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 Infrastructure (U-NII) Devices in the 5 GHz Band	ET Docket No. 13-49

COMMENTS OF NCTA—THE INTERNET & TELEVISION ASSOCIATION REGARDING THE OFFICE OF ENGINEERING AND TECHNOLOGY'S REPORT ON PHASE I TESTING OF PROTOTYPE U-NII-4 DEVICES

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I. INTRODUCTION AND SUMMARY

The Office of Engineering and Technology's (OET) extensive tests of Wi-Fi devices' ability to coexist with Dedicated Short Range Communications (DSRC) operations in the 5.9 GHz band were a success.[1] The test Report further clears the path to resolving this long-running proceeding. The time has come to issue a Further Notice of Proposed Rulemaking (FNPRM) proposing to open the band to unlicensed operations.

The Report comes nearly twenty years after the Federal Communications Commission (FCC or Commission) first designated the 5.9 GHz band for DSRC operations. But DSRC clearly has not met the expectations that underlay the Commission's decision to grant this one technology the extraordinary benefit of exclusive access to spectrum without an auction. Over those same twenty years, demand for Wi-Fi and unlicensed spectrum has skyrocketed, and Wi-Fi

[1] *Office of Engineering and Technology Requests Comment on Phase I Testing of Prototype U-NII-4 Devices*, Public Notice, ET Docket No. 13-49, Attach. A (rel. Oct. 29, 2018) (the "Phase I Public Notice" and attached "Report").

has become a central feature in consumers' lives and in American businesses, supporting important applications from medical telemetry and home security, to critical machine communications and billions of dollars in daily financial transactions. Five years ago, the FCC initiated a proceeding to determine how to fix the underutilized 5.9 GHz band by opening these frequencies to unlicensed broadband operations,[2] and over two years ago it issued a public notice to "refresh the record."[3] All this time, 75 megahertz of valuable spectrum have lain fallow—completely unused almost everywhere in the country. Opening the band to Wi-Fi will finally put this spectrum to work.

As the *Phase I Public Notice* recognizes, "there have been a number of developments" even since testing began in 2016.[4] Consumer demand for Wi-Fi has continued to expand, creating an impending spectrum crunch, while DSRC has not deployed as the Commission expected when it established the rules for this band. There has also been immense investment in the next generation of broadband, including Gigabit Wi-Fi and 5G, which will be compromised without near-term access to additional unlicensed spectrum. Accordingly, OET now seeks comments on how these changed circumstances "should impact our evaluation of the test results, our three-phase test plan, or our pending proceeding on unlicensed use in the 5.9 GHz band."[5]

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2 *See Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Notice of Proposed Rulemaking, 28 FCC Rcd. 1769, 1793-94 ¶¶ 78-81, 1798-99 ¶ 97 (2013) ("5.9 GHz NPRM").

3 *The Commission Seeks to Update and Refresh the Record in the "Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band" Proceeding*, Public Notice, 31 FCC Rcd. 6130 (2016) ("Refresh the Record Public Notice").

4 Phase I Public Notice at 2.

5 *Id.*

Given the facts on the ground, NCTA recently requested that the Commission issue an FNPRM or other appropriate vehicle to take a "fresh look" at the 5.9 GHz band and propose to designate all or a substantial portion of the band for unlicensed use.[6] OET's Report further confirms that the Commission can and should issue this FNPRM without further delay.

In particular, the Report demonstrates that Wi-Fi devices can avoid harmful interference with DSRC devices in adjacent channels. Regardless of whether the 5.9 GHz band is ultimately the right home for automotive-safety operations, this key finding supports any effort by the Commission to propose a band segmentation approach that would designate a portion of the band for Wi-Fi and a portion for DSRC or future Intelligent Transportation Systems (ITS) technologies. Should the Commission propose to reserve a portion of the band for safety-of-life DSRC uses, the Report's adjacent-channel interaction results show that the Commission can place Wi-Fi and DSRC on adjacent channels without significantly impacting the efficacy of DSRC systems.

II. THE OET REPORT DEMONSTRATES THAT THERE IS NO TECHNICAL IMPEDIMENT TO THE COMMISSION OPENING THE 5.9 GHZ BAND TO UNLICENSED OPERATIONS.

A. Band Segmentation Would Protect Any Future DSRC Safety-of-Life Operations.

OET specifically tested a "re-channelization" approach under which the upper 30 megahertz of the 5.9 GHz band would be designated for "safety-related DSRC applications," while the lower 45 megahertz would be "re-channelized . . . into two 20-MHz" Wi-Fi channels (with the remaining 5 megahertz joined with the adjacent U-NII-3 spectrum to create an

[6] Letter from Rick Chessen, Chief Legal Officer and Senior Vice President, NCTA, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49 (filed Oct. 16, 2018) ("Fresh Look Letter").

additional 20-megahertz channel).[7] The "re-channelization" testing went on to consider co-channel sharing in the lower part of the band that would require Wi-Fi to protect non-safety DSRC services. Given the current state of affairs discussed below in Section III.B, the FCC should no longer consider such co-channel sharing.[8] At the same time, OET's adjacent-channel results support splitting the band without co-channel sharing in the lower frequencies, which would facilitate next-generation Wi-Fi services by creating the nation's only contiguous, commercially viable 160-megahertz channel.[9] The Report demonstrates that such a band segmentation approach works. OET reached this positive result despite the fact that its tests included overly conservative design decisions and assumptions. In real-world environments, Wi-Fi adjacent-channel operations would be even more protective of DSRC than the already positive test results suggest.

OET's testing concluded that band segmentation would "offer a means for U-NII-4 devices to coexist with DSRC devices."[10] In particular, OET found that "the probability of interference due to adjacent channel operation" of U-NII-4 and DSRC devices was "considerably less" than the already low likelihood of harmful interference from co-channel operation.[11]

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7 Report at 15-16.

8 As part of its overall "re-channelization" assessment, OET tested whether U-NII-4 devices could adapt "the existing IEEE 802.11ac Enhanced Distributed Channel Access (EDCA) protocol . . . to enable priority access to" non-safety-related DSRC message traffic in the lower 45 megahertz of the band. *Id.* at 16. As discussed in greater detail below, NCTA strongly disagrees that *non-safety-related* DSRC traffic should receive any special protection or priority, to the extent that it is permitted to occupy any portion of the 5.9 GHz band.

9 The 5.9 GHz band's location next to the U-NII-3 band makes it the perfect location the creation of a contiguous 160-megahertz channel to support fully functional Wi-Fi 6, the next generation of smart devices at Gigabit speeds.

10 *Id.* at 17.

11 *Id.* at 97.

Indeed, without applying any guard band or specialized filter, the Wi-Fi devices reliably protected DSRC from adjacent-channel interference at received Wi-Fi power levels higher than those likely to occur in the real world.

OET's methodology in reaching its adjacent-channel coexistence results was very conservative in important respects. For example, OET examined the impact on each DSRC device of adjacent-channel Wi-Fi signals transmitted from each Wi-Fi device by measuring DSRC's packet completion rate—the percentage of DSRC packets transmitted that reach their intended destinations. Packet completion rate is, at best, an imperfect proxy for, and bears only an indirect relationship to, the real-world performance of a DSRC system.

DSRC is designed to minimize latency and maximize reliability in a noisy radiofrequency environment. It is specifically designed with the expectation that it will experience packet loss, and includes mechanisms to meet performance expectations under these conditions.[12] While real-world DSRC performance can be affected by extremely low packet completion rates, DSRC is able to tolerate a significant amount of packet loss before its performance meaningfully degrades. For example, although DSRC is designed to transmit Basic Safety Messages at a rate of 10 Hz (*i.e.*, ten messages per second), "safety applications have been successfully tested" at 5 Hz—*i.e.*, a packet error rate of 50 percent.[13] In fact, another study produced for the National Highway Traffic Safety Administration (NHTSA) characterized a DSRC packet error rate

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[12] *See*, *e.g.*, *Federal Motor Vehicle Safety Standards; V2V Communications*, 82 Fed. Reg. 3,854, 3,864 (proposed Jan. 12, 2017) (to be codified at 49 C.F.R. pt. 571); Booz Allen Hamilton, FHWA-JPO-483, *Development of DSRC Device and Communication System Performance Measures – Final Report* 80-83 (2016) (produced for National Highway Traffic Safety Administration) ("Booz Allen Study").

[13] U.S. Department of Transportation, Crash Avoidance Metrics Partnership, *Vehicle-to-Vehicle Safety System and Vehicle Build for Safety Pilot (V2V-SP), Draft Final Report, Volume 2 of 2: Performance Testing* 10 (2014).

"below 20%" as packet-error-rate "free."[14] Put another way, the 10 Hz transmission rate transmits more Basic Safety Messages than necessary in order to minimize the effect of packet loss. The successful reception of all ten out of ten packets transmitted per second, per vehicle, is not a DSRC performance requirement. Therefore, measuring packet loss is not the same as measuring harmful interference. If it were, DSRC licensees would constantly be causing harmful interference to other DSRC licensees under the Commission's paradigm. Accordingly, the packet error rate that actually corresponds to harmful interference to DSRC is likely well above the 10 percent packet error rate that OET tested.

OET was also conservative in designing the scenario to test for DSRC packet loss from Wi-Fi usage in the first, second, and third adjacent channels. OET over-loaded the Wi-Fi channel with 55-75 percent channel occupancy, or duty cycle, simulating many simultaneously operating Wi-Fi devices. By comparison, a United States contribution to the International Telecommunication Union's Working Party 5A concluded that a typical duty cycle for Wi-Fi devices in U-NII-1 is approximately 5 percent.[15] For proposed Wi-Fi deployments in the adjacent 6 GHz band, studies have shown that typical duty cycles would be far lower still, averaging a mere 0.44 percent.[16]

OET also measured the impact of those extremely high usage rates on DSRC signals received at a very low -90 dBm, a worst-case power level one would expect to see at the extreme

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[14] Booz Allen Study at 52.

[15] *See Working Document Toward a Preliminary Draft New Report ITU-R M.[RLAN REQ-PAR]*, Document 5A/893-E, at 13 tbl. 6 (Oct. 23, 2018).

[16] RKF Engineering Services, *Frequency Sharing for Radio Local Area Networks in the 6 GHz Band* 15 (Jan. 2018), as attached to Letter from Paul Margie, Counsel, Apple Inc., Broadcom Corporation, Facebook, Inc., Hewlett Packard Enterprise, and Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-183 (filed Jan. 25, 2018).

edge of the DSRC device's expected coverage area. In fact, according to research published by NHTSA, DSRC power levels of -90 dBm occur less than 0.5 percent of the time on local roads. 99.5 percent of the time DSRC received levels are higher, further decreasing the likelihood of interference from adjacent-channel Wi-Fi.[17] Thus, OET tested the effect of extremely intense Wi-Fi usage on the most vulnerable DSRC signals ever likely to be received by a real-world DSRC device—a very conservative and unlikely scenario, by any measure. Yet even under this over-conservative test protocol, OET's results demonstrate that Wi-Fi devices can protect DSRC devices from harmful interference at the first, second, and third adjacent channel, even with no guard band and with no specialized emission filter in place.

In analyzing these results, it is important to recognize that OET's adjacent-channel-interaction charts show Wi-Fi power levels as they would be *received* at the DSRC device, not the power levels as they would be *transmitted* by the Wi-Fi device. Although these power levels are lower than the transmitted-power level permitted by the FCC's rules for U-NII operations in other parts of the 5 GHz band, the test set up is appropriate because it uses received Wi-Fi power levels rather than transmit power levels. That is because OET's tests did not transmit Wi-Fi signals over the air, but instead simulated reception of over-the-air signals by connecting a Wi-Fi device with a DSRC device using a cable. This method allows more accurate measurement, but it removes real-world signal loss, such as free-space loss. To account for this, OET appropriately attenuated the Wi-Fi signals to received-power levels, rather than inappropriately using the

[17] *See* Letter from Paul Margie, Counsel to NCTA, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49, attachment at slide 10 (filed June 28, 2017). The -90 dBm received power applies to the devices designated "DSRC 1" and "DSRC 2" in the Report. OET tested "DSRC 3" with a received power level of -86 dBm, which is not materially different in this context and still represents the edge of DSRC reception. *See id.*

higher transmitted-power levels at which Wi-Fi devices can operate in the U-NII bands. This aspect of OET's testing is important because, in the real world, received Wi-Fi power levels are typically attenuated by more than 60 dB as they propagate from Wi-Fi transmitters to a receiver mounted on a car on the road.[18]

Because the received signal strengths of both Wi-Fi and DSRC have been measured through drive testing, it is possible to convert OET's results into probabilities. The probability of reduction in DSRC packet completion rate below a specified level is a combination of the probabilities of 1) a DSRC signal level of -90 dBm or less for DSRC 1 and DSRC 2, or -86 dBm for DSRC 3, as provided in research published by NHTSA, and 2) a received Wi-Fi signal level greater than or equal to the value measured by OET for a given packet completion rate, as in CableLabs' operator device data from live outdoor Wi-Fi networks submitted to the Commission on June 28, 2017.[19] For even a very strict packet completion rate of 90 percent in the first-adjacent channel, OET's results make clear that this outcome is highly improbable, as illustrated below:

[18] *See id*. at slides 5, 9.

[19] *See id.* at slides 9, 10.

Probability of Packet Completion Rate ≤ 90 Percent[20]

	Cisco (60 Percent Duty Cycle)	Qualcomm (75 Percent Duty Cycle)	Broadcom (75 Percent Duty Cycle)
DSRC 1	0.03%	0.003%	0.009%
DSRC 2	0.009%	0.02%	0.04%
DSRC 3	0.04%	0.02%	0.07%

As noted above, however, DSRC has been successfully tested with a far lower packet completion rate of 50 percent. Predictably, OET's test results, combined with real-world measurement of DSRC and Wi-Fi received signal levels, suggest that the odds of Wi-Fi causing DSRC packet completion rates to drop below this 50 percent threshold are even more remote:

Probability of Packet Completion Rate ≤ 50 Percent

	Cisco (60 Percent Duty Cycle)	Qualcomm (75 Percent Duty Cycle)	Broadcom (75 Percent Duty Cycle)
DSRC 1	0.01%	0.001%	0.004%
DSRC 2	0.005%	0.009%	0.02%
DSRC 3	0.03%	0.01%	0.04%

[20] Wi-Fi signal strength values are approximate and were derived from the apparent 90 percent and 50 percent packet completion rate intercepts of the curves depicted in Report figures 11 (90%: -59 dBm; 50%: -56 dBm), 15 (90%: -50 dBm; 50%: -46 dBm), 18 (90%: -54 dBm; 50%: -51 dBm), 20 (90%: -54 dBm; 50%: -52 dBm), 26 (90%: -58 dBm; 50%: -54 dBm), 30 (90%: -62 dBm; 50%: -57 dBm), 38 (90%: -52 dBm; 50%: -51 dBm), 41 (90%: -50 dBm; 50%: -48 dBm), and 44 (90%: -54 dBm, 50%: -52 dBm). The Report also considered various Wi-Fi duty cycles greater than and less than the values in these figures. While all of these values reflect extremely high traffic levels—more similar to the total traffic in an environment of extremely high Wi-Fi usage—these values were selected to facilitate comparison.

Notably, the DSRC devices that OET tested exhibited significant variability in their susceptibility to adjacent-channel interference. Nonetheless, even for the worst-case result for the worst-performing DSRC device—DSRC device #3, receiving a DSRC signal at -86 dBm, with an adjacent-channel Broadcom device transmitting with an unrealistically high duty cycle of 75 percent[21]—the impact of adjacent-channel Wi-Fi would not be perceptible in the real world, with only a 0.07 percent chance of a material impact on DSRC packet completion rate.

These measurements confirm the results of a separate CableLabs study, published in TPRC 46: The 46th Research Conference on Communication, Information and Internet Policy, which used a detailed simulation of traffic behavior and radio propagation between vehicles along roadways. The study found that actual DSRC reliability was not affected by adjacent-channel Wi-Fi, regardless of adjacent-channel Wi-Fi utilization rates.[22] Moreover, the CableLabs study also included laboratory testing to validate its simulation model and found that the simulation overestimated the likelihood of harmful interference in every case.[23]

OET's results confirm that Wi-Fi devices can safely operate on the first adjacent channel to DSRC operations, should that be necessary. NCTA suggests that the Commission proceed with an FNPRM that proposes to re-designate the full band for unlicensed operations—but if the Commission decides to also seek comment on segmenting the band into an unlicensed section and a safety-of-life ITS section, the Report lays the foundation for doing so.

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21 *See* Report at fig. 44.

22 Yimin Pang et al., *Sophisticated Spectrum Sharing Analysis: The Case of the 5.9 GHz Band* 15-16 (2018), *available at* https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3140690.

23 *Id*. at 12-13.

B. Co-Channel Sharing Is Unnecessary and Undesirable, but the OET Report Nonetheless Shows that Wi-Fi Devices Can Share Channels Without Causing Harmful Interference.

Notwithstanding the technical ability of Wi-Fi devices to share spectrum, any co-channel-sharing scheme between Wi-Fi and DSRC is unnecessary and likely to undermine robust deployment of both technologies if implemented. While co-channel operation of Wi-Fi and DSRC devices was considered earlier in this proceeding, this approach introduces far more complexity and cost—and requires a heavier regulatory hand—than re-designation or band segmentation. Co-channel sharing would drive investment away from the band, much as it has in the U-NII-2 bands that Wi-Fi shares with government radar, and it has little or no support among the companies that would deploy Wi-Fi and other unlicensed services in a U-NII-4 band. That convoluted approach is unnecessary because, even if DSRC or other ITS technologies develop in the future, band segmentation would provide the dedicated spectrum needed to support safety-of-life DSRC communications while allowing non-safety transportation and broadband applications to operate as unlicensed devices and equally share the lower part of the band. To the extent any space in the 5.9 GHz band should be reserved for future DSRC or other ITS use, the interests of both unlicensed uses and automotive safety are best served by allocating well-defined and separate band segments to each.

Although the conversation has largely moved beyond co-channel sharing between Wi-Fi and DSRC, OET's testing nevertheless offers important results in confirming that Wi-Fi devices can safely and effectively share channels with DSRC even in co-channel-sharing scenarios. In testing the detect-and-vacate approach, OET demonstrated that U-NII-4 devices could operate throughout the 5.9 GHz band, but they would "be required to cease transmission upon detection of DSRC activity in *any* of the DSRC channels (i.e., the entire [5.9 GHz] band and the upper

25 MHz of the existing U-NII-3 band)."[24] This is an extreme and inefficient approach that requires all Wi-Fi devices that detect even a single, very faint DSRC transmission on a single DSRC channel to vacate the entire 75-megahertz-wide U-NII-4 band, plus part of the workhorse U-NII-3 band where hundreds of millions of Wi-Fi devices operate today. What's more, because Wi-Fi 6 uses 160-megahertz channels, this proposal would force consumers to stop all operations across *both* the U-NII-3 and U-NII-4 bands when using Wi-Fi 6 if their device detects a single DSRC transmission on a single channel. Facing such a scenario, operators will simply avoid using the U-NII-4 band, thereby defeating the Commission's goal of achieving more efficient utilization of spectrum.[25]

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[24] Report at 14 (emphasis added).

[25] OET also tested a variant of the re-channelization approach under which the FCC would reserve 30 megahertz for exclusive DSRC safety uses, and permit U-NII-4 devices in the lower 45 megahertz of the band with a requirement that they detect *non-safety-related* DSRC traffic in these lower channels and give it "priority access" (without vacating the band entirely). *Id.* at 16; *see also*, *e.g.*, *id.* at 33, 35. Just as with the "detect and vacate" testing, the U-NII-4 devices OET tested performed strongly in this "prioritized-sharing" co-channel approach. But even if the Commission determines that it should provide a designated set of frequencies for automotive safety-of-life applications because of the importance of these operations, it should not grant non-safety applications preferential access to spectrum over competing technologies without an auction. Rather, non-safety automotive use cases that wish to access the spectrum should be permitted to do so on an unlicensed basis, co-equal with other unlicensed users, including Wi-Fi. The Commission has worked hard to avoid picking technology winners and losers, allowing consumers in the marketplace to determine the best technologies and frequency uses. Non-safety automotive and transportation applications—in-car electronic commerce, entertainment programming, maps, toll taking, and digital signs—operate today using other spectrum bands and use multiple competing technologies. There is no reason to grant non-safety DSRC operations preference over every other technology—at least not without requiring them to acquire a license at auction to have the protections granted by a license.

III. THE COMMISSION NEED NOT WAIT FOR FUTURE TESTING TO PROCEED WITH A FURTHER NOTICE OF PROPOSED RULEMAKING TAKING A FRESH LOOK AT THE 5.9 GHZ BAND.

OET requested comment on how developments since the "three-phase test plan was announced in 2016" should impact the future of the test plan and the Commission's "pending proceeding on unlicensed use in the 5.9 GHz band."[26] The Commission is right to reassess the test plan and how it fits into this proceeding, because critical facts have changed. In the years since the Commission composed its test plan, the demand for unlicensed spectrum has grown tremendously. The FCC has proposed to open the adjacent 6 GHz band to unlicensed operations (provided incumbent spectrum users can be adequately protected), meaning that the allocation for vehicle-to-vehicle communications in the 5.9 GHz band could be sandwiched between two unlicensed bands. At the same time, there is little if any support for the co-channel-sharing proposals among the companies that would deploy Wi-Fi in the U-NII-4 band.[27] New automotive technologies—like lidar, radar, and cameras—that do not use the 5.9 GHz band have emerged and are bringing real safety benefits across the country. And now the automotive industry is shifting away from DSRC and is beginning to consider LTE-based vehicle-communication technologies that could work in many different bands. What has not changed is that DSRC remains a failed technology—stuck in the pilot-project stage, even after twenty years of government subsidy.

The Commission should therefore determine that 1) developments in the years since it composed the test plan render further testing of co-channel-sharing proposals unnecessary, or at

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[26] Phase I Public Notice at 2.

[27] *See*, *e.g.*, Letter from H. Nwana, Executive Director, Dynamic Spectrum Alliance, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49 (filed July 7, 2016); Comments of Wireless Internet Service Providers Association, ET Docket No. 13-49 (filed July 7, 2016).

a minimum require the FCC and Department of Transportation (DOT) to develop a new plan for Phases 2 and 3 that focuses on adjacent-channel interactions; and 2) it can move forward with an FNPRM proposing re-designation of the band for unlicensed services or band segmentation without further testing of co-channel sharing.

A. Further Co-Channel Tests Would Be a Waste of Government Resources.

As OET, Commissioner O'Rielly, and Commissioner Rosenworcel have recognized, the landscape has changed substantially since stakeholders identified co-channel DSRC/Wi-Fi coexistence as a potential path forward. It is now clear that co-channel sharing between Wi-Fi and safety-critical, latency-sensitive DSRC operations is not desirable or necessary. As Commissioner O'Rielly recently explained, "the reality is that the entire debate has gravitated away from the type of sharing regime envisioned in the testing."[28]

While there is continued support for re-designating the 5.9 GHz band for unlicensed operations or achieving sharing through band segmentation, there is little or no support today among companies hoping to deploy Wi-Fi for co-channel sharing between unlicensed services and safety-of-life services.[29] At the same time, DOT has appropriately shifted its focus away from a sweeping command-and-control proposal to mandate DSRC in all new light vehicles, and toward a technology-neutral policy that would allow the market to determine outcomes.[30] The

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[28] Statement of Commissioner Michael O'Rielly on 5.9 GHz Phase I Testing Data (Oct. 29, 2018), https://docs.fcc.gov/public/attachments/DOC-354831A1.pdf ("O'Rielly Phase I Statement"); *see also* Statement of Commissioner Jessica Rosenworcel on Phase 1 Test Report of Prototype U-N-II-4 Devices (Oct. 29, 2018), https://docs.fcc.gov/public/attachments/DOC-354830A1.pdf (while test results are "long overdue," the Commission should "start a rulemaking to take a fresh look at this band and its real possibilities").

[29] *See*, *e.g.*, note 27 *supra* and accompanying text.

[30] U.S. Department of Transportation, *Automated Vehicles 3.0: Preparing for the Future of Transportation* iv, 7 (2018), *available at* https://www.transportation.gov/sites/dot.gov/files/

fact that DOT and many in the automotive industry have begun to examine different safety technologies makes the inefficient detect-and-vacate approach especially unjustifiable.

Consequently, if the Commission were to adopt a detect-and-vacate approach with Wi-Fi and safety-of-life DSRC sharing channels, the largest broadband network providers in the country would not deploy in the 5.9 GHz band, the band would be unable to support the residential, enterprise, and 5G cellular-offload services that the country needs, and the FCC's and DOT's efforts would be wasted. Even co-channel sharing with priority for non-safety-of-life DSRC traffic would likely result in underutilization of the band. This may be the result that some DSRC supporters seek, but the Commission and DOT should recognize that investigating a sharing approach that no one will employ is not a good use of government resources. The Commission should therefore "move past" the idea of a co-channel "sharing regime,"[31] and reassess Phases II and III of the 2016 test plan.

As discussed above, the Report's findings on out-of-band emissions show that harmful interference to adjacent-channel DSRC operations from Wi-Fi is extremely improbable. This is the finding the Commission needs in order to seek comment on band segmentation in an FNPRM, in addition to exploring re-designating the 5.9 GHz band for Wi-Fi while examining new, more suitable homes for automotive communications.

B. The Commission Should Issue a Further Notice of Proposed Rulemaking Now.

Both the automotive and broadband sectors need regulatory certainty about spectrum availability before making deployment plans. Continued uncertainty and delay undermine both

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docs/policyinitiatives/automated-vehicles/320711/preparing-future-transportation-automated-vehicle30.pdf ("Preparing for the Future").

[31] O'Rielly Phase I Statement.

technologies. The Commission should therefore issue a new FNPRM that 1) recognizes the dramatic changes in the 5.9 GHz landscape, 2) proposes re-designation of the band or band segmentation, and 3) takes the option of co-channel sharing between unlicensed and DSRC safety-of-life operations off the table.

1. The 5.9 GHz Landscape Has Changed Dramatically.

DSRC is unlikely ever to be deployed widely in the 5.9 GHz band, as "time and technology advancements elsewhere have undermined previous [DSRC] use cases."[32] Even after nearly two decades of spectrum subsidy and millions of dollars in direct government funding, DSRC is at once both aspirational and outmoded. DSRC will be reliable and effective (if ever) only after "every car and truck is equipped with DSRC" and "the country builds a nationwide network of roadside units at taxpayer expense."[33] That will likely never occur. Proposals to mandate DSRC have been removed from active consideration, and DOT has instead correctly changed course and committed to a technology-neutral approach.[34] Even if DSRC or another ITS technology begins to deploy, it will take decades for any V2V technology to reach enough vehicles to be reliable. And the technology has not even reached the starting line for such deployment. DSRC projects are still in the pilot stage—"just a few thousand vehicles have DSRC on board out of the more than 260 million cars on the road."[35]

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[32] Statement of Commissioner Michael O'Rielly on NCTA 5.9 GHz Letter (Oct. 16, 2018), https://docs.fcc.gov/public/attachments/DOC-354589A1.pdf.

[33] Letter from Ryan Hagemann, Director of Technology Policy, The Niskanen Center, to Elaine L. Chao, Secretary, U.S. Department of Transportation and Ajit Pai, Chairman, FCC, ET Docket No. 13-49, at 2 (filed June 12, 2017) ("Niskanen Letter").

[34] Preparing for the Future at iv, 7.

[35] Remarks of Commissioner Jessica Rosenworcel, Silicon Flatirons Conference, Boulder, Colo., at 3 (Sept. 6, 2018), https://docs.fcc.gov/public/attachments/DOC-353982A1.pdf ("Rosenworcel Boulder Remarks").

Meanwhile, other technologies that do not use the 5.9 GHz band have largely taken the place of V2V and V2I systems, such as lidar, radar, and cameras. And emerging technologies like C-V2X, which could use LTE/5G bands, are in their infancy. Unsurprisingly, automakers, chipmakers, carriers, and policy experts have spoken out against continuing or adopting measures that favor DSRC.[36] The bottom line is that while the Commission's "bet on DSRC" twenty years ago may have made sense at the time, it "didn't pan out the way we thought it would."[37] The time is right to revisit that bet with a wide-ranging FNPRM.

While DSRC has stalled, the spectrum environment around the 5.9 GHz band has changed rapidly. The adjacent U-NII-3 band has experienced explosive growth and is now the most-used Wi-Fi band in the country. The 5.9 GHz band's location next to the U-NII-3 band makes it the perfect location for freeing additional unlicensed spectrum for Wi-Fi, including the creation of a contiguous 160-megahertz channel to support the next generation of smart devices at Gigabit speeds. The location of the 5.9 GHz band next to the workhorse U-NII-3 band also means that some existing Wi-Fi equipment could access the band with simple software or firmware changes, saving years of delay compared to any other band. Moreover, as the Commission considers authorizing unlicensed use of the upper-adjacent 5925-7125 MHz (6 GHz) band, the 5.9 GHz band could become a critical link between existing and future unlicensed spectrum uses, provided that widespread incumbent 6 GHz operations can be protected.[38]

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[36] *See*, *e.g.*, Niskanen Letter at 2-3.

[37] Rosenworcel Boulder Remarks at 3.

[38] *See* Statement of Commissioner Michael O'Rielly, ET Docket No. 18-295, GN Docket No. 17-183 (Oct. 23, 2018) ("Now, if we could only open up the 5.9 GHz Band for unlicensed use as well, for which I believe there are four solid votes in favor, we would really be on to something special, as it's the missing link between the 5 GHz and 6 GHz

In contrast to DSRC's long-running but unfulfilled promises, the need for new unlicensed spectrum is a technological and economic reality today. Recent studies have demonstrated that Wi-Fi needs more spectrum to support economic growth and innovation, not only for residential broadband services, but also to meet business and industrial needs across sectors. A 2016 Qualcomm study concluded that "regulators should plan for around 1280 MHz of unlicensed spectrum centered around the 5 GHz band for use by unlicensed technologies,"[39] while a 2017 study by Quotient Associates for the Wi-Fi Alliance similarly concluded that between 788 megahertz and 1.6 gigahertz of new mid-band spectrum will be needed by 2025 to satisfy demand just for Wi-Fi.[40] This need will only be more acute when one considers the importance of unlicensed spectrum resources to supporting the deployment of 5G technologies. As chipmakers and equipment vendors have stated, unlicensed spectrum will be critical to delivering on the capacity, speed, and low-latency promises of 5G technology.[41] Expanding unlicensed

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bands."); Statement of Commissioner Jessica Rosenworcel, ET Docket No. 18-295, GN Docket No. 17-183 (Oct. 23, 2018) ("Wi-Fi is a powerful force in the economy. . . . It's time for more of it—and the 6 GHz band and 5.9 GHz band are the right place to start."); *see also*, *e.g.*, Letter from Claude Aiken, President & CEO, Wireless Internet Services Providers Association, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 13-49, at 1 (filed Oct. 26, 2018).

[39] Rolf de Vegt et al., Qualcomm Techs., Inc., *A Quantification of 5 GHz Unlicensed Band Spectrum Needs* 5 (2016).

[40] Steve Methley & William Webb, Quotient Assocs. Ltd., *Wi-Fi Spectrum Needs Study* 26, 28 (2017).

[41] *See*, *e.g.*, Reply Comments of Apple, Inc., Broadcom Limited, Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, MediaTek Inc., Microsoft Corporation, and Qualcomm Incorporated, GN Docket No. 17-183, at 7-8 (filed Nov. 15, 2017); Letter from Alex Roytblat, Senior Director of Regulatory Affairs, Wi-Fi Alliance, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 17-183 et al. (filed Oct. 16, 2017); *see also* Comments of Open Technology Institute at New America, Public Knowledge, Engine, Common Cause, and Next Century Cities, ET Docket No. 13-49 (July 7, 2016).

uses into the 5.9 GHz band and creating the United States' first 160-megahertz-wide channel unconstrained by Dynamic Frequency Selection limitations is an important first step.

2. The FNPRM Should Recognize these Changes and Propose to Designate All or a Portion of the Band for Unlicensed Operations.

Even if DSRC or another V2X technology may someday overcome the odds and achieve commercial acceptance, continuing to delay this proceeding is still unjustified. Inaction and uncertainty in the face of today's Wi-Fi spectrum challenge would have serious economic consequences for the country. The time to act is now.

OET's Report is only the most recent addition to the robust record that the Commission has developed in this proceeding over five years. The Commission has already discussed designating at least a portion of the 5.9 GHz band for unlicensed uses, and it has already refreshed the record once.[42] Given the changes discussed above, the Commission should now issue an FNPRM proposing to designate some or all of the band for unlicensed uses and seeking comment on other, more suitable spectrum for technology-neutral automotive communications functions. Even if the Commission proposes to designate only a portion of the band for unlicensed uses and to reserve frequencies for future safety-of-life automotive services, an FNPRM will ensure that all parties have the opportunity to update the FCC on recent developments, such as the emerging possibility that C-V2X operations will make DSRC obsolete.

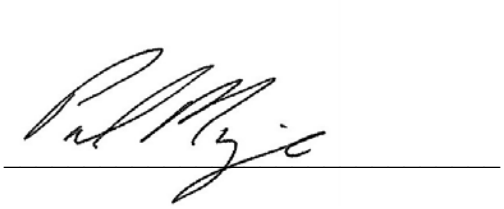
IV. CONCLUSION

OET's Report demonstrates that there is no technical impediment to a Commission decision to open the 5.9 GHz band to unlicensed technologies, either by re-designating the band

[42] *See* 5.9 GHz NPRM; Refresh the Record Public Notice.

for unlicensed operations or through a band-segmentation approach. NCTA therefore requests that the Commission issue a "fresh look" FNPRM without delay and affirm that the Commission is no longer considering co-channel-sharing approaches.

Respectfully submitted,



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