

**INSTRUMENT SPECIALTIES CO., INC. – WORLD COMPLIANCE CENTER
EMC MEASUREMENT/TECHNICAL REPORT**

FCC PART 15 Subpart C Section 15.249 MFGR: EASE Simulation, Inc. EUT: OBD 1/2 Wireless Vehicle Interface FCC ID: O8A-WI-916	<i>Document No.</i>	<i>Revision</i>	<i>Issue Date</i>
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EMC MEASUREMENT/TECHNICAL REPORT

Manufacturer: EASE Simulation, Inc.
Equipment Under Test: OBD 1/2 Wireless Vehicle Interface
FCC ID Number: O8A-WI-916

Test Report No.: 127109
Purchase Order No.: 99-214814

DOCUMENT HISTORY

<i>Revision</i>	<i>Issue Date</i>	<i>Affected Page(s)</i>	<i>Description of Modifications</i>	<i>Revised By</i>	<i>Approved By</i>
0	22 August 2000		Initial release		

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**EMC MEASUREMENT/TECHNICAL REPORT
Document No.: 127109
From
Instrument Specialties Co., Inc.
World Compliance Center**

**Test for
EASE Simulation, Inc.
OBD 1/2 Wireless Vehicle Interface**

Written By	Bridget A. Keesser, EMC Sales Representative	Date
Reviewed By	Eugene P. Clarke Sr., Senior EMC Technician	Date
Authorized By	J. Fred Gardner, EMC Quality Assurance Manager	Date

TEST PERSONNEL – Instrument Specialties Co., Inc.

Eugene P. Clarke Sr., Senior EMC Technician	17 July 2000
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EUT RECEIPT/DISPOSITION INFORMATION

Date of Receipt of Equipment Under Test (EUT)	5 July 2000
Disposition of EUT	In House

Test Facility	Instrument Specialties Company Incorporated
Address	Shielding Way
City, State Zip Code	Delaware Water Gap, PA 18327
Phone	(570) 424-8510 ext. 1216
Fax	(570) 421-4227

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1 MEASUREMENT/TECHNICAL REPORT SUMMARY

Representative	John Yaron
Manufacturer	EASE Simulation Inc.
Manufacturer Address	State Route 492, Box 3011
City, State Zip Code	New Milford, PA 18834
Phone	570-489-1063
Fax	570-465-9061
Type of Authorization	Certification Part 15, Subpart C - Intentional Radiators
Applicable FCC Rules	<p>PART 15 – RADIO FREQUENCY DEVICES</p> <p>Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Chapter 1 (10-1-99 Edition). The following subparts are applicable to the results in this test report:</p> <p>Part 2, Subpart J Paragraph 2.1031 - Certification</p> <p>Part 15, Subpart A Paragraph 15.31 – Measurement Standards Paragraph 15.33 – Frequency Range of Radiated Measurements Paragraph 15.35 – Measurement Detector Functions and Bandwidths</p> <p>Part 15, Subpart C – Intentional Radiators Paragraph 15.203 – Antenna Requirement Paragraph 15.205 – Restricted Bands of Operation Paragraph 15.207 – Conducted limits Paragraph 15.209 – Radiated emission limits, general requirements Paragraph 15.249 – Operation with the bands 902 – 928 MHz</p>
Equipment Under Test	OBD 1/2 Wireless Vehicle Interface, Model WVI1
FCC ID	O8A-WI-916
Testing Dates	17 July 2000
Summary of Data	The equipment tested is capable of operation in accordance with the requirements of 47 CFR Chapter 1 Part 15.

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2 GENERAL INFORMATION

2.1 Product Description

Equipment Under Test	OBD 1/2 Wireless Vehicle Interface
Model Number	WVI-916 (Vehicle Unit); WBI-916 (Base Unit)
Dimensions	Size: 1.25" H x 2.75" W x 6.5" L, Weight: 12 oz.
Description	The WVI set consists of a base unit connected to the PC and a vehicle unit, which connects to the vehicle's DLC. The WVI works on all OBDII compliant vehicles (96+) and currently supports OBDII Generic and GM, Ford, Chrysler and Toyota Enhanced data in wireless or cable mode.
Power	120 VAC / 50 Hz and 12 VDC at 0.15 A
Clock Frequencies	7.0759, 14.318 and 16 MHz
Transmit Frequency	916.48 MHz

2.2 Related Submittal(s)/Grant(s)

There are no related submittals or grants for the EUT.

2.3 Table: Tested System Details

Item No.	Description	Model No.
1.	Base WVI unit	WBI-916
2.	Vehicle WVI unit	WVI-916
3.	12 VDC wall cube	TR-12VDC-0.5A
4.	DB9 serial cable 15'	Cable-DB9-15
5.	EASE OBD2 cable	Cable-OBD2
6.	OBD verification tool	OVT-OBD2
7.	12 VDC wall cube	TR-12VDC-0.5A
8.	Host PC (IBM compatible) with EASE generic OBD2 scan tool	ST2-Express

2.4 Test Methodology

Conducted emissions tests were performed according to the general provisions of ANSI C63.4-1992 (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).

Radiated emissions tests were performed according to the general provisions of ANSI C63.4-1992 (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). Radiated emissions tests were performed at an antenna to EUT distance of 3 meters.

2.5 Test Facility

The open area test site and measurement facility used to collect the radiated data is located at the Instrument Specialties Co., Inc. test facility in Delaware Water Gap, PA. This site has been fully described in a report submitted to the FCC, and accepted in a letter dated 11 August 2000 (Registration Number 90682). The lab is accredited by NVLAP (LAB CODE: 200076-0) for FCC Part 15 and CISPR 22 emissions measurements.

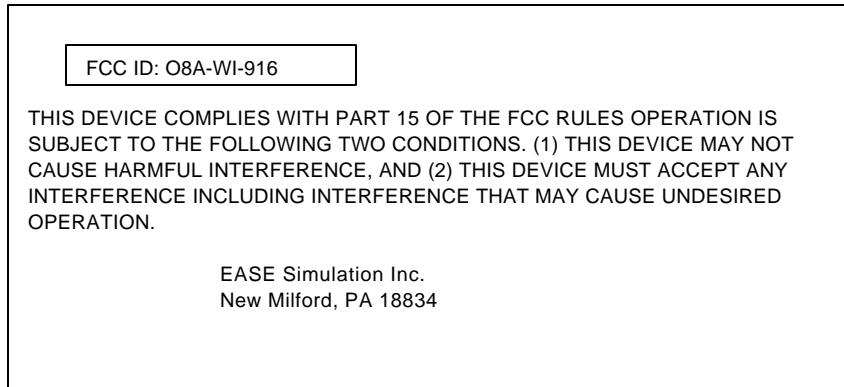
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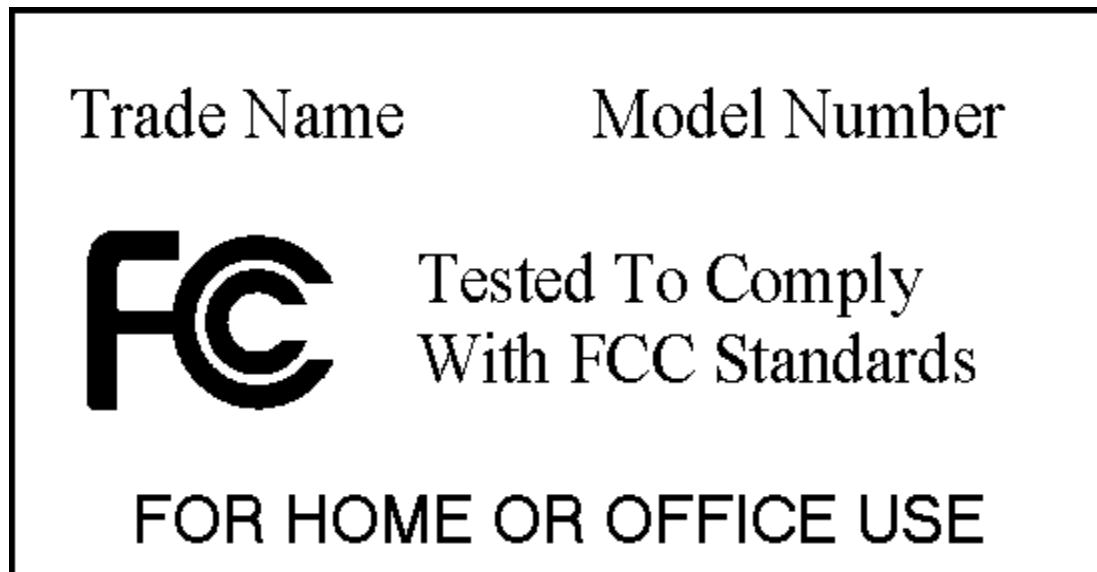
3 PRODUCT LABELING

3.1 FCC ID Label



3.2 Location of Label on EUT

FCC ID Label will be on the transceiver located inside the OBD 1/2 units. The outside of the unit shall contain the following label:



This device contains FCC ID: O8A-WI-916

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3.3 FCC ID Label

Labels are to follow the existing size requirements in that they must contain letters, numbers and symbols that are visible and readable without the use of magnification.

When the device is so small or for such use that is not practicable to place the statement specified on the label, such as for a CPU board or a plug-in circuit board peripheral device, the text associated with the logo may be placed in a prominent location in the instructional manual or pamphlet supplied to the user. However, the unique identification (trade name and model number) and the logo must be displayed on the device.

All warning statements regarding interference potential are to be placed in the user manual, rather than on the label as is currently required. The user manual contains general operating instruction on the use of a device, and, according to the FCC, placing the warning statements in the user manual would better serve the consumer. The requirement that an informational statement be included in the user's manual regarding actions the user can take to resolve any interference that may occur from use of the device is still required.

The label showing the equipment identification data may be combined with a label showing other information (serial numbers, other government requirements, etc.), if desired. Compliance statements, when required, may be shown on the same label or a separate label.

County of Origin – US Customs and the Federal Trade Commission regulations require all equipment produced in foreign countries to be marked with the country of origin. Questions concerning marking of equipment with the country of origin should be directed to these agencies.

4 SYSTEM TEST CONFIGURATION

4.1 Justification

The test sample was arranged in a tabletop configuration. The EUT was configured for active communications between the base and vehicle units transmitting diagnostic information from vehicle and requests from base unit.

4.2 Special Accessories

The EUT requires no special accessories to comply with the required specification limits.

4.3 Equipment Modifications

The following is a list of modifications made to the EUT during EMI testing:

Yageo Inc. part number 620QBK was soldered in place of the R1-1k resistor at the R1 location of the PCB.

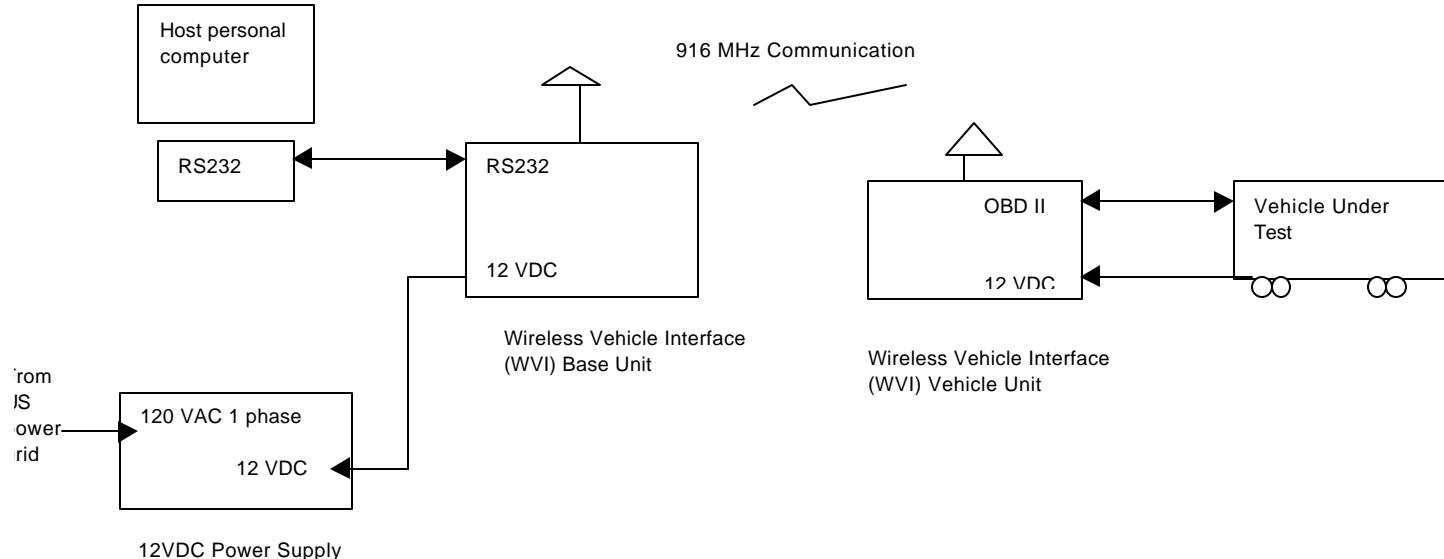
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FCC PART 15 Subpart C Section 15.249
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5 BLOCK DIAGRAM(S) OF THE EUT

5.1 Block Diagram



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6 TEST DATA

6.1 Conducted Emissions Data

6.1.1 Table: FCC Part 15, Subpart B, Class B Conducted Emissions Limits

<i>Frequency Range</i> <i>MHz</i>	<i>Limit</i> <i>dB(uV)</i>
0.45 – 30.0	47.96

6.1.2 Data Collection Procedure

The initial step in collecting data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the data page, and these signals are then quasi-peaked if necessary. Spectrum analyzer plots and additional tabulated data are included in the Appendices of this document. The following data lists the significant emission frequencies and measured levels measured from the EUT.

6.1.3 Table: Judgement for Active Communication between Base & Vehicle

EUT	OBD 1/2 Wireless Vehicle Interface
Judgement	Passed by 8.2 dB

6.1.4 Table: Summary of Highest Conducted Emissions Levels

<i>Frequency</i> <i>MHz</i>	<i>Sensor Location</i> <i>(Line Phase)</i>	<i>Detection</i> <i>Mode</i>	<i>Corrected Reading</i> <i>dB(mV)</i>	<i>Limit</i> <i>dB(mV)</i>	<i>Margin to Quasi</i> <i>Peak Limit dB</i>
11.67	Line	Peak	39.8	47.96	-8.2
0.4812	Line	Peak	38.4	47.96	-9.6
0.4693	Line	Peak	38.3	47.96	-9.7
0.5082	Line	Peak	37.9	47.96	-10.1
0.7667	Line	Peak	36.9	47.96	-11.1
0.7079	Line	Peak	36.6	47.96	-11.4
11.72	Neutral	Peak	36.8	47.96	-11.2
11.48	Neutral	Peak	35.7	47.96	-12.3
0.5345	Neutral	Peak	32.5	47.96	-15.5
11.05	Neutral	Peak	32.1	47.96	-15.9
0.5861	Neutral	Peak	31.7	47.96	-16.3
0.5621	Neutral	Peak	31.6	47.96	-16.4

* All readings are peak unless stated otherwise.

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6.1.5 Table: Judgement for no active transmission mode

EUT	OBD 1/2 Wireless Vehicle Interface
Judgement	Passed by 8.6 dB

Frequency MHz	Sensor Location (Line Phase)	Detection Mode	Corrected Reading dB(mV)	Limit dB(mV)	Margin to Quasi Peak Limit dB
0.4853	Line	Peak	39.4	47.96	-8.6
12.17	Line	Peak	38.3	47.96	-9.7
0.7321	Line	Peak	37.9	47.96	-10.1
0.7139	Line	Peak	37.8	47.96	-10.2
0.7764	Line	Peak	37.6	47.96	-10.4
0.5527	Line	Peak	36.5	47.96	-11.5
11.72	Neutral	Quasi Peak	34.7	47.96	-13.3
11.48	Neutral	Quasi Peak	29.3	47.96	-18.7
11.29	Neutral	Quasi Peak	23.2	47.96	-24.8
11.1	Neutral	Quasi Peak	22.4	47.96	-25.6
11.01	Neutral	Quasi Peak	21.5	47.96	-26.5
10.87	Neutral	Quasi Peak	19.5	47.96	-28.5

* All readings are peak unless stated otherwise.

6.1.6 Measurement Uncertainty

The measurement uncertainty (with a confidence level of 95%) for this test was: +/- 3 dB

6.1.7 Measured Calculation

Corrected Reading = CL + LISN

where: Corrected Reading = dB(μ V)

CL = cable loss - dB

LISN = LISN correction factors - dB

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6.2 Radiated Emissions Data

6.2.1 Table: FCC Part 15, Subpart B, Class B Radiated Emissions Limits

Frequency Range MHz	3 meter Limit dB(mV/m)
30 – 88	40.0
88 – 216	43.52
216 – 960	46.02
960 and above	53.97

6.2.2 Data Collection Procedure

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable, preamplifier and antenna corrections), the corrected reading, plus the limit. Supplemental data is included in the Appendices of this document. The following data lists the significant emission frequencies and measured levels measured from the EUT.

6.2.3 Table: Judgement

EUT	OBD 1/2 Wireless Vehicle Interface
Judgement	Passed by 3.3 dB

6.2.4 Table: Summary of Highest Radiated Emissions Levels

Frequency MHz	Polarity V/H	Antenna Height cm	Antenna Azimuth deg	Correction Factor dB(1/m)	Limit dB(mV/m)	Corrected Reading dB(mV/m)	Margin dB
902.121	V	200	0	-1.5	46.4	43.1 QP	-3.3
897.183	V	150	0	-1.5	46.4	42.5 QP	-3.9
930.749	V	110	180	-0.9	46.4	42.4 QP	-4.0
895.062	V	150	0	-1.6	46.4	42.3 QP	-4.1
905.772	V	100	180	-1.4	46.4	39.7 QP	-6.7
762.661	V	150	0	-3.9	46.4	37.3 QP	-9.1

* QP = Quasi Peak Detector, PK = Peak Detector. Measurements were made with an IF bandwidth of 120 kHz, along with a 100 ms sweep time. A video filter was not used.

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6.3 Radiated Emissions Data

6.3.1 Table: FCC Part 15, Subpart C, Section 15.249 Radiated Emissions Limits

Fundamental Frequency (MHz)	Field Strength of fundamental dB(mV/m)	Field Strength of Spurious Emissions dB(mV/m)
902 – 928 MHz	93.97	53.97

* Linear interpolation of field strength requirement.

Note: Radiated Emission Limits for the Restricted Bands are the same as Table 6.2.1.

6.3.2 Table: Judgement

EUT	OBD 1/2 Wireless Vehicle Interface
Judgement	Passed by 5.77 dB

FCC Part 15 Subpart C Section 15.249
Radiated Emissions @ 3 Meters
Data Sheet

Date : 17 July 2000

Customer : EASE Simulation, Inc.

Technician : Eugene P. Clarke Sr.

EUT : OBD 1/2 Wireless Vehicle Interface

Frequency (MHz)	Measured Level (dBuV)	Antenna Factor +(dB)	Cable Loss +(dB)	Preamp Gain -(dB)	Final Level (dBuV/m)	Spec Limit (dBuV/m)	Polarity (V/H)	Delta to Limit	Restricted Bands
1 916.48	88.2	23.2	2	25.2	88.20	93.97	V	-5.77	No
2 1832.96	41.17	25.82	3.9	37.1	33.79	53.97	V	-20.18	No
3 2749.44	49.5	30.36	6.4	37.7	48.56	53.97	V	-5.41	Yes
4 3665.92	6.17	30.47	6.40	37.40	5.64	53.97	V	-48.33	Yes
5 4582.4	5.67	33.13	6.40	37.30	7.90	53.97	V	-46.07	Yes
6 5498.88	6.67	34.18	7.70	36.85	11.70	53.97	H	-42.27	No
7 6415.36	5.67	35.31	10.60	38.50	13.08	53.97	H	-40.89	No
8 7331.84	7.17	36.48	11.90	40.40	15.15	53.97	V	-38.82	Yes
9 8248.32	4.5	37.56	10.60	39.00	13.66	53.97	V	-40.31	Yes
10 9164.8	8.17	37.65	10.40	38.60	17.62	53.97	H	-36.35	Yes

Equipment used :

Low loss cables, S/N 329 (3m), S/N 338 (3m), S/N 331 (1m)

HP8449B Preamp

EMCO 3115 Antenna S/N 2845

HP8566B Spectrum Analyzer

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6.3.3 Field Strength Calculation

The field strength is calculated by adding the antenna factor and cable factor, and subtracting the amplifier gain (if any) and duty cycle correction factor from the measured reading. The basic equation with a sample calculation is as follows:

$$FS=RA + AF + CF - AG - DC$$

Where:

FS = field strength dB (μ V/m)

RA = receiver amplitude dB (μ V)

AF = antenna factor dB/m

CF = cable attenuation factor dB

AG = amplifier gain dB

DC = duty cycle correction factor

Example: Assume a receiver reading of 99.2 dB (μ V) is obtained. The antenna factor of 13.3 and cable factor of 4 is added. The amplifier gain of 32.5 dB is subtracted, and the duty cycle correction factor of 10.7 is subtracted giving a field strength of 73.3 dB (μ V/m.)

$$FS = 99.2 + 13.3 + 4.0 - 32.5 - 10.7 = 73.3 \text{ dB } (\mu\text{V/m})$$

6.3.4 Measurement Uncertainty

The measurement uncertainty (with a confidence level of 95%) for this test was: 5.59 dB

6.4 Section 15.249 Bandwidth Measurements

The requirement for bandwidth is 0.25% of the fundamental measured 26 dB down from the modulated carrier. At 916.48 MHz 0.25% is 2.29 MHz. The actual measurement at 26 dB down was 25.52 kHz, which complies with the rules. See Section 9, Supplemental Pages Section for bandwidth measurements.

6.5 Section 15.203 Antenna Requirement

Requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The antenna supplied with the unit is not user replaceable. The device must be disassembled and a unique connector is used to connect the antenna to the PC board.

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7 TEST EQUIPMENT

A complete list of test equipment used of reach test can be found in their perspective test procedure. The absolute performance calibration of equipment requiring calibration is performed on an as needed basis in accordance with MIL-STD 45662. The test equipment is capable of making measurements within tolerances of at least +/- 2 dB amplitude and +/- 2% frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at Instrument Specialties Corporate offices in Delaware Water Gap, PA. All equipment is checked and verified for proper operation before and after each series of tests.

7.1 Conducted Emissions

Mfgr./Model	Description	Serial	Calibration Due
FCC/LISN-3B	(1 phase) (10 kHz - 30 MHz) LISN	36	9/27/00
FCC/LISN-3B	(1 phase) (10 kHz - 30 MHz) LISN	33	9/27/00
HP/8572A	(100 Hz - 22 GHz) EMI receiver sys #1	3010A01163	9/29/00
HP/85869A	EMI Conducted Emissions Measurement software	VA 03.00	Calibration Not Required

7.2 Radiated Emissions

Mfgr./Model	Description	Serial	Calibration Due
CHA/CBL6111A	(30 MHz - 1 GHz) bilog	1822	12/29/00
HP/8572A	(100 Hz - 22 GHz) EMI receiver sys #1	3010A01163	9/29/00
HP/85879A	EMI Radiated Emissions Measurement software	VA 02.01	Calibration Not Required
EMO/3115	Double ridge wave guide	2845	10/11/00

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8 TEST MEASUREMENT PHOTOS

8.1.1 Test Photographs

<i>Photo Layout</i>	<i>Test Type</i>	<i>Remarks</i>	<i>Page No.</i>
Top	Conducted Emissions	FCC Part 15, Class B	16
Bottom	Radiated Emissions	FCC Part 15, Class B	

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9 SUPPLEMENTAL TEST DATA

9.1.1 Test Data Sheets

Test Type	Test Name	Comments	Data Format	Page No.
Conducted Emissions	FCC Part 15	Transmit and Receive	plotted	18
Conducted Emissions	FCC Part 15	Transmit and Receive	datasheet	19
Conducted Emissions	FCC Part 15	Transmit and Receive	plotted	20
Conducted Emissions	FCC Part 15	Transmit and Receive	datasheet	21
Conducted Emissions	FCC Part 15	No active transmission	plotted	22
Conducted Emissions	FCC Part 15	No active transmission	datasheet	23
Conducted Emissions	FCC Part 15	No active transmission	plotted	24
Conducted Emissions	FCC Part 15	No active transmission	datasheet	25-26
Radiated Emissions	FCC Part 15 at 3 meters	Active comm between base & vehicle	plotted	27
Radiated Emissions	FCC Part 15 at 3 meters	Active comm between base & vehicle	datasheet	28
Radiated Emissions	FCC Part 15 at 3 meters	Subpart C Section 15.249	datasheet	29
Radiated Emissions	Duty Cycle	Occupied Bandwidth	plotted	30
Radiated Emissions	Duty Cycle	Occupied Bandwidth	plotted	31