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November 7, 2014

David Cameron
Hetronic International
3905 NW 36th St.
Oklahoma City, OK 73112
USA

David:

Thank you for allowing Professional Testing (EMI), Inc. an opportunity to perform testing for Hetronic International. Enclosed is the Wireless Certification Report for the RX-MFS-ESCAN-HS1. This report can be used to demonstrate compliance with requirements for wireless devices in North America.

If you have any questions, please contact me.

Sincerely,

Jeffrey A. Lenk
President

Attachment

Project 16271-15

**Hetronic International
Model RX-MFS-ESCAN-HS1**

Wireless Certification Report

Prepared for:

Hetronic International
3905 NW 36th St.
Oklahoma City, OK 73112
USA

By

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

November 7, 2014

Reviewed by



Larry Finn
Chief Technical Officer

Written by



Eric Lifsey
Test Engineer

Revision History

Revision Number	Description	Date
00	Draft for review.	November 7, 2014
01	Revised per comments of Dave Cameron & Larry Finn.	November 7, 2014

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Compliance Certificate

Applicant	Device & Test Identification
David Cameron Hetronic International 3905 NW 36th St. Oklahoma City, OK 73112 USA Certificate Date: November 7, 2014	FCC ID: LW9-RXMFSESCANHS1 Industry Canada ID: 2119B-RXMFSCANHS1 Model(s): RX-MFS-ESCAN-HS1 Part Number(s): N/A Laboratory Project ID: 16271-15

The device named above was tested utilizing the following documents and found to be in compliance with the required criteria:

Standard	Reference	Detail
FCC 47 CFR Part 15 C	15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
FCC 47 CFR Part 15 C	15.209	Radiated emission limits; general requirements.
FCC 47 CFR Part 15 C	15.205	Restricted Bands of Operation
KDB 558074 D01	DR01	DTS Measurement Guidance v03r02
KDB 412172	D01	Guidelines for Determining the ERP and EIRP of an RF Transmitting System
OET Bulletin 65*	Edition 97-01, and Supplement C, Ed. 01-01	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
RSS-210	Issue 8	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS-Gen	Issue 3	General Requirements and Information for the Certification of Radio Apparatus
RSS-102	Issue 4	Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

*MPE is reported separately from this document.

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 rules listed above.

Representative of Applicant

1.0 Introduction

1.1 Scope

This report describes the extent to which the equipment under test (EUT) conformed to the intentional radiator requirements of the United States and Canada.

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. The procedures of ANSI C63.4: 2009 were used for making all radiated enclosure and mains emission measurements.

1.2 EUT Description

The device (EUT) as tested is identified in the table that follows.

Table 1.2.1: Equipment Under Test

Manufacturer	Model	Serial #	Description
Hetronic International	RX-MFS-ESCAN-HS1	None	Wirelessly controlled transmitter/receiver for 2400-2483.5 MHz.

This device is a remote wireless transmitter/receiver for actuating relays on industrial vehicles/machines such as cranes. It is normally mounted to a surface of the host machine and is not hand held. It is controlled by wireless means from a companion portable wireless control device that is operated by a person.

The EUT measures approximately 6 x 12 x 17 cm and is shaped as a simple box with an external antenna. The EUT is powered by a 6 to 36 Volt DC source on the host machine.

1.3 EUT Operation

The EUT was exercised in a manner consistent with normal operations.

The EUT internal software operated the transmitter in a continuous modulated transmit mode, receive mode, or operated in communication with the remote wireless control device as needed for measurement.

1.4 Modifications to Equipment

Programmatic power setting for the highest channel of 2480 MHz was reduced to meet the limits of band edge and spurious above 1 GHz. The final setting was 0x7.

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.

1.6 Applicable Documents and Clauses

Table 1.6.1: Applicable Documents	
Document	Title
47 CFR	Part 15 – Radio Frequency Devices Subpart C -Intentional Radiators
RSS-210 Issue 3	Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment
RSS-Gen Issue 3	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

Table 1.6.2: Applicable Clauses		
Parameter	FCC Part 15 Rule Paragraphs	IC RSS References
Transmitter Characteristics	15.247	RSS 210 A1.1, RSS-Gen
Spurious Radiated Power	15.247, 15.209, 15.205	RSS 210 A1.1
Antenna Requirement	15.203	RSS-Gen

2.0 Fundamental Power

2.1 Test Procedure

Bandwidth is first determined to select correct entire bandwidth for power measurement and the fundamental power is measured.

2.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247(a)(3) // RSS-210 Issue 8, A2.9	Fundamental Power Conducted Limit: 1 Watt	2014-10-03

2.3 Test Results

Bandwidth was found to be 1343.8 kHz in 6 dB, so 3 MHz resolution bandwidth was employed for peak power measurement. Power was measured conducted direct to spectrum analyzer with no attenuation or cable loss. Power was measured with peak detection.

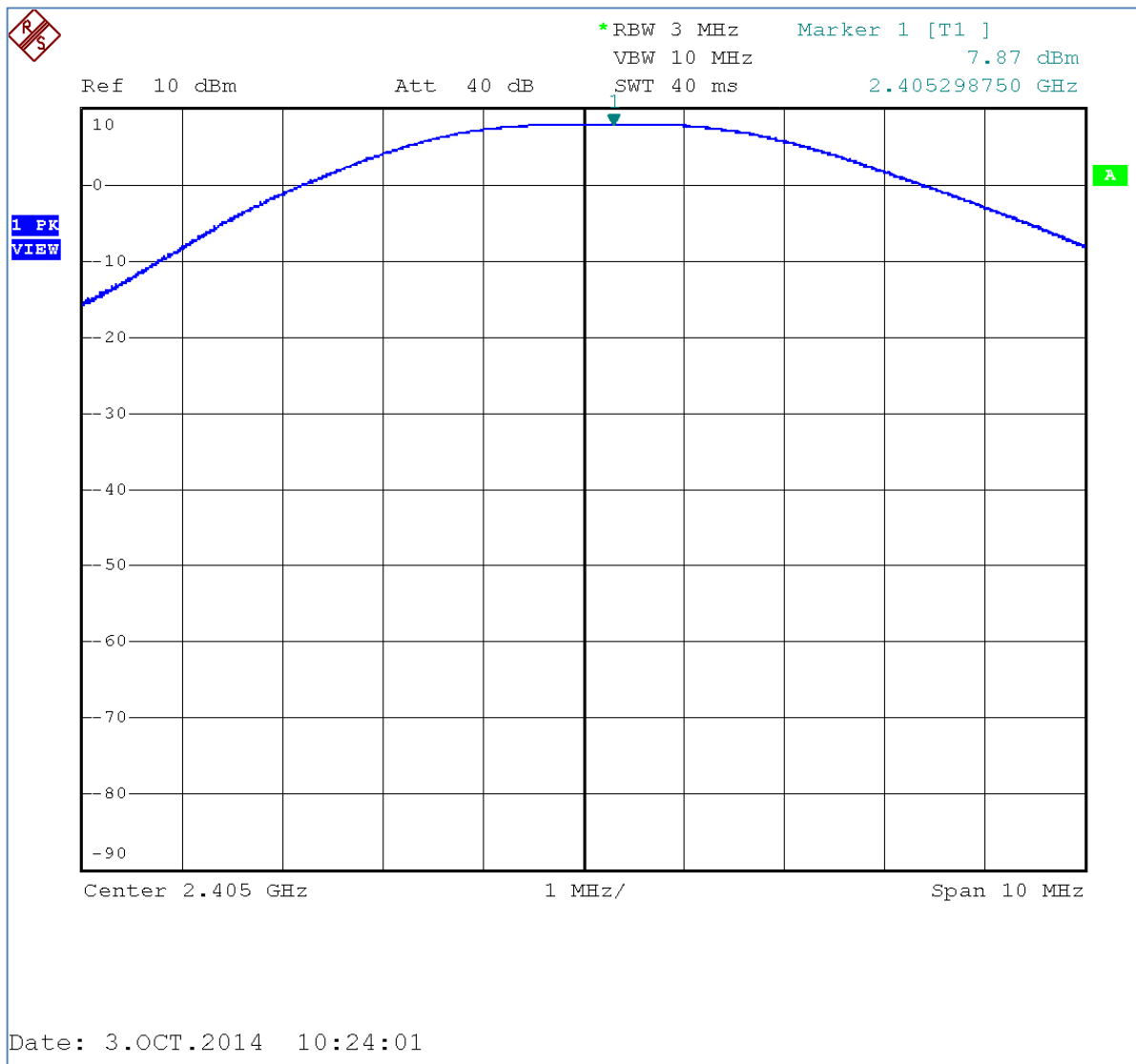
Table 2.3.1 Fundamental Conducted Power, Peak		
Conducted Limit 1 Watt (30 dBm)		
Frequency (MHz)	Measured Peak Power (dBm)	Measured Peak Power Restated Linear Terms (mW)
2405	7.87	6.12
2440	7.72	5.92
2480	2.01	1.59

Measured in 3 MHz RBW, 10 MHz VBW.

Power is reduced on the high channel to reduce band edge emissions (setting reference 0xB).

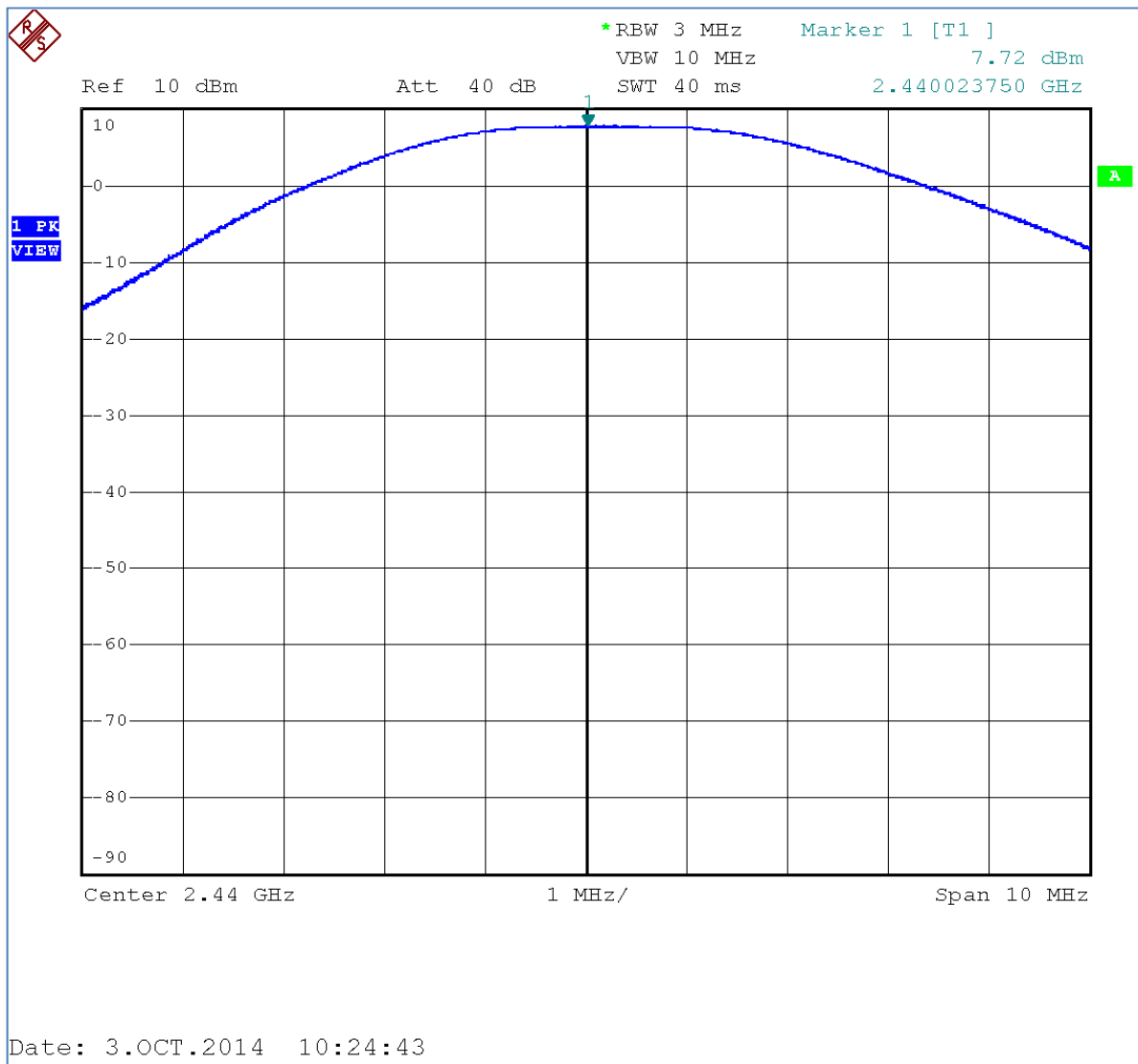
The EUT was found to be in compliance with the applicable criteria. Plotted measurements follow.

2.3.1 Low Channel



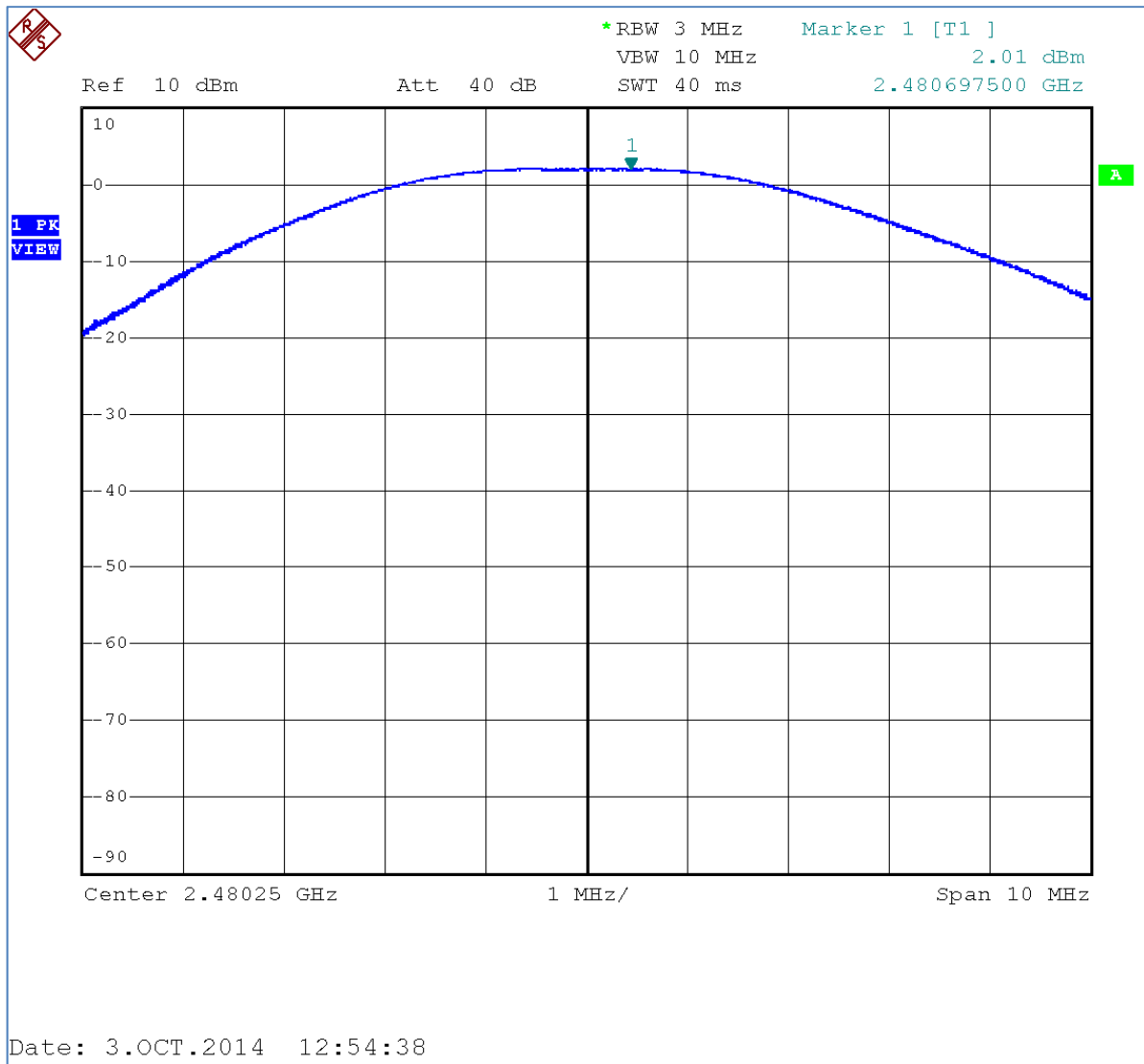
Peak Power, Low Channel

2.3.2 Middle Channel



Peak Power, Middle Channel

2.3.3 High Channel



Peak Power, High Channel

3.0 Power Spectral Density

3.1 Test Procedure

The EUT is placed in maximum signal orientation in operation on the test site turntable positioned for maximum signal. The spectrum analyzer is then adjusted to measure the power spectral density in the prescribed resolution bandwidth with an extended sweep time.

3.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.247e // RSS-210 Issue 8, A2.9	Power Spectral Density, Conducted Limit: 8 dBm / 3 kHz	2014-10-03

3.3 Test Results

Power Spectral Density Conducted Limit 8 dBm in 3 kHz
--

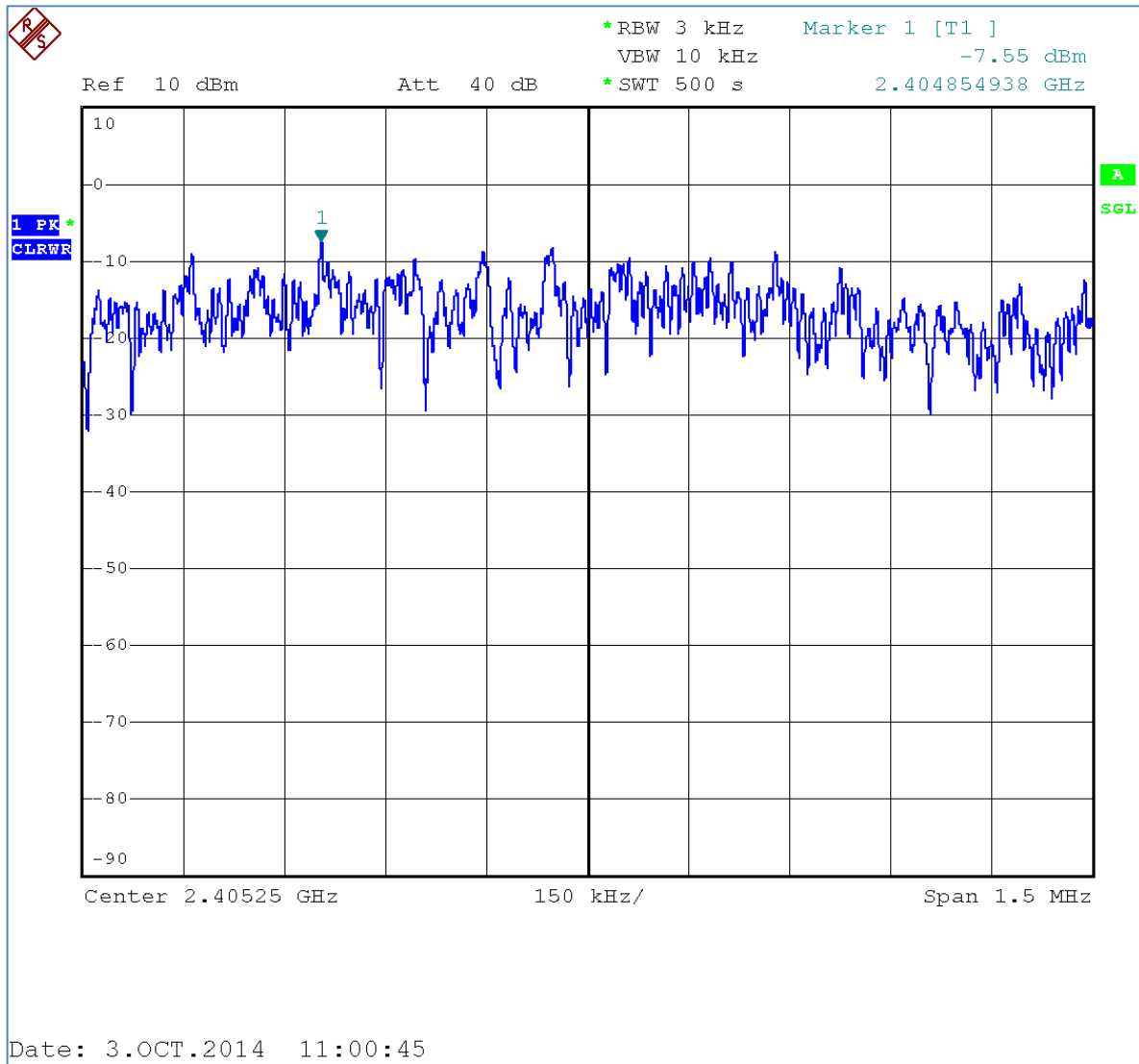
Frequency MHz	Corrected Measured Peak PSD (dBm)
2405	-7.55
2440	-7.63
2480	-13.52

Sweep time 500 seconds.

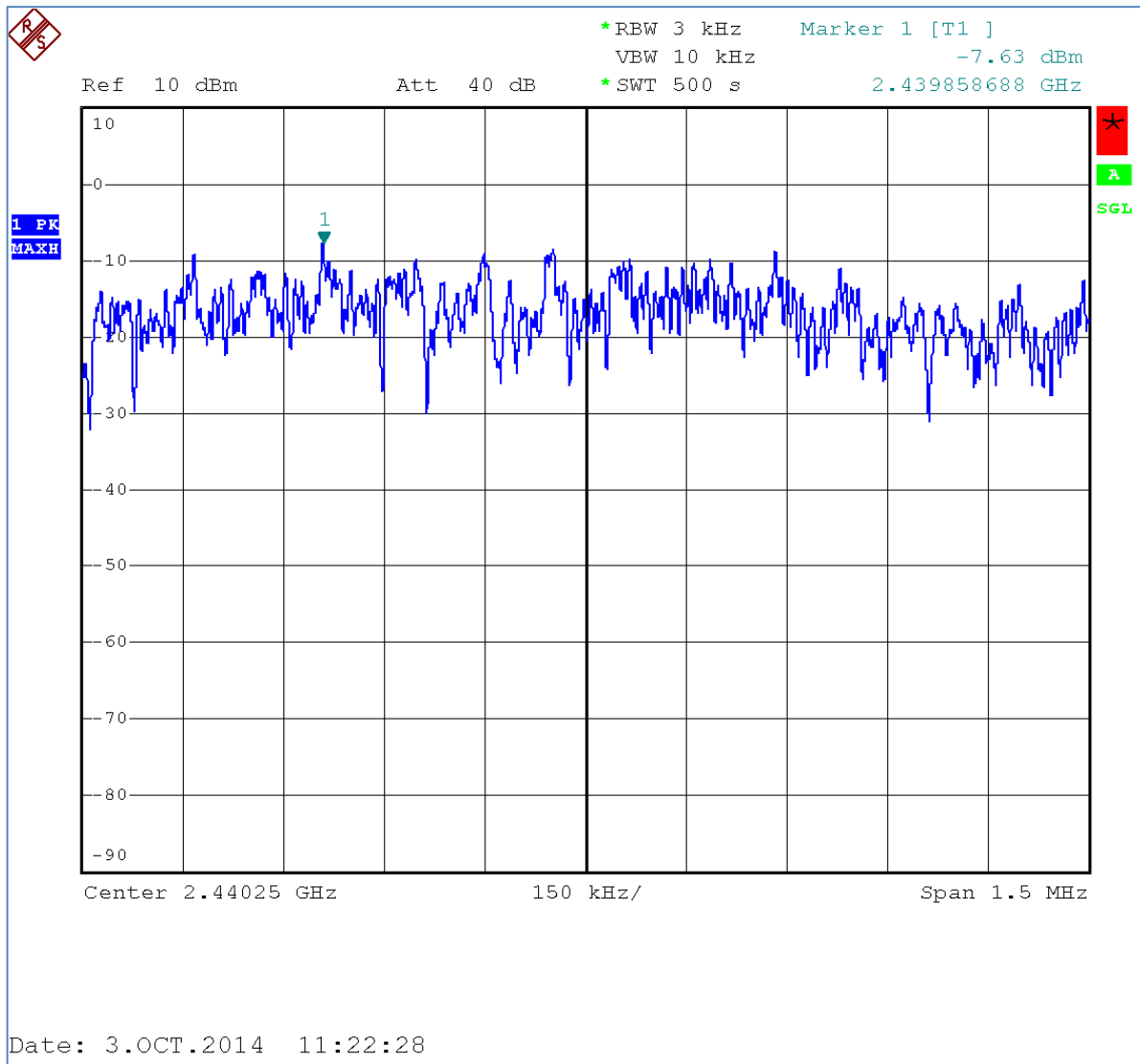
The EUT was found to be in compliance with the applicable criteria.

Plotted measurements appear below.

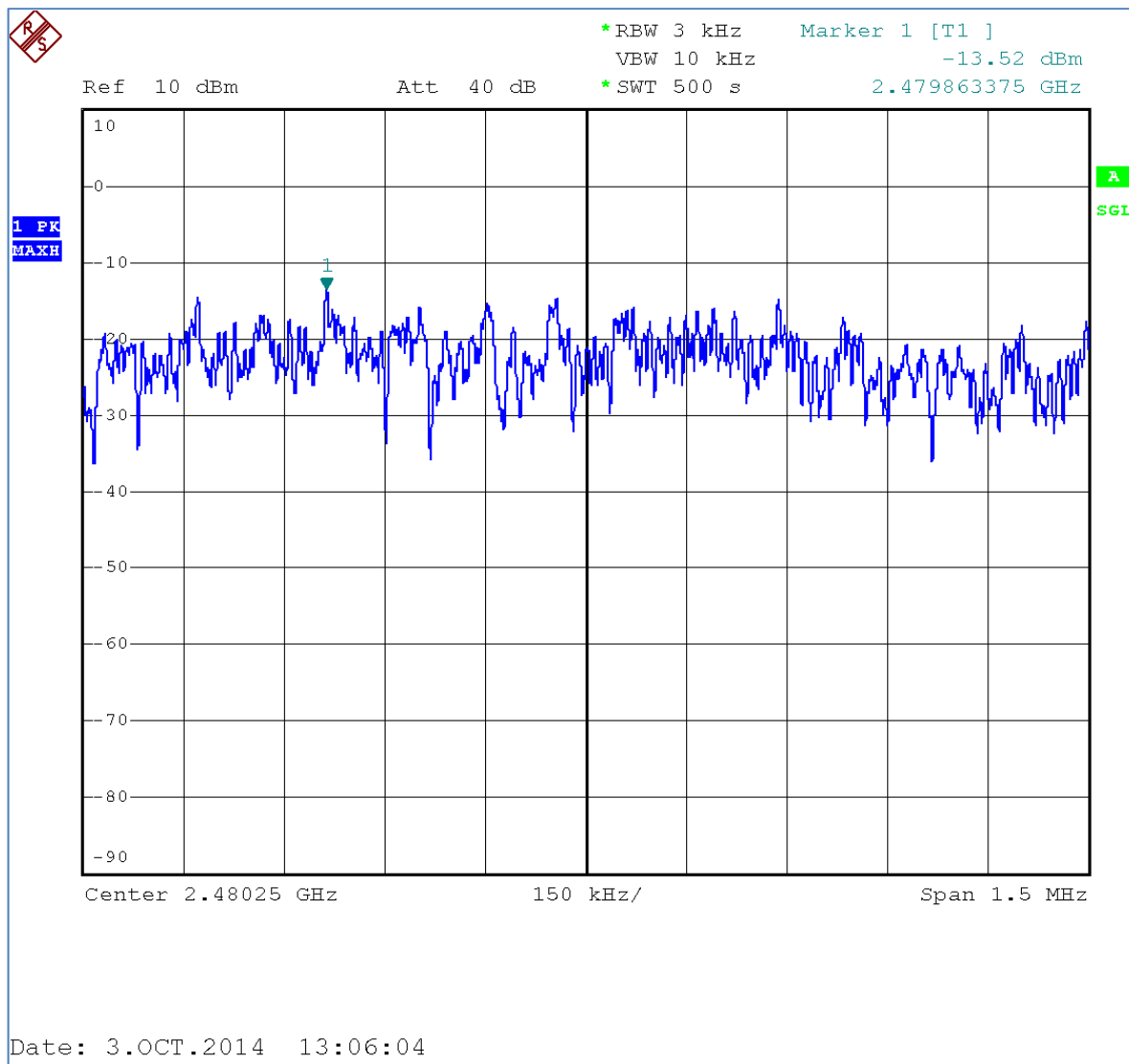
3.3.1 Low Channel PSD



3.3.2 Middle Channel PSD



3.3.3 High Channel PSD



4.0 Transmitter Duty Cycle

4.1 Test Procedure

EUT is placed into normal transmit operation to observe and record transmitter time domain performance.

4.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date
15.35(c) // RSS-Gen Issue 8, 4.5	Averaging of Pulsed Transmissions	2014-09-15

Measurement is based on intervals not to exceed 100 msec. Maximum transmitter on time is divided by the lesser of 100 msec or the actual measured minimum transmitter interval time. The result is converted to dB and applied as needed to peak measurements of transmitter artifacts to determine average power. For permissible exposure the calculation is based on power and no limit applies to the result. This is not a pass/fail measurement.

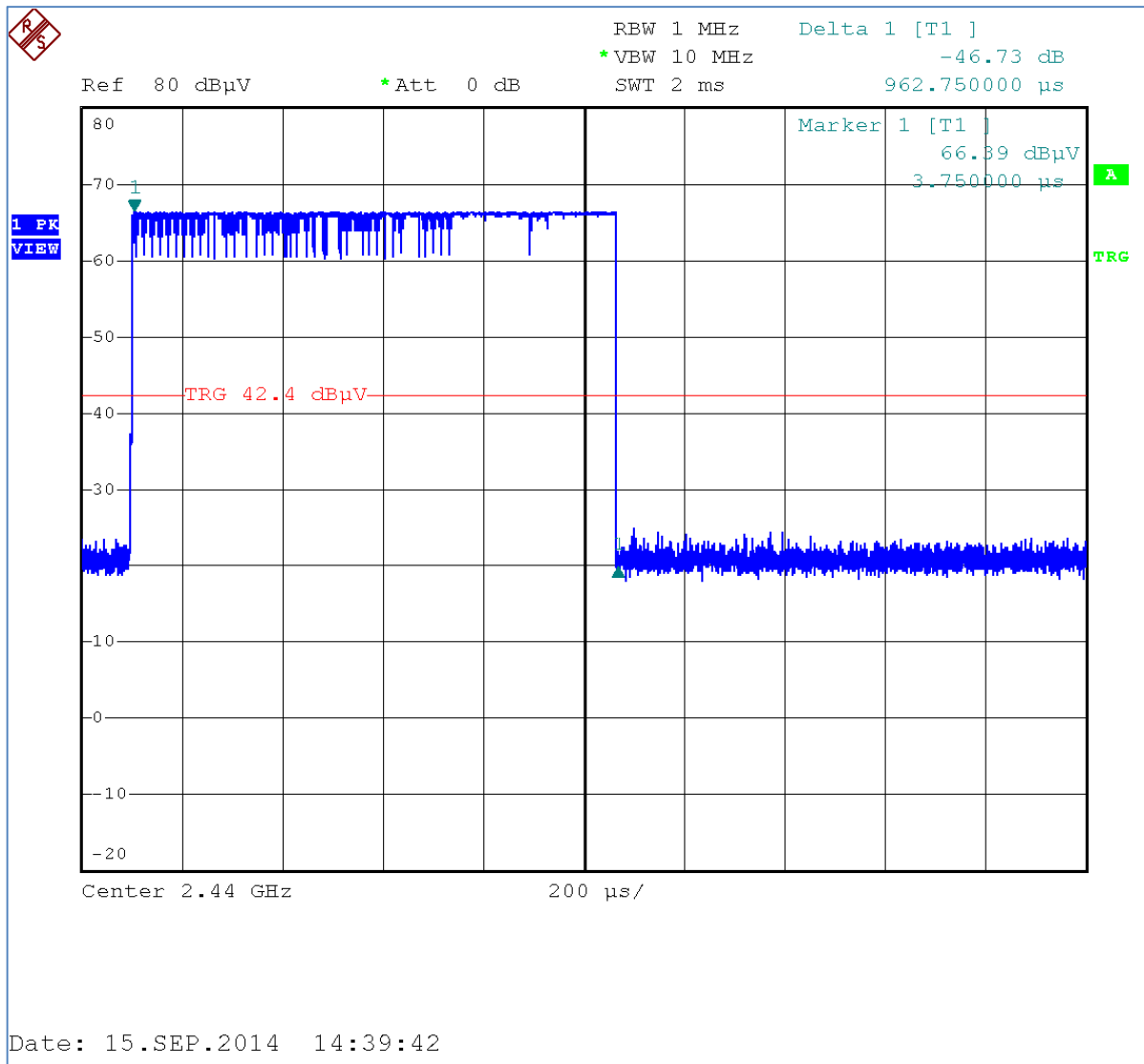
4.3 Test Results

Table 4.3.1 Duty Cycle Results				
Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)
0.96275	13.28	$= 20 * \text{Log}_{10} (0.96275 \text{ msec} / 13.28 \text{ msec})$	-23.13	-20

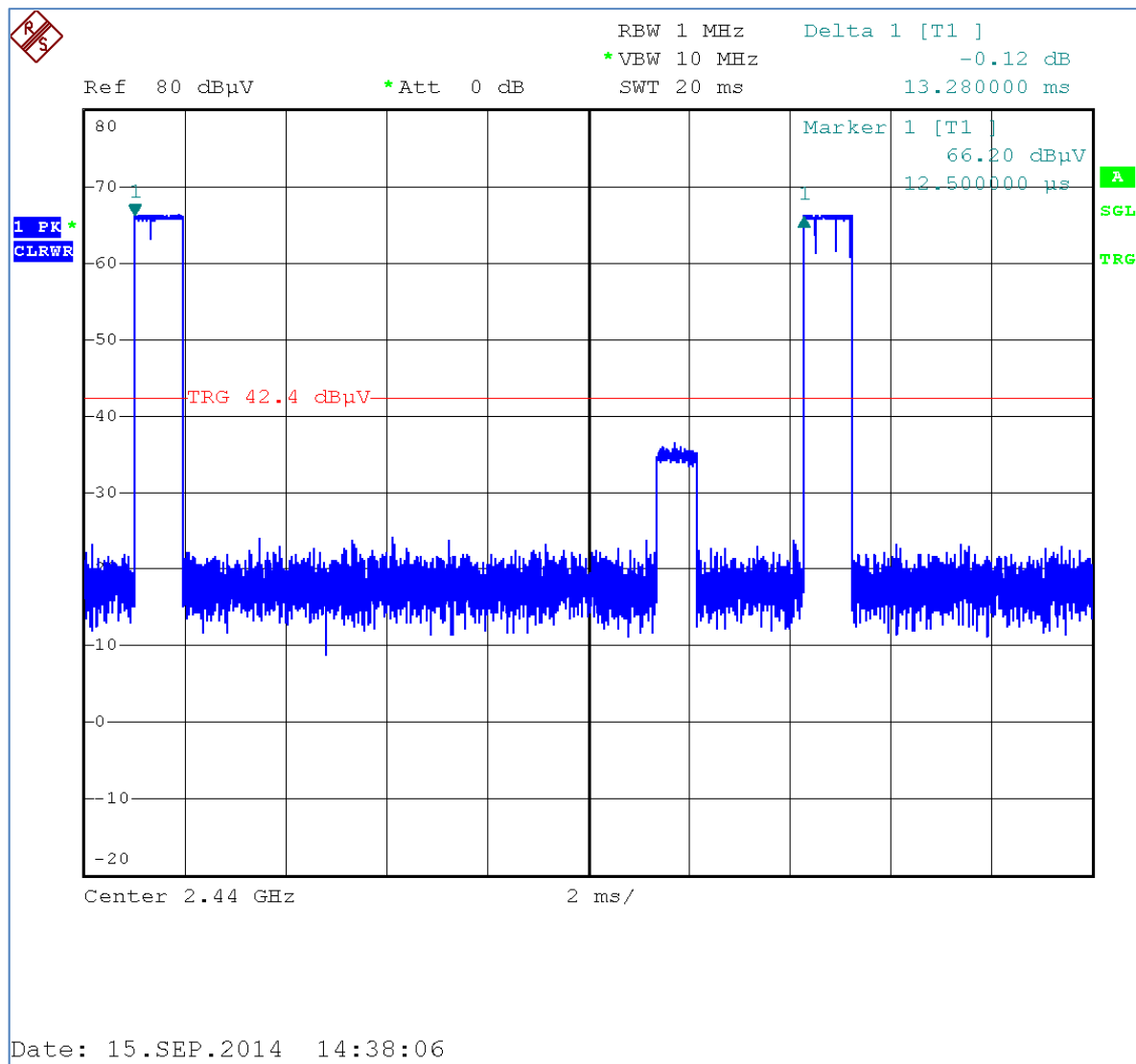
Table 4.3.2 Exposure Source Duty Cycle Results				
Measured On Time (msec)	Measured Time Interval (msec)	Exposure Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)
0.96275	13.28	$= 10 * \text{Log}_{10} (0.96275 \text{ msec} / 13.28 \text{ msec})$	-11.56	-11.56

Plotted measurements appear below.

4.3.1 Transmit On Time



4.3.2 Transmit Interval Time



5.0 Occupied Bandwidth

5.1 Test Procedure

Bandwidth is measured by conducted means.

5.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
14.247(a)(2), 2.1049, KDB 558074 D01 // RSS-Gen Issue 3, 4.6	Bandwidth, 6 dB, 20 dB	2014-10-03

5.3 Test Results

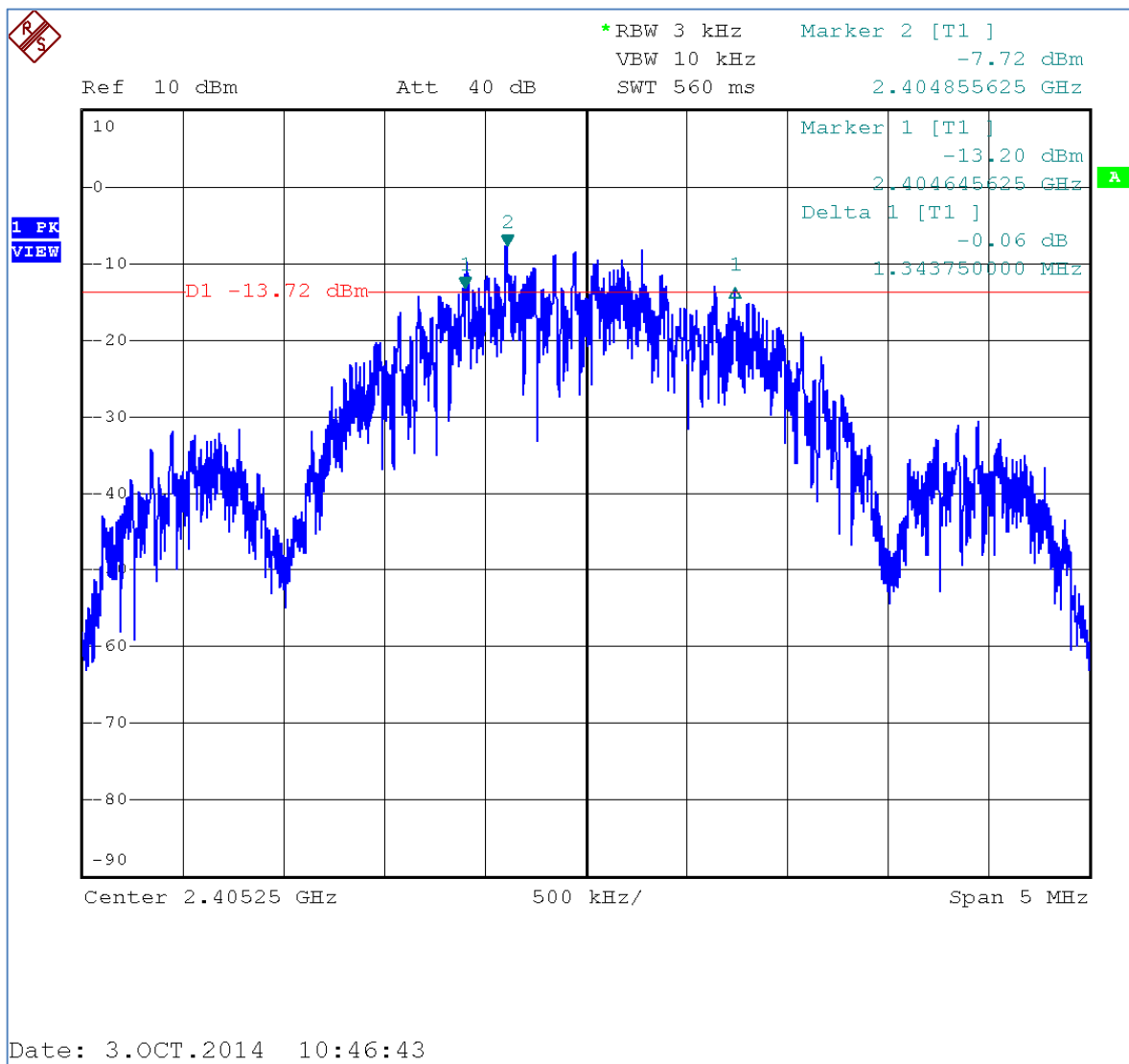
Table 5.3.1 Bandwidth 6 dB, Minimum 500 kHz			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Minimum BW (kHz)
1343.8	1344.4	1566.9	1343.8

Table 5.3.2 Bandwidth 20 dB, Measure and Report			
Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Reported Maximum BW (kHz)
2536.3	2536.3	2536.3	2536.3

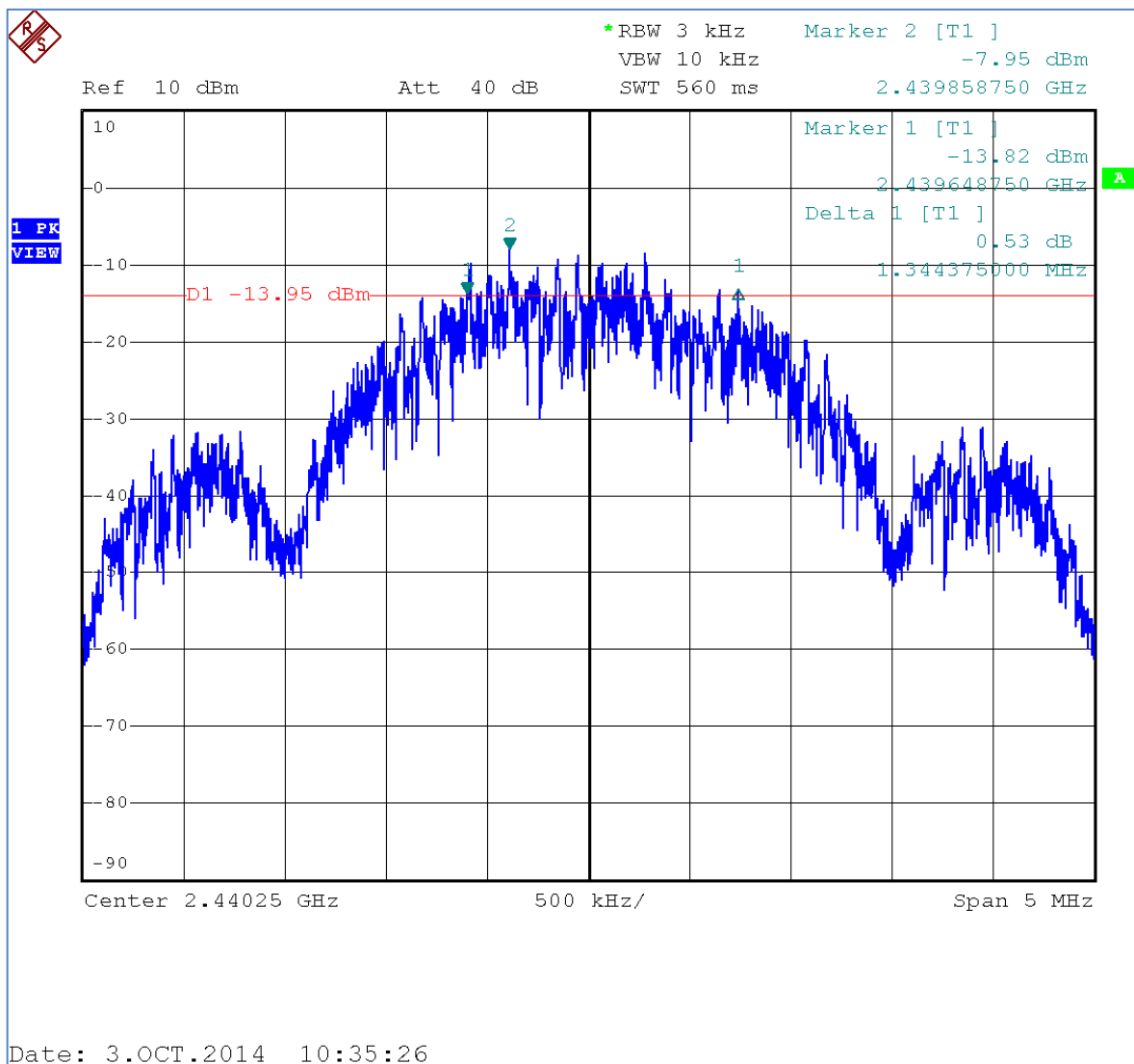
EUT was found to be in compliance with applicable requirements.

Plotted measurements appear on the following pages.

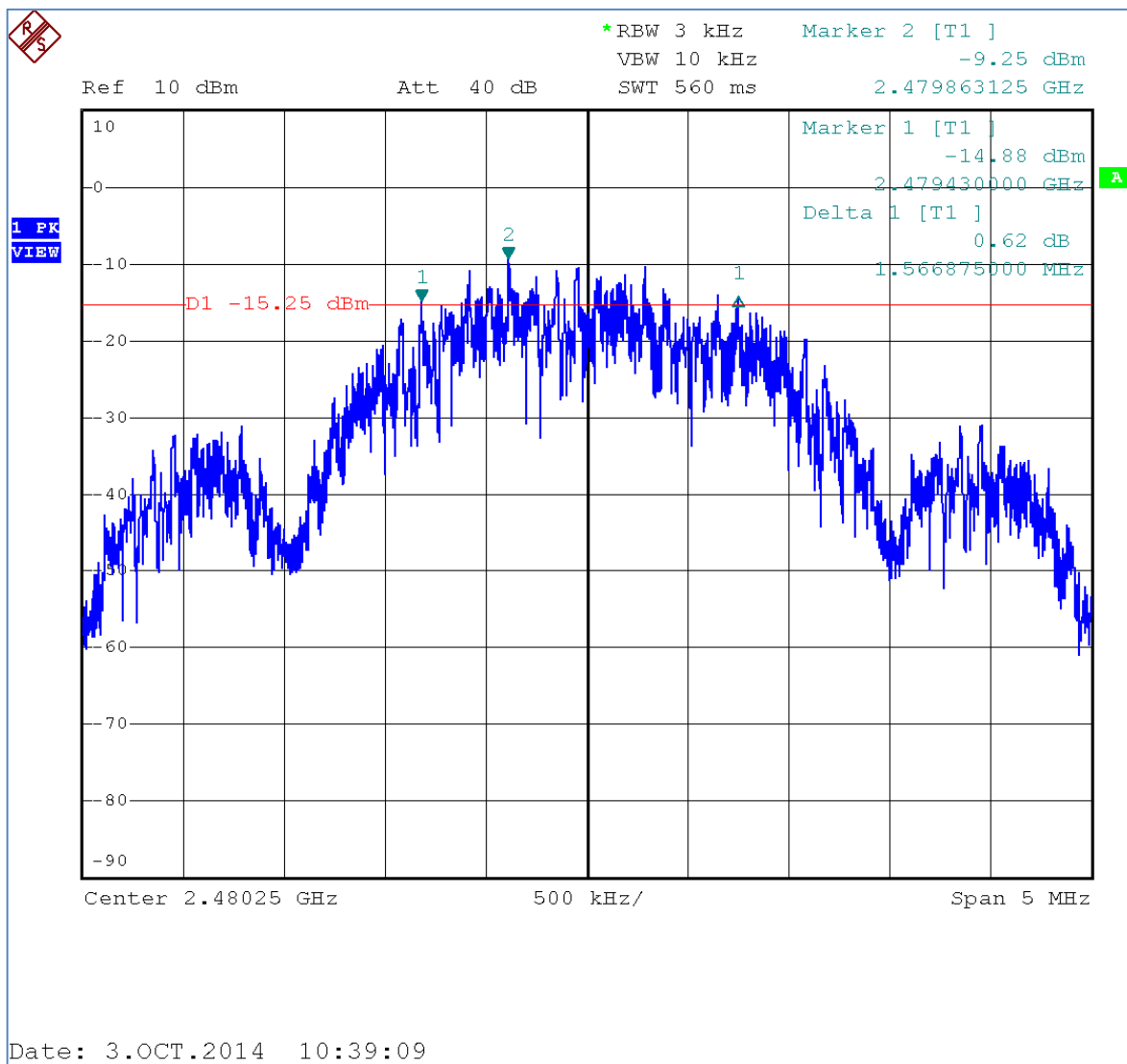
5.3.1 Bandwidth Plots, 6 dB



6 dB, Low Channel

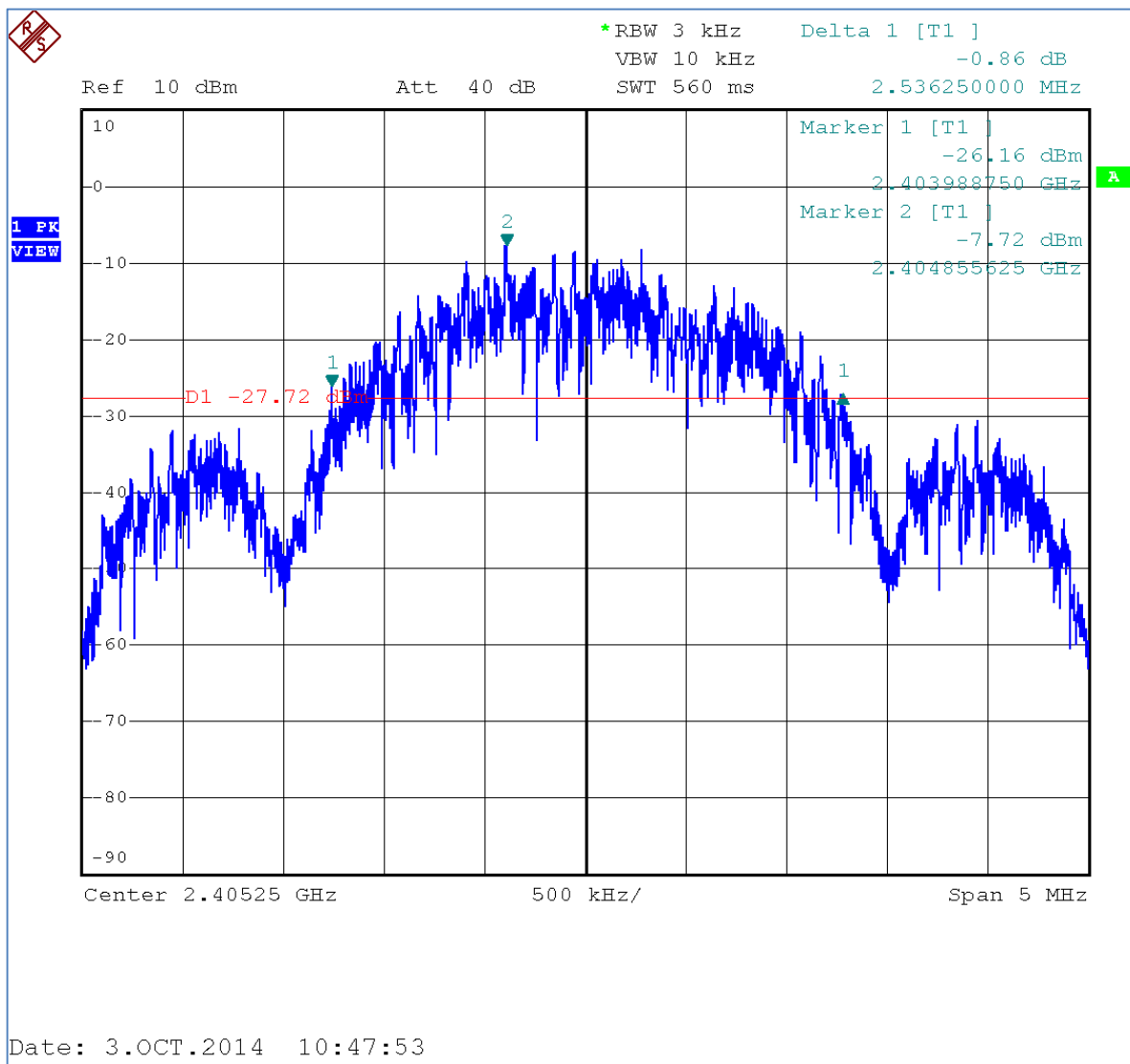


6 dB, Middle Channel

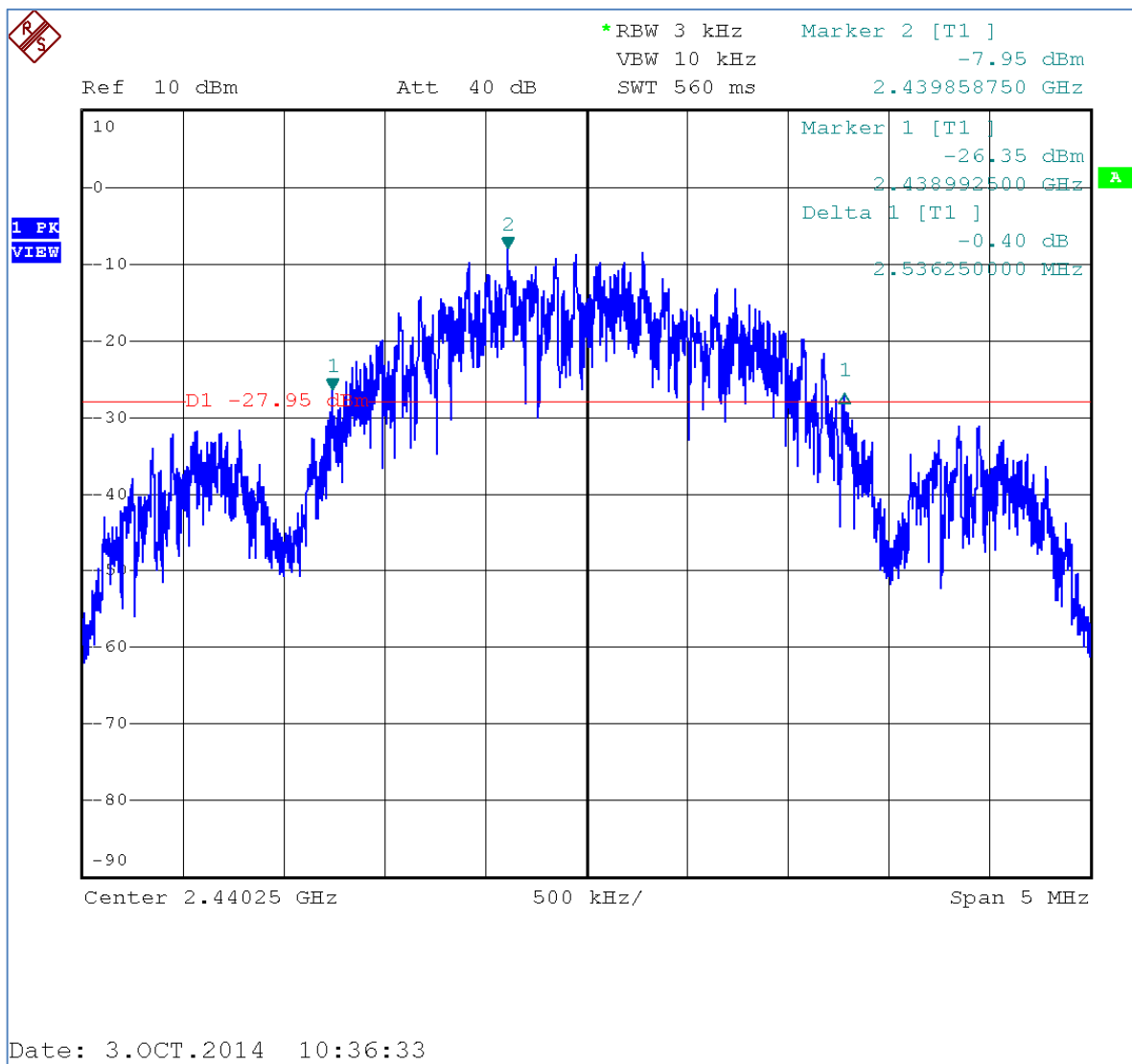


6 dB, High Channel

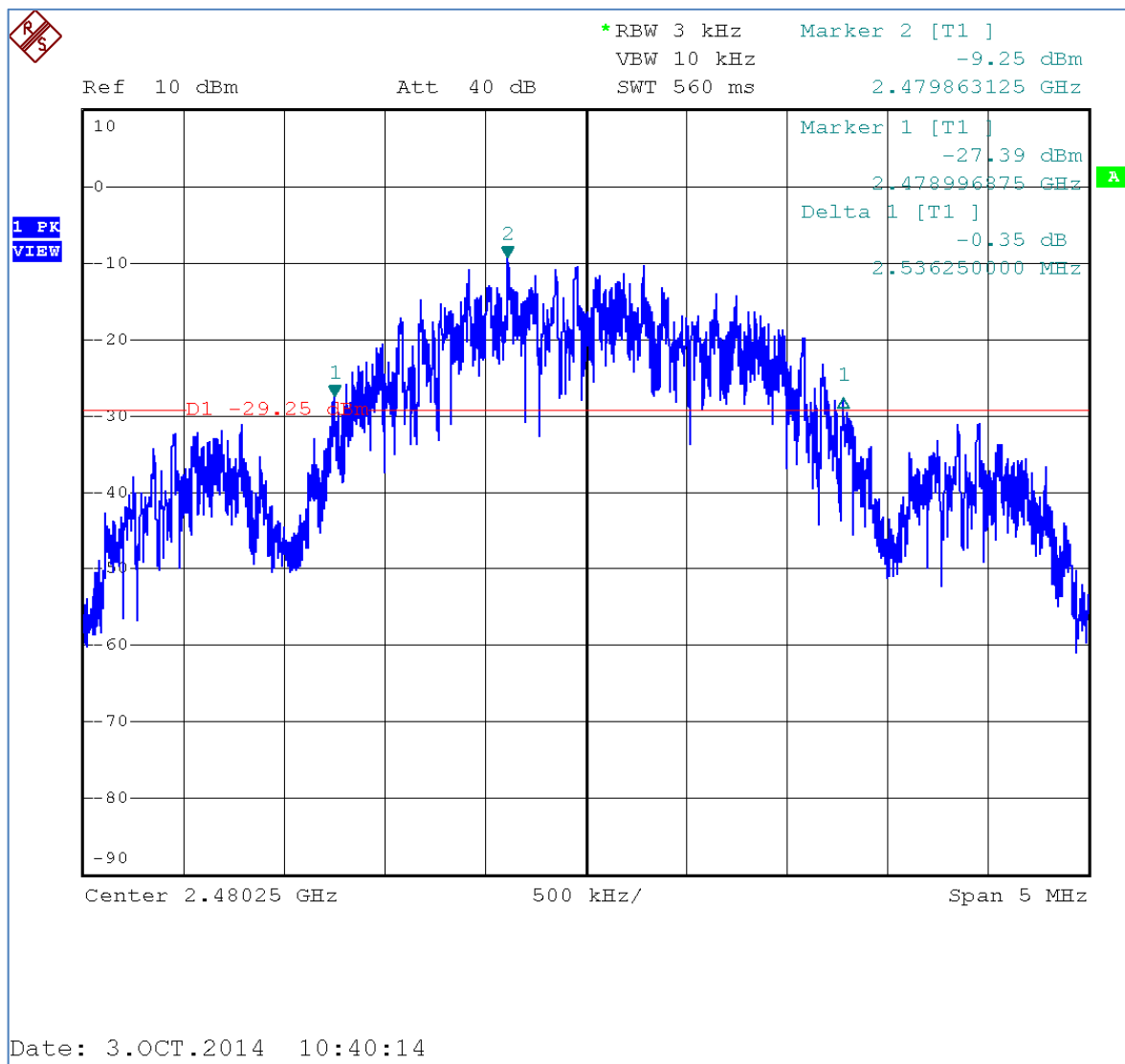
5.3.2 Bandwidth Plots, 20 dB



20 dB, Low Channel



20 dB, Middle Channel



20 dB, High Channel

6.0 Band Edge

6.1 Test Procedure

EUT is placed into normal transmit operation on the nearest band edge channel. The spectrum analyzer is centered on the band edge frequency with span sufficient to include the peak of the adjacent fundamental signal. Measurement includes at least two standard bandwidths from the respective band edge. If required, the band-edge marker-delta method of C63.4 is utilized.

6.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.205 // RSS-Gen Issue 3, 4.9	Unwanted Emissions Adjacent to Authorized Band, Conducted	2014-10-03

6.3 Test Results

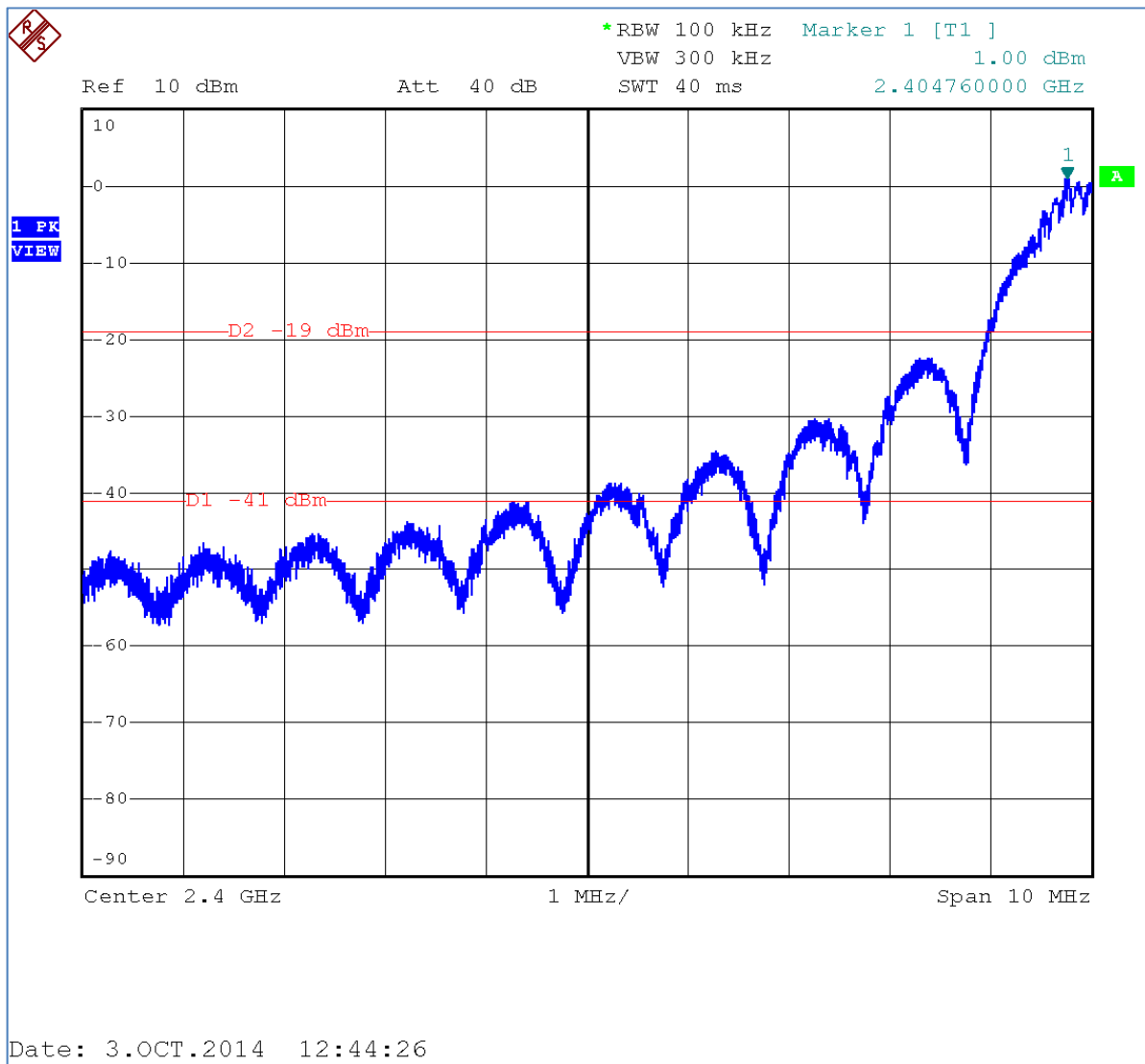
Measurements included more than 2 standard bandwidths (standard bandwidth 100 kHz) from the band edges to provide a clear view of the declining emission levels. Peak detection with max-hold is employed. The general emission (FCC 15.209) limits for peak and average detection are shown.

The average duty cycle factor is -20 dB so the average emission would be 20 dB below the peak detected levels in every case.

Peak detection of emissions at low band-edge was below the -20 dBc criteria and below the general emission peak limits. At high band-edge peak limit margin was -2.6 dB and consequently average would have the same margin to the average limit.

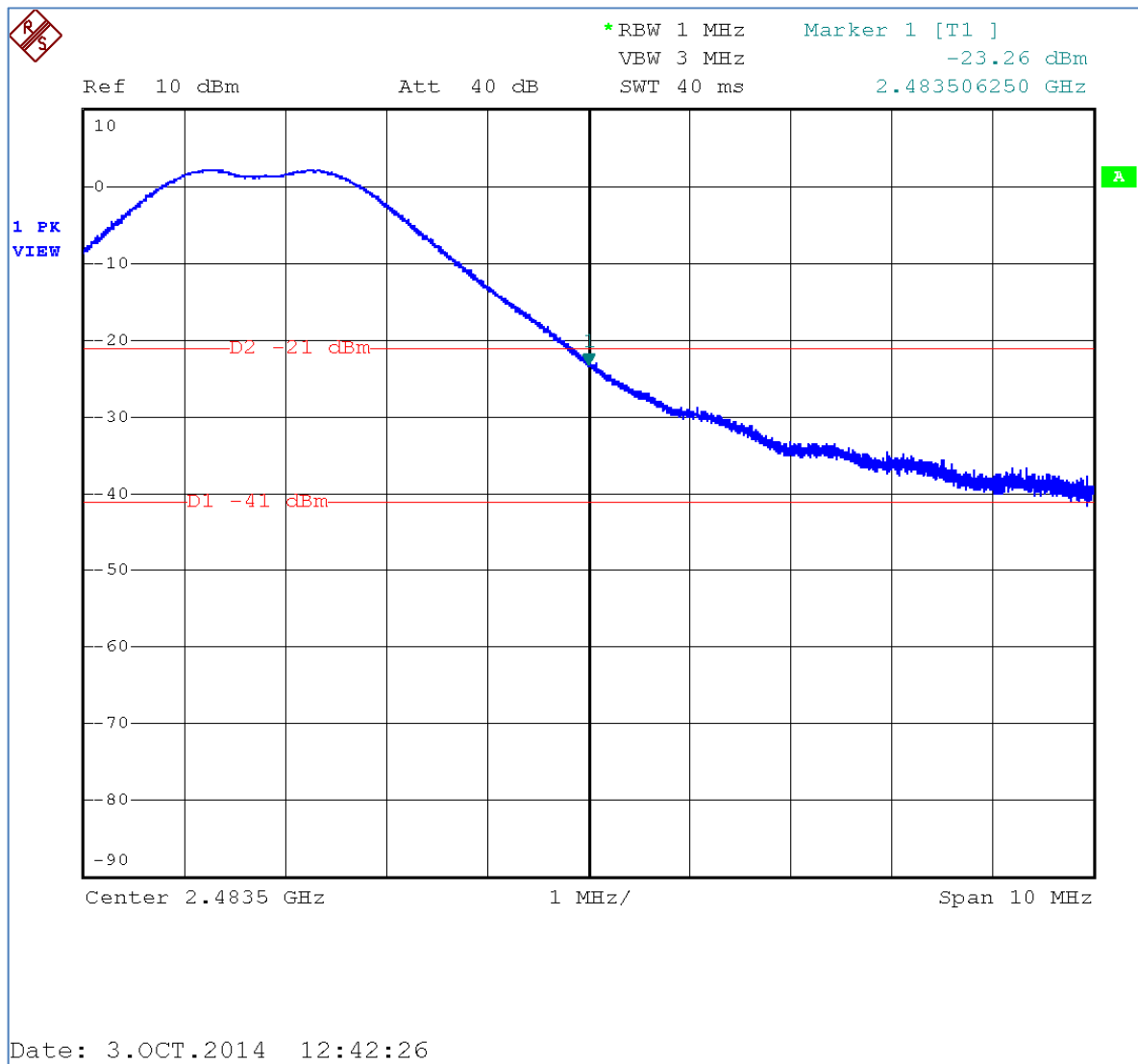
The EUT satisfied the criteria. Plotted results appear on the following pages.

6.3.1 Low Channel Band Edge



Band Edge Emission, Peak Detection, Satisfies -20 dBc and 15.209 Criteria

6.3.2 High Channel Band Edge



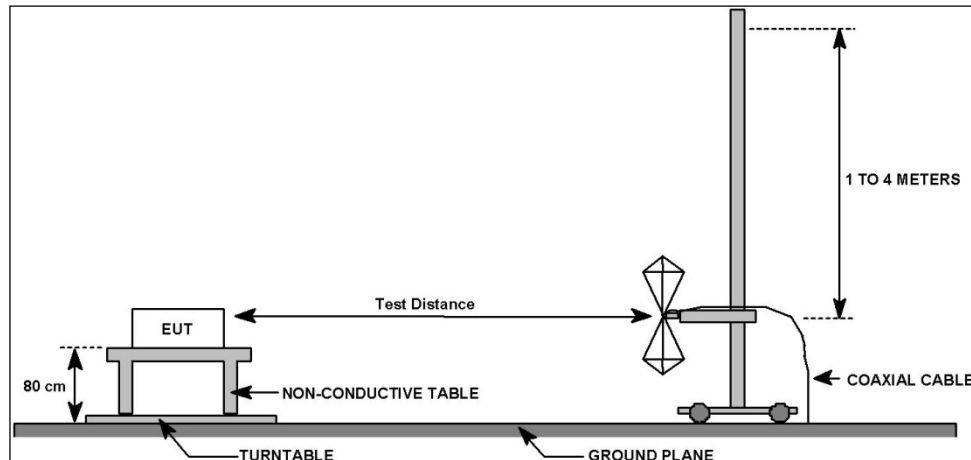
Band Edge Emission, Peak Detection, Satisfies -20 dBc and 15.209 Criteria

7.0 Radiated Spurious Emissions, Receive Mode

7.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate. A diagram showing the test setup appears below.



7.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-Gen Issue 3, 4.9, 4.10	Field Strength of Radiated Spurious/Harmonic Emissions	2014-08-27

7.3 Test Results

The EUT was tuned to the middle channel and external antenna was attached. The EUT was oriented as if mounted on a vertical surface with the antenna on top such that it was polarized vertically.

The EUT satisfied the criteria. Recorded data is presented below.

Table 7.3.1: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Vertical Polarity

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):		8/27/2014			EUT Serial #:		None		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Bob Redoutey		
Purchase Order #:		Not Listed			Supervisor:		Rob McCollough		
Equip. Under Test:		RX-MFS-ESCAN-HS-1 Receiver			Witness' Name:		None		
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:					Receive				
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
31.7347	10	297	3.74	Quasi-peak	24.1	12.153	29.5	-17.3	Pass
52.977	10	174	1.4	Quasi-peak	23.5	2.938	29.5	-26.6	Pass
56.9022	10	351	1.45	Quasi-peak	23.6	2.644	29.5	-26.9	Pass
128.028	10	116	2.74	Quasi-peak	23.3	2.224	33.1	-30.9	Pass
129.699	10	356	2.54	Quasi-peak	23.5	2.481	33.1	-30.6	Pass
253.392	10	22	1.46	Quasi-peak	22.2	8.711	35.6	-26.9	Pass
621.871	10	39	3.23	Quasi-peak	22	16.412	35.6	-19.2	Pass
916.52	10	288	4.05	Quasi-peak	21.3	21.148	35.6	-14.5	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 10m Distance
30MHz - 1GHz Vertical Polarity Measured Emissions

Field Strength (dBμV/m)

60
50
40
30
20
10
0

30M100M1G

Frequency

30M100M1G

Operator: Bob Redoutey
16271_2014 Rad Emissions_ClassB_071514.til
10:35:08 AM, Wednesday, August 27, 2014

EUT Mode: Receive
EUT Power: 12VDC

EUT: RX-MFS-ESCAN-HS-1 Receiver
Project Number: 16271-15
Client: Hetronic

Quasi-peak Limit Level
Corrected Quasi-peak Reading
Peak Limit Level
Corrected Peak Value

≤ 1GHz Vertical Antenna Polarity Measured Emissions

≤ 1GHz Vertical Antenna Polarity Measured Emissions

Table 7.3.2: Radiated Spurious Emissions, Receive Mode, Below 1 GHz, Horizontal Polarity

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):		8/27/2014			EUT Serial #:		None		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Bob Redoutey		
Purchase Order #:		Not Listed			Supervisor:		Rob McCollough		
Equip. Under Test:		RX-MFS-ESCAN-HS-1 Receiver			Witness' Name:		None		
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:				Receive					
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
31.0865	10	321	3.45	Quasi-peak	24.2	12.59	29.5	-16.9	Pass
50.5305	10	335	1.67	Quasi-peak	23.2	2.925	29.5	-26.6	Pass
90.1008	10	281	1.31	Quasi-peak	23.1	2.063	33.1	-31.0	Pass
170.8	10	29	3.76	Quasi-peak	22.8	4.763	33.1	-28.3	Pass
251.796	10	165	1.3	Quasi-peak	22.2	8.71	35.6	-26.9	Pass
479.091	10	182	1.06	Quasi-peak	22.3	13.871	35.6	-21.7	Pass
616.217	10	122	1.19	Quasi-peak	22.1	16.359	35.6	-19.2	Pass
924.64	10	201	2.3	Quasi-peak	21.2	21.098	35.6	-14.5	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 10m Distance
30MHz - 1GHz Horizontal Polarity Measured Emissions

— Quasi-peak Limit Level
△ Corrected Quasi-peak Reading
— Peak Limit Level
— Corrected Peak Value

PROFESSIONAL TESTING

Operator: Bob Redoutey
16271_2014 Rad Emissions_ClassB_071514.til
10:35:08 AM, Wednesday, August 27, 2014

EUT Mode: Receive
EUT Power: 12VDC

EUT: RX-MFS-ESCAN-HS-1 Receiver
Project Number: 16271-15
Client: Hetronic

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

Table 7.3.3: Radiated Spurious Emissions, Receive Mode, Above 1 GHz, Vertical Polarity

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):		8/27/2014			EUT Serial #:		None		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Bob Redoutey		
Purchase Order #:		Not Listed			Supervisor:		Rob McCollough		
Equip. Under Test:		RX-MFS-ESCAN-HS-1 Receiver			Witness' Name:		None		
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:					Receive				
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
1347.16	3	88	1	Average	35.4	22.825	54.0	-31.1	Pass
1971.55	3	302	1	Average	38.1	27.957	54.0	-26.0	Pass
2398.81	3	314	1	Average	34.8	25.851	54.0	-28.1	Pass
2792.56	3	228	1	Average	35	27.415	54.0	-26.5	Pass
3608.63	3	202	1	Average	34.8	27.554	54.0	-26.4	Pass
6649.75	3	348	1	Average	30.4	32.443	54.0	-21.5	Pass
8680.45	3	237	1	Average	27.3	35.718	54.0	-18.2	Pass
11593.2	3	101	1	Average	27.4	38.275	54.0	-15.7	Pass
16764.4	3	260	1	Average	27.6	43.733	54.0	-10.2	Pass

Professional Testing, EMI, Inc

Radiated Emissions, 3m Distance

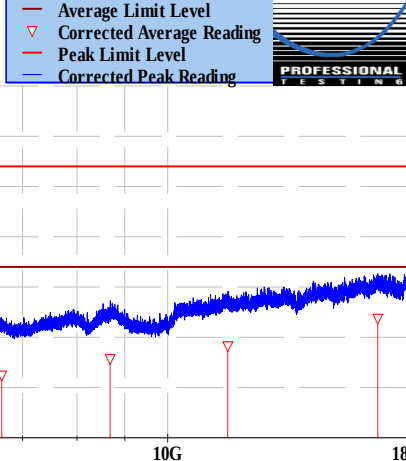
1-18GHz Vertical Polarity Measured Emissions

Average Limit Level

Corrected Average Reading

Peak Limit Level

Corrected Peak Reading



Operator: Bob Redoutey

16271_2014 Rad Emissions_ClassB_071514.til

11:29:03 AM, Wednesday, August 27, 2014

EUT Mode: Receive

EUT Power: 12VDC

EUT: RX-MFS-ESCAN-HS-1 Receiver

Project Number: 16271-15

Client: Hetronic

> 1GHz Vertical Antenna Polarity Measured Emissions

> 1GHz Vertical Antenna Polarity Measured Emissions

Table 7.3.4: Radiated Spurious Emissions, Receive Mode, Above 1 GHz, Vertical Polarity

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):		8/27/2014			EUT Serial #:		None		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Bob Redoutey		
Purchase Order #:		Not Listed			Supervisor:		Rob McCollough		
Equip. Under Test:		RX-MFS-ESCAN-HS-1 Receiver			Witness' Name:		None		
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:					Receive				
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
1390.27	3	321	1	Average	36.1	23.495	54.0	-30.5	Pass
1989.11	3	219	1	Average	35	24.874	54.0	-29.1	Pass
2403.38	3	33	1	Average	34.8	25.892	54.0	-28.1	Pass
4202.9	3	309	1	Average	34.1	28.521	54.0	-25.4	Pass
6108.29	3	65	1	Average	31.3	31.556	54.0	-22.4	Pass
8682.24	3	312	1	Average	27.3	35.714	54.0	-18.2	Pass
10736.1	3	182	1	Average	27.2	37.172	54.0	-16.8	Pass
11589.3	3	94	1	Average	27.3	38.242	54.0	-15.7	Pass
16923.5	3	240	1	Average	27.4	43.678	54.0	-10.3	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18GHz Horizontal Polarity Measured Emissions

Average Limit Level

Corrected Average Reading

Peak Limit Level

Corrected Peak Reading

PROFESSIONAL TESTING

Operator: Bob Redoutey
16271_2014 Rad Emissions_ClassB_071514.til
11:29:03 AM, Wednesday, August 27, 2014

EUT Mode: Receive
EUT Power: 12VDC

EUT: RX-MFS-ESCAN-HS-1 Receiver
Project Number: 16271-15
Client: Hetronic

> 1GHz Horizontal Antenna Polarity Measured Emissions

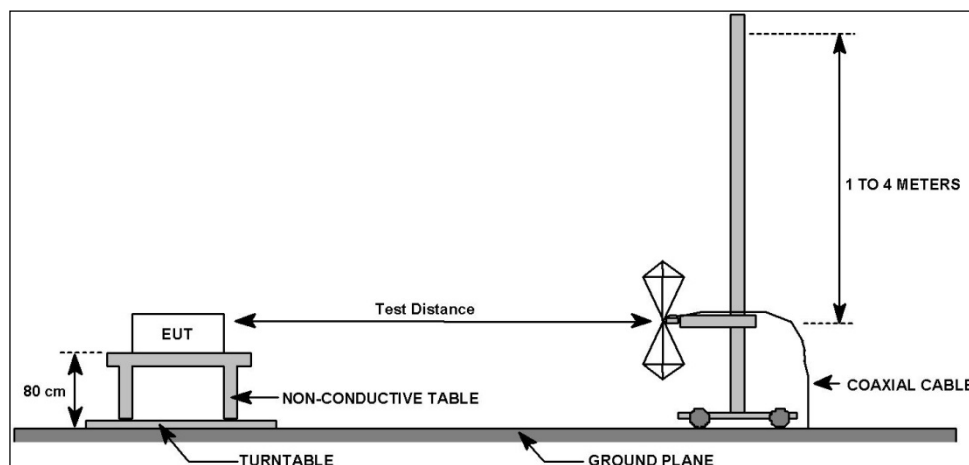
> 1GHz Horizontal Antenna Polarity Measured Emissions

8.0 Radiated Spurious Emissions, Transmit Mode

8.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The EUT was centered on a rotating turntable. Measurements below 1 GHz were taken at a test distance of 10 meters from the measurement antenna. Above 1 GHz the measurement distance was 3 meters.

Spurious emissions below 1 GHz were measured with quasi-peak detection with a resolution bandwidth of 120 kHz. Above 1 GHz peak measurements were taken and average measured where appropriate. A diagram showing the test setup appears below.



8.2 Test Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.247, 15.209 // RSS-Gen Issue 3, 4.9, 4.10	Field Strength of Radiated Spurious/Harmonic Emissions	2014-09-11 to 2014-10-02

8.3 Test Results

Below 1 GHz measurements were taken in transmit mode on the middle channel. Above 1 GHz measurements were taken on the three standard channels of the band.

The EUT external antenna was attached. The EUT was oriented as if mounted on a vertical surface with the antenna on top such that it was polarized vertically.

Peak measurements were taken above 1 GHz. The applicable duty cycle factor for averaging transmitter spurious to compare to average limit above 1 GHz is -20 dB. General emission peak and average limits lines are provided on the relevant plots.

Table 8.3.1: TX Mode, Below 1 GHz, Vertical Polarity, Mid. Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		9/11/2014		EUT Serial #:		Sample 2			
Customer:		Hetronic		EUT Part #:		None			
Project Number:		16271-15		Test Technician:		Eric Lifsey			
Purchase Order #:		Not Listed		Supervisor:		Lisa Ardnt			
Equip. Under Test:		RX-MFS-ESCAN-HS-1		Witness' Name:		None			
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:				Transmit Mid Chan					
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
52.2059	10	15	1.54	Quasi-peak	23.9	3.421	29.5	-26.1	Pass
52.7798	10	220	1.54	Quasi-peak	24.3	3.738	29.5	-25.8	Pass
53.1388	10	17	3.82	Quasi-peak	24	3.385	29.5	-26.1	Pass
935.79	10	242	3.97	Quasi-peak	21.2	21.205	35.6	-14.4	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 10m Distance
30MHz - 1GHz Vertical Polarity Measured Emissions

— Quasi-peak Limit Level
▽ Corrected Quasi-peak Reading
— Peak Limit Level
— Corrected Peak Value

Operator: Eric Lifsey, Bob Redoutey
16271 RERun01Tx MHzGHzCh8.ttl
10:14:21 AM, Thursday, September 11, 2014

EUT Mode: Transmit Ch 8
EUT Power: 12 VDC

EUT: RX-MFS-ESCAN-HS-1
Project Number: 16271-15
Client: Hetronic

≤ 1GHz Vertical Antenna Polarity Measured Emissions

Table 8.3.2: TX Mode, Below 1 GHz, Horizontal Polarity, Mid. Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		9/11/2014		EUT Serial #:		Sample 2			
Customer:		Hetronic		EUT Part #:		None			
Project Number:		16271-15		Test Technician:		Eric Lifsey			
Purchase Order #:		Not Listed		Supervisor:		Lisa Ardnt			
Equip. Under Test:		RX-MFS-ESCAN-HS-1		Witness' Name:		None			
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:				Transmit Mid Chan					
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
938.628	10	72	3.64	Quasi-peak	21	21.11	35.6	-14.5	Pass
990.793	10	21	1.73	Quasi-peak	21.1	22.163	43.5	-21.3	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 10m Distance
30 MHz - 1 GHz Horizontal Polarity Measured Emissions

— Quasi-peak Limit Level
▽ Corrected Quasi-peak Reading
— Peak Limit Level
— Corrected Peak Value

Operator: Eric Lifsey, Bob Redoutey
16271 RERun01TxMHzGHzCh8.ttl
10:14:21 AM, Thursday, September 11, 2014

EUT Mode: Transmit Ch 8
EUT Power: 12 VDC

EUT: RX-MFS-ESCAN-HS-1
Project Number: 16271-15
Client: Hetronic

≤ 1GHz Horizontal Antenna Polarity Measured Emissions

Table 8.3.3: TX Mode, Above 1 GHz, Vertical Polarity, Low Channel

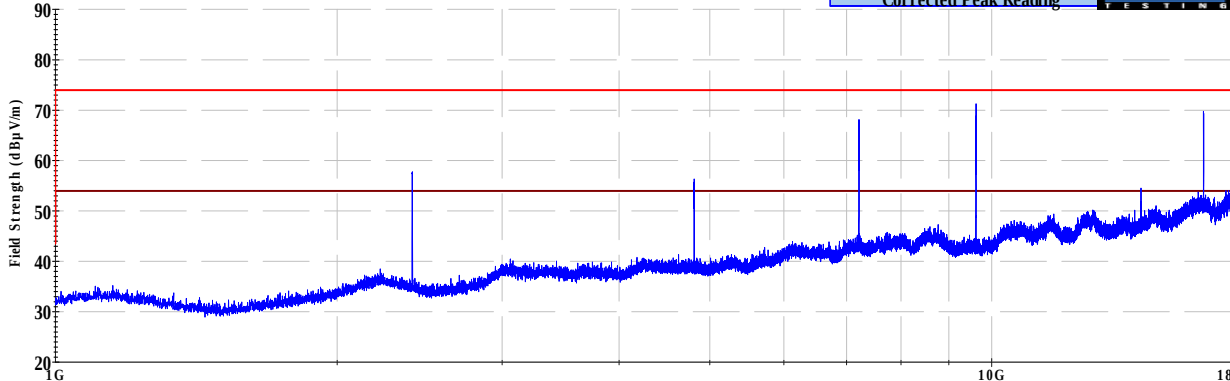
Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/28/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:		Transmit Low Chan	
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Vertical Polarity Measured Emissions Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading   Operator: Eric Lifsey 16271'RE2'Run02'Tx'MHzGHz'Ch1.tif 03:27:37 PM, Sunday, September 28, 2014 EUT Mode: Transmit Ch 1 EUT Power: 12 VDC Sample 2 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Vertical Antenna Polarity Measured Emissions			

Table 8.3.4: TX Mode, Above 1 GHz, Horizontal Polarity, Low Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/28/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:	Transmit Low Chan		
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading The graph displays Field Strength (dBµV/m) on the y-axis (ranging from 20 to 90) against Frequency (GHz) on the x-axis (ranging from 1G to 18G). A blue line represents the measured emissions, which fluctuates between approximately 30 and 55 dBµV/m. Two horizontal red lines indicate the limit levels: the upper line is at approximately 75 dBµV/m (Peak Limit Level) and the lower line is at approximately 55 dBµV/m (Average Limit Level). The measured emissions remain below both limit levels throughout the frequency range. Operator: Eric Lifsey 16271'RE2'Run02'Tx'MHzGHz'Ch1.tif 03:27:34 PM, Sunday, September 28, 2014 EUT Mode: Transmit Ch 1 EUT Power: 12 VDC Sample 2 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

Table 8.3.5: TX Mode, Above 1 GHz, Vertical Polarity, Middle Channel

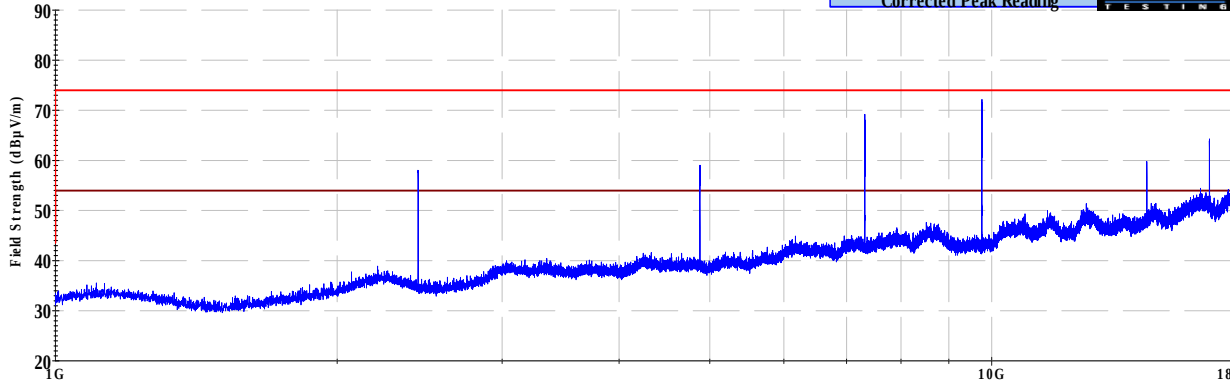
Professional Testing, EMI, Inc.			
Test Method:		ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).	
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits	
Section:		15.209	
Test Date(s):		EUT Serial #:	Sample 2
Customer:		EUT Part #:	None
Project Number:		Test Technician:	Eric Lifsey
Purchase Order #:		Supervisor:	Lisa Ardnt
Equip. Under Test:		Witness' Name:	None
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:		Transmit Mid Chan	
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Vertical Polarity Measured Emissions Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading   Operator: Erik Lifsey 16271'RE2'Run01 Tx'MHzGHz'Ch8.tif 02:22:12 PM, Sunday, September 28, 2014 EUT Mode: Transmit Ch 8 EUT Power: 12 VDC Sample 2 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Vertical Antenna Polarity Measured Emissions			

Table 8.3.6: TX Mode, Above 1 GHz, Horizontal Polarity, Middle Channel

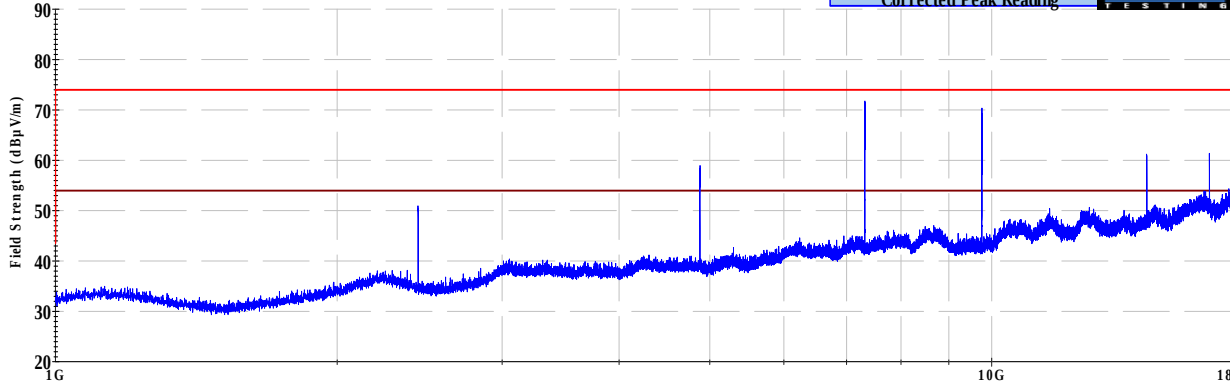
Professional Testing, EMI, Inc.			
Test Method:	ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).		
In accordance with:	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/28/2014	EUT Serial #:	Sample 2
Customer:	\	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:		Transmit Mid Chan	
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18 GHz Horizontal Polarity Measured Emissions Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading   Operator: Eric Lifsey 16271'RE2'Run01 Tx'MHzGHz'Ch8.tif 02:22:08 PM, Sunday, September 28, 2014 EUT Mode: Transmit Ch 8 EUT Power: 12 VDC Sample 2 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

Table 8.3.7: TX Mode, Above 1 GHz, Vertical Polarity, High Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		10/2/2014			EUT Serial #:		Sample 2		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Eric Lifsey		
Purchase Order #:		Not Listed			Supervisor:		Lisa Ardnt		
Equip. Under Test:		RX-MFS-ESCAN-HS-1			Witness' Name:		None		
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:					Transmit High Chan				
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
9919	3	0	1	Peak	72.97	72.97	74.0	-1.0	Pass

Professional Testing, EMI, Inc
Radiated Emissions, 3m Distance
1-18 GHz Vertical Polarity Measured Emissions

— Average Limit Level
▽ Corrected Average Reading
— Peak Limit Level
— Corrected Peak Reading

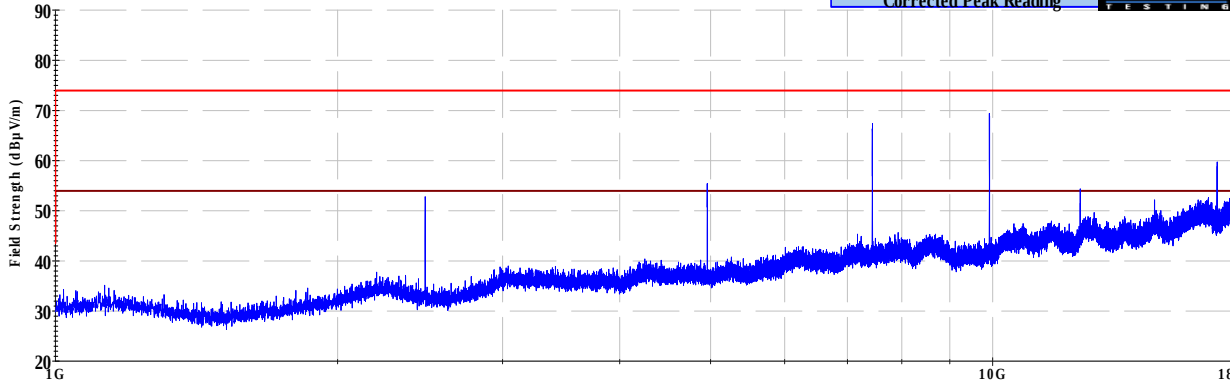
Operator: Eric Lifsey
16271 RE2 Run04 Tx MHzGHz Ch16 0x7.tif
03:30:25 PM, Thursday, October 02, 2014

EUT Mode: Transmit Ch 16
EUT Power: 12 VDC
Sample 2, Power 0x7

EUT: RX-MFS-ESCAN-HS-1
Project Number: 16271-15
Client: Hetronic

> 1GHz Vertical Antenna Polarity Measured Emissions

Table 8.3.8: TX Mode, Above 1 GHz, Horizontal Polarity, High Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits	
Section:		15.209	
Test Date(s):	10/2/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:		Transmit High Chan	
Professional Testing, EMI, Inc Radiated Emissions, 3m Distance 1-18GHz Horizontal Polarity Measured Emissions Average Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading   Operator: Eric Lifsey 16271'RE2'Run04Tx'MHzGHzCh16'0x7.tif 03:30:23 PM, Thursday, October 02, 2014 EUT Mode: Transmit Ch 16 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

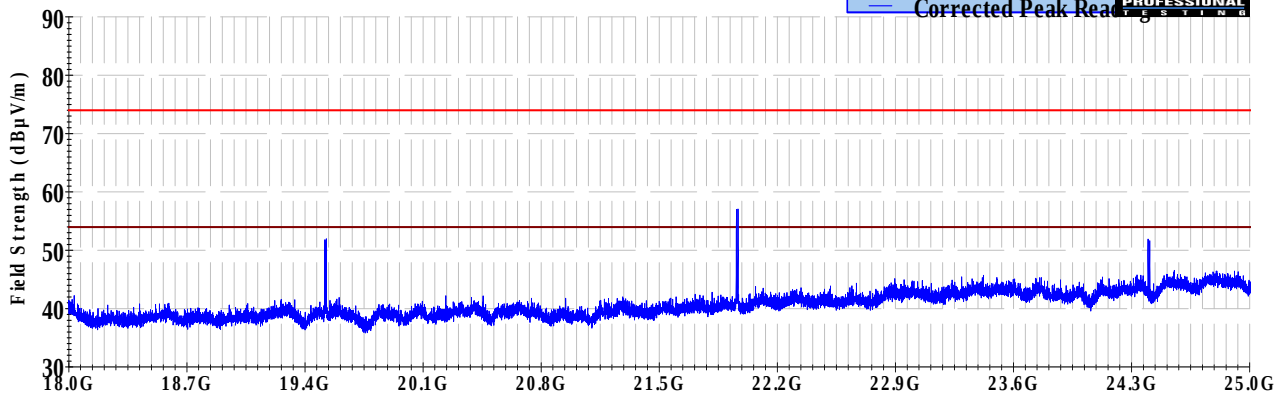
8.3.9 TX Mode, 18 GHz to 25 GHz, Vertical, Low Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		10/2/2014			EUT Serial #:		Sample 2		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Eric Lifsey		
Purchase Order #:		Not Listed			Supervisor:		Lisa Ardnt		
Equip. Under Test:		RX-MFS-ESCAN-HS-1			Witness' Name:		None		
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:					Transmit Low Chan				
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
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions Average Limit Level Corrected Average Level Peak Limit Level Corrected Peak Readings Operator: Eric Lifsey 16271'RE2'Run05'Tx'MHzGHzGHz2'Ch1'0x7.tif 04:38:46 PM, Thursday, October 02, 2014 EUT Mode: Transmit Ch 1 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic									
> 1GHz Vertical Antenna Polarity Measured Emissions									

8.3.10 TX Mode, 18 GHz to 25 GHz, Horizontal, Low Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	10/2/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:		Transmit Low Chan	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions Operator: Eric Lifsey 16271 RE2 Run05 Tx MHzGHzGHz2 Ch1 0x7.tif EUT Mode: Transmit Ch 1 04:38:46 PM, Thursday, October 02, 2014 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

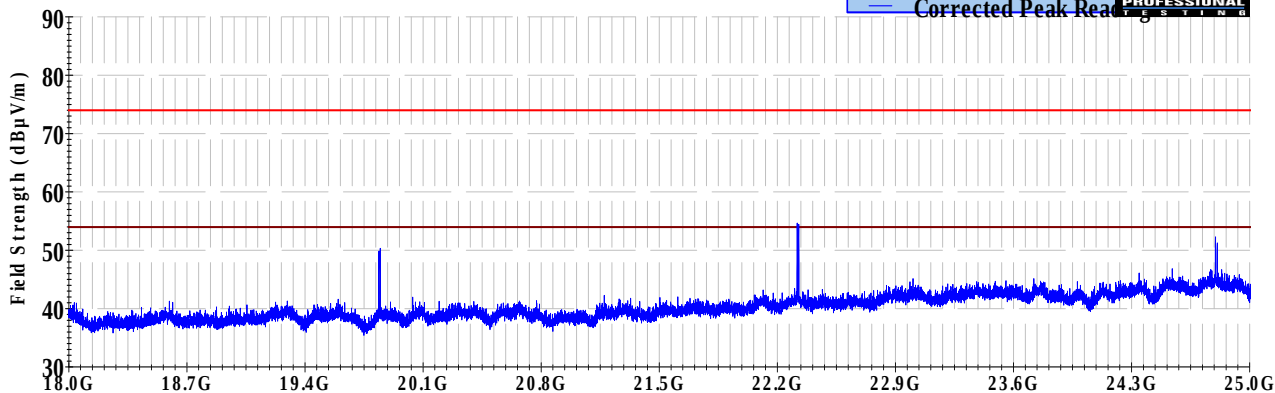
8.3.11 TX Mode, 18 GHz to 25 GHz, Vertical, Middle Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		10/2/2014			EUT Serial #:		Sample 2		
Customer:		Hetric			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Eric Lifsey		
Purchase Order #:		Not Listed			Supervisor:		Lisa Ardnt		
Equip. Under Test:		RX-MFS-ESCAN-HS-1			Witness' Name:		None		
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:				Transmit Middle Chan					
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
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions — Average Limit Level — Corrected Average Level — Peak Limit Level — Corrected Peak Readings   Operator: Eric Lifsey 16271 RE2 Run 06 Tx MHzGHzGHz2 Ch8 0x7.tif 04:51:40 PM, Thursday, October 02, 2014 EUT Mode: Transmit Ch 8 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetric									
> 1GHz Vertical Antenna Polarity Measured Emissions									

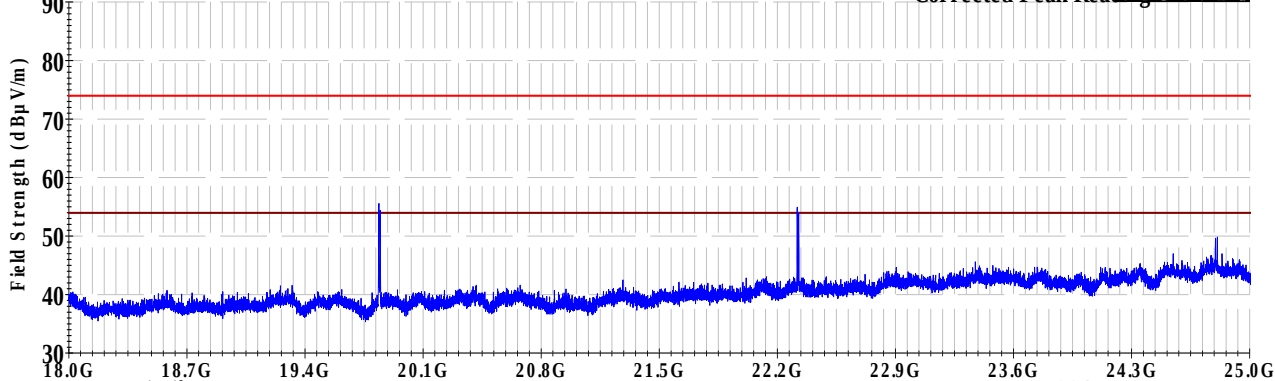
8.3.12 TX Mode, 18 GHz to 25 GHz, Horizontal, Middle Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	10/2/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:	Transmit Middle Chan		
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions The graph displays field strength in dBµV/m on the y-axis (ranging from 30 to 90) against frequency in GHz on the x-axis (ranging from 18.0 to 25.0). A blue line represents the measured emissions, which fluctuate between approximately 35 and 45 dBµV/m. Two horizontal red lines indicate the limit levels: the upper line is the Average Limit Level at approximately 75 dBµV/m, and the lower line is the Peak Limit Level at approximately 55 dBµV/m. The measured emissions remain well below both limit levels. A legend in the top right corner identifies the lines: Average Limit Level (red line), Corrected Average Level (blue line), Peak Limit Level (red line), and Corrected Peak Level (blue line). The Professional Testing, EMI, Inc. logo is also present. Operator: Eric Lifsey 16271 RE2 Run 06 Tx MHz GHz 2 Ch 8 0x7.tif EUT Mode: Transmit Ch 8 04:51:39 PM, Thursday, October 02, 2014 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

8.3.13 TX Mode, 18 GHz to 25 GHz, Vertical, High Channel

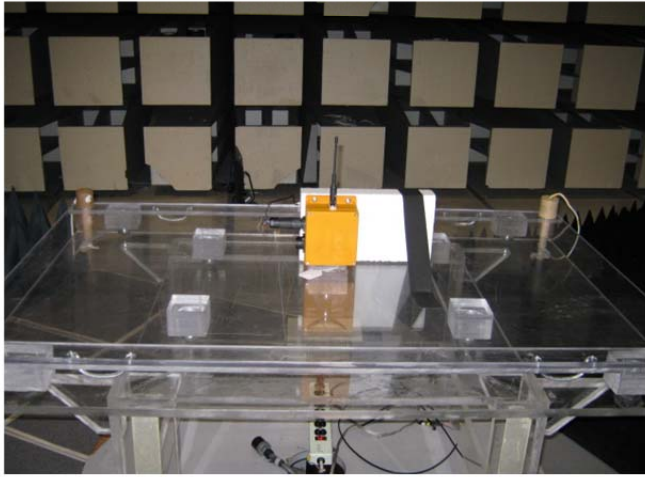
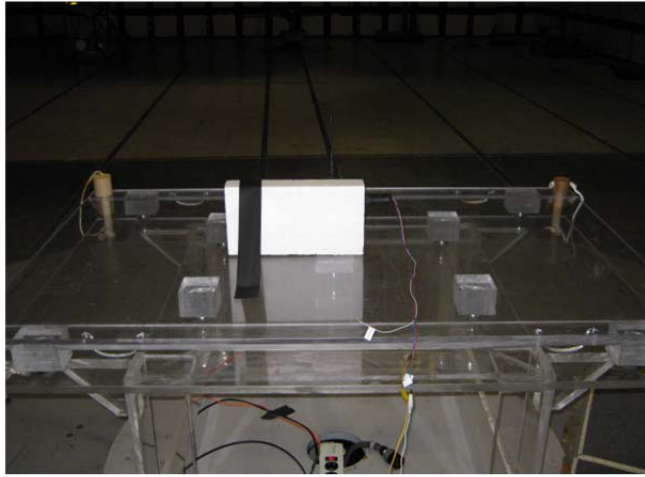
Professional Testing, EMI, Inc.									
Test Method:		ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see §15.38).							
In accordance with:		FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits							
Section:		15.209							
Test Date(s):		10/2/2014			EUT Serial #:		Sample 2		
Customer:		Hetronic			EUT Part #:		None		
Project Number:		16271-15			Test Technician:		Eric Lifsey		
Purchase Order #:		Not Listed			Supervisor:		Lisa Arndt		
Equip. Under Test:		RX-MFS-ESCAN-HS-1			Witness' Name:		None		
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:				Transmit High Chan					
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
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Vertical Polarity Measured Emissions — Average Limit Level — Corrected Average Level — Peak Limit Level — Corrected Peak Level   Operator: Eric Lifsey 16271 RE2 Run 07 Tx MHzGHzGHz2 Ch16 0x7 05:01:37 PM, Thursday, October 02, 2014 EUT Mode: Transmit Ch 16 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic									
> 1GHz Vertical Antenna Polarity Measured Emissions									

8.3.14 TX Mode, 18 GHz to 25 GHz, Horizontal, High Channel

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 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	10/2/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None
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:		Transmit High Chan	
Professional Testing, EMI, Inc Radiated Emissions, Measured at 1m and Scaled to 3m Distance 18-26.5 GHz Horizontal Polarity Measured Emissions — Average Limit Level — Corrected Average Emission — Peak Limit Level — Corrected Peak Reading   Operator: Eric Lifsey 16271 RE2 Run 07 Tx MHz GHz 2 Ch 16 0x7 05:01:36 PM, Thursday, October 02, 2014 EUT Mode: Transmit Ch 16 EUT Power: 12 VDC Sample 2, Power 0x7 EUT: RX-MFS-ESCAN-HS-1 Project Number: 16271-15 Client: Hetronic			
> 1GHz Horizontal Antenna Polarity Measured Emissions			

9.0 Setup Photographs

9.1 Receive Mode Spurious

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, FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators,		
In accordance with:	Radiated Emissions Limits		
Section:	15.109		
Test Date(s):	8/27/2014	EUT Serial #:	None
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Bob Redoutey
Purchase Order #:	Not Listed	Supervisor:	Rob McCollough
Equip. Under Test:	RX-MFS-ESCAN-HS-1 Receiver	Witness' Name:	None
Radiated Emissions Photographs		Page:	1 of 1
			
Front		Back	

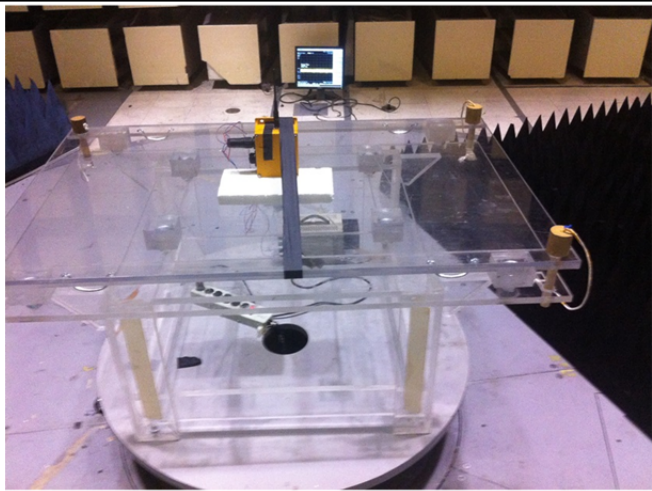
9.2 Transmit Mode Spurious, 30 MHz to 25 GHz

Professional Testing, EMI, Inc.

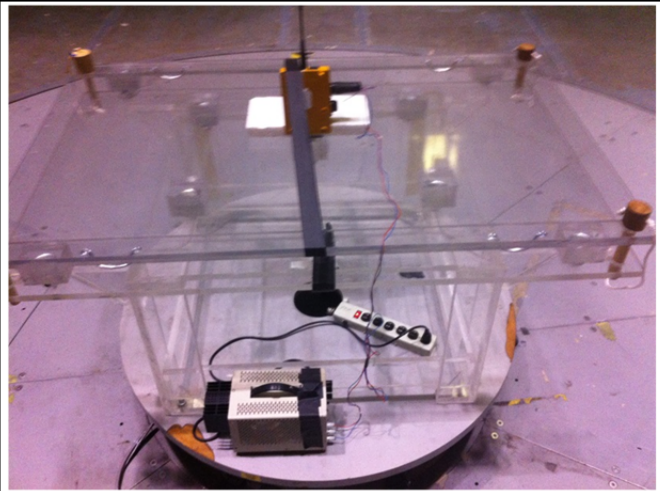
Test Method:	ANSI C63.4–2003: “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz” (incorporated by reference, FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators,		
In accordance with:	Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	10/2/2014	EUT Serial #:	Sample 2
Customer:	Hetronic	EUT Part #:	None
Project Number:	16271-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Lisa Ardnt
Equip. Under Test:	RX-MFS-ESCAN-HS-1	Witness' Name:	None

Radiated Emissions Photographs

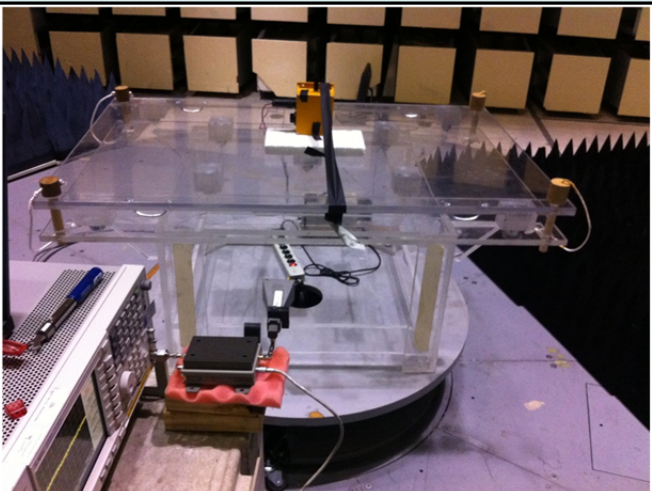
Page: 1 of 1



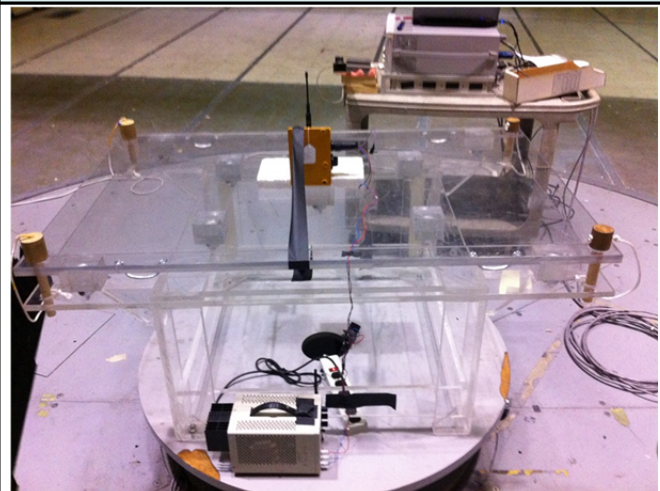
Front 1-18 GHz



Back 1-18 GHz

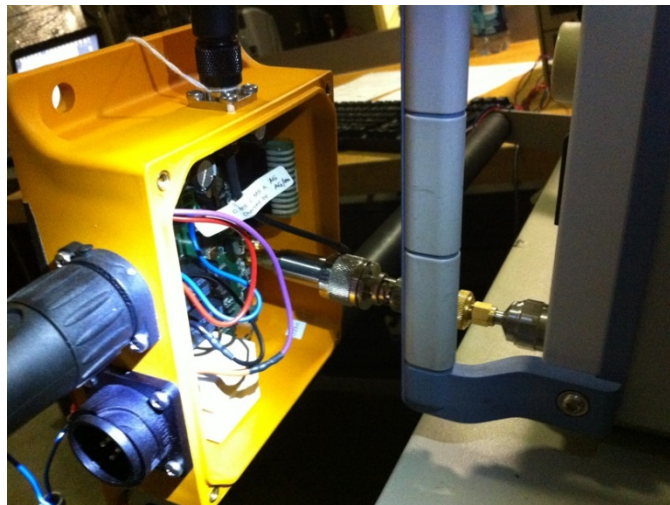
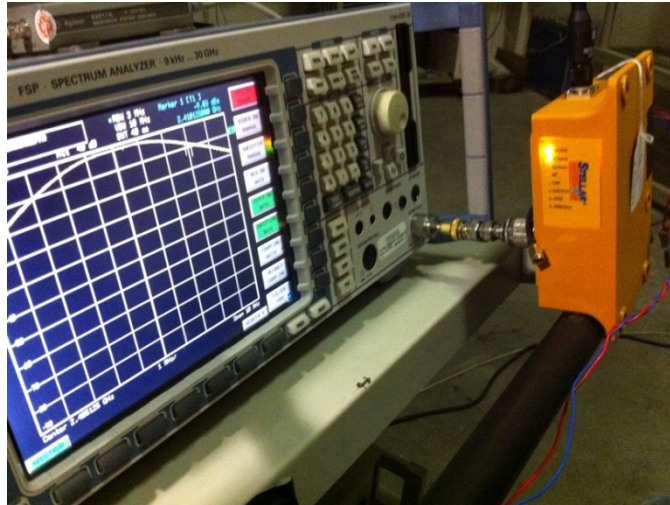


Front 18-25 GHz



Back 18-25 GHz

9.3 Conducted Port Setup, Power, PSD, Timing and Bandwidth



10.0 Antenna Construction Requirements

The design was investigated for meeting the antenna construction requirements of the applicable rules.

10.1 Procedure

A direct examination of the antenna construction is performed and compared to rule criteria that prevent wireless device antennas from being modified by end users in ways that would void their authorization to use the device.

10.2 Criteria

47 CFR (USA) // IC (Canada)		
Section Reference	Parameter	Date(s)
15.203 // RSS-210 Issue 8, A2.9	Antenna Construction	2014-10-04

10.3 Results

Table 9.3.1 Antenna Construction Details	
Antenna Manufacturer and Model	Specifications
Antenna is Model: 56506605 Manufacturer: APEX - Gainflex Type GK 442TF R	Half wave flexible dipole – maximum power 10W – TNC Plug Reverse Polarity Gain 3 dBi

- Antenna connector uses reverse polarity center pin.
- Antenna is provided with the device.

The antenna design above satisfies the requirements of the rules.

11.0 Equipment

11.1 Spurious Radiated Emissions 30 MHz to 25 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, FCC Part 15.109 - Code of Federal Regulations Part 47, Subpart B - Unintentional Radiators, Radiated Emissions Limits			
In accordance with:		Radiated Emissions Limits			
Section:		15.109			
Test Date(s):		8/27/2014	EUT Serial #:	None	
Customer:		Hetronic	EUT Part #:	None	
Project Number:		16271-15	Test Technician:	Bob Redoutey	
Purchase Order #:		Not Listed	Supervisor:	Rob McCollough	
Equip. Under Test:		RX-MFS-ESCAN-HS-1 Receiver	Witness' Name:	None	
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	11/29/2014
1890	HP	8447F	Preamp/Amp, 9kHz-1300MHz, 28/25dB	3313A05298	1/22/2015
1937	Agilent	E4440A	Spectrum Analyzer, 3 Hz - 26.5 GHz	MY44303298	12/2/2015
1926	ETS-Lindgren	3142D	Antenna, Biconilog, 26 MHz - 6 GHz	00135454	10/29/2014
C027	N/A	RG214	Cable Coax, N-N, 25m	none	10/22/2015
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	N/A	TDK 10M Chamber, VSWR > 1 GHz	DAC-012915-005	11/16/2014
2004	Miteq	AFS44-00101800-2S-10P-44	Amplifier, 40dB, .1-18GHz	0	11/19/2014
C030	N/A	0	Cable Coax, N-N, 30m	none	10/10/2015
1780	ETS-Lindgren	3117	Antenna, Double Ridged Guide Horn, 1 - 18 GHz	00110313	1/21/2015
1325	EMCO	1050	Controller, Antenna Mast	9003-1461	N/A

11.2 Timing and Bandwidth Measurements

Asset #	Manufacturer	Model #	Description	Calibration Due
ALN-077	Rohde & Schwarz	FSP-30	Spectrum Analyzer	2015-01-29

12.0 Measurement Bandwidths, Radiated Emissions, Spurious

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	300	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

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