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

In the Matter of	)	
	)	
Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
	)	
	)	
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
	)	

THIRD REPORT AND ORDER, MEMORANDUM OPINION AND ORDER, AND THIRD FURTHER NOTICE OF PROPOSED RULEMAKING

Adopted: June 7, 2018 **Released: June 8, 2018**

Comment Date: September 10, 2018
Reply Comment Date: September 28, 2018

By the Commission: Chairman Pai and Commissioner Carr issuing separate statements; Commissioner O'Reilly approving in part, concurring in part and issuing a statement; Commissioner Rosenworcel approving in part, dissenting in part and issuing a statement.

TABLE OF CONTENTS

I. INTRODUCTION

1. Today, we continue our efforts to make available millimeter wave (mmW) spectrum, at or above 24 GHz, for fifth-generation (5G) wireless, Internet of Things, and other advanced spectrum-based services. In the *Third Report and Order* (*3rd R&O*), we address pending issues regarding FSS sharing and operability in the 24 GHz band, as well as pending issues regarding performance requirements and mobile spectrum holdings policies for the mmW bands authorized for flexible use. With respect to the 37-37.6 GHz band (Lower 37 GHz band), we resolve pending petitions for reconsideration, establish a band plan, and in the *Third Further Notice of Proposed Rulemaking* (*3rd FNPRM*), we seek comment on a more detailed framework to facilitate Federal and non-Federal use. In addition, we propose to make additional spectrum in the 42-42.5 GHz (42 GHz band) and 25.25-27.5 GHz band (26 GHz band) available for flexible wireless use, while recognizing the need to protect and provide continued opportunities for Federal use of this band. We note that we will consider other bands and issues raised in this proceeding in future Commission items.

2. Our efforts in this proceeding to make mmW spectrum available for wireless uses is vital to ensuring continued American leadership in wireless broadband. That leadership represents a critical component of economic growth, job creation, public safety, and global competitiveness. We will continue to take steps to facilitate access to additional low-band, mid-band, and high-band spectrum for the benefit of American consumers, including holding an auction of the 28 GHz band starting in November followed by an auction of the 24 GHz band.

II. BACKGROUND

3. On November 22, 2017, the Commission released the *2nd R&O, 2nd FNPRM, Order on Recon, and MO&O* in this proceeding.[1] In relevant parts, the *2nd R&O* authorized the 24 GHz band and

[1] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order*, 32 FCC Rcd 10988 (2017). *See also Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al*., Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016). When citing to the *Second Report and Order* portion of the 2017 document, we will refer to the *2nd R&O*. When citing to the *Second Further Notice of Proposed Rulemaking* portion of the 2017 document, we will refer to the *2nd FNPRM*. When citing to the *Order on Reconsideration* portion of the 2017 document, we will refer to the *Order on Recon*. When citing to the

the 47.2-48.2 GHz band (47 GHz band) for flexible wireless use;[2] it declined to set pre-auction limits on the amount of spectrum an entity may acquire at auction in the 24 GHz and 47 GHz bands;[3] and it revised the mmW spectrum threshold for reviewing proposed secondary market transactions to 1850 megahertz by including the 24 GHz and 47 GHz bands.[4] The *2nd FNPRM* sought comment on five issues. First, we proposed to license Fixed-Satellite Service (FSS) earth stations in the 24.75-25.25 GHz band on a co-primary basis under the provisions in Section 25.136(d) applicable to the 47 GHz band.[5] Second, we sought comment on adopting additional performance metrics tailored to Internet of Things (IoT)-type deployments.[6] Third, we proposed to eliminate the pre-auction limit of 1250 megahertz that the *R&O* had adopted for the 28 GHz, 37 GHz and 39 GHz bands.[7] Fourth, we proposed to require that any equipment capable of operating anywhere within the 24 GHz band must be capable of operating across the entire 24 GHz band, on all frequencies in both band segments.[8] Finally, we invited commenters to submit new studies or data on bands under consideration by the Commission, as well as comments on additional bands the Commission should consider.[9]

4. We received 15 comments and 12 reply comments. A list of commenters, reply commenters, and *ex parte* filings is contained in Appendix E.[10] No petitions for reconsideration of the *2nd R&O* were filed.[11]

III. THIRD REPORT AND ORDER

A. Performance Requirements –Geographic Area Metric

5. *Background*. In the *R&O*, the Commission moved away from a substantial service regime in the mmW bands by adopting a defined set of metrics for performance requirements for Upper Microwave Flexible Use Service (UMFUS).[12] This reliance on fixed metrics was a change from the

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Memorandum Opinion and Order portion of the 2017 document, we will refer to the *MO&O*. When citing to the *Report and Order* portion of the 2016 document, we will refer to the *R&O*. When citing to the *Further Notice of Proposed Rulemaking* portion of the 2016 document, we will refer to the *FNPRM*.

[2] *2nd R&O*, 32 FCC Rcd at 10996-97, 11003, paras. 22, 47.

[3] *2nd R&O*, 32 FCC Rcd at 11010-11, para. 73.

[4] *2nd R&O*, 32 FCC Rcd at 11011, para. 74.

[5] *2nd FNPRM*, 32 FCC Rcd at 11019-20, paras. 94-97.

[6] *2nd FNPRM*, 32 FCC Rcd at 11020-22, paras. 98-104.

[7] *2nd FNPRM*, 32 FCC Rcd at 11022, paras. 105-106.

[8] *2nd FNPRM*, 32 FCC Rcd at 11022-23, paras. 107-108.

[9] *2nd FNPRM*, 32 FCC Rcd at 11023, para. 109.

[10] When citing comments, we will use the short name of the commenter contained in Appendix E, followed by the words "Comments" or "Reply Comments." Similarly, for *ex parte* filings, we will use the name of the commenter along with the date the *ex parte* was filed as listed in ECFS (this date may be different from the date on the actual *ex parte* letter).

[11] SOM1101, LLC filed a comment addressing the issue of allowing satellite user equipment in the 37.5-40 GHz band. Comment of SOM1101 LLC (filed Jan. 23, 2018). In the *MO&O*, we declined to authorize satellite user equipment in the 37.5-40 GHz band. *MO&O*, 32 FCC Rcd at 11061, paras. 219-220. Because SOM1101's comment neither acknowledges nor seeks reconsideration of the *MO&O*'s decision, we will not give further consideration to this issue.

[12] *R&O*, 31 FCC Rcd at 8088, para. 203. UMFUS licensees relying on mobile or point-to-multipoint service must show 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

buildout rules formerly applicable to 28 GHz and 39 GHz licensees, which used a substantial service standard.[13] In the *FNPRM*, the Commission sought comment on expanding this list of metrics by adopting a performance metric designed to accommodate IoT-type deployments.[14] In the *2nd FNPRM*, the Commission sought comment more specifically on a geographic area metric that might accommodate IoT or other services deployed along non-traditional lines, while still measuring a meaningful level of service in a proven way.[15]

6. The record on this issue was mixed. Verizon supports the idea of a geographic area metric with 25% area coverage, on the grounds that it would increase flexibility and reduce uncertainty for licensees, "thereby encouraging the continuing introduction of new services."[16] CTIA, opposing the proposal, argues that a geographic area metric would "stifle experimentation and innovation of 5G use cases."[17] CCA agrees "that a geographic performance metric is preferable" at this time, but argues it is too soon to adopt "further supplemental requirements."[18] T-Mobile believes it is too soon to adopt a performance metric for IoT or innovative services,[19] and it also opposes any "supplemental" metrics.[20]

7. Other commenters suggest a wholesale change in our established performance requirements regime. CTIA suggests a "representative, non-exhaustive list of flexible options," reminiscent of the substantial service standard we abandoned in the 2016 *Report and Order*.[21] AT&T supports a substantial service regime, with case-by-case review for all licenses,[22] and T-Mobile also argues for universal case-by-case review.[23] Another commenter suggests that "the existing area and population based performance requirements for UMFUS licenses would preclude deployment of many new IoT-type applications and services," and it offers site-based licensing as the most appropriate alternative.[24] CTA suggests that "[o]ne way to provide flexibility [would be] to recognize multiple safe harbor benchmarks,"[25] which is in fact our current regime.[26]

8. *Discussion.* We adopt a geographic area metric for UMFUS licenses, to be included in the existing list of performance metrics from which licensees may choose, as an additional alternative to

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service must demonstrate it has at least one link in operation and is providing service for each 67,000 population within the license area. 47 CFR § 30.104(a). Showings that rely on a combination of multiple types of service will be evaluated on a case-by-case basis. 47 CFR § 30.104(b).

[13] 47 CFR §§ 101.17, 101.1011 (2015).

[14] *FNPRM*, 31 FCC Rcd at 8174-75, paras. 467-69.

[15] *2nd FNPRM*, 32 FCC Rcd at 11020-22, paras. 98-104.

[16] Verizon Comments at 2-4.

[17] CTIA Comments at 11. Subsequently, however, CTIA indicated that it supported language indicating that the geographic area performance requirement is but one option for a licensee to satisfy its performance obligation. CTIA May 29, 2018 *Ex Parte* at 3.

[18] CCA Comments at 3-4.

[19] T-Mobile Comments at 7-9.

[20] T-Mobile Reply Comments at 10-11.

[21] CTIA Comments at 11.

[22] AT&T Comments at 8.

[23] T-Mobile Comments at 9.

[24] Huawei Comments at 4.

[25] CTA Comments at 6.

[26] *See* 47 CFR § 30.104. Although the Commission has avoided referring to these metrics as "safe harbors," in order to reduce confusion between our current regime and substantial service, the current rules do contain a list of multiple benchmarks from which licensees may choose.

meeting the Commission's performance requirements.[27] Consistent with the option on which we sought comment in the *2nd FNPRM*, licensees may fulfill the requirements of this metric either by demonstrating mobile or point-to-multipoint coverage of at least 25% of their license's geographic area, or by showing the presence of equipment transmitting or receiving on the licensed spectrum in at least 25% of census tracts within the license area.[28] We believe the 25% level would maintain parity with the 40% population coverage metric. As with our previously-adopted metrics, equipment must be in use and actually providing service, either for private, internal use or to unaffiliated customers, in order to be counted.[29] This metric, like our previously-adopted metrics, may be used by any UMFUS licensee, regardless of the type of service deployed.[30]

9. We emphasize that this geographic area metric is an additional alternative for licensees, not a supplemental requirement. If a licensee deploying IoT systems finds that our existing mobile or fixed metrics better fit their needs, it is welcome to use either of those metrics instead. As the Commission has emphasized since the *R&O*, all licensees may choose the particular metric they wish to satisfy,[31] and the adoption of this metric merely expands their list of choices. Without the adoption of this additional choice of metric, licensees would have only the mobile or fixed options through which to demonstrate their compliance with our performance requirements.[32] While we continue to support the Commission's previous conclusion that it is too soon to design a *usage-based* metric that will be technology- and use case-neutral,[33] we believe it is important to provide some additional option for UMFUS licensees whose deployments may not track residential population, or that may not involve traditional higher-power fixed links, as will likely be the case for some IoT-type services.[34] Our adoption of a geographic area metric is responsive to the calls from commenters for greater flexibility. In the interest of providing licensees with as much flexibility and certainty as possible in advance of our contemplated auctions of UMFUS spectrum, we do not believe it is appropriate to delay the adoption of an additional choice of metric to future rounds of this proceeding.

10. The objections raised by, and alternative suggestions offered by commenters, are not persuasive. With respect to calls for entirely different regimes, such as substantial service or site-based licensing, the Commission has already determined that geographic area licensing with the performance requirements that the Commission adopted in the *Report and Order* strikes the best balance between flexibility for licensees and accountability in ensuring efficient use of mmW spectrum.[35] We note that the Commission has also designated a total of fourteen gigahertz of unlicensed spectrum in the mmW bands, and that we seek further comment today on the sharing regime we have adopted for the lower 37 GHz band.[36]

B. Operability in the 24 GHz Band

11. *Background*. The 24 GHz band consists of two band segments: the lower segment, from 24.25-24.45 GHz, and the upper segment, from 24.75-25.25 GHz. In the *2nd R&O*, the Commission

[27] *See* 47 CFR §§ 30.104(a), (c).

[28] *See 2nd FNPRM*, 32 FCC Rcd at 11021, paras. 100-01.

[29] *See R&O*, 31 FCC Rcd at 8089, para. 208; 47 CFR § 30.104(a).

[30] *See R&O*, 31 FCC Rcd at 8088, para. 203; *2nd R&O*, 32 FCC Rcd at 11007-08, paras. 61, 65.

[31] *See R&O*, 31 FCC Rcd at 8088, para. 203; *2nd FNPRM*, 32 FCC Rcd at 11021, para. 103.

[32] *See* 47 CFR § 30.104(a). Licensees may also demonstrate compliance through an operational satellite earth station, but this option is presumably unattractive to providers of terrestrial services. *See* 47 CFR § 30.104(c).

[33] *See 2nd R&O*, 32 FCC Rcd at 11007-08, paras. 62-64.

[34] *See, e.g.*, Verizon Comments at 2-4.

[35] *See MO&O*, 31 FCC Rcd at 11064, para. 231.

[36] *See R&O*, 31 FCC Rcd at 8062-66, paras. 125-31; Section V.B, *infra*.

adopted UMFUS licensing and technical rules for the 24 GHz band.[37] The Commission also proposed to adopt an operability requirement for the 24 GHz band.[38] Under this requirement, any mobile or transportable equipment capable of operating in any portion of the 24 GHz band must be capable of operating at all frequencies within the 24 GHz band, in both band segments.[39]

12. Most commenters support an operability requirement for this band;[40] they argue that operability would increase competitive access to the band by smaller carriers[41] and increase efficient use of the spectrum by ensuring that no band segment is left without a device ecosystem.[42] CTIA and T-Mobile do not object to an operability requirement, so long as its adoption does not delay an auction of the 24 GHz band.[43] One commenter supports the requirement, but also asserts that the filtering signals from the intervening portion of the band (*i.e.*, in 24.45-24.75 GHz) could degrade quality of service in 24 GHz UMFUS band if services in 24.45-24.75 GHz are too different or operate at too high a power level.[44] No commenters oppose our proposal.

13. *Discussion*. We adopt our proposal to require operability throughout the 24 GHz band. Any mobile or transportable equipment capable of operating on any frequency between 24.24-24.45 GHz or 24.75-25.25 GHz must be capable of operating on all frequencies in those ranges. This requirement will support competition by ensuring a robust device ecosystem throughout the band. Given the separation of the 24 GHz band into two different segments, we believe an operability requirement is important to supporting development of the lower portion of the band.

14. We reiterate that this operability requirement in no way dictates the use of any particular technology or air interface.[45] We also emphasize that this operability requirement is specific to the 24 GHz band, and does not extend to other UMFUS bands. The 28 GHz band and the 37 and 39 GHz bands also have operability requirements,[46] but those are separate and independent from the one we adopt today for the 24 GHz band. Devices are not required to operate across all UMFUS bands. While one commenter expresses concern about the ability to filter signals from the 24.45-24.75 GHz band, it ultimately supports the operability requirement, and it does not provide any technical analysis in support of its concern.[47]

15. In addition, as the Commission noted in the *2nd R&O*, ongoing international studies include analyses to determine IMT-2020 out-of-band emission limits necessary to protect passive sensors onboard weather satellites in the 23.6-24.0 GHz band.[48] The Commission recognizes the need to protect these passive satellite operations that provide important data necessary for weather predictions and warnings. Given that this is a matter of interest to multiple stakeholders internationally and that we cannot predict the outcome, we find it inappropriate to adopt U.S.-only limits that may need to be

[37] *2nd R&O*, 32 FCC Rcd at 10994-11002, paras. 15-42.

[38] *2nd FNPRM*, 32 FCC Rcd at 11022-23, paras. 107-108.

[39] *2nd FNPRM*, 32 FCC Rcd at 11023, para. 108.

[40] *See, e.g.*, AT&T Comments at 10-11; CTA Comments at 6.

[41] *See* CCA Comments at 8-9; Starry Comments at 5; T-Mobile Comments at 10; GeoLinks Reply at 3-4; WISPA Reply at 4-5.

[42] *See* Nokia Comments at 4; T-Mobile Comments at 10; U.S. Cellular Comments at 2-5.

[43] *See* CTIA Comments at 15-16; T-Mobile Reply at 9.

[44] Huawei Comments at 6-8.

[45] *See* CTIA May 29, 2018 *Ex Parte* at 2.

[46] 47 CFR § 30.208.

[47] Huawei Comments at 6-7.

[48] *2nd R&O*, 32 FCC Rcd at 10997, para. 22.

modified at a later time. Once interference protection standards are agreed upon internationally we will, if necessary, consider through notice and comment whether any modification of our current out-of-band limits may be needed. We encourage non-Federal operators in the 24 GHz band to monitor these studies and to plan their systems, to the extent possible, to take into account the potential for additional future protection of passive sensors in the 23.6-24.0 GHz band.

C. 24 GHz FSS Sharing

16. *Background.* The U.S. Table of Frequency Allocations (U.S. Table) currently includes primary, non-Federal, Fixed, Mobile and Fixed-Satellite Service (FSS) (Earth-to-space) allocations in the 24.75-25.25 GHz band.[49] Footnote NG535 to the U.S. Table provides feeder links in the Broadcasting-Satellite Service (BSS) priority over other FSS uses in the 24.75-25.05 GHz band segment, and restricts FSS use of the 25.05-25.25 GHz band segment to feeder links for the BSS.[50] In the *2nd R&O* the Commission adopted a primary Fixed Service allocation in the 24.75-25.05 GHz band segment, added a primary Mobile Service allocation in the 24.75-25.25 GHz band segment, and authorized both mobile and fixed operations in those bands under the Part 30 UMFUS rules.[51] The Commission did not make changes to its current rules at that time, but decided instead to seek comment in the *2nd FNPRM* in conjunction with a proposal to allow more flexible use of the band for FSS earth stations.[52]

17. In the *2nd FNPRM*, the Commission proposed to license FSS earth stations in 24.75-25.25 GHz band on a co-primary basis under the provisions contained in Section 25.136(d), which currently applies to the 47 GHz band, by adding the 24.75-25.25 GHz band to this rule section.[53] This change would limit availability of the 24.75-25.25 GHz band for FSS to individually-licensed FSS earth stations that meet the same specific licensing requirements applicable to earth stations in the 47 GHz band.[54] We also sought comment on adding a U.S. Table footnote specifying the relative interference protection obligations of FSS and UMFUS stations in this band.[55] In addition, we proposed various conforming modifications to certain earth station application requirements.[56] The Commission sought comment on these proposals and on possible actions needed to address the potential for aggregate interference from terrestrial users into satellite systems in the band.[57]

18. Commenters generally support licensing FSS earth stations in the 24.75-25.25 GHz band under the provisions of Section 25.136, but express varying opinions regarding the specific conditions under which such earth stations should be authorized.[58] SIA, EchoStar and Hughes support the Commission's proposal based on the rule applicable to the 47 GHz band as an appropriate balance

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[49] *See* 47 CFR. § 2.106.

[50] *See* 47 CFR. § 2.106, n. NG535.

[51] *2nd R&O,* 32 FCC Rcd at 10994-11000, paras. 15-35.

[52] *Id.* at 11000-11001, paras. 37-38.

[53] *2nd FNPRM* 32 FCC Rcd at 11019, para. 94.

[54] These include limitations on population covered, number of earth station locations in a PEA, and a prohibition on earth stations in places where they would preclude terrestrial service to people or equipment that are in transit or are present at mass gatherings. *2nd FNPRM* 32 FCC Rcd at 11019, para. 94.

[55] *2nd FNPRM* 32 FCC Rcd at 11019, para. 94.

[56] Specifically, we proposed changes to Sections 25.115(e) and 25.130(b), and to delete as obsolete the licensing requirements for the 25.05-25.25 GHz band specified in Section 25.203(l). 47 CFR §§ 25.115(e), 25.130(b), 25.203(l).

[57] *2nd FNPRM* 32 FCC Rcd at 11019, paras. 94-95.

[58] CTIA Comments at 12-13; SIA Comments at 7-9; Comments of AT&T at 6-7.

between the spectrum needs of FSS and terrestrial services.[59] By contrast, CTIA and AT&T recommend adopting FSS earth station licensing rules consistent with those governing the 27.5-28.35 GHz band where FSS is secondary to UMFUS, except for FSS operations associated with earth stations authorized pursuant to 47 CFR Section 25.136, and earth station licensing requirements are based upon a county-wide UMFUS license area.[60] CTIA argues that the 47 GHz band sharing criteria are "inferior" to those in the 27.5-28.35 GHz band, citing the underlying area size for which the criteria are applied, and it further argues that because FSS use is not widespread, satellite operators should be expected to undertake more extensive coordination.[61] CCA advocates generally for clear guidelines to protect UMFUS use of the band.[62]

19. Commenters also disagree on our proposal to add a footnote to the Table of Allocations setting out the relative interference protection obligations among services in the band. SIA supports the proposal and suggests that the Commission extend applicability of footnote NG65,[63] which is currently applied to the 47 GHz band, by adding the 24.75-25.25 GHz band.[64] CTIA counters that there is no evidence demonstrating that such a footnote is appropriate or necessary.[65] CTIA proposes instead a new footnote that would identify a number of shared frequency bands available "predominantly for terrestrial mobile and fixed services on a primary basis."[66] CTIA argues that this footnote would provide regulatory certainty that the identified bands are intended primarily for terrestrial services implementation.[67] Finally, CTIA, Nokia and T-Mobile all argue that there is no basis for the Commission to revisit its earlier decision concerning the establishment of an aggregate interference limit.[68] SIA, in contrast, asks the Commission to ensure that UMFUS operating parameters adequately protect spacecraft operating in the 24.75-25.25 GHz band from aggregate interference.[69]

20. To provide for more flexible FSS use of the 24.75-25.25 GHz band, the Commission proposed to eliminate footnote NG535, thereby making this band available for general FSS uplink operations without restricting these operations to, or affording priority for, the provision of feeder links

[59] SIA Comments at 6-8; SIA Reply Comments at 1; EchoStar-Hughes Reply Comments at 2-3. Both SIA and Hughes expressed particular support for grandfathering of protections for currently licensed, or pending applications for, BSS feeder link earth stations as would be afforded in the proposed rule.

[60] CTIA Comments at 14; CTIA Reply Comments at 9-10; AT&T Comments at 7; T-Mobile Reply Comments at 12. Rules addressing earth station licensing in the 27.5-28.35 GHz band are contained in Section 25.136(a) of the Commission's rules. 47 CFR § 25.136(a).

[61] CTIA Reply Comments at 14.

[62] These guidelines would include limitations on population covered and earth station numbers within a PEA as well as earth station locations in places where they would preclude terrestrial service to people that are in transit or assembled at mass gatherings. CCA Comments at 9-10.

[63] NG65 currently applies to the 47.2-48.2 GHz band and states that "[i]n the band 47.2-48.2 GHz, stations in the fixed and mobile services may not claim protection from individually licensed earth stations authorized pursuant to 47 C.F.R. 25.136. However, nothing in this footnote shall limit the right of UMFUS licensees to operate in conformance with the technical rules contained in 47 C.F.R. Part 30. The Commission reserves the right to monitor developments and to undertake further action concerning interference between UMFUS and FSS, including aggregate interference to satellite receivers, if appropriate." 47 CFR § 2.106, n. NG65.

[64] SIA Comments at 8.

[65] CTIA Reply Comments at 8.

[66] CTIA Comments at 12-13; CTIA Reply Comments at 8. In addition to the 24.74-25.25 GHz band, CTIA's proposed footnote would also specify the 24.25-24.45 GHz, 27.5-28.35 GHz, 37-40 GHz and 47.2-48.2 GHz bands.

[67] CTIA Reply Comments at 8.

[68] Nokia comments at 3-4; CTIA Comments at 13-14; T-Mobile Comments at 7; T-Mobile Reply Comments at 14.

[69] SIA Comments at 7.

for 17/24 GHz BSS space stations.[70] To further increase flexibility for all FSS uses in this new sharing regime, we also proposed to eliminate the Appendix F[71] orbital-location restrictions for 17/24 GHz BSS space stations specified in Section 25.262(a), thus providing more flexibility to these BSS operations.[72] Consistent with these proposals, we proposed several other rule changes to part 25 of our rules to harmonize the treatment of BSS feeder links with other FSS transmissions.[73]

21. The majority of commenters support our proposals to increase FSS flexibility in the 24.75-25.25 GHz band by eliminating footnote NG535 and removing the Appendix F orbital-location restrictions.[74] Although generally supporting increased FSS flexibility, AT&T argues that the same flexibility could be achieved by retaining the BSS feeder link priority relative to other FSS operations in the 24.75-25.05 GHz portion of the band, and it proposes deleting only subsection (b) of footnote NG535.[75] T-Mobile and CTIA oppose the Commission's proposal to afford additional flexibility for FSS operations. They argue that we should not create additional opportunities for FSS operations in mmW

[70] *2nd FNPRM* 32 FCC Rcd at 11019, para. 94.

[71] *Establishment of Policies and Service Rules for the Broadcasting-Satellite Service at the 17.3-17.7 GHz Frequency Band and at the 17.7-17.8 GHz Frequency Band Internationally, and at the 24.75-25.25 GHz Frequency Band for Fixed-Satellite Services Providing Feeder Links to the Broadcasting-Satellite Service and for the Satellite Services Operating Bi-directionally in the 17.3-17.8 GHz Frequency Band,* Report and Order, 22 FCC Rcd 8842 (2007) (*17/24 GHz BSS Report and Order*), on reconsideration, 22 FCC Rcd 17951 at 17972, Appendix F. *See also*, *17/24 GHz BSS Report and Order*, at 8869-70, para. 66. We will maintain the four-degree spacing framework for the 17.3-17.8 GHz (space-to-Earth) operations outlined in the *17/24 GHz BSS Report and Order*.

[72] *2nd FNPRM*, 32 FCC Rcd at 11019, para. 94.

[73] Specifically, we proposed the following rule changes: (1) modify Section 25.138 to extend applicability of the Ka-band off-axis EIRP density limits in paragraph (a) to the 24.75-25.25 GHz band, and then to eliminate the nearly identical BSS feeder link-specific earth station off-axis EIRP density limits for the 24.75-25.25 GHz band in Section 25.223(b); (2) add the 24.75-25.25 GHz band to the list of frequency bands in our general FSS earth station coordination rules in Section 25.220(a), thereby permitting us to eliminate the coordination provisions contained in Sections 25.223(c) and (d); (3) remove and reserve Section 25.223, because there would be no need for these provisions, which provide an alternative means of licensing BSS feeder links, and also eliminate cross references to Section 25.223 contained in Section 25.209(f); (4) eliminate Section 25.204(e)(4), which contains rain fade specifications specific to 17/24 GHz BSS feeder link transmissions, and instead include the 24.75-25.25 GHz band in paragraph (e)(3), which contains nearly identical Ka-band FSS rain fade specifications; (5) modify the interference-showing requirements for FSS applicants in Section 25.140(a) to make clear its applicability to FSS (Earth-to-space) transmissions to 17/24 GHz BSS space stations; (6) add a new subparagraph (iv) to Section 25.140(a) requiring applicants for space stations receiving uplinks in the 24.75-25.25 GHz band to certify, among other things, that the earth stations transmitting to such space stations will not exceed the off-axis EIRP density limits in Section 25.138(a); (7) modify the definitions of "routine processing or licensing" and "two-degree compliant space station" contained in Section 25.103; (8) eliminate the operational requirements associated with the Appendix F orbital-location constraints in Section 25.262 by deleting paragraphs (a) and (d), and modifying paragraphs (b) and (e); (9) modify Sections 25.140(b), (c) and (d) to reflect changes in the interference showing required by 17/24 GHz BSS applicants, which is currently defined in part by the applicant's orbital position relative to Appendix F locations; (10) delete Section 25.262(b) to eliminate an operational requirement made moot; (11) delete Appendix F specific requirements contained in Section 25.114(d)(17); (12) eliminate a reference in Section 25.114(d)(7) to a deleted subparagraph in Section 25.140(b); and (13) modify the cross-polarization isolation requirement in Section 25.210(i) to making clear that it applies only to 17/24 GHz BSS space-to-Earth transmissions, to provide for consistent treatment of 17/24 GHz feeder uplinks with other FSS transmissions in the 24.75-25.25 GHz band. *2nd FNPRM*, 32 FCC Rcd at 11019-20, paras. 96-97.

[74] AT&T Comments at 6-7; CCA Comments at 9-10; SIA Comments at 8-10; SIA Reply Comments at 1; EchoStar-Hughes Reply Comments at 4; SES Reply Comments at 3-5.

[75] AT&T Comments at 6-7. AT&T's proposal would retain subsection (a) of NG535 which states that in the band 24.75-25.05 GHz, feeder links to stations of the broadcasting-satellite service have priority over other uses. Such other uses must protect and may not claim protection from existing and future operating feeder-link networks to such broadcasting satellite stations. 47 CFR § 2.106, n. NG535.

bands, that satellite has failed to justify a need for broader FSS use in the band, and that we should limit FSS sharing with UMFUS in the 24.75-25.25 GHz band to earth stations that exist today.[76]

22. *Discussion.* After review of the record, we modify the FSS earth station licensing proposal set out in the *2nd FNPRM* so as to better provide FSS with additional capacity for satellite services while permitting substantial terrestrial use of the band. As with the 28 GHz and 47 GHz bands, we find generally that allowing a limited number of FSS earth stations in the 24.75-25.25 GHz band would further the public interest, and therefore provide for sharing of the 24.75-25.25 GHz band by UMFUS and FSS earth stations, including BSS feeder link earth stations. Based on the record, we adopt rules that incorporate certain sharing criteria applicable in the 27.5-28.35 GHz and 47.2-48.2 GHz bands. Specifically, we apply the permitted aggregate population limits within the specified earth station PFD contour on a per-county basis, similar to the requirement in the 27.5-28.35 GHz band,[77] rather than the per-PEA limits applicable to the 47.2-48.2 GHz band. Additionally, as in the 47.2-48.2 GHz band, we adopt constraints on the number of permitted earth stations not only in the county but also in the UMFUS licensing area (PEA) in which the earth station is located.[78] To reflect these requirements, we adopt a new rule section 25.136(e), which we find includes sufficient defined restrictions on earth station operations consistent with CCA's request.

23. We will not adopt any operational requirements addressing limits on aggregate interference into satellite receivers at this time, as we do not believe such limits are justified by the current record, and we received no specific proposals for such a rule.[79] We will amend footnote NG65 to the U.S. Table to include the 24.75-25.25 GHz band to make clear the relative interference protection obligations between the co-primary services. We reject CTIA's argument that we should adopt a new footnote stating that certain shared frequency bands are identified predominantly for terrestrial mobile and fixed services on a primary basis. We do not believe that this proposed footnote fulfills our intent to specify accurately the relative interference protection obligations of FSS and UMFUS stations in this band, and further, it would go beyond the scope of this rulemaking by including frequency bands apart from the 24.75-25.25 GHz band (*i.e.*, the 28 GHz, 37 GHz, 39 GHz, and 47 GHz bands). We also adopt the proposed conforming modifications to Sections 25.115(e) and 25.130(b), and delete the obsolete licensing requirements for the 25.05-25.25 GHz band specified in Section 25.203(l).

24. We adopt our proposals to remove footnote NG535. In doing so, we remove the restriction on FSS operations apart from BSS feeder links, in the 25.05-25.25 GHz band segment, and eliminate the priority of BSS feeder links relative to other FSS operations in the 24.75-25.05 GHz band. We also eliminate the Appendix F orbital-location restrictions contained in Section 25.262(a), which should give 17/24 GHz BSS feeder link operators the same flexibility as other FSS operators in the band. FSS use beyond the provision of BSS feeder links is already permitted in the lower portion of the band, and we believe that it will further spectrum efficiency to extend this same flexibility to other types of individually licensed FSS earth stations in the upper band segment. We reject T-Mobile's argument that the Commission should constrain satellite operators' use of the 24.75-25.25 GHz band beyond limits placed on satellite operators in comparable UMFUS bands. Such a position is at variance with the Commission's stated objectives in the *Spectrum Frontiers* proceeding to make available millimeter wave (mmW) bands for flexible wireless deployment while simultaneously adopting rules that will allow the mmW bands to be shared with other uses, including satellite, in bands where there are existing FSS

[76] T-Mobile Comments at 4-5; T-Mobile Reply Comments at 12; CTIA Reply Comments at 8.

[77] 47 CFR § 25.136(a)(4)(ii).

[78] 47 CFR § 25.136(d)(4)(i). These limits are no more than two other earth stations in the same county and no more than 14 other earth stations within the same PEA. There are no limits on the number of earth stations in each PEA in the rule applicable to the 28 GHz band.

[79] We note however, that the Commission retains the authority to monitor developments and intervene to prevent unacceptable interference to satellites if that becomes necessary, but we find no evidence to date that suggests that any such intervention will be necessary.

allocations.[80] We also disagree with AT&T that retention of subsection (a) in footnote NG535 is warranted, as we believe it would only serve to undermine our goals of increasing flexibility of use and spectrum efficiency.[81] AT&T acknowledges that the Commission's two-degree spacing requirements are sufficient to protect BSS feeder links from other FSS operations,[82] and it provides no justification for retaining BSS feeder link priority in the 24.75-25.05 GHz portion of the band.

25. We received no opposition to our proposed rule changes to harmonize the treatment of FSS and BSS feeder link transmissions under our rules, nor any opposition on the associated conforming amendments. Accordingly, we adopt these rule changes as elaborated above, for the reasons set forth in the *2nd FNPRM*.[83] Once the rules become effective, these rule changes will ensure that all FSS transmissions in the 24.75-25.25 GHz band, including BSS feeder link transmissions, are subject to our two-degree spacing requirements. The four-degree spacing regimen applicable to 17/24 GHz BSS downlink transmissions[84] however, will be unaltered, which SIA notes is an important predicate for its support of proposed changes to our rules governing uplink band operations.[85]

D. Lower 37 GHz Band Plan

26. *Background*: In the *R&O*, the Commission adopted rules to permit fixed and mobile terrestrial operation in the 37 GHz band.[86] The Commission also adopted a licensing regime for the 37.6-38.6 GHz portion of the band (Upper 37 GHz Band), which would be licensed in five 200 megahertz blocks on a geographic area basis. Rather than adopting a particular licensing regime for the Lower 37 GHz Band, the Commission made it available for coordinated co-primary sharing between Federal and non-Federal users.[87] The Commission explained that Federal and non-Federal users would access the Lower 37 GHz Band through a coordination mechanism, which it would more fully develop through government/industry collaboration.[88]

27. In the *FNPRM*, the Commission sought comment, among other things, on the appropriate band plan for the Lower 37 GHz. The Commission proposed to establish a 100 megahertz minimum channel size. It also proposed to allow users to aggregate 100 megahertz channels into larger channel sizes up to the maximum of 600 megahertz where available.[89] Starry and T-Mobile support the proposal

[80] *2nd R&O*, 32 FCC Rcd at 10990, paras. 1-2.

[81] We note that AT&T's proposal would not establish BSS feeder link priority relative to other operations in the 25.05-25.25 GHz segment of the 24.75-25.25 GHz band.

[82] AT&T Comments at 6.

[83] *See* n.7171, *supra*. We will not however, include in the amended definition of "routine processing or licensing" in § 25.103 an exclusion for earth stations in the 24.75-25.25 GHz band as originally proposed in the *FNPRM*. Upon further consideration, we do not believe this to be necessary to accurately reflect our licensing procedures. In addition, as a consequence of eliminating the Appendix F orbital-location requirement in § 25.262(a), we also delete § 25.262(c)(2). This provision, which addresses cancelled or surrendered licenses relative specifically to Appendix F orbital locations, is moot.

[84] The 17/24 GHz broadcasting-satellite service operates in the 17.3-17.7 GHz (space-to-Earth) (domestic allocation), 17.3-17.8 GHz (space-to-Earth) (international allocation) and 24.75-25.25 GHz (Earth-to-space) bands. 47 CFR § 25.103.

[85] SIA Comments at 10.

[86] *R&O*, 31 FCC Rcd at 8057, para. 105.

[87] *R&O*, 31 FCC Rcd at 8059, para. 111.

[88] *R&O*, 31 FCC Rcd at 8060, para. 113.

[89] *FNPRM*, 31 FCC Rcd at 8171, para. 454.

to license 100 megahertz channels in the Lower 37 GHz band.[90] No party opposed the proposal.

28. *Discussion*: As discussed in Sections IV.A and V.B *infra*, we affirm the Commission's decision to adopt a co-primary sharing approach for the Lower 37 GHz band and we seek additional comment on the details of that approach. Here, we adopt the Commission's proposal to license the Lower 37 GHz Band as six 100 megahertz channels. This channelization will allow for a sufficient acquisition of spectrum by smaller users while still allowing for aggregation by larger entities. We believe that 100 megahertz channels will be sufficient for a licensee to provide the type of high rate data services, and other innovative uses and applications, contemplated for this spectrum. These smaller channels offer an opportunity to provide low-barrier access to spectrum for new technologies and providers while also enhancing shared access methods and technologies between commercial and Federal users.[91]

E. Mobile Spectrum Holdings

29. *Background.* The *R&O* established a pre-auction, bright-line limit of 1250 megahertz on the amount of mmW spectrum in the 28 GHz, 37 GHz, and 39 GHz bands (*R&O* bands) that an entity could acquire at auction.[92] In the *2nd R&O*, we declined to adopt a similar pre-auction limit on the 24 GHz and 47 GHz bands,[93] primarily because preemptive limits on the amount of spectrum an entity might acquire could unnecessarily inhibit participation at auction and discourage the development of spectrum-intensive services.[94] Moreover, we found that mmW technology currently is at a nascent stage of development and that there was insufficient information to predict the amount of spectrum needed for future still-to-be-developed services.[95] No petitions for reconsideration were filed in response to the Commission's decisions in the *2nd R&O*. In the *2nd FNPRM*, we proposed to eliminate the pre-auction limit of 1250 megahertz that the *R&O* had adopted for the *R&O* bands.[96] Further, in the absence of any pre-auction limits, we sought comment regarding whether we should apply a post-auction case-by-case review on all mmW spectrum available at auction.[97]

30. Verizon and AT&T support the Commission's proposal to eliminate the pre-auction limit for the *R&O* bands.[98] Verizon points to the Commission's finding that bright-line pre-auction limits may restrict unnecessarily the ability of entities to participate in and acquire spectrum in an auction when it declined to adopt a pre-auction limit for the 24 GHz and 47 GHz bands.[99] Verizon and AT&T contend that eliminating the pre-auction limit would facilitate innovation and investment and promote the efficient use of spectrum.[100] Verizon also argues that with such large amounts of mmW spectrum becoming available, no firm could reasonably exclude a competitor by acquiring too much mmW spectrum in

[90] T-Mobile FNPRM Reply Comments at 29-30; Starry, Inc. *ex parte*, filed Jul. 14, 2017, at 3.

[91] Reply Comments of WISPA at 6.

[92] *R&O*, 31 FCC Rcd at 8082, paras. 185-86.

[93] *2nd R&O*, 32 FCC Rcd at 11010-11, paras. 73-74.

[94] *2nd R&O*, 32 FCC Rcd at 11010-11, para. 73.

[95] *2nd R&O*, 32 FCC Rcd at 11010-11, para. 73.

[96] *2nd FNPRM*, 32 FCC Rcd at 11022, para. 105.

[97] *2nd FNPRM*, 32 FCC Rcd at 11022, para. 106; *see also Policies Regarding Mobile Spectrum Holdings Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6133, 6190-91, para. 136 (2014) (*Mobile Spectrum Holdings Order*).

[98] AT&T Comments at 8-9; Verizon Comments at 4-5; AT&T Reply Comments at 4-5; Verizon Reply Comments at 1-2, 4.

[99] Verizon Comments at 4-5; Verizon Reply Comments at 4.

[100] AT&T Comments at 9; Verizon Comments at 5; AT&T Reply Comments at 4-5; Verizon Reply Comments at 1.

certain bands at auction,[101] and that it is too early to know how much bandwidth operators will need to provide customers with innovative 5G services.[102] AT&T maintains that spectrum holding limits potentially prevent a licensee of one mmW band from acquiring needed spectrum in another mmW band, thereby restricting the utility of the bands.[103] Commenters opposing the Commission's proposal argue that pre-auction limits will assist in curbing anti-competitive spectrum aggregation.[104] U.S. Cellular and CCA assert that, absent limits, the largest service providers would have the means and motivation to prevent smaller and regional service providers from acquiring the mmW spectrum they need to serve as a competitive balance, and to ensure that those living in rural and other underserved areas also have an opportunity to benefit from innovative 5G services.[105] CCA contends that because standards for 5G have not yet been established, wireless service providers with unlimited resources have the ability to emerge as dominant players at the outset.[106] Starry maintains that establishing individual bidders' limits in advance of an auction promotes transparency in an auction and provides all bidders with valuable information that facilitates rational bidding.[107]

31. Regarding whether to apply a case-by-case review of post-auction mmW spectrum holdings, Verizon and AT&T contend that such a review is unnecessary and would create uncertainty and complexity resulting in less competitive auctions.[108] AT&T maintains that "the auction mechanism itself inherently ensures that spectrum is put to its highest value use and has resulted in spectrum being acquired by multiple licensees of all sizes."[109] Verizon and AT&T argue that such post-auction analysis is contrary to Section 309 of the Communications Act, which emphasizes the need for clear upfront bidding rules.[110] Verizon points to the language in that Act that states that clear bidding rules are necessary to ensure that parities have sufficient time to develop business plans, assess market conditions, and evaluate the availability of equipment for the relevant services.[111] CCA and U.S. Cellular disagree.[112] CCA asserts that such a case-by-case review would allow for divestitures to address potential competitive harms associated with excessive spectrum aggregation and provide a mechanism by which the Commission can promote competition.[113] U.S. Cellular supports case-by-case review, and proposes a two-tiered framework for determining when the public interest requires the divestiture of licenses in order to address

[101] Verizon Comments at 5; Verizon Reply Comments at 5.

[102] Verizon Comments at 5.

[103] AT&T Comments at 9.

[104] CCA Comments at 5-6; Starry Comments at 3-4; T-Mobile Comments at 15-16; U.S. Cellular Comments at 6-7; GeoLinks Reply Comments at 2-3; Starry Reply Comments at 4-5; T-Mobile Reply Comments at 4-6; WISPA Reply Comments at 2-3.

[105] CCA Comments at 7-8; U.S. Cellular Comments at 6; *see also* GeoLinks Reply Comments at 3; Starry Reply Comments at 4; WISPA Reply Comments at 3.

[106] CCA Comments at 6; *see also* Starry Reply Comments at 5; WISPA Reply Comments at 3.

[107] Starry Comments at 3.

[108] AT&T Comments at 9; Verizon Comments at 7; AT&T Reply Comments at 7; Verizon Reply Comments at 5-6.

[109] AT&T Comments at 9; AT&T Reply Comments 8.

[110] AT&T Comments at 9-10; Verizon Comments at 7; AT&T Reply Comments at 7; Verizon Reply Comments at 5-6.

[111] Verizon Comments at 7.

[112] CCA Comments at 6; U.S. Cellular Comments at 9; *see also* Starry Comments at 3-4.

[113] CCA Comments at 6; *see also* Starry Comments at 4.

any competitive harms identified in the Commission's review.[114]

32. *Discussion*. We adopt our proposal in the *2nd FNPRM* to eliminate the pre-auction limit of 1250 megahertz for the 28 GHz, 37 GHz, and 39 GHz bands. In the *R&O*, the Commission indicated that its consideration of whether to adopt a mobile spectrum holdings limit for the licensing of spectrum through competitive bidding – and, if so, what type of limit – would take into account several objectives, including: the promotion of competition in relevant markets; the acceleration of private sector deployment of advanced services; and generally managing the spectrum in the public interest.[115] In reaching its decision to adopt a pre-auction spectrum aggregation limit for the 28 GHz, 37 GHz, and 39 GHz bands, the Commission observed, among other things, that mmW spectrum is likely to be a critical component in the development of 5G and that pre-auction limits could encourage the development of innovative services to the benefit of the American consumer.[116] We continue to recognize that mmW spectrum is an important resource for the deployment of 5G and other advanced wireless services, as evidenced by the steps we take in this *3rd R&O, MO&O, and 3rd FNPRM* to further promote this deployment. We also note that in addition to mmW spectrum, various providers have announced plans to develop 5G in other bands, such as 600 MHz and 2.5 GHz, and have indicated an interest in using 3.5 GHz and 3.7-4.2 GHz for 5G.[117] Overall, we observe that there are a variety of spectral paths to 5G deployment in the United States, and that accelerating this deployment, including through the use of mmW spectrum, is an increasingly important objective given the potential economic benefits.[118]

33. Thus, while technological development in the mmW bands remains in a nascent stage, our balancing of objectives shifts towards facilitating rapid 5G deployment in the United States. In that context, and given our balancing of various statutory objectives, we weigh more heavily the risk that bright-line, pre-auction limits may restrict unnecessarily the ability of entities to participate and acquire spectrum in a mmW band auction. This could, in turn, unnecessarily constrain providers in their paths towards 5G deployment on mmW bands, limit their incentives to invest in these new services, and delay the realization of related economic benefits. We are not inclined to adopt such limits on auction participation absent a clear indication that they are necessary to address a specific competitive concern.[119] In the case of the 28 GHz, 37 GHz, and 39 GHz bands, we are not persuaded by commenters' generalized assertions that a bright-line, pre-auction limit in these bands is necessary to protect competition in the provision of wireless services, particularly in light of our decision below to adopt a post-auction case-by-

[114] U.S. Cellular Comments at 9. Specifically, U.S. Cellular urges the Commission to adopt a rebuttable presumption that total mmW spectrum band holdings in excess of 1850 megahertz or holdings in excess of one-half of the spectrum in a particular band are not in the public interest, and thus, require divestiture. *Id.*

[115] *R&O*, 31 FCC Rcd at 8081, para. 183. *See also* 47 U.S.C. § 309(j)(3).

[116] *R&O*, 31 FCC Rcd at 8082, 8085 paras. 184, 185.

[117] *See e.g.*, Press Release, T-Mobile, T-Mobile Building Out 5G in 30 Cities This Year …and That's Just the Start (Feb. 27, 2018), https://newsroom.t-mobile.com/news-and-blogs/mwc-2018-5g.htm; Press Release, Sprint, Sprint Unveils Six 5G-Ready Cities: Significant Milestone Toward Launching First 5G Mobile Network in the U.S. (Feb. 27, 2018), http://newsroom.sprint.com/sprint-unveils-5g-ready-massive-mimo-markets.htm; CTIA Ex Parte Presentation, *Promoting Investment in the 3550-3700 MHz Band*, GN Docket No. 17-258; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183*; Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band*, GN Docket No. 18-122 (May 30, 2018) at 1.

[118] *See e.g.*, 47 U.S.C. § 309(j)(3) (requiring Commission to promote various objectives as part of its competitive bidding spectrum policies, including "the development and rapid deployment of new technologies, products, and services for the benefit of the public, including those residing in rural areas, without administrative or judicial delays"). *See also*, *e.g.*, Letter from Scott K. Bergmann, CTIA, to Marlene H. Dortch, FCC, GN Docket No. 14-177, Attach. "The Global Race to 5G" at 2 (filed April 17, 2018) (noting that, according to Accenture, "American's wireless industry is ready to invest $275 billion to deploy next generation 5G networks" and "adding $500 billion to our economy.").

[119] *See 2nd R&O*, 32 FCC Rcd at 11010, para. 73.

case review of spectrum in the UMFUS bands.[120] We emphasize that the Commission has adopted rules to facilitate flexible terrestrial wireless use of 4950 megahertz of mmW spectrum across five bands, which will be licensed in multiple blocks of different sizes and geographic areas, providing many spectrum opportunities for various types of auction bidders. In addition, given the similar technical characteristics and potential uses of the mmW spectrum for the *R&O* bands – relative to the 24 GHz and 47 GHz bands – we see no reason to reach a different conclusion regarding a pre-auction limit for the *R&O* bands than we reached for the 24 GHz and 47 GHz bands. Moreover, treating certain UMFUS bands differently from others for purposes of a pre-auction limit would be inconsistent with our policy of treating *all* five UMFUS bands the same for purposes of secondary market transactions.[121] We therefore conclude that entities bidding for licenses in the 24 GHz, 28 GHz, 37 GHz, 39 GHz, and 47 GHz bands should not be subject to bright-line, pre-auction limits on the amount of spectrum they may acquire at an auction of these bands. Consistent with our rationale in the *2nd R&O*, we conclude that this approach will maximize the opportunities in these bands for putting this mmW spectrum to efficient use.

34. Although we will not apply an *ex ante* bright-line limit to the acquisition of spectrum in the five UMFUS bands through auction, we will conduct an *ex post* case-by-case review to the acquisition through auction of spectrum in the UMFUS bands. In particular, we find that it is in the public interest to review applications for initial licenses filed post-auction on a case-by-case basis using the same 1850 megahertz threshold we use for reviewing applications for secondary market transactions. As noted above, we continue to recognize that mmW spectrum is an important resource for the deployment of 5G and other advanced wireless services, as we acknowledged in retaining the mmW spectrum threshold for secondary markets.[122] Applying a post-auction case-by-case review will provide an opportunity to evaluate whether an applicant's post-auction spectrum holdings would result in excessive concertation of licenses, in a manner consistent with our obligations under Section 309(j)(3)(B). Moreover, we find that applying a case-by-case review to initial applications for spectrum won at auction is necessary to ensure that the public interest benefits of having a mmW spectrum threshold for reviewing proposed secondary market transactions are not rendered ineffective. In addition, unlike a bright-line pre-auction limit, a post-auction case-by-case review will provide flexibility to bidders and facilitate the assignment of licenses to those who value them the most. As is the case for the mmW spectrum threshold applied to secondary market transactions, the threshold we will apply to review initial applications for spectrum won at auction merely identifies those markets that may warrant further competitive analysis.

35. We intend to conduct the same type of case-by-case review that the Commission anticipated in 2001 when it eliminated the CMRS spectrum cap,[123] and that it articulated in 2008 in the context of the 700 MHz auction (Auction 73),[124] but which it discontinued in the 2014 *Mobile Spectrum*

[120] *See, e.g.*, CCA Comments at 5-6; T-Mobile Comments at 15-16; U.S. Cellular Comments at 6-7.

[121] *Cf. 2nd R&O*, 32 FCC Rcd at 11011, para. 74 (stating "Given that the 24 GHz and 47 GHz bands share similar technical characteristics and potential uses with the 28 GHz, 37 GHz, and 39 GHz bands already included in the mmW spectrum threshold, we will group all five bands together for purposes of applying the mmW spectrum threshold to review secondary market transactions.").

[122] *2nd R&O*, 32 FCC Rcd at 11011, para. 74.

[123] In eliminating the CMRS spectrum cap in 2001 for secondary market transactions, the Commission noted that "to the extent that the initial distribution of spectrum through auction is an issue in the future, that is also amenable to case-by-case review." *2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Radio Services*, Report and Order, 16 FCC Rcd 22668, 22696, para. 54. (2001) (*CMRS Cap Sunset Order*).

[124] *Union Tel. Co. Cellco P'ship d/b/a Verizon Wireless, Applications for 700 MHz Band Licenses, Auction No. 73,* Memorandum Opinion and Order, 23 FCC Rcd 16787, 16791–92, 16796, paras. 9, 18 (2008) (*Union Telephone Order*) ("Although we do not apply this standard competitive analysis to the instant auction applications of Verizon Wireless and Union Telephone, we note that we intend to apply prospectively our standard competitive analysis to spectrum acquired via auction as well as via transactions.").

Holdings Order.[125] Case-by-case review permits bidders to participate fully in a mmW spectrum auction, while still allowing the Commission to assess the impact on competition from the assignment of initial mmW spectrum licenses, and to take appropriate action to preserve or protect competition only where necessary. Thus, for example, the Commission may allow a winning auction bidder to exceed the threshold if it finds that this would not foreclose other competitors from acquiring similar mmW spectrum. Further, as was the case under the Commission's post-auction case-by-case review that previously was applied, in the event that a divestiture is required before issuing any new licenses, the winning bidder likely would have greater flexibility to choose which spectrum to divest among its existing mmW spectrum holdings or winning bids, in a manner that nevertheless would address competitive concerns.

36. In supporting such a case-by-case review, U.S. Cellular proposed a two-tiered public interest framework that relied on band-specific spectrum concentration limits.[126] We reject their proposal for specific in-band limits for similar reasons as we articulated in the *R&O* and *2nd R&O*, where we stated that, either at auction or in the secondary market, separate band-specific limits are not necessary.[127] Further, we disagree with commenters that allege that a post-auction case-by-case review creates uncertainty that is inconsistent with Section 309(j).[128] The post-auction case-by-case review will be based on the standard articulated in the 2008 *Union Telephone Order*,[129] and we will apply this review to auctions of mmW bands going forward.[130] Spectrum auctions were subject to this kind of review for a number of years before 2014, and we find that it is similarly appropriate with respect to the mmW spectrum. We find that such a case-by-case review provides parties with a clear and familiar standard that the Commission and Bureau have used, and continue to use, in reviewing proposed secondary market transactions currently.[131] In that regard, we find that post-auction case-by-case review is likely to create sufficient bidder certainty consistent with Section 309(j)(3)(E) of the Communications Act, which emphasizes the need for clear bidding rules "to ensure that interested parties have a sufficient time to develop business plans, assess marketplace conditions, and evaluate the availability of equipment for the relevant services."[132] In addition, for the reasons discussed above, we find that the adoption of a post-auction case-by-case review for mmW spectrum is the best way to satisfy our obligation under another part of Section 309 to guard against the excessive concentration of licenses.

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[125] *Mobile Spectrum Holdings Order*, 29 FCC Rcd at 6190–92, paras. 136-42.

[126] U.S. Cellular Comments at 9; *see supra* para. 30.

[127] *R&O*, 31 FCC Rcd at 8082, para. 186; *2nd R&O*, 32 FCC Rcd at 11041, para. 162.

[128] Verizon Comments at 7 (stating that Section 309(j)(3)(E) of the Communications Act emphasizes the need for clear upfront bidding rules); AT&T Reply at 7 (arguing that post-auction review would create uncertainty and complexity and runs counter to a statutory requirement for clear, upfront bidding rules).

[129] The Commission indicated that such a case-by-case review would identify the relevant product and geographic markets, evaluate the market participants and input market for spectrum, apply an initial screen to identify specific markets of concern, and use a number of factors to evaluate each market, including: (1) the total spectrum available for mobile telephony use; (2) the particular applicant's portion of available spectrum; (3) licensees in the market and their spectrum holdings; (4) licensees currently providing service in the market; (5) whether current service providers, who may be capacity constrained in the near-term, can access additional spectrum in the market either through auction or on the secondary market; and (6) licensees currently holding spectrum that could enter the market to provide service. *Union Telephone Order,* 23 FCC Rcd at 6793–96, paras. 9-18.

[130] *Union Telephone Order,* 23 FCC Rcd at 16793–96, paras. 9-18 (2008).

[131] *Union Telephone Order,* 23 FCC Rcd at 16791-92, 16796, paras. 9, 18 (stating that "we intend to apply prospectively our *standard competitive analysis* to spectrum acquired via auction as well as via transactions") (emphasis added).

[132] 47 U.S.C. § 309(j)(3)(E).

IV. MEMORANDUM OPINION AND ORDER

A. Licensing Lower 37 GHz

37. *Petitions for Reconsideration*. CTIA,[133] CCA,[134] 5G Americas,[135] TIA,[136] and T-Mobile [137] (Petitioners) filed Petitions for Reconsideration (Petitions) of the *R&O* asking the Commission to reconsider decisions it made regarding the 37 GHz band. First, CTIA, CCA, 5G Americas, and T-Mobile ask the Commission to reconsider its decision to adopt a Shared Access Licensing scheme for the lower band segment in which non-Federal users would be licensed by rule. CTIA, 5G Americas, CCA, and T-Mobile recommend that the Commission instead adopt exclusive area licensing in the 37-37.6 GHz band.[138] Second, 5G Americas and TIA ask the Commission to reconsider its decision that Federal operations should have expansion rights in the Lower 37 GHz band.

38. *Discussion:* We deny the petitions of CTIA, CCA, 5G Americas, TIA, and T-Mobile under Section 1.429(b) of the Commission's rules because the Commission has already considered and rejected the arguments raised by the petitioners in favor of exclusive area licensing.[139] In their comments and reply comments to the *NPRM*, the petitioners urged the Commission to adopt an exclusive area licensing scheme for the 37-37.6 GHz band. [140] In their petitions for reconsideration, they raise no new facts or arguments here. In the *R&O*, the Commission concluded that "[a]lthough there is support in the record to license the entire 37 GHz band by geographic area, we find that it is in the public interest to license a portion of this band on a non-exclusive shared basis, and to license the remainder of the band by geographic area to give potential licensees additional opportunity to access large blocks of spectrum or to use 37 GHz spectrum in combination with, and similarly to, 39 GHz spectrum."[141] The Commission explained that "[a]llowing part of the band to be made available on a non-exclusive, shared basis will promote access to spectrum by a wide variety of entities, support innovative uses of the band, and help ensure that spectrum is widely utilized."[142] The Commission further explained that "[a]dopting geographic area licensing for the other portion of the band will expeditiously make spectrum available and allow common development of the 37 GHz and 39 GHz bands."[143] Thus, we will not reconsider the Commission's decision to adopt a co-primary sharing scheme for the 37-37.6 GHz band and we reaffirm the Commission's decision in the *Report and Order*.

39. We reject CTIA's argument that the Commission's action was arbitrary and capricious because the Commission did not "provide reasoning for adopting an untested sharing model that requires licensees to coordinate with Federal parties, the latter of which has proven to be highly successful for the

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[133] CTIA Petition.

[134] CCA Petition.

[135] 5G Americas Petition.

[136] TIA Petition.

[137] T-Mobile Petition.

[138] 47 CFR § 2.106 n.US151.

[139] 4G Americas Comments to the NPRM at 14. CTIA Comments to the NPRM at 17. T-Mobile Comments to the NPRM at 13. CCA Reply Comments to the NPRM at 5-6.

[140] 4G Americas Comments to the NPRM at 14. CTIA Comments to the NPRM at 17. T-Mobile Comments to the NPRM at 13. CCA Reply Comments to the NPRM at 5-6.

[141] Spectrum Frontiers *R&O* and Further Notice of Proposed Rulemaking, WT Docket N0, 10-112, 31 FCC Rcd at 8059 para. 112.

[142] *R&O*, 31 FCC Rcd at 8059, para. 112.

[143] *R&O*, 31 FCC Rcd at 8059, para. 112.

AWS-1 and AWS-3 bands."[144] In the *R&O*, the Commission explained that the sharing approach it adopted best enables "the band to be used for new commercial uses while simultaneously allowing fixed and mobile Federal use to expand."[145] The Commission added that "[a]llowing part of the band to be made available on a non-exclusive, shared basis will promote access to spectrum by a wide variety of entities, support innovative uses of the band, and help ensure that spectrum is widely utilized."[146] The Commission further stated that the approach it adopted provided "satellite operators the certainty they need to be able to expand their operations into the 37 GHz band in the future.[147] Nothing in the petitions supports the change in direction suggested by petitioners.

40. In the *R&O*, the Commission directed the Wireless Bureau and Office of Engineering and Technology to collaborate with NTIA and Federal stakeholders, as well as industry stakeholders and other interested parties to further define the sharing framework."[148] Initial collaboration has identified the issues raised in the *3rd FNPRM* adopted today. The *3rd FNPRM* presents another opportunity to open a dialogue about how sharing can best be implemented and achieved in the Lower 37 GHz band prior to the adoption of final sharing rules.[149] We look forward to continuing to work with NTIA, Federal stakeholders, and industry to complete development of the sharing mechanism.

B. FSS Allocation in 42-42.5 GHz

41. *Background.* In the *R&O*, the Commission declined to allocate the 42 GHz band for fixed satellite service (FSS) downlink operations.[150] It concluded there was less reason to expand FSS operations into the 42 GHz band given that it was already granting FSS enhanced access to the 37.5-40 GHz band and because FSS has exclusive access to the 40.5-42 GHz band.[151] Rather, the Commission saw greater value in making the band available exclusively for terrestrial use.[152]

42. Various satellite interests sought reconsideration of that decision.[153] ViaSat asserts that "the 42-42.5 GHz band segment could be used in connection with the downlink spectrum that currently is available for satellite use in the adjacent 37.5-42 GHz band segment to achieve increased satellite broadband network capabilities that will be needed to meet this exponentially expanding consumer demand."[154] ViaSat, SES, and O3b argue that providing satellite access to the 42 GHz band also comes with an established public interest benefit - helping to bridge the digital divide in rural America.[155]

43. O3b asserts that allocating the band to FSS use would be consistent both with the record, which demonstrates a need for 5 gigahertz of uplink and downlink spectrum for FSS use in the V-Band

[144] CTIA Reply at 8-9. *See also* T-Mobile's Petition at 6-7 (there are already established and successful mechanisms for Federal users to share with non-Federal licensees in the AWS-1 and AWS-3 bands).

[145] *R&O*, 31 FCC Rcd at 8059, para. 112.

[146] *R&O*, 31 FCC Rcd at 8059, para. 112.

[147] *R&O*, 31 FCC Rcd at 8059, para. 112.

[148] *R&O*, 31 FCC Rcd at 8060, para. 115.

[149] *R&O*, 31 FCC Rcd at 8060, para. 115.

[150] *R&O*, 31 FCC Rcd at 8144, para. 368.

[151] *R&O*, 31 FCC Rcd at 8144, para. 368.

[152] *R&O*, 31 FCC Rcd at 8144, para. 368.

[153] *See, e.g.* ViaSat Dec. 14, 2016 Petition for Partial Reconsideration at 1-2; Boeing Dec. 14, 2016 Petition for Reconsideration at 21-22; SES and O3b Jan. 31, 2017 Opposition to Petitions for Reconsideration at 14.

[154] ViaSat R&O Recon. Pet. at 8. *See also ViaSat* May 31 *Ex Parte*.

[155] ViaSat R&O Recon. Pet. at 3-4; SES and O3b Recon. Opp. at 13-14.

and with the band's international primary allocation for FSS use in the band.[156] Boeing, ViaSat, Inmarsat, Lockheed Martin, O3b, and SIA argue for satellite access to the 42-42.5 GHz on the ground that FSS access to the 42 GHz band will be necessary to meet the broadband data demands of customers.[157] Others argue the Commission wrongly justified its decision not to grant an FSS allocation in the 42 GHz band on the ground that FSS had enhanced or sufficient access to spectrum at the 37.5-40 GHz and the 40.5-42 GHz bands, and that there was therefore no need for a further satellite allocation.[158]

44. CTIA and T-Mobile respond that the Commission sought general comment at the *NPRM* stage on "the relative merits of using [the 42-42.5 GHz] band for FSS, fixed, or mobile use, or the ability to share among these different uses" as well as "the extent to which different services could share in this band, and what sharing mechanisms, if any, would be appropriate."[159] According to these respondents, the Commission did not fail to seek comment on all the various services to which the band could have been allocated nor did it act without regard to the record in reaching its decision since some satellite petitioners themselves commented in response to the Commission's invitation.[160] T-Mobile concludes the Commission made no legal or factual error in declining to allocate the band for FSS.[161] T-Mobile also disputes the assertion that FSS access to the 37.6-40 GHz band was not enhanced pursuant to the *R&O*, when prior to its issuance FSS deployments at these frequencies had been dependent on obtaining licenses themselves or reaching agreements with license holders.[162] T-Mobile argues that satellite interests have failed to demonstrate that this enhanced access to 37.5-40 GHz band, combined with their priority access to the 40.5-42 GHz band, is insufficient to meet their needs.[163]

45. *Discussion.* We decline to reconsider our decision to not allocate the 42 GHz band for FSS use. Our decision was part of an overall goal to have a balanced strategy for sharing between terrestrial and satellite services in V-band. Given our prior decisions to provide FSS with exclusive access to the 40-42 GHz and 48.2-50.2 GHz bands -- plus shared access to the 37.5-40 GHz and 28 GHz bands, we see nothing arbitrary in reserving 500 megahertz of spectrum for exclusive terrestrial use.[164] Moreover, we note that in the *3rd R&O* above, we provide for shared FSS use of the 24 GHz band. Satellite interests raise no new facts and merely reassert arguments they made previously regarding the need for the 42 GHz band to deploy broadband.[165] They also have not demonstrated that we have committed any error.

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[156] O3b FNPRM Reply Comments at 12 (citing Boeing FNPRM Comments at iii, 9, 11; *see also* ViaSat FNPRM Comments at i, 5, 6).

[157] *See* Boeing FNPRM Comments at 9, 42-43; ViaSat FNPRM Comments at 15-16; Inmarsat FNPRM Comments at 16; Lockheed Martin FNPRM Comments at 3; O3b FNPRM Reply at 12-13; SIA FNPRM Comments at 12; *See also* ViaSat Feb. 24, 2017 Reply to Oppositions to Petitions for Reconsideration at 5. Inmarsat and the Global VSAT Forum both have argued that FSS user terminals should be permitted to receive signals in the 37, 39 and 40-42 GHz bands. Global VSAT Forum Sept. 30, 2014 FNPRM Comments at 4; Inmarsat Oct. 31, 2016 FNPRM Reply Comments at 16.

[158] Boeing R&O Recon. Pet. at 21; ViaSat R&O Recon. Pet. at 5-6.

[159] CTIA Jan. 31, 2017 Opposition to Petitions for Reconsideration at 13 & n.54 (citing *NPRM*, 30 FCC Rcd. at 11904, para. 80); T-Mobile Jan. 31, 2017 Opposition to Petitions for Reconsideration at 19.

[160] CTIA *R&O* Recon. Opp. at 12 & n.51 (citing *R&O*, 31 FCC Rcd. At 8144, para. 366; SIA Feb. 26, 2016 NPRM Reply Comments at 14; Boeing Jan. 28, 2016 NPRM Comments at 9); *see also* T-Mobile R&O Recon. Opp. at 19.

[161] T-Mobile R&O Recon. Opp. at 19.

[162] T-Mobile R&O Recon. Opp. at 19-20 (citing ViaSat R&O Recon. Pet. at 8 ("In fact, the Spectrum Frontiers Order significantly diminished satellite access to the 37.5- 40 GHz band segment.").

[163] T-Mobile R&O Recon. Opp. at 20.

[164] T-Mobile is correct that the *R&O* enhanced FSS access to the 37.5-40 GHz band.

[165] *See* 47 C.F.R. § 1.429(l)(3).

46. The MOBILE NOW Act does not require us to give further consideration to adding an FSS allocation in the 42 GHz band. While the Act asks that we consider how this band may be used to provide "commercial wireless broadband service," including licensed and/or unlicensed service, it also asks that the Commission include technical characteristics under which the band may be employed for "mobile or fixed terrestrial wireless operations, including any appropriate coexistence requirements."[166] By its express language limiting any proposed licensed or unlicensed services in the band to "mobile and fixed terrestrial operations," we find that Congress excluded the alternative of permitting licensed satellite service in the band. Legislative history also indicates that Congress intended such mmW spectrum for "mobile or fixed *terrestrial* wireless operations, including for broadband" without any concomitant discussion of satellite service.[167] Accordingly, we do not believe the MOBILE NOW Act requires that we reconsider permitting satellite service in the 42 GHz band or to consider how this non-terrestrial service could share with any possible licensed and unlicensed terrestrial services on whose coexistence we now seek comment.[168]

V. THIRD FURTHER NOTICE OF PROPOSED RULEMAKING

A. 42-42.5 GHz Band

1. Introduction

47. The 42-42.5 GHz band (42 GHz band) consists of 500 megahertz, allocated to non-Federal fixed and mobile services on a primary basis, and it contains no current Federal allocation or service rules.[169] The adjacent 42.5-43.5 GHz band is allocated to the Radio Astronomy Service (RAS) on a primary basis for Federal and non-Federal use and to the Federal fixed, fixed-satellite (Earth-to-space), and mobile except aeronautical mobile services on a primary basis.[170] The allocations footnote corresponding to the 42.5-43.5 GHz band also requires that any assignments to the stations of other services also allocated to the band take all practicable steps to protect the RAS from harmful interference.[171] Out-of-band signals into allocated radio astronomy bands can cause interference to radio astronomy observations.[172] In its 2016 *FNPRM*, the Commission sought comment on a proposal to authorize flexible fixed and mobile operations in the band under the new Part 30 UMFUS rules, but only on the condition that adjacent channel radio astronomy services (RAS) at 42.5-43.5 GHz could be protected.[173] The *FNPRM* also sought specific comment and detailed study on what protections should be established for this adjacent band – for example, whether out-of-band emission limits into the 42.5-43.5 GHz band should be established or whether it was necessary or appropriate to create a guard band below

[166] MOBILE NOW Act, § 604(b)(2).

[167] *See* Making Opportunities for Broadband Investment and Limiting Excessive and Needless Obstacles to Wireless Act, S. Rep. No. 115-4 at 16 (2017).

[168] We note that in the *3rd FNPRM*, we are seeking further comment, consistent with the MOBILE NOW Act, on commercial wireless broadband use of the 42 GHz band, including sharing in the 42 GHz band. *See* Section V.A, *infra*.

[169] 47 CFR § 2.106.

[170] 47 CFR § 2.106. Footnote US211 urges applicants for airborne or space stations assignments in the 40.5-42.5 GHz band to take all practicable steps to protect radio astronomy observations in the 42.5-43.5 GHz band from harmful interference. 47 CFR § 2.106 n.US211.

[171] 47 CFR § 2.106 n.US342.

[172] We also note that radio astronomy as a service frequently makes use of observations (passive) in bands not allocated to the radio astronomy service. This practice is a result of scientifically valuable signals being subject to the Doppler Effect and shifted in frequency outside radio astronomy-allocated bands.

[173] *FNPRM*, 31 FCC Rcd at 8154, para. 403.

42.5 GHz.[174] In addition to the appropriate licensing and technical rules, the Commission also sought comment on the appropriate band plan for the 42 GHz band – including whether the band should be licensed as a single channel, split into two channels, or split into multiple 100 megahertz channels,[175] – and whether to license the band geographically using Partial Economic Areas (PEAs).[176] Although the Commission received comment on these various issues, in our *3rd FNPRM*, we seek further comment on several of these proposals and issues, in light of recently enacted legislation that addresses the 42 GHz band.

48. The MOBILE NOW Act, passed as part of the RAY BAUM'S Act of 2018[177] provides that, within two years of its enactment, the Commission shall publish an NPRM "to consider service rules to authorize mobile or fixed terrestrial wireless operations, including for advanced mobile service operations," in the 42 GHz band.[178] Section 604(b) of the MOBILE NOW Act provides that, in conducting this rulemaking, the Commission shall: "(1) consider how the band described in subsection (a) may be used to provide commercial wireless broadband service, including whether — (A) such spectrum may be best used for licensed or unlicensed services, or some combination thereof; and (B) to permit additional licensed operations in such band on a shared basis; and (2) include technical characteristics under which the band described in subsection (a) may be employed for mobile or fixed terrestrial wireless operations, including any appropriate coexistence requirements."[179] Consistent with the MOBILE NOW Act, and out of an abundance of caution, we issue this *3rd FNPRM* to seek further comment on how the 42 GHz band could be used to provide commercial wireless broadband service including possible opportunities for unlicensed and/or shared use of the 42 GHz band.

2. Suitability for Mobile and Fixed Use

49. *Background*. We previously proposed to authorize fixed and mobile service operations in the 42 GHz band under the Part 30 UMFUS rules. In response to our *FNPRM*, most commenters generally supported establishing service rules that would allow the band to be flexibly licensed for fixed and mobile operations under Part 30.[180] Qualcomm and T-Mobile argue that flexible use will allow individual licensees to shape the nature of the services they provide.[181] Intel and Samsung argue that authorizing UMFUS expansion in the 42 GHz band would place it within the 'tuning range' of radio equipment designed for the 37-40 GHz bands, accelerating the deployment of technology capable of

[174] *FNPRM*, 31 FCC Rcd at 8154, para. 405.

[175] *FNPRM*, 31 FCC Rcd at 8154, para. 406.

[176] *FNPRM*, 31 FCC Rcd at 8154, para. 403.

[177] Consolidated Appropriations Act of 2018, Pub. L. No. 115-141, 132 Stat. 348, DIVISION P – Repack Airwaves Yielding Better Access for Users of Modern Services (RAY BAUM's) Act of 2018, Title VI Making Opportunities for Broadband Investment and Limiting Excessive and Needless Obstacles for Wireless (MOBILE NOW) Act, § 601, e*t seq.* (2018).

[178] MOBILE NOW Act, § 604(a).

[179] MOBILE NOW Act, § 604(b)(1), (2).

[180] *See* AT&T Sept. 30, 2016 FNPRM Comments at 9; CTIA Sept. 30, 2016 FNPRM Comments at 8-9, 10, 13; CTA Sept. 30, 2016 FNPRM Comments at 4-5; Ericsson Sept. 30, 2016 FNPRM Comments at 2; Facebook Sept. 30, 2016 FNPRM Comments at 4; Nokia Sept. 30, 2016 FNPRM Comments at 5-6; Qualcomm Sept. 30, 2016 FNPRM Comments at 5-6; Samsung Sept. 30, 2016 FNPRM Comments at 3, 5; Straight Path Sept. 30, 2016 FNPRM Comments at 3, 5; TIA Sept. 30, 2016 FNPRM Comments at 3, 11; T-Mobile Sept. 30, 2016 FNPRM Comments at 3, 7 & 13; Verizon Sept. 30, 2016 FNPRM Comments at 3; AT&T Oct. 31, 2016 FNPRM Reply Comments at 3, 7; CTIA Oct. 31, 2016 FNPRM Reply Comments at 5; Qualcomm Oct. 31, 2016 FNPRM Reply Comments at 2-3; Samsung Oct. 31, 2016 FNPRM Reply Comments at 4.

[181] Qualcomm FNPRM Comments at 6; *see also* T-Mobile FNPRM Comments at 15.

serving these bands.[182] CTIA, Ericsson, Intel, and Samsung, among others, point to the ITU's WRC-19 identification of the entire 37-42.5 GHz band as a candidate to study for mobile services, and they argue for similar treatment domestically.[183] Commenters supporting geographic area licensing explained why they believe the alternatives of unlicensed or shared licensed use were not appropriate.[184]

50. Various commenters view the global harmonization of this band, and 5G spectrum generally, as an important step towards greater manufacturing efficiencies and more rapid development and deployment of services.[185] For example, Samsung notes that the Commission has frequently highlighted international harmonization of spectrum as a key policy goal and endorsed its benefits.[186] Commenters present different views, however, on the timing of US action on the band relative to ITU action. One commenter argues the FCC's studying bands like 42 GHz will supplement and advance the study efforts of ITU study groups.[187] Lockheed Martin, however, opposes taking action in bands currently subject to ITU study because the Commission allegedly has provided no evidence it will protect incumbent services in these bands or respect the outcome of these studies.[188] Alternatively, T-Mobile argues the Commission must address domestic wireless capacity requirements and should not await input from the ITU given that the international process can be manipulated to delay the designation of spectrum for terrestrial use.[189]

51. Certain FSS operators argue that the band should be licensed for satellite uses,[190] and they raise arguments similar to those raised in petitions for reconsideration of the Commission's decision not to allocate the 42 GHz band for FSS.[191] FWCC argues the band by itself is too narrow for fixed duplex operations and that, accordingly, the 42 GHz band should be combined with the adjacent 42.5-43.5 GHz

[182] *See* Intel Oct. 31, 2016 FNPRM Reply Comments at 6; Samsung FNPRM Comments at 5.

[183] CTIA FNPRM Comments at 12-13, n.34 (See World Radiocommunication Conference 2015 (WRC-15): Presentation to the FCC Open Meeting, Report, at 6-7 (Int'l Bur. Dec. 17, 2015), http://transition.fcc.gov/Daily_Releases/Daily_Business/2015/db1217/DOC-336915A1.pdf.); Ericsson FNPRM Comments at 11; Samsung FNPRM Comments at 4; Intel FNPRM Reply Comments at 6.

[184] *See* CTIA FNPRM Comments at 10 ("With substantial millimeter wave spectrum already available for unlicensed and shared purposes, deploying exclusive-use licensing policies in the bands discussed in the *FNPRM* is all the more important."); AT&T FNPRM Comments at 11 ("In this proceeding, the Commission should prioritize exclusively licensed spectrum. In particular, the Commission should not assume that higher bands will never work for exclusively licensed services and, in a haste to promote experimentation, rush to designate the bands for unlicensed operation."); Verizon FNPRM Comments at 3 ("To the extent the Commission decides to experiment with a novel 'use it or share it' model in mmW bands, it should not permit such sharing in the 28 GHz and 37-40 GHz licensed bands or the nearby 24 GHz, 32 GHz, and 42 GHz bands. 'Use it or share it' experiments will take time to put in place and will subject licensees to substantial uncertainty.")

[185] *See* AT&T FNPRM Comments at 8; Samsung FNPRM Comments at 4-5; TIA FNPRM Comments at 4; Intel Oct. 31, 2016 FNPRM Reply Comments at 6; Samsung FNPRM Reply Comments at 5-6. *Compare* CCA Sept. 30, 2016 FNPRM Comments at 9-10 (indicating in 2016 that the Commission should refrain from implementing any licensing regimes until carriers test various shared uses of the band – or in the alternative, that the Commission should adopt as flexible a regime as possible).

[186] Samsung FNPRM Reply Comments at 5 & n.15 (citing Amendment of the Commission's Rules With Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands, Report and Order, 29 FCC Rcd 4610, at ¶ 42 (2014) ("International harmonization will enhance international roaming, create economies of scale that lowers device costs, speed deployment, and reduce interference potential near international borders.").

[187] Huawei FNPRM Comments at 5.

[188] Lockheed Martin Sept. 30, 2016 FNPRM Comments at 10-11.

[189] T-Mobile Oct. 31, 2016 FNPRM Reply Comments at 9-10.

[190] Inmarsat Martin Sept. 30, 2016 FNPRM Comments at 16; ESOA Oct. 31, 2016 FNPRM Reply Comments at 4.

[191] *See* Section IV.B, *supra*.

band to create a single band with rules for fixed operations.[192] We note that although in its *R&O*, the Commission deleted the broadcasting and broadcasting-satellite service allocations from the 42-42.5 GHz band (42 GHz band) and declined to allocate the band to the fixed-satellite service (space-to-Earth),[193] we again decline to reverse those decisions. We also decline to revisit our decision to deny FWCC's prior request that we establish service rules to enable fixed service at 42 GHz under Part 101 of our Rules.[194]

52. *Discussion.* We tentatively conclude that our Part 30 UMFUS Rules provide the best opportunity to provide commercial wireless broadband service to the public in this band.[195] The ability to use this band together with the existing 37 GHz and 39 GHz bands, the international consideration of this band for mobile use, and the availability of 500 megahertz of unassigned spectrum all support our conclusion that this band is suitable for flexible use. In view of the extensive support in the record, we propose to authorize fixed and mobile licensed operations in this band under Part 30, and we seek comment on this tentative conclusion and on alternate proposals. In particular, consistent with the MOBILE NOW Act, we seek comment on whether unlicensed services should be permitted in the band under Part 30, or whether licensed services, unlicensed services, or other types of sharing besides unlicensed and licensed should be permitted under other rule parts as well. Proponents of unlicensed uses or sharing in the band between various types of operations should provide technical studies describing how such operations should coexist and share this band.

53. We also seek to refresh the record on the previous proposal in the 2016 FNPRM to add Federal fixed and mobile allocations in this band and a framework under which both Federal and non-Federal operations could share.[196] Under this proposal, we would add a Federal allocation to the fixed and mobile services on a primary basis for Federal use in addition to the current non-Federal allocation.

3. Licensing, Technical, and Service Rules

54. *Introduction.* In the *FNPRM*, the Commission previously sought comment on licensing the 42 GHz band under the Part 30 UMFUS licensing and technical rules.[197] The Commission sought comment on whether the 42 GHz band should be licensed for exclusive use by PEAs,[198] and commenters have generally supported this proposal.[199] The *FNPRM's* proposal contemplated that licensing and operations in the 42 GHz band would be subject to the Part 30 rules concerning permissible communications, initial authorizations, license term, construction requirements, partitioning and disaggregation, discontinuance of service, equipment authorization, power limits, emission limits, field strength limits, international coordination, RF safety, flexible duplexing, and competitive bidding procedures.[200] Commenters have thus far generally supported applying the existing licensing and

[192] FWCC FNRPM Comments at 2, 5.

[193] *R&O*, 31 FCC Rcd at 8144, paras. 367-68.

[194] *FNPRM*, 31 FCC Rcd at 8154, para. 404.

[195] MOBILE NOW Act, § 604(b)(1).

[196] *FNPRM*, 31 FCC Rcd at 8155, para. 407.

[197] *FNPRM*, 31 FCC Rcd at 8154, para. 403.

[198] *FNPRM,* 31 FCC Rcd at 8154, para. 403.

[199] *See* AT&T FNPRM Comments at 13; Samsung FNPRM Comments at 6; T-Mobile FNPRM Comments at 7; Verizon FNPRM Comments at 3; AT&T Reply Comments at 11-12; Qualcomm FNPRM Reply Comments at 4; Samsung FNPRM Reply Comments at 6; U.S. Cellular Oct. 31, 2016 FNPRM Reply Comments at 3.

[200] *See* 47 C.F.R. §§ 30.6, 30.101, 30.103, 30.104, 30.105, 10.106, 30.202, 30.203, 30.204, 30.205, 30.206, 30.207, 30.209, 30.301, 30.302.

technical rules to the 42 GHz band.[201] We will consider those comments in resolving those issues, as well as additional comments.[202] Further, as described below, we seek comment on additional considerations regarding protection of radio astronomy at 42.5-43.5 GHz, and the band plan for the 42 GHz band.

55. *Protecting RAS Services at 42.5-43.5 GHz.* As noted above, the Commission previously proposed to authorize flexible mobile and fixed operations in the 42 GHz band, as long as RAS could be protected in the adjacent 42.5-43.5 GHz band, and it sought comment on and invited detailed study of the forms that such protection should take given the location of RAS observatories.[203] In response, The National Academy of Sciences' Committee on Radio Frequencies (CORF) informed the Commission that RAS observations are currently made at a limited set observatories around the U.S. These sites are the GBT in Green Bank, WV, the VLA at Soccoro, NM, the Haystack Observatory in Westford, MA, and ten sites of the Very Long Baseline Array (VLBA), noted in the Table of Allocations footnote US 131.[204] CORF asserted that frequency lines at 42.519, 42.821, 43.122, and 43.424 GHz are of the greatest importance for the detection of strong silicon monoxide maser emissions from stars and star forming regions – important for measuring stellar temperature, density, wind velocity and other parameters.[205] The 42 GHz band also is one of the preferred bands for measuring continuum observations.[206] Because of the very low signal levels being measured, RAS telescopes are particularly vulnerable to in-band emissions, spurious out-of-band emissions, and emissions producing harmonics, making protection all the more important.[207] CORF stated that the detrimental levels for continuum and spectral line radio astronomy observations for single dishes are -227 dBW/m^2/Hz and -210 dBW/m^2/Hz, respectively, for the average across the full 1 gigahertz of the 42.5-43.5 GHz band and the peak level in any single 500 kHz channel, as based upon ITU-R RA.769, Tables 1 and 2, respectively.[208] For observations using the entire VLBA, the corresponding limit is -175 dBW/m^2/Hz.[209]

56. Proponents of using the 42 GHz band for flexible terrestrial wireless use generally agree that there are various effective means to protect RAS, including use of exclusion zones, coordination zones, and aggregate emissions limits – particularly since RAS sites are generally in remote locations. No commenter, however, provided studies or examples showing how these proposed methods would work in practice in this particular band.[210] T-Mobile suggested that coordination with RAS should be required

[201] *See* CTIA FNPRM Comments at 10-11; Ericsson FNPRM Comments at 10-12; Huawei FNPRM Comments at 6-7; Mobile Future FNPRM Comments at 4; T-Mobile FNPRM Comments at 7; Verizon FNPRM Comments at 3; Intel FNPRM Reply Comments at 6; Samsung FNPRM Reply Comments at 4.

[202] Accordingly, commenters whose positions remain consistent with what was filed in their *FNPRM* comments are not obliged to refile.

[203] *FNPRM*, 31 FCC Rcd at 8154, at para. 405. The adjacent band, 42.5-43.5 GHz, is allocated for Federal and non-Federal RAS operations and Federal fixed, earth-to-space satellite and mobile services.

[204] RAS observations in this band are currently made at various U.S. observatories: Green Bank Telescope (GBT), WV; VLA Socorro, NM; Westford, MA (Haystack); Brewster, WA; Fort Davis, TX; Hancock, NH; Kitt Peak, AZ; Los Alamos, NM; Mauna Kea, HI; North Liberty, IA; Owens Valley, CA; Pie Town, NM; St. Croix, VI. CORF FNPRM Comments at 9 & n.7 (citing 47 C.F.R. § 2.106. Footnote U.S. 131).

[205] CORF Sept. 29, 2016 FNPRM Comments at 8 n.6; CORF Mar. 14, 2016 NPRM Reply Comments at 8-9.

[206] CORF FNPRM Comments at 8.

[207] CORF FNPRM Comments at 3.

[208]CORF FNPRM Comments at 9; *see also FNPRM* at para. 405 (citing CORF NPRM Reply Comments at 8-9).

[209] CORF FNPRM Comments at 9; *see also FNPRM* at para. 405 (citing CORF NPRM Reply Comments at 9).

[210] T-Mobile FNPRM Comments at 13-14; TIA FNPRM Comments at 7; AT&T FNPRM Reply Comments at 7, CTIA FNPRM Reply Comments at 16; Qualcomm FNRPM Reply Comments at 4; T-Mobile FNPRM Reply Comments at 25.

within a defined coordination distance.[211] We note that CORF and T-Mobile agree that the relevant received power spectrum density at the RAS receiver should be the parameters established by ITU-R RA.769. We agree with CORF and T-Mobile that RAS bands can be protected by limiting UMFUS operations near a RAS. However, because no one has submitted technical studies regarding protection of RAS in this band, we do not currently have sufficient information to propose specific rules to protect RAS facilities. We seek comment on how we can protect RAS facilities in the 42.5-43.5 GHz band from UMFUS operations in 42-42.5 GHz.[212] Should our rules be based on the ITUR RA.769 parameters or are there alternative protection criteria? We also seek comment on establishing coordination zones around the relevant RAS facilities, and on the appropriate distance at which coordination with RAS should be required.[213] Interested parties should provide detailed technical analysis of the coexistence of RAS with terrestrial mobile operations that fully supports any proposed distance or methodology. We also seek comment on other proposals for ensuring protection of RAS facilities in the 42.5-43.5 GHz band.

57. *Band Plan.* In the *FNPRM*, the Commission sought comment on whether the band's 500 megahertz of spectrum should be licensed as a single channel, split in two, or broken into various multiple sizes.[214] In response, several commenters noted the value of 100 megahertz channels as an acceptable outcome, particularly in a band such as 42 GHz where less spectrum is available.[215] We propose to license the 42 GHz band as 100 megahertz channels because this size would be consistent with developing industry standards that maximize spectral efficiency, all the while permitting interested parties to aggregate these channels should they desire larger bands. We seek comment on this proposal. Commenters seeking alternative band plans should justify why they believe other channel sizes would better serve future services they envision for this band.

B. 37-37.6 GHz (Lower 37 GHz Band) – Licensing Frameworks

58. *Background*. The Federal and non-Federal allocations of the 37-38.6 GHz Band (37 GHz Band) are as follows: The entire 37 GHz band (37 – 38.6 GHz) is allocated to the fixed and mobile services on a primary basis for Federal and non-Federal use.[216] Portions of the 37 GHz band are also allocated to the Space Research Service (SRS) (space-to-Earth) on a primary basis for Federal use (37-38 GHz) and to the Fixed-Satellite Service (FSS) (space-to-Earth) on a primary basis for non-Federal use (37.5-38.6 GHz).[217] The use of this FSS downlink allocation is limited to individually licensed earth

[211] T-Mobile FNPRM Comments at 14.

[212] *See* footnote US342.

[213] The National Radio Quiet Zone (NRQZ) has special protections afforded outside the allocated bands requiring coordination. The NRQZ does work with mobile radio providers, but coordination is required for operation of any mobile radio service above 24 GHz in the NRQZ. See Section 8.3.9 of the NTIA Manual and 47 CFR § 1.924. Also, as with the existing coordination requirements for the 37-38 GHz band, we contemplate that any coordination requirement would require licensees to coordinate all operations. *See* 47 CFR § 30.205(a).

[214] *FNPRM,* 31 FCC Rcd at 8154, para. 406.

[215] *See* Samsung FNPRM Comments at 5-6; T-Mobile FNPRM Comments at 15; U.S. Cellular FNPRM Reply Comments at 8.

[216] The Commission has modified the mobile service allocation in the 37-38 GHz band to exclude the aeronautical mobile service, i.e., the 37-38 GHz band is allocated to the mobile except aeronautical mobile service. *See Amendment of Parts 2, 15, 80, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2012) (WRC-12), Other Allocation Issues, and Related Rule Updates*, Report and Order, 32 FCC Rcd 2703, 2722 para. 57 (2017).

[217] The existing rules limit the FSS use of the 37.5-40 GHz band to gateway earth stations. See 47 CFR § 25.202(a)(1) n.3

stations and is also subject to other limitations.[218] In addition, the 37 GHz band is adjacent to the 36-37 GHz band, where passive sensors in the Earth exploration satellite service (EESS) and SRS are located.[219]

59. In the *R&O*, the Commission adopted rules to permit fixed and mobile terrestrial operation in the 37 GHz band.[220] The Commission also adopted a licensing regime for the 37.6-38.6 GHz portion of the band (Upper 37 GHz Band), which would be licensed in five 200 megahertz blocks on a geographical area basis, and made the Lower 37 GHz band available for coordinated co-primary sharing between Federal and non-Federal users.[221] The Commission identified non-Federal users as Shared Access Licensees (SAL) and decided that such users would be licensed by rule.[222] The Commission explained that Federal and non-Federal users will access the Lower 37 GHz Band through a coordination mechanism, which it would develop more fully through government/industry collaboration.[223] The Commission adopted the same technical rules for the Lower 37 GHz Band and the Upper 37 GHz Band.[224]

60. In the *FNPRM*, the Commission stated that Federal and non-Federal fixed and mobile users would access the Lower 37 GHz Band by registering individual sites through a coordination mechanism.[225] The Commission explained that the coordination mechanism is the regulatory, technical, or procedural tool necessary to actually facilitate coordinated access, will authorize a particular user to use a particular bandwidth of spectrum at a particular location.[226] The Commission stated that the coordination mechanism must; (1) 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; (2) be capable of regularly updating the status of a coordinated location (on/off or authorized/unauthorized); and (3) be able to incorporate this type of information for both Federal and non-Federal fixed and mobile uses.[227] The Commission sought comment on the coordination mechanism and the functions that it should be able to perform. The Commission also proposed 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.[228] The Commission sought comment on: whether a portion of the lower band segment should be made available for priority access by Federal users, whether an enforcement mechanism in the lower band segment is necessary to help identify and rectify interference events, and whether and how to apply secondary market rules to the lower band segment.[229]

61. Two commenters, Starry and Intel, offer recommendations on the specific regulatory, technical, or procedural tool necessary to facilitate coordinated access in the Lower 37 GHz band. Starry proposes site-based registration through a third-party coordinator. Under its proposal, licensees would file "specific information about each site sufficient for a third-party coordinator to conduct an interference

[218] *See also* 47 CFR § 25.136(b), (c) (limitations include limits on how much population can be affected by earth stations and limits on the number of earth stations in a given area).

[219] *NPRM*, 30 FCC Rcd at 11897-11898, paras. 52-53. See U.S. Table of Frequency Allocations, 47 CFR § 2.106.

[220] *R&O*, 31 FCC Rcd at 8057, para. 105.

[221] *R&O*, 31 FCC Rcd at 8059, para. 111.

[222] *R&O*, 31 FCC Rcd at 8060, para. 113.

[223] *R&O*, 31 FCC Rcd at 8060, para. 113.

[224] *R&O*, 31 FCC Rcd at 8060, para. 113.

[225] *FNPRM*, 31 FCC Rcd at 8170, para. 448.

[226] *FNPRM*, 31 FCC Rcd at 8170, paras. 448, 449.

[227] *FNPRM*, 31 FCC Rcd at 8170, para. 449.

[228] *FNPRM*, 31 FCC Rcd at 8172, para. 456.

[229] *FNPRM*, 31 FCC Rcd at 8172, paras. 457-459.

analysis," including its location, height above ground level, EIRP, transmitter azimuth, and channel size.[230] In addition, "end points operating under the control of a registered transmitter" would not be registered individually, and would instead fall under the authorization of the transmitter."[231] The third-party coordinator would conduct an interference analysis under which previously registered sites would be protected at a modeled receive signal strength of -79 dBm/10 MHz assuming a test antenna at the end points with a gain of 25 dBi, at a height of 10 meters above ground.[232] Also, under this proposal, licensees would be able to negotiate alternative sharing arrangements and sites would be required to be constructed and in operation within 120 days after the registration is accepted. Under Starry's proposal, there would be clear penalties for registering unused sites.[233] Starry also offers additional ideas for an enhanced sharing framework that could be implemented over time.[234] No party responded to Starry's proposal. Intel's proposal would use a database similar to the database used for the 70 GHz and 80 GHz bands, except that the database would also play a role in frequency coordination.[235]

62. *Discussion.* We conclude that it is appropriate to further develop the record regarding the coordination mechanism that we would expect to use, as between either two or more non-Federal entities or between Federal and non-Federal entities. In order to facilitate shared use of the Lower 37 GHz band between Federal and non-Federal users, as well as among non-Federal users, we seek comment on a proposed coordination mechanism and alternatives, as set forth below.[236] We anticipate that a sharing mechanism would facilitate quick access to spectrum without unreasonable processing delays and a predictable path for future coordination in the band among stakeholders. We recognize the importance of the Lower 37 GHz band to future Federal operations, and we will work in partnership with NTIA, DoD, and other Federal agencies to develop a sharing approach that allows for robust Federal and non-Federal use in this band.

63. In designing a licensing mechanism for the Lower 37 GHz Band, we seek to accommodate a variety of use cases that may develop for this band – in essence, we envision Lower 37 GHz as an innovation band in the mmW spectrum. In particular, we anticipate that there will be at least four types of non-Federal deployments in the Lower 37 GHz Band: point-to-point links (for example backhaul and backbone links); fixed wireless broadband systems (generally consisting of a fixed access point and fixed subscriber units); single base station IoT-type systems (for example, in a factory); and carrier-based deployments of mobile systems using the Lower 37 GHz Band as supplemental capacity tied to other bands that are licensed on a geographic area basis. We seek comment on whether there are additional types of deployments contemplated for this band. If so, what would those additional uses be, and how would they affect the licensing of the Lower 37 GHz Band?

64. As detailed above, Starry proposes a model in which proposed facilities would be registered with a third-party coordinator.[237] Another possible model, under which the Commission would issue licenses authorizing operations, would be the coordination model used in Part 101 point-to-point bands. In order to complete frequency coordination, an applicant must give prior notice to nearby

[230] Starry July 14, 2017 *Ex Parte* at 2.

[231] Starry July 14, 2017 *Ex Parte* at 3.

[232] Starry July 14, 2017 *Ex Parte* at 4.

[233] Starry July 14, 2017 *Ex Parte* at 5.

[234] Starry July 14, 2017 *Ex Parte* at 6-8.

[235] *See* Intel Comments at 2-14. Intel's proposal also includes two non-overlapping administrative categories of licenses: General Site licenses, and Property Exclusion Zone licenses. Intel Comments at 2.

[236] In the *MO&O*, we deny petitions for reconsideration asking that the Commission reject a shared licensing regime and instead adopt an exclusive licensing scheme for the Lower 37 GHz Band, *See* Section IV.A, *supra*. In the *3rd R&O*, we adopt 100 megahertz channels for licensees in the Lower 37 GHz band. *See* Section III.D, *supra*.

[237] *See also Starry* May 25, 2018 *Ex Parte* at 1-2.

licensees and other applicants for licenses of the proposed applicant's operations, make reasonable efforts to avoid interference and resolve conflicts, and certify to the Commission that the proposed operation has been coordinated.[238] Once the applicant has completed frequency coordination, the applicant must file an application for authorization with the Commission, specifying the latitude and longitude of the transmitter to be used to an accuracy of one second.[239] The applicant must coordinate each operation,[240] including any change in the location of the transmitter of more than five seconds in latitude or longitude or both, and must apply for a modification of their license.[241] Similarly, if the applicant later seeks to deploy additional transmitters, the Commission's Part 101 rules require coordination of those facilities and the applicant must apply for modification of the license.[242] We seek comment on the relative merits of using these coordination models in the Lower 37 GHz band. We also seek comment on the criteria we should use to determine whether predicted interference would be harmful. If actual harmful interference occurs after successful coordination, how should the interference be resolved? How will future Federal operations be accommodated in the sharing framework and what parameters will be used to develop a trigger for required coordination? Given that we are proposing construction requirements for non-Federal licensees in this band, as discussed below, we seek comment on how best to enforce those requirements in an environment where registrations are not filed with the Commission.

65. For the four types of deployments, we seek comment on a first-come-first-served licensing or registration scheme, in which actual users have a right to interference protection, but no right to exclude other users. We seek comment on subsequent users being required to coordinate with previously registered non-Federal and Federal sites through Part 101 notice and response rules or on the alternative of registering facilities with a third-party coordinator.

66. With regard to Federal sites, we propose to require non-Federal users to work with Federal users in good faith to coordinate any new system Federal users may seek to deploy. We anticipate that non-Federal users would not be required to agree to coordination requests that would carry a significant risk of harmful interference. We seek comment on the criteria we should use to determine whether interference is harmful. Is the coordination trigger that Starry proposes appropriate, or should we use an alternative set of criteria? We seek comment on the best means of coordinating with Federal operations. We intend to adopt as part of the rules a coordination methodology that will facilitate coordination for the kinds of cases that we anticipate may be typical. This will allow us to test the assumption that any coordination zone typically "can be measured in meters rather than kilometers."[243] To do so, we will work with NTIA, on behalf of Federal users, and with industry to identify those cases. DoD has expressed an interest in a possible aeronautical allocation in the Lower 37 GHz band, so we anticipate including aeronautical cases in our consideration of coordination methodologies.

67. We expect the identification and analysis of these cases to be a critical component to our understanding of the extent that the band can be shared dynamically. Commenters should address how to prevent "warehousing," whereby a licensee preserves its rights without providing actual service. Should licensees receive any protection before they have completed construction and begun operations? How should "operation" be defined and how can we plan to monitor compliance, including whether operations have been discontinued? Should we put limits on the aggregate area, or amount of spectrum, that any one licensee or its affiliates can protect? These issues are critical to establishing the co-primary sharing rights that we envision for this band.

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[238] *See* 47 C.F.R. § 101.21(f).

[239] 47 C.F.R. § 101.103(d)(2)(ii).

[240] *Id*.

[241] 47 C.F.R. § 1.929(d)(1)(i).

[242] 47 C.F.R. §§ 1.929(d)(1)(i), 1.947(a).

[243] *NPRM*, 31 FCC Rcd at 11912, para. 111.

68. To the extent that the solution to preserving Federal entity's options may be to reserve a part of the band for their priority use, we seek comment on how to define such priority rights. Are there geographic areas where such priority rights would have little or no adverse impact on non-Federal operations and, if so, what should be the process for identifying those areas? We seek comment on alternative approaches that can be used to ensure Federal and non-Federal users will have access to the band to meet their needs.

69. Below, we seek comment on whether offering three types of non-Federal licenses -- point-to-point licenses; base stations licenses; and site-cluster licenses -- would facilitate deployment in the Lower 37 GHz band.

70. *Point-to-point licenses*. We seek comment on requiring individual point-to-point links to be coordinated with previously licensed or registered sites using Part 101 notice and response rules. If it is determined that the proposed link would not interfere or could be modified not to interfere with previously licensed or registered sites, then a license would be issued for the specific point-to-point link in the Commission's Universal Licensing System (ULS) to establish future interference protection rights. A point-to-point licensee would be required to construct its sites within 18 months from the date the site was registered. If the licensee fails to construct these sites within the 18 months, the licensee might be prohibited from reapplying for that specific link for 12 months. We seek comment on this approach, as well as alternatives. Are there other methods that would facilitate licensing of point-to-point links? We also seek comment on whether we should require licensees to file individual construction notices in order to facilitate enforcement of construction obligations. We seek comment on the relative costs and benefits of this licensing mechanism.

71. *Base station licenses.* We seek comment on permitting an applicant to select a point around which it would get a license for a specific site with either a 360 degree radius or a defined sector of a 360 degree radius. This license also would authorize any customer premises equipment (such as equipment used for point-to-multipoint networks) or mobile devices operating in conjunction with the licensed base station. The licensee would receive interference protection for a certain specified distance, for example one kilometer, that would then be a protection zone. We propose to require that individual base stations be coordinated with previously licensed or registered sites using Part 101 notice and response rules. If it is determined that the proposed base station license would not interfere or could be modified to not interfere with a previously licensed or registered site, then a license would be issued in ULS to establish future interference protection rights. Under this licensing scheme, a subsequent licensee would not be precluded from licensing either a point-to-point link or a base station, or from registering a facility under a site-cluster license (discussed below) within a previously established protection zone, as long as it can be coordinated successfully with any previously licensed or registered facilities. We propose to require that a base station licensee must construct its site within 18 months from the date the site was licensed. If the licensee fails to construct its site within the 18 months, we propose that the licensee be prohibited from reapplying for a base station license covering any portion of the same area for 12 months. We seek comment on this approach, as well as alternatives commenters might propose. Are there other means or requirements that would facilitate licensing of these types of deployments? We seek comment on whether we should require licensees to file individual construction notices. If so, should these construction notices be filed with the Commission or with a third-party database administrator? We seek comment on the relative costs and benefits of this licensing mechanism.

72. *Site-cluster licenses.* We recognize that operators proposing 5G deployments may have difficulties determining the precise locations of their facilities, particularly in instances where they are deploying a large number of facilities. Requiring licensees to identify specific locations, file applications for each individual facility, and then wait 30 days for each application to undergo the mandatory public notice period may not promote efficient deployment of 5G services. Accordingly, we seek comment on the use of a novel concept to address this issue: the site-cluster license. Under a site-cluster license, instead of licensing individual base stations or point-to-point links, the applicant would license a larger (*e.g.*, 5 km) non-exclusive point-radius license within which it could register individual base stations and/or point-to-point links. Much like the licensing paradigm for the 70-80 GHz band, a non-exclusive

point and radius license would not authorize operation, but rather would authorize the licensee to register individual base stations and/or point-to-point links within its non-exclusive site cluster area.[244] A site-cluster licensee would not have the right to preclude facilities proposed by other licensees. To receive interference protection for specific facilities within the site-cluster, the applicant would have to coordinate those facilities with other Federal and non-Federal Lower 37 GHz licensees (point-to-point, base station, or site-cluster) within the radius of its site cluster area, and register each specific facility. First-in-time rights would be triggered only for those facilities that are successfully registered. We propose that applicants for site-cluster licenses would file in ULS and would be issued a non-exclusive site-cluster license for a specific radius. Should individual base stations or point-to-point links registered under the umbrella of the site cluster license be registered either in ULS or, alternatively in a third-party database? We seek comment on the relative costs and benefits of either approach. Is this concept an effective means of facilitating large deployments?

73. We seek comment on two buildout requirements for site-cluster licenses. First, a buildout period by which an applicant with a site-cluster license must register and construct a minimum of one specific facility within its site cluster area. Second, a buildout period for each specific site that the applicant registers, which would require the applicant to build that site within a specified period after registration. We seek comment on what those buildout periods should be. We propose that failure to meet its buildout requirement would preclude the applicant from reapplying for a non-exclusive license in that area for a certain period. We seek comment on what that period of time should be. We also seek comment on whether we should require licensees to file individual construction notices. If so, should these construction notices be filed with the Commission or with a third-party database administrator? We also seek comment on alternative means of enforcing construction requirements. As mentioned above, we seek comment on what rights a registrant should have before it actually constructs its facility and begins operations.

C. 37.0-38.6 GHz (37 GHz band)

74. With regard to Federal co-primary access to the 37 GHz band, the *R&O* adopted rules that establish the coordination zones for the 14 military sites and three scientific sites identified by NTIA, and noted the ability for Federal agencies to add future sites on a coordinated basis.[245] We seek comment on how best to accommodate coordination zones for future Federal operations at a limited number of additional sites. For instance, should we supplement Section 30.205 to add more specific sites for Federal operations, or should we establish a process that would permit Federal entities in the future to identify a limited number of additional sites on an as-needed basis? We also seek comment on whether the coordination zones previously established in Section 30.205 might be reduced to better accommodate nearby non-Federal operations without adversely impacting Federal operations at those sites.

D. 25.25-27.5 GHz Band (26 GHz Band)

1. Suitability for Mobile Use

75. *Background.* In this proceeding, the Commission has authorized mobile services in the 700 megahertz of spectrum in the 24 GHz band[246] and 850 megahertz of spectrum in the 28 GHz band).[247] In the U.S., the 25.25-27.5 GHz ("26 GHz") band is allocated primarily for Federal government services,[248] but Commenters in this proceeding note that there is a growing international consensus that

[244] *See Wireless Telecommunications Bureau Announces Permanent Process for Registering Links in the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands*, Public Notice, 20 FCC Rcd 2261 (WTB BD 2005).

[245] *See* R&O, para. 149; Section 30.205 of the Rules.

[246] *See 2nd R&O,* 32 FCC Rcd at 10994-11002, paras. 15-42.

[247] *See R&O,* 31 FCC Rcd 8014 at 8026, para. 25.

[248] *See* Table of Allocations, 47 C.F.R. § 2.106.

terrestrial mobile services should be authorized in the broader 24.25-27.5 GHz band.[249] This year the European Conference of Postal and Telecommunications Administrations (CEPT) has adopted a preliminary determination to make the 24.25-27.5 GHz band a "clear priority" for harmonization of 5G services throughout Europe and to promote it for worldwide harmonization at WRC-19.[250] In addition, at least eight countries in other parts of the world are also preparing to authorize terrestrial mobile services in that range.[251] In February, 2018, ITU-R Task Group 5/1 issued a set of preliminary technical analyses concluding that the band can be shared among terrestrial mobile and incumbent services.[252] Most of the contributors represented national governments, including the U.S.

76. *Discussion.* As noted above, in regional and international forums leading to the World Radiocommunication Conference 2019 (WRC-19), the frequency range from 24.25-27.5 GHz has emerged as the leading candidate for 5G services, referred to in ITU parlance as "International Mobile Telecommunication 2020" (IMT-2020). The international momentum presents us with an opportunity to consider whether the 26 GHz band would be suitable for flexible fixed and mobile use. We note that in the U.S., the 25.25-27.5 GHz ("26 GHz") band is allocated primarily for Federal government services.[253]

77. Equipment manufacturers indicate that they can readily integrate the 26 GHz band into a tuning range that includes two bands that the United States has already authorized for mobile services, the 24 GHz band (24.25-24.45 GHz and 24.75-25.25 GHz) and the 28 GHz band (27.5-28.35 GHz).[254] That presents three opportunities – first, to achieve manufacturing economies by covering several bands with a single radio; second, to provide international roaming capability in affordable user devices, and third, to accelerate the availability of equipment in newly authorized bands that share a tuning range with early-deployed bands.[255] Some commenters also contend that the 26 GHz band has better coverage characteristics than other bands that might potentially be available at higher frequencies.[256]

78. We will continue to actively support the 24 GHz and 28 GHz bands. At the same time, we believe the 26 GHz band could be suitable for flexible fixed and mobile use. It is relatively near to the 24 GHz and 28 GHz bands, which we have already found suitable for fixed and mobile use. The amount of spectrum potentially available (over two gigahertz) could make this band a useful addition to UMFUS. We recognize that we would need to work out suitable sharing or protection arrangements with Federal incumbents in the band. Accordingly, we seek comment on whether the 26 GHz band could be made available for non-Federal fixed and mobile use.

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[249] *See* Comments of AT&T at 5; CTIA at 2 and 8-10; Nokia at 6-7; Starry at 5-6; T-Mobile at 3 and 11; Reply Comments of CTIA at 6-7; and Elefante at 5-6; and T-Mobile Ex Parte Notice, Jan. 9, 2018, at 3.

[250] Draft CEPT Brief on WRC-19 Agenda Item 1.13, Budapest, Hungary, Jan. 11, 2018 (Doc. TEMP04 – CPG(18)017 Annex IV-13) at 2. "CEPT intends to harmonise the 24.25-27.5 GHz band for Europe for 5G before WRC-19 through the adoption of a harmonisation decision and to promote it for worldwide harmonisation by an IMT identification. Hence the 24.25-27.5 GHz is a clear priority for immediate study within CEPT and these studies are assuming an individual authorisation regime. Studies need to take into account the compatibility with and protection of all existing services, including their future deployments, in the same and adjacent frequency bands; in particular the protection of current and future EESS/SRS earth stations should be addressed." *Id*.

[251] *See* Global Mobile Suppliers Assn., Spectrum for 5G: Plans, Licences and Trials, Jan. 2018, at 5-8 (https://gsacom.com/paper/spectrum-for-5g/). According to the report, Australia, China, Hong Kong, New Zealand, Singapore, Thailand, Vietnam, and Russia are targeting the band.

[252] *See* ITU-R Task Group 5/1 Chairman's Report, Sharing and Compatibility Studies of IMT Systems in the 24.25-27.5 GHz Frequency Range, Document 5-1/287-E, Annex 3, 1 February 2018.

[253] *See* Table of Allocations, 47 C.F.R. § 2.106.

[254] *See* Nokia Comments responding to *Spectrum Frontiers R&O and FNPRM*, filed Oct. 3, 2016, at 6-7; Intel Reply Comments responding to *Spectrum Frontiers R&O and FNPRM* filed Nov. 1, 2016, at 4.

[255] *See* Intel Reply Comments responding to *Spectrum Frontiers R&O and FNPRM*, filed Nov. 1, 2016, at 4 15.

[256] *See, e.g.,* CTIA Comments at 9, *citing* Ericsson Comment, filed Sept. 30, 2016, at 10.

2. Spectrum Sharing and Compatibility

79. Existing allocations for the 26 GHz band in this country are mostly Federal.[257] While Federal use of the 26 GHz band to this point has been fairly limited, we recognize that Federal agencies may aspire to make heavier use of that band in the future. Any exploration of private sector opportunities in the band must therefore address the potential for spectrum sharing and compatibility among diverse participants.

a. Protection of Incumbents

80. *Background*. The Federal allocations for the 25.25-27.5 GHz bands in this country generally follow the ITU's international allocations.[258] In the Federal column of the U.S. Table of Allocations, the entire 25.25-27.5 GHz band has primary allocations for Fixed (FS), Mobile (MS), and Inter-Satellite (ISS) services, with Inter-Satellite limited to space research and Earth exploration-satellite applications, along with transmissions of data originating from industrial and medical activities in space.[259] The 25.5-27 GHz band has a primary allocation for both Federal and non-Federal Space Research service (SRS) (space-to-Earth), with non-Federal Earth exploration-satellite service (EESS) subject to case-by-case electromagnetic compatibility analysis.[260]

81. Consistent with the international community's focus on making the 24.25-27.5 GHz band available for terrestrial mobile services, a.k.a. IMT, ITU-R's Study Group 5 Task Group 5/1 (TG 5/1) has been conducting extensive studies to evaluate the potential for sharing and compatibility in that range between mobile and EESS, SRS, FS, FSS, and ISS.[261] As directed by WRC-15 Resolution 238, TG 5/1 has focused on ensuring the protection of EESS and SRS earth stations operating in the 25.5-27 GHz band segment.[262] The U.S. contribution to the EESS/SRS Study found that the coordination distances necessary to prevent IMT from causing interference is 52 km for SRS and 7 km for EESS.[263]

82. *Discussion*. We seek comment on the best ways to protect existing incumbent operations and systems that Federal agencies might choose to deploy in the future, including identifying appropriate separation distances. We invite comment on steps we could take to facilitate sharing now and in the future. For example, should we give priority to Federal operations at certain locations such as military bases and test ranges? Alternatively, can we strike an appropriate balance by ensuring deployment of Federal operations provided they do not affect more than a certain amount of population? Or might we provide priority to non-Federal operations in a certain number of markets, with priority to Federal

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[257] *See* Table of Allocations, 47 C.F.R. § 2.106. One apparent exception is an international Region 2 primary allocation for Fixed-Satellite (Earth-to-space) in the 27-27.5 GHz band, which is not mirrored in the U.S. Table.

[258] *See* Table of Allocations, 47 C.F.R. § 2.106. One apparent exception is an international Region 2 primary allocation for Fixed-Satellite (Earth-to-space) in the 27-27.5 GHz band, which is not mirrored in the U.S. Table.

[259] *See* 47 C.F.R. 2.106 n. 5.536.

[260] The Table of Allocations also includes secondary allocations for Federal and non-Federal standard frequency and time signal-satellite (earth-to-space) in the 25.5-27 GHz band, and a secondary non-Federal allocation for inter-satellite services in the 25.5-27.5 GHz band. 47 C.F.R. 2.106.

[261] *See*, *e.g.*, Sharing and Compatibility of ISS and IMT Operating in the 24.25-27.5 GHz Frequency Range, Attachment 4 to Annex 3 to Task Group 5/1 Chairman's Report, ITU-R Document 5-1/406-E, 21 May 2018.

[262] *See* WRC-15 Resolution 238, Studies on frequency-related matters for International Mobile Telecommunications identification including possible additional allocations to the mobile services on a primary basis in portion(s) of the frequency range between 24.25 and 86 GHz for the future development of International Mobile Telecommunications for 2020 and beyond, at 3 n.2. As noted in paragraph 15, *supra*, there are also ongoing international studies to determine IMT-2020 out-of-band emission limits necessary to protect passive sensors onboard weather satellites in the 23.6-24.0 GHz band.

[263] EESS/SRS Study, Table 1.

operations elsewhere? To what extent would it be possible to develop coordination mechanisms between licensees and Federal operations?

83. We note that the United States and other governments have submitted detailed sharing and compatibility studies for a frequency range that includes the 26 GHz band, which are being evaluated by that group. In general, it appears that protection zones around existing EESS and SRS earth stations would affect only small percentages of the overall U.S. population, though their impact on specific localities could be significant for the affected populations. The protection radiuses being considered by TG 5/1 are generally intended to serve only as triggers to begin a coordination process. The final definitions of exclusion zones around particular earth stations will need to take into account a variety of local factors, including terrain, clutter, and network design features that could mitigate the effect of IMT deployment inside coordination zones. We also seek comment on the best means of protecting existing fixed links in the band. We note that there are well-established protocols for coordinating Federal and non-Federal point-to-point services.[264]

84. The 26 GHz band currently has Federal fixed and mobile allocations in addition to the EESS, ISS, and SRS allocations. While Federal use of the 26 GHz band appears to be fairly limited to this point, we recognize that Federal agencies may be considering various potential uses for this spectrum in the future. It is difficult to predict what those services might be, their characteristics, and where they may be deployed. Nevertheless, we believe that the nature of the technology apt to be used in this region of the spectrum is likely to enable sharing using such techniques as geographic separation, highly directional antennas, and taking advantage of the relatively high path losses to enable operation in close proximity. This should make sharing between Federal and non-Federal systems easier than it has been at lower frequencies. Nevertheless, sharing the 26 GHz band between Federal and non-Federal systems will still require a carefully developed framework. We intend to work closely with NTIA to enable UMFUS use of the 26 GHz band while preserving the ability of Federal users to develop and deploy new technologies and services in the 26 GHz band. We intend to explore a number of different approaches for sharing the band. For example, this may involve sharing the band using a framework similar to what we are proposing for the lower 37 GHz band. Alternately, we may set aside portions of the 26 GHz band for exclusively Federal use while making other portions available exclusively for non-Federal use. We may limit non-Federal use of the band to certain geographic areas while reserving use of the band in other areas for Federal use. We request comment on various approaches to sharing the 26 GHz band between UMFUS licensees and both existing and future Federal operations.

b. Spectrum Sharing and Compatibility with Other New Services

85. *Background.* Elefante proposes to deploy what it calls "persistent stratospheric-based communications infrastructure" at altitudes below 20 km in the 26 GHz band, and it says that ITU study groups are conducting studies for stations that would operate at altitudes between 20 and 50 km.[265] Having analyzed the band with Lockheed Martin, Elefante concludes that spectrum sharing between unaffiliated mobile deployments and persistent stratospheric communications systems may not be possible absent an extremely high degree of dynamic coordination and information sharing.[266] On that basis, Elefante recommends that UMFUS not be authorized in the 26 GHz band.[267]

[264] *See, e.g., Allocations and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands*, Report and Order, 18 FCC Rcd 23318, 23322-23331, paras. 6-26 (2003) (*70-80-90 GHz Report and Order*).

[265] *See* Elefante Reply at 1-3 and 6-7.

[266] Elefante Reply at 6-7.

[267] Elefante Reply at 6-7.

86. *Discussion.* Where a high-altitude platform stations (HAPS)[268] or Elefante-style platform is deployed above the center of an urban area, ground stations in the urban core would presumably communicate with the airborne station at relatively high elevation angles, which would allow shorter separation distances from terrestrial mobile equipment. By contrast, ground stations in the periphery of the urban area would likely require lower elevation angles to communicate with the airborne platform and would therefore require larger separation distances. A HAPS operator or Elefante might also choose to deploy some of their airborne platforms away from urban cores, which would enable some ground stations in exurban or rural areas to communicate at high elevation angles and with limited separation from terrestrial systems.

87. In light of the above, we invite comment on Elefante's conclusion that spectrum sharing between airborne platform services (*i.e.*, both HAPS and systems such as Elefante's that would operate at lower altitudes) and unaffiliated UMFUS operators would be infeasible, and that UMFUS should therefore not be authorized in the 26 GHz band.[269] Alternatively, we inquire whether we should prohibit airborne platform systems in the band, or authorize airborne platform services only if they are affiliated with UMFUS licensees. We also invite comment on any additional spectrum-sharing techniques that might reduce the required separation distances between UMFUS equipment and ground stations communicating with airborne platforms. Finally, we invite comment on any other new or proposed services, Federal or non-Federal, that should be given priority over UMFUS in the band or, alternatively, would be compatible with UMFUS and with incumbent services.

3. Licensing the 26 GHz Band

88. *Background*. In the *R&O*, the Commission noted that in recent years it has sought greater consistency in its approach to geographic license area sizes in order to help providers aggregate licenses in a more targeted and efficient manner, and that it has gravitated toward license areas that are derived from Economic Area (EA) units.[270] Because Partial Economic Areas (PEAs) nest into EAs but can also be broken down into counties, the Commission found that choosing them would strike the right balance by facilitating access to spectrum by large and small providers, simplifying frequency coordination, and incentivizing investment.[271] By contrast, the Commission decided to license the 28 GHz band by counties, primarily because the band was already licensed by Basic Trading Areas (BTAs), which could not readily be reformed into either EAs or PEAs.[272] In the *Second Report and Order,* the Commission selected PEAs as the geographic unit for UMFUS licenses in two other bands, the 24 GHz and 47 GHz.[273]

89. *Discussion.* We seek comment on using geographic area licensing and adopting PEAs as the geographic license area size for UMFUS licenses in the 26 GHz band. We also seek comment on site-

[268] The Commission defines HAPS as a station that is located on an object at an altitude of 20 to 50 kilometers and at a specified, nominal, fixed point relative to the Earth. 47 CFR § 2.1.

[269] On May 31, 2018, Elefante filed a petition for rulemaking to establish the Stratospheric-Based Communications Services (SBCS). This petition is pending, and the Commission has not initiated the requested rulemaking proceeding at this time. Petition of Elefante for Rulemaking to Modify Parts 2 and 101 of the Commission's Rules to Enable Timely Deployment of Fixed Stratospheric-Based Communications Services in the 21.5-23.6, 25.2527.5, 71-76, and 81-86 GHz Bands (filed May 31, 2018). We see no basis for deferring initial consideration of flexible fixed and mobile use of the 26 GHz band, as Elefante requests. *See* Elefante May 31, 2018 *Ex Parte* at 1.

[270] *Spectrum Frontiers R&O,* 31 FCC Rcd at 8029, para. 36. The Commission also noted that the EA license areas that the Commission uses are based upon a definition established by the U.S Department of Commerce's Bureau of Economic Analysis. *Id.* at n. 74, *citing* Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, GN Docket No. 12-268, 29 FCC Rcd 6567, 6595, n.193(2014) (Incentive Auction Report and Order).

[271] *Spectrum Frontiers R&O,* 31 FCC Rcd at 8046, para. 82.

[272] *Spectrum Frontiers R&O,* 31 FCC Rcd at 8029-8030, para. 36, and 8046, para. 82.

[273] *Spectrum Frontiers 2nd R&O,* 32 FCC Rcd 10988 at 10997, para. 25 and 11004, para. 50.

based licensing, as well as other licensing mechanisms. Geographic area licensing may provide licensees with the flexibility to provide a variety of services, and will foster innovation and investment and thereby spur deployment. Will geographic area licensing facilitate coexistence between Federal and non-Federal uses? If we decide to use geographic area licensing, PEAs also appear to provide a balance between the larger areas that can encourage more investment, and the smaller areas that can more efficiently accommodate mmW propagation characteristics. To the extent licensees are interested in smaller areas, partitioning is an available option. Commenters favoring site-based licensing or other licensing methods should set forth specific proposals for licensing the 26 GHz band. Given the amount of spectrum available, should we consider using different licensing approaches in different parts of the band?

4. Band Plan

90. *Background*. In the *Second Report and Order,* the Commission acknowledged that most millimeter-wave mobile design work is being built around 100-megahertz building blocks.[274] It chose to license the 700 megahertz in the 24 GHz band as seven 100-megahertz channels[275] and to license the 1,000 megahertz in the 47.2-48.2 GHz band as five 200-megahertz channels.[276] In the *R&O,* the Commission decided to issue new licenses for the 28 GHz band in two 450-megahertz blocks,[277] and it divided the 39 GHz band into seven 200-megahertz channels.[278]

91. *Discussion.* If carriers will eventually require 200 megahertz bandwidths to meet their customers' needs, we recognize that the necessity of combining smaller channels to achieve the requisite scale could involve transaction costs that might eventually be passed on to consumers. On the other hand, 100 megahertz channels would increase the opportunity for competitive entry into the band and provide flexibility for uses that might require less spectrum. With those countervailing considerations in mind, we seek comment on adopting channel bandwidths of 100 megahertz or, in the alternative, 200 megahertz for the 26 GHz band.[279]

E. 50.4-51.4 GHz Band

92. *Background*. The 50.4-51.4 GHz band includes primary Federal and non-Federal allocations for fixed and mobile services, as well as primary Federal and non-Federal allocations for fixed-satellite (Earth-to-space) and mobile satellite (Earth-to-space) services.[280] In 1998, in the *V-Band First Report and Order*, the Commission designated the 50.4-51.4 GHz band for use by wireless (fixed and mobile) services.[281] In the *FNPRM* in the Spectrum Frontiers proceeding, the Commission proposed to authorize fixed and mobile operations throughout the 50.4-52.6 GHz band in accordance with the Part 30 Upper Microwave Flexible Use Service rules.[282] The Commission also proposed to use geographic area licensing to license UMFUS stations on a PEA basis and sought comment on sharing with satellite services.[283] The Commission has received eight satellite applications or market access requests[284] and twenty earth station

[274] *Spectrum Frontiers 2nd R&O,* 32 FCC Rcd 10988 at 10999-11000, para. 33, *citing* Qualcomm Comments at 7.

[275] *Spectrum Frontiers 2nd R&O,* 32 FCC Rcd 10988 at 11000, para. 34.

[276] *Spectrum Frontiers 2nd R&O,* 32 FCC Rcd 10988 at 11006, para. 59.

[277] *Spectrum Frontiers R&O,* 31 FCC Rcd 8014 at 8043, para. 72

[278] *Spectrum Frontiers R&O,* 31 FCC Rcd 8014 at 8053, para. 95

[279] We recognize that the total amount of spectrum is not an even multiple of 100 megahertz. We seek comment on whether we should license one channel of 50 megahertz or have one channel that is 50 megahertz wider.

[280] The Federal allocations are limited to military systems. *See* 47 CFR § 2.106 n.G117.

[281] *V-Band First Report and Order*, 13 FCC Rcd at 24651, para. 2.

[282] *FNPRM*, 31 FCC Rcd at 8157, para. 420.

[283] *Id.*

[284] *See* IBFS File Nos. SAT-LOA-20160622-00058, as amended by IBFS File No. SAT-AMD-20170301-00030 (The Boeing Company); SAT-MOD-20160624-00060 and SAT-AMD-20170301-00026 (O3b Limited); SAT-LOI-

applications[285] seeking to use the existing FSS (Earth-to-space) allocation in the 50.4-51.4 GHz band for delivery of broadband services.

93. In response to the *FNPRM*, certain satellite companies request that the Commission designate satellite services in the 50.4-52.4 GHz band currently allocated to FSS.[286] Echostar supports preserving the co-primary status of FSS and terrestrial fixed/mobile services in the 50.4-52.4 GHz band and recommends adopting spectrum sharing rules that recognize likely deployment scenarios by the different services. CTIA asserts that any technical requirements should be equivalent to the Commission's Part 30 rules for other shared bands.[287] To the extent the Commission decides to adopt a sharing framework in the band, Viasat urges the Commission to consider broader and more balanced sharing between the services on a true co-primary basis at 50.4-52.4 GHz instead of imposing the "three earth stations per license area" framework adopted for the 28 GHz Band.[288]

94. *Discussion*. Although the 50.4-52.6 GHz band remains under consideration for UMFUS licensing,[289] we have throughout this proceeding sought to promote spectrum efficiency by permitting spectrum made available for UMFUS to be shared with other allocated services when possible. As in the case of other bands shared between co-primary terrestrial and fixed-satellite services, (*e.g.*, 24.75-25.25 GHz, 37.5-40 GHz and 47.2-48.2 GHz), we believe that in the 50.4-51.4 GHz band, where an FSS allocation already exists, that a limited number of individually licensed FSS earth stations can share the 50.4-51.4 GHz band with minimal impact on terrestrial operations. Therefore, we propose to adopt rules permitting licensing of individual FSS earth stations in the 50.4-51.4 GHz band using the criteria identical to those applicable in the 24.75-25.25 GHz band.[290] Specifically, we propose to apply the permitted aggregate population limits within the specified earth station PFD contour on a per-county basis, similar to the requirement in the 27.5-28.35 GHz band.[291] Additionally, as in the 47.2-48.2 GHz band, we propose to adopt constraints on the number of permitted earth stations, not only per county, but also per PEA in which the earth stations are located.[292] To reflect these requirements, we propose to modify Section 25.136(e) of the Commission's rules to include the 50.4-51.4 GHz band. We also propose to amend footnote NG65 to the U.S. Table to include the 50.4-51.4 GHz band, making clear the relative interference protection obligations between the co-primary services. We seek comment on these proposals.

F. Mobile Spectrum Holdings Policies in the 26 GHz and 42 GHz Bands

95. In this *Third R&O*, we adopted our proposal to eliminate the pre-auction limit for the *R&O* bands, finding that entities bidding for licenses in the 24 GHz, 28 GHz, 37 GHz, 39 GHz, and 47

(Continued from previous page)

20170301-00023 (Telesat Canada); SAT-LOI-20170301-00031 (WorldVu Satellites Limited (OneWeb)); SAT-LOA-20170301-00027 (Space Exploration Holdings, LLC (SpaceX)); SAT-LOA-20170301-00028 (The Boeing Company) (application for a separate system including both low-Earth orbit (LEO) and highly inclined orbit NGSO satellites); SAT-LOA-20161115-00112 and SAT-AMD-20170301-00029 (Theia Holdings A, Inc.) and SAT-LOA-20170621-00092, as amended by SAT-AMD-20170908-00128 (Hughes Network Systems, LLC.).

[285] IBFS File Nos. SES-LIC-20170807-00876 through SES-LIC-20170807-00895.

[286] Boeing Comments at 13.and ViaSat Comments at 17.

[287] CTIA Reply Comments at 9. https://ecfsapi.fcc.gov/file/103158579212/161031 - FILED CTIA Spectrum Frontiers Reply Comments.pdf

[288] ViaSat Comments at 13.

[289] The Commission has not yet addressed licensing of fixed and mobile services in the 50.4-52.6 GHz band in accordance with the Part 30 Upper Microwave Flexible Service Rules. It remains an open issue in this proceeding and will be addressed in the future.

[290] *See* para.21, *supra*. We note that Boeing has petitioned for FSS access to 51.4-52.4 GHz. Our proposal applies only to 50.4 - 51.4 GHz, where there currently is an FSS allocation, and does not address Boeing's petition.

[291] 47 CFR § 25.136(a)(4)(ii).

[292] 47 CFR § 25.136(d)(4)(i). These limits are no more than two other earth stations in the same county and no more than fourteen other earth stations within the same PEA.

GHz bands will not be subject to bright-line, pre-auction limits on the amount of spectrum they may acquire at an auction of these bands.[293] Similarly, to the extent that we adopt UMFUS rules for some portion or all of the 26 GHz and 42 GHz bands, we propose to have no pre-auction limit on the amount of spectrum in these bands (or portions thereof) that an entity may acquire through competitive bidding. We believe that the reasons for eliminating the pre-auction limit for these five bands would apply equally to the 26 GHz and 42 GHz bands, given their technical characteristics relative to these other bands. We seek comment on this proposal.

96. To the extent that we adopt UMFUS rules for some portion or all of the 26 GHz and 42 GHz bands, we propose to include those bands (or portions thereof) in the mmW spectrum threshold for reviewing proposed secondary market transactions. We note that these bands share similar technical characteristics to the 24 GHz, 28 GHz, 37 GHz, 39 GHz, and 47 GHz bands. We seek comment on this proposal.

VI. PROCEDURAL MATTERS

A. *Ex Parte* Rules – Permit-But-Disclose

97. Pursuant to Section 1.1200(a) of the Commission's rules,[294] this *3rd FNPRM* shall be treated as a "permit-but-disclose" proceeding in accordance with the Commission's *ex parte* rules.[295] 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.

B. Comment Period and Procedures

98. Pursuant to Sections 1.415 and 1.419 of the Commission's rules, 47 CFR §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using the Commission's Electronic Comment Filing System (ECFS). *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: http://fjallfoss.fcc.gov/ecfs2/.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

[293] We also found above that it is in the public interest to apply a post-auction case-by-case review of mmW spectrum holdings. *See* Section III.E, *supra*.

[294] 47 CFR § 1.1200(a).

[295] 47 CFR §§ 1.1200 *et seq.*

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., SW, Room TW-A325, Washington, DC 20554. The filing hours are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes and boxes must be disposed of before entering the building.
- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9050 Junction Drive, Annapolis Junction, MD 20701.
- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

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

C. Regulatory Flexibility Analysis

100. As required by the Regulatory Flexibility Act of 1980 (RFA),[296] the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA) and a Supplementary Final Regulatory Flexibility Analysis (Supplemental FRFA) of the possible significant economic impact on small entities of the policies and rules adopted in the *Second Report and Order and Order on Reconsideration*. The analysis associated with the policies and rules in *Second Report and Order* are contained in the FRFA found in Appendix C, and the Supplemental FRFA in Appendix D contains the analysis associated with the policies and rules in *Order on Reconsideration*.

101. In addition, we have prepared an Initial Regulatory Flexibility Analysis (IRFA) regarding the significant economic impact on small entities of the policies and rules adopted in the *Second Further Notice of Proposed Rulemaking*, which is found in Appendix F. We request written public comment on the IRFA. Comments must be filed in accordance with the same deadlines as comments filed in response to the *2nd FNRPM* and must have a separate and distinct heading designating them as responses to the IRFA.

D. Paperwork Reduction Analysis

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

E. Further Information

103. 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.

[296] *See* 5 U.S.C. § 603.

VII. ORDERING CLAUSES

104. IT IS ORDERED, pursuant to the authority found in Sections 1, 2, 3, 4, 5, 7, 301, 302, 302a, 303, 304, 307, 309, and 310 of the Communications Act of 1934, 47 U.S.C. §§ 151, 152, 153, 154, 155, 157, 301, 302, 302a, 303, 304, 307, 309, and 310, Section 706 of the Telecommunications Act of 1996, as amended, 47 U.S.C. § 1302, and Section 1.411 of the Commission's Rules, 47 C.F.R § 1.411, that this *Third Report and Order, Third Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order* IS HEREBY ADOPTED.

105. IT IS FURTHER ORDERED that the Commission's rules ARE HEREBY AMENDED as set forth in Appendix A.

106. IT IS FURTHER ORDERED that the provisions and requirements of this *Third Report and Order* and the rules adopted herein WILL BECOME EFFECTIVE 30 days after the date of publication in the *Federal Register*, except for rules and requirements which contain new or modified information collection requirements that require approval by the Office of Management and Budget under the Paperwork Reduction Act and WILL BECOME EFFECTIVE after the Commission publishes a notice in the *Federal Register* announcing such approval and the relevant effective date.

107. IT IS FURTHER ORDERED that the petitions for reconsideration listed in Appendix F ARE GRANTED to the extent indicated and are otherwise DENIED.

108. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Third Report and Order, Third Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order,* including the Final, Supplemental Final, and Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

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

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR parts 2, 25, and 30 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. In § 2.106, the Table of Frequency Allocations is amended as follows:

   a. Page 54 is revised.

   b. In the list of non-Federal Government (NG) Footnotes, footnote NG65 is revised and footnote NG535 is removed.

§ 2.106 Table of Frequency Allocations.

The revisions read as follows:

* * * * *

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	24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) NG65 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)			25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH (space-to-Earth) Standard frequency and time	25.5-27 SPACE RESEARCH (space-to-Earth) Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-space)	

5.536A	signal-satellite (Earth-to-space) 5.536A US258	5.536A US258	Page 54

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NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NG65 In the bands 24.75-25.25 GHz and 47.2-48.2 GHz, stations in the fixed and mobile services may not claim protection from individually licensed earth stations authorized pursuant to 47 CFR 25.136. However, nothing in this footnote shall limit the right of UMFUS licensees to operate in conformance with the technical rules contained in 47 CFR part 30. The Commission reserves the right to monitor developments and to undertake further action concerning interference between UMFUS and FSS, including aggregate interference to satellite receivers, if appropriate.

* * * * *

PART 25 – SATELLITE COMMUNICATIONS

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

Authority: 47 U.S.C. 154, 301, 302, 303, 307, 309, 310, 319, 332, 605, and 721, unless otherwise noted.

4. Amend § 25.103 by revising the definitions of "Routine processing or licensing" and "Two-degree-compliant space station" to read as follows:

§ 25.103 Definitions.

* * * * *

Routine processing or licensing. Expedited processing of unopposed applications for earth stations in the FSS communicating with GSO space stations, that satisfy the criteria in §§ 25.138(a), 25.211(d), 25.212(c), 25.212(d), 25.212(e), 25.212(f), or 25.218, include all required information, are consistent with all Commission rules, and do not raise any policy issues. Some, but not all, routine earth station applications are eligible for an autogrant procedure under § 25.115(a)(3).

* * * * *

Two-degree-compliant space station. A GSO FSS space station operating in the conventional or extended C-bands, the conventional or extended Ku-bands, the 24.75-25.25 GHz band, or the conventional Ka-band within the limits on downlink EIRP density or PFD specified in §25.140(a)(3) and communicating only with earth stations operating in conformance with routine uplink parameters specified in §§ 25.138(a), 25.211(d), 25.212(c), (d), or (f), §§ 25.218, 25.221(a)(1) or (a)(3), or § 25.222(a)(1) or (a)(3), § 25.226(a)(1) or (a)(3), or § 25.227(a)(1) or (a)(3).

* * * * *

5. Amend § 25.114 by revising paragraph (d)(7) and removing and reserving paragraph (d)(17) as follows:

§ 25.114 Applications for space station authorizations.

* * * * *

(d)* * *

(7) Applicants for authorizations for space stations in the Fixed-Satellite Service, including applicants proposing feeder links for space stations operating in the 17/24 GHz Broadcasting-Satellite Service, must also include the information specified in § 25.140(a). Applicants for authorizations for space stations in the 17/24 GHz Broadcasting-Satellite Service must also include the information specified in § 25.140(b);

* * * * *

(17) [Reserved]

* * * * *

6. Amend § 25.115 by revising paragraphs (e)(1) and (g)(1)(vii) to read as follows:

§ 25.115 Applications for earth station authorizations.

* * * * *

(e) * * *

(1) An application for a GSO FSS earth station license in the 17.8-19.4 GHz, 19.6-20.2 GHz, 24.75-25.25 GHz, 27.5-29.1 GHz, or 29.25-30 GHz bands not filed on FCC Form 312EZ pursuant to paragraph (a)(2) of this section must be filed on FCC Form 312, Main Form and Schedule B, and must include any information required by paragraph (g) or (j) of this section or by §25.130.

* * * * *

(g) * * *

(1) * * *

(vii) The relevant off-axis EIRP density envelopes in §§ 25.138, 25.218, 25.221, 25.222, 25.226, or § 25.227 must be superimposed on plots submitted pursuant to paragraphs (g)(1)(i) through (vi) of this section.

* * * * *

7. Amend § 25.136 by adding new paragraph (e) to read as follows, revising current paragraph (e) to read as follows and redesignating as paragraph (f) and redesignating current paragraph (f) as paragraph (g) :

§ 25.136 Earth Stations in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz and 47.2-48.2 GHz

bands.

* * * * *

(e) Notwithstanding that FSS is co-primary with the Upper Microwave Flexible Use Service in the 24.75-25.25 GHz band, earth stations in that bands shall be limited to individually licensed earth stations. An applicant for a license for a transmitting earth station in the 24.75-25.25 GHz band must meet one of the following criteria to be authorized to operate without providing any additional interference protection to stations in the Upper Microwave Flexible Use Service:

(1) The FSS licensee also holds the relevant Upper Microwave Flexible Use Service license(s) for the area in which the earth station generates a power flux density (PFD), at 10 meters above ground level, of greater than or equal to −77.6 dBm/m2/MHz;

(2) The earth station in the 24.75-25.25 GHz band was authorized prior to **[insert effective date of this rule]**; or

(3) The application for the earth station in the 24.75-25.25 GHz band was filed prior to **[insert effective date of this rule];** or

(4) The applicant demonstrates compliance with all of the following criteria in its application:

(i) There are no more than two other authorized earth stations operating in the 24.75-25.25 GHz band within the county where the proposed earth station is located that meet the criteria contained in either paragraphs (e)(1) (e)(2), (e)(3) or (e)(4) of this section, and there are no more than 14 other authorized earth stations operating in the 24.75-25.25 GHz band within the Partial Economic Area where the proposed earth station is located that meet the criteria contained in paragraphs (e)(1) (e)(2), (e)(3) or (e)(4) of this section. For purposes of this requirement, multiple earth stations that are collocated with or at a location contiguous to each other shall be considered as one earth station;

(ii) The area in which the earth station generates a power flux density (PFD), at 10 meters above ground level, of greater than or equal to −77.6 dBm/m^2/MHz, together with the similar area of any other earth station operating in the 24.75-25.25 GHz band authorized pursuant to paragraph (e) of this section,

does not cover, in the aggregate, more than the amount of population of the county within which the earth station is located as noted below:

Table 1 to Paragraph (e)(4)(ii)

Population within the County where earth station is located	Maximum permitted aggregate population within −77.6 dBm/m^2/MHz PFD contour of earth stations
Greater than 450,000	0.1 percent of population in county.
Between 6,000 and 450,000	450 people.
Fewer than 6,000	7.5 percent of population in county.

(iii) The area in which the earth station generates a PFD, at 10 meters above ground level, of greater than or equal to −77.6 dBm/m2/MHz does not contain any major event venue, urban mass transit route, passenger railroad, or cruise ship port. In addition, the area mentioned in paragraph (a)(4)(ii) of this section shall not cross any of the following types of roads, as defined in functional classification guidelines issued by the Federal Highway Administration pursuant to 23 CFR 470.105(b): Interstate, Other Freeways and Expressways, or Other Principal Arterial. The Federal Highway Administration Office of Planning, Environment, and Realty Executive Geographic Information System (HEPGIS) map contains information on the classification of roads. For purposes of this rule, an urban area shall be an Adjusted Urban Area as defined in section 101(a)(37) of Title 21 of the United States Code.

(iv) The applicant has successfully completed frequency coordination with the UMFUS licensees within the area in which the earth station generates a PFD, at 10 meters above ground level, of greater than or equal to −77.6 dBm/m2/MHz with respect to existing facilities constructed and in operation by the UMFUS licensee. In coordinating with UMFUS licensees, the applicant shall use the applicable processes contained in §101.103(d) of this chapter. (f) If an earth station applicant or licensee in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz and/or 47.2-48.2 GHz bands enters into an agreement with an

UMFUS licensee, their operations shall be governed by that agreement, except to the extent that the agreement is inconsistent with the Commission's rules or the Communications Act.

* * * * *

8. Amend § 25.138 by revising the section heading and paragraph (a) introductory text, and paragraph (a)(6) to read as follows:

§ 25.138 Licensing requirements for GSO FSS earth stations in the conventional Ka-band and the 24.75-25.25 GHz band.

(a) Applications for earth station licenses in the GSO FSS in the conventional Ka-band or the 24.75-25.25 GHz band that indicate that the following requirements will be met and include the information required by relevant provisions in §§ 25.115 and 25.130 may be routinely processed:

* * *

(6) The pfd at the Earth's surface produced by emissions from a space station operating in the conventional Ka-band, for all conditions including clear sky, and for all methods of modulation, shall not exceed a level of -118 dBW/m2/MHz, in addition to the limits specified in §25.208(d).

* * * * *

9. Amend § 25.140 by revising paragraphs (a)(2), (a)(3) introductory text, (a)(3)(iv) through (v), adding paragraph (a)(3)(vi), revising paragraph (b) introductory text, (b)(3) through (b)(5), removing paragraph (b)(6), removing and reserving paragraph (c), and revising paragraph (d) introductory text to read as follows:

§ 25.140 Further requirements for license applications for GSO space station operation in the FSS and the 17/24 GHz BSS.

(a) * * *

(2) In addition to the information required by § 25.114, an applicant for GSO FSS space station operation, including applicants proposing feeder links for space stations operating in the 17/24 GHz BSS, that will be located at an orbital location less than two degrees from the assigned location of an authorized co-frequency GSO space station, must either certify that the proposed operation has been coordinated

with the operator of the co-frequency space station or submit an interference analysis demonstrating the compatibility of the proposed system with the co-frequency space station. Such an analysis must include, for each type of radio frequency carrier, the link noise budget, modulation parameters, and overall link performance analysis. (See Appendices B and C to Licensing of Space Stations in the Domestic Fixed-Satellite Service, FCC 83-184, and the following public notices, copies of which are available in the Commission's EDOCS database: DA 03-3863 and DA 04-1708.) The provisions in this paragraph do not apply to proposed analog video operation, which is subject to the requirement in paragraph (a)(1) of this section.

(3) In addition to the information required by § 25.114, an applicant for a GSO FSS space station, including applicants proposing feeder links for space stations operating in the 17/24 GHz BSS, must provide the following for operation other than analog video operation:

* * * * *

(iv) With respect to proposed operation in the 24.75-25.25 GHz band (Earth-to-space), a certification that the proposed uplink operation will not exceed the applicable EIRP density envelopes in §25.138(a) and that the associated space station will not generate a power flux density at the Earth's surface in excess of the applicable limits in this part, unless the non-routine uplink and/or downlink FSS operation is coordinated with operators of authorized co-frequency space stations at assigned locations within six degrees of the orbital location and except as provided in paragraph (d) of this section.

(v) With respect to proposed operation in the 4500-4800 MHz (space-to-Earth), 6725-7025 MHz (Earth-to-space), 10.70-10.95 GHz (space-to-Earth), 11.20-11.45 GHz (space-to-Earth), and/or 12.75-13.25 GHz (Earth-to-space) bands, a statement that the proposed operation will take into account the applicable requirements of Appendix 30B of the ITU Radio Regulations (incorporated by reference, see § 25.108) and a demonstration that it is compatible with other U.S. ITU filings under Appendix 30B.

(vi) With respect to proposed operation in other FSS bands, an interference analysis demonstrating compatibility with any previously authorized co-frequency space station at a location two degrees away or a certification that the proposed operation has been coordinated with the operator(s) of

the previously authorized space station(s). If there is no previously authorized space station at a location two degrees away, the applicant must submit an interference analysis demonstrating compatibility with a hypothetical co-frequency space station two degrees away with the same receiving and transmitting characteristics as the proposed space station.

(b) Each applicant for a license to operate a space station transmitting in the 17.3-17.8 GHz band must provide the following information, in addition to that required by § 25.114:

* * * * *

(3) An applicant for a license to operate a space station transmitting in the 17.3-17.8 GHz band must certify that the downlink power flux density on the Earth's surface will not exceed the values specified in §25.208(c) and/or (w), or must provide the certification specified in § 25.114(d)(15)(ii).

(4) An applicant for a license to operate a space station transmitting in the 17.3-17.8 GHz band to be located less than four degrees from a previously licensed or proposed space station transmitting in the 17.3-17.8 GHz band, must either certify that the proposed operation has been coordinated with the operator of the co-frequency space station or provide an interference analysis of the kind described in paragraph (a) of this , except that the applicant must demonstrate that its proposed network will not cause more interference to the adjacent space station transmitting in the 17.3-17.8 GHz band operating in compliance with the technical requirements of this part, than if the applicant were locate at an orbital separation of four degrees from the previously licensed or proposed space station.

(5) In addition to the requirements of paragraphs (b)(3) and (b)(4) of this section, the link budget for any satellite in the 17.3-17.8 GHz band (space-to-Earth) must take into account longitudinal stationkeeping tolerances. Any applicant for a space station transmitting in the 17.3-17.8 GHz band that has reached a coordination agreement with an operator of another space station to allow that operator to exceed the pfd levels specified in the rules for this service, must use those higher pfd levels for the purpose of this showing.

(c) [Reserved]

(d) An operator of a GSO FSS space station in the conventional or extended C-bands, conventional or

extended Ku-bands, 24.75-25.25 GHz band (Earth-to-space), or conventional Ka-band may notify the Commission of its non-routine transmission levels and be relieved of the obligation to coordinate such levels with later applicants and petitioners.

* * * * *

§25.203 [Amended].

10. Amend § 25.203 by removing and reserving paragraph (l).

11. Amend § 25.204 by removing paragraph (e)(4) and revising paragraphs (e) introductory text, (e)(1) and (3) to read as follows:

§25.204 Power limits for earth stations.

* * * * *

(e) To the extent specified in paragraphs (e)(1) through (e)(3) of this section, earth stations in the Fixed-Satellite Service may employ uplink adaptive power control or other methods of fade compensation to facilitate transmission of uplinks at power levels required for desired link performance while minimizing interference between networks.

(1) Except when paragraphs (e)(2) through (e)(3) of this section apply, transmissions from FSS earth stations in frequencies above 10 GHz may exceed the uplink EIRP and EIRP density limits specified in the station authorization under conditions of uplink fading due to precipitation by an amount not to exceed 1 dB above the actual amount of monitored excess attenuation over clear sky propagation conditions. EIRP levels must be returned to normal as soon as the attenuating weather pattern subsides.

* * * * *

(3) FSS earth stations transmitting to geostationary space stations in the 24.75-25.25 GHz, 28.35-28.6 GHz, and/or 29.25-30.0 GHz bands may employ uplink adaptive power control or other methods of fade compensation. For stations employing uplink power control, the values in paragraphs (a)(1), (a)(2), and (a)(4) of §25.138 of this part may be exceeded by up to 20 dB under conditions of uplink fading due to precipitation. The amount of such increase in excess of the actual amount of monitored excess attenuation over clear sky propagation conditions must not exceed 1.5 dB or 15 percent of the actual

amount of monitored excess attenuation in dB, whichever is larger, with a confidence level of 90 percent except over transient periods accounting for no more than 0.5 percent of the time during which the excess is no more than 4.0 dB.

* * * * *

12. Amend § 25.209 by revising paragraph (f) to read as follows:

§ 25.209 Earth station antenna performance standards.

* * * * *

(f) A GSO FSS earth station with an antenna that does not conform to the applicable standards in paragraphs (a) and (b) of this section will be authorized only if the applicant demonstrates that the antenna will not cause unacceptable interference. This demonstration must comply with the requirements in §§ 25.138, 25.218, 25.220, 25.221, 25.222, 25.226, or § 25.227, as appropriate.

* * * * *

13. Amend § 25.210 by revising paragraph (i) to read as follows:

§ 25.210 Technical requirements for space stations.

* * * * *

(i) 17/24 GHz BSS space station antennas transmitting in the 17.3-17.8 GHz band must be designed to provide a cross-polarization isolation such that the ratio of the on axis co-polar gain to the cross-polar gain of the antenna in the assigned frequency band is at least 25 dB within its primary coverage area.

* * * * *

14. Amend § 25.220 by revising paragraph (a) to read as follows:

§25.220 Non-routine transmit/receive earth station operations.

(a) The requirements in this section apply to applications for, and operation of, earth stations transmitting in the conventional or extended C-bands, the conventional or extended Ku-bands, the 24.75-25.25 GHz band, or the conventional Ka-band that do not qualify for routine licensing under relevant criteria in §§ 25.138, 25.211, 25.212, 25.218, 25.221(a)(1) or (a)(3), § 25.222(a)(1) or (a)(3), §

25.226(a)(1) or (a)(3), or § 25.227(a)(1) or (a)(3).

* * * * *

§ 25.223 [Removed and Reserved].

15. Remove and reserve § 25.223.

16. Revise § 25.262 to read as follows:

§ 25.262 Licensing and domestic coordination requirements for 17/24 GHz BSS space stations.

(a) An applicant may be authorized to operate a space station transmitting in the 17.3-17.8 GHz band at levels up to the maximum power flux density limits defined in § 25.208(c) and/or § 25.208(w) of this part, without coordinating its power flux density levels with adjacent licensed or permitted operators, only if there is no licensed space station, or prior-filed application for a space station transmitting in the 17.3-17.8 GHz band at a location less than four degrees from the orbital location at which the applicant proposes to operate.

(b) Any U.S. licensee or permittee authorized to transmit in the 17.3-17.8 GHz band that does not comply with the power flux-density limits set forth in § 25.208(c) and/or § 25.208(w) of this part shall bear the burden of coordinating with any future co-frequency licensees and permittees of a space station transmitting in the 17.3-17.8 GHz band under the following circumstances:

(1) If the operator's space-to-Earth power flux-density levels exceed the power flux-density limits set forth in § 25.208(c) and/or § 25.208(w) of this part by 3 dB or less, the operator shall bear the burden of coordinating with any future operators proposing a space station transmitting in the 17.3-17.8 GHz band in compliance with power flux-density limits set forth in § 25.208(c) and/or §25.208(w) of this part and located within ±6 degrees of the operator's 17/24 GHz BSS space station.

(2) If the operator's space-to-Earth power flux-density levels exceed the power flux-density limits set forth in § 25.208(c) and/or § 25.208(w) of this part by more than 3 dB, the operator shall bear the burden of coordinating with any future operators proposing a space station transmitting in the 17.3-17.8 GHz band in compliance with power flux-density limits set forth in § 25.208(c) and/or § 25.208(w) of this part and located within ±10 degrees of the operator's space station.

(3) If no good faith agreement can be reached, the operator of the space station transmitting in the 17.3-17.8 GHz band that does not comply with § 25.208(c) and/or § 25.208(w) of this part shall reduce its space-to-Earth power flux-density levels to be compliant with those specified in § 25.208(c) and/or § 25.208(w) of this part.

(c) Any U.S. licensee or permittee using a space station transmitting in the 17.3-17.8 GHz band that is required to provide information in its application pursuant to § 25.140(b)(4) of this part must accept any increased interference that may result from adjacent space stations transmitting in the 17.3-17.8 GHz band that are operating in compliance with the rules for such space stations.

(d) Notwithstanding the provisions of this, licensees and permittees will be allowed to apply for a license or authorization for a replacement satellite that will be operated at the same power level and interference protection as the satellite to be replaced.

PART 30 – UPPER MICROWAVE FLEXIBLE USE SERVICE

17. The authority citation for part 30 continues to read as follows:

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

18. Amend § 30.104 by redesignating paragraphs (b) through (e) as paragraphs (c) through (f), adding new paragraph (b), and revising newly redesignated paragraphs (c), (e), and (f) to read as follows:

§ 30.104 Performance Requirements

* * * * *

(b) In the alternative, a licensee may make its buildout showing on the basis of geographic area coverage. To satisfy the requirements of using this metric, licensees relying on mobile or point-to-multipoint service must show that they are providing reliable signal coverage and service to at least 25% of the geographic area of the license. The geographic area of the license shall be determined by the total land area of the county or counties covered by the license. Licensees relying on fixed point-to-point links or other, low-power point-to-point connections must show that they have deployed at least one transmitter or receiver in at least 25% of the census tracts within the license area. All equipment relied upon in the showing, whatever type of service or connection it provides, must be operational and providing service,

either to customers or for internal use, as of the date of the filing.

(c) Showings that rely on a combination of multiple types of service will be evaluated on a case-by-case basis. Licensees may not combine population-based showings with geographic area-based showings.

* * * * *

(e) 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 or land area within the license area to a level where the licensee's buildout would meet one of the applicable performance metrics.

(f) Existing 24 GHz, 28 GHz and 39 GHz licensees shall be required to make a showing pursuant to this rule by June 1, 2024.

19. Revise § 30.208 to read as follows:

§ 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. Mobile and transportable stations that operate on any portion of either the 24.25-24.45 GHz or 24.75-25.25 GHz bands must be capable of operating on all frequencies within both of those bands.

APPENDIX B

Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),[1] an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Second Further Notice of Proposed Rulemaking (2nd FNPRM)* released in November 2017 in this proceeding.[2] The Commission sought written public comment on the proposals in the *2nd FNPRM*, including comments on the IRFA. No comments were filed addressing the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.[3]

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

2. In the attached *Third Report and Order*, we authorize Fixed-Satellite Service (FSS) use of the 24.75-25.25 GHz band for individually licensed earth stations. Under the current rules, Broadcasting Satellite Service (BSS) feeder links have priority over other FSS uses in the 24.75-25.25 GHz band. Given the very light use of the 24.75-25.25 GHz band for BSS feeder links, the existence of our earth station two-degree spacing rules that can protect BSS feeder links from other FSS earth stations in the band, and the power limits placed on BSS feeder link earth stations, there is no need to give BSS feeder link earth stations priority over other uses of the FSS for earth stations located within the United States, or to preclude other FSS earth stations from claiming protection from feeder link earth stations located within the United States.

3. The *Third Report and Order* also creates a buildout standard for Upper Microwave Flexible Use Service (UMFUS) licensees based on geographic area coverage that would be an alternative to the current population coverage standard in the current rules. A performance metric based on geographic area coverage (or presence) would allow for networks that provide meaningful service but deploy along other lines than residential population. Such a metric could be useful for sensor-based networks, particularly for uses in rural areas. We adopt the following metric as an option for UMFUS licensees to fulfill their buildout requirements: geographic area coverage of 25% of the license area. The latter standard could accommodate deployments, such as sensor networks, that are not designed to provide mobile or point-to-multipoint area coverage, and for whom calculating "coverage of 25% of the area" would therefore not be a meaningful standard.

4. The *Third Report and Order* also adopts an operability requirement such that any device designed to operate within the 24 GHz bands must be capable of operating on all frequencies within those bands. This operability requirement will ensure that devices developed for the 24 GHz band operate throughout the band, making it easier for smaller businesses with fewer resources to find equipment that can operate across the entire band.

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

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

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

[2] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order*, 32 FCC Rcd 10988 (2017).

[3] *See* 5 U.S.C. § 604.

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

6. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.[4]

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

7. *Wireless Telecommunications Carriers (except Satellite)*. This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless internet access, and wireless video services.[5] The appropriate size standard under SBA rules is that such a business is small if it has 1,500 or fewer employees.[6] For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.[7] Of this total, 955 firms had employment of 999 or fewer employees and 12 had employment of 1,000 employees or more.[8] Thus under this category and the associated size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities.

8. *Fixed Microwave Services.* Microwave services include common carrier,[9] private-operational fixed,[10] and broadcast auxiliary radio services.[11] They also include the Upper Microwave Flexible Use Service[12] and the Millimeter Wave Service[13] where licensees can choose between common carrier and non-common carrier status.[14] At present, there are approximately 66,680 common carrier fixed licensees, 69,360 private and public safety operational-fixed licensees, 20,150 broadcast auxiliary radio licensees, 411 LMDS licenses, 33 24 GHz DEMS licenses, 777 39 GHz licenses, and five 24 GHz

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[4] 5 U.S.C. § 604(a)(3).

[5] NAICS Code 517210. *See* https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517210.

[6] 13 CFR § 121.201, NAICS code 517210.

[7] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ5, Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012 NAICS Code 517210 (rel. Jan. 8, 2016). https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ5//naics~517210.

[8] *Id*. Available census data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[9] *See* 47 CFR Part 10, Subpart I.

[10] Persons eligible under Parts 80 and 90 of the Commission's rules can use Private-Operational Fixed Microwave services. *See* 47 CFR Parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee's commercial, industrial, or safety operations.

[11] Auxiliary Microwave Service is governed by Part 74 and Part 78 of Title 47 of the Commission's rules. Available to licensees of broadcast stations, cable operators, and to broadcast and cable network entities. Auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes TV pickup and CARS pickup, which relay signals from a remote location back to the studio.

[12] *See* 47 CFR Part 30.

[13] *See* 47 CFR Part 101, Subpart Q.

[14] *See* 47 CFR §§ 30.6, 101.1017.

licenses, and 467 Millimeter Wave licenses in the microwave services.[15] The Commission has not yet defined a small business with respect to microwave services. The closest applicable SBA category is Wireless Telecommunications Carriers (except Satellite) and the appropriate size standard for this category under SBA rules is that such a business is small if it has 1,500 or fewer employees.[16] For this industry, U.S. Census Bureau data for 2012 shows that there were 967 firms 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.[17] Thus under this SBA category and the associated standard, the Commission estimates that the majority of fixed microwave service licensees can be considered small.

9. The Commission does not have data specifying the number of these licensees that have more than 1,500 employees, and thus is unable at this time to estimate with greater precision the number of fixed microwave service licensees that would qualify as small business concerns under the SBA's small business size standard. Consequently, the Commission estimates that there are up to 36,708 common carrier fixed licensees and up to 59,291 private operational-fixed licensees and broadcast auxiliary radio licensees in the microwave services that may be small and may be affected by the rules and policies adopted herein. We note, however, that both the common carrier microwave fixed and the private operational microwave fixed licensee categories includes some large entities.

10. *Satellite Telecommunications and All Other Telecommunications.* This category comprises firms "primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications."[18] The category has a small business size standard of $32.5 million or less in average annual receipts, under SBA rules.[19] For this category, U.S. Census Bureau data for 2012 shows that there were a total of 333 firms that operated for the entire year.[20] Of this total, 299 firms had annual receipts of less than $25 million.[21] Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

11. *All Other Telecommunications*. The **"**All Other Telecommunications" category is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.[22] 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.[23] Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also

[15] These statistics are based on a review of the Universal Licensing System on September 22, 2015.

[16] 13 CFR § 121.201, NAICS code 517210.

[17] *Id*. Available census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[18] U.S. Census Bureau, 2012 NAICS Definitions, "517410 Satellite Telecommunications", https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517410#.

[19] 13 CFR § 121.201, NAICS code 517410.

[20] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517410 https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517410.

[21] *Id*.

[22] *See* U.S. Census Bureau, 2012 NAICS Definitions, NAICS Code "517919 All Other Telecommunications", https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517919#.

[23] *Id*.

included in this industry."[24] The SBA has developed a small business size standard for "All Other Telecommunications," which consists of all such firms with gross annual receipts of $32.5 million or less.[25] For this category, U.S. Census Bureau data for 2012 shows that there were a total of 1442 firms that operated for the entire year.[26] Of these firms, a total of 1400 firms had gross annual receipts of under $25 million and 42 firms had gross annual receipts of $25 million to $49,999,999.[27] Thus, the Commission estimates that a majority of "All Other Telecommunications" firms potentially affected by our actions can be considered small.

12. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* 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."[28] The SBA has established a size standard for this industry of 1,250 employees or less.[29] U.S. Census Bureau data for 2012 shows that 841 establishments operated in this industry in that year.[30] Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.[31] Based on this data, we conclude that a majority of manufacturers in this industry is small.

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

13. We expect the rules adopted in the *Third Report and Order* will impose new or additional reporting or recordkeeping and/or other compliance obligations on small entities as well as other applicants and licensees. The projected reporting, recordkeeping, and other compliance requirements in the *Third Report and Order* 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.

14. Small entities and other applicants for Upper Microwave Flexible Use Service licenses will be required to file license applications using the Commission's automated Universal Licensing System (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 weekly public notices, FCC rulemakings, processing utilities, and a telecommunications glossary. Small entities, like all other entities who are Upper Microwave Flexible Use Service applicants, must submit long-form license applications must do so through ULS using Form

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[24] *Id.*

[25] 13 CFR § 121.201; NAICS Code 517919.

[26] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517919, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517919.

[27] *Id.*

[28] *See* U.S. Census Bureau, 2012 NAICS Definitions, NAICS Code 334220, available at https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.334220#.

[29] 13 CFR § 121.201, NAICS Code 334220.

[30] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1231SG2, Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012 NAICS Code 334220, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/31SG2//naics~334220.

[31] *Id.*

601,[32] FCC Ownership Disclosure Information for the Wireless Telecommunications Services using FCC Form 602,[33] and other appropriate forms.[34]

15. We expect that the filing, recordkeeping and reporting requirements associated with the demands described above will require small businesses as well as other entities that intend to utilize these new UMFUS licenses to use professional, accounting, engineering or survey services in order to meet these requirements. As described below, several steps have been taken that will alleviate the burdens of the requirements on small businesses.

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

16. The RFA requires an agency to describe any significant, specifically small business, 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.[35]

17. The Commission does not believe that its adopted changes will have a significant economic impact on small entities. As noted above, the various construction and performance requirements and their associated showings will be the same for small and large businesses that license the Upper Microwave Flexible Use Service bands. To the extent applying the rules equally to all entities results in the cost of complying with these burdens being relatively greater for smaller businesses than for large ones, these costs are necessary to effectuate the purpose of the Communications Act, namely to further the efficient use of spectrum and to prevent spectrum warehousing. Likewise compliance with our service and technical rules and coordination requirements are necessary for the furtherance of our goals of protecting the public while also providing interference free services. Moreover, while small and large businesses must equally comply with these rules and requirements, we have taken the steps described below to help alleviate the burden on small businesses that seek to comply with these requirements.

18. The proposals to facilitate satellite service in the 24 GHz band should also assist small satellite businesses by providing them with additional flexibility to locate their earth stations without causing interference to or receiving interference from UMFUS licensees.

Report to Congress

19. The Commission will send a copy of the *Third Report and Order*, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.[36] In addition, the Commission will send a copy of the *Third Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Third Report and Order*, and FRFA (or summaries thereof) will also be published in the Federal Register.[37]

[32] 47 CFR § 1.913(a)(1).

[33] 47 CFR § 1.919.

[34] 47 CFR § 1.2107.

[35] 5 U.S.C. § 603(c)(1)-(4).

[36] *See* 5 U.S.C. § 801(a)(1)(A).

[37] *See* 5 U.S.C. § 604(b).

APPENDIX C

Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR parts 2, 25, and 30 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. In § 2.106, the Table of Frequency Allocations is amended as follows:

a. Revise pages 54, 55, 58, and 60.

b. In the list of non-Federal Government (NG) Footnotes, footnote NG65 is revised.

§ 2.106 Table of Frequency Allocations.

The revisions read as follows:

* * * * *

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	24.75-25.25 FIXED FIXED-SATELLITE (Earth-to-space) NG65 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 FIXED MOBILE Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-space)	RF Devices (15) Upper Microwave Flexible Use (30)
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)			25.5-27 EARTH EXPLORATION-SATELLITE (space-to-Earth) FIXED INTER-SATELLITE 5.536 MOBILE SPACE RESEARCH	25.5-27 FIXED MOBILE SPACE RESEARCH (space-to-Earth) Inter-satellite 5.536 Standard frequency and time signal-satellite (Earth-to-	

5.536A	(space-to-Earth) Standard frequency and time signal-satellite (Earth-to-space) 5.536A US258	space) 5.536A US258	Page 54

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	27-27.5 FIXED FIXED-SATELLITE (Earth-to-space) INTER-SATELLITE 5.536 5.537 MOBILE		27-27.5 FIXED INTER-SATELLITE 5.536 MOBILE	27-27.5 FIXED MOBILE Inter-satellite 5.536	Upper Microwave Flexible Use (30) RF Devices (15)
27.5-28.5 FIXED 5.537A FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE 5.538 5.540			27.5-30	27.5-28.35 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE	RF Devices (15) Satellite Communications (25) Upper Microwave Flexible Use (30) Fixed Microwave (101)
28.5-29.1 FIXED FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.523A 5.539 MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540				28.35-29.1 FIXED-SATELLITE (Earth-to-space) NG165 NG62	Satellite Communications (25)
29.1-29.5 FIXED FIXED-SATELLITE (Earth-to-space) 5.516B 5.523C 5.523E 5.535A 5.539 5.541A MOBILE Earth exploration-satellite (Earth-to-space) 5.541 5.540				29.1-29.25 FIXED FIXED-SATELLITE (Earth-to-space) NG166 MOBILE	RF Devices (15) Satellite Communications (25) Fixed Microwave (101)
				29.25-29.5 FIXED-SATELLITE (Earth-to-space) NG535A NG62	Satellite Communications (25)
29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542	29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.525 5.526 5.527 5.529 5.540 5.542	29.5-29.9 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 Earth exploration-satellite (Earth-to-space) 5.541 Mobile-satellite (Earth-to-space) 5.540 5.542		29.5-30 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space)	

29.9-30 FIXED-SATELLITE (Earth-to-space) 5.484A 5.516B 5.539 MOBILE-SATELLITE (Earth-to-space) Earth exploration-satellite (Earth-to-space) 5.541 5.543 5.525 5.526 5.527 5.538 5.540 5.542				5.525 5.526 5.527 5.529 5.543	
30-31 FIXED-SATELLITE (Earth-to-space) 5.338A MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) 5.542			30-31 FIXED-SATELLITE (Earth-to-space) MOBILE-SATELLITE (Earth-to-space) Standard frequency and time signal-satellite (space-to-Earth) G117	30-31 Standard frequency and time signal-satellite (space-to-Earth)	
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			41-42.5 US211	41-42 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE BROADCASTING BROADCASTING-SATELLITE 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	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)
5.554			Page 58

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) NG65	Satellite Communications (25) 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

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NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NG65 In the bands 24.75-25.25 GHz, 47.2-48.2 GHz and 50.4-51.4 GHz, stations in the fixed and mobile services may not claim protection from individually licensed earth stations authorized pursuant to 47 CFR 25.136. However, nothing in this footnote shall limit the right of UMFUS licensees to operate in conformance with the technical rules contained in 47 CFR part 30. The Commission reserves the right to monitor developments and to undertake further action concerning interference between UMFUS and FSS, including aggregate interference to satellite receivers, if appropriate.

* * * * *

PART 25 – SATELLITE COMMUNICATIONS

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

Authority: 47 U.S.C. 154, 301, 302, 303, 307, 309, 310, 319, 332, 605, and 721, unless otherwise noted.

4. Amend § 25.136 by revising the section heading, paragraph (e) introductory text, paragraphs (e)(1), (e)(2), (e)(3), (e)(4)(i)-(ii), and paragraph (f) to read as follows:

§ 25.136 Earth Stations in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz, 47.2-48.2 GHz and 50.4-51.4 GHz bands.

* * * * *

(e) Notwithstanding that FSS is co-primary with the Upper Microwave Flexible Use Service in the 24.75-25.25 GHz and 50.4-51.4 GHz bands, earth stations in these bands shall be limited to individually licensed earth stations. An applicant for a license for a transmitting earth station in the 24.75-25.25 GHz or 50.4-51.4 GHz band must meet one of the following criteria to be authorized to operate without providing any additional interference protection to stations in the Upper Microwave Flexible Use Service:

(1) The FSS licensee also holds the relevant Upper Microwave Flexible Use Service license(s) for the area in which the earth station generates a power flux density (PFD), at 10 meters above ground level,

of greater than or equal to −77.6dBm/m2/MHz;

(2) The earth station in the 24.75-25.25 GHz band was authorized prior to **[insert effective date of 3rd R&O]**; or the earth station in the 50.4.2-51.4 GHz band was authorized prior to [effective date of this rule]; or

(3) The application for the earth station in the 24.75-25.25 GHz band was filed prior to **[insert effective date of 3rd R&O];** or the application for the earth station in the 50.4-51.4 GHz band was filed prior to [effective date for this rule]; or

(4) The applicant demonstrates compliance with all of the following criteria in its application:

(i) There are no more than two other authorized earth stations operating in the same frequency band within the county where the proposed earth station is located that meet the criteria contained in either paragraphs (e)(1) (e)(2), (e)(3) or (e)(4) of this section, and there are no more than 14 other authorized earth stations operating in the same frequency band within the Partial Economic Area where the proposed earth station is located that meet the criteria contained in paragraphs (e)(1) (e)(2), (e)(3) or (e)(4) of this section. For purposes of this requirement, multiple earth stations that are collocated with or at a location contiguous to each other shall be considered as one earth station;

(ii) The area in which the earth station generates a power flux density (PFD), at 10 meters above ground level, of greater than or equal to −77.6 dBm/m^2/MHz, together with the similar area of any other earth station operating in the same frequency band authorized pursuant to paragraph (e) of this section, does not cover, in the aggregate, more than the amount of population of the county within which the earth station is located as noted below:

Table 1 to Paragraph (e)(4)(ii)

Population within the County where earth station is located	Maximum permitted aggregate population within −77.6 dBm/m^2/MHz PFD contour of earth stations
Greater than 450,000	0.1 percent of population in county.
Between 6,000 and 450,000	450 people.

Fewer than 6,000	7.5 percent of population in county.

* * * * *

(f) If an earth station applicant or licensee in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz, 47.2-48.2 GHz and/or 50.4-51.4 GHz bands enters into an agreement with an UMFUS licensee, their operations shall be governed by that agreement, except to the extent that the agreement is inconsistent with the Commission's rules or the Communications Act.

* * * * *

PART 30 – UPPER MICROWAVE FLEXIBLE USE SERVICE

5. The authority citation for part 30 continues to read as follows:

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

6. Amend § 30.4 by adding a new paragraph (b), redesignating paragraphs (b) , (c), (d), and (e)as paragraphs (c), (d), (f), and (g), respectively, adding a new paragraph (e) to read as follows, and :

§ 30.4 Frequencies.

(b) 25.25-27.5 GHz band – 25.25-25.45 GHz; 25.45-25.65 GHz; 25.65-25.85 GHz; 25.85-26.05 GHz; 26.05-26.25 GHz; 26.25-26.45 GHz; 26.45-26.65 GHz; 26.65-26.85 GHz; 26.85-27.05 GHz; 27.05-27.25 GHz; 27.25-27.45 GHz; 27.45-27.5 GHz.

* * * * *

(e) 42-42.5 GHz band – 42-42.1 GHz; 42.1-42.2 GHz; 42.2-42.3 GHz; 42.3-42.4 GHz; 42.4-42.5 GHz.

* * * * *

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APPENDIX D

Initial Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),[1] 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 attached *Third Further Notice of Proposed Rulemaking (3rd FNPRM)*. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments as specified in the *3rd FNPRM*. The Commission will send a copy of this *3rd FNPRM*, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).[2] In addition, the *3rd FNPRM* and IRFA (or summaries thereof) will be published in the Federal Register.[3]

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

2. In the *Third Further Notice of Proposed Rulemaking*, we propose to increase the Nation's supply of spectrum for mobile broadband by adopting rules for fixed and mobile services in the 25.25-27.5 GHz and 42-42.5 GHz band. We propose to include this band in the Part 30 Upper Microwave Flexible Use Service (UMFUS). 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 will also make possible new types of services for consumers and businesses. We propose to award Partial Economic Area-based licenses for these bands to best balance the needs of large and small carriers. The *Third Further Notice of Proposed Rulemaking* also proposes to include these bands, or portions of these bands, in the mmW spectrum threshold for reviewing proposed secondary market transactions.

3. 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, the 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.

4. In the *Third Further Notice of Proposed Rulemaking*, we also seek comment on developing the licensing framework we have 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. We seek comment on a first-come-first-served licensing or registration scheme, in which actual users have a right to interference protection, but no right to exclude other users. We seek comment on subsequent users being required to coordinate with previously registered non-

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

[2] *See* 5 U.S.C. § 603(a).

[3] *See* 5 U.S.C. § 603(a).

Federal and Federal sites through Part 101 notice and response rules or on the alternative of registering facilities with a third-party coordinator.

5. The *Third Further Notice of Proposed Rulemaking* also proposes to adopt rules permitting licensing of individual FSS earth stations in the 50.4-51.4 GHz band using the criteria identical to those applicable in the 24.75-25.25 GHz band. Although the 50.4-52.6 GHz band remains under consideration for UMFUS licensing, we have throughout this proceeding sought to promote spectrum efficiency by permitting spectrum made available for UMFUS to be shared with other allocated services when possible. We believe that in the 50.4-51.4 GHz band, where an FSS allocation already exists, that a limited number of individually licensed FSS earth stations can share the 50.4-51.4 GHz band with minimal impact on terrestrial operations.

6. Overall, this proposal is 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.

B. Legal Basis

7. The proposed action is authorized pursuant to Sections 1, 2, 3, 4, 5, 7, 301, 302, 302a, 303, 304, 307, 309, and 310 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 153, 154, 155, 157, 301, 302, 302a, 303, 304, 307, 309, and 310, 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

8. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.[4] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[5] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act."[6] A "small business concern" is one 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.[7]

9. *Small Businesses, Small Organizations, Small Governmental Jurisdictions*. Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe here, at the outset, three broad groups of small entities that could be directly affected herein.[8] First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the SBA's Office of Advocacy, in general a small business is an independent

[4] 5 U.S.C. § 603(b)(3).

[5] 5 U.S.C. § 601(6).

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

[7] 15 U.S.C. § 632.

[8] *See* 5 U.S.C. § 601(3)-(6).

business having fewer than 500 employees.[9] These types of small businesses represent 99.9% of all businesses in the United States which translates to 28.8 million businesses.[10]

10. Next, the type of small entity described as a "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[11] Nationwide, as of August 2016, there were approximately 356,494 small organizations based on registration and tax data filed by nonprofits with the Internal Revenue Service (IRS).[12]

11. Finally, the small entity described as a "small governmental jurisdiction" is defined generally as "governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."[13] U.S. Census Bureau data from the 2012 Census of Governments[14] indicate that there were 90,056 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.[15] Of this number there were 37, 132 General purpose governments (county[16], municipal and town or township[17]) with populations of less than 50,000 and 12,184 Special purpose governments (independent school districts[18] and special districts[19]) with populations of less than 50,000. The 2012 U.S. Census Bureau data for most types of

[9] *See* SBA, Office of Advocacy, "Frequently Asked Questions, Question 1 – What is a small business?" https://www.sba.gov/sites/default/files/advocacy/SB-FAQ-2016_WEB.pdf (June 2016)

[10] *See* SBA, Office of Advocacy, "Frequently Asked Questions, Question 2- How many small business are there in the U.S.?" https://www.sba.gov/sites/default/files/advocacy/SB-FAQ-2016_WEB.pdf (June 2016).

[11] 5 U.S.C. § 601(4).

[12] Data from the Urban Institute, National Center for Charitable Statistics (NCCS) reporting on nonprofit organizations registered with the IRS was used to estimate the number of small organizations. Reports generated using the NCCS online database indicated that as of August 2016 there were 356,494 registered nonprofits with total revenues of less than $100,000. Of this number 326,897 entities filed tax returns with 65,113 registered nonprofits reporting total revenues of $50,000 or less on the IRS Form 990-N for Small Exempt Organizations and 261,784 nonprofits reporting total revenues of $100,000 or less on some other version of the IRS Form 990 within 24 months of the August 2016 data release date. *See* http://nccs.urban.org/sites/all/nccs-archive/html//tablewiz/tw.php where the report showing this data can be generated by selecting the following data fields: Report: "The Number and Finances of All Registered 501(c) Nonprofits"; Show: "Registered Nonprofits"; By: "Total Revenue Level (years 1995, Aug to 2016, Aug)"; and For: "2016, Aug" then selecting "Show Results".

[13] 5 U.S.C. § 601(5).

[14] *See* 13 U.S.C. § 161. The Census of Government is conducted every five (5) years compiling data for years ending with "2" and "7". *See also* Program Description Census of Government *https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=program&id=program.en.COG#*.

[15] *See* U.S. Census Bureau, 2012 Census of Governments, Local Governments by Type and State: 2012 - United States-States. https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG02.US01. Local governmental jurisdictions are classified in two categories - General purpose governments (county, municipal and town or township) and Special purpose governments (special districts and independent school districts).

[16] *See* U.S. Census Bureau, 2012 Census of Governments, County Governments by Population-Size Group and State: 2012 - United States-States. https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG06.US01. There were 2,114 county governments with populations less than 50,000.

[17] *See* U.S. Census Bureau, 2012 Census of Governments, Subcounty General-Purpose Governments by Population-Size Group and State: 2012 - United States – States. https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG07.US01. There were 18,811 municipal and 16,207 town and township governments with populations less than 50,000.

[18] *See* U.S. Census Bureau, 2012 Census of Governments, Elementary and Secondary School Systems by Enrollment-Size Group and State: 2012 - United States-States. https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG11.US01. There were 12,184 independent school districts with enrollment populations less than 50,000.

[19] *See* U.S. Census Bureau, 2012 Census of Governments, Special District Governments by Function and State:

governments in the local government category show that the majority of these governments have populations of less than 50,000.[20] Based on this data we estimate that at least 49,316 local government jurisdictions fall in the category of "small governmental jurisdictions."[21]

12. *Wireless Telecommunications Carriers (except Satellite)*. This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless internet access, and wireless video services.[22] The appropriate size standard under SBA rules is that such a business is small if it has 1,500 or fewer employees.[23] For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.[24] Of this total, 955 firms had employment of 999 or fewer employees and 12 had employment of 1,000 employees or more.[25] Thus under this category and the associated size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities.

13. *Fixed Microwave Services.* Microwave services include common carrier,[26] private-operational fixed,[27] and broadcast auxiliary radio services.[28] They also include the Upper Microwave Flexible Use Service,[29] the Millimeter Wave Service,[30] Local Multipoint Distribution Service (LMDS),[31]

(Continued from previous page)
2012 - United States-States. https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG09.US01. The U.S. Census Bureau data did not provide a population breakout for special district governments.

[20] *See* U.S. Census Bureau, 2012 Census of Governments, County Governments by Population-Size Group and State: 2012 - United States-States - https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG06.US01; Subcounty General-Purpose Governments by Population-Size Group and State: 2012 - United States–States - https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG07.US01; and Elementary and Secondary School Systems by Enrollment-Size Group and State: 2012 - United States-States. https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG11.US01. While U.S. Census Bureau data did not provide a population breakout for special district governments, if the population of less than 50,000 for this category of local government is consistent with the other types of local governments the majority of the 38, 266 special district governments have populations of less than 50,000.

[21] *Id.*

[22] NAICS Code 517210. *See* https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517210.

[23] 13 CFR § 121.201, NAICS code 517210.

[24] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ5, Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012 NAICS Code 517210 (rel. Jan. 8, 2016). https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ5//naics~517210.

[25] *Id*. Available census data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[26] *See* 47 CFR Part 10, Subpart I.

[27] Persons eligible under Parts 80 and 90 of the Commission's rules can use Private-Operational Fixed Microwave services. *See* 47 CFR Parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee's commercial, industrial, or safety operations.

[28] Auxiliary Microwave Service is governed by Part 74 and Part 78 of Title 47 of the Commission's rules. Available to licensees of broadcast stations, cable operators, and to broadcast and cable network entities. Auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes TV pickup and CARS pickup, which relay signals from a remote location back to the studio.

[29] *See* 47 CFR Part 30.

[30] *See* 47 CFR Part 101, Subpart Q.

the Digital Electronic Message Service (DEMS),[32] and the 24 GHz Service,[33] where licensees can choose between common carrier and non-common carrier status.[34] At present, there are approximately 66,680 common carrier fixed licensees, 69,360 private and public safety operational-fixed licensees, 20,150 broadcast auxiliary radio licensees, 411 LMDS licenses, 33 24 GHz DEMS licenses, 777 39 GHz licenses, and five 24 GHz licensees, and 467 Millimeter Wave licenses in the microwave services.[35] The Commission has not yet defined a small business with respect to microwave services. The closest applicable SBA category is Wireless Telecommunications Carriers (except Satellite) and the appropriate size standard for this category under SBA rules is that such a business is small if it has 1,500 or fewer employees.[36] For this industry, U.S. Census Bureau data for 2012 shows that there were 967 firms 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.[37] Thus under this SBA category and the associated standard, the Commission estimates that the majority of fixed microwave service licensees can be considered small.

14. The Commission does not have data specifying the number of these licensees that have more than 1,500 employees, and thus is unable at this time to estimate with greater precision the number of fixed microwave service licensees that would qualify as small business concerns under the SBA's small business size standard. Consequently, the Commission estimates that there are up to 36,708 common carrier fixed licensees and up to 59,291 private operational-fixed licensees and broadcast auxiliary radio licensees in the microwave services that may be small and may be affected by the rules and policies adopted herein. We note, however, that both the common carrier microwave fixed and the private operational microwave fixed licensee categories includes some large entities.

15. *Satellite Telecommunications.* This category comprises firms "primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications."[38] Satellite telecommunications service providers include satellite and earth station operators. The category has a small business size standard of $32.5 million or less in average annual receipts, under SBA rules.[39] For this category, U.S. Census Bureau data for 2012 shows that there were a total of 333 firms that operated for the entire year.[40] Of this total, 299 firms had annual receipts of less than $25 million.[41] Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

16. *All Other Telecommunications*. The **"**All Other Telecommunications" category is

(Continued from previous page)

[31] *See* 47 CFR Part 101, Subpart L.

[32] *See* 47 CFR Part 101, Subpart G.

[33] *See id*.

[34] *See* 47 CFR §§ 30.6, 101.1017.

[35] These statistics are based on a review of the Universal Licensing System on September 22, 2015.

[36] 13 CFR § 121.201, NAICS code 517210.

[37] *Id*. Available census data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees; the largest category provided is for firms with "1000 employees or more."

[38] U.S. Census Bureau, 2012 NAICS Definitions, "517410 Satellite Telecommunications", https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517410#.

[39] 13 CFR § 121.201, NAICS code 517410.

[40] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517410 https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517410.

[41] *Id*.

comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.[42] 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.[43] Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry."[44] The SBA has developed a small business size standard for "All Other Telecommunications," which consists of all such firms with gross annual receipts of $32.5 million or less.[45] For this category, U.S. Census Bureau data for 2012 shows that there were a total of 1,442 firms that operated for the entire year.[46] Of these firms, a total of 1400 firms had gross annual receipts of under $25 million and 42 firms had gross annual receipts of $25 million to $49, 999,999.[47] Thus, the Commission estimates that a majority of "All Other Telecommunications" firms potentially affected by our actions can be considered small.

17. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.[48] 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."[49] The SBA has established a size standard for this industry of 1,250 employees or less.[50] U.S. Census Bureau data for 2012 shows that 841 establishments operated in this industry in that year.[51] Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.[52] Based on this data, we conclude that a majority of manufacturers in this industry is small.

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[42] *See* U.S. Census Bureau, 2012 NAICS Definitions, NAICS Code "517919 All Other Telecommunications", https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517919#.

[43] *Id*.

[44] *Id.*

[45] 13 CFR 121.201; NAICS Code 517919.

[46] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012, NAICS code 517919, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517919.

[47] *Id.*

[48] The NAICS Code for this service is 334220. 13 C.F.R 121.201. *See also* U.S. Census Bureau, 2012 NAICS Definitions, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing" *https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.334220#.*

[49] *See* U.S. Census Bureau, 2012 NAICS Definitions, NAICS Code 334220, available at https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.334220#.

[50] 13 CFR § 121.201, NAICS Code 334220.

[51] U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1231SG2, Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012 NAICS Code 334220, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/31SG2//naics~334220.

[52] *Id.*

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

18. We expect the rules proposed in the *Third Further Notice of Proposed Rulemaking* will impose new or additional reporting or recordkeeping and/or other compliance obligations on small entities as well as other licensees and applicants.

19. Applicants in the Lower 37 GHz band will be required to coordinate their proposed operations with other licensees and applicants. Such coordination is necessary to ensure that neighboring operations will not interfere with each other. Potential applicants will also be required to coordinate their operations with any Federal agencies with operations in the areas.

20. Small entities and other applicants in 26 GHz, 42 GHz, and Lower 37 GHz Upper Microwave Flexible Use Service will be required to meet buildout requirements. In doing so, 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. With respect to the 26 GHz performance requirements, the Commission believes such requirements are necessary to ensure that spectrum is being put into use and has proposed a variety of metrics to provide small entities as well as other licensees with a variety of means by which they may demonstrate compliance. The Commissions anticipates the performance requirements will encourage rapid deployment of next generation wireless services, including 5G, which will benefit small entities and the industry as a whole.

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

21. The RFA requires an agency to describe any significant alternatives for small businesses that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.[53]

22. The Commission does not believe that its proposed changes will have a significant economic impact on small entities. We believe the proposed site-based licensing scheme for the Lower 37 GHz band would facilitate access to spectrum by small businesses and a wide variety of other entities. However, to get a better understanding of costs and any burdens, we seek comment on whether any of burdens associated the filing, recordkeeping and reporting requirements described above can be minimized for small businesses. In particular, we seek comment on whether any of the costs associated with our construction or performance requirements in the 26 GHz and Lower 37 GHz bands can be alleviated for small businesses. The Commission expects to more fully consider the economic impact and alternatives for small entities following the review of comments filed in response to the 3rd FNPRM.

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

23. None.

[53] 5 U.S.C. § 603(a)(1)-(4).

APPENDIX E

List of Commenters to *2nd FNPRM*

Comments
Alaska Communications
AT&T Services Inc. (AT&T)
Consumer Technology Association (CTA)
CTIA
Elefante Group, Inc. (Elefante)
Huawei Technologies, Co., Ltd. (Huawei)
Iridium Communications, Inc. (Iridium)
Nokia
Satellite Industry Association (SIA)
SOM1101 LLC
Starry, Inc.
T-Mobile USA, Inc.
United States Cellular Corporation (U.S. Cellular)
Verizon

Reply Comments
AT&T
California Internet, L.P. DBA GeoLinks (GeoLinks)
CTIA
Elefante
Facebook, Inc. (Facebook)
Hughes Network Systems, LLC and EchoStar Satellite Operating Corporation (Hughes/EchoStar)
Iridium
SES Americom, Inc. and O3b Limited (SES/O3b)
SIA
Starry
T-Mobile
Verizon
Wireless Internet Service Providers Association (WISPA)

***Ex Parte* Comments**
AT&T
CCA
CTIA
Elefante
Ericsson
Fixed Wireless Communications Coalition
Hughes
Nokia
Starry
T-Mobile
Verizon
ViaSat
WorldVu Satellites Ltd. d/b/a/ One Web

APPENDIX F

Petitions for Reconsideration of *Spectrum Frontiers Report and Order* Addressed Herein

Petitions for Reconsideration

5G Americas
CTIA
Satellite Industry Association
Telecommunications Industry Association (TIA)
T-Mobile USA, Inc.
ViaSat, Inc.

STATEMENT OF
CHAIRMAN AJIT PAI

Re: *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services,* GN Docket No. 14-177*; Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services,* WT Docket No. 10-112

In order to bring 5G, the next generation of wireless connectivity, to American consumers, we have to make available the spectrum necessary for new services to flourish. Like Will Ferrell and John C. Reilly constructing their own bunkbeds in the 2008 cultural milestone *Step Brothers*, our goal is to create "so much space" for "so many activities!"[387]

To that end, today we're putting more spectrum on the table. Specifically, we propose to make available 2.75 GHz of spectrum across the 26 GHz and 42 GHz bands for flexible wireless use. I look forward to the record that develops and working with our federal partners to hopefully allocate this spectrum for more efficient uses.

Moreover, we're continuing to make progress on spectrum bands we've already targeted for new and innovative uses. For instance, we push forward on putting the Lower 37 GHz band to good use by establishing a band plan and asking about the appropriate coordination mechanisms for sharing with both federal and non-federal users. In that band, we have to work toward a licensing framework that preserves the band's viability for various potential users.

We're also putting finishing touches on the rules for previously allocated flexible-use bands in order to get ready for our upcoming spectrum auctions. The operability requirement in the 24 GHz band, for example, will help potential users—both large and small—with competitive access and will ensure that no portion of the band gets left behind as the equipment is developed.

With respect to satellite, we take another positive step forward in the 50 GHz band by proposing fixed-satellite service (FSS) licensing rules similar to those in the 24 GHz band. While mobile use remains a work in progress for 50 GHz, we propose a framework to move forward with satellite operations in this band.

Put all this together and you have an agency that remains hard at work to extend American leadership in 5G. This is the FCC's third Report and Order and third Further Notice of Proposed Rulemaking in three years relating to the millimeter wave bands in our *Spectrum Frontiers* proceeding. And in our *Spectrum Horizons* proceeding, we've broken new ground above 95 GHz to explore the potential of ultra-high bands. Critically, we're also pursuing infrastructure policies vital for densified 5G networks, from updating our wireless infrastructure rules to encouraging the massive fiber deployments needed for backhaul. And of course, we're actively planning for spectrum auctions starting this November.

Many thanks to the staff who have led "so many activities" to help the Commission achieve these goals. In particular, I'd like to express my gratitude to all those who worked on today's item: Simon Banyai, Stephen Buenzow, Tim Hilfiger, Stephen Keegan, Charles Oliver, Matthew Pearl, John Schauble, Catherine Schroeder, Becky Schwartz, Blaise Scinto, Dana Shaffer, Don Stockdale, Joel Taubenblatt, Jeffrey Tignor, Janet Young, and Nancy Zaczek from the Wireless Telecommunications Bureau; Bahman

[387] STEP BROTHERS (Columbia Pictures 2008), *available at* https://www.youtube.com/watch?v=3BlHY69ZsZ0.

Badipour, Brian Butler, Martin Doczkat, Michael Ha, Julie Knapp, Ed Mantiply, Tom Mooring, Nick Oros, Jamison Prime, Barbara Pavon, Karen Rackley, and Anh Wride from the Office of Engineering and Technology; Jose Albuquerque, Diane Garfield, Jennifer Gilsenan, Kal Krautkramer, Alyssa Roberts, Jim Schlichting, and Tom Sullivan from the International Bureau; and, David Horowitz, Bill Richardson, and Anjali Singh from the Office of General Counsel.

STATEMENT OF
COMMISSIONER MICHAEL O'RIELLY
APPROVE IN PART, CONCUR IN PART

Re: *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services,* GN Docket No. 14-177*; Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services,* WT Docket No. 10-112

As I have often stated, it is of the utmost importance that the Commission release sufficient spectrum resources to develop and deploy next-generation technologies and to maintain the U.S.'s leadership position in wireless technologies. That is why I am so pleased for today's item. I thank the Chairman for his continued efforts to move this proceeding forward, meeting not only his commitment to me to move this item – especially in a summer month starting with the letter "J" – but also for including 26 GHz in the further notice.

Moreover, by resolving the outstanding issues surrounding 24 GHz, we have cleared the final policy hurdles in front of conducting an auction, enabling us to move forward as the Chairman announced. Additionally, we rightfully take steps to bring our consideration of the 37 GHz band to conclusion so that this spectrum can be included in a future auction. In this vein, I am hopeful that we can set a specific timeline for upcoming auctions soon, and that they will include the highly anticipated 37 GHz auction and the remaining 39 GHz licenses. As the Commission considers spectrum opportunities in both the mid- and millimeter wave bands, it is important to provide interested parties with sufficient time to prepare for these auctions.

There are, however, some sections of the item that cause me concern. In particular, I believe that the Commission should have reconsidered its prior decision to adopt non-exclusive sharing in the lower 37 GHz band. A preferable framework would have involved exclusive licensees sharing spectrum with federal incumbents. It would have been commonsense to license these frequencies similarly to the adjacent upper 37 GHz band. But, I recognize that this decision may be influenced by our fellow agencies and, therefore, I will concur to the portions of this item related to the lower 37 GHz band.

My concerns regarding such a sharing paradigm are exemplified in the further notice. In setting up what is now being considered a millimeter wave "innovation" band, the Commission stated that sharing will promote a variety of uses, including both fixed and mobile, and ensure that the band is widely utilized. However, it is quite likely that some of the sharing concepts proffered in the notice will have quite the opposite effect. For instance, I question whether the suggested licensing frameworks will work for mobile services, if first-come-first-served licensing will ensure spectrum is put to its highest and best use, and how federal aeronautical operations in the band will co-exist with wireless operations. I look forward to discussing these and other issues with interested parties.

I am also concerned by the suggestion in the further notice that federal operations could expand in the upper 37 GHz, even if such expansion is limited or on an "as-needed" basis. The federal government needs to reduce its spectrum footprint, not expand it. This is why I have stated, along with Commissioner Rosenworcel, that the value of current federal spectrum holdings should be appropriately quantified. I have gone even further, suggesting imposing agency spectrum fees or permitting agencies the ability to surrender spectrum for budgetary relief to facilitate the reallocation of underused federal spectrum to commercial uses.

Finally, while I fully support not imposing a pre-auction spectrum cap, I am deeply troubled by the portions of the item that discuss post-auction and secondary market case-by-case spectrum

aggregation review. As I stated last year, these spectrum screens should be eliminated. First and foremost, we continue to put more spectrum out into the marketplace. To date, we have made 4950 megahertz of licensed millimeter wave spectrum available;[388] we are also inquiring into the 26 GHz band, which includes more than two gigahertz of spectrum; and, hopefully, we will open other bands that have been teed up, like 32 and 50 GHz.[389] Altogether, this provides abundant opportunities for those seeking high-band licenses, and, of course, there is also unlicensed spectrum. Additionally, there is still no evidence of the wireless industry ever "warehousing" spectrum, and, in fact, the existence of such "foreclosure" behavior was clearly debunked during the 600 MHz incentive auction experience. I was hoping that we would finally put an end to this charade.

Overall, I thank the Chairman for his leadership on the issue. I approve in part and concur in part.

[388] *See supra* ¶ 33.

[389] *See, e.g., Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket No. 14-177, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8148-52, 8157-58 ¶¶ 386-99, 418-23; *supra* ¶ 94 (stating that "50.4-52.6 GHz band remains under consideration for UMFUS licensing.").

STATEMENT OF
COMMISSIONER BRENDAN CARR

Re: *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services,* GN Docket No. 14-177*; Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services,* WT Docket No. 10-112

America's Main Streets are getting 5G Ready.

You can see it on a walking tour of Sioux Falls, South Dakota, where a local provider is installing 50 small cells. You can see it outside Central High School in Woodstock, Virginia, where a new small cell is enabling a connected curriculum. And you can see it in the miles of new fiber and other high-speed deployments that are connecting everything from a family farm in rural Michigan to an after-school boxing gym in downtown Detroit.

You can also see it a thousand miles from here at a manufacturing plant in Iowa where Sabre Industries is working to meet increased demand for its smart poles. The poles look like ordinary utility or light poles—some are even visually identical to city trash cans—but within them are all of the antennas and radios needed for next-gen deployments.

Sabre's 360,000 square foot plant is not a quiet place. The iron needed for the poles rolls into the facility on railroad tracks. It's then run through a series of presses and welding stations before being galvanized and painted. Tyler, who is one of the 500 employees who works there, walked me through the process, and he says that production and demand for these new poles is on the rise.

The good-paying jobs that small cell deployments are creating at plants like Sabre's are part of a broader story about the economic opportunity that can come when we clear the way for next-generation deployments. But the FCC has work to do if we are going to win the race to 5G, if we are going to extend these opportunities and deployments to communities across the country.

We took a significant step in the right direction earlier this year when we cut about $1.6 billion from the federal regulatory costs associated with small cell deployments. By reducing red tape, we can flip the business case for thousands of communities—ones that otherwise might miss out on 5G. And we are currently looking at additional infrastructure reforms that can enable greater deployments.

On the spectrum side, we take another concrete step today in our effort to free up the high-band spectrum that could help support next-gen networks. We do this by finalizing rules for the 24 GHz band. We do this by extending our bipartisan, 2017 decision regarding mobile spectrum holdings to the 28 GHz, 37 GHz, and 39 GHz bands. And we do this by seeking comment on opening up the 42 GHz and 26 GHz bands for flexible use, which include spectrum covered by the MOBILE NOW Act, which Congress passed earlier this year.

With respect to the Lower 37 GHz Band, I might have struck a different balance than the one the agency reached in 2016. But recently stakeholders have not shown significant interest in revisiting that decision and, overall, the item reaches the right result by promoting greater commercial access to millimeter wave spectrum. So it has my support.

Going forward, the Commission is going to keep up the work of identifying low-, mid-, and high-band spectrum, and we will continue to remove unnecessary barriers to infrastructure deployment. I look forward to further progress on those issues.

Thank you to the staff of the Wireless Telecommunications Bureau for your work on the item.

STATEMENT OF
COMMISSIONER JESSICA ROSENWORCEL
APPROVING IN PART, DISSENTING IN PART

Re: *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services,* GN Docket No. 14-177*; Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services,* WT Docket No. 10-112

If we want our 5G future to be bold, we have to acknowledge right here and now that the policies that made us successful in the past may not be the policies that lead to victory in the future. That's because if we want to be first to the future, we have to move past same-old, same-old spectrum policy and embrace new tools and techniques.

In many ways, the actions we take today do just that. We take steps to clarify just how we will make more high-band spectrum available for commercial use. We update our performance requirements to provide licensees with flexibility for innovative services beyond just the voice and data universe we know today to one custom-built for the internet of things. That's important, because this agency needs to recognize that 5G service is about much more than smartphones. We also ensure operability in the 24 GHz band, preventing a future with the kind of device ecosystem problems we have seen in the past. In addition, we make clear that we will preserve a sharing framework in the 37 GHz band. This is important for continued investment and innovation through new spectrum access models.

But in other respects, I'm afraid today's action falls short. Specifically, the decision here to limit any pre-auction limits for high-band spectrum and replace them all with post-auction case-by-case review misses the mark. On this aspect of our decision, I dissent.

To be fair, there may be reason to think that bright-line pre-auction limits on millimeter wave spectrum are unnecessary, given the real technical challenges of bringing this spectrum to market. I also recognize that striking the right balance is not easy at this early stage in the development of 5G service.

However, as our national providers seek to grow bigger and fewer in number, it is important we take steps now to avoid undue aggregation of spectrum in these new markets. This is not some radical notion. It has long been a bedrock of wireless policy. Moreover, it's an obligation under the law, as section 309(j) charges us with avoiding excessive concentration of licenses by disseminating licenses among a wide variety of applicants.

This principle becomes even more important when you consider that the FCC is timidly moving to auction millimeter wave bands one by one instead of boldly all together. It also has yet to put on a public calendar just when additional airwaves will be made available. These are confusing signals to send to the marketplace. We need to fix them. We need to be more thoughtful about our auctions because while our supply of high-band spectrum is increasing, the list of potential bidders may be shrinking. We need to structure each and every one of our auctions going forward in a way designed to bring in different spectrum interests with new ideas that may not always look like the bidders of the past. After all, more participation is bound to yield a better auction and a brighter 5G future.