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July 21, 2009

FILED/ACCEPTED
JUL 21 2009
Federal Communications Commission
Office of the Secretary

Ms. Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: Amendment of Section 15.253 of the Commission's Rules Regarding Operation within the Band 76.0-77.0 GHz (vehicle radar systems)

Dear Ms. Dortch:

Enclosed herewith for filing, on behalf of Toyota Motor Corporation (TMC), are an original and nine (9) copies of our "PETITION FOR RULEMAKING" regarding the above-referenced proceeding. We are resubmitting our petition, originally filed on May 1, 2009, in response to our recent discussions with staff of the FCC's Office of Engineering and Technology to clarify certain issues relating to TMC's proposals for amending Section 15.253 of the Commission's rules.

If you have any inquiries or correspondence concerning this matter, please feel free to contact me at 202-463-6824, or my staff, Ms. Megumi Suzuki, at 202-463-6821.

Sincerely,

Chris Tinto
Vice President, Technical and Regulatory Affairs
Toyota Motor North America, Inc.

Enclosures

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Before the
Federal Communications Commission
Washington, D.C. 20554

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In the Matter of	)
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Amendment of Section 15.253 of the Commission's Rules Regarding Operation within the Band 76.0-77.0 GHz (vehicle radar systems)	)

PETITION FOR RULEMAKING

OF THE

TOYOTA MOTOR CORPORATION

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Submitted: May 1, 2009
Resubmitted: July 21, 2009

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PETITION FOR RULEMAKING

OF THE

TOYOTA MOTOR CORPORATION

SUMMARY

Pursuant to Section 1.401 of the Federal Communications Commission's (FCC's) Rules,[1] Toyota Motor North America, Inc. (TMA), on behalf of Toyota Motor Corporation (TMC) hereby submits this petition for rulemaking to amend 47 C.F.R., Part 15, Section 15.253, "Operation within the bands 46.7-46.9 GHz and 76.0-77.0 GHz,"[2] to enable the introduction of new vehicular technologies in the United States that can help enhance collision avoidance and safety, and also contribute to driver convenience. TMC believes that the radiated emission limits specified in Section 15.253 of the FCC's Rules are based on overly conservative assumptions and requests that the Commission amend this rule section to provide for reasonable and technically supportable limits for radiated emissions that will be based on preventing unwanted electromagnetic interference.

[1] 47 C.F.R. §1.401.
[2] 47 C.F.R. §15.253.

I. INTRODUCTION

In 1995, the FCC adopted the rules and emission limits for vehicular radar systems set forth in Section 15.253 of the Commission's Rules and Regulations.[3] At that time, technologies for vehicle safety support systems were still in the early stages of development. However, since then there has been significant growth in the use of automobile radar systems, and it is anticipated that these systems will become relatively commonplace within a few years as a result of consumer demand and the desire to increase vehicular comfort and safety.[4] Indeed, the Commission itself noted its expectation several years ago that vehicular radar will soon become "as essential to passenger safety as airbags in motor vehicles."[5]

TMC has developed advanced vehicular technologies for "stop and go" adaptive cruise control (ACC) and for rear pre-collision (RPCS) systems. These systems are part of TMC's Integrated Safety Management Concept – an expression of the direction of Toyota's development of new technologies to help enhance the safety of vehicles.[6] ACC is designed to assist drivers by controlling acceleration and braking to help provide seamless control in driving environments, from high speed cruising to driving in congested traffic. RPCS is designed to help occupants in certain lower-speed rear-end collisions by incorporating a rear-end collision alert signal using lamps for the driver of the following vehicle, and a pre-collision "intelligent" head restraint which helps mitigate against whiplash injuries.

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[3] In the Matter of 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, ET Dkt 94-124, *First Report and Order and Second Notice of Proposed Rulemaking*, FCC 95-499, 11 FCC Rcd 4481 (1995) (Millimeter Wave First Report and Order).

[4] *See, e.g.,* Steven Ashley, "Driving Toward Crashless Cars," *Scientific American*, December 2008, pp.86-94.

[5] In the Matter of Review of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, *Report and Order,* 17 FCC Rcd. 7435, 7459 (2002).

[6] *See* "Toyota Strengthens Efforts to Develop Safe Vehicles," Toyota Motor Corporation News Release (August 26, 2006), available at http://www.toyota.co.jp/en/news/06/0825.html.

Toyota has been showing strong initiative in introducing various automobile safety systems around the world.[7] One of Toyota's goals is to realize integrated vehicular safety based on "omni-directional" monitoring systems that use millimeter wave radar. Such systems would incorporate both RPCS and "stop and go" ACC, and are an important part of helping to achieve Toyota's objectives of promoting consumer and vehicular safety. Statistics from the National Highway Traffic Safety Administration (NHTSA) show that rear end collisions account for 28% of all crashes[8] and 34% of all whiplash injuries[9] in the United States, resulting in societal costs of approximately 8.5 billion dollars annually.[10] The introduction of ACC and RPCS is expected to help reduce the number of these collisions, and thus have a positive societal impact.

ACC and RPCS use millimeter wave radar beams emitted from antennas mounted in the front or rear of a vehicle. The frequencies used are located in the 76-77 GHz band, and therefore are subject to the limits for radiated emissions specified in Section 15.253 of the Commission's Rules. Specifically, the Commission's limits on radiated emissions in Section 15.253 are specified in terms of whether a vehicle is "in motion" or is "not in motion."[11] For forward-looking vehicle-mounted field disturbance sensors, if the vehicle is in motion, the average power density of any emission within the specified bands cannot exceed 60 $\mu W/cm^2$ at a distance of 3 meters from the exterior surface of the radiating structure. For side-looking or rear-looking vehicle-mounted radars

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[7] These technologies include, but are not limited to: *Lane Keep Assist, Vehicle Stability Control and Pre-Collision System.*

[8] *See, e.g.,* Kanianthra, Joseph N., Ph.D. "Integrated Safety: Will Technologies Accelerate Safety Delivery?" *Society of Automotive Engineering Government Industry Meeting* (May 2007), available at http://www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/NRD/Multimedia/PDFs/Public%20Paper/SAE/2007/2007%20SAE%20Gov%20Ind%20Mtg_Kanianthra.pdf.

[9] *Federal Motor Vehicle Safety Standards; Head Impact Restrains, 49 CFR Part 571 Final Rule,* Docket No. NHTSA-2004-19807, National Highway Traffic Safety Administration, Department of Transportation (December 2004).

[10] *See* "Head restraints are improving but not fast enough," *IIHS Status Report, Vol. 42, No. 8,* Aug. 4, 2007.

[11] 47 C.F.R. §15.253(b).

when a vehicle is in motion the power density cannot exceed 30 $\mu W/cm^2$ at a distance of 3 meters from the radiating structure. For vehicles not in motion, the power density of any emission within the bands cannot exceed an average power density of 200 nW/cm^2 at a distance of 3 meters from the exterior surface of the radiating structure. There is also a requirement that peak power density cannot exceed a value 20 dB (100 times) greater than the value for average power density.[12]

TMC believes that the current emissions limits governing the operation of vehicle radar systems at 76-77 GHz are too conservative. These limits were developed nearly fifteen years ago based on concerns regarding human exposure to radio frequency (RF) energy. Today, it is apparent that RF exposure concerns can be readily addressed without the need for the stringent emissions limits set forth in the rule. Given the acknowledged important public safety benefits that attend the continued development and deployment of vehicle radar systems, this Petition respectfully urges that the Part 15 emissions limits governing 76-77 GHz systems be modified, and based instead on the potential for harmful electromagnetic interference.

II. BACKGROUND

A. PUBLIC POLICY CONSIDERATIONS FAVORING THE CONTINUED DEVELOPMENT AND DEPLOYMENT OF VEHICLE RADAR SYSTEMS AT 76-77 GHz

Commencement of the requested rulemaking proceeding will continue to help advance the acknowledged public interest benefits to the American public of potentially improving highway safety.[13] The Commission for years has been pursuing the express goal of "ensur[ing] that vehicle

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[12] 47 C.F.R. §15.35(b).

[13] *Millimeter Wave First Report and Order* at 4485. *See also* In the Matter of Amendment of Part 2 of the Commission's Rules to Realign the 76-81 GHz band and the Frequency Range Above 95 GHz Consistent with the International Allocation Changes; Amendment of Part 2 of the Commission's Rules to Allocate Additional Spectrum to the Inter-Satellite, Fixed, and Mobile Services and to Permit Unlicensed Devices to Use Certain Segments in the 50.2-50.4 GHz and

radar systems will have sufficient spectrum and design flexibility to develop their systems successfully."[14] Indeed, the Commission has taken affirmative measures to ensure that interference and emissions limits do not "increase the cost" of unlicensed vehicular radar devices at 76-77 GHz in a manner that would

> result in the delay or interruption of the availability of these beneficial devices to the public. Depriving the public or eliminating the availability of these unlicensed devices, which will enhance the safety of travel of the public via motor vehicles would be contrary to the public interest.[15]

The Commission's desire to promote continued innovation in vehicular radar technology is laudable, given its expectation – with which TMC agrees – that these devices will very soon be as ubiquitous and "essential to passenger safety as airbags in motor vehicles."[16]

B. CURRENT BASIS FOR RADIATED EMISSION LIMITS IN SECTION 15.253

The radiated emission limits adopted by the FCC in Section 15.253 were based on a consideration of the potential for human exposure to harmful RF energy.[17] At the time of adoption of these limits the Commission was considering revising its guidelines for human exposure to RF energy but had not yet finalized these guidelines.[18] The Commission subsequently adopted final guidelines for RF exposure and issued OET Bulletin 65 to provide guidance on compliance with its

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51.4-71.0 GHz Bands, *Report and Order*, 19 FCC Rcd 3212, 3218 (2004) (recognizing that "vehicular radar operations in [the 76-77 GHz] band may be able to increase the level of safety on highways and benefit the public") (76-81 GHz Order).

[14] *Millimeter Wave First Report and Order* at 4490.

[15] In the Matter of Amendment of Parts 2, and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications, *Third Memorandum Opinion and Order*, 15 FCC Rcd 10515, 10518 (2000).

[16] In the Matter of Review of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, *Report and Order*, 17 FCC Rcd 7435, 7459 (2002).

[17] *Millimeter Wave First Report and Order* at para. 26.

[18] In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, *Notice of Proposed Rulemaking*, 8 FCC Rcd 2849 (1993).

RF exposure rules.[19]

The emission limits in Section 15.253 were derived assuming "worst case" conditions for human exposure and based on the most restrictive standards for human exposure that were then under consideration for adoption by the FCC. For example, the value of 200 nW/cm^2 was derived by assuming that a given device would cause exposure at a level of 1.0 mW/cm^2 at a distance of 2-4 cm from the radiating structure, and then extrapolating this value to calculate the resulting power density at a distance of 3 meters assuming "far-field" conditions.[20] TMC believes that the assumptions made for this calculation were overly cautious considering the unlikely event that an individual could be 2-4 cm from the radiating structure for any significant period of time, especially given the 30-minute averaging interval subsequently adopted by the FCC for the general population.

The Commission's RF exposure regulations are specified in Sections 1.1307(b), 1.1310, 2.1091 and 2.1093 of the FCC's Rules.[21] The RF exposure limits adopted by the FCC for frequencies that include the 76-77 GHz band are a power density level of 1.0 mW/cm^2 with a 30-minute averaging interval for "general population/uncontrolled" exposure and 5.0 mW/cm^2 with a 6-minute averaging interval for "occupational/controlled" exposure.[22]

The FCC's OET Bulletin 65 provides detailed guidance for determining compliance with the FCC's RF exposure limits. As noted previously, this information was not available when the

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[19] In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, *Report and Order*, 11 FCC Rcd 15123 (1996). *See also* In the Matter of Procedures for Reviewing Requests for Relief From State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act of 1934; Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation; Petition for Rulemaking of the Cellular Telecommunications Industry Association Concerning Amendment of the Commission's Rules to Preempt State and Local Regulation of Commercial Mobile Radio Service Transmitting Facilities, *Second Memorandum Opinion and Order and Notice of Proposed Rulemaking*, 12 FCC Rcd 13494 (1997).

[20] *Millimeter Wave First Report and Order* at 4493.

[21] 47 C.F.R. §§1.1307(b), 1.1310, 2.1091 and 2.1093.

[22] 47 C.F.R. §1.1310.

radiated emission limits for Section 15.253 were adopted in 1995, and the latter limits were based on assumptions that are overly conservative for the systems used for typical vehicular radar systems. Bulletin 65 describes in detail how power density can be predicted from high gain, directional antennas such as those used for automotive radar systems.[23] The calculation methods described are much more detailed than those originally used for calculating the limits of Section 15.253.

A sample calculation using the equations specified in Bulletin 65 is useful for illustration. A typical vehicular radar system might have a peak power level of 20 watts EIRP and a duty cycle of 0.1 resulting in an average EIRP of 2 watts. Assuming a hypothetical gain of 30 dBi (1000), the average power transmitted to the antenna would be about 2 milliwatts. Assuming a hypothetical physical area for the antenna of 20 cm^2, Equation 11 in Bulletin 65 can be used to predict the maximum average power density directly in front of this antenna. The value calculated, 0.4 mW/cm^2, is *less than half* of the exposure limit and is predicted in an area where there is little likelihood of exposure. Also, in such a hypothetical case, Equation 13 from Bulletin 65 would predict a maximum average power density anywhere in the near field of this antenna to be about 0.2 mW/cm^2 (assuming an aperture efficiency of 0.5), which is about one-fifth of the exposure limit for the general population.

For the systems it would like to introduce in the United States, TMC has followed the procedures described in Bulletin 65 and has also obtained measurement data to demonstrate compliance of its systems with the applicable FCC RF exposure limits.[24] TMC's measured data clearly demonstrate that these systems comply with the FCC's RF exposure limits even though they may exceed the overly restrictive limits specified in Section 15.253 for radiated emissions.

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[23] *See* OET Bulletin 65, "Aperture Antennas," pp. 26-30.
[24] TMC can provide details upon request.

C. INTERNATIONAL EMISSION STANDARDS FOR 76-77 GHZ RADAR SYSTEMS

Automotive radar systems have been the subject of several standards, discussion papers, and recommendations. The European Telecommunications Standards Institute (ETSI) standard EN 301 091-2 specifies requirements for short-range automotive radar in the 76-77 GHz band.[25] The scope of the ETSI standard states that it is intended to cover the provisions of Directive 1999/EC[1] (Radio and Telecommunication Terminal Equipment (R&TTE) Directive article 3.2, which states that "...radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference").[26] The ETSI standard specifies that the radiated spatial peak power ("e.i.r.p.") shall not exceed the limits specified in clause 7.2.3 of EN 301-091-1.[27] That value is 55 dBm (approximately 316 watts) peak power ("e.i.r.p.") for both fixed and steerable antennas.[28]

In Japan, the Association of Radio Industries and Businesses (ARIB) Standard STD-T48 provides the following specifications for emissions in the 76-77 GHz band.[29] Transmit power is less than or equal to 10mW with a limit on antenna gain of 40 dBi. Similarly, Recommendation ITU-R M.1452 of the International Telecommunications Union (ITU) suggests a peak power limit of 10 mW for these systems with a limit on antenna gain of 40 dBi.[30]

Many countries have adopted the power and technical specifications recommended by ETSI,

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[25] European Telecommunications Standards Institute (ETSI) standard EN-301 091-2 v1.3.2 (2006-11).

[26] *Id.* 1. Scope, page 5. *See also* Radio and Telecommunication Terminal Equipment (R&TTE) Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity, available at http://ec.europa.eu/enterprise/rtte/dir99-5.htm#Article%203.

[27] *Id.* 4. Technical requirement specifications, 4.2.1.3.

[28] European Telecommunications Standards Institute (ETSI) standard EN-301 091-1 v1.3.3 (2006-11), 7.2.3 (Limits).

[29] ARIB STD-T48 2.1 (2005).

[30] International Telecommunications Union, Recommendation ITU-R M.1452, (Question ITU-R 205/8), 2000.

ARIB and the ITU. Table 1 below provides an overview of major international standards and regulations used for the 76-77 GHz band.

Table 1: Major International EMI Standards and Regulations for 76-77 GHz Band

Organization (Country)	**FCC (US)**	**MIAC[31] (Japan)**	**ETSI (Europe)[32]**	**ACMA[33] (Australia)**	**ITU**
Standard	§15.253	ARIB STD-T48 2.1	EN301 091-1 ver.1.3.3	Radiocommunications (Low Interference Potential Devices) Class License 2000	ITU-R M. 1452
Range	76-77 GHz	76-77 GHz	76-77 GHz	76-77 GHz	76-77 GHz
Operating Band	1 GHz	1 GHz	1 GHz	1 GHz	1 GHz
Radiated Emission Limit (power density)	In motion: forward $\leq$60μW/cm^2@ 3m; side/rear $\leq$30μW/cm^2@ 3m Not in motion: $\leq$200nW/cm^2@ 3m	----	----	----	----
Output Power Limit	----	10mW +50/-70% (Antenna input)	----	----	Power to antenna $\leq$10 mW
Antenna Gain	----	$\leq$40 dBi	----	----	$\leq$40 dBi
EIRP	----	Peak Power $\leq$50 dBm (Converted)	Peak Power: EIRP $\leq$ 55 dBm Avg Power: EIRP $\leq$ 50 dBm	Peak Power: EIRP $\leq$ 25W (44dBm Converted)	Peak Power $\leq$50 dBm (Converted)

[31] Ministry of Internal Affairs and Communications, Japan.

[32] TMC research indicates that European countries that have adopted the ETSI recommendations include: Iceland, Ireland, Great Britain, Italy, Ukraine, Estonia, Austria, Netherland, Kazakhstan, Cyprus, Greece, Croatia, Switzerland, Sweden, Spain, Slovakia, Slovenia, Czech Republic, Denmark, Germany, Norway, Hungary, Finland, France, Bulgaria, Belgium, Poland, Portugal, Marta, Latvia, Lithuania, Romania, Luxemburg, Russia, Lichtenstein, and Georgia.

[33] *See* Federal Register of Legislative Instruments, Office of Legislative Drafting and Publishing, Australia. Radiocommunications (Low Interference Potential Devices) Class License Variation Notice 2008 (No. 1), 15 Jan 2009 (F2009L00038), Schedule 1, Item 48, "Radiodetermination transmitters," 76-77 GHz.

For comparison purposes, TMC believes that the radiated emission limits specified by the FCC could be interpreted as limiting EIRP to $\leq$ 48.3 dBm for forward-looking radar and < 45.3 dBm for side-looking or rear-looking radar for the case when a vehicle is "in motion" and $\leq$ 23.5 dBm for the "not in motion" case. This interpretation is based on calculations using Equation 18 in OET Bulletin 65 for far-field conditions at a distance of 3 meters from the radiating antenna. TMC research indicates that of fifty-eight countries surveyed that have regulations in this area, the United States and its territories, Canada, Singapore, Thailand and Taiwan are the only countries which have adopted "not-in motion" criteria. As indicated in Table 1, the majority of countries surveyed have adopted either the ARIB or ETSI standard.

In 2001, the Australian Communications Authority (now the Australian Communications and Media Authority (ACMA)) published a review of devices and regulatory schemes for vehicular radar systems that provides a discussion of electromagnetic interference (EMI) issues relevant to these systems.[34] The ACMA report points out that characteristics of automotive radar systems and propagation factors for frequencies in the 76-77 GHz band mitigate against there being a significant risk for EMI from these systems.[35] The report notes that although these systems may operate at peak (pulse) power levels up to 20 watts (20 W) EIRP, propagation loss in this band is much higher than that for lower frequencies. For example, at a given distance from a radiating source it would take an EIRP of about 20 watts at 77 GHz to result in power density levels comparable to those radiated by 20 mW at 2.4 GHz or 3 mW at 900 MHz. In other words, these systems are short-range

[34] "*A Review of Automotive Radar Systems - Devices and Regulatory Frameworks*," Spectrum Planning Team, Radiofrequency Planning Group, Australian Communications Authority (ACA), Document SP 4/01, April 2001, available at: http://www.acma.gov.au (A Review of Automotive Radar Systems).

[35] *Id.* at 7.3.

applications and pose limited risk for interference.[36] The limited risk of interference posed by these systems is also recognized by the ETSI standard in its system reference document.[37]

The ACMA report notes that the emissions from automotive radar systems are generally confined to flat narrow beams along highways and roads, propagation is essentially line-of-sight, and transmitting antennas are typically mounted at heights one meter or less from the ground. Therefore, the propagated beam, and subsequent potential for EMI, generally does not extend far. Also, the report continues, "above horizon" radiation is limited by the relatively narrow antenna beam width in elevation (<4°), and the systems often operate in built-up areas and along tree-lined roads.

The ACMA Report concludes that taking all these factors into consideration, the risk of EMI from these systems to other services that might be operated in the 76-77 GHz band in the future is expected to be limited or "non-existent."[38] The report does raise the question of possible localized effects for radio astronomy or earth station receivers due to their high sensitivities. However, the report concludes, should any future EMI problems arise, simple measures could be taken such as placement of local signage requesting either that drivers turn off automotive radar devices in sensitive areas or lower their vehicle speed (to cause the device to shut off automatically). The report notes that radio astronomy sites already take such precautions to prevent interference from ignition noise due to motor vehicles.

The ACMA Report concludes that an "appropriate power limitation" for these systems

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[36] This conclusion is buttressed by TMC's own experience. In 2006, TMC introduced both "stop and go" ACC and RPCS in Japan, and immediately followed suit in Europe, introducing RPCS in 2006, and ACC in 2007. Significantly, no incidents of EMI have been reported for these systems since their introduction.

[37] European Telecommunications Standards Institute, System Reference Document for automotive collision warning Short Range Radar, ETSI TR 102 263 V1.1.2 (2004-02), Annex C.1 (Coexistence studies).

[38] *A Review of Automotive Radar Systems* at 7.3.

should be a maximum peak EIRP of 25 watts.[39] This is the value adopted in Australia for "Low Interference Potential Devices" (LIPD) in the 76-77 GHz band classified as "Radiodetermination Transmitters."

III. SECTION 15.253 EMISSION LIMITS SHOULD BE REVISED TO ADDRESS THE POTENTIAL FOR HARMFUL ELECTROMAGNETIC INTERFERENCE RATHER THAN THE POTENTIAL FOR HARMFUL RF EXPOSURE

As noted, TMC would like to introduce its advanced "stop and go" ACC and RPCS systems into the U.S. market. However, TMC's radar-based systems must be operational at all times while a vehicle is being driven, since the distance between the subject vehicle and others must be continuously monitored even while the vehicle is "not in motion." TMC's data indicate that the TMC systems will have difficulty meeting the "not in motion" emission limit of 200 nW/cm^2 at 3 m. This barrier could prevent the introduction of vehicle radar systems into the U.S. market.

TMC believes that limits for radiated emissions in Section 15.253 should be based on consideration of the potential for EMI from vehicle radar systems rather than on the potential for harmful human RF exposure. As noted, at the time that these emission limits were developed nearly fifteen years ago, it was believed that the primary consideration for emission limits from these systems should be human exposure to RF energy, especially given the fact that there was no evidence of undesirable EMI from these systems. However, the Commission now has extensive requirements in place for ensuring safe levels of exposure to vehicle radar systems. TMC believes it is no longer supportable or desirable from a public interest perspective to base limits for radiated emissions in Section 15.253 on exposure considerations that yield overly conservative results.

Furthermore, TMC notes that applicants for FCC equipment authorization under Part 15 already are required to comply with the Commission's requirements for RF exposure. It is thus

[39] *Id.* at 7.4.

unnecessary and duplicative to also base radiated emission limits in Section 15.253 on exposure considerations, particularly when those limits are too conservative. As mentioned, TMC has determined that its advanced vehicle radar systems will comply with the relevant RF exposure guidelines based on the guidance for determining compliance provided in the FCC's OET Bulletin 65 and also based on TMC's own measurement data. Exposure to TMC's radar systems will not exceed the FCC's limits for human exposure at the closest distances from the surface of a radiating structure that are accessible to workers or to the general public.

For these reasons, TMC hereby requests that the Commission revise the emission limits in Section 15.253 and base them on the potential for electromagnetic interference rather than on exposure to RF energy. These limits could be defined either in terms of allowable radiated power (EIRP) or power density at a distance (*e.g.*, 3 meters). The examples given in the previous section indicated that many international standards and governmental authorities have adopted limits that differ significantly from those in Section 15.253. The consensus appears to be that a maximum peak EIRP of 55 dBm (316 W) is appropriate for radar systems in the 76-77 GHz frequency band given the relative lack of EMI potential for these systems. A peak EIRP of 55 dBm would result in a peak power density limit of approximately 279 $\mu W/cm^2$ at a distance of 3 meters from the radiating structure based on far-field calculations. However, TMC urges the Commission to specify its limits in Section 15.253 in terms of maximum peak power in conformance with other international standards for these frequencies. Furthermore, specifying a limit in terms of maximum peak power instead of power density obviates the need to specify limits based on beam direction (e.g., side-looking or rear-looking), as is the case for the existing rules.

TMC also believes that there should be no reason to specify different limits for radiated emissions that depend on whether a vehicle is in motion or not in motion. EMI considerations should be independent of whether a vehicle is in motion or not, and TMC therefore strongly

supports the promulgation of a uniform limit for radiated emissions regardless of whether a vehicle is in motion or not in motion.

TMC sees little prospect for harmful EMI based upon its requested rule change. In the United States, radiolocation services have a primary allocation status at 76-81 GHz, and, in 2004, the Commission adopted a further primary allocation at 76-77 GHz for the radio astronomy service (RAS), along with a secondary allocation for the space research service (SRS).[40] None of these services, however, heavily uses the spectrum at 76-77 GHz. In fact, the Commission has noted, consistent with the ACMA report discussed in Section II, that the risk of harmful interference to these services from unlicensed vehicular radar devices is both small and manageable. For example, RAS observatories "are few, and are sited and designed to protect from sources of interference," while SRS users similarly can "site earth stations or use shielding to protect their operations from vehicular radar operations."[41]

Bringing the FCC's emissions limits in Section 15.253 in line with international standards and recommendations will allow the introduction of advanced vehicular safety systems into the U.S. market. This development is expected to benefit consumers and will help encourage the development of future innovative technologies in the area of vehicular safety and comfort.

IV. CONCLUSION

For the reasons described above, TMC strongly urges the Commission to amend Section 15.253 of its Rules and Regulations to adopt reasonable and technically supportable limits for radiated emission levels in the 76-77 GHz frequency band as set forth herein. Specifically, TMC is proposing that the Commission amend its rules to eliminate the "not in motion" criteria in Section

[40] *See 76-81 GHz Order* at 3218. The Commission also has retained an existing secondary amateur service allocation in this band, but that allocation currently is suspended. *Id.*

[41] *Id.*

15.253 (b)1 and replace the existing applicable power density limits specified in Sections 15.253 (b)(2), and (b)(3), with a uniform limit for peak power not to exceed 55 dBm EIRP, in conformance with existing international standards and recommendations.

Respectfully submitted,

Christopher J. Tinto
Vice President
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Safety

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July 21, 2009