National Transportation Safety Board
Washington, DC 20594

Office of the Chairman

March 4, 2020

ET Docket
Federal Communications Commission
Office of the Secretary
Commission's Secretary
445 12th Street SW
Room CY–A257
Washington, DC 20554

Attention: ET Docket No. 19-138; FCC 19-129; FRS 16447

Dear Sir or Madam:

The National Transportation Safety Board (NTSB) has reviewed the Federal Communications Commission (FCC) notice of proposed rulemaking (NPRM) titled "Use of the 5.850–5.925 GHz Band," published at 85 *Federal Register* 6841 on February 6, 2020. The FCC proposes to limit Intelligent Transportation System (ITS) operations to the upper 30-megahertz (MHz) part of the band while opening the remaining 45 MHz to unlicensed devices—mainly Wi-Fi devices. The FCC also proposes to divide the remaining 30-MHz spectrum between cellular vehicle-to-everything (C-V2X) devices (occupying 20 MHz of the spectrum) and C-V2X or dedicated short-range communication (DSRC) applications (occupying 10 MHz of the spectrum). The NTSB believes there will be negative safety consequences from releasing a large part of the spectrum to mainly Wi-Fi devices and limiting safety operations to a smaller part of the spectrum. The NTSB asserts that these actions by the FCC will likely compromise the advancement of automated vehicle technologies and further delay their development. The NTSB therefore offers the following comments.

Background and NTSB History of Relevant Recommendations

The NTSB has a long history of advocating for collision avoidance technologies. Since 1995, we have made dozens of recommendations pertaining to such technologies that rely on either vehicle-based sensors or on vehicle-to-vehicle (V2V) or vehicle-to-infrastructure (V2I) communication. In 1995, after investigating a multivehicle crash in Menifee, Arkansas, we issued Safety Recommendation H-95-46 to the FCC:[1]

> Expedite rulemaking action on the allocation of frequencies that would enhance the development possibilities of collision warning systems.

[1] *Multiple Vehicle Collision With Fire During Fog Near Milepost 118 on Interstate 40, Menifee, Arkansas, January 9, 1995, and Special Investigation of Collision Warning Technology*, Highway Accident Report NTSB/HAR-95/03 (Washington, DC: NTSB).

After the FCC allocated 75 MHz on a 5.9-gigahertz (GHz) radio spectrum for ITS applications in 1999, we classified Safety Recommendation H-95-46 "Closed—Acceptable Action."[2] We expressed full support for the FCC's action, inasmuch as it allowed continued development of connected vehicle (CV) technology in support of collision avoidance systems, with the potential for increasing transportation safety.

At the time the radio spectrum was allocated for transportation safety applications, DSRC was the only available short-range communication method (and had the only standard).[3] Therefore, much of the research and other activities undertaken since then by federal agencies such as the National Highway Traffic Safety Administration (NHTSA) and the US Department of Transportation (DOT) have focused on DSRC. The last two decades have seen considerable federal-, state-, and industry-sponsored DSRC research and field testing, identifying specific CV applications and predicting the technology's benefits. The findings are clear—CV technology can save lives and greatly improve transportation safety. For example, in 2011, NHTSA published an analysis showing that DSRC-based CV technology could address about 80 percent of all crashes involving nonimpaired drivers.[4]

In light of the maturing CV technology and its increased application, and as a result of its own investigations, the NTSB has made specific recommendations regarding the technology.[5] After investigating a 2012 crash in Chesterfield, New Jersey, in which a school bus traveled into the path of a refuse truck, we determined that had CV technology been available on both vehicles, the school bus driver would have been made aware of the approaching truck and likely avoided the crash.[6] We issued Safety Recommendations H-13-30 and -31 to NHTSA to develop minimum performance standards for CV technology for all highway vehicles and require that the technology be installed on all new vehicles.[7]

Four years later, NHTSA initiated steps to further expand CV technology. As a result of the continued advancements, clear benefits, and demonstrated applications of CV technology, in 2017 NHTSA issued an NPRM to mandate CV technology for new light-duty vehicles and to standardize the communication requirements of V2V messages based on the DSRC standard. In its response to the NPRM, we supported the mandate, stating that a government requirement is essential for

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[2] In 1998, Congress passed and the president signed into law the Transportation Equity Act for the 21st Century, which directed the FCC to consider the spectrum needs of ITSs. In October 1999, the FCC allocated the 5.9 GHz band for DSRC-based ITS applications and adopted technical rules for DSRC operations ("Dedicated Short Range Communications (DSRC) Service," FCC website, accessed February 12, 2020).

[3] The FCC specified a single technological standard for DSRC. The standard was developed under an ASTM standard-setting procedure (ASTM E2213-03 or ASTM-DSRC).

[4] *Fact Sheet: Improving Safety and Mobility Through Connected Vehicle Technology* (Washington, DC: DOT, 2011).

[5] See (a) *Vehicle- and Infrastructure-Based Technology for the Prevention of Rear-End Collisions*, Special Investigation Report NTSB/SIR-01/01 (Washington, DC: NTSB); and (b) *Truck-Tractor Semitrailer Rear-End Collision into Passenger Vehicles on Interstate 44 Near Miami, Oklahoma, June 26, 2009,* Highway Accident Report NTSB/HAR-10/02 (Washington, DC: NTSB).

[6] *School Bus and Truck Collision at Intersection Near Chesterfield, New Jersey, February 16, 2012*, Highway Accident Report NTSB/HAR-13/01 (Washington, DC: NTSB).

[7] The current status of Safety Recommendations H-13-30 and -31 is "Open—Unacceptable Response."

market saturation, but we also criticized the proposed rulemaking for excluding heavy vehicles.[8] We argued that widespread deployment in the entire highway vehicle fleet (including heavy vehicles) is necessary to realize the full safety benefits of CV technology. Since NHTSA's 2017 NPRM, we have continued to advocate for the necessity of *connecting* all roadway users, including motorcycles, pedestrians, and bicyclists through our reports and safety recommendations. [9]

CV Technology Adoption and Risk of Sharing 75-MHz Band

Although CV technology has advanced and its benefits continue to be demonstrated, CV adoption in vehicles has been slow. The actions of the three primary stakeholders (NHTSA/DOT, FCC, and industry) provide some explanation for the delay.

NHTSA/DOT Actions. While the 2017 NPRM for mandating V2V technology appeared to spearhead application of the technology, NHTSA has halted progress on the rulemaking, partly because of industry comments. At the end of 2018, the DOT issued a request for comments about whether DSRC as a primary method of CV communication was still appropriate, considering recent technological developments—cellular 4G and upcoming 5G communication. The DOT also inquired about the interoperability of alternative cellular technologies with DSRC and how to best support emerging automated vehicle applications. In response, we restated our position about the benefits and necessity of CV technologies but refrained from commenting on the technical distinctions between different communication technologies.[10] However, we stated that ". . . DOT should not put existing lifesaving technologies, such as DSRC, on hold while waiting for the next emerging technology to arrive . . ."

FCC Actions. In 2013, the FCC issued an initial spectrum-sharing NPRM, in which the commission sought comments about sharing the 75-MHz band (allocated for DSRC) with unlicensed devices. In response, we stated that the security and success of communication for transportation safety must first be ensured before spectrum sharing can occur. We were concerned that interference from unlicensed devices could affect the integrity of transportation safety communications. After reviewing comments on the NPRM, the FCC identified interference from unlicensed devices as a risk factor. The FCC, however, did not resolve questions about the sharing of the spectrum by unlicensed operators and DSRC.

Instead, in the current NPRM, the FCC proposes to reduce the allocated spectrum for transportation safety communication by 60 percent. Considering that the NTSB and other stakeholders voiced concerns about interference, and that even the FCC previously identified

[8] NTSB letter to Rules Docket No. NHTSA-2016-0126, March 29, 2017, in response to NPRM "Federal Motor Vehicle Safety Standards (FMVSS): V2V Communications," published at 82 *Federal Register* 3854, January 12, 2017.

[9] (a) See *Select Risk Factors Associated with Causes of Motorcycle Crashes*, Safety Report NTSB/SR-18/01 (Washington, DC: NTSB); *Pedestrian Safety,* Special Investigation Report NTSB/SIR-18/03 (Washington, DC: NTSB); and *Bicyclist Safety on US Roadways: Crash Risks and Countermeasures*, Safety Research Report NTSB/SS-19/01 (Washington, DC: NTSB). (b) Safety Recommendations H-18-30, -31, and -37 were issued as a result of our report on the causes of motorcycle crashes and are currently classified "Open—Acceptable Response." Safety Recommendation H-18-43 was issued as a result of our report on pedestrian safety and is currently classified "Open—Acceptable Response." Safety Recommendations H-19-35, -37, and -43 were issued as a result of our report on bicycle safety and are currently classified "Open—Await Response."

[10] NTSB letter to Rules Docket No. DOT-OST-2018-0210, March 11, 2019, in response to Notice of Request for Comment, "V2X Communications," published at 83 *Federal Register* 246, December 26, 2018.

interference as a risk element, it is prudent to ask whether the FCC is no longer concerned about possible interference from unlicensed devices. The question is particularly apt, considering the DOT's recent tests examining the effects of interference from Wi-Fi devices on DSRC-based communication.[11] The results showed not only that interference exists, but that the extent of Wi-Fi intrusion into the remaining 30-MHz radio spectrum will render unusable the part remaining for vehicle safety. The tests documented interference at up to 500 meters (1,640 feet) from a Wi-Fi antenna, with a typical interference distance within 200 to 300 meters (656 to 984 feet). While the extent of the interference varied depending on the spectral occupancy of the Wi-Fi device (the closer it was to the FCC-proposed 10-MHz band for DSCR-communication, the greater the interference), the results showed that even at the most distant range, unfiltered signals from Wi-Fi devices reduced the integrity of safety-critical DSRC communication.

Industry Actions. Despite decades of research and substantial expected safety benefits, the adoption of CV technology in vehicles has been slow. Recent developments give rise to both optimism and concern. A small number of *connected* vehicles has been traveling on our roads for the last 3 years. Starting with the 2017 model year, General Motors has equipped its Cadillac CTS model vehicles with DSRC-based V2V communication. In 2018, the manufacturer announced plans to expand V2X communication in its high-volume models in 2023.[12] In 2018, Toyota announced plans to equip its entire fleet with DSRC devices by 2021; however, the manufacturer recently announced that it is pausing its deployment plans because of safety concerns about the dedicated spectrum, the lack of significant deployment plans from other manufacturers, and the regulatory uncertainty about the dedicated spectrum resulting from the FCC's actions.[13] In our communication with vehicle manufacturers, the stalled V2V mandate is frequently mentioned as one of the reasons the industry has been reluctant to deploy the technology fleetwide.

CV Technology and Vehicle Automation

In 2016, the NTSB investigated the first fatal crash involving a vehicle with automated (partial) driving capabilities, in Williston, Florida.[14] Our investigation determined that this crash scenario—a truck-tractor combination vehicle crossing the road in front of a partially automated vehicle—was beyond the capabilities of the vehicle's automation and collision avoidance systems. But such a scenario—vehicles meeting at an intersection (controlled or not)—also represents a basic safety application of V2V technology. V2V technology provides safety information beyond that of vehicle-based sensors, especially for occluded vehicles and objects or vehicles traveling on perpendicular paths. As a result of the Williston investigation, the NTSB determined that V2V

[11] *DSRC and Wi-Fi Baseline Cross-channel Interference Test and Measurement Report*, Vehicle-to-Vehicle-to-Vehicle Communications Research Project (V2V-CR), Pre-Final version (Washington, DC: NHTSA, December 2019).

[12] General Motors described its 2017 and 2018 decisions to deploy V2V in the US market in a letter to Secretary Marlene H. Dortch of the FCC (re: 5GAA Petition for Waiver to Allow Deployment of Cellular Vehicle-to-Everything [C-V2X] Technology in the 5.9 GHz Band; GN Docket No. 18-357; Revision of Part 15 of the Commission's Rules; ET Docket No. 13-49) from Maryann L. Combs, Vice President, Global Vehicle Safety, General Motors (April 18, 2019).

[13] Toyota described its decision in a comment letter to Secretary Marlene H. Dortch of the FCC (ET docket No. 13-49, GN docket No. 18-357) from Hilary M. Cain, Director of Technology and Innovation Policy, Toyota (April 26, 2019). See also "Toyota Puts Connected-Car Tech Plans on Hold, *Car and Driver*, April 29, 2019.

[14] *Collision Between a Car Operating With Automated Vehicle Control Systems and a Tractor-Semitrailer Truck Near Williston, Florida, May 7, 2016*, Highway Accident Report NTSB/HAR-17/02 (Washington, DC: NTSB).

communications would provide a complementary source of information to vehicle-based systems, improve the reliability and accuracy of data, extend the range of threat detection, and detect crash risks that are outside a vehicle-based sensor's field of observation.

Since the Williston crash, the NTSB has investigated other crashes involving vehicles with partial automation in which the vehicle-based systems were unable to detect an obvious hazard (a stopped vehicle ahead, a crossing vehicle, a concrete barrier).[15] Our investigation of a fatal pedestrian crash in Tempe, Arizona, involving an automated test vehicle also showed the limits of vehicle-based sensors.[16] In that crash, the developmental system was unable to accurately identify and predict the path of a pedestrian who was crossing a road while walking a bicycle.

Frequently, V2X technologies are discussed as a means to complement vehicle automation because vehicle-based sensors will always have perceptual limitations. Specifically, determining the identity of a road user and its trajectory, for a *connected* vehicle, is simply a matter of receiving a communication. Because the weakness of vehicle-based sensors is a strength of a communication-based system, CV technology represents an optimal complement to vehicle-based collision avoidance and automation systems.

Summary

Testing by the DOT shows that the FCC-proposed bandwidth of 30 MHz for transportation safety applications would make V2X applications functionally infeasible. Decades of research showing the benefits of CV technology, particularly as a complement to vehicle-based sensors, would not be implemented, which could further delay the development of automated vehicle technologies. Although the industry has been slow in adopting CV technology and has not reached a consensus regarding the type of communication technology that should be used (DSRC or cellular), by reducing the available radio spectrum for safety transportation applications to unusable levels, the FCC would hinder future adoption of CV technology for all vehicles.

The NTSB urges the FCC not to allow sharing of the 75-MHz band with unlicensed Wi-Fi devices. Such action would be detrimental to safety and dramatically set back advancements in transportation safety, including automated vehicle technologies.

Sincerely,

[Original Signed]

Robert L. Sumwalt, III
Chairman

cc: sara.peters@dot.gov

[15] See our recent report on a crash in Culver City, California (*Rear-End Collision Between a Car Operating with Advanced Driver Assistance Systems and a Stationary Fire Truck, Culver City, California, January 22, 2018*, Highway Accident Brief NTSB/HAB-19/07); and the public dockets for our current investigations of crashes in Delray Beach, Florida (HWY19FH008), and Mountain View, California (HWY18FH011).

[16] *Collision Between Vehicle Controlled by Devlopmental Automated Driving System and Pedestrian, Tempe, Arizona, March 18, 2018*, Highway Accident Report 19/03 (Washington, DC: NTSB).