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Radio Test Report

FCC Part 22 and RSS 132

FCC Part 24 and RSS 133

Model: Delphi Telematics Device SV40001-U1B1 (Halo)

FCC ID:	L2C0047TR
COMPANY:	Delphi Product & Service Solutions (DPSS) 5820 Delphi Drive, Building D Troy, MI 48098
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	April 4, 2011
FINAL TEST DATES:	March 21 and 24, 2011

AUTHORIZED SIGNATORY:

Mark Briggs
Staff Engineer
Elliott Laboratories

A2LA ACCREDITED
Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	04/04/2011	First release	

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SCOPE

Tests have been performed on the Delphi Product & Service Solutions (DPSS) model Delphi Telematics Device SV40001-U1B1 (Halo) , pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- Industry Canada RSS-Gen Issue 3
- CFR 47 Part 22
- CFR 47 Part 24
- RSS-132 Issue 2, Rev. 1 September 2005 Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
- RSS-133 Issue 5, February 2009 2GHz Personal Communications Services

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
ANSI TIA-603-C August 17, 2004
FCC Public Notice, DA-02-1097, May 10, 2002 *Guidance on Certification of Linear Power Amplifiers used with Cellular and PCS Transmitters*

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Delphi Product & Service Solutions (DPSS) model Delphi Telematics Device SV40001-U1B1 (Halo) and therefore apply only to the tested sample. The sample was selected and prepared by Doug Hansen of Delphi Product & Service Solutions (DPSS).

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Delphi Product & Service Solutions (DPSS) model Delphi Telematics Device SV40001-U1B1 (Halo) complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

Testing in this report is limited to measurements of the radiated power and radiated spurious emissions. All other regulatory measurements are provided for the transceiver module used in the device. As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.

TEST RESULTS

FCC Part 22 and RSS-132 (Handset or other UE)

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 22	RSS 132	Operating Frequencies	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 22.913(a)	RSS-132 4.4	RF power output at the antenna terminals (Peak output power)			
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 22.913(a)	RSS-132 4.4	ERP	2.29 Watts erp	7 Watts erp	
§2.1033 (c) (4) §2.1047 § 22.917(b)	RSS 132 4.5.1.1	Emission types	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
		Emission mask			
	RSS GEN 4.4.1	99% Bandwidth			
§2.1049		Occupied Bandwidth			
Transmitter spurious emissions					
§2.1051 §2.1057 §22.917	RSS 132 4.5	At the antenna terminals	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
§2.1053 §2.1057 §22.917	RSS 132 4.5	Field strength	-29.6dBm erp 869.19MHz	-13dBm	Pass
Receiver spurious emissions					
15.109	RSS GEN 7.2.3 Table 1	Field strength	No spurious emissions related to the receiver were observed within 20dB of the limit	See limit table on page 16	Pass
Other details					
§2.1055 §22.355	RSS-132 4.3	Frequency stability	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
§2.1093	RS 102	RF Exposure	Refer to SAR report		

FCC Part 24 (Handset or other UE) and RSS-133

FCC	Canada	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics					
§2.1033 (c) (5) § 24	RSS-133	Operating Frequencies	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 24.232(c)	RSS-133 6.4	RF power output at the antenna terminals			
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 24.232(c)	RSS-133 6.4	EIRP	1.31 Watts eirp	2 Watts eirp	
§2.1033 (c) (4) §2.1047 §24.238 (b)	RSS-133 6.5	Emission types	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
		Emission mask			
	RSS GEN 4.4.1	99% Bandwidth			
§2.1049 §24.238 (b)		Occupied Bandwidth			
Transmitter spurious emissions					
§2.1051 §2.1057 §24.238	RSS-133 6.5	At the antenna terminals	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
§2.1053 §2.1057 §24.238	RSS-133 6.5	Field strength	All transmitter spurious more than 20dB below the limit	-13dBm	Pass
Receiver spurious emissions					
-	RSS GEN 7.2.3 Table 1	Field strength	No spurious emissions related to the receiver were observed within 20dB of the limit	See limit table on page 16	Pass
Other details					
§2.1055 §24.235		Frequency stability	As the transceiver module is not modified by Delphi the module-level test results are considered applicable to their device for antenna port measurements.		
§2.1093	RS 102	RF Exposure	Refer to SAR report		

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Delphi Product & Service Solutions (DPSS) model Delphi Telematics Device SV40001-U1B1 (Halo) is a telemetrics device with data modem that is installed into automobiles to perform wireless data logging of parameters such as vehicle speed, diagnostics trouble codes (DTCs), and GPS location.

The device is built around an FCC and Industry Canada approved cellular modem module; however as the device may be closer than 20cm from persons when transmitting Delphi is seeking approval for the final product. As Delphi make no changes to the module only the radiated spurious emissions and eirp/erp measurements of the fundamental signals are included in this test report. All other technical requirements are considered to be covered by the module test report.

Testing has been performed on the final product containing the L2C0041TR module to determine the erp/eirp as required under Parts 22 and 24 of the FCC rules.

The sample was received on March 14, 2011 and tested on March 21 and 24, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Delphi Product & Sevice Solutions (DPSS)	SV40001-U1B1	Data modem	-	L2C0047TR

ENCLOSURE

The host device enclosure is constructed of an ABS plastic material. It measures approximately 56cm wide by 75cm deep by 24cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number
Agilent	E5515C/2/3/E1993A 3/H03/V48 8960	Cell simulator	GB44052640

EUT INTERFACE PORTS

The EUT has a connector that is designed to be installed directly into the DLC port of an automobile. For testing purposes the 12Vdc pins of the connector were connected to a12Vdc power source via unshielded cables approximately 1m long.

EUT OPERATION

During testing, the EUT was configured using an external cell simulator to transmit at maximum power on a single time slot on the low, center and high channels in the GSM850 and PCS bands. The EUT was rotated through all three orthogonal axes to determine the orientation that produced the highest eirp/erp.

TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the Elliott Laboratories test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

Radiated spurious emissions measurements were taken at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 7	A2LA Accredited	IC 2845B-7	

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.4:2003 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor is sued when measurements are made at a test distance that is different to the specified limit distance by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS –RADIATED POWER

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\ P\ G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at eirp P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

Appendix A Test Equipment Calibration Data

Radiated Emissions and Signal Substitution, 21-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	5/17/2011
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	6/1/2011
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	11/22/2011
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7GHz	ESIB7	1538	11/2/2011
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	6/24/2012
EMCO	Antenna, Horn, 1-18 GHz	3117	1662	5/4/2012
Compliance Design	Tuned Dipole Antenna	Roberts (400-1000MHz)	1896	12/16/2011
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	6/4/2011
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447E	1606	4/29/2011
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7GHz	ESIB7	1756	4/16/2011
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	5/26/2011
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	6/1/2011
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	9/13/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/22/2012
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7GHz	ESIB7	1756	4/16/2011
Agilent	PSG, Performance Signal Generator, (installed options, HEH, HEC, 602, 420)	E8267C	2200	5/5/2011
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2237	7/14/2012

Appendix B Test Data

Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen	Project Manager:	Mark Briggs
Emissions Standard(s):	FCC Part 22 and 24	Class:	-
Immunity Standard(s):	-	Environment:	Mobile

EMC Test Data

For The

Delphi Product & Service

Model

Delphi Telematics Device SV40001-U1B1

Date of Last Test: 3/28/2011

Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

FCC Part 22/24
Power (EIRP)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

All measurements were made with the EUT's antenna connected. The EUT was tested in three orientations on the center channel in each band. The top and bottom channels in each band were evaluated with the EUT in the orientation that produced the highest field strength in that band. The EUT was configured using the Agilent Call Box to transmit at maximum power on one time slot.

Radiated measurements were made with the EUT located on a non-conductive table, 3m from the measurement antenna, 1.5m above the floor with anechoic materials placed between the antenna and EUT to reduce floor reflections.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 44 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power (ERP)	FCC P22 7W erp	-	33.6dBm (2.29 W)
1	Output Power (EIRP)	FCC P24.23(c) 2W eirp	-	31.2dBm (1.31W)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Run #1: Output Power
EUT Field Strength Measurements and Substitution Measurements

Date: 3/21/2011 Engineer: David Bare Location: Chamber #7

Note:	Based on preliminary measurements, the EUT emissions are highest with the EUT in a flat orientation for the 824-849 MHz band and on its side in the 1850-1910 MHz band with the receive antenna horizontal. This was reconfirmed.

EUT Field Strength, Measurment BW = 10 MHz, Peak Detector, VB> RB

Frequency	Level	Pol	FCC		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
GSM850 Band									
824.200	131.5	H	-	-	Pk	219	1.0	EUT Flat	
836.600	130.0	H	-	-	Pk	215	1.4	EUT Flat	
848.800	128.0	H	-	-	Pk	215	1.0	EUT Flat	
PCS Band									
1850.200	130.4	H	-	-	Pk	88	2.3	EUT on Side	
1880.200	132.3	H	-	-	Pk	90	2.0	EUT on Side	
1909.800	132.1	H	-	-	Pk	78	1.9	EUT on Side	

Substitution measurements
Horizontal

Frequency	Substitution measurements			Site	EUT measurements				
								eirp	erp
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	W	W
824.200	-2.8	2.2	95.1	95.7	131.5	35.8	33.6		2.291
836.600	-2.8	2.2	94.2	94.8	130.0	35.2	33.0		1.995
848.800	-2.8	2.2	93.7	94.3	128.0	33.7	31.5		1.413
1850.200	-4.3	3.8	100.3	100.8	130.4	29.6		0.912	
1880.200	-4.3	3.8	100.6	101.1	132.3	31.2		1.318	
1909.800	-4.3	3.8	101.0	101.5	132.1	30.6		1.148	

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Radiated Spurious Emissions FCC Part 22 & 24

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

All measurements were made with the EUT's antenna connected. The EUT was tested in three orientations on the center channel in each band. The top and bottom channels in each band were evaluated with the EUT in the orientation that produced the highest field strength in that band. The EUT was configured using the Agilent Call Box to transmit at maximum power on one time slot.

Radiated measurements were made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions:

Temperature: 19.5 °C

Rel. Humidity: 37 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1-3	Radiated Emissions, 30MHz - 9GHz	FCC Part 22 (-13dBm erp)	Pass	-29.6dBm @ 869.19MHz (-16.6dB)
4-6	Radiated Emissions, 30MHz - 18GHz	FCC Part 24 (-13dBm eirp)	Pass	All emissions more than 20dB below the limit

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

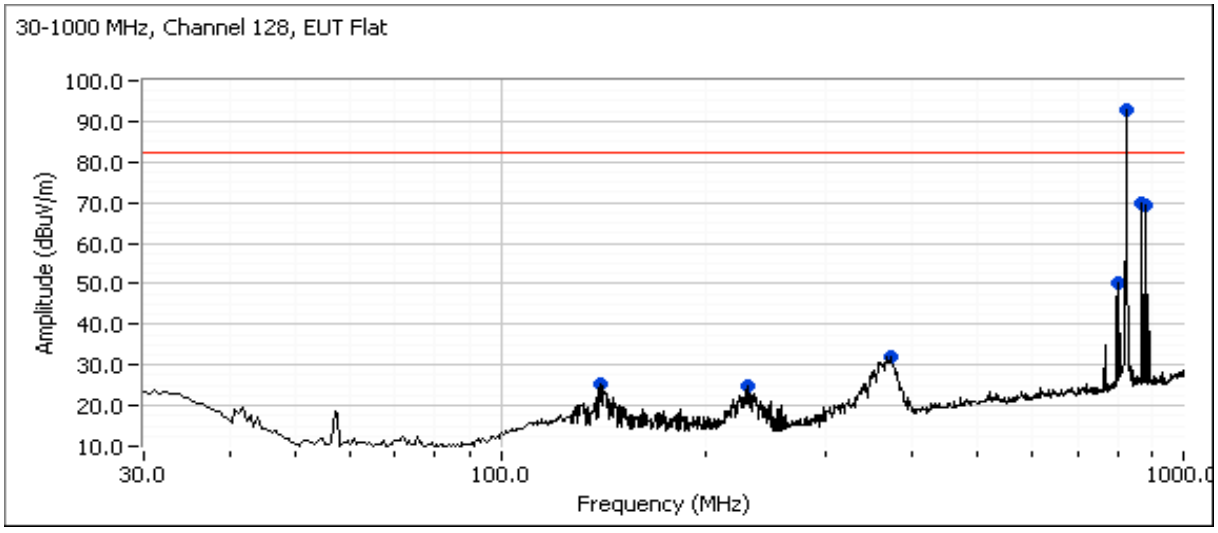
Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

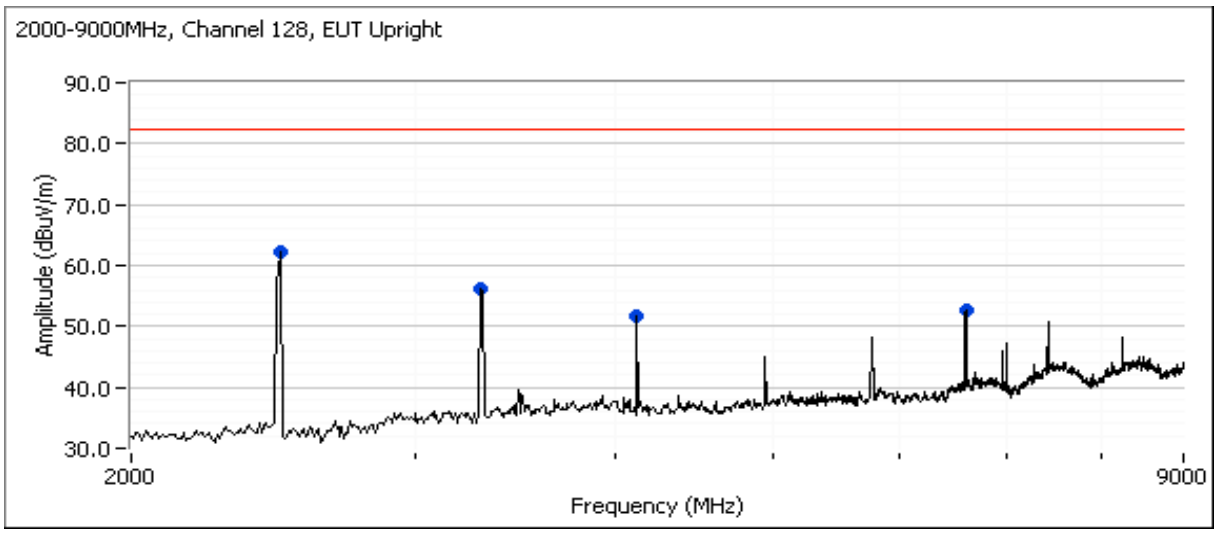
Run #1: Radiated Spurious emissions, 30 MHz- 9 GHz

GSM850 Band - Device tested in all three orthogonal axes for the center channel to determine worst case orientation for the highest emissions. Low and high channels were then evaluated in that orientation (Flat for the emissions below 1GHz and upright for emissions above 1GHz).

Date: 3/24/2011 Engineer: Rafael Varelas Location: Chamber #3

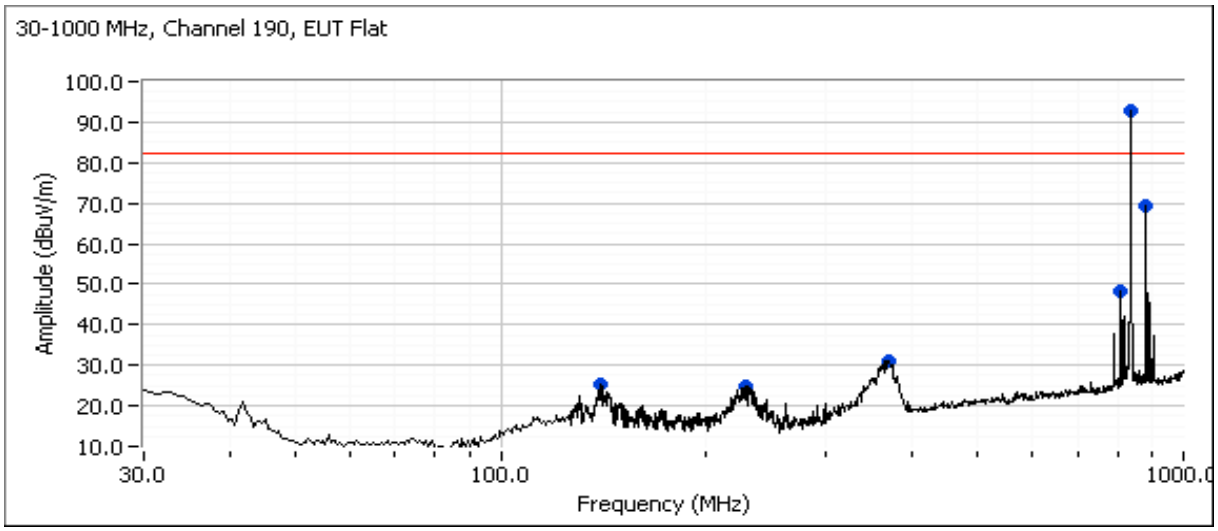
Low Channel

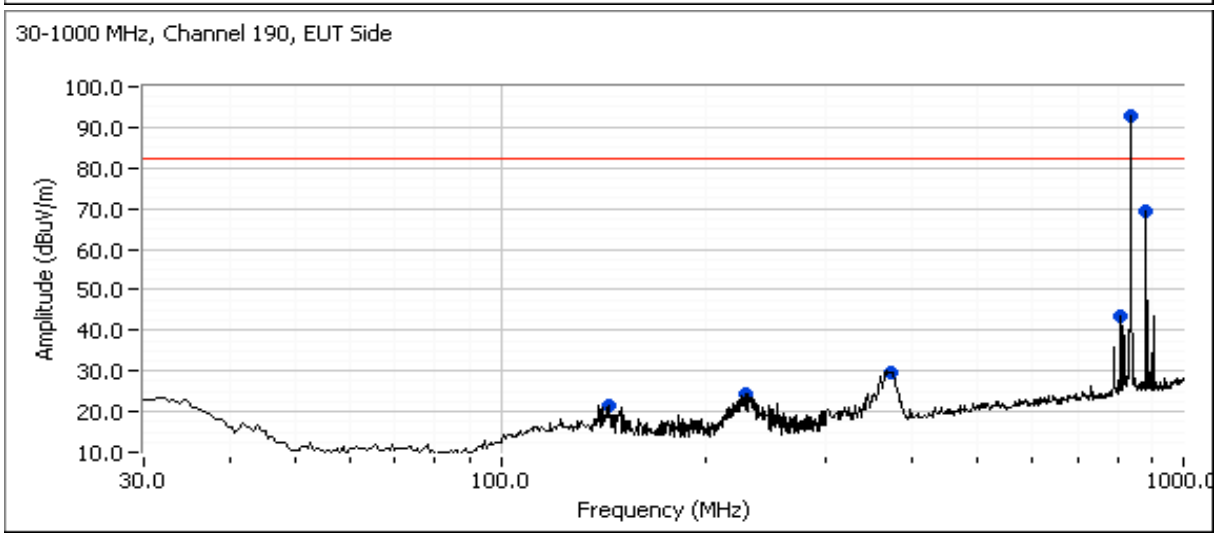




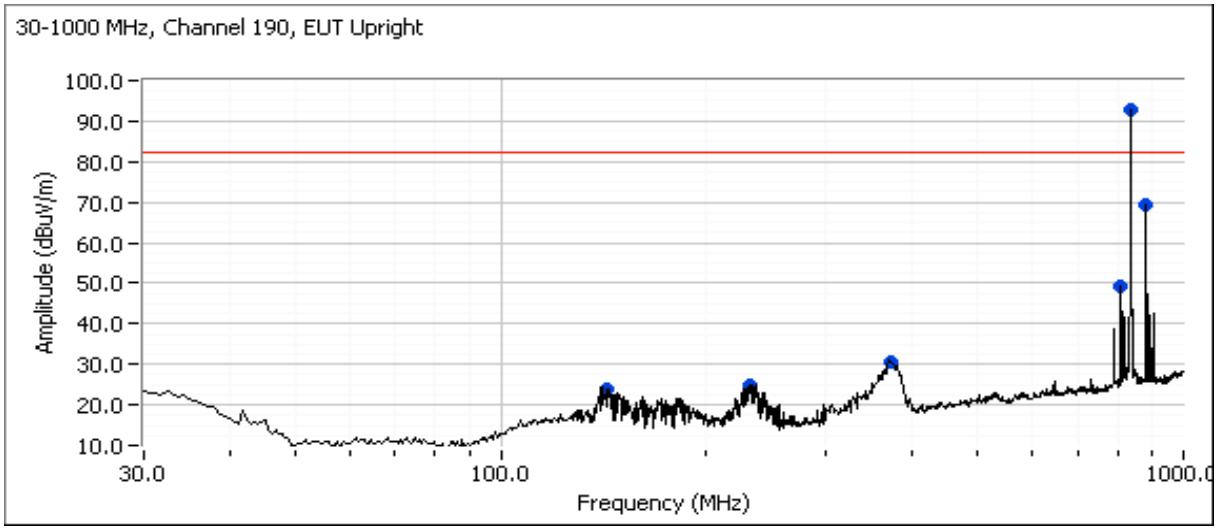
Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Center Channel

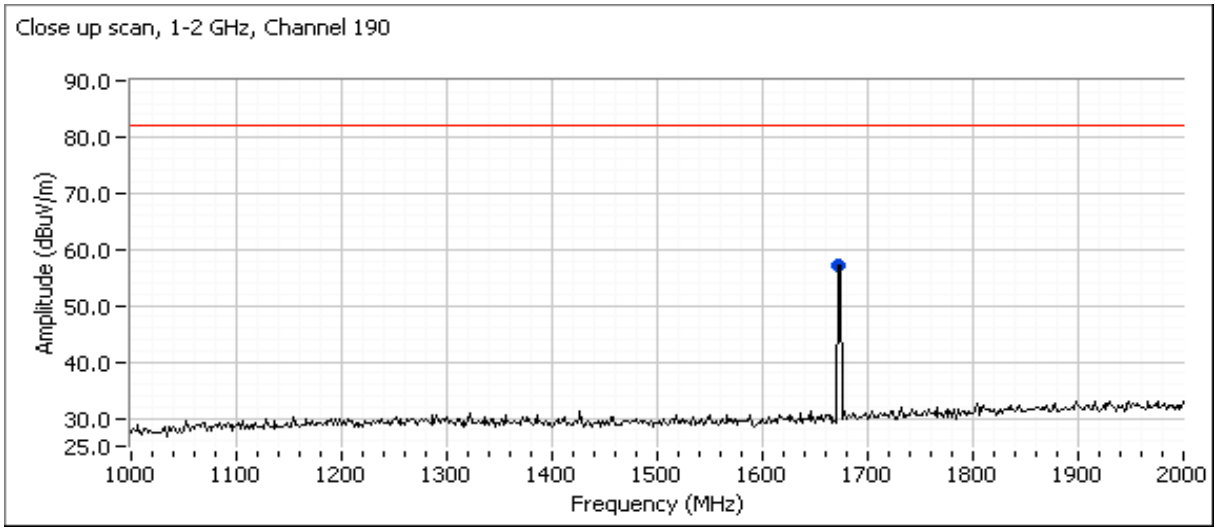




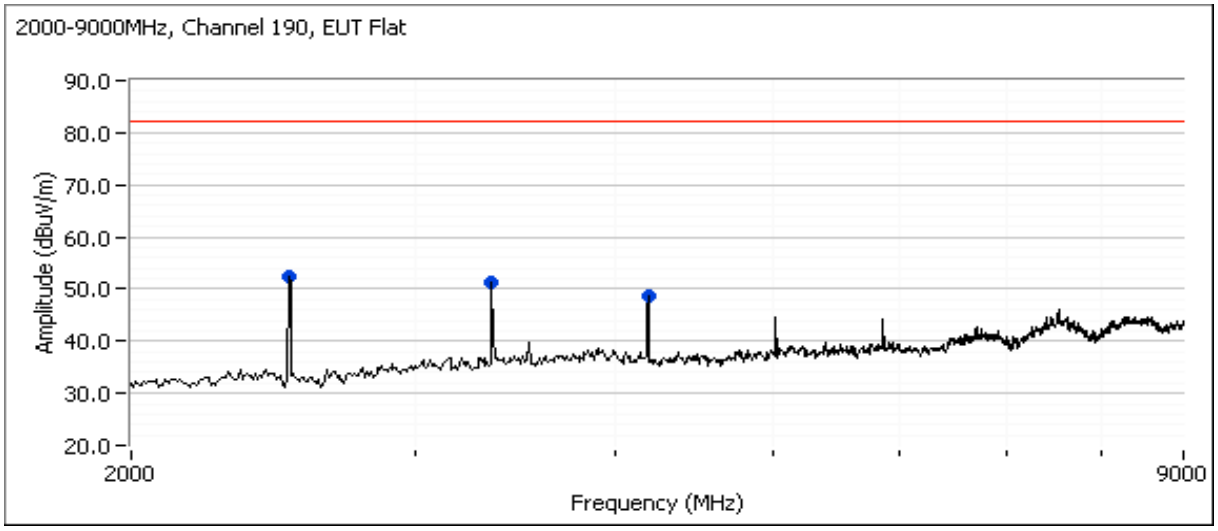
Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

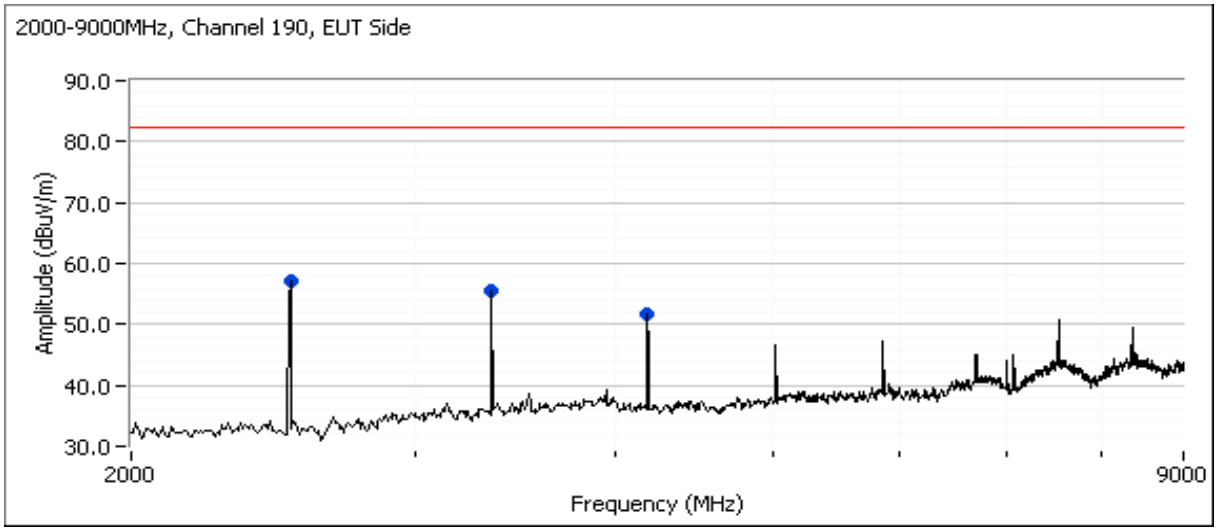


Scan to show no signals other than the second harmonic between 1 and 2GHz:

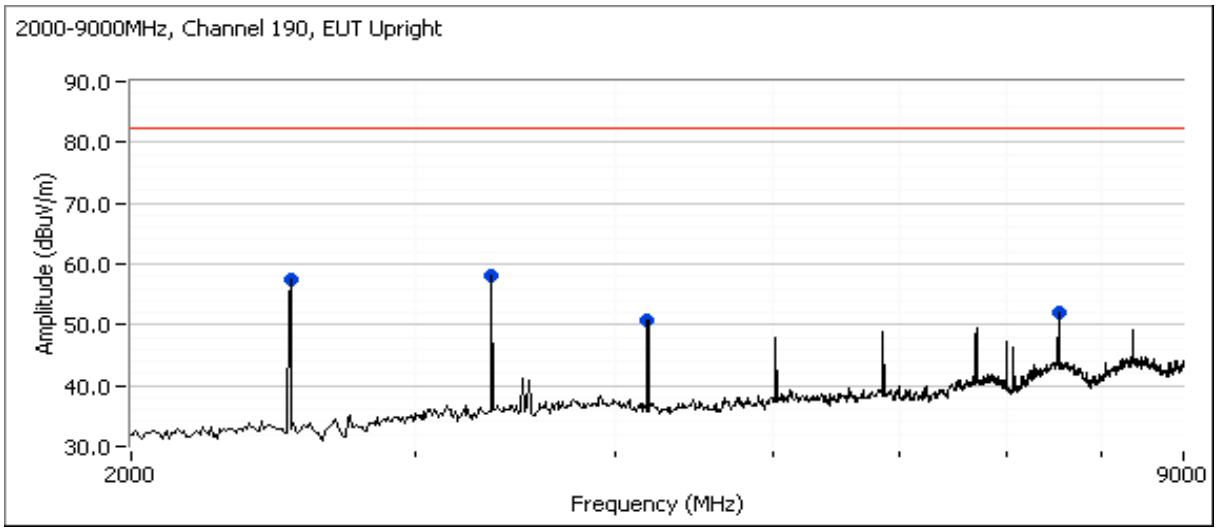


Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-



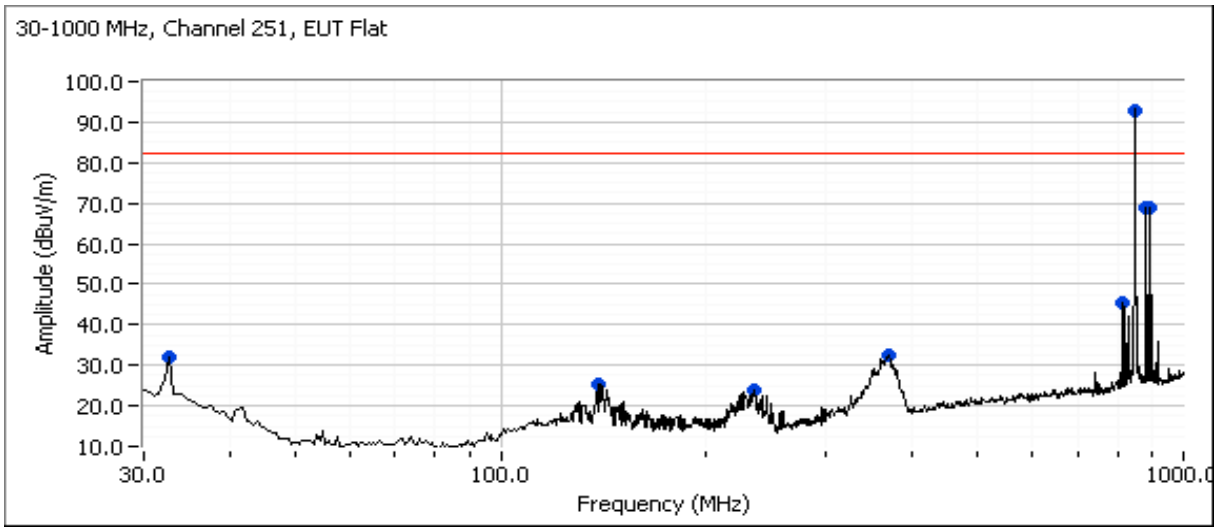


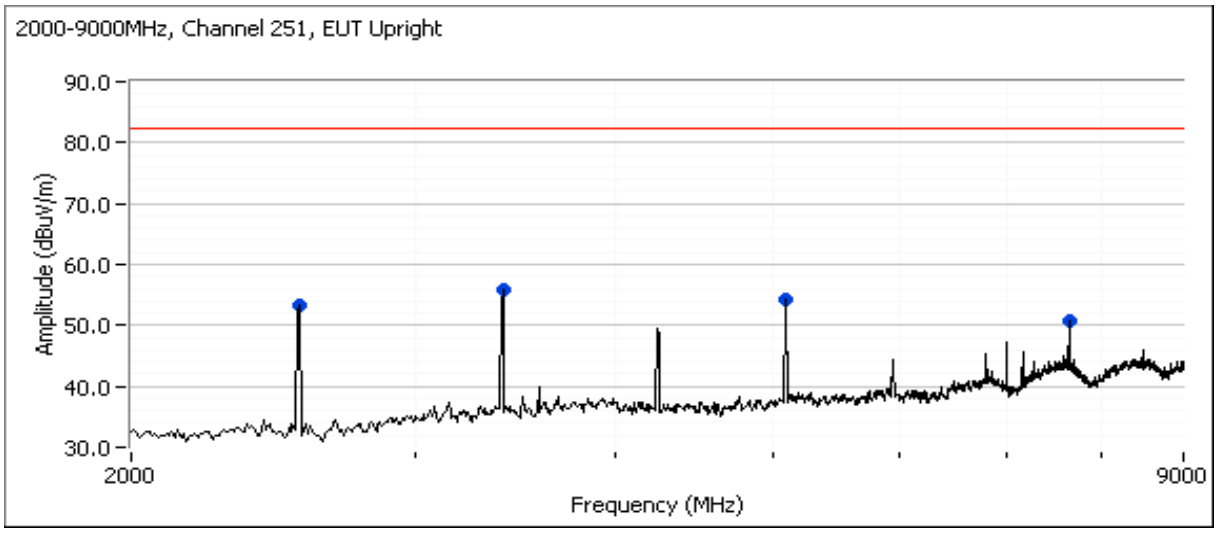
Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-



Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

High Channel





Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Low Channel

Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		orientation
140.381	*25.1*	*H*	-	-	*Peak*	*277*	*1.5*	*Digital device emission*	Flat,128
229.659	*24.8*	*H*	-	-	*Peak*	*266*	*1.0*	*Digital device emission*	Flat,128
371.543	*31.9*	*H*	-	-	*Peak*	*126*	*1.0*	*Digital device emission*	Flat,128
799.110	50.3	H	82.2	-31.9	Peak	157	1.0	Tx-related	Flat,128
824.203	92.9	V	-	-	Peak	233	4.0	Fundamental	Flat,128
869.194	69.8	V	82.2	-12.4	Peak	35	1.0	Tx-related	Flat,128
881.617	69.3	V	-	-	Peak	38	1.0	Call Box	Flat,128
2472.500	*62.1*	*H*	*82.2*	*-20.1*	*Peak*	*180*	*2.0*	Tx-related	Upright,128
3297.500	*56.2*	*V*	*82.2*	*-26.0*	*Peak*	*221*	*2.0*	Tx-related	Upright,128
4122.500	*51.7*	*H*	*82.2*	*-30.5*	*Peak*	*114*	*2.0*	Tx-related	Upright,128
6595.830	*52.8*	*H*	*82.2*	*-29.4*	*Peak*	*118*	*1.5*	Tx-related	Upright,128

Center Channel

Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		orientation
140.381	*25.1*	*H*	-	-	*Peak*	*265*	*2.0*	*Digital device emission*	Flat,190
142.545	*24.1*	*H*	-	-	*Peak*	*267*	*3.0*	*Digital device emission*	Upright,190
143.627	*21.3*	*H*	-	-	*Peak*	*286*	*2.5*	*Digital device emission*	Side,190
228.577	*24.9*	*H*	-	-	*Peak*	*253*	*1.0*	*Digital device emission*	Flat,190
228.577	*24.2*	*H*	-	-	*Peak*	*124*	*1.0*	*Digital device emission*	Side,190
231.283	*24.8*	*H*	-	-	*Peak*	*238*	*1.5*	*Digital device emission*	Upright,190
368.128	31.3	H	-	-	Peak	125	1.0	*Digital device emission*	Flat,190
368.128	*29.7*	*H*	-	-	*Peak*	*221*	*2.5*	*Digital device emission*	Side,190
368.128	*30.7*	*H*	-	-	*Peak*	*221*	*2.5*	*Digital device emission*	Upright,190
809.788	48.1	H	82.2	-34.1	Peak	156	1.0	Tx-related	Flat,190
809.788	43.4	H	82.2	-38.8	Peak	244	2.0	Tx-related	Side,190
810.394	49.3	H	82.2	-32.9	Peak	142	1.0	Tx-related	Upright,190
836.391	93.0	V	-	-	Peak	347	3.0	Fundamental	Flat,190
881.617	69.3	V	-	-	Peak	115	1.0	Call Box	Upright,190
1671.670	*57.2*	*H*	*82.2*	*-25.0*	*Peak*	*360*	*1.0*	Tx-related	
2502.500	*52.5*	*V*	*82.2*	*-29.7*	*Peak*	*175*	*1.0*	Tx-related	Flat,190
2510.000	*57.1*	*V*	*82.2*	*-25.1*	*Peak*	*96*	*1.5*	Tx-related	Side,190
2510.000	*57.6*	*H*	*82.2*	*-24.6*	*Peak*	*155*	*2.5*	Tx-related	Upright,190
3350.000	*51.1*	*H*	*82.2*	*-31.1*	*Peak*	*342*	*2.0*	Tx-related	Flat,190
3350.000	*55.6*	*H*	*82.2*	*-26.6*	*Peak*	*327*	*1.5*	Tx-related	Side,190
3350.000	*58.2*	*H*	*82.2*	*-24.0*	*Peak*	*286*	*1.5*	Tx-related	Upright,190
4182.500	*51.6*	*V*	*82.2*	*-30.6*	*Peak*	*127*	*1.5*	Tx-related	Side,190
4182.500	*50.9*	*V*	*82.2*	*-31.3*	*Peak*	*359*	*1.0*	Tx-related	Upright,190
4190.000	*48.7*	*H*	*82.2*	*-33.5*	*Peak*	*304*	*1.5*	Tx-related	Flat,190
7529.170	*52.0*	*H*	*82.2*	*-30.2*	*Peak*	*22*	*1.0*	Tx-related	Upright,190

Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

High Channel

Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		orientation
32.705	*32.2*	*V*	-	-	*Peak*	*287*	*1.0*	*Digital device emission*	Flat,251
139.299	*25.3*	*H*	-	-	*Peak*	*249*	*2.0*	*Digital device emission*	Flat,251
235.070	*23.8*	*H*	-	-	*Peak*	*242*	*1.0*	*Digital device emission*	Flat,251
370.140	*32.6*	*H*	-	-	*Peak*	*131*	*1.0*	*Digital device emission*	Flat,251
814.119	45.4	V	82.2	-36.8	Peak	116	1.0	Tx-related	Flat,251
848.707	92.9	V	-	-	Peak	221	1.5	Fundamental	Flat,251
881.617	69.1	V	-	-	Peak	38	1.0	Call Box	Flat,251
893.738	69.1	V	82.2	-13.1	Peak	109	1.0	Tx-related	Flat,251
2547.500	*53.3*	*H*	*82.2*	*-28.9*	*Peak*	*178*	*2.5*	Tx-related	Upright,251
3402.500	*55.7*	*H*	*82.2*	*-26.5*	*Peak*	*66*	*1.5*	Tx-related	Upright,251
5097.500	*54.3*	*H*	*82.2*	*-27.9*	*Peak*	*145*	*1.5*	Tx-related	Upright,251
7641.670	*50.8*	*H*	*82.2*	*-31.4*	*Peak*	*22*	*1.0*	Tx-related	Upright,251

Run #2: Maximized Radiated Spurious emissions, 30 MHz- 9 GHz

Frequency	Level	Pol	FCC Part 22		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
869.194	69.8	V	82.2	-12.4	PK	35	1.0	PK (0.10s)	Flat,128
893.738	69.1	V	82.2	-13.1	PK	109	1.0	PK (0.10s)	Flat,251

Run #3: Substitution measurements
Vertical

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
869.194	-12.6	7.3	91.9	97.2	69.8	-27.4	-29.6		-13.0	-16.6
893.738	-12.6	6.9	92.0	97.7	69.1	-28.6	-30.8		-13.0	-17.8

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

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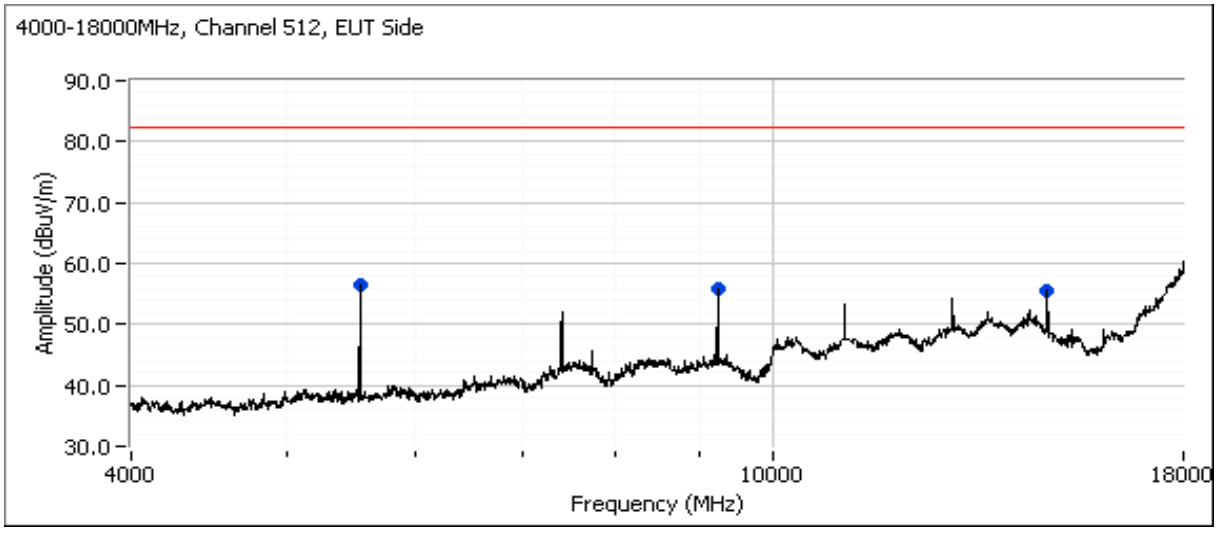
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Run #4: Radiated Spurious emissions, 30 MHz- 18 GHz

PCS Band - Device tested in all three orthogonal axes for the center channel to determine worst case orientation for the highest emissions. Low and high channels were then evaluated in that orientation. No emissions related to the transmitter were observed below 1GHz. The worst case orientation for the signifcant emissions above 1GHz was with the EUT on its side.

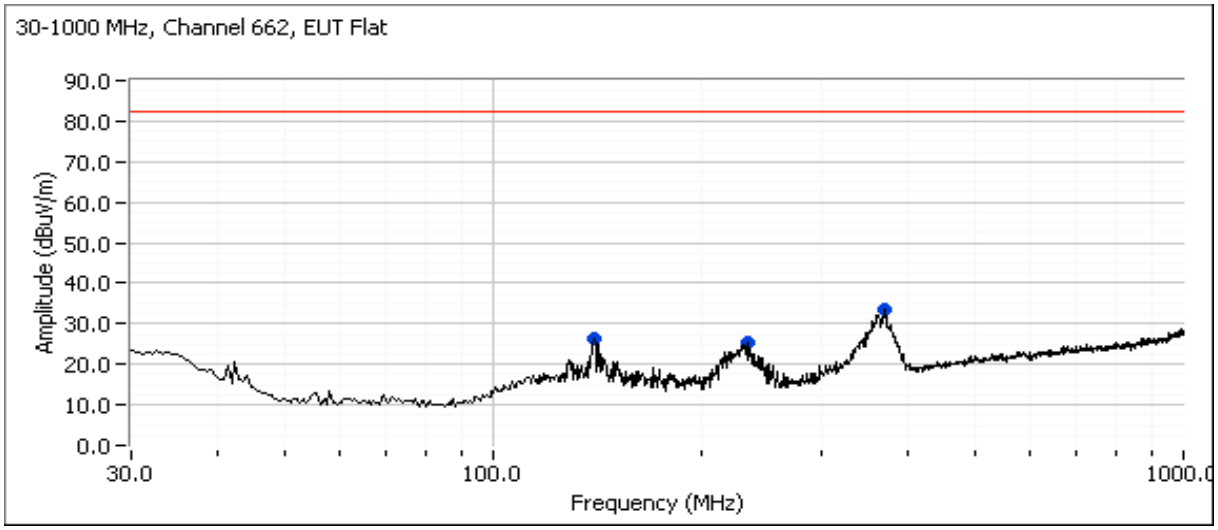
Date: 3/24/2011 Engineer: Rafael Varelas Location: Chamber #3

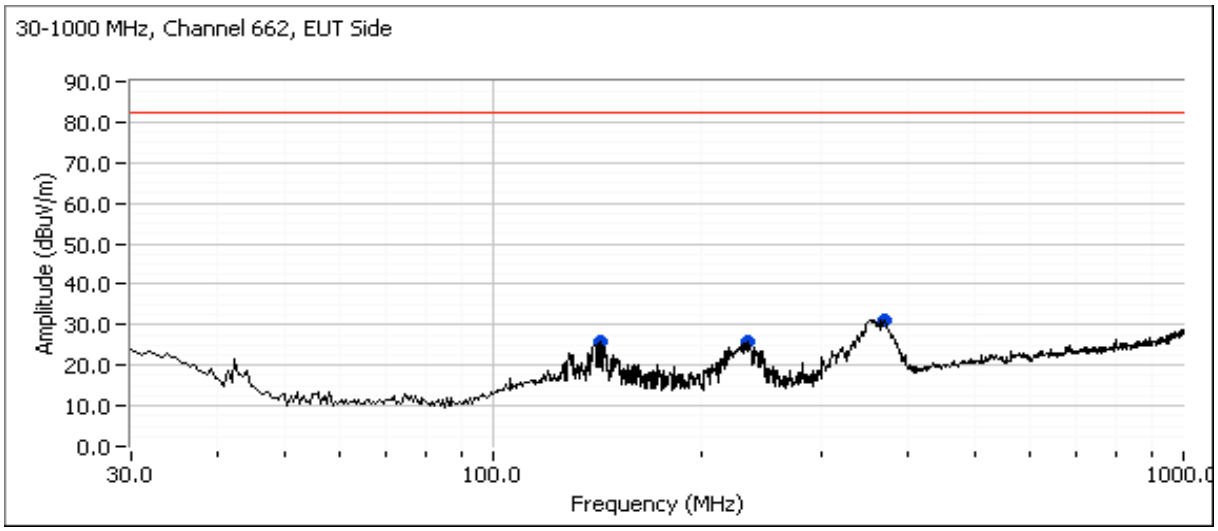
Low Channel



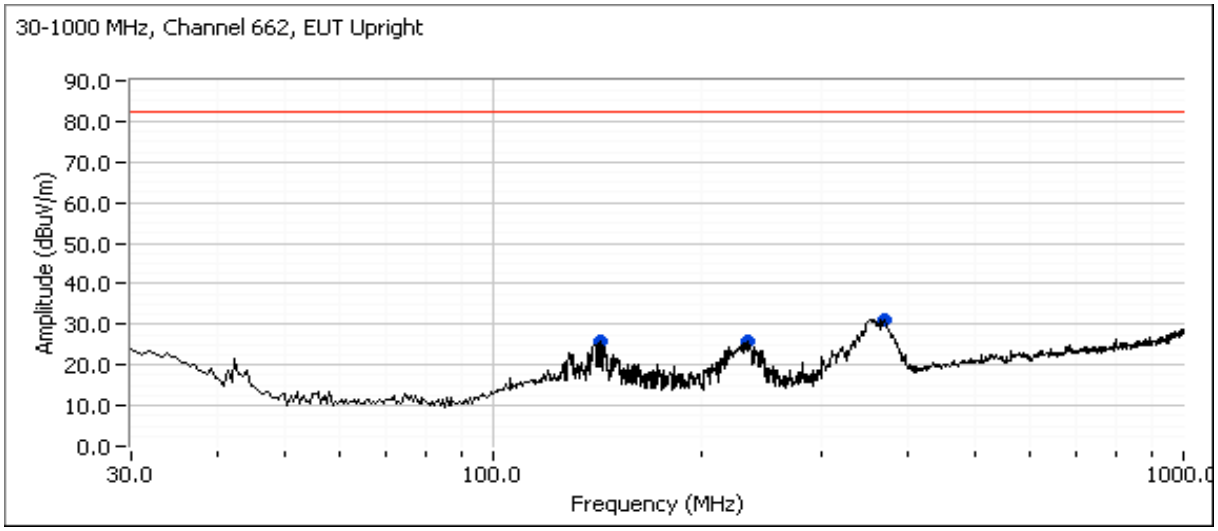
Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

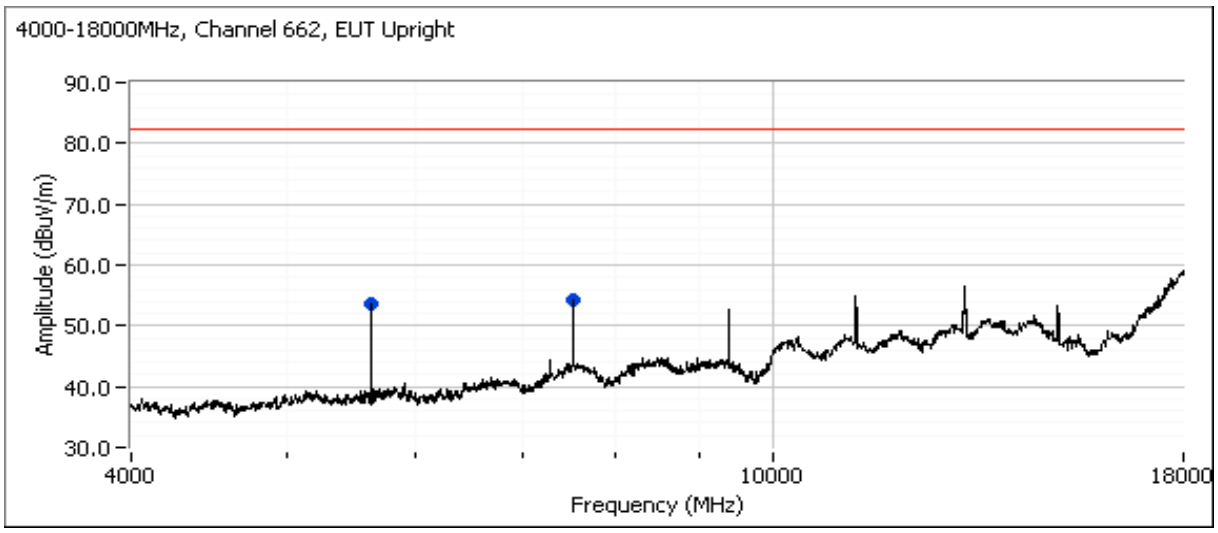
Center Channel



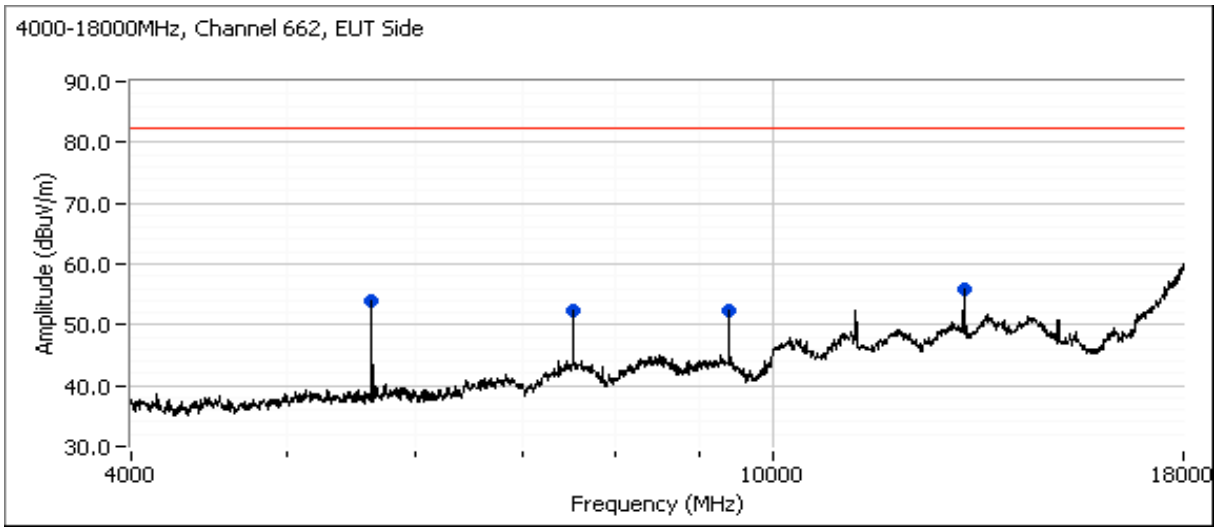


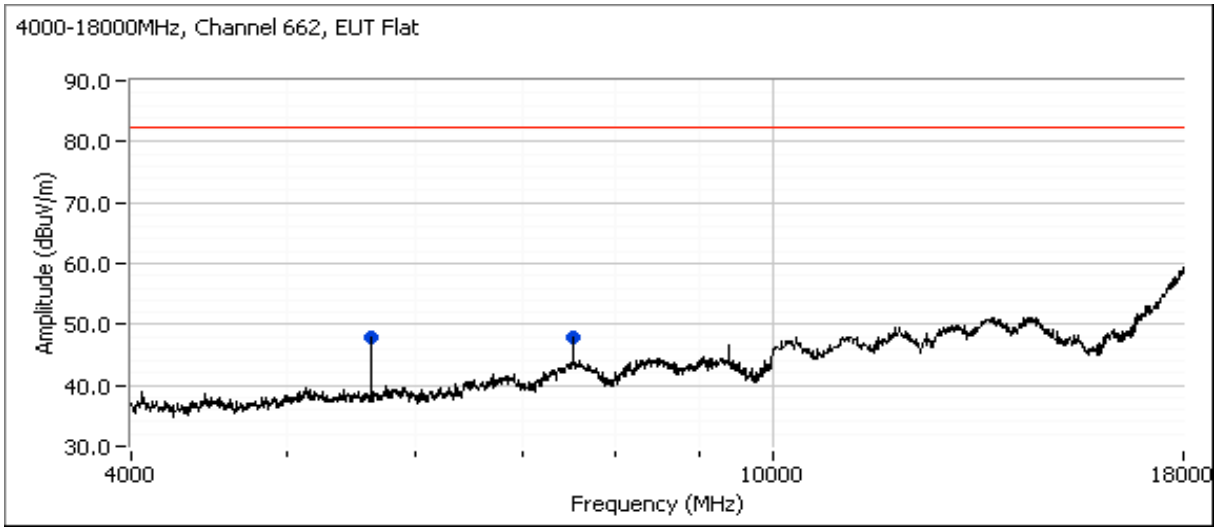
Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-





Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-





Client:	Delphi Product & Service	Job Number:	J82358
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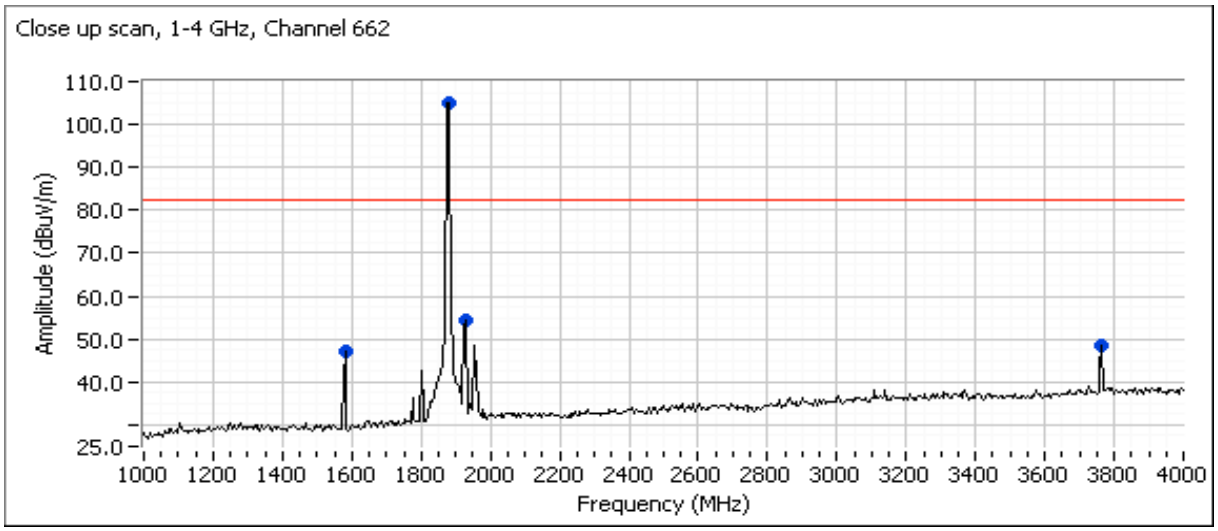
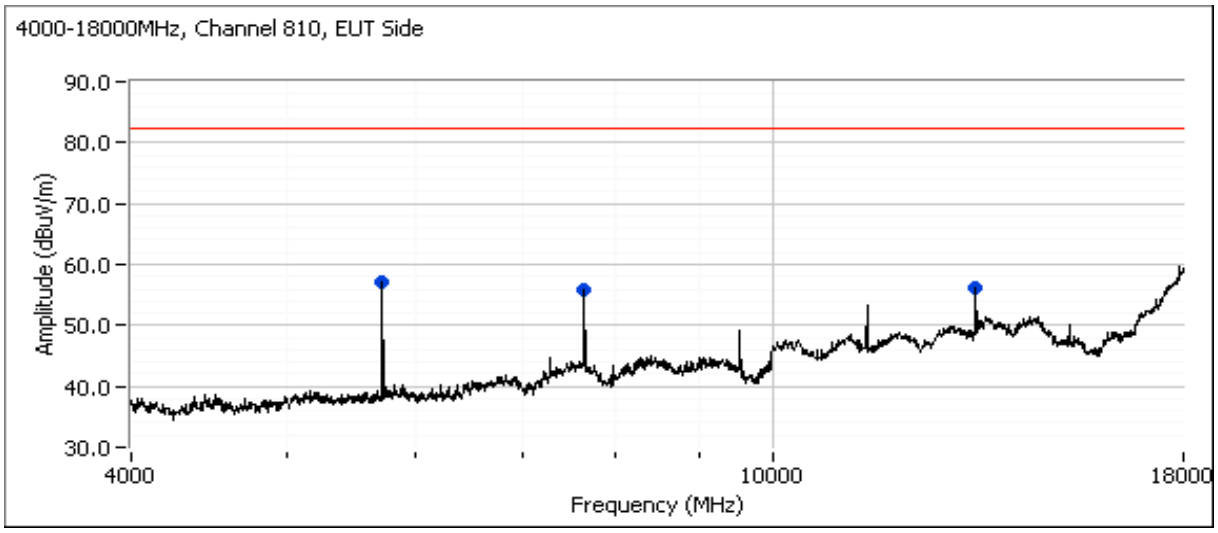
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Scan, 1 - 4GHz to show no significant emissions other than the fundamental in this frequency range.



High Channel 810



Client:	Delphi Product & Service	Job Number:	J82358
Model:	Delphi Telematics Device SV40001-U1B1	T-Log Number:	T82472
		Account Manager:	Christine Krebill
Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Low Channel

Frequency	Level	Pol	FCC Part 24		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
5550.000	56.6	H	82.2	-25.6	Peak	116	1.5		Side,512
9253.330	*55.9*	*H*	*82.2*	*-26.3*	*Peak*	*57*	*1.5*		*Side,512*
14813.330	*55.5*	*H*	*82.2*	*-26.7*	*Peak*	*22*	*1.5*		*Side,512*

Center Channel

Frequency	Level	Pol	FCC Part 24		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		Orientation
140.381	*26.5*	*H*	-	-	*Peak*	*264*	*2.5*	*Digital device emission*	*Flat,662*
142.004	*24.8*	*H*	-	-	*Peak*	*283*	*2.5*	*Digital device emission*	*Upright,662*
143.086	*25.8*	*H*	-	-	*Peak*	*109*	*2.0*	*Digital device emission*	*Side,662*
233.447	*25.3*	*H*	-	-	*Peak*	*249*	*1.5*	*Digital device emission*	*Flat,662*
233.447	*25.8*	*H*	-	-	*Peak*	*257*	*1.5*	*Digital device emission*	*Side,662*
233.447	*25.4*	*H*	-	-	*Peak*	*276*	*1.5*	*Digital device emission*	*Upright,662*
368.737	*33.3*	*H*	-	-	*Peak*	*142*	*1.0*	*Digital device emission*	*Flat,662*
370.020	*30.9*	*H*	-	-	*Peak*	*120*	*1.0*	*Digital device emission*	*Upright,662*
370.140	*30.9*	*H*	-	-	*Peak*	*120*	*1.0*	*Digital device emission*	*Side,662*
1580.000	*47.2*	*H*	*82.2*	*-35.0*	*Peak*	*360*	*1.0*		*Flat,662*
1880.000	*105.2*	*H*	-	-	*Peak*	*360*	*1.0*	*Fundamental*	*Flat,662*
1930.000	*54.4*	*H*	*82.2*	*-27.8*	*Peak*	*360*	*1.0*		*Flat,662*
3765.000	*48.6*	*H*	*82.2*	*-33.6*	*Peak*	*360*	*1.0*		*Flat,662*
5637.500	*47.9*	*V*	*82.2*	*-34.3*	*Peak*	*194*	*1.5*		*Flat,662*
5637.500	*53.9*	*H*	*82.2*	*-28.3*	*Peak*	*242*	*1.5*		Side,662
5637.500	*53.7*	*H*	*82.2*	*-28.5*	*Peak*	*326*	*1.5*		*Upright,662*
7520.830	*48.0*	*V*	*82.2*	*-34.2*	*Peak*	*18*	*1.5*		*Flat,662*
7520.830	*52.5*	*H*	*82.2*	*-29.7*	*Peak*	*266*	*1.5*		Side,662
7520.830	*54.3*	*V*	*82.2*	*-27.9*	*Peak*	*356*	*1.5*		*Upright,662*
9399.170	*52.2*	*H*	*82.2*	*-30.0*	*Peak*	*264*	*1.5*		Side,662
13146.670	55.9	V	82.2	-26.3	Peak	250	1.5		Side,662

High Channel

Frequency	Level	Pol	FCC Part 24		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
5725.000	57.2	H	82.2	-25.0	Peak	121	1.9		Side,810
7643.330	*55.8*	*H*	*82.2*	*-26.4*	*Peak*	*49*	*1.3*		*Side,810*
13373.330	*56.3*	*V*	*82.2*	*-25.9*	*Peak*	*123*	*1.6*		*Side,810*

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Contact:	Doug Hansen		
Standard:	FCC Part 22 and 24	Class:	-

Run #5: Maximized Radiated Spurious emissions, 30 MHz- 9 GHz

Frequency	Level	Pol	FCC Part 24		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
5550.000	56.6	H	82.2	-25.6	Peak	116	1.5		Side,512
13146.670	55.9	V	82.2	-26.3	Peak	250	1.5		Side,662
5725.000	57.2	H	82.2	-25.0	Peak	121	1.9		Side,810

As all emissions were more than 20dB below the limit no subsitution measurements were made. The approximate eirp of the highest emission was -38.1dBm.

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