Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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

Comments of the United States Department of Transportation

The Federal Communication Commission ("FCC" or "Commission") has previously allocated the 5.80 – 5.925 GHz band ("5.9 GHz band") of the spectrum to Dedicated Short Range Communications ("DSRC") within the Intelligent Transportation Systems ("ITS") radio service. ET Docket No. 98-95, Report & Order, 14 FCC Rcd18221 (1999) ("1999 Allocation"). [1] At that time the Commission deferred action on the many policy and technical questions that must be answered before such allocations may actually be utilized while the United States Department of Transportation ("DOT" or "Department") developed standards addressing such matters. Id. at ¶ 1. The FCC in this proceeding will consider these issues and promulgate licensing and service rules governing the licensing and use of the 5.9 GHz band. Notice of Proposed Rule Making and Order, WT Docket No. 01-90; ET Docket No. 98-95 (November 15, 2002) ("NPRM"). The Department respectfully submits these comments in response to specific issues posed by the Commission.

I. Introduction

The NPRM outlines the important details of the background of this proceeding. NPRM at ¶¶ 4-8, 18, 26-27. More specifically, the Commission accurately stresses Congress' adoption of the national ITS program to enhance the safety and efficiency of our surface transportation system, its express recognition of the central role played by DSRC in that effort, and the need for interoperability to expand benefits nationwide. Id. [2]

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[1]/ DSRC systems have historically consisted of vehicle-mounted transponders that communicate in the microwave band with roadside "readers." They are also likely to include vehicle-to-vehicle communications in the near future.

[2]/ The Intermodal Surface Transportation Efficiency Act of 1991 ("ISTEA") and the Transportation Equity Act for the 21st Century ("TEA-21") are the pertinent federal statutes in this regard. Pub. Law No. 102-240, 105 Stat. 1914 (1991) and Pub. Law No. 105-178, 112 Stat. 107 (1998), respectively.

Congress directed DOT and the Commission to work in their respective spheres to bring this about. NPRM at ¶¶ 7, 26-27.

In carrying out its statutory responsibilities, the FCC has allocated the 5.9 GHz band for DSRC, it has encouraged consensus-building on standards leading to national interoperability, and it has committed to additional action deemed necessary to implement those standards. Id. at ¶ 27. For its part, DOT has supported the allocation of spectrum for DSRC and has sponsored the development of standards for this technology. The progress made to date supports Congress' judgment that significant potential benefits can be achieved in transportation safety through the use of the DSRC technology. Currently, over 40,000 lives are lost each year on our nation's highways. DSRC is a key technology that can aid in crash avoidance systems and other safety applications that could significantly reduce this tragic loss of life. *See* Id. at ¶¶ 18, 20.

Accordingly, the Department is working toward the day when every vehicle on our roadways will incorporate DSRC in-vehicle safety applications. Two conditions, however, are necessary to make that day a reality: national interoperability (which requires mandatory standards), and opening the 5.9 GHz band to additional (non-safety) uses on a non-priority basis.

II. DSRC Experience To Date

The safety applications of DSRC generally fall into two categories: those that have been tested and could be deployed immediately, and those that are being explored for future implementation. Experience with the former is most instructive in determining how best to nurture the development and deployment of the latter.

DSRC safety applications available right now include techniques such as traffic signal preemption by emergency vehicles, automatic safety screening of trucks, and international border clearance. [3] Despite their availability, use of these technologies has been limited. Currently, although there are approximately 6,000,000 heavy trucks on the nation's highways, only about 250,000 commercial vehicles have DSRC devices installed for the purpose of electronic safety screening. [4] Broader deployment has been hampered by the lack of a national DSRC standard, the relatively modest capabilities of current

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[3]/ DSRC is the subject of a Technical Working Group under the North American Free Trade Agreement ("NAFTA") to work toward interoperability on the North American continent. This group includes DOT, the Immigration and Naturalization Service, and U.S. Customs.

[4]/ States have limited resources to devote to such safety inspections, and physically inspect only a small percentage of vehicles. Electronic screening at roadside inspection stations is thus key to monitoring the safety status of many more trucks and their drivers. Electronic screening entails an inquiry to a national database containing records of the safety status of individual trucks and drivers to determine whether a physical inspection of a particular vehicle or driver should be undertaken. In a study of 40,000 inspections conduced via DSRC systems in the 900 MHz band, safety inspectors increased the number of unsafe commercial drivers and vehicles removed from the highways by 50 percent. Thirty-one states are deploying this technology, and fourteen are in the planning phase.

technology, and the absence of any obvious or recurring "payoff" arising from existing safety applications.

Where even the relatively basic capabilities of current technology meet an obvious need in an economic manner, however, deployment has been widespread indeed. The total of installed DSRC safety devices is dwarfed by the approximately 15 million trucks and non-commercial vehicles that employ DSRC for electronic toll-collection purposes. Even for such relatively attractive devices, however, the lack of interoperability has impeded the growth of the market in both geographic and absolute terms. Historical experience is again instructive. Producers and users of DSRC devices and services in the 900 MHz band, the only other portion of the spectrum allocated to DSRC, are typically technology companies, toll and highway authorities, and motorists in limited geographic areas. Proprietary systems for individual toll or regulatory entities, incompatibility, and/or interference are the rule; frustration and inefficiency the result. *See* Id. at ¶ 25. [5]

This experience suggests at least two fundamental points. The first is that an application with a clear commercial value (like on-the-fly toll payments) will be more apt to attract large numbers of suppliers and users, while an application with a perhaps less measurable return -- despite a clear contribution to safety -- will not. The second is that voluntary standards have not worked to extend use of such devices beyond finite areas and limited categories of users, and that the existence of incompatible devices has impeded the creation of a broader market. [6] These circumstances have combined to produce what is at present a limited opportunity for DSRC devices and services that by itself is unlikely to attract investment sufficient to sustain and advance that technology.

History thus teaches that advanced safety applications demand national interoperability. DSRC provides the critical communications link to the roadside and to

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[5]/ For example, if a motor carrier wanted to take advantage of both electronic screening and electronic toll paying as its vehicles crossed the country, it would need a minimum of four DSRC devices in each vehicle. Virtually no trucking firms or individual drivers do this, and it is not clear the current non-standardized DSRC devices would even operate in this environment.

[6]/ The Commission has asked whether the apparent existing consensus on a standard, discussed below, obviates the need for a mandatory standard. Id. at ¶ 33. The answer is that it does not. The ASTM standards committee consisted of about forty interested parties and included all of the current manufacturers of DSRC devices in the 900 MHz Band. However, there is no guarantee that the existing members of the committee will adhere to the agreed-upon standard if they believe that there is a market advantage to be gained in not doing so. In fact, the committee members recognized this fact of life and *recommended* that the standard be mandatory. There are also many more potential suppliers of DSRC technology that did not participate in the standards process. Some of these companies will undoubtedly conclude that they have better/cheaper DSRC technology with which to implement their particular applications. They will adopt whatever technical approach they believe serves their business interests. The consistent result of our previous experiences tells DOT that without some mandatory set of standards designed to ensure interoperability, the marketplace will produce a variety of solutions that are guaranteed not to be compatible.

other vehicles in these applications. DSRC in the 5.9 GHz band has the potential to stimulate expansive deployment of these technologies. However, the market for purely safety-related applications is relatively small. *See* NPRM at ¶ 22. Opening this band (on a non-priority basis) to applications other than safety would broaden the market qualitatively, so as to provide industry the incentive to develop DSRC products on which public safety applications would "piggyback," and both types of application would benefit from economies of scale. *See* Id. at ¶¶ 22, 31. It would also be consistent with Congress' intent that ITS technologies be relied upon to advance both the safety *and* efficiency of our surface transportation system. *See, e.g.*, Id. at ¶¶ 18, 20. We therefore urge the Commission to take this opportunity to put in place the conditions necessary to make nationwide interoperability and deployment of DSRC technologies a reality.

III. National Interoperability and Non-Safety Uses in the 5.9 GHz Band

The Commission has already indicated that it appreciates the import of Congress' charge to ensure national interoperability in the ITS program where appropriate, and with respect to DSRC in particular. NPRM at ¶¶ 4-8, 26-27. [7] Beyond the dictates of law, national interoperability is crucial because the benefits of so many DSRC technologies will be realized only if owners and drivers of all kinds of vehicles, safety and regulatory authorities, and others can expect the same information and services no matter where they are or what kind of vehicle is involved. 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. *See* NPRM at ¶ 26-27. 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. DOT has worked with two well-known bodies in developing the appropriate set of DSRC standards, the American Society of Testing and Materials ("ASTM"), and the Institute of Electrical and Electronic Engineers ("IEEE"). [8] It is the ASTM standards that the Intelligent Transportation Society of America ("ITS America") has proposed that the FCC adopt in this proceeding. *See* NPRM at ¶¶ 11, 28, 34. It is these standards that the

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[7]/ DOT has identified DSRC services as a critical component of the ITS program for which national interoperability is essential. Id. at ¶¶ 5, 7.

[8]/ As the Commission knows, Congress required that federally funded ITS technologies conform to national standards. *See* § 5206(e)(1) of TEA-21, *quoted in* note 34 of the current NPRM. It is therefore appropriate to note that, through ASTM and IEEE, the dozens of companies and public agencies of all kinds that have participated in their development have very recently requested DOT to explore ways to ensure total interoperability through the entire set of DSRC standards adopted by these two standard-setting organizations. DOT will seriously consider this request.

Department believes the FCC should mandate for use by DSRC devices in the 5.9 GHz band. [9]

Indeed, satisfying the diverse technical requirements of both safety and other applications of DSRC, and the fundamental issues related to interoperability discussed above, have been the genesis for the coordinated set of licensing and service rules proposed by ITS America. Id. Given the primacy of interoperability and its dependence on mandatory standards, DOT requests the Commission to adopt service rules and licensing requirements that are consistent with the ASTM standards.

A second generation of DSRC safety applications is currently in development and could begin deployment in five to seven years. Examples in this category include in-vehicle signing technologies and systems to aid in crash avoidance. Over the past ten years the Department has expended over $100 million on the development of in-vehicle safety technologies for all classes of motor vehicles. Moreover, seven of the major motor vehicle manufacturers (Ford, Daimler-Chrysler, General Motors, Nissan, Toyota, BMW, and Volkswagen) have collectively spent over $40 million of their own funds researching these same applications. This program, the Intelligent Vehicle Initiative ("IVI"), offers the potential of saving thousands of lives each year. But current indications are that this potential is less likely to be reached without a market sizeable enough to attract the private investment in technological advances and cost reductions necessary to appeal to the traveling public. Indeed, the Department and its IVI partners have formally acknowledged the necessity for standards in order for these technologies to be successfully deployed. Thus, the vehicle manufacturers in the IVI program have been active participants in the DSRC standards process.

The safety applications under development in the IVI program include systems that can help prevent front-end and rear-end crashes, lane departure and run-off-the-road accidents, and collisions in intersections. If successfully developed and deployed, these systems will be able to save thousands of lives a year. Several of these systems depend upon a reliable, secure, short range, high-speed communications link between the vehicle and the roadside and/or between vehicles. DSRC is that communications link. Some of these key applications will begin vehicle testing this summer. Prototype DSRC devices, built to the ASTM standards, will be part of that test.

It will be at least five years before this generation of safety systems appear in vehicles. It will be several more years after that before a large percentage of vehicles are so equipped. For this process to begin and to evolve in the proper way, the manufacturers of vehicles and producers of DSRC hardware and software must have some assurance of stability -- standards -- in the underlying devices to ensure interoperability. Absent such assurances, the market for DSRC devices and services may develop other safety and non-

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[9]/ We do not ask the Commission to adopt and mandate the IEEE standards, which concern other aspects of DSRC operations.

safety applications using a variety of technical approaches. [10] The investments made to produce these myriad devices and services would naturally generate self-interested positions by market participants who would oppose any alternative technical standard, whatever its other merits. The time to establish standards is now, before market positions become entrenched. [11]

The Commission is intimately familiar with the consequences of the continuing lack of interoperable equipment in the public safety community. In the aftermath of September 11, 2001, the visibility of that problem has materially increased. Developing solutions to work around the problem and thereby allow various agencies to communicate information in a variety of emergency situations is an expensive proposition. [12] There is every reason to act now to avoid this problem in the future.

Although it is unusual, it is not unprecedented for the FCC to adopt technical standards. *See* NPRM at ¶ 32. For a new radio service such as DSRC, the FCC has the opportunity to ensure interoperability, and enhance the viability of the major advances in vehicle safety that depend upon DSRC, through this rulemaking. DOT accordingly urges the Commission to adopt the ASTM standards, including revisions subsequently approved by ASTM. Id. at ¶ 34. [13] We also support a requirement that manufacturers of DSRC equipment certify their compliance with those standards. Id. at ¶ 33.

The Commission is concerned that requiring use of a specific standard might stifle innovation. Id. at ¶ 33. There is no basis for this concern in this case. DSRC is a new radio service. The innovative skills of American industry will be concentrated on developing creative services for this new market opportunity. Already, there has been interest in using DSRC as a means to download entertainment into vehicles while at the gas pump. Experiments are underway to use DSRC to pay for meals at a nationally known fast food restaurant chain. The creative approach taken by the standards committee in using a control channel and offering great flexibility in the capability and use of the spectrum will foster more innovative uses of DSRC in a competitive

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[10]/ This would particularly tend to be the case for devices that could accommodate only one or a very small number of applications rather than the relatively unlimited number of uses for which the ASTM standards were designed.

[11]/ As noted previously, proprietary systems for individual toll or regulatory entities have resulted in incompatibility and/or interference, with their attendant frustration and inefficiency. *See* NPRM at ¶ 25.

[12]/ For example, Congress allocated $20 million to the Capital Integrated Wireless Network ("CapWIN") project. CapWIN is a partnership between the States of Maryland and Virginia and the District of Columbia to develop an integrated transportation, public safety, and criminal justice information wireless network. http://capwinproject.com

[13]/ This only recognizes the practical fact that truly viable standards will have to undergo revisions through actual field experience in the deployment of various applications of the technology. Therefore, to achieve the result of interoperability, the standards must be flexible enough to respond to the needs of the users.

nationwide market. DOT has encouraged these applications since we view private sector services as essential to the successful deployment of DSRC at 5.9 GHz.

IV. Other Issues

A. Definitions

The Commission has also asked for comment on various potential definitions. The first is for DSRC service itself, and particularly whether it should include voice communications. NPRM at ¶¶ 14-16. DSRC service has never been intended to be a two-way voice communication system. However, in various safety applications it will provide motorists with location-specific warnings about relevant road conditions, work zones, incidents, or other travel-inhibiting information, that are consistent with the short range nature of DSRC. DOT has been researching how best to convey such information to the driver without undue distraction. This research is not yet complete, but it now appears that a voice interface seems to be the most appropriate way to present this information. Therefore, the Department suggests that the term "non-voice" be deleted from the current definition of DSRC service.

Similarly, the FCC has also sought comment on the appropriate definition of "public safety," "public safety services," and other terms in various contexts, including whether to permit non-public safety (*i.e.,* "private") services in the 5.9 GHz band. Id. at ¶¶ 16, 18-23. There should be no question but that the advancement of public safety is DOT's single most important mission. We would not participate in this proceeding absent the prospect that it would assist in that endeavor. It is for this reason that the ASTM standards we urge the Commission to adopt accord safety the highest priority over all private uses. *See, e.g.,* Id. at ¶¶ 22, 40, 42. At the same time, as noted above, DOT recognizes the need to permit such uses in the 5.9 GHz band on a subordinate basis in order to further the cause of transportation safety. The Department has no expertise in the relevant FCC regulatory provisions, and thus takes no position on whether particular definitions may need revision or reinterpretation. We simply ask the Commission to make whatever regulatory modifications it deems appropriate to maximize the use of the band while preserving the priority of safety services therein. DOT believes that applying the ASTM standards to all uses would have this result.

B. Licensing

ITS America has proposed that the fixed roadside units with which in-vehicle transponders will communicate be licensed on a site-specific basis, in order to maximize the opportunities for investment in and deployment of different DSRC applications. Id. at ¶¶ 41-45. The Commission discusses potential disadvantages to this licensing plan and the merits of geographic area licensing as an alternative, and asks for comment. Id. at ¶¶ 46-47.

Unfortunately the Department has no more expertise in the fine points of various licensing options or their implications than we do in regulatory definitions. DOT does, however, appreciate how critical national interoperability is to a widespread deployment of DSRC services and their benefits and how these in turn rely upon mandatory technical standards. We also recognize that, even if the FCC shares our views on these fundamental points, their import will be directly affected by the licensing scheme adopted herein. DOT accordingly recommends that the Commission's decision on licensing be guided by the need to ensure national interoperability and uniform technical standards. [14]

C. Incumbent Services in the 5.9 GHz Band

There are two major incumbent users in the 5.9 GHz band: the fixed satellite service ("FSS") and government radars operated by the Department of Defense ("DOD"). The Commission has requested comment on the coordination between these services and DSRC. *See* NPRM at ¶ 3.

1. Fixed Satellite Services

The Department recognizes that there is potential for the FSS to interfere with DSRC operations. However, at the same time it is important to clarify the limited scope of this potential. Currently the number of satellites and the uplink facilities that communicate with them is very limited. Further, only two of these satellites are capable of receiving transmissions in the 5.9 GHz band: the Intelsat VI and Intelsat VIII hemi/zone transponders. Additionally, most of the uplink facilities are located away from metropolitan areas where most DSRC activity is expected to occur. Finally, most satellite uplink facilities use highly directional antennas and limit the amount of energy radiated in directions other than to the satellite.

To better understand the precise technical dimensions of this problem, when the question of allocating the 5.9 MHz band to DSRC was pending Department had the Institute for Telecommunication Sciences in Boulder, Colorado, analyze the incident field strength of an earth station uplink facility. *See* NTIA Report 00-373. [15] The empirical data showed that the interference range in the main beam of the antenna can extend out beyond 1500 meters, but drops off at slightly less than $1/r^2$ (where r is the distance to the transmitter). As users leave the main beam, they will enter side lobes, but the power in these will be much lower than in the main beam and significantly reduced interference ranges will result. Add to this the antenna elevation angle, and DOT anticipates that interference would be very localized.

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[14]/ In this regard, we understand that geographic area licensing may be inconsistent with the ASTM technical standards that are key to national interoperability.

[15]/ This report is available on the NTIA website at: http://glossary.its.bldrdoc.gov/pub/ntia-rpt/98-352/dsrc.html/ .

Our conclusion is that overall there does exist some minor but irreducible need for new earth stations operating in the 5.9 GHz band to coordinate with existing DSRC users within a two-mile radius. New earth stations in that case would need to be aware of existing DSRC facilities and work with them to reduce the potential interference through mitigation techniques (such as terrain shielding, directional antennas, and radio frequency fencing). The Department suggests that the FSS providers coordinate any new installations with the selected frequency coordinators.

2. Government Radars

Military radars operated by the DOD are the other major incumbent users in the 5.9 GHz band. The potential for interference between these installations and DSRC devices was addressed previously to the satisfaction of DOD in the Interdepartmental Radio Advisory Committee ("IRAC") and subsequently before the Commission, which resulted in the coordination zones now found in FCC rules. 47 C.F.R. § 90.371(b).

Through IRAC, DOD provided a list of all locations that either currently or in the future could support the operation of government radars in this band and require coordination. At that time DOT again tasked the Institute for Telecommunication Sciences with exploring the technical parameters of extant DSRC equipment operating in the 5.9 GHz band. [16] The analyses considered worst-case scenarios in order to ensure the degree of protection and flexibility desired by DOD; they did not examine the potential various mitigation techniques might have for reducing the coordination zone. [17] The Department will now pursue additional analyses using equipment that complies with the ASTM standards. We will also examine the effectiveness that mitigation techniques such as terrain shielding, directional antennas, and RF fencing could have on a case-by-case basis.

What is important to stress at this point is that the Department has expended substantial effort in developing the existing coordination zones with DOD and IRAC to ensure that their concerns, including the potential future deployment of high-power military radars, were resolved. All participants agreed on the language now contained in Section 90.371(b) of the Commission's rules to forestall interference. We will continue to work with DOD and IRAC to ensure that appropriate guidelines are developed in coordination with industry to provide adequate protection for all users of the band. In short, there is no need to promulgate additional regulations on this matter.

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[16]/ European and Japanese DSRC devices operating in this band were used, since all relevant U.S. equipment then functioned (and still does) at 900 MHz.

[17]/ NTIA Report Nos. 98-352 and 99-359. Theses analyses are available on the NTIA website at: http://glossary.its.bldrdoc.gov/pub/ntia-rpt/98-352/dsrc.html/ and http://glossary.its.bldrdoc.gov/pub/ntia-rpt/99-359/

V. Conclusion

Through this proceeding the Commission will adopt the technical and other conditions necessary to implement its prior allocation of spectrum in the 5.9 GHz band to DSRC services. Those services are an integral part of the Department's ITS program, as Congress and the FCC have recognized. Nonetheless, DSRC services can truly bring about advances in safety and efficiency only to the extent they are developed and deployed. Technological development and nationwide deployment depend upon a robust marketplace, which requires that the Commission adopt technical standards nationwide and allow use of the band by private services in a manner that is subordinate to public safety services. So long as they proceed from and serve these critical requirements, the FCC's decisions on licensing regimes, definitions, and other such matters will help create the environment most conducive to fulfilling the promise of DSRC services.

Respectfully submitted,

Kirk K. Van Tine
General Counsel

March 17, 2003

April 14, 2003

Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445 12th Street, SW
Washington, DC 20554

Re: WT Docket No. 01-90

Dear Secretary Dortch:

Enclosed herewith are the Comments of the United States Department of Transportation in the above-referenced proceeding. I submitted this document electronically on March 17, 2003, but, through inadvertence, filed it in a related matter, ET Docket No. 98-95. I just became aware of this error and would like to correct it by entering the Department's comments in the proper docket.

Thank you for your assistance. I apologize for any inconvenience or uncertainty.

Respectfully submitted,

Paul Samuel Smith
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Enclosure