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November 12, 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 TC1. 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 16270-15

Hetronic International Model TC1

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 10, 2014

Reviewed by

Written by

Larry Finn Chief Technical Officer Eric Lifsey Test Engineer

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Revision History

Revision Number	Description	Date
00	Draft for review.	November 6, 2014
01	Revised to client and internal review comments.	November 10, 2014
02	Revised to TCB comments.	November 12, 2014

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Hetronic	International	- TC1
11Cti Offic	International	

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NOTICE: (1) This Report must not be used to claim product endorsement, by NVLAP, NIST, the FCC or any other Agency. This report also does not warrant certification by NVLAP or NIST. (2) This report shall not be reproduced except in full, without the written approval of Professional Testing (EMI), Inc. (3) The significance of this report is dependent on the representative character of the test sample submitted for evaluation and the results apply only in reference to the sample tested. The manufacturer must continuously implement the changes shown herein to attain and maintain the required degree of compliance.

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Compliance Certificate

Applicant	Device & Test Identification	
David Cameron	FCC ID:	LW9-TX-TC1
Hetronic International	Industry Canada ID:	2119B-TXTC1
3905 NW 36th St.	Model(s):	TC1
Oklahoma City, OK 73112 USA	Part Number(s):	N/A
Certificate Date: November 10, 2014	Laboratory Project ID:	16270-15

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.



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

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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

Ī	Manufacturer	Model	Serial #	Description
	Hetronic International	TC1	None	Wireless remote control transmitter/receiver for 2400-2483.5 MHz.

This device is a remote wireless transmitter/receiver that communicates by wireless means with a companion wireless device that incorporates relays to control moving industrial machinery.

The EUT measures approximately $15 \times 12 \times 23$ cm and is shaped with a handle extending out from the main enclosure that contains a small array of toggle switches and an LCD display with four smaller push buttons. The EUT is powered by a 3.6 Volt DC rechargeable battery housed in the handle.

1.3 EUT Operation

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

This device is strictly battery powered cannot be powered from the AC mains during use. The antenna is embedded internally and not subject to user modification.

The EUT internal software operated the transmitter in a continuous modulated mode, unmodulated mode or operating in communication with the companion wireless device as needed for measurement.

1.4 Modifications to Equipment

No modifications were made to the EUT during the performance of the test program.

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.

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1.6 Applicable Documents and Clauses

Table 1.6.1: Applicable Documents		
Document	Title	
47 CFR	Part 15 – Radio Frequency Devices	
47 CFR	Subpart C -Intentional Radiators	
DCC 210 Issue 9	Licence-exempt Radio Apparatus (All Frequency Bands):	
RSS-210 Issue 8	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	
ANSI C05.4 2009	from Low Voltage Electrical and Electronic Equipment	

Table 1.6.2: Applicable Clauses				
Parameter	FCC Part 15	IC RSS References		
	Rule Paragraphs			
Transmitter Characteristics	15.247	RSS 210 A1.1, RSS-Gen		
Power Spectral Density	15.247e	RSS 210 A2.9		
Bandwidth	15.247(a)(2), 2.1049, KDB 558074 D01	RSS-Gen 4.6		
Spurious Radiated Power	15.247, 15.209, 15.205	RSS 210 A1.1, RSS-GEN 4.9, 4.10		
Band Edge	15.274, 15.205	RSS-Gen 4.9		
Antenna Requirement	15.203	RSS-Gen		

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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	2014-09-28		

2.3 Test Results

Bandwidth was found to be 1377.4 kHz in 6 dB, so 3 MHz resolution bandwidth was employed for peak power measurement. The EUT has no antenna port or connector so power was measured as a radiated field. The EUT is hand-held so three orientations of the device were measured.

Fundamental Power Measured as Field Strength
Conducted Limit 1 Watt (30 dBm)
Restated as Radiated Limit 125.23 dBµV/m at 3 meters

Table 2.3.1 Field Strength, Maximum			
Frequency (MHz)	Polarity / Orientation	Measured Peak Power (dBµV/m)	
2405	Vertical / Side	91.4	
2440	Vertical / Side	89.4	
2480	Vertical / Side	88.4	

Measured in 3 MHz RBW, 3 MHz VBW.

Field strength maximum from above converts to EIRP of 0.414 mW.

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

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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 //	Power Spectral Density, Conducted	2014-10-04		
RSS-210 Issue 8, A2.9	Limit: 8 dBm / 3 kHz	2014-10-04		

3.3 Test Results

Power Spectral Density
Conducted Limit 8 dBm in 3 kHz
Restated as Radiated Limit 103.23 dBμV/m

	Corrected
Frequency	Measured Peak
MHz	PSD
	(dBμV/m)
2405	63.9
2440	61.7
2480	73.8

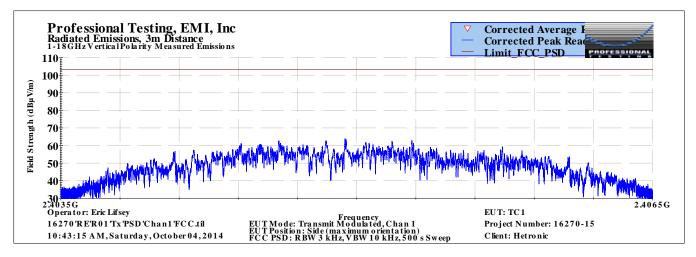
Sweep time 500 seconds.

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

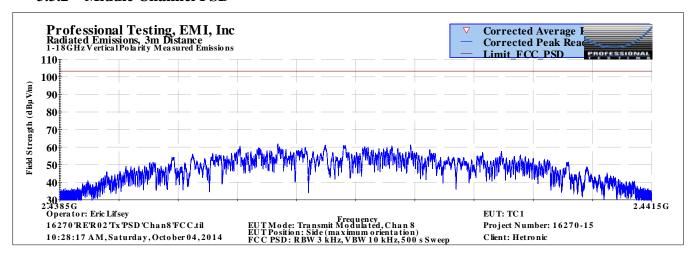
Plotted measurements appear below.

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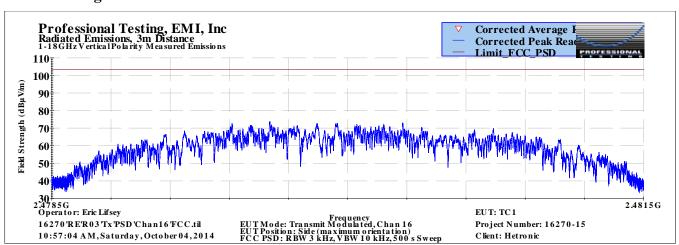
3.3.1 Low Channel PSD



3.3.2 Middle Channel PSD



3.3.3 High Channel PSD



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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

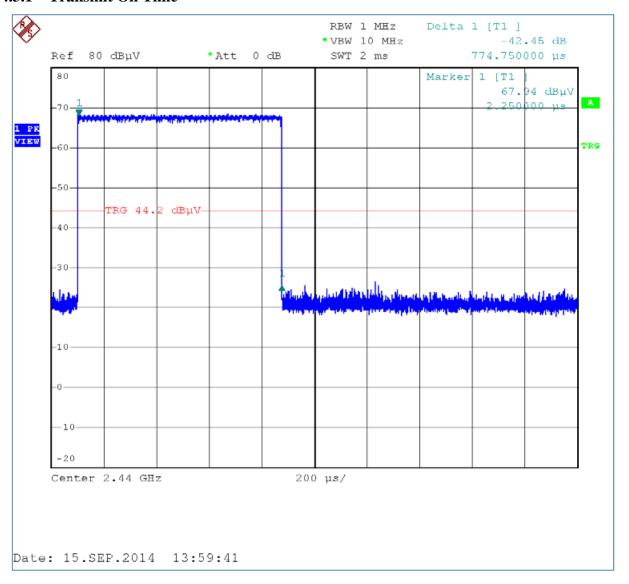
Table 4.3.1 Duty Cycle Results							
Measured On Time (msec)	Measured Time Interval (msec)	Duty Cycle Factor Calculation	Result (dB)	Duty Cycle Factor Allowed (dB)			
0.77475	14.88	= 20 * Log ₁₀ (0.77475 msec / 14.88 msec)	-25.67	-20			

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)			
0.77475	14.88	= 10 * Log ₁₀ (0.77475 msec / 14.88 msec)	-12.83	-12.83			

Plotted measurements appear below.

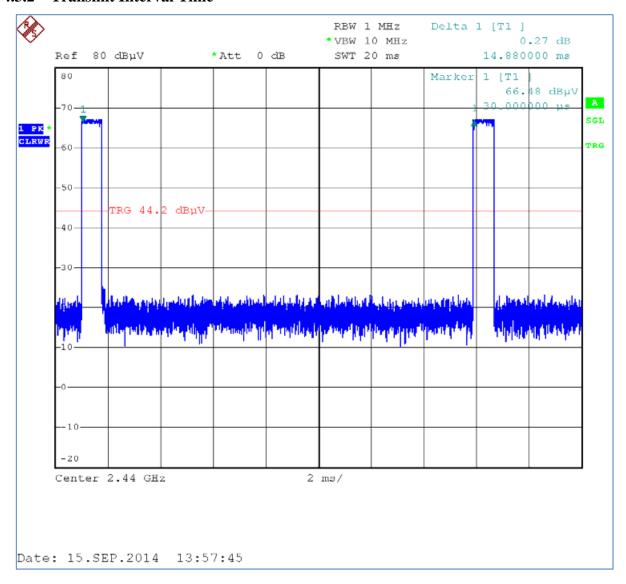
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4.3.1 Transmit On Time



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4.3.2 Transmit Interval Time



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5.0 Occupied Bandwidth

5.1 Test Procedure

Bandwidth is measured by radiated means. A recording of the results is included.

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	2014-09-05				

5.3 Test Results

EUT was found to be in compliance with applicable requirements.

Devid Make Calo
Bandwidth 6 dB
Minimum 500 kHz
William 300 km2

Low Channel Measured BW (kHz)	Mid Channel Measured BW (kHz)	High Channel Measured BW (kHz)	Minimum BW (kHz)
1377.0	1377.4	1374.0	1374

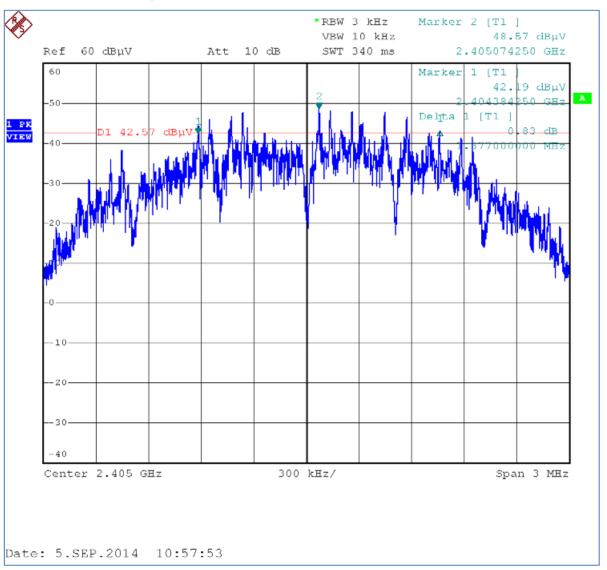
Bandwidth 20 dB
Measure and Report

Low Channel	Mid Channel	High Channel	Reported
Measured BW	Measured BW	Measured BW	Maximum BW
(kHz)	(kHz)	(kHz)	(kHz)
2371.9	2450.6	2455.5	2455.5

Plotted measurements appear on the following pages.

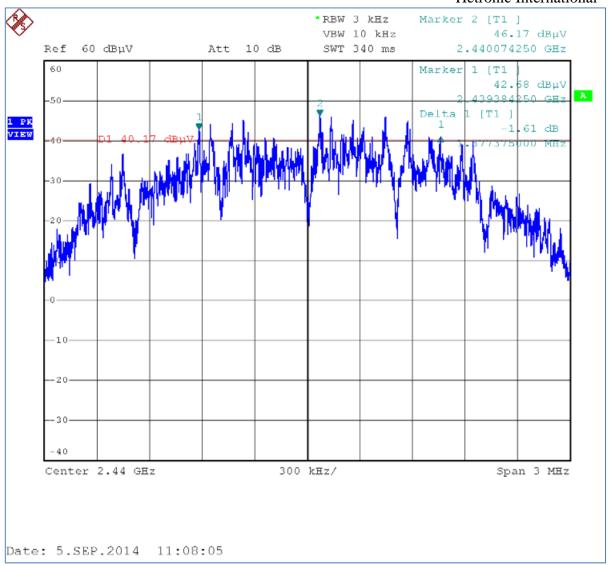
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5.3.1 Bandwidth Plots, 6 dB



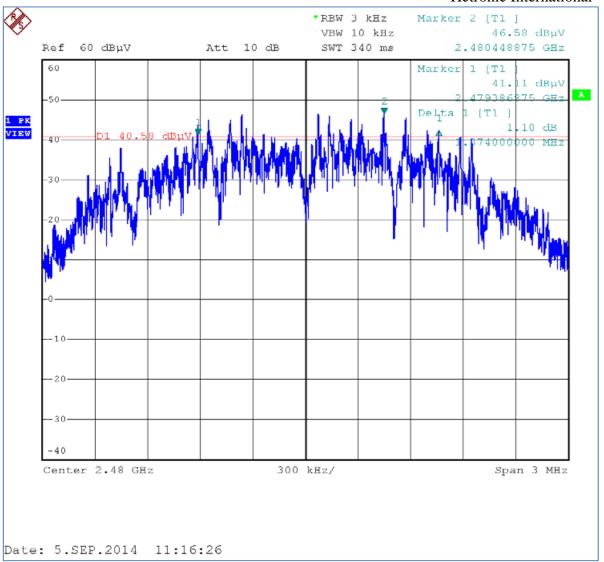
6 dB, Low Channel

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6 dB, Middle Channel

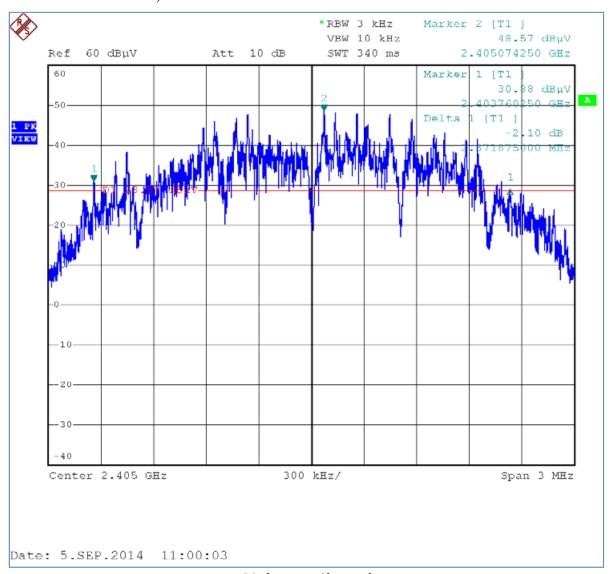
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6 dB, High Channel

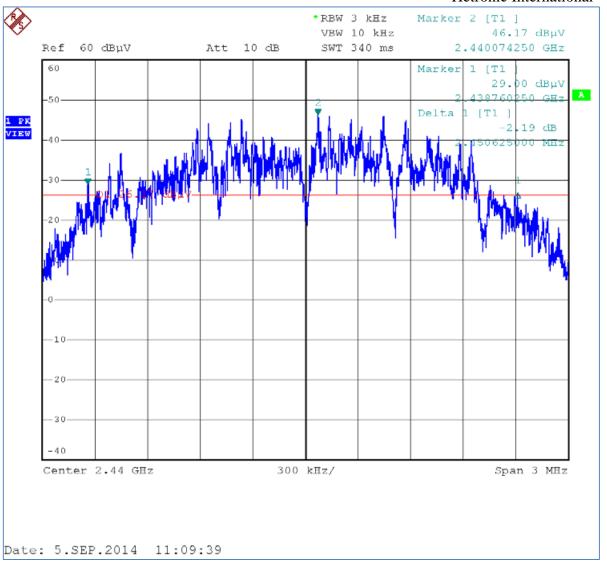
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5.3.2 Bandwidth Plots, 20 dB



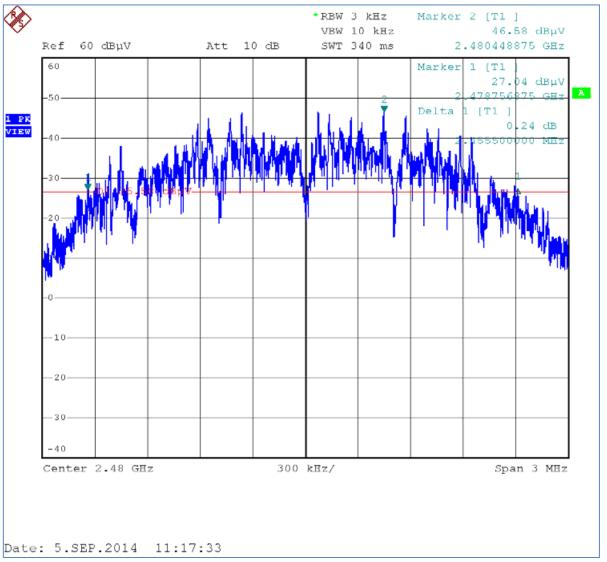
20 dB, Low Channel

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20 dB, Middle Channel

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20 dB, High Channel

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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 //	Unwanted Emissions Adjacent to Authorized	2014-10-04
15.247, 15.205 // RSS-Gen Issue 3, 4.9	Unwanted Emissions Adjacent to Authorized Band, Radiated	2014-10-0

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.

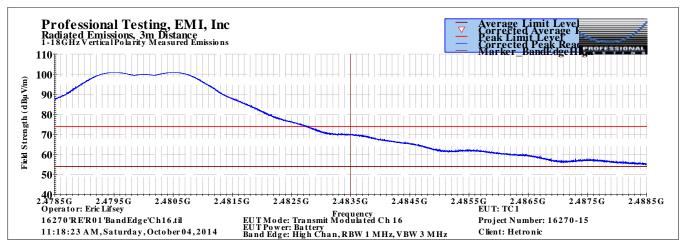
The average duty cycle factor is -20 dB so the average emission would be 20 dB below the peak detected levels.

Peak detection of emissions at band edges were below the -20 dBc criteria and below the general emission peak limits with worse case margin of -3.8 dB on the high channel. The low channel peak emissions were below the general emission average detection limits.

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

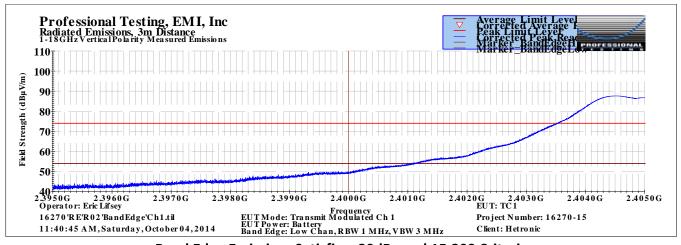
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6.3.1 High Channel Band Edge



Band Edge Emission, Satisfies -20dBc and 15.209 Criteria

6.3.2 Low Channel Band Edge



Band Edge Emission, Satisfies -20dBc and 15.209 Criteria

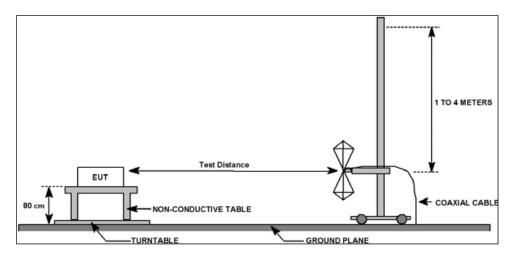
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7.0 Radiated Spurious Emissions, Receive Mode

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 //	Field Strength of Radiated	2014-09-02
RSS-Gen Issue 3, 4.9, 4.10	Spurious/Harmonic Emissions	2014-0

7.3 Test Results

The EUT was tuned to the middle channel. In receive mode the EUT occasionally transmits a broadcast signal and this was captured during the scan.

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

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

			Profes	sional Te	sting, El	VII, Inc.				
Test Metho	od:			ds of Measuren e Range of 9 kH					•	
n accordai	nce with:	Emissions Li		Federal Regulat	ions Part 47, S	Subpart B - Ur	nintentio	nal Rad	iators, Radi	ated
Section:		15.109			l		.			
Test Date(s	<u>s):</u>	9/2/2014			EUT Serial		None			
Customer:		Hetronic			EUT Part #:		None			
Project Nu		16270-15			Test Techn		Eric Life	•		
Purchase C		Not Listed			Supervisor:		Rob M	cCollo	ugh	
quip. Und		TC1			Witness' N	ame:	None			
			nissions Test	t Results Data	l .			Page	: 1	of 1
	ine Voltage		VDC			ver Frequen		-	N/A	
Antenn	a Orientation		Vertic	al	Frequ	ency Range			OMHz to	1GHz
	EUT N	/lode of Op	eration:	ı			Recei	ve		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees)	Antenna Height (Meters)	Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Le		Margin (dB)	Test Resul
30.3624	10	141	3.87	Quasi-peak	24	12.783	29.5	5	-16.7	Pass
94.8008	10	92	2.68	Quasi-peak	30.3	9.781	33.1	L	-23.3	Pass
505.758	10	180	3.53	Quasi-peak	22.2	14.348	35.6	5	-21.3	Pass
752.348	10	285	1.34	Quasi-peak	21.7	18.568	35.6	5	-17.0	Pass
904.874	10	194	4.03	Quasi-peak	21.3	21.138	35.6		-14.5	Pass
934.076	10	288	3.68	Quasi-peak	21.2	21.21	35.6	5	-14.4	Pass
Radiated	sional Testing, Emissions, 10m D GHz Vertical Polarity	istance				▽ Cor — Pe	asi-peak Lin rrected Qua ak Limit Le rrected Pea	si-peak R vel	PROFES	SIONAL
Field Strength (d Bu V/m)								I day to the late of the late	and the second	The state of the s
D*****	Maria di I				للسال	والمستور والمرافع والمراور والمراور والمراور	The state of the s	7		
10	Marinimalinaling of the separation of the separa	A-levanigage, benilplatignshag	Land Andrea Company of the Company o	Acquired Language State Company						_
-							-			1G
0 30M	-		100M							
0	Eric Lifsey		100M	Freq	luency	E	UT: TC1			10

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

			Profes	sional Te	sting, EN	VII, Inc.			
Test Metho	d:			ods of Measurer e Range of 9 kH				•	
n accordar	ice with:	Emissions Li		Federal Regulat	ions Part 47, S	Subpart B - Ur	intentional R	adiators, Rad	iated
Section:		15.109							
Test Date(s):	9/2/2014			EUT Serial		None		
Customer:		Hetronic			EUT Part #:		None		
Project Nur		16270-15			Test Techni		Eric Lifsey		
Purchase O		Not Listed			Supervisor:		Rob McCol	lough	
quip. Und	er Test:	TC1			Witness' N	ame:	None		
		Radiated Er	nissions Tes	t Results Data	Sheet		Pa	ge: 1	of 1
EUT Li	ne Voltage	: 3	3.3 VDC		EUT Pow	er Frequen	су:	- N/A	
Antenna	Orientation	n:	Horizo	ntal	Frequ	ency Range:	:	30MHz to	1GHz
	EUT N	/lode of Op	eration:				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
30.9151	10	245	3.45	Quasi-peak	24.2	12.658	29.5	-16.8	Pass
189.928	10	332	1.36	Quasi-peak	22.5	4.785	33.1	-28.3	Pass
524.647	10	344	3.69	Quasi-peak	22.2	14.658	35.6	-20.9	Pass
729.251	10	338	2.84	Quasi-peak	21.7	18.017	35.6	-17.6	Pass
838.733	10	176	1.93	Quasi-peak	21.4	19.472	35.6	-16.1	Pass
989.791	10	10	3.97	Quasi-peak	21.1	22.144	43.5	-21.4	Pass
Radiated	sional Testing, Emissions, 10m D GHz Horizontal Polar		ns			▽ Cor — Pea	asi-peak Limit Le rrected Quasi-pea ak Limit Level rrected Peak Valu	k Readin	SIONAL
20 (m/V 40 strength (dB b/V) 30 strength (dB b/V) 10 strength (dB b/V) 1	- Mark And Links								The state of the s
+ 1	zwinisty	hadelate the same of the same	Marile Lagran and Industrial Control of the Control	the state of the s	7				
-									
0 30M			100M						1 G

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

			Profess	sional Te	sting, El	VII, Inc.				
Test Metho	od:			ds of Measure e Range of 9 kH				•	rical and	
In accorda	nce with:	FCC Part 15. Emissions Li		ederal Regula	tions Part 47, S	Subpart B - Un	intentional R	adiators, Radi	ated	
Section:		15.109								
Test Date(s):	9/2/2014			EUT Serial		None			
Customer:		Hetronic			EUT Part #:		None			
Project Nu		16270-15			Test Techn		Eric Lifsey	U a consta		
Purchase C	Order #:	Not Listed			Supervisor:		Rob McCol	lough		
Equip. Und	ler Test:	TC1			Witness' Name: None					
	F	Radiated En	nissions Test	Results Dat	a Sheet		Pa	ge: 1	of 1	
EUT L	Radiated Emissions Test EUT Line Voltage: 3.3 VDC Antenna Orientation: Vertice				EUT Pow	ver Frequen	cy:	- N/A		
Antenn	a Orientatio	n:	Vertic	al	Frequ	ency Range:		Above 1	GHz	
	EUT N	/lode of Op	eration:				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	
2142.07	3	155	1	Average	35.3	25.927	54.0	-28.0	Pass	
8597.32	3	242	1	Average	26.8	34.999	54.0	-19.0	Pass	
11530.4	3	273	1	Average	27	38.152	54.0	-15.8	Pass	
12678.7	3	32	1	Average	27.6	38.691	54.0	-15.3	Pass	
Radiated	sional Testing, Emissions, 3m Dis Vertical Polarity Measu	tance				∇ CorPea	rage Limit Level rected Average R k Limit Level rected Peak Read	deading	SIONAL N 6	
80 -								mile me mileting		
80 — 80 — 80 — 80 — 80 — 80 — 80 — 80 —	الماسان الماسا	and the state of t			And a second of the second of	and the state of t	V	Y Y		
ed Strength (d BµV/m) 202 203 204 205 206 207 208	ngathana ngakanakharinta		ilean un in ilean (ilean ilean i	third was a beautiful and a second a second and a second and a second and a second and a second	And the state of t		7	Y Y		
Field Strength (d Bp V/m) 100 - 00 - 00 - 00 - 00 - 00 - 00 - 00	ngalenging dipadinah dian				A control of the cont		Y	Y Y		

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

			Profes	sional Te	sting, El	VII, Inc.			
Test Metho	od:		4–2003: "Metho Equipment in th					_	
In accorda	nce with:	FCC Part 1 Emissions	5.109 - Code of Limits	Federal Regula	tions Part 47, S	Subpart B - Ur	nintentional R	adiators, Rad	iated
Section:		15.109							
Test Date(s	s):	9/2/201	4		EUT Serial	#:	None		
Customer:		Hetronic			EUT Part #:		None		
Project Nu		16270-1			Test Techn	ician:	Eric Lifsey		
Purchase C		Not Liste	ed		Supervisor:		Rob McCol	lough	
Equip. Und	ler Test:	TC1			Witness' N	ame:	None		
	Radiated Emissions Test Results EUT Line Voltage: 3.3 VDC				a Sheet		Pa	ge: 1	of 1
EUT L	ine Voltage	:	3.3 VDC		EUT Pow	ver Frequen	су:	N/A	
Antenna	a Orientatio	n:	Horizo	ntal	Frequ	ency Range	:	Above 1	GHz
	EUT N	/lode of C	peration:				Receive		
Frequency Measured (MHz)	Test Distance (Meters)	EUT Direction (Degrees		Detector Function	Recorded Amplitude (dBµV)	Corrected Level (dBµV/m)	Limit Level (dBμV/m)	Margin (dB)	Test Results
2090.77	3	258	1	Average	35.4	25.728	54.0	-28.2	Pass
7861.12	3	291	1	Average	28.1	34.82	54.0	-19.1	Pass
11492.1	3	332	1	Average	27.1	38.396	54.0	-15.6	Pass
12654.9	3	248	1	Average	27.9	38.871	54.0	-15.1	Pass
Radiated 1-18GHz1 90	sional Testing, Emissions, 3m Dis Horizontal Polarity Mo	tance				▽ Cor — Pea	erage Limit Level crected Average R ak Limit Level crected Peak Read		SIONAL
30 Field Strength	on the floring the state of the	ent property and a second		The American State of Manager and Part of the Control of the Contr	Marketing and the state of the	<u> </u>		7 7	
-			1 1			+ + +	 		
20 G			+ *				10 G		18G

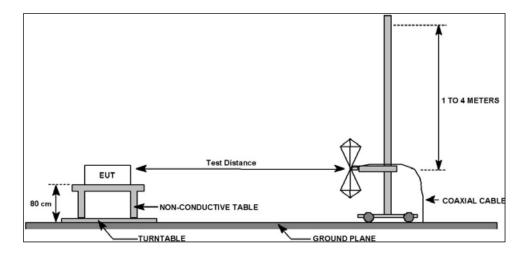
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8.0 Radiated Spurious Emissions, Transmit Mode

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 //	Field Strength of Radiated	2014-09-06
RSS-Gen Issue 3, 4.9, 4.10	Spurious/Harmonic Emissions	2014-09-00

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 and three orientations of the EUT.

The applicable duty cycle factor for averaging above 1 GHz is -20 dB.

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

		Pr	ofessional 1	Testing, E	MI, Inc.					
Test Method:			"Methods of Measu ent in the Range of S					_	rical and	i
n accordance w	ith: FCC Pa	rt 15.209 -	Code of Federal Reg	ulations Part 47	, Subpart C - Int	entiona	l Radiators,	. Radiate	d Emis	ion
Section:	15.209)								
Test Date(s):	9/6/2	014		EUT Seria	l #:	None				
Customer:	Hetro	nic		EUT Part	#:	None				
Project Number:	16270)-15		Test Tech	nician:	Eric Lif	fsey			
Purchase Order	#: Not Li	isted		Superviso	r:	Rob M	lcColloug	h		
quip. Under Te	st: TC1			Witness'	Name:	None				
	Radiate	ed Emissio	ons Test Results D	ata Sheet			Page:	1	of	1
EUT Line Vo	oltage:	3.3	VDC	EUT Po	wer Frequen	cy:	-	N/A		
Antenna Orie	ntation:		Vertical	Freq	uency Range:		30N	/lHz to	1GHz	
	EUT Mode o	of Operati	on:		Transmit Mic	d Chan	, Upright	Positio	n	
Radiated Emission 30MHz-1GHzVertie	is, 10m Distance calPolarity Measured E	missions			— Pea	rected Qu ak Limit Le rected Pea		PROFESS	SIONAL IN 6	
Fed Strength (dBp Vm) 30										
					والمرابع المرابع المرا					
20 Labert 10	Homphily with a same and same	hartekantil dibarrapakka dapatra	and the second s	A STATE OF THE PARTY OF THE PAR	The second secon					
10 10 10 10 10 10 10 10 10 10 10 10 10 1	the model for the contract of	ortaniliter and the party	100M	A STATE OF THE STA	Name of the state				1G	

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

	F	Professional To	esting, EMI, I	nc.				
Test Method:		3: "Methods of Measure ment in the Range of 9 I				•	ical and	ł
n accordance with:	FCC Part 15.209 Limits	- Code of Federal Regul	ations Part 47, Subpar	t C - Intentiona	l Radiators,	Radiate	d Emiss	ion
Section:	15.209							
Test Date(s):	9/6/2014		EUT Serial #:	None				
Customer:	Hetronic		EUT Part #:	None				
Project Number:	16270-15		Test Technician:	Eric Li	fsey			
Purchase Order #:	Not Listed		Supervisor:	Rob N	1cCollougl	h		
quip. Under Test:	TC1		Witness' Name:	None				
R	Radiated Emiss	sions Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltage:	3.3	VDC	EUT Power Fro	equency:	-	N/A		
Antenna Orientatio	on:	Horizontal	Frequency F	Range:	30N	/IHz to 1	1GHz	
EUT N	Node of Opera	tion:	Transn	nit Mid Chan	, Upright	Positio	n	
Radiated Emissions, 10m Dis 30 MHz - 1 GHz Horizontal Polari					ıasi-peak Readiı			
50 (m/n fg p) than 30	Ity Measured Emissions			Peak Limit I Corrected Pe		PROFESS	SIONAL	
50 (III) 40 (III) 30								
500 (m) Ado (d Bp V/m) 300 200 200 200 200 200 200 200 200 200		100M	requency				Sional Control of the	

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

		Prof	essional T	esting, EMI, I	nc.				
Test Method:				rement of Radio-Noise kHz to 40 GHz" (incorp			_	ical and	i
n accordance with:	FCC Part :	15.209 - Code	of Federal Regu	lations Part 47, Subpar	t C - Intention	al Radiators,	, Radiate	d Emiss	io
Section:	15.209								
Test Date(s):	9/6/201	.4		EUT Serial #:	None)			
Customer:	Hetroni	С		EUT Part #:	None)			
Project Number:	16270-1	.5		Test Technician:	Eric L	ifsey			
Purchase Order #:	Not List	ed		Supervisor:	Rob	McCollough	h		
quip. Under Test:	TC1			Witness' Name:	None				
	Radiated	Emissions ⁻	Test Results Da	ata Sheet		Page:	1	of	
EUT Line Voltag	ge:	3.3 VI	DC	EUT Power Fro	equency:	-	N/A		
Antenna Orientat	ion:	Ve	ertical	Frequency F	Range:	Al	bove 1G	Ήz	
EUT	Mode of	Operation:		Transmit	t Bottom Ch	an, Uprigh	t Positi	on	
Radiated Emissions, 3m 1-18 GHz Vertical Polarity Mo					— Peak Limit	Average Reading Level Peak Reading	PROFESS	IONAL I N 6	
		_							
A _n		<u> </u>							
B 60						1		Marie Marie	
20 Strength (dB		 							
n gth		Liebbit.	laborary lattice, compatibilities	and the same of th					
30 30 30 30 30 30 30 30 30 30 30 30 30 3			the state of the s						
30	letter distribution distribution distribution distribution distribution distribution distribution distribution			Mark Control of the C		106		186	ł.
de de la constitue de la const	illigation to the state of the		destroit the second des	Frequency	EUT: TC1	10G		180	ţ

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

		Profe	essional Te	esting, EMI,	, Inc.					
Test Method:				ement of Radio-Nois kHz to 40 GHz" (inco			_		ical and	d
In accordance with:	FCC Part 1 Limits	1 5.209 - Cod e	of Federal Regula	ations Part 47, Subp	oart C - Int	entional Ra	diators,	Radiate	d Emiss	sio
Section:	15.209									
Test Date(s):	9/6/201	4		EUT Serial #:		None				
Customer:	Hetronic	2		EUT Part #:		None				
Project Number:	16270-1	5		Test Technicia	n:	Eric Lifse	У			
Purchase Order #:	Not Liste	ed		Supervisor:		Rob McC	ollough)		
Equip. Under Test:	TC1			Witness' Name	e:	None				
	Radiated	Emissions T	est Results Da	ta Sheet		F	Page:	1	of	
EUT Line Volta	ge:	3.3 VI	oc	EUT Power	Frequen	cy:	-	N/A		
Antenna Orienta	tion:	Hori	zontal	Frequenc	y Range:		Ab	ove 10	SHz	
EUT	Γ Mode of C	peration:		Transn	nit Botto	m Chan,	Uprigh ¹	t Positi	ion	
Radiated Emissions, 3m 1-18GHz Horizontal Polarity 90 80		:			— Pea	rected Averag k Limit Level rected Peak R	8	PROFESS T E S T	SIONAL	
<u>+</u>										
(170 m/a γ m/a						_ _ _			The state of the s	
ВµV	and the state of t									
30	the Market of the Parket									2
and the body of the same	Carlett State of Carlette Stat		F.	requency	E	10G JT: TC1			180	T.

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

		Pr	ofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emiss Hz to 40 GHz" (incorporate		-		ical and	l
n accordance with:	FCC Pa Limits	rt 15.209 -	Code of Federal Regula	ntions Part 47, Subpart C - Ir	ntention	al Radiators,	Radiated	d Emiss	ion
Section:	15.209	•							
Γest Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	nic		EUT Part #:	None				
Project Number:	16270)-15		Test Technician:	Eric Li	ifsey			
Purchase Order #:	Not L	isted		Supervisor:	Rob N	AcCollough	า		
Equip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Freque	ncy:	-	N/A		
	•		\$4 1 1	5		A I.	ove 1G	Н	
Antenna Orientat	ion:		Vertical	Frequency Range	e:	At	JOVE 10		
EUT Professional Testin	Mode o	of Operati		Transmit Bo	ottom C	Chan, Side			
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M	Mode o	nc		Transmit Bo	ottom C Average Lin Corrected A Peak Limit I	Chan, Side		1	
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80 (m/A) 70 60 60 60	Mode o	nc		Transmit Bo	ottom C Average Lin Corrected A Peak Limit I	Chan, Side nit Level verage Reading Level	Positio	1	
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80 (III) 70 70 40 90 10 10 10 10 10 10 10 10 10 10 10 10 10	Mode o	nc		Transmit Bo	ottom C Average Lin Corrected A Peak Limit I	Chan, Side nit Level verage Reading Level	Positio	1	
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80 (III 70 70 70 70 189 0 60 193 40 30	Mode o	nc	on:	Transmit Bo	ottom C Average Lin Corrected A Peak Limit I	it Level verage Reading Level eak Reading	Positio	IONAL	

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

		Pr	ofessional Te	esting, EMI, Inc.					
Fest Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated		-		rical and	i
n accordance with:	FCC Pa	art 15.209 -	Code of Federal Regula	itions Part 47, Subpart C - Int	tentiona	l Radiators,	Radiate	d Emiss	ion
Section:	15.209	9							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	onic		EUT Part #:	None				
Project Number:	16270	0-15		Test Technician:	Eric Li	fsey			
Purchase Order #:	Not L	isted		Supervisor:	Rob N	1cCollough	า		
Equip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	ісу:	-	N/A		
Antenna Orientat	tion:		Horizontal	Frequency Range:	:	Ak	ove 10	3Hz	
EUT	Mode o	of Operation	on:	Transmit Dat			D:+:-	n	
Professional Testin Radiated Emissions, 3m	ng, EMI, Iı	· · · · · · · · · · · · · · · · · · ·	UII.		erage Limi		Positio		
Radiated Emissions, 3m 1-18 GHz Horizont al Polarity 90 80	ng, EMI, In Distance	nc		— Avo	erage Limi rrected Av ak Limit L	it Level erage Reading	PROFESS		_
Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 70	ng, EMI, In Distance	nc		— Avo	erage Limi rrected Av ak Limit L	it Level erage Reading evel			
Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 70 40 70 60 90 90 90 90 90 90 90 90 90 90 90 90 90	ng, EMI, In Distance	nc		— Avo	erage Limi rrected Av ak Limit L	it Level erage Reading evel			
Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 80 60 70 40 50 80 40 30	ng, EMI, In Distance	nc		— Avo	erage Limi rrected Av ak Limit L	it Level erage Reading evel			
Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 70 40 70 60 90 90 90 90 90 90 90 90 90 90 90 90 90	ng, EMI, In Distance	nc		— Avo	erage Limi rrected Av ak Limit L rrected Pe	it Level erage Reading evel			

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

	Pr	ofessional Te	esting, EMI, Inc.					
Fact Mathad:			ement of Radio-Noise Emission Hz to 40 GHz" (incorporated			_	rical and	ł
n accordance with: FCC Limit		Code of Federal Regula	ations Part 47, Subpart C - In	tentiona	l Radiators,	. Radiate	d Emiss	sion
Section: 15.2	09							
Test Date(s): 9/6	/2014		EUT Serial #:	None				
Customer: Het	ronic		EUT Part #:	None				
Project Number: 162	70-15		Test Technician:	Eric Lif	fsey			
Purchase Order #: Not	Listed		Supervisor:	Rob N	1cColloug	h		
Equip. Under Test: TC1			Witness' Name:	None				
Radia	nted Emissio	ons Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltage:	3.3	VDC	EUT Power Frequen	icy:	-	N/A		
Antenna Orientation:		Vertical	Frequency Range	:	Al	bove 10	GHz	
EUT Mode	of Operati	on:	Transmit Bo	ttom C	han, End	Positio	n	
1-18 GHz Vertical Polarity Measured Emi	ssio ns			ak Limit L rrected Pe	evel ak Reading	PROFESS T E S T	SIONAL	
80 Field Strength (d Bµ V/m) (a Bµ V/m) (b Q Bµ V/m) (b Q Bµ V/m) (b Q Bµ V/m) (c Q								
20 Streagth (d Bµ Vm)		de controlle que primer de la controlle que prim	equency E	EUT: TC1	, athur		186	ì

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

		Pı	rofessional [*]	Testing, I	EMI, Inc.					
Test Method:			: "Methods of Meas ent in the Range of					_	rical and	d
n accordance with:	FCC Par Limits	t 15.209 -	Code of Federal Reg	ulations Part 4	7, Subpart C - In	tentiona	al Radiators,	, Radiate	d Emis	sion
Section:	15.209									
Test Date(s):	9/6/20)14		EUT Seria	al #:	None				
Customer:	Hetror	nic		EUT Part	#:	None				
Project Number:	16270-	·15		Test Tech	nnician:	Eric Li	fsey			
Purchase Order #:	Not Lis	sted		Supervise	or:	Rob N	/lcColloug	h		
quip. Under Test:	TC1			Witness'	Name:	None				
	Radiate	d Emissio	ons Test Results [ata Sheet			Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT P	ower Frequer	icy:	-	N/A		
Antenna Orientat	tion:		Horizontal	Fred	quency Range	:	Al	bove 10	GHz	
EUT	Mode of	Operati	on:		Transmit Bo	ttom C	han. End	Positio	n	
1-18GHz Horizontal Polarity 90 80 80 90 90 60 90 90 90 90 90 90 9						ak Limit L	ak Reading	PROFES	SIONAL	
30 G	t mis the legacity			Frequency		EUT: TC1	10 G		180	ŝ

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Table 8.3.9: TX Mode, Above 1 GHz, Vertical Polarity, Mid Channel, Upright

		Pr	ofessional T	esting, EMI, Inc	.				
Test Method:				ement of Radio-Noise Emis kHz to 40 GHz" (incorporat			_	rical and	d
n accordance with:	FCC Part 1	15.209 -	Code of Federal Regu	ations Part 47, Subpart C -	Intention	al Radiators	, Radiate	d Emiss	sion
Section:	15.209								
Test Date(s):	9/6/201	.4		EUT Serial #:	None				
Customer:	Hetroni	С		EUT Part #:	None				
Project Number:	16270-1	5		Test Technician:	Eric Li	ifsey			
Purchase Order #:	Not List	ed		Supervisor:	Rob N	/lcColloug	h		
Equip. Under Test:	TC1			Witness' Name:	None				
	Radiated	Emissic	ons Test Results Da	nta Sheet		Page:	1	of	1
EUT Line Voltage	:	3.3	VDC	EUT Power Frequ	ency:	-	N/A		
Antenna Orientation	on:		Vertical	Frequency Ran	ge:	Al	bove 10	GHz	
EUT I	Mode of 0	Operation	on:	Transmit I	Mid Char	ı, Upright	Positio	n	
Professional Testing, Radiated Emissions, 3m Di				$\overline{}$	Average Lim Corrected Av	nit Level verage Reading			
Radiated Emissions, 3m Di 1-18GHz Vertical Polarity Meas 90 80	stance					verage Reading Level	PROFES	SIONAL	
Radiated Emissions, 3m Di 1-18GHz Vertkal Polarity Meas 90 80	stance				Corrected Av Peak Limit I	verage Reading Level		SIONAL	
Radiated Emissions, 3m Di 1-18GHz Vertical Polarity Meas 90 80 70 60 60 60	stance		Market and a section of		Corrected Av Peak Limit I	verage Reading Level		SIONAL	
Radiated Emissions, 3m Di 1-18GHz Vertical Polarity Meas 90 80	stance				Corrected Av Peak Limit I	verage Reading Level		SIONAL	
Radiated Emissions, 3m Di 1-18GHz Vertical Polarity Meas 90 80 80 60 70 50 40 40 40	stance				Corrected Ar Peak Limit I Corrected Pr	verage Reading Level		SIONAL 18	G

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8.3.10 TX Mode, Above 1 GHz, Horizontal Polarity, Mid Channel, Upright

Equipment in the Range of 9 k	Supervisor: Rol Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range:	reference, see §15.38). ional Radiators, Radiated Em ine ine c Lifsey b McCollough ine Page: 1 of - N/A Above 1GHz	
d Emissions Test Results Da 3.3 VDC Horizontal	EUT Serial #: No EUT Part #: No Test Technician: Eric Supervisor: Rol Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	ne ne c Lifsey b McCollough ne Page: 1 of - N/A Above 1GHz	
d Emissions Test Results Da 3.3 VDC Horizontal	EUT Part #: No Test Technician: Eric Supervisor: Rol Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	ne c Lifsey b McCollough ne Page: 1 of - N/A Above 1GHz nan, Upright Position	1
d Emissions Test Results Da 3.3 VDC Horizontal	EUT Part #: No Test Technician: Eric Supervisor: Rol Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	ne c Lifsey b McCollough ne Page: 1 of - N/A Above 1GHz nan, Upright Position	1
d Emissions Test Results Da 3.3 VDC Horizontal	Test Technician: Eric Supervisor: Rol Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	c Lifsey b McCollough ne Page: 1 of - N/A Above 1GHz nan, Upright Position	1
Emissions Test Results Da 3.3 VDC Horizontal	Supervisor: Rol Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	b McCollough ne Page: 1 of - N/A Above 1GHz nan, Upright Position	1
Emissions Test Results Da 3.3 VDC Horizontal	Witness' Name: No ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	Page: 1 of - N/A Above 1GHz nan, Upright Position	1
3.3 VDC Horizontal	ta Sheet EUT Power Frequency: Frequency Range: Transmit Mid Ch	Page: 1 of - N/A Above 1GHz nan, Upright Position	1
3.3 VDC Horizontal	EUT Power Frequency: Frequency Range: Transmit Mid Ch	- N/A Above 1GHz	
Horizontal	Frequency Range: Transmit Mid Ch	Above 1GHz nan, Upright Position	
	Transmit Mid Ch	nan, Upright Position	
peration:			
•			
	— Peak Lin	ed Average Reading nit Level ed Peak Reading PROFESSIONAL	
	and the second s		
A STATE OF THE PARTY OF THE PAR	and the latest and th		
		10G	8 G
F	requency EUT: TO		
EUT Mode: Transmit Ch 8 EUT Power: Battery EUT Position: Upright	· · · · · · · · · · · · · · · · · · ·		
	EUT Mode: Transmit Ch 8 EUT Power: Battery EUT Position: Upright	EUT Mode: Transmit Ch 8 Project EUT Power: Battery EUT Position: Upright Client: 1	Frequency EUT: TC1 EUT Mode: Transmit Ch 8 Project Number: 16270-15 EUT Power: Battery

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8.3.11 TX Mode, Above 1 GHz, Vertical Polarity, Mid Channel, Side

		Pr	rofessional Te	esting, EMI, Inc.					
est Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated		-		rical and	i
n accordance with:	FCC Pa Limits	rt 15.209 -	Code of Federal Regula	itions Part 47, Subpart C - Int	tentiona	l Radiators,	Radiate	d Emis	io
Section:	15.209)							
Test Date(s):	9/6/2	014		EUT Serial #:	None				
Customer:	Hetro	nic		EUT Part #:	None				
Project Number:	16270)-15		Test Technician:	Eric Lif	fsey			
Purchase Order #:	Not Li	isted		Supervisor:	Rob M	lcCollough	า		
Equip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Da	ta Sheet		Page:	1	of	
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	icy:	-	N/A		
Antenna Orienta	tion:		Vertical	Frequency Range	:	Ak	ove 10	ЭНz	
Professional Testin Radiated Emissions, 3m	ng, EMI, In Distance		on:	▽ Coi	erage Limit	t Level erage Reading	osition		_
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80	ng, EMI, In Distance	nc	on:	— Avo	erage Limit	t Level erage Reading evel	PROFESS	SIONAL	_
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80 6 70	ng, EMI, In Distance	nc	on:	— Avo	erage Limit rrected Ave ak Limit Le	t Level erage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80 60 40 60 40 50 80 30	ng, EMI, In Distance	nc	United States of the States of	— Avo	erage Limit rrected Ave ak Limit Le	t Level erage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Polarity M 90 80 60 60 10 10 10 10 10 10 10 10 10 10 10 10 10	ng, EMI, In Distance	nc		— Ave ✓ Coi — Per — Coi	erage Limit rrected Ave ak Limit Le rrected Pea	t Level erage Reading evel		SIGNAL . N G	

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8.3.12 TX Mode, Above 1 GHz, Horizontal Polarity, Mid Channel, Side

		P	rofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated				ical and	I
n accordance with:	FCC Pa	art 15.209 -	Code of Federal Regula	ations Part 47, Subpart C - In	tentiona	al Radiators,	Radiate	d Emiss	ion
Section:	15.209	9							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	onic		EUT Part #:	None				
Project Number:	16270	0-15		Test Technician:	Eric Li	fsey			
Purchase Order #:	Not L	isted		Supervisor:	Rob N	/cCollough	า		
quip. Under Test:	TC1			Witness' Name:	None				
	Radiat	ed Emissi	ons Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	ncy:	-	N/A		
Antenna Orientat	tion:		Horizontal	Frequency Range	:	Ak	ove 10	ЭНz	
FLIT			_						
Professional Testin Radiated Emissions, 3m	ng, EMI, In Distance		ion:	— Av. ▽ Co	erage Lim	verage Reading	osition		
Professional Testin Radiated Emissions, 3m 1-18GHz Horizontal Polarity	ng, EMI, In Distance	nc		— Av ▽ Co — Pe	erage Lim orrected Av	it Level verage Reading	PROFESS	SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHz Horizontal Polarity	ng, EMI, In Distance	nc	ion:	— Av ▽ Co — Pe	erage Lim orrected Av	it Level verage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHz Horizontal Polarity 90 80 70 60 70 40 40	ng, EMI, In Distance	nc		— Av ▽ Co — Pe	rerage Lim prrected Av ak Limit L prrected Pe	it Level verage Reading evel		SIONAL	

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8.3.13 TX Mode, Above 1 GHz, Vertical Polarity, Mid Channel, End

		Pı	ofessional To	esting, EMI, Inc.				
Test Method:				ement of Radio-Noise Emissi Hz to 40 GHz" (incorporated		•		i
n accordance with:	FCC Pa Limits	rt 15.209 -	Code of Federal Regula	ations Part 47, Subpart C - In	tentional Ra	diators, Radiate	ed Emiss	ion
Section:	15.209	•						
Test Date(s):	9/6/2	2014		EUT Serial #:	None			
Customer:	Hetro	nic		EUT Part #:	None			
Project Number:	16270)-15		Test Technician:	Eric Lifsey			
Purchase Order #:	Not L	isted		Supervisor:	Rob McCo	ollough		
Equip. Under Test:	TC1			Witness' Name:	None			
	Radiate	ed Emissio	ons Test Results Da	ta Sheet	Р	age: 1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequer	ncy:	- N/A		
Antenna Orientat	ion:		Vertical	Frequency Range):	Above 1	GHz	
EUT	Mode o	of Operati	on:	Transmit I	Mid Chan, I	End Position		
Radiated Emissions, 3m I 1-18 GHz Vertical Polarity Me		ns		— Pe	orrected Average eak Limit Level	, and the second second	2122121	
80	easured Emissio				orrected Peak Re	ading TES	T I N 6	
80	easured Emissio				prected Peak Re	ading	SIDOAL	
80	easured Emissio				prected Peak Re	ading	SUCAL	
90 80 80 90 90 90 90 90 90 90 90 90 90 90 90 90	easured Emissio			Co	prected Peak Re	ading		
80	easured Emissio				prected Peak Re	ading		
90 80 80 70 90 90 90 90 90 90 90 90 90 90 90 90 90	easured Emissio				prected Peak Re	ading		
90 80 80 80 Grand Paris Space	Laured Emissio				10G	ading	180	
90 80 80 70 90 90 90 90 90 90 90 90 90 90 90 90 90			F. EUT Mode: Transmit Ch 8	requency		adulig		

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8.3.14 TX Mode, Above 1 GHz, Horizontal Polarity, Mid Channel, End

ctronic Equipn	nent in the Range of 9 k	ment of Radio-Noise Emissic Hz to 40 GHz" (incorporated tions Part 47, Subpart C - Int EUT Serial #: EUT Part #: Test Technician:	by reference, see entional Radiators None None	§15.38).		
209 6/2014 tronic 270-15 tt Listed	Code of Federal Regula	EUT Serial #: EUT Part #:	None None	s, Radiate	d Emis	sion
6/2014 tronic 270-15 of Listed		EUT Part #:	None			
tronic 270-15 ot Listed		EUT Part #:	None			
270-15 ot Listed						
t Listed		Test Technician:				
			Eric Lifsey			
1		Supervisor:	Rob McColloug	gh		
		Witness' Name:	None			
iated Emissi	ons Test Results Dat	a Sheet	Page:	1	of	1
3.3	VDC	EUT Power Frequen	су: -	N/A		
	Horizontal	Frequency Range:		Above 10	SHz	
e of Operat	ion:	Transmit M	id Chan, End P	osition		
1 Emissions				PROFESS	SIONAL	
	and the many of the state of th	his property and the state of t	Water Company of the			
A STATE OF THE PARTY OF THE PAR	Name of the last o					
			100		100	,
	Fre	equency E			180	,
	EUT Mode: Transmit Ch 8 EUT Power: Battery	P	roject Number: 16270-15			
I e en	3.3 de of Operat II, Inc ed Emissions	Horizontal de of Operation: II, Inc e ed Emissions Free EUT Mode: Transmit Ch 8 EUT Power: Battery EUT Position: End	3.3 VDC EUT Power Frequency Range: the of Operation: Transmit N II, Inc et de Emissions Frequency Frequency EUT Mode: Transmit Ch 8 EUT Power: Battery EUT Position: End	3.3 VDC EUT Power Frequency: - Horizontal Frequency Range: A de of Operation: Transmit Mid Chan, End F II, Inc e e Corrected Average Limit Level Corrected Average Readin Peak Limit Level Corrected Peak Reading Frequency Frequency EUT: TCI EUT Power Frequency: - Average Limit Level Corrected Average Readin Peak Limit Level Corrected Peak Reading	3.3 VDC EUT Power Frequency: - N/A Horizontal Frequency Range: Above 10 de of Operation: Transmit Mid Chan, End Position UI, Inc end Emissions Peak Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading Project Number: 16270-15 EUT Power: Battery EUT Position: End Project Number: 16270-15 Client: Hetronic	3.3 VDC EUT Power Frequency: - N/A Horizontal Frequency Range: Above 1GHz de of Operation: Transmit Mid Chan, End Position II, Inc ed the Emissions Peak Limit Level Corrected Average Reading Peak Limit Level Corrected Peak Reading Professional Frequency EUT: TC1 Project Number: 16270-15 EUT Power: Battery EUT Po

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8.3.15 TX Mode, Above 1 GHz, Vertical Polarity, High Channel, Upright

		Pı	rofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated		•	•	ical and	l
n accordance with:	FCC Pa Limits	rt 15.209 -	Code of Federal Regula	itions Part 47, Subpart C - In	tentiona	l Radiators,	Radiate	d Emiss	ion
Section:	15.209)							
Гest Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	nic		EUT Part #:	None				
Project Number:	16270)-15		Test Technician:	Eric Li	fsey			
Purchase Order #:	Not Li	isted		Supervisor:	Rob N	1cCollough	1		
quip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	ncy:	-	N/A		
Antenna Orientat	tion:		Vertical	Frequency Range	:	Ab	ove 1G	Hz	
Professional Testin	ng, EMI, In	of Operati	on:		erage Limi	it Level	Position	1 2	
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Pola rity Mo 90 80 60 40 60 40 60 60 60 60 60 60 60 60 60 60 60 60 60	ng, EMI, In Distance	nc	on:	— Av ▽ Co — Pe:	erage Limi orrected Av	it Level erage Reading	PROFESS		
Professional Testin Radiated Emissions, 3m 1-18 GHz Vertical Polarity Mo 90 80 70 60 40 30	ng, EMI, In Distance	nc	on:	— Av ▽ Co — Pe:	erage Limi orrected Av	it Level erage Reading evel			
Professional Testin Radiated Emissions, 3m 1-18GHz Vertical Pola rity Mo 90 80 70 60 40 40 40	ng, EMI, In Distance	nc		— Av ∨ Co — Per — Co	rerage Limirerected Avak Limit L	it Level erage Reading evel			

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8.3.16 TX Mode, Above 1 GHz, Horizontal Polarity, High Channel, Upright

		Pr	rofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emissio Hz to 40 GHz" (incorporated		_		rical and	t
n accordance with:	FCC Pa	art 15.209 -	Code of Federal Regula	tions Part 47, Subpart C - Int	entional	l Radiators,	Radiate	d Emis	sion
Section:	15.20	9							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	onic			None				
Project Number:	16270	0-15		Test Technician:	Eric Lif	fsey			
Purchase Order #:	Not L	isted		Supervisor:	_	IcCollough			
quip. Under Test:	TC1			Witness' Name:	None				
	Radiat	ed Emissio	ons Test Results Da	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	су:	-	N/A		
Antenna Orientat	ion:		Horizontal	Frequency Range:	:	Ab	ove 10	3Hz	
Antenna Orientat	.1011.		110112011141	are question question gen					
EUT Professional Testin Radiated Emissions, 3m	Mode of the stance	of Operations		Transmit Top — Ave	crage Limit	, Upright P	Positio	n	
EUT Professional Testin	Mode of the stance	of Operations		Transmit Top - Ave ▽ Cor - Pea	Chan,	t Level erage Reading	PROFESS		
Professional Testin Radiated Emissions, 3m 1-18GHz Horizontal Polarity	Mode of the stance	of Operations		Transmit Top - Ave ▽ Cor - Pea	crage Limit crected Ave	t Level erage Reading			
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 60 70 40 50 84 40 30	Mode of the stance	of Operations		Transmit Top - Ave ▽ Cor - Pea	crage Limit crected Ave	t Level erage Reading			
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 7 80 60 91 50 50 50 50 50 50 50 50 50 50 50 50 50	Mode of the stance	of Operations	on:	Transmit Top	erage Limit rected Ave ak Limit Le rected Pea	t Level erage Reading			G
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 60 70 40 50 84 40 30	Mode of g, EMI, In Distance Measured Emi	of Operations assigns	on:	Transmit Top Ave Cor Pea Cor Cor Cor Cor Cor Cor Cor Co	erage Limit rrected Ave ak Limit Le crected Pea	t Level erage Reading evel ak Reading		SIONAL	

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8.3.17 TX Mode, Above 1 GHz, Vertical Polarity, High Channel, Side

		Pr	ofessional Te	sting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated		~		rical and	ł
n accordance with:	FCC Pa Limits	art 15.209 -	Code of Federal Regula	tions Part 47, Subpart C - Int	tentiona	l Radiators,	Radiate	d Emis	ion
Section:	15.209	9							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	nic		EUT Part #:	None				
Project Number:	16270)-15		Test Technician:	Eric Lif	fsey			
Purchase Order #:	Not L	isted		Supervisor:	Rob IV	1cCollough	1		
Equip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	cy:	-	N/A		
Antenna Orientat	L!		Vertical	Frequency Range:		٨h	ove 10	GHz	
Antenna Oriental	tion:		verticai	Frequency Range.	•	AU			
Professional Testin	Mode on the second of the seco			Transmit To — Ave	op Cha erage Limi rrected Avo	t Level			
EUT Professional Testin	Mode on the second of the seco	nc		Transmit To — Ave ▽ Cor — Pea	op Cha	t Level erage Reading		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18 GHz Vertical Polarity M 90 80 60 60 60 10 10 10 10 10 10 10 10 10 10 10 10 10	Mode on the second of the seco	nc		Transmit To — Ave ▽ Cor — Pea	erage Limi rrected Ava ak Limit L rrected Per	t Level erage Reading	sition	SIONAL	•
Professional Testin Radiated Emissions, 3m 1-18 GHz Vertical Polarity M 90 80 60 40 50 40 30	Mode on the second of the seco	nc	on:	Transmit To	erage Limi rrected Ava ak Limit L rrected Per	t Level erage Reading evel ak Reading	sition		•

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8.3.18 TX Mode, Above 1 GHz, Horizontal Polarity, High Channel, Side

		Pr	rofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emissic Hz to 40 GHz" (incorporated		~		rical and	ţ
n accordance with:	FCC Pa Limits	art 15.209 -	Code of Federal Regula	tions Part 47, Subpart C - Int	tentional	l Radiators,	Radiate	d Emis	ion
Section:	15.209	9							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	nic		EUT Part #:	None				
Project Number:	16270	0-15		Test Technician:	Eric Lif	sey			
Purchase Order #:	Not L	isted		Supervisor:	Rob M	lcCollough)		
quip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	су:	-	N/A		
Antenna Orientat	tion:		Horizontal	Frequency Range:		Ab	ove 10	GHz	
Professional Testin	ng, EMI, In	of Operations	on:		erage Limit		sition		
Professional Testin Radiated Emissions, 3m 1-18GHzHorizontalPolarity 90 80	ng, EMI, In Distance	nc	on:	— Ave ∨ Cor — Pes	erage Limit	t Level erage Reading evel	PROFESS	SIONAL N 6	
Professional Testin Radiated Emissions, 3m 1-18GHzHorizontalPolarity 90 80	ng, EMI, In Distance	nc	on:	— Ave ∨ Cor — Pes	erage Limit rrected Ave ak Limit Le	t Level erage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHzHorizontalPolarity 90 80	ng, EMI, In Distance	nc	on:	— Ave ∨ Cor — Pes	erage Limit rrected Ave ak Limit Le	t Level erage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHz Horizontal Polarity 90 80 70 40 90 90 40 40 40 40	ng, EMI, In Distance	nc	on:	— Ave ∨ Cor — Pes	erage Limit rrected Ave ak Limit Le	t Level erage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18GHz Horizontal Polarity 90 80 60 70 48 90 60 90 40 30	ng, EMI, In Distance	nc	on:	— Ave ∨ Cor — Pes	erage Limit rrected Ave ak Limit Le	t Level erage Reading evel		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 70 70 40 20 10 30 20 10	ng, EMI, In Distance	nc		— Ave ∨ Cor — Per — Cor	erage Limit crected Ave ak Limit Le crected Pea	t Level erage Reading evel		SIONAL SIONAL	•
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 70 70 40 40 30	ng, EMI, II Distance Measured Emis	nc		— Ave ∇ Cor — Per — Cor Squency E	erage Limit crected Ave ak Limit Le crected Pea	t Level erage Reading evel ak Reading			

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8.3.19 TX Mode, Above 1 GHz, Vertical Polarity, High Channel, End

		Pı	rofessional Te	esting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emissi Hz to 40 GHz" (incorporated				ical and	i
n accordance with:	FCC Pa	rt 15.209 -	Code of Federal Regula	ations Part 47, Subpart C - In	tention	al Radiators,	Radiate	d Emiss	ion
Section:	15.209)							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro	nic		EUT Part #:	None				
Project Number:	16270)-15		Test Technician:	Eric Li	ifsey			
Purchase Order #:	Not L	isted		Supervisor:	Rob N	/lcCollough	า		
quip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Da	ta Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequer	ncy:	-	N/A		
Antenna Orientat	tion:		Vertical	Frequency Range	e:	Ak	ove 10	Hz	
FUT	Mode	· f O · · · · · · · · ·			_	_			
Professional Testin	ng, EMI, Ir	of Operati	on:	— Av	verage Lim		sition		
Professional Testin Radiated Emissions, 3m 1-18GHzVerticalPolarity M 90 80	ng, EMI, Ir Distance	nc	on:	— Av ▽ Cc — Pe	verage Lim orrected Av	it Level verage Reading	PROFESS	SIONAL	
Professional Testin Radiated Emissions, 3m 1-18 GHz Vertical Polarity M 90 80 60 60 60 60 60 70 60 60 60 60 60 60 60 60 60 60 60 60 60	ng, EMI, Ir Distance	nc	on:	— Av ▽ Cc — Pe	verage Lim orrected Av	nit Level verage Reading Level		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18 GHz Vertical Polarity M 90 80 70 70 70 40 80 40 30	ng, EMI, Ir Distance	nc	on:	— Av ▽ Cc — Pe	verage Lim orrected Aveak Limit I corrected Pe	it Level verage Reading evel eak Reading		· N 6	
Professional Testin Radiated Emissions, 3m 1-18 GHz V ertical Polarity M 90 80 70 60 45 50 40 40	ng, EMI, Ir Distance	nc		— Av ∇ Cc — Pe — Cc	verage Lim orrected Aveak Limit I corrected Pe	nit Level verage Reading Level		SIONAL 186	

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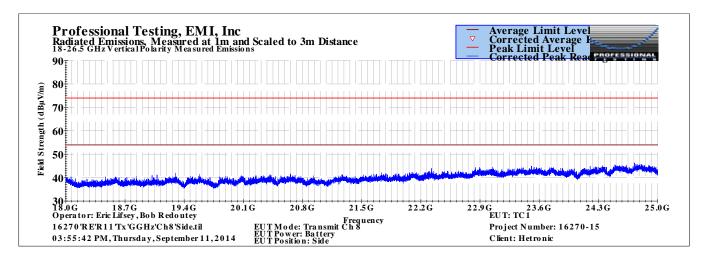
8.3.20 TX Mode, Above 1 GHz, Horizontal Polarity, High Channel, End

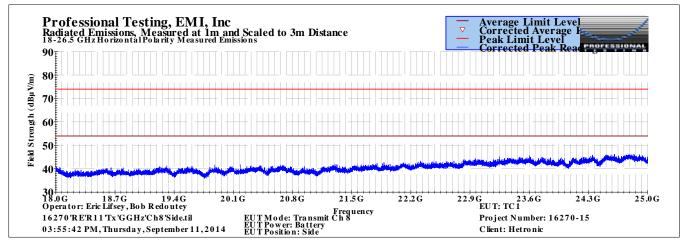
		Pr	rofessional Te	sting, EMI, Inc.					
Test Method:				ment of Radio-Noise Emission Hz to 40 GHz" (incorporated		_		rical and	t
n accordance with:	FCC Pa	FCC Part 15.209 - Code of Federal Regulations Part 47, Subpart C - Intentional Radiators, Radiated E Limits					d Emis	sion	
Section:	15.209	9							
Test Date(s):	9/6/2	2014		EUT Serial #:	None				
Customer:	Hetro			EUT Part #:	None				
Project Number:	16270	D-15		Test Technician:	Eric Lif	sey			
Purchase Order #:	Not L	isted		Supervisor:	Rob M	IcCollough)		
Equip. Under Test:	TC1			Witness' Name:	None				
	Radiate	ed Emissio	ons Test Results Dat	a Sheet		Page:	1	of	1
EUT Line Voltag	ge:	3.3	VDC	EUT Power Frequen	су:	-	N/A		
Antenna Oriental	tion: Horizontal Frequency Range:				Δh	ove 10	3Hz		
Antenna Orienta	LIOII.		110112011tai	rrequeries name.		710			
EUT Professional Testin Radiated Emissions, 3m	Mode on the state of the stance	of Operations		Transmit T — Ave	op Cha	t Level			
EUT Professional Testin	Mode on the state of the stance	of Operations		Transmit T - Ave ∨ Cor - Pea	op Cha	t Level erage Reading		SIONAL	
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 (W) 70 60 40 50 40 30	Mode on the state of the stance	of Operations		Transmit T - Ave ∨ Cor - Pea	erage Limi rrected Ave ak Limit Le rrected Pez	t Level erage Reading evel ak Reading	sition		
Professional Testin Radiated Emissions, 3m 1-18 GHz Horizontal Polarity 90 80 70 60 70 40 40 40	Mode on the stance	of Operations	on:	Transmit T Ave Cor Pea Cor	erage Limi rrected Ave ak Limit Le rrected Pez	t Level erage Reading	sition	SIONAL	

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8.3.21 TX Mode, 18 GHz to 25 GHz

No emissions were detected in this range. Measurements of the middle channel in worse-case orientation, side, are presented below.





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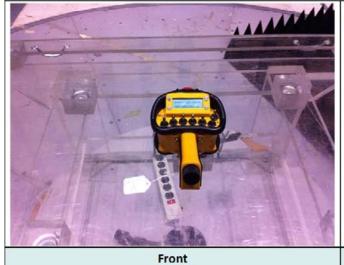
9.0 Setup Photographs

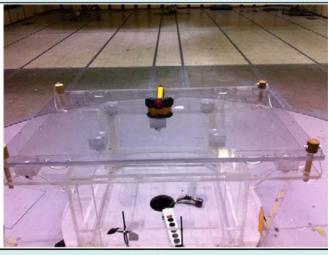
9.1 Receive Mode Spurious

Professional Testing, EMI, Inc.						
Test Method:	ANSI C63.4-2003: "Methods of	Measurement of Radio-N	oise Emissions from Low-Voltage			
rest Metriou.	Electrical and Electronic Equipn	nent in the Range of 9 kH	z to 40 GHz" (incorporated by reference			
	FCC Part 15.109 - Code of Feder	al Regulations Part 47, Su	ubpart B - Unintentional Radiators,			
In accordance with:	Radiated Emissions Limits					
Section:	15.109					
Test Date(s):	9/2/2014	EUT Serial #:	None			
Customer:	Hetronic	EUT Part #:	None			
Project Number:	16270-15	Test Technician:	Eric Lifsey			
Purchase Order #:	Not Listed	Supervisor:	Rob McCollough			
Equip. Under Test:	TC1	Witness' Name:	None			



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ront Back

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9.2 Transmit Mode Spurious, 30 MHz to 18 GHz

	Professional Te	esting, 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 referen					
n accordance with:	FCC Part 15.209 - Code of Federal Re Radiated Emissions Limits	egulations Part 47, Su	bpart C - Intentional Radiators,			
Section:	15.209					
Test Date(s):	9/6/2014	EUT Serial #:	None			
Customer:	Hetronic 16270-15	EUT Part #: Test Technician:	None			
Project Number: Purchase Order #:	Not Listed		Eric Lifsey			
Equip. Under Test:	TC1	Supervisor: Witness' Name:	Rob McCollough None			
equip. Onder Test.						
	Radiated Emissions Photograph	ns	Page: 1 of 1			
	Upright Position		Side Position			
	End Position		Closeup			

Also applies to tests of 2014-09-11.

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9.3 Transmit Mode Spurious, 18 GHz to 25 GHz

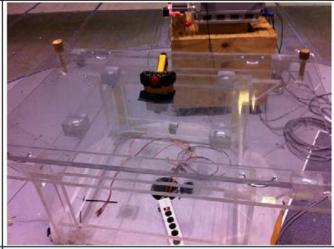
Professional Testing, EMI, Inc.					
Test Method:			oise Emissions from Low-Voltage z to 40 GHz" (incorporated by reference		
	FCC Part 15.209 - Code of	Federal Regulations Part 47, Su	ıbpart C - Intentional Radiators,		
In accordance with:	Radiated Emissions Limits	•			
Section:	15.209				
Test Date(s):	9/6/2014	EUT Serial #:	None		
Customer:	Hetronic	EUT Part #:	None		
Project Number:	16270-15	Test Technician:	Eric Lifsey		
Purchase Order #:	Not Listed	Supervisor:	Rob McCollough		
Equip. Under Test:	TC1	Witness' Name:	None		

Radiated Emissions Photographs

Page: 1

1 of





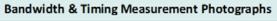
Front 18-25 GHz

Rear 18-25 GHz

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9.4 Transmit Timing and Bandwidth

	Professio	nal Testing, EMI, Inc	с.
Test Method:			oise Emissions from Low-Voltage z to 40 GHz" (incorporated by reference
	FCC Part 15.209 - Code of Fe	ederal Regulations Part 47, Su	ıbpart C - Intentional Radiators,
In accordance with:	Radiated Emissions Limits		
Section:	15.209		
Test Date(s):	9/6/2014	EUT Serial #:	None
Customer:	Hetronic	EUT Part #:	None
Project Number:	16270-15	Test Technician:	Eric Lifsey
Purchase Order #:	Not Listed	Supervisor:	Rob McCollough
Equip. Under Test:	TC1	Witness' Name:	None



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1



Front

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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 Spe	ecifications
Hetronic International	Invested Ficture printed on circuit heard
BOM Reference: ANT_F_2G4_SOLD	Inverted-F style, printed on circuit board.

- Antenna is internal only.
- Antenna is printed on circuit board.
- There is no external antenna connector.

The antenna design above satisfies the requirements of the rules.

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11.0 Equipment

11.1 Spurious Radiated Emissions 30 MHz to 25 GHz

		Profes	sional 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 accordan		ted Emissions Limi	ts				
Section:	15.20						
Test Date(s)			EUT Serial #:	None			
Customer:	Hetro		EUT Part #:	None			
Project Nun Purchase O			Test Technician: Supervisor:	Rob McCollough			
Equip. Unde		steu	Witness' Name:	None			
Equip. Onu	irest. Tel	Radiate	d Emissions Test Equipment List	None			
Til	e! Software Version	on: 4.2.A,	May 23, 2010, 08:38:52 AM				
	Test Profile:	Radia	ted Emissions_Profile Version Octob	er 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	НР	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	НР	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		

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11.2 Timing and Bandwidth Measurements

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

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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:

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^{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.

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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
nadiated Emissions	1 to 18 GHz	3 m	5.7

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End of Report

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