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February 23, 2016

Via ECFS

Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Ex Parte* Filing of Trex Enterprises Corporation, ET Docket No. 15-26, RM-11666, ET Docket No. 11-90 and RM-11555, ET Docket No. 10-28, and WT Docket No. 11-202

Dear Ms. Dortch:

On February 11, 2016, John Lovberg, Trex Enterprises Corporation (“Trex”), and the undersigned, Thomas Cohen, Kelley Drye & Warren LLP, Counsel to Trex, had a telephone call with staff of the Office of Engineering and Technology concerning the above-referenced dockets.¹ During that discussion, Dr. Lovberg stated that he would file additional information concerning use of Phase Modulated Continuous Wave radar and the appropriate service and technical rules for authorizing radar applications in the 76-81 GHz band. Trex, in conjunction with Innosent, Multicoreware, Cogilux, and Ceenav, (collectively, the “Trex Group”), supplies that information below.

I. Introduction and Background

In the NPRM, the Commission proposed to substantially modify the Commission’s Part 15 and 95 rules and the domestic Table of Allocations with respect to the 76-81 GHz band to accommodate the development of and to authorize automotive and other radar applications in

¹ *Ex Parte* Filing of Trex Enterprises Corporation, ET Docket No. 15-26 *et al.* (Feb. 16, 2016).

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that band.² The Commission also sought to develop a regulatory framework that will allow various services, including automotive radars, to operate on an interference-protected basis in the band. The NPRM further considered service rules that provide for the deployment of various radar applications in this band.

The Trex Group appreciates the Commission's goal is to create a regulatory framework for 76-81 GHz that will "encourage efficient, innovative uses of the spectrum and to allow various services to operate on an interference-protected basis."³ They also appreciate that additional uses of the 76-81 GHz band must be compatible with existing and proposed applications. However, in an increasingly spectrum-constrained environment, they submit that the public interest is best served by the Commission pursuing dual goals of protecting existing uses while also ensuring that spectrum is used intensely. The Trex Group therefore urges the Commission to maximize the full potential of the 76-81 GHz band by adopting a regulatory framework that allows the band to be used for other radiolocation applications in addition to automotive radar. Additional radiolocation applications using technologies that are similar to those used in vehicular radar applications are entirely consistent with the existing and anticipated uses of the band – including vehicular radars, airport foreign object debris ("FOD") detection radars, level proving radars ("LPRs"), Radio Astronomy Service ("RAS") operations, and Amateur operations.

Other interested parties filing in the proceeding also envision additional radar applications that can be used in the 76-81 GHz band. For instance, Trimble Navigation Limited ("Trimble") has suggested that the Commission allow use of the band for non-fixed, three dimensional ("3D") scanning, surveying, mapping, and Geographic Information System ("GIS") data collection applications.⁴ Mantissa Ltd. ("Mantissa") has suggested that the Commission allow additional fixed radars, such as miniature fixed radar sensors for perimeter security that Mantissa manufactures, to operate in the 76-81 GHz band.⁵ Navtech Radar Ltd ("Navtech") has similarly supported permitting use of the 76-77 GHz band for a range of fixed applications, including highway monitoring, obstacle detection, navigation for industrial machinery, and wide

² *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 al.*, ET Docket No. 15-26 *et al.*, Notice of Proposed Rulemaking and Reconsideration Order, FCC 15-16 (rel. Feb. 5, 2015) ("NPRM").

³ NPRM, ¶ 1.

⁴ Comments of Trimble Navigation Limited, ET Docket No. 15-26 *et al.* (Apr. 6, 2015).

⁵ Comments of Mantissa Ltd., ET Docket No. 15-26 *et al.* (Apr. 6, 2015).

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area surveillance and security monitoring, among others.⁶ And, Rockwell Collins, Inc. (“Rockwell Collins”) has recommended that the Commission make the 76-77 GHz band available for helicopter-mounted surveillance radar systems – known as “heliborne radar.”⁷

Some of these additional uses may be compatible with incumbent and proposed operations. Other parties express legitimate concern, however, that additional uses of the band will degrade the operations of incumbent users – particularly those operating vehicular radars. The Trex Group agrees that the Commission should take no action that will jeopardize current vehicular radar and other operations in the 76-81 GHz band. Nevertheless, continuing to preserve the band for a limited application in the face of potential compatible uses is not necessary to limit harmful interference and will inhibit innovative spectrum applications in the band. Accordingly, the Commission should not reject outright all additional uses of the band. Instead, it should adopt rules that permit applications so long as they are compatible with existing and planned operations.

The Trex Group’s proposal has a sound basis because vehicular radar is already designed to accommodate multiple cars in the same location. This is necessary since the use of radar in automobiles is expanding and, to be effective, the automotive radar manufacturers must necessarily design their systems to be unaffected by other automotive radar systems, often at close proximity. The potential addition of non-automotive devices, including contention technologies, that use the same technological platform as vehicular radar devices, will be consistent with how vehicles already co-exist with each other.

The Commission already has a strong record of supporting shared use in the 76-77 GHz band in the United States by vehicular radars and airport FOD detection radars, RAS, and Amateur operations. There have been no reported instances of interference between current users of the band today. The Commission should build on that success by permitting additional compatible use of the expanded 76-81 GHz band.

⁶ Navtech Radar Ltd Comments on Proceeding Number 15-26, FCC 15-16 Notice of Proposed Rulemaking and Reconsideration Order for the band of 76-81 GHz Band, ET Docket No. 15-26 *et al.* (Apr. 1, 2015).

⁷ Comments of Rockwell Collins, Inc. ET Docket No. 15-26 *et al.* (Apr. 6, 2015).

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II. The 76-81 GHz band has unique characteristics, not available in any other band, that are beneficial for critical applications besides automotive radar systems.

The 76-81 GHz band has significant advantages over lower-frequency microwave radar. The 5 GHz of contiguous bandwidth permits higher degrees of range separation and object discrimination than any lower frequency band, with the exception of 57-64 GHz. The shorter wavelength increases specular backscatter return from small objects and increases diffraction-limited radar beam directionality from size-constrained apertures.

The 76-81 GHz band also is superior to the 57-64 GHz (Part 15) band in certain critical applications, including: i) applications at ranges beyond 1 km, where O₂ absorption at 60 GHz dramatically limits the useful range, and ii) constrained-aperture, wide-area sensing applications such as those with antenna gain below 36 dB, where Part 15 emissions limits constrain Equivalent Isotropically Radiated Power (“EIRP”) to less than the 55 dBm limits of Part 95.

Higher frequency radar bands near 140 and 220 GHz will be accessible in the near future as millimeter wave technology evolves further, but atmospheric attenuation in these bands is highly affected by water vapor such that reliable terrestrial radar operation at ranges beyond a few hundred meters will never be possible in these bands. This leaves 76-81 GHz as the only available spectrum slice that can now or ever serve a number of critical applications.

A sampling of radar applications uniquely served by the 76-81 GHz band is as follows:

- Critical Asset Perimeter Protection
 - Detection of Quadcopter Drones Approaching Airspace Above Prisons or Military Installations
 - People/Animal Tracking in Open Ranges
- Airborne Sense-and-Avoid Systems (coordinated with RAS)
 - Navigating Drones in Commercial Airspace
 - Helicopter Collision and Wire Avoidance and Brownout Landing Assistance
- Short-to-Medium Range Marine Radar
- Micro Doppler Applications (Indoor/Outdoor)
 - This application environment will be heavily shared with 802.11ad WiFi which uses the 57-64 GHz band broadly with spectrum and beam agility

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III. The Commission should not limit radiolocation operations at 76-81 GHz to automotive radar systems.

Automotive radars will be available from many manufacturers, with a wide range of antenna and modulator characteristics. These radars will be designed to coexist with hundreds of radar systems operating in close proximity at one time. The burden is already on radar manufacturers to devise extremely interference-tolerant system architectures. It is entirely reasonable to expect then that well-coordinated non-automotive radars using the same technology could easily coexist without any adverse impact on automotive radar operations. A co-primary allocation or secondary allocation for future non-automotive applications is entirely appropriate. At the same time, it is important that there be no outright prohibitions to uses of the band for non-automotive applications, many of which, for pure physics reasons, cannot be supported by any other frequency band.

As discussed above, the band characteristics of 76-81 GHz are uniquely beneficial, and as such should not be restricted to a single application. Higher frequencies attenuate too much in water vapor to support terrestrial radars operating over longer ranges, while lower frequencies do not allow the combination of highly directional radiating beams and highly directional backscatter return to support small-target discrimination from practical radar apertures at long ranges.

Indeed, the Commission's actions to date with respect to the 76-77 GHz band have been consistent with a prudent, case-by-case approach. As the Commission notes in the NPRM, the Commission has found that FOD radars could be made compatible with LPRs at 76-77 GHz by limiting the FOD radars to airports only and to condition their use on the absence of illumination of any public roadway.⁸ Because of these limitations, the Commission ensured that there would be no interaction with LPR and automotive radars at 76-77 GHz. Similarly, in authorizing tank-level probing radars, the Commission analyzed the characteristics of that specific fixed application to ensure that it would not interact with automotive LPR due to the differences in operating environments of each.

The Commission should follow the same approach here and expressly affirm that nothing in its new rules should be construed to prohibit non-automotive radiolocation operations in the 76-81 GHz band. Moreover, in future actions, the Commission can and should expand use of the 76-81 GHz band to support additional, compatible radar applications.

⁸ NPRM, ¶ 35.

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In sum, the Trex Group urges the Commission to leave flexibility to permit future applications, including contention technologies, which use the same technological platform as vehicular radar devices, under a coordinated regulatory framework which can be developed as such technologies and their specific benefits to society become more evident. Doing so will facilitate greater use of the spectrum without causing harmful interference to existing or proposed operations.

Should you have any questions, please contact me. This letter is being filed electronically pursuant to Section 1.1206 of the Commission's rules.

Sincerely,



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