UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

JUN 10 2013

Mr. Julius Knapp
Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

RE: Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band, *Notice of Proposed Rulemaking* in ET Docket No. 13-49 – Department of Transportation Comments

Dear Mr. Knapp:

The National Telecommunications and Information Administration (NTIA) has discussed with the Department of Transportation (DOT) questions and issues raised regarding the 5850-5925 MHz band in the above-referenced *Notice of Proposed Rulemaking*. Accordingly, NTIA forwards for inclusion in the record the enclosed DOT comments relating to the deployment of Intelligent Transportation Systems (ITS) in this band.[1]

NTIA understands the vital role that Unlicensed National Information Infrastructure (U-NII) devices play in the telecommunications economy. In our January 2013 report to Congress and the FCC, NTIA presented the results of its initial study evaluating known and proposed spectrum-sharing technologies and the risk to federal users if the FCC allows U-NII devices to operate in the 5350-5470 MHz and 5850-5925 MHz bands.[2] Our report identified a number of risks to FCC-authorized ITS stations operating Dedicated Short Range Communication Service (DSRCS) systems in the 5850-5925 MHz band and suggested mitigation strategies. Some of the key ITS applications will perform important public safety functions by acting to prevent the majority of types of roadway crashes.[3] Therefore, direct interaction and cooperation between wireless and transportation industry representatives is essential for the development of constructive proposals to accommodate evolving U-NII and ITS technologies.

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[1] *See* Letter from John D. Porcari, Deputy Secretary of Transportation, to Lawrence E. Strickling, Assistant Secretary for Communications and Information (May 16, 2013) (enclosed). NTIA authorizes the use of the radio spectrum by the U.S. Government, establishes the policies concerning spectrum assignments and the use of radio stations owned and operated by the U.S. Government, and represents the views of the Executive Branch before the Federal Communications Commission (FCC). *See* 47 U.S.C. § 902 (b)(2)(A), (J), (K).

[2] *See* United States Department of Commerce, *Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief and Job Creation Act of 2012* (Jan. 2013), *available at* http://www.ntia.doc.gov/files/ntia/publications/ntia_5_ghz_report_01-25-2013.pdf. For the purpose of this study, NTIA treated DSRCS systems like a federal system in assessing the feasibility of allowing U-NII devices to operate in the 5850-5925 MHz band.

[3] *Id.* at 5-1.

NTIA looks forward to working with the FCC, DOT, and other interested parties to review approaches to the introduction of wireless broadband devices in this band while protecting ITS applications. If you have any questions regarding these comments, please contact Mr. Edward M. Davison (edavison@ntia.doc.gov; 202-482-5526) of my staff.

Sincerely,

Karl B. Nebbia
Associate Administrator
Office of Spectrum Management

Enclosure

THE DEPUTY SECRETARY OF TRANSPORTATION
WASHINGTON DC 20590

May 16, 2013

Mr. Lawrence E. Strickling
Assistant Secretary for Communications and Information
U.S. Department of Commerce
1401 Constitution Avenue, NW
Washington, DC 20230

Re: FCC ET Docket No. 13-49
Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band

Dear Mr. Strickling:

On April 10, 2013, the Federal Communications Commission (FCC or Commission) published in the *Federal Register* its Notice of Proposed Rulemaking (the NPRM or the Proposed Rule) in the above-referenced matter. Among other things, the FCC proposes to make available additional spectrum in the 5.850-5.925 GHz band for use by National Information Infrastructure (U-NII) devices, so as to "increase wireless broadband access and investment." 78 Fed. Reg. 21320, 21321 (April 10, 2013).

The United States Department of Transportation (DOT or the Department) appreciates the attention that the FCC and the National Telecommunications and Information Administration (NTIA) have devoted to this matter, and recognizes that spectrum is a scarce national resource and that it is important to find ways to expand wireless broadband capacity. However, the Department has concerns about the FCC's proposal, particularly as it relates to the deployment of Intelligent Transportation Systems (ITS)—a DOT priority for improving safety across all surface transportation modes. DOT has invested significant resources in ITS research and development activities, given the technologies' potential to save thousands of lives annually and to achieve other important national transportation goals (such as reducing roadway congestion). Indeed, the Department has worked extensively for well over a decade, in partnership with a variety of stakeholders in the public and private sectors, domestically and internationally, to make broad deployment of these technologies in vehicles and infrastructure a reality in the near future.

Thus, DOT respectfully asks that the NTIA share the concerns outlined here, in their entirety, with the Commission. Further, the Department requests that it be given a full and continuous opportunity to be engaged in the technical analyses necessary to achieving a thoughtful resolution of the issues raised by the proposed rule.

Background

ITS broadly refers to the integration of advanced communications technologies into the transportation infrastructure and into vehicles to improve transportation safety and mobility. Among other applications, ITS includes Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) architecture. V2V involves the dynamic wireless exchange of data between nearby vehicles regarding position, speed, and location. This enables a vehicle to maintain a 360-degree awareness of the position of other vehicles to identify potential hazards, calculate risk, issue driver advisories or warnings, and potentially take preemptive action to avoid or mitigate imminent crashes. Similarly V2I, through the wireless exchange of safety and operational data between vehicles and highway infrastructure, is intended to avoid and reduce the severity of crashes, and to enable a broad range of additional safety, mobility, and environmental benefits. Thus, the aim of these systems is to foster a "smart infrastructure" that recognizes high-risk situations in advance, provides appropriate driver alerts and warnings to reduce accidents, and promotes other vital transportation interests.

In recognition of these benefits, and as described more fully below, DOT has taken a lead role for over a decade in fostering the development of ITS. Further, the Department has been closely involved in working with the FCC and the NTIA over time to ensure that there is adequate spectrum to support ITS as it has evolved from theory to reality.

With DOT's input, in 1999, the FCC allocated 75 megahertz of spectrum in the 5.850-5.925 GHz band to support ITS and the Dedicated Short Range Communications (DSRC) upon which V2V and V2I depend.[1] The Commission recognized that the 5.9 GHz band is especially appropriate for ITS, given the need for system reliability, the short distances over which the communications would occur, and the growing international consensus over the deployment of ITS in this area of the spectrum. 1999 Order at ¶ 1.7. The Commission explained that its decision to set aside this spectrum for ITS would "further the goals of the United States...Congress and the Department of Transportation to improve the efficiency of the Nation's transportation infrastructure." *Id.* ¶ 1.1. Furthermore, the FCC expressly stated that its allocation was intended to meet the needs of ITS *as it developed.* For example, the Commission said in its 1999 Report and Order that the 5.850-5.925 GHz band allocation would "ensure that adequate spectrum will be available for advanced DSRC applications *that are anticipated in the future*," including highway systems requiring "dedicated wideband channels to ensure service reliability." *Id.* ¶ 1.9 (emphasis added).

Since that time, the Department has taken substantial interest in the Commission's and the NTIA's efforts to help develop the technical standards and policy principles that would govern the 5.9 GHz band. As you know, the 5.9 GHz band is also used for certain fixed satellite service operations (FSS) and military radar systems. The FCC and the NTIA, with assistance from the Department, have worked to establish service rules and other guidelines to help ensure that these

[1] *See* Report and Order, ET Docket No. 98-95, *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* (Oct. 21, 2009) (1999 Order).

various users can coexist harmoniously within the same portion of the spectrum.[2] The Department looks forward to continued efforts among interested federal agencies and other parties to update those service rules to accommodate evolving technologies.

The FCC and the NTIA are keenly aware of Congress's interest in these issues and in considering the ways in which the radio spectrum may be made more accessible to additional users, particularly for wireless broadband applications. DOT recognizes the challenging requirements for both the FCC and the NTIA set by section 6406 of the Middle Class Tax Relief and Job Creation Act of 2012 (Act), "Unlicensed Use in the 5 GHz Band," which led directly to the NPRM. While section 6406(b) includes the 5.850-5.925 GHz band as a candidate for the NTIA studies, section 6406(a) does not require FCC action in the 5.850-5.925 GHz band; however, the NPRM includes the 5.850-5.925 GHz band as part of the proposed amendment of FCC's Part 15 rules. NPRM ¶ 2, 15, 62.

The Department's Interests and Investments in ITS

More than 30,000 people die and more than 2 million people are injured in traffic crashes on our nation's highways every year, resulting in hundreds of billions of dollars in economic costs. More than 90 percent of these crashes are due to human error. National Highway Traffic Safety Administration (NHTSA) analyses show that connected vehicle technology could potentially address approximately 80 percent of human-factor crashes involving unimpaired drivers, thereby preventing many thousands of deaths each year.[3] DOT respectfully asks that the FCC and the NTIA also take into consideration the DSRC-based innovations in which DOT, the U.S. and international auto industry, auto suppliers, and foreign governments have invested hundreds of millions of dollars over the past decade in anticipation of an international deployment of safety and other critical transportation applications.

As you know, DSRC was allocated for ITS services due to its key characteristics for mobile, active safety transportation applications. More specifically, these characteristics provide:

- Reliable, secure communications among quickly-moving vehicles;
- Fast communication speed for low latency;
- Invulnerability to extreme weather; and
- Tolerance of multi-path transmissions.

Over the past decade, the DOT ITS program has invested approximately $450 million in researching and developing the technology and applications that will fully leverage the DSRC spectrum. From 1999 – 2003, with the DSRC allocation set, DOT partnered with industry to develop the initial round of standards, while furthering our understanding of the functionality of collision warning systems and their impact on safety. From 2004 – 2009, DOT conducted the proof of concept testing on DSRC-dependent technology. Since 2010, DOT has updated the

[2] *See* Report and Order, WT Docket No. 01-90, *Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band*, & ET Docket No. 98-95, Memorandum Opinion and Order (July 20, 2006); Report and Order, WT Docket No. 01-90, ET Docket No. 98-95 (Dec. 17, 2003).
[3] *See* NHTSA Technical Report, *Frequency of Target Crashes for IntelliDrive Safety Systems*, DOT HS 811 381 (October 2010).

standards, enhanced the safety applications, moved to the second generation of technology, operated a DSRC-enabled testbed, and is now in the midst of the world's most comprehensive on-the-road test of the safety applications enabled by the DSRC technology, the Connected Vehicle Safety Pilot in Ann Arbor, Michigan. Data derived from this deployment of nearly 3,000 vehicles will provide critical support for NHTSA's decisions on the agency's next steps concerning V2V technology. NHTSA will decide in 2013 whether to begin rulemaking action to require the technology in all new light vehicles, conduct additional research, or to combine regulatory action and further research. In 2014, NHTSA will make such a decision concerning heavy vehicles. In making these decisions, NHTSA will assume that the 5.9 GHz spectrum will remain fully available, without any disruptive interference, to permit implementation of the technology's safety potential.

In addition to the eight global automotive manufacturers supporting this work, DOT has certified for operational use in the Safety Pilot five roadside equipment manufacturers and six onboard equipment manufacturers. Retrofit systems for truck and transit fleets have also been developed. DSRC investment by U.S.-based industries continues to grow significantly. The Department and the American Association of State Highway and Transportation Officials (AASHTO) are actively planning initial deployment of infrastructure to support V2I messaging. Initial implementation pilot programs could be underway as early as 2015.

In addition to the Connected Vehicle Safety Pilot, our European and Japanese colleagues and their auto industries are conducting similar demonstrations, expecting to move swiftly to broader deployment. Other nations and the European Commission (EC) have allocated the same or similar spectrum for DSRC, and have generally harmonized allocations to enable international ITS interoperability and to enable manufacturing across the interconnected worldwide auto market supply chain. DOT has worked closely with its EC and Japanese counterparts to develop internationally harmonized, interoperable Connected Vehicle standards, based on DSRC availability and its unique technical characteristics. This international harmonization around the 5.9 GHz band is a unique opportunity for the global community to coalesce around a standard prior to widespread development and deployment—a prospect that would significantly reduce overall costs for all participants through global economies of scale. DOT is significantly concerned by the prospect of failing to maintain this harmonization, as it would likely significantly delay, or even cancel, planned implementations at a moment when the global transportation community is poised to deploy Connected Vehicle safety, mobility and environmental solutions, and related infrastructure applications.

The FCC's Proposal

The Department remains critically interested in the deployment of ITS and views this technology as an important means of promoting safety, mobility, and other goals. The 5.9 GHz band at issue in this proceeding is crucial to ITS, and the Department asks that the FCC and the NTIA take steps to ensure that this portion of the spectrum remains adequately protected for ITS purposes. In particular, the Department respectfully asks that the FCC and the NTIA fully take into account the following concerns in the course of this proceeding.

First, in considering the extent to which new technologies or users will be permitted in the 5.9 GHz band, the FCC should ensure that this portion of the spectrum remains available on a co-primary basis for the purpose for which it was allocated in the Commission's 1999 decision, the Intelligent Transportation Systems radio service. In the Department's view, the FCC is correct in recognizing that it "must protect incumbent authorized services, both Federal and non-Federal." NPRM ¶ 38. In particular, the FCC and the NTIA should ensure that unlicensed devices, if permitted to operate in the 5.9 GHz band, "do not cause harmful interference" to the ITS architecture, operations or safety-critical applications. *Id.* ¶ 1. To do otherwise would be to undermine the Commission's stewardship in allocating this spectrum and to frustrate the ongoing regulatory and engineering development processes by which ITS technical standards, and other operating parameters, are established.

Recognizing that the detailed technical definition of "harmful interference" is a subject of the planned NTIA-led testing and assessment effort, DOT notes that, in order to provide a reliable and trusted public safety service, DSRC-enabled safety applications require instant availability to the medium to meet safety requirements. In other words, a DSRC transmitter needs to be able to transmit whenever it senses the requirement to transmit, so that safety information is immediately shared with recipients in real time to be useful. Thus, DOT would initially define "harmful interference" with safety as anything that prevents or delays access to the desired channel, or otherwise pre-empts the safety applications for which the spectrum is allocated.

Second, the Department wishes to remain actively involved in the ongoing discussions and technical analyses relating to this proceeding. We appreciate being fully included in the NTIA's study efforts in the 5.850-5.925 GHz band required by the Act, efforts that include fully considering DOT comments to the NTIA's January 25, 2013 report, "Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief and Job Creation Act of 2012." DOT appreciates the NTIA's collaborative efforts thus far, and looks forward to working closely with the NTIA on developing and implementing a work plan to assess all of the technical risks documented in the initial report. In support of addressing the technical questions surrounding the NPRM's impact on DSRC, DOT is submitting a Technical Appendix to provide the NTIA and the FCC with additional information about the technical issues raised in the NPRM, as well as the Department's approach on how these technical issues may be considered or resolved. DOT requests that the NTIA ensure there is sufficient time to complete the necessary technical assessments in the 5.9 GHz band while supporting the FCC's goals for the NPRM.

Finally, DOT has specific technical concerns about the NPRM's request to consider spectrum sharing with U-NII devices in the 5.9 GHz band. The NTIA has not completed its statutorily mandated study to evaluate spectrum sharing in the 5.9 GHz band. Consequently, it would appear untimely for the FCC to move forward prior to the conclusions of such an evaluation. DOT has not, to this point, encountered any proposed technical solution to maintaining the channel (or medium) access needed to guarantee interference-free operation of the critical safety applications if U-NII devices were granted access; nor have we seen an assessment of the technical risk to Connected Vehicle safety operations of potential interference from U-NII devices. We have set forth the suite of technical assumptions and interference characteristics that DOT believes need to be tested and verified (Technical Appendix). We ask that the NTIA

continue to consider fully the information that DOT brings to this proceeding, just as we know that the FCC will consider data and test results provided by the private sector entities and others with a direct interest in safety, mobility, Connected Vehicle and the DSRC spectrum.

The Department looks forward to participating in the technical analyses relevant to this proceeding and stands ready to offer any assistance that it can to the NTIA or the FCC throughout the process. If I can provide further information or assistance, please feel free to call me.

Sincerely,

John D. Porcari

Enclosure

Technical Appendix:
DOT Comments to NTIA on FCC NPRM on U-NII Devices in the 5 GHz Band

1.0 Introduction

DOT respectfully submits this Technical Appendix to its letter to the NTIA regarding the FCC's NPRM on U-NII Devices in the 5 GHz Band. The purpose of this Technical Appendix is to provide the NTIA and the FCC with additional information about the technical issues raised in the NPRM, as well as the Department's views on how those technical issues should be considered.

2.0 General Discussion

2.1 Description of DSRC Applications With Emphasis on Safety

DSRC has been developing over the past decade and has reached the point where the large investment of both the Federal Government and private industry is achieving its goal – deployment of safety services for the traveling public. This is no small feat as the transportation community must assure a high degree of availability and reliability when deploying any sort of technology that the traveling public will use. Where public safety is concerned, we must be certain that changes "do no harm."

Safety is the Department's highest priority. DSRC should continue to be protected for the uses and goals for which it was allocated: reducing crashes, injuries, and fatalities. The FCC's proposals should not be implemented until and unless rigorous testing has shown that these critical safety goals will still be satisfied.

Safety is the primary objective of the Intelligent Transportation System's (ITS) use of DSRC, and there are other additional benefits that can be gained. Applications are generally divided between Safety, Mobility, and Environment. These application areas are further described in the following paragraphs.

2.1.1. *Safety*

Safety applications include intersection collision avoidance, collision warning, emergency signal preemption, and highway-rail intersection warning.

DSRC supports communications-based active safety applications, implemented as Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications. Safety applications save lives by warning drivers of an impending dangerous condition or event in time to take corrective or evasive actions. Examples of DSRC-supported safety applications include:

V2I Safety Applications	*Cooperative V2V Safety Applications*
Intersection Red Light Running	Intersection Movement Assist
Emergency Vehicle Prioritization	Forward Collision Warning
Approaching Emergency Responder Vehicle	Emergency Electronic Brake Lights
In-Vehicle Signage[1]	Blind Spot/Lane Change Warning
Pedestrian Signal Assist	Do Not Pass Warning
Rail Crossing Warning	Highway Merge Assist

DSRC channels support safety application transmissions at a specific periodicity and need highly reliable reception. This requires an instantly available communication link with very low latency. In 2011, there were 32,367 fatalities and approximately 2,200,000 injuries from an estimated 5,338,000 crashes resulting in billions of dollars in cost to society in the U.S.[2] Many of the applications that use DSRC could significantly reduce these numbers.

One compelling safety application is the Red Light Warning Violation application, which is designed to improve safety at signalized intersections by integrating vehicle-based and infrastructure-based DSRC equipment. By integrating Signal Phase and Timing (SPaT) information, the system can inform drivers of an impending red light in time to bring the vehicle safely to a stop. Furthermore, this application can warn drivers about other vehicles that are likely to violate traffic signals, thereby preventing a crash.

Another compelling safety application is the Intersection Movement Assist (IMA) collision warning application, which is designed to improve safety at both signalized and non-signalized intersections solely through the broadcast and receipt of a vehicle-based DSRC safety message. Through analysis of the data contained within Basic Safety Messages broadcast by nearby vehicles, the IMA application warns the driver when it is unsafe to enter an intersection due to a high likelihood of collision with other vehicles approaching the same intersection. This application has the potential to prevent crashes which are not currently addressable with non-cooperative vehicle-based safety technologies (e.g., radar, camera or laser-based).

2.1.2. *Mobility and Environmental Applications*

While safety is the driving factor behind the development of DSRC and applications that use it, both mobility and environmental improvement applications will use DSRC as an enabling technology to improve traffic flow and reduce environmental impact. DSRC has been specifically engineered to work well in situations where rapidly-moving devices need to communicate over short distances. Mobility and environment improvement applications often depend on communication from moving vehicles to devices close by the side of the roadways.

Mobility applications include electronic toll collection, fleet management, weather information, in-vehicle signage, and traffic information. Additional environmental applications can reduce fuel consumption and emissions, such as managing public transportation, optimizing intersection traffic, and collecting additional probe data.

[1] In-vehicle signage displays signs, such as speed limits, no passing, and exit signs, on the driver-vehicle-interface.
[2] NHTSA Traffic Safety Facts, Research Note, December 2012. http://www-nrd.nhtsa.dot.gov/Pubs/811701.pdf

To illustrate a mobility application, consider electronic screening (E-Screening). By applying two-way DSRC Wireless Access in Vehicular Environments (WAVE) radiocommunication technology, E-Screening systems enable commercial vehicle (large truck and bus) operators to transfer vehicle inspection information automatically as the vehicle passes an inspection point, and ensuring smooth, continuous flow of traffic – without the need to stop at the gates, or even to have gates. E-Screening systems can improve traffic flow on Interstate highways, and reduce fuel consumption and pollution. In addition, allowing heavy vehicle traffic to pass through without stopping can increase road capacity and relieve traffic congestion at high traffic times. It is also expected that E-Screening systems will reduce the operating costs of roads by replacing some aspects of manual inspections. Due to the inherent security protocols being considered for DSRC-based communications, motor carriers will be able to securely send data in support of motor carrier e-screening processes.

To illustrate an environment application, consider a vehicle approaching a signalized intersection with DSRC WAVE available to provide SPaT and Geometric Intersection Description (GID) data to a vehicle properly equipped with onboard computer processor and a display device to provide the driver with speed advice. The onboard computer received SPaT and GID messages from the intersection, interprets the received information along with current vehicle speed and location with an algorithm designed to improve environmental performance, and suggests a vehicle speed trajectory for both the approach and departure legs of the intersection.

2.2. International Harmonization

The Department places significant value in developing DSRC in harmony with the international community. This can benefit domestic users by creating larger markets for individual products as well as increasing the size of the creativity pool of new applications. By working with global standards organizations to harmonize DSRC standards, devices designed and manufactured in the United States can also be used in other international markets. This will enable greater economies of scale to decrease costs and improve safety for both domestic and international users, while creating a larger overall market for U.S. device makers.

These efforts have been particularly fruitful in North America. Starting in the 1990s, the ITS program has worked with Industry Canada to ensure cross border compatibility. Like the United States, Canada has also allocated the 5850-5925 MHz band to support DSRC applications and gives priority to fixed and mobile services over the fixed-satellite service.[3] There have also been discussions with Mexico about greater use of DSRC devices as the applications are deployed. Most recently, the focus has been on U.S.-Mexico border aspects with the intent to support not only routine operations such as electronic toll collection, but transportation safety, policy and operations as well.[4]

The international agreements and coordination to harmonize DSRC across North America have been significant and ongoing for many years. In Canada and Mexico, the DSRC band is already

[3] Industry Canada, Canadian Table of Frequency Allocations 9 kHz to 275 GHz (2009 Edition), http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/cane2009edition-eng.pdf/$FILE/cane2009edition-eng.pdf

[4] Rajbhandari, Rajat, PhD, PE, Juan Carlos Villa, Roberto Macias, and William Tate, Texas Transportation Institute, Transportation Research Board, January 2013, http://docs.trb.org/prp/13-2064.pdf

coordinated, with limited or no flexibility, as the system crosses international borders, due to rules and regulations that were in place prior to DSRC development. Adding an additional layer of sharing with Part 15 devices in the U.S. would introduce significant more uncertainty and negatively impact deployment scenarios.

DOT is working collaboratively with the European Commission on connected vehicle research. In particular, we are focused on the international harmonization of standards. Over the past year, we worked with the global automotive industry, the Society of Automotive Engineers, and the European Telecommunications Standards Institute to harmonize the core safety message operating on DSRC. DOT has also initiated harmonization activities with Japan and, more recently, the Republic of Korea. This harmonization will lead to more effective applications at reduced cost worldwide.

3.0 Specific Questions Raised By The Commission

3.1. Current rules – Harmonization across U-NII 1 and U-NII 2 bands

In NPRM ¶ 39, 40, and 41, the Commission seeks comment on whether to harmonize rules across the U-NII-1 and U-NII-2 bands and whether the rules for the U-NII-1 band should be modified to harmonize with rules in the U-NII-3 band. In ¶ 97, the Commission further asks if the technical requirements specified in Section 15.407 should apply across the expanded U-NII-3 and the U-NII-4 bands. Thus, it seems reasonable to address the question of harmonization raised in ¶ 39, 40, and 41 across all bands, including the new proposed U-NII-4 band. Section 15.407 addresses the following topics, among others: power limits, undesirable emission limits, indoor/outdoor restrictions, frequency stability, transmit power control, dynamic frequency selection and related topics.

DOT is working with the NTIA to analyze the current proposals for sharing. Once this analysis is complete, DOT, along with the NTIA and the FCC, will be better poised to assess how the proposed changes to existing rules and regulations for harmonization across such a large swath of spectrum will impact DSRC. There is insufficient information about how U-NII devices would detect DSRC devices, and how U-NII devices would yield access to the channels within the 5850-5925 MHz band. Therefore, we cannot accurately and reliably assess the impacts on sharing in the 5850-5925 MHz band at this time. As a result, we are concerned that taking steps toward a sharing scheme would jeopardize safety.

3.2. Interference

3.2.1. *Implications of NPRM Proposed U-NII-4 Expansion into the DSRC Band*

Figure 1 depicts the current DSRC channel plan in the 5850-5925 MHz band showing a 5 MHz guard band, the control channel (Channel 178), and the six service channels, overlaid with the NPRM proposed U-NII-4 channels based on elaborated IEEE 802.11ac (or other implementation) into this band. The proposed channels in the NPRM include 20 MHz, 40 MHz, 80 MHz, and 160 MHz bandwidths. These proposed channels step on all DSRC channels with the exception of channel 184.

Safety-critical applications on the DSRC channels require that the channels be instantly accessible. The NTIA risk assessment on sensing of DSRC signals (see Chapter 5 of the NTIA report[5]) plus the non-alignment of the two channels schemes suggest that DSRC safety-critical applications will not be able to coexist in exactly the same spectrum as U-NII-4 without modifications to the U-NII devices. As the existing standards require sensing on the center frequency, they will not detect DSRC activity. Additionally, if U-NII devices are listening before a mobile DSRC device enters its listening area and begins to transmit, they will not detect the DSRC device. Clearly, there are concerns over shared use of the same spectrum in the same geographic area. In areas where there is no geographic overlap, there may not be any issues, but that will be difficult to define, because listening alone will not be 100% effective.

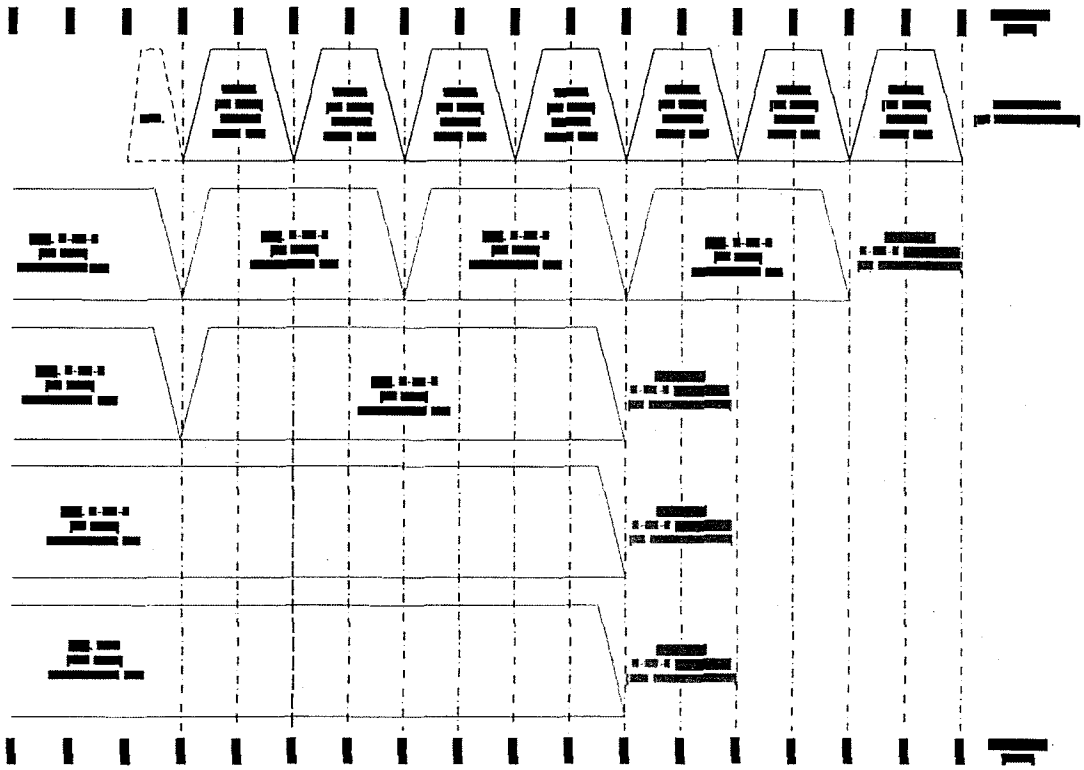

Figure 1 - Envisaged Overlay of Proposed U-NII channels on Current DSRC Channel Plan

3.2.2. *Existing Interference and Potential Impact on a Safety Service*

As described previously, DSRC is a safety service and must have a very high level of assurance to ensure that the time and location information from both fixed and mobile devices reaches the intended destination. Failure to achieve these service levels will undermine the value of the safety service, and of drivers' confidence in warnings and other information received.

[5] Evaluation Of The 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) Of The Middle Class Tax Relief and Job Creation Act of 2012

It is unclear at this point if the parameters and techniques used by U-NII devices identified thus far can ensure the level of communication reliability required to support DSRC as a safety service. As noted in various reports, even FCC-certified devices were found not to function properly – in one case failing to detect the Terminal Doppler Weather Radar (TDWR)[6] used by the Federal Aviation Administration. Furthermore, in some cases the U-NII device's firmware had been updated by the manufacturer and still could not detect the TDWR signal to avoid interfering with it.

In other cases, the U-NII device firmware may have been modified in the field. Clearly, devices that currently operate in other portions of the U-NII spectrum have been manufactured either without the appropriate safeguards or without sufficient firmware "guards." This makes it difficult to ensure that, once the device leaves the manufacturer, it cannot be modified to produce signals outside legal operating parameters.

3.2.2.1. Potential Impact from Easily Modified Equipment

As noted in Paragraph 49 of the NPRM, equipment is "designed so that end-users can modify them to operate in bands for which they are not certified and this does not meet the specific requirements intended to protect sensitive incumbent services." Given the safety critical aspect of DSRC, there must be clear assurance that harmful interference will not occur. The level of flexibility envisioned by the NPRM, as well as the sharing of the DSRC band, introduces significant risk to DSRC safety services. Rules must be developed to ensure this risk is mitigated.

3.2.2.2. Inadequacy of Indoor Only Restrictions

In paragraph 37, the FCC raises the issue of the use of indoor-only devices. The Commission is correct in its assessment that many devices are incorporating U-NII capabilities, and that these devices are increasingly portable or mobile in nature. Such devices include cellular phones and in-vehicle devices for sharing audio and video content. An examination of devices authorized for indoor-only use finds that any distinction between indoor and outdoor use has been lost on end users, given that consumers are not informed of this restriction until deep within the owner's manual. While this may meet the applicable rules and regulations, strengthening the warning to include a notice on the device itself may be appropriate.

It may be beneficial to integrate U-NII devices on vehicles to aid in applications as diverse as engine monitoring, warranty notices, and other non-time critical information to and from infrastructure. The beneficial aspects of U-NII devices must be balanced with the DSRC-based applications' requirement to provide time and location specific information to vehicles, their subsystems, and their operators to reduce crashes, save lives, and create a more robust transportation infrastructure.

3.2.3. ***Similarities with Existing U-NII Operations***

The NPRM states that the "FCC believes that because the types of incumbent services across the 5 GHz spectrum share similar characteristics, the technical requirements for unlicensed devices could also share similar characteristics." NPRM ¶ 95. When addressing DSRC, DOT agrees that

[6] NTIA Technical Report TR-11-479, Executive Summary.

some characteristics may be similar to some unlicensed devices already in the lower portion of the 5 GHz spectrum, but there are also some fundamental differences. First and foremost, DSRC has been developed as a safety service to reduce fatalities and injuries in our nation's surface transportation network. For this to occur, implementers must be assured of a high level of availability. It is imperative that no interference will occur that disrupts this level of reliability in communication. Furthermore, a significant portion of this communication will take place between vehicles. Traveling late at night or on rural roads, there are few vehicles, and detecting DSRC transmissions becomes difficult.

Carrier Sense Multiple Access (CSMA), a recognized means of detecting an operating device, works by looking at the center of the sought-for channel. If the Wi-Fi device is looking there, it won't see DSRC because, by design, DSRC's channel centers are misaligned. In addition, a device searching for the center of an 80 MHz channel will miss most DSRC channels in the existing Channel Plan, whether or not the center is misaligned.

In NPRM ¶ 98, the Commission seeks comment on whether Dynamic Frequency Selection (DFS) might be effective. It may well work with radar systems. However, in order for DFS to work with DSRC, it must be able to sense a vehicle as the vehicle transits an area, starting out beyond the U-NII-4 unit's sensing range, transitioning into it, and then transitioning out of that range. If U-NII-4 units are arranged along a roadway, the DSRC unit may transition in and out of multiple U-NII pockets very quickly, making it exceedingly difficult for DFS to be effective. Technologies like DFS, unless they are implemented on an "always listen, never transmit if heard" basis will interfere with V2V operations as these vehicles constantly transition from outside the receivers' listening range to within it.

3.3. NTIA Report

The NTIA has begun the process of addressing the potential for sharing of the 5350-5470 and 5850-5925 MHz bands based on direction from Congress in the Middle Class Job Creation and Tax Relief Act of 2012. The first phase of this effort was to describe the risks associated with sharing with U-NII devices. As noted in the NTIA report,[7] current U-NII regulations were not developed to detect DSRC signals, and U-NII signal detection technologies may not be capable of detecting DSRC signals. Current U-NII regulations were not developed to protect non-co-located transmitters and receivers, and changes to U-NII detection parameters may not protect systems from serious degradation.

DOT is working with the NTIA to analyze the current proposals for sharing. Further analysis is needed to determine if there are appropriate mitigation techniques. Once this analysis is complete, DOT, along with the NTIA and the FCC, will be better poised to assess how the proposed changes to existing rules and regulations for harmonization across such a large swath of spectrum will impact DSRC. In all events, safety cannot be compromised.

[7] Evaluation Of The 5350-5470 and 5850-5925 MHZ Bands Pursuant To Section 6406(b) of the Middle Class Tax Relief and Job Creation Act of 2012, January, 2013.

3.4. Sensing Technologies

The FCC seeks comments on various technologies that could support spectrum sharing, including sensing based technologies, beaconing/pilot channel technologies, and geo-location based technologies. The first two technologies will be difficult to support with the mobile nature of the V2V applications for DSRC due to their transitive nature of entering and leaving U-NII zones. There may be some benefit for stationary V2I applications, but that may be limited by the mobile nature of the vehicle platform and its need to sense and respond to infrastructure-based services. For activities which are strictly infrastructure, a geo-location based service may work well, but there are concerns that identifying all stationary DSRC devices will be difficult, especially since some are likely to be used with work zones (they will be temporary in nature, perhaps for only a few hours in some cases) and the other aspect of providing a list of potential high value infrastructure services that are geo-coded.

4.0 Summary

DSRC should continue to be protected for the uses and goals for which it was allocated: reducing crashes, injuries, and fatalities. The FCC's proposals should not be implemented until and unless rigorous testing has shown that these critical safety goals will still be satisfied.

The Commission has raised some good points and asked questions that focus on the immediate issues of sharing and competing services being able to maintain an operational effectiveness. At this time, it is unclear if such sharing can take place. We are confident that the Commission will take the time to allow the NTIA and others to look cooperatively at this issue and present sound facts and technical analysis that will lead both to greater spectrum flexibility, and to saving lives.