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

In the Matter of	)	
	)	
Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band	)))	GN Docket No. 12-354

FURTHER NOTICE OF PROPOSED RULEMAKING

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I. INTRODUCTION

1. We are in the midst of a communications revolution that has connected us to each other as never before through an ever increasing number of wireless devices. As a result of the continuing proliferation of connected devices, demand for wireless broadband capacity is growing rapidly. New, more efficient wireless network architectures and innovative approaches to spectrum management are tools that can help maximize the utility of existing spectrum resources and make new spectrum bands available for broadband access. As we previously discussed,[1] our proposals for the 3550-3650 MHz band

[1] *See* Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket No. 12-354, *Notice of Proposed Rulemaking*, 27 FCC Rcd 15594, 15595, ¶ 1 (2012) (*3.5 GHz NPRM*).

(3.5 GHz Band) focus on two components of the Commission's ongoing efforts to address wireless coverage and capacity issues: *small cells* and *spectrum sharing*—both of which were addressed in a report issued by the President's Council of Advisors on Science and Technology (PCAST).[2]

2. With this *Further Notice of Proposed Rulemaking* (*FNPRM* or *Further Notice*), we propose specific rules for a new Citizens Broadband Radio Service in the 3.5 GHz Band that would make the 3.5 GHz sharing regime originally described by PCAST a reality. The 3.5 GHz Band could be an "innovation band," where we can explore new methods of spectrum sharing and promote a diverse array of network technologies, with a focus on relatively low-powered applications. If successful, the spectrum sharing model proposed for this band could ultimately be expanded to other spectrum bands and "transform the availability of a precious national resource —spectrum—from scarcity to abundance."[3]

3. The proposed rules set forth herein build upon the record developed in response to a series of prior proposals and workshops over the past sixteen months. These detailed proposals will allow for more focused comment prior to establishing rules governing the proposed Citizens Broadband Radio Service in a new Part 96 of the Commission's rules.[4] Specifically, the proposed rules would implement an innovative and comprehensive framework to authorize a variety of small cell and other broadband uses of the 3.5 GHz Band on a shared basis with incumbent federal and non-federal users of the band, with oversight and enforcement through a Spectrum Access System (SAS). The proposed rules reflect our belief that the 3.5 GHz Band could be an ideal "innovation band," well suited to exploring the next generation of shared spectrum technologies, to drive greater productivity and efficiency in spectrum use.

4. The creation of the Citizens Broadband Radio Service was originally proposed in a *Notice of Proposed Rulemaking* (*3.5 GHz NPRM* or *NPRM*) released in December 2012.[5] After reviewing the record generated by the *3.5 GHz NPRM*, we released a *Public Notice* to supplement the record with focused comment on specific concepts for the 3.5 GHz Band (*Licensing PN*).[6] The *Licensing PN* described a "Revised Framework" that elaborated on some of the alternative licensing and authorization concepts set forth in the *NPRM*.[7] With this *FNPRM* we fulfill a commitment made in issuing the *Licensing PN* that we would seek comment on specific detailed rules before publishing a *First Report and Order* in this proceeding.[8]

5. As set forth in more detail below, we propose to establish a three-tiered authorization framework – Incumbent Access, Priority Access, and General Authorized Access (GAA) tiers - based on the recommendations of PCAST and originally proposed in the *NPRM*.[9] Under this framework, existing primary operations – including authorized federal users and grandfathered Fixed Satellite Service (FSS) earth stations - would compose the Incumbent Access tier and would receive protection from harmful interference from Citizens Broadband Radio Service users. At this time, we propose to establish

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[2] *See* PCAST, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (rel. July 20, 2012) (PCAST Report), *available at* http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf (PCAST Report) at vi and 17-20.

[3] *See* PCAST Report at vi.

[4] *See* Appendix A.

[5] *See 3.5 GHz NPRM*.

[6] Commission Seeks Comment on Licensing Models and Technical Requirements in the 3550-3650 MHz Band, GN Docket No. 12-354, *Public Notice*, 28 FCC Rcd 15300 (2013) (*Licensing PN*).

[7] *See Licensing PN*, 28 FCC Rcd at 15301, ¶ 2.

[8] *See id.* at 15301, ¶ 3.

[9] *See* PCAST Report at 16-21, 82-84; 3.5 GHz NPRM, 27 FCC Rcd at 15612-22, ¶¶ 53-82.

geographic Exclusion Zones[10] based on the models suggested in the National Telecommunications and Information Administration's (NTIA) Fast Track Report to protect federal Incumbent Access tier operations.[11] We plan to work with NTIA in coming months to reassess these Exclusion Zones in light of new technologies envisioned in this *FNPRM* and new data from technical studies evaluating the coexistence of radars and wireless broadband services. If there are further developments that would enable a reduction in the size of the Exclusion Zones, we encourage participants to file in the record to ensure that there is sufficient opportunity for public comment prior to issuance of a *Report and Order* in this proceeding.

6. Interference management with respect to the three tiers of service, including adherence to designated Exclusion Zones, would be managed by a dynamic SAS, conceptually similar to, but more advanced than the databases used to manage Television White Spaces (TVWS) devices. Consistent with the Revised Framework, we propose to define each Priority Access License (PAL) as an authorization to use for one-year a 10 megahertz channel in a single census tract. PALs would be open to any prospective licensee that meets basic FCC qualifications and mutually exclusive applications for PALs would be subject to competitive bidding. PAL channels would be dynamically coordinated by the SAS and the exact spectral location of a given PAL authorization could shift from time to time as directed by the SAS during its license term.[12] The GAA tier would be licensed-by-rule to permit open, flexible access to the band to the widest possible group of potential users. We propose to reserve at all times for GAA use, a minimum of 50 percent of the band that is not encumbered by Incumbent Access tier users in any given location.

7. We propose baseline technical standards for the operation of Citizens Broadband Radio Service Devices (CBSDs) and End User Devices in the 3.5 GHz Band as well as general rules for the operation of the SAS and approval of SAS Administrators. Many of these concepts were originally raised in the *NPRM* and *Licensing PN*. We also seek further comment on other important issues raised in this proceeding, including: (1) protection criteria for Incumbent Users; (2) potential protection of FSS earth stations in the 3700-4200 MHz band (C-Band); (3) competitive bidding procedures for resolving mutually exclusive applications for PALs; and (4) the possible extension of the proposed rules to include the 3650-3700 MHz band. Some of these issues, particularly those dealing with protection criteria for Incumbent Access tier users, may require additional focused input from government and private industry stakeholders.

8. Our goal in this *FNPRM* is to generate focused comment on specific proposed rule text as a penultimate step before the establishment of a new rule part – Part 96 – authorizing fixed and mobile wireless use of the 3.5 GHz Band.[13] Our goal is to adopt rules that promote efficient and widespread use of the 3.5 GHz Band for a variety of potential users. We emphasize that this is an iterative process and that, while some issues remain open, the proposed rules set forth herein provide a clear framework that would allow users to begin operations in the Citizens Broadband Radio Service in designated geographic areas.

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[10] Unless otherwise noted, capitalized terms in this *FNPRM* are defined as set forth in section 96.3 of the Proposed Rules. *See* Appendix A, § 96.3.

[11] *See* NTIA, An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, 4200-4220 MHz, and 4380-4400 MHz Bands (rel. October 2010) (Fast Track Report), available at http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf.

[12] We do not propose to create a fixed bandplan (*i.e.*, 10x10 megahertz channels). *See infra* section III (A)(1)(a)(vii).

[13] *See Licensing PN*, 28 FCC Rcd at 15301, ¶ 3.

II. BACKGROUND

9. The Fast Track Report first identified the 3.5 GHz Band as potentially suitable for commercial broadband use.[14] NTIA recommended that this band could be made available for commercial wireless broadband by 2015 based on the conditions outlined in the Fast Track Report.[15] NTIA's recommendation included significant geographic restrictions to protect existing Department of Defense (DoD) radar and FSS operations and to protect new commercial systems from co-channel interference from high-powered military in-band shipborne and adjacent band DoD ground-based radar systems.[16] The radar systems that operate in the 3.5 GHz Band overcome the inherent propagation limitations of this frequency range by employing high transmitter power levels and high-gain antennas.[17] These characteristics of the radar systems were a contributing factor to the size of the exclusion zones in the Fast Track evaluation.

10. In July 2012, PCAST recommended that the Federal Government identify 1,000 megahertz of federal spectrum for shared use to create "the first shared use spectrum superhighways."[18] PCAST recommends that shared spectrum be organized into three tiers. To ensure interference protection, all users would be required to register in a database modeled on the TVWS database.[19] The first tier would consist of incumbent federal users.[20] These users would be entitled to full protection for their operations within their deployed areas, consistent with the terms of their assignments.[21] The second tier would consist of users that would receive short-term priority authorizations to operate within designated geographic areas.[22] Secondary users would receive protection from interference from third tier users but would be required to avoid interference with and accept interference from Federal Primary users.[23] Third tier users (GAA) would be entitled to use the spectrum on an opportunistic basis and would not be entitled to interference protection. PCAST recommends that the Commission, in conjunction with NTIA, work expeditiously to implement its recommendations in the 3.5 GHz Band.[24]

11. The Commission's December 2012 *NPRM* proposed a three-tier, license-by-rule authorization framework, based on concepts described in the PCAST Report that are intended to facilitate rapid broadband deployment while protecting existing incumbent users of the 3.5 GHz Band.[25] The *NPRM* solicited comment on all aspects of this proposal, including the appropriate licensing framework and the potential uses of each service tier. The Commission received extensive comment from a wide range of stakeholders in response.[26] The *NPRM* also included a supplemental proposal to expand the

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[14] *See* Fast Track Report, at 1-6 – 1-7 and Appendix D.

[15] *Id.* at 1-8.

[16] *Id.* at 1-6 to 1-7, figures D-45 to D-55, and Appendix B.

[17] *Id.* at 3-30 to 3-33.

[18] PCAST Report at 50-52.

[19] *See* 47 C.F.R. §§ 15.713-15.

[20] *See* PCAST Report at 23-24.

[21] *Id*.

[22] *Id.* PCAST refers to the second tier as "Secondary Access."

[23] *Id*.

[24] *Id.* at 82-83.

[25] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15612-21, ¶¶ 53-77, PCAST Report at 16-21, 82-84.

[26] *See generally* comments filed in Docket No. 12-354.

proposed licensing and authorization model to an additional adjacent 50 megahertz of spectrum in the 3650-3700 MHz band, making up to 150 megahertz available for shared wireless broadband access.[27]

12. As we noted in the *NPRM*, the technical characteristics of the 3.5 GHz Band and the existence of important incumbent operations in the band in many areas of the country contribute to make the band an ideal platform to explore innovative approaches to shared spectrum use and small cell technology.[28] NTIA's Fast Track Report recommended, based on technical assumptions typical of traditional macrocell deployments of commercial wireless broadband technology, that new commercial uses of the band occur outside of large "exclusion zones" to protect Federal government operations.[29] Given that the exclusion zones would cover approximately 60 percent of the U.S. population[30] and because of limited signal propagation in the band, the band did not appear to be well-suited for macrocell deployment. However, as noted in the *NPRM*, these very disadvantages could be turned into advantages if the band were used to explore spectrum sharing and small cell innovation.[31] This proposal was based on recommendations put forth by the FCC's Technology Advisory Council (TAC), which has advocated for the increased use of small cell devices in spectrum constrained areas and supported dedicating a spectrum band to small cell uses.[32] The combination of small cells and spectrum sharing technologies could vastly increase the usability of the 3.5 GHz Band for wireless broadband and serve as a model for future coexistence among services in other spectrum bands.

13. In November 2013, in response to record comments received up to that point, we released the *Licensing PN*, which described a Revised Framework that elaborated upon some of the licensing concepts and alternatives set forth in the *NPRM*.[33] The Revised Framework retains the three-tier model proposed in the *NPRM* but expands eligibility to apply for PALs, and explores innovative means of assigning authorizations within that tier.[34] Like the *NPRM*'s main proposal, the Revised Framework would leverage the unique capabilities of small cell and SAS technologies to enable sharing among users in the Priority Access and GAA tiers. Specifically, the Revised Framework contains the following core concepts:

- An SAS to dynamically manage frequency assignments and automatically enforce access to the Priority Access and GAA tiers;
- Expansive eligibility for Priority Access tier use;
- Granular, but administratively-streamlined licensing of the Priority Access tier;
- Exclusive spectrum rights for Priority Access subject to licensing by auction in the event of mutually exclusive applications;
- A defined "floor" of GAA spectrum availability, to ensure that GAA access is available nationwide (subject to Incumbent Access tier use);

[27] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15620-23, ¶¶ 77-86.

[28] *Id.* 27 FCC Rcd at 15601-03, ¶¶ 17-25.

[29] *See* Fast Track Report at 1-6 – 1-7 and Appendix D.

[30] *See* Fast Track Report at 1-6 – 1-7 and Appendix D and *3.5 GHz NPRM*, 27 FCC Rcd at 15597 and 15601, ¶¶ 6 and 17-18.

[31] *See 3.5 GHz NPRM* at 15630-35, ¶¶ 113-23

[32] *See* Technical Advisory Council, Chairman's Report, (rel. April 22, 2011) at 3, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-306065A1.pdf.

[33] *See Licensing PN*, 28 FCC Rcd at 15301, ¶ 2.

[34] *Id.* at 15305-10, ¶¶ 10-27.

- Additional GAA access to unused Priority Access bandwidth, as identified and managed by the SAS, to maximize dynamic use of the unutilized portion of the band and ensure productive use of the spectrum;
- Opportunities for Contained Access Users to obtain targeted priority spectrum use within specific facilities (such as buildings) that meet certain requirements to mitigate the potential for interference to and from Incumbent Users and other Citizens Broadband Radio Service users; and
- A set of baseline technical standards to prevent harmful interference and ensure productive use of the spectrum.[35]

14. The *Licensing PN* generated a robust supplementary record, eliciting comments from a wide range of stakeholders. While most commenters support expanding Priority Access tier eligibility from "critical access" users to all qualified applicants,[36] opinions were split on other specific aspects of the Revised Framework. Notably, commenters diverged greatly on the band plan, PAL specifications, authorization methodology, and technical specifications of CBSDs. These submissions are addressed in greater detail on an issue-by-issue basis in Section III.

15. In addition, we have convened two workshops to discuss technical issues related to this proceeding.[37] The first workshop explored broad issues that emanated from the original *NPRM*.[38] More recently, on January 14, 2014, the Bureau and OET hosted a workshop to further explore the technical requirements, operational parameters, and architecture of the proposed SAS (SAS Workshop).[39] A diverse group of engineers representing industry stakeholders, trade associations, and academia submitted

[35] *See Licensing PN*.

[36] *See e.g.*, Reply Comments of CTIA in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) (CTIA *Licensing PN* Reply Comments) at 3; Comments of Alcatel-Lucent in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Alcatel-Lucent *Licensing PN* Comments) at 1-2; Comments of Nokia Solutions and Networks US LLC in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (NSN *Licensing PN* Comments) at 4-8; Comments of Google, Inc. in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Google *Licensing PN* Comments) at 5; and Comments of the Consumer Electronics Association in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (CEA *Licensing PN* Comments) at 2-3; *but see* Comments of Utilities Telecom Council in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (UTC *Licensing PN* Comments) at 3-4; Reply Comments of the American Petroleum Institute in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (API *Licensing PN* Reply Comments) at 2-4.

[37] FCC Wireless Telecommunications Bureau and Office of Engineering and Technology Announce Agenda for Workshop on the 3.5 GHz Notice of Proposed Rulemaking, GN Docket No. 12-354, *Public Notice*, DA 13-367 (2013) (*First 3.5 GHz Workshop PN*); FCC Wireless Telecommunications Bureau and Office of Engineering and Technology Announce Agenda for Workshop to Discuss the Creation of a Spectrum Access System in the 3.5 GHz Band, GN Docket No. 12-354, *Public Notice*, 29 FCC Rcd 174 (rel. January 9, 2014) (*SAS Workshop Agenda PN*); Workshop video and presentation materials available at: http://www.fcc.gov/events/35-ghz-spectrum-access-system-workshop and http://www.fcc.gov/events/35-ghz-workshop.

[38] *See First 3.5 GHz Workshop PN*; Video and presentation materials available at: http://www.fcc.gov/events/35-ghz-workshop.

[39] *See* Wireless Telecommunications Bureau and Office of Engineering and Technology Call for Papers on the Proposed Spectrum Access System for the 3.5 GHz Band, GN Docket No. 12-354, *Public Notice*, 28 FCC Rcd 15843 (rel. November 18, 2013) (*SAS Papers PN*); *SAS Workshop Agenda PN*; Workshop video and presentation materials available at: http://www.fcc.gov/events/35-ghz-spectrum-access-system-workshop. The Commission also announced a two week online discussion to further explore topics addressed in the workshop. The results of that discussion were added to the record. *See* Wireless Telecommunications Bureau and Office of Engineering and Technology Submission for the Record in GN Docket No. 12-354 (filed March 31, 2014).

technical papers in advance of the workshop and participated in panels throughout the day.[40] We address many of these submissions in greater detail below.[41]

16. The purpose of this *FNPRM* is to solicit focused comment on specific proposed rules and other specifically identified open issues. To the extent that parties require additional background on any of the proposals we describe in this *FNPRM*, we encourage them to review prior releases in this docket, including the *NPRM*, the *Licensing PN*, and the recorded footage of the two workshops.

III. DISCUSSION

17. With this *FNPRM*, we seek comment on proposed rules for the Citizens Broadband Radio Service.[42] These proposed rules build upon the concepts and proposals set forth in the *NPRM* and the *Licensing PN*, in light of the record created in this proceeding. Notably, the proposed rules would:

- Implement the three-tier model proposed in the *NPRM*;
- Establish Exclusion Zones to ensure compatibility between incumbent federal operations and Citizens Broadband Radio Service users;
- Create an open eligibility authorization system for Priority Access and GAA operations;
- Establish granular, exclusive spectrum rights for the Priority Access tier, consistent with parameters discussed in the *Licensing PN*;
- Set a defined "floor" for GAA spectrum availability, to ensure that GAA access is available nationwide (subject to Incumbent Access tier use);
- Set guidelines to allow Contained Access Users to request up to 20 megahertz of reserved frequencies from the GAA pool for use within their facilities;
- Establish baseline technical rules for fixed or nomadic base stations operating in the 3.5 GHz Band;
- Set guidelines for the operation and certification of SASs in the band.

We seek detailed comment on these proposals, as well as viable alternative or supplemental rule provisions that could help to achieve our stated objectives. We encourage commenters to focus their submissions on the specific proposed rule text and structure. We further encourage commenters to identify the specific costs and benefits associated with any proposal. To the extent possible, commenters should provide specific data and information, such as actual or estimated dollar figures for each specific cost or benefit addressed, including a description of how the data or information was calculated or obtained, and any supporting documentation or other evidentiary support.

A. Proposed Regulatory Framework

18. Below we discuss the proposed Part 96 and its component subsections, as well as proposed modifications to our existing rules designed to accommodate the new proposed Citizens Broadband Radio Service. The discussion parallels the proposed structure of Part 96, as detailed in Appendix A.[43]

[40] *See SAS Workshop Agenda PN*; *See generally*, SAS workshop submissions in GN Docket No. 12-354.

[41] *See infra* section III (A)(1)(e)-(f).

[42] *See* Appendix A.

[43] Where rule sections are mentioned in this *FNPRM* (*e.g.*, § 96.1), these refer to sections of the proposed rules set forth in Appendix A, unless otherwise noted.

1. Proposed Part 96 Rule Part

a. Subpart A – GENERAL RULES

(i) Scope (§ 96.1)

19. We propose to implement the three-tier authorization framework originally described in the *NPRM* and further discussed in the *Licensing PN*.[44] This proposal is consistent with the framework for the 3.5 GHz Band originally described in the PCAST Report.[45] Under this framework, existing primary operations – including authorized federal users and grandfathered FSS earth stations - would make up the Incumbent Access tier and would receive protection from harmful interference consistent with the proposed rules.[46] The Citizens Broadband Radio Service would be divided into Priority Access and GAA tiers of service, each of which would be required to operate on a non-interference basis with the Incumbent Access tier.[47] We also propose that any party that meets basic eligibility requirements under the Communications Act be eligible to hold a PAL or, when authorized, operate a CBSD on a GAA basis in the Citizens Broadband Radio Service.

20. The proposed three-tier framework enjoys significant support from a diverse group of commenters, including AT&T, Google, Public Knowledge, and the Open Technology Institute at the New America Foundation.[48] Others, including CTIA – The Wireless Association (CTIA), NSN, and Qualcomm have argued that a two-tier framework that would prohibit or segregate GAA users would be a more efficient way to manage the 3.5 GHz Band.[49]

21. Some commenters, including some who have also expressed support for the three-tiered model, argue that the 3.5 GHz Band should be divided between two and three-tiered authorization schemes, at least on a transitional basis.[50] Under this concept, as originally described by Verizon Communications Inc. and Verizon Wireless Inc. (Verizon), a portion of the band would be set aside for a "transitional framework" sub-band which would be licensed on a more traditional, exclusive-use basis and would not include GAA users.[51] The remainder of the band could be split between GAA-only use

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[44] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15612-14, ¶¶ 53-60; *Licensing PN*, 28 FCC Rcd at 15304-13, ¶¶ 10-40.

[45] *See* PCAST Report at 23-24.

[46] *See infra* sections III(A)(1)(b) and (B)(1); Appendix A, § 96.15.

[47] GAA users must also operate on a non-interference basis with respect to Priority Access Licensees. *See* Appendix A, § 96.33.

[48] *See* Google *Licensing PN* Comments at 1-2; Comments of AT&T Services Inc. in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (AT&T *Licensing PN* Comments) at 3-6; Comments of the Open Technology Institute at the New America Foundation and Public Knowledge in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (OTI/PK *Licensing PN* Comments) at 3-4; *See also* Letter from Amplex Electric, Inc. Aristotle Inc., Cambium Networks Ltd., CompTIA , Consumer Federation of America, Free Press, Google, Highspeedlink, JAB Wireless, Inc. , Microsoft, New America Foundation , Public Knowledge, Shelby Broadband, Texas Instruments, Ubiquiti Networks, Inc., and Wireless Internet Service Providers Association to Marlene H. Dortch in GN Docket No. 12-354 (filed March 24, 2014) (Coalition Letter).

[49] *See* Comments of Qualcomm Incorporated in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Qualcomm *Licensing PN* Comments) at 4-5; CTIA *Licensing PN* Reply Comments at 3; NSN *Licensing PN* Comments at 8-15 (Proposing that the Commission assign the 3.5 GHz Band exclusively for Priority Access and the 3650-3700 MHz band for GAA use).

[50] *See* Comments of Verizon and Verizon Wireless in response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Verizon *Licensing PN* Comments); Reply Comments of AT&T Services Inc., in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) (AT&T *Licensing PN* Reply Comments) at 3.

[51] *See* Verizon *Licensing PN* Comments at 10-11 (arguing that the geographic area, terms, and administration of licenses in the "transitional framework" sub-band should approximate existing exclusive-use licensing models).

and the proposed three-tiered sharing framework. The "transitional framework" sub-band could then be phased out after the three-tier framework is proven to be workable in practice.[52]

22. The specific Part 96 rules we propose today would apply the three-tier authorization model across the entire 3.5 GHz Band, based, at least in part, on concerns about the impact that Balkanization of this spectrum may have in terms of limiting the development of a robust and varied shared spectrum ecosystem in the band. We seek comment on the proposed section 96.1 and encourage commenters to consider the costs and benefits of any alternate proposals that they may put forward in light of the recommendations of PCAST and the Commission's goals for this band.

(ii) Definitions (§ 96.3)

23. Section 96.3 of the proposed rules sets forth definitions for various terms included in the proposed Part 96. We seek comment on these definitions and any additional terms that may need to be defined.

(iii) Eligibility (§ 96.5)

24. We propose that any entity, other than those precluded by section 310 of the Communications Act be eligible to operate a CBSD on a Priority Access or GAA basis.[53] Issues related to qualifications for Priority Access, GAA, and Contained Access Users are explored in greater detail below.[54]

(iv) Authorization Required (§ 96.7)

25. We propose that operators be authorized consistent with this part prior to operating CBSDs in the Citizens Broadband Radio Service. The proposed rules governing authorizations for Priority Access, GAA, and Contained Access Users are discussed in greater detail below.[55] We seek comment on this proposed rule and on the proposed changes to Part 1 of the Commission's rules. We also seek comment on whether the licensing and authorization methods described herein would require the Commission to alter its existing rules governing filing, retention, and public access for licenses and applications in the Wireless Radio Services.[56]

(v) Regulatory Status (§ 96.9)

26. We propose to allow Citizens Broadband Radio Service users to select whether to provide service on a common carrier or non-common carrier basis, regardless of whether they operate in the Priority Access tier, GAA tier, or both. Users that choose to offer services on a common carrier basis would be required to comply with all of the Commission's rules applicable to common carriers. This is consistent with our approach in other licensed services.[57] We seek comment on this proposal. Specifically, should GAA users be permitted to provide common carrier services? Could the SAS effectively coordinate and enforce these individual service selections, subject to appropriate Commission oversight?

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[52] Verizon *Licensing PN* Comments at 3.

[53] *See* 47 U.S.C. § 310; We note, however, that only qualified Contained Access Users operating in Contained Access Facilities (CAFs) will be able to take advantage of the provisions of the proposed Section 96.35. *See* Appendix A, § 96.35.

[54] *See infra* section III(A)(1)(c)-(d).

[55] *See id.*

[56] *See* 47 C.F.R. §§ 1.901, *et seq.*

[57] *See e.g.* 47 C.F.R. § 90.1309 (3650-3700 MHz Service) and 47 C.F.R. § 27.10 (Miscellaneous Wireless Communications Services).

(vi) Frequencies (§ 96.11)

27. We propose to include the 3550-3650 MHz band in Part 96. These proposed rules could be expanded to include the 3650-3700 MHz band or other encumbered spectrum bands in the future. We discuss our supplementary proposal to include the 3650-3700 MHz band in greater detail below.[58] We seek comment on the proposed section 96.11.

(vii) Frequency Assignments (§ 96.13)

28. Consistent with the concepts set forth in the *Licensing PN*, we propose to adopt rules governing frequency assignments that would balance the needs of Priority Access Licensees and GAA users. To foster a robust GAA ecosystem, a meaningful amount of the 3.5 GHz Band must be reserved for GAA use in any given geographic area. To that end, we propose to reserve for GAA use a minimum of 50 percent of the 3.5 GHz Band in any given census tract – after accounting for any frequencies reserved for Incumbent Access tier use in the area - with the remainder to be assigned as PALs. We do not propose to assign GAA users and Priority Access Licensees to fixed spectral locations (*e.g.*, GAA from 3550-3600 MHz and Priority Access from 3600-3650 MHz). Rather, under our proposal, the SAS would dynamically assign PAL channels and GAA bandwidth in real time to promote efficient spectrum use.

29. Under this proposal, PALs would be assigned in 10 megahertz channels, consistent with the processes described in section III(A)(1)(c) below, but we do not propose to establish a fixed channel size for GAA users. Rather, GAA users would be permitted to operate on a range of frequencies within the GAA pool, as determined by the SAS. In addition, in areas in which bandwidth has not yet been assigned to PALs or where assigned bandwidth is not in actual use by Priority Access Licensees, such bandwidth would be made available for additional GAA operations on an opportunistic basis. The SAS would coordinate Priority Access and GAA operations consistent with its responsibilities under the proposed rules.[59]

30. *Proportional Assignment of GAA and Priority Access Frequencies.* In response to the *Licensing PN*, commenters supported a wide range of potential frequency assignment models for the 3.5 GHz Band, ranging from rejection of a GAA Tier[60] to fully dynamic assignment of GAA and Priority Access rights based on demand and network needs.[61] Of those commenters that supported the proposed three-tier model, AT&T, T-Mobile, and Google argued that a higher, fixed quantity of spectrum should be assigned for Priority Access use.[62] Microsoft argued that a minimum of 50 megahertz of spectrum should be retained for GAA use while Public Knowledge argued that no less than 50 percent of available

[58] *See infra* section III(B)(4).

[59] *See* Appendix A, §§ 96.43-48.

[60] *See e.g.*, Qualcomm *Licensing PN* Comments at 4-5; CTIA *Licensing PN* Reply Comments at 3.

[61] *See* Comments of Federated Wireless LLC in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Federated *Licensing PN* Comments) at 32-33.

[62] *See* AT&T *Licensing PN* Comments at 6 (Arguing that 70 megahertz of the band should be reserved for Priority Access or 100 megahertz if the 3650-3700 MHz band is included); Comments of T-Mobile USA, Inc. in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (T-Mobile *Licensing PN* Comments) at 3 (60 megahertz of the band should be reserved for Priority Access use if the Commission adopts a three-tier licensing model); Google *Licensing PN* Comments at 15 (Commission should reserve 100 megahertz of spectrum for Priority Access and 50 megahertz for GAA).

spectrum should be reserved for GAA.[63] WISPA argued that, in rural areas, 70 megahertz of the band should be available for GAA use while in non-rural areas only 50 megahertz should be reserved.[64]

31. We seek comment on whether the proposed rule appropriately balances public interest considerations raised by commenters on this matter. Does the proposed 50 percent floor for GAA bandwidth provide sufficient spectrum to foster a robust user ecosystem while ensuring that enough spectrum is made available for multiple Priority Access Licensees? We seek comment on the proposed rule, including any costs and benefits of the proposed approach. We also seek comment on alternative approaches to the apportioning of available spectrum between the PAL and GAA tiers.

32. *Dynamic Frequency Assignment.* Commenters differed as to whether frequency assignments should be fixed or dynamically assigned by the SAS. Notably, Google and WISPA supported dynamic assignment of Priority Access and GAA frequencies and argued that the SAS would be able to efficiently and dynamically assign frequencies to appropriate parties.[65] Commenters including AT&T, T-Mobile, CTIA, and Ericsson argued for designated, fixed channel assignments, claiming that dynamic frequency assignments would interfere with network planning and channel aggregation.[66]

33. Under our proposal, in place of fixed channel assignments, the SAS would dynamically assign bandwidth within given geographic areas to Priority Access Licensees and GAA users in accordance with the procedures set forth in the proposed rules.[67] The SAS would ensure that Priority Access Licensees have access to allotted 10 megahertz channels and that GAA users are provided access to at least 50 percent of the band. However, the exact spectral location of any given authorization, whether Priority Access or GAA, would not be fixed. For example, a licensee might have Priority Access rights for a single PAL, but the specific channel location assigned to that user would be managed by the SAS and could be reassigned from time to time (*e.g.*, from 3550-3560 MHz to 3630-3640 MHz). Individual GAA users would be assigned available bandwidth of a size and spectral location determined by the SAS (*e.g.*, from 3550-3556 MHz or 3662-3673 MHz). The SAS would assign and maintain appropriate frequency assignments and ensure that lower tier users do not interfere with higher tier users. To the extent that some level of regional or national consistency of assignment facilitates the provision of service, SAS providers would be free to agree upon a common assignment convention. However, such a convention would not be specified in the rules, in order to allow the greatest degree of operational flexibility.

34. We seek comment on the proposed rule, including the capabilities that the SAS would have to incorporate to manage operations in the band consistent with this proposal.[68] Alternately, should we adopt a more traditional model with static frequency assignments for GAA users and Priority Access Licensees? What advantages and disadvantages would a fixed channel assignment model provide as compared to the dynamic system set forth in the proposed rules?

35. We also seek comment on our proposal to allow the SAS to assign a flexible amount of bandwidth to individual GAA users. Should GAA users instead be assigned a consistent amount of

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[63] *See* Comments of Microsoft, Inc. in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Microsoft *Licensing PN* Comments) at 4; OTI/PK *Licensing PN* Comments at 9-11.

[64] *See* Comments of the Wireless Internet Service Providers Association in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (WISPA *Licensing PN* Comments) at 14.

[65] *See* WISPA *Licensing PN* Comments at 19; Google *Licensing PN* Comments at 10-13.

[66] *See* AT&T *Licensing PN* Comments at 5-6; T-Mobile *Licensing PN* Comments at 10-12; Comments of Ericsson in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Ericsson *Licensing PN* Comments) at 7; CTIA *Licensing PN* Reply Comments at 7-8.

[67] *See infra* section III(A)(1)(f); Appendix A, §§ 96.23, 96.33, and 96.46.

[68] SAS capabilities are addressed in greater detail in section III(A)(1)(f).

bandwidth (*e.g.*, 10 megahertz) like Priority Access Licensees? What would be the costs and benefits of such an approach?

36. *GAA Access to Unused Priority Access Channels.* The Revised Framework discussed allowing GAA users to access unused Priority Access channels on an opportunistic basis. AT&T and T-Mobile supported the concept of allowing GAA users to make use of unused Priority Access tier channels so long as use was limited to unassigned and undeployed channels. Under their proposal, a channel would be unavailable for GAA once it is assigned to a Priority Access Licensee.[69] Public Knowledge, The New America Institute, Federated Wireless, and Google as well as a broad coalition of broadband service providers, manufacturers, trade associations, and technology companies (Coalition) argued for a more flexible model that would allow GAA use over Priority Access channels that are not in actual use.[70] The rule we propose here would allow GAA use on unused PAL channels to promote efficient and consistent use of spectrum.

37. We seek comment on the proposed rule, including any costs and benefits of the proposed approach. How should "use" be practically and consistently determined in this context? How should the determination be made in the context of our dynamic frequency assignment proposal? If an assigned but previously unused PAL channel is later determined to be "in use," how long should a GAA user be given to vacate the Priority Access channel? What should be the triggering event that reserves assignment of a channel for PAL use? Should the event be based on action by a Priority Access Licensee (*e.g.*, initiating service in a portion of the PAL) or by the SAS (*e.g.*, assigning a channel to the PAL in response to a request from a Priority Access licensee)?

b. Subpart B – INCUMBENT PROTECTIONS

(i) Protection of Federal Incumbents (§ 96.15)

38. Consistent with the three-tier construct, we propose in Section 96.15 to require that CBSDs[71] may not cause harmful interference to and must accept interference from authorized federal users in the 3.5 GHz Band. As an initial matter, we also propose at this time that CBSDs comply with the geographic Exclusion Zones based on the parameters set forth in the Fast Track Report to ensure compatibility with federal operations, and that the SAS ensure that CBSDs do not operate within Exclusion Zones.[72] We discuss issues related to these requirements in more detail, including the size of Exclusion Zones and our intention to revisit the appropriate incumbent protection criteria, in section III(B)(1) below. We seek comment on these proposed rules.

(ii) Protection of Existing Fixed Satellite Service Earth Stations in the 3550-3650 MHz Band (§ 96.17)

39. We also propose to protect existing FSS earth stations in the 3.5 GHz Band by requiring that CBSDs not cause harmful interference to these sites. We discuss broader issues related to these requirements in more detail in Section III(B)(3)(a) below and seek comment on the issue of protection for "out-of-band" FSS earth stations in section III(B)(3)(b). We seek comment on these proposed rules.

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[69] *See* AT&T *Licensing PN* Comments at 6, note 12; T-Mobile *Licensing PN* Comments at 9-10.

[70] *See* OTI/PK *Licensing PN* Comments at 11-12; Google *Licensing PN* Comments at 15-16; Reply comments of Federated Wireless LLC in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) (Federated *Licensing PN* Reply Comments) at 6-10; Coalition Letter at 1.

[71] Defined as "[f]ixed or Portable Base stations, or networks of such base stations, that operate on a Priority Access or General Authorized Access basis in the Citizens Broadband Radio Service consistent with this rule part. Does not include End User Devices." *See* Appendix A.

[72] *See* Fast Track Report at 1-6 to 1-7, figures D-45 to D-55, and Appendix B.

(iii) Operation near Canadian and Mexican Borders (§ 96.19)

40. Our proposed rules note that Citizens Broadband Radio Service operations along the Canadian and Mexican borders would be subject to international agreements with Mexico and Canada. The SAS would be required to enforce these requirements. We seek comment on these proposed rules.

c. Subpart C – PRIORITY ACCESS

41. We propose not to limit eligibility for the Priority Access tier, to assign rights based upon targeted PAL parameters, resolve mutually exclusive license applications via competitive bidding, and to require access coordination through an SAS. These proposals are generally consistent with the Revised Framework described in the *Licensing PN*.

(i) Authorization (§ 96.21)

42. Under our proposed rules, any entity eligible to hold an FCC license would be eligible to apply for, and hold, a PAL.[73] Commenters generally support expanding eligibility to the Priority Access tier to a broader class of users than we proposed in the *NPRM*.[74] Expanded access to the Priority Access tier would promote more intensive use of the 3.5 GHz Band and would promote investment in new small cell technologies. We propose to require all applicants for PALs to demonstrate their qualification to hold an authorization and demonstrate how a grant of authorization would serve the public interest.[75] Qualifications would include those under Section 310 of the Act regarding foreign ownership. The Commission has broad authority to prescribe "citizenship, character, and financial, technical, and other qualifications" for its licensees.[76] We seek comment on how to apply this authority with respect to the 3.5 GHz Band, and whether to adopt the same policies in this respect that the Commission has established for other services. We also propose that certain of the processes and requirements may be reasonably automated by SAS Administrators, in accordance with the Commission's rules. We seek comment on these proposed rules, including on any limitations posed by our Title III obligations on the scope of authority that may be delegated to such SAS Administrators.

(ii) Priority Access Licenses (§ 96.23)

43. Our proposed rules stipulate that Priority Access Licensees would receive interference protection from GAA users but would operate on a non-interfering basis with respect to Incumbent Users.[77] Conceptually, the proposed PALs would be "building blocks" that an eligible licensee could aggregate over frequency, time, and geography to meet diverse spectrum needs.[78] The use of PALs - and interactions between and among tiers - would be managed by the SAS. This licensing and access model is consistent with the recommendations of PCAST and would effectively serve the public interest. We seek comment on these proposed rules as described in more detail below.

44. *Geography*. We propose to authorize PALs at the census tract level and to permit geographic aggregation across license areas. As explained in the *Licensing PN*, census tracts offer a variety of benefits, including geographic sizes varying by population density, nesting into other political

[73] *See* Appendix A, § 96.5.

[74] *See e.g.*, AT&T *Licensing PN* Comments at 3; T-Mobile *Licensing PN* Comments at 4; Alcatel Lucent *Licensing PN* Comments at 2; Comments of Spectrum Bridge in response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Spectrum Bridge *Licensing PN* Comments) at 2; NSN *Licensing PN* Comments at 2; Google *Licensing PN* Comments at 5; OTI/PK *Licensing PN* Comments at 16-17; Coalition Letter at 1.

[75] *See* 47 U.S.C. §§ 303, 307, 309, 310.

[76] 47 U.S.C. § 308(b).

[77] *See* Appendix A, § 96.23.

[78] *See Licensing PN*, 28 FCC Rcd at 15305, ¶ 12.

subdivisions including city lines, and aligning with other natural features that track population density.[79] Under our proposal, PAL applicants could target specific geographic areas in which they need additional coverage and avoid applying for areas that they do not intend to serve. Our proposal reflects the unique technical characteristics of small cells to promote a high degree of spectral and spatial reuse while facilitating flexible, targeted deployment of CBSDs.

45. We received a diverse record in response to our proposal to use census tracts as a licensing area. Some commenters agreed with our proposal.[80] Others argued that census tracts were inappropriate geographic license areas because the borders of census tracts frequently divide streets and their relatively small size would make co-channel coordination between Priority Access Licensees more difficult.[81] Other commenters suggest that even smaller geographic areas, such as census block groups would allow for granular and demand-focused assignments.[82] Others proposed larger, more traditional license areas such as counties, EAs, or CMAs.[83] Google suggests license boundaries be based on proposed network parameters and actual contours, as determined and enforced by the SAS.[84]

46. Our census tract proposal occupies a middle ground among these diverse recommendations, and is designed as an equitable means of achieving the Commission's public interest goals. Census tracts are sufficiently granular to promote intensive use of the band and are large enough, either on their own or in aggregate, to support a variety of use cases, including small cell base stations and backhaul. We seek comment on the proposed rule including any potential costs or benefits. Would adopting alternative geographic license sizes further the public interest given the Commission's goals and contemplated use cases for the band? We also seek comment on whether PALs could be deployed on an even more focused basis, employing a fine grained grid of "pixels" (*i.e.*, small, regular geographic regions that can be combined to approximate, with high resolution, the operational and protection contours of various system deployments) to promote more targeted and customizable network deployment. If the Commission adopts census tracts, or something smaller, as the appropriate geographic license area, should package bidding or another mechanism that would allow applicants to bid on larger geographic areas be adopted? To the extent that commenters believe that the use of census tracts would foreclose a particular use case for the band, we encourage them to provide detailed technical analyses to support their claims.

47. *Channels.* As described in the Revised Framework and section III (A)(1)(a)(vii) above, we propose to authorize PALs to operate over 10 megahertz unpaired channels.[85] While a few commenters argued for larger or smaller channels,[86] the record generally supports our proposal to utilize

[79] *See id.*, 28 FCC Rcd at 15305-06, ¶ 15.

[80] *See* WISPA *Licensing PN* Comments at 7; Spectrum Bridge *Licensing PN* Comments at 2-3 (Supporting census tracts but arguing that a smaller grid may be preferable).

[81] *See* AT&T *Licensing PN* Reply Comments at 6-7; Verizon *Licensing PN* Comments at 6-7; Reply Comments of T-Mobile USA, Inc. in response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) at 7-8; Google *Licensing PN* Comments at 5-8.

[82] *See* OTI/PK *Licensing PN* Comments at 19 (suggesting census block groups); Comments of Motorola Solutions in in Response to *Licensing PN* GN Docket No. 12-354 (filed December 5, 2013) (Motorola Solutions *Licensing PN* Comments) at 8-9 (suggesting 100 meter x 100 meter grid spaces); Microsoft *Licensing PN* Comments at 6-7 (suggesting census block groups).

[83] *See* Qualcomm *Licensing PN* Comments at 3-4; Ericsson *Licensing PN* Comments at 7-8; NSN *Licensing PN* Comments at 5; T-Mobile *Licensing PN* Comments at 6-7.

[84] Google *Licensing PN* Comments at 5-8.

[85] *See Licensing PN*, 28 FCC Rcd at 15307, ¶ 17.

[86] *See* Federated *Licensing PN* Comments at 20-25 (Advocating the highest possible degree of granularity) and Ericsson *Licensing PN* Comments at 8 (Advocating for an interim assignment of 60-80 megahertz spectrum blocks).

10 megahertz channels for PALs with the ability to aggregate multiple channels.[87] Ten megahertz channels provide a flexible, scalable, practically deployable bandwidth for high data rate technologies that would permit multiple Priority Access Licensees to operate effectively in a given geographic area. We seek comment on the proposed rule.

48. In addition, consistent with the Revised Framework, we propose that once the Commission has assigned PAL rights to a user, the specific channels would be dynamically assigned to the PALs by the SAS.[88] As discussed previously, some commenters argue for fixed channel assignments.[89] Others, like Google and WISPA support the dynamic assignment model outlined in the Revised Framework.[90] We should maximize flexibility in the band to allow the SAS to use channel assignments as a tool in maximizing efficiency and minimizing interference scenarios. However, we propose that the SAS be permitted to assign specific frequencies to Priority Access Licensees upon their request, when available and on a dynamic basis. To the extent a licensee has PALs in adjacent census tracts, we propose that the SAS should endeavor to assign contiguous frequencies across geographic boundaries. In addition, consistent with the dynamic nature of the proposed channel assignments, we encourage SAS Administrators to make reasonable efforts to assign adjacent frequencies to licensees with access rights to multiple channels in a single census tract. Dynamically assigning spectrum based upon the demand within a geographic area at a given time would promote efficient use of the band across wider geographic areas without compromising flexibility. We seek comment on this proposal. What effect would such assignment have on spectrum efficiency as opposed to the use of channel bonding techniques across non-contiguous spectrum? Would such a rule simplify or complicate the SAS's ability to manage the spectrum within any given census tract? What effect would such a rule have on the ability to predict and take measures to prevent harmful interference among users within the same census tract and users in nearby census tracts?

49. *Term.* We propose to limit license terms to one-year with no renewal, but allow entities to aggregate up to five consecutive years of licenses, through competitive bidding.[91] PALs would automatically terminate at the end of each year. As explained in the *Licensing PN*, we believe that this approach would promote flexibility, simplify administration, and promote fungibility and liquidity in the secondary market.[92] Allowing applications for multiple years of PALs would provide Priority Access Licensees with the certainty they may need to make capital investments in any PAL.

50. The record related to these licensing concepts was also mixed. Some commenters agreed with our proposal of one-year terms with the option to aggregate multiple years.[93] Others argued for

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[87] *See e.g.*, AT&T *Licensing PN* Comments at 3-5; Google *Licensing PN* Comments at 10-13; Motorola Solutions *Licensing PN* Comments at 4; NSN *Licensing PN* Comments at 5-8 (Stating a preference for larger blocks but agreeing that 10 megahertz blocks have some advantage); OTI/PK *Licensing PN* Comments at 20; Qualcomm *Licensing PN* Comments (Supporting 10 megahertz or 20 megahertz unpaired channels); T-Mobile *Licensing PN* Comments at 7.

[88] *See Licensing PN*, 28 FCC Rcd at 15310-15311, ¶ ¶ 30-32.

[89] *See* AT&T *Licensing PN* Comments at 5-6; T-Mobile *Licensing PN* Comments at 10-12; Ericsson *Licensing PN* Comments at 7; *See supra* section III(A)(1)(a)(vii).

[90] *See* WISPA *Licensing PN* Comments at 19; Google *Licensing PN* Comments at 10-13; *See supra* section III(A)(1)(a)(vii).

[91] *See infra* section III(A)(2)(b)(1).

[92] *Licensing PN*, 28 FCC Rcd at 15306, ¶ 13.

[93] *See* WISPA *Licensing PN* Comments at 14-15 (one-year terms with a four-year aggregation limit); OTI/PK *Licensing PN* Comments at 16-18 (one-year terms with a three-year aggregation cap); Spectrum Bridge *Licensing PN* Comments at 2-3 (supporting one year "leases" but advocating a mix of fixed and variable length lease times); *See also* AT&T *Licensing PN* Comments at 3-5 (supporting one-year terms but arguing for a "keep what you use"

(continued….)

license terms shorter than one year[94] while Microsoft agreed with the one-year proposal but argued for a prohibition on term aggregation.[95] On the other hand, several commenters including Ericsson, NSN, and Qualcomm supported a more traditional licensing model with longer (*e.g.* 10-year) license terms.[96]

51. Under this proposal, licensees would be able to hold up to five-years of PALs in a given geographic area at any given time. Licensees holding less than five-years of PALs in a geographic area may apply for additional PALs in the same geographic area, up to a total (including their existing PALs) of five-years. For example, a licensee awarded five-years of PALs through the annual application window in one year would be allowed to apply for a one year PAL through the annual application window in the subsequent year.[97]

52. We note that in response to the *Licensing PN*, several commenters argued for a shorter temporal aggregation limit than we propose here. For example, WISPA suggests a four-year aggregation cap, Public Knowledge and the New America Foundation suggest a three-year cap, Motorola Solutions suggests only two years, and Microsoft suggests we not permit term aggregation (effectively a one-year availability in the licensing window).[98] AT&T, by contrast, suggests that licensees be permitted to retain their authorizations indefinitely for areas in which they have deployed equipment and provided service within one year.[99] By combining short-term licenses with a multi-year application window, our proposal for one-year licenses with term aggregation balances the competing public interest concerns expressed in the record. We seek comment on the proposed one-year, non-renewable license terms and aggregation limit, including any costs and benefits.

(iii) Application Window (§ 96.25)

53. We propose to accept applications for PALs annually and to make up to five consecutive years of PALs available in any given application window. We seek comment on the proposed rule including any potential costs or benefits.

(iv) Assignment of Licenses (§ 96.27)

54. We propose to adopt a geographic area license scheme for the Priority Access tier, which permits the filing and acceptance of mutually exclusive applications. Section 309(j) of the Communications Act requires that the Commission assign initial licenses through the use of competitive bidding when mutually exclusive applications for such licenses are accepted for filing, except in the case of certain specific statutory exemptions. Although the *NPRM* asked whether a licensing scheme for PALs should include a "mission critical" eligibility criterion that might involve such exemptions,[100] under our current eligibility proposal such exemptions would not appear applicable here.[101] Consistent with the

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approach to renewals); Federated *Licensing PN* Comments at 17-25 (supporting one-year terms as a nominal level but advocating for finer temporal granularity with usage fees).

[94] *See* Motorola Solutions *Licensing PN* Comments at 7-8 (quarterly terms with a two-year aggregation cap).

[95] Microsoft *Licensing PN* Comments at 6.

[96] *See* Ericsson *Licensing PN* Comments at 7-8; NSN *Licensing PN* Comments at 4-5; Qualcomm *Licensing PN* Comments at 7-8.

[97] Stated differently, a licensee that successfully acquires rights to a PAL for years X through X+4 (*e.g.*, years 1, 2, 3, 4, 5) during the year X (*e.g.*, year 1) application window would be eligible to apply for, and acquire, rights to a PAL in year X+5 (*e.g.*, year 6) during the year X+1 (*e.g.*, year 2) application window.

[98] *See* OTI/PK *Licensing PN* Comments at 16-18; WISPA *Licensing PN* Comments at 15; Motorola Solutions *Licensing PN* Comments at 7-9; Microsoft *Licensing PN* Comments at 6.

[99] AT&T *Licensing PN* Comments at 5.

[100] *See 3.5 GHz NPRM,* 27 FCC Rcd at 15618-19 and 22-23, ¶¶ 70-73, 85.

[101] *See* 47 U.S.C. § 309(j)(1), (2).

Commission's policy that competitive bidding places licenses in the hands of those that value the spectrum most highly, we believe that it would be in the public interest to adopt a licensing scheme for PALs which allows the filing of mutually exclusive applications that, if accepted, would be resolved through competitive bidding. Accordingly, in section III(A)(2)(b) below, we seek comment on a number of proposals regarding competitive bidding rules that would apply to resolve any mutually exclusive applications accepted for PALs in the Citizens Broadband Radio Service.

(v) Aggregation of Priority Access Licenses (§ 96.29)

55. OTI, New America Foundation, and Public Knowledge argue that when mutual exclusivity exists no licensee should hold more than 20 megahertz of spectrum in a given license area.[102] They argue that the limitation would allow future entrants and new competitors to enter the market.[103] We propose to allow licensees to hold up to three PALs in one census tract at one time (*i.e.*, 30 megahertz in one census tract at any time). Given the unique circumstances of this band and the proposed rules, it would be difficult to apply the Commission's traditional competitive review process with respect to proposed transfers of licenses in the band. In this specific instance, a clear aggregation limit, applicable to all PAL licensees in the band, could promote competitive access to the band while avoiding the need for case-by-case review of license transfers. This approach should facilitate a liquid "spot market" in PALs, as described further in section III(A)(2)(c), below. We seek comment on the proposed rule. Should we set a higher or lower allowance? Should aggregation allowances only apply when mutual exclusivity exists? Is an aggregation limit necessary when interested parties also have access to GAA spectrum, along with other bands that can be used for Wi-Fi and other similar services? Should aggregation limits change if the band is partially encumbered by Incumbent Users? What are the costs and benefits of higher or lower allowances? Are there other methods to promote competition, incentivize investment and innovation, and ensure spectrum availability for diverse uses?

d. Subpart D – GENERAL AUTHORIZED ACCESS

(i) Authorization and General Authorized Access Use (§ 96.31 and § 96.33)

56. As explained above, we propose to reserve a floor of at least 50 percent of available bandwidth in the 3.5 GHz Band in each census tract for GAA use, with additional frequencies to be made available on an opportunistic basis when not in use by Priority Access Licensees.[104] As described in the *NPRM* and *Licensing PN*, GAA devices would be licensed-by-rule as under Section 307 of the Communications Act[105] to promote rapid deployment by a wide range of users at low cost and with minimal barriers to entry.[106] GAA users would be required to use only certified, Commission-approved CBSDs and register with the SAS.[107] Consistent with the proposed rules governing CBSDs, devices operating on a GAA basis would be required to provide the SAS with all information required by the rules – including operator identification, device identification, and geo-location information – upon initial registration and as required by the SAS.[108] GAA users would also be required to comply with the instructions of the SAS and avoid causing harmful interference to Priority Access Licensees and Incumbent Access tier users. Similar to unlicensed operations, GAA users would have no expectation of

[102] OTI/PK *Licensing PN* Comments at 20.

[103] OTI/PK *Licensing PN* Comments at 20.

[104] *See supra* section III (A)(1)(a)(vii).

[105] *See* 47 U.S.C. § 307(e)(1); Appendix A §§ 95.401 and 96.31.

[106] *See Licensing PN*, 28 FCC Rcd at 15309, ¶ 23; *3.5 GHz NPRM*, 27 FCC Rcd at 15616-17 and 15620, ¶¶ 61-63 and 75-76.

[107] *See* Appendix A, § 96.36 and 96.39.

[108] *See* Appendix A, § 96.36.

interference protection from other Citizens Broadband Radio Service users.[109] Are there other licensing paradigms that the Commission should consider? If so, commenters are requested to provide a detailed analysis of the pros and cons of the approach.

57. As discussed previously, commenters took a variety of positions with regard to the portion of the band that should be used for GAA as well as our proposals to allow dynamic and opportunistic use of unused Priority Access channels.[110] Some commenters also objected to our proposal to authorize the GAA tier on a license-by-rule basis.[111] These positions are discussed in greater detail in sections III(A)(1)(a)(vii) and III(A)(2)(a). Our proposals would ensure widespread availability of GAA frequencies for the broadest possible class of users and applications. We seek comment on the proposed rules including potential costs and benefits.

(ii) Contained Access Facilities (§ 96.35)

58. As we noted in the *NPRM* and *Licensing PN*, a wide variety of critical services in the United States have current and future spectrum needs and there is currently insufficient spectrum to allocate exclusive bandwidth to all such services.[112] While we believe that broad eligibility for use of the 3.5 GHz Band will produce significant public interest benefits, we continue to believe that "the high spatial reuse characteristics of low-power 3.5 GHz transmissions, combined with access management facilitated by the SAS, should allow the 3.5 GHz Band to be utilized on a shared, licensed basis by a variety of critical users to provide high quality services to localized facilities."[113] To that end, the *Licensing PN* sought comment on whether it would be in the public interest to allow critical users to receive interference protections, akin to Priority Access users, within a limited portion (*e.g.,* 20 megahertz) of the GAA pool inside the confines of their facilities.

59. Commenters responding the *Licensing PN* diverged as to how the Commission should treat critical facilities. Commenters including T-Mobile and Spectrum Bridge support allowing critical access users to reserve spectrum on a highly localized basis.[114] Motorola Solutions argues that critical facilities should be assigned 20 to 30 megahertz of the 3.5 GHz Band and be permitted to utilize that spectrum for indoor or outdoor applications, while UTC asserts that the entire Priority Access Tier should be reserved for critical access facilities.[115] Google argues that preferential treatment for critical facilities should be limited to "available spectrum" and that such users should not be able to evict users that have already deployed network facilities.[116] In addition, PCIA argues that the Commission should provide for the deployment of both critical and non-critical localized indoor networks.[117]

60. We propose to allow Contained Access Users, such as hospitals, public safety organizations, and local governments to request up to 20 megahertz of reserved frequencies from the GAA pool for indoor use within their facilities in furtherance of the public interest. These frequencies may be used only for private internal radio services and may not be made available to the general public. Other GAA users would not be permitted to utilize the reserved frequencies within designated Contained

[109] *See* 47 C.F.R. §15.5.

[110] *See supra* section III(A)(1)(a)(vii).

[111] *See infra* section III(A)(2)(a).

[112] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15618, ¶ 70; *Licensing PN*, 28 FCC Rcd at 15311-12, ¶ 36.

[113] *3.5 GHz NPRM*, 27 FCC Rcd at 15619, ¶ 73.

[114] *See* T-Mobile *Licensing PN* Comments at 12-13; Spectrum Bridge *Licensing PN* Comments at 6.

[115] *See* Motorola Solutions *Licensing PN* Comments at 2-5; UTC *Licensing PN* Comments at 4-6.

[116] *See* Google *Licensing PN* Comments at 19.

[117] *See* Comments of PCIA in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (PCIA *Licensing PN* Comments) at 5-6.

Access Facilities (CAFs). Except for the ability to prohibit third-party use in CAFs, Contained Access Users availing themselves of the reserved channels would still operate on a GAA basis and would have no special rights with respect to interference from Incumbent Users and other Citizens Broadband Radio Service users. We also propose that Contained Access Users must undertake reasonable efforts to safeguard against harmful interference from GAA transmissions originating outside the CAF. The "reasonable efforts" requirement would therefore ensure that Contained Access Users take advantage of RF isolation intrinsic to the CAF, along with any other potential interference "self-help" measures, to protect the RF environment within the CAF.[118] Potential Contained Access Users would be required to receive approval from the Commission to be eligible to utilize reserved frequencies. The public interest would be served by giving designated Contained Access Users the ability to utilize reserved frequencies indoors, within CAFs in this fashion. Moreover, the limited geographic and spectral impact of this proposal will allow for the effective coexistence of Contained Access Users, Incumbent Users, and other Citizens Broadband Radio Service operators.

61. We seek comment on the proposed rule including any costs or benefits. Specifically, what types of entities should be considered qualified Contained Access Users? Does this proposal adequately address the spectrum needs of Contained Access Users? Would this proposal effectively address a demonstrated spectrum need for certain users that would not otherwise be addressed by the proposals in this FNPRM? Should this proposed framework be limited to Contained Access Users or expanded to include other types of facilities, including outdoor facilities? Would the SAS be able to effectively manage spectrum use by a large number of facilities? How would the SAS limit the operation of other GAA users within CAF premises? Would this plan unacceptably encumber GAA spectrum? We ask that commenters provide detailed technical and/or economic analysis to support their arguments.

e. Subpart E – TECHNICAL RULES

(i) Citizens Broadband Radio Service Devices General Requirements (§ 96.36)

62. To enable the SAS to authorize and effectively coordinate the use of shared spectrum in the 3.5 GHz Band, CBSDs must transmit certain operational and identification information to the SAS. In the *NPRM*, *Licensing PN*, and *SAS Papers PN* we sought comment on the types of information that CBSDs should be required to transmit.[119] Commenters took a wide range of positions with regard to information transmission requirements for CBSDs.[120] Elements of these proposals have been incorporated into proposed rule 96.36. Specifically, we propose that CBSDs must provide the SAS with the following information: (1) geographic location (within ±50 meters horizontal and ±3 meters vertical); (2) antenna height above ground level (meters); (3) requested authorization status (Priority Access or General Authorized Access); (4) unique FCC identification number; (5) user contact information; and (6) unique serial number. This information must be communicated when the CBSD initially registers at the SAS and at regular intervals thereafter. We also propose that CBSDs must follow directions and updates sent by SAS in a timely manner. For managed networks, while it is likely that information exchanges

[118] We note that Contained Access Users requiring stronger interference protections, or protections that extend beyond the perimeter of a CAF, could also apply for PALs using the same procedures as other potential Citizens Broadband Radio Service operators.

[119] *See SAS Papers PN*, 28 FCC Rcd at 15845-46.

[120] *See e.g.*, WISPA Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (WISPA SAS Paper) at 3-4; InterDigital, Inc. Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (InterDigital SAS Paper) at 11-13; Google, Inc. Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (Google SAS Paper) at 4; and Nokia Siemens Networks Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (NSN SAS Paper) at 6.

between CBSDs and the SAS would be aggregated through a proxy such as a network access manager,[121] the proposed requirements would still be applicable to all CBSDs operating in the band.

63. *Geo-location and Reporting Capability.* For the SAS to predict and evaluate potential interference and spectrum availability accurately it must have accurate location information for all CBSDs. We propose that all CBSDs must accurately report the location of each of their antennas to within ±50 meters (horizontal) and ±3 meters (vertical). The proposed horizontal geo-location requirement is consistent with a similar requirement in the TVWS rules.[122] We also propose that CBSDs report their location to the SAS within 60 seconds of a change in location exceeding the accuracy requirement. We seek comment on these proposals, including potential costs and benefits. Is this degree of accuracy feasible with current technology? Should we require greater accuracy? What effect do the accuracy requirements have on actual spectrum efficiency and the SASs ability to manage interference potential among different users? Would the proposed geo-location requirement place undue burden on equipment manufacturers or SAS operators? Is such a requirement reasonable to control the interference environment among users? Is there a different timeframe for reporting that should be used?

64. *Interoperability.* To facilitate our proposed dynamic approach to frequency assignment,[123] we propose to require CBSDs to be interoperable across all frequencies from 3550-3700 MHz. This would ensure that all CBSDS and End User Devices certified to operate in the band would be capable of sending and receiving information regardless of the frequencies assigned by the SAS. It also anticipates the possible inclusion of the 3650-3700 MHz band. Several commenters also supported band-wide device interoperability.[124] We seek comment on this proposal including any potential costs and benefits. What effects would such a requirement have on equipment cost and design? What are the implications of equipment that may only work over a portion of the band and may not be able to tune to channels as assigned by the SAS? To what extent would an interoperability requirement promote consumer choice, given the characteristics of this service? To what extent should we seek to align the proposed interoperability requirement with existing international harmonization efforts for the 3.5 GHz Band (*e.g.*, 3GPP Bands 42 and 43)? Similarly, how are current coexistence efforts among products conforming to multiple industry standards (*e.g.*, 3GPP, IEEE 802.11 series) affected by the proposed interoperability requirement?[125]

65. *Registration with SAS.* As set forth in greater detail below,[126] we also propose that CBSDs be permitted to operate only if authorized by the SAS and if they follow frequency assignments and power limitations set by SAS. We propose that CBSDs must move their transmission to another channel or stop operation in the band as directed by SAS within a reasonable time. We seek comment on the appropriate time for CBSDs to respond to instructions from the SAS. Is sixty seconds a reasonable response timeframe or could a shorter response period be imposed? How does the timeframe affect the

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[121] *See* NSN SAS Paper at 6; Alcatel Lucent Inc. Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (Alcatel Lucent SAS Paper) at 4; T-Mobile USA, Inc. Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (T-Mobile SAS Paper) at 8; Ericsson and iconectiv Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (Ericsson SAS Paper) at 6.

[122] *See* 47 C.F.R. § 15.711(b).

[123] *See supra* section III(A)(1)(a)(vii).

[124] *See* Comments of Motorola Mobility LLC in response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) at 3-4; Reply Comments of Google Inc. in response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) (Google *Licensing PN* Reply Comments) at 9-10.

[125] *See* Letter from Jessica de Simone, Telecommunications Law Professionals PLLC on behalf of Motorola Mobility, Inc. in GN Docket No. 12-354, *Ex Parte* (filed April 15, 2014).

[126] *See infra* section III(A)(1)(f); Appendix A, §§ 96.43-48.

overall spectrum efficiency within the band? What effect would this timeframe have on the ability of the SAS to manage potential interference?

66. *Interference Reporting.* Some commenters suggested that, to enable the SAS to tune or update its predictive models and also address real time interference issues, CBSDs should be required to provide the SAS with signal level measurements in their band or other adjacent frequency channels as requested by SAS.[127] Many technologies already support this capability to allow radio resource management within a network.[128] This capability could be a valuable tool for managing interference and promoting productive coexistence between multiple operators in the 3.5 GHz Band. We propose to require CBSDs to measure and report on their local signal level environment as set forth in the proposed rules.[129] We seek comment on this proposal. What effect would the incorporation of such capability have on the cost of equipment? How should such a requirement be structured? Over what bandwidth or over how many channels should such measurements be reported? Does the Commission need to adopt measurement guidelines or procedures specifying how such measurements should be taken to ensure consistency in reporting among users?

67. *Security.* During the SAS Workshop many commenters also emphasized the importance of end-to-end security for communications among CBSDs, End User Devices, and the SAS.[130] We are mindful of the need to provide robust security for Federal information, personally identifiable information, and sensitive business information that may be transmitted between these devices and the SAS. To that end, we propose a security requirement for all communications between authorized SASs and CBSDs. We also propose to adopt comprehensive procedures to test and certify CBSDs and associated end user devices for operation in this band and to require the SAS to disconnect any device whose proper operation has been compromised. We seek comment on these proposed security measures. We ask commenters to suggest appropriate security protocols and discuss how these protocols would effectively safeguard sensitive information transmitted among the SAS, CBSDs, and End User Devices. If not, what additional measures should we adopt? Are there other enforcement mechanisms that can be put in place to ensure proper security of devices?

(ii) End User Devices General Requirements (§ 96.37)

68. We propose that mobile, portable, or fixed End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.[131] This requirement would effectively prevent End User Devices from unauthorized operation in the 3.5 GHz Band and ensure that such devices operate only according to the instructions transmitted from the SAS to the CBSD. We seek comment on this proposed rule.

(iii) General Radio Requirements (§ 96.38)

69. *Digital Modulation.* We propose that systems operating in the Citizens Broadband Radio Service use digital modulation techniques. We seek comment on this proposed rule.

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[127] *See* Google SAS Paper at 4.

[128] *See* Third Generation Partnership Project (3GPP), Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access, Radio Resource Control (RRC), Protocol specification (Release 12), 3GPP TS 36.331 v. 11.7.0 (2014-03), *available at*: http://www.3gpp.org/DynaReport/36331.htm.

[129] *See* Appendix A, § 96.36.

[130] *See* Google SAS Paper at 4-6; InterDigital SAS Paper at 16-17; Federated Wireless, LLC Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (Federated SAS Paper) at 5-6.

[131] *See* Appendix A, § 96.37.

70. *Conducted and Emitted Power Limits.* To prevent harmful interference among users of the 3.5 GHz Band, we propose to establish appropriate and flexible power limits for CBSDs and End User Devices when operating in this band. In the *Licensing PN*, we sought comment on limiting CBSD emitted power to 24 dBm.[132] We also sought comment on a 6 dBi antenna gain for installations requiring an external antenna.[133] With negligible cable and insertion loss, this makes the maximum effective isotropically radiated power (EIRP) 1W or 30 dBm.[134] We noted that these are consistent with the values commonly assumed in various studies for small cell base stations.[135] We also indicated that the maximum operational EIRP of individual base stations might be reduced by the SAS to prevent interference and promote efficient network operation.[136] In addition, we assume that End User Devices would have configurable maximum power levels below typical 24 dBm values and support for some form of power control.[137]

71. Commenters diverged greatly with regard to the maximum allowable power for devices operating in the band, with many supporting variable power limits for different use cases. For instance, CommScope supported a 24 dBm maximum transmit power for base stations with low gain antennas.[138] T-Mobile supported a maximum transmit power of 24 dBm for GAA users and 37 dBm for Priority Access devices.[139] Verizon advocated a maximum transmit power of 30 dBm for outdoor Priority Access base stations, while noting that 24 dBm might be appropriate for GAA indoor uses.[140] Similarly, Motorola Solutions, BliNQ, and Qualcomm supported maximum transmit power of 30 dBm for at least some use cases.[141] WISPA encouraged the Commission to allow higher power operations in rural areas of the country.[142]

72. Commenters also supported a wide range of allowable antenna gains for base stations - from 6 dBi through 29 dBi - and maximum allowable power levels for different transmitters within that range.[143] For the combination of transmit power and antenna gain, commenters proposed a range of EIRP from low 30 dBm to high 47 dBm for different use cases. Motorola Solutions, Qualcomm, and CommScope (for lower than 12 dBi antenna gain) suggested a maximum EIRP of 30 dBm.[144] Some,

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[132] *See Licensing PN*, 28 FCC Rcd 15314 at ¶¶ 45-46.

[133] *Id.*

[134] *Id.*

[135] *Id.*

[136] *Id.*

[137] *Id.*

[138] *See* Comments of CommScope in response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Commscope *Licensing PN* Comments) at 5-6 (recommending maximum transmit power of 24 dBM and maximum EIRP of 30 dBM for devices with low gain antennas); *See also* T-Mobile SAS Paper at 13-14 (recommending maximum transmit power of 24 dBm for GAA users).

[139] *See* T-Mobile *Licensing PN* Comments at 13-14.

[140] *See* Verizon *Licensing PN* Comments at 12.

[141] *See* Motorola Solutions *Licensing PN* Comments at 6; Comments of BLiNQ Networks, Inc. in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (BLiNQ *Licensing PN* Comments) at 7; Qualcomm *Licensing PN* Comments at 4.

[142] WISPA *Licensing PN* Comments at 8-12.

[143] *See* CommScope *Licensing PN* Comments at 5-6; Verizon *Licensing PN* Comments at 12; BLiNQ *Licensing PN* Comments at 7.

[144] *See* Commscope *Licensing PN* Comments at 5; Motorola Solutions *Licensing PN* Comments at 6; Qualcomm *Licensing PN Comments* at 4.

including Google (36 dBm), CommScope (37 dBm for equal or higher than 12 dBi antenna gain), and Verizon (47 dBm) argued for higher maximum EIRP figures.[145]

73. We also received transmit power recommendations from parties who would like to utilize the 3.5 GHz Band for point-to-point and backhaul service. BLiNQ argued that a maximum EIRP allowance of 43 dBm would help enable non-line-of-sight (NLOS) backhaul applications as well as other important services, such as rural point-to-point communications.[146] CommScope also recommended 54 dBm EIRP for point-to-point backhaul and Verizon suggested that 53 dBm EIRP would be appropriate for outdoor point-to-point service.[147]

74. It is important to establish flexible rules that would allow for a wide variety of innovative services to be deployed in the 3.5 GHz Band and we are encouraged that many commenters share this view. Ensuring that the band is available for multiple use cases should encourage rapid network deployment, promote the development of a robust device ecosystem, and help to ensure the long-term viability of the band. Therefore, we propose to adopt different transmit power levels to accommodate a range of Citizens Broadband Radio Service use cases. Except for fixed point-to-point radio systems addressed below, we propose to adopt a 24 dBm (per 10 megahertz) peak transmit power for CBSDs that are not operating in rural areas. For devices with a 6 dBi antenna gain, we propose a maximum aggregate EIRP of 30 dBm for CBSDs located in non-rural areas. The power spectral density for such transmit power would be 14 dBm/MHz. We also propose to adopt 30 dBm (per 10 megahertz) peak transmit power for CBSDs that operate in rural areas.[148] With 17 dBi antenna gain, we propose a maximum aggregate EIRP of 47 dBm for CBSDs located in rural environments. The power spectral density for such transmit power would be 20 dBm/MHz. These proposed transmit power limits are generally consistent with recommendations in the record. These proposed maximum transmit power levels would help promote productive use of the band.

75. For fixed point-to-point radio systems, we propose a 30 dBm (per 10 megahertz) peak transmit power limit for CBSDs. With a 23 dBi antenna gain, we propose a maximum aggregate EIRP of 53 dBm for CBSDs. We propose that the maximum allowable peak transmit power in this paragraph be reduced by 1 dB for every 1 dB that the directional gain of the antenna exceeds 23 dBi. The power spectral density for such transmit power would be 20 dBm/MHz.

76. We also propose that maximum EIRP for End User Devices not exceed 23 dBm in 10 megahertz bandwidth. We also propose that CBSDs and End User Devices limit their operating power to the minimum necessary for successful operation.

77. We note that NTIA did not consider these proposed use cases or technical criteria in calculating the Fast Track Exclusion Zones. What effects would these additional use cases have on the size of the Exclusion Zones?

78. We seek comment on these proposed rules. Are the proposals in this section appropriate for the variety of use cases possible in the 3.5 GHz Band? Would these proposals further the public interest by promoting efficient and innovative use of spectrum resources? Should the proposed definition of "rural environments" be altered due to the use of small cells and in light of the fact that these systems are proposed to be deployed in areas smaller than counties? In light of the flexible approach to EIRP limits proposed herein, should we consider allowing higher power operations in the 3.5 GHz Band? We

[145] *See* CommScope *Licensing PN* Comments at 5-6; Verizon *Licensing PN* Comments at 12; Google *Licensing PN Comments* at 20.

[146] *See* BLiNQ *Licensing PN* Comments at 7-8.

[147] *See* CommScope *Licensing PN* Comments at 6; Verizon *Licensing PN* Comments at 12.

[148] For purposes of the proposed Part 96, a rural area would be defined as a county (or equivalent) with a population density of 100 persons per square mile or less, based upon the most recently available Census data. *See* Appendix A.

encourage commenters to support their positions with detailed technical and cost benefit analyses taking into account the various interference scenarios that may exist in this band among different CBSDs and among CBSDs and Incumbent Users.

79. *Received Signal Strength Limits.* To perform proper frequency assignments and interference management, it is important for the SAS to have a baseline threshold for the maximum signal level from CBSDs at the border of their service area. Therefore, Citizens Broadband Radio Service users should ensure that the aggregate signal level from their CBSDs as well as transmissions from their associated End User Devices at the edge of their authorized service areas remain at levels that would not harm other CBSDs in the same or higher tiers. For small cell networks, the industry standards and studies have shown 20 dB and 55 dB of interference rise over noise to be acceptable for picocells and femtocells respectively.[149] Based on these industry standards, and taking into account reasonable distance between authorized use operations, we propose a signal level threshold of - 80 dBm measured by a 0 dBi isotropic antenna in a 10 megahertz bandwidth anywhere along PAL service area boundaries between different Citizens Broadband Radio Service users.[150] We also propose to allow neighboring users to coordinate a higher signal level threshold. We seek comment on this proposed rule. How should this signal level be determined? Over what bandwidth should the signal threshold be measured? The proposal implies that this signal level would need to be met at all points along the PAL service boundary at ground level and all heights above ground level. Is such a requirement feasible? Should there be a single point at which this signal level should be enforced? What is the effect of this proposal on operation of CBSDs and on the interference potential within the band? How feasible would it be for the SAS to calculate and enforce such a limit?

80. *Emission Limits.* In the *NPRM* we sought comment on whether to adopt out-of-band emission (OOBE) limits or other requirements to protect services in adjacent bands from harmful interference. We also asked for comment on the appropriate OOBE limits for small cells in the 3.5 GHz Band and the interference protection threshold limits of relevant services.[151] Several commenters highlighted the importance of protecting incumbent and adjacent band services but differed as to the specific protection criteria.[152] Some commenters presented co-existence analysis and protection distances

[149] *See* 3GPP,Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access (E-UTRA), Radio Frequency (RF) requirements for LTE Pico Node B (release 11), 3GPP TR 36.931 version 11.0.0 (2012-09), *available at*: http://www.3gpp.org/DynaReport/36931.htm atsection 6.1.2.3.1; and 3GPP, Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access (E-UTRA), TDD Home eNode B (HeNB) Radio Frequency (RF) requirements analysis (release 11), 3GPP TR 36.922 v11.0.0 (2012-09), *available at*: http://www.3gpp.org/DynaReport/36922.htm.

[150] Under our proposal, PAL boundaries within a single Priority Access Licensee's service area would not be subject to the -80 dBm threshold.

[151] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15637-15638, ¶¶ 136-138.

[152] *See e.g.*, Reply Comments of Baron Services, Inc. in response to *NPRM* in GN Docket No. 12-354 (filed April 5, 2013, corrected April 10, 2013) (Baron *NPRM* Reply Comments) at 6-8; Comments of Spectrum Bridge in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (Spectrum Bridge *NPRM* Comments) at 13-16; Comments of WiMax Forum in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (WiMax Forum *NPRM* Comments) at 8; Comments of National Association of Broadcasters in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 2-3; Comments of Pierre De Vries, Senior Fellow, Silicon Flatirons Center for Law, Technology, and Entrepreneurship in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 6-14; Comments of the Satellite Industry Association in GN Docket No. 12-354 (filed February 20, 2013) (SIA *NPRM* Comments)at 18-20; Harris Corporation Reply Comments in response to *NPRM* in GN Docket No. 12-354 (filed April 5, 2013) at 5-6; Letter from Aparna Sridhar, Telecom Policy Counsel, Google Inc. to Julius Knapp and Ruth Milkman, *ex parte*, GN Docket No. 12-354 (filed September 3, 2013) (Google Letter); and Declaration of Dr. Preston Marshall, Principal Systems Architect, Google Services, *ex parte*, GN Docket No. 12-354 (filed September 3, 2013) (Marshall Declaration).

based on long-standing 43 + 10 log (P) dB OOBE limits.[153] Issues specifically related to OOBE that could affect the operations of earth stations in the C-Band are addressed in detail in section III(B)(3)(b). We also seek comment on whether to specify particular OOBE limits.

81. The Commission's rules generally limit the amount of radio frequency (RF) power that may be emitted outside of, or in a range of frequencies outside of, the assigned frequencies/channel(s) of an RF transmission. Moreover, the Commission has previously concluded that in certain circumstances, attenuating transmitter OOBEs to at least 43 + 10 log (P) dB is appropriate to minimize harmful electromagnetic interference between operators.[154] This limit has served well as a basis for development of industry standards which may impose tighter limits in certain cases. For Priority Access and GAA operations in the 3.5 GHz Band, we propose to apply the limit of 43 + 10 log (P), which is equivalent to –13 dBm / MHz, to all emissions outside of channel assignments and frequency authorizations by SAS in the 3.5 GHz Band. We seek comment on this limit and whether it should be more stringent (*i.e.*, at a lower power spectral density) given the state-of-the art of modern radio technologies, and the potential gains in spectral efficiency and minimizing interference coupling distance between neighboring radios operating in the 3.5 GHz Band.

82. Notwithstanding the foregoing paragraph, we recognize the need for Citizens Broadband Radio Service operations to protect incumbent and dissimilar radio services with sensitive weak signal receivers such as in-band and out-of-band FSS earth stations and DoD radar systems.[155] These incumbent radio service operations may be within and adjacent to the 3.5 GHz Band. Protection thresholds for weak signal receivers and minimizing the interference coupling distance to these receivers from new 3.5 GHz Band transmitters may require greater out-of-band attenuation (lower than -13 dBm / MHz) than can be achieved within the RF filter pass-band of 3.5 GHz Band radios. Striking the proper balance between the emission limits of CBSDs and End User Devices, along with the protection thresholds of incumbent receivers, may require more stringent OOBE limits in certain circumstances.[156] We also recognize that there has been considerable technological advancement in transmitter and receiver device technologies deployed in the mobile broadband industry over recent years, such that more stringent OOBE limits may be practical without undue burden to manufacturers and operators.

83. For example, the current LTE standards for the use in PCS requires mobiles in 1850 – 1915 MHz to meet a limit of -50 dBm/MHz in 1930-1995 MHz.[157] The current capabilities for mobile broadband manufacturers will support this level of tolerance for interference. Given that other mobile broadband service operations may already be imposing OOBE at the -40 dBm/MHz level, we propose this limit specifically for CBSD emissions above 3680 MHz and below 3520 MHz. We recognize that a more stringent limit would enable closer proximity of neighboring service operations. We seek comment as to whether this limit should be more stringent at -50 dBm/MHz.

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[153] *See* Comments of Redline Communications Inc. in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 4; Comments of Tarana Wireless in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 4; Comments of the Utilities Telecom Council, Edison Electric Institute, and National Rural Telecommunications Cooperative in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (UTC/EEI/NRTC *NPRM* Comments) at 23-24.

[154] *See e.g.*, 47 C.F.R. § 24.238(a); 27.53(h) (for PCS and AWS, respectively).

[155] *See infra* section III(B)(1) and (3).

[156] *See infra* section III(B)(3).

[157] This applies to both LTE band 2, supporting PCS blocks A through F, and LTE band 25, supporting PCS blocks A through G. *See* 3GPP,Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access (E-UTRA), User Equipment (UE) radio transmission and reception (release 12), 3GPP TS 36.101 V12.2.0 (2013-12), *available at*: http://www.3gpp.org/DynaReport/36101.htm (3GPP TS 36.101 rel. 12) at Table 6.6.3.2-1.

84. In general, while OOBE limits to -40 dBm/MHz are reasonable and not burdensome, a spectral transition gap immediately above and below the edges of the 3.5 GHz Band may be necessary given the limitations of RF/radio filter technology, in stepping down from an in-band limit of -13 dBm/MHz to an out-of-band emission limit of -40 dBm/MHz. Some current research indicates that a transition gap of approximately 1 percent of the band edge frequency may be within the state-of-the-art of existing radio/filter technologies.[158] Therefore, we propose a transition gap of 30 MHz above 3650 MHz and 30 MHz below 3550 MHz, for setting the OOBE attenuation levels to -40 dBm/MHz. We seek comment on the size of this transition gap, whether it is in the range of existing RF filter technology, and whether the gap could be smaller through the use of more narrow RF filters in CBSD and user devices (*e.g.*, two RF filters over 3550 – 3650 MHz, one covering the lower 50 MHz and the other covering the upper 50 MHz).

85. *Reception Limits.* Priority Access Licensees may be authorized for operation in the same geographic area, with other Priority Access Licensees authorized to operate in adjacent or near-adjacent channels. The potential for interference between two or more Priority Access Licensees depends on both the transmitter and receiver performance of the respective radio systems, because unwanted RF energy received by a CBSD can be caused by both the emissions from an adjacent licensee spilling into the desired frequencies of operation, as well as the imperfections of radio receivers. Establishing an RF field strength/power spectral density that PAL receivers would need to accept from nearby licensed transmitters, would effectively define the spectrum rights between PALs,[159] and enable the SAS to assign these rights with clear obligations between respective licensees. We seek comment on this approach.

86. While the Commission's rules in this regard are technology neutral, we note the signal strength levels of undesired interfering signals in widely adopted industry standards for receiver performance (*e.g.*, 3GPP LTE).[160] We recognize the in-band and out-of-band blocking characteristics and adjacent channel selectivity of modern radio receivers that must perform over a high dynamic range of RF power levels. We note that the interfering signal mean power, for acceptable Home Base Station (HeNB; Femtocell) adjacent channel selectivity and blocking, ranges in the relevant 3GPP standards between -28 dBm[161] and -15 dBm[162] (in all LTE channel bandwidths) with moderately high wanted signal power. The 3GPP interfering signal power for acceptable LTE User Equipment adjacent channel selectivity and blocking performance, in many cases is -30 dBm or above.[163] Therefore, we propose a power spectral density limit of -30 dBm / 10 megahertz as the interference limit that CBSDs operating on a Priority Access basis must accept, not to be exceeded with greater than 99 percent probability, unless the affected user agrees to a higher or lower limit and communicates such agreement to the SAS. Establishing a probability threshold is important because worst-case conditions for highly transient and unlikely RF interference events would otherwise establish an excessive constraint on neighboring radio service

[158] *See* International Wireless Industry Consortium, Mobile RF Filter Group, *Ex Parte* presentation in WT Docket No. 12-268 (2012).

[159] *See* FCC Technological Advisory Council, Receivers and Spectrum Working Group, Interference Limits Policy - The Use of Harm Claim Thresholds to Improve the Interference Tolerance of Wireless Systems, *White Paper* (February 6, 2013) (TAC *White Paper*), *available at*: http://transition.fcc.gov/bureaus/oet/tac/tacdocs/WhitePaperTACInterferenceLimitsv1.0.pdf (Last visited August 30, 2013); *Licensing PN*, 28 FCC Rcd 15315.

[160] *See* 3GPP TS 36.101 rel. 12; and 3GPP, Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access, Base Station Radio Transmission and Reception (release 12), 3GPP TS 36.104 V12.2.0, *available at*: http://www.3gpp.org/DynaReport/36104.htm (3GPP TS 36.104 rel. 12).

[161] *See* 3GPP TS 36.104 rel. 12 at Table 7.5.1-5.

[162] *See id.* at Table 7.6.1.1-1b (at frequencies further than 20 MHz from band edge).

[163] *See* 3GPP TS 36.101 rel. 12 at Table 7.6.2.1-2 (frequency range categories 2, 3 and 4).

operations.[164] Would such a scheme be feasible for the SAS to administer? That is, how difficult would it be for the SAS to track, manage and enforce agreements between different users? What mechanism would be used to communicate such agreements to the SAS? How would an SAS be assured that all affected users are in agreement?

87. As described previously, GAA users must not cause harmful interference to and must accept harmful interference from Incumbent Users and Priority Access Licensees. Therefore, we propose that a GAA CBSD be required to change its operational frequencies, lower its transmit power, or cease transmitting in accordance with instructions from the SAS if its operations are causing harmful interference to higher tier users. We seek comment on this proposal and any operational details necessary to ensure that the requirement is complied with. What is an acceptable response time for GAA CBSDs to comply with instructions from the SAS? How frequently should CBSDs be required to query the SAS regarding the status of their operations or should CBSDs only query the SAS when they change location in excess of the accuracy requirements and otherwise adjust operations only when receiving instructions from the SAS? What are the implications for spectrum efficiency and network traffic for various communication requirements between CBSDs and the SAS?

88. We seek comment on these proposed rules. We also seek comment on methods and procedures that may be employed by Priority Access Licensees or the SAS to enforce these thresholds. We encourage commenters to provide detailed technical and cost benefit analyses analyses to support their proposals.

89. In addition, as we noted in the *Licensing PN*, the TAC has been studying spectrum interference policy and receiver standards in general, and it recommends that the Commission consider forming one or more multi-stakeholder groups to study such standards and interference limits policy at suitable service boundaries, such as those related to the 3.5 GHz Band.[165] The Wireless Innovation Forum, in its comments to the *Licensing PN,* recommended that the FCC encourage the formation of industry led multi-stakeholder groups, proposed key characteristics of such a process, and committed to establishing such a multi-stakeholder process to develop recommendations for the 3.5 GHz Band and other band opportunities.[166] Consistent with the recommendations of the TAC, we encourage and suggest industry action to charter a technical group of stakeholders to develop industry coordination agreements and protocols, including technical options and methods for managing spectrum access that would improve access to and make efficient use of the 3.5 GHz Band. What should the scope and charter be of such a multi-stakeholder group? What should be the governance structure of such a group?

f. Subpart F – SPECTRUM ACCESS SYSTEM

90. The overall effectiveness of our proposals depends largely on the development and implementation of a robust SAS. We therefore propose to codify several high-level SAS requirements in the Part 96 rules. Following the TVWS database model, we expect that industry participants will take it upon themselves to develop technical implementations of these requirements and, where applicable, to develop industry-wide standards.

91. Our proposed rules also assume that multiple SAS Administrators and, consequently, multiple SASs would be authorized to operate in the 3.5 GHz Band, much as multiple databases have

[164] *See* 3GPP, Technical Specification Group Radio Access Network, Evolved Universal Terrestrial Radio Access, TDD Home eNode B Radio Frequency requirements analysis (release 11), 3GPP TR 36.922 V11.0.0 (2012-09) *available at*: http://www.3gpp.org/DynaReport/36922.htmat (3GPP TR 36.922 rel. 11) at Figure 6.2.2.2-2 (IoT level of HeNB, note the worst case (*i.e.*, highest level of IoT) in contrast to IoT with relatively high probability (*e.g.*, 99%)).

[165] *See* TAC *White Paper* at ¶ 50.

[166] *See* Wireless Innovation Forum *Licensing PN* Comments.

been authorized in the TVWS context,[167] to ensure that consumers are provided with a robust set of choices in the marketplace. We seek comment on what techniques could be used to effectively coordinate multiple SASs in the band. What other implementation challenges arise from the possibility of multiple SAS providers? Are they solvable? We seek comment on the proposal to authorize multiple SAS providers. In responding to the questions and proposed rules in this section, we ask commenters to consider the implications of multiple authorized SASs and to address these issues in their filings.

92. We also intend to institute a comprehensive approval process for SASs and SAS Administrators that closely follows the multi-step process used to test, certify, and approve TVWS databases and administrators. In the TVWS context, prospective database administrators were invited to submit proposals outlining how their systems would meet the Commission's requirements for database operators and provide information sufficient to show that they have the technical expertise to administer a database and a viable business plan for operating a database for a five-year term.[168] OET then reviewed these proposals and approved the proposals of those operators that met the requirements.[169] Approved operators were then required to attend mandatory workshops to ensure compliance with the rules, meet milestone dates set by OET for reporting and compliance, and submit to rigorous real-world testing of all database elements prior to making their services available to the public.[170] By following the precedent set in the TVWS proceeding, we can ensure that the technical solutions and developed by prospective SAS Administrators are consistent with the letter and spirit of our high-level rules, especially with regard to the protection of Incumbent Access tier users.[171]

(i) Spectrum Access System Purposes and Functionality (§ 96.43)

93. We sought comment on the essential high level requirements of the SAS in both the *Licensing PN* and the *NPRM*.[172] In addition, in recognition of the complexity of the proposed SAS framework, OET and the Bureau held a workshop to discuss the operational and functional parameters of the SAS.[173] The workshop and associated technical papers were organized according to the following focus areas: (1) General Responsibilities and Composition of the SAS; (2) SAS Functional Requirements; (3) SAS Monitoring and Management of Spectrum Use; and (4) Issues related to the Initial Launch and Evolution of the SAS and Band Plan.[174]

94. While commenters and workshop presenters submitted a diverse set of positions regarding the necessary features of the SAS, most agreed that an effective SAS would need to be more

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[167] *See* FCC, "Whitespace Database Administrator Guide," *available at*: http://www.fcc.gov/encyclopedia/white-space-database-administrators-guide (last visited February 20, 2014).

[168] *See* Office of Engineering and Technology Invites Proposals from Entities Seeking to be Designated TV Band Device Database Managers, ET Docket No. 04-186, *Public Notice*, 24 FCC Rcd 14136 (OET 2009). The information requested in the *Public Notice* was based on rules for TVWS databases and administrators adopted in Unlicensed Operation in the TV Broadcast Bands Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 04-186, ET Docket No. 02-380, *Second Report and Order and Memorandum Opinion and Order*, 23 FCC Rcd 16807 (2008).

[169] *See* Unlicensed Operation in the TV Broadcast Bands Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket No. 04-186, ET Docket No. 02-380, *Order*, 26 FCC Rcd 554 (OET 2011).

[170] *See id.* at 556-57 and 559-60, ¶¶ 9-10 and 15-19.

[171] *See supra* section III(A)(1)(f)(vi).

[172] *See 3.5 GHz NPRM* 27 FCC Rcd at 15625-28, ¶¶ 95-108; *Licensing* PN, 28 FCC Rcd at 15313, ¶¶ 41-43.

[173] *See SAS Workshop Agenda PN.*

[174] *See id. SAS Papers PN.*

dynamic and responsive than the current TVWS database.[175] Moreover, many commenters agreed that the FCC should set only baseline parameters and guidelines for the SAS and should allow industry stakeholders to develop detailed policies and standards to facilitate operation consistent with the Commission's rules.[176] Some commenters that supported a two-tiered licensing model also advocated a simplified, "binary" SAS that would only inform Priority Access Licensees whether or not they could operate in a given area or frequency range without causing harmful interference to incumbents.[177] Other commenters opposed giving the SAS the ability to dynamically assign channels or modify the maximum allowable transmit power for CBSDs.[178]

95. After thorough review of the record and using the TVWS rules as a guide, we propose that authorized SASs would perform the following core functions:

- Determine the available frequencies at a given geographic location and assign them to CBSDs;
- Determine the maximum permissible radiated transmission power level for CBSDs at a given location and communicate that information to the CBSDs;
- Register and authenticate the identification information and location of CBSDs;
- Enforce Exclusion Zones to ensure compatibility between Citizens Broadband Radio Service users and incumbent federal operations;
- Protect Priority Access Licensees from harmful interference from General Authorized Access Users;
- Reserve the use of GAA channels for use in a CAF;
- Ensure secure transmission of information between the SAS and CBSDs.[179]

96. Under our proposal, each SAS would provide nationwide service. Each SAS would also collect and retain all information provided by CBSDs and Incumbent Users according to the proposed rules and enforce robust security protocols to protect such information.[180] If multiple SASs are authorized, each SAS would be responsible for sharing this information with other authorized SASs to ensure effective coordination of operations within the band. The proposed rules outline the essential requirements for a successful SAS and would promote innovation and productive use of the 3.5 GHz Band. Further, these rules represent the lightest regulatory approach possible to accomplish the core objectives of the SAS.

97. We seek comment on these proposed rules. Specifically, do the proposed rules accurately describe the necessary functions of an SAS? What additional elements, if any, should be included in the SAS? What responsibilities should SASs (and SAS Administrators) have to maximize use by and minimize interference among GAA users, notwithstanding any absence of interference protection rights that may be extended to such users under our rules? How should the Commission most appropriately discharge its Title III responsibilities in supervising these and other functions that may be

[175] *See e.g.*, BLiNQ *Licensing PN* Comments at 14-16; WISPA *Licensing PN* Comments at 18-19; Google SAS Paper.

[176] *See* Spectrum Bridge Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed December 20, 2013) (Spectrum Bridge SAS Paper); Google SAS Paper at 2-3.

[177] *See* Qualcomm Response to FCC Call for Papers on Proposed 3.5 GHz Spectrum Access System in GN Docket No. 12-354 (filed January 3, 2014) (Qualcomm SAS Paper); NSN SAS Paper.

[178] *See* AT&T *Licensing PN* Reply Comments at 4-5 (Supporting fixed channel assignments for PALs); T-Mobile SAS Paper.

[179] *See* Appendix A, §§ 96.43 – 96.48.

[180] *See id.*, §§ 96.44 and 96.47 - 96.48.

delegated to the SASs and SAS Administrators? Are the proposed rules unduly burdensome for potential SAS Administrators? Could a compliant SAS be built and operated using existing or "in development" technology?

98. In addition, under this proposal multiple SASs could be authorized, much as multiple databases have been authorized in the TVWS context,[181] to ensure that consumers are provided with a robust set of choices in the marketplace. We seek comment on what techniques could be used to effectively coordinate multiple SASs in the band? What other implementation challenges could arise from the possibility of multiple SAS providers? Are they solvable? We seek general comment on the proposal to authorize multiple SAS providers.

(ii) Information Gathering and Retention (§ 96.44)

99. To protect Incumbent Users and effectively coordinate Citizens Broadband Radio Service users, we propose that the SAS retain information on all operations within the 3.5 GHz Band. For CBSDs, such information would include all data that they are required to transmit to the SAS pursuant to the proposed section 96.36.[182] For incumbent FSS operators, the SAS would maintain a record of the location of protected earth stations as well as the direction and look angle of all earth station receivers and any other information needed to perform its functions. For incumbent federal users, the SAS would include only the geographic coordinates of the Exclusion Zones.[183] We seek comment on these proposed rules and alternative approaches.

100. With regard to federal operations, if Exclusion Zones are altered or other incumbent protection criteria implemented in future phases of this proceeding, the SAS may eventually need to gather and manage a significant amount of data on federal operations. Much of this information is likely to be sensitive or classified and would require additional safeguards that may not be necessary to protect non-federal information. Some commenters raised the possibility of establishing a separate database to store sensitive federal information and instruct registered SASs on the required protection contours for federal operations.[184] We seek comment on whether a separate database should be established for federal information. Would such a database be more efficient and secure than entrusting federal information to each registered SAS? What additional security measures should be required for a database holding sensitive federal information? Who should maintain such a database? We will continue to work with NTIA and incumbent federal users to develop this aspect of the SAS requirements.

101. Some commenters have argued that the SAS should be required to incorporate spectrum sensing information from CBSDs or other remote beaconing and sensing sites to accurately detect incumbent usage models and respond to the interference environment.[185] We seek comment on whether such capabilities would be helpful for the operation of the SAS.

(iii) Registration and Authorization of Citizens Broadband Radio Service Devices (§ 96.45)

102. In addition to gathering required information from CBSDs, the SAS would confirm and verify the identity of any CBSD seeking to use the 3.5 GHz Band prior to authorizing its operation. The SAS would also prevent CBSDs from operating within any Exclusion Zones. We seek comment on these proposed rules.

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[181] *See* FCC, "Whitespace Database Administrator Guide," *available at*: http://www.fcc.gov/encyclopedia/white-space-database-administrators-guide (last visited February 20, 2014).

[182] *See* Appendix A, § 96.36.

[183] *See id*, § 96.44 and 96.48.

[184] *See* Ericsson SAS Paper at 4-5.

[185] *See* Federated SAS Paper at 3-4; Comments of Shared Spectrum Company in Response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (Shared Spectrum *Licensing PN* Comments).

(iv) Frequency Assignment (§ 96.46)

103. As discussed in section III(A)(1)(a)(7) above, under our proposal, assignment of PAL channels and GAA frequencies in the 3.5 GHz Band would be a dynamic process. The SAS would be responsible for determining the available and appropriate frequencies at a location using the location information supplied by CBSDs, compliance with Exclusion Zones, the authorization status and operating parameters of CBSDs in the surrounding area, and such other information necessary to ensure effective operations of CBSDs. The SAS would also take into consideration any channel requests submitted by CBSDs as well as geographic and spectral efficiency considerations. We also propose that the SAS be able to provide a list of available frequencies in a given area and confirm that any CBSDs causing harmful interference to an Incumbent User have been deactivated or reassigned upon request. We seek comment on these proposed rules.

(v) Security (§ 96.47)

104. We propose to require that the SAS employ protocols and procedures to ensure that all communications and interactions between the SAS and CBSDs are accurate and secure and that unauthorized parties cannot access or alter the SAS or the list of frequencies sent to a CBSD. These protocols and procedures would be reviewed and approved by the Commission before the SAS Administrator could be certified.[186] We seek comment on these proposed rules and on any additional safeguards needed to protect sensitive federal information.

(vi) Spectrum Access System Administrators (§ 96.48)

105. Drawing on our experience with the TVWS, we propose that SASs be operated only by designated SAS Administrators that have been approved by the Commission. As noted above, this approval process will be essential to determining that the SAS can meet the regulatory requirements, without having to provide overly prescriptive and detailed rules about its implementation.[187]

106. To this end, we propose that SAS Administrators be required to:

- maintain a regularly updated database that contains the information described in the proposed rules;
- establish a process for acquiring and storing in the database necessary and appropriate information from the Commission's databases;
- establish and follow a process for ensuring compatibility between Citizens Broadband Radio Service users and Incumbent Users, including enforcement of Exclusion Zones;
- establish and follow processes for registering and coordinating Priority Access Licensees and GAA users;
- establish and follow protocols and procedures to ensure that Incumbent Users are protected from harmful interference from Citizens Broadband Radio Service operators;
- establish and follow protocols and procedures to ensure that Priority Access Licensees are protected from harmful interference from Priority Access and GAA users;
- establish and follow protocols and procedures to ensure that all communications and interactions between the SAS and CBSDs are accurate and secure;
- make its services available on a non-discriminatory basis;

[186] *See supra* section III(A)(1)(f)(vi).

[187] *See supra* section III(A)(1)(f).

- respond in a timely manner to verify, correct or remove, as appropriate, data in the event that the Commission or a party brings claim of inaccuracies in the SAS to its attention;
- securely transfer the information in the SAS to another designated entity in the event it does not continue as the SAS administrator at the end of its term;
- cooperate with other SAS Administrators to develop a standardized process for coordinating and exchanging required information;
- provide a means to make public information available to the public in an accessible manner;
- establish protocols to maintain appropriate security clearances and other security measures as may be determined by the Commission for access to and storage of required federal incumbent information if required in future phases of this proceeding.[188]

107. Under our proposed rules, SAS Administrators would be authorized to provide service for a five-year term, which could be renewed at the Commission's discretion. We further propose that the Bureau review applications for certification and establish procedures for reviewing the qualifications of prospective SAS Administrators. What conflict of interest requirements, competitive or other selection process, technical qualifications, or other standards should govern this process? Do other models involving Commission selection of third-party assistance provide useful insights into these questions?

108. We seek comment on this proposal. Do the proposed rules establish appropriate qualifications for SAS Administrators? What procedures should the Bureau adopt to select SAS Administrators, ensure that they are qualified to perform their duties, and ensure that SASs are able to perform the functions required by the proposed rules. What steps should the Commission take to ensure that SAS Administrators are properly supervised and operating within the bounds of the law? Commenters should provide a detailed analysis, including economic costs and benefits, of any alternate or supplemental approach they propose.

(vii) Spectrum Access System Administrator Fees (§ 96.47)

109. We propose to allow SAS Administrators to collect reasonable fees from Priority Access Licensees and General Authorized Access users for use of the SAS and associated services. We based this proposal on a similar rule adopted for TVWS database administrators.[189] We seek comment on this proposed rule. We also seek comment on whether SAS Administrators should be permitted to collect fees from all Citizens Broadband Radio Service users. Specifically, should SAS Administrators be permitted to collect fees from GAA users? Or should fees be collected only from Priority Access Licensees? Would limiting fees to Priority Access Licensees effectively promote diverse and innovative use of the GAA service tier? What role, if any, should the Commission play in resolving any disputes or other issues regarding the collection of any such fees by the SAS Administrators?

2. Modifications to Existing Rule Parts

110. In addition to the proposed new Part 96, we also seek comment on any necessary amendments to existing rule parts, as discussed below.

[188] *See* Appendix A, § 96.48.

[189] *See* 47 C.F.R. § 47.1515.

a. Table of Frequency Allocations (§ 2.106)

111. In the *NPRM*, the Commission requested comment on the allocation structure that should be used to accommodate the Citizens Broadband Radio Service.[190] The *NPRM* proposed to retain the primary allocation for existing federal radar systems in the 3.5 GHz Band, while also proposing to allocate that band for non-federal fixed and mobile use. The *NPRM* observed that this proposed structure is consistent with international allocations for use of the 3.5 GHz Band, and also appears consistent with requirements for the allocation of flexible use spectrum under Section 303(y) of the Communications Act.[191] However, the *NPRM* sought comment on what allocation scheme would best accomplish the goals set forth in that *NPRM*, and also inquired how that scheme should account for potential Federal fixed and mobile use of the band.[192]

112. The *NPRM* also proposed to restrict primary non-federal FSS earth station use in the 3600-3650 MHz band to the FSS earth stations licensed or applied for as of the effective date of the Report and Order in this proceeding.[193] Additionally, the *NPRM* noted the existence in the 3.5 GHz Band of federal allocations for Aeronautical Radio Navigation Service and mobile ground-based radars, and stated that the Commission would work with NTIA regarding the continued need for those allocations.[194] Moreover, the *NPRM* noted the existence of a non-Federal secondary allocation for radiolocation services, and requested comment on what existing 3.5 GHz band allocations should be maintained.[195] Finally, the *NPRM* sought comment on the potential for interference to and from existing and future international operations in the 3.5 GHz Band.[196]

113. There was limited comment on the allocation proposals *per se*, although the great majority of commenting parties support shared federal/non-federal use of the 3.5 GHz Band for new broadband technologies.[197] This suggests implicit support for adopting an allocation structure that will

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[190] *3.5 GHz NPRM*, 27 FCC Rcd at 15623-25, ¶¶ 87-94.

[191] *Id*. at 15624-25, ¶ 91.

[192] *Id*. at 15624, ¶ 90.

[193] *Id*. at 15625, ¶ 92. In connection with the *NPRM,* the Commission also issued an order freezing applications for new FSS earth stations more than 10 statute miles from a license earth station's coordinates. *Id.* at 15642-45, ¶¶ 154-55.

[194] *Id*. at 15625, ¶ 93.

[195] *Id*.

[196] *Id*. at 15625, ¶ 94.

[197] *See*, *e.g.*, Comments of Microsoft Corporation in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 2 (Microsoft *NPRM* Comments); Comments of Motorola Solutions, Inc. in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (Motorola Solutions *NPRM* Comments) at 1-2; Comments of Nokia Siemens Networks US LLC in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (NSN *NPRM* Comments) at 23; Comments of PCIA – The Wireless Infrastructure Association and the DAS Forum, a Membership Section of PCIA in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013,) at 2; Comments of Qualcomm Incorporated in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (Qualcomm *NPRM* Comments)at ii; Comments of Shared Spectrum Company in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (Shared Spectrum *NPRM* Comments)at ii; Comments of T-Mobile USA, Inc. in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 2-3; Comments of Wi-Fi Alliance in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 2; WiMax Forum *NPRM* Comments at 8; Reply Comments of AT&T Services, Inc. in response to *NPRM* in GN Docket No. 12-354 (filed April 5, 2013) at 2; Reply Comments of Exelon Corporation in response to *NPRM* in GN Docket No. 12-354 (filed April 5, 2013) at 2; Reply Comments of Spectrum Bridge, Inc. in response to *NPRM* in GN Docket No. 12-354 (filed April 5, 2013) at 1; Reply Comments of Verizon and Verizon Wireless in response to *NPRM* in GN Docket No. 12-354 (filed April 8, 2013) at 1; Reply Comments of Wireless Internet Service Providers Association in response to *NPRM* in GN Docket No. 12-354 (filed April 5, 2013) at 2.

allow for this type of use.[198] Of the commenters that explicitly discuss the allocation proposals, the Utilities Telecom Council, Edison Electric Institute, and National Rural Electric Cooperative Association contend that a non-federal fixed and mobile allocation of the 3.5 GHz Band would spur innovation and investment in new wireless technologies with little or no impact on incumbent uses, including federal radar systems, and support the proposal to restrict FSS earth station use of the 3600-3650 MHz band to the FSS earth stations licensed or applied-for as of the effective date of the Report and Order in this proceeding.[199] SIA, however, expresses concern about the impact on FSS earth stations and contends that, if there are any small cell operations in allowed in the 3.5 GHz Band, they should be permitted only on a secondary basis.[200]

114. We propose to add new primary fixed and land mobile allocations to the 3.5 GHz Band to permit commercial use of the band consistent with our accompanying licensing and service rule proposals.[201] The adoption of a United States allocation structure that permits that band to be used for fixed and land mobile services on a primary basis is also consistent with the approach the Commission has previously taken when it has determined that uses of other bands for new broadband purposes was in the public interest.[202] Moreover, the proposed allocation is consistent with the Region 2 International allocation for the band.[203] We do not think it serves the public interest to pursue a secondary fixed and mobile allocation, as suggested by SIA, and we will continue to propose that FSS earth stations be restricted to those that were licensed or applied for as of the effective date of the Report and Order in this proceeding. As we observed in the *NPRM*, our proposed treatment of FSS earth stations is the same as what has previously been implemented in the 3650-3700 MHz band.[204] Additionally, we note that FSS earth stations are authorized to use other nearby spectrum at 3.7-4.2 GHz on a primary basis.[205] For these

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[198] *See* 47 C.F.R. § 2.102(a) (stating that "…the assignment of frequencies … and the actual use of such frequencies … shall be in accordance with the Table of Frequency Allocations.").

[199] *See* UTC/EEI/NRTC *NPRM* Comments at 19.

[200] *See* SIA *NPRM* Comments at 10-12 and 21.

[201] We note that, while the *NPRM* proposed to include all mobile services in the new 3.5 GHz Band allocation, the low-power nature of the proposed Citizens Broadband Radio Service makes it inconsistent with higher-power aeronautical and maritime mobile uses. The United States falls under Region 2 in the International Table of Frequency Allocations, and the Region 2 allocation for the 3.5 GHz Band is "Mobile except aeronautical mobile." *See* 47 CFR § 2.106. Thus, our proposal would be somewhat more restrictive than the Region 2 allocation, but in no way would constrain the Citizens Broadband Radio Service. In particular, we note that our proposal would not preclude Citizens Broadband Radio Service use on-board a vessel, as such use would fall under the definition of a land mobile service rather than a maritime mobile service, provided that the subscriber was communicating through a base station – rather than a coast station – within the geographical limits of the United States. The two services are defined in our rules as follows: *Land Mobile Service.* "A mobile service between base stations and land mobile stations, or between land mobile stations." *Maritime Mobile Service.* "A mobile service between coast stations and ship stations, or between ship stations, or between associated on-board communication stations; survival craft stations and emergency position-indicating radiobeacon stations may also participate in this service." *See* 47 C.F.R. § 2.1.

[202] For example, when the Commission found that it was in the public interest to transfer TV Channels 52-69 (698-806 MHz) from broadcast use to new wireless and public safety uses, it added primary fixed and mobile allocations to the 698-806 MHz band. *See* Reallocation of Television Channels 60-69, the 746-806 MHz Band, ET Docket No. 97-157, *Report and Order*, 12 FCC Rcd 22953 (1998); and Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59), GN Docket No. 01-74, *Report and Order*, 17 FCC Rcd 1022 (2002).

[203] The 3.5 GHz band is already allocated on a primary basis in Region 2 for fixed and mobile except aeronautical mobile services, but in the United States it is not allocated to those services. *See* 47 C.F.R. § 2.106.

[204] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15625, ¶ 92.

[205] *See* 47 C.F.R. § 2.106.

reasons, providing the Citizens Broadband Radio Service a primary allocation offers important new opportunities to make robust use of our spectrum resources, and we propose appropriate technical rules to protect existing incumbent FSS operations.

115. We further observe that, with respect to the GAA tier, some commenting parties express a preference for an unlicensed (Part 15) framework, rather than the *NPRM*'s proposed licensed-by-rule framework.[206] We nevertheless propose to adopt a primary fixed and land mobile allocation across the entire band. Doing so could afford us the flexibility to adopt a licensing framework for all Citizens Broadband Radio Service tiers that will ensure that these operations are prioritized over existing secondary users in the band. This could also help ensure that quality spectrum is available for GAA users. We seek comment on this proposal and other licensing frameworks.

116. In addition to proposing to add fixed and land mobile allocations to the 3.5 GHz Band in the non-Federal Table, we propose to remove the secondary radiolocation service allocation from that band in the non-Federal Table and to add three US footnotes (US106, US107, and US433, respectively) to: (1) permit 3.5 GHz Band non-federal stations in the radiolocation service that were licensed or applied for prior to the effective date of any Report and Order we adopt in this proceeding to continue to operate on a secondary basis until the end of the equipment's useful lifetime; (2) limit primary FSS use of the 3600-3650 MHz band to earth stations authorized prior to, or granted as a result of an application filed prior to, the effective date of any Report and Order we adopt in this proceeding, and constructed within 12 months of initial authorization; and specify that FSS use of that band for all other earth stations will be on a secondary basis to non-federal stations in the fixed and land mobile services; (3) both specify provisions for 3.5 GHz Band federal use of the aeronautical radionavigation (ground-based) and radiolocation services, and provide for continued federal use in light of new non-federal fixed and mobile operations in the band; and (4) prohibit federal use of airborne radar systems in the 3.5 GHz Band. We seek comment on these proposals, including whether the potential effects on federal incumbents would serve the public interest.

117. We also note that the *NPRM* sought comment on allowing federal fixed and mobile use in the band. Should we consider permitting federal fixed and mobile operations in the 3.5 GHz Band? If so, how should such uses be effectively implemented and managed? What, if any, implications would federal fixed and mobile use have for non-federal use of the band?

b. Procedures for Priority Access Licenses Subject to Assignment by Competitive Bidding (§ 1.2101 *et seq.*)

118. If we adopt our proposed geographic area licensing approach for PALs that would permit the filing and acceptance of mutually exclusive applications, we will be required to resolve such applications through competitive bidding consistent with the mandate of Section 309(j) of the Communications Act.[207] Accordingly, we seek comment on a number of proposals relating to competitive bidding for PALs in the 3.5 GHz Band.

(i) Application of Part 1 Competitive Bidding Rules (§ 1.2101 *et seq.*)

119. We consider here changes to the Commission's general competitive bidding rules set forth in Part 1, Subpart Q, of the Commission's rules that may be necessary or desirable to conduct an auction of initial PALs in the 3.5 GHz Band. We propose to employ the general competitive bidding rules set forth in Part 1, Subpart Q to resolve any mutually exclusive applications received for initial

[206] *See*, *e.g.*, AT&T *Licensing PN* Comments at 2; Microsoft *Licensing PN* Comments at 5; Google *Licensing PN* Reply Comments at 3-5; Reply Comments of Open Technology Institute of the New America Forum and Public Knowledge in response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) (OTI/PK *Licensing PN* Reply Comments) at 3.

[207] 47 U.S.C. § 309(j)(1).

PALs. The Commission's competitive bidding rules provide a framework from which the Commission develops final procedures—through a series of public notices with opportunities for comment—for the particular competitive bidding processes that it conducts. The public notice process allows both the Commission and interested parties to focus and provide input on certain details of the auction design and the auction procedures after the rules have been established and the remaining procedural issues are better defined. Our experience with spectrum license auctions demonstrates the value of this approach and therefore, we anticipate following a similar approach here. Under this proposal, any modifications that the Commission may adopt for its Part 1 general competitive bidding rules in the future would apply to an auction of PALs in the 3.5 GHz Band. In addition, consistent with our long-standing approach, auction-specific matters such as the competitive bidding design and mechanisms, as well as minimum opening bids and/or reserve prices, would be determined through these public notices. We seek comment on this approach, including the costs and benefits of this approach. We also seek comment on whether any of our Part 1 rules would be inappropriate or should be modified for an auction for licenses in the 3.5GHz Band.

(ii) Applications Subject to Competitive Bidding

120. To date, the Commission has considered two or more parties seeking to bid for a particular license to present mutually exclusive applications for the license, irrespective of whether each party subsequently bids for the license. Where only one party seeks a particular license offered in competitive bidding, that license will be removed from the competitive bidding process and the Commission will consider that party's non-mutually exclusive application for the license through a process separate from the competitive bidding.[208] This has worked well with respect to defined licenses that have parameters such as frequency and geography defined apart from and in advance of competitive bidding.

121. Here we have proposed that the Commission, on an annual basis, would open windows for applications for available PALs. To accommodate the ability of licensees to aggregate consecutive one-year terms, the Commission may offer multiple consecutive years of PAL rights simultaneously. At the close of such a window, the Commission would hold an auction to assign PALs where there are mutually exclusive applications pending. Consistent with the Commission's approach in other spectrum auctions, mutual exclusivity would be triggered when more applications are submitted than can be accommodated geographically, temporally, and spectrally. Under our proposed licensing framework in which we assign PALs in an auction that offers generic (non-frequency-specific) blocks, we propose to determine that mutual exclusivity exists when the total number of applicants for a PAL in a specific geographic area for a given year exceeds the total number of PALs available in that geographic area for that year. We seek comment on this proposal.

(iii) Bidding Process Options

122. *Competitive Bidding Design Options*. The Commission's current rules list types of auction designs from which the Commission may choose when conducting competitive bidding for spectrum licenses.[209] These options include sequential and simultaneous auctions, single and multiple round auctions, and auctions with combinatorial bidding.[210] Since the Commission's Part 1 competitive bidding rules were originally adopted, auction design has evolved and continues to evolve in new directions, sometimes combining several of these listed auction design elements and sometimes utilizing different elements.

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[208] 47 C.F.R. § 1.2102(a); *see* Implementation of Section 309(j) of the Communications Act - Competitive Bidding, PP Docket No. 93-253*, Second Report and Order*, 9 FCC Rcd 2348 at 2376, ¶ 165 (1994).

[209] *See* 47 C.F.R. § 1.2103.

[210] 47 C.F.R. § 1.2103(a).

123. In the *Broadcast Incentive Auction Notice of Proposed Rulemaking*, the Commission proposed to revise the current list of auction design options set forth in section 1.2103 of the rules.[211] In particular, the Commission proposed a rule that provides for the establishment of specific auction procedures governing bid collection, assignment of winning bids, and the determination of payment amounts in spectrum license auctions.[212] Such auctions may use one or more rounds of bidding and/or contingent stages of bidding; and may incorporate bids or offers that simply specify a price for an item, that indicate demand for an item at a specified price, or that are more complex. We anticipate that procedures established to implement these broad auction design elements would take into account sound economic principles and practice and the needs of the Commission and the bidders. We seek comment on whether, in light of the licensing proposals set forth in this *FNPRM*, we should adopt any other or additional revisions to section 1.2103 in addition to those proposed in the Broadcast Incentive Auction proceeding. Given the large number of license areas and relatively short license terms envisioned for PALs, are there any auction mechanisms that would enhance the Commission's ability to effectively manage the use of the Priority Access tier?

124. Section 1.2104 of the Commission's current rules sets forth various mechanisms that can be used in connection with any system of competitive bidding for Commission licenses.[213] For example, the rules enable the Commission to determine how to sequence or group the licenses offered;[214] whether to utilize reserve prices,[215] minimum opening bids and minimum or maximum bid increments;[216] whether to establish stopping or activity rules;[217] and how to determine payments required in the event of bid withdrawal, default, or disqualification.[218] We note, however, that section 1.2104 does not attempt to list exhaustively all potential aspects of the Commission's procedures for competitive bidding.

125. The Commission recently proposed to amend the current stopping rule contained in section 1.2104 to permit the Commission to establish stopping rules before or during multiple round auctions in order to terminate the auctions not only within a reasonable time, but also in accordance with the goals, statutory requirements, and rules for the auction, including the reserve price or prices.[219] The revised stopping rule would thereby allow us to adopt criteria to determine, prior to terminating the auction, whether such requirements have been met. We seek comment on whether we should adopt any other revisions to section 1.2104, in addition to those proposed in the Broadcast Incentive Auction proceeding?

126. *Payment Rules.* Our existing competitive bidding rules also establish additional procedures regarding the competitive bidding process. More specifically, our existing rules address applications to participate in competitive bidding,[220] communications among applicants to participate,[221]

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[211] *See* 47 C.F.R. § 1.2103; Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Docket No. 12-2678, *Notice of Proposed Rulemaking*, 27 FCC Rcd 12357 (*BIA NPRM*) at 12456, ¶¶ 298-99 (2012).

[212] *See BIA NPRM*, 27 FCC Rcd at 12456, ¶¶ 298-99.

[213] 47 C.F.R. § 1.2104.

[214] 47 C.F.R. § 1.2104(a)-(b).

[215] 47 C.F.R. § 1.2104(c).

[216] 47 C.F.R. § 1.2104(d).

[217] 47 C.F.R. § 1.2104(e)-(f).

[218] 47 C.F.R. § 1.2104(g). A bidder assumes a binding obligation to pay its full bid amount upon acceptance of the winning bid at the close of an auction. 47 C.F.R. § 1.2104(g)(2).

[219] *See* 47 C.F.R. § 1.2104(e); *BIA NPRM*, 27 FCC Rcd at 12457, ¶¶ 300-02.

[220] *See* 47 C.F.R. § 1.2105.

[221] *See* 47 C.F.R. § 1.2105(c).

reporting requirements, upfront payments from competitive bidding participants,[222] down and final payments by winning bidders,[223] and applications for licenses by winning bidders,[224] as well as the processing of such applications and default by and disqualification of winning bidders.[225] We seek comment on whether these existing rules require any revisions in connection with the conduct of an auction of PALs.

127. Specifically, we seek comment on whether we should revise any of our payment rules to take into consideration the proposed short license term for PALs, and the potential for applicants to become winning bidders for licenses that do not become effective until a year or more after the initial PAL? For instance, should we revise our upfront payment requirement to better safeguard the Commission against defaults by a winning bidder on consecutive years of a PAL? Should we require a winning bidder for consecutive years of a PAL to make a larger down payment to better safeguard the Commission from defaults in subsequent years? Currently, unless otherwise noted by public notice, the Commission's rules require that within 10 business days after being notified that it is a high bidder on a particular license the winning bidder must submit its down payment necessary to bring its total deposits up to twenty (20) percent of its winning bid(s) or it will be deemed to have defaulted.[226] Should we increase the down payment percentage here to be forty (40) percent of the winning bid(s)? Similarly, unless otherwise specified by public notice, auction winners are required to pay the balance of their winning bids in a lump sum within ten (10) business days following the release of a public notice establishing the payment deadline.[227] Here, we could collect the down payment required for each PAL at the close of the auction, including PALs for consecutive years, but final payment(s) would not be due until we are ready to grant a particular PAL at the beginning of the subsequent license term. Alternatively, in order to provide further incentives for the productive use of spectrum, could the further payment be required upon initiation of service in specific PAL? Will retaining down payments on deposit for consecutive PALs, particularly if the down payment obligation for such PALs is increased, help the Commission safeguard against the potential of default in subsequent years? Are there any statutory or other legal considerations that the Commission should consider in designing payment rules to accommodate these proposals?

128. We also seek comment on whether we should revise our default rule to ensure that if a winning bidder wins PALs in a licensing area for consecutive years and defaults on a payment obligation for a PAL in that area, it loses its ability to be granted a license for any winning bids for PALs in that area in any subsequent year, and is considered to be in default on those winning bids? Would such a default provision ensure that a winning bidder could not game the results of an auction by bidding upon consecutive year PALs only to seek to selectively pay for some but not others of those bids at a later date? In situations where the Commission has determined that a bidder's default might have a greater potential to detrimentally impact the integrity of an auction, it has adopted a higher default percentage to serve as deterrent against such an outcome.[228] If we hold an auction that offers individual PALs for several consecutive years, should we hold a winning bidder for such licenses who defaults on its winning bids responsible for a larger default payment? What percentage of the defaulted bid should be assessed as the additional payment portion of the default payment obligation? Should the amount of the additional payment be greater than the percentage prescribed in our rules for defaults on combinatorial bids?

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[222] *See* 47 C.F.R. § 1.2106.

[223] *See* 47 C.F.R. § 1.2107.

[224] *See id*.

[225] *See* 47 C.F.R. § § 1.2107; 1.2109.

[226] 47 C.F.R. § 1.2107.

[227] 47 C.F.R. § 1.2109.

[228] *See* 47 C.F.R. § 1.2104(g)(2)(ii).

129. Would such a default rule adequately safeguard the Commission should a winning bidder file bankruptcy between the close of an auction and the date of a future payment obligation? Commenters should address in particular the application of the Bankruptcy Code's requirement that an agency "may not deny, revoke, suspend, or refuse to renew a license . . . or other similar grant to," or "discriminate with respect to such a grant against," a debtor or a bankrupt "solely because" it "has not paid a debt that is dischargeable" in bankruptcy.[229] In other contexts, the Commission has addressed its potential financial risks arising out of the bankruptcy of a winning bidder by requiring appropriate letters of credit for each winning bid.[230] However, these bids were for Mobility Fund Phase I financial support rather than for spectrum licenses, and thus did not pose the risk of being unable to re-auction and put to more efficient use the spectrum licensed to an entity that later files for bankruptcy. Would the Commission be restricted by the bankruptcy laws in its efforts to recover and re-auction spectrum won by a defaulting bidder that had filed for bankruptcy? Would the costs of obtaining a letter of credit be reasonable in light of the expected value of the spectrum? Would a payment bond be equally effective in giving financial security to the Commission and protecting the Commission from a winning bidder's bankruptcy? Could bids be aggregated for purposes of issuing a letter of credit, without jeopardizing the Commission's ability to recover the auction amounts and any reasonable penalty associated from default? Would the benefits of our proposed annual payment mechanism outweigh the risks in bankruptcy and the associated costs?

130. Further, we seek comment regarding whether we should amend any of our other Part 1 rules to accommodate our proposals for assigning PALs and facilitate more frequent auctions and the dynamic auction mechanisms that may be required? For example, are there any changes that we should make to the auction application process or the information that we collect from applicants to participate in an auction of PALs? Do we need to amend any of our rules regarding prohibited communications for an auction that offers generic spectrum blocks? In considering our proposed licensing model, are there any particular aspects of the administration of auctions of PALs with which SAS Administrators or another third party could be effective in assisting the Commission, consistent with its statutory responsibilities?[231]

131. *Bidding Credits*. In authorizing the Commission to use competitive bidding, Congress mandated that the Commission "ensure that small businesses, rural telephone companies, and businesses owned by members of minority groups and women are given the opportunity to participate in the provision of spectrum-based services."[232] One of the principal means by which the Commission furthers these statutory goals is the award of bidding credits to small businesses. To award these bidding credits, the Commission defines eligibility requirements for small businesses on a service-specific basis, taking into account the capital requirements and other characteristics of each particular service in establishing

[229] *See* 11 U.S.C. § 525(a).

[230] *See* 47 C.F.R. § 54.1007; GCI Communication Corp. Waiver of Section 54.1007(a) of the Commission's Rules, *Order*, 28 FCC Rcd 15874 (WTB Nov. 21, 2013); *See also* Connect America Fund; A National Broadband Plan for Our Future; Establishing Just and Reasonable Rates for Local Exchange Carriers; High-Cost Universal Service Support; Developing an Unified Intercarrier Compensation Regime; Federal-State Joint Board, WC Docket No. 10-90, GN Docket No. 09-5, WC Docket No. 07-135, WC Docket No. 05-337, CC Docket No. 01-92, CC Docket No. 96-45, WC Docket No. 03-109, WT Docket No. 10-208*, Report and Order and Further Notice of Proposed Rulemaking*, 26 FCC Rcd 17663, 17812 ¶ 449 (2011) ("It is well established that an LOC and the proceeds thereunder are not property of a debtor's estate under section 541 of Title 11 of the [Bankruptcy Code].").

[231] *See Licensing PN*, 28 FCC Rcd at 15309, ¶ 25.

[232] *See* 47 U.S.C. § 309(j)(4)(D). Such entities are collectively described as "designated entities." *See* 47 C.F.R. § 1.2110(a). In addition, section 309(j)(3)(B) of the Act provides that in establishing eligibility criteria and bidding methodologies, the Commission shall promote "economic opportunity and competition . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women." 47 U.S.C. § 309(j)(3)(B).

the appropriate threshold.[233] Bidding credits have proven an effective means to allow small businesses to compete with larger, more well-established companies. However, we also note that in deciding whether to offer bidding credits, the Commission takes into account both the nature of the service and the nature of the parties most likely to be interested in using the spectrum.

132. Many of our proposals for PALs envision more flexible and dynamic auction and licensing mechanisms for effective and administratively streamlined management of the Priority Access tier. We anticipate that the robust licensing and spectrum access models we propose could serve to ensure that small businesses are given the opportunity to participate in the provision of the Citizens Broadband Radio Service. We therefore seek comment on whether awarding bidding credits in the Citizens Broadband Radio Service would be necessary to ensure the participation of small businesses in competitive bidding.[234] Would our proposals to offer numerous licenses within relatively small geographic licensing areas, and our proposals to cap the number of licenses any particular entity may hold in a license area adequately promote the dissemination of licenses among a wide variety of applicants, including small businesses and rural telephone companies?[235] Likewise, will the one-year license term and the size of the license area we propose make it more likely that small businesses will be able to effectively compete for a PAL and the opportunity to participate in the provision of Priority Access service? Do the unique characteristics of this service reduce the likelihood that small businesses will face barriers in gaining accessing to capital? We request that commenters address the expected capital requirements for service in this band and other characteristics of the service. We invite commenters to use comparisons with other services for which the FCC has already established auction procedures as a basis for their comments regarding whether we should adopt small business size standards and bidding credits for PALs and if so, the appropriate small business size standards. Moreover, to the extent that commenters propose provisions to ensure participation by minority-owned or women-owned businesses, they should address how such provisions should be crafted to meet the relevant standards of judicial review.[236]

133. We note that under our existing Part 1 rules, a winning bidder for a PAL will be eligible to receive a bidding credit for serving a qualifying tribal land within that market, provided that it complies with the applicable competitive bidding rules.[237] We seek comment on whether any revisions to our rules governing eligibility for or implementation of Tribal land bidding credits are necessary for PALs. In addition, the Commission currently has under consideration various provisions and policies intended to promote greater use of spectrum over tribal lands.[238] We seek comment regarding whether any rules and policies adopted in that proceeding should apply to any licenses that may be issued through competitive bidding in a PAL auction. We also note that the award of bidding credits can be an administratively intensive process, requiring verification of eligibility and other aspects of the application. We seek comment on whether the relative costs of this process are greater in the context of highly granular PALs

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[233] *See* 47 C.F.R. § 1.2110(c)(1); Implementation of Section 309(j) of the Communications Act—Competitive Bidding, PP Docket No. 93-253, *Second Memorandum Opinion and Order*, 9 FCC Rcd 7245 at 7269, ¶ 145 (1994). *See also* Amendment of Part 1 of the Commission's Rules – Competitive Bidding Procedures, WT Docket No. 97-82, ET Docket No. 94-32, *Third Report and Order and Second Further Notice of Proposed Rulemaking,* 13 FCC Rcd 374 at 388, ¶ 18 (1997).

[234] *See* 47 U.S.C. §309(j)(4)(B).

[235] *Id.*

[236] Adarand Constructors Inc. v. Pena, Secretary of Transportation, 515 U.S. 200 (1995) (requiring a strict scrutiny standard of review for Congressionally mandated race-conscious measures); United States v. Virginia, 518 U.S. 515 (1996) (applying an intermediate standard of review to a state program based on gender classification).

[237] *See* 47 C.F.R. §1.2110(f)(3).

[238] Improving Communications Services for Native Nations by Promoting Greater Utilization of Spectrum over Tribal Lands, WT Docket 11-40, *Notice of Proposed Rulemaking*, 26 FCC Rcd 2623 (2011) (*Tribal Lands NPRM*).

as compared to more traditional FCC licenses for large geographic areas and license terms. We also seek comment on the degree to which the administrative process for bidding credits might be reasonably automated to reduce transaction costs.

134. *Commission Notices*. Upon the conclusion of spectrum license auctions, the Commission typically issues a public notice declaring the bidding closed and identifying the winning bidders. We propose to do so for the PAL auction. We invite comment on this proposal and ask commenters to address whether there are any other issues we should consider with respect to notifying auction participants and the public of the auction results.

c. Secondary Markets

135. We seek comment on the extent to which our existing secondary market rules (both for license transfers and for leases) might be appropriately modified with respect to the secondary market for PALs in the 3.5 GHz Band. Commenters had varied opinions about the frequency with which we should conduct auctions for PALs. Some commenters argued for more frequent auctions so as to accommodate changes in market demand for PALs.[239] Others noted that the development of a robust secondary market in the 3.5 GHz Band would be beneficial for potential Priority Access Licensees.[240] We emphasize that, while auctions are a mode of initial assignment, the secondary market could provide a viable means of matching supply and demand in units more granular than our proposed PAL structure. Indeed, we are interested in the possibility that one or more spectrum exchanges, operating pursuant to our secondary market rules, could facilitate a vibrant and deep market for PAL rights.[241] Such an exchange could improve the ability of individual licensees to obtain micro-targeted (in geography, time, and bandwidth) access to priority spectrum rights narrowly tailored to their needs on a highly customizable, fluid basis. We note that any spectrum exchange would be subject to the requirements of Section 310(d) of the Communications Act and other relevant statutory provisions.[242] To the extent that commenters agree with this concept, we request specific and focused comment on any necessary changes to our Part 1 rules to facilitate the secondary market for PALs in the 3.5 GHz Band. We are particularly interested in modifications that could reduce transaction costs and allow increased automation of transfer and lease applications. What would such a spectrum exchange entail? What legal, technical, or logistical issues could be raised by this proposal?

B. Other Issues

136. In addition to the proposed rules described above, several other issues implicated by this proceeding would benefit from additional, focused comment. We seek further, focused comment on the following issues, and request that commenters provide suggested rules or other specific approaches to implement any proposals they put forward:

- Interference protection for federal incumbents;
- Interference protection for CBSDs from federal radar transmissions;
- Interference protection for in-band FSS operations;
- Interference protection for FSS earth stations in the C-Band; and

[239] Google *Licensing PN* Comments at 19-20; Reply Comments of Google, Inc. in response to *NPRM* (filed April 5, 2013) at 12; Federated *Licensing PN* Comments at 11-12; Comments of Telecommunications Industry Association in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) (TIA *NPRM* Comments) at 5.

[240] *See* Alcatel Lucent *Licensing PN* Comments at 6-7; TIA *NPRM* Comments at 5; Cantor Fitzgerald Telecom Services, LLC, GN Docket No. 12-354, *ex parte* (filed July 31, 2013) (Cantor *Ex Parte*).

[241] *See* Cantor *Ex Parte*.

[242] 47 U.S.C. § 310(d).

- The potential integration of the 3650-3700 MHz band into the Citizens Broadband Radio Service.

1. Protections for Federal Incumbent Access Tier Users

137. In the *NPRM*, the Commission requested comment on measures that would optimize the use of spectrum while protecting both incumbent operations and prospective users of the band. Incumbent operations of this band include high-powered DoD radar systems using ground-based, shipboard, and airborne platforms, as well as non-Federal FSS earth stations used for receive-only, space-to-earth operations and feeder links.[243]

138. In its Fast Track Report, NTIA concluded that geographic separation and frequency offsets could be used to minimize interference between commercial networks and ground-based, airborne, and shipborne radar systems currently operating in the 3.5 GHz Band. However, NTIA's analysis indicated that it would be necessary to put in place extensive exclusion zones to prevent incumbent operations and broadband wireless systems from causing interference to each other. NTIA concluded that effective exclusion zone distances around ground-based and airborne radar systems would extend approximately one to 60 kilometers, coupled with frequency offsets of 40 or 50 megahertz,[244] while exclusion zones around certain high-power shipborne Naval radars would require over-land separation distances of several hundred kilometers.[245] NTIA acknowledged, however, that its analysis assumed deployment of high power, macrocell networks, and stated that its conclusions would require revision to the extent the Commission proposes to implement systems with different technical characteristics.[246]

139. In the *NPRM*, the Commission noted that the large exclusion zones and limited signal propagation in the 3.5 GHz Band weighed against the use of macrocell deployment in the band. Instead, the Commission stated that the use of the 3.5 GHz Band could be significantly increased through spectrum sharing and application of small cell technology. The Commission therefore proposed the creation of the Citizens Broadband Radio Service premised on 1) technical rules that focused on the use of low-powered small cells, and 2) the use of a dynamic SAS to manage users of the band. In light of the small cell deployment model, the Commission noted that some of the assumptions made in the Fast Track Report's analysis regarding the requisite exclusion zone distances would not apply and would need to be revisited.[247] The Commission indicated that it may be possible to reduce any exclusion zones through technical and operational parameters for small cells in combination with an effective SAS and other interference mitigation techniques. The *Notice* therefore requested technical analysis as to how application of small cell and access management technologies may impact interference to and from incumbent 3.5 GHz Band users as well as the size of exclusion zones necessary to ensure compatibility with incumbent and prospective users of the band.[248]

140. Many of the comments filed in response to the *Notice* supported the tentative conclusion that the size of Exclusion Zones as estimated by NTIA should be re-evaluated given the proposal to apply the small cell model.[249] We note that the Exclusion Zones were a condition for the Executive Branch

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[243] *See* Fast Track Report at 3-30 – 3-33. *See also 3.5 GHz NPRM*, 27 FCC Rcd at 15602-15605, ¶¶ 22-28 (discussion of entities operating in the 3.5 GHz and adjacent bands).

[244] *Id.* at 5-3 – 5-4.

[245] *Id.* at 5-6, Table 5-4. *See also 3.5 GHz NPRM*, 27 FCC Rcd at 15633 ¶ 118.

[246] Fast Track Report at 1-7.

[247] *3.5 GHz NPRM*, 27 FCC Rcd at 15633, ¶ 118.

[248] *Id.* at 15618, ¶ 68.

[249] *See e.g.*, Comments of AT&T Services, Inc. in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 12; Comments of the Consumer Electronics Association in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 8; Comments of InterDigital in response to *NPRM* in GN Docket No. 12-354 (filed

(continued….)

agreeing to provide access to this spectrum for non-federal use.[250] As a starting point for continued analysis and discussion, we propose to implement the geographic Exclusion Zones proposed in the Fast Track Report.[251] Nevertheless, preliminary studies have been performed on the potential effects of small cells on radar operations, with additional studies planned, that could lead to a reduction in Exclusion Zones in the near future.[252] We also note that the rules proposed in this *FNPRM* contemplate additional uses other than small cells, with varying maximum transmit power levels and antenna gains, which must factor into the consideration of Exclusion Zones.

141. We are continuing our dialogue with NTIA and the federal agencies on this matter and, if possible, plan to reduce the Exclusion Zone distances from the instant proposal based on the Fast Track Report, which distances, we emphasize, we propose as a starting point for further analysis. We intend to work collaboratively and expeditiously with NTIA and other relevant federal agencies on this project. We emphasize that important technical studies involving federal agencies, industry, and academia are underway and will likely provide data that will be informative in determining whether and to what extent the size of the Exclusion Zones can be reduced. If there are further developments that would enable a reduction in the size of the Exclusion Zones, we encourage participants to file them in the record to ensure that there is sufficient opportunity for public comment prior to issuance of a *Report & Order* in this proceeding. We will also consider any data and studies submitted in this proceeding in our ongoing discussions with NTIA and other federal agencies on this topic.

142. Additionally, in the *NPRM*, the Commission stated that GAA use could be allowed in areas where small cell operations would not cause harmful interference to Incumbent Access tier users but where signals from incumbent users could possibly interfere with GAA uses.[253] However, the *NPRM* noted that Priority Access users, which have quality-of-service expectations, would only be permitted where CBSD operations would not interfere with incumbent operations, and where harmful interference would not be reasonably expected from Incumbent Access tier operations.[254] It may eventually be practicable to authorize coordinated operations for GAA – and possibly Priority Access - tier users inside the proposed Exclusion Zones. We anticipate such use would involve a level of dynamic access to the spectrum and would be authorized through the SAS. However, adding this kind of dynamic element to the SAS raises many technical and operational questions that are not ripe for resolution at this time. Accordingly, we will explore the topic of dynamic coordinated access within the Exclusion Zones (*i.e.*, converting Exclusion Zones to protection zones) in future phases of this proceeding.[255] We seek comment on allowing Citizens Broadband Radio Service operations within currently designated Exclusion Zones and encourage commenters to submit technical analyses to support their positions.

(Continued from previous page)
February 20, 2013) at 3-4; Motorola Solutions *NPRM* Comments at 7; NSN *NPRM* Comments at 22-23; Qualcomm *NPRM* Comments at 16-17; Shared Spectrum *NPRM* Comments at 3-4; TIA *NPRM* Comments at 3; Comments of the National Cable and Telecommunications Association in response to *NPRM* in GN Docket No. 12-354 (filed February 20, 2013) at 10.

[250] *See* Fast Track Report 1-6 – 1-7 and 5-3 – 5-8.

[251] *See* Fast Track Report at 5-6, Table 5-4; *See also 3.5 GHz NPRM*, 27 FCC Rcd at 15633 ¶ 118.

[252] *See* Qualcomm *NPRM* Comments at 16-18; Jeffrey H. Reed, Charles Clancy, Virginia Tech (sponsored by NSWC Dahlgren Division), Measurement Results for Radar and Wireless System Coexistence at 3.5 GHz, (presented January 14, 2014), *available at*: http://wireless.fcc.gov/workshops/sas_01-14-2014/end/Reed-VA_TECH.pdf; Frank Sanders, Robert Sole, and John Carroll, NTIA, Effects of Pulsed Radar Waveforms on LTE (TDD) Receiver Performance (presented January 14, 2014), *available at*: http://wireless.fcc.gov/workshops/sas_01-14-2014/end/Sanders-NTIA.pdf.

[253] *3.5 GHz NPRM*, 27 FCC Rcd at 15614, ¶ 59.

[254] *Id.* at 15618, ¶ 70.

[255] *See* Appendix A.

2. Protections for Citizens Broadband Radio Service Devices from Federal Radar Systems

143. While the proposed Exclusion Zones will prevent interference from radar systems into CBSDs, the possibility of future CBSD operations in close proximity to high power federal radar systems may require that Priority Access Licensees and GAA users take reasonable measures to protect their CBSDs from these high powered operations. Radar systems operating at the power levels described in the NTIA Fast Track Report[256] could lead to peak field strengths in excess of 180 dBuV/m (~33 dBm) at line of sight distances of approximately 1 km.[257] We also recognize that modern receiver technologies incorporate Surface Acoustic Wave / Bulk Acoustic Wave filters that may have peak input power limits in the range of 10 dBm to 33 dBm. To ensure that end users are not adversely affected by the hard failure of receiver components due to interference from such radars, we propose that CBSDs must be capable accept interference in authorized areas of operation up to a peak field strength level of 180 dBuV/m. We seek comment on these proposals and ask that commenters support their proposals with detailed technical analyses. How would such a requirement impact the design and cost of equipment for this band? Alternatively, are there measures that licensees can take to minimize the potential of receiving interference from federal incumbent operations?

144. In addition to the high-power interference effects discussed in the previous paragraph, pulsed radar signals can also cause degradation of CBSD receiver performance. NTIA recently performed measurements to examine the impact of pulsed radar signals on digital receiver performance.[258] Three receiver parameters were examined: (1) data throughput rates; (2) block error rates; and (3) internal noise level. These performance parameters were measured as a function of radar pulse parameters and the incident power level of radar pulses. We seek comments on how the NTIA report can be used to develop thresholds for CBSD receivers to be used in assessing potential interference from federal incumbent operations.

3. Protections for Fixed Satellite Service Earth stations

a. Earth Stations in the 3.5 GHz Band

145. As noted in the *NPRM*, the Commission has licensed primary FSS earth stations to receive on frequencies in the 3600-3650 MHz band in 37 locations.[259] Currently, FSS earth station facilities in 32 cities are authorized to receive in the 3625-3650 MHz sub-band, and Vizada, Inc. operates two gateway earth stations (located northeast of Los Angeles and New York City) that provide feeder links for Inmarsat's L-band mobile-satellite service system.[260] While the Commission directed the International Bureau to cease accepting applications for new earth stations in the 3.5 GHz Band in an order accompanying the *NPRM*, these existing stations would be included in the Incumbent Use tier and afforded protection from lower-tier operations in the proposed Citizen's Broadband Radio Service.[261]

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[256] *See* Fast Track Report at 4-59 to 4-69, ship radars #1 - #5. Peak radar transmit power levels vary depending on the type of radars, up to 98 dBm for ship radar #3, main beam antenna gain 41.8 dB, with 3.4 dB transmit antenna insertion loss.

[257] *Id.* at 4-63, Ship radar #3, Peak transmit EIRP = 98 dBm – 3.4 + 41.8 dBi = 136.4 dBm. Free space path loss at 1 km (in dB, = 20 log $(4\pi d/\lambda) \cong 103.6$ dB at 3600 MHz), resulting in peak power at 1km = 136.4 dBm – 103.6 = 32.8 dBm, approximately 1 watt. 1 km is chosen in this calculation as an approximation of a minimum coupling loss distance. 180 dBuV/m at 3600 MHz $\cong$ 31.7 dBm.

[258] Department of Commerce, National Telecommunications and Information Administration, NTIA Report 13-499, *Effects of Radar Interference on LTE Base Station Receiver Performance* (Dec. 2013).

[259] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15642-43and 15647-48, ¶¶ 154-55 and Appendix A.

[260] *See id.* at 15647-48, Appendix A for a complete list of these FSS earth stations.

[261] *See id.* at 15642-43, ¶¶ 154-55.

146. The *NPRM* also sought extensive comment on appropriate interference protection and mitigation strategies for incumbent FSS earth stations.[262] Specifically, the *NPRM* sought comment on whether geographic protection zones would be necessary to protect existing FSS earth stations from harmful interference.[263] Commenters offered a variety of perspectives on these questions in the record.

147. Notably, SIA filed several comments and letters arguing that the Commission should allow small cell operations in the 3.5 GHz Band only if it can show that in-band and C-Band satellite services will be protected from interference and asking the Commission to lift the freeze on earth station applications in the band.[264] SIA also submitted a technical analysis that indicated that in-band FSS earth stations would require protection distances of up to 107.4 km to mitigate long-term interference and 487 km to mitigate short-term interference.[265]

148. On September 3, 2013, Google made an *ex parte* submission addressing potential interference from proposed Citizens Broadband operations into existing in-band and out-of-band satellite earth stations.[266] With regard to grandfathered FSS earth stations in the 3.5 GHz Band, Google asserts that these earth stations can be protected by the SAS through a combination of coordination, spectral separation, and protection zones.[267] Google also asserts that SIA's submission overstates the potential for interference from CBSDs into in-band FSS earth stations.[268] According to Google, these overstatements are largely due to inappropriate assumptions about terrain, small cell emissions output, and typical small cell power levels as well as a reliance on an ITU interference protection standard that was not intended to apply in this context.[269]

149. Harris Corporation filed comments encouraging the Commission to extend the Incumbent Access tier to include satellite earth stations and incumbent teleport stations in the adjacent 3650-3700 MHz band and limit mobile and itinerant commercial use of the 3.5 GHz Band.[270] Baron Services, Inc. (Baron) also filed comments encouraging the Commission to adopt rules that would protect S-band weather radar systems with equipment authorizations in the 3.5 GHz Band.[271] To accomplish this, Baron suggests that the Commission enforce substantial exclusion zones around S-band radar installations and impose strict OOBE limits on Citizens Broadband Radio Service base stations and handsets.[272] As stated above, the proposed Citizens Broadband Radio Service would be co-primary with existing incumbent

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[262] *See id.* at 15635-36, ¶¶ 124-127.

[263] *Id*.

[264] *See* SIA *NPRM* Comments; Reply Comments of Satellite Industry Association in response to *NPRM* in GN Docket No. 12-354 (SIA *NPRM* Reply Comments); Comments of Satellite Industry Association in response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) (SIA *Licensing PN* Comments); Reply Comments of Satellite Industry Association in response to *Licensing* PN in GN Docket No. 12-354 (filed December 20, 2013) (SIA *Licensing PN* Reply Comments); Letter from Patricia Cooper, President, Satellite Industry Association to Marlene Dortch in GN Docket No. 12-354, *Ex Parte* (filed February 3, 2014) (SIA February 2014 Letter).

[265] *See* Letter from Satellite Industry Association to Marlene Dortch, *ex parte*, GN Docket No. 12-354 (filed August 20, 2013) (SIA August 2013 Letter); Satellite Industry Association, Sharing Considerations Between Small Cells and Geostationary Satellite Networks in the Fixed-Satellite Service in the 3.4-4.2 GHz Frequency Band, *ex parte*, GN Docket No. 12-354 (filed August 20, 2013) (SIA Earth Station Interference Study) at 4.

[266] *See* Google Letter and Marshall Declaration.

[267] *See* Google Letter at 7.

[268] *Id.* at 8.

[269] *Id.* SIA responded to Google's assertions in its February 2014 letter. *See* SIA February 2014 Letter.

[270] *See* Harris *NPRM* Comments at 3-7.

[271] *See* Baron *NPRM* Comments.

[272] *See id.* at 4-8.

operations and would supersede existing secondary uses of the band in the table of allocations.[273] At this time, as stated above, we do not believe that it would be in the public interest to grant Incumbent Access tier status to current or planned non-federal secondary radiolocation operations in the band.

150. We propose to require CBSDs to avoid causing harmful interference to currently operational grandfathered FSS earth stations. It may be possible to minimize or eliminate geographic protection areas around FSS earth stations by incorporating detailed information on the "look angles" of FSS earth stations, the emissions characteristics of CBSDs and End User Devices, detailed regional topographical information, and other relevant variables into the SAS. An analytic model of expected aggregate power-flux density could be used by the SAS to authorize operations to ensure that aggregate power-flux density interference limits are not exceeded, over a specified probabilistic function. Can a Complementary Cumulative Distribution Function (CCDF) of the aggregate power flux density be used for this purpose? We seek comment on the necessity of geographic protection areas and, if necessary, the size of such areas. We also seek comment on additional or alternative mitigation strategies that could be employed to prevent harmful interference to FSS earth stations from CBSDs. What criteria should the SAS incorporate to ensure that FSS earth stations are protected while maximizing the areas available for Citizens Broadband Radio Service operations? How would the SAS manage this data?

151. We also seek comment on protection approaches other than protection areas. For example, we are interested in whether field strength, power-flux density, or some other technical metric, measured in relation to the earth station's technical configuration (antenna characteristics, etc.) might provide FSS earth stations with adequate protections while maximizing the available geographic area and bandwidth for Citizens Broadband Radio Service Users. To the extent such an approach is dependent upon operation of the SAS, we seek comment on what functionalities would need to be required by rule and what functionalities could be specified through other means (*e.g.,* industry standards, multi-stakeholder groups, etc.). Again, we request that parties provide specific and actionable suggestions in providing comments on this issue, including the potential costs and benefits of these approaches.

b. Earth Stations in the C-Band

152. In addition to protections for FSS earth stations in the 3.5 GHz Band, we sought comment on the degree to which the performance of FSS receivers in the C-Band could be affected by Citizens Broadband Radio Service users.[274] We also sought comment on methods for mitigating potential harmful interference from Citizens Broadband Radio Service operations into these receivers. Parties submitted multiple comments, presentations, and technical analyses related to this issue. These submissions relied on very different assumptions about CBSDs, the capabilities of the SAS, receiver performance, and other technical criteria and, as a result, commenters reached very different conclusions regarding the need for protection for C-Band earth stations.

153. Notably, a coalition of media companies and trade organizations, including Fox Entertainment Group, Inc., Time Warner Inc., Viacom Inc., the Walt Disney Company, CBS Corporation, and the National Association of Broadcasters (NAB) (jointly, Content Interests) filed jointly to encourage the Commission to study the potential for interference into C-Band satellite operations before considering commercial operations in the 3.5 GHz Band.[275] Their filings included technical reports from Comsearch

[273] *See supra* section III(A)(2)(a).

[274] *See 3.5 GHz NPRM*, 27 FCC Rcd at 15635-36, ¶¶ 124-127.

[275] *See* National Association of Broadcasters, News Corporation, Time Warner Inc., Viacom Inc., CBS Corporation, and The Walt Disney Company, *ex parte*, GN Docket No. 12-354 (Content Interests Letter) and Attachment A, Comsearch, "Estimating the Required Separation Distances to Avoid Interference from Citizens Broadband Radio Service Transmitters into C-Band Earth Stations" (Comsearch Report) (filed May 8, 2013); Reply Comments of CBS Corporation, the National Association of Broadcasters, Fox Entertainment Group Inc., Time Warner Inc., Viacom Inc., and The Walt Disney Company response to *NPRM* in GN Docket No. 12-354 (Content Interests

(continued….)

and Alion Science and Technology (Alion) that concluded that C-Band earth stations would require significant geographic protection from CBSDs.[276] Alion asserts that separation distances ranging from 600 meters to 9 Km[277] would be required to protect C-Band earth station locations with appropriate filters installed while unfiltered sites would require 19 to 33 Km separation distances.[278] The separation distances would increase to 14 to 28 Km for filtered sites if the full 3550-3700 MHz band is utilized.[279]

154. The Comsearch Report largely comports with Alion's findings. Comsearch noted that the 43+10 log (P) dB OOBE limit proposed in the *NPRM* is equivalent to OOBE of -13 dBm/MHz (-43 dBW/MHz), the same as the International Telecommunication Union (ITU) and LTE-Advanced (LTE-A) baseline "Category A" limits.[280] Comsearch suggests that adopting the ITU's more stringent "Category B" limit for OOBE would significantly reduce required protection zones around C-Band earth stations.[281] According to Comsearch, interference could occur at a range of up to 47.6 km from C-Band receivers with typical separation distances of 5.1 km if Category A devices are authorized by the Commission.[282] The typical separation distance would be reduced to 0.7 km if devices are limited to Category B emission limits.[283]

155. SIA's comments also addressed protection criteria for C-Band earth stations.[284] SIA's technical analysis indicated that C-Band earth stations would require protection zones of up to 36.4 km to protect them from OOBE in the 3.5 GHz Band.[285] SIA also asserts that simply determining the size of these protection zones is insufficient to ensure protection of existing FSS operations and that the Commission must ensure that these protection zones are effectively enforced.[286]

156. Google also made multiple submissions, including a detailed technical analysis, addressing potential interference from proposed Citizens Broadband operations into C-Band earth stations.[287] Google asserts that emissions from small cells in the 3.5 GHz Band would cause minimal interference issues to C-Band receivers and that any potential interference would come from operations in close spatial and spectral proximity to those earth stations.[288] Moreover, Google claims that the look angle of C-Band earth stations can have a significant effect on potential interference from OOBE and that

(Continued from previous page)
NPRM Reply Comments) and Attachment A, Alion Science and Technology, "Effects of the Proposed Citizens Broadband Radio Service to C-Band Domsat Earth Stations" (Alion Report) (filed April 5, 2013).

[276] *See* Alion Report and Comsearch Report.

[277] All interference calculations assume that commercial operations in the 3.5 GHz Band utilize 10 megahertz bandwidth channels. *See* Alion Report at 2-3.

[278] The specific distance varies depending on the elevation angle and interference to noise (I/N) ratio of each C-Band earth station. *See id.*

[279] Detailed charts showing proposed separation distances under different circumstances can be found at pages 13-18 of the Alion Report. *See id.* at 3, 13-18.

[280] *See id.* at 6.

[281] *See* Comsearch Report at 6.

[282] *Id.* at 10.

[283] *Id.*

[284] *See* SIA *NPRM* Comments at 18-20; SIA *NPRM* Reply Comments at 22-24; SIA August 2013 Letter; SIA Earth Station Interference Study; SIA February 2014 Letter.

[285] *See* SIA Earth Station Interference Study at 6.

[286] *See* SIA August 2013 Letter at 2-3.

[287] *See* Google Letter and Marshall Declaration.

[288] *See* Google Letter at 4-7.

protection zones can be significantly reduced by including the positions of these receivers in the SAS.[289] While SIA disagrees with many of Google's conclusions, they agree that relevant data related to CBSDs and earth stations could be programmed into the SAS to allow for real-time calculation of required protection distances.[290]

157. According to Google's studies, accounting for the elevation angle of C-Band dishes coupled with appropriate placement of Citizens Broadband devices can further reduce the required separation distances and areas around C-Band earth stations.[291] Using Google's assumptions,[292] the maximum required protection distance for any C-Band earth station would be 1.67 km (with an excluded area of only .55 km) for an earth station with a 5 degree elevation.[293] The average protection area for a typical earth station would be approximately 0.285 km.[294] Google asserts that these shaped exclusion zones could be managed and enforced by the SAS and that the same techniques could be applied to grandfathered earth stations in the 3600-3650 MHz band.[295]

158. Google also asserts that, due to differences in international C-Band allocations, many C-Band earth stations in the U.S. "listen" to transmissions well outside of their authorized spectrum allocations.[296] Indeed, Google claims that many such earth stations "listen" for transmissions as low as 3400 MHz, a full 300 megahertz below their authorized allocation.[297] The ITU studies cited by SIA consider these equipment specifications in reaching their conclusions about harmful interference from commercial operations in the 3.5 GHz Band.[298] Google asserts that existing C-Band operators should not be afforded special protections for equipment that listens well beyond their licensed allocation.[299] Moreover, according to Google, many C-Band earth stations can effectively mitigate interference from commercial operations in the 3.5 GHz Band by utilizing readily available, low-cost filters.[300] Indeed, Google asserts that C-Band operators already utilize similar filters to protect themselves from Federal radar operations on the 3500-3700 MHz band.[301]

159. While the proposed Part 96 rules do not necessarily address all concerns about potential interference into C-Band earth stations raised in the record, they do include stricter-than-normal out of band emission limits for CBSDs/user devices, and a spectrum access framework utilizing a dynamic SAS. The SAS can calculate the expected aggregate power flux density at in-band station locations attributable to authorized CBSDs and End User Devices, and authorize operations to ensure that interference protection criteria are not exceeded. We propose an equivalent power flux density (EPFD), which would

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[289] *See id.* at 6-7 and Marshall Declaration at 7-17.

[290] *See* SIA February 2014 Letter at 5-6.

[291] *Id.* at 5-8.

[292] *See* Marshall Declaration.

[293] *See id.* at 13.

[294] *See id.* at 13-14.

[295] *See id.* at 14-17.

[296] *See* Google Letter at 2.

[297] *See id.*

[298] *See id.*

[299] *See id.*

[300] *See id.* at 1-3 and Marshall Declaration at 4-7. In their Reply Comments, the Content Interests asserted that, while RF front end filters may work in some circumstances, they are not a "panacea." *See* Content Interests *NPRM* Reply Comments at 3.

[301] *See* Google Letter at 2-3.

be the sum of the power flux densities produced at a geostationary satellite system receive Earth station, by CBSD and End User Devices in the area of that earth station. The EPFD would be calculated to take into account the off-axis discrimination of the Earth station receiving antenna assumed to be pointing in its nominal direction. We seek comment as to whether CBSD and End User Device emission limits based on EPFD and SAS authorization controls would adequately address concerns over potential interference with C-Band earth stations, or whether additional protections are necessary.

160. The "look angle" of FSS earth stations would have a significant impact on the potential for interference from CBSDs, particularly those located at moderate angles (*e.g.*, > 15°) from the axis of the FSS earth station main lobe. We seek comment on the effect of the "look angles" of FSS earth stations for potential interference from CBSDs, including any potential costs and benefits. Would the SAS be able to effectively monitor and manage information on FSS earth station "look angles" to calculate EPFD interference limits, and dynamically adjust any potential protection areas around these earth stations accordingly?

161. We also seek comment on additional mitigation strategies that could be employed to prevent harmful interference to earth stations and reduce or eliminate the need for geographic separation between CBSDs and C-Band earth stations. Specifically, to what degree could filters be utilized to reduce or eliminate harmful interference? Are current commercially available filters sufficient? What would be the likely cost of installing filters in C-Band and 3.5 GHz Band FSS earth stations?

4. Enforcement Issues

162. We acknowledge that the proposals in this *FNPRM* may raise unique enforcement issues for the Commission. Managing real time interactions between a large number of potential Priority Access Licensees and GAA Users while ensuring that Incumbent Users are protected from harmful interference could present novel enforcement challenges for the Commission to address. Our proposals, including SAS specifications, CBSD technical requirements, and security protocols would help address some of these issues and facilitate secure and consistent access to the 3.5 GHz Band for all authorized users. Regardless of the degree of automation incorporated into the SAS, the Commission retains ultimate responsibility for ensuring that its rules are enforced. We seek comment on additional enforcement techniques and protocols that could be implemented, inside or outside the SAS, to address the unique enforcement concerns raised by the proposals set forth in this *FNPRM*.

5. Extension of Part 96 Rules to 3650-3700 MHz Band

163. In the *NPRM*, the Commission sought comment on a supplemental proposal to include the adjacent 3650-3700 MHz band in the proposed regulatory regime.[302] As noted in the *NPRM*, incorporating this additional 50 megahertz would create a 150 megahertz contiguous block of spectrum that could be used by existing licensees in the 3650-3700 MHz band – as well as new licensees – to expand the services that they are already providing. Subsequently in the *Licensing PN* the Commission sought comment on extending the Revised Framework to the 3650-3700 MHz band, and asked what provisions would need to be made for existing operators and how much transition time would be required.[303]

164. Commenters generally support the proposal to create a 150 megahertz contiguous block of spectrum,[304] while a few commenters oppose changing the existing framework for the 3650-3700 MHz

[302] *3.5 GHz NPRM*, 27 FCC Rcd at 15620-22, ¶¶ 77-82.

[303] *Licensing PN*, 28 FCC Rcd at 15315-16, ¶ 51.

[304] *See e.g.*, Google *Licensing PN* Comments at 13-16; NSN *Licensing PN* Comments at 8-15; T-Mobile *Licensing PN* Comments at 14; Verizon *Licensing PN* Comments at 4-5; Qualcomm *NPRM* Comments at 19.

band.[305] In addition, WISPA believes that existing 3650–3700 MHz users should get priority access protection and have five years to transition to the new framework.[306]

165. There could be long term gains and significant public interest benefits to extending the rules proposed here to the 3650-3700 MHz band, both in terms of terms of spectrum efficiency and availability, and economies of scale for equipment across the full 150 megahertz. However, we recognize the significant investment that incumbent 3650-3700 MHz licensees have made. Should we incorporate 3650-3700 MHz into the regulatory scheme proposed in this *FNPRM*, we would seek to do so in a way that would maximize the benefits to all potential licensees, while minimizing the costs to incumbent licensees. Below we set forth proposed rules in the event that we opt to incorporate the 3650-3700 MHz band into our proposed regulatory framework.[307]

166. If we extend these proposed rules, we propose to grandfather existing 3650-3700 MHz operations for a period of five years after the effective date of the proposed rules. More specifically, we would treat each incumbent 3650-3700 MHz nationwide licensee (Grandfathered Wireless Broadband Provider) as an Incumbent User within the service contours of its registered base stations or fixed access points during the transition period. During the transition period, existing licensees would be permitted to operate stations in accordance with the technical rules in Part 90, Subpart Z, if any have been authorized, and would have priority over GAA and Priority Access users in the 3650-3700 MHz band. During this period, Grandfathered Wireless Broadband Providers would be required to avoid causing harmful interference to federal users and grandfathered FSS earth stations, in accordance with existing Part 90 rules.[308] After the transition period, Grandfathered Wireless Broadband Providers would be required to protect incumbent operations in the 3650-3700 MHz band consistent with any applicable protection criteria the Commission develops in conjunction with NTIA, DoD, and other stakeholders. Because the Grandfathered Wireless Broadband Provider would continue to operate under Part 90 rules and would not operate equipment that is authorized by the SAS, GAA use would not be permitted to interfere with the service contour of Grandfathered Wireless Broadband Providers during the transition period.

167. At the end of the transition period Grandfathered Wireless Broadband Providers would have the option, available to all eligible 3.5 GHz Band users, to apply for PALs or to operate on a GAA basis consistent with Part 96 rules. During the transition period, Grandfathered Wireless Broadband Provider with overlapping service contours would be required to coordinate with one another as currently required by Part 90, Subpart Z.[309]

168. We seek comment on this proposed approach to incorporating the 3650-3700 MHz band into the regulatory scheme described in this *FNPRM.* In particular, we seek comment on whether the five year transition period proposed is appropriate. What are current equipment upgrade cycles for fixed and mobile equipment in the 3650-3700 MHz band? Given upgrade cycles, what is the incremental cost of

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[305] *See* Comments of Neptuno Media, Inc. d/b/a Neptuno Networks in response to *Licensing PN* in GN Docket No. 12-354 (filed December 5, 2013) at 8-9; UTC *Licensing PN* Comments at 6 (The Commission should only extend the Citizens Broadband Radio Service to the 3650-3700 MHz band if it adopts the licensing proposals set forth in the *NPRM*); Reply Comments of KanOkla Communications, Inc. in response to *Licensing PN* in GN Docket No. 12-354 (filed December 20, 2013) at 1-2 (Arguing that the Commission should maintain the *status quo* in the 3650-3700 MHz band).

[306] WISPA *Licensing PN* Comments at 19.

[307] *See* Appendix B.

[308] We note that operators in the 3650-3700 MHz band currently operate without restriction within the Exclusion Zones we propose. As such, we do not propose to exclude Citizens Broadband Radio Service operations from these areas. However, operators in the 3650-3700 MHz band t would be required to continue to protect grandfathered FSS earth stations and the grandfathered federal radiolocation facilities listed in Section 90.1331 of the Commission's Rules. 47 C.F.R. § 90.1331.

[309] 47 C.F.R. § 90.1319.

upgrading a 3650-3700 MHz system to one that can operate consistent with the proposed Part 96 rules over a five year period? How do these costs weigh against the possibility of upgrading to equipment that could access a full 150 megahertz on a PAL or GAA basis? We seek comment on our proposal to protect the service contour of existing licensees. More specifically what criteria should be used to define the existing service contour? What criteria should be used to define interference to the existing contour from GAA users? We also seek comment on whether there are other grandfathering and transition mechanisms that we should consider.

169. We also seek comment on how the band should be assigned to GAA and Priority Access tier users after the transition period. Under the proposed rules, a minimum of 50 percent of available bandwidth would be made available for GAA use at any given time in any given geographic area. Would this formulation still be in the public interest if the supplemental proposal is adopted? Notably, Microsoft suggested that a minimum of 50 megahertz of spectrum should be reserved for GAA uses at all times.[310] If we adopt the supplemental proposal, should we guarantee a fixed spectrum floor for GAA (*i.e.*, 50 megahertz) and make the remainder of the spectrum available as PALs? We encourage commenters to consider the costs and benefits of any proposals they put forth.

IV. PROCEDURAL MATTERS

A. *Ex Parte* Rules

170. This proceeding shall continue to be treated as a "permit-but-disclose" proceeding in accordance with the Commission's *ex parte* rules.[311] 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 section 1.1206(b).[312] In proceedings governed by section 1.49(f)[313] or for which the Commission has made available a method of electronic filing, written *ex parte* presentations and memoranda summarizing oral *ex parte* presentations, and all attachments thereto, must be filed through the electronic comment filing system available for that proceeding, and must be filed in their native format (*e.g.,* .doc, .xml, .ppt, searchable .pdf). Participants in this proceeding should familiarize themselves with the Commission's *ex parte* rules.

171. We note that our *ex parte* rules provide for a conditional exception for all *ex parte* presentations made by NTIA or Department of Defense representatives.[314] This *FNPRM* raises significant technical issues implicating federal and non-federal spectrum allocations and users. Staff from NTIA, DoD, and the FCC have engaged in technical discussions in the development of this *FNPRM*, and we anticipate these discussions will continue after this *FNPRM* is released. These discussions will benefit

[310] *See* Microsoft *Licensing PN* Comments at 4.

[311] 47 C.F.R. § 1.1200 *et seq.*

[312] 47 C.F.R. § 1.1206(b).

[313] 47 C.F.R. § 1.49(f).

[314] *See* 47 C.F.R. §1.1204

from an open exchange of information between agencies, and may involve sensitive information regarding the strategic federal use of the 3.5 GHz Band. Recognizing the value of federal agency collaboration on the technical issues raised in this *FNPRM*, NTIA's shared jurisdiction over the 3.5 GHz Band, the importance of protecting federal users in the 3.5 GHz Band from interference, and the goal of enabling spectrum sharing to help address the ongoing spectrum capacity crunch, we find that this exemption serves the public interest.

B. Filing Requirements

172. Pursuant to Sections 1.415 and 1.419 of the Commission's rules,[315] 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: (1) the Commission's Electronic Comment Filing System (ECFS), (2) the Federal Government's eRulemaking Portal, or (3) by filing paper copies.[316]

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

  Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail. All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

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

173. Comments, reply comments, and *ex parte* submissions will be available for public inspection during regular business hours in the FCC Reference Center, Federal Communications Commission, 445 12th Street, S.W., CY-A257, Washington, D.C., 20554. These documents will also be available via ECFS. Documents will be available electronically in ASCII, Microsoft Word, and/or Adobe Acrobat.

174. To request information in accessible formats (Braille, large print, electronic files, audio format), send an e-mail to fcc504@fcc.gov or call the FCC's Consumer and Governmental Affairs Bureau at (202) 418-0530 (voice), (202) 418-0432 (TTY). This document can also be downloaded in Word and Portable Document Format (PDF) at: http://www.fcc.gov.

175. For additional information on this proceeding, please contact Paul Powell of the Wireless Telecommunications Bureau at (202) 418-1613 or Paul.Powell@fcc.gov.

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[315] *See id*. §§ 1.415, 1.419.

[316] *See* Electronic Filing of Documents in Rulemaking Proceedings, GC Docket No. 97-113, *Report and Order*, 13 FCC Rcd 11322 (1998).

C. Initial Regulatory Flexibility Analysis

176. As required by the Regulatory Flexibility Act of 1980 (RFA),[317] the Commission prepared an Initial Regulatory Flexibility Analysis (IRFA) relating to the *NPRM*. No parties filed comments responding to that IRFA. We seek comment on how the proposed rules set forth herein could affect the IRFA. These comments must be filed in accordance with the same filing deadlines as comments filed in response to this *FNPRM* as set forth on the first page of this document and have a separate and distinct heading designating them as responses to the IRFA.

177. Our previous IRFA set forth the need for and objectives of our proposed rules;[318] the legal basis for the proposed action;[319] a description and estimate of the number of small entities to which the proposed rules would apply;[320] a description of projected reporting, recordkeeping, and other compliance requirements for small entities;[321] steps taken to minimize the significant economic impact on small entities and significant alternatives considered;[322] and a statement that there are no federal rules that may duplicate, overlap, or conflict with the proposed rules.[323] Those descriptions remain unchanged by our *FNPRM*, except that we now propose unrestricted eligibility for Priority Access use of the 3.5 GHz Band.

178. Our *FNPRM* does, however, provide greater detail on some of the specific reporting, recordkeeping, and other compliance requirements on which we are now seeking comment. For example, it proposes qualifications requirements, and requirements to designate whether users have selected common carrier status. It proposes specific requirements for interactions with the SAS. It would require devices to be interoperable across all frequencies from 3550 MHz to 3700 MHz. It proposes Exclusion Zones to ensure compatibility between incumbent federal operations and Citizens Broadband Radio Service users, application window procedures for PALs, and limits on the geographic areas, time periods, and numbers of PALs that may be acquired, as well as auction procedures that would govern mutually exclusive applications therefor. It proposes a 24 dBm (per 10 megahertz) peak transmit power limit for CBSDs in non-rural areas, and 30 dBm (per 10 megahertz) for rural areas. For fixed point-to-point radio systems, it proposes a 30 dBm (per 10 megahertz) peak transmit power limit. It proposes a maximum EIRP for End User Devices of 23 dBm (per 10 megahertz), and a -80 dBm signal level threshold as measured by a 0 dBi isotropic antenna in 10 megahertz anywhere along any PAL service area boundaries. It proposes OOBE of 43 + 10 log (P) dB, and 70 + 10 log (P) dB for emissions below 3520 MHz and above 3680 MHz. In the *3.5 GHz NPRM*, the Commission also asked for comment on other alternatives, such as utilizing a two-tiered authorization framework, establishing a license-by-rule approach to Priority Access, and utilizing an alternative "licensed light" framework akin to the authorization model currently used for the 3650-3700 MHz band. This *FNPRM* also seeks comment on alternatives, including static rather than dynamic frequency assignments and prescribed GAA bandwidths.

D. Initial Paperwork Reduction Act Analysis

179. This *FNPRM* contains proposed new and modified information collection requirements. The Commission, as part of its continuing effort to reduce paperwork burdens, invites the general public and the Office of Management and Budget (OMB) to comment on the information collection

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[317] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601 *et seq.*, 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). The SBREFA was enacted as Title II of the Contract with America Advancement Act of 1996 (CWAAA).

[318] *3.5 GHz NPRM,* 27 FCC Rcd at 15649, App. B ¶¶ 2-5.

[319] *Id.,* 27 FCC Rcd at 15650, App. B ¶ 6.

[320] *Id.,* 27 FCC Rcd at 15650-51, App. B ¶¶ 7-12.

[321] *Id.,* 27 FCC Rcd at 15651, App. B ¶¶ 13-15.

[322] *Id.,* 27 FCC Rcd at 15652, App. B ¶¶ 16-18.

[323] *Id.,* 27 FCC Rcd at 15652, App. B ¶ 19.

requirements contained in this *FNPRM*, as required by the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198,[324] we seek specific comment on how we might "further reduce the information collection burden for small business concerns with fewer than 25 employees."

V. ORDERING CLAUSES

180. Accordingly, IT IS ORDERED, pursuant to Sections 1, 2, 4(i), 4(j), 7, 301, 302(a), 303, 307(e), and 316 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152, 154(i), 154(j), 157, 301, 302(a), 303, 307(e), and 316, that this *Further Notice of Proposed Rulemaking* in GN Docket No. 12-354 IS ADOPTED.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

[324] *See* 44 U.S.C. § 3506(c)(4).

APPENDIX A
Proposed Rules

The Federal Communications Commission (FCC or Commission) proposes to amend parts 1, 2, 90, and 95 and add a new Part 96 to Part 47 of the Code of Federal Regulations (CFR) as set forth below:

Part 1 – Practice and Procedure

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

   AUTHORITY: 15 U.S.C. 79 et seq.; 47 U.S.C. 151, 154(i), 154(j), 155, 157, 225, 227, 303(r), 309, 1403, 1404, and 1451.

2. Section 1.901 is amended to read as follows:

§1.901 Basis and purpose

These rules are issued pursuant to the Communications Act of 1934, as amended, 47 U.S.C. 151 *et seq.* The purpose of these rules is to establish the requirements and conditions under which entities may be licensed in the Wireless Radio Services as described in this part and in parts 13, 20, 22, 24, 26, 27, 74, 80, 87, 90, 95, 96, 97 and 101 of this chapter.

3. Section 1.902 is amended to read as follows:

§1.902 Scope

In case of any conflict between the rules set forth in this subpart and the rules set forth in Parts 13, 20, 22, 24, 26, 27, 74, 80, 87, 90, 95, 96, 97, and 101 of title 47, chapter I of the Code of Federal Regulations, the rules in part 1 shall govern.

4. Section 1.907 is amended to read as follows:

§ 1.907 Definitions

****

Private Wireless Services. Wireless Radio Services authorized by parts 80, 87, 90, 95, 96, 97, and 101 that are not Wireless Telecommunications Services, as defined in this part.

****

Wireless Radio Services. All radio services authorized in parts 13, 20, 22, 24, 26, 27, 74, 80, 87, 90, 95, 96, 97 and 101 of this chapter, whether commercial or private in nature.

Wireless Telecommunications Services. Wireless Radio Services, whether fixed or mobile, that meet the definition of "telecommunications service" as defined by 47 U.S.C. 153, as amended, and are therefore subject to regulation on a common carrier basis. Wireless Telecommunications Services include all radio services authorized by parts 20, 22, 24, 26, and 27 of this chapter. In addition, Wireless Telecommunications Services include Public Coast Stations authorized by part 80 of this chapter, Commercial Mobile Radio Services authorized by part 90 of this chapter, and common carrier fixed microwave services, Local Television Transmission Service (LTTS), Local Multipoint Distribution

Service (LMDS), and Digital Electronic Message Service (DEMS), authorized by part 101 of this chapter, and Citizens Broadband Radio Services authorized by part 96 of this chapter.

5. Section 1.1307 is amended to read as follows:

§ 1.1307 - Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.

* * * *

(b) * * * *

(2)(i) Mobile and portable transmitting devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services (PCS) pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth stations only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, the 4.9 GHz Band Service, or the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; the Wireless Medical Telemetry Service (WMTS), or the Medical Device Radiocommunication Service (MedRadio) pursuant to part 95 of this chapter; or the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, as specified in §§ 2.1091 and 2.1093 of this chapter.

* * * * *

Part 2 – Frequency Allocations and Radio Treaty Matters; General Rules and Regulations

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

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

7. Section 2.106, the Table of Frequency Allocations, is amended as follows:

a. Revise pages 39-40.

b. In the list of United States (US) Footnotes, add footnotes US106, US107, and US433.

§ 2.106 Table of Frequency Allocations.

The revisions and additions read as follows:

* * * * *

Table of Frequency Allocations 2655-4990 MHz (UHF/SHF) Page 39

International Table			United States Table		FCC Rule Part(s)
Region 1 Table	Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
2655-2670 FIXED 5.410 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.208B 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412	2655-2670 FIXED 5.410 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.208B	2655-2670 FIXED 5.410 FIXED-SATELLITE (Earth-to-space) 5.415 MOBILE except aeronautical mobile 5.384A BROADCASTING-SATELLITE 5.413 5.416 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.208B 5.420	2655-2690 Earth exploration-satellite (passive) Radio astronomy US385 Space research (passive)	2655-2690 FIXED US205 MOBILE except aeronautical mobile Earth exploration-satellite (passive) Radio astronomy Space research (passive)	Wireless Communications (27)
2670-2690 FIXED 5.410 MOBILE except aeronautical mobile 5.384A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149 5.412	2670-2690 FIXED 5.410 FIXED-SATELLITE (Earth-to-space) (space-to-Earth) 5.208B 5.415 MOBILE except aeronautical mobile 5.384A Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149	2670-2690 FIXED 5.410 FIXED-SATELLITE (Earth-to-space) 5.415 MOBILE except aeronautical mobile 5.384A MOBILE-SATELLITE (Earth-to-space) 5.351A 5.419 Earth exploration-satellite (passive) Radio astronomy Space research (passive) 5.149	US205	US385	
2690-2700 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY SPACE RESEARCH (passive) 5.340 5.422			2690-2700 EARTH EXPLORATION-SATELLITE (passive) RADIO ASTRONOMY US74 SPACE RESEARCH (passive) US246		
2700-2900 AERONAUTICAL RADIONAVIGATION 5.337 Radiolocation 5.423 5.424			2700-2900 METEOROLOGICAL AIDS AERONAUTICAL RADIONAVIGATION 5.337 US18 Radiolocation G2 5.423 G15	2700-2900 5.423 US18	Aviation (87)
2900-3100 RADIOLOCATION 5.424A RADIONAVIGATION 5.426 5.425 5.427			2900-3100 RADIOLOCATION 5.424A G56 MARITIME RADIONAVIGATION 5.427 US44 US316	2900-3100 MARITIME RADIONAVIGATION Radiolocation US44 5.427 US316	Maritime (80) Private Land Mobile (90)
3100-3300 RADIOLOCATION Earth exploration-satellite (active) Space research (active) 5.149 5.428			3100-3300 RADIOLOCATION G59 Earth exploration-satellite (active) Space research (active) US342	3100-3300 Earth exploration-satellite (active) Space research (active) Radiolocation US342	Private Land Mobile (90)
3300-3400 RADIOLOCATION 5.149 5.429 5.430	3300-3400 RADIOLOCATION Amateur Fixed Mobile 5.149	3300-3400 RADIOLOCATION Amateur 5.149 5.429	3300-3500 RADIOLOCATION US108 G2 US342	3300-3500 Amateur Radiolocation US108 5.282 US342	Private Land Mobile (90) Amateur Radio (97)

3400-3600 FIXED FIXED-SATELLITE (space-to-Earth) Mobile 5.430A Radiolocation 5.431	3400-3500 FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile 5.431A Radiolocation 5.433 5.282	3400-3500 FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile 5.432B Radiolocation 5.433 5.282 5.432 5.432A			
	3500-3700 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.433	3500-3600 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile 5.433A Radiolocation 5.433	3500-3550 RADIOLOCATION G59 AERONAUTICAL RADIONAVI- GATION (ground-based) G110	3500-3550 Radiolocation	Private Land Mobile (90)
			3550-3650 RADIOLOCATION G59 AERONAUTICAL RADIONAVI- GATION (ground-based) G110 US106 US107 US245 US433	3550-3600 FIXED LAND MOBILE US106 US433	
3600-4200 FIXED FIXED-SATELLITE (space-to-Earth) Mobile		3600-3700 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation 5.433 5.435		3600-3650 FIXED FIXED-SATELLITE (space-to-Earth) US107 US245 LAND MOBILE US106 US433	Satellite Communications (25) Private Land Mobile (90)
			3650-3700 US109 US349	3650-3700 FIXED FIXED-SATELLITE (space-to-Earth) NG169 NG185 MOBILE except aeronautical mobile US109 US349	
	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile		3700-4200	3700-4200 FIXED FIXED-SATELLITE (space-to-Earth) NG180	Satellite Communications (25) Fixed Microwave (101)
4200-4400 AERONAUTICAL RADIONAVIGATION 5.438 5.439 5.440			4200-4400 AERONAUTICAL RADIONAVIGATION 5.440 US261		Aviation (87)
4400-4500 FIXED MOBILE 5.440A			4400-4500 FIXED MOBILE	4400-4500	
4500-4800 FIXED FIXED-SATELLITE (space-to-Earth) 5.441 MOBILE 5.440A			4500-4800 FIXED MOBILE US245	4500-4800 FIXED-SATELLITE (space-to-Earth) 5.441 US245	
4800-4990 FIXED MOBILE 5.440A 5.442 Radio astronomy			4800-4940 FIXED MOBILE US203 US342	4800-4940 US203 US342	
5.149 5.339 5.443			4940-4990 5.339 US342 US385 G122	4940-4990 FIXED MOBILE except aeronautical mobile 5.339 US342 US385	Public Safety Land Mobile (90Y) Page 40

* * * * *

UNITED STATES (US) FOOTNOTES

* * * * *

US106 In the band 3550-3650 MHz, non-Federal stations in the radiolocation service that were licensed or applied for prior to [effective date of Report and Order] may continue to operate on a secondary basis until the end of the equipment's useful lifetime.

US107 In the band 3600-3650 MHz, the following provisions shall apply to earth stations in the fixed-satellite service (space-to-Earth):

(a) Earth stations authorized prior to, or granted as a result of an application filed prior to, [effective date of Report and Order], and constructed within 12 months of initial authorization may operate indefinitely on a primary basis. Applications for new earth stations or modifications to earth station facilities shall not be accepted, except for changes in polarization, antenna orientation or ownership.

(b) The assignment of frequencies to new earth stations shall be authorized on secondary basis to non-Federal stations in the fixed and land mobile services.

* * * * *

US433 In the band 3550-3650 MHz, the following provisions shall apply to Federal use of the aeronautical radionavigation (ground-based) and radiolocation services and to non-Federal use of the fixed and land mobile services:

(a) Airborne radar systems shall not be authorized.

(b) Non-Federal stations in the fixed and land mobile services shall not be authorized within [XXX km] of the territorial sea baseline.

(c) Ground-based radar systems operate at the following fixed sites: [RESERVED]. Non-federal operations shall not be permitted within [XX km] of these fixed sites.

* * * * *

§ 2.1091 Radiofrequency radiation exposure evaluation: mobile devices

* * * * *

(c)(1) Mobile devices that operate in the Commercial Mobile Radio Services pursuant to part 20 of this chapter; the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Services pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use if:

* * * * *

§ 2.1093 Radiofrequency radiation exposure evaluation: portable devices

* * * * *

(c)(1) Portable devices that operate in the Cellular Radiotelephone Service pursuant to part 22 of this chapter; the Personal Communications Service (PCS) pursuant to part 24 of this chapter; the Satellite Communications Services pursuant to part 25 of this chapter; the Miscellaneous Wireless Communications Services pursuant to part 27 of this chapter; the Maritime Services (ship earth station devices only) pursuant to part 80 of this chapter; the Specialized Mobile Radio Service, the 4.9 GHz Band Service, and the 3650 MHz Wireless Broadband Service pursuant to part 90 of this chapter; the Wireless Medical Telemetry Service (WMTS) and the Medical Device Radiocommunication Service (MedRadio), pursuant to subparts H and I of part 95 of this chapter, respectively, unlicensed personal communication service, unlicensed NII devices and millimeter wave devices authorized under §§15.253(f), 15.255(g), 15.257(g), 15.319(i), and 15.407(f) of this chapter; and the Citizens Broadband Radio Service pursuant to part 96 of this chapter are subject to routine environmental evaluation for RF exposure prior to equipment authorization or use.

* * * * *

Part 90 – Private Land Mobile Radio Services

8. The authority citation for Part 90 continues to read as follows:

AUTHORITY: Sections 4(i), 11, 303(g), 303(r), and 332(c)(7) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7).

9. Section 90.103 is amended by revising the "3500 to 3650" entry in the Megahertz portion of the Radiolocation Service Frequency Table in paragraph (b) to read as follows:

§ 90.103 Radiolocation Service.

* * * * *

RADIOLOCATION SERVICE FREQUENCY TABLE

Frequency or band	Class of station(s)	Limitation
	Kilohertz	
* *	* *	*
	Megahertz	
420 to 450 …….	.....do	21
2450 to 2500 …….	.....do	9, 22, 23
2900 to 3100 …….	.....do	10, 11
3100 to 3300 ……...	.....do	12
3300 to 3500 ……...	.....do	12, 13
3500 to 3550 ……...	.....do	12
* *	* *	*

Part 95 – Personal Radio Services

10. The authority citation for Part 95 continues to read as follows:

AUTHORITY: Secs. 4, 303, 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303.

11. Section 95.401 is amended to read as follows:

§ 95.401 (CB Rule 1) What are Citizens Band Radio Services?

*****
(h) Citizens Broadband Radio Service – The rules for this service, including technical rules, are contained in Part 96 of the Commission's rules. Only Citizens Broadband Radio Service Devices authorized on a General Authorized Access basis, as those terms are defined in section 96.3, are considered part of the Citizens Band Radio Services.

12. Section 95.601 is amended to read as follows:

§95.601 Basis and purpose

This section provides the technical standards to which each transmitter (apparatus that converts electrical energy received from a source into RF (radio frequency) energy capable of being radiated) used or intended to be used in a station authorized in any of the Personal Radio Services listed below must comply. This section also provides requirements for obtaining certification for such transmitters. The Personal Radio Services to which these rules apply are the GMRS (General Mobile Radio Service)—subpart A, the Family Radio Service (FRS)—subpart B, the R/C (Radio Control Radio

Service)—subpart C, the CB (Citizens Band Radio Service)—subpart D, the Low Power Radio Service (LPRS)—subpart G, the Wireless Medical Telemetry Service (WMTS)—subpart H, the Medical Device Radiocommunication Service (MedRadio)—subpart I, the Multi-Use Radio Service (MURS)—subpart J, and Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs)—subpart L.

A new Part 96 is added to read as follows:

13. The authority citation for Part 96 reads as follows:

AUTHORITY: Sections 4(i), 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i), 303, and 307.

Part 96 – Citizens Broadband Radio Service

Subpart A – GENERAL RULES

§ 96.1 – Scope

§ 96.3 – Definitions

§ 96.5 – Eligibility

§ 96.7 – Authorization Required

§ 96.9 – Regulatory Status

§ 96.11 – Frequencies

§ 96.13 – Frequency Assignments

Subpart B – INCUMBENT PROTECTION

§ 96.15 – Protection of Federal Incumbents

§ 96.17 – Protection of Existing Fixed Satellite Service (FSS) Earth Stations in the 3550-3650 MHz Band

§ 96.19 – Operation Near Canadian and Mexican Borders

Subpart C – PRIORITY ACCESS

§ 96.21 – Authorization

§ 96.23 – Priority Access Licenses

§ 96.25 – Application Window

§ 96.27 – Competitive Bidding Procedures

§ 96.29 – Aggregation of Priority Access Licenses

Subpart D – GENERAL AUTHORIZED ACCESS

§ 96.31 – Authorization

§ 96.33 – General Authorized Access Use

§ 96.35 – Contained Access Facilities (CAFs)

Subpart E – TECHNICAL RULES

§ 96.36 – Citizens Broadband Radio Service Device (CBSD) General Requirements

§ 96.37 – End User General Requirements

§ 96.38 – General Radio Requirements

§ 96.39 – Equipment Authorization

§ 96.41 – RF Safety

Subpart F – SPECTRUM ACCESS SYSTEM

§ 96.43 – Spectrum Access System Purposes and Functionality

§ 96.44 – Information Gathering and Retention

§ 96.45 – Registration and Authorization of Citizens Broadband Radio Service Devices

§ 96.46 – Frequency Assignment

§ 96.47 – Security

§ 96.48 – Spectrum Access System Administrators

§ 96.49 – Spectrum Access System Administrator Fees

Subpart A - GENERAL RULES

96.1 – Scope

(a) This section sets forth the regulations governing use of devices in the Citizens Broadband Radio Service. Citizens Broadband Radio Service Devices (CBSDs) may be used in the frequency bands listed in section 96.11. The operation of all CBSDs shall be coordinated by one or more authorized Spectrum Access Systems (SASs).

(b) The Citizens Broadband Radio Service includes Priority Access and General Authorized Access tiers of service. Priority Access Licensees and General Authorized Access Users shall be authorized to operate only outside of the Exclusion Zones detailed in section 96.15 and must not cause harmful interference to Incumbent Users, including authorized federal users and the fixed satellite service (FSS) sites set forth in sections 96.15 and 96.17. General Authorized Access Users must not cause harmful interference to Priority Access Licensees and must accept interference from Priority Access Licensees, consistent with section 96.33.

96.3 – Definitions

Census Tract: Census tracts are relatively permanent statistical subdivisions of a county or equivalent entity that are updated by local participants prior to each decennial census as part of the Census Bureau's Participant Statistical Areas Program. Census tracts are defined by the United States Census Bureau and current census tract maps can be found at https://www.census.gov/geo/maps-data/maps/2010tract.html.

Citizens Broadband Radio Service Device (CBSD): Fixed or Portable Base stations, or networks of such base stations, that operate on a Priority Access or General Authorized Access basis in the Citizens Broadband Radio Service consistent with this rule part. Does not include End User Devices.

Contained Access Facility (CAF): An indoor or otherwise physically contained location used by Contained Access Users for the express purpose of performing core mission operations.

Contained Access Use: Private internal radio services, not made commercially available to the public, employed by Contained Access Users.

Contained Access User: Qualified government and non-government entities entitled to protection within CAFs in furtherance of a mission that supports the public interest.

End User Device: A fixed, portable, or mobile device authorized and controlled by an authorized CBSD. These devices may not be used as intermediate service links or to provide service to other End User Devices.

Exclusion Zone: A geographic area wherein no CBSD shall operate. Exclusion Zones shall be enforced and maintained by the SAS.

Fast Track Report: National Telecommunications and Information Administration, "An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, 4200-4220 MHz, and 4380-4400 MHz Bands" (October 2010).

Geo-Location Capability: The capability of a CBSD to determine its geographic coordinates within the level of accuracy specified in section 96.36 (*i.e.*, 50 meters horizontally and 3 meters vertically). This capability is used by a SAS to determine frequency availability and maximum power limits for CBSDs.

General Authorized Access User: An authorized user of CBSDs operating on a General Authorized Access basis, as set forth in this part.

Incumbent User: A federal entity or fixed satellite service operator authorized to operate on a primary basis on frequencies designated in section 96.11.

Priority Access License (PAL): A license to operate on a Priority Access basis, consistent with section 96.21, *et seq*.

Priority Access Licensee: A holder of one or more PALs. Priority Access Licensees shall be entitled to protection from harmful interference from General Authorized Access Users and other Priority Access Licensees within the defined limits of their PAL, consistent with the rules set forth in this part.

Rural Area. For purposes of this part, a Rural Area is defined as a county (or equivalent) with a population density of 100 persons per square mile or less, based upon the most recently available Census data.

Spectrum Access System (SAS): A system that maintains records of all authorized services and devices in the Citizens Broadband Radio Service frequency bands, is capable of determining the available channels at a specific geographic location, provides information on available channels to CBSDs that have been certified under the Commission's equipment authorization procedures, determines and enforces maximum power levels for CBSDs, and enforces protection criteria for Incumbent Users and Priority Access Licensees, and performs other functions as set forth in section 96.43, *et seq*. Spectrum Access System shall also refer to multiple Spectrum Access Systems operating in coordination and in accordance with this rule part.

SAS Administrator: An entity authorized by the Commission to operate an SAS in accordance with the rules and procedures set forth in section 96.48.

96.5 – Eligibility

Any entity, other than those precluded by section 310 of the Communications Act of 1934, as amended, 47 U.S.C. 310, is eligible to be a Priority Access Licensee or General Authorized Access User under this part, except as set forth in section 96.35.

96.7 – Authorization Required

(a) CBSDs must be used and operated consistent with the rules in this part.

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

96.9 – Regulatory Status

(a) Priority Access Licensees and General Authorized Access Users are permitted to provide services on a non-common carrier and/or on a common carrier basis. An authorized Citizens Broadband Radio Service user may render any kind of communications service consistent with the regulatory status in its authorization and with the Commission's rules applicable to that service.

96.11 – Frequencies

(a) The Citizens Broadband Radio Service shall be authorized in the 3550-3650 MHz frequency band.

96.13 – Frequency Assignments

(a) A minimum of fifty percent of the bandwidth, rounded to the nearest 10 megahertz, available for Citizens Broadband Radio Service users in a given census tract must be reserved for General Authorized Access use. The remaining bandwidth shall be made available to Priority Access Licensees, consistent with the procedures in subpart C of this rule part.

(b) Each PAL shall be authorized to use a 10 megahertz channel as set forth in section 96.23.

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

(d) The SAS shall assign particular authorized users to specific frequencies, which may be reassigned by the SAS.

Subpart B - INCUMBENT PROTECTION

96.15 – Protection of Federal Incumbents

(a) CBSDs must not cause harmful interference to and must accept harmful interference from federal users authorized to operate on frequencies set forth in section 96.11.

(1) To ensure compatibility between incumbent federal operations and Citizens Broadband Radio Service user, an Exclusion Zone consistent with the recommendations of the Fast Track Report shall be

maintained around terrestrial federal radiolocation sites and the coastline. This Exclusion Zone shall be enforced by the SAS.

(3) The SAS must immediately suspend operation of any CBSDs found to be causing harmful interference to Incumbent Users until such harmful interference can be resolved.

96.17 - Protection of Existing FSS Earth Stations in the 3550-3650 MHz Band

(a) CBSDs shall not cause harmful interference to the FSS earth stations listed in the chart below:

Earth Station No.	State	City	Call Sign	Coordinates
1	CA	Livermore	KA232	37° 45' 40.0" N, 121° 47' 53.0" W
2	CA	Malibu	E980066	34° 04' 52.6" N, 118° 53' 52.9" W
			KA273	34° 04' 50.3" N, 118° 53' 46.4" W
			KA91	34° 04' 49.7" N, 118° 53' 43.9" W
			KB32	34° 04' 51.0" N, 118° 53' 44.0" W
3	CA	Mountain Home	KA86	37° 45' 01.7" N, 121° 35' 38.8" W
4	CA	Napa	E950307	38° 14' 43.7" N, 122° 16' 50.9" W
5	CA	Nuevo	E010206	33° 47' 46.1" N, 117° 05' 15.1" W
			E020169	33° 47' 46.5" N, 117° 05' 15.0" W
			E020314	33° 47' 46.0" N, 117° 05' 14.0" W
			E020315	33° 47' 45.0" N, 117° 05' 15.0" W
6	CA	Salt Creek	KA371	38° 56' 20.2" N, 122° 08' 48.0" W
			KA372	38° 56' 21.0" N, 122° 08' 49.2" W
			KA373	38° 56' 22.3" N, 122° 08' 49.6" W
7	CA	San Ramon	E6241	37° 45' 39.7" N, 121° 47' 56.8" W
8	CA	Santa Paula	KA31	34° 24' 05.0" N, 119° 04' 26.0" W
			KB34	34° 24' 05.0" N, 119° 04' 29.4" W
			KA249	34° 24' 05.0" N, 119° 04' 29.4" W
			E980136	34° 24' 06.0" N, 119° 04' 21.8" W
9	CA	Somis	KA318	34° 19' 31.0" N, 118° 59' 41.0" W
10	CA	Sylmar	KA274	34° 19' 04.0" N, 118° 29' 00.0" W
			E6148	34° 18' 55.0" N, 118° 29' 12.0" W
11	CT	Southbury	KA312	41° 27' 06.3" N, 073° 17' 21.4" W
			KA313	41° 27' 06.3" N, 073° 17' 16.4" W
			WA28	41° 27' 05.0" N, 073° 17' 21.0" W
			WB36	41° 27' 05.3" N, 073° 17' 19.4" W
			WB36	41° 27' 05.1" N, 073° 17' 19.0" W
12	FL	Medley	E960068	25° 51' 19.0" N, 080° 19' 52.0" W
13		Miami	KA407	25° 48' 35.0" N, 080° 21' 10.0" W
			KA412	25° 48' 35.0" N, 080° 21' 11.0" W
14	GUM	Pulantat	KA28	13° 25' 00.0" N, 144° 44' 57.0" E
15	GUM	Yonagu	KA326	13° 25' 05.2" N, 144° 45' 05.7" E
16	HI	Haleiwa	E080059	21° 40' 10.4" N, 158° 01' 59.4" W
			KA25	21° 40' 14.6" N, 158° 02' 03.1" W
17	HI	Kapolei	E010016	21° 20' 08.0" N, 158° 05' 25.0" W
			E980250	21° 20' 12.6" N, 158° 05' 21.1" W
			E100091	21° 20' 10.2" N, 158° 05' 18.0" W

Earth Station No.	State	City	Call Sign	Coordinates
			E030087	21° 20' 09.0" N, 158° 05' 25.0" W
18	HI	Paumalu	KA265	21° 40' 27.0" N, 158° 02' 16.0" W
			KA266	21° 40' 15.5" N, 158° 02' 06.1" W
			KA267	21° 40' 14.1" N, 158° 02' 06.1" W
			KA270	21° 40' 24.0" N, 158° 02' 16.0" W
19	MD	Clarksburg	KA260	39° 13' 05.0" N, 077° 16' 12.0" W
			KA275	39° 13' 07.0" N, 077° 16' 12.0" W
			KA259	39° 13' 05.6" N, 077° 16' 12.4" W
			KA263	39° 13' 04.4" N, 077° 16' 13.9" W
			KA264	39° 13' 05.2" N, 077° 16' 13.9" W
20	MD	Hagerstown	KA262	39° 35' 57.0" N, 077° 45' 23.0" W
			E030071	39° 35' 57.9" N, 077° 45' 17.3" W
			E030082	39° 35' 57.9" N, 077° 45' 21.4" W
			E030100	39° 35' 59.6" N, 077° 45' 21.4" W
			E030101	39° 35' 59.6" N, 077° 45' 17.4" W
			E030103	39° 35' 59.1" N, 077° 45' 18.4" W
			E000296	39° 35' 54.0" N, 077° 45' 35.0" W
			KA261	39° 35' 57.0" N, 077° 45' 22.0" W
			E100118	39° 35' 55.0" N, 077° 45' 22.0" W
21	ME	Andover	E000700	44° 38' 01.2" N, 070° 41' 51.3" W
			KA386	44° 37' 58.2" N, 070° 41' 55.3" W
			KA349	44° 37' 58.2" N, 070° 41' 54.0" W
22	NJ	Franklin	E6777	41° 07' 04.0" N, 074° 34' 33.0" W
23	NY	Hauppauge	E950436	40° 49' 15.4" N, 073° 15' 48.4" W
24	PA	Catawissa	E980493	40° 53' 39.3" N, 076° 26' 19.8" W
25	PA	Roaring Creek	KA444	40° 53' 35.9" N, 076° 26' 22.6" W
			WA33	40° 53' 37.5" N, 076° 26' 21.8" W
26	PR	Humacao	E872647	18° 09' 05.0" N, 065° 47' 20.0" W
27	PR	San Juan	E050314	18° 24' 23.9" N, 066° 01' 46.6" W
28	TN	Nashville	E960050	36° 14' 05.7" N, 086° 45' 21.4" W
			E960073	36° 14' 05.7" N, 086° 45' 19.4" W
			E970010	36° 14' 06.2" N, 086° 45' 20.4" W
29	VA	Alexandria	KA81	38° 47' 36.0" N, 077° 09' 59.0" W
			E970267	38° 47' 38.0" N, 077° 09' 46.0" W
30	VA	Bristow	E000696	38° 47' 02.4" N, 077° 34' 21.9" W
			E000152	38° 47' 01.6" N, 077° 34' 24.3" W
			E000726	various
31	VA	Sterling	E030336	38° 59' 07.0" N, 077° 26' 45.0" W
32	VA	Quicksburg	E000589	38° 43' 45.4" N, 078° 39' 25.1" W
			E990175	38° 43' 45.4" N, 078° 39' 24.2" W
33	WA	Brewster	KA294	48° 08' 50.5" N, 119° 41' 33.2" W
			E960222	48° 08' 51.0" N, 119° 41' 29.0" W
			E120128	48° 08' 50.0" N, 119° 41' 28.0" W
34	WA	Yacolt	KA221	45° 51' 46.4" N, 122° 23' 44.3" W
			KA323	45° 51' 45.5" N, 122° 23' 43.8" W
35	WV	Albright	KA413	39° 34' 07.0" N, 079° 34' 45.0" W

Earth Station No.	State	City	Call Sign	Coordinates
36	WV	Etam	KA378	39° 16' 50.0" N, 079° 44' 13.0" W
			WA21	39° 16' 48.0" N, 079° 44' 14.0" W
37	WV	Rowlesburg	KA351	39° 16' 52.1" N, 079° 44' 10.7" W

These operational restrictions shall be enforced by the Spectrum Access System authorized pursuant to section 96.48 below.

(1) These protection criteria shall only apply to FSS earth stations that are in actual use. FSS earth station licensees must inform SAS Administrators of their operational status annually, no later than 30 days before the end of the preceding calendar year.

(2) CBSDs may operate within areas that may cause harmful interference to FSS earth stations listed in this section provided that the licensee of the FSS earth station and an SAS Administrator mutually agree on such operation and the terms of any such agreement are provided to SAS and can be enforced by the SAS.

96.19 – Operation Near Canadian and Mexican Borders

Citizens Broadband Radio Service operation in the 3550-3650 MHz band is subject to current and future international agreements with Mexico and Canada. The terms of these agreements shall be enforced by the SAS.

Subpart C - PRIORITY ACCESS

96.21 – Authorization

(a) In general, applications for PALs must:

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

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

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

(4) Propose operation of a facility or facilities in compliance with all rules governing the Citizens Broadband Radio Service; and

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

(b) Authorization processes and requirements may be reasonably automated by SAS Administrators approved by the Commission in accordance with section 96.48. The Commission shall oversee these processes consistent with its responsibilities under the Communications Act of 1934, as amended.

(c) CBSDs used for Priority Access must register with the SAS and comply with its instructions consistent with section 96.36.

96.23 – Priority Access Licenses

(a) Frequencies shall be made available for Priority Access use, consistent with section 96.13.

(b) Priority Access Licensees shall be protected from harmful interference from CBSDs operated by other Priority Access Licensees and General Authorized Access Users, consistent with the technical rules and interference avoidance criteria set forth in sections 96.36 and 96.38. Priority Access Licensees must protect Incumbent Users from harmful interference, consistent with sections 96.15 and 96.17.

(c) PALs shall have the following parameters:

(1) *Geography*: Each PAL shall consist of a single census tract, as defined in the 2010 census.

(i) *Contiguous Geographic Areas*: The SAS shall make reasonable efforts to assign geographically contiguous PALs held by the same licensee to the same frequencies.

(2) *Channels*: Each PAL shall consist of a 10 megahertz channel within the frequency range set forth in section 96.13. Channels shall be assigned by the SAS and the exact frequencies of specific assigned channels may be changed at the SAS Administrator's discretion, in coordination with other SAS Administrators. Priority Access Licensees may request a particular channel or frequency range but will not be guaranteed a particular assignment.

(i) *Contiguous Channel Frequencies*: The SAS shall make reasonable efforts to assign multiple channels held by the same Priority Access Licensee to contiguous frequencies.

(3) *License Term*: Each PAL shall be issued for one-year. Each PAL shall automatically terminate at the end of its one-year term and may not be renewed. However, Priority Access Licensees may reapply for subsequent authorizations in the same census tract, subject to the limitations set forth in section 96.25. Priority Access Licensees may hold consecutive PALs up to the maximum established in 96.25.

(d) CBSDs operating under a PAL authorization must register with an SAS and comply with its instructions in accordance with sections 96.36, 96.45, and 96.46.

(e) Unused PAL channels shall be made available for assignment by the SAS for General Authorized Access use provided:

(1) General Authorized Access operation on unused PAL channels must obey the same field strength limits established in section 96.38 with respect to any operational areas within the PAL assignment; and

(2) Generally Authorized Access Users shall have no expectation of interference protection from any other users and shall operate on a non-interfering basis with respect to Priority Access Licensees and Incumbent Users, consistent with sections 96.15, 96.17, and 96.23.

96.25 – Application Window

(a) Applications for PALs will be accepted annually. The annual application window and application process will be announced by the Wireless Telecommunications Bureau via Public Notice.

(b) The Wireless Telecommunications Bureau may make up to five consecutive years of any PAL available through the same application window. Applicants may apply for PALs up to five years in advance of the effective license date.

96.27 – Competitive Bidding Procedures

(a) Mutually exclusive initial applications for PALs are subject to competitive bidding. The general competitive bidding procedures set forth in part 1, subpart Q of this chapter will apply unless otherwise provided in this subpart.

96.29 – Aggregation of Priority Access Licenses

(a) Priority Access Licensees may aggregate up to three channels in any single census tract.

Subpart D - GENERAL AUTHORIZED ACCESS

96.31 – Authorization

(a) Any party meeting the eligibility requirements set forth in section 96.5 is authorized to operate a CBSD on a General Authorized Access basis by this rule without an individual station license.

(b) CBSDs used for General Authorized Access must register with the SAS and comply with its instructions consistent with sections 96.36, 96.45, and 96.46.

96.33 – General Authorized Access Use

(a) Frequencies shall be made available for General Authorized Access use consistent with the section 96.13.

(b) General Authorized Access Users shall be permitted to utilize frequencies assigned to PALs when such frequencies are not in use, as determined by the SAS.

(c) Frequencies that are available for General Authorized Access Use shall be made available on a shared basis and shall not be assigned for the exclusive use of any party.

(d) General Authorized Access Users shall have no expectation of interference protection from other General Authorized Access Users and shall avoid causing harmful interference to Priority Access Licensees and Incumbent Users, consistent with sections 96.15, 96.17, and 96.23.

96.35 –Contained Access Facilities (CAFs)

(a) Commission approved Contained Access Users may request an assignment of up to 20 megahertz of frequencies reserved for GAA use from the SAS to be reserved for Contained Access Use inside a CAF.

(1) The requestor must certify to the SAS that it will use the reserved frequencies for Contained Access Use within each specifically requested location.

(b) Such reserved frequencies shall not be available for use by other General Authorized Access Users within the physical confines of the CAF, provided:

(1) The requestor undertakes reasonable efforts to safeguard against harmful interference from General Authorized Access transmissions originating outside the CAF;

(2) All other rules applicable to General Authorized Access Users apply to CAF use of the reserved frequencies, including, but not limited to the requirements that that there shall be no expectation of interference protection from other General Authorized Access Users and that CAF users shall not cause harmful interference to Priority Access Licensees and Incumbent Users, consistent with sections 96.15, 96.17, and 96.23.

Subpart E - TECHNICAL RULES

96.36 Citizens Broadband Radio Service Device (CBSD) General Requirements

(a) *Geo-location and Reporting Capability*:

(1) The CBSD shall be able to determine its geographic coordinates (referenced to the North American Datum of 1983 (NAD83)) to an accuracy of ±50 meters horizontal and ±3 meters elevation. Such geographic coordinates shall be reported to SAS at the time of first activation from a power-off condition.

(2) A CBSD must re-establish its position and report that position within 60 seconds to the SAS each time it is activated from a power-off condition.

(3) A CBSD must check its location at least once every 60 seconds while in operation and report to SAS any location changes exceeding ±50 meters horizontal and ±3 meters elevation within 60 seconds of such location change.

(b) *Interoperability*: All CBSDs must be capable of operating on any frequency from 3550-3700 MHz as instructed by the SAS.

(c) *Registration with SAS*: A CBSD must register with and be authorized by an SAS prior to its initial service transmission. The CBSD shall provide the SAS with its geographic location, antenna height above ground level (meters), requested authorization status (Priority Access or General Authorized Access), unique FCC identification number, and unique serial number. If any of this information changes, the CBSD shall update the SAS within 60 seconds. A CBSD shall only operate at or below the maximum power level and within locations/areas permitted by the SAS on the frequencies authorized by the SAS.

(1) A CBSD must query the SAS regarding frequency availability at 10 minute intervals and it must also receive any incoming commands from the SAS about any changes to power limits and frequency availabilities. CBSD operation must cease within 60 seconds if the SAS indicates that an assigned frequency is no longer available or as otherwise instructed by the SAS.

(d) *Interference Reporting*: CBSDs shall report to an SAS if they experience interference in exceeding a threshold as set by an SAS. Such interference reporting may be based on received interference signal strength in the same and adjacent channels, packet error rates or other common standard metrics as set by SAS.

(e) *Security*: CBSDs shall incorporate adequate security measures sufficient to ensure that they are capable of communicating with respect to lists of available frequencies only with SASs operated by approved SAS Administrators, and that communications between CBSDs and SASs, between individual CBSDs, and between CBSDs and mobile devices are secure to prevent corruption or unauthorized interception of data.

(1) For purposes of obtaining operational limits and availabilities and their updates, CBSDs shall only contact SASs operated by SAS Administrators approved by the Commission in accordance with section 96.48.

(2) All communications between CBSDs and SASs are to be transmitted using secure methods that protect the systems from corruption or unauthorized modification of the data.

(3) Communications between a CBSD and all End User Devices for purposes of obtaining operational power and frequency assignments shall employ secure methods that protect the system from corruption or unauthorized modification of the data.

(4) An SAS shall be protected from unauthorized data input or alteration of stored data. To provide this protection, the SAS Administrator shall establish communications authentication procedures sufficient to ensure that the data that the CBSDs receive is from an authorized source.

(f) *Device Security*: All CBSDs and End User Devices must contain security features sufficient to protect against modification of software by unauthorized parties. Applications for certification of CBSDs and End User Devices must include an operational description of the technologies and measures that are incorporated in the device to comply with the security requirements of this section. In addition, applications for certification of CBSDs and End User Devices must identify at least one of the SAS databases operated by a designated SAS database administrator that the device will access for channel/frequency availability and affirm that the device will conform to the communications security methods used by such databases.

(g) Airborne operations by CBSDS and End User Devices are prohibited.

96.37 - End User Devices General Requirements

Mobile, portable or fixed End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequency channels and power limits for their operation.

96.38 – General Radio Requirements

The requirements in this section apply to CBSDs and their associated End User Devices, unless otherwise specified.

(a) *Digital Modulation*: Systems operating in the Citizens Broadband Radio Service must use digital modulation techniques.

(b) *Conducted and Emitted Power Limits*: Unless otherwise specified in this subsection, the maximum conducted output power, maximum transmit antenna gain, maximum Equivalent Isotropically Radiated Power (EIRP), and maximum Power Spectral Density (PSD) of any CBSD and End User Device must comply with the limits shown in the table below:

		Maximum Conducted Output Power (dBm/10 megahertz)**	**Maximum EIRP (dBm/10 megahertz)**	**Maximum Conducted PSD (dBm/MHz)**
End User Device	**All**	**n/a**	**23**	**n/a**
CBSD	**Baseline***	**24**	**30**	**14**
CBSD	**Rural Areas**	**30**	**47**	**20**
CBSD	**Fixed Point to Point System (PTP)**	**30**	**53**	**20**

1. *Baseline is all cases not qualified under rural or fixed PTP.
2. ** Maximum Conducted Output Power (as defined in paragraph (4) of this section)

(1) For fixed point-to-point radio systems, the maximum conducted output power in paragraph (b) must be reduced by 1 dB for every 1 dB that the directional gain of the antenna exceeds 23dBi.

(2) CBSDs shall limit their operating power to the minimum necessary for successful operations.

(3) CBSDs shall include transmit power control capability and the capability to adjust maximum EIRP in response to instructions from an SAS (either directly or through an intermediary system). Applicants for PAL or General Authorized Access use of the band must include a description of these two functionalities for all CBSDs and End User Devices.

(4) Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (*e.g.*, alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(c) *Received Signal Strength Limits*: CBSD transmissions shall be managed such that the median signal strength at any location on the boundary of a co-channel PAL shall not exceed -80 dbm as measured by a 0 dBi isotropic antenna in 10 megahertz unless the affected licensees or incumbents agree to a different field strength and communicate that to SAS.

(d) *3.5 GHz Emissions and Interference Limits:*

(1) *General protection levels.* Except as otherwise specified below, for channel and frequency assignments made by the SAS to CBSDs operating in the 3550 -3650 MHz band, the power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

(2) *Additional protection levels.* Notwithstanding the foregoing paragraph (d)(1) of this section, the power of any emissions below 3520 MHz and above 3680 MHz shall be attenuated below the transmitter power (P) in watts by at least $70 + 10 \log_{10}(P)$ dB.

(3) *Measurement procedure*:

(i) Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (*i.e.*, 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

(ii) When measuring unwanted emissions to demonstrate compliance with the limits, the CBSD and End User Device nominal carrier frequency/channel shall be adjusted as close to the licensee's authorized frequency block edges, both upper and lower, as the design permits.

(iii) Emission power measurements shall be performed with a peak detector in maximum hold.

(4) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

(e) *Reception Limits*:

(1) Priority Access Licensees must accept adjacent channel and in-band blocking interference (emissions from other Priority Access users transmitting between 3550 and 3650 MHz) up to a power spectral density level not to exceed -30dBm/10 megahertz with greater than 99% probability, unless the affected licensees agree to a higher or lower power spectral density limit and communicate with the terms of such agreement to the SAS.

(2) General Authorized Access operations are subject to the conditions that they cause no harmful interference to Incumbent Users or Priority Access Licensees and they can claim no protection from interference received from Incumbent Users or Priority Access Licensees. The operator of a General Authorized Access CBSD shall be required to cease operating the device upon notification by a SAS that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

(3) PA and GAA Licensees must accept interference in authorized areas of operation from federal radar systems up to a peak field strength level of 180 dBuV/m.

96.39 – Equipment Authorization

(a) Each CBSD or End User Device utilized for operation under this part and each transmitter marketed as set forth in §2.803 of this chapter must be of a type which has been certificated for use under this part.

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

96.41 – RF safety

Licensees and manufacturers are subject to the radio frequency radiation exposure requirements specified in § 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

Subpart F – SPECTRUM ACCESS SYSTEM

96.43 – Spectrum Access System Purposes and Functionality

The SAS serves the following purposes:

(a) To determine and provide to CBSDs the available channels/frequencies at their location.

(b) To determine the maximum permissible transmission power level available to CBSDs at a given location and communicate that information to the CBSDs.

(c) To register the identification information and location of CBSDs.

(d) To retain information on and enforce Exclusion Zones in accordance with sections 96.15 and 96.17.

(e) To protect Priority Access Licensees from harmful interference from General Authorized Access Users consistent with 96.23.

(f) To reserve the use of GAA channels for use in a CAF consistent with 96.35.

(g) To ensure secure transmission of information between the SAS and CBSDs.

96.44 - Information Gathering and Retention

(a) The SAS shall maintain information on registered CBSDs, FSS locations listed in section 96.17, and Exclusion Zones

(1) For CBSDs, such information shall include all information required by section 96.36.

(2) For incumbent FSS operators, the SAS shall maintain a record of the location of protected earth stations as well as the direction and look angle of all earth station receivers and any other information reasonable necessary to perform its functions under this part.

96.45 - Registration and Authorization of Citizens Broadband Radio Service Devices

(a) An SAS must collect required information from CBSDs in accordance with the provisions of this part. CBSDs composed of a network of base and fixed stations may employ a subsystem for aggregating and communicating all required information with the SAS.

(1) The SAS must also verify that the FCC identifier (FCC ID) of a device seeking access to its services is valid. A list of devices with valid FCC IDs and the FCC IDs of those devices is to be obtained from the Commission's Equipment Authorization System.

(2) The SAS shall not permit CBSDs within Exclusion Zones to register or operate within the Citizens Broadband Radio Service.

96.46 - Frequency Assignment

(a) The SAS will determine the available and appropriate channels/frequencies at a given location using the geographic information supplied by CBSDs, the frequency assignment data for Incumbent Users in the SAS, the authorization status and operating parameters of CBSDs in the surrounding area, and such other information necessary to ensure effective operations of CBSDs consistent with this part.

(1) Upon request from the Commission or a CBSD, the SAS shall confirm whether frequencies are available in a given geographic area.

(2) Upon request from the Commission, the SAS shall confirm that CBSDs in a given geographic area and frequency band have been shut down in response to a request from an Incumbent User.

96.47 – Security

(a) The SAS shall employ protocols and procedures to ensure that all communications and interactions between the SAS and CBSDs are accurate and secure and that unauthorized parties cannot access or alter the SAS or the list of frequencies sent to a CBSD.

(b) Communications between CBSDs and the SAS, between individual CBSDs, and between different SASs, shall be secure to prevent corruption or unauthorized interception of data. An SAS shall be protected from unauthorized data input or alteration of stored data.

(c) An SAS shall verify that the FCC identification number supplied by a CBSD is for a certified device and may not provide service to an uncertified device.

96.48 – Spectrum Access System Administrators

The Commission will designate one or more entities to administer the SAS. The Commission may, at its discretion, permit the functions of an SAS, such as a data repository, federal information database, registration, and query services, to be divided among multiple entities; however, it shall designate one or more specific entities to be an SAS Administrator responsible for coordination of the overall functioning of an SAS and providing services to operators in the Citizens Broadband Radio Service. Each SAS Administrator designated by the Commission shall:

(a) Maintain a regularly updated database that contains the information described in section 96.44.

(b) Establish a process for acquiring and storing in the database necessary and appropriate information from the Commission's databases and synchronizing the database with the current Commission databases at least once a day to include newly licensed facilities or any changes to licensed facilities.

(c) Establish and follow a process for registering and protecting the Incumbent Users and enforcing the protection criteria set forth in sections 96.15 and 96.17.

(d) Establish and follow a process for registering and coordinating Priority Access Licensees.

(e) Establish and follow a process for registering and coordinating General Authorized Access Users.

(g) Establish and follow protocols and procedures sufficient to ensure that Incumbent Users are protected from harmful interference from Priority Access Licensees and General Authorized Access Users consistent with sections 96.15 and 96.17.

(h) Establish and follow protocols and procedures sufficient to ensure that Priority Access Licensees are protected from harmful interference from spectrally or geographically adjacent Priority Access Licensees and from General Authorized Access Users.

(i) Establish and follow protocols and procedures sufficient to ensure that all communications and interactions between the SAS and CBSDs are accurate and secure and that unauthorized parties cannot access or alter the SAS or the information transmitted from the SAS to CBSDs.

(j) Make its services available to Priority Access Licensees and General Authorized Access Users on a non-discriminatory basis.

(k) Provide service for a five-year term. This term can be renewed at the Commission's discretion.

(l) Respond in a timely manner to verify, correct or remove, as appropriate, data in the event that the Commission or a party brings claim of inaccuracies in the SAS to its attention. This requirement applies only to information that the Commission requires to be stored in the SAS.

(m) Secure transfer the information in the SAS, along with the IP addresses and URLs used to access the system, and a list of registered CBSDs, to another designated entity in the event it does not continue as the SAS administrator at the end of its term. It may charge a reasonable price for such conveyance.

(p) If more than one SAS is developed, the administrators shall cooperate to develop a standardized process for providing on a daily basis or more often, as appropriate, the data collected pursuant to section 96.44.

(q) Provide a means to make all information that the rules require the SAS to collect available to the public in a reasonably accessible fashion.

(r) Coordinate with other SAS Administrators including, to the extent possible, sharing information, facilitating non-interfering use by CBSDs connected to other SASs, maximizing available General Authorized Access frequencies by assigning PALs to similar channels in the same geographic regions, and other functions necessary to ensure that available spectrum is used efficiently consistent with this part.

96.49 – Spectrum Access System Administrator Fees

(a) An SAS Administrator may charge Citizens Broadband Radio Service users a reasonable fee for provision of the services set forth in section 96.43, *et seq.*

(b) The Commission, upon request, will review the fees and can require changes in those fees if they are found to be excessive.

APPENDIX B

Proposed Rules

…

3650 Addendum

In this Appendix, proposed additions to existing and proposed rules are underlined and proposed deletions are noted in strike through text,

Part 2 – Frequency Allocations and Radio Treaty Matters; General Rules and Regulations

2.106 – Table of Frequency Allocations.

Part 90 – Private Land Mobile Radio Services

90.1303 – Eligibility

~~(a) Any entity, other than those precluded by section 310 of the Communications Act of 1934, as amended, 47 U.S.C. 310, is eligible to hold a license under this part.~~

(a) Eligibility under this part is limited to entities authorized under this Part as of [adoption date].

(b) Eligibility for all authorized users under this Part terminates 5 years after [adoption date].

90.1307 – Licensing

~~(a) The 3650-3700 MHz band is licensed on the basis of non-exclusive nationwide licenses. Non-exclusive nationwide licenses will serve as a prerequisite for registering individual fixed and base stations. A licensee cannot operate a fixed or base station before registering it under its license and licensees must delete registrations for unused fixed and base stations.~~

(a) The Commission shall issue no new non-exclusive nationwide licenses for this band after [adoption date],

90.1311 – License Term

~~(a) The license term is ten years, beginning on the date of the initial authorization (non-exclusive nationwide license) grant. Registering fixed and base stations will not change the overall renewal period of the license.~~

(a) All licenses will terminate in accordance with the procedures set forth in Part [x referencing relevant Part 96 rules] 5 year after [adoption date].

90.1338 – Grandfathered Operation and Transition to Citizens Broadband Radio Service

(a) Existing licenses as of [adoption date] may continue to operate fixed or base stations that were registered prior to [adoption date] in a manner consistent with the rules in this Part for a period of 5 years after [adoption date].

(1) Fixed and Base station registrations (for access points) filed prior to [adoption date] will be afforded protection from interference caused by GAA users for 5 years from [adoption date]

(b) Existing licensees as of [adoption date] may register new fixed and base stations under their existing non-exclusive nationwide license until 5years after [adoption date]. Registrations filed after [adoption date] will not be afforded protection from harmful interference unless the licensee applies separately under the provisions in section 96.23.

(c) Existing licensees as of [adoption date] may add new mobile or portable stations (as defined in 90.1333) and/or add new subscriber units that operate above the power limit defined in 90.1333, but otherwise comply with the requirement to operate only if they can positively receive and decode an enabling signal from a base station. Such mobile/portable/subscriber units may operate until 5 years after [adoption date].

(d) After 5 years from [adoption date], licensees that wish to continue operation must either apply for a PAL license and operate consistent with the rules set forth in Part 96, subpart C or operate as a GAA user consistent with the Rules in Part 96, subpart D .

Part 96 – Citizens Broadband Radio Service

Subpart A - GENERAL RULES

96.3 – Definitions

Grandfathered Wireless Broadband Licensee: A licensee authorized to operate in the 3650-3700 MHz band under the rules in Part 90 subpart Z as of date of [adoption].

96.7 – Authorization Required

(c) (c) Grandfathered Wireless Broadband Licensees are authorized as to operate their fixed base station access points that were registered as of [adoption date], for a period of 5 years [from the date of adoption].

Subpart [X] - INCUMBENT PROTECTION

96.20 – Protection of Existing Operators in the 3650-3700 MHz Band

(a) Grandfathered Wireless Broadband Licensees shall be granted Incumbent User status for the area of operation and frequencies of their fixed base station access points that were registered prior to [adoption date] for 5 years from [adoption date]. Notwithstanding this status, Grandfathered Wireless Broadband Licensees shall avoid harmful interference to authorized federal users and grandfathered FSS earth stations consistent with the rules governing Citizens Broadband Radio Service operators in this part.

(1) The area of operation for Grandfathered Wireless Broadband Licensees will be defined as the service contour of an existing registered base or fixed access point. Registered subscriber units (subscriber units that were registered because they operate above the mobile power limit listed in 90.1333) will not be included in these service contour calculations. These contours will be included in the SAS.

(2) Grandfathered Wireless Broadband Licensees may operate within their service contours consistent with the technical rules in Part 90, subpart Z until 5 years from [adoption date].

(3) Where the service contours of Grandfathered Wireless Broadband Licensees overlap, the licensees will be required to share the spectrum as previously required under the technical rules in Part 90, subpart Z. After 5 years from [adoption date] licensees that wish to continue operation after that date must apply for PALs consistent with the rules set forth in Part 96 subpart C or operate as a GAA user

consistent with the Rules in Part 96, subpart D . Mutually exclusive applications for PALs in the initial window after these grandfathering provisions sunset will be resolved as set forth in section 96.27.

(a) To protect authorized federal operations in the 3650-3700 MHz band, an Exclusion Zone of [XX] kilometers from the following locations shall be maintained.

St. Inigoes, MD—38° 102 N., 76°, 232 W.
Pascagoula, MS—30° 222 N., 88°, 292 W.
Pensacola, FL—30° 212 283 N., 87°, 162 263W.

This Exclusion Zones shall be enforced by the SAS.

(b) To protect grandfathered FSS earth stations in the 3650-3700 MHz band a protection zone of 150 kilometers from the locations of grandfathered FSS earth stations shall be maintained for 5 years from [adoption date] for Citizens Broadband Radio Services operating in the 3650 -3700 MHz band. Thereafter, such FSS earth stations shall be protected from harmful interference consistent with the protections afforded other FSS earth stations pursuant to section 96.17.

Subpart [X] – SPECTRUM ACCESS SYSTEM

96.43 – Spectrum Access System

(a) . . .

(b) . . .

. . .

(3) For incumbent federal users, the SAS shall maintain a record of any information submitted by federal users necessary to protect their operations in the 3550-~~3650~~ 3700 MHz band.

STATEMENT OF
CHAIRMAN TOM WHEELER

Re: *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, GN Docket No. 12-354

Today we take an important step towards a new spectrum future. Not only are we proposing to open up the 3.5 GHz band, but we are also enabling the powerful new concept of spectrum sharing among multiple users on an hierarchical basis.

In July 2012, the President's Council of Advisors on Science and Technology (PCAST) issued a landmark report on maximizing the potential of wireless spectrum to grow our economy and enable other benefits for the American people. The PCAST report highlighted spectrum sharing as a next-generation policy innovation that holds the potential to revolutionize the way we manage our airwaves. With this item, the Commission takes another significant step to turning this concept into reality.

Both the PCAST and the FCC's Technological Advisory Council, which I was honored to lead, recommended that the Commission target the 3.5 GHz as an "innovation band." Building on what the Commission has already done under the leadership of Chairman Genachowski and Chairwoman Clyburn, that's exactly what we're doing in this item.

This Notice proposes a three-tiered spectrum access model, which includes federal and non-federal incumbents, priority access licensees, and general authorized access users. The three-tiered construct was a key aspect of the PCAST report, and is necessary to realizing the full potential of spectrum sharing.

Second, it proposes a single, highly flexible band plan, avoiding the analog trap of Balkanizing spectrum into sub-bands, each with its own sets of rules.

Third, the Notice anticipates a wide range of flexible uses. Small cells will undoubtedly be a core use case, but we would not limit the band to such use.

Finally, the Notice reflects economic incentives. Even with the most efficient technology, there will always be places and times where there is rivalry for spectrum access. To that end, the Notice proposes a flexible auction and licensing scheme that leverages the technical capabilities of a Spectrum Access System (SAS) database. Think of the SAS as a traffic cop for spectrum in that it can assess what spectrum is available so that it can be accessed by prioritized users.

I know that the three-tier construct and non-traditional licensing scheme is a bit nouveau. That's by design; if we are going to have sufficient spectrum for the needs of the 21st century, we are going to have to think anew. This proposal could unlock vast new opportunities for wireless – in huge verticals like energy, healthcare, and financial services. We also see the 3.5 GHz band as a potential home for new technologies like LTE-Unlicensed, which could inhabit the General Authorized Access tier. Or it could allow for new flavors of Wi-Fi. There is huge upside within this proceeding. We should not flinch from the opportunity simply because it is not standard operating procedure.

Thank you to the Wireless Telecommunications Bureau, the Office of Engineering and Technology, the International Bureau, and the Office of the General Counsel for their outstanding, out-of-the-box work on this issue.

STATEMENT OF
COMMISSIONER MIGNON L. CLYBURN

Re: *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, GN Docket No. 12-354

There are some who say that – like oil and water – regulation and innovation just don't mix. All too often, they contend, regulation effectively protects incumbents and stifles innovation by creating barriers to entry for new entrants and disruptive technologies.

This proceeding, which builds upon recommendations in the July 2012 PCAST Report, offers a possible rebuttal to that position. It clearly shows the federal government understands that technological advances can enable us to depart from traditional regulatory models and adopt new approaches, with lower administrative costs, which could spur even greater innovation from incumbent carriers, and new entrants. Because repurposing federal spectrum for commercial use can take years, and the country's demand for mobile broadband services will not wait that long, the PCAST Report recommended that commercial services share underutilized federal spectrum to the maximum extent possible. The advances in small cell networks and the concepts in the successful TV White Space databases, make that degree of spectrum sharing possible.

So, in 2012, we adopted an NPRM that proposed new spectrum management concepts with a license by rule framework which would provide for Incumbent Access, Priority Access, and General Authorized Access tiers. We proposed a highly flexible band plan to facilitate rapid broadband deployment while protecting existing federal and commercial incumbent users in the 3.5 Gigahertz band. That NPRM also improved on the PCAST recommendation by including the 3650 to 3700 megahertz band. This band is used extensively by wireless Internet service providers, or WISPs, to provide broadband in rural and other underserved areas.

This Further Notice brings even more creativity to the proceeding, by revising the licensing framework, in order to incentivize more efficient use of the Priority Access tier. Instead of licensing that tier to only certain institutions by rule, we propose to expand the eligibility to all entities and establish granular flexible Priority Access Licenses that would amount to a 10 megahertz license, for one census tract, for one year that can be aggregated. If more than one entity wants the same license for the same year, there will be an auction. Although these licenses would have some of the key features of traditional FCC licenses, such as exclusive spectrum rights, because they are shorter in duration, they would not have other features, such as performance requirements. The goal is to establish a license, with lower administrative costs, that would allow for micro-targeted network deployments; and easy aggregation, to serve a larger footprint for a longer period of time.

By enabling aggregation, this framework would allow for the type of predictability that would attract larger carriers, to invest in equipment for the band. Because we also propose to require interoperability across all three tiers throughout the 150 megahertz in the band, this approach has the added benefit of bringing greater spectrum availability and equipment scale economies to WISPs, new entrants, and small businesses who want to provide service in the band.

I want to thank Roger Sherman, Julie Knapp, and the staffs of the Wireless Bureau, OET and International Bureau, and my legal advisor, Louis Peraertz, for their hard work on this item and their contributions throughout this proceeding.

STATEMENT OF
COMMISSIONER JESSICA ROSENWORCEL

Re: *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, GN Docket No. 12-354

If you want to get a glimpse into the future of spectrum policy, take a look at the 3.5 GHz band. What we are poised to do with this band is creative, innovative, and could serve as the blueprint for making smarter use of our airwaves going forward.

But before looking ahead, it is helpful to look back at how we got here. Four years ago, the National Telecommunications and Information Administration (NTIA) identified the 3.5 GHz band as one of the spectrum bands most suitable for shared use between government and commercial interests. But the response to the NTIA proposal was muted, interest was limited, and enthusiasm was hard to find. Because it was apparent to everyone that protecting existing users in the band—from Department of Defense radars to commercial fixed satellite services—would mean significant geographic limitations for new services. As a result, the ability to make use of this spectrum was limited in the most populous areas of the country. Moreover, because the band is above 3 GHz, it did not hold much appeal for mobile broadband. After all, signals at high frequency like this can fade too quickly.

So the outlook for commercial opportunity in the 3.5 GHz band was not good. But now, based on recommendations from the President's Council of Advisors on Science and Technology, rather than discarding this band as junk, we are staring at new opportunities. These opportunities will be built on a creative three-tiered approach to spectrum access. This proposal simultaneously protects existing users, creates new spectrum licenses custom-built for small cell deployments, and opens up more spectrum for unlicensed services—the jet fuel of wireless innovation. This is very cool—and very smart, too.

But setting aside history and the here and now, I want to talk about what our proposals mean for the future.

First, with our work on the 3.5 GHz band we demonstrate that we are leaving behind the tired notion that we face a choice between licensed and unlicensed airwaves. This kind of division is a simplistic relic from the spectrum past. We cannot let it haunt us in the future. Because there is no doubt that good spectrum policy requires both licensed and unlicensed services. Moreover, the next generation of wireless devices and the coming Internet of Things will not rely on a single spectrum band to function. Instead, services will overcome spectral and physical challenges by moving from frequency to frequency—sometimes on spectrum that is licensed and sometimes on spectrum that is unlicensed.

Second, with our work on the 3.5 GHz band we make clear that small cells have a big future. They can expand connectivity and facilitate more efficient use of existing frequencies. They can cover areas that cannot be reached using macro cell services—and at the same time they can limit interference risk. In fact through small cell use, what was once considered a weakness of higher spectrum bands—namely short propagation distance—can be turned into a strength.

Third, if we can manage the exclusion zones that have previously limited interest in the 3.5 GHz band, we may have also discovered the key to unlocking use of another 120 megahertz in the 5 GHz band. That's because the same kinds of federal radar systems that use the 3.5 GHz band also operate in the 5350-5470 MHz band. If this band sounds familiar, that's because it was a band identified by Congress in the Middle Class Tax Relief and Job Creation Act as a potential new home for unlicensed services. But our efforts to realize this potential have been frustrated by the usual and familiar—the needs of existing users in the band, including federal radar systems.

However, as we move closer to solutions for the 3.5 GHz band, we just might have blueprint for freeing more spectrum for unlicensed services in the 5350-5470 MHz band. In other words, what we learn from managing exclusion zones in the 3.5 GHz band could yield possibilities for commercial services in the 5 GHz band. That would be a good way to honor our directive from Congress, a good way to reduce congestion on licensed service networks, and a good way to increase unlicensed spectrum opportunities. These are all good things that can lead to more spectral support for the Internet of Things.

So thank you to the Wireless Telecommunications Bureau and Office of Engineering and Technology for your creative work on the 3.5 GHz band and for your continuing work on more innovative spectrum possibilities in the future.

CONCURRING STATEMENT OF COMMISSIONER AJIT PAI

Re: *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, GN Docket No. 12-354

To those familiar with spectrum policy, it should be no surprise that federal incumbents aren't the most efficient users. The 3.5 GHz band is a case in point—relatively minor use of that band along the nation's coasts has left the majority of this spectrum under-utilized for decades. Now it's time to put it to work for consumers. As I observed when we launched this proceeding,[1] a simple test must guide our approach: What works? Can our proposals for the 3.5 GHz band be implemented in the real world? Can consumer products be brought to market in a timely manner? We must approach the 3.5 GHz band from a practical perspective, not merely a theoretical one.

When viewed through this lens, today's item is a mixed bag, and I therefore will be voting to concur. I am pleased that our proposals have improved in some respects over the course of the last sixteen months. For example, while the 2012 NPRM proposed that the Commission set aside the entire category of tier two priority access authorizations for a small and defined set of preferred users, today's item moves in a different direction. It liberalizes access to the band and proposes that any entity should be eligible to hold a priority access authorization. The item finds that open eligibility will promote more intensive use of the band and promote investment in new small cell technologies that could make 3.5 GHz a success. That's the right approach.

Unfortunately, much of this item is "déjà vu all over again" as Yogi Berra once put it, and represents a disappointing lack of progress. The foremost problem involves exclusion zones. Back in 2010, when the National Telecommunications and Information Administration (NTIA) first identified the 3.5 GHz band for possible commercial use, the agency drew enormously large protection zones around the federal incumbent users. It developed these zones based on its analysis and modeling of a specific type of commercial use—one that involved high-power, high-site, macro-cell deployments.

In light of NTIA's determination, our 2012 NPRM declined to pursue a macro-cell approach for the 3.5 GHz band. Instead, we sought comment on low-power, small cell deployments.[2] Because this kind of network architecture is vastly different from traditional deployments, we noted that some key NTIA assumptions would "not apply and would need to be revisited."[3] We indicated our view that those 2010 exclusion zones could be reduced significantly in light of our small cell proposal. And we asked commenters to perform and provide the technical analyses that would be necessary to do so.[4]

They did. The private sector took up the Commission's call and supplied us with detailed and unchallenged technical analyses showing that NTIA's 2010 exclusion zones can be dramatically reduced for small cell deployments.[5] The calculations performed by Qualcomm have been particularly helpful.

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[1] *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550–3650 MHz Band*, GN Docket No. 12-354, Notice of Proposed Rulemaking, 27 FCC Rcd 15594, 15658 (2012) (Statement of Commissioner Ajit Pai).

[2] *See, e.g.*, *id.* at 15597, para. 6.

[3] *Id.* at 15633, para. 118.

[4] *See, e.g.*, *id.* at 15629–34, paras. 109–18.

[5] *See, e.g.*, Letter from John W. Kuzin, Senior Director of Government Affairs – Regulatory, Qualcomm, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 12-354 (Apr. 15, 2014) (Qualcomm *Ex Parte* Letter); *see also* Qualcomm Comments at iii, 17 (Feb. 20, 2013).

They show that NTIA's exclusion zones, which reached a maximum of 346 miles, can be reduced to less than 10 miles for small cell deployments.[6]

But unfortunately, the FCC has not done its part. Today's item does not incorporate the unrebutted technical evidence showing that the 2010 exclusion zones can be dramatically reduced while still protecting incumbent federal users—evidence we asked parties to submit. In fact, the Commission refuses even to seek comment on that analysis and simply proposes to codify the 2010 exclusion zones. Instead of going where the facts take us, the Commission double downs on where they don't. To be clear, the Commission does not simply seek comment on this issue. It proposes to adopt those zones as rules.

This is surprising for two basic reasons. First, I have yet to hear from anyone who believes NTIA's 2010 exclusion zones are appropriate for the type of small cell uses we're proposing for this band. Indeed, even NTIA did not propose that the Commission adopt those zones for small cell use cases. Its Fast Track Report included the express caveat that NTIA would "need to revise the analysis" for any use case other than the high-power one it studied.[7] Similarly, the 2012 PCAST Report explained that those zones would be necessary for high-power, wide-area uses but concluded that low-power uses greatly minimize the need for exclusion zones and could even eliminate them entirely.[8]

Second, I have serious concerns about what the item's proposed exclusion zones mean for the success of the 3.5 GHz band. I noted at the outset of this proceeding that a decision to adopt those zones would mean that 60 percent of the U.S. population would be prohibited from using 3.5 GHz devices. I explained that this was particularly troublesome because the substantial majority of spectrum-limited markets in the U.S. would fall within those zones. And now the record indicates that the band simply "would not be commercially viable" were the 3.5 GHz band only available for consumer use outside of those 2010 zones.[9]

So, to summarize: The entity that drew the 2010 exclusion zones did not recommend that they apply here; PCAST found that they are not needed for small cell deployments; the unchallenged record evidence shows that they're unnecessary to protect federal incumbents; and no one that I'm aware of believes that they make sense for the use cases we're considering. Nonetheless, we once again propose to codify them.

Going forward, the success of the 3.5 GHz band depends on shrinking the proposed exclusion zones. I hope interested parties take advantage of the Commission's characterization of this proposal as a "starting point" and, once again, share their ideas and analysis on how to accomplish that goal.

Beyond the exclusion zones, I have additional concerns regarding some of today's proposals. For instance, I question the proposal to impose a hard, 30 MHz cap on the amount of priority access spectrum that any one entity can hold. Similarly, I question the item's proposal to carve out 20 MHz of spectrum as a set aside for certain groups of preferred users. I am skeptical that these attempts to pick winners and losers will serve the public interest.

Notwithstanding these concerns, I look forward to learning from the record that will be compiled as a result of today's item. And I hope we meaningfully improve our proposals so that American consumers will be able to benefit from the 3.5 GHz band. In this sentiment, I take inspiration from another of Yogi Berra's wise aphorisms, "It ain't over 'til it's over."

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[6] *See* Qualcomm Comments at 17 (Feb. 20, 2013).

[7] *See* NTIA, An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675–1710 MHz, 1755–1780 MHz, 3500–3650 MHz, 4200–4220 MHz, and 4380–4400 MHz Bands at 1–7 (2010).

[8] *See* President's Council of Advisors on Science and Technology, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth at 7 n.33 (July 20, 2012); *see id*. at 51.

[9] *See, e.g.*, Qualcomm *Ex Parte* Letter at 1.

STATEMENT OF
COMMISSIONER MICHAEL O'RIELLY

Re: *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Further Notice of Proposed Rulemaking, GN Docket No. 12-354

Today, we take another step towards allocating the 3.5 GHz Band for additional wireless uses. Currently, this valuable spectrum is used for federal and non-federal services, such as radar systems and satellite earth stations. In the future, it could be opened up for use by small cell systems, wireless backhaul, or the next innovative wireless technology. But, we are faced with balancing the introduction of new wireless services with the challenging task of protecting incumbents from harmful interference.

That is why I strongly prefer clearing federal government users and reallocating over sharing. In this unique case, however, it may be worthwhile to pursue sharing to move forward quickly instead of waiting for a better solution or for clearing to be completed. To this end, the 3.5 GHz Band will be one big experiment in terms of the proposed sharing design and licensing scheme. We place a lot of trust that this novel effort will be successful. But, if it does not meet expectations, we are not precluded from altering it in the future. Accordingly, I will vote in favor today's further notice that seeks to ask questions, acquire additional information, and obtain necessary data on how this experiment should best proceed. While I will keep an open mind as the record develops, I have several concerns that I would like to see addressed before any final rulemaking.

First, I worry that the proposed exclusion zones are too large to attract adequate interest and investment in this band. Despite evidence in the record showing that low-power small cell systems will not require such large exclusion zones, there has been no progress in reducing their size, even for this limited purpose. Today's further notice walls off the same 60 percent of the United States population as introduced by NTIA in 2010 and put forth in the Commission's original notice in December 2012.[1] The 3.5 GHz Band would be largely unusable on the east and west coasts and along the Gulf. As you can see from the slide, New England, Florida, South Carolina, Louisiana; almost all of New York, Virginia, California; and half of Texas are in exclusion zones.[2] I hope and trust that they can be substantially reduced and that there will be opportunities for the new wireless operators and federal incumbents to coordinate in these areas.

Second, I am concerned that the proposed term and geographic size of the Priority Access Licenses, or "PALs," may also hinder investment and innovation. For example, the PALs may be licensed for one year terms that may be aggregated up to five years. There is no certainty that, after making the capital expenditure during that time, a licensee would be able to continue its priority access. Additionally, the item proposes to license PALs by census tracts, which means there would be approximately 74,000 licenses.[3] As a result, applicants could face the difficulty of bidding on thousands of licenses in order to cover any one metropolitan area.

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[1] U.S. Department of Commerce, National Telecommunications and Information Administration, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, 4200-4220 MHz, and 4380-4400 MHz Bands* (rel. Oct. 2010) (*NTIA Fast Track Report*), *available at* http://www.ntia.doc.gov/files/ntia/publications/fasttrackevaluation_11152010.pdf; *Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Notice of Proposed Rulemaking and Order, 27 FCC Rcd 15594 (2012).

[2] *NTIA Fast Track Report* at 5-7, Fig. 5-3.

[3] U.S. Department of Commerce, Census Bureau, *2010 Census Tallies of Census Tracts, Block Groups & Blocks*, https://www.census.gov/geo/maps-data/data/tallies/tractblock.html (last visited Apr. 22, 2014).

Third, this further notice supports a three-tiered use system that includes incumbents, PALs, and General Authorized Access (GAA) users. If this is not complicated enough, the Commission proposes to reserve up to 20 megahertz of spectrum for critical users within indoor facilities and may expand this preferential treatment to certain outdoor facilities. This could reduce available spectrum for GAA users. And, although we have not fully defined this class of users at this stage, it does not appear that many hospitals, public safety entities or local governments are actively seeking this spectrum. Why not eliminate Contained Access User set-asides and allow GAA or PAL providers to offer services to these users? Similarly, if critical users have a need, why can't they apply for GAA spectrum or PALs?

Further, this item proposes spectrum aggregation limits for PALs in the 3.5 GHz Band which I believe to be completely unnecessary. Given the propagation characteristics of this spectrum and its ease of reuse, there will be plenty of opportunity for operators to deploy any number of devices and services in this spectrum.

Finally, the 3.5 GHz Band is ideal for placement of small cells which are helping carriers manage network congestion as data use increases exponentially every year. We need to do all we can to enable more efficient small cell deployment to bring better wireless broadband service to Americans. Therefore, I hope that the Commission will expeditiously conclude this proceeding to make the additional spectrum available for this purpose. At the same time, we should work to finalize the proceeding to implement section 6409 of the Middle Class Tax Relief and Job Creation Act, or separate off for its own proceeding consideration of just small cells, whichever can be done faster. If we want the 3.5 GHz experiment to work, we need to move on small cell siting.

I thank the dedicated staff from the Wireless Telecommunications Bureau, the Office of Engineering and Technology and the International Bureau for all of their efforts so far, including sensitive and complicated negotiations with NTIA and other federal agencies, and for all the work that lies ahead to get this rulemaking across the finish line.

Composite Depiction of Exclusion Zone Distances, Shipborne Radar Systems

Source: NTIA Fast Track Report at 5-7, Fig. 5-3.