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July 18, 2003

VIA MESSENGER

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
Office of the Secretary
445-12th Street, S.W.
TW-A325
Washington, D.C. 20554

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JUL 18 2003

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

**RE: Revision of Part 15 of the Commission's Rules Regarding
Ultra-Wideband Transmission Systems**

Comments of Delphi Automotive Systems Corporation

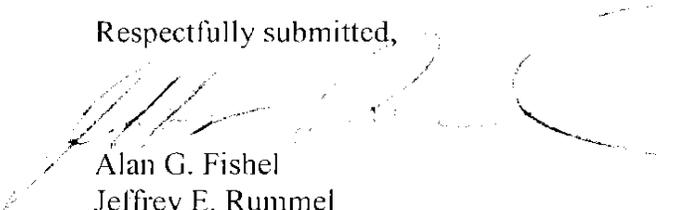
ET Docket 98-153

Dear Ms. Dortch:

On behalf of Delphi Automotive Systems Corporation ("Delphi"), transmitted herewith are an original and four (4) copies of Delphi's "Comments" in connection with the above-referenced proceeding.

If any questions arise with respect to these Comments, please do not hesitate to contact undersigned counsel.

Respectfully submitted,


Alan G. Fishel
Jeffrey E. Rummel

Enclosures

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**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 **RECEIVED**

JUL 1 8 2003

**COMMENTS OF
DELPHI AUTOMOTIVE SYSTEMS CORPORATION**

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Delphi Automotive Systems Corporation ("Delphi"), by its undersigned attorneys, hereby submits these "Comments" in response to the Commission's "Further Notice of Proposed Rule Making" ("FNPRM") released on March 12, 2003, in the above-captioned proceeding.¹ Delphi is a leader and innovator in the design and manufacture of automotive radar and has actively and consistently participated in the Commission's ultra-wideband ("UWB") rulemaking process throughout this proceeding.² Delphi's Comments address the following critical matters:

- The Commission should permit the operation of any UWB device pursuant to the UWB standards currently designated for hand held devices, but only so long as the permission granted would extend to the following devices as well: (i) devices employing the pseudo-noise direct sequence binary phase shift key ("PN DS BPSK") waveform; and (ii) high PRF devices (in addition to the low PRF devices contemplated by the Commission).
- The Commission should allow any UWB device to be operated under the standards for hand held UWB devices, e.g. the Commission should allow any UWB device to be operated in the 3.1 – 10.6 GHz band.
- UWB devices should generally be permitted in all frequencies above 10.6 GHz (as well as frequencies between 3.1 and 10.6 GHz), except where it can be established that such use would interfere with existing licensees (in which instances the Commission should, to the extent necessary, reduce UWB emissions limits for those specific bands where the interference may occur).

¹ "Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems", Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, ET Docket No. 98-152, FCC 03-33, ¶¶ 153-166 (rel. March 12, 2003) ("MO&O and FNPRM").

² See, e.g., "Ex Parte Comments of Delphi Automotive Systems Corporation" ("July 2001 Comments") and accompanying "Engineering Study" ("Study") filed July 13, 2001; "Comments" filed on September 12, 2000; and "Reply Comments" filed October 12, 2000.

- The proposed rule changes to 47 C.F.R. §15.35(b) (“Section 15.35(b)”) set forth in paragraph 164 of the FNPRM should be adopted, as Section 15.35(b) currently unnecessarily constrains emissions of non-UWB part 15 wideband devices to levels well below that of UWB devices.
- The alternative proposal of Multispectral Solutions, Inc. (“MSSI”) to use a 1 MHz bandwidth in measuring the peak power of an emitter is inappropriate and should be rejected.
- The 500 MHz minimum emissions bandwidth requirement for UWB devices should be eliminated because it is an unnecessary constraint that potentially hampers spectrum use, while not providing added interference protection to existing services.

In support of these “Comments”, Delphi respectfully states as follows:

I. PERMITTING ANY UWB DEVICE TO BE OPERATED UNDER THE STANDARDS FOR HAND HELD UWB DEVICES

A. Inclusion of PN DS BPSK Devices and High PRF Devices

In response to a submission from MSSI, the Commission has proposed to amend the rules to “permit the operation of any UWB device under the UWB standards currently designated for hand held devices as long as the PRF does not exceed 200 kHz and the equipment employs a pulsed or an impulse modulation.”³

Delphi strongly supports permitting the operation of any UWB device under the UWB standards currently designated for hand held devices, but only so long as the permission granted would extend to the following devices as well: (i) devices employing the PN DS BPSK waveform; and (ii) high PRF devices (in addition to the low PRF devices contemplated by the Commission).

1. Inclusion of PN DS BPSK Devices

In Delphi’s July 2001 Comments filed in connection with the initial rulemaking in this proceeding, Delphi established the following:

³ See FNPRM, ¶¶153-155.

- Pulsed waveforms and the PN DS BPSK signal employed by Delphi are virtually identical in the frequency domain.⁴
- The PN DS BPSK signal is as close to thermal noise in physical properties as has been invented, and is more noise-like than proposed pulse type signals. *Id.* at 3-4.
- Due to its noise-like properties, the interference risk presented by the PN DS BPSK signal to existing receivers is no greater than, and ordinarily will be less than, the interference risk presented by proposed pulsed type signals. *Id.* at 3-4, 5-10.

In light of the comments of Delphi and others, in the First Report and Order in this proceeding,⁵ the Commission concluded “that various modulation types should be permitted as long as the products comply with all of the technical standards that are being adopted in this proceeding,” and, in particular, PN DS BPSK is one of the modulation types approved.⁶

For the same reasons, if the Commission permits the operation of any UWB device under the UWB standards currently designated for hand held devices where the PRF does not exceed 200 kHz and the equipment employs a pulsed or an impulse modulation, the Commission should also permit such operation where the device employs the PN DS BPSK waveform. Non-pulsed waveforms should be allowed at any frequency where pulse waveforms are permitted, as Delphi has demonstrated that pulsed waveforms and the PN DS BPSK signal employed by Delphi are not only virtually identical in the frequency domain, but when operating within the UWB average power and peak power limits they have similar interference potential.⁷ Because the pulse/impulse waveform has no less interference potential in any case than a PN DS BPSK waveform, prohibiting PN DS BPSK waveforms and allowing pulse waveforms has no physical

⁴ *See Study*, p. 2-5. The PN DS BPSK waveform is created by bi-phase modulating an RF carrier with a digital sequence, where the sequence is a “maximal length” code. The RF carrier is reversed in phase 180° according to the digital sequence : a digital sequence of 1, 0, 1, 1, 1, 0, 1, 0, ... would result in a transmitted carrier with phase states 0°, 180°, 0°, 0°, 0°, 180°, 0°, 180°, ... accordingly. Each code bit state and corresponding carrier phase state is called a “chip”, where the time duration of the chip is called the chip period. The code sequence has a finite length. When the entire code sequence has been applied to the RF carrier, the process is repeated in most communications and radar applications. *Id.* at 3.

⁵ “Revision of Part 15 of the Commission’s Rules Regarding Ultra-Wideband Transmission Systems”, *First Report and Order*, ET Docket No. 98-152, FCC 02-48 (rel. April 22, 2002) (“First R&O”).

⁶ *First R&O*, ¶¶32, 270.

justification. That is, excluding the PN DS BPSK waveform in this context would constitute an arbitrary, impermissible distinction unsupported by the technical characteristics of the signal when compared to pulse-type signals.⁸

Moreover, excluding the PN DS BPSK waveform would also be patently contrary to the public interest. Devices that use the PN DS BPSK waveform that could be highly beneficial to the public would be barred for no valid reason whatsoever. For example, a vehicular radar application for a side detection system could use the PN DS BPSK waveform in the 3.1 – 10.6 GHz band.⁹

In sum, selectively allowing certain waveforms while prohibiting other waveforms provides an unfair bias towards certain manufacturers, underutilizes the frequency spectrum, inhibits UWB technology development, and does not enhance interference protection to existing services.

2. Inclusion of High PRF Devices

A PRF criteria for operation of any UWB device in the 3.1 – 10.6 GHz band should not be applied.

In the MO&O and FNPRM, the Commission confirmed that the “combination of technical standards and operational restrictions [adopted by the Commission for UWB] is designed to ensure that UWB devices can coexist with the authorized radio services without the risk of harmful interference....”¹⁰ UWB devices, when operated in accordance with all of the UWB emissions standards, whether low PRF pulse, high PRF pulse, or PN DS-BPSK waveforms, will not cause harmful interference with existing services in the 3.1 – 10.6 GHz

⁷ See Study, p. 2-5.

⁸ See *Melody Music, Inc. FCC*, 345 F.2d 730 (D.C. Cir. 1965) (The Commission must treat similarly situated parties alike unless it explains its reasons for differential treatment).

⁹ A side detection system continuously observes the side blind spots that typically evade the driver’s view. When an object is in a blind spot, a clearly visible indicator lights up, allowing a quick glance by the driver to see if he/she has a clear adjacent lane to make a lane change.

¹⁰ See MO&O and FNPRM, ¶5.

band. UWB emissions are too low in power to represent a harmful interference threat in these bands. Therefore, in light of the Commission's stated policies in this proceeding, there is no reason to exclude from approval high PRF devices. As with devices employing the PN DS BPSK waveform, any exclusion of high PRF devices from UWB operations would be arbitrary and capricious and contrary to the public interest.

B. Inclusion of All UWB Devices to be Operated in the 3.1 -- 10.6 Band.

The Commission should allow any UWB device to be operated under the standards for hand held UWB devices, e.g. the Commission should allow any UWB device to be operated in the 3.1 – 10.6 GHz band. Delphi knows of no interference potential to existing services that would be introduced by operating any UWB device(s) outdoors in accordance with the emissions standards for hand held UWB devices. In addition, no changes to the UWB standards are required to accommodate UWB devices in the 3.1 – 10.6 GHz band. The presently existing restraints on UWB average and peak EIRP emissions provide for more than adequate protection against potential interference to existing services.

C. Frequencies above 10.6 GHz

In the FNPRM, the Commission seeks comment on permitting the operation of all or certain UWB devices in the 3.1 – 10.6 GHz band. While that issue is very important, Delphi respectfully submits that it is in the public interest to expand the scope of such analysis beyond that particular frequency band. Specifically, UWB devices should generally be permitted in *all* frequencies above 10.6 GHz (as well as frequencies between 3.1 and 10.6 GHz), except where it can be established that such use would interfere with existing licensees (in which instances the Commission should, to the extent necessary, reduce UWB emissions limits for those specific bands where the interference may occur). Given the presently existing restraints on UWB average and peak EIRP emissions, generally speaking, UWB devices will not cause interference

in the frequency bands above 10.6 GHz, just as they will not do so in the frequency bands between 3.1 GHz and 10.6 GHz.¹¹

Not only is permitting operation of UWB devices in the bands above 10.6 GHz consistent with the public interest, such action would be supported by recent unambiguous pronouncements of the Commission with respect to spectrum policy. An important goal of the Commission, as indicated in the “Spectrum Policy Task Force Report”, ET Docket No. 02-135, November 2002, (the “Task Force Report”), is to increase spectrum utilization via innovative spectrum management techniques. As the Commission recognized in the Task Force Report, it is in the public interest for the Commission to expand spectrum access for unlicensed transmitters and to allow for the maximum feasible flexibility of spectrum use by both licensed and unlicensed users.¹² Specific methods for achieving such flexibility and increased spectrum utilization recommended in the Task Force Report include “underlay[ing] beneath primary users unlicensed devices [that] operate below acceptable interference level[s] (that is, operate on a non-interference basis with licensees) ..”¹³

Given the presently existing restraints on UWB average and peak EIRP emissions, UWB devices provide excellent examples of unlicensed devices that generally operate below acceptable interference levels. Accordingly, with regard to UWB, the Commission has a perfect opportunity in this proceeding to put its principles into practice, and to begin to make the goals in the Task Force Report a reality. Moreover, by allowing the operation of any UWB device above 10.6 GHz (as well as between 3.1 and 10.6 GHz), the Commission can

¹¹ If the Commission considers the issue of whether permitting UWB devices in *all* frequencies above 10.6 GHz to be a logical outgrowth of the Commission’s proposal to permit UWB devices between 3.1 and 10.6 GHz, it can decide the issue without issuing a Supplemental Further Notice or initiating a new rulemaking. See Weyerhaeuser Company v. Costle, 590 F.2d 1011 (D.C. Cir. 1978). Should the Commission, however, view the consideration of such a request to be beyond the scope of the FNPRM, Delphi respectfully suggests that the Commission issue a supplemental Further Notice (or initiate a new rulemaking) so that this important issue can be decided.

¹² Task Force Report, ET Docket No. 02-135, p. 54-58; Public Notice, “Commission Seeks Public Comment On Spectrum Policy Task Force Report”, FCC 02-322, Separate Statement of Commissioner Copps.

¹³ Task Force Report at 63.

increase spectrum use and maximize the development of this important technology, thereby bringing substantial benefits to the greatest number of citizens.

II. MODIFYING NON-UWB STANDARDS TO ACCOMMODATE WIDEBAND PART 15 TRANSMITTERS

A. Revisions Contemplated in Paragraph 164 of the Further Notice

Delphi supports the proposed rule changes to Section 15.35(b) set forth in paragraph 164 of the FNPRM. At the present time, through the peak power rules alone, Section 15.35(b) unnecessarily constrains emissions of non-UWB part 15 wideband devices to levels well below that of UWB devices. The modifications contemplated in paragraph 164 will rectify this imbalance and allow manufacturers to best utilize the available spectrum resource. In short, the peak power options proposed by the Commission in paragraph 164 will limit peak power emissions to the extent necessary to protect existing services, both with respect to narrowband as well as wideband emitters.

Under the proposed rule, the minimum peak measurement bandwidth requirement of 1 MHz exists in conjunction with the requirement that the peak measurement bandwidth shall be no more than 10% of the 10 db emissions bandwidth. Delphi understands that these proposals collectively create an implicit requirement that, in order to use the peak power measurement described in the proposed rule, the emitter must exhibit a 10 db radiated bandwidth of at least 10 MHz. Proposed changes in the UWB definition would also contain this implicit rule. Delphi has no concerns with the implicit requirements, given narrowband systems have relatively high power allocations for unlicensed transmitters throughout the spectrum, with *emissions limits unto their own*.

B. The Alternative Proposal of MSSSI

The alternative proposal of MSSSI to use a 1 MHz bandwidth in measuring the peak power of an emitter is inappropriate and should be rejected. There must be, other than the

type of detector, a method to distinguish estimates of “Peak” power and “Average” power, as both emissions parameters should be monitored and controlled. Peak power measurement bandwidth is critical in assessing peak power emissions, and must be wider than the average power measurement bandwidth so as to distinguish between the two quantities of “average” and “peak” power. MSSI’s proposed rule could potentially allow extremely high peak power emissions due to the narrow bandwidth of the proposed measurement.

III. PROPOSED CHANGES TO THE UWB DEFINITION

Delphi wholeheartedly agrees with the Commission’s assessment that requiring a minimum emissions bandwidth of 500 MHz in order to qualify a device as a “UWB device” is an unnecessary constraint that potentially hampers spectrum use, while not providing added interference protection to existing services. As shown in earlier filings by Delphi, relatively narrowband UWB emissions exhibit less potential for interference than do wider bandwidth emissions.¹⁴ By allowing “narrowband” operations in UWB devices, the utility and flexibility of UWB devices will be increased, thereby increasing spectrum use with less potential for interference than from wideband UWB devices.

Industry has identified applications where the “best design” calls for the device to vary its 10 db radiated bandwidth. As an example, Delphi has fielded an application that would greatly benefit from a variable bandwidth of ~ 250 MHz and 2500 MHz.¹⁵ This is one of potentially many applications that call for variable radiation bandwidth to the significant benefit of the user. By allowing UWB radiated bandwidth to fall below 500 MHz, the Commission will directly benefit the users of UWB products by allowing the lowest cost and most useful designs to be applied -- and, in fact, to be applied without increasing (and in many instances actually decreasing) the potential for interference.

¹⁴ See *Study* at 10-12.

¹⁵ *Id.* at 10-11.

IV. COMBINATION OF MODIFICATIONS DISCUSSED IN SECTIONS II AND III

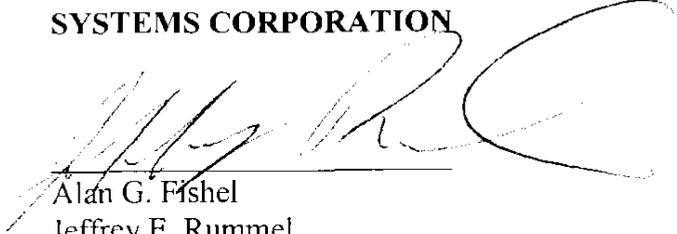
It is Delphi's view that the combination of rules changes regarding peak power limits for non-UWB unlicensed part 15 devices and changes to the required UWB bandwidth would make the Part 15 rules for unlicensed transmitters much more consistent and equitable. Artificial bandwidth and peak power constraints would be removed under the proposed rules, where potential for interference to existing services will not be elevated and in some cases actually reduced.

V. CONCLUSION

For the reasons set forth herein, the Commission should adopt rules consistent with the comments and proposals of Delphi, as specified in these *Comments*.¹⁶

Respectfully submitted,

**DELPHI AUTOMOTIVE
SYSTEMS CORPORATION**

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Dated: July 18, 2003

¹⁶ At ¶156 of the FNPRM, the Commission sought comment in connection with the request of Siemens VDO Automotive AG ("Siemens") to permit the operation of frequency hopping systems as vehicular radar systems in the 22-29 GHz band. While Delphi has not addressed Siemens' request in these comments, Delphi does believe that if the Commission grants Siemens' request, the Commission should ensure that its approval is not unduly narrow and would cover other vehicular radar systems that have waveforms (i.e., swept frequency) that are similar to Siemens' proposed waveform.