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

REPLY COMMENTS OF THE

TOYOTA MOTOR CORPORATION

TOYOTA MOTOR NORTH AMERICA, INC.
601 Thirteenth Street, NW
Suite 910 South
Washington, DC 20005
(202) 463-6831

Kevin S. Ro
Director
Technical & Regulatory Affairs, Safety

Submitted: July 24, 2013

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

REPLY COMMENTS OF THE

TOYOTA MOTOR CORPORATION

Toyota Motor North America, Inc., on behalf of Toyota Motor Corporation (collectively, "Toyota") hereby submits Toyota's reply comments in connection with the above-captioned Notice of Proposed Rulemaking ("Notice").[1]

The record in this proceeding strongly supports the protection of Dedicated Short Range Communications ("DSRC") safety systems from harmful interference. Many parties have joined Toyota in urging the Commission to take a cautious and deliberate approach before considering the implementation of sharing rules in the 5.850-5.925 GHz band ("5.9 GHz band").[2] It should

[1] 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, *Notice of Proposed Rulemaking*, 28 FCC Rcd 1769 (2013) ("Notice").

[2] *See e.g.*, Letter from United States Department of Transportation to Lawrence E. Strickling, Administrator, National Telecommunications and Information Administration, on FCC Notice on U-NII Devices in the 5 GHz Band, Technical Appendix, ET Docket No. 13-49 (May 16, 2013); Letter from National Transportation Safety Board, ET Docket No. 13-49 (May 28, 2013); Comments of Intelligent Transportation Systems Program Advisory Committee, ET Docket No. 13-49 (May 28, 2013); Comments of Wi-Fi Alliance, ET Docket No. 13-49 (May 28, 2013); Comments of IEEE 802, ET Docket No. 13-49 (May 28, 2013); Comments of Motorola Solutions, Inc., ET Docket No. 13-49 (May 28, 2013);

be noted that even proponents of sharing the spectrum acknowledge the importance of 5.9 GHz safety DSRC systems and support additional study and testing to ensure absolutely no harmful interference possible in expanding the U-NII devices in the 5.9 GHz operation,[3] and Toyota reiterates that Congress did not mandate this band be shared – only that it be studied. And given the stakes involved with DSRC safety-of-life systems, which require extremely high availability, low-latency communications, the Commission should build a thorough empirical record that conclusively demonstrates no risk of harmful interference before moving forward with any proposed rules or sharing approach.

More generally, a vocal majority of comments expressed the same concern as Toyota that co-existence between licensed uses of the 5.9 GHz band and unlicensed U-NII devices poses a number of technical complexities and challenges that are not close to being resolved, affirming that the Commission's proposal to open the 5.9 GHz band to unlicensed U-NII devices is premature.[4]

Comments of OmniAir Consortium Inc., ET Docket No. 13-49 (May 28, 2013); Comments of Consumer Electronics Association, ET Docket No. 13-49 (May 28, 2013); Comments of SAE International, ET Docket No. 13-49 (May 28, 2013); Comments of the Alliance of Automobile Manufactures, Inc. and Global Automakers, Inc., ET Docket No. 13-49 (May 28, 2013); Comments of General Motors Company, ET Docket No. 13-49 (May 24, 2013); Comments of Ford Motor Company, ET Docket No. 13-49 (May 28, 2013); Comments of Volkswagen Group of America, ET Docket No. 13-49 (May 28, 2013); Comments of Intelligent Transportation Society of America, ET Docket No. 13-49 (May 28, 2013); Comments of Mercedes-Benz USA, ET Docket No. 13-49 (May 28, 2013); Comments of European Automobile Manufacturers' Association and the CAR-2-CAR Communication Consortium, ET Docket No. 13-49 (May 28, 2013); Comments of Savari Networks, ET Docket No. 13-49 (May 28, 2013); Comments of American Association of State Highway and Transportation Officials, ET Docket No. 13-49 (May 28, 2013); Comments of Intelligent Transportation Society of America, ET Docket No. 13-49 (May 28, 2013).

[3] *See e.g.*, Comments of Cisco Systems, Inc., ET Docket No. 13-49 (May 28, 2013); Comments of Ericsson, ET Docket NO. 13-49 (May 28, 2013); Comments of Telecommunications Industry Association, ET Docket No. 13-49 (May 28, 2013).

[4] *See e.g.*, Comments of SAE International, ET Docket No. 13-49 (May 28, 2013); Comments of Alliance of Automobile Manufacturers and Association of Global Automakers, Inc., ET Docket No. 13-49 (May

Toyota is a member of the Alliance of Automobile Manufacturers ("Alliance") and Association of Global Automakers, Inc. ("Global Automakers"), and endorses their reply comments in this proceeding. Toyota thus supports and incorporates by reference the reply comments of those parties in their entirety, but submits these separate reply comments to address briefly a few points raised by QUALCOMM Incorporated ("QUALCOMM").

RESPONSES TO QUALCOMM COMMENTS

Toyota has reviewed the comments filed by QUALCOMM,[5] and commends QUALCOMM's commitment to facilitate further the deployment of DSRC systems; however, Toyota would like to address several DSRC-related issues that QUALCOMM raises.

a) QUALCOMM's Proposal Raises a Risk of Cross Channel Interference

In its Comments, QUALCOMM proposes to relocate the safety Channel 172 to Channels 182/184, in order "to minimize the impact of spectrum sharing to the current V2V/V2I (vehicle-to-vehicle and vehicle-to-infrastructure) testing programs."[6] Based on previous studies, Toyota strongly believes that this proposal would lead to a great risk of cross channel interference (*i.e.*, the interference effect that a transmission in one channel has on communications in another channel) between current Channel 172 and Channel 184 traffic once the channels are moved adjacent to each other, or even if one channel is placed between them. Specifically, the tests

---

28, 2013); Comments of Intelligent Transportation Society of America, ET Docket No. 13-49 (May 28, 2013); Comments of Savari Networks, ET Docket No. 13-49 (May 28, 2013); Letter from Arizona Department of Transportation, ET Docket No. 13-49 (May 28, 2013); Comments of Mercedes-Benz USA, LLC, ET Docket No. 13-49 (May 28, 2013).

[5] *See* Comments of the Qualcomm Incorporated, ET Docket No. 13-49 (May 28, 2013) ("Qualcomm Comments").

[6] Qualcomm Comments at 9.

conducted by Vehicle Safety Communications 2 ("VSC2"), a consortium formed under the auspices of the Collision Avoidance Metrics Partnership ("CAMP"), found that a transmitter in one DSRC channel can create interference leading to significant packet errors in another channel. This is especially true if the interference is closer by an order of magnitude or more than the desired transmitter to the receiver, and the two channels are adjacent.[7]

b) Safety Critical Systems Will Require Contiguous Channels

QUALCOMM's proposal also is based on the faulty premise that a DSRC safety service will only require two or three of its seven channels for critical safety-of-life communications.[8] To the contrary, the industry expects that contiguous channel frequency bands will be necessary in the future to realize V2V and V2I communications for a wide variety of next generation safety-of-life applications, including pre-collision mitigation, vehicle platooning and other applications that support and enable omni-directional safety.[9] Under QUALCOMM's proposal, it is not possible to isolate these applications from U-NII traffic while also protecting vehicle-to-vehicle safety communications, public safety applications and control channel, currently assigned to Channels 172, 184[10] and 178,[11] respectively.

---

[7] *See* "Cross-Channel Interference Test Results: A Report From the VSC-A Project," V. Rai, F. Bai, J. Kenney, and K. Laberteaux, 2007, available at https://mentor.ieee.org/802.11/dcn/07/11-07-2133-00-000p-cross-channel-interference-test-results-a-report-from-the-vsc-a-project.ppt. Members of VSC2 were Ford Motor Company, General Motors Corporation, Honda R & D Americas, Inc., Mercedes-Benz Research and Development North America, Inc., and Toyota Motor Engineering & Manufacturing North America, Inc.

[8] Qualcomm Comments at 9-12.

[9] *See e.g.*, Toyota Motor Corporation Global Website at http://www.toyota-global.com/innovation/safety_technology/

[10] *See* Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.580-5.925 GHz Band (5.9 GHz Band), WT Docket No. 01-90, Amendment of Part 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services, ET Docket No. 98-95, RM-9096, Memorandum Opinion and Order, 21 FCC Rcd 8961, FCC 06-

c) 20 MHz Channels Do Not Perform Similarly to 10 MHz Channels

While QUALCOMM offers some simulation data to suggest that 20 MHz channels would perform similarly to 10 MHz channels,[12] QUALCOMM's proposal that DSRC adopt 20 MHz channels Channel 173 and Channel 177 instead of 10 MHz Channels 172-178 contradicts the expert opinion from the DSRC community that 10 MHz channels will achieve better performance in real multi-path high-mobility environments that a driver will encounter on the road. Specifically, researches conducted by Carnegie Mellon University, General Motors, University of California, Berkeley and Toyota provided data that augments the idea that 10 MHz channel bandwidths have advantages compared to 20 MHz channel bandwidths.[13]

In sum, Toyota believes that the DSRC proposal described in QUALCOMM's comments is not "straightforward and simple,"[14] and in fact requires extensive testing and careful consideration to ensure that no harmful interference is caused into DSRC systems.

---

110 (2006).

[11] *See* Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.580-5.925 GHz Band (5.9 GHz Band), WT Docket No. 01-90, Amendment of Part 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services, ET Docket No. 98-95, RM-9006, Report and Order, FCC 03-324, 19 FCC Rcd 2458 (2004).

[12] Qualcomm Comments at 15.

[13] *See* "Mobile Vehicle-to-Vehicle narrow-Band Channel Measurement and Characterization of the 5.9 GHz Dedicated Short Range Communication (DSRC) Frequency Band," Lin Cheng, B. Henty, Dan Stancil, Fan Bai, and Pri Mudalige, IEEE Journal on Selected Areas in Communications, Vol. 25, Issue 8, 2007; pp. 1501-1516. *See* also "Measurement and Analysis of Wireless Channel Impairments in DSRC Vehicular Communications," Ian Tan, Wanbin Tang, Ken Laberteaux, and Ahmad Bahai, IEEE International Conference on Communications 2008, ICC '08.

[14] Qualcomm Comments at 3.

CONCLUSION

The Commission should not proceed to consider specific sharing rules until many different interference-related issues are thoroughly explored regarding the feasibility of co-existence between U-NII devices and DSRC systems. Toyota stands ready to work with the Commission and other federal and industry stakeholders to explore these issues constructively. In the meantime, given the potential consequences to vehicular and consumer safety, the Commission should not take any precipitous action with respect to sharing until adequate evidence and data can be collected and studied.

Respectfully submitted,

– /s/ –

Kevin Ro
Director
Technical & Regulatory Affairs, Safety

Toyota Motor North America, Inc.
601 Thirteenth Street, NW
Suite 910 South
Washington, DC 20005
(202) 463-6831

July 24, 2013