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

In the Matter of	)	
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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

NOTICE OF PROPOSED RULE MAKING

Adopted: June 11, 1998 **Released:** June 11, 1998

Comment Date: [75 days after Federal Register publication]
Reply Comment Date: [105 days after Federal Register publication]

By the Commission:

INTRODUCTION

1. By this action, we propose to allocate 75 megahertz of spectrum for use by Dedicated Short Range Communications ("DSRC") of Intelligent Transportation Systems ("ITS"). DSRC systems are being designed that require a short range, wireless link to transfer information between vehicles and roadside systems. ITS services are expected to improve traveler safety, decrease traffic congestion, and facilitate reduction of air pollution and conservation of fossil fuels. We are also proposing basic technical rules establishing power limits and unwanted emission limits for DSRC operations. Additionally, we seek comment on the need for nationwide operational standards and channelization, and on the potential for DSRC operations in this band to share spectrum with other services. We are deferring consideration of licensing and service rules. This action furthers the goals of the U. S. Congress, Department of Transportation and the ITS industry to improve the efficiency of the Nation's transportation infrastructure and to facilitate the growth of the ITS industry.

BACKGROUND

2. The Intermodal Surface Transportation Efficiency Act of 1991 ("ISTEA")[1] established a national program within the U.S. Department of Transportation ("DOT") to develop "Intelligent Transportation Systems" or "ITS" (previously referred to as "Intelligent Vehicle-Highway Systems") within the United States. Section 6059 of 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.

The DOT, in cooperation with public and private partners throughout the United States, has sought to foster the development of ITS through the creation of a "National ITS Program Plan" and "National ITS Architecture." The National ITS Program Plan and Architecture identify 30 "user services" or applications that comprise the collaborative public/private vision of ITS, as well as the technological framework for implementing these services. These ITS applications rely upon the integration of advanced communications systems and highway infrastructure systems. Communications are an essential component of the backbone of all ITS applications, which rely heavily on swift and accurate flow of information. Many ITS communications requirements are being met within the framework of existing telecommunications systems, such as broadcast related systems, commercial and private wireless systems, and land-line telecommunication systems. The National ITS Architecture, however, identifies a need for spectrum for reliable short-range wireless communications links between vehicles traveling at highway speeds and roadside systems, *i.e.*, DSRC. Specifically, the National ITS Architecture cites the critical functions of DSRC user services and the location-dependent nature of these communications links.

3. We note that on June 9, 1998, the President signed the Transportation Equity Act for the 21st Century.[2] Section 5206(f) of this Act states that "[t]he Federal Communications Commission shall consider, in consultation with the Secretary, spectrum needs for the operation

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[1] Pub. L. No. 102-240, 105 Stat. 1914 (1991). Section 6052 of ISTEA identifies some of the goals for ITS as: (1) widespread implementation of ITS to enhance the capacity, efficiency, and safety of the nation's highways; (2) enhancement, through more efficient use of the nation's highways, of efforts to attain air quality goals; (3) enhancement of safe and efficient operation of the nation's highways; (4) development and promotion of an ITS industry in the United States; (5) reduction of societal, economic, and environmental costs associated with traffic congestion; and (6) enhancement of United States competitiveness and productivity by improving the free flow of people and commerce and by establishing a significant United States presence in this emerging field of technology.

[2] *See* Transportation Equity Act for the 21st Century, Pub. L.105-178, signed June 9, 1998.

of intelligent transportation systems, including spectrum for the dedicated short-range vehicle-to-wayside wireless standard. Not later than January 1, 2000, the Federal Communications Commission shall have completed a rulemaking considering the allocation of spectrum for intelligent transportation systems." By this action, we are initiating a proceeding that will enable us to meet the statutory requirements and deadline.

4. On May 19, 1997, the Intelligent Transportation Society of America ("ITS America") filed a Petition for Rulemaking ("Petition") requesting that the Commission allocate 75 megahertz of spectrum in the 5.850-5.925 GHz band on a co-primary basis for DSRC-based ITS services.[3] The Petition states that DSRC links are needed for eleven ITS user services and places DSRC needs into three categories: current DSRC applications;[4] emerging DSRC applications;[5] and future DSRC applications.[6] See Appendix B for DSRC applications description. While the benefits of some DSRC applications such as automatic toll collection in the 900 MHz range already are being realized, ITS America's Petition describes several new DSRC applications that would be made possible by an allocation in the 5.9 GHz range. For example, one emerging DSRC application, Automated Roadside Safety Inspection, would enable the transmission of vehicle safety and other data between roadside inspection stations and large commercial trucks moving at highway speeds. The trucks would thus not need to stop unless signalled to do so by authorities at the inspection station. Another application, Incident Management operations, would use roadway sensors and DSRC-equipped vehicles to more quickly detect traffic congestion (*i.e.*, accidents, traffic from sporting events, *etc.*) and dispatch any necessary emergency personnel or take other needed action. ITS America contends that these and other DSRC-based user services will help facilitate the safety and efficiency goals of the ISTEA legislation.[7] ITS America states that the 902-928 MHz band, currently used on a shared

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[3] *See* Public Notice, DA 97-1106, RM-9096, released May 28, 1997. ITS America is a nonprofit, educational association dedicated to the development and deployment of intelligent transportation systems to improve the safety and efficiency of the nation's transportation infrastructure. ITS America states that, since its inception in 1991, it has provided a leadership role in the public/private partnership to deploy ITS and currently serves as a Utilized Federal Advisory Committee to the U.S. Department of Transportation under the Federal Advisory Committee Act, Pub. L. No. 92-463, 86 Stat. 770 (1972), codified at 5 U.S.C. App. 2. *See* Petition at 2; *see also* DOT Comments, filed July 28, 1997, at 1-2 & n.2.

[4] Current DSRC applications include Electronic Payment services and Commercial Vehicle Electronic Clearance.

[5] Emerging DSRC applications include Traffic Control (including the sub-categories of Transit Vehicle Signal Priority and Emergency Vehicle Signal Preemption); Incident Management; En-route Driver Information (including In-vehicle Signing and Driver Advisory); Automated Roadside Safety Inspection; Public Transportation Management; Freight Mobility (including Automatic Equipment Monitoring and Fleet Management); Access Control; Trip Log; and Highway-Rail Intersection.

[6] Future DSRC applications include Intersection Collision Warning Systems and Automated Highway Systems.

[7] *See supra* note 1 (ISTEA goals). DSRC applications are described more fully in Appendix B, *infra*.

basis for some DSRC-type applications within the Location and Monitoring Service ("LMS"),[8] does not have sufficient spectral capacity to support ubiquitous deployment and national interoperability of all the DSRC applications and expresses concern that increased use of the 902-928 MHz band could lead to congestion of that spectrum.

5. The 5.850-5.925 GHz band is allocated internationally on a primary basis for Fixed Services, Fixed Satellite Service ("FSS") Earth-to-space links ("uplinks"), and Mobile Services. Additionally, in Region 2,[9] this band is allocated on a secondary basis to the Amateur Radio Service and the Radiolocation Service. Finally, the 5.850-5.875 GHz segment is designated internationally for industrial, scientific and medical ("ISM") applications.[10] Domestically, the entire band is currently allocated on a co-primary basis for the Government's Radiolocation Service (*i.e.*, for use by high-powered military radar systems) and for non-Government FSS uplink operations. ISM devices and unlicensed Part 15 devices are also permitted to operate in the 5.850-5.875 GHz segment. Finally, the Amateur Radio Service has a secondary domestic allocation in the entire band.[11]

6. In response to ITS America's Petition, the Commission received 15 comments and 11 reply comments. The majority of the comments support an allocation of spectrum for the use of DSRC-based ITS services. However, some entities oppose the use of the 5.850-5.925 GHz band for such services, claiming such use could interfere with incumbent operations or could create unsafe levels of electromagnetic energy.

DISCUSSION

A. Need for DSRC-based Services and Spectrum Allocation.

7. The record in this proceeding overwhelmingly supports the use of spectrum to support ITS services to increase the safety and efficiency of the Nation's transportation infrastructure. We are cognizant of the substantial efforts by both Government and non-Government entities to develop, in response to Congress' ISTEA legislation, a National ITS Plan and Architecture addressing ways of using communications technologies to increase the efficiency

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[8] *See* 47 C.F.R. § 90.353. For instance, Electronic Payment Services and Commercial Vehicle Electronic Clearance are provided within the LMS.

[9] The International Telecommunications Union ("ITU") Radio Regulations divide the world into three regions for the purposes of its rules and North America is within Region 2. For a precise description of these regions, *see* 47 C.F.R. §2.104(b).

[10] International Footnote S5.150 incorporates the older provisions of Footnote 806 designating the 5.725-5.875 GHz band for ISM applications and stating that radiocommunication services operating within this band must accept harmful interference which may be caused by these applications.

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

of the nation's transportation infrastructure. The limited ITS services now available well serve the public interest,[12] and their future development could potentially increase traveler safety, reduce fuel consumption and pollution, and continue to advance the country's economy. We are encouraged that the National ITS Plan and Architecture incorporates, where possible, the use of existing communications infrastructure and services to efficiently meet the communications needs of ITS services. We believe the record sufficiently justifies a proceeding to explore the additional radio spectrum needs of, and to consider a proposed allocation for, a wider range of DSRC-based ITS services. We also believe that a proposed new allocation of spectrum for DSRC applications might encourage the private sector to develop operational standards facilitating nationwide compatibility and interoperability of these applications.

8. In support of this proceeding, DOT comments that the General Accounting Office has projected that congestion in metropolitan areas could worsen by 300 to 400 percent over the next 15 years unless significant changes are made to the existing transportation infrastructure. Congress, DOT observes, has chosen to emphasize the development and use of communications technologies for improving the performance of the transportation infrastructure and increasing the efficiency of existing roads rather than relying primarily on additional road construction.[13] DOT submits that a new allocation of spectrum is needed to support the requirements of emerging and future DSRC services -- particularly those with public safety implications -- as well as to support the growth and interoperability of existing services.[14] Further, DOT claims, a new allocation of spectrum for DSRC applications will facilitate their nationwide compatibility and interoperability, as well as permit innovative new uses for DSRC-based services.[15] No commenter challenges the need for a DSRC allocation or the public benefits that would accrue from the anticipated DSRC operations, but, as addressed below, some commenters do question the wisdom of allocating spectrum in the 5.850-5.925 GHz band for DSRC or state that there is an inadequate basis to support the full 75 megahertz allocation proposed by ITS America.

9. In their comments, ITS proponents state that the 5.850-5.925 GHz band is optimal for a DSRC allocation because: the band has favorable frequency propagation characteristics for DSRC; a DSRC allocation in the band would be consistent with international allocations for, and deployment of, similar services; and DSRC operations would be compatible with existing operations in the band. Specifically, Saab Systems, Inc. ("Saab") states that frequencies in this range exhibit short range propagation characteristics that, in combination with the use of small DSRC transceivers, deployment of multiple transponders, and use of triangulation techniques,

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[12] *See generally* 47 C.F.R. Part 90, Subpart M, governing the LMS.

[13] *See* DOT Comments at 3.

[14] *See* DOT Comments at 4-5.

[15] *See* DOT Comments at 8.

facilitate the tailoring of signal coverage to meet the needs of individual applications.[16] Similarly, ITS America states that the propagation characteristics in this frequency range would facilitate DSRC use of narrowly-focused and rapidly dissipating signals and, thus, heavy channel reuse in nearby locations. ITS America asserts that such DSRC links would be able to achieve desired communications distances of 30 to 90 meters, even with transmission at relatively low power, and under all weather conditions.[17] Further, ITS America states, unlike lower frequency ranges, the 5.9 GHz range offers adequate spectrum capacity for DSRC, yet, unlike higher frequencies for which equipment may be prohibitively expensive, this frequency range allows for use of affordable communications equipment. The American Automobile Manufacturers Association ("AAMA"), Saab and others also point out that the 5.9 GHz frequency range is generally consistent with the allocation for DSRC in Europe[18] and some countries in Asia.[19] They state that this factor will facilitate lower production costs for 5.9 GHz DSRC equipment, encourage quicker development and deployment of DSRC equipment globally, stimulate increased competition among equipment manufacturers, and spur U.S. equipment manufacturers to compete in the global DSRC market.[20] Finally, ITS America and DOT point out that the Public Safety Wireless Advisory Committee ("PSWAC")[21] in its Final Report stressed the important public safety value of ITS and recommended the allocation of the 5.850-5.925 GHz band for DSRC systems.[22]

10. However, some parties with interests in this band question whether the allocation of the 5.850-5.925 GHz band is appropriate for DSRC applications. Specifically, the American Radio Relay League, Inc ("ARRL") claims that alternatives to this band have not been adequately explored and urges that frequencies above 40 GHz ("millimeter wave frequencies") are largely undeveloped and also have short range capabilities. Additionally, ARRL argues that millimeter wave frequencies provide significant frequency reuse capability, and DSRC applications in those

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[16] *See* Saab Comments at 2. In particular, Saab stresses that these techniques will allow development of high accuracy toll collection systems.

[17] *See* ITS America Petition at 44.

[18] The Comité Européen de Normalisation ("CEN") has approved the 5.795-5.805 GHz band for DSRC and may consider the 5.805-5.815 GHz band for additional DSRC applications. *See* ITS America Petition at 45.

[19] Japan, Singapore, Korea, and other Asian countries have agreed to DSRC use of 40 megahertz of spectrum chosen from ISM frequencies within the 5.725-5.875 GHz range. *See* ITS America Petition Attachment 4 to Appendix L at 6.

[20] *See* Saab Comments at 3 and AAMA Comments at 1.

[21] PSWAC is a joint committee established by the FCC and the National Telecommunications and Information Administration ("NTIA") to explore the spectrum needs of public safety agencies. *See, e.g., Second Notice of Proposed Rulemaking, In the Matter of the Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010*, WT Docket No. 96-86, 12 FCC Rcd. 17706 (1997).

[22] *See* ITS America Petition at 34 and DOT Comments at 3-4.

frequencies would not receive interference because of the current dearth of commercial users in that spectrum. The ARRL also claims that the 5.850-5.925 GHz band is necessary for the future development of amateur wideband digital transmissions and video. It also states that, of the 275 megahertz of spectrum allocated to the amateur service in the 5.8 GHz range, 175 megahertz would be rendered significantly less useful to amateurs by ITS America's proposal in combination with our recent decision to allow unlicensed National Information Infrastructure ("U-NII") devices to operate in the 5.725-5.825 GHz band.[23] Additionally, ARRL argues that the DSRC spectrum allocations being considered in Europe and Asia operate on spectrum below 5.850 GHz and, thus, are not consistent with the allocation proposed in the Petition despite ITS proponents' contention to the contrary.[24] Further, Resound Corporation ("Resound"), a manufacturer of unlicensed low power auditory assistance devices used by people with hearing disabilities, opposes a DSRC allocation in the 5.850-5.875 GHz segment, claiming that such operations could interfere with hearing assistance devices it plans to manufacture for operation in this segment.[25]

11. Regarding the size of the spectrum allocation, ITS America states that 75 megahertz of spectrum is needed in this frequency range to accommodate all existing, emerging and future DSRC-based ITS services. ITS America's Petition includes as an attachment ARINC's Spectrum Requirements for DSRC Report ("ARINC Report") which indicates that 75 megahertz of DSRC spectrum is necessary to permit frequency coordination with existing spectrum users and other DSRC users; to allow the development of affordable in-vehicle transponders; and to maintain consistency with the design of many operational and experimental DSRC systems that use channel bandwidths ranging from 5 to 10 megahertz.[26] Additionally, ITS America argues that a 75 megahertz allocation will permit future DSRC-based services to evolve without further regulatory action. Moreover, ITS America, AAMA, the American Trucking Association ("ATA") and others state that the existing LMS allocation at 902-928 MHz cannot support all developing DSRC-based user services.[27]

12. Opposing comments contend that if an allocation is made, it should be less than 75 megahertz. BellSouth Corporation ("BellSouth"), though generally supporting a primary allocation of contiguous spectrum for DSRC that would be sufficiently large to accommodate the contemplated public safety applications, stresses that the existing record is not sufficient to justify

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[23] *See Report and Order*, ET Docket No. 96-102, 12 FCC Rcd 1576 (1997).

[24] *See* ARRL Comments at 8.

[25] *See* Resound Comments at 5.

[26] *See* ITS America Petition at 37. ITS America's Petition does not endorse a particular channeling plan or specific channel bandwidth. However, the spectrum requirements study, prepared by ARINC, Inc. for ITS America, presupposes that the DSRC-based services anticipated for this band will need at least eight 6-megahertz channels, as well as additional channels to allow for flexibility in channel assignment and coordination of frequencies among various DSRC users. *See id.* App. H (ARINC Report) at 55.

[27] *See* ITS America Petition at 43, AAMA Comments at 1 and ATA Comments at 1.

an allocation of 75 megahertz.[28] Similarly, ARRL considers premature ITS America's 75 megahertz allocation proposal because the record is insufficient to determine the amount of spectrum minimally necessary for DSRC applications.[29]

13. *Proposal.* We find that the record justifies proposing a substantial allocation for DSRC in the 5.9 GHz band. While the DSRC spectrum in Europe and Asia does not overlap the 5.850-5.925 GHz band, we believe it is close enough to enable equipment manufacturers to benefit from global economies of scale. Such an allocation would likely facilitate global research, technological innovations, and industry standards-setting activities that would result in the mass production of equipment to take advantage of economies of scale. We believe that, in the 5.9 GHz band, equipment can be designed with built-in flexibility, allowing, for example, use of highly directional antennas to focus signals where needed. In contrast, we believe that the development of DSRC equipment for the emerging millimeter wave band, as suggested by ARRL, might increase considerably production costs. Further, we believe that the 5.9 GHz range offers adequate spectral capacity for DSRC applications and that, below this range, it would be extremely difficult to find an available spectrum block with adequate spectral capacity. For instance, the 902-928 MHz LMS band is currently used for DSRC-like applications and, though we intend to allow continued use of that band for such applications, we agree with comments that the limited amount of spectrum in the band and its increasing use by other services render it inadequate to support the full panoply of DSRC applications.[30] The record indicates that the spectral environment and propagation characteristics of the 5.9 GHz band are appropriate for short range DSRC applications, enabling sufficient signal coverage and considerable frequency reuse.

14. Regarding the specific amount of spectrum needed for a DSRC allocation, we believe it important to propose an allocation sufficiently large to accommodate existing and emerging services plus future development of the full panoply of DSRC applications which have great potential to improve highway safety and efficiency, even in those areas where Fixed Satellite Service ("FSS") operations or high powered Government radar systems may reduce the availability of some channels. Nevertheless, we question whether the 6 megahertz channels used as a basis for the spectrum requirements study[31] will truly be needed for DSRC applications, especially in the rapidly advancing age of digital communications. Further, we have some

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[28] *See* BellSouth Comments at 4.

[29] ARRL prefers that any such allocation be outside the 5.9 GHz range. *See supra* para. 10. However, ARRL argues that if an allocation must be made in this band it generally supports a DSRC allocation substantial enough to facilitate use of efficient interference mitigation techniques such as roaming channel selection.

[30] We note that ITS America has not requested any rule changes for existing DSRC-type LMS operations in the 902-928 MHz band and that several incumbent parties support continued use of the 902-928 MHz band for such operations. *See, e.g,* International Bridge, Tunnel and Turnpike Association Comments at 3; and Mark IV Industries, LTD, I.V.H.S. Division Comments at 5.

[31] *See supra* para. 11 and note 26.

concern as to whether certain technical approaches identified in the record,[32] such as passive backscatter and active transceivers requiring wide bandwidth channels, would pose a spectrally efficient solution for DSRC applications, and we discuss this issue below in greater depth. In any event, we propose to allocate 75 megahertz of spectrum, at 5.850-5.925 GHz, to the Mobile Service and to designate its use for DSRC operations. We tentatively conclude that this significant amount of proposed spectrum would further the goals of the National ITS program and encourage the development of advanced technologies to increase the safety and efficiency of the national transportation infrastructure well into the future. Additionally, a 75 megahertz allocation should enable avoidance of occupied frequencies in areas where incumbent use is heavy and should be sufficient to meet the spectrum demands of future DSRC operations, such as Automated Highway Systems,[33] which could require several dedicated wideband channels to ensure reliability. We request comment on whether this proposed allocation is excessive given that efficient spectrum use techniques exist and our goal of promoting spectrum efficiency. We welcome alternative suggestions for an allocation for DSRC.

B. Spectrum Sharing.

15. In its Petition, ITS America states that ARINC's technical analysis indicates that DSRC-based services can successfully share the 5.850-5.925 GHz band on a co-primary basis with existing Government and non-Government users. ITS America also states that the Federal Department of Highways ("FDHW") and the Department of Defense ("DOD") are currently developing a test program to identify and alleviate any interference concerns.[34] ITS America indicates that coordination and testing activities are ongoing and contends that suitable mitigation techniques should be able to alleviate interference from DOD emitters. Further, the ARINC Report, relied upon by ITS America, states that most of the Nation's roadways will be free of interference to DSRC operations in the 5.9 GHz range, but in those areas where high powered weather radar operations and satellite stations have a potential to interfere with DSRC operations, design adaptations (*e.g.*, highly directional antennas, filters, signal absorption or reflection devices) could be used to compensate for unwanted signals.[35] Similarly, ITS America points out that because there are few FSS Earth station transmitters, DSRC transceivers can easily be located to avoid interference.

16. ITS America also avers that low power DSRC devices would be designed to suppress unwanted emissions and therefore would provide little likelihood of causing harmful

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[32] *See i.e.*, ARINC Report at 61-62, ITS America Petition at 52-54 and ITS America Petition Attachment 5 to Appendix L at 1.

[33] Automated Highway Systems ("AHS") would transfer full control of equipped vehicles to an automated system operating on designated AHS lanes.

[34] *See* ITS America Petition at 48.

[35] *See supra* n. 26, ARINC Report at 79.

interference to current RF spectrum users. The ARINC Report attached to the ITS America Petition states that low power DSRC signals will be pointed down towards the roadway or horizontal to the roadway, reducing their potential to interfere with other operations. ARINC's Report adds that the FSS has only space station receivers in this band and no terrestrial receivers for DSRC operations to influence. Similarly, ITS America points out that the high directionality of the FSS links reduces the interference potential with DSRC operations. ITS America states that while it is not aware of any ISM devices currently operating in the 5.850-5.925 GHz band, existing ITS operations under the LMS service at 902-928 MHz currently co-exist with ISM operations with minimal interference, and it reasons that similar sharing should be possible at 5.9 GHz.[36] Additionally, ITS America states that it is working with representatives of the ARRL and Resound to develop a potential sharing plan with amateur and unlicensed Part 15 operations, respectively. The ARINC Report states that the full 75 megahertz allocation will permit DSRC operations to choose channels within the band to avoid interference with other operations in certain geographic areas.[37]

17. However, one DSRC proponent argues that spectrum sharing may not be possible between certain incumbent operations and new DSRC operations. Specifically, the Minnesota Mining and Manufacturing Company ("3M") argues that DSRC communications require protection from secondary and unlicensed operations such as amateur, Part 15 devices and ISM devices because harmful interference to DSRC systems could jeopardize the safety of drivers. 3M claims that the amateur radio operations have the greatest potential to interfere with ITS operations because their stations are permitted to transmit at 1.5 kilowatts ("kW") peak envelope output power ("PEP") with unlimited gain antennas. 3M states that an amateur station at this power could "swamp out" an entire area, rendering DSRC services there unusable.[38] Additionally, 3M states that the amateur service has access to 1624 megahertz of spectrum between 50 MHz and 50 GHz and makes only light use of the 5.9 GHz band. Therefore, 3M argues that the amateur service could be displaced from the band without suffering any substantial impact upon its current or future operations. Further, 3M points out that unlicensed ISM devices in the same frequency range have no power or field strength limitations. Therefore, 3M urges that ISM, secondary and unlicensed operations be removed from the 5.850-5.925 GHz band.

18. Additionally, incumbent interests argue that spectrum sharing potential in this band has not been demonstrated. Specifically, the ARRL states that, though DSRC applications may not necessarily be incompatible with incumbent and future amateur use of the spectrum, the record in this proceeding is insufficient to demonstrate such compatibility. ARRL also argues that no one has explored the impact on secondary amateur use of the band if DSRC facilities are permitted to operate on a primary basis. ARRL states that the public safety nature and Part 90 status of this allocation implies that those operations will need to be interference free, a concern

[36] *See* ITS America Petition at 48-51.

[37] *See* ARINC Report at 80.

[38] *See* 3M Reply at 6.

that is reinforced by 3M's request (opposed by ARRL) to remove secondary operations from this band.[39] ARRL claims that if 3M is correct that DSRC public safety applications would be susceptible to interference from amateur operations, then the proposed DSRC allocation would be unjustified.[40] Nevertheless, ARRL states that it is ready to work with the ITS entities to resolve spectrum sharing issues, but until this issue is resolved a action is premature. Further, Resound states that the ITS America Petition offers no protection for low power unlicensed operations in the 5.850-5.875 GHz band. Resound adds that the Petition does not contain sufficient information to determine whether DSRC devices will interfere with low power unlicensed operations. Additionally, Resound and ARRL stress that there are no specific designs or technical standards for DSRC devices, so that it is impossible to evaluate whether and under what conditions these devices would cause or receive interference. Nevertheless, Resound asserts that DSRC systems as described in the Petition are certain to create interference to co-frequency low power hearing assistance devices in a mobile environment. Resound states its concerns could be addressed by excluding DSRC applications from the 5.850-5.875 GHz segment.[41] Resound adds that although the Petition states that ITS America is working with Resound and ARRL to address spectrum compatibility, they have only had one meeting and no testing has been done. 3M responds that the Commission's Rules do not provide any protection to Resound's proposed unlicensed operations.[42] The Land Mobile Communications Council ("LMCC"), however, states that Resound's auditory assistance devices do serve the public interest and the parties should, therefore, work to achieve a sharing protocol between these operations.[43]

19. *Proposal.* As discussed above, we believe that DSRC-based ITS services are in the public interest and should be accommodated in the 5.9 GHz range if possible. We also believe the band at issue does offer spectrum sharing capabilities because of the operating characteristics of the incumbent services and the apparent light use of the band, but seek comment on likely future use of the band by current operators. Specifically, we note that Government radar systems and ISM devices typically would not be susceptible to interference from DSRC applications and that DSRC operations, in turn, could use frequency and geographic separation to avoid interference from those Government and ISM operations.

20. As mentioned above, this band is also used for FSS uplinks. However, a review of the Commission's records indicates that there are 55 FSS earth stations, including two transportable stations, licensed to use this band. Given the limited number of FSS earth stations currently authorized, we believe that spectrum sharing between FSS and DSRC operations may

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[39] *See* ARRL Comments at 7.

[40] *See* ARRL Reply at 5.

[41] *See* Resound Reply at 4.

[42] *See* 3M Reply at 6.

[43] *See* LMCC Reply at 2.

be possible. However, we seek comment on the likely future needs for this spectrum for FSS earth stations. In this regard, we note that given the much higher power of FSS operations and the relatively low power of DSRC operations, individual DSRC operations should not cause harmful interference to incumbent FSS satellite operations. We also do not expect that DSRC devices in the aggregate would negatively impact existing or future FSS operations, particularly given that there are several other potentially significant contributors to the overall noise level in this band, such as government radars and ISM devices. We request comment on this preliminary assessment. We also seek comment on what, if any, effects the widespread deployment of DSRC devices could have on future development of FSS operations in this band. In this regard, we observe that widespread deployment of mobile devices, including devices with potential public safety uses, could make it more difficult to coordinate new FSS operations. We also seek comment on whether there are any instances in which DSRC services might be unacceptably impaired by FSS operations. We seek comment on whether terrain shielding, directional antennas,[44] RF fencing and other techniques can be employed by DSRC operators to avoid receiving or causing interference. Alternatively, should interference situations arise where the two services are not compatible in a specific area or over a range of frequencies, we request comment on the feasibility of relocating the FSS operations to other geographic areas or frequency bands using the principles outlined in the Emerging Technologies rulemaking.[45] That is, if the DSRC licensee needs spectrum used by an FSS licensee, the DSRC entity would be responsible for the expense of modifying the FSS uplink to another location or frequency and ensuring that the FSS entity is able to achieve comparable operations.

21. Unlicensed low power operations in the 5.850-5.875 GHz segment may be affected by this potential allocation. We agree with Resound that its proposed low power hearing assistance devices, which may operate pursuant to Part 15, could receive harmful interference if used in a roaming mobile environment in close proximity to co-channel DSRC operations. Although unlicensed devices have no allocation status and are not protected by our Rules, we believe that the provision of hearing assistance devices to those with disabilities is a valuable service in the public interest. At present, any mobile Part 15 hearing assistance device operations in the 5.850-5.875 GHz band could encounter interference problems from various higher powered incumbent operations such as Government radar operations, FSS and ISM operations. To our knowledge Resound has not yet manufactured devices that use this band, but merely plans to manufacture such devices. Therefore, we request comment on whether the 5.850-5.875 GHz segment is currently being used for hearing assistance device operations, the likelihood of any such future uses, and whether any measures can or should be taken to protect such uses.

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[44] For example, the use of directional antennas to point DSRC transmissions down towards the roadway or horizontally to the road surface would reduce the strength of unwanted DSRC signals received by the satellite.

[45] *See* Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, *First Report and Order and Third Notice of Proposed Rule Making*, 7 FCC Rcd 6886 (1992); *Second Report and Order*, 8 FCC Rcd 6495 (1993); *Third Report and Order and Memorandum Opinion and Order*, 8 FCC Rcd 6589 (1993); *Memorandum Opinion and Order*, 9 FCC Rcd 1943 (1994); *Second Memorandum Opinion and Order*, 9 FCC Rcd 7797 (1994).

22. We also note that the secondary amateur radio allocation which overlaps the band requested by ITS America appears to be lightly used. We acknowledge that amateur operations are permitted to operate at up to 1.5 kW PEP[46] output with high gain antennas which could interfere with DSRC receivers if operated on similar frequencies in the same geographic area. Nevertheless, amateur operations have access to 275 megahertz in the 5.650-5.925 GHz band and we believe any amateur use of the 5.9 GHz range could be engineered to avoid DSRC operations. Also, amateurs may be able to continue use of these frequencies in rural areas where DSRC applications may not be extensively deployed. We anticipate that any interference problems that may develop between amateur stations and DSRC operations could be resolved by changing the frequency of the amateur operation in order to protect primary status operations or by other engineering techniques, such as power reduction or directional antennas.

23. Accordingly, we tentatively conclude that DSRC-based ITS services can share spectrum with incumbent operations in this frequency range. We request comment on this issue and solicit further analysis of the spectrum sharing potential between DSRC-based operations and the incumbent use of the 5.850-5.925 GHz band.

24. Finally, even with the apparent compatibility of DSRC applications with the existing operations in this band, we believe it is necessary to outline an order of responsibility in resolving interference problems, if they occur. Specifically, we note that DSRC operations are not likely to interfere with Government radar operations and ISM operations, but the reverse may not always be the case. We propose to require DSRC operations to accept interference generated by ISM operations in this range, as is generally the case in ISM bands.[47] Additionally, we note that DSRC operations, Government radar operations and FSS Earth-to-space operations would operate on a co-primary basis in this frequency range. Therefore, we propose to place the responsibility for coordination equally on each of those operations through the Frequency Assignment Subcommittee of the Interdepartment Radio Advisory Committee. As is generally the case with co-primary services, any licensee initiating new or modified service in the band would be required to avoid interference to existing operations. Finally, secondary amateur operations would not be permitted to cause harmful interference to primary licensed operations in this frequency range. Nonetheless, to the extent that DSRC applications may operate on an unlicensed basis under Part 15, they would be required to avoid causing interference to and cannot claim interference protection from all operations with secondary and primary allocation status. We request comment on this issue and encourage suggestions for alternative approaches.

C. Technical Standards.

25. In its Petition, ITS America states that it does not endorse a particular technical approach to DSRC deployment and indicates that the record should illustrate many alternative

[46] *See* 47 C.F.R. § 97.313.

[47] *See* 47 C.F.R. § 2.106 footnote 806.

technical approaches to deployment and channelization. ITS America does not propose a specific channelization plan, licensing method or technical rules, but argues that these issues require development of consensus through standardization activities and the Commission's deliberations in this proceeding.[48] Nevertheless, ITS America does propose amendments to Part 90 of our Rules that would permit 5.9 GHz DSRC operations, but these rules would only require that an applicant include the technical details of its system within its license application. ITS America offers to work with the Commission and interested parties during the proceeding to examine and accommodate as many different technical approaches as possible for DSRC operations. Additionally, ITS America indicates that several standards-setting bodies are currently developing air interface and other technical standards for DSRC operations.

26. Comments from DSRC proponents generally agree that nationwide, as well as global, DSRC device compatibility and interoperability is desirable to permit users to benefit from ITS services as they travel among different geographic areas. For example, the American Association of State Highway and Transportation Officials ("AASHTO") and the International Bridge, Tunnel and Turnpike Association ("IBTTA") state that it is important for motorists to be able to purchase a single DSRC device capable of receiving roadside ITS transmissions from a variety of information systems in all regions of the country.[49] The State of Minnesota argues that the lack of a national standard would be a problem for DSRC implementation and that it is being addressed in several committees of standards development organizations. Similarly, 3M contends that the adoption of technical standards is necessary for optimal spectrum utilization, coordination, and to facilitate orderly development of future DSRC systems.[50] DOT states that it is funding the development of DSRC standards through recognized standards-setting organizations, including the Institute of Electronics and Electrical Engineers ("IEEE") and the American Society of Testing and Materials ("ASTM"), and anticipates that this process will lead to a consensus DSRC standard for the nationwide allocation.[51]

27. The DSRC proponents add that it is too early to propose technical operating standards, but they encourage the Commission to proceed with an allocation while standards organizations develop consensus operating parameters. Specifically, Amtech Corporation ("Amtech") asserts that while standards may lower costs and facilitate interoperability, the early freezing of standards could saddle the public with sub-optimal solutions. Amtech suggests that the Commission encourage field testing of various systems as standards development proceeds and adds that the standards setting process should include participation by various stakeholders.[52]

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[48] *See* ITS America Petition at 41.

[49] *See* AASHTO Comments at 4 and IBTTA Comments at 3.

[50] *See* 3M Comments at 9.

[51] *See* DOT Comments at 8.

[52] *See* Amtech Reply at 9.

Amtech believes that the choice of technology for ITS will be sorted out in the standards development process and the Commission should not preclude any technology. Therefore, Amtech urges the Commission to proceed with a Notice of Proposed Rulemaking ("NPRM") to provide the allocation, followed by a second proceeding focused on service rules. Because different DSRC applications may call for different technologies, Amtech recommends that the Commission limit unwanted emissions, but that service rules be considered only after standards have matured and among other things, accommodate the need for flexibility and broadly define "transportation" to accommodate related services, such as cashless transactions for food and fuel.[53] Similarly, 3M states that the Commission's first step should be to allocate spectrum to ITS for DSRC, and then it should allow DSRC systems to be deployed on a developmental basis, subject to adoption of final technical standards. 3M also states that the Commission should propose an emission mask to minimize unwanted emissions and reduce interference, as well as propose appropriate maximum power levels for general types of DSRC applications.[54]

28. *Proposal.* We propose only rules necessary to prevent harmful interference among the licensees of the DSRC systems and incumbent radio services with equal or greater allocation status. This approach will offer licensees the maximum technical flexibility so that market forces can optimize development. The weight of the comments support this proposal. Below, we propose power limits, unwanted emission limits, and RF safety guidelines. These rules are necessary to enhance spectrum sharing compatibility and efficiency, rely on market forces, and apply our existing RF safety guidelines to protect spectrum users and the general public. We also seek comment on other technical issues in order to encourage industry to begin a process that, we believe, will lead to consensus on standards that will permit nationwide interoperability for some DSRC applications and that may bear fruit in a future proceeding to establish licensing and service rules.

C.1. Power.

29. While no party proposed specific power limits for DSRC operations in the 5.9 GHz band, the record contains information regarding the necessary operating range of these operations and the power needed to achieve reliable communications. Specifically, ITS America states that DSRC systems must be able to transmit over distances of 30 to 90 meters (98 to 295 feet) at relatively low power levels under all weather conditions. While it does not propose a maximum power limit,[55] in its reply comments ITS America states that a typical DSRC transmitter is anticipated to have an Effective Isotropically Radiated Power ("EIRP") of 4 watts ("W") and certain high-powered transmitters are anticipated to have an EIRP of 40 W.[56] Further, ITS

[53] *See* Amtech Reply at 8.

[54] *See* 3M Comments at 10.

[55] *See* ITS America Petition at 44.

[56] *See* ITS America Reply Attachment at 2.

America's Petition indicates that the European Prestandard for DSRC operations permits DSRC roadside units ("beacons") to operate with an EIRP of 2 W (33 dBm) to achieve communications distances of up to 15 meters (50 feet).[57] Additionally, the Japanese draft standard, "Road Traffic and Transport Telematics (RTTT) DSRC Standard Using Microwave in Japan," anticipates communications over distances of 10 to 50 meters (33 to 164 feet) and points to experiments with beacons operating with less than 300 milliwatts ("mW") EIRP and on-board units with less than 10 mW EIRP. However, ITS America states that the RTTT Standard permits beacons to transmit with a maximum power of 40 W (46 dBm) EIRP.[58] As mentioned above, Saab supports the use of directional antennas to tailor coverage to meet the needs of individual applications and to enable triangulation techniques for increased system accuracy for toll collection.[59] Additionally, Amtech states that service rules should provide great flexibility regarding power and antenna height to easily accommodate highway situations such as elevated roadways and bridges.

30. *Proposal.* We recognize that different DSRC applications could have different range and power requirements and that the specific requirements for each application will be customized for the application and may be established in an informal standards setting process. We do believe it is beneficial to propose a maximum power limit for DSRC operations sufficient to achieve the necessary communication ranges while also limiting their potential to cause harmful interference. The operational characteristics of DSRC operations should generally require relatively low power levels, would cover very short distances and could require a high degree of frequency reuse. We acknowledge the need for flexibility to accommodate various antenna heights and levels of antenna directionality dependent on the DSRC application and transportation infrastructure. In addressing power limits, we take into account the likelihood that use of directional antennas will be crucial to DSRC operations in the 5.9 GHz range in order to increase frequency reuse, reduce interference with other spectrum users, increase accuracy and reliability of communications between roadside beacons and individual vehicles, and permit specialized DSRC applications such as triangulation.

31. We note that DSRC type LMS operations in the 902-928 MHz band are permitted to operate with a maximum power of 30 watts Effective Radiated Power ("ERP"), measured as peak envelope power.[60] Further, the maximum antenna height above ground for non-multilateration LMS systems is 15 meters.[61] We recognize that signals in the 5.9 GHz range propagate shorter distances than equivalently powered signals in the 900 MHz range. Nevertheless, LMS operations in the 902-928 MHz band are not necessarily limited to the short

[57] *See* ARINC Report at Appendix D page 7 and ITS Petition Attachment 3 to Appendix L at 15.

[58] *See* ITS America Petition Attachment 4 to Appendix L at 6 and Attachment 5 at 1.

[59] *See* Saab Comments at 2.

[60] *See* 47 C.F.R. § 90.205(j).

[61] *See* 47 C.F.R. § 90.353(h).

range communications anticipated for most DSRC operations in the 5.9 GHz range. We also note that Appendix A of the ARINC Report indicates that several ITS equipment manufacturers are making equipment in both the 900 MHz and 5.8 GHz range capable of communicating over distances ranging from a couple of feet to a mile, using a transmitter power much less than 1 watt coupled with various antenna gains. Given that LMS operations are permitted 30 W ERP and that such power can permit communication ranges much farther than that needed for DSRC links; we tentatively conclude that a 40 W EIRP limit would be excessive for the relatively short range communications to be provided by DSRC links. Nevertheless. we request comment on whether such higher powered operations should be permitted for DSRC applications. We believe most DSRC applications would reliably be achieved using less than 4 W EIRP, but in order to permit flexibility of services and system design, we propose to permit DSRC operations in the 5.9 GHz range to operate with a maximum transmitter output power of 750 mW with up to 16 dBi gain antennas (30 W EIRP). We propose to allow DSRC equipment to use antennas with more than 16 dBi gain if the maximum permitted transmitter output power is reduced by 1 dB for each dB that the antenna gain exceeds 16 dBi, *i.e.*, as long as the 30 W EIRP limit is not exceeded. We believe that specifying DSRC power limits in this fashion and allowing use of directional gain antennas will promote frequency reuse, customization of signal coverage areas, and reduction of interference potential with other operations. We believe that such rules will allow DSRC operations a high degree of flexibility and will lead to the manufacture of affordable DSRC equipment. We request comment on our proposal. Specifically, should the DSRC power limits be expressed only in terms of EIRP or is an approach such as considering antenna gain preferable? Is there a need to restrict or prohibit wide area DSRC operations?

C.2. Unwanted Emission Limits.

32. Some DSRC proponents recommend that the Commission establish limits on unwanted emissions to minimize interference problems, but no party proffers any specific limits. We agree that it is important to limit the amount of unwanted emissions, both those occurring outside of the DSRC spectrum band and those emanating from one channel to the next within the DSRC band. As pointed out above, some DSRC applications may have traveler-safety implications that would require reliable communications. Therefore, interference from an adjacent channel DSRC operation may create safety concerns. We tentatively conclude that the existing emission mask requirements for LMS operations in the 902-928 MHz band[62] would satisfactorily address those concerns and therefore would also be appropriate for DSRC applications in the 5.9 GHz range. We believe that this level of unwanted emission suppression is necessary to permit the use of adjacent DSRC channels in any given geographic area. Accordingly, we propose to amend the emission mask requirements of Section 90.210(k) to also apply to DSRC operations in the 5.9 GHz band.[63]

[62] *See* 47 C.F.R. § 90.210(k).

[63] *See* proposed rule §90.210(k) in App. A.

C.3. RF Guidelines.

33. Two parties oppose the allocation of spectrum for DSRC operations because they claim that such operations would generate sufficient levels of RF energy to cause health problems to the public. Specifically, the Cellular Phone Taskforce ("CPT") and the Electrical Sensitivity Network ("ESN") claim that some people are especially sensitive to RF energy and oppose the use of DSRC devices along highways, claiming that these operations will not permit "electrically sensitive" people to travel safely. According to ESN, the general notion that RF exposure to low power DSRC operations would not pose any biohazard concern fails to consider "electrical sensitivity," which reduces one's tolerance to "normal" electromagnetic exposures. Until the electrically sensitive population is considered in the overall planning of wireless exposures in public areas, ESN argues that no further approval of wireless systems should be considered.[64] CPT claims that the Commission's RF exposure level guidelines are based on studies of *acute* exposure to RF emissions at levels of 1 mW per square cm or more and have no bearing on the safety of *chronic* exposure to much smaller levels of RF exposure.

34. DSRC proponents respond that the Commission's guidelines adequately address any scientifically-based RF exposure concerns. 3M and ITS America point out that the Commission specifically rejected ESN's and CPT's RF exposure arguments in the Second Memorandum Opinion and Order ("Second MO&O") in ET Docket No. 93-62.[65] ITS America adds that the Commission in its Second MO&O amended the Commission's Rules to clarify and refine the regulations governing the evaluation of the environmental effects of RF electromagnetic emissions. The Commission also issued a new OET Bulletin 65 to be used in evaluating compliance with the new requirements. ITS America states that DSRC operations will comply with the Commission's RF exposure rules and stresses that neither CPT nor ESN has submitted any technical information showing why these rules should not apply to DSRC operations in the 5.9 GHz band.[66]

35. *Proposal.* The issues raised by CPT and ESN were addressed in the Second MO&O in ET Docket No. 93-62, in which we amended our rules regarding safe levels of RF electromagnetic emissions.[67] Additionally, as is always the case for FCC approved devices, we will require all DSRC equipment to comply with our RF safety guidelines. We believe this level of protection is appropriate and will not result in the generation of unsafe levels of RF energy.

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[64] *See* ESN Reply at 3.

[65] *See* 3M Reply at 10.

[66] *See* ITS America Reply at 6.

[67] *See Report and Order*, ET Docket No. 93-62, 11 FCC Rcd 15123 (1997), *Second Memorandum Opinion and Order and Notice of Proposed Rulemaking* at para. 31, ET Docket No. 93-62, 12 FCC Rcd 13494 (1997). *See also*, 47 C.F.R. § 1.1307(b).

We request comment, however, on whether any specific aspects of our RF safety guidelines are inappropriate for the deployment of DSRC equipment.

C.4. Channelization and Frequency Stability.

36. The DSRC proponents generally support adoption of a channelization plan to facilitate the goal of nationwide compatibility and interoperability. 3M states that it is imperative to promptly move towards adoption of a channelization plan in order to accommodate orderly development of both broadband and narrowband DSRC operations. 3M argues that different DSRC services will require different operational limits; for instance, both one-way low data rate and two-way high data rate operations are anticipated. For applications that only require low data rate one-way links, a narrowband channelization plan would allow many channels to exist within the same bandwidth occupied by a single broad channel.[68] BellSouth suggests that the Commission solicit comment on whether it would be useful to channelize the spectrum based on the particular services offered.[69] Additionally, Amtech states that the Commission should consider how a limited amount of spectrum could be employed on an uncoordinated non-exclusive basis for use without individual station licenses. Amtech adds that unlicensed devices would serve various transportation needs involving the use of portable and vehicle-mounted tag readers to identify "passive electronic landmarks"[70] such as street addresses and intersections.[71]

37. Another issue related to channelization and technical flexibility is the use of both active transceiver tags and passive backscatter DSRC mobile units. Amtech and others point out that current DSRC mobile units employ either passive backscatter tags[72] or active transceiver tags to communicate with roadside beacons. Amtech states that, on the one hand, passive backscatter tags are more reliable than active transceivers and are more "frequency agile," having the ability to communicate over a wider range of frequencies. On the other hand, Amtech points out, active transceiver tags can communicate over longer distances with less power than passive backscatter tags, but may have a limited battery life. ITS America indicates that a dual mode environment, in which both backscatter and active equipment could operate in the band, is possible. For instance, ITS America states, backscatter equipment could operate in the separation spaces

[68] *See* 3M Comments at 5.

[69] *See* BellSouth Comments at 6.

[70] In this scenario, for example, a vehicle-mounted, beacon-type transmitter would emit signals that would reflect off and convey data from passive devices attached to the landmark.

[71] *See* Amtech Reply at 8.

[72] Amtech explains that backscatter tags contain circuitry that modulates a signal striking the tag so that the reflected (backscatter) signal can be received by a reader and then decoded. Backscatter tags do not contain a transmitter and may operate without a battery, relying on the incident signal as a source of electric power. By contrast, active DSRC tags (transceivers) contain transmitters and receivers for communicating with beacons and must be connected to batteries or some other source of electric power. *See* Amtech Reply at 7.

between the active device channels. ITS America adds that backscatter equipment could also operate in the active device channels in those locations where active devices are not used.[73]

38. Proposal. Although we may defer decisions on channelization issues to a later proceeding addressing service rules and licensing of DSRC services, we believe it useful now to discuss, explore and solicit comment on these issues. This process should assist standards setting organizations that are currently studying and evaluating channelization concerns. While the anticipated variety of DSRC services and technologies may complicate considerably the ultimate resolution of channelization issues, we believe that some channelization of the DSRC spectrum may be essential to promote spectrum efficiency and to facilitate interoperability. Any DSRC channelization plan would almost certainly have to accommodate needs to deploy affordable equipment, to transmit and receive both narrowband and broadband data, and to handle a variety of communications, including one-way low-speed data links, two-way high-speed data links and so forth. Given the varying capacity demands of the anticipated DSRC applications, there appears to be a need for DSRC channels of different bandwidths.

39. We agree with commenters that active and passive backscatter tags have been used advantageously for existing DSRC-type services, but we do have some concerns as to how these technologies may be best put to use in the proposed spectrum. Though passive backscatter devices are affordable and suitable for many DSRC applications, they are typically less spectrum efficient than active transceivers. To accomplish the same coverage distances as active transceivers, backscatter system beacons must transmit with much higher power, which in turn reduces system frequency reusability. Additionally, backscatter system beacons sweep across wide bandwidth channels to activate the passive backscatter device and then to receive the reflected signal. By contrast, active tag systems could employ channels of narrower bandwidth. Further, active devices can employ higher order modulation techniques capable of transmitting more data in narrower bandwidth channels. We also note that ITS manufacturers are currently developing both active and passive DSRC equipment for the 5.8 GHz range with various bandwidth requirements. As DSRC services and technologies develop, we anticipate that a desire for higher data throughput and increased spectrum efficiency may favor a migration to active devices using efficient modulation techniques. Further, we believe that economies of scale will cause active DSRC devices to become more affordable as DSRC services develop.

40. We solicit comment and proposals for a channelization plan. We encourage commenters and standards setting organizations to consider and discuss the following factors in developing a DSRC channelization plan: optimization of spectrum use; use of informal standards to promote compatibility or interoperability of certain DSRC applications; flexible channel options for emerging services;[74] diversity of DSRC services; and equipment affordability. For

[73] *See* ITS America Petition Attachment 5 to Appendix L at 1.

[74] We note that ARINC's Report indicates that some DSRC applications may need to operate at data rates of up to 508,707 bits/sec, while others may only need data rates as low as 12,646 bits/sec. To allot the same size channel for both applications would be wasteful. *See supra* Section A (discussion of size of DSRC allocation). We

example, a proposed DSRC channelization plan could provide for a few wideband channels for certain purposes, such as backscatter automatic toll collection, and reserve a number of narrowband channels for active transponder DSRC services or other services with smaller data throughput requirements. We request comment on whether provision for different channel bandwidths for different data requirements or technologies would significantly effect the viability or cost of DSRC equipment. Further, we request comment specifically on whether to permit use of both passive and active DSRC devices and on whether and how reliance on informal DSRC technical standards, as opposed to Commission-adopted standards, may facilitate a smoother transition or integration among DSRC technologies.

41. Another important technical parameter, which affects the ability of DSRC operations to avoid causing interference to DSRC operations on other channels or to other services in nearby spectrum, is frequency stability. We propose to require DSRC emissions to comply with the requirements specified in Section 2.995 of our Rules.[75] The technical requirements we propose above should be achievable with existing technologies without unnecessarily or unreasonably increasing the cost of DSRC equipment. These requirements would be incorporated into the certification process by requiring equipment manufacturers to certify as part of their application for certification that their equipment meets the necessary technical requirements. Therefore, licensees and new applicants would be assured that any equipment they purchase would comply with these requirements. We request comment on the technical requirements proposed above.

C.5. Unlicensed DSRC Technical Standards.

42. As previously observed, Amtech has requested that some DSRC channels be made available on an uncoordinated non-exclusive basis. We note that Part 15 of our Rules currently permits operation of some unlicensed devices in the 5.8 GHz range that may be appropriate for DSRC use. Specifically, Section 15.245 of our Rules permits unlicensed field disturbance sensors to operate in the 5.785-5.815 GHz band. While these field disturbance sensors are not available for two-way information communications, our Rules would permit backscatter type toll-tag operations in this band with a permitted average field strength of 500 millivolts/meter at a distance of 3 meters (75 mW EIRP).[76] Additionally, Section 15.247 of our Rules permits unlicensed spread spectrum communications devices to operate in the 5.725-5.850 GHz band with

especially note that current technology permits active transceivers to operate at the higher data rate with channel widths of less than 500 KHz and therefore are skeptical of the asserted need for 6 megahertz channels. Therefore, we encourage entities working on channelization plans to consider spectrum efficiency issues and avoid channelization that could result in the use of inefficient modulation techniques.

[75] *See* 47 C.F.R. § 2.995. (Frequency stability to be measured with ambient temperature variation of -30° to +50° Centigrade and with variation of primary supply voltage of 85-115% of nominal value.)

[76] *See* 47 C.F.R. § 15.245(b).

a maximum peak transmitter output power of 1 watt with antenna gain of up to 6 dBi.[77] Finally, Section 15.249 permits unlicensed communications devices to operate in the 5.725-5.875 GHz band with a maximum average field strength of 50 millivolts/meter at a distance of 3 meters (0.8 mW EIRP).[78] We note that each of these three sections may have some limiting factors, such as restrictions on power, modulation technique and type of operations permitted. Nevertheless, we believe there are several DSRC applications that could be deployed on unlicensed spectrum and could benefit from the flexibility typically permitted these operations. For example, the low power, short range aspect of some unlicensed operations would permit many businesses within the same area to establish cashless transaction services at drive-through windows. We request comment on the sufficiency of the existing rules with respect to employment of unlicensed devices for DSRC.

D. Other Issues.

43. In its proposed rules, ITS America defines DSRC 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.

3M states that the Part 90 LMS rules limit the 902-928 MHz band to non-voice radio techniques to determine the location and status of mobile radio units, but it argues that ITS could extend far beyond the "location and status" functions of LMS under Part 90. 3M contends that the Commission should not create the impression that it is substantially identical to the LMS, which has a far more limited application than the new and evolving DSRC systems.

44. While some ITS proponents assert that DSRC implementation should be driven by public safety and roadway government authorities and licensed under the Part 90 Private Land Mobile Radio Service rules,[79] BellSouth contends that commercial DSRC applications provided by non-government entities should be considered as commercial services and licensed by competitive bidding. BellSouth questions the impact of new DSRC services on existing commercial wireless service providers and requests the Commission to seek comment on licensing and competition issues.[80] ITS America and others acknowledge that further consideration and

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[77] *See* 47 C.F.R. § 15.247(b).

[78] *See* 47 C.F.R. § 15.249(a).

[79] *See e.g.*, 3M Reply at 9 and ITS America Reply at 8.

[80] *See* BellSouth Comments at 5.

consensus building is needed regarding issues of licensing, commercialization, and other implementation matters, but believes that these issues could be resolved through standardization activities and the Commission's deliberations in this proceeding.[81]

45. *Proposal.* We acknowledge that ITS operations, including those of the DSRC type, could expand well beyond the current functions of the LMS. Similarly to the LMS, however, we do not anticipate a need for voice communications as part of DSRC applications, but request comment on this issue. Further, we believe it is appropriate for now to include the DSRC rules under Part 90 of our Rules and as part of Subpart M, "Intelligent Transportation Systems Radio Service."[82] We anticipate no difficulty in distinguishing between LMS and DSRC rules where necessary. Further, we propose to adopt ITS America's definition of DSRC applications. We request comment all these matters.

46. We also acknowledge that DSRC applications could include a varied mix of commercial, private and public safety services. This mix of services could possibly be provided over designated channels to each service or all DSRC channels could possibly be used for any mix of services. It is also possible that the licensing of these services will depend on many factors, including the structure of the channelization plan and whether licenses will be issued on a mutually exclusive basis. In any event, we believe it is premature to address BellSouth's competition and licensing concerns and will defer discussion of these issues to a later proceeding addressing service and licensing rules. Nevertheless, we request comment on the extent to which the potential licensing issues and the private versus commercial nature of DSRC-based services effects the allocation, channelization and other technical issues discussed in this proceeding.

PROCEDURAL INFORMATION

47. Initial Regulatory Flexibility Analysis. We have certified under the Regulatory Flexibility Act that this present action will not have a significant economic impact on a substantial number of small entities, and have nonetheless voluntarily written an Initial Regulatory Flexibility Analysis (IRFA) of our action. The certification and voluntary IRFA can be found in Appendix C. Written public comments are requested on the IRFA. Comments should must be identified as responses to the IRFA and must be filed by the deadlines for comments on this NPRM provided in paragraph 50, *infra*.

48. Ex Parte Presentation. This is a permit-but-disclose rule making proceeding. Ex parte presentations are permitted, provided they are disclosed as provided in Commission Rules. See generally 47 C.F.R. Sections 1.1202, 1.1203, and 1.1206(a).

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[81] *See* ITS America Petition at 41.

[82] We note that the name of Subpart M of Part 90 has recently been changed from the "Transportation Infrastructure Radio Service" to the "Intelligent Transportation Radio System Service." Therefore, 3M's request to rename this subpart is moot. *See Memorandum Opinion and Order*, WT Docket No. 93-61, 12 FCC Rcd 13942 (1997).

49. Authority. This action is taken pursuant to Sections 4(i), 7(a), 303(c), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 157(a), 303(c), 303(f), 303(g), and 303(r). The Commission's Office of Public Affairs, Reference Operations Division, will send a copy of this Notice of Proposed Rulemaking, including the Initial Regulatory Flexibility Certification and voluntary Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

50. Comment. Pursuant to applicable procedures set forth in Sections 1.415 and 1.419 of the Commission's Rules, interested parties may file comments on or before **[75 days after Federal Register publication]**, and reply comments on or before **[105 days after Federal Register publication]**. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. To file formally in this proceeding, participants must file an original and four copies of all comments, reply comments, and supporting comments. If participants want each Commissioner to receive a personal copy of their comments, an original plus nine comments must be filed. Comments and reply comments should be sent to Office of the Secretary, Federal Communications Commission, Washington, DC 20554. Comments and reply comments will be available for public inspection during regular business hours in the FCC Reference Center (Room 239) of the Federal Communications Commission, 1919 M Street, N.W., Washington, DC 20554.

51. Additional Information. For further information concerning this rule making proceeding contact Tom Derenge at (202) 418-2451, internet: tderenge@fcc.gov, Office of Engineering and Technology, Federal Communications Commission, Washington, DC 20554.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas

Magalie Roman Salas WRC
Secretary

Appendix A: Proposed Rules

Parts 2 and 90 of title 47 of the Code of Federal Regulations are proposed to be amended as follows:

PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

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

AUTHORITY: Sec. 4, 302, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303 and 307, unless otherwise noted.

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

a. Remove the existing entry for the 5850-5925 MHz band in columns (1) through (7).

b. Add the entry in numerical order for the 5850-5925 MHz band in columns (1) through (7).