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THE DISCONNECT BETWEEN IMPLEMENTATION OF V2V COMMUNICATION AND THE V2V TECHNOLOGY EMPLOYED TO ACHIEVE IT

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The ability of vehicles to communicate their location, direction of travel and speed data to other nearby vehicles (vehicle-to-vehicle communications or V2V) will significantly augment the safety gains associated with autonomous vehicle technologies. While the autonomous vehicle uses vehicle-based devices like cameras and sensors to “see” the environment around the vehicle and avoid potential incidents, V2V communications provide additional information about other potential vehicle threats that the vehicle-based devices cannot yet see. However, while V2V technology is already being deployed throughout the U.S., the effectiveness of those deployments may be impaired by another, yet-to-be fully developed technology based on 5G cellular communications.

In January 2017, the National Highway Traffic Safety Administration issued a Notice of Proposed Rulemaking (NPRM) for V2V communications. The NPRM proposed to require the adoption of designated short range communications (DSRC) technology to enable such communications. Using DSRC devices, cars would be able to communicate basic safety messages (BSMs) directly with each other (not through a cellular base station), which would, among other things, warn a vehicle receiving a BSM of an impending collision. Under the NPRM, DSRC devices would operate in the 5.9 GHz spectrum that had previously been set aside by the FCC for that purpose. The NPRM did not foreclose the eventual use of other technologies in that spectrum, provided the technologies were interoperable with DSRC. Interoperability means “the ability of the DSRC devices to decode at least one mode of transmission by the other technology devices and of the other technology devices to decode DSRC.”¹ That is, the two devices would have to be able to talk to each other, not just amongst themselves. Progress on this NPRM stalled in the Trump administration.

The 5.9 GHz spectrum consists of seven 10 MHz wide channels. DSRC uses all seven channels. Two of the channels, 172 and 184, were designated for “safety of life and property applications.”² These are the crash avoidance and mitigation applications. Four of the remaining channels were designated as service channels to support related vehicle-to-everything (V2X) applications. The last channel, 178, was designated as a control channel.

For the past several years, the FCC has been aggressively undertaking to free up bandwidth for future 5G wireless communications. Its efforts have included reconfiguring bands; auctioning spectrum in the upper 37 GHz, 39 GHz and 47 GHz bands; freeing up spectrum in the 2.5 GHz, 3.7GHz, 4.9 GHz and 6 GHz bands; and permitting wireless to share other spectrum. One candidate being targeted for sharing is the 5 GHz spectrum, including the 5.9 GHz band currently designated for DSRC.

In 2016, the FCC commenced a three-phase test program to determine whether unlicensed (e.g., cellular) and DSRC networks could operate together in the 5.9 GHz band without causing harmful interference with DSRC communications. The results of the first phase of testing were finally published in late 2018.³ The second and third phases are pending.

Presently, the specific cellular technology being proposed to share the 5.9 GHz spectrum with DSRC is LTE-V2X or cellular V2X (C-V2X). It is projected that the 5G version of this technology, 5G-V2X or New Radio V2X, will ultimately replace the C-V2X technology. Unlike DSRC, which is a thoroughly vetted and proven technology for V2X communications that is already being deployed in locations around the U.S., field studies of C-V2X have only recently begun. Ford, along with Panasonic and Qualcomm, began deployment and testing of C-V2X in Colorado in 2018. The 5G network does not yet exist and 5G V2X is under development.

There is an issue with the C-V2X technology. It is not interoperable with DSRC – it can only communicate with other C-V2X equipped vehicles. C-V2X and DSRC are fundamentally different, non-interoperable technologies. The proposed 5G New Radio technology has two issues. It is not interoperable with DSRC or C-V2X. In contrast, the next generation of the DSRC based technology (called NGV) will be fully interoperable with the previous generation DSRC. Non-interoperability of communications technologies results in fragmentation of the vehicle population and significantly decreases the effectiveness of V2V communications.

Solutions for the interoperability problem proposed by the cellular industry include dedicating part of the 5.9 GHz spectrum for use by DSRC and a separate part for C-V2X (channel separation) and requiring V2X on-board units (radios) to have two or more separate radios and antennas, one for DSRC and another for C-V2X (and/or 5G NR). Critics of these proposals cite concerns with interference, congestion-related latency issues, inefficient use of spectrum and increased cost.

Last November, the 5G Automation Association (5GAA) petitioned the FCC for a waiver to use the upper 20 MHz of the 5.9 GHz spectrum for C-V2X and later, 5G communications. The request has faced significant criticism. Many commenters noted that the waiver process was not the proper tool to use to partition the spectrum. Rather, formal rulemaking is required. Some also suggested that 5GAA should apply for an experimental license like the one Ford obtained for its Colorado testing. The petition remains pending.

Apparently sensing an opportunity with a receptive FCC, 5GAA recently lobbied the commission to banish DSRC to only one of the seven 10 MHz bands in the 5.9 GHz spectrum while allowing the nascent C-V2X technology to operate in the other six “to achieve its evolutionary path to 5G.”^{5,6} The request is certainly premature. And, given that at least one of 5GAA’s automotive members began installing DSRC radios in their luxury vehicles in 2017, it is potentially at odds with the interests of at least that member.

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So, what is the disconnect? DSRC is an existing V2X communications technology that is currently being deployed in the U.S. by numerous communities, Municipal Planning Organizations and Infrastructure Owners and Operators. It is a proven technology and is presently the only technology authorized to use the 5.9 GHz spectrum. However, proponents of 5G, with the assistance of a supportive FCC, are seeking to co-op the “safety of life” spectrum for the exclusive benefit of their own future untested commercial communications technology services at the expense of both DSRC and those state and local agencies implementing DSRC-based V2X systems. The technology is available for use and is being used, but might get shoved aside for commercial reasons unrelated to motor vehicle safety. An indication that this may be occurring is that Toyota recently informed the FCC that it is pausing its previously announced deployment of DSRC devices in its vehicles because of a perceived lack of commitments to the technology from other automakers and the “uncertain and unstable” regulatory environment concerning the 5.9 GHz band.⁷

¹ Comments of IEEE 802 LAN/MAN Standards Committee, February 21, 2019 on DOT’s request for comment on V2X Communications, December 26, 2018.

² FCC Public Notice FCC 16-68, June 1, 2016.

³ This study is being conducted under an experimental license from the FCC.

⁴ In its petition, 5GAA touts itself as a “Global cross-industry organization of companies from the automotive, technology and telecommunications industries.” Members from the automotive industry include Ford, GM, BMW, Daimler, and Nissan among others.

⁵ Letter from Wilkinson Baker Knauer, LPP, on behalf of the 5GAA, to Marlene Dortch, FCC dated April 3, 2019 p.11.

⁶ The use of the term evolutionary path seems to disregard the fact that C-V2X and 5G are not interoperable with each other.

⁷ Letter from Hillary Cain, Toyota to Marlene Dortch, FCC dated April 26, 2019. (GN Docket No, 18-357)

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