Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	**)**	
	)	
Amendment of Part 15 of the Commission's	**)**	**RM - 11666**
Rules to Permit the Operation of Vehicular	**)**	
Radar Systems in the 77-81 GHz Band	**)**	

To: The Commission
Via: Office of the Secretary

COMMENTS OF CONTINENTAL AUTOMOTIVE SYSTEMS, ADAS BUSINESS UNIT

Continental Automotive Systems, ADAS Business Unit (Conti ADAS), a member of the "CSA 79 GHz Project" (the Project), pursuant to Section 1.405(a) of the Commission's Rules [47 C.F.R. §1.405(a)], hereby respectfully submits its comments in support of the *Petition for Rule Making* filed on or about May 15, 2012 by Robert Bosch LLC.[1] The Bosch petition proposes to modify Section 15.253 of the Commission's rules (47 C.F.R. §15.253) so as to permit the operation of unlicensed, short-range vehicular radar systems (SRR) in the band 77-81 GHz band (in addition to the band 76.0-77.0 GHz) in the United States. Conti ADAS is a manufacturer of short-range vehicular radar systems (SRR) and views the availability of spectrum in the 77-81 GHz band as being critical to improved automobile safety features in the United States. In support of the Bosch petition, Conti ADAS states as follows:

[1] The Bosch Petition was placed on public notice by the Commission on or about July 17, 2012 (See, Public Notice DA 12-1139) and therefore these comments are timely filed within thirty days of that Commission Public Notice.

1. There is within the automobile equipment industry a migration from early deployments of vehicular radar, principally Adaptive Cruise Control, [2] to more sophisticated, safety based uses, including distance warning, collision warning, collision mitigation (partial braking, autonomous emergency braking and other systems), blind spot monitoring, parking lot rear traffic crossing alerting, backup and parking assistance, and lane change assistance. These new deployments for automotive radar systems are true safety systems, and will assist in the reduction of fatalities and personal injuries by reductions in collisions between automobiles and between automobiles and bicyclists, motorcyclists and pedestrians. The future holds virtually unlimited applications for automotive radar systems, including increasingly autonomous vehicle operation.

2. Vehicular fatalities, though decreasing for various reasons including new technology, are nevertheless staggeringly high, and the number of vehicles is substantially increasing. The National Highway Traffic Safety Administration determined that the number one cause of death in persons aged 4 to 34 during 2005 was multiple vehicle traffic crashes. In 2011, there were 32,310 automobile fatalities, according to the Fatality Analysis Reporting System of the National Traffic Safety Administration, and the number of registered motor vehicles in the United States in 2009 was almost 259 million, up from 217 million in 2000. The Commission, in 2002, when it first permitted automotive radar at 24 GHz, said that it expected "vehicular radar to become as essential to passenger safety as air bags for motor vehicles." That prediction is close to fruition now.

[2] Adaptive Cruise Control enables a vehicle to maintain a minimum cruising distance from a vehicle in front. It is essentially a driving enhancement rather than a safety feature.

3. In the progress toward the ultimate future goal of autonomous driving, it is notable that the earliest goal was the elimination of fatalities and injuries. Those goals now also include the elimination of accidents. Ultimately the progress will be toward increased driver autonomy. That these goals are realistic is evidenced by studies such as those Bosch refers to in its Petition. For example, emergency braking assist technology is expected ultimately to reduce personal injury rear-end collisions by 39%, and automatic emergency braking will reduce personal injury rear-end collisions by 74%.

4. However, the two frequency ranges now in use for automotive radar systems in the United States, at 24 GHz and 76-77 GHz, are insufficient to accommodate the implementation of new safety functions for automotive radars due to insufficient bandwidth and thus insufficient object discrimination. Now, the long range automotive radar systems in those two frequency ranges must be supplemented by a wider bandwidth segment for short range radars. There are various reasons [3] for the necessary wider bandwidth for newer radar deployments. In general, however, there is a need for better range separation, range accuracy, angular accuracy and good object discrimination. This requires an occupied bandwidth of up to 4 GHz. With systems operating in the current available frequency ranges, the demand for better object discrimination cannot be fulfilled.

[3] Hardware distortions degrade range separation. Pedestrian/automobile collision avoidance and side impact warning functions require high range separation. Expanded target inclusion (e.g. pedestrians, motorcycles, passenger vehicles, buses and trucks) causes amplitude fluctuation within large angular-range cells. Amplitude fluctuation degrades range accuracy (influencing time-to-collision calculations) and angular accuracy (limiting cross-traffic observations). Determination of small ranges requires high range separation (as in the case of parking assistance and roadwork avoidance functions). Good range and angular separation enables contour determination, target classification and orientation determination. Greater bandwidth leads directly to greater range separation.

5. The Bosch petition proposes the use of the 77-81 GHz band[4] for such new applications as high-speed pedestrian detection, pedestrian detection while turning, motorcycle detection while the motorcycle is driving at high speed, and roadside detection of small obstacles such as pedestrians in intersections.

6. Automotive radars in Japan and Europe now have access to the 79 GHz band as well as 22-29 GHz and 76-77 GHz. There is scheduled at the World Radiocommunication Conference in 2015 a review of the allocation of the 77.5-78 GHz band, so as to create a worldwide contiguous Radiolocation allocation in the 76-81 GHz band. What is used at 79 GHz in Europe and Japan now are FMCW emissions. The occupied bandwidth could be up to 4 GHz, depending on the object discrimination needs of a given application. Largely because of this allocation plan and the existing allocation scheme in Europe and in Japan, the extent of implementation of automotive radars is on the increase. In the past, deployments have been limited largely to higher-end automobiles. One benefit of international harmonization at 76-81 GHz is that it will be cost-effective to deploy the technology in smaller, less expensive vehicles.[5] Customer awareness of automotive radar systems is increasing, as is demand. While there are various sources that drive the market for automotive radars, one future initiative is sensor standardization. The longer term goal for sensor standards is, for example, to have vehicles with video sensors send data to intelligent roadside systems. This requires sensor standardization that does not now exist. The absence of these standards has not inhibited deployment of radar systems, but there are future goals of increased interactivity that will be facilitated by the 79 GHz allocation.

[4] This band is referred to as the "79 GHz" band typically.
[5] The types of passenger vehicles equipped with radars between 1999 and 2008 were principally (though decreasingly) large luxury type vehicles, trending toward the end of the period to a wider deployment.

7. There are two categories of automotive radars now. The long range radars (LRR) are used principally for adaptive cruise control in the 76-77 GHz band for ranges up to 300 meters. These have lower resolution relative to short range radars (SRR). The SRRs would be deployed in the 79 GHz band, which can accommodate high-resolution safety functions. They have high resolution and demand a higher bandwidth than LRRs. [6] Automotive radars operate in the United States in either the 24 GHz or 76-77 GHz range. The 24 GHz radars are Ultra-Wideband systems. The migration from use of the 24 GHz band to 76-81 GHz worldwide is strongly influenced by the fact that in Europe, there is a 2018 deadline for use of 24 GHz UWB systems for new model certification. UWB Radar use at 24 GHz is currently scheduled to cease in 2022 in Europe. There is no deadline in the United States for cessation of use of the 24 GHz band, but the effect of the cessation of the use of that band in Europe will strongly affect availability of 24 GHz radars in the United States in the near term. Further influencing the need for global harmonization of LRRs at 76-77 GHz and SRRs at 77-81 GHz is the importance of harmonization to sensor manufacturers, and the general need to encourage research and development in a stable spectrum environment.[7] Administration-specific solutions are an inhibiting factor. Spectrum harmonization reduces prices and encourages deployments in lower-cost vehicles.

8. Conti ADAS is encouraged by the ongoing cooperative dialog with Radioastronomy interests during the past several years with respect to compatible sharing

[6] From a technical perspective, the two bands are used for different purposes, but could be combined in hardware configurations. Performance parameters such as higher object discrimination call for Short Range Radars, and applications which have a narrow beamwidth would be used for Long Range Radars.
[7] Sensor manufacturing is a major trigger for investment in research and development in this area. Significant progress has been made recently in radio frequency component packaging and deployment in high production volumes.

of the 79 GHz band in the United States. The October, 2011 Kitt Peak, Arizona tests of potential interaction between 77-81GHz radars and millimeter-wave radioastronomy observatories[8] demonstrate that, even under true worst-case conditions for interaction (including line-of-sight paths with the main beamwidth of the radar unit aimed at the observatory dish), a separation distance of 30 to 40 kilometers would preclude any interaction between the observatory and the radar. Shorter distances would be appropriate where there is any attenuation. There is in this frequency range a substantial amount of attenuation from foliage, buildings, roadside barriers and other vehicles. The radars are in a generally downward orientation. It is noteworthy that there have since 1996 been no reports of interference to radioastronomy from automotive radar systems at 76-77 GHz, either in the United States or in Europe where the observatories are closer to urban centers. Therefore, a realistic assessment of the potential for interaction between millimeter-wave radioastronomy operations and automotive radars at 79 GHz must consider the likelihood of geographic proximity of, and the density of automobile traffic deploying SRR to radioastronomy sites. When this is done, it is clear that the interaction potential is very low indeed.[9]

9. Conti ADAS agrees with Bosch that there is not any necessary incompatibility between Short Range Automotive Radars and Amateur Radio,[10] level

[8] There are fewer than ten millimeter-wave observatories in the United States. The Commission has determined that such facilities are removed from roadways and vehicular access is controlled near the sites.
[9] It is noteworthy, however, that 37% of the radio spectrum between 1GHz and 240 GHz is allocated to Radioastronomy, which requires a high degree of interference protection and therefore creates a very extensive preclusion effect relative to spectrum overlays and adjacent channel uses.
[10] Nevertheless, Bosch has proposed that the Commission consider reallocating the 75.5-76 GHz band to the Amateur Service in the United States so as to harmonize that allocation with the existing Amateur allocation in Europe, and as an accommodation for any displacement of Amateurs in their primary allocation at 77.5-78 GHz now. Conti ADAS supports this proposal.

probing radars (LPR) or Foreign Object Detection (FOD) radars located at airports for detecting runway debris in advance of aircraft landing. The Bosch Petition proposes the continuation of cooperative dialog with radioastronomy and other incumbent and proposed users of the 77-81 GHz band to cooperatively address spectrum sharing. Conti-ADAS is supportive of this plan and suggests that it does not necessitate any Federal oversight.

10. The worldwide effort to harmonize the deployment of automotive radars in the 76-81 GHz band is firmly established. The 79 GHz band provides an optimum frequency band for SRRs and a complement to the use of 76-77 GHz for LRRs operating pursuant to Section 15.253 of the Commission's Rules. Because frequency sharing between SRRs and LRRs is not possible, the 79 GHz frequency range should be considered as the most suitable band for SRR worldwide.

Therefore, the foregoing considered, Conti-ADAS respectfully requests that the Commission modify Section 15.253 of the Commission's Rules [47 C.F.R. §15.253] governing the operation of automotive radar systems in accordance with the Petition for Rule Making filed by Robert Bosch LLC.

Respectfully submitted,

Christian Schumacher / Business Unit Head, NAFTA

By: _____

July 13th, 2012