EMISSIONS TEST REPORT

Report Number: 101930181BOX-001b
Project Number: G101930181

Report Issue Date: 03/26/2015

Product Designation: NC-2000 (originally tested as Igeacom II)

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

Testing was originally performed for IGEACare Solutions Inc.
163 Rivalda Road
North York M9M 2M7
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	Receiver Radiated Spurious Emissions (CFR47 FCC Part 15 Subpart B 15.109, IC RSS-Gen Sections 4.10 & 6.0)	Pass
12	AC Line Conducted Emissions (CFR47 FCC Part 15 Subpart B 15.207, IC RSS-Gen Section 7.2.4)	Pass
13	Revision History	

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
Emergency Response Base Station	Mircom Technologies Ltd.	N-2000 (originally tested as Igeacom II	000000017 000000018

Receive Date:	01/25/2012	Start Date:	04/24/2012
Received Condition:	Good	Complete date:	04/25/2012
Type:	Prototype		

Description of Equipment Under Test (provided by client)

The NC-2000 (originally tested as Igeacom II) is an emergency response device with Zigbee wireless application. Wireless communication to a host via an internal chip antenna and Zigbee application with O-PQSK modulation is used. The Zigbee transceiver operates in the 2400-2483.5MHz band from 2405-2480MHz using an integral antenna.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
120VAC	200mA	60Hz	1

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	The device was in transmit mode
2	The device was also tested in receive mode

5 System Setup and Method

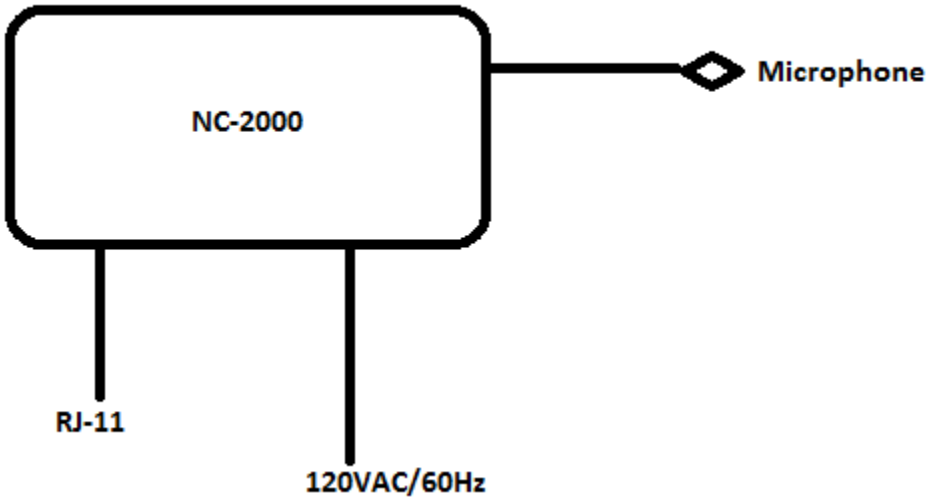
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	RJ11 cable	>3	None	None	Unterminated
1	AC adapter cable	<3	None	None	AC mains

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 C 63.4:2009, ANSI C63.10:2009, FCC Part 15:2015, Subpart C Section 15.247, IC RSS-247 Issue 1 May 2015, RSS-Gen Issue 4 November 2014, 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
DAV003'	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	08/02/2012
145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	08/23/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	09/04/2012

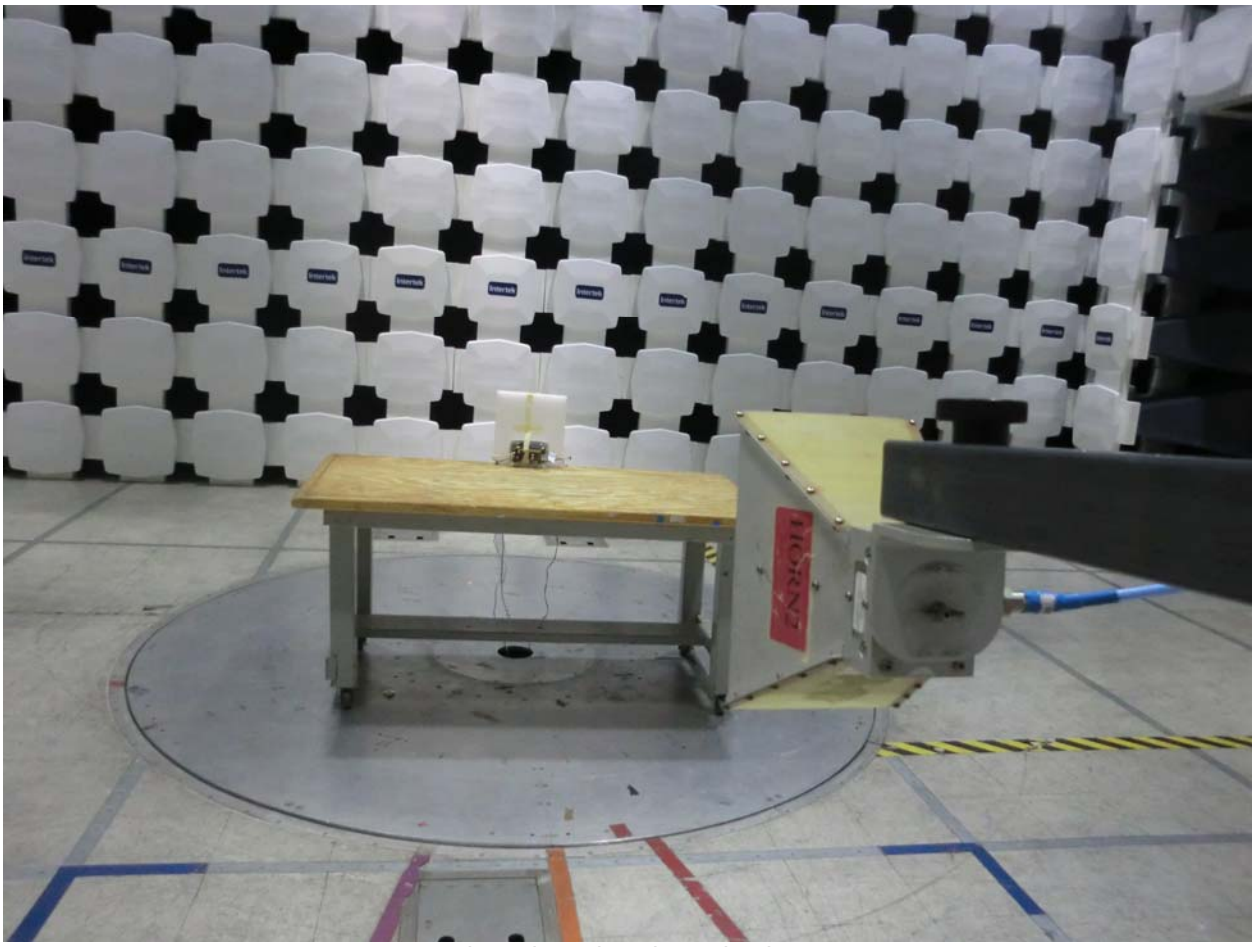
Software Utilized:

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

6.3 Results:

The EIRP must not exceed 36 dBm. The sample tested was found to Comply.

6.4 Setup Photograph:



Axis3 orientation shown in photo

6.5 Test Data:

RF Output Power

Company: IGEACare Solutions Inc
Model #: Igeacom II
Serial #: 000000018
Engineers: Vathana Ven
Project #: G100334102 Date(s): 04/24/12
Standard: FCC Part 15 Subpart C 15.247/RSS-247
Receiver: R&S ESI (145128) 08-23-2012
PreAmp: PRE145014 12-16-2012.txt
PreAmp Used? (Y or N): N
Antenna & Cables: N 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 NONE.
Location: 10m Chamber Barometer: DAV003 Filter: NONE
Temp/Humidity/Pressure: 20c 33% 992mB
Limit Distance (m): 3
Test Distance (m): 3
Voltage/Frequency: 102/120/138VAC/60Hz Frequency Range: Frequencies Shown

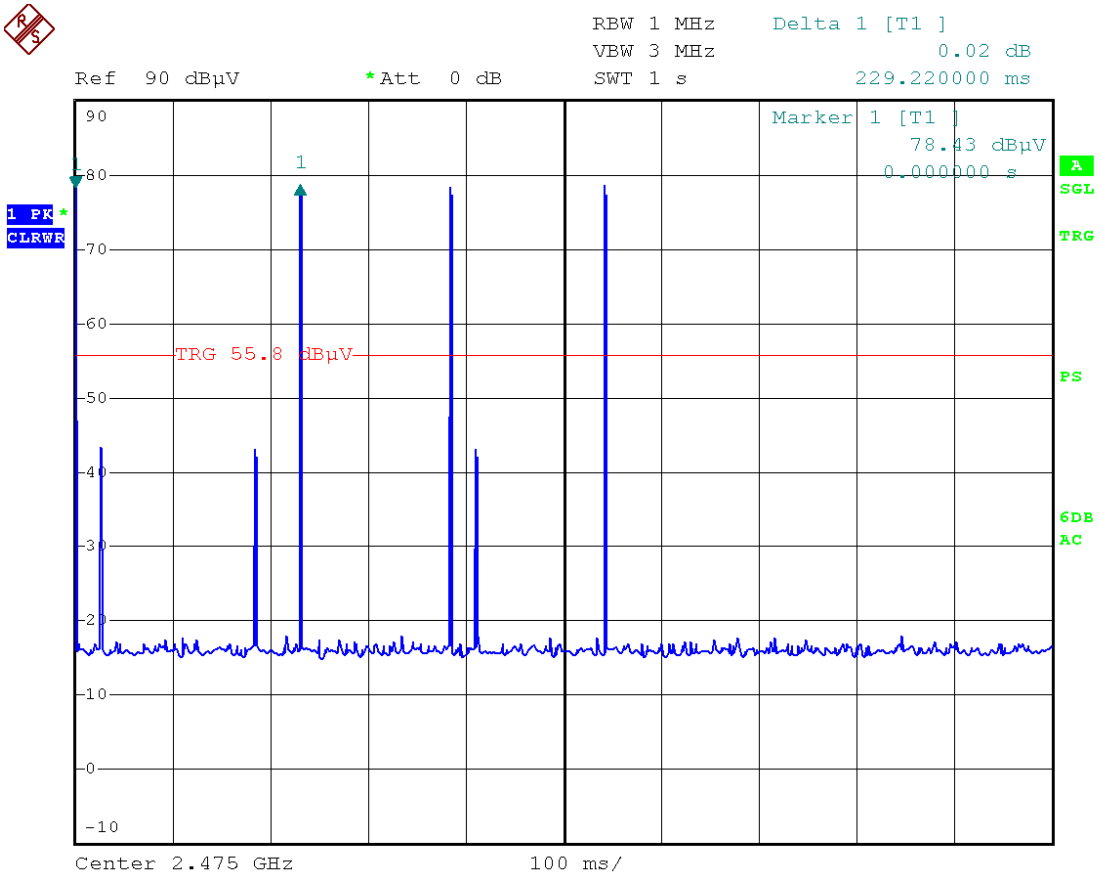
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

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	EIRP Net dBm	EIRP Limit dBm	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													
PK	H	2405.000	62.50	28.33	5.93	0.00	0.00	1.54	36.00	-34.46	5/10 MHz		
PK	H	2440.000	63.09	28.43	5.98	0.00	0.00	2.28	36.00	-33.72	5/10 MHz		
PK	H	2480.000	63.22	28.54	6.03	0.00	0.00	2.58	36.00	-33.42	5/10 MHz		

Testing was performed with mains power varied between 85% and 115% of nominal voltage. No change in output power was observed.

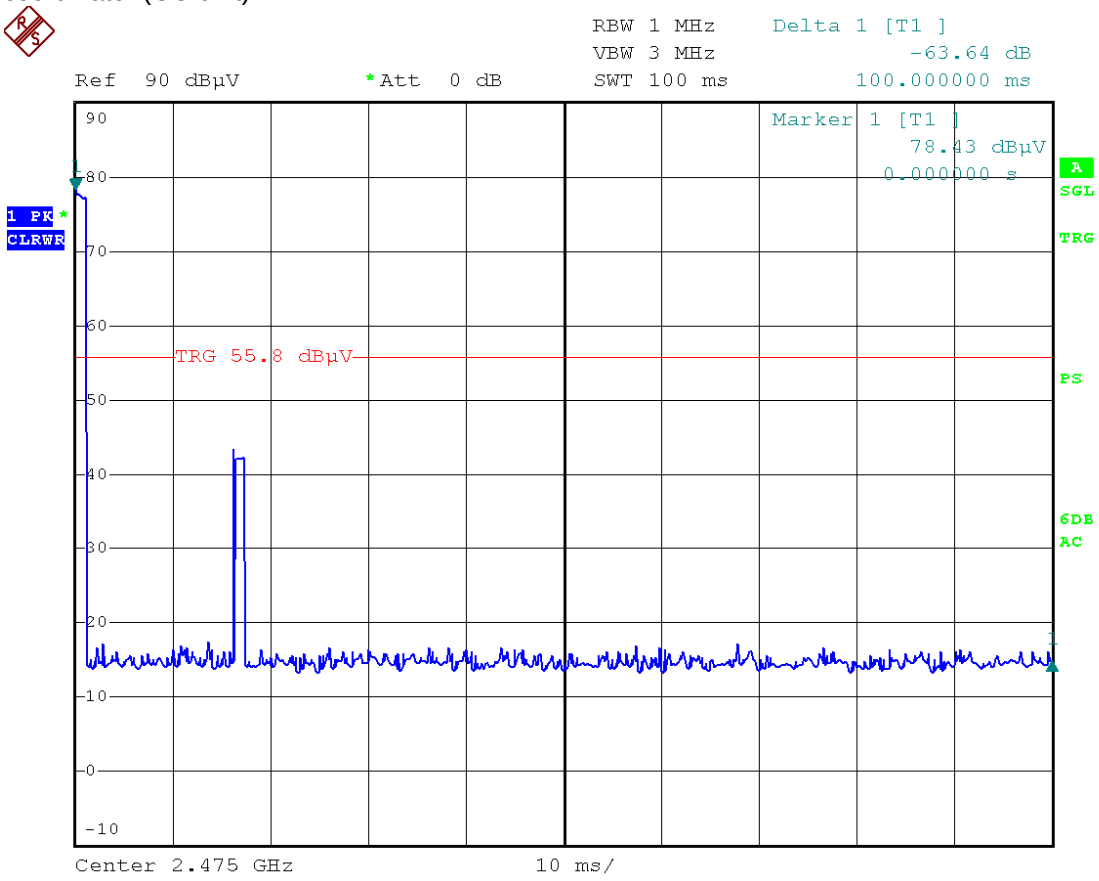
Duty Cycle

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. Note that the small pulse was from a support coordinator unit (CO) and that no other pulse trains are in 100 ms period.



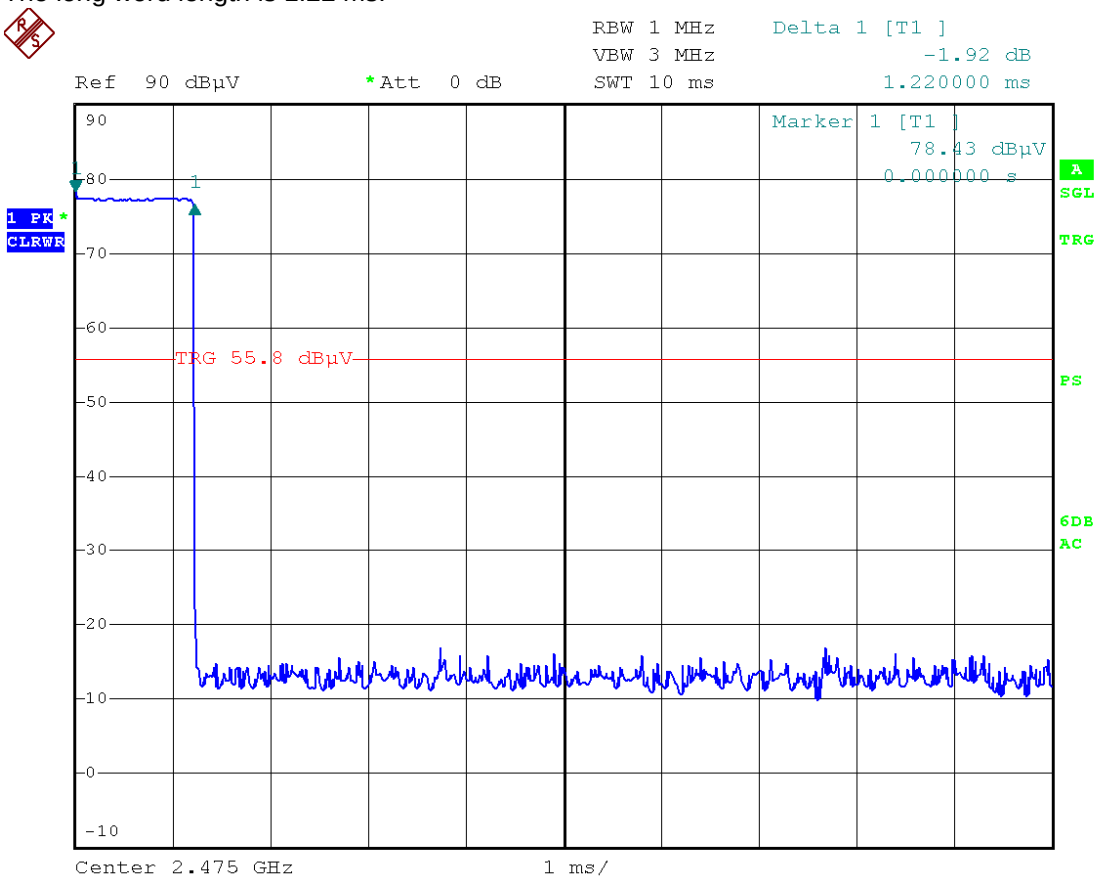
Date: 27.APR.2012 21:54:22

This period contains one long word, as shown here. Note that the small pulse was from a supported coordinator (CO unit).



Date: 27.APR.2012 21:34:56

The long word length is 1.22 ms.



Date: 27.APR.2012 21:44:42

The duty cycle is therefore, 1.22 ms in a 100ms period, or 1.22%, for a duty cycle correction factor of 38.3 dB.

Human RF Exposure:
The EUT is a fixed installation device and was measured in a radiated fashion. The RF output power was measured using a resolution bandwidth larger than the bandwidth of the emission. The data obtained was adjusted for equipment losses and converted from a field strength reading to a power reading using the provisions of FCC KDB 558074 and RSS-Gen 4.6. The human RF exposure limit is 1 mW/cm^2. The power density S in mW/cm^2 generated by some value of EIRP in mW at a given distance d in cm is related by the equation:

$$S=EIRP / (4\pi d^2)$$

The distance, given a maximum EIRP of 2.58 dBm (1.81 mW), at which the radiated power density of the EUT is equal to the human RF exposure limit is 0.38 cm from the antenna. This result does not take averaging into account.

The EUT is exempt from FCC RF exposure evaluation due to the peak output power being below $60/f_{(GHz)}$ where f is the frequency in GHz. This expression yields an exemption threshold of 24.2 mW (13.84 dBm) at 2480 MHz.

The EUT is exempt from IC SAR RF exposure evaluation as referenced in IC RSS-102 Issue 4 March 2010 section 2.5.2 because the operating frequency is above 1.5 GHz and the EIRP does not exceed 5 Watts (37.0 dBm).

Test Personnel:	Vathana Ven VV	Test Date:	04/24/2012
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:	102/120/138VAC/60Hz		
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Ambient Temperature:	21 ºC
		Relative Humidity:	41 %
		Atmospheric Pressure:	991 mbars

Deviations, Additions, or Exclusions: None

7 6 dB 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.

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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
DAV003'	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	08/02/2012
145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	08/23/2012
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	09/04/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012

Software Utilized:

Name	Manufacturer	Version
None		

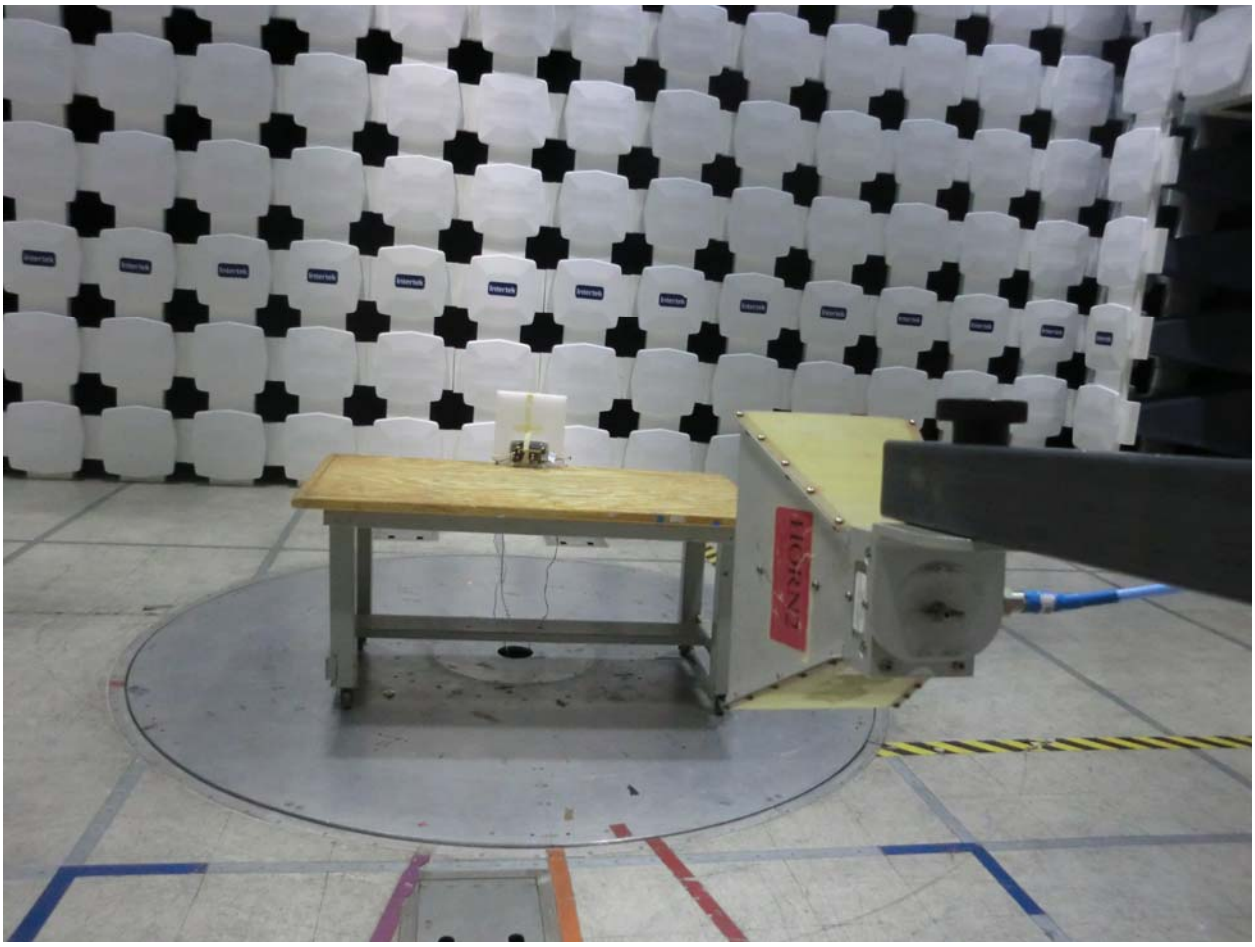
7.3 Results:

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)	1.471 MHz	2.753 MHz
Channel 18 (2440 MHz)	1.450 MHz	2.710 MHz
Channel 26 (2480 MHz)	1.450 MHz	3.800 MHz

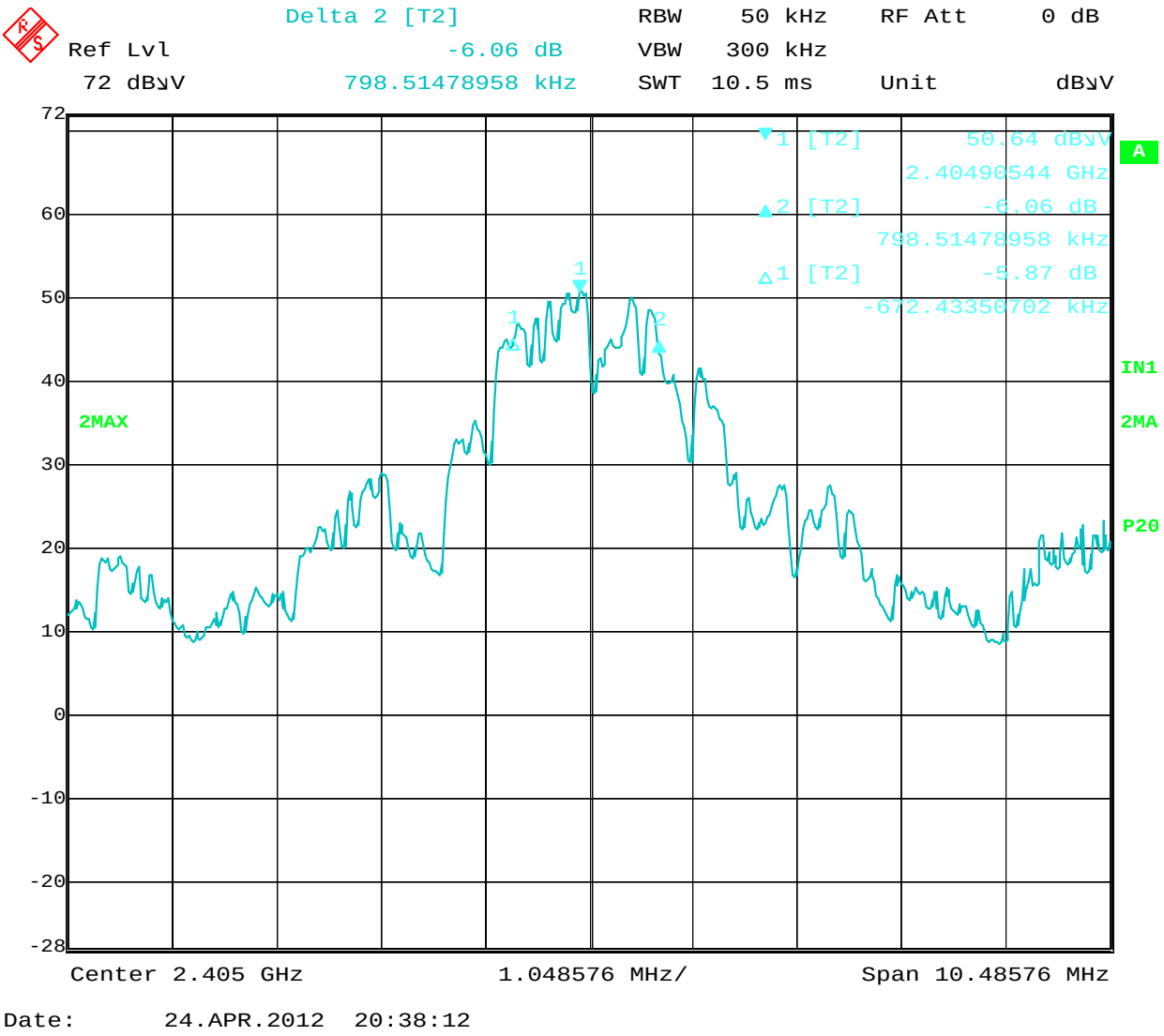
Plots were taken using an RBW of ~1-5% of the measured emission bandwidth, per KDB 558074v01 01/18/2012 and IC RSS-Gen Section 4.6.2.

7.4 Setup Photograph:



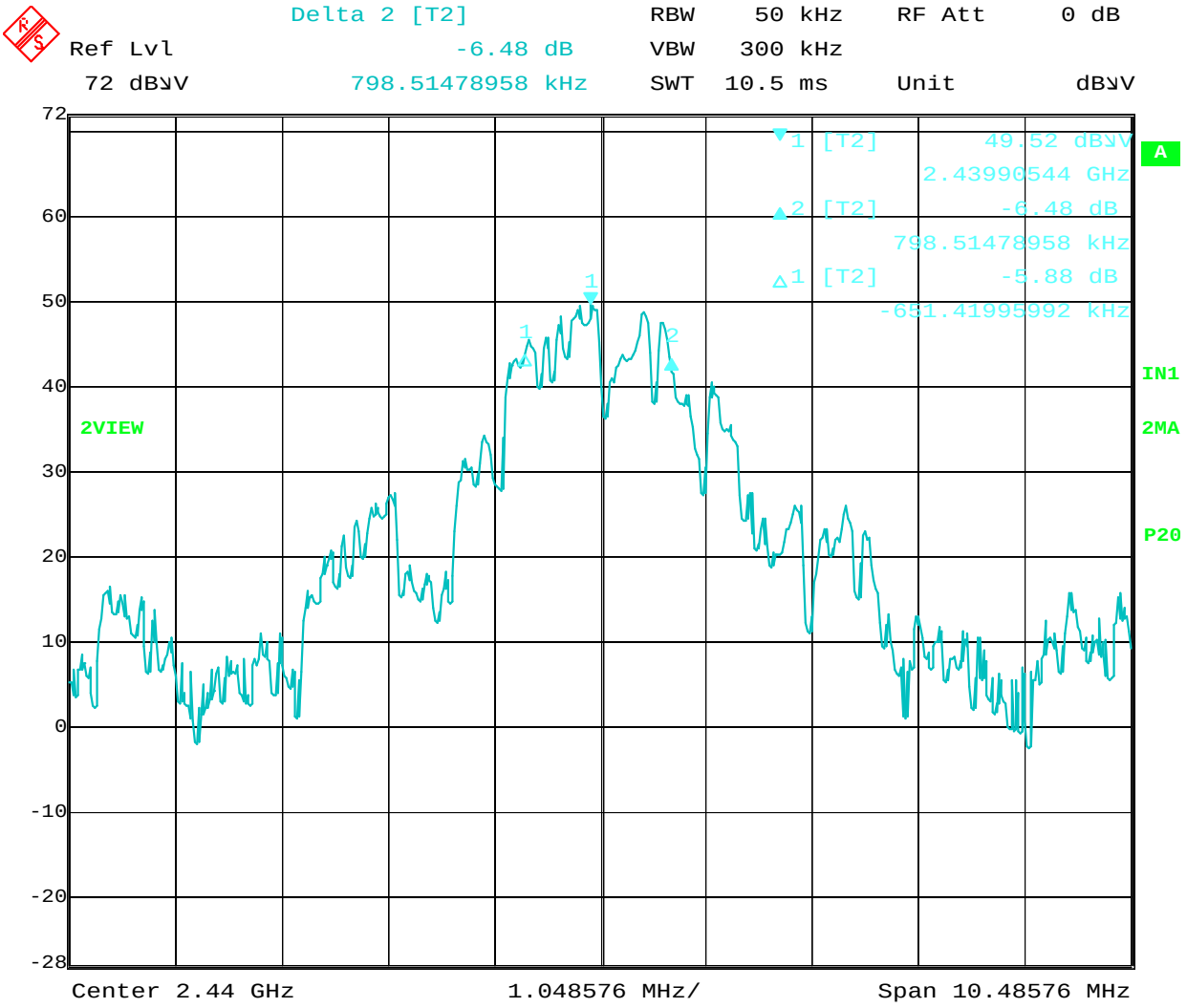
7.5 Plots/Data:

Channel 11 (2405 MHz) 6 dB Bandwidth

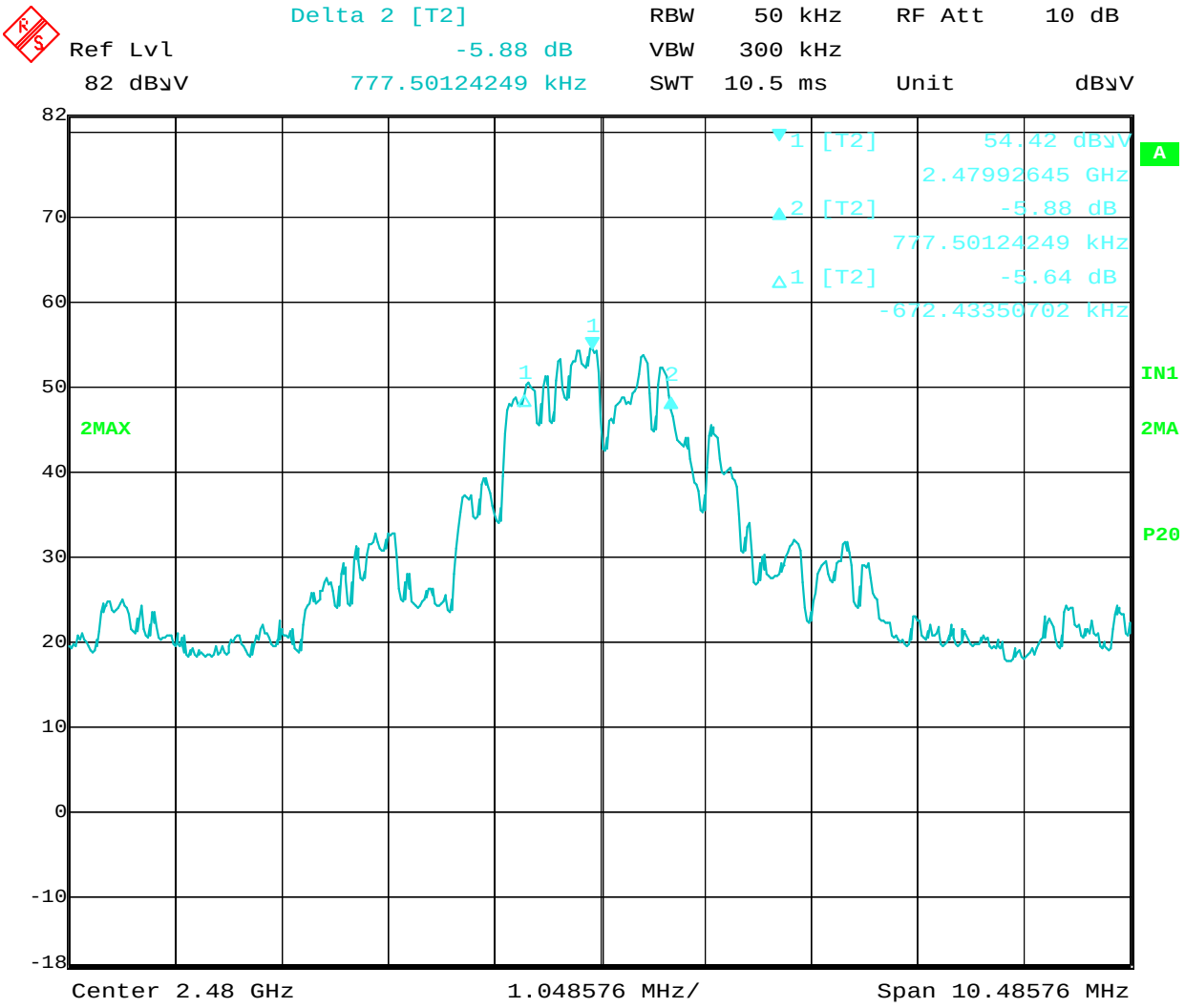


Date: 24.APR.2012 20:38:12

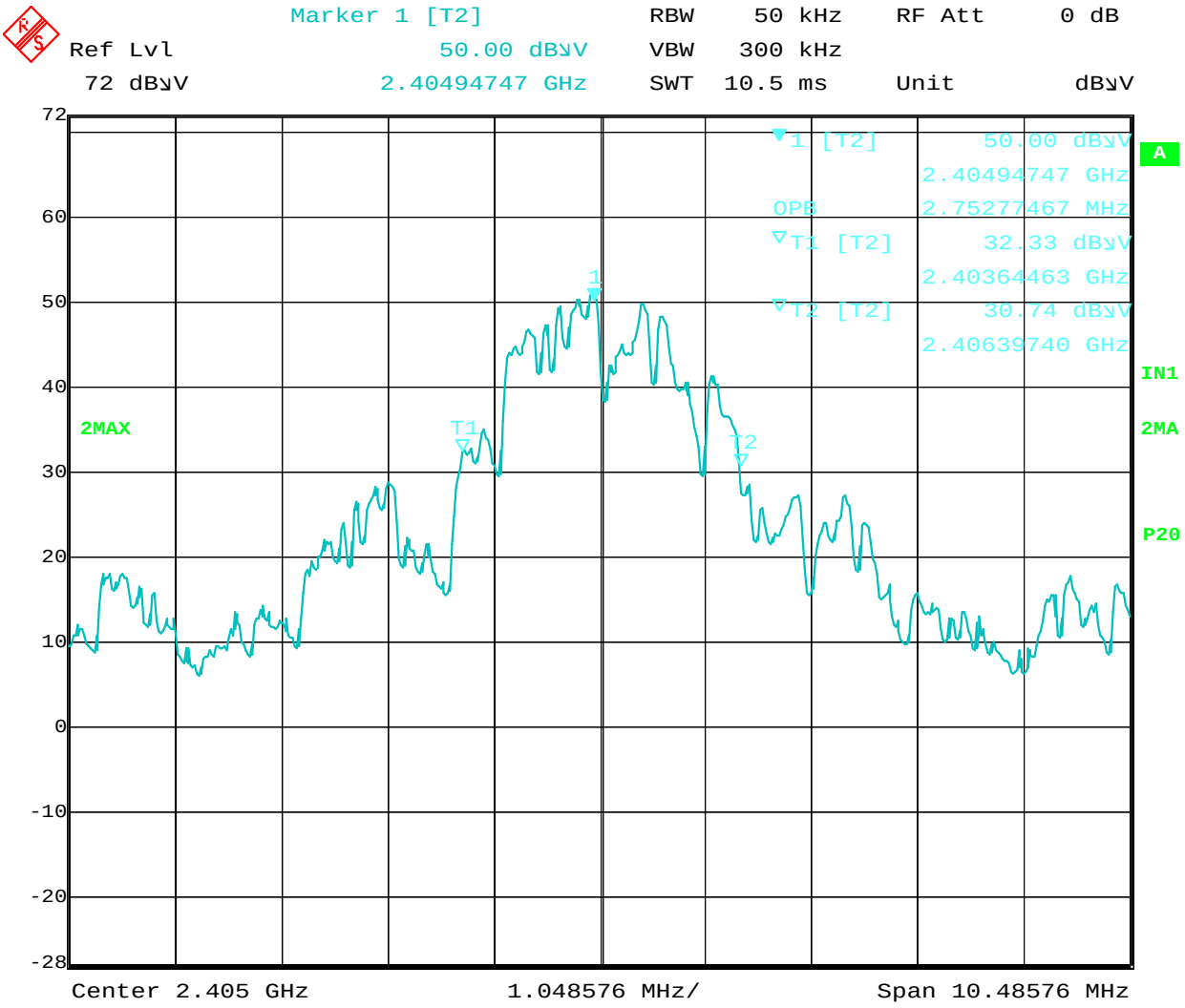
Channel 18 (2440 MHz) 6 dB Bandwidth



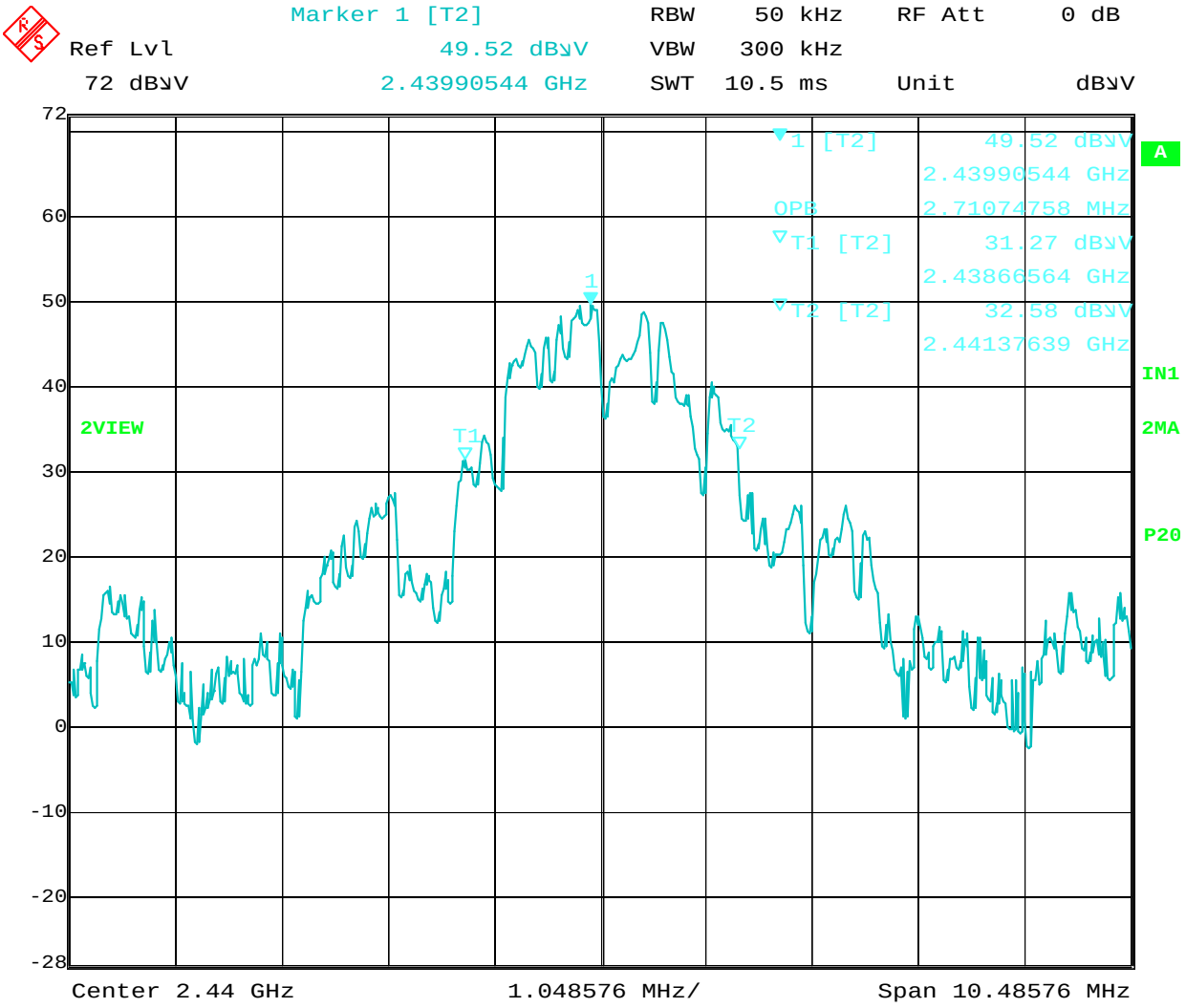
Channel 26 (2480 MHz) 6 dB Bandwidth



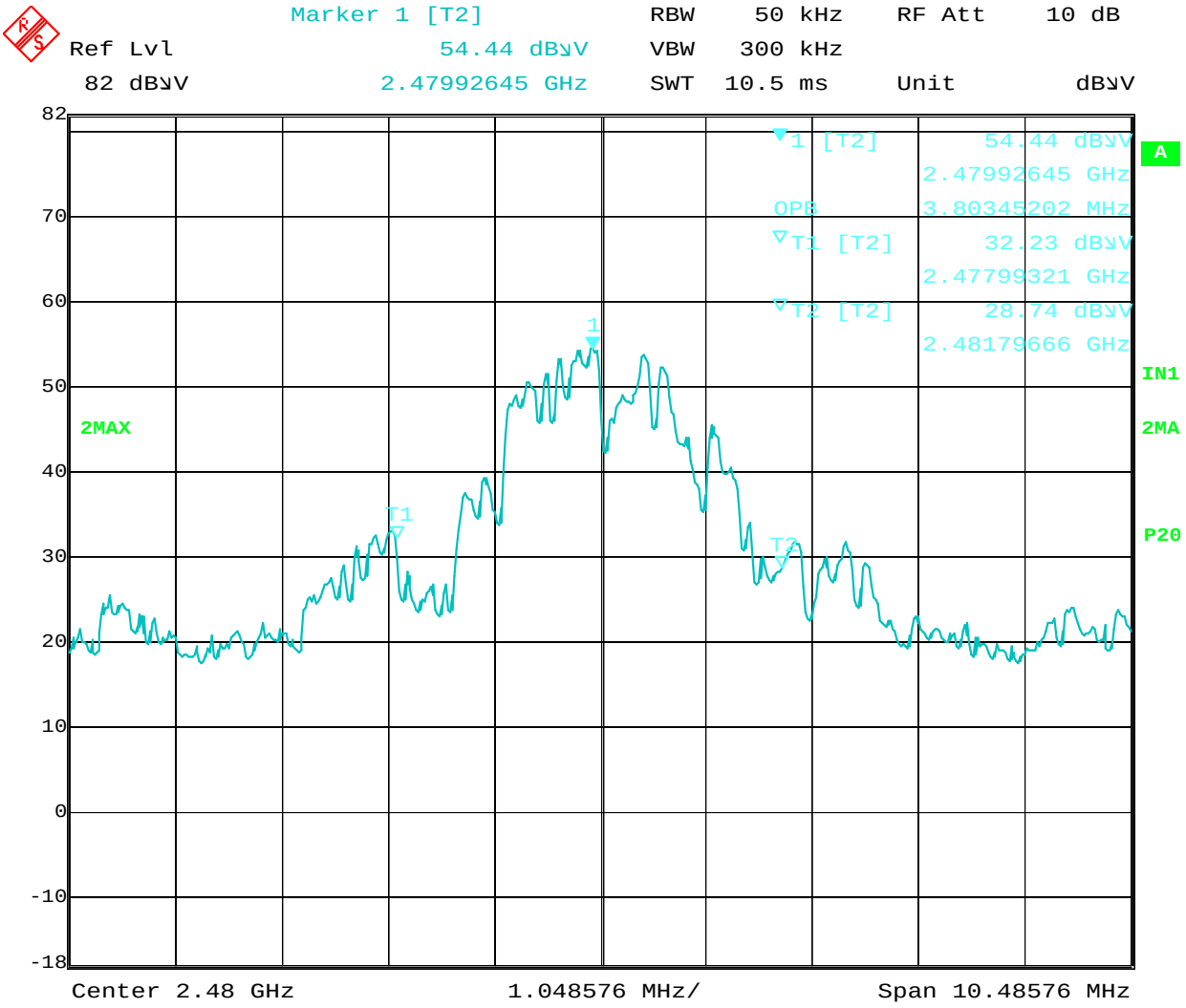
Channel 11 (2405 MHz) 99% Power Bandwidth



Channel 18 (2440 MHz) 99% Power Bandwidth



Channel 26 (2480 MHz) 99% Power Bandwidth



Test Personnel:	Vathana Ven VSV	Test Date:	04/24/2012
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:	120VAC/60Hz	Ambient Temperature:	20 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Relative Humidity:	33 %
		Atmospheric Pressure:	992 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.

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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
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145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	08/23/2012
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	09/04/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012

Software Utilized:

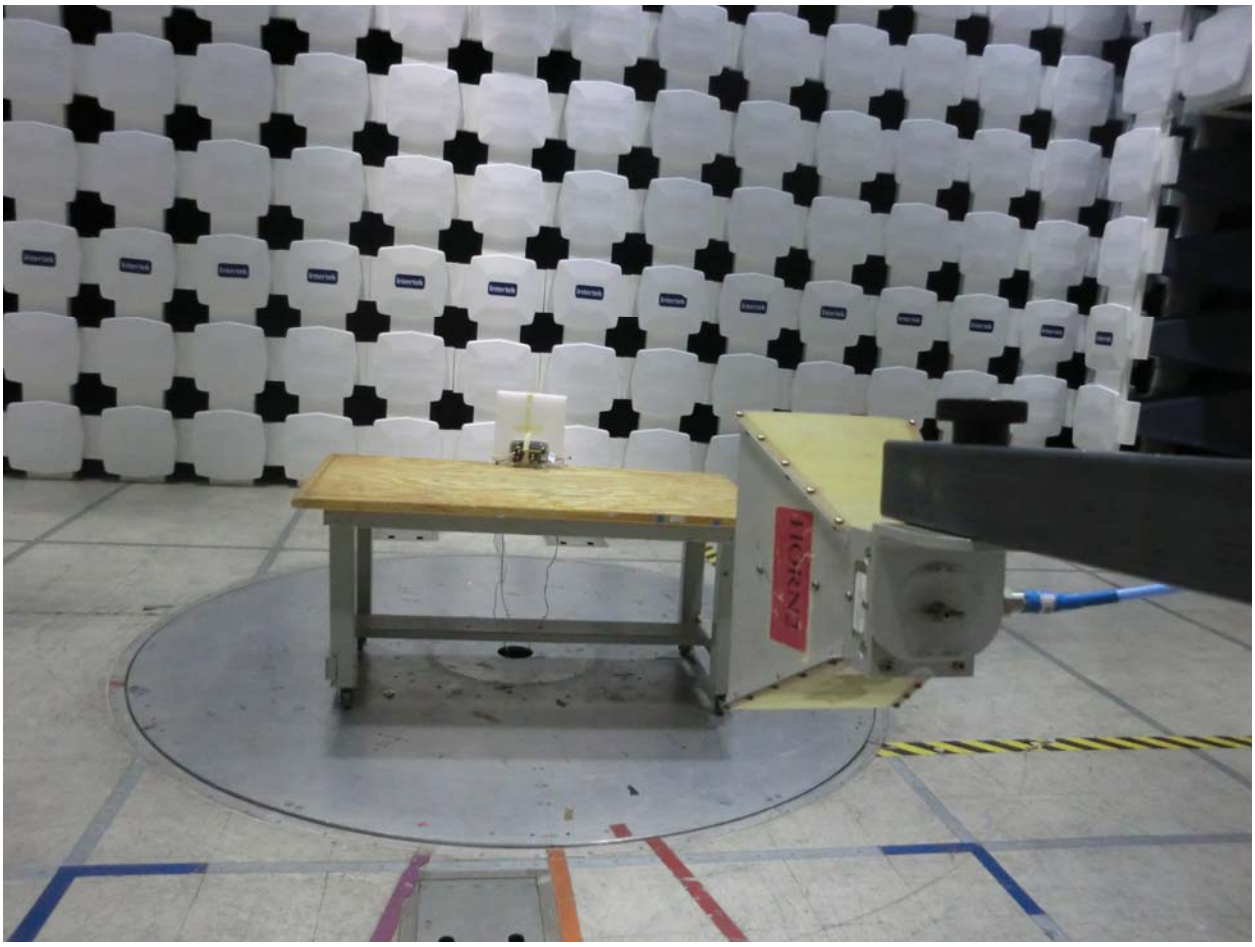
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

8.3 Results:

The peak power spectral density must not exceed 8 dBm in any 3 kHz bandwidth.

The sample tested was found to Comply.

8.4 Setup Photograph:



8.5 Test Data:

Radiated Emissions

Company: IGEACare Solutions Inc | Antenna & Cables: N | Bands: N, LF, HF, SHF
Model #: Igeacom II | Antenna: HORN2 V3m 10-24-2012.txt | HORN2 H3m 10-24-2012.txt
Serial #: 000000018 | Cable(s): 145-416 3mTrkB 09-04-2012.txt | NONE.
Engineers: Vathana Ven | Location: 10m Chamber | Barometer: DAV003 | Filter: NONE
Project #: G100334102 | Date(s): 04/24/12
Standard: FCC Part 15 Subpart C 15.247/RSS-247 | Temp/Humidity/Pressure: 20c | 33% | 992mB
Receiver: R&S ESI (145128) 08-23-2012 | Limit Distance (m): 3
PreAmp: PRE145014 12-16-2012.txt | Test Distance (m): 3
PreAmp Used? (Y or N): N | Voltage/Frequency: 102/120/138VAC/60Hz | Frequency Range: Frequencies Shown
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	EIRP Net dBm	EIRP Limit dBm	Margin dB	Bandwidth
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											
PK	H	2405.000	55.35	28.33	5.93	0.00	0.00	-20.81	8.00	-28.81	100/300 kHz
PK	H	2440.000	57.57	28.43	5.98	0.00	0.00	-18.44	8.00	-26.44	100/300 kHz
PK	H	2480.000	57.72	28.54	6.03	0.00	0.00	-18.12	8.00	-26.12	100/300 kHz
Note: Power Density measured in a 3 kHz RBW											
PK	H	2405.000	51.50	28.33	5.93	0.00	0.00	-9.46	8.00	-17.46	3/10 kHz
PK	H	2440.000	52.44	28.43	5.98	0.00	0.00	-8.37	8.00	-16.37	3/10 kHz
PK	H	2480.000	52.55	28.54	6.03	0.00	0.00	-8.09	8.00	-16.09	3/10 kHz

Test Personnel: Vathana Ven VJV
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC Part 15 Subpart C 15.247; IC RSS-247
Input Voltage: 120VAC/60Hz
Pretest Verification w/ Ambient Signals or BB Source: **Ambient**

Test Date: 04/24/2012
Test Levels: See section 8.3
Ambient Temperature: 20 ºC
Relative Humidity: 33 %
Atmospheric Pressure: 992 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 C63.10, 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.

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	08/02/2012
145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	08/23/2012
145-416'	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	09/04/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012

Software Utilized:

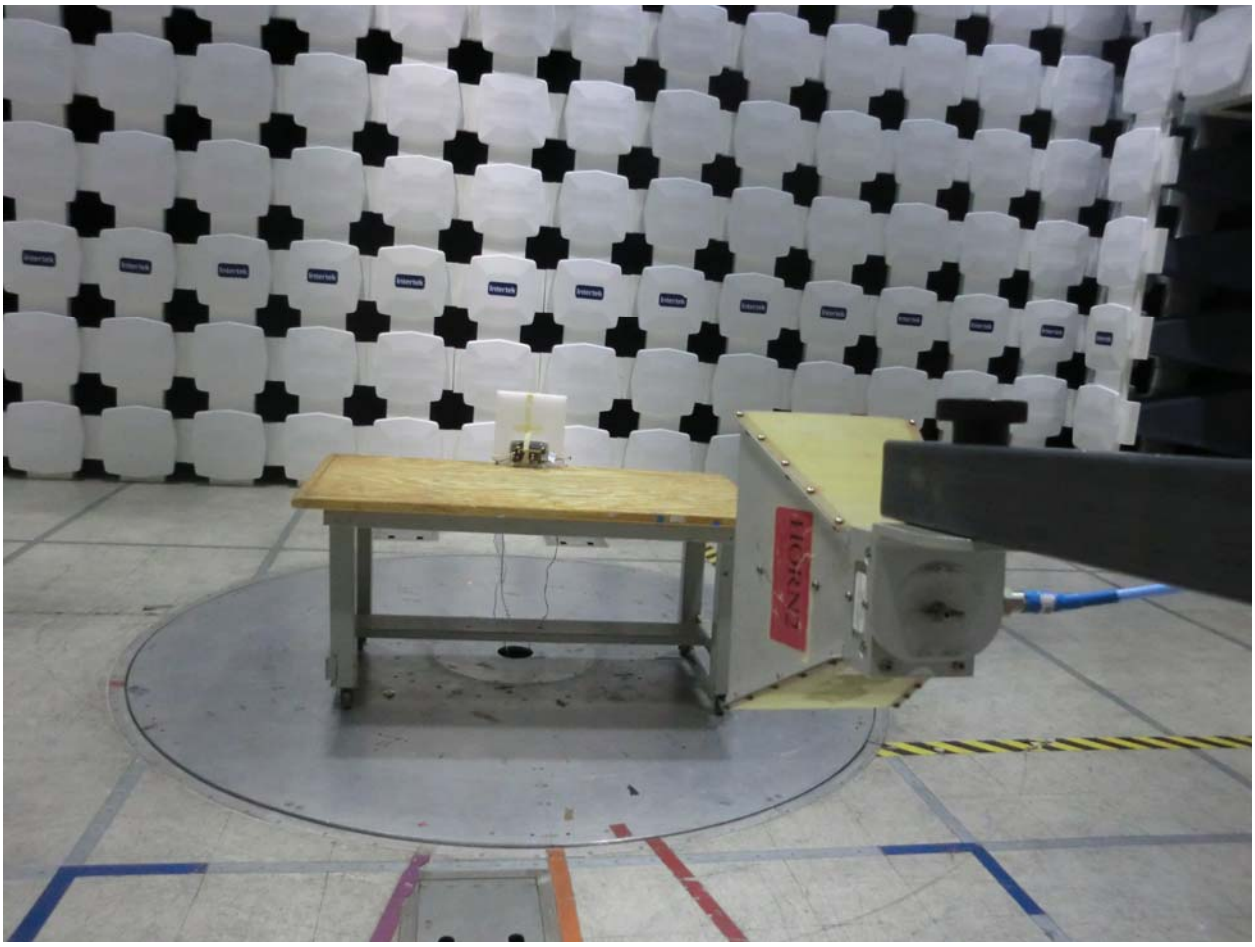
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

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 7.2.5 Table 5. Emissions in restricted bands must meet the general limits of FCC Part 15 Section 15.209 and of RSS-Gen 7.2.5 Table 5.

The sample tested was found to Comply.

9.4 Setup Photograph:



9.5 Test Data:

Special Radiated Emissions

Company: IGEACare Solutions Inc | Antenna & Cables: N | Bands: N, LF, HF, SHF
Model #: Igeacom II | Antenna: HORN2 V3m 10-24-2012.txt | HORN2 H3m 10-24-2012.txt
Serial #: 000000018 | Cable(s): 145-416 3mTrkB 09-04-2012.txt | CBL030, MEG005
Engineers: Vathana Ven | Location: 10m Chamber | Barometer: DAV003 | Filter: REA004
Project #: G100334102 | Date(s): 04/25/12
Standard: FCC Part 15 Subpart C 15.247/RSS-247 | Temp/Humidity/Pressure: 21c | 34% | `1001mB
Receiver: R&S ESI (145128) 08-23-2012 | Limit Distance (m): 3
PreAmp: PRE145014 12-16-2012.txt | Test Distance (m): 3
PreAmp Used? (Y or N): N | Voltage/Frequency: 120VAC/60Hz | Frequency Range: See Frequencies
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	28.04	28.56	6.04	0.00	0.00	62.63	74.00	-11.37	10 kHz/30 kHz
AVG	H	2484.000	-10.26	28.56	6.04	0.00	0.00	24.33	54.00	-29.67	10 kHz/30 kHz
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent											
PK	H	2484.000	29.74	28.56	6.04	0.00	0.00	64.33	74.00	-9.67	100/300kHz
AVG	H	2484.000	-8.56	28.56	6.04	0.00	0.00	26.03	54.00	-27.97	100/300kHz
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent											
PK	H	2484.000	31.02	28.56	6.04	0.00	0.00	65.61	74.00	-8.39	500kHz/3MHz
AVG	H	2484.000	-7.28	28.56	6.04	0.00	0.00	27.31	54.00	-26.69	500kHz/3MHz

Test Personnel: Vathana Ven VJV
Test Date: 04/25/2012
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC Part 15 Subpart C 15.247; IC RSS-247
Test Levels: See section 9.3
Input Voltage: 120VAC/60Hz
Pretest Verification w/ Ambient Signals or BB Source: **Ambient**
Ambient Temperature: 21 ºC
Relative Humidity: 29 %
Atmospheric Pressure: 997 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, 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
~145106	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	08/15/2011	08/15/2012
~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	08/23/2012
~145-410	Cables 145-400 145-406 145-407 145-405 145-403	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	09/04/2012
~145-416	Cables 145-400 145-408 145-402 145-404	Huber + Suhner	3m Track B cables	multiple	09/04/2011	09/04/2012
~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
~DAV002	Weather Station	Davis Instruments	7400	PE80519A93	08/17/2011	08/17/2012
~PRE9	100MHz-40GHz Preamp	MITEQ	NSP4000-NFG	1260417	05/12/2011	05/12/2012
~CBL030	High Frequency Cable 40GHz	Megaphase	TM40 K1K1 80	CBL030	02/08/2012	02/08/2013
~EMC04	ANTENNA, RIDGED GUIDE, 18-40 GHZ	EMCO	3116	2090	02/08/2012	02/08/2013

Software Utilized:

Name	Manufacturer	Version
C5	Teseq	Build 5.26.00.3

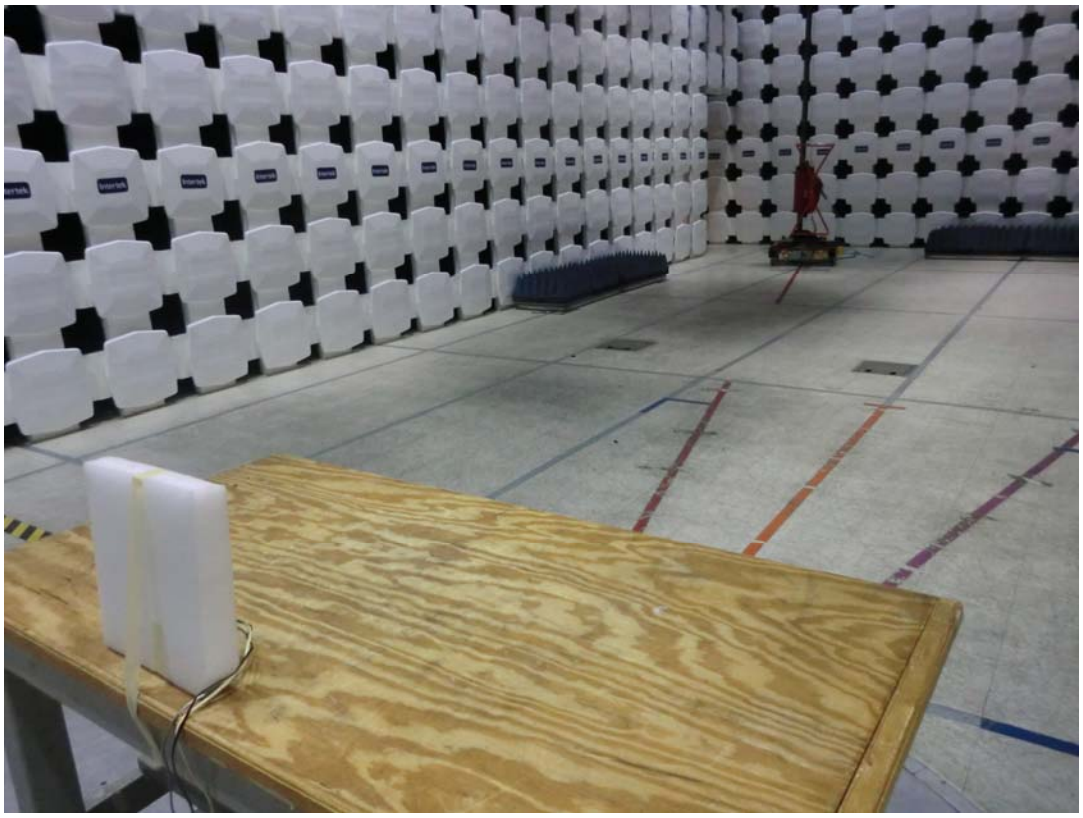
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

10.3 Results:

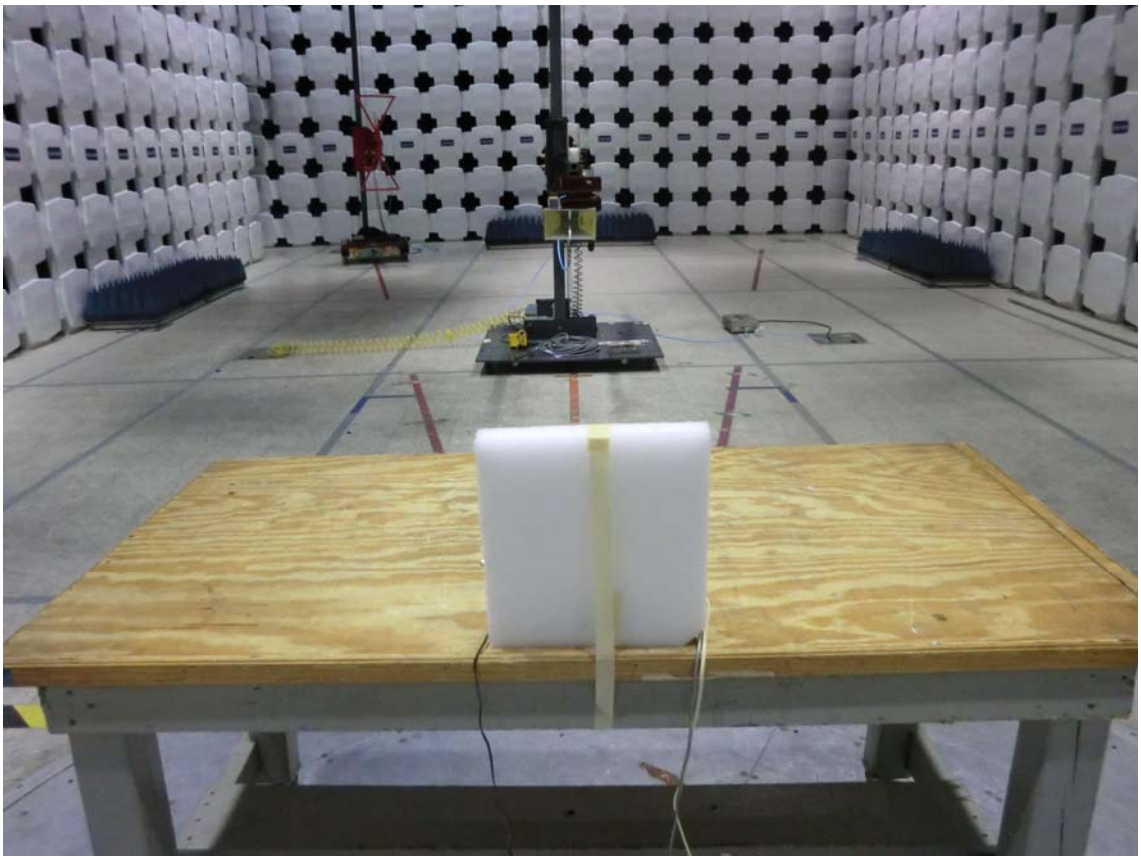
Spurious emissions at the band edges must be at least 20 dB lower than the fundamental field strength when measured with a 100 kHz bandwidth, without the need to be below the general limits of FCC Part 15 Section 15.209 and of RSS-Gen 7.2.5 Table 5. Emissions in restricted bands must meet the general limits of FCC Part 15 Section 15.209 and of RSS-Gen 7.2.5 Table 5.

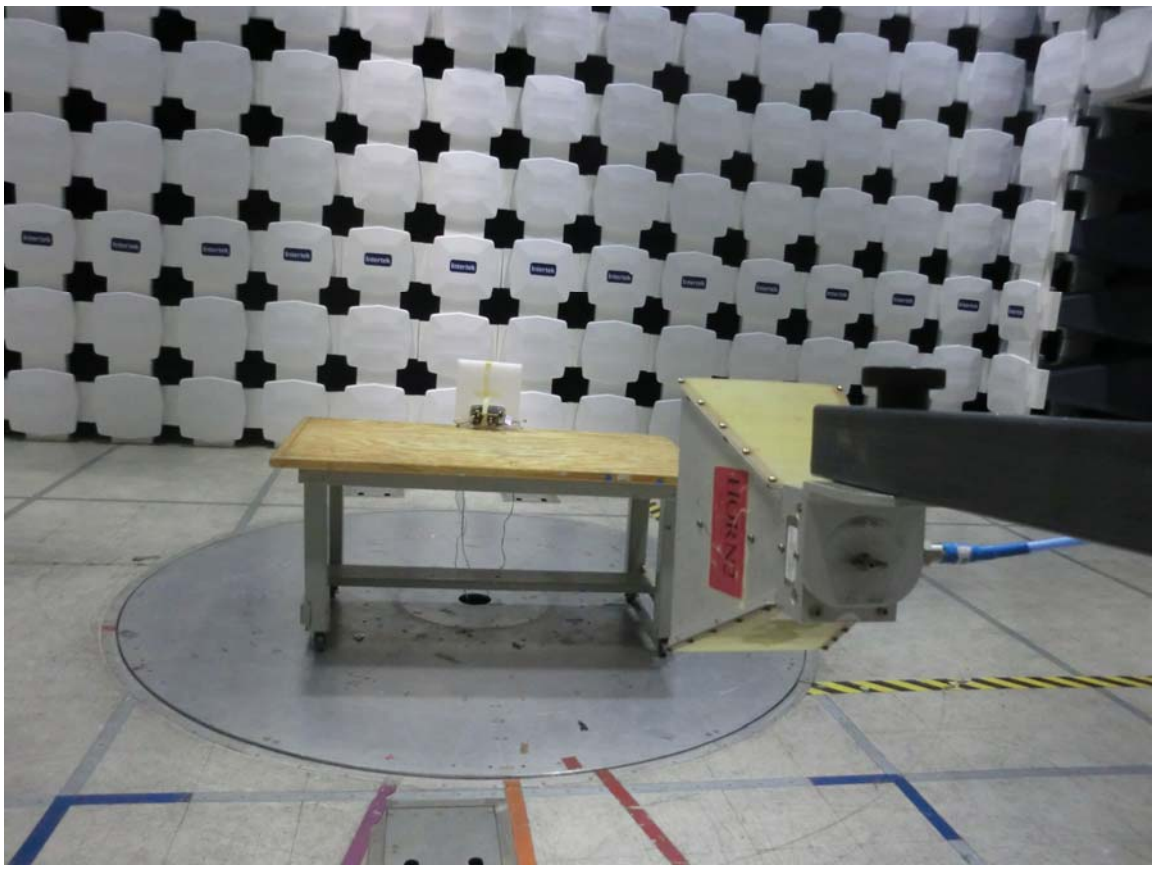
The sample tested was found to Comply.

10.4 Setup Photographs:

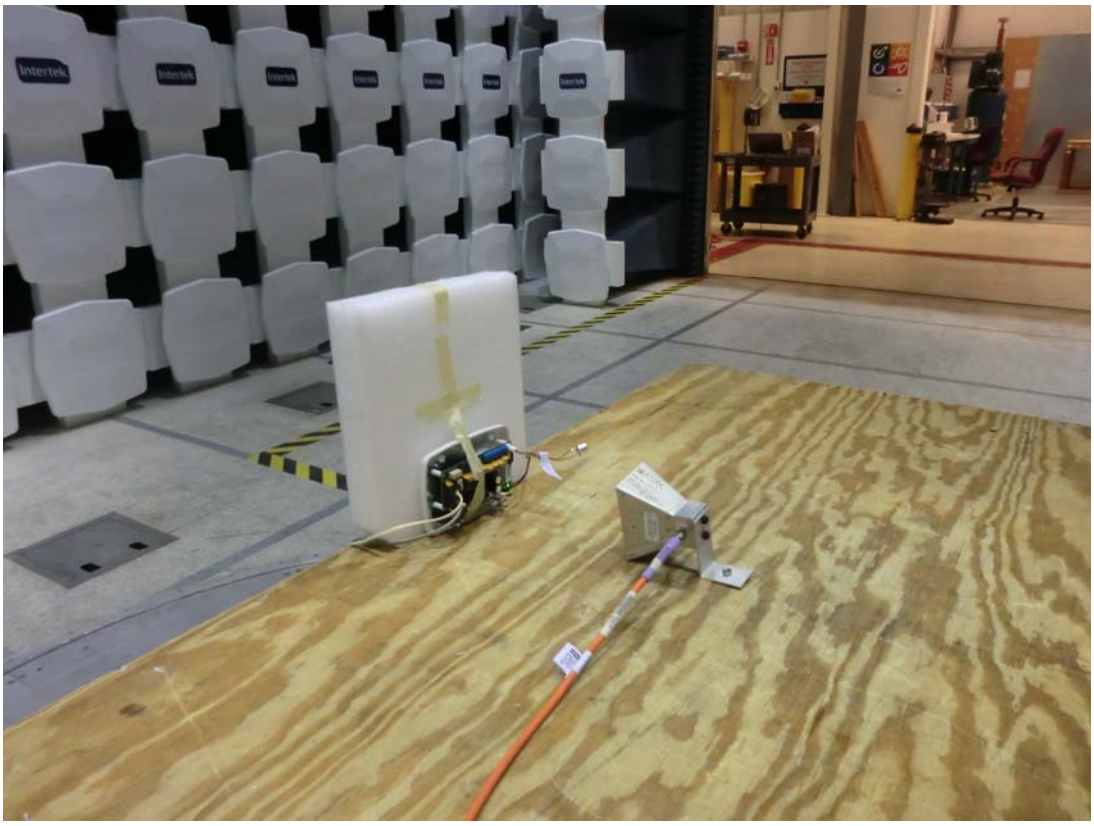


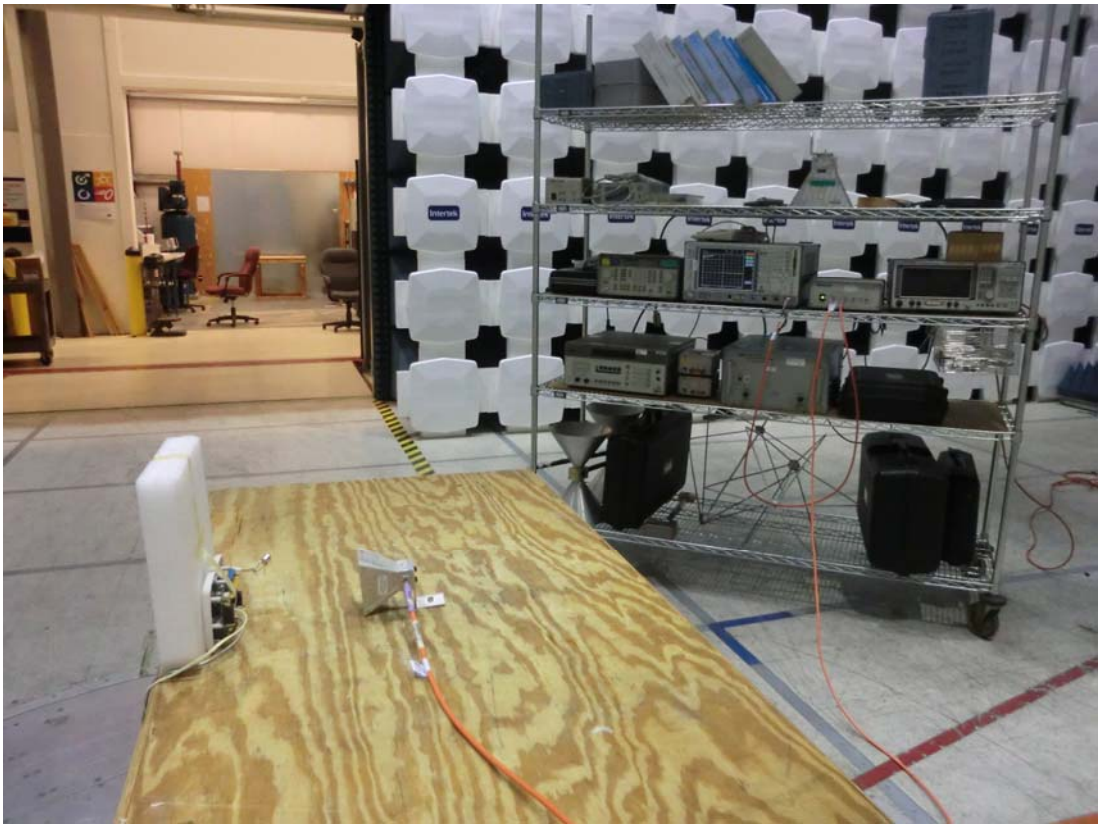
30-1000MHz





1-18GHz



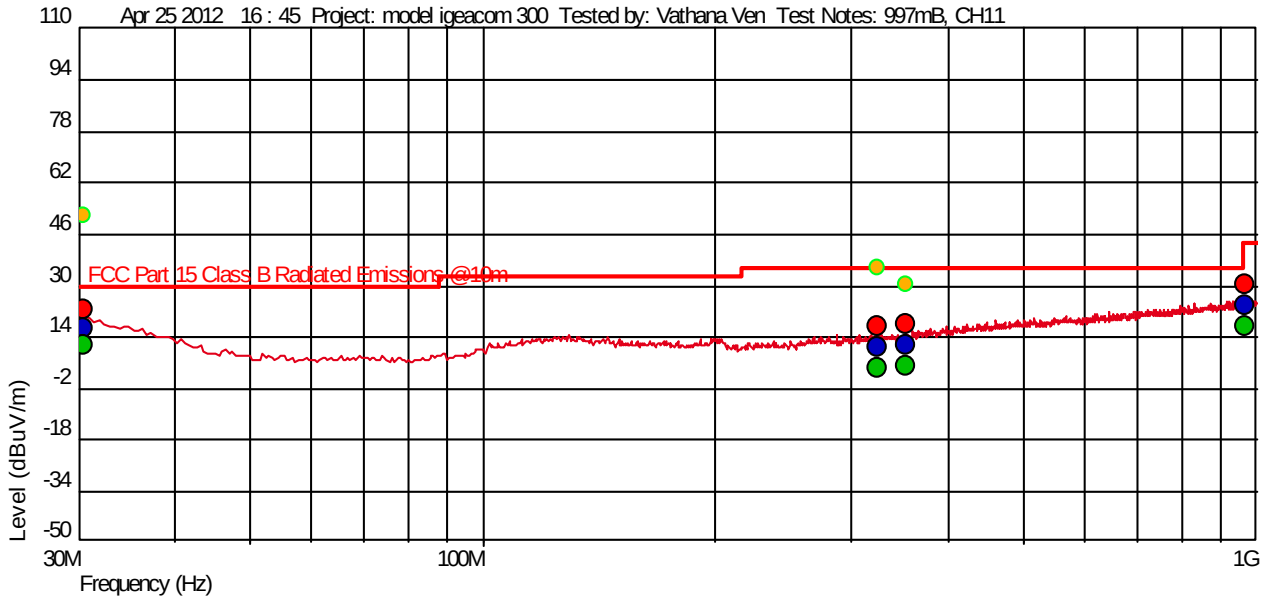


18-25GHz Hand scans

10.5 Plots/Data:

Spurious Emissions 30-1000MHz

Information	
Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH11 Tx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 16 : 45



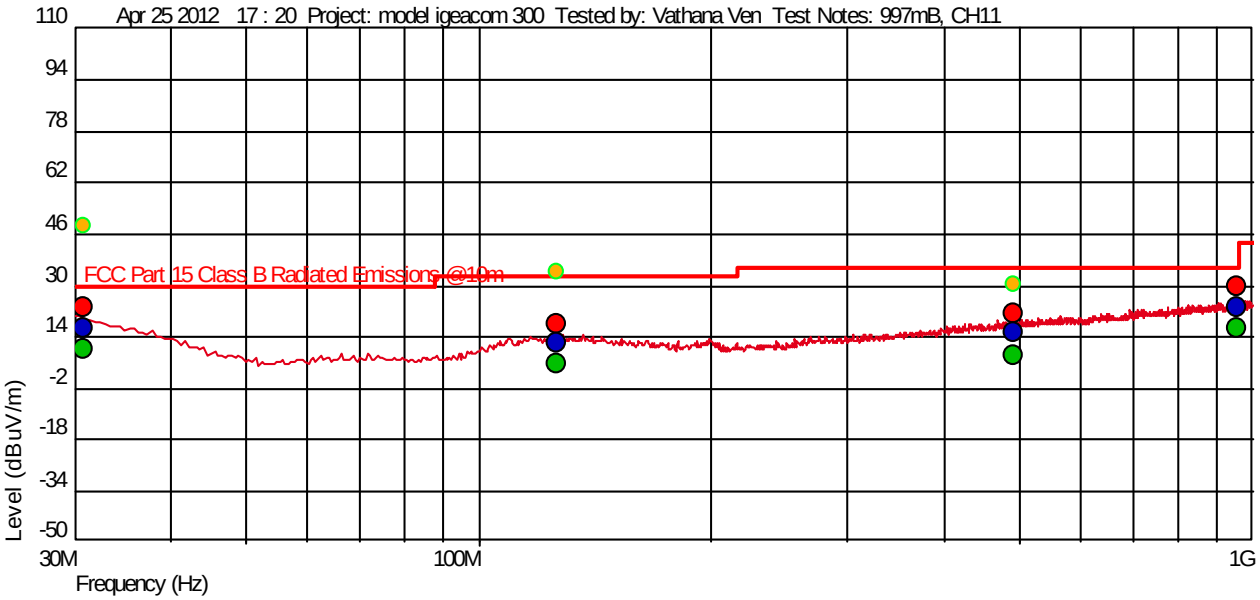
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)	Angle (Deg)	Mast Height(m)	Detector	RBW (Hz)
30.484591487 M	16.36	20.412	-26.107	29.54	-13.18	|	269	3.59	QP	120 k
323.566332553 M	10.61	14.371	-24.042	35.54	-24.93	|	192	3.11	QP	120 k
352.634980922 M	11.30	14.705	-23.963	35.54	-24.24	|	225	3.32	QP	120 k
964.466933846 M	23.72	23.400	-22.386	43.54	-19.82	|	183	1.78	QP	120 k

Test Information

Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH11 Tx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 17 : 20



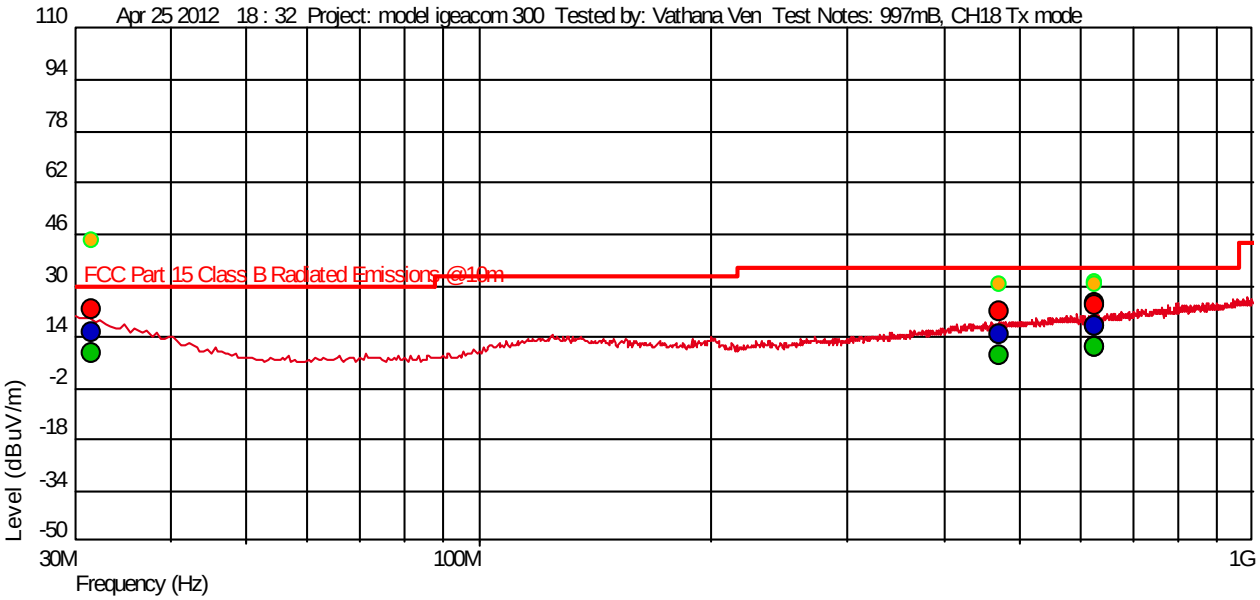
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)		Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
30.845936299 M	16.58	20.523		-26.106	29.54	-12.96	--	114	3.20	QP	120 k
126.093498064 M	11.85	14.000		-24.970	33.04	-21.19	--	98	3.61	QP	120 k
490.763393337 M	15.16	17.985		-24.037	35.54	-20.38	--	69	2.67	QP	120 k
958.301135587 M	23.00	22.800		-22.400	35.54	-12.54	--	241	3.18	QP	120 k

Test Information

Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH18 Tx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 18 : 32



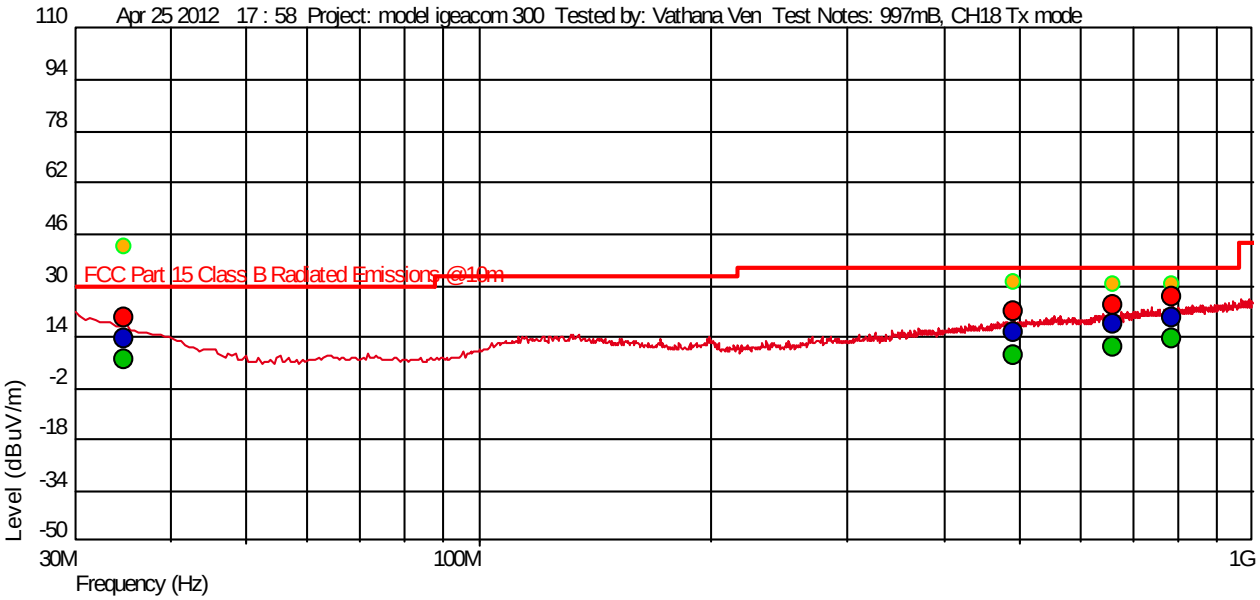
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
31.487842451 M	15.56	19.610	-26.104	29.54	-13.98	|	97	3.07	QP	120 k
472.366176862 M	14.65	17.447	-24.005	35.54	-20.89	|	250	2.76	QP	120 k
624.783455816 M	17.45	19.591	-23.962	35.54	-18.09	|	27	1.93	QP	120 k
626.89040306 M	17.35	19.600	-23.955	35.54	-18.19	|	263	2.34	QP	120 k

Test Information

Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH18 Tx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 17 : 58



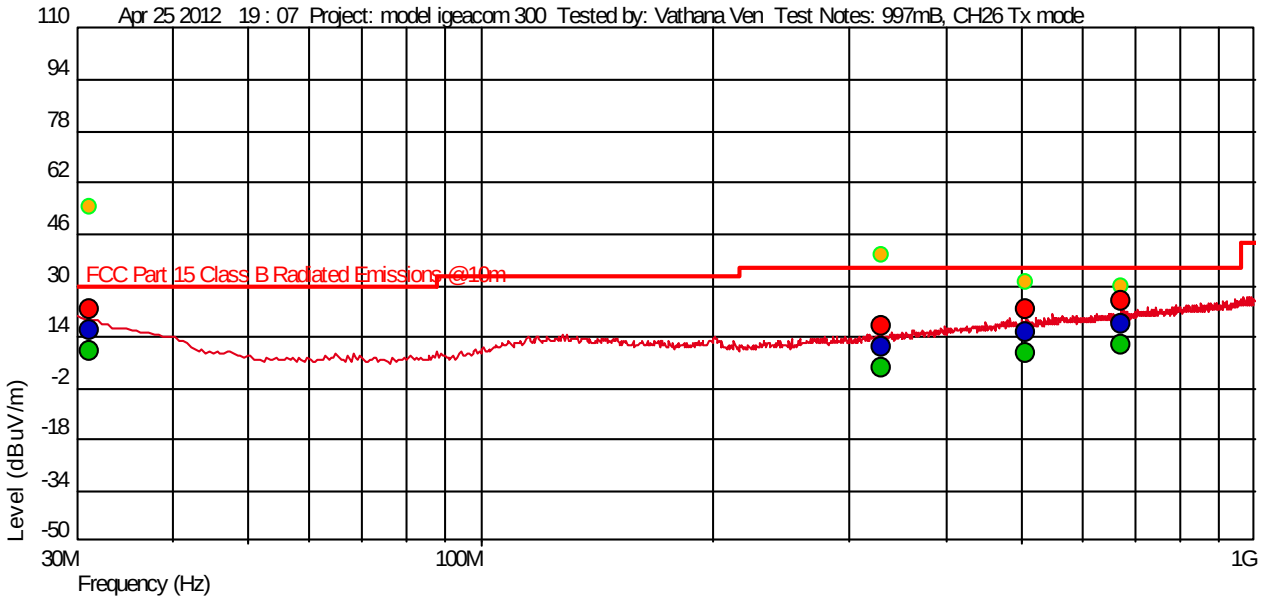
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dBuV/m)	Hor (--), Ver (|)		Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
34.735827066 M	13.52	17.911	-26.094	29.54	-16.02	--	45	3.91	QP	120 k
492.510353984 M	15.25	17.950	-24.040	35.54	-20.29	--	68	2.91	QP	120 k
659.550011283 M	17.65	19.791	-23.841	35.54	-17.89	--	255	1.95	QP	120 k
789.67871288 M	20.01	21.094	-23.249	35.54	-15.53	--	195	2.19	QP	120 k

Test Information

Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH26 Tx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 19 : 07



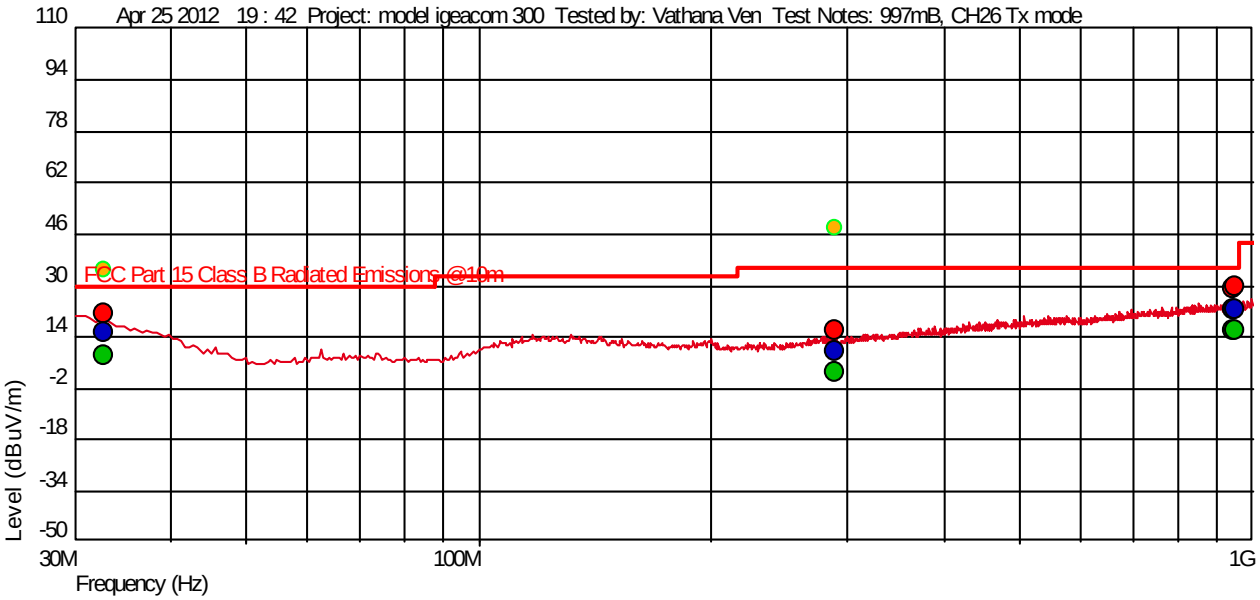
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)		Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
31.186706882 M	15.91	19.851	-26.105	29.54	-13.63			350	3.43	QP	120 k
330.032754367 M	10.90	14.499	-24.023	35.54	-24.64			246	1.30	QP	120 k
507.623357846 M	15.56	17.905	-24.044	35.54	-19.98			3	2.15	QP	120 k
674.411556513 M	18.15	20.000	-23.787	35.54	-17.39			202	1.36	QP	120 k

Test Information

Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH26 Tx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 19 : 42



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)		Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
32.768826565 M	15.07	19.239	-26.100	29.54	-14.47	--	101	3.46	QP	120 k
288.142062044 M	9.59	13.437	-24.132	35.54	-25.95	--	218	3.80	QP	120 k
945.032531679 M	22.75	22.700	-22.444	35.54	-12.79	--	189	3.05	QP	120 k
951.770184701 M	22.71	22.735	-22.414	35.54	-12.83	--	334	3.06	QP	120 k

Tx Spurious Emissions above 1GHz

Company: IGEACare Solutions Inc
Model #: Igeacom II
Serial #: 000000018
Engineers: Vathana Ven
Project #: G100334102
Standard: FCC Part 15 Subpart C 15.247/RSS-247
Receiver: R&S ESI (145128) 08-23-2012
PreAmp: PRE145014 12-16-2012.txt
Date(s): 04/24/12
Location: 10m Chamber
Limit Distance (m): 3
Test Distance (m): 3
Antenna & Cables: N
Antenna: HORN2 V3m 10-24-2012.txt HORN2 H3m 10-24-2012.txt EMC04
Cable(s): 145-416 3mTrkB 09-04-2012.txt CBL030, MEG005
Barometer: DAV003
Temp/Humidity/Pressure: 20c 33% 992mB
Bands: N, LF, HF, SHF
Filter: REA004
PreAmp Used? (Y or N): Y
Voltage/Frequency: 120VAC/60Hz
Frequency Range: 1-25GHz

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														
PK	H	2405.000	56.90	28.33	5.93	0.00	0.00	91.16	-	-	100/300 kHz			No pre-amp
PK	H	2440.000	57.57	28.43	5.98	0.00	0.00	91.98	-	-	100/300 kHz			No pre-amp
PK	H	2480.000	57.72	28.54	6.03	0.00	0.00	92.30	-	-	100/300 kHz			No pre-amp
Tx CH 11, F = 2405 MHz, Spurious emissions														
PK	H	4810.000	35.50	32.86	9.17	34.54	0.00	42.98	74.00	-31.02	1/3 MHz	RB	Noise Floor	
AVG	H	4810.000	26.30	32.86	9.17	34.54	0.00	33.78	54.00	-20.22	1/3 MHz	RB	Noise Floor	
PK	V	7215.000	27.98	36.12	10.85	35.66	9.54	29.75	71.16	-41.41	100/300 kHz		Noise Floor	1 meter
PK	V	9620.000	28.59	37.89	13.16	35.85	9.54	34.25	71.16	-36.91	100/300 kHz		Noise Floor	1 meter
PK	V	12025.000	35.75	39.52	14.97	35.38	9.54	45.32	74.00	-28.68	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	12025.000	25.40	39.52	14.97	35.38	9.54	34.97	54.00	-19.03	1/3 MHz	RB	Noise Floor	1 meter
PK	V	14430.000	26.10	42.14	15.16	34.64	9.54	39.22	71.16	-31.94	100/300 kHz		Noise Floor	1 meter
PK	V	16835.000	23.40	39.85	25.50	37.74	9.54	41.48	71.16	-29.68	100/300 kHz		Noise Floor	1 meter
Tx CH 18, F = 2440 MHz, Spurious emissions														
PK	V	4880.000	39.60	33.13	9.28	34.41	0.00	47.60	74.00	-26.40	1/3 MHz	RB	Noise Floor	
AVG	V	4880.000	27.00	33.13	9.28	34.41	0.00	35.00	54.00	-19.00	1/3 MHz	RB	Noise Floor	1 meter
PK	V	7320.000	42.17	36.46	10.97	35.73	9.54	44.33	74.00	-29.67	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	7320.000	30.80	36.46	10.97	35.73	9.54	32.96	54.00	-21.04	1/3 MHz	RB	Noise Floor	1 meter
PK	V	9760.000	31.20	38.04	13.35	35.35	9.54	37.70	71.98	-34.28	100/300 kHz		Noise Floor	1 meter
PK	V	12200.000	39.80	39.18	14.88	35.45	9.54	48.88	54.00	-5.12	1/3 MHz		Noise Floor	1 meter
AVG	V	12200.000	30.50	39.18	14.88	35.45	9.54	39.58	54.00	-14.42	1/3 MHz		Noise Floor	1 meter
PK	V	14640.000	25.00	41.60	15.25	34.87	9.54	37.44	71.98	-34.54	100/300 kHz		Noise Floor	1 meter
PK	V	17080.000	23.21	40.72	18.66	37.60	9.54	35.45	71.98	-36.53	100/300 kHz		Noise Floor	1 meter
Tx CH 26, F = 2480 MHz, Spurious emissions														
PK	V	4960.000	39.24	33.30	9.41	34.25	0.00	47.69	74.00	-26.31	1/3 MHz	RB	Noise Floor	
AVG	V	4960.000	27.92	33.30	9.41	34.25	0.00	36.37	54.00	-17.63	1/3 MHz	RB	Noise Floor	
PK	V	7440.000	40.89	36.58	11.10	35.81	9.54	43.21	74.00	-30.79	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	7440.000	30.90	36.58	11.10	35.81	9.54	33.22	54.00	-20.78	1/3 MHz	RB	Noise Floor	1 meter
PK	V	9920.000	30.88	38.27	13.57	34.78	9.54	38.39	72.20	-33.81	100/300 kHz		Noise Floor	1 meter
PK	V	12400.000	41.24	38.98	14.79	35.52	9.54	49.95	54.00	-4.05	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	12400.000	30.85	38.98	14.79	35.52	9.54	39.56	54.00	-14.44	1/3 MHz	RB	Noise Floor	1 meter
PK	V	14880.000	31.92	40.37	15.75	35.32	9.54	43.18	72.30	-29.12	100/300 kHz		Noise Floor	1 meter
PK	V	17360.000	30.50	42.09	23.22	36.91	9.54	49.36	72.30	-22.94	100/300 kHz		Noise Floor	1 meter

Hand scans were performed from 18-25GHz, no emissions were detected above the measuring equipment noise floor.

Test Personnel: Vathana Ven VJV
Test Date: 04/24/2012, 04/25/2012
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: 120VAC/60Hz
Pretest Verification w/ Ambient Signals or BB Source: **Ambient**
Ambient Temperature: see tables
Relative Humidity: see tables
Atmospheric Pressure: See tables

Deviations, Additions, or Exclusions: None

11 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 4.10 & 6.0.

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
~145106	Bilog Antenna (30MHz - 5GHz)	Sunol Sciences	JB5	A111003	08/15/2011	08/15/2012
~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	08/23/2012
~145-410	Cables 145-400 145-406 145-407 145-405 145-403	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	09/04/2012
~145-416	Cables 145-400 145-408 145-402 145-404	Huber + Suhner	3m Track B cables	multiple	09/04/2011	09/04/2012
~HORN3	HORN ANTENNA	EMCO	3115	9610-4980	03/28/2011	03/28/2012
~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	08/02/2011	08/02/2012

Software Utilized:

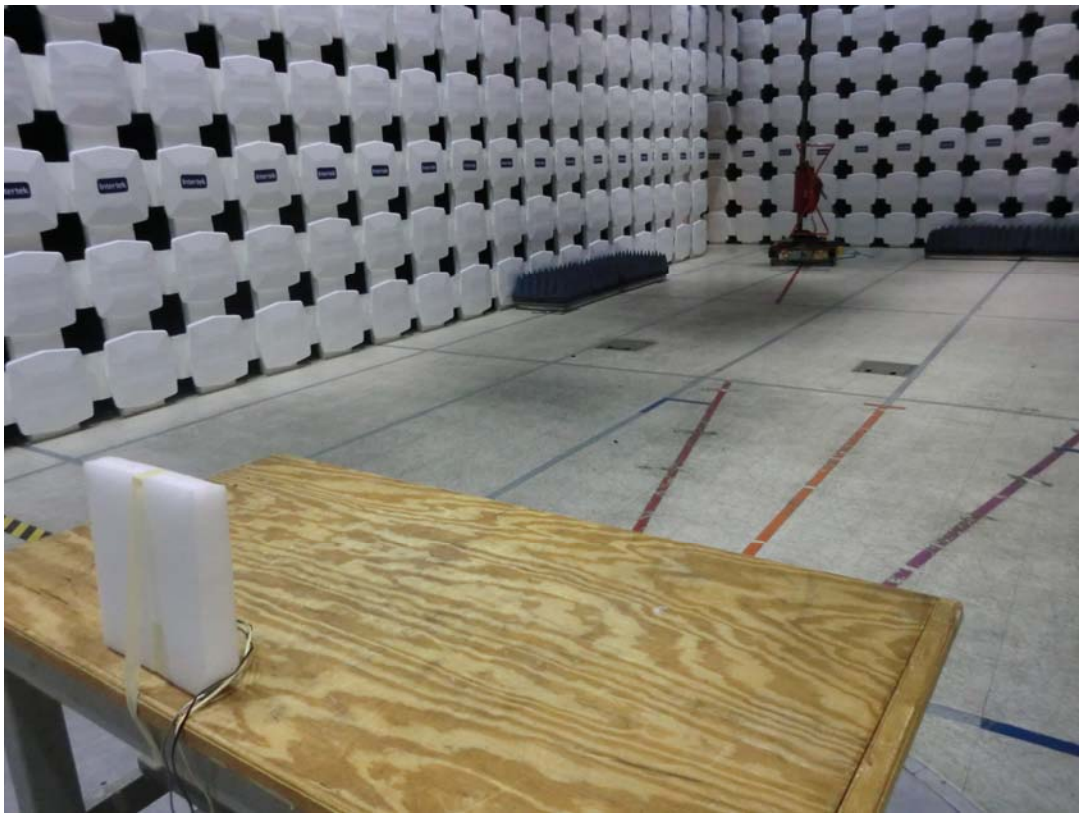
Name	Manufacturer	Version
C5	Teseq	Build 5.26.00.3

11.3 Results:

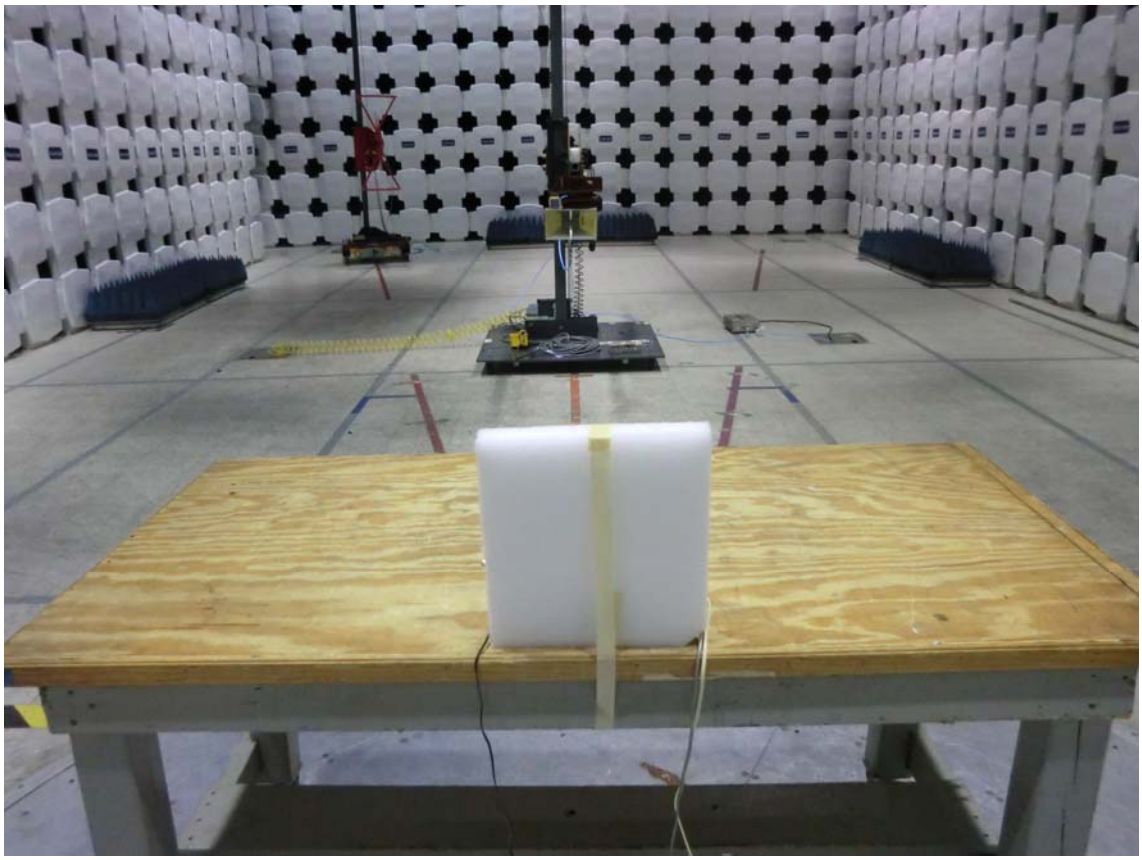
Emissions must be below the general limits of FCC 15.109 and IC RSS-Gen Issue 3 December 2010 Section 6.0 Table 2.

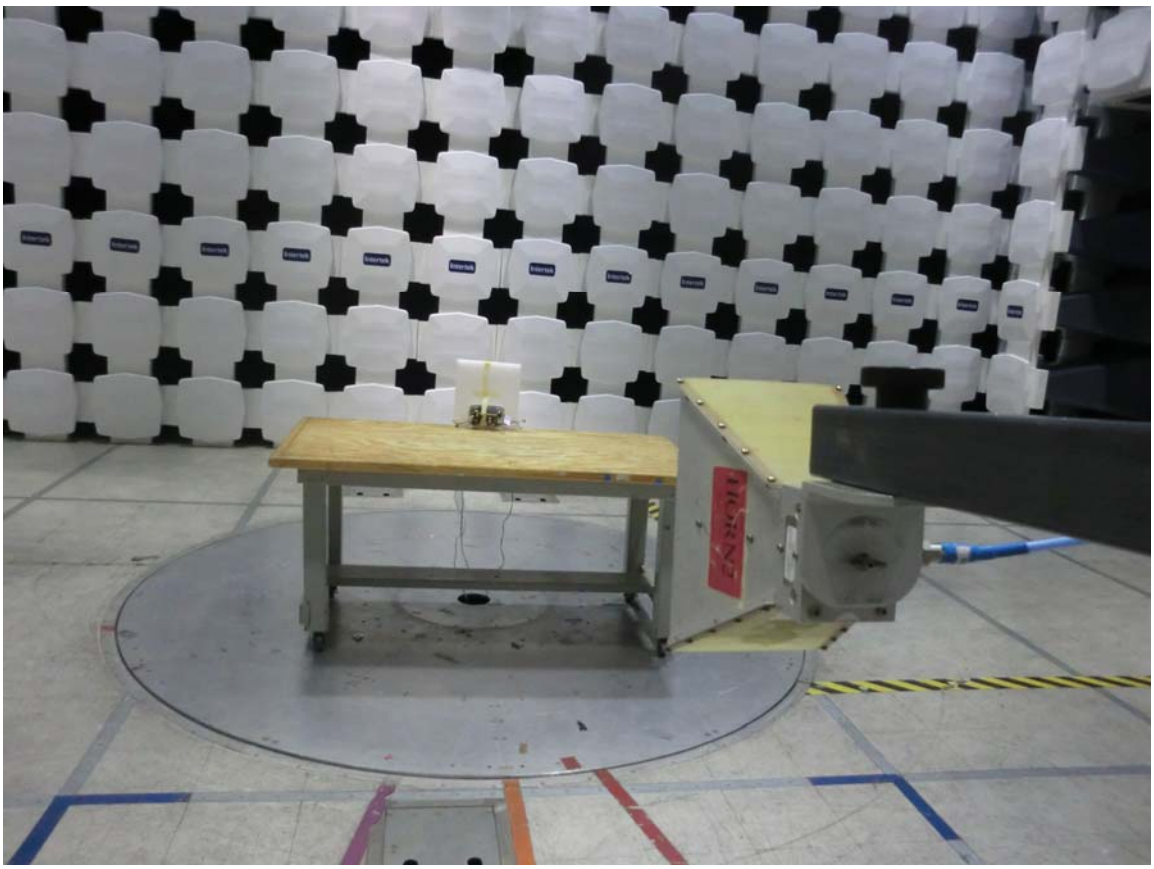
The sample tested was found to Comply.

11.4 Setup Photographs:



30-1000MHz



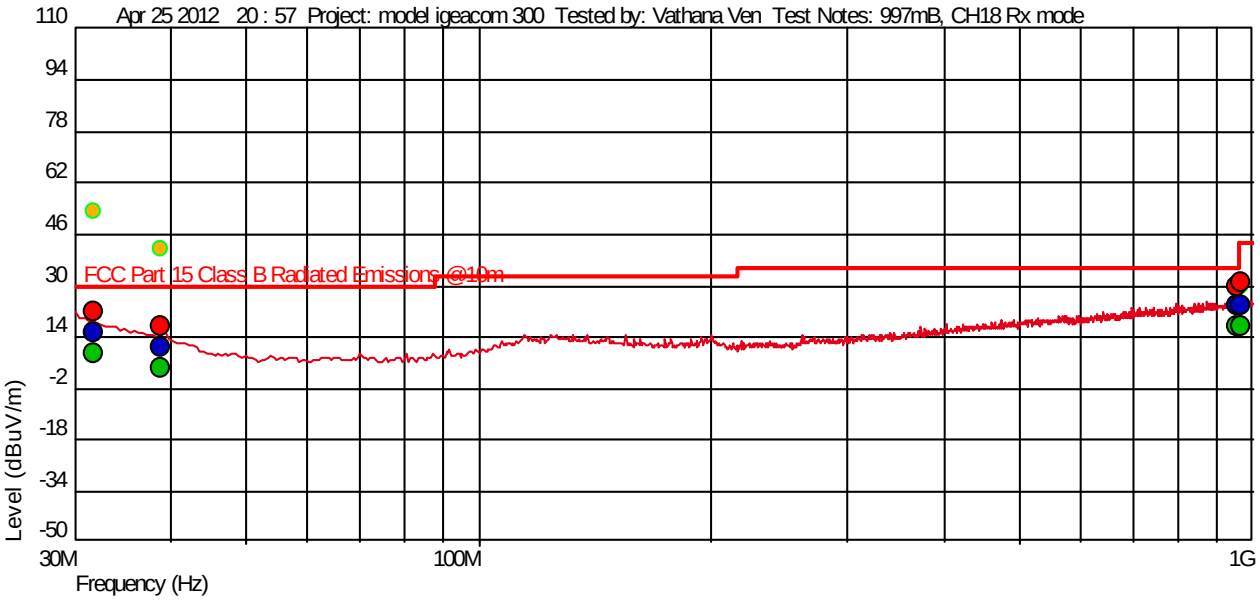


1-13GHz

11.5 Plots/Data:

Rx Spurious Emissions 30-1000MHz

Test Information
Test Details User Input
Project: model igeacom II
Test Notes: 997mB, CH18 Rx mode
Temperature: 21 deg C
Humidity: 29%
Tested by: Vathana Ven
Test Started: Apr 25 2012 20 : 57



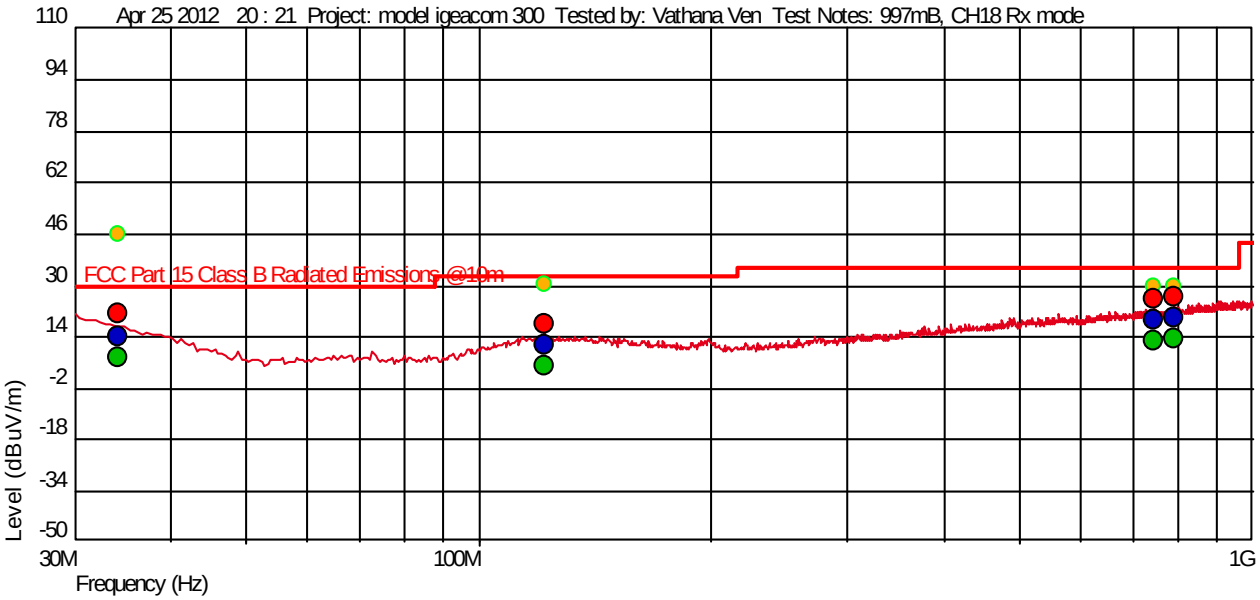
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)		Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
31.815497707 M	15.30	19.348		-26.103	29.54	-14.24	|	284	3.39	QP	120 k
38.736873778 M	10.89	14.811		-26.083	29.54	-18.65	|	270	3.70	QP	120 k
956.616833717 M	23.60	23.400		-22.403	35.54	-11.94	|	93	3.60	QP	120 k
967.312558593 M	23.78	23.446		-22.380	43.54	-19.76	|	360	3.96	QP	120 k

Test Information

Test Details	User Input
Project:	model igeacom II
Test Notes:	997mB, CH18 Rx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 20 : 21



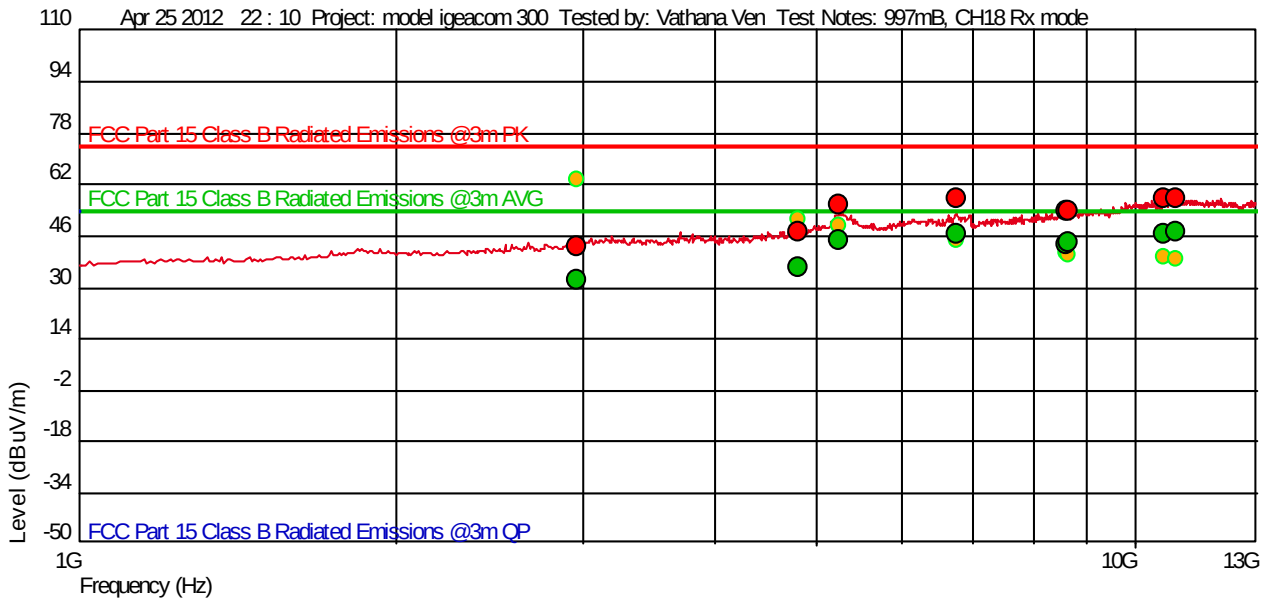
Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)		Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
34.111534218 M	14.13	18.411		-26.096	29.54	-15.41	--	312	3.23	QP	120 k
121.27668677 M	11.47	13.900		-25.034	33.04	-21.57	--	322	2.57	QP	120 k
747.993030491 M	19.41	20.660		-23.413	35.54	-16.13	--	48	1.61	QP	120 k
791.995413178 M	20.18	21.140		-23.240	35.54	-15.36	--	8	1.58	QP	120 k

Rx Spurious Emissions above 1GHz

Test Information	
Test Details	User Input
Project:	model igeacom 300
Test Notes:	997mB, CH18 Rx mode
Temperature:	21 deg C
Humidity:	29%
Tested by:	Vathana Ven
Test Started:	Apr 25 2012 22 : 10



Measured Peak Value
Measured Quasi Peak Value
Measured Average Value
Maximum Value of Mast and Turntable
Level (dBuV/m) = AF + CL + PA + Raw
AF = Antenna Factor
CL = Cable Losses
PA = Pre-Amplifier
Raw = Raw Instrument Reading (Not listed on Spot Tables)

Measured: PEAK

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
2.96756758 G	42.54	30.018	-27.165	74.00	-31.46	|	162	1.47	PEAK	1 M
4.804088621 G	47.15	32.842	-25.375	74.00	-26.85	|	297	1.65	PEAK	1 M
5.249678023 G	55.61	33.717	-19.389	74.00	-18.39	--	16	1.19	PEAK	1 M
6.779655311 G	57.45	35.062	-24.536	74.00	-16.55	|	337	1.84	PEAK	1 M
8.595061679 G	53.56	37.463	-23.252	74.00	-20.44	--	117	2.54	PEAK	1 M
8.626549543 G	53.95	37.488	-23.224	74.00	-20.05	|	214	1.72	PEAK	1 M
10.607459808 G	57.35	38.400	-20.042	74.00	-16.65	--	120	2.23	PEAK	1 M
10.933251837 G	57.33	38.277	-19.574	74.00	-16.67	--	334	1.69	PEAK	1 M

Measured: AVERAGE

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver (|)	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
2.96756758 G	32.41	30.018	-27.165	54.00	-21.59	|	162	1.47	AVERAGE	1 M
4.804088621 G	36.05	32.842	-25.375	54.00	-17.95	|	297	1.65	AVERAGE	1 M
5.249678023 G	44.47	33.717	-19.389	54.00	-9.53	--	16	1.19	AVERAGE	1 M
6.779655311 G	46.76	35.062	-24.536	54.00	-7.24	|	337	1.84	AVERAGE	1 M
8.595061679 G	43.61	37.463	-23.252	54.00	-10.39	--	117	2.54	AVERAGE	1 M
8.626549543 G	43.66	37.488	-23.224	54.00	-10.34	|	214	1.72	AVERAGE	1 M
10.607459808 G	46.77	38.400	-20.042	54.00	-7.23	--	120	2.23	AVERAGE	1 M
10.933251837 G	46.94	38.277	-19.574	54.00	-7.06	--	334	1.69	AVERAGE	1 M

Test Personnel:	Vathana Ven VSV	Test Date:	04/25/2012
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:	120VAC/60Hz	Ambient Temperature:	21 ºC
Pretest Verification w/ Ambient Signals or BB Source:	**Ambient**	Relative Humidity:	29 %
		Atmospheric Pressure:	997 mbars

Deviations, Additions, or Exclusions: None

12 AC Mains Conducted Emissions

12.1 Method

Tests are performed in accordance with CFR47 FCC Part 15 Subpart B 15.207, IC RSS-Gen Section 7.2.4.

TEST SITE: AMAP (Bump Out)

The AMAP Building and Lab includes general lab space that can be used for testing where a shielded/enclosed environment is not required.

Measurement Uncertainty

For conducted emissions, U_{lab} (3.2 dB in worst case) < U_{CISPR} (3.6 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 Calculations

The following is how net line-conducted readings were determined:

NF = RF + LF + CF + AF
Where NF = Net Reading in dBμV
RF = Reading from receiver in dBμV
LF = LISN Correction Factor in dB
CF = Cable Correction Factor in dB
AF = Attenuator Loss Factor in dB

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:

NF = RF + LF + CF + AF = 28.5 + 0.2 + 0.4 + 20.0 = 49.1 dBμV
$UF = 10^{(49.1\ dB\mu V / 20)}$ = 285.1 μV/m

12.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	08/02/2012
ROS002	9kHz to 3GHz EMI Test Receiver	Rohde & Schwartz	ESCI 1166.5950K03	100067	04/15/2011	05/15/2012
CBLBNC51	Cable BNC/BNC, 30'	ITS	BNC-30	CBLBNC51	09/08/2011	09/08/2012
LISN10	LISN, 50uH, .01 - 50MHz, 24A	Solar Electronics	9252-50-R-24-BNC	941712	01/27/2012	01/27/2013
DS32	Attenuator, 3dB	Mini Circuits	3dB, 50 ohm	DS32	02/08/2012	02/08/2013
145-141A	Power Supply NSG 1007-5-208	California Instr. Co	5kVa	56119	03/22/2012	03/22/2014
145-141B	Power Supply NSG 1007-5-208	California Instr. Co	5kVa	56120	03/22/2012	03/22/2014
145-141C	Power Supply NSG 1007-5-208	California Instr. Co	5kVa	56121	03/22/2012	03/22/2014

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough	Intertek	8/27/2010

12.3 Results:

The sample tested was found to Comply.

12.4 Setup Photograph:

12.5 Test Data:

Conducted Emissions

Company: IGEACare Solutions Inc
Model #: Igeacom II
Serial #: 000000018
Engineer(s): Vathana Ven
Project #: G100334102
Notes: Tx mode
Standard: FCC Part 15 Subpart C 15.247/RSS-Gen
Barometer: DAV003

Date: 04/24/12
Location: 10m Chamber
Temp/Humidity/Pressure: 20 deg C 29% 1001 mB
Voltage/Frequency: 120VAC/60Hz

Receiver: R&S ESCI (ROS002) 05-15-2012
Cable: CBLBNC51_9-08-2012.txt
LISN 1: LISN10_line 1_01-27-2013.txt
LISN 2: LISN10_line 2_01-27-2013.txt
LISN 3: NONE.
LISN 4: NONE.
Attenuator: DS32 02-08-13.txt
Frequency Range: 0.150-30MHz

Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.152	32.10	29.70			35.18	65.89	-30.71	9/30 kHz
QP	0.164	31.90	29.30			34.98	65.26	-30.28	9/30 kHz
QP	0.269	29.10	24.60			32.15	61.15	-29.00	9/30 kHz
QP	0.435	28.40	16.00			31.45	57.16	-25.71	9/30 kHz
QP	0.551	22.90	10.10			25.96	56.00	-30.04	9/30 kHz
QP	1.170	9.00	-2.20			12.08	56.00	-43.92	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.152	13.50	4.20			16.58	55.89	-39.31	9/30 kHz
AVG	0.164	21.50	9.80			24.58	55.26	-30.68	9/30 kHz
AVG	0.269	12.00	0.00			15.05	51.15	-36.10	9/30 kHz
AVG	0.435	7.00	-5.10			10.05	47.16	-37.11	9/30 kHz
AVG	0.551	-1.60	6.90			9.96	46.00	-36.04	9/30 kHz
AVG	1.170	-8.20	-9.90			-5.12	46.00	-51.12	9/30 kHz

Conducted Emissions

Company: IGEACare Solutions Inc
Model #: Igeacom II
Serial #: 000000018
Engineer(s): Vathana Ven
Project #: G100334102
Notes: Rx mode
Standard: FCC Part 15 Subpart C 15.247/RSS-Gen
Barometer: DAV003

Location: 10m Chamber
Date: 04/24/12
Temp/Humidity/Pressure: 20 deg C 29% 1001 mB
Voltage/Frequency: 120VAC/60Hz
Frequency Range: 0.150-30MHz

Receiver: R&S ESCI (ROS002) 05-15-2012
Cable: CBLBNC51_9-08-2012.txt
LISN 1: LISN10_line 1_01-27-2013.txt
LISN 2: LISN10_line 2_01-27-2013.txt
LISN 3: NONE.
LISN 4: NONE.
Attenuator: DS32 02-08-13.txt

Net is the sum of worst-case lisn, cable, & attenuator losses, and initial reading, factors are not shown
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor; Bandwidth denoted as RBW/VBW

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	QP Limit dB(uV)	Margin dB	Bandwidth
QP	0.152	31.40	32.00			35.08	65.89	-30.81	9/30 kHz
QP	0.164	36.70	30.60			39.78	65.26	-25.48	9/30 kHz
QP	0.269	29.10	25.80			32.15	61.15	-29.00	9/30 kHz
QP	0.435	28.60	25.80			31.65	57.16	-25.51	9/30 kHz
QP	0.551	22.90	7.70			25.96	56.00	-30.04	9/30 kHz
QP	1.170	22.90	-1.20			25.98	56.00	-30.02	9/30 kHz

Detector Type	Frequency MHz	Reading Line 1 dB(uV)	Reading Line 2 dB(uV)	Reading Line 3 dB(uV)	Reading Line 4 dB(uV)	Net dB(uV)	Average Limit dB(uV)	Margin dB	Bandwidth
AVG	0.152	12.60	4.80			15.68	55.89	-40.21	9/30 kHz
AVG	0.164	7.70	10.00			13.07	55.26	-42.19	9/30 kHz
AVG	0.269	12.00	1.40			15.05	51.15	-36.10	9/30 kHz
AVG	0.435	1.20	1.60			4.66	47.16	-42.50	9/30 kHz
AVG	0.551	-4.20	-10.10			-1.14	46.00	-47.14	9/30 kHz
AVG	1.170	-2.90	-12.40			0.18	46.00	-45.82	9/30 kHz

Test Personnel: Vathana Ven VFV
Test Date: 04/24/2012
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: 120VAC/60Hz
Pretest Verification w/ Ambient Signals or BB Source: **Ambient**
Ambient Temperature: 20 ºC
Relative Humidity: 29 %
Atmospheric Pressure: 1001 mbars

Deviations, Additions, or Exclusions: None

13 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	04/29/2012	100334102BOX-023	MV	Rb initials	Original
1	04/29/2012	101930181BOX-001b	MV	KPS KPS	Company name and model number changed