traveling public. As an example, in-vehicle signing will warn drivers in advance of ice and other roadway hazards. Slippery road conditions contribute to approximately 20 percent of all single vehicle roadway departure crashes. Lack of attention to roadway conditions – which can be remedied with a DSRC-based in-vehicle alert system – contributes to another 15.5 percent of this crash type.

The clear consensus of the ITS stakeholders is that safety-related DSRC services should be accorded the highest priority in the service rules. To this end, under any scenario, the ITS community urges that a significant portion of the DSRC spectrum be designated for ITS-related public safety services, and licensed as such. This will ensure that spectrum is available on a national, interoperable basis to provide these critically-needed communications. ITS America believes that a public safety designation for a portion of the DSRC spectrum is consistent with recent FCC action.

In particular, the Commission sought comment on the conclusions and recommendations of the Public Safety Wireless Advisory Committee ("PSWAC") – a joint advisory committee established by the Commission and NTIA to explore the spectrum needs of public safety agencies. Among other things, the *PSWAC Final Report*[17] promoted the participation of non-traditional public safety organizations, such as ITS service providers, in the provision of public safety services. Moreover, the *PSWAC Final Report* and accompanying subcommittee reports stressed the important public safety value of ITS, and recommended expeditious allocation of the 5.850-5.925 GHz band for DSRC systems.

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[17] Final Report of the Public Safety Wireless Advisory Committee to the Federal Communications Commission and the National Telecommunications and Information Administration, September 11, 1996 ("*PSWAC Final Report*").

Both the *PSWAC Final Report* and the *Public Safety NPRM* correctly recognized that, in today's world, many entities in addition to traditional public safety organizations perform essential public safety functions. Consequently, both documents proposed a modification of public safety-related definitions to reflect and encourage this reality. These modified definitions permit public safety agencies to better fulfill their missions by allowing them to utilize the full panoply of available communication and information technologies, including ITS-related services.

To meet this public safety need, the options under active consideration have been narrowed to three possibilities. These are: (1) allocation of the DSRC spectrum for public safety usage; (2) division of the DSRC spectrum between public safety and private uses; and (3) division of the DSRC spectrum between public safety and commercial usage.

1. Allocation of the DSRC Spectrum for Public Safety Usage

Allocation of the entire 75 MHz to public safety DSRC uses would ensure that the critical public safety applications that are the core of the DSRC-based ITS user services could be provided as robustly as possible. This would provide spectrum both for the known public safety DSRC applications and for new uses. The discussions of ITS stakeholders evidence a concern, however, that the public safety eligibility limitations may chill the introduction of innovative new ITS applications for private and/or commercial uses. Moreover, there is some concern that this approach would require an allocation of public funding to the DSRC infrastructure build out that would not be feasible in the near term. Thus, allocation of the entire DSRC band for ITS public safety uses may be at odds with the goal of obtaining rapid deployment of these services as well as with attaining economies of mass production that may be spurred by the commercial markets.

As discussed in Section I of this Status Report, a number of ITS stakeholders are encouraging U.S. DOT to explore the costs and benefits of mandating DSRC devices, offering a new communications capability, be installed in all new vehicles. At the present time, however, there are differences of opinion among ITS stakeholders on the benefits of such a mandate and further dialogue and consensus building are required on this issue.

2. Division of the DSRC Spectrum Between Public Safety and Private Uses

The second band plan under consideration would segment the DSRC band between public safety and private uses. The precise division between public safety and private uses would require careful balancing of the respective needs of both segments with priority accorded to public safety uses. The initial focus is on the market-driven deployment of private sector commercial DSRC applications with the expectation that this deployment will promote adequately widespread installation of in-vehicle communications capability and provide a backbone of technology for Public Safety applications. There are variations in how this band plan could be implemented including the allocation of some (or all) of the private band for low power unlicensed use or potentially (as discussed in Section III of this Report) licensed by rule uses. Alternatively, because the private uses are of a short range, they could be licensed on a first come, first-served site specific basis. Mutually exclusive applications would be unlikely to occur with any frequency under this approach.

This band plan would offer a balancing of public and private sector interests, and would encourage the deployment of DSRC infrastructure by the commercial markets. At present, it is unclear whether site specific licensing of private uses would present a sufficiently attractive alternative to commercial entities that desire to establish a DSRC-based business. This issue requires further exploration and consensus building.

3. Division of the DSRC Spectrum between Public Safety and Commercial Usage

The third approach under consideration reflects a division of the DSRC spectrum between public safety and commercial uses licensed by geographic area. This may present the most certain commercial environment for the capital markets. ITS stakeholders, however, are concerned that this approach may also pose the greatest danger that the spectrum would be diverted by the geographic licensees to non-ITS purposes. In this respect, use and eligibility limitations must be imposed to ensure that the primary use of the spectrum is the deployment of ITS applications.

The opportunity provided by these frequencies to establish a successful commercial service is substantial:

- The frequencies are available nationwide with very little interference.
- Frequencies in the same range have been set aside for ITS purposes in Europe and Japan.
- There is no existing base of ITS public and commercial applications at these frequencies to impede the development of an interoperable technology.

One scenario under consideration would divide the DSRC band into three 25 MHz bands: a National Band, a Regional/Local Band and a Public Safety Band.[18] The National Band and the Regional/Local Band would be assigned on a Geographic Licensing basis. The Public Safety Band would be coordinated, although new concepts in self-coordination are also being evaluated. Each band can be sub-divided into 5 MHz Channels and, as appropriate, strung together into larger (10 MHz, 15 MHz, etc.) channels for broadband applications.

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[18] This is one example of how channelization could work. Several other approaches are also under consideration (*e.g.*, 7 channels of 10 MHz; 3 channels of 20 MHz and one of 15 MHz; etc.) corresponding to different broadband technical approaches for using the spectrum. Channelization approaches will evolve and converge as the technical consortia and SDOs work toward harmonized technical approaches.

The Public Safety Band could only be used for Public Safety applications. The National Band and the Regional/Local bands could be used for commercial applications, but geographic licensees would have to agree to provide public safety access in the Public Safety Band in any areas where commercial services are provided. Thus, the commercial services would enable and facilitate the provision of public safety services.

Both narrowband and wideband solutions have been proposed by ITS stakeholders. Both of these technical approaches appear feasible (although development risk must also be taken into consideration), capable of serving ITS applications and supported by significant capital formation. ITS stakeholders have some concern at present that the wideband approaches may more easily lend themselves to non-ITS uses. Accordingly, it appears that a band channelization plan must also be accompanied by usage limitations with ITS uses provided on a priority basis.

B. The Service Rules Should Promote Nationwide Interoperability, Competitive Markets, System Expansion and Spectrum Efficiency.

The fundamental national objective established by Congress in ISTEA and reaffirmed in TEA-21 is the establishment of a national interoperable ITS infrastructure that is available to all members of the public. The consensus discussions of the ITS stakeholders have affirmed this objective as of paramount importance in the promulgation of service rules. While ITS services may be provided in other bands and by other technologies, only the DSRC band may meet the Congressional mandate of attaining a universal, interoperable system. The several band plans and deployment strategies under consideration would facilitate the attainment of this goal by establishing common nationwide channels for use by public safety and by encouraging private sector interests to standardize.

Recognizing the important opportunities associated with ITS, the U.S. DOT and ITS America adopted the national goal of completing deployment of basic ITS services for

consumers of passenger and freight transportation across the nation by 2005. Reaching that goal requires that: (1) the private sector will lead in the development and training to market reliable and affordable intelligent transportation systems; (2) the public sector will lead in the deployment of core intelligent transportation infrastructure to meet essential public needs, forming innovative partnerships with the private sector where appropriate; and (3) the intelligent transportation systems developed and deployed will be integrated, interoperable and intermodal.

A second important goal of the service rules is the establishment of a competitive ITS marketplace. The benefits of such competition in establishing a dynamic environment for the evolution of new services and technologies have long been recognized by the Commission. Because ITS is intended to reach all members of the public, regardless of income level, it is especially important that competition in the ITS markets drive user costs to their lowest levels.

Finally, there is consensus among ITS stakeholders that DSRC service rules must promote system expansion and spectrum efficiency. These twin goals will further the introduction of new services and prevent band stagnation. In this respect, the Commission may consider adopting aggressive construction requirements and "use it or lose it" policies.

The ITS community endeavors to promote competition, allow for maximum flexibility, encourage efficiency of use, promote innovation, facilitate seamless networks and maximize the amount of applications that will be available for use. In order to bring to the public the highest valued services, the ITS community believes that users of the spectrum will need an implementation flexibility to respond to public and market demands. This flexibility also includes the freedom to determine how they will use the spectrum and the geographic area in which they will provide service, as well as the technical flexibility in order to respond to changes in technologies and equipment.

C. DSRC Technologies and Architectures

At the request of the Commission, ITS America is pleased to submit a brief survey and overview of technologies that may deliver DSRC services. Although there is consensus among ITS stakeholders that the use of these systems for ITS purposes is valuable and is to be encouraged, some of the technologies described below may not meet the national imperative of establishing a robust nationwide, interoperable network for DSRC, at this time.

The summary describes technical alternatives, other than radio frequency identification (RFID) devices, that might be used to implement prospective DSRC applications. These technologies are either currently available or are expected within the next year or two. These products, listed in Table 1 below, can be operated in a point-to-point as well as a point-to-multipoint mode, and have the potential to be used for one or more DSRC applications. They are designed for portable operation (transmitting terminals are either stationary or moving at pedestrian speeds). Under certain and limited circumstances, they also may function at moderate highway speeds.

For the purpose of this discussion, the Commission should be aware that the design requirements for electronic toll collection, for example, are based on a vehicular speed of 120 miles per hour.

Technology	Modulation/Freq.	Data Rate	Specification Owner	Potential DSRC Applications
802.11	FH/2.4 GHz	1-2 Mbps	IEEE	Slow vehicle speed, 10-15 collocated readers
802.11	DS/2.4 GHz	1-2 Mbps	IEEE	Slow-medium vehicle speed, 3 collocated readers
802.11 b	DS/2.4 GHz	11 Mbps	IEEE	Stationary operation, 2.4 GHz band
802.11 a	OFDM/5 GHz	> 20 Mbps	IEEE	Stationary operation , 5 GHz band, large downloads
Bluetooth	FH/2.4 GHz	108-732 Kbps	Bluetooth SIG	Very short range, 8 active tags per reader
HomeRF	FH/2.4 GHz	1-2*Mbps	HomeRF WG	Similar to 802.11 FH
HIPERLAN	GMSK/5 GHz	24 Mbps	ETSI	Stationary, 5 GHz band, large downloads
FreeSpace	FSK/5 GHz	10 Mbps	Motorola	Short and long range DSRC applications, slow and fast vehicular speed, extendable to higher data rates

* Increased to 10 Mbps per the *First Report and Order*, ET Docket 99-231, released August 31, 2000.

Table 1. Summary of Technologies

User requirements developed by the ASTM standards writing group demonstrate a wide range of communications distances required for DSRC applications. For example, while probe data collection uses distances on the order of 50 feet, work zone warnings and traffic signal preemption require a distance on the order of 1000 feet or more. Wireless LAN products typically have ranges of up to 300 feet, although in an outdoor application with a directional antenna, these products can be engineered to handle greater distances within the radiated power limitations of Part 15 of the FCC Rules. First generation Bluetooth products will have a range of 10 meters, while some versions of HIPERLAN can communicate over distances of several miles. Furthermore, maximum and minimum communications zones must be estimated for every version of wireless LAN products (frequency hopping, direct sequence, data rate, etc.) and

compared against DSRC requirements in order to validate whether the DSRC application can be implemented with one of these products.

Vehicles moving at high speeds spend very little time in the communication zone of a DSRC installation. To successfully complete a transaction, data rates on the order of 1 Mbps or greater may be needed. Most wireless LAN products can support these data rates. Bluetooth products currently support an asymmetric rate without error correction of 732 Kbps. The maximum symmetric data rate with error correction is 172.8 Kbps. IEEE 802.11 products can support data rates ranging from 1 to 54 Mbps. As the data rate increases, however, the robustness of the link deteriorates in a mobile multipath environment.

Wireless LAN products are designed for portable operations. The terminals using the network are expected to move from location to location, but are expected to be stationary while transmitting. The modulations and protocols have been optimized for use in office buildings, warehouses, factories, retail outlets and other locations that would benefit from wireless LANs. The user terminals have to locate the system controller frequencies, synchronize transmission, authenticate the user and access the channel before transmission can occur. If errors occur, stationary terminals have ample time to retransmit in a manner transparent to the user.

DSRC systems are designed for communications with terminals that operate at speeds common to highway and rail travel. Channel acquisition and transmission, therefore, have to be very rapid and extremely reliable since the terminal will spend very little time in a communication zone. The specifications for each version of a product need to be examined closely, and in particular the MAC protocol, in order to determine, for each DSRC application, whether the transaction can be completed within the vehicle's communication zone.

Some wireless LAN products will operate while the terminal is moving. There are many factors that determine how fast and how reliable the communications will be. Different combinations of modulation and data rate will operate differently in the mobile multipath environment. Discussions held with members of the IEEE 802.11 Committee confirm anecdotal evidence that low data rate (1Mbps Direct Sequence Spread Spectrum) 802.11 products work in some mobile applications; however, Committee members were highly skeptical of reliable operation at speeds in excess of 20 or 30 miles per hour. Experiments performed with Orthogonal Frequency Division Multiplex (OFDM)-based 802.11a equipment demonstrate the potential to support 5-20 Mbps at freeway speeds.

Each protocol has some limits on the number of active terminals in a network at any given time. For example, a Bluetooth piconet supports only eight active terminals. IEEE 802.11 may support over 100 terminals under certain circumstances. DSRC applications, such as open gantry toll collection, will require communications to a larger number of users.

A new technology, FreeSpace, has also been offered by Motorola for DSRC, otherwise planned for applications in the 5 GHz U-NII band as a multiple mile point-to-multipoint solution, and also offered as a candidate for IEEE 802.15.3 higher rate Bluetooth. It is characterized by binary FSK, short packet transmission bursts (62.9 μsec) and traditional non-linear FM receiver. According to Motorola, FreeSpace's advantages include simplicity, speed and interference robustness.

The technologies, identified in Table 1, operate in unlicensed bands without protection against interference. There is a growing multitude of products in the ISM bands. Reliable operation is a function of how many co-channel devices are operating in the same vicinity at the same time. These devices operating in an office environment, with wireless LAN equipment,

wireless telephones, remote data terminals and microwave ovens, could easily experience periods of poor performance.

With the exception of HIPERLAN and some IEEE 802.11 products, all of the consumer devices operate without frequency coordination in the ISM bands, with the greatest concentration of products operating in the 2.4 GHz band. Direct Sequence systems have good protection against narrowband interference, but not wideband interference (other DS systems or microwave ovens). Therefore, collocated DS systems use non-overlapping channels. For example, IEEE 802.11 systems can have three non-overlapping channels. Collocated frequency hopping systems can have collisions that will require retransmission. When the concentration of collocated transmitters is on the order of 10 to 15, severe degradation can result.

Another issue is the integration of one or more technologies. Devices with embedded Bluetooth transmitters (*e.g.*, PDA or laptop computer) that access wireless LANs (for example 802.11) have to be carefully engineered to ensure that the two transmitters, located inches apart in the same device, do not render each other inoperable. This issue is important for two reasons: (1) there are many instances of multiple reader DSRC installations and (2) these technologies can become a victim of their own success. Fast food restaurants, gas stations and other retail outlets may use these technologies for transactions such as pay at the pump and drive through ordering. Drivers of the vehicles performing these transactions may have active Bluetooth piconets in the vehicles operating their computing devices and cell phones. Busy intersections with gas stations and fast food restaurants on the corners can easily create a transient situation where there are hundreds of devices within line of sight, and as the number of devices increases, the performance of all of the affected networks will degrade. Success in a transaction will depend on the users being relatively stationary in a communication zone long enough to complete it error free. Since

the technologies identified in Table 1 are Part 15 devices, there is no frequency coordination required between the commercial establishments implementing these technologies.

Wireless LAN and Bluetooth devices have to be power efficient. They use the host device's power supply (*e.g.*, a laptop, cell phone or PDA). These power supplies are rechargeable, and power efficiency relates to the time between charges, which is on the order of tens of hours. DSRC devices are generally simple to install, designed to be maintenance free and traditionally have a design life of up to five years. Commercial off-the-shelf wireless LAN equipment used to implement DSRC applications would likely need to be installed to derive power from the vehicle.

The technologies described in this section have the potential to be used for certain DSRC applications. The products with the greatest potential are the products that have a mechanism in the MAC protocol for fast acquisition of a channel. The DSRC applications that make the best candidates for implementation with such products are the ones that are performed while vehicles are either stationary or moving at pedestrian speeds. Several groups wishing to use DSRC-type communications such as gas/automotive repair stations and credit/debit card operators are investigating wireless LAN technologies to perform retail transactions from a vehicle such as pay at the pump and drive through purchasing. These groups have also requested the support of the ASTM standards writing group in identifying potential solutions based on a DSRC standard.

III. LEGAL ISSUES

In the *Report & Order*, the Commission appropriately deferred consideration of licensing and service rules and spectrum channelization plans to a later proceeding because standards addressing such matters were, and continue to be, under development by the U.S. DOT and an

ASTM-sponsored industry standards group. As previously stated in this Status Report, ITS America has been working with various stakeholders (government and non-government) to develop standards and to achieve consensus on a variety of licensing and technical issues.

While ITS America does not, at this time, advocate any particular licensing and service requirement, it recognizes that the rules the Commission ultimately adopts necessarily must foster interoperability, the growth and development of a wide array of Public Safety DSRC applications and the continued investment in ITS technology.

The spectrum allocation will be used by both government and non-government entities to improve the efficiency of the Nation's transportation infrastructure and facilitate the growth and development of the ITS industry. As a general matter, establishing a flexible regulatory framework for public safety and other uses of the band will enable licensees to effectively use this new allocation for a variety of operations, promote competition in the equipment markets through flexible technical standards, and promote the development of innovative technologies. Most importantly, all stakeholders should strive for nationwide interoperability.

A. Band Channelization

In the *Report & Order*, the Commission determined that "a spectrum channelization plan would facilitate the efficient use of this spectrum and interoperability among various DSRC services."[19] The Commission, however, did not devise a specific channelization plan that would adequately address the spectrum requirements, both narrowband and broadband, of the various potential DSRC applications. The Commission thus "invit[ed] the ITS industry and the DOT to consider the spectrum requirements of various DSRC applications and recommend a spectrum

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[19] *Report & Order*, 14 FCC Rcd at 18231.

channel plan."[20] Preliminary insights on industry discussions concerning the issue of band channelization are provided to the Commission.

The selection of the appropriate channelization plan must balance DSRC applications that could include a varied mix of public safety and other services. ITS America has observed industry concern that DSRC public safety uses will not establish a large enough market to attain economies of scale in the production of DSRC receivers that are needed to attain ubiquitous availability.

Ideally, DSRC spectrum channelization must not hinder interoperability, and should include flexible options to allow for various technologies, application specific deployment and the evolution of DSRC services. In ITS America's consensus building activities, four potential approaches to DSRC band channelization have been advanced: a narrowband channelization plan, two wideband/broadband channelization plans and a hybrid of a narrowband and broadband approach. The varied approaches stem from the fact that the 5.850-5.925 GHz band can accommodate a wide variety of reliable DSRC applications. As the Commission has recognized, DSRC applications will be mobile and not all DSRC communications will be line of sight. In the *NPRM*, the Commission recognized that "[a]ny 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."[21]

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20 *Id.*

21 *See* In the Matter of Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services, ET Docket No. 98-95, Notice of Proposed Rulemaking, 13 FCC Rcd 14321, 14340 (1998) ("*NPRM*").

In developing a DSRC channelization plan, the following goals are paramount: (1) the establishment of national interoperability and ubiquity; (2) the promotion of competitive ITS markets; and (3) the attainment of spectrum efficiency and channel flexibility.[22]

1. Flexible Approach

The Commission could specify technical standards for the basic channelization for the band, but allow for the private coordination of the DSRC spectrum to best meet the particular needs of various regions. The Commission could also adopt a nationwide band plan mandating a specific channelization that would be used uniformly by all regions. Yet another view is to divide the band into three segments: narrowband channels, wideband channels and a reserved block for a hybrid or future expansion of the two categories.

2. A Narrowband, Wideband or Hybrid Approach

Some parties contend that the only way to truly achieve national interoperability is to utilize a single channelization plan – either a narrowband or a wideband approach. For applications that only require low data rate one-way links, a narrowband channelization plan might be advantageous because it would allow many channels to exist within the same bandwidth occupied by a single broad channel. One example of an instance in which this plan was applied was in the 900 MHz band (*i.e.*, 901-902, 930-931, 940-941) for paging, data transfer, and digital voice messaging. Another example of a narrowband channelization plan is the Commission's recent allocation of spectrum in the 220-222 MHz band for the development of narrowband spectrum efficient technologies. Further, non-multilateration systems operating in the Location and Monitoring Service use narrowband technology to transmit data to and from vehicles passing through a particular location.

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22 *See id at 14340-41.*

The availability of a wideband/broadband approach, on the other hand, would accommodate multiple applications, including those that are not yet envisioned. A wideband channelization plan could also optimize the usefulness of the spectrum. As an example of a utilized wideband approach, multilateration systems operating in the Location and Monitoring Service use spread-technology to locate vehicles (and other moving objects) with great accuracy throughout a wide geographic area. There is, however, a potential concern that wideband applications could cause adjacent channel interference, and it is uncertain whether they could successfully operate in channels that are adjacent to narrowband applications. The ITS community is exploring these issues.

Still, some stakeholders advocate that both narrowband and broadband transmissions should be permitted to assure the provision of a wide variety of competitive services, technologies and applications. Thus, a hybrid plan potentially would offer the most flexibility. Such a plan would less likely preclude the development of new technologies. This approach, however, may hinder efforts to establish national interoperability. Additionally, some believe that too much flexibility might even deter investment in ITS technology. In such a case the Commission might suggest specific restrictions on how spectrum should be used by a licensee, and require detailed analyses of the economic trade-offs between flexibility and investment that justify the recommended use restriction.

B. Service Definition and Eligibility Requirements

DSRC communications should be directly related, and necessary, to those activities that make the licensee eligible for the station licensed held under Part 90 of the Commission's Rules. As established in Section 90.371, DSRCS licensees operating systems in the 5.850-5.925 GHz

band may serve individuals, federal government agencies and entities eligible for licensing in Part 90, and must comply with specific requirements.[23] As the Commission recognized in the *NPRM*, DSRC applications could include a varied mix of commercial, private and public safety services.[24] The spectrum, however, should be put to its best and most valued use such that the greatest benefit to the public is attained. While allowing for the flexible use of the 5.850-5.925 GHz band will provide potential licensees the ability to offer a wide range of services employing varying technologies, some restrictions on use and eligibility may need to be employed. For example, as the definition of DSRC that was adopted by the Commission indicates, DSRC services do not include the delivery of voice. Section 90.7 defines DSRC 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.[25]

Some contend that only few restrictions, if any, should be in place to open the DSRC market to a wide range of applicants, which will permit and encourage entrepreneurial efforts to develop new technologies and services, while ensuring the highest and best use of the spectrum.

As the Commission previously noted, 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 Services Rules. Other parties further

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23 *See* 47 C.F.R. § 90.371.

24 *See NPRM*, 13 FCC Rcd at 14343.

25 47 C.F.R. § 90.7.

contend that the potential commercial DSRC applications provided by non-government entities should be considered as commercial services.

As enumerated below, the potential mix of DSRC services could result in the establishment of three separate eligibility criteria – one for public safety use, one for private use and another for non-ITS secondary uses.

1. Public Safety Use

As a general matter, public safety radio services spectrum must be used to protect the safety of life, health or property, and may not be commercially available to the public.[26] Many anticipated DSRC applications would appear to qualify under this eligibility restriction. These include, among others, in-vehicle signing, intersection collision avoidance systems and electronic toll collection. Given the potential mixed use of these systems between public and private applications, ITS America believes it is important that the FCC adopt an expansive and inclusive interpretation of public safety services within the ITS context. This will help facilitate the deployment of, and investment in, DSRC infrastructure by the private sector and will further the goal of interoperability.

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[26] The Public Safety Radio Pool was created in 1997. It covers the licensing of the radio communications of state and local governmental entities and the following category of activities: medical services, rescue organizations, veterinarians, persons with disabilities, disaster relief organizations, school buses, beach patrols, establishments in isolated places, communications standby facilities, and emergency repair of public communications facilities. The Commission, however, has held that entities not meeting these eligibility criteria may also be licensed under certain circumstances.

[27] *See In the Matter of Service Rules for the 746-764 and 776-794 MHz Bands and Revisions to Part 27 of the Commission's Rules*, First Report and Order, 15 FCC Rcd 476, at ¶ 10 (2000) ("*700 MHz First Report and Order*").

2. Private User Eligibility

Private radio communications systems are used by companies, organizations, public safety agencies and other entities to support their internal communications requirements. Many different entities use private systems for a variety of purposes, and the systems themselves operate on a number of different frequency bands. Although there are general commonalities across private wireless services and systems, each company or organization has unique needs, and the different frequency bands used have different technical characteristics. As a result, private radio systems are often customized to meet the specialized and unique needs of the company or organization that owns and operates the system.[28]

Over the years, the FCC has divided private wireless services into several distinct categories. PLMRS currently consists of several services spread among six service categories: Public Safety, Special Emergency, Industrial, Land Transportation, Radiolocation and Transportation Infrastructure. Eligibility and use criteria for DSRC could certainly be modeled after some of these existing services.

3. Non-ITS Secondary Uses

While DSRC systems have the potential to offer a wide array of services, they generally should be limited to vehicle-oriented services. Accordingly, some restrictions would seem appropriate if the band will be used for non-ITS services. Moreover, there is a concern that non-ITS secondary uses might result in more intensive use of the band, to the detriment of other users.

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[28] *See* FCC Wireless Telecommunications Bureau Staff Paper, "Private Land Mobile Radio Services: Background" (Dec. 18, 1996).

C. Spectrum Assignment

In order to operate within a service, a license issued by the Commission generally is required. Some devices are permitted to operate without a license, and certain services are "licensed by rule" and are exempt from the general licensing requirement, but operation in these services must still meet the applicable eligibility and technical requirements. As detailed below, the ITS community is exploring the use of the DSRC band in this manner.

1. Unlicensed Uses (Low Power)

In the *NPRM*, the Commission noted that Part 15 of its Rules currently permits operation of some unlicensed devices in the 5.8 GHz range that may be appropriate for DSRC use. The Commission stated:

> Specifically, Section 15.245 of our Rules permits unlicensed field disturbance sensors to operate in the 5.785-5.818 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). Additionally, Section 15.247 of our Rules permits unlicensed spread spectrum communications devices to operate in the 5.725-5.850 GHz band with a maximum peak transmitter output of power of 1 watt with antenna gain of up to 6 dBi. 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). 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.[29]

ITS America agrees that some non-safety DSRC applications would benefit from unlicensed status because of the ease of implementing and the technical flexibility typically permitted such

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[29] *NPRM*, 13 FCC Rcd at 14341-42.

operations. At the same time, ITS America recognizes that unlicensed applications under Part 15 may not be appropriate for many other DSRC applications because they must accept any interference and must not cause interference to other operations, particularly any services with allocated status such as the Part 90 DSRC operations.[30]

2. Licensing by Rule

Under Section 307(e) of the Communications Act, as amended, the Commission may by rule authorize the operation of radio stations without individual licenses in the following radio services: (A) the citizens band radio service; (B) the radio control service; (C) the aviation radio service; and (D) the maritime radio service for ship stations.[31] While Section 307(e) does not

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30 Examples of unlicensed services include: services operating under the FCC's Part 15 Rules (which are low-power devices, such as cordless phones, surveillance equipment, utility metering devices, fire and security alarm devices, collision avoidance systems, etc.); U-NII devices (short range, high-speed wireless digital communications, which allows communications among computers and associated equipment, such as printers); certain PCS devices (transmission of high- and low-speed data between computing devices, cordless telephones, and wireless private branch exchanges; these are short-range communications that operate with very low power and have a limit on the duration of transmissions).

31 The Commission's authority to license certain radio services by rule stems from Section 307(e) of the Act, which states:

> (1) Notwithstanding any license requirement established in this Act, if the Commission determines that such authorization serves the public interest, convenience, and necessity, the Commission may by rule authorize the operation of radio stations without individual licenses in the following radio services: (A) the citizens band radio service; (B) the radio control service; (C) the aviation radio service for aircraft stations operated on domestic flights when such aircraft are not otherwise required to carry a radio station; and (D) the maritime radio service for ship stations navigated on domestic voyages when such ships are not otherwise required to carry a radio station.
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> (2) Any radio station operator who is authorized by the Commission to operate without an individual license shall comply with all other provisions of this Act and with rules prescribed by the Commission under this Act.

expressly include DSRC systems in the list of services that can be licensed by rule, the Commission may, nonetheless, be authorized to apply that licensing approach if it determines that certain DSRC systems can properly be classified as a citizens band service or a radio control service.[32]

The Commission's *Report & Order* indicated that it would consider a licensing by rule approach for certain (but not all) DSRC applications. In the order, the Commission stated that it would explore the possibility of unlicensed and licensed-by-rule requirements for the 5.850-5.925 GHz band once DSRC standards are developed.[33] Indeed, the Commission does have some flexibility to determine what types of radio services can be classified as a citizens band radio service or a radio control service. Section 307(e)(3) states: "For purposes of this subsection, the terms 'citizens band radio service', 'radio control service', 'aircraft station' and 'ship station' shall have the meanings given them by the Commission by rule."[34] Section 95.401(a) of the Commission's Rules defines the Citizens Band (CB) Radio Service as "a private, two-way, short-distance voice communications service for personal or business activities of the general public."[35] Section 95.201 of the Commission's Rules defines the Radio Control (R/C) Service as "a private, one-way, short distance non-voice communications service for the operation of devices at remote locations."[36] Thus, to the extent that certain DSRC systems can

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32 It is clear, however, that DSRC systems, given their intended applications, cannot be considered an aviation or maritime radio service.

33 *See Report & Order*, 14 FCC Rcd at 18235-36.

34 47 U.S.C. § 307(e)(3).

35 47 C.F.R. § 95.401(a).

36 47 C.F.R. § 95.201.

operate under the technical parameters for CB or R/C services, a "license by rule" approach could be applied to certain DSRC applications.

Furthermore, the Commission appears to have broadly defined the citizens band radio service, for example, by including in the CB service: medical implant communications services ("MICS") and wireless medical telemetry services ("WMTS"). In deciding that WMTS equipment should be "licensed by rule," rather than requiring individual operators' licenses, the Commission applied the following reasoning. Individual licensing, the Commission stated, is generally designed to give a licensee a protected service area, and thus establishes rights among competing entities in the same service. The Commission noted that operators in the WMTS will not be in competition with each other as are parties in other radio services. According to the Commission, the WMTS spectrum will be shared among medical telemetry users, and there will be no mutual exclusivity between users. In addition, the Commission determined that "licensing by rule" will minimize regulatory procedures and thus facilitate deployment. The Commission asserted its authority under Section 307(e) of the Communications Act to define the citizen's band radio services and to license them by rule,[37] and thus determined that WMTS can be appropriately classified as a CB service. Given the Commission's inclination to define CB services broadly, certain DSRC systems may fall within the definition of CB or R/C services so that such systems can operate under, and receive the benefits of, a "license by rule" approach.

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37 *See* In the Matter of Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service, ET Docket No. 99-255, Report and Order (rel. June 12, 2000) (indicates proceeding terminated).

3. Licensed Uses

a. First Come, First Served Licensing

Under first come, first served site-specific licensing, a separate license is required for each transmitter site. An applicant must first apply for a frequency on which to operate a service, and then the applicant must be issued a license by the Commission. Each licensee application would propose a transmission frequency and set of technical information on the proposed station, including its potential for electric interference with adjacent stations. The applicant goes through a frequency coordinator in applying for the frequency. Once an application is filed, the FCC would review each site-specific application preliminarily for formal compliance. Generally, if an applicant's proposed service would overlap and interfere with an incumbent licensee's transmission, the application is denied.

This method of licensing might prove to be effective given the availability of electronic filing, which gives the Commission the ability to ascertain the precise sequence in which applications are submitted by different parties. This would prevent the accumulation of numerous mutually exclusive applications.

b. Geographic Licensing

The ITS community is currently exploring the costs and benefits of geographic licensing for DSRC applications that do not fall within public safety services. In this respect, the definition of DSRC covers applications "in a variety of public and commercial environments." ITS America is aware of potential private uses of the DSRC spectrum, including in-vehicle signing and electronic payment services. ITS America is not aware, at this time, of any planned use of the DSRC spectrum for a commercial mobile radio service or private mobile radio service, *i.e.*, for service that would be provided to subscribers for compensation. ITS America recognizes

that there may be other parties, with an interest in providing DSRC applications, that have not participated in the consensus building activities of the ITS community over the past year. Accordingly, in order to fully evaluate the potential commercial uses of the DSRC spectrum, ITS America requests that the FCC seek public comment on this issue.

D. System Construction Requirements

The DSRC service rules must consider the appropriate construction requirements for stations licensed in the 5.850-5.925 GHz band. For example, Part 90 of the Commission's Rules generally require a licensee in the 800 MHz band to construct a station and place it in operation within eight months for conventional systems and twelve months for trunked systems. Public safety applicants in the 700 MHz band are afforded a twelve-month construction deadline. For the 700 MHz band, the Commission recognized that "because state and local governments often follow multi-year cycles for the planning, approval, funding and purchasing of their public safety systems, it would also follow Section 90.155(b), which permits local government entities a longer period for placing a station in operation where the applicant submits a specific schedule for completion of each portion of the entire system, along with a showing that the system has been approved and funded for implementation in accordance with that schedule."[38] Under this construction requirement, an applicant in the 700 MHz band has twelve months to place a system in operation or up to five years if application is made pursuant to Section 90.155(b).

DSRC licensing must also accommodate extended area systems and corridor/ribbon systems. With a ribbon system, the licensee may operate along a particular highway. Under this system, the Commission may impose reporting requirements to ensure that licensees are using

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[38] *700 MHz Report and Order*, 15 FCC Rcd 476, at ¶ 103.