
Project 20186-15

Houston Radar

**Model DR600
24 GHz Doppler Module**

FCC 15.245, RSS-210

Wireless Test Report

Prepared for:

Houston Radar, LLC
12818 Century Dr
Stafford, TX 77477

By

Professional Testing (EMI), Inc.
1601 North A.W. Grimes Blvd., Suite B
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13 Feb 2019

Reviewed by

A handwritten signature in black ink, appearing to read 'Larry Finn'.

Larry Finn
Chief Technical Officer

Written by

A handwritten signature in black ink, appearing to read 'Eric Lifsey'.

Eric Lifsey
EMC Engineer

Revision History

Revision Number	Description	Date
Final 02	Applicant address corrected.	27 Feb 2019

Errata:

None.

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Compliance Certificate

FCC MRA Designation Number: US5270
 NVLAP Accreditation Number: 200062-0

Applicant	Device & Test Identification
Houston Radar, LLC 12818 Century Dr Stafford, TX 77477 Certificate Date: 13 Feb 2019	FCC ID: TIADR600 IC ID: 21838-DR600 Model(s): DR600 Laboratory Project ID: 20186-15

The EUT(s) listed above were tested utilizing the following documents and found to be in compliance with the required criteria.

Standard	Reference	Detail
FCC 47 CFR Part 15 C	15.245 Field Disturbance Sensors, 15.209, 15.205, 15.212(a)(1)	Radiated Power & Harmonic Emissions Frequency Stability 40 dB Bandwidth
ISED IC RSS-210 Issue 9 Annex F	F.2 Speed Radar Meters, 24.075 to 24.175 GHz	Radiated Power & Harmonic Emissions Frequency Stability 40 dB Bandwidth

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

Eric Lifsey
EMC Engineer

This report has been reviewed and accepted by the Applicant. The undersigned is responsible for ensuring that this device will continue to comply with the requirements listed above.

 Representative of Applicant

1.0 Introduction

1.1 Scope

Demonstrate conformance to the intentional wireless radiator requirements of North America.

1.2 EUT Description

The EUT is a 24 GHz K-band speed radar. It is powered by 12V DC nominal voltage which is typically provided by a battery. The emission consists of CW unmodulated waves centered in the 24.075 to 24.175 GHz band.

Table 1.2: EUT Essential Information		
Manufacturer: Model	Identification	Description
Houston Radar, LLC: DR600	FCC ID: TIADR600 IC ID: 21838-DR600	24 GHz Radar Module

1.3 EUT Operation

The EUT was operated in continuous transmit mode at maximum power with modulation.

There is no separate receive mode as this technology must transmit to be able to receive and does so on the same antenna in full duplex fashion.

1.4 Modifications to Equipment

None.

1.5 Test Site

Measurements were made at the PTI semi-anechoic facility designated Site 45 (FCC 459644, IC 3036B-1) in Austin, Texas. The site is registered with the FCC under Section 2.948 and Industry Canada per RSS-GEN, and is subsequently confirmed by laboratory accreditation (NVLAP). The test site is located at 11400 Burnet Road, Austin, Texas 78758, while the main office is located at 1601 North A.W. Grimes Boulevard, Suite B, Round Rock, Texas, 78665.

Professional Testing (EMI), Inc., (PTI) follows the guidelines of National Institute of Standards and Technology (NIST) for all uncertainty calculations, estimates, and expressions thereof for electromagnetic compatibility testing.

1.6 Radiated Measurements

Table 1.6.1 Measurement Corrections	
Parameter	From Sums Of
Radiated Field Strength	Raw Measured Level + Antenna Factor + Cable Losses – Amplifier Gain
Conducted Antenna Port	Raw Measured Level + Attenuator Factor + Cable Losses
Conducted Mains Port	Raw Measured Level + LISN Factor + Cable/Filter/Limiter Losses

Measurement distance extrapolation factors are applied and documented where used.

1.7 Applicable Documents and Clauses

Table 1.7.1: Applicable Documents	
Document	Title
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
RSS-210 Issue 9	Licence-Exempt Radio Apparatus: Category I Equipment
RSS-Gen Issue 4	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.4 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment
ANSI C63.10 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

Table 1.7.2: Applicable Clauses		
Parameter	FCC Part 15 Rule Paragraphs	ISED IC RSS Clause References
Transmitter Characteristics	15.245	RSS 210 Annex F.2
Spurious Radiated Power	15.245, 15.209, 15.205	RSS 210 Annex F.2
Antenna Requirement	15.203	RSS-Gen

2.0 Fundamental Power

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 and to the measurement antenna.

2.2 Test Criteria

Section Reference	Parameter	Date(s)
15.245(b) RSS-210 Annex F.2.1(a)	24075 to 24175 MHz Radiated Field Strength, 2500 mV/m @ 3 m Restated as 128 dB μ V/m @ 3 m Restated as 137.5 dB μ V/m @ 1 m Limit is average and peak limit applies.	12 Jul 2018

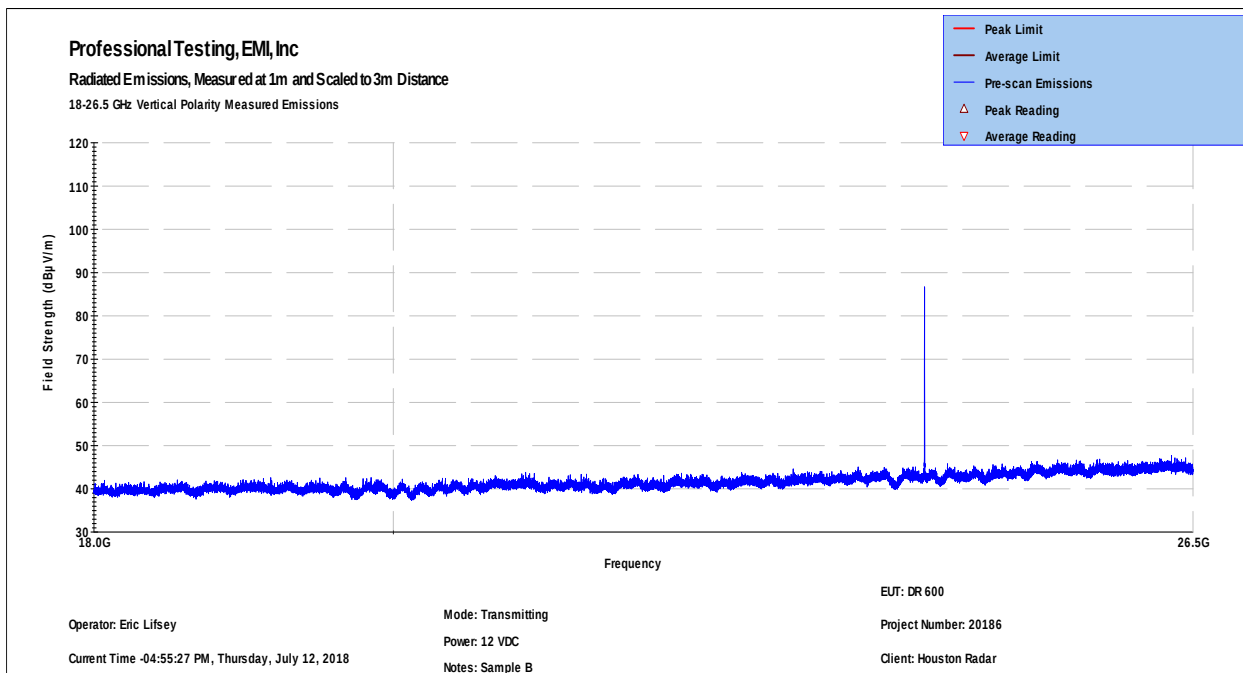
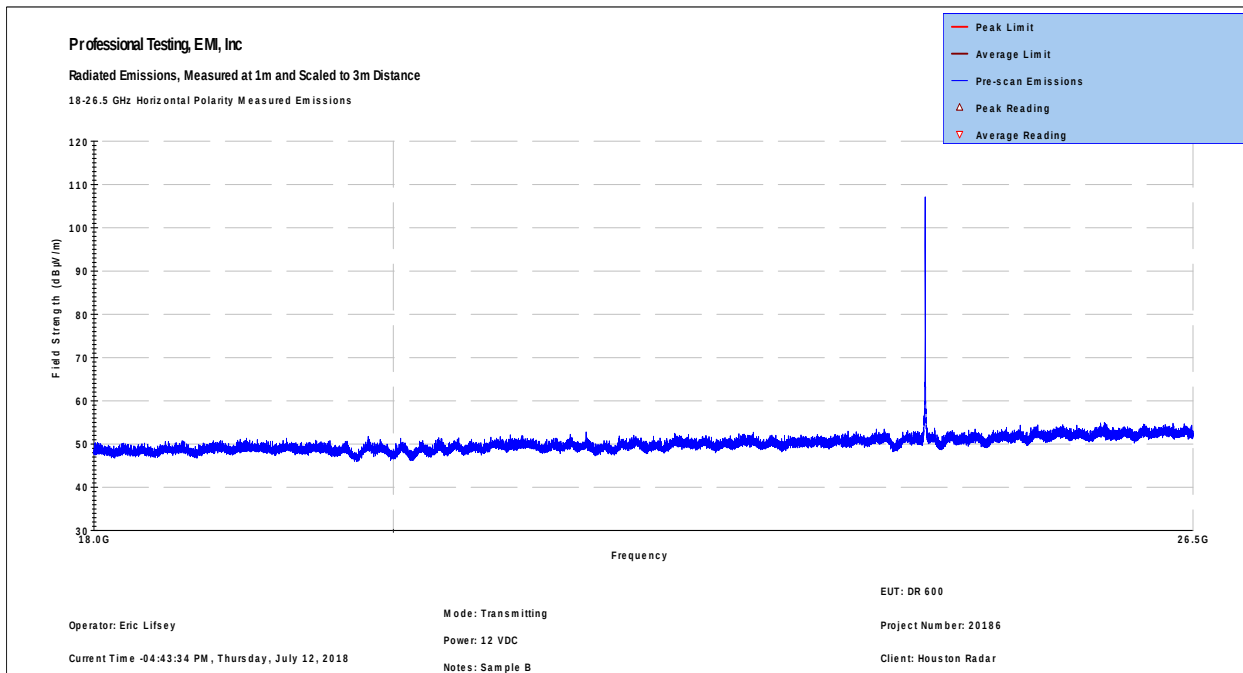
2.3 Test Results

Table 2.3.1: Field Strength of Fundamental, 1 Meter Measurement Distance			
Frequency GHz	Antenna Polarity	Antenna Height meters	Corrected Level* (Measured Peak Level) dB μ V/m
24.117	H	1	107.1
24.129	V	1	86.7

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

Table 2.3.2: Limit, Corrected Maximum Power and Margin		
Limit at 1 meter dB μ V/m	Maximum Corrected Level (Measured Peak Level) dB μ V/m	Margin dB
137.5	107.1	-30.4

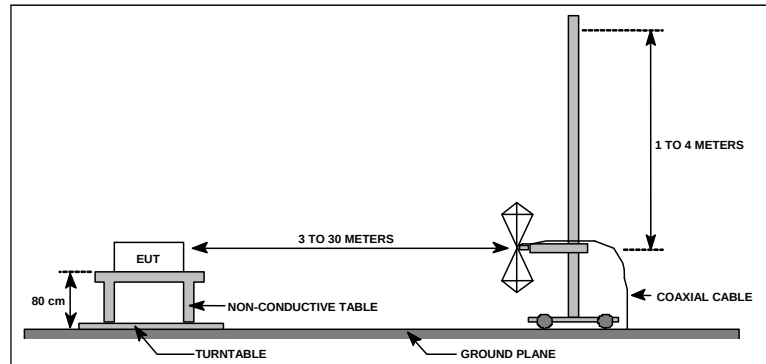
The EUT satisfies the criteria.



3.0 Radiated Spurious Emissions

3.1 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.



Test Site Diagram

3.2 Test Criteria

Section Reference	Parameter	Date(s)
15.245, 15.209 // RSS-210, RSS-Gen	Field Strength of Radiated Spurious/Harmonic Emissions Transmit Mode	12 Jul 2018

Specific Emission Limits (Measured at 3 meters.)

FCC 15.245(1)(i) For the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for other field disturbance sensors designed for use only within a building or to open building doors, 25.0 mV/m.

FCC 15.245(3) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

FCC 15.245(4) The emission limits shown above are based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply.

The above corresponds with provisions of RSS-210 Annex F.2 for speed radar meters.

3.3 Test Results

Emissions were measured from 30 MHz to 100 GHz. Peak detection was used during the test for the fundamental and harmonics. Quasi-Peak detection was used for spurious emissions below 1 GHz.

The EUT satisfied the criteria.

3.3.1 30 MHz to 1 GHz

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		7/12/2018		EUT Serial #:		Sample A			
Customer:		Houston Radar		EUT Part #:		0			
Project Number:		20186		Test Technician:		Eric Lifsey			
Purchase Order #:		N/A		Supervisor:		Lisa Arndt			
Equip. Under Test:		DR600		Witness' Name:		N/A			
Radiated Emissions Test Results Data Sheet									
Page: 1 of 1									
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A N/A			
Antenna Orientation:		Vertical		Frequency Range:		30MHz to 1GHz			
EUT Mode of Operation:					Transmit+Receive 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
94.706	10	270	1.44	Quasi-peak	33.524	14.913	30.8	-15.9	Pass
100.722	10	334	1.28	Quasi-peak	32.602	14.569	30.8	-16.2	Pass
452.705	10	31	1.55	Quasi-peak	22.346	15.563	30.8	-15.2	Pass
825.936	10	282	1.89	Quasi-peak	21.426	23.354	30.8	-7.4	Pass
944.25	10	274	1.44	Quasi-peak	21.105	25.614	30.8	-5.2	Pass
981.978	10	188	1.78	Quasi-peak	21.074	26.537	48.8	-22.2	Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Vertical Polarity Measured Emissions Operator: Eric Lifsey 20186'RET7v1.2'TXRun02'w10dB'18-26GHz'SampleB'FCC.tif Current Time -02:54:57 PM, Thursday, July 12, 2018 Frequency Mode: Transmitting Power: 12 VDC Notes: Sample B EUT: DR 600 Project Number: 20186 Client: Houston Radar									
≤ 1GHz Vertical Antenna Polarity Measured Emissions									

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		7/12/2018			EUT Serial #:		Sample A		
Customer:		Houston Radar			EUT Part #:		0		
Project Number:		20186			Test Technician:		Eric Lifsey		
Purchase Order #:		N/A			Supervisor:		Lisa Arndt		
Equip. Under Test:		DR600			Witness' Name:		N/A		
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC			EUT Power Frequency:		N/A N/A		
Antenna Orientation:		Horizontal			Frequency Range:		30MHz to 1GHz		
EUT Mode of Operation:					Transmit+Receive 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
31.44	10	262	1.34	Quasi-peak	24.243	12.593	30.8	-18.2	Pass
180.302	10	218	1.48	Quasi-peak	22.707	7.61	30.8	-23.2	Pass
521.707	10	283	3.52	Quasi-peak	22.259	17.775	30.8	-13.0	Pass
760.923	10	286	2.69	Quasi-peak	21.695	22.402	48.8	-26.3	Pass
850.572	10	314	2.36	Quasi-peak	21.445	23.958	48.8	-24.8	Pass
991.953	10	30	1.09	Quasi-peak	21.109	26.82	30.8	-4.0	Pass
Professional Testing, EMI, Inc Radiated Emissions, 10m Distance 30MHz - 1GHz Horizontal Polarity Measured Emissions — Ambient Scan — Pre-scan Emissions x Quasi-peak Reading x LPRF Verification Limit x Verified Low-PRF QP Reading — LIM_X_QP_AVG Operator: Eric Lifsey 20186*RE7v1.2*TXRun02*w10dB*18-26GHz*Sample A*FCC-III Current Time -02:17:12 PM, Thursday, July 12, 2018 Notes: Sample B EUT: DR 600 Project Number: 20186 Client: Houston Radar									
≤ 1GHz Horizontal Antenna Polarity Measured Emissions									

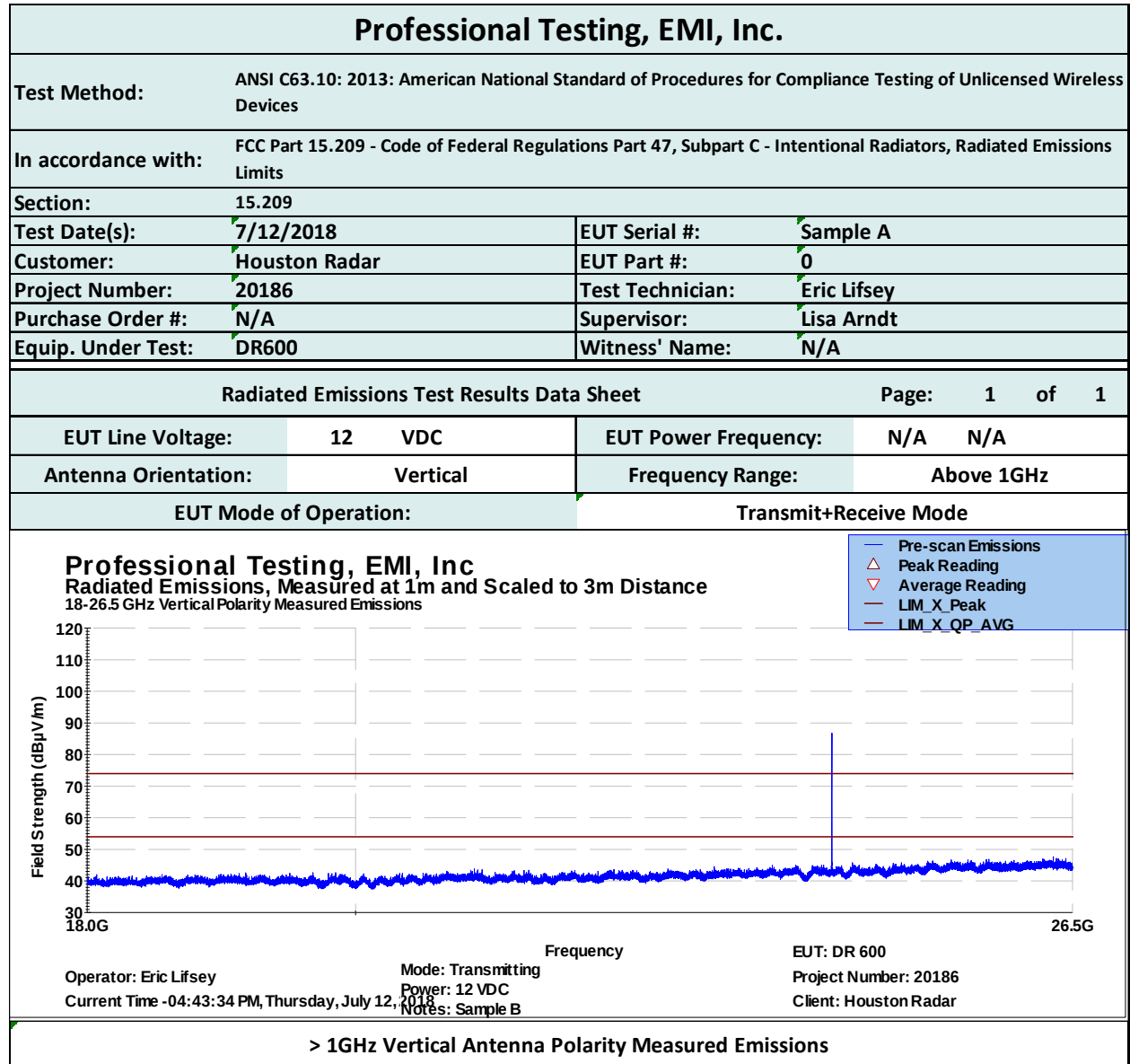
3.3.2 1 GHz to 18 GHz

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		7/12/2018		EUT Serial #:		Sample A			
Customer:		Houston Radar		EUT Part #:		0			
Project Number:		20186		Test Technician:		Eric Lifsey			
Purchase Order #:		N/A		Supervisor:		Lisa Arndt			
Equip. Under Test:		DR600		Witness' Name:		N/A			
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC		EUT Power Frequency:		N/A N/A			
Antenna Orientation:		Vertical		Frequency Range:		Above 1GHz			
EUT Mode of Operation:				Transmit+Receive 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
1211.99	3	142	1.12	Average	44.7	32.711	54.0	-21.3	Pass
1307.96	3	222	1.39	Average	40.2	28.449	54.0	-25.6	Pass
13270.21	3	290	1.41	Average	27.2	38.813	54.0	-15.2	Pass
14225.51	3	101	2.95	Average	26.8	39.003	54.0	-15.0	Pass
15404.29	3	328	3.97	Average	26.7	39.918	54.0	-14.1	Pass
16029.53	3	52	2.72	Average	25.4	39.87	54.0	-14.1	Pass
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Vertical Polarity Measured Emissions ▽ Average Reading — Pre-scan Emissions ▲ Peak Reading — LIM_X_Peak — LIM_X_QP_AVG Operator: Eric Lifsey Current Time -03:46:07 PM, Thursday, July 12, 2018 Mode: Transmitting Power: 12 VDC Notes: Sample B EUT: DR 600 Project Number: 20186 Client: Houston Radar									
> 1GHz Vertical Antenna Polarity Measured Emissions									

Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		7/12/2018			EUT Serial #:		Sample A		
Customer:		Houston Radar			EUT Part #:		0		
Project Number:		20186			Test Technician:		Eric Lifsey		
Purchase Order #:		N/A			Supervisor:		Lisa Arndt		
Equip. Under Test:		DR600			Witness' Name:		N/A		
Radiated Emissions Test Results Data Sheet								Page: 1 of 1	
EUT Line Voltage:		12 VDC			EUT Power Frequency:		N/A N/A		
Antenna Orientation:		Horizontal			Frequency Range:		Above 1GHz		
EUT Mode of Operation:					Transmit+Receive 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
1187.84	3	210	0.98	Average	44.1	31.947	54.0	-22.1	Pass
10350.4	3	136	2.19	Average	26.1	37.042	54.0	-17.0	Pass
13235.74	3	106	2.81	Average	27.1	38.777	54.0	-15.2	Pass
14399.58	3	254	1.89	Average	27.4	39.566	54.0	-14.4	Pass
15886.51	3	77	2.91	Average	25.6	39.936	54.0	-14.1	Pass
16526.23	3	219	2.44	Average	25.5	39.843	54.0	-14.2	Pass
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions — Pre-scan Emissions ▲ Peak Reading ▼ Average Reading — LIM_X_Peak — LIM_X_QP_AVG Operator: Eric Lifsey Current Time -03:46:07 PM, Thursday, July 12, 2018 Mode: Transmitting Power: 12 VDC Notes: Sample B EUT: DR 600 Project Number: 20186 Client: Houston Radar									
> 1GHz Horizontal Antenna Polarity Measured Emissions									

3.3.3 18 GHz to 26.5 GHz

For this measurement the receive antenna was fixed in position on the spectrum analyzer. The EUT was rotated with the motorized turntable.

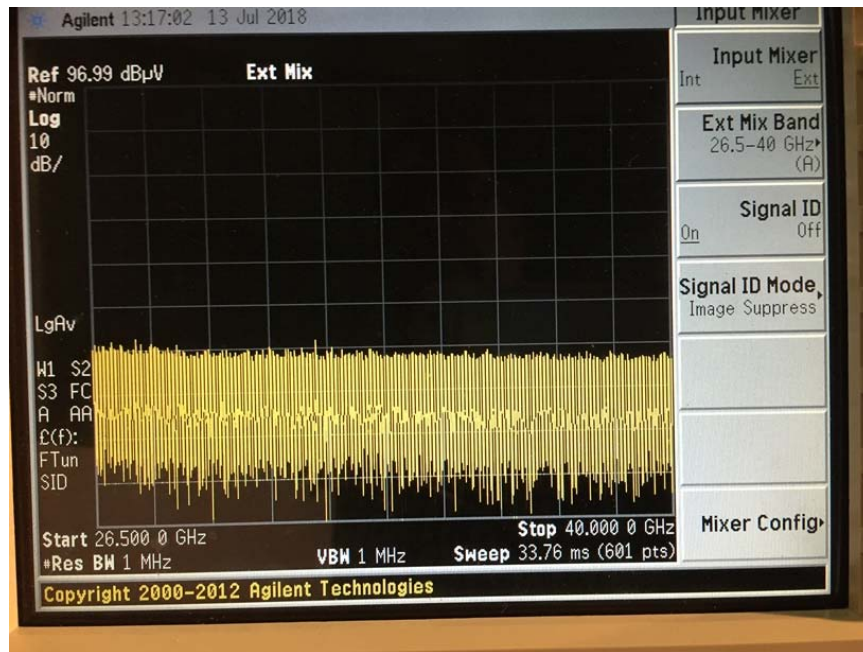


Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.10: 2013: American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	7/12/2018	EUT Serial #:	Sample A
Customer:	Houston Radar	EUT Part #:	0
Project Number:	20186	Test Technician:	Eric Lifsey
Purchase Order #:	N/A	Supervisor:	Lisa Arndt
Equip. Under Test:	DR600	Witness' Name:	N/A
Radiated Emissions Test Results Data Sheet		Page: 1 of 1	
EUT Line Voltage:	12 VDC	EUT Power Frequency:	N/A N/A
Antenna Orientation:	Horizontal	Frequency Range:	Above 1GHz
EUT Mode of Operation:	Transmit+Receive Mode		
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions — Pre-scan Emissions △ Peak Reading ▽ Average Reading — LIM_X_Peak — LIM_X_QP_AVG Operator: Eric Lifsey Current Time -10:29:08 AM, Thursday, October 25, 2018 Mode: Transmitting Power: 12 VDC Notes: Sample B EUT: DR 600 Project Number: 20186 Client: Houston Radar			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

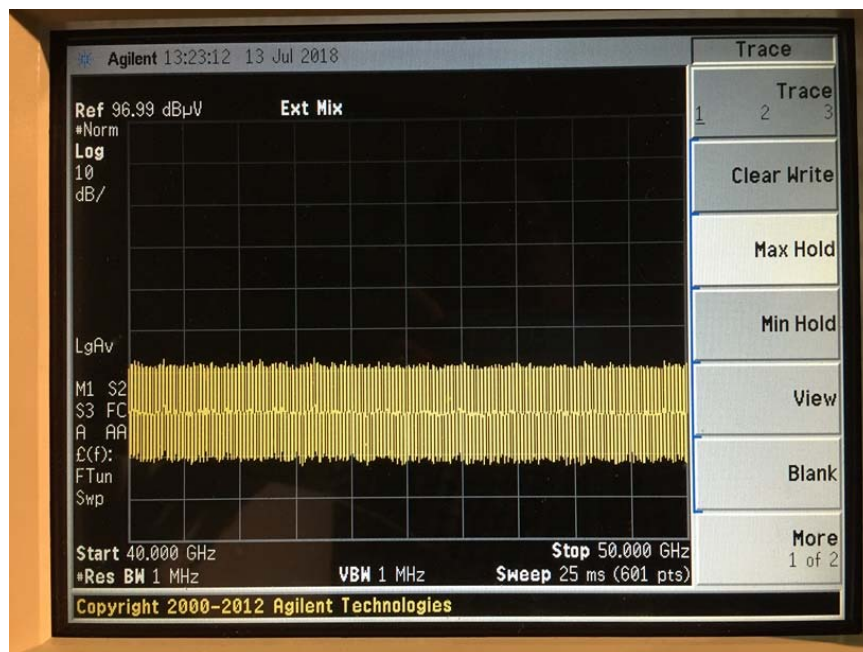
3.3.4 26.5 GHz to 100 GHz

For this measurement the receive antenna was manually brought to within 10 cm of the EUT and a search for emissions of both polarities was conducted. The analyzer Signal Ident feature was used to identify valid signals; the display was recorded photographically.

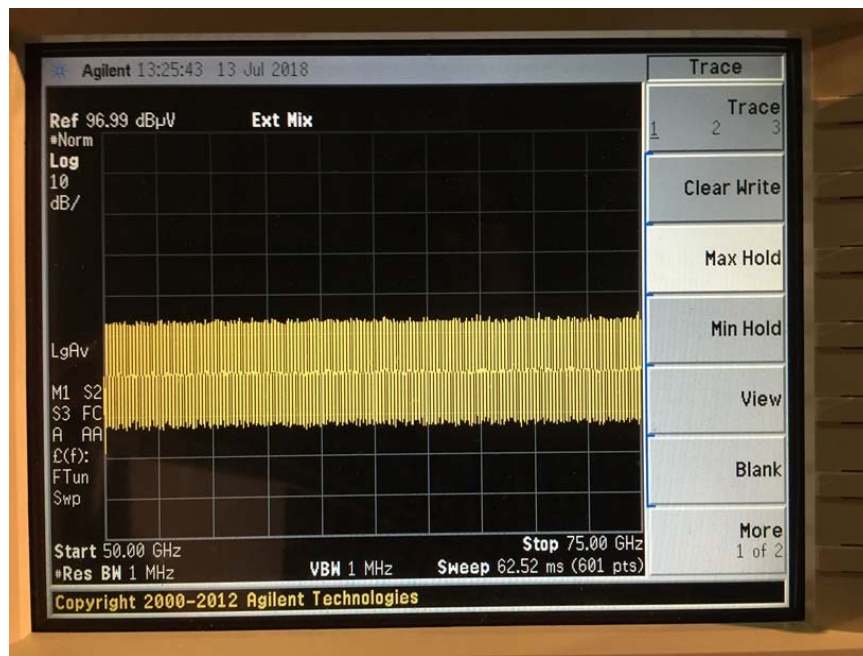
No signals were detected above the fundamental band.



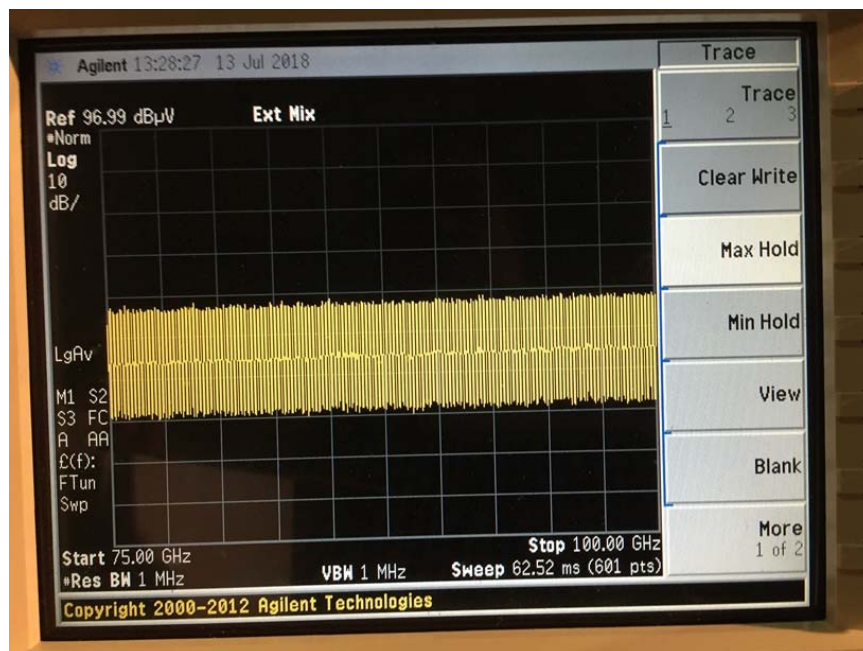
Composite Max-Hold of Vertical and Horizontal, 26.5 to 40 GHz



Composite Max-Hold of Vertical and Horizontal, 40 to 50 GHz



Composite Max-Hold of Vertical and Horizontal, 50 to 75 GHz



Composite Max-Hold of Vertical and Horizontal, 75 to 100 GHz

4.0 Occupied Bandwidth

4.1 Test Procedure

Bandwidth is measured for reporting purposes and to verify emissions are contained within the allocated band.

4.2 Test Criteria

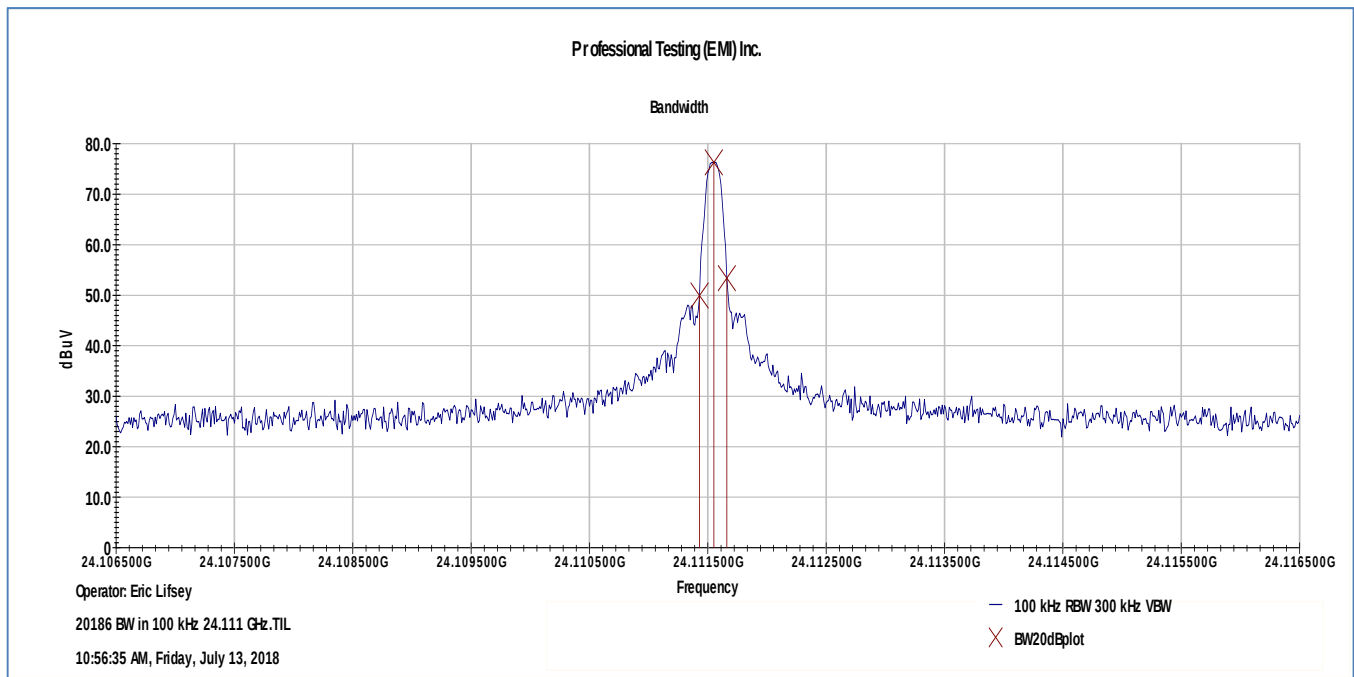
Section Reference	Parameter	Date(s)
15.245, RSS-Gen 4.9	Bandwidth 99%	13 Jul 2018

4.3 Test Results

This is an unmodulated transmitter and the 1 to 3% aspect is not relevant. This measurement confirms the signal is within the allocated band.

Table 4.3.1: Frequency and Bandwidth

Frequency GHz	Bandwidth 99% kHz
24.1116	230



5.0 Antenna Requirement

5.1 Test Procedure

Examine the EUT design and compare to rule requirements for modular approval.

5.2 Criteria & Results

Table 5.2.1: Modular Construction Criteria and Results		
Criteria	Evaluation	Pass/Fail
Antenna must be permanently attached to the unit.	The antenna is a permanent integral antenna (a printed circuit patch array).	Pass
Antenna must use a unique type of connector to attach to the EUT.	There is no antenna connector.	Pass
Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.	The antenna is not subject to replacement or modification by the user; there is no auxiliary antenna connector.	Pass
Optional criteria for confidentiality of user manual.	The circuitry is potted which prevents field repair or tampering. Only the printed antenna surface is exposed.	Pass

6.0 Equipment

6.1 Radiated Emissions to 26.5 GHz

Radiated Emissions Test Equipment List					
Tile! Software Version:		Version: 7.1.2.17 (Jan 08, 2016 - 02:12:48 PM) or 4.1.A.0, April 14, 2009, 11:01:00PM			
Test Profile:		2018 Radiated Emissions_TILE7_v1EL.til			
Asset #	Manufacturer	Model	Equipment Nomenclature	Serial Number	Calibration Due Date
1509A	Braden	TDK 10M	TDK 10M Chamber, NSA < 1 GHz	DAC-012915-005	7/10/2019
1890	HP	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	11/10/2020
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz, Opt. AYZ	MY44808298	11/7/2018
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	135454	3/7/2019
C027D	PTI	None	Relay	none	N/A
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
1509B	Braden	TDK 10M	TDK 10M Chamber, sVSWR > 1 GHz	DAC-012915-005	11/16/2019
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	N/A	1/11/2018
C030	none	none	Cable Coax, N-N, 30m, 30 MHz - 18GHz	none	9/28/2018
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A
1974	Agilent	83017A	Amplifier, Microwave 0.5-26.5 GHz	MY39500684	11/17/2018
1735	Pasternack	PE9850-20	Antenna, horn, WR28	N/A	N/A

6.2 Radiated Emissions Above 26.5 GHz

Asset #	Manufacturer	Model #	Description	Calibration Due
1937	Agilent	E4440A	Spectrum Analyzer SN MY44303298	18 Dec 2018
None	Agilent	5061-5458	Agilent harmonic mixer cable 1: IF/LO SN none	NCR
None	Agilent	5061-5458	Agilent harmonic mixer cable 2: IF/LO SN none	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

6.3 Bandwidth

Asset #	Manufacturer	Model #	Description	Calibration Due
2295	Agilent	E4440A	Spectrum Analyzer	18 Dec 2018
1735	Pasternack	PE9850-20	WR28 Horn Antenna	CNR

7.0 Measurement Bandwidths

Radiated Emissions Spectrum Analyzer Bandwidth and Measurement Time - Peak Scan				
Frequency Band Start (MHz)	Frequency Band Stop (MHz)	6 dB Bandwidth (kHz)	Number of Ranges Used	Measurement Time per Range
0.009	0.15	0.3	2	Multiple Sweeps
0.15	30	9	6	Multiple Sweeps
30	1000	120	2	Multiple 800 mS Sweeps
1000	6000	1000	2	Multiple Sweeps
6000	18000	1000	2	Multiple Sweeps
18000	26500	1000	2	Multiple Sweeps
*Notes: 1. The settings above are specifically calculated for the E4440A series of spectrum analyzers, which have 8,000 data points per range. 2. The measurement receiver resolution bandwidth setting was 300 Hz for quasi-peak measurements from 9-150 kHz. 3. The measurement receiver resolution bandwidth setting was 9 kHz for quasi-peak measurements from 0.15-30 MHz. 4. The measurement receiver resolution bandwidth setting was 120 kHz for quasi-peak measurements from 30-1000 MHz. 5. The measurement receiver resolution bandwidth setting was 1 MHz for average measurements from 1-18 GHz.				

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

End of Report