencing operations. In contrast, *de facto* transfer spectrum leasing arrangements are typically subject to the Commission's general approval procedures, under which the Commission must grant the application prior to the parties putting the proposed spectrum leasing arrangement into effect.

59. We seek comment on whether a variation of the *de facto* transfer leasing arrangement may be an efficient and effective way to encourage SiriusXM to make the 2320–2345 MHz band available to earth station licensees on an expedited basis. As proposed above, any earth station licensee that seeks to operate in the 2320–2345 MHz band would have to certify that its proposed operations have been coordinated with and approved by SiriusXM in order to avoid harmful interference to SiriusXM's current and potential operations. We propose that no authorization for such uplinks will be accepted for filing absent such coordination and approval. We also propose that any existing authority to operate in the 2320–2345 MHz band will be conditioned on such coordination and approval, and the authority will terminate automatically unless the licensee maintains coordination with and approval by SiriusXM. Such coordination is likely to require expenditure of resources by SiriusXM, or the forgoing of future rights to operate in certain areas, for the benefit of third party spectrum users. As such, we tentatively conclude it is reasonable for SiriusXM to require financial compensation for the expenditures under these conditions. For these reasons, we tentatively conclude that SiriusXM and potential earth station licensees should be permitted to reach private arrangements suited to each party's needs, including financial consideration, in order to permit the use of the 2320–2345 MHz band for uplink TT&C functions to support emergent space operations. Such private leasing arrangements would provide incentive for SiriusXM to make as much of its spectrum rapidly available for use by others as feasible, while still maintaining protection from interference for its own operations in the band. We seek comment on these tentative conclusions, proposals, and reasoning underlying them.

60. Under this leasing proposal, private spectrum leasing arrangements with SiriusXM can be made with earth station licensees for individual earth stations or for multiple earth stations. They also can be made for earth stations communicating with the earth station licensee's own space stations, or through an earth station licensee that provides Ground-Station-as-a-Service (GSaaS) for multiple third-party space stations. We seek comment on whether there are efficiencies to be gained from conducting TT&C for emergent space operations as GSaaS, rather than having each space station license also build its own facilities for TT&C. For example, these efficiencies could include reducing the overall number of earth stations that need to be constructed, coordinated, and licensed, or facilitating the ability of TT&C to be provided on an unprotected and non-interference basis through a single GSaaS licensee acting as a *de facto* spectrum coordinator. We seek comment on these questions.

61. We also propose that space stations can be authorized by the Commission to receive in the 2320–2345 MHz band without needing to certify that such use has been coordinated with and approved by SiriusXM, but such authority would be limited to reception of commands from earth stations licensed by the FCC or from earth stations located outside of the United States. For reception of commands in the 2320–2345 MHz from earth stations located outside the United States, we tentatively see no harm should such TT&C uplinks be permitted outside the United States, since SiriusXM satellites do not receive in the 2320–2345 MHz band and there are no SiriusXM subscribers outside the United States, with the exception of Canada. We seek comment on these proposals for earth and space station applications in the 2320–2345 MHz band.

62. We also propose, unlike the spectrum leasing arrangements under our secondary markets policy and rules, lessees of the 2320–2345 MHz band will

be licensed for earth stations under the proposal made today. As proposed above, entities wishing to use the 2320–2345 MHz band to provide command uplinks must still obtain an earth station license from the Commission prior to transmitting in the band and will be subject to all licensing and regulatory requirements applicable to earth station licensees. A review of the license application will allow the Commission to review the lessee's qualifications under section 310 of the Act. We seek comment on this proposal and whether instead the Commission should seek to adopt the requirements for approving long and short term *de facto* transfers of control of spectrum under our spectrum leasing rules applicable to wireless radio services, which generally presume that no separate Commission license is needed to permit the operations using leased spectrum.

63. We also seek comment on whether a variation of the spectrum manager lease approach could be adopted in the 2320–2345 MHz band in which SiriusXM retains legal control and remains primarily responsible for ensuring lessees' compliance with our rules and policies We seek comment on whether requiring a license for the earth station operations in the leased spectrum would allow better assurance that interference is not caused to SiriusXM or other adjacent spectrum users and would allow the Commission to check compliance with any geographic areas restrictions on the use of the spectrum. The Commission would still review the qualifications of the lessees through their applications to operate earth stations using the leased spectrum, and the use of the leased spectrum would be expressly authorized by the Commission through the earth station licenses. As a result, we tentatively conclude that the *de facto* transfer lease approach (modified by requiring an earth station license) avoids the need for potentially complicated notification and eligibility requirements designed under the spectrum manager lease approach to address compliance of the lessee with our rules and policies. We seek comment on this approach and tentative conclusions, as well as whether we should adopt a spectrum manager approach instead of a *de facto* transfer approach.

64. We also seek comment on whether SiriusXM is obliged to lease or coordinate use by others of its exclusive use spectrum under the leased spectrum, secondary markets proposal above, or under any of the alternatives discussed in the *NPRM.* We also seek comment on whether the incentives provided by the leased spectrum, secondary markets proposal would make additional spectrum resources available more quickly and efficiently than a process that provides no incentives for SiriusXM to forego use of its exclusive use spectrum and to expend resources on coordination solely for the benefit of other potential spectrum users.

e. International Issues

65. We seek comment on any international issues that may arise from our proposal to allow the use of the 2320–2345 MHz band for command uplinks to non-communications satellites. We tentatively conclude that authorizing earth stations in the United States to transmit in the 2320–2345 MHz band for command uplink would be unlikely to cause harmful interference to spectrum users in other countries that do not share borders with the United States. As observed above, only the United States, India, and Canada stated an intent to use this band for satellite communications, and only the United States and Canada are actually using the band for satellite communications. In the remainder of the world, this band is used for terrestrial fixed and mobile communications. The geographic distance between transmitting earth stations in the United States and the terrestrial operations of other countries is likely to attenuate greatly any in-band or out of band emissions, thereby avoiding interference to those terrestrial operations. We seek comment on this observation and the potential of interference to the terrestrial operations of other countries. In addition, the current bilateral agreements with Canada and Mexico do not address such Earth-to-space operations in the 2320–2345 MHz band. To what extent would the United States need to request changes to those agreements in order to implement the proposal, if it is adopted? We also seek comment on whether space stations could receive commands in the 2320–2345 MHz band, on either a protected or unprotected basis, consistent with the ITU Radio Regulations, absent an allocation for SOS in the International Table.

66. We also seek comment on to what extent other countries might explore ways to authorize earth stations to provide command uplinks in the 2320–2345 MHz band if there is sufficient demand globally for such services. We observe that global networks of TT&C facilities are often used for NGSO spacecraft that do not remain fixed relative to a location on the earth, unlike GSO spacecraft. Although the 2320–2345 MHz band is allocated on a primary basis for terrestrial fixed and mobile service in the rest of the world, and is not allocated for satellite communications, individual countries may be amenable to licensing earth stations at fixed locations to uplink in this band, if those uplinks would not cause harmful interference to terrestrial and mobile services in the band. Of course, this is a matter of decision for the regulatory authorities of other countries, but we seek comment on these observations and whether world-wide facilities are needed to provide TT&C in the 2320–2345 MHz band to spacecraft that do not otherwise provide radiocommunication services to the public.

f. Potential Alternatives

67. We seek comment on alternatives to the specific proposals above. In particular, we seek comment on whether allowing the use of the 2320–2345 MHz band for command uplinks to non-communication satellites or spacecraft could be better effectuated through a non-governmental (NG) footnote to the United States Table than through a secondary allocation. For example, the footnote could state that ''the frequency band 2320–2345 MHz can also be used for command uplinks to non-Federal space stations in the Earth-to-space direction.'' If additional restrictions are desired on those operations, such as limiting them to a particular geographic area, those restrictions could be incorporated into the text of the footnote. In this regard, such restrictions may not be necessary in the footnote, since the footnote would only apply in the United States to non-Federal communications, such that any such transmitting earth stations conducting those communications would need to be licensed by the Commission and would have to comply with any Commission rules that could also set forth restrictions on use of the band. We seek comment on the possible advantages and disadvantages of allowing use of the 2320–2345 MHz band for command uplinks in the Earth-to-space direction by footnote, in addition to or in lieu of a secondary allocation for SOS, and what should be the specific language of any such footnote.

68. We also seek comment on whether to allow earth stations to provide command uplinks to non-communications satellites in the 2320–2345 MHz band within a defined geographic area, such as an area of northern Alaska defined by latitude, without requiring coordination and approval of SiriusXM. If SiriusXM

satellites do not currently provide service into these areas, there may not be need for coordination and approval prior to operations to avoid harmful interference to SiriusXM operations in the 2320–2345 MHz band. Although such a process would obviate the need for SiriusXM to lease spectrum or to spend resources reviewing coordination requests, is it possible to adequately define the area of operations where coordination would not be necessary? Is it possible to foresee and address potential cases of harmful interference in advance and to adopt rules to prevent them, rather than relying on the parties to address potential harmful interference concerns on a case-by-case basis, and to reach an arrangement suitable to both parties? Does such a process take into account the fact that SiriusXM maintains the ability to provide service in all of the United States? We seek comment on these questions.

69. In addition, we seek comment on whether there are other market mechanisms, such as competitive bidding, that could be used to effectuate the efficient and expeditious use of the 2320–2345 MHz band for command uplinks consistent with statutory limitations. For example, could the Commission auction earth station licenses to operate in the United States, using the 2320–2345 MHz band spectrum that may not be internationally allocated for satellite communications? We seek comment on whether more intensive use of the band could be effectuated by auctioning the use to bidders who value the spectrum the highest for operations in a particular geographic area, for example by auctioning the use of the 2320–2345 MHz band for command uplinks in a specific geographic area to a single earth station licensee. If so, how would we define those geographic areas? Are any restrictions or other limitations needed on what entities are eligible to bid for the spectrum use in a geographic area? We seek comment on these questions.

70. We also seek comment on our statutory authority to use auctions to authorize earth station operations using the 2320–2345 MHz band. The Open-market Reorganization for the Betterment of International Telecommunications Act, enacted in 2000 (ORBIT Act), prohibits the Commission from assigning orbital locations or spectrum used for the provision of international or global satellite communications services through competitive bidding (*i.e.,* auctions). This prohibition, codified at 47 U.S.C. 765f, was intended to prevent the imposition of auction-based licensing regimes on international satellite operators, which could lead to burdensome and duplicative auction requirements in multiple jurisdictions. We ask for comment on these questions in the specific context of our proposals to authorize earth stations to provide command uplinks to non-communication satellites and spacecraft in the 2320–2345 MHz band. Does the fact that the proposal does not seek to use competitive bidding for orbital locations comport with both the letter and intent of the ORBIT Act? Does the fact that SiriusXM provides SDARS service into Canada in the 2320–2345 MHz band transform the band into spectrum ''that is used for the provision of international or global satellite communications services,'' even though the purpose for which the 2320–2345 MHz band could be used is not SDARS, but SOS, which is not currently being provided in the 2320–2345 MHz band anywhere in the world? Are SOS or TT&C ''international or global satellite communications services'' as that term is used in the ORBIT Act?

2. Possible Application to Other Frequency Bands

71. We seek comment on whether there are frequency bands, besides the 2320–2345 MHz band, that are allocated for non-Federal use that could be used more intensively to address the need for spectrum for emergent space operations. Although the 2320–2345 MHz band appears particularly promising due to the exclusive use of the band by a single non-Federal licensee, low level of use by Federal operations, and the proximity of the spectrum to existing S-band spectrum that is in high demand, we seek comment on whether there are other frequency bands that also possess these characteristics. In particular, we seek comment on whether frequency bands adjacent to the 2320–2345 MHz band could also be made available, in the same or similar manner as the proposals for the 2320–2345 MHz band, for the provision of command uplinks to spacecraft that do not otherwise provide radiocommunication services.

a. 2315–2320 MHz and 2345–2350 MHz

72. On each side of the 2320–2345 MHz band that is used for SDARS subscriber downlinks are five megahertz of spectrum that served as ''guard band'' spectrum between SDARS and WCS operations in the 2305–2315 MHz and 2350–2360 MHz bands. These two spectrum bands, known as WCS Blocks C & D, were acquired by SiriusXM in 2024. We seek comment on whether these two 5-megahertz spectrum bands could also be used to provide command uplinks similar to the proposed use in the 2320–2345 MHz band.

73. If the 2315–2320 MHz and 2345–2350 MHz bands were to be used to provide command uplinks similar to the proposed use of the 2320–2345 MHz band, the same mechanisms—adding a secondary allocation for SOS or by adding a footnote to the non-Federal column of the United States Table—could be used to implement such use. Likewise, we propose that any use of the bands by applicants for earth station licenses would require certification that the proposed operations have been coordinated with and approved by SiriusXM and subject to any spectrum leasing regimes that may be adopted for the 2320–2345 MHz band. We seek comment on the use of the 2315–2320 MHz and 2345–2350 MHz bands for uplink commands to non-communications satellites. We also seek comment on use of these bands under any of the alternatives discussed above. In addition, footnote US100 provides for use of the 2345–2360 MHz band for Federal aeronautical telemetering and associated telecommand operations for flight testing of manned or unmanned aircraft, missiles, or major components thereof, on a secondary basis to WCS. Would additional technical or geographic restrictions on earth station uplinks in the 2345–2350 MHz band be necessary to protect such Federal secondary allocations from harmful interference? Footnote US97 states that WCS base stations in the 2305–2320 MHz band must be subject to a coordination agreement with NASA prior to operations within 145 kilometers of Goldstone, California. Would additional technical or geographic restrictions be necessary to protect the NASA radioastronomy site in Goldstone from harmful interference in the 2315–2320 MHz band, as required for WCS base stations operating in that band under footnote US97? Would a requirement for prior coordination of any earth stations seeking to provide command uplinks in the 2315–2320 MHz band within 145 kilometers of Goldstone be adequate to provide the same level of protection that NASA currently has for WCS operations in the 2305–2320 MHz band? The near adjacent 2360–2395 MHz band is allocated on a primary basis for Federal and non-Federal aeronautical mobile telemetry (AMT) for flight testing, and WCS base station operations in the 2345–2360 MHz band must be coordinated to ensure AMT receive stations are protected. Would additional technical or geographic restrictions on earth station uplinks in the 2345–2350

MHz band be necessary to protect Federal and non-Federal flight test operations in the 2360–2395 MHz band from harmful interference caused by SOS out-of-band emissions? We also seek comment on the impact that use of the 2315–2320 MHz and 2345–2350 MHz bands for command uplinks could have on the proposed use of these bands by SiriusXM for the provision of public safety communication services originating from SiriusXM satellites.

b. 2305–2315 MHz and 2350–2360 MHz

74. We seek comment on whether a secondary allocation for SOS could also be made in the 2310–2320 MHz band and 2350–2360 MHz band in the non-Federal column of the United States Table in the Earth-to-space direction and whether to allow WCS licensees, particularly AT&T, to lease the use of the spectrum that they acquired through competitive bidding to earth station licensees to provide uplink commands to non-communications satellites in a manner similar to that proposed for the 2320–2345 MHz band.

75. As observed above, the 2320–2345 MHz band is part of a larger block of spectrum from 2305–2360 MHz that is divided between WCS and SDARS licensees. Within this block of spectrum, 2305–2310 MHz is allocated on a primary basis to non-Federal operations in the fixed, mobile (except aeronautical mobile), and radiolocation services. There is also a secondary non-Federal allocation for the amateur service. There are no Federal allocations in 2305–2310 MHz, although footnote G122 provides that Federal operations may be authorized on a non-interference basis to authorized non-Federal operations and shall not constrain the implementation of any non-Federal operation. In addition, footnote US97 states that space-to-Earth operations in the 2305–2310 MHz band are prohibited, and that WCS base stations in the 2305–2320 MHz band must be subject to a coordination agreement with NASA prior to operations within 145 kilometers of Goldstone, California.

76. The 2310–2320 MHz band has primary allocations for non-Federal fixed, mobile, and radiolocation services, as well as a primary allocation for BSS (sound). There are secondary allocations in this band for Federal fixed, mobile, and radiolocation services. The 2310–2320 MHz band also is subject to footnote US97. Footnote US100 also provides for use of the band for Federal aeronautical telemetering and associated telecommand operations for flight testing of manned or unmanned aircraft, missiles, or major components thereof, on a secondary basis to WCS, and that 2312.5 MHz is shared on a co-equal basis by Federal stations for telemetering and associated telecommand operations of expendable and reusable launch vehicles. Footnote US100 also provides that other Federal mobile telemetering uses may be provided in the 2310–2320 MHz band on a non-interference basis to all other uses authorized pursuant to footnote US100.

77. The 2345–2360 MHz band has the same allocations as the 2310–2320 MHz band, and is also subject to footnotes G2, US100, and US327. Provisions of footnote US100 that made the 2324–2360 MHz band available for non-Federal aeronautical telemetering and telecommand flight testing operations on a secondary basis to WCS expired on January 1, 2020.

78. WCS was established in 1997. Mutually exclusive initial applications for WCS in the 2305–2320 MHz and 2345–2360 MHz bands are subject to competitive bidding, and in 1997 the Commission auctioned and issued 128 WCS licenses. WCS licenses are issued by FCC market areas and channel blocks, with 12 Regional Economic Area Groupings (REAG) and 52 Major Economic Areas (MEA). Blocks A (2305–2310 MHz and 2350–2355 MHz) and B (2310–2315 MHz and 2355–2360 MHz) are issued by MEAs, and blocks C (2315–2320 MHz) and D (2345–2350 MHz) are issued by REAGs. AT&T currently holds all WCS licenses in Blocks A and B. Thus, similar to SiriusXM in the 2320–2345 MHz band, AT&T has exclusive use of the Block A and B licenses in the 2305–2315 MHz and 2350–2360 MHz bands.

79. We seek comment on whether, for the same reasons discussed above for the 2320–2345 MHz band, the 2305–2315 MHz and 2350–2360 MHz bands could be well suited for more intensive use for command uplinks in support of emergent space operations. First, the two bands are also relatively close in proximity to the Federal S-band spectrum that is currently being requested for command and control of ISAM and other spacecraft that do not otherwise provide radiocommunication services to the public. In addition, allowing leased use of the 2305–2315 MHz and 2350–2360 MHz bands for command uplinks would provide nearly contiguous 45 megahertz of S-band spectrum, or 55 megahertz of contiguous S-band spectrum if the 2315–2320 MHz and 2345–2350 MHz bands were also allowed leased use for command uplinks. Second, there are relatively few existing licensed users of the bands, with AT&T having exclusive, or near exclusive use, of the bands in the United States. Finally, similar to the situation with SiriusXM, AT&T does not operate in Blocks A and B uniformly throughout its licensed areas, and there may be geographical areas where earth stations may be able to transmit without causing harmful interference to AT&T's current or future operations. We expect that this may be particularly true in remote and rural areas, such as northern Alaska. We seek comment on these observations and expectations.

80. We also seek comment on whether the same general framework could be implemented for making spectrum available in the 2305–2320 MHz and 2350–2360 MHz bands that was discussed for the 2320–2345 MHz band, that is, adding a secondary allocation for SOS in the bands or alternatively adding a footnote to the United States Table to permit SOS in the bands, and allowing AT&T to lease use of its spectrum in the 2305–2315 MHz and 2350–2360 MHz bands (Blocks A and B) to earth station licensees to provide command uplinks to spacecraft that do not otherwise provide radiocommunication services, subject to a certification by the earth station licensee that the proposed operations have been coordinated with and approved by AT&T. We observe that the Commission already permits leased access to WCS spectrum, including that held currently by AT&T, through secondary market mechanisms, although those mechanisms are limited to the provision of wireless radio services and do not apply to use of the spectrum by earth stations to provide SOS. We seek comment on what changes to our rules would be necessary to permit AT&T to lease use of its Block A and B WCS spectrum for use by earth station licensees to provide command uplinks in support of emergent space operations. Are there any concerns for such leasing of spectrum by AT&T that are not implicated by the proposed leasing of the 2320–2345 MHz band by SiriusXM? We seek comment on these questions.

81. We also seek comment on whether there should be any technical or geographic restrictions or limitations on the use of the 2305–2315 MHz and 2350–2360 MHz bands that are different from technical or geographic restrictions in the 2320–2345 MHz band. For example, footnote US100 provides for use of the 2310–2320 MHz band and 2345–2360 MHz band for Federal aeronautical telemetering and associated telecommand operations for flight testing of manned or unmanned aircraft, missiles, or major components thereof, on a secondary basis to WCS. We also seek comment on whether coordination with Aerospace and Flight Test Radio

Coordinating Council (AFTRCC) and Federal AMT coordinators would be needed to protect AMT operations in the 2360–2395 MHz band, much as WCS base stations operating in the 2350–2360 MHz band must coordinated today with AFTRCC. Would additional technical or geographic restrictions on earth station uplinks in these bands be necessary to protect such Federal secondary allocations from harmful interference? Similarly, would additional technical or geographic restrictions be necessary to protect the NASA radioastronomy site in Goldstone from harmful interference in the 2305–2320 MHz band, as required for WCS base stations operating in that band under footnote US97? Would a requirement for prior coordination of any earth stations seeking to provide command uplinks in the 2305–2320 MHz band within 145 kilometers of Goldstone be adequate to provide the same level of protection that NASA currently has for WCS operations in the 2305–2320 MHz band? Would new earth station uplink operations be compatible with sensitive Moon bounce operations conducted under the amateur radio service in the 2305–2310 MHz band? We also seek comment on whether it may be possible to allow downlinks in the 2305–2315 MHz and 2350–2360 MHz bands through a secondary SOS allocation or footnote to the United States Table, without causing interference or economic harm to WCS licensees or other authorized Federal or non-Federal spectrum users in the same or adjacent spectrum bands.

82. We also seek comment on any international issues that may arise from our proposal to allow the use of the 2305–2315 MHz and 2350–2360 MHz bands for command uplinks to spacecraft that do not otherwise provide radiocommunication services. We observe that these bands are subject to the same allocations internationally as the 2320–2345 MHz band. Are any differences expected in the potential for interference to spectrum users outside of the United States from those addressed above in the context of our proposal for the 2320–2345 MHz band? Would any changes to the current bilateral agreements with Canada and Mexico be needed to address Earth-to-space operations in the 2305–2315 MHz and 2350–2360 MHz bands that would not be needed to address such operations in the 2320–2345 MHz band? Could stations could receive commands in the 2305–2315 MHz and 2350–2360 MHz bands, on either a protected or unprotected basis, consistent with the ITU Radio Regulations, absent an allocation for SOS in the International Table? To what extent might other countries explore ways to authorize earth stations to provide command uplinks in the 2305–2315 MHz and 2350–2360 MHz bands if there is sufficient demand globally for such services? If other countries allow use of these bands for SOS, could such frequencies be considered to be spectrum ''that is used for the provision of international or global satellite communications services'' under the ORBIT Act? We seek comment on these questions.

83. We also seek comment on whether any future auctions involving WCS license that are currently in inventory might specifically address the ability of future WCS licensees to lease spectrum to earth station licensees to provide command uplinks to spacecraft that do not otherwise provide radiocommunication services. We observe that there are ten WCS licenses in the Pacific Island REAG that are in the Commission's inventory of spectrum. Would the value of such licenses be increased in an auction if the winner would also be able to lease spectrum to earth station licensees to provide command uplinks to spacecraft that do not otherwise provide radiocommunication services? Would the ability of earth station licensees to provide such command uplinks in the Pacific Islands be useful in creating a global network of TT&C facilities that are often used for NGSO spacecraft? We seek comment on these questions.

3. Intersatellite Links

84. We seek comment on whether licensed satellite operators should be authorized by rule to use their FCC-licensed satellites and intersatellite links to provide TT&C and data downlinks in support of emergent space operations, without the need to file a modification or obtain additional authorization from the Commission. We expect that such authorization could provide additional spectrum because it will allow the use of off-the-shelf equipment, such as MSS user terminals, and already established ground and space infrastructure. Additionally, we expect such authorization could open up a new avenue of business for established NGSO or GSO space station licensees if there is a regulatory framework for clear authorization for these kinds of radiofrequency communications. We seek comment on these expectations.

85. Many spacecraft that are used to test technologies or perform experiments on-orbit do not have large antennas. This is largely due to financial and launch constraints, and the need for satellites to be small. Since the spacecraft are not intended to provide radiocommunication service to the public, much of a spacecraft's mass could be taken up by non-radio equipment, such as robot arms or other tools, and radios and antennas will need to be as small as possible. As a result, many small satellites and experimental satellites rely on intersatellite links whereby one satellite sends data and TT&C information to the ground via another satellite system. The Commission has experience with this kind of arrangement for experimental part 5 satellite applications and Iridium companion filings. In this arrangement, an experimental satellite operator files a part 5 application for experimental authority and the other satellite system then files a companion application for part 5 experimental authority to communicate with the other experimental satellite using its constellation that is licensed under part 25. We observe that this can be a cost-effective way for many new companies to deploy experimental satellites because they do not have to invest in large antennas or an extensive ground station network. We seek comment on this observation.

86. We seek comment on allowing space stations already licensed by the Commission to use intersatellite links to provide TT&C and payload data downlinks and uplinks to and from spacecraft that do not otherwise provide radiocommunication services. Are there any concerns with allowing satellite operators to communicate with such spacecraft via intersatellite links without the need to file a modification? Should we require these operators, like Iridium, to file a notification that they consent to the communications as part of the license application, or should the obligation fall on the applicant to certify that the other satellite system operator has consented to the intersatellite links? We seek comment on these questions.

87. Additionally, should we limit or identify the specific frequency bands in which intersatellite links may be used in connection with spacecraft that do not otherwise provide radiocommunication service? We expect that satellite operators already licensed to use specific frequencies for intersatellite links, like Iridium, are best placed to coordinate the use of their licensed spectrum and determine the amount of capacity they have to provide intersatellite links to other spacecraft. Should we allow operators to use these intersatellite links in any frequency band in which their satellite partner (*e.g.,* Iridium would be the satellite

partner for part 5 experimental satellites described above) is licensed and willing to offer the intersatellite service? It is also likely that other satellite operators besides Iridium will be able to offer this proposed intersatellite link service if the Commission provides a regulatory pathway. Are there additional interference concerns that need to be considered if multiple NGSO or GSO satellite operators are providing intersatellite links in support of emergent space operations? We seek comment on these questions.

88. We also seek comment on how to address international coordination of such intersatellite links, given the absence of an international allocation for inter-satellite links and the ongoing discussion of intersatellite links at recent World Radio Conferences (WRC). Should we only allow intersatellite links in bands that are allocated internationally for intersatellite links? Should we allow intersatellite links as a non-conforming use provided that applicants provide compatibility showings? We seek comment on these questions.

89. Finally, we seek comment on any other changes to our rules or allocations under the United States Table that would be necessary to facilitate the ability of spacecraft to communicate with existing commercial communications satellites in NGSO or GSO to relay TT&C or payload data. How would any changes to existing rules and allocations be consistent with studies or initiatives that have been made internationally, particularly at the WRC regarding this type of activity? What further steps would be necessary to allow this domestically and/or internationally? We seek comment on these questions.

C. Benefits and Costs

90. The rules we propose, if adopted, will make additional spectrum available for spacecraft engaged in TT&C functions while also promoting efficiency by clarifying our rules concerning TT&C. In particular, we expect that our proposals would significantly reduce costly federal coordination for TT&C missions by making available a non-federal alternative. We estimate that total cost savings from this and other proposals would amount to approximately $6.8 million per year. We therefore tentatively conclude that the proposed rules are in the public interest. We seek comment on these findings.

91. The *NPRM* first proposes or seeks comment on codifying several Commission policies to provide additional regulatory clarity for these operators. This includes (1) codification of frequency piggybacking; (2) allowing additional applications for frequencies for emergent space operations under existing service allocations; (3) permitting TT&C functions within existing radiocommunication service allocations; and (4) refining the definition of TT&C. To the extent that lack of clarity in our rules has prevented stakeholders from engaging in certain TT&C operations, we could anticipate real benefits of providing stakeholders with regulatory clarity. We seek comment on this tentative conclusion.

92. We find that the proposal to add a secondary allocation for SOS in the 2320–2345 MHz band will benefit the public by reducing regulatory costs. The proposal could potentially eliminate costly coordination with NTIA to use Federal bands for TT&C by giving a non-Federal alternative. While leasing the 2320–2345 MHz band may entail a payment to SiriusXM, this payment is a pure transfer from the operator to SiriusXM and so has no effect on total costs and benefits. Negotiating with SiriusXM would generate some new costs, but these would be smaller than the costs of coordinating with NTIA or else operators would not seek to negotiate with SiriusXM. Further, operators could set up a longstanding contract with SiriusXM, limiting negotiation during the term of the contrast. By contrast, at present, to the extent that operators are unable to conduct TT&C functions within non-Federal bands such as those for FSS, MSS, BSS, or EESS, operators must engage in frequency coordination with NTIA to use the S-band or other Federal allocations of spectrum on a case-by-case basis. We also believe that the proposal has the potential to generate additional space operations by expanding the total bandwidth available to space operators and allowing operations that may not have been justified by the costs and uncertainty of NTIA coordination, which is not guaranteed to result in approval. We seek comment on these observations.

93. We estimate the magnitude of the annual regulatory cost savings to be $8.2 million. We estimate this by assuming the NTIA coordination process is handled on the operator's side by a team of two lawyers and two engineers. We assume they work through the application process over two months, which we approximate as eight forty-hour workweeks or three hundred and twenty work hours for each worker. We estimate that the lawyers have an hourly compensation of $106.10/hour and that the engineers have an hourly compensation of $94.64. Total compensation for one space operator's team in an NTIA coordination is therefore $128,473.60. We estimate on the NTIA side, a team of three government employees handle the coordination. We estimate the average government hourly compensation is $80.67, so the total NTIA team compensation for the coordination process is $77,443.20. The total labor costs of coordination combining both private and public expenses is $205,916.80. Based on the number of application requests in the Federal S-band (2025–2110 MHz) from 2021 to 2025, we estimate the future average for such applications to be about 80. Not all of these applications are related to TT&C, and we assume that some operators will rely on non-Federal bands or prefer to continue coordinating with NTIA, so we estimate that only 50% of applications, 40 annually, will be replaced by leases in the 2320–2345 MHz band. Multiplying this number by the per coordination labor costs results in a total annual labor cost saving of approximately $8.2 million. Total benefits would equal the economic value of additional operations allowed by the new spectrum plus the cost savings. Given the uncertain nature of additional operations, we do not estimate them here, such that $8.2 million is a lower bound on benefits. We seek comment on this methodology.

94. We estimate additional negotiation costs by assuming every negotiation between a space operator and SiriusXM is handled by two teams of two lawyers. Using the 2025–2110 MHz band allows operators to avoid the complex coordination needed for other bands, so that we assume no engineers are involved and the negotiation time falls to two weeks. With these assumptions, and the earlier assumption of hourly compensation for lawyers being $106.10/hour, total negotiations costs for each lease is only $33,952.00. Assuming, again, 40 leases leads to total negotiation costs of approximately $1.4 million. These costs are likely to be front-loaded because we predict negotiations will result in long-term contracts, allowing operators to bypass such costs for a number of years. The long-run average negotiation cost is likely lower than $1.4 million, so $1.4 million represents an upper bound on costs. The lower bound of $8.2 million for benefits is higher than the upper bound of $1.4 million for costs, so we tentatively conclude that the benefits of the 2320–2345 MHz band proposal will exceed its costs and be at least $6.8 million, annually. We seek comment on this methodology.

95. We postpone until a later date estimating the benefits and costs associated with possible secondary allocations in addition to the 2320–2345 MHz band. Currently, we do not have a specific proposal on how to implement other secondary allocations, so it is not possible to estimate benefits or costs at this time. We seek comment on this tentative conclusion.

96. Although we only seek comment on whether satellite operators should be authorized by rule to use their FCC-licensed satellites and intersatellite links to provide TT&C and data downlinks to spacecraft, we can tentatively estimate benefits as costs avoided from no longer needing to file modification applications. Currently, there are about 25 annual applications for experimental modifications for TT&C related activities, so we will assume that number of applications going forward. Applications involve labor costs from a lawyer, which we estimate to be 1.5 hours of work at a total hourly compensation of $106.10/hour. We will assume the avoided fee is equal to $140, the modification fee for experimental licenses. Total benefit from the intersatellite links proposal is then approximately $7.4 thousand, which is a lower bound given potentially higher future demand for intersatellite links and additional space operations that might be spurred on by lower costs. We predict no costs would result from simply reducing application requirements, so we conclude that the net benefit of the intersatellite links proposal also has a lower bound of $7.4 thousand. While this is positive, it is only a small increase relative to the net benefits of the 2320–2345 MHz band proposal, so to avoid an impression of false precision, we do not add this to the net benefit total. We seek comment on this methodology.

Initial Regulatory Flexibility Analysis

97. As required by the Regulatory Flexibility Act of 1980, as amended (RFA), the Commission has prepared the Initial Regulatory Flexibility Analysis (IRFA) of the policies and rules proposed in the *NPRM* assessing the possible significant economic impact on a substantial number of small entities. The Commission requests written public comments on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments specified on the first page of the *NPRM.* The Commission will send a copy of the *NPRM,* including the IRFA, to the Chief Counsel for the Small Business Administration (SBA) Office of Advocacy. In addition, the *NPRM* and IRFA (or summaries thereof) will be published in the **Federal Register**.

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

98. In the *NPRM,* we initiate this rulemaking proceeding seeking comment on ways in which to make additional spectrum available to support emergent space operations. We continue our efforts to identify spectrum or ways in which spectrum can be used more efficiently to support emergent space operations. We therefore propose to establish regulatory clarity for the use of existing spectrum allocations in support of emergent space operations, and to codify certain Commission policies to provide further regulatory clarity. We also propose to make additional non-Federal spectrum available for TT&C in support of emergent space operations.

99. The primary objectives of the proposals in the *NPRM* are to identify additional spectrum for spacecraft that conduct emergent space operations and to identify ways in which existing allocated spectrum can be used more efficiently to support such spacecraft. To that end, the *NPRM* proposes to codify the use of frequency piggybacking to allow certain spacecraft engaged in servicing a client spacecraft to operate in frequency bands consistent with the client's authorized radiofrequency communications. The *NPRM* seeks comment on how to codify the potential use of frequency piggybacking, how such codification might be structured to accommodate a broad range of scenarios while ensuring both regulatory certainty and operational flexibility, and whether additional use cases—beyond servicing, monitoring, or collaborating with a client spacecraft—should also be considered for piggybacking. The *NPRM* also proposes to refine the definition of ''TT&C'' to encompass radiofrequency usage by spacecraft that do not otherwise provide radiocommunication services and to permit TT&C within existing radiocommunication service allocations.

100. Finally, the *NPRM* proposes to add a secondary allocation for space operation service (SOS) (Earth-to-space) in the 2320–2345 MHz band in the non-Federal column of the U.S. Table of Frequency Allocations (United States Table), and allow leasing of spectrum by the exclusive licensee within this frequency band in the U.S., to earth station licensees for command of spacecraft that do not otherwise provide radiocommunication services. The secondary allocation proposal includes a requirement for applicants to seek authority from the Commission to operate an earth station in the 2320–2345 MHz band under secondary allocation, and to certify that their proposed operations have been coordinated with, and approved by, the exclusive licensee within this frequency band to safeguard the existing operations from interference. The *NPRM* seeks comment on the proposed certification requirement, and on whether there are additional non-Federally allocated spectrum bands such as the 2315–2320 MHz and 2345–2350 MHz bands, and the 2305–2315 MHz and 2350–2360 MHz bands, that could be used in support of emergent space operations.

B. Legal Basis

101. The proposed action is authorized pursuant to sections 4(i), 4(j), 7(a), 301, 303, 307, 308, 309, 310, 312, 316, and 332 of the Communications Act of 1934, as amended, U.S.C. 154(i), 154(j), 157(a), 301, 303, 307, 308, 309, 310, 312, 316, and 332.

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

102. 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. The RFA generally defines the term ''small entity'' as having the same meaning as the terms ''small business,'' ''small organization,'' and ''small governmental jurisdiction.'' In addition, the term ''small business'' has the same meaning as the term ''small business concern'' under the SBA. A ''small business concern'' is one in which: (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. The SBA establishes small business size standards that agencies are required to use when promulgating regulations relating to small businesses; agencies may establish alternative size standards for use in such programs, but must consult and obtain approval from SBA before doing so.

103. Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe three broad groups of small entities that could be directly affected herein. In general, a small business is an independent business having fewer than 500 employees. These types of small business represent 99.9% of all businesses in the United States, which translates to 34.75 million businesses. Next, ''small organizations'' are not-for-profit enterprises that are independently

owned and operated and not dominant in their field. While we do not have data regarding the number of non-profits that meet that criteria, over 99 percent of nonprofits have fewer than 500 employees. Finally, ''small governmental jurisdictions'' are defined as cities, counties, towns, townships, villages, school districts, or special districts with populations of less than fifty thousand. Based on the 2022 U.S. Census of Governments data, we estimate that at least 48,724 out of 90,835 local government jurisdictions have a population of less than 50,000.

104. The rules proposed in the *NPRM* will apply to small entities in the industries identified in the chart below by their six-digit North American Industry Classification System (NAICS) codes and corresponding SBA size standard. Based on currently available U.S. Census data regarding the estimated number of small firms in each identified industry, we conclude that the proposed rules will impact a substantial number of small entities. Where available, we also provide additional information regarding the number of potentially affected entities in the industries identified below.

Regulated industry	NAICS code	SBA size standard	Total firms	Small firms	% Small firms in industry
Wired Telecommunications Carriers	517111	1,500 employees	3,403	3.027	88.95
Satellite Telecommunications	517410	$44 million	332	195	88.69
All Other Telecommunications	517810	$40 million	1,673	1,007	60.19

D. Discussion of Significant Alternatives Considered That Minimize the Significant Economic Impact on Small Entities

105. The RFA directs agencies to describe the economic impact of proposed rules on small entities, as well as projected reporting, recordkeeping and other compliance requirements, including an estimate of the classes of small entities which will be subject to the requirements and the type of professional skills necessary for preparation of the report or record.

106. In the *NPRM,* we seek to make additional spectrum available for certain types of spacecraft and satellite operators, and do not propose to change the way the space station licensing process works. By clarifying the use of existing allocations and permitting TT&C on a non-interference basis as proposed in the *NPRM,* we may reduce the time and expense for small and other entities associated with acquiring spectrum access. Further, these clarifications and the codification of practices such as frequency piggybacking and spectrum leasing should lower barriers to entry, eliminate the need for small entities to file requests for waiver of the United States Table (47 CFR 2.106) to access certain spectrum, and allow small entities to avoid lengthy coordination with Federal users making the application process easier and avoid some legal and administrative costs. We estimate a total cost savings of approximately $6.8 million annually from the proposals discussed in the *NPRM.*

107. Notwithstanding the benefits of streamlined access to spectrum, small and other entities would be subject to complying with certification and coordination requirements to lease spectrum from incumbent licensees, and are likely to incur new costs in the form of lease payments to incumbent licensees. Small and other entities seeking to lease spectrum would also be required to obtain their own earth station license from the Commission, and would be subject to the applicable reporting, recordkeeping, and compliance obligations for licensees. Additionally, while the proposals in the *NPRM* will reduce regulatory complexities, burdens and costs, small entities may incur compliance costs and may need to engage the assistance of professionals such as engineers, lawyers or consultants to meet their obligation to demonstrate technical compliance with spectrum use parameters, negotiate leasing agreements and certify coordination with incumbent licensees, and to assist with filings involving coordination with Federal users or international obligations.

108. If the proposals in the *NPRM* are adopted, we expect the overall burden for small and other entities to be less than under our current requirements. Adding a secondary allocation for SOS in the 2320–2345 MHz band has the potential to eliminate costly coordination with the National Telecommunications and Information Administration (NTIA) to use Federal bands for TT&C by giving small and other entities a non-Federal alternative. Further, while leasing 2320–2345 MHz band spectrum may require small and other entities to negotiate with, and make lease payments to, the exclusive licensee in the band, SiriusXM, we anticipate that these costs would be significantly lower than those associated with any individual NTIA coordination effort, since leasing spectrum will eliminate the need for engineering coordination. We estimate the annual regulatory cost savings from the elimination of NTIA coordination will be $8.2 million. By eliminating NTIA coordination, we estimate that small and other entities will each save $128,473.60 in legal and engineering compensation costs. Our estimate assumes an operator's NTIA coordination process uses two lawyers and two engineers working through the application process over a two months period—eight forty-hour workweeks or three hundred and twenty work hours for each worker, with an hourly compensation rate of $106.10/hour for the lawyers, and $94.64 for the engineers. The total calculated compensation for an operator's NTIA coordination is therefore $128,473.60. Additional cost savings may be realized by small and other operators by establishing long-term contracts reducing the need for ongoing negotiations during the contract period. In contrast, frequency coordination with NTIA for each specific use case is required under the current process.

E. Discussion of Significant Alternatives Considered That Minimize the Significant Economic Impact on Small Entities

109. The RFA directs agencies to provide a description of any significant alternatives to the proposed rules that would accomplish the stated objectives of applicable statutes, and minimize any significant impact on small entities. The discussion is required to include alternatives such as: ''(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 such 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 such small entities.''

110. The *NPRM* proposes ways to identify more spectrum for spacecraft

that conduct emergent space operations and to make it easier for operators of these spacecraft to apply for and use spectrum. We consider some alternatives that would minimize the economic impact on small entities while achieving our goal of expanding spectrum availability for space operations in an evolving space industry and economy. These alternatives would balance regulatory certainty with flexibility, and could enable small entities to access spectrum more efficiently and affordably.

111. We generally propose to continue reviewing requests to operate space stations within specific service allocations on a case-by-case basis to assess whether the proposed communications can justifiably fit within the definition of the service allocation; however, we consider and seek comment on allowing TT&C operations within existing service allocations, provided the operations fit within the service allocation definition. Another option upon which we seek comment is allowing licensees and market access grantees to conduct TT&C in any band where TT&C may already be provided within the radiocommunication service. Allowing such flexible use of existing allocations would avoid the need for new rulemakings to create new allocations or conduct spectrum reallocation. We also consider and seek comments on whether to grant applicants authority to provide fixed-satellite service (FSS) in bands allocated for non-Federal FSS, limited to the provision of TT&C on an unprotected, non-interference basis, subject to coordination with other spectrum users, outside of a first-come, first service procedure or a processing round.

112. While our proposed allowance of spectrum leasing in the 2320–2345 MHz band discussed in the *NPRM* would have certification and coordination requirements for lessees, we consider and propose allowing space station authorization in the 2320–2345 MHz band with a certification and coordination requirement in the limited circumstance of reception of commands from earth stations licensed by the Commission, or from earth stations located outside of the United States. We also consider and seek comment on allowing earth stations to provide command uplinks to non-communications satellites and spacecraft in the 2320–2345 MHz band within a defined geographic area, such as an area of northern Alaska defined by latitude, without requiring coordination and approval. These approaches offer regulatory flexibility and would minimize the need for complex coordination which could lower compliance costs for small and other entities.

113. Our proposal for spectrum leasing would still require small and other entities that want to use the 2320–2345 MHz band to provide command uplinks to obtain an earth station license from the Commission prior to transmitting in the band, and lessees would be subject to all licensing and regulatory obligations applicable to earth station licensees. As an alternative, we seek comment on whether to adopt the more extensive requirements for approving long and short term *de facto* transfers of control of spectrum under the Commission's spectrum leasing rules applicable to Wireless Radio Services and other wireless licensees. Adoption of this approach presumes no additional license authorization is required from the Commission to allow the operations using leased spectrum.

114. Other alternatives we consider and seek comment on in the *NPRM* include whether a non-governmental (NG) footnote to the United States Table is a better method than our proposed secondary allocation allowance to permit use of the 2320–2345 MHz band for command uplinks to non-communications satellites, and whether competitive bidding or alternative market-based approaches can be employed to promote the efficient and timely use of the 2320–2345 MHz band for command uplinks, consistent with statutory limitations. We specifically inquire whether earth station licenses to operate in the U.S. using the 2320–2345 MHz band—spectrum that is not internationally allocated for satellite communications—could be auctioned by the Commission. If we decide to use an auction process, as in prior auctions, small entity bidding credits could be made available to promote competitive entry for small entities.

115. To assist with our evaluation of the economic impact on small entities that may result from the proposals and matters upon which we seek comment in this proceeding, the *NPRM* seeks alternative proposals, and requests information from small and other licensees. We expect to consider more fully the economic impact on small entities following its review of comments filed in response to the *NPRM,* including any costs and benefits information. Alternative proposals and approaches from commenters may help the Commission further minimize the economic impact on small entities. Our evaluation of the comments filed in this proceeding will shape the final conclusions we reach, the final alternatives we consider, and the actions we ultimately take in this proceeding to minimize any significant economic impact that may occur on small entities from the final rules that are ultimately adopted.

116. The *NPRM* seeks comment from all interested parties. Small entities are encouraged to bring to our attention any specific concerns that they may have with the proposals outlined in the *NPRM.*

F. Federal Rules That May Duplicate, Overlap, or Conflict With the Proposed Rules

117. None.

Ordering Clauses

118. *It is ordered,* pursuant to sections 4(i), 4(j), 7(a), 301, 303, 307, 308, 309, 310, 312, 316, 332 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 154(j), 157(a), 301, 303, 307, 308, 309, 310, 312, 316, 332, that the *NPRM is adopted.*

119. *It is further ordered* that the Commission's Office of the Secretary *shall send* a copy of the *NPRM,* including the IRFA, to the Chief Counsel for the SBA Office of Advocacy.

Federal Communications Commission.

Marlene Dortch,

Secretary.

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