

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

In the Matter of)	
)	
Revision of Part 15 of the Commission's Rules to)	ET Docket No. 13-49
Permit Unlicensed National Information)	
Infrastructure (U-NII) Devices in the 5 GHz Band)	
)	

MEMORANDUM OPINION AND ORDER

Adopted: March 1, 2016

Released: March 2, 2016

By the Commission: Commissioner Pai issuing a statement.

I. INTRODUCTION

1. By this action, the Commission addresses seven petitions for reconsideration¹ of the *First Report and Order (First R&O)* in this proceeding.² Specifically we modify our rules to provide a relaxation of the out-of-band emission (OOBE) limits for operation of U-NII-3 (5.725-5.85 GHz) band devices.³ We are also providing an alternative for manufacturers that require additional time to bring their U-NII-3 band devices into compliance with the new out-of-band limits adopted herein. We extend the deadline for certification of U-NII-3 band devices with more than 10dBi antenna gain to March 2, 2017. The deadline for the manufacture, marketing, sale and importation of these devices is extended until March 2, 2018. For devices with antenna gain of 10 dBi or less, we implement a new certification deadline of March 2, 2018, and extend the deadline for the manufacture, marketing, sale and importation of devices not meeting the modified out-of-band limits until March 2, 2020. The actions taken herein will add to the flexibility and capability of U-NII operations while protecting other authorized users from harmful interference. We decline to adopt rules in response to some petitions that would remove restricted band protections from emissions produced by U-NII-1 (5.15-5.25 GHz) band devices or would permit U-NII-1 client devices to operate with higher emissions and we decline to reduce the upper U-NII-3 band edge from 5.85 to 5.825 GHz.

¹ See EchoStar Technologies, L.L.C. Petition for Reconsideration, filed June 2, 2014., Cambium Networks, Ltd. Petition for Reconsideration (Cambium Petition), filed June 2, 2014, JAB Wireless, Inc. Petition for Reconsideration, filed June 2, 2014, Mimosa Networks, Inc. Petition for Reconsideration, filed June 2, 2014., Motorola Solutions, Inc. Petition for Reconsideration, filed on June 2, 2014, Wireless Internet Service Provider Association, ET AL. filed on June 2, 2015. Association of Global Automakers, Inc. Petition for Reconsideration, filed on May 1, 2014.

² See *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5GHZ Band, First Report and Order*, ET Docket 13-49, 29 FCC Rcd 4127 (2014) (*First R&O*).

³ U-NII devices are unlicensed intentional radiators that operate in the frequency bands 5.15-5.35 GHz and 5.47-5.825 GHz, and which use wideband digital modulation techniques to provide a wide array of high data rate mobile and fixed communications for individuals, businesses, and institutions. See 47 C.F.R. § 15.403(s).

II. BACKGROUND

2. On April 1, 2014, the Commission released the *First R&O* in this proceeding to enhance the utility of the 5.15-5.25 GHz (U-NII-1) band by removing the indoor-only restriction and increasing the maximum output power limit from 50 mW to 1W for access points and to 250 mW for client devices. It also extended the upper edge of the 5.725-5.825 GHz (U-NII-3) band to 5.85 GHz and consolidated the provisions applicable to digitally modulated devices from Section 15.247 of the rules with the U-NII-3 rules in Section 15.407 so that all of the digitally modulated devices operating in the U-NII-3 band will operate under a consistent set of rules and be subject to the new device security requirements.⁴ Notably, these consolidated rules contained the more stringent out-of-band emissions limit that was formerly applicable only to U-NII-3 devices. These consolidated rules were adopted in order to protect the Federal Aviation Administration's (FAA's) Terminal Doppler Weather Radar (TDWR) and other radar facilities from interference.⁵

3. To facilitate the transition to the new technical requirements, the Commission adopted transition provisions which are outlined in Section 15.37(h).⁶ These provisions require that the marketing, sale and importation into the United States of digitally modulated and hybrid devices designed to operate in the 5.725-5.85 GHz band and certified under the old Section 15.247 rules must cease by June 2, 2016. As an intermediate measure, they provide that after June 2, 2015, digitally modulated devices and the digital modulation portion of hybrid devices designed to operate in the 5.725-5.85 GHz band must meet the new Section 15.407 U-NII-3 rules to be FCC certified. The Commission has subsequently extended the certification cut-off to March 2, 2016.⁷

4. In response to the *First R&O*, several parties filed petitions for reconsideration. EchoStar's petition asked the Commission to clarify that set-top boxes that serve as client devices may operate in the U-NII-1 band at the 1 Watt maximum power level allowed for indoor access points. Cambium Networks, Ltd. (Cambium), JAB Wireless, Inc. (JAB), Mimosa Networks Inc. (Mimosa), and The Wireless Internet Service Providers Association (WISPA) asked the Commission to reconsider the more restrictive out-of-band emissions (OOBE) limit for the U-NII-3 band adopted in the *First R&O*. Mimosa and Cambium requested that the OOBE limits be modified for the U-NII-1 band as well. Motorola Solutions, Inc. (Motorola) asked that the Commission reconsider its requirement that the manufacture, marketing, sale and importation into the United States of digitally modulated and hybrid devices certified under Section 15.247 operating in the 5.725-5.850 GHz band cease two years after the effective date of the *First R&O*. The Association of Global Automakers, Inc. (Global) requested that the Commission suspend its decision to allow unlicensed U-NII devices to operate in the 5 GHz band adjacent to the band used for Intelligent Transportation Systems (ITS) utilizing the 5.850-5.925 GHz band.

5. Subsequent to the filing deadlines for petitions for reconsideration, multiple *ex parte* presentations have been submitted by various parties or groups of parties proposing alternatives to the current OOBE requirements. Two hundred and twelve parties filed comments in response to the petitions

⁴ See *First R&O*, 29 FCC Rcd 4127 at 1. See also, 47 C.F.R. Part 15 Subpart E—Unlicensed National Information Infrastructure Devices. See also, 47 C.F.R. § 15.247.

⁵ This interference was occurring despite the Commission's rules that require U-NII devices operating in this band to incorporate an interference mitigation technique called dynamic frequency selection (DFS). DFS is a mechanism that detects the presence of radar signals and dynamically guides a transmitter to switch to another channel whenever a conflict with an active radar is detected.

⁶ 47 C.F.R. §15.37(h).

⁷ See *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5GHz Band, Order*, ET Docket 13-49, 30 FCC Rcd 6572 (2015) (*First Extension Order*). See also, *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5GHz Band, Order*, ET Docket 13-49, 30 FCC Rcd 13986 (2015) (*Second Extension Order*).

generally supporting the arguments opposing the new limits. A list of commenters is available in Appendix B.

III. DISCUSSION

A. U-NII-3 Band Proposals for Changes to the *First R&O*

6. *Background.* In early 2009, the FAA reported harmful interference to TDWRs that operate within the 5.6-5.65 GHz band. Extensive interference investigations by the National Telecommunications and Information Administration (NTIA), FAA and FCC determined that many of the interference complaints could be traced to devices that had been certified for operation in the U-NII-3 band, either as U-NII devices under Section 15.407 of our rules, or as digitally modulated intentional radiators under Section 15.247 of our rules, and had been illegally modified and operated at high power levels in elevated locations.⁸ In some cases, the differences in these rules led to the situation where devices authorized under Section 15.247 that do not include DFS were modified to operate on frequencies permitted only for U-NII devices that require DFS, resulting in interference to TDWRs. NTIA's Institute for Telecommunications Sciences (ITS), the FAA, the FCC's Enforcement Bureau and Office of Engineering and Technology, and industry participants analyzed the interference reports.⁹ Most of these interference cases were determined to have not been caused by U-NII devices certified for operation in the U-NII-2C (5.47-5.725 GHz) band, which includes the 5.6-5.65 GHz band used by the TDWRs. Instead, the majority of these devices had been certified for operation as digitally modulated intentional radiators under Section 15.247 of our rules, and had been illegally modified and operated at high power levels in elevated locations without incorporating DFS. The Air Force reported that it has experienced interference to 5 GHz radar systems used on Department of Defense facilities.¹⁰

7. Prior to adoption of the *First R&O*, the FCC's rules permitted the certification of devices that operate in the 5.725-5.85 GHz band under two different rule sections (*i.e.* Section 15.247 and Section 15.407). In the *First R&O*, the Commission adopted a consolidated set of rules for the 5.725-5.85 GHz band devices under the Section 15.407 U-NII rules to resolve interference issues.¹¹ These new rules also implemented a requirement for manufacturers to ensure that their devices could not be easily modified to operate beyond the parameters for which the device was certified. In some instances, and especially for devices that operate in point-to-point configurations with high gain antennas, the old Section 15.247 OOB limits were as much as 47 dB more permissive than the Section 15.407 OOB limits and, therefore devices certified under the old limits were significantly more likely to create harmful interference to other operations.

⁸ See NTIA Technical Report TR-11-473, *Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part I* (Nov. 2010), available at <http://www.its.bldrdoc.gov/publications/2548.aspx> (NTIA Case Study Part I); NTIA Technical Report TR-11-479, *Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part II* (July 2011), available at <http://www.its.bldrdoc.gov/publications/2554.aspx> (NTIA Case Study Part II); and NTIA Technical Report TR-12-486, *Case Study: Investigation of Interference into 5 GHz Weather Radars from Unlicensed National Information Infrastructure Devices, Part III* (June 2012), available at <http://www.its.bldrdoc.gov/publications/2677.aspx> (NTIA Case Study Part III).

⁹ See Federal Communications Commission, Public Notice, FCC Enforcement Action, *Enforcement Bureau Takes Action to Prevent Interference to FAA-Operated Terminal Doppler Weather Radars Critical to Flight Safety*, DA-12-459 (Sept. 27, 2012) Enforcement Advisory No. 2012-07.

¹⁰ See Federal Communications Commission, Letter, *5 GHz Interference to Patrick Air Force Base*, (March 10, 2015) available at <https://www.fcc.gov/general/u-nii-and-tdwr-interference-enforcement>.

¹¹ These two rules sections, 15.247 and 15.407, were not consistent in the frequency band permitted and the out-of-band emission (OOBE) limits.

8. In the *First R&O*, the Commission recognized that point-to-point systems utilizing high gain transmit antennas certified under the old Section 15.247 requirement may have to be modified to comply with the lower out-of-band emissions limit required for operation under Section 15.407.¹² The Commission stated that manufacturers had the flexibility to determine how they should meet the lower out-of-band emissions limits, whether by reducing output power, decreasing the transmit antenna gain, or utilizing improved bandpass filters.

9. In response to the *First R&O*, the Commission received several petitions for reconsideration of its decision.¹³ Petitioners, mainly manufacturers and operators of high gain point-to-point communication systems, provided various reasons why the Commission's decision to impose more restrictive OOB limits for devices in the U-NII-3 band should either be reversed or modified. In particular, these parties express concerns regarding increased equipment costs, sustainability of existing service, and diminished performance of devices in the band.¹⁴ The petitioners state that the limits adopted in the *First R&O* will prevent remote communities from receiving access to critical services and will render required upgrades costly and unobtainable.¹⁵

10. Numerous comments were filed in general support of the petitions requesting modification of the new OOB limits.¹⁶ Only Cisco agreed with the Commission's stricter new OOB limits, stating that more stringent limits on unwanted emissions ultimately would benefit all users of the 5 GHz band, and that the Commission had provided ample time for WISPs to adjust to the same emissions limits that the U-NII community had been meeting for years.¹⁷ Subsequent to the closing of the comment period, several new proposals were submitted into the record that warrant particular mention.

11. *Consensus Certification Proposal*. On March 31, 2015, a group of industry stakeholders,¹⁸ submitted an *ex parte* filing that proposed multiple certification requirements for point-to-point equipment intended to reduce the probability of harmful interference while minimizing burdens on manufacturers and users (the Consensus Certification Proposal).¹⁹ In particular, the Consensus Certification Proposal would require users to verify that a device's location and transmission direction would not cause interference with TDWRs while allowing equipment that supports DFS in the U-NII-2C band to automatically allow increased emissions from the U-NII-3 band in frequency ranges where no radars are detected.²⁰ The Consensus Certification Proposal also would create a 5 km radius exclusion

¹² See *First R&O*, 29 FCC Rcd 4127 at 4158-4160.

¹³ See, Cambium Networks, Ltd. Petition for Reconsideration (Cambium Petition), filed June 2, 2014, JAB Wireless, Inc. Petition for Reconsideration (JAB Petition), filed June 2, 2014, Mimosa Networks, Inc. Petition for Reconsideration (Mimosa Petition), filed June 2, 2014, Wireless Internet Service Provider Association, ET AL., Petition for Reconsideration (WISPA Petition), filed on June 2, 2015.

¹⁴ See, Cambium Petition at 3-8, Mimosa Petition at 1-2, WISPA Petition at 1, and JAB Petition at 1-3.

¹⁵ See Cambium Petition, JAB Petition, Mimosa Petition, and WISPA Petition.

¹⁶ See, e.g., Comments of FreeWave Technologies, Inc. in Support of Petitions for Reconsideration, filed August 14, 2014; Comments of the Fixed Wireless Communications Coalition, filed August 14, 2014; Comments of the Utilities Telecom Council, filed August 14, 2014; Comments of Interisle Consulting Group Regarding the WISPA and MIMOSA Networks Petitions for Partial Reconsideration, file July 15, 2014.

¹⁷ See Cisco Systems, Inc., Reply to Petition for Reconsideration (Cisco Reply), filed August 14, 2014 at 3-5.

¹⁸ The industry stakeholders submitting the "Consensus Certification Proposal" include Alcatel-Lucent, American Petroleum Institute, Cambium Networks, Inc., Fastback Networks, JAB Wireless, Inc., Mimosa Networks, Inc., Zebra Technologies(formerly Motorola Solutions), and the WISPA.

¹⁹ See Wireless Internet Service Providers Association, et al., March 31, 2015 *ex parte* filing in ET Docket 13-49 (Consensus Certification Proposal).

²⁰ *Id.*

zone around each TDWR and would prohibit the peak of a transmitter's antenna beam from intersecting with such exclusion zones.

12. *Ubiquiti Proposal.* On July 02, 2015, Ubiquiti submitted an *ex parte* proposal that contained three alternatives to the Commission's OOB limits for the U-NII-3 band.²¹ Discussions with the FCC staff focused primarily on Ubiquiti's third alternative. The third alternative proposed that, for transmitters operating in the 5.725-5.85 GHz band, all out-of-band emissions be limited to a level of -27 dBm/MHz at 75 MHz beyond the band edge, increasing linearly to 10 dBm/MHz at 25 MHz beyond the band edge, and from 25 MHz beyond the band edge, increasing linearly to a level of 17 dBm/MHz at the band edge.²²

13. *Joint Emissions Proposal.* On November 4, 2015, a group of stakeholders, consisting of many of the same parties that submitted the Consensus Certification Proposal, filed a joint proposal presenting another alternative to the Commission's OOB limits (the Joint Emissions Proposal).²³ The Joint Emissions Proposal closely resembled the Ubiquiti proposal, but would provide further relief from the OOB limits in the 5 MHz closest to the band edge by allowing emissions to increase linearly to a maximum level of 27 dBm/MHz. The proposed emission mask combining both the Ubiquiti and Joint Emissions Proposal can be seen in Figure 1 below.

14. *Broadcom Proposal.* Finally, on January 27, 2016, Broadcom Corporation, submitted an *ex parte* proposal presenting yet another alternative to the OOB limits.²⁴ The Broadcom proposal mimics the Ubiquiti and the Joint emissions proposal, but would roll off emissions to -17 dBm/MHz at 75 MHz beyond the band edge. Broadcom believes the change is necessary because of an artifact that occurs outside of the in-band wanted emissions in certain of their current model chips. These spurious emissions are unintentional artifacts in the design of their current chipsets and did not create a compliance issue until the UNII rules were modified in 2014. Broadcom asserts that the mask can be modified to accommodate their circumstance while continuing to provide the same level of interference protection to TDWRs.

²¹ See Ubiquiti Networks, Inc. Notice of *ex parte*, filed July 2, 2015.

²² *Id.* at 15-16.(Labeled Alternative 3).

²³ See Wireless Internet Service Providers Association, et al., November 4, 2015 *ex parte* filing in ET Docket 13-49. Parties for the final agreement included Alcatel-Lucent, Cambium Networks, Ltd., Fastback Networks, JAB Wireless, Mimosa Networks, Ubiquiti Networks, Inc., Zebra Technologies, and WISPA. Notably, this group included all petitioners that asked the Commission to reconsider its decision regarding OOB from U-NII-3 devices.

²⁴ See Broadcom Corporation Notice of *ex parte*, filed January 27, 2016.

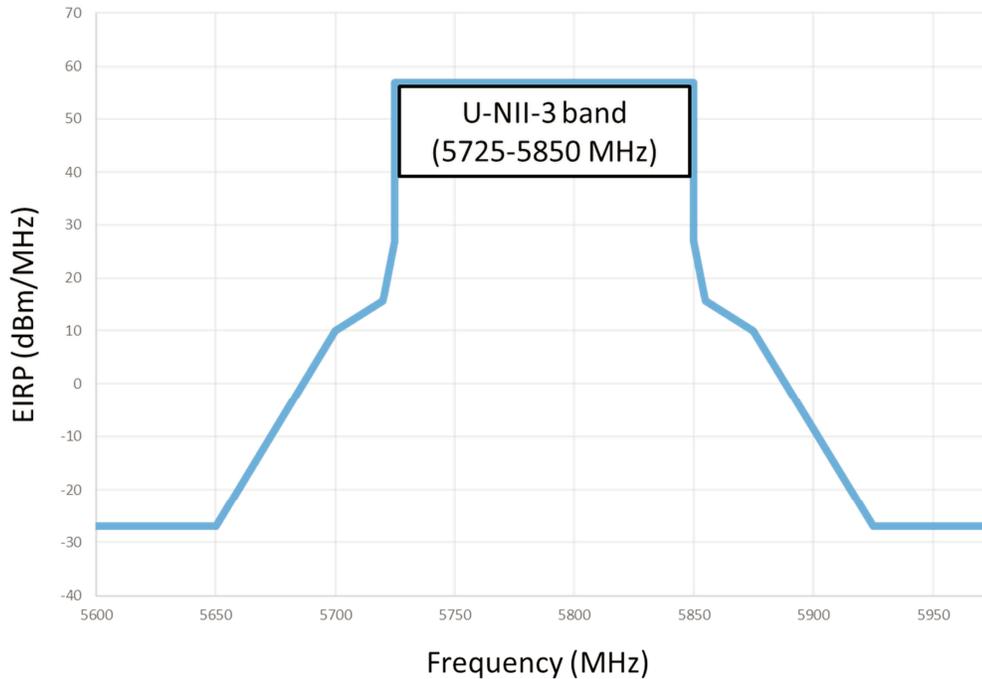


Figure 1. Proposed emission mask

15. *Decision.* After evaluating the available options, we believe that the Joint Emissions Proposal best addresses the need for amended rules in the U-NII-3 band. We recognize that, without further accommodation, point-to-point systems that utilize high gain transmit antennas with full permissible output power may not readily be able to comply with the OOB limit adopted in the *First R&O*. Based on the record, in order for today's systems to suppress emissions to the degree required by the existing OOB limits, they would require prohibitively expensive equipment modifications which would add an undue amount of weight to the devices.²⁵ We believe that the rules we are adopting here will allow point-to-point systems to operate, while avoiding harmful out of band interference, without excessive difficulty or cost. Unlike the Consensus Certification Proposal, which would apply different OOB requirements based on a variety of situations, including the location of each installation relative to TDWRs, the approach adopted here will provide a single, consistent OOB requirement for all equipment. Also unlike the Consensus Certification Proposal, our chosen approach will also avoid the need for onerous oversight by the Commission and we expect that it will, ultimately, better protect TDWRs against harmful interference because it is simpler to administer and enforce at the certification level. We do not believe that Broadcom's difficulty in meeting the new limits for its current product is sufficient reason to further relax the OOB limits. Instead, as discussed further below, we provide relief to all manufacturers by allowing some extra time to certify and to bring newly compliant devices into the marketplace.

16. As demonstrated in Ubiquiti's *ex parte* presentation, the proposed emission limits closely reflect the emissions mask seen in devices that are currently being sold, and thus the manufacturers may have a reduced need to undergo extensive redesigns to their equipment.²⁶ Additionally, this revision should provide relief for WISPS and operators of long range point-to-point U-NII-3 equipment by reducing the need to redesign their networks because manufacturers will be able to use the rules adopted herein to design equipment that achieves link distances comparable to what they were able to achieve

²⁵ See Mimosa Networks, Inc. Petition for Reconsideration, filed June 2, 2014.

²⁶ See Ubiquiti Networks, Inc. Notice of *ex parte*, filed July 2, 2015.

with the old rules.²⁷ We therefore add new language for Section 15.407 (b)(4) that would provide relief from the OOB limits adopted in the *First R&O* by permitting emissions to roll off linearly from 27 dBm/MHz at the band edge to a level of 15.6 dBm/MHz at 5 MHz from the band edge, then decreasing linearly to 10 dBm / MHz at 25 MHz from the band edge and continue to decrease linearly to a level of -27 dBm / MHz at all frequencies more than 75 MHz from band edge. We adopt additional provisions in the first 5 MHz outside of the band edge because manufacturers have sufficiently demonstrated their inability to suppress their emissions to meet the Ubiquiti Proposal mask within this region. This approach will offer the needed relief to manufacturers, but will still provide a level of interference protection to adjacent band services that is greater than that provided in Section 15.247. This approach offers relief for users and manufacturers by relaxing the OOB roll-off requirement outside of the TDWR band while maintaining the same level of interference protection within the TDWR band as specified under the rules the Commission adopted in the *First R&O*. We appreciate the work of the industry, and are adopting the proposed emission mask outlined in the Joint Emissions Proposal.

B. Association of Global Automakers Petition

17. *Background.* Dedicated Short Range Communications (DSRC) Systems are designed to operate under the FCC provisions for the Intelligent Transportation Systems (ITS) radio service. The Commission has allocated 75 megahertz of spectrum in the 5.85-5.925 GHz band to ITS.²⁸ As explained above, prior to the adoption of the *First R&O*, unlicensed devices were permitted in the adjacent 5.725-5.85 GHz band under two different rule Sections, 15.247 and 15.407, and the differences in these rules led to devices authorized under Section 15.247 causing harmful interference to TDWRs.²⁹ The Commission, in the *First R&O*, consolidated the rules for devices operating in the 5.725-5.85 GHz band and imposed the more stringent Section 15.407 OOB limits, which provide more protection from interference to adjacent band incumbent spectrum users.³⁰

18. In its petition for reconsideration, the Association of Global Automakers, Inc. (Global) requests that the Commission suspend or reverse key decisions made in the *First R&O* based on the claim that it failed to explain how its decision to allow additional, higher-powered, unlicensed U-NII devices to operate in the 5 GHz band would not cause harmful interference to previously-authorized DSRC operations. It claims that substantial evidence suggests that harmful interference will likely result to DSRC operations from expanded “high power Wi-Fi” operations in the 5 GHz band, absent affirmative steps from the FCC to guard against that harmful interference. Global further states that, on reconsideration, the FCC should explain what steps the agency will take to protect DSRC operations against that harmful interference.³¹

19. Global states that the Commission should adopt procedures that will swiftly and effectively resolve any harmful interference that may subsequently occur to DSRC from U-NII devices once they are deployed.³² It also states that if the FCC expects that there will be some level of interference between these adjacent-band operations, the FCC should clarify what level of interference

²⁷ *Id.* at 20.

²⁸ See Amendment of Parts 2 and 90 of the Commission’s Rules to Allocate the 5.850-5925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services, ET Docket No. 98-95, *Report and Order*, 14 FCC Rcd 18221 (1999) ([FCC 99-305](#)).

²⁹ See *supra* note 5 and 11. See also, 47 C.F.R. Part 15 Subpart E—Unlicensed National Information Infrastructure Devices. See also, 47 C.F.R. § 15.247. See also, 47 C.F.R. § 15.407.

³⁰ See *First R&O*, 29 FCC Rcd 4151-4160.

³¹ See Association of Global Automakers, Inc. Petition for Reconsideration, filed on May 1, 2014 at iii – iv.

³² *Id.* at 2-3.

will be acceptable and what course of action will be available to DSRC operators to protect their networks from unacceptable levels of interference.³³

20. *Comments.* The majority of parties that responded to Global's petition were opposed to reversing the decisions that the Commission made in the *First R&O* regarding the U-NII-3 band.³⁴ For example, FWCC states that Global overlooks the fact that that Section 15.247 has been used to authorize unlicensed operations over the entire 5.725-5.85 GHz band, including those frequency bands adjacent to what is now DSRC, since 1985.³⁵ Similarly, the TIA believes the Commission has not undermined any legitimate expectation of the automakers because when the Commission first allocated the 5850-5925 MHz band to DSRC in 1999 it explicitly recognized that ISM and unlicensed Part 15 operations were permitted in the band up to 5875 MHz.³⁶

21. Cisco, the National Cable & Telecommunications Association (NCTA), and the Wi-Fi Alliance assert that the new rule adopted by the *First R&O* better protects DSRC systems than the rule that preceded it.³⁷ They maintain that the Commission should not reverse the decision because the more stringent limits associated with the new rule will serve to provide additional protection from unlicensed (e.g., Wi-Fi) OOB to DSRC receivers and operations. They observe that this finding is consistent with the record, and should not be reversed on reconsideration.³⁸ They note that the new limit was put in place to protect primary users of the spectrum from harmful interference.³⁹

22. In reply, Global claims, that as few as three outdoor U-NII devices could cause serious, harmful interference to nearby DSRC operations, effectively disabling a car's DSRC-based safety systems.⁴⁰ They further claim that concentrated U-NII devices can impede and degrade messages transmitted on adjacent networks when operating with the low latency necessary to protect drivers from vehicular accidents and, as such, the interference risk posed by U-NII devices represents a serious threat.⁴¹

23. *Decision.* We reject Global's Request and decline to reverse or suspend our decision to consolidate the rules for unlicensed devices operating in the 5.725-5.85 GHz band under one rule section. We find that DSRC systems will receive greater interference protection under the emission mask adopted in this MO&O than was provided under the old rules. In the *First R&O* we explained that higher powered operations in the 5.725- 5.85 GHz band are already permitted to operate under Section 15.247.⁴² We also explained that adopting more stringent limits for the newly modified Section 15.407 rules would

³³ *Id.*

³⁴ See Cisco Comments, WISPA Comments, Fixed Wireless Communications Coalition Comments, Information Technology Industry Council Comments, Wi-Fi Alliance, Telecommunications Industry Association (TIA) Comments, National Cable & Telecommunications Association Comments.

³⁵ See Fixed Wireless Communications Coalition (FWCC) Comments at 8, filed in ET-Docket 13-49.

³⁶ See Telecommunications Industry Association, Opposition to Petition for Reconsideration, filed on August 14, 2014 at 3-4.

³⁷ See Wi-Fi Alliance, Comment, filed on August 14, 2014, Cisco Systems, Inc. Reply to Petition for Reconsideration, filed on August 14, 2014, National Cable & Telecommunications Association, Opposition to Petition for Reconsideration, filed on August 14, 2014.

³⁸ See Cisco Systems, Inc. Reply to Petition for Reconsideration, filed on August 14, 2014.

³⁹ *Id.* at 15-16. See, National Cable & Telecommunications Association, Opposition to Petition for Reconsideration, filed on August 14, 2014, at 5. See, Wi-Fi Alliance, Comment, filed on August 14, 2014, at 4.

⁴⁰ See Association of Global Automakers, Reply to Opposition to Petition for Reconsideration, filed on September 2, 2014.

⁴¹ *Id.* at 9.

⁴² See *First R&O*, 29 FCC Rcd 4127.

reduce the OOB from each U-NII-3 device and, in turn, should reduce the aggregate emissions from these devices.⁴³ Therefore, the decisions made in the *First R&O* with respect to U-NII-3 did not result in an expansion of use but, instead, provided increased protection for systems operating in the adjacent bands, such as DSRC systems and TDWRs. Even with the slight relaxation of the U-NII-3 OOB limit that we are adopting in this MO&O, as described above, the allowed emissions from U-NII devices into the DSRC band will still be held to a lower limit than what was permitted by Section 15.247 prior to the adoption of the *First R&O*.⁴⁴ This in turn will result in less potential interference to ITS operating in the adjacent band because the per device and aggregate emissions in the band will be reduced. Additionally, we believe the additional level of protection afforded to DSRC systems is sufficient because unlike the TDWR, the DSRC systems were not experiencing interference problems previously. Given that the new rules increase protections for the ITS systems, we don't consider additional protections from adjacent band signals to be necessary.

C. EchoStar Proposal

24. *Background.* Prior to adoption of the *First R&O*, the U-NII-1 band had a very low peak transmitter conducted output power limit of 50 mW, and U-NII operations were restricted to indoor only operations. In the *First R&O*, the Commission adopted rules to remove the indoor-only restriction and increase the permitted power for these devices in order to increase the utility of the U-NII-1 band and to accommodate the next generation of Wi-Fi technology. Specifically, under the new rules all client devices in the U-NII-1 band may now operate at conducted power levels up to 250 mW without distinction as to whether devices are located indoors or outdoors.⁴⁵ The new rules permit Access Points to operate in the U-NII-1 band at conducted power levels up to 1 Watt if they use antennas that limit gain in the upward direction, or if they are located indoors. Client devices are permitted to operate in the U-NII-1 band without limiting the antenna gain in the vertical direction because they typically represent mobile or portable devices,⁴⁶ such as handsets, laptops, and tablets. These devices are not typically installed in permanent outdoor locations, and due to their mobile nature the antenna gain in any particular direction cannot be guaranteed. Finally, many client devices incorporate power control features that encourage the device to use as little power as necessary to establish and maintain the communications link. In consideration of all of these factors, the Commission anticipated a negligible interference potential associated with client devices that operate as described and, as a result, determined that the antenna requirements described above for access points were not necessary for client devices.⁴⁷

25. EchoStar (ETC) argues that the *First R&O* is unclear regarding the power limit applicable to its set-top boxes that serve as client devices for indoor wireless access points and operate in the U-NII-1 band (5.15-5.25 GHz). ETC further asks the Commission to permit such set-top boxes to operate at the maximum power level afforded under new Section 15.407(a)(1)(ii) (*i.e.*, 1 Watt).⁴⁸ ETC states that it has integrated Wi-Fi technologies into its set-top boxes and systems to facilitate the distribution of programming within a customer location, at faster speeds than those achievable via in-home cable connections.⁴⁹ By including an access point as part of the customer's installation, the system effectively creates a private 802.11 Wi-Fi network in the home. ETC claims that it is essential that they

⁴³ *Id.* at Rcd 4151-4160.

⁴⁴ See Cisco Systems, Inc. Reply to Petition for Reconsideration, filed on August 14, 2014.

⁴⁵ *First R&O*, 29 FCC Rcd at 4142, para. 45.

⁴⁶ See 47 C.F.R. §2.1091 and §2.1093.

⁴⁷ See *First R&O*, 29 FCC Rcd at 4142.

⁴⁸ See EchoStar Technologies L.L.C. Petition for Reconsideration, filed on June 2, 2014.

⁴⁹ *Id.* at 1-2.

be permitted to operate at the same maximum power levels that Part 15 affords to facilitate access points and other indoor devices that operate in an entirely stationary mode.⁵⁰

26. ETC states in its petition that while these devices are not usually attached to anything physically, the box can only operate while sitting still and, generally cannot be moved throughout the home without risking a degradation or loss of video service. As such, the box is functionally identical to an indoor access point, and therefore, the interference considerations are the same for both. Thus, ETC claims there is no reason not to permit both types of devices from transmitting at a maximum power level of 1 Watt when operating in the U-NII-1 band.⁵¹

27. Cisco, TIA, and NCTA submit comments in support of ETC's petition and assert that the *First R&O* is not clear regarding devices that rely on AC power such as Wi-Fi equipped television sets, set-top boxes, and other devices that are used in a "fixed" indoor location. They agree that such devices can operate without risk of interference at the higher power levels. Therefore, they advise that the Commission clarify the *First R&O* and modify Section 15.407 to carve out a new provision that would permit all fixed indoor devices, including those that operate as client devices, to operate at the maximum power level of 1 Watt⁵²

28. *Decision.* As an initial matter, we clarify that the Commission in the *First R&O* adopted a power limit of 250 mW for all client devices, regardless of whether they are fixed, mobile, or portable. While the Commission noted that client devices are "typically mobile or portable," it also made clear that the new 250 mW power limit applies to "any client device which operates under control of an access point."⁵³ To avoid further confusion, we modify Section 15.407(a)(1)(iv) by deleting the words "mobile and portable".⁵⁴

29. In response to ETC's recommendation to adopt rules that allow U-NII-1 band indoor set-top boxes or any other type of client devices to operate at 1 Watt, the same power levels as U-NII-1 band access points, we decline to do so. As a point of clarification, we have allowed set-top boxes that serve as access points to operate up to 1 Watt based on the rationale that access points generally remain in one location. However, we have treated client devices as subject to the 250 mW limit because it is generally more difficult to control the location and use of these devices (i.e. client devices can be used outdoors). Some commenters have suggested that a possible point of distinction between fixed and mobile client devices could be the need for AC power. We note, however, that many mobile devices can operate from AC power as an alternative to battery power. While, we understand from Echostar's petition that their particular set-top box is not designed to be moved throughout the home, we are not convinced that this can be ensured on a general basis for all "fixed" client devices. Furthermore, we do not know of a reliable way to determine whether or not a client device will be positioned indoors or outdoors.

30. It is unclear from Echostar's petition that its set top box qualifies as an access point and therefore would be permitted to operate at 1 W. This will depend on the specific characteristics of the device as presented through the equipment authorization process. Echostar and any other entity can, therefore, seek approval, at the time it files for equipment authorization, for a set-top box or other such device to operate up to 1 Watt by making a showing that it serves as an access point. However, we are

⁵⁰ *Id.* at 2.

⁵¹ *Id.* at 3.

⁵² See Cisco Systems, Inc. Reply to Petition for Reconsideration, filed on August 14, 2014 at 17. See also National Cable and Telecommunications, Opposition to Petition for Reconsideration, filed on August 14, 2014 at 11. See also Telecommunications Industry Association, Opposition to Petition for Reconsideration, filed on August 14, 2014 at 7.

⁵³ *First R&O*, 29 FCC Rcd at 4142, para. 45. See also ETC Petition at 3 (observing that the *First R&O* could be read as establishing a 250 mW for all client devices operating in the U-NII-1 band).

⁵⁴ See 47 C.F.R. § 15.407(a)(1)(iv).

not convinced of the need to increase the in-band power levels for set-top boxes. We note that, if consumers desire to increase the range between the access point and the set-top boxes, repeaters are widely available at commercially reasonable prices for this purpose. We conclude that 250 mW is adequate for most client device installations. For the aforementioned reasons, we will continue to limit client devices, in the U-NII-1 band to operating at conducted power levels up to 250 mW with a maximum PSD level of 11dBm/MHz using a transmit antenna with a maximum gain of 6 dBi. We continue to impose this limit on client devices, and without distinction as to whether devices are located indoors or outdoors.

D. Proposals to Increase OOB in Restricted Bands 5.091-5.15 GHz

31. Section 15.205 identifies a number of restricted bands in which low power, non-licensed transmitters are not allowed to place any portion of their fundamental emission because of potential interference to sensitive radio communications such as commercial aviation communications and navigation, radio astronomy, search and rescue operations, and other critical government radio services.⁵⁵ Additionally, unwanted emissions from non-licensed transmitters that fall into restricted bands must comply with the general radiated emission limits in Section 15.209.⁵⁶ We note that the 5.091-5.15 GHz band falls within the larger 4.5-5.15 GHz restricted band, as specified in Section 15.205(a).⁵⁷

32. In order to support additional aviation communication needs for applications with high data throughput, the Commission recently allocated the 5.091-5.15 GHz band to the Aeronautical Mobile Service (AMS) on a primary basis for Federal and non-Federal use.⁵⁸ The Commission also expressly permitted aeronautical fixed communications, as an integral part of the AeroMACS system, to be authorized on a primary basis for Federal and non-Federal use.⁵⁹ These fixed applications would be part of a larger system of surface applications at airports. The Commission also permitted use of the 5.091-5.15 GHz band for Aeronautical Mobile Telemetry (AMT),⁶⁰ restricted to 52 designated flight test areas and allowed additional locations to be authorized for flight testing on a case-by-case basis.⁶¹ We also note that the allocation for the FSS in the band is limited to feeder links for non-geostationary orbit (NGSO) satellite systems in the Mobile Satellite Service (MSS).⁶² The only MSS operator in the United States using this band, Globalstar, connects its satellites to the phone network and Internet through a terrestrial network of gateways that use the 5096-5250 MHz band for uplink communications.⁶³

⁵⁵ See 47 C.F.R. § 15.205.

⁵⁶ See 47 C.F.R. § 15.209.

⁵⁷ See 47 C.F.R. § 15.205(a).

⁵⁸ See *Amendments of Parts 2, 15, 80, 90, 97 and 101 of the Commission's Rules Regarding Implementation of Final Acts of the World Radiocommunication Conference (Geneva, 2007)(WRC-07), Other Allocation Issues, and Related Rule Update, Report and Order, Order, and Notice of proposed Rulemaking*, ET Docket 15-99, 30 FCC Rcd 4183 (2015) (*WRC-07 R&O*) at Rcd 4205. See also, footnote 138 in the same document.

⁵⁹ *Id.* at 4209.

⁶⁰ AMT is a mobile service for the flight testing of aircraft in which an aircraft station transmits the results of measurements made onboard an aircraft, including those related to the functioning of the aircraft. We note that the term AeroMACS refers to the emerging wireless communications networks in the 5091-5150 MHz band which operates in the airport surface domain.

⁶¹ See *WRC-07 R&O* at Rcd 4209.

⁶² The mobile-satellite service (MSS) is a radio communication service: 1) Between mobile earth stations and one or more space stations, or between space stations used by this service; or 2) Between mobile earth stations by means of one or more space stations. The MSS may also include feeder links necessary for its operation. 47 C.F.R. § 2.1(c).

⁶³ See *Globalstar Licensee LLC Application for Modification of Non-geostationary Mobile Satellite Service Space Station License, Order*, 26 FCC Rcd 3948 (Int'l Bur., 2011). Globalstar is currently licensed to operate 4 gateway stations in the United States.

33. The proposal filed by WISPA et al. on March 23, 2015, supports relaxing the section 15.205 provisions between 5.091 GHz and 5.15 GHz by 1dB for every dB that the antenna gain exceeds 6 dBi provided that the antenna is oriented at 30 degrees or less above the horizon.⁶⁴ Agreeing with the WISPA et al. proposal, Fastback similarly proposes to change the restricted band at 4.5-5.15 GHz to end at 5.091 GHz, thus allowing higher out of band emissions (up to -17 dBm/MHz) from U-NII-1 devices into the 5.091-5.15 GHz portion.⁶⁵ It further states that adopting its proposed recommendations would enable an increase in EIRP for U-NII-1 point-to-point links, corresponding to an increased communication range of two hundred and fifty percent.⁶⁶

34. *Decision.* We decline to adopt the WISPA et al. or the Fastback proposal to increase the allowable emissions from U-NII band devices into the restricted band below 5.15 GHz. The restricted bands were created to protect radio communications services that are sensitive to interference and that provide critical benefits to public safety and national security.⁶⁷ WISPA and Fastback have not offered any analysis showing that increasing the emissions limit in this restricted band would not create an unacceptable risk of interference in the restricted band. Moreover, to the extent that WISPA and Fastback make their proposals in order to increase the utilization of the U-NII-1 band, we observe that the Commission has already adopted rule revisions for this purpose, by removing the restriction to indoor operation and increasing the permitted power level for U-NII-1 devices. We recognize that the emission limits into the adjacent restricted band from U-NII-1 devices may not provide all of the benefits that some equipment suppliers desire, and that some equipment manufacturers may find that they need to reduce power below the level permitted under the rules in order to achieve compliance with the OOB limit below 5.15 GHz. However, the removal of the indoor restriction and the increase in power permitted in the 5.15 – 5.25 GHz band provide greater opportunities than were available before. Other parts of the 5 GHz band can accommodate higher powered operation where it may not be possible to achieve the desired power level and compliance with the OOB limit at 5.15 – 5.25 GHz.

E. Proposals to Extend the Transition Period

35. *Background.* In the *First R&O*, the Commission adopted rules requiring that 12 months after the effective date of this *First R&O*, applications for certification of 5 GHz devices must meet the new and modified rules (June 2, 2015). Additionally, the manufacture, marketing, sale and importation into the United States of devices that did not meet the new or modified rules must cease two years after the effective date of the rules adopted in the *First R&O* (June 2, 2016). While the Commission was sympathetic to the arguments of commenters that the more restrictive unwanted emission limits for digital modulation devices may present design challenges for some manufacturers, the Commission ultimately found that it was in the public interest to implement the changes as soon as possible to eliminate the potential of harmful interference to TDWRs.

36. Motorola Solutions, Inc. (MSI) asked that the Commission reconsider its requirement that the manufacture, marketing, sale and importation into the United States of digitally modulated and hybrid devices certified under Section 15.247 operating in the 5.725- 5.850 GHz U-NII-3 band cease two years after the effective date of the *First R&O*.⁶⁸ MSI estimates that almost all of its nearly 200 enterprise WLAN products and access points will require reengineering to comply with the more stringent OOB

⁶⁴ See Wireless Internet Service Providers Association et al., Letter, filed on March 23, 2015.

⁶⁵ See Fastback Networks, Inc. Notice of *ex parte*, filed on September 25, 2015.

⁶⁶ *Id.* at 7.

⁶⁷ See *Revision of Part 15 of the Commission's Rules Regarding the Operation of Radio Frequency Devices Without an Individual License, First Report and Order*, GEN Docket 87-389, 4 FCC Rcd 3493 (1989). The Commission concluded that frequency bands allocated for services involving safety-of-life or for services that are required by the nature of their operation to use signals received at very low received levels should be designated as restricted bands.

⁶⁸ See Motorola Solutions, Inc. Petition for Reconsideration, filed on June 2, 2014.

requirements and believes this undertaking cannot be completed in two years.⁶⁹ MSI recommends a five-year transition, but they believe it is unnecessary and arbitrary to impose any time limit on the continued sale of pre-approved devices, as the new certification obligations adopted by the Commission will facilitate a prompt transition on their own.⁷⁰ Similarly, Cambium requests that the one-year and two-year deadlines be extended to three years for equipment not yet certified and the two-year deadline be eliminated for product models certified under the old rules.⁷¹ They claim that this will allow manufacturers a reasonable timeframe to address design issues with meeting new requirements.⁷²

37. *Comments.* In Cisco's reply comments, it claims that MSI and Cambium fail to adequately acknowledge that modified WISP equipment created harmful interference to TDWR in the DFS bands and that the continued sale of such equipment would further perpetuate the problem.⁷³ Cisco, however, has raised no objection to a short extension of the transition deadlines if manufacturers can make a compelling case that it is not possible to redesign and re-certify equipment with a reasonable effort. However, Cisco states that, given that central role U-NII-3 equipment has played in causing interference to TDWR, any extension that delays the introduction of enhanced security features should be as brief as possible, and certainly should not be indefinite as proposed by MSI and Cambium.⁷⁴ MSI responds by clarifying that its Petition for Partial Reconsideration was not intended to extend the deadline for introduction of enhanced security features to previously certified devices, but that its request was limited to the period of time in which equipment previously certified under the legacy rules could continue to be manufactured and marketed.⁷⁵ Broadcom claims that enterprise and home router devices that use its chipsets have completely different use cases than the point to point systems using high-gain antennas that prompted the industry emission limits proposal adopted above.⁷⁶ It believes equipment that uses its chipsets have less potential to cause interference because home and enterprise devices are generally operated indoors.⁷⁷ Broadcom states that devices used for enterprise, home, and small office purposes have lower antenna gains than the last mile access devices contemplated by the petitioners.⁷⁸ Broadcom further states that it would be able to meet the emission limits we adopted above, but would need more time to bring their devices into compliance.⁷⁹

38. *Decision.* We are modifying the dates by which the certification, manufacture, marketing, sale and importation into the United States of U-NII-3 band devices that do not meet the modified emission limits adopted in this Memorandum Opinion and Order must cease.⁸⁰ We are modifying Section 15.407(b)(4) to permit manufacturers of devices certified before March 2, 2017 with antenna gain greater than 10 dBi to demonstrate compliance with the emission limits in Section 15.247(d), but manufacturing, marketing, sale and importing of devices certified under this alternative must cease by March 2, 2018. We further modify Section 15.407(b)(4) to permit manufacturers of

⁶⁹ *Id.* at 3-4.

⁷⁰ *Id.* at 5.

⁷¹ *See* Cambium Petition at 15.

⁷² *Id.*

⁷³ *See* Cisco Systems, Inc. Reply to Petition for Reconsideration, filed on August 14, 2014.

⁷⁴ *Id.* at 14-15.

⁷⁵ *See* Motorola Solutions, Inc. Reply to Opposition to Petition for Reconsideration, filed on September 2, 2014.

⁷⁶ *See* Broadcom Corporation Notice of *ex parte*, filed January 27, 2016 at 6.

⁷⁷ *Id.*

⁷⁸ *Id.*

⁷⁹ *See* Broadcom Corporation Notice of *ex parte*, filed February 11, 2016.

⁸⁰ *See First R&O*, 29 FCC Rcd 4127.

devices certified before March 2, 2018 with an antenna gain of 10 dBi or less to demonstrate compliance with the emission limits in Section 15.247(d), but manufacturing, marketing, sale and importing of devices certified under this alternative must cease before March 2, 2020. We note that the Commission has already issued two orders that have provided a 10-month extension that permitted manufacturers to continue to certify devices under the old rules until March 2, 2016.⁸¹ Here, we do not further extend the transition provisions in Section 15.37(h) allowing certification and marketing under the old rules, but rather implement a phased implementation of only the out-of-band limits in Section 15.407.

39. We understand Cisco's concerns and agree that manufacturers should be granted an extension of time only if they cannot comply with the modified rules with reasonable effort and that the time extension should not be indefinite. We recognize that during the years leading up to the rule change, the industry had made a significant investment in the research, design, and development of new product lines. We also recognize that manufacturers have made a significant effort to design compliant equipment but are not able to reasonably suppress their OOB without significantly reducing the in-band power and thereby reducing the range of their devices. The majority of products that are effected, operate with relatively low power and employ antenna gains of less than 10dBi. We understand that the typical design cycle for enterprise and home routers can last two to three years and that there is no simple solution for manufacturers to swiftly redesign compliant products before the transition period deadlines. Therefore, we will provide a slightly longer transition period for devices that operate a 10 dBi or lower antenna. We note that these devices tend to present a lower risk of harmful interference because they are typically lower powered and are installed indoor. We recognize that in theory, harmful interference could occur from an enterprise or home access point, however we have not observed this in practice. In practice harmful interference to the TDWR was typically caused by long range devices that were unlawfully modified and typically operated with antenna gains of 15 dBi and above. The devices that employ higher gain antennas are typically operated by service providers for the purposes of wireless back haul and are installed in outdoor environments. We therefore conclude that in the case of devices that employ an antenna with a gain of 10 dBi or less, appropriate deadlines are March 2, 2018 as the new deadline for certification, and March 2, 2020 as the cut-off for devices that can be imported or marketed within the United States under the old emission limits.

40. We believe these extensions will give manufacturers and vendors sufficient time to come into compliance with the new emission limits. We do not believe a short extension of the deadlines will represent a significant risk of harmful interference for the TDWR. The new certification and marketing deadlines apply to devices that operate in the U-NII-3 band.

41. We note that, the ultimate purpose of the transition date, was to expediently reduce the threat of harmful interference to the TDWR and other radar facilities from devices on the market that were easily and unlawfully modified. However, we recognize that manufacturers will need additional time to design new product lines that comply with the new rules. Extending the emission limit deadlines will permit manufacturers to plan their research and design activities to comply with the outcome of our actions here. Permitting this extended period will provide economic relief by allowing manufacturers to continue to sell through remaining inventory. We reiterate that the Commission has already provided more time than originally intended to bring these devices into compliance and no further extensions are contemplated.

IV. PROCEDURAL MATTERS

42. *Final Regulatory Flexibility Certification.* The Regulatory Flexibility Act of 1980, as amended (RFA),⁸² requires that a regulatory flexibility analysis be prepared for notice-and-comment rule making proceedings, unless the agency certifies that "the rule will not, if promulgated, have a significant

⁸¹ See *First Extension Order* and *Second Extension Order*, *supra* note 7.

⁸² The RFA, *see* 5 U.S.C. §§ 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

economic impact on a substantial number of small entities.”⁸³ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁸⁴ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁸⁵ A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the U.S. Small Business Administration (SBA).⁸⁶ The adopted rules pertain to manufacturers of unlicensed communications devices. The appropriate small business size standard is that which the SBA has established for radio and television broadcasting and wireless communications equipment manufacturing. The Census Bureau defines this category as follows: “This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.”⁸⁷ The SBA has developed a small business size standard for firms in this category, which is: all such firms having 750 or fewer employees.⁸⁸ According to Census Bureau data for 2007, there were a total of 939 establishments in this category that operated for part or all of the entire year. Of this total, 784 had fewer than 500 employees and 155 had more than 100 employees.⁸⁹ Thus, under this size standard, the majority of firms can be considered small.

43. Pursuant to the RFA, the Commission incorporated an Initial Regulatory Flexibility Analysis (IRFA) into the *Notice of Proposed Rulemaking (NPRM)* in ET Docket No. 13-49.⁹⁰ There were no public comments filed that specifically addressed the rules and policies proposed in the IRFA, and the Commission concluded in the Final Regulatory Flexibility Analysis (FRFA) in the *First Report and Order (First R&O)*⁹¹ that the rules adopted in the *First R&O* do not add substantial additional compliance burden on small businesses. For the reasons described below, we now certify that the policies and rules adopted in the present *Memorandum Opinion and Order (MO&O)* will not have a significant economic impact on a substantial number of small entities.

44. In the *First R&O*, the Commission prepared a FRFA detailing the ways in which the Commission sought to minimize the impact of the new regulations on small businesses.⁹² The rule

⁸³ 5 U.S.C. § 605(b).

⁸⁴ 5 U.S.C. § 601(6).

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

⁸⁶ 15 U.S.C. § 632.

⁸⁷ U.S. Census Bureau, 2007 NAICS Definitions, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”; <http://www.census.gov/naics/2007/def/ND334220.HTM#N334220>.

⁸⁸ 13 C.F.R. § 121.201, NAICS code 334220.

⁸⁹ http://factfinder.census.gov/servlet/IBQTable?_bm=y&-fds_name=EC0700A1&-geo_id=&-_skip=300&-ds_name=EC0731SG2&-_lang=en.

⁹⁰ See *Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band* in ET Docket No. 13-40, *Notice of Proposed Rulemaking*, 28 FCC Rcd. 1769 (2013) (*NPRM*).

⁹¹ See *Revision of Part 15 of the Commission’s Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5GHz Band*, ET Docket 13-49, 29 FCC Rcd 4127 (2014) (*First R&O*).

⁹² See *First R&O* at 4165-4168.

change adopted in this *MO&O* is merely a modification of the rule adopted in the *First R&O* that will provide relief for those entities that are required to comply with rules adopted in the *First R&O* and modified herein. Therefore, we certify pursuant to the RFA that the final rule adopted in this order will not have a significant economic impact on a substantial number of small entities.⁹³

45. The Commission will send a copy of the *MO&O*, including a copy of this final Regulatory Flexibility Certification⁹⁴, in a report to Congress pursuant to the Congressional Review Act. In addition, the *MO&O* and this final certification will be sent to the Chief Counsel for Advocacy of the SBA, and will be published in the Federal Register.⁹⁵

46. *Paperwork Reduction Act* Analysis. This document contains no new or modified information collection requirement that are subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. We note that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, 44 U.S.C. 3506(c)(4), we previously sought specific comment on how we might further reduce the information collection burden for small business concerns with fewer than 25 employees.

47. *Congressional Review Act*. The Commission will send a copy of this Memorandum Opinion and Order in a report to Congress and the Government Accountability Office pursuant to the Congressional Review Act, 5 U.S.C. § 801(a)(1)(A).

V. ORDERING CLAUSES

48. Accordingly, IT IS ORDERED that pursuant to Sections 4(i), 301, 302, 303(e), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302a, 303(e), 303(f), 303(g), and 303(r), this Memorandum Opinion and Order is hereby ADOPTED and Part 15 of the Commission's Rules, 47 C.F.R. Part 15, ARE AMENDED as set forth in Appendix A [effective 30 days after date of publication in the Federal Register].

49. IT IS FURTHER ORDERED that, pursuant to Sections 4(i), 302, 303(e), 303(f), 303(g), 303(r), and 405 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(e), 303(f), 303(g), 303(r), and 405, the petitions for reconsideration addressed herein ARE GRANTED to the extent discussed above and otherwise DENIED.

50. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Memorandum Opinion and Order, including the Final Regulatory Flexibility Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

⁹³ See 5 U.S.C. §605 (b).

⁹⁴ See 5 U.S.C. § 801(a)(1)(A).

⁹⁵ See 5 U.S.C. § 605(b).

APPENDIX A
Final Rules

For the reasons set forth in the preamble the Federal Communications Commission amends Part 15 of the Code of Federal Regulations to read as follows:

PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation for Part 15 continues to read as follows:

Authority: 47 U.S.C. 154, 302a, 303, 304, 307, 336, 544a, and 549.

2. Section 15.407 is amended by revising paragraphs (a)(1)(iv) and (b)(4), to read as follows:

§ 15.407 General technical requirements.

(a) ***

(1) For the band 5.15 – 5.25 GHz:

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(b) ***

(4) For transmitters operating in the 5.725-5.85 GHz band:

(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in Section 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in Section 15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.

APPENDIX B
Commenting Parties

Parties filing comments:

1. 101Netlink
2. Aloha Broadband Inc.
3. ALSAT Wireless
4. ALTIUS Communications
5. Amplex Electric, Inc.
6. Aristotle, Inc.
7. Arnold Burkert
8. Avolutia, LLC dba Shelby
Broadband
9. Bertram Wireless
10. Bill woodruff
11. Birgitte Elbek
12. Blair Davis
13. Bolt Internet
14. BPS Networks
15. Brian Jones
16. BridgeWire Communications
17. Bright.net
18. Broadband VI
19. Bspeedy Wireless Inc
20. C. Mullins
21. Cal.net, Inc.
22. Caleb Pennington
23. Christopher Sones
24. CKS Wireless, Inc.
25. CloudWyze Inc.
26. Community Broadband
27. Computer Sales and Services, Inc.
28. CresComm WiFi, LLC
29. CSInet Internet Access Corp.
30. Cybemetl, Inc.
31. David Nowell
32. David Smith
33. DC Access, LLC
34. DD Wireless
35. Deborah Hersman
36. Deliberant, Inc
37. Devin Sain
38. Digital Plains, LLC
39. Don Brabb
40. Doug Koehn
41. Douglas Wilson
42. DSLbyAir,LLC
43. E. Kleeman
44. Elizabeth Trotter
45. Eric
46. Ethoplex LLC
47. Excel.Net, Inc.
48. First Step Internet, LLC
49. Fixed Wireless Communications Coalition
50. Fixed Wireless Communications Coalition
51. Fourway Computer Products, Inc.
52. Frank S Farrington II
53. FreeWave Technologies, Inc.
54. Gene Reck
55. Globalstar, Inc.
56. Good Hart General Store
57. Grand County Internet Services, Inc.
58. Gtek Computers & Wireless
59. Gunby Communications Inc
60. GVEC.net
61. Haug Communications, Inc.
62. Hintzsche Fertilizer, Inc.
63. Hudson Valley Wireless
64. ICON Technologies Inc.
65. Imagine Networks, LLC
66. In the Stix Broadband
67. InfoWest, Inc.
68. Intelligent Computing Solutions
69. Interisle Consulting Group LLC
70. Internet America, Inc.
71. Interstate Wireless, Inc.
72. Inventive Wireless of Nebraska, LLC
73. InvisiMax, Inc.
74. J. Mcalister
75. J. Stafford
76. Jade Communications
77. James Phillips
78. James Watson
79. Jennifer Read
80. Jess Kemp
81. Jest Kidding
82. Jo-Carroll Energy, Inc. (NFP)
83. Joink, LLC
84. K. Adams
85. K. Short

86. Ken Hohhof
87. Kent Andersen
88. Kerry Fountain
89. Keystone Community Network
90. KWISP Internet
91. LightSpeed
92. Lisa Bowman
93. LiteWire Internet Services, Inc.
94. Lucas Doroshenko
95. M. Rupley
96. Margie Hammet
97. Marlon K. Schafer
98. Mary Higgins
99. Michael Jones
100. Midwest Telecom of America, Inc.
101. Mike Cavazzini
102. Multi-Path Networks, Inc.
103. New River Valley Unwired, LLC
104. New Wave Net Corp
105. NexGenAccess Inc.
106. NGL Connection
107. North Coast Wireless Communications, LLC
108. Northwest Ohio Broadband
109. OACYS Technology
110. On-Ramp Indiana, Inc.
111. Outback Internet LLC
112. Patty Flanagan
113. PCS-WIN
114. PEAK Internet, LLC
115. Plexicomm, LLC
116. Port Networks, Inc.
117. Q Wireless LLC
118. R. Wilson
119. RapidDSL & Wireless, Inc
120. Razzo Link, Inc.
121. Rebekah Brown
122. Ridge Wireless
123. Robert Ores
124. Rory McCann
125. Rowe Wireless Networks LLC
126. Royell Communications, Inc.
127. Russell Fish
128. S. Adams
129. S. Adams
130. S. Bergman
131. Sam Rellier
132. SCS Broadband
133. Shannon Kimery
134. Simply Bits LLC
135. Skyrunner, Inc.
136. SmarterBroadband, Inc.
137. Sooner Wireless LLC
138. Spectrum Bridge Inc
139. State of Maryland, Gov O'Malley
140. STE Wireless, Inc.
141. Surf Air Wireless
142. TaosNet, LLC
143. TechAmerica
144. Tekify Broadband Internet Services
145. TELE-PAGE, Inc
146. Texas Communications of Bryan, Inc.
147. Texas Communications, Inc.
148. The Blue Zone
149. The Wireless Internet Service Providers Association
150. Tim Badgely
151. Timothy Trout
152. Tnet Broadband Internet, LLC
153. Travis Mikalson
154. Tularosa Communications, Inc.
155. Turner, Coombs & Malone, PLLC
156. Tushar Patel
157. Ubiquiti Networks
158. Utilities Telecom Council
159. Veloxnet Incorporated
160. Virginia Broadband. LLC
161. Virginia Everywhere, LLC
162. Wave Wireless
163. Wavelinc Communications
164. Webjogger Internet Services
165. Wicked Broadband
166. Wi-Fi Alliance
167. Wireless ETC.
168. Wireless Internet Services, Inc.
169. WVVA.net Inc.
170. X1 Communications
171. Zachary Lym
172. Zeecon Wireless Internet, LLC
173. Zirkel WirelessAloha Broadband Inc.

Parties filing reply comments:

1. Association of Global Automakers
2. Cambium Networks, Ltd.
3. Cisco Systems, Inc.
4. EchoStar Technologies L.L.C.
5. Information Technology Industry Council
6. Interisle Consulting Group LLC
7. Mimosa Networks, Inc.
8. Motorola Solutions, Inc.
9. National Cable & Telecommunications Association
10. Telecommunications Industry Association
11. The Wireless Internet Service Providers Association
12. Time Warner Cable Inc.
13. Utilities Telecom Council

Parties filing Ex-Parte Statements:

14. Alliance of Automobile Manufacturers
15. American Library Association
16. Association of Global Automakers
17. Black Mesa Wireless LLC
18. Broadcom Corporation
19. Cablevision Systems Corporation
20. Cambium Networks, Ltd.
21. Carnegie Mellon University
22. Cisco Systems, Inc.
23. Consumer Electronics Association
24. Crash Avoidance Merics Partners LLC
25. Cyber Broadband Inc
26. EchoStar Technologies L.L.C.
27. Ericsson
28. Fastback Networks, Inc.
29. Google Inc.
30. HP Inc.
31. Industry Representatives
32. Intel Corporation
33. Interisle Consulting Group LLC
34. Mimosa Networks, Inc.
35. National Cable & Telecommunications Association
36. NETGEAR, Inc.
37. OmniAir Consortium
38. Open Technology Institute at New America
39. Proxim Wireless Corporation
40. SES Americom Inc. and Intelsat Corporation
41. SHLB Coalition

42. Telecommunications Industry Association
43. The Alliance of Automobile Manufacturers
44. The Wireless Internet Service Providers Association
45. Toyota
46. Ubiquiti Networks, Inc.
47. Utilities Telecom Council
48. Verizon
49. Wi-Fi Alliance

**STATEMENT OF
COMMISSIONER AJIT PAI**

Re: *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, ET Docket No. 13-49.

Today's *Order* is a win for rural America. Consumers who live in some of the most remote and difficult to serve portions of the country rely on wireless Internet service providers (WISPs) for their on-ramp to the Internet. Without the relief the Commission provides today, many of those providers would have been unable to continue to serve their communities. Indeed, Wave Wireless, a WISP that serves southeast Kansas, where I grew up, told the Commission that without a rule change it would be "impossible for us to continue to provide affordable, high performance broadband service in many of these areas."

1

The reason? Nearly two years ago, the FCC changed the emissions limits that apply to a portion of the 5 GHz band that nearly every WISP relies on to serve their rural communities. If the rule changes had kicked in, many WISPs would not have been able to operate at the power levels necessary to reach their existing customers. Rural Americans who enjoy high-speed Internet access today would have been unable to do so tomorrow. So I am glad that industry stakeholders were able to reach a consensus solution and that FCC staff worked diligently to move this process forward.

I hope that we are able to build on this success by moving quickly to open up another 195 MHz of the 5 GHz band for the next-generation of wireless uses. Consumers in rural America—and throughout the United States—have waited long enough.

¹ Letter from Galen Manners, President, Wave Wireless, to Marlene H. Dortch, FCC Secretary, ET Docket No. 13-49 (filed July 22, 2014).