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

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

To: The Commission

COMMENTS OF
Open Technology Institute at New America Public Knowledge, Engine, Common Cause, and Next Century Cities

Harold Feld
John Gasparini
Public Knowledge
1818 N Street, NW
Washington, DC 20036

Evan Engstrom
Emma Peck
Engine
414 Brannan Street
San Francisco, CA 94107

Michael Calabrese
Wireless Future Project at
New America's Open Technology Institute
740 15th Street, N.W. – 9th Floor
Washington, DC 20005

Todd O'Boyle
Common Cause
805 15th Street NW – 8th Floor
Washington, D.C. 20005

Deb Socia
Next Century Cities
1200 18th Street, NW – Suite 700
Washington, DC 20036

July 7, 2016

Table of Contents

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

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

To: The Commission

COMMENTS OF
Open Technology Institute at the New America
Public Knowledge, Engine, Common Cause
and Next Century Cities

The undersigned groups, members of the Public Interest Spectrum Coalition, are pleased to submit these Comments in response to the Federal Communications Commission's ("FCC") *Public Notice* seeking to update and refresh the record in the above-captioned proceeding.[1]

I. INTRODUCTION AND SUMMARY

The undersigned members of the Public Interest Spectrum Coalition (hereinafter the "Public Interest Organizations," or "PIOs") strongly supported the Commission's 2013 proposal to expand unlicensed public access to 775 contiguous megahertz across the 5 GHz band, thereby enabling gigabit-fast and more affordable Wi-Fi connectivity made possible by the existing 802.11ac Wi-Fi standard. The beneficial and mushrooming impact of unlicensed spectrum on the availability and affordability of mobile Internet access – and on the telecom sector and the U.S. economy more generally – is well documented. Wi-Fi is the workhorse of the Internet that currently carries an average 80 percent of all mobile device data traffic – and does so in an

[1] Public Notice, *Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, ET Docket No. 13-49 (rel. June 1, 2016) ("*Public Notice*").

incredibly democratic and efficient manner through end-user networks and small cell spectrum re-use. Expanding unlicensed and wider-channel access to frequencies above 5 GHz can complement the use of licensed spectrum and facilitate new market entrants, services and applications that rely solely on unlicensed.

First, we strongly support opening the 5850-5925 MHz (U-NII-4) band for shared and unlicensed use, subject only to necessary interference protections for band incumbents. Contiguous unlicensed access to at least the lower 40 megahertz of U-NII-4 band, combined with technical rules harmonized with the U-NII-3 band, will enable access to 80 and 160 megahertz channels which can greatly amplify the potential increases in capacity for Wi-Fi operations. Accordingly, the Public Interest Organizations urge the Commission to lead and expedite a collaborative testing process aimed at a win-win compromise that doubly benefits nearly all Americans by enabling two services – DSRC and U-NII devices – to coexist and share at least the lower portion of the 5.9 GHz band without risk of harmful interference to truly delay-sensitive safety-of-life V2V or V2I communications.

Second, the Public Interest Organizations believe that the re-channelization approach to sharing strikes the best balance between DOT's legitimate interest in promoting crash avoidance and the Commission's interest in promoting ubiquitous broadband connectivity and innovation. Since both DSRC safety-of-life applications and expanded broadband capacity can deliver important benefits for virtually all Americans, the Commission should strive to enable both of these compelling public interest outcomes.

The critical factor in striking this balance is the distinction between real-time safety and other non-safety (or non-time-critical) DSRC applications. By dedicating three channels exclusively to DSRC safety applications – including the dedicated 10 megahertz BSM channel needed to implement DOT's proposed V2V mandate – the Qualcomm proposal virtually eliminates the risk of interference with safety-of-life applications, while at the same time adhering to the FCC's evolving principles of spectrum efficiency and flexibility that require public safety allocations to be narrowly defined and "limited" to "the amount of spectrum . . . which ensures that those [compelling public interest] objectives are achieved." Our groups generally support proposals to re-channelize the band so that V2V Basic Safety Messaging and other latency-sensitive safety-of-life DSRC applications will have two or three dedicated safety channels (20 or 30 megahertz) at the top of the ITS band, furthest away from any potential interference from unlicensed operations in U-NII-3 and in the bottom 40 megahertz of U-NII-4.

The Public Interest Organizations urge the Commission to reject the detect-and-avoid approach outlined in the *Public Notice*. The fundamental problem with the Cisco approach, as currently described, is that it would not permit the economically feasible deployment of unlicensed technologies, particularly Wi-Fi. Vacating the entire band if any DSRC transmission is detected on any channel across a 100 megahertz range (the entire 5.9 GHz band and the adjacent 5825-5850 MHz) is an extreme restriction that may effectively exclude 802.11ac Wi-Fi and future unlicensed innovation from the band. Since a V2V mandate would require that vehicles use the BSM safety channel to constantly communicate their location, heading, speed and other data to surrounding vehicles, the continual and ubiquitous traffic on this single 10 MHz channel could exclude unlicensed devices from the entire 5.9 GHz band, with the exception of those inside well-shielded buildings and away from streets and vehicles. The Cisco detect-and-avoid approach would make unlicensed devices substantially more expensive and restrict the benefits of extended gigabit Wi-Fi connectivity to indoor enterprise Wi-Fi systems (such as hotels, convention center, corporate campuses), while denying those benefits to individual households and other business establishments located close to streets and vehicles.

Third, the Public Interest Organizations strongly agree with Commissioner O'Rielly and others that non-safety of life commercial and informational DSRC applications should share at least the lower portion of the band on an equal basis with unlicensed operators. The Commission's 1999 ITS allocation order contemplated, and reserved for later judgment, that non-safety functions could operate on an unlicensed basis separate from the safety-of-life DSRC. And certainly after more than 15 years of leaving the band fallow, even the speculative non-safety applications suggested by the auto industry (such as advertising, social media, navigation, in-vehicle displays and electronic payments) have been or soon will be subsumed by more efficient general purpose cellular and Wi-Fi networks –including the high-capacity and low-latency benefits of general purpose 5G networks – at least a decade before NHTSA expects DSRC to achieve a critical adoption rate sometime in the 2030s.

Fourth, and relatedly, the fundamental framework of FCC spectrum allocation policy has evolved since 1999 in a manner that completely contradicts auto industry pleas for an auction-free and effectively exclusive silo of special-purpose spectrum with a designated technology (DSRC) that will be obsolete (if it isn't already) long before the 20-to-30-year deployment period NHTSA estimates is needed even before it can judge whether DSRC is effective for crash avoidance. Leaving most of the band's capacity essentially fallow for the indefinite future is distinctly inconsistent with FCC spectrum management principles adopted in the years since the original 1999 ITS allocation. It also runs counter to the Obama Administration's historic initiative to open underutilized bands for sharing to the greatest extent feasible.

The Commission's effort since 1999 to move away from silos of special-purpose use and toward more intensively-used and flexible general-purpose use makes the distinction between DSRC's anticipated real-time safety and non-safety applications critical. In 2002 the Spectrum Policy Task Force (SPTF) Report recommended that the Commission "eschew command-and-control regulation" of spectrum use. The Task Force Report emphasized that exceptions made for public safety or other public interest allocations should be narrowly defined ***"and the amount of spectrum . . . limited to that which ensures that those [compelling public interest] objectives are achieved."*** Embracing this trend, the 2010 National Broadband Plan criticized the traditional approach to allocating spectrum "on a band-by-band, service-by-service basis, typically in response to specific requests for service allocations" and concluded that "the failure to revisit historical allocations can leave spectrum handcuffed to particular use cases and outmoded services, and less valuable and less transferable to innovators who seek to use it for new services."

Finally, the auto industry's recent Petition for Reconsideration challenging the out of band emission (OOBE) limits adopted by the Commission for unlicensed use of the adjacent U-NII-3 band reinforces just how easily the interference concerns of the auto industry could be addressed through re-channelization. By re-channelizing to physically separate the real-time life-and-safety channels from unlicensed OOBE, the automakers' concern about interference to BSMs can be completely satisfied, removing virtually all risk of interference between future Wi-Fi and V2V safety signaling. This can be done without undue delay since there are no DSRC deployments and DOT is expected to give automakers a multi-year transition period before requiring the installation of at least a single-radio DSRC system in every new car sold.

II. THE PUBLIC INTEREST IN GIGABIT-FAST AND AFFORDABLE WI-FI CONNECTIVITY DEPENDS ON SHARED, UNLICENSED ACCESS TO THE 5.9 GHZ BAND

The enormous and increasing economic value of unlicensed spectrum for both personal and business productivity is well-documented. As FCC Chairman Tom Wheeler observed last year, although access to unlicensed spectrum draws less public attention than multi-billion dollar auctions for licensed spectrum, "the remarkable success of Wi-Fi demonstrates [that unlicensed spectrum] literally is an indispensable element in the provision of broadband today."[2] In addition to generating more than $200 billion in value for the U.S. economy each year, unlicensed spectrum serves as an incubator of wireless innovation, including as the connective tissue of the emerging Internet of Things. A single application – Wi-Fi – already carries roughly 80 percent of all mobile device data traffic, making wireless Internet access far more available, fast and affordable for consumers. However, just like licensed spectrum, more unlicensed spectrum with wider channels to accommodate the public's rapidly growing demand for video and other broadband data services is a pressing need. Opening large contiguous tracts of spectrum in the 5 GHz band – and including the U-NII-4 band for unlicensed sharing – is key to creating the "wider pipe" required for gigabit Wi-Fi connectivity.

A. More Ubiquitous, Fast and Affordable Wi-Fi is Increasingly Central to the Public Interest in Mobile Connectivity, Competition and Innovation

The widespread availability of Wi-Fi operating on *unlicensed* spectrum is the single most important factor in mitigating the "spectrum crunch." Today, Wi-Fi networks operating on unlicensed spectrum carry the vast majority of all mobile device data traffic. Mobidia, which measures the actual usage of tens of thousands of consumers, reported that Wi-Fi was carrying

[2] *See* Monica Alleven, "Wheeler Gives Shout-Out to Unlicensed Spectrum Sharing," *FierceWirelessTech* (June 26, 2015), *available at* http://www.fiercewireless.com/tech/story/wheeler-gives-shout-out-unlicensed-spectrum-sharing/2015-06-26.

an average of 80 percent of total mobile device data traffic at the end of 2014.[3] An AT&T executive recently confirmed that the carrier's subscribers offload an average 80 percent of mobile device data over Wi-Fi networks.[4] This is the same level of Wi-Fi offloading projected for Western Europe by the end of 2016, according to a European Commission study.[5]

Wi-Fi is increasingly the public's primary gateway to Internet access. More than two-thirds of U.S. households have one or more Wi-Fi networks, and the adoption rate is expected to rise to 86 percent by 2017.[6] Virtually every licensed device incorporates Wi-Fi and most service providers depend on Wi-Fi to make high data-rate applications like video feasible and affordable to users. However, much of the vast Wi-Fi device ecosystem is not connected to any cellular network. For example, more than 90 percent of iPads and other tablets are used exclusively on wireline connections via Wi-Fi, as are virtually all laptops and netbooks.

This trend toward small cell re-use of unlicensed spectrum will only increase. Americans spend a growing share of their time online using a mobile device – and increasingly they use high-bandwidth applications (video chat, music and video streaming, social media) indoors and in other stationary locations where connecting over a faster and less expensive fixed LAN via

[3] *See* Mobidia, "Network Usage Insights: Average Data Usage for LTE, 3G and Wi-Fi of Wireless Subscribers in the USA, Q3 2014" (Nov. 2014); Analysys Mason, "Consumer Smartphone Usage 2014: Mobile Data" (April 2015) (consumer survey panel showed 19% data traffic on cellular, 81% over Wi-Fi).

[4] Colin Gibbs, "AT&T routing more than 4 million voice calls a day over Wi-Fi," *FierceWireless* (June 21, 2016), quoting comments by Bill Smith, AT&T president of Technology Operations, at the Wells Fargo 2016 Convergence and Connectivity Symposium ("About 80 percent of the wireless traffic today is handled over Wi-Fi networks, so we're actually pretty bullish about . . . unlicensed bands.").

[5] *See* J. Scott Marcus and John Burns, *Study on the Impact of Traffic Off-Loading and Related Technological Trends on the Demand for Wireless Broadband Spectrum*, European Commission, at p. 3 (Aug. 2013). The E.C. study used data from surveys that monitored the actual activity of thousands of mobile devices to project offload rates for the U.K., France, Spain, Germany and Italy.

[6] *See* Raul Katz, *Assessment of the Economic Value of Unlicensed Spectrum in the United States*, Telecom Advisory Services (Feb. 2015), at p. 14, *available at:* http://www.wififorward.org/wp-content/uploads/2014/01/Value-of-Unlicensed-Spectrum-to-the-US-Economy-Full-Report.pdf.

Wi-Fi is most popular.[7] The application driving data demand – video – is the most nomadic, and is expected to surge to 75 percent of total U.S. mobile data traffic by 2019 and 80 percent globally.[8] Surveys of user behavior show that nearly 85 percent of video on mobile devices is watched at home (50 percent), at work (15 percent), or in other indoor locations. Only 15 percent is watched outdoors or "in transit" and it's likely that an increasing share of this traffic will be covered by Wi-Fi hotspots in the future.[9]

Unlicensed Wi-Fi routers, chips and services are a rapidly-growing, multi-billion-dollar industry. But more important for the economy overall is the tremendous *multiplier effect* that Wi-Fi has on the use and utility of the Internet by making a single wired connection available for shared use on a very low-cost, do-it-yourself basis. This generates enormous consumer welfare. Wi-Fi connections in homes, schools, libraries, and businesses, along with rapidly proliferating public hot spots have proven to be complementary and cost-saving to both commercial wireless

---

[7] According to a 2012 Cisco survey, users report that two-thirds of their mobile device use for broadband applications is at home or work, while only 10-to-15 percent is "on the go" or outside of retail and public locations that are increasingly wired for Wi-Fi access. *See* Stuart Taylor, Andy Young and Andy Noronha, *What do Consumers Want from Wi-Fi? Insights from Cisco IBSG Consumer Research* (May 2012), at 5. *See also* Stuart Taylor, *What do Mobile Business Users Want from Wi-Fi? Insights from Cisco IBSG Consumer Research* (Nov. 2012), at p. 6. Similarly, the 2013 Cisco user survey report states: "The 'nomadic' use of mobile devices continues to evolve, as many people now use their mobile devices in 'mobile stationary' locations" that are increasingly served by fixed Wi-Fi access. Taylor and Christensen, *Understanding the Changing Mobile User, supra*, at 4.

[8] Robert Pepper, *Cisco Visual Networking Index* (VNI) *Mobile Data Traffic Update, 2014-2019*, presentation at Mobile World Congress, GSMA Seminar, at 36 (Mar. 3, 2015), *available at* http://www.gsma.com/spectrum/wp-content/uploads/2015/03/MWC15-Spectrum-Seminar.-Dr-Roberto-Pepper.-Cisco-presentation.pdf. Cisco projects video will surpass 80% globally, up from 67% in 2014. See *Cisco Visual Networking Index* (VNI): *Forecast and Methodology, 2014-2019*, Cisco, (May 27, 2015) ("Cisco Visual Networking Index"), *available at* http://www.cisco.com/c/en/us/solutions/collateral/service-provider/ip-ngn-ip-next-generation-network/white_paper_c11-481360.html.

[9] *See* Stuart Taylor, *A New Chapter for Mobile? How Wi-Fi Will Change the Mobile Industry as We Know It*, Cisco Internet Business Strategy Group, at p. 6 (Nov. 2011).

carriers (which need fewer base stations and less licensed spectrum) and to wireline ISPs seeking to give their customers the ability to access content away from their home wired connections.[10]

A series of economic studies have documented the steadily increasing economic value of unlicensed spectrum use for both personal and business productivity. A pair of 2014 studies by Columbia University economist Raul Katz estimated that the broader set of applications currently operating in unlicensed spectrum bands in the United States (primarily Wi-Fi and RFID) generated a total economic value of $222 billion in 2013, which he projected to increase to $531 billion by 2017.[11] A second pair of economic studies by the Consumer Technology Association (formerly the Consumer Electronics Association) estimates that unlicensed spectrum generates $62 billion in retail sales value for devices and over $200 billion when combined with "unlicensed spectrum's value in terms of cost savings to individuals and firms."[12]

---

[10] One example is the enormous cost savings experienced by mobile carriers attributable to Wi-Fi connections carrying the majority of their customer's smartphone data traffic. A 2012 study by Consumer Federation of America economist Mark Cooper found that Wi-Fi offloading, in addition to reducing the spectrum needed by U.S. carriers, also reduced the infrastructure costs of cellular broadband service by roughly $20 billion per year, "which is a substantial savings in a market with annual revenues of $70 billion." *See* Comments of Consumer Federation of America, *In the Matter of Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Docket No. 12-268, FCC 12-118 (rel. Jan. 25, 2013), at 2, 19 (updating key findings from its previously published study on the economics of Wi-Fi offloading).

[11] Raul Katz, *Assessment of the Future Economic Value of Unlicensed Spectrum in the United States*, Telecom Advisory Services (Aug. 2014), at 28, *available at* http://www.wififorward.org/wp-content/uploads/2014/01/Katz-Future-Value-Unlicensed-Spectrum-final-version-1.pdf. Katz's estimate of economic value included both consumer and producer surplus for residential Wi-Fi, Wi-Fi offloading from mobile devices, RFID and Wi-Fi only tablets. Katz also estimated that unlicensed operations contributed $6.7 billion to the nation's GDP in 2013, a contribution that will grow to $13.5 billion by 2017. *See also* Raul Katz, *Assessment of the Economic Value of Unlicensed Spectrum in the United States*, Telecom Advisory Services, at 72 (Feb. 2014).

[12] *See* Comments of Consumer Electronics Association, ET Docket No. 15-105 (Jun. 11, 2015), at 3, notes 6 and 7 ("Comments of CEA"); *see also* Paul Milgrom, Jonathan Levin, and Assaf Eilat, *The Case for Unlicensed Spectrum* (Oct. 2011), at 19 ("Milgrom Study") (estimating the economic value of the share of mobile data carried by Wi-Fi to be at least $25 billion annually), *available at* http://web.stanford.edu/~jdlevin/Papers/UnlicensedSpectrum.pdf.

Unlicensed spectrum as a public resource increasingly serves as an incubator of wireless innovation. Although Wi-Fi is the best known unlicensed standard, the expansion of unlicensed spectrum has also enabled other communications technologies, such as Bluetooth, ZigBee, z-Wave, Near Field Communication (NFC) and wireless HD connections, "technologies [that] have opened new frontiers of communications for consumers."[13] One example of how access to unlicensed spectrum access lowers the barriers to entry and innovation is the proliferation of new device certifications. Overall, there are far more unlicensed than licensed devices.[14] More devices have been certified to use the 2.4 GHz unlicensed band (more than 22,000) than in any other band (the FM band was second with 7,275 devices certified as of early 2013). About two billion Wi-Fi capable devices were sold in 2013 alone and the Wi-Fi Alliance projects that sales of devices with Wi-Fi connectivity will exceed 4 billion by 2020 (a six-fold increase from 2010).[15] In their valuation study, Stanford economists Paul Milgrom and Jonathan Levin observed that "the primary benefits of unlicensed spectrum may very well come from innovations that cannot yet be foreseen. The reason is … that unlicensed spectrum is an enabling resource. It provides a platform for innovation upon which innovators may face lower barriers to bringing new wireless products to market."[16]

The benefits of access to unlicensed spectrum extend far beyond wireless broadband. Immense opportunities exist for startups and innovators to harness the data services enabled by

---

[13] *See* Comments of Consumer Electronics Association, *Revision of Part 15 in the 5 GHz Band*, ET Docket No. 1349 (May 28, 2013), at 7.

[14] *See* Comments of Wi-Fi Alliance, *Office of Engineering and Technology and Wireless Telecommunications Bureau Seek Information on Current Trends in LTE-U and LAA Technology*, ET Docket No. 15-105 (Jun. 11. 2015), at 7 ("Comments of Wi-Fi Alliance").

[15] *See* Wi-Fi Alliance, "Wi-Fi Alliance celebrates 15 years of Wi-Fi," *Press Release* (Sep. 8, 2014), *available at* http://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-celebrates-15-years-of-wi-fi.

[16] *See Milgrom Study*, *supra* note 12, at 2 (Oct. 2011).

unlicensed spectrum to develop and offer new products and services for logistics, fleet management, smart grid, the growing Internet of Things, and innumerable other sectors. Open wireless strategies (Wi-Fi and other unlicensed technologies) are already dominant in a number of industries that are rapidly incorporating wireless connectivity, making up 70 percent of smart grid communications, 80 percent of wireless healthcare solutions, over 90 percent of wireless tablet connectivity, nearly all RFID inventory and asset tracking, as well as a growing share of the emerging Internet of Things.[17] Using unlicensed spectrum, power companies have been able to deploy advanced smart grid solutions without vying for their own piece of spectrum – an entry cost prohibitive to most innovators. Thanks primarily to the availability of unlicensed spectrum at 900 MHz, in the U.S. only one major provider in the smart grid market uses its own licensed spectrum.[18] In contrast, Europe's lack of access to unlicensed low-band spectrum equivalent to the U.S. 900 MHz band has resulted in only 15 percent wireless deployment (the rest uses wireline) – a situation that has stagnated the deployment of smart grid technology in European markets.[19]

The overall impact of high-capacity, ubiquitous and affordable wireless connectivity for the nation's economy is enormous. A May 2013 study by the McKinsey Global Institute examined 100 disruptive technologies and ranked the mobile Internet first, with an estimated global economic impact of \$3.7 to \$10.8 *trillion* by 2025 (nearly double the impact of the second

---

[17] *See* Yochai Benkler, *Open Wireless vs. Licensed Spectrum: Evidence from Market Adoption*, 26 HARV. J. L. & TECH. 1, at 72 (Fall 2012) ("*Benkler Study*").

[18] *See Id.* at 110. ("A single major provider in this market, Sensus, uses its own licensed spectrum. It serves 20% of the market") (citations omitted). Similarly, nearly all of the nation's estimated 2,000 Wireless Internet Service Providers (WISPs) rely entirely or primarily on unlicensed spectrum to provision fixed-wireless broadband in underserved rural, exurban and small town markets.

[19] *See Id.* at 110-113.

most valuable technology, the automation of knowledge work).[20] The impact of wireless connectivity on the U.S. economy is amplified because it is what Jason Furman, chairman of the president's Council of Economic Advisors, called "a General Purpose or 'platform' technology, meaning that improvements in communication technologies stimulate innovation across a wide variety of other sectors."[21] The implications for innovation and economic competitiveness led the FCC's National Broadband Plan to recommend the reallocation of an additional 500 MHz of licensed and unlicensed spectrum by 2020 in the prime low- and mid-band frequencies. Even if this goal is met, since few new allocations of exclusively-licensed spectrum below 6 GHz are identified beyond the ongoing TV band incentive auction, expanded use of unlicensed spectrum for Wi-Fi traffic will be necessary to absorb projected demand, to ensure consumers higher-speed connections, and to promote innovation in M2M connectivity more broadly.

B. Unlicensed Sharing of the 5.9 GHz Band is a Unique Opportunity for Gigabit Wi-Fi

Unfortunately, there are obstacles to extending and expanding the enormous public interest benefits of Wi-Fi connectivity. One challenge is that the unlicensed bands themselves are becoming congested, particularly in cities and other densely populated areas where many users are sharing spectrum in order to operate increasingly high-bandwidth applications like video chat and streaming video. Commissioners Jessica Rosenworcel and Michael O'Rielly warned in a joint blog post last year that because "Wi-Fi spectrum bands are wildly popular . . . with more and more people and devices taking advantage of this technology, these bands are getting

---

[20] James Manyika, *et al*., *Disruptive Technologies: Advances that Will Transform Life, Business and the Global Economy*, McKinsey Global Institute (May 2013), *available at* http://www.mckinsey.com/insights/business_technology/disruptive_technologies.

[21] Chairman of Council of Economic Advisors Jason Furman, "Remarks on Public Sector Spectrum Policy," Brookings Institution (Sep. 23, 2014), *available at* http://whitehouse.gov/sites/default/files/docs/remarks_on_public_sector_spectrum_policy_jf.pdf.

congested."[22] Although unlicensed bands are used very efficiently – due to sharing and small-area re-use of spectrum – the FCC has not increased access to unlicensed spectrum at the same pace as it has for licensed services.

A second related challenge to the nation's broadband goals is throughput capacity. With more and more users demanding increasingly high-bandwidth and real-time applications, such as high-definition video calling and streaming, the 20 megahertz wide channels that characterize today's Wi-Fi do not offer enough capacity to accommodate the projected increases in demand for mobile data. Wider channels will be critical to fuel very high-bandwidth apps and pervasive connectivity. This is particularly true in the enterprise environment and in user-dense venues such as schools, hotels, retail malls and sporting events.

As Wi-Fi transports an increasing majority of the nation's mushrooming mobile data traffic, and as innovators develop new uses for unlicensed airwaves, Americans will therefore need both more unlicensed spectrum *and* the wider channels. Opening large contiguous tracts of spectrum in the 5 GHz band for unlicensed sharing is key to creating the "wider pipe" required for gigabit Wi-Fi connectivity that both complement licensed mobile services and continue to make mobile Internet access more available and affordable to all Americans.

Wi-Fi using the IEEE's 802.11ac standard is designed specifically to operate on the wider, contiguous channels available only in the 5 GHz band. Using 802.11ac, Wi-Fi routers can support multiple, simultaneous high-bandwidth uses, such as parallel streams of very high-definition video, and with better performance. The 802.11ac technology achieves this huge boost in speed and capacity by combining several improvements: wideband channels of 40, 80 and even 160 megahertz (far wider than the three non-overlapping 20-megahertz channels

[22] Michael O'Rielly and Jessica Rosenworcel, "Driving Wi-Fi Ahead: the Upper 5 GHz Band," FCC Blog (Feb. 23, 2015), *available at* [*https://www.fcc.gov/news-events/blog/2015/02/23/driving-wi-fi-ahead-upper-5-ghz-band*](https://www.fcc.gov/news-events/blog/2015/02/23/driving-wi-fi-ahead-upper-5-ghz-band).

available at 2.4 GHz); extended multiple input, multiple output (MIMO) that enables eight spatial streams (twice as many as 802.11n); denser modulation, using 256 QAM (quadrature amplitude modulation), compared to 64 QAM in 802.11n; and enhanced channel bonding techniques.[23] The benefits of leveraging 80 and 160 megahertz channel sizes in the 5 GHz band include:

Gigabit Network Capacity: Wideband channels will initially more than triple Wi-Fi throughput rates, boosting the Quality of Experience for both home and enterprise users, including virtually instantaneous downloads and support for many parallel streams of high-definition video with improved spectrum efficiency and reliability.[24]

Enhanced Performance for Video*:* In user-dense environments 802.11ac can deliver many parallel streams of streaming video because MIMO and enhanced channel aggregation route traffic over multiple spatial streams.[25]

Longer Battery Use*:* With higher data rates, devices consume less battery power since transmission times are far shorter and more efficient.

Improved Hotspot Coverage*:* The higher capacity of each access point enables relatively high data rates over larger coverage areas, reducing the cost and improving the utility of both indoor networks and shared, public Wi-Fi networks.[26]

---

[23] *Id.* at 3. The 802.11ac standard has a link data rate of approximately 1 Gbps, compared to 54 Mbps for the 802.11a standard and 54 to 600 Mbps for the 802.11n standard. 5 GHz NPRM, at ¶ 18.

[24] *Id.* at 4; Motorola Solutions, *What You Need to Know About 802.11ac* (Jul. 2012), at 4-5, *available at* http://goo.gl/kzggg4.

[25] *Id*. at 4.

[26] *Id.* at 4-5.

Achieving this public interest benefit for faster and more affordable broadband connectivity will depend, to a considerable degree, on unlicensed sharing of at least the lower portion of the 5.9 GHz band.

III. SHARED USE OF THE BAND SHOULD BE BASED ON THE CRITICAL DISTINCTION BETWEEN SAFETY OF LIFE AND OTHER NON-REAL-TIME DSRC APPLICATIONS

As the Commission decides whether and how DSRC systems can share all or at least part of the 5.9 GHz band with Wi-Fi and other low-power unlicensed operations, it is critical to consider the distinction between DSRC safety-of-life applications and DSRC commercial and informational applications. And even among safety-related DSRC applications, it is important to distinguish between applications that can tolerate a degree of latency (e.g., the exchange of traffic flow and other informational data between vehicles and roadside units) and those that cannot (e.g., V2V crash avoidance signaling and first responder incident communication).

In making spectrum allocations, the Commission's *Public Notice* is correct to note the importance of identifying and separating out the spectrum requirements for safety-of-life applications.[27] DSRC safety-of-life transmissions are inherently narrowband, whereas informational services can require far more bandwidth. Non-safety DSRC applications are likely to include in-car information that enables services such as turn-by-turn directions, traffic and weather alerts, wireless payments at gas stations or parking garages, and display advertisements from roadside vendors. Most of the informational services DSRC technology is touted to deliver are *already* publicly available via smartphone applications and other mobile edge providers. And as ubiquitous, high-speed cellular and Wi-Fi connectivity increasingly give drivers and their passengers the ability to access any mobile app or service anywhere, the utility, efficiency and

[27] *See Public Notice* at 8.

equity of an exclusive and free band of spectrum for duplicative and competing auto industry applications is rightly called into question.

In August 2014 NHTSA released an advanced notice of proposed rulemaking (ANPRM) seeking comment on whether it should issue a mandate requiring V2V safety technology in all future passenger cars and light trucks.[28] NHTSA has not proposed extending DSRC safety applications to V2I, which is not within its jurisdiction and would be dependent on widespread infrastructure builds by thousands of state, county and municipal governments across the nation.

However, even if DOT adopts a V2V mandate, most of the ITS band would not be used for real-time crash avoidance or public safety purposes. From the outset, the auto industry has emphasized other potential DSRC applications in addition to real-time V2V safety. According to the industry, these non-safety-of-life apps range from navigation assistance (e.g., turn-by-turn directions), mobile tolling and parking payments, real-time traffic and weather updates, in-vehicle displays of roadside signage, among others.[29] These applications are clearly useful, but are also generally "ancillary" to the core safety-of-life applications that narrow-band DSRC signaling enables on a single V2V safety channel.[30] Moreover, these non-safety applications are already available to millions of drivers on the road today using smartphones through systems that include Apple CarPlay, Android Auto, Mirrorlink and OEM-designed integrations of cellular connectivity.

---

[28] NHTSA, *ANPRM*, "Executive Summary."

[29] For a partial list, see Table at 50 below. *See generally* Michael Calabrese, *Spectrum Silos to Gigabit Wi-Fi – Sharing the 5.9 GHz 'Car Band'*, Open Technology Institute at New America *(Jan. 2016)* ("*OTI 5.9 GHz Report*"), *available at* https://goo.gl/RY8M09.

[30] *See* Alderfer, et al., *Optimizing DSRC Safety Efficacy and Spectrum Utility in the 5.9 GHz Band*, Attachment to Comments of NCTA to NHTSA, at 10 (Oct. 20, 2014), *available at* http://www.regulations.gov/#!documentDetail;D=NHTSA-2014-0022-0932. "A variety of other services have been envisioned by DSRC stakeholders, though these services are generally ancillary to NHTSA's core interest in V2V safety and are at an even more nascent stage of development."

Real-time V2V safety-of-life applications are inherently narrowband and designed to require only a fraction of the 75 megahertz of spectrum currently allocated for ITS and DSRC technology. Basic safety messages (BSMs) are the central component of crash avoidance technology. These are simple transmissions, broadcast in all directions by an onboard DSRC antenna, that include information on the vehicle's speed, heading, braking status, and other details on its current state. Safety-of-life applications require real-time transmission of small amounts of data on the order of 100 to 500 bytes of information per transmission with a general latency requirement of 100 milliseconds or less.[31]

NHTSA and international regulatory bodies acknowledge the narrowband character of V2V safety communications, and emphasize that the real-time reliability of the BSMs communicated between vehicles is what's most critical.[32] When the FCC adopted the channelization plan for DSRC proposed by ITS America in 2003, it allocated one 10 MHz channel specifically to V2V basic safety messaging.[33] NHTSA has subsequently taken the position that crash-avoidance signaling (BSMs) must be limited to a ***single dedicated 10 MHz channel*** that is not shared with non-safety applications:

---

[31] Harding, J. et al., *Vehicle-to-vehicle communications: Readiness of V2V technology for application,* National Highway Traffic Safety Administration, Report No. DOT HS 812 014, at 98 (Aug. 2014) ("*V2V Readiness Report*"). *See also* National Highway Traffic Safety Commission, *Vehicle Safety Communications Project: Task 3 Final Report – Identify Intelligent Vehicle Safety Applications Enabled by DSRC,* at 141 (March 2005).

[32] *See* Comments of NCTA, at p. 13-14; *See also HSTP-CITS-Reqs Global ITS Communication Requirements*, ITU Technical Paper, at 11-12 (Jul. 11, 2014) ("Safety applications do not require high bandwidth"), *available at* http://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-ITS-2014-REQS-PDF-E.pdf.

[33] Federal Communications Commission, *Amendment of the Commission's Rules Regarding DSRC Services in the 5.850-5.925 GHz Band,* Report and Order, WT Docket No. 01-90 (rel. Feb. 10, 2004) at 16-17 ¶ 25. Under the band plan adopted by the Commission, there is one control channel and six service channels, two of which are designated for public safety applications. Channel 172 is dedicated to V2V signaling. Channel 184 is designated for higher-power public safety communications, but also for shared use by "non-public safety DSRC operations." *Id.*

Testing for DSRC will likely require procedures to establish both that the DSRC unit itself is able to receive and transmit the needed messages as timely as needed and without being compromised (recognizing that in the current design, **one radio will be used exclusively for sending and receiving BSMs,** while the other will be used to communicate with infrastructure and the security system), and that the BSM elements are accurate.[34] Accordingly, the most comprehensive field testing of DSRC technology to date focused on the single-channel BSM-based safety services.[35] The current band plan identifies a separate DSRC channel at the very top of the 5850-5925 MHz band for public safety and first responder communications.

Non- safety-of-life, informational DSRC services will be required to operate on other DSRC channels and could have much higher bandwidth needs.[36] These services are wider-band, less delay-sensitive and typically premised on connectivity to the Internet or other external data sources.[37] NHTSA's pending rulemaking to decide whether to mandate DSRC technology as a

---

[34] *V2V Readiness Report*, *supra* note 31, at 56. In the report's section discussing three potential V2I applications – real-time traffic information, weather updates and Applications for the Environment (AERIS) – NHTSA cautions that other DSRC applications must not congest the BSM channel. "It is critical that safety messaging not be compromised due to broadcasting more data for V2I." *Id.* at 13.

[35] A fact sheet describing the Department of Transportation's DSRC safety pilot in Ann Arbor, MI lists forward collision warning, lane change/blind spot warnings, emergency electric brake light warning, and intersection movement assist as the DSRC safety applications being tested. All of these applications operate on a single safety channel using narrowband basic safety messages (BSMs). *See* U.S. Department of Transportation, Office of the Assistant Secretary for Research, "Intelligent Transportation Systems Safety Pilot: Model Deployment Technical Fact Sheet," *available at* http://www.its.DOT.gov/factsheets/technical_fs_model_deployment.htm.

[36] From Section 8 on V2V applications of ITU Technical Paper: "Safety applications do not require high bandwidth. Infotainment, navigation, and vehicle monitoring applications require moderate to high bandwidth. Some require multiple channels (audio, video, etc.)." *HSTP-CITS-Reqs Global ITS Communication Requirements*, ITU Technical Paper, at 12 (Jul. 11, 2014).

[37] According to one study, "other drivers of near-future growth include the increased availability of high-speed wireless networks and cloud-based data services around the world, and the development of application programming interfaces (APIs) needed to create connected car software." Richard Vierecki et al., *Connected Car Study 2015: Racing ahead with autonomous cars and digital innovation*, Strategy& (Sep. 16, 2015), at p. 11, *available at* http://www.strategyand.pwc.com/global/home/what-we-think/reports-white-papers/article-display/connected-car-2015-study. Another found that "telecom

standard feature in future vehicles has, rightly, focused solely on real-time V2V crash avoidance warnings. Although the auto industry would gain some competitive and financial advantage from free, exclusive access to interleaved spectrum for non-safety, informational DSRC applications (most of which are already available to consumers through smartphone and tablet apps) it's important to realize that these would be required by DOT to operate on different service channels separate from BSM safety applications.

IV. FCC POLICY HAS EVOLVED SINCE 1999 TO FAVOR GENERAL PURPOSE OVER SPECIAL PURPOSE NETWORKS AND TO LIMIT COMMAND-AND-CONTROL ALLOCATIONS TO COMPELLING PUBLIC INTEREST PURPOSES

Whether or not the auto industry's non-safety-of-life DSRC services are ever deployed and gain traction with consumers, the industry's insistence on excluding other technologies from the band is clearly problematic. The auto industry did not acquire its licenses via auction, and leaving most of the band's capacity essentially fallow for the indefinite future is distinctly inconsistent with FCC spectrum management principles adopted in the years since the original 1999 ITS allocation. It also runs counter to the Obama Administration's historic initiative to open underutilized bands for sharing to the greatest extent feasible. The admonition in the 2012 report and recommendations of the President's Council of Advisors on Science and Technology (PCAST) is as relevant for the 5.9 GHz band as it is for sharing underutilized Navy radar spectrum at 3.5 GHz:

> The incongruity between concern about a 'looming spectrum crisis' and the reality that only a fraction of the Nation's prime spectrum capacity is actually in use suggests the

---

operators are often said to be nervous about being restricted to the role of data pipe providers," but that "within the automotive industry, there is an opportunity to become much more if embedded telematics becomes the long-term de-factor connectivity method." GSMA and SBD, "2025 Every Car Connected: Forecasting the Growth and Opportunity," at 2 (Feb. 2012), *available at* http://www.gsma.com/connectedliving/wp-content/uploads/2012/03/gsma2025everycarconnected.pdf.

> need for a new policy framework to unlock fallow bandwidth in all bands, as long as it can be done without compromising the missions of Federal users and ideally by improving spectrum availability for Federal users. [38]

As Julius Knapp, chief of the FCC's Office of Engineering and Technology, stated in a speech last year, "the days of service-specific spectrum allocations are over – the Commission's flexible rules in both unlicensed and licensed bands obviate the need for allocations narrowly tailored to specific uses."[39] Knapp went on to note that dedicating spectrum exclusively for particular smart devices or machine-to-machine applications would waste limited resources. He also observed that although the 5.9 GHz band has been allocated for DSRC applications for 15 years, today automakers are advertising "connected vehicle" applications that rely on LTE cellular and Wi-Fi networks for wireless connectivity.[40]

A. FCC Policy Suggests that Effectively Exclusive Public Safety Allocations Must be Limited to the Amount Needed for Compelling Public Interest Purposes

The auto industry's defense of single-purpose allocations and command-and-control spectrum regulation is a throwback to the period that pre-dated the industry's 1997 petition requesting the ITS allocation. Until the late 1990s, the FCC historically allocated frequency bands to specific, often narrowly defined services with restrictive service rules. This "command-and-control" approach became increasingly subject to criticism by advocates of both flexible licensing and unlicensed use. Narrow, highly-specified allocations can rapidly become obsolete

[38] President's Council of Advisors on Science and Technology, *Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth*, Report to the President, at 16 (Jul. 2012) ("*PCAST Report*").

[39] Alton Burton Jr., "Winnik Forum: U.S. Federal Communications Commission's chief engineer explains that flexible use spectrum policy will readily accommodate the Internet of Things," Hogan Lovells Blog (Nov. 18, 2014), *available at* http://www.lexology.com/library/detail.aspx?g=0b64c821-c219-4d0d-8229-8b4a887dc7f7.

[40] *Id*.

or spectrally inefficient, since "[a]ny narrow allocation locks in a particular technology or spectrum use" long after "it has been surpassed by an existing service or technology . . . or by an entirely new service or technology."[41]

Just three years after the Commission adopted its 1999 Report and Order allocating 75 megahertz exclusively for Intelligent Transportation Systems, the FCC's Spectrum Policy Task Force (SPTF) Report recommended that the Commission "eschew command-and-control regulation" of spectrum use and transition "legacy command-and-control bands to more flexible rules."[42] Extending the Commission's 1999 *Spectrum Allocation Principles*, [43] the Task Force recommended that the agency should make exceptions only in cases "where prescribing spectrum use by regulation is necessary to accomplish compelling public interest objectives," or to conform to treaty obligations.[44] The Task Force Report emphasized that exceptions made for public safety or other public interest allocations should be narrowly defined **"*and the amount of spectrum . . . limited to that which ensures that those [compelling public interest] objectives are achieved*."**[45] The Task Force Report went on to warn that since many spectrum users will claim their planned use deserves an "exemption from any reform of their service allocation

---

[41] Covington & Burling, *Prospects for U.S. Spectrum Management* (June 2002) ("Covington & Burling Report"), at p. 4. "Narrow allocations are likely to be suboptimal: Any system that demands *ex ante* evaluation of competing technologies and their public benefits involves some risk of error, even by an expert agency." *Id.*

[42] *Report of the Spectrum Policy Task Force*, ET Docket No. 02-135 (Nov. 2002), *available at* http://sites.nationalacademies.org/cs/groups/bpasite/documents/webpage/bpa_048826.pdf ("Task Force Report).

[43] *See* Policy Statement, *Principles for Reallocation of Spectrum to Encourage the Development of Telecommunications Technologies for the New Millennium*, 14 FCC Rcd 19868, 19870 (rel. Nov. 22, 1999) ("1999 Reallocation Order"), at ¶¶ 9, 11, *available at* https://transition.fcc.gov/Bureaus/Engineering_Technology/Orders/1999/fcc99354.txt.

[44] *Spectrum Policy Task Force Report*, at 41.

[45] *Id. See also* FCC, "Report of the Spectrum Efficiency Working Group," Spectrum Policy Task Force (2002), at p. 34-36, *available* at https://transition.fcc.gov/sptf/files/SEWGFinalReport_1.pdf.

rules," it is "critical to distinguish between special interests and the public interest, establishing a high bar for any service to clear prior to receiving an exemption."[46]

With respect to allocations not strictly necessary for compelling non-market purposes, such as safety-of-life, the Task Force recommended that "existing spectrum that is subject to command- and-control regulation should be transitioned to the more flexible exclusive use and commons models to the greatest extent possible."[47] The Report further recommended that the "Commission should, where feasible, seek to designate additional bands for unlicensed spectrum use to better optimize spectrum access and provide room for expansion in the fast-growing market for unlicensed devices and networks."[48]

Eight years later, in its 2010 National Broadband Plan, the Commission again distanced itself from its traditional approach to allocating spectrum "on a band-by-band, service-by-service basis, typically in response to specific requests for service allocations or station assignments."[49] The National Broadband Plan states that this approach "has been criticized for being ad hoc, overly prescriptive and unresponsive to changing market needs."[50] Echoing the Spectrum Policy Task Force, the National Broadband Plan asserts that "where there is no overriding public interest in maintaining a specific use, flexibility should be the norm." The Plan goes on to assert that "flexibility in access to spectrum can be just as important" as flexibility in spectrum use, and

---

[46] *Id.*

[47] *Id.* at 6.

[48] *Id.*

[49] Federal Communications Commission, "Chapter 5: Spectrum," *National Broadband Plan: Connecting America*, (2010), at p. 75, *available at* http://download.broadband.gov/plan/national-broadband-plan.pdf.

[50] *Id.*

should increasingly include "unlicensed uses, shared uses and opportunistic uses."[51] The Plan further concludes that "the failure to revisit historical allocations can leave spectrum handcuffed to particular use cases and outmoded services, and less valuable and less transferable to innovators who seek to use it for new services."[52]

B. General Purpose Allocations and Sharing are More Flexible, Spectrum Efficient and Future Proof than Industry- or Technology-Specific Allocations

In an early, influential critique of command-and-control allocations, former FCC Chief Economist Greg Rosston warned the Commission "should also be wary of unnecessarily reserving spectrum for future use."[53] As the history of DSRC demonstrates, given the rapid evolution of wireless technology and mobile apps, the Commission cannot reliably predict what services will be available or which frequency range will be efficient for proposed services a decade or more into the future, much less what public demand for each service will be. For example, in its original 1999 *Order* allocating the requested 75 megahertz to ITS, the Commission describes a future of autonomous vehicles that, like trains on a track, "would transfer full control of equipped vehicles to an automated system operating on designated [Automated Highway System] lanes."[54] This suggests that *even if* the Commission could correctly identify the most productive use of spectrum at any given time, it would need to

---

[51] *Id.*

[52] *Id.*

[53] Gregory L. Rosston and Jeffrey S. Steinberg, "Using Market-Based Spectrum Policy to Promote the Public Interest," Fed. Comm. L.J: Vol. 50: Iss. 1, Article 4, at 94 (1997), *available at* http://www.repository.law.indiana.edu/fclj/vol50/iss1/4.

[54] "This vision of safe, autonomous vehicles was correct, except for the fact that the driverless cars being tested on the U.S. roads today neither need nor use DSRC communications, whether V2V or V2I." *1999 Reallocation Order* at 5.

continually modify single-purpose allocations to reflect technological and economic developments.[55]

The fact that most of the non-safety-of-life applications proposed for DSRC have become available using more general-purpose technologies and networks – most commonly smartphone apps using LTE and Wi-Fi connectivity – is a familiar outcome for narrow, special-purpose allocations. The need to reallocate or reorganize valuable spectrum occupied by special-purpose services that have become outdated or replaced by general-purpose networks is an ongoing challenge for the FCC. An example includes large allocations for "wireless cable" (the Instructional Television Fixed Service and the Multichannel Multipoint Distribution Service) in the 2.5 GHz band, which has been functionally replaced by high-capacity wireline connections and by the cellular/LTE networks that now lease most of the reorganized band.

As the most recent report of the annual Aspen Institute Roundtable on Spectrum Policy (AIRS) observed, the FCC's prior practice of single-use allocations leading to underutilized spectrum "is flawed from a societal perspective because it creates a classic externality by ignoring the value of alternative uses of the spectrum."[56] In recent years the Commission has repeatedly recognized both the reality and benefits of the migration from special-purpose to general-purpose networks and allocations. For example, in its 2014 NPRM on wireless microphones, the Commission observed that "the past several decades have seen widespread development and deployment of 'general purpose' wireless technology standards that may be

---

[55] *Id.* at 92; *see also* Covington & Burling Report, *supra* note 156, at 4: "As the pace of technological change increases, suboptimal allocations are likely to become obsolete even faster just as spectrum is urgently needed for new services."

[56] *Id.* "As Intel's Peter Pitsch put it: 'If we've learned anything about spectrum policy over the last 30 years, it's that . . . old technologies and uses get locked in, and the . . . process slows innovation to the detriment of society.'"

used for a wide variety of end-user applications," including the IEEE 802.11 family of standards, and asks whether these technologies could allow wireless mics to operate on a shared basis in one or more of the unlicensed bands.[57]

A study of wireless market adoption by Harvard Law School Professor Yochai Benkler concludes that the market is rapidly gravitating toward open and general-purpose spectrum bands. Benkler emphasizes that although a particular application's need for real-time connectivity could be an exception to this trend, in general market forces and the need for spectrum efficiency is pushing toward open wireless technologies (such as Wi-Fi) and shared bands:

> The past decade has seen a gradual emergence of what was, fifteen years ago, literally unbelievable: spectrum commons are becoming the basic model for wireless communications, while various exclusive models – both property-like and command-and-control – are becoming a valuable complement for special cases that require high mobility and accept little latency.[58]

Benkler's survey and analysis of seven wireless product markets (including smart grid communications, health care monitoring, RFID and mobile payments) suggest that consumers – and quite possibly the auto industry itself – would benefit from shared and unlicensed use of at least the lower portion of the 5.9 GHz band. The ability to use Wi-Fi and other open, unlicensed technologies in car systems – either separately or in tandem with DSRC – could stoke innovation and give both consumers and automakers more choices.

For example, Benkler shows that compared to Europe, the U.S. has achieved a far larger and faster deployment of wireless smart grid communications systems (particularly advanced

---

[57] Federal Communications Commission, 79 Fed. Reg. 69, 387 (proposed Nov. 21, 2014) (GN Docket Nos. 14–166 and 12–268; FCC 14–145) (to be codified at 47 C. F. R. pt. 74) ("Spectrum Access for Wireless Microphone Operations NPRM").

[58] Benkler Study, *supra* note 22, at 75.

metering infrastructure) because utilities here can directly and freely access the unlicensed 900 MHz ISM band on an unlicensed basis, whereas European utilities need to strike deals with licensed cellular carriers.[59] Benkler also describes how – despite special-purpose spectrum allocations to hospitals for certain critical and real-time patient monitoring (Wireless Medical Telemetry Service devices) – at home and in hospitals personal wearable devices used for medical monitoring primarily use Wi-Fi (and open, shared spectrum) to connect to the Internet.[60] Overall, three unlicensed technologies – Wi-Fi, Bluetooth and Zigbee – had 70 percent of the market share for wireless health care applications as of 2010, a share that's undoubtedly larger now as Wi-Fi has grown far more ubiquitous and reliable.[61]

One irony of the auto industry's determination to retain exclusive or at least priority use of the entire 5.9 GHz band is that at the time ITS America petitioned for a 75 megahertz special-purpose allocation for DSRC in 1997, existing and successful DSRC applications – automatic toll collection (e.g., E-ZPass) – operated on the general-purpose unlicensed band at 900 MHz In its 1998 NPRM, the Commission opined that the 900 MHz LMS band already in use for DSRC applications was a "limited amount of spectrum" and that its increased use by other services "render it inadequate to support the full panoply of DSRC applications."[62] Yet tolling at 900 MHz reliably continues today on a far larger scale. ITS America argued then, as now, that its 75

---

[59] *Id*. at p. 74-75, 108-112.

[60] *Id*. at p. 113-116.

[61] *Id*. at p. 114-115. *See also* Jonathan Collins & Sam Lucero, "Wireless Technologies in Professional Healthcare," ABI Research, at 24 (2011).

[62] FCC, *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 the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services,* ET Docket No. 98-95, RM-9096, FCC 98-119, at 8 (rel. Jun. 11, 1998) ("1998 NPRM").

megahertz cost-free allocation was needed to implement the industry's vision of 11 or more categories of "user services" (such as navigation assistance, driver notifications, traffic monitoring) that would require additional channels.

Of course, that "wide array" of DSRC non-safety consumer applications and services promised by automaker interests 15 years ago proved to be illusory, as it typically is when it comes to claims of amazing public interest benefits from a special-purpose spectrum giveaway. Every one of the 11 categories of DSRC "user services" (applications) cited by the FCC as the rationale for a special-purpose allocation – current, emerging and future applications – today either have proven general-purpose substitutes or depend on the widespread deployment of dense roadside infrastructure by localities nationwide that is widely acknowledged to be unlikely in the foreseeable future (and less so as private spending on driver-assist technology and, ultimately, autonomous vehicles supplant the need for massive public spending). Indeed, even at the time, BellSouth's comments supported a dedicated allocation for DSRC safety-of-life applications, but argued that could be accommodated in far less than 75 megahertz.[63] The Amateur Radio Relay League (ARRL) similarly argued there was no basis for such a large allocation, noting that Europe was considering an allocation limited to 20 megahertz.[64]

The Commission's longtime effort to move away from silos of special-purpose use and toward more intensively-used and flexible general-purpose use makes the distinction between DSRC's anticipated real-time safety and non-safety applications critical. DOT's pending proposed mandate for real-time V2V communication for safety-of-life crash avoidance will necessarily occupy a single designated safety channel of 10 megahertz. In both the U.S. and Europe, safety-of-life applications are not anticipated to need more than three DSRC channels

[63] *See* 1998 NPRM, at 7 note 28.

[64] *See* 1999 Reallocation Order, at 5.

(30 megahertz in total). The remainder of the 75 MHz allocation for DSRC has always been anticipated to provide multiple channels for a wide variety of non-safety-of-life applications and commercial services, most of which are either already or could be provided most efficiently over existing general purpose LTE and Wi-Fi networks.

V. THE COMMISSION SHOULD RE-CHANNELIZE THE BAND TO ACHIEVE THE PUBLIC INTEREST IN BOTH SAFETY-OF-LIFE DSRC AND GIGABIT WI-FI CONNECTIVITY

The Commission should conclude that the re-channelization approach to sharing the band outlined in the *Public Notice* (or a close variation of it) strikes the best balance between DOT's legitimate interest in promoting crash avoidance and the Commission's interest in promoting ubiquitous broadband connectivity and innovation. Since both DSRC safety-of-life applications and expanded broadband capacity can deliver important benefits for virtually all Americans, the Commission should strive to enable both of these compelling public interest outcomes.

The critical factor in striking this balance is the distinction between real-time safety and other non-safety (or non-time-critical) DSRC applications, as described in section III above. By dedicating three channels exclusively to DSRC safety applications – including the dedicated 10 megahertz BSM channel essential to real-time V2V crash avoidance alerts – the Qualcomm proposal virtually eliminates the risk of interference with safety-of-life applications, while at the same time adhering to the FCC's evolving principles of spectrum efficiency and flexibility that require public safety allocations to be narrowly defined and "limited" to "the amount of spectrum . . . which ensures that those [compelling public interest] objectives are achieved."[65]

[65] *Spectrum Policy Task Force Report*, *supra* note 40, at 41. *See also* FCC, "Report of the Spectrum Efficiency Working Group," Spectrum Policy Task Force (2002), at 34-36, *available* https://transition.fcc.gov/sptf/files/SEWGFinalReport_1.pdf.

A. Cisco's Detect-and-Avoid Proposal Would Effectively Foreclose Wi-Fi and Subject Safety-of-Life DSRC to Unnecessary Interference Risk

As the *Public Notice* states, under the band-sharing proposal put forward by Cisco, unlicensed devices would need to "detect and avoid" DSRC transmissions across the entire band. If an unlicensed device operating anywhere in the band detects a DSRC transmission (e.g., a passing vehicle or fixed roadside infrastructure), the device would be required to vacate the entire band for at least 10 seconds. The band is currently divided into seven channels, each 10 megahertz wide. Under Cisco's proposal, if a DSRC transmission is detected on any one of those seven channels – regardless of spectral proximity or whether the transmission relates to a V2V safety or a non-safety commercial application – this forecloses access for unlicensed devices to the entire 75-megahertz band.[66]

As described in the Tiger Team's report, the Cisco proposal would actually be far more preclusive since it would require that if a DSRC signal is detected on any channel, the 100 megahertz from 5825 to 5925 MHz (which includes the adjacent top 25 megahertz of the U-NII-3 band) "will be declared busy for at least 10 seconds."[67] There is no channel move time, as there is for Dynamic Frequency Selection to protect military radar lower in the 5 GHz band. This means that when DSRC is detected anywhere in the band, unlicensed transmissions must instantly cease across the entire 100 megahertz. The 10-second hold period is also "a relatively long period" compared to normal [802.11] deference."[68]

---

[66] *See* Alan Chachich et al., *DSRC-Unlicensed Device Test Plan*, U. S. Department of Transportation (August 2015), *available at* http://www.its.dot.gov/connected_vehicle/pdf/DSRC_TestPlanv3.5.3.pdf.

[67] *Id.* at 6.

[68] *Id.*

The fundamental problem with the Cisco approach, as currently described, is that it would not permit the economically feasible deployment of unlicensed technologies, particularly Wi-Fi. Vacating the entire band if any DSRC transmission is detected on any channel across a 100 megahertz range is an extreme restriction that may effectively exclude Wi-Fi from the band. Motorized vehicles and roads are ubiquitous. If V2V is widely deployed, 802.11ac Wi-Fi and other unlicensed technologies – no matter how low their transmit power – could only operate indoors and away from windows, in places where the constant patter of mandated V2V safety signaling is not detectable. Although the expected NHTSA mandate would apply only to the single DSRC channel designated for real-time V2V signaling, under Cisco's approach the detection of the V2V Basic Safety Message on this 10 megahertz BSM channel precludes, for all practical purposes, the use of 100 megahertz of spectrum capacity for the vast majority of Americans. This would cripple the utility of Wi-Fi for individual consumers as well as for wireless ISPs, small retailers, schools, local governments and virtually all other Wi-Fi users.

An effective indoor-only restriction would be particularly crippling, since consumers increasingly rely on mobile devices and seamless connectivity as they move between locations. Such an extreme detect-and-avoid requirement seems likely to deter widespread use of the additional 80 and 160 MHz 802.11ac channels that would otherwise be available. The cable industry, which has deployed over 400,000 Wi-Fi hotspots in heavily-trafficked outdoor areas, has stated it is not aware of any outdoor Wi-Fi hotspot deployments in the U.S. that use the portions of the 5 GHz band subject to the DFS requirement that requires unlicensed WLAN deployments to detect and avoid military radar.[69] The Cisco proposal for sharing 5.9 GHz would seem to create even stricter and more costly limitations and uncertainties about availability.

The Tiger Team further observed that although Cisco's approach leverages the commonality of 802.11ac (Wi-Fi) and 802.11p (DSRC), "[f]rom a practical perspective, non-802.11 unlicensed devices may not find adding this CCA [detection] method cost effective."[70] Moreover, even the 802.11ac standard already in use across the rest of the 5 GHz band may not be able to sense traffic separately on seven different 10 megahertz DSRC channels, since Wi-Fi is designed to sense on the single channel on which it is operating, in increments of 20 megahertz.[71] Therefore, the Cisco proposal "would require changes in the base 802.11 specification and add complexity to existing 802.11ac chipsets."[72]

The Public Interest Organizations believe that a re-channelization approach strikes a better balance between DOT's interest in promoting auto safety and the Commission's interest in promoting ubiquitous broadband connectivity and innovation. The critical factor in striking this balance is the distinction between real-time safety and non-safety DSRC applications. By dedicating three channels exclusively to DSRC safety – including the single BSM channel that NHTSA describes as essential to real-time V2V crash avoidance alerts – the Qualcomm proposal greatly reduces the risk of unlicensed device interference with safety-of-life applications, while at the same time adhering to the evolving principles of spectrum efficiency and flexibility that the FCC increasingly applies to non-safety wireless services, particularly to

---

[69] *See* Comments of Time Warner Cable Inc., ET Docket No. 13-49, at 13 (May 28, 2013).

[70] *Id.*

[71] *Id.* at 7.

[72] *Id.*

those that are largely redundant and even subject to robust competition (such as DSRC navigation assistance, weather alerts, toll collections, etc.).

Additional considerations also lead our groups to conclude that the re-channelization approach, if feasible, strikes a better balance overall:

First, even if the strict detect-and-avoid approach proposed by Cisco is appropriate to protect the DSRC channels necessary to implement a DOT mandate related directly to delay-sensitive crash avoidance and safety-of-life signaling, a requirement to make *all* DSRC channels unavailable for unlicensed transmissions seems both unnecessary and likely to result in a continued waste of the band's carrying capacity. It's not clear that non-safety DSRC applications will ever be widely deployed, in demand by consumers, or even needed by the time they are feasible. Non-safety applications will necessarily need to wait for widespread deployment of V2V safety systems, which NHTSA itself estimates will take 15 to 30 years or longer (see section III above). Since applications available via smartphones and car-based connectivity by general-purpose cellular and Wi-Fi networks already offer most of the functionality promised by DSRC, the auto industry will need to innovate ahead of the tech and telecom companies to differentiate their future offerings. Competing DSRC applications will appear even more obsolete when they are widely available in a decade or so, when clouds of 5G connectivity can serve the same purpose without the extra cost.

Second, the bandwidth needs of vehicle-to-infrastructure (V2I) are both speculative and likely to be modest. As explained above, NHTSA will not mandate deployments of fixed roadside units, nor is the federal government contemplating a multi-billion dollar expenditure to integrate V2I even as part of the federal highway system, which represents a tiny share of

America's road miles. Nor is it likely that the thousands of state, county and municipal jurisdictions, most already fiscally squeezed, will decide that this investment is a priority. And regardless of the scope of deployment, V2I applications cited by DSRC proponents are, like V2V itself, almost entirely narrow band and short duration, using relatively little overall bandwidth. More critically, these V2I applications can tolerate more latency than V2V Basic Safety Messages and, to the extent they cannot, can be accommodated on one or two of the three exclusive DSRC safety channels. V2I deployments would also likely be limited to highways and major thoroughfares, whereas the benefits of 802.11ac could be available immediately and up and down every street under an approach more similar to Qualcomm's.

Finally, as explained above, maintaining an exclusive and underutilized spectrum allocation for non-safety-of-life DSRC applications runs counter to the FCC's commitment to the more flexible and efficient spectrum management principles the agency first embraced 15 years ago. The Commission must continue its effort to move away from silos of special-purpose spectrum bands and toward more intensively-used and flexible general-purpose use of spectrum. As both the FCC's 2002 Spectrum Policy Task Force and the FCC's 2010 National Broadband Plan emphasized, exceptions made for public safety or other public interest allocations should be narrowly defined **"*and the amount of spectrum . . . limited to that which ensures that those [compelling public interest] objectives are achieved*."**[73] The effectively exclusive allocation and non-use of most of the 75 megahertz allocated for DSRC contradicts the Obama Administration's historic initiative to open underutilized federal bands for sharing to the greatest extent feasible. As the PCAST recommended and NTIA and the Department of Defense and

[73] *Id. See also* FCC, "Report of the Spectrum Efficiency Working Group," Spectrum Policy Task Force, at 34-36 (2002), available at https://transition.fcc.gov/sptf/files/SEWGFinalReport_1.pdf.

other federal agencies have increasingly agreed: "The essential element of [the] new Federal spectrum architecture is that the norm for spectrum use should be sharing, not exclusivity."

In short, the Cisco proposal would effectively fragment the U-NII bands, require a complete retooling of existing 802.11ac devices, and increase device costs – all of which undermine the FCC's goal in proposing the 5.9 GHz band as an extension of the U-NII bands for wide-channel use by 802.11ac Wi-Fi. In contrast, the FCC's proposal to allow unlicensed operations above 5850 MHz under rules that already apply to the neighboring U-NII-3 band would unleash 200 MHz of contiguous and uniquely useful spectrum that accommodates the only unfettered 160 megahertz channel sufficient to support truly gigabit Wi-Fi networks.

Unlike the Cisco approach, under Qualcomm's proposal Wi-Fi 802.11ac devices could prioritize DSRC transmissions on the channels they are authorized to share (presumably the bottom 40 megahertz of the ITS band), but without the need to retool the existing 802.11ac standard or limit unlicensed use to a new class of indoor-only devices capable of a detect-and-vacate-the-band restriction. More importantly for consumer broadband access and spectrum efficiency, the Qualcomm proposal could accommodate the FCC's proposal to permit indoor and outdoor deployments under technical rules compatible with the adjacent U-NII-3 unlicensed band – thereby realizing the broader public interest benefits of 80 and 160 MHz channel widths ("gigabit Wi-Fi") that would be effectively foreclosed under the Cisco approach.

B. Three Public Safety Channels Dedicated to DSRC is Sufficient for Time-Critical Safety-of-Life Applications

1. DOT's Proposed V2V Mandate Requires a Single Dedicated DSRC Channel

Even if DOT adopts its proposed V2V mandate on future new model cars, most of the ITS band would not be used for real-time crash avoidance or public safety purposes. Real-time

V2V safety-of-life applications are inherently narrowband and designed to require only a fraction of the 75 megahertz of spectrum currently allocated for ITS and DSRC technology. Basic safety messages (BSMs) are the central component of crash avoidance technology. These are simple transmissions, broadcast in all directions by an onboard DSRC antenna, that include information on the vehicle's speed, heading, braking status, and other details on the vehicles status. Safety-of-life applications require real-time transmission of small amounts of data on the order of 100 to 500 bytes of information per transmission with a general latency requirement of 100 milliseconds or less.[74]

NHTSA and international regulatory bodies acknowledge the narrowband character of V2V safety communications and emphasize that the real-time reliability of the BSMs communicated between vehicles is what's most critical.[75] When the FCC adopted the channelization plan for DSRC proposed by ITS America in 2003, it allocated one 10 MHz channel specifically to V2V basic safety messaging (currently DSRC channel 172 at the very bottom of the ITS band).[76] NHTSA has subsequently taken the position that crash-avoidance

[74] *V2V Readiness Report*, at p. 98. *See also* National Highway Traffic Safety Commission, *Vehicle Safety Communications Project: Task 3 Final Report – Identify Intelligent Vehicle Safety Applications Enabled by DSRC*, at 141 (March 2005).

[75] *See* Comments of NCTA, at p. 13-14; *See also HSTP-CITS-Reqs Global ITS Communication Requirements*, ITU Technical Paper (Jul. 11, 2014), at 11-12 ("Safety applications do not require high bandwidth"), *available at* http://www.itu.int/dms_pub/itu-t/opb/tut/T-TUT-ITS-2014-REQS-PDF-E.pdf.

[76] Federal Communications Commission, *Amendment of the Commission's Rules Regarding DSRC Services in the 5.850-5.925 GHz Band*, Report and Order, WT Docket No. 01-90 (rel. Feb. 10, 2004) at 16-17 ¶ 25. Under the band plan adopted by the Commission, there is one control channel and six service channels, two of which are designated for public safety applications. Channel 172 is dedicated to V2V signaling. Channel 184 is designated for higher-power public safety communications, but also for shared use by "non-public safety DSRC operations." *Id.*

signaling (BSMs) must be limited to a ***single dedicated 10 MHz channel and radio*** that is not shared with non-safety applications, or even by "broadcasting more data for V2I" purposes.[77]

Accordingly, the most comprehensive field testing of DSRC technology to date focused on the single-channel BSM-based safety services.[78] NHTSA's *V2V Readiness Report* further states that "one radio will be used exclusively for sending and receiving BSMs, while the other will be used to communicate with infrastructure and the security system . . .."[79] The current band plan identifies a separate DSRC channel at the very top of the 5850-5925 MHz band for public safety and first responder communications.

Non- safety-of-life, informational DSRC services will be required to operate on other DSRC channels and could have much greater bandwidth needs.[80] These services are wider-band, less delay-sensitive and typically premised on connectivity to the Internet or other external data sources.[81] NHTSA's pending rulemaking to decide whether to mandate DSRC technology as a

---

[77] *V2V Readiness Report*, at 56. In the report's section discussing three potential V2I applications – real-time traffic information, weather updates and Applications for the Environment (AERIS) – NHTSA cautions that other DSRC applications must not congest the BSM channel. "It is critical that safety messaging not be compromised due to broadcasting more data for V2I." *Id.* at 13.

[78] A fact sheet describing the Department of Transportation's DSRC safety pilot in Ann Arbor, MI lists forward collision warning, lane change/blind spot warnings, emergency electric brake light warning, and intersection movement assist as the DSRC safety applications being tested. All of these applications operate on a single safety channel using narrowband basic safety messages (BSMs). *See* U.S. Department of Transportation, Office of the Assistant Secretary for Research, "Intelligent Transportation Systems Safety Pilot: Model Deployment Technical Fact Sheet," *available at* http://www.its.DOT.gov/factsheets/technical_fs_model_deployment.htm.

[79] *Id.* at 13.

[80] From Section 8 on V2V applications of ITU Technical Paper: "Safety applications do not require high bandwidth. Infotainment, navigation, and vehicle monitoring applications require moderate to high bandwidth. Some require multiple channels (audio, video, etc.)." *HSTP-CITS-Reqs Global ITS Communication Requirements*, ITU Technical Paper, at 12 (Jul. 11, 2014).

[81] According to one study, "other drivers of near-future growth include the increased availability of high-speed wireless networks and cloud-based data services around the world, and the development of

standard feature in future vehicles has, rightly, focused on real-time V2V crash avoidance warnings. Although the auto industry would gain some competitive and financial advantage from free, exclusive access to interleaved spectrum for non-safety, informational DSRC applications (most of which are already available to consumers through smartphone and tablet apps) it's important to realize that these would operate on different service channels separate from BSM safety applications.

2. The European Union has Concluded 20 MHz is Sufficient for V2V and Related Time-Critical Road Safety Applications

Global developments reinforce the fact that real-time safety applications using DSRC require at most 30 megahertz of the larger 5.9 GHz band. Both the EU and Japan have allocated considerably less spectrum specifically for safety-related DSRC systems. In Europe, regulators concluded that two DSRC channels (20 megahertz) are sufficient for "time critical road safety applications" and another 10 megahertz for non-critical but safety-related applications. Japan has taken an entirely different approach, focusing on non-time critical roadside applications (e.g., tolling) and in any case uses entirely different bands of spectrum than the U.S. and Europe.

In 2008 the Electronic Communication Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) issued decisions allocating the

---

application programming interfaces (APIs) needed to create connected car software." Richard Vierecki et al., *Connected Car Study 2015: Racing ahead with autonomous cars and digital innovation*, Strategy& (Sep. 16, 2015), at 11, *available at* http://www.strategyand.pwc.com/global/home/what-we-think/reports-white-papers/article-display/connected-car-2015-study. Another found that "telecom operators are often said to be nervous about being restricted to the role of data pipe providers," but that "within the automotive industry, there is an opportunity to become much more if embedded telematics becomes the long-term de-factor connectivity method." GSMA and SBD, "2025 Every Car Connected: Forecasting the Growth and Opportunity" (Feb. 2012), at 2, *available at* http://www.gsma.com/connectedliving/wp-content/uploads/2012/03/gsma2025everycarconnected.pdf.

spectrum band from 5855 to 5925 MHz for potential ITS use.[82] While this is nearly identical to the current U.S. allocation, there are notable differences. The CEPT makes a clear distinction between the allocation for critical safety and non-safety ITS services. "Traffic Safety Applications" (including non-critical but safety-related applications) are specifically allocated a 30 MHz block in the middle of the band, from 5875 to 5905 MHz.[83]

In Europe, the bottom 20 MHz (5855 MHz to 5875 MHz) is specifically allocated for "non-safety applications" for ITS on a shared basis with license-exempt devices. In fact, the 150 MHz immediately below 5875 MHz – which includes the spectrum corresponding to the lowest 25 MHz of the U.S. allocation for ITS (5850 to 5875 MHz) – is allocated for ISM (unlicensed) devices and a diverse array of Short Range Devices that use shared frequency bands on a license-exempt basis.[84] Finally, the top 20 MHz of the band (5905 MHz to 5925 MHz) is not actively allocated to ITS services, but instead is reserved and "to be considered for future ITS extension."[85]

The CEPT decision acknowledges that ITS safety applications do not require a full 75 MHz of bandwidth, stating:

---

[82] *See* Electronic Communications Committee, "The harmonized use of the 5875-5925 MHz frequency band for Intelligent Transport Systems (ITS)," ECC Decision (08)01 (amended Jul. 3, 2015), *available at* http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC0801.PDF.

[83] *See* Electronic Communications Committee, *The European Table of Frequency Allocations and Applications In The Frequency Range 8.3 kHz to 3000 GHz* (May 2015), at 121, *available at* http://www.erodocdb.dk/docs/doc98/official/pdf/ERCRep025.pdf.

[84] *Id*. *See also* European Commission Digital Agenda for Europe, "Short Range, Mass Market" (May 9, 2014), *available at* http://ec.europa.eu/digital-agenda/en/short-range-mass-market.

[85] *See* ECC Decision (08)01, *supra* note 130.

> CEPT/ECC studies regarding the necessary spectrum requirements for road safety and traffic efficiency within the 5.9 GHz band based on accepted traffic scenarios with both IVC and I2V communication have confirmed that **a realistic estimate of the needed bandwidth is between 30-to-50 MHz <u>including 20 MHz of bandwidth for time critical road safety applications</u>**.[86]

In addition, as NHTSA acknowledges, the EU is not contemplating a V2V mandate and is pursuing a "market-driven" approach that does not emphasizes V2V for critical safety signaling. Rather, it supports communication with infrastructure and other networks to enhance mobility and sustainability applications.[87] "While the EU has defined crash-critical safety applications as well, the priority in the EU is driver safety advisories (not safety-critical warnings), driver support messages (such as eco-driving), and commercial applications such as insurance," NHTSA reports.[88]

Japan's ITS spectrum allocation is not harmonized at all with the U.S. or Europe. Japan has assigned 80 MHz for connected car services in the band below 5850 MHz (from 5775 to 5805 MHz and 5815 to 5845 MHz), in what are the license-exempt ISM bands in the U.S. and Europe.[89] Japan also has a limited allocation for Advanced Safety Vehicle (ASV) functions of

[86] *See* Explanatory Memorandum for ECC/DEC/(08)01, *available at* http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC0801.PDF.

[87] *V2V Readiness Report*, *supra* note __, at 116.

[88] *Ibid.*

[89] *See* Hideki Hada, "Intelligent Transportation Systems: Opportunities for Communication-Based Driving Support," Toyota Technical Center (2011), at 11, *available at* *http://www.toyota.com/csrc/printable/9Hada.pdf. See also* "Frequency Allocation Table of Japan," *available at* http://www.rf114.com/lib/download.php?code=tbl_board&seq_name=bseq&seq=765; Paul Spaanderman, "Spectrum Allocation for ITS: From Out of the EU Perspective," *available at* http://www.imobilitysupport.eu/library/imobility-forum/plenary-meetings/2015-1/5th-plenary-meeting-28-jan-2015-1/presentations/2737-18-paul-spaanderman-tno/file .

V2V and V2I in the 760 MHz band.[90] As NHTSA acknowledges, Japan is "appears likely to proceed with a two-band solution" that focuses, as in Europe, on vehicle to infrastructure communication.[91] And neither band corresponds to the U.S. allocation.

3. DSRC for V2V Crash Avoidance is Likely to be Redundant Long Before it is Effective in 20 to 30 Years or More

While DSRC has the potential to substantially reduce accidents and injuries, policymakers must also consider whether alternative technologies, particularly driver assist sensing (radar, lidar, cameras, automated braking) can accomplish these same safety goals many years faster and more effectively (through automation). The biggest challenge facing V2V signaling is that it only works to prevent accidents when all or at least most other vehicles have DSRC installed and operating.[92] NHTSA itself acknowledges V2V will not be viable without a regulatory mandate.[93] Even if NHTSA adopts a regulatory mandate, the agency projects that it could take decades before a critical mass of V2V adoption is achieved. In the *V2V Readiness Report*, NHTSA explained that ubiquitous adoption of DSRC could not only take more than 30 years, but until a critical mass is achieved, it may not be possible to determine how effective it will be:

---

[90] *See* John B. Kenney, "DSRC: Deployment and Beyond," Presentation at Toyota InfoTechnology Center (May 14, 2015), at 10, *available at* http://www.winlab.rutgers.edu/iab/2015-01/Slides/06.pdf.

[91] *V2V Readiness Report*, *supra* note 31, at 118.

[92] *See* U.S. Department of Transportation, "Transportation Sec. Foxx announces steps to accelerate road safety innovation" (May 13, 2015), *available at* http://www.nhtsa.gov/About+NHTSA/Press+Releases/2015/nhtsa-will-accelerate-v2v-efforts.

[93] *V2V Readiness Report*, *supra* note 31, at 6: "It is NHTSA's view that, if V2V were not mandated by the government, it would fail to develop or would develop slowly. . . . [B]ecause the value of V2V to one driver depends upon other drivers' adoption of the technology, it seems unlikely to NHTSA that a manufacturer would volunteer to 'go first' with adding DSRC to its new vehicles, because those units would provide little benefit to their drivers until some critical mass of V2V equipped vehicles is achieved, ..."

> Even if the market drives faster uptake by consumers of aftermarket devices (if, for example, auto insurance companies offer discounts for installing the devices), . . . ***it will still take 37 years before we would expect the technology to fully penetrate the fleet.*** As a result, full knowledge of how different aspects of the V2V system perform . . . may be delayed. . . .[94]

The agency's ANPRM does not specify when DSRC systems would be required in all new cars sold, but its *V2V Readiness Report* implicitly assumed (in 2014) that the base year for such a mandate would be 2020.[95] The existing motor vehicle fleet (more than 270 million cars, trucks and motorcycles) would generally lack DSRC technology until replacements are purchased. It will likely take 15-to-20 years on average for the nation's vehicle fleet to completely turn over.[96] In theory, drivers choosing to install 'aftermarket' DSRC devices could speed up this timeline. However, DOT estimates that aftermarket systems, not including installation, could cost as much as $1,000 initially.[97] Since consumers would have little incentive to bear this cost until the vast majority of vehicles on the road are equipped – and because many could still not afford the expense – billions of dollars in government subsidies would likely be needed to achieve a critical mass of adoption prior to 2030.[98]

Notably, DSRC is not the exclusive path to crash avoidance. Increasingly sophisticated crash-avoidance radar, lasers (LIDAR), cameras, automatic braking, ultrasonic sensors,

---

[94] *V2V Readiness Report* at 27 (emphasis added).

[95] *Id.* at 230.

[96] NHTSA, *ANPRM*, at ¶ 53.

[97] *See* U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology "Costs Database: Unit Costs for DSRC-based Data Collection Equipment Costs Can Range From $4150 - $9200" (Jun. 27, 2014), *available* http://www.itscosts.its.DOT.gov/ITS/benecost.nsf/SummID/SC2014-00330?OpenDocument&Query=Home. According to the *V2V Readiness Report*, the labor installation costs of a retrofit DSRC device would be $135. *V2V Readiness Report*, *supra* note 50, at 229-230.

[98] For example, a refundable federal tax credit of $500 could conceivably equip 200 million used vehicles (roughly 75% of the fleet at the time the mandate becomes effective) by 2025 at a cost of $100 billion.

drowsiness detection and other onboard sensors make each individual car immediately more aware and capable of avoiding accidents regardless of how many other vehicles on the road are similarly equipped. These driver-assist safety applications are already available and will soon be standard features in the majority of new model cars. Secretary of Transportation Anthony Fox announced last fall that ten major automakers representing nearly 60 percent of U.S. car and light truck sales have agreed to make sensing-based automatic emergency braking systems standard equipment in all new vehicles.[99]

Rapid advances in driver assist technologies have other advantages in addition to their promise of immediate and incremental (vehicle by vehicle) contribution to crash avoidance. While DSRC does permit vehicles to "hear" other vehicles around a blind curve or corner, V2V will typically not enable vehicles to "see" other hazards. This is significant since collisions with non-vehicle fixed and mobile obstacles represent more than 30 percent of all collisions, 28 percent of all injuries, and more than 50 percent of all traffic fatalities.[100]

---

[99] U.S. Department of Transportation, "DOT and IIHS Announce Historic Commitment from 10 Automakers to Include Automatic Emergency Braking on All New Vehicles," Press Release (Sep. 11, 2015), *available at* http://www.transportation.gov/briefing-room/us-dot-and-iihs-announce-historic-commitment-10-automakers-include-automatic-emergency. The ten companies committing to make automatic emergency braking standard equipment are Audi, BMW, Ford, General Motors, Mazda, Mercedes Benz, Tesla, Toyota, Volkswagen and Volvo. *See also* Paul Stenquist, "On the Road to Autonomous Pause at Extrasensory," *The New York Times* (Oct. 25, 2013), *available at* http://www.nytimes.com/2013/10/27/automobiles/on-the-road-to-autonomous-a-pause-at-extrasensory.html?_r=3; Jurgen Dickmann et al., "How We Gave Sight To the Mercedes Robotic Car," *IEEE Spectrum* (Jul. 24, 2014), *available at* http://spectrum.ieee.org/transportation/self-driving/how-we-gave-sight-to-the-mercedes-robotic-car; Ellen Hall, "Can Cars Help Prevent Distracted Driving?" Esurance Blog (Sep. 26, 2014), *available at* http://blog.esurance.com/can-cars-help-prevent-distracted-driving/#.VZL4qUZkrm4.

[100] National Highway Traffic Safety Administration, U.S. Dept. of Transportation, *Traffic Safety Facts 2013* (2014), at 70, *available at* http://www-nrd.nhtsa.dot.gov/Pubs/812139.pdf. Although NHTSA speculates that pedestrians could carry smartphones that broadcast a DSRC signal to surrounding traffic, it does not speculate about how vehicles would distinguish pedestrian smartphones from the smartphones of passengers in surrounding vehicles, including cars that might be parked just a few feet from the

Recognizing these realities, the National Transportation Safety Board warned in a June 2015 report that an effective implementation of V2V using DSRC technology is so far off NHSTA should make sensor-based crash avoidance technology mandatory:

> It may be an additional two to three decades more before the majority of the passenger and commercial fleets become connected [with DSRC]. Given this timeline, an alternative active safety system is necessary until the [DSRC/V2V] technology matures. Vehicle-based [sensing systems] provide just such an alternative for two significant reasons: (1) they are immediately available and can prevent collisions and save lives today; and (2) they address the limitations of the [connected vehicle] technology.[101]

C. The Automakers' Petition for Reconsideration is Further Evidence that Re-Channelization Best Serves the Public Interest in Both Safety and Broadband

The auto industry's recent Petition for Reconsideration concerning the out of band emission limits adopted by the Commission for unlicensed use of the U-NII-3 band adjacent to the ITS band reinforces just how easily the interference concerns of the auto industry could be addressed through re-channelization. As Public Knowledge indicated in its Opposition, "the Commission can - and should - address the purported grievances of the Auto Manufacturers by relocating the life and safety channels to the top 20 MHz of the band."[102] By re-channelizing to physically separate the life-and-safety channels from any OOBE, the automakers' concern about

---

pedestrian about to dash into traffic. *See V2V Readiness Report, supra note 50, at 11.*

[101] National Transportation Safety Board, *The Use of Forward Collision Avoidance Systems to Prevent and Mitigate Rear-End Crashes* (2015), Special Investigation Report NTSB/SIR-15-01 ("*NTSB Report*"), at 34-35, available at http://www.ntsb.gov/safety/safety-studies/Pages/SIR1501.aspx. The NTSB also warns that during the initial decade or more, drivers could resist or be misled by a V2V system that does not detect most other vehicles on the road. "A safety system that frequently fails to detect a conflict (even if such a limitation is by design) could easily become an unreliable system in the eyes of the driver, further necessitating the need for the comprehensive active safety system offered by a vehicle-based [sensing systems]."

[102] Opposition of Public Knowledge to Petition for Reconsideration of Association of Global Automakers and Alliance of Automobile Manufacturers, ET Docket No. 13-49 (June 6, 2016).

interference to BSMs can be completely satisfied, removing virtually all risk of interference between future Wi-Fi and V2V safety signaling. This can be done without undue delay since there are no deployments of either DSRC for safety (or any other purpose) or of 802.11ac Wi-Fi anywhere on the band and DOT is expected to give automakers a multi-year transition period before requiring the installation of at least a single-radio DSRC system in every new car sold.

When Channels 172 and 184 were designated for life and safety traffic in 2006, part of the Commission's justification was a request, from the auto industry, to separate the channels in order to relieve anticipated congestion from non-life and safety traffic.[103] As the auto industry has, for a decade since that Order, failed to deploy any DSRC systems, however, the anticipated congestion has never emerged. Furthermore, it remains unclear if DSRC systems will even need a single dedicated 10 MHz channel for life and safety applications, let alone two dedicated channels. The Commission can therefore provide certainty for the auto industry, and make the most beneficial use of the spectrum in furtherance of the public interest, by rechannelizing the 5.9 GHz band, moving Life & Safety away from Channel 172 and up to Channels 182 and 184. This would serve the auto industry's apparent need for significant spacing away from any interference, by placing the remainder of the 5.9 GHz band between their hypothetical DSRC deployments, and any OOBE from other U-NII devices. As PK noted in its Opposition, "Because the Commission's rules require that all DSRC devices have the capacity to detect incoming life and safety messages, and dynamically prioritize these messages and route them to any DSRC

[103] Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.850-5.925 GHz Band (5.9 GHz Band), WT Docket No. 01-90; 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 Communication SErvices, ET Docket No. 98-95, RM-9096, Memorandum and Order, 21 FCC Rcd 8961 (2006).

channel, this directive can be achieved at zero cost to DSRC licensees."[104] Rechannelization would also allow discussion of unlicensed sharing to proceed without the issue being clouded by claims of interference, despite the absence of any demonstration on the part of the auto industry that sharing would cause harmful interference as a result of OOBE.

This would allow the Commission to move forward with a sharing proposal that would benefit the continually expanding broadband marketplace, while ensuring total protection for important safety of life systems as they are deployed. That the auto industry wishes to avoid sharing in favor of its own exclusive playground, devoid of privacy and cybersecurity rules, for it to provide commercial services, is not a compelling enough reason to inhibit the continued growth of the broadband marketplace through increasing access to unlicensed spectrum. The public interest is best served, in the 21st Century, by granting the public direct access to spectrum for their use. Unlicensed technologies and spectrum sharing drive economic investment and innovation, allowing new services and industries to prosper and grow. Industry-specific allocations remain necessary in some areas, but should not be the default absent a strong showing of such an allocation being in the public interest. Simply allowing an industry to deploy commercial technologies by piggybacking on spectrum allocated to that industry under the guise of saving lives, cannot be considered to be more closely in the public interest than simply letting the public make use of that valuable spectrum directly.

VI. DSRC Applications Should be Prioritized Only to Protect Time-Critical Safety-of-Life and Crash Avoidance

The Public Interest Organizations strongly urge the Commission to distinguish delay-sensitive safety-of-life DSRC applications (e.g., BSMs) from other commercial and

[104] *See* 47 C.F.R. §§ 90.377, 90.379.

informational DSRC applications, which should share at least the lower portion of the band on an equal basis with unlicensed operators. Our groups generally agree with Commissioner O'Rielly that "[p]roviding non-safety-of-life DSRC applications the same protection as safety-of-life uses would unnecessarily restrict the use of unlicensed devices, if and when the Commission approves sharing in the band."[105] Commissioner O'Rielly correctly observes that "the Commission's 1999 DSRC item (1999 Order) contemplated, and reserved for later judgment, that non-safety functions could operate on an unlicensed basis separate from the safety-of-life DSRC."[106]

The Public Interest Organization further concur with Commissioner O'Rielly's view that "[i]t seems fair to believe that if non-safety functions were appropriate for unlicensed treatment in 1999, they are even more so now,"[107] particularly since after more than 15 years of leaving the band fallow, even the speculative non-safety applications suggested by the auto industry (such as advertising, social media, navigation, in-vehicle displays and electronic payments) have all been or soon will be subsumed by more efficient general purpose cellular and Wi-Fi networks – or certainly will be soon considering that the Commission anticipates Americans will be enjoying the high-capacity and low-latency benefits of general purpose 5G networks at least a decade before NHTSA expects DSRC to achieve a critical adoption rate sometime in the 2030s.

A. Non-Safety of Life DSRC Applications are not Time-Critical and Generally Redundant with Commercial General Purpose Network Applications with Which they Would Compete

105 Michael O'Rielly, Defining Auto Safety of Life in 5.9 GHz, *FCC Blog* (June 8, 2016), available at https://www.fcc.gov/news-events/blog/2016/06/08/defining-auto-safety-life-59-ghz.

106 *Id.*, citing *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, Report and Order, 14 FCC Rcd 18221, ¶¶ 28-30 (1999).

107 *Id*.

When the FCC originally allocated 75 megahertz to the auto industry more than 15 years ago, it certainly sounded cutting edge to envision DSRC connectivity delivering a host of informational services to drivers that would provide turn-by-turn directions, improve traffic flow, provide in-vehicle displays of signage, send driver notification advisories (e.g., bad weather or construction ahead), and facilitate fleet management for commercial enterprises.[108] DSRC advocates continue to point to similar information services, such as mobile tolling or eco-friendly driving guidance, to justify maintaining exclusive access to 75 megahertz of spectrum.

Needless to say, mobile technology has made radical advances since 1999. Today most cars on the road are already "connected." But that connectivity is provided by general purpose cellular and/or Wi-Fi networks that power an innovative and constantly evolving variety of competing cloud-based applications to the driver's (or passenger's) smartphone or tablet. Vehicles themselves are increasingly becoming "smart" by integrating this same cellular and/or Wi-Fi connectivity to cloud-based applications and the wider Internet. AT&T, for example, added 1 million connected car subscribers during the second quarter of 2015.[109]

Clearly, the rise in mobile phone technologies and Internet technologies has subsumed the purported benefits of DSRC. Just eight years after Apple introduced the iPhone in 2007, two thirds of American adults own a smartphone, including 85 percent of those aged 18-29.[110] The smartphone application market in particular has provided consumers with most of the same

---

[108] *See* ITS Petition to the FCC.

[109] *See* "AT&T Reports Double-Digit Adjusted EPS and Free Cash Flow Growth, and 2.1 Million Wireless Net Adds in Second-Quarter Results" AT&T Newsroom (Jul. 23, 2015), *available at* http://about.att.com/story/att_second_quarter_earnings_2015.html.

[110] *See* Aaron Smith, "US Smartphone Use in 2015," The Pew Research Center (Apr. 1, 2015), *available at* http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/.

Table 1: List of Potential DSRC Informational, Non-Safety Applications[111]

DSRC Application	**Description**	**Status**
Electronic Tolling	Wireless payment of road tolls	Already widespread using 900 MHz unlicensed spectrum
Electronic Parking	Wireless payment for parking	Already available via cellular or Wi-Fi
Traffic Updates	real-time updates on area traffic conditions	Already widely available as mobile app via cellular or Wi-Fi (e.g., Waze, OnStar, Google Maps)
Traveler Information & Navigation	Provide driver with detailed turn-by-turn directions to a final destination	Already widely in use as mobile app via cellular or Wi-Fi (e.g., Google Maps, Waze)
In-vehicle signage	Provide driver with in-vehicle display of roadside signs	Not real-time: connectivity could be cellular or Wi-Fi
Signal Phase and Timing notifications for non-safety applications	Inform drivers of traffic lights status and a timer on how long the current signal state will last	Not real-time: connectivity could be cellular or Wi-Fi (depends on future local public infrastructure buildout)
Environmental Apps: Eco-driving tips	Provide driver with recommendations on driving behavior to improve fuel efficiency, reduce emissions	Not real-time: connectivity could be cellular or Wi-Fi
Driver Notifications	Notify driver of approaching congestion, accident, severe weather, hazardous road conditions, construction	Generally available now, or could be, via mobile apps using cellular or Wi-Fi connectivity

[111] For additional detail on DSRC safety and non-safety applications, see *OTI 5.9 GHz Report*, *supra* note 29, at 19-22.

services that safety-ancillary DSRC applications were initially envisioned to provide. Individuals today can get real-time information updates via apps on their smartphones. Not only are smartphones and cellular networks nearly ubiquitous, but so are apps connected to cloud-based services that can crowd source real-time data without a new nationwide infrastructure build out (as DSRC must, since without roadside backhaul DSRC itself offers no connection to the Internet). Although DSRC could conceivably prove useful for collecting and uploading V2V signaling data via cellular or Wi-Fi networks to the cloud (e.g., to enrich the data used to map traffic flows or improve navigation services such as Waze or Google Maps), there is no clear rationale to prioritize these applications with an exclusive allocation of spectrum to a single industry segment (automakers).

The general purpose cellular and Wi-Fi networks that have flourished as DSRC floundered already offer consumers – whether or not they are in a car – ubiquitous access to mobile data and a diverse ecosystem of apps, many of which are free. Irrespective of DSRC, mobile connectivity will only increase further as 5G networks are developed and Wi-Fi becomes more and more accessible. Cable companies and some cities (such as New York City) are building out large networks of Wi-Fi hotspots in urban areas, including hundreds of thousands of access points in public areas that could readily include highway corridors and other major roadways. Consumers might pay more for certain DSRC-based apps, which might some day operate from a deeper pool of V2V data. But that hypothetical opportunity appears a shaky rationale for the FCC to give one industry virtually exclusive use of more spectrum than is needed for real-time auto safety, blocking Wi-Fi, the technology that would be the auto industry's competitor for delivering non-safety services.

B. The Viability of Non-Safety-of-Life DSRC is Speculative Given the 20-to-30 Year Timeframe for a Federal Vehicle-to-Vehicle DSRC Mandate

Another reason why the Commission should not require Wi-Fi and other low-power unlicensed operations to detect and avoid, or otherwise prioritize, non-safety or non-time-critical DSRC applications is the very real possibility that these services will never actually be deployed at a scale that benefits the general public. NHTSA itself acknowledges V2V will not be viable without a regulatory mandate.[112] And, of course, DSRC non-safety applications are likely to be viable only to the degree that the DOT mandate requires consumers to purchase vehicles equipped with at least the single radio dedicated to the BSM channel – and to the degree that automakers choose to install a more expensive system capable of operating on other DSRC channels.[113] Based on DOT estimates, the mass adoption of even the mandated DSRC systems for crash avoidance could take decades.

Even if NHTSA adopts a regulatory mandate by the end of 2016, the agency stated in its *V2V Readiness Report* that ubiquitous adoption of DSRC could not only take more than 30 years, but until a critical mass is achieved, it may not be possible to determine how effective it will be:

> Even if the market drives faster uptake by consumers of aftermarket devices (if, for example, auto insurance companies offer discounts for installing the devices), . . . ***it will still take 37 years before we would expect the technology to fully penetrate the fleet.***

[112] "It is NHTSA's view that, if V2V were not mandated by the government, it would fail to develop or would develop slowly. . . . [B]ecause the value of V2V to one driver depends upon other drivers' adoption of the technology, it seems unlikely to NHTSA that a manufacturer would volunteer to 'go first' with adding DSRC to its new vehicles, because those units would provide little benefit to their drivers until some critical mass of V2V equipped vehicles is achieved, ..." *V2V Readiness Report*, *supra* note 93, at 6.

[113] NHTSA acknowledges that depending on automaker choices, "V2V devices in various vehicles may not be able to support all the safety applications," let alone non-safety applications that are not permitted to operate on the BSM channel. *V2V Readiness Report*, at 28, citing NHTSA, "Description of Light-Vehicle Pre-Crash Scenarios for Safety Applications Based on Vehicle-to-Vehicle Communications," Report No. DOT HS 811 731 (May 2013), *available at* www.nhtsa.gov/Research/Crash+Avoidance/Office+of+Crash+Avoidance+Research+Technical+Publications.

The agency's ANPRM does not specify when DSRC systems would be required in all new cars sold, but its *V2V Readiness Report* implicitly assumed (in 2014) that the base year for such a mandate would be 2020.[114] The existing motor vehicle fleet (more than 270 million cars, trucks and motorcycles) would generally lack DSRC technology until replacements are purchased. It will likely take 15-to-20 years on average for the nation's vehicle fleet to completely turn over.[115] In theory, drivers choosing to install 'aftermarket' DSRC devices could speed up this timeline. However, DOT estimates that aftermarket systems, not including installation, could cost as much as $1,000 initially.[116] Since consumers would have little incentive to bear this cost until the vast majority of vehicles on the road are equipped – and because many could still not afford the expense – substantial government subsidies would likely be needed to achieve a critical mass of adoption prior to 2030.[117]

The mass adoption of Vehicle to Infrastructure (V2I) DSRC applications is even more speculative. The agency is researching but not formally considering any requirements or regulations related to the use of DSRC with roadside infrastructure. This is notable considering that, based on auto industry assertions, DSRC that connects "Roadside Units" (RSUs) to vehicles were a major focus of the FCC's spectrum allocation and licensing scheme in the *Report and Order* adopted in 2003. Yet V2I remains at a much earlier stage of development than even V2V,

---

[114] *V2V Readiness Report*, *supra* note 31, at 230.

[115] NHTSA, *ANPRM*, at ¶ 53.

[116] *See* U.S. Department of Transportation, Office of the Assistant Secretary for Research and Technology "Costs Database: Unit Costs for DSRC-based Data Collection Equipment Costs Can Range From $4150 - $9200" (Jun. 27, 2014), *available* http://www.itscosts.its.DOT.gov/ITS/benecost.nsf/SummID/SC2014-00330?OpenDocument&Query=Home. According to the *V2V Readiness Report*, the labor installation costs of a retrofit DSRC device would be $135. *V2V Readiness Report*, *supra* note 31, at 229-230.

[117] For example, a refundable federal tax credit of $500 could conceivably equip 200 million used vehicles (roughly 75% of the fleet at the time the mandate becomes effective) by 2025 at a cost of $100 billion.

and as noted above, faces far greater challenges. V2I requires interoperable infrastructure deployed along at least primary roadways. Building, installing and maintaining DSRC infrastructure would be enormously expensive. Costs and responsibilities would need to be divided between the federal government (presumably for the 1 percent of U.S. road miles that comprise the Interstate Highway System) and the thousands of state, county, and municipal jurisdictions that are responsible for the remaining 99 percent, including virtually all city streets.

In a highly skeptical report to Congress last September 2015, the Government Accountability Office (GAO) concluded there is "a lack of state and local resources to develop and maintain V2I systems," stating:

> Because the deployment of V2I technologies will not be mandatory, the decision to invest in these technologies will be up to the states and localities that choose to use them . . . However, many states and localities may lack resources for funding both V2I equipment and the personnel to install, operate and maintain the technologies. . . . current state budgets are the leanest they have been in years. Furthermore, traditional funding sources, such as the Highway Trust Fund, are eroding, and funding is further complicated by the federal government's current financial condition and fiscal outlook.[118]

Local transportation budgets are tight and there is already an enormous unfunded need to repair and maintain current roads and bridges. Installing expensive new transportation infrastructure would introduce an entirely separate and contentious political debate that at least so far has received little attention or support.

VII. CONCLUSION

The undersigned Public Interest Organizations applaud the Commission for moving ahead with a comprehensive proposal to both expand and harmonize unlicensed access across

[118] U.S. Government Accountability Office, "Intelligent Transportation Systems: Vehicle-to-Infrastructure Technologies Expected to Offer Benefits, but Deployment Challenges Exist," Report to Congressional Requesters at 21-22 (September 2015).

775 megahertz of the 5 GHz band. We urge the Commission and the Administration to expedite a collaborative testing process aimed at a win-win compromise that doubly benefits nearly all Americans by enabling two services – DSRC and U-NII devices – to coexist and share at least the lower portion of the 5.9 GHz band without risk of harmful interference to truly delay-sensitive safety-of-life V2V or V2I communications. Our groups look forward to assisting the Commission in any way possible in the hope it moves quickly to adopt and implement an Order that expands and enhances unlicensed public access to the 5 GHz band.

Respectfully Submitted,

Open Technology Institute at the New America Foundation
Public Knowledge, Engine. Common Cause,
and Next Century Cities

Respectfully submitted,

/s/ Harold Feld
Harold Feld
John Gasparini
Public Knowledge
1818 N Street, NW
Washington, DC 20036

/s/ Michael Calabrese
Michael Calabrese
Wireless Future Project at
New America's Open Technology Institute
740 15th Street, NW – 9th Floor
Washington, DC 20005

/s/ Evan Engstrom
Evan Engstrom
Emma Peck
Engine
414 Brannan Street
San Francisco, CA 94107

/s/ Todd O'Boyle
Todd O'Boyle
Common Cause
805 15th Street NW – 8th Floor
Washington, D.C. 20005

/s/ Deb Socia
Deb Socia
Next Century Cities
1200 18th Street, NW – Suite 700
Washington, DC 20036

July 7, 2016