1601 North A.W. Grimes Blvd., Suite B
Round Rock, TX 78665
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(512) 244-3371 Fax: (512) 244-1846

September 6, 2013

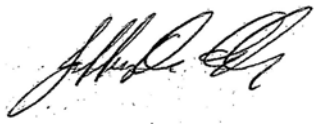
Vipin Malik
Houston Radar, LLC.
13814 Sherburn Manor Drive
Cypress, TX 77429

Dear: Vipin

Thank you for allowing Professional Testing (EMI), Inc. an opportunity to perform testing for Houston Radar, LLC. Enclosed is the Wireless Certification Report for the DC310. This report can be used to demonstrate compliance with FCC requirements for wireless devices in the United States.

If you have any questions, please contact me.

Sincerely,



Jeffrey A. Lenk
President

Attachment

Project Number: 14570-10

DC310 Modular Transceiver

Prepared for:

Houston Radar, LLC.

12818 Century Dr
Stafford, TX 77477

By
Professional Testing (EMI), Inc.
1601 N. A.W. Grimes Blvd., Suite B
Round Rock, Texas 78665

September 6, 2013

CERTIFICATION
Electromagnetic Interference Test Report
Houston Radar, LLC.
DC310 Doppler Radar

Table of Contents

Certificate Of Compliance

Applicant:	Houston Radar, LLC.
Applicant's Address:	12818 Century Dr Stafford, TX 774
FCC ID:	TIADC310
Project Number:	14570-10
Test Dates:	March 15, 2013; March 20, 2013; July 5, 2013; July 30, 2013; September 6, 2013

I, Eric Lifsey, 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., DC310 Doppler Radar** was tested to and found to be in compliance with FCC Part 15 Subpart C for an Intentional Radiator.

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by Houston Radar, LLC.. The undersigned is responsible for ensuring that the **Houston Radar, LLC, DC310 Doppler Radar** will continue to comply with the FCC rules.

Vipin Malik

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 EUT 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 Effect and are received by the same transmitting patch 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 emission consists of unmodulated continuous waves.

The system tested consisted of the following:

Manufacturer & Model	FCC Number	Description
Houston Radar, LLC., DC310	TIADC310	Doppler Radar Module

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 Part 15 Rule Paragraphs
Transmitter Characteristics	15.245
Spurious Radiated Power	15.205, 15.209, 15.245
Antenna Requirement	15.203
Spurious Conducted Emissions	15.207, 15.107

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-GEN and is subsequently confirmed by laboratory accreditation (NVLAP). Site 45 is located at 11400 Burnett Rd., Austin, Texas, 78758. The main office is located at 1601 N. A.W. Grimes Blvd., Suite B, Round Rock, Texas, 78665.

1.5 Applicable Documents

Document	**Title**
ANSI C63.4 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment.
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators

2.0 Fundamental Emission Measurements

2.1 Test Procedure

For measurements of the fundamental signal, the EUT was positioned on a motorized turntable at a distance of 1 meter as measured from the closest point of the EUT from the measurement antenna. The limit was extrapolated accordingly. The emissions were maximized by rotating the EUT.

2.2 Test Criteria

Section Reference	Parameter	Date(s)
15.245	Radiated Field Strength, 2500 mV/m @ 3 m Restated as 127.96 dBµV/m @ 3 m Or 137.5 dBµV/m @ 1 m	2013-03-14

2.3 Test Results

The maximum emission is presented below and compared to the limit. Note that since the signal is continuous waves, there is no duty cycle timing factor to apply.

Field Strength of Fundamental
1 Meter Measurement Distance

Frequency GHz	EUT Direction degrees	Antenna Polarity	Antenna Height meters	Measured Level dBµV	Amplifier Gain dB	Antenna Factor dB/m	Cable Loss dB	Corrected Level* (Measured Peak Level) dBµV/m
24.119	0	H	1	80.6	0	37.1	3	120.7
24.119	0	V	1	59.9	0	37.1	3	100.0

*Resolution bandwidth 1 MHz, video bandwidth 3 MHz, using peak detection.

Limit at 1 meter dBµV/m	Maximum Corrected Level (Measured Peak Level) dBµV/m	Margin dB
137.5	120.7	-16.8

The EUT satisfies the criteria.

3.0 Radiated Spurious Emissions Measurements

3.1 Test Procedure

For 30 to 1000 MHz spurious emission measurement, 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 spurious measurements below 1 GHz the measurement antennas were located 10 meters from the EUT. The 3 meter limit was extrapolated to 10 meters.

For the spurious emission measurements above 1 GHz, 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. The measurement antennas were located at 1, 0.5 and 0.1 meters from the EUT as noted in the associated tables. The 3 meter limit was extrapolated accordingly.

3.2 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 up to 100 GHz. The reference distance for each limit is also shown in this table.

Frequency MHz	Test Distance (Meters)	Field Strength (µV/m)@3m	(dBµV/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

3.3 Test Results

Peak detection was used during the test for the fundamental and harmonics. Quasi-Peak detection was used for spurious emissions below 1 GHz. The correct signal level is determined by the following formula:

Corrected Level = Measured Level + Antenna Factor + Cable Loss – Amplifier Gain (if any)

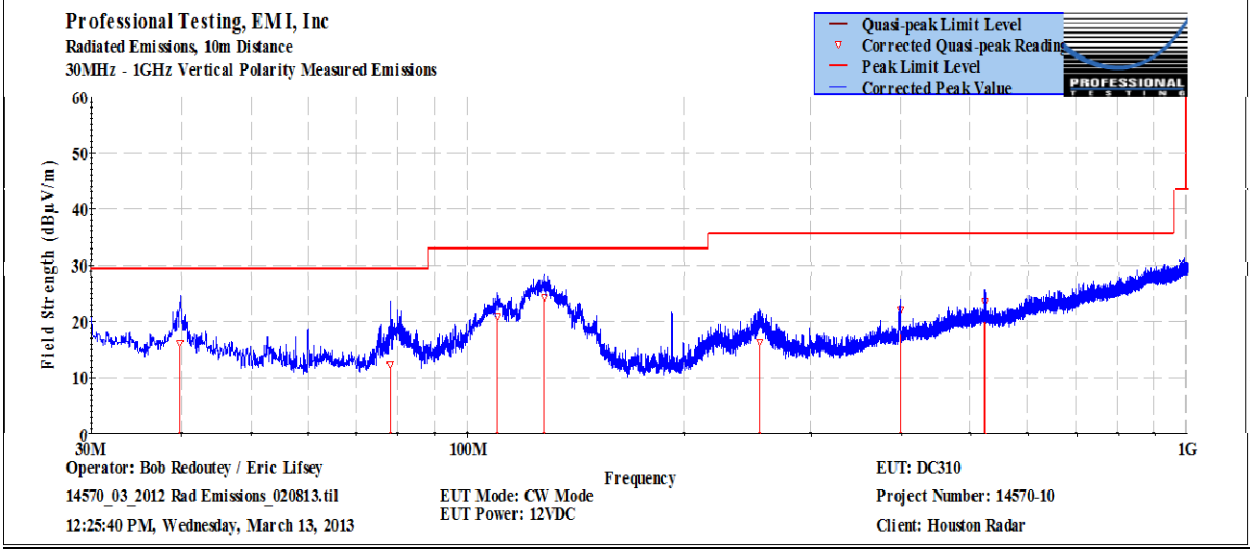
The radiated emissions generated by the EUT are below the FCC Part 15.245 limits.

3.3.1 Measurements 30 MHz to 1 GHz

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	3/13/2013	EUT Serial #:	20130301
Customer:	Houston Radar	EUT Part #:	None
Project Number:	14570-10	Test Technician:	Bob Redoutey / Eric Lifsey
Purchase Order #:	None Listed	Supervisor:	Rob McCollough
Equip. Under Test:	DC310 Modular Radio	Witness' Name:	Vipin Malik

Radiated Emissions Test Results Data Sheet			Page: 1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	- N/A
Antenna Orientation:	Vertical	Frequency Range:	30MHz to 1GHz
EUT Mode of Operation:		CW Mode	

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
39.7762	10	245	1.48	Quasi-peak	31.9	16.16	29.5	-13.3	Pass
78.0171	10	235	2.72	Quasi-peak	33.5	12.371	29.5	-17.1	Pass
110.039	10	258	1.38	Quasi-peak	40.2	20.948	33.1	-12.2	Pass
127.85	10	204	1.42	Quasi-peak	44.1	24.232	33.1	-8.9	Pass
254.758	10	357	1.96	Quasi-peak	28.4	16.407	35.6	-19.2	Pass
400.034	10	77	4.09	Quasi-peak	30.8	22.091	35.6	-13.5	Pass
524.381	10	188	2.98	Quasi-peak	28.4	23.492	35.6	-12.1	Pass



≤ 1GHz Vertical Antenna Polarity Measured Emissions

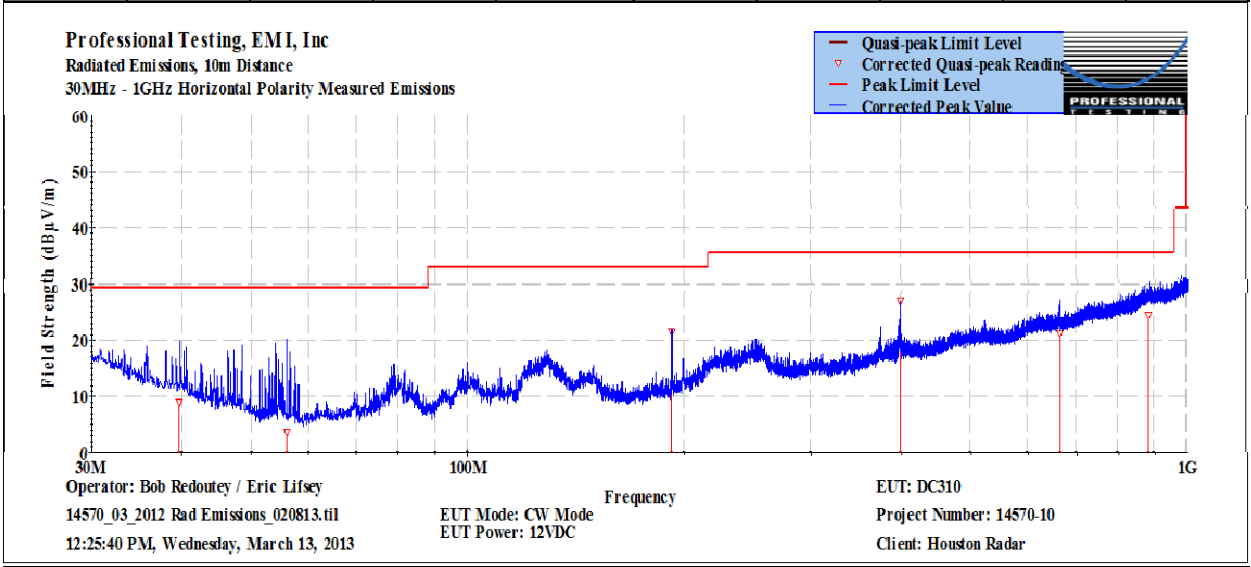
Professional Testing, EMI, Inc.

Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	3/13/2013	**EUT Serial #:**	20130301
Customer:	Houston Radar	**EUT Part #:**	None
Project Number:	14570-10	**Test Technician:**	Bob Redoutey / Eric Lifsey
Purchase Order #:	None Listed	**Supervisor:**	Rob McCollough
Equip. Under Test:	DC310 Modular Radio	**Witness' Name:**	Vipin Malik

Radiated Emissions Test Results Data Sheet — **Page: 1 of 1**

EUT Line Voltage:	12 VDC	**EUT Power Frequency:**	- N/A
Antenna Orientation:	Horizontal	**Frequency Range:**	30MHz to 1GHz
EUT Mode of Operation:		CW Mode	

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
39.7066	10	265	1.43	Quasi-peak	24.7	9.0	29.5	-20.5	Pass
56.058	10	35	3.91	Quasi-peak	24.1	3.6	29.5	-25.9	Pass
192.265	10	74	3.8	Quasi-peak	37.5	21.5	33.1	-11.6	Pass
399.878	10	15	2.19	Quasi-peak	35.7	27.0	35.6	-8.6	Pass
666.434	10	14	1.67	Quasi-peak	23.2	21.2	35.6	-14.4	Pass
884.368	10	226	3.02	Quasi-peak	21.4	24.4	35.6	-11.2	Pass



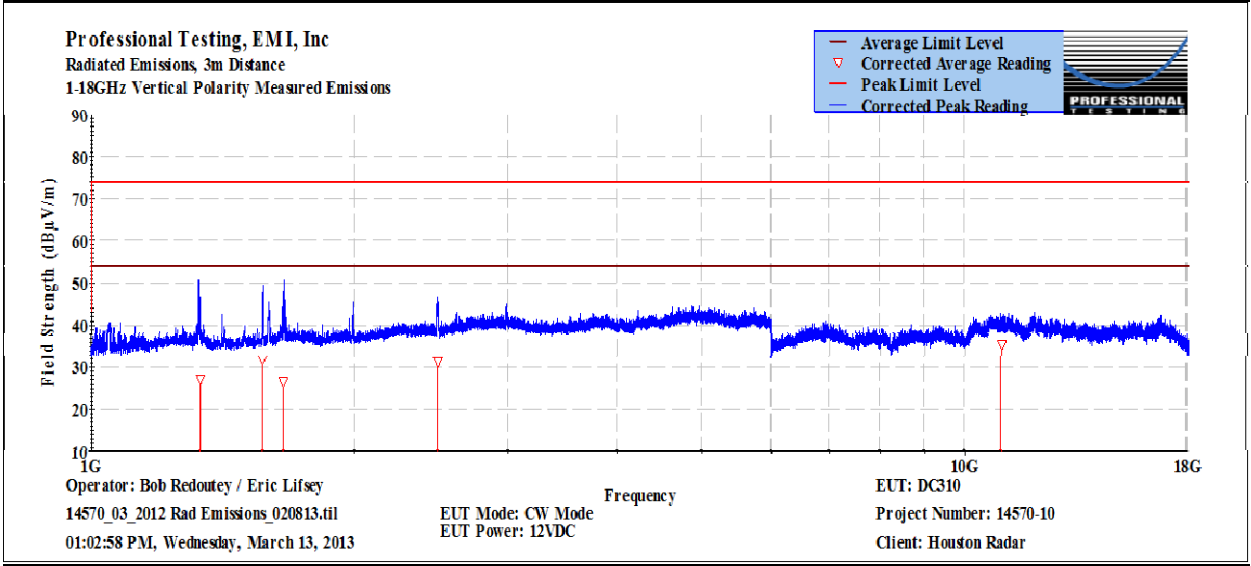
≤ 1GHz Horizontal Antenna Polarity Measured Emissions

3.3.2 Measurements 1 GHz to 18 GHz

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	3/13/2013	EUT Serial #:	20130301
Customer:	Houston Radar	EUT Part #:	None
Project Number:	14570-10	Test Technician:	Bob Redoutey / Eric Lifsey
Purchase Order #:	None Listed	Supervisor:	Rob McCollough
Equip. Under Test:	DC310 Modular Radio	Witness' Name:	Vipin Malik

Radiated Emissions Test Results Data Sheet			Page: 1 of 1
EUT Line Voltage:	12 VDC	EUT Power Frequency:	- N/A
Antenna Orientation:	Vertical	Frequency Range:	Above 1GHz
EUT Mode of Operation:		CW Mode	

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
1332.68	3	308	1	Average	78	27.23	54.0	-26.7	Pass
1569.74	3	25	1	Average	82.7	31.851	54.0	-22.1	Pass
1658.14	3	277	1	Average	76.9	26.522	54.0	-27.4	Pass
2493.44	3	258	1	Average	79.3	31.322	54.0	-22.6	Pass
11019.8	3	337	1	Average	61.2	35.43	54.0	-18.5	Pass



> 1GHz Vertical Antenna Polarity Measured Emissions

Professional Testing, EMI, Inc.

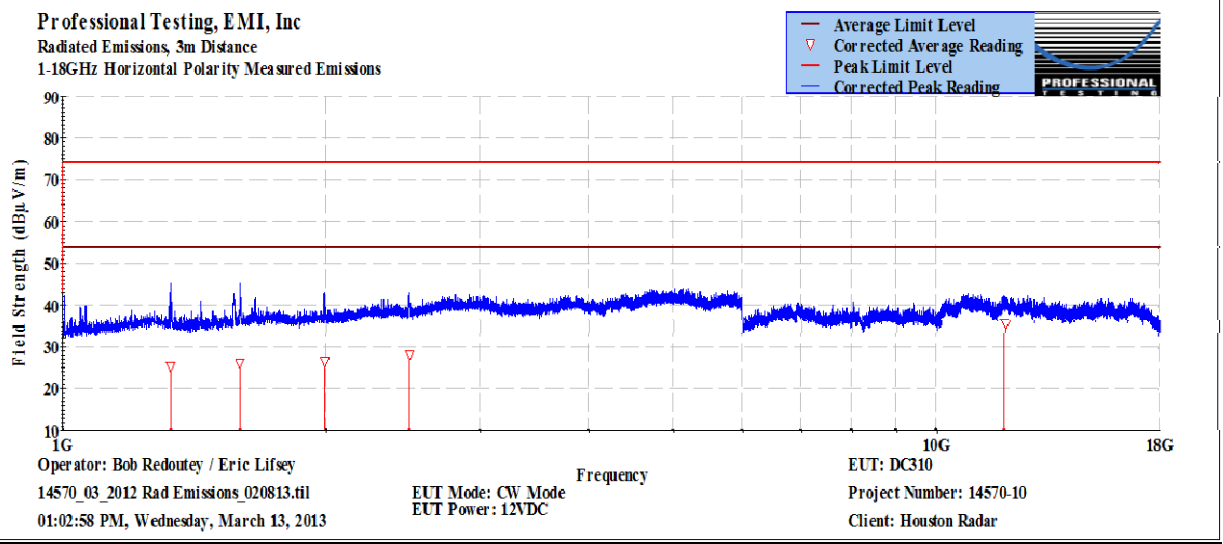
Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).
In accordance with:	FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits
Section:	15.109

Test Date(s):	3/13/2013	**EUT Serial #:**	20130301
Customer:	Houston Radar	**EUT Part #:**	None
Project Number:	14570-10	**Test Technician:**	Bob Redoutey / Eric Lifsey
Purchase Order #:	None Listed	**Supervisor:**	Rob McCollough
Equip. Under Test:	DC310 Modular Radio	**Witness' Name:**	Vipin Malik

Radiated Emissions Test Results Data Sheet — **Page: 1 of 1**

EUT Line Voltage:	12 VDC	**EUT Power Frequency:**	- N/A
Antenna Orientation:	Horizontal	**Frequency Range:**	Above 1GHz
EUT Mode of Operation:		CW Mode	

Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBµV/m)	Margin (dB)	Test Results
1328.15	3	329	1	Average	76	25.3	54.0	-28.7	Pass
1594.49	3	193	1	Average	76.9	26.1	54.0	-27.8	Pass
1996.63	3	341	1	Average	76.4	26.4	54.0	-27.5	Pass
2496.1	3	200	1	Average	76.1	28.1	54.0	-25.8	Pass
11985.8	3	205	1	Average	60.2	35.6	54.0	-18.3	Pass



> 1GHz Horizontal Antenna Polarity Measured Emissions

3.3.3 Measurements 18 GHz to 30 GHz

For this measurement the receive antenna was fixed in position on the spectrum analyzer. The EUT was moved manually in a fashion to check bother polarities, cover its exposed surface area, tilted, and rotated to search for emissions.

Reference	Parameter
15.245(b)	Harmonics Radiated Field Strength, Limit 25 mV/m @ 3 m Restated as 87.96 dBµV/m @ 3 m Or 103.5 dBµV/m @ 0.5 m; Or 117.5 dBµV/m @ 0.1 m
15.245(b)(3)	Radiated Emissions Outside Specified Band, Limit -50 dBc Calculated as 120.7 dBµV/m – 50 dB = 70.7 dBµV/m @ 3 m Or 100.24 dBµV/m at 0.1 m

Harmonics & Spurious above 18 GHz							Measured		7/30/2013
Distance		dBuV/m			Antenna	Cable	Corrected		
meters	VBW	Measured*	Frequency	Polarity	dB	dB	dBuV/m	Limit	Margin dB
Band Edges (noise floor in each case)								(-50dBc)	
0.1	3 MHz	44.06	24.175	H	37.1	3	84.2	100.24	-16.1
0.1	3 MHz	44.29	24.175	V	37.1	3	84.4	100.24	-15.9
0.1	3 kHz	33.26	24.175	H	37.1	3	73.4	100.24	-26.9
0.1	3 kHz	33.18	24.175	V	37.1	3	73.3	100.24	-27.0
0.1	3 MHz	44.07	24.075	H	37.1	3	84.2	100.24	-16.1
0.1	3 MHz	44.18	24.075	V	37.1	3	84.3	100.24	-16.0
0.1	3 kHz	32.75	24.075	H	37.1	3	72.9	100.24	-27.4
0.1	3 kHz	33.07	24.075	V	37.1	3	73.2	100.24	-27.1
Other Spurious Up To 30 GHz									
0.1	none							91.25	
0.1	found							91.25	

*Peak in 3 MHz VBW, average in 3 kHz VBW. RBW in all cases is 1 MHz.

3.3.4 Measurements 30 GHz to 100 GHz

For this measurement the receive antenna had some degree of freedom on a limited length cable and combined with the same approach as used in section 3.3.3; this method was employed to search for emissions.

Harmonics & Spurious 30 to 100 GHz 7/5/2013								
Distance m	Measured Level dBµV/m *	Frequency GHz	Polarity	Antenna Factor dB	Cable Loss* dB	Corrected Level dBµV/m	Limit dBµV/m	Margin dB
0.5	52.20	48.243	V	36	0	88.2	103.5	-15.3

*Horn is attached direct to mixer by waveguide. Detector mode is peak.

No signals detected above 48.243 GHz.

4.0 Occupied Bandwidth Measurements

Measurements of the occupied bandwidth are to insure that the EUT emission is substantially within the authorized band.

4.1 Test Procedure

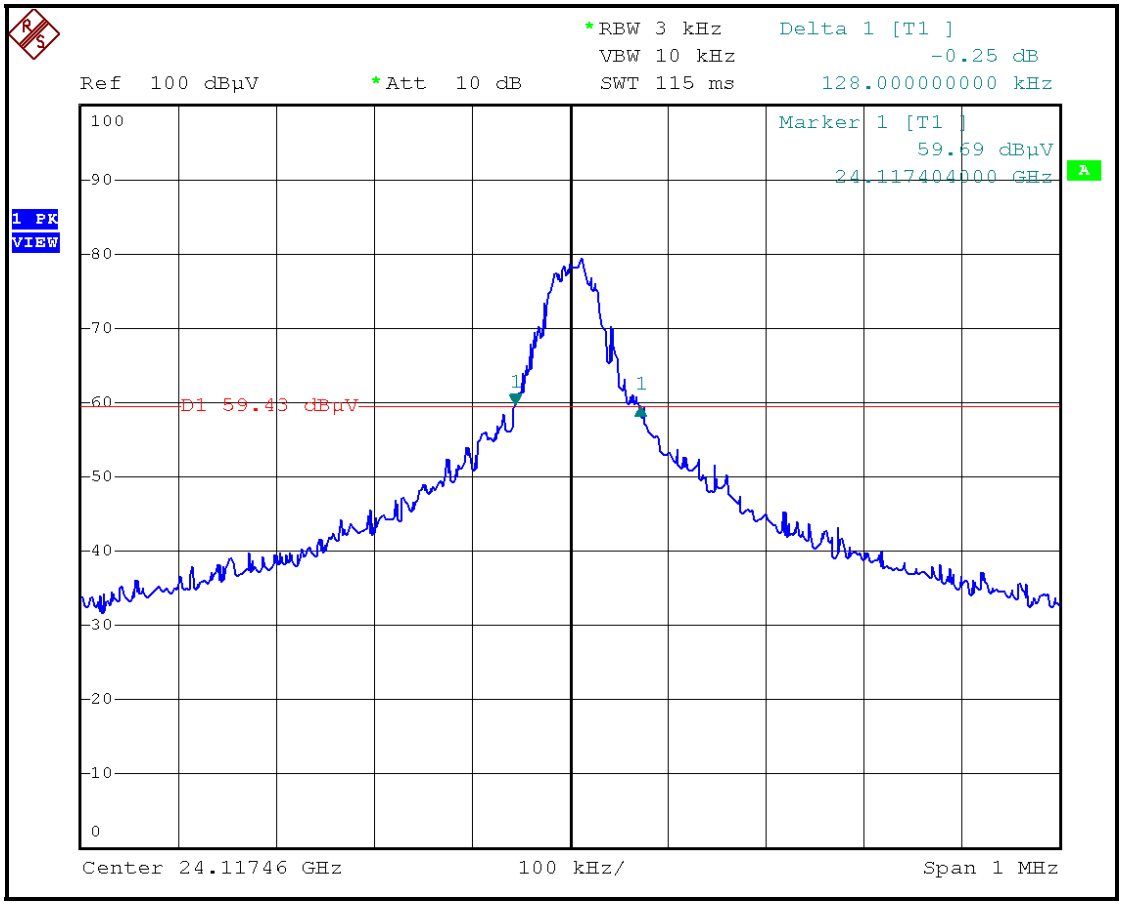
The EUT was placed on a non-conductive table 0.8 meters above the floor. The table was rotated to an angle which presented the highest signal level. A drawing showing the test setup is given as Figure 1.

4.2 Test Criteria

Per FCC Part 15.245, the bandwidth consisting of 20 dB or 99% of the power of the emission shall not fall outside of the specified band of 24075-24175 MHz.

4.3 Test Results

The occupied bandwidth test data is included below.



Measured 20 dB bandwidth in 3 kHz is 128 kHz.

Measured bandwidth is applied using 50% of value added/subtracted numerically to the center reference frequency with the following results.

Center Reference Frequency MHz f_c	Half Bandwidth Applied MHz	Calculated Frequency at 20 dB Down MHz	Band Limit MHz	Margin* to Band Limit MHz
24117.64	+ 0.064	$f_c + f_{hbw} = f_a =$ 24117.704	24175 (f_{amax})	$f_{amax} - f_c = 57.296$
24117.64	- 0.064	$f_c - f_{hbw} = f_b =$ 24117.576	24075 (f_{bmin})	$f_c - f_{bmin} = 42.576$

*As math is applied, a positive value indicates passing margin. A negative value would indicate emission outside the band limit.

5.0 Antenna Requirement

This is a design and documentation review to confirm that the EUT meets the FCC rules for antenna construction.

5.1 Evaluation Procedure

The structure and application of the EUT was analyzed with respect to the rules.

5.2 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.

5.3 Evaluation Results

Inspection of the EUT design and documentation shows:

1. The antenna is a permanent integral antenna (a printed circuit patch array).
2. The antenna is not subject to replacement or modification by the user.
3. There is no auxiliary antenna port.

The EUT is therefore compliant.

6.0 Mains AC Conducted Emissions

Measurements of the mains conducted emissions were taken.

6.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor and 0.4 meters from the conductive reference plane (wall). The EUT is powered through a line impedance stabilization network (LISN) that provides a measurement tap and a termination approximating 50 Ohms in the measurement range of 150 kHz to 30 MHz. A spectrum analyzer is connected, in turn, to each mains line measurement tap and software is employed to measure the radio frequency noise generated by the EUT.

6.2 Test Criteria

Clause Subject	Section Number	Date
Mains Conducted Emissions, Class B	15.107	2013-09-05

6.3 Test Results

The measurement results are included below.

Table 6.3.1 – Mains Conducted Emissions, Measurement Bandwidth Table

Professional Testing, EMI, Inc.			
Test Method:	**ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference,**		
In accordance with:	**FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Emissions Limits**		
Section:	**15.107**		
Test Date(s):	**9/5/2013**	**EUT Serial #:**	**None**
Customer:	**Houston Radar**	**EUT Part #:**	**DC310**
Project Number:	**14570-15**	**Test Technician:**	**Eric Lifsey**
Purchase Order #:	**None**	**Supervisor:**	**Rob McCollough**
Equip. Under Test:	**DC310**	**Witness' Name:**	**None**

Conducted Emissions Spectrum Analyzer Bandwidth and Measurement Time

Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.01	0.15	0.3	7	Five 1 second sweeps
0.15	30	9	20	Five 1 second sweeps

*Notes:
1. The settings above are specifically calculated for the HP856X series of spectrum analyzers, which have 1,000 data points per range.
2. The measurement receiver resolution bandwidth setting is 300 Hz for quasi-peak measurements from 10-150 kHz.
3. The measurement receiver resolution bandwidth setting is 9 kHz for quasi-peak measurements from 0.15-30 MHz.

Table 6.3.2 – Mains Conducted Emissions, Neutral Line

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Emissions Limits		
Section:	15.107		
Test Date(s):	9/5/2013	**EUT Serial #:**	None
Customer:	Houston Radar	**EUT Part #:**	DC310
Project Number:	14570-15	**Test Technician:**	Eric Lifsey
Purchase Order #:	None	**Supervisor:**	Rob McCollough
Equip. Under Test:	DC310	**Witness' Name:**	None

Conducted Emissions Test Results Data Sheet - Neutral Lead **Page: 1 of 2**

EUT Line Voltage: 120 VAC **EUT Line Frequency:** 60 Hz

Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.29906	56.9	47.6	60.3	-12.7	PASS	17	50.3	-33.3	PASS
0.31336	56.9	47.6	59.9	-12.2	PASS	16.6	49.9	-33.3	PASS
0.32228	56.5	47.9	59.6	-11.7	PASS	16.9	49.6	-32.8	PASS
0.50033	49.3	42.3	56	-13.7	PASS	9.3	46	-36.7	PASS
0.50115	49.2	42.3	56	-13.7	PASS	9.4	46	-36.6	PASS
0.50178	49	42.2	56	-13.8	PASS	9.3	46	-36.7	PASS
12.7037	28.1	21.5	60	-38.5	PASS	16.3	50	-33.7	PASS
15.0614	27.9	22.3	60	-37.7	PASS	16.4	50	-33.6	PASS
15.1583	28.2	22.8	60	-37.2	PASS	16.8	50	-33.2	PASS
15.5541	27.3	21.7	60	-38.3	PASS	16	50	-34	PASS

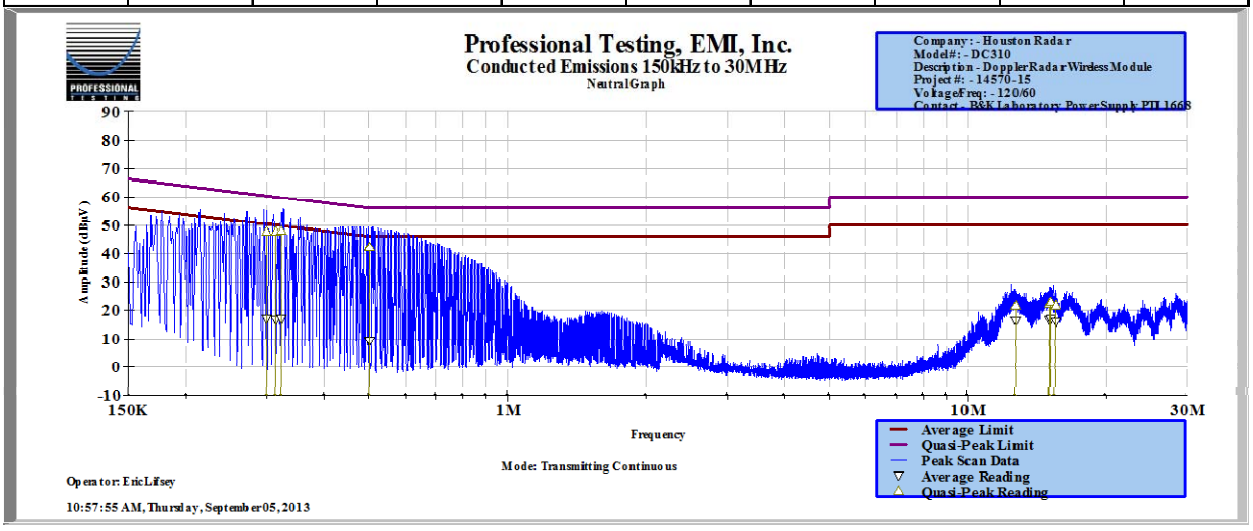


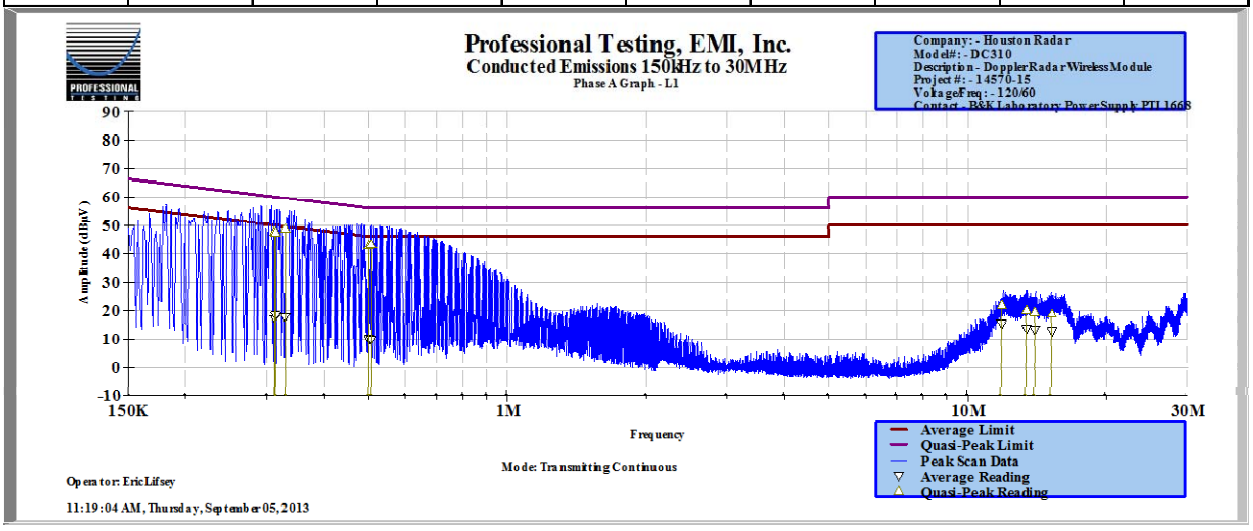
Table 6.3.3 – Mains Conducted Emissions, Phase Line

Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Emissions Limits		
Section:	15.107		
Test Date(s):	9/5/2013	**EUT Serial #:**	None
Customer:	Houston Radar	**EUT Part #:**	DC310
Project Number:	14570-15	**Test Technician:**	Eric Lifsey
Purchase Order #:	None	**Supervisor:**	Rob McCollough
Equip. Under Test:	DC310	**Witness' Name:**	None

Conducted Emissions Test Results Data Sheet - Phase Lead **Page: 2 of 2**

EUT Line Voltage: 120 VAC **EUT Line Frequency:** 60 Hz

Frequency Measured (MHz)	Peak Detector Reading (dBµV)	Quasi-peak Detector Reading (dBµV)	Quasi-peak Detector Limit (dBµV)	Quasi-peak Detector Margin (dB)	Quasi-peak Detector Test Results	Average Detector Reading (dBµV)	Average Detector Limit (dBµV)	Average Detector Margin (dB)	Average Detector Test Results
0.31192	56.5	47.8	59.9	-12.1	PASS	17	49.9	-32.9	PASS
0.31331	56.1	47.4	59.9	-12.4	PASS	18.1	49.9	-31.8	PASS
0.3287	56.6	48.6	59.5	-10.8	PASS	17.7	49.5	-31.8	PASS
0.500112	49.8	42.9	56	-13.1	PASS	9.9	46	-36.1	PASS
0.500254	49.7	42.8	56	-13.2	PASS	9.8	46	-36.2	PASS
0.50556	50	43.2	56	-12.8	PASS	9.7	46	-36.3	PASS
11.854	28	21.8	60	-38.2	PASS	15.2	50	-34.8	PASS
13.4072	26.7	20	60	-40	PASS	13.6	50	-36.4	PASS
13.9665	25.7	19.4	60	-40.6	PASS	13.2	50	-36.8	PASS
15.2436	25.6	18.6	60	-41.4	PASS	12.7	50	-37.3	PASS



7.0 List of Test Equipment

Table 7.1 – Radiated Emissions 30 MHz to 1000 MHz and 1 GHz to 18 GHz

Professional Testing, EMI, Inc.			
Test Method:	**ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference,**		
In accordance with:	**FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits**		
Section:	**15.109**		
Test Date(s):	**3/13/2013**	**EUT Serial #:**	**20130301**
Customer:	**Houston Radar**	**EUT Part #:**	**None**
Project Number:	**14570-10**	**Test Technician:**	**Bob Redoutey / Eric Lifsey**
Purchase Order #:	**None Listed**	**Supervisor:**	**Rob McCollough**
Equip. Under Test:	**DC310 Modular Radio**	**Witness' Name:**	**Vipin Malik**

Radiated Emissions Test Equipment List	
Tile! Software Version:	**4.2.A, May 23, 2010, 08:38:52 AM**
Test Profile:	**Radiated Emissions_Profile Version October 12, 2011**

Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	N/A	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/27/2013
1890	HP	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/8/2014
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	00135454	7/24/2013
C027	N/A	RG214	Cable Coax, N-N, 25m	none	9/7/2013
1327	EMCO	1050	Controller, Antenna Mast	none	N/A
0942	EMCO	11968D	Turntable, 4ft.	9510-1835	N/A
1969	HP	11713A	Attenuator/Switch Driver	3748A04113	N/A
Rental	Agilent	E4440A-239	Spectrum Analyzer, 3 Hz - 26.5 GHz	203523	11/19/2014
1509B	Braden	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	4/8/2013
1594	Miteq	AFS44-00102650	Amplifier, 1-26.5GHz, 42dB	none	10/15/2013
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	N/A	11/26/2013
C030	N/A	0	Cable Coax, N-N, 30m	none	N/A
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	00110313	2/4/2014
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A

Table 7.2 – Radiated Emissions 18 GHz to 30 GHz

Asset #	Manufacturer	Model #	Description	Calibration Due
0582	EMCO	3115	Ridge Guide Antenna	2014-02-14
1594	Agilent	83017A	Microwave Preamplifier (preamp 1)	2014-09-24
1342	Rohde & Schwarz	FSP-30	Spectrum Analyzer	2015-01-29
C059	Pasternack		Cable	2014-02-06
C249	Pasternack		Cable	2014-02-06
C250	Pasternack		Cable	2014-02-06
1542	AH Systems	SAS-572	Horn Antenna, Standard Gain, 20 dB	Not Required

Table 7.3 – Radiated Emissions 30 GHz to 100 GHz

Asset #	Manufacturer	Model #	Description	Calibration Due
1937	Agilent	E4440A	Spectrum Analyzer SN MY44303298	2013-08-09
None	Agilent	5061-5458	Agilent harmonic mixer cable 1: IF/LO SN none	NEW- NCR
None	Agilent	5061-5458	Agilent harmonic mixer cable 2: IF/LO SN none	NEW - NCR
2063	Agilent	11970A	Mixer, Harmonic, 26.5 - 40 GHz SN 3003A08717	NCR
2062	Agilent	11970Q	Mixer, Harmonic, 33 - 50 GHz SN 3003A03234	NCR
2064	Agilent	11970V	Mixer, Harmonic, 50 - 75 GHz SN MY30033017	NCR
2061	Agilent	11970W	Mixer, Harmonic, 75 - 110 GHz SN 2521A00784	NCR
0730	Millitech	SGH-19	Standard Gain Horn (no mixer) SN B020598	NCR
0730	Millitech	SGH-12	Standard Gain Horn (no mixer) SN 035-8344	NCR
0730	Millitech	SGH-10	Standard Gain Horn (no mixer) SN 085-8344	NCR
0730	Millitech	SGH-08	Standard Gain Horn (no mixer) SN 012-8344	NCR

Table 7.4 – Mains AC Conducted Emissions

Professional Testing, EMI, Inc.			
Test Method:	**ANSI C63.4–2009: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (incorporated by reference,**		
In accordance with:	**FCC Part 15.107 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Conducted Emissions Limits**		
Section:	**15.107**		
Test Date(s):	**9/5/2013**	**EUT Serial #:**	**None**
Customer:	**Houston Radar**	**EUT Part #:**	**DC310**
Project Number:	**14570-15**	**Test Technician:**	**Eric Lifsey**
Purchase Order #:	**None**	**Supervisor:**	**Rob McCollough**
Equip. Under Test:	**DC310**	**Witness' Name:**	**None**

Conducted Emissions Test Equipment List	
Tile! Software Version:	**4.1.A.0, April 14, 2009, 11:01:00PM**
Test Profile:	**Profile#: CE_2010.til, dated December 16, 2010**

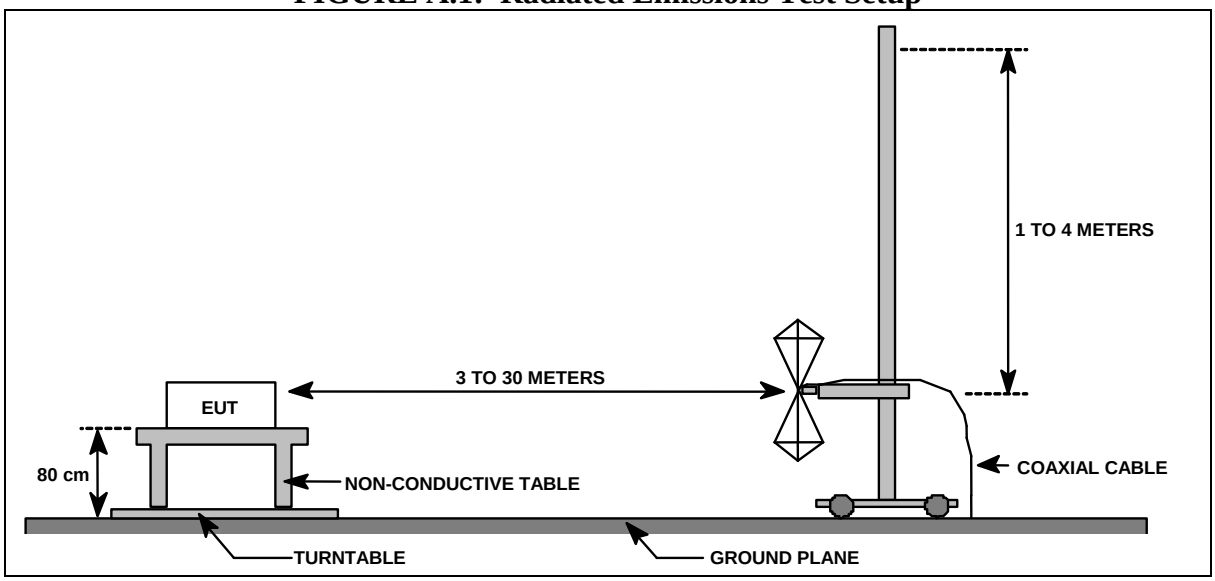
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1129	HP	8568B	Spectrum Analyzer 100Hz-1.5GHz	2140A01754	11/6/2013
1629	HP	85662A	Spec Anal Dsply for A/N 1129	3001A18433	N/A
238	HP	85685A	RF Preselector	2887A00841	9/20/2013
85	HP	85650A	Quasi-Peak Adapter CISPR	3033A01458	9/21/2013
939	EMCO	3825/2	LISN, 10kHz-100MHz	9603-2521	9/27/2013
1173	PTI	100k HPF	Filter, High Pass, 100kHz	none	CBU
1086	PTI	PTI-ALF2	Attenuator Limiter Filter	none	4/8/2014
C149	PTI	None	Cable, RF, BNC-BNC, 41", Black	none	9/7/2013
C174	Belden	none	Cable, RF, BNC-BNC, 9", White	none	9/7/2013
C107	Pomona	RG-223	Cable 9 ft BNC RG-223 (black)	none	7/10/2014
C108	Pomona	RG-223	Cable 5.5 ft BNC RG-223 (black)	none	7/10/2014

Table 7.5 – Mains AC Conducted Emissions, Supporting Equipment

Description, Make, Model	S/N
Laboratory Power Supply, B&K, Model 1610	A/N 1668, 145-00069
Laptop Computer, Dell, Model Latitude E5520	3HP46S1
USB to Serial Bridge, ATEN, Model GUC232A	23874150BKN3143

APPENDIX A - TEST SETUP DIAGRAMS

FIGURE A.1: Radiated Emissions Test Setup



Appendix: Policy, Rationale, and Evaluation of EMC Measurement Uncertainty

All uncertainty calculations, estimates and expressions thereof shall be in accordance with NIST policy. Since PTI operates in accordance with NIST (NVLAP) Handbook 150-11: 2007, all instrumentation having an effect on the accuracy or validity of tests shall be periodically calibrated or verified traceable to national standards by a competent calibration laboratory. The certificates of calibration or verification on this instrumentation shall include estimates of uncertainty as required by NIST Handbook 150-11.

1. Rationale and Summary of Expanded Uncertainty.

Each piece of instrumentation at PTI that is used in making measurements for determining conformance to a standard (or limit), shall be assessed to evaluate its contribution to the overall uncertainty of the measurement in which it is used. The assessment of each item will be based on either a type A evaluation or a type B evaluation. Most of the evaluations will be type B, since they will be based on the manufacturer's statements or specifications of the calibration tolerances, or uncertainty will be stated along with a brief rationale for the type of evaluation and the resulting stated uncertainties.

The individual uncertainties included in the combined standard uncertainty for a specific test result will depend on the configuration in which the item of instrumentation is used. The combination will always be based on the law of propagation of uncertainty. Any systematic effects will be accommodated by including their uncertainties, in the calculation of the combined standard uncertainty; except that if the direction and amount of the systematic effect cannot be determined and separated from its uncertainty, the whole effect will be treated as uncertainty and combined along with the other elements of the test setup.

Type A evaluations of standard uncertainty will usually be based on calculating the standard deviation of the mean of a series of independent observations, but may be based on a least-squares curve fit or the analysis of variance for unusual situations. Type B evaluations of standard uncertainty will usually be based on manufacturer's specifications, data provided in calibration reports, and experience. The type of probability distribution used (normal, rectangular, a priori, or u-shaped) will be stated for each Type B evaluation.

In the evaluation of the uncertainty of each type of measurement, the uncertainty caused by the operator will be estimated. One notable operator contribution to measurement uncertainty is the manipulation of cables to maximize the measured values of radiated emissions. The operator contribution to measurement uncertainty is evaluated by having several operators independently repeat the same test. This results in a Type A evaluation of operator-contributed measurement uncertainty.

A summary of the expanded uncertainties of PTI measurements is shown as Table 1. These are the worst-case uncertainties considering all operative influence factors.

Table 1: Summary of Measurement Uncertainties for Site 45

Type of Measurement	Frequency Range	Meas. Dist.	Expanded Uncertainty U, dB (k=2)
Mains Conducted Emissions	150 kHz to 30 MHz	N/A	2.9
Telecom Conducted Emissions	150 kHz to 30 MHz	N/A	2.8
Radiated Emissions	30 to 1,000 MHz	10 m	4.8
	1 to 18 GHz	3 m	5.7