SARA
Short range Automotive Radar frequency Allocation

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RE: **Regulatory Framework for Devices Using Ultra-Wideband Technology**

The automotive industry group SARA is very pleased to submit its views to the IDA on the regulatory framework for ultra-wideband (UWB) devices, in response to the public consultation paper released on 1 March 2007.

SARA stands for the Short Range Automotive Radio Frequency Allocation group, comprised of automotive manufacturers and component suppliers supporting the introduction of UWB short range vehicular radar (SRR). SARA has very actively participated in proceedings in the United States, Europe, Canada, Japan and New Zealand concerning rules for these devices to operate on a license exempt basis to support road safety.

SARA will limit its comments in this proceeding to question 5 in the IDA's consultation paper, relating to the proposal to adopt a license-exemption approach for UWB vehicular radar devices within the frequency bands 21650 to 29500 MHz and 77000 to 81000 MHz.[1] We strongly support these proposals.

[1] For avoidance of confusion, we note that the IDA has proposed to authorize an extended range of frequencies within 21650 to 29500 MHz, which is similar to the rules of the U.S. FCC and which SARA will refer to as the "flexible 24 GHz range." The current European authorization of SRR permits SRR to operate in the range of 21650 to 26650 MHz (i.e., 24.15 GHz ± 2.5 GHz), which SARA will refer to as the "24 GHz range." We generally refer to frequencies within 77000 to 81000 MHz as the "79 GHz" band.

I. SRR is an Important Part of Accident Mitigation and Traffic Safety

A substantial amount of literature has been developed in support of SRR, showing its important contribution to accident mitigation and the goals of vehicle safety. Regulators around the world have assessed this technology to be a key factor in developing future automotive safety applications.

When it adopted regulations in 2002, the U.S. Federal Communications Commission (FCC) stated "we expect vehicular radar to become as essential to passenger safety as air bags for motor vehicles…."[2] The European Commission determined in September 2003 that UWB vehicular radar supplies important public traffic safety benefits and therefore made SRR an integral component of its eSafety programme, noting "Ultra wide band (UWB) automotive radar (SRR) operating at 24 GHz is considered to be a key technology for the rapid and cost-effective introduction of many Intelligent Vehicle Safety Systems."[3] When the UK regulator Ofcom adopted a license exemption regulation for 24 GHz SRR, it assessed the impact of SRR over the period 2010 to 2014 and stated the "net present value of the benefits from using automotive SRR devices [is] estimated to range form £139 to £279 million over this period."[4]

SRR technology is important because it contributes to active safety. Consumers and industry are familiar with passive safety applications that already mitigate accident consequences, e.g., seat belts and airbags. Some active safety applications already in use also are contribute to vehicle stabilization, e.g., anti-brake locks. Both approaches decrease fatality rates, but the benefits are leveling out and new forward looking technologies and applications are needed, including active safety approaches using vehicular radar to mitigate accidents.

UWB radar opens the market for a new generation of active safety applications. Vehicular radar can sense all objects around the car, available both day and night, and largely independent of the weather and environmental conditions. UWB applications permit reliable object determination with high spatial resolution, which requires a large bandwidth for a wide range of applications. Use of the 24 GHz frequency range is affordable because this technology is ready for mass production and deployment.

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2 *First Report and Order* in ET Docket 98-153, Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, 17 FCC Rcd 7435 (2002), paragraph 65.

3 European Commission, "Information and Communications Technologies for Safe and Intelligent Vehicles," Brussels, 15 September 2003, COM(2003) 542 final, at page 20.

4 UK, "Ofcom's decision to exempt the use of automotive short-range radar equipment at 24 GHz from Wireless Telegraphy licensing," 14 June 2005, paragraph 4.8. Ofcom noted "Research into the road safety initiatives has identified information communications technologies and intelligent road safety systems, such as those based around SRR equipment, as one of the most important tools in achieving the EC road safety goal of reducing road fatalities in Europe by half by 2010." Id. at paragraph 4.5.

II. SRR Deployment is Compatible with other Spectrum Uses

The Australian Communications and Media Authority noted in a consultation paper in March 2006 that "[s]tudies indicate that, provided mitigation factors are taken into account, it is possible for 24 GHz short range vehicular radar to share this spectrum with existing services."[5] Extensive studies in both Europe and the United States, as well as the ITU compatibility studies cited in the IDA paper, support this conclusion. SARA believes the objective and thorough assessment made by the FCC shows the way forward for global introduction of this important new accident mitigation technology.

When the FCC adopted regulations in 2002, FCC Commissioner Michael J. Copps stated "[b]ecause the effects of widespread use of UWB are not yet fully known, and interference could impact critical spectrum users, I will support, albeit somewhat reluctantly, the ultra-conservative ultra-wideband step we take today. The limits we place on UWB are designed to reduce the interference risks associated with the technology to levels far, far below those placed on technologies that place energy into narrower portions of the spectrum."[6]

Subsequently, as more experience and a better insight of the UWB methodology and interference effects have been gathered, there seems to be justification to increase the FCC emission power limits, especially for the flexible 24 GHz range of frequencies that the IDA is considering. This assessment is substantiated by the recently finalized ITU-R SG1 study results.[7]

The main concerns for potential interference for UWB SRR relate to the following services solely within the 24 GHz range:

- passive sensing systems operating in the 23.6 – 24 GHz band on low earth orbiting satellites in the Earth Exploration Satellite Service (EESS);
- radio astronomy service station in the 22.21 – 22.5 GHz and 23.6 – 24 GHz bands (RAS); and
- fixed services in the 21.2 – 23.6 GHz band (FS).

SARA will briefly comment on each service, noting that very extensive analysis, accumulated in many volumes of documentation, has been prepared during the course of adopting regulations in other jurisdictions to demonstrate appropriate compatibility of the SRR application.

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5 Australian Communications and Media Authority, Background Paper, "Proposed Variations to the Radiocommunications (Low Interference Potential Devices) Class Licence 2000," 16 March 2006. Subsequently, on 20 June 2006, the ACMA amended its Low Potential Interference Device Class Licence to authorize UWB SRR within the 24 GHz range.

6 Separate Statement of Commissioner Michael J. Copps, 14 February 2002, Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems (ET Docket No. 98-153).

7 See Draft New Recommendation ITU R SM.[UWB.COMP] - summary of analytic studies A.2.5.

A. Passive Sensing Systems on EESS

The FCC analyzed whether interference from vehicular radar would be a threat to EESS. After detailed discussion and negotiation, the FCC determined that the risk of such interference was insubstantial when combined with the phased introduction of attenuation standards for vehicular radar.[8] The European Commission (and the European Conference of Post and Telecommunication Administrations – the CEPT) also assessed that the risk of interference was acceptable so long as the percentage of vehicles equipped with 24 GHz vehicular radar was limited to 7%. SARA believes the 7% limitation was set too cautiously and, on the basis of published scientifically validated assessments, argued that higher thresholds should be accepted.[9]

Among other reasons, the 7% limitation is based on parameters including the density of vehicles in a given metropolitan area and the number of those vehicles equipped with SRR. In SARA's view, the CEPT figures greatly overstate the vehicle density, activity and use of cars equipped with SRR.[10]

The European approach is to permit the temporary introduction of UWB vehicular radar within the band 21650 to 26650 MHz until mid-2013, on the presumption that introduction of the new devices would result in market penetration lower than or equal to 7% of the total car fleet. A mid term review is contemplated by 2009. This type of market introduction restriction jeopardizes the proliferation of 24 GHz SRR technology because some car manufacturers, especially in the lower priced segments, are discouraged to implement this product if the market presence is too short. This consideration is a vital issue for enhanced safety on the roads because the mass market is represented by medium and lower priced vehicles.

SARA strongly supports the IDA's proposal to adopt a bandwidth approach that permits adoption of UWB SRR within the flexible 24 GHz frequency range 21650 to 29500 MHz. SARA believes that manufacturers might start with 24 GHz range because this technology is available and can contribute to road safety immediately. Over the mid-term, manufacturers are likely to rely on a somewhat higher frequency band between

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8 These attenuation standards are set forth in the FCC rule section 15.515(c). They apply only to use of frequency below 24 000 MHz, i.e., in the band 23.6 to 24.0 GHz.

9 See "Interference From 24-GHz Automotive Radars to Passive Microwave Earth Remote Sensing Satellites," M. Younis et al, IEEE Transactions on Geoscience and Remote Sensing, vol. 42, No. 7, July 2004, page 1387 (SARA can submit a copy of this publication for reference if desired).

10 ECC Report 23, "Compatibility of Automotive Collision Warning Short Range Radar Operating at 24 GHz with FS, EESS and Radio Astronomy," May 2003, page 44 at section 4.1.3.2.2 ("24 GHz automotive radar density") states that the expected density of vehicles is taken to be 123 vehicles/km^2 for the highway scenario outside urban/suburban areas and up to 330 vehicles/ km^2 for urban/suburban areas. That number was an early assumption offered by SARA. Further research and analysis led SARA to recalculate that this number overstated vehicle density in urban settings by substantial factor – even the most densely packed urban center (Paris, France) represented average vehicle densities of a maximum of 202 to 224 cars/km^2. *See* Robert Bosch GmbH, Siemens AG, "Traffic Density Study for Use in Compatibility Studies Between SRR Devices around 24 GHz and Earth Exploration Satellites (EESS)," ITU-R, TG1/8 Doc. 418, 4 October 2005.

24.25 – 29 GHz which is the upper part of the US regulation. This approach avoids intentional emissions into the passive band at 23.6 -24 GHz, using technology similar to that which is available at 24 GHz, which is therefore available soon. Important for the implementation of this technology is that the frequency allocation should be available without restrictions in time or quantity, in order to give car manufacturers adequate planning certainty.

Adopting rules that permit the 79 GHz frequency band for the long term is an important element in the overall strategy for supporting road safety. The technology for this band will be available in the future and the frequency already is allocated in Europe. SARA members are actively seeking to develop this technology for road safety applications.

B. Radio Astronomy Services

With respect to RAS use of passive bands, SARA argued that RAS sites should be protected by normal reliance on radio quiet zones and the isolated location of RAS sites. Thus, we supported the approach proposed by the ACMA to protect the two identified RAS sites in Australia and rely on typical radio quiet zones. If any such facilities are located in Singapore, similar measures could be employed.

The same move towards the use of the higher frequencies in the flexible 24 GHz band, and subsequently towards the 79 GHz allocation, will further serve to attenuate any risk of potential harmful interference to RAS.

C. Fixed Service

The FCC analyzed the potential risk of interference from vehicular radar to all affected services and concluded the risk was minimal. European standards were developed to protect certain ITU Region 1 telecommunications services that are not totally analogous to Region 3, due to the density of European applications. For example, a substantial concern in the European context was to protect fixed service use of microwave links used to transport mobile telephony traffic. The CEPT stated there are as many as 37,000 FS links across Europe in the 22.0 – 23.6 GHz band.[11]

The European 24 GHz Decision is based on an extremely conservative CEPT assessment that sharing between FS and vehicular radar is feasible so long as the percentage of vehicles equipped with 24 GHz radar within sight of a FS receiver is limited to less than 10%. SARA argued that this assessment offers excessive protection to FS – the models used to calculate potential harmful interference did not take into account that the different assumptions necessary for potential interference to occur had a probability of close to nil.[12]

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[11] ECC Report 23, at page 18.

[12] For interference to FS links to occur, numerous unlikely circumstances must coincide, including highway stretches of several kilometers with line of site FS transmissions parallel to the road; no obstructing roadside clutter; the precise amount of torrential rain that uses up the FS receiver interference margin, but not so much that the margin is exceeded; a high number of radar-equipped vehicles operating

The European approach also did not take into account mitigation from the SRR activity factor, which represents the actual "on time" of SRRs during normal driving situations. This factor was analyzed and accepted by the ITU-R Study Group 1 in formulating ITU-R Recommendation SM.1755. This activity factor represents a reduction of the risk of interference by approximately 50%.

In sum, the assumptions behind the CEPT compatibility assessment between SRR and FS cannot reliably be transplanted to the Singapore context.

In any event, the implementation of vehicular radar into the market is expected to be moderate, as the normal customer take-up of such devices and the existing number of vehicles already in the market means that even after as much as eight years the market penetration into the total fleet would be less than 7% (under the most aggressive scenarios of first adopter markets and widespread implementation by many automotive manufacturers). No one argues that this number of SRR-equipped vehicles offers any discernible risk of FS interference. Thus, there is substantial time to assess real world impact of vehicular radar and aggregation impacts, which gives a very large safeguard against any potential adverse effect.

during the downpour; and finally FS antennas mounted at 5 meters or less from the ground and only a few meters from the highway (a technical and commercial abnormality that reduces the maximum FS coverage area by a huge amount). The relevance of such assumptions in Singapore is of limited value. In addition, substantial mitigation factors were disregarded in the CEPT study (taking a "worst case" approach), which makes the results even less relevant to the IDA's assessment.

III. SRR Deployment Requires a Licence-Exemption Approach

SARA strongly supports the IDA's proposal to adopt a licence exemption approach. No country in the world has seriously suggested an individual licensing requirement for vehicular radar. To achieve the road safety benefits of this technology requires a consumer friendly approach with long-term widespread deployment.

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In summary, SARA is very pleased to see the IDA proposing to adopt a flexible and forward-looking regulatory framework for vehicular radar using ultra-wideband technology. We are committed to fostering the widespread adoption of this technology for its many road safety benefits, and we would be happy to supply additional information that would be helpful to an expeditious adoption of the IDA's proposal.

Respectfully submitted,
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