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February 25, 2019

Office of the Secretary
Docket Management Facility, U.S. Dept. of Transportation,
West Building, Ground Floor Room W12-140
1200 New Jersey Avenue, SE
Washington, DC 20590

Re: Docket No. DOT-OST-2018-0210
Federal Register: 83 FR 66338 (December 26, 2018)
Notice of Request for Comments (RFC)
V2X Communications

Dear Sir or Madam:

Enclosed are the comments of American Honda Motor Co., Inc. regarding the above referenced docket and Federal Register notice.

We thank you for this opportunity to provide our comments. If you have any questions, require additional information or further clarification, please contact Mr. Douglas Longhitano, American Honda Connected and Automated Vehicle Policy Manager at (937) 309–9860 at your earliest convenience.

Sincerely,

American Honda Motor Co., Inc.

John Turley
Senior Manager
Product Regulatory Office

JET:wvt

American Honda Motor, Co., Inc.

Comments on V2X Communications

[Docket No. DOT-OST-2018-0210]

[Federal Register: 83 FR 66338 (December 26, 2018)]

[Submitted February 25, 2019]

Introduction

Honda appreciates this opportunity to provide comment to DOT's RFC on V2X communications and commends the U.S. DOT's efforts to encourage the integration of V2X. We fully agree that V2X has the potential to provide significant safety and mobility benefits, both on their own and as complementary technology to AV sensor technology.

Honda remains committed to V2X technologies and the benefits they bring. We continue to expand our research and development in this area to create V2X applications independent of the communication technology. Honda's latest V2X innovation is the development of SAFE SWARM[1]. Inspired by the fluidity of a swimming school of fish, SAFE SWARM enables vehicles to share information about road conditions and prevents traffic congestion by assisting drivers with merging and lane changes by analyzing the speeds of vehicles in the nearby proximity. Honda is testing SAFE SWARM as part of the 33 Smart Mobility Corridor along State Route 33 in Marysville, Ohio in partnership with the Ohio Department of Transportation and the Ohio State University, among others. Honda has been developing additional V2X communications safety applications to protect other road users, including pedestrians and motorcyclists,[2] as well as applications to make intersections safer.[3]

Honda has historically been a long-standing supporter of V2X in the form of DSRC as it was proposed in NHTSA's January 12, 2017 Notice of Proposed Rulemaking (NPRM). We believe that the strength of this NPRM, and of DSRC based V2X communications in general, lied in its proven capability to provide a secure and streamlined Basic Safety Message (BSM) with widespread deployment and interoperability. Although Honda has

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[1] *See* Honda, *Honda SAFE SWARM™*, https://hondanews.com/releases/ces-2019-honda-creates-new-categories-of-technology-to-enhance-work-offer-convenience-reduce-carbon-and-save-lives/videos (last visited Jan. 17, 2019).

[2] *See* Honda, *Honda Demonstrates Advanced Vehicle-to-Pedestrian and Vehicle-to-Motorcycle Safety Technologies*, https://hondanews.com/channels/corporate/releases/honda-demonstrates-advanced-vehicle-to-pedestrian-and-vehicle-to-motorcycle-safety-technologies/videos/honda-demonstrates-advanced-vehicle-to-pedestrian-and-vehicle-to-motorcycle-safety-technologies (last visited Jan. 17, 2019).

[3] *See* Press Release, Honda, *Honda Demonstrates New "Smart Intersection" Technology* (Oct. 4, 2018), https://csr.honda.com/2018/10/04/honda-demonstrates-new-smart-intersection-technology.

always been aware of the relatively static performance potential for DSRC, we believed that widespread adoption with a common technology to be of much greater value.

However, in light of the subsequent designation of the NPRM as a “Long Term Action” and uncertainty regarding other federal government actions, Honda understands that we must proceed with developing V2X technologies in the absence of a universally agreed upon technology standard. Honda and industry have delayed application and deployment plans for V2X as it has become imperative for Honda to reassess evolving technologies and policies to most effectively realize the safety potential for V2X. This reassessment included consideration of numerous factors, including:

- Risk of harmful interference due to possible spectrum sharing being considered by the FCC;
- Confusion caused by outstanding technical issues present in the 2017 NPRM;
- Confusion surrounding the status of the 2017 NPRM and designation as a Long Term Action;
- Lack of widespread deployment without a mandate; and
- Conflicts surrounding emerging and disparate communication protocols.

As a result of this reassessment, Honda has come to the following conclusions:

- 5G New Radio holds significant additional potential compared to DSRC and LTE C-V2X alone.
- With regards to the 5.9GHz safety spectrum, spectrum availability needs to accommodate new technology developments, such as 5G New Radio and advancements in DSRC. All 7 channels of the 5.9GHz spectrum must be preserved for Automotive V2X use.
- In order for V2X BSMs to have the intended widespread benefit, it remains preferable to have a single communication protocol for all vehicles. In the absence of such a universally agreed upon protocol, the DOT should outline a plan with related government agencies to achieve the greatest safety benefit for the greatest number of consumers.

Honda provides additional comments through the following responses to NHTSA’s guiding questions.

Responses to Guiding Questions Posed

1. **Please provide information on what existing or future technologies could be used for V2X communications, including, but not limited to, DSRC, LTE C-V2X and 5G New Radio. What are the advantages and disadvantages of each technology? What is the timeframe for deployment of technologies not yet in production? Please provide data supporting your position.**

   Honda agrees that the main technology candidates are DRSC, LTE C-V2X and 5G New Radio. The differences are outlined as follows:

   DSRC technology exists today with established standards and extensive testing completed. DSRC is essentially ready to deploy today and would provide substantial safety benefit provided there is widespread deployment. The advantages and disadvantages are inherently similar - DSRC is able to provide a secure and streamlined Basic Safety Message (BSM) however, with regards to evolutionary potential, its performance is relatively static. It should also be noted that DSRC expansion is being studied in the form of Next Generation V2X (as IEEE802.11bd) for applications such as real-time sensor sharing and platooning.

   LTE C-V2X may possess similar capabilities to send a BSM using a peer-to-peer PC5 radio sidelink communication which is substantially similar to DSRC. However, the advantage is that the separate and additional uplink communication to the cellular network (V2N) can further augment V2X communications. In the global landscape, China is proceeding towards LTE C-V2X. Convergence on a global platform will allow industry to develop applications instead of managing complexities between multiple platforms. Ultimately though, as C-V2X technology evolves, 5G New Radio holds greater potential to use V2X communications to create a safer and smarter transportation network.

   5G New Radio builds upon all of the advantages of V2X but promises significant advances in critical areas for V2X – higher bandwidth, lower latency, and more cell networks. Thus, 5G New Radio is expected to provide significant benefits for AV safety and integration into a smart transportation network. However, the main disadvantage is that 5G New Radio standards, especially for automotive use, are not yet mature and testing is therefore very limited.

2. Of the V2X communications technologies previously discussed, at present only DSRC is permitted to be used in the 5.9 GHz spectrum band for transportation applications. If that allocation were to be changed to allow any communication technology for transportation applications, could DSRC and other technologies (e.g., C-V2X, 5G or any future technology) operate in the same spectrum band or even the same channel without interference? Why or why not? If there are any technical challenges to achieving this goal, what are they and how can they be overcome?

Honda is aware that the spectrum band itself can be feasibly divided to allow different technologies to exist on different channels. However, we are not aware that multiple technologies can share the same frequency without causing harmful interference. Interference must be avoided, especially for the safety critical channels (i.e. BSM on Channel 172).

While the advantage and disadvantages (outlined above in the response to Question 1) in some cases are clear, in many cases they are yet to be realized. What is most clear is the need to ensure sufficient spectrum in the 5.9GHz band to allow multiple technologies to coexist and allow continued V2X innovation. We see this as one of the major technical challenges. This challenge should be addressed with the development of spectrum policy that accommodates testing and deployment of multiple technologies in the 5.9GHz band. Such testing is necessary to understand the safety benefits of using different technologies, accounting for the possibility that different technologies may be better suited for different safety and mobility applications. In practice, it will be most preferable to have a single communication protocol for all vehicles such that maximum interoperability can be realized.

3. To what extent is it technically feasible for multiple V2X communications technologies and protocols to be interoperable with one another? Why or why not? Can this be done in a way that meets the performance requirements for safety of life applications, as they were discussed in the V2V NPRM? What additional equipment would be needed to achieve interoperability or changes in standards and specifications? What is the projected cost of any necessary changes? How soon can these changes and equipment prototypes be available for testing?

Honda is not aware that it is technically feasible for multiple V2X communications to be interoperable with one another. We are aware of some proposed solutions that require two separate radios that communicate using each of the two protocols separately. This results in duplicative hardware and cost. In other words, we expect that to accommodate both DSRC and LTE C-V2X communications (and only able to operate non-simultaneously), the system cost would be duplicated. The value of such an arrangement would be questionable given that the system would need to decide which communication protocol to operate under and also potentially limiting the performance to the lowest common denominator of both protocols.

4. **To what extent is it technically feasible for different generations of the same V2X communications technologies and protocols to be interoperable with one another? Why or why not? Can this be done in a way that meets the performance requirements for safety of life applications? What additional equipment or changes in standards and specifications would be needed to achieve interoperability? What is the projected cost of any necessary changes?**

   We are aware that the IEEE Working Group is working towards the next generation of DSRC with potential enhancements including real-time sensor sharing and platooning. Additionally, both DSRC and LTE C-V2X solutions are being developed which allow interoperability between different generations, provided that new generations could be potentially tuned to older generation waveform and frequencies.

5. **Even if they are interoperable across different technologies and generations of the same technology, would there be advantages if a single communications protocol were to be used for V2V safety communications? What about other V2X safety applications, such as those involving V2I and V2P communications?**

   Both advantages and disadvantages exist if a single communications protocol were to be used for V2V. The advantages include:

   - *Reduced technical complexity, number of parts, and associated costs.*
   - *Maximized interoperability thereby providing the greatest safety benefit to society.*
   - *Efficient use of spectrum – interoperability and functionality can be accelerated, without delays regarding the choice of technology.*
   - *Backward and forward compatibility*

   The disadvantages of using a single communications protocol include:
   - *A single protocol may not be best suited for all safety applications. Limiting use to a single protocol could unnecessarily inhibit innovation.*
   - *AV communication and data sharing will be better accomplished using 5G or Next Generation DSRC.*
   - *V2P adoption potential is significantly greater with 5G due to existing phone hardware.*

6. **How would the development of alternative communication technologies affect other V2I and V2P communications, such as those supporting mobility or environmental applications? Do these applications have the same or different interoperability issues as V2V safety communications? Do different V2X applications (e.g., platooning) have different communication needs, particularly latency?**

   5G New Radio can significantly improve the adoption potential for V2P, V2M, or any other Vulnerable Road Users (VRU) that carry a mobile phone. It is very unlikely that phones will adopt DSRC or LTE C-V2X radios whereas 5G New Radio might be able to leverage existing cellular hardware.

7. **Do different communication technologies present different issues concerning physical security (i.e., how to integrate alternative communication technologies into vehicle systems), message security (i.e., SCMS design or other approaches), or other issues such as cybersecurity or privacy? Would these concerns be affected if multiple but still interoperable communication technologies are used rather than one?**

   Since security is implemented in the application layer, and not in the communication layer, the security issues are largely the same regardless of communication method. The SCMS developed for DSRC should have the ability to be scaled and applied to different technologies. Security credential provisioning could be enhanced by the implementation of a V2N network but protection against the additional threat vector from the network is required.

8. **How could communications technologies (DSRC, C-V2X, 5G or some other technology) be leveraged to support current and emerging automated vehicle applications? Will different communication technologies be used in different ways? How?**

   Honda believes that V2X is essential for Automated Vehicle applications but, due to policy and application uncertainty, has been forced to proceed without it at a loss to innovation and safety. Most AVs under development today are largely relying upon various visions systems to see the environment and lack the basic ability to communicate directly. V2X is essential for data sharing, crash avoidance, and relative action negotiation between vehicles, amongst many other yet unrealized possibilities. While it is possible to develop AVs without V2X, the capabilities V2X technology bring will significantly improve the performance, reliability, and resilience of AV applications.

9. How could deployments, both existing and planned, assess communications needs and determine which technologies are most appropriate and whether and how interoperability could be achieved?

Honda is actively testing V2X applications in real-world scenarios in Ohio, including activity in the 33 Smart Corridor and Smart Marysville Intersection. There are several goals to this activity. We have developed a flexible V2X platform and infrastructure to continuously evaluate expanded V2X functionality. This platform also facilitates performance comparisons between DSRC and LTE C-V2X under different applications. We are also able to evaluate the creation of a high-density V2X environment to create, analyze, and validate V2X interaction performance. This development of an enduring V2X research environment allows for continuous research, innovation, and collaboration with industry and government partners.