Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of Parts 1, 2, 15, 90 and 95 of the Commission's Rules to Permit Radar Services in the 76-81 GHz Band	)	ET Docket No. 15-26
	)	
Amendment of Part 15 of the Commission's Rules to Permit the Operation of Vehicular Radar Services in the 77-78 GHz Band	)	RM-11666
	)	
Amendment of Sections 15.35 and 15.253 of the Commission's Rules Regarding Operation of Radar Systems in the 76-77 GHz Band	)	ET Docket No. 11-90 RM-11555
	)	
Amendment of Section 15.253 of the Commission's Rules to Permit Fixed Use of Radar in the 76-77 GHz Band	)	ET Docket No. 10-28
	)	
Amendment of the Commission's Rules to Permit Radiolocation Operations in the 78-81 GHz Band	)	WT Docket No. 11-202

REPLY COMMENTS OF THE
CONSUMER ELECTRONICS ASSOCIATION

I. INTRODUCTION

The Consumer Electronics Association ("CEA")[1] respectfully submits these reply comments in response to comments filed on the above-captioned Notice of Proposed

[1] CEA is the principal U.S. trade association of the consumer electronics and information technologies industries. CEA's more than 2,000 member companies lead the consumer electronics industry in the development, manufacturing and distribution of audio, video, mobile electronics, communications, information technology, multimedia, and accessory products, as well as related services, that are sold through consumer channels. Ranging from giant multinational corporations to specialty niche companies, CEA members cumulatively generate more than $286 billion in annual factory sales and employ tens of thousands of people in the United States.

Rulemaking ("*Notice*").[2] CEA applauds the Commission's many efforts to facilitate deployment of new products and services, including vehicular radar technologies.[3] In that vein, CEA urges the Commission to adopt the proposals in the *Notice* to help spur advancement of autonomous vehicle efforts.[4] In the long run, such technologies are projected to generate significant benefits in areas including safety, fuel economy, and efficient use of transportation infrastructure funds. In the short term, partially autonomous (driver-assist) technologies will offer important incremental benefits in vehicular safety. Thus, the Commission should adopt its proposal, based on the Bosch petition and the 79 GHz Project, to make the 76-81 GHz band available for automotive radar systems. Vehicular radar will enhance automotive safety, benefiting American consumers, and promoting important public policy goals.

Expanding the spectrum available for vehicular radar operations is both necessary and feasible. As numerous commenters demonstrate, the 76-81 GHz band is an excellent technical fit for vehicular radar, and modifying the U.S. Table of Frequency Allocations will harmonize the deployment of these technologies with other countries' allocations, allowing seamless global advancement in safety technologies, eventually leading to autonomous vehicles. To minimize the potential for interference, the Commission should adopt a licensed approach to 76-81 GHz

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[2] Amendment of Parts 1, 2, 15, 90 and 95 of the Commission's Rules to Permit Radar Services in the 76-81 GHz Band, Notice of Proposed Rulemaking and Reconsideration Order, ET Docket No. 15-26 (rel. Feb. 5, 2015) ("*Notice*").

[3] *See* Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, First Report and Order and Second Notice of Proposed Rulemaking, 11 FCC Rcd 4481 (1995) ("*Vehicular Radar R&O*"); *Notice* ¶ 5 ("In a series of rulemaking proceedings that date back to 1995, the Commission has established rules to allow the use of this spectrum by automotive collision avoidance radar applications ('vehicular radars') and radar systems that detect foreign object debris at airport facilities…."). *See also* Mercedes-Benz Comments at 2. As the *Notice* explains, "[v]ehicular radars can determine the exact distance and relative speed of objects in front of, beside, or behind a car to improve the driver's ability to perceive objects under bad visibility conditions or objects in blind spots." *Notice* ¶ 6.

[4] *Notice* ¶ 25 ("We recognize that the usage of vehicular radar applications has continued to grow and evolve since the Commission issued the *Vehicular Radar R&O*, and that providing expanded access to the 76-81 GHz band could help those applications deliver important public benefits.").

vehicular radar spectrum under Part 95 of its Rules and also should authorize radar systems that detect foreign object debris ("FOD") under the same Part. Other proposed operations in the band should be authorized only if proven not to interfere with vehicular radar systems. Finally, licensed vehicular radar systems will not harm radio astronomy services, and no mitigation requirements are warranted.

II. FULLY AUTONOMOUS VEHICLES WILL SAVE LIVES AND PROMOTE EFFICIENCY IN THE VERY NEAR FUTURE

Today's advanced driver assistance systems ("ADAS") offer features such as adaptive cruise control, lane-keeping assist, and automated steering that were unimaginable even a decade ago. Even with these functions, however, the driver remains in control of the automobile. But within the next 10-15 years, the United States will see full-scale production of the fully autonomous (*i.e.*, driverless) automobile. The benefits of this technology are readily apparent – the vast majority of automobile accidents are caused by human error, and their economic costs are substantial.[5] As the Telecommunications Industry Association ("TIA") aptly explains, "Even as transportation systems are constantly becoming safer and more reliable, motor vehicle deaths continue to exceed 30,000 per year in the United States[, and] there were 3.9 million non-fatal injuries in 2010, along with 24 million damaged vehicles in that year alone."[6] Self-driving cars are projected to save more than 1,000 lives and prevent more than 200,000 accidents – if just ten percent of the vehicles on the road were autonomous. At 50 percent of vehicles on U.S. roads, the projections increase to 9,600 lives and 1.88 million fewer crashes; at a level of 90 percent, autonomous vehicles would save more than 21,000 lives and prevent more than four million

[5] Robert E. Calem, Driverless Cars on the Rise, i3 (Jan. 5, 2014), available at http://www.ce.org/i3/Features/2014/January-February/Driverless-Cars-on-the-Rise (citing analyst estimates that more than 90 percent of traffic accidents are caused by human error, and in 2010, traffic accidents in the U.S. cost more than $300 billion, up from more than $230 billion in 2000, even as accident rates in the U.S. have been falling).

[6] TIA Comments at 2.

accidents.[7] Deployment of technologies such as "adaptive cruise control, collision warning, blind-spot monitoring, lane-change assistance, and back-up parking assistance … have all had positive effects on reducing dangers to persons and property, and it is expected that this impact will continue to increase as autonomous vehicle technology continues to develop."[8]

Self-driving cars also are more efficient than human-driven cars in terms of time and energy. An autonomous vehicle can gauge and utilize roadway space, reducing traffic congestion, and thereby reducing fuel consumption and, ultimately, greenhouse gas emissions. In addition, autonomous vehicles will offer new freedom to disabled and elderly individuals who are unable to drive themselves.[9]

Since the Commission authorized vehicular radar technology in the 76-77 GHz band, the technology "has continued to evolve, and industry has developed more enhanced and cost-effective long-range vehicular radars ("LRR")"; however, the one gigahertz currently allocated for such operations is not sufficient for high-resolution short-range vehicular radars ("SRR").[10] Thus, in order to facilitate implementation of safety features such as collision warning, lane departure warning, lane change assistance, blind-spot detection, and pedestrian protection, the

[7] Eno Center for Transportation, Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers and Policy Recommendations (2013), available at https://www.enotrans.org/store/research-papers/preparing-a-nation-for-autonomous-vehicles-opportunities-barriers-and-policy-recommendations.

[8] TIA Comments at 2.

[9] The U.S. Department of Transportation's National Highway Traffic Safety Administration ("NHTSA") is closely watching the automotive industry's research and development in vehicle autonomy. NHTSA has defined four levels of vehicle automation concerning self-driving vehicles: Level 0 is a car with no self-driving capabilities – the driver is fully in control of steering, acceleration and braking at all times; Level 1 provides "function-specific automation" in which the vehicle automatically assists the driver by taking over one or more specific control function (e.g., electronic stability control, which applies braking to keep the vehicle planted); Level 2 provides "combined function automation" in which "at least two primary control functions" are taken over by the car and used in unison to "relieve the driver of control" (e.g., adaptive cruise control in combination with lane centering); Level 3 provides "limited self-driving automation" in which the vehicle can be fully autonomous "under certain traffic or environmental conditions," with the vehicle responsible for continuously monitoring for changes in those conditions that would require the driver to take back control and for giving the driver a "sufficiently comfortable transition time"; and Level 4 provides "full self-driving automation" in which the vehicle is always in full control of itself and monitoring roadway conditions continuously from the start of a trip to the end.

[10] *Notice* ¶¶ 8-9.

Commission should expand the available spectrum for vehicular radar to encompass 76-81 GHz, which is "essential to allow such next-generation technologies to move forward toward commercialization."[11]

III. THE 76-81 GHZ BAND IS A GOOD FIT FOR VEHICULAR RADAR TECHNOLOGIES IN THE U.S. AND WORLDWIDE

To meet the spectrum need discussed above, the Commission should modify the Table of Frequency Allocations to provide an allocation for the radiolocation service in the 77.5-78 GHz band.[12] This spectrum is a good fit for vehicular radar technologies, and the Commission's action will constitute an important step in harmonizing U.S. allocations with other countries'.[13] CEA agrees with the Commission's observations that the radio propagation characteristics of the 76-81 GHz band and narrowly focused antennas, which enables high concentrations of transmitters in a geographic area, "makes this band especially desirable" for vehicular radar.[14] Indeed, "the very short-range nature of SSR signals" and "the exceptionally high frequency re-use capabilities of 76-81 GHz" means that "vehicular radar is well-suited to operate in the 76-81 GHz band."[15] In addition, because manufacturers can adapt equipment designed to operate in the 76-77 GHz band, "they will enjoy the benefits of expanded radar use" in the adjacent band at a lower cost than if they needed to design for a non-adjacent band.[16]

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[11] TIA Comments at 2.

[12] *Notice* ¶¶ 2, 24, Appendix B at 1.

[13] *See id.* ¶ 32 (noting that "the 77-81 GHz band is already available for SRR applications in many parts of the world, including Europe, Australia, Russia, and Chile, and is in progress in many others.").

[14] *Id.* ¶ 31.

[15] Former Strategic Automotive Radar Frequency Allocation Group et al Comments at 4 ("SARA Comments"); *see also* Alliance of Automobile Manufacturers, Inc. Comments at 2-3 ("Alliance Comments").

[16] *Notice* ¶ 31.

As CEA previously has explained, "international harmonization is crucial to enabling the most efficient deployment of next generation technology."[17] Commenters agree that "the proposed allocation is consistent with current efforts to create a globally harmonized spectrum allocation for vehicular radars in the 76-81 GHz band."[18] Indeed, Commissioner Clyburn recently noted that "[r]egional and global coordination and harmonization are key to getting the greatest possible benefit out of available spectrum."[19] There are, for example, numerous initiatives underway to deploy vehicular radar around the world in the 76-81 GHz band.[20] The United States can achieve faster, better results by leveraging these initiatives.[21]

IV. LICENSING VEHICULAR RADAR AND FOD OPERATIONS UNDER PART 95 WILL PROVIDE CRITICAL PROTECTION AGAINST INTERFERENCE

Due to the long-term safety applications of vehicular radar and autonomous vehicles, the Commission should adopt its proposal to shift vehicular radar operations away from the Part 15 unlicensed model to the Part 95 licensed regime, which, unlike Part 15, provides a certain amount of interference protection.[22] The record demonstrates that, "if operated without interference, [vehicular radar operations] can substantially reduce injuries and death due to

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[17] *See, e.g.*, Comments of Consumer Electronics Association, GN Docket No. 14-177 et al (filed Jan. 15, 2015) at 11-12.

[18] SARA Comments at 6; *see also* Continental Comments at 1 ("The proposed expansion would also be helpful in creating a globally harmonized spectrum allocation for vehicular radars in the 76-81 GHz band."); TIA Comments at 2-3.

[19] FCC, Remarks of Commissioner Mignon L. Clyburn, 4th Annual Americas Spectrum Management Conference, at 5 (Nov. 13, 2014), available at http://transition.fcc.gov/Daily_-Releases/Daily_Business/2014/db1113/DOC-330471A1.pdf.

[20] *See, e.g.*, Davide Brizzolara, Band Substance – Radio based driver assistance systems are evolving from comfort functions to those for car safety. These functions require higher available bandwidth – 79 GHz offer many advantages, Vision Zero International, June 2013, available at http://viewer.zmags.com/publication/783832a6#/783832a6/56 (describing vehicular radar projects in the 76-81 GHz band in France and Germany).

[21] *See* TIA Comments at 2 ("global coordination regarding spectrum policy [facilitates] economies of scale in manufacturing and technology development").

[22] *See Notice* ¶ 38 ("A unified licensed approach for all vehicular radars under our Part 95 rules can offer a level of interference protection that the Part 15 rules cannot provide.").

automobile collisions."[23] Mercedes-Benz's observes that "Part 95 grants the important advantage of a formal interference protection for qualifying technologies."[24] The increased level of interference protection will undoubtedly benefit future vehicular radar deployment, which will only increase with increasingly autonomously driving vehicles.[25] Furthermore, the Part 95 licensed-by-rule regime, like Part 15, avoids the "burdens" of obtaining individual licenses for particular uses.[26] The Commission also should license radar systems that detect FOD at airport facilities under Part 95. As explained below, these systems are unlikely to interfere with vehicular radar systems and properly are consolidated in a similar licensing regime. Shifting to Part 95 for vehicular and FOD radar operations makes sense and does not carry disadvantages.[27]

V. THE COMMISSION SHOULD PERMIT OTHER OPERATIONS IN THE BAND ONLY TO THE EXTENT THEY ARE PROVEN NOT TO INTERFERE WITH VEHICULAR RADAR SYSTEMS

The *Notice* and some commenters raise the possibility of authorizing additional radar and non-radar technologies in the same band as the proposed vehicular radar expansion. The Commission must carefully consider such proposals, as authorizing systems that would interfere with vehicular radar would directly contravene the Commission's well-intended proposal to facilitate advanced deployment of vehicular radar operations. With respect to radio astronomy, the Commission is correct that the "proposed radar operations will be compatible with incumbent [radio astronomy] operations in the 76-81 GHz band" and that "the same technical principles that already allow successful shared operation in the 76-77 GHz band should apply in the larger 76-

[23] Delphi Automotive Systems Comments at 1 ("Delphi Comments"); *see also* SARA Comments at 8.

[24] Mercedes-Benz Comments at 3.

[25] *See id*.; Delphi at 1 ("the added level of interference protection is beneficial to the future of vehicular radar"); Alliance Comments at 3.

[26] Alliance Comments at 3.

[27] *See* Delphi Comments at 1 ("Delphi does not see any disadvantages in moving to Part 95 as outlined in the NPRM….").

81 GHz range."[28] Thus, there is no need to impose any specific mitigation requirements on vehicular radar systems with respect to radio astronomy users.

A. Radar and Non-Radar Proposals

Just as they are in the 76-77 GHz band, vehicular radar operations in the 76-81 GHz band are compatible with radar systems that detect FOD at airport facilities. These detection radars have limited geographic usage that does not include roadways, and thus they are unlikely to interfere with vehicular radar systems.[29] The Commission therefore should adopt its proposal to consolidate the FOD detection radar operations in the 76-81 GHz band under Part 95 on a non-exclusive licensed basis, consolidating all radar operations operating in the 76-81 GHz range. CEA applauds this approach to "promot[ing] spectrum efficiency and maximiz[ing] the shared use" of spectrum.[30] Similarly, level probing radars ("LPRs") should be compatible with vehicular radar operations because LPRs are mounted in tanks or on bridges in fixed locations pointing downward.[31]

The Commission should not address aircraft-mounted radar or other proposed operations (including proposals such as helicopter-borne radar operations[32] and mapping and geographic information systems[33]) at this time. There is an insufficient record to support expanding the use of aircraft-mounted radar on the ground. While such systems clearly provide public benefits, most notably reducing aircraft wingtip collisions, they are likely to interfere with vehicular radar

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[28] *Notice* ¶ 33.

[29] *Id.* ¶ 47 ("[T]here is good reason to conclude that, if vehicular radars can co-exist with FOD detection radars in 76-77 GHz band, then both vehicular radars and FOD detection radars operating under the Part 95 rules will be able to operate successfully throughout the 76-81 GHz band.").

[30] *Notice* ¶ 48.

[31] *Notice* ¶ 23.

[32] Rockwell Collins Comments at 5-6.

[33] Trimble Navigation Comments at 5, 11.

applications. The Commission should decline to authorize such operations in the same band as vehicular radar unless there is a clear path to keeping the power of such applications out of roadways.

B. Radio Astronomy

The Commission should decline to impose overly stringent mitigation requirements with respect to radio astronomy users.[34] The Commission previously established that vehicular radars and radio astronomy services are compatible in the 76-77 GHz band.[35] The Commission should rely on this same conclusion in authorizing vehicular radar operations in the 76-81 GHz band. Specifically, the Commission should rely on radio astronomy sites, which are already largely in remote areas to minimize interference from vehicular emissions, to take appropriate steps within their control, such as signage and terrain features, to minimize receipt of interference from vehicles outside their protected perimeters.[36] The Commission also should refrain from imposing either manual or automatic on/off switch requirements due to concerns about reliability and safety, as well as cost. The Commission should instead encourage radio astronomy organizations to work with industry to develop best practices for the minimization of interference from vehicular radars to radio telescopes.

[34] *See, e.g.*, National Academy of Sciences' Committee on Radio Frequencies Comments at 9-11 and National Radio Astronomy Observatory Comments at 5-10 (suggesting measures to protect radio astronomy, such as equipping vehicular radars with a manual or automatic off/on switch, establishing location-based coordination zones, and other measures).

[35] *Notice* ¶ 34, n.70; *Vehicular Radar R&O*, 27 FCC Rcd at 7885, ¶ 15.

[36] *Notice* ¶ 21 ("RAS installations are remotely located to provide interference protection from active services. The Commission previously concluded that there is very negligible risk of potential interference to RAS equipment from vehicular radars in the 76-77 GHz band.").

VI. CONCLUSION

For the reasons discussed above, the Commission should adopt its proposals designed to facilitate the commercial deployment of vehicular radar technologies in the 76-81 GHz band and should refrain from authorizing services in the band that would undermine such deployment.

Respectfully submitted,

CONSUMER ELECTRONICS ASSOCIATION

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