

FCC FACT SHEET*

Modernizing and Expanding Access to the 70/80/90 GHz Bands

Notice of Proposed Rulemaking and Order, WT Docket No. 20-133, et al.

Background: This *Notice of Proposed Rulemaking* initiates a proceeding to explore innovative new commercial uses of the 71–76 GHz, 81–86 GHz, 92–94 GHz, and 94.1–95 GHz bands (collectively, the “70/80/90 GHz bands”), which are allocated to co-primary non-Federal and Federal use. 70/80/90 GHz band licensees currently use this spectrum for fixed, point-to-point communications links but the spectrum is unused (or minimally used) in large parts of the United States. This underuse, combined with recent technological developments, makes the 70/80/90 GHz bands a potential resource for several categories of new and innovative service offerings, especially wireless 5G backhaul and broadband services on-board aircraft and ships, in furtherance of the Commission’s 5G FAST Plan.

What the Notice of Proposed Rulemaking Would Do:

- Propose changes to antenna standards for the 70 and 80 GHz bands to permit the use of smaller antennas and seek comment on whether to make similar changes in the 90 GHz band.
- Propose to authorize point-to-point links to endpoints in motion in the 70 and 80 GHz bands and classify those links as “mobile” service.
- Seek comment on whether the Commission should change its link registration rules for the 70/80/90 GHz bands to eliminate never-constructed links from third-party registration databases.
- Seek comment on any technical and operational rules necessary to allow new service offerings in the 70 and 80 GHz bands and to mitigate interference to both incumbents and other proposed users of these bands.

What the Order Would Do:

- Deny two requests for partial waiver of the Commission’s existing antenna standards for the 71–76 and 81–86 GHz bands.

* This document is being released as part of a “permit-but-disclose” proceeding. Any presentations or views on the subject expressed to the Commission or its staff, including by email, must be filed in WT Docket No. 20-133, which may be accessed via the Electronic Comment Filing System (<https://www.fcc.gov/ecfs/>). Before filing, participants should familiarize themselves with the Commission’s *ex parte* rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission’s meeting. See 47 CFR § 1.1200 et seq.

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

In the Matter of)
Modernizing and Expanding Access to the) WT Docket No. 20-133
70/80/90 GHz Bands)
Amendment of Part 101 of the Commission's) WT Docket No. 10-153
Rules to Facilitate the Use of Microwave for)
Wireless Backhaul and Other Uses and to Provide)
Additional Flexibility to Broadcast Auxiliary)
Service and Operational Fixed Microwave)
Licensees)
Aeronet Global Communications Inc. Petitions for) RM-11824 (Aviation)
Rulemaking to Amend the Commission's) RM-11825 (Maritime)
Allocation and Service Rules for the 71-76 GHz,)
81-86 GHz, and 92-95 GHz Bands to Authorize)
Aviation and Maritime Scheduled Dynamic)
Datalinks)
Requests of Aviat Networks and CBF Networks,) WT Docket No. 15-244
Inc. d/b/a Fastback Networks for Waiver of Certain) (Terminated)
Antenna Requirements in the 71-76 and 81-86 GHz)
Bands)

NOTICE OF PROPOSED RULEMAKING AND ORDER*

Adopted: []

Released: []

Comment Date: 30 days after date of publication in the Federal Register
Reply Comment Date: 60 days after date of publication in the Federal Register

By the Commission:

I. INTRODUCTION

1. We initiate a proceeding to explore innovative new uses of the 71-76 GHz, 81-86 GHz, 92-94 GHz, and 94.1-95 GHz bands (collectively, the "70/80/90 GHz bands"). In particular, we seek comment on potential rule changes for non-Federal users to facilitate the provision of wireless backhaul for 5G, as well as the deployment of broadband services to aircraft and ships, while protecting incumbent

* This document has been circulated for tentative consideration by the Commission at its June 2020 open meeting. The issues referenced in this document and the Commission's ultimate resolution of those issues remain under consideration and subject to change. This document does not constitute any official action by the Commission. However, the Chairman has determined that, in the interest of promoting the public's ability to understand the nature and scope of issues under consideration, the public interest would be served by making this document publicly available. The FCC's ex parte rules apply and presentations are subject to "permit-but-disclose" ex parte rules. See, e.g., 47 CFR §§ 1.1206, 1.1200(a). Participants in this proceeding should familiarize themselves with the Commission's ex parte rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission's meeting. See 47 CFR §§ 1.1200(a), 1.1203.

operations in the 70/80/90 GHz bands. We seek to promote expanded use of this co-primary millimeter-wave spectrum for a myriad of innovative services by commercial industry, and in particular, we seek to take advantage of the highly directional signal characteristics of these bands, which may permit the co-existence of multiple types of deployments. We also deny two requests for partial waiver of the antenna standards for the 71–76 and 81–86 GHz bands. Because this is co-primary spectrum for Federal and non-Federal users, we will coordinate any proposed rule changes with the affected agencies and the National Telecommunications and Information Administration (NTIA). This is consistent with established practice, in that, when evaluating any band that includes a shared allocation for Federal use, the FCC will work with NTIA to evaluate potential impacts associated with any new or expanded non-Federal use of shared allocations.

II. BACKGROUND

A. 70/80/90 GHz Bands

2. In the United States, the 70/80/90 GHz bands are allocated on a co-primary basis for Federal and non-Federal use, as follows.¹

| <u>Band</u> | <u>Non-Federal Use</u> | <u>Federal Use</u> |
|------------------------|--|---|
| 71–74 GHz | Fixed, Fixed Satellite, Mobile, and Mobile Satellite | Fixed, Fixed Satellite, Mobile, and Mobile Satellite |
| 74–76 GHz ² | Fixed, Fixed Satellite, Mobile, Broadcasting, and Broadcasting Satellite | Fixed, Fixed Satellite, and Mobile |
| 81–84 GHz ³ | Fixed, Fixed Satellite, Mobile, Mobile Satellite, and Radio Astronomy | Fixed, Fixed Satellite, Mobile, Mobile Satellite, and Radio Astronomy |
| 84–86 GHz | Fixed, Fixed Satellite, Mobile, and Radio Astronomy | Fixed, Fixed Satellite, Mobile, and Radio Astronomy |
| 92–94 GHz, 94.1–95 GHz | Fixed, Mobile, Radio Astronomy, and Radiolocation | Fixed, Mobile, Radio Astronomy, and Radiolocation |

In addition, the 94–94.1 GHz segment of the band is allocated for Federal use for Earth Exploration Satellite, Radiolocation, and Space Research and for non-Federal use for Radiolocation.⁴ In the 71–76 GHz band (the “70 GHz band”) and 81–86 GHz band (the “80 GHz band”), Fixed, Mobile, and Broadcasting services must not cause harmful interference to, nor claim protection from, Federal Fixed-Satellite Service operations located at 28 military installations.⁵ In addition, in the 80 GHz band, and in the 92–94 GHz and 94.1–95 GHz bands (collectively, the “90 GHz band”), licensees proposing to register links located near 18 radio astronomy observatories must coordinate their proposed links with those

¹ 47 CFR § 2.106.

² 47 CFR § 2.106. Additional allocations for Federal and non-Federal use for Space Research are on a secondary basis.

³ 47 CFR § 2.106. Additional allocations for Federal and non-Federal use for Space Research are on a secondary basis.

⁴ 47 CFR § 2.106. Additional allocations for Federal and non-Federal use for Radio Astronomy are on a secondary basis.

⁵ See 47 CFR § 2.106, n.US389.

observatories.⁶ Finally, the adjacent 86–92 GHz band is allocated for Earth Exploration-Satellite (passive), Space Research (passive), and Radio Astronomy services.⁷ Given that the allocations for these bands include Federal and non-Federal use, we will follow established practice in coordinating with NTIA prior to adopting any new or revised rules in this proceeding that would affect Federal users.⁸

3. In 2003, the Commission established service rules for non-Federal use of the 70/80/90 GHz bands through a two-pronged, non-exclusive licensing regime.⁹ Under the first prong, an entity may apply for a nationwide, non-exclusive license for the entire 12.9 gigahertz of the 70/80/90 GHz bands, which serves as a prerequisite to satisfying the second prong. Under the second prong, a licensee may operate links after completing coordination with Federal operations through NTIA’s database¹⁰ and after providing an interference analysis to one of the third-party database managers.¹¹ Licensees are afforded first-in-time priority for successfully registered links relative to subsequently registered links.¹² Non-Federal licensees may use the 70/80/90 GHz bands for any point-to-point, non-broadcast service.¹³

4. The Commission periodically has reviewed the service rules governing the 70/80/90 GHz bands. For example, in 2005, the Commission modified several of its technical rules, including interference protection criteria, antenna characteristics, band segmentation, and power spectral density.¹⁴ In 2012, the Commission sought input on whether modifications of the Commission’s antenna standards applicable to a number of microwave bands (including the 70/80/90 GHz bands) would promote wireless

⁶ See 47 CFR § 2.106, n.US161.

⁷ See 47 CFR § 2.106, n.US246 and n.US74.

⁸ The Communications Act charges the Commission with the licensing and regulation of commercial and private spectrum use, 47 U.S.C. §§ 151, 301, while NTIA has been delegated authority over radio stations “belonging to and operated by the United States.” 47 U.S.C. § 305(a); 47 U.S.C. § 902(b)(2)(A) (delegating authority to regulate government radio stations to NTIA). The Commission and NTIA coordinate their respective spectrum management responsibilities pursuant to a Memorandum of Understanding, with the goal of promoting the efficient use of the radio spectrum in the public interest. Memorandum of Understanding Between the Federal Communications Commission and the National Telecommunications and Information Administration, at 1 (Jan. 31, 2003), <https://docs.fcc.gov/public/attachments/DOC-230835A2.pdf>.

⁹ *Allocations and Service Rules for 71–76 GHz, 81–86 GHz and 92–95 GHz Bands*, WT Docket No. 02-146, Report and Order, 18 FCC Rcd 23318, 23322, para. 5 (2003) (*70/80/90 GHz Report and Order*).

¹⁰ If a proposed link does not interfere with existing Federal operations then it is given a “green light;” if it may interfere with existing Federal operations, then it is given a “yellow light,” indicating that further coordination is necessary. 47 CFR § 101.1523; *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23342–43, para. 54; *Wireless Telecommunications Bureau Announces Licensing and Interim Link Registration Process, Including Start Date for Filing Applications for Non-Exclusive Nationwide Licenses in the 71 –76 GHz, 81 –86 GHz, and 92 –95 GHz Bands*, WT Docket No. 02-146, Public Notice, 19 FCC Rcd 9439, 9447 (WTB 2003). The “green light” / “yellow light” system protects the sensitive nature of the locations of military installations.

¹¹ See 47 CFR § 101.1523(b).

¹² *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23339–40, para. 45.

¹³ 47 CFR § 101.1507.

¹⁴ *Allocations and Service Rules for the 71–76 GHz, 81–86 GHz, and 92–95 GHz Bands*, WT Docket No. 02-146, Memorandum Opinion and Order, 20 FCC Rcd 4889, 4905, para. 34 (2005) (*70/80/90 GHz Reconsideration Order*). The current service rules governing the 70/80/90 GHz bands are in 47 CFR § 101.1501–101.1527, in addition to other operative subparts of Part 101. Unlicensed devices operating in the 92–95 GHz band are governed by Part 15 of the Commission’s rules. This Notice of Proposed Rulemaking does not contemplate changes to the Part 15 rules. See 47 CFR § 15.257.

backhaul use.¹⁵ In the *2016 Spectrum Frontiers* proceeding, the Commission sought comment on whether to authorize flexible-use services, including mobile, in the 70/80/90 GHz bands,¹⁶ but it ultimately declined to do so.¹⁷

5. Use of spectrum in the 70/80/90 GHz bands is primarily concentrated along a few routes, with minimal use in large parts of the United States.¹⁸ As of March 23, 2020, there were 658 active non-exclusive nationwide licensees in the 70/80/90 bands.¹⁹ Based upon information available from the third-party database managers responsible for registering links in those bands, as of March 23, 2020, there were 18,770 registered fixed links²⁰ in the 70 GHz and 80 GHz bands.²¹

B. Rule Modifications Proposed by Parties

6. Several parties supporting expanded use of the 70/80/90 GHz bands propose changes to the rules governing the bands. The Fixed Wireless Communications Coalition (FWCC) proposes several changes to the Commission's Part 101 rules governing the 70 GHz and 80 GHz bands.²² In particular, FWCC asks for the following rule modifications: (1) allow smaller antennas for fixed point-to-point operations; (2) permit alternate polarization for antennas; (3) prevent the accumulation of never-built

¹⁵ See *Amendment of Part 101 of the Commission's Rules to Facilitate the Use of Microwave for Wireless Backhaul and Other Uses and to Provide Additional Flexibility to Broadcast Auxiliary Services and Operational Fixed Microwave Licensees, et al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Second Notice of Inquiry, Order on Reconsideration, and Memorandum Opinion and Order, 27 FCC Rcd 9735, 9764–65, paras. 76–81 (2012) (*Wireless Backhaul Reform Order*). This proceeding remains open.

¹⁶ *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8165–67, para. 440 (2016) (*2016 Spectrum Frontiers FNPRM*).

¹⁷ *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, 11054, para.200 (2017) (*2017 Spectrum Frontiers Second Report and Order*). The Commission reserved the right to reconsider mobile use in the 70/80/90 GHz bands as the technology develops. *2017 Spectrum Frontiers Second Report and Order*, 32 FCC Rcd at 11054, para. 201.

¹⁸ *2016 Spectrum Frontiers FNPRM* at 8161-2, para. 432 and Figure 3.

¹⁹ These statistics are based on a review of the Universal Licensing System on March 23, 2020.

²⁰ A link in this context is defined as a communication path between one location and another in a single direction. Multiple channels registered between the same transmit and receive location are considered separate links. Bi-directional communications are also counted as separate links.

²¹ These statistics are based on a review of the third-party database managers' data on March 23, 2020. This excludes 142 additional links whose registration was pending on March 23, 2020. See <https://www.comsearch.com/products/online-tools/millimeter-wave-70-90-ghz-registration/>; and <http://www.micronetcommunications.com/LinkRegistration/Query.aspx>; see also Comsearch, Aeronet Aviation and Maritime Communications Systems; Compatibility with Incumbent E-band Fixed Services and Link Registration System 13 (May 2, 2019) (Comsearch Report), attached to *Ex Parte* Letter from Samuel L. Feder, Counsel to Aeronet Global Communications Inc. to Marlene H. Dortch, Secretary, FCC, RM-11824 and RM-11825 (filed May 10, 2019) (Aeronet May 10, 2019 Letter) (asserting that 31,772 antennas were deployed in the E-band as of February 25, 2019).

²² Letter from Cheng-yi Liu, Counsel, Fixed Wireless Communications Coalition, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 2 (filed Feb. 13, 2018) (FWCC *Ex Parte*) citing Comments of the Fixed Wireless Communications Coalition in Response to the Commission's Notice Of Inquiry, WT Docket No. 10-153 (filed Oct. 5, 2012), amended by Letter from Mitchell Lazarus, Counsel, FWCC to Marlene H. Dortch, Secretary, FCC in WT Docket No. 10-153 (filed April 4, 2013), further amended by Letter from Mitchell Lazarus, Counsel, FWCC to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 (filed March 24, 2014).

links in the registration database and allow certain amendments to registrations; and (4) adopt a channel plan for the bands.²³ In particular, FWCC contends that the use of smaller antennas will support the provision of backhaul for emerging 5G services using higher frequency bands. Because of short-distance propagation in these bands, FWCC asserts that backhaul facilities will be deployed in neighborhoods and communities, and must be smaller, lower-cost, and more aesthetically pleasing than the antennas permitted under the current rules.²⁴ T-Mobile, Nokia, and 5G Americas have supported FWCC's proposals for smaller antenna sizes in the 70 GHz and 80 GHz bands.²⁵ Several parties support the accommodation of smaller antennas for 5G backhaul.²⁶ Additionally, the 5G Wireless Backhaul Advocates support changes to the link registration system to prevent the accumulation of never-constructed links in the system.²⁷ FWCC and the 5G Backhaul Advocates note that Canada and other countries have rules that permit smaller antennas in the 70 GHz and 80 GHz bands.²⁸

7. In 2019, Aeronet Global Communications, Inc. (Aeronet) filed petitions for rulemaking that sought to permit the use of "Scheduled Dynamic Datalinks" (SDDLs) to provide broadband service to aircraft or ships in motion in the 70/80/90 GHz bands.²⁹ Aeronet indicates that its technology would configure and maintain, in real time, multiple networks involving a variety of point-to-point links between nodes, including ground stations, relay nodes, ships, and aircraft.³⁰ Aeronet asserts that it would use ground or shore stations to transmit narrow beams towards known flight paths or ship routes without

²³ FWCC *Ex Parte* at 2.

²⁴ FWCC *Ex Parte* at 3.

²⁵ Letter from John Hunter, Senior Director, Technology and Engineering Policy, T-Mobile USA, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153, *et al.* (filed January 18, 2018) (T-Mobile *Ex Parte*); Letter from Jeffrey A. Marks, Head of Regulatory Affairs North America, Nokia, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 *et al.* (filed Mar. 19, 2019) (Nokia *Ex Parte*); Letter from Chris Pearson, President, 5G Americas, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 *et al.* (filed May 6, 2019) at 1 (5G Americas *Ex Parte*).

²⁶ Letter from Jeffrey A. Marks, Head of Regulatory Affairs North America, Nokia, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 *et al.* (filed Mar. 17, 2020) (5G Wireless Backhaul Advocates *Ex Parte*); Letter from John Hunter, Senior Director, Technology and Engineering Policy, T-Mobile USA, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153, *et al.* (filed January 18, 2018) (T-Mobile *Ex Parte*); Letter from Jeffrey A. Marks, Head of Regulatory Affairs North America, Nokia, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 *et al.* (filed Mar. 19, 2019) (Nokia *Ex Parte*); Letter from Chris Pearson, President, 5G Americas, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 *et al.* (filed May 6, 2019) at 1 (5G Americas *Ex Parte*).

²⁷ 5G Wireless Backhaul Advocates *Ex Parte* at 2.

²⁸ FWCC *Ex Parte* at 4; 5G Wireless Backhaul Advocates *Ex Parte* Presentation at 13.

²⁹ *See* Petition for Rulemaking of Aeronet Global Communications Inc., RM-11824 (filed Feb. 6, 2019) (Aeronet Aviation Petition); Petition for Rulemaking of Aeronet Global Communications Inc., RM-11825 (filed Feb. 6, 2019) (Aeronet Maritime Petition). In its filings, Aeronet refers to the 70/80/90 GHz bands collectively as the E-band, a designation used by the Radio Society of Great Britain (RSGB), but not by the IEEE. *See* Fundamentals of Microwave Photonics, Vincent J. Urlick, Jr., Jason D. McKinney, Keith J. Williams (6 February 2015) at 450–452. Except where quoting from Aeronet's (or others') pleadings, we will continue to use the 70/80/90 GHz bands designation to refer to these frequencies, consistent with the Commission's prior practice. Aeronet's specific proposals for changes to our rules are laid out in its Petitions. *See* Aeronet Aviation Petition at 28–29; Aeronet Maritime Petition at 26–27.

³⁰ Aeronet Aviation Petition at 13; Aeronet Maritime Petition at 11. Aeronet defines "relay nodes" as aerostats or drones, at fixed locations below 1,000 feet, either tethered or untethered, to allow SDDLs beyond the horizon. Aeronet Maritime Petition at 11, n.25. Comsearch defines an aerostat as "a tethered airship at a fixed location above international waters functioning as a repeater station." Comsearch Report at 3, n.1.

causing interference to existing point-to-point links authorized in the bands.³¹ The initial connected aircraft or ship also could serve as a conduit through which broadband service could reach other aircraft or ships within a specified area through a sub-mesh network.³² As Comsearch notes, Aeronet's links for aviation would operate between ground stations and aircraft, and between aircraft; Aeronet's links for maritime would operate between shore stations and ships, between shore stations and aerostats, between aerostats and ships, and between ships.³³ In its 2019 petitions for rulemaking, Aeronet contends that its operations could "further mitigate any risk of interference" to not only mobile and terrestrial users of the spectrum for 5G backhaul but also to "Federal FSS operations located at the 28 military bases" and the 18 Federal radio astronomy observatories.³⁴ Aeronet requests that the Commission modify its Part 101 rules to authorize SDDLs as a "fixed service" that can operate in the 70/80/90 GHz bands and to increase the transmitter power limits that would apply to these operations.³⁵

8. In response to the Commission's Public Notice seeking comment on Aeronet's petitions,³⁶ several parties expressed general support for changes to the rules applicable to the 70/80/90 GHz bands provided that any changes do not foreclose other future uses of the bands.³⁷ Other commenters opposed Aeronet's proposal or argued that the Commission should consider all proposed changes in the 70/80/90 GHz bands in a comprehensive proceeding.³⁸ Several parties raised concerns about the potential co-existence of multiple services specifically in the 90 GHz band.³⁹ Nearly all commenters indicated a need for more information about how Aeronet's proposed system would work,⁴⁰

³¹ Aeronet Aviation Petition at 12–14; Aeronet Maritime Petition at 11–13. The ground stations would be located "away from dense urban areas" to prevent interference issues and in order to "maximize efficient spectrum use across more land mass." Aeronet Aviation Petition, RM-11824 at 22–23; Aeronet Maritime Petition at 21. The ground stations would be connected via fiber circuits. Aeronet Aviation Petition at 13; Aeronet Maritime Petition at 11. Each station would transmit multiple narrow and "highly directional" steerable beams in order to "support the delivery of targeted bandwidth with propagation losses that ensure very limited signal leakage beyond the intended range." Aeronet Aviation Petition at 23; Aeronet Maritime Petition at 21.

³² Aeronet Aviation Petition at 13; Aeronet Maritime Petition at 12. For aircraft, Aeronet would install up to three antennas on each aircraft it services for receiving from and transmitting to the ground station, and two more antennas for transmitting "air-to-air" datalinks to other aircraft. Aeronet Aviation Petition at 13. For maritime vessels, Aeronet would install up to two antennas on each serviced vessel—one to serve as a "ship-to-ground datalink" and the other to serve either as a "ship-to-ship datalink" or "ship-to-relay datalink." Aeronet Maritime Petition at 12.

³³ Comsearch Report at 3.

³⁴ Aeronet Maritime Petition at 20–21; Aeronet Aviation Petition at 22–23.

³⁵ Aeronet Maritime Petition at 26; Aeronet Aviation Petition at 28.

³⁶ *Aeronet Global Communications Inc.'s Petition for Rulemaking to Amend the Commission's Allocation and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands to Authorize Aviation Scheduled Dynamic Datalinks*, Public Notice, Report No. 3112, CG RM-11824 (2019); *Aeronet Global Communications Inc.'s Petition for Rulemaking to Amend the Commission's Allocation and Service Rules for the 71–76 GHz, 81–86 GHz, and 92–95 GHz Bands to Authorize Maritime Scheduled Dynamic Datalinks*, Public Notice, Report No. 3113, CG RM-11825 (2019).

³⁷ See, e.g., Elefante Comments; Loon Comments.

³⁸ See, e.g., T-Mobile Comments at 1 ("The Commission should deny the Aeronet Petitions, or, in the alternative, defer consideration and consolidate all proposals for use of the 70/80 GHz bands into a comprehensive proceeding."); 5G Americas *Ex Parte* at 3 ("5G Americas also urges the Commission to consider proposals to modify the existing service rules in the E-band together.").

³⁹ See Moog Comments; Sierra Nevada Comments.

⁴⁰ See, e.g., Sierra Nevada Comments at 2, Elefante Comments, Loon Comments at 2, Moog Reply Comments at 1–2.

and Aeronet subsequently placed additional information in the record.⁴¹ In developing the record on the Aeronet petitions, several commenters suggested alternative uses for the 70/80/90 GHz bands.⁴²

III. DISCUSSION

9. We propose targeted changes to the Commission's rules to promote additional wireless backhaul for 5G, in furtherance of the Commission's goals of expanding access to broadband and fostering the efficient use of millimeter-wave spectrum in the public interest. Specifically, we propose changes to the antenna standards applicable to the 70 GHz and 80 GHz bands and seek comment on whether similar changes are necessary in the 90 GHz band. We seek comment on whether the Commission should make changes to its current link registration rules for the 70/80/90 GHz bands to eliminate never-constructed links from the database. The Commission also proposes to authorize point-to-point links to endpoints in motion in the 70 GHz and 80 GHz bands and to classify those links as a "mobile" service. We seek comment on any technical and operational rules that would be needed to allow these new service offerings in the 70 GHz and 80 GHz bands and to mitigate interference to incumbents and other proposed users of these bands and in adjacent bands. Finally, we seek comment on whether the Commission should adopt a channelization plan in the 70 GHz and 80 GHz bands.

A. 5G Backhaul

1. Antenna Rules

10. We propose a number of changes to the antenna standards for the 70 GHz and 80 GHz bands to provide greater flexibility in deploying 5G wireless backhaul. We observe that smaller, lighter antennas are less susceptible to sway and less visually obtrusive than larger antennas, which would make them ideal for 5G network densification.⁴³ We seek to leverage these characteristics of smaller antennas to promote 5G deployment, while protecting incumbent uses of these bands and providing opportunities for other innovative uses of these bands.

11. The Commission's rules currently apply a single category of antenna standards to the 70 GHz band and the 80 GHz band.⁴⁴ We propose to increase the maximum beamwidth by 3 dB points, from 1.2 degrees to 2.2 degrees.⁴⁵ Additionally, we propose to reduce minimum antenna gain from 43 dBi to 38 dBi and to retain the proportional EIRP reduction requirement.⁴⁶ We seek comment on these proposals. Both FWCC and the 5G Wireless Backhaul Advocates argue that these proposed changes are critical to deploying nationwide 5G wireless backhaul and fostering network densification.⁴⁷ We note that

⁴¹ Aeronet May 10, 2019 Letter. Pursuant to section 1.405(c) of our rules, 47 CFR § 1.405(c), we authorize the filing of the additional pleadings submitted by Aeronet, Bahama Paradise Cruise Lines, and Loon LLC.

⁴² Sierra Nevada seeks to use the 90 GHz band for Enhanced Flight Vision Systems to allow aircraft to land in low-visibility conditions. Sierra Nevada Comments at 2. Elefante seeks to use the 70 GHz and 80 GHz bands for feeder links in its proposed Stratospheric-Based Communications Service. Elefante Comments at 2. Loon intends to use a network of balloons at heights of about 20 kilometers to provide Internet access to unserved and underserved communities. Loon Comments at 2. Moog intends to use spectrum in the 90 GHz band for its proposed Foreign Object Debris Detection System to help airplanes avoid hazards on runways. Moog Reply Comments at 2.

⁴³ 5G Wireless Backhaul Advocates *Ex Parte* at 1–2.

⁴⁴ See 47 CFR §101.115(b) (table of antenna standards).

⁴⁵ 5G Wireless Backhaul Advocates *Ex Parte* Presentation at 12. See also FWCC *Ex Parte* at Appx. i. See 47 CFR 101.115(b)(2).

⁴⁶ 5G Wireless Backhaul Advocates *Ex Parte* at 1–2, Presentation at 12; FWCC *Ex Parte* at Appx. i. See 47 CFR 101.115(b)(2), n.14.

⁴⁷ FWCC *Ex Parte* at 3; 5G Wireless Backhaul Advocates *Ex Parte* at 1–2.

adoption of these changes would harmonize our rules with Canada's rules,⁴⁸ which could facilitate economies of scale in equipment deployment in North America.

12. We also propose reducing the co-polar and cross-polar discrimination requirement applicable to 70 GHz and 80 GHz antennas.⁴⁹ Co-polar and cross-polar discrimination requirements were established to facilitate coordination of multiple links that share the same frequency path.⁵⁰ FWCC contends that some of the smaller, lighter antennas its members contemplate using cannot meet the existing requirement.⁵¹ Recognizing that small cell backhaul applications will not involve shared high-capacity paths, we seek comment on whether our current stricter co-polar and cross-polar discrimination requirements are now unnecessary.⁵² Do commenters agree that operators needing relatively short-distance links for small-cell backhaul will not require high-capacity shared paths?⁵³ We note that the 5G Wireless Backhaul Advocates suggest eliminating the co-polar discrimination requirement entirely.⁵⁴ We seek comment on this suggestion.

13. In addition, we seek comment on FWCC's recommendation that the Commission allow +/- 45 degree polarization (also known as slant polarization) in the 70 GHz and 80 GHz bands.⁵⁵ Section 101.117 of the Commission's rules generally limits licensees to horizontal or vertical polarization.⁵⁶ We seek comment on FWCC's contention that flat plate antennas generally have cleaner azimuth/elevation radiation pattern envelopes when used in slanted polarization.⁵⁷ Would slant polarization aid coordination at congested points in the 70 GHz and 80 GHz bands? Should we consider slant polarization in the 90 GHz band? We seek comment on any disadvantages of allowing slant polarization.⁵⁸ We ask commenters to provide data on the benefits and costs of any proposed changes.

⁴⁸ FWCC *Ex Parte* at 4; 5G Wireless Backhaul Advocates *Ex Parte* Presentation at 13.

⁴⁹ See FWCC April 4th *Ex Parte* at 2 as amended by FWCC March 24th *Ex Parte* at 1–2. Currently, at angles between 1.2 and 5 degrees from the centerline of the main beam, co-polar discrimination must be G-28, where G is the antenna gain in dBi; and at angles of less than 5 degrees from the centerline of main beam, cross-polar discrimination must be at least 25 dB. See 47 CFR. § 101.115(b)(2) n.15. FWCC proposes that magnitude of co-polar discrimination requirement be reduced from G-28 dB to G-33 dB and only apply between 2.5 and 5 degrees from the centerline of the main beam and that the cross-polar discrimination requirement be reduced from 25 dB to 21 dB. FWCC April 4th *Ex Parte* at 2 as amended by FWCC March 24th *Ex Parte* at 1–2.

⁵⁰ FWCC April 4th *Ex Parte* at 2.

⁵¹ FWCC April 4th *Ex Parte* at 2.

⁵² See FWCC April 4th *Ex Parte* at 2.

⁵³ FWCC April 4th *Ex Parte* at 2.

⁵⁴ 5G Wireless Backhaul Advocates *Ex Parte* at 2 (noting that “FWCC has suggested a modification to the specification below 5 [degrees] to accommodate 38 dBi antennas, seeking to achieve a similar affect, rather than our proposal to remove the requirement altogether”).

⁵⁵ FWCC 2nd NOI Comments at 7–8.

⁵⁶ 47 CFR § 101.117.

⁵⁷ Letter from Mitchell Lazarus, Counsel, FWCC to Marlene H. Dortch, Secretary, FCC in WT Docket No. 10-153 (filed April 4, 2013) Appx. at 7.

⁵⁸ We note that the 5G Wireless Backhaul Advocates do not support slant polarization. 5G Wireless Backhaul Advocates *Ex Parte* at 2.

14. Some commenters have suggested that adopting a second category of antenna standards would promote flexibility in the 70 GHz and 80 GHz bands.⁵⁹ The Commission's rules for many other services regulated under Part 101 allow for two categories of antennas, Category A and Category B; Category A performance standards are more stringent than Category B.⁶⁰ We seek comment on whether to adopt an additional antenna standard—Category B—applicable to the 70 GHz and 80 GHz bands, which could permit less restrictive use under certain circumstances than our proposed modified antenna standards (which would be the accompanying Category A standards).⁶¹ We seek comment on the advantages and disadvantages of adopting Category A and Category B standards in the 70 GHz and 80 GHz bands. Should the new Category B standards permit use of even smaller, wider beamwidth antennas, or other less restrictive uses?⁶² Under what circumstances should use of such antennas be permitted? Would such changes promote investment in these bands?⁶³ In other bands, if a station using a Category B antenna causes interference that cannot be eliminated by lowering EIRP, the station must upgrade to a Category A antenna to eliminate the interference.⁶⁴ Should the Commission adopt similar rules or other conditions of use here? What impact, if any, should changing from one antenna standard to the other have on a registrant's first-in-time status? Commenters proposing alternative standards should provide a detailed justification for those standards.

15. With respect to our proposed modifications to the antenna standards for the 70 GHz and 80 GHz bands, or any alternate proposals by commenters, we seek detailed, quantitative data on the relative likely benefits and costs. Such data should include information on cost savings that could result from the changes, as well as increased costs that would result from an increase in interference.

16. We note that the Commission's antenna standards for the 90 GHz band are considerably different from those that apply to the 70 GHz and 80 GHz bands.⁶⁵ While advocates for changes to our antenna standards for the 70 GHz and 80 GHz bands do not propose changes to the standards for the 90 GHz band, we seek comment on whether any of the changes discussed in this Notice or other changes should apply to the 90 GHz band.

17. Finally, we seek comment on how the proposed changes to the antenna standards for the 70 GHz and 80 GHz bands, as well as any changes to the antenna standards for the 90 GHz band, would affect existing Federal operations in these shared bands, including the Radiolocation service. We also seek comment on how changes to the antenna standards would impact the system for coordination between Federal and non-Federal users?

⁵⁹ FWCC *Ex Parte* at 4. T-Mobile supports adopting Category A and Category B standards to promote 5G backhaul. Letter from John Hunter, Sr. Director, Technology and Engineering Policy, T-Mobile USA, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153, at 2 (filed Jan. 18, 2018).

⁶⁰ FWCC Comments, WT Docket No. 10-153 at 6 (FWCC 2nd NOI Comments). *See* 47 CFR § 101.115(b); *see also* *Wireless Backhaul Reform Order*, 27 FCC Rcd at 9741, para. 9.

⁶¹ *See* FWCC 2nd NOI Comments at 5–6; 5G Wireless Backhaul Advocates *Ex Parte* Presentation at 12.

⁶² For example, FWCC proposes that Category B antennas would have the same maximum beamwidth and minimum antenna gain as Category A antennas but would have a lower minimum radiation suppression requirement. *See* FWCC *Ex Parte* at Appx. i.

⁶³ *See* *Spectrum Frontiers R&O and FNPRM*, 31 FCC Rcd 8014, 8164, para. 436.

⁶⁴ *Amendment of Part 101 of the Commission's Rules to Modify Antenna Requirements for the 10.7–11.7 GHz Band*, Order, 22 FCC Rcd. 17153, 17171–72, paras. 31–32.

⁶⁵ For example, the standards for the 90 GHz band do not distinguish between co-polar and cross-polar standards. The 90 GHz standards also set a narrower maximum beamwidth and lower minimum antenna gain. 47 CFR 101.115(b)(2).

2. Link Registration Processes

18. We seek comment on whether we should make changes to the current link registration rules in the 70/80/90 GHz bands. The 5G Wireless Backhaul Advocates and FWCC propose requiring licensees to certify that their registered links are constructed as required.⁶⁶ When the Commission adopted service rules for the 70/80/90 GHz bands, it shortened the construction requirement generally applicable to other Part 101 services.⁶⁷ Licensees in the 70/80/90 GHz bands must complete construction and bring into regular use registered links within 12 months of the date on which a third-party database manager registers the link.⁶⁸ Currently, the Commission relies on licensees to notify database managers to withdraw unconstructed links from the database.⁶⁹ FWCC alleges that the current registration process encourages licensees to submit multiple registrations at various locations and heights for a single transmit site, “seeking priority protection while not yet knowing precisely where their equipment will be deployed.”⁷⁰ The 5G Wireless Backhaul Alliance contends that requiring licensees to certify that their links have been constructed at the end of the 12 month construction period, or when they seek to renew their license, would improve “database hygiene.”⁷¹

19. Do commenters agree that certain licensees submit multiple registrations at various locations and heights for a single transmit site? If so, do we need to adopt rule revisions to require that each registration satisfies the interference-protection requirements of section 101.1523(b)(2)—including as to the licensee’s other current or pending registrations?⁷² Do commenters agree that there are registrations in the database that are not operational and likely never will be?⁷³ If so, how common are such inaccurate registrations? We note that failure to begin operations in a timely manner pursuant to a Part 101 authorization results in the automatic cancellation of the authorization. Nevertheless, because the Commission currently does not require licensees to file a construction certification, such cancellations are not automatically reflected in ULS or the third-party database, and the Commission therefore does not have a ready mechanism for accurately tracking them.⁷⁴ Should we require 70 GHz and 80 GHz band registrants to file a certification of construction when a link has been placed in operation? If so, when should we require registrants to file the certifications? Should certifications be filed when the links become operational, at any time prior to the expiration of the construction deadline, or whenever a licensee seeks to renew its license? Should different rules apply for registrants in the 90 GHz band?

⁶⁶ 5G Wireless Backhaul Advocates *Ex Parte* Presentation at 21; FWCC *Ex Parte* at 4–5.

⁶⁷ See *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23351 para. 80.

⁶⁸ See *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23351 para. 80; 47 CFR § 101.63(b).

⁶⁹ See *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23351 para. 80. The Commission did, however, reserve the discretion to revisit this issue if its experience indicated that additional measures might be necessary. *Id.*

⁷⁰ FWCC *Ex Parte* at 4–5.

⁷¹ 5G Wireless Backhaul Alliance *Ex Parte* a 2.

⁷² See 47 CFR § 101.1523(b)(2) which requires licensees to “[p]rovide an electronic copy of an interference analysis to the third-party database manager which demonstrates that the potential for harmful interference to or from all previously registered non-government links has been analyzed according to the standards of section 101.105 and generally accepted good engineering practice, and that the proposed non-government link will neither cause harmful interference to, nor receive harmful interference from, any previously registered non-government link[.]”

⁷³ FWCC *Ex Parte* at 5.

⁷⁴ FWCC *Ex Parte* at 5 (citing 47 CFR § 101.63(c)). Micronet’s database provides information about links that have been registered and not constructed, but there is no requirement that Micronet provide this information and there is no requirement that licensees inform Micronet when links are built. Therefore, links that appear in Micronet’s database as unconstructed may be constructed. See Micronet Database,

<http://www.micronetcommunications.com/LinkRegistration/>.

What changes, if any, should we make to our rules to ensure that registrations accurately reflect actual use of the 70/80/90 GHz bands? Should we adopt rules to promote competition and prevent licensees from filing multiple, duplicative registrations that dilute the accuracy of the database and potentially foreclose use of the band from competitors or additional, future uses? If so, how should those rules be structured?

20. If the Commission does adopt a construction certification requirement, how should we manage the certification process? We seek comment on FWCC's suggestion that certificates be managed through ULS or by a third party.⁷⁵ Should the Commission accept construction certifications through one of its systems (e.g., ULS) and pass the certification on to the third-party database administrators? Or should registrants file certifications with the third-party database administrators directly? Should certifications, whether filed in ULS or with database managers, be based on FCC Form 601 Schedule K (Schedule for Required Notifications for Wireless Services) or would a checkmark certification—under penalty of perjury—suffice? Would a directive to the database managers to remove registrations from the database if no certification is filed within 12 months be appropriate? Should the Commission require licensees to list registrations that are beyond the construction deadline as part of their renewal applications, and—for each registration—either certify the link's construction and operation or identify the link for removal from third-party databases? What penalties, if any, should we impose for failure to comply with a certification requirement if we adopt one? Should failure to timely begin operations result in license forfeitures or other penalties? What are the costs and benefits resulting from a construction certification requirement, including potential one-time costs for existing licensees to certify links that have been constructed prior to the certification requirement and projected costs from links that would need to be certified in the future?

21. FWCC also proposes that we allow registrants to amend their registrations under certain circumstances without losing their first-in-time priority rights.⁷⁶ We seek comment on whether licensees should be allowed to amend their registered links without losing first-in-time status. What amendments, if any, should be allowed without losing first-in-time status?

B. Communications to Ships and Aircraft

1. Authorization and Framework

22. We propose to authorize point-to-point links to endpoints in motion in the 70 GHz and 80 GHz bands under our Part 101 rules.⁷⁷ We agree with Aeronet that authorizing these links in the 70 GHz and 80 GHz bands can benefit consumers by meeting an increasing demand for broadband services that can be accessed on aircraft and ships,⁷⁸ and that using highly directional signals in these bands has the potential to avoid interference to other point-to-point links.⁷⁹

23. *Provision of Broadband to Ships and Planes.* The aviation and maritime markets are currently underserved by broadband providers. According to one study by the London School of Economics, approximately 3.8 billion passengers fly annually across the globe, with only around 25% of planes offering some form of on-board broadband—often of variable quality, coverage, speed, or capacity.⁸⁰ According to another study, aviation-based Internet access service has an adoption (or take)

⁷⁵ FWCC *Ex Parte* at 5.

⁷⁶ FWCC *Ex Parte* at 6.

⁷⁷ We do not, however, propose to allow these operations in the 90 GHz band.

⁷⁸ Aeronet Aviation Petition at 4–10; Aeronet Maritime Petition at 4–10.

⁷⁹ Aeronet Aviation Petition at 23; Aeronet Maritime Petition at 21.

⁸⁰ Alexander Grous, London School of Economics and Political Science, *Sky High Economics Chapter One: Quantifying the Commercial Opportunities of Passenger Connectivity for the Global Airline Industry* 3 (2017),

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rate of 10% or less, due to a combination of factors, such as high prices, intermittent coverage, poor performance, and difficult payment mechanisms.⁸¹ Similarly, broadband connectivity on-board passenger ships has been characterized as “notoriously difficult,” because broadband Internet access service provided at sea “has been patchy, slow, expensive, and [] mainly a luxury associated with premium packages.”⁸²

24. Different systems or services operating at different altitudes or unique locations could create opportunities for expanded use (or reuse) of spectrum frequencies as between traditional terrestrial locations and unique altitudes and locations. Stated another way, “3D” spectrum management techniques could allow for the deployment of new broadband products and services while helping to alleviate growing demands for spectrum resources. Innovative products and services are being developed specifically to improve broadband access on-board airplanes, ships, and other methods of transport. A 3D model of spectrum management, however, presents not only potential opportunities but also potential challenges, as managing potential harmful interference between systems becomes more complicated.

25. The 70/80/90 GHz bands could provide a unique spectrum resource for the provisioning of broadband services to airplanes, ships, and other antennas in motion. In general, atmospheric attenuation tends to increase the higher the signal goes in the radio spectrum frequency range, limiting the potential length of transmission paths. The 70/80/90 GHz bands, however, experience less attenuation than frequencies lower down in the 50–60 GHz range.⁸³

26. We note that, in response to Aeronet’s petitions, several commenters have raised concerns specific to proposed systems that would operate in the 90 GHz band. Sierra Nevada, for example, opposes use of the 90 GHz band for the types of operations proposed by Aeronet.⁸⁴ Sierra Nevada believes these systems will interfere with the Enhanced Flight Visions Systems (EFVS) for which Sierra Nevada seeks to establish rules in this segment of the band.⁸⁵ In addition, the Commission proposed to permit use of the 92–95.5 GHz band for EFVS, including amending the Table of Allocations to add a Radionavigation Service allocation in this segment of the band.⁸⁶ Moog opposes Aeronet’s use of the 90 GHz band because it may interfere with Moog’s proposed Foreign Object Debris (FOD) Detection System.⁸⁷ We note that the 92–100 GHz band is also recognized worldwide for FOD radar use.⁸⁸ Aeronet has acknowledged that the 90 GHz band may pose unique coordination problems for the

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<http://www.lse.ac.uk/business-and-consultancy/consulting/assets/documents/sky-high-economics-chapter-one.pdf>
(last visited Mar. 18, 2020).

⁸¹ Peter Lemme, Seamless Air Alliance, *The Profitable Economics of Inflight Connectivity* 7 (Mar. 2019), <https://www.seamlessalliance.com/wp-content/uploads/Seamless-Whitepaper-07.pdf> (last visited Mar. 18, 2020).

⁸² Eva Grey, *The Race for Faster WiFi on Board Cruise Ships*, Ship Technology (May 15, 2018), <https://www.ship-technology.com/features/race-faster-wifi-board-cruise-ships/> (last visited Mar. 18, 2020).

⁸³ See Lou Frenzel, *Millimeter Waves Will Expand The Wireless Future*, ElectronicDesign (Mar. 6, 2013), <https://www.electronicdesign.com/communications/millimeter-waves-will-expand-wireless-future> (last visited Sept. 11, 2019).

⁸⁴ Sierra Nevada Comments at 2.

⁸⁵ Sierra Nevada Comments at 2.

⁸⁶ See *Amendment of the Commission’s Rules to Promote Aviation Safety*, Notice of Proposed Rulemaking, 34 FCC Rcd 4984, 4988, para. 13 (2019); Petition of Sierra Nevada Corporation for Amendment of the Commission’s Rules to Allow for Enhanced Flight Vision System Radar under Part 87, RM-11799 (Feb. 16, 2018).

⁸⁷ Moog Reply Comments at 7.

⁸⁸ See International Civil Aviation Organization (ICAO) Reply Liaison Statement to ITU-R Working Party 5B, “Deployment of Foreign Object Debris Detection Radars in the 92-100 GHz frequency range at airports globally”.

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services it intends to deploy.⁸⁹ Because the deployment of links to endpoints in motion in the 90 GHz band may present some unique coordination problems—particularly to EFVS systems that the Commission has already proposed to allow in the 92–95.5 GHz band—we propose to authorize these links to or from (or between) endpoints in motion only in the 70 GHz and 80 GHz bands. We seek comment on this proposal.

27. We seek to develop a record on the balance of benefits and costs of permitting new uses of the 70 GHz and 80 GHz bands for communications to points in motion. We seek comment on the types of benefits to consumers of the services to aircraft and ships proposed by Aeronet. For example, we seek comment on the value of enhanced competition in the aeronautical and maritime broadband markets that could result from authorizing Aeronet’s operations and similar types of services in the 70 GHz and 80 GHz bands. Should we adopt rules to promote competition and prevent licensees from filing multiple registrations that result in a bevy of first-in-time registrations that potentially foreclose use of the band from competitors?

28. How would the introduction of these new types of services in the 70 GHz and 80 GHz bands affect existing point-to-point microwave services or the potential for deployment of other non-Federal and Federal services in the bands? Would aeronautical or maritime deployments, such as the ones proposed by Aeronet and other parties in this proceeding,⁹⁰ be compatible with more robust use of the band for small cell backhaul, as proposed by FWCC, Ericsson, Nokia, and others? If particular non-Federal use cases are not compatible, then how should the Commission weigh the various public interest considerations in allowing, prohibiting, or prioritizing among such uses?

29. We also note that there are both Federal and non-Federal space-service frequency allocations in the bands discussed here; fixed satellite, mobile satellite, broadcasting satellite, Earth Exploration-Satellite (passive) and radio astronomy. In addition, there are primary Federal allocations in adjacent bands for earth exploration-satellite (passive), space research (passive), and radio astronomy services in the 86–92 GHz band. We seek comment on any possible impact that the proposals discussed in this Notice may have on Federal use of the 70/80/90 GHz bands by these services.

30. *Classification of Service.* We propose to classify links to endpoints in motion as a “mobile” service under the existing mobile allocation for the 70 GHz and 80 GHz bands.⁹¹ Aeronet asserts that its systems would be “almost fixed” because they are “a forecasted series of fixed point-to-point broadband links” and “[t]he location of any given node at any given moment would be knowable in advance and known in real time.”⁹² Aeronet further asserts that links to endpoints in motion could be

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(Document 5B-E, March 3, 2020). ICAO states in Page 2: “FOD radars have been deployed at certain airports, and worldwide rollout of the FOD detection systems is a possibility.”

⁸⁹ Aeronet Reply Comments at 12, n.40 (“Aeronet is . . . not opposed to the Commission’s granting the petitions in part, authorizing SDDL[s] in the 70/80 GHz Bands and deferring action on the 90 GHz Band until Aeronet and [Sierra Nevada] can explore mitigation and resolution scenarios.”).

⁹⁰ Aeronet Aviation Petition; Aeronet Maritime Petition; Loon Comments; Elefante Comments; Sierra Nevada Comments; Moog Comments.

⁹¹ The 70/80/90 GHz bands are allocated for both terrestrial fixed and mobile services. See 47 CFR § 2.106.

⁹² Aeronet Maritime Petition at 31; Aeronet Aviation Petition at 32. Aeronet further claims that SDDL systems rely on advance knowledge of where the receiving antenna will be located based on planned and known routes like flight plans; if a receiving antenna deviates from the known route, then the SDDL system will be offline until the antenna returns to the predetermined course. Aeronet Maritime Petition at 13; Aeronet Aviation Petition at 14. *But see* Elefante Comments at 6, n.14 (Elefante “reserves judgment” on whether SDDLs operate within the Fixed Service but suggesting that “there are several aspects of the SDDLs as described in the *Aeronet Petitions* that merit closer examination in this regard”); Sierra Nevada Comments at 5 (“providing transmissions into the air at long range to airplanes and aerostats or drones is substantially different from typical point-to-point microwave operations,

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authorized as fixed services by adding: (1) definitions in the Part 101 rules for “Scheduled Dynamic Datalink,” “Maritime Scheduled Dynamic Datalink,” “Aviation Scheduled Dynamic Datalink,” and “Scheduled Dynamic Datalink Relay;”⁹³ and (2) a note to the relevant frequency assignments specified in Section 101.147 of the Commission’s rules.⁹⁴ We tentatively conclude, however, that the appropriate service classification for Aeronet’s proposed services, if we decide to authorize air- and sea-based links or links between antennas in motion in the 70 GHz and 80 GHz bands, should be “mobile.” We seek comment on this tentative conclusion.

31. Aeronet’s proposed service classification appears to be inconsistent with the language of the Communications Act and the Commission’s rules. While the Communications Act does not define “fixed stations” or “fixed service,” our rules provide that “fixed stations” are stations in the fixed service, which is defined in our rules as a “radiocommunication service between specified *fixed* points.”⁹⁵ Aircraft and ships must be in motion to serve their intended purposes, and we tentatively conclude that transmission of signals to endpoints on aircraft and ships does not become communication to fixed points simply because, as Aeronet suggests, the expected locations of the aircraft or ships may be known or specified before movement begins. In contrast, the Communications Act defines the term “mobile station” to mean “a radio-communication station capable of being moved and which ordinarily does move.”⁹⁶ The Commission’s rules include a similar definition of mobile stations.⁹⁷ Moreover, our rules define “aeronautical mobile service” as a “mobile service between aeronautical stations and aircraft

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especially given that the Part 101 rules contemplate the use of directional antennas ‘in the horizontal plane.’”) (quoting 47 CFR § 101.115(a)). Aeronet also analogizes the Commission’s authorization of earth stations in motion in bands allocated for Fixed Satellite Service. Aeronet Maritime Petition at 29–30; Aeronet Aviation Petition at 31–32. *But see* Elefante Comments at 6, n.14; Sierra Nevada Comments at 5–6.

⁹³ Aeronet advocates modifying 47 CFR § 101.3 to add the following definitions: “Aviation Scheduled Dynamic Datalink” is “A scheduled dynamic datalink serving aircraft, including a link between a fixed ground station and an aircraft or between two aircraft;” and “Scheduled Dynamic Datalink” is “A point-to-point link between fixed stations and mobile stations, or between mobile stations, where the mobile stations generally follow known routes at known times.” *See* Aeronet Aviation Petition at 28. Aeronet further advocates adding the following definitions: “Maritime Scheduled Dynamic Datalink” is “A scheduled dynamic datalink serving ships, including a link between a fixed ground station and a ship, between a fixed ground station and a Scheduled Dynamic Datalink Relay, between a Scheduled Dynamic Datalink Relay and a ship, or between two ships;” and “Scheduled Dynamic Datalink Relay” is “An aerostat or drone at a fixed location, below 1,000 feet of elevation, either tethered or untethered, to enable Scheduled Dynamic Datalinks beyond the horizon.” *See* Aeronet Maritime Petition at 26.

⁹⁴ Aeronet Maritime Petition at 27; Aeronet Aviation Petition at 29 (recommending a new note 35 to rule 101.147(a) that “Scheduled Dynamic Datalinks are permitted in the bands 71,000–76,000 MHz, 81,000–86,000 MHz, 92,000–94,000 and 94,100–95,000 MHz bands.”). *See* 47 CFR § 101.147(a). Aeronet also has requested that the Commission increase the maximum allowable equivalent isotropically radiated power (EIRP) for “mobile services” in the 70/80/90 GHz bands. Aeronet Aviation Petition at 32; Aeronet Maritime Petition at 30.

⁹⁵ 47 CFR § 2.1(c) (emphasis added).

⁹⁶ 47 U.S.C. § 153(33).

⁹⁷ 47 CFR § 2.1(c) (defining a mobile station as a “station in the mobile service intended to be used while in motion or during halts at unspecified points.”). The mobile service is defined as “[a] radiocommunication service between mobile and land stations, or between mobile stations.” *Id.*

stations, or between aircraft stations”⁹⁸ Our rules similarly define “maritime mobile service” as a “mobile service between coast stations and ship stations, or between ship stations”⁹⁹

32. We tentatively conclude that the definitions of “mobile station” in the Communications Act and our rules and of “aeronautical mobile service” and “maritime mobile station” in our rules are consistent with Aeronet’s descriptions of its service. Aeronet’s antennas on-board aircraft appear to fit most closely within the definition of aircraft stations operating in the aeronautical mobile service, while the ground stations in its system appear to fit the definition of aeronautical stations. Antennas operating on ships appear to fit the description of ship stations operating in the maritime mobile service, while the ground stations and aerostats meet the definition of coast stations. We seek comment on these tentative conclusions.

33. We note that we are revisiting the Commission’s decision in the *2017 Spectrum Frontiers Order* not to allow mobile service in the 70/80/90 GHz bands, given the evolution in technology.¹⁰⁰ In the *2017 Spectrum Frontiers Order*, the Commission acknowledged that companies, including Aeronet, Google, and The Elefante Group, proposed different uses of the 70/80/90 GHz bands “which neither fit the traditional mobile broadband nor fixed link models,” but it determined that the Commission should consider these proposals and possible future uses in its Wireless Backhaul proceeding.¹⁰¹ The Commission did, however, reserve the right to revisit this issue as mobile deployments increased in other millimeter-wave bands, as technology developed, and as frameworks for mobile and fixed services to coexist in the bands came to light.¹⁰² Nearly two years later, in February 2019, Aeronet filed its petitions for rulemaking, and in May 2019 Comsearch submitted its compatibility study. Based on this additional information now before the Commission, we consider Aeronet’s proposal in conjunction with the targeted rule changes set forth in this Notice to allow for expanded wireless backhaul.

34. We additionally seek comment on whether any changes to Aeronet’s proposed definitions would be necessary to accommodate a classification of these services as mobile, and whether any changes would be necessary to create a provider- and technology-neutral framework for the provision of air- and sea-based links or links between antennas in motion.

35. *Coordination, Licensing, and Registration.* We seek comment on what changes to the 70/80/90 GHz coordination, licensing, and registration framework would be necessary to permit the operation of links to endpoints in motion under Part 101.¹⁰³ Currently, non-exclusive nationwide licensees in the 70/80/90 GHz bands coordinate point-to-point links with Federal and other non-Federal users on a first-in-time basis using a coordination mechanism managed by NTIA and shared databases

⁹⁸ 47 CFR § 2.1(c). Aircraft stations are defined as “mobile station[s] in the aeronautical mobile service . . . located on board an aircraft.” *Id.* Aeronautical stations are defined as “land station[s] in the aeronautical mobile service.” *Id.* Land stations are “station[s] in the mobile service not intended to be used while in motion.” *Id.*

⁹⁹ 47 CFR § 2.1(c). Ship stations are defined as “mobile station[s] in the maritime mobile service located on board a vessel which is not permanently moored” *Id.* Coast stations are defined as “land station[s] in the maritime mobile service.” *Id.*

¹⁰⁰ See *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988, 11054, para. 200 (2017) (*2017 Spectrum Frontiers Order*).

¹⁰¹ *2017 Spectrum Frontiers Order*, 32 FCC Rcd at 11054, para. 201.

¹⁰² *2017 Spectrum Frontiers Order*, 32 FCC Rcd at 11054, para. 201.

¹⁰³ Sierra Nevada asserts that allowing SDDL service would require a “substantial departure from the [current] regulatory scheme.” Sierra Nevada Comments at 5.

managed by several third-party managers.¹⁰⁴ As an initial matter, we propose to continue licensing use of the 70 GHz and 80 GHz bands on a non-exclusive, nationwide basis, to the extent we authorize links to endpoints in motion in these bands. This type of flexible licensing approach could facilitate multiple types of uses in these bands, provided that an appropriate Federal coordination and non-Federal registration framework is in place. We seek comment on this proposal.

36. In that regard, we propose to require coordination and registration of all air- and sea-based links/links between antennas in motion, and we seek comment on this proposal. Aeronet asserts that its links involving ground or shore stations can be registered using the existing coordination framework for the 70/80/90 GHz bands, with minor modifications to the registration databases to represent multi-dimensional polygons and polyhedrons, as well as narrow beam-width antennas that operate within a wider-beamwidth cone.¹⁰⁵ Aeronet further represents that links that do not involve a ground or shore station—links between aircraft, links between ships, and links between relay nodes and ships—do not need to be registered at all if Aeronet adopts reasonable limitations on its operations to manage exposures to Fixed Service receivers.¹⁰⁶ We tentatively conclude that coordination and registration should include not only links involving ground or shore stations, but also links between aircraft, links between ships, and links between relay nodes and ships. Requiring appropriate coordination and registration of all links would facilitate protection of Federal and non-Federal operations under the coprimary allocation and allow for future coordination among similar deployments, if additional entrants seek to offer competing services in the 70/80/90 GHz bands. Further, appropriate coordination and registration requirements would potentially allow NTIA and the Commission to track and evaluate the construction and use of all links in the event of interference issues, to the extent we adopt the construction certification requirements proposed in this Notice. We seek comment on this tentative conclusion.

37. We seek comment on how these links could be coordinated and registered to represent multi-dimensional areas or polyhedrons, which would involve a significant transformation of NTIA's and the Commission's current systems that coordinate and register two-dimensional point-to-point links. For example, should the coordination and registration requirements for aircraft-to-aircraft links differ depending on the altitude of one or both of the respective aircrafts? How wide should the beams be represented to account for the potential for aircraft or ships to vary their routes? Will there be any effects

¹⁰⁴ *70/80/90 GHz Report and Order*, 18 FCC Rcd at 22320, para. 2. See also *Key Bridge Global LLC Proposal to be Designated as a Database Manager for the 70/80/90 GHz Link Registration System*, WT Docket No. 13-291, Order and Notice to Database Managers for the 70/80/90 GHz Link Registration System Under Subpart Q of Part 101, 31 FCC Rcd 9564 (WTB-BD 2016) (*Key Bridge Order*).

¹⁰⁵ Aeronet Aviation Petition at 30–31; Aeronet Maritime Petition at 28–29. For aircraft, the coordination area is either a three-dimensional cone originating from the ground station (for air-to-ground/ground-to-air) or a three-dimensional polyhedron (for air-to-air). Aeronet Aviation Petition, RM-11824 at 14. The coordination area for ship-to-ground and ship-to-ship SDDLs will be a two-dimensional polygon originating from the ground station and “limited to the heights of the fixed location (or ship if higher).” Aeronet Maritime Petition at 12. For ground-to-relay-to-ship SDDLs, the coordination area “will be defined by a direct link from the fixed location ground station to the relay node... and then three-dimensional polyhedrons from the relay node to the ships assigned to it.” Aeronet Maritime Petition at 12–13. Wide-beam antennas would be used in the link database to represent the variable narrow-beam transmission directions of ground stations transmitting to aircraft and shore stations transmitting to ships. Comsearch Report at 4. See also Aeronet May 10, 2019 Letter at 2 n.10 (noting that, notwithstanding the anticipated depiction in the link registration database, Aeronet would not actually be using wide-beam antennas in its systems). For air-to-ground links, the Comsearch Report suggests that a link record “with a cone-shaped ‘antenna pattern’—down to 5 degrees elevation with required roll-off below 5 degrees—facing upward” could be entered in the existing database, provided that the rules are updated to allow such a wide beam. Comsearch Report at 25.

¹⁰⁶ Aeronet May 10, 2019 Letter at 3–4; Comsearch Report at 5.

from allowing parties to coordinate and register links for wider beams than they potentially may use?¹⁰⁷ Should the databases distinguish between registration of “phantom” widebeam antennas such as Aeronet proposes to use to represent the multi-dimensional coverage of ground or shore stations, and wider beamwidth antennas actually used to provide service, as contemplated in this Notice? How should the construction requirements in section 101.63(b) of the Commission’s rules, which govern Fixed Service links on a link-by-link basis, apply to the various elements of Aeronet’s system that are registered or not registered?¹⁰⁸ Are different construction requirements necessary? We seek comment on how to address any other technical challenges related to updating the current information technology systems that coordinate and register two-dimensional links to a system that can coordinate and register three-dimensional polyhedrons.

38. Even if aircraft-to-aircraft or ship-to-ship links do not require an interference analysis of traditional Fixed Service links, how would coordination and registration work in the event the 70/80/90 GHz bands are used by multiple air-based or ship-based systems? Should first-in-time priority be afforded to multidimensional areas, and if so, what effect would that have on competing uses of the bands? Is the existing, static third-party database system sufficient to accommodate links to endpoints in motion, or would a more robust coordination and registration mechanism be needed to accommodate services like those Aeronet seeks to deploy? What are the additional costs and benefits of modifying the coordination and registration framework and associated systems as necessary in light of Aeronet’s proposal?

39. In light of the importance of a modified coordination and registration framework to the successful expansion of use of the 70 GHz and 80 GHz bands, we propose to require FCC review and approval of third-party database managers with the capability of accepting coordination data for air- and sea-based links/links between antennas in motion as a condition precedent to deployment. Currently, two companies (Comsearch and Micronet Communications) serve as third-party database administrators for registering 70/80/90 GHz band links.¹⁰⁹ When the Commission designated database administrators in 2004, it required administrators to monitor and implement FCC rules and policies (including any changes) pertaining to the 70/80/90 GHz bands.¹¹⁰ Would the undertakings included in the *Designation Order* require the current administrators to make any changes necessary to accommodate air- and sea-based links or links between antennas in motion?

40. Further, we seek comment on how to continue to protect co-primary and adjacent Federal operations if we authorize links to endpoints in motion.¹¹¹ What changes would be needed to NTIA’s “green light” / “yellow light” coordination system to accommodate deployment of air- or sea-based links, or links between antennas in motion?

41. In addition, we note that certain commenters, while expressing support for Aeronet’s proposal, assert that changes to the Part 101 rules should be flexible enough to permit other new uses of the 70/80/90 GHz bands.¹¹² We seek comment on whether changes to our 70/80/90 GHz rules, including

¹⁰⁷ Aeronet May 10, 2019 Letter at 2 n.10.

¹⁰⁸ See 47 CFR 101.63(b) (“For the 70 GHz, 80 GHz, and 90 GHz bands, the 12-month construction period will commence on the date of each registration of each individual link; adding links will not change the overall renewal period of the license.”).

¹⁰⁹ Millimeter Wave 70/80/90 GHz Service | Federal Communications Commission, <https://www.fcc.gov/wireless/bureau-divisions/broadband-division/microwave-services/millimeter-wave-708090-ghz-service> (last visited Mar. 18, 2020).

¹¹⁰ See *Designation Order*, 19 FCC Rcd at 20524, para. 10.

¹¹¹ See *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23342, para 54.

¹¹² See Loon Comments at 1–3. See also Elefante Comments at 1 (requesting more technical information).

any new definitions, should encompass a broader array of new services. We also seek comment on whether any alternate licensing frameworks would be more effective in facilitating expanded use of these bands

2. Technical and Operational Rules

42. To facilitate provision of its proposed service, Aeronet requests a change in the maximum allowable mobile Equivalent Isotropically Radiated Power (EIRP) for 71–76 GHz and 81–86 GHz from +55 dBW to +57 dBW.¹¹³ Aeronet also requests that, for purposes of SDDL operation, the Commission increase the maximum transmitter power from 3 watts (5 dBW) to 5 watts (7 dBW) and the maximum transmitter power spectral density from 150 mW per 100 MHz to 500 mW per 100 MHz.¹¹⁴ Aeronet claims that its proposed services otherwise fit within the current rules for use of the 70/80/90 GHz bands.¹¹⁵ We seek comment on whether to increase the maximum allowable EIRP, the maximum transmit power, and the maximum power spectral density applicable to the 70/80/90 GHz bands. What are the potential costs and benefits of increasing the power limits in the 70/80/90 GHz bands, including to existing licensees in those bands or in adjacent bands? We note that vehicular radars operate in the adjacent 76–81 GHz band and we seek comment on whether Aeronet’s proposed uses and technical rules would increase the potential for harmful interference to these vehicular radars. Earth Exploration-Satellite (passive) and Space Research (passive) services operate in the adjacent 86–92 GHz band.¹¹⁶ We seek comment on whether Aeronet’s proposed uses and technical rules would increase the potential for harmful interference to these adjacent band vehicular radars and passive services, and if there is a potential for interference, what technical or operational mechanisms should be considered to mitigate it? We seek comment on whether changes to other technical or operational rules would be warranted to accommodate the deployment of links to endpoints in motion in the 70/80/90 GHz bands. For example, would rule changes be needed to promote the security of communications to and from aircraft and ships in motion?

43. In addition, we seek comment on whether the interference mitigation measures proposed by Aeronet and Comsearch would be sufficient to protect co-primary Federal services and, if so, whether they should be required by our Part 101 rules.¹¹⁷ For Aeronet’s proposed aviation system, Aeronet would employ ground stations located “away from urban and suburban areas where Part 101 fixed service use of the 70/80/90 GHz bands is concentrated” and would use a minimum elevation angle of five degrees at the ground stations.¹¹⁸ Comsearch indicates that Aeronet’s ground stations may require coordination zones of up to 35 kilometers.¹¹⁹ Aeronet also would use aircraft-to-aircraft links¹²⁰ that, according to the Comsearch Report, would pose little interference risk to fixed links when operating near horizontally

¹¹³ Aeronet Aviation Petition at 28; Aeronet Maritime Petition at 26. *See* 47 CFR § 101.113.

¹¹⁴ Aeronet Aviation Petition at 28; Aeronet Maritime Petition at 27. *See* 47 CFR § 101.113(a).

¹¹⁵ Aeronet Reply Comments 4–5.

¹¹⁶ *See* 47 CFR Part 95, Subpart M; 47 CFR § 2.106, n.US246.

¹¹⁷ *See* Aeronet Reply Comments; Comsearch Report at 19–41. We also note that several commenters raised concerns about the compatibility between Aeronet’s proposed network and other potential uses of the 70/80/90 GHz bands. *See, e.g.*, Elefante Comments; Sierra Nevada Comments; 5G Americas *Ex Parte*; Loon Comments.

¹¹⁸ Comsearch Report at 21.

¹¹⁹ For ground-to-air links, the Comsearch Report claims that in the “worst case” there would be a 35-kilometer radius coordination zone around Aeronet’s ground stations in which new FS links would need to be coordinated. Comsearch Report at 22 (defining “worst case” as “5 degrees elevation and aircraft at 15.24 km altitude (50,000 ft.)”).

¹²⁰ Aeronet Aviation Petition at 15.

because they can only intersect the main-beam of FS receivers “at very low or negative elevation angles and at large distances.”¹²¹

44. For Aeronet’s maritime system, the Comsearch Report proposes a coordination zone for ship-to-shore communications of up to 30 kilometers to alleviate the risk of interference,¹²² and it recommends frequency planning to avoid “co-channel operation.”¹²³ The Comsearch Report indicates that there is little risk of interference to fixed links from links from shore station-to-aerostat, aerostat-to-shore station, aerostat-to-ship, and ship-to-ship links because these links would be located at least 20 kilometers out to sea and the antenna beamwidth for links to ships would be directed away from land.¹²⁴ Comsearch asserts that shore station-to-aerostat and aerostat-to-shore station links could be registered as ordinary fixed point-to-point links because the aerostats would be tethered and move within +/- 135 meters laterally and -11 meters vertically.¹²⁵ For ship-to-ship links and aerostat-to-ship links, the Comsearch Report proposes mitigation measures such as a minimum offshore distance or a minimum off-axis angle towards land.¹²⁶

45. We seek comment on whether the mitigation measures Comsearch advocates would be necessary or sufficient to protect fixed point-to-point users. We also seek comment on what additional interference mitigation measures, if any, would be necessary to protect other operations, including vehicular radars, passive services, and the Radio Astronomy Service. Should the Commission amend its Part 101 rules to require such measures if SDDLs or other links to endpoints in motion are deployed in these bands? What restrictions or unique operating parameters, if any, should we adopt to mitigate the risk of harmful interference? How far away from traditional fixed stations would ground stations need to be located to avoid interference? What degree of elevation angle would be sufficient to prevent interference? What mitigation measures would be effective to address the risk of harmful interference potentially caused by aircraft-to-aircraft links between aircraft operating at significantly different altitudes? Would other entities be able to operate similar systems without receiving interference from or causing interference to Aeronet’s system? In considering these issues, we seek comment on what assumptions should be made about the number of airports and seaports where SDDLs or similar services would be deployed.

C. Channelization Plan

46. We seek comment on FWCC’s request that the Commission develop a channel plan for the 70 GHz and 80 GHz bands.¹²⁷ Supporters of adopting a channelization plan should provide a specific

¹²¹ Comsearch Report at 26. The Comsearch Report suggests, however, that “above small elevation angles, paths through the atmosphere have reduced absorption losses as a function of increasing angle,” indicating that links between aircraft at different altitudes would increase the risk for interference. Comsearch Report at 26–27.

¹²² Comsearch Report at 33. Aeronet anticipates links spanning 40 kilometers from ships to shore stations could cause interference to FS receivers as far as 30 kilometers behind the shore station. *Id.*

¹²³ Comsearch Report at 34.

¹²⁴ Comsearch Report 36–41.

¹²⁵ Comsearch Report 36–41. Comsearch notes that, while the elevation angle variation is negligible, the azimuth angle variation resulting from the lateral movement of the aerostats could result in up to a 9 dB difference in antenna gain. *Id.* at 40. The Comsearch Report advises that “[t]o ensure a conservative analysis for compatibility with other registered fixed links, Aeronet should use three registrations to represent the shore station to aerostat links in the database: the link with the nominal or mean aerostat coordinates, and links with aerostat coordinates +/- 135 m perpendicular to the link azimuth.” *Id.* at 40–41.

¹²⁶ Comsearch Report at 38–39.

¹²⁷ FWCC *Ex Parte* at 6. FWCC does not advocate for a specific channel plan but has previously noted that the ITU Recommendation F.2006 (Radio-frequency channel and block arrangements for fixed wireless systems operating in

(continued....)

description of changes since the Commission eliminated the 1.25 gigahertz segments in 2005 that necessitate development of a channel plan. Is existing equipment, which has been deployed or is being sold, compatible with FWCC's proposal to adopt a channel plan? Can existing equipment be reprogrammed to conform to a channel plan or would major modifications or replacement be necessary? Would establishing a channel plan restrict the development of innovative equipment for the bands, as the Commission feared in 2005?¹²⁸ Alternatively, does the increasing use of these bands justify FWCC's concerns about potential interference that may result due to the absence of a channel plan, particularly in light of FWCC's proposal to loosen antenna standards? Should the Commission, in light of these factors, also consider a channel plan in the 90 GHz band?

47. Commenters should also address whether authorizing links to endpoints in motion requires us to adopt a formal channel plan for the 70/80/90 GHz bands. For example, should we limit SDDL operations to receive (uplink) operations in the 80 GHz band to protect Radio Astronomy Service systems?¹²⁹ The Table of Frequency Allocations notes that, in the 76–86 GHz band, emissions from airborne stations can be particularly serious sources of interference to the Radio Astronomy Service.¹³⁰ In the event we adopt a channelization plan, should we continue to apply the standard emission limit rules in section 101.1011 (which use a formula for limiting OOB at the edge of the bandwidth in use, as opposed to subchannels), or do we need to adopt additional or different rules to accommodate a formal channel plan for the 70/80/90 GHz bands or the rule changes requested by Aeronet, FWCC, and others?¹³¹

48. If the Commission were to adopt a channel plan, then what channel plan should it use? Should we allow for multiple operators to transmit or receive signals in opposite directions (i.e., air-to-ground versus ground-to-air) in the same spectrum? Parties advocating for a formal channel plan or specific designations should explain why a particular band (e.g. 70 GHz or 80 GHz) is more suitable for uplink versus downlink for the advocated-for designations. If we adopt a channel plan, how should it take into account the various new uses of the bands proposed in this Notice? Should we revise section 101.109(c) of our rules to specify a maximum bandwidth less than 5,000 megahertz for the 70 GHz and 80 GHz bands? Should we increase the minimum bit rate of 0.125 bits per second per Hertz to, for example, 1 bit per second per Hertz?¹³² Would any specific channel plan and direction of service be particularly conducive to protecting the other co-primary services from interference? Should we adopt a minimum loading requirement before a licensee will be assigned an additional channel? What other changes would be necessary or appropriate to accommodate a channelization plan? Lastly, what are the costs and benefits of adopting channel plans?

D. Other Considerations

49. We seek comment on whether changes to any other Part 101 service rules would be needed to accommodate the various service offerings and potential rule changes examined in this Notice

(Continued from previous page) _____
the 71–76 GHz and 81–86 GHz bands) would be “one place to start,” and that the ITU plan could be incorporated into the Commission's rules by reference. FWCC Comments, WT Docket No. 10-153 at 7–8 (filed Oct. 5, 2012); see also <https://www.itu.int/rec/R-REC-F.2006-0-201203-I/en>.

¹²⁸ *70/80/90 GHz Reconsideration Order* at 20 FCC Rcd. at 23329 para. 20.

¹²⁹ In the context of SDDL service, “uplink” means ground-to-air, shore-to-ship, and shore-to-aerostat. Aeronet Aviation Petition at 28; Aeronet Maritime Petition at 26.

¹³⁰ 47 C.F.R. § 2.106, n.US342.

¹³¹ The Commission adopted the existing formula in section 101.111(a)(2)(ii) for limiting out of band emissions, applied at the edge of the bandwidth in use (and not to subchannels established by licenses within the bandwidth in use). *70/80/90 GHz Report and Order*, 18 FCC Rcd at 23353, para. 92.

¹³² See 47 CFR § 101.147(z)(2).

of Proposed Rulemaking. For example, could existing microwave links, new small cell backhaul applications, and links to endpoints in motion coexist in the 70 GHz and 80 GHz bands? Would increasing maximum allowable EIRP and increasing maximum output power, as proposed by Aeronet, affect the ability to deploy smaller antennas in the 70 GHz and 80 GHz bands? Would relaxing the antenna standards for the 70 GHz and 80 GHz bands affect the viability of new and innovative proposed uses in these bands?

50. In addition, we note that section 101.1(b) describes the purpose of the rules in Part 101 as “prescrib[ing] the manner in which portions of the radio spectrum may be made available for private operational, common carrier, 24 GHz Service and Local Multipoint Distribution Service fixed, microwave operations *that require transmitting facilities on land or in specified offshore coastal areas within the continental shelf*.”¹³³ Similarly, section 101.215 of the Commission’s rules requires that, except for remote stations using certain frequencies, “[e]ach licensee shall post at the station the name, address and telephone number of the custodian of the station license or other authorization if such license or authorization is not maintained at the station.”¹³⁴ Are revisions to these rules (or others) necessary or advisable to accommodate the services contemplated in this Notice of Proposed Rulemaking? If we authorize links to endpoints in motion as a mobile service, what other rule changes would be necessary to accommodate that change?

51. Are any other rule changes necessary to accommodate other potential uses of the 70/80/90 GHz bands? For example, Loon is developing a High-Altitude Platform Station (HAPS) service that may use the 70/80/90 GHz bands to provide “balloon-powered Internet access to unserved and underserved communities.”¹³⁵ Similarly, Elefante seeks to use the 70 GHz and 80 GHz bands to provide 5G and Internet-of-Things backhaul.¹³⁶ Could these uses co-exist with existing co-primary uses of the band as well as the new uses discussed in this NPRM? Would any other rule changes help to promote innovative use of the 70/80/90 GHz bands?

52. In addition, we propose that any mobile operations be authorized on a non-interference basis to fixed operations in Canada and Mexico and subject to future international agreements. We seek comment on the international coordination implications of the services proposed in this Notice of Proposed Rulemaking. Would the separation/coordination zones defined in the rules for terrestrial Fixed Service, which are based on certain characteristics for terrestrial operations (such as EIRP and antenna height), be sufficient to prevent interference to services in neighboring countries from an aeronautical or maritime service operating with different parameters?¹³⁷ What mechanisms should be in place with regard to operation in or over quiet zones and/or near international borders with Canada and Mexico?

53. We note that any systems for the provision of broadband that we authorize in this proceeding must not create hazards to air navigation, whether near airports, over water, or in any other area. We seek comment on any necessary rule changes to promote public safety. For example, should any Commission rules, such as those on tower lighting, apply to relay stations, including aerostats or drones?

¹³³ 47 CFR § 101.1(b) (emphasis added).

¹³⁴ 47 CFR § 101.215(a).

¹³⁵ Loon Comments at 2.

¹³⁶ Elefante Comments at 3.

¹³⁷ See 47 CFR § 101.1527 (Canadian and Mexican coordination); *id.* at § 101.1527(a) citing 47 CFR § 1.928(f), which pertains to coordination with Canada.

IV. ORDER

A. Waiver Petitions

54. Aviat Networks, Inc. (Aviat)¹³⁸ and CBF Networks, Inc., d/b/a Fastback Networks (Fastback), each filed a request for partial waiver of the antenna standards for the 71–76 and 81–86 GHz bands (collectively, the Waiver Requests).¹³⁹ The relief requested is consistent with FWCC’s previously proposed changes to our antenna rules, and the Waiver Requests acknowledge that any relief granted would be subject to the outcome of any “rulemaking proceeding affecting 71–76/81–86 GHz antenna standards.”¹⁴⁰ On October 13, 2015, the Wireless Telecommunications Bureau consolidated the Waiver Requests and sought comment on them.¹⁴¹ Several commenters support approval of the waiver petitions,¹⁴² while others oppose them¹⁴³ or seek to expand their applicability.¹⁴⁴

55. Generally, the Commission may waive any rule for good cause shown.¹⁴⁵ Waiver is appropriate if special circumstances warrant a deviation from the general rule, such deviation will serve the public interest, and the waiver does not undermine validity of the general rule.¹⁴⁶ More specifically,

¹³⁸ Because Aviat Networks, Inc. is an affiliate of Aviat USA, Inc., we herein collectively refer to them as “Aviat.”

¹³⁹ Request for Waiver, Aviat Networks, Inc. (filed Apr. 5, 2013) (Aviat Waiver Request); Amendment to Request for Waiver, Aviat Networks, Inc. (filed Mar. 24, 2014) (Aviat Amended Waiver Request); CBF Networks, Inc., Request for Waiver (filed June 19, 2015) (Fastback Waiver Request) at 1 (seeking the same relief and conditions requested by Aviat). On November 10, 2014, Aviat and Radio Frequency Systems (RFS) asked that RFS be added as a party to the Aviat Waiver Request. *See* Letter from Mitchell Lazarus and Cheng-yi Liu, Counsel for Aviat U.S., Inc., to Marlene H. Dortch, Secretary, FCC (filed Nov. 10, 2014). Because Radio Frequency Systems asked to be added to the Aviat Waiver Request, we address it collectively as the Aviat Waiver Request.

¹⁴⁰ Aviat Waiver Request at 13.

¹⁴¹ *Wireless Telecommunications Bureau Seeks Comment on Requests of Aviat Networks and CBF Networks, Inc., d/b/a Fastback Networks for Waiver of Certain Antenna Requirements in the 71-76 and 81-86 GHz Bands*, Public Notice, 30 FCC Rcd 10961 (WTB 2015).

¹⁴² Letter from Matthias Fries PhD, Product Line Manager Antennas, Huber & Suhner (filed Oct. 8, 2015) (Huber & Suhner Comments); Letter from Vijay Lewis, Chief Technology Officer, PEG Bandwidth, LLC to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Oct. 8, 2015) (PEG Bandwidth Comments); Comments of CBF Networks, Inc., d/b/a Fastback Networks (filed Nov. 12, 2015) (Fastback Networks Comments); Reply Comments of CBF Networks, Inc., d/b/a Fastback Networks (filed Nov. 30, 2015) (Fastback Networks Reply Comments); Comments of Radio Frequency Systems (filed Nov. 12, 2015) (RFS Comments); Reply Comments of Aviat USA, Inc. (filed Nov. 30, 2015) (Aviat Reply Comments); Letter from Kathleen O’Brien Ham, Vice President, Federal Regulatory Affairs, T-Mobile USA, Inc. to Marlene H. Dortch, Secretary, Federal Communications Commission (filed Oct. 8, 2015) (T-Mobile Comments); Reply Comments of T-Mobile USA, Inc. (filed Nov. 30, 2015) (T-Mobile Reply Comments); Reply Comments of Telecommunications Industry Association (filed Nov. 30, 2015) (TIA Reply Comments).

¹⁴³ Comments of Dash Networks Corporation (filed Nov. 12, 2015) (Dash Networks Comments).

¹⁴⁴ Comsearch, a 70/80/90 GHz Database Manager, states that the record reflects confusion as to whether any grants of the Waiver Requests would be limited to the licensees that specifically requested relief (which Comsearch opposes due to the cost of developing this new capability in the registration database) or extended to all licensees. Comments of Comsearch (filed Nov. 12, 2015) (Comsearch Waiver Comments). AT&T Services, Inc. (AT&T) supports grant of an industry-wide waiver of Section 101.115 under the conditions requested by Aviat and Fastback. Reply Comments of AT&T Services, Inc. (filed Nov. 30, 2015) (AT&T Reply Comments) at 2.

¹⁴⁵ 47 CFR § 1.3.

¹⁴⁶ *WAIT Radio v. FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969), *cert. denied*, 409 U.S. 1027 (1972); *Northeast Cellular Tel. Co. v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990); *NetworkIP, LLC v. FCC*, 548 F.3d 116, 125-28 (D.C. Cir. 2008).

section 1.925(b)(3) of our rules requires parties seeking a waiver of wireless radio services licensing rules to demonstrate that: (i) the underlying purpose of the rule(s) would not be served or would be frustrated by application to the instant case, and that a grant of the requested waiver would be in the public interest; or (ii) in view of unique or unusual factual circumstances of the instant case, application of the rule(s) would be inequitable, unduly burdensome or contrary to the public interest, or the applicant has no reasonable alternative.¹⁴⁷

56. Aviat and Fastback have not met the first prong of section 1.925(b)(3) because they have not shown that the requested waivers would be in the public interest. Specifically, as discussed in this NPRM, there are multiple and complex issues to be explored before allowing antennas that do not satisfy the current requirements of section 101.115. We, therefore, also decline suggestions to grant an industry-wide waiver.¹⁴⁸ Moreover, Aviat and Fastback do not meet the second prong of section 1.925(b)(3) because the record does not establish that waivers are justified based on special circumstances. In short, while we agree that FWCC's proposed changes to the antenna rules merit full consideration, Aviat and Fastback have not justified the need for individual waivers prior to our developing a full record on the proposed rule changes. We conclude that the public interest is best served through a thorough and deliberate examination of the possibility of revising antenna and other rules in the 70/80/90 bands through the rulemaking process rather than on an individual basis.

V. PROCEDURAL MATTERS

57. *Ex Parte Presentations.*—The proceedings shall be treated as a “permit-but-disclose” proceeding in accordance with the Commission's *ex parte* rules.¹⁴⁹ 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.

58. *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).

¹⁴⁷ 47 C.F.R. § 1.925(b)(3).

¹⁴⁸ *WAIT Radio v. F.C.C.*, 418 F.2d 1153, 1159 (D.C.Cir.1969) (an agency's obligation to give meaningful consideration to requests for waiver of its rules does not contemplate that the agency must or should tolerate evisceration of a rule by waivers).

¹⁴⁹ 47 CFR §§ 1.1200 *et seq.*

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: <https://www.fcc.gov/ecfs/>.
- Paper Filers: Parties who choose to file by paper must file an original and one copy of each filing.

59. Filings can be sent 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.

- 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.
- Hand or messenger deliveries will not be accepted absent clear operational necessity and special permission from the Office of Managing Director, consistent with FCC guidance from March 12, 2020 announcing that we are no longer allowing visitors into our facilities.¹⁵⁰

60. 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).

61. *Availability of Documents.*—Comments, reply comments, and *ex parte* submissions will be available via ECFS. Documents will be available electronically in ASCII, Microsoft Word, and/or Adobe Acrobat.

62. *Initial Regulatory Flexibility Analysis.*—As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹⁵¹ the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the policies and actions considered in the Notice of Proposed Rulemaking. The text of the IRFA is set forth in Appendix A. Written public comments are requested on this IRFA. Comments must be specifically identified as responses to the IRFA and must be filed by the deadlines for comments on the Notice of Proposed Rulemaking.¹⁵²

63. *Initial Paperwork Reduction Act of 1995 Analysis.*—This Notice of Proposed Rulemaking may contain new or modified information collection(s) subject to the Paperwork Reduction Act of 1995.¹⁵³ If the Commission adopts any new or modified information collection requirements, it will be submitted to the Office of Management and Budget (OMB) for review under section 3507(d) of the PRA. OMB, the general public, and other federal agencies are invited to comment on the new or modified information collection requirements contained in this proceeding. In addition, pursuant to the

¹⁵⁰ *FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy*, Public Notice, DA-20-304 (2020).

¹⁵¹ See 5 U.S.C. §§ 601-612. The RFA 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).

¹⁵² See 5 U.S.C. § 603(a).

¹⁵³ Public Law 104-13.

Small Business Paperwork Relief Act of 2002,¹⁵⁴ we seek specific comment on how we might “further reduce the information collection burden for small business concerns with fewer than 25 employees.”¹⁵⁵

64. *Further Information.*—For additional information on this proceeding, contact Anthony Patrone of the Broadband Division, Wireless Telecommunications Bureau, at anthony.patrone@fcc.gov or (202) 418-2428, or Jeffrey Tignor of the Broadband Division, Wireless Telecommunications Bureau, at jeffrey.tignor@fcc.gov or (202) 418-0774.

VI. ORDERING CLAUSES

65. Accordingly, IT IS ORDERED that, pursuant to sections 4(i) and (j), 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), (j), 303, 307, and 47 CFR § 1.407, the petitions for rulemaking filed by Aeronet, RM-11824 and RM-11825, are GRANTED as discussed herein, and this Notice of Proposed Rulemaking in WT Docket No. 19-xxx is ADOPTED.

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

67. IT IS FURTHER ORDERED, pursuant to Section 4(i) -(j) of the Communications Act of 1934, 47 U.S.C. § 154(i), (j), and Section 1.925 of our rules, that the Request for Waiver of Aviat Networks, Inc. filed on April 5, 2013, as amended on March 24, 2014; and on November 10, 2014 (to add Radio Frequency Systems as a party), and the Request for Waiver of CBF Networks, Inc. d/b/a Fastback Networks, filed on June 19, 2015, ARE DENIED. If no petitions for reconsideration are timely filed, WT Docket No. 15-244 is terminated and its docket shall be closed.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

¹⁵⁴ Public Law 107-198.

¹⁵⁵ 44 U.S.C. § 3506(c)(4).

APPENDIX A

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 the *Notice of Proposed Rulemaking (Notice)*. Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments as specified in the *Notice of Proposed Rulemaking*. 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. In the *Notice*, the Commission explores various proposals seeking to change its Part 101 rules to permit innovative uses of the 71–76 GHz, 81–86 GHz, 92–94 GHz, and 94.1–95 GHz bands, collectively referred to as the “70/80/90 GHz bands.” The potential rule changes seek to facilitate the provision of wireless backhaul for 5G, as well as the deployment of broadband services to aircraft and ships, while protecting incumbent operations in the 70/80/90 GHz bands. Further, in promoting the expanded use of this millimeter-wave spectrum for a myriad of innovative services, the Commission seeks to take advantage of the highly directional signal characteristics of these bands which may permit the co-existence of multiple types of deployments.

3. The 70/80/90 GHz bands are high millimeter-wave bands allocated for co-primary Federal and non-Federal uses in the FS, FSS (70/80 GHz only), Mobile (70/80/90 GHz), Radio Astronomy (80/90 GHz only) and Radiolocation (90 GHz only) services under Part 101 of the Commission’s Rules. Spectrum use in the 70/80/90 GHz bands is primarily concentrated along a few popular routes, with minimal use in large parts of the United States. These bands are presently used primarily for fixed point-to-point and satellite services via non-exclusive registered links in a third-party registration database. As of March 23, 2020, there were 658 active non-exclusive nationwide licensees in the 70/80/90 bands.⁴ Based upon information available from the third-party database managers responsible for registering links in those bands, as of March 23, 2020, there were 18,770 registered fixed links⁵ in the 70 GHz and 80 GHz bands.⁶ To further the Commission’s goals of expanding access to

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 These statistics are based on a review of the Universal Licensing System on March 23, 2020.

⁵ A link in this context is defined as a communication path between one location and another in a single direction. Multiple channels registered between the same transmit and receive location are considered separate links. Bi-directional communications are also counted as separate links.

⁶ These statistics are based on a review of the third-party database managers’ data on March 23, 2020. This excludes 142 additional links whose registration was pending on March 23, 2020. See <https://www.comsearch.com/products/online-tools/millimeter-wave-70-90-ghz-registration/>; <http://www.gigabitlink.com/>; <http://mmradioforms.com/mmRadioForms/FrontPage.aspx>; and <http://www.micronetcommunications.com/LinkRegistration/>; *see also* Comsearch, Aeronet Aviation and Maritime Communications Systems; Compatibility with Incumbent E-band Fixed Services and Link Registration System 13 (May 2, 2019) (Comsearch Report), *attached to Ex Parte* Letter from Samuel L. Feder, Counsel to Aeronet Global Communications Inc. to Marlene H. Dortch, Secretary, FCC, RM-11824 and RM-11825 (filed May 10, 2019)

broadband and fostering the efficient use of millimeter wave spectrum, we propose targeted changes to the Commission's rules to facilitate the provision of wireless backhaul for 5G and seek comment. Included in the Commission's discussion of potential rule changes and requests for comments in *Notice* are proposed changes to our rules in the 70/80/90 GHz bands by the Fixed Wireless Communications Coalition (FWCC)⁷, the 5G Wireless Backhaul Advocates⁸ and Aeronet Global Communications, Inc. (Aeronet).⁹

4. Specifically, the Commission proposes changes to the antenna standards applicable to the 70 GHz and 80 GHz bands and seeks comment on whether similar changes are necessary in the 90 GHz band. We also propose to continue licensing use of the 70 GHz and 80 GHz bands on a non-exclusive, nationwide basis, to the extent we authorize links to endpoints in motion in these bands and seek comment on this proposal. We further propose to require registration of all air and sea-based links/links between antennas in motion, and we seek comment on this proposal. In addition, we seek comment on whether the Commission should make changes to its current link registration rules for the 70/80/90 GHz bands to prevent the registration of never-constructed links. The Commission also proposes to authorize point-to-point links to endpoints in motion in the 70 GHz and 80 GHz bands and to classify those links as a "mobile" service. We seek comment on technical and operational rules necessary to facilitate these new service offerings in the 70 GHz and 80 GHz bands and mitigate interference to incumbents and other proposed users of these bands. Finally, we seek comment on whether the Commission should adopt a channelization plan in the 70 GHz and 80 GHz bands.

5. By modifying our rules and implementing policies designed to provide for more flexible use of new technologies in the 70/80/90 GHz band, the Commission hopes to ensure that this spectrum is efficiently utilized and will foster the development of new and innovative technologies and services, as well as encourage the growth and development of a wide variety of services, ultimately leading to greater benefits to consumers.

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(Aeronet May 10, 2019 Letter) (asserting that 31,772 *antennas* were deployed in the E-band as of February 25, 2019).

⁷ Letter from Cheng-yi Liu, Counsel, Fixed Wireless Communications Coalition, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153, GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, at 2 (filed Feb. 13, 2018) (FWCC *Ex Parte*) citing Comments of the Fixed Wireless Communications Coalition in Response to the Commission's Notice Of Inquiry, WT Docket No. 10-153 (filed Oct. 5, 2012), *amended*, Letter from Mitchell Lazarus, Counsel, FWCC to Marlene H. Dortch, Secretary, FCC in WT Docket No. 10-153 (filed April 4, 2013), *further amended*, Letter from Mitchell Lazarus, Counsel, FWCC to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 (filed March 24, 2014).

⁸ Letter from Jeffrey A. Marks, Head of Regulatory Affairs North America, Nokia, to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-153 et al. (filed Mar. 17, 2020) (5G Wireless Backhaul Advocates *Ex Parte*).

⁹ *Aeronet Global Communications Inc.'s Petition for Rulemaking to Amend the Commission's Allocation and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands to Authorize Aviation Scheduled Dynamic Datalinks*, Public Notice, Report No. 3112, CG RM-11825 (2019); *Aeronet Global Communications Inc.'s Petition for Rulemaking to Amend the Commission's Allocation and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands to Authorize Maritime Scheduled Dynamic Datalinks*, Public Notice, Report No. 3113, CG RM-11824 (2019). In its filings, Aeronet refers to the 70/80/90 GHz bands collectively as the E-band, a designation used by the Radio Society of Great Britain (RSGB), but not by the IEEE. See *Fundamentals of Microwave Photonics*, Vincent J. Urick, Jr., Jason D. McKinney, Keith J. Williams (6 February 2015) at 450–452. Except where quoting from Aeronet's (or others') pleadings, we will continue to use the 70/80/90 GHz bands designation to refer to these frequencies, consistent with the Commission's prior practice

B. Legal Basis

6. The proposed action is authorized pursuant to Sections 4, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154, 303, 307.

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

7. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.¹⁰ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”¹¹ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.¹² A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.¹³

8. *Small Businesses, Small Organizations, Small Governmental Jurisdictions.* Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe here, at the outset, three broad groups of small entities that could be directly affected herein.¹⁴ 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.¹⁵ These types of small businesses represent 99.9% of all businesses in the United States which translates to 30.7 million businesses.¹⁶

9. 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.”¹⁷ The Internal Revenue Service (IRS) uses a revenue benchmark of \$50,000 or less to delineate its annual electronic filing requirements for small exempt organizations.¹⁸ Nationwide, for tax year 2018, there

¹⁰ 5 U.S.C. § 603(b)(3).

¹¹ 5 U.S.C. § 601(6).

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

¹³ 15 U.S.C. § 632.

¹⁴ See 5 U.S.C. § 601(3)-(6).

¹⁵ See SBA, Office of Advocacy, “What’s New With Small Business,” <https://cdn.advocacy.sba.gov/wp-content/uploads/2019/09/23172859/Whats-New-With-Small-Business-2019.pdf> (Sept 2019).

¹⁶ *Id.*

¹⁷ 5 U.S.C. § 601(4).

¹⁸ The IRS benchmark is similar to the population of less than 50,000 benchmark in 5 U.S.C § 601(5) that is used to define a small governmental jurisdiction. Therefore, the IRS benchmark has been used to estimate the number small organizations in this small entity description. See Annual Electronic Filing Requirement for Small Exempt Organizations — Form 990-N (e-Postcard), “Who must file,”

<https://www.irs.gov/charities-non-profits/annual-electronic-filing-requirement-for-small-exempt-organizations-form-990-n-e-postcard>. We note that the IRS data does not provide information on whether a small exempt organization is independently owned and operated or dominant in its field.

were approximately 571,709 small exempt organizations in the U.S. reporting revenues of \$50,000 or less according to the registration and tax data for exempt organizations available from the IRS.¹⁹

10. 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.”²⁰ U.S. Census Bureau data from the 2017 Census of Governments²¹ indicate that there were 90,056 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.²² Of this number there were 36,931 general purpose governments (county²³, municipal and town or township²⁴) with populations of less than 50,000 and 12,040 special purpose governments - independent school districts²⁵ with enrollment populations of less than 50,000.²⁶ Accordingly, based on the 2017 U.S. Census of Governments data, we estimate that at least 48,971 entities fall into the category of “small governmental jurisdictions.”²⁷

¹⁹ See Exempt Organizations Business Master File Extract (EO BMF), “CSV Files by Region,” <https://www.irs.gov/charities-non-profits/exempt-organizations-business-master-file-extract-eo-bmf>. The IRS Exempt Organization Business Master File (EO BMF) Extract provides information on all registered tax-exempt/non-profit organizations. The data utilized for purposes of this description was extracted from the IRS EO BMF data for Region 1-Northeast Area (76,886), Region 2-Mid-Atlantic and Great Lakes Areas (221,121), and Region 3-Gulf Coast and Pacific Coast Areas (273,702) which includes the continental U.S., Alaska, and Hawaii. This data does not include information for Puerto Rico.

²⁰ 5 U.S.C. § 601(5).

²¹ 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 *See also* Census of Governments, <https://www.census.gov/programs-surveys/cog/about.html>.

²² See U.S. Census Bureau, 2012 Census of Governments, Local Governments by Type and State: 2012 - United States-States. <https://factfinder.census.gov/bkmk/table/1.0/en/COG/2012/ORG02.US01>. Local governmental jurisdictions are classified in two categories - General purpose governments (county, municipal and town or township) and Special purpose governments (special districts and independent school districts).

²³ See U.S. Census Bureau, 2017 Census of Governments - Organization, Table 5. County Governments by Population-Size Group and State: 2017 [CG1700ORG05]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 2,105 county governments with populations less than 50,000. This category does not include subcounty (municipal and township) governments.

²⁴ See U.S. Census Bureau, 2017 Census of Governments - Organization, Table 6. Subcounty General-Purpose Governments by Population-Size Group and State: 2017 [CG1700ORG06]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 18,729 municipal and 16,097 town and township governments with populations less than 50,000.

²⁵ See U.S. Census Bureau, 2017 Census of Governments - Organization, Table 10. Elementary and Secondary School Systems by Enrollment-Size Group and State: 2017 [CG1700ORG10]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 12,040 independent school districts with enrollment populations less than 50,000. See also Table 4. Special-Purpose Local Governments by State Census Years 1942 to 2017 [CG1700ORG04], CG1700ORG04 Table Notes_Special Purpose Local Governments by State_Census Years 1942 to 2017.

²⁶ While the special purpose governments category also includes local special district governments, the 2017 Census of Governments data does not provide data aggregated based on population size for the special purpose governments category. Therefore, only data from independent school districts is included in the special purpose governments category.

²⁷ This total is derived from the sum of the number of general purpose governments (county, municipal and town or township) with populations of less than 50,000 (36,931) and the number of special purpose governments - independent school districts with enrollment populations of less than 50,000 (12,040), from the 2017 Census of Governments - Organizations Tables 5, 6, and 10.

11. *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.²⁸ The appropriate size standard under SBA rules is that such a business is small if it has 1,500 or fewer employees.²⁹ For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.³⁰ Of this total, 955 firms had employment of 999 or fewer employees and 12 had employment of 1,000 employees or more.³¹ Thus under this category and the associated size standard, the Commission estimates that the majority of wireless telecommunications carriers (except satellite) are small entities.

12. *Fixed Microwave Services*. Microwave services include common carrier,³² private-operational fixed,³³ and broadcast auxiliary radio services.³⁴ They also include the Upper Microwave Flexible Use Service,³⁵ the Millimeter Wave Service,³⁶ Local Multipoint Distribution Service (LMDS),³⁷ the Digital Electronic Message Service (DEMS),³⁸ and the 24 GHz Service,³⁹ where licensees can choose between common carrier and non-common carrier status.⁴⁰ There are approximately 66,680 common carrier fixed licensees, 69,360 private and public safety operational-fixed licensees, 20,150 broadcast auxiliary radio licensees, 411 LMDS licenses, 33 24 GHz DEMS licenses, 777 39 GHz licenses, and five 24 GHz licensees, and 467 Millimeter Wave licenses in the microwave services.⁴¹ The Commission has not yet defined a small business with respect to microwave services. The closest applicable SBA

²⁸ U.S. Census Bureau, *2017 NAICS Definitions*, “517312 Wireless Telecommunications Carriers (Except Satellite)”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517312&search=2017%20NAICS%20Search>.

²⁹ 13 CFR § 121.201, NAICS Code 517312 (previously 517210).

³⁰ U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ5, *Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517210, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ5//naics~517210.

³¹ *Id.* Available census data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

³² See 47 CFR Part 10, Subpart I.

³³ Persons eligible under Parts 80 and 90 of the Commission’s rules can use Private-Operational Fixed Microwave services. See 47 CFR Parts 80 and 90. Stations in this service are called operational-fixed to distinguish them from common carrier and public fixed stations. Only the licensee may use the operational-fixed station, and only for communications related to the licensee’s commercial, industrial, or safety operations.

³⁴ Auxiliary Microwave Service is governed by Part 74 and Part 78 of Title 47 of the Commission’s rules. Available to licensees of broadcast stations, cable operators, and to broadcast and cable network entities. Auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between two points such as a main studio and an auxiliary studio. The service also includes TV pickup and CARS pickup, which relay signals from a remote location back to the studio.

³⁵ See 47 CFR Part 30.

³⁶ See 47 CFR Part 101, Subpart Q.

³⁷ See 47 CFR Part 101, Subpart L.

³⁸ See 47 CFR Part 101, Subpart G.

³⁹ See *id.*

⁴⁰ See 47 CFR §§ 30.6, 101.1017.

⁴¹ These statistics are based on a review of the Universal Licensing System on September 22, 2015.

category is Wireless Telecommunications Carriers (except Satellite).⁴² The appropriate size standard for this category under SBA rules is that such a business is small if it has 1,500 or fewer employees.⁴³ For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.⁴⁴ Of this total, 955 had employment of 999 or fewer, and 12 firms had employment of 1,000 employees or more.⁴⁵ Thus under this SBA category and the associated standard, the Commission estimates that the majority of fixed microwave service licensees can be considered small.

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

14. *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."⁴⁶ Satellite telecommunications service providers include satellite and earth station operators. The category has a small business size standard of \$35 million or less in average annual receipts, under SBA rules.⁴⁷ 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.⁴⁸ Of this total, 299 firms had annual receipts of less than \$25 million.⁴⁹ Consequently, we estimate that the majority of satellite telecommunications providers are small entities.

15. *All Other Telecommunications.* The "All Other Telecommunications" category is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.⁵⁰ This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and

⁴² ⁴² U.S. Census Bureau, *2017 NAICS Definitions*, "517312 Wireless Telecommunications Carriers (Except Satellite)", <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517312&search=2017%20NAICS%20Search>.

⁴³ 13 CFR § 121.201, NAICS Code 517312 (previously 517210).

⁴⁴ U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ5, *Information: Subject Series, Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517210, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ5//naics~517210.

⁴⁵ *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."

⁴⁶ U.S. Census Bureau, *2017 NAICS Definitions*, "517410 Satellite Telecommunications", <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517410&search=2017+NAICS+Search&search=2017>.

⁴⁷ 13 CFR § 121.201, NAICS Code 517410.

⁴⁸ U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, *Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012*, NAICS Code 517410, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517410.

⁴⁹ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard of annual receipts of \$35 million or less.

⁵⁰ See U.S. Census Bureau, *2012 NAICS Definitions*, "517919 All Other Telecommunications", <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517919&search=2017+NAICS+Search&search=2017>.

receiving telecommunications from, satellite systems.⁵¹ Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.”⁵² The SBA has developed a small business size standard for “All Other Telecommunications,” which consists of all such firms with gross annual receipts of \$35 million or less.⁵³ For this category, U.S. Census Bureau data for 2012 show that there were a total of 1,442 firms that operated for the entire year.⁵⁴ Of these firms, a total of 1400 firms had gross annual receipts of under \$25 million and 42 firms had gross annual receipts of \$25 million to \$49, 999,999.⁵⁵ Thus, the Commission estimates that a majority of “All Other Telecommunications” firms potentially affected by our actions can be considered small.

16. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.⁵⁶ Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”⁵⁷ The SBA has established a size standard for this industry of 1,250 employees or less.⁵⁸ U.S. Census Bureau data for 2012 show that 841 establishments operated in this industry in that year.⁵⁹ Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.⁶⁰ Based on this data, we conclude that a majority of manufacturers in this industry is small.

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

17. We expect the rule proposals in the *Notice* may impose new or additional reporting or recordkeeping and/or other compliance obligations on small entities as well as on other licensees and applicants if adopted. In particular, proposed requirements involving licensing, registration, and construction certification could increase recordkeeping and reporting obligations for small entities and for other licensees and applicants. There may also be new compliance obligations created by antenna

⁵¹ *Id.*

⁵² *Id.*

⁵³ 13 CFR 121.201, NAICS Code 517919.

⁵⁴ U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1251SSSZ4, *Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the United States: 2012*, NAICS Code 517919, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/51SSSZ4//naics~517919.

⁵⁵ *Id.*

⁵⁶ The NAICS Code for this service is 334220. 13 C.F.R 121.201. *See also* U.S. Census Bureau, 2012 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing” <https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.334220#>.

⁵⁷ *See* U.S. Census Bureau, 2012 NAICS Definitions, NAICS Code 334220, available at <https://factfinder.census.gov/faces/affhelp/jsf/pages/metadata.xhtml?lang=en&type=ib&id=ib.en./ECN.NAICS2012.334220#>.

⁵⁸ 13 CFR § 121.201, NAICS Code 334220.

⁵⁹ U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1231SG2, *Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012* NAICS Code 334220, https://factfinder.census.gov/bkmk/table/1.0/en/ECN/2012_US/31SG2//naics~334220.

⁶⁰ *Id.*

standard changes, and changes to Part 101 technical and/or operational rules in order to accommodate proposed new service offerings and other potential uses of the 70/80/90 GHz bands. The Commission believes at this time that applying the rules equally to all entities would promote fairness.

18. In the *Notice*, the Commission is considering adopting rules with the goal of preventing one party from filing a bevy of coordination requests, choking-off the band from competitors. We propose requiring registrants in the 70/80/90 GHz bands to file such certificates of construction, through either ULS or a third party, when a link has been placed into operation. As it currently stands, failure to timely begin operations pursuant to Part 101 authorization results in the authorization cancelling automatically, however, the Commission has no way of knowing whether operation has begun without a requirement to file a construction certificate. The *Notice* seeks comment on whether we should also require licensees to list registrations under their licenses that are beyond their construction deadlines as part of their renewal applications, and—for each registration—either certify the link’s construction and use or to identify the link for removal from the third-party databases. While filing such construction certificates or requiring the listing of registrations with missed construction deadlines with third-party database administrators may appear to increase the paperwork burden on all affected entities, strict construction requirements may actually reduce the overall number of filings to only those that entities would actually build.

19. The record in this proceeding contains assertions that the innovative aeronautical and maritime services proposed by Aeronet have lower interference potential and therefore could avoid the need to engage in the proposed registration process described above. If this becomes the Commission’s approach, it would lower the recordkeeping burden on small entities and other licensees. However, to the extent such links would also be coordinated through the current registration system, the recordkeeping burden associated with such new services would presumably remain the same as the burden on legacy systems in the 70/80/90 GHz bands. There are various methods of interference mitigation that could be applicable to the newly proposed services, such as the use of coordination zones or frequency planning which may also place a greater recordkeeping burden on licensees operating these services. However, if new services are able to operate without causing interference to competitors’ systems, and existing mitigation techniques remain effective, then related compliance costs may not increase. In the *Notice*, we seek comment on the various proposals and considerations.

20. When the Commission first reduced the minimum antenna standard, the Commission did so as a matter of public policy to expand potential use in the bands to more business locations. In the past, the cost of the 70 GHz and 80 GHz antennas were specifically noted as major factors limiting deployment in the 70/80/90 GHz band. As mentioned in the *Notice*, the antennas mandated in the 70/80/90 GHz bands can cost up to eight times as much as smaller antennas. The FWCC’s proposal to permit even smaller antenna designs, could result in more small entities using the band. To the extent such new antenna standards would increase interference between antennas, it is also possible that higher levels of coordination and hence recordkeeping would be essential. However, the Commission does not believe that the costs and/or administrative burdens associated with these rules would unduly burden small entities or other licensees. In the *Notice*, we seek comment on these proposals and considerations.

21. The *Notice* notes that certain Part 101 rules need modification, such as the requirement “[e]ach licensee shall post at the station the name, address and telephone number of the custodian of the station license or other authorization if such license or authorization is not maintained at the station.”⁶¹ The Commission asks commenters how to apply this rule (if at all), to stations on-board aircraft or ships or HAPS. In the absence of any modifications, this rule would create a recordkeeping obligation for operators of newly proposed services.

22. At this time, Commission is not currently in a position to determine whether, if adopted,

⁶¹ 47 CFR § 101.215(a).

the proposed rules and associated requirements raised in the *Notice* would require small entities to hire attorneys, engineers, consultants, or other professionals and cannot quantify the cost of compliance with the potential rule changes and compliance obligations raised herein. In our discussion of these proposals in the *Notice*, we have sought comments from the parties in the proceeding, and requested cost and benefit analyses, which may help the Commission identify and evaluate relevant matters for small entities, including any compliance costs and burdens that may result in the proceeding.

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

23. The RFA requires an agency to describe any significant, specifically small business, alternatives for small businesses that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities; (3) the use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.⁶²

24. To assist with the Commission's evaluation of the economic impact on small entities, and to better evaluate options and alternatives should there be a significant economic impact on small entities as a result of the proposals in this *Notice*, the Commission has sought comment from the parties. The proposals in this proceeding for expanded use in the 70/80/90 bands are predicted on Aeronet's petitions for rulemaking to permit the use of SDDLs to enable the provision of broadband service to aircraft or ships in motion. However, alternative uses for the band were raised by commenters on the Aeronet petitions. Sierra Nevada seeks to use the 90 GHz band for Enhanced Flight Vision Systems to allow aircraft to land in low-visibility conditions.⁶³ Elefante seeks to use the 70 GHz and 80 GHz bands for feeder links in its proposed Stratospheric-Based Communications Service.⁶⁴ Loon intends to use a network of balloons at heights of about 20 kilometers to provide Internet access unserved and underserved communities.⁶⁵ Moog intends to use spectrum in the 90 GHz band for its proposed Foreign Object Debris Detection System to help airplanes avoid hazards on runways.⁶⁶ Additionally as mentioned above, FWCC proposes several changes to the Commission's Part 101 rules governing the 71–76 GHz and 81–86 GHz bands. To facilitate further consideration of the various use proposals, in the *Notice* the Commission seeks comments on how to weigh public interest considerations associated with allowing, prohibiting and prioritization of uses and on the costs and benefits of allowing new uses of the 70/80/90 GHz bands for communications to points in motion. The Commission also seeks comment on whether changes to the 70/80/90 GHz licensing framework would be necessary to accommodate the operation of links to endpoints in motion under Part 101.

25. In light of FWCC's proposed changes to the 70 GHz and 80 GHz antenna standards, the Commission seeks comments and alternatives for changing the antenna standards in 70/80/90 GHz bands. We believe that reducing the minimum antenna size will facilitate access to spectrum by a wide variety of small entities at a cost that is substantially less than the antennas currently mandated for the 70/80/90 GHz bands. We seek detailed quantitative data on the benefits and costs of relaxing antenna standards for the 70/80 GHz bands which may allow us to analyze the impact on small entities. This includes any cost savings from the changes and any cost increases that may result from increased interference. In the

⁶² 5 U.S.C. § 603(a)(1)-(4).

⁶³ Sierra Nevada Comments at 2.

⁶⁴ Elefante Comments at 2.

⁶⁵ Loon Comments at 2.

⁶⁶ Moog Reply Comments at 2.

Notice, Commission queries whether to require 70 GHz and 80 GHz band registrants to file a certification of construction when a link has been placed into operation in response to FWCC's proposed changes to our rules for link registration in the 70/80 GHz bands and seeks comments on these matters. The Commission also queries what penalties should be imposed for failure to comply with a certification requirement, if adopted, and whether license forfeitures or other penalties should be imposed for failure to timely begin operations and seeks comments.

26. The Commission expects to more fully consider the economic impact and alternatives for small entities following the review of comments and costs and benefits analyses filed in response to the *Notice*. The Commission's evaluation of this information will shape the final alternatives it considers, the final conclusions it reaches, and any final actions it ultimately takes in this proceeding to minimize any significant economic impact that may occur on small entities.

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

27. None.