

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of)
)
Establishment of an Interference Temperature)
Metric to Quantify and Manage Interference and) ET Docket No. 03-237
to Expand Available Unlicensed Operation in)
Certain Fixed, Mobile and Satellite Frequency)
Bands)

**Comments of
Delphi Corporation**

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To: The Commission

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Delphi Corporation (“Delphi”), by its attorneys, respectfully submits its comments regarding the Federal Communications Commission’s (“FCC”) *Notice of Inquiry and Notice of Proposed Rulemaking* (“*NOI/NPRM*”) in the above-captioned proceeding.¹ Delphi is a leader and innovator in the design and manufacture of vehicular radar systems and has actively and consistently participated in the several FCC’s rulemakings affecting such devices in recent years. Delphi has obtained a number of FCC authorizations for sale of non-licensed Part 15 products, but has not been involved with licensed fixed and mobile transmitters and receivers. Accordingly, Delphi’s comments will be limited to discussing the implications of the proposed interference temperature metric for vehicular radar systems.

¹ *In the Matter of Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands*, ET Docket No. 03-237, Notice of Inquiry and Notice of Proposed Rulemaking, 18 FCC Rcd 25309 (2003) (“*NOI/NPRM*”).

I. BACKGROUND

According to the National Highway Traffic Safety Administration (“NHTSA”), there were over 6.3 million police-reported motor vehicle accidents in the United States, accounting for more than 3 million injuries and 42,000 deaths.² NHTSA estimates that, in 2000, the economic impact of motor vehicle accidents, reported and unreported, reached approximately \$230.6 billion.³

Vehicular radar systems, such as those developed by Delphi, have the potential to reduce these numbers by reducing the likelihood of an accident occurring in the first place or, if an accident cannot be avoided, by mitigating its potential severity. Presently, there are three types of vehicular safety systems based on radar technology: (1) notification to the driver of potential obstacles or collision; (2) automatic response of the vehicle, such as applying the brakes; and (3) impact protection to lessen the severity of an unavoidable accident on the driver and passengers. Delphi’s Back-up Aid (operating at 17 GHz and 24 GHz) can detect and alert a driver to an object behind a vehicle at five meters distance. Delphi has also developed radar-enabled Adaptive Cruise Control (at 76 GHz), which automatically maintains a vehicle’s speed and distance between it and a lead vehicle. Future radar systems will detect and warn of objects at any point around a vehicle as well as initiate impact protection measures, such as tightening of seat belts, if an accident is unavoidable.

Delphi’s vehicular radar systems employ a variety of waveforms, including frequency modulation continuous wave, pulse Doppler, frequency shift key, and spread spectrum waveforms using phase shift key modulation. Delphi has in production vehicle radar systems

² National Highway Traffic Safety Administration, Traffic Safety Facts 2001, 2 (December 2002).

³ *Id.*

based on low transmit power, wideband techniques authorized under Part 15, subpart C of the Commission's Rules,⁴ and is developing second generation ultra-wideband ("UWB") products under the new UWB vehicular radar allocation (Part 15, subpart F).

II. COMMENTS

Delphi generally supports the FCC in its efforts to continue evaluating the rules and improving the rules governing frequency usage and has previously expressed its agreement in principle to the proposed development and shift to an interference temperature spectrum regulatory policy.⁵ Such change is necessary to optimize procedures and policies to new conditions resulting from advances in technology and changed market realities. Delphi cautions, however, that great care must be taken before any new rules are established to ensure that incumbent and deployed systems are protected to the greatest extent possible while this transition takes place. Any such transition should also be done over a sufficient period of time to effectively analyze and implement policy changes of this magnitude.⁶

Delphi, however, would oppose at this time the introduction of an interference temperature metric in the bands used by vehicle radar systems: 17 GHz, 22-29 GHz and 76-77

⁴ In June 2000, the Commission granted authority to Delphi to market and deploy its "UWB-like" vehicular radar systems under Part 15 as unlicensed devices pursuant to Rules 15.209 and 15.231, 47 C.F.R. §§ 15.209 and 15.231. Grant of Equipment Authorization, FCC Identifier L2C0004TR (June 1, 2000).

⁵ See *Reply Comments of the Short Range Automotive Radar Frequency Allocation Group ("SARA") on the FCC's Spectrum Policy Task Force Report*, ET Docket No. 02-135, at 9 (Feb. 27, 2003) ("*SARA Reply Comments*"). SARA, of which Delphi is a member, is made up of automotive component manufacturers and automobile manufacturers that are developing and deploying vehicular radar systems.

⁶ In this regard, Delphi supports the Commission's suggestion that any proposed interference temperature metric be studied and evaluated before a general implementation. *NOI/NPRM* at ¶ 4.

GHz.⁷ Vehicular radar systems provide critical safety-of-life benefits to the traveling public, and the technology and market for these systems are still only emerging. The implementation of an unproven interference temperature metric in these bands would introduce uncertainty that may threaten the widespread deployment and application of these systems. Because of the critical safety functions associated with radars, these bands should receive the highest priority and protection. Delphi therefore recommends that the Commission implement an interference temperature metric on an experimental basis in bands not used by vehicular radar systems. Only after the concept is mature and proven should the Commission consider introducing it into the bands used by vehicular radar systems.

In the *NOI/NPRM* the Commission discusses a variety of options regarding band usage monitoring and control, including having all new unlicensed devices be equipped with circuitry that would enable the unit “not to operate” when either commanded to do so by an external monitoring system or when an in-unit detector determines the noise floor to be above a predetermined level.⁸ As described above, vehicular radar systems will be used as safety devices to reduce the number of accidents that occur and to minimize the severity of an accident should it be unavoidable.⁹ A vehicle safety device, however, cannot be “unexpectedly” turned off on command based on, for example, location or measured signal strength. It must be operable at all times when the vehicle is operable.¹⁰

⁷ Moreover, Delphi would oppose introducing the concept in bands, such as the 77-81 GHz band, that are potential candidates for allocation for vehicle radar systems.

⁸ *NOI/NPRM*. at ¶¶ 14, 22.

⁹ See *SARA Reply Comments* at 3-5.

¹⁰ While some applications, such as Back-Up Aid, which provide assistance in backing up and parking, are enabled only when a vehicle’s transmission is in reverse, the general rule is that

Moreover, the market for vehicular radar systems is extremely cost sensitive. The addition of extra circuitry to perform microwave frequency noise monitoring or to receive external commands could significantly increase the cost of these devices, which can be the difference between a particular vehicle model adding the radar feature or not. Any cost increases have the potential to turn vehicular radar systems into luxury items unaffordable to the general driver, thus denying the tremendous safety benefits of these devices to the majority of the traveling public. Accordingly, Delphi asks that the FCC take into account these and other unique features of automotive radar applications as it considers the rules for an interference temperature metric.

Vehicular radar systems also require significant bandwidth and often precise narrow beam low sidelobe antenna designs. These designs cannot change operating frequency significantly in order to reduce interference effects. Vehicular radar systems must therefore receive some degree of protection against interference if they are to become an effective safety device.¹¹ Delphi recognizes that establishing band sharing and interference temperature policies require some degree of compromise on the part of all spectrum users, but cautions that a very careful study of band sharing and noise floor control techniques must first take place before a general policy can be implemented. Given the important safety benefits to be gained from vehicular radar systems, any implemented interference temperature metric must ensure that vehicle radar devices are “protected from harmful interference from all other non-safety-related

most vehicle radar applications, such as Pre-Crash Sensing, Auto-Cruise, Stop&Go, Side Detection System, are enabled for continuous operation when the automobile is turned on. *See id.* at 6-7 n.9

¹¹ *See id.* at 9.

devices subject to the same interference limit.”¹² For this reason, a hybrid spectrum management model that includes varying requirements as a function of how the spectrum is to be utilized is required.¹³ For example, there needs to be certain bands, such as the existing 22-29 GHz and 76-77 GHz bands, where vehicle radar is considered a primary user and receives sufficient interference protection.

The Commission also proposes in the *NOI/NPRM* to apply certain of the new interference temperature approaches to unlicensed operations in the 6.525-6.700 GHz, 12.75-13.15 GHz and 13.2125-13.25 GHz bands.¹⁴ The Commission further suggests that “new” unlicensed devices operating in these frequency bands would have to incorporate transmit power control and dynamic frequency selection circuitry based on real time monitoring of the existing RF emissions by the unlicensed devices (*e.g.*, “listen-before-talk” or “sniff”).¹⁵ The existing part 15 rules allow use of the 5.46-7.25 GHz and the 12.7–13.25 GHz bands for any use at a maximum power level of 500 uV/m @ 3m.¹⁶ However, clarification of the definition of “new” devices operating in any of these bands is required. Specifically, would the introduction of a device operating within these bands be required to conform to the proposed interference temperature rules, or may the applicant elect to certify the equipment under existing Part 15 rules?¹⁷

¹² *Id.*

¹³ *See id.* at 6.

¹⁴ *NOI/NPRM* at ¶ 35.

¹⁵ *Id.* at ¶ 44.

¹⁶ 47 C.F.R. ¶ 15.209.

¹⁷ *NOI/NPRM.* at ¶ 38.

III. CONCLUSION

While Delphi generally supports the development of an interference temperature metric, Delphi opposes any implementation of this concept into the bands used by vehicle radar systems at this time. The technical development of and markets for vehicular radar systems are too immature to tolerate the resulting disruption and uncertainty. Delphi asks that the Commission recognize the unique and critical safety functions provided by vehicular radar systems, and ensure they are adequately protected. Any interference temperature metric should be introduced first in bands not used by vehicle radar systems.

Respectfully submitted,

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