

November 28, 2018

Via ECFA  
Via Email

Marlene H. Dortch, Secretary  
Federal Communications Commission  
Office of the Secretary  
445 12<sup>th</sup> Street, SW  
Room TW-A325  
Washington, DC 20554

**RE: Comment on Phase 1 Testing of Prototype U-NII-4 Devices, ET Docket No. 13-49**

Dear Ms. Dortch:

DENSO International America, Inc., on behalf of DENSO Corporation and its US affiliate (DENSO), herein submits comments on the Federal Communications Commission's (FCC) Office of Engineering and Technology (OET) request for comment on the Phase 1 Testing of Prototype U-NII-4 Devices.

DENSO, a leading supplier of advanced automotive technology, systems, and components for all major global vehicle manufacturers, operates in 35 countries and regions with approximately 170,000 employees. With a U.S. presence for over 50 years, we have been supplying world-class automotive technology that protects lives and preserves the planet. Our 17,000 U.S. employees and more than \$4.3 billion of U.S. capital investment in 32 facilities across 13 states express our commitment to creating a bright future for generations to come. In the United States, DENSO employs people in Alabama, Arkansas, California, Iowa, Georgia, Kentucky, Michigan, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee and Texas.

Our corporate focus and direction is to develop safety products for vehicles that help reduce and avoid crashes. This focus is intensifying as we see increases in fatal crashes globally. In fact, the U.S. Department of Transportation (DOT) records show fatalities increasing over the past year, after a longtime trend of decreasing in previous years. There is also an increasing trend in vulnerable road user incidents. Often these crashes are the result of impaired and distracted drivers. That is why DENSO has been an industry leader in developing and testing connected vehicle technologies that can help reduce crashes and save lives with both proven technologies (e.g. DSRC) and emerging technologies (e.g. Cellular-V2X).

We applaud the Commission's completion of Phase 1 of the three-phase test plan described by the U-NII-4 Public Notice of June 1, 2016, appreciate the opportunity to comment on the Phase 1 report, and encourage the Commission to continue with Phases II and III of the test plan before making any decisions that would impact the future of these technologies.

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### **Review of Phase 1 Test Report**

First, we would like to thank the Commission for releasing the results on the Phase 1 testing. As a key supplier of 5.9 GHz DSRC radio devices to OEMs, CAMP, FHWA, and NHTSA, DENSO focuses on understanding and characterizing lab and on-road DSRC performance. We have these comments regarding the FCC test results and U-NII-4 device characterization.

- The Phase 1 test results point to clear signs of harmful interference to DSRC operation due to Co-Channel interference with DSRC operating in the lower 20 MHz channels 173 and 177 (See Figure 48).
- Because the Phase I tests were lab tests performed in RF cables (not over the air), they could not evaluate a worse Co-Channel interference condition that exists due to a 16dB radiated power imbalance between high-power U-NII-4 devices operating up to FCC limits of 36 dBm (to cost-effectively maximize U-NII outdoor coverage) and typical lower-power DSRC V2X radiated power levels of 20 dBm (to have power for NLOS links but restrict far-away emissions). DENSO recommends that FCC Phase II tests include such over-air outdoor radiated power imbalance because such large imbalance creates a much larger region of interference to DSRC than the region to detect DSRC and stop interfering. No sharing solution can protect what it cannot first detect.
- The Phase 1 test results point to clear signs of harmful interference to DSRC operation due to Cross-Channel interference with DSRC operating in the upper 10 MHz channels 180, 182, and 184 (See Figure 11).
- Because the Phase I tests were performed with reference U-NII-4 devices from chipset vendors (not commercial WiFi transmitters from production manufacturers), the TX output power was low (Tables 14-17) and the spectral skirts were 10 to 20dB below allowed mask limits (See most of the Figures 125-163). In addition, there was a large discrepancy in the mask margin among the tested WiFi devices. This benign transmit performance hides the true Cross-Channel interference results expected near commercial outdoor WiFi deployments using transmit amplifiers with much more conducted and radiated power, and with noise skirts that generate more cross-channel noise into the DSRC channels. DENSO recommends that FCC Phase II tests include such higher-power U-NII-4 transmitters be used, leading to more realistic cross-channel interference results.
- Because Cross-Channel interference is also sensitive to DSRC link signal strength, DENSO recommends that FCC Phase II testing, which will include DSRC-equipped vehicles using over-air links, be conducted with links operating at -85 dBm +/- 5 dB. The Phase I test results clearly show DSRC radios can operate well below this level (Figures 6-9).
- The Phase 1 test results also seem to show that in some cases the detect-and-vacate time averaged a large enough timespan that the resulting channel access delay for DSRC should be considered harmful interference (See Table 22). The FCC, to ensure Part 15 protection for DSRC, should propose a solution to reduce the high latency levels.



- The Phase 1 testing highlights the obvious need for more testing, and the Phase I results and the identified shortcomings above should clearly prevent the Commission from concluding that either sharing approach is currently able to protect DSRC from harmful interference that either sharing approach is currently able to protect DSRC from harmful interference.

### **Support to Continue 3-Phase Test Plan**

As mentioned earlier, we ask the FCC, DOT, and Department of Commerce to continue the 3-phase test plan underway to explore spectrum sharing technology. All three phases must be completed before a decision on sharing is possible. It should be noted that this spectrum sharing assumes that DSRC is the primary licensee in the band.

It should be noted that DOT released a statement that all 75 MHz is needed for safety applications, and that the band is now supporting seventy active deployments using the seven channels in the spectrum.<sup>1</sup> Also noteworthy is the global trend towards deploying V2X technology in the 5.9 GHz band, including China and Japan.

### **Support for Safety Channelization**

DENSO strongly disagrees with any “non-safety” designation for the safety channels. This term is not found in FCC documents associated with related rulings, although it has been used by some stakeholders to describe some related channels—a description that the auto industry does not use. We support past filings from the Alliance of Automobile Manufacturers and Global Automakers that have demonstrated a similar strong disagreement with the term, including referring to non-safety applications. We believe the vast majority of currently discussed connected vehicle applications have a safety critical nature. Even if some applications do not perform an imminent crash avoidance function, they almost always involve safe passage through traffic. Development of an increasingly wide variety of safety-critical applications has triggered stakeholders in the transportation industry to submit numerous filings to the FCC refresh notice stating that the application has a safety-critical nature and that all 75 MHz is needed to support safety functionality.<sup>2</sup> Examples of these applications include real-time control of platoons, sensor sharing of autonomous vehicles, and detection of pedestrians and bicyclists.

### **Support for Multi-Stakeholder Joint Statement**

Connected vehicle technologies have the potential benefits of increasing mobility efficiency, reducing crashes, and most importantly, saving lives. These technologies are dependent on the entire 5.9GHz allocations—all seven channels—for V2X auto safety services. We support the recent multi-stakeholder statement on preserving 5.9 GHz:

*“...The entire 5.9 GHz band is needed to achieve the full benefit of these communication technologies in the years to come. These safety innovations require dedicated spectrum to ensure they work right every time without signal interference. Millions of dollars have already been invested in this effort, including incorporating connected vehicle technologies into infrastructure.*

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<sup>1</sup> U.S. Department of Transportation, A Vision for Safety 3.0, <https://www.transportation.gov/av/3>

<sup>2</sup> FCC ET Docket No. 13-49, FCC 16-68

*We are on the cusp of a major breakthrough in vehicle connectivity and safety innovations. With significant past and present investments in connected vehicle innovations, V2X technologies are already being deployed for the purposes of improving road safety. This will only continue moving forward. With 37,133 deaths on U.S. roadways last year alone, we must take every opportunity to save the lives of road users. Connected vehicle technologies offer the U.S. a powerful set of tools to save lives, but only if these technologies are given the ability to progress. We support protecting the entire 5.9GHz band for transportation safety applications. Any unlicensed use in the band should be done without harmful interference to the incumbent technology or other intelligent transportation systems technology.”<sup>3</sup>*

We applaud the FCC’s past efforts to improve vehicle safety with the establishment of the 5.9 GHz Vehicle Safety Spectrum, but we remain concerned regarding efforts to share or re-channelize this spectrum. Any V2V communication messages lost due to interference will degrade the safety benefits offered by V2V technology.

#### **Summary**

In summary, DENSO asks the FCC to continue its testing program to resolve remaining concerns regarding sharing of the 5.9 GHz spectrum allocated for intelligent transportation systems. As stated above, the 5.9 GHz allocation is critical for proper functioning of these technologies. We firmly believe that evaluating the impacts of sharing, and any potential sharing plan, should work around intelligent transportation operations in the band and not slow deployment of current and future safety technologies. Any sharing arrangements that would require rechanneling the band would delay the implementation of safety technologies and the establishment of safety protocols, thus effectively relegating vehicle safety to a secondary concern.

DENSO supports the continued allocation of the 5.850-5.925 GHz band to intelligent transportation systems in the United States. We support research and development of other future technology that will help improve vehicle safety in ways that allow today’s and tomorrow’s features to be compatible (a standard automotive industry practice). Any uncertainty in this strategically important frequency band could delay crash-avoiding, life-saving technologies needed today.

Sincerely,



Pat Bassett  
Vice President  
NA Research and Engineering Center  
DENSO International America, Inc.

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<sup>3</sup> Multi-Stakeholder Joint Statement, October 24, 2018 (<https://www.globalautomakers.org/posts/press-release/multi-stakeholder-statement-on-preserving-5.9-ghz>)