

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

In the Matter of)
)
Use of the 5.850-5.925 GHz Band) ET Docket No. 19-138

SECOND REPORT AND ORDER

Adopted: November 20, 2024

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By the Commission:

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I. INTRODUCTION

1. The Intelligent Transportation System (ITS) holds promise to improve transportation safety and mobility by integrating advanced communications technologies into vehicles and infrastructure. The connected vehicle ecosystem of the future will make the nation's transportation system more flexible, resilient, and safe. This ecosystem requires technical and operational rules governing devices using C-V2X (cellular-vehicle-to-everything) based technology. In the *First Report and Order* of this proceeding, the Commission retained the upper 30 megahertz portion (5.895-5.925 GHz) of the 5.850-5.925 GHz (5.9 GHz) band for ITS operations.¹ The Commission also required the

¹ See *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, First Report and Order (*First Report and Order*), Further Notice of Proposed Rulemaking (*FNPRM*), and Order of Proposed Modification, 35 FCC Rcd 13440, (continued....)

ITS service to transition from Dedicated Short Range Communications (DSRC)-based technology to C-V2X-based technology as the connected mobility platform for implementing the future of ITS communications in the United States.² In this *Second Report and Order*, we further address the transition of 5.9 GHz ITS operations from DSRC to C-V2X by codifying C-V2X technical parameters in the Commission’s rules, including band usage, message priority, and channel bandwidth.³ We promulgate rules governing equivalent isotropically radiated power (EIRP) and out-of-band emissions (OOBE) limits for C-V2X on-board units (OBUs) and roadside units (RSUs), and antenna height limits for RSUs. In addition, we encourage the development of industry standards and finalize the timeline for sunsetting the use of DSRC-based technology. Finally, we address the issues of additional spectrum allocations for ITS use and reimbursing the transition costs of DSRC incumbents.

II. BACKGROUND

2. The Commission adopted the *First Report and Order* in 2020, wherein it concluded that the most efficient use of the 75 megahertz of spectrum in the 5.9 GHz band would be achieved by expanding unlicensed operations in the lower 45 megahertz of the band (5.850-5.895 GHz),⁴ and designating the upper 30 megahertz of the band (5.895-5.925 GHz) for the ITS service using C-V2X technology.⁵ Among other considerations, the Commission made this decision because (1) the DSRC services once contemplated for operations across the full 5.9 GHz band had not come to fruition in the 20 years since it allocated the spectrum for the ITS service;⁶ (2) those envisioned vehicle-safety features can be or are already being provided using other spectrum bands or alternative technology;⁷ and (3) the significant public interest benefits of adding 45 megahertz of Unlicensed National Information Infrastructure (U-NII) spectrum to enable the next-generation Wi-Fi, which operates on wider channels and allows gigabit connectivity with lower latency, improved coverage, and power efficiency.⁸

13451-61, paras. 29-47 (2020), *corrected by Erratum (OET Dec. 11, 2020) and Second Erratum, 36 FCC Rcd 1444 (OET 2021), aff’d Intelligent Transportation Society of America v. FCC 45 F.4th 406 (D.C. Cir. 2022) (ITS America v. FCC)*. In 1999, the Commission reserved the entire 75 megahertz of the 5.9 GHz band for ITS operations. *See Amendment of Parts 2 and 90 of the Commission’s Rules to Allocate the 5.850-5.925 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) (DSRC Report and Order). Note that the Commission’s rules for the “Intelligent Transportation Systems Radio Service” include the Location Monitoring Service in lower frequencies than 5.9 GHz. *See, e.g.*, 47 CFR §§ 90.350-90.365. ET Docket No. 19-138 addresses only ITS operations in the 5.9 GHz band.

² See *First Report and Order*, 35 FCC Rcd at 13483-85, paras. 107-110. Vehicle-to-everything (V2X)-based technology allows vehicles to communicate directly with other vehicles (V2V), infrastructure (V2I), and vulnerable road users such as pedestrians and bicyclists (V2P), via the 5.895-5.925 GHz-band frequencies, *i.e.*, without the participation of a cellular network or other base stations. C-V2X-based technology also has a vehicle-to-network function (V2N) by which vehicles communicate with other vehicles, infrastructure, and vulnerable road users via mobile broadband network providers outside of the 5.895-5.925 GHz band in compliance with the providers’ authorization. *See id.* at 13443-44, n.12. In this *Second Report and Order*, we primarily use the term “C-V2X” since the Commission adopted C-V2X-based technology for the provision of ITS services in the 5.895-5.925 GHz band. *See id.* at 13441, 13479, paras. 1, 95.

³ The term “DSRC” refers to dedicated short range communications, the technology being phased out of use to provide ITS in the 5.9 GHz band; the service rules governing the licensing and use of DSRC use the term “Dedicated Short Range Communications Service” (DSRCS). *See, e.g.*, 47 CFR §§ 90.370-90.395; §§ 95.3101-95.3189. For ease of reference, we use the term “DSRC” throughout this document.

⁴ See *First Report and Order*, 35 FCC Rcd at 13441, para. 2.

⁵ See *id.* at 13441-42, para. 3.

⁶ See *id.* at 13452-53, para 31.

⁷ See *id.* at 13453-54, para 32.

⁸ See *id.* at 13441, 13449, paras. 2, 20.

3. To protect incumbent 5.9 GHz band services, including federal incumbent operations, from potential harmful interference from unlicensed operations, the Commission imposed stringent power limits and operating requirements on unlicensed devices (i.e., access points, subordinate devices, and client devices) operating in the lower 45 megahertz and restricted unlicensed use of the lower 45 megahertz to indoor locations.⁹ In addition, to protect ITS operations during and after their transition to the upper 30 megahertz, the Commission set indoor U-NII device OOB limits into the upper 30 megahertz based on, but not identical to, the previously-affirmed unlicensed device OOB limits for the 5.725-5.850 GHz (U-NII-3) band.¹⁰ Because the Commission restricted unlicensed use of the lower 45 megahertz to indoor use only, the Commission took advantage of building attenuation, as well as other factors such as path loss, to increase the OOB limits allowed into the upper 30 megahertz from indoor unlicensed devices by 20 dB as compared to the U-NII-3 band OOB limits.¹¹ The Commission also permitted a root mean square (RMS) detector, instead of requiring a peak detector, to be used to conduct all 5.9 GHz band unlicensed device OOB measurements.¹²

4. As the *First Report and Order* determined that the operators in the revised ITS band must use C-V2X technology, the *FNPRM* sought comment on further transition issues and proposed rules to finalize the technical parameters for C-V2X operations and the timing of when operations must transition from the DSRC technology.¹³ The *FNPRM* also sought comment on the possibility for full-power outdoor unlicensed operations across the lower 45 megahertz portion of the 5.9 GHz band.¹⁴ Those unlicensed operations issues are not addressed in this *Second Report and Order*.¹⁵

5. *ITS America v. FCC*. After releasing the *First Report and Order*, the Intelligent Transportation Society of America (ITS America) and the American Association of State Highway and

⁹ *First Report and Order*, 35 FCC Rcd at 13466-76, paras. 61-79; 47 CFR § 15.407(a)(3)(ii)-(v). A U-NII access point operates either as a bridge in a peer-to-peer connection or as a connector between the wired and wireless segments of the network, or as a relay between wireless network segments. A U-NII subordinate device operates in the 5.850-5.895 GHz under the control of an indoor access point. A U-NII client device transmits generally under the control of an access point and is not capable of initiating a network. An indoor access point or subordinate device is supplied power from a wired connection, has an integrated antenna, is not battery powered, and does not have a weatherized enclosure. Access points that operate in the 5.850-5.895 GHz band are restricted to indoor use; subordinate devices and client devices that operate in the 5.850-5.895 GHz band must operate under the control of an indoor access point. 47 CFR §§ 15.403, 15.407(a)(3)(ii)-(v).

¹⁰ See *First Report and Order*, 35 FCC Rcd at 13475-76, para. 83. Under the Commission's current rules, out-of-band emissions from unlicensed transmitters operating in the 5.725-5.850 GHz (U-NII-3) band are limited to -27 dBm/MHz at 75 megahertz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 megahertz above or below the band edge, and from 25 megahertz above or below the band edge increasing linearly to 15.6 dBm/MHz at 5 megahertz above or below the band edge, and from 5 megahertz above or below the band edge increasing linearly to 27 dBm/MHz at the band edge. 47 CFR § 15.407(b)(4)(i). These specifications result in OOB limits of -5 dBm/MHz at 5.895 GHz, decreasing linearly to -27 dBm/MHz at 5.925 GHz.

¹¹ Specifically, for indoor unlicensed access point or subordinate devices operating solely in the 5.850-5.895 GHz (U-NII-4) band or on a channel that spans across 5.725-5.895 GHz (U-NII-3 and U-NII-4), all emissions at or above 5.895 GHz must not exceed an equivalent isotropically radiated power (EIRP) of 15 dBm/MHz at 5.895 GHz, decreasing linearly to -7 dBm/MHz at or above 5.925 GHz. *First Report and Order*, 35 FCC Rcd at 13475-76, para. 83; 47 CFR § 15.407(b)(5)(i). For client devices operating solely in the 5.850-5.895 GHz (U-NII-4) band or on a channel that spans across 5.725-5.895 GHz (U-NII-3 and U-NII-4), all emissions at or above 5.895 GHz must not exceed an EIRP of -5 dBm/MHz and decrease linearly to an EIRP of -27 dBm/MHz at or above 5.925 GHz. 47 CFR § 15.407(b)(5)(ii).

¹² *First Report and Order*, 35 FCC Rcd at 13476-77, paras. 84-85.

¹³ See *FNPRM*, 35 FCC Rcd at 13500-08, paras. 146-168.

¹⁴ See *id.* at 13511, para. 179.

¹⁵ We also do not address C-V2X intellectual property issues in this *Second Report and Order*. See *FNPRM*, 35 FCC Rcd at 13506 n.432.

Transportation Officials (AASHTO) petitioned the United States Court of Appeals for the D.C. Circuit to vacate the part of the *First Report and Order* repurposing the lower 45 megahertz for unlicensed operations.¹⁶ The Amateur Radio Emergency Data Network (AREDN) filed a separate petition asking the court to vacate the entire *First Report and Order*.¹⁷ The D.C. Circuit rejected each of the petitioners' arguments and affirmed the Commission's decisions in the *First Report and Order*.¹⁸

6. *Order on Reconsideration.* In response to the *First Report and Order*, the Alliance for Automotive Innovation (Auto Innovators) and the 5G Automotive Association (5GAA) filed petitions for reconsideration on June 2, 2021.¹⁹ In its Petition for Reconsideration, Auto Innovators asked the Commission to reconsider its decision to designate the lower 45 megahertz for unlicensed use and restore that portion of the 5.9 GHz band for ITS.²⁰ In the *Order on Reconsideration*, the Commission denied the Auto Innovators' request and affirmed its decision to repurpose the lower 45 megahertz for the reasons discussed in the *First Report and Order*, including the cost-benefit analysis therein.²¹ In its Petition for Partial Reconsideration, 5GAA asked the Commission to reduce the OOB limits for indoor unlicensed access points, subordinate devices, and client devices operating in the lower 45 megahertz.²² In the *Order on Reconsideration*, the Commission rejected 5GAA's various arguments regarding indoor unlicensed devices' potential to cause harmful interference to ITS operations in the upper 30 megahertz.²³

7. *Waivers.* Recently, the Office of Engineering and Technology, the Public Safety and Homeland Security Bureau (PSHSB), and the Wireless Telecommunications Bureau (WTB) (hereafter, "the Bureaus") granted rule waivers to parties requesting to deploy C-V2X operations in the upper 30-megahertz portion of the 5.9 GHz band (5.895-5.925 GHz) prior to adopting final C-V2X-based technical rules.²⁴ Specifically, each waiver applicant sought waivers for rule sections that establish the technical

¹⁶ *ITS America v. FCC*, 45 F.4th at 411.

¹⁷ *Id.*

¹⁸ *Id.* at 409, 411, 415. The D.C. Circuit also denied AREDN's emergency motion for a judicial stay. *See* Intelligent Transportation Society of America v. FCC, Case No. 21-1130 (consolidated with 21-1131, 21-1141), Order (July 2, 2021).

¹⁹ *See* Petition for Partial Reconsideration, ET Docket No. 19-138 (filed June 2, 2021) (5GAA Petition). *See also* Petition for Reconsideration of the Alliance for Automotive Innovation, ET Docket No. 19-138 (filed June 2, 2021) (Auto Innovators Petition). The Amateur Radio Emergency Data Network (AREDN) also submitted a reconsideration petition, which it subsequently withdrew. *See* Petition for Reconsideration of AREDN, ET Docket No. 19-138 (filed May 3, 2021). *See also* Letter from Julian Gehman, Gehman Law PLLC, to Marlene H. Dortch, Secretary, FCC (filed June 21, 2021). 5GAA and AREDN also petitioned the Commission to stay the effective date of the rules set forth in the *First Report and Order*. *See* Petition for Stay, ET Docket No. 19-138 (filed June 2, 2021). *See also* Petition for Stay, ET Docket No. 19-138 (filed May 2, 2021). The rules became effective without Commission action.

²⁰ Auto Innovators Petition at 1-2.

²¹ *See Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, Order on Reconsideration, FCC 24-32, paras. 9-11 (rel. Mar. 18, 2024) (*Order on Reconsideration*).

²² 5GAA Petition at 2, 7, 11.

²³ *See Order on Reconsideration*, FCC 24-32, paras. 12-22.

²⁴ *See Request for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Order, 38 FCC Rcd 3986 (PSHSB, OET, WTB 2023) (*Joint Waiver Order*); *Request to Modify April 24, 2023 Waiver Order of the 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, 38 FCC Rcd 6086 (PSHSB, OET, WTB 2023) (*Waiver Modification Order*); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Letter (PSHSB, OET, WTB rel. Aug. 16, 2023) (*Aug 16, 2023 Waiver Letter*) (available at <https://www.fcc.gov/document/pshsb-oet-wtb-waiver-order-permits-c-v2x-operations-59-ghz-band-0>); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, Order, 38 FCC Rcd 3986 (PSHSB, OET, WTB 2023) (*Waiver Order*).

(continued....)

requirements mandating DSRC-based technology in the upper 30 megahertz of the 5.9 GHz band, to allow C-V2X-based operations in the band, and to provide adjustments to the technical parameters where the two technologies differ.²⁵ The Bureaus found that waiving those rules was warranted under section 1.925, subject to the waiver applicants' commitments to adhere to the technical parameters and conditions imposed by the *Joint Waiver Order*, as modified by the *Waiver Modification Order*.²⁶ The technical parameters and conditions agreed to were developed to protect DSRC and federal incumbents from potential harmful interference caused by C-V2X operations in the upper 30 megahertz of the 5.9 GHz band.²⁷ These protections include requirements that (1) the waiver grantees' spectrum usage be limited to a 20-megahertz channel at 5.905-5.925 GHz;²⁸ (2) the EIRP for both OBUs and RSUs be limited to 33 dBm, with the EIRP for OBUs reduced to 27 dBm within ± 5 degrees in elevation from the horizontal plane;²⁹ (3) the waiver grantees' RSUs and OBUs operate with OOB limits consistent with the OOB limits specified in IEEE 802.11p-2010, Table I.8³⁰ and (4) the waiver grantees operate on a secondary basis to the Federal radiolocation service operating on a primary basis in the band.³¹ Waiver grantees' RSUs and OBUs may operate without a transmitter output power limit.³² Also, all C-V2X operations pursuant to a waiver are limited to transportation and vehicle-safety related communications.³³ Finally, all waivers granted were conditioned on the requirement that each waiver recipient would ensure that RSU and OBU operations and devices authorized under the waiver would comply with the final rules or other guidance provided by the Commission.³⁴

III. DISCUSSION

8. In this *Second Report and Order*, we finalize rules concerning band usage, message prioritization, channel bandwidth, communications zones, power for RSUs and OBUs, and OOB limits for C-V2X operations, along with other transition issues, including the transition timeline. Additionally, we reach several conclusions related to the incorporation of standards, the allocation of additional

Everything Technology, ET Docket No. 19-138, Letter, 38 FCC Rcd 10401 (PSHSB, OET, WTB 2023) (Nov. 3, 2023 *Waiver Letter*); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, DA 24-363 (PSHSB, OET, WTB rel. April 18, 2024) (Apr. 18, 2024 *Waiver Letter*); *Requests for Waiver of 5.9 GHz Band Rules to Permit Initial Deployment of Cellular Vehicle-to-Everything Technology*, ET Docket No. 19-138, DA 24-707, Letter (PSHSB, OET, WTB rel. Jul. 19, 2024) (Jul. 19, 2024 *Waiver Letter*).

²⁵ See *Joint Waiver Order*, 38 FCC Rcd at 3988, para. 5. The involved rule sections include 47 CFR §§ 90.375, 90.377, 90.379, 95.3163, 95.3167, and 95.3189.

²⁶ See *Waiver Modification Order*, 38 FCC Rcd at 6088-89, paras. 8-10 (ordering removal of the 20 dBm transmitter output power limit requirement stipulated in the *Joint Waiver Order*, finding that removal of the transmitter output power limit would not change the interference dynamics among systems sharing the band).

²⁷ See, e.g., *Joint Waiver Order*, 38 FCC Rcd at 3993-95, paras. 17-26.

²⁸ See, e.g., *id.* at 3993, para. 19.

²⁹ See, e.g., *id.* at 3994, para. 23. The maximum 33 dBm EIRP limit for RSUs and OBUs granted in the C-V2X waivers is the same maximum EIRP limit the Commission sought comment on in the *FNPRM*. See *FNPRM*, 35 FCC Rcd at 13503-505, paras. 157-161.

³⁰ See, e.g., *Joint Waiver Order*, 38 FCC Rcd at 3994-95, para. 23 (-16 dBm/100 kHz at the channel edge, -22 dBm/100 kHz at 1 MHz from the channel edge, -30 dBm/100 kHz at 10 MHz from the channel edge, and -40 dBm/100 kHz at 20 MHz from the channel edge). The OOB limits granted for RSUs and OBUs in the C-V2X waivers, based on the then-existing DSRC standards specified in IEEE 802.11p-2010, *see id.*, are more relaxed than the OOB limits the Commission proposed in the *FNPRM*. See *FNPRM*, 35 FCC Rcd at 13506, para. 163.

³¹ See, e.g., *Joint Waiver Order*, 38 FCC Rcd at 3994, para. 22.

³² See, e.g., *Waiver Modification Order*, 38 FCC Rcd at 6088-89, paras. 7-9.

³³ See, e.g., *Joint Waiver Order*, 38 FCC Rcd at 3993, para. 18.

³⁴ See *id.*, 38 FCC Rcd at 3992-93, 3995, paras. 14, 26.

spectrum for ITS, and compensation to incumbents. The decisions in this item will not only promote the efficient use of 30 megahertz of spectrum dedicated to ITS but also the safety benefits this technology promises to deliver to the American public.

9. DSRC is defined in the Commission's rules as the use of radio techniques to transfer data over short distances between roadside and mobile units, between mobile units, and between portable and mobile units to perform operations related to improving traffic flow, traffic safety, and other ITS applications in a variety of environments. DSRC systems may also transmit status and instructional messages related to the units involved.³⁵ Currently, local government entities and entities eligible for Industrial/Business Pool licenses are eligible to operate RSUs using DSRC, while OBUs in vehicles are licensed by rule.³⁶ The existing DSRC rules lay out a hierarchical priority system for messages. Communications involving safety of life have priority access over all other DSRC communications. Communications involving public safety have the next highest priority, with a presumption that RSUs operated by state or local governmental entities are engaged in public safety communications.³⁷ The lowest tier in this communications hierarchy are non-priority communications, which include all other communications not related to safety of life or public safety.³⁸

10. As stated in the *FNPRM*, our goal is to facilitate a smooth transition from DSRC-based operations to C-V2X-based operations. Accordingly, we must address the need, if any, to adopt requirements analogous to existing DSRC requirements that would similarly govern C-V2X operations in the 5.895-5.925 GHz band. We now address the technical issues necessary to ensure efficient and effective use of the band.

A. C-V2X Standards

11. In the *5.9 GHz NPRM*, the Commission proposed to incorporate by reference into the Commission's rules the 3rd Generation Partnership Project (3GPP) C-V2X standard Release 14.³⁹ The Commission did not receive significant comment on this issue. After the release of the *5.9 GHz NPRM*, 3GPP announced the completion of Release 16, which includes enhanced 5G network capabilities. Accordingly, the *FNPRM* sought further comment on how the Commission should handle standards with respect to C-V2X.⁴⁰ Specifically, the Commission asked whether either 3GPP C-V2X standard Release 16 or Release 14, in whole or in part, should be incorporated into its rules; whether Release 14 should be incorporated initially with an eventual transition to Release 16; or whether there is a compelling argument

³⁵ 47 CFR §§ 90.7, 90.73.

³⁶ 47 CFR § 90.373. Among other things, Industrial/Business Pool licenses may be used to provide communications necessary for the operation of a commercial activity. 47 CFR § 90.35(a).

³⁷ 47 CFR § 90.377(d).

³⁸ 47 CFR § 90.377(e).

³⁹ See *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, Notice of Proposed Rulemaking, 34 FCC Rcd 12603, 12618-19, para. 39 (2019) (*5.9 GHz NPRM*). 3GPP unites seven telecommunications standard development organizations, known as “Organizational Partners,” providing their members with “a stable environment to produce the Reports and Specifications that define 3GPP technologies.” <https://www.3gpp.org/about-us/introducing-3gpp>. 3GPP specifications provide a complete system description for mobile telecommunications technologies. *See id.* The 3GPP technical reports and technical specification have, in themselves, no legal standing; they only become “official” when transposed into corresponding publications of the Organizational Partner. *See* <https://www.3gpp.org/about-us/partners>. Relevant to C-V2X are 3GPP TR 21.914 V14 (Release 14) for LTE technology and 3GPP TR 21.916 V16 (Release 16) for 5G New Radio technology, as well as 4G (LTE) radio, and improving the cooperation between them. *See* 3GPP Specifications & Technologies/Releases/Release 14, <https://www.3gpp.org/specifications-technologies/releases/release-14>; 3GPP Specifications & Technologies/Releases/Release 16, <https://www.3gpp.org/specifications-technologies/releases/release-16>.

⁴⁰ *FNPRM*, 35 FCC Rcd at 13505, para 162.

for not incorporating either standard into the rules.⁴¹

12. Comments received in this regard suggest a variety of approaches to the issue. T-Mobile disputes the need for a general incorporation, stating that “referencing specific 3GPP releases in the rules [would] quickly make them outdated and stifle innovation by freezing technologies in place, instead of allowing them to evolve naturally to satisfy customer needs and reflect innovation.”⁴² The Institute of Transportation Engineers (ITE) expresses similar views, suggesting that the Commission refrain from incorporating by reference any one particular standard, instead allowing industry to test and evaluate the technology and applicable standards without imposing a regulatory ceiling.⁴³ Further, ITE asserts that the Commission’s question regarding a phased-in approach where it would adopt Release 14 now and replace it with Release 16 later does not correctly characterize the actual technology implementation process. Rather, ITE indicates that the 5G equipment based on Release 16 would enhance and complement Release 14 Long Term Evolution (LTE) operating equipment and Release 14 equipment would likely remain in use even after Release 16 becomes dominant.⁴⁴ Other commenters find merit in incorporating standard(s) references in some manner. 5G Americas, for example, citing the ongoing technology evolution, asks the Commission to generally refer to 3GPP releases covering C-V2X, instead of “cementing a specific 3GPP release.”⁴⁵ While skeptical that C-V2X can be sufficiently realized on the allocated spectrum, AT&T nonetheless suggests, without further specificity, that “the Commission should incorporate by reference those portions of both Release 14 and Release 16 that are relevant to C-V2X, giving ITS band users sufficient latitude to innovate.”⁴⁶ Autotalks indicates that “Releases 14, 15, and 16 are non-interoperable” and it supports incorporating by reference “explicit” C-V2X releases to assure “wide-scale interoperability.”⁴⁷

13. Based on the record before us, we are not incorporating by reference any one particular standard. We encourage industry to develop a consensus concerning 3GPP releases covering C-V2X. We believe this approach is necessary due to the constantly evolving nature of both 3GPP standards and the functionality of C-V2X. As stated by ITE, new testing will undoubtedly lead to changes or enhancements to the applicable standards—and being held to a regulatory ceiling by imposing a particular standard may cap the potential of future C-V2X applications.⁴⁸ Our focus in this proceeding is to set objective performance expectations for C-V2X technology but let industry come to a consensus on the technology standard that should be applicable to C-V2X moving forward. Given the broad record support for not incorporating any one particular standard, we will thus provide industry the flexibility to develop a technology standard that fits within the technical bounds prescribed in this Order.

14. In making this decision, we reiterate our commitment to vehicle safety and the need for all vehicles that incorporate C-V2X technology to have the capability to successfully communicate with each other. Although we are not mandating a particular standard through incorporation by reference, we expect that the industry will ensure that all equipment, regardless of manufacturer or vehicle integrator, is interoperable and that future iterations of equipment based on evolving standards will be forwards and backwards compatible to ensure that C-V2X technology delivers the expected safety benefits to the American public.

15. Finally, we recognize that safety-related wireless devices and services need to be secure

⁴¹ *Id.*

⁴² T-Mobile FNPRM Reply Comments at 3.

⁴³ ITE FNPRM Comments at 5.

⁴⁴ *Id.*

⁴⁵ 5G Americas FNPRM Comments at 5.

⁴⁶ AT&T FNPRM Comments at 3-4.

⁴⁷ Autotalks FNPRM Comments at 3.

⁴⁸ ITE FNPRM Comments at 5.

to protect user privacy and ensure efficient and timely delivery of the intended safety service.⁴⁹ The Commission prioritizes cybersecurity and privacy of consumer communications through rulemaking and other activities.⁵⁰ In addition, cybersecurity and privacy actions specific to connected vehicles are the focus of ongoing actions at the U.S. Department of Transportation (U.S. DOT) with its C-V2X acceleration plan⁵¹ and at the U.S. Department of Commerce's Bureau of Industry and Security with its proposed ban on the sale or importation of connected vehicles integrating specific pieces of hardware and software, or separately sold components, with a sufficient nexus to the People's Republic of China or Russia.⁵² We expect that equipment manufacturers implementing C-V2X technology will comply with existing standards⁵³ and best practices⁵⁴ and collaborate with the automotive industry to develop new guidance, standards, and best practices that consider cybersecurity and privacy concerns to improve the C-V2X security posture. The FCC will continue to monitor and engage with federal and private sector partners on these vital issues.

B. Band Usage

16. The Commission's existing ITS rules lay out a hierarchical priority system for messages.⁵⁵ In the *FNPRM*, the Commission sought comment on whether to retain the message priority hierarchy for C-V2X deployment⁵⁶ and whether the 5.895-5.925 GHz band should be limited to non-commercial services or safety-of-life applications, and if so, how such a restriction could be implemented.⁵⁷ In this regard, the Commission noted that because the stated purpose of ITS is to promote safety, it was inclined to retain this message prioritization system in the rules to help ensure successful

⁴⁹ See, e.g., Letter from Harold Feld, Senior Vice President, Public Knowledge to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-138 (submitted July 22, 2024).

⁵⁰ See, e.g., *Cybersecurity Labeling for Internet of Things*, PS Docket No. 23-239, Report and Order and Further Notice of Proposed Rulemaking, FCC 24-26 (rel. Mar. 15, 2024) (establishing a voluntary cybersecurity labeling program where qualifying wireless consumer Internet of Things products that meet robust cybersecurity standards will bear a label—including a “U.S Cyber Trust Mark”); *Protecting Consumers from SIM Swap and Port-Out Fraud*, WC Docket No. 21-341, Report and Order and Further Notice of Proposed Rulemaking, 38 FCC Rcd 11182 (2023) (aimed at strengthening protections related to fraudulent SIM swaps); *Data Breach Reporting Requirements*, WC Docket No. 22-21, Report and Order, 38 FCC Rcd 12523 (2023) (updated data breach notification rules to protect consumers).

⁵¹ See U.S. Department of Transportation, *Saving Lives with Connectivity: A Plan to Accelerate V2X Deployment* (2024), https://www.its.dot.gov/research_areas/emerging_tech/pdf/Accelerate_V2X_Deployment_final.pdf at 8 (Secure Deployment: Cybersecurity and Privacy Principles).

⁵² See Bureau of Industry and Security, Department of Commerce, Notice of Proposed Rulemaking, 89 FR 79088 (Sept. 26, 2024).

⁵³ See 3GPP Specifications & Technologies Release 14 and Release 16, *supra* note 39.

⁵⁴ In an *ex parte* letter filed in PS Docket No. 23-239, Auto Innovators provides a non-exhaustive list of such resources, including The National Highway Traffic Safety Administration (NHTSA) Cyber Best Practices for Motor Vehicles, and states that NHTSA has the authority to promulgate motor vehicle safety regulations on cybersecurity, and has enforcement authority to secure recalls of motor vehicles and motor vehicle equipment with a safety-related defect, including one involving cybersecurity flaws. See Letter from Tara Hairston, Senior Director – Technology Policy, Alliance for Automotive Innovation, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 23-239 at 1 (filed March 8, 2024); <https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-09/cybersecurity-best-practices-safety-modern-vehicles-2022-tag.pdf>. See also National Institute of Standards and Technology, *Cybersecurity Framework*, <https://www.nist.gov/cyberframework> (last visited Oct. 29, 2024).

⁵⁵ See *supra* para. 9; 47 CFR §§ 90.377(d), (e).

⁵⁶ *FNPRM*, 35 FCC Rcd at 13503, para. 156.

⁵⁷ *Id.* at 13507, para. 168.

transmission of the most important messages.⁵⁸ The Commission asked how “safety-of-life” should be defined, how appropriate applications should be delineated, and whether such a limitation could be established via changes to the licensee eligibility requirements.⁵⁹ Additionally, the Commission asked how the priority requirement would work in the C-V2X environment and whether the priority determination should continue to be associated with the type of licensee or a more granular approach that considers the type of message.⁶⁰ As noted above, all C-V2X operations pursuant to the recently granted waivers are limited to transportation and vehicle-safety related communications.⁶¹

17. Several commenters state that the upper 30 megahertz (5.895-5.925 GHz) of the 5.9 GHz band should be limited to safety-of-life or non-commercial applications.⁶² In its comments, Auto Innovators states that safety-of-life messages should always have priority when competing for spectrum with other types of messages and that the Commission should retain its three-tier message priority hierarchy.⁶³ The Motor and Equipment Manufacturers Assoc. (MEMA) also states that the Commission should retain its existing message priority hierarchy, given the need to ensure that the most important messages are successfully transmitted over less critical messages.⁶⁴ Robert Bosch LLC (Bosch) comments that a hierarchical priority system is necessary to ensure safety-of-life messages. Therefore, Bosch states that the FCC should preserve the safety-of-life/public safety/non-priority framework for message prioritization.⁶⁵ Bosch recommends that the Commission allocate a dedicated portion of the 30 megahertz to safety-of-life messages, which would help ensure uninterrupted transmission of related messages.⁶⁶ Bosch claims that the remainder of the band could be used for both safety-of-life messages and/or advanced safety services, thereby reducing the risk of interference, while mitigating high channel load scenarios.⁶⁷ However, Bosch states that advanced safety messages that are not strictly safety-of-life can also provide notable safety benefits as well as improved efficiency. For example, Bosch contends that vehicle platooning or timed vehicle intersection movement can be viewed as beneficial functionalities within the transportation sector. Bosch expressed agreement with the Alliance for Automotive Innovation that the Commission should not overly restrict operations in the upper 30 megahertz to only safety-of-life operations and that it is critical for the Commission to recognize the importance and value of additional functions, such as vehicle platooning, that require use of the spectrum.⁶⁸

18. Responding to the Commission’s request that commenters address the need for granularity in the three-tier message priority hierarchy, MEMA states that, utilizing the existing framework, any messages that could reduce the risk of an accident should receive priority over other messages. For instance, MEMA mentions that public safety messages should defer to safety-of-life messages, while messages that strictly relate to traffic congestion, efficiency, or other non-safety issues should only be transmitted when there is little risk of harmful interference.⁶⁹ On the other hand, MEMA

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *Id.*

⁶¹ *See supra* para. 7.

⁶² AT&T FNPRM Comments at 5; DSA FNPRM Comments at 12 (no free spectrum for commercial use); OTI/PK FNPRM Comments at 27-28; ITE FNPRM Reply Comments at 4. MEMA Reply Comments at 1.

⁶³ Auto Innovators FNPRM Reply Comments at 13-14.

⁶⁴ MEMA FNPRM Comments at 3.

⁶⁵ Bosch FNPRM Comments at 4.

⁶⁶ *Id.*

⁶⁷ *Id.*

⁶⁸ *Id.* at 4-5.

⁶⁹ MEMA FNPRM Comments at 3.

asserts that commercial operations should be permitted in the ITS band because a prohibition on commercial operations “will further disincentivize continued innovation in V2X applications” and, in any case, the distinction between “commercial” vs. “non-commercial” services is undefined in this context.⁷⁰ AT&T suggests that the Commission should limit the ITS band to non-commercial applications and services that promote road safety, but allow the U.S. DOT to define specific road-safety related applications and services that qualify for use in the 5.895-5.925 GHz band.⁷¹ New America’s Open Technology Institute (OTI) and Public Knowledge (PK) state that prohibiting commercial activity on the upper 30 megahertz would be consistent with the auto industry’s repeated insistence on the critical need for additional spectrum for public safety and collision avoidance purposes.⁷² Similarly, DSA questions the automotive industry’s claims that 30 megahertz is an insufficient amount of spectrum for vehicular safety applications while it also advocates for the ability to use that same 30 megahertz to support commercial, non-safety applications and services.⁷³ OTI/PK also state that if the Commission does not prohibit commercial use, it would be creating an incentive for both the auto and mobile industries to underinvest in potential safety-of-life signaling applications in favor of commercial applications that are quicker to monetize.⁷⁴ OTI/PK “continues to believe that requiring licensees to use public safety spectrum exclusively for public safety best serves the public interest and avoids any potential conflict between maximizing safety and maximizing profit.”⁷⁵

19. The Intelligent Transportation Society of America (ITS America) argues that spectrum use questions have traditionally been decided by groups that construct standards for these technologies – namely, the U.S. DOT, SAE International, or the Institute of Electrical and Electronics Engineers (“IEEE”). ITS America asserts that these groups have appropriately balanced the primacy of safety-of-life applications and the possibility of commercial applications that could incentivize V2X on-board unit deployment in private vehicle fleets. ITS America contends that OTI/PK’s suggestion to limit use of the 5.895-5.925 GHz band to safety-of-life and public safety communications would materially deter V2X investment and deployment, thereby limiting the number of vehicles utilizing V2X safety measures.⁷⁶ NCTA – The Internet & Television Association (NCTA) contends that it is unfair to allow licensees to gain access to valuable spectrum without an auction.⁷⁷ AT&T states that limiting use of the spectrum to non-commercial applications and services would prevent undue commercial gain from those deploying C-V2X and allow the range of operations needed to improve road safety.⁷⁸ ITE and ITS America join MEMA in arguing that it is impractical to try determining which applications are safety-of-life for the purposes of restricting the use of the spectrum.⁷⁹

20. Given that the ITS remains focused on integrating radio-based technologies to enhance the transportation and vehicular-safety related ecosystem, we agree with those commenters that argue C-V2X operations should be governed by a prioritization system that is similar to the hierarchical system currently in place for DSRC. Thus, safety-of-life messages have top priority, followed by public safety

⁷⁰ See MEMA FNPRM Comments at 1-2; MEMA FNPRM Reply Comments at 1-2.

⁷¹ AT&T FNPRM Comments at 1, 5.

⁷² OTI/PK FNPRM Comments at 26.

⁷³ See DSA FNPRM Comments at 12-14.

⁷⁴ See OTI/PK FNPRM Comments at 26.

⁷⁵ See, e.g., Letter from Nat Purser, Government Affairs Policy Advocate, Public Knowledge, and Michael Calabrese, Director, Wireless Future Project, New America’s Open Technology Institute to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-138, *et. al.* at 4 (Aug. 19, 2024).

⁷⁶ ITS America FNPRM Reply Comments at 19.

⁷⁷ See NCTA FNPRM Comments at 24-25; NCTA FNPRM Reply Comments at 37-40.

⁷⁸ See AT&T FNPRM Comments at 5

⁷⁹ See ITE FNPRM Reply Comments at 4; ITS America FNPRM Reply Comments at 18-20.

communications, and then non-priority communications that promote road safety and efficient, effective road use. We disagree with commenters such as OTI/PK who state that allowing non-priority communications in the band could lead to underinvestment in safety-of-life applications.⁸⁰ We also disagree with commenters such as Bosch that the Commission allocate a dedicated portion of the 30 megahertz to safety-of-life messages.⁸¹ Given that we are prioritizing safety-of-life and public safety usage, we expect that C-V2X operators will focus their efforts on applications within this range in order to effectively utilize the 30 megahertz of spectrum made available to them in this proceeding. We adopt C-V2X rules that reflect the existing DSRC message prioritization hierarchy as follows (in order of precedence): safety-of-life, public safety, and non-priority communications.

21. Based on the record in this proceeding, we believe that the communications prioritization hierarchy will ensure that the ITS spectrum is not being used for communications and applications that would impair the timely and reliable use of the spectrum for safety of life and public safety communications. As a practical matter, our decision to adopt a prioritization system for C-V2X communications and the high priority to which safety-of-life and public safety usage messages are entitled will limit the extent to which other type of applications (such as those supporting paid advertising and marketing messages) can be effectively developed and deployed. We note that the distinction between “commercial” and “non-commercial” remains undefined in the C-V2X context,⁸² and find limited information in the record to help us craft a meaningful and readily applicable definition at this time.⁸³ We further note that there is fundamental disagreement in the record as to whether such a distinction would be helpful or harmful to the realization of C-V2X’s fundamental safety-related objectives. Finally, there is no “commercial” component to the definition we adopt for C-V2X, which is limited to operations “related to the improvement of traffic flow, traffic safety, and other Intelligent Transportation System applications.” Given the evolving nature of the C-V2X technology integration, we will continue to assess how the C-V2X technology in the upper 30 megahertz develops and promotes safety-of-life applications and public safety services and whether a further change to the band usage would maximize the spectrum usage without compromising the intended safety purposes to be supported by the 5.9 GHz band.

22. We also see no reason to modify the structure by which C-V2X licenses are licensed under parts 90 and 95 of our rules, notwithstanding NCTA’s contention that the value of the spectrum warrants use of an auction process unless its use is restricted to safety-of-life services.⁸⁴ As an initial matter, RSU/OBU licenses are issued on a non-exclusive basis and we see no need to revise that approach based on the record here.⁸⁵ Because our RSU/OBU licensing process does not contemplate the

⁸⁰ OTI/PK FNPRM Comments at 25-33; OTI/PK FNPRM Reply Comments at 36-39.

⁸¹ See Bosch FNPRM Comments at 4. In that regard, given the reduction of ITS spectrum to 30 megahertz, and our general policy of providing licensees’ flexibility to evolve and modify operations as necessary, we are not adopting an exclusive-use channel for safety-of-life as we did in 2006 when ITS had 75 megahertz of spectrum. See *Amendment of the Commission’s Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band)*, WT Docket No. 01-90, *Amendment of Parts 2 and 90 of the Commission’s Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short-Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, Memorandum Opinion and Order, 21 FCC Rcd 8961 (2006).

⁸² See MEMA FNPRM Comments at 1-2; MEMA FNPRM Reply Comments at 1-2.

⁸³ The common conception of “commercial” would be for-profit marketing and advertising.

⁸⁴ See NCTA FNPRM Comments at 24-25 (“The only possible justification for licensees to gain access to this extremely valuable spectrum without an auction, and without any obligation to share the spectrum broadly with non-C-V2X users, is to deliver safety-of-life services.”).

⁸⁵ *Amendment of the Commission’s Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band)*, WT Docket No. 01-90, *Amendment of Parts 2 and 90 of the Commission’s Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, Memorandum Opinion and Order, 21 FCC Rcd 8961 (2006). (continued....)

acceptance of mutually exclusive applications, there is no basis to use an auction process.⁸⁶ We also see no reason to deviate from the history of this band that supported the prior DSRC licensing process. Under the Transportation Equity Act for the 21st Century, Congress directed the Commission to consider the spectrum needs for ITS.⁸⁷ The subsequent allocation of the 5.9 GHz band was made based on a finding that DSRC applications would be a key element in meeting the nation's transportation needs and improving highway safety.⁸⁸ Additionally, in the *DSRC Report and Order*, the Commission decided against an auction requirement for ITS licensees, as users would already be subject to licensing and regulatory fees.⁸⁹

C. Channel Bandwidth

23. In the *FNPRM*, the Commission proposed a “light touch” regarding C-V2X channel bandwidth, essentially retaining the remaining portion of the ITS band plan in place for the legacy DSRC technology beyond the transition to C-V2X-based technology.⁹⁰ In this regard, the Commission described “the existing ITS band plan” in the upper 30 megahertz as containing three, 10-megahertz DSRC channels: channels 180, 182, and 184 corresponding to 5.895-5.905 GHz, 5.905-5.915 GHz, and 5.915-5.925 GHz, respectively. Channels 180 and 182 can be combined into channel 181 (5.895-5.915 GHz) to provide a single 20-megahertz channel.⁹¹ In the *FNPRM*, the Commission sought comment on whether this band plan, specifying three 10-megahertz channels, *inter alia*, should apply to C-V2X operations.⁹² Specifically, the Commission asked whether the band plan should continue to accommodate combining two channels into a single 20-megahertz channel; whether channels 182 and 184 should be permitted to be combined into a single 20-megahertz channel;⁹³ and whether all three channels should be permitted to be combined and used as a single 30-megahertz channel.⁹⁴ The Commission further asked what consequences any of these channel bandwidths would have on C-V2X deployment and adoption and how a completely flexible band plan versus a prescriptive band plan would affect the ability of C-V2X technology to maximize efficient and effective use of the band.⁹⁵ In this regard, the Commission urged commenters to provide sufficient detail regarding their preferred band plan and how such a plan could work with C-V2X and all other operational and technical rules being addressed, such as power limits and

Intelligent Transportation Services, ET Docket No. 98-95, Report and Order, 19 FCC Rcd 2458, 2485, para. 57 & n.196 (2003) (*DSRC Licensing and Service Rules Report and Order*).

⁸⁶ 47 U.S.C. § 309(j)(1).

⁸⁷ See Transportation Equity Act for the 21st Century, Pub. L. 105-178, 112 Stat. 107 § 5206(f) (1998) (TEA-21). The TEA did not require that the Commission allocate the 5.9 GHz band for ITS, only that the Commission consider doing so.

⁸⁸ *DSRC Report and Order*, 14 FCC Rcd at 18225, para. 9.

⁸⁹ *Id.* at B-4.

⁹⁰ *FNPRM*, 35 FCC Rcd at 13502, para. 153.

⁹¹ 47 CFR §§ 90.370, 90.377(b), and 95.3163. Note that the DSRC channelization from 5.850-5.925 GHz currently appears in 47 CFR § 90.377(b). This reflects the decision in the *First Report and Order* that allowed ITS operations to transition from the lower 45 megahertz to the upper 30 megahertz. 47 CFR § 90.370(b), which was adopted in the *First Report and Order*, prohibits ITS use of 5.850-5.985 GHz as of July 5, 2022. As this transition date has passed, the rules that we adopt herein are consistent with ITS operating in the 5.895-5.925 GHz band.

⁹² *FNPRM*, 35 FCC Rcd at 13502, para. 153.

⁹³ The Commission's recently-granted waivers permit C-V2X operations in the 20-megahertz channel at 5.905-5.925 GHz, *i.e.*, DSRC channels 182 and 184 combined (47 CFR § 90.377(b)). *See supra* para. 7.

⁹⁴ *FNPRM*, 35 FCC Rcd at 13502, para. 153.

⁹⁵ *Id.*

out-of-band emissions limits.⁹⁶

24. Some commenters state that the Commission should refrain from an overly prescriptive plan and instead allow C-V2X operators to utilize the upper 30 megahertz in a flexible manner.⁹⁷ Other commenters state that C-V2X channelization issues should be determined by the transportation industry.⁹⁸ Arguing for maximum flexibility, AT&T cites the continued evolution of C-V2X and states that the Commission should continue to allow “10 MHz channels and, through their aggregation, wider 20 MHz and 30 MHz channels.”⁹⁹ The Utah Department of Transportation (UDOT) similarly echoes the desire for the band plan to continue to accommodate combining two 10-megahertz channels into a single 20-megahertz channel for C-V2X.¹⁰⁰ The Motor Equipment and Manufacturers Association (MEMA) argues for retaining the existing ITS 30-megahertz band plan following the transition to C-V2X, saying that “by retaining separate channels within the ITS band, licensees can better support safety-of-life use cases which rely on more stringent requirements in terms of safety, security, prioritization, and resource availability.”¹⁰¹

25. Given our preference for a light touch to minimize disruption to ongoing transition activities, we will continue to provide for 10-megahertz channel bandwidths, resulting in three channels : 5.895-5.905 GHz, 5.905-5.915 GHz, and 5.915-5.925 GHz, respectively. We will allow users to combine the 10-megahertz channels into 20 megahertz contiguous channels or a single 30-megahertz channel without restriction, thus accommodating various ITS applications and services. Additionally, because the current channel number designations reflect the original DSRC band plan and related standards,¹⁰² such designations are not relevant to C-V2X and we therefore do not assign channel number designations to the 10-megahertz bandwidths in the C-V2X rules adopted in this Order. This band plan will provide maximum flexibility to enable the ITS industry, which is in the early stages of implementing C-V2X systems, to evolve and modify operations as necessary to use the band in the most efficient way possible to deliver safety applications to the American public.

D. Communications Zones

26. The 5.9 GHz band ITS spectrum is shared and licensed in non-exclusive geographic areas based on geo-political boundaries.¹⁰³ To maximize the use within this shared spectrum, the Commission’s rules require that each registered RSU designate its intended area of operation or “communications zone” and that such communications zones be the smallest necessary. Under the rules, a communications zone is defined as the service area associated with an individual fixed RSU.¹⁰⁴ The communications zone radius is derived from the RSU equipment class specified in section 90.375.¹⁰⁵ In

⁹⁶ *Id.*, 35 FCC Rcd at 13502-03, para. 154.

⁹⁷ See AT&T FNPRM Comments at 2

⁹⁸ See DENSO FNPRM Comments at 1; Alliance for Automotive Innovation FNPRM Comments at 8; Robert Bosch LLC FNPRM Comments at 5.

⁹⁹ AT&T FNPRM Comments at 2.

¹⁰⁰ UDOT FNPRM Comments at 15.

¹⁰¹ Motor Equipment and Manufacturers Association FNPRM Comments at 3.

¹⁰² See *DSRC Licensing and Service Rules Report and Order*, 19 FCC Rcd at 2475, para. 27 (generally adopting the channels and segmentation contained in the ASTM-DSRC Standard).

¹⁰³ 47 CFR § 90.375(a). For a governmental entity, the license would encompass the area in which it has legal jurisdiction. Other entities propose areas of operation based on county(s) and/or, state(s). Nationwide licenses are permitted.

¹⁰⁴ 47 CFR § 90.7 Definitions. Communications zone.

¹⁰⁵ 47 CFR § 90.375(c). The rules provide for four communications zones designated “A” through “D” for coverage areas ranging from 15 meters to 1000 meters. Correspondingly, each zone is associated with a maximum permitted

(continued....)

the *FNPRM*, the Commission proposed to retain the “communications zone” designations currently in the rules and require RSUs to specify their intended zone, believing this would maximize spectrum use among all users, continue to ensure that stations only cover their intended area, and provide opportunities for other licensees to install RSUs for other nearby areas without mutually interfering. The Commission asked commenters to address whether the current communications zone distance limits should be retained without change, modified, or eliminated. The Commission also sought comment on what effect any proposed changes would have on the ability for C-V2X to deploy new systems and continue operating into the future. The Commission also sought comment on whether it should continue to specify both transmitter output power and radiated power levels for communications zones.¹⁰⁶

27. In response, 5GAA states that, while DSRC technology theoretically was required to utilize RSU communications zones to manage congestion, use of communications zones did not occur in practice, and C-V2X does not require a similar mechanism for congestion control. 5GAA recommends revisions to sections 90.375 and 90.377 of the rules to remove references to communications zones and the associated output power limits.¹⁰⁷ Furthermore, as noted above, the Bureaus recently granted waivers to parties requesting to deploy C-V2X operations in the upper 30-megahertz portion of the 5.9 GHz band (5.895-5.925 GHz) prior to adopting final C-V2X-based rules.¹⁰⁸ Notably, C-V2X waiver applicants did not specify communications zones in their waiver requests and requested waiver of that rule section.¹⁰⁹ Consequently, as part of those grants, the Bureaus permitted C-V2X RSUs and OBUs to operate with a 33 dBm EIRP and without transmitter output power limits. Waiver grant recipients are not required to designate communications zones or limit their transmitter output power or EIRP for designated communications zone sizes in their areas of operation.¹¹⁰

28. We find that retaining the existing communications zone construct is unnecessary as ITS evolves from DSRC to C-V2X technology. Based on information contained in the record indicating that DSRC operations did not utilize communications zones to manage congestion and that C-V2X operations do not require such a mechanism to manage congestion, along with the fact that no C-V2X waiver applicants requested communications zone designations, we conclude that the communications zone definitions, designations, and associated reduced power limits are unnecessary to manage congestion control in C-V2X operations. Thus, the C-V2X rules adopted herein do not include communications zone requirements. See Appendix A, Final Rules, §§ 90.7, 90.375, 90.377 for these rule changes.

E. C-V2X Technical Requirements

1. Power and Antenna Height Limits for C-V2X Roadside Units (RSUs)

29. *Power.* The Commission’s current DSRC rules specify the maximum radiated RSU power permitted on each channel, ranging generally from 23 dBm to 33 dBm, but permitting state and local government entities to radiate at higher levels on the control channel (channel 178) at up to 44.8 dBm and on the public safety priority channel (channel 184) at up to 40 dBm.¹¹¹ In the *FNPRM*, the Commission sought comment on what RSU power levels should be associated with each communications zone, channel, and user under the modified ITS band plan, and whether the rules should continue to

output power (power from the RSU transmitter supplied to the input of the transmitting antenna) ranging from 0 dBm to 28.8 dBm.

¹⁰⁶ *FNPRM*, 35 FCC Rcd at 13504, paras. 157-159.

¹⁰⁷ 5GAA FNPRM Comments at 22, A-4.

¹⁰⁸ *See supra* para. 7.

¹⁰⁹ *See, e.g.*, Request for Waiver of 5.9 GHz Band Rules to Permit Initial Deployments of Cellular Vehicle-to-Everything Technology, Ford Motor Company, *et al.*, ET Docket No. 19-138, at 2, 5, n.10 (filed Dec. 13, 2021) (*Joint Waiver Request*).

¹¹⁰ *See, e.g.*, *Joint Waiver Order*, 38 FCC Rcd at 3993, para. 15.

¹¹¹ 47 CFR § 90.377(b).

permit higher radiated power for state and local government entities or be consistent among all users as a way of maximizing spectrum use and controlling potential harmful interference between users. The Commission sought comment on whether RSU radiated power should be limited to 23 dBm as specified for some channels, 33 dBm as specified for others, or some other value, such as permitting higher power on a control channel; whether the rules should continue to specify both output power (power delivered to the input of the transmitting antenna) and radiated power levels for communications zone/channel combinations, or whether it would be more appropriate to specify only a radiated power limit, and specify power as a power density (power per unit of frequency, commonly known as power spectral density (PSD)) to normalize power for wider bandwidth channels, if the use of such channels is still permitted; and whether compliance with the limits should be determined with a root mean square (RMS) detector (i.e., average measurement) or with a peak detector.¹¹²

30. 5GAA recommends adopting a maximum 33 dBm EIRP without transmitter output power limits for C-V2X RSUs to promote more robust safety services and maximize the overall benefits of C-V2X safety services.¹¹³ A broad range of commenters support 5GAA's recommendation.¹¹⁴ Auto Innovators contends that raising the RSU EIRP limit in this manner would provide more flexibility to C-V2X operations.¹¹⁵ DENSO International America, Inc., on behalf of DENSO Corporation and its US affiliate (DENSO) supports a maximum 33 dBm EIRP for C-V2X RSUs to provide more protection from unlicensed device out-of-band emissions from the adjacent 5.850-5.895 GHz U-NII-4 band.¹¹⁶ 5G Americas supports 5GAA's recommendation for C-V2X RSU's in-band power limit because the proposal is consistent with 3GPP physical layer standards.¹¹⁷ In response to the *5.9 GHz NPRM* proposal, the National Telecommunications and Information Administration (NTIA) supported a maximum RSU EIRP limit of 33 dBm.¹¹⁸ In its comments on the Joint Waiver Parties C-V2X waiver request, which only specified the 5.905-5.925 GHz band, NTIA supported an RSU EIRP limit of 33 dBm over a 20-megahertz channel (33 dBm/20 MHz) at 5.905-5.925 GHz,¹¹⁹ and then, in its October 2020 Technical Report, an RSU EIRP limit of 33 dBm in the lower 10-megahertz channel (33 dBm/10 MHz) at 5.895-5.905 GHz.¹²⁰ In its June 7, 2024 letter, NTIA further expressed support for the 33 dBm limit throughout the entire 30 megahertz.¹²¹ NTIA expressed agreement with the Commission's conclusion that requiring coordination for ITS RSU installations located within a section 90.371 coordination zone is the best approach to

¹¹² *FNPRM*, 35 FCC Rcd at 13504-5, paras. 159-160.

¹¹³ 5GAA FNPRM Comments at 21, A-4.

¹¹⁴ 5G Americas FNPRM Comments at 10; Auto Innovators FNPRM Comments at 8; Applied Information FNPRM Comments at 1; Fiat Chrysler Automobiles (FCA) FNPRM Comments at 2; Ford FNPRM Comments at 11-12; LG Electronics FNPRM Comments at 2; Qualcomm FNPRM Comments at 12-13.

¹¹⁵ Auto Innovators FNPRM Comments at 8.

¹¹⁶ DENSO FNPRM Comments at 2.

¹¹⁷ 5G Americas FNPRM Comments at 10.

¹¹⁸ See Letter from Kathy Smith, Chief Counsel, National Telecommunications and Information Administration, enclosed Technical Report, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 19-138, at 38, n.55 (filed Oct. 22, 2020) (Smith NTIA 2020 Letter); *5.9 GHz NPRM*, 34 FCC Rcd at 12618-19, paras. 38-39.

¹¹⁹ See Letter from Charles Cooper, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, to Ronald T. Repasi, Acting Chief, Office of Engineering and Technology, FCC, ET Docket No. 19-138, at 2 (filed April 14, 2023) (Cooper NTIA 2023 Letter).

¹²⁰ Smith NTIA 2020 Letter at 38, n.55.

¹²¹ Letter from Charles Cooper, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, to Ronald Repasi, Chief, Office of Engineering and Technology, FCC, ET Docket No. 19-138 (June 7, 2024) (NTIA Geofencing Letter).

facilitate sharing with federal systems.¹²² We received no comments on whether it would be appropriate to specify the EIRP as a PSD, or whether compliance with the EIRP limits should be evaluated using RMS or peak measurements.

31. After consideration of the record, we adopt an EIRP PSD limit for C-V2X RSU operations, without any limit on the transmitter output power. Because the PSD limit will limit the overall EIRP, we see no need to also adopt a corresponding maximum EIRP limit. By specifying radiated power limits, without a transmitter output power limit, we offer more flexibility for RSU stations to provide reliable service in a given coverage area, and enable licensees to select the most efficient and effective equipment parameters to meet their coverage requirements, while protecting incumbent federal radiolocation stations from harmful interference. An EIRP PSD limit will keep the power even across the channel to avoid RSUs concentrating energy in a narrow bandwidth, thereby keeping the harmful interference potential low, and promoting more efficiency/higher data throughput by making the use of wider bandwidth channels more attractive when RSUs are transmitting. Although we adopt these general limits, we note that if C-V2X RSUs are to be located within a coordination zone identified in section 90.387(b), they must first be coordinated with NTIA.¹²³ As recommended in the NTIA letter and supported in the record, we adopt a 33 dBm/10 MHz, 33dBm/20 MHz, and 33dBm/30 MHz EIRP PSD limits for C-V2X RSUs. These power levels will enable ITS systems to operate over their intended service areas and protect federal incumbent radar systems for any RSU location outside the coordination zones.

32. Consistent with the measurement procedure for out-of-band emissions from unlicensed devices that operate in the 5.850-5.895 GHz (U-NII-4) and 5.925-6.425 GHz (U-NII-5) bands,¹²⁴ we permit compliance with the RSU EIRP limits to be determined using RMS measurements rather than requiring peak measurements. As the Commission has previously determined, RMS measurements are more appropriate to characterize a transmitter's operation because peak power may only be reached occasionally and for short periods of time, whereas RMS measurements represent the continuous power being generated from a device.¹²⁵

33. *Antenna height.* The Commission's rules restrict DSRC RSU antenna height to limit their signals within their designated zones to the extent practicable.¹²⁶ RSU antenna height is currently limited to 8 meters at full power and may be as high as 15 meters with a corresponding power reduction.¹²⁷ In the *FNPRM*, the Commission sought comment on whether the existing RSU antenna height limitations in the rules are justified, if there are any reasons to permit higher antenna heights, and

¹²² See Letter from Charles Cooper, Associate Administrator, Office of Spectrum Management, National Telecommunications and Information Administration, to Ronald T. Repasi, Acting Chief, Office of Engineering and Technology, FCC, ET Docket No. 19-138, at 3 (filed Sept. 8, 2020); Smith NTIA 2020 Letter, enclosed Technical Report, at 38.

¹²³ 47 CFR § 90.387(b). See also 47 CFR § 90.371.

¹²⁴ *First Report and Order*, 33 FCC Rcd at 13476-77, para. 85; *Order on Reconsideration*, FCC 24-32, paras. 19-20; *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852, 3926, para. 198 (2020) (unlicensed use of 5.925-7.125 GHz (U-NII-5 to -8)).

¹²⁵ See, e.g., *First Report and Order*, 33 FCC Rcd at 13476, para. 85.

¹²⁶ 47 CFR § 90.377 (b).

¹²⁷ Frequencies are available for assignment to eligible applicants within the 5.895-5.925 GHz band for RSUs and the maximum EIRP permitted for an RSU with an antenna height not exceeding 8 meters above the roadway bed surface. An RSU may employ an antenna with a height exceeding 8 meters but not exceeding 15 meters provided the EIRP is reduced by a factor of $20 \log(Ht/8)$ in dB where Ht is the height of the radiation center of the antenna in meters above the roadway bed surface. The EIRP is measured as the maximum EIRP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam. The RSU antenna height shall not exceed 15 meters above the roadway bed surface. 47 CFR § 90.377(b), n.1.

whether licensees should continue to be required to reduce their power for higher RSU antenna heights as a way of controlling coverage area and reducing the potential for harmful interference.¹²⁸ In the C-V2X waiver grants noted above,¹²⁹ the Commission requires compliance with the existing RSU antenna height limitation requirements.¹³⁰

34. In its comments, 5GAA recommends that the Commission retain the existing RSU antenna height limitations and associated power reduction requirement for roadside antennas over 8 meters in height up to a maximum of 15 meters.¹³¹ DENSO contends that the power and antenna height issues require sufficient technical study and should be agreed to by all stakeholders because these technical requirements have a significant impact on V2X communication system performance and cost.¹³²

35. We agree with 5GAA that the existing limitations on roadside unit transmitting antenna height and associated power reduction requirement for RSU transmitting antennas over 8 meters in height up to a maximum of 15 meters should be retained in the Commission's rules. These limitations have been successful in enabling coexistence within the band and preventing harmful interference between ITS DSRC operations and to other incumbent operations in the 5.9 GHz band while also enabling sufficient signal coverage over the localized areas being served by each RSU. Retaining the roadside antenna height limits and the associated power reduction requirement for antennas more than 8 meters in height will continue to provide a known spectral environment for C-V2X systems so that network designers can create efficient systems while reducing the potential for harmful interference with other ITS licensees and incumbents in the 5.895-5.925 GHz band. Thus, we retain the roadside unit antenna height limitations and associated power reduction requirement currently specified in the Commission's rules.¹³³ In instances where the maximum RSU EIRP must be reduced due to an antenna height greater than 8 meters above the roadway surface, the RSU PSD limits must be equivalently reduced.

2. Power Limits for C-V2X On-Board Units (OBUs)

36. Under the Commission's part 95 rules, DSRC OBU transmitters operating in the 5.895-5.925 GHz band must comply with technical standard Institute of Electrical and Electronics Engineers (IEEE) 802.11p-2010 for wireless access in vehicular environments.¹³⁴ For vehicular and portable on-board units,¹³⁵ IEEE standard 802.11p-2010 specifies maximum transmitter output power (power supplied to the input of the transmitting antenna) limits ranging from 1 mW (0 dBm) to 760 mW (28.8 dBm), and maximum radiated power (EIRP) permitted on each channel ranging generally from 23 dBm to 33 dBm, but permitting state and local government entities to radiate at higher levels up to 44.8 dBm.¹³⁶ In the *FNPRM*, the Commission sought comment on whether it should modify these power rules for application to C-V2X on-board units. The Commission proposed to limit C-V2X OBU transmitter output power to no more than 20 dBm and EIRP to no more than 23 dBm, believing these power levels to be appropriate for C-V2X vehicular and portable devices. The Commission sought comment on whether

¹²⁸ *FNPRM*, 35 FCC Rcd at 13505, para. 160.

¹²⁹ *See supra* para. 7.

¹³⁰ *See Joint Waiver Order*, 38 FCC Rcd at 3994, para 23; *Aug 16, 2023 Waiver Letter* at 7-8; *Nov. 3, 2023 Waiver Letter*, 38 FCC Rcd at 10407; *Apr. 18, 2024 Waiver Letter*, DA 24-363, at 7; *Jul. 19, 2024 Waiver Letter*, DA 24-707, at 6.

¹³¹ 5GAA FNPRM Comments at A4-A5.

¹³² DENSO FNPRM Comments at 2.

¹³³ *See* 47 CFR § 90.377(c).

¹³⁴ 47 CFR § 95.3189(a).

¹³⁵ A portable on-board unit is a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. 47 CFR § 95.3167(c).

¹³⁶ *See* technical standard IEEE 802.11p-2010 at 31, Table I.5a.

it should increase the OBU EIRP limit to 33 dBm and whether such an increase would affect the ability of C-V2X roadside units to co-exist with and protect federal radiolocation stations. Further, in this context, the Commission also reminded commenters of the need to simultaneously ensure that portable on-board units comply with the Commission's radiofrequency (RF) radiation exposure limits.¹³⁷

37. In its comments, 5GAA recommends increasing the C-V2X OBU EIRP limit to 33 dBm and eliminating the transmitter output power limit requirement.¹³⁸ A broad range of commenters support this 5GAA recommendation.¹³⁹ Ford Motor Company (Ford) stated “that the transmit power limit for OBUs should be specified only as an EIRP of 33 dBm RMS to provide broader coverage including emergency/public safety vehicles.” Ford submits that “an increased EIRP limit (achieved through a combination of higher transmit power and antenna gain) will allow C-V2X-OBU equipped vehicles to communicate more effectively among each other and with C-V2X RSUs. This additional flexibility can be useful to first responders and public safety vehicles in providing higher reliability and range for their safety critical needs (e.g., traffic light preemption).”¹⁴⁰ Auto Innovators similarly supports 5GAA’s proposed power limits to provide more flexibility for C-V2X operations.¹⁴¹

38. Fiat Chrysler Automobiles supports swift adoption of 5GAA’s proposed C-V2X service rules to facilitate deployment in the U.S.¹⁴² 5G Americas supports 5GAA’s proposed C-V2X technical rules, including the OBU in-band power limit, because it is consistent with 3GPP physical layer standards.¹⁴³ OTI/PK agree that the Commission should adopt 5GAA’s proposal and authorize on board units to operate at up to 33 dBm, if feasible.¹⁴⁴ Dynamic Spectrum Alliance (DSA), a global, cross-industry alliance focused on increasing dynamic access to unused radio frequencies and unlicensed usage proponent, supports 5GAA’s request for OBUs to operate with a 33 dBm EIRP.¹⁴⁵

39. In its reply comments, NCTA states that the 5GAA proposal would increase power tenfold without addressing NTIA guidance relating to the protection of radiolocation exclusion zones.¹⁴⁶ Further, NCTA suggests that “if the Commission determines that C-V2X OBUs can operate at such high power (i.e. up to 33 dBm) without the need for exclusion zones, it should also permit U-NII-4 devices to operate using at least the same power level without exclusion zones, as they would pose a significantly lower risk of potential harmful interference to federal radars than similarly powered C-V2X devices.”¹⁴⁷

40. Subsequent to the comment period, 5GAA modified its original support for a general 33 dBm EIRP limit by suggesting that the Commission’s rules should allow the OBU EIRP limits that were granted in the C-V2X waivers *i.e.*, OBUs operating in the 5.905-5.925 GHz band may operate at 33 dBm EIRP, but not exceed 27 dBm EIRP within \pm 5 degrees of horizontal. 5GAA states that OBUs that seek to operate at up to 33 dBm within \pm 5 degrees of horizontal can implement a geolocation function to reduce their power to the 27 dBm EIRP level when operating near federal radar sites that require

¹³⁷ FNPRM, 35 FCC Rcd at 13505, para. 161.

¹³⁸ 5GAA FNPRM Comments at Appendix A, A-7.

¹³⁹ 5G Americas FNPRM Comments at 10; Auto Innovators FNPRM Comments at 8; Applied Information FNPRM Comments at 1; Fiat Chrysler Automobiles (FCA) FNPRM Comments at 2; Ford FNPRM Comments at 11-12; LG Electronics FNPRM Comments at 2; Qualcomm FNPRM Comments at 12-13.

¹⁴⁰ Ford FNPRM Comments at 6, 11-12.

¹⁴¹ Auto Innovators FNPRM Comments at 8.

¹⁴² Fiat Chrysler Automobiles FNPRM Comments at 2.

¹⁴³ 5G Americas FNPRM Comments at 10.

¹⁴⁴ OTI/PK FNPRM Comments at 14-15.

¹⁴⁵ DSA Comments at 10.

¹⁴⁶ NCTA FNPRM Reply Comments at 41.

¹⁴⁷ *Id.*

protection.¹⁴⁸

41. In its Technical Report submitted in response to the *5.9 GHz NPRM*, NTIA determined that OBUs operating at 23 dBm EIRP or less would not need to be coordinated to protect federal operations in the 5.905-5.925 GHz band, thus providing an implied power limitation for non-NTIA coordinated ITS operations.¹⁴⁹ Subsequently, in its comments on the *Joint Waiver Request* filing,¹⁵⁰ NTIA supported a maximum 33 dBm OBU EIRP limit for the C-V2X operations in the 5.905-5.925 GHz band. However, to adequately protect the primary federal radiolocation services operating in the 5.9 GHz band during the period in which devices are operating under a waiver, NTIA requested that C-V2X OBUs be limited to 27 dBm EIRP within \pm 5 degrees in elevation from the horizontal plane.¹⁵¹ The granted waivers limit OBU operations and power reduction conditions to the 5.905-5.925 GHz band, as requested by NTIA.¹⁵²

42. On June 7, 2024, NTIA submitted a letter to the Commission providing additional information in response to the *5.9 GHz FNPRM*.¹⁵³ The NTIA letter addressed, among other things, the C-V2X OBU EIRP limits necessary for “the protection of federal radiolocation systems.”¹⁵⁴ As the NTIA’s OBU proposal, which was similar to the most recent 5GAA proposal,¹⁵⁵ differed from the Commission’s initial *5.9 GHz FNPRM* proposal, the Office of Engineering and Technology (OET) issued a Public Notice on June 11, 2024 inviting comment on the proposal.¹⁵⁶ The NTIA proposal, as set forth in the OET Public Notice, would permit OBU devices to optionally incorporate geofencing¹⁵⁷ techniques to

¹⁴⁸ See Letter from Suzanne M. Tetrault, Counsel to 5GAA, to Marlene Dortch, Secretary, FCC, at 2 (dated April 24, 2024).

¹⁴⁹ See Smith NTIA 2020 Letter, enclosed Technical Report at 38-39, n.55. We note that, at the time the NTIA report was filed, the Commission had proposed to split the band with 5.895-5.905 GHz for DSRC or C-V2X operations and 5.905-5.925 GHz for C-V2X operations. *5.9 GHz NPRM*, 34 FCC Rcd at 12613-16, paras. 24-31. The NTIA Technical Report acknowledged this distinction, but it does consider the overall Commission proposal, including the entire 5.895-5.925 GHz band and 23 dBm EIRP for OBU units in the context of addressing the technical merits of the Commission proposal. See, e.g., Smith NTIA 2020 Letter, enclosed Technical Report at 2, n.17.

¹⁵⁰ *Joint Waiver Request*, *supra* note 109.

¹⁵¹ See Cooper NTIA 2023 letter at 3.

¹⁵² See, e.g., *Joint Waiver Order*, 38 FCC Rcd at 3994, paras. 22-23.

¹⁵³ NTIA Geofencing Letter, *supra* note 121.

¹⁵⁴ *Id.* at 1.

¹⁵⁵ See *supra* para. 37.

¹⁵⁶ *Office of Engineering and Technology Seeks Additional Comment on On-Board Unit Power Limits for C-V2X Operations*, ET Docket 19-138, Public Notice, DA 24-538, at 2-3 (OET, rel. Jun. 11, 2024) (*Geofencing Public Notice*). Overall, the NTIA letter addressed “three specific areas related to the protection of federal radiolocation systems: (1) general provisions for C-V2X technical and service rules”; “(2) C-V2X roadside unit (RSU) equivalent isotropically-radiated power (EIRP) limits; and, (3) EIRP limits for C-V2X OBUs.” The NTIA filings in the first two instances were reasonably similar to the *5.9 GHz FNPRM* proposals and did not represent a significant departure from the comments generally filed within the record of this proceeding.

¹⁵⁷ Geofencing is used to create a virtual geographic boundary around a physical location. A geofence can be dynamically generated (as in a radius around a point location) or match a predefined set of boundaries (such as school zones or neighborhood boundaries). The Commission has required white space devices and 6 GHz unlicensed U-NII devices to incorporate geographic awareness (i.e., a geolocation capability) and use a database to avoid areas where the potential for causing harmful interference would exist. For example, white space devices are required to incorporate a geolocation capability and check a white space database for a list of available channels before they can operate. 47 CFR § 15.711. Similarly, 6 GHz standard power U-NII devices are required to incorporate a geolocation capability and consult an automated frequency coordination database prior to operating to avoid causing interference to fixed service incumbents. 47 CFR § 15.407(k)(9).

protect federal radiolocation sites from harmful interference, while operating with higher power in otherwise unaffected areas.¹⁵⁸ In sum, for geofenced devices, the Public Notice proposal would provide a 33 dBm EIRP PSD limit over the operating bandwidth in areas outside of coordination zones. Such devices would rely on a geofencing capability to limit the EIRP PSD to 23 dBm for operations that utilize the 5.895-5.905 GHz band within coordination zone areas¹⁵⁹ and 27 dBm within \pm 5 degrees of horizontal for coordination area operations that exclusively use the 5.905-5.925 GHz band. Geofenced devices operating in any portion of the 5.895-5.905 GHz band would have to abide by the “worse-case” 23 dBm limit if operating within the coordination zones. Devices that do not incorporate a geofencing capability would be required to meet the aforementioned restrictions at all locations.

43. Additionally, NTIA asks that the Commission adopt specific compliance requirements to ensure geofencing capabilities are properly implemented. In this regard, NTIA suggests that manufacturers implementing a geofencing capability would need to specifically demonstrate and certify compliance of the capability within the FCC’s equipment certification process specified in part 2 of the Commission’s rules. Further, in the event that interference protection requirements are changed, resulting in updated protection zones, the device should include a mechanism to update the OBUs with new information within a reasonable timeframe.¹⁶⁰

44. Comments filed in response to the Public Notice support the optional use of geofencing techniques. In its comments, the Intelligent Transportation Society of America (ITS America) states that it supports NTIA’s proposal related to optional geofencing capabilities and appreciates the flexibility that the proposal provides to C-V2X operations with regards to power levels.¹⁶¹ ITS America further states that updating geofencing parameters for deployed devices poses challenges and will require collaboration among government and industry stakeholders to successfully implement.¹⁶² Auto Innovators also supports the use of geofencing techniques to enable operations at less restrictive EIRP levels.¹⁶³

45. Support for geofencing techniques also came from additional commenters, including the 5G Automotive Association, the American Association of State Highway and Transportation Officials, the Institute of Transportation Engineers, and the Wireless Infrastructure Association.¹⁶⁴ These commenters recommend the Commission define two distinct C-V2X channels, specifically focusing on the lower 10 megahertz channel at 5.895-5.905 GHz and the upper 20 megahertz channel at 5.905-5.925 GHz.¹⁶⁵ Doing so, they say, will ensure interoperability within the band. These commenters also request that the Commission adopt rules requiring C-V2X operators to look to the NTIA website for information on the location of coordination zones.¹⁶⁶ Both the Commission’s rules and the NTIA’s comments in this item specify section 90.371(b) of the rules as the location of the coordination zones necessary to protect federal radiolocation systems.¹⁶⁷ Lastly, these commenters also recommend including provisions in the rules that would require an OBU equipped with geofencing capability to lower its transmit EIRP to the

¹⁵⁸ *Geofencing Public Notice*, DA 24-538, at 2-3.

¹⁵⁹ See 47 CFR § 90.371(b).

¹⁶⁰ *Geofencing Public Notice*, DA 24-538, at 3.

¹⁶¹ ITS America Public Notice Comments at 2.

¹⁶² *Id.*

¹⁶³ Auto Innovators Public Notice Comments at 1.

¹⁶⁴ See 5GAA, AASHTO, ITE, and WIA Public Notice Comments at 1. NCTA also submitted comments in response to the Public Notice, although these comments focused on outdoor and portable U-NII-4 operations, which we have declined to address in this Report and Order.

¹⁶⁵ *Id.* at 2.

¹⁶⁶ 5GAA, AASHTO, ITE, and WIA Public Notice Comments at 3.

¹⁶⁷ While DSRC coordination zones were located in 47 CFR § 90.371(b), the coordination zones applicable to C-V2X operations are located in 47 CFR § 90.387(b).

appropriate level within 60 seconds of entering the power reduction zone.¹⁶⁸

46. Based on consideration of the record, we adopt power limit rules for C-V2X OBUs that provide for optional use of “geofencing” techniques to allow the OBUs to operate at a higher radiated power in some locations. As we have discussed, geofencing technique involves a radiofrequency device using a geolocation capability to determine whether its geographic coordinates are within a defined geographic area. In the instant case, “geofenced” OBU devices would incorporate a geolocation capability to be aware of the appropriate protection areas around federal radiolocation sites. The OBUs would be programmed with the existing 5.895-5.925 GHz band federal radiolocation sites’ coordination zones (specified by geographic coordinates and a radius) to ensure that they operate with lower power levels within the protected areas. OBU equipment that does not incorporate this geolocation capability would be required to comply with the more restrictive OBU EIRP limit.

47. Thus, reflective of NTIA’s June 7, 2024 recommendation and to allow the maximum flexibility possible for C-V2X OBU operations while still protecting incumbent federal radar operations in the band from harmful interference, we will permit C-V2X OBUs with geolocation capabilities to operate with up to the maximum 33 dBm/10 MHz, 33 dBm/20 MHz, and 33 dBm/30 MHz EIRP PSD outside of a section 90.387(b) coordination zone. Within the coordination zones, the following limits will apply: all operations that include use of the 5.895-5.905 GHz channel (i.e., 5.895-5.905 GHz, 5.895-5.915 GHz, and 5.895-5.925 GHz) are limited to a 23 dBm EIRP over the channel bandwidth; all other channels (i.e., 5.905-5.915 GHz, 5.915-5.925 GHz, 5.905-5.925 GHz operations) are limited to 33 dBm over the channel bandwidth, but must be reduced to 27 dBm over the channel bandwidth within \pm 5 degrees of horizontal in elevation.¹⁶⁹ OBUs not equipped with geofencing capability will be limited to the power levels specified for operation within the coordination zones. Manufacturers incorporating geofencing capability for an OBU will need to specifically demonstrate and certify that the device implements the capability in a manner that complies with the requirements discussed herein when seeking an FCC Equipment Certification under part 2 of the Commission’s rules. If geofencing locations and parameters are subsequently modified, a mechanism should be available such that OBUs can be updated with the new information.

48. We further decline to implement recommendations from parties responding to the Public Notice that we re-channelize C-V2X operations into two distinct 10 megahertz and 20 megahertz channels. As stated in the channel bandwidth section above, we are providing maximum flexibility to enable the ITS industry to evolve and modify operations as necessary to use the band in the most efficient way possible to deliver safety applications to the American public. We also decline these parties’ recommendation that the Commission adopt rules requiring C-V2X operators obtain coordination zone information from NTIA’s website.¹⁷⁰ However, we do support industry and government collaboration on additional means of obtaining this information. To that end, we note that NTIA has developed machine readable KML files for download from its website that can be used by C-V2X devices for determining if they are within a coordination zone.¹⁷¹ We also decline to implement a 60-second EIRP adjustment requirement after an OBU enters a coordination zone. The rules require C-V2X devices to comply with the power limits for their location and manufacturers must ensure that devices operate such that they comply with the rules for their location. Thus, a specific requirement, such as a 60-second adjustment period is not necessary.

49. Although the rules we adopt today permit OBUs to operate at up to 33 dBm (with geolocation capability), we decline to grant similar power limits for U-NII-4 devices at this time. This *Second Report and Order* is focused solely on C-V2X operations in the 5.9 GHz band and issues related

¹⁶⁸ 5GAA, AASHTO, ITE, and WIA Public Notice Comments at 3.

¹⁶⁹ This list will also be reflected in the Commission’s part 95 OBU rules.

¹⁷⁰ 5GAA, AASHTO, ITE, and WIA Public Notice Comments at 3.

¹⁷¹ The KML files are available at: <https://www.ntia.gov/spectrum-frequency-bands/59-ghz>.

to U-NII-4 operations as contemplated in the FNPRM remain pending. Although NCTA suggested that the Commission should simultaneously address U-NII-4 outdoor rules and C-V2X service rules, the record has not been sufficiently developed to address the interference dynamics to licensed operations from the outdoor U-NII-4 operations, including the federal radar operations. Application of the 2023 *Policy Statement* regarding the spectrum management will be considered when outdoor U-NII-4 operation is addressed.¹⁷²

3. Out-of-Band Emissions Limits for C-V2X Roadside Units and On-Board Units

50. Under the Commission's part 90 and 95 rules, DSRC RSU and OBU transmitters operating in the 5.895-5.925 GHz band must comply with IEEE standard 802.11p-2010 for wireless access in vehicular environments.¹⁷³ Under this standard, the applicable out-of-band emissions (OOBE) EIRP limits are:

- -16.0 dBm/100 kHz at the channel edge;
- -22.0 dBm/100 kHz at 1 megahertz from the channel edge;
- -30.0 dBm/100 kHz at 10 megahertz from the channel edge; and
- -40 dBm/100 kHz at 20 megahertz from the channel edge.¹⁷⁴

In the recently granted C-V2X waivers, the Bureaus require C-V2X RSUs and OBUs to comply with these IEEE 802.11p-2010 OOBE limits.¹⁷⁵

51. In the *FNPRM*, the Commission proposed that all C-V2X equipment limit OOBE measured at the antenna input (i.e., conducted limits) to:

- -29 dBm/100 kHz at the band edge;
- -35 dBm/100 kHz at ± 1 megahertz from the band edge;
- -43 dBm/100 kHz at ± 10 megahertz from the band edge; and
- -53 dBm/100 kHz at ± 20 megahertz from the band edge.¹⁷⁶

The Commission also proposed to limit out-of-band radiated emissions to -25 dBm/100 kHz or less EIRP outside the 5.895 GHz and 5.925 GHz band edges. The Commission sought comment on these proposed limits and whether they would continue to be appropriate for C-V2X equipment.¹⁷⁷ Additionally, in the *FNPRM*, the Commission noted that 5GAA, in its comments to the *5.9 GHz NPRM*, recommended the following C-V2X conducted OOBE limits for RSUs and OBUs:¹⁷⁸

- -16 dBm/100 kHz at ± 1 megahertz of the band edge;
- -13 dBm/MHz at ± 1 megahertz to ± 5 megahertz of the band edge;
- -16 dBm/MHz at ± 5 megahertz to ± 30 megahertz of the band edge; and
- -28 dBm/MHz beyond 30 megahertz from the band edges.¹⁷⁹

¹⁷² See *Principles for Promoting Efficient Use of Spectrum and Opportunities for New Services*, ET Docket No. 23-122, Policy Statement, 38 FCC Rcd 3682 (2023) (2023 Policy Statement).

¹⁷³ 47 CFR §§ 90.379, 95.3189(a).

¹⁷⁴ See technical standard IEEE 802.11p-2010 at 32, Table I.8.

¹⁷⁵ See *Joint Waiver Order*, 38 FCC Rcd at 3995, para 23; *Aug 16, 2023 Waiver Letter* at 8; *Nov. 3, 2023 Waiver Letter*, 38 FCC Rcd at 10407; *Apr. 18, 2024 Waiver Letter*, DA 24-363, at 7; *Jul. 19, 2024 Waiver Letter*, DA 24-707, at 6.

¹⁷⁶ *FNPRM*, 35 FCC Rcd at 13506, para. 163.

¹⁷⁷ *Id.*

¹⁷⁸ *Id.* at 13506, para. 164; 5GAA *NPRM* Comments, Appx. A, at A-9.

¹⁷⁹ 5GAA *NPRM* Comments, Appx. A, at A-8 to A-9 and A-11 to A-12.

The Commission sought comment on 5GAA's proposed limits, asking whether it should adopt those alternative OOB limits; what effect those relaxed limits would have on the ability to design and manufacture C-V2X equipment; how they would affect equipment cost; and whether the limits would ensure compatibility with adjacent U-NII devices in both the U-NII-4 (5.850-5.895 GHz) and U-NII-5 (5.925-6.425 GHz) bands, which are below and above the modified ITS band, respectively; and what effects those limits would have on adjacent band fixed services in the 6 GHz band.¹⁸⁰ The Commission also sought comment on the measurement standards that should be associated with equipment approval for verifying that C-V2X equipment meets whatever OOB limits it ultimately adopts.¹⁸¹

52. In response, 5GAA recommends that the Commission provide more flexibility for C-V2X operations by adopting the OOB limits for RSUs and non-public safety OBUs that it had previously proposed. Their proposed limits are less restrictive than the OOB limits the Commission proposed in the *FNPRM* and specified in the C-V2X waiver grants. For RSUs and non-public safety OBUs, 5GAA recommends that the Commission adopt the following conducted OOB limits:

- -16 dBm/100 kHz at ± 1 megahertz of the band edge;
- -13 dBm/MHz at ± 1 megahertz to ± 5 megahertz of the band edge;
- -16 dBm/MHz at ± 5 megahertz to ± 30 megahertz of the band edge; and
- -28 dBm/MHz beyond 30 megahertz from the band edges.¹⁸²

53. To help "improve the performance and speed the delivery of critical C-V2X services to fire trucks, police vehicles, ambulances, and other public safety vehicles," 5GAA recommends that the Commission adopt the following conducted OOB limits for OBUs operating from such vehicles:

- -10 dBm/100 kHz at the band edge linearly decreasing to -26 dBm/100 kHz at ± 20 megahertz from the band edges;
- -16 dBm/MHz within 20 to 30 megahertz from the upper band edge and within -30 megahertz to -20 megahertz from the lower band edge; and
- -28 dBm/MHz beyond 30 megahertz from the band edges.¹⁸³

54. A broad range of commenters support 5GAA's recommended C-V2X OOB limits.¹⁸⁴ 5G Americas supports adopting 5GAA's recommended OOB limits because they are consistent with 3GPP physical layer standards.¹⁸⁵ Auto Innovators urges the Commission to adopt 5GAA's recommended C-V2X OOB limits, rather than the OOB limits proposed in the *FNPRM*, because the more relaxed OOB limits recommended by 5GAA would "facilitate both C-V2X's evolution and more robust safety services for travelers" given V2X's reduced spectrum allotment.¹⁸⁶ CNH Industrial America LLC urges the Commission to provide slightly more relaxed OOB limits for safety messages transmitted in "off-road" rural areas.¹⁸⁷ Qualcomm expresses support for 5GAA's recommended OOB limits for RSUs and OBUs that operate in the upper 30-megahertz portion of the 5.9 GHz band.¹⁸⁸ Fiat Chrysler

¹⁸⁰ *FNPRM*, 35 FCC Rcd at 13506, para. 164.

¹⁸¹ *Id.*

¹⁸² 5GAA FNPRM Comments at 22-23, Appx. A, at A-5, A-7.

¹⁸³ *Id.* at 22, Appx. A, at A-7.

¹⁸⁴ 5G Americas FNPRM Comments at 10; Auto Innovators FNPRM Comments at 8; Applied Information FNPRM Comments at 1; Fiat Chrysler Automobiles (FCA) FNPRM Comments at 2; Ford FNPRM Comments at 11-12; LG Electronics FNPRM Comments at 2; Qualcomm FNPRM Comments at 12-13.

¹⁸⁵ 5G Americas FNPRM Comments at 10.

¹⁸⁶ Auto Innovators FNPRM Comments at 8.

¹⁸⁷ CNH Industrial America LLC FNPRM Comments at 6.

¹⁸⁸ Qualcomm FNPRM Comments at 12-13; Qualcomm FNPRM Reply Comments at 2.

Automobiles also supports 5GAA's recommended C-V2X service rules to facilitate deployment in the U.S.¹⁸⁹ Ford expresses its belief that the power and emissions rules 5GAA specified in its comments on the *FNPRM* are essential.¹⁹⁰

55. T-Mobile expresses support for technical rules for C-V2X operations that are based on 3GPP standards and potentially more permissive requirements if they are necessary to fully maximize C-V2X operations and are based on sound technical analyses.¹⁹¹ However, Autotalks urges the Commission not to adopt the 3GPP's C-V2X OOB values because they are too strict, would be challenging to implement, require a filter in most systems that would increase costs, and add an insertion loss that would decrease the system reception sensitivity and communication range. According to Autotalks, 5GAA's recommended OOB limits can be supported without adding a filter.¹⁹²

56. On the other hand, NCTA – The Internet & Television Association, argues that 5GAA's push for relaxed OOB limits for C-V2X operations in the 5.895-5.925 GHz band threatens to undermine Wi-Fi across the country; those OOB limits could erode reliance on Wi-Fi in the new U-NII-4 band adjacent to C-V2X operations in the 5.895-5.925 GHz band. Instead of adopting 5GAA's recommended limits, NCTA recommends adopting the C-V2X OOB limits the Commission proposed in the *FNPRM*, claiming those limits are sufficient for C-V2X operations and support compatibility with adjacent U-NII operations. NCTA argues that the Commission should reject 5GAA's proposed OOB limits because C-V2X advocates have failed to describe the impact of these more permissive levels on the Commission's goal of making the U-NII-4 and U-NII-5 bands a success for Wi-Fi service.¹⁹³ In response, 5GAA asserts that the Commission should dismiss NCTA's assertion, which 5GAA characterizes as baseless both because it is made without any technical support and because unlicensed broadband communications inside buildings should not be impacted, much less undermined, by C-V2X operations occurring on roadways.¹⁹⁴

57. Based on consideration of the record, we adopt 5GAA's recommended set of OOB limits for all RSUs and OBUs. We decline to adopt different OOB limits for public safety OBUs because there is not enough information in the record to justify how more relaxed OOB limits for public safety OBUs can improve the performance of critical safety message delivery. Also, because of the wide variety of vehicles associated with public safety and uncertainty in whether they get outfitted with ITS equipment by the manufacturer or through aftermarket vehicle alterations, it would be administratively burdensome for entities within the supply chain, equipment integrators and installers, and agencies themselves to track different classes of OBUs for different vehicles. Furthermore, having a single class of OBUs would lower manufacturing costs as separate public safety and non-public safety models are not necessary to design and build. Thus, consistent with the limits recommended by 5GAA, we adopt the following conductive OOB limits outside of the authorized 5.895-5.925 GHz band for all RSUs and OBUs:

- -16 dBm/100 kHz within ± 1 megahertz of the band edges;
- -13 dBm/MHz within ± 1 megahertz to ± 5 megahertz of the band edges;
- -16 dBm/MHz within ± 5 megahertz to ± 30 megahertz of the band edges; and
- -28 dBm/MHz beyond 30 megahertz from the band edges.

¹⁸⁹ Fiat Chrysler Automobiles FNPRM Comments at 2.

¹⁹⁰ Ford FNPRM Comments at 12.

¹⁹¹ T-Mobile FNPRM Reply Comments at 2.

¹⁹² Autotalks FNPRM Comments at 2-3.

¹⁹³ NCTA – The Internet & Television Association FNPRM Comments at 26 and FNPRM Reply Comments at 42-43.

¹⁹⁴ 5GAA FNPRM Reply Comments at 9.

The OOB limits we are adopting are consistent with OOB limits the Commission has previously adopted to protect operations in adjacent bands from harmful interference.¹⁹⁵ These limits will provide equipment manufacturers and C-V2X operators with the flexibility to design, manufacture, and operate RSUs and OBUs, respectively, that will help ensure reliable service while protecting adjacent bands operations from harmful interference. Furthermore, we do not expect that the OOB limits will impact, much less undermine, unlicensed broadband communications inside buildings, as claimed by NCTA.¹⁹⁶ The separation distance between 5.895-5.925 GHz band C-V2X transmitters operated on roadways and indoor unlicensed devices operating in frequency bands adjacent to the 5.895-5.925 GHz band, coupled with signal losses due to the angular antenna discrimination between the respective transmitting and receiving antennas, and building attenuation, will significantly reduce the power level of any C-V2X OOB received by a receiver operating on an unlicensed basis.¹⁹⁷

F. Technology Transition

58. In order to complete the transition to C-V2X technology in a timely manner, in the *FNPRM*, the Commission proposed that all ITS operations in the 5.895-5.925 GHz band either convert to C-V2X or cease operating two years after the effective date of a *Second Report and Order* in this proceeding. The Commission indicated that two years would be a sufficient timeframe to allow ITS supply chains to amass C-V2X equipment and to allow the remaining DSRC incumbents to sunset DSRC technology.¹⁹⁸ The Commission asked commenters for input on various timeline-related issues, including the state of C-V2X equipment development, whether supply chains could readily distribute such equipment, and whether vehicle manufacturers could install C-V2X equipment within the proposed two-year timeframe.¹⁹⁹ Further, the Commission asked several questions related to the technical implications of C-V2X and DSRC operations occurring simultaneously in the 5.895-5.925 GHz band during the transition period. In this regard, the Commission asked whether any geographic or spectral separation requirements are necessary to ensure that simultaneous DSRC and C-V2X operations do not result in harmful interference and generally suggested that commenters address any transitional operation concerns in the context of any comments addressing technical parameters.²⁰⁰ Additionally, the Commission sought comment on how it should treat DSRC OBUs after the final transition date. The Commission asked commenters whether OBUs could be turned off by that date, whether they could be modified to become C-V2X compatible through hardware or software updates, whether the potential for harmful interference existed if DSRC OBUs continued to communicate after the final transition date, and whether the Commission should take affirmative steps to notify the owners of vehicles equipped with DSRC OBUs of the transition.²⁰¹

59. Commenters generally expressed agreement with the Commission's proposal to mandate a two-year timeframe for DSRC incumbents to cease operations.²⁰² In its comments, the UDOT states that the two-year timeframe is reasonable and adequate for most public agencies, but stipulates that the process to replace its existing DSRC system would make any timeframe shorter than two years

¹⁹⁵ See, e.g., 47 CFR §§ 27.53(n)(1), (2).

¹⁹⁶ NCTA FNPRM Comments at 26.

¹⁹⁷ Under the Commission's part 15 rules, unlicensed operations are subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station. See 47 CFR § 15.5(b).

¹⁹⁸ *FNPRM*, 35 FCC Rcd at 13500, para. 147.

¹⁹⁹ *Id.* at 13501, paras. 149-150.

²⁰⁰ *Id.* at 13502, para. 152.

²⁰¹ *Id.* at 13501, paras. 149-150.

²⁰² See UDOT FNPRM Comments at 3; Maryland Dept. of Transportation FNPRM Comments at 2; Hyundai America Technical Center FNPRM Reply Comments at 1.

unacceptable.²⁰³ Other commenters suggest that issues such as procurement, engineering, workforce training, testing, installation, and different budgetary concerns all necessitate a minimum timeframe of two years.²⁰⁴ In its reply comments, Hyundai states that an unreasonably short transition period could prematurely discontinue ongoing deployments and research projects or add an undue investment burden to entities that operate within tighter budgetary constraints.²⁰⁵ The Institute of Transportation Engineers, however, states that C-V2X testing and deployment should serve as the main influence on the length of the transition timeframe, rather than a strictly calendar view of the issue.²⁰⁶ MEMA suggests that, during the transition period, 20 megahertz should be dedicated exclusively to C-V2X, permitting DSRC operations on the remaining 10 megahertz until the phase out is complete. MEMA suggests this proposal would reduce the chances of harmful interference occurring between DSRC and C-V2X operations during the transition.²⁰⁷

60. Given the time already elapsed since the Commission's decision to adopt C-V2X technology in the 5.9 GHz band, and the information provided in the record, we believe that two years will provide sufficient time for incumbents, industry, and suppliers to sunset DSRC operations. We believe this timeframe adequately allows public entities with longer budgetary timelines to procure compliant equipment and complete the sunsetting of DSRC. This two year period will commence on the Federal Register publication date of the rules adopted in this *Second Report and Order*. We find good cause to start the two-year DSRC sunset effective with Federal Register publication of this *Second Report and Order*, rather than the effective date of the rules, because we have provided ample notice of the pending action and the intent to sunset DSRC operations.²⁰⁸ To effectuate this transition period, new licenses issued after the effective date of the final rules will only authorize C-V2X operations (not DSRC).²⁰⁹ Because of the lack of interoperability between DSRC and C-V2X operations and the issuance of multiple waivers allowing early C-V2X deployment, ceasing licensing of DSRC as of the effective date of these rules will prevent circumvention of the rules we adopt here and ensure a timely transition. Moreover, the period of time between release of this *Second Report and Order* and the effective date of the rules provides additional time to finalize or modify any pending license applications. We direct PSHSB and WTB to work with any prospective licensees with pending applications to ensure compliance with this timeframe. Existing licensees may use DSRC technology during the two-year transition period and may file RSU modification applications as necessary to continue operations during the transition period. We delegate authority to PSHSB and WTB to issue a public notice, if necessary, detailing any filing requirements for licensees transitioning from DSRC to C-V2X operations.²¹⁰ We also make conforming and non-substantive edits to the Commission's rules that are necessitated by the decision to sunset DSRC technology in this *Second Report and Order*.

61. Regarding waivers for deployment of C-V2X operations in the upper 30-megahertz portion of the 5.9 GHz band (5.895-5.925 GHz), we hereby terminate those waivers issued prior to adopting final C-V2X-based technical rules upon the effective date of the final rules adopted herein. We

²⁰³ UDOT FNPRM Comments at 3.

²⁰⁴ See *id.* at 5; Maryland Department of Transportation FNPRM Comments at 2.

²⁰⁵ Hyundai America Technical Center, Inc. FNPRM Comments at 1.

²⁰⁶ Institute of Transportation Engineers FNPRM Comments at 3.

²⁰⁷ *Id.*

²⁰⁸ See 5 U.S.C. 553(d)(3) (allows agencies to make a rule effective with less than 30 days' notice with a good cause showing).

²⁰⁹ Recognizing the Commission will need time to update Universal Licensing System (ULS) consistent with the new rules and policies here, we direct the PSHSB and WTB to issue licensing and filing guidance to licensees during the transition.

²¹⁰ These delegations include authority to use notice-and-comment procedures if PSHSB and WTB deem it necessary or advisable to do so.

direct PSHSB and WTB to implement any necessary license modifications in accordance with final rules. As to equipment authorizations granted pursuant to the same waiver authority, we note that the power limits and out-of-band emissions limits permitted under waiver authority are within those that we adopted herein, with the exception of optional geofencing.²¹¹ Thus, we do not expect that such devices would cause harmful interference and they may continue to be operated and marketed under their existing equipment authorizations if the authorization is received or in process (i.e., all required information has been provided to a Telecommunication Certification Body) as of the effective date of the final rules adopted herein. However, if any such devices are subsequently modified, the device must comply with all currently applicable rules, including those rules adopted herein.

62. We decline to dedicate 10 megahertz to DSRC operations during the transition, as MEMA suggests. Doing so would deprive C-V2X operators of the opportunity to utilize the full bandwidth made available through this proceeding during the transition, only to require additional modifications and filings at the end of the transition. Similarly, many existing DSRC devices would require modification in order to operate on a dedicated channel or cease operation on the C-V2X channels, an inefficient process given that any requirement would only be temporary. We further note that because most licensees provide the sole service within defined geographic areas, such licensees can provision their systems accordingly, if necessary, without a Commission imposed mandate. Thus, we expect instances where C-V2X and DSRC operations may cause harmful interference to each other to be unlikely. In any event, if harmful interference does occur, under our rules, the later-filed licensee would be required to take any steps necessary to protect the incumbent.

63. We recognize that there are existing DSRC OBUs that have been deployed and are currently in operation, many of which are operated on a licensed-by-rule basis. Commenters urge us not to dictate a particular method of compliance with any transition deadline for OBUs. For example, the UDOT states that it would not be possible to turn off these units remotely, nor would such an operation be acceptable.²¹² UDOT further states that all of its DSRC OBUs will be replaced with C-V2X OBUs before the final transition date, with the replacement taking place at night to minimize service disruptions. We anticipate that other OBU operators will likely follow a similar replacement strategy to replace DSRC OBUs with C-V2X OBUs, or cease to use DSRC OBUs altogether, consistent with the cessation of DSRC RSU operations. We expect that any remaining DSRC OBUs are unlikely to present significant interference concerns because the opportunities for such devices to communicate with DSRC RSUs will be significantly reduced throughout the transition period and eventually eliminated, and we believe that the continued operation of DSRC OBUs will be minimal. Consistent with stakeholders' calls for flexibility, while we complete the sunset of DSRC operations, we will provide flexibility in ceasing DSRC OBU operations. To assist licensees and operators, we direct PSHSB and WTB to conduct outreach providing appropriate reminders and information to facilitate compliance with the DSRC sunset date.

64. Finally, with respect to administrative issues associated with ITS station licenses during this transition, in the *First Report and Order*, the Commission modified all ITS licenses by eliminating authorization to transmit in the 5.850-5.895 GHz band (lower 45 megahertz), thus limiting authority to channels in the 5.895-5.925 GHz band (upper 30 megahertz).²¹³ The Commission also required those licensees to exit the lower 45 megahertz by a date certain and file a notification confirming their timely exit.²¹⁴ Where licensees failed to timely transition out of the lower 45 megahertz and notify the

²¹¹ See, e.g., *Joint Waiver Order*, 38 FCC Rcd at 3994-95, paras. 23-24.

²¹² UDOT FNPRM Comments at 13.

²¹³ See *First Report and Order*, 35 FCC Rcd at 13456-59, paras. 48-55.

²¹⁴ See *id.* at 13459, para. 52; see also *Wireless Telecommunications Bureau and Public Safety and Homeland Security Bureau Remind 5.9 GHz Band ITS Licensees of the July 5, 2022, Deadline to Transition Out of the 5850-5895 MHz Portion of the Band and the July 20, 2022, Deadline to Notify the Bureaus of the Transition*, ET Docket No. 19-138, 37 FCC Rcd 6650, 6651 (2022) (5.9 GHz Deadline Reminder PN).

Commission, those licenses terminated automatically²¹⁵ (but operators may seek a new license if they wish to operate in the upper 30 megahertz). Today, we adopt flexible channelization rules permitting any licensee to operate on any 10-megahertz channel (or aggregation of channels) in the upper band. In light of this flexible approach, going forward, we will streamline our licensing mechanism to authorize each licensee to use the entire 30-megahertz band on all of its RSUs, following registration of those RSUs with the Bureaus.

G. Other Spectrum for ITS

65. The Commission sought comment on whether, notwithstanding its determination that current safety-of-life services can continue to operate using 30 megahertz of spectrum, it should consider allocating additional spectrum for ITS applications. In this regard, the Commission directed commenters to provide specific information indicating why existing spectrum resources were inadequate and what specific safety benefits would result from additional spectrum allocations for ITS applications.²¹⁶ Given that the Commission designated C-V2X as the sole technology for 5.9 GHz ITS applications, it also sought comment on how additional spectrum could be used to leverage C-V2X and aid in its deployment.

66. Commenters generally support the prospect of the Commission providing additional spectrum for C-V2X deployment. Some, such as University of Michigan Transportation Research Institute (UMTRI) and UDOT, take specific issue with the Commission's conclusion in the *First Report and Order* that the record supported that 30 megahertz of spectrum is sufficient to provide ITS basic safety functions, both current and those under consideration in the near future.²¹⁷ The Institute of Transportation Engineers specifically states that it is "important to note that advanced C-V2X applications, including those that rely on collective perception messages (CPM), maneuver coordination messages (MCM), and personal safety messages (PSM) will likely be lost."²¹⁸ Multiple commenters echo this sentiment, collectively stating that if the Commission fails to provide additional mid-band spectrum for safety-of-life and advanced safety applications, the utility of C-V2X will be limited.²¹⁹

67. Many commenters that dispute the need for additional spectrum express concerns that ITS advocates seeking additional spectrum under the guise of providing safety-of-life services in fact intend to use the additional spectrum for commercial, non-safety applications and services.²²⁰ OTI/PK, in their reply comments, raise this exact concern, stating that the Commission should ensure that it does not "create incentives for the auto and mobile industries to preempt future safety mandates or needs by occupying ITS spectrum for commercial applications or services."²²¹

68. Commenters, such as 5GAA and the Alliance for Automotive Innovation, request that the Commission identify an additional 40 megahertz of contiguous, mid-band spectrum for advanced V2X operations.²²² Multiple commenters implore the Commission to convene a working group consisting of representatives from the U.S. DOT, NTIA, state departments of transportation, and the private sector to

²¹⁵ See *First Report and Order*, 35 FCC Rcd at 13459, para. 52; *5.9 GHz Deadline Reminder PN*, 37 FCC Rcd at 6651.

²¹⁶ *FNPRM*, 35 FCC Rcd at 13505, para. 190.

²¹⁷ See UMTRI FNPRM Comments at 3; UDOT FNPRM Comments at 11.

²¹⁸ Institute of Transportation Engineers FNPRM Comments at 12.

²¹⁹ See Bosch FNPRM Comments at 5; Ford Motor Company FNPRM Comments at 6; DENSO FNPRM Comments at 6-7.

²²⁰ See, e.g., DSA FNPRM Comments at 14; OTI/PK FNPRM Comments at 25-26; OTI/PK FNPRM Reply Comments at 38.

²²¹ OTI/PK FNPRM Reply Comments at 39.

²²² 5GAA FNPRM Comments at 21; Alliance for Automotive Innovation FNPRM Comments at 11.

identify and validate additional spectrum for V2X services.²²³

69. The Commission concluded in the *First Report and Order* that the 30 megahertz provided for ITS is sufficient to provide basic safety services consistent with the objectives for this technology and we remain convinced that such spectrum is sufficient for that purpose without the need for additional spectrum. Moreover, given that the Commission is adopting a safety-of-life communication priority hierarchy in this proceeding, we are confident that this spectrum will be preserved for those vital safety applications. As C-V2X deployments are only just beginning, we encourage industry to fully test the bounds of the current spectrum allocation, the C-V2X technology itself, and the technical parameters we prescribe in this *Second Report and Order* for its operation in order to reach a full consensus on whether there is a need for additional spectrum to support safety-of-life services. We anticipate that industry testing, system optimization, and evaluation of the currently allotted spectrum will obviate the need for additional spectrum allocations to support basic safety services.

H. Compensation or Reimbursement for Transition Costs

70. In the *FNPRM*, the Commission sought comment on the possibility of compensating for transition costs, how such costs would be documented, and the process by which such compensation would be determined or implemented.²²⁴ The UDOT states that incumbent DSRC users must be compensated for the cost of replacing their systems and that it should be the manufacturers and users who benefit and profit from using unlicensed technologies in the lower 45 megahertz that should pay those transition costs.²²⁵ In comments considering the process by which such costs would be implemented, UDOT references the method by which microwave licensees in the 2 GHz band that were displaced in the mid-1990's to make way for broadband Personal Communications Services were compensated.²²⁶

71. The Institution of Transportation Engineers (ITE) makes similar arguments regarding compensating incumbents, stating that “[t]he funding source for these reimbursements could be covered by those who are gaining benefit from the newly available 45 MHz of spectrum.”²²⁷ The Alliance for Automotive Innovation also states that the Commission should require unlicensed new entrants to the band to compensate ITS incumbents for their reasonable relocation costs.

72. Other commenters, however, dispute the need for unlicensed entrants to reimburse DSRC incumbents. The National Cable and Telecommunications Association (NCTA) states that “it would be arbitrary and unreasonable for the Commission to require individual purchasers of unlicensed equipment or the broadband providers, companies, schools, libraries, and hospitals that provide Wi-Fi networks to pay existing operators for access to the U-NII-4 band, particularly after DSRC licensees failed to make meaningful use of the band for 20 years.”²²⁸ NCTA further expounds on the lack of a reasonable mechanism to collect a levy on the unlicensed entities, as well as the lack of a legal structure to force payment.²²⁹

73. OTI/PK also strongly oppose imposing a reimbursement mechanism. OTI/PK cite the Commission’s broad authority under section 316 of the Communications Act to modify licenses under the public interest standard, as well as arguments against reimbursing incumbents for investing in failed

²²³ See Intelligent Transportation Society of America FNPRM Comments at 15-16; Alliance for Automotive Innovation FNPRM Comments at 12; Panasonic FNPRM Reply Comments at 6.

²²⁴ FNPRM, 35 FCC Rcd at 13505, para. 167.

²²⁵ See UDOT FNPRM Comments at 3.

²²⁶ *Id.* at 9.

²²⁷ Institute of Transportation Engineers FNPRM Comments at 6.

²²⁸ National Cable and Telecommunications Association FNPRM Comments at 22.

²²⁹ *Id.* at 23-24.

technology, and the impracticality of assessing and collecting user fees from unlicensed users.²³⁰ The Wireless Internet Service Providers Association (WISPA) states that, in the instances cited by proponents of the third-party reimbursement mechanism, such as UDOT above, the Commission has never required unlicensed users to reimburse transitioning licensees.²³¹

74. We agree with NCTA, OTI/PK, and WISPA regarding reimbursement for DSRC incumbents. As the Supreme Court has held, “[n]o licensee obtains any vested interest in any frequency.”²³² Moreover, Courts have repeatedly upheld the Commission’s broad authority under section 316 to modify licenses so long as it is in the public interest.²³³ Section 304 and section 316 grant the Commission broad authority to alter a spectrum license while also eliminating any claim that an incumbent licensee has on the spectrum it was originally allocated. Nothing in these provisions obligates the Commission to compensate a licensee when it exercises its authority to modify a license.

75. As the Commission stated in the *First Report and Order*, “existing DSRC licensees have recently begun to employ C-V2X on an experimental basis, telling us that the transition to C-V2X is ongoing.”²³⁴ It was at this stage that the Commission determined that, due to the DSRC to C-V2X transition already being underway, including the cost of transitioning to C-V2X in the transition calculation was inappropriate. Further, in the *First Report and Order*, the Commission, acting in the public interest, modified all existing 5.9 GHz licenses to operate in the upper 30 megahertz. This action, coupled with the long timeline between the Commission’s issuing of the FNPRM and the two-year transition date adopted herein, should provide all licensees sufficient time to work within their normal budgetary cycles to procure C-V2X equipment in cases where they may have previously planned for DSRC equipment. Further, given the Commission’s broad authority to modify licenses when doing so would be in the public interest, the aforementioned ongoing transition to C-V2X currently underway, and the impracticality of levying fees on unlicensed entities and entrants, the Commission will not take action on reimbursement at this time.

IV. COST-BENEFIT ANALYSIS

76. The rules that we adopt in this *Second Report and Order* enable the repurposing and transition of ITS spectrum sought in the *First Report and Order*, in particular, by codifying C-V2X technical parameters in the Commission’s rules, including band usage, message priority, channel bandwidth, and channelization building. The sources of benefits and costs of those outcomes have therefore not changed from those analyzed in the *First Report and Order*.²³⁵ In that analysis, the Commission concluded that the expected \$17.2 billion of benefits²³⁶ outweigh the costs.²³⁷ The benefits and costs of that analysis were calculated to occur over the time period 2022 to 2025.²³⁸ Because of the

²³⁰ OTI/PK FNPRM Reply Comments at 21.

²³¹ Wireless Internet Service Providers Association FNPRM Reply Comments at 10.

²³² See *Ashbacker Radio Corp. v. FCC*, 326 U.S. 327, 332 (1945).

²³³ See, e.g., *California Metro Mobile Communications Inc. v. FCC*, 365 F.3d 38, 45 (D.C. Cir. 2004) (“Section 316 grants the Commission broad power to modify licenses; the Commission need only find that the proposed modification serves the public interest, convenience and necessity.”); *Celco Partnership v. FCC*, 700 F.3d 534, 543-544 (D.C. Cir. 2012); *Community Television, Inc. v. FCC*, 216 F.3d 1133, 1140-41 (D.C. Cir. 2000).

²³⁴ *First Report and Order*, 35 FCC Rcd at 13499, para. 143.

²³⁵ *Id.* at 13493-99, paras. 133-43.

²³⁶ *Id.* at 13495, paras. 135.

²³⁷ *Id.* at 13499, paras. 143. The *First Report and Order* did not specifically endorse a particular cost estimate, but did argue that an estimate of \$500 million based on comments and a U.S. DOT analysis was likely too high. *Id.* at 13493, 13499, paras. 131, 143.

²³⁸ *Id.* at 13493-99, paras 133-43.

court challenges to, and petitions to reconsider, the *First Report and Order*,²³⁹ some of the benefits and costs that we calculated could only be fully realized over a deferred time horizon, following this *Second Report and Order*. However, we note that demand for unlicensed use has remained strong in the intervening years, and we find that the benefits from the transition of ITS, while delayed, have not been reduced.²⁴⁰ Further, the *First Report and Order* recognized costs with regards to the ITS transition only, and the delay in implementation has likely reduced costs going forward as some efforts in the ITS transition have already occurred in the time since the release of the *First Report and Order*.²⁴¹ We therefore conclude that the benefits continue to outweigh costs for this *Second Report and Order*.

V. PROCEDURAL MATTERS

77. *Final Regulatory Flexibility Analysis.* As required by the Regulatory Flexibility Act of 1980 (RFA),²⁴² as amended, the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA) regarding the significant economic impact on small entities of the policies and rules of this *Second Report and Order*, which is found in Appendix B. The Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, will send a copy of the *Second Report and Order*, including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration.²⁴³

78. *Paperwork Reduction Act.* – This document does not contain any new or modified information collection requirements subject to the Paperwork Reduction Act of 1995, Public Law 104-13. Thus, it does not contain any new or modified information collection burden for small business concerns with fewer than 25 employees, pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, see 44 U.S.C. § 3506(c)(4).

79. *Congressional Review Act.* – The Commission has determined, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget concurs, that this rule is “major” under the Congressional Review Act, 5 U.S.C. § 804(2). The Commission will send a copy of this *Second Report and Order* to Congress and the Government Accountability Office pursuant to 5 U.S.C. § 801(a)(1)(A).

80. *Further Information.* For further information, contact Jamie Coleman of the Office of Engineering and Technology, at 202-418-2705 or Jamie.Coleman@fcc.gov.

VI. ORDERING CLAUSES

81. Accordingly, **IT IS ORDERED** that, pursuant to the authority found in sections 1, 4(i), 301, 302, 303, 309, 316, and 332 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 154(i), 301, 302, 303, 309, 316, and 332 that this Second Report and Order IS HEREBY ADOPTED and, except as otherwise provide below, is effective sixty days after the date of publication in the Federal Register.

²³⁹ See *supra* paras. 5-6.

²⁴⁰ Telecom Advisory Services estimates that in 2021, the economic benefits associated with Wi-Fi in the United States were almost \$979 billion and would increase to nearly \$1.4 trillion in 2025. Telecom Advisory Services, *The Economic Value of Wi-Fi: a global view* (2021 – 2025) at 34-35 (Sept. 2021), <https://www.wi-fi.org/file/detail-global-economic-value-of-wi-fi-2021-2025>. Park Associates estimates that the number of connected devices per household with Internet access has increased to 17 in 2023 from 12 in 2020. Parks Associates, *Parks: Average U.S. Internet Home Had 17 Connected Devices in 2023* (Jan. 10, 2024), <https://www.parksassociates.com/blogs/in-the-news/parks-average-us-internet-home-had-17-connected-devices-in-2023>.

²⁴¹ In the *First Report and Order*, the Commission observed that some experimentation with C-V2X already began with C-V2X, so concluded “the transition to C-V2X is already ongoing.” *First Report and Order*, 35 FCC Rcd at 13499, para. 143.

²⁴² See 5 U.S.C. § 603.

²⁴³ See 5 U.S.C. § 603(a). In addition, the Second Report and Order and FRFA (or summaries thereof) will be published in the Federal Register.

82. IT IS FURTHER ORDERED that no Intelligent Transportation System license will be issued for Dedicated Short Range Communications (DSRC) systems after the effective date of the Final Rules adopted herein. Existing licenses may be renewed as necessary following the effective date of the Final Rules but only for a period not to exceed the date two years after publication of Final Rules in the Federal Register. ITS licenses that reflect DSRC will cancel automatically on the date two years after publication of Final Rules in the Federal Register.

83. IT IS FURTHER ORDERED that the amendments of the Commission's rules as set forth in Appendix A ARE ADOPTED, effective sixty days after publication in the Federal Register.

84. IT IS FURTHER ORDERED that the Commission's Office of the Secretary, SHALL SEND a copy of this Second Report and Order, including the Final Regulatory Flexibility Analyses, to the Chief Counsel for Advocacy of the Small Business Administration.

85. IT IS FURTHER ORDERED that the Office of the Managing Director, Performance Program Management, SHALL SEND a copy of this Second Report and Order, including the Final Regulatory Flexibility Analysis, to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Final Rules

For the reasons set forth in the preamble, the Federal Communications Commission amends 47 CFR parts 1, 90, 95, and 97 as follows:

PART 1 – PRACTICE AND PROCEDURE

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

Authority: 47 U.S.C. chs. 2, 5, 9, 13; 28 U.S.C. 2461 note; 47 U.S.C. 1754, unless otherwise noted.

2. Amend § 1.907 by revising the definition of “*Covered geographic licenses*” to read as follows:

§ 1.907 Definitions.

Covered geographic licenses. Covered geographic licenses consist of the following services: 1.4 GHz Service (part 27, subpart I, of this chapter); 1.6 GHz Service (part 27, subpart J); 24 GHz Service and Digital Electronic Message Services (part 101, subpart G, of this chapter); 218-219 MHz Service (part 95, subpart F, of this chapter); 220-222 MHz Service, excluding public safety licenses (part 90, subpart T, of this chapter); 600 MHz Service (part 27, subpart N); 700 MHz Commercial Services (part 27, subparts F and H); 700 MHz Guard Band Service (part 27, subpart G); 800 MHz Specialized Mobile Radio Service (part 90, subpart S); 900 MHz Specialized Mobile Radio Service (part 90, subpart S); 900 MHz Broadband Service (part 27, subpart P); 3.45 GHz Service (part 27, subpart Q); 3.7 GHz Service (part 27, subpart O); Advanced Wireless Services (part 27, subparts K and L); Air-Ground Radiotelephone Service (Commercial Aviation) (part 22, subpart G, of this chapter); Broadband Personal Communications Service (part 24, subpart E, of this chapter); Broadband Radio Service (part 27, subpart M); Cellular Radiotelephone Service (part 22, subpart H); Citizens Broadband Radio Service (part 96, subpart C, of this chapter); Intelligent Transportation Systems Radio Service in the 5895-5925 MHz band, excluding public safety licenses (part 90, subpart M); Educational Broadband Service (part 27, subpart M); H Block Service (part 27, subpart K); Local Multipoint Distribution Service (part 101, subpart L); Multichannel Video Distribution and Data Service (part 101, subpart P); Multilateration Location and Monitoring Service (part 90, subpart M); Multiple Address Systems (EAs) (part 101, subpart O); Narrowband Personal Communications Service (part 24, subpart D); Paging and Radiotelephone Service (part 22, subpart E; part 90, subpart P); VHF Public Coast Stations, including Automated Maritime Telecommunications Systems (part 80, subpart J, of this chapter); Space Launch Services (part 26 of this chapter); Upper Microwave Flexible Use Service (part 30 of this chapter); and Wireless Communications Service (part 27, subpart D).

PART 90 – PRIVATE LAND MOBILE RADIO SERVICES

3. The authority citation for part 90 continues to read as follows:

Authority: 47 U.S.C. 154(i), 161, 303(g), 303(r), 332(c)(7), 1401-1473.

4. Amend § 90.7 by adding the definition of “*Cellular Vehicle to Everything (C-V2X)*” in alphabetical order, and revising the definitions of “*On-Board unit (OBU)*”, “*Roadside unit (RSU)*”, and “*Roadway bed surface*” to read as follows:

Subpart A—General Information.

§ 90.7 Definitions.

* * * * *

Cellular Vehicle to Everything (C-V2X). The use of cellular radio techniques to transfer data between roadside and on-board units or between on-board units to perform operations related to the improvement of traffic flow, traffic safety, and other Intelligent Transportation System applications in a variety of environments. C-V2X systems may also transmit status and instructional messages related to the units involved.

* * * * *

On-Board Unit (OBU). An On-Board Unit is an Intelligent Transportation System transceiver, operating in the 5895-5925 MHz band, that is normally mounted in or on a vehicle, or which in some instances may be a portable unit. An OBU can be operational while a vehicle or person is either mobile or stationary. The OBUs receive and transmit on one or more radio frequency (RF) channels. Except where specifically excluded, OBU operation is permitted wherever vehicle operation or human passage is permitted. The OBUs mounted in vehicles are licensed by rule under part 95 of this chapter and communicate with Roadside Units (RSUs) and other OBUs. Portable OBUs also are licensed by rule under part 95 of this chapter.

* * * * *

Roadside Unit (RSU). A Roadside Unit is an Intelligent Transportation System transceiver, operating in the 5895-5925 MHz band, that is mounted along a road or pedestrian passageway. An RSU may also be mounted on a vehicle or is hand carried, but it may only operate when the vehicle or hand-carried unit is stationary. Furthermore, an RSU operating under this part is restricted to the location where it is licensed to operate. However, portable or hand-held RSUs are permitted to operate where they do not interfere with a site-licensed operation. An RSU broadcasts data to or exchanges data with OBUs. For DSRC-based RSUs operating in the Intelligent Transportation System until [INSERT DATE 2 YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], an RSU also provides channel assignments and operating instructions to OBUs in its communications zone, when required.

Roadway bed surface. For the Intelligent Transportation System Radio Service, the road surface at ground level.

* * * * *

§ 90.7 [Amended]

5. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], amend § 90.7 by removing the definitions of “*Communications zone*” and “*Dedicated Short Range Communication Services (DSRCS)*” and the last sentence in the definition of “*Roadside Unit (RSU)*”.

Subpart B—Public Safety Radio Pool

6. Amend § 90.20 by revising paragraph (d)(86) to read as follows:

§ 90.20 Public Safety Pool.

* * * * *

(d) * * *

(86) Subpart M of this part contains rules for assignment of frequencies in the 5895-5925 MHz band.

Subpart C—Industrial/Business Radio Pool

7. Amend § 90.35 by revising paragraph (c)(91) to read as follows:

§ 90.35 Industrial/Business Pool.

(c) * * *

(91) Subpart M of this part contains rules for assignment of frequencies in the 5895-5925 MHz band.

Subpart G—Applications and Authorizations

8. Amend § 90.149 by revising paragraph (b) to read as follows:

§ 90.149 License term.

(b) Non-exclusive geographic area licenses for Intelligent Transportation Systems radio service Roadside Units (RSUs) in the 5895-5925 MHz band under subpart M of this part will be issued for a term not to exceed ten years from the date of original issuance or renewal. The registration dates of individual RSUs (see §§ 90.375, 90.389 of this part) will not change the overall renewal period of the single license.

9. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], amend § 90.149 by revising the second sentence of paragraph (b) to read as follows:

§ 90.149 License term.

(b) * * * The registration dates of individual RSUs (see § 90.389 of this part) will not change the overall renewal period of the single license.

10. Amend § 90.155 by revising paragraph (i) to read as follows:

§ 90.155 Time in which station must be placed in operation.

(i) Intelligent Transportation Systems radio service Roadside Units (RSUs) under subpart M of this part in the 5895-5925 MHz band must be placed in operation within 12 months from the effective date of registration (see §§ 90.375, 90.389 of this part) or the authority to operate the RSUs cancels automatically (see § 1.955 of this chapter). Such registration date(s) do not change the overall renewal period of the single license. Licensees must notify the Commission in accordance with § 1.946 of this chapter when registered units are placed in operation within their construction period.

11. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], amend § 90.155 by revising the first sentence of paragraph (i) to read as follows:

§ 90.155 Time in which station must be placed in operation.

(i) Intelligent Transportation Systems radio service Roadside Units (RSUs) under subpart M of this part in the 5895-5925 MHz band must be placed in operation within 12 months from the effective date of

registration (see 90.389 of this part) or the authority to operate the RSUs cancels automatically (see § 1.955 of this chapter). * * *

Subpart H—POLICIES GOVERNING THE ASSIGNMENT OF FREQUENCIES

12. Amend § 90.175 by revising paragraph (j)(16) to read as follows:

§ 90.175 Frequency coordinator requirements.

* * * * *

(j) * * *

(16) Applications for licenses in the Intelligent Transportation Systems radio service (as well as registrations for Roadside Units) under subpart M of this part in the 5895-5925 MHz band.

13. Amend § 90.179 by revising paragraph (f) to read as follows:

§ 90.179 Shared use of radio stations.

* * * * *

(f) Above 800 MHz, shared use on a for-profit private carrier basis is permitted only by SMR, Private Carrier Paging, LMS, and C-V2X and DSRCS licensees. See subparts M, P, and S of this part.

14. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], further amend § 90.179 by revising the first sentence of paragraph (f) to read as follows:

§ 90.179 Shared use of radio stations.

* * * * *

(f) Above 800 MHz, shared use on a for-profit private carrier basis is permitted only by SMR, Private Carrier Paging, LMS, and C-V2X licensees. * * *

Subpart I—GENERAL TECHNICAL STANDARDS

15. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], amend § 90.210 by deleting from Table 1 the entry for “5895-5925” and footnote 4.

16. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], amend § 90.213 by revising footnote 10 of Table 1 to paragraph (a) to read as follows:

§ 90.213 Frequency stability.

* * * * *

Table 1 to § 90.213 – Minimum Frequency Stability

* * * * *

¹⁰ For all equipment, frequency stability is to be specified in the station authorization.

* * * * *

Subpart M – Intelligent Transportation Systems Radio Service

17. In subpart M, add an undesignated center heading above §§ 90.350 through 90.365 to read as follows:

REGULATIONS GOVERNING THE LOCATION AND MONITORING SERVICE (LMS)

§ 90.395 [Redesignated as § 90.384]

18. In subpart M, redesignate § 90.395 as § 90.384.

19. Revise § 90.350 to read as follows:

§ 90.350 Scope.

The Intelligent Transportation Systems (ITS) radio service is for the purpose of integrating radio-based technologies into the nation's transportation infrastructure and developing and implementing the nation's intelligent transportation systems. It includes the Location and Monitoring Service (LMS), Dedicated Short Range Communications Service (DSRCS), and Cellular Vehicle to Everything (C-V2X). Rules regarding eligibility for licensing, frequency availability, and any special requirements for services in the ITS radio service are set forth in this subpart.

(a) DSRCS stations must cease operations in the 5895-5925 MHz band no later than [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. No applications for new DSRCS station licenses will be issued after [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) DSRCS stations licensed as of [INSERT DATE 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER] may continue to operate and make modifications in accordance with the rules in this subpart until [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

20. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], further revise § 90.350 to read as follows:

§ 90.350 Scope.

The Intelligent Transportation Systems (ITS) radio service is for the purpose of integrating radio-based technologies into the nation's transportation infrastructure and developing and implementing the nation's intelligent transportation systems. It includes the Location and Monitoring Service (LMS) and Cellular Vehicle to Everything (C-V2X). Rules regarding eligibility for licensing, frequency availability, and any special requirements for services in the ITS radio service are set forth in this subpart.

21. Amend § 90.371 by revising the first sentence of paragraphs (a) and (b) to read as follows:

§ 90.371 Dedicated short range communications service.

(a) These provisions pertain to systems in the 5895-5925 MHz band for Dedicated Short-Range Communications Service (DSRCS). * * *

(b) DSRCS Roadside Units (RSUs) operating in the band 5895-5925 MHz shall not receive protection from Government Radiolocation services in operation prior to the establishment of the DSRCS station. * * *

* * * * *

22. Amend § 90.377 by revising paragraph (b), designating the table in paragraph (b) as "Table 1 to paragraph (b)" and revising it, and adding paragraphs (b)(1) through (3) to read as follows:

§ 90.377 Frequencies available; maximum EIRP and antenna height, and priority communications.

* * * * *

(b) Frequencies available for assignment to eligible applicants within the 5895-5925 MHz band for RSUs and the maximum EIRP permitted for an RSU with an antenna height not exceeding 8 meters above the roadway bed surface are specified in the table below. ***

Table 1 to paragraph (b)

Channel No.	Frequency range (MHz)	Max. EIRP (dBm)	Channel use
180	5895-5905	23	Service Channel.
181	5895-5915	23	Service Channel.
182	5905-5915	23	Service Channel.
184	5915-5925	33/40	Service Channel.

(1) An RSU may employ an antenna with a height exceeding 8 meters but not exceeding 15 meters provided the EIRP specified in the table above is reduced by a factor of $20 \log(Ht/8)$ in dB where Ht is the height of the radiation center of the antenna in meters above the roadway bed surface. The EIRP is measured as the maximum EIRP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam. The RSU antenna height shall not exceed 15 meters above the roadway bed surface.

(2) Channels 180/182 may be combined to create a twenty-megahertz channel, designated Channel No. 181.

(3) Channel 184 is designated for public safety applications involving safety of life and property. Only those entities meeting the requirements of § 90.373(a) are eligible to hold an authorization to operate on this channel.

* * * * *

§§ 90.370 through 90.384 [Removed]

23. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], further amend subpart M by removing §§ 90.370 through 90.384.

24. Add an undesignated center heading and §§ 90.386 through 90.394 to subpart M to read as follows:

REGULATIONS GOVERNING THE LICENSING AND USE OF FREQUENCIES IN THE 5895-5925 MHZ BAND FOR CELLULAR VEHICLE TO EVERYTHING (C-V2X) ROADSIDE UNITS (RSUS)

§ 90.386 Permitted frequencies.

(a) Cellular Vehicle to Everything (C-V2X) Roadside Units (RSUs) are permitted to operate in the 5895-5925 MHz band.

(b) Frequencies in the 5895-5925 MHz band will not be assigned for the exclusive use of any licensee. Channels are available on a shared basis only for use in accordance with the Commission's rules. All licensees shall cooperate in the selection and use of channels in order to reduce interference. This includes

monitoring for communications in progress and any other measures as may be necessary to minimize interference.

(c) Licensees of C-V2X RSUs suffering or causing harmful interference are expected to cooperate and resolve this problem by mutually satisfactory arrangements. If the licensees are unable to do so, the Commission may impose restrictions including specifying the transmitter power, antenna height and direction, additional filtering, or area or hours of operation of the stations concerned. The use of any channel at a given geographical location may be denied when, in the judgment of the Commission, its use at that location is not in the public interest; use of any such channel may be restricted as to specified geographical areas, maximum power, or such other operating conditions, contained in this part or in the station authorization.

§ 90.387 Cellular Vehicle to Everything (C-V2X).

(a) These provisions pertain to Cellular Vehicle to Everything (C-V2X) Roadside Units (RSUs) operating in the 5895-5925 MHz band. C-V2X On-Board Units are authorized under part 95, subpart L of this chapter.

(b) C-V2X RSUs operating in the band 5895-5925 MHz shall not receive protection from Government Radiolocation services in operation prior to the establishment of the RSU. Operation of RSU stations within the radius centered on the locations listed in the table below, must be coordinated through National Telecommunications and Information Administration (NTIA).

Table 1 to § 90.387(b)—Coordination Locations

Location	Latitude	Longitude	Coordination zone radius
Anclote, Florida	28-11-18	82-47-40	45
Cape Canaveral, Florida	28-28-54	80-34-35	47
Cape San Blas, Florida	29-40-31	85-20-48	47
Carabelle Field, Florida	29-50-38	84-39-46	36
Charleston, South Carolina	32-51-48	79-57-48	16
Edwards, California	34-56-43	117-54-50	53
Eglin, Florida	30-37-51	86-24-16	103
Fort Walton Beach, Florida	30-24-53	86-39-58	41
Kennedy Space Center, Florida	28-25-29	80-39-51	47
Key West, Florida	24-33-09	81-48-28	12
Kirtland AFB, New Mexico	34-59-51	106-28-54	15
Kokeepark, Hawaii	22-07-35	159-40-06	5
MacDill, Florida	27-50-37	82-30-04	47
NV Test Training Range, Nevada	37-18-27	116-10-24	186
Patuxent River, Maryland	38-16-55	76-25-12	6

Location	Latitude	Longitude	Coordination zone radius
Pearl Harbor, Hawaii	21-21-17	157-57-51	16
Pillar Point, California	37-29-52	122-29-59	36
Poker Flat, Alaska	65-07-36	147-29-21	13
Port Canaveral, Florida	28-24-42	80-36-17	19
Port Hueneme, California	34-08-60	119-12-24	24
Point Mugu, California	34-07-17	119-09-1	18
Saddlebunch Keys, Florida	24-38-51	81-36-22	29
San Diego, California	32-43-00	117-11-00	11
San Nicolas Island, California	33-14-47	119-31-07	195
Tonopah Test Range, Nevada	37-44-00	116-43-00	2
Vandenberg, California	34-34-58	120-33-42	55
Venice, Florida	27-04-37	82-27-03	50
Wallop Island, Virginia	37-51-23	75-30-41	48
White Sands Missile Range, New Mexico	32-58-26	106-23-43	158
Yuma, Arizona	32-54-03	114-23-10	2

(c) NTIA may authorize additional station assignments in the federal radiolocation service and may amend, modify, or revoke existing or additional assignments for such service. Once a federal assignment action is taken, the Commission's Universal Licensing System (ULS) database will be updated accordingly and the list in paragraph (b) of this section will be updated as soon as practicable.

§ 90.388 Eligibility.

The following entities are eligible to hold an authorization to operate C-V2X RSUs:

- (a) Any territory, possession, state, city, county, town or similar governmental entity.
- (b) Any entity meeting the eligibility requirements of §§ 90.20, 90.33 or 90.35.

§ 90.389 RSU license areas and registrations.

- (a) Roadside Units (RSUs) in the 5895-5925 MHz band are licensed on the basis of non-exclusive geographic areas. Governmental applicants will be issued a geographic area license based on the geo-political area encompassing the legal jurisdiction of the entity. All other applicants will be issued a geographic area license for their proposed area of operation based on county(s), state(s) or nationwide.
- (b) Applicants who are approved in accordance with FCC Form 601 will be granted non-exclusive licenses for the channel(s) corresponding to their intended operations (see § 90.386). Such licenses serve as a prerequisite of registering individual RSUs located within the licensed geographic area described in paragraph (a) of this section. Licensees must register each RSU in the Universal Licensing System (ULS) before operating such RSU. RSU registrations are subject, inter alia, to the requirements of § 1.923 of this chapter as applicable (antenna structure registration, environmental concerns, international

coordination, and quiet zones). Additionally, RSUs at locations subject to NTIA coordination (see § 90.387(b)) may not begin operation until NTIA approval is received. Registrations are not effective until the Commission posts them on the ULS. It is the licensee's responsibility to delete from the ULS registration database any RSUs that have been discontinued.

(c) Licensees must operate each C-V2X RSU in accordance with the Commission's rules and the registration data posted on the ULS for such C-V2X RSU.

§ 90.390 Channels and priority communications.

(a) *Channels.* C-V2X may operate on the following band segments:

10-megahertz channels:	20-megahertz channels:	30-megahertz channel:
5895-5905 MHz	5895-5915 MHz	5895-5925 MHz
5905-5915 MHz	5905-5925 MHz	
5915-5925 MHz		

(b) *Safety/public safety priority.* The following access priority governs all C-V2X operations:

- (1) Communications involving the safety of life have access priority over all other C-V2X communications;
- (2) C-V2X communications involving public safety have access priority over all other C-V2X except those communications described in (b)(1) of this section. Roadside Units (RSUs) operated by state or local governmental entities are presumptively engaged in public safety priority communications.

(c) *Non-priority communications.* C-V2X communications not listed in paragraph (b) of this section, are non-priority communications.

- (1) If a dispute arises concerning non-priority communications, the licensee of the later-registered RSU must accommodate the operation of the early registered RSU, i.e., interference protection rights are date-sensitive, based on the date that the RSU is first registered (see § 90.389) and the later-registered RSU must modify its operations to resolve the dispute in accordance with paragraph (c)(2) of this section.
- (2) For purposes of this paragraph (c), objectionable interference will be considered to exist when the Commission receives a complaint and the difference in signal strength between the earlier-registered RSU and the later-registered RSU is 18 dB or less (co-channel). Later-registered RSUs causing objectionable interference must correct the interference immediately unless written consent is obtained from the licensee of the earlier-registered RSU.

§ 90.391 Maximum EIRP and antenna height.

(a) C-V2X licensees must limit RSU equivalent isotropically radiated power (EIRP) to 33 dBm. This limit applies to any operation within the 5895-5925 MHz band as follows:

- (1) 33 dBm/10 MHz EIRP;
- (2) 33 dBm/20 MHz EIRP; and
- (3) 33 dBm/30 MHz EIRP.

For purposes of this section, the EIRP is root mean squared (RMS) measured as the maximum EIRP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam.

(b) The radiation center of an RSU antenna shall not exceed 8 meters above the roadway bed surface, except that an RSU may employ an antenna with a height exceeding 8 meters but not exceeding 15 meters provided the EIRP specified in paragraph (a) of this section is reduced by a factor of $20 \log(Ht/8)$ in dB where Ht is the height of the radiation center of the antenna in meters above the roadway bed surface.

The RSU antenna height must not exceed 15 meters above the roadway bed surface.

§ 90.392 C-V2X emissions limits.

C-V2X Roadside Units (RSUs) must comply with the following out-of-band emissions limits.

(a) Conducted limits measured at the antenna input must not exceed:

- (1) -16 dBm/100 kHz within ± 1 megahertz of the band edges;
- (2) -13 dBm/MHz within ± 1 megahertz to ± 5 megahertz of the band edges;
- (3) -16 dBm/MHz within ± 5 megahertz to ± 30 megahertz of the band edges; and
- (4) -28 dBm/MHz beyond 30 megahertz from the band edges

(b) [reserved]

§ 90.393 RSU sites near the U.S./Canada or U.S./Mexico border.

Until such time as agreements between the United States and Canada or the United States and Mexico, as applicable, become effective governing border area use of the 5895-5925 MHz band, authorizations to operate Roadside Units (RSUs) are granted subject to the following conditions:

- (a) RSUs must not cause harmful interference to stations in Canada or Mexico that are licensed in accordance with the international table of frequency allocations for Region 2 (see § 2.106 of this chapter) and must accept any interference that may be caused by such stations.
- (b) Authority to operate RSUs is subject to modifications and future agreements between the United States and Canada or the United States and Mexico, as applicable.

Subpart N—OPERATING REQUIREMENTS

25. Amend § 90.421 by adding paragraph (d) to read as follows:

§ 90.421 Operation of mobile station units not under the control of the licensee.

(d) C-V2X On-Board Units licensed by rule under part 95 of this chapter may communicate with any C-V2X roadside unit authorized under this part or any licensed commercial mobile radio service station as defined in part 20 of this chapter.

26. Amend § 90.425 by revising paragraph (d)(10) to read as follows:

§ 90.425 Station identification.

(d) * * *

- (10) It is a Roadside Unit (RSU) in an Intelligent Transportation System operating in the 5895-5925 MHz band.

PART 95—PERSONAL RADIO SERVICES

27. The authority citation for part 95 continues to read as follows:

Authority: 47 U.S.C. 154, 303, and 307.

28. Amend subpart L by revising the subpart heading to read as follows:

Subpart L—Intelligent Transportation Systems (ITS) On-Board Units (OBUs) in the 5895-5925 MHz Band

29. Revise § 95.3101 to read as follows:

§ 95.3101 Scope.

This subpart contains rules that apply only to ITS On-Board Units (OBUs) transmitting in the 5895-5925 MHz frequency band. ITU Roadside Units (RSUs) are authorized under part 90, subpart M of this chapter.

30. Amend § 95.3103 by

- a. Adding the definition of “*Cellular Vehicle to Everything (C-V2X)*”;
- b. Revising the definition of “*Dedicated Short-Range Communications Services (DSRCS)*”;
- c. Adding the definitions of “*Geofenced Onboard Unit*” and “*Geofencing*”; and
- d. Revising the definition of “*Onboard Unit (OBU)*”.

The additions and revisions read as follows:

§ 95.3103 Definitions.

Cellular Vehicle to Everything (C-V2X). See § 90.7 of this chapter.

Dedicated Short-Range Communications Services (DSRCS). See § 90.7 of this chapter.

Geofenced Onboard Unit. An OBU that incorporates geofencing to protect the appropriate areas around federal radiolocation sites currently enumerated in 47 CFR § 90.387(b) by reducing power within those areas. Such OBUs programmed with information about these sites have the option of operation under the transmit power limits set forth in section 95.3404 of this subpart.

Geofencing. For the purposes of this subpart, geofencing is used to create a virtual boundary around a physical location by enabling a radiofrequency device using a geolocation capability to determine whether its geographic coordinates are within a defined geographic area.

On-Board Unit (OBU). See § 90.7 of this chapter.

31. Amend subpart L by adding an undesignated center heading after § 95.3103, to read as follows:

REGULATIONS GOVERNING THE USE OF FREQUENCIES IN THE 5895-5925 MHZ BAND FOR DEDICATED SHORT-RANGE COMMUNICATIONS SERVICES (DSRCS) ON BOARD UNITS (OBUS)

Subpart L—[Amended]

32. Effective [INSERT DATE TWO YEARS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], further amend subpart L by removing the undesignated center heading and §§ 95.3105 through 95.3189.

33. Add the undesignated center heading and §§ 95.3201 through 95.3205 to subpart L to read as follows:

REGULATIONS GOVERNING THE USE OF FREQUENCIES IN THE 5895-5925 MHZ BAND FOR CELLULAR VEHICLE TO EVERYTHING (C-V2X) ON BOARD UNITS (OBUS)

§ 95.3201 Permissible uses.

C-V2X OBUs may transmit signals to other C-V2X OBUs and to C-V2X Roadside Units (RSUs) authorized under part 90 of this chapter or any licensed commercial mobile radio service station as defined in part 20 of this chapter.

§ 95.3202 OBU transmitter certification.

- (a) Each C-V2X OBU that operates or is intended to operate in the 5895-5925 MHz band must be certified in accordance with this subpart and subpart J of part 2 of this chapter.
- (b) A grant of equipment certification for this subpart will not be issued for any C-V2X OBU transmitter type that fails to comply with all of the applicable rules in this subpart.

§ 95.3203 OBU frequencies.

C-V2X OBUs are permitted to operate in the 5895-5925 MHz band.

§ 95.3204 OBU transmit power limit.

- (a) The following power limits apply for OBUs without a geofencing capability at all locations and for OBUs with a geofencing capability when operating within any coordination zone specified in § 90.387(b) of this chapter:

- (1) 10 MHz channel (5895-5905 MHz): 23 dBm/10 MHz EIRP;
- (2) 10 MHz channel (5905-5915 MHz): 33 dBm/10 MHz EIRP, reduced to 27 dBm within \pm 5 degrees of horizontal;
- (3) 10 MHz channel (5915-5925 MHz): 33 dBm/10 MHz EIRP, reduced to 27 dBm within \pm 5 degrees of horizontal;
- (4) 20 MHz channel (5895-5915 MHz): 23 dBm/20 MHz EIRP;
- (5) 20 MHz channel (5905-5925 MHz): 33 dBm/20 MHz EIRP, reduced to 27 dBm within \pm 5 degrees of horizontal; and
- (6) 30 MHz channel: 23 dBm/30 MHz EIRP.

- (b) The following power limits apply to OBUs with a geofencing capability when operating at locations outside any coordination zone specified in § 90.387(b) of this chapter:

- (1) 10 MHz channel (5895-5905 MHz): 33 dBm/10 MHz EIRP;
- (2) 10 MHz channel (5905-5915 MHz): 33 dBm/10 MHz EIRP;
- (3) 10 MHz channel (5915-5925 MHz): 33 dBm/10 MHz EIRP;
- (4) 20 MHz channel (5895-5915 MHz): 33 dBm/20 MHz EIRP;
- (5) 20 MHz channel (5905-5925 MHz): 33 dBm/20 MHz EIRP; and
- (6) 30 MHz channel: 33 dBm/30 MHz EIRP.

- (c) For purposes of this section, the EIRP is root mean squared (RMS) measured as the maximum EIRP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam.

- (d) For purposes of this section, a portable unit is a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

34. Add § 95.3179 to subpart L to read as follows:

§ 95.3205 Unwanted emissions limits.

- (a) C-V2X OBUs must comply with the following out-of-band emissions limits. Conducted emissions limits measured at the antenna input shall not exceed:

- (1) -16 dBm/100 kHz within \pm 1 megahertz of the band edges;
- (2) -13 dBm/MHz within \pm 1 megahertz to \pm 5 megahertz of the band edges;
- (3) -16 dBm/MHz within \pm 5 megahertz to \pm 30 megahertz of the band edges; and
- (4) -28 dBm/MHz beyond 30 megahertz from the band edges.

PART 97—AMATEUR RADIO SERVICE

35. The authority citation for part 97 continues to read as follows:

Authority: 47 U.S.C. 151-155, 301-609, unless otherwise noted.

36. Amend § 97.303 by revising the last sentence of paragraph (r)(2) to read as follows:

§ 97.303 Frequency sharing requirements.

* * * * *

(r) * * *

(2) * * * In the United States, the use of mobile service is restricted to operations in the Intelligent Transportation System radio service.

* * * * *

APPENDIX B

Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated into the *Use of the 5.850-5.925 GHz Band, Further Notice of Proposed Rulemaking (FNPRM)* released in November 2020.² The Federal Communications Commission (Commission) sought written public comment on the proposals in the *FNPRM*, including comment on the IRFA. No comments were filed addressing the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

A. Need for, and Objectives of, the Second Report and Order

2. In the *Second Report and Order*, the Commission addresses the transition of 5.9 GHz Intelligent Transportation System (ITS) operations from Dedicated Short Range Communications (DSRC) to cellular-to-vehicle-everything (C-V2X). Specifically, the *Second Report and Order* discusses standards and establishes C-V2X technical parameters in the Commission's rules, such as those governing C-V2X equivalent isotropically radiated power (EIRP) and out-of-band emissions (OOBE) limits for C-V2X on-board units (OBUs) and roadside units (RSUs), and for antenna height limits for RSUs. We also eliminate the DSRC requirement for communications zone designations and finalize the timeline for phasing out DSRC-based technology. Additionally, we address the issues of additional spectrum allocations for ITS use and reimbursing the transition costs of DSRC incumbents. The term "DSRC" refers to the technology being phased out of use to provide ITS in the 5.9 GHz band. For ease of reference, we use the term "DSRC" throughout this document. The rules adopted in the *Second Report and Order* address the Commission's objectives of promoting the efficient use of 30 megahertz of spectrum dedicated to ITS as well as providing the safety benefits this technology promises to deliver to the American public.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

3. There were no comments filed that specifically addressed the proposed rules and policies presented in the IRFA.

C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration

4. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.⁴ The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

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

5. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the rules adopted herein.⁵ The RFA generally defines

¹ 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601 – 612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² *Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138, First Report and Order (*First Report and Order*), Further Notice of Proposed Rulemaking (*FNPRM*), and Order of Proposed Modification, 35 FCC Rcd 13440, 13500-08, paras. 146-68 (2020).

³ 5 U.S.C. § 604.

⁴ *Id.* § 604 (a)(3).

⁵ *Id.* 604(a)(4).

the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁶ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁷ A “small business concern” is one that: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).⁸

6. *Small Businesses, Small Organizations, Small Governmental Jurisdictions.* Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe, at the outset, three broad groups of small entities that could be directly affected herein.⁹ First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the Small Business Administration’s (SBA) Office of Advocacy, in general a small business is an independent business having fewer than 500 employees.¹⁰ These types of small businesses represent 99.9% of all businesses in the United States, which translates to 33.2 million businesses.¹¹

7. Next, the type of small entity described as a “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”¹² The Internal Revenue Service (IRS) uses a revenue benchmark of \$50,000 or less to delineate its annual electronic filing requirements for small exempt organizations.¹³ Nationwide, for tax year 2022, there were approximately 530,109 small exempt organizations in the U.S. reporting revenues of \$50,000 or less according to the registration and tax data for exempt organizations available from the IRS.¹⁴

8. Finally, the small entity described as a “small governmental jurisdiction” is defined generally as “governments of cities, counties, towns, townships, villages, school districts, or special

⁶ *Id.* § 601(6).

⁷ *Id.* § 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.”

⁸ Small Business Act, 15 U.S.C. § 632 (1996).

⁹ 5 U.S.C. § 601(3)-(6).

¹⁰ See SBA, Office of Advocacy, “What’s New With Small Business?,” <https://advocacy.sba.gov/wp-content/uploads/2023/03/Whats-New-Infographic-March-2023-508c.pdf> (Mar. 2023).

¹¹ *Id.*

¹² 5 U.S.C. § 601(4).

¹³ The IRS benchmark is similar to the population of less than 50,000 benchmark in 5 U.S.C. § 601(5) that is used to define a small governmental jurisdiction. Therefore, the IRS benchmark has been used to estimate the number of small organizations in this small entity description. See Annual Electronic Filing Requirement for Small Exempt Organizations – Form 990-N (e-Postcard), “Who must file,” <https://www.irs.gov/charities-non-profits/annual-electronic-filing-requirement-for-small-exempt-organizations-form-990-n-e-postcard>. We note that the IRS data does not provide information on whether a small exempt organization is independently owned and operated or dominant in its field.

¹⁴ See Exempt Organizations Business Master File Extract (EO BMF), “CSV Files by Region,” <https://www.irs.gov/charities-non-profits/exempt-organizations-business-master-file-extract-eo-bmf>. The IRS Exempt Organization Business Master File (EO BMF) Extract provides information on all registered tax-exempt/non-profit organizations. The data utilized for purposes of this description was extracted from the IRS EO BMF data for businesses for the tax year 2022 with revenue less than or equal to \$50,000 for Region 1-Northeast Area (71,897), Region 2-Mid-Atlantic and Great Lakes Areas (197,296), and Region 3-Gulf Coast and Pacific Coast Areas (260,447) that includes the continental U.S., Alaska, and Hawaii. This data includes information for Puerto Rico (469).

districts, with a population of less than fifty thousand.”¹⁵ U.S. Census Bureau data from the 2022 Census of Governments¹⁶ indicate there were 90,837 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.¹⁷ Of this number, there were 36,845 general purpose governments (county,¹⁸ municipal, and town or township¹⁹) with populations of less than 50,000 and 11,879 special purpose governments (independent school districts²⁰) with enrollment populations of less than 50,000.²¹ Accordingly, based on the 2022 U.S. Census of Governments data, we estimate that at least 48,724 entities fall into the category of “small governmental jurisdictions.”²²

9. *Radio Frequency Equipment Manufacturers (RF Manufacturers).* There are several analogous industries with an SBA small business size standard that are applicable to RF Manufacturers. These industries are Fixed Microwave Services, Other Communications Equipment Manufacturing, Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. A description of these industries and the SBA small business size standards are detailed below.

10. *Fixed Microwave Services.* Fixed microwave services include common carrier,²³ private-operational fixed,²⁴ and broadcast auxiliary radio services.²⁵ They also include the Upper Microwave

¹⁵ 5 U.S.C. § 601(5).

¹⁶ 13 U.S.C. § 161. The Census of Governments survey is conducted every five (5) years compiling data for years ending with “2” and “7”. *See also* Census of Governments, <https://www.census.gov/programs-surveys/economic-census/year/2022/about.html>.

¹⁷ *See* U.S. Census Bureau, 2022 Census of Governments – Organization Table 2. Local Governments by Type and State: 2022 [CG2200ORG02], <https://www.census.gov/data/tables/2022/econ/gus/2022-governments.html>. Local governmental jurisdictions are made up of general purpose governments (county, municipal and town or township) and special purpose governments (special districts and independent school districts). *See also* tbl.2. CG2200ORG02 Table Notes _Local Governments by Type and State_2022.

¹⁸ *See id.* at tbl.5. County Governments by Population-Size Group and State: 2022 [CG2200ORG05], <https://www.census.gov/data/tables/2022/econ/gus/2022-governments.html>. There were 2,097 county governments with populations less than 50,000. This category does not include subcounty (municipal and township) governments.

¹⁹ *See id.* at tbl.6. Subcounty General-Purpose Governments by Population-Size Group and State: 2022 [CG2200ORG06], <https://www.census.gov/data/tables/2022/econ/gus/2022-governments.html>. There were 18,693 municipal and 16,055 town and township governments with populations less than 50,000.

²⁰ *See id.* at tbl.10. Elementary and Secondary School Systems by Enrollment-Size Group and State: 2022 [CG2200ORG10], <https://www.census.gov/data/tables/2022/econ/gus/2022-governments.html>. There were 11,879 independent school districts with enrollment populations less than 50,000. *See also* tbl.4. Special-Purpose Local Governments by State Census Years 1942 to 2022 [CG2200ORG04], CG2200ORG04 Table Notes Special Purpose Local Governments by State Census Years 1942 to 2022.

²¹ While the special purpose governments category also includes local special district governments, the 2022 Census of Governments data does not provide data aggregated based on population size for the special purpose governments category. Therefore, only data from independent school districts is included in the special purpose governments category.

²² This total is derived from the sum of the number of general purpose governments (county, municipal and town or township) with populations of less than 50,000 (36,845) and the number of special purpose governments - independent school districts with enrollment populations of less than 50,000 (11,879), from the 2022 Census of Governments - Organizations tbls. 5, 6 & 10.

²³ *See* 47 CFR part 101, subparts C and I.

²⁴ *See id.* subparts C and H.

²⁵ Auxiliary Microwave Service is governed by part 74 of Title 47 of the Commission’s Rules. *See* 47 CFR part 74. Available to licensees of broadcast stations and to broadcast and cable network entities, broadcast auxiliary microwave stations are used for relaying broadcast television signals from the studio to the transmitter, or between

(continued....)

Flexible Use Service (UMFUS),²⁶ Millimeter Wave Service (70/80/90 GHz),²⁷ Local Multipoint Distribution Service (LMDS),²⁸ the Digital Electronic Message Service (DEMS),²⁹ 24 GHz Service,³⁰ Multiple Address Systems (MAS),³¹ and Multichannel Video Distribution and Data Service (MVDDS),³² where in some bands licensees can choose between common carrier and non-common carrier status.³³ Wireless Telecommunications Carriers (*except Satellite*)³⁴ is the closest industry with an SBA small business size standard applicable to these services. The SBA small size standard for this industry classifies a business as small if it has 1,500 or fewer employees.³⁵ U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.³⁶ Of this number, 2,837 firms employed fewer than 250 employees.³⁷ Thus, under the SBA size standard, the Commission estimates that a majority of fixed microwave service licensees can be considered small.

11. The Commission's small business size standards with respect to fixed microwave services involve eligibility for bidding credits and installment payments in the auction of licenses for the various frequency bands included in fixed microwave services. When bidding credits are adopted for the auction of licenses in fixed microwave services frequency bands, such credits may be available to several types of small businesses based average gross revenues (small, very small and entrepreneur) pursuant to the competitive bidding rules adopted in conjunction with the requirements for the auction and/or as identified in part 101 of the Commission's rules for the specific fixed microwave services frequency bands.³⁸

12. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to

two points such as a main studio and an auxiliary studio. The service also includes mobile TV pickups, which relay signals from a remote location back to the studio.

²⁶ See 47 CFR part 30.

²⁷ See 47 CFR part 101, subpart Q.

²⁸ See *id.* subpart L.

²⁹ See *id.* subpart G.

³⁰ See *id.*

³¹ See *id.* subpart O.

³² See *id.* subpart P.

³³ See 47 CFR §§ 101.533, 101.1017.

³⁴ See U.S. Census Bureau, *2017 NAICS Definition*, “517312 Wireless Telecommunications Carriers (*except Satellite*)”, <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

³⁵ See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

³⁶ See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIRM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePrevious=false>. At this time, the 2022 Economic Census data is not available.

³⁷ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

³⁸ See 47 CFR §§ 101.538(a)(1)-(3), 101.1112(b)-(d), 101.1319(a)(1)-(2), and 101.1429(a)(1)-(3).

estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

13. Other Communications Equipment Manufacturing. This industry comprises establishments primarily engaged in manufacturing communications equipment (except telephone apparatus, and radio and television broadcast, and wireless communications equipment).³⁹ Examples of such manufacturing include fire detection and alarm systems manufacturing, intercom systems and equipment manufacturing, and signals (e.g., highway, pedestrian, railway, traffic) manufacturing.⁴⁰ The SBA small business size standard for this industry classifies firms having 750 or fewer employees as small.⁴¹ For this industry, U.S. Census Bureau data for 2017 shows that 321 firms operated for the entire year.⁴² Of that number, 310 firms operated with fewer than 250 employees.⁴³ Based on this data, we conclude that the majority of Other Communications Equipment Manufacturers are small.

14. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing*. This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.⁴⁴ 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.⁴⁵ The SBA small business size standard for this industry classifies firms having 1,250 employees or less as small.⁴⁶ U.S. Census Bureau data for 2017 show that there were 656 firms in this industry that operated for the entire year.⁴⁷ Of this number, 624 had fewer than 250 employees.⁴⁸ Based on this data, we conclude that a majority of manufacturers in this industry are small.

15. *Wireless Telecommunications Carriers (except Satellite)*. This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves.⁴⁹ Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless Internet access, and

³⁹ See U.S. Census Bureau, 2017 NAICS Definitions, “334290 Other Communications Equipment Manufacturing,” <https://www.census.gov/naics/?input=334290&year=2017&details=334290>.

⁴⁰ *Id.*

⁴¹ See 13 CFR 121.201, NAICS Code 334290.

⁴² See U.S. Census Bureau, 2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017, Table ID: EC1700SIZEEMPFIRM, NAICS Code 334290, <https://data.census.gov/cedsci/table?y=2017&n=334290&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePreview=false>. At this time, the 2022 Economic Census data is not available.

⁴³ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

⁴⁴ See U.S. Census Bureau, 2017 NAICS Definition, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing,” <https://www.census.gov/naics/?input=334220&year=2017&details=334220>.

⁴⁵ *Id.*

⁴⁶ See 13 CFR § 121.201, NAICS Code 334220.

⁴⁷ See U.S. Census Bureau, 2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017, Table ID: EC1700SIZEEMPFIRM, NAICS Code 334220, <https://data.census.gov/cedsci/table?y=2017&n=334220&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePreview=false>. At this time, the 2022 Economic Census data is not available.

⁴⁸ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

⁴⁹ See U.S. Census Bureau, 2017 NAICS Definition, “517312 Wireless Telecommunications Carriers (except Satellite),” <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

wireless video services.⁵⁰ The SBA size standard for this industry classifies a business as small if it has 1,500 or fewer employees.⁵¹ U.S. Census Bureau data for 2017 show that there were 2,893 firms in this industry that operated for the entire year.⁵² Of that number, 2,837 firms employed fewer than 250 employees.⁵³ Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 594 providers that reported they were engaged in the provision of wireless services.⁵⁴ Of these providers, the Commission estimates that 511 providers have 1,500 or fewer employees.⁵⁵ Consequently, using the SBA's small business size standard, most of these providers can be considered small entities.

16. *Automobile Manufacturing.* This U.S. industry comprises establishments primarily engaged in (1) manufacturing complete automobiles (i.e., body and chassis or unibody) or (2) manufacturing automobile chassis only.⁵⁶ The SBA small business size standard for this industry classifies firms having 1,500 employees or less as small.⁵⁷ 2017 U.S. Census Bureau data indicate that 157 firms operated in this industry for the entire year.⁵⁸ Of this number, 145 firms employed fewer than 100 employees.⁵⁹ Therefore, the Commission estimates that the majority of manufacturers in this industry are small entities.

17. *Internet Service Providers (Non-Broadband).* Internet access service providers using client-supplied telecommunications connections (e.g., dial-up ISPs) as well as VoIP service providers using client-supplied telecommunications connections fall in the industry classification of All Other Telecommunications.⁶⁰ The SBA small business size standard for this industry classifies firms with annual receipts of \$40 million or less as small.⁶¹ For this industry, U.S. Census Bureau data for 2017 show that there were 1,079 firms in this industry that operated for the entire year.⁶² Of those firms, 1,039

⁵⁰ *Id.*

⁵¹ See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

⁵² See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIRM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePreview=false>. At this time, the 2022 Economic Census data is not available.

⁵³ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

⁵⁴ Federal-State Joint Board on Universal Service, Universal Service Monitoring Report at 26, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

⁵⁵ *Id.*

⁵⁶ See U.S. Census Bureau, *2017 NAICS Definition*, “336111 Automotive Manufacturing,” <https://www.census.gov/naics/?input=336111&year=2017&details=336111>.

⁵⁷ See 13 CFR § 121.201, NAICS Code 336111 (as of 10/1/22 NAICS Code 336110).

⁵⁸ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIRM, NAICS Code 336111, <https://data.census.gov/cedsci/table?y=2017&n=336111&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePreview=false>. At this time, the 2022 Economic Census data is not available.

⁵⁹ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

⁶⁰ See U.S. Census Bureau, *2017 NAICS Definition*, “517919 All Other Telecommunications,” <https://www.census.gov/naics/?input=517919&year=2017&details=517919>.

⁶¹ See 13 CFR § 121.201, NAICS Code 517919 (as of 10/1/22, NAICS Code 517810).

⁶² See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517919, (continued....)

had revenue of less than \$25 million.⁶³ Consequently, under the SBA size standard a majority of firms in this industry can be considered small.

18. *Wired Broadband Internet Access Service Providers (Wired ISPs).*⁶⁴ Providers of wired broadband Internet access service include various types of providers except dial-up Internet access providers. Wireline service that terminates at an end user location or mobile device and enables the end user to receive information from and/or send information to the Internet at information transfer rates exceeding 200 kilobits per second (kbps) in at least one direction is classified as a broadband connection under the Commission's rules.⁶⁵ Wired broadband Internet services fall in the Wired Telecommunications Carriers industry.⁶⁶ The SBA small business size standard for this industry classifies firms having 1,500 or fewer employees as small.⁶⁷ U.S. Census Bureau data for 2017 show that there were 3,054 firms that operated in this industry for the entire year.⁶⁸ Of this number, 2,964 firms operated with fewer than 250 employees.⁶⁹

19. Additionally, according to Commission data on Internet access services as of June 30, 2019, nationwide there were approximately 2,747 providers of connections over 200 kbps in at least one direction using various wireline technologies.⁷⁰ The Commission does not collect data on the number of employees for providers of these services, therefore, at this time we are not able to estimate the number of providers that would qualify as small under the SBA's small business size standard. However, in light of the general data on fixed technology service providers in the Commission's *2022 Communications Marketplace Report*,⁷¹ we believe that the majority of wireline Internet access service providers can be considered small entities.

20. *Cable System Operators (Telecom Act Standard).* The Communications Act of 1934, as amended, contains a size standard for a "small cable operator," which is "a cable operator that, directly or

<https://data.census.gov/cedsci/table?y=2017&n=517919&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>. At this time, the 2022 Economic Census data is not available.

⁶³ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see https://www.census.gov/glossary/#term_ReceiptsRevenueServices.

⁶⁴ Formerly included in the scope of the Internet Service Providers (Broadband), Wired Telecommunications Carriers and All Other Telecommunications small entity industry descriptions.

⁶⁵ See 47 CFR § 1.7001(a)(1).

⁶⁶ See U.S. Census Bureau, *2017 NAICS Definition*, "517311 Wired Telecommunications Carriers," <https://www.census.gov/naics/?input=517311&year=2017&details=517311>.

⁶⁷ See 13 CFR § 121.201, NAICS Code 517311 (as of 10/1/22, NAICS Code 517111).

⁶⁸ See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIRM, NAICS Code 517311, <https://data.census.gov/cedsci/table?y=2017&n=517311&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePreview=false>. At this time, the 2022 Economic Census data is not available.

⁶⁹ *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

⁷⁰ See Federal Communications Commission, *Internet Access Services: Status as of June 30, 2019 at 27*, Fig. 30 (*IAS Status 2019*), Industry Analysis Division, Office of Economics & Analytics (March 2022). The report can be accessed at <https://www.fcc.gov/economics-analytics/industry-analysis-division/iad-data-statistical-reports>. The technologies used by providers include aDSL, sDSL, Other Wireline, Cable Modem and FTTB). Other wireline includes: all copper-wire based technologies other than xDSL (such as Ethernet over copper, T-1/DS-1 and T3/DS-1) as well as power line technologies which are included in this category to maintain the confidentiality of the providers.

⁷¹ See *Communications Marketplace Report*, GN Docket No. 22-203, 2022 WL 18110553 at 10, paras. 26-27, Figs. II.A.5-7. (2022) (*2022 Communications Marketplace Report*).

through an affiliate, serves in the aggregate fewer than one percent of all subscribers in the United States and is not affiliated with any entity or entities whose gross annual revenues in the aggregate exceed \$250,000,000.”⁷² For purposes of the Telecom Act Standard, the Commission determined that a cable system operator that serves fewer than 498,000 subscribers, either directly or through affiliates, will meet the definition of a small cable operator.⁷³ Based on industry data, only six cable system operators have more than 498,000 subscribers.⁷⁴ Accordingly, the Commission estimates that the majority of cable system operators are small under this size standard. We note however, that the Commission neither requests nor collects information on whether cable system operators are affiliated with entities whose gross annual revenues exceed \$250 million.⁷⁵ Therefore, we are unable at this time to estimate with greater precision the number of cable system operators that would qualify as small cable operators under the definition in the Communications Act.

21. *Intelligent Transportation System (ITS).* The Commission’s own data—available in its Universal Licensing System—indicate that, as of June 11, 2024, there are 310 active ITS licenses in the Commission’s database that will be affected by our actions.⁷⁶ An authorization to operate in the ITS service may be obtained by any territory, possession, state, city, county, town, or similar governmental entity, and any public safety or industrial/business entity meeting the pertinent eligibility requirements. Prior to operation, applicants are issued a non-exclusive, geographic area license: governmental entities are authorized based on that entity’s legal jurisdictional area of operations; and non-governmental entities are licensed based on each applicant’s area of operation (i.e., by county, state, multi-state, or nationwide). 91 licensees are considered “public safety eligible” with the remaining 212 qualified under the Industrial/Business Pool requirements. The Commission does not know how many of these licensees are small, as the Commission does not collect that information for these types of entities.

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

22. In the *Second Report and Order*, the Commission adopts crucial rules that will optimize the use of 30 megahertz of spectrum dedicated to ITS. The adopted rules address band usage, message prioritization, channel bandwidth, power for RSUs and OBUs, and out-of-band emissions (OOBE) limits for C-V2X operations, along with transition issues and compensation to existing users.

23. The Commission expects that all filing, recordkeeping and reporting requirements associated with the adopted rules will be the same for small and other entities. Further, we believe the rules adopted in the *Second Report and Order* would effectively provide an advantage to small entities, as these entities would benefit from the C-V2X rules that reflect the existing DSRC message prioritization hierarchy in order of precedence as follows: safety-of-life, public safety, and non-priority communications. We also believe minimizing the disruption to ongoing transition activities by maintaining the 10-megahertz channel bandwidths, corresponding to 5.895-5.905 GHz, 5.905-5.915 GHz,

⁷² 47 U.S.C. § 543(m)(2).

⁷³ *FCC Announces Updated Subscriber Threshold for the Definition of Small Cable Operator*, Public Notice, DA 23-906 (MB 2023) (2023 *Subscriber Threshold PN*). In this Public Notice, the Commission determined that there were approximately 49.8 million cable subscribers in the United States at that time using the most reliable source publicly available. *Id.* This threshold will remain in effect until the Commission issues a superseding Public Notice. See 47 CFR § 76.901(e)(1).

⁷⁴ S&P Global Market Intelligence, S&P Capital IQ Pro, *Top Cable MSOs 06/23Q* (last visited Sept. 27, 2023); S&P Global Market Intelligence, Multichannel Video Subscriptions, Top 10 (April 2022).

⁷⁵ The Commission does receive such information on a case-by-case basis if a cable operator appeals a local franchise authority’s finding that the operator does not qualify as a small cable operator pursuant to § 76.901(e) of the Commission’s rules. See 47 CFR § 76.910(b).

⁷⁶ See Federal Communications Commission, *Universal Licensing System*, <http://wireless.fcc.gov/uls>. For the purposes of this (IRFA), consistent with Commission practice for wireless services, the Commission estimates the number of licensees based on the number of unique FCC Registration Numbers.

and 5.915-5.925 GHz will equally allow users and small entities to combine the 10-megahertz channels into 20 or 30-megahertz channels without restriction, thus accommodating various ITS applications and services.

24. In addition, by eliminating the communications zone requirements that managed congestion, the modified rules under §§ 90.7, 90.375, 90.377, which were once required under DSRC rules, are now unnecessary as ITS evolves to C-V2X technology, thereby reducing burdens on small entities. Further, the adopted rules also offer more flexibility for RSU stations without any limit on transmitter output power, thereby enabling those stations to be able to provide reliable service in a given coverage area and also enable licensees to select the most efficient and effective equipment parameters to meet their coverage requirements by a simple coordination with the National Telecommunications and Information Administration (NTIA). Additionally, retaining the existing limitations on RSU transmitting antenna height and associated power reduction requirement for RSU transmitting antennas over 8 meters in height and up to a maximum of 15 meters, will eliminate a significant impact on performance and cost to small and other entities.

25. Lastly, the Commission believes two years is sufficient time for small and other suppliers to sunset DSRC operations and convert to C-V2X technology in the 5.9 GHz band. This timeframe adequately allows public entities with longer budgetary timelines to obtain compliant equipment. Therefore, allowing smaller entities an easier transition. This two year period will commence on the effective date of the *Second Report and Order* followed by reminders delegated to PSHSB and WTB via public notice. Regarding the cost of compliance for small entities, the record in this proceeding does not currently include a sufficient economic analysis that would allow us to quantify those costs, including whether it will be necessary for small entities to hire professionals to comply with the adopted rules. However, we believe the benefits gained from the repurposing and transition of ITS spectrum, the continued strong demand for unlicensed use, and the reduced costs that have already occurred in the time since the release of the *First Report and Order*⁷⁷ outweigh the costs of the adopted rules in the *Second Report and Order*.

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

26. The RFA requires an agency to provide, “a description of the steps the agency has taken to minimize the significant economic impact on small entities. . .including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.”⁷⁸

27. The *Second Report and Order* enables the repurposing and transition of ITS spectrum and specifically outlines C-V2X technical parameters in its adopted rules. This includes band usage, message priority, channel bandwidth, and channelization building. The Commission anticipates significant economic benefits from expanding Wi-Fi capacity for small and other entities, as the expected \$17.2 billion of benefits over three years should outweigh the cost for ITS use. Further, the rules adopted in the *Second Report and Order* will be sufficient for current and future ITS licensees to continue offering this service in the band. We also believe that we have appropriately streamlined these rules to provide new cost-effective opportunities for small entities to access that spectrum, thereby reducing economic barriers to entry for that market. In addition, we find that the public interest is best served by addressing the needs of both ITS and unlicensed users for access to distinct parts of the 5.9 GHz band. The adopted rules for unlicensed use have remained strong in recent years, and we find the benefits from the transition of ITS, while delayed, have not diminished. Consequently, we do not expect that the current and future

⁷⁷ See *First Report and Order*, 35 FCC Rcd 13440.

⁷⁸ 5 U.S.C. § 604(a)(6).

licensees in the band, including small entities, would experience a significant economic impact from additional unlicensed use of the spectrum permitted under the adopted rules.

28. In making its final determinations in the *Second Report and Order*, the Commission considered various alternatives and approaches to the rules ultimately adopted. For example, we considered proposals for imposing a reimbursement mechanism for transition costs incurred by DSRC incumbents. Ultimately, however, we agreed with industry associations representing small entities such as the Wireless Internet Service Providers Association (WISPA) and rejected this approach, thereby reducing an economic burden on unlicensed users, which include small entities.⁷⁹ In addition, we considered proposals that all ITS operations in the 5.895-5.925 GHz band either convert to C-V2X or cease operating in less than two years after the effective date of the *Second Report and Order*, however, in adopting the two-year timeframe, which was generally agreed with by commenters in this proceeding, we reduced undue economic hardship on those small entities who may lack the economic or staffing resources to comply with a shorter timeframe. We will continue to explore alternatives in the future to eliminate unnecessary regulations and minimize any significant impact on small entities.

G. Report to Congress

29. The Commission will send a copy of the *Second Report and Order*, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.⁸⁰ In addition, the Commission will send a copy of the *Second Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Second Report and Order* and FRFA (or summaries thereof) will also be published in the *Federal Register*.⁸¹

⁷⁹ See *Second Report and Order*, para 71.

⁸⁰ *Id.* § 801(a)(1)(A).

⁸¹ *Id.* § 604(b).

APPENDIX C
List of Commenters

5G Americas
5G Automotive Association
5G Automotive Association; American Association of State Highway and Transportation Officials; Institute of Transportation Engineers; Wireless Infrastructure Association
Alliance for Automotive Innovation
Amateur Radio Emergency Data Network (AREDN)
American Association of State Highway and Transportation Officials
American Society of Civil Engineers
Applied Information and the Infrastructure Automotive Technology
Association of Equipment Manufacturers
AT&T Services, Inc.
Auto Innovators FNPRM
Autotalks FNPRM
Broadcom, Inc. and Facebook, Inc.
City of New York
CLAAS Omaha, Inc.
CNH Industrial America LLC
Commsignia
Commonwealth of Kentucky Transportation Cabinet
Continental Automotive Systems
Dennis, PE, Eric Paul
DENSO International America, Inc.
DriveOhio
Dynamic Spectrum Alliance
Fiat Chrysler Automobiles (FCA) US LLC
Ford Motor Company
Georgia Department of Transportation
LG Electronics Inc.
Hyundai America Technical Center
Institute of Transportation Engineers (ITE)
Intelligent Transportation Society of America (ITS America)
ACT|The App Association; American Honda Motor Co., Inc.; Apple, Inc.; Cisco Systems, Inc.; Computer Ways, Inc.; Fair Standards Alliance; Juniper Networks, Inc.; Lenovo (United States) Inc.; Motorola Mobility LLC; Nordic Semiconductor ASA; Sierra Wireless, Inc.; Telit Communication S.p.A.; Valeo

Telematik and Akustik GmbH; Volkswagen Group of America, Inc.
Maryland Department of Transportation
Massachusetts Department of Transportation
Michigan Department of Transportation
Motor and Equipment Manufacturers Association (MEMA)
National Cable and Telecommunications Association
National Safety Council (NSC)
National Telecommunications and Information Administration (NTIA)
NCTA – The Internet & Television Association FNPRM and FNPRM Reply
New America's Open Technology Institute and Public Knowledge
NW 33 Innovation Council of Governments (COG)
Panasonic Corporation of North America
Public Knowledge
Qualcomm Incorporated
Robert Bosch LLC
T-Mobile USA, Inc.
Toyota Motor Corporation
University of Michigan Transportation Research Institute (UMTRI)
Utah Department of Transportation (UDOT)
Wi-Fi Alliance
Wireless Internet Service Providers Association (WISPA)