Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Use of the 5.850-5.925 GHz Band	)	ET Docket No. 19-138
	)	
Petition for Rulemaking and Request for	)	
Emergency Stay of Operation of Dedicated	)	RM-11771
Short Range Communications Service in the	)	
5.850-5.925 GHz Band (5.9 GHz Band)	)	

To: The Commission

COMMENTS OF NEW AMERICA'S OPEN TECHNOLOGY INSTITUTE AND PUBLIC KNOWLEDGE

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COMMENTS OF THE OPEN TECHNOLOGY INSTITUTE AT NEW AMERICA AND PUBLIC KNOWLEDGE

New America's Open Technology Institute and Public Knowledge ("OTI and PK") file these Comments in response to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-captioned proceeding.[1] A related, more detailed Issue Brief by OTI is being filed separately today. In addition, OTI and PK request that their pending 2016 Petition for Rulemaking, captioned above, be consolidated with this proceeding. The Petition and a supporting white paper are attached.

I. Introduction and Summary

The virtually unused 5.9 GHz band has become a roadblock to an immensely valuable Wi-Fi superhighway comprised of contiguous wide channels capable of delivering gigabit-fast and affordable wireless connectivity to all of America's homes, workplaces, enterprises, schools and public spaces. Our groups strongly support the Commission's proposal reallocate *at least* 45 megahertz of the virtually unused 5.9 GHz band for unlicensed use. This increment of additional

[1] Notice of Proposed Rulemaking, *In the Matter of Use of the 5.850-5.925 GHz Band*, ET Docket No. 19-138 (rel. Dec. 17, 2019) ("5.9 GHz NPRM").

unlicensed spectrum is critical for consumers and the economy to the extent that it creates the first unencumbered 160 megahertz channel needed to support the next generation of Wi-Fi technology that will enable Americans in all areas of the country to access gigabit-fast and more affordable 5G-capable applications and services.

Leaving the entire 5.9 GHz allocated for auto safety communication (whether DSRC or Cellular V2X) would impose high costs on consumers with little return on the horizon. The 45 megahertz the Commission proposes opening for unlicensed use is absolutely essential to the future of Wi-Fi, specifically as the industry moves to next-generation Wi-Fi services—Wi-Fi 6—to support faster speeds, lower latency, more devices, and new use cases.

Critically for U.S. consumers and businesses, reallocating the lower 45 megahertz of the 5.9 GHz band for unlicensed use would create the first and only gigabit-capable Wi-Fi channel that is not subject to the detect-and-avoid requirements that have hobbled the U-NII-2 band (shared with military radar). If the technical rules for this new 160 megahertz channel are compatible with today's U-NII-3 band, this added spectrum for unlicensed use would ensure the swift availability of Wi-Fi 6's capabilities without undue delay or reduced performance. Consumers, schools, libraries, small businesses, manufacturers, retailers and other public spaces will all be able to avail themselves of the improvements that come with Wi-Fi 6 quickly.

OTI and PK strongly support the Commission's proposal to limit V2X operations to 30 megahertz of exclusive-use spectrum for public safety applications. The proposal to limit V2X to the 30 megahertz needed for critical public safety needs follows Commission precedent, provides the auto industry with sufficient spectrum to deploy critical public safety communications, allows for a technology-neutral competition among V2X approaches, and limits the risk that 75 megahertz of valuable spectrum will continue to lie fallow, while also allowing the industry to

make use of other bands of spectrum for non-critical commercial and safety-related applications. As NHTSA emphasized in its analysis leading up to the proposed DSRC mandate, a V2X system of real-time public safety communication requires at most 20 or 30 megahertz. Regulatory agencies around the world have concluded that 30 megahertz or less is sufficient for V2X safety communications.

It is important to note that when the Commission allocated 75 MHz to DSRC 20 years ago, the auto industry intended to use the band for commercial purposes as well as for collision avoidance. The Commission permitted this in 2004 as a mechanism for encouraging adoption. Today, such incentives are neither necessary nor desirable. They provide an unfair advantage to auto licensees at the expense of the public, by giving them free commercial use of valuable spectrum under the guise of public safety.

We urge the Commission to consider moving ITS operations to another band to better harmonize C-V2X services with mobile 5G networks. It is far from optimal to wedge a public safety communication service between two unlicensed bands. If an alternative band is available, it could provide C-V2X with more spectrum, better propagation, and a less intensively-used spectrum environment in adjacent bands, facilitating an even more robust win-win for consumers and the U.S. economy. An additional consideration is the extreme uncertainty that even C-V2X will be deployed in every new vehicle and added to roadside infrastructure at a scale that will make it reliable as an automated safety communication system.

An alternative and potentially better band of spectrum for ITS operations, and C-V2X specifically, is the 4.9 GHz band – 50 megahertz of extremely underutilized spectrum already allocated for public safety operations. At most 3.5% of potential licensees use the band, as the Commission has lamented in a pending rulemaking seeking ideas for more intensive use of the

band. Because of its light usage, substantial bandwidth and mid-band propagation characteristics, OTI and PK urge the Commission to study the 4.9 GHz band as a more appropriate alternative for V2X safety communications in particular.

C-V2X, which is still under development, is a particularly good candidate for alternative and ideally better spectrum. C-V2X technology is not compatible with DSRC services and is in no way tethered to the 5.9 GHz band. Once C-V2X safety signaling is actually deployed and viable on 20 megahertz, the Commission could decide to expand ITS at 4.9 GHz to as much as 50 megahertz, thereby allowing C-V2X to evolve toward its eventual integration with general purpose mobile 5G mobile networks.

Finally, the Commission should combine the pending Petition in RM-11771 with this rulemaking. Even if the rulemaking is not formally consolidated, ITS licensees should be restricted to non-commercial, safety-related services and receive no allocation of free licensed spectrum to support commercial uses of the spectrum. As part of re-banding 5.9 GHz, in the event the Commission allocates 10 MHz to DSRC, the Commission should clarify that the 10-MHz "control channel" in the DSRC band plan will be replaced by a 10 MHz non-commercial use DSRC channel. The remaining 20 MHz assigned for Cellular V2X should be conditioned on a requirement that non-commercial collision avoidance and public safety use prioritized over any commercial use. Ideally, however, the Commission would allocate the entire ITS auto safety allocation (whether or not it remains at 5.9 GHz) for C-V2X as the safer, more efficient technology.

II. The Reallocation of 45 MHz or More of the Vacant 5.9 GHz Band for Gigabit-Fast Wi-Fi is Critical to a World-Leading, Affordable 5G Wireless Ecosystem

The virtually unused 5.9 GHz band has become a roadblock to an immensely valuable Wi-Fi superhighway comprised of contiguous wide channels capable of delivering gigabit-fast and affordable wireless connectivity to all of America's homes, workplaces, enterprises, schools and public spaces. Very soon the two primary bands for 5G-quality Wi-Fi 6 connectivity will be immediately adjacent to the 5.9 GHz band (one above and one below). The auto industry has left the band lie fallow for 20 years while both vehicle safety technology and the enormous social and economic importance of Wi-Fi in 5 GHz has passed it by. The Commission should unlock the potential of the 5.9 GHz band and provide Wi-Fi with the spectrum needed to make at least one – and ideally multiple –160 megahertz channels available to enable and accelerate the 5G-capable applications and services of next generation Wi-Fi 6, which is ready to deploy now.

A. The Stalled 5.9 GHz Band is a Roadblock to Next Generation Wi-Fi

The 5.9 GHz band has been reserved exclusively for a specific vehicle safety signaling technology – Dedicated Short Range Communications (DSRC) – for nearly 20 years. In that time the auto industry has failed to deploy the technology, leaving 75 megahertz of immensely valuable spectrum unused. The Commission acknowledges this in the NPRM: "Although the Commission had high expectations, DSRC has not lived up to its promise of achieving the ITS goals, leaving valuable mid-band spectrum largely fallow."[2] DSRC has "not been widely deployed within the consumer automobile market."[3] Leaving the entire 5.9 GHz allocated for auto safety communication (whether DSRC or Cellular V2X) would impose high costs on

[2] *Ibid.*
[3] *Id.* at ¶ 4.

consumers with little return on the horizon. As the Commission correctly states in the *NPRM*, a V2X system of real-time public safety communication requires at most the 30 megahertz the Commission proposes to set aside on an exclusive basis at the top of the band.

The 45 megahertz the Commission proposes opening for unlicensed is absolutely essential to the future of Wi-Fi as the wireless ecosystem advances to 5G and next-generation Wi-Fi services—Wi-Fi 6—to support faster speeds, lower latency, more devices, and new use cases. As the Commission notes in the *NPRM*, Wi-Fi 6 offers "gigabit speeds, superior performance in crowded environments, and better device battery life" and requires "wide-bandwidth 160-megahertz channels to deliver the most capacity and advanced features."[4] By reallocating the lower 45 megahertz of the 5.9 GHz band, the Commission will be able to create a 160 MHz channel by combining that portion with the adjacent U-NII-3 unlicensed band.[5]

Because today's Wi-Fi is already operating intensively on the adjacent U-NII-3 band, the additional 45 megahertz in the 5.9 GHz band would unlock immediate additional capacity for Wi-Fi services and significant benefits for consumers and businesses. As the Commission observes, "because the 5.850-5.895 GHz sub-band is adjacent to the U-NII-3 band which supports unlicensed operations, equipment manufacturers should be able to readily and cost-effectively manufacture devices to expand operations into this sub-band."[6]

Critically for U.S. consumers and business, reallocating the lower 45 megahertz of the 5.9 GHz band for unlicensed use would create the first and only gigabit-capable Wi-Fi channel that is not subject to the detect-and-avoid requirements that have hobbled the U-NII-2 band

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[4] 5.9 GHz NPRM at ¶ 14.
[5] *Id.* at ¶ 16 ("Our proposal to add 45 megahertz of 5.9 GHz spectrum that can be combined with the adjacent U-NII-3 band (5.725-5.850 GHz), if adopted, would provide a large contiguous block of unlicensed spectrum that could accommodate a variety of options—including two 80-megahertz Wi-Fi channels, four 40-megahertz Wi-Fi channels, or a single contiguous 160-megahertz Wi-Fi channel.").
[6] *Ibid.*

(shared with military radar).[7] If the technical rules for this new 160 megahertz channel are compatible with today's U-NII-3 band, this added spectrum for unlicensed use would ensure the rapid availability of Wi-Fi 6's capabilities without undue delay or reduced performance. Additionally, consumers, schools, libraries, small businesses, manufacturers, retailers and public spaces will all be able to leverage the improvements that come with Wi-Fi 6 quickly and nationwide. These benefits will include new services such as augmented reality and virtual reality, as well as new capabilities – not just higher throughput and lower latency, but also enabling an enormous increase in the number of devices on a Wi-Fi network without a deterioration in performance.

The additional capacity for Wi-Fi is necessary not just for next-generation services, but also to help relieve the congestion the current Wi-Fi bands are experiencing due to the dependence of mobile device users carriers for cellular offload. The issue of offloaded mobile data traffic is particularly important in the context of the indoor use of mobile devices, where more than 80% of mobile data is consumed.[8] Charter reports that its network currently supports more than 300 million devices and that 80 percent of the wireless data its customers consume on those devices travel over Wi-Fi onto Charter's cable network.[9] Overall, according to Cisco,

[7] *Id.* at ¶ 17.

[8] Comments of the Open Technology Institute at New America, American Library Association, the Benton Foundation, Consumer Federation of America, Consumers Union, Institute for Local Self-Reliance, National Hispanic Media Coalition, Next Century Cities, Public Knowledge, Schools, Health, & Libraries Coalition, and X-Lab, GN Docket No. 17-258, GN Docket No. 15-319, GN Docket No. 17-183, GN Docket No. 14-177 (Sep. 11, 2018), https://ecfsapi.fcc.gov/file/1091216959118/PISC_Comments_SpectrumPipelineAct_FINAL_AsFiled_091118.pdf at 22-23 ("The mobile device data traffic transported over Wi-Fi networks - rather than over mobile carrier networks -- is increasing and vastly exceeds all other wireless technologies, making more spectrum capacity for Wi-Fi critical…").

[9] Notice of Ex Parte Presentation of Charter Communications and CableLabs, ET Docket No. 18-295, GN Docket No. 17-183, at 1 (Feb. 21, 2020) ("Charter and CableLabs Ex Parte").

carriers offloaded 54 percent of all mobile data traffic onto the fixed network in 2017.[10] Cisco has further predicted that by 2022, carriers will be offloading 59 percent of traffic onto Wi-Fi networks from cellular networks.[11] Cisco estimates that by 2023, 75 percent of all networked devices will be wired or connected over Wi-Fi, with just 25 percent mobile.[12]

This critical synergy between cellular and Wi-Fi networks will only deepen as 5G networks spawn very high-bandwidth applications and services. Cisco estimates that 71 percent of global 5G traffic will be offloaded onto Wi-Fi by 2022.[13]

B. Gigabit-Fast and 5G-capable Wi-Fi Will Generate Enormous Benefits for Consumers, Business and the Broader Economy

During the two decades that the 5.9 GHz band has sat idling, Wi-Fi has emerged as an essential pillar of our wireless ecosystem and enabler of affordable connectivity in homes, workplaces, schools, and for the productivity of a broad and diverse set of industries.

The U.S. economy benefits significantly from Wi-Fi. Unlicensed technologies – Wi-Fi being the largest – generated $525 billion in economic value in the U.S. alone in 2017. This represented $496.13 billion in economic surplus and $29 billion in added GDP—an impact estimated to grow to over $834 billion this year.[14] The offloading of mobile carrier data traffic

[10] "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022," Cisco White Paper (Feb. 2019), https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visualnetworking-index-vni/white-paper-c11-738429.pdf ("Cisco 2019 VNI").
[11] Cisco 2019 VNI.
[12] Cisco, "Annual Internet Report (2018–2023) White Paper" (Feb. 28, 2020), https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html.
[13] Cisco 2019 VNI.
[14] Raul Katz, Telecom Advisory Services LLC, "A 2017 Assessment of the Current & Future Economic Value of Unlicensed Spectrum in the United States," at 75 (Apr. 2018).

via Wi-Fi by itself generated $25.2 billion of value in 2017.[15] The 5.9 GHz band alone, if repurposed for Wi-Fi, could "provide gains to economic welfare in the form of consumer and producer surplus of $82.2 billion to $189.9 billion," according to a study by the RAND Corporation.[16]

Wi-Fi will need more capacity to handle the incoming surge of data traffic from the Internet of Things (IoT) and more bandwidth-intensive 5G services. Machine-to-machine data transfer and IoT networks are mostly reliant today on unlicensed spectrum for use cases that include energy and environmental monitoring, mobile healthcare applications, industrial automation, and smart city operations such as intelligent transportation, smart meters, vehicle tolling and inventory tracking. These use cases have seen a spike in growth with declining costs to consumers thanks to the connectivity powered by unlicensed spectrum.[17] Further, mobile carriers will need higher-capacity Wi-Fi to offload traffic as far more bandwidth-intensive 5G applications and services become popular and generate enormous data demands.[18]

Wi-Fi also enables use cases that meet the critical needs of community anchor institutions and businesses of all types. For example, schools and other educational institutions are increasingly reliant on robust Wi-Fi connectivity. Schools can only take advantage of gigabit internet connections and make simultaneous use of hundreds of laptops and other devices in a school if the Wi-Fi network has the capacity to distribute that bandwidth to every classroom and

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[15] "Economic Value of Unlicensed Spectrum in the U.S. Tops $525 Billion," Wi-Fi Forward, (May 17, 2018), http://wififorward.org/2018/05/17/new-report-economic-value-of-unlicensedspectrum-in-the-u-stops-525-billion/.

[16] Diana Gehlhaus Carew et al., "The Potential Economic Value of Unlicensed Spectrum in the 5.9 GHz Frequency Band," RAND Corporation (2018), https://www.rand.org/pubs/research_reports/RR2720.html.

[17] See Richard Thanki, "The Economic Significance of License-Exempt Spectrum to the Future of the Internet," at 65 (June 2012).

[18] David Nield, "Why You'll Still Need Wifi When 5G Is Everywhere, According to the Wi-Fi Alliance" (Dec. 18, 2018), https://gizmodo.com/why-youll-still-need-wifi-when-5g-is-everywhere-accord1831167997.

individual student. Interactive video, virtual reality, multi-user educational gaming, and other bandwidth-intense applications will only add to this challenge. That's why the contiguous and wide channels at the top of the 5 GHz band and across the 6 GHz band are essential to actually realize the potential of the fiber backhaul that the Commission's E-rate program and local school districts are deploying.

Wi-Fi empowers students to access individualized lesson plans and complete homework. The participation rate of schools and libraries in the E-Rate program's "category two" funding for internal connections (which primarily refers to Wi-Fi) has skyrocketed. According to the Wireline Competition Bureau, the average number of schools receiving category two funding (or pending requests) is at about 45,000 per year—a 525% increase from the period between fiscal years 2008 and 2012.[19] Libraries experienced a similar increase in participation; about 2,700 libraries per year receive category two commitments or pending requests—an 865% increase.[20]

The E-Rate program's increased funding for Wi-Fi networks is producing results. Since the FCC's 2014 reforms of the E-Rate program, 83 percent of schools districts have invested in Wi-Fi upgrades—a drastic increase from 14 percent in 2011-2014.[21] Schools and school districts are investing in these networks because they see it as a necessary tool to improve learning. Nearly 200 school and district leaders and over 50 education organizations emphasized this fact: "Category two services that support high-speed internet access, including reliable Wi-Fi, are vital

[19] Wireline Competition Bureau Report, WC Docket No. 13-184, at ¶ ¶ 17-18 (Feb. 11, 2019), https://docs.fcc.gov/public/attachments/DA-19-71A1.pdf.
[20] *Ibid.*
[21] EducationSuperHighway, "2018 State of the States" (Oct. 2018), https://s3-us-west1.amazonaws.com/esh-sots-pdfs/2018%20State%20of%20the%20States.pdf. School districts are increasingly investing in Wi-Fi also. $2.9 billion went to deploying Wi-Fi networks from 2015 to 2018, compared to $1.5 billion between 2011 and 2014.

for providing all students with a quality education to prepare them for today's modern economy."[22] Wi-Fi is also crucial for libraries.[23]

The availability of Wi-Fi in libraries, community technology centers, coffee shops, and other retail and public spaces are another essential use of Wi-Fi to bridge the Homework Gap, particularly for students without internet access at home. Roughly 70 percent of teachers in the U.S. assign homework that requires internet access to complete and that number is believed to increase as students rise to high school.[24] Twelve percent of U.S. teenagers surveyed by the Pew Research Center said they rely on public Wi-Fi to do homework due to a lack of broadband access at home—and this share is higher for low-income teenagers, a demographic where 21 percent of respondents reported they rely on Wi-Fi outside the home.[25]

Stories frequently describe students using free Wi-Fi at local McDonald's locations and even on school buses due to a lack of internet service at home—these vignettes are a common byproduct of the Homework Gap.[26] Dr. Nicol Turner-Lee recently wrote of an ice cream parlor

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[22] Reply Comment Letter from 191 School and District Leaders from 38 States Requesting that the Federal Communications Commission Support High-Speed Broadband and Wi-Fi through E-Rate Category Two Services, WC Docket No. 13-184 (Nov. 7, 2017), https://all4ed.org/wpcontent/uploads/2017/11/school-and-district-leader-support-letter-for-e-rate.pdf.

[23] Comments of American Library Association, WC Docket No. 13-184 (Oct. 23, 2017), https://ecfsapi.fcc.gov/file/102330495230/ALA_E-rate_Comments_10_23_2017.pdf ("High-speed internet connections and robust Wi-Fi are essential for all libraries and underpin services on which communities across the country depend.").

[24] Alia Wong, "Why Millions of Teens Can't Finish Their Homework," *The Atlantic* (Oct. 30, 2018) https://www.theatlantic.com/education/archive/2018/10/lacking-internet-millions-teens-cant-do-homework/574402/.

[25] Monica Anderson and Andrew Perrin, Nearly one-in-five teens can't always finish their homework because of the digital divide, Pew Research Center (Oct. 26, 2018), http://www.pewresearch.org/facttank/2018/10/26/nearly-one-in-five-teens-cant-always-finish-their-homework-because-of-the-digitaldivide/.

[26] Anton Troianovski, "The Web-Deprived Study at McDonald's," *The Wall Street Journal* (Jan. 28, 2013), https://www.wsj.com/articles/SB10001424127887324731304578189794161056954; Alia Wong, "Why Millions of Teens Can't Finish Their Homework," *The Atlantic* (Oct. 30, 2018) https://www.theatlantic.com/education/archive/2018/10/lacking-internet-millions-teens-cant-do-homework/574402/; Cecilia Kang, "Bridging a Digital Divide That Leaves Schoolchildren Behind," *The*

near a school that offered free Wi-Fi so that students had a place to complete their homework. The owner told her: "'We sometimes have more white people here [at The Social] than [Black] students because they have no transportation,' [owner Betty] Cadore pointed out. 'I really wish that I could figure that problem out because we are here to offer a safe space for the kids to do their homework.' . . . [I]t was also clear that there were not too many places that offered Wi-Fi or fixed broadband services to community residents."[27]

Wi-Fi plays a large role in the rapid adoption of smart agriculture, where next-generation services are already being deployed across the country. For smart farming operations, Wi-Fi networks are preferable to LTE and 4G networks because, once deployed, they are more cost-effective to sustain, customize, and operate.[28] Using Wi-Fi-enabled smart agriculture, farmers can review data and weather conditions using mobile devices, and smaller farms work especially well for Wi-Fi networks.[29] Microsoft's FarmBeats program—which provides complex data analytics to the farming industry—is a prime example of how unlicensed technologies such as Wi-Fi and TV White Spaces can offer advances to efficient farming techniques.[30]

New York Times (Feb. 22, 2016), https://www.nytimes.com/2016/02/23/technology/fcc-internet-access-school.html.

[27] Nicol Turner Lee, "Bridging digital divides between schools and communities," The Brookings Institution (March 2, 2020), https://www.brookings.edu/research/bridging-digital-divides-between-schools-and-communities/.

[28] Stephanie Bergeron Kinch, "Agriculture: A cash cow for Wi-Fi-based IoT?," Wi-Fi NOW (June 2, 2018), https://wifinowevents.com/news-and-blog/agriculture-a-cash-cow-for-wi-fi-based-iot/, (Agnov8's CEO Andrew Cameron "says that Wi-Fi has a competitive advantage over LTE and 4G networks because it is more economically feasible to maintain and operate once it is installed. Farmers can check data and conditions on their smartphones and tablets, and the system is compatible with other Wi-Fi-enabled technology. Wi-Fi works especially well for smaller farms, he says.").

[29] *Ibid.*

[30] Kyle Wiggers, "With FarmBeats, Microsoft makes a play for the agriculture market," VentureBeat (Nov. 4, 2019), https://venturebeat.com/2019/11/04/with-farmbeats-microsoft-makes-a-play-for-the-agriculture-market/. "FarmBeats leverages unlicensed TV white spaces . . . to establish a high-bandwidth link from a farmer's home internet connection to a base station, sometimes supplemented by the open source long-range IoT protocol LoRa. Sensors, drones, and the like connect to the base station, which draws power from a battery-backed solar panel pack. . . . The Wi-Fi module lets farmers connect off-the-

Another example is the Wi-Fi network built by the company BlueTown, in partnership with the University of California's Kearney Agricultural Research and Education Center (KARE). Each Wi-Fi access point delivered 250 Mbps throughput and provided coverage over a 250-meter radius.[31] KARE's solution brought significant benefits for farming, by placing sensors throughout an alfalfa field that detect and review subsurface irrigation in comparison to flood irrigation.[32] "One of the nice things about the W-Fi is we can move to real-time evaluation of the data that is coming off this field," Dr. Jeffery A. Dahlberg, director of KARE, told RCR Wireless.[33]

The indoor use of Wi-Fi offers reliability and increased productivity for factory automation and is becoming an invaluable tool for the manufacturing sector broadly. Entire warehouses and production lines are equipped with Wi-Fi networks that monitor and administer the synchronized movements of robots, sensors, inventory tracking, and other efficiency gains.

Amazon, for example, uses unlicensed spectrum to control the robots in their enormous warehouse fulfillment centers (more than 100,000 robots as of 2017), by using a customized indoor network based on variations of the Wi-Fi 802.11 standard.[34] Amazon is able to use a secured Wi-Fi network to control the robots in its warehouses through a centralized computer.[35] Through Wi-Fi-enabled communication, robots guide warehouse employees to find packages

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shelf soil temperature, pH, carbon dioxide, and moisture sensors with their phones to access farming productivity apps. *Ibid*.

[31] Susan Rambo, "High-speed Wi-Fi at ag research center may be blueprint for rural communities," RCR Wireless (July 20, 2018), https://www.rcrwireless.com/20180719/internet-of-things/high-speed-wifi-atag-research-center-may-be-blueprint-for-rural-communities-tag41.

[32] *Ibid.*

[33] *Ibid.*

[34] Nick Wingfield, "As Amazon Pushes Forward With Robots, Workers Find New Roles," *The New York Times* (Sep. 10, 2017), https://www.nytimes.com/2017/09/10/technology/amazon-robots-workers.html.

[35] Pablo Valerio, "Amazon Robotics: IoT in the Warehouse," *Information Week* (Sep. 28, 2015), https://www.informationweek.com/strategic-cio/amazon-robotics-iot-in-the-warehouse/d/d-id/1322366.

and then transport it if the package is too heavy.[36] The robots maneuver around employees by sensing the bluetooth signals on their badges.

Hospitals are also critical institutions that have an increasing number of applications that requires much higher-capacity Wi-Fi to meet their needs. Next-generation WiFi technologies (Wi-Fi 6) will enable more and better internet-connected medical benefits (and telehealth) only if there is enough contiguous, wide-channel spectrum available. As the Wi-Fi Alliance has stated: "Hospitals are a perfect example of congested, high-traffic, constantly changing environments that would benefit from Wi-Fi 6. Wi-Fi is common in hospitals given the many benefits it provides."[37] Through Wi-Fi, doctors and nurses can remotely monitor patients and devices, use interconnected devices to communicate accurate patient records and real-time data analysis, and send and receive real-time alerts and observation data.[38] However, for data-intensive uses such as telehealth, low latency and the ability to support thousands of separate devices is critical to the safety of those under the care at that hospital. Strengthening Wi-Fi services with more spectrum through the creation of one 160 megahertz channel will be crucial to realizing the potential of next-generation healthcare and telehealth.

More generally, adding capacity for next generation Wi-Fi is necessary to avoid the worsening digital divide that could otherwise result from the long and costly buildout of mobile 5G networks. Although mobile carrier 5G networks will offer revolutionary speeds and applications in core urban and high-traffic areas where it is practical and profitable to deploy dense, smaller-cell networks that leverage very high-capacity millimeter wave spectrum, true

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[36] Will Knight, "Inside Amazon's Warehouse, Human-Robot Symbiosis," MIT Technology Review (July 7, 2015), https://www.technologyreview.com/s/538601/inside-amazons-warehouse-human-robotsymbiosis/.
[37] Jay White, "Wi-Fi 6 and healthcare," Wi-Fi Alliance (Jan. 15, 2019), https://www.wi-fi.org/beacon/jaywhite/wi-fi-6-and-healthcare.
[38] *Ibid.*

5G-capable coverage will be slow in coming to less rural, small town and even low-income urban areas. Mobile carriers have acknowledged that the 5G networks deployed on millimeter wave spectrum will never materially scale beyond urban areas, meaning that the most "revolutionary" services that come with 5G will leave rural, Tribal, and other harder-to-serve areas behind.[39] The 5G services deployed in rural and other hard-to-serve areas, on low-band spectrum, is likely to resemble "good 4G," rather than actual 5G, according to an executive at Verizon.[40] Further complicating the issue is affordability: Americans who live in areas where mobile carriers have deployed *actual* 5G services might be priced out of enjoying this technology due to the high cost of 5G-capable devices or subscriptions.[41]

Wi-Fi 6 will serve as a complement to 5G mobile networks, where available, while also accelerating the availability of 5G-quality wireless connectivity and services in any location where a sufficiently fast fixed internet connection (e.g., cable) is within range. While Wi-Fi lacks the mobility of wide-area mobile network coverage (e.g., driving in a car), most video and other high-bandwidth uses are indoors or in a fixed location. For most uses, Wi-Fi 6 with sufficient spectrum can make 5G-capable services more rapidly available—and far more affordable—to most of the country. While large parts of the U.S. wait for mobile 5G to be deployed, Wi-Fi 6 is

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[39] Jon Brodkin, "Millimeter-wave 5G will never scale beyond dense urban areas, T-Mobile says," *Ars Technica* (April 22, 2019), https://arstechnica.com/information-technology/2019/04/millimeter-wave-5g-will-never-scale-beyond-dense-urban-areas-t-mobile-says/; Sean Hollister, "Verizon and T-Mobile agree much of the US won't see the fast version of 5G," The Verge (April 24, 2019), https://www.theverge.com/2019/4/24/18514905/verizon-t-mobile-agree-rural-united-states-dont-get-millimeter-wave-5g.

[40] Jon Brodkin, "Verizon: 5G speeds on low-spectrum bands will be more like 'good 4G'," *Ars Technica* (August 8, 2019), https://arstechnica.com/information-technology/2019/08/verizon-5g-speeds-on-low-spectrum-bands-will-be-more-like-good-4g/.

[41] Cameron Faulkner, "T-Mobile will launch 5G in six US cities on June 28th with Samsung's Galaxy S10 5G," *The Verge* (June 25, 2019), https://www.theverge.com/2019/6/25/18744225/samsungs-galaxy-s10-5g-launch-t-mobile-mmwave ("Be aware that the S10 5G costs far more than Samsung's other Galaxy S10 phones: $1,299 if you pay full price. You can pay $31.25 per month if you prefer monthly payments, but it'll first require a $549.99 down payment.").

ready now for widespread adoption.[42] Wi-Fi 6—fueled by a sufficient amount of unlicensed spectrum—can improve broadband service in any given home or business that has a gigabit-capable fixed broadband service, as more than 80 million cable subscribers do currently.

Conversely, without WiFi 6, the benefits of gigabit speed to the home will remain largely unrealized. The broadband bottleneck for homes and small businesses is increasingly the ability to distribute the connectivity from a fixed broadband connection (e.g., cable or fiber) to a dozen or more wireless devices sharing that bandwidth. The vast majority of devices for deployment in the home, including tablets, many laptops, and devices for gaming and streaming have no Ethernet port. They rely entirely on Wi-Fi to connect to the home network and the Internet. Consumers will not spend money on gigabit connections to the home if their devices cannot come take advantage of high throughput and low latency due to Wi-Fi congestion. By creating an unencumbered 160 megahertz channel for Wi-Fi 6, the Commission will further the broader national policy of promoting the adoption and use of gigabit broadband.

III. The Commission Correctly Limits the V2X Allocation to 30 Megahertz of Exclusive Use for Public Safety

OTI and PK strongly support the Commission's proposal to limit intelligent transport systems (ITS) to 30 megahertz of exclusive use for public safety purposes.[43] This proposal follows Commission precedent, provides the auto industry with sufficient spectrum to deploy critical public safety communications, allows for a technology-neutral competition among V2X approaches, and limits the risk that 75 megahertz of valuable spectrum will continue to lie fallow, while also allowing the industry to make use of other bands of spectrum for non-critical

[42] Jacob Kastrenakes, "Wi-Fi 6 is finally here," The Verge (Jan. 11, 2020), https://www.theverge.com/2020/1/11/21060167/wifi-6-ces-2020-mesh-routers-laptops-6e-5g.
[43] 5.9 GHz NPRM at ¶ 18.

commercial and safety-related applications. The Commission correctly follows other nations in limiting V2X to the 30 megahertz or less that it needs for critical safety signaling applications.

A. Commission Principles of Modern Spectrum Management Support Limiting the V2X Allocation to the Amount Necessary for Critical Public Safety Communication

The Commission has moved decisively away from command-and-control and industry-specific spectrum allocation over the past two decades, emphasizing instead the benefits of more flexible-use spectrum allocations, reliance on general purpose networks, and limiting exceptions for special purpose needs like public safety to no more than what is necessary to satisfy a compelling public purpose.[44] Shortly after the Commission's decision to allocate the 5.9 GHz band exclusively to the auto industry for a particular technology (DSRC), the Commission moved away from the approach of creating industry-specific silos of spectrum that restrict bands to specific technologies. The Commission acknowledged such rules hinder innovation and are incompatible with the ever-changing nature of technology and the wireless ecosystem.

In 1999, the Commission issued a new statement of spectrum policy principles, arguing that "[f]lexible allocations may result in more efficient spectrum markets."[45] In that statement, the Commission conceded that exceptions could be made for public safety and particular other areas "where market forces would fail to provide for the operation of important services."[46]

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[44] For a fuller discussion of this evolution, see the attached OTI Issue Brief and see Michael Calabrese, *"Spectrum Silos to Gigabit Wi-Fi: Sharing the 5.9 GHz 'Car Band', at 30-34 (Jan. 2016), available* https://www.newamerica.org/oti/policy-papers/spectrum-silos-to-gigabit-wi-fi/.

[45] 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.

[46] 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.

Later, in its 2002 Spectrum Policy Task Force Report, the Commission stated that older technology-specific rules for spectrum management should evolve to "more flexible rules."[47] The Task Force 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."***[48] The report also argued the Commission should "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," whenever possible.[49]

In 2010, the Commission reiterated and expanded on these principles in its National Broadband Plan, stating that "where there is no overriding public interest in maintaining a specific use, flexibility should be the norm" and 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."[50] In 2014, Julius Knapp, until recently chief of the FCC's Office of Engineering and Technology, declared: "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

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[47] *Report of the Spectrum Policy Task Force*, ET Docket No. 02-135, at 41 (Nov. 2002), available at http://sites.nationalacademies.org/cs/groups/bpasite/documents/webpage/bpa_048826.pdf; 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").

[48] *Id.* at 41 (emphasis added).

[49] *Id.* at 6.

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

uses."[51] The OTI Issue Brief (filed separately today) explains this spectrum policy evolution more fully.

B. Real-Time V2X Safety Communication Requires No More than 30 Megahertz

In its proposed DSRC mandate, NHTSA explicitly acknowledged that critical vehicle safety functions require at most 20 or 30 megahertz. The DOT mandate for DSRC, since abandoned, would have *required* all V2V crash-avoidance signaling (Basic Safety Messages, or BSMs) to be transmitted on a single 10 MHz channel and on a radio separate from other non-critical ITS communications. As NHTSA explained:

> "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."[52]

Similarly, regulatory agencies around the world have concluded that the 30 megahertz or less is sufficient for V2X safety communications. Japan has allocated one single channel of 10 megahertz for DSRC that, as the Commission notes, has "successfully and actively used for

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[51] 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.

[52] *V2V Readiness Report*, at 56 (emphasis added). 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." *See also* Rob Alderfer, Dirk Grunwald and Kenneth Baker, "Optimizing DSRC Safety Efficacy and Spectrum Utility in the 5.9 GHz Band," CableLabs and University of Colorado/Boulder (2016) (explaining NHTSA requirement to separate the BSM channel from other V2X applications and why 20 or 30 megahertz is sufficient in light of the policy objectives of NHTSA's goals and *V2V Readiness Report*).

collision avoidance around intersections."[53] The European Union long ago allocated 30 megahertz for one harmonized ITS band.[54] More recently, as the NPRM also notes, the European Union concluded that 30 MHz is all that is required for real-time auto safety operations *even if* DSRC and C-V2X deployments coexist in the same spectrum band.[55] A 2019 EU report that considered a possible expansion of frequencies to support both auto and rail ITS applications, concluded that "[t]here is no evidence that spectrum availability is currently a constraint on the development of ITS."[56]

In its Europe-based advocacy, 5GAA itself has acknowledged the ability of the two V2X technologies to both achieve real-time V2V safety signaling and coexist within a 30 megahertz allocation (in Europe, 5875-5905 MHz), initially relying on exclusive 10 MHz channels, and later sharing the total of 30 megahertz the EU has allocated for V2X safety. The group's 2018 whitepaper touts the ability of ITS-G5 (the 802.11-based equivalent of DSRC) and Cellular-V2X to eventually share the entire 30 megahertz the EU has decided to allocate using detect-and-avoid. 5GAA proposed a spectrum sharing solution based on technology detection and dynamic frequency/channel selection – to be agreed among the stakeholders – to be implemented in up to three steps."[57] 5GAA described a two-step evolution to band sharing on 30 megahertz:

> In all steps, each of C-V2X and ITS-G5 can operate safety-related ITS services free from co-channel interference from the other technology. The difference between the distinct steps lies in the overall usage of the spectrum resource: **In the short-term first step, we propose to specify preferred 10 MHz channels at 5875- 5905 MHz to each of the two**

[53] *5.9 GHz NPRM* at ¶ 21.
[54] *Ibid. See* "2008/671/EC: Commission Decision of 5 August 2008 on the harmonised use of radio spectrum in the 5875-5905 MHz frequency band for safety-related applications of Intelligent Transport Systems (ITS) (notified under document number C(2008) 4145)," Document 32008D0671 (2008), https://eur-lex.europa.eu/legalcontent/en/ALL/?uri=CELEX:32008D0671.
[55] *See* European Conference of Postal and Telecommunications Administrations, CEPT Report 71 at 7 (2019) https://www.ecodocdb.dk/download/19a361a9-d547/CEPTRep071.pdf.
[56] *Ibid.*
[57] 5GAA, "Coexistence of C-V2X and ITS-G5 at 5.9 GHz" (April 5, 2018) at 1, http://5gaa.org/wpcontent/uploads/2018/10/Position-Paper-ITG5.pdf.

> **technologies, while in the longer term third step, the solution will allow full sharing of all available channels [30 MHz] by the two technologies.**[58]

5GAA has also told the Commission that its testing "demonstrate[s] C-V2X's ability to deliver important safety messages over a 20 MHz channel."[59] This is twice the bandwidth that NHTSA proposed in its 2016 NPRM for a V2V mandate relying on DSRC. Although the auto industry understandably would like additional free, exclusive-use spectrum for non-critical driving and commercial connected car applications, it would be more consistent with a path to 5G network convergence and the broader public interest to use a combination of unlicensed spectrum and bands other than 5.9 GHz, as we explain in the next section.

IV. Relocating V2X to Better Spectrum Will Best Serve the Overall Public Interest

The Commission should study the feasibility of moving ITS operations to another band to better harmonize C-V2X services with 5G networks and allow more spectrum to go toward both ITS operations and Wi-Fi. If DSRC did not already occupy the 5.9 GHz band, there is little likelihood that the Commission in 2020 would even seriously consider allocating the 30 megahertz from 5895 to 5925 MHz to an exclusive public safety vehicle communication system.

The spectrum ecosystem has shifted markedly since the Commission first allocated the 5.9 GHz band for auto safety communication and DSRC. In 1999, the 5.9 GHz band was not considered valuable for personal communication. But today the band sits immediately between the current and future most valuable and used bands for high-capacity Wi-Fi: the U-NII-3 band (5725-5850 MHz) and the U-NII-5 band (5925-6425 MHz). The FCC's proposal to authorize

[58] *Ibid* (emphasis added).
[59] Letter from Sean T. Conway, Counsel, 5G Automotive Association, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 18-357, ET Docket No. 13-49, at 2 (filed July 8, 2019).

Wi-Fi to share the latter is expected to be adopted in advance of a decision on reorganizing the 5.9 GHz band. The location of ITS spectrum is the reason the FCC, in its initial 2013 notice of rulemaking that proposed shared Wi-Fi access to the 5.9 GHz band, designated it the U-NII-4 band. In short, the vacant 5.9 GHz band is a roadblock in a potential next generation Wi-Fi superhighway that is key to more accessible, affordable and gigabit-fast 5G wireless connectivity for every American home, business, classroom and public space.

Moreover, we agree with NCTA that because of the rapid growth of unlicensed operations in U-NII-3 and the Commission's proposal to authorize unlicensed operations immediately above 5925 MHz, "[i]f engineers were starting today with a clean slate and looking for a home for automotive operations, they would never choose the 5.9 GHz band."[60] It is far from optimal to wedge a public safety communication service between two unlicensed bands. If a different band could provide C-V2X with more spectrum, better propagation, and a less intensively-used spectrum environment in the adjacent bands, then relocating the ITS band would be an even more robust win-win for consumers and the U.S. economy.

An additional consideration is the extreme uncertainty that even C-V2X will be deployed in every new vehicle and added to roadside infrastructure at a scale that will make it reliable as an automated safety communication system. The deployment of a ubiquitous V2V or V2X safety signaling system is by all accounts unlikely and at least two decades away. This is not our opinion, but rather the logical conclusion of findings by DOT and NHTSA in the run-up to the proposed DSRC mandate that is no longer planned.

First, as the National Highway Traffic Safety Administration (NHTSA) has acknowledged, DSRC will not be reliable as an automated safety signaling network in the

[60] NCTA ex parte letter, ET Docket No. 13-49 (Oct. 23, 2018), https://ecfsapi.fcc.gov/file/1023778523876/Oct%2023%205.9%20GHz%20Ex%20Parte.pdf.

absence of a regulatory mandate, a proposal the Department of Transportation (DOT) has abandoned.[61] But the costs are daunting. NHTSA estimated years ago that mandating DSRC would cost an extra $5 billion each year and that by 2060 the total costs would be $108 billion.[62] The enormous unfunded mandate on both consumers and local governments associated with a DSRC mandate have been highlighted by the Brattle Group and the Government Accountability Office.[63] Will every vehicle makers voluntarily impose this cost on every new vehicle?

Second, even with a government mandate, the technology was not expected to permeate the broader market for decades. In 2014, NHTSA released a comprehensive report on the viability of V2V that concluded: "Even if the market drives faster uptake by consumers of aftermarket devices (if, for example, auto insurance companies offer discounts for installing the devices), which would increase the ability of V2V devices to find each other earlier on, it will still take 37 years before we would expect the technology to fully penetrate the fleet."[64] Further, as the Mercatus Center noted: "The indirect safety benefits, plus the long timeline before net benefits arise [15 to 30 years], plus the unreasonably optimistic predictions of market-ready units

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[61] Department of Transportation, National Highway Traffic Safety Administration, 79 Fed. Reg. 49,270 (proposed Aug. 20, 2014) (to be codified at 49 C. F. R. pt. 9701) at p. 6 ("… if V2V were not mandated by the government, it would fail to develop or would develop slowly.").

[62] National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT) NPRM, Docket No. NHTSA-2016-0126 (Jan. 12, 2017), at 4000, https://www.federalregister.gov/documents/2017/01/12/2016-31059/federal-motor-vehiclesafetystandards-v2v-communications; Letter of Competitive Enterprise Institute, American Commitment, Niskanen Center, Reason Foundation, and R St. Institute to Transportation Secretary Elaine Chao (April 3, 2017), https://cei.org/sites/default/files/Letter%20to%20USDOT%20on%20V2V%20April032017.pdf.

[63] The Brattle Group, "The Economic Costs and Benefits of a Federal Mandate that All Light Vehicles Employ 5.9 GHz DSRC Technology," (May 2, 2016), http://files.brattle.com/system/publications/pdfs/000/005/284/original/brattle_costs_benefits_of_v2v_mandate_may_2_2016.pdf; Government Accountability Office, "Vehicle-to-Infrastructure Technologies Expected to Offer Benefits, but Deployment Challenges Exist" (Sep. 2015), https://www.gao.gov/assets/680/672548.pdf.

[64] 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 (Aug. 2014) ("V2V Readiness Report"), at 24.

should counsel caution. The agency's estimate that cumulative benefits will match cumulative costs in 2030 should be viewed skeptically."[65]

DSRC in particular is on life support, at best. As the spectrum in the 5.9 GHz band has lain fallow, technological innovation, including in auto safety, have bypassed DSRC. Commissioner Michael O'Rielly has observed that "DSRC as it is currently in our rules is an outdated technology" compared to what automakers actually want to offer.[66] In recent years auto and high-tech companies have developed alternative wireless "driver assist" safety technologies – including lane departure warnings, lane keeping assist, auto pilot, and sophisticated camera and sensor technology (called LiDAR) – that use entirely different spectrum and operate independently of any future DSRC or C-V2X radio signaling system.

C-V2X, which is still under development, is a particularly good candidate for different and ideally better spectrum. C-V2X technology is not compatible with DSRC services and is in no way tethered to the 5.9 GHz band, as the Commission itself acknowledges.[67] In fact, as the 5GAA coalition of mobile carriers and automotive companies have pointed out, one goal of C-V2X technology is eventual integration with the general purpose 5G mobile networks, which can also extend its functionality with a wide range of commercial and ancillary connected car applications and services.[68] The set of applications that come with C-V2X are being developed for eventual integration with mobile 5G networks and commercial connected car applications

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[65] Brent Skorup, "The Department of Transportation's Proposed Vehicle-to-Vehicle Technology Mandate is Unprecedented and Hasty," Mercatus Center Blog (April 14, 2017), https://www.mercatus.org/publications/department-transportation-v2v-technology-mandate.
[66] FCC February Open Meeting, Press Conference with Commissioners O'Rielly and Carr (Feb. 2019), https://www.youtube.com/watch?v=1dCW8jiM7xc.
[67] 5.9 GHz NPRM at ¶ 5.
[68] *Id.* at ¶ 8, note 25 ("5GAA contends that C-V2X represents a significant advancement in connected vehicle technology and would constitute an important first step toward leveraging 5G to increase road safety and to maximize the myriad other benefits of connected vehicles").

and services. 5GAA maintains, as the Commission notes, that "C-V2X protocol provides an evolutionary path to 5G and subsequent wireless generations that will amplify and expand upon the safety and other driving applications."[69] This would serve the public interest, if it ever happens. Nonetheless, the rapid emergence of C-V2X technology as a "slice" of 5G mobile networks that will rely on hundreds of megahertz of licensed and unlicensed spectrum in other bands suggests that an exclusive allocation at 5.9 GHz is not necessary.

One option for an alternative and potentially better band of spectrum for ITS operations, and C-V2X specifically, is the 4.9 GHz band – an extremely underutilized band already allocated for public safety operations. The Commission noted in its 2018 Further Notice of Proposed Rulemaking on underutilization of the 4.9 GHz band that at most 3.5% of potential licensees use the band: "Although nearly 90,000 public safety entities are eligible under our rules to obtain licenses in the band, there were only 2,442 licenses in use in 2012 and only 3,174 licenses in use nearly six years later in 2018."[70] Active use of the band may be considerably less than even the number of licensees suggest. The Wireless Internet Service Providers Association (WISPA) and Federated Wireless similarly argued the band's 50 megahertz of contiguous spectrum remains seriously underutilized and that use of the 4.9 GHz band has fallen short of its potential.[71]

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[69] *Id.* at ¶ 30.

[70] FCC, Sixth Further Notice of Proposed Rulemaking, WP Docket No. 07-100, at ¶ 1 (March 22, 2018) ("4.9 GHz 6th FNPRM"), https://www.fcc.gov/document/fcc-seeks-expand-use-and-investment-49-ghz-band-0.

[71] Comments of the Wireless Internet Service Providers Association, WP Docket No. 07-100 (July 6, 2018), https://ecfsapi.fcc.gov/file/10706024512062/Comments_on_4_9_GHz_Sixth_FNPRM.pdf. *See also* Comments of Federated Wireless, WP Docket No. 07-100, at 3 (July 6, 2018), https://ecfsapi.fcc.gov/file/10706037937202/Federated%20Wireless%20Comments%20to%204.9%20GHz%206th%20FNPRM.pdf ("Despite years of efforts by the Commission to encourage greater use and investment in the band, a dearth of equipment and lack of widespread use from the public safety community, continues to render the band largely underutilized.").

This proceeding is an opportunity to consider whether another public safety band, particularly one that the Commission concedes "has not lived up to its potential,"[72] could be more intensively used in whole or part for V2X operations. In his 2018 statement marking the adoption of the most recent 4.9 GHz FNPRM, Commissioner O'Rielly lamented that the 4.9 GHz band is "woefully underutilized" and that "it is way past time to take a fresh look at this 50 megahertz of spectrum."[73] He further stated that the 4.9 GHz band's gross underutilization for public safety "is not sustainable in an environment in which every megahertz of spectrum, especially below 6 GHz, needs to be fully scrutinized and maximized in quick order."[74]

Because of its light usage, substantial bandwidth (50 megahertz) and mid-band propagation characteristics, OTI and PK urge the Commission to study the 4.9 GHz public safety band as a more appropriate alternative for V2X safety communications in particular. The band plan seems to accommodate a consolidation of incumbent public use. The 4.9 GHz band is divided into ten one-megahertz channels and eight five-megahertz channels, and the Commission rules limit channel aggregation bandwidth to 20 megahertz.[75] In contrast to proposals that limit ITS to the 5.9 GHz band, the consideration of 4.9 GHz (or other bands) would give the Commission additional options to optimize the overall public interest outcome with respect to both auto safety and wireless broadband connectivity. For example, the Commission might authorize the DSRC basic safety messaging channel to operate in 5.905- 5.915 GHz (Channel 184) and authorize new C-V2X operations in the lightly-used 4.9 GHz band. As the NPRM proposes, C-V2X systems in 4.9 GHz might initially be limited to the 20 megahertz that the

[72] *4.9 GHz 6th FNPRM* at ¶ 1.
[73] Statement of Commissioner Michael O'Rielly, Further Notice of Proposed Rulemaking, *Amendment of Part 90 of the Commission's Rules*, WP Docket No. 07-100 (March 22, 2018) ("4.9 GHz FNPRM), available at https://www.fcc.gov/document/fcc-seeks-expand-use-and-investment-49-ghz-band-0.
[74] *Ibid.*
[75] *4.9 GHz FNPRM* at ¶ 8.

5GAA has stated they need for critical safety communications. And once C-V2X safety signaling is actually deployed and viable on its requested 20 megahertz channel, the Commission could decide to expand 5G- interoperable ITS at 4.9 GHz to as much as 50 megahertz, thereby allowing C-V2X to evolve toward its eventual integration with general purpose mobile 5G networks.

V. The Commission Should Consolidate The Pending Petition For Rulemaking, Prohibit Commercial Use By DSRC and C-V2X Licensees, and Adopt Privacy and Cybersecurity Requirements

The auto industry makes a great show of its concern for the safety of life, and accuses those seeking to reclaim unused spectrum of indifference to traffic accidents and fatalities. The truth, however, is far less noble and more prosaic. As noted above, other nations that use DSRC or V2X technologies for public safety and collision avoidance do not require anything close to 75 MHz of spectrum to achieve these aims. The only discernable rationale for more than 30 megahertz is that additional channels can be used to offer in-vehicle advertising, video entertainment, and other high-bandwidth and for-profit services in addition to the public safety and collision avoidance services. When pressed in the past to give up these for-profit services, or rely on Wi-Fi for commercial services, the auto industry answered resoundingly "no."

In 2016, OTI and PK filed a Petition for Rulemaking asking the Commission to prevent DSRC licensees from exploiting free licenses for commercial gain.[76] The Petition did not seek reallocation of the spectrum, but asked the Commission to revoke its previous decision in 2004 to permit licensees to use excess capacity to offer commercial services. In addition, the Petition

[76] *See* Public Notice, "Consumer & Government Affairs Bureau Reference Information Center Petition For Rulemaking Filed," RM-11771 (July 25, 2016). The Petition is attached to this filing.

asked the FCC to require licensees to protect the privacy of drivers whose cars have DSRC installed. Although the critical safety uses have privacy mandates, the non-safety uses of the excess capacity, which drivers cannot control, have no restrictions. Indeed, as one industry representative explained, DSRC privacy worked "like Facebook."[77] Finally, the Petition noted that DSRC and autos generally had significant cybersecurity flaws and urged the FCC to impose cybersecurity requirements.

The auto industry vociferously resisted each of these requests. Note that they did not disavow the intent to offer commercial services or use personal information obtained from drivers. They simply argued that they should continue to be allowed to do so. It is a hoary cliché that when someone says it isn't the money but the principle, it's really the money. Similarly, when the auto industry here says that the need for a full 75 megahertz is not for commercial applications but for public safety – it is really for commercial applications.

The Commission should combine the pending Petition in RM-11771 with this rulemaking. Even if the rulemaking is not formally consolidated, ITS licensees should be restricted to non-commercial, safety-related services and receive no allocation of free licensed spectrum to support commercial uses of the spectrum. As part of re-banding 5.9 GHz, in the event the Commission allocates 10 MHz to DSRC, the Commission should clarify that the 10-MHz "control channel" in the DSRC band plan will be replaced by a 10 MHz non-commercial use DSRC channel. The remaining 20 MHz assigned for Cellular V2X should be conditioned on a requirement that non-commercial collision avoidance and public safety use prioritized over any commercial use. Ideally, however, the Commission would allocate the entire ITS auto safety band (whether or not it remains at 5.9 GHz) for C-V2X as the safer, more efficient technology.

[77] Margaret Harding McGill, "Latest privacy Debate: Crash-avoidance Technology," *Politico* (Jun. 28, 2016).

If the Commission does not reallocate the lower 45 megahertz, it should still prohibit non-commercial use on the entire ITS band. Similarly, the Commission should prohibit any use of personal information collected by DSRC (or C-V2X) licensees. Certainly the Commission should not permit those given exclusive licenses to promote collision avoidance and public safety the ability to exploit the most sensitive geolocation information of consumers to serve up distracting advertisements, or worse, sell that information to stalkers and others.

The same is true for cybersecurity. Automobiles remain highly vulnerable to hacking, and DSRC remains a significant vector for spreading malware from car to car. A 2017 report by SecureSet found significant concerns associated with using DSRC for connected vehicle communications.[78] Nothing indicated that DSRC proponents have taken any steps to address these security concerns. The Commission should not permit DSRC or C-V2X to go forward unless its proponents can demonstrate that DSRC provides reasonable and reliable security against spreading malware among connected vehicles.

[78] Alex Kreilein, "Security Considerations for Connected Vehicles & Dedicated Short-Range Communications," SecureSet (2017) (copy attached).

VI. Conclusion

Our groups strongly support the Commission's proposal reallocate *at least* 45 megahertz of the virtually unused 5.9 GHz band for unlicensed use. This increment of unlicensed spectrum is particularly critical for consumers and the economy to the extent that it creates an additional 80 and the first unencumbered 160 megahertz channel to support the next generation of Wi-Fi technology that will help Americans in all areas of the country to access gigabit-fast and affordable 5G-capable applications and services. The Commission's proposal to reallocate 45 megahertz for unlicensed, creating the first unencumbered 160 megahertz Wi-Fi channel, while designating 30 megahertz exclusively for V2X vehicle safety communications strikes an appropriate balance between adding necessary spectrum for Wi-Fi and protecting auto safety. The Commission should also consider moving V2X services to another band, particularly the 4.9 GHz band, to better harmonize V2X services with 5G networks and to ideally remove the current allocation of ITS as a roadblock to a potential gigabit-fast Wi-Fi superhighway.

Sincerely,

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