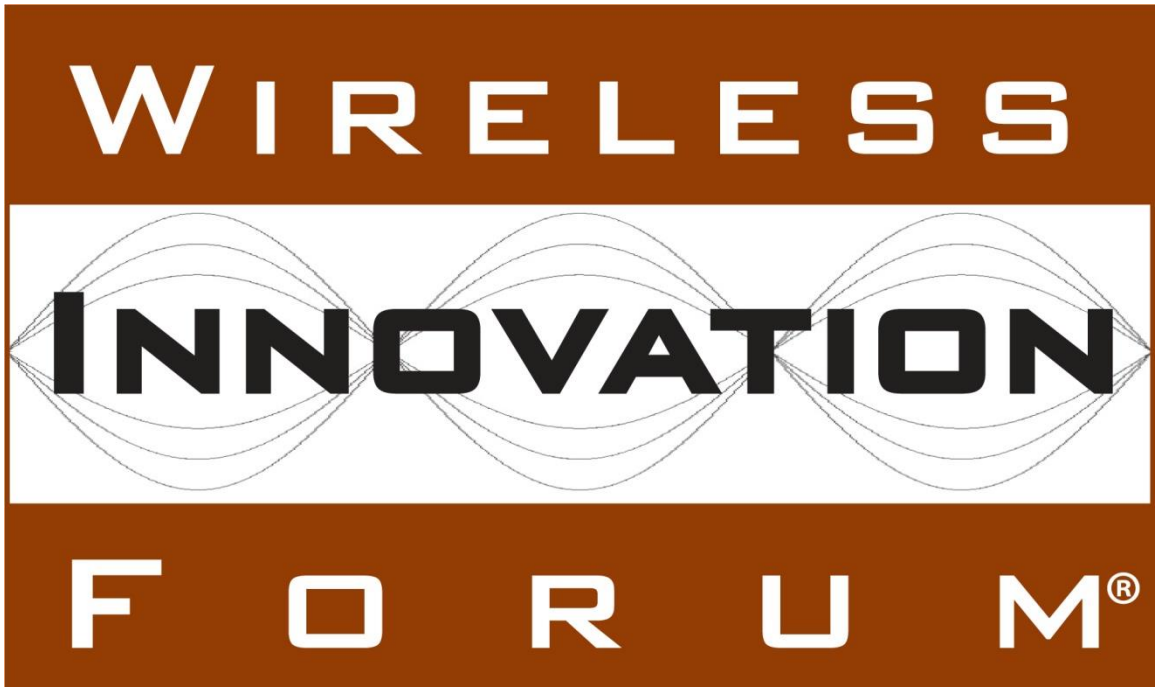

Wireless Innovation Forum's Comments to the FCC regarding the Notice of Proposed Rulemaking in the Matter of Promoting Investment in the 3550-3700 MHz Band

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Before the

Federal Communications Commission

Washington, D.C. 20554

In the matter of	)	
	)	
Promoting investment in	)	
the 3550 to 3700 MHz	)	GN Docket No. 17-258
Band	)	
	)	
	)	

COMMENTS OF THE WIRELESS INNOVATION FORUM ON THE FEDERAL COMMUNICATIONS COMMISSION NOTICE OF PROPOSED RULEMAKING AND DECLARATORY RULING ON PROMOTING INVESTMENT IN THE 3550-3700 MHZ BAND

The Wireless Innovation Forum (Forum) is a US based international non-profit organization driving technology innovation in commercial, civil, and defense communications around the world. Forum members bring a broad base of experience in Software Defined Radio (SDR), Cognitive Radio (CR) and Dynamic Spectrum Access (DSA) technologies in diverse markets and at all levels of the wireless value chain to address emerging wireless communications requirements through enhanced value, reduced total life cost of ownership, and accelerated deployment of standardized families of products, technologies, and services.

The members of the Forum commend the Commission on the release of this NPRM and offer the balloted and approved responses to the Commission's specific questions in Appendix 1 of this document. In addition, the members of the WInnForum suggest edits to the changes to the rules contained in Appendix A of the NPRM. These edits have also been balloted and approved by our members and are captured in Appendix 2 of this document.

The WInnForum is pleased to submit these comments in this proceeding and looks

forward to working with all stakeholders to develop technical standards for any resulting change in rules. In addition, we are ready to work with the Commission to further evolve the necessary requirements to help expand the ecosystem and to fully realize the vision for the CBRS band.

Respectfully submitted,

By /s/:
Mark Gibson
President and Chair
Wireless Innovation Forum

Dated: 4 November 2024

Appendix 1: Wireless Innovation Forum Responses to FCC 24-86

The following provides responses to specific paragraphs in the NPRM and the proposed rules.

Item #	Para #	NPRM Text	WInnForum Response
1	22	We now propose to define coastal DPAs in the Commission's rules and to require all current and future SASs to utilize them to protect federal operations. We seek comment on this proposal.	WInnForum supports removing the old exclusion zone-based incumbent protections and replacing them with the new DPA and DPA neighborhood framework. However, WInnForum encourages the commission to make the definitions of these constructs as general as possible so as to facilitate future improvements and innovations in federal incumbent protections without requiring rules changes or waivers.
2	23	We propose to require SASs to use an approved scheduling portal to protect P-DPAs75 and add a definition of P-DPAs to the part 96 rules. We seek comment on this proposal.	WInnForum concurs with the requirement to use an approved scheduling portal. Consistent with our response in (1), WInnForum suggests keeping the definition of DPA as generic as possible to allow for future innovations without rules changes or waivers.
3	24	We propose to require SASs to protect Always Activated DPAs and to add a definition of Always Activated DPAs to the part 96 rules. We seek comment on this proposal.	Consistent with our response in (1), WInnForum suggests keeping the definition of DPA as generic as possible to allow for future innovations without rules changes or waivers.
4	26	we seek comment on changes to the definition of "Exclusion Zone" to account for the possibility of coordination with federal users in the remaining areas protected by such zones.	WInnForum agrees with the proposed new definition of exclusion zone and supports examining conditions under which CBSDs can operate in the exclusion zones. The FCC should work with DoD, NTIA, and industry to examine methods under which CBRS exclusion zones are handled similar to Cooperative Planning Areas (CPAs) in the 3.45 GHz Service, hence changing CBRS exclusion zones into coordination zones. We note that SASs have already implemented similar aspects of this proposal in the manner in which they protect CBRS deployments in the National Radio Quiet Zone, among others.

Item #	Para #	NPRM Text	WInnForum Response
5	26	We also seek comment on whether there are changes or improvements we should make to the DPA-based framework to improve the ways in which DPA-based protections operate. We welcome suggestions regarding how we can modify the DPA regime to encourage Citizens Broadband Radio Service network buildout while maintaining protections for federal incumbents.	WInnForum has no specific comments on this topic, but individual members, including CBRS users, SAS Administrators, and ESC Operators, have ideas that will be submitted in separate comments, and/or discussed among the CBRS stakeholder community. Consistent with our response in (1), WInnForum recommends that definitions of the DPA-based protection methods be sufficiently general to allow for flexibility and innovation in future federal incumbent protection frameworks.
6	30	We propose to modify the part 96 rules to require that SAS administrators use a Commission-authorized scheduling portal—currently, the TARDyS3 system—to protect P-DPAs. We believe that codifying this requirement will further the public interest by formalizing the use of a secure, reliable, and resilient scheduling portal that will be utilized by SAS administrators to improve federal coordination and ensure the protection of critical federal operations against harmful interference. We seek comment on this proposal.	WInnForum supports removing the rule (since waived by the FCC) that prohibits SASs from connecting to a federal system. WInnForum supports the concept of protecting incumbents using information provided by the incumbents through an authorized scheduling portal. Per our comments above, WInnForum does not otherwise support referring to P-DPAs or other DPA constructs in the rules, and instead allow for maximum flexibility and innovation in future spectrum sharing, without over-prescribing protection methodologies in inflexible rules.
7	30	We also seek comment on possibly expanding future use of the portal system to protect federal operations in other areas, particularly in areas outside of the CONUS with difficult terrain or unique protection needs (e.g., Alaska and Hawaii92). Do commenters see any need to distinguish any such areas from those already included in the TARDyS3 system?	WInnForum supports expanding the use of portal systems in the future. WInnForum applauds the introduction of the TARDyS3 system by the DoD. WInnForum suggests that, for any portal-based system, the DoD continue to be vigilant that reservations reflect only actual spectrum use and any other reservations possibly needed for obfuscation, while not scheduling spectrum use when and where protections are not needed.
8	30	we seek comment on whether we should consider other applications for portal-based solutions to protect federal users and securely manage harmful interference between non-federal and federal entities.	WInnForum believes industry should continue to work directly and jointly with the DoD, NTIA, FCC, and other federal partners to initiate and evaluate proposals as they evolve.

Item #	Para #	NPRM Text	WInnForum Response
9	32	We seek comment on whether there are opportunities to revise the rules governing the 3.5 GHz band to align the protection of specific inland and port-based federal systems and facilities given the spectrum sharing framework adopted in the adjacent 3.45 GHz band. Specifically, we seek comment on whether 3.5 GHz band protection methodologies could be aligned to correspond to 3.45 GHz band protections—for the same systems and facilities—to increase commercial access to the band while maintaining necessary protection for federal incumbent users. For example, some 3.45 GHz facilities protected by CPAs or PUAs are also protected from out of band emissions from the Citizens Broadband Radio Service by Always On DPAs.98 In some instances, the 3.5 GHz band protections may restrict nonfederal operations more than the corresponding CPA or PUA. In addition, both services use a portalbased approach to protect certain federal incumbents, some of which are the same across the two bands. Are there opportunities to create efficiencies by modifying the protection mechanisms in the 3.5 GHz band to better align with those in the 3.45 GHz band in these, or other instances? We note that any potential changes to the protection of federal operations will need to be coordinated with NTIA and DoD. We encourage commenters to consider approaches wherein we may be able to increase commercial spectrum opportunities and facilitate more efficient use of valuable spectrum resources.	See the comment on Item 4. WInnForum welcomes the opportunity to work with NTIA to evaluate protection of ground based sites that are always protected from CBRS OOBE given that 3.45 GHz base stations are being coordinated and possibly deployed in the same areas. For example, it does not make sense to protect federal sites from out-of-band emissions from CBRS at a level of, for example, -25 dBm per MHz (0.0001 W per 40 MHz) if co-channel 3.45 GHz Service systems with transmit power as much as 128,000 W EIRP per 40 MHz are deployed in the same area.
10	34	without altering existing DPA coverage requirements for ESC certification, should we consider modifying any of the ESC sensor approval procedures given the state of competition in the SAS/ESC marketplace? Should we direct WTB and OET to consider the competitive and deployment impacts of new ESC sensors during the ESC sensor approval process (e.g., assessment of the population within the geographic area that would be potentially affected by a sensor deployment)? If so, how should those impacts be quantified and considered?	The need for interference protection of ESC sensors create, "whisper zones" in the vicinity of the sensors in which CBRS deployments in the 3550-3650 MHz band may be impacted. WInnForum does not specifically recommend whether or not the FCC should consider deployment impacts of new ESC siting applications (i.e., whisper zones). However, WInnForum points the FCC to a WInnForum Technical Report (TR-1015) that contains potential metrics for assessing the impact of ESC sensors

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			and networks on CBRS deployments. The URL for the TR is: https://winnf.memberclicks.net/assets/work_products/Reports/WINNF-TR-1015-V1.0.0%20ESC%20Sensor%20Impact%20Technical%20Report.pdf
11	34	to facilitate and maintain a competitive marketplace, should ESC operators be required to make their services available to any certified SAS administrator?	WInnForum has no opinion as the decision of an ESC operator to make ESC service available to other SAS is a commercial issue, rather than something that should be established by FCC rule.
12	36	Consistent with our efforts in American Samoa and Hawaii, we seek comment on whether there are other OCONUS areas that may benefit from an alternate approach to federal protection, on a temporary or permanent basis.	WInnForum believes that portals should be used in areas where ESC sensor deployment is not viable due to economic or whisper zone concerns.
13	36	We also seek comment generally on the feasibility of implementing the Citizens Broadband Radio Service licensing framework in the 3.55-3.65 GHz band segment in OCONUS areas given the difficulty of installing ESC sensors in remote or hard-to-reach areas. How can we overcome the logistical and economic barriers to ESC development and deployment in OCONUS territories? Should we consider other means of ensuring federal protection in OCONUS areas? If so, what are the hurdles to achieving the desired outcome? Are there ways in which we can incentivize or expedite ESC deployment in OCONUS areas? Are there different approaches that might work better in different OCONUS areas? Should we modify our part 96 rules to effectuate these potential solutions and, if so, what specific changes should we make?	See Item 12
14	37	We also seek comment on whether Citizens Broadband Radio Service operations should be permitted in offshore areas (e.g., the Gulf of Mexico) in the 3.65-3.7 GHz band segment.	WInnForum supports such operations pending technical analysis showing that adjacent channel interference associated with these operations do not interfere with ESC operation.
15	37	What are the costs and benefits associated with permitting offshore Citizens Broadband Radio Service operations in the 3.65-3.7 GHz band?	WInnForum has no opinion on costs. WInnForum believes that this will increase the potential market for CBRS. For example, there were numerous Part 90Z deployments in the 3650 - 3700 MHz band in the Gulf of Mexico before Part 90Z was sunset.

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16	37	Could offshore operations in the 3.65-3.7 GHz band have adverse impacts on ESC sensors along the coastline and, if so, how could such interference be mitigated?	WInnForum has existing requirements for protection of ESC sensors from CBSDs operating in the 3650 - 3680 MHz portion of the band. We will apply these constraints in analysis of coexistence between offshore CBSDs and ESC sensors and file the results with the Commission. Note that there are no WInnForum coexistence standards between ESC sensors and CBSDs operating above 3680 MHz, since it is assumed that ESC filters will be sufficient to mitigate any impacts, as frequencies above 3680 MHz are at least 30 MHz outside of the passband of ESC sensors.
17	37	How would CBSDs located offshore maintain connectivity with a SAS as required by the Commission's rules?	SAS connectivity only requires access to the internet. The offshore industry has likely already determined various methods to achieve internet connectivity on their platforms and WInnForum has no further input to provide.
18	39	The Commission requires CBSDs to provide measured interference metric information when a SAS administrator requests the data. We seek comment on how this works in practice. In the 2015 3.5 GHz First Report and Order, the Commission indicated that any such requirements may be set by a multistakeholder group. Are these issues effectively addressed in the standards set within WInnForum?	Standards and policies related to CBSD measurement reporting capabilities are established in WInnForum specifications TS-0112, TS-0016, and SSC-002. WInnForum has no consensus view on the effectiveness of these measured interference metrics as actually implemented in CBSDs. TS-0112: https://winnf.memberclicks.net/assets/CBRS/WINNF-TS-0112.pdf TS-0016: https://winnf.memberclicks.net/assets/CBRS/WINNF-TS-0016.pdf SSC-0002: https://winnf.memberclicks.net/assets/CBRS/WINNF-SSC-0002.pdf
19	40	Would different information or a broader set of information about the Citizens Broadband Radio Service radiofrequency environment support improvements in the 3.5 GHz band? In particular, we would be interested to understand if additional real world data about Citizens Broadband Radio Service operations would enable the SAS administrators to more effectively manage spectrum access within the band or if additional data could be beneficial to Priority Access Licensees, GAA users, the FCC, or NTIA and DoD.	WInnForum has no consensus on a response to this question.

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20	40	Do currently certified CBSDs have the capability to measure additional data about the PAL and GAA radiofrequency environment? In particular, the Commission is interested in whether CBSDs' measurement of additional data would require a hardware change or software upgrade and the costs of adding any such a capability to already certified CBSDs.	WInnForum has no consensus on a response to this question.
21	43	we seek comment on whether we should consider modifying our disclosure rules to reinstate the original information disclosure requirements or whether we should implement an alternative approach.	WInnForum has no consensus on a response to this question.
22	43	Commenters are encouraged to indicate whether current permissible disclosure of aggregated spectrum usage data for a geographic area, including total available spectrum and the maximum available contiguous spectrum, provides sufficient information to determine whether a market they have singled out for consideration warrants CBSD deployment and capital investment. Commenters seeking changes to the disclosure rules should explain why the use of aggregate heat maps, showing the total amount of occupied and available spectrum in a given area of interest, has been insufficient to meet their needs.	WInnForum has no consensus on a response to this question.
23	44	proponents of alternative disclosure approaches should outline how their proposals would safeguard sensitive business or network operations data while yielding enough spectrum use data to assist parties interested in obtaining access to the band on a GAA basis or engaging with Priority Access Licensees for secondary market transactions.	WInnForum has no consensus on a response to this question.
24	45	To supplement the Declaratory Ruling and further clarify this point in part 96, we propose to modify section 96.55 of the Commission's rules to require SAS administrators to provide CBSD registration data to NTIA and DoD upon request. We seek comment on this proposal.	WInnForum concurs with clarifying this point in Part 96.

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25	49	In light of recent developments in the 3 GHz bands, including the Commission's findings in the 3.7 GHz Report and Order and the transition of FSS operations out of the 3.7-4.0 GHz band, we seek comment on whether we should relax the Citizens Broadband Radio Service OOBE limits at the upper edge of the 3.5 GHz band and, if so, what new OOBE limit would be appropriate.	For EUDs, WInnForum acknowledges that -40 dBm/MHz out of band requirement is too restrictive to allow adequate uplink (UL) performance/UL coverage due to large UE Additional Maximum Power Reduction (A-MPR) even for single UL carrier transmission, and even worse A-MPR for UL carrier aggregation. WInnForum recommends that the -40 dBm/MHz EUD emission limit requirement should be removed. The relaxation value (-25 dBm/MHz or -13 dBm/MHz) should be decided by FCC taking into account inputs received from industry. For CBSDs, WInnForum acknowledges that -40 dBm/MHz out of band requirement is too restrictive to allow effective radio development e.g., to support wide band radios (for example, AMBIT & CBRS radios or CBRS & C-band radios). WInnForum recommends that the -40 dBm/MHz CBSD out-of-band emission limit requirement should be relaxed. The relaxation value (-25 dBm/MHz or -13 dBm/MHz) should be decided by the FCC taking into account comments from industry.
26	49	Would relaxing the 3.5 GHz band OOBE limits both within and outside the band to comport with the adjacent 3.7 GHz Service OOBE limits (i.e., replacing the current OOBE limits with a -13 dBm/MHz OOBE limit from 3.55-3.7 GHz) help to facilitate broader deployment of multi-band 5G radio equipment? Alternatively, would some other changes to the OOBE limits (e.g., removing the -40 dBm/MHz limit above 3.72 GHz while leaving the other limits unchanged) be more effective? Would such changes increase the possibility of harmful interference to adjacent band operations—or operations in nearby channels in the 3.5 GHz band—and, if so, how could such interference be mitigated? Would such changes privilege one type of user or network deployment over another?	See input on Item 25.

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27	53	We seek comment on whether to add one or more classes of higher power CBSDs to the Citizens Broadband Radio Service. If so, how should these classes be defined and what should the maximum permissible power levels be for each new class of CBSDs?	WInnForum has no consensus view on higher-power outdoor devices. Today, approximately 95% of all CBRS deployments are outdoors. The lagging uptake of CBRS for indoor operations indicates that that the marketplace has not fully rationalized the best applications for CBRS in enterprise and institutional settings compared with other wireless connectivity options. This reluctance leaves valuable spectrum underutilized. Coverage, capacity and financial efficiency are considerations for CBRS adoption, and current rules concerning Category A and Category B devices represent constraints. WInnForum recommends that the Commission evaluate the introduction of a new device category that allows indoor CBSD transmit power above Category A limits and below Category B limits as a means of providing more flexibility for services providers and equipment makers in designing solutions for indoor applications. The specific parameters for this new category of CBSD should be established by technical studies.
28	53	would higher power levels affect spectrum availability near incumbent operations—including federal operations and FSS earth stations—and, if so, would some types of operations be more affected than others?	WInnForum has no consensus view on higher power outdoor devices. For indoor operations, SASs would protect incumbent operations in the same manner they protect incumbents today, but taking the higher power limits into account while calculating the protections. Including building entry loss, even significant increase in allowed indoor power levels would still not be close in power to Category B operations outdoors, so the new high power indoor devices would be able to coexist with incumbents even better than Category B devices do today.
29	53	Would higher power levels lead to increased geographic distance between base stations operated by different licensees? If so, could the increased distance potentially limit the number of simultaneous users in the band, making it less efficient in terms of number of users per megahertz?	Almost all of today's coexistence challenges are among outdoor users, where building losses don't shield devices from one another. Indoor-to-indoor coexistence between devices in different buildings will benefit from 30 dB or more of additional isolation due to building losses. WInnForum does not expect significant coexistence challenges due to indoor devices, even when higher indoor power is allowed.

Item #	Para #	NPRM Text	WInnForum Response
30	53	Would an increase in power lead to in-band or adjacent band coexistence issues between commercial wireless operators and, if so, would some types of deployments be affected more than others?	See the response in Item 29.
31	53	If higher power devices are permitted, should we require the SASs to make any changes to their operations to ensure the equitable division of power levels and channel assignments between different users and types of operations?	If needed, coexistence solutions should be established by industry groups.
32	55	We seek comment on aligning UE power levels in the Citizens Broadband Radio Service with 3GPP standards	WInnForum supports a 3 dB increase on EUD maximum power spectral density compared to the current Part 96 limits. The new limit should be 26 dBm per 10 MHz.
33	55	Given that UEs are not directly controlled by SASs, we seek comment on what the potential impact of introducing higher power UEs will be on incumbent operators and other Citizens Broadband Radio service users.	WInnForum believes a 3 dB increase will be negligible interference impact on incumbents, as the maximum EUD power level is still 4 - 21 dB below that allowed for CBSDs. Higher EUD power will have a positive impact on the CPE-CBSD handshake procedure, since the CPE-CBSD handshake power begins at the maximum level allowed for EUDs.
34	59	we seek comment on whether there are other specific circumstances that may warrant less restrictive application of our SAS connectivity requirements. Specifically, we seek comment on what, if any, circumstances or deployment types may warrant an alternate approach to SAS connectivity. If we were to provide some degree of situational flexibility, what changes to our SAS connectivity requirements should we consider? Should Citizens Broadband Radio Service users be required to renew access to any alternative approach periodically and, if so, what period would be appropriate? Should we provide more general, time limited relief to Citizens Broadband Radio Service operators in the event of a SAS outage or other connectivity issue?	WInnForum feels that recent changes in the rules related to transmit expiration and maximum heartbeat interval are a significant improvement and has no consensus on further changes at this time. However, we are evaluating proposals for discussion with DoD and NTIA as appropriate. For example, could the transmit expiry time rules be relaxed for CBSDs that are within a DPA neighborhood but not on the move list (i.e., devices on the list to be reconfigured/shut down if incumbent operations begin on the same frequency in the associated DPA)?

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35	60	We also welcome feedback on what factors to take into account in determining whether to relax SAS connectivity in specific circumstances. For example, should we consider different SAS connectivity requirements for spectrum usage that is both geographically and temporally confined (e.g.,where the potential for interference is tempered by terrain attenuation or involves spectrum uses that are short in duration)? Along those lines, should we provide greater flexibility for low powered Category A CBSDs or should we provide flexibility to all CBSDs in circumstances where transmissions are less likely to cause harmful interference? If the latter, what would those circumstances be?	Please refer to comments in Item 34.
36	61	We seek comment on how federal operators and other incumbent users would be protected if we adopt more flexible SAS connectivity rules for some situations. If we modify our SAS connectivity requirements to reflect specific uses or circumstances, how should we implement such changes to ensure that incumbent federal operations, and other higher tier operators in the band, are protected? Would such changes increase the likelihood that higher tier users, including federal incumbents, would be subject to harmful interference? How, specifically, could interference issues be avoided or mitigated?	Please refer to comments in Item 34.
37	64	We seek comment on whether to impose out-of-band TDD coordination procedures on Citizens Broadband Radio Service licensees to make sure data sharing occurs on a bilateral basis between 3.45 GHz Service and Citizens Broadband Radio Service users seeking to provide service in the same or adjacent geographic areas.	WInnForum has no consensus on a response to this question.
38	64	We also seek comment on whether Citizens Broadband Radio Service operators should have an obligation to make any corresponding changes to their operations to facilitate TDD synchronization or if we should simply permit parties to negotiate changes to their respective networks.	WInnForum has no consensus on a response to this question.

Item #	Para #	NPRM Text	WInnForum Response
39	65	we seek comment on whether to impose out-of-band coordination requirements on Citizens Broadband Radio Service operators to encourage TDD synchronization with the adjacent 3.7 GHz band.	WInnForum has no consensus on a response to this question.
40	66	We also welcome feedback generally on the potential benefits and drawbacks of imposing in-band TDD coordination procedures on Citizens Broadband Radio Service licensees given the tiered licensing structure in the 3.5 GHz band.171 Could an in-band TDD synchronization requirement decrease the potential for harmful interference between operators in the Citizens Broadband Radio Service? Could TDD synchronization be equitably applied across the myriad use cases supported by the Citizens Broadband Radio Service, including GAA deployments? Could such requirements be managed at the SAS level and, if so, how would they be enforced? Would TDD synchronization improve the SASs' ability to coordinate between and among Citizens Broadband Radio Service users in the band? Would such requirements improve spectrum availability for synchronized operators? Would imposing TDD requirements impose new burdens on operators in the band?	WInnForum has no consensus on a response to this question.
41	68	we seek comment on whether we should limit protection of TT&C sites in the 3.7-4.2 GHz band to those facilities that were specifically identified in the 3.7 GHz Report and Order and subsequent satellite operator submissions.	WInnForum concurs with this proposal.
42	68	We also seek comment more generally on whether we should modify section 96.17 of the Commission's rules to require FSS operators to provide additional technical or operational parameters as part of their annual registration submission to ensure that SASs have the most up-to-date and accurate information necessary to protect registered in-band and adjacent band FSS earth stations against harmful interference from Citizens Broadband Radio Service users operating in the 3.5 GHz band. What additional information would be useful?	WInnForum does not believe that additional data elements are needed. However, with regard to protection of in-band FSS, there are several issues with the current rules and procedures that need to be fixed. 1) The existing rules only point to a "Preliminary List" of FSS sites that are eligible for grandfathered protection. No final list was ever published to our knowledge. 2) The FCC allows an FSS operator to register in the CBRS FSS protection API, and SASs automatically pick up these new registrations and begin protecting the site without any further consideration. The FCC

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			does not appear to validate that sites entered into the API are in fact eligible for protection. For example, it does not appear that the sites must correspond to one of the sites listed in the preliminary list, and several sites have been (and still are) protected at locations far removed from any of the sites in the preliminary list. Since protections can extend as far as 150 km away, potentially spurious registrations can, in theory, impact CBRS operations over an area that is larger than the size of West Virginia. 3) Further, sites that are eligible for protection do not appear to abide by the requirement to register their operations on an annual basis as required by 47 CFR 96.17(d). SASs do not protect sites that are not registered, and a CBRS ecosystem can (and does) become established within the 150 km coordination area. However, at any time in the future, it appears that such sites can register and suddenly appear active (so-called "zombie sites"). SASs must then begin protecting the site, and the established CBRS ecosystem in the area could get knocked off the air with no forewarning, despite, perhaps, years of ongoing operations providing wireless services to CBRS customers. Revised Part 96 rules should remedy these issues by the following: 1) A final list of sites eligible for protection should be published. Only FSS sites that are within a short distance (i.e., 3 km) of the protected sites, operating over a frequency range no greater than specified in the final list, shall be protected. Any sites that register in the FSS API that are beyond the 3 km distance from any point in the final list, or for frequencies outside of those established in the final list, will not be protected by SASs. 2) Any site in the final list that does not abide by its annual registration process in 96.17(d) (i.e., registration by Dec 1 of each year) permanently loses its grandfathered status on December 2 of that year. It is removed from the list of protected sites and a new "final list" is published by the FCC. The "final list" can only shrink in size as sites lose their grandfathered status.

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			3) In any event, all FSS sites must attest to the FCC on an annual basis that they are still in operation in accordance with the registration parameters they enter into the FSS API.
43	69	We propose to clarify the Commission's rules to state that SASs no longer have to apply the protection criteria in 47 CFR part 90, subpart Z, to protect FSS earth stations in the 3.65-3.7 GHz band now that the transition window for Grandfathered Wireless Broadband Licensees has closed.	WInnForum concurs with proposal
44	71	We therefore propose to sunset the rules set forth in part 90, subpart Z that apply to wireless broadband services in the 3.65-3.7 GHz band and the corresponding rules protecting part 90 licenses from Citizens Broadband Radio Service operations. We tentatively conclude these rules are no longer needed as the transition period for the last Grandfathered Wireless Broadband Licensee's license ended on January 8, 2023. We seek comment on this proposal.	WInnForum concurs with proposal
45	74	We seek comment on the efficacy of the current professional installation regime and whether any rule changes are needed to ensure that CBSDs are installed and maintained correctly. Do the current rules sufficiently ensure that CBSD locations and configurations are reported accurately? If not, what improvements could be made to better address the need for accurate CBSD information in this band?	The FCC Part 96 rules requires "professional installation." WInnForum created the Certified Professional Installer (CPI) program to address this requirement. The program has certified over 5000 CPIs to date who have been extensively trained on the CBRS rules, ensuring proper installation of CBSDs. Further, through the CPI program, if an installation error occurs, there is traceability back to the specific installer to correct the issue. WInnForum's members do not feel that changes to this arrangement are required at this time.
46	74	We also seek comment on whether some devices that are classified as Category B devices under the rules (e.g., outdoor Category A devices installed over 6 meters high, devices used solely as customer premise equipment, etc.) could be safely installed and operated without a CPI. If so, what safeguards should be required to ensure that such devices do not cause harmful interference to incumbent operators and other Citizens Broadband Radio Service users?	At this time, WInnForum believes that the rule requiring professional installation works and should remain. The current model has led to the successful installation of over 400,000 CBSDs without a single reported case of interference reported from a federal incumbent.

Item #	Para #	NPRM Text	WInnForum Response
47	78	To that end, we seek comment on whether there are steps we can take to facilitate additional use of the 3.5 GHz band for low power indoor operations, including private networks. Specifically, should we allow operators to reserve some amount of GAA spectrum for private, low-power indoor operations—akin to the CAF approach—and, if so, what parameters should be established to ensure equitable access to spectrum resources and safeguard other operators from harmful interference? What specific use cases would benefit from this type of reservation model? Should eligibility be reserved for certain categories of users (e.g., public safety organizations, medical care facilities, etc.) or should it be more generally available? We also seek comment on whether we should adopt equipment-related hardware requirements and operational parameters similar to those adopted for indoor services in the 5.9 GHz and 6 GHz bands given that users in those bands are, in some cases, deploying low-power devices similar to Category A CBSDs and, if we did so, whether we would need to make any adjustments for 3.5 GHz band operations?	WInnForum points out that there exists a light-touch leasing capability for CBRS PALs which could provide some of the benefits described in the proposed scheme.
48	79	Given that building attenuation is a key factor in minimizing potentially harmful interference from indoor access points to incumbent receivers, should the Commission expressly allow the operation of drones connected to various low-power access points within a single structure or building? Would such operations be possible without causing harmful interference to higher tier operations? How would SAS administrators coordinate indoor drone operations? Would such operations benefit from some amount of reserved GAA spectrum (akin to the CAF model)?	WInnForum has no consensus on a response to this question.

Item #	Para #	NPRM Text	WInnForum Response
49	80	we seek comment on whether a GAA spectrum reservation system—or other methods—could be used to facilitate and support the growing interest in private networks more generally. For instance, could a CAF-like GAA spectrum reservation system be used to support some outdoor private networks in geographically contained areas (e.g., corporate campuses or manufacturing facilities)? What effects would such a system have on spectrum access for other Citizens Broadband Radio Service users and the overall spectrum environment in the band? Are there other technical or policy approaches that we should consider to support deployment of private networks in the 3.5 GHz band?	Please see the response to Item 47.
50	83	we seek comment on whether there are new rules, or clarifications of current rules, that could foster coexistence and preempt disputes among GAA users in a manner that will also advance GAA spectrum use and continued deployment of the Citizens Broadband Radio Service. Alternately, would the development of specific coexistence criteria be better left to multistakeholder groups? What would be the costs and benefits of any such rule changes and what impact would they have on existing and future GAA deployments? What role should the SASs play in monitoring GAA users' compliance with any such new rules? How could such rules be equitably enforced by the Commission?	WInnForum has no consensus on a response to this question.

Appendix 2: Wireless Innovation Forum Proposed Edits to Changes in Rules Contained in Appendix A of the NPRM

The members of the WInnForum suggest the below edits to the changes to the rules contained in Appendix A of the NPRM. Please note that the edits do not include new rules or modifications to existing rules to implement all of the FCC's proposals in the NPRM or WInnForum's priorities as detailed in our responses to the individual questions. The redlines are only against the edits proposed by the FCC in Appendix A of the NPRM. Additional edits would be needed to implement some of the FCC's proposals described in the NPRM (for example, modifications of the technical rules regarding emissions).

The text below provides justifications for our suggested edits. Please refer to the edits themselves starting on page 23 while reviewing the justifications.

- 96.3
    - Modifications to the definition of Dynamic Protection Areas
        - Current DPAs along the coast do not begin at the coastline, but instead begin 10 km off the coastline. Practically speaking, beginning DPAs at the coastline would increase DPA neighborhood sizes (i.e., extend them 10 km farther inland in the current case), increase the number of devices impacted by DPA activations by reducing the distance to the closest DPA protection points, and would exacerbate whisper zone impacts to CBRS deployments because ESC sensor antennas would have to point directly along the coastline, with inevitable substantial spillover to highly populated areas.

- In the spirit of retaining maximum flexibility for industry to work with NTIA, DoD, and FCC to innovate the techniques by which SASs become aware of DPA activity, we suggest that the Commission include an "other manner," in addition to ESC and portal, in the DPA definition.
- Definition of "Coastal DPA"
    - We believe that the FCC's proposed term "Coastal DPA" more accurately refers to DPAs that are monitored by ESC, not all of which are "coastal." For example, Webster Field in southern Maryland is inland, but is monitored by ESC, as are the Pensacola FL and Pascagoula MS R&D sites.
    - These sites operate ground-based radars instead of shipborne radars.
    - The modification of the definition also brings consistency in the naming conventions between portal-managed DPAs ("P-DPAs") and ESC-monitored DPAs ("E-DPAs"), which is also consistent with the NTIA's naming convention for the respective KML files.[1]
    - We inserted the word "operating" because ESC's only detect radars that are operating.
    - Below, we make appropriate changes to subsequent rules to reflect the change from "Coastal DPA" to "E-DPA."

[1] https://www.ntia.gov/spectrum-frequency-bands/3550-3650-mhz

        - Definition of “Portal-Activated DPA”
            - The edit adds flexibility to accommodate any new scheduling portals that may be created in the future.
        - Definition of “Always Activated DPA”
            - The definition of “Always Activated DPA” was changed to refer to it as “Always Active.”
            - We corrected the definition to indicate that SASs protect an area, not a specific point at which a radar (or the radar’s antenna aperture) is located. SASs are not provided the specific point location of the radar.
    - Modification to the definition of DPA Neighborhood
        - The definition was edited to make it clear that not all CBSDs within a neighborhood are necessarily affected by incumbent operations in the associated DPA.
        - We do not believe the last sentence of the definition is necessary as it specifies procedures to take (as opposed to making a definition), and the procedures in that sentence are covered by the text in 96.53(f) and 96.53(p).
- 96.15(a)(3)
    - Updated to reflect the use of “E-DPAs” and “Always Active DPAs”, consistent with our proposed edits in 96.3.

- Also clarifies that "frequency range" refers to the activated frequency range of the DPA.

- 96.15(a)(3)(i)
  - The KML files have been moved to a new page on the NTIA web site. While the new page is ultimately linked (through a two-step process) via the current URL in the 96.15(a)(3)(i), we suggest using the link that takes the user directly to the page where the KML files are located. (WInnForum notes that NTIA URLs do change on occasion, and the Commission should continue to ensure that URLs listed in Part 96 remain correct over time).

- 96.15(a)(3)(iii)
  - Updated reference to "E-DPA."
  - Edited to make it clear that individual DPAs are covered by associated sensors, otherwise the rule implies that coverage of "DPAs" by "ESC sensors" is "all-or-nothing." That is, one DPA may be uncovered if there are no sensors that monitor it, or if one or more of those sensors are not working, but other DPAs that do not rely on those sensors will remain covered.

- 96.15(a)(3)(iv)
  - Explicitly indicates that a SAS that has no connection to any ESC network must treat all E-DPAs as active.

- 96.53(f)
  - Updated term to "E-DPA" consistent with our edits to 96.3.

- Clarified that not all CBSDs in a neighborhood may necessarily be impacted by incumbent activity.
- Clarified that a reduction in transmit power is another allowed remedy to mitigate interference to incumbent operations.

- 96.53(p)
  - Similar edits to the last two edits of 96.53(f).
- 96.67(d)
  - Updated term to E-DPA consistent with our edits to 96.3.
  - Clarified that ESC *sensors* are deployed in the vicinity of E-DPAs. Other "ESC equipment" (for example, the decision engine) is typically cloud-based and does not have a well-defined location.
- Throughout Part 96 (not explicitly shown in our edits)
  - Replace all occurrences in Part 96 of "an SAS" with "a SAS." The CBRS community universally pronounces SAS as "sass" as opposed to "ess a ess."

Please note that the original changes proposed by the Commission are in blue below. The WInnForum's proposed edits to these changes are in purple.

PART 96—CITIZENS BROADBAND RADIO SERVICE

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 § 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 must not cause harmful interference to Incumbent Users and must accept interference from Incumbent Users. General Authorized Access Users must not cause harmful interference to Priority Access Licensees and must accept interference from Priority Access Licensees.

§ 96.3 Definitions.

The definitions in this section apply to this part.

Adjacent Channel Leakage Ratio. The Adjacent Channel Leakage Ratio (ACLR) is the ratio of the filtered mean power over the assigned Aggregated Channel Bandwidth to the filtered mean power over the equivalent adjacent channel bandwidth. The power in the assigned Aggregated Channel Bandwidth and its equivalent adjacent channel bandwidth are measured with rectangular filters with measurement bandwidths equal to the Aggregated Channel Bandwidth.

Aggregated Channel Bandwidth. The Aggregated Channel Bandwidth is the bandwidth of a single channel, or in the case of multiple contiguous channels, the bandwidth between the upper and lower limits of the combined contiguous channels.

Citizens Broadband Radio Service Device (CBSD). Fixed Stations, or networks of such stations, that operate on a Priority Access or General Authorized Access basis in the Citizens Broadband Radio Service consistent with this rule part. For CBSDs which comprise multiple nodes or networks of nodes, CBSD requirements apply to each node even if network management and communication with the SAS is accomplished via a single network interface. End User Devices are not considered CBSDs.

(1) *Category A CBSD.* A lower power CBSD that meets the general requirements applicable to all CBSDs and the specific requirements for Category A CBSDs set forth in §§ 96.41 and 96.43.

(2) *Category B CBSD.* A higher power CBSD that meets the general requirements applicable to all CBSDs and the specific requirements for Category B CBSDs set forth in §§ 96.41 and 96.45.

Coastline. The mean low water line along the coast of the United States drawn according to the principles, as recognized by the United States, of the Convention on the Territorial Sea and the

Contiguous Zone, 15 U.S.T. 1606, and the 1982 United Nations Convention on the Law of the Sea, 21 I.L.M. 1261.

County. For purposes of this part, counties shall be defined using the United States Census Bureau's data reflecting county legal boundaries and names valid through January 1, 2017.

Dynamic Protection Area (DPA). DPAs are geographic protection areas, extending from off the ~~c~~Coastline into the ocean or enclosing a protected federal facility, which may be activated or deactivated as necessary to protect Department of Defense (DOD) radar systems. DPAs are activated when DoD radar systems are using the band—as communicated to a Spectrum Access System (SAS) by either an Environmental Sensing Capability (ESC), ~~or~~ Scheduling Portal, or other manner—signaling that federal incumbents in the DPA must be protected from Citizens Broadband Radio Service operations within the active frequency range.

(1) ~~Coastal~~ESC-monitored DPAs (E-DPAs) are geographic protection areas that are monitored by ESC sensors to detect and ~~located along the Coastline to~~ protect operating shipborne radar systems and operating radar systems in designated port facilities. ~~Coastal~~ESC-monitored DPAs are activated consistent with information received by an SAS from an ESC.

(2) Portal-Activated DPAs (P-DPAs) are geographic protection areas located around designated federal facilities or coastal areas that utilize ~~a~~ dedicated Scheduling Portal(s) to schedule federal operations in the 3.5 GHz band. P-DPAs are activated consistent with information received by an SAS from a Scheduling Portal.

(3) Always Active~~ated~~ DPAs are geographic protection areas that are always considered to be in active use by federal operators. These DPAs protect a limited number of federal radar systems by limiting the maximum aggregate received power level within the DPA from the CBSDs in the DPA Neighborhood~~at the location of the protected radar antenna aperture~~.

Dynamic Protection Area (DPA) Neighborhoods. A DPA neighborhood is the area in which registered CBSDs ~~may cause~~must be considered as potential contributors to interference to federal incumbent operations in activated DPAs. ~~The SAS may direct CBSDs within DPA Neighborhoods to cease operations, reduce transmit power, or relocate to a non-interfering frequency when the associated DPA is activated.~~ [The last line is not needed because of 96.53(f) and (p)]

End user device. A device authorized and controlled by an authorized CBSD. These devices may not be used as intermediate service links or to provide service over the frequencies listed in § 96.11 to other End User Devices or CBSDs.

Environmental Sensing Capability (ESC). A system that detects and communicates the presence of a signal from an Incumbent User to an SAS to facilitate shared spectrum access consistent with §§ 96.15 and 96.67.

Exclusion ~~z~~Zone. A geographic area wherein no CBSD shall operate without the express consent of NTIA. Exclusion Zones shall be enforced and maintained by the SAS. ~~Exclusion Zones will~~

~~be converted to Protection Zones following the approval and commercial deployment of an ESC and SAS consistent with this part.~~

Fixed station. A CBSD or End User Device that transmits and/or receives radio communication signals at a fixed location. Fixed Stations may be moved from time to time but Fixed CBSDs must turn off and re-register with the SAS prior to transmitting from a new location.

Geo-location capability. The capability of a CBSD to register its geographic coordinates within the level of accuracy specified in § 96.39. The CBSD location is used by the SAS to determine frequency availability and maximum transmit power limits for CBSDs.

General Authorized Access (GAA) User. An authorized user of one or more CBSDs operating on a General Authorized Access basis, consistent with subpart D of this part.

~~*Grandfathered wireless broadband licensee.* A licensee authorized to operate in the 3650-3700 MHz band consistent with § 90.1338 of this chapter.~~

~~*Grandfathered wireless protection zone.* A geographic area and frequency range in which Grandfathered Wireless Broadband Licensees will receive protection from Citizens Broadband Radio Service transmissions and defined using methodology determined by the Wireless Telecommunications Bureau and Office of Engineering and Technology.~~

Incumbent user. A federal entity authorized to operate on a primary basis in accordance with the table of frequency allocations, or a fixed satellite service operator~~, or Grandfathered Wireless Broadband Licensee authorized to operate on a primary basis on frequencies designated in § 96.11~~.

License area. The geographic component of a PAL. A License Area consists of one county.

Mobile station. A device intended to be used while in motion or during halts at unspecified points.

PAL Protection Area. The area within the Priority Access Licensee's default protection contour, as calculated by the SAS in accordance with § 96.25 (or smaller, self-reported protection contour). This area will be protected from interference in accordance with §§ 96.25 and 96.41(d).

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

Priority Access License (PAL). A license to operate on a Priority Access basis, consistent with subpart C of this part.

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

~~*Protection zone.* A geographic area wherein CBSDs may operate only with the permission of an approved SAS and ESC.~~

Rural area. For purposes of this part, any Census Tract which is not located within, or overlapping:

(1) A city, town, or incorporated area that has a population of greater than 20,000 inhabitants; or

(2) An urbanized area contiguous and adjacent to a city or town that has a population of greater than 50,000 inhabitants.

Scheduling portal. A calendar-based system, authorized by the Commission for use by the SASs, that supports the scheduling and communication of federal spectrum use within designated P-DPAs to SASs.

Service area. One or more contiguous License Areas held by the same Priority Access Licensee.

Spectrum Access System (SAS). A system that authorizes and manages use of spectrum for the Citizens Broadband Radio Service in accordance with subpart F of this part.

Spectrum Access System (SAS) administrator. An entity authorized by the Commission to operate an SAS in accordance with the rules and procedures set forth in § 96.63.

§ 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, and otherwise meets the technical, financial, character, and citizenship qualifications that the Commission may require in accordance with such Act is eligible to be a Priority Access Licensee or General Authorized Access User under this part; provided further, that no entity barred by 47 U.S.C. 1404 is eligible to be a Priority Access Licensee.

§ 96.7 Authorization required.

(a) CBSDs and End User Devices 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, and the Commission's rules and policies thereunder.

~~(c) Grandfathered Wireless Broadband Licensees are authorized to operate consistent with § 90.1338 of this chapter.~~

§ 96.9 Regulatory status.

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 is authorized in the 3550-3700 MHz frequency band.
  (1) General Authorized Access Users may operate in the 3550-3700 MHz frequency band.
  (2) Priority Access Users may operate in the 3550-3650 MHz frequency band.

  ~~(3)Grandfathered Wireless Broadband Licensees may continue to use the 3650-3700 MHz band in accordance with § 90.1338 of this chapter.~~

(b) [Reserved]

§ 96.13 Frequency assignments.

(a) Each PAL shall be authorized to use a 10 megahertz channel in the 3550-3650 MHz band.
  (1) No more than seven PALs shall be assigned in any given License Area at any given time.
  (2) Multiple channels held by the same Priority Access Licensee in a given License Area shall be assigned consistent with the requirements of § 96.25.
  (3) Any frequencies designated for Priority Access that are not in use by a Priority Access Licensee may be utilized by General Authorized Access Users.
(b) The 3650-3700 MHz band shall be reserved for ~~Grandfathered Wireless Broadband Licensees and~~ GAA Users.
(c) An SAS shall assign authorized CBSDs to specific frequencies, which may be reassigned by that SAS, consistent with this part.

Subpart B—Incumbent Protection

§ 96.15 Protection of federal incumbent users.

(a) This paragraph (a) applies only to CBSDs operating in the 3550-3650 MHz band.
  (1) CBSDs and End User Devices must not cause harmful interference to and must accept interference from federal Incumbent Users authorized to operate in the 3550-3700 MHz band and below 3550 MHz.
  (2) The SAS shall only authorize the use of CBSDs consistent with information on federal frequency use ~~obtained from an approved ESC, except~~ as provided in this section.
  (3) The SAS shall protect federal incumbent sites using DPAs—including ~~Coastal~~ E-DPAs, P-DPAs, and Always Activ~~eated~~ DPAs—and Exclusion Zones. A DPA may be activated when DoD radar systems are active within the DPA. The SAS shall protect each activated DPA from aggregate CBSD interference within the activat~~ede~~ frequency range. ~~For Category A CBSDs, Exclusion Zones shall be maintained along the Coastline, as shown at *ntia.doc.gov/category/3550-3650-mhz*. Exclusion Zones shall also be maintained around federal radiolocation sites as set forth at~~

ntia.doc.gov/category/3550-3650-mhz . NTIA shall notify the Commission in writing if and when the list of protected federal radiolocation sites is updated. Exclusion Zones shall be maintained and enforced until one or more ESCs are approved and used by at least one SAS, in accordance with § 96.67. Thereafter, Exclusion Zones shall be converted to Protection Zones.

(i) The specific coordinates and protection requirements for all DPAs, DPA Neighborhoods, and Exclusion Zones are maintained by NTIA and are publicly available at: https://www.ntia.doc.gov/fcc-filing/2015/ntia-letter-fcc-commercial-operations-3550-3650-mhz-bandhttps://www.ntia.gov/spectrum-frequency-bands/3550-3650-mhz. Category A CBSDs may be authorized by an approved SAS in geographic areas outside of Exclusion Zones before an ESC is approved.

(ii) NTIA shall notify the Commission in writing if and when the list of DPA-protected federal radiolocation sites and Exclusion Zones is to be updated or the methodology used to protect specific sites is to be changed. Once an ESC is approved and used by at least one SAS, Category A CBSDs may only be authorized consistent with information on federal frequency use provided to the SAS by an approved ESC.

(iii) The SAS must treat an Coastal E-DPAs as activated prior to approved ESC sensor deployment for that DPA, and if the associated ESC sensors lose contact with the SAS. Category B CBSDs may only be authorized consistent with information on the presence of a signal from a federal system provided to the SAS by an approved ESC.

(iii)(iv) A SAS that does not communicate with any approved ESC network must treat all ESC-monitored DPAs as active.

(4) Within 300 seconds after the ESC communicates that it has detected a signal from a federal system in a given area, or the SAS is otherwise notified of current federal incumbent use of the band, the SAS must either confirm suspension of the CBSD's operation or its relocation to another unoccupied frequency, if available. If the President of the United States (or another designated Federal Government entity) issues instructions to discontinue use of CBSDs pursuant to 47 U.S.C. 606, SAS Administrators must instruct CBSDs to cease operations as soon as technically possible.

(5) The Commission will, as necessary, add or modify DPAs and Exclusion Zones or Protection Zones to protect current and future federal Incumbent Users.

(6) The Commission may temporarily extend or modify DPAs and Exclusion Zones and Protection Zones to protect temporary operations by federal Incumbent Users and will notify the public prior to implementation. Federal Incumbent Users will coordinate with the Commission prior to the beginning of any non-emergency operation requiring additional protection. Such modifications will be communicated to the SAS along with the expiration date and time of any modification.

(b) This paragraph (b) applies to CBSDs operating in the 3650-3700 MHz band.

(1) CBSDs and End User Devices must not cause harmful interference to and must accept interference from federal Incumbent Users authorized to operate in the 3500-3700 MHz band.

(2) Exclusion Zones shall be maintained for an 80 km radius around the federal radiolocation sites listed in § 2.106(c)(109) of this chapter47 CFR 90.1331 and 47 CFR

2.106, US 109. These Exclusion Zones shall be maintained and enforced until one or more ESCs are approved and used by at least one SAS, in accordance with § 96.67. Thereafter, Exclusion Zones shall be converted to Protection Zones.

(3) CBSDs may only be authorized within these Protection Zones consistent with information on the presence of a signal from a federal system provided to the SAS by an approved ESC, in accordance with § 96.67.

(4)(3) Within 300 seconds after the ESC communicates that it has detected a signal from a federal system in a given area, or the SAS is otherwise notified of current federal incumbent use of the band, the SAS must either confirm suspension of the CBSD's operation or its relocation to another unoccupied frequency. If the President of the United States (or another designated Federal Government entity) issues instructions to discontinue use of CBSDs pursuant to 47 U.S.C. 606, SAS Administrators must instruct CBSDs to cease operations as soon as technically possible.

§ 96.17 Protection of existing fixed satellite service (FSS) earth stations in the 3600-3700 MHz Band and 3700-4200 MHz Band.

(a) FSS earth stations licensed to operate in the 3600-3700 MHz band listed at *www.fcc.gov/cbrs-protected-fss-sites* shall be protected from CBSD operation consistent with this section. The protections in this section shall only apply to registered FSS earth stations that are authorized to operate on a co-primary basis consistent with § 2.106 of this chapter.

(1) FSS earth stations in the 3650-3700 MHz band will be afforded protection consistent with this section only after the conditions set forth in § 96.21(c) are satisfied.

(2) ***Co-channel.*** The aggregate passband radiofrequency (RF) power spectral density at the output of a reference RF filter and antenna at the location of an FSS earth station operating in the 3600-3700 MHz band, produced by emissions from all co-channel CBSDs (within 150 km) operating in the Citizens Band Radio Service shall not exceed a median root mean square (RMS) value of −129 dBm/MHz. The reference antenna system requires SAS to calculate antenna gain using § 25.209(a)(1) and (4) of this chapter, and a reference RF filter between the feed-horn and low noise amplifier (LNA)/low noise block downconverter (LNB), with 0.5 dB insertion loss in the passband.

(3) ***Blocking.*** The aggregate RF power at the output of a reference RF filter and antenna at the location of an FSS earth station operating in the 3600-3700 MHz band, produced by emissions from all CBSDs (within 40 km), shall not exceed a median RMS value of −60 dBm. The reference antenna system requires an SAS to calculate antenna gain using § 25.209(a)(1) and (4) of this chapter, and a reference RF filter between the feed-horn and LNA/LNB, with a filter mask of 0.6 dB/MHz attenuation to 30.5 dB at 50 MHz offset below the lower edge of the FSS earth station's authorized passband, and 0.25 dB/MHz attenuation to 55.5 dB at an offset greater than or equal to 150 MHz below the lower edge of the FSS earth station's authorized passband.

(b) Registered FSS earth stations in the 3700-4200 MHz band listed at *www.fcc.gov/cbrs-protected-fss-sites* shall be protected from CBSD operation in accordance with this section. Only licensed FSS earth stations used for satellite telemetry, tracking, and control

(TT&C) operations will be protected under this section. Other licensed 3700-4200 MHz earth stations may be protected consistent with § 96.17(f).

(1) ***Out-of-band emissions into FSS.*** The aggregate passband RF power spectral density at the output of a reference RF filter and antenna at the location of a TT&C FSS earth station operating in the 3700-4200 MHz band, produced by emissions from all CBSDs (within 40 km) operating in the Citizens Band Radio Service shall not exceed a median RMS value of −129 dBm/MHz. The reference antenna system requires SAS to calculate antenna gain using § 25.209(a)(1) and (4) of this chapter, and a reference RF filter between the feed-horn and LNA/LNB, with 0.5 dB insertion loss in the passband.

(2) ***Blocking.*** The aggregate RF power at the output of a reference RF filter and antenna at the location of a TT&C FSS earth station operating in the 3700-4200 MHz band, produced by emissions from all CBSDs (within 40 km), shall not exceed a median RMS value of −60 dBm. The reference antenna system requires SAS to calculate antenna gain using § 25.209(a)(1) and (4) of this chapter, and a reference RF filter between the feed-horn and LNA/LNB, with a filter mask of 0.6 dB/MHz attenuation to 30.5 dB at 50 MHz offset below the lower edge of the FSS earth station's authorized passband, and 0.25 dB/MHz attenuation to 55.5 dB at an offset greater than or equal to150 MHz below the lower edge of the FSS earth station's authorized passband.

(c) These protection criteria will be enforced by the Spectrum Access System authorized consistent with subpart F of this part.

(d) FSS earth station licensees requesting protection under this part must register with the Commission annually, no later than 30 days before the end of the preceding calendar year, or upon making changes to any of the operational parameters listed in this section. Registration information will be made available to all approved SASs.

(1) Annual registration for each earth station shall include, at a minimum:
  (i) The earth station's geographic location (Using NAD83 coordinates);
  (ii) Antenna gain;
  (iii) Azimuth and elevation antenna gain pattern;
  (iv) Antenna azimuth relative to true north; and
  (v) Antenna elevation angle.
  (vi) Whether the earth station is used for satellite telemetry, tracking, and control (for earth stations in the 3700-4200 MHz band).

(2) Such information must be made available to SAS Administrators and maintained consistent with § 96.55.

(e) CBSDs may operate within areas that may cause interference to FSS earth stations, in excess of the levels described in § 96.17(a) and (b), provided that the licensee of the FSS earth station and the authorized user of the CBSD mutually agree on such operation and the terms of any such agreement are provided to an SAS Administrator that agrees to enforce them. The terms of any such agreement shall be communicated promptly to all other SAS Administrators.

(f) FSS earth station licensees in the 3600-3700 and 3700-4200 MHz bands may request additional protection from SAS Administrators to prevent harmful interference into their systems. SAS Administrators must establish a process to receive and address such requests, consistent with § § 96.53(o) and 96.63 and shall make good faith efforts to address interference concerns, consistent with their other responsibilities under this part. In addressing such requests, SASs shall assume that 3700-4200 MHz earth stations are

utilizing filters with the characteristics described in § 96.17(a)(3) or (b)(2) as appropriate for the 3600-3700 or 3700-4200 MHz band.

§ 96.19 Operation near Canadian and Mexican borders.

Citizens Broadband Radio Service operation in the 3550-3700 MHz band is subject to current and future international agreements with Mexico and Canada. The terms of these agreements shall be implemented by the SAS.

§ 96.21 [Removed] ~~Protection of existing operators in the 3650-3700 MHz Band.~~

~~(a) Grandfathered Wireless Broadband Licensees shall be granted Incumbent User status consistent with §§ 90.1307 and 90.1338 of this chapter. Notwithstanding this status, Grandfathered Wireless Broadband Licensees shall not cause harmful interference to federal Incumbent Users and grandfathered FSS earth stations consistent with the rules governing Citizens Broadband Radio Service operators in this part.~~

~~(1) Incumbent User protections for a Grandfathered Wireless Broadband Licensee shall only apply within its Grandfathered Wireless Protection Zone.~~

~~(2) Incumbent User protections for a Grandfathered Wireless Broadband Licensee shall only apply to Grandfathered Wireless Protection Zones around base or fixed stations that are registered in ULS on or before April 17, 2015 and constructed, in service, and fully compliant with the rules in part 90, subpart Z of this chapter as of April 17, 2016. Grandfathered Wireless Protection Zones will be reduced in geographic area and/or applicable frequency range if portions of the protected network fail to meet the above criteria after April 17, 2016. Grandfathered Wireless Protection Zones will not be defined for subscriber units operated by Grandfathered Wireless Broadband Licensees, regardless of whether they have been registered in ULS.~~

~~(3) Grandfathered Wireless Protection Zones must be registered in the SAS for these protections to apply.~~

~~(b) Grandfathered Wireless Broadband Licensees may operate within their Grandfathered Wireless Protection Zones and operational frequencies consistent with the technical rules in part 90, subpart Z, consistent with the transition period set forth in §§ 90.1307 and 90.1338 of this chapter.~~

~~(c)Grandfathered Wireless Broadband Licensees and Citizens Broadband Radio Service users must protect authorized grandfathered FSS earth stations in the 3650-3700 MHz band, consistent with the existing protection criteria in 47 CFR part 90, subpart Z, until the last Grandfathered Wireless Broadband Licensee's license expires within the protection area defined for a particular grandfathered FSS earth station. Thereafter, the protection criteria in § 96.17 applicable to FSS earth stations in the 3600-3700 MHz band shall apply.~~

Subpart C—Priority Access

§ 96.23 Authorization.

(a) An applicant must file an application for an initial PAL. 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) CBSDs used for Priority Access must register with an SAS and comply with its instructions consistent with § 96.39 and subpart F of this part.

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

§ 96.25 Priority access licenses.

(a) Priority Access Licensees must operate CBSDs consistent with the technical rules and interference protection requirements set forth in this part.

(b) PALs have the following parameters:
  (1) ***Geography:*** Each PAL consists of a single License Area.
    (i) ***Contiguous geographic areas:*** An SAS must assign geographically contiguous PALs held by the same Priority Access Licensee to the same channels in each geographic area, to the extent feasible. The SAS may temporarily reassign individual PALs held by the same Priority Access Licensee to different channels, so that geographical contiguity is temporarily not maintained, to the extent necessary to protect Incumbent Users or if necessary to perform its required functions under subpart F of this part.
    (ii) [Reserved]
  (2) ***Channels:*** Each PAL consists of a 10 megahertz channel within the frequency range set forth in § 96.11. Channels must be assigned by the SAS. Priority Access Licensees may request a particular channel or frequency range from the SAS but will not be guaranteed a particular assignment.
    (i) ***Contiguous channels:*** An SAS must assign multiple channels held by the same Priority Access Licensee to contiguous channels in the same License Area, to the extent feasible. The SAS may temporarily reassign individual PALs to non-contiguous channels to the extent necessary to protect Incumbent Users or if necessary to perform its required functions under subpart F of this part.
    (ii) [Reserved]
  (3) ***License term.*** Each PAL has a ten-year license term. Licensees must file a renewal application in accordance with the provisions of § 1.949 of this chapter.
  (4) ***Performance requirement.*** Priority Access Licensees must provide substantial service in their license area by the end of the initial license term. “Substantial” service is defined as service which is sound, favorable, and substantially above the level of

mediocre service which might minimally warrant renewal. Failure by any licensee to meet this requirement will result in forfeiture of the license without further Commission action, and the licensee will be ineligible to regain it. Licensees shall demonstrate compliance with the performance requirement by filing a construction notification with the Commission in accordance with the provisions set forth in § 1.946(d) of this chapter. The licensee must certify whether it has met the performance requirement, and file supporting documentation, including description and demonstration of the bona fide service provided, electronic maps accurately depicting the boundaries of the license area and where in the license area the licensee provides service that meets the performance requirement, supporting technical documentation, any population-related assumptions or data used in determining the population covered by a service to the extent any were relied upon, and any other information the Wireless Telecommunications Bureau may prescribe by public notice. A licensee's showing of substantial service may not rely on service coverage outside of the PAL Protection Areas of registered CBSDs or on deployments that are not reflected in SAS records of CBSD registrations.

(i) ***Safe harbor for mobile or point-to-multipoint service.*** A Priority Access Licensee providing a mobile service or point-to-multipoint service may demonstrate substantial service by showing that it provides signal coverage and offers service, either to customers or for internal use, over at least 50 percent of the population in the license area.

(ii) ***Safe harbor for fixed point-to-point service.*** A Priority Access Licensee providing a fixed point-to-point service may demonstrate substantial service by showing that it has constructed and operates at least four links, either to customers or for internal use, in license areas with 134,000 population or less and in license areas with greater population, a minimum number of links equal to the population of the license area divided by 33,500 and rounded up to the nearest whole number. To satisfy this provision, such links must operate using registered Category B CBSDs.

(c) ***PAL Protection Areas.*** PAL channels shall be made available for assignment by the SAS for General Authorized Access use only in areas outside of PAL Protection Areas consistent with this section and § 96.41(d).

(1) A CBSD will be considered to be in use for purposes of calculating a PAL Protection Area once it is registered and authorized for use on a Priority Access basis by an SAS consistent with §§ 96.39, 96.53, and 96.57.

(i) Priority Access Licensees must inform the SAS if a previously activated CBSD is no longer in use.

(ii) Any CBSD that does not make contact with the SAS for seven days shall not be considered in use and will be excluded from the calculation of the PAL Protection Area until such time as contact with the SAS is re-established.

(2) The default protection contour will be determined by the SAS as a −96 dBm/10 MHz contour around each CBSD. The default protection contour will be calculated based on information included in the CBSD registration and shall be determined and enforced consistently across all SASs.

(i) The default protection contour is the outer limit of the PAL Protection Area for any CBSD but a Priority Access Licensee may choose to self-report protection contours smaller than the default protection contour to the SAS.

(ii) If the PAL Protection Areas for multiple CBSDs operated by the same Priority Access Licensees overlap, the SAS shall combine the PAL Protection Areas for such CBSDs into a single protection area.

(3) The PAL Protection Area may not extend beyond the boundaries of the Priority Access Licensee's Service Area.

§ 96.27 [Reserved]

§ 96.29 Competitive bidding procedures.

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.

§ 96.30 Designated entities in the Citizens Broadband Radio Service.

(a) ***Small business.***

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

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

(b) ***Eligible rural service provider.*** For purposes of this section, an eligible rural service provider is an entity that meets the criteria specified in § 1.2110(f)(4) of this chapter.

(c) ***Bidding credits.***

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

(2) An entity that qualifies as eligible rural service provider or a consortium of rural service providers who has not claimed a small business bidding credit may use a bidding credit of 15 percent, as specified in § 1.2110(f)(4) of this chapter.

§ 96.31 Aggregation of priority access licenses.

(a) Priority Access Licensees may aggregate up to four PAL channels in any License Area at any given time.

(b) The criteria in § 20.22(b) of this chapter will apply in order to attribute partial ownership and other interests for the purpose of applying the aggregation limit in paragraph (a) of this section.

§ 96.32 Priority access assignments of authorization, transfers of control, and leasing arrangements.

(a) Priority Access Licensees may transfer or assign their licenses and enter into de facto leasing arrangements in accordance with part 1 of this chapter.
(b) Priority Access Licensees may partition or disaggregate their licenses and partially assign or transfer their licenses pursuant to § 1.950 of this chapter and may enter into de facto transfer leasing arrangements for a portion of their licensed spectrum pursuant to part 1 of this chapter.
(c) Priority Access Licensees may enter into spectrum manager leasing arrangements with approved entities as prescribed in § 1.9046 of this chapter. Priority Access Licensees may only enter into leasing arrangements for areas that are within their Service Area and outside of their PAL Protection Areas.

Subpart D—General Authorized Access

§ 96.33 Authorization.

(a) Any party meeting the requirements set forth in § 96.5 is eligible to operate a CBSD on a General Authorized Access basis.
(b) CBSDs used for General Authorized Access must register with the SAS and comply with its instructions.

§ 96.35 General authorized access use.

(a) General Authorized Access Users shall be permitted to use frequencies assigned to PALs when such frequencies are not in use, as determined by the SAS, consistent with § 96.25(c).
(b) Frequencies that are available for General Authorized Access Use shall be made available on a shared basis.
(c) General Authorized Access Users shall have no expectation of interference protection from other General Authorized Access Users operating in accordance with this part.
(d) General Authorized Access Users must not cause harmful interference to and must accept interference from Priority Access Licensees and Incumbent Users in accordance with this part.
(e) General Authorized Access Users operating Category B CBSDs must make every effort to cooperate in the selection and use of available frequencies provided by an SAS to minimize the potential for interference and make the most effective use of the authorized facilities. Such users shall coordinate with an SAS before seeking station authorization, and make every effort to ensure that their CBSDs operate at a location, and with technical parameters, that will minimize the potential to cause and receive interference among CBSDs. Operators of CBSDs suffering from or causing harmful interference are expected to cooperate and resolve interference problems through technological solutions or by other mutually satisfactory arrangements.

Subpart E—Technical Rules

§ 96.39 Citizens Broadband Radio Service Device (CBSD) general requirements.

This section applies to all CBSDs. Additional rules applicable only to Category A or Category B CBSDs are set forth in §§ 96.43 and 96.45.

(a) ***Geo-location and reporting capability.***
  (1) All CBSDs must be able to determine their geographic coordinates (referenced to the North American Datum of 1983 (NAD83)) to an accuracy of ±50 meters horizontal and ±3 meters of elevation. Such geographic coordinates shall be reported to an SAS at the time of first activation from a power-off condition.
  (2) For professionally installed CBSDs, geographic coordinates to the same accuracy specified in paragraph (a)(1) of this section may be determined and reported to the SAS as part of the installation and registration process. Geographic coordinates must be determined and reported each time the CBSD is moved to a new location.
  (3) A non-professionally installed CBSD must check its location and report to the SAS any location changes exceeding 50 meters horizontal and ±3 meters elevation from its last reported location within 60 seconds of such location change.

(b) ***Operability.*** All CBSDs must be capable of two-way operation on any authorized frequency assigned by an SAS. ~~Equipment deployed by Grandfathered Wireless Broadband Licensees during their license term will be exempt from this requirement.~~

(c) ***Registration with SAS.*** A CBSD must register with and be authorized by an SAS prior to its initial service transmission. The CBSD must provide the SAS upon its registration with its geographic location, antenna height above ground level (in meters), CBSD class (Category A/Category B), requested authorization status (Priority Access or General Authorized Access), FCC identification number, call sign, user contact information, air interface technology, unique manufacturer's serial number, sensing capabilities (if supported), and additional information on its deployment profile required by §§ 96.43 and 96.45. If any of this information changes, the CBSD shall update the SAS within 60 seconds of such change, except as otherwise set forth in this section. All information provided by the CBSD to the SAS must be true, complete, correct, and made in good faith.
  (1) A CBSD must operate at or below the maximum power level authorized by an SAS, consistent with its FCC equipment authorization, and within geographic areas permitted by an SAS on the channels or frequencies authorized by an SAS.
  (2) A CBSD must receive and comply with any incoming commands from its associated SAS about any changes to power limits and frequency assignments. A CBSD must cease transmission, move to another frequency range, or change its power level within 60 seconds as instructed by an SAS.

(d) ***Signal Level Reporting.*** A CBSD must report to an SAS regarding received signal strength in its occupied frequencies and adjacent frequencies, received packet error rates or other common standard metrics of interference for itself and associated End User Devices as directed by an SAS.

(e) ***Frequency reporting.*** If directed by the SAS, a CBSD that receives a range of available frequencies or channels from an SAS must promptly report to the SAS which of the available channels or frequencies it will utilize.

(f) ***Security.*** CBSDs shall incorporate security measures sufficient to ensure that they are capable of communicating only with SASs operated by approved SAS Administrators, and that communications between CBSDs and SASs, between individual CBSDs, and between CBSDs and End User Devices are secure to prevent corruption or unauthorized interception of data.
  (1) For purposes of obtaining operational limits and frequency availabilities and their updates, CBSDs shall only contact SASs operated by SAS Administrators approved by the Commission in accordance with subpart F of this part.
  (2) All communications between CBSDs and SASs must be transmitted using secure methods that protect the systems from corruption or unauthorized modification of the data.
  (3) Communications between a CBSD and its associated End User Devices for purposes of obtaining operational power, location, and frequency assignments shall employ secure methods that protect the system from corruption or unauthorized modification of the data.

(g) ***Device security.*** All CBSDs and End User Devices must contain security features sufficient to protect against modification of software and firmware 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 an approved SAS 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.

(h) ***Airborne operations.*** Airborne operations by CBSDs and End User Devices are prohibited.

§ 96.41 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) ***Power limits.*** Unless otherwise specified in this section, the maximum effective isotropic 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 in this paragraph (b):

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
End User Device	23	n/a
Category A CBSD	30	20
Category B CBSD[1]	47	37

Device	Maximum EIRP (dBm/10 megahertz)	Maximum PSD (dBm/MHz)
[1] Category B CBSDs will only be authorized for use after an ESC is approved and commercially deployed consistent with §§ 96.15 and 96.67.		

(c) ***Power management.*** CBSDs and End User Devices shall limit their operating power to the minimum necessary for successful operations.

(1) CBSDs must support transmit power control capability and the capability to limit their maximum EIRP and the maximum EIRP of associated End User Devices in response to instructions from an SAS.
(2) End User Devices shall include transmit power control capability and the capability to limit their maximum EIRP in response to instructions from their associated CBSDs.

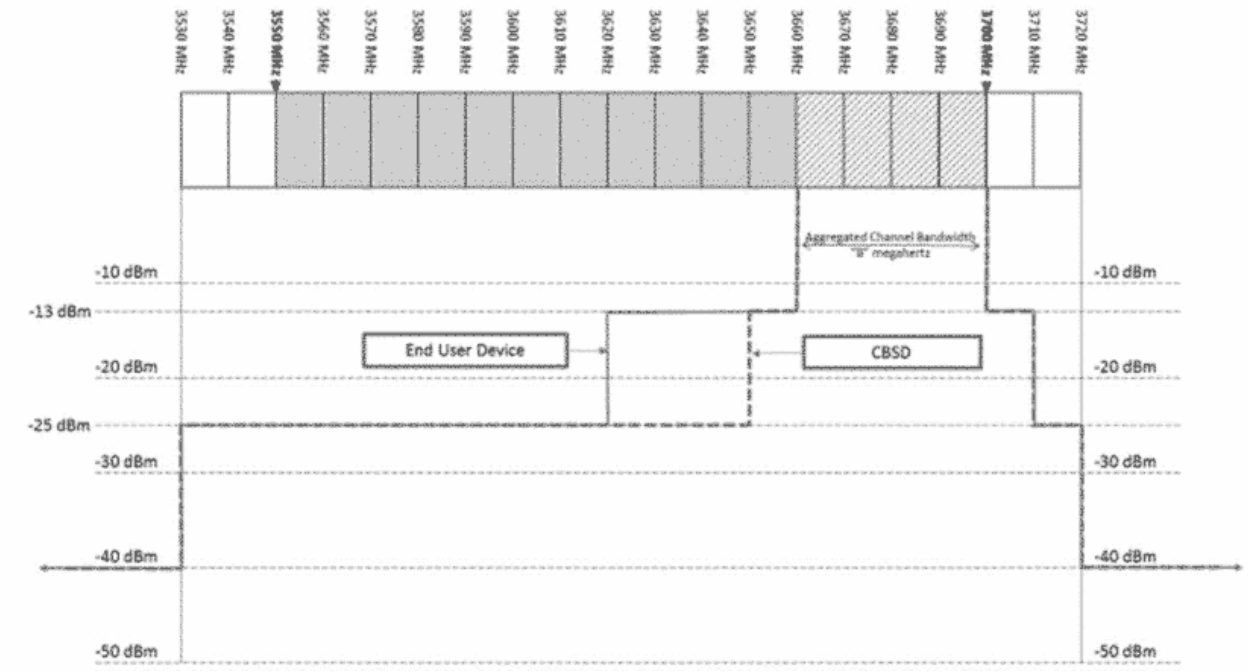
(d) ***Received Signal Strength Limits.***

(1) For both Priority Access and GAA users, CBSD transmissions must be managed such that the aggregate received signal strength for all locations within the PAL Protection Area of any co-channel PAL, shall not exceed an average (RMS) power level of −80 dBm in any direction when integrated over a 10 megahertz reference bandwidth, with the measurement antenna placed at a height of 1.5 meters above ground level, unless the affected PAL licensees agree to an alternative limit and communicate that to the SAS.
(2) These limits shall not apply for co-channel operations at the boundary between geographically adjacent PALs held by the same Priority Access Licensee.

(e) ***3.5 GHz Emissions and Interference Limits*** —

(1) ***General protection levels.***

Figure 1 to paragraph (e) – Protection levels



(i) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth as specified in paragraph (e)(3) of this section (whether the emission is inside or outside of the authorized band) shall not exceed −13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed −25 dBm/MHz. The upper and lower SAS assigned channel edges are the upper and lower limits of any channel assigned to a CBSD by an SAS, or in the case of multiple contiguous channels, the upper and lower limits of the combined contiguous channels.

(ii) Except as otherwise specified in paragraph (e)(2) of this section, for channel and frequency assignments made by a CBSD to End User Devices, the conducted power of any End User Device emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed −13 dBm/MHz within 0 to B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B megahertz below the lower CBSD-assigned channel edge, the conducted power of any End User Device emission shall not exceed −25 dBm/MHz. Notwithstanding the emission limits in

this paragraph, the Adjacent Channel Leakage Ratio for End User Devices shall be at least 30 dB.

(2) ***Additional protection levels.*** Notwithstanding paragraph (e)(1) of this section, for CBSDs and End User Devices, the conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed −25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/MHz.

(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 fundamental 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) Compliance with emission limits shall be demonstrated using either average (RMS)-detected or peak-detected power measurement techniques.

(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.

(f) ***Reception limits.*** Priority Access Licensees must accept adjacent channel and in-band blocking interference (emissions from other authorized Priority Access or GAA CBSDs transmitting between 3550 and 3700 MHz) up to a power spectral density level not to exceed −40 dBm in any direction with greater than 99% probability when integrated over a 10 megahertz reference bandwidth, with the measurement antenna placed at a height of 1.5 meters above ground level, unless the affected Priority Access Licensees agree to an alternative limit and communicates that to the SAS.

Note to paragraph (f): Citizens Broadband Radio Service users should be aware that there are Federal Government radar systems in the band and adjacent bands that could adversely affect their operations.

(g) ***Power measurement.*** The peak-to-average power ratio (PAPR) of any CBSD transmitter output power must not exceed 13 dB. PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities or

another Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

§ 96.43 Additional requirements for category A CBSDs.

(a) Category A CBSDs shall not be deployed or operated outdoors with antennas exceeding 6 meters height above average terrain. CBSDs deployed or operated outdoors with antennas exceeding 6 meters height above average terrain will be classified as, and subject to, the operational requirements of Category B CBSDs.
(b) When registering with an SAS, Category A CBSDs must transmit all information required under § 96.39. This transmission shall also indicate whether the device will be operated indoors or outdoors.
(c) Any CBSD operated at higher power than specified for Category A CBSDs in § 96.41 will be classified as, and subject to, the operational requirements of a Category B CBSD.

§ 96.45 Additional requirements for category B CBSDs.

(a) Category B CBSDs must be professionally installed.
(b) In the 3550-3650 MHz band, Category B CBSDs must be authorized consistent with information received from an ESC, as described in § 96.15.
(c) Category B CBSDs are limited to outdoor operations.
(d) When registering with an SAS, Category B CBSDs must transmit all information required under § 96.39 plus the following additional information: antenna gain, beamwidth, azimuth, downtilt angle, and antenna height above ground level.

§ 96.47 End user device additional requirements.

(a) 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.
  (1) An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.
  (2) [Reserved]
(b) Any device operated at higher power than specified for End User Devices in § 96.41 will be classified as, and subject to, the operational requirements of a CBSD.

§ 96.49 Equipment authorization.

(a) Each transmitter used 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.

§ 96.51 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 and technical information showing the basis for this statement must be submitted to the Commission upon request.

Subpart F—Spectrum Access System

§ 96.53 Spectrum access system purposes and functionality.

The purposes of the SAS include:

(a) To enact and enforce all policies and procedures developed by the SAS Administrator pursuant to § 96.63.
(b) To determine and provide to CBSDs the permissible channels or frequencies at their location.
(c) To determine and provide to CBSDs the maximum permissible transmission power level at their location.
(d) To register and authenticate the identification information and location of CBSDs.
(e) To retain information on, and enforce, DPAs and Exclusion Zones ~~and Protection Zones~~ in accordance with § § 96.15 and 96.17.
(f) To communicate with the ESC to obtain information about federal Incumbent User transmissions within ~~Coastal~~ E-DPAs and instruct a subset of CBSDs operating within the associated DPA Neighborhoods, as determined by a SAS, to move to another frequency range, reduce transmit power, or cease transmissions to prevent interference to federal Incumbent Users within activated ~~Coastal~~ E-DPAs.
(g) To ensure that CBSDs operate in geographic areas and within the maximum power levels required to protect federal Incumbent Users from harmful interference, consistent with the requirements of ~~§~~ § 96.15 ~~and 96.21~~.
(h) To ensure that CBSDs protect non-federal Incumbent Users from harmful interference, consistent with the requirements of ~~§~~ § 96.17 ~~and 96.21~~.
(i) To protect Priority Access Licensees from interference caused by other PALs and from General Authorized Access Users, including the calculation and enforcement of PAL Protection Areas, consistent with § 96.25.
(j) To facilitate coordination between GAA users operating Category B CBSDs, consistent with § 96.35.
(k) To resolve conflicting uses of the band while maintaining, as much as possible, a stable radio frequency environment.

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

(m) [Reserved]~~To protect Grandfathered Wireless Broadband Licensees consistent with §§ 90.1307 and 90.1338 of this chapter, and § 96.21.~~

(n) To implement the terms of current and future international agreements as they relate to the Citizens Broadband Radio Service.

(o) To receive reports of interference and requests for additional protection from Incumbent Access users and promptly address interference issues.

(p) To use a Scheduling Portal to obtain information about federal Incumbent User transmissions within P-DPAs and instruct a subset of CBSDs operating within the associated DPA Neighborhoods, as determined by a SAS, to move to another frequency range, reduce transmit power, or cease transmissions to prevent interference to federal Incumbent Users within activated P-DPAs.

§ 96.55 Information gathering and retention.

(a) The SAS shall maintain current information on registered CBSDs, the geographic locations and configuration of protected FSS locations as set forth in § 96.17, and the federal Incumbent User Exclusion Zones ~~and Protection Zones~~.

(1) For registered CBSDs, such information shall include all information required by §§ 96.39 and 96.45.

(2) SAS Administrators must make all information necessary to effectively coordinate operations between and among CBSDs available to other SAS Administrators.

(3) Upon request, SAS Administrators must make available to the general public aggregated spectrum usage data for any geographic area. Such information must include the total available spectrum and the maximum available contiguous spectrum in the requested area. SAS Administrators shall not disclose specific CBSD registration information to the general public except where such disclosure is authorized by the registrant.

(4) For non-federal Incumbent Users, the SAS shall maintain a record of the location of protected earth stations as well as the all registration information required by § 96.17.

(5) Upon request, SAS Administrators must make CBSD registration information available to NTIA and DoD for any designated geographic area, frequency range, or time period.

(b) The SAS shall maintain records not pertaining to federal Incumbent User transmissions for at least 60 months.

(c) The SAS shall only retain records of information or instructions received regarding federal Incumbent User transmissions from the ESC in accordance with information retention policies established as part of the ESC approval process.

(d) The SAS shall be technically capable of directly interfacing with any necessary FCC database containing information required for the proper operation of an SAS.

(e) The SAS shall process and retain acknowledgements by all entities registering CBSDs that they understand the risk of possible interference from federal Incumbent User radar operations in the band.

§ 96.57 Registration, authentication, and authorization of Citizens Broadband Radio Service Devices.

(a) An SAS must register, authenticate, and authorize operations of CBSDs consistent with this part.
(b) CBSDs composed of a network of base and fixed stations may employ a subsystem for aggregating and communicating all required information exchanges between the SAS and CBSDs.
(c) An SAS must also verify that the FCC identifier (FCC ID) of any CBSD seeking access to its services is valid prior to authorizing it to begin providing service. A list of devices with valid FCC IDs and the FCC IDs of those devices is to be obtained from the Commission's Equipment Authorization System.
(d) An SAS must not authorize operation of CBSDs within Exclusion Zones, DPAs, or DPA NeighborhoodsProtection Zones except as set forth in § 96.15.
(e) An SAS must calculate and enforce PAL Protection Areas consistent with § 96.25 and such calculation and enforcement shall be consistent across all SASs.

§ 96.59 Frequency assignment.

(a) An SAS must determine the available and appropriate channels/frequencies for CBSDs at any given location using the information supplied by CBSDs, including location, the authorization status and operating parameters of other CBSDs in the surrounding area, information communicated by the ESC, other SASs, and such other information necessary to ensure effective operations of CBSDs consistent with this part. All such determinations and assignments shall be made in a non-discriminatory manner, consistent with this part.
  (1) Upon request from the Commission or a CBSD, an SAS must confirm whether frequencies are available in a given geographic area.
  (2) Upon request from the Commission, an SAS must confirm that CBSDs in a given geographic area and frequency band have been shut down or moved to another available frequency range in response to information received from the ESC.
  (3) If an SAS provides a range of available frequencies or channels to a CBSD, it may require that CBSD to confirm which channel or range of frequencies it will utilize.
(b) Consistent with the requirements of § 96.25, an SAS shall assign geographically contiguous PALs held by the same Priority Access Licensee to the same channels in each geographic area, where feasible. The SAS shall also assign multiple channels held by the same Priority Access Licensee to contiguous frequencies within the same License Area, where feasible.
(c) An SAS may temporarily assign PALs to different channels (within the frequency range authorized for Priority Access use) to protect Incumbent Access Users or if necessary to perform its required functions.

§ 96.61 Security.

(a) An SAS must 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 information it sends to a CBSD.

(b) Communications between CBSDs and an SAS, between an ESC and an SAS, between individual CBSDs, and between different SASs, must be secure to prevent corruption or unauthorized interception of data. An SAS must be protected from unauthorized data input or alteration of stored data.
(c) An SAS must verify that the FCC identification number supplied by a CBSD is for a certified device and must not provide service to an uncertified device.

§ 96.63 Spectrum access system administrators.

The Commission will designate one or more SAS Administrators to provide nationwide service. The Commission may, at its discretion, permit the functions of an SAS, such as a data repository, 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 coordinating the overall functioning of an SAS and providing services to operators in the Citizens Broadband Radio Service. Each SAS Administrator designated by the Commission must:

(a) Maintain a regularly updated database that contains the information described in § 96.55.
(b) Establish a process for acquiring and storing in the database necessary and appropriate information from the Commission's databases, including PAL assignments, 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 protocols and procedures to ensure compliance with the rules set forth in this part, including the SAS functions set forth in subpart F of this part.
(d) Establish and follow protocols and procedures sufficient to ensure that all communications and interactions between the SAS, ESC, 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.
(e) Provide service for a five-year term. This term may be renewed at the Commission's discretion.
(f) Respond in a timely manner to verify, correct or remove, as appropriate, data in the event that the Commission or a party brings a 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.
(g) Securely 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 approved 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.
(h) Cooperate to develop a standardized process for coordinating operations with other SASs, avoiding any conflicting assignments, maximizing shared use of available frequencies, ensuring continuity of service to all registered CBSDs, and providing the data collected pursuant to § 96.55.
(i) 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.

(j) Provide a means to make non-federal non-proprietary information available to the public in a reasonably accessible fashion in conformity with the rules in this part.
(k) Ensure that the SAS shall be available at all times to immediately respond to requests from authorized Commission personnel for any and all information stored or retained by the SAS.
(l) Establish and follow protocols to respond to instructions from the President of the United States, or another designated Federal government entity, issued pursuant to 47 U.S.C. 606.
(m) Establish and follow protocols to comply with enforcement instructions from the Commission.
(n) Ensure that the SAS:
  (1) Operates without any connectivity to any military or other sensitive federal database or system, except as otherwise required by this part; and
  (2) Does not store, retain, transmit, or disclose operational information on the movement or position of any federal system or any information that reveals other operational information of any federal system that is not required by this part to effectively operate the SAS.

§ 96.65 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 subpart F of this part.
(b) The Commission, upon request, will review the fees and can require changes to those fees if they are found to be unreasonable.

§ 96.66 Spectrum access system responsibilities related to priority access spectrum manager leases.

(a) An SAS Administrator that chooses to accept and support leasing notifications shall:
  (1) Verify that the lessee is on the certification list, as established in § 1.9046 of this chapter.
  (2) Establish a process for acquiring and storing the lease notification information and synchronizing this information, including information about the expiration, extension, or termination of leasing arrangements, with the Commission databases at least once a day;
  (3) Verify that the lease will not result in the lessee holding more than the 40 megahertz of Priority Access spectrum in a given License Area;
  (4) Verify that the area to be leased is within the Priority Access Licensee's Service Area and outside of the Priority Access Licensee's PAL Protection Area; and
  (5) Provide confirmation to licensee and lessee whether the notification has been received and verified.
(b) During the period of the lease and within the geographic area of a lease, SASs shall treat any CBSD operated by the lessee the same as a similarly situated CBSDs operated by the lessor for frequency assignment and interference mitigation purposes.

Subpart G—Environmental Sensing Capability

§ 96.67 Environmental sensing capability.

(a) The primary purpose of the ESC is to facilitate coexistence of Citizens Broadband Radio Service users with federal Incumbent Users through signal sensing. An ESC will be operated by a non-governmental entity and, except as set forth in this section, will not rely on governmental agencies to affirmatively communicate information about the operations of incumbent radio systems.

(b) An ESC may only operate after receiving approval by the Commission. Such approval shall be conditioned on meeting the requirements of this part and any other requirements imposed by the Commission. The Commission may revoke, modify, or condition ESC approval at its discretion.

(c) An ESC must meet the following requirements:
   (1) Be managed and maintained by a non-governmental entity;
   (2) Accurately detect the presence of a signal from a federal system in the 3550-3700 MHz band and adjacent frequencies using approved methodologies that ensure that any CBSDs operating pursuant to ESC will not cause harmful interference to federal Incumbent Users;
   (3) Communicate information about the presence of a signal from a federal Incumbent User system to one or more approved SASs;
   (4) Maintain security of detected and communicated signal information;
   (5) Comply with all Commission rules and guidelines governing the construction, operation, and approval of ESCs;
   (6) Ensure that the ESC shall be available at all times to immediately respond to requests from authorized Commission personnel for any information collected or communicated by the ESC; and
   (7) Ensure that the ESC operates without any connectivity to any military or other sensitive federal database or system and does not store, retain, transmit, or disclose operational information on the movement or position of any federal system or any information that reveals other operational information of any federal system that is not required by this part to effectively operate the ESC.

(d) ESC ~~equipment~~ sensors ~~may~~ shall be deployed in the vicinity of ~~Coastal~~ E-DPAs~~the Exclusion Zones and Protection Zones~~ to accurately detect federal Incumbent User transmissions.