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September 12, 2000

VIA MESSENGER

Ms. Magalie Roman Salas, Secretary
Federal Communications Commission
445 12th Street, S.W., TW-A325
Washington, D.C. 20554

RE: In the Matter of Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems, ET Docket 98-153

Dear Ms. Salas:

Enclosed for filing in the above referenced proceeding is the original and four (4) copies of the Comments of Delphi Automotive Systems Corporation.

Please date-stamp the enclosed extra copy of the cover sheet, marked for this purpose, and return in the self-addressed, postage-paid envelope which is provided.

If you have any questions regarding this filing, please do not hesitate to contact me.

Respectfully submitted,

Brett A. Snyder

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

In the Matter of	)	
	)	
Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems	)	ET Docket 98-153

COMMENTS OF DELPHI AUTOMOTIVE SYSTEMS CORPORATION

DELPHI AUTOMOTIVE SYSTEMS CORPORATION

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Its Attorney

Dated: September 12, 2000

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SUMMARY OF COMMENTS

Delphi Automotive Systems Corporation ("Delphi") has developed vehicular radar sensors using a variety of non-pulsed waveforms. Such devices have the potential to help greatly reduce fatalities, injuries, and property damage. Delphi believes the Commission should take care not to inadvertently exclude from this proceeding other such beneficial devices that operate at extremely low power levels.

Delphi supports the Commission's proposal to regulate UWB devices under Part 15 because low-power UWB devices are intended to be mass marketed to businesses and consumers, and it would be impractical and unwieldy to do otherwise.

Delphi supports the Commission's proposal to retain the general emission limits for emissions greater than 2 GHz. However, Delphi believes the Commission should limit absolute peak power emission to 30 dB above the permitted average emission level.

Delphi strongly believes the Commission should broaden the definition of UWB by modifying its proposed bandwidth and waveform requirements. Delphi believes the Commission should define UWB to include any device that (i) has a fractional bandwidth greater than 0.25, or (ii) occupies 500 MHz or more of spectrum, regardless of center frequency. Delphi strongly recommends that new rules allow all modulation schemes provided that peak, average, and spectral density power limits are met.

Delphi believes the Commission should modify its proposed definitions of UWB for three important reasons: (1) there are many useful narrower band waveforms with emissions levels lower than those of devices the Commission would approve under the proposed bandwidth requirements; (2) companies which have been producing radar sensors under the Commission's current rules, such as Delphi, would be disadvantaged

under the Commission's proposed definition because their systems would not be able to operate in restricted bands; and (3) consumers will not be able to benefit from improvements in existing technology.

Delphi supports the Commission position of eliminating frequency band restrictions for UWB devices at frequencies greater than 2 GHz. However, Delphi suggests that the Commission should not attempt to make a determination regarding frequency of operation or emission levels below 2 GHz until adequate testing of interference potential has been performed and commented upon.

Before the
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COMMENTS OF
DELPHI AUTOMOTIVE SYSTEMS CORPORATION

Delphi Automotive Systems Corporation ("Delphi"), by its undersigned attorneys, hereby submits these Comments in response to the Notice of Proposed Rule Making ("NPRM") in the above-referenced docket.[1]

I. BACKGROUND

A. Overview of Delphi

Delphi is a multi-national corporation headquartered in Troy, Michigan, with regional headquarters located in Paris, Tokyo and São Paulo. Delphi has approximately 216,000 employees and operates 179 wholly-owned manufacturing sites, 53 customer centers and sales offices, and 31 technical centers in 39 countries. Delphi, whose customers include every major manufacturer of light vehicles,[2] is generally recognized as a world leader in mobile electronics and transportation components and systems

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[1] *See Notice of Proposed Rule Making*, ET Docket 98-153, FCC 00-163 (rel. May 11, 2000).

technology, and Delphi has been heavily involved in the development, application, and deployment of vehicular radar sensors systems.

B. Overview of Vehicular Radar Sensor Systems

There are three types of vehicular radar sensor systems: (i) notification systems; (ii) automatic response systems; and (iii) impact protection systems. A notification system helps provide a driver with advance notice of a potential obstacle or possible collision. The notification may take the form of a video signal, such as a light, an audible sound, such as a buzzer, or a tactile signal, such as tapping on the brakes. Where a driver's vehicle has a notification system, it is still the responsibility of the driver to avoid the potential obstacle or collision. The vehicle will not automatically take any actions.

With a automatic response system, the vehicle itself will automatically act without any intervention from the driver. For example, such a system may apply the brakes to slow the driver's vehicle. Impact protection systems help to protect the driver from serious injury where a collision is imminent. Such a system may, for example, increase seat belt tension.

All three types of systems can and will help save lives and help prevent numerous serious injuries to drivers and passengers once they become readily available to the public at affordable prices. Notification and automatic response systems also can and will help prevent significant damage to property, including damage to automobiles, once they are commonly used. Vehicular radar sensor systems promise a significant advance

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[2] Delphi's customers include Audi, DaimlerChrysler, Daewoo, Fiat, Ford, General Motors, Harley-Davidson, Honda, Hyundai, Hummer, Isuzu, Mitsubishi, Renault, Rover, SEAT, Skoda, Suzuki, Toyota, Volvo, and VW.

in motor vehicle safety given traffic related death and injury statistics: In 1998, motor vehicle crashes caused a death every 13 minutes and a disabling injury every 14 seconds. Motor vehicle deaths totaled 41,200 and were the leading cause of fatal unintentional injuries in the country and the leading cause of death overall for people aged 1 to 29. Among pedestrians, there were an estimated 5,900 deaths and 84,000 injuries.[3]

While vehicular radar sensor systems are highly valuable under all driving conditions, their use will be particularly valuable in adverse weather conditions, such as snow, rain or fog, when the driver has difficulty seeing. These systems are also extremely beneficial where the driver has difficulty seeing because of other conditions such as bright sun light during the day or poor lighting at night.

C. Delphi's Vehicular Radar Sensor Systems

Delphi has been developing and building vehicular radar sensor systems since the late 1980s. As discussed below, some of Delphi's systems are currently licensed, marketed and sold in Europe, some systems have been licensed in the United States, and some systems are at various stages of planning and development. Delphi has developed its radar sensors using a variety of waveforms including Frequency Modulation Continuous Wave (FMCW), Frequency Shift Key (FSK), Psuedo Noise (PN), and spread spectrum techniques because impulse systems would operate in restricted bands. The

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[3] National Safety Council, *Injury Facts*™ (1999), *reprinted in part at* <http://www.nsc.org/lrs/statinfo/99report.htm>.

vehicular radar sensor systems that Delphi has created, is in the process of creating, or intends to develop include the following:[4]

Back-up Aid. Delphi has developed a sensor to assist the driver when backing up and parking. The Back-up Aid ("BUA") uses a radar sensor to provide a signal to help alert the driver of an object behind the vehicle within a range of six meters—enough distance for many drivers to stop before hitting an object. The BUA assists the driver in locating people, vehicles, or other objects when the car is operating in reverse, such as when the driver is backing out of a driveway or backing into a parking space. The BUA can also be used to inform the driver of the distance between the vehicle and a stationary object behind it. For example, the BUA can tell the driver as he backs up closer to another car while trying to park, how close the driver's car is to the other car.

Delphi received Commission and Canadian approval for the BUA sensor this year. In the United States, the BUA utilizes a PN Code spread spectrum waveform operating at 17 GHz. Delphi plans a European version of the BUA utilizing a PN Code spread spectrum waveform operating at 24.125 GHz. The 17-GHz BUA sensor can calculate the distance of objects behind the driver to within ± 10 cm. The 24-GHz BUA sensor, with its greater bandwidth, will be able to calculate the distance of objects behind the vehicle to within ± 5 cm. The Commission's adoption of regulations as suggested by Delphi herein would allow Delphi either to increase the bandwidth of its 17-GHz model,

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[4] In addition to sensors for use in notification, automatic response, and impact protection, Delphi has developed a licensed motion sensor to assist in the safe loading and unloading of bus passengers. This sensor is currently in use in the United States but is no longer offered by Delphi. Delphi also developed a sophisticated side radar detection system which has been licensed by the Commission. Because of the cost

or to adopt the 24 GHz model in the United States, in order to increase distance resolution and lower costs to consumers through increased volume of common sensor desgin.

Adaptive Cruise Control. Delphi has developed a forward-looking radar sensor to be used in conjunction with cruise control. The Adaptive Cruise Control ("ACC") system uses a radar sensor mounted at the front of the vehicle to detect objects in the vehicle's path. If the lane ahead is clear, the system will maintain the preselected speed determined by the driver. When slower traffic is detected, the ACC system will reduce speed using throttle control and limited braking to maintain a preset distance behind the lead vehicle. If additional braking is required, the system will provide a warning to the driver. In this regard, the system acts both as an automatic response system and a notification system.

The ACC sensor is approved, marketed and sold in Europe, and Delphi expects to apply for a Commission license in the near future for use in the United States. The ACC sensor utilizes a Frequency Modulated Continuous Wave (FMCW) waveform operating at 76 GHz.

Future Notification, Automatic Response, and Impact Protection Systems: Delphi is currently working on (i) a notification system that will help alert the driver of a potential collision from any direction through an audible, visual or tactile signal; (ii) an automatic response system that would apply the brakes of the vehicle to help avoid a potential collision from any direction, and (iii) an impact protection system that would

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involved in producing this system, demand for the system was low and Delphi does not offer it at this time.

help protect the safety of the driver by setting restraints such as an increased seatbelt tension to brace the driver for impact when a collision is unavoidable. In addition to these systems, Delphi is currently working with both foreign and domestic manufacturers on short-range radar sensors that will enable drivers to obtain more detailed measurements of their distance from other objects when attempting to park their vehicles.

Tradeoffs between size, performance, and cost indicate that an optimal center frequency for these future notification, automatic response, and impact reduction systems would be at 24 GHz. In addition, such a sensor operating at 24 GHz would be acceptable in Europe, where restrictions around 24 GHz are fewer than in the United States. Automobile manufacturer customers would be more likely to incorporate such safety systems into their vehicles since they could be assured of being able to sell the same car in both the European and U.S. markets. However, such 24-GHz systems, requiring emissions in restricted frequency bands, are not possible under current Commission regulations.

Delphi has expended a tremendous amount of resources over the past dozen years to select design approaches that are consistent with current Part 15 rules. However, Delphi believes that this UWB proceeding can greatly enhance Delphi's ability to produce high performance, lower cost products that can help save lives and reduce injuries and property damage. The Commission's adoption of regulations as suggested by Delphi herein would allow Delphi and others to operate in restricted bands. Such an approach would ultimately result in safety benefits to consumers through enhanced functionality of Delphi's equipment, lower cost of production, increased measurement accuracy, and the development of new radar applications. Delphi believes the

Commission should take care not to inadvertently exclude from this proceeding other such beneficial devices that will operate at extremely low power levels.

II. DISCUSSION

A. The Commission Should Regulate Low Power UWB Devices Under Part 15.

The Commission proposes regulating low-power UWB devices under Part 15 of the rules.[5] Delphi supports the Commission's proposal because low-power UWB devices are intended to be mass marketed to businesses and consumers, and it would be impractical and unwieldy to do otherwise. Delphi further agrees with the Commission's proposal to exclude high-power UWB devices from operating under Part 15 or on a licensed basis because of interference concerns.[6]

B. The Commission Should Regulate Average and Peak Power Emission Limits.

1. The Commission should adopt the general emission limits under the current rules for emissions above 2 GHz.

The Commission proposes that the general emission limits contained in 47 C.F.R. Section 15.209 are appropriate for UWB operations above 2 GHz.[7] Such limitations would apply to quasi-peak emission levels for frequencies under 1 GHz and to average emission levels for frequencies over 1 GHz.[8] Delphi supports the Commission's proposal

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5 *See* NPRM at ¶ 18.

6 *See id.* at ¶ 19.

7 *See id.* at ¶ 39.

8 *See id.* at ¶ 36.

to retain the general emission limits for emissions greater than 2 GHz. Past experience has shown that such limits are effective in avoiding potential interference.

2. The Commission should limit absolute peak power emission to 30 dB above the permitted average emission level.

The Commission proposes two methods of measuring peak emission levels for purposes of limiting such emissions over 1 GHz: (1) the peak level of the emission when measured over a bandwidth of 50 MHz; and (2) the absolute peak output of the emission over its entire bandwidth. The Commission proposes that peak emissions measured under the first method should not exceed 20 dB above the maximum permitted average emission level under current Part 15 rules, consistent with 47 C.F.R. Section 15.35(b). The Commission proposes that for purposes of the second method, the peak emission limit be based on the amount the –10 dB bandwidth of UWB emission exceeds 50 MHz,[9] but in no event to exceed 60 dB above the maximum permitted average emission level.[10]

Delphi agrees with the Commission that the peak power of UWB devices should be limited. Furthermore, Delphi supports the use of *both* proposed peak power measurements and the concept of a variable absolute peak power limit in proportion to the amount the emission's bandwidth exceeds 50 MHz. Based on knowledge of automotive applications and use of a variety of spread spectrum waveforms, Delphi

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[9] The Commission proposes the following formula to calculate a device's maximum peak emission level under the second method:
$[20 + 20\log_{10}((-10 \text{ dB bandwidth of the UWB emission in Hertz})/50 \text{ MHz})]$ dB.
See NPRM at ¶ 43.

[10] *See* NPRM at ¶¶ 36, 42-43.

agrees with the Commission in maintaining the existing 20 dB limit for measurements in a 50 MHz bandwidth.

Delphi, however, does not believe that the overall magnitude of the proposed absolute peak emission limit needs to be relaxed as much as the Commission proposes. As stated in the NPRM, detailed knowledge of all types of receivers and all possible interference mechanisms is not known. This issue requires additional analysis and testing. Therefore, at this time, Delphi recommends a more conservative approach: the "absolute peak" emissions, as measured over the entire emission bandwidth, should be no more than 30 dB above the average limit, regardless of the emission total bandwidth. This would mean that the waivers issued to Time Domain Corporation, U.S. Radar Inc. and Zircon Corporation would have to be maintained, but it would minimize the number of devices radiating at higher power and reduce the possibility of encountering unexpected interference. Delphi believes that the Commission must guard against extremely high power, extremely short duration pulse emissions because such emissions may overload the wideband (microwave) sections of otherwise narrowband receivers. Delphi has shown that effective automotive radar can be readily designed within current Commission emissions limits.

C. The Commission Should Define UWB More Broadly So As Not To Reject Emissions Causing Less Interference Risk, Which Would Disadvantage Consumers As Well As Companies Such As Delphi.

Delphi strongly believes the Commission should broaden the definition of UWB by modifying its proposed bandwidth and waveform requirements. The Commission should modify its proposed definition of UWB because it would preclude narrower band waveforms with emissions levels lower than devices the Commission proposes to

approve, companies that have been producing radar sensors under the Commission's current rules would be disadvantaged, and consumers will not benefit from improvements in existing technology.

Bandwidth definition. The Commission proposes defining UWB devices to include any device that (i) has a fractional bandwidth greater than 0.25, or (ii) occupies 1.5 GHz or more of spectrum when the center frequency of the emission is greater than 6 GHz. The Commission noted that most of the UWB systems that had been brought to its attention employ fundamental emissions greater than 1.5 GHz. The Commission proposes that the definition be based on the -10 dB bandwidth and that the center frequency be defined as the average of the upper and lower -10 dB points, *i.e.*, $(F_{H10} + F_{L10})/2$. Finally the Commission proposes that the bandwidth be determined by using the antenna that is designed for use with the UWB device.[11]

Delphi agrees with the proposed definition of center frequency and with the proposal that the bandwidth and center frequency be determined by the antenna to be used with the device. Delphi also agrees with creating a definition that uses the -10 dB power points in order to simplify and improve the accuracy of measurements.

Delphi strongly believes, however, that the Commission's proposed minimum bandwidth requirement of 1.5 GHz is too large. Specifically, for the reasons set forth in subsections 1, 2, and 3 of this section below, Delphi believes the Commission should

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[11] *Id.* at ¶ 21.

define UWB to include any device that (i) has a fractional bandwidth greater than 0.25, or (ii) occupies 500 MHz or more of spectrum, regardless of center frequency.[12]

Waveform definition. The Commission has requested comments regarding whether the UWB definition should be limited to pulsed devices and for comments regarding other ways to determine bandwidth, such as calculated bandwidth based on pulse width.[13] Delphi strongly believes that the definition of UWB should not be limited to pulse only operation for the reasons set forth below and in Subsections 1, 2, and 3 below.

Delphi does not believe that making a rules change to allow only one type of RF modulation, *i.e.*, "pulse" or short duty cycle amplitude modulation, to qualify a device as "UWB" is in the best interest of market competition or the general concern of minimizing possible interference. There are a variety of waveforms, *i.e.*, modulation techniques, that can be utilized to obtain required system cost and performance for many applications. Some of these alternate, non-impulse waveforms transmit far less peak power and average power than devices the Commission proposes to approve in the NPRM. As discussed below, Delphi strongly recommends that new rules allow all modulation schemes provided that peak, average, and spectral density power limits are met.

The Commission should modify its proposed bandwidth and waveform definitions of UWB for three important reasons: (1) there are many useful narrower band waveforms with emissions levels lower than those of devices the Commission would

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[12] If the device operates completely within the rules of an existing allocation, such as for 76 GHz automotive radar, the device should be licensed under that intended application and not as a UWB device.

[13] *See* NPRM at ¶ 21.

approve under the proposed fractional bandwidth requirement of 0.25 or the minimum bandwidth requirement of 1.5 GHz; (2) companies which have been producing radar sensors under the Commission's current rules, such as Delphi, would be disadvantaged under the Commission's proposed definition because their systems would not be able to operate in the restricted bands; and (3) consumers will not be able to benefit from improvements in existing technology.

1. Useful narrower band waveforms with emissions levels lower than those the Commission would accept under the proposed UWB definition would be precluded by the proposed minimum bandwidth requirements.

The Commission should set the minimum bandwidth requirement to include devices that use a smaller portion of the spectrum or antennas that have higher directivity and sharper skirts. Specifically, Delphi strongly believes the Commission should reduce the minimum bandwidth requirement to 500 MHz, as there are many useful waveforms with very low level emissions that would be precluded by the proposed minimum bandwidth requirement of 1.5 GHz. The interference levels of narrower band devices can be controlled by average and peak power rules in conjunction with power spectral density limits in the same manner as proposed for devices with bandwidths in excess of 1.5 GHz.

As discussed herein, if the Commission does not lower its bandwidth requirements, it will reject devices with less interference potential than those it would accept. Figure 1 shows two power spectral density curves of two different waveforms, one with a narrower band (curve A) and one with a much wider bandwidth (curve B).

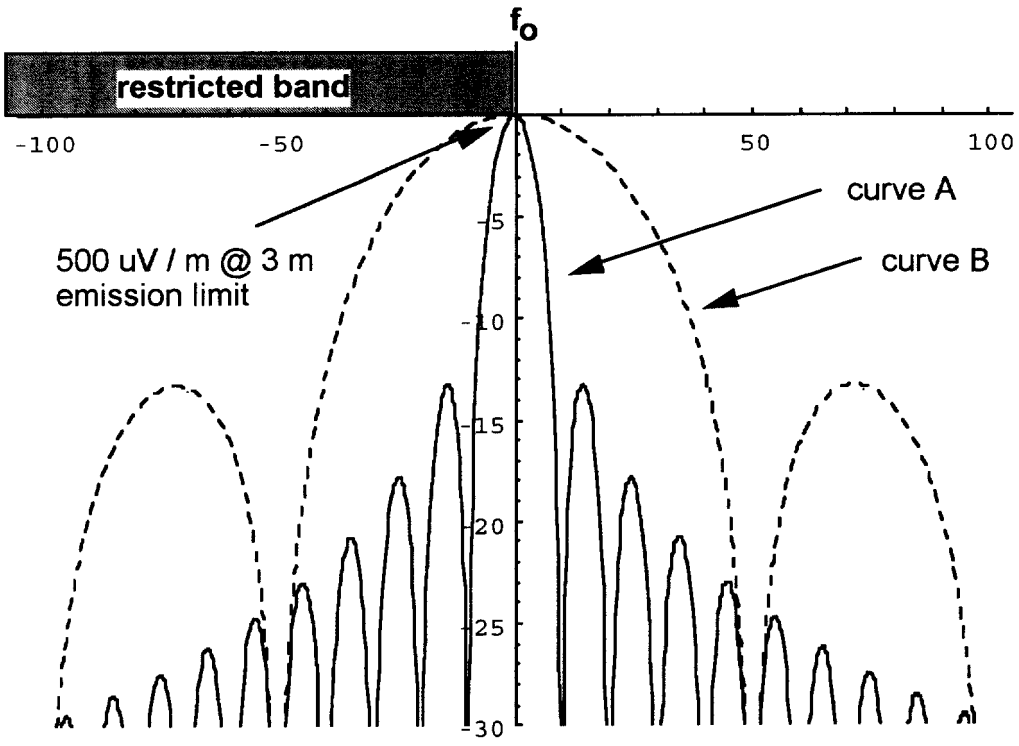

Figure 1. Example waveform power spectral densities, positioned next to an example restricted band. The "narrow band" waveform (curve A, solid line) exhibits substantially less potential for interference with devices operating in the restricted band than curve B (dashed line).

Both waveforms comply with the general E field emissions limits of 500 μV/m at 3 meters as measured on a spectrum analyzer in a 1 MHz bandwidth. Under the proposed rules, a device with curve "A" emissions would not qualify as a "UWB" device, whereas a device radiating curve "B" would. Device "A" exhibits less potential for interference to devices operating in the example restricted band than would device "B"; it occupies less bandwidth, radiates less average power, and has a lower "peak" power than device "B". The proposed rules regarding minimum bandwidth requirements would allow device "B" to operate while preventing device "A" from operating, even though device "A" is less

harmful to potential victim receivers than is device "B". In addition to occupying less bandwidth, radiating less power, and having less interference potential relative to device "B", device "A" in many instances (especially in radar applications) is more useful to the consumer than device "B".

2. Companies which have been producing radar sensors under the Commission's current rules would be disadvantaged under the Commission's proposed definition.

Limiting the definition of UWB to impulse devices or to devices with a bandwidth of 1.5 GHz greatly disadvantages companies that have invested in developing RF sensor technology that is compliant with the Commission's current rules.

Impulse-based radar systems generally require at least 1.5 GHz of bandwidth in their operation. Under the Commission's current rules, however, radar devices requiring 1.5 GHz or more of bandwidth would usually be rejected by the Commission because the fundamental emission of the device would invariably intrude into restricted frequency bands or into television broadcast frequency bands. Because of this inherent limitation in impulse devices, Delphi made a deliberate business decision to focus on developing technology of similar application using narrower band waveforms that would comply with the Commission's rules. Since the late 1980s, Delphi has heavily invested in the research, development, and testing of non-impulse technology and in the infrastructure required to manufacture vehicular radar sensors using such technology.

Delphi has been successful to an extent in its design of radar devices utilizing a narrower bandwidth (relative to impulse radar devices) that would conform to current Commission regulations. Delphi has developed sensors using a variety of waveforms including Frequency Modulation Continuous Wave (FMCW), Frequency Shift Key

(FSK), Psuedo Noise (PN), and spread spectrum techniques. Delphi has been able to get such devices licensed by the Commission because these narrower band radar devices utilize non-pulsed waveforms which do not intentionally operate in restricted or television frequency bands.

The Commission's proposed bandwidth and waveform requirements would exclude devices of identical application utilizing non-impulse wave forms with narrower bandwidths developed to conform to current Commission regulations. If the proposed definition were adopted, impulse devices would be permitted to operate in restricted bands, while devices utilizing other wave forms would be unable to do so. Companies such as Delphi, which have developed narrower band, continuous wave technology will find themselves suddenly competing with less controlled devices operating in restricted bands. Consequently, companies such as Delphi, which have attempted to work within the current regulatory framework, would out of necessity be required to abandon their alternative, non-impulse sensor technology and would have to start from scratch to design impulse devices. Delphi's competitors, which have already begun to develop impulse devices over the past several years even though many of those devices have little chance of meeting existing rules, would have a distinct competitive advantage over Delphi. Delphi does not advocate the exclusion of impulse devices from restricted bands, but strongly believes that its non-impulse devices should not be excluded from the definition of UWB when it has relied on current Commission regulation when choosing among technologies.

The fact of the matter is that Delphi would be at a disadvantage to improve upon its current radar sensors if narrower band, non-impulse wave forms are excluded from the

definition of UWB. Delphi's current radar bandwidths, made to "fit" within unrestricted frequency bands but adjacent to restricted bands, cannot be expanded without fundamental emissions into those restricted bands. If UWB is limited to wider band, impulse waveforms, the growth of technology already developed by Delphi under the current rules will be impeded. Given that such devices have emissions levels lower than those the Commission would accept under the proposed definition (and thus even less interference potential), Delphi strongly believes that narrower band, non-impulse devices should be included in the definition of UWB.

Further, the inclusion of narrower band, non-impulse devices in the definition of UWB will decrease the cost of providing such devices to the consumer. Currently, many radar sensors operating at 24 GHz can be licensed in Europe but not in the United States because of U.S. frequency band restrictions around 24 GHz.[14] Delphi, which has designed 24 GHz radar sensors for the European market, has had to develop devices utilizing other frequency bands for the same application in the United States. If the Commission were to include non-impulse devices in its definition of UWB, then companies such as Delphi would not be required to start all over for the United States market. Delphi would be able to produce one device for both the U.S. and European markets, thereby decreasing the per unit cost of production. Producing sensors for the same application at different frequencies results in inherent production cost increases. This cost, of course, must be passed along to the consumer. Higher production costs

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[14] Such devices are generally centered at 24.125 GHz. Commission regulations prohibit non-spurious emissions in the frequency band 23.6–24.0. *See* 47 C.F.R. § 15.205.

mean that fewer consumers will purchase the radar systems, with the result that fewer collisions are avoided overall.

3. Under the proposed definition, consumers will not have access to improvements in existing non-impulse technology.

Delphi believes that adoption of a definition of UWB that excludes narrower band, non-impulse systems would have a detrimental effect on consumers. As shown above, companies such as Delphi would be precluded from improving upon existing designs. Consequently, consumers of sensor systems such as those produced by Delphi would be denied the advantage of lower costs of production due to common designs and the development of new radar applications. As a result, consumer safety benefits offered by future systems would be adversely affected.

D. The Commission Should Not Restrict Frequency of Operation Above 2 GHz.

The Commission is proposing no restrictions with regard to frequency of operation of UWB devices above approximately 2 GHz and invites comments on this proposal.

Delphi supports the Commission position of eliminating restricted bands for UWB devices at frequencies greater than 2 GHz. Delphi also suggests that, for frequencies greater than 2 GHz, if the peak power exceeds the current 20 dB limit[15] the Commission consider requiring the center frequency of the emission to occupy existing bands already allocated to higher-power operations. Since the highest power levels will

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[15] *See* 47 C.F.R. § 15.35(b).

occur at the center frequency, the interference potential will be minimized since higher power transmitters already exist in these bands. Delphi also suggests that the Commission require center frequency stability to be maintained within current higher-power bands.

If the Commission concludes that it cannot eliminate all frequency band restrictions for emissions above 2 GHz, Delphi believes that the Commission can at least safely do so for all emissions above 5 GHz.

E. The Commission Should Not Make a Determination Regarding Emissions Below 2 GHz Until Adequate Testing is Completed.

The Commission has asked for comments on UWB operations, potential restrictions on operation for UWB below 2 GHz, and the impacts such restrictions would have on any potential applications for UWB technology. The Commission has also invited comment as to the precise frequency below which operations of UWB devices may need to be restricted.[16]

Delphi currently produces interior security systems in Europe that operate with a center frequency lower than 2 GHz. Adoption of rules prohibiting UWB devices from operating below 2 GHz would eliminate the possibility of marketing these devices in the United States. Delphi suggests that the Commission should not attempt to make a determination regarding frequency of operation below 2 GHz until adequate testing of interference potential has been performed and commented upon. Additionally, Delphi believes that the Commission should not attenuate general emission limits below 2 GHz

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16 *See* NPRM at ¶¶ 27-29.

before adequate testing has been performed and the Commission has received comments on such tests.

III. CONCLUSION

For the reasons set forth herein, the Commission should adopt rules consistent with the comments and proposals of Delphi.

Respectfully submitted,

DELPHI AUTOMOTIVE SYSTEMS CORPORATION

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Dated: September 12, 2000