

# TOYOTA

TOYOTA MOTOR NORTH AMERICA, INC.

WASHINGTON OFFICE  
601 THIRTEENTH STREET, NW - SUITE 910 SOUTH, WASHINGTON, DC 20005

TEL: (202) 775-1700  
FAX: (202) 393-1142

July 18, 2011

FILED/ACCEPTED

JUL 18 2011

Federal Communications Commission  
Office of the Secretary

Ms. Marlene H. Dortch  
Office of the Secretary  
Federal Communications Commission  
445 Twelfth Street, S.W.  
Room TW-A 325  
Washington, D.C. 20554

**Re: Amendment of Sections 15.35 and 15.253 of the Commission's Rules Regarding  
Operation of Radar Systems in the 76.0-77.0 GHz Band.**

**Amendment of Section 15.253 of the Commission's Rules to Permit Fixed Use of  
Radar in the 76-77 GHz Band.**

Dear Ms. Dortch:

Enclosed herewith for filing, on behalf of Toyota Motor Corporation (TMC), are an original and nine (9) copies of our "COMMENTS" regarding the above-referenced proceedings.

If you have any inquiries or correspondence concerning this matter, please feel free to contact me at 202-463-6831, or my staff, Ms. Megumi Suzuki, at 202-463-6821.

Sincerely,



Kevin Ro  
National Manager  
Technical and Regulatory Affairs  
Toyota Motor North America, Inc.

Enclosures

FILED/ACCEPTED

JUL 18 2011

Federal Communications Commission  
Office of the Secretary

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

In the Matter of	)	
	)	
Amendment of Sections 15.35 and 15.253 of the Commission's Rules Regarding Operation of Radar Systems in the 76.0-77.0 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
	)	

**COMMENTS OF THE**

**TOYOTA MOTOR CORPORATION**

**TOYOTA MOTOR NORTH AMERICA, INC.**  
601 Thirteenth Street, NW  
Suite 910 South  
Washington, DC 20005  
(202) 463-6831

Kevin Ro  
National Manager  
Technical and Regulatory Affairs

Submitted: July 18, 2011

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List A B C D E

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

In the Matter of	)	
	)	
	)	ET Docket No. 11-90
Amendment of Sections 15.35 and 15.253 of	)	RM-11555
the Commission's Rules Regarding Operation	)	
of Radar Systems in the 76.0-77.0 GHz Band.	)	
	)	
Amendment of Section 15.253 of the	)	
Commission's Rules to Permit Fixed Use of	)	ET Docket No. 10-28
Radar in the 76-77 GHz Band.	)	

**COMMENTS OF THE  
TOYOTA MOTOR CORPORATION**

**SUMMARY**

Toyota Motor North America, Inc. (TMA), on behalf of Toyota Motor Corporation (TMC) hereby submits comments in response to the *Notice of Proposed Rule Making* issued by the Commission in the above-captioned proceeding.<sup>1</sup> As discussed in our original Petition for Rule Making, TMC believes that the radiated emission limits specified in Section 15.253 of the FCC's Rules are based on overly conservative assumptions.<sup>2</sup> We requested 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.

As set forth below, TMC supports the Commission's proposals in the NPRM with respect to vehicular radar systems. However, TMC is concerned with the Commission's proposal to generally

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<sup>1</sup> See 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, *Notice of Proposed Rule Making* (rel. May 25, 2011) (NPRM).

<sup>2</sup> See Petition for Rulemaking of the Toyota Motor Corporation, RM-11555 (filed July 21, 2009) (Toyota Petition).

allow fixed radar installations regardless of location, pending a thorough analysis of the potential for electromagnetic interference from these systems to vehicular radar. TMC respectfully urges the Commission to separate these proposals and to approve the changes for vehicular radar, but defer action on allowing unlicensed fixed systems in this frequency band.

## **I. INTRODUCTION AND BACKGROUND**

In the Toyota Petition, TMC explained why it has proposed that the FCC modify Section 15.253. 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. These systems increase vehicular comfort and safety, and in the past the Commission has noted that vehicular radar will soon become “as essential to passenger safety as airbags in motor vehicles.”<sup>3</sup>

TMC has developed advanced vehicular technologies for “stop and go” adaptive cruise control (ACC) and for rear pre-collision (RPCS) systems. ACC assists drivers by controlling acceleration and braking to provide 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 for the driver of the following vehicle, and a pre-collision “intelligent” head restraint to mitigate against whiplash injuries. Details of these systems were discussed in the Toyota Petition and in subsequent material submitted into the record of this proceeding.

Toyota intends to enhance vehicular safety based on integrated “omni-directional” monitoring systems that use millimeter wave radar. Such systems would incorporate both RPCS and “stop and go” ACC. In our petition we referenced statistics from the National Highway Traffic

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<sup>3</sup> 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).

Safety Administration (NHTSA) that illustrate the high incidence rate and annual societal costs of rear end collisions in the United States. TMC believes that the introduction of ACC and RPCS will help reduce the number of these collisions.

ACC and RPCS use millimeter wave radar beams that transmit in the 76-77 GHz band. They are therefore subject to the limits for radiated emissions specified in Section 15.253 of the Commission's Rules. As noted in the Commission's NPRM, the limits on radiated emissions in Section 15.253 are specified in terms of whether a vehicle is "in motion" or is "not in motion."<sup>4</sup> 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.<sup>5</sup>

These limits were developed over fifteen years ago based on concerns regarding human exposure to radio frequency (RF) energy, and, as explained in our petition, TMC believes that these limits are too conservative and are preventing the introduction of new technologies that utilize frequencies in this band. RF exposure concerns are now addressed separately in the Commission's Rules,<sup>6</sup> and we believe that there is no need to base 76-77 GHz emission limits on these concerns. Instead, as explained in the Toyota Petition, TMC proposes that the emission limits in Section 15.253 be based on the prevention of potentially harmful electromagnetic interference.

The NPRM was issued in response to the Toyota Petition along with a related petition for rulemaking filed by Era Systems Corporation (Era) (Era Petition).<sup>7</sup> The Commission now is proposing to amend Sections 15.253 and 15.35 to adopt new emission limits that would apply to both vehicular and fixed radar systems that use frequencies in the 76-77 GHz band. We discuss these two different applications below.

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<sup>4</sup> 47 C.F.R. §15.253(b).

<sup>5</sup> 47 C.F.R. §15.35(b).

<sup>6</sup> *See, e.g.*, 47 C.F.R. §§1.1307(b), 1.1310, 2.1091 and 2.1093.

<sup>7</sup> NPRM, para.1.

## II. RULE CHANGES PROPOSED FOR VEHICULAR RADAR SYSTEMS

The record in this proceeding generally supports the rule amendments proffered in the Toyota Petition. As the NPRM observes, comments filed by Denso Corporation; Denso International America, Inc.; the Strategic Automotive Radar Frequency Allocation Group (SARA); Mercedes-Benz USA, LLC (MBUSA); Fujitsu Ten Technical Center, USA, Inc.; and the Association of International Automobile Manufacturers, Inc. (AIAM)<sup>8</sup> all support TMC's request that the Commission revise Section 15.253 of its Rules to adopt reasonable and technically supportable limits for radiated emission limits in the 76-77 GHz frequency band allocated for vehicular radar systems.<sup>9</sup>

TMC also responded to concerns expressed by the National Radio Astronomy Observatory (NRAO) regarding potential interference to radio astronomy facilities.<sup>10</sup> TMC pointed out that the limits it has proposed are those recommended by ETSI and others (55 dBm peak power and 50 dBm average power), and that in terms of peak power, these levels are actually *lower* than those currently specified in Section 15.253. Therefore, TMC noted that NRAO's assessment of the magnitude of the changes to the emission limits proposed by TMC is not realistic. TMC's position on this point was echoed by MBUSA, which observed that it is unaware of its vehicular radar systems causing harmful interference to any U.S. radio telescope operations during its more than ten years of experience with such systems.<sup>11</sup> Significantly, the Commission has tentatively agreed with these assessments and notes that its proposed peak emission limit will actually increase the level of

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<sup>8</sup> Please note AIAM has been changed its name to the Association of Global Automakers as of January 2011 (<http://www.globalautomakers.org/media/press-release/2011/01/global-automakers-opens-new-washington-office>)

<sup>9</sup> See NPRM, para. 4.

<sup>10</sup> TMC Reply Comments (filed Oct. 8, 2009).

<sup>11</sup> MBUSA Reply Comments (filed Oct. 8, 2009).

interference protection for radio astronomy stations and other users of the 76-77 GHz band.<sup>12</sup>

The Toyota Petition proposed that the Commission's current emission criteria, based on whether a vehicle was "in motion" or "not in motion," be eliminated in favor of the establishment of a single emission limit that would apply in all directions from a vehicle. We are pleased that the Commission agrees that this is desirable and proposes to eliminate the "in motion" and "not in motion" distinction.<sup>13</sup> As noted by TMC previously, whether a vehicle is or is not in motion would not impact concerns over electromagnetic interference. Also, these systems are independently required to comply with the FCC's RF exposure rules, rendering the basis for the original emission limits no longer relevant.

In the NPRM, the Commission proposes to adopt the changes to Sections 15.253 and 15.35 requested by TMC. The proposed limit for average power density is  $88 \mu\text{W}/\text{cm}^2$  at a distance of 3 meters and the proposed limit for peak power density is  $279 \mu\text{W}/\text{cm}^2$  at 3 meters. These limits would apply regardless of the illumination direction of the vehicular radar system, and TMC continues to support their adoption as in the public interest.

TMC also had proposed that the emission limits be specified in terms of maximum peak power to conform to other international standards for these frequencies.<sup>14</sup> As TMC discussed in the Toyota Petition, ETSI and other comparable standards are specified in terms of peak power. The Commission has asked for comments on TMC's proposal.<sup>15</sup>

TMC continues to believe that it is desirable to use maximum peak power for specifying limits in Section 15.253. This would make the new rules comparable to those established in other countries and would benefit the automotive industry with regard to the development of new

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<sup>12</sup> NPRM, para. 14.

<sup>13</sup> *Id.*, paras. 12 and 13.

<sup>14</sup> *See* Toyota Petition.

<sup>15</sup> NPRM, para. 15.

products and technology. Uniformity of standards also aids in cost reduction, a benefit for both the manufacturer and the consumer. Given that the NPRM provides no countervailing reasons that offset such public policy benefits, TMC strongly urges the Commission to resist specifying these limits in terms of the equivalent power density at distances of 3 meters and instead follow TMC's proposal to specify limits in terms of peak and average power.

Finally, TMC seeks clarification of the language used in the NPRM that refers to an average "power density" limit of 50 dBm and a peak "power density" limit of 55 dBm.<sup>16</sup> TMC assumes that the intended meaning is that the power density limits proposed by the Commission correspond to power limits of 50 dBm (average) and 55 dBm (peak), respectively, but would like to ensure that this assumption is accurate. (It should be also noted that the proposed rules set forth in Appendix A of the Notice specify power density at a distance of 3 meters, and do not refer to average or peak power.)

### **III. RULE CHANGES PROPOSED FOR FIXED RADAR SYSTEMS**

The NPRM also proposes to apply the new limits for Sections 15.253 and 15.35 to fixed radar transmitters in response to the Era Petition.<sup>17</sup> Era has requested the Commission to amend Section 15.253 to permit the use of 76-77 GHz fixed radars at airports for monitoring terrestrial vehicle movement.<sup>18</sup>

Specifically, Era requests that Section 15.253 be amended to permit the unlicensed use of fixed radars at airports under the following conditions: 1) the maximum power complies with the present limits for vehicles in motion, 2) radars must be professionally installed and may not exceed

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<sup>16</sup> *Id.*, para. 12.

<sup>17</sup> *Id.*, para. 1.

<sup>18</sup> *Id.*, para. 5. *See also* Era comments filed in response to "FCC Seeks Comment Regarding Possible Revision or Elimination of Rules Under The Regulatory Flexibility Act, 5 U.S.C. 610", DA 09-1307, CB Docket No. 09-102, released June 24, 2009.

the Maximum Permissible Exposure limits in Section 1.1310 of the rules, 3) radars may only be used at airports recognized by FAA and must be owned and operated by either the airport operator or an air carrier licensed by FAA, or operated on their behalf, 4) radars must be installed so as to limit the power flux density reaching roads used by the general public to  $-57 \text{ dBW/m}^2$  (peak), and 5) the installer must make measurements to verify the power flux density on public roads at time of installation. Era asserts that these fixed radars would be located high above the ground on structures such as rooftops or lamp posts.

In response to the Era Petition, the NPRM proposes to relax the rules for fixed radars in this band and to allow fixed radars to operate on an unlicensed basis. Further, the Commission professes its belief that fixed radars should be able to co-exist with vehicular radars because both would operate with the same restrictions on power and both would use antennas with narrow beamwidths. The Commission believes these factors would reduce the potential for a signal from one radar intercepting the main lobe of another and causing interference.<sup>19</sup> The Commission asserts that, in a “worst case” scenario, where two radars are aimed directly at one another, a fixed radar should have no more impact on a vehicular radar system than would another vehicular radar.

TMC agrees that allowing fixed radar applications at specific locations could be permitted, and TMC tentatively supports the proposal set forth in Era’s original petition for allowing such installations at airports, with the same restrictions on power as those proposed for vehicular radar. TMC recognizes that the Commission has already granted Era a temporary grant for two years to operate such systems, and we support this action.<sup>20</sup>

However, TMC does not believe that generally allowing fixed radar applications on an unlicensed basis and regardless of location is desirable. The NPRM does not provide an adequate

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<sup>19</sup> NPRM, para. 17.

<sup>20</sup> In the Matter of Era Systems Corporation Request for Waiver of Sections 2.803, 15.201 and 15.253 of the Commission's Rules, ET Docket No. 09-55, Order (2009).

technical rationale for expanding Era's original proposal in this fashion, and TMC believes that allowing widespread use of unlicensed fixed transmitters could seriously impact the safety and the practicality of deployment of vehicular radar systems due to the potential for electromagnetic interference.

TMC has obtained information from SARA that fixed 76-77 GHz installations can result in significant interference to automotive radar sensors. We understand that SARA intends to submit detailed comments in this proceeding that will summarize the preliminary data acquired through a European-funded project that is examining the risk of interference from fixed installations to vehicular radar. This project, known as "MOSARIM" ("More Safety for All by Radar Interference Mitigation") was initiated in 2010 and is expected to be completed by the end of 2012.<sup>21</sup> It is funded and led by a consortium made up of a substantial portion of the European automotive industry and the European Commission's Joint Research Centre (JRC). The MOSARIM project is designed to develop recommendations and guidelines for mutual interference mitigation techniques for vehicular radar systems and, also, to examine the potential for interference of fixed 76-77 GHz radar systems to vehicular radar systems. As noted, preliminary results from this project indicate that the Commission's proposal to expand the authorization of fixed radar installations in this frequency band may have serious consequences for vehicular radar.

It thus appears that the Commission's initial view that interference from unlicensed fixed radar installations would not be of significant concern is premature. Obviously, any significant interference to vehicular radar systems from fixed installations could have serious consequences with regard to safety, and we are confident that the Commission shares TMC's concerns that such scenarios be avoided. TMC believes that any fixed radar installations that may be approved by the Commission should be subject to specific requirements with respect to location, antenna height,

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<sup>21</sup> See [www.mosarim.eu](http://www.mosarim.eu)

power limitation, and antenna directionality. Such requirements for fixed installations would be needed to minimize the possibility of significant electromagnetic interference to vehicular radar systems on nearby roadways.

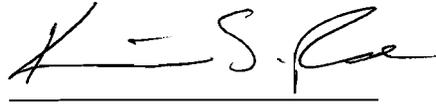
Because of the importance of the results from the MOSARIM project, and because data continue to be developed regarding the issue of interference from fixed radar systems in the 76-77 GHz band, TMC believes that the Commission should defer action on any decision regarding amending Section 15.253 with respect to allowing fixed radar applications on an unlicensed basis regardless of location. TMC believes that the Commission should separate the proposals made in the NPRM, approving the proposals made in TMC's petition with respect to vehicular radar but deferring action with respect to generally allowing unlicensed fixed radar installations. Deferring action on the latter issue will allow more time for a careful analysis of data acquired through the MOSARIM project and other means. This will help ensure that vehicular radar systems in the 76-77 GHz band operate in an environment free of potentially harmful and unsafe electromagnetic interference.

#### **IV. CONCLUSION**

For the reasons described above, TMC supports the Commission's proposal to amend Sections 15.253 and 15.35 of its Rules and Regulations regarding the authorization of vehicular radar systems. However, TMC continues to urge the Commission to specify limits for these systems in terms of maximum peak power instead of power density at a distance. Although TMC could support allowing certain fixed radar systems subject to technical restrictions and location, it does not believe that fixed systems should be generally allowed to operate on an unlicensed basis as proposed by the Commission. TMC's view on this latter point is based on our concern that

significant electromagnetic interference from such systems may occur that could compromise the safe operation of vehicular radar systems.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "K. S. Ro", is written over a horizontal line.

Kevin Ro  
National Manager  
Technical and Regulatory Affairs

Toyota Motor North America, Inc.  
601 Thirteenth Street, NW  
Suite 910 South  
Washington, DC 20005  
(202) 463-6831

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