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Via Email to: dgse-uwb@ic.gc.ca (document in Adobe PDF)

RE: Notice No. SMSE-002-05

The automotive industry group SARA is very pleased to submit comments in this proceeding. SARA stands for the Short Range Automotive Radio Frequency Allocation group, comprised of automotive manufacturers and component suppliers supporting the introduction of ultra-wideband short range vehicular radar operating in the 24 GHz range. SARA has very actively participated in proceedings both in the United States and Europe leading to implementation of rules for these devices, and therefore is directly interested in Industry Canada’s proceeding.

Introduction

SARA wholeheartedly agrees with the perspective stated at the outset of the consultation that –

“It has been the Canadian experience that consumers and business have a strong interest in adopting new wireless products and in having access to the latest technology and applications, so as to increase productivity and improve the standard of living.” Introduction and page 1

We believe that vehicular radar, which is mentioned several times in the consultation paper, can have a noticeable impact on the well-being of Canadian consumers. The consultation paper itself notes potential benefit from UWB systems, with reference to “[a]pplications for improved public safety through the use of vehicular radar systems for collision avoidance, airbag activation, road sensors, etc.” (pg 3)

Due to our focus on active traffic safety applications, we limit our comments in this paper to the application defined at page 5:
Vehicular radar systems: This category includes collision warning radars, improved airbag activation, and field disturbance sensors, etc. Vehicular radar systems can detect the distance between objects and a vehicle, or can be integrated into the navigation system of the vehicle. Some vehicular radar devices started appearing at car exhibits in luxury cars. Should it become mandatory to install such devices on all vehicles, then a proliferation of vehicular radar systems is expected. Users of this category are mostly mobile and outdoor which could increase the potential of interference to other services.  

Benefits of UWB Vehicular Radar

Regulators in the United States and Europe have assessed this technology to be a key factor in developing future automotive safety applications. The reason this technology is important is 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 also are used to avoid vehicle destabilization, e.g., anti-brake locks. Both approaches decrease fatality rates, but the benefits are leveling out and new applications are needed, including active safety approaches using vehicular radar to mitigate accidents.

24 GHz UWB radar opens the market for a new generation of active and passive safety applications. Vehicular radar can sense all objects around the car, available both day and night independent of the weather. UWB applications permit reliable object determination with high resolution, which requires the wide bandwidth for a wide range of applications. Use of the 24 GHz band range is affordable because it is ready for mass production and deployment, while UWB technology using higher bands such as next generation 79 GHz is not yet ready.

Worldwide Attention to UWB Vehicular Radar

At the outset, SARA agrees with the assessment in Chapter 3 of the consultation paper that there is “considerable worldwide effort” to study and implement policies for compatible use of UWB. There have been substantial policy steps taken in the US and in Europe which should be considered in this proceeding. As the consultation paper notes, the FCC in 2002 authorized the license-exempt operation of vehicular radar in the 22 – 29 GHz band. Vehicular radar was one of the major success stories in that proceeding – the FCC stated “we expect vehicular radar to become as essential to passenger safety as air bags for motor vehicles…."

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1 The consultation paper states that a proliferation of vehicular radar systems could be expected “if it became mandatory to install them.” No jurisdiction has discussed making such systems mandatory and, indeed, the European Union expressly would avoid this approach. The automotive industry does not support any mandatory system, due to the substantial benefits of innovation arising from reliance on different active safety devices. Gradual distribution into the marketplace can be expected even in the absence of a mandatory approach.

Europe was in the final steps of adopting rules on vehicular radar just as the consultation paper was issued. The European Commission determined as early as September 2003 that UWB vehicular radar supplies important public traffic safety benefits and made UWB 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

European policy makers determined through CEPT procedures that 24 GHz UWB short range radar is compatible with affected services with certain conditions.4 Based on this assessment, the European Commission took steps to support the removal of regulatory barriers and supported standardization of short range radar in the European Telecommunications Standards Institute. Taking into account the previous CEPT work, the Commission acknowledged that harmful interference will not be caused to other users of the 24 GHz band where the total number of vehicles in the market equipped with such devices does not exceed 7% of the total number of vehicles in circulation.

The European Commission’s binding decision of January 17, 2005, permits UWB vehicular radar in the 24 GHz band,5 in conjunction with decisions of the CEPT’s Electronic Communications Committee (ECC).6 As the consultation paper notes, ETSI was drafting a technical standard for these operations, and the 24 GHz standard has been adopted and published as ETSI EN 302 288-Parts 1 & 2 V1.1.1 (2005-01).7


6 ECC Decision of 12 November 2004 on the frequency bands to be designated for the temporary introduction of Automotive Short Range Radars, ECC/DEC/(04)10.

7 ETSI EN 302 288 Part 1 covers “Technical requirements and methods of measurement” for short range vehicular radar and Part 2 is the “Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive” for this application. The scope of this harmonized European standard expressly applies to UWB applications (see Part 2, “Scope”).
Discussion and Proposals

Vehicular UWB short range radar have unique characteristics for aggregation (section 4.2.2) and measurements (section 4.2.3) that require special attention. Thus, SARA suggests that the issues and technical details concerning vehicular radar should be resolved separately from those concerning general classes of UWB devices.

For the aggregate impact of vehicular radar, it is important to take into account vehicle density, traffic patterns, and penetration into the automotive fleet. Unlike other types of UWB devices that might be used for consumer applications in a variety of locations, vehicular radar are only used where the vehicles are operating – i.e., on the road and while parking. Some early analyses of vehicular radar assumed exaggerated notions of traffic density, and similar mistakes should avoided by Industry Canada.

Further, where the roads are located is also important – thus, when analyzing the impact of vehicular radar on Radio Astronomy Service observatories, it is important to keep in mind that the RAS locations in North America typically are far from highways and can be protected through radio quiet or exclusion zones. SARA discusses these factors in more detail below.

For measurements, it also is important to take into account that vehicular radar in the real world environment are affected by clutter, scatter and highway signal obstructions. Assessments of vehicular radar must avoid the concept of an imaginary highway without guard rails, berms, nearby brush or trees or any of the other normal obstructions that attenuate signals from vehicular radar.

(Q1) Sections 3.1 and 3.2 of this consultation describe potential benefits and concerns relevant to the introduction of wireless devices using ultra-wideband (UWB) technology. Please provide additional interests and/or concerns that you may have.

When analyzing the potential interference from 24 GHz UWB vehicular radar, Industry Canada should consider those services that currently use the band. SARA’s experiences in proceedings before the FCC and in Europe indicate the following services or applications are relevant:

- Passive sensing systems operating in the 23.6 to 24.0 GHz band on low earth orbiting satellites, including meteorological satellites (EESS); and Radio Astronomy Service stations (RAS) in that same band.
- Fixed Services in the 21.2 – 23.6 GHz and 24.5 – 26.5 GHz
- Radar Speed Meter control in the 24.05 – 24.25 GHz (SRD or ISM) band

SARA will address each of these sectors in turn.

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8 The EC 24 GHz Decision also refers to future use of the band 21.4 - 22.0 GHz for BSS. This allocation does not apply in ITU Region 2 and in any event that band is protected under the emission mask adopted by the FCC and the EC.
A. Passive Sensing Systems

Most controversy arises in the consideration of protecting passive sensing systems from potential interference from vehicular radar. It is necessary to balance the proven societal value of weather satellites and RAS observations against potential traffic safety applications of vehicular radar.

Passive sensing systems operate in the 23.6 – 24.0 GHz band, which is subject to international Radio Regulation footnote 5.340. That footnote prohibits “all emissions” in the band to protect passive services, which cannot avoid harmful interference by any combination of increased power or greater sensitivity, because their operation is passive. Nevertheless, both Europe and the United States have concluded that the international rules do not bar UWB operation across this band, because Article 4.4 of the Radio Regulations also provides that non-conforming operations are permissible on a non-interference basis. Thus, the question becomes whether a national administration seeks to authorize the non-conforming operation due to perceived social benefits.

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. The European Commission (and 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.

The European approach is to permit the temporary introduction of UWB vehicular radar, until mid-2013, on the presumption that introduction of the new devices would result in market penetration lower than or equal to 7%. A mid term review is contemplated by 2009. Translated into a global approach, this temporary introduction permits later assessment by Industry Canada to determine if interference calculations and assumptions remain appropriate.

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. We are not aware of the number of RAS sites in Canada that might rely on the 23.6 – 24.0 GHz band, but it is very likely that the number or location of such sites is sufficiently limited that any additional regulatory parameter is not required.

B. 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 2. For example, a substantial concern in the European context was to protect fixed

9 These attenuation standards are set forth in the FCC rule section 15.515(c).

service use of fixed microwave links used to transport mobile telephony traffic. ITU Region 1, and thus Europe, allocates the bands 24.45 –26.5 GHz to Fixed Service on a primary basis, but a smaller part of these bands are allocated to FS in Region 2, so the European assessment is not totally relevant in Canada.

The EC 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 receive 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.11

In any event, the implementation of vehicular radar into any market is expected to be slow, 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 would be under 7% (under the most aggressive scenarios of first adopter markets and widespread implementation by many automotive manufacturers). No one argues that a small 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.

C. Radar Speed Meters

SARA understands that some police speed detection radar units continue to operate in the “K band,” i.e., 24.150 GHz, although we have no information on how prevalent such usage is in Canada, or whether current usage relies on more recent radar units in higher bands from 33.4 GHz upwards. In any event, SARA and one EU Member State sponsored technical tests in Europe to determine the possibility for interference or false readings to radar speed meters from UWB 24 GHz vehicular radar.

The results showed there to be no significant problem. The European Commission concluded in its EC 24 GHz Decision that “[t]he reliability of radar speed meter equipment will therefore not be affected by the operation of automotive short-range radar to any significant extent.” Put in concrete terms, vehicular radar were shown to create no risk of false speed measurements and the risk of harmful interference, i.e., blocking readings, was not measurable during laboratory and road tests due to the extremely low probability of occurrence.

11 For interference to FS links to occur, there must be a concurrence of unlikely circumstances, including highway stretches of sufficient straight length (several kilometers) with line of site transmissions parallel to the road; no obstructing roadside clutter; episodes of torrential rain that use up the FS receiver interference margin – but not so much that the margin is exceeded regardless of the impact of vehicular radar; sufficiently high number of radar-equipped vehicles operating at precisely that time during the downpour; and finally FS antennas mounted less than 5 meters from the ground and only a few meters from the highway (which is a technical and commercial abnormality that also reduces the maximum FS coverage area by a huge amount). Regardless of whether such circumstances occur frequently in Europe – and SARA maintained that the probability of such occurring was inconsequential for any given FS link – the relevance of such assumptions in Canada is of limited value.
(Q2) The Department proposes to use the set of definitions and terminology in Section 4.1 in reference to UWB technology. Is this set adequate and if not, what would be the appropriate alternative(s)?

These definitions appear appropriate, although certain definitions specific to vehicular radar may ultimately prove to be useful.

(Q3) The Department is proposing guidelines in Section 4.2.3 for measuring emissions from devices which use UWB technology. Please provide your comments regarding these guidelines.

SARA is concerned over one element of the Department’s proposed guidelines with respect to measuring emissions, where the Department states that

Radiated UWB emissions are to be made based on power spectral density measurements in terms of e.i.r.p. per one MHz spectral segments. The measurement is to be based on the use of a spectrum analyzer employing a 10 kHz integration bandwidth. If the transmission is in bursts, measurements are to be made over any 100 millisecond period or over the burst duration if the burst is shorter than 100 milliseconds, during which its power value is at its maximum.

The approach of making measurements in this manner would be inconsistent with the rules adopted by the FCC and the ETSI standards. FCC rule section 15.521 (d) provides for a measurement with resolution bandwidth of 1 MHz over 1 millisecond or less averaging time. Setting a different approach could cause difficulties for manufacturers. For instance, one vehicular radar system relies on a gating rate of approximately 10 kHz [on off cycle period]. The signal is not sufficiently random enough to guarantee passing with one cycle and the waveform was designed to pass a >1 ms integration time, not a 100 microsecond time. (10 kHz integration time = 100 microseconds.) As a result, there is a possibility that units made to the FCC specification would not pass the Department’s proposed specification.

The ETSI standards provide for a measurement detector mode with a resolution bandwidth of 1 MHz and a RMS Detector mode with an averaging time of less than 50 ms/MHz. While not totally consistent with the FCC measurement, the difference is less problematic than that proposed by the Department.

An additional factor is the Department’s reference to measuring over the burst duration if shorter than 100 milliseconds, if the burst is shorter than 100 milliseconds. The FCC amended its rules in December 2004, to permit systems to be measured in their normal operating mode. But the Department’s proposed technique appears to require measurement with the gating off, which conflicts with the FCC approach. The gating strategy of some manufacturers will perform correctly for the latter approach, but not for an interval that is shorter than 1ms/MHz.

Given the technical complexity of these issues and comparing several methods of expressing the measurement methodology (i.e., using different resolution bandwidth and averaging time), it may be useful to review this issue in more detail.
(Q4) The Department is of the view that licensing is a valid approach to authorize ground penetrating radar, wall imaging, and through-wall imaging devices that use UWB technology. The Department is considering limiting the use of these devices to specialized user groups (e.g. law enforcement agencies, scientific research institutes, fire and emergency rescue organizations) and of limiting area(s) of operation. Please provide your comments regarding this licensing approach.

SARA has no comments on this question, as it is not pertinent to vehicular radar.

(Q5) UWB will be integrated into various wireless applications including consumer devices (e.g. laptops, home theatre, etc.) and into transportation vehicles (e.g. vehicular radars, road sensors, etc.). These applications will be mass distributed in markets and may be acquired both in Canada and abroad. Consequently the Department is of the view that a licence-exempt approach is a valid regulatory option to authorize these devices. These devices must comply with specific radio standards specifications and be certified. Please provide your comments on the use of an appropriate approach for authorizing UWB consumer devices, UWB communications and measurement devices, UWB vehicular radars, and UWB field disturbance sensors.

SARA agrees that licence-exemption is the only appropriate approach for authorizing UWB vehicular radars. An analogy can be made to use of licence-exempt wireless car key and locking devices – no one argues these should be individually licensed. Neither the U.S. nor Europe has considered requiring individual licences for vehicular radar.

(Q6) Considering the FCC and the proposed CEPT emission masks for UWB systems, what emission masks and what other, if any, measures (operational restrictions, etc.) would protect authorized radiocommunication services from harmful interference and would not impede the development of UWB devices?

SARA limits its comments to measures that could apply to vehicular radar. SARA suggests that the FCC approach is preferable and that the CEPT measures described above are inappropriate for Canadian regulatory policy.

Adoption of measures reflecting FCC regulations would facilitate cross-border traffic between Canada and the United States. In light of the strong interest in minimizing barriers to such traffic and the value of encouraging economies of scale in production of the safety devices, it would be strongly preferred that Canadian and U.S. standards are compatible.

For further information, please contact

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