EMISSIONS TEST REPORT

Report Number: 102172761BOX-001
Project Number: G102172761

Report Issue Date: 09/08/2015

Product Designation: NC-220

Standards: CFR47 FCC Part 15 Subpart C 15.247:2015
CFR47 FCC Part 15 Subpart B:2015
IC RSS-247 Issue 1 May 2015
IC RSS-Gen Issue 4 November 2014
IC ICES-003 Issue 5 August 2012
IC RSS-102 Issue 5 March 2015 updated December 2010

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719

Client:
Mircom Technologies Ltd.
25 Interchange Way
Vaughan ON L4K 5W3
Canada

Report prepared by Reviewer

Vathana F. Ven / Staff Engineer, EMC

Report reviewed by

Kouma Sinn / Staff Engineer, EMC

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	
4	Description of Equipment Under Test	
5	System Setup and Method	
6	RF Output Power, Duty Cycle, and Human RF Exposure (CFR47 FCC Part 15 Subpart C 15.247(b)(3), KDB 558074, IC RSS-247 Issue 1 May 2015 5.4(4), IC RSS-102 Issue 5 March 2015)	Pass
7	6 dB Bandwidth (CFR47 FCC Part 15 Subpart C 15.247(a)(2), IC RSS-247 Issue 1 May 2015 5.2, IC RSS-Gen Section 6.6, KDB 558074)	Pass
8	Peak Power Spectral Density (FCC 15:2015 Subpart C Section 15.247 (e), RSS-247 Issue 1 May 2015 5.2(2), KDB 558074)	Pass
9	Band Edge Compliance (FCC 15:2015 Subpart C Section 15.247 (d), RSS-247 Issue 1 May 2015 5.2(2), KDB 558074)	Pass
10	Transmitter Radiated Spurious Emissions (CFR47 FCC Part 15 Subpart C 15.247(d), IC RSS-247 Issue 1 May 2015 5.5, KDB 558074)	Pass
11	Digital Devices and Receiver Radiated Spurious Emissions (CFR47 FCC Part 15 Subpart B 15.109, IC RSS-Gen Sections 7.1 & IC ICES-003 Issue 5 August 2012)	Pass
--	AC Mains Conducted Emissions CFR47 FCC Part 15:2015 Subpart B Section 15.207 IC RSS-Gen Issue 3 December 2010, 7.2.2 (Table 2)	N/A, Battery Powered
12	Revision History	

* - The EUT is battery powered and does not have facility to connect to the AC mains, directly or indirectly.

3 Client Information

This EUT was tested at the request of:

Company: Mircom Technologies Ltd.
25 Interchange Way
Vaughan ON L4K 5W3
Canada
Contact: Mr. Mike Mahoney
Telephone: (905) 660-4655
Fax: (905) 695-3538
Email: mmahoney@mircomgroup.com

4 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Zigbee Wireless Sensor	Mircom Technologies	NC-220	00032 Transmit mode
Zigbee Wireless Sensor	Mircom Technologies	NC-220	00031 Normal mode
Zigbee Wireless Sensor	Mircom Technologies	NC-220	A00068 Transmit mode

Receive Date:	06/04/2012, 07/30/2015	Start Date:	09/14/2012
Received Condition:	Good	Complete date:	09/08/2015
Type:	Prototype		

Description of Equipment Under Test (provided by client)
The NC-220 is a Wireless sensor with Zigbee wireless application. The Zigbee transceiver operates in the 2400-2483.5 MHz band from 2405-2480MHz using an integral antenna.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3VDC	N/A	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	The device was in transmit mode, channels 11 (2405 MHz), 18 (2440 MHz), 26 (2480 MHz)
2	The device was also tested in receive mode

5 System Setup and Method

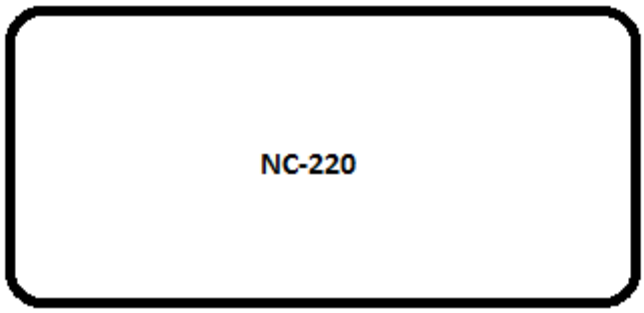
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	None				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	HP	350	N/A
AC adapter	Direct Plug-in	35-D12-200	N/A

5.1 Method:

Configuration as required by ANSI C63.4:2014, ANSI C63.10:2013 and KDB 558074.

5.2 EUT Block Diagram:



6 RF Output Power, Duty Cycle, and Human RF Exposure

6.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C Section 15.247, *KDB 558074*, ANSI C63.10, RSS-102, FCC Part 2 and KDB 447498, and RSS-247.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

Software Utilized:

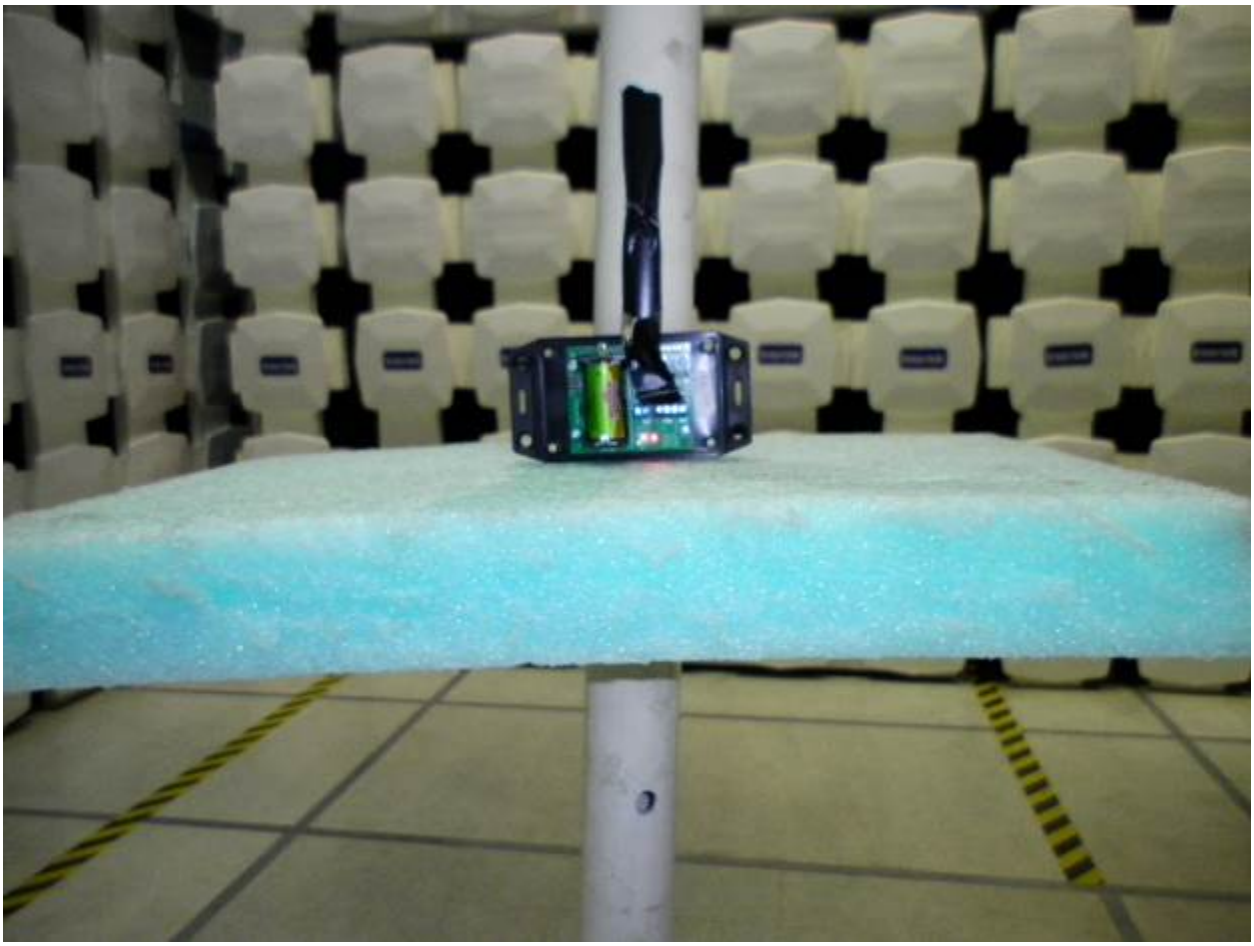
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

6.3 Results:

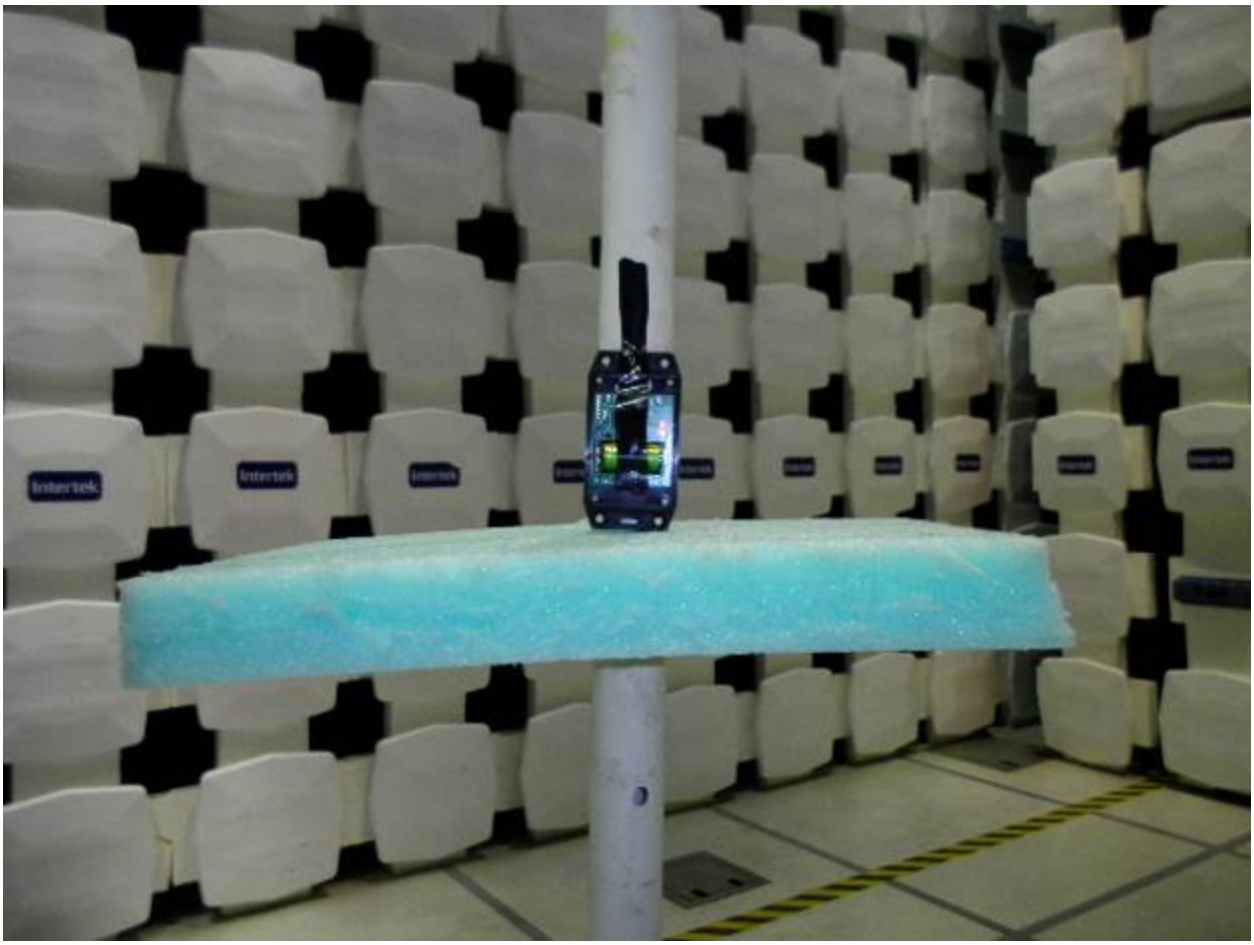
The sample tested was found to Comply with both the FCC and Industry Canada requirements. The EIRP must not exceed 30 dBm. The RSS-102 Issue 5 Human Exposure Limit at 2.48 GHz = 5.47 W/m^2.

6.4 Setup Photographs:

Axis1 orientation



Axis 2 orientation



Axis 3 orientation

6.5 Test Data:

RF Output Power

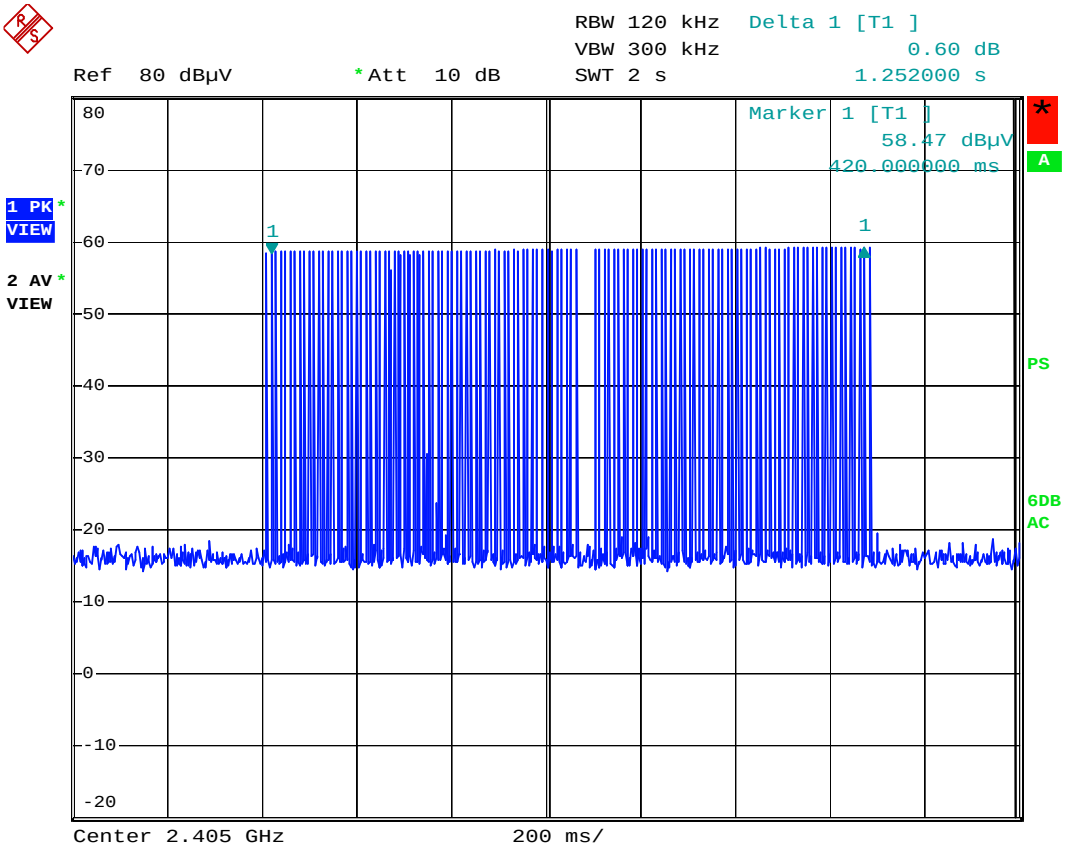
Company: Mircom Technologies Ltd. Antenna & Cables: HF Bands: N, LF, HF, SHF
Model #: NC-220 Antenna: ETS001 01-14-16.txt ETS001 01-14-16.txt
Serial #: A00068 Cable(s): 145-416 3m Track B 1-15GHz Cable 10-04-15.txt NONE.
Engineers: Vathana Ven Location: 10M Barometer: DAV004 Filter: NONE
Project #: G102179505 Date(s): 08/28/15
Standard: FCC Part 15 Subpart C 15.247 Temp/Humidity/Pressure: 21 deg C 51% 1011 mB
Receiver: R&S ESI (145-128) 03-14-2016 Limit Distance (m): 3
PreAmp: 145014 05-13-16.txt Test Distance (m): 3
PreAmp Used? (Y or N): N Voltage/Frequency: Battery powered Frequency Range: Fundamental

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

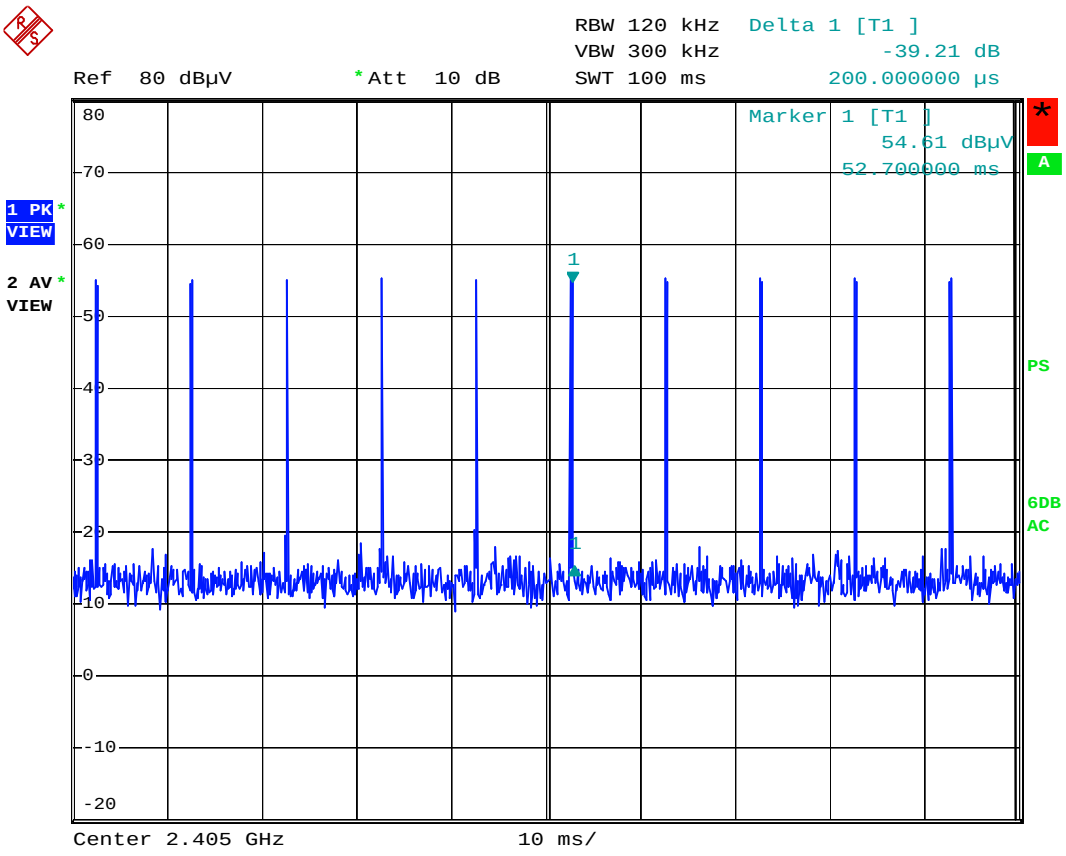
Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(m)	Limit dB(m)	Margin dB	Bandwidth	FCC	IC
Note: RF Output Power													
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP													
CH11 - 2405MHz, No pre-amp, X-Axis (EUT Flat)													
PK	H	2405.000	50.49	31.97	5.87	0.00	0.00	-6.89	30.00	-36.87	5/10MHz		
PK	V	2405.000	46.20	31.97	5.87	0.00	0.00	-11.18	30.00	-41.18	5/10MHz		
CH11 - 2405MHz, No pre-amp, Y-Axis (EUT on its long side)													
PK	H	2405.000	49.83	31.97	5.87	0.00	0.00	-7.55	30.00	-37.55	5/10MHz		
PK	V	2405.000	50.88	31.97	5.87	0.00	0.00	-6.50	30.00	-36.50	5/10MHz		
CH11 - 2405MHz, No pre-amp, Z-Axis (EUT on its short side)													
PK	H	2405.000	48.63	31.97	5.87	0.00	0.00	-8.75	30.00	-38.75	5/10MHz		
PK	V	2405.000	48.24	31.97	5.87	0.00	0.00	-9.14	30.00	-39.14	5/10MHz		
CH18 - 2440MHz, No pre-amp, X-Axis (EUT flat)													
PK	H	2440.000	50.54	32.11	5.92	0.00	0.00	-6.65	30.00	-36.65	5/10MHz		
PK	V	2440.000	47.56	32.11	5.92	0.00	0.00	-9.63	30.00	-39.65	5/10MHz		
CH18 - 2440MHz, No pre-amp, Y-Axis (EUT on its long side)													
PK	H	2440.000	48.39	32.11	5.92	0.00	0.00	-8.80	30.00	-38.80	5/10MHz		
PK	V	2440.000	50.13	32.11	5.92	0.00	0.00	-7.06	30.00	-37.06	5/10MHz		
CH18 - 2440MHz, No pre-amp, Z-Axis (EUT on its short side)													
PK	H	2440.000	49.31	32.11	5.92	0.00	0.00	-7.88	30.00	-37.88	5/10MHz		
PK	V	2440.000	49.18	32.11	5.92	0.00	0.00	-8.01	30.00	-38.01	5/10MHz		
CH26 - 2480MHz, No pre-amp, X-Axis (EUT flat)													
PK	H	2480.000	52.00	32.26	5.98	0.00	0.00	-4.98	30.00	-34.98	5/10MHz		
PK	V	2480.000	47.56	32.26	5.98	0.00	0.00	-9.42	30.00	-45.42	5/10MHz		
CH26 - 2480MHz, No pre-amp, Y-Axis (EUT on its long side)													
PK	H	2480.000	52.19	32.26	5.98	0.00	0.00	-4.79	30.00	-36.79	5/10MHz		
PK	V	2480.000	51.90	32.26	5.98	0.00	0.00	-5.08	30.00	-35.08	5/10MHz		
CH26 - 2480MHz, No pre-amp, Y-Axis (EUT on its short side)													
PK	H	2480.000	49.45	32.26	5.98	0.00	0.00	-7.53	30.00	-37.53	5/10MHz		
PK	V	2480.000	49.04	32.26	5.98	0.00	0.00	-7.94	30.00	-37.94	5/10MHz		

Duty Cycle

The worst-case duty cycle for typical EUT operation is shown below. The pulse train of the EUT extends beyond 100 ms as shown in the following plot.



Date: 17.SEP.2012 11:49:42



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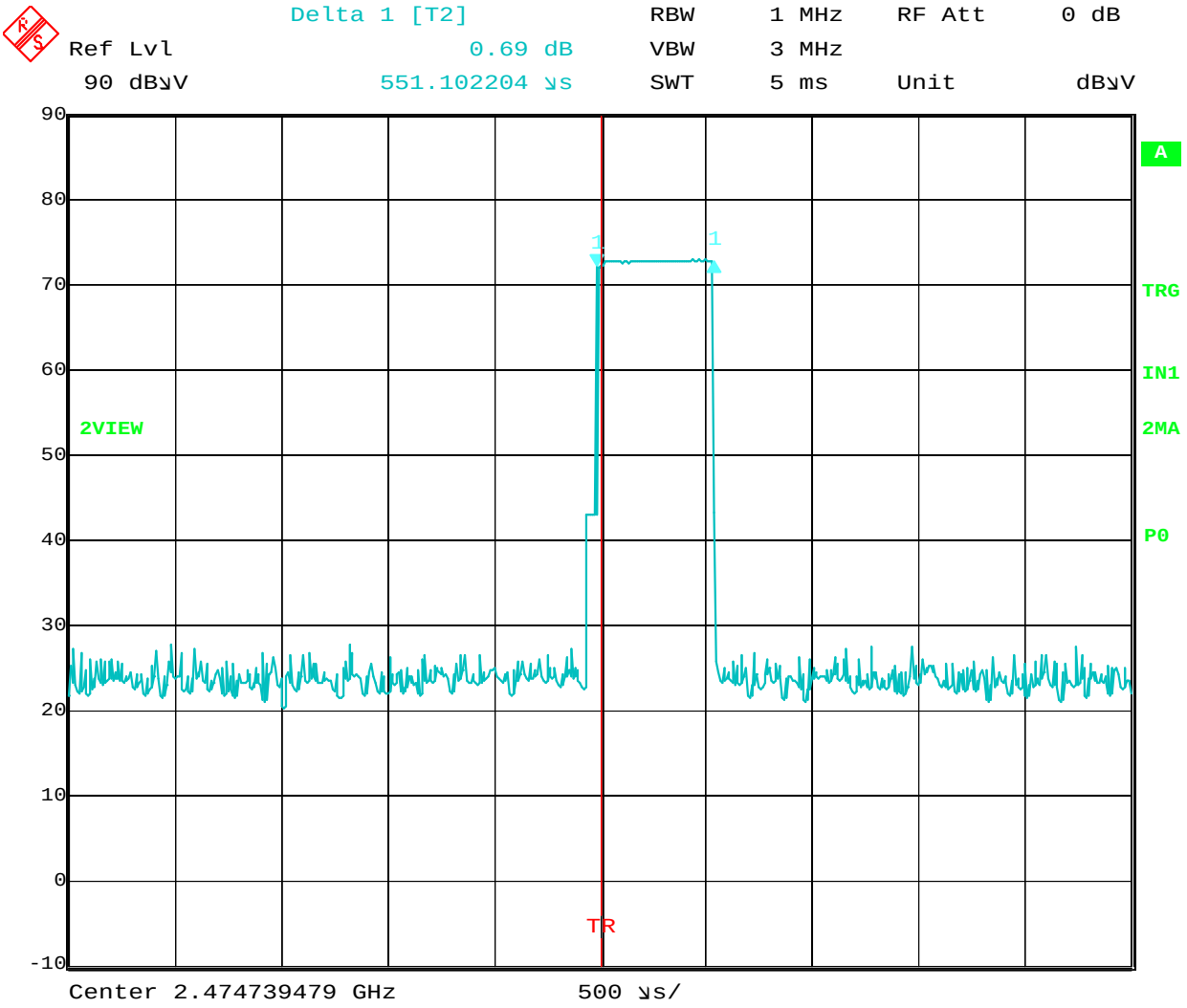


Date: 22.SEP.2012 20:16:41

There were 10 pulse trains in 100 ms period and the length of each pulse train was 551.102 µS. The duty cycle is therefore, 5.511 ms in a 100ms period, or 5.511%, for a duty cycle correction factor of 25.18 dB.

RSS-102 Issue 5 Exposure Limits:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

1.1 Test Procedure

The EUT was measured in a radiated fashion. The RF output power was measured using a resolution bandwidth which encompassed the entire emission bandwidth. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of RSS-Gen 4.6. .

1.2 Results:

RSS-102 Issue 5 Exposure Limit at 2.48 GHz = 5.47 W/m^2

Maximum EIRP measured at 2480 MHz -4.79 dBm or 0.332 mW

Power Density = EIRP/(4*pi*20^2)

Power Density = 0.00006604 mW/cm^2

Power Density = 0.0006604 W/m^2

The calculated maximum power density at 20 cm distance is less than the limit for general population / uncontrolled exposure. The device has also met the higher FCC RF exposure limits.

Test Personnel:	Vathana Ven VSV	Test Date:	09/14/2012, 08/28/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C 15.247; IC RSS-247	Test Levels:	See tables
Input Voltage:	3V Fresh battery		
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Ambient Temperature:	21 ºC
		Relative Humidity:	51 %
		Atmospheric Pressure:	1011 mbars

Deviations, Additions, or Exclusions: None

7 6 dB Bandwidth & 99% Power Bandwidth

7.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C Section 15.247, *KDB 558074*, ANSI C63.10, and RSS-247.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

Software Utilized:

Name	Manufacturer	Version
None		

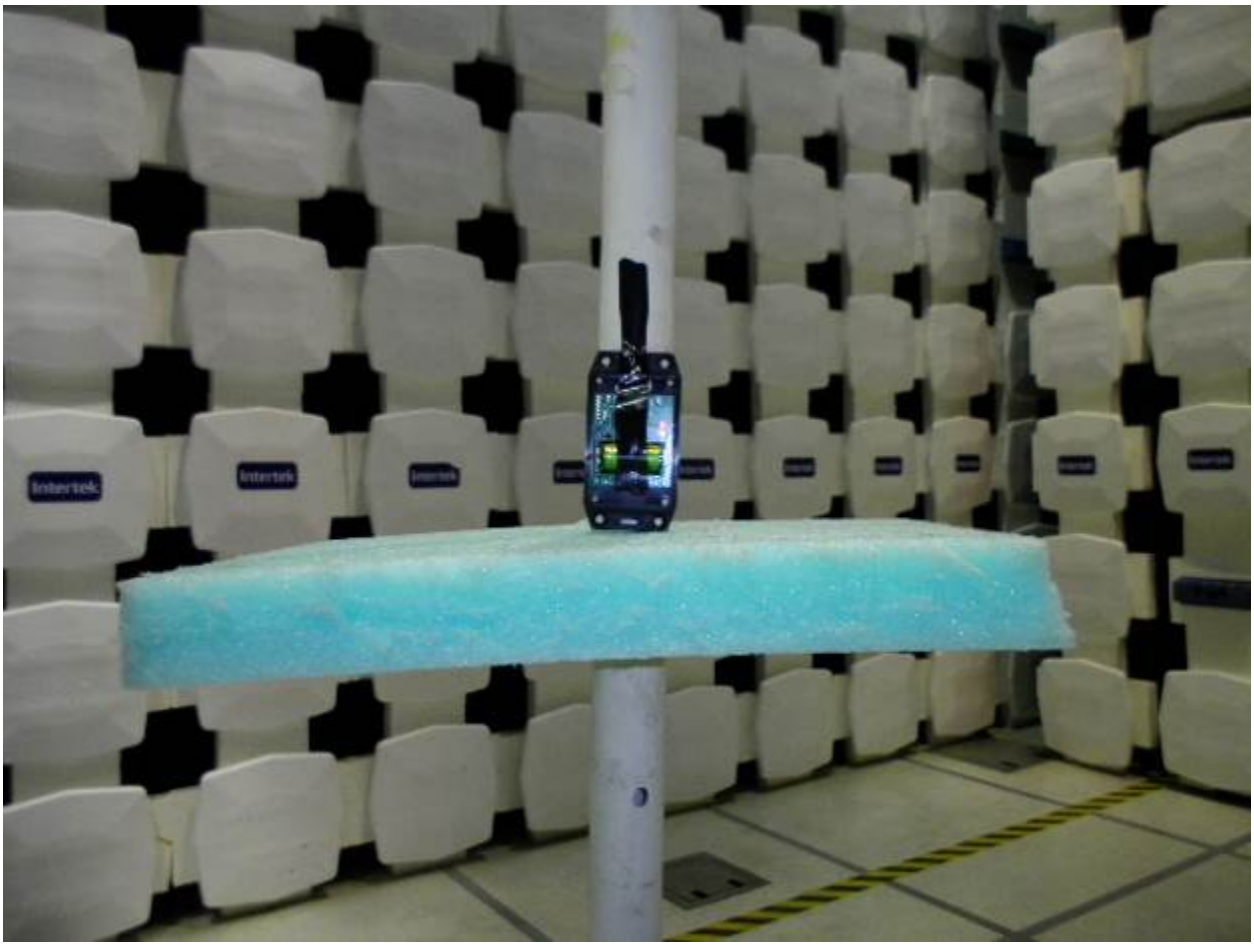
7.3 Results:

The 99% power bandwidth, or 6 dB bandwidth, must not be less than 500 kHz. The sample tested was found to Comply.

Channel	6 dB Bandwidth	99% Power Bandwidth
Channel 11 (2405 MHz)	1.488 MHz	3.151 MHz
Channel 18 (2440 MHz)	1.507 MHz	2.975 MHz
Channel 26 (2480 MHz)	1.527 MHz	2.975 MHz

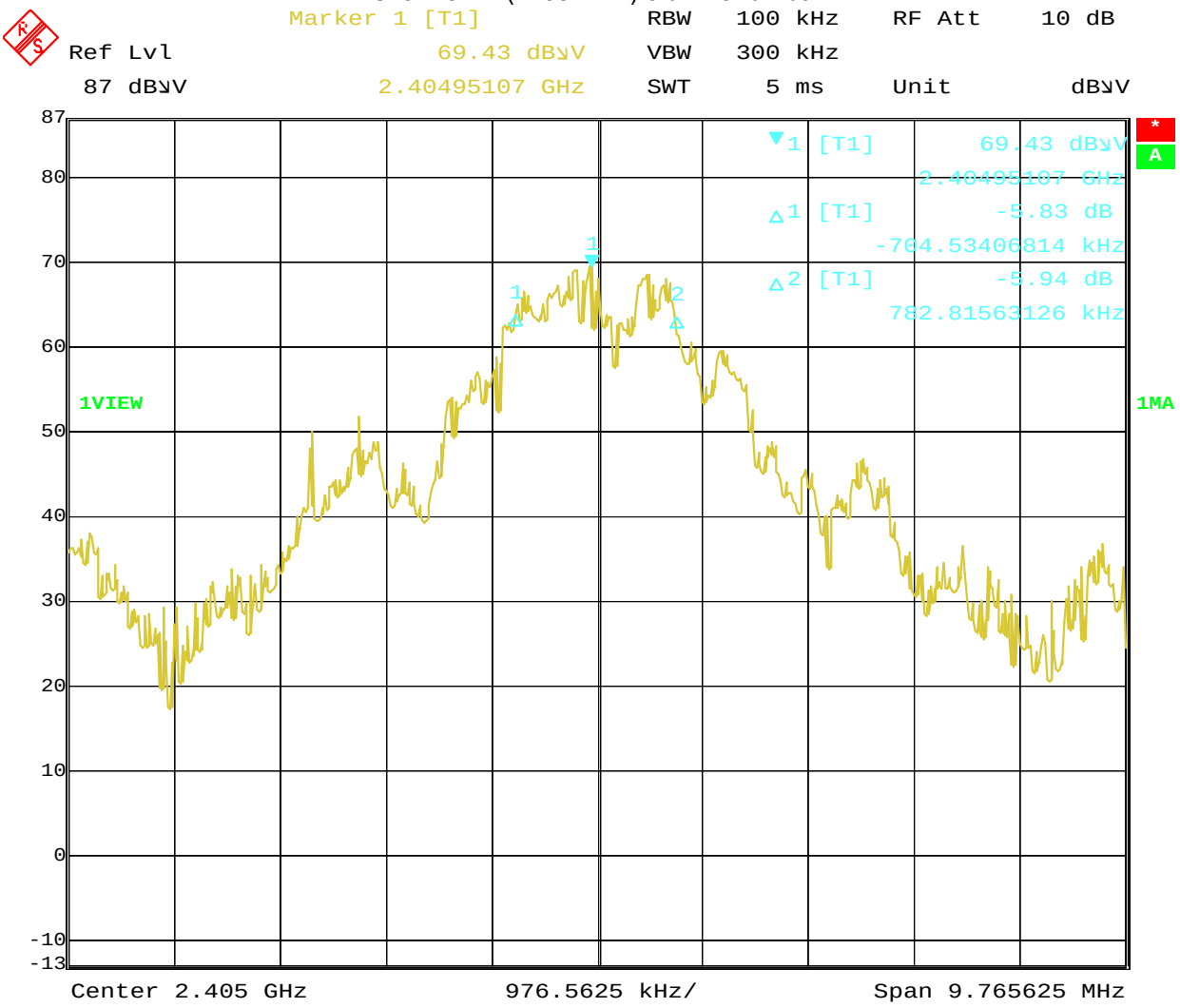
Plots were taken using an RBW of ~1-5% of the measured emission bandwidth, per KDB 558074 and IC RSS-Gen 6.6.

7.4 Setup Photograph:

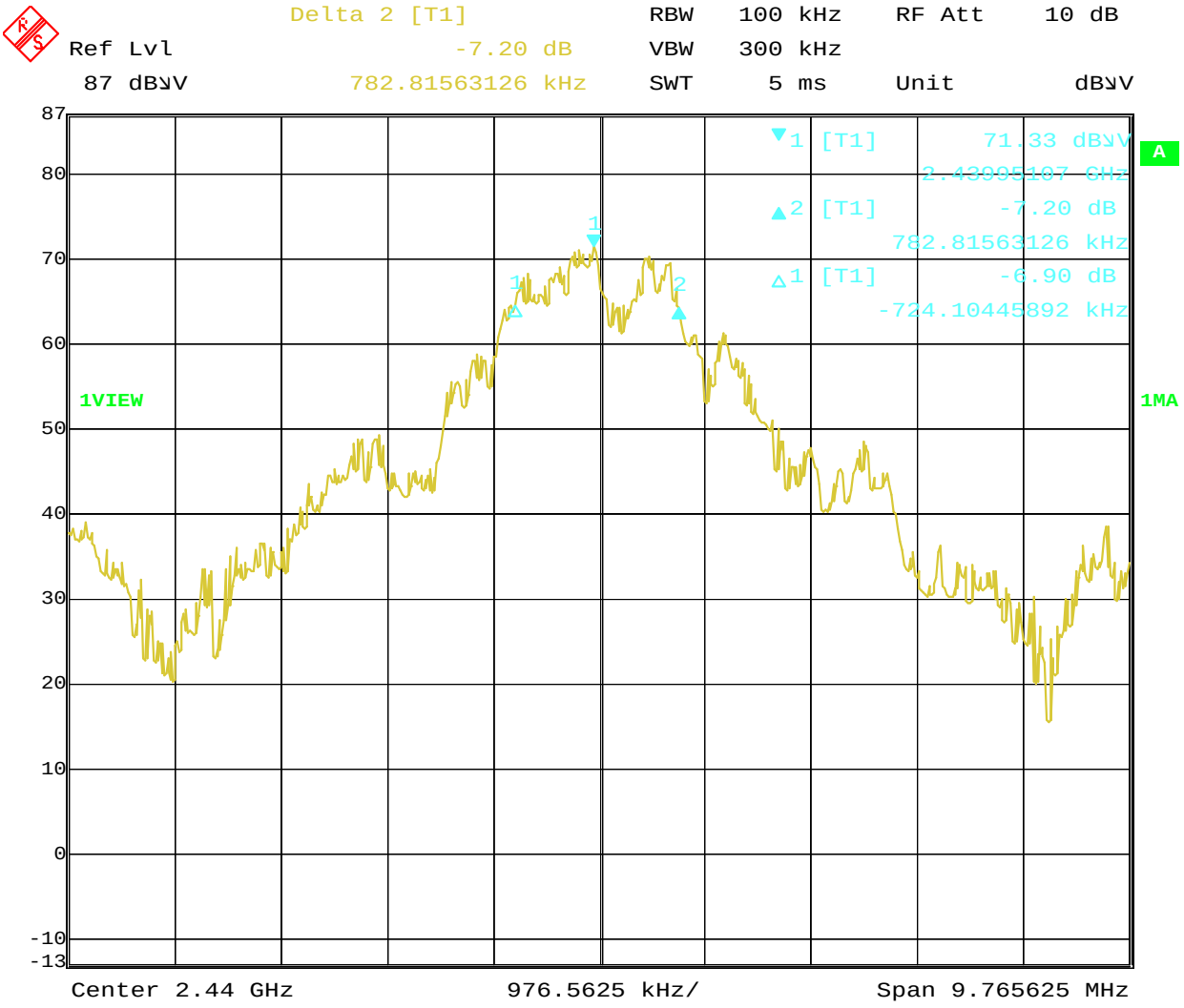


7.5 Plots/Data:

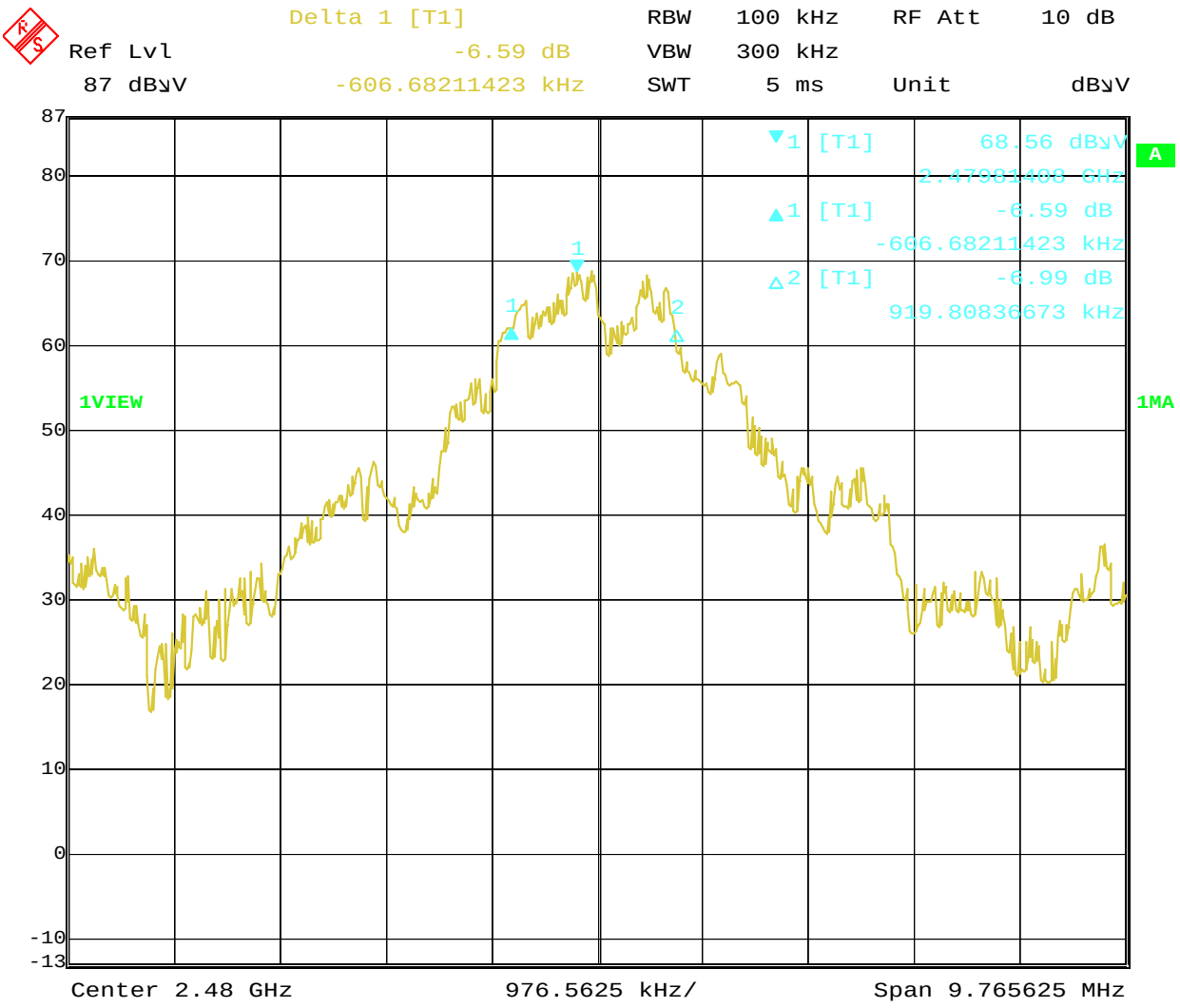
Channel 11 (2405 MHz) 6 dB Bandwidth



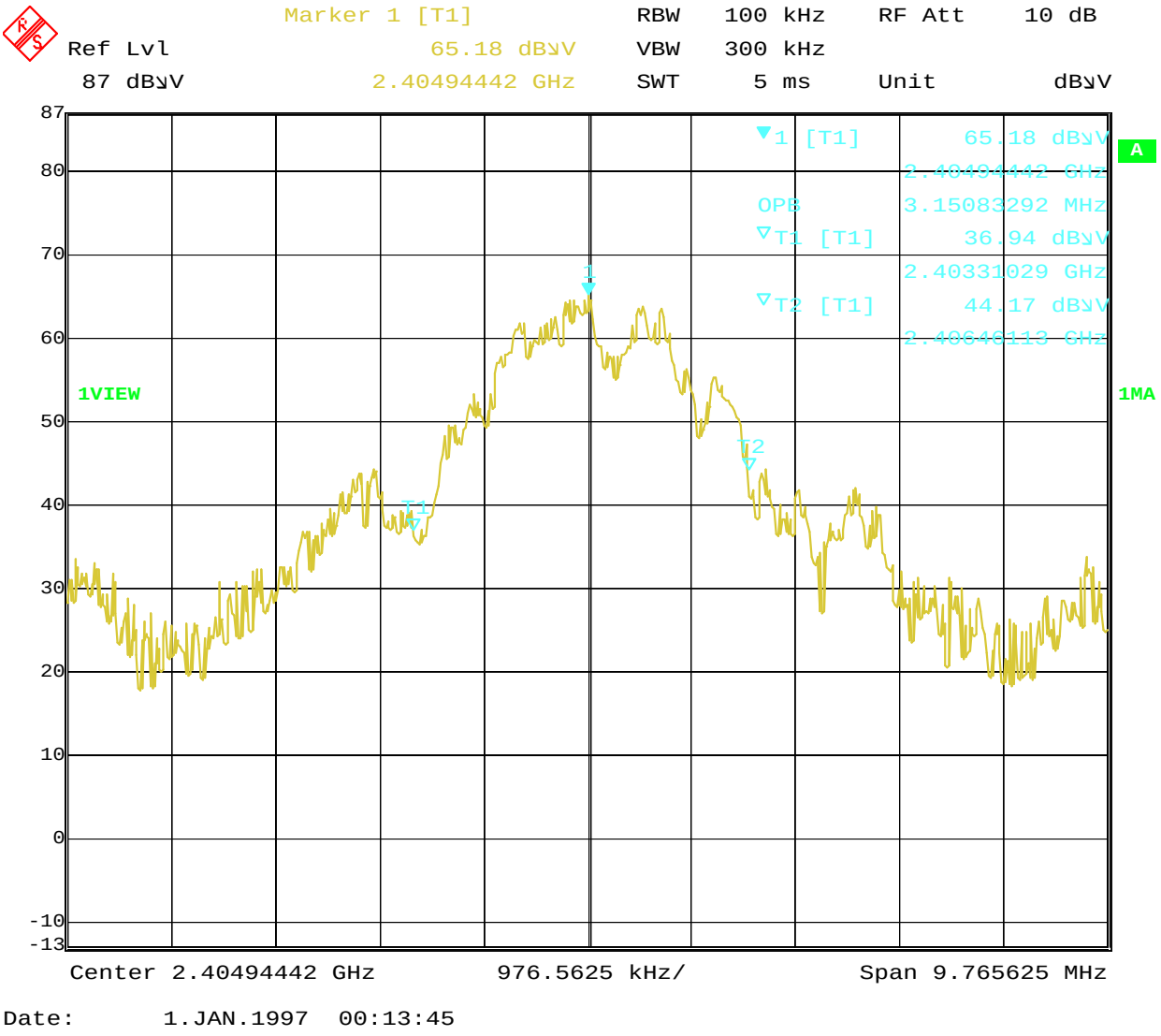
Channel 18 (2440 MHz) 6 dB Bandwidth



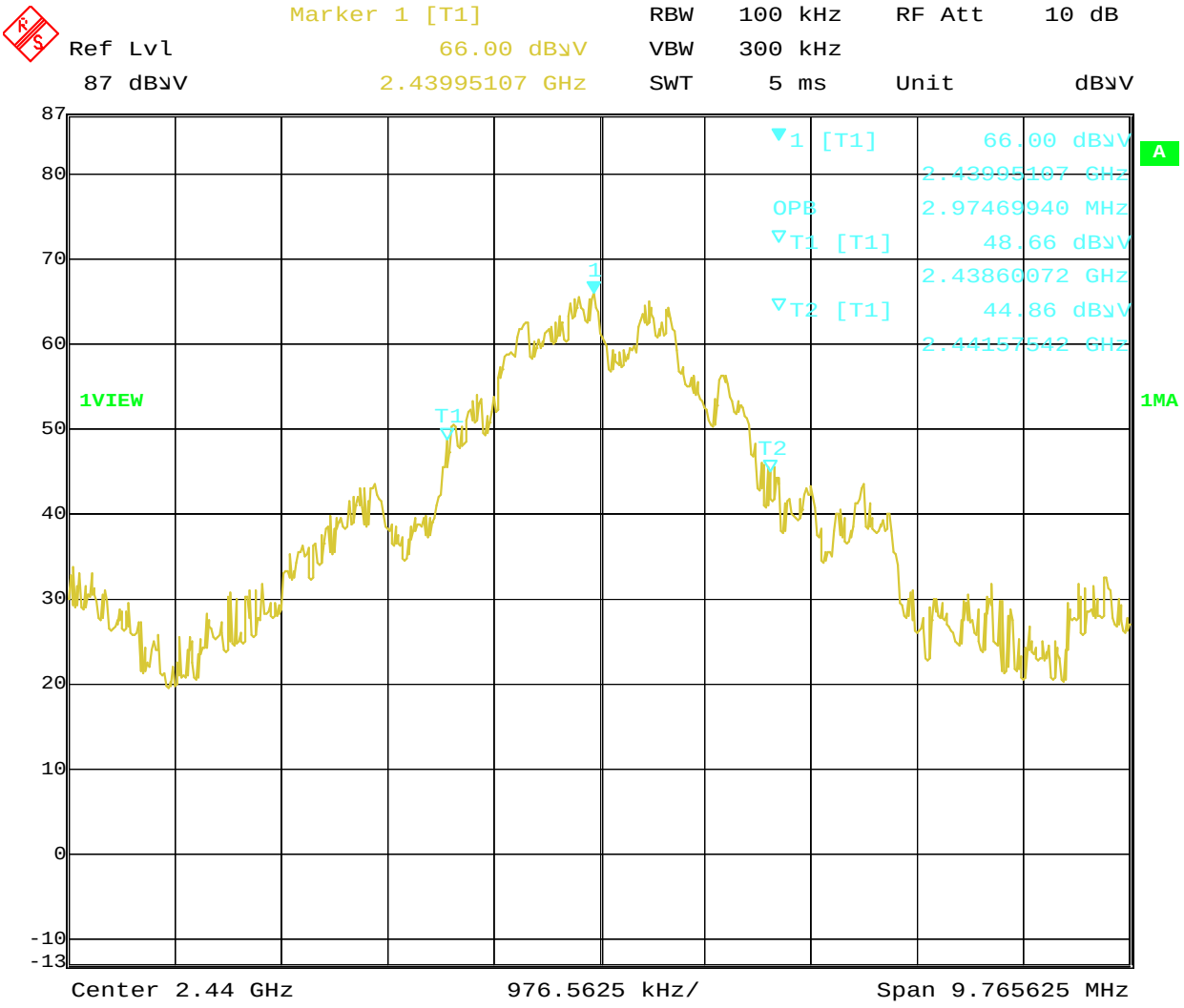
Channel 26 (2480 MHz) 6 dB Bandwidth



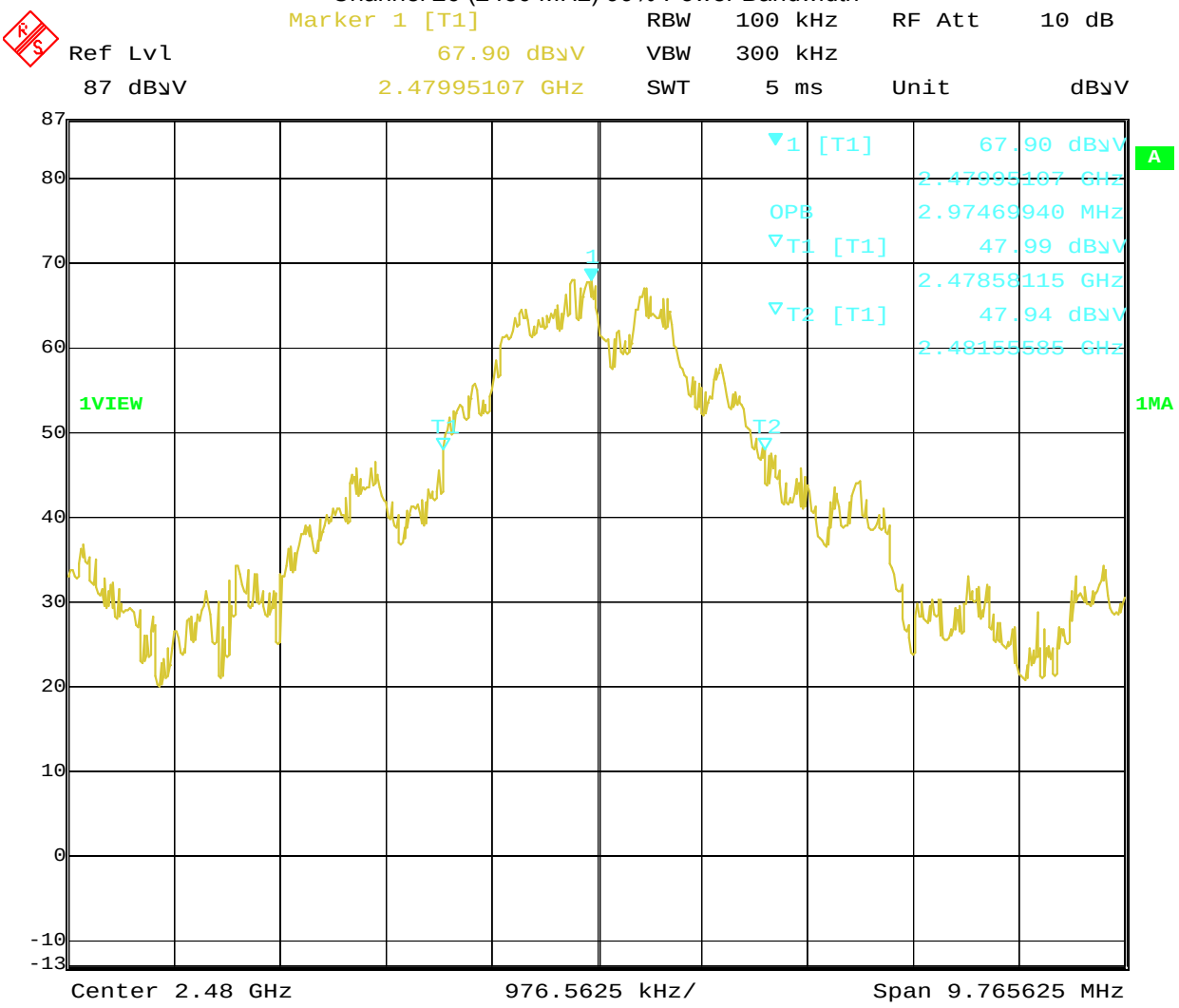
Channel 11 (2405 MHz) 99% Power Bandwidth



Channel 18 (2440 MHz) 99% Power Bandwidth



Channel 26 (2480 MHz) 99% Power Bandwidth



Test Personnel:	Vathana Ven VSV	Test Date:	09/08/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C 15.247; IC RSS-247	Test Levels:	See section 7.3
Input Voltage:	3V Fresh battery	Ambient Temperature:	24 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Relative Humidity:	49 %
		Atmospheric Pressure:	1009 mbars

Deviations, Additions, or Exclusions: None

8 Peak Power Spectral Density

8.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C Section 15.247, *KDB 558074*, ANSI C63.10, and RSS-247.

TEST SITE: 10m ALSE

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Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015

Software Utilized:

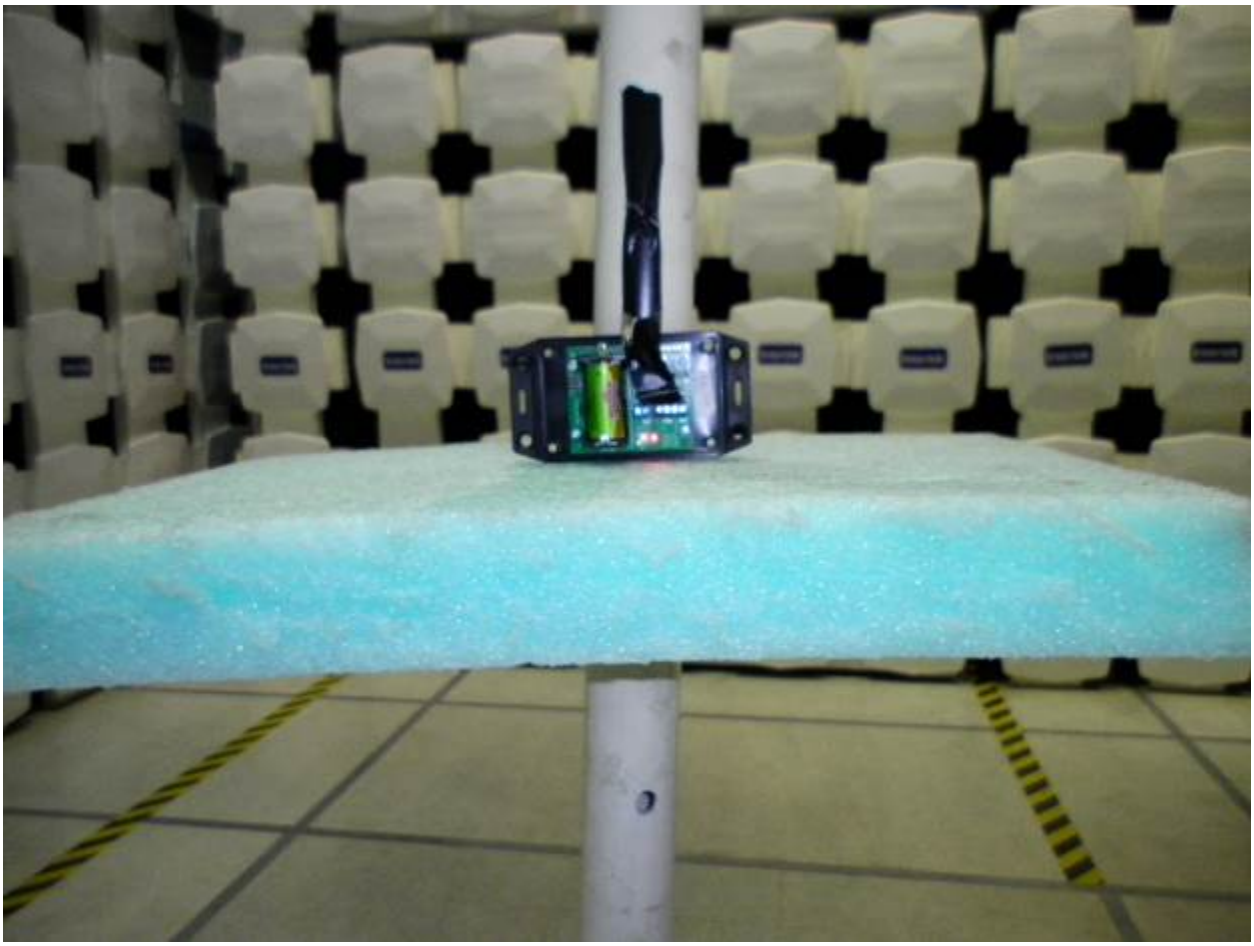
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

8.3 Results:

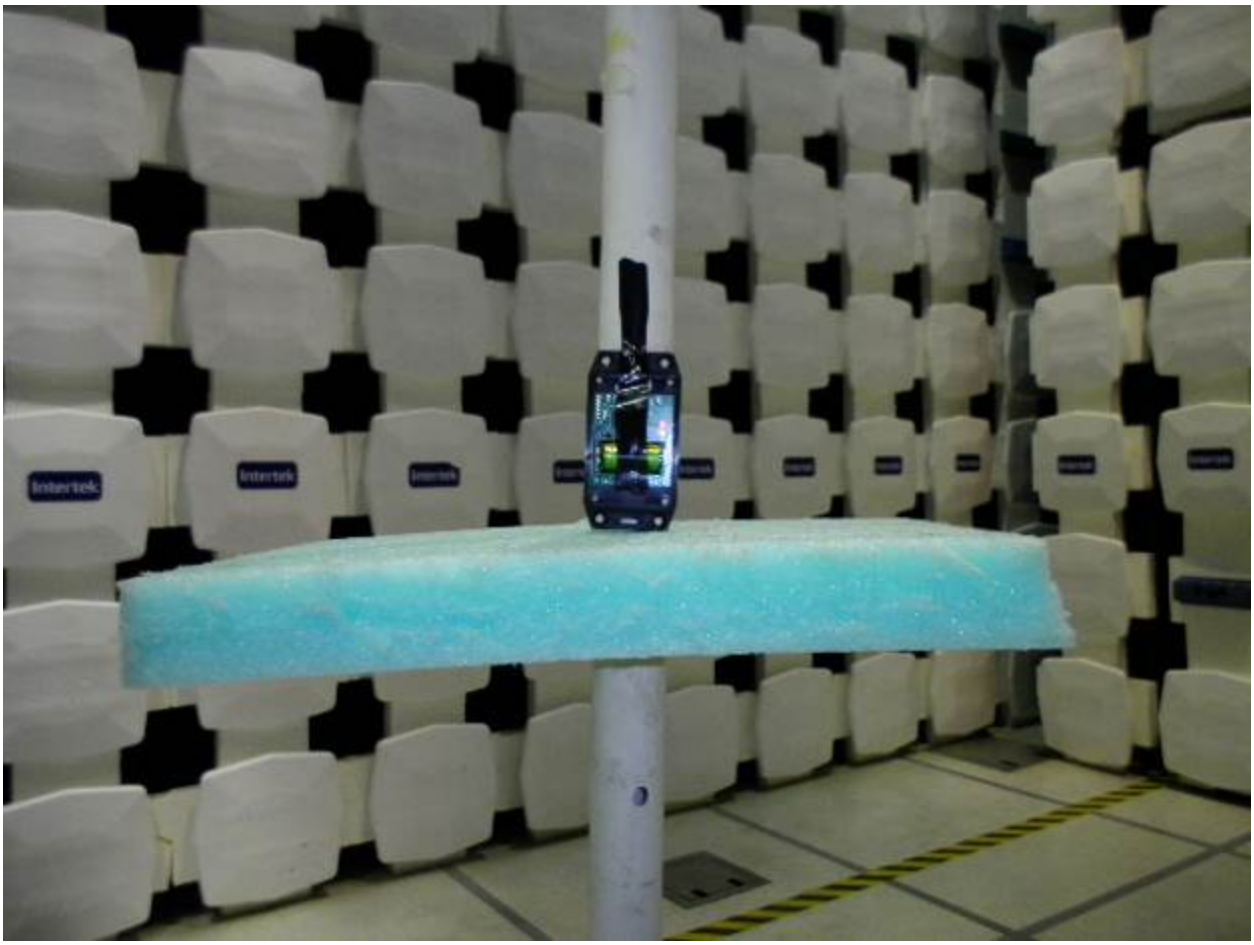
The sample tested was found to Comply. The peak power spectral density must not exceed 8 dBm in any 3 kHz bandwidth using the methods of KDB 558074.

8.4 Setup Photographs:

Axis1 orientation



Axis 2 orientation



Axis 3 orientation

8.5 Test Data:

Radiated Emissions

Company: Mircom Technologies Ltd. | Antenna & Cables: HF | Bands: N, LF, HF, SHF
Model #: NC-220 | Antenna: ETS001 01-14-16.txt | ETS001 01-14-16.txt
Serial #: A00068 | Cable(s): 145-416 3m Track B 1-15GHz Cable 10-04-15.txt | NONE.
Engineers: Vathana Ven | Location: 10M | Barometer: DAV004 | Filter: NONE
Project #: G102179505 | Date(s): 08/28/15
Standard: FCC Part 15 Subpart C 15.247 | Temp/Humidity/Pressure: 21 deg C | 51% | 1011 mB
Receiver: R&S ESI (145-128) 03-14-2016 | Limit Distance (m): 3
PreAmp: 145014 05-13-16.txt | Test Distance (m): 3
PreAmp Used? (Y or N): N | Voltage/Frequency: Battery powered | Frequency Range:

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Peak Power Spectral Density, normalized from 100kHz to 3 kHz using Bandwidth Correction Factor 10LOG(3/100 kHz)=-15.2 dB													
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP													
CH11 - 2405MHz, No pre-amp, Worst-case Orientation													
PK	H	2405.000	38.75	31.97	5.87	0.00	0.00	-33.83	8.00	-41.83	3/10kHz		
PK	V	2405.000	33.77	31.97	5.87	0.00	0.00	-38.81	8.00	-46.81	3/10kHz		
CH18 - 2440MHz, No pre-amp, Worst-case Orientation													
PK	H	2440.000	36.98	32.11	5.92	0.00	0.00	-35.41	8.00	-43.41	3/10kHz		
PK	V	2440.000	39.14	32.11	5.92	0.00	0.00	-33.25	8.00	-41.25	3/10kHz		
CH26 - 2480MHz, No pre-amp, Worst-case Orientation													
PK	H	2480.000	39.69	32.26	5.98	0.00	0.00	-32.49	8.00	-40.49	3/10kHz		
PK	V	2480.000	36.11	32.26	5.98	0.00	0.00	-36.07	8.00	-44.07	3/10kHz		

Test Personnel:	Vathana Ven VSV	Test Date:	08/28/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C 15.247; IC RSS-247	Test Levels:	Below 8 dBm
Input Voltage:	3V Fresh battery	Ambient Temperature:	21 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Relative Humidity:	51 %
		Atmospheric Pressure:	1011 mbars

Deviations, Additions, or Exclusions: None

9 Band Edge Compliance

9.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C Section 15.247, *KDB 558074*, ANSI C63.4:2013, and RSS-247.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003'	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	09/17/2012
145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	09/23/2012
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	10/04/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

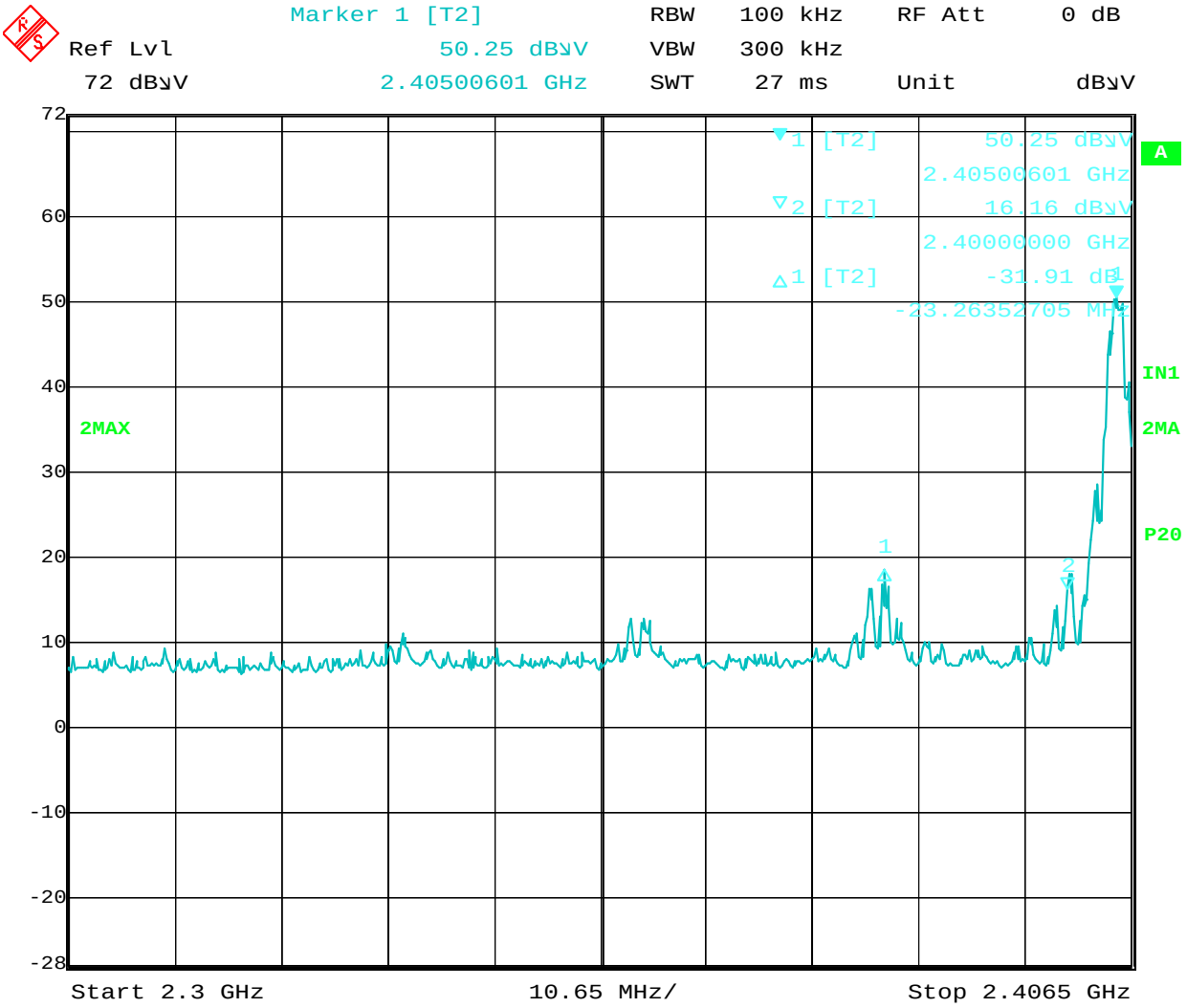
9.3 Results:

Spurious emissions at the band edges must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth, without the need to be below the general limits of FCC Part 15 Section 15.209 and of RSS-Gen. Emissions in restricted bands must meet the general limits of FCC Part 15 Section 15.209 and of RSS-Gen.

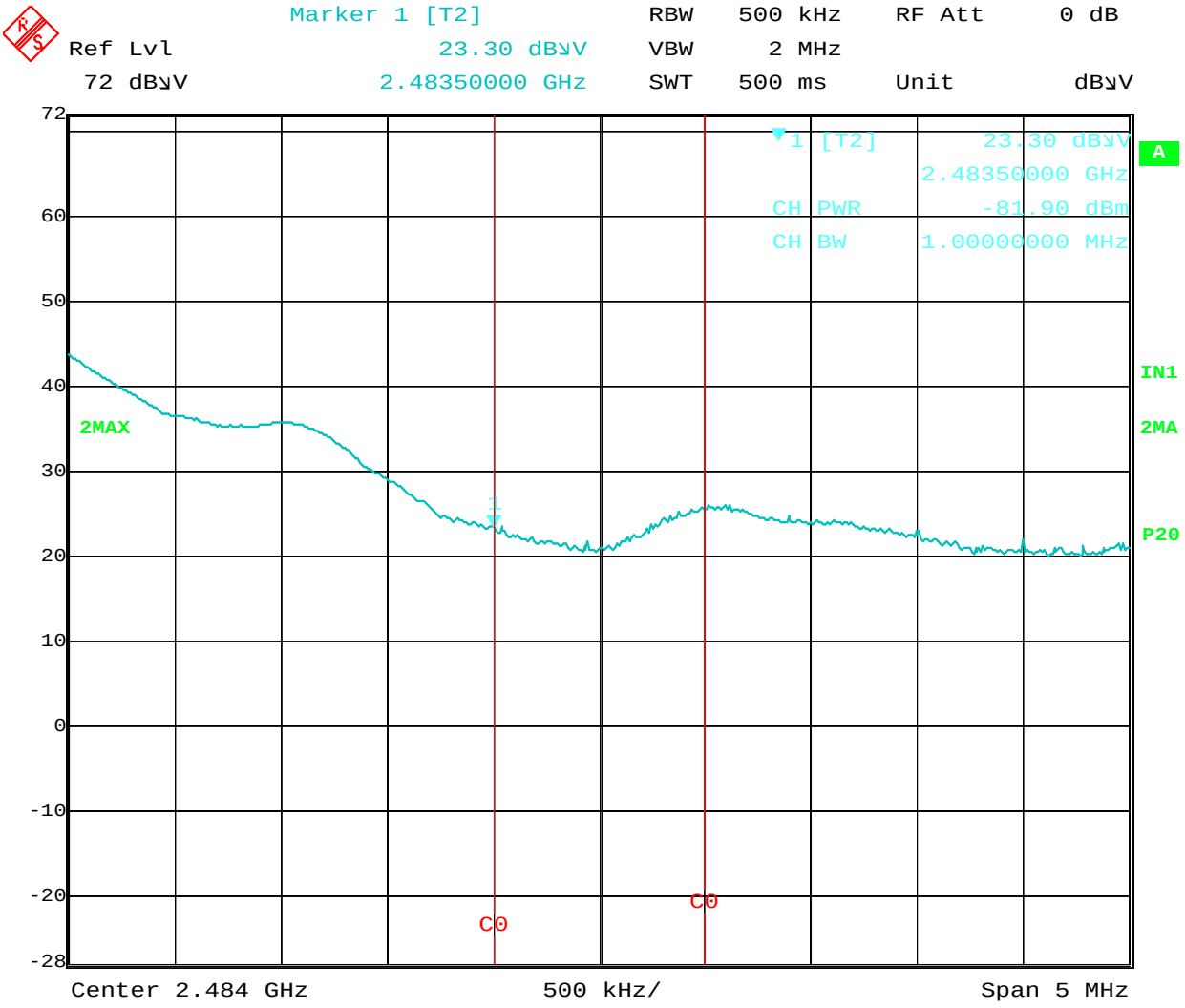
The sample tested was found to Comply.

9.4 Setup Photograph:

9.5 Plots/Data:



Lower Band Edge Compliance, 31.91 dB down



Upper Band Edge Compliance
dBm converted to dBuV in the analyzer front end using dBm + 107 = dBuV

Radiated Emissions

Company: IGEACare Solutions Inc
Model #: NC-220
Serial #: 00032
Engineers: Vathana Ven
Project #: G100334102 Date(s): 09/14/12
Standard: FCC Part 15 Subpart C 15.247/RSS-247
Receiver: R&S ESI (145-128) 09-23-2012 Limit Distance (m): 3
PreAmp: PRE145014 12-16-2012.txt Test Distance (m): 3
PreAmp Used? (Y or N): N Voltage/Frequency: Battery powered Frequency Range: See Frequency

Antenna & Cables: SHF Bands: N, LF, HF, SHF
Antenna: HORN2 V3m 10-24-2012.txt HORN2 H3m 10-24-2012.txt
Cable(s): 145-416 3mTrkB 09-04-2012.txt
Location: 10m Chamber Barometer: DAV003 Filter:
Temp/Humidity/Pressure: 24C 49% 1009mbar

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent											
PK	H	2484.000	25.10	28.56	6.04	0.00	0.00	59.69	74.00	-14.31	500kHz/3MHz
AVG	H	2484.000	-0.08	28.56	6.04	0.00	0.00	34.51	54.00	-19.49	500kHz/3MHz

Test Personnel: Vathana Ven VFV
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC Part 15 Subpart C 15.247; IC RSS-247
Input Voltage: 3V Fresh battery
Pretest Verification w/ Ambient Signals or BB Source: **Ambient**

Test Date: 09/14/2012
Test Levels: See section 9.3
Ambient Temperature: 24 ºC
Relative Humidity: 49 %
Atmospheric Pressure: 1009 mbars

Deviations, Additions, or Exclusions: None

10 Transmitter Radiated Spurious Emissions

10.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C Section 15.247, *KDB 558074*, ANSI C63.10:2013, and RSS-247.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

10.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
'DAV003	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	09/17/2012
'145128	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	09/23/2012
'ROS001	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	02/10/2012	02/10/2013
'REA004	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	11/30/2011	11/30/2012
'REA006	18GHz High Pass Filter	Reactel, Inc	7HS-18G/40G K11	(06)1	08/08/2012	08/08/2013
'145-410	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	10/04/2012
'145-416	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	10/04/2012
'CBL030	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	02/08/2012	02/08/2013
'MEG005	High Frequency Cable	Megaphase	TM40-K1K1-197	8148601-001	02/07/2012	02/07/2013
'PRE8	PREAMPLFIER 1- 40 GHz	MITEQ	NSP4000-NF	507145	01/26/2012	01/26/2013
'145003	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	10/04/2011	10/04/2012
'145014	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	12/16/2011	12/16/2012
'145034	BiLog Antenna (30 MHz to 1GHz)	Schaffner Chase EMC	CBL6111C	2564	02/07/2012	02/07/2013
'HORN2	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012
'EMC04	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	02/08/2012	02/08/2013

Tested 08/28/2015

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV004'	Weather Station	Davis Instruments	7400	PE80529A61A	10/06/2014	10/06/2015
145128'	EMI Receiver (20 Hz - 40 Ghz)	Rohde & Schwarz	ESIB 40	839283/001	03/14/2015	03/14/2016
ROS001'	Spectrum Analyzer 20Hz - 40 GHz	Rohde & Schwartz	FSEK-30	100225	06/04/2015	06/04/2016
REA004'	3GHz High Pass Filter	Reactel, Inc	7HSX-3G/18G-S11	06-1	12/30/2013	12/30/2015
REA006'	18GHz High Pass Filter	Reactel, Inc	7HS-18G/40G K11	(06)1	08/28/2014	08/28/2016
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	10/04/2014	10/04/2015
CBLHF2012 -2M-2'	2m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252675002	02/05/2015	02/05/2016
CBLHF2012 -5M-2'	5m 9kHz-40GHz Coaxial Cable - SET2	Huber & Suhner	SF102	252676002	02/05/2015	02/05/2016
PRE9'	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	09/06/2013	09/06/2014
145014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	05/13/2015	05/13/2016
ETS001'	1-18GHz DRG Horn Antenna	ETS-Lindgren	3117	00143259	01/14/2015	01/14/2016
EMC04'	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	04/07/2015	04/07/2016

Software Utilized:

Name	Manufacturer	Version
C5	Teseq	Build 5.26.00.3

Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

10.3 Results:

The sample tested was found to Comply.

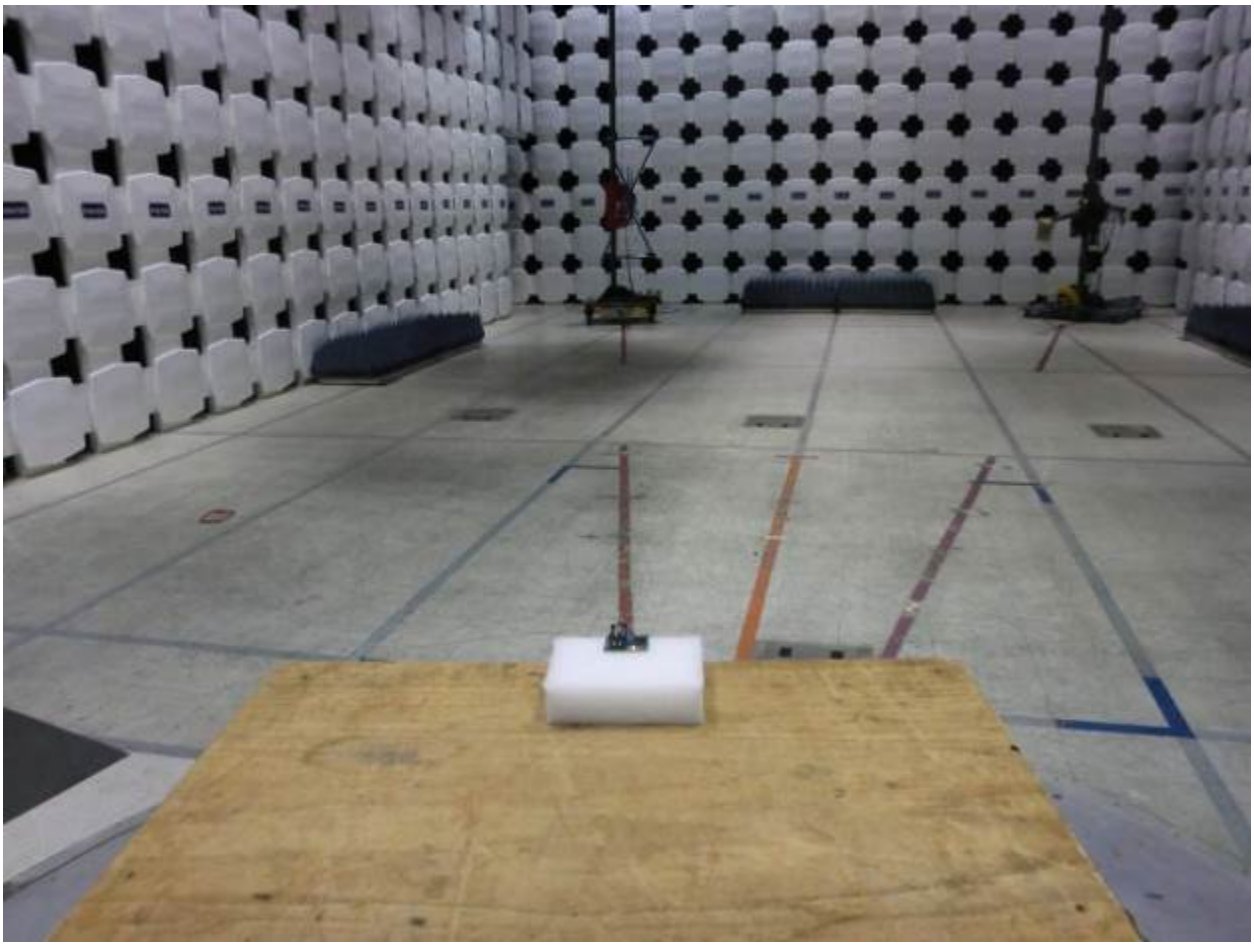
FCC Part 15.247(d) & RSS-247 – Non Restricted Band Radiated Spurious/Harmonics Limits

In any 100 kHz bandwidth outside the frequency band , the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) and RSS-Gen Section 7.2.5 Table 5 is not required. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a) and RSS-Gen Section 7.2.2 Table 3, must also comply with the radiated emission limits specified in 15.209(a) and IC RSS-Gen Section 7.2.5 Table 5).

FCC Part 15.209(a) & RSS-210 A8.5 & RSS-Gen Section 7.2.5 Table 5 – Restricted Band Radiated Spurious/Harmonics Limits

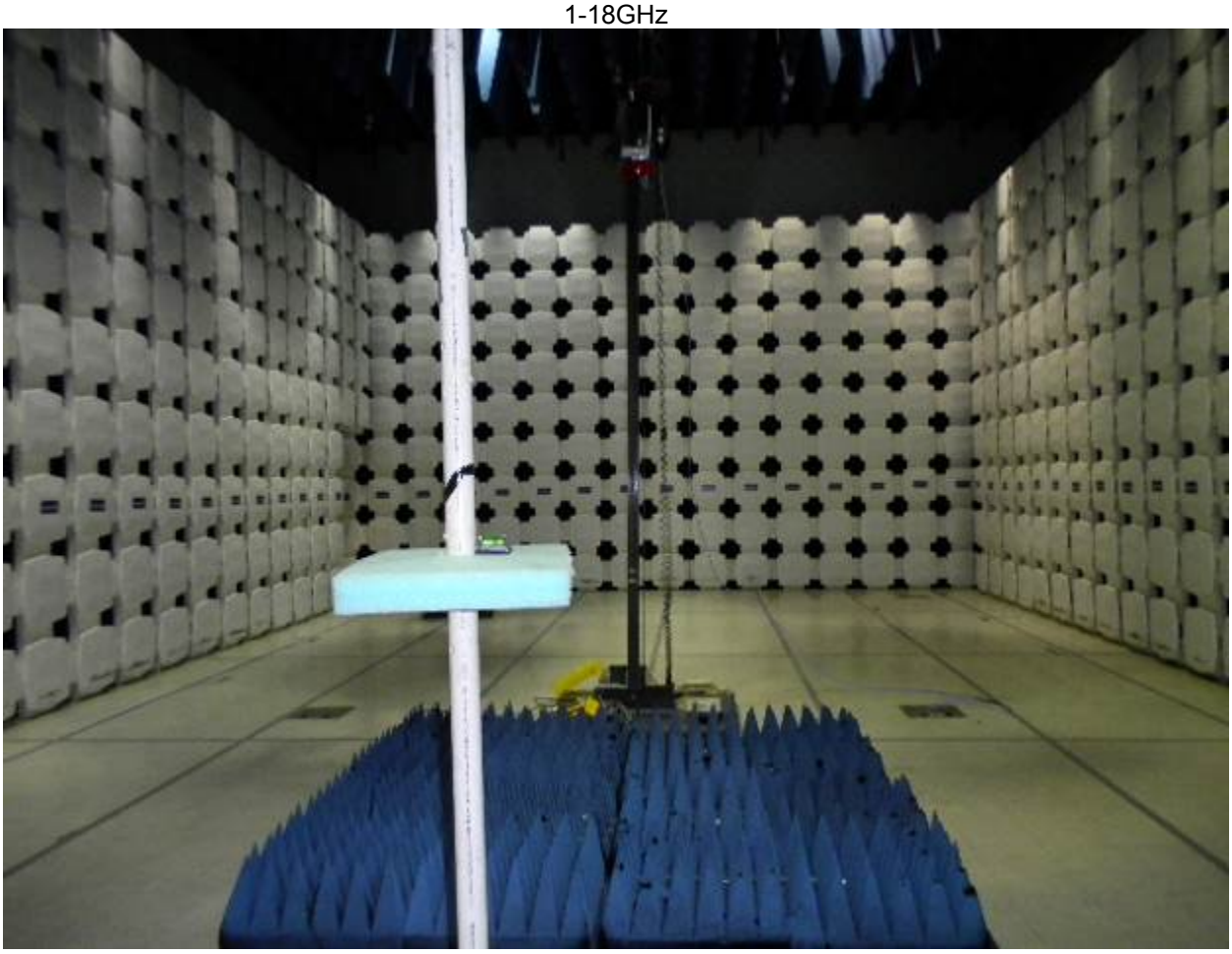
Frequency	Field Strength		Test Distance
(MHz)	µV/m	dBµV/m	(meters)
30–88	100	40.00	3
88–216	150	43.52	3
216–960	200	46.02	3
Above 960	500	53.98	3

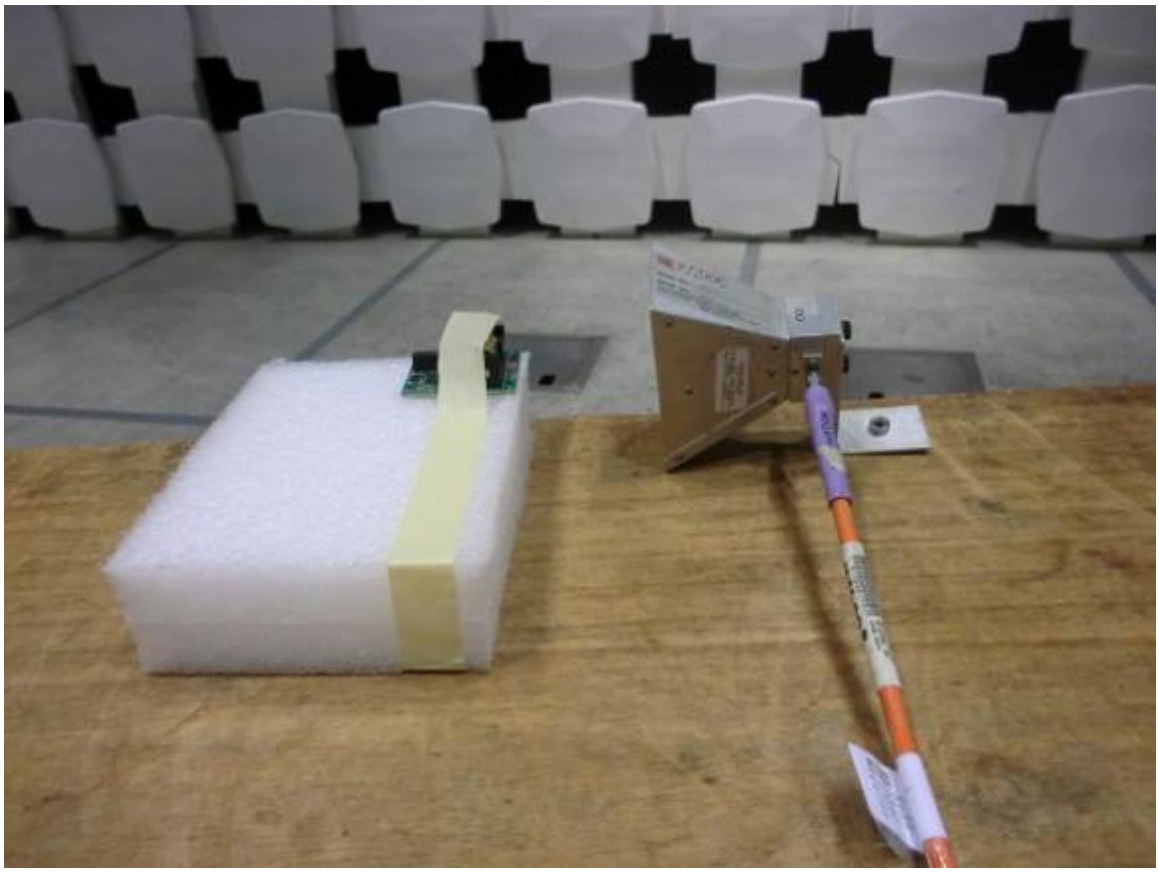
10.4 Setup Photographs:



30-1000MHz

1-18GHz





18-25GHz Hand scans

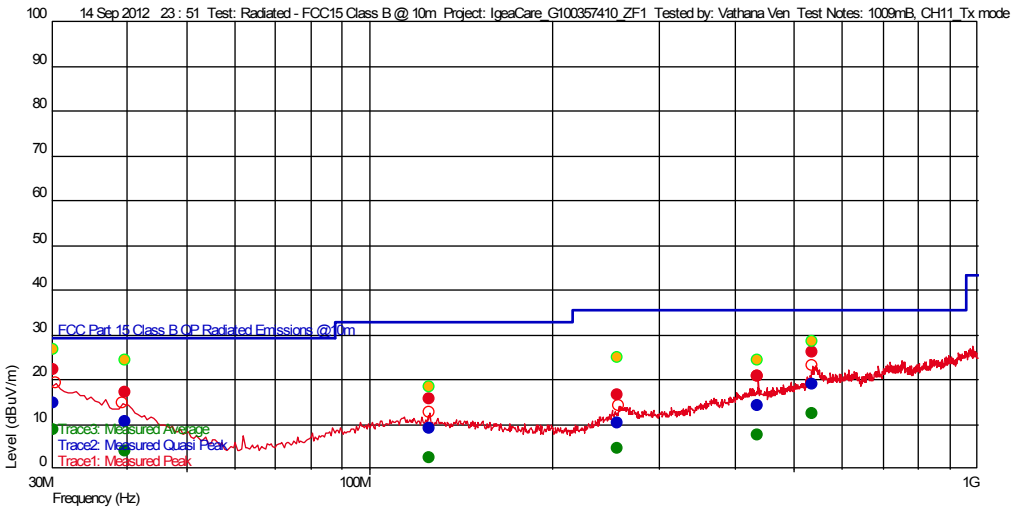
10.5 Plots/Data:

Spurious Emissions 30-1000MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Mirecom (IgeaCare_G100357410)	
Test Notes:	1009mB, CH11_Tx mode	
Temperature:	24 deg	
Humidity:	50mB	
Tested by:	Vathana Ven	
Test Started:	14 Sep 2012 23 : 51	

Prescan Emission Graph



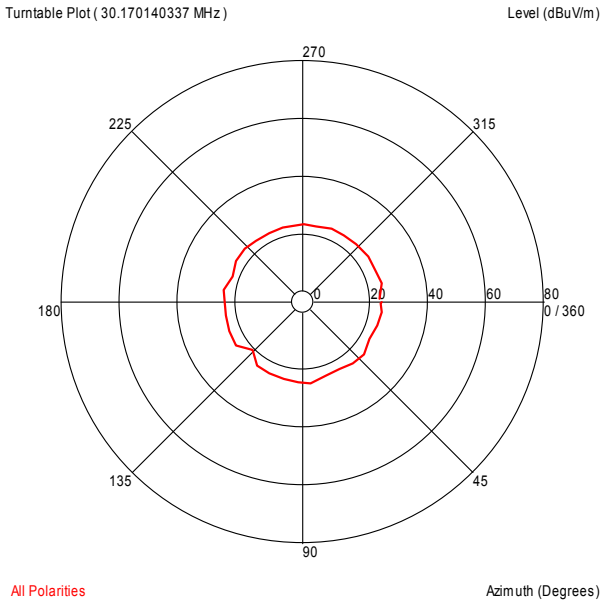
- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

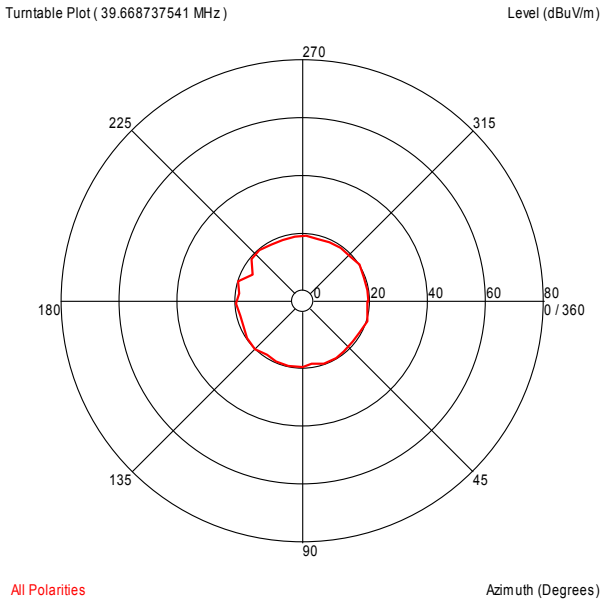
Emissions Test Data

Trace2: Measured Quasi Peak

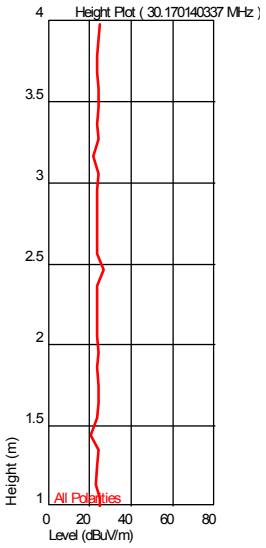
Frequency (Hz)	Leve (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg) (Deg)	Mast Heigh (m)	RBW (Hz)
256.465531267 M	10.23	13.676	-24.137	35.540	-25.31	|	144	1.05	120 k
125.755711477 M	9.07	11.276	-25.023	33.040	-23.97	--	360	1.98	120 k
436.040681216 M	14.24	17.079	-23.922	35.540	-21.30	--	333	2.17	120 k
39.668737541 M	10.50	14.199	-26.081	29.540	-19.04	--	360	2.69	120 k
536.137274962 M	18.83	21.227	-23.981	35.540	-16.71	--	360	4.00	120 k
30.170140337 M	14.92	18.981	-26.114	29.540	-14.62	|	357	2.56	120 k

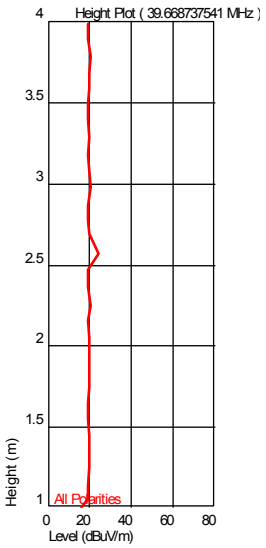
Azimuth Plots

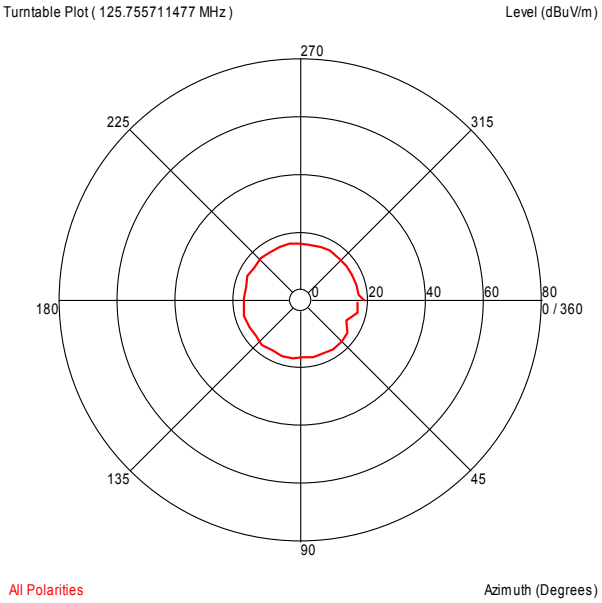


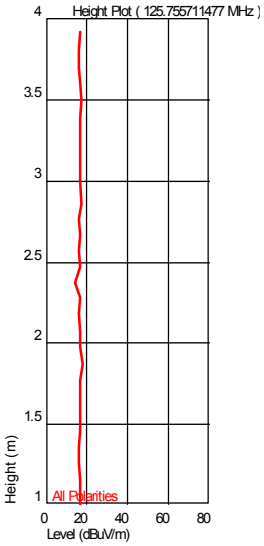


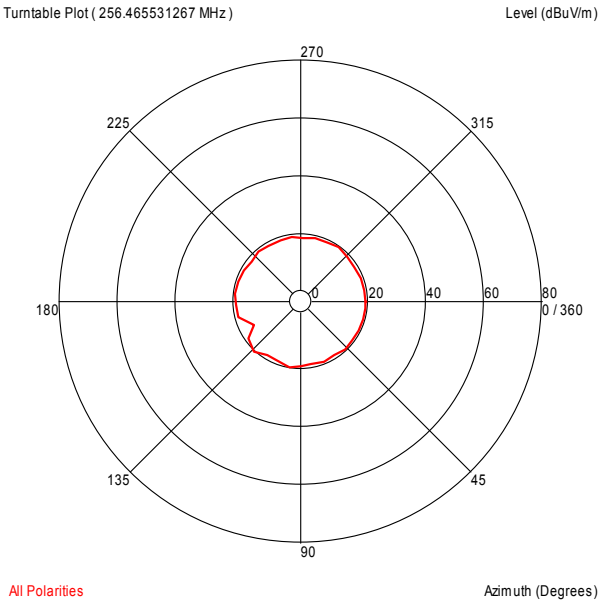
Turntable Plots

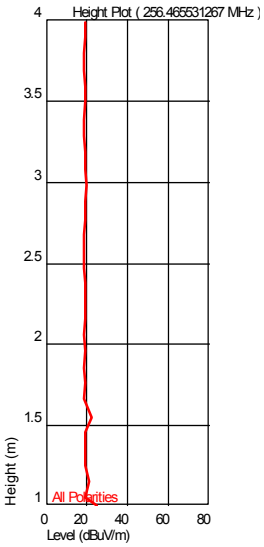


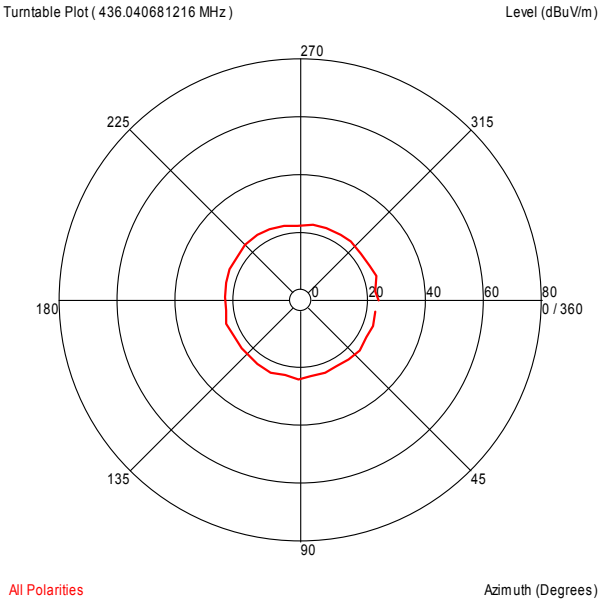


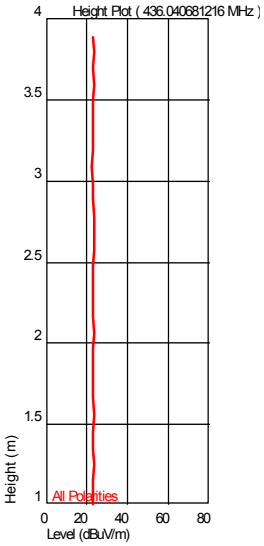

Turntable Plot (125.755711477 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

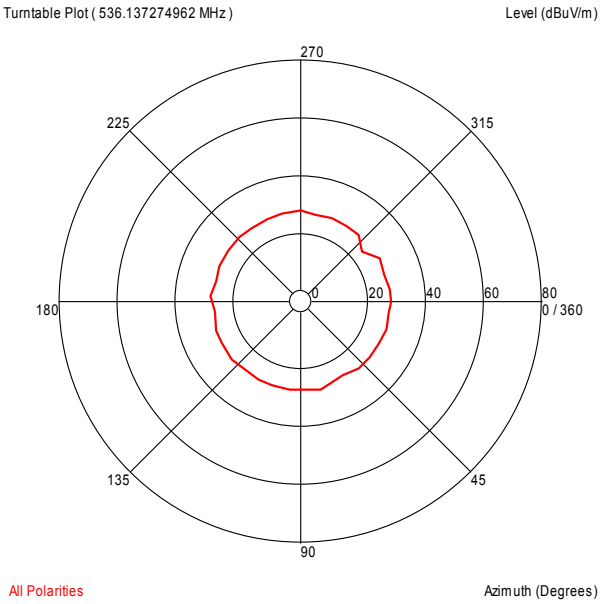

Height Plot (125.755711477 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

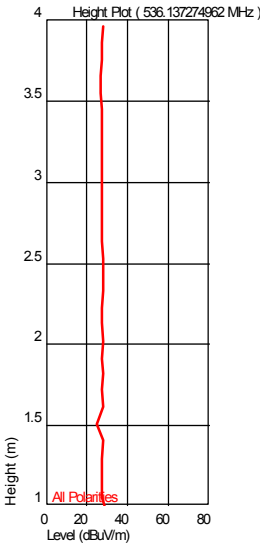

Turntable Plot (256.465531267 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (256.465531267 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (436.040681216 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (436.040681216 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

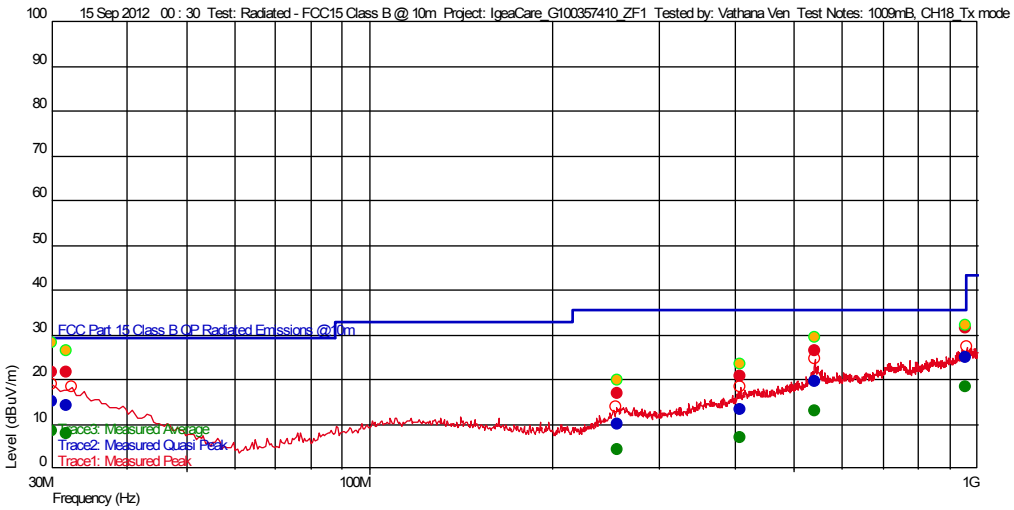

Turntable Plot (536.137274962 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (536.137274962 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	(Mircom) IgeaCare_G100357410	
Test Notes:	1009mB, CH18_Tx mode	
Temperature:	24 deg	
Humidity:	50mB	
Tested by:	Vathana Ven	
Test Started:	15 Sep 2012 00 : 30	

Prescan Emission Graph



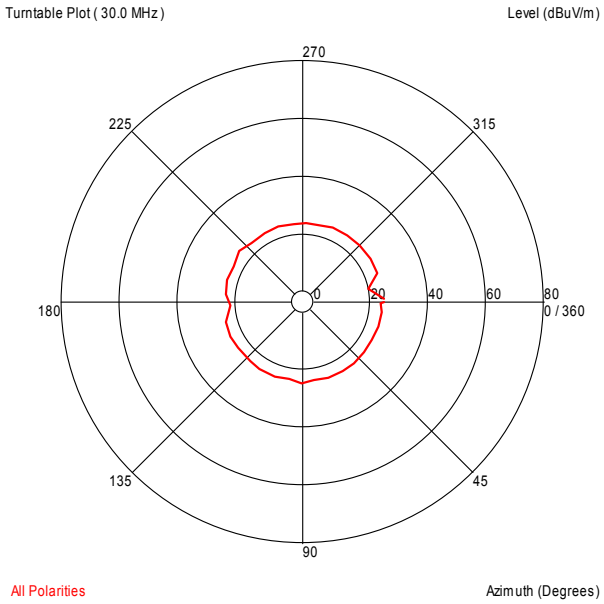
- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

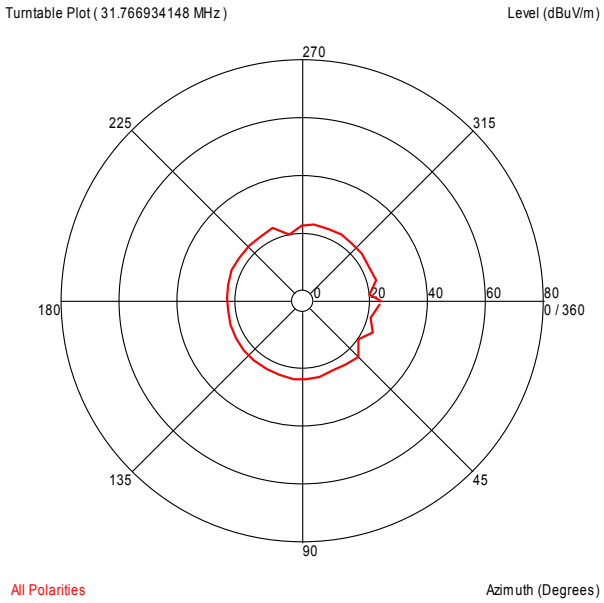
Emissions Test Data

Trace2: Measured Quasi Peak

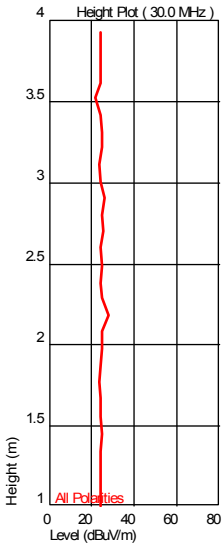
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg) (Deg)	Mast Height (m)	RBW (Hz)
256.141883804 M	9.92	13.637	-24.137	35.540	-25.62	|	300	1.35	120 k
407.925650902 M	13.41	16.359	-23.905	35.540	-22.13	|	203	4.00	120 k
960.373347148 M	24.92	24.615	-22.403	43.540	-18.62	|	315	3.68	120 k
540.135871661 M	19.60	21.992	-23.978	35.540	-15.94	--	180	2.99	120 k
31.766934148 M	14.26	18.093	-26.109	29.540	-15.28	--	237	3.52	120 k
30.0 M	15.15	19.100	-26.115	29.540	-14.39	--	229	2.29	120 k

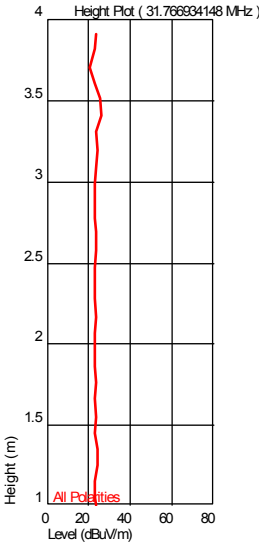
Azimuth Plots

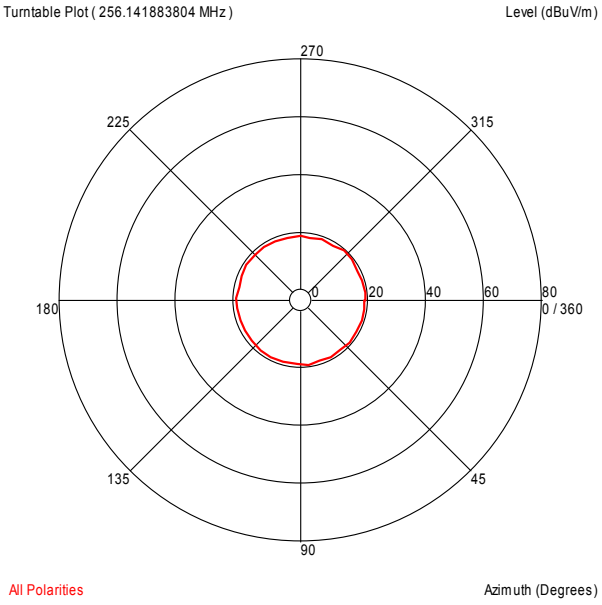


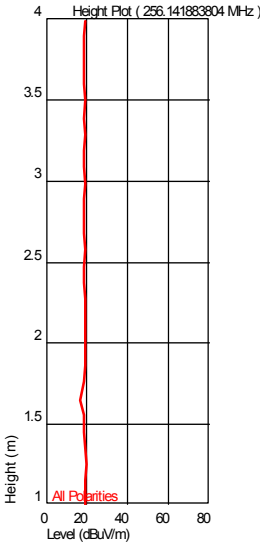


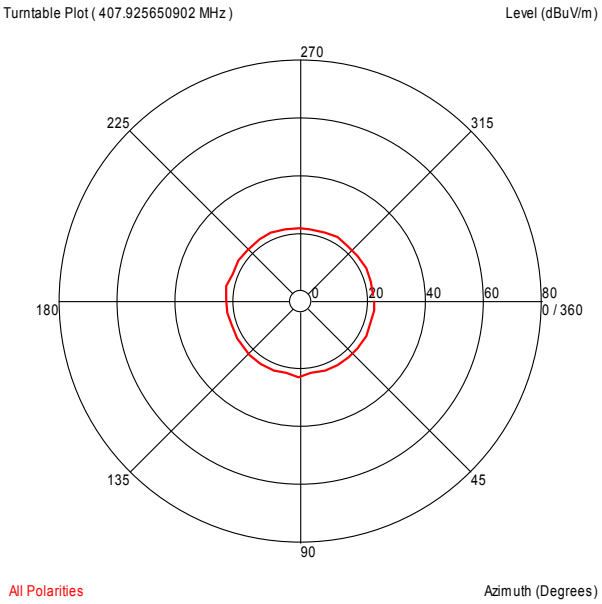
Turntable Plots

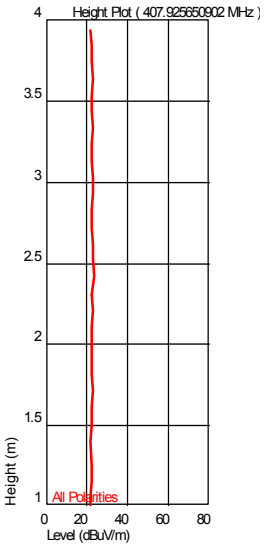


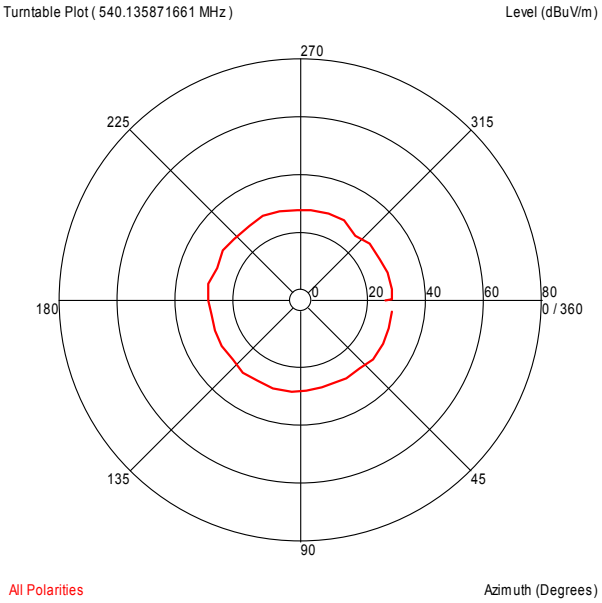


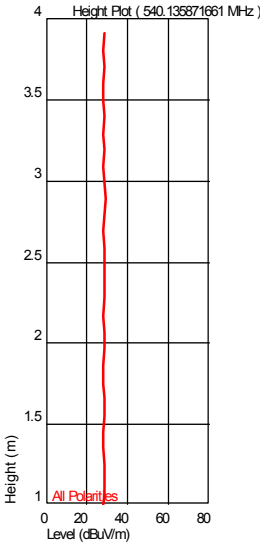

Turntable Plot (256.141883804 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

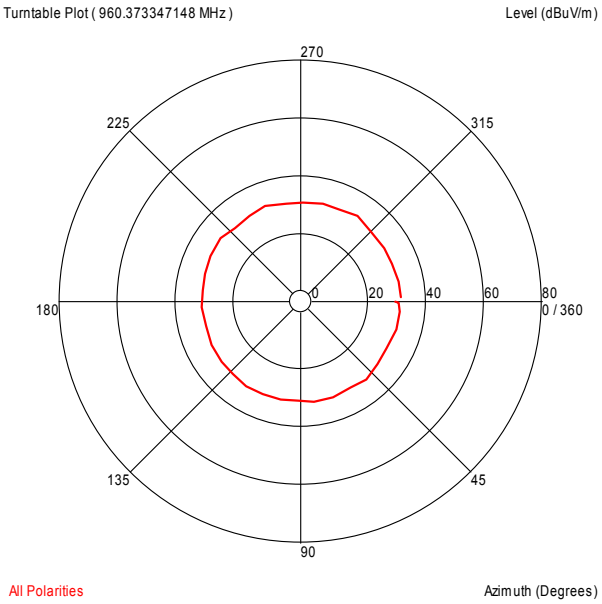

Height Plot (256.141883804 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

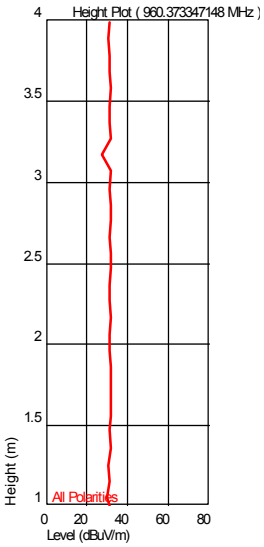

Turntable Plot (407.925650902 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (407.925650902 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (540.135871661 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (540.135871661 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

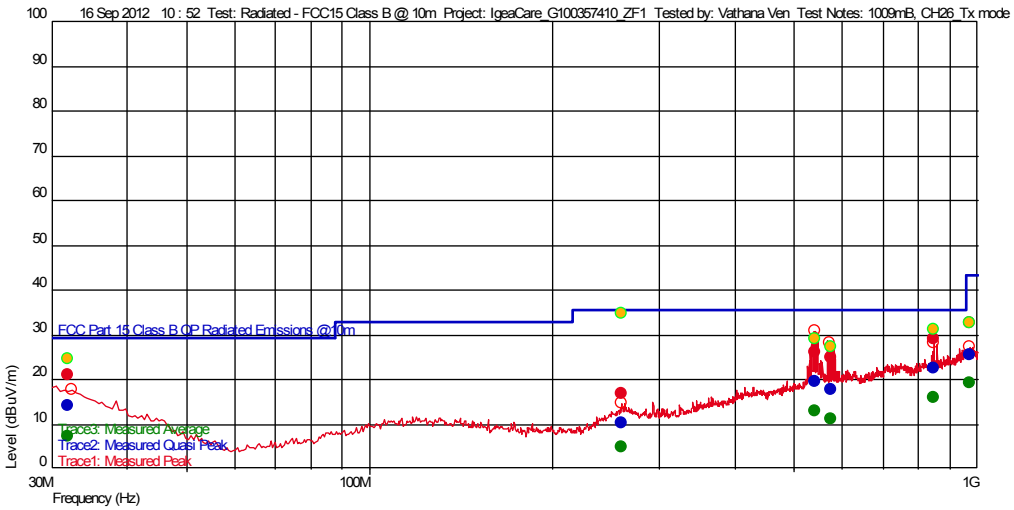

Turntable Plot (960.373347148 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (960.373347148 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Mircom (IgeaCare_G100357410)	
Test Notes:	1009mB, CH26_Tx mode	
Temperature:	24 deg	
Humidity:	50mB	
Tested by:	Vathana Ven	
Test Started:	16 Sep 2012 10 : 52	

Prescan Emission Graph



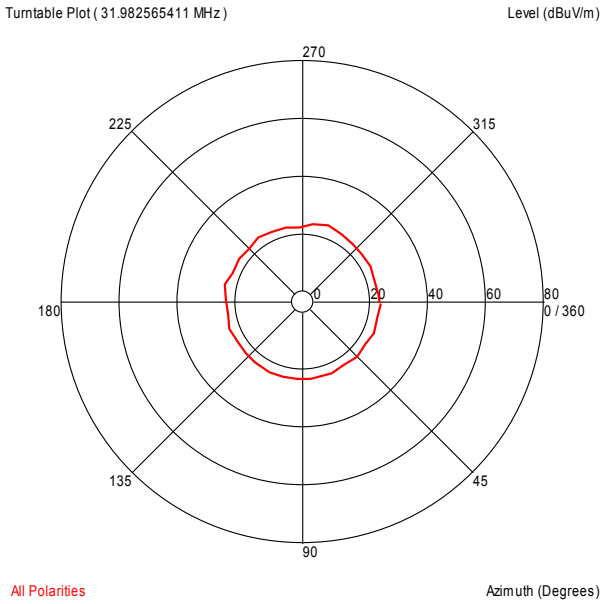
- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

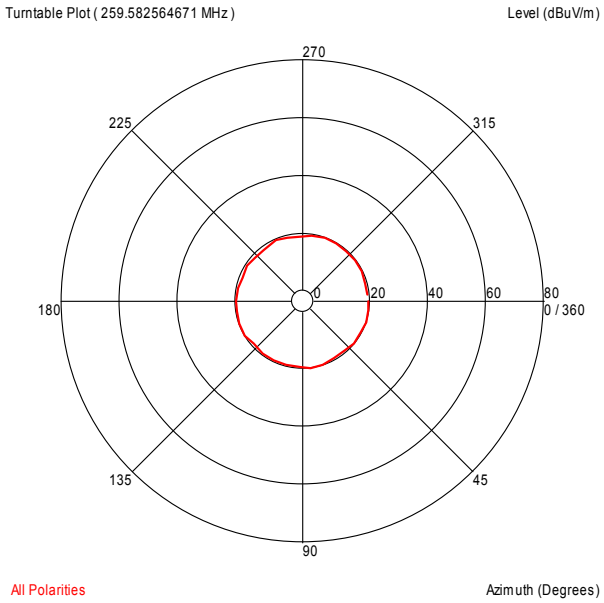
Emissions Test Data

Trace2: Measured Quasi Peak

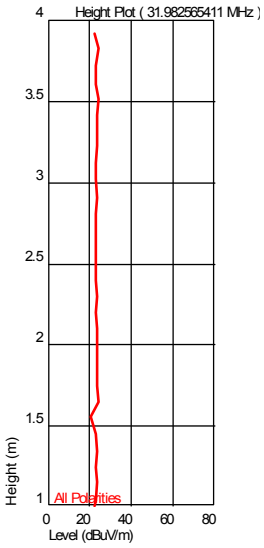
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg) (Deg)	Mast Height (m)	RBW (Hz)
259.582564671 M	10.34	14.050	-24.132	35.540	-25.20	|	160	2.37	120 k
974.652304635 M	25.55	25.000	-22.370	43.540	-17.99	--	7	4.00	120 k
573.626051838 M	17.66	19.845	-24.008	35.540	-17.88	--	198	1.46	120 k
541.505611309 M	19.51	21.910	-23.977	35.540	-16.03	--	0	1.56	120 k
31.982565411 M	14.06	18.007	-26.108	29.540	-15.48	|	278	3.92	120 k
846.578156637 M	22.59	23.337	-23.026	35.540	-12.95	--	0	4.00	120 k

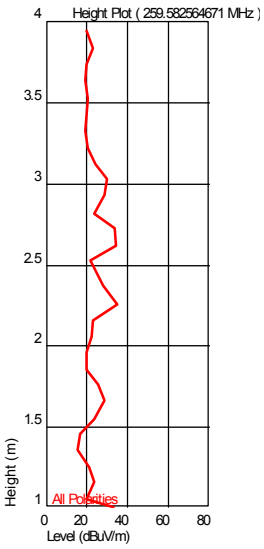
Azimuth Plots

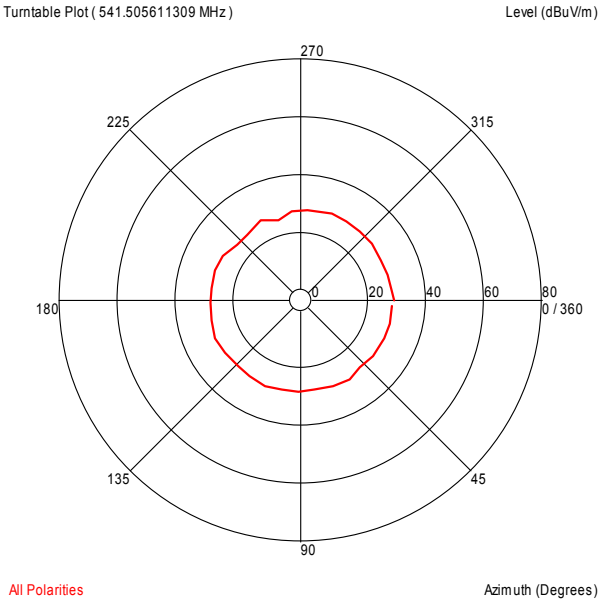


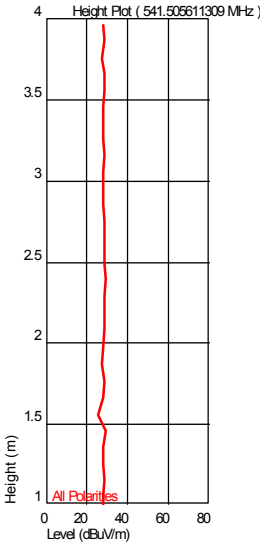


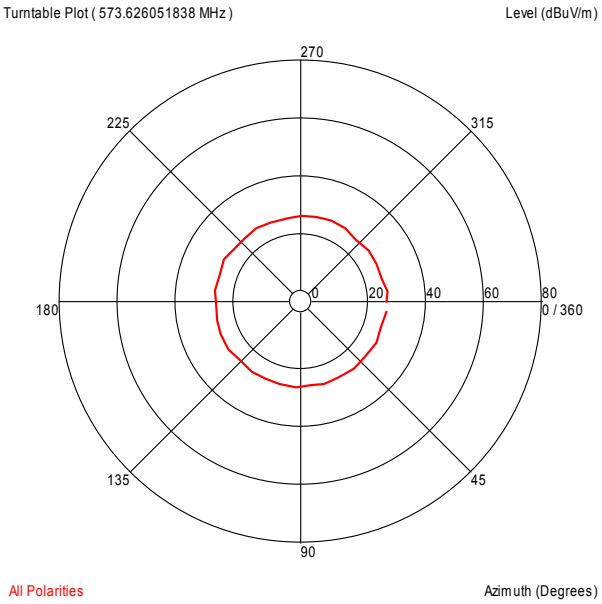
Turntable Plots

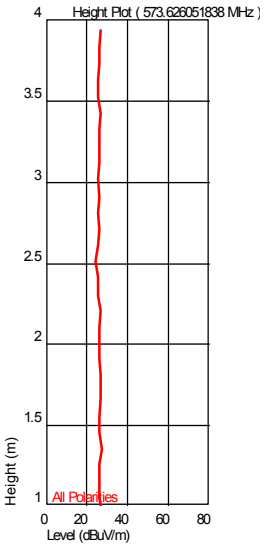


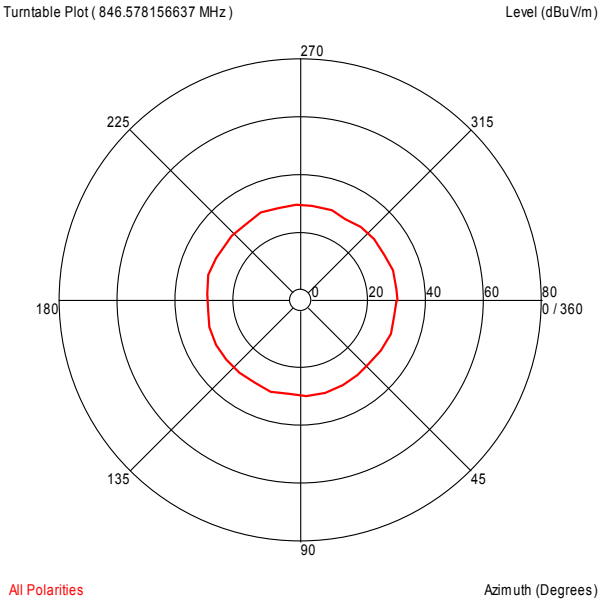


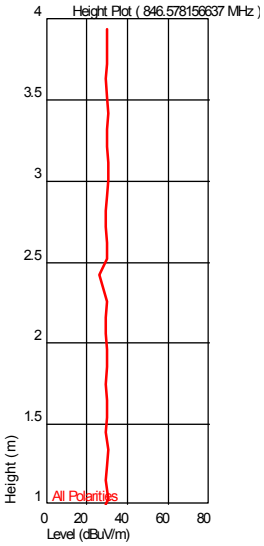

Turntable Plot (541.505611309 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

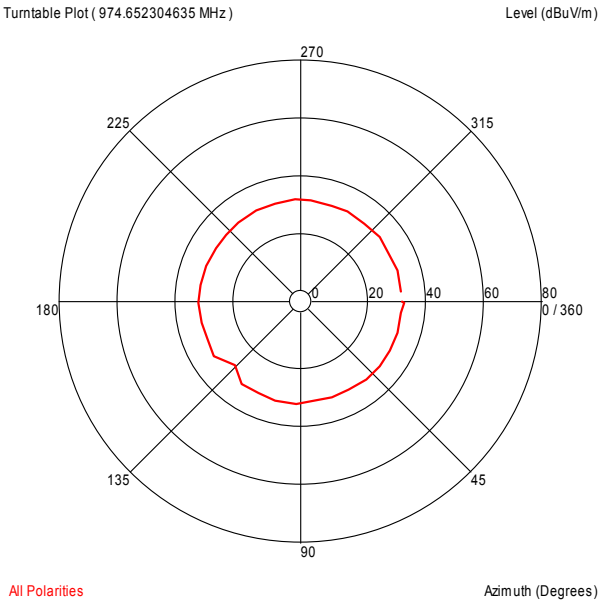

Height Plot (541.505611309 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

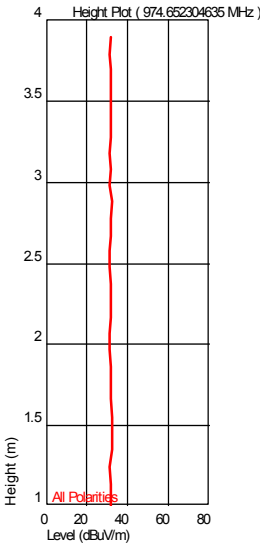

Turntable Plot (573.626051838 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (573.626051838 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (846.578156637 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (846.578156637 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (974.652304635 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (974.652304635 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Tx Spurious Emissions above 1 GHz

Radiated Emissions

Company: Mircom Technologies Ltd. | Antenna & Cables: HF | Bands: N, LF, HF, SHF
Model #: NC-220 | Antenna: ETS001 01-14-16.txt | ETS001 01-14-16.txt
Serial #: A00068 | Cable(s): 145-416 3m Track B 1-15GHz Cable 10-04-15.txt | NONE.
Engineers: Vathana Ven | Location: 10M | Barometer: DAV004 | Filter: REA004
Project #: G102179505 | Date(s): 08/28/15
Standard: FCC Part 15 Subpart C 15.247 | Temp/Humidity/Pressure: 21 deg C | 51% | 1011 mB
Receiver: R&S ESI (145-128) 03-14-2016 | Limit Distance (m): 3
PreAmp: 145014 05-13-16.txt | Test Distance (m): 3
PreAmp Used? (Y or N): Y | Voltage/Frequency: Battery powered | Frequency Range: 1-25 GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)

Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: Spurious Emissions Reference. Fundamental frequencies (modulated) at 3 meters with no pre-amp														
CH11 - 2405MHz, No pre-amp, Worst-case Orientation														
PK	H	2405.000	45.00	31.97	5.87	0.00	0.00	82.84	-	-	100/300 kHz			
PK	V	2405.000	44.58	31.97	5.87	0.00	0.00	82.42	-	-	100/300 kHz			
CH18 - 2440MHz, No pre-amp, Worst-case Orientation														
PK	H	2440.000	44.71	32.11	5.92	0.00	0.00	82.74	-	-	100/300 kHz			
PK	V	2440.000	44.20	32.11	5.92	0.00	0.00	82.23	-	-	100/300 kHz			
CH26 - 2480MHz, No pre-amp, Worst-case Orientation														
PK	H	2480.000	46.29	32.26	5.98	0.00	0.00	84.53	-	-	100/300 kHz			
PK	V	2480.000	46.44	32.26	5.98	0.00	0.00	84.68	-	-	100/300 kHz			
CH11 - 2405MHz, Spurious Emissions from 1-18GHz, REA004														
PK	H	4810.000	35.80	34.19	8.53	31.62	0.00	46.90	74.00	-27.10	1/3MHz	Noise Floor		
AVG	H	4810.000	10.62	34.19	8.53	31.62	0.00	21.72	54.00	-32.28	1/3MHz	Noise Floor		
PK	H	7215.000	24.72	35.68	10.62	31.08	0.00	39.94	62.84	-22.90	100/300kHz	Noise Floor		
PK	H	9620.000	23.63	36.69	12.12	28.47	0.00	43.97	62.84	-18.87	100/300kHz	Noise Floor		
PK	H	12025.000	36.00	38.81	12.17	24.91	0.00	62.06	74.00	-11.94	1/3MHz	Noise Floor		
AVG	H	12025.000	10.82	38.81	12.17	24.91	0.00	36.88	54.00	-17.12	1/3MHz	Noise Floor		
PK	H	14430.000	23.47	39.30	13.85	26.24	0.00	50.38	62.84	-12.46	100/300kHz	Noise Floor		
PK	H	16835.000	25.82	41.41	16.52	26.75	0.00	57.00	62.84	-5.84	100/300kHz	Noise Floor		
CH18 - 2440MHz, Spurious Emissions from 1-18GHz, REA004												Noise Floor		
PK	H	4880.000	36.63	34.16	8.65	31.60	0.00	47.83	74.00	-26.17	1/3MHz	Noise Floor		
AVG	H	4880.000	11.45	34.16	8.65	31.60	0.00	22.65	54.00	-31.35	1/3MHz	Noise Floor		
PK	H	7320.000	35.83	35.61	10.73	31.05	0.00	51.12	74.00	-22.88	1/3MHz	Noise Floor		
AVG	H	7320.000	10.65	35.61	10.73	31.05	0.00	25.94	54.00	-28.06	1/3MHz	Noise Floor		
PK	H	9760.000	23.90	36.85	12.38	28.26	0.00	44.87	62.74	-17.87	100/300kHz	Noise Floor		
PK	H	12200.000	35.71	38.96	11.92	25.01	0.00	61.58	74.00	-12.42	1/3MHz	Noise Floor		
AVG	H	12200.000	10.53	38.96	11.92	25.01	0.00	36.40	54.00	-17.60	1/3MHz	Noise Floor		
PK	H	14640.000	23.98	39.64	14.03	26.35	0.00	51.30	62.74	-11.44	100/300kHz	Noise Floor		
PK	H	17080.000	23.12	41.73	16.76	26.64	0.00	54.97	62.74	-7.77	100/300kHz	Noise Floor		
CH26 - 2480MHz, Spurious Emissions from 1-18GHz, REA004														
PK	H	4960.000	38.43	34.24	8.78	31.58	0.00	49.87	74.00	-24.13	1/3MHz	Noise Floor		
AVG	H	4960.000	13.25	34.24	8.78	31.58	0.00	24.69	54.00	-29.31	1/3MHz	Noise Floor		
PK	H	7440.000	36.20	35.63	10.82	31.03	0.00	51.63	74.00	-22.37	1/3MHz	Noise Floor		
AVG	H	7440.000	11.02	35.63	10.82	31.03	0.00	26.45	74.00	-47.55	1/3MHz	Noise Floor		
PK	H	9920.000	25.91	37.01	12.51	28.02	0.00	47.40	64.53	-17.13	100/300kHz	Noise Floor		
PK	H	12400.000	35.00	38.99	11.65	25.12	0.00	60.52	74.00	-13.48	1/3MHz	Noise Floor		
AVG	H	12400.000	9.82	38.99	11.65	25.12	0.00	35.34	54.00	-18.66	1/3MHz	Noise Floor		
PK	H	14880.000	24.63	39.76	14.49	26.48	0.00	52.39	64.53	-12.14	100/300kHz	Noise Floor		
PK	H	17360.000	23.00	41.83	17.04	26.52	0.00	55.34	64.53	-9.19	100/300kHz	Noise Floor		

Average factor = 20*LOG((0.5511*10)/100) = 25.18 dB

Hand scans were performed from 18-25GHz at a distance of <1m, no emissions were detected above the measuring equipment noise floor.

Test Personnel:	Vathana Ven VSV	Test Date:	08/28/2015
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart C 15.247; IC RSS-247	Test Levels:	See tables
Input Voltage:	3V Fresh battery		
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Ambient Temperature:	21 ºC
		Relative Humidity:	51 %
		Atmospheric Pressure:	1011 mbars

Deviations, Additions, or Exclusions: None

11 Digital Device and Receiver Radiated Spurious Emissions

11.1 Method

Tests are performed in accordance with CFR47 FCC Part 15 Subpart B 15.109, IC RSS-Gen Sections 7 & 6.0, IC ICES-003 Issue 5 August 2012.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

11.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
~145034	BiLog Antenna (30 MHz to 1GHz)	Schaffner Chase EMC	CBL6111C	2564	02/07/2012	02/07/2013
~145003	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	10/04/2011	10/04/2012
~145 128	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESI	837771/027	08/23/2011	09/23/2012
~145-410	Cables 145-400 145-406 145-407 145-405 145-403	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	10/04/2012
~145-416	Cables 145-400 145-408 145-402 145-404	Huber + Suhner	3m Track B cables	multiple	09/04/2011	10/04/2012
~HORN2	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012
~145 014	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	12/16/2011	12/16/2012
~DAV003	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	09/17/2012

Software Utilized:

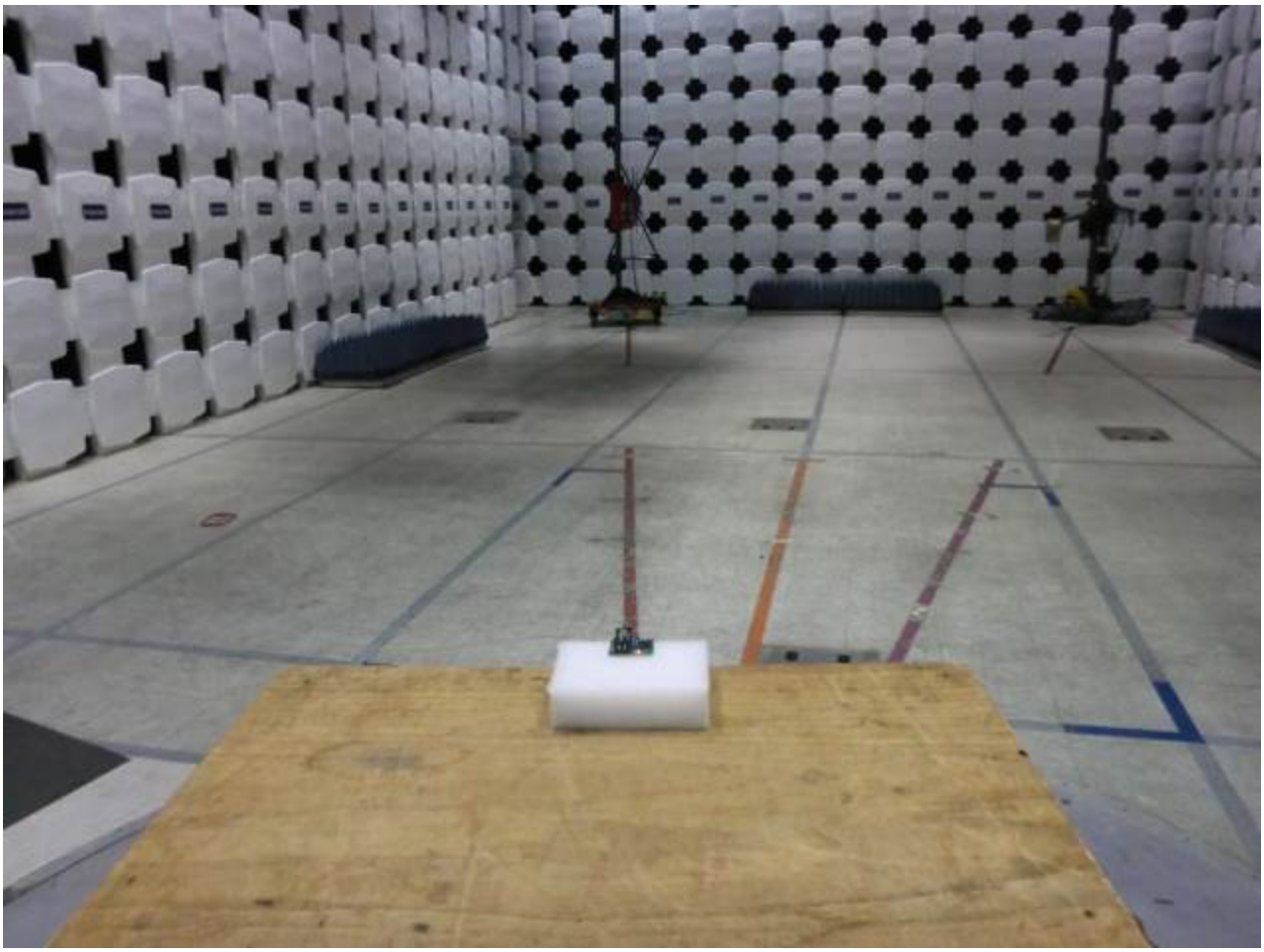
Name	Manufacturer	Version
C5	Teseq	Build 5.26.00.3

11.3 Results:

Emissions must be below the general limits of FCC 15.109, IC ICES-003 Issue 5 August 2012, and IC RSS-Gen Issue 4 December 2010 Section 6.0 Table 2.

The sample tested was found to Comply.

11.4 Setup Photographs:



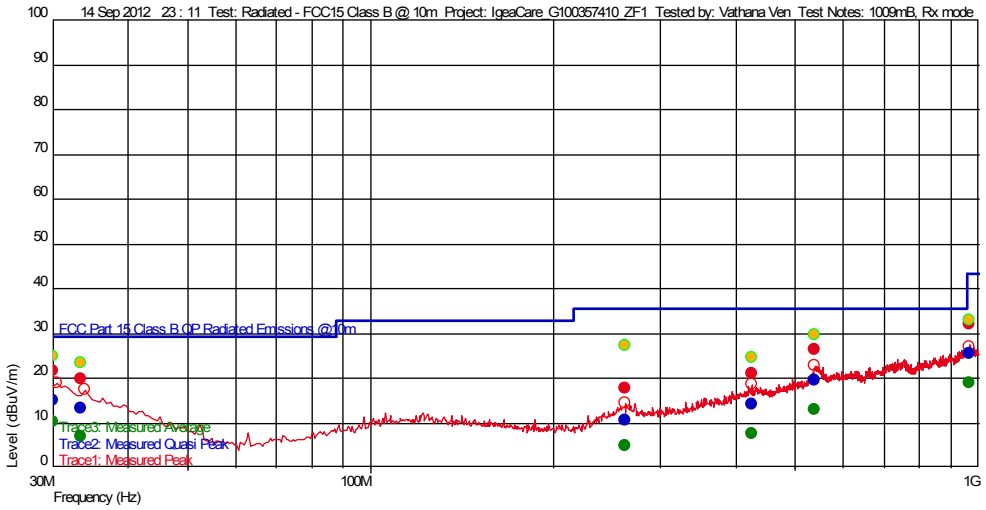
11.5 Plots/Data:

Rx Spurious Emissions 30-1000MHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 10m	
Project:	Mircom (IgeaCare_G100357410)	
Test Notes:	1009mB, Rx mode	
Temperature:	24 deg	
Humidity:	50%	
Tested by:	Vathana Ven	
Test Started:	14 Sep 2012 23 : 11	

Prescan Emission Graph



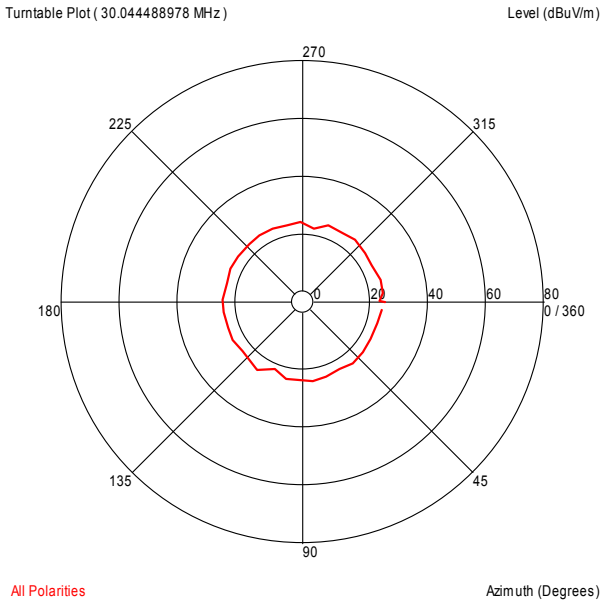
- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

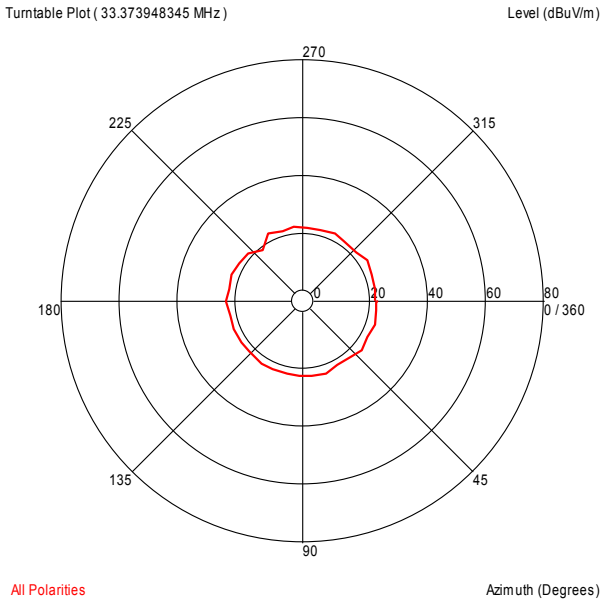
Emissions Test Data

Trace2: Measured Quasi Peak

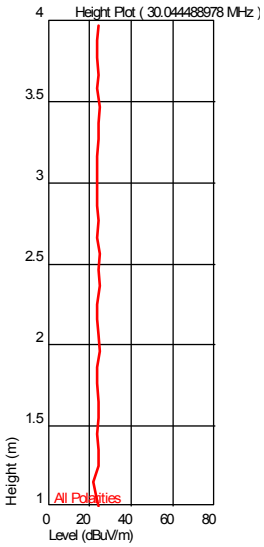
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg) (Deg)	Mast Height (m)	RBW (Hz)
262.723046026 M	10.67	14.100	-24.127	35.540	-24.87	|	7	1.25	120 k
423.674148747 M	14.04	16.873	-23.914	35.540	-21.50	|	59	2.88	120 k
968.737475359 M	25.49	24.949	-22.383	43.540	-18.05	--	128	1.34	120 k
33.373948345 M	13.42	17.250	-26.103	29.540	-16.12	|	49	3.86	120 k
539.565530868 M	19.52	21.913	-23.978	35.540	-16.02	--	104	2.47	120 k
30.044488978 M	15.00	19.069	-26.115	29.540	-14.54	|	359	2.66	120 k

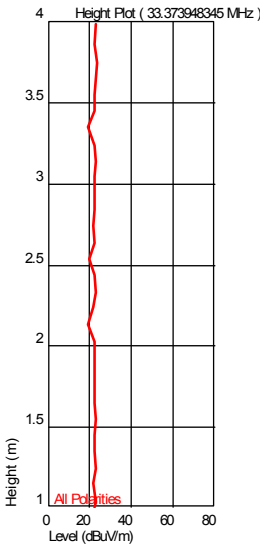
Azimuth Plots

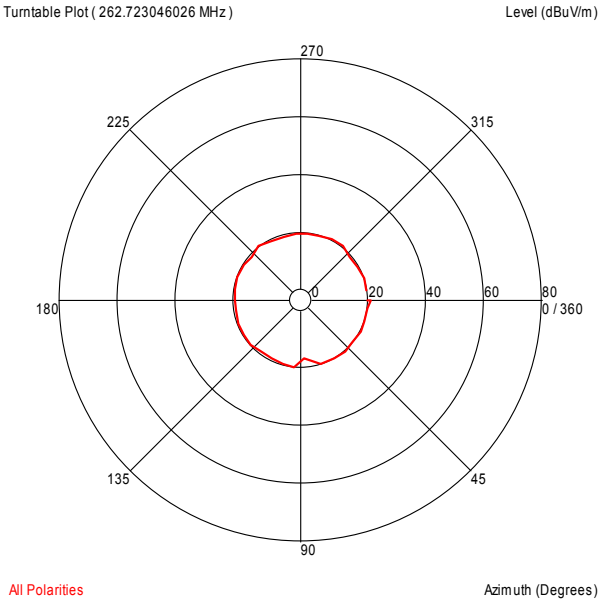


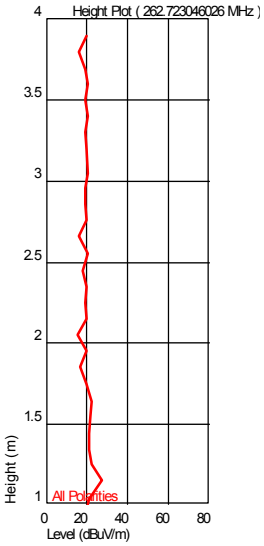


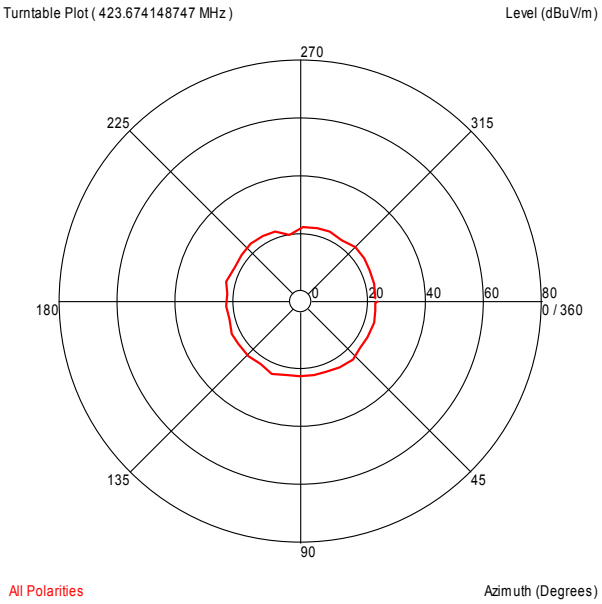
Turntable Plots

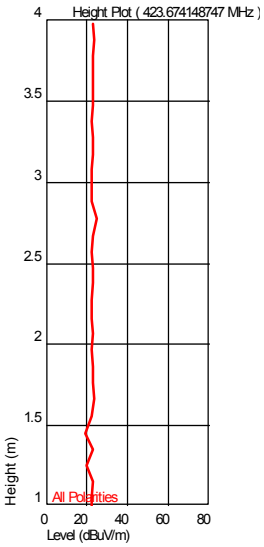


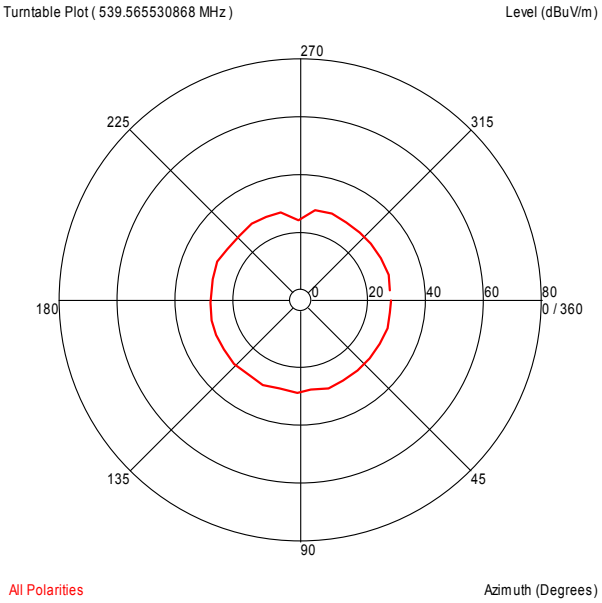


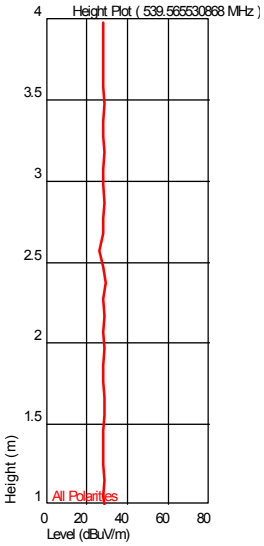

Turntable Plot (262.723046026 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

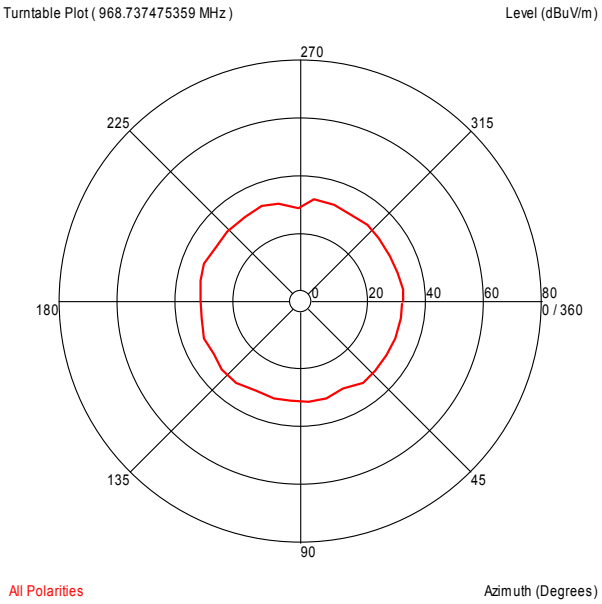

Height Plot (262.723046026 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

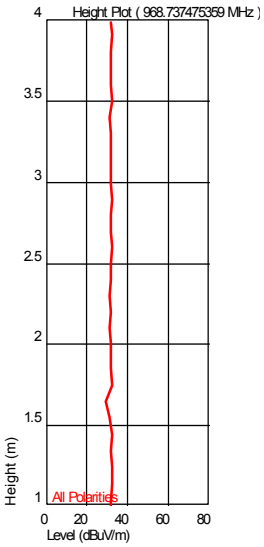

Turntable Plot (423.674148747 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (423.674148747 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (539.565530868 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (539.565530868 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)


Turntable Plot (968.737475359 MHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

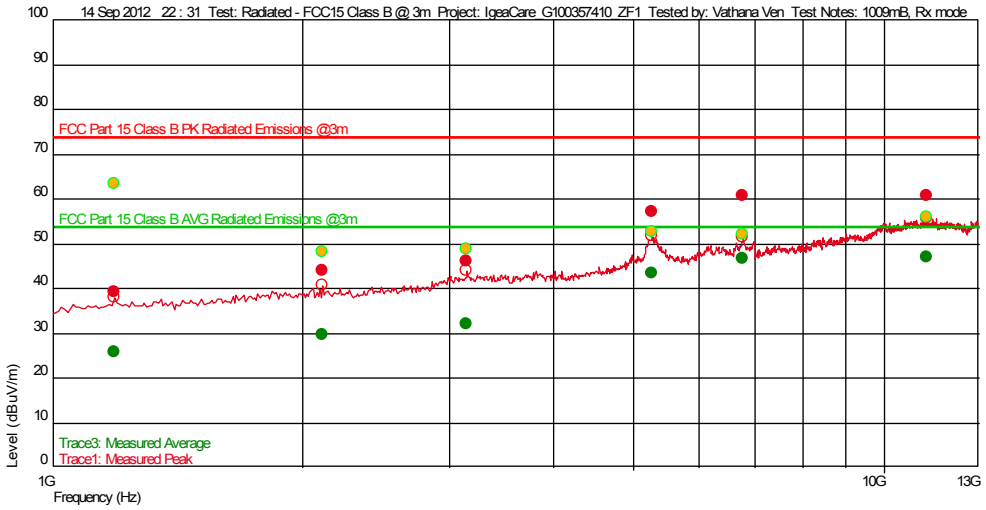

Height Plot (968.737475359 MHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

Rx Spurious Emissions 1-13GHz

Test Information

Test Details	User Entry	Additional Information
Test:	Radiated - FCC15 Class B @ 3m	
Project:	Mircom (IgeaCare_G100357410)	
Test Notes:	1009mB, Rx mode	
Temperature:	24 deg	
Humidity:	50%	
Tested by:	Vathana Ven	
Test Started:	14 Sep 2012 22 : 31	

Prescan Emission Graph



- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Swept Peak Data
- Swept Quasi Peak Data
- Swept Average Data

Emissions Test Data

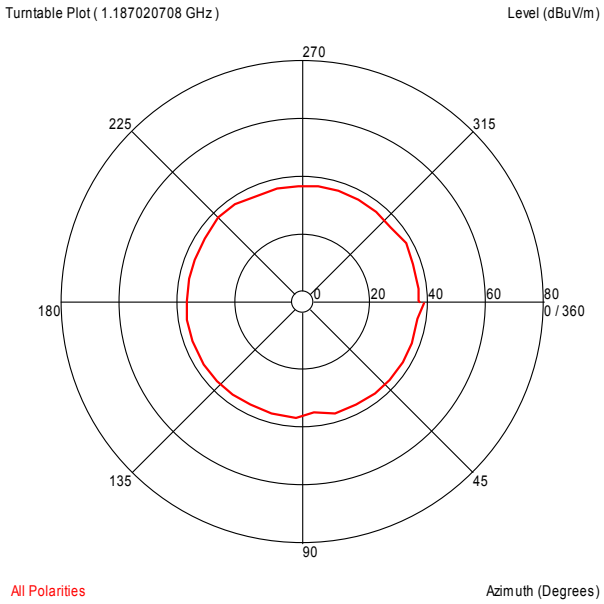
Trace1: Measured Peak

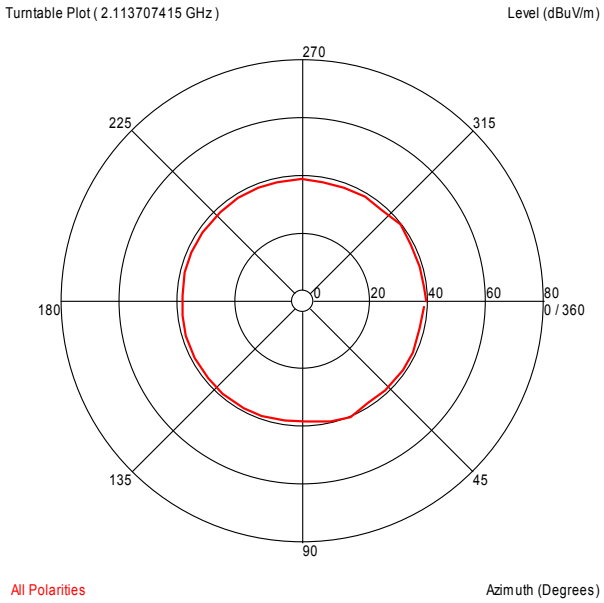
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg) (Deg)	Mast Height (m)	RBW (Hz)
1.187020708 G	39.40	25.590	-29.785	74.000	-34.60	--	0	1.10	1 M
2.113707415 G	43.99	27.607	-28.422	74.000	-30.01	--	0	1.45	1 M
3.149091516 G	46.11	30.677	-27.234	74.000	-27.89	|	332	1.56	1 M
5.264435537 G	57.12	33.730	-19.667	74.000	-16.88	--	28	4.01	1 M
11.277388109 G	60.69	38.813	-19.902	74.000	-13.31	--	183	1.21	1 M
6.770354041 G	60.83	35.066	-24.513	74.000	-13.17	|	158	2.39	1 M

Trace3: Measured Average

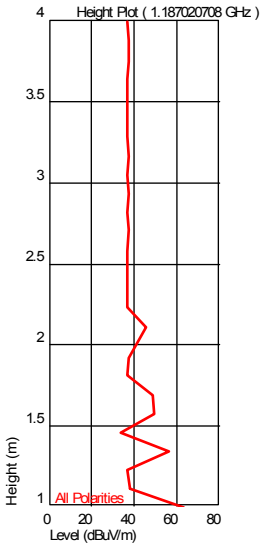
Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)	Azimuth (deg) (Deg)	Mast Height (m)	RBW (Hz)
1.187020708 G	25.80	25.590	-29.785	54.000	-28.20	--	0	1.10	1 M
2.113707415 G	29.74	27.607	-28.422	54.000	-24.26	--	0	1.45	1 M
3.149091516 G	32.20	30.677	-27.234	54.000	-21.80	|	332	1.56	1 M
5.264435537 G	43.46	33.730	-19.667	54.000	-10.54	--	28	4.01	1 M
6.770354041 G	46.86	35.066	-24.513	54.000	-7.14	|	158	2.39	1 M
11.277388109 G	46.97	38.813	-19.902	54.000	-7.03	--	183	1.21	1 M

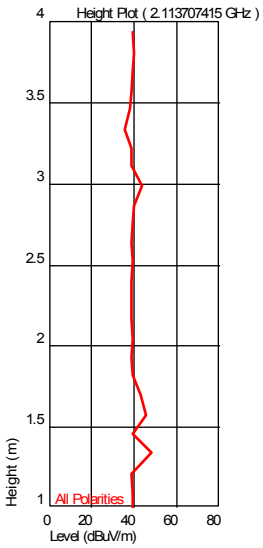
Azimuth Plots

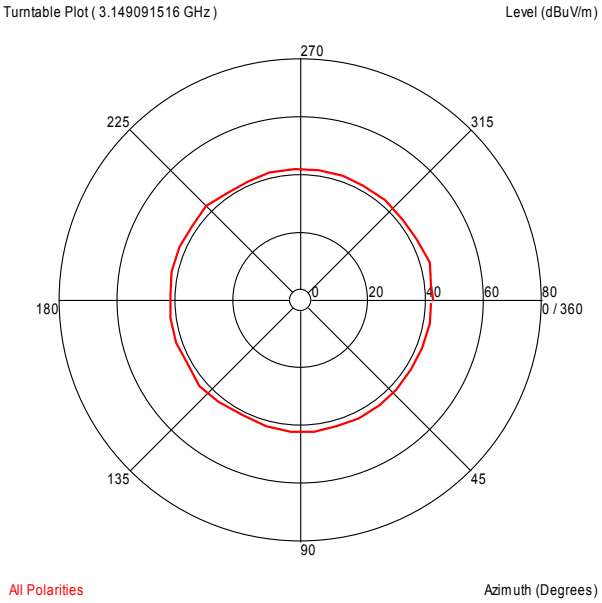


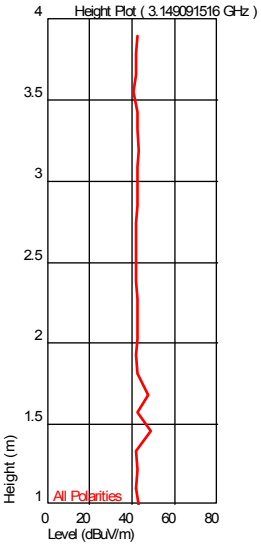


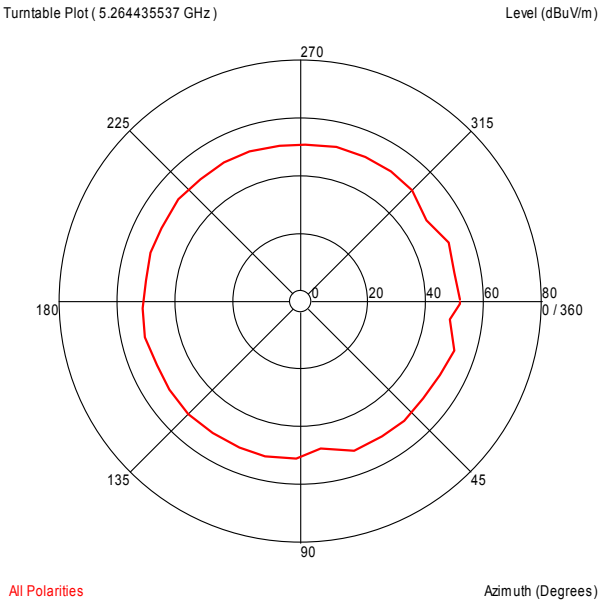
Turntable Plots

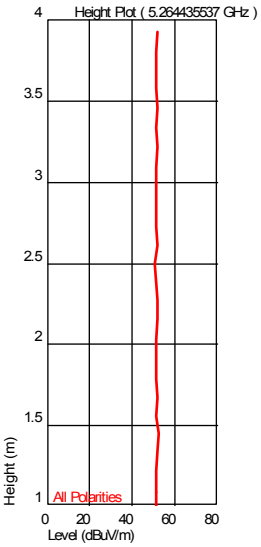


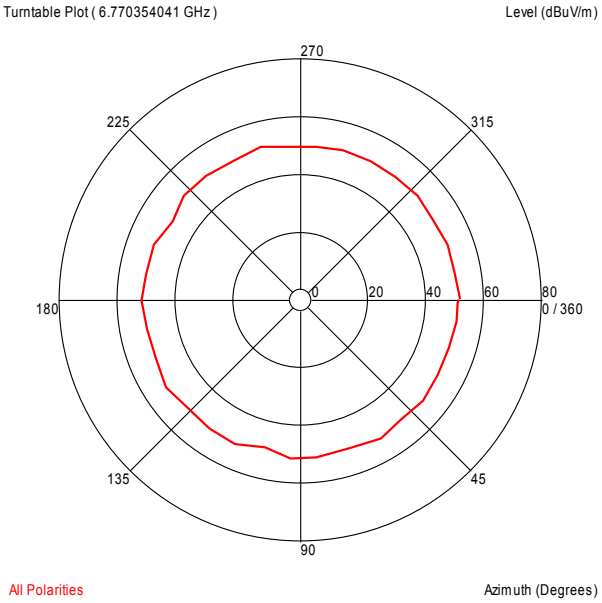


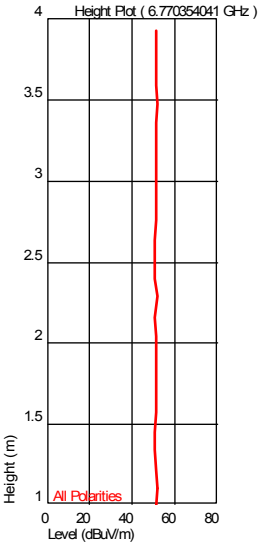

Turntable Plot (3.149091516 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)

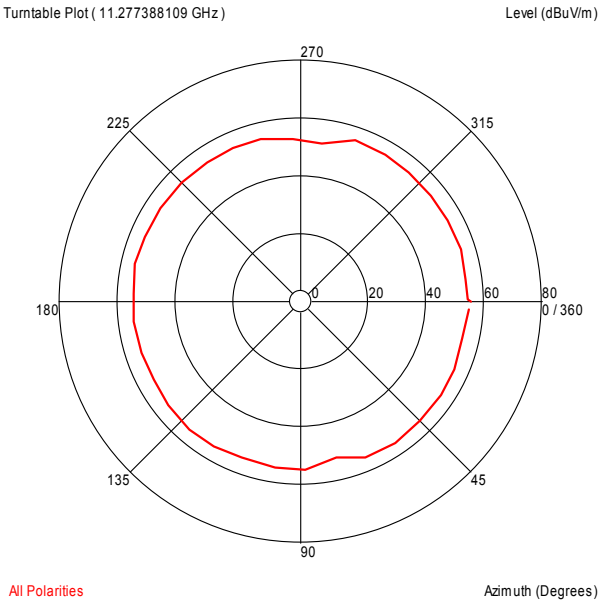

Height Plot (3.149091516 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)

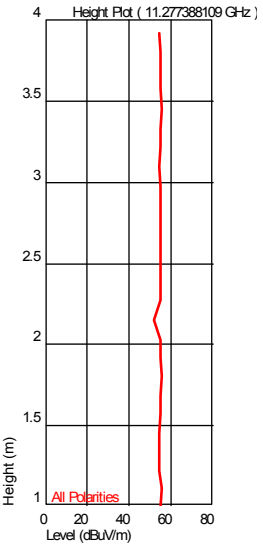

Turntable Plot (5.264435537 GHz)
Level (dBuV/m)
270
225
315
180
0
20
40
60
80
0 / 360
135
45
90
All Polarities
Azimuth (Degrees)


Height Plot (5.264435537 GHz)
4
3.5
3
2.5
2
1.5
1
Height (m)
All Polarities
0
20
40
60
80
Level (dBuV/m)









Test Personnel:	Vathana Ven VSV	Test Date:	09/14/2012
Supervising/Reviewing Engineer: (Where Applicable)	N/A		
Product Standard:	FCC Part 15 Subpart B; IC RSS-247, IC RSS-Gen, IC ICES-003	Test Levels:	Class B
Input Voltage:	3V Fresh battery	Ambient Temperature:	24 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Relative Humidity:	50 %
		Atmospheric Pressure:	1009 mbars

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	09/27/2012	100334102BOX-026			Original Issue
1	03/25/2015	100334102BOX-026a		KPS	Company name and model number changed
2	09/03/2015	102172761BOX-001			Added data above 1 GHz