Project Number: 10081-10

Prepared for:

Houston Radar, LLC.

13814 Sherburn Manor Drive
Cypress, TX 77429

By
Professional Testing (EMI), Inc.
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August 2009

Revised
October 2009

CERTIFICATION
Electromagnetic Interference Test Report
Houston Radar, LLC.
SS300 Doppler Radar

Table of Contents

Certificate Of Compliance

Applicant:	Houston Radar, LLC.
Applicant's Address:	13814 Sherburn Manor Drive Cypress, TX 77429
FCC ID:	TIASS300
Project Number:	10081-10
Test Dates:	July 20, 2009; October 7, 2009

I, Jason Anderson, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

The **Houston Radar, LLC., SS300 Doppler Radar** was tested to and found to be in compliance with FCC Part 15 Subpart C for an Intentional Radiator.

The highest emissions generated by the above equipment are listed below:

	Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Fundamental	24086	122.8	137.5	-14.7
Spurious	631.96	34.5	35.5	-1.0
Occupied Bandwidth	475 (kHz)			

Jason Anderson
Director of Testing Services

This report has been reviewed and accepted by Houston Radar, LLC.. The undersigned is responsible for ensuring that **Houston Radar, LLC, SS300 Doppler Radar** will continue to comply with the FCC rules.

1.0 Introduction

1.1 Scope

This report describes the extent of the Equipment Under Test (EUT) conformance to the Intentional Radiator requirements of the USA.

1.2 EUT Description

The DR-1500 is a Doppler speed radar is powered by 12V DC nominal voltage. The microwave Gunn oscillator in the transceiver generates a 24.1 GHz signal and sends it continuously out of the patch antenna at the target. The signal also "illuminates" internal (to the microwave transceiver) mixer diodes that act as a receiver mixer. The transmitted radar waves are reflected off the moving target, change the reflected microwave frequency per the well-known "Doppler principle" and are received by the same transmitting horn antenna and mixed in the receiving mixer diodes with the local oscillator. The difference in the transmitted/received frequencies is produced as a low frequency (audio frequency range) out of the mixer diode and into the preamp.

The system tested consisted of the following:

Manufacturer & Model	FCC Number	Description
Houston Radar, LLC., SS300	TIASS300	Doppler Radar

1.3 EUT Operation

The EUT was operated in continuous transmit mode at max power to measure fundamental, harmonics, and spurious radiation.

The following rules apply to the operation of the EUT:

Guidelines	FCC Rule Parts Part 15
Transmitter Characteristics	15.245
Spurious Radiated Power	15.205, 15.209, 15.245
Antenna Requirement	15.203
Spurious Conducted Emissions	15.207

1.4 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. This site is registered with the FCC under Section 2.948 and Industry Canada per RS-212 and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnett Rd., Austin, Texas, 78758 while the main office is located at 1601 N. A.W. Grimes Blvd., Suite B, Round Rock, Texas, 78665. Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing. The procedure of ANSI C63.4:2003 and FCC Public Notice DA 00-705 were utilized for making all emissions measurements.

1.5 Applicable Documents

Document	Title	Release
ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment.	2003
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators	

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing.

2.2 Conducted Emissions Measurements

Conducted emissions measurements were made on the mains terminals of the EUT to determine the line-to-ground radio noise emitted from each power-input terminal. Conducted emissions measurements on the mains terminals were performed at Professional Testing, located in Austin, Texas.

2.1.1 Test Procedure

The EUT was configured and operated in a manner consistent with typical applications. The EUT power cord in excess of one meter was folded back and forth forming a bundle 30 to 40 cm long in the approximate center of the cable. Power supply cords for the peripheral equipment were powered from an auxiliary LISN. Excess interface cable lengths were separately bundled in a non-inductive arrangement at the approximate center of the cable with the bundle 30 to 40 centimeters in length. The conducted emissions were maximized, by varying the operating states and configuration of the EUT. The tests were performed in a 12' x 16' RayProof modular shielded room. The EUT was placed on a non-metallic table 0.4 meters from a vertical metal reference plane and 0.8 meters from a horizontal metal reference plane.

The measurements were taken using a Line Impedance Stabilization Network (LISN). A Spectrum Analyzer with a measurement bandwidth of 9 kHz was used to record the conducted emissions measurements. The configuration of the shielded room showing the location of the EUT and the measurement equipment is given as Figure 1.

2.1.2 Test Criteria

The table below shows FCC conducted limits for an intentional radiator operating under the provisions of part 15.207.

Frequency MHz	Maximum RF Line Voltage (dBuV) Average	Quasi-Peak
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5.0	56	46
5.0 to 30.0	60	50

2.1.3 Test Results

The conducted emission test data is included in Appendix A. The conducted emissions generated by the SS300 Doppler Radar are below the FCC Part 15.207 limits.

2.2 Radiated Emissions Measurements

2.2.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable which allows 360 degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious measurements below 1 GHz the measurement antennas were located 10 meters from the EUT. The associated 3 meter limit was extrapolated to 10 meters. For spurious/harmonic measurements from 1-24 GHz, the measurement antenna was placed 1 meter from the EUT. From 24-100 GHz the measurement antenna was placed 0.1 meters from the EUT. The radiated emissions were maximized by rotating the EUT.

Tests of the fundamental for the device were performed to determine the worst case polarization of the devices. The fundamental emissions of the device were measured with the antenna of the device in horizontal and vertical polarization.

A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 2.

2.2.2 Test Criteria

The table below shows FCC radiated limits for an intentional radiator operating under the provisions of part 15.245. The measurement of the harmonics was performed to 100 GHz. The reference distance for each limit is also shown in this table.

Frequency MHz	Test Distance (Meters)	Field Strength (uV/m)@3m	(dBuV/m)@Test Distance
30 to 88	10	100	29.5
88 to 216	10	150	33.0
216 to 960	10	200	35.5
960 to 1000	10	500	43.5
1000 to 24000	3	500	54.0
24000 to 100000	.1	500	83.5
Fundamental	1	2500000	137.5
Harmonics	.1	25000	117.5

Note: Fundamental and Harmonic Limits are expressed in Average field strengths. The spurious limits are expressed in Quasi-Peak.

2.2.3 Test Results

The radiated test data for the fundamental is included in Appendix A. Peak detection was used during the test for the fundamental and harmonics. Quasi-Peak detection was used for spurious emissions below 1 GHz. The radiated emission test data is included in Appendix A. The radiated emissions generated by the SS300 Doppler Radar are below the FCC Part 15.245 limits.

3.0 Occupied Bandwidth Measurements

Measurements of the occupied bandwidth for the fundamental signals were made at Professional Testing Austin, Texas site. All measurements were made in a controlled indoor environment in a configuration which did not present measurement distortion or ambient interference.

3.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor. The table was rotated to an angle which presented the highest signal level. The occupied bandwidth was based on a 20 dB criteria (20 dB down either side of the emission from the peak emission). A drawing showing the test setup is given as Figure 1.

3.2 Test Criteria

According to FCC Part 15.245, the bandwidth of the emission shall not be outside of the specified band of 24075-24175 MHz.

3.3 Test Results

The occupied bandwidth test data is included in Appendix B. The occupied bandwidth for the fundamental frequency is 350 kHz. This occupied bandwidth complies with the FCC requirement.

4.0 Antenna Requirement

An analysis of the SS300 Doppler Radar was performed to determine compliance with FCC Section 15.203. This section requires specific handling and control of antennas used for devices subject to regulations.

4.1 Evaluation Procedure

The structure and application of the SS300 Doppler Radar was analyzed with respect to the rules. The antenna is an integral antenna, and is interchangeable by the user. An auxiliary antenna port is not present.

4.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

(a) Antenna must be permanently attached to the unit.

(b) Antenna must use a unique type of connector to attach to the EUT.

(c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.3 Evaluation Results

The SS300 Doppler Radar meets the criteria of this rule by virtue of having an integral antenna. The EUT is therefore compliant.

5.0 Modifications to Equipment

No modifications were made to the EUT.

6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Asset #	Manufacturer	Model #	Description	Calibration Due
275	HP	85650A	Quasi-peak Adapter (high band)	October 21, 2009
83	HP	85662A	Spectrum Analyzer Display (high band)	NCR
84	HP	8566B	Spectrum Analyzer (high band)	February 23, 2010
1035	HP	85685A	RF Preselector (high band)	January 29, 2010
1277	HP	85650A	Quasi-peak Adapter (low band)	July 16, 2010
45	HP	85662A	Spectrum Analyzer Display (low band)	NCR
1148	HP	8568B	Spectrum Analyzer (low band)	July 16, 2010
990	HP	85685A	RF Preselector (low band)	March 17, 2010
1455	HP	8447D	RF Preamplifier	June 22, 2010
1497	Emco	3108	Biconical Antenna	April 16, 2010
1486	Emco	3147	Log Periodic Dipole Araay Antenna	April 16, 2010
C026	none	none	Coaxial Cable (low band)	July 27, 2010
C027	none	none	Coaxial Cable (high band)	July 27, 2010
C056-059	Paternack	LLS	4 sections, 12ft	January 21, 2010
0582	EMCO	3115	Ridge Guide Antenna	October 30, 2009
1594	Miteq	AFS44-001-02650	Microwave Preamplifier	February 25, 2010
1342	Rohde & Schwarz	ESMI	EMI Test Receiver	December 4, 2010
1343	Rohde & Schwarz	ESMI	EMI Test Receiver Display	December 4, 2010
1542	AH Systems	SAS-572	Horn Antenna, Standard Gain, 20 dB	NCR
0730	Millitech/Pacific Microwave		Horn/Mixer, 40-60 GHz	NCR
0730	Millitech/Pacific Microwave		Horn/Mixer, 60-90 GHz	NCR
0730	Millitech/Pacific Microwave		Horn/Mixer, 90-140 GHz	NCR
0716	Tektronix	492AP	Spectrum Analyzer	June 6, 2010
0716	Tektronix		Diplexer/Mixer	June 6, 2010
1037	PTI	PTI-ALF1	Attenuator, Limiter, Filter	June 2, 2010
1185	Emco	3825/2	Line Impedance Stabilization Network	September 13, 2009
0081	ELGAR	1751SL	AC Power Supply	NCR
1683	TESEQ	T800	ISN	November 24, 2009
1173	PTI	100KHz HPF	High Pass Filter	January 26, 2010

FIGURE 1: Conducted Emissions Test Setup

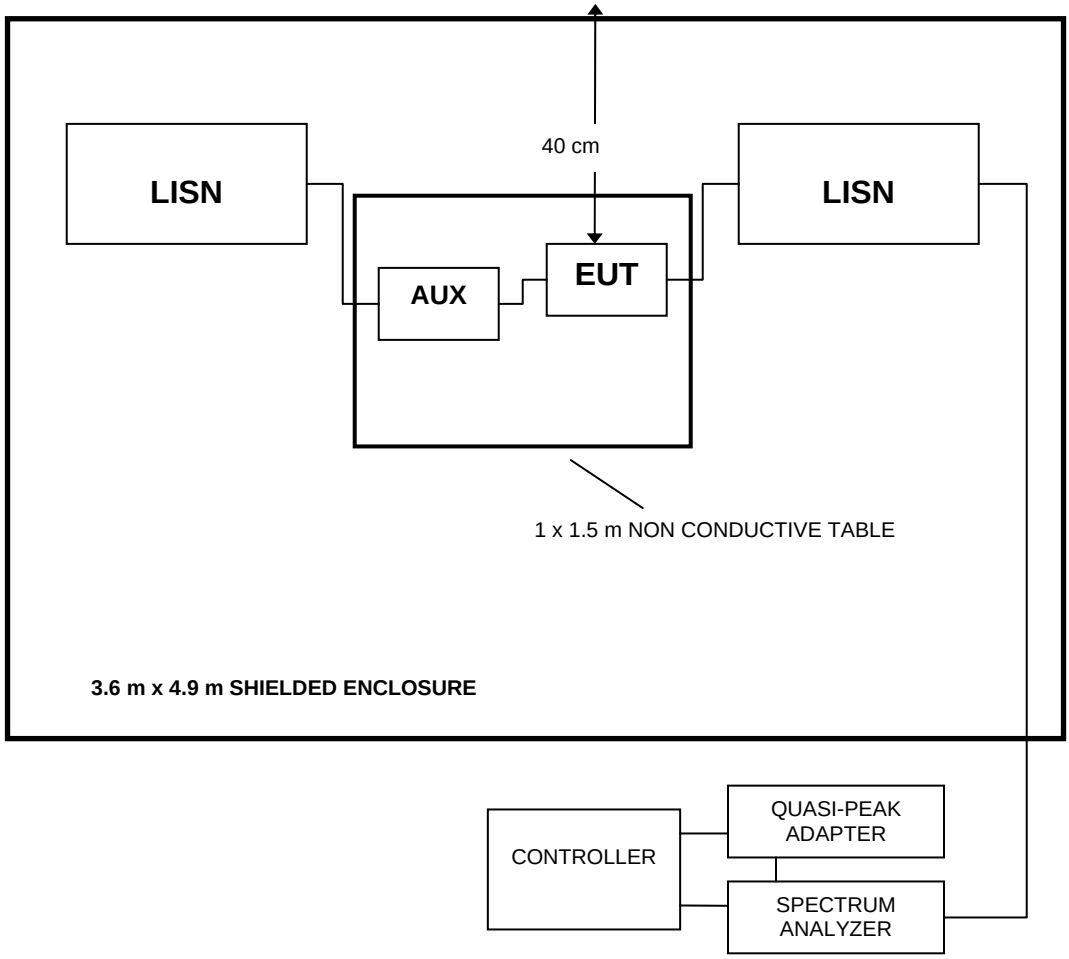
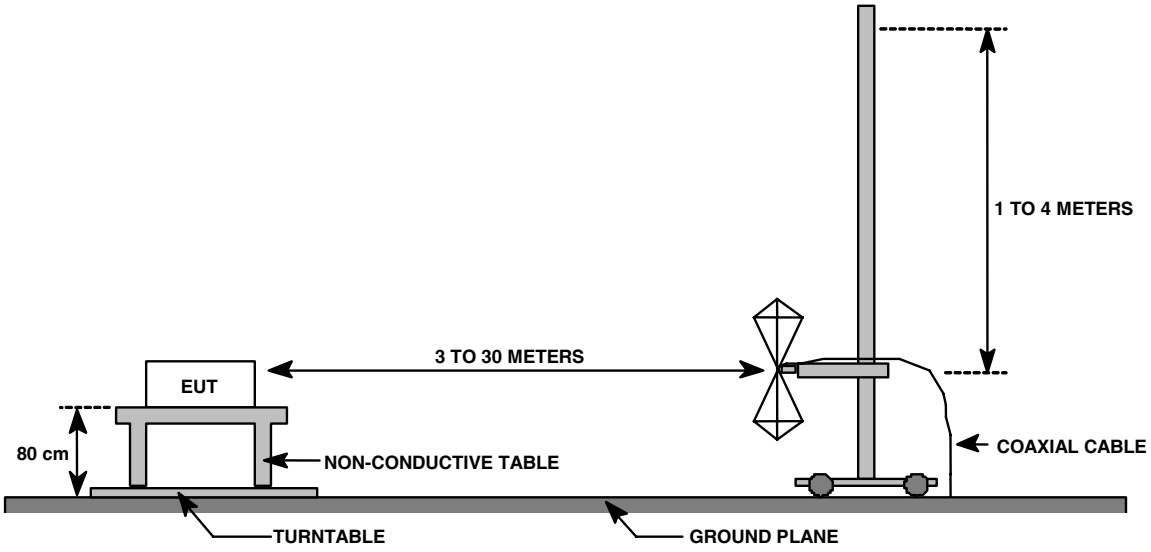


FIGURE 2: Radiated Emissions Test Setup

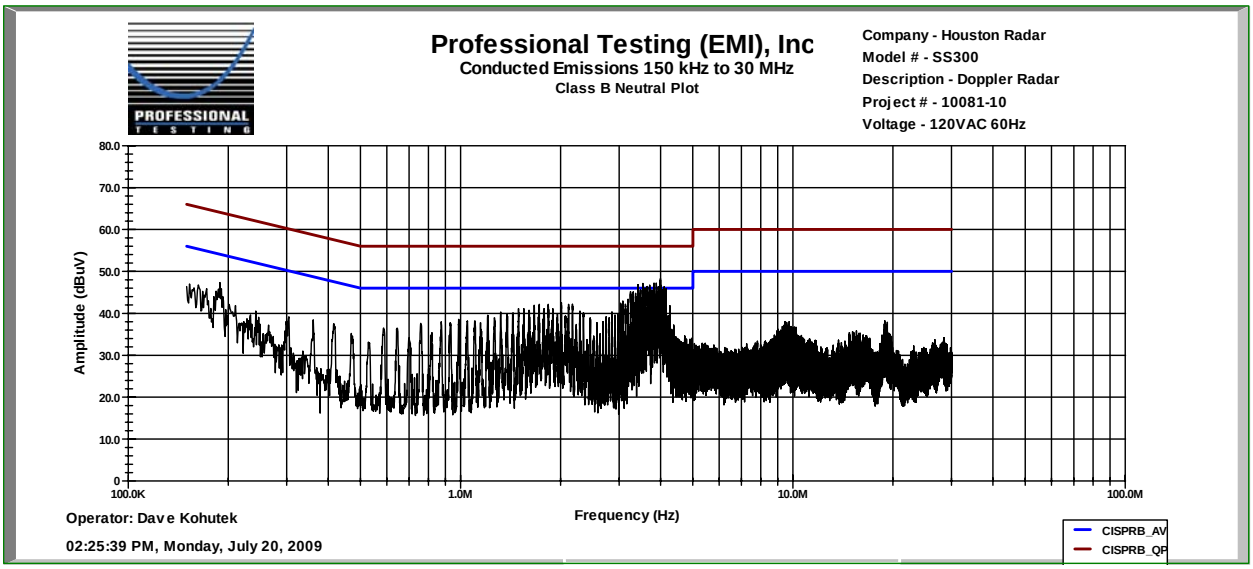


APPENDIX A EMISSIONS DATA SHEET

Radiated Data Sheet
Neutral Line
Houston Radar, LLC.
SS300 Doppler Radar
Quasi-Peak Detection RBW =9 kHz VBW = 100kHz
Average Detection RBW = 9kHz VBW = 10Hz

Test Date: July 20, 2009

Frequency Reading (MHz)	Quasi-peak Reading (dBuV)	Average Reading (dBuV)	Quasi-peak Limit (dBuV)	Quasi-peak Margin (dB)	Average Limit (dBuV)	Average Margin (dB)
3.41183	43.9	31.9	56	-12.1	46	-14.1
3.52479	44.9	32.3	56	-11.1	46	-13.7
3.8088	43.6	34.1	56	-12.4	46	-11.9
3.862	44.3	34.7	56	-11.7	46	-11.3
3.97888	43.9	34.7	56	-12.1	46	-11.3
9.46743	35.6	29.2	60	-24.4	50	-20.8
9.57325	35.8	29.5	60	-24.2	50	-20.5
9.74668	35.9	29.5	60	-24.1	50	-20.5
18.8531	31.7	22.9	60	-28.3	50	-27.1
18.907	32.3	22.8	60	-27.7	50	-27.2

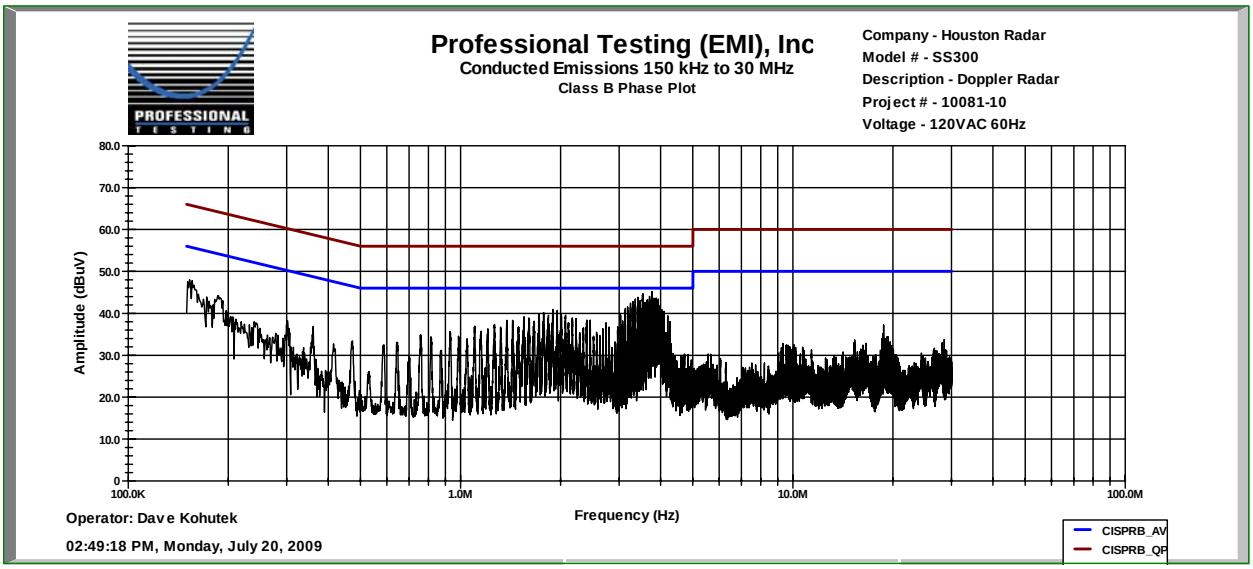


COMMENT #1: 115VAC/60Hz
Graphical data for overview only.

Radiated Data Sheet
Phase Line
Houston Radar, LLC.
SS300 Doppler Radar
Quasi-Peak Detection RBW =9 kHz VBW = 100kHz
Average Detection RBW = 9kHz VBW = 10Hz

Test Date: July 20, 2009

Frequency Reading (MHz)	Quasi-peak Reading (dBuV)	Average Reading (dBuV)	Quasi-peak Limit (dBuV)	Quasi-peak Margin (dB)	Average Limit (dBuV)	Average Margin (dB)
3.41183	40.4	28.2	56	-15.6	46	-17.8
3.52246	40.6	29.1	56	-15.4	46	-16.9
3.52412	40.5	28.6	56	-15.5	46	-17.4
3.69645	41.3	29.7	56	-14.7	46	-16.3
3.75412	40.4	30.5	56	-15.6	46	-15.5
18.523	28.9	20.7	60	-31.1	50	-29.3
18.6362	29.5	21.8	60	-30.5	50	-28.2
18.755	29.9	20.9	60	-30.1	50	-29.1
19.2091	29.3	18.1	60	-30.7	50	-31.9
19.2785	28.5	17.5	60	-31.5	50	-32.5



COMMENT #1: 115VAC/60Hz
Graphical data for overview only.

Radiated Data Sheet
Fundamental
Houston Radar, LLC.
SS300 Doppler Radar
Peak Detection RBW =1 MHz

Test Date: October 7, 2009
Measurement Distance (Meters): 1

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
24.0861	180	1	74.2	0.0	37.1	10.3	121.6	137.5	-15.9

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
24.0861	180	1	55.1	0.0	37.1	10.3	102.5	137.5	-35.0

TEST ENGINEER: Jason Anderson

Radiated Data Sheet
Spurious/Harmonics >18GHz
Houston Radar, LLC.
SS300 Doppler Radar
Peak Detection RBW =1 MHz

Test Date: October 7, 2009
Measurement Distance (Meters): 0.1

Vertical

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Conversion Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.178	0	1	54.1	0.1	39.9	0	93.9	117.5	-23.6
72.267	0	1	46.4	0.1	43.4	0	89.7	117.5	-27.8
96.356	0	1	47.9	0.1	45.9	0	93.7	117.5	-23.8

Horizontal

Frequency (GHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Conversion Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.178	0	1	44.2	0.1	39.9	0.0	84.0	117.5	-33.5
72.267	0	1	46.4	0.1	43.4	0.0	89.7	117.5	-27.8
96.356	0	1	47.9	0.1	45.9	0.0	93.7	117.5	-23.8

Note: No detectable emissions above 72 GHz

TEST ENGINEER: Jason Anderson

Radiated Data Sheet
Spurious <1 GHz
Houston Radar, LLC.
SS300 Doppler Radar
Quasi-Peak Detection
RBW=120kHz

Test Date: October 7, 2009
Measurement Distance (Meters): 10

Vertical

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
192.03	23	1	30.9	26.1	13.4	1.6	19.9	33	-13.1
499.818	140	3.5	38.1	31.1	18.9	3.4	29.3	35.5	-6.2
631.96	259	2.7	41.5	31.1	20.1	4.0	34.5	35.5	-1.0
750.06	329	2.5	37.3	31.3	21.6	4.3	31.9	35.5	-3.6

Horizontal

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
192.018	297	4	29	26.069	13.4	1.6	18.0	33	-15.0
499.818	176	2.4	36.5	31.1	18.9	3.4	27.7	35.5	-7.8
631.96	174	4	35.1	31.1	20.1	4.0	28.1	35.5	-7.4

TEST TECHNICIAN: Larry Fuller

Radiated Data Sheet
Spurious 1-18 GHz
Houston Radar, LLC.
SS300 Doppler Radar
Peak Detection
RBW=1MHz

Test Date: October 7, 2009
Measurement Distance (Meters): 3

Vertical

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2500	104	1	59	54.9	28.3	4.8	37.2	54	-16.8
1830	108	1	61.3	55.3	26.8	4.4	37.2	54	-16.8

Horizontal

Frequency (MHz)	EUT Direction (degrees)	Antenna Elevation (Meters)	Recorded Level (dBuV)	Amplifier Gain (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2500	21	1	53.1	54.9	28.3	4.8	31.3	54	-22.7
1830	125	1	61.4	55.3	26.8	4.4	37.3	54	-16.7

TEST TECHNICIAN: Larry Fuller

Note: Full retest not performed. Previous results have been verified.

Occupied Bandwidth Datasheet
Houston Radar, LLC.
SS300 Doppler Radar