6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 2, 25, 30, and 101

[GN Docket No. 14-177, IB Docket Nos. 15-256 and 97-95, RM-11664, WT Docket No. 10-112; FCC 16-89]

Use of Spectrum Bands above 24 GHz for Mobile Radio Services

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: In this document, the Federal Communications Commission (Commission or FCC) seeks comment on proposed service rules to allow flexible fixed and mobile uses in additional bands and on refinements to the rules the Commission adopted in FCC 16-89. These refinements include: providing additional detail on the sharing arrangement the Commission adopted in FCC 16-89 for the 37 GHz band; performance requirements for innovative uses such as Internet of Things (IoT) and machine-to-machine communications; additional issues relating to our mobile spectrum holdings policies; whether antenna height limits are necessary in mmW bands; whether minimum bandwidth scaling factors are necessary for transmitter power limits; whether allowing higher Power Flux Density (PFD) levels for Fixed Satellite Service (FSS) in the 37 and 39 GHz bands would be consistent with terrestrial use of those bands; refining the coordination limits for point-to-point operations; and on sharing analysis and modeling.

DATES: Comments are due on or before September 30, 2016; reply comments are due on or before October 31, 2016.

ADDRESSES: You may submit comments, identified by GN Docket No. 14-177, by any of the following methods:

- Federal eRulemaking Portal: http://www.regulations.gov. Follow the instructions for

submitting comments.

- Federal Communications Commission's website: https://www.fcc.gov/ecfs/. Follow the instructions for submitting comments.
- People with Disabilities: Contact the FCC to request reasonable accommodations (accessible format documents, sign language interpreters, CART, etc.) by e-mail: FCC504@fcc.gov, phone: 202-418-0530 or TTY: 202-418-0432.

For detailed instructions for submitting comments and additional information on the rulemaking process, see the SUPPLEMENTARY INFORMATION section of this document.

FOR FURTHER INFORMATION CONTACT: John Schauble of the Wireless Telecommunications Bureau, Broadband Division, at 202-418-0797 or John.Schauble@fcc.gov, Michael Ha of the Office of Engineering and Technology, Policy and Rules Division, at 202-418-2099 or Michael.Ha@fcc.gov, or Jose Albuquerque of the International Bureau, Satellite Division, at 202-418-2288 or Jose.Albuquerque@fcc.gov.

SUPPLEMENTARY INFORMATION: This is a summary of the Further Notice of Proposed Rulemaking (FNPRM), GN Docket No. 14-177, IB Docket Nos. 15-256 and 97-95, RM-11664, WT Docket No. 10-112; FCC 16-89, adopted and released on July 14, 2016. The full text of the FNPRM is available for inspection and copying during normal business hours in the FCC Reference Center, 445 12th Street, S.W., Washington, DC 20554. The document also is available for download over the Internet at https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-89A1.docx.

Comment Filing Procedures: You may submit comments, identified by GN Docket No. 14-177, by any of the following methods:

• Electronic Filers: Comments may be filed electronically using the Internet by accessing the Commission's Electronic Comment Filing System (ECFS) https://www.fcc.gov/ecfs/ or the

Federal eRulemaking Portal: http:www.regulations.gov. Filers should follow the instructions provided on the Commission's website for submitting comments and transmit one electronic copy of the filing to GN Docket No. 14-177. For ECFS filers, in completing the transmittal screen, filers should include their full name, U.S. Postal Service mailing address, and the applicable docket number.

• Parties may also submit an electronic comment by Internet e-mail. To get filing instructions, filers should send an e-mail to ecfs@fcc.gov, and include the following words in the body of the message, "get form <your e-mail address>". A sample form and instructions will be sent in response.

• Paper Filers: Parties who choose to file by paper must file an original and four copies of reach filing. Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

- All hand-delivered or messenger-delivered paper filings for the Commission's Secretary must be delivered to FCC Headquarters at 445 12th St., S.W., Room TW-A325, Washington, DC 20554. All hand deliveries must be held together with rubber bands or fasteners. The filing hours are 8:00 a.m. to 7 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 E. Hampton Drive, Capitol Heights, MD 20743.
- U.S. Postal Service first-class, Express, and Priority must be addressed to 445 12th Street, S.W., Washington DC 20554.

Ex Parte Rules – Permit-But-Disclose

Pursuant to Section 1.1200(a) of the Commission's rules, this FNPRM 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 rule 1.1206(b). In proceedings governed by rule 1.49(f) or for which the Commission has made available a method of electronic filing, written ex parte presentations and memoranda summarizing oral ex parte presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (e.g., .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's ex parte rules.

Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980, as amended (RFA), the Commission has prepared this present IRFA of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in the attached FNPRM. Written public

comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines specified in the FNPRM for comments. The Commission will send a copy of this FNPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).

Paperwork Reduction Analysis

This document does not contain new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104–13.

Synopsis

1. This FNPRM has two sections that the Commission is seeking comment. First, the Commission proposes to adopt service rules allowing flexible fixed and mobile uses in additional bands. These bands potentially offer 17.7 GHz of spectrum that could be available for fixed or mobile use. By examining the suitability for mobile use of such a large amount of spectrum, the Commission takes steps to ensure that additional spectrum is available to allow the next generation of wireless technologies to flourish in the mmW bands. In addition, many of these bands will require sharing solutions to unlock their potential for flexible use services – the Commission seeks comment on the potential sharing mechanisms, and continue to encourage all stakeholders to work to develop and refine effective solutions to sharing. Second, the Commission seeks further comment on refinements to the rules the Commission adopted in the Report and Order in GN Docket No. 14-177, IB Docket Nos. 15-256 and 97-95, RM-11664, WT Docket No. 10-112; FCC 16-89, adopted and released on July 14, 2016 (hereinafter Order or Report and Order). In particular, the Commission seeks comment on: (1) providing additional detail on the sharing arrangement that the Commission adopted in the Order for the 37 GHz band; (2) performance requirements for innovative uses such as IoT and machine-to-machine communications; (3) additional issues relating to our mobile spectrum holdings policies; (4)

whether antenna height limits are necessary in mmW bands; (5) whether minimum bandwidth scaling factors are necessary for transmitter power limits; (6) whether allowing higher PFD levels for FSS in the 37 and 39 GHz bands would be consistent with terrestrial use of those bands; (7) refining the coordination limits for point-to-point operations; and (8) on sharing analysis and modeling.

2. In the Order, several commenters ask the Commission to consider other bands for mobile use. Many commenters argue that the criteria should not preclude the Commission from considering bands that do not meet all of those criteria. For example, CTIA and Nokia ask the Commission to consider bands that do not have 500 MHz of spectrum because certain applications may be feasible for smaller bandwidths. Commenters also agree that while international harmonization is preferable, the Commission should not preclude bands from further consideration just because they are not proposed for mobile use throughout the world.

3. Several factors lead us to conclude that it is now appropriate to consider additional bands for mobile use. First, as the record to the Report and Order has made clear, there are a wide variety of services, including fixed, mobile, and satellite, for which these bands could be used. This variety favors making multiple bands available, including bands for which the Commission did not to propose service rules in the NPRM (see In the Matter of Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, Notice of Proposed Rulemaking, 30 FCC Rcd 11878 (2015)). Second, the World Radio Conference identified a large number of bands as candidate bands for IMT-2020 (International Mobile Telecommunications), including several bands that the Commission did not address in the NPRM. Third, it appears that the amount of global data traffic will continue to grow exponentially. Cisco estimates that global mobile data traffic will grow nearly tenfold between 2014 and 2019. Under these circumstances, the Commission believes it is now appropriate to seek comment on proposing mobile service rules

for most of the bands identified at the 2015 World Radio Conference.

4. Specifically, the Commission proposes authorizing flexible use licenses that would permit fixed and mobile services in the following bands: 24.25-24.45 GHz and 24.75-25.25 GHz, 31.8-33.4 GHz, 42-42.5 GHz, 47.2-50.2 GHz, 50.4-52.6 GHz, 71-76 GHz, and 81-86 GHz. Each of these bands was identified as a candidate band for IMT-2020.

5. At the same time, the Commission recognizes that there are challenges that must be overcome before the Commission can authorize service in these bands, including existing allocations and/or operations in these bands. The Commission will continue to work with existing stakeholders, wireless providers, the satellite industry, National Telecommunications and Information Administration (NTIA), and other interested Federal stakeholders to determine where different services can coexist and develop ways to maximize flexible use. In several bands, the Commission believes sharing mechanisms that the Commission has adopted in the Report and Order and in other proceedings can allow many of these bands to be utilized for fixed and mobile use while also accommodating existing uses.

6. The Commission discusses each of the bands in additional detail below. The Commission generally proposes to use the licensing and service rule framework the Commission adopted in the Order. Except for the 71-76 GHz, and 81-86 GHz bands, the Commission proposes to use geographic area licensing with Partial Economic Area (PEAs) as the license area size. For the 71-76 GHz and 81-86 GHz bands, the Commission proposes to use a licensing framework similar to the framework developed for the Citizens Broadband Radio Service. For any Upper Microwave Flexible Use Service (UMFUS) bands for which the Commission adopts geographic area licensing and accept mutually exclusive initial applications, the Commission has decided to conduct any spectrum auction of licenses in conformity with the general competitive bidding procedures set forth in Part 1 Subpart Q of the Commission's rules, including rules

governing designated entity preferences. The Commission seeks comment here on whether to apply the same small business definitions and associated bidding credits the Commission has adopted for auctions of UMFUS licenses to auctions of licenses in the additional bands discussed below, as the Commission seeks any other spectrum bands that the Commission may subsequently decide to include in the UMFUS. Our proposal is based on our anticipation that the same types of services would be deployed in these additional bands as are contemplated to be deployed in the bands that the Commission has already designated for the UMFUS. The Commission asks commenters to provide specific data on the costs and benefits associated with the licensing mechanisms the Commission has proposed.

7. In the Order, the Commission is making 3.85 GHz of mmW spectrum available for licensed mobile use, as well as adding seven gigahertz of spectrum for unlicensed use, bringing the total to 14 GHz of unlicensed spectrum available in the 57-71 GHz band. In view of these relative proportions, the Commission believes it is appropriate to make additional licensed spectrum available for flexible use. Furthermore, the Commission continues to believe there is value in using both geographic area licensing and shared access. The Commission seeks comment on alternative licensing mechanisms for each of these bands, including unlicensed operation. To the extent the Commission adopts geographic area licensing, the Commission also seeks comment on alternative license area sizes.

8. The Commission also proposes to generally apply the Part 30 technical rules the Commission has adopted in the Order to each of the bands where the Commission ultimately adopts flexible use rules. The Commission seeks comment on any deviations from those rules or special technical rules that would be needed for any of those bands. Commenters who propose special technical rules should explain the specific need for such rules and quantify the costs and benefits associated with their proposed rules. The Commission also encourages commenters to

provide detailed technical analysis supporting any technical proposals.

9. As the Commission explained in the NPRM, the Commission believes these bands might be able to support expanded sharing, including two-way shared use between Federal and non-Federal users in these bands and sharing among different types of service platforms. The Commission continues to believe there is an opportunity to leverage the propagation characteristics of these bands to further enhance sharing Federal and non-Federal users. The Commission seeks comment generally on ways to further Federal and non-Federal sharing in these bands, including refinement of the concept the Commission adopted in the Order for the 37 GHz band.

A. Additional Bands

1. 24 GHz Bands (24.25-24.45 GHz and 24.75-25.25 GHz)

10. The Commission proposes to add a mobile allocation to the 24.25-24.45 and 24.75-25.25 GHz segments of the 24 GHz band, a fixed allocation to 24.75-25.05 GHz, and to authorize both mobile and fixed operations in those segments under the new Part 30 UMFUS rules. This band is already used internationally for fixed service and is included in the WRC study for future international mobile allocation. The existing manufacturing base and global harmonization of this band make it an attractive option for mobile use. The Commission further proposes to grant mobile rights to the existing fixed licensees, in order to facilitate coordination between fixed and mobile uses in the areas that are currently licensed. The Commission proposes to add these new fixed and mobile authorizations on a co-primary basis. The Commission seeks comment on that arrangement, as well as on the alternative of making mobile or fixed use secondary to FSS.

11. The Commission recognizes that there are existing satellite interests and operations in this band, and the Commission seeks comment on the best way to promote effective sharing

between satellite and mobile uses. Given that the current use of the band for satellite appears to be rather limited, should the Commission maintain the existing limits and coordination procedures on satellite operations in the 25.05-25.25 GHz band, and apply those same limits to the 24.75-25.05 GHz band? Alternatively, are there other sharing mechanisms that would better achieve coexistence? Would the sharing regime the Commission has adopted for the 28 GHz band be appropriate in this band, or do the differences between FSS earth stations in that band and BSS feeder links here suggest a different solution?

12. The Commission also proposes to modify the existing band plan for new licenses in the 24 GHz band. Currently, the 24 GHz bands is channelized into five 40 MHz by 40 MHz channel pairs. As with the 39 GHz band, the Commission sees benefits to converting the 24 GHz band plan to unpaired blocks. Going forward, the Commission proposes to license the 24.25-24.45 GHz band segment as a single, unpaired block of 200 MHz, and the 24.75-25.25 GHz band segment as two unpaired blocks of 250 MHz each. The Commission seeks comment on this proposal, as well as the alternative of using 100 MHz unpaired channels, or two 200 MHz channels and one 100 MHz channel in 24.75-25.25 GHz. The Commission also seeks comment on how to treat existing 24 GHz band licensees. Should incumbent licenses be converted to UMFUS licenses, as the Commission has done in 28 GHz and 39 GHz? Also, is it necessary to repack existing licensees, or can they keep their existing frequency assignments because there are so few licensees?

2. 32 GHz Band (31.8-33.4 GHz)

13. The Commission proposes to add primary non-Federal fixed and mobile service allocations to the 32 GHz band (31.8-33.4 GHz).[1] The Commission also proposes to authorize

[1] In the *NPRM*, the Commission addressed the 31.8-33 GHz band. Because the ITU identified 31.8-33.4 GHz as a potential candidate band, we will expand our consideration to the 31.8-33.4 GHz band.

fixed and mobile operations in the 32 GHz under the Part 30 Upper Microwave Flexible Use Service rules. In the NPRM, the Commission noted that the 32 GHz band is not currently allocated for mobile operations, and therefore, perhaps it is not as suited to the provision of 5G services as other bands under consideration. Since the NPRM was adopted, however, ITU WRC-15 decided to conduct the appropriate sharing and compatibility studies for the 32 GHz band, which may lead to an allocation for mobile service in the 32 GHz band at WRC-19 and the opportunity for globally harmonized services in this band. Global harmonization, in turn, will promote global interconnection, roaming, and interoperability. In addition, there is a significant amount of contiguous bandwidth available in the 32 GHz band. Finally, the Commission notes that there is significant support among the commenters to allocate the 32 GHz band for fixed and mobile 5G services.

14. However, there are still two major challenges to authorizing mobile operations in the 32 GHz band: (1) protecting radionavigation operations in the 32 GHz band; and (2) protecting radio astronomy observations in the adjacent 31.3-31.8 GHz band. The Commission discusses those challenges and invites further comment on those issues below.

a. Federal and non-Federal Services in the 32 GHz Band

15. In the NPRM, the Commission sought comment on the compatibility of mobile use of the 32 GHz band with existing aeronautical and shipborne radar use of the band, future radionavigation and other Federal services, as well as deep space research in the 31.8-32.3 GHz portion of the 32 GHz band. In the Order, commenters did not address these issues directly. Instead, Echodyne, a technology startup, asks the Commission to proceed cautiously to ensure that it does not hinder the development of innovative technologies for the radionavigation bands. Echodyne states that "near term advances in radar technology soon will help fuel revolutionary changes in many sectors." For instance, Echodyne indicates that "accurate, lightweight, and

low-power detect and avoid systems will be essential to widespread commercial deployment of Unmanned Aerial Systems and autonomous vehicles," which Echodyne argues, will change the face of transportation, shipping, security, and numerous other industries. According to Echodyne, these advances rely on effective radionavigation operations that need consistent operating conditions across a geographic region, including a predictable and uniform interference environment. Echodyne indicates that it is skeptical that the 32 GHz band could be made available for mobile use.

16. The Commission seeks comment on the compatibility of fixed and mobile services with existing allocated services in the 32 GHz band. In the Order, commenters who support mobile use of this band should provide specific technical information and proposals showing how fixed and mobile uses of this band is compatible with radionavigation uses. In that regard, the Commission asks Echodyne and other commenters to provide specific information on existing and planned non-Federal uses of radar in this band. The Commission will continue to work with NTIA and other Federal partners to determine the protection requirements for Federal users and the opportunity to expand shared Federal use across the band.

17. The Commission also seeks comment on protecting other allocated service within the 32 GHz band. For Space Research Service operations in the Goldstone, California area, would coordination requirements be sufficient to protect those operations? In the NPRM, the Commission noted that the risk of interference between terrestrial operations and ISS links in 64-71 GHz appeared to be low because of atmospheric absorption. Would the same analysis apply in the 32 GHz band?

b. Radio Astronomy and EESS in the Adjacent 31.3-31.8 GHz Band

18. The 32 GHz band is adjacent to the 31.3-31.8 GHz band. In the United States, the 31.3-31.8 GHz band is allocated for Earth Exploration Satellite (passive), radio astronomy, and

Space Research (passive). No station is authorized to transmit in the 31.3-31.8 GHz band and the radio astronomy operations in the 31.3-31.8 GHz band are protected from unwanted emissions only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates.

19. In the NPRM, the Commission noted that the need to protect the 31.3-31.8 GHz passive band may severely limit the availability of usable spectrum in the 31.8-33 GHz band and sought detailed technical analysis from commenters on the out-of-band emission limits required to protect operations in the 31.3-31.8 GHz band. The Commission indicated that a detailed analysis would help it determine how much of the 31.8-33 GHz band could be used for mobile operations while protecting the passive services in the 31.3-31.8 GHz band.

20. In the Order, CORF submitted the most information on this topic. CORF states that although the critical science undertaken by Radio Astronomy observers cannot be performed without access to interference free bands, Radio Astronomy Service (RAS) bands can be protected regionally by limiting emissions within a certain radius of the facility. But, CORF explains, "the emissions that radio astronomers receive are extremely weak—a radio telescope receives less than 1 percent of one-billionth of one-billionth of a watt (10-20 W) from a typical cosmic object." CORF further explains that radio observatories are particularly vulnerable to interference from in-band emissions, spurious and out-of-band emissions from licensed and unlicensed users of neighboring bands, and emissions that produce harmonic signals in the RAS bands, even when those manmade signals are weak and distant. EMEA Satellite Operators Association (ESOA) argues that any deep space research operations in the 31.3-31.8 GHz band can be protected from mobile terrestrial operations in the 32 GHz band because there are very few research facilities and they are located in very remote areas. The Commission seeks specific

comment on how the Commission should protect these operations.

21. CORF stresses the importance of the data collected from Earth Exploration Satellite Service (EESS) and that billions of dollars have been invested in EESS satellites. CORF notes that for certain applications, satellite-based microwave remote sensing is the only practical method of obtaining atmospheric and surface data for the entire planet. Data derived from EESS have contributed substantially to the study of meteorology, atmospheric chemistry, climatology, and oceanography and is used by multiple governmental agencies. CORF indicates that incumbent users designed and developed EESS missions without the expectation of transmissions in close proximity to the 31.3-31.8 GHz band. They also report that most incumbent users at 31.5 GHz operate in a direct detection (homodyne) mode. CORF recommends that the Commission adopt adequate guard bands to protect EESS operations in the 31.3-31.8 GHz "until the current satellites can be replaced with satellites with filtering suited to the new spectral environment." CORF claims that proportionally larger guard bands are needed as the frequency increases. In direct detection, CORF explains, band definition is achieved with filters that are limited by the properties of the materials used in the filter itself. Thus, for example, "for a given material, the minimum bandwidth of a filter is proportional to the central frequency, so that the width of the necessary guard bands to suppress emissions to a desired level also increases in proportion to the frequency." CORF continues, "it is impossible to reject a signal 10 MHz away from a band edge at these higher frequencies, so guard bandwidths must be scaled in frequency to accommodate this physical limitation." The Commission seeks comment on whether the Commission should adopt a guard band to protect EESS operations in the 31.3-31.8 GHz band, and if so, how large should the guard band be? ESOA, disagrees with CORF and states that services operating in the 31.3-31.8 GHz band can be protected through "carefully crafted operating requirements." The Commission seeks comment on ESOA's statement and ask

what these "carefully crafted operating requirements" might be.

22. CORF also expresses concern that "mobile devices with limited size and cost will not be able to adequately filter their out-of-band emissions to meet the stringent requirements" of the 31.3-31.8 GHz band. Avanti responds that under agenda item 1.13 for WRC-19 (World Radiocommunication Conference), the International Telecommunication Union-Radiocommunication (ITU-R) will develop technical measures, if necessary, to protect passive services from interference from 5G mobile broadband systems. The Commission seeks detailed information concerning the capability of mobile and other consumer devices to limit out-of-band emissions into the 31.3-31.8 GHz band, and seek comment on whether guard bands or other special rules will be necessary to limit emissions into the 31.3-31.8 GHz band.

c. Band Plan

23. The Commission also seeks comment on the appropriate band plan for the 32 GHz band. The Commission proposes to license the band using channels of either 200 MHz or 400 MHz bandwidth. Given the contemplated use cases and the nature of this band, what channel size would be best? The Commission encourages commenters to discuss the specific advantages and disadvantages of various band plans.

3. 42 GHz Band (42-42.5 GHz)

24. The Commission proposes to authorize fixed and mobile service operations to operate in the 42 GHz band (42-42.5 GHz) under the Part 30 Upper Microwave Flexible Use Service rules, as long as the Commission can ensure that adjacent channel RAS services will be protected. The band potentially offers 500 megahertz for new flexible use services, has existing fixed and mobile allocations, and is being studied internationally for possible mobile use. The Commission also proposes to adopt geographic area licensing using PEAs as the geographic area. The Commission seeks comment on this proposal, as well as alternatives.

25. The Commission denies FWCC's request that the Commission establish service rules to enable fixed service at 42.-42.5 GHz, but keeps its request pending for the 42.5-43.5 GHz band. The Commission believes that flexible use licensing, which would allow a variety of services to be offered, would be more likely to place the spectrum in its highest and best use, as opposed to rules that would only allow point-to-point operation. Nevertheless, the Commission does not deny FWCC's petition with respect to the 42.5-43.5 GHz band because point-to-point operation may be more likely to co-exist with co-channel RAS. The Commission will give further consideration to the 42.5-43.5 GHz band separately.

26. The Commission seeks comment on whether it is possible to authorize fixed and mobile use in the 42 GHz band while protecting RAS observations in the adjacent 42.5-43.5 GHz band. If protection is possible, the Commission seeks comment on what protections should be established. CORF notes that frequency lines at 42.519, 42.821, 43.122, and 43.424 GHz (for observations of silicon monoxide) are among those of greatest importance to radio astronomy. CORF represents, "The detrimental levels for continuum and spectral line radio astronomy observations for single dishes are -227 dBW/m2/Hz and -210 dBW/m2/Hz, respectively, for the average across the full 1 GHz band and the peak level in any single 500 kHz channel. For observations using the entire Very Long Baseline Array (VLBA), the corresponding limit is -175 dBW/m2/Hz." Does the Commission need to establish special out-of-band emission limits into the 42.5-43.5 GHz band? Is it necessary or appropriate to establish a guard band below 42.5 GHz? The Commission asks proponents of terrestrial use in the 42 GHz band to provide detailed studies demonstrating how such use can be compatible with RAS use in the 42.4-43.5 GHz band. The Commission also asks CORF and other radio astronomy interests to provide additional information on the locations where observations are made in the 42.4-43.5 GHz band.

27. The Commission also seeks comment on the appropriate band plan for the 42 GHz

band. Should the band be licensed as a single channel, split into two channels, or split into multiple 100 megahertz channels? The Commission recognizes that if the Commission adopts a guard band to protect adjacent channel radio astronomy, the guard band will affect the band plan by making less spectrum available. Given the contemplated use cases and the nature of this band, what channel size would be best? The Commission encourages commenters to discuss the specific advantages and disadvantages of various band plans.

28. Finally, the Commission proposes to add Federal fixed and mobile allocations into this band, and additionally seek comment on establishing a framework under which Federal and non-Federal users could share the band. Given the short propagation distances, lack of incumbent licensees, and other factors, as described in the 37 GHz sharing section and the rules the Commission adopted in the Report and Order, the Commission believes it is possible for both Federal and non-Federal users to coexist on a co-primary basis, particularly using simple methods of coordination (to enable geographic sharing). The Commission therefore seeks comment on whether to extend Federal access to this band, including how to best achieve coexistence with non-Federal uses. For instance, are there additional considerations in addition to leveraging the sharing regime adopted for the co-primary coordinated sharing in the 37 GHz band? Should the Commission use more static sharing mechanisms? Would an SAS-based sharing approach facilitate Federal and non-Federal sharing of this band? Are there other tools the Commission can leverage to create a robust sharing environment that allows this spectrum to meet both Federal and non-Federal needs?

4. 47 GHz Band (47.2-50.2 GHz)

29. The Commission proposes to authorize fixed and mobile operations in the 47 GHz band (47.2-50.2 GHz) under the Part 30 Upper Microwave Flexible Use Service rules. The band potentially offers 3 GHz of spectrum and is being studied internationally for possible mobile use.

30. At the same time, the Commission recognizes that this band is authorized for FSS use. While there are no current authorized operations, this band may be paired with the 40-42 GHz downlink band. Unlike in the 28 GHz or 39 GHz bands, where FSS can use other spectrum to operate user equipment, FSS would have to use some portion of the 47 GHz band to operate user equipment. Sharing between terrestrial mobile and FSS user equipment is more complicated, particularly when the FSS user equipment is transmitting.

31. With respect to individually licensed earth stations, it appears that the Commission could adopt the sharing framework the Commission has adopted for the 28 GHz band. Specifically, in each PEA, the Commission proposes that there can be one location where FSS earth stations can be located on a co-primary basis, subject to the conditions and limitations the Commission has adopted in other bands. The Commission seeks comment on this proposal, as well as alternatives.

32. The Commission seeks comment on the best approach for sharing between FSS user equipment and terrestrial operations. One option would be to have geographic area licensing on a PEA basis, but also authorize database-driven sharing between terrestrial licensees and stationary FSS user equipment. In the NPRM, the Commission sought comment on leveraging a Spectrum Access System (SAS) or other database coordination mechanism to facilitate sharing between terrestrial operations and FSS user equipment. Under the SAS proposal, terrestrial licensees would provide the geographic coordinates and other pertinent technical information concerning their facilities to the SAS. Satellite operators would then access the information in the SAS to determine where their user equipment could transmit without causing interference to terrestrial operations. The Commission recognizes that many terrestrial operators oppose being required to provide information on their deployments to a database, but those operators have not presented a viable alternative that would allow sharing between these services.

33. Another option would be to divide the band into a segment where FSS has priority and a segment where UMFUS operations has priority.[2] In the segment where FSS had priority, FSS could operate its user equipment without any obligation to protect UMFUS operations. Conversely, in the segment where UMFUS licensees had priority, satellite user equipment could operate on a purely secondary basis and would be required to cease transmitting if it caused interference to fixed or mobile operations. Supporters of this option should propose a split for the band and explain how their proposed split best balances the needs of UMFUS and FSS licensees.

34. A third option would be to develop specific criteria for assigning priority between FSS and terrestrial operations. For example, the Commission could require both FSS and UMFUS licensees to register their operations in a database, and the Commission could assign interference protection on a first-come, first-served basis. The Commission seeks comment on a first-come, first-served approach, and the Commission also invites commenters to propose alternative criteria for assigning priority. Commenters should provide detailed information on the costs and benefits of their proposed mechanisms for assigning priorities. The Commission also seeks comment on other alternatives for sharing between UMFUS and FSS in this band.

35. The Commission also seeks comment on sharing with co-primary Federal services in the 48.2-50.2 GHz band, as well as protection of passive services in the adjacent 50.2-50.4 GHz band. Our understanding is that there are currently no authorized Federal or non-Federal operations in the 48.2-50.2 GHz band but that there may be future Federal operations in that band. Are the rules and framework the Commission adopted in the Order for sharing of the 37 GHz band applicable to the 48.2-50.2 GHz band? Could a modified first-come, first-served

[2] The Commission could maintain the current wireless services and FSS designations. When the Commission made the separate designations for the FSS and wireless services in the band, it did not place any restrictions on the use of either portion of the band by either the FSS or wireless services.

mechanism be used to establish priority in this band without precluding use of the band by co-primary Federal users? Should the Commission leverage the database-driven sharing mechanism? The Commission intends to work with NTIA and other Federal agencies to identify an appropriate framework to protect current or planned Federal interests in and ensure future access to this band on a co-primary shared basis. The Commission also seeks comment on protecting radio astronomy in the 48.94-49.04 GHz band. Are there any steps the Commission needs to take to protect radio astronomy over and above implementing the existing prohibition on aeronautical use in that segment? The Commission encourages CORF and other radio astronomy interests to provide information on locations where this band is used for radio astronomy observations. With respect to the 50.2-50.4 GHz band, the Commission notes that the international allocation for the passive services "shall not impose undue constraints on the use of adjacent bands by the primary allocated services in those bands." On the other hand, at WRC-12, the WRC recognized "that long-term protection of the EESS in the [, inter alia, 50.2-50.4 GHz band] is vital to weather prediction and disaster management." The WRC did establish emission limits for FSS stations operating in the 49.7-50.2 GHz and 50.4-50.9 GHz bands, but did not address fixed or mobile stations operating in those bands. Given that framework, what requirements would be appropriate to protect passive services in the 50.2-50.4 GHz bands?

36. The Commission also seeks comment on the appropriate band plan for the 47 GHz band. One possibility would be to divide the band into six channels of 500 MHz each. One advantage of that band plan is that the channels would align with 48.2 GHz, which is where the Federal allocation and current FSS designation begin and where FSS user equipment can begin to be deployed. On the other hand, 500 megahertz channels would not align with the band plan in other bands, where the Commission is using multiples of 200 MHz. Given the contemplated use cases and the nature of this band, what channel size would be best? The Commission

encourages commenters to discuss the specific advantages and disadvantages of various band plans.

5. 50 GHz Band (50.4-52.6 GHz)

37. The Commission proposes to authorize fixed and mobile operations in the 50 GHz band (50.4-52.6 GHz) under the Part 30 Upper Microwave Flexible Use Service rules. The band potentially offers 2 GHz of spectrum and is being studied internationally for possible mobile use. The Commission also proposes to use geographic area licensing in this band and license the band on a PEA basis. The Commission seeks comment on these proposals, as well as alternatives. The Commission also seeks comment on the non-Federal satellite allocations in the 50.4-51.4 GHz band.[3] Assuming that the 40-42 GHz (space-to-Earth) band is paired with the 48.2-50.2 GHz (Earth-to-space) band, the Commission requests comments on how this uplink band would be used by FSS operators. The Commission also requests comments on means of accommodating sharing between terrestrial and satellite operations.

38. The Commission also seeks comment on sharing with co-primary Federal services in the 50.4-52.6 GHz band, as well as protection of passive services in the adjacent 50.2-50.4 GHz and 52.6-54.25 GHz bands. The Commission's understanding is that there are currently no authorized Federal or non-Federal operations in this band but that there may be future Federal operations in that band. Are the rules and framework the Commission adopted in the Order for sharing of the 37 GHz band applicable to this band? Could a database-driven sharing approach facilitate sharing between Federal and non-Federal operations? Could a modified first-come, first-served mechanism be used to establish priority in this band without precluding use of the band by co-primary Federal users? The Commission intends to work with NTIA and other

[3] The Commission notes that the NATO Joint Frequency Agreement identifies the 39-5-40.5 GHz downlink band and the 50.4-51.4 GHz uplink band for future military FSS and MSS requirements. *See* NTIA letter, IB Docket No. 97-95, received May 7, 1997, at p. 4. *See also* NTIA's Federal Long-Range Spectrum Plan, September 2000, at p. 122 (available at https://www.ntia.doc.gov/files/ntia/publications/final-1rsp.pdf).

Federal agencies to identify an appropriate framework to protect current or planned Federal interests and to ensure future access to this band on a co-primary shared basis. With respect to the 50.2-50.4 GHz band this band is vital to weather prediction and disaster management, and the international allocation for the passive services "shall not impose undue constraints on the use of adjacent bands by the primary allocated services in those bands." Given that framework, what limits on emissions into the 50.2-50.4 GHz would be appropriate? On the other hand, there is a specific limit on fixed emissions into the 52.6-54.25 GHz band. What impact will that limit have on the suitability of this band to provide terrestrial service? What limits would be necessary on mobile service to protect the 52.6-54.25 GHz band?

39. The Commission also seeks comment on the appropriate band plan for the 50 GHz band. One option is to establish ten channels of 200 MHz each, which would be consistent with the channel plan for the 39 GHz band. Other options include four channels of 500 megahertz each or five channels of 400 MHz each, with one extra 200 MHz channel. Is there any value in establishing a guard band immediately below 52.6 GHz to protect the passive band above 52.6 GHz? Given the contemplated use cases and the nature of this band, what channel size would be best? The Commission encourages commenters to discuss the specific advantages and disadvantages of the various band plans.

6. 70/80 GHz Bands (71-76 GHz and 81-86 GHz)

40. When evaluating services or uses that could be viable if the Commission authorize their introduction into the 71-76 and 81-86 GHz bands, the Commission must consider three basic issues. First, the Commission needs to consider whether the bands offer adequate spectrum for the proposed new services or uses in bands where tens of thousands of incumbent operations are already registered. Second, the Commission needs to consider whether the new services or uses are compatible with the fundamental electromagnetic characteristics of the relevant

spectrum. And third, the Commission needs to consider whether more than one service or use can coexist in the bands. The Commission addresses each of these considerations and corollary concerns below.

41. The NPRM posited that it might not be possible to authorize mobile services or unlicensed access in the 71-76 and 81-86 GHz bands without causing interference to incumbent point-to-point links. After further review, the Commission finds that the bands are relatively lightly used both in terms of the number of registered sites (especially on a large geographic scale) and with respect to the quantity of spectrum available. As E-Band Communications notes, "The 10 GHz of spectrum available [in the 71-76 and 81-86 GHz bands] represents by far the most ever allocated by the FCC at any one time, representing 50-times the bandwidth of the entire cellular spectrum." Moreover, the great majority of existing links in the bands are concentrated in just a few localities. As of June 10, 2016, only 16 counties had an average site density of more than one transmission or reception site per square mile, and those 16 counties contain more than 73 percent of all registered transmitters and receivers in the 71-76 and 81-86 GHz bands. Given the narrow beamwidths and limited path lengths involved, it would be reasonable to treat the remaining 3,125 counties and county-equivalents as the functional equivalent of a green field, provided that adequate measures are taken to protect the few incumbents in them.

42. The Commission must also consider whether the physical characteristics of the bands are suitable for the kinds of services that might be authorized in the bands – this is particularly true for mmW bands where atmospheric and other environmental phenomena affect the utility of the band. In general, for example, atmospheric attenuation increases the higher one goes in the electromagnetic spectrum, limiting the potential length of transmission paths. However, the 71-76 and 81-86 GHz bands experience less attenuation than frequencies in the 50-60 GHz range.

43. In addition to atmospheric attenuation, spreading loss also becomes an issue in the mmW bands. As the Friis transmission law states, path loss grows with the square of the frequency, even when radio waves are traveling through a vacuum. The caveat, however, is that Friis's law applies only to transmissions from omnidirectional antennas. As a recent technical study and analysis explains, "[T]he smaller wavelength of mmW signals also enables proportionally greater antenna gain for the same physical antenna size. Consequently, the higher frequencies of mmW signals do not in themselves result in any increased free space propagation loss, provided the antenna area remains fixed and suitable directional transmissions are used." In short, the directionality of the antennas that are feasible at shorter wavelengths may result in less path loss than theorized. Based upon this preliminary analysis, the Commission believes the bands might be valuable for a variety of uses, including mobile as well as fixed uses. In determining whether new and different services can coexist in these bands, the Commission must also look at whether the new service use can be authorized in a manner that does not disrupt the incumbent use (or otherwise, the Commission could decide to disrupt the incumbent use), and whether the existing use can and should continue to expand. Specific to this analysis is whether the current and potential future fixed point-to-point uses of these bands might be compatible with other types of fixed or mobile uses.

44. When evaluating the compatibility between fixed and mobile services in the 70/80 GHz band, one important consideration is the beamwidths of their transmission paths because tighter beams are less likely to cause interference. Historically, the Commission has tried to balance the desire for smaller antennas against the spectrum efficiencies of narrow beamwidths in the 70/80 GHz band. Over the last decade, the Commission has continued to explore modifying the technical rules to allow larger beamwidths. Most recently, on October 13, 2015, WTB's Broadband Division opened a new docket (Public Notice 30 FCC Rcd 10961 (WTB

2015)) to address two waiver requests seeking a further relaxation of antenna standards in the 71-76 and 81-86 GHz bands. As the waiver requests and comments filed in that docket attest, evidence suggests that the Commission might further relax the allowed beamwidth to 2.2 degrees. That step, if taken, would bring the bands' technical standards into a realm that is at least potentially compatible with dynamic beamforming technology because a 2.2-degree beamwidth is also achievable by the kinds of MIMO base stations that will be supporting mmW mobile services. At least when operating with beamforming MIMO, these base stations would likely be able to coexist with conventional point-to-point Fixed Service links.

45. The introduction of fixed services under somewhat relaxed directionality requirements in addition to mmW mobile services pose a new coexistence consideration. It is likely that, when both fixed and mobile mmW services are operated by the same entity, they can sufficiently plan, coordinate, and time their use to facilitate coexistence. In looking at whether incumbent fixed services, new more dynamic fixed services, and potential mobile services (and equipment) in these bands may coexist, it is apparent that the use of a central coordinating database capable of calculating and enforcing protections among different types of users, like a Spectrum Access System, could facilitate this coexistence.

46. Initially, coordination of non-Federal links with Federal operations in the 71-76 GHz, 81-86 GHz, and 92-95 GHz (70/80/90) bands was accomplished under a traditional coordination process: that is, requested non-Federal links were recorded in the Commission's Universal Licensing System (ULS) database and coordinated with the NTIA through the Interdepartment Radio Advisory Committee (IRAC) Frequency Assignment Subcommittee. However, beginning on February 8, 2005, this interim link registration process was replaced by a permanent process in which third-party database managers are responsible for recording each proposed non-Federal link in the third-party database link system and coordinating with NTIA's automated "green

light/yellow light" mechanism to determine the potential for harmful interference with Federal operations. A "green light" response indicates that the link is coordinated with the Federal Government; a "yellow light" response indicates a potential for interference to Federal Government or certain other operations. In the case of a "yellow light," the licensee must file an application for the requested link with the Commission, which in turn will submit the application to IRAC for individual coordination. This automated process is designed to streamline the administrative process for non-Federal users in the bands. The Commission noted that the classified nature of some Federal operations precludes the use of a public database containing both Federal and non-Federal links.

47. This system has been effectively used for over a decade to facilitate coexistence between commercial systems and Federal systems: the technical data needed to avoid interfering with incumbent non-Federal licensees is already available in existing registration databases, and an automated system to prevent interference with Federal systems is already in place and has been in operation for years.

48. Recently, the Commission has developed other means of facilitating spectrum sharing. In May 2016, seven parties filed applications to be certified SAS Administrators for the Citizens Broadband Radio Service. The SAS is a critical tool to enable spectrum sharing in the band. SAS will protect incumbent users based on technical criteria, authorize all devices in the band, protect a Priority Access Tier, and coordinate a General Authorized Access (GAA) Tier. By leveraging the SAS computational power, protections can be tailored to the characteristics of the systems that require protection, different uses with different characteristics can be coordinated in a similar area, and spectrum efficiency can be maximized. Based on the experience with the coordination system for the 70/80 GHz band, and the existing rules for the SAS, the Commission proposes to establish a SAS-based regulatory framework adapted to the

constraints and the opportunities of the 71-76 and 81-86 GHz bands. In particular, the Commission invites comments on the following questions and proposals:

- The Commission proposes to establish three tiers of users for the 71-76 and 81-86 GHz band, consisting of: (1) Incumbent Access users, which would receive the highest level of protection; (2) Priority Access Licensees (PALs); and (3) GAA users. Each tier would be required to prevent interference to, and accept interference from, higher tier users.
- The Commission seeks comment on whether the rules for these bands should be included in Part 30 (Upper Microwave Flexible Use Service) or Part 96 (Citizens Broadband Radio Service).
- Incumbent Access: The Commission proposes to continue to protect existing Federal locations and seek comment on the ability to add future sites on the same protected basis. The Commission seeks comment on whether existing 70/80 GHz licensees and registered links should also qualify for incumbent protection. Alternatively, the Commission seeks comment on whether they should be grandfathered for some period of time, then required to transition to the new service the Commission proposes here (most notably, deploy equipment consistent with the technical rules and capable of communicating to an SAS). To the extent grandfathered links are protected, the Commission proposes to require the links to be operational and in service, and seek comment on requiring incumbent licensees to certify their construction and operational status with the Commission. The Commission also seeks comment on the appropriate means for protecting Federal incumbents, including whether the Commission should modify the existing system or utilize a more automated system (like a sensor-based system). Finally, the Commission seeks comment on the extent to which Federal users could expand their service area and gain protected status under the incumbent tier.
- Priority Access: As in the Citizens Broadband Radio Service, the Commission proposes

to create a Priority Access Tier in which the Commission would make PALs available for geographic license areas. The Commission proposes to authorize PALs within census tracts, with one-year, non-renewable license terms. The Commission believes that this approach will provide licensees with the certainty required to promote investment while maximizing efficient use of the spectrum and incentivizing a variety of innovative deployment models. The Commission seeks comment on this proposal.

- General Authorized Access: The Commission proposes to create a GAA tier, and seek comment on whether the tier should be licensed by rule or subject to a "licensed light" regime similar to the existing structure for the 70/80 GHz band (non-exclusive nationwide licenses with individual sites authorized). The Commission seeks comment on whether the GAA tier should have access to a set channels, (i.e., there would be some first-in-time right that would provide some level of certainty) or if the Commission should require (or allow) the SAS to dynamically maximize the number of GAA sites in a given area. Finally, the Commission seeks comment on whether the Commission should defer authorizing GAA users until the conclusion of initial Priority Access license terms.
- Protection Methodology: The Commission invites comment on the appropriate technical methodologies for protecting licensees that are entitled to protection, including but not limited to the following alternatives:
    a. Require SAS to calculate expected aggregate interference at each incumbent or Priority Access receiver, based on their positions and the technical parameters of their equipment, together with the corresponding parameters of intruding transmitters.
    b. Establish a maximum aggregate received signal level within Priority Access license areas, which would be measured in terms of power flux density (PFD) per megahertz of bandwidth at specified heights above the ground.

c. Implement an alternate protection scheme whereby the SAS would protect operator-defined contours around Priority Access base stations to a protection level at a specified dBm per megahertz of bandwidth anywhere within the contour.

- Technical Rules: The Commission proposes to establish two classes of licenses for point-to-point operations in these bands that will be subject to the technical requirements described below.

a. Class A licenses would be authorized only for operations at a minimum specified height above ground level, would be authorized to use comparatively high power levels, and would be required to use tight-beamwidth antennas. Class B point-to-point licenses would be authorized transmit at streetlamp level, with somewhat relaxed beamwidth requirements in order to accommodate smaller antennas. The Commission invites comment on the appropriate height limits, power levels, and beamwidth constraints that would be appropriate for these purposes.

b. The Commission proposes to authorize dynamic beamforming antennas to provide in-band backhaul so long as they conform to the same beamwidth requirements, height limitations, and other requirements that apply to conventional antennas used for point-to-point links.

c. The Commission proposes to authorize the same dynamic beamforming antennas to serve mobile user equipment, with further relaxation of beamwidth requirements, provided that they are situated no higher than streetlamp level and provided further that their antennas are inclined downward at a minimum specified angle when they are communicating with mobile user equipment. The Commission invites comment on appropriate beamwidths, inclination angles, power levels, and height constraints for these purposes.

d. The Commission proposes to require that Class A license equipment be professionally installed but that non-professionals be allowed to install Class B license equipment and mobile base station equipment, provided that the installer is equipped with the necessary geo-location

equipment or that the equipment itself is capable of ascertaining its location and its orientation.

e. The Commission invites comment on technical requirements that would be appropriate for different kinds of user equipment in these bands, differentiating between point-to-point, handheld mobile equipment, and mobile equipment that will typically be situated more than 20 centimeters away from people. The Commission proposes to require that user equipment be allowed to transmit only when it is locked onto a serving base station, with the possible exception of brief pilot or sounding signals.

f. The Commission proposes to require SAS to maintain and verify information from registered base stations and Fixed Service transmitters and receiver equipment under their coordination, and the Commission invites comment on the minimum geographic positioning accuracy that the Commission should require, including accuracy with respect to altitude as well as latitude and longitude. The Commission also seeks comment on requiring licenses to update registration information if the location or operational status of registered base station equipment changes. The Commission does not propose to require SAS to maintain position awareness of mobile user equipment.

g. The Commission proposes to establish out of band emissions (OOBE) limits for all equipment authorized to operate in these bands, and the Commission invites comments on the appropriate technical parameters to apply for that purpose.

- Indoor Use: The Commission invites comments on the feasibility of authorizing unlicensed, indoor-only operations, subject to Part 15 of our rules. The Commission has decided not to adopt the NPRM's proposal to authorize unlicensed indoor-only operations in the 37 GHz band, but the Commission believes that the comparative amount of signal leakage through windows could be much lower in the 71-76 GHz and 81-86 GHz bands, and consequently would be less likely to interfere with outdoor operations. The Commission seeks further information on

that issue, especially from commenters that have performed relevant tests or have access to the results of such tests. The Commission notes that Part 15 already provides technical rules for indoor-only operation in the 92-95 GHz band that are similar to the rules in the existing 57-64 GHz band, but require that these devices be AC-powered in order to ensure that they only operate indoors. If the Commission allows unlicensed operation at 71-76 GHz/81-86 GHz, should similar technical rules apply? What additional restrictions should be added to ensure that this type of equipment will not interfere with authorized services that are currently operating in these bands? Alternatively, would registered indoor GAA use be a better mechanism for facilitating indoor use of these bands? The Commission seeks comment on this and any other relevant issue regarding unlicensed and indoor operations within this spectrum.

- The Commission proposes to extend the same requirements and privileges to all parts of the United States, but the Commission also invites comment on the alternative of establishing a separate regulatory framework for the 16 counties that are heavily registered with incumbent users.

- The Commission proposes to require SAS to be capable of performing the following operations:

a. Determine the available frequencies at a given geographic location and assign them to PAL and/or GAA licensees;

b. Determine the maximum permissible transmission power level for incumbent, PAL, and GAA licensees at a given location and communicate that information;

c. Register and authenticate the identification information and location of incumbent, PAL and GAA licensees;

d. Enforce Exclusion and Protection Zones, including any future changes to such Zones, to ensure compatibility between non-Federal users of spectrum in the 71-76 GHz and 81-86 GHz

bands and incumbent Federal operations;

e. Ensure that PAL and GAA licensees protect non-Federal incumbent users consistent with the rules;

f. Protect Priority Access Licensees from impermissible interference from other users;

g. Facilitate coordination between GAA users to promote a stable spectral environment;

h. Ensure secure and reliable transmission of information between the SAS, ESC, and PAL and GAA licensees;

i. Provide any ESC that the Commission might approve with any sensing information reported by PAL and GAA licensees if available;

j. Facilitate coordination and information exchange with other SASs and exchange information, as needed, with NTIA.

49. The Commission also seeks comment on alternative methods of authorizing additional access to these bands, including exclusive use licensing and unlicensed. As discussed, authorizing new flexible use operations in these bands is difficult given the incumbent fixed commercial and Federal operations. How would an exclusive use licensing or unlicensed access models work? How would incumbents be protected and be permitted to expand? Could the Commission auction overlay licenses that allow the auction winner to negotiate with the incumbents in the area for their rights? How could unlicensed operations sufficiently protect incumbents? Have circumstances changed since the Commission declined to allow unlicensed operations in these bands in 2003? The Commission seeks comment on these and other issues implicated in any alternative licensing or authorization scheme.

8. Bands Above 95 GHz

50. In the NPRM, the Commission noted that several parties expressed support for making additional spectrum available in the upper reaches of the spectrum, particularly above 95

GHz. The Commission invited parties to submit proposals for use of this spectrum, including proposals for authorizing use under our Part 15 rules for unlicensed devices. Commenters generally did not respond to this request, but the Commission recognizes that the NPRM explored many spectrum issues and commenters may have chosen to focus on the specific proposals for the frequency bands below 95 GHz. Moreover, the Commission is aware that operations above 95 GHz involve nascent technology that is being developed by small companies that may not be accustomed to participating in FCC proceedings. Nevertheless, the Commission is committed to developing a record that will provide a basis for proposing rules that will encourage the introduction of new services and devices above 95 GHz.

75. The spectrum from 95 to 275 GHz has been allocated for a variety of different types of Federal and non-Federal radio services. In addition, the international Table of Frequency Allocations has been extended from 275 to 1,000 GHz for specific services and, in a separate proceeding, the Commission is considering how to amend the United States table. The bands above 95 GHz have already been identified for services that typically involve the reception of extremely weak signals, such as radio astronomy, space research, and Earth Exploration Satellite. All of the bands, with some minor exceptions, are allocated on a co-primary basis for Federal and non-Federal use.

51. The Commission recognizes that signals in the frequency bands above 95 GHz will attenuate rapidly, intuitively tending to minimize the risk of harmful interference to other radio services. However, this does not by itself provide a basis for proposing to allow use of any spectrum above 95 GHz. The Commission believes the process of facilitating technology above 95 GHz can best be advanced by identifying specific frequency bands rather than attempting to address all parts of the spectrum above 95 GHz. Accordingly, the Commission takes this opportunity to solicit information on the specific parts of the spectrum that would be most

attractive from the standpoint of technology development while successfully coexisting with the types of radio communications services that operate under the existing allocations.

52. In identifying specific frequency bands, the Commission asks commenters to provide specific analyses to justify any claims that there are no risks of harmful interference to other radio services. Which bands should be made available for licensed or unlicensed use? Is there sufficient information to identify where and on what frequencies both existing and planned radio astronomy, space research, Earth Exploration Satellite, and similar users will actually operate? What technical rules may be appropriate? For parties supporting unlicensed use, will it be necessary to control the locations of operation to prevent harmful interference to radio astronomy, space research, Earth Exploration Satellite, or other services? If so, how could the areas of permissible operations be controlled under the unlicensed rules? For bands that commenters believe should be made available on a licensed basis, should the new Part 30 rules or other service rules apply? How would the Commission create a licensing scheme for signals that generally propagate over very short distances? Should the Commission permit both mobile and fixed service? What technical rules should apply? The Commission encourages parties to file comments addressing these matters.

B. Federal Sharing Issues – 37 GHz band (37-38.6 GHz)

53. As the Commission indicated in the Report and Order, FCC staff will – in coordination with NTIA, Department of Defense (DoD), and other Federal and non-Federal stakeholders – further define the sharing framework by more fully developing the coordination mechanisms the Commission adopt for the lower band segment. The Commission also seeks comment on adopting methods for shared (Federal and non-Federal) access of the upper band segment, including through a use or share requirement, and how to facilitate coordination for potential future Federal access across the licensed portions. Thus the Commission seeks

comment on the issues described below.

1. Coordination Mechanism for the Lower Band Segment

54. As explained in the Report and Order, the lower band segment is available for coordinated coequal sharing between Federal fixed and mobile users and non-Federal fixed and mobile users. Non-Federal fixed and mobile users, which the Commission will identify as Shared Access Licensees (SALs), will be authorized by rule. Federal and non-Federal fixed and mobile users will access the band by registering individual sites through a coordination mechanism. The Report and Order explained that FCC staff will work with stakeholders, both Federal and non-Federal, to help develop the details of the coordination process. Here, the Commission seeks comment on the coordination mechanism – that is, the regulatory, technical, or procedural tool necessary to actually facilitate coordinated access. Our expectation is that some of the issues raised here may be further developed through the collaborative process between the FCC, NTIA, DOD, and other Federal users set out in the Report and Order, as well as through comments in response to this FNPRM.

55. The Commission believes that a robust coordination mechanism is essential to ensuring that both Federal and non-Federal fixed and mobile users have effective coordinated access to the lower band segment. The coordination mechanism will authorize a particular user to use a particular bandwidth of spectrum at a particular location. To do so efficiently and effectively, it must be able to obtain information about the type of equipment used, the signal contour from the coordinated location, and the bandwidth requested compared with the bandwidth available. As discussed below, it must also be capable of regularly updating the status of a coordinated location (on/off or authorized/unauthorized). Moreover, it will have to incorporate this type of information for both Federal and non-Federal fixed and mobile uses. Here, the sharing environment is relatively straight forward – there are limited incumbent uses

that need to be protected, and Federal and non-Federal fixed and mobile users will have coequal rights to the band. The Commission also believes that the propagation characteristics of this band might help minimize the complexity of the coordination mechanism.

56. The Commission notes that historically the Commission has used manual frequency coordination managed by third party frequency coordinators. Recently however, the Commission finalized the rules for the 3.5 GHz Citizens Broadband Radio Service, which relies not on a static frequency coordination mechanism, but on a dynamic mechanism known as a SAS that coordinates uses among different tiers of users, rather than on an individual basis. The Commission seeks comment on the most appropriate mechanism for the lower band segment. Should the Commission rely on static, manual frequency coordination, a dynamic SAS-type mechanism, or something in between? For instance, would the advanced capabilities of automated coordination from SAS present advantages over other types of coordination? Is a full SAS implementation, consistent with the Part 96 requirements, appropriate here?

57. The Commission also seeks comment on the protection or operation contours necessary for the coordination mechanism to reserve a quantity of spectrum at a location for a user. In the Report and Order, the Commission established technical rules for operation in the lower band segment, which are consistent with the rules adopted for the 28 GHz band, the 39 GHz band, and the upper band segment of the 37 GHz band. Based on this technical information, should the Commission establish a maximum protection contour for coordinated sites? Alternatively, should the Commission allow the coordinated party to request less or more protection?

58. Although non-Federal fixed and mobile users must follow the coordination requirements that the Commission adopted in the Report and Order to protect the Federal sites listed in Section 30.205 of our rules, the Commission seeks comment on how to ensure

coexistence between Federal and non-Federal fixed and mobile users. Ideally, Federal fixed and mobile uses would comply with the same or similar technical requirements as non-Federal fixed and mobile uses. For instance, NTIA might establish in its Manual of Regulations and Procedures for Federal Radio Frequency Management a set of technical rules for operations in this band, there could be a notation in the U.S. Table of Frequency Allocations, or the Commission could rely on some other means. The Commission seeks comment on these and other mechanisms. Absent consistent (or known) technical rules governing Federal operations, how should the coordination mechanism account for their protection or operational area of these operations?

59. Finally, the Commission seeks comment on how best to coordinate Federal access. Is it feasible for Federal users to rely on the same coordination mechanism as non-Federal? How should the coordination mechanism address information security issues particular to Federal users? The Commission seeks comment on the means of achieving information security, including ways for the information to be masked, e.g., by having Federal users coordinate through a Federal intermediary that interfaces with the non-Federal coordination mechanism, such as the existing mechanism in the 70/80/90 GHz band.

2. Channelization of the Lower Band Segment

60. As discussed in the Report and Order, the lower band segment consists of 600 MHz of spectrum from 37-37.6 GHz. Although the Commission adopted a channelization plan for the upper band segment, the Commission did not do so for the lower band segment. Thus, the Commission proposes to guarantee users in the lower band segment a minimum channel size. Specifically, the Commission proposes to establish a 100 MHz minimum channel size. The Commission also proposes, however, to allow users to aggregate 100 MHz channels into larger channel sizes, up to the maximum of 600 MHz where available (subject to use requirements as

described below).

61. The Commission also finds that our proposal to adopt a minimum channel size of 100 MHz strikes the right balance between providing enough spectrum for a diversity of wireless uses with helping to minimize the complexity of the coordination mechanism. The Commission notes that while most commenters in this proceeding generally favor channel sizes of 200 MHz or greater, other commenters suggest that smaller channel sizes can still facilitate robust wireless broadband services. By permitting users to aggregate up to 600 MHz channels, the Commission found that it has enabled maximum flexibility for a variety of use cases involving a variety of channel sizes. The Commission seeks comment on these proposals. The Commission also seeks comment on alternative approaches, including whether the Commission should adopt 100 MHz or a larger minimum channel size. In addition, the Commission seeks comment on whether the Commission should refrain from setting a minimum channel size and instead require the coordination mechanism to attempt to maximize the number of users in a given area.

3. Authorization Expiration/Construction Requirement for the Lower Band Segment.

62. To achieve a robust and efficient sharing environment and prevent spectrum warehousing, the Commission proposes that registered non-Federal sites must be put into service within seven days of coordination and that registered and coordinated sites must reassert their registration every seven days. For example, if the Commission relies on a database for coordination, a user could query the database for available frequencies at a location, and reserve those frequencies for seven days. Within seven days, it would need to activate a device that is capable of notifying the database that it is active on the channel. That device would then check in with the database (or receive and respond to a message from the database) at least once every seven days. If the device fails to check in within the seven day period, its authorization would lapse. The Commission seeks comment on this proposal. Are these time frames appropriate?

Are there other tools to ensure the spectrum is put to use consistent with the public interest?

4. Priority Access for Federal Users of the Lower Band Segment.

63. The Commission recognizes that Federal users' needs are not necessarily commensurate with non-Federal users' needs. The use cases will likely differ, the level of certainty and protection or a use related to a critical defense or national security mission may vary. The Commission therefore seeks comment on whether the Commission should make a portion of the lower band segment available for priority access by Federal users. For instance, should the Commission allow Federal users to claim priority access to up to 200 MHz of the 600 MHz lower band segment? Could the coordination mechanism statically reserve this space or dynamically make it available when requested? For instance, if the entire band is in use, could the database reconfigure the channels or clear the necessary channel size?

5. Interference Mitigation in the Lower Band Segment.

64. The Commission seeks comment on any necessary enforcement mechanism in the lower band segment to help identify and rectify interference events. Because the Commission proposes to require users in the lower band segment to coordinate on a site-basis, it may be easier to identify and rectify any interference issues that may arise. The Commission recognizes, however, that there may be users and uses, both Federal and non-Federal, for which any interference may be significantly problematic. Therefore, the Commission seeks comment on any additional interference mitigation and enforcement mechanisms that might be necessary.

6. Secondary Market Policies for the Lower Band Segment.

65. Finally, the Commission seeks comment on whether and how to apply secondary market rules to the lower band segment. As proposed, the band will be made available on a site-by-site basis. Partitioning and disaggregation generally do not apply in site-based licensing circumstances. Should they apply here, and if so, how? Should the Commission apply our

leasing rules? What are the benefits to secondary market rules for the lower band segment relative to other ways to gain access to the spectrum?

7. Use It or Share It and Federal Sharing in the Upper Band Segment.

66. As described in the Report and Order, the upper band segment, 37.6-38.6 GHz, is divided into five channels each 200 megahertz wide. The upper band segment will be available on a geographic basis (with protected Federal sites) via auction. The technical and service rules the Commission adopted allow continuity between the upper band segment and the 39 GHz band, which provides 2400 MHz of contiguous spectrum under the same licensing and technical rules. Given the types of uses that may be deployed in the 37 GHz band and the flexible build out requirements that the Commission adopted in the Report and Order, there may be significant unused spectrum in in the upper band segment at any given time. To improve the spectrum efficiency and provide an opportunity for Shared Access Licensees and Federal users to expand in a manner that does not impact geographically licensed uses, the Commission proposes to permit shared access of the unused portions of the five channels in the upper band segment, under certain conditions. The Commission also seeks comment on establishing a process by which Federal users could coordinate with licensees for future expanded access in the upper band segment.

67. The Commission notes that it has found spectrum sharing to be an effective tool to maximize spectrum efficiency. In the 700 MHz band, the Commission adopted a performance requirement that results in the licensee losing its unconstructed license area. In the Citizens Broadband Radio Service, Priority Access License areas that are not in use must be made available for General Authorized Access use. Moreover, in the Report and Order, to meet the applicable performance requirements, licensees in the 28 GHz and 39 GHz band may choose to share access to their licensed spectrum. Furthermore, the Commission believes that the prospect

of future shared access (on a coordinated and non-interference basis) to the remainder of the band may create incentives for investment and innovation in the shared channel.

68. The Commission understands that upper band segment licensees may make reasonable business decisions to not serve particular parts of a licensed area, and that these decisions may change over time. In an environment where these unserved areas are shared, it is important to be able to both accurately identify the areas in use and enable the geographic area licensees to expand or contract their coverage as necessary. Under our proposal, the upper band segment licensee would retain the primary right to construct and provide service anywhere within its license area at any time, and any operations undertaken on a shared basis would be subject to displacement by the primary licensee. The Commission therefore proposes to require licensees to provide information about the extent of their operations at some future point in order to enable shared access.

69. The Commission also seeks comment on when the Commission should phase in shared access. Would it be appropriate to phase in shared access at the end of the initial license term, or would it be appropriate to adopt a sharing requirement at an earlier time (e.g., 5 years from the date the upper band segment geographic area license is granted). The Commission seeks comment on the scope of the information that the incumbent licensee must provide to the coordinating mechanism. Would a map with simple protection contours be sufficient, or would additional information be necessary? The Commission also seeks comment on the appropriate mechanism for dealing with multiple requests to share the same spectrum in the same location. Should the Commission adopt a first-come, first-served approach, require multiple parties to share unused spectrum amongst themselves, or adopt some other mechanism? In the Report and Order, the Commission established coordination zones around three Space Research Service (SRS) sites and 14 military sites that apply across the entire 37 GHz band, including the upper

band segment. As the Commission envision non-Federal users being able to coordinate for access on within the 14 military sites, the Commission seeks comment on additional circumstances and methods under which the upper band segment can be made for expanded future Federal use, in addition to the shared access scheme. For example, should the Commission establish a required coordination process under which Federal users could formally request coordinated access from a licensee? If the Commission establishes such a process, how does the Commission properly balance the respective rights and interests of Federal users and non-Federal licensees? How would the Commission ensure co-existence between deployed commercial systems (or planned systems) and the Federal system that is seeking coordinated access? Should the Commission impose an obligation on UMFUS licensees to consider in good faith such coordination requests from Federal users? What standards should the Commission establish for consideration of such coordination requests? Are there alternative ways of ensuring that Federal users can take advantage of their co-primary fixed and mobile allocations while protecting the rights of non-Federal licensees? Are there lessons and recommendations that the Commission can incorporate form the ongoing work within the Commerce Spectrum Management Advisory Committee? The Commission seeks comment on all issues relating to Federal access to the upper band segment.

C. Performance Requirements

1. Additional Metrics

70. In the Report and Order, the Commission adopted a list of performance metrics for measuring sufficient use of a license to qualify for renewal. The Commission acknowledged that this list is not exhaustive, and in particular, does not contain metrics designed to accommodate new and innovative services that may develop in the millimeter wave bands. The Commission therefore seeks comment on additional performance metrics that will better accommodate these

new services while fulfilling our statutory obligation to encourage productive use of spectrum and avoid warehousing and speculation.

71. In particular, the Commission seeks comment on an appropriate metric to evaluate the deployment and performance of an Internet of Things (IoT) type service, which is designed primarily to facilitate machine-to-machine communication. Such services may or may not be deployed in areas of substantial residential population, and may or may not be designed to serve unaffiliated customers. Examples of this type of service would include the Supervisory Control and Data Acquisition (SCADA) systems described by Southern Co. Because of the unique characteristics of these machine-to-machine services, the Commission proposes to develop a distinct metric by which to measure the deployment of such services, rather than attempting to modify a population coverage approach for this purpose. The Commission seeks comment on this proposal, including specific suggestions for what aspects of such services should be measured, how they should be measured, and what specific levels would constitute an acceptable level of service.

72. In the Order, several commenters suggested that the Commission measure performance for all services in the millimeter wave bands on the basis of actual use of the service, including number of devices connected, volume of data transmitted, or number of sessions initiated on the network. The Commission seeks further comment on these metrics, including specific numbers for the levels of devices, sessions, and data volume that commenters believe would be appropriate milestones. Would one of these metrics be the most appropriate way to measure deployment of an Internet of Things or machine-to-machine type service? The Commission also seeks comment on whether and how it would be practical to implement this type of usage-based requirement. How could the Commission verify information provided by licensees? Should all kinds of devices, sessions, and/or data be counted equally? How should

such a requirement be structured to ensure that it both measures and encourages meaningful service, rather than gamesmanship?

73. As some commenters note in this proceeding, licensees in these bands may seek to provide service to areas with high daytime or transient populations but low or no residential populations, such as corporate campuses, interstate highways, or event venues. The Commission seeks comment on how to define such locations for the purposes of evaluating service coverage. The Commission also seeks comment on the appropriate framework for incorporating coverage of such locations into an overall performance metric. Would a venue per population metric be appropriate, similar to the current treatment for fixed links? Should the applicable milestone be based on the daytime or transient population served by such venues or traffic corridors? How should such population be measured?

74. The Commission also seeks comment on any other types of service being contemplated by potential providers, as well as metrics that would be appropriate to measure performance or build-out of those services.

75. Finally, in the Report and Order the Commission explained that licensees may demonstrate combinations of fixed and mobile deployments in order to meet their performance requirement, and that the Commission intended to review the showings on a case-by-case basis. Here, the Commission seeks comment on whether to establish clear benchmarks or even guidance for the amount of buildout that might be adequate in these combined showings. For instance, should the Commission establish a scale with levels showing acceptable combinations of mobile and fixed deployment, where either mobile or fixed is increased relative to the other? Or should the Commission establish variations depending on the population density of a given license area, the land mass of the area, or some other factor? The Commission seeks comment on any other means to provide flexibility and clarity in how the Commission may measure

combined showings, or whether the Commission should continue to review the showings on a case-by-case basis as contemplated in the Report and Order.

2. Sharing Mechanisms

76. Given the relatively limited record on the substantive issues regarding mechanisms for sharing unused portions of UMFUS licenses, the Commission seeks further comment on the possibility of implementing a use-or-share regime in the UMFUS bands. The Commission continues to believe that a use-or-share regime may have the potential to enhance the efficiency and productivity of spectrum, if properly implemented. In particular, given the propagation characteristics, and high potential for re-use, of the mmW spectrum, the Commission seeks comment on whether such a regime could maximize the efficient use of these spectrum bands. The Commission further seeks comment on the costs and benefits of adopting mechanisms for sharing unused UMFUS spectrum, as well as on the incentives that particular sharing regimes will create. In addition, the Commission seeks comment on the appropriateness of requiring UMFUS licensees to share unused portions of their license in addition to, or in lieu of, meeting specific construction requirements, particularly in geographically licensed bands such as 28 GHz and 39 GHz.

77. In crafting an effective mechanism to share unused spectrum, there are two governing considerations: first, ensuring the licensee has exclusive use of the areas in which it is using the spectrum; and second, creating an efficient mechanism that both makes unused spectrum available and protects the licensee from interference. There are a variety of potential options for enhanced sharing mechanisms that address these considerations. The Commission seeks comment generally on the following opportunistic sharing mechanisms: a fully dynamic sharing solution, facilitated by a SAS or other third-party database; a modified shared access system that would be less dynamic but simpler; an unlicensed shared access approach, similar to white

spaces, and other alternatives.

78. The Commission seeks comment on variations of a use it or share it mechanism. A potential drawback of a keep what you use mechanism is that the Commission must reclaim, and later re-auction, the unused portions of the band, which takes time and minimizes a licensee's ability to decide later to deploy in an area (which is also a feature of the approach because it incentivizes maximum initial deployment). Use or share mechanisms permit a licensee to retain control of its license area, but require the licensee to share with other entrants in portions of the license area in which it is not operating. A use or share mechanism may be less administratively burdensome than keep what you use, and may also allow a greater number of users to access the shared spectrum. There are a number of possible variations of use or share, all of which share characteristics of basic frequency coordination.

79. One option would be to automate shared access to enable dynamic opportunistic sharing. In a dynamic sharing solution, licensees would have some initial period of time to build out their networks. After this period, information about the extent of licensees' deployment would be made available, and other entities would be free to deploy outside of the area used by the licensee's operations on a coordinated basis, subject to further expansion by the licensee. The Commission seeks comment on whether an automated dynamic use or share mechanism would be appropriate in the mmW bands. Generally, these shared users would need to operate similar technologies subject to the same technical rules as the licensee to maximize spectrum efficiency and economies of scale with respect to equipment. The Commission seeks comment on whether the propagation characteristics of these bands might facilitate shared access with slightly different technical rules. With respect to the sharing mechanism, what types of information, and what level of detail, would be required to facilitate dynamic sharing? Should opportunistic users be authorized on a license-by-rule basis, or by some other method? Should

opportunistic users be afforded some level of interference protection from each other, and if so what should that level be?

80. Another option is to rely on more traditional frequency coordination, typically used in point-to-point microwave, shared millimeter wave bands, and other services today. Under a simple frequency coordination process, the licensee's operations would be protected around a contour, and new sites would be individually coordinated into the license area. While a database could further automate this process, it may not be necessary given the relatively simple sharing regime. The Commission seeks comment on whether a sharing mechanism based on traditional frequency coordination would be appropriate for the mmW bands.

81. Yet another option is to established pre-defined geographic areas that will be available for shared access, depending on a licensee's construction. For instance, if a licensee meets its performance requirement, the Commission could find that any county (or other unit of geographic area) in which it has any operation is unavailable for sharing. For example, a licensee of a PEA might deploy heavily in some counties but not others; the heavily-deployed counties would then be deemed "in use," while the counties with no deployment would be available for opportunistic use in undeployed areas. The Commission seeks comment on the appropriateness of this mechanism as a whole, and on the specific details. What level of subdivision would best accommodate both licensee certainty and sharing opportunity? Should the Commission stop at the county level, or should the Commission further subdivide into census tracts or census blocks? What level of deployment in each subdivision should qualify that area for "used" status? How should the Commission enable sharing – through a database, individual coordination, or some other method?

82. Finally, the Commission also seeks comment on implementing unlicensed shared access, similar to TV white spaces, in the unused portions of the UMFUS bands. In this case,

opportunistic users would operate on an unlicensed basis at lower power in any area where the licensee was not actually deployed. The Commission seeks comment on whether and how to implement such a system in the millimeter wave bands. Would this system require a third-party database, similar to the dynamic sharing solution? How should the Commission draw the contours around licensee deployments? Should the Commission use a fixed radius, or an interference contour at a certain level, or some other metric? Would this method be preferable to a dynamic sharing solution where the opportunistic users and the licensee followed the same technical rules? Are there technical benefits to this approach? Will there be sufficient scale to drive more special-purpose equipment development?

83. To the extent that the Commission implements any variation of a use it or share it mechanism in the mmW bands, certain key aspects of that mechanism must be defined. Most importantly, the Commission seeks comment on how to define a licensee's "use" of its licensed spectrum. Should "use" be defined geographically, either by the service area of a network or by a defined radius or contour around deployed equipment? In the Citizens Broadband Radio Service, the Commission recently adopted an engineering metric to determine the extent to which Priority Access Licenses are in use. Licensees can define the area of use subject to an objective maximum. Should the Commission follow this model? Should "use" be defined differently for different types of deployments, for example mobile vs. fixed links? Additionally, the Commission seeks comment on how best to allow the licensee room to expand beyond its area of actual deployment (or its "used" spectrum, however ultimately defined). For example, should the Commission define a contour for an additional protected area? If so, on what basis and how often should the Commission do so? Should the Commission set some level at which a subdivision of a license area would be declared "used" in its entirety, and off-limits to opportunistic use? If so, what subdivisions and what level of deployment would be appropriate

(e.g., 40% of the geographic area of a census tract)? Finally, the Commission seeks comment on the appropriate level of protection for licensees at the boundaries between "used" and "unused" areas. Should the level of cross-border interference protection be the same as that between two licensees, or would some other limit, either higher or lower, be more appropriate?

84. In addition to the inquiries above, the Commission seeks comment on any other mechanisms of opportunistic sharing that could enhance spectrum efficiency in the UMFUS bands, as well as any other aspects of such a system that would be required to ensure it could be reliably and effectively implemented. The Commission especially seeks comment from any entity interested in using spectrum on an opportunistic basis in these bands. What technologies or business cases would lend themselves to this type of spectrum access? Which sharing mechanism, described above or otherwise, would best accommodate that use?

D. Mobile Spectrum Holdings Policies

85. In the Order, the Commission adopted an ex ante spectrum aggregation limit of 1250 megahertz that will apply to licensees acquiring spectrum in the 28 GHz, 37 GHz, and 39 GHz bands through competitive bidding.[4] By helping to ensure that multiple providers have access to the spectrum the Commission made available in the Report and Order, the spectrum aggregation policies the Commission adopted support our overarching goals of facilitating competition, innovation, and the efficient use of the spectrum. The Commission seeks comment below on additional mobile spectrum holdings issues related to how to implement the spectrum aggregation limit; the appropriate holding period; and whether a spectrum aggregation limit would be appropriate as additional "frontier" spectrum bands become available.

1. Implementation of a Spectrum Aggregation Limit at Auction

[4] The Commission adopted a spectrum threshold of 1250 MHz in the Order for proposed secondary market transactions, and noted that while this 1250 MHz threshold would help identify those markets that provide particular reason for further competitive analysis, the Commission's consideration of potential competitive harms would not be limited solely to those markets.

86. Of the 986 designated license areas in the 28 GHz band, 412 areas have active licenses, which cover about 75 percent of the U.S. population, while the 37 GHz band is not yet licensed, and in the 39 GHz band, current licensed areas cover about 49 percent of the U.S. population. Further, in terms of geographic licensed areas, the 28 GHz band will be licensed on a county basis across the U.S., while the 37 GHz and 39 GHz bands will be licensed by PEA.

87. For purposes of assessing eligibility to bid across the three spectrum bands any given entity cannot hold more than 1250 MHz of this spectrum in total. Taking into account existing incumbents' holdings in the 28 GHz band and the 39 GHz band, as well as different geographical license areas, the Commission put forward and seeks comment on two alternative methodologies for assessing bidding eligibility. The Commission asks for comment on which methodology is more appropriate, and why. The Commission also asks that interested parties comment on the likely costs and benefits associated with each methodology. Are there additional methodologies beyond the two alternatives set out below that would be more appropriate to adopt? If so, the Commission invites interested parties to present their alternatives. Which methodological approach should the Commission use and how best would the Commission implement it?

88. The first methodology that the Commission invites comment on is the "maximum county-to-PEA" option. Under this option, if any incumbent licensee in the 28 GHz band, for example, holds such spectrum, its spectrum holdings at the county level would be counted at the PEA level when determining eligibility to bid on 37 GHz and 39 GHz spectrum. For instance, if an incumbent licensee currently holds two licenses, or 850 MHz of spectrum, in the 28 GHz band in any county within a PEA, then that licensee's 28 GHz spectrum holdings would be counted as 850 MHz for the PEA as a whole. In addition, that same licensee's 39 GHz holdings, if any, would be added on to its 28 GHz holdings of 850 MHz. That licensee would then be able to acquire a maximum of an additional 400 MHz of spectrum across the 37 GHz and 39 GHz

bands if it so chose (this maximum of 400 MHz assumes it has no current holdings in the 39 GHz band). Similar calculations would apply in the 39 GHz band. For instance, for those licensees that currently hold more than 400 MHz of spectrum in the 39 GHz band in any county in a given PEA, such entities would be unable to bid on both licenses in the 28 GHz band but potentially could still bid for one license in the 28 GHz band, as well as on 37 GHz spectrum and additional 39 GHz spectrum. To determine bidding eligibility across the three bands for those entities who do not currently hold licenses in the 28 GHz or 39 GHz band, the Commission would similarly count maximum spectrum holdings in counties at the PEA level. The "maximum county-to-PEA" option is a simple way to calculate spectrum holdings in which the licensing areas of each band have varied geographies, and the Commission seeks comment on this first methodology for determining eligibility to bid.

89. The second methodology that the Commission invites comment on is the "population-weighted-average" option. This option involves calculating an entity's current spectrum holdings on a county-by-county basis within a PEA in the 28 GHz and 39 GHz bands, and then constructing a population the weighted average for that PEA as a whole. For incumbent licensees in the 28 GHz and 39 GHz bands, the Commission would sum the product of county spectrum holdings and county population within the PEA (using U.S. Census 2010 population data), and then divide that sum by the total population of the PEA. This would provide us with the population-weighted amount of 28 GHz and 39 GHz spectrum held by that incumbent in that PEA. The entity would then be able to bid on 28 GHz spectrum (by county, and any winning bid would be weighted by the county population divided by the PEA population), and 37 GHz and 39 GHz spectrum (by PEA or partial PEA), up to the population-weighted limit of 1250 MHz. To determine eligibility to bid for those entities who do not currently hold licenses in the 28 GHz or 39 GHz bands, the Commission would also calculate prospective holdings based on a

population-weighted average within the PEA. Overall, any entity would not be able to bid on certain spectrum if, across the three bands, it would hold 1250 megahertz or more on a population-weighted basis. The Commission seeks comment on this second methodology for determining eligibility to bid.

2. Holding Period

90. In addition to the decisions made in the Report and Order, the Commission seeks comment on our proposal to adopt a holding period that would preclude certain proposed secondary market transactions for licensees that acquire certain amounts of 28 GHz, 37 GHz, and/or 39 GHz spectrum at auction. In the Mobile Spectrum Holdings Report and Order (see Policies Regarding Mobile Spectrum Holdings; WT Docket No. 12-269, Report and Order, 29 FCC Rcd 6133 (2014)), the Commission established a six-year holding period, which represented the interim buildout period for 600 MHz licensees, restricting certain proposed secondary market transactions for 600 MHz band licensees. The Commission determined that establishing a holding period best balanced its goals of preserving the integrity of the market-based spectrum reserve it had established while still permitting some flexibility in secondary market transactions.

91. The Commission proposes to adopt a holding period for licensees acquiring spectrum in the 28 GHz, 37 GHz, and/or 39 GHz bands. In particular, the Commission seeks comment on our proposal to adopt a holding period that would restrict certain proposed secondary market transactions for mmW licensees necessary to support the spectrum aggregation policies the Commission adopted in the Report and Order, as well as our objective of ensuring that multiple providers will be able to access mmW spectrum as it becomes available.

92. The Commission proposes a period of three years, given the nascent nature of the frontier spectrum in the 28 GHz, 37 GHz, and 39 GHz bands and the likely rapid development of

multiple use cases for this spectrum. While the Commission could establish a holding period tied to the length of the license term or build out period for licensees in these bands, a shorter three-year holding period that is half of the buildout period the Commission established for incumbent licensees in the 28 GHz and 39 GHz bands may best serve the public interest by allowing flexibility while still preventing entities from undermining our ex ante spectrum aggregation policies. The Commission seeks comment on our proposal. To the extent commenters support a longer holding period, the Commission seeks comment on how a longer holding period would better help the Commission achieve its objectives for the use of this spectrum. If a longer holding period is warranted, how long should it be? For example, should the length of the holding period be based on the 10 year license term and performance benchmarks for new licensees that the Commission adopted in the Order or would a different holding period be appropriate? The Commission asks commenters to address how it can best balance its general policy of promoting flexibility in secondary market transactions with our goals of encouraging competition and facilitating the deployment of new services and innovation to the benefit of consumers.

3. Spectrum Aggregation Limits for Additional Spectrum Bands

93. The Commission determined in the Order that grouping spectrum in the 28 GHz, 37 GHz, and 39 GHz bands together for purposes of applying these mobile spectrum holdings policies is appropriate in view of the similar technical characteristics and potential uses of spectrum in these bands. The Commission seeks comment on the proposal to apply spectrum aggregation policies generally in the bands the Commission proposes making available in this Further Notice. The objective of the spectrum aggregation polices the Commission adopted in the Order is to promote competitive conditions and help ensure that multiple providers have the ability to acquire mmW spectrum as it becomes available, while avoiding the excessive

concentration of licenses. Further, to the extent these bands to be made available have similar technical characteristics and potential uses as the 28 GHz, 37 GHz, and 39 GHz bands, the Commission proposes to use the approximately one-third threshold of the total amount of spectrum as our starting point but recognizes that its understanding of the appropriate approach for these bands is developing and that other thresholds may be appropriate. Is the approximately one-third threshold appropriate or are there alternative thresholds that the Commission should consider? What are the likely benefits and costs of our proposed threshold? The Commission asks interested parties to provide us with any alternative approaches to the appropriate spectrum aggregation policies for these bands as they become available.

E. 37.5-40 GHz Band Satellite Issues

1. Satellite Power Flux Density Limits

94. The Commission does not believe the current record is sufficient for us to conclude that authorizing satellites to operate at the higher PFD of -105 dBW/m2/MHz would be consistent with terrestrial use of the 37.5-40 GHz band. In theory, the same rain storm that impairs satellite reception might be able to shield earth stations if the satellite raises its power level; the problem is that rain will rarely be uniformly present throughout a spot beam's footprint, leaving at least some terrestrial stations unshielded or inadequately shielded by rain and, hence, vulnerable to any increase in the spot beam's PFD level. Unlike with respect to the 28 GHz band, the issue of satellite-terrestrial coexistence in the 39 GHz band has received relatively little attention.

95. At the same time, the Commission recognizes that Boeing has submitted a study which shows that coexistence is possible, even at the higher PFD level. Boeing's presentation suggests that terrestrial mobile units might be able to suppress interfering signals from satellites if the satellite signals arrive at sufficiently high angles of elevation. On the other hand, Boeing

assumes a maximum distance of 200 meters between mobile units and base stations. The Commission believes the record would benefit from further development on this issue.

96. Accordingly, the Commission seeks further comment on whether there are any circumstances under which allowing FSS satellites in the 37.5-40 GHz band to operate at a higher PFD level than permitted under the existing rules would be consistent with terrestrial use of the 37.5-40 GHz band. If a higher PFD limit would be appropriate, what limit should the Commission adopt? Commenters should provide detailed technical studies that explicitly list the assumptions they made concerning both terrestrial and satellite operations. Studies should study both fixed and mobile terrestrial operations. If a commenter believes a study submitted by another commenter is not valid, it should list the specific assumptions or analysis that it believes are not valid and provide its own assumptions or analysis. Ultimately, the Commission believes the burden is on FSS interests to show that the higher PFD level is consistent with terrestrial use. Terrestrial interests do have an obligation to provide sufficient information concerning the nature of their systems to allow other parties to analyze the interference impact of a higher PFD level.

2. Authorizing Satellite User Equipment.

97. The Commission seeks comment on the possibility of repealing the prohibition on satellite user equipment in the 37.5-40 GHz band. Initially, the Commission asks satellite interests to provide further information concerning the need and demand for user equipment in that band. The Commission notes that FSS user equipment can receive in the 40-42 GHz band, which is not licensed for terrestrial operations. Are there uses for which access to the 40-42 GHz band is insufficient? The Commission asks FSS providers to provide specific examples and data demonstrating the need for user equipment in the 37.5-40 GHz band.

98. Assuming a need exists, the Commission seeks comment on the appropriate manner of authorizing satellite user equipment. The Commission agrees with ViaSat's observation that

because user equipment in this band would be receiving, it would not cause interference to terrestrial operations. One option would be to adopt ViaSat's proposal to allow FSS user equipment purely on a secondary basis at their own risk. If the Commission adopted that proposal, the Commission emphasizes that the equipment would truly be on a secondary basis and that FSS user equipment would have no expectation of interference protection. A variation on that option, based on the analysis Boeing has done, would be to require terrestrial operators to provide information on their deployments to FSS providers through a database, which the FSS providers could then use to determine where user equipment could operate without interference. The Commission asks other parties to comment on Boeing's technical analysis. To the extent Boeing relies on erroneous data concerning the nature of technical operations, the Commission asks terrestrial operators and equipment manufacturers to provide a specific analysis in response, with an explanation for the specific parameters used in their analysis. The Commission also seeks comment on whether the benefit to FSS operators of enhancing the ability to operate user equipment in the band outweighs the burden to UMFUS licensees of providing information on their deployments. The Commission asks both FSS operators and terrestrial operators to provide specific data on the relative costs and benefits.

F. Digital Station Identification

99. Currently, AM/FM/TV broadcasters are required to announce their call signs, as are land mobile station operators. Adopting a similar requirement for millimeter wave band operations could make it easier to identify and monitor signals, which in turn could make it easier to find sources of interference to these systems. Accordingly, the Commission seeks comment on requiring a digital identification (digital ID) for the millimeter wave band systems under consideration in this proceeding. Specifically, should operators be required to transmit an ID that is readily observable and decipherable by the Commission and/or other users that could

be used to identify the operator/licensee of an unknown and/or interference source?

100. If so, the Commission seeks comment on the details of such a digital ID requirement. For example, should the ID requirement apply to all millimeter wave band services, or be limited to licensed services, non-licensed services, or fixed operations? Alternatively, should it apply to all transmissions above a certain power limit or antenna height, or be limited to transmissions with some other technical parameter? If so, what should those technical parameters be? If there is an ID requirement for unlicensed equipment, what should the content of the ID be? Should unlicensed equipment authorization holder or equipment user be required to register in a nationwide database that would allow either the FCC and/or anyone to search an ID for operator contact information? Should the ID be continuously broadcast, similar to consumer Wi-Fi routers, only when the transmitter is operational, or only at regular intervals? Finally, should there be a labeling (or software screen display) requirement for the equipment itself that identifies the owner/operator? If so, should the requirement apply to all millimeter wave band equipment, or only to fixed or mobile equipment, only to outdoor equipment, or only to some other subset of millimeter wave band equipment?

G. Technical Issues

1. Antenna Height

101. The Commission seeks further comment on whether antenna height limits are appropriate and, if so, what thresholds and corresponding reductions in power should apply at higher antenna heights. Considering what future wireless networks are envisioned to be, are the antenna height thresholds and corresponding power reductions in the existing Part 24 (PCS) or Part 27 rules appropriate for future mmW mobile base stations? Based on what has been presented on the record, mobile mmW base stations in this band may be more likely deployed at street lamp post height, and will not be deployed at the heights of traditional mobile base station

deployments. In that context is the 305 meter threshold currently in Part 27 valid or would lower thresholds be appropriate? Is there an alternative maximum height that should be considered? Conversely, given the existing PFD limits that the Commission has adopted to control interference at market boundaries and at the edge of an earth station contour, are additional antenna height restrictions and corresponding power reductions even necessary? The Commission tentatively proposes to adopt antenna height and power limits similar to those in our Part 27 rules. However, the Commission seeks comment on whether power limits based on antenna height are necessary and/or whether any modifications should be made to either the height thresholds or the power limits at specific heights that the Commission have proposed. The Commission also seeks comment on whether there would there be any benefit in requiring antenna downtilt for antennas above a certain height?

2. Minimum Bandwidth for Given BS/MS/Transportable Transmit Power Levels

102. For applications and technologies that operate under the umbrella of the next generation of wireless networks, is it worth considering a sub-set of networks that might operate with band widths less than 100 MHz and how the maximum power limits adopted should be evaluated? What minimum band width should be established for base stations, transportable station, and mobile station classes of equipment? Is there value in establishing these bandwidth scaling limits for mobile and transportable classes such as the Commission did for base stations? If so what should the minimum band width scaling factors be for these classes of equipment based on the power levels the Commission adopted in the Report and Order? What is the minimum bandwidth that should be established for these two classes of equipment in relation to the adopted transmit power limits? Should the establishment of these limits be comparable to the rules that currently exist for part 27 frequency bands?

3. Coordination Criteria at Market Borders for Fixed Point-to-Point Operations

103. In the Report and Order, in particular with smaller licensed areas, the Commission recognized that the existing coordination distances of 16 km for 39 GHz and 20 km for 28GHz result in coordination zones that encompass a large part of many license areas. In fact, in the context of 28 GHz county based licenses, the entire market area is subject to the coordination requirement in many cases. In adopting market border limits and coordination requirements our goal is to ensure that there is a mechanism in place to mitigate interference between adjacent area licensees without creating an unnecessary burden on licensees. While the Commission recognizes that under our rules adjacent area licensees are able to negotiate and agree to mutual terms and criteria that deviate from the market border and coordination limits imposed in our rules, the Commission also believes that the changes that the Commission adopted to market sizes warrants re-examination of the market boundary coordination requirements that were originally developed in the context of larger market sizes. Therefore, the Commission now seeks to create a record with an eye toward reducing the coordination burden on licensees. The Commission notes that in its comments in response to the NPRM, Sprint recommends that the Commission require an operator proposing to initiate new fixed operations to coordinate those operations with the adjacent block operator when a new fixed transmitter would be located within 3 km and within +/- 10 degrees of the receive azimuth of an existing fixed receiver, or a new fixed transmitter would be within 1 km of an existing fixed receiver, but outside the +/- 10 degree receive antenna main lobe, in order to avoid adjacent channel OOBE interference or brute force receiver overload. While Sprint's comments were in relation to adjacent channel interference a similar approach might be appropriate for co-channel coordination. The Commission seeks comment first on whether the existing coordination distances for traditional fixed point-to-point operations are still appropriate given smaller market area sizes. The Commission also seeks comment on whether the coordination distance should incorporate other

technical criteria into factoring the distance. For example, should the coordination distances be dependent on the orientation of the fixed point-to-point antenna relative to the market boundary? Should the coordination distance be reduced in cases where a directional antenna is pointed away from the market boundary? Should the coordination distance be dependent on other technical factors such as the EIRP of the transmitting station, gain of the antenna, or other factors? The Commission requests comment on these issues. The Commission requests that commenters support any proposal with technical analysis.

4. Sharing Analysis and Modeling

104. The wireless industry, standards groups, government organizations, and academia are currently engaged in developing propagation models for millimeter wave bands. The National Institute of Standards and Technology (NIST) and the European Commission's 5G partnership with industry have active study groups looking at millimeter wave propagation modeling. Academia have published papers describing several models such as the Close In (CI) and alpha-beta-gamma (ABG) free space reference distance models. The Commission seeks comment on whether these or other models are appropriate propagation models to apply when analyzing inter-service interference between terrestrial-based transmitters and receivers of different services. There are several factors that are common to the interference effects in both directions to and from 5G stations, including antenna beam forming, the location and height of antennas, and the propagation distance and environment between other systems and the 5G stations. Lower gain 5G antennas that are mostly indoors in cluttered environments and at lower heights will reduce the degree of RF coupling in both directions, and therefore reduce the propagation path loss required to meet interference threshold limits. Which millimeter wave propagation models are most appropriate for sharing analyses where the interfering emitters may be assembled from a group of indoor and outdoor emitters? When applying transmitter or

receiver isolation factors such as antenna directionality, should a degree of statistical probability be associated with the factor versus the assumption of worse case interference? The Commission asks parties to submit propagation analysis and path loss models of 5G deployment in both indoor and outdoor environments for use in determining interference impact and potential mitigation.

105. If the terrestrial receiver or transmitter is fixed at a specific location then a terrain-based propagation loss model can be employed; what terrain based propagation models are most appropriate for millimeter wave analyses? When the terrestrial receiver is not at a known location, what are the most appropriate millimeter wave models to apply? How much isolation could one typically assume due to antenna beam forming techniques? What other interference mechanism, such as clutter, should be considered when modeling inter-service interference in millimeter wave bands? Generally, the Commission seeks further comment on millimeter wave propagation models appropriate for spectrum sharing studies between fixed, mobile and satellite systems, as well as active and passive services.

5. Part 15 Operation On-board Aircraft in the 57-71 GHz Band

107. The Commission is seeking further technical analyses and sharing studies, specifically with respect to the various types of unlicensed applications envisioned on-board aircraft, the priority/order of their planned introduction, as well as their associated potential harmful interference profile with respect to passive sensor services. For example, is the intent to provide only for applications that are used by the aircraft itself to reduce weight by replacing cabling and wiring with radio for applications, such as for connecting inflight entertainment systems, seatback display consoles, or connecting with sensors used to monitor the health of the aircraft structure and its critical systems in wireless avionics intra-communication (WAIC)? Or is the intent to provide for the direct streaming of movies/news/internet service from

ceiling-mounted access points to portable electronic devices carried aboard the aircraft by passengers in nearby seats? Are there additional inflight applications that commenters further envision?

108. What harmful interference profile could be expected from each of these various types of on-board aircraft provisions of 60 GHz transmitters? How much difference would the type of aircraft body make in providing additional protection to passive sensor services from operation of these transmitters? Should the Commission propose, as a first cautious step, to allow WiGig transmissions on-board aircraft only for certain applications, such as inflight entertainment provision beaming from seatback display to user-provided devices, because such transmissions would be at a very short distance (1-2 feet, or 30 to 60 cm), in a direct line-of-sight between each seatback display and user-provided device, with little risk of escaping through cabin windows? If the Commission were to prohibit the first WiGig channel (57.24-59.4 GHz) as CORF suggested to protect EESS, would this limitation ameliorate in any way the need to protect RAS, as WiGig devices will be using the rest of the spectrum from 59.4 GHz to 71 GHz? How would RAS and EESS be protected from potential WAIC applications using external structural sensors or cameras mounted on the outside of the aircraft structure to monitor the performance of the aircraft during various phases of aircraft operation (taxi, take-off, landing, cruise, etc.)? Commenters should provide detailed technical analyses, with possible real-world transmission scenarios on aircraft, including expected signal leakage in this particular frequency band through unshielded cabin windows for the various types of inflight applications (e.g., entertainment provisions, WAIC provisions, etc.) in different aircraft body structures if the fuselage type and cabin window placements make a difference in signal shielding, etc., and any other additional harmful interference considerations involving use of 60 GHz transmitters on-board aircraft.

H Initial Regulatory Flexibility Analysis

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

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

110. In this FNPRM, the Commission proposes to authorize mobile operations in the 24.25-24.45 and 24.75-25.25 GHz band (24 GHz band), the 31.8-33.4 GHz band (32 GHz band), the 42-42.5 GHz band (42 GHz band), the 47.2-50.2 GHz band (47 GHz band), the 50.4-52.6 GHz band (50 GHz band) and the 71-76 and 81-86 GHz bands (70/80 GHz bands). The Commission is also seeking comment on possible uses of bands above 95 GHz. Together with the bands that are the subject of our Report and Order – namely the 28, 37, 39 and 57-71 GHz bands, these bands are known as the "mmW bands".

111. Until recently, the mmW bands were generally considered unsuitable for mobile applications because of propagation losses at such high frequencies and the inability of mmW signals to propagate around obstacles. As increasing congestion has begun to fill the lower bands and carriers have resorted to smaller and smaller microcells in order to re-use the available spectrum, however, industry is taking another look at the mmW bands and beginning to realize that at least some of its presumed disadvantages can be turned to advantage. For example, short

transmission paths and high propagation losses can facilitate spectrum re-use in microcellular deployments by limiting the amount of interference between adjacent cells. Furthermore, where longer paths are desired, the extremely short wavelengths of mmW signals make it feasible for very small antennas to concentrate signals into highly focused beams with enough gain to overcome propagation losses. The short wavelengths of mmW signals also make it possible to build multi-element, dynamic beam-forming antennas that will be small enough to fit into handsets—a feat that might never be possible at the lower, longer-wavelength frequencies below 6 GHz where cell phones operate today.

112. The Commission proposes to include the 24 GHz, 32 GHz, 42 GHz, 47 GHz, 50 GHz and 70/80 GHz bands in the Part 30 Upper Microwave Flexible Use Service. The Commission also proposes to add a mobile allocation in the 24 GHz and 32 GHz bands. This additional spectrum for mobile use will help ensure that the speed, capacity, and ubiquity of the nation's wireless networks keeps pace with the skyrocketing demand for mobile service. It could also make possible new types of services for consumers and businesses.

113. In proposing service rules for these bands, which include technical rules to protect against harmful interference, licensing rules to establish geographic license areas and spectrum block sizes, and performance requirements to promote robust buildout, the Commission advances toward enabling rapid and efficient deployment. The Commission does so by proposing flexible service, technical, assignment, and licensing rules for this spectrum, except where special provisions are necessary to facilitate shared use with other co-primary users.

114. For the 24 GHz, 32 GHz, 42 GHz, 47 GHz and 50 GHz bands the Commission proposes to assign PEA-based licenses through competitive bidding. In the 48.2-50.2 GHz portion of the 47 GHz band, the Commission proposes to require licensees to provide information on their facilities to enable sharing with FSS user equipment. Finally, in the 71-

76/81-86 GHz bands, the Commission seeks comment on various systems managed by database operators which will coordinate use as between mmW base stations, fixed point-to-point links used for backhaul, and Federal operations.

115. A portion of the 24 GHz band is allocated for satellite service but is limited to only feeder links for the Broadcast Satellite Service (BSS), and the Commission has proposed to either retain existing coordination procedures or to adopt the sharing regime used for the 28 GHz band to manage interference between terrestrial and satellite operations. Meanwhile, the 47 GHz band is also allocated for satellite and is intended to be used for FSS user equipment. The Commission has proposed that FSS operation at 47 GHz be limited to individually licensed earth stations subject to the same sharing framework the Commission adopted in the 28 GHz band except with SAS-based sharing between terrestrial and satellite operations. Finally, although the 50 GHz band is also allocated for satellite, it contains no present satellite use and the Commission is exploring sharing mechanisms for the band in the future, including SAS.

116. Overall, these proposals are designed to provide for flexible use of this spectrum by allowing licensees to choose their type of service offerings, to encourage innovation and investment in mobile broadband use in this spectrum, and to provide a stable regulatory environment in which fixed, mobile, and satellite deployment would be able to develop through the application of flexible rules. The market-oriented licensing framework for these bands would ensure that this spectrum is efficiently utilized and will foster the development of new and innovative technologies and services, as well as encourage the growth and development of a wide variety of services, ultimately leading to greater benefits to consumers.

117. In the FNPRM, the Commission also seeks comment on various proposals for refining the rules the Commission have adopted in the Report and Order. The Commission seeks comment on various ways of developing the shared access framework the Commission has

adopted for the 37-37.6 GHz band. That framework creates an innovative shared space that can be used by a wide variety of Federal and non-Federal users, by new entrants and by established operators – and smaller businesses in particular – to experiment with new technologies in the mmW space. The Commission proposes to adopt additional performance requirement metrics for uses such as Internet of Things and machine-to-machine communications. Adopting these additional metrics will allow licensees to use the mmW bands for innovative uses with the certainty that they can meet performance requirements and renew their licenses. For example, the Commission seeks further comment on whether the Commission should impose a "use-or-share" obligation on UMFUS licensees in order to efficiently make as much unused spectrum available as possible. Such a "use-or-share" regime could take varying forms, such as a fully dynamic sharing solution whereby opportunistic users could indefinitely deploy outside a licensee's geographic build-out area subject to the latter's potential expansion - as coordinated by a third-party database administrator; a modified shared access system whereby meeting a defined level of deployment in a set of geographic areas would foreclose their opportunistic use; and, an unlicensed shared access approach whereby opportunistic users would operate wherever licensees were not actually deployed.

118. The Commission seeks comment on whether the Commission can allow FSS satellites in the 37.5-40 GHz band to operate at higher power and transmit a higher power flux density at the Earth's surface. If the Commission can allow such higher power without causing interference to terrestrial operations, this change could allow FSS operators to make greater use of the band. The Commission also asks whether the Commission should repeal the prohibition on satellite (FSS) user equipment in the 37.5-40 GHz band and seek comment on whether terrestrial operators should have to divulge their deployments to FSS providers through a database in order to allow individual users to install their own receiving equipment without

interfering with terrestrial operations. In addition, the Commission asks whether the Commission should adopt a requirement that millimeter wave band systems transmit an ID identifying themselves to enable better identification and control of sources of interfering signals much the same way that TV, radio or even WiFi systems presently identify themselves. Finally, the Commission seeks comment on revisions to the technical rules for the Upper Microwave Flexible Use Service, including revising coordination criteria between adjacent licensees for point-to-point operations; establishing a minimum bandwidth and bandwidth scaling factor corresponding to various power levels; proposing a reduction in transmit power limits responsive to increasing antenna height, and obtaining further information on millimeter wave propagation models, and whether Part 15 operations in the 57-71 GHz band can be allowed on board aircraft. These portions of the FNPRM will help ensure that licensees have maximum flexibility to operate while not causing interference to other licensees.

B. Legal Basis.

119. The proposed action is authorized pursuant to Sections 1, 2, 3, 4, 5, 7, 10, 201, 225, 227, 301, 302, 302a, 303, 304, 307, 309, 310, 316, 319, 332, and 336 of the Communications Act of 1934, 47 U.S.C. §§ 151, 152, 153, 154, 155, 157, 160, 201, 225, 227, 301, 302, 302a, 303, 304, 307, 309, 310, 316, 319, 332, 336 and Section 706 of the Telecommunications Act of 1996, as amended, 47 U.S.C. § 1302.

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

120. 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 and policies, 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 Small Business Act. A "small business concern" is one 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.

D. Small Businesses, Small Organizations, and Small Governmental Jurisdictions.

121. Our action may, over time, affect small entities that are not easily categorized at present. The Commission therefore describe here, at the outset, three comprehensive, statutory small entity size standards. First, nationwide, there are a total of approximately 28.2 million businesses, 99.7 percent of which are small, according to the SBA. In addition, a "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field." Nationwide, as of 2007, there were approximately 1,621,315 small organizations. Finally, the term "small governmental jurisdiction" is defined generally as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand." Census Bureau data for 2011 indicate that there were 89,476 local governmental jurisdictions in the United States. The Commission estimates that, of this total, as many as 88, 506 entities may qualify as "small governmental jurisdictions." Thus, the Commission estimates that most governmental jurisdictions are small.

1. Wireless Telecommunications Carriers (except satellite).

122. The appropriate size standard under SBA rules is for the category Wireless Telecommunications Carriers. Under that size standard, such a business is small if it has 1,500 or fewer employees. Census Bureau data for 2012, show that there were 967 firms in this category that operated for the entire year. Of this total, 955 had employment of 999 or fewer, and 12 firms had employment of 1,000 employees or more. Thus under this category and the associated small business size standard, the Commission estimates that the majority of wireless

telecommunications carriers (except satellite) are small entities that may be affected by our action.

2. Fixed Microwave Services.

123. Microwave services include common carrier, private-operational fixed, and broadcast auxiliary radio services. They also include the Local Multipoint Distribution Service (LMDS), the Digital Electronic Message Service (DEMS), the 39 GHz Service (39 GHz), the 24 GHz Service, and the Millimeter Wave Service where licensees can choose between common carrier and non-common carrier status. At present, there are approximately 61,970 common carrier fixed licensees, 62,909 private and public safety operational-fixed licensees, 20,349 broadcast auxiliary radio licensees, 412 LMDS licenses, 35 DEMS licenses, 870 39 GHz licenses, and five 24 GHz licenses, and 408 Millimeter Wave licenses in the microwave services. The Commission has not yet defined a small business with respect to microwave services. For purposes of the FRFA, the Commission will use the SBA's definition applicable to Wireless Telecommunications Carriers (except satellite)—i.e., an entity with no more than 1,500 persons is considered small. Under that size standard, such a business is small if it has 1,500 or fewer employees. Census Bureau data for 2012, show that there were 967 firms in this category that operated for the entire year. Of this total, 955 had employment of 999 or fewer, and 12 firms had employment of 1,000 employees or more. Thus under this category and the associated small business size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities that may be affected by our proposed action. The Commission notes that the number of firms does not necessarily track the number of licensees. The Commission estimates that virtually all of the Fixed Microwave licensees (excluding broadcast auxiliary licensees) would qualify as small entities under the SBA definition.

3. Satellite Telecommunications and All Other Telecommunications.

124. Two economic census categories address the satellite industry. The first category has a small business size standard of $32.5 million or less in average annual receipts, under SBA rules. The second also has a size standard of $32.5 million or less in annual receipts.

125. The category of Satellite Telecommunications "comprises establishments primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications." Census Bureau data for 2012 show that 333 Satellite Telecommunications firms operated for that entire year. Of this total, 275 firms had annual receipts of under $10 million, and 58 firms had receipts of $10 million to $24,999,999. Consequently, the Commission estimates that the majority of Satellite Telecommunications firms are small entities that might be affected by our action.

126. The second category, i.e., "All Other Telecommunications," comprises "establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry." For this category, Census Bureau data for 2012 show that there were a total of 1442 firms that operated for the entire year. Of this total, 1400 firms had annual receipts of under $25 million and 42 firms had annual receipts of $25 million to $49, 999,999. Consequently, the Commission estimates that the majority of All Other Telecommunications firms are small entities that might

be affected by our action.

4. Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.

127. The proposed rules relating to Part 15 operation pertain to manufacturers of unlicensed communications devices. The Census Bureau defines this category as follows: "This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment." The SBA has developed a small business size standard for firms in this category, which is: all such firms having 750 or fewer employees. According to Census Bureau data for 2007, there were a total of 939 establishments in this category that operated for part or all of the entire year. Of this total, 784 had less than 500 employees and 155 had more than 100 employees. Thus, under this size standard, the majority of firms can be considered small.

E. Description of Projected Reporting, Recordkeeping, and other Compliance Requirements.

128. The projected reporting, recordkeeping, and other compliance requirements proposed in the FNPRM will apply to all entities in the same manner. The revisions the Commission adopts should benefit small entities by giving them more information, more flexibility, and more options for gaining access to wireless spectrum.

129. Any applicants for UMFUS licenses will be required to file license applications using the Commission's automated ULS. ULS is an online electronic filing system that also serves as a powerful information tool, one that enables potential licensees to research applications, licenses, and antenna structures. It also keeps the public informed with the weekly public notices, FCC rulemakings, processing utilities, and a telecommunications glossary.

UMFUS applicants that must submit long-form license applications must do so through ULS using Form 601, FCC Ownership Disclosure Information for the Wireless Telecommunications Services using FCC Form 602, and other appropriate forms.

130. Applicants in the UMFUS will be required to meet buildout requirements at the end of their initial license terms. In doing do, they will be required to provide information to the Commission on the facilities they have constructed, the nature of the service they are providing, and the extent to which they are providing coverage in their license area.

131. The Commission also proposes to require UMFUS licensees to provide information on their proposed operations in order to facilitate sharing with other authorized services. This may include the possibility that UMFUS licensees will have to digitally identify their stations in order to help identify and eliminate causes of interference. In the 48.2-50.2 GHz band, terrestrial licensees may have to report their deployment information to FSS providers to facilitate the deployment of FSS user equipment. The Commission seeks comment on the scope of the information to be provided and the manner in which it should be provided.

132. The Commission expects that all of the filing, recordkeeping and reporting requirements associated with the demands described above, including professional, accounting, engineering or survey services used in meeting these requirements will be the same for large and small businesses that intend to utilize these new UMFUS licenses, but the Commission seeks comment on any steps that could be taken to minimize any significant economic impact on small businesses.

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

133. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its approach, which may include the following four alternatives (among

others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities. Accordingly, the Commission seeks comment on whether any of burdens associated the filing, recordkeeping and reporting requirements described above can be minimized for small businesses. In particular, the Commission seeks comment on whether any of the costs associated with our construction or performance requirements in these bands can be alleviated for small businesses.

134. The Commission intends to license the 24 GHz, 32 GHz, 42 GHz, and 50 GHz bands on a PEA basis, but the Commission will also permit partitioning and disaggregation by licensees in the mmW bands. As the Commission noted in the Report and Order, while PEAs are small enough to provide spectrum access opportunities for smaller carriers and PEAs could even be further disaggregated, PEAs also nest within, and may be aggregated to form, larger license areas. Therefore, the benefits and burdens resulting from assigning spectrum in PEA license areas would be equivalent for small and large businesses. Depending on the licensing mechanisms the Commission adopts for these bands, licensees may adjust their geographic coverage through auction or through the secondary markets. This proposal should enable providers, or any entities, whether large or small, providing service in the mmW bands to more easily adjust their spectrum to build their networks pursuant to individual business plans. And the Commission believes this ability to adjust spectrum holdings will make it easier for small entities to acquire or access spectrum. The Commission seeks comment from the public concerning whether these license area determinations would indeed benefit the small businesses or whether there are other alternatives the Commission should consider.

135. For UMFUS bands for which the Commission accept mutually exclusive initial applications, the Commission will resolve such applications by competitive bidding conducted pursuant to Part 1 Subpart Q of the Commission's rules, including rules governing designated entity preferences. In the Report and Order, the Commission adopted bidding credits for applicants for UMFUS licenses who qualify as small businesses. An entity with average annual gross revenues for the preceding three years not exceeding $55 million will qualify as a "small business" and be eligible to receive a 15 percent discount on its winning bid. An entity with average annual gross revenues for the preceding three years not exceeding $20 million will qualify as a "very small business" and be eligible to receive a 25 percent discount on its winning bid. The FNPRM seeks comment on whether to apply the these same small business definitions and associated bidding credits to the auction of licenses in the additional bands the FNPRM proposes, as the well as any other spectrum bands the Commission may subsequently decide to include in the UMFUS. The Commission believes providing small businesses and very small businesses with bidding credits, in addition to the protections built into the auction rules themselves should provide an economic benefit to small businesses by making it easier for them to acquire or access spectrum in these bands. The Commission seeks comment on this assessment and on whether there are any alternative steps the Commission could take to better assist small businesses.

136. In the Report and Order, the Commission adopted service rules that will permit licensees the flexibility to provide any fixed or mobile service that is consistent with their spectrum allocation. The Commission proposes that the same flexibility shall apply to the 24 GHz, 32 GHz, 42 GHz, 47 GHz, and 50 GHz bands and the Commission seeks comment concerning whether this flexibility will benefit small businesses by giving them more avenues for gaining access to valuable wireless spectrum. Finally, as noted above, the Commission is

proposing to create a SAS-based regulatory framework in the 70/80 GHz band that will permit an innovative shared space in these bands. The SAS serves as an advanced, highly automated frequency coordinator across the band, potentially allowing this shared space to be used by a wide variety of Federal and non-Federal users, by new entrants, by established operators, and small businesses in particular – to experiment with new technologies in the mmW space and innovate. Our proposals require that small businesses register with an SAS and comply with the rules established for the service and in return they receive the ability to access spectrum currently unavailable to them. The Commission believes this should constitute a significant benefit for small businesses, and the Commission seeks comment on this proposal.

137. The technical rules the Commission now proposes will allow licensees of mmW band spectrum to operate while also protecting licensees of nearby spectrum, some of whom are small entities, from harmful interference, and the Commission also seeks comment on these proposals.

J. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules.

138. None.

List of Subjects in 47 CFR Parts 2, 25, 30, and 101

Reporting and recordkeeping requirements, Communications equipment.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch,

Secretary.

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR parts 2, 25, 30 and 101 as follows:

PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;

GENERAL RULES AND REGULATIONS

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

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

2. Amend § 2.106, the Table of Frequency Allocations, by revising pages 54, 56, and 58 through 62 to read follows:

§ 2.106 Table of Frequency Allocations.

* * * * *

24-24.05 AMATEUR AMATEUR-SATELLITE 5.150			24-24.05 5.150 US211	24-24.05 AMATEUR AMATEUR-SATELLITE 5.150 US211	ISM Equipment (18) Amateur Radio (97)
24.05-24.25 RADIOLOCATION Amateur Earth exploration-satellite (active) 5.150			24.05-24.25 RADIOLOCATION G59 Earth exploration-satellite (active) 5.150	24.05-24.25 Amateur Earth exploration-satellite (active) Radiolocation 5.150	RF Devices (15) ISM Equipment (18) Private Land Mobile (90) Amateur Radio (97)
24.25-24.45 FIXED	24.25-24.45 RADIONAVIGATION	24.25-24.45 FIXED MOBILE RADIONAVIGATION	24.25-24.45	24.25-24.45 FIXED MOBILE	RF Devices (15) Upper Microwave Flexible Use (30)
24.45-24.65 FIXED INTER-SATELLITE	24.45-24.65 INTER-SATELLITE RADIONAVIGATION 5.533	24.45-24.65 FIXED INTER-SATELLITE MOBILE RADIONAVIGATION 5.533	24.45-24.65 INTER-SATELLITE RADIONAVIGATION 5.533		RF Devices (15) Satellite Communications (25)
24.65-24.75 FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE	24.65-24.75 INTER-SATELLITE RADIOLOCATION-SATELLITE (Earth-to-space)	24.65-24.75 FIXED FIXED-SATELLITE (Earth-to-space) 5.532B INTER-SATELLITE MOBILE 5.533	24.65-24.75 INTER-SATELLITE RADIOLOCATION-SATELLITE (Earth-to-space)		
24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.532B	24.75-25.25 FIXED-SATELLITE (Earth-to-space) 5.535	24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) 5.535 MOBILE		24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) NG535 MOBILE	RF Devices (15) Satellite Communications (25) Upper Microwave Flexible Use (30)
25.25-25.5 FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)			25.25-25.5 FIXED INTER-SATELLITE 5.536 MOBILE Standard frequency and time signal-satellite (Earth-to-space)	25.25-25.5 Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-space)	RF Devices (15)
25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) 5.536B FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) 5.536C Standard frequency and time signal-satellite (Earth-to-space) 5.536A			25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) Standard frequency and time signal-satellite (Earth-to-space) 5.536A US258	25.5-27 Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-space) 5.536A US258	Page 54

31-31.3 FIXED 5.338A 5.543A MOBILE Standard frequency and time signal-satellite (space-to-Earth) Space research 5.544 5.545 5.149			31-31.3 Standard frequency and time signal-satellite (space-to-Earth) US211 US342	31-31.3 FIXED NG60 MOBILE Standard frequency and time signal-satellite (space-to-Earth) US211 US342	Fixed Microwave (101)
31.3-31.5 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340			31.3-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive)		
31.5-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149 5.546	31.5-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340	31.5-31.8 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) Fixed Mobile except aeronautical mobile 5.149	US246		
31.8-32 FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547B 5.548			31.8-32.3 RADIONAVIGATION US69 SPACE RESEARCH (deep space) (space-to-Earth) US262	31.8-32.3 FIXED MOBILE SPACE RESEARCH (deep space) (space-to-Earth) US262	Upper Microwave Flexible Use (30)
32-32.3 FIXED 5.547A RADIONAVIGATION SPACE RESEARCH (deep space) (space-to-Earth) 5.547 5.547C 5.548			5.548 US211	5.548 US211	
32.3-33 FIXED 5.547A INTER-SATELLITE RADIONAVIGATION 5.547 5.547D 5.548			32.3-33 INTER-SATELLITE US278 RADIONAVIGATION US69 5.548	32.3-33 FIXED INTER-SATELLITE US278 MOBILE RADIONAVIGATION US69 5.548	Upper Microwave Flexible Use (30) Aviation (87)
33-33.4 FIXED 5.547A RADIONAVIGATION 5.547 5.547E			33-33.4 RADIONAVIGATION US69 US360 G117	33-33.4 FIXED MOBILE RADIONAVIGATION US69 US360	
33.4-34.2 RADIOLOCATION 5.549			33.4-34.2 RADIOLOCATION US360 G117	33.4-34.2 Radiolocation US360	Private Land Mobile (90)
34.2-34.7 RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) 5.549			34.2-34.7 RADIOLOCATION SPACE RESEARCH (deep space) (Earth-to-space) US262 US360 G34 G117	34.2-34.7 Radiolocation Space research (deep space) (Earth-to-space) US262 US360	Page 56

40-40.5 EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED FIXED-SATELLITE (space-to-Earth) 5.516B MOBILE MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth)			40-40.5 EARTH EXPLORATION-SATELLITE (Earth-to-space) FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth) SPACE RESEARCH (Earth-to-space) Earth exploration-satellite (space-to-Earth) G117	40-40.5 FIXED-SATELLITE (space-to-Earth) MOBILE-SATELLITE (space-to-Earth)	Satellite Communications (25)
40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile Mobile-satellite (space-to-Earth) 5.547	40.5-41 FIXED FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Mobile 5.547	40.5-41 FIXED-SATELLITE (space-to-Earth) Mobile-satellite (space-to-Earth) US211 G117	40.5-41 FIXED-SATELLITE (space-to-Earth) BROADCASTING BROADCASTING-SATELLITE Fixed Mobile Mobile-satellite (space-to-Earth) US211	
41-42.5 FIXED FIXED-SATELLITE (space-to-Earth) 5.516B BROADCASTING BROADCASTING-SATELLITE Mobile 5.547 5.551F 5.551H 5.551I			41-42 US211	41-42 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE US211	
			42-42.5 FIXED MOBILE US211	42-42.5 FIXED MOBILE US211	Upper Microwave Flexible Use (30)
42.5-43.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 5.547			42.5-43.5 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE except aeronautical mobile RADIO ASTRONOMY US342	42.5-43.5 RADIO ASTRONOMY US342	
43.5-47 MOBILE 5.553 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554			43.5-45.5 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) G117	43.5-45.5	
			45.5-46.9 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.554		RF Devices (15)

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)			46.9-47 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.554	46.9-47 FIXED MOBILE MOBILE-SATELLITE (Earth-to-space) RADIONAVIGATION-SATELLITE 5.554	
47-47.2 AMATEUR AMATEUR-SATELLITE			47-48.2	47-47.2 AMATEUR AMATEUR-SATELLITE	Amateur Radio (97)
47.2-47.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A				47.2-48.2 FIXED FIXED-SATELLITE (Earth-to-space) US297 MOBILE	Satellite Communications (25) Upper Microwave Flexible Use (30)
47.5-47.9 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A MOBILE	47.5-47.9 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE				
47.9-48.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.552A					
48.2-48.54 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	48.2-50.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.338A 5.516B 5.552 MOBILE		48.2-50.2 FIXED FIXED-SATELLITE (Earth-to-space) US156 US297 MOBILE US264		
48.54-49.44 FIXED FIXED-SATELLITE (Earth-to-space) 5.552 MOBILE 5.149 5.340 5.555					
49.44-50.2 FIXED FIXED-SATELLITE (Earth-to-space) 5.338A 5.552 (space-to-Earth) 5.516B 5.554A 5.555B MOBILE	5.149 5.340 5.555		5.555 US342		
50.2-50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340			50.2-50.4 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US246		

50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE Mobile-satellite (Earth-to-space)	50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) US156 MOBILE MOBILE-SATELLITE (Earth-to-space) G117	50.4-51.4 FIXED FIXED-SATELLITE (Earth-to-space) US156 MOBILE MOBILE-SATELLITE (Earth-to-space)	Upper Microwave Flexible Use (30)
51.4-52.6 FIXED 5.338A MOBILE 5.547 5.556	51.4-52.6 FIXED US157 MOBILE		
52.6-54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) 5.340 5.556	52.6-54.25 EARTH EXPLORATION-SATELLITE (passive) SPACE RESEARCH (passive) US246		
54.25-55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive) 5.556B	54.25-55.78 EARTH EXPLORATION-SATELLITE (passive) INTER-SATELLITE 5.556A SPACE RESEARCH (passive)		Satellite Communications (25)
55.78-56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED 5.557A INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	55.78-56.9 EARTH EXPLORATION-SATELLITE (passive) FIXED US379 INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) US353 US532		
56.9-57 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.558A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	56.9-57 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE G128 MOBILE 5.558 SPACE RESEARCH (passive) US532	56.9-57 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE 5.558 SPACE RESEARCH (passive) US532	
57-58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) 5.547 5.557	57-58.2 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 SPACE RESEARCH (passive) US532		RF Devices (15) Satellite Communications (25)
58.2-59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) 5.547 5.556	58.2-59 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE SPACE RESEARCH (passive) US353 US354		RF Devices (15) Page 60

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
59-59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive)			59-59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED INTER-SATELLITE 5.556A MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive) US353	59-59.3 EARTH EXPLORATION-SATELLITE (passive) FIXED MOBILE 5.558 RADIOLOCATION 5.559 SPACE RESEARCH (passive) US353	RF Devices (15)
59.3-64 FIXED INTER-SATELLITE MOBILE 5.558 RADIOLOCATION 5.559 5.138			59.3-64 FIXED INTER-SATELLITE MOBILE 5.558 RADIOLOCATION 5.559 5.138 US353	59.3-64 FIXED MOBILE 5.558 RADIOLOCATION 5.559 5.138 US353	RF Devices (15) ISM Equipment (18)
64-65 FIXED INTER-SATELLITE MOBILE except aeronautical mobile 5.547 5.556			64-65 FIXED INTER-SATELLITE MOBILE except aeronautical mobile	64-65 FIXED MOBILE except aeronautical mobile	RF Devices (15)
65-66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH 5.547			65-66 EARTH EXPLORATION-SATELLITE FIXED MOBILE except aeronautical mobile SPACE RESEARCH	65-66 EARTH EXPLORATION-SATELLITE FIXED INTER-SATELLITE MOBILE except aeronautical mobile SPACE RESEARCH	RF Devices (15) Satellite Communications (25)
66-71 INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554			66-71 MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	66-71 INTER-SATELLITE MOBILE 5.553 5.558 MOBILE-SATELLITE RADIONAVIGATION RADIONAVIGATION-SATELLITE 5.554	
71-74 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth)			71-74 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE MOBILE-SATELLITE (space-to-Earth) US389		Upper Microwave Flexible Use (30)
74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE Space research (space-to-Earth) 5.561			74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE Space research (space-to-Earth) US389	74-76 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE Space research (space-to-Earth) US389	RF Devices (15) Upper Microwave Flexible Use (30)

76-77.5 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)	76-77.5 RADIO ASTRONOMY RADIOLOCATION Space research (space-to-Earth)	76-77 RADIO ASTRONOMY RADIOLOCATION Amateur Space research (space-to-Earth) US342	RF Devices (15)
		77-77.5 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)	RF Devices (15) Amateur Radio (97)
5.149	US342	US342	
77.5-78 AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth)	77.5-78 Radio astronomy Space research (space-to-Earth)	77.5-78 AMATEUR AMATEUR-SATELLITE Radio astronomy Space research (space-to-Earth)	
5.149	US342	US342	
78-79 RADIOLOCATION Amateur Amateur-satellite Radio astronomy Space research (space-to-Earth)	78-79 RADIO ASTRONOMY RADIOLOCATION Space research (space-to-Earth)	78-79 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)	
5.149 5.560	5.560 US342	5.560 US342	
79-81 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)	79-81 RADIO ASTRONOMY RADIOLOCATION Space research (space-to-Earth)	79-81 RADIO ASTRONOMY RADIOLOCATION Amateur Amateur-satellite Space research (space-to-Earth)	
5.149	US342	US342	
81-84 FIXED 5.338A FIXED-SATELLITE (Earth-to-space) MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth)	81-84 FIXED FIXED-SATELLITE (Earth-to-space) US297 MOBILE MOBILE-SATELLITE (Earth-to-space) RADIO ASTRONOMY Space research (space-to-Earth)		RF Devices (15) Upper Microwave Flexible Use (30)
5.149 5.561A	US161 US342 US389		
84-86 FIXED 5.338A FIXED-SATELLITE (Earth-to-space) 5.561B MOBILE RADIO ASTRONOMY	84-86 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE RADIO ASTRONOMY		
5.149	US161 US342 US389		Page 62

PART 25 – SATELLITE COMMUNICATIONS

3. The authority citation for part 25 continues to read as follows:

Authority: Interprets or applies Sections 4, 301, 302, 303, 307, 309, 319, 332, 705, and 721 of the Communications Act, as amended, 47 U.S.C. 154, 301, 302, 303, 307, 309, 319, 332, 605, and 721, unless otherwise noted.

4. Amend § 25.208 by revising paragraphs (q) and (r) to read as follows:

§ 25.208 Power flux density limits.

* * * * *

(q) In the band 37.5-40.0 GHz, the power flux-density at the Earth's surface produced by emissions from a geostationary space station for all methods of modulation shall not exceed the following values:

-127 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-127 + 4/3\ (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 20 degrees above the horizontal plane; and

$-107 + 0.4\ (\delta - 20)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 20 and 25 degrees above the horizontal plane;

-105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

(r) In the band 37.5-40.0 GHz, the power flux-density at the Earth's surface produced by emissions from a non-geostationary space station for all methods of modulation shall not exceed the following values:

-120 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

$-120 + 0.75\ (\delta - 5)$ dB(W/m^2) in any 1 MHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane; and

-105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

* * * * *

5. Add part 30 to read as follows:

PART 30 – UPPER MICROWAVE FLEXIBLE USE SERVICE

Subpart A – General

Sec.

Subpart B – Applications and Licenses

Subpart C – Technical Standards

30.205 Federal coordination requirements.

30.206 International coordination.

30.207 RF safety.

30.208 Operability.

30.209 Duplexing.

30.210 Information sharing requirements in the 48.2-50.2 GHz band.

Subpart D – Competitive Bidding Procedures

30.301 Upper microwave flexible use service subject to competitive bidding.

30.302 Designated entities and bidding credits.

Subpart E - Special Provisions for Fixed Point-to-Point, Fixed Point-to-Multipoint Hub Stations, and Fixed Point-to-Multipoint User Stations

30.401 Permissible service

30.402 Frequency tolerance

30.403 Bandwidth

30.404 Emission limits

30.405 Transmitter power limitations

30.406 Directional antennas

30.407 Antenna Polarization

Subpart F – Shared operation in the 71-76 GHz and 81/86 GHz bands

30.501 Scope.

30.502 Authorization required.

30.503 Frequency assignments.

30.504 Technical rules.

30.505 Protection of Federal incumbents.

30.506 Priority Access Licenses.

30.507 General Access.

30.508 Spectrum access system purposes and functionality

30.509 Registration, authentication, and authorization of devices

Authority: 47 U.S.C. 151, 152, 153, 154, 301, 303, 304, 307, 309, 310, 316, 332, 1302.

§ 30.1 Creation of upper microwave flexible use service, scope and authority.

As of **[effective date of final rule],** Local Multipoint Distribution Service licenses for the 27.5-28.35 GHz band, and licenses issued in the 38.6-40 GHz band under the rules in part 101 of this chapter shall be reassigned to the Upper Microwave Flexible Use Service. Local Multipoint Distribution Service licenses in bands other than 27.5-28.35 GHz shall remain in that service and shall be governed by the part 101 of this chapter applicable to that service.

§ 30.2 Definitions.

The following definitions apply to this part:

Authorized bandwidth. The maximum width of the band of frequencies permitted to be used by a station. This is normally considered to be the necessary or occupied bandwidth, whichever is greater. (See § 2.202 of this chapter).

Authorized frequency. The frequency, or frequency range, assigned to a station by the Commission and specified in the instrument of authorization.

Fixed satellite earth station. An earth station intended to be used at a specified fixed point.

Local Area Operations. Operations confined to physical facility boundaries, such as a factory.

Point-to-Multipoint Hub Station. A fixed point-to-multipoint radio station that provides one-way or two-way communication with fixed Point-to-Multipoint Service User Stations.

Point-to-Multipoint User Station. A fixed radio station located at users' premises, lying within the coverage area of a Point-to-Multipoint Hub station, using a directional antenna to receive one-way communications from or providing two-way communications with a fixed Point-to-Multipoint Hub Station.

Point-to-Multipoint Service. A fixed point-to-multipoint radio service consisting of point-to-multipoint hub stations that communicate with fixed point-to-multipoint user stations.

Point-to-point station. A station that transmits a highly directional signal from a fixed transmitter location to a fixed receive location.

Portable device. Transmitters designed to be used within 20 centimeters of the body of the user.

Prior coordination. A bilateral process conducted prior to filing applications which includes the distribution of the technical parameters of a proposed radio system to potentially affected parties for their evaluation and timely response.

Secondary operations. Radio communications which may not cause interference to operations authorized on a primary basis and which are not protected from interference from these primary operations

Transportable Station. Transmitting equipment that is not intended to be used while in motion, but rather at stationary locations.

Universal Licensing System. The Universal Licensing System (ULS) is the consolidated database, application filing system, and processing system for all Wireless Radio Services. ULS supports electronic filing of all applications and related documents by applicants and licensees in the Wireless Radio Services, and provides public access to licensing information.

§ 30.3 Eligibility.

Any entity who meets the technical, financial, character, and citizenship qualifications that the Commission may require in accordance with such Act, other than those precluded by section 310 of the Communications Act of 1934, as amended, 47 U.S.C. 310, is eligible to hold a license under this part.

§ 30.4 Frequencies.

The following frequencies are available for assignment in the Upper Microwave Flexible Use Service:

(a) 27.5 GHz – 28.35 GHz band - 27.5-27.925 GHz and 27.925-28.35 GHz.

(b) 38.6-40 GHz band:

(1) New channel plan:

Channel Number	Frequency band limits (MHz)
1	38,600-38,800
2	38,800-39,000
3	39,000-39,200
4	39,200-39,400
5	39,400-39,600
6	39,600-39,800
7	39,800-40,000

(2) Pending transition to the new channel plan, existing 39 GHz licensees licensed under part 101 of this chapter may continue operating on the following channel plan:

Channel Group A		Channel Group B	
Channel No.	Frequency band limits (MHz)	Channel No.	Frequency band limits (MHz)
1-A	38,600-38,650	1-B	39,300-39,350
2-A	38,650-38,700	2-B	39,350-39,400
3-A	38,700-38,750	3-B	39,400-39,450
4-A	38,750-38,800	4-B	39,450-39,500
5-A	38,800-38,850	5-B	39,500-39,550
6-A	38,850-38,900	6-B	39,550-39,600
7-A	38,900-38,950	7-B	39,600-39,650
8-A	38,950-39,000	8-B	39,650-39,700
9-A	39,000-39,050	9-B	39,700-39,750
10-A	39,050-39,100	10-B	39,750-39,800
11-A	39,100-39,150	11-B	39,800-39,850
12-A	39,150-39,200	12-B	39,850-39,900
13-A	39,200-39,250	13-B	39,900-39,950
14-A	39,250-39,300	14-B	39,950-40,000

(c) 37-38.6 GHz band: 37,600-37,800 MHz; 37,800-38,000 MHz; 38,000-38,200 MHz; 38,200-38,400 MHz, and 38,400-38,600 MHz. The 37,000-37,600 MHz band segment shall be available on a site-specific, coordinated shared basis with eligible Federal entities;

(d) 24.25-24.45 GHz band:

(e) 24.75-25.25 GHz band: 24.75-25.00 GHz, 25.00-25.25 GHz;

(f) 31.8-33.4 GHz band:

Channel Number	Frequency
1	31,000-32,000
2	32,000-32,200
3	32,200-32,400
4	32,400-32,600
5	32,600-32,800
6	32,800-33,000
7	33,000-33,200
8	33,200-33,400

(g) 42-42.5 GHz band:

(h) 47.2-50.2 GHz band:

Channel Number	Frequency
1	47,200-47,700

2	47,700-48,200
3	48,200-48,700
4	48,700-49,200
5	49,200-49,700
6	49,700-50,200

(i) 50.4-52.6 GHz band:

Channel Number	Frequency
1	50,400-50,600
2	50,600-50,800
3	50,800-51,000
4	51,000-51,200
5	51,200-51,400
6	51,400-51,600
7	51,600-51,800
8	51,800-52,000
9	52,000-52,200
10	52,200-52,400
11	52,400-52,600

(j) The 71-76 GHz and 81-86 GHz bands shall be available on a shared basis pursuant to the rules in subpart F of this part.

§ 30.5 Service areas.

(a) Except as noted in paragraphs (b) and (c) of this section, and except for the shared 37-37.6 GHz, 71-76 GHz, and 81-86 GHz bands, the service areas for the Upper Microwave Flexible Use Service are Partial Economic Areas.

(b) For the 27.5-28.35 GHz band, the service areas shall be counties.

(c) Common Carrier Fixed Point-to-Point Microwave Stations licensed in the 38.6-40 GHz bands licensed with Rectangular Service Areas shall maintain their Rectangular Service Area as defined in their authorization. The frequencies associated with Rectangular Service Area authorizations that have expired, cancelled, or otherwise been recovered by the Commission will automatically revert to the applicable county licensee.

(d) In the 37.5-40 GHz band, Upper Microwave Flexible Use Service licensees shall not place facilities within the protection zone of Fixed-Satellite Service earth stations authorized pursuant to § 25.136 of this

chapter, absent consent from the Fixed-Satellite Service earth station licensee.

§ 30.6 Permissible communications.

(a) A licensee in the frequency bands specified in § 30.4 may provide any services for which its frequency bands are allocated, as set forth in the non-Federal Government column of the Table of Frequency Allocations in § 2.106 of this chapter (column 5).

(b) Fixed-Satellite Service shall be provided in a manner consistent with part 25 of this chapter.

§ 30.7 37-37.6 GHz Band – Shared Coordinated Service.

(a) The 37-37.6 GHz band will be available for site-based registrations on a coordinated basis with co-equal eligible Federal entities.

(b) Any non-Federal entity meeting the eligibility requirements of § 30.3 of this part may operate equipment that complies with the technical rules of this part pursuant to a Shared Access License.

(c) Licensees in the 37-37.6 GHz band must register their individual base stations and access points prior to placing them in operation.

(d) The minimum authorized channel bandwidth in this band is 100 megahertz.

(e) Registered non-Federal sites must be put placed service within seven days of coordination.

(f) Equipment in this band must be capable of notifying the database that it is active on the channel. At least once every seven days, the equipment must be capable of notifying the coordination mechanism that the equipment is active and operating. If the equipment fails to make such a notification, the registration to operate that equipment is automatically terminated.

(g) Federal licensees may claim access to 200 megahertz of spectrum in this area on a priority basis.

§ 30.8 5G Provider Cybersecurity Statement Requirements.

(a) Statement. Each Upper Microwave Flexible Use Service licensee is required to submit to the Commission a Statement describing its network security plans and related information, which shall be signed by a senior executive within the licensee's organization with personal knowledge of the security plans and practices within the licensee's organization. The Statement must contain, at a minimum, the following elements:

(1) Security Approach. A high-level, general description of the licensee's approach designed to safeguard

the planned network's confidentiality, integrity, and availability, with respect to communications from:

(i) A device to the licensee's network;

(ii) One element of the licensee's network to another element on the licensee's network;

(iii) The licensee's network to another network; and

(iv) Device to device (with respect to telephone voice and messaging services).

(2) Cybersecurity Coordination. A high-level, general description of the licensee's anticipated approach to assessing and mitigating cyber risk induced by the presence of multiple participants in the band. This should include the high level approach taken toward ensuring consumer network confidentiality, integrity, and availability security principles, are to be protected in each of the following use cases:

(i) Communications between a wireless device and the licensee's network;

(ii) Communications within and between each licensee's network;

(iii) Communications between mobile devices that are under end-to-end control of the licensee; and

(iv) Communications between mobile devices that are not under the end-to-end control of the licensee;

(3) Cybersecurity Standards and Best Practices. A high-level description of relevant cybersecurity standards and practices to be employed, whether industry-recognized or related to some other identifiable approach;

(4) Participation with Standards Bodies, Industry-Led Organizations. A description of the extent to which the licensee participates with standards bodies or industry-led organizations pursuing the development or maintenance of emerging security standards and/or best practices;

(5) Other Security Approaches. The high-level identification of any other approaches to security, unique to the services and devices the licensee intends to offer and deploy; and

(6) Plans with Information Sharing and Analysis Organizations. Plans to incorporate relevant outputs from Information Sharing and Analysis Organizations (ISAOs) as elements of the licensee's security architecture. Plans should include comment on machine-to-machine threat information sharing, and any use of anticipated standards for ISAO-based information sharing.

(b) Timing. Each Upper Microwave Flexible Use Service licensee shall submit this Statement to the

Commission within three years after grant of the license, but no later than six months prior to deployment.

(c) Definitions. The following definitions apply to this section:

(i) Confidentiality. The protection of data from unauthorized access and disclosure, both while at rest and in transit.

(ii) Integrity. The protection against the unauthorized modification or destruction of information.

(iii) Availability. The accessibility and usability of a network upon demand.

Subpart B – Applications and Licenses

§ 30.101 Initial authorizations.

Except with respect to in the 37-37.6 GHz band, an applicant must file a single application for an initial authorization for all markets won and frequency blocks desired. Initial authorizations shall be granted in accordance with § 30.4. Applications for individual sites are not required and will not be accepted, except where required for environmental assessments, in accordance with §§ 1.1301 through 1.1319 of this chapter.

§ 30.103 Transition of existing local multipoint distribution service and 39 GHz licenses.

Local Multipoint Distribution Service licenses in the 27.5 – 28.35 GHz band issued on a Basic Trading Area basis shall be disaggregated into county-based licenses and 39 GHz licenses issued on an Economic Area basis shall be disaggregated into Partial Economic Area-based licenses on **[effective date of final rule].** For each county in the Basic Trading Area or Partial Economic Area in the Economic Area which is part of the original license, the licensee shall receive a separate license. If there is a co-channel Rectangular Service Area licensee within the service area of a 39 GHz Economic Area licensee, the disaggregated license shall not authorize operation with the service area of the Rectangular Service Area license.

§ 30.104 License term.

Initial authorizations will have a term not to exceed ten years from the date of initial issuance or renewal.

§ 30.105 Construction requirements.

(a) Upper Microwave Flexible Use Service licensees must make a buildout showing as part of their renewal applications. Licensees relying on mobile or point-to-multipoint service to demonstrate that they

are providing reliable signal coverage and service to at least 40 percent of the population within the service area of the licensee, and that they are using facilities to provide service in that area either to customers or for internal use. Licensees relying on point-to-point service must demonstrate that they have four links operating and providing service, either to customers or for internal use. If the population within the license area is equal to or less than 268,000. If the population within the license area is greater than 268,000, a licensee relying on point-to-point service must demonstrate it has at least one link in operation and providing service for each 67,000 population within the license area.

(b) Showings that rely on a combination of multiple types of service will be evaluated on a case-by-case basis.

(c) If a licensee in this service is also a Fixed-Satellite Service licensee and uses the spectrum covered under its UMFUS license in connection with a satellite earth station, it can demonstrate compliance with the requirements of this section by demonstrating that the earth station in question is in service, operational, and using the spectrum associated with the license. This provision can only be used to demonstrate compliance for the county in which the earth station is located.

(d) Failure to meet this requirement will result in automatic cancellation of the license. In bands licensed on a Partial Economic Area basis, licensees will have the option of partitioning a license on a county basis in order to reduce the population within the license area to a level where the licensee's buildout would meet one of the applicable performance metrics.

(e) Existing 28 GHz and 39 GHz licensees shall be required to make a showing pursuant to this rule by June 1, 2024.

§ 30.106 Geographic partitioning and spectrum disaggregation.

(a) Parties seeking approval for partitioning and disaggregation shall request from the Commission an authorization for partial assignment of a license pursuant to § 1.948 of this chapter. Upper Microwave Flexible Use Service licensees may apply to partition their licensed geographic service area or disaggregate their licensed spectrum at any time following the grant of their licenses.

(b) Technical standards—(1) Partitioning. In the case of partitioning, applicants and licensees must file FCC Form 603 pursuant to § 1.948 of this chapter and list the partitioned service area on a schedule to the

application. The geographic coordinates must be specified in degrees, minutes, and seconds to the nearest second of latitude and longitude and must be based upon the 1983 North American Datum (NAD83).

(2) Spectrum may be disaggregated in any amount.

(3) The Commission will consider requests for partial assignment of licenses that propose combinations of partitioning and disaggregation.

(4) For purposes of partitioning and disaggregation, part 30 systems must be designed so as not to exceed the signal level specified for the particular spectrum block in § 30.204 at the licensee's service area boundary, unless the affected adjacent service area licensees have agreed to a different signal level.

(c) License term. The license term for a partitioned license area and for disaggregated spectrum shall be the remainder of the original licensee's license term as provided for in § 30.104.

(d)(1) Parties to partitioning agreements must satisfy the construction requirements set forth in § 30.105 by the partitioner and partitionee each certifying that it will independently meet the construction requirement for its respective partitioned license area. If the partitioner or partitionee fails to meet the construction requirement for its respective partitioned license area, then the relevant partitioned license will automatically cancel.

(2) Parties to disaggregation agreements must satisfy the construction requirements set forth in § 30.105 by the disaggregator and disaggregatee each certifying that it will independently meet the construction requirement for its respective disaggregated license area. If the disaggregator or disaggregatee fails to meet the construction requirement for its respective disaggregated license area, then the relevant disaggregated license will automatically cancel.

§ 30.107 Discontinuance of service.

(a) An Upper Microwave Flexible Use License authorization will automatically terminate, without specific Commission action, if the licensee permanently discontinues service after the initial license term.

(b) For licensees with common carrier regulatory status, permanent discontinuance of service is defined as 180 consecutive days during which a licensee does not provide service to at least one subscriber that is not affiliated with, controlled by, or related to the licensee in the individual license area. For licensees with non-common carrier status, permanent discontinuance of service is defined as 180 consecutive days

during which a licensee does not operate.

(c) A licensee that permanently discontinues service as defined in this section must notify the Commission of the discontinuance within 10 days by filing FCC Form 601 or 605 requesting license cancellation. An authorization will automatically terminate, without specific Commission action, if service is permanently discontinued as defined in this section, even if a licensee fails to file the required form requesting license cancellation.

Subpart C – Technical Standards

§ 30.201 Equipment authorization.

(a) Except as provided under paragraph (c) of this section, each transmitter utilized for operation under this part must be of a type that has been authorized by the Commission under its certification procedure.

(b) Any manufacturer of radio transmitting equipment to be used in these services may request equipment authorization following the procedures set forth in subpart J of part 2 of this chapter. Equipment authorization for an individual transmitter may be requested by an applicant for a station authorization by following the procedures set forth in part 2 of this chapter.

(c) Unless specified otherwise, transmitters for use under the provisions of subpart E of this part for fixed point-to-point microwave and point-to-multipoint services must be a type that has been verified for compliance.

§ 30.202 Power limits.

(a) For fixed and base stations operating in connection with mobile systems, the average power of the sum of all antenna elements is limited to a maximum equivalent isotopically radiated power (EIRP) density of +75dBm/100MHz, except as specified in paragraph (e) of this section.

(b) For mobile stations, the average power of the sum of all antenna elements is limited to a maximum EIRP density of +43 dBm/100MHz

(c) For transportable stations, as defined in § 30.2, the average power of the sum of all antenna elements is limited to a maximum EIRP density of +55 dBm/100MHz.

(d) For fixed point-to-point and point-to-multipoint limits see § 30.405.

(e) Antenna Height Limits

Antenna height (AAT) in meters (feet)	Effective isotropic radiated power density (EIRP) (dBm/ 100 MHz)
Above 1372 (4500)	62
Above 1220 (4000) To 1372 (4500)	63
Above 1067 (3500) To 1220 (4000)	64
Above 915 (3000) To 1067 (3500)	65
Above 763 (2500) To 915 (3000)	67
Above 610 (2000) To 763 (2500)	69
Above 458 (1500) To 610 (2000)	71
Above 305 (1000) To 458 (1500)	73
Up to 305 (1000)	75

§ 30.203 Emission limits.

(a) The conductive power or the total radiated power of any emission outside a licensee's frequency block shall be -13 dBm/MHz or lower. However, in the bands immediately outside and adjacent to the licensee's frequency block, having a bandwidth equal to 10 percent of the channel bandwidth, the conductive power or the total radiated power of any emission shall be -5 dBm/MHz or lower.

(b)(1) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater.

(2) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges as the design permits.

(3) The measurements of emission power can be expressed in peak or average values.

(c) For fixed point-to-point and point-to-multipoint limits see § 30.404.

§ 30.204 Field strength limits.

(a) Base/Mobile Operations. The predicted or measured Power Flux Density (PFD) from any Base Station operating in the 27.5-28.35 GHz band, 37-38.6 GHz band, and 38.6-40 GHz bands at any location on the geographical border of a licensee's service area shall not exceed -76dBm/m^2/MHz (measured at 1.5 meters above ground) unless the adjacent affected service area licensee(s) agree(s) to a different PFD.

(b) Fixed Point-to-point Operations:

(1) Prior to operating a fixed point-to-point transmitting facility in the 27,500-28,350 MHz band where the facilities are located within 20 kilometers of the boundary of the licensees authorized market area, the

licensee must complete frequency coordination in accordance with the procedures specified in § 101.103 (d)(2) of this chapter with respect to neighboring licensees that may be affected by its operations.

(2) Prior to operating a fixed point-to-point transmitting facility in the 37,000 – 40,000 MHz band where the facilities are located within 16 kilometers of the boundary of the licensees authorized market area, the licensee must complete frequency coordination in accordance with the procedures specified in § 101.103 (d)(2) of this chapter with respect to neighboring licensees that may be affected by its operations.

§ 30.205 Federal coordination requirements.

(a) Licensees in the 37-38 GHz band located within the zones defined by the coordinates in the tables below must coordinate their operations with Federal Space Research Service (space to Earth) users of the band via the National Telecommunications and Information Administration (NTIA). All licensees operating within the zone defined by the 60 dBm/100 MHz EIRP coordinates in the tables below must coordinate all operations. Licensees operating within the area between the zones defined by the 60 dBm and 75 dBm/100 MHz EIRP coordinates in the tables below must coordinate all operations if their base station EIRP is greater than 60 dBm/100 MHz or if their antenna height exceeds 100 meters above ground level. Licensees operating outside the zones defined by the 75 dBm/100 MHz EIRP coordinates in the tables below are not required to coordinate their operations with NTIA.

Table 1: Goldstone, California Coordination Zone

60 dBm/100 MHz EIRP		75 dBm/100 MHz EIRP	
Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)
34.69217/-115.6491	34.19524/-117.47963	34.69217/-115.6491	34.19524/-117.47963
35.25746/-115.32041	34.24586/-117.36210	35.25746/-115.32041	34.24586/-117.36210
36.21257/-117.06567	35.04648/-117.03781	36.11221/-116.63632	34.21748/-117.12812
36.55967/-117.63691	35.04788/-117.00949	36.54731/-117.48242	34.20370/-116.97024
36.66297/-118.31017	34.22940/-117.22327	36.73049/-118.33683	34.12196/-116.93109
36.06074/-118.38528	34.20370/-116.97024	36.39126/-118.47307	34.09498/-116.75473
35.47015/-118.39008	34.12196/-116.93109	36.36891/-118.47134	34.13603/-116.64002
35.40865/-118.34353	34.09498/-116.75473	35.47015/-118.39008	34.69217/-115.6591
35.35986/-117.24709	34.19642/-116.72901	35.40865/-118.34353	34.69217/-115.6491
35.29539/-117.21102	34.64906/-116.62741	35.32048/-117.26386	
34.67607/-118.55412	34.44404/-116.31486	34.63725/-118.96736	
34.61532/-118.36919	34.52736/-116.27845	34.55789/-118.36204	
34.91551/-117.70371	34.76685/-116.27930	34.51108/-118.15329	

34.81257/-117.65400	34.69217/-115.6591	34.39220/-118.28852	
34.37411/-118.18385	34.69217/-115.6491	34.38546/-118.27460	
34.33405/-117.94189		34.37524/-118.24191	
34.27249/-117.65445		34.37039/-118.22557	

Table 2:Socorro, New Mexico Coordination Zone

60 dBm/100 MHz EIRP		75 dBm/100 MHz EIRP
Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)
34.83816/-107.66828	33.44401/-108.67876	33.10651/-108.19320
34.80070/-107.68759	33.57963/-107.79895	33.11780/-107.99980
34.56506/-107.70233	33.84552/-107.60207	33.13558/-107.85611
34.40826/-107.71489	33.85964/-107.51915	33.80383/-107.16520
34.31013/-107.88349	33.86479/-107.17223	33.94554/-107.15516
34.24067/-107.96059	33.94779/-107.15038	33.95665/-107.15480
34.10278/-108.23166	34.11122/-107.18132	34.08156/-107.18137
34.07442/-108.30646	34.15203/-107.39035	34.10646/-107.18938
34.01447/-108.31694	34.29643/-107.51071	35.24269/-107.67969
33.86740/-108.48706	34.83816/-107.66828	34.06647/-108.70438
33.81660/-108.51052		33.35946/-108.68902
33.67909/-108.58750		33.29430/-108.65004
33.50223/-108.65470		33.10651/-108.19320

Table 3: White Sands, New Mexico Coordination Zone

60 dBm/100 MHz EIRP		75 dBm/100 MHz EIRP	
Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)	Latitude/Longitude (decimal degrees)
33.98689/-107.15967	31.78455/-106.54058	31.7494/-106.49132	32.88382/-108.16588
33.91573/-107.46301	32.24710/-106.56114	32.24524/-106.56507	32.76255/-108.05679
33.73122/-107.73585	32.67731/-106.53681	32.67731/-106.53681	32.56863/-108.43999
33.37098/-107.84333	32.89856/-106.56882	32.89856/-106.56882	32.48991/-108.50032
33.25424/-107.86409	33.24323/-106.70094	33.04880/-106.62309	32.39142/-108.48959
33.19808/-107.89673	33.98689/-107.15967	33.21824/-106.68992	31.63664/-108.40480
33.02128/-107.87226		33.24347/-106.70165	31.63466/-108.20921
32.47747/-107.77963		34.00708/-107.08652	31.78374/-108.20798
32.31543/-108.16101		34.04967/-107.17524	31.78322/-106.52825
31.79429/-107.88616		33.83491/-107.85971	31.7494/-106.49132

(b) Licensees in the 37-38.6 GHz band located within the zones defined by the coordinates in the table below must coordinate their operations with the Department of Defense via the National Telecommunications and Information Administration (NTIA).

Table - Coordination Areas for Federal Terrestrial Systems

Location	Agency	Coordination Area (Decimal Degrees)
China Lake, CA	Navy	30 kilometer radius centered on latitude 35.59527 and longitude -117.22583 30 kilometer radius centered on latitude 35.52222 and longitude -117.30333 30 kilometer radius centered on latitude 35.76222 and longitude -117.60055 30 kilometer radius centered on latitude 35.69111 and longitude -117.66916
San Diego, CA	Navy	30 kilometer radius centered on latitude 32.68333 and longitude -117.23333
Nanakuli, HI	Navy	30 kilometer radius centered on latitude 21.38333 and longitude -158.13333
Fishers Island, NY	Navy	30 kilometer radius centered on latitude 41.25 and longitude -72.01666
Saint Croix, VI	Navy	30 kilometer radius centered on latitude 17.74722 and longitude -64.88
Fort Irwin, CA	Army	30 kilometer radius centered on latitude 35.26666 and longitude -116.68333
Fort Carson, CO	Army	30 kilometer radius centered on latitude 38.71666 and longitude -104.65
Fort Hood, TX	Army	30 kilometer radius centered on latitude 31.11666 and longitude -97.76666
Fort Bliss, TX	Army	30 kilometer radius centered on latitude 31.8075 and longitude -106.42166
Yuma Proving Ground, AZ	Army	30 kilometer radius centered on latitude 32.48333 and longitude -114.33333
Fort Huachuca, AZ	Army	30 kilometer radius centered on latitude 31.55 and longitude -110.35
White Sands Missile Range, NM	Army	30 kilometer radius centered on latitude 33.35 and longitude -106.3
Moody Air Force Base, GA	Air Force	30 kilometer radius centered on latitude 30.96694 and longitude -83.185
Hurlburt Air Force Base, FL	Air Force	30 kilometer radius centered on latitude 30.42388 and longitude -86.70694

§ 30.206 International coordination.

Operations in the 27.5-28.35 GHz, 37-38.6, and 38.6-40 GHz bands are subject to existing and future international agreements with Canada and Mexico.

§ 30.207 RF safety.

Licensees and manufacturers are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment

authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

§ 30.208 Operability.

Mobile and transportable stations that operate on any portion of frequencies within the 27.5-28.35 GHz or the 37-40 GHz bands must be capable of operating on all frequencies within those particular bands.

§ 30.209 Duplexing.

Stations authorized under this rule part may employ frequency division duplexing, time division duplexing, or any other duplexing scheme, provided that they comply with the other technical and operational requirements specified in this part.

§ 30.210 Information sharing requirements in the 48.2-50.2 GHz band.

(a) Each operator of a Fixed Service or Mobile Service system in the 48.2-50.2 GHz band will make the technical information about its system listed in paragraphs (b) and (c) of this section available to FSS operators by one or more of the following means:

(1) An online database operated by the Upper Microwave Flexible Use licensee;

(2) An online database operated by a third-party database manager, or

(3) A continuously transmitted pilot signal receivable throughout the terrain within which a FSS facility could cause interference to or receive interference from the terrestrial system.

(b) All licensees deploying fixed systems in the48.2-50.2 GHz bands will make the following information about each such system available to FSS operators in those bands by one or more of the means described in paragraph (a) of this section:

(1) Licensee's name and address.

(2) Transmitting station name.

(3) Transmitting station coordinates.

(4) Frequencies and polarizations.

(5) Transmitting equipment, its stability, effective isotropic radiated power, emission designator, and type of modulation (digital).

(6) Transmitting antenna(s), model, gain, and a radiation pattern provided or certified by the manufacturer.

(7) Transmitting antenna center line height(s) above ground level and ground elevation above mean sea level.

(8) Transmitting antenna boresight(s) angle of elevation with respect to the horizon.

(9) Receiving station name.

(10) Receiving station coordinates.

(11) Receiving antenna(s), model, gain, and, if required, a radiation pattern provided or certified by the manufacturer.

(12) Receiving antenna center line height(s) above ground level and ground elevation above mean sea level.

(13) Receiving antenna boresight(s) angle of elevation with respect to the horizon.

(14) Path azimuth and distance.

(c) All licensees deploying mobile service base stations in the 48.2-50.2 GHz bands will make the following information about each such base station available to FSS operators by one or both of the means described in paragraph (a) of this section:

(1) Licensee's name and address.

(2) Transmitting station name.

(3) Transmitting station coordinates.

(4) Frequencies and polarizations.

(5) Transmitting equipment, its stability, maximum effective isotropic radiated power, emission designator, and types of modulation.

(6) Transmitting antenna(s), model, maximum gain, and maximum extent of all possible radiation patterns provided or certified by the manufacturer.

(7) Transmitting antenna center line height(s) above ground level and ground elevation above mean sea level.

(8) Transmitting antenna boresight(s) maximum and minimum angles of elevation with respect to the

horizon.

(9) Transmitting antenna boresight minimum and maximum azimuths, or designation of omnidirectionality.

(10) Boundary of the area served by the base station for purposes of communication with mobile user equipment.

(11) Receiving antenna(s), model, gain, and maximum extent of all possible radiation patterns provided or certified by the manufacturer.

(12) Receiving antenna center line height(s) above ground level and ground elevation above mean sea level.

(13) Receiving antenna boresight maximum and minimum angles of elevation with respect to the horizon.

(14) Receiving antenna boresight minimum and maximum azimuths, or designation of omnidirectionality.

Subpart D – Competitive Bidding Procedures

§ 30.301 Upper microwave flexible use service subject to competitive bidding.

Mutually exclusive initial applications for Upper Microwave Flexible User Service licenses are subject to competitive bidding. The general competitive bidding procedures set forth in part 1, subpart Q of this chapter will apply unless otherwise provided in this subpart.

§ 30.302 Designated entities and bidding credits.

(a) Eligibility for small business provisions. (1) A small business is an entity that, together with its affiliates, its controlling interests and the affiliates of its controlling interests, have average gross revenues that are not more than $55 million for the preceding three (3) years.

(2) A very small business is an entity that, together with its affiliates, its controlling interests and the affiliates of its controlling interests, has average gross revenues that are not more than $20 million for the preceding three (3) years.

(b) Bidding credits. A winning bidder that qualifies as a small business, as defined in this section, or a consortium of small businesses may use a bidding credit of 15 percent, as specified in § 1.2110(f)(2)(i)(C)

of this chapter. A winning bidder that qualifies as a very small business, as defined in this section, or a consortium of very small businesses may use a bidding credit of 25 percent, as specified in § 1.2110(f)(2)(i)(B) of this chapter.

(c) A rural service provider, as defined in § 1.2110(f)(4) of this chapter, who has not claimed a small business bidding credit may use a bidding credit of 15 percent bidding credit, as specified in § 1.2110(f)(4)(i) of this chapter.

Subpart E - Special Provisions for Fixed Point-to-Point, Fixed Point-to-Multipoint Hub Stations, and Fixed Point-to-Multipoint User Stations

§ 30.401 Permissible service.

Stations authorized under this subpart may deploy stations used solely as fixed point-to-point stations, fixed point-to-multipoint hub stations, or fixed point-to-multipoint user stations, as defined in § 30.2 subject to the technical and operational requirements specified in this subpart.

§ 30.402 Frequency tolerance.

The carrier frequency of each transmitter authorized under this subpart must be maintained within the following percentage of the reference frequency (unless otherwise specified in the instrument of station authorization the reference frequency will be deemed to be the assigned frequency):

Frequency (MHz)	Frequency tolerance (percent)
27,500 to 28,350	0.001
38,600 to 40,000	0.03

§ 30.403 Bandwidth.

(a) Stations under this sub-part will be authorized any type of emission, method of modulation, and transmission characteristic, consistent with efficient use of the spectrum and good engineering practice.

(b) The maximum bandwidth authorized per frequency to stations under this subpart is set out in the table that follows.

Frequency band (MHz)	Maximum authorized bandwidth

27,500 to 28,350	850 MHz
38,600 to 40,000	200 MHz[1]

[1]For channel block assignments in the 38,600-40,000 MHz bands when adjacent channels are aggregated, equipment is permitted to operate over the full channel block aggregation without restriction.

§ 30.404 Emission limits.

(a) The mean power of emissions must be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) When using transmissions other than those employing digital modulation techniques:

(i) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 decibels;

(ii) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 decibels;

(iii) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \text{ Log}_{10}$ (mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation.

(2) When using transmissions employing digital modulation techniques in situations not covered in this section:

(i) In any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 11 decibels:

$A = 11 + 0.4(P-50) + 10 \text{ Log}_{10} B$. (Attenuation greater than 56 decibels or to an absolute power of less than −13 dBm/1MHz is not required.)

(ii) In any 1 MHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least $43 + 10 \text{ Log}_{10}$ (the mean output power in watts) decibels, or 80 decibels, whichever is the lesser attenuation. The authorized bandwidth includes the nominal radio frequency bandwidth of an individual transmitter/modulator in block-assigned bands. Equipment licensed prior to April 1, 2005 shall only be required to meet this standard in any 4 kHz band.

(iii) The emission mask in paragraph (a)(2)(i) of this section applies only to the band edge of each block of spectrum, but not to subchannels established by licensees. The value of P in the equation is the percentage removed from the carrier frequency and assumes that the carrier frequency is the center of the actual bandwidth used. The emission mask can be satisfied by locating a carrier of the subchannel sufficiently far from the channel edges so that the emission levels of the mask are satisfied. The emission mask shall use a value B (bandwidth) of 40 MHz, for all cases even in the case where a narrower subchannel is used (for instance the actual bandwidth is 10 MHz) and the mean output power used in the calculation is the sum of the output power of a fully populated channel. For block assigned channels, the out-of-band emission limits apply only outside the assigned band of operation and not within the band.

(b) [Reserved]

§ 30.405 Transmitter power limitations.

On any authorized frequency, the average power delivered to an antenna in this service must be the minimum amount of power necessary to carry out the communications desired. Application of this principle includes, but is not to be limited to, requiring a licensee who replaces one or more of its antennas with larger antennas to reduce its antenna input power by an amount appropriate to compensate for the increased primary lobe gain of the replacement antenna(s). In no event shall the average equivalent isotropically radiated power (EIRP), as referenced to an isotropic radiator, exceed the following:

Maximum allowable EIRP	
Frequency band (MHz)	**Fixed (dBW)**
27,500-28,350[1]	+ 55
38,600-40,000	+ 55

[1]For Point-to-multipoint user stations authorized in these bands, the EIRP shall not exceed 55 dBw or 42 dBw/MHz.

§ 30.406 Directional antennas.

(a) Unless otherwise authorized upon specific request by the applicant, each station authorized under the rules of this subpart must employ a directional antenna adjusted with the center of the major lobe of radiation in the horizontal plane directed toward the receiving station with which it communicates;

provided, however, where a station communicates with more than one point, a multi- or omni-directional antenna may be authorized if necessary.

(b) Fixed stations (other than temporary fixed stations) must employ transmitting and receiving antennas (excluding second receiving antennas for operations such as space diversity) meeting the appropriate performance Standard A indicated below, except that in areas not subject to frequency congestion, antennas meeting performance Standard B may be used. For frequencies with a Standard B1 and a Standard B2, in order to comply with Standard B an antenna must fully meet either Standard B1 or Standard B2. Licensees shall comply with the antenna standards table shown in this paragraph in the following manner:

(1) With either the maximum beamwidth to 3 dB points requirement or with the minimum antenna gain requirement; and

(2) With the minimum radiation suppression to angle requirement.

Frequency (MHz)	**Category**	**Maximum beamwidth to 3 dB points[1] (included angle in degrees)**	**Minimum antenna gain (dbi)**	**Minimum radiation suppression to angle in degrees from centerline of main beam in decibels**						
				5° to10°	**10° to 15°**	**15° to 20°**	**20° to 30°**	**30° to 100°**	**100° to 140°**	**140° to 180°**
38,600 to 40,000[2]	A	n/a	38	25	29	33	36	42	55	55
	B	n/a	38	20	24	28	32	35	36	36

[1]If a licensee chooses to show compliance using maximum beamwidth to 3 dB points, the beamwidth limit shall apply in both the azimuth and the elevation planes.

[2]Stations authorized to operate in the 38,600-40,000 MHz band may use antennas other than those meeting the Category A standard. However, the Commission may require the use of higher performance antennas where interference problems can be resolved by the use of such antennas.

§30.407 Antenna polarization.

In the 27,500-28,350 MHz band, system operators are permitted to use any polarization within its service area, but only vertical and/or horizontal polarization for antennas located within 20 kilometers of the outermost edge of their service area.

Subpart F – Shared operation in the 71-76 GHz and 81/86 GHz bands

§ 30.501 Scope.

(a) This section sets forth the regulations governing use of devices in the 71-76 GHz and 81-86 GHz bands. The operation of all equipment in this band shall be coordinated by one or more authorized Spectrum Access Systems (SASs).

(b) Operations in this band include Priority Access and General Authorized Access tiers of service. Priority Access Licensees and General Authorized Access Users must not cause harmful interference to Incumbent Users and must accept interference from Incumbent Users. General Authorized Access Users must not cause harmful interference to Priority Access Licensees and must accept interference from Priority Access Licensees.

§ 30.502 Authorization required.

(a) Devices must be used and operated consistent with the rules in this subpart.

(b) Authorizations for PALs may be granted upon proper application, provided that the applicant is qualified in regard to citizenship, character, financial, technical and other criteria established by the Commission, and that the public interest, convenience and necessity will be served. See 47 U.S.C. 301, 308, 309, and 310. The holding of an authorization does not create any rights beyond the terms, conditions, and period specified in the authorization and shall be subject to the provisions of the Communications Act of 1934, as amended, and the Commission's rules and policies thereunder.

(c) Grandfathered registered fixed links are authorized to operate consistent with § 101.1529 of this chapter.

§ 30.503 Frequency assignments.

(a) Any frequencies designated for Priority Access that are not in use by a Priority Access Licensee may be utilized by General Authorized Access Users.

(b) An SAS shall assign authorized devices to specific frequencies, which may be reassigned by that SAS, consistent with this part.

§ 30.504 Technical rules.

Devices in these bands shall be subject to the technical rules in subpart C of this part.

§ 30.505 Protection of Federal incumbents.

Prior to commencing operation, all operations in these bands must complete coordination with Federal Government links according to the coordination standards and procedures adopted in Report and Order, FCC 03-248, and as further detailed in subsequent implementation public notices issued consistent with that order.

§ 30.506 Priority Access Licenses.

(a) Applications for Priority Access Licenses must:

(1) Demonstrate the applicant's qualifications to hold an authorization;

(2) State how a grant would serve the public interest, convenience, and necessity;

(3) Contain all information required by FCC rules and application forms;

(4) Propose operation of a facility or facilities in compliance with all applicable rules; and

(5) Be amended as necessary to remain substantially accurate and complete in all significant respects, in accordance with the provisions of § 1.65 of this chapter.

(b) Devices used for Priority Access must register with a Spectrum Access System and comply with its instructions pursuant to § 30.508.

(c) Records pertaining to PALs, including applications and licenses, shall be maintained by the Commission in a publicly accessible system.

§ 30.507 General Access.

(a) Devices used for General Authorized Access must register with the Spectrum Access System and comply with its instructions.

(b) General Authorized Access Users shall be permitted to use frequencies assigned to Priority Access Licenses when such frequencies are not in use, as determined by the Spectrum Access System.

(c) Frequencies that are available for General Authorized Access Use shall be made available on a shared basis.

(d) General Authorized Access Users shall have no expectation of interference protection from other General Authorized Access Users operating in accordance with this part.

(e) General Authorized Access Users must not cause harmful interference to and must accept interference from Priority Access Licensees and Grandfathered Registered Links in accordance with this part.

§ 30.508 Spectrum access system purposes and functionality.

The Spectrum Access System shall:

(a) Enact and enforce all policies and procedures developed by the SAS Administrator.

(b) Determine and provide to devices the permissible channels or frequencies at their location.

(c) Determine and provide to devices the maximum permissible transmission power level at their location.

(d) Register and authenticate the identification information and location of devices.

(e) Ensure that devices protect Grandfathered Register Links from harmful interference.

(f) Protect Priority Access Licensees from interference caused by other Priority Access Licenses and from General Authorized Access Users.

(g) Resolve conflicting uses of the band while maintaining, as much as possible, a stable radio frequency environment.

(h) Ensure secure and reliable transmission of information between the SAS and devices.

(i) Protect Grandfathered Registered Links consistent with § 101.1529 of this chapter.

(j) Implement the terms of applicable current and future international agreements.

§ 30.509 Registration, authentication, and authorization of devices.

(a) A Spectrum Access System must register, authenticate, and authorize operations of devices consistent with this part.

(b) Devices composed of a network of base and fixed stations may employ a subsystem for aggregating and communicating all required information exchanges between the SAS and devices.

(c) A Spectrum Access System must also verify that the FCC identifier (FCC ID) of any device seeking access to its services is valid prior to authorizing it to begin providing service. A list of devices with valid FCC IDs and the FCC IDs of those devices is to be obtained from the Commission's Equipment Authorization System.

PART 101 – FIXED MICROWAVE SERVICES

6. The authority citation for part 101 continues to read as follows:

Authority: 47 U.S.C. 154, 303.

7. Add § 101.1529 to read as follows:

§ 101.529 Grandfathered operation and transition to upper microwave flexible use service.

Links registered with a third party database administrator on or before [**insert effective date of rules**] that are constructed, in service, and fully compliant with the rules in part 101, subpart Q as of [**insert date one year after effective date of rules**] will be afforded protection from harmful interference caused by Upper Microwave Flexible Use users until the end of their license term.

[FR Doc. 2016-19793 Filed: 8/23/2016 8:45 am; Publication Date: 8/24/2016]