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

In the Matter of	)	
	)	
Amendment of the Commission's Rules	)	
Regarding Dedicated Short-Range	)	WT Docket No. 01-90
Communication Services in the 5.850-5.925	)	
GHz Band (5.9 GHz Band)	)	
	)	
Amendment of Parts 2 and 90 of the	)	ET Docket No. 98-95
Commission's Rules to Allocate the 5.850-	)	RM-9096
5.925 GHz Band to the Mobile Service for	)	
Dedicated Short Range Communications of	)	
Intelligent Transportation Services	)	

REPORT AND ORDER

Adopted: December 17, 2003 **Released: February 10, 2004**

By the Commission: Chairman Powell and Commissioner Adelstein issuing separate statements.

TABLE OF CONTENTS

I. INTRODUCTION

1. In this proceeding, we are adopting licensing and service rules for the Dedicated Short Range Communications Service (DSRCS) in the Intelligent Transportation Systems (ITS) Radio Service in the 5.850-5.925 GHz band (5.9 GHz band). We believe that the rules we adopt today further the important Commission goal of striking a sound balance between "flexible" rules that more easily facilitate the development and offering of new and innovative services and the "command and control" approach that is often regarded as necessary for effective public safety communications. We also believe that this approach is particularly appropriate in the context of the transportation industry, which involves protecting the safety of the traveling public.

2. DSRC provides the critical communications link for intelligent transportation systems,[1] which according to the Secretary of Transportation, are the key to achieving the United States Department of Transportation's (DOT) number one priority, reducing highway fatalities.[2] Each year, hazards or driver error lead to more than six million crashes that—

- cause nearly 43,000 deaths and 3 million injuries;
- cost "more than $230 billion dollars; and
- consume a greater share of the Nation's health care costs than any other cause of illness injury."[3]

3. Time is critical in crash avoidance—at 70 miles per hour, a vehicle travels more than 100 feet every second.[4] Dedicated short-range communications (DSRC), which involves vehicle-to-vehicle and vehicle-to-infrastructure communications, can save lives by warning drivers of an impending dangerous condition or event in time to take corrective or evasive actions. For example, one life-saving ITS application made possible by DSRC is intersection collision avoidance (*e.g.*, audible alarm: "Intersection ahead with red light – STOP."). The intersection collision avoidance application will use roadside speed and location sensing equipment, DSRC equipment, in-vehicle signing and trajectory computing and control electronics to help drivers avoid intersection collisions, the most prevalent type of traffic accident in the U.S. Intersection collision avoidance functions through the application of the "three Ps" – perceive, process, and present. First, sensors perceive the location, trajectory and speed of other vehicles. Next, processors calculate the likelihood of a collision and avoidance actions. Finally, information is presented to the driver in one of three forms: information on

[1] Jeffrey N. Shane, Under Secretary for Transportation, DOT, Address at the Intelligent Vehicle Initiative National Meeting and Demonstration (June 25, 2003) (http://www.dot.gov/affairs/shane06252003.htm).

[2] Press Release, U.S. Transportation Secretary Mineta Announces Opening of Crash-Preventing "Intelligent Intersection" Test Facility (June 24, 2003) (http://www.its.dot.gov/press/fhw2003.htm).

[3] U.S. DOT (http://www.its.dot.gov/ivi/mission.html). Over ninety percent of crashes result from driver error. *Id.* *See also* Intelligent Safety Efforts in America, Jeffrey F. Paniati, Director, Intelligent Transportation Systems, U.S. Department of Transportation (presentation at 10th ITS World Congress, Madrid, Spain, on Nov. 17, 2003) (http://www.its.dot.gov/speeches/madridvii2003.ppt).

[4] Alliance of Automobile Manufacturers Comments at 7.

threats; instructions regarding evasive actions; or a partial system take-over of control of the vehicle. For example, a driver can be alerted when a high speed vehicle is approaching as she waits to cross a roadway. In addition, drivers can receive warning of an approaching vehicle about to run a red light or of the speed of on-coming vehicles when making a left turn.[5] Our decision today to adopt a technical standard for all DSRC devices promotes a nationwide solution to the transportation safety challenges faced by all Americans.

4. The inefficiency of our surface transportation system also has costs on both the societal and individual level. According to one study, in 2000 the seventy-five largest metropolitan areas experienced 3.6 billion vehicle-hours of delay resulting in 5.7 billion gallons of wasted fuel, and $67.5 billion in lost productivity.[6] DSRC in the 5.9 GHz band will provide a critical link necessary for intelligent transportation systems to reduce these delays.

II. EXECUTIVE SUMMARY

5. In this *Report and Order*, we establish service rules to govern the licensing and use of the 5.850-5.925 GHz band (5.9 GHz band) for the Dedicated Short Range Communication Service (DSRCS) in the ITS[7] radio service. Specifically, in this *Report and Order*:

- We note that DOT envisions DSRC units in every new motor vehicle for life-saving communications. To ensure interoperability and robust safety/public safety[8] communications among these DSRC devices nationwide, we adopt the standard supported by most commenters and developed under an accredited standard setting process (ASTM E2213-03 or "ASTM-DSRC").

- We conclude that it is possible to license both public safety and non-public safety use of the 5.9 GHz band. Accordingly, we adopt open eligibility for licensing and technical rules, most of which are embodied in the ASTM-DSRC standard, aimed at creating a framework that ensures priority for public safety communications.

[5] *See* ITS America Petition for Rulemaking, RM 9096, ET Docket No. 98-95 at 28-29 (filed May 19, 1997) (ITS America Allocation Petition). Other ITS safety applications envisioned to promote crash avoidance are road departure warning (*e.g.*, audible alarm: "Driver Alert! Vehicle is headed off the road.") and lane merge ("Unsafe to merge left/right!"). See Appendix C for a list of safety and other DSRC-based ITS applications.

[6] Federal Highway Administration, Congestion Mitigation at http://www.fhwa.dot.gov/congestion/congest2.htm.

[7] Section 6059 of the Intermodal Surface Transportation Efficiency Act of 1991, Pub. L. 102-240, 105 Stat. 1914 (1991) (ISTEA) defines ITS as:

> The development or application of electronics, communications, or information processing (including advanced traffic management systems, commercial vehicle operations, advanced traveler information systems, commercial and advanced vehicle control systems, advanced public transportation systems, satellite vehicle tracking systems, and advanced vehicle communications systems) used singly or in combination to improve the efficiency and safety of surface transportation systems.

ISTEA § 6059.

[8] We refer herein to "safety/public safety" communication interchangeably because DSRCS involves both safety of life communication transmitted from any vehicle, *e.g.,* vehicle-to-vehicle imminent crash warnings, as well as communication transmitted by public safety entities, *e.g.*, infrastructure-to-vehicle intersection collision warnings.

- We license DSRC Roadside Units (RSUs), communication units that are fixed along the roadside, under subpart M (Intelligent Transportation Radio Service) of Part 90 of the Commission's Rules. Licensees will receive non-exclusive geographic-area licenses authorizing operation on seventy megahertz of the 5.9 GHz band. We also adopt a framework whereby licensees would register RSUs by site and segment(s).

- We license On-Board Units (OBUs), in-vehicle communications units, by rule under new subpart L of Part 95 of our Rules.

III. BACKGROUND

A. Creation and Development of ITS

6. Congress created the ITS[9] program, a national program administered by the DOT in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA).[10] Congress established goals for the ITS program that would incorporate technology and advanced electronics into the nation's surface transportation infrastructure to improve traveler safety, decrease traffic congestion, facilitate the reduction of air pollution, and conserve vital fossil fuels.[11] DOT selected the Intelligent Transportation Society of America (ITS America)[12] as its Federal Advisory Committee (FAC)[13] on ITS matters.[14]

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[9] Originally entitled "Intelligent Vehicle Highway Systems" ("IVHS"). *See* ISTEA.

[10] ISTEA § 6051.

[11] *See* ISTEA § 6052(b). Section 6053(b) of ISTEA states that:

> The Secretary shall develop and implement standards and protocols to promote the widespread use and evaluation of intelligent vehicle-highway systems technology as a component of the Nation's surface transportation systems. To the extent practicable, such standards and protocols shall promote compatibility among intelligent vehicle-highway systems technologies implemented throughout the States. In carrying out this subsection, the Secretary may use the services of such existing standards-setting organizations as the Secretary determines appropriate.

[12] ITS America, a Federal Advisory Committee to DOT, was first organized in 1991 and is a non-profit, educational association. Its members are drawn from the business, academic, and government sectors. ITS America has over 600 members. Over 350 of its members represent corporations involved in providing transportation of goods and services, 135 members represent federal, state, and municipal transportation agencies, and fifty members represent research institutions and universities. *See* Status Report on Licensing and Service Issues and Deployment Strategies for DSRC-Based Intelligent Transportation Services in the 5.850-5.925 GHz Band (filed by ITS America on Oct. 6, 2000) at 4-5 (Status Report). *See Ex Parte* Comments of the Intelligent Transportation Society of America: Status Report and Recommendations for Licensing and Service Rules for the DSRC Spectrum in the 5850-5925 MHz Band from Mark D. Johnson, counsel to ITS America, to Federal Communications Commission at 19 (filed July 9, 2002) (July *Ex Parte* Comments).

[13] *See* Federal Advisory Committee Act, P.L. 92-463, 86 Stat. 770 (1972) *codified at* 5 U.S.C. Appendix 2.

[14] Until March 17, 2003, DOT recognized ITS America as its FAC on ITS matters, including DSRC. DOT indicates that this change in status "does not suggest an intention on the part of DOT to revisit positions taken on technical standards and licensing and service rules proposed by ITS America. . . ." Letter from Paul Samuel Smith, Senior Attorney, United States Department of Transportation to Marlene H. Dortch, Federal Communications Commission (continued….)

7. In 1993, DOT, its partners, and ITS America began developing a national architecture[15] to implement ITS services.[16] Completed in 1996, and amended from time-to-time, the National Architecture[17] currently identifies thirty-four ITS User Services,[18] which are divided into one or more of the eight User Service Bundles.[19] Recognizing the need to convey information between vehicles and roadside infrastructure in the development of ITS, the National Architecture identifies DSRC as critical for deploying many ITS User Services;[20] such uses are generally called DSRC-based ITS applications.[21]

8. In 1997, ITS America petitioned the Commission to allocate seventy-five megahertz of spectrum in the 5.9 GHz band for ITS, in particular for DSRC.[22] The following year, in 1998, Congress passed and the President signed into law the TEA-21,[23] which directed

(Continued from previous page)
at 1 (Apr. 29, 2003). Although, ITS America is no longer DOT's FAC on ITS matters, it is still required by TEA-21 to work with DOT to develop and update as necessary, the National ITS Program Plan. *See* Transportation Equity Act for the 21st Century, Pub. L. 105-178, 112 Stat. 107 § 5205(a)(1) (1998) (TEA-21).

[15] TEA-21 subsequently required the use of the National Architecture. Section 5206(a) of TEA-21 states:

> Consistent with section 12(d) of the National Technology and Advancement Act of 1995 . . ., the Secretary shall develop, implement, and maintain a national architecture and supporting standards and protocols to promote the widespread use and evaluation of intelligent transportation system technology as a component of the surface transportation systems of the United States.

[16] U.S. Department of Transportation, Intelligent Transportation Systems, The National Architecture for ITS: A Framework for Integrated Transportation into the 21st Century (1996) at 2.

[17] The National Architecture establishes the types of information and communication that are needed to support various ITS services, how data should be shared and used by which physical entities, and the types of standards that are needed to facilitate sharing of information. ITS relies on the interaction among three "layers" of infrastructure, the transportation layer, the communications layer, and the institutional layer. The transportation layer is the physical ITS infrastructure composed of travelers, vehicles, and roadside equipment. The communications layer is the information infrastructure that connects elements of the transportation layer, thus allowing coordination and sharing among systems and people. The institutional layer is composed of organizations. *Id*. at 4.

[18] ITS America states that as "expected use of the band increases in the future, new and unforeseen applications will be deployed consistent with the ITS User Service Bundles." *See* July *Ex Parte* Comments at 24. Since the July *Ex Parte* Comments were filed, two new applications have been developed "Road Departure Prevention" and "Lange Merge Crash Avoidance." *See* Letter from Paul Samuel Smith, Senior Attorney, United States Department of Transportation to Marlene H. Dortch, Federal Communications Commission, Attachment (Nov. 4, 2003).

[19] July *Ex Parte* Comments at 24-25. The eight service bundles are listed in Appendix C.

[20] U.S. Department of Transportation, *Background: DSRC Allocation to Support Intelligent Transportation System*s (Apr. 1997) at http://www.its.dot.gov/tcomm/dsrcbk.htm.

[21] *See* Status Report at 5-6.

[22] ITS America Allocation Petition at 1. DSRC is currently used for non-multilateration systems in the Location and Monitoring Service (LMS) in the 902-928 MHz band, primarily for electronic toll collection (ETC). Non-multilateration LMS systems use narrowband technology to transmit data to and from vehicles passing through a particular location. The LMS also includes multilateration systems. Multilateration LMS systems use spread spectrum technology to locate vehicles or other moving objects with great accuracy throughout a wide geographic area. *LMS Report and Order,* 10 FCC Rcd 4695, 4697 ¶ 4.

[23] *See supra* note 14.

the Commission, in consultation with DOT, to consider the spectrum needs "for the operation of intelligent transportation systems, including spectrum for the dedicated short-range vehicle-to-wayside wireless standard,"[24] DSRC. TEA-21 also directed DOT to promote, through the National Architecture, interoperability among ITS technologies implemented throughout the United States.[25] In October 1999, the Commission allocated the 5.9 GHz band for DSRC-based ITS applications and adopted basic technical rules for DSRC operations. The Government's Radiolocation Service (*i.e.*, for use by high-powered military radar systems) and non-Government Fixed Satellite Service (FSS) uplink operations are co-primary in the 5.9 GHz band.[26] Additionally, Amateur Radio Services have a secondary allocation in the 5.9 GHz band and Industrial, Scientific and Medical (ISM) devices may operate in the 5.85-5.875 GHz portion.

9. Subsequent to the Commission's allocation of the 5.9 GHz band to the mobile service for use by DSRC systems, ITS America, as the FAC to DOT, began to hold stakeholder workshops, panel discussions, and other industry meetings to develop a consensus on how to achieve national interoperability in the deployment of DSRC-based ITS user services.[27] The Federal Highway Administration (FHWA), an agency of DOT, entered into a cooperative agreement[28] with the American Society for Testing and Materials (ASTM)[29] to develop a national, interoperable standard for DSRC equipment operating in the 5.9 GHz band. On October 6, 2000, ITS America filed a Status Report with the Commission, which addressed licensing and service rules and deployment strategies for DSRC. On March 22, 2001, the Wireless Telecommunications Bureau (Bureau) sought comment on the Status Report.[30] On May 10, 2002, the ASTM Subcommittee E17.51[31] selected the ASTM-DSRC Standard, which uses

[24] TEA-21 § 5206(f).

[25] Section 5206(a) of TEA-21 states:

> (2) Interoperability and efficiency.—To the maximum extent practicable, the national architecture shall promote interoperability among, and efficiency of, intelligent transportation system technologies implemented throughout the United States.
>
> (3) Use of standards development organizations.—In carrying out this section, the Secretary may use the services of such standards development organizations as the Secretary determines to be appropriate.

[26] *See* 47 C.F.R. § 2.106, Table of Frequency Allocations.

[27] Status Report at ii.

[28] *See* Transportation Equity Act for the 21st Century; Critical Intelligent Transportation Standards, *Notice*, 66 Fed. Reg. 20517 (Apr. 23, 2001), where the FHWA states that, in response to the requirements of TEA-21, it entered into cooperative agreements with five Standards Development Organizations (SDOs), including ASTM, to accelerate the development of ITS standards that would promote national interoperability. FHWA further states that the standards developed under this program are "consensus standards and will remain the property of the SDO under which they were developed." *See also* Status Report at 11-12.

[29] According to ITS America, ASTM is a participating member of the American National Standards Institute (ANSI). *See* July *Ex Parte* Comments at 13.

[30] Wireless Telecommunications Bureau Seeks Comment Regarding Intelligent Transportation System Applications Using Dedicated Short Range Communications, *Public Notice*, DA 01-686 (WTB PSPWD rel. Mar. 16, 2001) (corrected Mar. 22, 2001) (*Bureau Public Notice)*.

[31] See Appendix E for a list of the Standards Writing Group participants.

Orthogonal Frequency Division Multiplexing (OFDM), as the standard for DSRC-based ITS applications in the 5.9 GHz band.[32]

B. Notice of Proposed Rulemaking

10. On November 7, 2002, we adopted a *Notice of Proposed Rule Making* (*NPRM*) regarding the service rules for the DSRCS in the 5.9 GHz band.[33] Generally, the *NPRM* sought comment on licensing and service rules proposed by DOT and ITS America.[34] Specifically, ITS America recommended that we incorporate into our rules the ASTM-DSRC Standard, which includes a band plan and technical rules; permit both public safety and non-public safety DSRC-based ITS applications in the 5.9 GHz band; license the roadside units, the fixed or portable DSRC transceiver by site; require frequency coordination using the Part 90 model; license the on-board units, the mobile transceivers generally mounted in motor vehicles, by rule; and amend the definition of DSRC service to permit a voice interface to warn drivers of hazardous conditions and to prohibit Commercial Mobile Radio Services (CMRS) or CMRS-like services in the band. We received thirty-five comments and thirteen reply comments in response to the *NPRM*. Subsequently, on June 10, 2003, the Standards Writing Group,[35] an ASTM working group, approved the ASTM-DSRC Standard for DSRC operations.[36]

IV. DISCUSSION

A. Technical Rules for Interoperability and Protection of Public Safety Communications

1. Necessity of a Standard for DSRC

11. *Background*. In the *NPRM*, we noted that TEA-21 requires the Secretary of DOT to promote "interoperability" among ITS technologies implemented throughout the United States and it appears to contemplate the adoption of a wireless standard as a means of achieving this "interoperability."[37] We sought comment on the meaning of "interoperability" within the context of the DSRCS. Specifically, we invited comment on whether public safety DSRC-based ITS applications should be interoperable or whether both public safety and non-public safety DSRC-based ITS applications should be interoperable.[38] Further, we requested comment on whether

[32] ASTM, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications, Designation: E 2213-03 (published September 2003) (ASTM-DSRC Standard). *See* July *Ex Parte* Comments at 1-2, 13.

[33] *Notice of Proposed Rule Making and Order*, 17 FCC Rcd 23136 (2002) (*NPRM*).

[34] July *Ex Parte* Comments (filed in response to the Bureau Public Notice). *See also* note 14, *supra* (DOT does not intend to revisit ITS America's technical and licensing proposals).

[35] The Standards Writing Group was formed by ASTM in June 1999 to develop user requirements for DSRC and to draft open and interoperable standards. *See* July *Ex Parte* Comments at 12-14.

[36] ASTM-DSRC Standard at 1(approved July 10, 2003).

[37] *See NPRM,* 17 FCC Rcd at 23142-43, 23157 ¶¶ 7, 31.

[38] *Id.* at 23158 ¶ 33.

adopting a technical standard would promote interoperability and, if so, whether to adopt Layers 1, the Physical Layer, and 2, the Medium Access Control Layer, of the ASTM-DSRC Standard, which the ASTM and the Institute of Electrical and Electronic Engineers (IEEE) developed as the means of achieving interoperability.[39]

12. All commenters, except QUALCOMM,[40] urge us to adopt a standard citing the current lack of interoperability among DSRC operations in the 900 MHz band, wherein there is no standard, and the critical need for 5.9 GHz band DSRC units to be interoperable nationwide. QUALCOMM recommends that the focus, at this juncture, should be on developing higher layer application interoperability specifications rather than lower-level interoperability, which it indicates can be achieved in a number of different ways, such as through the use of multi-mode devices.[41] However, DOT states that "historical experience is . . . instructive"[42] because electronic toll collection (ETC) in the 902-928 MHz band, which is the only other allocation for DSRC, is plagued with proprietary systems for individual toll or regulatory entities that cause incompatibility and/or interference that hampers interstate commerce.[43] Johns Hopkins University, Applied Physics Laboratory (Johns Hopkins) maintains that equipment costs are multiplied because a motorist, such as a commercial vehicle operator, must purchase more than one transponder, *i.e.*, on-board unit,[44] per state or region. Some states have more than one toll system, which often have incompatible ETC systems.[45] These multiple transponders degrade performance and reliability and increase the potential for interference of ETCs.[46] For the individual states, new start-up costs are higher and "many potential new services and their value-added benefits to the nation are not realized because of this entry cost."[47] According to the International Bridge, Tunnel and Turnpike Association (IBTTA), several regions or states have attempted to address interoperability issues among their ETC systems through a patchwork of

[39] *Id.* at 23155 ¶ 28.

[40] QUALCOMM Reply Comments at 8 (urges neutrality and leaving the selection of technology to licensees).

[41] QUALCOMM Reply Comments at 3-4.

[42] DOT Comments at 3.

[43] *Id.* DSRC licensees in the LMS have continued to express concern that they will be required to migrate from the 902-928 MHz band to the 5.9 GHz band before they are ready to do so. E-ZPass indicates that while it is anticipated that existing Electronic Toll Collection operations in the 902-928 MHz band will migrate over time to the 5.9 GHz band, an extended implementation process requiring dual transitional operations in both the 902-928 MHz band and 5.9 GHz band will be necessary. E-ZPass Comments at iii. Johns Hopkins notes that FHWA requires Commercial Vehicle Operations projects receiving federal funds to comply with a 902-928 MHz standard, commonly referred to as the Sandwich Specification. Johns Hopkins Comments at 5. Commenters also note the significant amount of public investment in DSRC operations in the 902-928 MHz band. For instance, IBTTA reports that over $1.5 billion has been invested in Electronic Toll Collections (ETCs) in the 902-928 MHz band. IBTTA Comments at 2. As we stated in the *NPRM* and we reiterate here, we do not have plans, at this time, to require DSRC-based ITS systems operating in the 902-928 MHz band to relocate to the 5.9 GHz band.

[44] Johns Hopkins Comments at 4.

[45] July *Ex Parte* Comments at 30.

[46] *Id.*

[47] *Id.*

multi-mode readers and transponders, resulting in complex, proprietary systems that limit ETC system performance.[48] DOT states that "[o]nly such standards can realistically spur the advancement and deployment of DSRC technology in ways that will make a difference to the safety and efficiency of the nation's surface transportation system."[49]

13. *Discussion*. As a general rule, the Commission does not select a single standard for equipment, leaving the selection of technology to its licensees.[50] Nonetheless, as most commenters advise, we are persuaded that adopting a standard for the DSRCS is appropriate for four reasons: interoperability, robust safety/public safety communications, to promote deployment of DSRC while reducing costs, and consistency with Congressional intent.

14. *Interoperability*. The primary goals of DSRC-based ITS applications are to increase the safety and efficiency of the nation's surface transportation system. To accomplish these goals, DOT envisions a 5.9 GHz DSRCS unit (On-Board Unit or OBU) in every vehicle, working in conjunction with a substantial infrastructure of DSRCS roadside units (RSUs). Information would be transmitted between OBUs and RSUs and between OBUs. Without an interoperability standard that enables units to communicate with one another regardless of location, equipment used, or the licensee, the overall effectiveness of the national DSRC operations would be drastically reduced.[51] As the Commission acknowledged in the *NPRM*,[52] and as we reaffirm here, the importance on both the societal and individual level of effective DSRC-based ITS applications, especially the safety applications such as crash avoidance and intersection collision avoidance, cannot be underestimated.[53]

15. *Robust safety/public safety communications*. Timeliness and reliability are essential components in this service[54] because DSRC operations in the 5.9 GHz band will be used for, among other things, crash avoidance applications involving vehicle-to-vehicle

[48] IBTTA Comments at 3.

[49] DOT Comments at 4-5.

[50] *See, e.g., NPRM*, 17 FCC Rcd at 23157 ¶ 32.

[51] We agree that the interoperability problems experienced among ETCs are instructive here because ETC is the most widely-deployed DSRC-based ITS application, to date.

[52] *See NPRM,* 17 FCC Rcd at 23154 ¶ 26.

[53] In 2002, there were 6,315,309 motor vehicle crashes, *see* Fatality Analysis Reporting System (FARS) and the National Automotive Sampling System General Estimates System (NASS GES) at 7 (date) at http://www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/Rpts/2003/Assess02.pdf in which 42,815 people were killed and 2,926,000 were injured. *See* National Highway Traffic Safety Administration, 2002 Annual Assessment Motor Vehicle Traffic Crash Fatality and Injury Estimates for 2002. Each year, more than 1.8 million crashes occur at intersections. *See* Federal Highway Administration, Stop Red Light Running at http://safety.fhwa.dot.gov/fourthlevel/pro_res_srlr_facts.htm. In 1998, there were 937,966 road departure crashes. *See* Department of Transportation, IVI 8 Major Problem Areas, http://www.its.dot.gov/ivi/8MPA.html. Over the last five years, on average, about 760 people have been killed by motor vehicles in work zones each year.[53] Federal Highway Administration, Work Zone Facts, http://safety.fhwa.dot.gov/fourth;eve;/pro_res_wzs_facts.htm.

[54] Alliance of Automobile Manufacturers Comments at 7.

communications and intersection collision avoidance applications.[55] As such, we further conclude that it is paramount that such communications be protected from interference given the consequences to the traveling public should any one of the safety applications fail due to unacceptable error rates or delay. In this connection, we also agree with the commenters that non-public safety use of the 5.9 GHz band would be inappropriate if such use would degrade the safety/public safety applications.[56]

16. *Promote deployment of nationwide DSRC-based ITS applications*. We agree with the commenters that adopting a standard will reduce overall implementation costs and accelerate deployment of DSRC-based ITS applications. The record clearly establishes that non-public safety use of this band is essential to promote the early deployment of all DSRC applications. In this connection, we further find that adopting a standard that includes technical rules to prevent degradation of public safety applications serves the public interest by allowing non-public safety use of the band, which promotes DSRC deployment nationwide. If we do not adopt a single standard, DOT[57] and ITS America maintain that equipment developers will adopt a wait-and-see approach on how the market develops or "create proprietary technologies in the hopes of grabbing market share and shutting out other competitors."[58] There is further concern that this scenario would result in a "fragmented market for DSRC products and services, higher costs for all, and 'stovepipe' deployments that are not interoperable."[59] Many commenters also relate that a market limited to public safety users would be relatively small"[60] whereas a single standard would promote DSRC deployment while providing public safety entities and the public with the benefit of the economies of scale resulting from the larger market.[61]

17. *Consistent with Congressional intent*. Finally, we believe adoption of an interoperability standard is consistent with Congress' intent when it adopted legislation concerning DSRCS.[62] In this connection, we note that the FHWA reported to Congress that

[55] DOT has identified four types of collisions that account for nearly 80 percent of highway crashes: (1) intersection collisions; (2) rear-end collisions; (3) road departure collisions; and (4) lane changes and merge collisions. *See* http://www.its.dot.gov/ivi/3DC.html.

[56] ARINC Incorporated Comments at 7 ("if a mandatory standard is not adopted, one or more companies could introduce radio techniques in the band that would be incompatible and could interfere with safety operations").

[57] DOT Comments at 4-5 (ITS program offers the potential to save thousands of lives each year, but "current indications are that this potential is less likely to be reached without a market sizable enough to attract private investment in technological advances and cost reductions necessary to appeal to the traveling public.").

[58] *Id.* at 9.

[59] *Id.*

[60] *See e.g.*, DOT Comments at 4. *See also* ITS America Comments at 8.

[61] *Id.,* E-ZPass Comments at 4; IBTTA Comments at 2 (market will be larger if both public safety and non-public safety DSRC-based ITS applications use the same standard, original equipment manufacturers would introduce OBUs as original manufactured hardware). *See* paras. 6, 8.

[62] The DSRC program was created by Congress. The congressional legislation creating this program required DOT to develop and implement standards and protocols to the extent practicable to promote compatibility between DSRC systems operating across the nation. Later legislation directed DOT to promote interoperability through a National Architecture.

adoption of a standard for DSRC operations in the 5.9 GHz band was a "critical standard" for the development of ITS.[63] Accordingly, we further believe that adopting a standard would meet the goals of TEA-21 and be a significant step towards achieving the goals of the national ITS program to increase the safety and efficiency of the nation's surface transportation system.

2. Selection of a Standard for DSRC

18. Based on the record before us, we will require all DSRCS operations in the 5.9 GHz band to comply with the ASTM-DSRC Standard. We note that most commenters urge this approach, and that the record presents no alternative standard or other technical rules that would both achieve interoperability and allow open eligibility. In this connection, we recognize that use of the ASTM-DSRC Standard will require compliance with certain technical parameters, such as power limits and receiver performance specifications, upon which interoperability does not depend. We nonetheless believe, based on the record of this proceeding, that requiring compliance with all aspects of the Standard is critical to the success of the DSRC service, which is an integral component of the ITS program. Specifically, even those components of the standard that do not directly serve interoperability goals serve an interference management purpose which will facilitate effective and robust public safety communications. Similarly, requiring use of equipment that meets the ASTM-DSRC Standard will help ensure that an adequate market develops for equipment that will meet the needs of the public safety DSRCS licensees. In short, the record has convinced us that if this service is to succeed in facilitating rapid deployment of ITS technologies to improve the safety of our nation's roadways, all DSRCS licensees should be required to use only ASTM-DSRC compliant equipment.

19. As detailed in the *NPRM*, the ASTM-DSRC Standard, is based on the IEEE 802.11 and 802.11a standards and was developed by the ASTM under a cooperative agreement with the FHWA.[64] ASTM operates as a consensus-based organization in accordance with the operating principles of the American National Standards Institute (ANSI); ASTM is a participating member of ANSI.[65] ASTM, through the Standards Writing Group,[66] developed the ASTM-DSRC Standard, which was approved on July 10, 2003 and published in September 2003.[67] The ASTM-DSRC Standard "is a product of a rigorous and concerted effort, for several years, which involved extensive participation of a broad cross section of the international, scientific, manufacturing, and user communities. Consensus was reached amongst these

[63] U.S. Department of Transportation, *Intelligent Transportation Systems: Critical Standards* at 19 (June 1999).

[64] *See NPRM*, 17 FCC Rcd at 23155 ¶ 28.

[65] *See* July *Ex Parte* Comments at 13.

[66] See Appendix E for a list of Standards Writing Group participants. *See also* note 18, *supra*.

[67] ASTM-DSRC Standard at 1.

participants who came from diverse interests, technical backgrounds and experiences."[68] In this connection, DOT as well as NTIA urge us to adopt the ASTM-DSRC Standard into our Rules.[69]

20. Given that 802.11a equipment is readily available, adopting the ASTM-DSRC Standard will promote the rapid development and deployment of DSRC equipment.[70] Moreover, as ITS America notes, the ASTM-DSRC Standard "is written to be a technical baseline for equipment and service developers to compete on the basis of performance, quality, and different forms of DSRC applications."[71] In this connection, we also note that adopting the ASTM-DSRC standard does not unduly restrict technical innovation given the long life-cycle of motor vehicles.[72] Rather, this long life cycle makes "backward" compatibility critical as DSRC-based ITS applications continue to develop and evolve in the future. In this connection, Nissan explains that, generally, the lower protocol layers of the standard are implemented in silicon chip sets, while the upper layers are implemented in software. Thus, according to Nissan, our adoption of the lower layers would ensure the long-term stability of the hardware while permitting the upper layers to evolve through software upgrades.[73] Moreover, the Alliance of Automobile Manufacturers advises that the ASTM standards development process appears capable of making certain that revisions to the ASTM-DSRC Standard "will continue to support earlier implementations of the standard, thus ensuring long-term stability in the fundamental technical hardware basis for DSRC."[74]

21. We note that two commenters that support adoption of the ASTM-DSRC Standard would have us codify exceptions for equipment designed for special use or limited applications.[75] We decline to do so by rule, however, given the weight of the record in support of

[68] E-ZPass Comments at 7-8; TransCore Corporation Comments at 4-5 (ASTM is an ANSI-accredited Standards Development Organization (SDO), which ensures that the standard was developed and approved in an open and fair process.).

[69] *See* DOT Comments at 6; NTIA Comments at 17 (there "would be a substantial public benefit in facilitating national interoperability of DSRC technology.").

[70] E-ZPass Comments at 8 (because the ASTM-DSRC Standard is based on the widely used IEEE 802.11 and 802.11a, a large manufacturing base of compatible devices already exists); Highway Electronics Comments at 2 (the "[s]ister 802 technologies are becoming the standard for wired Local Area, Medium Area, and Wide Area Network (LAN, MAN, WAN) implementations," thus, the "required use of the technology in the ITS Band will support the seamless extension of the LAN, MAN, and WAN systems into the WLAN mobile environment."); TransCore Corporation Comments at 4 ("adoption of the ASTM-DSRC standard will speed market acceptance, create additional incentives for manufacturers to design and develop mass market – and niche market – equipment, and provide a platform upon which to support future innovative products.").

[71] ITS America Comments at 7; Intersil Corporation Comments at 6 (adoption of Layers 1 and 2 would provide for "coexistence without interference," thus enabling different services to operate in close proximity).

[72] *See, e.g.,* Nissan North America, Inc. Comments at 5 (modern automobiles have a long life cycle in comparison with consumer electronics devices, in many cases extending to ten years or more).

[73] *See* Nissan North America, Inc. Comments at 6.

[74] Alliance of Automobile Manufacturers Comments at 11.

[75] Siemens Transportation System Comments at 7 (private internal systems do not need to be interoperable and, in the case of mass transit systems, interoperability may put them at increased risk of interference from other systems). TransCore Comments at 11 (the Commission should not foreclose the design and development of low-(continued….)

an interoperability standard for all DSRC operations in the 5.9 GHz band. Nonetheless, we also recognize that provisions of the ASTM-DSRC Standard are rigorous and detailed, which could impede the deployment of future technological advances in the DSRCS. As DSRC technology develops, any waiver requests[76] will be reviewed by the Commission, in consultation with DOT as appropriate.

22. ITS America and several other commenters urge us to adopt a rule today that automatically requires new equipment to meet future versions of the ASTM-DSRC Standard[77] and these suggestions are well taken. We recognize that the standard will be revised in the future to reflect technological advances. Nonetheless, we decline to adopt an "automatic update" rule given the rigorous and detailed mandates of the ASTM-DSRC Standard. In this connection, we are concerned that future revisions could impact a widespread incumbent base.[78] Therefore, at this time, we are adopting the existing version of the ASTM-DSRC Standard and will consider future revisions as they arise. As noted in paragraph 20, *supra*, we anticipate that all revisions will be "backward" compatible, *i.e.*, will continue to support earlier implementations of the standard, thus ensuring long-term stability in the fundamental technical hardware basis for DSRC.

3. The ASTM-DSRC Standard

a. DSRC Operations

23. DSRC provides highly reliable real-time data communications with a rapidly moving vehicle.[79] The ASTM-DSRC Standard is an extension of IEEE 802.11[80] and IEEE 802.11a[81] for vehicles traveling at high speeds. The ASTM-DSRC Standard describes a medium access control layer (MAC) and physical layer (PHY) specification for wireless connectivity using DSRC services.[82] The ASTM-DSRC Standard enables wireless communications over short distances between information sources and transactions stations on the roadside and mobile radio units, between mobile units, and between portable units and mobile units.[83] DSRC operations generally occur over line-of-sight distances of less than 1000 meters between roadside units and mostly high speed (up to 120 mph), but occasionally stopped and slow moving

(Continued from previous page)
cost simple devices that do not implement all of the capabilities contained in the adopted standard, but provide useful applications without interfering with other DSRC devices).

[76] *See* 47 C.F.R. § 1.925.

[77] ITS America Comments at 11.

[78] *See* PSWN Reply Comments at 6 (Commission should regularly review the ASTM-DSRC Standard to ensure that it remains current).

[79] ASTM-DSRC Standard at 1; Status Report at 5-6.

[80] Wireless LAN Medium Access Control and Physical Layer Specifications. *See* ASTM-DSRC Standard at 1.

[81] Wireless LAN Medium Access Control and Physical Layer Specifications High-Speed Physical Layer in the 5 GHz Band. *See* ASTM-DSRC Standard at 1.

[82] ASTM-DSRC Standard at 1.

[83] *Id.*

vehicles, or between high speed vehicles.[84] DSRC operations will use short-range, low-power data transmissions of limited duration.[85] According to ITS America,[86] the majority of DSRC-based ITS wireless transmissions will occur either between vehicles or between a moving vehicle and a fixed transmitter in a line-of-sight, point-to-point, or point-to-multipoint configuration.[87] In many instances, ITS America states that the vehicle will be traveling at highway speeds and will quickly pass through the "communications zone" of a fixed transmitter.[88]

24. In-vehicle communications units are called On-Board Units (OBUs).[89] An OBU is a DSRC transceiver that is normally mounted in or on a vehicle, but which in some instances may be a portable unit.[90] An OBU can be operational while a vehicle or person is either mobile or stationary.[91] OBUs receive and contend for time to transmit on one or more radio frequency (RF) channels.[92] Except where specifically excluded, OBU operation is permitted wherever vehicle operation or human passage is permitted.[93] Communication units that are fixed along the roadside, over the road on gantries or poles, or off the road in private or public areas are called RSUs.[94] An RSU is a DSRC transceiver that is mounted along a roadside or pedestrian passageway.[95] 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.[96] An RSU transmits data to or exchanges data with OBUs in its communications zone.[97] The ASTM-DSRC Standard also establishes band segments as well as other technical and operating parameters, most significantly a "control channel," which is described below.

b. Band Plan

25. *Background*. The Commission sought comment on the band plan proposed by ITS America, which would divide the 5.9 GHz band into the following channels: seven, ten-

[84] *Id.*

[85] July *Ex Parte* Comments at 48.

[86] *See* Status Report at 4-5.

[87] July *Ex Parte* Comments at 27.

[88] *Id*.

[89] ASTM-DSRC Standard at 1-2.

[90] *Id*.

[91] *Id.*

[92] *Id*. at 1-2.

[93] *Id.* at 2.

[94] *Id.*

[95] *Id.*

[96] *Id.*

[97] *Id.*

megahertz channels consisting of one Control Channel (Channel 178) and six Service Channels (Channels 172, 174, 176, 180, 182, and 184) and one, five megahertz channel, which would be held in reserve.[98] Under the ITS America plan, Channel 172 was designated for vehicle-to-vehicle communications and Channel 184 was for high power public safety and non-public safety DSRC operations. Non-public safety applications were secondary to existing public safety applications on Channel 184. Channels 174 and 176 and Channels 180 and 182 could be combined to produce two twenty-megahertz channels, Channel 175 and 181, respectively. We sought comment on ITS America's proposal, invited alternative proposals, and asked whether we should establish a different channel bandwidth.[99]

26. The ASTM-DSRC band plan is supported by all commenters: no commenter recommends changing the size of the channels. Johns Hopkins explains that the sizes were developed to support DSRC in a mobile, high multi-path environment and that channels smaller than ten megahertz would not meet these performance requirements.[100] Sirit Technologies recommends using the five megahertz reserve channel for safety applications or non-public safety applications that do not fully comply with the standard; for instance, simple one-way or two-way data transmissions, such as vehicle identification.[101]

27. *Discussion*. The channels (or segmentations) are an essential component of the ASTM-DSRC Standard that we are adopting herein.[102] In this connection, we note that the band plan reflects a harmonization with Canada and Mexico, and that it is divided into channels that are adequate to support the fundamental band communications needs.[103] We acknowledge the timing concerns raised by the Alliance of Automobile Manufacturers and QUALCOMM as to adopting the band plan before the upper layers of the standard (Layer 3 and above) are final.[104] We agree that our action today is by no means the only prerequisite of DSRC deployment in the 5.9 GHz band. Nonetheless, DOT, which Congress directed to deploy ITS and ensure interoperability, advises that mandatory standards are required to achieve this goal.[105]

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[98] *NPRM*, 17 FCC Rcd at 23159-60 ¶ 36.

[99] *Id.* at ¶ 38.

[100] Johns Hopkins Comments at 18.

[101] Sirit Technologies Comments at 2-3.

[102] *See e.g.,* ASTM-DSRC Standard at 10; 3M Comments at 3 ("channelization is necessary for interoperability").

[103] *See* Highway Electronics Comments at 1-2.

[104] Alliance of Automobile Manufacturers Comments at 11 ("[u]ntil agreement is achieved on the upper layers of the DSRC standard, it is premature to achieve the level of specificity proposed regarding the band plan."); QUALCOMM Incorporated Reply Comments at 3 (until the full set of system specifications have been developed, *e.g.,* specifications for security protocol, control channel operation, and overall system operation, it is premature to mandate the use of the band plan proposed by ITS America).

[105] DOT Comments at 2. "The promise of a market that is nationwide in scope and inclusive of safety and other purposes would in turn provide the necessary incentive to industry to invest in the development of DSRC technologies. The 5.9 GHz band offers the potential to realize these benefits to the fullest. The first condition to the creation of such a market is the adoption of mandatory technical standards (cite omitted). Only such standards can realistically spur the advancement and deployment of DSRC technology in ways that will make a significant difference to the safety and efficiency of the nation's surface transportation system. [Moreover, DOT worked with ASTM to develop the ASTM-DSRC standard, and DOT urges the Commission to adopt it.]" *Id.* at 6.

Additionally, we note that five megahertz is reserved to accommodate future, unforeseen developments.[106] Accordingly, we decline the Sirit Technologies proposal to allow use of the five megahertz at this time.

28. The ASTM-DSRC Standard was approved and published in September 2003. With the exception of the reserve channel (which is simply not discussed in the standard), ITS America's channel plan is generally consistent with the band plan of the ASTM-DSRC Standard. ITS America proposes, however, use-designations that are not included in the standard for Channels 172 and 184. We are addressing these proposals in this section of the item for convenience. Several commenters, including ITS America, propose a change to Channel 172. As originally proposed, Channel 172 would be dedicated for public safety and non-public safety vehicle-to-vehicle communications. According to the Alliance of Automobile Manufacturers, however, they are studying vehicle safety applications that require not only vehicle-to-vehicle communications, but also vehicle-to-roadside communications.[107] Because these applications need a channel of high availability, low latency, and limited message duration, commenters recommend reserving Channel 172 for applications that require a channel of high availability and low latency.[108] These include applications that involve accident avoidance and mitigation techniques.[109] In November 2003, ITS America clarified that Channel 172 should be designated for "vehicle *safety* and other high priority applications to prevent lower priority transmissions from limiting the availability of the channel or increasing the latency of the communications on the channel."[110] Similarly, ITS America recommends that Channel 184 be designated for long range public safety applications and intersection collision applications.[111]

29. Based on the record before us, we believe it is premature to adopt rules that reserve certain service channels for specific applications. We note that virtually all commenters agree that both public safety and non-public safety users should be eligible for licensing on all channels, subject to priority for safety/public safety. Further, as expressed by commenters, we believe channel assignments are best addressed under the priority levels of the Control Channel protocol. This will give transportation experts additional flexibility in system design and should not have a negative impact on interoperability. Finally, we note that DSRC system design is in its infancy and we expect further development and refinement. Thus, we may need to revisit this issue in the future once we have gained more experience with DSRC operations. For reference, the DSRCS band plan is set forth in the following table.

[106] ASTM-DSRC Standard at 9-10 § 8.8.3.3.

[107] Alliance of Automobile Manufacturers Comments at 13.

[108] ITS America Comments at 21.

[109] ARINC Comments at 4.

[110] *Ex Parte* Comments of the Intelligent Transportation Society of America from Robert B. Kelly, counsel to ITS America, to Federal Communications Commission at 3 (filed Nov. 14, 2003). *See also* Nissan North America, Inc. Comments at 6 (recommends dedicating Channel 172 to ensure that vehicle safety applications can migrate away if the Control Channel reaches its capacity limits).

[111] July *Ex Parte* Comments at Appendix D.

5.850 GHz							5.925 GHz
		CH175			CH181		
5850-5855 reserve 5 MHz	CH172 service 10 MHz	CH174 service 10 MHz	CH176 service 10 MHz	CH178 control 10 MHz	CH180 service 10 MHz	CH182 service 10 MHz	CH184 service 10 MHz

c. Control Channel Priority for Safety/Public Safety Communications

30. *Control Channel protocol*. Channel 178 is the Control Channel,[112] a single (ten megahertz) channel accessible throughout the country[113] that establishes a communications link between an RSU and an OBU or between OBUs.[114] OBUs are required to listen to the Control Channel every few hundred milliseconds to check for public safety messages.[115] The length of messages on the Control Channel can vary, but are generally kept short to permit maximum access to the Control Channel.[116] When tuned to the Control Channel, all RSUs and OBUs, by default will listen for a transmission.[117] If an RSU or an OBU desires to transmit a message, but detects the broadcast of another message on the Control Channel, it must wait before attempting to transmit.[118] An OBU or an RSU initiates a "request to send" (RTS) and the Control Channel will grant time first to high priority, *i.e.*, a public safety communications, then to lower priority non-public safety communications.[119] If an RSU or an OBU leaves the Control Channel to communicate on a service channel, a timer, defined by mandatory data transfer time limits, will be activated to indicate it should return to the Control Channel to listen for additional transmissions and distinguish between priority and non-priority calls.[120] In this connection, the Control Channel implements the priority given to public safety communications through a priority interruption capability.[121] Specifically, the Control Channel operates using a "set of rules

[112] ASTM-DSRC Standard at 10, Table 8.

[113] Johns Hopkins Comments at 18.

[114] Highway Electronics Comments, Appendix at 1. The Control Channel is used for roadside-to-vehicle, vehicle-to-roadside, and vehicle-to-vehicle, communications and it must be accessed on a periodic basis by every OBU and RSU operating in the 5.9 GHz band. Johns Hopkins Comments at 10-11.

[115] Johns Hopkins Comments at 10.

[116] *Id.*

[117] *Id.*

[118] *Id.*

[119] *Id.*

[120] ASTM-DSRC Standard at 2. Johns Hopkins Comments at 11.

to provide a Quality of Service (QoS) that includes access time, access priority, and channel capacity service" to RSUs and OBU ("the Control Channel protocol").[122]

31. *Priority framework*. As a preliminary matter, we observe that given the low power of RSUs and other interference-mitigation provisions of the ASTM-DSRC Standard, interference disputes among DSRCS operations should be rare. Thus, in the context of the DSRCS, "priority" is largely a matter of how messages are ranked and sent under the Control Channel protocol. That is, a higher priority communication will precede or interrupt a lower or non-priority communication, whenever necessary, in which case the lower or non-priority communication will be sent or resent after the higher priority communication is completed. In reviewing the record of this proceeding, we find that Control Channel protocol is capable of giving access priority to public safety communications, thereby ensuring that non-public safety use of the band does not degrade public safety communications.[123] We note, however, that the upper layers of the ASTM-DSRC Standard, which will establish one or more levels of public safety priority over non-public safety communications, are still under development.[124] Given this circumstance, we are adopting the following priority framework based on the record before us.[125]

32. *Safety of life*. First, DSRCS communications involving the imminent safety of life—whether by traditional public safety entities, *i.e.*, state and local governments, or by nongovernmental entities, *e.g.,* vehicle-to-vehicle collision avoidance—must have access priority over all other DSRCS communications.

33. *Public safety vs. non-public safety*. Next, public safety communications—whether by traditional public safety entities or other entities—have access priority over all DSRCS communications except safety of life communications. Should a dispute arise between public safety and non-public safety users, *i.e*., a dispute or scenario not contemplated/governed by the Control Channel protocol, communications by the following entities will be presumed to be "public safety" priority communications: state and local governments, possessions, territories, districts, and authorities (including mass transit and toll authorities).[126]

34. *Safety/public safety vs. safety/public safety*. Finally, in the event of disputes involving classifications or rankings of DSRCS-based ITS applications *within* the safety and/or public safety priority levels of the Control Channel protocol, we anticipate that the parties will

(Continued from previous page)

[121] ASTM-DSRC Standard at 2. *See also* Highway Electronics Comments, Appendix at 1.

[122] *Id.*

[123] *See* para. 15, *supra* (non-public safety use of the 5.9 GHz band would be inappropriate if such use would degrade the safety/public safety applications).

[124] ASTM-DSRC Standard at 2 § 4.1.1.2(4).

[125] Hence, we need not license non-public safety applications on a secondary basis, as suggested by the Port Authority of New York and New Jersey. Port Authority Comments at 2. Additionally, we observe that the control channel priority for DSRCS operations does not alter the relationship between the co-primary allocations.

[126] *Accord* Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communications Requirements Through the Year 2010, WT Docket No. 96-86, *First Report and Order and Third Notice of Proposed Rule Making*, 14 FCC Rcd 152, 180 ¶ 53 (1998) (adopted "bright line" eligibility criteria under which governmental entities are presumed eligible for licensing on public safety spectrum.

seek resolution of such disputes by the appropriate Federal, state, or local transportation agency(s), in the first instance, as these issues are most appropriately resolved by the agency(s) with expertise in transportation matters. In this connection and based on the record before us, we clarify that it would be permissible for the Control Channel protocol to prioritize: Channel 172 for safety communications that involve vehicle safety and other high priority applications, and Channel 184 for high power public safety and intersection collision applications.[127]

d. Power Limits

35. *Power limits*. In the *Allocation Report and Order*, the Commission limited the peak transmit output power over the frequency band of operations to no more than 750 mW (28.8 dBm), and the maximum EIRP to no more than 30 W (44.8 dBm).[128] In its petition, Mark IV Industries argued that the 750 mW (28.8 dBm) maximum output power was overly restrictive and should be replaced with an antenna input power of up to 4 watts (36 dBm).[129] Mark IV Industries also states that maximum output power limit does not account for cable loss in cases where a transmitter and the antenna are separated by a large distance. However, in its comments to the *NPRM*, Mark IV Industries supported the adoption of the ASTM-DSRC Standard, which contains power level specifications for each channel, for both public safety and non-public safety RSUs and OBUs. We also note that the overwhelming majority of commenters supported the Standard. Thus, it appears that Mark IV Industries' concerns are satisfied by the incorporation of the ASTM-DSRC Standard into our Rules. The relevant provisions of the ASTM-DSRC Standard establish an overall maximum allowable EIRP at 44.8 dBm (30 W), and the maximum allowable device output power at 28.8 dBm (750 mW). A device is allowed to transmit more power to overcome cable losses to the antenna as long as the antenna input power does not exceed +28.8 dBm and the EIRP does not exceed +44.8 dBm.[130] Further, specific channels and categories of uses have additional limitations, under the ASTM-DSRC Standard,[131] mainly:

- Public Safety and Private RSU installations operating in DSRC Channels 172, 174, 175 and 176 are used to implement small and medium range operations. RSU installation transmissions in DSRC Channels 172, 174, 176 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP. RSU installation transmissions in DSRC Channel 175 shall not exceed 10 dBm antenna input power and 23 dBm EIRP.

- Public Safety RSU installation transmissions in DSRC Channel 178 shall not exceed 28.8 dBm antenna input power and 44.8 dBm EIRP. Private RSU

[127] Non-public safety vs. non-public safety DSRCS disputes are addressed at para. 61, *infra*.

[128] *See* 47 C.F.R. § 90.205(o) (1999) (currently § 90.205(p)). *See also Allocation Report and Order*, 14 FCC Rcd 18221, 18232 ¶ 24.

[129] Mark IV Petition at 2. *See also* Intersil Comments at 13.

[130] ITS America recommends a maximum power limit for portable OBUs of 1.0 mW. *See* July *Ex Parte* at 12. We are adopting this recommendation to limit exposure to radiofrequency radiation. *See* paras. 42-43, *infra*.

[131] *See* ASTM-DSRC Standard at 10-11, § 8.9.1.

installation transmissions in DSRC Channel 178 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP.

- The DSRC Channels 180, 181, and 182 are used to implement small zone operations. Public Safety and Private RSU installations in these DSRC channels shall not exceed 10 dBm antenna input power and 23 dBm EIRP. These installations shall use an antenna with a minimum 6 dBi gain. Interfering emissions from an RSU installation in these DSRC channels shall not exceed a maximum received power level of -76 dBm at 15 m from the installation being evaluated. The received power level is measured at 1.2 m above the ground with a 0 dBi antenna.

- Public Safety RSU and OBU operations in DSRC Channel 184 shall not exceed 28.8 dBm antenna input power and 40 dBm EIRP. Private RSU operations in DSRC Channel 184 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP.

- Private OBU operations in DSRC Channels 172, 174, 176, 178, and 184 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP. Private OBU operations in DSRC Channel 175 shall not exceed 10 dBm antenna input power and 23 dBm EIRP. Private OBU operations in DSRC Channels 180, 181, and 182 shall not exceed 20 dBm antenna input power and 23 dBm EIRP.

- Public Safety OBU operations in DSRC Channels 172, 174, and 176 shall not exceed 28.8 dBm antenna input power and 33 dBm EIRP. Public Safety OBU operations in DSRC Channel 175 shall not exceed 10 dBm antenna input power and 23 dBm EIRP.

- Public Safety OBU operations in Channel 178 shall not exceed 28.8 dBm antenna input power and 44.8 dBm EIRP.

- RSUs and OBUs shall transmit only the power needed to communicate over the distance required by the application being supported.

e. Emission Limits

36. In the *NPRM,* we requested comments on whether the attenuation schedule for the emissions mask in Section 90.210(k)(3) was adequate, or whether a Mark IV Industries' (Mark IV's) proposal to limit emissions according to the formula: 55+ 10 log (P) (P is power in Watts), should be adopted.[132] Siemens Transportation Systems (STS) responded that the out-of-band emissions limits for many services, such as those managed under Parts 22, 24, and 90, only require attenuation according to the formula: 43 + 10 log (P). Furthermore, STS asserts that power densities associated with ITS services would likely be lower than power densities for the

[132] *NPRM*, 17 FCC Rcd at 23176 ¶ 70 citing, ET Docket No. 98-95, Mark IV Petition at 2.

services considered in Parts 22, 24, and 90. Consequently, STS recommends that out-of-band emissions for DSRC equipment be attenuated according to the formula: 43 + 10 log (P).[133]

37. We understand STS's rationale in its desire to use a less restrictive mask formula, but are also aware of the uniqueness of the DSRC/ITS evolving network, and the diversity of applications to be carried on this 5.9 GHz band. Specifically, it is projected that the density of microwave links will be much higher in this band than for current microwave bands, because RSU transceivers will be placed in close proximity to one another, anywhere from 100 to 1000 meters apart. Such high density requires a more rigorous mask to accomplish the desired sharing of the spectrum. Furthermore, since the development of this band is at its early stages, there is no sufficient empirical data to support the assumption that the STS proposed formula will guard against possible harmful interference among users in such a high density of electromagnetic links environment. We conclude, therefore, that it is safer and in the public interest, given the current development of the band, to use the emission mask and formulas in the ASTM-DSRC Standard as the technical regulatory framework for the band. We reserve discretion to revisit this issue after empirical data become available to construct a reasonable and appropriate propagation model. Finally, given that the ASTM-DSRC Standard contains emission mask limits, we believe that Mark IV's concerns have been addressed by the adoption of the ASTM-DSRC Standard.[134] Nonetheless, because the limits we adopt today are similar to the out-of-band requirements adopted in the 4.9 GHz proceeding,[135] we observe that the National Public Safety Telecommunications Council (NPSTC) has petitioned for reconsideration of the emissions mask and out-of-band requirements adopted therein.[136] Given this recent experience at 4.9 GHz, we reserve discretion to revisit this issue after empirical data becomes available to construct a reasonable and appropriate propagation model.

4. Other Technical Matters

38. We believe that our adoption of the ASTM-DSRC Standard addresses the bulk of the technical issues concerning DSRC operations. Nonetheless, certain technical matters require additional discussion at this juncture.

a. Antenna Height

39. *Antenna Height*. The ASTM-DSRC Standard contains requirements for antenna input power limits, EIRPs, and an antenna position calibration for OBU antennas. The ASTM standard requests that antenna height deviations from the nominal 0.25 meters above ground be reported in increments of 0.1 meter, for the purpose of making accurate calculations of the

[133] STS Comments at 8-9.

[134] *See, e.g.,* Highway Electronics Comments at 1-2 (ASTM-DSRC spectral mask requirements are necessary for the interference free adjacent channel operation of multiple RSUs and OBUs).

[135] The out-of-band spectral power density limit for operations in the 4.9 GHz band contained in 47 C.F.R. § 90.210(l)(6) is -53 dBm/MHz. *See* In the Matter of The 4.9 GHz Band Transferred from Federal Government Use, *Memorandum Opinion and Third Report and Order*, WT Docket No. 00-32, 18 FCC Rcd 9152 (2002).

[136] *See* Petition for Reconsideration of the National Public Safety Telecommunications Council (NPSTC), WT Docket 00-32, filed July 30, 2003. *See also* Siemens Transportation System Comments at 8-9, indicating that the 55 = 10 LogP is too stringent for DSRCS.

vehicle's location. Additionally, ITS America proposed to correct the maximum output from RSUs by a factor of 20 log (Ht/6), where Ht is the height of the antenna in meters, in those cases where the antenna height above ground falls between 6 and 15 meters, with a maximum authorized EIRP of 33 dBm for antenna heights of 6 meters or more.[137] 3M, however, states that the antenna height correction factor is not required in the DSRC service.[138] Specifically, 3M states that DSRC communications use the minimum radio frequency (RF) power necessary to complete a communication link regardless of the maximum operating power and that the two-ray propagation model is too simplistic to be applicable to the DSRC radio service.[139] Furthermore, 3M asserts that the two-ray propagation model should not be used for DSRC operations because roadway surfaces are usually curved to aide runoff of water, a clear line-of-sight propagation path is not always available when a receiving vehicle is behind another vehicle, and a clear propagation path for the reflected ray is not always available because of intervening vehicles that are present in an urban environment.[140]

40. The record before us, as well as our experience with land mobile operations generally,[141] persuades us that an antenna height correction factor for DSRC is appropriate to minimize the potential for interference. Although 3M raises concerns focused largely on the specific correction factors recommended by ITS America, the record before us does not include sufficient technical information to support adoption of any other correction factor. Specifically, we find no compelling arguments supported by actual data in the urban and rural environments, or on a proven propagation prediction model, that would support adoption of another correction factor. Additionally, the ASTM standard does not specify an antenna height correction factor, but specifies maximum power and EIRP levels. We understand that the possibility of direct adjacent harmful interference, and interference in the form of unwanted harmonics, becomes a greater threat as the EIRP and antenna height of the RSU increases, and find ITS America's recommendation complementary to the standard's intention of protecting adjacent users from harmful interference. Nonetheless, we reserve discretion to revisit the adequacy of these parameters if a propagation model more appropriate for DSRC operations in urban and rural areas is developed.[142]

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[137] July *Ex Parte* Comments, Appendix C at 9.

[138] 3M Comments at 4.

[139] *Id.*

[140] *Id*. at 5.

[141] *See generally* 47 C.F.R. § 90.205.

[142] On November 14, 2003, ITS America reported that the Standards Writing Group voted to delete the following sentence from the antenna height correction factor proposed by ITS America in its July *Ex Parte* Comments at 9: "The maximum authorized effective isotropic radiated power ('EIRP') is 33 dBm for any Roadside Unit installation where the antenna height is six meters or greater above the roadway bed surface." ITS America stated that the additional restriction contained in this sentence will result in inadvertent drop-off in channels with higher EIRP limits and is unnecessary n light of other protections to guard against potential harmful interference. *See* Letter from Robert B. Kelly, Esq., counsel to ITS America, to Marlene H. Dortch, Federal Communications Commission at 2 (Nov. 14, 2003).

b. Duty Cycle Limit for Control Channel (Channel 178)

41. At the time of the *NPRM,* ITS America indicated that the duty cycle for the Control Channel should be 200 μsec at intervals of less than 100 msec.[143] In discussing ITS America's proposal, ARINC notes that ASTM is in the process of developing a standard that will describe the mechanisms and required limits of the Control Channel operation.[144] On November 7, 2003, however, ITS America proposed a duty cycle limit for the control channel.[145] Specifically, ITS America proposed no limit for public safety applications and a maximum data transmission duration of 750 μsec and 580 μsec for non-public safety RSUs and OBUs, respectively with a minimum interval between data transmissions of 20 msec and 100 msec, respectively. These limits are not contained in the ASTM-DSRC Standard and we did not receive any comment on this latest proposal. We therefore conclude that the record is insufficient to support adopting such limitations. We note that the Commission's rules require licensees to restrict all transmissions to the minimum practical transmission time and that communications involving the imminent safety of life or property are to be accorded priority to all licensees.[146] As noted earlier, the Control Channel Standard is still under development.[147]

c. RF Exposure

42. OBUs may operate as either a mobile or a portable transmitter with respect to Sections 2.1091 and 2.1093 of the Commission's Rules to comply with RF exposure requirements.[148] In mobile configurations, OBU antennas are normally mounted on vehicles where the antennas can be located with sufficient distance from passengers for meeting RF exposure requirements. A separation distance of 50 cm between the antenna and persons is necessary at the maximum output of 30 W EIRP to ensure compliance. This distance should be easily achieved in most vehicle configurations. By implementing specific antenna installation requirements to ensure compliance, routine MPE evaluation (Section 2.1091) would be unnecessary. In portable configurations, *i.e.*, when the transmitting device is designed to be used within 20 cm of the body of the user, ITS America recommends a maximum output power of 1.0 mW.[149] We note that the specific absorption rate (SAR) limit for portable transmitters is 1.6 W/kg (Section 2.1093) and that it would take 1.6 mW or more to exceed the SAR limit. Therefore, we find that ITS America's proposal is reasonable approach to limit exposure to radiofrequency radiation. In this connection, we consider that under ITS America's approach, certification of portable OBUs will not require SAR evaluations to demonstrate compliance with our RF exposure rules.

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[143] July *Ex Parte* Comments at 60.

[144] ARINC Comments at 10.

[145] *See* Letter from Mark D. Johnson, Esq., counsel to ITS America, to Marlene H. Dortch, Secretary, Federal Communications Commission, Attachment (Nov. 7, 2003).

[146] *See* 47 C.F.R. § 90.403(c) and (d). See also discussion of control channel protocol at paras. 0-31, *supra.*

[147] *See* para. 31, *supra.*

[148] 47 C.F.R. §§ 2.1091, 2.1093.

[149] *See* July *Ex Parte* at 12.

43. RSUs are mostly intended to be fixed-mounted on road sides and structures at street intersections but may be mounted in a vehicle or hand carried and operated while stationary. Given that RSUs may only operate when stationary, a minimum separation distance of 50 cm or more can be easily maintained with specific antenna installation procedures to ensure compliance at the maximum output of 30 W EIRP. However, when a stationary RSU is operated in a vehicle mounted or hand carried configuration at higher output power or using high gain antennas, the RSU operator must maintain a minimum separation distance from the antenna to ensure RF exposure compliance. Since RSUs are intended to be used by persons employed in public safety or industrial/business occupations and should not be available to the general public, occupational/controlled exposure limits and occupational RF exposure training (*see* Sections 2.1091 and 2.1093) are applicable. We emphasize that users of hand carried RSUs will need to be able to control their exposure condition and duration to qualify for occupational/controlled limits. This is typically accomplished through RF exposure training instructions.

5. Equipment Certification

44. The Commission sought comment on whether we should require DSRC devices to be certified under our Rules to ensure that they meet our electromagnetic compatibility (EMC) and emission requirements in Part 2. We agree with the majority of commenters, including DOT, NTIA, and ITS America, that we should require that DSRC equipment operating in the 5.9 GHz band be certified according to the procedures in Parts 2, 90, and 95 of our Rules, because these devices will be widely deployed and non-compliance with our requirements could cause serious interference problems.[150] Consequently, we require all transponders, transmitters, and transceivers, whether associated with RSUs or OBUs used in the DSRCS to be certified in accordance with subpart M of Part 90 and subpart L of Part 95, and subpart J of Part 2 of our Rules. In the *NPRM*, we also sought comment on whether the definition of interoperability in the context of DSRC, should include equipment compatibility, so that OBUs and RSUs from different vendors would be interchangeable. Thus, an OBU or RSU manufactured by vendor X would be able to communicate and exchange information with an OBU or RSU manufactured by vendor Y. The Commission also sought comment on whether to adopt equipment performance specifications, such as receiver standards, to reduce the likelihood of interference between devices. Given our adoption of the ASTM-DSRC Standard, however, we now conclude that the definition of "interoperability"[151] and whether to adopt separate equipment performance specifications are largely irrelevant to the DSRCS. In this connection, test procedures to demonstrate compliance with the ASTM-DSRC Standard shall be left to the industry to develop. Compliance with the standard will also be left to industry to determine how to best achieve. To ensure compliance, applicants will be required to supply a statement that the equipment was tested and complies with the ASTM-DSRC Standard, as a prerequisite for certification.[152]

[150] DOT Comments at 6; NTIA Comments at 17; ITS America Comments at 20.

[151] *See* 47 C.F.R. § 90.7.

[152] Given that we are adopting the ASTM-DSRC Standard, we clarify that the definition of "interoperability," 47 C.F.R. § 90.7, is largely irrelevant to DSRC.

B. Definitional Issues

1. Intelligent Transportation Radio Service

45. The Intelligent Transportation Radio Service was established by the Commission "for the purpose of integrating radio-based technologies into the *nation's transportation infrastructure*"[153] and is comprised of the Location and Monitoring Service, grandfathered automatic vehicle monitoring systems, and DSRC.[154] In the *NPRM,* we invited comment on whether to amend Section 90.350 of our Rules[155] to limit the use of the Intelligent Transportation radio service to the integration of radio-based technologies to the "nation's surface transportation infrastructure" rather than to the "nation's transportation infrastructure."[156] We received only one comment on this issue; the Public Safety Wireless Network (PSWN) favored making this change as more consistent with the language of ISTEA and TEA-21.[157] Upon further consideration, we conclude that retaining the current definition of the Intelligent Transportation Radio Service best serves the public interest by promoting flexible use of the band. We further conclude that that the current definition is not contrary to ISTEA and TEA-21. In reaching this conclusion, we consider that DOT did not comment on this issue. Accordingly, to promote the flexible use of the 5.9 GHz band, we decline to amend Section 90.350 of our Rules.

2. DSRC Service

46. *Background.* Because the number and kinds of DSRC-based ITS applications continue to evolve, we sought comment on whether the definition of DSRC service in Section 90.7 of the Commission's Rules would include all of the DSRC-based ITS applications envisioned for the band. Section 90.7 defines "Dedicated Short Range Communication Services" as

> The use of non-voice radio techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation service applications in a variety of public and commercial environments. DSRC systems may also transmit status and instructional messages related to the units involved.[158]

Specifically, we sought comment on whether to delete the term "non-voice", which would permit the conversion of certain types of data transmissions into voice messages using Voice-over-IP, Voice XML, or another packet radio technique that would "store and forward" the message.[159]

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[153] 47 C.F.R. § 90.350 (emphasis added).

[154] *See* 47 C.F.R. §§ 90.351, 90.363, and 90.371.

[155] 47 C.F.R. § 90.350.

[156] *NPRM*, 17 FCC Rcd at 23181 ¶ 82.

[157] Public Safety Wireless Network (PSWN) Comments at 13.

[158] 47 C.F.R. § 90.7. *See also* 47 C.F.R. § 90.371(a).

[159] *NPRM*, 17 FCC Rcd at 23147 ¶ 16.

To promote the flexible use of the band, the Commission sought comment on whether to replace the phrase "in a variety of public and commercial environments" with the phrase "in a variety of environments."[160] We noted that these issues are directly related to eligibility.

47. *Discussion*. Although one commenter[161] opposed deleting the term "non-voice" from the definition of DSRC service, we are persuaded by the reasoning of the other commenters who favored such a change, in particular DOT.[162] DOT indicated that it has been conducting research on how to provide motorists with safety-related information, such as work zones or road condition warnings, without unduly distracting the driver.[163] DOT reports that although its research is not complete, a "voice interface seems to be the most appropriate way to present this information."[164] Consequently, we intend to delete the term "non-voice" from the definition of DSRC service.

48. As noted above, we sought comment on whether to replace the phrase "in a variety of public and commercial environments" with "in a variety of environments." According to ITS America, changing "and commercial environments" to "and private environments," should be coupled with deleting the phrase "non-voice" to ensure that the 5.9 GHz band cannot be used for CMRS or CMRS-like service.[165] In addition to ITS America, Mark IV Industries and Intersil recommended that we expressly exclude the provision of CMRS service or CMRS-type service from the band instead of adopting ambiguous language that could be misinterpreted later.[166] Two commenters, the Alliance of Automobile Manufacturers and TransCore, favored the alternative phrasing.[167]

49. Although the majority of commenters supported ITS America's approach, we shall replace the phrase "and commercial environments" with "in a variety of environments" to preserve flexible use of the 5.9 GHz band. In this connection, we find that the record does not provide a technical basis for excluding CMRS as a definitional matter. Thus, provided that a CMRS operation meets all DSRC service rules, such operation is consistent with our allocation.[168] In sum, on review of the record in this proceeding, we believe that we should amend the definition of DSRC Service as follows:

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[160] *Id.*

[161] 3M Comments at 2.

[162] *See* E-ZPass Comments at 5; ARINC Comments at 2; New York Thruway Comments at 3; Alliance of Automobile Manufacturers Comments at 7; Telecommunications Officials Comments at 2; UC Davis Comments at 1; MTA Bridges & Tunnels Comments at 2; NENA Comments at 2; AASHTO Comments at 4.

[163] DOT Comments at 7.

[164] *Id*.

[165] ITS America Comments at 20-21.

[166] Mark IV Industries Reply Comments at 4; Intersil Corporation Comments 4.

[167] Alliance of Automobile Manufacturers Comments at 7-8. TransCore, LP Comments at 6.

[168] *Allocation Report and Order*, 14 FCC Rcd 18221. We note that any CMRS operations would be subject to E-911 and other CMRS requirements.

> The use of radio techniques to transfer information over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation service applications in a variety of environments. DSRC systems may also transmit status and instructional messages related to the units involved.

C. Eligibility

1. Roadside Units (RSUs)

50. In the NPRM, we tentatively concluded that the 5.9 GHz band should be used primarily for public safety purposes.[169] We also sought comment on how to define public safety; whether public safety and non-public safety licensees should share the band as recommended by ITS America; and how to define non-public safety use, if such uses are allowed.

51. *Discussion*. We continue to believe that public safety communications must have priority over non-public safety communications and we provide for such priority, *supra*.[170] However, the record in this proceeding indicates that public safety DSRC-based ITS applications will benefit from open eligibility through the economies of scale achieved through the development of a larger market consisting of public safety and non-public safety entities. We believe that open eligibility is appropriate in this service, with different technical rules where necessary. This decision is also consistent with Section 257 of the Act, in which Congress articulated a "national policy" in favor of "vigorous economic competition" and the elimination of barriers to market entry by a new generation of telecommunications providers.[171] Accordingly, the only restriction on eligibility will be that required by Section 310(a) of the Communications Act, *i.e.*, foreign governments or representatives of foreign governments.[172]

2. On Board Units (OBUs)

52. DOT envisions that OBUs will be installed in every new vehicle sold or manufactured in the United States,[173] and most of these OBUs will not be associated with any particular RSUs. Taken with our "open eligibility" decision for RSU licensing, we find "open eligibility" to be appropriate for OBUs as well. Accordingly, all motorists will be eligible to operate OBUs unless barred by statute.[174]

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[169] *NPRM*, 17 FCC Rcd at 23149 ¶ 18.

[170] *See* paras 23-38, *supra*.

[171] *See* 47 U.S.C. § 257.

[172] *See* 47 U.S.C. § 310(a). For the licensing requirements for RSUs, see paras. 57-59, *infra.*

[173] July *Ex Parte* Comments at 45 (equipping all new vehicles with OBUs is a primary goal of DOT). *See also Ex Parte* Comments of the United States Department of Transportation, from Paul Samuel Smith, Esq., DOT, at 7 (filed Nov. 5, 2003).

[174] *See, e.g.,* note 172*, supra* and accompanying text. For the licensing requirements for OBUs, see paras. 62-67, *infra.*

D. Licensing Plan

1. DSRC-to –DSRC Issues

a. RSUs

53. In the *NPRM*, we requested comment on whether to license RSUs by site or by geographic area. We also specifically asked commenters to propose other methods of licensing RSUs, such as licensing by rule. The majority of commenters, including ITS America and NTIA favor site-based licensing,[175] although DOT indicates only that it favors a licensing plan that ensures national interoperability and uniform technical standards.[176] The commenters who favor site-based licensing argue that geographic area licensing promotes exclusivity, whereas the ASTM-DSRC Standard was developed to promote shared use.[177] Specifically, the ASTM-DSRC Standard was developed based on licensees operating within localized "communications zones" with the RSUs transmitting at ranges less than 1000 meters;[178] geographic area licensing, in contrast, is most appropriate, according to commenters, where a service requires high-power 360 degree coverage.[179]

54. Commenters in favor of site-based licensing argue that the ASTM-DSRC Standard was developed based on a site-specific licensing scheme.[180] These commenters believe that site-based licensing better achieves the goal of interoperability because it enables public safety and non-public safety entities to share frequencies.[181] It is more spectrum efficient because it maximizes the number of entities using the spectrum and allows close-spacing and overlapping communications zones.[182] It will enable more intensive spectrum sharing and frequency reuse.[183] It will spur rapid deployment of DSRC–based ITS applications because it will permit the use of factory installed OBUs for use throughout the country and not limited to one geographic area.[184] Site-based licensing will "facilitate the coordination process that is necessary to avoid interference between DSRC RSUs and high power Government radar systems."[185] To prevent new RSU deployments from causing harmful interference to existing DSRCS systems, ITS America would require RSU applications to be frequency coordinated by a

[175] ITS America Comments at 12; NTIA Comments at 6-7.

[176] DOT Comments at 8.

[177] *See* ITS America Comments at 11-12.

[178] NTIA Comments at 6.

[179] ITS America Reply Comments at 11.

[180] TransCore Reply Comments at 3

[181] ITS America Comments at 13-14.

[182] ITS America Reply Comments at 11; Johns Hopkins Comments at 14.

[183] TransCore Reply Comments at 3

[184] Alliance of Automobile Manufacturers Reply Comments at 3.

[185] NTIA Comments at i. *See also* 47 C.F.R. § 90.371(b).

Commission-certified frequency coordinator for the private land mobile radio services.[186] The Commission in turn would license each RSU for specific service channels, based on the coordinator's recommendation, as well as the Control Channel.[187] Site-based licensing could be facilitated by the use of high technology "smart antennas"[188]

55. Although these commenters recognize that site-based licensing is more administratively difficult for the Commission than geographic area licensing, they believe there are many ways to lessen this burden.[189] Specifically, commenters recommend coordination of RSU location by frequency coordinators and management of the applications through the Commission's ULS.[190] ITS America recommends that we use a ribbon or corridor licensing approach for public safety entities, such as freeway authorities, transit agencies, and others that will need to place multiple RSUs "across a large geographic area that will likely cross several jurisdictional boundaries."[191] Other commenters recommend a "blanket" approach under Section 90.353(i) of our Rules for these types of public safety entities.[192] Not all commenters favored site-based licensing. Others favored geographic-area licensing as less cumbersome.[193] Intersil Corporation recommended a licensing by rule approach through the use of a commercially operated web site and private frequency coordination.[194]

56. Based on our analysis of the record before us and the goals and objectives we are trying to accomplish, we believe that a nonexclusive geographic area licensing approach, described below, has the benefits of site-based licensing and the efficiencies and administrative benefits associated with geographic area licensing. Accordingly, we are adopting non-exclusive geographic area licenses. To address the concerns raised in support of frequency coordination and site-by-site licensing, we also adopt a post-license registration requirement.

57. *Non-exclusive geographic area licensing*. Non-exclusive area licensing is flexible, especially in light of the technical characteristics of DSRCS, *i.e.,* low power and short range. Moreover, geographic area licensing can accommodate many different licensees offering different DSRC-based ITS applications, which we believe will promote the use of the 5.9 GHz

[186] *See* 47 C.F.R. § 90.175. *See also* July *Ex Parte* Comments at 65-66.

[187] July *Ex Parte* Comments at 65-66.

[188] John Hopkins Comments at 14. Johns Hopkins states that the "use of high frequency/short wavelength combined with new higher dielectric microwave materials permits tiny, inexpensive antenna arrays, and patches to be customized to service any communication zone requirement. Coverage initially granted to an RSU to serve a broad area could later be adjusted when new RSUs enter the area." *Id.* (citations omitted*)*.

[189] ITS America Comments at 15.

[190] *Id*. at 15-16.

[191] ITS America Reply Comments at 12.

[192] Mark IV Industries Comments at 9.

[193] *See* National Assoc. of Telecommunications Officers and Advisors/National League of Cities Comments at 3. *See also* National Emergency Number Association at 3.

[194] Intersil Corporation Reply Comments at 4 n.10.

band and the development of new and innovative DSRC services. Moreover, geographic area licensing is preferable to site-based licensing, in this instance, because geographic area licensing involves significantly less expense than site based licensing. Thus, given the low power of RSUs, the interference-mitigation provisions of the ASTM-DSRC Standard, and that the potential number of sites could be in the tens of thousands, we conclude that the burden and expense that site licensing (even if we authorized several sites per license) would impose on applicants and the Commission is unwarranted. Similarly, we find that mandatory frequency coordination will not be necessary because the ASTM-DSRC Standard will promote the sharing between DSRC operations in this band such that imposing the cost and delay of mandatory frequency coordination is unwarranted. Moreover, we are concerned that licensing RSUs for less than all of the service channels would impede DSRCS flexibility in using the band with the other co-primary allocations.[195] Accordingly, we adopt non-exclusive geographic-area licensing for DSRC operations in the 5.9 GHz band.[196]

58. With regard to governmental entities, we believe that a geographic-area licensing plan based on that entity's legal jurisdictional area of operations is most appropriate. With regard to non-governmental entities, we believe that they can be licensed based on each applicant's area-of-operation, *i.e.,* by county, state, multi-state, or nationwide. We will determine applicant qualifications for these non-exclusive geographic-area licenses in accordance with FCC Form 601 and our Rules. Those applicants who are approved will each be granted a non-exclusive license for the geographic-area requested, *i.e.*, county, state *etc*.[197] There is no limit to the number of non-exclusive geographic-area licenses that may be granted for this band. Because such licenses serve as a prerequisite of registering individual RSUs located within the licensed geographic area, each licensee will be authorized for seventy-megahertz of co-primary spectrum, 5.855-5.925 GHz. Authorizing licensees for all of the 5.9 GHz band, except for the reserve,[198] and adopting the ASTM-DSRC Standard, which channelizes the spectrum, are complementary. This spectrum will not be subject to any aggregation limit, so each licensee will use channels in accordance with the ASTM-DSRC Standard.

59. *Post license registration requirement*. As noted, we believe that most of the concerns raised in support of site-by-site licensing can be addressed through a post-license

[195] In allocating the 5.9 GHz band for DSRC operations, the Commission noted, in part, that seventy-five megahertz of spectrum "will provide the flexibility needed to share the spectrum with incumbent operations." *Allocation Report and Order*, 14 FCC Rcd at 18225 ¶ 9. *See also,* ET Docket No. 98-95, DOT Reply Comments at 3 (DOT cited an ARINC study that "in order to avoid potential interference from incumbent users in the 5.9 GHz band, an allocation of 75 MHz" was necessary "as a practical matter.").

[196] Because licenses will be non-exclusive, there will be no mutual exclusivity between or among applications. Consequently, our competitive bidding authority is not implicated. *See BBA Report and Order*, 15 FCC Rcd at 22,715 ¶ 14. Given that we are not authorizing licenses via competitive bidding, we have no need to address in this *Report and Order* the various competitive bidding-related issues that were raised in the *NPRM*, which included matters of competitive bidding design, designated entities, bidding credits, application and payment procedures, reporting requirements, collusion issues, and unjust enrichment. *See NPRM*, 17 FCC Rcd 23,179-81 ¶¶ 75-81.

[197] 47 C.F.R. §§ 1.913-1.917. FCC Form 601 – *Application for Authorization in the Wireless Radio Service*.

[198] At this time, we are not adopting licensing and service rules for the five megahertz reserve located in the 5.850-5.855 portion of the 5.9 GHz band.

registration process somewhat similar to the one we adopted in our *70-80-90 GHz Report and Order.*[199] We believe that the registration process must be streamlined, particularly in light of the potential for thousands of coordinated RSUs in this band. Licensees will register RSU sites, channels, and other relevant data on the Universal Licensing System (ULS) under the call sign of the relevant license.[200] Nonetheless, we observe that there may be administrative benefits to having RSU registrations maintained in a third-party (*i.e*., non-FCC) database. Given that the DSRCS is evolving, we will continue to collaborate with DOT in considering whether it would be prudent to have RSU registrations housed on a system other than ULS.[201] Given that the post license registration process will also implement the requirement to coordinate certain DSRC stations through NTIA, *see* paragraph 73, *infra*, we will consult with NTIA prior to any change in the registration process we adopt today.

60. Licensees must register each RSU in the Universal Licensing System (ULS) and authority to operate a given RSU begins after the Wireless Telecommunications Bureau (Bureau) screens the filing and posts the registration on the ULS. The Bureau will use an automated "overnight batch" program to screen registration filings and RSUs that do not require additional processing will be posted within one business day (for electronically filed registrations). RSU registrations are subject, *inter alia*, to the requirements of Section 1.923 of the Commission's rules (antenna structure registration,[202] environmental concerns,[203] international coordination,[204] and quiet zones[205]). Additionally, RSUs at locations subject to NTIA coordination (see § 90.371(b) of this part) may not begin operation until NTIA approval is received. RSU registrations that raise these issues may require additional time to process. Accordingly, licensees must plan ahead given that authority to operate does not begin until the registration process is completed.[206]

61. *DSRCS Interference Disputes.* Given the low power of RSUs and the interference-mitigation provisions of the ASTM-DSRC Standard, interference disputes among DSRC operations should be rare. Nonetheless, we clarify that in the event a dispute arises, it is

[199] *See* Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands, WT Docket No. 02-146, *Report and Order*, 18 FCC Rcd 23318 (2003) (*70-80-90 GHz Report and Order*).

[200] This information is described with more specificity in Appendix F.

[201] By comparison, in the *70-80-90 GHz Report and Order*, we determined that non-Federal Government links will be registered in a third-party (*i.e.*, non-FCC) database after an interim period. *See 70-80-90 GHz Report and Order* at ¶ 50.

[202] *See* 47 C.F.R. § 1.923(d) citing 47 C.F.R. Part 17.

[203] *See* 47 C.F.R. § 1.1307.

[204] *See, e.g*. 47 C.F.R. § 1.928 (regarding frequency coordination arrangements between the United States and Canada).

[205] 47 C.F.R. § 1.924.

[206] *Accord 70-80-90 GHz Report and Order* at ¶ 56 (the Commission believes the licensee is in the best position to determine the nature of its operations and whether those operations impact certain settings).

to be resolved using the priority framework set forth in paragraph 31, *supra*.[207] If a dispute arises between non-public safety RSU licensees, the licensee of the later-registered RSU must accommodate the operation of the early registered RSU, *i.e.*, interference protection rights would be date-sensitive, based on the date that the RSU is first registered and the later registered RSU would have to modify its operations.[208]

b. OBUs

62. With regard to OBUs, we noted in the *NPRM* that there could be two kinds of OBUs, those associated with an RSU and those not associated with an RSU.[209] In this context, we invited comment on whether the OBU associated with an RSU should be licensed under the associated RSU's license. With regard to OBUs not associated with an RSU, we requested comment on whether to license them by rule, or authorize their use as unlicensed under Part 15 of our Rules.[210]

63. As a preliminary matter, we note that there is contradictory information in the record concerning whether there are OBUs that are associated with an RSU. ITS America notes that "while there will be instances where a licensee will deploy a number of On-Board Units for communication with its Roadside Units, it is expected that the majority of On-Board Units will be deployed without any association with a particular licensee or fixed system."[211] Johns Hopkins, however, states that because "OBUs are general purpose devices, supporting a wide range of both private and public services throughout the nation, it is impossible to associate these OBUs with a single system."[212] From ITS America's statement in the First Proposed Band Plan, it appears that not all OBUs are general purpose OBUs; some OBUs are used for public safety purposes only. For instance, ITS America indicated that public safety vehicles would have two OBUs, with the second OBU, which does not use the Control Channel, used for intersection applications, such as "Emergency Vehicle Signal Pre-emption."[213] It appears, from this description, that this second OBU would be associated with a fixed system. We note that several commenters, especially toll agencies, support licensing OBUs under the associated RSU license.[214]

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[207] We clarify that this prioritization only applies between DSRC operations and does not affect interference rights relative to the other services operating in this spectrum.

[208] Because registration filing dates may be time-sensitive and given the minimal burden involved in filing a new registration for an RSU that needs to change locations or channels, we will limit the capability to modify site registrations.

[209] *NPRM*, 17 FCC Rcd at 23167 ¶¶ 52-53.

[210] 47 C.F.R. Part 15.

[211] ITS America Comments at 19.

[212] Johns Hopkins Comments at 12.

[213] First Proposed band Plan at 7.

[214] *See* IBTTA Comments at 7; North Texas Tollway Authority Comments at 2; Maine Turnpike Authority Comments at 2; Delaware Department of Transportation Comments at 2; Siemens Transportation System Comments at 6.

64. Regardless of this inconsistency in the record, the majority of commenters favor licensing all OBUs by rule. Specifically, these commenters note that licensing by rule is consistent with the technical characteristics of OBUs.[215] A licensing by rule regime would require OBUs to comply with transmission power limits, and specific rules on timing intervals and length of transmission, especially concerning the Control Channel, as found in the ASTM-DSRC Standard.[216] Other commenters note that licensing OBUs by rule balances the operational characteristics of the OBUs with providing the license status necessary for full operation.[217] Commenters also claim that licensing OBUs by rule would enhance the development of new devices as well as speed production and market growth.[218]

65. Most commenters oppose unlicensed operations under Part 15 for any DSRC-based ITS application, whether associated or not associated with a fixed system. These commenters maintain that Part 15 does not provide the needed technical protection necessary for DSRC operations.[219] NTIA agrees with these commenters and states that Part 15 would not offer sufficient protection for public safety and safety-related services, which could prohibit the deployment of critical public safety DSRC applications, thus potentially reducing the overall public benefits envisioned for DSRC.[220] Nissan argues that DSRC operations under Part 15 are "likely to cause interference with safety applications in terms of reduced channel availability and capacity, especially regarding the control channel, as well as increased latency."[221] The Alliance of Automobile Manufacturers argues against unlicensed operations, stating that radio frequency interference from unlicensed devices and their noncompliance with channel controls and the message prioritization framework would undermine the projected effectiveness of vehicle safety enhancements made possible by DSRC; therefore, unlicensed devices may have the ability to cause these same safety applications to fail during emergencies, putting lives and property unnecessarily at risk.[222]

66. In supporting unlicensed operations under Part 15, Intersil Corporation maintains that those opposed to unlicensed operation of OBUs underestimate the technical control available under Part 15: Intersil notes that some Part 15 devices are subject to extremely detailed technical rules and there is "extensive precedent for controlling any needed transmitter characteristics under Part 15."[223] Again, we note that DOT did not comment on licensing issues, instead asking

[215] ITS America Reply Comments at 15.

[216] *Id.* at 16.

[217] E-ZPass Reply Comments at 6.

[218] E-ZPass Comments at 12.

[219] ITS America Reply Comments at 16.

[220] NTIA Comments at ii.

[221] Nissan Comments at 7.

[222] Alliance of Automobile Manufacturers Reply Comments at 2.

[223] Intersil Corporation Reply Comments at 4-5.

that whatever option we choose should support interoperability and uniform technical standards.[224]

67. We note that authorizing unlicensed operations is an efficient means to promote a variety of operations, under certain technical requirements to ensure that they do not cause interference, even if an allocation does not exist for those operations. In this case, ITS DSRC applications have a primary allocation in the Mobile Service and our "license by rule" mechanism is an appropriate method to allow widespread deployment of OBUs without unnecessarily burdensome individual licensing requirements. We believe this approach is consistent with the ASTM-DSRC Standard and is particularly appropriate here because the 5.9 GHz band will be shared among millions of motorists, and thus, there will be no mutual exclusivity between users. In addition, "licensing by rule" will minimize regulatory procedures and thus facilitate deployment while protecting public safety communications. Further, we do not think the "license-by-rule" approach will threaten the protection of public safety operations because such protections are addressed through the operating standards adopted herein, rather than through an individual licensing mechanism.

2. Government Radar Operations-to-DSRC

68. *Background*. In 1999 the Commission allocated the 5.9 GHz band to the DSRCS.[225] Because this seventy-five megahertz of spectrum is co-allocated on a co-primary basis for both Federal Government and non-Federal Government use, coordination between non-Federal Government (private entities and state and local governments) and Federal Government operations is of critical interest. Accordingly, in the *Allocation Report and Order*, the Commission adopted Section 90.371(b), which provides that "DSRCS stations operating in the 5.9 GHz band shall not receive protection from Government radar services in operation prior to the establishment of the DSRCS station."[226] The rule further requires that operation of DSRCS stations within seventy-five kilometers of fifty-nine locations (current or future Government radar sites that DoD reported to the Interdepartment Radio Advisory Committee (IRAC) in 1997) must be coordinated through NTIA.[227] In the *NPRM*, we noted that new Government radar installations that may be deployed subsequent to DSRC implementation must coordinate with incumbent DSRC operations.[228] In this connection, we requested comment on whether we should adopt specific provisions to forestall interference from new high power government radar operations to the DSRC Control Channel.

69. *Discussion*. The Federal Government is the largest incumbent user of the 5.9 GHz band.[229] According to NTIA, the Department of Defense (DOD) uses fixed, transportable,

[224] DOT Comments at 8.

[225] *Allocation Report and Order,* 14 FCC Rcd at 18225 ¶ 9. The DSRCS also shares the band on a co-primary basis with Fixed Satellite Service uplinks.

[226] 47 C.F.R. § 90.371(b).

[227] *Id. See also* NTIA Comments at 14.

[228] *NPRM*, 17 FCC Rcd at 23171 ¶ 58 citing *Allocation Report and Order,* 14 FCC Rcd at 18228 ¶ 14.

[229] NTIA Comments at 3.

and mobile radars for surveillance, test range instrumentation, airborne transponders, and experimental testing.[230] DOD uses these radars extensively in support of national and military test range operations in the tracking and control of manned and unmanned airborne vehicles.[231] The NTIA reports that "[t]he potential interference between these incumbent military systems and DSRC stations was addressed to the satisfaction of the DoD . . . and resulted in the coordination zones"[232] found in Section 90.371(b) of our Rules. NTIA states that Section 90.371(b) strikes "a reasonable balance between establishing new services that will benefit the public and allow[ing] for the continued operation of Government radar systems to support national defense."[233] In this connection, the Commission adopted the coordination zones in Section 90.371(b) as a result of studies sponsored by DOT and performed by NTIA's Institute for Telecommunication Sciences in 1997.[234] At the time of the testing, DoD provided IRAC with a list of all existing and planned locations for Government radar in the 5.9 GHz band that would require coordination.[235] Because an American standard had not yet been developed, at the time of the testing, the Institute used the European and Japanese standard to perform all the testing and analysis.[236] DOT states that this analysis considered worst-case scenarios to ensure the degree of protection and flexibility described by DoD, but it did not examine mitigation techniques to reduce the coordination zones.[237] The electromagnetic compatibility (EMC) tests and analysis were the basis for developing the coordination zones established in Section 90.371(b).[238]

70. Given these changes since the 1997 study, DOT plans to conduct another study using the details of the ASTM-DSRC Standard that have been finalized to determine the

[230] *Id*. at 11.

[231] *Id.*

[232] NTIA Comments at 11-12.

[233] *Id*. at 4.

[234] *Id*. at 13. *See also* Institute for Telecommunications Sciences, National Telecommunications and Information Administration (NTIA), *Electromagnetic Compatibility Testing of a Dedicated Short-Range Communication System*, Report 98-352 (1998).

[235] NTIA Comments at 14.

[236] *Id.* at 13. These studies included electromagnetic compatibility (EMC) tests of DSRC equipment and . . . analysis of interference to DSRC receivers. To examine potential interference, the EMC testing used simulated radar signals that were coupled into the DSRC receiver considering both co-channel and off-channel radar operations. The radar signals were selected to represent the range of parameters used by both existing radars and possible future radar designs. As a result of the EMC testing, it was determined that improved DSRC system performance in the presence of interfering radar signals may be achieved through the use of shorter DSRC data packets and possibly through the use of forward error correction (FEC) into the DSRC coding scheme. Based on the EMC tests, an analysis was performed that considered other factors such as antenna coupling and separation distances, which could provide additional protection to DSRC receivers. *Id.*

[237] DOT Comments at 9.

[238] NTIA Comments at 13.

effectiveness of the current coordination zones listed in Section 90.371(b) of our Rules.[239] DOT reports that the new study, to be performed by DOT in cooperation with DoD, will examine the effectiveness that mitigation techniques, such as terrain shielding, directional antennas, and RF fencing could have on a case-by-case basis, as well as future radar pulse waves.[240]

71. According to NTIA, DoD has expressed the concern that, in light of the terrorist attacks of September 11, 2001, Government radars may be used to support homeland defense.[241] Because of the limited amount of spectrum available for future radar development, it is likely that these new radar systems will be developed for use in the 5.9 GHz band.[242] Moreover, NTIA relates that this expanded role of government radar may result in deployment of radars in areas other than the fifty-nine sites listed in Section 90.371(b) of our Rules.[243] NTIA notes that some of these sites could include cities and highways where DSRC equipment is expected to be used.[244] NTIA further relates that DoD is concerned that this expanded deployment of 5.9 GHz radars could increase the potential for interference with DSRC operations.[245]

72. NTIA recommends that the Commission wait until the conclusion of the new testing before adopting any additional provisions to prevent interference from future Government radar operations.[246] We agree and will follow the recommendation. Additionally, given that DoD may deploy radars in areas other than the fifty-nine sites listed in Section 90.371(b), we delegate authority to the Wireless Telecommunications Bureau to update this list.[247]

73. We will use the post-license registration process to implement the NTIA coordination requirement of Section 90.371(b). Specifically, ULS will be programmed to refer RSU registrations through NTIA that are within seventy-five kilometers of any of the existing Government radar sites listed in Section 90.371(b). In this connection, ULS will notify the licensee that the site is not registered pending NTIA coordination, which will be accomplished under the existing coordination process, *i.e.*, coordination with NTIA through IRAC.[248] While

[239] NTIA Comments at 15. As noted below, we will examine the results of the study before amending the coordination zones.

[240] DOT Comments at 9; NTIA Comments at 15.

[241] NTIA Comments at 14.

[242] *Id.*

[243] *Id.*

[244] *Id.*

[245] *Id.*

[246] *Id.* at 15.

[247] Once a Federal Government assignment is made it will be protected and the staff will update the ULS database, accordingly.

[248] We note that the filing date of the proposed RSU registration will serve as the licensee's date stamp relative to any "first-in-time" issues.

this process remains in effect, NTIA has informed us, it will, through the IRAC's Frequency Assignment Subcommittee, coordinate requests within fourteen working days of receipt.[249]

3. Fixed Satellite Service Uplinks-to-DSRC

74. *Background.* The 5.9 GHz band, is known in the satellite industry as the "extended C-band" and is used to provide uplinks for intercontinental FSS services and is adjacent to the more heavily used "C-band" FSS uplink spectrum at 5.925-6.425 GHz."[250] According to the Satellite Industry Association (SIA), the "extended C-band" and the "C-band" are among the principle frequency bands for the global FSS industry.[251] We note that the C-band is extensively used by the Fixed Service for point-to-point microwave, although we did not receive comment from any Fixed Service provider regarding DSRC operations.

75. NTIA's Institute for Telecommunications Services also studied the potential for interference from FSS uplink operations into DSRC operations in the 5.9 GHz band.[252] The Institute for Telecommunications Services found that there is a limited scope of potential co-channel interference to DSRC operations from FSS earth stations because they use highly directional antennas and the number of FSS earth stations is limited. The DOT concluded that there was a minor, but irreducible need for coordination between FSS earth stations and DSRC operations if they are within 2 miles of each other.[253]

76. The Commission did not adopt a coordination requirement between DSRC and FSS operations in the *Allocation Report and Order*, stating that it would most likely be unnecessary, but also stating that it would consider the matter in a future proceeding.[254] PanAmSat petitioned for reconsideration of this issue and suggested that without coordination procedures, widespread DSRC deployment could give rise to extensive areas where future FSS earth station would be excluded. PanAmSat also suggests that the level of DSRC deployment should account for the "noise floor" that is present from FSS uplinks.[255] We dismissed the Petition for Reconsideration in the *NPRM* as moot because the issues raised by PanAmSat would be addressed in this proceeding.[256] We then sought comment on whether prior coordination between DSRC operations and FSS uplinks is necessary.[257] The Commission further sought

[249] NTIA has further indicated that it will provide a website indicating the applications that it has received from the Commission, the date received, the date action is complete, and the status. NTIA will provide the location of that site via a public notice.

[250] Satellite Industry Association Reply Comments at 2-3.

[251] *Id*. at 3.

[252] DOT Comments at 8. *See also* Institute for Telecommunication Sciences, NTIA, *Measured Occupancy of 5850-5925 MHz and Adjacent 5-GHz Spectrum in the United States* (1999) (FSS Study).

[253] FSS Study at ix.

[254] *Allocation Report and Order,* 14 FCC Rcd at 18228 ¶ 15.

[255] PanAmSat Corporation, Petition for Reconsideration or Clarification at 2 (filed Dec. 27, 1999).

[256] *NPRM*, 17 FCC Rcd at 23139 ¶ 3.

[257] *Id.* at 23170 ¶ 57.

comment on whether, in light of incumbent and potential future FSS operations, the ASTM-DSRC Standard would provide robust and reliable DSRC operations.[258] We further asked whether DSRC equipment and operations should take into account the "noise floor" that is present from FSS uplink transmissions.[259] We were particularly interested in whether FSS uplink transmissions in the 5.9 GHz band would interfere with the DSRC Control Channel.[260] The commenters identify two interrelated issues: "noise floor" and "prior coordination. We will next address these issues.

77. *Discussion*. Regarding the first issue, PanAmSat and SIA maintain that we should establish a "noise floor" to ensure that DSRC equipment can withstand out-of-band emissions from FSS earth stations operating in the adjacent conventional C-band at 5.925-6.425 GHz.[261] In fact, SIA states that, through the Commission's FSS earth station operational rules[262] combined with minimum permissible earth station elevation angle, the Commission has established such a noise floor with respect to out-of-band emissions from conventional C-band earth stations.[263] ITS America emphasizes that in developing the ASTM-DSRC Standard, the Standards Writing Group considered and took steps to mitigate the potential from in-band and out-of-band emissions from the C-band satellite operations.[264] For instance, ITS America notes that the Standards Writing Group located the Control Channel in the middle of the band.[265] ITS America further notes that Channel 184, which will be used for high-powered DSRC operations (1000 meters or less) most frequently in cities, is located at the lower end of the C-band at 5915-5925 MHz, which should not result in interference because the existing satellite uplinks are located in areas away from population centers.[266] Moreover, ITS America asserts that out-of-band emissions from these FSS earth stations will likely be no greater than out-of-band emissions from the higher power operations in Channel 184.[267] We did not receive any comment from Fixed Service point-to-point microwave providers on this issue.

78. Regarding the second issue, "prior coordination," SIA contends that prior coordination is necessary between new DSRC operations and existing earth station teleports and new earth station teleports and existing DSRC operations.[268] Both ITS America and DOT contend that DOT's FSS Study showed that the potential for interference between FSS uplinks

[258] *Id.*

[259] *Id.*

[260] *Id.*

[261] PanAmSat Comments at 1; Satellite Industry Association Reply Comments at 5.

[262] The FSS earth station operational rules are 47 C.F.R. §§ 25.202(f), 25.209, 25.211, 25.212.

[263] SIA Reply Comments a 7.

[264] ITS America Reply Comments at 19.

[265] *Id.*

[266] *Id.*

[267] *Id.*

[268] Satellite Industry Association Reply Comments at 8-9.

and DSRC operations is minimal because the FSS uplinks in the C band use a very narrow emission footprint on the ground, and that interference can be avoided through the use of a frequency coordinator and the use of mitigation techniques, such as terrain shielding, directional antennas, and radio frequency fencing.[269] ITS America contends that licensees can locate RSUs outside any potential satellite uplink interference area.[270] SIA further recommends that we establish protection and coordination provisions modeled after Section 90.371(b) for FSS earth stations and DSRC stations.[271] Under such a provision, prior coordination would be necessary only in identified geographic regions.

79. In November 2003, ITS America and SIA reported that they are discussing the development of a sharing protocol between DSRC and FSS operations in the 5.9 GHz band.[272] The parties state that significant progress has been made in these discussions and they are hopeful that an agreement will be reached. In this connection, SIA avers that given the complexity of these issues and that industry discussions remain ongoing, the Commission should defer any decision on DSRC-FSS sharing until after the ongoing technical studies and industry discussions have been completed, and the parties have had an opportunity to present their conclusions.

80. We commend the efforts of ITS America and members of the satellite industry to resolve these issues. Because the record does not contain an analysis of the ASTM-DSRC Standard relative to FSS uplinks, and given the ongoing industry study and discussions, we agree that a decision on these issues would be premature. Accordingly, based on the record before us, we will not adopt rule changes at this juncture but will reserve the right to revisit this issue if necessary once the results of the industry study and discussions are known. Given the importance of safety/public safety applications in the DSRC, we urge the parties to conclude the technical study as quickly as possible to ensure that the ASTM-DSRC Standard will be able to provide robust and reliable DSRC operations near FSS uplink sites.[273]

E. General Application, Licensing, and Processing Rules

81. *Background*. In the *NPRM*, we proposed to apply the application, licensing, and processing rules set forth in Part 90, Subpart G and in Part 1, Subpart F of our Rules for public safety and for non-public safety licensees in the event that we selected a licensing framework that did not result in mutually exclusive applications.[274] We also sought comment on construction or coverage requirements, license terms, and renewal expectancy.[275]

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[269] ITS America Reply Comments at 19-20; DOT Comments at 9.

[270] ITS America Reply Comments at 19.

[271] Satellite Industry Association Reply Comments at 9.

[272] *See* Letter from Robert B. Kelly, Esq., counsel to ITS America, to Marlene H. Dortch, FCC (Nov. 14, 2003); Letter from Richard DalBello, President, SIA to Marlene H. Dortch, FCC (Nov. 19, 2003).

[273] We also observe that the post-license registration process that we are adopting may facilitate spectrum sharing.

[274] *NPRM*, 17 FCC Rcd at 23173 ¶ 63.

[275] *Id.* at 23173 ¶ 64.

82. *Discussion*. In light of the record of this proceeding and our decision to adopt a non-exclusive geographic area licensing scheme, we will apply the application, licensing, and processing rules set forth in Part 90, subpart G of the Commission's Rules[276] for both public safety and non-public safety applicants as we proposed. We believe that applying Part 90, Subpart G to both public safety and non-public safety applicants enables sharing of the band and is consistent with other services subject to Part 90. As discussed, *supra*, CMRS is not excluded from the definition of DSRC. Nonetheless, except for applications that specify interconnection with the public switched network, we adopt a presumption that DSRC is private mobile radio service (PMRS). Therefore, only applicants that elect interconnected common carrier status will be required to provide the information that CMRS applicants must submit in order to address the alien ownership restrictions under Section 310(b) of the Act.[277]

83. *Construction requirements*. ITS America recommends that we require both public safety and non-public safety RSUs to be placed in operation within twelve months from the date of license grant or the authorization cancels immediately.[278] We believe that the overarching purpose of our requirements in this setting, concerning construction, modification,[279] and discontinuance of RSUs is to maintain the integrity of the information in the relevant databases by correctly reflecting the actual record concerning these issues.[280] Therefore, we will adopt the 12-month construction requirement found in Section 90.155 of our Rules[281] and clarify that in this setting, each construction period will commence on the date that the Wireless Telecommunications Bureau posts an RSU registration on the database. However, we will not require licensees to file notifications of compliance for each RSU as is ordinarily required by Section 1.946(d) of the Commission's Rules. We will instead rely on licensees to withdraw unconstructed or discontinued RSUs from the registration database. We reserve the discretion to revisit this issue if our experience with DSRCS indicates that additional measures are necessary.

F. Canadian and Mexican Coordination

84. *Background*. In the *NPRM*, we noted that we do not have international agreements between, and among the United States, Mexico, and Canada concerning the 5.9 GHz band spectrum for ITS applications.[282] We further noted that although the agreement with the Canadian Government, "Agreement Concerning the Coordination and Use of Radio Frequencies Above Thirty Megacycles per Second," with Annex, as amended, applies to the 5.850-5.925

[276] 47 C.F.R. Part 90, subpart G.

[277] *See* 47 C.F.R. § 20.5 (Citizenship).

[278] July *Ex Parte* Comments at 66.

[279] *See* note 208 *supra*, concerning "modifications" to RSU registrations.

[280] In this setting, if the construction requirement is not met, although the licensee will not be barred from re-registering and constructing the RSU later, it will lose the original registration date for the purpose of resolving time-sensitive disputes between non-public safety RSU licensees. See para. 61, *supra*.

[281] 47 C.F.R. § 90.155.

[282] *NPRM*, 17 FCC Rcd at 23178 ¶ 74.

GHz band, no agreement is in place for the current ITS allocation.[283] As a consequence, we stated that licensees may be subject to future agreements with Canada and Mexico and therefore may be subject to further modification. We requested comment on whether to adopt certain interim requirements for terrestrial licenses along these borders, and to provide that licensees will be subject to the provisions contained within future agreements between and among the three countries. Until such time as agreements with Mexico and Canada become effective, we proposed to apply the same technical restrictions at the border that we adopt for operation between service areas, *i.e.* operations must not cause harmful interference across the borders.[284] Commenters on this issue noted the importance of spectrum harmonization across the borders.

85. *Discussion*. The record before us reflects that DSRCS operations in the 5.9 GHz band may be subject to future agreements with Canada and Mexico. As such, we could either prohibit DSRCS operations in border areas pending agreements or authorize DSRCS operations in border areas subject to modifications or future agreements. We conclude that the latter approach is appropriate because DSRCS operates at relatively low power levels that are unlikely to cause harmful interference to operations in Canada or Mexico. Moreover, the record before us reflects that Canada[285] has allocated the 5.9 GHz band for DSRC use and that Mexico[286] may allocate the 5.9 GHz band for DSRC use. Accordingly, we are adopting a rule that DSRCS operations in border areas (1) 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* 47 C.F.R. § 2.106) and (2) are issued conditionally, subject to modifications or future agreements with Canada or Mexico.

V. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Analysis

86. This *Report and Order* includes a Final Regulatory Flexibility Analysis at Appendix B.

B. Paperwork Reduction Analysis

87. This *Report and Order* contains either a new or modified information collection. As part of the Commission's continuing effort to reduce paperwork burdens, we invite the

[283] *NPRM*, 17 FCC Rcd at 23178-79 ¶ 74 *citing* Exchange of Notes at Ottawa, Canada, October 24, 1962. Entered into force October 24, 1962. *See* USA: T*reaties and Other International Acts Series* (TIAS) 5205; CAN: *Canada Treaty Series* (CTS) 1962 No. 15. *Agreement for Revision to Technical Annex to the Agreement of October 24, 1962* (TIAS 5205/CTS 1962 No. 15) Effected by Exchange of Notes at Ottawa, Canada, June 16 and 24, 1965. Entered into force June 24, 1965. USA: TIAS 5833/CAN: CTS 1962 No. 15, as amended June 24, 1965.

[284] *NPRM*, 17 FCC Rcd at 23179 ¶ 74.

[285] *See* ASTM-DSRC Standard at 9-10 § 8.8.3.3 and Table 8. *See also NPRM*, 17 FCC Rcd at 23178-79, n.333 citing July *Ex Parte* Comments at 17. (ITS America reported that Industry Canada was in the process of allocating the 5.855-5.925 GHz band for DSRC applications and that "Spectrum Management, Radio Standard Specification, Location and Monitoring Service," a proposed nationwide Canadian standard, would likely be adopted and include the same channelization plan as specified in the ASTM-DSRC Standard.)

[286] *See e.g.*, note 103, *supra* and accompanying text.

general public and the Office of Management and Budget (OMB) to take this opportunity to comment on revision to the information collections contained in the *Report and Order* as required by the Paperwork Reduction Act of 1995.[287] Public and agency comments are due ***[60 days after date of publication in the Federal Register]***. Comments should address:

- Whether the proposed collection of information is necessary for the proper performance of the functions of the Commission, including whether the information shall have practical utility.
- The accuracy of the Commission's burden estimates.
- Ways to enhance the quality, utility, and clarity of the information collected.
- Ways to minimize the burden of the collection of information on the respondents, including the use of automated collection techniques or other forms of information technology.

Written comments by the public on the new or modified information collections are due ***[60 days from date of publication in the Federal Register.]*** Written comments must be submitted by the public, Office of Management and Budget (OMB), and other interested parties on the new and/or modified information collections on or before ***[60 days from date of publication in the Federal Register.]*** In addition to filing comments with the Secretary, a copy of any Paperwork Reduction Act comments on the information collection(s) contained herein should be submitted to Judith B. Herman, Federal Communications Commission, Room 1-C804, 445 12th Street, SW, Washington, DC 20554, or via the Internet to Judith-B.Herman@fcc.gov and to Kim A. Johnson, OMB Desk Officer, Room 10236 NEOB, 725 17th Street, N.W., Washington, DC 20503 via the Internet to Kim_A._Johnson@omb.eop.gov or by fax to 202-395-5167.

C. Further Information

88. For further information concerning the *Report and Order,* contact Nancy M. Zaczek regarding legal maters, and/or Gerardo Mejia regarding engineering matters via phone at (202) 418-0680, via TTY (202) 1418-7233, via e-mail at Nancy.Zaczek@fcc.gov; Gerardo.Mejia@fcc.gov, respectively, or via regular mail at Federal Communications Commission, Wireless Telecommunications Bureau, 445 12th Street, SW, Washington, D.C. 20554.

89. Alternative formats (computer diskette, large print, audio cassette, and Braille) are available to persons with disabilities by contacting Brian Millin at (202) 418-7426, TTY (202) 418-7365, or via e-mail to bmillin@fcc.gov. This *Report and Order* can be downloaded at http://wireless.fcc.gov/releases.html#orders.

[287] *See* Pub. L. No. 104-13.

VI. ORDERING CLAUSES

90. ACCORDINGLY, IT IS ORDERED that, pursuant to Sections 1, 4(i), 302, 303(f) and (r), and 332 of the Communications Act of 1934, as amended, 47 U.S.C. 1, 154(i), 302, 303(f) and (r), and 332, this *Report and Order* is ADOPTED.

91. IT IS FURTHER ORDERED that Parts 0, 1, 2, 90, and 95 of the Commission's Rules ARE AMENDED as specified in Appendix A, effective sixty days after publication in the Federal Register. Information collection contained in these rules will be effective upon OMB approval.

92. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this REPORT AND ORDER, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the U.S. Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A: FINAL RULES

Parts 0, 1, 2, 90, and 95 of Title 47 of the Code of Federal Regulations are amended as follows:

I. PART 0 – COMMISSION ORGANIZATION

1. The authority citation for part 0 continues to read as follows:

AUTHORITY: Sec. 5, 48 Stat. 1068, as amended; 47 U.S.C. 155, 225, unless otherwise noted.

2. Section 0.331 is amended as follows:

§ 0.331 Authority delegated.

* * * * *

(d) *Authority concerning rulemaking proceedings.* The Chief, Wireless Telecommunications Bureau shall not have the authority to act upon notices of proposed rulemaking and inquiry, final orders in rulemaking proceedings and inquiry proceedings, and reports arising from any of the foregoing except such orders involving ministerial conforming amendments to rule parts, or orders conforming any of the applicable rules to formally adopted international conventions or agreements where novel questions of fact, law, or policy are not involved. In addition, revisions to the airport terminal use list in § 90.35(c)(61) of this chapter and revisions to the Government Radiolocation list in § 90.371(b) of this chapter need not be referred to the Commission. Also, the addition of new Marine VHF frequency coordination committee(s) to § 80.514 of this chapter need not be referred to the Commission if they do not involve novel questions of fact, policy or law, as well as requests by the United States Coast Guard to:

* * * * *

II. PART 1 – PRACTICE AND PROCEDURE

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

AUTHORITY: 47 U.S.C. 47 U.S.C. 151, 154(i), 154(j), 155, 225, 303(r), 309 and 325(e).

2. Paragraph (d) of section 1.946 is amended by adding the following sentence at the end of paragraph (d) as follows:

§ 1.946 Construction and coverage requirements.

* * * * *

(d) * * * This notification requirement is not applicable to authorizations subject to post-license registration requirements under the Dedicated Short-Range Communication Service (DSRCS), subpart M of part 90 of this chapter.

* * * * *

III. PART 2 – FREQUENCY ALLOCATIONS AND RADIO MATTERS; GENERAL RULES AND REGULATIONS

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

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

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

§ 2.106 Table of Frequency Allocations

* * * * *

5650-7250 MHz (SHF)					Page 57
International Table			United States Table		FCC Rule Part(s)
Region 1	Region 2	Region 3	Federal Government	Non-Federal Government	
5850 – 5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE S5.150	5850 – 5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Amateur Radiolocation S5.150	5850 – 5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation S5.150	5650-5925 RADIOLOCATION G2 S5.150 US245	5850 – 5925 FIXED-SATELLITE (Earth-to-space) US245 MOBILE NG160 Amateur S5.150	 ISM Equipment (18) Private Land Mobile (90) Personal Radio Services (95) Amateur (97)

* * * * *

IV. PART 90 – PRIVATE LAND MOBILE RADIO SERVICES

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

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

2. Section 90.7 is amended by revising the definition of "Dedicated Short Range Communications Services" and adding the definitions of "Communications Zone," "On-Board Unit (OBU)," "Roadside Unit (RSU)," and "Roadway bed surface", as follows:

* * * * *

Dedicated Short-Range Communications Services (DSRCS). 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 the improvement of traffic flow, traffic safety, and other intelligent transportation service applications in a variety of environments. DSRCS systems may also transmit status and instructional messages related to the units involved.

* * * * *

Communications Zone. The service area associated with an individual fixed Roadside Unit (RSU). The communications zone is determined based on the RSU equipment class specified in section 90.375 of this part.

* * * * *

On-Board Unit (OBU). An On-Board Unit is a DSRCS transceiver 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 contend for time to 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 are also licensed by rule under part 95 of this chapter. OBU operations in the Unlicensed National Information Infrastructure (UNII) Bands follow the rules in those bands.

* * * * *

Roadside Unit (RSU). A Roadside Unit is a DSRC transceiver 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. A RSU broadcasts data to OBUs or exchanges data with OBUs in its communications zone. An RSU also provides channel assignments and operating instructions to OBUs in its communications zone, when required.

Roadway bed surface. For DSRCS, the road surface at ground level.

* * * * *

3. Section 90.20 is amended by inserting the following in the table at paragraph (c)(3) before the entry referencing the 10,550 to 10,680 band, and adding a new paragraph (d)(86) to read as follows:

§ 90.20 Public Safety Pool.

* * * * *

(c) * * * * *

(3) *Frequencies.* * * *

PUBLIC SAFETY POOL FREQUENCY TABLE

Frequency or band	Class of station(s)	Limitations	Coordinator
* * * * *	* * * * *	* * * * *	* * * * *
5850-5925	Base or mobile	86.	Not applicable
* * * * *	* * * * *	* * * * *	* * * * *

* * * * *

(d) * * * * *

(86) Subpart M of this part contains rules for assignment of frequencies in the 5850-5925 MHz band.

4. Section 90.35 is amended by inserting the following in the table at paragraph (b)(3) before the entry referencing the 10,550 to 10,680 band, and adding a new paragraph (c)(90) to read as follows:

§ 90.35 Industrial/Business Pool.

* * * * *

(b) * * * * *

(3) *Frequencies.* * * *

INDUSTRIAL/BUSINESS POOL FREQUENCY TABLE

Frequency or band	Class of station(s)	Limitations	Coordinator
* * * * *	* * * * *	* * * * *	* * * * *
5850-5925	.....do.....	90.	Not applicable

* * * * *	* * * * *	* * * * *	* * * * *

(c) * * * * *

(90) Subpart M of this part contains rules for assignment of frequencies in the 5850-5925 MHz band.

5. Section 90.149 is amended by adding a new paragraph (b) to read as follows:

§ 90.149 License term.

* * * * *

(b) Non-exclusive geographic area licenses for DSRCS Roadside Units (RSUs) in the 5850-5925 MHz band 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 of this part) will not change the overall renewal period of the single license.

* * * * *

6. Section 90.155 is amended by adding a new paragraph (i) to read as follows:

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

* * * * *

(i) DSRCS Roadside Units (RSUs) in the 5850-5925 MHz band must be placed in operation within 12 months from the date of registration (see § 90.375 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.

* * * * *

7. Section 90.157 is amended as follows:

§ 90.157 Discontinuance of station operation.

(a) A station license shall cancel automatically upon permanent discontinuance of operations. Unless stated otherwise in this part or in a station authorization, for the purposes of this section, any station which has not operated for one year or more is considered to have been permanently discontinued.

(b) For DSRCS Roadside Units (RSUs) in the 5850-5925 MHz band, it is the DSRCS licensee's responsibility to delete from the registration database any RSUs that have been discontinued.

* * * * *

8. Section 90.175(j) is amended by adding a new subparagraph (17) to read as follows:

§ 90.175 Frequency coordination requirements.

* * * * *

(j) The following applications need not be accompanied by evidence of frequency coordination:

* * * * *

(17) Applications for DSRCS licenses (as well as registrations for Roadside Units) in the 5850-5925 GHz band.

* * * * *

9. Section 90.179 is amended 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 DSRCS licensees. See subparts M, P, and S of this part.

* * * * *

10. Section 90.205 is amended by revising paragraph (p) to read as follows:

§ 90.205 Power and antenna height limits.

* * * * *

(p) *5850-5925 MHz*. Power and height limitations are specified in subpart M of this part.

* * * * *

11. Section 90.210 is amended by revising the entry for "5850-5925 MHz" and adding footnote 4 in the table that follows the introductory paragraph, and by revising paragraphs (k)(3) and (k)(4) to read as follows:

§ 90.210 Emission masks.

* * * * *

Applicable Emission Masks

Frequency band (MHz)	Mask for equipment with Audio low pass filter	Mask for equipment without audio low pass filter

* * *

5850-5925 \4\ ..... - - - - - -

\4\ DSRCS Roadside Units equipment in the 5850-5925 MHz band is governed under subpart M of this part.

* * * * *

(k) * * *

(3) *Other transmitters.* For all other transmitters authorized under subpart M that operate in the 902-928 MHz band, the peak power of any emission shall be attenuated below the power of the highest emission contained within the licensee's sub-band in accordance with the following schedule:

* * * * *

(4) In the 902-928 MHz band, the resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that, in regard to paragraph (2) of this section, a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies with 1 MHz of the edge of the authorized subband. The video filter bandwidth shall not be less than the resolution bandwidth.

* * * * *

12. Section 90.213 is amended by revising footnote 10 to read as follows:

§ 90.213 Frequency stability.

* * * * *

\10\ Except for DSRCS equipment in the 5850-5925 MHz band, frequency stability is to be specified in the station authorization. Frequency stability for DSRCS equipment in the 5850-5925 MHz band is specified in subpart M of this part.

* * * * *

13. Subpart M, is amended by inserting the following heading before Section 90.371 to read as follows:

* * * * *

REGULATIONS GOVERNING THE LICENSING AND USE OF FREQUENCIES IN THE 5850-5925 MHz BAND FOR DEDICATED SHORT-RANGE COMMUNICATIONS SERVICE (DSRCS)

* * * * *

14. Section 90.371 is amended by revising paragraphs (a) and (b) to read as follows:

§ 90.371 Dedicated short-range communications service (DSRCS).

(a) These provisions pertain to systems in the 5850-5925 MHz band for Dedicated Short-Range Communications Service (DSRCS). DSRCS systems use 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 the improvement of traffic flow, traffic safety, and other intelligent transportation service applications in a variety of environments. DSRCS systems may also transmit status and instructional messages related to the units involved. DSRCS Roadside Units are authorized under this part. DSRCS On-Board Units are authorized under part 95 of this chapter.

(b) DSRCS Roadside Units (RSUs) operating in the band 5850-5925 MHz shall not receive protection from Government Radiolocation services in operation prior to the establishment of the DSRCS station. Operation of DSRCS RSU stations within 75 kilometers of the locations listed in the table below must be coordinated through the National Telecommunications and Information Administration.

* * * * *

(c) NTIA may authorize additional Government Radiolocation services. Once a new Federal assignment is made, the Commission's Universal Licensing System database will be updated, accordingly, to protect the new Federal assignment and the list in paragraph(b) of this section will be updated as soon as practicable.

15. Add § 90.373 to read as follows:

§ 90.373 Eligibility in the DSRCS.

The following entities are eligible to hold an authorization to operate Roadside units in the DSRCS:

(a) Any territory, possession, state, city, county, town or similar governmental entity.

(b) Any entity meeting the eligibility requirements of §§ 90.33 or 90.35 of this part.

16. Add § 90.375 to read as follows:

§ 90.375 RSU license areas, communication zones and registrations

(a) DSRCS Roadside Units (RSUs) in the 5850-5925 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 all non-reserved DSRCS frequencies (see § 90.377 of this part). Such licenses serve as a prerequisite of registering individual RSUs located within the licensed geographic area described in paragraph (a). 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 § 90.371(b) of this part) may not begin operation until NTIA approval is received. Registrations are not effective until the Commission posts them on the ULS.

(c) Licensees must operate each RSU in accordance with the Commission's Rules and the registration data posted on the ULS for such RSU. Licensees must register each RSU for the smallest communication zone needed (for the DSRC-based intelligent transportation systems application) using one of the following four communication zones:

RSU Class	Max. Output Power (dBm) [1]	Communications Zone
A	0	15 meters
B	10	100 meters
C	20	400 meters
D	28.8	1000 meters

\1\ The ASTM-DSRC Standard (see § 90.379) limits output power to 28.8 dBm but allows more power to overcome cable losses to the antenna as long as the antenna input power does not exceed 28.8 dBm and the EIRP does not exceed 44.8 dBm. However, specific channels and categories of uses have additional limitations under the ASTM-DSRC Standard.

17. Add § 90.377 to read as follows:

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

(a) Licensees shall transmit only the power (EIRP) needed to communicate with an OBU within the communications zone and must take steps to limit the Roadside Unit (RSU) signal within the zone to the maximum extent practicable.

(b) Frequencies available for assignment to eligible applicants within the 5850-5925 MHz band for RSUs and the maximum EIRP permitted for an RSU with an antenna height not exceeding 6 meters above the roadway bed surface are specified in the table below. Where two EIRP limits are given, the higher limit is permitted only for state or local governmental entities.

Channel No.	Frequency Range (MHz)	Max. EIRP[1] (dBm)	Channel Use
170	5850-5855		Reserved
172	5855-5865	33	Service Channel
174	5865-5875	33	Service Channel
175	5865-5885	23	Service Channel[2]
176	5875-5885	33	Service Channel
178	5885-5895	33 / 44.8	Control channel
180	5895-5905	23	Service Channel
181	5895-5915	23	Service Channel[2]
182	5905-5915	23	Service Channel
184	5915-5925	33 / 40	Service Channel

\1\ An RSU may employ an antenna with a height exceeding 6 meters but not exceeding 15 meters provided the EIRP specified in the table above is reduced by a factor of 20 log(Ht/6) 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\ Channel Nos. 174/176 may be combined to create a twenty megahertz channel, designated Channel No. 175. Channels 180/182 may be combined to create a twenty-megahertz
channel, designated Channel No. 181.

(c) Except as provided in paragraphs (d) and (e), non-reserve DSRCS 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. Licensees of RSUs suffering or causing harmful interference within a communications zone 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. Further 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; the use of any 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.

(d) *Safety/public safety priority*. The following access priority governs all DSRCS operations:

(1) communications involving the safety of life have access priority over all other DSRCS communications;

(2) subject to a Control Channel priority system management strategy (see ASTM E2213-03 DSRC Standard at § 4.1.1.2(4)) DSRCS communications involving public safety have access priority over all other DSRC communications not listed in paragraph (d)(1). Roadside Units (RSUs) operated by state or local governmental entities are presumptively engaged in public safety priority communications.

(e) *Non-priority communications*. DSRCS communications not listed in paragraph (d) are non-priority communications. 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 § 90.375 of this part) and the later registered RSU must modify its operations to resolve the dispute in accordance with paragraph (f).

(f) Except as otherwise provided in the ASTM-DSRC Standard (see § 90.379 of this part) for the purposes of paragraph (e) 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 (anywhere within the earlier-registered RSU's communication zone) 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.

18. Add § 90.379 to read as follows:

§ 90.379 ASTM E2213-03 DSRC Standard (ASTM-DSRC Standard).

Roadside Units operating in the 5850-5925 MHz band shall comply with the following technical standards, which are incorporated by reference: American Society for Testing and Materials (ASTM) E2213-03, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications published September 2003 (ASTM E2213-03 DSRC Standard). The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 C.F.R. part 51. Copies may be inspected at the Federal Communications Commission, 445 12th Street, SW, Washington, DC 20554 or at the Office of the Federal Register, 800 N. Capitol Street, NW, Washington, DC. Copies of the ASTM E2213-03 DSRC Standard can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. Copies may also be obtained from ASTM via the Internet at http://www.astm.org.

19. Add Section 90.383 to read as follows:

§ 90.383 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 5850-5925 MHz band for DSRCS, 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 DSRCS Roadside Units is subject to modifications and future agreements between the United States and Canada or the United States and Mexico, as applicable.

20. Section 90.425(d) is amended by adding a new paragraph (10) to read as follows:

§ 90.425 Station identification.

* * * * *

(d) * * *

(10) It is a Roadside Unit in a DSRCS system.

* * * * *

V. PART 95 – PERSONAL RADIO SERVICES

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

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

2. Section 95.401 is amended by adding a new paragraph (g) to read as follows:

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

* * * * *

(g) Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs). The rules for this service are contained in subpart L of this part. DSRCS-OBUs may communicate with DSRCS Roadside Units (RSUs), which are authorized under part 90 of this chapter. DSRCS, RSU, and OBU are defined in § 90.7 of this chapter.

* * * * *

3. Section 95.601 is amended to read as follows:

§ 95.601 Basis and purpose.

This section provides the technical standards to which each *transmitter* (apparatus that converts electrical energy received from a source into RF (radio frequency) energy capable of being radiated) used or intended to be used in a station authorized in any of the Personal Radio Services must comply. This section also provides requirements for obtaining certification for such transmitters. The Personal Radio Services are the GMRS (General Mobile Radio Service) -

- subpart A, the Family Radio Service (FRS) -- subpart B, the R/C (Radio Control Radio Service) -- subpart C, the CB (Citizens Band Radio Service) -- subpart D, the Low Power Radio Service (LPRS) -- subpart G, the Wireless Medical Telemetry Service (WMTS) -- subpart H, the Medical Implants Communication Service (MICS) -- subpart I, the Multi-Use Radio Service (MURS) -- subpart J, and Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs) – subpart L.

4. Section 95.603 is amended by adding a new paragraph (h) to read as follows:

§ 95.603 Certification required.

* * * * *

(h) Each Dedicated Short-Range Communications Service On-Board Unit (DSRCS-OBU) that operates or is intended to operate in the DSRCS (5.850-5.925 GHz) must be certified in accordance with subpart L of this part and subpart J of part 2 of this chapter.

5. Section 95.605 is amended to read as follows:

§ 95.605 Certification procedures.

Any entity may request certification for its transmitter when the transmitter is used in the GMRS, FRS, R/C, CB, IVDS, LPRS, MURS, or MICS following the procedures in part 2 of this chapter. Medical implant transmitters shall be tested for emissions and EIRP limit compliance while enclosed in a medium that simulates human body tissue in accordance with the procedures in § 95.639(g). Frequency stability testing for MICS transmitters shall be performed over the temperature range set forth in § 95.628. Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs) must be certified in accordance with subpart L of this part and subpart J of part 2 of this chapter.

6. Section 95.631 is amended by adding a new paragraph (k) to read as follows:

§ 95.631 Emission types.

* * * * *

(k) DSRCS-OBUs are governed under subpart L of this part.

7. Section 95.633 is amended by adding a new paragraph (g) to read as follows:

§95.633 Emission bandwidth.

* * * * *

(g) DSRCS-OBUs are governed under subpart L of this part.

8. Section 95.635 is amended by adding a DSRC-OBU designation to the Table and a new paragraph (f) to read as follows:

§ 95.635 Unwanted radiation.

(a) * * *

(b) * * *

Transmitter	Emission type	Applicable paragraphs (b)
* * * * *	* * * * *	* * * * *
DSRCS-OBU	As specified in paragraph (f)	

* * * * *

(f) DSRCS-OBUs are governed under subpart L of this part.

9. Section 95.637 is amended by adding a new paragraph (f) to read as follows:

§ 95.637 Modulation standards.

* * * * *

(f) DSRCS-OBUs are governed under subpart L of this part.

10. Section 95.639 is amended by adding a new paragraph (i) to read as follows:

§ 95.639 Maximum transmitter power.

* * * * *

(i) DSRCS-OBUs are governed under subpart L of this part, except the maximum output power for portable DSRCS-OBUs is 1.0 mW. For purposes of this paragraph, a portable 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.

11. Add Section 95.643 below the existing heading "CERTIFICATION REQUIREMENTS" to read as follows:

§ 95.643 DSRCS-OBU certification.

Sections 95.645 through 95.655 do not apply to certification of DSRCS-OBUs. DSRCS-OBUs must be certified in accordance with subpart L of this part and subpart J of part 2 of this chapter.

12. Part 95 is amended by adding a new Subpart L to read as follows:

Subpart L –Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs)

§ 95.1501 Scope.

This subpart sets out the regulations governing Dedicated Short-Range Communications Service On-Board Units (DSRCS-OBUs) in the 5850-5925 MHz band. DSRCS Roadside Units (RSUs) are authorized under part 90 of this chapter and DSRCS, RSU, and OBU are defined in § 90.7 of this chapter.

§ 95.1503 Eligibility.

All entities for which the Commission has licensing authority are authorized by rule to operate an FCC certified On-Board Unit in accordance with the rules contained in this subpart. No individual FCC license will be issued. (The FCC does not have authority to license foreign governments or their representatives, nor stations belonging to and operated by the United States Government.)

§ 95.1505 Authorized locations.

Operation of DSRCS On-Board Units is authorized anywhere CB station operation is permitted under § 95.405.

§ 95.1507 Station Identification.

A DSRCS On-Board Unit is not required to transmit an FCC station identification announcement.

§ 95.1509 ASTM E2213-03 DSRC Standard.

On-Board Units operating in the 5850-5925 MHz band shall comply with the following technical standards, which are incorporated by reference: American Society for Testing and Materials (ASTM) E2213-03, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications published September 2003 (ASTM E2213-03 DSRC Standard). The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 C.F.R. part 51. Copies may be inspected at the Federal Communications Commission, 445 12th Street, SW, Washington, DC 20554 or at the Office of the Federal Register, 800 N. Capitol Street, NW, Washington, DC. Copies of the ASTM E2213-03 DSRC Standard can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. Copies may also be obtained from ASTM via the Internet at http://www.astm.org.

§ 95.1511 Frequencies available.

(a) The following table indicates the channel designations of frequencies available for assignment to eligible applicants within the 5850-5925 MHz band for On-Board Units (OBUs):[1]

Channel No.	Channel Use	Frequency Range (MHz)
170	Reserved	5850-5855
172	Service Channel	5855-5865
174	Service Channel	5865-5875
175	Service Channel [2]	5865-5885
176	Service Channel	5875-5885
178	Control channel	5885-5895
180	Service Channel	5895-5905
181	Service Channel [2]	5895-5915
182	Service Channel	5905-5915
184	Service Channel	5915-5925

\1\ The maximum output power for portable DSRCS-OBUs is 1.0 mW. See § 95.639(i).

\2\ Channel Nos. 174/176 may be combined to create a twenty megahertz channel, designated Channel No. 175. Channels 180/182 may be combined to create a twenty-megahertz
channel, designated Channel No. 181.

(b) Except as provided in paragraph (c), non-reserve DSRCS 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. Licensees suffering or causing harmful interference within a communications zone 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. Further 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; the use of any 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.

(c) *Safety/public safety priority*. The following access priority governs all DSRCS operations:

(1) communications involving the safety of life have access priority over all other DSRCS communications;

(2) subject to a Control Channel priority system management strategy (see ASTM E2213-03 DSRC Standard at § 4.1.1.2(4)) DSRCS communications involving public safety have access priority over all other DSRC communications not listed in paragraph (c)(1). On-Board Units (OBUs) operated by state or local governmental entities are presumptively engaged in public safety priority communications.

(d) *Non-priority communications*. DSRCS communications not listed in paragraph (c) are non-priority communications. If a dispute arises concerning non-priority DSRCS-OBU communications with Roadside Units (RSUs), the provisions of §§ 90.377(e) and (f) of this chapter will apply. Disputes concerning non-priority DSRCS-OBU communications not associated with RSUs are governed by paragraph (b) of this section.

APPENDIX B

FINAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act (RFA),[1] an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Notice of Proposed Rule Making* (*NPRM*).[2] The Commission sought written public comment on the proposals in the *NPRM*, including comment on the IRFA. No comments were submitted specifically in response to the IRFA; we nonetheless discuss certain general comments below. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.[3]

Need for, and Objectives of, the Proposed Rules

In this *Report and Order*, we adopt licensing, service, and operating rules for the 5.850-5.925 GHz band for use by Dedicated Short Range Communications (DSRC) Services in the provision of Intelligent Transportation Systems (ITS) services. DSRC communications are used for the wireless transfer of data over short distances between roadside and mobile units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety, and other intelligent transportation service applications in a variety of environments. This action is taken in response to the Transportation Equity Act for the 21st Century,[4] which requires the Commission, in consultation with the Secretary of the United States Department of Transportation (DOT), to consider the spectrum needs for DSRC. This action will assist DOT's goal of using advanced electronics and technology to increase the safety and efficiency of the nation's surface transportation system.

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

No comments were submitted specifically in response to the IRFA. Generally, the comments supported permitting both public safety and non-public safety uses in the 5.9 GHz band, with non-public safety uses secondary. Commenters supported the adoption of the ASTM-DSRC Standard into the Commission's Rules. They further supported site-based licensing, frequency coordination, and the use of the Universal Licensing System.

---

[1] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. §§ 601-612, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-121, 110 Stat. 847 (1996) (CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

[2] Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band), *Notice of Proposed Rulemaking*, WT Docket No. 01-90, 17 FCC Rcd 23136, 23185 (Appendix A) (2002).

[3] *See* 5 U.S.C. § 604. We note that we could also certify this action under the RFA, see 5 U.S.C. § 605.

[4] Transportation Equity Act for the 21st Century, Pub. L. 105-178, 112 Stat. 107 (1998) (TEA-21).

Description and Estimate of the Number of Small Entities To Which the Proposed Rules Will Apply

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.[5] The RFA defines 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 which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).[8] A small organization is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[9] Nationwide, as of 1992, there were approximately 275,801 small organizations.[10] The term "small governmental jurisdiction" is defined as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."[11] As of 1997, there were about 87,453 governmental jurisdictions in the United States.[12] This number includes 39,044 county governments, municipalities, and townships, of which 37,546 (approximately 96.2%) have populations of fewer than 50,000, and of which 1,498 have populations of 50,000 or more. Thus we estimate the number of small governmental jurisdictions overall to be 84,098 or fewer.

The rules we adopt today will affect users of public safety radio services. These rules may also affect manufacturers of radio communications equipment. An analysis of the number of small businesses that may be affected follows. We also note that nationwide, there are approximately 22.4 million small businesses, total, according to the SBA data.13

[5] 5 U.S.C. § 603(b)(3).

[6] 5 U.S.C. § 601(6).

[7] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small business concern" in 15 U.S.C. 632). Pursuant to the RFA, 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." 5 U.S.C. § 601(3).

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

[9] 5 U.S.C. § 601(4).

[10] 1992 Economic Census, U.S. Bureau of the Census, Table 6 (special tabulation of data under contract to Office of Advocacy of the U.S. Small Business Administration).

[11] 5 U.S.C. 601(5).

[12] U.S. Census Bureau, Statistical Abstract of the United States: 2000, Section 9, pages 299-300, Tables 490 and 492.

[13] See SBA, *Programs and Services*, SBA Pamphlet no. CO-0028, at page 40 (July 2002).

Small Businesses Sharing Spectrum with Public Safety Radio Services and Governmental Entities. As a general matter, Public Safety Radio Services include police, fire, local government, forestry conservation, highway maintenance, and emergency medical services.[14] Private entities that using DSRC-based ITS applications may be licensed in the 5.9 GHz band on a secondary basis to public safety radio services.

Wireless Service Providers. The SBA has developed a small business size standard for wireless small businesses within the two separate categories of Paging15 and Cellular and Other Wireless Telecommunications. 16 Under both SBA categories, a wireless business is small if it has 1,500 or fewer employees. According to the Commission's most recent data,17 1,761 companies reported that they were engaged in the provision of wireless service. Of these 1,761 companies, an estimated 1,175 have 1,500 or fewer employees and 586 have more than 1,500 employees.18 Consequently, the Commission estimates that most wireless service providers are small entities that may be affected by the rules and policies adopted herein.

The Commission has not developed a definition of small entities specifically applicable to Dedicated Short-Range Communications Manufacturers (DSRC Manufacturers). However, the SBA has established a small business size standard for Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. Under this standard, firms are considered small if they have 750 or fewer employees.[19] Census data for 1997 indicate that, for that year, there were a total of 1,215 establishments[20] in this category.[21] Of those, there

[14] *See* Subparts A and B of Part 90 of the Commission's Rules, 47 C.F.R. §§ 90.1-90.22. Police licensees include 26,608 licensees that serve state, county, and municipal enforcement through telephony (voice), telegraphy (code), and teletype and facsimile (printed material). Fire licensees include 22,677 licensees comprised of private volunteer or professional fire companies, as well as units under governmental control. Public Safety Radio Pool licensees also include 40,512 licensees that are state, county, or municipal entities that use radio for official purposes. There are also 7,325 forestry service licensees comprised of licensees from state departments of conservation and private forest organizations that set up communications networks among fire lookout towers and ground crews. The 9,480 state and local governments are highway maintenance licensees that provide emergency and routine communications to aid other public safety services to keep main roads safe for vehicular traffic. Emergency medical licensees (1,460) use these channels for emergency medical service communications related to the delivery of emergency medical treatment. Another 19,478 licensees include medical services, rescue organizations, veterinarians, handicapped persons, disaster relief organizations, school buses, beach patrols, establishments in isolated areas, communications standby facilities, and emergency repair of public communications facilities.

[15] 13 C.F.R. § 121.201, North American Industry Classification System (NAICS) code 513321 (changed to 517211 in October 2002).

[16] 13 C.F.R. § 121.201, North American Industry Classification System (NAICS) code 513322 (changed to 517212 in October 2002).

[17] FCC, Wireline Competition Bureau, Industry Analysis and Technology Division, Trends in Telephone Service, Table 5.3, (May 2002).

[18] *Id*.

[19] 13 C.F.R. § 121.201, NAICS code 334220.

[20] The number of "establishments" is a less helpful indicator of small business prevalence in this context than would be the number of "firms" or "companies," because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a (continued….)

were 1150 that had employment under 500, and an additional 37 that had employment of 500 to 999. The percentage of wireless equipment manufacturers to total manufacturers in this category is approximately 61.35%,[22] so we estimate that the number of wireless equipment manufacturers with employment under 500 was actually closer to 706, with an additional 23 establishments having employment of between 500 and 999. Given the above, we estimate that the majority of wireless communications equipment manufacturers are small.

Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

Applicants for licenses to provide DSRC operations in the 5.9 GHz band those licensees must submit license applications through the Universal Licensing System using Form 601, and follow the service rules at 47 C.F.R. Part 90.[23] These licenses are not subject to spectrum auctions although, they will be subject to licensing and regulatory fees.

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

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its determinations, which may include the following four alternatives, among others: (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.[24]

Regarding our decision to permit open eligibility for licensing in the 5.9 GHz, *see* paras. 50-51, *supra*, we do not believe that there will be any significant effect on small entities. Any interested and qualified entity may apply for a license.

Regarding our decision to use non-exclusive geographic area licensing, *see* paras. 57-59, *supra*, we do not believe that there will be any significant adverse effect on small entities. We believe that this licensing approach will actually benefit small entities by enabling them to obtain licenses to provide a DSRC service. We further believe this decision benefits small entities by eliminating the costs associated with frequency coordination. Because of the short

(Continued from previous page)
different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the census breaks-out data for firms or companies only to give the total number of such entities for 1997, which was 1,089.

[21] U.S. Census Bureau, 1997 Economic Census, Industry Series: Manufacturing, "Industry Statistics by Employment Size," Table 4, NAICS code 334220 (issued Aug. 1999).

[22] *Id*. Table 5, "Industry Statistics by Industry and Primary Product Class Specialization: 1997."

[23] *See* 47 C.F.R. § 1.913(a)(1).

[24] *See* 5 U.S.C. § 603(c).

range of this service (less than 1000 meters), resulting in relatively lower costs, we believe that small entities will be attracted to this service.

Regarding our decision to require the use of the ASTM-DSRC Standard, *see* paras. 18-22, *supra*, we do not believe that there will be any adverse effect on small entities. We believe that this decision will benefit small entities. We required the ASTM-DSRC Standard for all DSRC operations in the 5.9 GHz band, which we anticipate will, in turn, reduce the cost of the DSRC devices.

Report to Congress

The Commission will send a copy of this *Report and Order*, including this FRFA, in a report to be sent to Congress pursuant to the Congressional Review Act.[25] In addition, the Commission will send a copy of this *Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of this *Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register.[26]

[25] *See generally,* 5 U.S.C. § 801 (a)(1)(A).

[26] *See* 5 U.S.C. § 604(b).

APPENDIX C

List of DSRC-based ITS Applications
(Eight User Service Bundles Identified by the National Architecture)

The eight safety related service bundles identified by the National Architecture are as follows:

Travel and Traffic Management, comprised of

- Probe Data Collection
- Traffic Information

Maintenance Construction Operations, comprised of

- In-Vehicle Signing
  - Work Zone Warning
  - Highway/Rail Intersection Warning
  - Road Condition Warning

Public Transit Management, comprised of

- Transit Vehicle Data Transfer (gate and yard)
- Transit Vehicle Signal Priority

Electronic Payment, comprised of

- Toll Collection
- Gas Payment
- Drive-Thru Payment
- Rental Car Processing
- Parking Lot Payment

Commercial Vehicle Operations (CVO), comprised of

- Main Screening
- Border Clearance
- CVO Driver's Daily Log
- Unique CVO Fleet Management
- CVO Truck Stop Data Transfer

Emergency Management, comprised of

- In-Vehicle Signing
    - Work Zone Warning
    - Highway/Rail Intersection Warning
    - Road Condition Warning
- On-Board Safety Data Transfer
- Vehicle Safety Inspection
- Emergency Vehicle Video Relay
- Emergency Vehicle Approach Warning

Advanced Vehicle Safety Systems, comprised of

- Intersection Collision Avoidance
- Road Departure
- Lane Merge
- In-Vehicle Signing
    - Work Zone Warning
    - Highway/Rail Intersection Warning
    - Road Condition Warning
- Vehicle-to-Vehicle
    - Vehicle Stopped or Slowing
    - Vehicle/Vehicle Collision Avoidance
    - Imminent Collision Warning
- Rollover Warning
- Low Bridge Warning

Information Management comprised of

- Main Screening
- Border Clearance
- Access Control Rental Car Processing
- Unique CVO Fleet Management
- CVO Truck Stop Data Transfer
- Locomotive Fuel Monitoring
- Locomotive Data Transfer

APPENDIX D

LIST OF COMMENTERS

Comments

3M
Alliance of Automobile Manufacturers
American Association of State Highway and Transportation Officials
ARINC Incorporated
Association of American Railroads
BD Industries
BMW Group
Delaware Department of Transportation
E-470 Public Highway Authority
E-Z Pass Interagency Group
Highway Electronics
Intelligent Transportation Society of America
International Bridge, Tunnel & Turnpike Association
International Municipal Signal Association
Intersil Corporation
Johns Hopkins University, Applied Physics Laboratory
Maine Turnpike Authority
Mark IV Industries, LTD, I.V.H.S. Division
MTA Bridges and Tunnels
National Assoc. of Telecommunications Officers and Advisors/National League of Cities
National Emergency Number Association
Nissan North America, Inc.
National Radio Astronomy Observatory
National Telecommunications and Information Administration
New York State Thruway Authority
North Texas Tollway Authority
PanAmSat
Port Authority of New York and New Jersey-Tunnels, Bridges, & Terminals Department
Public Safety Wireless Network
Siemens Transportation System
Sirit Technologies
Texas Department of Transportation
TransCore, LP
United States Department of Transportation
University of California, Davis-AHMCT Research Center

Reply Comments

Alliance of Automobile Manufacturers
Association of International Automobile Manufacturers, Inc., Technical Affairs Comm.
E-Z Pass Interagency Group
Florida Department of Transportation
Intelligent Transportation Society of America
Intersil Corporation
Mark IV Industries, Ltd., I.V.H.S. Division
MTA Bridges and Tunnels
OmniAir Consortium, Inc.
Public Safety Wireless Network
QUALCOMM Incorporated
Satellite Industry Association
TransCore, LP

APPENDIX E

ASTM 5.9 GHz DSRC STANDARDS WRITING GROUP PARTICIPANTS

3-M
AASHTO
Acunia
Amtech
ARINC
Armstrong Consulting
Atheros
Caltrans
Diamler-Chrysler
Denso
GM
GTRI
Highway Electronics
Hitachi
IDMICRO
IMEC
Intersil
Intelligent Transportation Society of America
Johns Hopkins University, Applied Physics Laboratory
King County Metro Transit
Mark IV Industries, LTD, I.V.H.S. Division
MiCom Spa
Michigan Department of Transportation
Mitretek
Motorola
Nissan
New York State Thruway Authority
OKI Electric
PATH
Raytheon
Sirit Technologies
Sumitomo Electric
Technocom
Toshiba
TransCore, LP
Visteon
Washington State Department of Transportation
Wi-Lan

APPENDIX F

Roadside Units -- REGISTRATION DATA

Fields

1. Call sign
2. Licensee name
3. RSU identification number
4. RSU site coordinates
5. Channel number(s)
6. Equipment class
7. Power
8. Antenna height
9. Antenna manufacturer & model
10. Antenna gain
11. Antenna azimuth
13. Antenna elevation angle
14. Registration date

SEPARATE STATEMENT OF
CHAIRMAN MICHAEL K. POWELL

Re: In re 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); and 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, RM-9096).

Smart radio technology means smarter highways, safer roads and a more secure homeland. By our action today, the Commission takes a giant step toward ensuring that all Americans have access to these life saving services provided through advanced telecommunications platforms. The Commission also demonstrates its continued commitment to assisting the United States Department of Transportation (DOT) in improving the safety and efficiency of the nation's surface transportation infrastructure through the use of Dedicated Short Range Communications (DSRC) Service in the 5.9 GHz band. DSRC provides critical communications links for Intelligent Transportation Systems (ITS) systems, and is essential to achieving a top priority of the DOT, reducing highway fatalities.

Specifically, in this *ITS Report and Order*, the Commission adopts the interoperability standard (ASTM E2213-02 or "ASTM-DSRC) supported overwhelmingly by the commenters and developed through an accredited standard setting process. The Report and Order makes it possible to license both public safety and non-public safety use of the 5.9 GHz band and will provide for open eligibility for licensing and technical rules, most of which are embodied in the standard. The Commission will also license DSRC Roadside Units (RSUs) that will receive non-exclusive geographic-area licenses utilizing seventy megahertz of the 5.9GHz band and will help provide a framework that ensures priority for public safety communications. Finally, although significant progress has been made in the industry discussion protocol regarding the sharing of DSRC and FSS operations in the 5.9 GHz band, the Commission has deferred a decision on the matter until the ongoing technical studies and industry discussions are completed. Give the importance of public safety applications in the DSRC, I urge the parties to conclude their discussions to ensure that the ASTM-DSRC Standard will provide reliable and robust operations.

I would like to thank the staffs of the National Telecommunications and Information Administration under the leadership of Michael D. Gallagher, Acting Assistant Secretary of Commerce for Communications and Information, and the Department of Transportation, headed by Norman Y. Mineta, Secretary of Transportation, for working closely with us to develop rules that will bring the benefits of this technology to our citizens.

SEPARATE STATEMENT OF
COMMISSIONER JONATHAN S. ADELSTEIN

Re: In re Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.8250-5.925 GHz Band (5.9 GHz Band); WT Docket No. 01-90

Today's Order represents another important step in improving the safety and efficiency of our Nation's surface transportation system. I am very pleased to support any role the Commission can play in reducing the more than six million crashes and over 43,000 deaths experienced each year in this country. The potential of dedicated short-range communications services is enormous. I am optimistic that the rules we adopt today will further enable the wide-scale and interoperable deployment of these systems in the near future.

Our item today is particularly noteworthy because it reflects the continued collaborative approach between all sectors of the government and the automotive industry. The Department of Transportation and ITS America in particular have played a leading role in the development of Intelligent Transportation Systems (ITS). I am pleased that we are able to continue these efforts by adopting the ASTM-DSRC Standard. This also helps fulfill the laudable goal of the Transportation Equity Act for the 21st Century (TEA-21) to promote interoperability of ITS systems across the United States. I had the privilege of working on TEA-21 when I was a staffer in the Senate so it is particularly exciting for me to oversee implementation of the Act from this position.

Finally, I am also pleased that the item acknowledges the ongoing discussions between NTIA and DOT and between the Satellite Industry Association and ITS America regarding potential interference to current and future operations in and around the 5.9 GHz band. As touched on above, the development of DSRC systems really is a cooperative and ongoing effort. I commend the parties for their continued discussions on how best to resolve potential interference issues, and look forward to hearing the results of their studies and collaborations.