DELPHI
Automotive Systems

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Mr. Greg Czumak
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FCC Application Processing Branch

Reference: FCC ID L2C0004TR, Applicant: Delphi Delco Electronics Systems, Correspondence Reference Number: 12255, 731 Confirmation Number: EA95105, (Back-up Aid Radar Sensor)

Dear Mr. Czumak:

The Delphi Delco Back-Up Aid Radar is a new safety feature designed to be used on vehicles in various short range applications including Backup Object Detection, Blind Spot Object Detection, Short Range Autonomous Cruise Control Stop and Go, and Pre-Crash. The purpose of this device is to signal a driver backing up at low speed (such as backing out of a driveway) that there is an object in his/her way in time for the driver to stop the car. Existing technology for this purpose relies upon ultrasonic sensors, which are limited in range and environmental performance. These ultrasonic sensors can operate only up to 2 meters in range and do not provide adequate warning to drivers backing up at low speeds of only 3 mph. The Delphi Delco sensor will advance public safety by replacing the functionality of ultrasonic sensors in these applications and offering extended ranges of performance. Specifically, for the Back-Up Aid application, a range of six meters is needed to allow for standard driver reaction times during typical backing maneuvers up to 10 mph. This allows the systems to not only inform the driver about the distance to known objects, but can warn the driver about unknown objects with time to react.

Delphi Delco believes its radar sensor is compliant with all of the FCC regulations. The sensor design accounts for radiation limits on average radiated power as measured in a 1 MHz bandwidth; peak instantaneous radiated power, and potential carrier leakage emissions. Special design features are incorporated to assure emission compliance. There is a bandstop filter in the transmitter output to suppress unmodulated carrier emissions (carrier leakage), the modulation employed is designed to assure average power limits are not exceeded. Attenuators are used in the transmitter output to assure compliance with rule 15.35(b) and 15.209

Delphi Delco has considered the comments made in your e-mail dated February 18th regarding rule 15.35(b) and provides both analysis and data to show the Back Up Aid Radar Sensor is compliant.

Your correspondence points out that the EUT waveform and a pulse train modulated waveform have the same power spectral density curves. Delphi Delco

believes that applying a pulse train analysis to the spectrum analyzer readings from the EUT is inappropriate. The two waveforms have fundamentally different characteristics, phase modulation vs. amplitude modulation and continuous wave emission vs. time dependent emission. As a result, the two waveforms interact with the spectrum analyzer in different ways.

The subject of the enclosed analysis is the relationship between a spectrum analyzer response and the total radiated power (or "peak" power) of a direct sequence spread spectrum signal as used by the EUT. This analysis showed that the total radiated power for the waveform and circuit design is 24 dB above the power measured on the spectrum analyzer using a 1 MHz resolution bandwidth.

The sensor was initially measured using the spectrum analyzer 1 MHz resolution bandwidth method. The resulting E-field at 3 meters is 45.5 dBuV/m. This result is compliant with the limit of 54 dBuV/m specified in rule 15.209 (See enclosed in the attachment).

Delphi Delco then measured the sensor using a peak power meter. Test and measurements of the radar sensor in conformance with the peak detection method of 15.35(b) are fully described in the attachments. The measurement result was an E-field of 71.9 dBuV/m at 3 meters. This result is consistent with the analysis and is compliant with the limit of 74 dBuV/m specified in rule 15.35 (b) (See enclosed in the attachment).

Regarding your question from 1/15/00, "can the spreading function be disabled, so that measurements can be made on the unmodulated carrier", Delphi Delco has disabled the spread spectrum modulation on a test sensor and conducted measurements on the unmodulated waveform. The modulation was disabled in such a manner as to bias the modulator in an "on"state. The measurement result was an E-field of 69.7 dBuV/m at 3 meters. This value is in compliance the limit of 74 dBuV/m at 3 meters specified in rule 15.35(b) (See enclosed in the attachment). (Note that the modified unit has all internal components functional and biased at the normal operating levels except the modulator is biased into a single "on" state.)

The analysis, test set-ups, a list of test equipment used including calibration dates, and the test results are attached.

Delphi Delco appreciates and fully supports the dialogue concerning our application. It is our intent as always, to fully comply with the letter and spirit of the

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regulations. Delphi Delco welcomes an opportunity to have further dialogue in a technical meeting with the FCC if it is so desired.

Regards,

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