

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

In the Matter of)
Expanding Flexible Use of the 3.7 to 4.2 GHz Band) GN Docket No. 18-122
Expanding Flexible Use in Mid-Band Spectrum) GN Docket No. 17-183
Between 3.7 and 24 GHz) (Inquiry Terminated as to 3.7-4.2 GHz)
Petition for Rulemaking to Amend and Modernize) RM-11791
Parts 25 and 101 of the Commission’s Rules to
Authorize and Facilitate the Deployment of
Licensed Point-to-Multipoint Fixed Wireless
Broadband Service in the 3.7-4.2 GHz Band)
Fixed Wireless Communications Coalition, Inc.,) RM-11778
Request for Modified Coordination Procedures in
Band Shared Between the Fixed Service and the
Fixed Satellite Service)

ORDER AND NOTICE OF PROPOSED RULEMAKING

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By the Commission: Chairman Pai and Commissioners O’Rielly, Carr, and Rosenworcel issuing separate statements.

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I. INTRODUCTION

1. Today, we seek to identify potential opportunities for additional terrestrial use—particularly for wireless broadband services—of 500 megahertz of mid-band spectrum between 3.7-4.2 GHz. In doing so, we propose to add a mobile, except aeronautical mobile, allocation to the band and seek comment on transitioning all or part of the band to terrestrial wireless broadband services. Today’s action is another step in the Commission’s efforts to close the digital divide by providing wireless broadband connectivity across the nation and to secure U.S. leadership in the next generation of wireless services, including fifth-generation (5G) wireless, Internet of Things (IoT), and other advanced spectrum-based services.

2. In this proceeding, we are pursuing the joint goals of making spectrum available for new wireless uses while balancing desired speed to the market, efficiency of use, and effectively accommodating incumbent Fixed Satellite Service (FSS) and Fixed Service (FS) operations in the band.¹ To gain a clearer understanding of the operations of current users in the band, we collect information on current FSS uses. We then seek comment on various proposals for transitioning all or part of the band for flexible use, terrestrial mobile spectrum, with clearing for flexible use beginning at 3.7 GHz and moving higher up in the band as more spectrum is cleared. We also seek comment on potential changes to the Commission’s rules to promote more efficient and intensive fixed use of the band on a shared basis starting in the top segment of the band and moving down the band. To add a mobile, except aeronautical mobile, allocation and to develop rules that would enable the band to be transitioned for more intensive fixed and flexible uses, we encourage commenters to discuss and quantify the costs and benefits associated with any proposed approach along with other helpful technical or procedural details.

¹ In this Order and Notice of Proposed Rulemaking, we draw from the record submitted with respect to the 3.7-4.2 GHz band in the Notice of Inquiry in GN Docket 17-183 asking about various “mid-band” frequency bands between 3.7 GHz and 24 GHz. *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Inquiry, 32 FCC Rcd 6373 (2017) (*Mid-Band NOI*). With respect to the 3.7-4.2 GHz band, we incorporate the record from the *Mid-Band NOI* into the docket for this proceeding, GN Docket No. 18-22. We also incorporate two earlier petitions for rulemaking that proposed specific approaches for rule changes concerning the 3.7-4.2 GHz band. Broadband Access Coalition, Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission’s Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband in the 3700-4200 MHz Band, RM-11791 (filed June 21, 2017) (Broadband Access Coalition Petition); Fixed Wireless Communications Coalition Inc., Request for Modified Coordination Procedures in Bands Shared Between the Fixed Service and the Fixed Satellite Service, RM 11778, Petition for Rulemaking (Oct. 11, 2016) (FWCC Petition). On April 19, 2018, the Commission opened Docket No. 18-122, which focuses exclusively on expanding flexible use of the 3.7-4.2 GHz band. *See Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band; Wireless Telecommunications Bureau, International Bureau, and Office of Engineering and Technology Establish GN Docket No. 18-122*, GN Docket No. 18-122, Public Notice, DA 18-396 (Apr. 19, 2018), 2018 WL 1898714 (*Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band PN*). Given that GN Docket 18-122 focuses on potential flexible use of the 3.7-4.2 GHz band, with the issuance of the instant Notice of Proposed Rulemaking, we terminate the *Mid-Band NOI* docket, GN Docket No. 17-183, with respect to the 3.7-4.2 GHz band. *See also* RM-11791, Section 7 Request, Letter from Julius P. Knapp, Chief, Office of Engineering and Technology, to Broadband Access Coalition (Jun. 26, 2018) (stating that staff believes that Broadband Access Coalition’s proposal for use of the band does not qualify as a new technology or service under Section 7, but the Commission is actively considering the proposal and plans to seek comment on it as part of the Expanding Flexible Use of the 3.7 to 4.2 GHz Band rulemaking).

II. BACKGROUND

A. 5G Leadership and Closing the Digital Divide

3. America's appetite for wireless broadband service is surging. According to Cisco, North American mobile traffic grew 44 percent in 2016 and will continue to grow at a near 35 percent compound annual growth rate through 2021.² Ericsson predicts that between 2016 and 2022 the data traffic generated by smartphones in North America will increase by a factor of six.³ And while mobile traffic is surging in sections of the United States, many communities still lack access to meaningful broadband connectivity. More intensive use of spectrum can allow wireless operators to fill in gaps in the current broadband landscape. For example, fixed wireless services provide an additional opportunity to connect rural communities and to offer competitive wireless alternatives in urban areas. Additional spectrum must be identified, however, if we are to seize the 5G future and meet the connectivity needs of all Americans.

4. Enabling next generation wireless networks and closing the digital divide will require efficient utilization of the low-, mid-, and high-bands. In recent years, the Commission has taken several steps to use low-band spectrum below 3.7 GHz more efficiently and intensely, and it has paved the way for new opportunities in high-band spectrum above 24 GHz. For example, the broadcast incentive auction made 70 megahertz of licensed spectrum in the 600 MHz band available for commercial wireless operations.⁴ This low-band spectrum is ideal for providing wide-area coverage in rural areas and for providing coverage inside buildings. The *Spectrum Frontiers* proceeding made available high-band spectrum in the 24 GHz, 28 GHz, 37 GHz, 39 GHz, and 47 GHz bands.⁵ Because high-band frequencies do not propagate as far as low-band frequencies, the spectrum can be reused in more closely spaced microcells and therefore is ideal for providing coverage in high-density areas. Having identified additional spectrum in low- and high-bands, the Commission now seeks to identify mid-band spectrum for wireless broadband services.

5. Mid-band spectrum is well-suited for next generation wireless broadband services due to the combination of favorable propagation characteristics (compared to high bands) and the opportunity for additional channel re-use (as compared to low bands). With the ever-increasing demand for more data on mobile networks, wireless network operators increasingly have focused on adding data capacity. One technique for adding capacity is to use smaller cell sizes—i.e., have each base station provide coverage over a smaller area. Using higher frequencies can be advantageous for deploying a higher density of base stations. The decreased propagation distances at higher frequencies reduces the interference between base stations using the same frequency, thereby allowing base stations to be more densely packed and increasing the overall system capacity. Therefore, mid-band spectrum presents wireless providers with the opportunity to deploy base stations using smaller cells to achieve higher spectrum reuse than the lower

² Cisco Systems Inc., *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016-2021* (Feb. 7, 2017, updated Mar. 28, 2017), <https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html>.

³ Ericsson, *Future Mobile Data and Traffic Growth*, <https://www.ericsson.com/en/mobility-report/future-mobile-data-usage-and-traffic-growth>.

⁴ *Incentive Auction Closing and Channel Reassignment Public Notice*, Public Notice, 32 FCC Rcd 2786, 2793, para. 15 (2017). The broadcast incentive auction repurposed 84 megahertz of spectrum – 70 megahertz for licensed use and another 14 megahertz for wireless microphones and unlicensed use. See Federal Communications Commission, *Broadcast Incentive Auction and Post-Auction Transition* (May 9, 2017), <https://www.fcc.gov/about-fcc/fcc-initiatives/incentive-auctions>.

⁵ *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988, 10994-11006, paras. 15-59 (2017) (*2017 Spectrum Frontiers Order and FNPRM*); Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8023-62, paras. 19-124 (2016) (*2016 Spectrum Frontiers Order and FNPRM*).

frequency bands while still providing indoor coverage.⁶ In addition, mid-band spectrum also offers more favorable propagation characteristics relative to higher bands for fixed wireless broadband services in less densely populated areas.

6. International governing bodies and several other countries are reviewing the suitability of a number of frequency bands for next generation 5G wireless services including the 700/800/900 MHz, 1.5 GHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and 3.7-4.2 GHz bands.⁷ The Radio Spectrum Policy Group of the European Commission has issued a mandate to the European Conference of Postal and Telecommunications Administrations (CEPT) that the 3.4-3.8 GHz band will be the first primary band for 5G.⁸ CEPT, the European regional organization dealing with postal and telecommunications issues, is currently seeking comment on a draft report providing recommendations for updating the European regulatory framework for this band.⁹ A number of European governments are already taking actions to make parts of the band available for 5G. For example, the Austrian government intends to auction the 3.4-3.8 GHz band in this fall.¹⁰ France is issuing temporary licenses in the 3.4-3.8 GHz band for 5G pilot projects.¹¹ Germany intends to make the 3.4-3.8 GHz band available by the end of 2021.¹² There is also interest in parts of the band outside of Europe. The Australian government, for example, is working to auction the 3.6-3.8 GHz band for 5G in 2018.¹³ And Japan is studying adding a mobile allocation for the 3.6-4.2 GHz band.¹⁴

7. Congress recently addressed the pressing need for additional spectrum for wireless broadband, including both mobile and fixed services, in the FY 2018 omnibus spending bill, which includes the MOBILE NOW Act under Title VI of RAY BAUM'S Act.¹⁵ The MOBILE NOW Act

⁶ According to the Broadband Access Coalition, the 3.7-4.2 GHz band can provide non-line-of-sight capabilities within a reasonable radius. Broadband Access Coalition Petition at 17.

⁷ Joe Barrett, President, Global Mobile Suppliers Association, 5G Spectrum Bands (Feb. 22, 2017), <https://gsacom.com/5g-spectrum-bands/>.

⁸ European Commission Directorate-General for Communications Networks, Content and Technology, Radio Spectrum Policy Group, Strategic Spectrum Roadmap Towards 5G for Europe: RSPG Second Opinion on 5G Networks at 2 (2018), https://circabc.europa.eu/sd/a/fe1a3338-b751-43e3-9ed8-a5632f051d1f/RSPG18-005final-2nd_opinion_on_5G.pdf.

⁹ Report A from CEPT to the European Commission responds to the mandate to develop harmonized technical conditions for spectrum use in support of the introduction of next generation (5G) terrestrial systems in the European Union. *See* European Conference of Postal and Telecommunications Administrations, CEPT Draft Report 67 at 3 (2018), https://www.cept.org/files/9522/Draft%20CEPT%20Report%2067%20PF_1.docx.

¹⁰ Mobile Europe, T-Mobile Austria Launches Pre-5G in Innsbruck (Feb. 9, 2018), <https://mobileeurope.co.uk/press-wire/t-mobile-austria-launches-pre-5g-in-innsbruck>.

¹¹ Juan Pedro Tomas, RCR Wireless News, French Regulator Launches Process for 5G Trials (Jan. 17, 2018), <https://www.rcrwireless.com/20180117/5g/french-regulator-launches-5g-trials-tag23>.

¹² Bundesnetzagentur, Key Elements for the Rollout of Digital Infrastructures and Identification of Demand for Nationwide Assignments in the 2 GHz and 3.6 GHz Bands at 14 (2017), https://www.bundesnetzagentur.de/SharedDocs/Downloads/EN/Areas/Telecommunications/Companies/TelecomRegulation/FrequencyManagement/ElectronicCommunicationsServices/201070704_KeyElementsDemandIdentification.pdf?__blob=publicationFile&v=1.

¹³ Australian Government Department of Communications and the Arts, 5G—Enabling the Future Economy at 10 (2017), <https://www.communications.gov.au/documents/5g-enabling-future-economy>.

¹⁴ Ministry of Internal Affairs and Communications, 5G Initiatives in Japan (2017), https://5gmf.jp/wp/wp-content/uploads/2017/06/02-Opening-Session-1_Isao-Sugino.pdf; 5G Americas Reply at 32 n.24, T-Mobile Comments at 8 n.30 (citing Kuniko Ogawa, Director for Land Mobile Communications Division, MIC, Japan's Radio Policy to Realize 5G in 2020 (2016), http://www.gsma.com/spectrum/wp-content/uploads/2016/08/MIC_Spectrum-for-5G-MIC-Kuniko-OGAWA.pdf).

¹⁵ *See* Consolidated Appropriations Act, 2018, P.L. 115-141, Division P, the Repack Airwaves Yielding Better

directs that spectrum be made available for new technologies and to maintain America's leadership in the future of communications technology. Section 603(a)(1) of the MOBILE NOW Act requires that no later than December 31, 2022, the Secretary of Commerce, working through the National Telecommunications and Information Administration (NTIA), and the Commission "shall identify a total of at least 255 megahertz of Federal and non-Federal spectrum for mobile and fixed wireless broadband use."¹⁶ In making 255 megahertz available, 100 megahertz below 8000 MHz shall be identified for unlicensed use,¹⁷ 100 megahertz below 6000 MHz shall be identified for use on exclusive, licensed basis for commercial mobile use, pursuant to the Commission's authority to implement such licensing in a flexible manner,¹⁸ and 55 megahertz below 8000 MHz shall be identified for licensed, unlicensed, or a combination of uses.¹⁹

8. Additionally, Section 605(b) of the MOBILE NOW Act specifically requires the Commission to evaluate "the feasibility of allowing commercial wireless services, licensed or unlicensed, to use or share use of the frequencies between 3700 megahertz and 4200 megahertz," which the Commission sought comment on in May 1, 2018 Public Notice.²⁰ We note that there is no federal allocation for the 3.7-4.2 GHz band. We intend to consult with NTIA and the heads of each affected Federal agency, as required by the Act, regarding the Federal entities, stations, and operations in the band, and the required issues and assessments for the report under Section 605(b). This *Notice*, in conjunction with the report under Section 605(b), furthers the Commission's evaluation of mid-band spectrum to meet Section 603's statutory mandate as well as to accommodate projected future demand.

B. The 3.7-4.2 GHz Band and Adjacent Bands

9. The 3.7-4.2 GHz band is currently allocated in the United States exclusively for non-federal use on a primary basis for FSS (space-to-Earth) and FS.²¹ For FS, 20 megahertz paired channels are assigned for point-to-point common carrier or private operational fixed microwave links.²² This band was the original long-haul common carrier microwave band, which provided an analog transcontinental network for television and long-distance telephone circuits.²³ In 1988, there were over 39,000 licenses in the band but that total had fallen to approximately 13,000 licenses by 1997, which was around the same time that the Commission opened the band for private operational fixed use.²⁴ Despite expanding the allowed uses, FS use of the band has declined steeply over the past 20 years as common carrier and private operational fixed licensees migrated to fiber or other FS bands that offered more channelization options without the risk of interference disputes with FSS earth stations and without the need to

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Access for Users of Modern Services (RAY BAUM'S) Act. Title VI of the RAY BAUM'S Act is the Making Opportunities for Broadband Investment and Limiting Excessive and Needless Obstacles to Wireless Act or MOBILE NOW Act (Act).

¹⁶ *Id.* § 603(a)(1).

¹⁷ *Id.* § 603(a)(2)(A).

¹⁸ *Id.* § 603(a)(2)(B).

¹⁹ *Id.* § 603(a)(2)(C).

²⁰ *Id.* § 605(b). See also *Office of Engineering and Technology, International, and Wireless Telecommunications Bureaus Seek Comment for Report on the Feasibility of Allowing Commercial Wireless Services, Licensed or Unlicensed, to Use or Share Use of the Frequencies Between 3.7-4.2 GHz*, Public Notice, DA 18-446 (OET/WTB/IB rel. May 1, 2018).

²¹ 47 CFR § 2.106, United States Table of Frequency Allocations, non-Federal Table for the band 3.7-4.2 GHz.

²² See *id.* § 101.147(h). 4.190 GHz may also be assigned for unpaired use. *Id.* § 101.147(h), n.1.

²³ See Robert J. Matheson, U.S. Department of Commerce, NTIA Report 00-378, Spectrum Usage for the Fixed Services at 52 (2000) (NTIA Report 00-378).

²⁴ See U.S. Department of Commerce Institute for Telecommunication Sciences, A Preliminary Look at Spectrum Requirements for the Fixed Services (1993).

coordinate new or modified links within the band with geostationary orbit (GSO) FSS.²⁵ Current FS use of this band is minimal (115 licenses).

10. For FSS, the 3.7-4.2 GHz band (space-to-Earth or downlink) is paired with the 5.925-6.425 GHz band (Earth-to-space or uplink), and collectively these bands are known as the “conventional C-band.”²⁶ Domestically, satellite operators use this band to provide downlink signals of various bandwidths to licensed transmit-receive, registered receive-only, and unregistered receive-only earth stations throughout the United States. Predominant uses include delivery of programming content to television and radio broadcasters, including transportable antennas used to cover live news and sports events, cable television and small master antenna systems, as well as the backhaul of telephone and data traffic.²⁷ Satellites operating in the C-band typically have 24 transponders, each with a bandwidth of 36 megahertz. The 24 transponders use 864 megahertz of spectrum, or 364 megahertz more than the 500 megahertz available in each direction. This is the result of spectrum reuse—adjacent transponders overlap and self-interference is avoided through the use of opposite polarizations.²⁸ Under existing rules, space station operators in the 3.7-4.2 GHz band are authorized for all 500 megahertz exclusively at any orbital slot, but non-exclusively in terms of geographic coverage. Therefore, multiple FSS incumbents transmit within overlapping geographic boundaries. Space stations serving the U.S. market may also be providing service to other countries. The 3.7-4.2 GHz band is also used for reception of telemetry signals transmitted by satellites, typically near 3.7 GHz or 4.2 GHz. These unique characteristics are relevant when considering possible mechanisms for a band transition that would account for incumbent operations.

11. There are various wireless operations in bands adjacent to 3.7-4.2 GHz. In 2015, the Commission established a new Citizens Broadband Radio Service for shared wireless broadband use of the 3.55-3.7 GHz band.²⁹ The new Citizens Broadband Radio Service rules encompass the existing 3.65-3.7 GHz radio service.³⁰ Under the Commission’s rules, existing terrestrial wireless operations (and FSS earth stations) in the 3.65-3.7 GHz band are grandfathered for up to five years or until the end of their license term, whichever is longer.³¹ Spectrum below the 3.7 GHz band is also used for reception of telemetry signals transmitted by satellites. Above the 3.7-4.2 GHz band, the 4.2-4.4 GHz band contains radio altimeters and wireless avionics intra-communications (WAIC) systems, which are both operating pursuant to co-primary allocations in the band. The 4.2-4.4 GHz band is allocated globally to the aeronautical radionavigation service for the exclusive use of radio altimeters.³² In 2015, the World Radio Conference (WRC) allocated the band on a global co-primary basis for WAIC systems.³³

²⁵ “In the 3700-4200 MHz band, terrestrial fixed links have problems sharing with fixed satellite downlinks. The existing fixed terrestrial links are leaving this band at a rapid rate, and the lack of any new narrowband channelization suggests that this band is likely to be relatively lightly used by terrestrial fixed systems in the future.” NTIA Report 00-378 at 8.

²⁶ See 47 CFR § 25.103 (Definitions).

²⁷ See GCI Comments at 4-6.

²⁸ ACA Comments at 9 n.17.

²⁹ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959 (2015) (3.5 GHz R&O).

³⁰ See *id.* at 3965-66, paras. 19-20.

³¹ See *id.* at 4075-80, paras. 400-12.

³² Boeing Comments at 2 (citing 47 CFR § 2.106, notes 5.438 and US261 (indicating that “[u]se of the band 4200-4400 MHz by the aeronautical radionavigation service is reserved exclusively for radio altimeters installed on board aircraft and for the associated transponders on the ground”).

C. 2017 Mid-Band Notice of Inquiry

12. In the 2017 *Mid-Band NOI*, the Commission began an evaluation of whether spectrum in-between 3.7 GHz and 24 GHz can be made available for flexible use—particularly for wireless broadband services.³⁴ The *Mid-Band NOI* sought comment in particular on three mid-range bands that have garnered interest from stakeholders for expanded flexible use (3.7-4.2 GHz, 5.925- 6.425 GHz, and 6.425-7.125 GHz), and it asked commenters to identify other mid-range frequencies that may be suitable for expanded flexible use.³⁵ The Commission asked questions specific to the challenges and opportunities presented by each band. Parties, therefore, commented on the 3.7-4.2 GHz band separately from the 5.925-6.425 GHz and 6.425-7.125 GHz bands.³⁶ In the interest of clarity and expeditiously making spectrum available for wireless broadband use, this *Notice* will evaluate the 3.7-4.2 GHz band individually, and the Commission may address other mid-band spectrum bands, including the 5.925-6.425 and 6.425-7.125 GHz bands, in subsequent item(s).

13. In the *Mid-Band NOI*, we asked commenters to identify options for more intensive fixed and mobile broadband use in the 3.7-4.2 GHz band.³⁷ Specifically, we asked whether the service rules should be modified to support more intensive fixed use by allowing for the deployment of point-to-multipoint FS broadband services and by making the band more viable for shorter, last mile point-to-point FS.³⁸ We also invited comment on whether the 3.7-4.2 GHz band is desirable or suitable for mobile use.³⁹ Comments on the *Mid-Band NOI* were due on October 2, 2017 and reply comments were due on November 1, 2017.⁴⁰

14. Commenters propose various approaches for expanding wireless broadband use in the band and identify challenges presented by the current incumbent ecosystem. Many parties support opening the band for flexible use, particularly for mobile broadband services.⁴¹ Notably, even the two largest incumbent FSS operators in the band acknowledge that at least 100 megahertz can be made

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³³ *Id.* § at 4 (citing ITU Radio Regulations No. 5.436 (indicating that use of the frequency band 4 200-4 400 MHz by stations in the aeronautical mobile (R) service is reserved exclusively for wireless avionics intra-communication systems that operate in accordance with recognized international aeronautical standards)).

³⁴ *Mid-Band NOI*, 32 FCC Rcd at 6373.

³⁵ *Id.* at 6374, para. 2. The Commission noted that, consistent with established coordination practices, any viable proposals for flexible use in spectrum allocated for both federal and non-federal use would need to be carefully evaluated by both the Commission and NTIA, taking into consideration the resources necessary to study such bands. *Id.* at 6385, para. 37.

³⁶ Most parties commented on the 3.7-4.2 GHz band separately from 5.925- 6.425 GHz and 6.425-7.125 GHz since the 3.7-4.2 GHz band presents different incumbent challenges and wireless broadband opportunities than the 6 GHz band.

³⁷ *Mid-Band NOI*, 32 FCC Rcd at 6379-83, paras. 16-20.

³⁸ *Id.* at 6380, para. 18.

³⁹ *Id.* at 6380, para. 19.

⁴⁰ A list of commenters, reply commenters, and *ex parte* filings is contained in Appendix C. Appendix C includes all commenters on the *Mid-Band NOI* and subsequent developments in Docket No. 17-183, Docket No. 18-122. When citing GN Docket No. 17-183 comments, we will use the short name of the commenter contained in Appendix C, followed by the words “Comments” or “Reply.” If we reference a comment or reply comment from another docket we will indicate so by providing the docket number. Similarly, for all *ex parte* filings, we will use the name of the commenter and docket number 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).

⁴¹ See, e.g., Verizon Reply at 2; CTIA Comments at 2; Nokia Comments at 2; Ericsson Comments at 5-6; T-Mobile Comments at 7; Mid-Band Spectrum Coalition Comments at 14.

available for wireless broadband use.⁴² Several incumbent operators and their customers, support additional terrestrial use of the band only if existing services are adequately protected.⁴³ Other parties claim that the band is underutilized by incumbents and should be opened for additional uses,⁴⁴ including more intensive fixed services.⁴⁵ Many parties emphasize that the 3.7-4.2 GHz band is being evaluated internationally for 5G⁴⁶ and urge the Commission to keep pace to unlock the benefits of international harmonization.⁴⁷ Most commenters also agree that mid-band spectrum must be evaluated for additional opportunities due to its favorable propagation characteristics and the increasing need for wireless broadband.⁴⁸

15. The record, however, reflects that the Commission lacks sufficient information regarding incumbent operations, including those of earth station licensees and registrants, and that correct usage data is vital to any action regarding modified use of the band. Specifically, commenters claim that in addition to the 4,700 earth stations registered or licensed in the International Bureau Filing System (IBFS), there is a significant number, possibly thousands, of unregistered receive-only earth stations that must be protected under any Commission action concerning the 3.7-4.2 GHz band.⁴⁹ Accordingly, in order to preserve the current landscape of authorized operations in the 3.7-4.2 GHz band pending the Commission's consideration of the issues raised in response to the *Mid-Band NOI*, the Wireless Telecommunications, International, and Public Safety and Homeland Security Bureaus opened a new docket (GN Docket No. 18-122) that focuses exclusively on the 3.7-4.2 GHz band,⁵⁰ and announced a temporary freeze, effective as of April 19, 2018, on the filing of new or modified applications for earth station licenses, receive only earth station registrations, and fixed microwave licenses in the 3.7-4.2 GHz band.⁵¹ The International Bureau established a window until October 17, 2018, for filing applications to license or register existing earth stations in the 3.7-4.2 GHz frequency band as a limited exception to the

⁴² Intelsat-SES Feb. 21, 2018 *Ex Parte* Letter, GN Docket No. 17-183, Attach. at 1 (Intelsat-SES Feb. 21, 2018 *Ex Parte*); Intelsat-Intel Comments at 3.

⁴³ See, e.g., AT&T Reply at 10; NPR Reply at 8; Intelsat-SES Feb. 21, 2018 *Ex Parte* at 1; Intelsat-Intel Comments at 3; Comcast May 16 *Ex Parte* Letter, WTB Docket No. 18-122, Attach. at 6; FWCC May 31, 2018 *Ex Parte* Letter, GN Docket No. 17-183, WTB Docket No. 18-122, at 2.

⁴⁴ See, e.g., CCA Comments at 2, CTIA Comments at 8, DSA Comments at 6, Broadband Access Coalition Comments at 6.

⁴⁵ See e.g., Google Comments at 9; GeoLinks Comments at 2-3; Broadband Access Coalition Comments at 4.

⁴⁶ Mid-Band Spectrum Coalition Comments at 10-12; Nokia Comments at 5; GSMA Comments at 4; CTIA Comments at 7; Verizon Comments at 13-14; T-Mobile Comments at 7-10; CompTIA Comments at 2; Ericsson Comments at 4; CCIA Reply at 2-3. *But see* SES Oct. 3, 2017 *Ex Parte* Letter, GN Docket No. 17-183, at 1 (“[T]he record includes inaccuracies regarding the extent to which other countries are pursuing the 3.7 – 4.2 GHz band for terrestrial services. Specifically ... only a handful of administrations globally are considering making any spectrum in this range available for mobile service, and those few mainly are focused on only the lowest portion of the band, below 3.8 GHz.”).

⁴⁷ Mid-Band Spectrum Coalition Comments at 10-12; Nokia Comments at 5; GSMA Comments at 4; CTIA Comments at 7; Verizon Comments at 13-14; T-Mobile Comments at 7-10; CompTIA Comments at 2; Ericsson Comments at 5; CCIA Reply at 2-3.

⁴⁸ Broadband Access Coalition Comments at 9.

⁴⁹ See, e.g., NABA Comments at 2; ACA Comments at 3; SIA Comments at 4; NAB Comments at 4.

⁵⁰ The Commission opened Docket No. 18-122 on Apr. 19, 2018. See *Expanding Flexible Use of the 3.7 GHz to 4.2 GHz Band PN*.

⁵¹ See *Temporary Freeze on Applications for New or Modified Fixed Satellite Service Earth Stations and Fixed Microwave Stations in the 3.7-4.2 GHz Band; 90-Day Window to File Applications for Earth Stations Currently Operating in 3.7-4.2 GHz Band*, GN Docket No. 17-183, WTB Docket No. 18-122, Public Notice, DA 18-398 at 1 (IB/PSHSB/WTB Apr. 19, 2018) (*Freeze and 90-Day Earth Station Filing Window Public Notice*).

implementation of the earth-station application freeze.⁵² Further, the International Bureau announced a temporary freeze on the filing of certain space station applications, effective June 21, 2018.⁵³

III. ORDER: COLLECTING INFORMATION ON SATELLITE USAGE OF THE BAND

16. The record in response to the *Mid-Band NOI* reflects that the Commission's information regarding current use of the band is inaccurate and/or incomplete. Therefore, we are collecting additional information to make an informed decision about the proposals discussed herein—including the scope of future FSS, FS, and potential mobile use of the band and the appropriate transition methodology. It is important that we obtain a clear understanding of the operations of current users in the band. This user data will be vital to our consideration of how much spectrum could be made available, how incumbent operators could be protected, accommodated, or relocated, and the overall structure of the band going forward. Several of the potential transition methods outlined in the *Notice* may require additional earth station or satellite information.

17. In furtherance of our goals of fostering more efficient and intensive use of the 3.7-4.2 GHz band as expeditiously as possible while protecting existing operations in the band from harmful interference, by this *Order* we adopt the information collection requirements described below. The Commission and the public will use the information collected to evaluate future use of the 3.7-4.2 GHz band. The various transition options discussed in the following *Notice* may require use of this information both for consideration and implementation of those options. The information may also be used in defining incumbent earth stations to be protected from harmful interference consistent with parameters that may be developed in this proceeding. FSS operators may request confidential treatment of some or all of the information that they submit, consistent with the Commission's rules.⁵⁴

18. *Earth Station Data.*—In order to evaluate the potential for a flexible use allocation in the 3.7-4.2 GHz band and determine how much spectrum could be made available, we must evaluate the existing earth station usage of C-band satellites—including location and technical data that may be necessary to mitigate harmful interference. This information will assist the Commission in determining whether earth stations will need to be protected as well as how they may need to be protected depending on how the Commission moves forward with increasing the intensity of terrestrial use of the band. It will also allow the Commission to evaluate the feasibility of the various transition proposals.

19. We direct operators of FSS earth stations, including temporary fixed or transportable earth stations, in the 3.7-4.2 GHz band that are licensed or registered (authorized) in IBFS to certify the accuracy of all information reflected on their license or registration in IBFS. Given that they recently will have filed for new or modified licenses or registrations in IBFS, we exempt from this *Order* those operators that file between April 19, 2018, and October 17, 2018, using the processes outlined in the *Earth Station Filing Window Public Notices*, including those that filed without coordination. This certification is necessary to inform the Commission's decisions in this proceeding. Although we do not require FSS earth station operators to provide additional information on their existing operations at this

⁵² See *Freeze and 90-Day Earth Station Filing Window Public Notice* at 1, *International Bureau Announces 90-Day Extension of Filing Window, to October 17, 2018, to File Applications for Earth Stations Currently Operating in 3.7-4.2 GHz Band, Filing Options for Operators with Multiple Earth Station Antennas*, Public Notice, DA 18- 639 (IB Jun. 21, 2018) (*Earth Station Filing Window Extension Public Notice*) (collectively, the *Earth Station Filing Window Public Notices*).

⁵³ See *International Bureau Announces Temporary Filing Freeze on New Fixed Satellite Service Space Stations in the 3.7-4.2 GHz Band*, Public Notice, DA 18-640 (IB Jun. 21, 2018) (*Space Station Freeze Public Notice*).

⁵⁴ Although the Broadband Access Coalition argues that all of the information required to be submitted by earth stations is “is no different from the detailed technical information provided, and made publicly available, for wireless providers in other services,” and thus should not be afforded confidential treatment, Broadband Access Coalition June 29, 2018 *Ex Parte* Letter, GN Docket No. 18-122, at 4, we will review and assess requests for confidential treatment for the information submitted in response to this information collection according to the procedures set forth in our rules. See 47 CFR § 0.459.

time, we propose in the *Notice* to protect only those earth stations licensed or registered in IBFS for which the licensee/registrant timely files the certification required in this *Order* (to the extent they registered before April 19, 2018). We also seek comment on whether further earth station information should be collected in the future to facilitate more efficient use of the 3.7-4.2 GHz band.⁵⁵

20. Further, to account for the variable nature of temporary fixed or transportable earth stations,⁵⁶ we order all such operations to submit additional information about their operations regardless of when they were licensed or registered. This information shall include:

- earth station call sign (or IBFS file number if a registration filed between April 19, 2018 and October 17, 2018, is pending);
- geographic location where the equipment is typically stored;
- the area within which the equipment is typically used;
- how often the equipment is used and the duration of such use (i.e., please provide examples of typical deployments, e.g., operation *x* days a week at sports arenas within a radius of *y* miles of its home base);
- number of transponders typically used in the 3.7-4.2 GHz band and extent of use on both the uplink and downlink; and
- licensee/registrant and point of contact information.

21. These data are needed to better understand the use of the band by temporary fixed or transportable operations. IBFS does not reflect the variations in the locations or intermittent use of such operations. This presents unique challenges for establishing a means of protecting temporary fixed or transportable operations against harmful interference.

22. We direct the Wireless Telecommunications Bureau, International Bureau, and Office of Engineering and Technology (the Bureaus) to issue a Public Notice that will: (1) provide detailed instructions for earth station licensees or registrants to file certifications regarding existing information in IBFS; (2) establish a window for initial filings of certifications; and (3) outline the details for temporary fixed or transportable earth stations to submit the information requested above. Because the Commission may use these data to inform its deliberations regarding the future use of the 3.7-4.2 GHz band, including possible interference avoidance coordination or relocation of facilities, we encourage FSS earth station operators to update their information in the event of a change in any of the operational parameters.

23. *Space Station Data.*—In order to evaluate the potential for a flexible use allocation in the 3.7-4.2 GHz band and to determine how much spectrum could be made available, it is also necessary to evaluate the existing FSS downlink capacity of C-band satellites. This information will assist the Commission in determining whether there is sufficient capacity in the upper portion of the C-band to

⁵⁵ NCTA filed an *ex parte* suggesting that this information collection order was not properly noticed under the Administrative Procedure Act (APA). Letter from Danielle Piñeres, NCTA, to Marlene Dortch, FCC, GN Docket No. 18-122 at 1-3 (filed July 2, 2018). While the Commission has discretion to seek comment before undertaking an information collection, it has never taken the position that such comment is a necessary prerequisite. Because the information collection adopted here is designed solely to obtain the information necessary to evaluate whether to adopt future Commission rules, it has no direct “future effect” and as such is not a rule requiring notice under the APA. See 5 U.S.C. § 551(4); see also 44 U.S.C. § 3507(c) (providing for PRA approval of an information collection not contained in a proposed rule). After adoption of the present *Order*, we will comply with the PRA’s requirements, including by seeking public comment on, and Office of Management and Budget approval of, the final information collection before it becomes effective. As is permitted by the PRA, 44 U.S.C. § 3506(c)(1)(B)(iii), this information collection is mandatory, but this *Order* does not specify any penalty for failure to respond. The *Notice* invites public comment on adoption of a prospective rule or policy that would take into account earth station operators’ responses to future information collections.

⁵⁶ A temporary fixed or transportable earth station is a fixed earth station that remains at a location for less than six months. See 47 CFR § 25.277. Operations from these fixed stations are on a temporary basis and therefore variable in nature. A satellite news gathering truck is a common example of a temporary fixed or transportable earth station.

accommodate customers vacating transponders from the lower portion of the C-band. It will also allow the Commission to evaluate the feasibility of various transition proposals.

24. Accordingly, operators with existing FSS space station licenses or grants of United States market access in the 3.7-4.2 GHz band shall provide the following information:

- satellite call sign, name, and orbital location;
- expected end-of-life for satellite;
- the approximate dates that any additional C-band satellites with a currently pending application in IBFS are planned for launch to serve the United States market (note whether this satellite is a replacement);
- whether any additional C-band satellites that do not have a currently pending application in IBFS are planned for launch to serve the United States market and the approximate date of such launch (note whether this satellite is a replacement);
- for each transponder operating in the 3.7-4.2 GHz range that is operational and legally authorized to serve customers in the United States, for the most recent month,⁵⁷ provide the following:
 - the frequency range of transponder and transponder number;⁵⁸
 - the capacity in terms of the number of megahertz on each transponder that are currently under contract (also provide this data for one month in 2016);⁵⁹
 - For each day in the most recent month, please provide the percentage of each transponder's capacity (megahertz) utilized and the maximum capacity utilized on that day. (Parties should use the most recent month of data and provide the date range at which the data was collected; they may also supplement the data with historical trend data over recent months up to three years if they feel it displays utilization variances);
- the center frequency and bandwidth of the Telemetry Tracking and Command beam(s); and
- the call sign and geographic location (using NAD83 coordinates) of each TT&C receive site.

25. We will seek approval from the Office of Management and Budget (OMB) before the information collection becomes effective, and following OMB approval, we will publish notice of the effective date of the information collection and filing deadline in the Federal Register. We also direct the Bureaus to consider whether additional information should be collected from either FSS earth station operators or satellite licensees and to seek notice and comment regarding the need to initiate a second information collection if such additional information is necessary to supplement the information submitted in this proceeding.

⁵⁷ The "most recent month" will be defined in the Bureaus' forthcoming public notice and will be a month following release of this *Order*.

⁵⁸ For purposes of this information collection, "transponder number" refers to a standard 36 megahertz wide transponder and that transponder numbering (1-24) is based on the former center-frequency requirement for C-band space stations. See 47 CFR § 25.211(a) (2014). While this rule is no longer in effect, most satellites providing service to the United States in the 3.7-4.2 GHz band are configured in accordance with the transponder plan described in the rule.

⁵⁹ The information collected will provide comparative data of transponder usage over time and allow the Commission and the public to evaluate options for the future use of the 3.7-4.2 GHz band.

IV. NOTICE OF PROPOSED RULEMAKING

A. The Future of Incumbent Usage of 3.7-4.2 GHz

26. To further our goals of fostering more efficient and intensive use of the 3.7-4.2 GHz band as expeditiously as possible while protecting existing operations in the band from harmful interference, we seek comment on the future of incumbent usage of the 3.7-4.2 GHz band, particularly on how to protect existing earth station users while limiting uses that would hamper new intensive terrestrial use of the band.

1. Protecting Incumbent Earth Stations

27. We propose to protect incumbent earth stations from harmful interference as we increase the intensity of terrestrial use in the band. We seek comment on how to define the appropriate class of incumbents for protection. For FSS earth station licensees and registrants, we propose to define incumbent stations as earth stations that: (1) were operational as of April 19, 2018; (2) are licensed or registered (or had a pending application for license or registration) in the IBFS database as of October 17, 2018; and (3) have timely certified the accuracy of information on file with the Commission to the extent required by the *Order*.⁶⁰ Although earth stations that have not filed an exhibit demonstrating coordination with terrestrial FS stations are unprotected from interference by FS links, that requirement is of less relevance today given the minimal FS usage in the band, as well as the fact that we propose new terrestrial uses for which coordination with existing FS users will have little value. Accordingly, we propose to protect even such earth stations so long as they meet the criteria described above.⁶¹

28. We propose to exclude from the definition of incumbents any earth stations that are not licensed or registered in IBFS, or that are licensed or registered in IBFS, but for which the licensee/registrant does not timely file the certification required in the *Order*. We further propose that unregistered FSS earth stations could continue to receive transmissions lawfully, but would operate on an unprotected basis as to any licensed operations in the band. We also seek comment on whether incumbents that are small entities face any special or unique issues with respect to the transition such that they should be defined differently or have different obligations.

29. We ask that commenters be specific in defining a protected incumbent and in explaining the relative obligations and/or rights that protected incumbents may have under each approach for more intense terrestrial use of the band.⁶² Which categories of incumbents must new flexible use licensees relocate under each approach, what would be the standard for determining the need to relocate each category of incumbents, and what are the terms or rules pursuant to which these relocations will occur? We seek comment on specific relief that should be provided to each class of incumbents. For example, should incumbent earth station operators be provided with filters to block transmissions from flexible use operations, should they receive filters and the technical assistance necessary to install them or repoint earth station antennas as necessary, or should earth station operators be provided with a lump sum to be used at their own discretion, either to upgrade existing facilities or to enable the switch to other means of transmission? Who would be responsible for reimbursing incumbent earth station operators and C-band customers for costs incurred in any transition, and how would such cost reimbursement be accomplished? How would disputes relating to cost reimbursement be resolved? What would be the basis for establishing reasonable cost reimbursements? For example, would it take into account any required improvements or replacement to an existing antenna or its supporting structure? Would it cover any

⁶⁰ See *infra* Appendix A, proposing to add a definition of incumbent earth stations to Section 25.203 of the Commission's rules. 47 CFR § 25.203.

⁶¹ We note that the International Bureau waived the coordination requirement for the duration of the freeze for applications filed during the filing window (April 19, 2018 to October 17, 2018). *Freeze and 90-Day Earth Station Filing Window Public Notice* at 3-4.

⁶² See *infra* Section IV.B

required technological assistance? How should satellite news gathering vehicles or other temporary-fixed earth stations be addressed?

a. Limiting New Earth Stations

30. On April 19, 2018, the staff released the *Freeze and 90-Day Earth Station Filing Window Public Notice*, which froze applications for new or modified earth stations in the 3.7-4.2 GHz band to preserve the current landscape of authorized operations pending action as part of the Commission's ongoing inquiry into the possibility of permitting mobile broadband use and more intensive fixed use of the band through this proceeding.⁶³ We now seek comment on revising the Part 25 rules to permanently limit eligibility to file applications for earth station licenses or registrations to incumbent earth stations. This would mean that earth station operators that register or license their existing stations by October 17, 2018, would be able to modify these stations at the registered location but not add new stations in new locations, and applications for new earth station registrations would not be allowed. Limiting new earth stations in this manner would provide a stable spectral environment for more intensive terrestrial use.

b. Removing Uncertified Earth Stations

31. In response to the *Mid-band NOI*, the Commission received comments from a variety of stakeholders, many of which addressed whether the Commission's IBFS data about current operations in the band is complete and up to date.⁶⁴ Some commenters stressed the importance of identifying existing unregistered earth stations before the Commission makes any substantial changes to the operations permitted in the band,⁶⁵ while other commenters contend that there may be earth stations in the database that are no longer in operation.⁶⁶

32. Regarding the first concern, in the *Freeze and 90-Day Earth Station Filing Window Public Notice*, the International Bureau announced as an exception to the freeze, a 90-day window for earth stations to register in IBFS.⁶⁷ Also, to obtain the best information possible on existing earth stations in this band in furtherance of the Commission's ongoing inquiry without imposing a potentially unnecessary economic burden on eligible FSS earth station applicants in the 3.7-4.2 GHz band filing within the 90-day window, the International Bureau granted a temporary waiver of the frequency coordination requirement.⁶⁸ Subsequently, the International Bureau extended the filing window by 90 days until October 17, 2018, waived additional provisions of the rules, clarified that multiple antennas located at the same address or geographic location may be filed under a single registration application and pay a single filing fee, and announced the availability of an additional option to facilitate the registration of large numbers of geographically diverse earth stations under a single "network" license and single fee.⁶⁹

33. Regarding the second concern, the staff noted that "after the 90-day window closes, the Commission may determine to require all licensees, registrants, and operators with pending applications for license or registration of FSS earth stations in the 3.7-4.2 GHz band to file a certification that the earth station was operational as of the start of the freeze and remains operational at the time of the certification

⁶³ See *Freeze and 90-Day Earth Station Filing Window Public Notice* at 1.

⁶⁴ See, e.g., CCA Reply at 7; Google Comments at 5; NCTA Reply at 12; SIA Reply at 14-16.

⁶⁵ See, e.g., SES Reply at 24; ACA Comments at 3.

⁶⁶ See, e.g., AT&T Comments at 9-10; CCA Reply at 7; Google Comments at 5; Broadband Access Coalition Comments at 8-9; DSA Comments at 8. Registrants are required to notify the Commission when a receive-only earth station is no longer operational or when it has not been used to provide any service during any 6-month period. 47 CFR § 25.131(i).

⁶⁷ *Freeze and 90-Day Earth Station Filing Window Public Notice* at 3.

⁶⁸ *Id.* at 4.

⁶⁹ *Earth Station Filing Window Extension Public Notice* at 2-4.

along with additional technical details regarding their operations to inform the Commission's resolution of issues raised in the inquiry.⁷⁰ In the *Order*, we require operators of earth stations licensed or registered in IBFS (except those that file new or modified registrations between April 19, 2018, and October 17, 2018, under the modified registration process outlined in the *Freeze and 90-Day Earth Station Filing Window Public Notice*) to file certifications as to the accuracy of all information in IBFS concerning their existing FSS earth station operations.⁷¹

34. To ensure that we have the best information possible on existing earth stations in this band, we propose to update IBFS to remove 3.7-4.2 GHz band earth station licenses or registrations for which the licensee or registrant does not file the certifications required in the *Order* (to the extent they were licensed or registered before April 19, 2018). We specifically propose that an earth station registered in IBFS be automatically terminated unless the registrant timely files the certification required by the *Order* (to the extent they were licensed or registered before April 19, 2018). We seek comment on this proposal.⁷²

c. Maintenance of IBFS Data Accuracy

35. We seek comment on how—once the accuracy of 3.7-4.2 GHz band earth station data has improved—to ensure that earth station data remains accurate to facilitate frequency coordination and maximize efficient use of the spectrum. How often do the frequencies received by a given earth station change? We seek comment on whether, for a constructed and operational earth station,⁷³ any combination of frequency, azimuth, and elevation listed in the license or registration that is unused for more than, e.g., 180 days, should be deleted from the license or registration to minimize unnecessary constraints on successful frequency coordination of new operations.

36. In addition, we ask for parties to comment on whether to require an earth station licensee or registrant in the 3.7-4.2 GHz band to certify periodically, e.g., annually, the continued accuracy of the information on file with the Commission. Should any requirements that we adopt to help ensure that IBFS data remains accurate become effective after a transition period?

d. Revising the Coordination Policy

37. Receive-only earth stations cannot cause interference, but under the Commission's current rules they can be coordinated and licensed or registered with the Commission to protect them from terrestrial microwave stations in bands shared co-equally with the FS.⁷⁴ Section 25.203 requires

⁷⁰ *Freeze and 90-Day Earth Station Filing Window Public Notice* at 5. The staff also advised all potential applicants that “the Commission may, for purposes of further action following the *NOI*, choose to take into consideration only those earth stations that are licensed, registered, or have pending applications for license or registration on file in IBFS as of [the close of the filing window].” *Id.* at 5.

⁷¹ Above, we propose to limit the definition of incumbent earth stations to licensed or registered stations for which the operator timely files the required certification, or for which the operators timely filed for new or modified registrations between April 19, 2018 and October 17, 2018 pursuant to the *Earth Station Filing Window Public Notices*.

⁷² *Cf.* 47 CFR § 25.161(c) (automatically terminating an earth station authorization without further notice upon the removal or modification of the facilities which render the station not operational for more than 90 days).

⁷³ We note that under Part 25, a station authorization shall be automatically terminated in whole or in part without further notice to the licensee upon the removal or modification of the facilities which renders the station not operational for more than 90 days, unless specific authority is requested. *Id.* § 25.161(c).

⁷⁴ *Id.* § 25.131(b) (Filing requirements and registration for receive-only earth stations). Receive-only earth stations in the FSS that operate with U.S.-licensed space stations, or with non-U.S.-licensed space stations that have been duly approved for U.S. market access, may be registered with the Commission in order to protect them from interference from terrestrial microwave stations in bands shared co-equally with the Fixed Service in accordance with the procedures of §§ 25.203 and 25.251, subject to the stricture in § 25.209(c). Receive-only earth stations

FSS applicants to coordinate their proposed frequency use prior to filing their license applications with the Commission. Earth station applicants, to the extent practicable, must select sites and frequencies in areas where the surrounding terrain and existing frequency use will minimize the possibility of harmful interference between the sharing services.⁷⁵ An earth station applicant, prior to filing an application to register or license with the Commission, must coordinate its proposed frequency usage with existing terrestrial users and with applicants that have filed for terrestrial station authorizations.⁷⁶ The purpose of this coordination requirement is to establish the baseline level of interference that an earth station must accept in frequency bands shared by the FS and FSS on a co-primary basis. The coordination results entitle the FSS earth station to the interference protection levels agreed to during coordination, including against subsequent FS licensees.⁷⁷ Currently, registered or licensed earth stations in the C-band are generally coordinated and authorized to use the entire band across the full geostationary arc, a policy known as full-band, full-arc.⁷⁸

38. In 2016, the Fixed Wireless Communications Coalition (FWCC) filed a petition for rulemaking proposing, among other things, modifications to the coordination procedures that govern FSS and point-to-point FS coexistence in the 3.7-4.2 GHz band.⁷⁹ According to the FWCC, the current procedures are spectrally inefficient because the full-band, full-arc coordination policy prevents point-to-point operations on fallow spectrum in the band where there would be no harmful interference to any existing earth station operations.⁸⁰ Satellite providers and programming and content distributors oppose FWCC's proposals⁸¹ while most of the other commenters support FWCC's call for a reexamination of the coordination procedures.⁸² Most of these other commenters also support a broad inquiry about rule

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must be licensed in cases where they seek to operate with non-U.S.-licensed space stations that have not been approved for market access. *See Id.* § 25.131(j)

⁷⁵ *Id.* § 25.203(a).

⁷⁶ *See id.* § 25.203(c). *See also* 47 CFR §§ 25.115(c)(2)(ii); 25.130(b)(1); 25.131(d). The coordination procedures specified in 47 CFR § 101.103 and § 25.251 shall be applicable except that the information to be provided shall be that set forth in § 25.203(c)(2).

⁷⁷ *See id.* §§ 25.131(d), (f); 25.251.

⁷⁸ *See, e.g., Establishment of Domestic Communications-Satellite Facilities by Nongovernmental Entities*, Report and Order, 22 FCC 2d 86, 102 (1970); *American Satellite Corp.*, 72 FCC 2d 750, 754 (1978). In establishing the policy permitting authorization of domestic communications satellite facilities to non-governmental entities in 1970, the Commission recognized that this band would be shared between FSS and FS on a co-primary basis. The Commission further acknowledged that coordination between these two services might prove difficult in many cases, especially because the adopted coordination procedures assumed that “each earth station and each radio relay station within the coordination distance contours utilizes the entire pertinent frequency band or bands.” *See Establishment of Domestic Communication-Satellite Facilities by Nongovernmental Entities*, Report and Order, 22 FCC 2d 86 para. 35 (1970). Thus, the Commission required earth station applicants to endeavor to find suitable earth station locations presenting the least amount of potential interference problems. This obligation is currently reflected in 47 CFR § 25.203(a).

⁷⁹ *See* FWCC Petition; *Fixed Wireless Communications Coalition, Inc. Request for Modified Coordination Procedures in Bands Shared Between the Fixed Service and the Fixed Satellite Service*, RM-11778, Public Notice, Consumer and Governmental Affairs Bureau Reference Information Center Petition for Rulemaking Filed, Report No. 3059 (CGB, Dec. 9, 2016) (FWCC Public Notice).

⁸⁰ *See* FWCC Petition.

⁸¹ SES Americom, Inc., Petition to Dismiss or Deny, RM-11778 (Jan. 9, 2017); Satellite Industry Association, Petition to Dismiss or Deny, RM-11778 (Jan. 9, 2017); EchoStar Satellite Operating Corporation and Hughes Network Systems, LLC, Opposition, RM-11778 (Jan. 9, 2017); Intelsat License LLC, Opposition, RM-11778 (Jan. 9, 2017); *see also* Content Companies Letter, RM-11778 (Jan. 24, 2017) (opposing the FWCC Petition).

⁸² *See* Mimosa Comments, RM-11778 (Jan. 9, 2017); WISPA Comments, RM-11778 (Jan. 9, 2017); Nokia, Comments, RM-11778 (Jan. 9, 2017); OTI and Public Knowledge, Comments, RM-11778 (Jan. 9, 2017); Google

changes that could support more intensive terrestrial fixed use of the 3.7-4.2 GHz range or additional shared uses of these bands while protecting incumbent operations from harmful interference.⁸³

39. A reexamination of the full-band, full-arc coordination policy is appropriate in light of our goal to maximize spectrum efficiency and use in the 3.7-4.2 GHz band including more intensive terrestrial use of the band. Accordingly, we propose that for purposes of interference protection, earth station operators will be entitled to protection only for those frequencies, azimuths, and elevation angles and other parameters reported as in regular use (i.e., at least daily) in response to future information collections, until the incumbent starts the coordination process for an application to modify its license or registration in IBFS for its earth station. We further propose that such modification applications identify and include a coordination report for the specific combinations of frequency,⁸⁴ azimuth, and elevation angle that the incumbent intends to use and that such technical information be reflected on the earth station application and authorization. We seek comment on this proposal.

40. At the same time, we acknowledge that the full-band, full-arc policy has certain advantages, e.g., it affords FSS operational flexibility,⁸⁵ and we seek comment about the consequences of eliminating the policy. Specifically, how would this policy alter current business models and operations of C-band licensees and registrants? Are there alternatives to eliminating this policy that would have less of an impact on the current C-band business models and operations without sacrificing the efficiency maximizing goals of our proposal?

e. Information on Incumbent FSS Operations

41. In the *Order*, we direct incumbent FSS earth station operators to certify as to the accuracy of existing information in IBFS, and require incumbent FSS space station operators to provide additional information.⁸⁶ To develop a more complete record on existing FSS operations in this band, we propose to require earth station operators to file additional information on their existing facilities. To the extent that the information requested would duplicate information already available in IBFS, we would direct the International Bureau to permit operators to certify that the information in IBFS remains accurate in lieu of providing the information again. Specifically, we propose and seek comment on requiring authorized earth station operators (including operators that file new or modified registrations between April 19, 2018, and October 17, 2018) to provide the following information for each antenna under each call sign:⁸⁷

- earth station call sign;
- geographic location;
- licensee and point of contact information;
- antenna gain;
- azimuth and elevation gain pattern;
- antenna azimuth relative to true north;
- antenna elevation angle;

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Fiber, Comments, RM-11778 (Jan. 9, 2017); Federated Wireless, Comments, RM-11778 (Jan. 9, 2017); DSA, Comments at 2, RM-11778 (Jan. 10, 2017).

⁸³ See, e.g., Google Fiber Comments at 7, RM-11778 (Jan. 9, 2017); OTI and Public Knowledge Comments at 7-8, RM-11778 (Jan. 9, 2017); DSA Comments at 2, RM-11778 (Jan. 10, 2017).

⁸⁴ See DSA June 29, 2018 *Ex Parte* Letter, GN Docket No. 18-122 (given that many earth stations may be receiving signals for less than the full transponder, understanding the actual utilization is useful and without significant additional burden to the earth station operator).

⁸⁵ PSSI, Intelsat, SES June 25, 2018 *Ex Parte* Letter (GN Docket Nos. 17-183, 18-122).

⁸⁶ See *supra* Section III.

⁸⁷ To reduce the burden on FSS earth station operators and ensure the accuracy of data obtained during the information collection process, IB would release a public notice that will provide guidance about how to obtain or calculate the information.

- satellite(s) at which the earth station is pointed;
- transponder number(s) and how often each transponder is used: regularly (i.e., at least daily); infrequently; or backup capacity;
- antenna site elevation and height above ground.

42. Our consideration of some transition options may also benefit from additional, more granular information on FSS earth station and space station operations in the band. For example, information on the type of content (i.e., audio or video feeds), the total bandwidth occupied by particular users or content feeds, and the identity of the content provider could provide additional clarity on the actual usage of the band. In addition, more granular information on the nature of any periodic usage of transponder capacity (i.e., daily, weekly or once a year) could provide additional clarity on the availability of spectrum in the band. We seek comment on whether to seek additional information from incumbent FSS earth station or space station operators beyond what is included in the list above. Should we seek additional information on transponder loading, content type, content provider information, periodic usage, or other data that would provide a more detailed picture of the actual usage of the band? Should we collect other information to more fully assess spectrum utilization in the band?

43. In the *Order*, we require operators of temporary fixed or transportable earth stations to file information concerning their existing operations, including the area within which the equipment is typically used and the frequency and duration of such use. Consistent with our proposal to collect additional information from fixed FSS earth stations, we seek comment on whether and to what extent we should collect additional information specifically with respect to temporary fixed or transportable earth stations. We also seek comment on whether the categories of information proposed above for fixed FSS earth stations would need to be modified or supplemented with respect to temporary fixed or transportable earth stations.⁸⁸ For example, would it be useful to further quantify the frequency or extent of use for these operations and, if so, how should they be quantified? Commenters should provide a clear rationale for any additional information collection along with an analysis of the costs and benefits of such additional collections.

44. We also seek comment on whether to collect the information described above on a nationwide basis or whether it may be appropriate to conduct an initial information collection for an initial sample of areas. For example, should we collect information from entities based on a representative sampling of different types of areas, such as urban, suburban, and rural areas? If so, how should the sample be determined? We seek comment on this and any other methodology that will effectively balance the potential burden that an information collection may impose against the need to evaluate the feasibility of clearing more spectrum in this band. We also seek comment on whether small entities and entities operating in rural areas face any special or unique issues with respect to the information collection such that they would require certain accommodations or additional time to comply. We also seek comment on the costs and benefits of an additional information collection on this band.

45. Commenters should describe, with specificity, how any additional information collection would support a given transition proposal and should provide a detailed assessment of the costs and benefits of such additional collections. We also encourage commenters to submit any information that could inform our consideration of specific transition proposals, including the types of information described in this section.

2. Limiting New Space Station Operators

46. On June 21, 2018, the International Bureau released the *Space Station Freeze Public Notice*, which froze the filing of certain space-station applications in the 3.7-4.2 GHz band. To limit

⁸⁸ SES and Intelsat provided many questions that could be asked about the nature of such earth stations and their patterns of use, but it may be difficult to quantify deployments for these earth stations other than typical capacity used when they are deployed and perhaps the area or areas within which they are typically used. Intelsat, SES July 3, 2018 *Ex Parte* Letter (GN Docket Nos. 17-183, 18-122).

speculative applications for satellite usage of the band in light of this proceeding, we propose to revise the rules to similarly bar new applications for space station licenses and new petitions for market access concerning space-to-Earth operations in the 3.7-4.2 GHz band. These revisions would not extend to applications for extension, cancellation, replacement or modification of existing authorizations. Additionally, we propose that this freeze would not bar operators with existing space station authorizations in the band as of June 21, 2018, from filing applications for additional space stations, if authorization of such space stations would promote more efficient use of the band. We seek comment on our proposal.

3. Sunsetting Incumbent Point-to-Point Fixed Services

47. Point-to-point FS use of the band has declined steeply over the past 20 years as common carrier and private operational fixed licensees migrated to fiber or other FS bands that offered more channelization options without the risk of interference disputes with earth stations and without the need to coordinate new or modified links within the band with GSO FSS.⁸⁹ Today, current point-to-point FS use of this band is minimal (115 licenses).

48. Due to the declining use of the band for fixed point-to-point FS links as well as the availability of other spectrum options for point-to-point links, we propose to sunset point-to-point FS use in the band.⁹⁰ In addition, we seek comment on whether existing fixed links should be grandfathered or transitioned out of the band over some time period, after which all licenses would either be cancelled or modified to operate on a secondary, non-interference basis. If the latter, how long would incumbent users have to transition from the band? Three years? Five years? And should we differentiate in treatment between those with permanent licenses and those with temporary licenses? Or those that have or are willing to relocate to the upper portion of the band?

B. Increasing the Intensity of Terrestrial Use

49. In the *Mid-Band NOI*, the Commission sought comment on how to make more efficient and intensive use of mid-band spectrum to facilitate and incentivize investment in next generation wireless broadband networks, including 5G.⁹¹ Specifically, the Commission sought comment on whether the 3.7-4.2 GHz band could be made available for more flexible wireless broadband use in addition to or in lieu of existing FSS and FS uses.⁹² A wide range of commenters, including incumbent satellite providers, potential licensees, and equipment manufacturers note the value associated with future terrestrial use in the band; and they claim that this band presents a significant opportunity to accommodate expected rapid growth of such services.⁹³ Other commenters support proposals that would add more intensive fixed use in the band by permitting point-to-multipoint service as a means to encourage efficient, cost-effective broadband deployment, particularly in rural areas.⁹⁴ Commenters also urge the Commission to explore all avenues for potential use of the band, including authorizing both flexible use and more intensive fixed use in the band.⁹⁵ We describe several potential approaches for repurposing the band and we encourage commenters in discussing their proposals to consider the economic tradeoffs described herein. Figure 1 below demonstrates the current and proposed future allocations and potential uses of the band.

⁸⁹ “In the 3700-4200 MHz band, terrestrial fixed links have problems sharing with fixed satellite downlinks.” NTIA Report 00-378 at 8.

⁹⁰ See 47 U.S.C. § 316; 47 CFR § 1.87.

⁹¹ See *Mid-Band NOI*, 32 FCC Rcd at 6373-6375, paras. 1-2, 6.

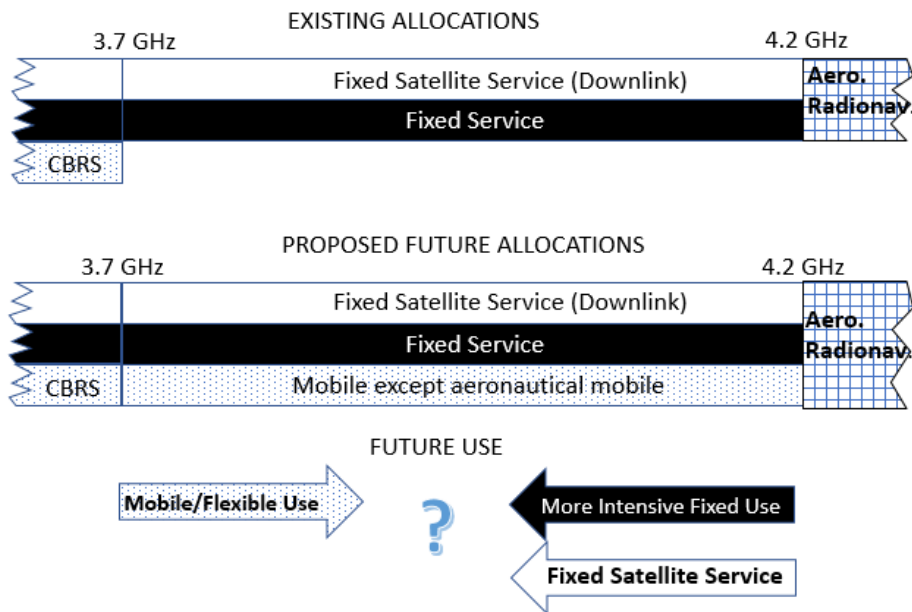
⁹² See *id.* at 6380-81, paras. 21-23.

⁹³ See, e.g., Intelsat-Intel Comments at 12; Verizon Comments at 11; Mid-Band Spectrum Coalition Comments at 2; CTIA Comments at 2; AT&T Comments at 5; Ericsson Comments at 4.

⁹⁴ See, e.g., Google Comments at 9; GeoLinks Comments at 2-3; Broadband Access Coalition Comments at 4.

⁹⁵ See, e.g., CCA Comments at 4.

Figure 1: 3.7-4.2 GHz Band Existing and Proposed Future Allocations and Use



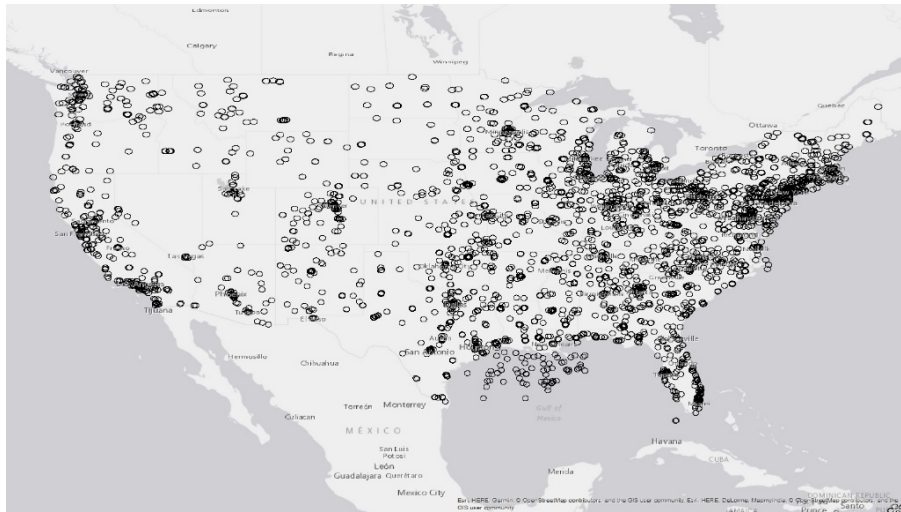
50. We recognize that co-channel sharing of spectrum between the FSS and more intensive terrestrial wireless use in the same geographic area may be difficult. For example, frequency coordination allows FSS and terrestrial fixed microwave to share the band on a co-primary basis, but coordination of mobile systems would be more complicated because the movement of the devices would require analyses and interference mitigation to FSS earth stations in this band spread over many locations within any given geographic area. In addition, because the C-band satellites are in geostationary orbit approximately 36,000 km above the equator, the signals received at the earth stations are extremely weak.⁹⁶ This means that terrestrial mobile operations could cause harmful interference to the earth station receivers over large distances absent adequate protection.

51. Geographic sharing may be similarly difficult. Current Commission policy permits earth stations to coordinate reception across the entire GSO arc and over the entire 3.7-4.2 GHz band, which would exclude mobile wireless operations from transmitting across the entire band in a wide area around each earth station. For purposes of illustration, Figure 2 below shows a hypothetical 20 km exclusion zone around each earth station in the continental United States in the International Bureau Filing System (IBFS) database as of early May 2018.⁹⁷ These exclusion zones would cover 83.25% of the United States population.

⁹⁶ See, e.g., SIA Reply at 29, quoting Content Companies Comments at 6 (“by design, receiving earth stations are extremely sensitive—a necessity in order to receive a low-power signal from a satellite”). According to link budget examples submitted by Intelsat and SES, the received power at the earth station antennas is approximately -124 dBm (before approximately 41 dB antenna gain). See Intelsat-SES Apr. 23 2018 *Ex Parte* Letter, GN Docket No. 17-183, Attach. C at 3.

⁹⁷ We note that commenters in this proceeding have argued that IBFS significantly undercounts the number of existing, but unregistered, earth stations. For purposes of this study the Commission used earth stations currently licensed or registered in IBFS.

Figure 2: Registered 3.7-4.2 GHz Band FSS Earth Stations in CONUS with 20 km Exclusion Zones



52. The Commission was able to establish the Citizens Broadband Radio Service in the 3550-3700 MHz despite the presence of FSS receivers because there are only FSS earth stations in 35 cities and two MSS gateways in the 3600-3700 MHz band.⁹⁸ This is unlike the current incumbent earth station environment in the 3.7-4.2 GHz band. Therefore, subject to confirming the landscape of existing earth stations through the certifications required by the *Order*, co-channel sharing between FSS and mobile wireless could exclude a majority of the population from receiving flexible fixed and mobile broadband service in the 3.7-4.2 GHz band unless FSS use of the band is modified or FSS protection criteria are significantly relaxed. We recognize that the affected population would likely be less if we were to only protect the earth stations based on the transponder frequencies received at each site and actual antenna azimuth and elevation, but the overall assessment that mobile service would not be viable for much of the population would remain the same. We seek comment on this assessment.

53. Notably, we believe that increased terrestrial use of the band is ripe to meet our mandate under the MOBILE NOW Act to identify (with NTIA) 255 megahertz of spectrum for mobile and fixed wireless broadband use.⁹⁹ For purposes of meeting Section 603(a)(1), Section 603(a)(3)(E) states “[s]pectrum that the Commission determines had more than *de minimis* mobile or fixed wireless broadband operations within the band on the day before the date of enactment of this Act” is non-eligible for purposes of satisfying the 255 megahertz requirement.¹⁰⁰ We believe that there was no more than a *de minimis* amount of mobile or fixed wireless broadband operations in the 3.7-4.2 GHz band on March 22, 2018 (the day before the date of enactment of the MOBILE NOW Act) for purposes of fulfilling Section 603. Specifically, since FSS is neither an “unlicensed use” nor an “exclusive, licensed basis for commercial mobile use,”¹⁰¹ FSS services are not included in the *de minimis* exception under Section 603(a)(3)(E). Additionally, FSS in the band is predominantly used for the delivery of video programming with only a *de minimis* portion of the satellite capacity used to provide data services. We note that there is no mobile allocation in the band and the Commission’s licensing database indicates that there are only 115 fixed point-to-point licenses in the band. Thus, any portion of this band made available for flexible terrestrial or more intensive fixed use would help satisfy the requirement of Section 603(a)(1) to identify a

⁹⁸ *Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959, 3965, para. 18 (2015).

⁹⁹ Section 603(a)(1) of the Act.

¹⁰⁰ *Id.* § 603(a)(3)(E).

¹⁰¹ *Id.* § 603(a)(2)(A)-(C).

total of at least 255 megahertz of spectrum for “mobile and fixed wireless broadband use.”¹⁰² We seek comment on these findings.

54. We seek comment on approaches for expanding flexible and more intensive fixed use of the band without causing harmful interference to incumbent operations. In discussing how much of the band should be made available for flexible use, more intensive fixed use, or maintained just for incumbent uses, we ask commenters to address the relative present and future economic value of each of these services to individuals and businesses in the United States. What are the tradeoffs in accommodating one type of use instead of another? And what are the costs associated with accommodating new uses? Commenters should provide a detailed cost-benefit analysis in their proposal and address the relative economic values of alternative uses and the implementation costs of their specific proposal vis-à-vis other possible approaches to the band. We also ask commenters to address the economic impact of the implementation time frame associated with their chosen approach.

55. We propose to add a non-federal mobile, except aeronautical mobile, service allocation to the 3.7-4.2 GHz band, and given our conclusion that co-channel sharing is not feasible, seek comment on several proposals below to clear all or part of the band for flexible use.

56. In particular, we seek comment on the economic benefits of introducing a new allocation for mobile, except aeronautical mobile, and flexible use relative to the introduction of point-to-multipoint FS, perhaps shared with FSS, in all or part of the 3.7-4.2 GHz band. Commenters should consider the economic value of current and future use cases for each type of service, including benefits and opportunity costs to consumers and the Nation’s economy overall, as well as to unserved or underserved areas and specialized market segments (e.g., education, telemedicine, and manufacturing). Commenters should also address the benefits of international harmonization both in terms of devices and network deployments. In addition, we encourage commenters to consider the economic impact on consumers and businesses in rural communities and areas that are unserved or underserved by current broadband providers, as well as any economic impact on small businesses. We also ask commenters to address how long it will take to transition various amounts of this band to flexible use or to point-to-multipoint FS use, how much such a transition will cost for each 100 megahertz that is transitioned, and how expeditiously the transition can be completed.

57. We also seek comment on the current and future economic value of FSS in the band. How intensively is this spectrum used by existing FSS licensees and how intensely will it be utilized in the future? Is spectrum in the band allocated to FSS currently being used efficiently and are there technologies that may facilitate more efficient use of spectrum in the band by FSS licensees without significant disruption to consumers and businesses that rely on these services? Are there alternative technologies available that could wholly or partially replace the services provided by FSS without significant disruption to existing customers? How long would it take and how much would it cost to transition existing customers to these alternative technologies? How may the cost-benefit analysis shift depending on how much spectrum is transitioned at particular times? Are there other considerations that we should consider when assessing the most economically efficient allocation of the band between services? And would such considerations differ depending on when and how much spectrum is ultimately transitioned to flexible use?

1. Mechanisms for Expanding Flexible Use

58. We seek comment on a variety of approaches for expanding flexible use in the 3.7-4.2 GHz band. Specifically, we ask commenters to consider whether a market-based approach would most efficiently and effectively repurpose a portion or all of the band for flexible use. In addition, we ask commenters to discuss auction-based approaches to repurpose some or all of the band. Finally, we seek comment on approaches that combine elements of the various options, as well as any other mechanisms for transitioning this band in part or whole.

¹⁰² *Id.* § 603(a)(1).

59. Repurposing of the 3.7-4.2 GHz spectrum bands allocated to FSS raises at least three economic problems, some of which have not arisen in previous spectrum auctions. The first two problems are direct consequences of the C-band licensing structure, while the last is common to all spectrum reallocations. First, because all FSS licensees have equal, nonexclusive rights to the entire band under Part 25 of our rules, they cannot compete in the same way that broadcast television licensees did in the broadcast incentive auction. Second, this nonexclusive licensing problem creates an incentive for an FSS licensee to overstate the value it assigns to the spectrum in order to increase the share of auction revenue it may receive. We will refer to this as the “holdout” problem. Third, repurposing some of the 3.7-4.2 GHz spectrum band will reduce the amount of spectrum available for FSS, which lowers industry capacity and could lead to higher prices for downstream services, such as the transmission of video to cable head ends. We note that the first and last problems create opposite incentives for FSS licensees. The first provides an incentive to repurpose less than the efficient amount of spectrum while the last may create an incentive to repurpose more than the efficient amount.

60. The broadcast incentive auction relied on competition among licensees to induce broadcast incumbents to reveal the least amount they must be paid to relinquish their spectrum rights. Many broadcast licenses were substitutes because if one licensee bid to relinquish its spectrum usage rights this could make spectrum available to repack other broadcast stations and free spectrum for flexible use. In the 3.7-4.2 GHz FSS, all licensees must agree to relinquish their spectrum rights in a given geographic area in order to reassign spectrum and therefore licenses are not substitutes and competition is limited.

61. In addition to the problem that satellite licensees will not be competing to supply spectrum in the same way that television licensees did in the broadband incentive auction, there is an additional problem concerning how the satellite licensees will split any revenues from repurposing. In order to increase its share of auction revenues, a FSS licensee may have an incentive to overstate the value it assigns to the spectrum or to withhold its consent to repurpose. The holdout problem is the inverse of a public goods problem. The 500 megahertz of spectrum allocated for FSS is a public good, in that several distinct companies make non-exclusive, non-rivalrous use of the spectrum within a geographic area.¹⁰³ Were the spectrum unallocated, the FSS providers would face a classic public goods problem since the total value of the spectrum is the sum of the values of the FSS operators.¹⁰⁴ With property rights assigned to FSS operators, the Commission faces a reverse public goods problem: How to recover an efficient amount of a public good which is no longer efficiently allocated? In the classic public goods problem, if individuals are asked to pay for the public good based on their valuation of that good, they will have an incentive to understate their value for the public good to lower their payment. In the reverse problem, however, each FSS licensee has an incentive to overstate its value of the spectrum in order to increase its payment.

62. Several mechanisms have been developed to generate an efficient allocation of public goods, including one proposed by Hal Varian.¹⁰⁵ In the standard public goods case, Varian proposed that individuals have the opportunity to subsidize the contributions of others towards the public good in a first-stage and then decide how much to contribute in a second-stage. Can such mechanisms be adapted to solve the holdout problem under consideration here? For example, in the first stage might each party announce the share of the payment it receives that it will give to each other party and in the second stage nominate how much spectrum to clear? Can such a mechanism be modified to mitigate the incentive to clear less than the efficient amount of spectrum? Some commenters suggest having the FSS providers

¹⁰³ We note, however, that orbital slots are rivalrous.

¹⁰⁴ See Theodore Groves. “Efficient Collective Choice when Compensation is Possible.” *Review of Economic Studies*, April 1979, 46(2), pp. 227-41; Hal Varian. “A Solution to the Problem of Externalities When Agents are Well-Informed.” *The American Economic Review*. Vol 84, No. 5 (Dec. 1994), pp. 1278-93.

¹⁰⁵ Varian, Hal, “Sequential contributions to public goods”, *Journal of Public Economics*, Volume 53, Issue 2, February 1994, Pages 165-186, Sections 5-6.

meet, privately negotiate, and agree to put spectrum up for auction. We seek comment on the relative merits of FSS provider cooperation versus a more formal, non-cooperative mechanism, especially with regard to the three economic problems.

63. FSS operators currently compete to provide communication services (for example, to deliver programming content to rural cable companies). For the efficient allocation of spectrum, the social value of these services needs to be balanced against the social value of alternative services that could be provided by that spectrum, such as mobile data. Several commenters, such as the American Cable Association, contend that earth stations can and do switch providers, suggesting that competition currently exists in the C-band.¹⁰⁶ Since a reduction in industry capacity generally leads to higher prices, reducing the spectrum associated with FSS may have the unintended consequence of increasing the price of FSS services and consequently of downstream services. Conversely, such a reduction should correspond with an increase in industry capacity for high-speed wireless broadband services, which would tend to lead to lower prices. How should the Commission evaluate proposed mechanisms with regard to their effect on downstream users of FSS and wireless broadband services? How should we take into account other opportunities to deliver these services—such as other means of transmitting programming data like alternative satellite bands¹⁰⁷ or fiber and other means of transmitting high-speed broadband like other mid-band spectrum or fiber¹⁰⁸—in evaluating these effects?

64. In addition, the value of spectrum in alternative uses like mobile data is likely highest in dense urban areas. When the Commission has sold spectrum by geographic region, the prices obtained have been positively correlated with population density. FSS substitutes, particularly fiber, are most prevalent in urban areas while in rural areas there are fewer FSS substitutes. Thus, in rural areas, typically the value of the spectrum remaining in FSS is relatively high while the opportunity cost of clearing less flexible-use spectrum is relatively low, suggesting that the amount of spectrum repurposed should vary across geographic areas. We therefore seek comment on whether we should repurpose a minimum amount of spectrum nationwide, and make additional fully unencumbered spectrum available in any areas where it is less costly to transition earth stations to other forms of transmission. Under this approach, we also seek comment on the appropriate size of such regions. If the regions are too small, this could make mobile data use impractical because it would not give wireless providers sufficient flexibility to scale their networks using this band, while if the regions are too large, this could threaten rural services because those regions would not be attractive to small and rural wireless providers. Is it practical to create regions based on the existence of alternatives to FSS like fiber? We seek comment on whether any flexible use licenses should also be overlay licenses, for which the terrestrial licensee is obligated to protect licensed or registered earth stations and can use any spectrum that becomes available by clearing earth stations.

65. Another consideration in the geographical division of spectrum involves the parties to compensate. Instead of paying FSS operators for relinquishing spectrum usage rights nationwide or in specific geographic regions a mechanism instead might pay earth stations for relinquishing access to C-band spectrum in specific geographic areas. Such earth stations might discontinue use in these areas by discontinuing receiving content or by receiving it by alternative transmission infrastructure like fiber, where the content might be delivered to the fiber from C-band earth stations in rural areas. Would such a

¹⁰⁶ ACA Comments at 18-19.

¹⁰⁷ We recognize that other transmission methods may also compete against satellite transmission via C-band spectrum. For example, in certain urban and suburban areas where fiber is widely deployed, fiber may be a cost-effective alternative. And there may be other radio spectrum that can deliver video transmission, such as the Ku band.

¹⁰⁸ See, e.g., Letter from Steve B. Sharkey, Vice President, Government Affairs Technology and Engineering Policy, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 17-183, GN Docket No. 18-122, at 2-3 (filed June 15, 2018) (T-Mobile June 15, 2018 *Ex Parte*); Letter from Steve B. Sharkey, Vice President, Government Affairs Technology and Engineering Policy, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 17-183, GN Docket No. 18-122, at 1-2 (filed June 29, 2018).

mechanism present an alternative supplier of spectrum—with either the FSS operators or the earth stations effectively releasing spectrum rights? We note, however, that the holdout problem for licensed earth stations is likely more severe because there are more such earth stations that are independently owned than satellite operators. The Commission seeks comment on the practicality and social value of compensating licensed earth stations in exchange for agreeing to no longer be licensed to receive in the 3.7-4.2 GHz band. In particular, would such a mechanism protect those earth stations but not unlicensed earth stations? Also, how would satellite operators be compensated for loss of revenues after the expiration of their contracts with content providers serving the licensed earth stations that discontinued their reliance on satellite delivery of content?

a. A Market-Based Mechanism

66. We seek comment on whether we should adopt rules that would facilitate a market-based approach to transitioning incumbents from some or all of the 3.7-4.2 GHz band. Under such an approach, the Commission would authorize incumbent FSS operators to voluntarily clear all or part of the band. Satellite operators in the band could choose to make some or all of their spectrum available to terrestrial operators on the secondary market in exchange for compensation. Under such an approach, satellite operators could be responsible for clearing the portion of the band that would be made available for flexible use, including notifying earth stations of the need to modify their operations and compensating them for any costs associated with that transition.

67. A secondary market approach might make spectrum available more quickly than other available mechanisms, such as an FCC auction, and thus could facilitate rapid deployment of next generation wireless broadband networks. In addition, such an approach could leverage the technical and operational knowledge of satellite space station operators while relying on market incentives to promote economic efficiency. We seek comment on whether a market-based approach could effectively and rapidly facilitate new terrestrial deployments in the band. We also seek comment on whether a market-based approach that allows FSS licensees to coordinate their capacity would raise any antitrust concerns.

68. The record shows that there is significant interest in using market-based approaches to make some (or all) of the 3.7-4.2 GHz band available for flexible terrestrial wireless use. Intel and Intelsat maintain that allowing market forces to identify and enable the “highest and best use of the spectrum . . . benefits all interested parties and advances the public interest without risk and delay associated with a sharing framework by regulatory fiat.”¹⁰⁹ Moreover, they claim that a market-based approach is the fastest and most efficient way to clear spectrum in the 3.7-4.2 GHz band and that it “will help cement American leadership on 5G technology and services.”¹¹⁰ Cisco believes that a market-based approach will take significantly less time than a Commission auction.¹¹¹ AlphaStar asserts that a market-based approach not only will provide the fastest avenue to adoption of 5G applications, but also best balances the need for satellite providers to continue their business plans with allowing terrestrial wireless providers to utilize a portion of the spectrum without interference.¹¹² Enlace, a customer of a satellite operator, maintains that the market-based approach best protects its services.¹¹³ Other commenters, opposing a market-based approach, argue that it will not result in the most efficient use of the band.¹¹⁴ T-Mobile, for example, urges the Commission to reject any incumbent-driven, market-based approach, and

¹⁰⁹ See Intelsat-Intel Comments at 9.

¹¹⁰ See *id.* at 15.

¹¹¹ Cisco Reply at 11.

¹¹² AlphaStar Comments at 2.

¹¹³ Enlace Reply at 1.

¹¹⁴ See, e.g., T-Mobile Reply at 13-14; Nokia Reply at 6. See also Speedcast Reply at 21 (pointing to the broadcast incentive auction as a more appropriate mechanism for allowing market forces to determine the highest and best use of the band and appropriately compensate incumbent operators); Eutelsat Reply at 6-7.

claims that it will result in a “patchwork quilt of spectrum [that] would draw no meaningful investment in the band for wireless mobile broadband use.”¹¹⁵

69. We seek comment on the efficacy of using a market-based approach to transition some or all of the 3.7-4.2 GHz band to flexible terrestrial use. We observe, and some commenters in the record maintain, that a significant benefit of a market-based approach may be a more rapid introduction of C-band spectrum to the market. For example, Intel, Intelsat, and SES claim that their consortium approach would result in licensed mobile services within 18-36 months of a Commission order.¹¹⁶ Commenters also should address the costs and benefits of this approach vis-à-vis the alternative proposals set forth in this section.

70. We seek comment on using a market-based approach through a Transition Facilitator, a cooperative entity created by relevant satellite operators to coordinate negotiations, clearing, and repacking the band. We note that because of the holdout problem, a market-based approach in which FSS licensees act independently is unlikely to succeed. Consequently, should we allow, encourage, or require satellite operators to cooperate in negotiating with potential terrestrial mobile licensees and in clearing an agreed amount of spectrum? A market-based approach that uses a Transition Facilitator would enable the satellite operators to use private negotiations to obtain participation and agreement from the relevant satellite operators, rather than requiring the Commission to address holdouts using more regulatory mechanisms.

71. We seek comment on whether using a market-based approach in which FSS operators form a Transition Facilitator would produce an economically efficient outcome. Specifically, would allowing all potential sellers to agree on the amount and price of the spectrum that will be repurposed result in a situation in which those sellers offer a lower quantity than is socially efficient? Is that concern mitigated by the fact that the market for spectrum for high-speed broadband services is much broader than just the 3.7-4.2 GHz band? We seek comment regarding some of these concerns about the potential effects of allowing collective action by C-band satellite operators below. We also seek comment on whether a Transition Facilitator raises any particular antitrust concerns.

72. A transition under a market-based approach could be undertaken in a four-step process. The first step would involve the industry voluntarily forming a Transition Facilitator composed of eligible C-band satellite operators.¹¹⁷ In the second step, the Transition Facilitator would negotiate with any interested terrestrial operators and incumbent users. In the third step, the Commission would review the Transition Facilitator’s plan and conditionally authorize terrestrial licenses in the band. And in step four, the Transition Facilitator would clear the negotiated-for spectrum, making it available for flexible use while protecting incumbent earth stations through a variety of potential means. We note as well that a market-based process need not be a one-time event—a Transition Facilitator could negotiate with parties for compensation and protection, seek Commission review and conditional authorization, and clear new spectrum multiple times to ensure the total spectrum dedicated to flexible use meets market demands. We seek comment on the effectiveness of such a four-step process. In addition, we invite commenters supporting a market-based approach to suggest additional details to the steps described below or other specific approaches for implementation.

73. *Step 1: Formation of a Transition Facilitator.*—The first step in the process would be for the industry to form a Transition Facilitator. Once the Transition Facilitator is formed and ready to begin negotiations with potential licensees, the Transition Facilitator would notify the Commission of its membership, its charter, i.e., its structure, objectives, and planned operation, and its compliance with any rules adopted as a result of this proceeding. Once the Transition Facilitator has filed its notification, the

¹¹⁵ T-Mobile Reply at 13. See also Nokia Reply at 6.

¹¹⁶ Intel-Intelsat-SES April 20, 2018 *Ex Parte* Letter, GN Docket No. 17-183, WTB Docket No. 18-122, at 1.

¹¹⁷ In this context, clearing refers to relinquishing interference protection. Satellite transmissions that do not cause interference to terrestrial operations would not necessarily have to be cleared.

Commission would have 60 days to review the filing and formally object to its creation through an order. We seek comment on this process. What additional information might the Commission need to conduct such a review? Should any parties have the opportunity to formally object? Should the Commission be required to affirmatively approve or reject the formation of a Transition Facilitator, and if so on what timeline?

74. There is record support for a centralized facilitator. Intelsat and SES—the two largest incumbent satellite operators in the 3.7-4.2 GHz band—support a consortium-based facilitator.¹¹⁸ While Eutelsat raises concerns regarding how satellite operators eligible to participate in a market-based approach would be defined¹¹⁹ it has stated publicly that it wants to participate.¹²⁰ In considering such an approach, we thus ask commenters to address how to define eligibility to participate in the Transition Facilitator. We seek comment on opening eligibility to participate in the Transition Facilitator to all C-band satellite operators providing service to any part of the United States pursuant to an FCC-issued license or grant of market access. Should we limit eligibility in any way, such as requiring service throughout the lower 48 states?

75. Given the holdout problem, we do not propose to require that all eligible satellite operators agree to a Transition Facilitator before it can take effect. Instead, we seek comment on the appropriate number of satellite spectrum interests in the band—a majority? all but one?—that should be represented by the Transition Facilitator to effectuate a successful transition. Are a minimum number of operators required to participate in the Transition Facilitator for this approach to work? If this number is not met, should the Transition Facilitator be approved by the Commission?

76. We also seek comment on what the Transition Facilitator should do if one or more eligible C-band satellite operators choose not to participate in the Transition Facilitator. Are any Commission actions necessary if one or more eligible C-band satellite operators do not join the Transition Facilitator? We note that Intelsat and SES propose that eligible C-band satellite operators that do not join a centralized facilitator would nonetheless have their “reconfiguration and relocation costs covered.”¹²¹ How would such a process work? Should the Transition Facilitator, or members of the Transition Facilitator, negotiate with non-participating satellite companies to ensure the spectrum is successfully repurposed? Or should non-participating satellite companies be bound by the decisions of the Transition Facilitator? If the latter, would a non-participating satellite company be limited to recouping its costs? Or would it be even eligible to recoup costs so long as the Transition Facilitator adequately protects its associated incumbent earth stations?

77. If there are earth station registrants or licensees that have no contractual relationship with any of the members of the Transition Facilitator or any FSS space station operators, will that create difficulties in clearing the band during later steps in the process? If so, how can those difficulties be addressed? Is there any reason that the Transition Facilitator would not be able to negotiate with earth stations that don't have contractual relationships with any of the Transition Facilitator's members?

¹¹⁸ See Intelsat-SES Feb. 14, 2018 *Ex Parte* Letter, GN Docket No. 17-183, Attach. at 2.

¹¹⁹ Eutelsat Reply at 4-5.

¹²⁰ *Id.* Eutelsat states that it wants to ensure that it will have a role in any process that is adopted for the possible clearing of C-band spectrum. *Id.* at 7. See also *Eutelsat Communications' (EUTLF) CEO Rodolphe Belmer on Q2 2018 Results - Earnings Call Transcript*, Seeking Alpha (Feb. 16, 2018), <https://seekingalpha.com/article/4147732-eutelsat-communications-cutlf-ceo-rodolphe-belmer-q2-2018-results-earnings-call-transcript?part=single>; <https://advanced-television.com/2018/02/19/eutelsat-wants-to-join-sesintelsat-5g-consortium-over-us/> (“[T]here has been a spontaneous and sort of unilateral step made by one of our competitors in the U.S., which aims at sharing in essence the C-band spectrum that we own in North America with mobile operators and to monetize this sharing through what they called a market-based approach. Well, do we like to participate to that initiative and do we like to be part of the consortium? The answer is yes. The fact is that we should be prudent by in all saying that it's a very complicated process.”).

¹²¹ Intelsat-SES Feb. 14, 2018 *Ex Parte* Letter, GN Docket No. 17-183, Attach. at 2.

Should there be a requirement that the C-band operators participating in the Transition Facilitator have contractual relationships with a minimum percentage of protected incumbent earth stations to avoid these potential difficulties? Should the Transition Facilitator be required to work with non-participating satellite companies to protect incumbent earth stations, or should the Transition Facilitator be free to work directly with those entities?

78. To ensure that the transition process proceeds expeditiously, should we establish a benchmark for the Transition Facilitator filing of six months after Federal Register publication of an order in this proceeding?¹²² What if a Transition Facilitator is not created within the specified timeframe? Should the Commission have in place other means of reassigning the spectrum? Finally, we also seek comment on what form of supervisory authority the Commission should maintain over the Transition Facilitator, if any.

79. *Step 2: Negotiation Period.*—The next step in the process would be to undertake negotiations for spectrum rights in the band. We anticipate that the Transition Facilitator would engage in a multi-step process to negotiate with prospective licensees and protected incumbent earth stations in the band. The result of these negotiations would be a Transition Facilitation Plan that would lay out what spectrum would be made available for flexible use (and where) as well as the steps the Transition Facilitator plans to take to ensure that protected incumbent earth stations continue to have access to the content or bandwidth they currently receive using C-band earth stations today.

80. For example, the negotiation process could include the following steps. First, the Transition Facilitator would identify the profit-maximizing feasible amount of spectrum to make available by soliciting inquiries from all interested terrestrial wireless parties and negotiating for specific spectrum blocks and markets. This amount of spectrum demanded might adjust during the course of negotiations. The Transition Facilitator would then conclude private agreements to protect incumbent earth stations and determine the total available supply. Next, having balanced the supply and the demand, the Transition Facilitator would provide each prospective licensee with a certification of the specific spectrum block(s) and market(s) negotiated for in the associated private agreement. Finally, the Transition Facilitator would file its Transition Facilitation Plan with the Commission. We seek detailed comment on this possible approach, including what, if any, Commission oversight is warranted. We also seek comment on this approach's costs and benefits as well as any alternative approaches.

81. Given the high demand for and high-value of mid-band spectrum, we should strive to adopt a mechanism that will repurpose a socially efficient amount of spectrum in the band. Intelsat-SES-Intel believe that consortium members could make approximately 100 megahertz of spectrum available for licensed terrestrial service via privately negotiated agreements between consortium members and prospective terrestrial licensees.¹²³ In addition, under that proposal, consortium members would clear an additional 40 to 60 megahertz above this spectrum to act as an internal band to protect against harmful interference from transmissions in the adjacent spectrum.¹²⁴ Intel maintains that, if the demand for terrestrial mobile spectrum is as robust as commonly believed by 5G supporters, this market-based approach could clear additional spectrum beyond the 100 megahertz proposed by Intelsat and SES in the same timeframe.¹²⁵ We note that T-Mobile asserts that a market-based approach “creates tremendous uncertainty regarding the availability of this spectrum for mobile broadband services and will likely result

¹²² The Commission would release a Public Notice announcing the start of the transition period.

¹²³ See Intelsat-SES Feb. 14, 2018 *Ex Parte* Letter, GN Docket No. 17-183, Attach. at 1 (Intelsat-SES Feb. 14, 2018 *Ex Parte*).

¹²⁴ See Intelsat-SES Apr. 23, 2018 *Ex Parte* Letter, GN Docket No. 17-183, WTB Docket No. 18-122, at 5 (Intelsat-SES Apr. 23, 2018 *Ex Parte*).

¹²⁵ Intel Apr. 26, 2018 *Ex Parte* Letter, GN Docket No. at 17-183, at 1. See also Verizon May 16, 2018 *Ex Parte* Letter, GN Docket No. 17-183, WTB Docket No. 18-122, at 1 (expressing support for a market-based approach to making spectrum available in the 3.7-4.2 GHz band and stressing that “well more than 100 MHz” of spectrum would need to be made available to ensure the effectiveness of the approach).

in inefficient reallocation of spectrum.”¹²⁶ To address this concern, we seek comment on whether to require that an Initial Minimum Spectrum Benchmark—a socially efficient amount of spectrum—be repurposed in the band in order to use a market-based approach, and what this amount should be. Should we set the Initial Minimum Spectrum Benchmark to be 100 megahertz, given the comments of Intelsat and SES? Would a higher or lower benchmark be appropriate? Should we require the Transition Facilitation Plan to require the clearing of at least the Initial Minimum Spectrum Benchmark for approval? In addition, we seek comment on whether an internal protection band is necessary both above and below (i.e., below 3.7 GHz) the repurposed spectrum. What benchmarks should be set for clearing an internal protection band? Commenters should describe the appropriate amount of spectrum to be repurposed, taking into account economic considerations and the expected time and costs associated with repurposing the spectrum.

82. To ensure a timely transition process, should the Commission set specific benchmarks for the completion of initial negotiations with potential terrestrial licensees as well as protected incumbent earth stations? Intel, Intelsat, and SES maintain that such negotiations could be completed within three to eight months.¹²⁷ We ask commenters to consider whether eight months is an appropriate benchmark for completion of Transition Facilitator negotiations and submission of the Transition Facilitation Plan. What should be the effect of a failure to meet such a benchmark?

83. We seek comment on how to ensure that the market-based approach’s negotiation process will facilitate a competitive and open market. For example, should we require that all parties act in good faith?¹²⁸ What other rules could we adopt to ensure competition in the marketplace? We note that T-Mobile raises concerns that satellite operators could choose to limit the amount of spectrum available for flexible use in order to increase their profits,¹²⁹ while others claim it will not take into sufficient account the interests of protected incumbent earth stations.¹³⁰ How can we ensure the negotiation process accounts for the interests of all stakeholders that have interests in the band—from new wireless entrants to existing satellite operators to protected incumbent earth stations, from those living in rural America to those living in cities?¹³¹ Would Commission oversight of this market-based approach—or over the Transition Facilitator—benefit in any way from insights from antitrust law?

84. We also seek comment on what role, if any, the Commission should play to facilitate or oversee these private market negotiations. For example, should the Commission allow some flexibility for the negotiators to make more spectrum available in some markets than others, potentially allowing a limited number of earth stations to continue to operate using wider bandwidths in certain areas where wireless operators are less interested in deploying (e.g., remote rural areas)? Should the Commission have some input on the FSS frequencies to be made available for private-market negotiations? How should these determinations be made? A market-based approach would not likely result in mutually exclusive applications for the Commission to consider if, for example, a negotiated agreement with the Transition Facilitator is a prerequisite for applying for a license in this band. Would this negotiation

¹²⁶ T-Mobile Reply at 14, 15.

¹²⁷ Intelsat-SES Feb. 14, 2018 *Ex Parte*, Attach. at 1.

¹²⁸ *See, e.g.*, 47 CFR §§ 27.1251, 101.73, 101.89.

¹²⁹ *See* T-Mobile Reply at 15.

¹³⁰ Eutelsat Reply at 5 (Under Intel-Intelsat’s proposals, “the interests of the most important stakeholders – i.e., the U.S. entities that rely on C-band satellite services to support critical communications – seem to be excluded from the decision making process.”).

¹³¹ *See, e.g.*, PSSI Reply at 2 (expressing support for a market-based approach but querying how the interests of customers in the band will be protected); ITSO Reply at 2 (asking the Commission to consider the effects of such a proposal on the provision of satellite services in other countries and noting that the approach should account for Intelsat’s ability to fulfill its obligations under the ITSO Agreement).

satisfy the Commission's obligation in the public interest to use negotiation to avoid mutual exclusivity pursuant to Section 309(j)(6)(E) of the Communications Act?¹³²

85. We also ask commenters to discuss the requirements and safeguards that we should adopt, if any, to ensure that these privately negotiated agreements result in a timely and complete transition. We would expect parties to negotiate a full range of transition commitments and penalties for failure to meet transition benchmarks. Nonetheless, do we need to adopt baseline requirements, such as defining comparable facilities, including the relocation of incumbent operations to another band, to fiber, and/or to more efficient technologies?¹³³ What would be the relative costs and benefits associated with adopting such requirements? Would such definitions or rules minimize disruption to existing operations during the transition? Are there mechanisms we can adopt to ensure that all or specific categories of incumbents are not adversely affected by repacking of this band? For example, should we require FSS space station licensees that are going to cease transmitting on a primary basis to notify earth stations receiving those signals? Could the parties determine that the transitioning of facilities should be undertaken by the terrestrial licensee instead of the Transition Facilitator? If so, would the parties or the FCC establish a benchmark for completing such a transition? Should the Transition Facilitator be required to have a mechanism for receiving reports from incumbents that experience disruptions, and should the Transition Facilitator also be required to notify the Commission when it receives such reports? We invite commenters to address the specific form of notification required, the time period for providing each notification, and the costs and benefits of each notification requirement.

86. If the Commission's role were more limited, what level of transparency, if any, should be required during the negotiation process? For example, should satellite operators be required to notify the Commission regarding the status of on-going negotiations?¹³⁴ What types of information should be included in such a notice? Further, should we require the filing of periodic reports (e.g., quarterly, bi-annually, annually) to ensure that the overall transition of this band will be completed in a timely manner? What should such reports include? We encourage interested parties to provide detailed comments regarding the level of Commission oversight envisioned for this process including how such oversight comports with the Commission's obligation to assign spectrum in the public interest.

87. *Step 3: Conditional Authorization of Mobile Licensees.*—Upon the submission of a Transition Facilitation Plan, the next step would be Commission review and approval of the plan, followed by applications for terrestrial license authorizations filed pursuant to the plan. We seek comment on this process. To facilitate a streamlined review, we seek comment on allowing applications for new terrestrial authorizations to be filed at the same time as a Transition Facilitation Plan, or while the Commission reviews that plan. And to avoid undue delay in commencing the band clearing process, we seek comment on the appropriate timing, criteria, and conditions that should apply to new license authorizations.

88. We seek comment on conducting the review of the Transition Facilitation Plan. Most specifically, how should we ensure that protected incumbent earth stations are indeed protected? What types of certifications should be required to ensure that the Commission can take all appropriate actions to ensure that the Transition Facilitator and its members carry out the Transition Facilitation Plan and appropriately protect, compensate, and ensure adequate access for relevant stakeholder? Should we make the plan available to comment, and what confidential information is likely to be included? How should we evaluate the various methods suggested for protecting incumbent earth stations, such as installing filters, extending fiber, offering service on new satellites or in new satellite bands, offering service over microwave links, and creating geographic separation from harmful interference (likely only in rural areas)? What level of granularity should we require the steps of the Transition Facilitation Plan to meet?

¹³² See 47 U.S.C. § 309(j)(6)(E).

¹³³ See, e.g., 47 CFR §§ 101.73(d), 101.75(b).

¹³⁴ See Intel-Intelsat-SES Apr. 20, 2018 *Ex Parte* Letter, GN Docket No. 17-183, WTB Docket No. 18-122, at 1-2 (Intel-Intelsat-SES Apr. 20, 2018 *Ex Parte*)

And how long should the Commission have to review and approve or reject a Transition Facilitation Plan?

89. We seek comment on how to address initial licensing applications. First, we seek comment on establishing a 30-day filing window for new terrestrial license applications. Prospective licensees would file an application for any new licenses they have agreed to acquire through their negotiations with the Transition Facilitator, along with a certification from the Transition Facilitator to clear that portion of the band for the terrestrial operator's use. Should we require any other specific information to be submitted as part of the application process? Applications would be accepted and reviewed pursuant to the requirements and procedures set forth in Part 1 of the Commission's rules, including, among other things, the filing of certain FCC forms,¹³⁵ release of a public notice listing the application as accepted for filing,¹³⁶ and the opportunity for third parties to file petitions to deny the application.¹³⁷ Upon the Commission's review and confirmation that the applicant has complied with all other Commission filing and qualification requirements, the Commission would grant a license subject to certain conditions discussed below. Second, we could treat the Transition Facilitation Plan as an application for all the flexible use licenses that would be made available as a result of it being carried out, and then allow the Transition Facilitator and prospective licensees to file separate applications to transfer those licenses as the parties saw fit. Under this approach, the Transition Facilitation Plan would also have to comport with the requirements and procedures set forth in Part 1 of the Commission's rules and would be conditioned as discussed below.

90. We would condition authorizations for licensed terrestrial operations on the licensee not commencing operations until the Transition Facilitation Plan's protections for incumbent earth stations have been carried out in that area (and subject to those conditions to the extent the plan requires geographic or other sharing). The provisions of any private agreement to transition designated spectrum to licensed terrestrial operations would therefore need to comply with the service rules the Commission may ultimately adopt in this proceeding. For example, under this approach, the deadlines for a licensee's regulatory obligations, including construction benchmarks, would begin running on the date of license issuance. We therefore anticipate that private agreements would take construction deadlines into account when negotiating the date by which the Transition Facilitator must clear the relevant spectrum such that the licensee may commence operations. However, we seek comment on whether the Commission should consider the individually negotiated time periods for band clearing when setting the deadlines for each licensee's satisfaction of its construction benchmarks. We seek comment on these and any other conditions on new license authorizations that would facilitate efficient implementation of the market-based approach.

91. Additionally, we seek comment on what, if any, conditions should be placed on the license with respect to the protection or relocation of the approximately 115 incumbent microwave links in the band that would sunset under our proposal. For example, should we require as a condition of the license that new licensees either protect or relocate incumbent users under the same Part 27 and Part 101 rules used for incumbent microwave links in the Advanced Wireless Services (AWS) bands or under some other protection and/or relocation mechanism?

92. To ensure a timely transition process, should the Commission set specific benchmarks for the completion of its review of the Transition Facilitation Plan and the processing of conditional authorizations? Intel, Intelsat, and SES expect the review process would take two to seven months, and propose the license grant would trigger certain obligations under private agreements, including the

¹³⁵ See 47 CFR § 1.913.

¹³⁶ See *id.* § 1.933(a)(1).

¹³⁷ See *id.* § 1.939.

clearing of the band within 12-20 months.¹³⁸ We seek comment on a process whereby the Commission would take action on all unopposed applications found acceptable for filing within four months from the commencement of the filing window discussed above (i.e., a 30-day filing window plus three months of review). Upon completion of the four-month application and review process, the Commission would notify the Transition Facilitator that it may begin clearing the designated spectrum in the band. We seek comment on this approach to triggering the commencement of the band-clearing process. Should the process instead be triggered only upon the Commission's grant of all licenses negotiated by the Transition Facilitator? Or is a certain critical mass of license grants sufficient to begin clearing incumbent users from the band? For example, to avoid undue delay of licensed operations in the band, would it be appropriate to begin clearing the band upon issuance of licenses authorized for operation in a certain portion of contiguous spectrum in the band? We seek comment on these and any other benchmarks that may be appropriate.

93. We also recognize that the Transition Facilitator may find it necessary and beneficial to modify certain aspects of its Transition Facilitation Plan. We therefore seek comment on allowing the Wireless Telecommunications Bureau to approve minor amendments to the Transition Facilitation Plan that would not increase harmful interference to protected incumbent earth stations.

94. We note that the ultimate assignment of any license is subject to FCC approval under Section 310(d) of the Communications Act.¹³⁹ We therefore seek comment on the application process described above and any other application criteria that may be appropriate to fulfill the Commission's statutory obligations to license spectrum in the public interest and ensure that spectrum is put to its highest and best use.¹⁴⁰

95. *Step 4 – Band Clearing.* Following approval of the Transition Facilitation Plan and grant of new terrestrial licenses in the band, the final step would be clearing certain incumbent users as needed from the designated spectrum and giving new terrestrial licensees access to their licensed spectrum. We seek comment on the best way to effectuate this process.

96. We seek comment on reasonable benchmarks for incumbents to cease transmitting on a primary basis in the portion of the 3.7-4.2 GHz band that becomes available for flexible use, a process Intel, Intelsat, and SES expect to take 12-20 months.¹⁴¹ We seek comment on providing the Transition Facilitator with 20 months to clear incumbent users from the designated spectrum in the band. Under this approach, the Transition Facilitator would be responsible for enforcing the various private agreements between new terrestrial licensees and incumbent users to clear the band. As spectrum becomes available for licensed use, the Transition Facilitator would notify licensees that they may begin operating in particular areas covered by their licenses where the spectrum has been cleared.¹⁴² In light of our expectation that spectrum will be cleared incrementally over the course of the 20-month band-clearing process, we propose to require the Transition Facilitator to provide periodic updates notifying the Commission of the specific spectrum that has been cleared. Should we require the Transition Facilitator to file status reports at various benchmarks (e.g., every four months)? We seek comment on these and any other benchmarks that may be appropriate to promote timely completion of the band-clearing process.

97. Finally, in light of our goal to promote the rapid deployment of new licensed terrestrial operations in the 3.7-4.2 GHz band, we seek comment on any further safeguards that should apply during

¹³⁸ Intel-Intelsat-SES Apr. 20, 2018 *Ex Parte*, GN Docket No. 17-183, WTB Docket No. 18-122, at 1-2.

¹³⁹ 47 U.S.C. § 310(d).

¹⁴⁰ *See id.* §§ 307, 310(d).

¹⁴¹ Intelsat-SES-Intel Apr. 20, 2018 *Ex Parte*, GN Docket No. 17-183, WTB Docket No. 18-122, at 2.

¹⁴² The entire area covered by a new license would not need to be cleared in order for licensees to begin operating. Instead, subject to their individual agreements, the Transition Facilitator could begin notifying licensees of their ability to begin operations once certain portions of the area covered by the license (e.g., counties) have been cleared.

the band-clearing process to ensure the transition is completed within a reasonable period of time. We expect that the private agreements between new terrestrial licensees and incumbent users would contain provisions and penalties sufficient to address either party's failure to satisfy their respective contractual obligations in a timely manner. In addition to, and independent of, those private agreements, we seek comment on any appropriate penalties that should apply in the event that the Transition Facilitator is unable to clear the designated spectrum within the 20-month time period discussed above. What, if any, opportunities to cure should the Commission provide? For example, should we allow new terrestrial licensees and incumbent users that default on their private agreements to re-enter the process beginning with Step 2 negotiations? If so, should we apply more abbreviated time periods for the completion of each step? We seek comment on these and any other actions that may be appropriate to provide adequate opportunity for successful completion of a market-based approach, while also ensuring a rapid and efficient transition to flexible use in the 3.7-4.2 GHz band.

b. Auction Mechanisms

98. We seek comment on various auction approaches to expand flexible use of the band. Specifically, we ask commenters to consider whether an overlay auction, incentive auction, capacity auction or other auction mechanism could be used to create opportunities for flexible use of the band. Commenters should provide data on the costs and benefits associated with each proposed mechanism along with other helpful technical or procedural details.

99. *Overlay Auction.*—An overlay license authorizes operations for an entire geographic area but requires the licensee to protect existing incumbents from interference indefinitely, i.e., until the rights are relinquished.¹⁴³ We note that the Commission has used overlay licensing to transition several bands from site-based to geographic-area licensing.¹⁴⁴

100. We seek comment on whether we should accept applications for one or more overlay licenses—assigned by competitive bidding if mutually exclusive applications for it were accepted—that would permit an overlay licensee to negotiate with both incumbent space station licensees and earth station owners and operators to clear all or part of the band. We also seek comment on whether we should require the overlay licensee(s) to transfer flexible use licenses in the secondary market (i.e., limit an individual licensee from holding more than a certain amount of spectrum in each market). Under this approach, the overlay licensee(s) would have the right to flexible use of any spectrum that becomes available as a result of incumbents' relinquishing their spectrum usage rights. If this approach were adopted, our presumption would be that incumbent space station licensees could bid individually, but not as a consortium. Allowing incumbents to bid collectively would eliminate the possibility of competition among them for the overlay license, and would discourage other potential bidders from participating in the auction. To encourage participation in the auction, are there rules we can adopt to share the risk (between bidders and the U.S. Treasury) of a less profitable repurpose than anticipated?¹⁴⁵ We also seek comment on whether, if no voluntary agreement is reached between an overlay licensee and earth station

¹⁴³ See, e.g., *Amendment of Parts 1 and 22 of the Commission's Rules with regard to the Cellular Service, including Changes in Licensing of Unserved Areas*, Notice of Proposed Rulemaking and Order, 27 FCC Rcd 1745, 1757, para. 23 (2012) ("overlay license is issued for the entire geographic area . . . but requires the overlay licensee to provide interference protection to incumbent operations. . . ."); *id.* at 1759, para. 30 (explaining that an overlay licensee is not required to protect an incumbent in any area where the incumbent relinquished spectrum).

¹⁴⁴ See, e.g., *Amendment of Part 90 of the Commission's Rules to Provide for the Use of the 220-222 MHz Band by the Private Land Mobile Radio Service*, Third Report and Order and Fifth Notice of Proposed Rulemaking, 12 FCC Rcd 10943 (1997); *Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems*, Second Report and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 2732 (1997); *Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band*, First Report and Order; Eighth Report and Order; Second Further Notice of Proposed Rulemaking, 11 FCC Rcd 1463, 1474 (1995).

¹⁴⁵ See 47 U.S.C. § 309(j)(4)(a).

operators after some number of years, the earth station operators should be required to discontinue operation in some portion of the 3.7-4.2 GHz band if requested by the overlay licensee and if the overlay licensee delivers equivalent quality service to the locations of the earth stations that would no longer be protected. We seek comment on how equivalent quality service should be defined, especially with respect to reliability. We also seek comment on how many years incumbent earth station operators should have before they would no longer receive protection in the 3.7-4.2 GHz band, and whether this deadline should apply to all areas or only to high-population-density areas. If the latter, how should such areas be defined?

101. Would assigning an overlay license or licenses for all of the band expedite flexible use of more of the band compared to other approaches? Compared to the market-based proposal, the overlay license approach potentially would allow non-incumbent bidders to develop innovative ways to clear the spectrum and clear more spectrum or varying amounts of spectrum depending on the relative costs and benefits of such repurposing. On the other hand, an overlay licensee may take longer to clear spectrum because the two largest FSS space station operators appear to already have an agreement on how to clear at least 100 megahertz for flexible use.

102. We also seek comment on how all parties that would be affected by repurposing 3.7-4.2 GHz band spectrum should be treated. In particular, should the space station operators relinquishing spectrum or the overlay licensee be required to provide incumbent earth station operators comparable replacement facilities or media? Would an overlay auction expedite the provision of terrestrial mobile services in the 3.7-4.2 GHz band or facilitate making more than 100 megahertz of the band available for flexible use? Commenters should also address the potential costs and benefits of an overlay approach for consumers and businesses in rural and underserved communities, as well as any economic impact on small businesses, and discuss any rules or procedures that could be implemented to ensure that the needs of these communities and businesses are adequately addressed. We invite comment on these issues and on other matters that we may need to address to conduct an overlay auction in this band.

103. *Incentive Auction.*—The Commission also seeks comment on approaches using the Commission’s general incentive auction authority to introduce flexible use in the 3.7-4.2 GHz band.¹⁴⁶ Incentive auctions provide the Commission with new tools to make additional spectrum available for broadband.¹⁴⁷ Incentive auctions are a voluntary, market-based means of repurposing spectrum by encouraging licensees to compete to voluntarily relinquish spectrum usage rights in exchange for a share of the proceeds from an auction of new licenses to use the repurposed spectrum.¹⁴⁸ Congress passed the Spectrum Act in 2012, which authorized the Commission to conduct incentive auctions to help meet the increasing demand for spectrum to provide highly valued wireless broadband services.¹⁴⁹ Section 6402, codified at 47 U.S.C. § 309(j)(8)(G), authorizes the Commission to encourage licensees to relinquish voluntarily some or all their spectrum usage rights in order to permit the assignment by auction of new initial licenses subject to flexible use service rules, in exchange for a portion of the resulting auction proceeds.¹⁵⁰

¹⁴⁶ See Spectrum Act, § 6402.

¹⁴⁷ See *Expanding the Economic and Innovation Opportunities of Spectrum through Incentive Auctions*, Notice of Proposed Rulemaking, 27 FCC Rcd 12357, 12368, para. 25 (2012) (*BIA NPRM*).

¹⁴⁸ *Id.* at 12368, para. 25.

¹⁴⁹ *Id.* at 12368, para. 26.

¹⁵⁰ *Id.* at 12496 (*citing* 47 U.S.C. § 309(j)(8)(G)); Spectrum Act § 6402. In any incentive auction, including the broadcast television spectrum incentive auction, the Commission must notify the appropriate committees of Congress of the methodology for calculating the amounts that will be shared with licensees that voluntarily relinquish spectrum usage rights. 47 U.S.C. § 309(j)(8)(G)(iv). In order for the Commission to accept a bid, at least

104. Building on the Commission's recent experiences with the broadcast incentive auction, we asked commenters in the *Mid-Band NOI* to address the circumstances under which a similar approach could be used to encourage incumbent non-federal licensees to relinquish their licenses in exchange for incentive payments.¹⁵¹ We also asked how an auction should be structured to promote robust use of the spectrum.¹⁵² Several commenters support opening some or all of the 3.7-4.2 GHz band for mobile broadband use through an incentive auction mechanism.¹⁵³ Commenters highlight that the broadcast incentive auction successfully used market forces to reallocate spectrum to more valued, flexible-use services, while preserving a robust broadcast service.¹⁵⁴ Other commenters maintain that incentive auction methods are untested and therefore caution against their use in this proceeding.¹⁵⁵ One commenter suggests that "[FSS incumbent] satellite operators, earth station licensees, and microwave licensees all could participate in a reverse auction and choose from among several options including, for example, vacating the band for another or a fiber alternative; limiting operations to a smaller swath of spectrum; or moving to a more remote location."¹⁵⁶ A forward auction would then generate the revenues from new entrants to support the reverse auction results,¹⁵⁷ and repack incumbents into the remaining portion of the band for FSS and/or move earth stations to more remote locations.¹⁵⁸

105. We seek comment on whether a variation of the incentive auction could work in the context of the 3.7-4.2 GHz band. We note that in the case of the Commission's incentive auction authority, there is a legal aspect to the problem of FSS satellite operators' incentives to reduce the amount of spectrum for repurposing discussed above.¹⁵⁹ Specifically, the Commission's legal authority to use that mechanism depends on having "at least two competing licensees participate in the reverse auction."¹⁶⁰ Would the Varian approach, discussed above, satisfy the statutory requirement that an incentive auction have at least two competing bidders take part in the reverse auction? We seek comment on means of inducing supply competition, such as by bringing in alternative bands as substitutes, both to insure a more competitive and efficient outcome, and to meet the legal requirement of having competing licensees participate in the reverse auction. We also seek comment on whether provision of supply by licensed earth stations can substitute for provision by FSS operators.

106. *Capacity Auction.*—As an alternative to paying satellite incumbents to directly relinquish their rights to operate on specified frequencies, the Commission seeks comment on a reverse auction for satellite transponder capacity that could be used to compensate the satellite incumbents for giving up C-band transponder capacity in order to enable the Commission to reallocate C-band spectrum to flexible use. Under this approach, an individual bidder in the reverse auction would help to clear spectrum by bidding to relinquish some (or all) of the bundle of rights they hold under their licenses and our rules to lease capacity to other parties, so as to allow alternative use of the bands of spectrum associated with

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two competing licensees must participate in a reverse auction to determine the amount of compensation for voluntarily relinquishing spectrum usage rights. *Id.* § 309(j)(8)(G)(ii).

¹⁵¹ *Mid-Band NOI*, 32 FCC Rcd at 6373, 6387, para. 41.

¹⁵² *Id.* at 6373, 6387, para. 41.

¹⁵³ CTIA Comments at 13; CompTIA Comments at 2; Ericsson Comments at 7; Verizon Comments at 17.

¹⁵⁴ CTIA Comments at 4. The broadcast incentive auction was conducted under the Spectrum Act, § 6402.

¹⁵⁵ See NAB Comments at 8; Federated Wireless Comments at 5; DSA Comments at 3; Southern Company Services Comments at 13; All Points Group Comments at 13-14; GeoLinks Comments at 3-4.

¹⁵⁶ CTIA Comments at 13.

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ See *supra* Section IV.B.1.

¹⁶⁰ 47 U.S.C. § 309(j)(8)(G)(ii)(II).

specific transponders. Potential bidders could be any FCC licensee that could make transponder capacity available in, for example, either the C-band or Ku-band, as discussed further below. Satellite operators could offer capacity created by launching new satellites in vacant orbital slots and/or by relinquishing some or all of their existing capacity. At the time of any incentive auction, could satellite customers or earth stations in their own right be eligible to offer capacity? For example, could they make available capacity through mechanisms such as substituting services (e.g. fiber) to fulfill their capacity needs, reducing the amount or quality of programming distributed, or using greater compression to reduce the capacity required to carry a given amount of programming or data? C-band capacity lost due to the reduced amount of available spectrum and that was not relinquished in the reverse auction by C-band satellite operators, could be repacked onto replacement capacity for the remaining lives of those lost transponders. This would compensate C-band licensees for their lost capital investments, but not for the loss of their spectrum. The amount of C-band spectrum reallocated could be determined by the reverse auction in combination with a forward auction for cleared spectrum. Adapting the approach of the broadcast incentive auction, the amount cleared could be the largest amount for which forward auction revenues exceed the cost of repacking the remaining C-band services plus any other compensation, e.g., for the loss of spectrum, and the cost of running the auction. We seek comment on a capacity auction and whether such a mechanism could be used to create flexible use in the band.

107. Several commenters propose that Ku-band capacity could be utilized for C-band services.¹⁶¹ Other commenters raise the concern that Ku-band capacity is not a reliable replacement spectrum for C-band services.¹⁶² We seek comment on Ku-band capacity as a replacement for C-band, including as an alternative for infrequent, portable, or more temporary uses such as for breaking news or live sporting events. We also seek comment on how to define capacity for purpose of this approach. What capacity definition meets the needs of such an auction? Depending on the band, what adjustments would be appropriate to ensure a unit of capacity in the band is comparable with a C-band unit of capacity? Would comparable communication capacity be defined in terms of throughput, reliability, and operating costs?

108. Advocates for a capacity auction should specifically discuss the Commission's legal authority as well as implementation details and options. For example, could the Commission use its general incentive auction authority to hold a capacity auction? Which parties should be allowed to participate in the reverse auction? Is there a way for end users to participate and, if so, how would their costs be compensated? Would this approach incentivize bidders to make the appropriate tradeoffs among inputs such as compression technology and bandwidth in producing capacity? How could a capacity auction be designed to allocate capacity efficiently over time? Would this require the reverse auction to establish separate prices for capacity in each year? Would capacity need to be defined as packages of capacity at specified dates, and would a combinatorial auction be needed to determine auction winners and prices?

109. We seek comment on the applicability of Section 647 of the Open-market Reorganization for the Betterment of International Telecommunications Act (ORBIT Act)¹⁶³ to a capacity or other auction mechanism. Section 647 of the ORBIT Act prohibits the Commission from assigning by competitive bidding orbital locations or spectrum used for the provision of international or global satellite communications services.¹⁶⁴ We tentatively conclude that the prohibition is not applicable here, as any auctioned spectrum would be used for a new domestic terrestrial service, and the spectrum capacity auction does not propose to assign by competitive bidding orbital locations or spectrum used for the

¹⁶¹ CTIA Comments at 10; Ericsson Comments at 7; Verizon Comments at 17-18.

¹⁶² AT&T Comments at 7-8; Content Companies Comments at 4, n.7; ACA Comments at 16, n.30; SIA Reply at 19; NCTA Reply at 4; General Communication Comments at 12-13.

¹⁶³ Open-market Reorganization for the Betterment of International Telecommunications Act, Pub. L. No. 106-80, § 647, 114 Stat. 48 (2000) (ORBIT Act); *see also* 47 U.S.C. § 765(f) (Satellite auctions).

¹⁶⁴ Section 647 of the ORBIT Act.

provision of international or global satellite communications services.¹⁶⁵ We also tentatively conclude that the participation in an incentive auction by Ku-band operators to provide spectrum capacity to C-band operators would not violate the ORBIT Act, because this would not constitute an “assignment” of satellite spectrum, because the Ku-band operators would only be giving up some of their licensed spectrum capacity, rather than ceding their actual licenses. We seek comment on this tentative conclusion and invite commenters to discuss the ORBIT Act’s application to any proposed auction mechanism.

110. We also invite comment on other novel incentive auction mechanisms under our general incentive auction authority. Commenters should provide data on the costs and benefits associated with any proposed approach along with other helpful technical or procedural details. Commenters should also address the potential costs and benefits of an incentive-auction approach for consumers and businesses in rural and underserved communities, as well as any economic impact on small businesses, and they should discuss any rules or procedures that could be implemented to ensure that the needs of these communities and businesses are adequately addressed.

c. Alternative Mechanisms

111. We also seek comment on approaches that combine various elements of the mechanisms discussed above, as well as other mechanisms for transitioning all or part of the 3.7-4.2 GHz band for wireless broadband use. Commenters offering sequential alternatives should address the circumstances under which one method of transitioning the band would end and a subsequent one would begin. Are any conditions necessary to prevent one approach from precluding later alternatives?

112. In response to the *Mid-Band NOI*, T-Mobile proposed a hybrid approach that would combine elements of an incentive auction and the market-based approach.¹⁶⁶ Under this proposal, a consortium of satellite operators (similar to the Transition Facilitator discussed above) and potential wireless bidders would participate in a phased auction process with both forward and reverse auction components. First, the Commission would conduct a simultaneous or near simultaneous auction of the band on a geographic basis to establish the initial price per area.¹⁶⁷ Second, in those areas where satellite operators were all willing to clear all 500 megahertz at the prices established in the initial phase, the spectrum would be sold and these areas would be deemed “cleared” for flexible terrestrial wireless use.¹⁶⁸ The Commission would then determine an appropriate amount of the remaining spectrum to reserve for satellite use and the forward and reverse auction processes would repeat until a Commission-determined amount of spectrum has been cleared.¹⁶⁹ Although T-Mobile proposes that auction revenues would be split between the federal government and the satellite operators, with the latter responsible for end-user

¹⁶⁵ See *Northpoint Technology, Ltd., and Compass Systems, Inc., v. F.C.C.*, 412 F.3d 145 (D.C. Cir. 2005); *Northpoint Technologies, Ltd., v. F.C.C.*, 414 F.3d 61 (D.C. Cir. 2005).

¹⁶⁶ Letter from Steve B. Sharkey, Vice President, Government Affairs Technology and Engineering Policy, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 17-183, GN Docket No. 18-122, at 4 (filed June 15, 2018) (T-Mobile June 15, 2018 *Ex Parte*). We note that T-Mobile originally proposed auctioning a majority of the band under traditional mechanisms and granting FSS operators flexible use authority so long as they timely cleared the auctioned portion. Letter from Steve B. Sharkey, Vice President, Government Affairs Technology and Engineering Policy, to Marlene H. Dortch, Secretary, Federal Communications Commission, GN Docket No. 17-183, GN Docket No. 18-122, at 4 (filed Feb. 8, 2018) (T-Mobile Feb. 8, 2018 *Ex Parte*).

¹⁶⁷ T-Mobile June 15, 2018 *Ex Parte*, GN Docket No. 17-183, GN Docket No. 18-122, at 5. T-Mobile suggests that the Commission auction the band on a Partial Economic Area (PEA) basis with a limited number of licenses within which satellite operations could be protected from wireless operations.

¹⁶⁸ *Id.*

¹⁶⁹ *Id.* at 6.

relocation costs as applicable, we tentatively conclude there could be statutory barriers to this aspect of the proposal, and seek comment.¹⁷⁰

113. We seek comment on whether T-Mobile's proposal, or a variant of this proposal, would solve or ameliorate the three economic problems discussed above. As discussed, there is a legal aspect to the problem of FSS satellite operators' incentives to reduce the amount of spectrum for repurposing because our incentive auction authority requires at least two competing participants in the reverse auction. Would T-Mobile's proposal, or a variant of that proposal, comply with the requirement that an incentive auction have two competing licensees in the reverse auction, as well as other requirements associated with our general incentive auction authority?

114. We seek comment on whether a hybrid approach that combines elements of the approaches discussed above would strike a balance between incumbent and new entrant interests. If the Commission decides to clear and auction the entire band, but reserve some of the band for satellite use in certain areas, what is the minimum amount that should be cleared for flexible wireless use? Would the minimum amount differ based on geographic area? Should the Commission consider auctioning a majority of the band, versus the entire band, and if so, what would be the appropriate amount of spectrum to be cleared under such an approach?¹⁷¹ How can the Commission ensure that the band is transitioned in a timely manner? Should a backstop approach be triggered by a FSS operator's failure to clear the band in a timely manner? Is this the right balance, or is there a better way that traditional relocation could be used as a backstop approach to any hybrid mechanism? Additionally, would this approach allow the Commission to meet its statutory requirements under its general incentive auction authority?¹⁷²

115. We ask commenters to provide data on the costs and benefits associated with any hybrid approach over other possible or suggested methods. If the Commission adopted a split-revenue approach, under which revenue would be split between the federal government and the satellite operators, how would those funds be distributed? Are there legal obstacles to such an approach? Commenters should also address the potential costs and benefits of any hybrid or alternative approach for consumers and businesses in rural and underserved communities, as well as any economic impact on small businesses, and discuss any rules or procedures that could be implemented to ensure that the needs of these communities and businesses are adequately addressed. Commenters should provide complete proposals to the extent technically and economically feasible.

2. More Intensive Point-to-Multipoint Fixed Use

116. The 3.7-4.2 GHz band has excellent propagation characteristics compared to high-band spectrum, offers near-line-of-sight capability at low power for last-mile services, and has 500 megahertz of contiguous spectrum to accommodate twenty-five 20 megahertz channels.¹⁷³ Such capacity could facilitate the provision by multiple entities of last-mile, fixed wireless broadband connectivity at gigabit or near-gigabit speeds.¹⁷⁴ On June 21, 2017, the Broadband Access Coalition filed a petition for rulemaking building on the FWCC Petition to authorize and facilitate the deployment of licensed point-to-multipoint broadband service in the 3.7-4.2 GHz band.¹⁷⁵ In connection with our proposals above to

¹⁷⁰ *Id.*

¹⁷¹ T-Mobile Feb. 8, 2018 *Ex Parte*, GN Docket No. 17-183, GN Docket No. 18-122, at 4.

¹⁷² *See* Spectrum Act, § 6402. *See supra* Section IV.B.1.b.

¹⁷³ *See* Broadband Access Coalition Petition at 4; Broadband Access Coalition Comments at 4-5; Frontier Comments at 4. In its comments to the *Mid-Band NOI*, the Broadband Access Coalition endorses the specific proposals for the 3.7-4.2 GHz band that it had set forth more fully in its Petition, and asks that the Commission consider the Petition in the *Mid-Band NOI* proceeding (GN Docket No. 17-183). Broadband Access Coalition Comments at 4.

¹⁷⁴ *See* Broadband Access Coalition Petition at 4.

¹⁷⁵ *Petition of Broadband Access Coalition for a Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless*

reform the full-band, full-arc earth station coordination policy, we seek comment on rule changes to Part 101 to allow point-to-multipoint FS use of the 3.7-4.2 GHz band and invite parties to offer alternative rules or requirements that will allow for the more intensive point-to-multipoint FS use of the band. In doing so, we seek comment on how permitting fixed wireless would affect the possible future clearing of the band for flexible use and the use of the band for satellite operations. We seek to protect incumbent FSS earth stations from harmful interference and avoid disruption to existing operations in the band. Accordingly, we seek comment on the impact that point-to-multipoint use would have on the flexibility of FSS earth stations to modify their operations in response to technical and business needs. We emphasize that—under the proposals in this *Notice*—point-to-multipoint would operate on a secondary basis *vis-à-vis* FSS in any part of the band in which FSS continues to operate during a transition period to accommodate repacking and, thereafter, on a frequency-coordinated basis to protect actual FSS operations.

117. In the 3.7-4.2 GHz band, point-to-point FS licensees may currently be assigned 20 megahertz paired channels for point-to-point common carrier or private operational fixed microwave links.¹⁷⁶ Pursuant to Part 101 frequency coordination procedures that apply to licensees in the 3.7-4.2 GHz band, an applicant planning an FS link or an FSS earth station (“applicant”) prepares a prior coordination notice that provides technical detail on the proposed facility’s transmit and receive characteristics.¹⁷⁷ An applicant sends the prior coordination notice to all FS and FSS licensees and prior applicants who might receive interference from the proposed facility, or cause interference to it (“notified party” or “notified parties”).¹⁷⁸ A notified party must assess possible interference to and from their own facilities and must respond to the applicant within 30 days if it concludes that it will receive interference from the new applicant’s operations.¹⁷⁹ Interference concerns raised during the coordination process must be resolved before an application may be filed with the Commission.¹⁸⁰ A notified party that predicts it will cause interference to a notifying party informs them of such and the notifying party can choose to accept the interference, modify the prior coordination notice to reduce or eliminate the interference, or withdraw the prior coordination notice.¹⁸¹ Once prior coordination is successful, an applicant may file its FS application with the Commission in ULS.¹⁸² We discuss various potential modifications to these existing Part 101 rules below to facilitate more intensive fixed use.

118. *Channel Plan.*—We seek comment on amending Section 101.101 to permit point-to-multipoint FS in some portion of the 3.7-4.2 GHz band. We seek further comment on amending the existing channel plan for FS in the band (paired 20 megahertz channels for frequency division duplex

(Continued from previous page)

Broadband Service in the 3700-4200 MHz Band, RM-11791, Public Notice, Consumer and Governmental Affairs Bureau Reference Information Center Petition for Rulemaking Filed, Report No. 3080 (CGB, July 7, 2017). Given that Broadband Access Coalition’s proposals for more intensive use of the 3.7-4.2 GHz band are set forth more fully in its Petition, we make frequent reference to the Petition in our discussion below.

¹⁷⁶ See 47 CFR § 101.147(h). 4.190 GHz may also be assigned for unpaired use. *Id.* § 101.147(h), note 1. In the 3.7-4.2 GHz band (space-to-Earth), earth stations on vessels (ESVs) may be authorized to communicate with space stations of the FSS and, while docked, may be coordinated for up to 180 days, renewable. ESVs in motion must operate on a secondary basis. See *id.*, Non-Federal Government (NG) Footnotes, 47 CFR § 2.106, footnote NG180.

¹⁷⁷ *Id.* §§ 101.103(d)(1); 101.103(d)(2)(ii)-(iii).

¹⁷⁸ *Id.* § 101.103(d)(1). A point-to-point FS applicant must also comply with the requirements of 47 CFR § 101.21(f) in coordinating frequency usage with stations in the fixed satellite service. 47 CFR § 101.103(d)(1).

¹⁷⁹ *Id.* § 101.103(d)(2)(iv). An expedited prior coordination period (less than 30 days) may be requested when deemed necessary by a notifying party. *Id.* § 101.103(d)(2)(vi).

¹⁸⁰ *Id.* § 101.103(d)(1).

¹⁸¹ 47 CFR § 101.103(d)(2)(vii); see also 47 CFR § 101.105 (Interference protection criteria).

¹⁸² *Id.* § 101.103(d)(1).

(FDD))¹⁸³ to allow time division duplex (TDD) on unpaired 20 megahertz channels.¹⁸⁴ We ask commenters to address interference concerns between FDD and TDD, explain how, or if, they could coexist in the portion of the band not being used for flexible use, and discuss coordination and interference rules that must apply if both were to be permitted. Should we allow licensees to aggregate contiguous 20 megahertz channels up to a maximum of 160 megahertz of bandwidth?¹⁸⁵ To the extent a licensee has 40 megahertz of unconstructed spectrum in a licensed service area, should we require construction before allowing the licensee to acquire additional spectrum in the licensed service area? We invite alternative proposals with specific discussion of the costs and benefits as to each. We also seek comment generally on the technical improvements to allow for better band utilization.

119. We seek comment on authorizing point-to-multipoint FS service, on a primary basis, in some portion of the 3.7-4.2 GHz band that does not become available for flexible use. We propose that flexible use licensees would operate in the lower segment of the band (starting at 3.7 GHz) and, if additional spectrum is cleared in the 3.7-4.2 GHz band, it would be relatively easy and cost-effective to expeditiously deploy more flexible use in the lower segment of this band that has been cleared and is contiguous to the spectrum for which flexible use is already licensed. We also seek comment as to whether, regardless of how much spectrum becomes available for flexible use in the near term, to make available for licensed point-to-multipoint use up to 160 megahertz (e.g., 4.04-4.2 GHz) to accommodate a transition from FSS to flexible use working-up from 3.7 GHz.¹⁸⁶ Alternatively, we seek comment on making available for point-to-multipoint use 40 megahertz, 100 megahertz¹⁸⁷ or up to 320 megahertz.¹⁸⁸

120. *Service Area of Each Point-to-Multipoint FS Access Point.*—We seek comment on the best approach to define a point-to-multipoint FS access point service area. The Broadband Access Coalition requests frequency coordinated, site-specific license areas, defined as a circle designated by a specified radial distance from a center point.¹⁸⁹ Should we define a service area based on a specified geographic access point location and maximum radius? As an alternative, should we consider coverage arc sector(s) (e.g., 0°N to 30°) around the access point location and specified radii, and what should such coverage arcs be based on (e.g., antenna beamwidth)? If a maximum radius around an access point is specified, should we adopt a single value for all access points or values relative to whether the access point is in densely populated or rural areas? For example, the Broadband Access Coalition proposes 10 kilometers for densely populated areas and 18 kilometers for rural areas.¹⁹⁰ If we allow different radii based on area population density, what threshold should we use to differentiate between densely populated, rural, and other areas? Should the definition of “rural” for these purposes be the definition

¹⁸³ See *id.* § 101.147(h).

¹⁸⁴ See Broadband Access Coalition Petition at 31; Tucson Electric Comments at 10-11; UTC & EEI Comments at 15-16; see also Micronet Comments at 1 (stating that the transmit/receive frequency separation of the current band plan is a primary reason the band remains underutilized due to filter requirements that greatly increase equipment costs for point-to-point system); NSMA Comments at 2 (same).

¹⁸⁵ See Broadband Access Coalition Petition at 32 (160 megahertz limit); Vivint Wireless Comments at 3 (100 megahertz limit); see also Microsoft Comments at 8.

¹⁸⁶ See *infra* Section IV.A, Figure 1.

¹⁸⁷ See generally Vivint Wireless Comments at 3 (proposing 20 megahertz blocks with channel bonding up to 100 megahertz permitted).

¹⁸⁸ See generally Broadband Access Coalition Reply at 8 (stating that the Commission may wish to seek comment on dividing the 500 megahertz of spectrum such that one portion of the band would be allocated for fixed services and another portion would be allocated for mobile services to ensure that one type of service will not have a preclusive impact on the other type of service).

¹⁸⁹ Broadband Access Coalition Petition at 28.

¹⁹⁰ *Id.* at 30.

used for the E-Rate program?¹⁹¹ If based on a population density, should the population be based on residents or businesses, or perhaps some combination of both? Should this information be based on the most current available U.S. Census database at the time of the license application? Is there some other metric that would be better suited to determining the appropriate maximum radius limit? We seek comment on variations of these approaches, as well as those of alternatives that might not necessarily be limited to circles, arcs, or population density.

121. *Frequency Coordination and Interference Protection.*—We seek comment on technical requirements for frequency coordination between point-to-multipoint FS applicants and licensees and FSS under Part 25 and point-to-point FS, if they are grandfathered or otherwise remain in the band, under Part 101. Under our current rules, the technical aspects of coordination between FSS and terrestrial operations are based on Appendix 7 of the International Telecommunication Union (ITU) Radio Regulations and certain recommendations of the ITU Radiocommunication Sector¹⁹² and the technical aspects of coordination between terrestrial licensees are based on Telecommunications Industry Association’s Telecommunications System Bulletin (TSB) 10-F¹⁹³ or other procedures generally following acceptable good engineering practices.¹⁹⁴ We ask parties to comment on how either of the above or other standards, such as those developed by the European Telecommunications Standards Institute (ETSI) or another organization, may be applicable or adaptable to point-to-multipoint FS operations in the 3.7-4.2 GHz band. We also seek comment on whether there are interference protection criteria set forth in other parts of our rules that may be adapted to protect FSS earth stations from interference by point-to-multipoint operations in the portion of the 3.7-4.2 GHz band that does not become available for flexible use.¹⁹⁵ Are there technical operating characteristics of point-to-multipoint equipment, such as power levels, that would require us to adopt different values to protect FSS earth stations from interference by point-to-multipoint operations? We ask that commenters be specific in addressing the technical requirements for coordination.

122. We seek comment on allowing a point-to-multipoint FS applicant to coordinate each access point by sector based on the radius around the geographic coordinates of the site, the antenna characteristics (e.g., beamwidth), and a maximum number of client devices to be deployed within a specific distance from the access point.¹⁹⁶ Should point-to-multipoint FS applicants be required to submit frequency coordination for each access point, including geographic coordinates of the access point, frequency range, power and antenna characteristics, service area limits, maximum number of future

¹⁹¹ See 47 CFR § 54.505(b)(3)(i) (“The Administrator shall designate a school or library as ‘urban’ if the school or library is located in an urbanized area or urban cluster area with a population equal to or greater than 25,000, as determined by the most recent rural-urban classification by the Bureau of the Census. The Administrator shall designate all other schools and libraries as ‘rural.’”).

¹⁹² *Id.* § 25.251(b).

¹⁹³ Telecommunications Industry Association’s Telecommunications System Bulletin TSB 10-F.

¹⁹⁴ 47 CFR § 101.105(c); *see also id.* § 101.105(a).

¹⁹⁵ *See, e.g., id.* § 96.17(a)(2) (an FSS earth station operating in the 3.6-3.7 GHz band is protected from interference produced by emissions from all co-channel fixed stations or networks of such stations (within 150 km) based on an aggregate passband radiofrequency (RF) power spectral density, not exceed a median root mean square (RMS) value of -129 dBm/MHz, at the output of a reference RF filter and antenna at the location of an FSS earth station); *id.* § 96.17(a)(3) (aggregate RF power at the output of a reference RF filter and antenna at the location of an FSS earth station operating in the 3.6-3.7 GHz band, produced by emissions from all fixed stations, or networks of such stations, within 40 km, shall not exceed a median RMS value of -60 dBm).

¹⁹⁶ *See also* Broadband Access Coalition Petition at 28; *but see* SIA Comments at 37-38 (“For the point-to-multipoint operations proposed in the Broadband Access Coalition Petition, depending on the antenna directivity and the deployment geometry, required separation distances ranging from around 38 kilometers to greater than 100 kilometers would be needed between the transmitting stations and the receiving FSS earth station in order to avoid co-channel interference into the FSS earth station. When the Commission introduced terrestrial services in the 3.65-3.7 GHz band, it adopted a protection distance of 150 kilometers.”) (*citing 3.65 GHz Order*, 20 FCC Red at 6524-27).

authorized client devices, and the power and antenna characteristics of individual client devices?¹⁹⁷ How will prior coordination be achieved for point-to-multipoint access points when the location, height, and technical characteristics of the client devices in the access point service area are not available at the time of access point coordination? If some probability of location/height is assigned for the maximum number of client locations in order to develop an interference profile for purposes of coordination, the resulting interference predictions will have some associated probability of interference occurrence; in that case should point-to-multipoint licensees be able to add up to the maximum number of client devices without independently coordinating each client device? Should client devices be subject to additional technical limitations, such as minimum directional antenna requirements, EIRP limits, or other criteria to limit their interference potential? Should the maximum number of client devices be specified for each channel? We seek comment on the above proposals and, whether, if a point-to-multipoint FS applicant cannot successfully coordinate a geographic service area, it should be permitted to coordinate client devices on a path-to-path basis.¹⁹⁸ Parties should address the technical requirements of the above, offer alternatives, and specifically detail the costs and benefits of each proposal.

123. We also seek comment on the administrative process that should apply to the coordination of point-to-multipoint FS operations in the band. Under the current rules, the administrative aspects of the coordination process are set forth in Section 101.103(d)¹⁹⁹ in the case of coordination of terrestrial stations with earth stations and in Section 25.203²⁰⁰ in the case of coordination of earth stations with terrestrial stations. What modifications to Sections 101.103(d), 25.203, or to another rule must be made to govern the administrative process that will apply to the coordination of point-to-multipoint FS operations with FSS and point-to-point FS, if grandfathered or remain in the band, and the coordination of FSS and point-to-point FS, if grandfathered or remain in the band, with point-to-multipoint FS operations in the band? We seek comment on subjecting point-to-multipoint FS applicants to an expedited coordination process with mandatory electronic notification and response.²⁰¹ Should an expedited process, if adopted, govern coordination that occurs beginning 90 days after the adoption of final rules published in the Federal Register? We also seek comment on any other modifications to our rules with respect to the coordination administrative process that would reduce the economic impact of the proposed rule changes on small entities.

124. Additionally, we seek comment on the possibility of adopting an automated coordination process for point-to-multipoint FS applications. There is a lack of a consensus in the record as to when, or if, we would be in a position to propose and adopt rules for automated coordination of point-to-multipoint FS applications in the 3.7-4.2 GHz band. The Broadband Access Coalition contends that automated coordination should not be the same as the Spectrum Allocation Server (SAS) system for licensing in the 3.5 GHz band.²⁰² However, the Broadband Access Coalition believes that the existing process can be modified and automated over time to incorporate real-time, real-world FSS protection criteria and enable coordination between and among point-to-point FS, if grandfathered or remain in the band, and point-to-multipoint FS based on FSS, point-to-point FS and point-to-multipoint FS industry standards of protection criteria to be developed by affected stake-holders.²⁰³ Several commenters including IEE DySPAN, OTI &PK, and Federated, support using a spectrum access database similar to

¹⁹⁷ See Broadband Access Coalition Petition at 29.

¹⁹⁸ See *id.* at 28.

¹⁹⁹ 47 CFR § 101.103(d).

²⁰⁰ *Id.* § 25.203.

²⁰¹ See *e.g., id.* § 101.103(d)(1)(vi).

²⁰² See Broadband Access Coalition Petition at 34-35; see also Microsoft Comments at 9; DSA Comments at 1-17; RWA Reply at 1-6; NetMoby Reply at 1-9; Tucson Electric Comments at 5-6; UTC and EEI Comments at 5.

²⁰³ See Broadband Access Coalition Petition at 34.

the sharing system used below 3.7 GHz for the Citizens Broadband Radio Service.²⁰⁴ Google offers another variant contending that a lightweight database supported authorization framework would enable the efficient deployment of fixed broadband access (FBA) systems.²⁰⁵ However, the satellite industry and content providers have strong objections to more intensive use of the 3.7-4.2 GHz by FS and have raised very specific concerns over the lack of proven methods for spectrum sharing with more intensive fixed use in this band.²⁰⁶ Satellite operators also raise concern about the ability of point-to-multipoint systems to quickly remedy interference when it is identified or to accommodate FSS earth stations when they change frequencies.²⁰⁷ We seek comment on the above. We also ask that, given the lack of consensus, parties continue to work together to offer a more widely supported proposal for the Commission to consider.

125. *Power Limits.*—We seek comment on adopting power limits for point-to-multipoint FS operations in the 3.7-4.2 GHz band. Our existing rules for FS provide power limits based on the link length. With point-to-multipoint FS service areas, individual links between access points and client devices will vary in length. Should we apply a rule to point-to-multipoint FS links specifying a minimum path length, similar to those specified for point-to-point FS links in Section 101.143²⁰⁸ or is some other variation of this rule more applicable to point-to-multipoint FS operations? What should our power limits be for point-to-multipoint FS service? The Broadband Access Coalition has proposed a 50 dBm EIRP

²⁰⁴ IEEE DySPAN-SC proposes the use of Spectrum Consumption Models based SAS to coordinate the use and enable the sharing of spectrum in the 3.7-4.2 GHz band. This will allow more intensive use of the band for the deployment of point-to-multipoint FS broadband services and last mile point to point FS links. It will also allow the protection of incumbent FS and FSS operations in this band. IEEE DySPAN-SC Comments at 6. Comsearch believes that sharing could be possible by using a SAS or database that is aware of actual frequencies received by the earth stations and can suggest frequencies to the mobile broadband system that do not conflict. Comsearch Comments at 3; Sony Comments at 1-2; Motorola Comments (supports the adoption of specifications for SAS use in 3.7-4.2 GHz with systems similar to those used in the Citizens Broadband Radio Service); OTI & PK Reply at 18 (supports SAS similar to that used for the Citizens Broadband Radio Service); Federated Comments (strongly advocating for system similar to the SAS used for the Citizens Broadband Radio Service); WIF Comments at 5-7 (same); Vivint Wireless Comments at 3-5 (same). *See also* Microsoft Reply at 6 (envisioning some form of spectrum auction for up to six priority access licenses with the remaining spectrum set aside for General Authorized Access); GeoLinks Comments at 1-3 (priority access licenses).

²⁰⁵ Google Comments at 9-10.

²⁰⁶ SIA Comments at 34-39 (opposed because there are currently no proven methods for spectrum sharing with more intensive fixed use of the band); NABA Comments at 1 (allowing widespread new terrestrial uses in the portion of the C-band used for satellite downlinks will cause significant harm to existing services using that band and to the consumers who rely on those services); Global VSAT Forum Comments at 1-3 (same); Charter Comments at 3 (same); EWTN Comments at 3 (same); General Communications Comments at 3 (same); iHeartMedia Comments at 1 (stating that earth station reception from satellites is highly sensitive to interference, so that authorizing other services to install nearby transmission systems would likely create intolerable interference to established satellite reception); NPR Comments at 10-11 (same); NCTA Comments at 3 (opposed because before authorizing use of these bands for flexible wireless or expanded fixed broadband use, the Commission must have before it a complete record, including detailed sharing analyses and test results, if appropriate, indicating that new operations will fully protect existing and future satellite operations); NSMA Comments at 14 (same); Inmarsat Reply at 2 (same); Content Companies Comments at 5-9 (same); Sirius XM Comments at 11 (same).

²⁰⁷ SIA Comments at 34 (“But the [Broadband Access Coalition] does not explain how, in a time-critical situation requiring immediate restoration of capacity to a protected satellite user, all the point-to-multipoint systems in the vicinity of all the satellite user’s hundreds or thousands of receive terminals would even be notified of the immediate need to clear frequencies, much less be able to determine available alternative frequencies and implement the switch frequencies, much less be able to determine available alternative frequencies and implement the switch.”); *see also* Intelsat-SES-Intel Apr. 20, 2018 *Ex Parte*, GN Docket No. 17-183, GN Docket No. 18-122, at 2.

²⁰⁸ 47 CFR § 101.143

limit and a maximum conducted power of 1 Watt.²⁰⁹ Should the access point EIRP be scalable with bandwidth? Likewise, should client devices be limited to 50 dBm EIRP regardless of bandwidth? If not scalable, how do changes in bandwidth impact frequency coordination? Should we apply the emission limits set forth in Section 101.111²¹⁰ to point-to-multipoint FS operations in this band, or would some other limits be more appropriate to protect adjacent-band operations? The Broadband Access Coalition anticipates that point-to-multipoint FS systems would be able to meet existing Part 101 out-of-band emission limits, without modification,²¹¹ but we seek comment as to this issue. We also invite comment on other proposals. We note that the adjacent 4.2-4.4 GHz band is allocated to the aeronautical radionavigation service on a primary basis and that, at WRC-15, the 4.2-4.4 GHz band was also allocated to the aeronautical mobile (R) service on a primary basis in all ITU Regions with use reserved for WAIC systems.²¹² WAIC systems are onboard short range wireless systems that will replace substantial portions of aircraft wiring.²¹³ These systems increase aircraft safety by providing dissimilar redundancy in communications links between aircraft systems.²¹⁴ We solicit comment on the needed out-of-band emission limit required to protect the aeronautical radionavigation service in the 4.2-4.4 GHz band.

126. *Antenna Standards.*—We ask parties to provide detailed technical comments as to antenna standards that should apply to point-to-multipoint FS operations in the 3.7-4.2 GHz band. Section 101.115 of our rules specifies the maximum beamwidth, minimum antenna gain and radiation suppression envelope for FS antennas in this band.²¹⁵ How should these antenna standards be modified to accommodate the range of antennas typically used in point-to-multipoint applications? The Broadband Access Coalition Petition proposes that, unlike point-to-point FS licensees subject to Section 101.115,²¹⁶ point-to-multipoint FS licensees be permitted to use any antenna in the 3.7-4.2 GHz band that meets the minimum performance requirements for access points and client devices.²¹⁷ Specifically, the Broadband Access Coalition Petition proposes that a point-to-multipoint FS licensee would be required to specify the gain; azimuth; polarization; height; azimuth and elevation half-power beamwidths; and tilt (e.g., -10 degrees) for sectorized antennas and gain, height and any electrical tilt for omni-directional antennas.²¹⁸ Should we specify a minimum radiation suppression at some angle from the edge of the main beam for sectorized antennas? We seek comment on the above and invite parties to offer alternative proposals. What are the relative costs and benefits for each proposal? How would each proposal affect other users in the band or provide mechanisms to address interference?

127. *Client Devices.*—We seek comment on whether we should require directional antennas on outdoor point-to-multipoint client devices and if so what should those antenna standards be? Would antenna standards for client devices make coordination easier? We ask that commenters address the minimum antenna gain and minimum suppression from main beam centerline. Should client devices be

²⁰⁹ Broadband Access Coalition Petition at 30.

²¹⁰ See 47 CFR § 101.111.

²¹¹ See Broadband Access Coalition Petition at 32.

²¹² “WRC-15 agreed on spectrum for wireless avionics intra-communications (WAIC) to allow for the heavy and expensive wiring used in aircraft to be replaced by wireless systems.” See *World Radiocommunication Conference Allocates Spectrum for Future Innovation, Conference Outcomes to Spur Long-term Investments in ICT Industry*, International Telecommunications Union (Nov. 27, 2015), http://www.itu.int/net/pressoffice/press_releases/2015/56.aspx#.Wyk3asQh30M.

²¹³ Boeing Comments at 4.

²¹⁴ *Id.* at 4-5.

²¹⁵ 47 CFR § 101.115.

²¹⁶ *Id.*

²¹⁷ See Broadband Access Coalition Petition at 28-29.

²¹⁸ See *id.*

limited to outdoor antennas only and permanently affixed at the client location? Should we allow portable indoor client devices, and should such devices be allowed under point-to-multipoint or flexible use rules? If we permit portable client devices with non-directional antennas, how will this impact the access point service area frequency coordination with incumbent licensees?

128. *Frequency Agility and Radio Capabilities.*—We seek comment on whether we should require point-to-multipoint FS radios (both access points and client devices) to be frequency agile and thus capable of operating across the 3.7-4.2 GHz band or allow radios to be agile over 3.7-4.2 GHz so long as the flexible use portion of the band is locked out and be able to accommodate any 20 megahertz channel assignment? The Broadband Access Coalition requests that licensed point-to-multipoint radios (both access points and client devices) be frequency agile and thus capable of operating across the entire 3.7-4.2 GHz band, and accommodate any 20 megahertz channel assignment.²¹⁹ Additionally, should we require that client devices be capable of modifying channel and bandwidth assignment when prompted by the associated access point? Should access points be software upgradable to communicate with future automated database and client devices to be capable of following instructions from associated access point to change channels and bandwidth, as necessary?²²⁰ We seek comment on how such requirements might be implemented in regulations, or whether any such features may instead be developed by manufacturer technical standards and/or multi-stakeholder interest groups.

129. *Construction.*—We seek comment on the construction deadlines and notifications that should apply to point-to-multipoint FS licensees in the 3.7-4.2 GHz band. Should we require point-to-multipoint FS licensees to build out, within 12 months, and operate at least one access point and at least five client radios in licensed areas or lose protection for the service area?²²¹ If a point-to-multipoint FS licensee fails to meet the above requirements, should we allow links already in service from that access point to maintain coordinated protection on an individual, path-by-path basis to protect existing customers served by those links?²²² In addition, we encourage commenters to consider the economic impact on consumers and businesses in rural communities and areas that are unserved or underserved by current broadband providers, as well as any economic impact on small businesses. We ask parties to comment on this proposal, offer alternative proposals, and discuss the relative costs and benefits for each proposal.

130. Additionally, Section 101.141(a)(3)(ii) requires that “traffic loading payload shall exceed 50 percent of payload capacity within 30 months of licensing.”²²³ We recognize that the minimum traffic loading payload requirement in Section 101.141(a)(3)(ii) was designed for symmetrical traffic and that IP traffic is often asymmetrical. Should we therefore not adopt a requirement for point-to-multipoint FS licensees or do parties have alternative proposals for us to consider?²²⁴

131. *Equipment Access/RF Exposure.*—Section 101.131(a) requires that “[t]he equipment at the operating and transmitting positions must be so installed and protected that it is not accessible to, or capable of being operated by, persons other than those duly authorized by the licensee.”²²⁵ The Broadband Access Coalition states that client radios providing low power point-to-multipoint services will operate from residential premises and will not present a radiofrequency (RF) hazard because, when operated at full power, the RF exposure keep-out zone for point-to-multipoint client radios operating at

²¹⁹ *Id.* at 31.

²²⁰ *See id.*

²²¹ *See id.* at 33-34.

²²² *See id.* at 34.

²²³ 47 CFR § 101.111(a)(3)(ii).

²²⁴ *See* Broadband Access Coalition Petition at 32 (eliminate requirement for all Part 101 services).

²²⁵ 47 CFR § 101.131(a).

the proposed maximum EIRP level is less than 0.6 meters (2 feet).²²⁶ We anticipate that client devices would likely be mounted in such a way as to provide a good connection back to the access point, free from obstructions within the transmission path, and so while such an installation may not strictly comply with the access restriction requirement in our rules, it is possible that other regulatory examples or analogies may apply to point-to-multipoint situations where home subscriber devices are involved. For example, fixed wireless licensees with home-installed consumer equipment are generally required to attach a label to transceiver antennas that: (1) provides adequate notice regarding potential radiofrequency safety hazards, e.g., information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radiofrequency exposure specified in Section 1.1310.²²⁷ We seek comment on whether a similar requirement for point-to-multipoint client devices may be a preferred alternative to Section 101.1310 of our rules. In addition, we seek comment on the possibility that there may be any other potential use cases, such as wireless routers or other types of devices, that may require separate consideration for the purposes of equipment authorization and RF exposure compliance. We note that all transmitters must comply with our exposure limits and requirements of Sections 1.1307(b), 1.1310, 2.1091, and 2.1093 of our rules, as applicable.

132. *ULS Requirements.*—What technical data should point-to-multipoint FS licensees be required to provide in ULS? We note that the Broadband Access Coalition requests in its petition that the applicant’s frequency coordination should correspond to the specific equipment and antenna orientation the applicant selects,²²⁸ and so we seek comment on whether at least that same information used for frequency coordination should be entered into our licensing database. At a minimum should licensees be required to provide the antenna gain, azimuth, polarization, height, half-power beamwidth (azimuth and elevation), and tilt (e.g. -10°) for each access point by sector?

3. Service Rules for Flexible Use

133. The scope of the service rules adopted herein will vary depending on the mechanism ultimately adopted by the Commission to expand flexible use in the band. For convenience, we refer to this indeterminate amount of spectrum as the Mid-Band Flexible Use or “MBX” spectrum. Assuming that the Commission ultimately decides to add a mobile, except aeronautical mobile, allocation and to make some or all of the 3.7-4.2 GHz band available for flexible use, in this section we propose or seek comment on band plan, licensing and operating and technical rules for the 3.7-4.2 GHz band spectrum that becomes available for terrestrial mobile and fixed flexible-use. We propose to license this spectrum under our flexible-use, Part-27 rules that permit licensees to provide any fixed or mobile service consistent with the allocations for this spectrum, subject to rules necessary to prevent or minimize harmful interference. We seek comment on this approach. We also seek comment, however, on whether there are any services, e.g., Internet of Things, that would not qualify under Section 603(a)(2)(B) of the MOBILE NOW Act, which requires us to identify 100 megahertz below 6000 MHz for use on exclusive, licensed basis for commercial mobile use, pursuant to the Commission’s authority to implement such licensing in a flexible manner?²²⁹

134. In the *Mid-band NOI*, the Commission sought comment on how the service rules governing the 3.7-4.2 GHz band could be modified to encourage the efficient use of spectrum resources.²³⁰ Noting, for example, the previous introduction of mobile service in other bands shared with fixed terrestrial and FSS users, the Commission sought comment on the experiences of licensees in such

²²⁶ See Broadband Access Coalition Petition at 32-33.

²²⁷ See 47 CFR § 1.1307(b)(1).

²²⁸ Broadband Access Coalition Petition at 33.

²²⁹ See Section 603(a)(2)(B) of the Act.

²³⁰ *Mid-Band NOI*, 32 FCC Rcd at 6380-81, paras. 21-23.

shared bands²³¹ and whether there are particular licensing frameworks or technical rules that would more effectively promote investment in the 3.7-4.2 GHz band.²³² Even though licenses in the 3.7-4.2 GHz band may be issued pursuant to one rule part, licensees in this band may be required to comply with rules contained in other parts of the Commission's rules by virtue of the particular services they provide. We seek comment on licensing new mobile operations in the 3.7-4.2 GHz band under our Part 27 rules, as well as on specific issues discussed below including the potential impact of each of the mechanisms for expanding flexible use on the implementation of our service rules. In addressing these issues, commenters should discuss the costs and benefits associated with their proposals, including any alternatives that commenters propose.

a. Band Plan

135. *Block Sizes.*—We seek comment on appropriate block size to promote efficient and robust use of the band for next generation wireless technologies, including 5G. Currently, the 3.7-4.2 GHz band is licensed terrestrially by 20 megahertz channels for fixed use.²³³ However, the current channelization of the band should not affect our consideration of alternate band plans. Therefore, we seek comment on the appropriate block size(s) to best accommodate the fullest range of terrestrial wireless services.²³⁴ Would 20 megahertz blocks be appropriate for the wireless technologies that are likely to be deployed in this band? Should we allow blocks to be aggregated to provide greater capacity where needed?²³⁵ Or, would licensing the 3.7-4.2 GHz band in larger block sizes (e.g., 50-100 megahertz) better support 5G services while promoting competition?²³⁶ Would a mix of channel sizes improve efficiency and flexibility for a wider variety of users in the band?

136. We also seek comment on whether the appropriate block sizes should be affected by the specific transition mechanism adopted by the Commission. For example, if we adopt a market-based approach, we seek comment on allowing parties to define block sizes in their agreements. In this regard, would a default block size that could be aggregated and disaggregated help facilitate a market-based process? Commenters should discuss and quantify the costs and benefits of their proposals.

137. *Spectrum Block Configuration.*—The Commission generally has licensed bands that support mobile broadband services on a paired basis but specified the downlink and uplink bands only when necessary to avoid harmful interference, e.g., to Federal incumbents.²³⁷ We recognize that the 3.7-4.2 GHz spectrum that becomes available for flexible use could be configured in any number of paired or unpaired modes. We therefore seek comment on a range of options. If we adopt an unpaired approach, are any administrative measures necessary to keep track of how spectrum blocks are being used? We

²³¹ *Id.* at 6380, para. 20 n.34, citing, e.g., 47 CFR § 27.2(a); *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, 4650-51, para. 108, 4652, para.112 (2014) (*AWS-3 Report and Order*) (licensing AWS-3 spectrum under Part 27 and providing AWS-3 licenses with the flexibility to provide any fixed or mobile service that is consistent with the allocations for the spectrum); *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd 3959, 3972, para. 34 (2015) (adding primary fixed and mobile, except aeronautical mobile, allocations to the 3.55-3.65 GHz band in the non-federal table).

²³² *Mid-Band NOI*, 32 FCC Rcd at 6381, para. 21.

²³³ See UTC and EEI Comments at 5. See also 47 CFR § 101.147(h).

²³⁴ The use of 20 megahertz blocks will enable transmission efficiencies achieved by 5G voluntary standards, including Long-Term Evolution ("LTE") derivatives. Vivint Wireless Comments at 3.

²³⁵ See Motorola Comments at 2.

²³⁶ See Nokia Comments at 13; Qualcomm Comments at 5.

²³⁷ See, e.g., 47 CFR § 27.5(h) (AWS-1) (specifies 1710-1755 MHz as mobile/uplink band to accommodate Federal incumbents, which necessitated specifying paired 2110-2155 MHz as base/downlink band). Compare *id.* § 24.229(a) and (b) (Broadband PCS Blocks A-F are paired but the rule does not specify uplink/downlink).

invite comment on what approach to take, and the costs and benefits of particular approaches. Above, we discuss various mechanisms for expanding flexible use in all or part of the band. We ask proponents of the various approaches described whether there are issues specific to this section and their preferred approach.

138. *Use of Geographic Licensing.*—Consistent with our approach in several other bands used to provide fixed and mobile services, we propose to license the 3.7-4.2 GHz MBX spectrum on an exclusive, geographic area basis.²³⁸ Geographic area licensing provides flexibility to licensees, promotes efficient spectrum use, and helps facilitate rapid assignment of licenses, utilizing competitive bidding when necessary. We seek comment on this approach, including the costs and benefits of adopting a geographic area licensing scheme. In the event that a party does not support using geographic licensing, it should explain its position, describe what type of licensing scheme it supports and identify the costs and benefits associated with its alternative licensing proposal.

139. *Service Areas.*—We seek comment on the appropriate service areas for any flexible use licenses. In determining the appropriate geographic license size, the Commission must consider several factors, including: (1) facilitating access to spectrum by both small and large providers; (2) providing for the efficient use of spectrum; (3) encouraging deployment of wireless broadband services to consumers, especially those in rural areas and Tribal lands; and (4) promoting investment in and rapid deployment of new technologies and services.²³⁹ In light of these statutory considerations, we ask commenters to discuss and quantify the economic, technical, and other public interest considerations of licensing on a PEA, county, nationwide, or other basis.²⁴⁰ We ask commenters to address the costs and benefits of their recommended licensing approach.

140. We also seek comment on a licensing approach for the Gulf of Mexico. In AWS-1, AWS-3, AWS-4, and the H Block, the Commission issued separate licenses for the Gulf of Mexico.²⁴¹ In the Upper 700 MHz band, however, the Commission included the Gulf of Mexico in larger service areas.²⁴² Commenters who advocate a separate service area or areas to cover the Gulf of Mexico should discuss what boundaries should be used, and whether special interference protection criteria or performance requirements are necessary due to the unique radio propagation characteristics and antenna siting challenges that exist for Gulf licensees.

141. We also seek comment on whether the service areas should be affected by the specific transition mechanism adopted by the Commission. For example, if we adopt a market-based approach, we seek comment on allowing parties to define service areas in their agreements. In this regard, would a default service-area size smaller than the contiguous 48 states that could be aggregated and disaggregated help facilitate a market-based process? If we adopt an overlay auction, we seek comment on issuing a single nationwide license, or alternatively issuing licenses for five regions: (1) the contiguous 48 states and the Gulf of Mexico, (2) Alaska, (3) Hawaii, (4) Puerto Rico and the U.S. Virgin Islands, and (5) Guam, the Northern Mariana Islands, and American Samoa. Commenters should discuss and quantify the costs and benefits of their proposals.

²³⁸ See, e.g., *id.* § 27.6(h) and (i) (AWS-1 and AWS-4, respectively).

²³⁹ See e.g., *Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Report and Order, 18 FCC Rcd 25162, 25174, para. 31 (2003) (*AWS-1 Service Rules R&O*); see also 47 U.S.C. § 309(j).

²⁴⁰ See Nokia Comments at 13 (recommending large license sizes (e.g., CMAs or larger)).

²⁴¹ See, e.g., *AWS-1 Service Rules R&O*, 18 FCC Rcd at 25174, para. 31 (2003). See also 47 CFR § 27.6(j) (H Block).

²⁴² See *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, First Report and Order, 15 FCC Rcd 476, 500, para. 56, n.137 (2000).

142. We also seek comment on a licensing approach for the Gulf of Mexico. In AWS-1, AWS-3, AWS-4, and the H Block, the Commission issued separate licenses for the Gulf of Mexico.²⁴³ In the Upper 700 MHz band, however, the Commission included the Gulf of Mexico in larger service areas.²⁴⁴ Commenters who advocate a separate service area or areas to cover the Gulf of Mexico should discuss what boundaries should be used, and whether special interference protection criteria or performance requirements are necessary due to the unique radio propagation characteristics and antenna siting challenges that exist for Gulf licensees.

b. Licensing and Operating Rules

143. We seek to afford licensees the flexibility to align licenses in the 3.7-4.2 GHz band with licenses in other spectrum bands governed by Part 27 of the Commission's rules. We therefore propose that licensees in the 3.7-4.2 GHz band comply with licensing and operating rules that are applicable to all Part 27 services,²⁴⁵ including assignment of licenses by competitive bidding,²⁴⁶ flexible use,²⁴⁷ regulatory status,²⁴⁸ foreign ownership reporting,²⁴⁹ compliance with construction requirements,²⁵⁰ renewal criteria,²⁵¹ permanent discontinuance of operations,²⁵² partitioning and disaggregation,²⁵³ and spectrum leasing.²⁵⁴ We seek comment on this approach and ask commenters to identify any aspects of our general Part 27 service rules that should be modified to accommodate the particular characteristics of the 3.7-4.2 GHz band. We ask proponents of the various mechanisms described above whether there are issues specific to this section and their preferred approach.

144. In addition, we seek comment on service-specific rules for the 3.7-4.2 GHz band, including eligibility, mobile spectrum holdings policies, license term, performance requirements, renewal term construction obligations, and other licensing and operating rules. In addressing these issues,

²⁴³ See *id.* See also 47 CFR § 27.6(j) (2013) (H Block); *Service Rules for the 746-764 and 776-794 MHz Bands*, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8064, 8085, para. 49 (2007) (*700 MHz Second Report and Order*).

²⁴⁴ See *Service Rules for the 746-764 and 776-794 MHz Bands, and Revisions to Part 27 of the Commission's Rules*, First Report and Order, 15 FCC Rcd 476, 500, para. 56, n.137 (2000).

²⁴⁵ We note the Commission recently amended several of the rules applicable to Part 27 services. See *Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal et al.*, Second Report and Order and Further Notice of Proposed Rulemaking and Order, 32 FCC Rcd 8874 (2017) (*WRS Renewal Reform 2nd R&O and FNPRM*).

²⁴⁶ 47 U.S.C. § 309(j); 47 CFR §§ 1.2101-1.2114.

²⁴⁷ Section 303(y) provides the Commission with authority to provide for flexibility of use if: "(1) such use is consistent with international agreements to which the United States is a party; and (2) the Commission finds, after notice and opportunity for public comment, that (A) such an allocation would be in the public interest; (B) such use would not deter investment in communications services and systems, or technology development; and (C) such use would not result in harmful interference among users." Balanced Budget Act of 1997, Pub. L. No. 105-22, 111 Stat. 251, 269-69; 47 U.S.C. § 303(y). See also 47 CFR §§ 1.2106, 27.2, 27.3.

²⁴⁸ 47 CFR § 27.10.

²⁴⁹ 47 U.S.C. § 310; 47 CFR § 27.12.

²⁵⁰ 47 CFR § 27.14(k)

²⁵¹ *Id.* § 1.949.

²⁵² *Id.* § 1.953.

²⁵³ *Id.* § 1.950.

²⁵⁴ *Id.* §§ 1.9001 *et seq.*

commenters should discuss the costs and benefits associated with these proposals and any alternatives that commenters propose.²⁵⁵

145. *Eligibility.*—Consistent with established Commission practice, we propose to adopt an open eligibility standard for licenses in the 3.7-4.2 GHz band.²⁵⁶ We seek comment on this approach. Specifically, we seek comment on whether adopting an open eligibility standard for the licensing of the 3.7-4.2 GHz band would encourage efforts to develop new technologies, products, and services, while helping to ensure efficient use of this spectrum.²⁵⁷ We note that an open eligibility approach would not affect citizenship, character, or other generally applicable qualifications that may apply under our rules. Commenters should discuss the costs and benefits of the open eligibility proposal on competition, innovation, and investment. Above, we discuss various mechanisms for expanding flexible use in all or part of the band. We ask proponents of the various approaches described above whether there are issues specific to this section and their preferred approach. Finally, a person who has been, for reasons of national security, barred by any agency of the Federal Government from bidding on a contract, participating in an auction, or receiving a grant is ineligible to hold a license that is required by 47 U.S.C. Chapter 13 (the Spectrum Act) to be assigned by a system of competitive bidding under Section 309(j) of the Communications Act.²⁵⁸ In the event that we assign licenses through competitive bidding, we propose to apply this ineligibility provision to the 3.7-4.2 GHz band.

146. *Mobile Spectrum Holdings.*—Spectrum is an essential input for the provision of mobile wireless services, and to implement provisions of the Communications Act, the Commission has developed policies to ensure that spectrum is assigned in a manner that promotes competition, innovation, and efficient use.²⁵⁹

147. We seek comment generally on whether and how to address any mobile spectrum holdings issues involving 3.7-4.2 GHz spectrum to meet our statutory requirements and ensure competitive access to the band. Similar to the Commission’s approach in the *2017 Spectrum Frontiers Order and FNPRM*, we propose not to adopt a pre-auction bright-line limit on the ability of any entity to

²⁵⁵ See, e.g., Nokia Comments at 13 (recommending that the Commission enable a licensing framework that supports sustained investment and widespread network deployment).

²⁵⁶ The Commission has determined in a number of services that eligibility restrictions on licenses may be imposed only when open eligibility would pose a significant likelihood of substantial harm to competition in specific markets and when an eligibility restriction would be effective in eliminating that harm. This approach relies on market forces absent a compelling showing that regulatory intervention to exclude potential participants is necessary. See, e.g., *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, Report and Order and Order of Proposed Modification, 27 FCC Rcd 16102, 16193, paras. 241-42 (2012) (*AWS-4 Service Rules R&O*); *700 MHz Second Report and Order*, 22 FCC Rcd at 15381, 15383-84 paras. 253, 256; *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, Report and Order, 18 FCC Rcd 23318, 23346-47 para. 70 (2003).

²⁵⁷ See 47 U.S.C. § 309(j)(3).

²⁵⁸ See 47 CFR § 27.12(b), citing 47 U.S.C. § 1404(c).

²⁵⁹ The Communications Act requires the Commission to examine closely the impact of spectrum aggregation on competition, innovation, and the efficient use of spectrum to ensure that spectrum is assigned in a manner that serves the public interest, convenience, and necessity. Section 309(j)(3) of the Communications Act provides that, in designing systems of competitive bidding, the Commission must “include safeguards to protect the public interest in the use of the spectrum,” and must seek to promote various objectives, including “promoting economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants,” and promoting the “efficient and intensive use” of spectrum. 47 U.S.C. § 309(j)(3). In addition, Section 6404 of the Spectrum Act recognizes the Commission’s authority “to adopt and enforce rules of general applicability, including rules concerning spectrum aggregation that promote competition.” Spectrum Act, § 6404.

acquire spectrum in the 3.7-4.2 GHz band through competitive bidding at auction.²⁶⁰ Since such pre-auction limits may unnecessarily restrict the ability of entities to participate in and acquire spectrum in an auction, we are not inclined to adopt such limits absent a clear indication that they are necessary to address a specific competitive concern, and we seek comment on any specific concerns of this type.

148. We also seek comment on whether this band should be included in the Commission's spectrum screen, which helps to identify markets that may warrant further competitive analysis, for evaluating proposed secondary market transactions. If we do determine that an auction is appropriate, we seek comment on reviewing holdings on a case-by-case basis when applications for initial licenses are filed post-auction to ensure that the public interest benefits of having a threshold on spectrum applicable to secondary market transactions are not rendered ineffective. We seek comment on whether and how the similarity of this spectrum to spectrum currently included in the screen should be factored into our analysis, including the suitability of 3.7-4.2 GHz spectrum for use in the provision of mobile telephony or broadband services. Commenters should discuss and quantify any costs and benefits associated with any proposals on the applicability of mobile spectrum holdings policies to 3.7-4.2 GHz spectrum. We discuss above various mechanisms for expanding flexible use in all or part of the band. We ask proponents of the various approaches described above whether there are issues specific to this section and their preferred approach. For example, should the Commission impose limits on the amount of spectrum acquired by one party through a market-based mechanism?

149. *License term.*—We seek comment on a 15-year term for licenses in the 3.7-4.2 GHz band.²⁶¹ We believe that 15 years will afford licensees sufficient time to achieve this significant buildout obligation.²⁶² We seek comment on the costs and benefits of this proposal. In addition, we invite commenters to submit alternate proposals for the appropriate license term, which should similarly include a discussion on the costs and benefits.

150. *Performance requirements.*—The Commission establishes performance requirements to ensure that spectrum is intensely and efficiently utilized. The Commission has applied different performance and construction requirements to different spectrum bands based on considerations relevant to those bands.²⁶³ We continue to believe that performance requirements play a critical role in ensuring that licensed spectrum does not lie fallow.

151. Accordingly, considering the unique characteristics of this band, and to ensure that licensees begin providing service to consumers in a timely manner, we seek comment on adopting specific quantifiable benchmarks as an important component of our performance requirements. We seek comment on requiring a 3.7-4.2 GHz band licensee, relying on mobile or point-to-multipoint service in accordance with our Part 27 rules, to provide reliable signal coverage and offer service to at least forty-

²⁶⁰ 2017 *Spectrum Frontiers Order and FNPRM*, 32 FCC Rcd at 11009-11, paras. 70-74.

²⁶¹ The Communications Act does not specify a term limit for wireless radio services licenses. The only statutory limit on license terms is eight years for licenses in the broadcast services. *See* 47 U.S.C. § 307(c)(1); *see also* 47 CFR § 73.1020(a).

²⁶² *See* Huawei Comments at 4 (as deployment of 5G systems requires a stable environment for both customers and wireless network operators, ensuring such stability may be realized through longer license terms, larger geographic areas, and an expectancy of license renewal); Nokia Comments at 13 (supporting 10-year or more licensing terms, with expectation of renewal).

²⁶³ *See, e.g., Service Rules for Advances Wireless Services H Block—Implementing Section 6401 of the Middle Class Tax Relief and Job Creation Act of 2012 Related to the 1915-1920 MHz and 1995-2000 MHz Bands*, Report and Order, 28 FCC Rcd 9483, at 9558-59, para. 195 (2013) (requiring 40 percent population coverage within four years of initial grant and 75 percent population coverage within 10 years of initial grant). *See also AWS-3 Report and Order*, 29 FCC Rcd at 4659-60, para. 135 (requiring 40 percent population coverage within six years of initial grant and 75 percent population coverage within 12 years of initial grant); *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Report and Order, 29 FCC Rcd 6567, 6877-78, para. 764 (2014) (*Incentive Auctions Report and Order*).

five (45) percent of the population in each of its license areas within six years of the license issue date (first performance benchmark), and to at least eighty (80) percent of the population in each of its license areas within 12 years from the license issue date (second performance benchmark). For licensees relying on point-to-point service, we seek comment on requiring them to demonstrate within six years of the license issue date (first performance benchmark) 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, we seek comment on requiring a licensee relying on point-to-point service to demonstrate it has at least one link in operation and providing service per every 67,000 persons within a license area. We seek comment on requiring licensees relying on point-to-point service to demonstrate within 12 years of the license issue date (final performance benchmark) that they have eight 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, we seek comment on requiring a licensee relying on point-to-point service to demonstrate it is providing service and has at least two links in operation per every 67,000 persons within a license area. We seek comment on whether in order to be eligible to be counted under the point-to-point buildout standard, a point-to-point link must operate with a transmit power greater than +43 dBm.²⁶⁴

152. We believe that 12 years will provide sufficient time for any 3.7-4.2 GHz licensee to meet the proposed coverage requirements. We anticipate that after satisfying the 12-year second performance benchmark, a licensee will continue to provide reliable signal coverage, or point-to-point links, as applicable, and offer service at or above that level for the remaining three years in the proposed 15-year license term prior to renewal.²⁶⁵ Establishing benchmarks before the end of the license term will ensure continuity of service over the license term, which is essential to our evaluation under the Commission's renewal standards.

153. We also seek comment on whether the proposals discussed above represent the appropriate balance between license-term length and a significant final buildout requirement. We seek comment on the proposed buildout requirements and any potential alternatives. We, for example, seek comment on alternative methodologies for measuring population coverage requirements in the Gulf of Mexico. Above, we discuss various mechanisms for expanding flexible use in all or part of the band. We ask proponents of the various approaches described above whether there are issues specific to this section and their preferred approach. We also seek comment on whether small entities face any special or unique issues with respect to buildout requirements such that they would require certain accommodations or additional time to comply. Finally, commenters should discuss and quantify how any supported buildout requirements will affect investment and innovation, as well as discuss and quantify other costs and benefits associated with the proposal.

154. *Internet of Things (IoT) Performance Requirements.*—While we propose performance benchmarks based on population coverage applicable for a range of fixed and mobile services, we recognize that 3.7-4.2 GHz licenses have flexibility to provide services potentially less suited to a population coverage metric. In particular, licensees providing IoT-type fixed and mobile services may benefit from an alternative performance benchmark metric, and we seek comment on the appropriate

²⁶⁴ In *Spectrum Frontiers*, the Commission defined a “fixed point-to-point link” as “a radio transmission between point-to-point stations (as already defined in Part 30), where transmit power exceeds +43 dBm.” Under this definition, stations or devices transmitting using lower power levels will not count towards the number of fixed links required under the performance metric. Licensees whose networks include such low-power connections may rely on another part of their network to demonstrate buildout (e.g., mobile area coverage or higher-power fixed backhaul links). See *2017 Spectrum Frontiers Order and FNPRM*, 32 FCC Rcd at 11008-09, paras. 66-68.

²⁶⁵ See *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd at 8886-89, paras. 27-34 (adopting continuity of service and other renewal showing requirements for WRS licensees).

metric to accommodate such service offerings.²⁶⁶ As the Commission did in *Spectrum Frontiers*, we acknowledge that some IoT-type services may have difficulty meeting the population-based metrics that the Commission proposes for fixed and mobile services.²⁶⁷ In *Spectrum Frontiers*, the Commission modified its existing Part 30 rules to adopt a specific definition of “fixed point-to-point link,” which includes the use of point-to-point stations as already defined in Part 30 and is based on power level.²⁶⁸ This definition is intended to separate “traditional” point-to-point links from the sensor and device connections we anticipate will be part of new Internet of Things networks in these bands.²⁶⁹ This definition applies to a network of fixed sensors or smart devices operating at low power over short distances.²⁷⁰ We seek comment on applying the same framework here and invite commenters to suggest new metrics that will accommodate innovative services in mid-band spectrum.²⁷¹ We also seek comment on how relatively lower power point-to-point operations at or below a transmit power of +43 dBm should be required to meet the buildout rules for 3.7-4.2 GHz licensees.

155. Today, we seek additional comment on what metric we should adopt to accommodate IoT services, while recognizing the difficulty of crafting an IoT-specific metric, especially while the relevant technologies and use cases are still being developed. For example, a performance metric based on geographic area coverage (or presence) could allow for networks that provide meaningful service but deploy along lines other than residential population. Consistent with our approach above seeking comment on a first and second performance benchmark, we seek comment on the following metrics as an option for MBX-spectrum licensees to fulfill their buildout requirements: geographic area coverage of 35 percent of the license area at the first (six-year) performance benchmark, and geographic area coverage of 65 percent of the license area at the second (12-year) performance benchmark. We also seek comment on an alternative requirement of presence in 35 percent of subset units of the license area, such as census tracts, counties, or some other area at the first performance benchmark, and presence in 65 percent of subset units at the second benchmark.²⁷² A standard requiring presence in subset units of a license area 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 65 percent of the area” would therefore not be a meaningful standard. Licensees would demonstrate compliance with this metric through a showing of the equipment or deployments that are part of a network that is actually providing service, either to external customers or for internal uses.

156. We suggest these levels of geographic coverage as an attempt to maintain parity between the requirements in these metrics and the requirements of our earlier proposal based on population

²⁶⁶ We seek comment above on whether there are any services that would not qualify under Section 603(a)(2)(B) of the MOBILE NOW Act.

²⁶⁷ *2017 Spectrum Frontiers Order and FNPRM*, 32 FCC Rcd at 11008, para. 64.

²⁶⁸ *Id.* at 11008, para. 66.

²⁶⁹ *Id.*

²⁷⁰ *Id.*

²⁷¹ *Id.* at 11008, para. 69.

²⁷² A showing of presence must demonstrate that the licensee has deployed at least one transmitter or receiver in the appropriate portion of subset units. See *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services; 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*, GN Docket No. 14-177, WT Docket No. 10-122, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, FCC 18-73 at 5, para. 8 (June 8, 2018); 47 CFR § 30.104(b).

coverage.²⁷³ We seek comment on these coverage levels, including any suggestions of alternative levels of coverage that might be more appropriate. We also emphasize that any metric we adopt to accommodate IoT services would, like the population coverage and fixed link metrics ultimately adopted, be available to any MBX-spectrum licensee. While we suggest an additional metric in order to facilitate the deployment of IoT and other innovative services, there would be no requirement that a licensee build a particular type of network or provide a particular type of service in order to use whatever metric we ultimately adopt. Above, we discuss various mechanisms for expanding flexible use in all or part of the band.²⁷⁴ We ask proponents of the various approaches described above whether there are issues specific to this section and their preferred approach. We strongly encourage stakeholders to fully develop a record on this issue.

157. *Penalty for Failure to Meet Performance Requirements.*—Along with performance benchmarks, we seek to adopt meaningful and enforceable penalties for failing to meet the benchmarks. We seek comment on which penalties will most effectively ensure timely build-out. Specifically, we propose that, in the event a 3.7-4.2 GHz MHz licensee fails to meet the first performance benchmark, the licensee's second benchmark and license term would be reduced by two years, thereby requiring it to meet the second performance benchmark two years sooner (at 10 years into the license term) and reducing its license term to 13 years. We further propose that, in the event a 3.7-4.2 GHz licensee fails to meet the second performance benchmark for a particular license area, its authorization for each license area in which it fails to meet the performance requirement shall terminate automatically without Commission action.

158. We propose that, in the event a licensee's authority to operate terminates, the licensee's spectrum rights would become available for reassignment pursuant to the competitive bidding provisions of Section 309(j). Further, consistent with the Commission's rules for other licenses, including AWS-1, AWS-3, AWS-4 and H Block, we propose that any 3.7-4.2 GHz licensee who forfeits its license for failure to meet its performance requirements would be precluded from regaining the license.²⁷⁵

159. *Compliance Procedures.*—In addition to compliance procedures applicable to all Part 27 licensees, including the filing of electronic coverage maps and supporting documentation,²⁷⁶ we propose that such electronic coverage maps must accurately depict the boundaries of each license area in the licensee's service territory. If a licensee does not provide reliable signal coverage to an entire license area, we propose that its map must accurately depict the boundaries of the area or areas within each license area not being served. Further, we propose that each licensee also must file supporting documentation certifying the type of service it is providing for each licensed area within its service territory and the type of technology used to provide such service. Supporting documentation must include the assumptions used to create the coverage maps, including the propagation model and the signal strength necessary to provide reliable service with the licensee's technology. We seek comment on our proposal. We also seek comment on whether small entities face any special or unique issues with respect to the transition such that they would require additional time to comply.

160. *Renewal Term Construction Obligation.*—In addition to, and independent of, the general renewal requirements contained in Section 1.949 of our rules, which apply to all Wireless Radio Services (WRS) licensees, we also seek comment on application of specific renewal term construction obligations

²⁷³ In most license areas, the residential population is unevenly distributed. In those areas, building a network covering 65% of the geographic area would require more intensive deployment than one covering 65% of the population, suggesting that a lower percent coverage requirement for geographic area could be appropriate.

²⁷⁴ See *supra* Section IV.B.1.

²⁷⁵ See, e.g., 47 CFR § 27.14(a), (q)(6), (r)(4).

²⁷⁶ See *id.* §§ 1.946(d); 27.14(k).

to 3.7-4.2 GHz licensees.²⁷⁷ In *WRS Renewal Reform FNPRM*, we reiterated the Commission’s mandate under the Communications Act to promote “the development and rapid deployment of new technologies, products, and services . . . for those residing in rural areas,” and we sought comment on various renewal term construction obligations that might serve those goals.²⁷⁸ Further, we noted that the Communications Act requires that in prescribing regulations for the assignment of initial licenses through a system of competitive bidding, the Commission shall “include performance requirements, such as appropriate deadlines and penalties for performance failures, to ensure prompt delivery of service to rural areas, to prevent stockpiling or warehousing of spectrum by licensees or permittees, and to promote investment and rapid deployment of new technologies and services.”²⁷⁹ In furtherance of these statutory mandates and in order to address the real and growing digital divide between rural and urban areas in the United States, the *WRS Renewal Reform FNPRM* sought comment on various renewal term construction obligations, such as incremental increases in the construction metric in each subsequent renewal term—e.g., by five or 10 percent—up to a certain threshold.²⁸⁰ In the event that licensees fail to satisfy any additional renewal term construction obligations, the Commission sought comment on a range of penalties for failure and methods for reassigning the unused spectrum, including automatic termination, “keep-what-you-serve,” and “use or share” approaches.²⁸¹

161. The *WRS Renewal Reform FNPRM* proposed to apply rules adopted in that proceeding to all flexible geographic licenses.²⁸² Given our proposal to license this band on a geographic basis for flexible use, any additional renewal term construction obligations proposed in the *WRS Renewal Reform FNPRM* also would apply to licenses in the 3.7-4.2 GHz band. We seek comment on whether there are unique characteristics of the 3.7-4.2 GHz band that might require a different approach than the various proposals raised by the *WRS Renewal Reform FNPRM*. For example, while the vast majority of existing wireless radio services have 10-year license terms,²⁸³ here we seek comment on a 15-year license term for the 3.7-4.2 GHz band. Do any of our proposals for this band, such as potentially longer license terms, necessitate a more tailored approach than the rules of general applicability proposed in the *WRS Renewal Reform FNPRM*? For instance, should we require buildout to 85 percent of the population by the end of second license term? Commenters advocating rules specific to the 3.7-4.2 GHz band should address the costs and benefits of their proposed rules and discuss how a given proposal will encourage investment and deployment in areas that might not otherwise benefit from significant wireless coverage. Above, we discuss various mechanisms for expanding flexible use in all or part of the band. We ask proponents of the various approaches described above whether there are issues specific to this section and their preferred approach. We seek comment on whether to require an applicant deploying IoT applications in the 3.7-4.2 GHz band to exceed its original construction metric by an additional five percent in its next full renewal term.

162. *Competitive Bidding Procedures.*—We seek comment above on the types of licenses for the 3.7-4.2 GHz band that would best serve the public interest. In the event that we accept mutually

²⁷⁷ See GeoLinks Comments at 3-4 (stating that the Commission should create a license renewal process that allows licensees reasonable certainty that licenses will be extended).

²⁷⁸ 47 U.S.C. § 309(j)(3)(A). See also *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd at 8911-18, paras. 100-23.

²⁷⁹ 47 U.S.C. § 309(j)(4)(B).

²⁸⁰ See *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd at 8912-14, paras. 105-109. The “renewal term” is tied to the license and refers to the second full term a license enters after being renewed at the end of the initial term. Under this incremental increase approach, assignment of the license to a new licensee would not impact whether a license is deemed to be in its first or second full license term.

²⁸¹ *Id.* at 8915-18, paras. 114-117.

²⁸² *Id.* at 8915, paras. 111-12.

²⁸³ See, e.g., 47 CFR §§ 24.15 (PCS); 27.13(a), (c), (d), (e), (g), (h), (i) (WCS).

exclusive applications for licenses in the band, we will grant the licenses through a system of competitive bidding, consistent with our statutory mandate.²⁸⁴ Accordingly, we seek comment on a number of proposals relating to competitive bidding for licenses for spectrum in this band, including the costs and benefits of those proposals.

163. Consistent with the competitive bidding procedures the Commission has used in previous auctions, we propose that the Commission would conduct any auction for licenses for spectrum in the 3.7-4.2 GHz band in conformity with the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's rules.²⁸⁵ Specifically, we propose to employ the Part 1 rules governing competitive bidding design, designated entity preferences, unjust enrichment, application and certification procedures, payment procedures, reporting requirements, and the prohibition on certain communications between auction applicants.²⁸⁶ Under this proposal, such rules would be subject to any modifications that the Commission may adopt for its Part 1 general competitive bidding rules in the future.²⁸⁷ In this *Notice*, we seek comment on general application of the Part 1 competitive bidding rules to any auction of 3.7-4.2 GHz licenses. We also seek comment on whether any of our Part 1 rules would be inappropriate or should be modified for an auction of licenses in this frequency band. In particular, we seek comment on the following proposals for bidding credits for designated entities in this band. As with other flexible use licenses in recent years, we propose in this band to adopt bidding credits for the two larger designated entity business sizes provided in the Part 1 rules.²⁸⁸ We also propose to offer rural service providers a

²⁸⁴ See 47 U.S.C. § 309(j)(1).

²⁸⁵ See 47 CFR §§ 1.2101-1.2114.

²⁸⁶ See, e.g., *Amendment of Part 1 of the Commission's Rules—Competitive Bidding Procedures*, Order, Memorandum Opinion and Order and Notice of Proposed Rule Making, 12 FCC Rcd 5686 (1997); Third Report and Order and Second Further Notice of Proposed Rule Making, 13 FCC Rcd 374 (1997) (“*Part 1 Third Report and Order*”); Order on Reconsideration of the Third Report and Order, Fifth Report and Order, and Fourth Further Notice of Proposed Rule Making, 15 FCC Rcd 15293 (2000), *aff'd in part and modified in part*, Second Order on Reconsideration of the Third Report and Order, and Order on Reconsideration of the Fifth Report and Order, 18 FCC Rcd 10180 (2003); Seventh Report and Order, 16 FCC Rcd 17546 (2001); Eighth Report and Order, 17 FCC Rcd 2962 (2002); Second Order on Reconsideration of the Part 1 Fifth Report and Order, 20 FCC Rcd 1942 (2005); *Implementation of the Commercial Spectrum Enhancement Act and Modernization of the Commission's Competitive Bidding Rules and Procedures*, Report and Order, 21 FCC Rcd 891 (2006); Second Report and Order and Second Further Notice of Proposed Rule Making, 21 FCC Rcd 4753 (2006); Order on Reconsideration of the Second Report and Order, 21 FCC Rcd 6703 (2006) (modified by *Erratum and Notice of Office of Management and Budget Approval of Information Collections*, 21 FCC Rcd 6622 (WTB 2006)), petition for review dismissed sub nom. *Council Tree Communications, Inc. v. FCC*, 503 F.3d 284 (3d Cir. 2007); Second Order on Reconsideration of the Second Report and Order, 23 FCC Rcd 5425 (2008), vacated in part, *Council Tree Communications, Inc. v. FCC*, 619 F.3d 235 (3d Cir. 2010); Order, 27 FCC Rcd 908 (2012).

²⁸⁷ In its most recent amendments to the Part 1 competitive bidding rules, the Commission, among other things, updated the standardized schedule of small business size standards, instituted a rural service provider bidding credit, and adopted a process by which we may establish a reasonable monetary limit or cap on the total amount of bidding credits that an eligible small business or rural service provider may be awarded in a particular auction. *Competitive Bidding Update Report & Order*, 30 FCC Rcd at 7530-31, para. 88, 7539-48, paras. 109-130.

²⁸⁸ See *Incentive Auctions Report and Order*, 29 FCC Rcd at 6761-63, paras. 473-75; 47 CFR § 1.2110(f)(2)(i)(A) (businesses with average gross revenues for the preceding 3 years not exceeding \$4 million may be eligible for a bidding credit of 35 percent), (B) (bidding credit of 25 percent for businesses with average gross revenues for the preceding 3 years not exceeding \$20 million), and (C) (bidding credit of 15 percent for businesses with average gross revenues for the preceding 3 years not exceeding \$55 million). The Part 1 rules provide that the Commission will adopt small business bidding credits in the service rules for a band. 47 CFR § 1.2110(f)(1). However, any caps with respect to available bidding credits are adopted on an auction-by-auction basis. *Id.* § 1.2110(f)(2)(ii) (cap on designated entity bidding discount), (4)(ii) (cap on rural service provider discount). Accordingly, those details will be addressed in a pre-auction Public Notices, rather than as a part of the service rules.

designated entity bidding credit for licenses in this band.²⁸⁹ Commenters addressing these proposals should consider what details of licenses in the band may affect whether designated entities will apply for them. We seek comment on new or revised rules that would be necessary to implement an incentive auction if we adopted that approach. Would a tailored version of the rules adopted for the reverse auction portion of the broadcast incentive auction²⁹⁰ be appropriate?

c. Technical Rules

164. *Power Limits for Fixed and Base Stations.*—The current rules for AWS-1, AWS-3 and AWS-4 limit base station power in non-rural areas to 1640 watts EIRP for emission bandwidths less than one megahertz and to 1640 watts per MHz EIRP for emission bandwidths greater than one megahertz,²⁹¹ and they double these limits (3280 watts EIRP or 3280 watts/MHz) in rural areas.²⁹² The same limits apply to broadband PCS stations.²⁹³ There are a few services that have a power limit of 2000 Watts per MHz, most notably, the recent 600 MHz band. In our experience the AWS limits have provided good service while avoiding harmful interference. Further, the higher power limit for rural areas may promote the Commission's goals of furthering rural deployment of broadband services. Therefore, we propose to extend Section 27.50(d)(1)-(2) to apply to both fixed and base stations in the 3.7-4.2 GHz MBX-spectrum. Thus, the power limits are proposed to be 1640 watts EIRP for emission bandwidths less than one megahertz and to 1640 watts per MHz EIRP for emission bandwidths greater than one megahertz. For operation in rural areas, defined as any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, the power limits are proposed to be 3280 watts EIRP for emission bandwidths less than one megahertz and to 3280 watts per MHz EIRP for emission bandwidths greater than one megahertz. These power limits apply to the sum of the power of all antenna elements of the fixed or base station. We seek comment on this proposal. Are the power levels we propose sufficient to provide robust mobile broadband service as well as being practical and realistic in this particular spectrum? Alternatively, would the proposed power levels need to be reduced to avoid the blocking of receivers operating in the adjacent Citizen's Broadband Radio Service at 3.5 – 3.7 GHz? We invite commenters who propose alternative solutions to provide specific technical details and thorough analysis to support their proposals.

165. It is anticipated that this new band may be able to accommodate much wider channel bandwidths than in the past. Current plans for 5G deployments are capable of channel bandwidths of as much as 100 MHz at frequencies below 6 GHz. There is some concern regarding the total power of a wide bandwidth channel when the power limit is specified as a power density level. Should the Commission propose a limit on the total power of a base station in order to relieve potential blocking? One possible solution is that the total power of a base station should be limited to 75 dBm EIRP, summed over all antenna elements, for fixed and base stations. We seek comment on this proposal.

166. We note that the power limit for most AWS services is specified based on an RMS-equivalent or average power measurement. This power measurement methodology is preferred for advanced digital modulation schemes that could create very short duration power spikes, while the overall power remains low. There are a few services whose power limit is specified based on a peak power

²⁸⁹ 47 CFR § 1.2110(f)(4)(i) (bidding credit of 15 percent for applicants meeting the requirements for being designated as a rural service provider). To be eligible to receive a rural service provider bidding credit, an applicant must meet the requirements set forth in Part 1. An applicant eligible for both small business bidding credits and rural service provider bidding credits may only receive one of the two credits. *Id.* § 1.2110(f)(2)(i).

²⁹⁰ *See id.* §§ 1.2200-2209.

²⁹¹ *Id.* § 27.50(d)(1).

²⁹² *Id.* § 27.50(d)(2). The AWS-4 limits supersede a 32 dBW limit that previously governed ATC stations in the 2180-2000 MHz band. *See New ICO Satellite Services, G.P. Order and Authorization*, 24 FCC Rcd 171, 188 para. 47 (IB 2009); *TerreStar Networks Inc., Order and Authorization*, 25 FCC Rcd 228, 235-36, paras. 23-24 (2010).

²⁹³ 47 CFR § 24.232.

measurement. We propose that the power limit be based on the average power measurement and seek comment on this proposal.

167. *Power Limits for Mobiles and Portables.*—We propose to limit the power of mobiles and portables in the 3.7-4.2 GHz MBX spectrum to 1 Watt (30 dBm). While power limits for flexible use mobile services vary in our rules (e.g., 50 milliwatts per MHz EIRP for WCS, 2 Watts EIRP for PCS, 3 Watts ERP in the 600 MHz band, 1 Watt EIRP for the AWS-1 and AWS-3 uplink bands, and 2 Watts EIRP for the AWS-4 uplink band); most devices operate at levels under 1 Watt to preserve battery life, meet exposure limits and meet power control requirements. The limit we propose falls within a range of values typically seen in AWS services, and should provide adequate power for the 5G mobile applications envisioned for the MBX spectrum considering the similarity in propagation characteristics for the MBX-spectrum band and AWS bands. Indeed, most commercial services, including LTE, CDMA and UMTS, commonly deploy mobile devices which operate at a maximum output power of 23 dBm (200 milliwatts), regardless of higher FCC power limits. However, there are a few new power class II LTE devices being developed with slightly higher output power of 26 dBm. Similar devices are expected for the new 5G standard as well. This development warrants continued flexibility in the rules to allow for a wider range of device types. We seek comment on this proposal. We further propose that mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

168. *Out of Band Emissions Limits.*—The limits we set on out of band emissions are important to protecting services in adjacent bands. This band is adjacent to the 3.5 GHz Citizens Broadband Radio Service and will also be adjacent to any service that remains in a portion of the 3.7-4.2 GHz FSS band after the Commission adopts and completes a transition plan. We propose that out of band emissions be kept to a level that will provide protection to incumbent services in adjacent bands, while allowing the full use of the new band. We propose to apply the longstanding limit on out of band emissions of -13 dBm/MHz at the authorized channel edge as measured at the antenna terminals. This out of band emission level has been used successfully to protect adjacent operations from harmful interference in several AWS bands. We seek comment on this proposal and whether to apply more stringent out of band emission limits beyond the band edge, as described below.

169. The out of band emission limits that we adopt for the MBX spectrum will depend on the characteristics of the services likely to be deployed in the MBX spectrum and the coexistence needs of services in the adjacent bands. Notably, to ensure effective coexistence with adjacent band services, it may be necessary to adopt more stringent out of band emission limits beyond the edges of the band. For example, in the Citizens Broadband Radio Service, the Commission limits out of band emission to -25 dBm/MHz at or beyond 10 megahertz outside of the band edge and -40 dBm/MHz at or beyond 20 megahertz outside of the band edge.²⁹⁴ We seek comment on the out of band emission limits that will be needed to facilitate widespread deployment of next generation wireless services in the MBX spectrum while ensuring effective coexistence with the services operating in the adjacent bands. Commenters should analyze the costs and benefits of different options and provide detailed technical analysis in support of their proposals.

170. To fully define an emissions limit, the Commission's rules generally specify details on how to measure the power of the emissions, such as the resolution bandwidth. For most AWS bands, the resolution bandwidth used to determine compliance with this limit for base stations is one megahertz or greater, except that within one megahertz of the channel edge where a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. Rather than allow use of a bandwidth dependent resolution bandwidth near the channel edge, the Upper

²⁹⁴ *Id.* § 96.41(e). We note that NCTA, in an ex parte, suggests, based on the record in the 3.5 GHz proceeding, that the Commission propose the more stringent limits and seek comment on whether different characteristics could enable relaxation of those limits. Letter from Danielle Piñeres, NCTA, to Marlene Dortch, FCC, GN Docket No. 18-122 at 4 (filed July 2, 2018). While we decline to make such a proposal, we invite comment on appropriate out of band emission limits.

Microwave Flexible Use Service (UMFUS) rules under Part 30 instead specify use of a one megahertz resolution bandwidth but allow an out of band emission limit of -5 dBm per megahertz from the channel edge out to 10 percent of the channel.²⁹⁵ Considering that the MBX spectrum, like UMFUS, will likely employ much larger signal bandwidths than AWS, should the MBX spectrum rules adopt the AWS approach to defining the resolution bandwidth or follow the UMFUS approach?

171. Finally, should the same out of band emission limits apply to both base stations and mobile handsets? While we find that mobile handsets can meet the out of band emission limit we have proposed, they also operate at lower power levels and their size could restrict the implementation of more stringent emission limits that would require nonstandard filtering. However, base station equipment may have more flexibility to implement more stringent filters if necessary to protect adjacent services. We seek comment on all aspects of the emission limits for mobile and portable devices as part of the discussion above.

172. *Coexistence with FSS Operations Above the MBX Spectrum.*—We seek comment on whether additional technical protection criteria, beyond out of band emission limits, are necessary to ensure effective coexistence with adjacent band FSS operations. As discussed above, several of the transition mechanisms under consideration could make available a portion of the 3.7-4.2 GHz band available for flexible use, while allowing continued widespread FSS operations in adjacent portions of the band.²⁹⁶ For example, under the proposal submitted by Intelsat and SES, the 3700-3800 MHz portion of the band would be initially cleared for flexible use along with an additional 40 to 60 megahertz of guard band adjacent to and above it.²⁹⁷ As part of the clearing process, Intelsat and SES have proposed to install a filter or replace the Low Noise Block converter (LNB) in every earth station so as to prevent 5G transmission in the 3700-3800 MHz from saturating the LNB of the earth stations. Intelsat and SES state that they are working with manufacturers to define the desired filter characteristics such as the rejection, roll-off, and insertion loss, but have not provided any specific numbers.²⁹⁸ We seek comment on whether such additional requirements are necessary to ensure coexistence with adjacent band operations.

173. In general, the width of the guard band and roll-off of the filter determine the amount of out-of-band rejection provided to a receiver. We seek comment on the earth station receiver protection criteria, necessary rejection performance from the external filter, and amount of spectrum it requires for the filter roll off. Should the protection limit of the FSS earth stations be based solely on interference-to-noise ratio (I/N) regardless of the actual FSS carrier power and/or earth station configuration? Should we establish a baseline FSS earth station configuration (antenna, LNB, receiver) for any interference and protection assumptions? Given the signal strength differential between the terrestrial and satellite systems, can terrestrial wireless base or mobile stations cause saturation of the LNB of FSS earth stations? Could an external filter be tunable across 3700-4200 MHz band? Will there be a minimum distance separation required between MBX transmitters and earth station receivers? What are the tradeoffs among filter performance, required guard band, level of protection, and cost of such filter? We request commenters to provide details of assumptions and analysis including MBX transmit power level, earth station protection limit, propagation model, antenna aperture and off-axis isolation.

174. Alternatively, should the Commission define the MBX transmit power limit, out of band emission limits, and guard band and allow the satellite service providers to determine how to protect the earth station receivers? The Commission typically does not specify receiver performance, and there are many variables that contribute to the receiver blocking performance from strong transmit signals in an adjacent band, including external filter, low-noise amplifier (LNA), mixer and other RF components, and digital signal processing in the baseband. Given the current design and operation of the earth stations,

²⁹⁵ 47 CFR § 30.203(b)(1).

²⁹⁶ See *supra* Section IV.B.1.

²⁹⁷ See Intelsat-SES Apr. 23, 2018 *Ex Parte*, GN Docket No. 17-183, WTB Docket No. 18-122, at 5.

²⁹⁸ See *id.*

each earth station receiver may be impacted differently for a given MBX transmit power. Therefore, it may be more practical for satellite service providers to determine how to protect the earth station receivers given the allowed transmit power level and out of band emission limits. We seek comment on this proposal.

175. The guard band used for receiver filter rejection can also be used to enhance the out of band emission performance of MBX transmitters. We seek comment on the out of band emission limit necessary at the upper end of guard band in order to ensure coexistence with earth station receivers. Does this out of band emission limit allow ubiquitous operation of base stations and mobile stations or does it require a minimum distance separation from earth station receivers? We request commenters to include proposed out of band emission at the upper end of guard band, propagation model, antenna gains and off-axis isolation between MBX transmitters and earth station receivers in their analysis. We also seek comment on whether this guard band could be used for other purposes such as coordinated fixed point-to-multipoint operations, a low power wireless broadband system, indoor-only system, or unlicensed use.

176. *Coexistence with FSS Operations in the MBX Spectrum.* There may be some FSS earth stations operating co-channel with MBX, depending on the mechanisms of expanding flexible use as described above.²⁹⁹ We seek comment on the coexistence challenges between terrestrial mobile services and the FSS earth stations that may remain in the cleared spectrum and on any specific rules that should be adopted to ensure effective coexistence between these services. In other bands, the Commission has adopted exclusion or coordination zones to protect co-channel FSS earth stations from harmful interference. Would exclusion zones or coordination zones be appropriate to protect any existing FSS earth stations in the MBX spectrum? If so, how should the size of the exclusion zone or coordination zone be determined? Should we instead specify interference protection limits that the terrestrial systems must meet to protect the earth stations? Such protection limits could take the form, for example, of an interference-to-noise ratio (I/N), carrier to interference-plus-noise ratio (C/I+N),³⁰⁰ or a power density at the FSS receiver. If so, how would such a protection limit be modeled and enforced? In applying a protection limit, exclusion zone, or coordination zone, how should the aggregate interference from multiple base stations and associated mobile devices from the different MBX licensees be taken into account? Should we require that earth stations remaining in the band be moved to less populated areas or can RF shielding of earth stations be employed to reduce the size of exclusion or coordination zones?

177. *Coexistence with FSS Operation Below 3700 MHz.*—There are 120 FSS earth stations that are authorized in the 3600-3700 MHz band. Yet, unlike FSS earth stations operating above 3800 MHz, Intelsat and SES have not proposed any particular means of protecting these earth stations against interference. Given that there will be no guard band to help prevent interference in this band, should operators of these stations be included in any transition mechanisms, including possible relocation to transponders above the MBX spectrum? How should these earth stations be treated during any transition process that is adopted for the MBX spectrum? If an earth station continues to receive signals below 3700 MHz, could the receiver be modified to protect the LNB from the MBX transmitters (e.g., by adding a filter)? We seek comment on alternative means for mitigating interference to protect any continued FSS downlink operation below 3700 MHz.

178. We seek comment and quantitative analysis to demonstrate if the proposed MBX spectrum power and emission limits are sufficient, without additional mitigation methods, to protect any FSS earth station operation below 3700 MHz.³⁰¹ We expect that a minimum propagation loss plus additional attenuation would be required to protect FSS earth stations below 3700 MHz, depending on the separation distance between FSS and MBX-spectrum transmitters, the RF propagation environment, and

²⁹⁹ See *supra* Section IV.B.1.

³⁰⁰ The carrier power is the power received by the earth station from the satellite.

³⁰¹ See 47 CFR §§ 96.17(a)(3), (b)(2) (blocking threshold of -60 dBm), 96.17(b)(1) (out of band emission into TT&C FSS), 98.17(a)(2) (co-channel threshold of -129 dBm/MHz).

FSS antenna (gain) orientation. Would exclusion zones or coordination zones be required around the earth stations?

179. We seek comment on the achievable RF shielding around the FSS earth stations and the cost thereof. Would using RF shielding be sufficient to protect FSS earth stations below 3700 MHz? In addition, or alternatively, would it be possible for the MBX spectrum licensees to engineer around the FSS antenna sites, such that the predicted propagation loss and additional attenuation of base/mobile emissions (fundamental power and out of band emission) would be sufficient to ensure that co-channel/out of band emission and blocking FSS thresholds were not exceeded?

180. *Coexistence with Telemetry, Tracking, and Command.*—FSS Earth stations that are used for telemetry, tracking and command of satellites have assignments near 3700 MHz, 3950 MHz, and 4200 MHz. These telemetry, tracking and command licenses may list widely varying bandwidths in IBFS. Most assignments are no more than 1-2 megahertz wide; however, others are less specific, and are recorded across the entire passband of the earth station receiver (i.e., 3625-4200 MHz). Since there are a limited number of telemetry, tracking and command earth stations, should we consider protection on a case-by-case basis through coordination between MBX-spectrum licensees and FSS earth station operators? What are the appropriate coexistence criteria for telemetry, tracking and command receivers³⁰² and do they differ from other earth station receivers? What interference mitigation techniques could be used to protect telemetry, tracking and command earth stations? For example, could RF shielding effectively reduce the interference to the telemetry, tracking and command earth stations? We also seek comment on whether telemetry, tracking and command earth stations located in or near densely populated areas could be relocated to more remote locations and, if so, how much such relocations would cost. Because telemetry, tracking and command transmissions are a function of satellite design and cannot be changed following launch, we recognize that earth stations receiving telemetry, tracking and command transmissions in the MBX spectrum will require protection for the lifetime of the satellite. We seek comment on if protection of these operations would require a different approach depending on whether telemetry, tracking and command earth stations are within or outside of the MBX spectrum.

181. *Coexistence with Citizens Broadband Radio Service Operations in the 3550-3700 MHz Band.*—We seek comment on the compatibility between Citizens Broadband Radio Service and MBX systems, including the suitability of the out of band emission limit proposed above.³⁰³ One concern about deploying a robust mobile broadband service adjacent to the Citizens Broadband Radio Service arises from the relatively higher power limits proposed above. One possibility for preventing interference between the services would be to impose adjacent channel power limits that could limit the differential between power levels for adjacent stations operating in the same area. Such a limit would be specified as a ratio between the total power in the channels immediately adjacent to an MBX-spectrum station to the total power in the MBX-spectrum station's emission bandwidth.³⁰⁴ Should the Commission specify such a ratio for MBX-spectrum devices, and if so, what limit would be appropriate?

³⁰² The Commission has adopted specific rules to protect TT&C earth stations that operate in and adjacent to the 3.55-3.7 GHz band. These rules require that the aggregate passband RF power spectral density at the output of a reference RF filter and antenna at the location of a TT&C FSS earth station produced by all Citizens Broadband Service Devices within 40km of the earth station shall not exceed a median RMS value of -129 dBm/MHz. See 47 CFR § 96.17.

³⁰³ In the Citizens Broadband Radio Service, the Commission has adopted out-of-channel emission limits of -13 dBm/MHz starting at the channel edges and -25 dBm/MHz beyond 10 megahertz of the channel edges. Additionally, the Commission adopted an out of band emission limit of -40 dBm/MHz beyond 20 megahertz of the 3.5 GHz band edges. 47 CFR § 96.41(e). The Commission is currently considering proposals to change the emission limits based on claims that more relaxed limits are necessary to facilitate wider channels in the 3.5 GHz band. See *Promoting Investment in the 3550-3700 MHz Band*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd 8071, 8089-8092 paras. 50-58 (2017).

³⁰⁴ This would be similar to the ACLR requirements specified in 3GPP standards.

182. *Field Strength Limit and Market Boundaries.*—If we ultimately decide to license the MBX spectrum based on geographic service areas that are less than nationwide, we will have to ensure that such licensees do not cause interference to co-channel systems operating along common geographic borders. The current rules for AWS-1, AWS-3 and AWS-4 address the possibility of harmful co-channel interference between geographically adjacent licenses by setting a field strength limit from base stations of 47 dB μ V/m at the edge of the license area. In the 600 MHz band, the Commission adopted a field strength limit of 40 dB μ V/m. In the UMFUS rules, the Commission adopted a limit of -76 dBm/m²/MHz at a height of 1.5 meters above ground at the border of a licensee’s service area.³⁰⁵

183. The 47 dB μ V/m limit that has been used in the AWS rules was developed at a time when signal bandwidths were much smaller than are likely to be used in the MBX spectrum. Furthermore, the 47 dB μ V/m limit did not have an associated bandwidth. In the H Block proceeding, Sprint requested that the Commission modify the boundary limit to set a reference measurement bandwidth of 1 MHz, with the aim of limiting boundary power density to the equivalent of that first applied to PCS systems in 1993. At that time, operators were deploying mostly Digital AMPS, PCS1900 and CDMA technologies, which had channel bandwidths of 30 kHz, 200 kHz and 1.25 MHz, respectively. Sprint claims that because today’s LTE transmissions operate on much wider bandwidths up to 20 MHz, a 47 dB μ V/m limit measured over the full channel bandwidth will effectively result in a comparatively lower power level. Sprint proposed to adjust the field strength limit from 47 dB μ V/m to 62 dB μ V/m per MHz. Verizon has made a similar claim in the Incentive Auctions proceeding, proposing a field strength limit of 50 dB μ V/m per MHz.

184. We agree with Sprint and Verizon that the market boundary limit should be related to the signal bandwidth. We propose to adopt the same -76 dBm/m²/MHz power flux density limit at the service area boundaries as is used for the UMFUS rules.³⁰⁶ This UMFUS limit was calculated based on an interference criterion of 0 dB I/N and made assumptions about a typical antenna gain. We seek comment on whether the interference criterion and technical assumptions are appropriate

185. Finally, we propose that adjacent affected area licensees may voluntarily agree upon higher field strength boundary levels. This concept is already codified in the field strength rules for both PCS and AWS services, as Sprint acknowledges. Accordingly, to maintain consistency with the PCS and other AWS bands, we propose to permit adjacent area licensees to agree to a higher field strength limit

186. *Antenna Height Limits.*—We propose, as discussed below, that the flexible antenna height rules that apply to AWS-1 and AWS-3 should generally also apply to MBX spectrum. Specific antenna height restrictions for AWS-1 and AWS-3 base stations are not set forth in Part 27 of our rules. However, all Part 27 services are subject to Section 27.56, which bans antenna heights that would be a hazard to air navigation. Furthermore, the limitations of field strength at the geographical boundary of the license discussed above also effectively limit antenna heights. We similarly propose that no unique antenna height limits are needed for MBX-spectrum facilities; rather, we believe that the general height restrictions are sufficient. We seek comment on this proposal, including the costs and benefits of the proposal and any alternatives. We do not propose a height limit for fixed stations in the MBX spectrum. Although fixed stations were limited to 10 meters above ground in the AWS-1 band and were prohibited in the AWS-3 band. There are no antenna height limits for fixed stations in the AWS-4 band, since, unlike the former, it is not directly adjacent to certain Federal incumbents. Using this same reasoning, we propose no antenna height limits for fixed operation in the MBX spectrum. We seek comment on this proposal and request technical support for any alternative proposals.

187. *Canadian and Mexican Coordination.*—Section 27.57(c) of our rules provide that several AWS services, including WCS, AWS-1, AWS-3, AWS-4 and the H Block, are subject to international agreements with Mexico and Canada. We propose to apply the same limitation to the new MBX spectrum. Until such time as any adjusted agreements between the United States, Mexico, and/or Canada

³⁰⁵ 47 CFR § 30.204(a).

³⁰⁶ 2016 *Spectrum Frontiers Order and FNPRM*, 31 FCC Rcd at 8123-8124, para. 312.

can be agreed to, operations must not cause harmful interference across the border, consistent with the terms of the agreements currently in force. We note that further modification (of the proposed or final rules) might be necessary in order to comply with any future agreements with Canada and Mexico regarding the use of these bands. We seek comment on this issue, including the costs and benefits of alternative approaches to this issue.

188. *General Part 27 Rules*—There are several additional technical rules applicable to all Part 27 services, including Sections 27.51 Equipment authorization, 27.52 RF safety, 27.54 Frequency stability, 27.56 Antennas structures; air navigation safety, and 27.63 Disturbance of AM broadcast station antenna patterns. As operations in the MBX spectrum will be a Part 27 service, we propose that all of these general Part 27 rules should apply to all MBX-spectrum licensees, including licensees who acquire their licenses through partitioning or disaggregation (to the extent the rules permit such aggregation). We seek comment on this approach, including its costs and benefits.

V. PROCEDURAL MATTERS

189. *Ex Parte Presentations*.—The proceedings shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission’s *ex parte* rules.³⁰⁷ 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 s 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.

190. *Comment Period and Filing Procedures*.—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://apps.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing. If more than one active docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

191. 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,

³⁰⁷ 47 CFR §§ 1.1200 *et seq.*

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.

192. 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).

193. *Availability of Documents.*—Comments, reply comments, and *ex parte* submissions will be available for public inspection during regular business hours in the FCC Reference Center, Federal Communications Commission, 445 12th Street, S.W., Room CY-A257, Washington, D.C.. These documents will also be available via ECFS. Documents will be available electronically in ASCII, Microsoft Word, and/or Adobe Acrobat.

194. *Initial Regulatory Flexibility Analysis.*—As required by the Regulatory Flexibility Act,³⁰⁸ the Commission has prepared an Initial Regulatory Flexibility Analysis (“IRFA”) of the possible significant economic impact on small entities of the policies and rules addressed in this *Notice*. The IRFA is set forth in Appendix B. Written public comments are requested on the IRFA. These comments must be filed in accordance with the same filing deadlines for comments on the *Notice*, and should have a separate and distinct heading designating them as responses to the IRFA.

195. *Paperwork Reduction Analysis.*—This document contains proposed new or modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) 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.

196. *Further Information.*—For additional information on this proceeding, contact Ariel Diamond of the Broadband Division, Wireless Telecommunications Bureau, at ariel.diamond@fcc.gov or (202) 418-2803, or Anna Gentry of the Mobility Division, Wireless Telecommunications Bureau, at anna.gentry@fcc.gov or (202) 418-7769, or Christopher Bair of the Satellite Division, International Bureau, at christopher.bair@fcc.gov or (202) 418-0945.

VI. ORDERING CLAUSES

197. IT IS ORDERED, pursuant to the authority found in Sections 1, 2, 3, 4(i), 7, 201, 301, 302, 303, 304, 307, 308, 309, and 310 of the Communications Act of 1934, 47 U.S.C. §§ 151, 152, 153, 154(i), 157, 201, 301, 302, 303, 304, 307, 308, 309, 310, and 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 *Notice of Proposed Rulemaking* IS HEREBY ADOPTED.

198. IT IS FURTHER ORDERED that NOTICE IS HEREBY GIVEN of the proposed regulatory changes described in this *Notice of Proposed Rulemaking*, and that comment is sought on these proposals.

199. IT IS FURTHER ORDERED that pursuant to Section 4(i) of the Communications Act of 1934, as amended, that this *Order* IS ADOPTED effective upon publication in the Federal Register. This

³⁰⁸ 5 U.S.C. § 603.

Order contains information collection requirements subject to the Paperwork Reduction Act of 1995 that are not effective until approved by the Office of Management and Budget.

200. IT IS FURTHER ORDERED that the Petition for Rulemaking filed by the Broadband Access Coalition on June 21, 2017, RM-11791, IS GRANTED to the extent indicated herein and is otherwise denied.

201. IT IS FURTHER ORDERED that the Petition for Rulemaking filed by the Fixed Wireless Communications Coalition, Inc, on October 11, 2016, RM-11778, IS GRANTED to the extent indicated herein and is otherwise denied.

202. IT IS FURTHER ORDERED that the NOTICE OF INQUIRY, GN Docket No. 17-183, *Expanding Flexible Use in the Mid-Band Spectrum Between 3.7-24 GHz*, adopted on August 3, 2017, IS TERMINATED as to the 3.7-4.2 GHz band.

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

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A
Proposed Rules

The Federal Communications Commission proposes to amend 47 CFR parts 1, 2, 25, and 27 as follows:

PART 1 – PRACTICE AND PROCEDURE

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

Authority: 47 U.S.C. 151, 154(i), 154(j), 155, 157, 160, 201, 225, 227, 303, 309, 310, 332, 1403, 1404, 1451, 1452, and 1455.

2. Amend section 1.907 by revising the definition of “Covered Geographic Licenses” to read as follows:

Covered Geographic Licenses. Covered geographic licenses consist of the following services: 1.4 GHz Service (part 27, subpart I); 1.6 GHz Service (part 27, subpart J); 24 GHz Service and Digital Electronic Message Services (part 101, subpart G); 218-219 MHz Service (part 95, subpart F); 220-222 MHz Service, excluding public safety licenses (part 90, subpart T); 600 MHz Service (part 27, subpart N); 700 MHz Commercial Services (part 27, subpart F and H); 700 MHz Guard Band Service (part 27, subpart G); 800 MHz Specialized Mobile Radio Service (part 90, subpart S); 900 MHz Specialized Mobile Radio Service (part 90, subpart S); Mid-Band Flexible Use Service (part 27, subpart O); Advanced Wireless Services (part 27, subparts K and L); Air-Ground Radiotelephone Service (Commercial Aviation) (part 22, subpart G); Broadband Personal Communications Service (part 24, subpart E); Broadband Radio Service (part 27, subpart M); Cellular Radiotelephone Service (part 22, subpart H); Dedicated Short Range Communications Service, excluding public safety licenses (part 90, subpart M); H Block Service (part 27, subpart K); Local Multipoint Distribution Service (part 101, subpart L); Multichannel Video Distribution and Data Service (part 101, subpart P); Multilateration Location and Monitoring Service (part 90, subpart M); Multiple Address Systems (EAs) (part 101, subpart O); Narrowband Personal Communications Service (part 24, subpart D); Paging and Radiotelephone Service (part 22, subpart E; part 90, subpart P); VHF Public Coast Stations, including Automated Maritime Telecommunications Systems (part 80, subpart J); Upper Microwave Flexible Use Service (part 30); and Wireless Communications Service (part 27, subpart D).

3. Amend section 1.9005 by adding paragraph (mm) to read as follows:

§ 1.9005 Includ services.

* * * * *

(mm) The Mid-Band Flexible Use Service in the 3700-4200 MHz band.

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

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

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

5. Amend Section 2.106, the Table of Frequency Allocations, by revising page 41 and, under “NON-FEDERAL GOVERNMENT (NG) FOOTNOTES,” adding footnote NG182 to read as follows:

§ 2.106 Table of Frequency Allocations.
* * * * *

Table of Frequency Allocations 3500-5460 MHz (SHF) Page 41

International Table		United States Table		FCC Rule Part(s)	
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
(See previous page)	3500-3700 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.433	3500-3600 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.433A Radiolocation 5.433	3500-3550 RADIOLOCATION G59 AERONAUTICAL RADIONAVIGATION (ground-based) G110	3500-3550 Radiolocation	Private Land Mobile (90)
3600-4200 FIXED FIXED-SATELLITE (space-to-Earth) Mobile		3600-3700 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.433	3550-3650 RADIOLOCATION G59 AERONAUTICAL RADIONAVIGATION (ground-based) G110	3550-3600 FIXED MOBILE except aeronautical mobile US105 US433	Citizens Broadband (96)
	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile	5.435	US105 US107 US245 US433 3650-3700	3600-3650 FIXED FIXED-SATELLITE (space-to-Earth) US107 US245 MOBILE except aeronautical mobile US105 US433	Satellite Communications (25) Citizens Broadband (96)
				3650-3700 FIXED FIXED-SATELLITE (space-to-Earth) NG169 NG185 MOBILE except aeronautical mobile US109 US349	
				3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) NG180, NG182 MOBILE except aeronautical mobile	Satellite Communications (25) Wireless Communications (27) Fixed Microwave (10)
4200-4400 AERONAUTICAL RADIONAVIGATION 5.438			4200-4400 AERONAUTICAL RADIONAVIGATION		Aviation (87)
5.439 5.440			5.440 US261		
4400-4500 FIXED MOBILE 5.440A			4400-4940 FIXED MOBILE	4400-4500	
4500-4800 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE 5.440A				4500-4800 FIXED-SATELLITE (space-to-Earth) 5.441 US245	
4800-4990 FIXED MOBILE 5.440A 5.442 Radio astronomy			US113 US245 US342 4940-4990	4800-4940 US113 US342 4940-4990 FIXED MOBILE except aeronautical mobile 5.339 US342 US385	
5.149 5.339 5.443 4990-5000			5.339 US342 US385 G122 4990-5000		Public Safety Land Mobile (90Y)

<p>FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Space research (passive) 5.149</p>	<p>RADIO ASTRONOMY US74 Space research (passive) US246</p>	
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NON-FEDERAL GOVERNMENT (NG) FOOTNOTES

* * * * *

NG182 In the band 3700-4200 MHz, the following provisions shall apply to geostationary satellite orbit (GSO) fixed-satellite service (space-to-Earth) operations:

(a) Space stations authorized prior to, or authorized as a result of an application filed prior to, June 21, 2018 may continue to operate on a primary basis, but no applications for new space station authorizations or new petitions for market access shall be accepted for filing after that date, other than applications by existing operators in the band seeking to make more efficient use of the band. Applications for extension, cancellation, replacement, or modification of existing space station authorizations in the band will continue to be accepted and processed normally.

(b) Earth station operations shall not claim protection from terrestrial stations, unless the requirements of 47 CFR § 25.203(n) are satisfied.

PART 25 – SATELLITE COMMUNICATIONS

6. 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.

7. Amend Section 25.203 by adding paragraph (n) to read as follows:

§ 25.203 Choice of sites and frequencies.

* * * * *

(n) Earth stations operating in the 3700-4200 MHz band shall receive interference protection from terrestrial stations only to the extent that (1) the earth station was operational as of April 19, 2018, (2) the earth station was licensed or registered (or had a pending application for license or registration) in the IBFS database as of October 17, 2018, and (3) the operator timely certified the accuracy of information on file with the Commission to the extent required by the Order adopted in FCC 18-XXX. Earth stations

failing to satisfy any of the above may continue to operate, but such operations shall be on an unprotected basis.

PART 27 – MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

8. The authority citation for Part 27 continues to read as follows:

Authority: 47 U.S.C. 154, 301, 302a, 303, 307, 309, 332, 336, 337, 1403, 1404, 1451, and 1452, unless otherwise noted.

9. Amend Section 27.1 by adding paragraph (b)(15) to read as follows:

§ 27.1 Basis and purpose.

* * * * *

(b) * * *

(15) 3700-4200 MHz.

10. Amend Section 27.13 by adding paragraph (m) to read as follows:

§ 27.13 License period.

* * * * *

(m) 3700-4200 MHz band. Authorizations for the 3700-4200 MHz band will have a term not to exceed 15 years from the date of issuance or renewal.

11. Amend Section 27.14 by revising the first sentence of paragraphs (a) and (k), and adding paragraph (u) to read as follows:

§ 27.14 Construction requirements.

(a) AWS and WCS licensees, with the exception of WCS licensees holding authorizations for the 600 MHz band, Block A in the 698-704 MHz and 728-734 MHz bands, Block B in the 704-710 MHz and 734-740 MHz bands, Block E in the 722-728 MHz band, Block C, C1 or C2 in the 746-757 MHz and 776-787 MHz bands, Block A in the 2305-2310 MHz and 2350-2355 MHz bands, Block B in the 2310-2315 MHz and 2355-2360 MHz bands, Block C in the 2315-2320 MHz band, Block D in the 2345-2350 MHz band, and 3700-4200 MHz band, and with the exception of licensees holding AWS authorizations in the 1915-1920 MHz and 1995-2000 MHz bands, the 2000-2020 MHz and 2180-2200 MHz bands, or

1695-1710 MHz, 1755-1780 MHz and 2155-2180 MHz bands, must, as a performance requirement, make a showing of “substantial service” in their license area within the prescribed license term set forth in §27.13. * * *

* * * * *

(k) Licensees holding WCS or AWS authorizations in the spectrum blocks enumerated in paragraphs (g), (h), (i), (q), (r), (s), (t), and (u) of this section, including any licensee that obtained its license pursuant to the procedures set forth in paragraph (j) of this section, shall demonstrate compliance with performance requirements by filing a construction notification with the Commission, within 15 days of the expiration of the applicable benchmark, in accordance with the provisions set forth in §1.946(d) of this chapter. * * *

* * * * *

(u) The following provisions apply to any licensee holding an authorization in the 3700-4200 MHz band:

(1) A licensee shall provide reliable signal coverage and offer service within six (6) years from the date of the initial license to at least forty-five (45) percent of the population in each of its license areas (“First Buildout Requirement”).

(2) A licensee shall provide reliable signal coverage and offer service within twelve (12) years from the date of the initial license to at least eighty (80) percent of the population in each of its license areas (“Second Buildout Requirement”).

(3) If a licensee fails to establish that it meets the First Buildout Requirement for a particular license area, the licensee’s Second Buildout Requirement deadline and license term will be reduced by two years.

(4) If a licensee fails to establish that it meets the Second Buildout Requirement for a particular license area, its authorization for each license area in which it fails to meet the Second Buildout Requirement shall terminate automatically without Commission action, and the licensee will be ineligible to regain it if the Commission makes the license available at a later date.

(5) To demonstrate compliance with these performance requirements, licensees shall use the most recently available decennial U.S. Census Data at the time of measurement and shall base their measurements of population served on areas no larger than the Census Tract level. The population within a specific Census Tract (or other acceptable identifier) will be deemed served by the licensee only if it provides reliable signal coverage to and offers service within the specific Census Tract (or other acceptable identifier). To the extent the Census Tract (or other acceptable identifier) extends beyond the boundaries of a license area, a licensee with authorizations for such areas may include only the population within the Census Tract (or other acceptable identifier) towards meeting the performance requirement of a single, individual license. For the Gulf of Mexico license area, the licensee shall demonstrate compliance with these performance requirements, using off-shore platforms, including production, manifold, compression, pumping and valving platforms as a proxy for population in the Gulf of Mexico.

12. Amend Section 27.50 by revising the introductory text to paragraphs (d), (d)(1), (d)(2), and (d)(4) to read as follows:

§ 27.50 Power limits and duty cycle.

* * * * *

(d) The following power and antenna height requirements apply to stations transmitting in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, 2180-2200 MHz, and 3700-4200 MHz bands:

(1) The power of each fixed or base station transmitting in the 1995-2000 MHz, 2110-2155 MHz, 2155-2180 MHz, 2180-2200 MHz band, or 3700-4200 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to:

(i) * * *

* * * * *

(2) The power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, 2180-2200, or 3700-4200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to:

(i) * * *

* * * * *

(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz, 1755-1780 MHz, and 3700-4200 MHz bands are limited to 1 watt EIRP. Fixed stations operating in the 1710-1755 MHz band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in these bands must employ a means for limiting power to the minimum necessary for successful communications.

13. Amend Section 27.53 by revising paragraph (h)(1) to read as follows:

§ 27.53 Emission limits.

* * * * *

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, 2180-2200 MHz, and 3700-4200 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB.

* * * * *

14. Amend Section 27.55 by adding paragraph (d) to read as follows:

§ 27.55 Power strength limits.

* * * * *

(d) Power flux density for stations operating in the 3700-4200 MHz band. The predicted or measured Power Flux Density from any Base Station operating in the 3700-4200 MHz bands at any location on the geographical border of a licensee's service area shall not exceed $-76\text{dBm/m}^2/\text{MHz}$

(measured at 1.5 meters above ground) unless the adjacent affected service area licensee(s) agree(s) to a different PFD.

* * * * *

15. Amend Section 27.57 by revising paragraph (c) to read as follows:

§ 27.57 International coordination.

* * * * *

(c) Operation in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, 2180-2200 MHz, and 3700-4200 MHz bands is subject to international agreements with Mexico and Canada.

16. Add new subpart O to read as follows:

Subpart O—3700-4200 MHz Band

Sec.

27.1400 3700-4200 MHz band subject to competitive bidding.
27.1401 Designated entities in the 3700-4200 MHz band.

§ 27.1400 3700-4200 MHz band subject to competitive bidding.

Mutually exclusive initial applications for 3700-4200 MHz band licenses are subject to competitive bidding. The general competitive bidding procedures set forth in 47 CFR part 1, subpart Q of this chapter will apply unless otherwise provided in this subpart.

§ 27.1401 Designated entities in the 3700-4200 MHz band.

(a) Eligibility for small business provisions.

(1) Definitions.

(i) Small business. A small business is an entity that, together with its affiliates, its controlling interests, and the affiliates of its controlling interests, has average gross revenues not exceeding \$55 million for the preceding three (3) years.

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

(2) Bidding credits. A winning bidder that qualifies as a small business, as defined in this section, or a consortium of small businesses may use the bidding credit of 15 percent, as specified in § 1.2110(f)(2)(i)(C) of this chapter. A winning bidder that qualifies as a very small business, as defined in this section, or a consortium of very small businesses may use the bidding credit of 25 percent, as specified in § 1.2110(f)(2)(i)(B) of this chapter.

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

APPENDIX B

Initial Regulatory Flexibility Analysis

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

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

2. Today's *Notice* seeks comment and makes proposals on a range of potential opportunities for more intensive fixed or flexible uses—particularly for wireless broadband services—in 500 megahertz of mid-band spectrum between 3.7-4.2 GHz (the band). In doing so, the *Notice* proposes to add a mobile, except aeronautical mobile, allocation to the band and seeks comment on transitioning all or part of the band to terrestrial wireless broadband services. Today's actions are another step in the Commission's efforts to close the digital divide by providing wireless broadband connectivity across the nation and to secure U.S. leadership in the next generation of wireless services, including fifth-generation (5G) wireless, Internet of Things (IoT), and other advanced spectrum-based services.

3. In this proceeding, the Commission is pursuing the joint goals of making spectrum available for new wireless uses while effectively accommodating incumbent Fixed Satellite Service (FSS) and Fixed Service (FS) operations in the band. The *Notice* seeks comment on various proposals for transitioning all or part of the band for flexible use. The *Notice* also proposes and seeks comment on revisions to Parts 25 and 101 of the Commission's rules to promote more intensive fixed use of the band. Additionally, as part of our proposal to add a mobile, except aeronautical mobile, allocation, and to develop rules that would enable the band to be transitioned for more intensive fixed and flexible uses, we encourage commenters to discuss and quantify the costs and benefits associated with any proposed approach along with other helpful technical or procedural details.

4. The 3.7-4.2 GHz band is currently allocated in the United States exclusively for non-federal use on a primary basis for the FSS (space-to-Earth) and the FS.⁴ For FSS, the 3.7-4.2 GHz band (space-to-Earth or downlink) is paired with the 5.925-6.425 GHz band (Earth-to-space or uplink), and collectively these bands are known as the "conventional C-band."⁵ Domestically, satellite operators use this band to provide downlink signals of various bandwidths to licensed transmit receive, registered receive-only, and unregistered receive-only earth stations throughout the United States. Geostationary orbit (GSO) FSS satellites operating in the C-band typically have 24 transponders, each with a bandwidth of 36 megahertz received by one or more earth stations. Predominant GSO FSS uses include delivery of programming content to television and radio broadcasters, including transportable antennas used to cover live news and sports events, cable television and small master antenna systems, as well as the backhaul of telephone and data traffic. The band is also used for reception of telemetry signals transmitted by satellites, typically near 3.7 or 4.2 GHz.

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 *id.*

⁴ 47 CFR § 2.106, United States Table of Frequency Allocations, non-Federal Table for the band 3.7-4.2 GHz.

⁵ See *id.* § 25.103 (Definitions).

5. Mid-band spectrum, in conjunction with lower and higher bands, is well suited for next generation wireless broadband services due to the combination of favorable propagation characteristics (as compared to bands above 24 GHz) and the opportunity for additional channel re-use (as compared to bands below 3.7 GHz). With the ever-increasing demand for more data on mobile networks, wireless network operators have increasingly focused on providing more data capacity rather than providing coverage over large areas from individual base stations. One technique for providing increased capacity is to use smaller cell sizes—i.e., have each base station provide coverage over a smaller area. Using higher frequencies can be advantageous for deploying a higher density of base stations. The decreased propagation distances at higher frequencies reduces the interference between base stations using the same frequency, thereby allowing base stations to be more densely packed and increasing the overall system capacity. Therefore, mid-band spectrum presents wireless providers with the opportunity to deploy base stations using smaller cells to get higher spectrum reuse than the lower frequency bands while still providing indoor coverage.⁶ Relative to higher bands, mid-band spectrum also offers favorable propagation characteristics for fixed wireless broadband services in less densely populated areas.

6. In today's *Notice* the Commission proposes to add a non-federal mobile, except aeronautical mobile, service allocation to the 3.7-4.2 GHz band, and based on our conclusion that co-channel sharing is not feasible, we seek comment on several proposals to clear all or part of the band for flexible use. Because the *Notice* seeks comment on several alternate approaches for making portions of the band available for flexible use, the appropriate operational and technical restrictions on terrestrial and FSS use of the band will depend on the selected mechanism for expanding flexible use in the band. Specifically, the *Notice* seeks comment on three potential mechanisms for expanding flexible use in the 3.7-4.2 GHz band: (1) a market-based mechanism, (2) auctions mechanisms, and (3) alternative mechanisms. In pursuing our goal of creating additional opportunities for wireless broadband in mid-band spectrum, under each approach, we seek to balance incumbent interests, speed to market, and efficiency of use.

B. Legal Basis

7. The proposed action is taken pursuant to Sections 1, 2, 3, 4(i), 7, 201, 301, 302, 303, 304, 307, 308, 309, and 310 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 153, 154(i), 157, 201, 301, 302, 303, 304, 307, 308, 309, 310, and Section 706 of the Telecommunications Act of 1996, as amended, 47 U.S.C. § 1302.

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

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 rules, if adopted.⁷ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁸ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁹ A small business

⁶ Petition for Rulemaking, Broadband Access Coalition, RM-11791, at 17 (filed June 21, 2017).

⁷ 5 U.S.C. § 603(b)(3).

⁸ *Id.* § 601(6).

⁹ *Id.* § 601(3) (incorporating by reference the definition of “small business concern” in 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.”

concern is one that: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.¹⁰

9. *Small Businesses, Small Organizations, and Small Governmental Jurisdictions.* Our action may, over time, 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.¹¹ 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 business having fewer than 500 employees.¹² These types of small businesses represent 99.9 percent of all businesses in the United States, which translates to 28.8 million businesses.¹³

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."¹⁴ 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).¹⁵

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."¹⁶ U.S. Census Bureau data from the 2012 Census of Governments¹⁷ indicate that there were 90,056 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.¹⁸ Of this number there were 37, 132 General purpose governments (county¹⁹, municipal and town or township²⁰) with populations of

¹⁰ 15 U.S.C. § 632.

¹¹ See 5 U.S.C. § 601(3)-(6).

¹² See SBA, Office of Advocacy, Frequently Asked Questions, Question 1—What is a small business? (2016), https://www.sba.gov/sites/default/files/advocacy/SB-FAQ-2016_WEB.pdf.

¹³ See SBA, Office of Advocacy, Frequently Asked Questions, Question 2—How many small businesses are there in the U.S.? (2016), https://www.sba.gov/sites/default/files/advocacy/SB-FAQ-2016_WEB.pdf.

¹⁴ 5 U.S.C. § 601(4).

¹⁵ 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 the NCCS Web Tools NCCS Nonprofits page, 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." See NCCS Nonprofits, <https://nccs.urban.org/sites/all/nccs-archive/html/tablewiz/tw.php> (last visited July 10, 2018).

¹⁶ 5 U.S.C. § 601(5).

¹⁷ 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#> (last visited July 10, 2018).

¹⁸ See U.S. Census Bureau, Local Governments by Type and State: 2012 – United States -- States 2012 Census of Governments (Sept. 26, 2013), <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).

¹⁹ See U.S. Census Bureau, County Governments by Population-Size Group and State: 2012 – United States -- States 2012 Census of Governments (Sept. 26, 2013),

less than 50,000 and 12,184 Special purpose governments (independent school districts²¹ and special districts²²) with populations of less than 50,000. The 2012 U.S. Census Bureau data for most types of governments in the local government category show that the majority of these governments have populations of less than 50,000.²³ Based on this data we estimate that at least 49,316 local government jurisdictions fall in the category of “small governmental jurisdictions.”

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.²⁴ The appropriate size standard under SBA rules is that such a business is small if it has 1,500 or fewer employees.²⁵ For this industry, U.S. Census data for 2012 show that there were 967 firms that operated for the entire year.²⁶ Of this total, 955 firms had employment of 999 or fewer employees and 12 had employment of 1000 employees or more.²⁷ Thus under this category and the associated size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities.

(Continued from previous page)

<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.

²⁰ See U.S. Census Bureau, Subcounty General-Purpose Governments by Population-Size Group and State: 2012 - United States -- States 2012 Census of Governments (Sept. 26, 2013),

<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.

²¹ See U.S. Census Bureau, Elementary and Secondary School Systems by Enrollment-Size Group and State: 2012 - United States -- States 2012 Census of Governments (Sept. 26, 2013),

<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.

²² See U.S. Census Bureau, 2012 Census of Governments, Special District Governments by Function and State: 2012 - United States -- States 2012 Census of Governments (Sept. 26, 2013),

<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.

²³ See U.S. Census Bureau, County Governments by Population-Size Group and State: 2012 - United States -- States 2012 Census of Governments (Sept. 26, 2013),

<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 2012 Census of Governments (Sept. 26, 2013), <https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG07.US01>; Elementary and Secondary School Systems by Enrollment-Size Group and State: 2012 - United States -- States 2012 Census of Governments (Sept. 26, 2013), <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.

²⁴ U.S. Census Bureau, 2012 NAICS Definitions, 517210 Wireless Telecommunications Carriers (Except Satellite), <https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.517210> (last visited July 10, 2018).

²⁵ 13 CFR § 121.201, NAICS code 517210.

²⁶ U.S. Census Bureau, Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012 Economics Census of the United States, (Jan. 08, 2016),

https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ5//naics~517210.

²⁷ *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.”

13. *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.”²⁸ 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.²⁹ For this category, U.S. Census Bureau data for 2012 show that there were a total of 333 firms that operated for the entire year.³⁰ Of this total, 299 firms had annual receipts of less than \$25 million.³¹ Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

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

14. The potential rule changes proposed in this *Notice*, if adopted, could impose some new reporting, recordkeeping, or other compliance requirements on some small entities. In addition to the proposed rule changes associated with the proposed mechanisms for expanding flexible use in the 3.7-4.2 GHz band, there could be new service rule compliance obligations. For new licensed flexible uses in the 3.7-4.2 GHz band, the *Notice* seeks comment on various service rules that should apply, including construction benchmarks and technical operating requirements. In the event the Commission adopts the proposed service rules and issues licenses for flexible use in the band, any small entity licensee would be required to satisfy construction requirements, and comply with limits on power, out of band emissions, field strength, antenna height, and other existing coordination requirements. Licensees would be responsible for making certain construction demonstrations with the Commission through the Universal Licensing System showing that they have satisfied the relevant construction benchmarks.

15. The projected reporting, recordkeeping, and other compliance requirements proposed in the *Notice* will apply to all entities in the same manner. The Commission believes that applying the same rules equally to all entities in this context promotes fairness. The revisions the Commission may ultimately adopt however, should benefit small entities by giving them more information about opportunities in the 3.7-4.2 GHz band, more flexibility to provide a wider range of services, and more options for gaining access to wireless spectrum.

16. *Application/Petition Freeze & Part 25 and 101 Modifications.* Applications for new or modified earth stations, applications for new or modified fixed microwave stations, and applications for new space stations operating in the 3.7-4.2 GHz band were previously frozen by the International, Wireless Telecommunications, and Public Safety and Homeland Security Bureaus.³² The Bureaus took these actions to preserve the current landscape of authorized operations while the Commission proceeded

²⁸ U.S. Census Bureau, 2012 NAICS Definitions, 517410 Satellite Telecommunications, <http://www.census.gov/naics/2012/def/ND517410.HTM> (last visited July 10, 2018).

²⁹ 13 CFR § 121.201, NAICS Code 517410.

³⁰ U.S. Census Bureau, Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012 Economic Census of the United States (Jan. 08, 2016), https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517410.

³¹ *Id.*

³² On April 19, 2018, the staff froze applications for new or modified fixed microwave stations and earth stations in the 3.7-4.2 GHz band to preserve the current landscape of authorized operations pending action as part of the Commission’s ongoing inquiry into the possibility of permitting mobile broadband use and more intensive fixed use of the band through this proceeding. To provide the Commission and commenters with more accurate information about existing earth stations, however, the International Bureau, as a limited exception to the freeze, concurrently opened a 90-day window during which entities that own or operate existing FSS earth stations in the 3.7-4.2 GHz band could file an application to register or license the earth station, or file an application to modify an existing registration or license. On June 21, 2018, the International Bureau extended this filing-window for an additional 90 days until October 17, 2018, and also imposed a freeze on new space stations in the 3.7-4.2 GHz band.

with an ongoing inquiry into the possibility of permitting mobile broadband use and more intensive fixed use of the band in this proceeding. To reexamine the existing full-band, full-arc coordination policy, the *Notice* proposes to revise the Commission's rules to bar new applications for space station licenses and new petitions for market access concerning space-to-Earth operations in the 3.7-4.2 GHz band. Additionally, the *Notice* seeks comment on modifying the Commission's Part 25 rules to require operators of licensed or registered FSS earth stations receiving in the 3.7-4.2 GHz band to coordinate only the specific combinations of frequency, azimuth, and elevation angle that they regularly use and that such technical information be reflected on each earth station application and authorization. The *Notice* seeks comment on whether this information should form the basis for protection from terrestrial stations.

17. The *Notice* further proposes to update IBFS to remove 3.7-4.2 GHz band earth station licenses or registrations for which the licensee or registrant does not file the certifications required in the *Order* (to the extent they registered before April 19, 2018) and, more specifically, proposes that an earth station licensed or registered in IBFS be automatically terminated unless the licensee or registrant timely files the certification required by the *Order*. The *Notice* seeks comment on revising the Part 25 rules to limit eligibility to file applications for earth station licenses or registrations to incumbent earth stations, including comments on the relative costs and benefits of such a restriction.

18. The *Notice* proposes to define incumbent earth stations as only those earth stations that (1) were operational as of April 19, 2018, (2) are licensed or registered in IBFS, or had a pending application for license or registration as of October 17, 2018, and (3) the licensee/registrant timely filed the certification required by the *Order*. We further propose that unregistered FSS earth stations lawfully receiving transmissions could continue to operate on an unprotected basis. We seek comment on whether incumbents that are small entities face any special or unique issues with respect to the transition such that they should be defined differently or have different obligations.

19. Because our consideration of some transition options may benefit from additional, more granular information on FSS earth station and space station operations in the band, the *Notice* seeks comment on whether to seek additional information from FSS earth station or space station operators,³³ including information on transponder use, satellite points of communication, and other technical and operational data that would provide a more detailed picture of the actual usage of the band. We also seek comment on whether small entities face any special or unique issues with respect to proposed information collections such that they would require certain accommodations or additional time to comply. Commenters have been asked to describe, with specificity, how any additional information collection would support a given transition proposal and should provide a detailed assessment of the costs and benefits of such additional collections.

20. Comments have also been sought by the Commission on amending Section 101.101 of the Commission's rules to permit point-to-multipoint FS broadband service in a portion of the 3.7-4.2 GHz band. In order to accommodate point-to-multipoint operations, the *Notice* seeks comment on several amendments that may be necessary to Part 25 and Part 101 of the Commission's rules that currently apply to FS. The Part 25 and 101 rules that would apply to point-to-multipoint FS operators would include regulatory requirements and restrictions including power limits, frequency coordination, and potential construction requirements. The *Notice* also seeks comment on the appropriate channel plan, power limits, service areas, antenna standards, and construction requirements for point-to-multipoint operations in the band. Further, the *Notice* seeks comment on any necessary technical requirements for frequency coordination between point-to-multipoint FS applicants and licensees and other operators in the band, including equipment authorizations for client devices that may be operated by persons other than those duly authorized by the licensee. The *Notice* also seeks comment on whether to sunset the existing point-to-point FS operations in the band.

³³ In the *Order*, we directed temporary fixed or transportable FSS earth station operators and FSS space station operators in the 3.7-4.2 GHz band to provide certain information on their current operations.

21. *Transitioning Mechanisms.* The transition to more intensive fixed and flexible use in the 3.7-4.2 GHz band will require Commission action to clear existing incumbent users from the band. The *Notice* discusses various mechanisms for clearing incumbent users from the band. Each of these potential mechanisms for transitioning the band to flexible use – (1) a market-based mechanism, (2) auctions mechanisms, (3) alternative mechanisms – would require small entities that are incumbent operators in the band to participate in some sort of negotiation and agreement (either through the secondary market or through a Commission-administered auction) to reassign their spectrum access rights. Incumbents operating in the spectrum designated for new licensed flexible use would further be required to relocate their operations to different bands, potentially requiring reconfiguration or replacement of their existing facilities. However, once relocated, such operators and licensees would remain subject to the same Commission rules and obligations under which they are already operating.

22. In light of the differing approaches to transitioning the band to flexible use and the obligations that would result, the *Notice* seeks comment from the parties on each mechanism. Specifically, for the market-based mechanism, the *Notice* seeks comment on whether the Commission should adopt rules that would enable a market-based mechanism to the clearing of incumbents from some or all of the 3.7-4.2 GHz band, introducing flexible use in the band or encouraging more intensive fixed use while simultaneously protecting critical services offered by incumbents (i.e., FSS space stations, FSS earth stations, FS licensees). Under such an approach, the Commission would seek to encourage incumbent FSS operators to voluntarily clear the spectrum. Satellite operators in the band could choose to make some or all of their spectrum available to terrestrial operators on the secondary market. In return, terrestrial operators would compensate affected incumbents. A secondary market approach could make spectrum available more quickly than other available mechanisms, such as an auction, and thus could facilitate rapid deployment of next generation wireless broadband networks. Moreover, such an approach could leverage the technical and operational knowledge of satellite space station operators while relying on market incentives to promote economic efficiency. The *Notice* seeks comment on whether a market-based mechanism could effectively and rapidly facilitate new terrestrial deployments in the band.

23. More specifically, the *Notice* states that a transition under a market-based mechanism could be undertaken in a four-step process. The first step would involve the industry voluntarily forming a Transition Facilitator composed of eligible C-band satellite operators. In the second step, the Transition Facilitator would negotiate with any interested terrestrial operators and incumbent users. In the third step, the Commission would review the Transition Facilitator's plan and conditionally authorize terrestrial licenses in the band. And in step four, the Transition Facilitator would clear the negotiated-for spectrum, making it available for flexible use while protecting incumbent earth stations through a variety of potential means. The *Notice* notes as well that a market-based process need not be a one-time event—a Transition Facilitator could negotiate with parties for compensation and protection, seek Commission review and conditional authorization, and clear new spectrum multiple times to ensure the total spectrum dedicated to flexible use meets market demands.

24. For auctions as a transition mechanism, the *Notice* seeks comment on approaches using the Commission's general auction authority to introduce flexible use in the 3.7-4.2 GHz band.³⁴ Incentive auctions provide the Commission with new tools to make additional spectrum available for broadband. Incentive auctions are a voluntary, market-based means of repurposing spectrum by encouraging licensees to compete to voluntarily relinquish spectrum usage rights in exchange for a share of the proceeds from an auction of new licenses to use the repurposed spectrum. The *Notice* therefore seeks comment on whether an incentive auction could work in the context of the 3.7-4.2 GHz band.

³⁴ See Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, § 6402, 125 Stat. 156 (2012) (Spectrum Act).

25. Recognizing that the band's incumbent structure presents unique issues distinct from those present in the broadcast incentive auction,³⁵ the *Notice* seeks comment on possible approaches to inducing satellite incumbents to reveal the least amount they must be paid to relinquish any given amount of spectrum. The *Notice* also seeks comment on whether the Commission should accept applications for overlay licenses—assigned by competitive bidding if mutually exclusive applications for it were accepted—that would permit the overlay licensees to negotiate with incumbent licensees to clear all or part of the band and then transfer flexible use licenses in the secondary market. An overlay license authorizes operation for an entire geographic area but requires the licensee to protect existing incumbents from interference indefinitely, i.e., until the rights are relinquished.³⁶ The *Notice* seeks comment on whether assigning overlay licenses in the band would expedite flexible use of more of the band compared with other approaches. Under this approach, the overlay licensee would have the right to flexible use of any spectrum that becomes available as a result of incumbents' relinquishing their spectrum usage rights. The *Notice* seeks comment on how other parties that would be affected by repurposing 3.7-4.2 GHz band spectrum should be treated, and whether the overlay licensee or the satellite incumbents relinquishing spectrum should be required to provide incumbent earth station operators comparable replacement facilities or media.

26. With the auctions mechanism, the *Notice* further seeks comment, as an alternative to paying satellite incumbents to relinquish spectrum usage rights, on conducting a reverse auction for satellite transponder capacity that could be used to replace lost C-band transponder capacity resulting from reallocating C-band spectrum to flexible use. Under this approach, an individual bidder in the reverse auction could contribute towards clearing spectrum. Potential bidders could be any FCC licensee that could make transponder capacity available in either C-band or Ku-band. Satellite bidders could offer capacity created by launching new satellites in vacant orbital slots and by relinquishing existing capacity. Satellite customers can offer capacity made available by substituting services (e.g. fiber) to fulfill their capacity needs, reducing the amount or quality of programming distributed, or using greater compression to reduce the capacity required to carry a given amount of programming or data. C-band transponder capacity that is lost due to the reduced amount of available spectrum and that was not relinquished in the reverse auction by C-band satellite operators, could be repacked onto replacement capacity for the life of those lost transponders. This would compensate C-band licensees for their lost capital investments, but not for the loss of their spectrum. The *Notice* seeks comment on whether under this approach such additional compensation for the loss of spectrum should be accomplished by extending the length of time free replacement capacity is offered or by some other means, e.g., a financial payment.

27. As another possible transition mechanism, the *Notice* seeks comment on approaches that combine various elements of the mechanisms discussed above, as well as other mechanisms for transitioning all or part of the 3.7-4.2 GHz band for wireless broadband use. For example, the *Notice* seeks comment on a hybrid approach under which the Commission would auction a majority of the band under traditional mechanisms and grant FSS operators flexible use authority (i.e., allowing them to use a market-based approach) for the rest of the band so long as they timely clear the auctioned portion. The *Notice* asks whether the Commission could use this approach or another combination of approaches to strike a balance between incumbent and new entrant interests and, if so, how much of the band should be cleared under a traditional mechanism and how much could be left for FSS space station operators to clear under a market approach. The *Notice* seeks comment on how the Commission can ensure the band

³⁵ See *Expanding the Economic and Innovation Opportunities of Spectrum through Incentive Auctions*, Notice of Proposed Rulemaking, 27 FCC Rcd 12357, 12368, para. 25 (2012).

³⁶ See, e.g., *Revision of Part 22 and Part 90 of the Commission's Rules to Facilitate Future Development of Paging Systems; Implementation of Section 309(j) of the Communications Act – Competitive Bidding*, Second Report and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 2732 (1997); *Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40 GHz Bands; Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40 GHz*, Report and Order and Second Notice of Proposed Rule Making, 12 FCC Rcd 18600 (1997).

is transitioned in a timely manner and whether a backstop mechanism should be triggered by a FSS operator's failure to clear the band in a timely manner. The *Notice* asks commenters to provide data on the costs and benefits associated with any alternative mechanism over other possible or suggested methods.

28. Recognizing that the transition to flexible use licenses in the 3.7-4.2 GHz band will be complicated logistically and needs to be carried out promptly in order to get the repurposed spectrum into the hands of flexible use licensees to address spectrum needs, the *Notice* seeks comment on a range of transition issues applicable to each of the alternative mechanisms for expanding flexible use discussed above. The *Notice* seeks comment on reasonable deadlines for implementation of each mechanism, or other approaches suggested by commenters, including deadlines for incumbents to cease transmitting on a primary basis in the portion of the 3.7-4.2 GHz band that becomes available for flexible use. The *Notice* seeks comment on how to define the appropriate class of incumbents for protection and possible reimbursement purposes and the relative obligations and/or rights that each category of incumbents may have under each mechanism. Further, the *Notice* seeks comment on what requirements and safeguards the Commission should adopt to ensure the timely and complete transition of all required incumbents pursuant to each mechanism for expanding flexible use in the band. Such requirements and safeguards could include, among others: requiring all parties act in good faith; adopting a definition of comparable facilities; adopting financial or regulatory protections that can ensure that all transition obligations are satisfied in the event of bankruptcy or other events; and any technical rules that the Commission needs to adopt to apply specifically during the transition. Finally, the *Notice* seeks comment on whether the Commission should seek additional information from FSS earth station and space station operators in the 3.7-4.2 GHz band that would provide additional clarity on the actual usage and availability of spectrum in the band.

29. Assuming that the Commission ultimately decides to add a mobile, except aeronautical mobile, allocation and make some or all of the 3.7-4.2 GHz band available for flexible use, the *Notice* proposes and seeks comment on band plans, licensing and operating, and technical rules for the 3.7-4.2 GHz band spectrum that becomes available for terrestrial mobile and fixed flexible use. The *Notice* proposes to license this spectrum under the Commission's flexible use, Part 27 rules that permit licensees to provide any fixed or mobile service consistent with the allocations for this spectrum, subject to rules necessary to prevent or minimize harmful interference.

30. *Band Plan(s)*. The *Notice* seeks comment on whether to license according to Part 27 nationwide or only in the contiguous 48 states and whether there are issues unique to any of the areas outside of the contiguous 48 that would make it impractical to transition all or part of the band to flexible use. The *Notice* seeks comment on appropriate block size(s) to promote efficient and robust use of the band for next generation wireless technologies, including 5G. Recognizing that the 3.7-4.2 GHz spectrum that becomes available for flexible use could be configured in any number of paired or unpaired modes, the *Notice* seeks comment on a range of options for paired and/or unpaired blocks and the costs and benefits of particular approaches. Finally, consistent with the Commission's approach in several other bands used to provide fixed and mobile services, the *Notice* proposes to license the 3.7-4.2 GHz Mid-Band Flexible Use (MBX) spectrum on an exclusive, geographic area basis. The *Notice* seeks comment on an appropriate geographic license area size(s) for this band and asks commenters to discuss and quantify the economic, technical, and other public interest considerations of licensing on a PEA, county, nationwide, or other basis.

31. *Licensing and Operating Rules*. In order to afford licensees the flexibility to align licenses in the 3.7-4.2 GHz band with licenses in other spectrum bands governed by Part 27 of the Commission's rules, the *Notice* proposes that licensees in the 3.7-4.2 GHz band comply with licensing and operating rules that are applicable to all Part 27 services,³⁷ including assignment of licenses by

³⁷ We note the Commission recently amended several of the rules applicable to Part 27 services. See *Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal et al.*, Second Report and Order

competitive bidding,³⁸ flexible use,³⁹ regulatory status,⁴⁰ foreign ownership reporting,⁴¹ compliance with construction requirements,⁴² renewal criteria,⁴³ permanent discontinuance of operations,⁴⁴ partitioning and disaggregation,⁴⁵ and spectrum leasing, and seeks comment on this approach.⁴⁶ The *Notice* also proposes an open eligibility standard for licenses in the 3.7-4.2 GHz band and seeks comments on the proposal that should include a discussion of the costs and benefits of the open eligibility proposal on competition, innovation, and investment. The adoption of an open eligibility approach would not affect citizenship, character, or other generally applicable qualifications that may apply under our rules. The *Notice* further seeks comment on a 15-year term for licenses in the 3.7-4.2 GHz band. Finally, in the event that the Commission assigns licenses for the 3.7-4.2 GHz band through competitive bidding, we propose to exclude from eligibility a person who has been, for reasons of national security, barred by any agency of the Federal Government from bidding on a contract, participating in an auction, or receiving a grant.⁴⁷

32. Regarding mobile spectrum holding policies, the Commission proposes not to adopt a pre-auction bright-line limit on the ability of any entity to acquire spectrum in the 3.7-4.2 GHz band through competitive bidding at auction similar to the Commission's approach in the *2017 Spectrum Frontiers Order and FNPRM*. Additionally, if an auction is chosen as the mechanism to transition to flexible uses in the 3.7-4.2 GHz band, the Commission proposes to review holdings on a case-by-case basis when applications for initial licenses are filed post-auction to ensure that the public interest benefits of having a threshold on spectrum applicable to secondary market transactions are not rendered ineffective.

33. *Performance Requirements.* The *Notice* seeks comment on requiring a 3.7-4.2 GHz band licensee, relying on mobile or point-to-multipoint service in accordance with our Part 27 rules, to provide reliable signal coverage and offer service to at least forty-five (45) percent of the population in each of its license areas within six years of the license issue date (first performance benchmark), and to at least eighty (80) percent of the population in each of its license areas within 12 years from the license issue date (second performance benchmark). For licensees relying on point-to-point service, the *Notice* seeks comment on requiring them to demonstrate within six years of the license issue date (first performance benchmark) 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, the *Notice* seeks comment on requiring a licensee relying on point-to-

(Continued from previous page) _____
and Further Notice of Proposed Rulemaking and Order, 32 FCC Rcd 8874 (2017) (*WRS Renewal Reform 2nd R&O and FNPRM*).

³⁸ 47 U.S.C. § 309(j); 47 CFR §§ 1.2101-1.2114.

³⁹ Section 303(y) provides the Commission with authority to provide for flexibility of use if: “(1) such use is consistent with international agreements to which the United States is a party; and (2) the Commission finds, after notice and opportunity for public comment, that (A) such an allocation would be in the public interest; (B) such use would not deter investment in communications services and systems, or technology development; and (C) such use would not result in harmful interference among users.” Balanced Budget Act of 1997, Pub. L. No. 105-22, 111 Stat. 251, 269-69; 47 U.S.C. § 303(y). See also 47 CFR §§ 1.2106, 27.2, 27.3.

⁴⁰ 47 CFR § 27.10.

⁴¹ 47 U.S.C. § 310; 47 CFR § 27.12.

⁴² 47 CFR § 27.14(k)

⁴³ *Id.* § 1.949.

⁴⁴ *Id.* § 1.953.

⁴⁵ *Id.* § 1.950.

⁴⁶ *Id.* § 1.9001 *et seq.*

⁴⁷ See *id.* § 27.12(b) *citing* 47 U.S.C. § 1404(c).

point service to demonstrate it has at least one link in operation and providing service per every 67,000 persons within a license area. Further, the *Notice* seeks comment on requiring licensees relying on point-to-point service to demonstrate within 12 years of the license issue date (final performance benchmark) that they have eight 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, the *Notice* seeks comment on requiring a licensee relying on point-to-point service to demonstrate it is providing service and has at least two links in operation per every 67,000 persons within a license area.

34. While the *Notice* seeks comment on performance benchmarks based on population coverage applicable for a range of fixed and mobile services, the *Notice* recognizes that 3.7-4.2 GHz licenses have flexibility to provide services potentially less suited to a population coverage metric. In particular, licensees providing Internet of Things-type fixed and mobile services may benefit from an alternative performance benchmark metric, and the *Notice* seeks comment on the appropriate metric to accommodate such service offerings.

35. Along with performance benchmarks, the *Notice* seeks comment on which penalties will most effectively ensure timely build-out. Specifically, the *Notice* states that, in the event a 3.7-4.2 GHz licensee fails to meet the first performance benchmark, the licensee's second benchmark and license term would be reduced by two years, thereby requiring it to meet the second performance benchmark two years sooner (at 10 years into the license term) and reducing its license term to 13 years. The *Notice* proposes that, in the event a 3.7-4.2 GHz licensee fails to meet the second performance benchmark for a particular license area, its authorization for each license area in which it fails to meet the performance requirement shall terminate automatically without Commission action. Additionally, we also propose that, in the event a licensee's authority to operate terminates, the licensee's spectrum rights would become available for reassignment pursuant to the competitive bidding provisions of section 309(j). Further, consistent with the Commission's rules for other licenses, including AWS-1, AWS-3, AWS-4, and H Block, the *Notice* proposes that any 3.7-4.2 GHz licensee who forfeits its license for failure to meet its performance requirements would be precluded from regaining the license.

36. *Compliance Procedures.* In addition to compliance procedures applicable to all Part 27 licensees, including the filing of electronic coverage maps and supporting documentation, the *Notice* proposes that such electronic coverage maps must accurately depict the boundaries of each license area in the licensee's service territory. If a licensee does not provide reliable signal coverage to an entire license area, the *Notice* proposes that its map must accurately depict the boundaries of the area or areas within each license area not being served. Further, the *Notice* proposes that each licensee also must file supporting documentation certifying the type of service it is providing for each licensed area within its service territory and the type of technology used to provide such service. Supporting documentation must include the assumptions used to create the coverage maps, including the propagation model and the signal strength necessary to provide reliable service with the licensee's technology. We seek comment on these proposals. We also seek comment on whether small entities face any special or unique issues with respect to the transition such that they would require additional time to comply.

37. *Renewal Term Construction Obligations.* The *WRS Renewal Reform FNPRM* proposed to apply rules adopted in that proceeding to all flexible geographic licenses.⁴⁸ Given the proposal to license this band on a geographic basis for flexible use, any additional renewal term construction obligations proposed in the *WRS Renewal Reform FNPRM* also would apply to licenses in the 3.7-4.2 GHz band. Accordingly, the *Notice* seeks comment on whether there are unique characteristics of the 3.7-4.2 GHz band that might require a different approach than the various proposals raised by the *WRS Renewal Reform FNPRM*.

38. *Competitive Bidding Procedures.* Consistent with the competitive bidding procedures the Commission has used in previous auctions, the *Notice* proposes that the Commission would conduct any

⁴⁸ *WRS Renewal Reform 2nd R&O and FNPRM*, 32 FCC Rcd at 8915, paras. 111-12.

auction for licenses for spectrum in the 3.7-4.2 GHz band in conformity with the general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's rules.⁴⁹ Specifically, the *Notice* proposes to employ the Part 1 rules governing competitive bidding design, designated entity preferences, unjust enrichment, application and certification procedures, payment procedures, reporting requirements, and the prohibition on certain communications between auction applicants. Under this proposal, such rules would be subject to any modifications that the Commission may adopt for its Part 1 general competitive bidding rules in the future.⁵⁰ The *Notice* seeks comment on whether any of our Part 1 rules would be inappropriate or should be modified for an auction of licenses in this frequency band. In particular, the *Notice* seeks comment on the following proposals for bidding credits for designated entities in this band. As with other flexible use licenses in recent years, the *Notice* proposes to adopt in this band, bidding credits for the two larger designated entity business sizes provided in the Part 1 rules. The *Notice* also proposes to offer rural service providers a designated entity bidding credit for licenses in this band.⁵¹ The *Notice* asks commenters addressing these proposals to consider what details of licenses in the band may affect whether designated entities will apply for them.

39. *Technical Rules.* Consistent with existing rules for other advanced wireless services, the *Notice* proposes power limits for fixed and base stations of 1640 watts EIRP for emission bandwidths less than one megahertz and to 1640 watts per MHz EIRP for emission bandwidths greater than one megahertz. For mobiles and portables in the 3.7-4.2 GHz band, the *Notice* proposes to limit the power to 1 Watt (30 dBm). The *Notice* also proposes that the power limit measurement methodology be based on the average power measurement and seeks comment on this proposal. Additionally, the *Notice* proposes that mobile and portable stations operating in the 3.7-4.2 GHz band must employ a means for limiting power to the minimum necessary for successful communications.

40. For out-of-band-emissions, the *Notice* proposes that emissions be kept to a level that will provide protection to incumbent services in adjacent bands, while allowing the full use of the new band, and therefore proposes to apply the longstanding limit on out-of-band-emission of -13 dBm/MHz at the authorized channel edge as measured at the antenna terminals. Further, the *Notice* seeks comment on whether additional technical protection criteria, beyond out-of-band-emission limits, are necessary to ensure effective coexistence with adjacent band FSS operations.

41. To implement field strength limit at market boundaries, the *Notice* proposes to adopt a -76 dBm/m²/MHz power flux density limit at the service area boundaries, and further proposes that adjacent affected area licensees may voluntarily agree upon higher field strength boundary levels and to permit such agreement. Regarding antenna height, the *Notice* proposes that the Part 27 flexible antenna height rules that apply to AWS-1 and AWS-3 should generally also apply to MBX spectrum, that no unique antenna height limits are needed for MBX-spectrum facilities and that no antenna height limits are needed for fixed operation in the MBX spectrum. The Commission seeks comments on these proposals, including cost and benefit information.

42. For new MBX spectrum, the *Notice* proposes to apply the limitations to Canada and Mexico from Section 27.57(c) of our rules that provide that several AWS services, including WCS, AWS-1, AWS-3, AWS-4 and H Block are subject to international agreements with Mexico and Canada.

⁴⁹ See 47 CFR §§ 1.2101-1.2114.

⁵⁰ In its most recent amendments to the Part 1 competitive bidding rules, the Commission, among other things, updated the standardized schedule of small business size standards, instituted a rural service provider bidding credit, and adopted a process by which we may establish a reasonable monetary limit or cap on the total amount of bidding credits that an eligible small business or rural service provider may be awarded in a particular auction. *Competitive Bidding Update Report & Order*, 30 FCC Rcd at 7530-31, para. 88, 7539-48, paras. 109-130.

⁵¹ 47 CFR § 1.2110(f)(4)(i) (bidding credit of 15 percent for applicants meeting the requirements for being designated as a rural service provider). An applicant eligible for both small business bidding credits and rural service provider bidding credits may only receive one of the two credits. *Id.* § 1.2110(f)(2)(i).

Lastly, the *Notice* proposes that several additional technical rules applicable to all Part 27 services, including sections 27.51 Equipment authorization, 27.52 RF safety, 27.54 Frequency stability, 27.56 Antennas structures; air navigation safety, and 27.63 Disturbance of AM broadcast station antenna patterns should apply to all MBX-spectrum licensees, including licensees who acquire their licenses through partitioning or disaggregation (to the extent the rules permit such aggregation). We seek comment on this approach, including its costs and benefits.

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

43. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): “(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof for small entities.”⁵²

44. In this proceeding, the Commission seeks to identify potential opportunities for additional flexible access—particularly for wireless broadband services—in 500 megahertz of mid-band spectrum between 3.7-4.2 GHz. While lacking specific data in general,⁵³ which includes data on small entities, the Commission has taken steps to enable it to minimize the economic burden on small entities that could occur if some of the rule changes or approaches proposed in the *Notice* are adopted. Throughout the *Notice*, the Commission seeks comment on whether small entities face any special or unique issues with respect to the information collection such that they would require certain accommodations or additional time to comply. The Commission also seeks comment on modifications that could be made to our rules regarding administrative processes that would reduce the economic impacts of proposed rule changes on small entities. Seeking comments specifically targeting small entities should provide the Commission with the requisite data to consider the most cost-effective approach to minimize the economic impact for such entities while achieving its statutory objectives.

45. With respect to the application freeze and information collection for incumbent earth stations operating in the 3.7-4.2 GHz band, the Commission has taken several steps to reduce the economic burden of its actions. During the freeze on new earth station applications and filing window for incumbent FSS earth station operators, the International Bureau granted a temporary waiver of the frequency coordination requirement in the band. To ensure that earth station data contained in the Commission’s IBFS remains accurate to facilitate frequency coordination and maximize efficient use of the spectrum, the *Notice* seeks comment on whether, for a constructed and operational earth station, any combination of frequency, azimuth, and elevation listed in the license or registration that is unused for more than, e.g., 180 days, must be deleted from the license or registration. By proposing to delete data for earth stations that are unused, the *Notice* seeks to minimize unnecessary constraints on successful frequency coordination of new operations, which reduces the economic impact on small entities, who often have more limited resources to allocate towards such regulatory compliance burdens. The *Notice* also proposes to adopt specific definitions of each class of incumbents that would require protection and be entitled to possible reimbursement for clearing the band. This proposal has the dual benefit to small entities of creating a means for compensating any unexpected costs they may experience as a result of transitioning the band to flexible use, as well as providing a clear definition of the class of operators that

⁵² 5 U.S.C. § 603(c)(1)-(4).

⁵³ *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, 32 FCC Rcd 6373 (2017) (*Mid-Band NOI*). The record in the *Mid-Band NOI*, where the Commission began an evaluation of whether spectrum between 3.7 GHz and 24 GHz can be made available for flexible use—particularly for wireless broadband services, reflects that the Commission lacks sufficient information regarding incumbent operations, including those of earth station licensees and registrants.

requires interference protection and coordination, thereby avoiding overly burdensome and unnecessary obligations.

46. The *Notice* seeks comment on several ways to facilitate more intensive fixed use of the 3.7-4.2 GHz band by allowing point-to-multipoint operations in the band through rules that will promote more efficient use of the limited spectrum available. In doing so, the *Notice* makes several proposals to reduce the burden of frequency coordination for any new point-to-multipoint licensees, which would benefit small entities, and seeks comment on rules that are narrowly tailored to the needs of point-to-multipoint operations in particular, without the need for unnecessary regulatory burdens. The *Notice* seeks comment on subjecting point-to-multipoint FS applicants to an expedited coordination process with mandatory electronic notification and response, and on the possibility of adopting an automated coordination process for point-to-multipoint FS applications. The *Notice* asks commenters to discuss specifically any modifications that could be made to the Commission's coordination rules that would reduce the economic impact on small entities. In seeking comment on the appropriate construction requirements to apply to point-to-multipoint operations, the *Notice* asks commenters to consider the economic impact on consumers and businesses in rural communities and areas that are unserved or underserved by current broadband providers, as well as any economic impact on small businesses.

47. The *Notice* discusses various proposals to reallocate and transition the 3.7-4.2 GHz band to more intensive fixed and flexible use, and seeks comment on ways to minimize the economic impact of any rule changes specifically with respect to small entities. For example, in seeking comment on whether to seek additional information from FSS earth station registrants or space station licensees, the *Notice* asks whether small entities face any special or unique issues with respect to the information collection such that they would require certain accommodations or additional time to comply.

48. Further, in its discussion of the three potential mechanisms for transitioning the band to flexible use – (1) market-based mechanism, (2) auctions mechanisms, (3) alternative mechanisms – the Commission seeks specific comment on the costs, benefits, and potential economic impact on small businesses, and asks commenters to discuss any rules or procedures that could be implemented to ensure that the needs of these communities and businesses are adequately addressed. Each of these transition mechanisms rely heavily on a competitive marketplace to set the value of spectrum and compensate incumbents for the costs of relocating, reconfiguring, and potentially lost opportunity cost. Specifically, for small entities that may be incumbent satellite or earth station operators in the band, the Commission is focused on facilitating competition in the band and ensuring that all relevant interests, not just those of the largest companies, are represented. This will help to reduce the potential economic impact on small entities.

49. The *Notice* also seeks comment on applying 15-year license terms for any licensees issued in the 3.7-4.2 GHz band. Specifically for small entities who must allocate resources carefully over the length of their license term, and have more limited funds should they be required to compete at auction for a particular license, the certainty of a longer license term would provide licensees with sufficient incentive to make the long-term investments necessary for compliance.

50. The Commission finds an overriding public interest in encouraging investment in wireless networks, facilitating access to scarce spectrum resources, and promoting the rapid deployment of mobile services to Americans. All licensees, including small entities, play a crucial role in achieving these goals. Thus while the *Notice* does not propose any exemption for small entities, as mentioned above, the Commission seeks comment on alternative obligations, timing for implementation, scope of subject licenses, penalties for failure, and other measures that could accommodate the needs and resources of small entities. The Commission will carefully consider these matters as it relates to small entities before adopting final rules in this proceeding.

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

51. None.

APPENDIX C

List of Commenters

“Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz,” GN Docket No. 17-183

21st Century Fox, Inc. (Content Companies)
3db Access
5G Americas
Aerospace and Flight Test Radio Coordinating Council, Inc.
Aerospace Vehicle Systems Institute
Agilion GmbH
Air Line Pilots Association Int'l
All Points Broadband
Alliance of Automobile Manufacturers
Alphastar America, LLC
Alteros, Inc.
American Association of State Highway & Transportation Officials
American Cable Association (ACA)
American Meteorological Society
American Weather & Climate Industry Association
Amplex Internet
APCO International
Apple Inc.
Arthur Litchfield
Association of American Railroads
Association of Global Automakers, Inc.
AT&T Services, Inc.
Aviat Networks U.S., Inc.
Aviation Spectrum Resources, Inc.
Blaze Broadband
Bluetooth SIG, Inc.
Bluetooth Special Interest Group, Inc.
Boeing Company
Broadband Access Coalition
Broadcom Corporation
Broadcom Inc.
Broadcom Limited
Cambium Networks
Cambridge Broadband Networks Limited (CBNL)
Carl Mower
CBS Corporation (Content Companies)
Center for Medical Interoperability
Central New York Interoperable Communications Consortium
CenturyLink
Charter Communications, Inc.
Cisco Systems, Inc.
City and County of Denver, Colorado
City of Kansas City, Missouri
City of Mesa, Arizona
Colorado Dept. of Transportation
Comcast Corporation
Competitive Carriers Association (CCA)

Computer & Communications Industry Association (CCIA)
Computing Technology Industry Association (CompTIA)
Comsearch
Consolidated Communications, Inc.
County of Fauquier, Virginia
County of Loudoun, Virginia
County of Suffolk New York
CTIA
Cypress Semiconductor
Decawave
Dell
DigitalGlobe, Inc.
Discovery, Inc. (Content Companies)
DISH Network Corporation
Duke Energy Corporation
Dutchess County, New York
Dynamic Spectrum Alliance (DSA)
Edison Electric Institute (EEI)
EIBASS
Elefante Group
Encina Communications Corporation
Enlace Christian Television, Inc.
Enterprise Wireless Alliance
Ericsson
Eternal Word Television Network, Inc. (EWTN)
Eutelsat S.A.
Extreme Networks
Facebook, Inc.
Federated Wireless, Inc.
Fire2Wire
Fixed Wireless Communications Coalition (FWCC)
Frontier Communications Corporation (Frontier)
General Communication, Inc.
General Electric Company
GeoLinks
Global VSAT Forum
Globalstar, Inc.
Globecast America, Inc.
Google LLC
Government Wireless Technology & Communications Association
GSM Association (GSMA)
Hewlett Packard Enterprise Company (HP)
Huawei Technologies Co., Ltd.
IEEE Dynamic Spectrum Access Networks Standards Committee (IEEE DySPAN-SC)
IEEE 802
IEEE 802.11 Wireless Local Area Networks
IEEE 802.15 Working Group
IEEE Broadcast Technology Society
iHeartMedia + Entertainment, Inc.
Information Technology Industry Council
Inmarsat, Inc.
Intel Corporation

Intelsat Corporation
Intelsat License LLC
iRobot Corporation
ITSO
Joink
Learfield Communications, LLC
LinkUp Communications Corporation
Los Angeles County, California
Lower Colorado River Authority
Massachusetts State Police
Matthew Sherman
MediaTek Inc.
MetaLINK Technologies
Michael Hamilton
Michigan Dept. of Transportation
Microchip Technology
Microsoft Corporation
Microspace Communications Corporation
Mid-Band Spectrum Coalition
Midcontinent Communications
Mimosa Networks, Inc.
Motorola Solutions, Inc.
Municipal Emergency Communication Districts Association (Texas 9-1-1 Entities)
MVDDS 5G Coalition
National Academy of Sciences
National Association of Broadcasters (NAB)
National Association of Manufacturers
National Public Radio
National Public Safety Telecommunications Council
National Spectrum Management Association (NSMA)
National Weather Association
NCTA - The Internet & Television Association (NCTA)
NetMoby, Inc.
Nevada Dept. of Transportation,
New Wave Net
New York City Police Department
Nokia
North American Broadcasters Association (NABA)
Novelda US, Inc
NTCA-The Rural Broadband Association (NCTA)
NXP Semiconductors
Open Technology Institute at New America (OTI)
OTA Broadcasting, LLC
Ozaukee County, Wisconsin,
Pacific Gas and Electric Company
PacifiCorp
Panasonic Corporation of North America
Pixius Communications,
PSSI Global Services, LLC
Public Knowledge
Qualcomm Incorporated
Regional Wireless Cooperative

Rise Broadband
RKF Engineering Solutions, LLC
Ruckus Networks, an ARRIS Company
Rural Wireless Association, Inc. (RWA)
Safety Spectrum Coalition,
Satellite Industry Association (SIA)
Satellite Technology Systems Inc
Sedgwick County Emergency Communications Advisory Board
SES Americom, Inc.
Sirius XM Radio Inc.
Snappy Internet
Society of Broadcast Engineers
Society of Broadcast Engineers Chapter 32
Sony Electronics
Sony Electronics Inc.
Southern Company Service, Inc.
Space Exploration Holdings, LLC
Space Norway AS
Speedcast Communications, Inc.
State of Florida Department of Management Services, Division of Telecommunications, Bureau of Public Safety
State of Maryland
TechNet
Telecommunications Industry Association (TIA)
Telesat Canada
Texas 9-11 Alliance (Texas 9-1-1 Entities)
Texas Commission on State Emergency Communications (Texas 9-1-1 Entities)
Time Warner Inc. (Content Companies)
T-Mobile USA, Inc.
Topaz Regional Wireless Cooperative
Tucson Electric Power Company (Tucson Electric)
United States Cellular Corporation
Univision Communications Inc. (Content Companies)
Users and Stakeholders of Hydrometeorological Information and Technology
Utah Dept. of Transportation
Utilities Technology Council (UTC)
Verizon
Viacom Inc. (Content Companies)
ViaSat, Inc.
Vivint Wireless
Walt Disney Company (Content Companies)
West Virginia Department of Military Affairs and Public Safety
Western Broadband
Wi-Fi Alliance
Windstream Services, LLC
Wireless Applications Corp.
Wireless Broadband Alliance
Wireless Innovation Forum (WIF)
Wireless Internet Service Provider Association
WISER Systems, Inc.
Wisper ISP
WorldVu Satellites Limited

Yuma Regional Communication System
Zebra Technologies
Zodiac Inflight Innovations

“Expanding Flexible Use of the 3.7 to 4.2 GHz Band,” GN Docket No. 18-122

21st Century Fox, Inc. (Content Companies)
Aerospace Industries Association
Air Line Pilots Association Int'l
Airlines for America
Alaska Communications
American Cable Association (ACA)
American Geophysical Union
American Meteorological Society
Arthur Litchfield
Association of Federal Communications Consulting Engineers
AT&T Services, Inc.
Aviation Spectrum Resources, Inc.
Bill Palone
Boeing Company
Broadband Access Coalition
CBS Corporation (Content Companies)
Comcast Corporation
Conner Media Corporation
Consolidated Communications, Inc.
Content Companies
Crawford Broadcasting Company
CTIA
Decawave
Delta Air Lines
Discovery, Inc. (Content Companies)
Dynamic Spectrum Alliance (DSA)
Eastern Sky, LLC
Edmond Trombley
Encina Communications Corporation
Ericsson
Ernest Withers
Eutelsat S.A.
Federated Wireless, Inc.
Fixed Wireless Communications Coalition (FWCC)
Frontier Communications Corporation
GCI Communication Corp.
General Aviation Manufacturers Association
GeoLinks
Globecast America, Inc.
Google LLC
Helicopter Association International
Heritage Broadcasting, LLC
iHeartMedia Communications, Inc.
Intel Corporation
Intelsat Corporation
Intelsat License LLC

International Air Transport Association
Interstate Wireless, Inc.
iPosi Inc.
James Clardy
Kentucky River Broadcasting Company, Inc.
Learfield Communications, LLC
LinkUp Communications Corporation
Mark Derbyshire
Media East, LLC
Michael Graves
Microspace Communications Corporation
Midcontinent Communications
Moody Bible Institute of Chicago
Motorola Solutions, Inc.
National Association of Broadcasters (NAB)
National Translator Association
National Weather Association
NCTA - The Internet & Television Association (NCTA)
Nokia
NPR
OTA Broadcasting, LLC
PSSI Global Services, LLC
Raytheon Company
Richard M Snavely Jr
Rockwell Collins, Inc.
Rory Conaway
Rune Duke
Satellite Industry Association
Satellite Technology Systems Inc
Sean Markis
SES Americom, Inc.
Society of Broadcast Engineers Chapter 32
Society of Broadcast Engineers
TerraNovaNet, Inc.
Thomas C. Smith
Time Warner Inc. (Content Companies)
T-Mobile USA, Inc.
United Parcel Service, Inc.
Univision Communications Inc. (Content Companies)
Verizon
Viacom Inc. (Content Companies)
Wallingford Communications, LLC
Walt Disney Company (Content Companies)
WGLM AM/FM
Wi-Fiber, Inc.
Windstream Services, LLC
WION-AM
Wireless Innovation Forum (WIF)

**STATEMENT OF
CHAIRMAN AJIT PAI**

Re: *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183; *Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission’s Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band*, RM-11791; *Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service*, RM-11778

In the 1975 summertime blockbuster *Jaws*, Police Chief Martin Brody, after a single glance at the massive shark lurking just beneath the water’s surface, memorably observed, “You’re gonna need a bigger boat.” This summer, we face a similar situation as next-generation 5G wireless innovations loom. It’s apparent that we’re gonna need a bigger boat as well—or in our case, more spectrum.

Our boat gets bigger today as we aim to make more spectrum available for the 5G future. Our focus here is on making more intensive use of the 3.7-4.2 GHz band, commonly called the C-band. To help us figure out the best way forward, we authorize the collection of additional information from the band’s current users. That data will help us figure out how to accommodate the needs of incumbents, which are primarily using the band to provide Fixed Satellite Service. It’ll also enable us to free up more spectrum for advanced wireless services.

Additionally, we seek comment on ways to open up some or all of this band for terrestrial wireless broadband use. Most notably, we tee up a number of market mechanisms for reallocating C-band spectrum. Like the \$3,000 bounty placed on the shark in *Jaws*, we hope to identify a mechanism that will unleash a frenzy of activity in this band.

Many thanks to the staff who have contributed to this complicated item. From the Wireless Telecommunications Bureau: Stephen Buenzow, Peter Daronco, Thomas Derenge, Ariel Diamond, Anna Gentry, Joyce Jones, John Lambert, Roger Noel, Matthew Pearl, Paul Powell, Becky Schwartz, Blaise Scinto, Dana Shaffer, Jeffrey Tignor, Colin Williams, Brian Wondrack, and Janet Young; from the International Bureau: Jose Albuquerque, Christopher Bair, Paul Blais, Kathleen Campbell, Diane Garfield, Jennifer Gilson, Kal Krautkramer, Robert Nelson, and Jim Schlichting; from the Office of Engineering and Technology: Bahman Badipour, Martin Doczkat, Chris Gao, Navid Golshahi, Michael Ha, Ed Mantiply, Tom Mooring, Nicholas Oros, Robert Pavlak, Barbara Pavon, Jamison Prime, Ron Repasi, and Rodney Small; from the Office of Strategic Planning & Policy Analysis: Evan Kwerel, Paul Lafontaine, and Jonathan Levy; from the Media Bureau: Thomas Horan and Sean Yun; and from the Office of General Counsel: Ashley Boizelle, Deborah Broderson, David Horowitz, Thomas Johnson, Linda Oliver, and Bill Richardson.

**STATEMENT OF
COMMISSIONER MICHAEL O'RIELLY**

Re: *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183; *Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band*, RM-11791; *Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service*, RM-11778

As someone who has spent considerable time on this issue, I thank the Chairman for bringing this important spectrum item to a vote. More than two years ago, it became readily apparent to me that a global shift in the future of spectrum had occurred and the world was eyeing mid-band spectrum as a component for 5G deployment. Thus, it became vital for the United States to have available a serious mid-band play to complement our spectrum work in the low and high bands. Since that time, I have pushed for this spectrum and other bands, such as the frequencies below 3.5 GHz, to be opened for commercial wireless use.

Given the limitations and difficulties elsewhere in mid-band, the 3.7 to 4.2 GHz band, or C-band downlink, became my primary focus. Specifically, it provides a wide swath of spectrum and it just so happens that the current primary users, certain satellite providers, are receptive to reducing their spectrum footprint. It is rare that you can see the stars align to be able to execute such a large change in spectrum policy.

To execute this win-win scenario, certain principles – at least from my view – need to be acknowledged and respected. First, the reallocation needs to happen fairly quickly. We cannot wait five or ten years to open the band for flexible wireless use. Second, a reallocation must release a sufficient amount of spectrum. In my mind, that is far more than the 100 megahertz initially proposed by the resident satellite providers. In particular, I have strongly advocated for at least 200 or 300 megahertz, with a serious review to release even more. Third, any reallocation must fully protect the incumbent contractees that currently use C-band to bring many services to consumers. From my perspective, any final proposal that doesn't do that will be close to a non-starter. That does not mean they all must be accommodated on remaining C-band spectrum, but their ability to offer services cannot be disrupted. And fourth, the proposal must include permitting unlicensed spectrum use in the C-band uplink, better known as 6 GHz. As a strong supporter of unlicensed spectrum use, this is a necessary ingredient to addressing the needs for more unlicensed spectrum users, while meeting our statutory obligations under the RAY BAUM'S Act of 2018.

The reality is that if everyone puts aside preconceived notions, a final proposal, in the very near future, can address everyone's concerns and needs. Cooperation and avoiding unnecessary tangents will be paramount. In the end, adding these frequencies to 3.5 GHz and, hopefully, spectrum at 3.4 GHz will be a firm foundation of new spectrum opportunities for 5G in the mid-bands. Today's item moves sufficiently in the right direction for my purpose, at least for the NPRM stage, so I am pleased to support it.

There are, however, some things I would have done differently than what is contained in the item. As previously stated, it is of utmost importance that this proceeding is concluded and spectrum is released into the marketplace quickly. There can be no unnecessary delays or distractions. Parts of this item, while interesting, are not practical and unlikely to be adopted. I'll just mention a couple for now. Consider that the record clearly supports a market-based approach, but the item veers off seeking comment on various auction mechanisms, many of which were not suggested in the record and some of which are incredibly complex or downright troubling. For example, those I have spoken with are scratching their heads at the transponder capacity incentive auction and are being forced to hire experts to try to make sense of it, unclear how it would work in practice. I am concerned that such ideas may detract time and attention from more viable options.

Although there are still many details to be worked out about the market-based approach, it is easy to see how the spectrum can be expeditiously put into the hands of the wireless industry and how the satellite industry and its broadcast, cable, and other customers can be made whole. The money received by the satellite industry from these free market negotiations will cover the costs of repacking their users, improving technology and filters, launching new satellites, laying fiber, or moving their customers to new technologies or satellite systems. It is not clear how some of these issues will be tackled under some of the other ideas proffered in this notice.

I also question whether eliminating full-band, full-arc is feasible. Further discussions will have to be held with industry to determine how the business model works under a different mechanism. I look forward to discussing these issues with satellite and the other affected industries as we move forward.

Additionally, I have serious concerns about the idea to permit fixed wireless use in 160 megahertz of spectrum in the upper portion of this band. I am fully supportive of fixed wireless, but the focus of this item should be clearing as much of this spectrum as possible for flexible use. It doesn't make sense to put fixed operations in 160 megahertz of this band if there are future possibilities to clear more spectrum. For example, entities have told me that 100 megahertz channels are ideal for 5G mobile operations, but taking 160 out of 500 megahertz takes two channels off the table. Once fixed operations are present, it will be hard to move them elsewhere and mobile or other uses would likely have to protect incumbents, minimizing its potential use. It is also unclear whether sharing between satellite and fixed wireless uses is compatible in bands that are likely to be congested when all satellite use is condensed into fewer frequencies. Basically, we have no idea whether and how this proposal will work.

Finally, I appreciate the Chairman's efforts to free up mid-band spectrum, including his commitment to me to bring the 6 GHz NPRM for the Commission's consideration this fall. This spectrum, which is next to the 5 GHz band, provides the next best opportunity, other than 5.9 GHz, to expand Wi-Fi and other unlicensed operations. Further, it will provide spectrum for new innovative opportunities for America's entrepreneurs and those who want to enter the marketplace without the expense of purchasing spectrum at auction. I wish we were voting on this item today, but recognizing that it will soon come will suffice.

**STATEMENT OF
COMMISSIONER BRENDAN CARR**

Re: *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183; *Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band*, RM-11791; *Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service*, RM-11778

Americans now send and receive nearly two exabytes of mobile data per month. If you have no idea how much data is in an exabyte, you're not alone. The World Cup final is on Sunday, so I thought I'd put it in soccer terms. Stay with me. If one gigabyte were the size of a soccer ball, and you were to fill a World Cup stadium from the field to the roof with them, it would take eleven stadiums to equal those two exabytes.

Not a soccer fan? OK, try this. With the amount of mobile data Americans send, you could transmit the entire printed collection of the Library of Congress every 12 seconds.

But Americans aren't just reading library books on their smartphones, of course. They're binge watching videos, they're hearing the voices of loved ones through VoLTE calls, and they're engaging the world around them using augmented reality. They're lifting themselves up and providing more opportunities for their families.

A few weeks ago in Philadelphia, I had the privilege of meeting someone who used her mobile broadband connection—and a whole bunch of grit and determination—to bring her family out of poverty and into a new life. Her name is Tommi. She's the mom to five kids, and many people have had an easier path in life. Tommi grew up in public housing. She dropped out of high school after giving birth to her first child. For the next 16 years, she made calls for a debt collection agency, which she described as a "dead end job." Tommi knew that she could do more with her life. So she enrolled in Philadelphia's Orleans Technical College. It was "four years of peanut butter and jelly sandwiches—often made for me by my kids," she said.

Tommi earned a perfect 4.0 GPA. She got a job at the Public Housing Authority, and she just bought her first home. Now she's starting a masters program in mental health so that she can give back to her community. None of this, Tommi told me, would have been possible without a mobile broadband connection. "Broadband is the backbone of a community—for finding a job, for education," she said. A mobile hotspot that she shared with her neighbors let her finish her homework, which was required to be completed online. A mobile connection enabled her to apply for employment and for admission to school.

Tommi is an inspiration. Getting the chance to meet her is something that has stuck with me. But in a lot of ways, Tommi's story is not unique. At the school in Philadelphia's Sharswood neighborhood where I met her, I spoke with kids that are in much the same position Tommi was in just a few years ago. Today, the Public Housing Authority is partnering with a wireless carrier to give each student at that school a tablet and a mobile connection. The Public Housing Authority did this because digital literacy is no longer optional for the next generation.

How do we ensure that Americans, and especially the least advantaged Americans, have the opportunity to learn, grow, and provide for a family of their own, like Tommi? It begins with a

connection.

Which brings us back to this item—to all of those soccer balls and the eleven World Cup stadiums filled to the brim every month. Five years from now, that data consumption will look more like 60 stadiums—and growing. The challenge we face is keeping up with that demand so that everyone gets a fair shot at next-generation opportunities.

At the federal level, we can help empower the private sector to meet Americans' mobile data demand through smart infrastructure policies and aggressive allocation of spectrum. On the infrastructure side, the Commission cut 1.6 billion dollars of red tape in our March order. We did so by exempting small cells, the physical building blocks of 5G, from certain federal historic and environmental review. And we're looking at additional reforms with the goal of ensuring that wireless infrastructure can be deployed in all communities.

The other key input for the future of mobile broadband is in the item before us: spectrum. I am proud of what the Commission has done so far on this front in just the past few months. In February, we paved the way for opening up spectrum above 95 GHz. In March, we sought comment on designating the 4.9 GHz band for flexible use. In April, we took a step towards bringing over 1.5 GHz of millimeter wave spectrum to auction. In May, we started a proceeding to put spectrum in the 2.5 GHz band to even more productive use. In June, we finalized rules for the 24 GHz band and sought comment on opening up the 26 GHz and 42 GHz bands for flexible use. And just this week, Chairman Pai announced that we're moving forward with the auction of spectrum in the 37 GHz, 39 GHz, and 47 GHz bands next year.

With these efforts and the race to 5G fresh in mind, we have now freed up more spectrum than any other country in the world. We're more than 4 GHz ahead of second place China. But there's still work to be done in the mid-band, where other countries have freed up substantial amounts of spectrum. That's why today's item is so important. The C-band encompasses 500 MHz of mid-band spectrum that some believe is primed for 5G deployment. As the item recognizes, we have some challenges in bringing more intensive use to this band in the U.S., including long-standing incumbent operations. This decision tees up a number of potential paths forward.

I want to draw particular attention to the notice's section on a market-based mechanism for clearing the spectrum. Under that option, we would authorize incumbents to clear on a voluntary basis all or nearly all of the band and allow them to engage in secondary market transactions. In my view, this could provide the quickest path to clearing the spectrum, and it could do so without the inevitable issues that arise when the Commission begins imposing mandates and repurposing the spectrum itself.

Financial analysts predict that investment in 5G infrastructure will peak around 2021. If this spectrum will be used for 5G, it makes the most sense to press forward with options that have the best shot at bringing this spectrum online during the initial 5G rollouts. So I encourage all stakeholders to come together to help resolve the issues.

After all, winning the race to 5G is important. And success in my view is ensuring that we get the spectrum and policies in place that will spur deployment and opportunities not just in New York or San Francisco but also in neighborhoods like Sharswood in North Philly.

This is a substantial item. I want to thank everyone who worked on it, especially the team in the Wireless Telecommunications Bureau. It has my support.

**STATEMENT OF
COMMISSIONER JESSICA ROSENWORCEL**

Re: *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183; *Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3.7-4.2 GHz Band*, RM-11791; *Fixed Wireless Communications Coalition, Inc., Request for Modified Coordination Procedures in Band Shared Between the Fixed Service and the Fixed Satellite Service*, RM-11778

The United States is not in the lead when it comes to making mid-band spectrum available for next-generation 5G networks. If you want evidence, it's right there, out in the open for all to see. You can start with South Korea, which just wrapped up an auction for the 3.5 GHz and 28 GHz bands last month, generating more than \$3 billion by moving the two bands together. You can also look at the United Kingdom, which auctioned the 2.3 GHz and 3.4 GHz bands earlier this year. In Spain, the process of auctioning 200 megahertz of spectrum in the 3.6-3.8 GHz bands is already underway. This morning Italy announced that on September 10 it will kick off an auction of 200 megahertz in the 3.6-3.8 GHz band. On top of that, China has already cleared and reserved the 3.3-3.6 GHz and 4.8-5.0 GHz bands for 5G service.

We're behind. That's the not-so-good news. Because the price we pay when we cede leadership is a loss in early scale and a voice in standards development and device specifications that can yield innovation and jobs we want to see here, on our shores.

Now the good news. With today's rulemaking and order we are doing something about it. We explore a variety of mechanisms for clearing the 3.7-4.2 GHz band for 5G use. And if we make headway here, we can start to reclaim lost leadership in spectrum that is critical for success in 5G networks.

To this end, we seek comment on a wide range of proposals for opening up the the 3.7-4.2 GHz band. We ask about everything from overlay licenses to incentive auctions to capacity auctions in order to expand the possibility of flexible use in this spectrum.

We also seek comment on a proposal from satellite operators that hold equal, non-exclusive rights to the entire band. Together, they have put forward a market-based mechanism to repurpose these airwaves in an expedited fashion. This proposal is creative. But it also raises challenging questions that this agency must tackle to fulfill our statutory obligations. First, the combination of a limited number of operators, non-exclusive licensing, and the scarcity of mid-band spectrum could create opportunities to price this resource above what a truly competitive market with a large pool of fungible spectrum would support. Second, that means we need to acknowledge that what incumbent providers stand to reap from a secondary market sale of repurposed spectrum is significant. We need a framework to ensure that this approach truly serves the public interest. Third, we need to acknowledge that these frequencies are used right now by television and radio broadcasters and cable operators to deliver programming to more than 100 million American households. I believe we need a record that addresses all three of these challenges in addition to the other proposals that aim to expand flexible use in this band.

Finally, I believe any effort to reclaim leadership in mid-band spectrum for 5G needs to include other airwaves, like the 3.5 GHz band, which for several years has been ready to go but is still inexplicably mired in this agency's bureaucracy. In addition, we need a spectrum calendar. We have no reason for not being transparent about how and when new resources will be made available to the public. With a blitz of proceedings before us involving the 2.5 GHz, 3.5 GHz, 3.7-4.2 GHz, 4.9 GHz, 5.9 GHz, 6 GHz, 12 GHz, 24 GHz, 26 GHz, 28 GHz, 32 GHz, 37 GHz, 39 GHz, 42 GHz, 47 GHz, 50 GHz, and above 95 GHz, it is time to put every band on a schedule that is publicly available. There is no reason for this agency to be so opaque about what is being auctioned and when. Moreover, when we do hold auctions we should put a premium on auctioning 5G bands together, instead of one-by-one, as proposed for the 28 GHz and 24 GHz auctions coming up this fall. If we do these things, we have a fighting chance to lead in the deployment of the next generation of wireless networks—for which mid-band spectrum is key both at home and abroad.

But most importantly, we need to get started. Right here, right now. As a result, today's rulemaking and order has my support.