



EMISSIONS TEST REPORT

Report Number: 100652281BOX-001

Project Number: G100652281

Report Issue Date: 02/29/2012

Product Designation: Cut Guide POD and Reference POD

Standards: CFR47 FCC Part 15 Subpart C 15.247:2012
CFR47 FCC Part 15 Subpart B:2012
IC RSS-210 Issue 8 December 2010 Annex 8
IC RSS-Gen Issue 3 December 2010
IC ICES-003 Issue 4 February 2004
IC RSS-102 Issue 4 March 2010

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

Client:
Zimmer CAS
75 rue Queen Suite 3300
Montréal QC H3C 2N6

Report prepared by Reviewer

Vathana F. Ven/Senior Project Engineer

Report reviewed by

Nicholas Abbondante/Staff Engineer

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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 447498, IC RSS-210 A8.4(4), IC RSS-102 Issue 4 March 2010)	Pass
7	6 dB Bandwidth (CFR47 FCC Part 15 Subpart C 15.247(a)(2), IC RSS-210 A8.2(a), IC RSS-Gen Section 4.6.2, KDB 558074v01 01/18/2012 Section 5.1)	Pass
8	Peak Power Spectral Density (FCC 15:2011 Subpart C Section 15.247 (e), RSS-210 Issue 8 December 2010, A8.2 (b), KDB 558074v01 01/18/2012 Section 5.3)	Pass
9	Band Edge Compliance (FCC 15:2011 Subpart C Section 15.247 (d), RSS-210 Issue 8 December 2010, A8.5, KDB KDB 558074v01 01/18/2012 Section 5.4.2.2.4)	Pass
10	Transmitter Radiated Spurious Emissions (CFR47 FCC Part 15 Subpart C 15.247(d), IC RSS-210 A8.5, KDB 558074v01 01/18/2012 Section 5.4)	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)	Not Required*
13	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: Zimmer CAS
75 rue Queen
Montréal QC H3C 2N6
Contact: Mr. Mathieu Chevrier
Telephone: (514) 861-4074
Fax: (514) 866-2197
Email: chevriem@zimmercas.com

4 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
POD Cutter Guide	Zimmer CAS	20-8011-000-02	Z204004
POD Reference	Zimmer CAS	20-8011-000-01	Z204001

Receive Date:	02/02/2012
Received Condition:	Good
Type:	Prototype

Description of Equipment Under Test (provided by client)

Medical devices (called pods) used on orthopaedic surgical instruments.

The pods are disposable and will be delivered in sterile packaging.

Will only be used in operating rooms by trained personnel.

Battery operation only (non-rechargeable, non-replaceable).

Power source is a Lithium-manganese primary battery, CR-1/3N size.

Plastic enclosure.

No external connections or cables.

Three versions of the pods:

- 20-8011-000-01 Pod Reference

- 20-8011-000-02 Pod Cut Guide TRFL

- 20-8011-000-03 Pod Cut Guide TLFR

The two cut guide versions are considered identical for certification purposes.

Wireless communication to a host via an internal chip antenna.

With respect to IEC 60601-1, the pods are considered:

- Portable ME equipment
- Applied parts
- Programmable electrical medical system (PEMS)

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

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

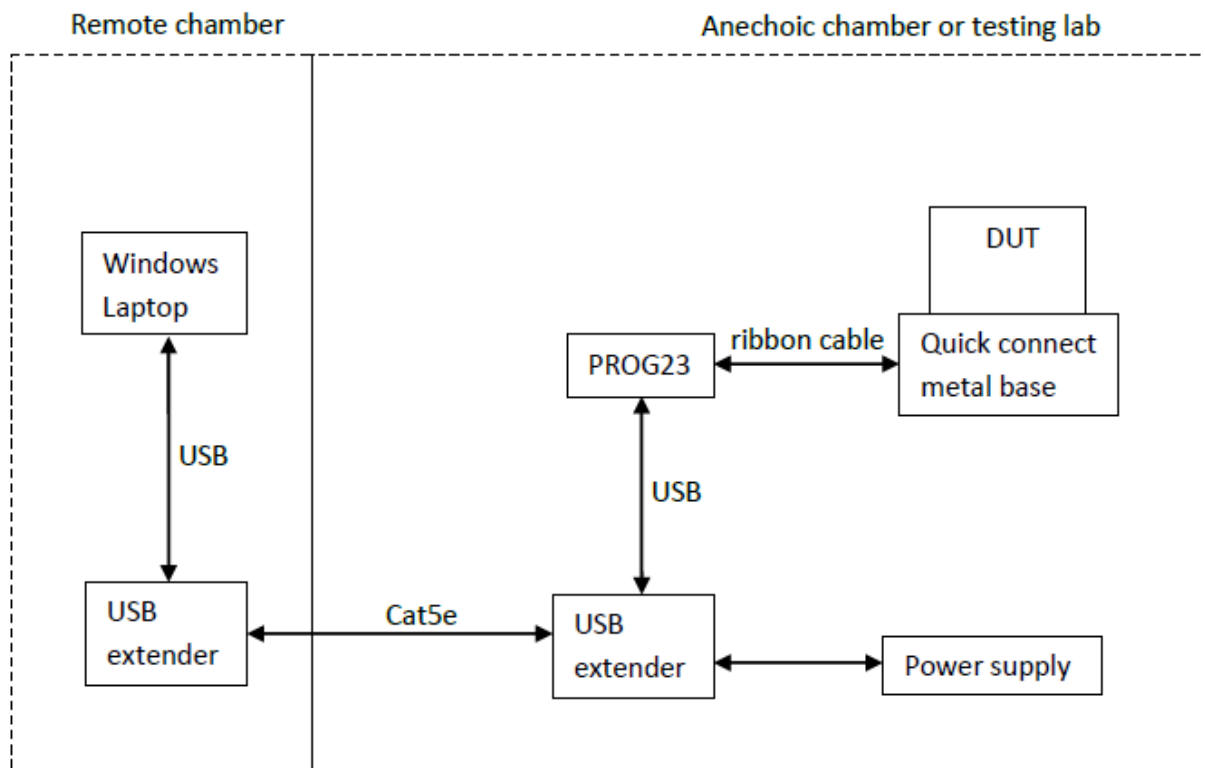
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	RJ45	13	None	None	Laptop
1	USB	1	Foil	None	Prog
1	USB	1	Foil	None	Laptop

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	Dell	Latitude 2120	27528210001

5.1 Method:

Configuration as required by ANSI C 63.4:2003, FCC Part 15:2011 Subpart C Section 15.247, RSS-210 Issue 8 December 2010, RSS-Gen Issue 3 December 2010, and KDB 558074v01 01/18/2012.

5.2 EUT Block Diagram:



6 RF Output Power, Duty Cycle and Human RF Exposure

6.1 Method

Tests are performed in accordance with ANSI C63.4:2003, CFR47 FCC Part 15 Subpart C 15.247, IC RSS-210 Issue 8 December 2010, IC RSS-Gen Issue 3 December 2010, KDB 558074v01 01/18/2012, KDB 447498, and IC RSS-102 Issue 4 March 2010.

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 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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003	Weather Station	Davis Instruments	7400	PE80529A39 A	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

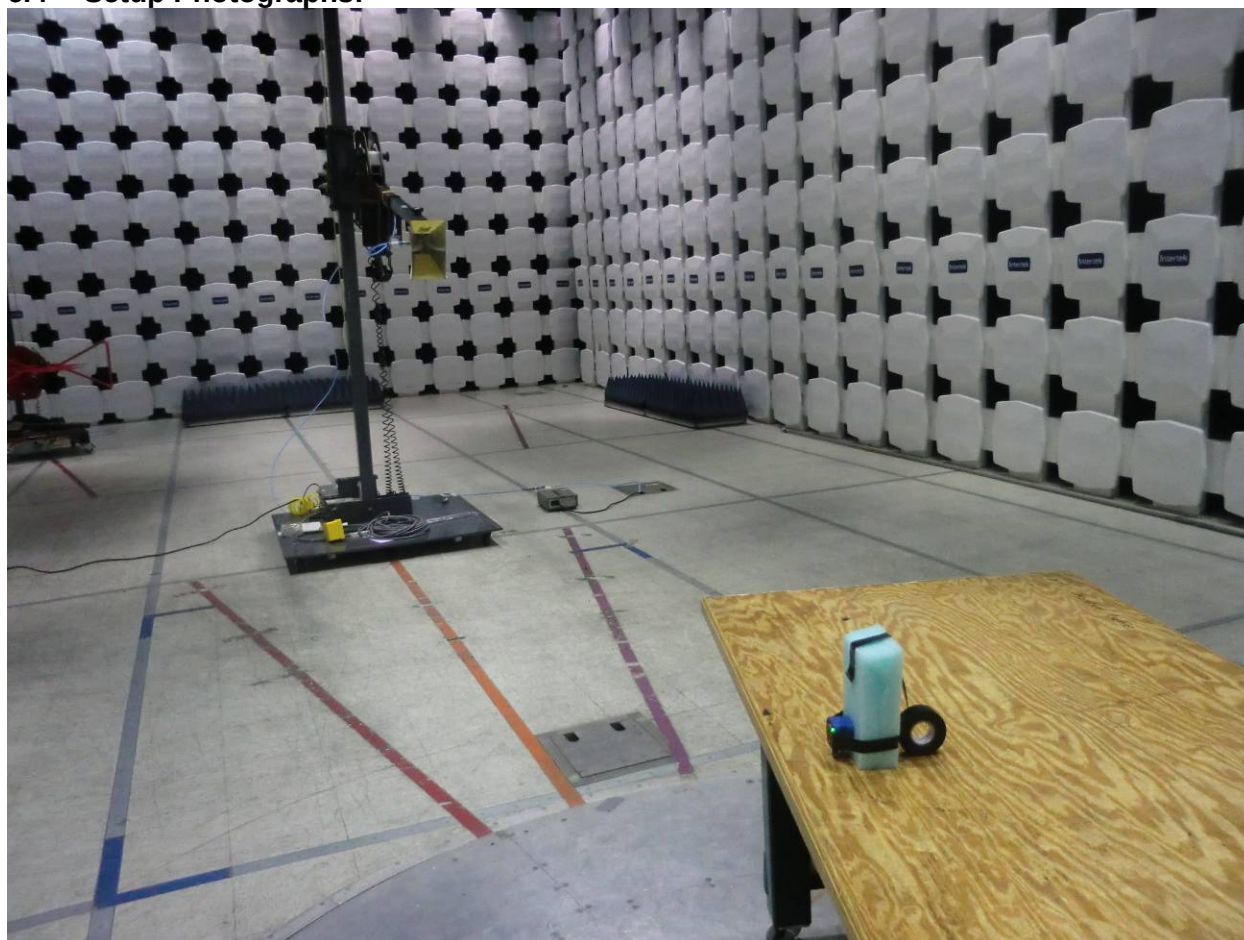
Software Utilized:

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

6.3 Results:

The EIRP must not exceed 36 dBm. The human RF Exposure limit is 1 mW/cm². The sample tested was found to Comply.

6.4 Setup Photographs:



Axis3 orientation shown in photo

6.5 Plots/Data:

RF Output Power for Cut Guide POD
Radiated Emissions

Company: Zimmer CAS
 Model #: 20-8011-000-02
 Serial #: Z204004
 Engineers: Vathana Ven
 Project #: G100652281 Date(s): 02/15/12
 Standard: FCC Part 15 Subpart C 15.247/RSS-210
 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: 3.3VDC 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
Note: RF Output Power (Axis3 Orientation was worst-case)											
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	59.87	28.73	5.93	0.00	0.00	-0.69	36.00	-36.69	5/10 MHz
PK	V	2440.000	59.90	28.73	5.98	0.00	0.00	-0.62	36.00	-36.62	5/10 MHz
PK	V	2480.000	60.77	28.78	6.03	0.00	0.00	0.36	36.00	-35.64	5/10 MHz

FCC

IC

RF Output Power for Reference POD

Radiated Emissions

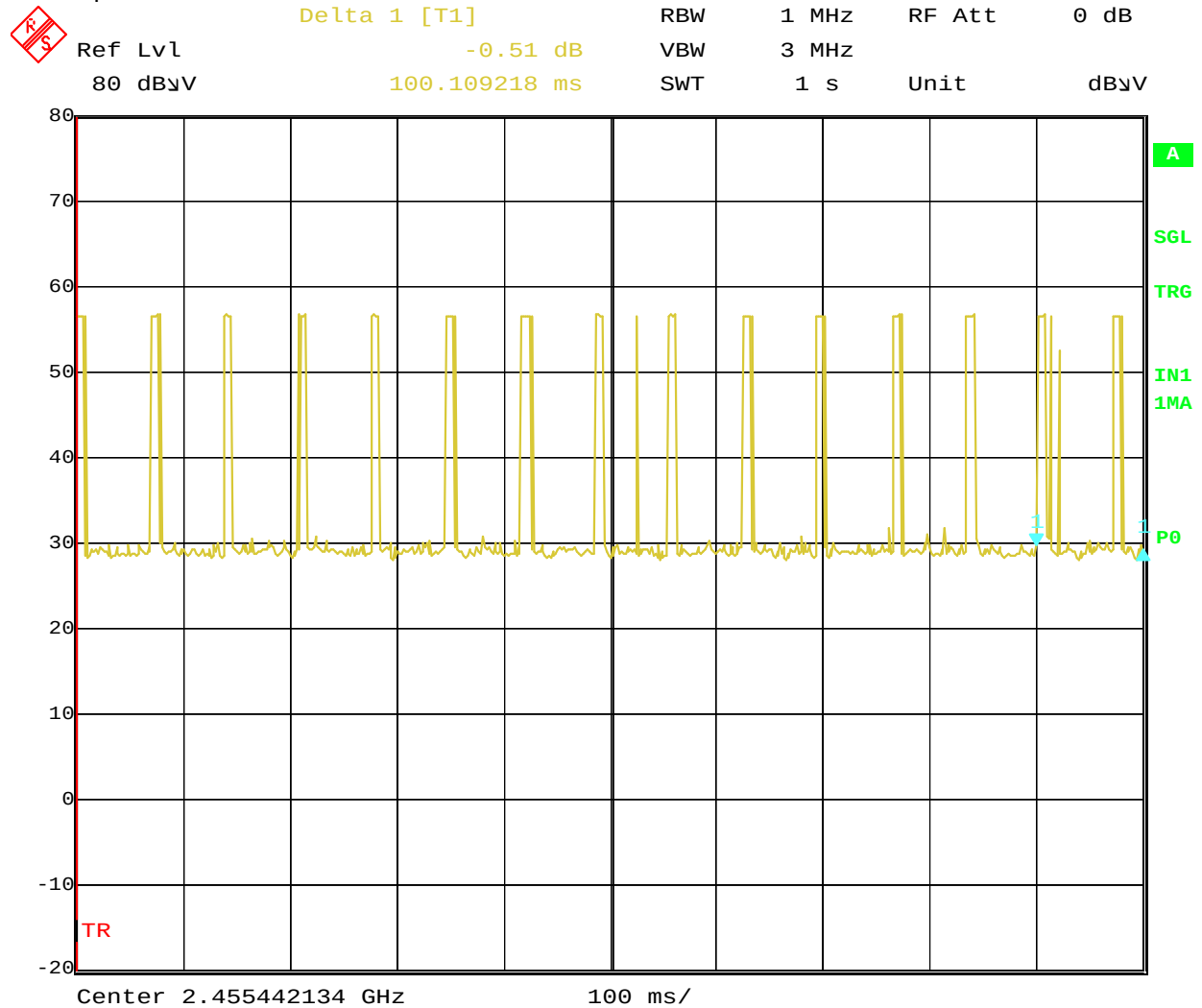
Company: Zimmer CAS Antenna & Cables: N Bands: N, LF, HF, SHF
 Model #: 20-8011-000-01 Antenna: HORN3 V3m 03-28-2012.txt HORN3 H3m 03-28-2012.txt
 Serial #: Z204001 Cable(s): 145-416 3mTrkB 09-04-2012.txt NONE.
 Engineers: Vathana Ven Location: 10m Chamber Barometer: DAV003 Filter: NONE
 Project #: G100652281 Date(s): 02/15/12
 Standard: FCC Part 15 Subpart C 15.247/RSS-210 Temp/Humidity/Pressure: 20c 21% 1012mB
 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: 3.3VDC 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
Note: RF Output Power (Axis3 Orientation was worst-case), Reference POD											
Note: EIRP Obtained by applying the path loss correction for a 3m test distance, E(dBuV/m)@3m - 95.22 = dBm EIRP											
PK	V	2405.000	60.39	28.68	5.93	0.00	0.00	-0.22	36.00	-36.22	5/10 MHz
PK	H	2440.000	59.92	28.77	5.98	0.00	0.00	-0.55	36.00	-36.55	5/10 MHz
PK	H	2480.000	59.22	28.82	6.03	0.00	0.00	-1.14	36.00	-37.14	5/10 MHz

FCC IC Harmonic?

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. Markers have been placed to denote the worst-case 100ms period.

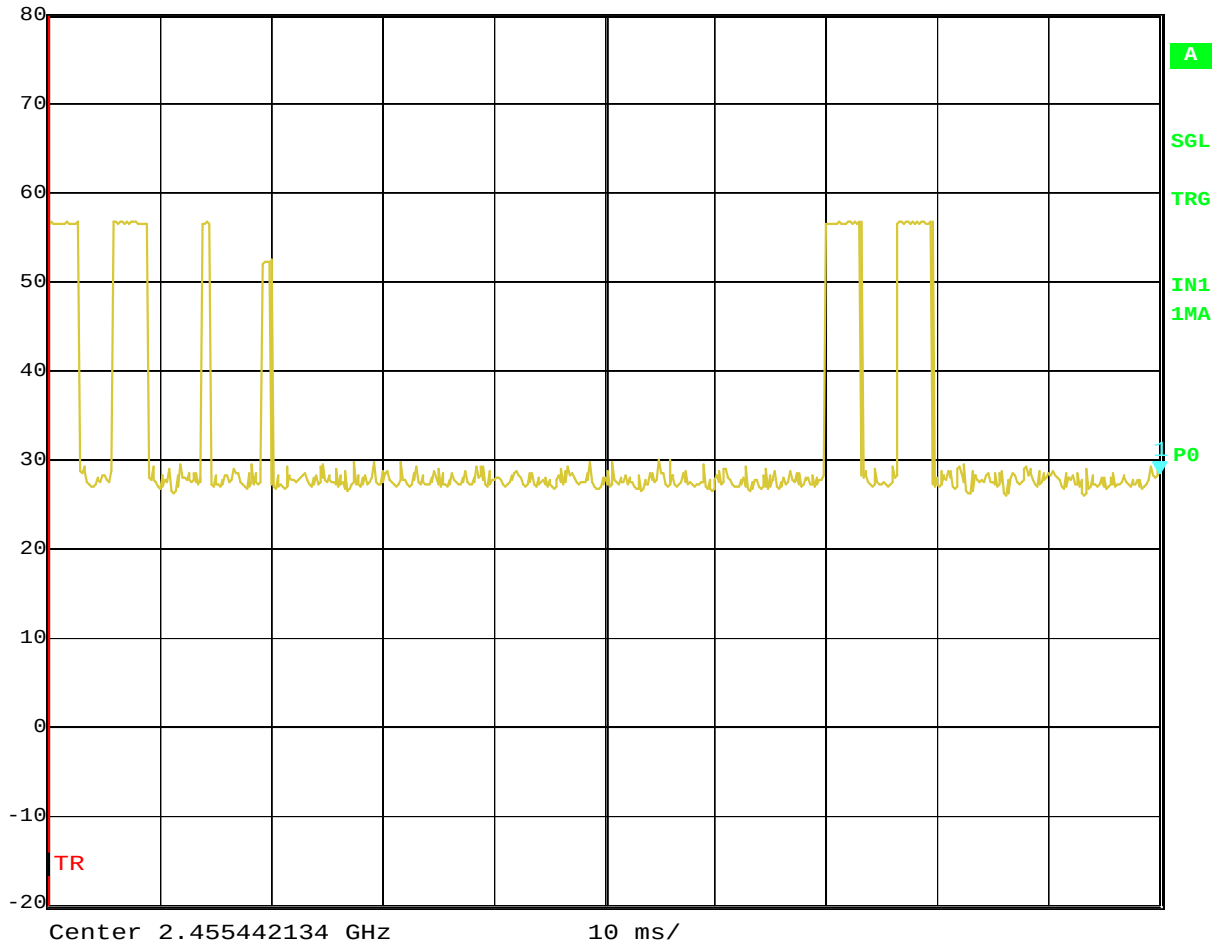


Date: 2.FEB.2012 19:15:21

This period contains two pairs of long words and two short words, as shown here.



Ref Lvl	Marker 1 [T1]	RBW	1 MHz	RF Att	0 dB
80 dBμV	28.29 dBμV	VBW	3 MHz		
	99.900000 ms	SWT	100 ms	Unit	dBμV

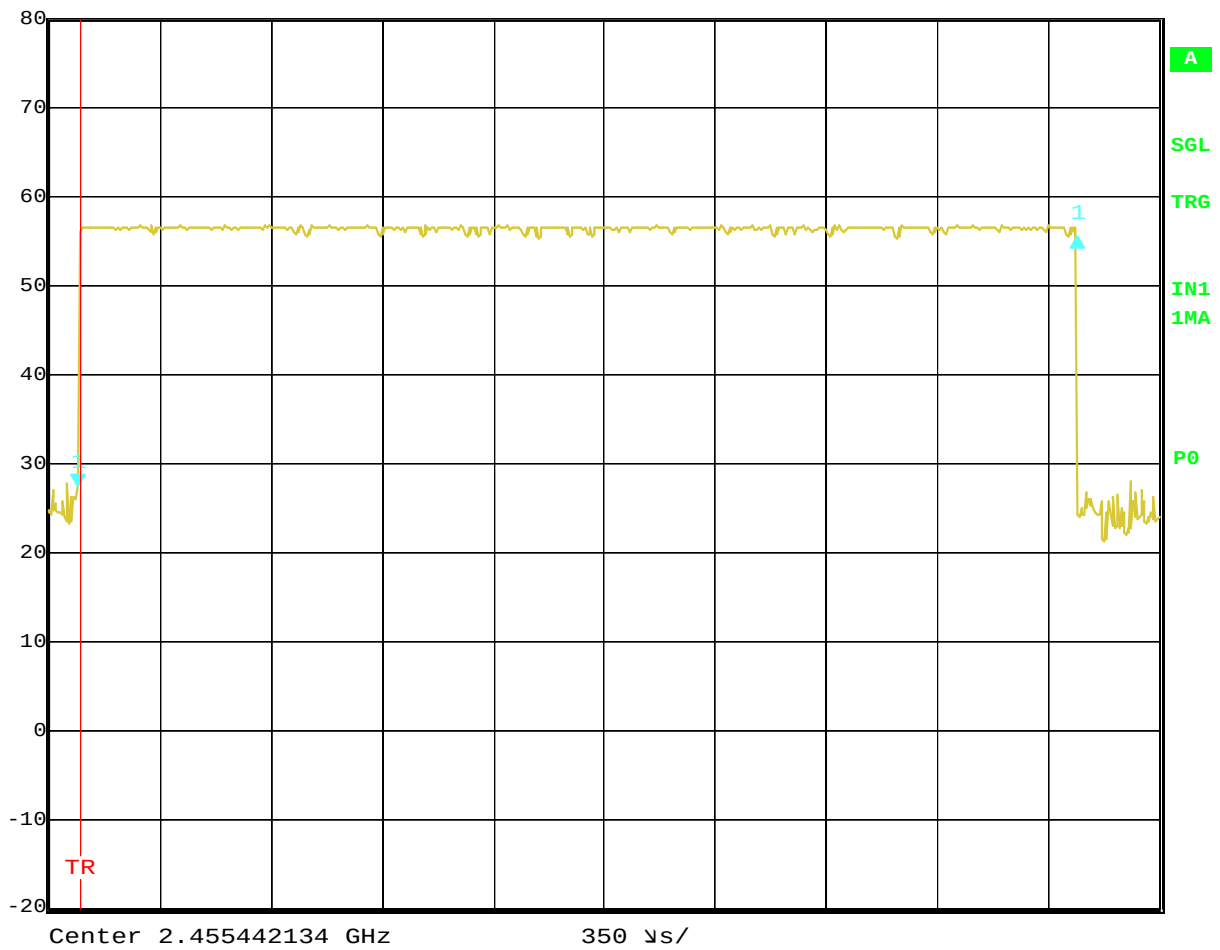


Date: 2.FEB.2012 19:11:52

The long word length is 3.15 ms.



Ref Lvl	Delta 1 [T1]	RBW	1 MHz	RF Att	0 dB
80 dBμV	27.92 dB	VBW	3 MHz		
	3.149299 ms	SWT	3.5 ms	Unit	dBμV

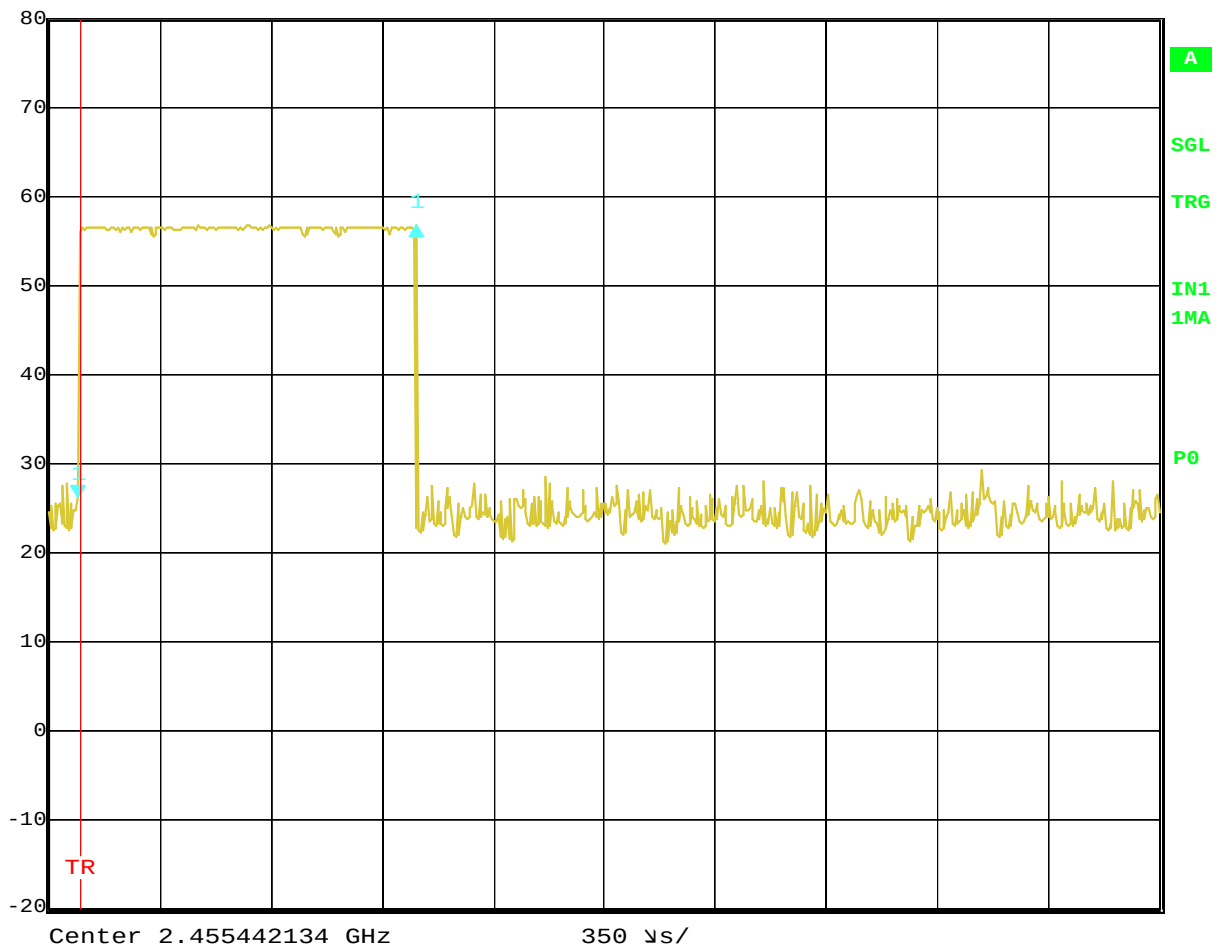


Date: 2.FEB.2012 19:12:46

The short word length is 1.066 ms.



Ref Lvl	Delta 1 [T1]	RBW	1 MHz	RF Att	0 dB
80 dBμV	30.29 dB	VBW	3 MHz		
	1.066132 ms	SWT	3.5 ms	Unit	dBμV



Date: 2.FEB.2012 19:13:47

The duty cycle is therefore $4(3.15) + 2(1.066) = 14.73$ ms in a 100ms period, or 14.73%, for a duty cycle correction factor of 16.63 dB.

RF Exposure:

The EUT is a portable 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 Public Notice DA-00-705A1 and RSS-Gen 4.6. The human RF exposure limit is 1 mW/cm². The power density S in mW/cm² generated by some value of EIRP in mW at a given distance d in cm is related by the equation:

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

The distance, given a maximum EIRP of 0.36 dBm (1.09 mW), at which the radiated power density of the EUT is equal to the human RF exposure limit is 0.3 cm from the antenna. This result does not take averaging into account.

The EUT is exempt from FCC SAR RF exposure evaluation as referenced in KDB 447498 section 1(c) due to the average output power being below $60/f_{(\text{GHz})}$ 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 2.5.1 because the operating frequency is between 2.2 and 3.0 GHz and the EIRP does not exceed 20 mW (13.0 dBm).

	Nicholas Abbondante <i>NA</i>
Test Personnel:	Vathana Ven <i>VSV</i>
Supervising/Reviewing Engineer:	
(Where Applicable)	N/A
Product Standard:	FCC Part 15 Subpart C
Input Voltage:	15.247; IC RSS-210 Annex 8
Pretest Verification w/ Ambient Signals or BB Source:	3.3VDC
	Ambient

Test Date: 02/01/2012, 02/02/2012, 02/15/2012

Test Levels: See tables

Ambient Temperature: 20, 20 °C

Relative Humidity: 24, 21 %

Atmospheric Pressure: 1010, 1012 mbars

Deviations, Additions, or Exclusions: None

7 6 dB Bandwidth

7.1 Method

Tests are performed in accordance with ANSI C63.4:2003, CFR47 FCC Part 15 Subpart C 15.247, IC RSS-210 Issue 8 December 2010, IC RSS-Gen Issue 3 December 2010, and KDB 558074v01 01/18/2012.

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7.2 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
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**.

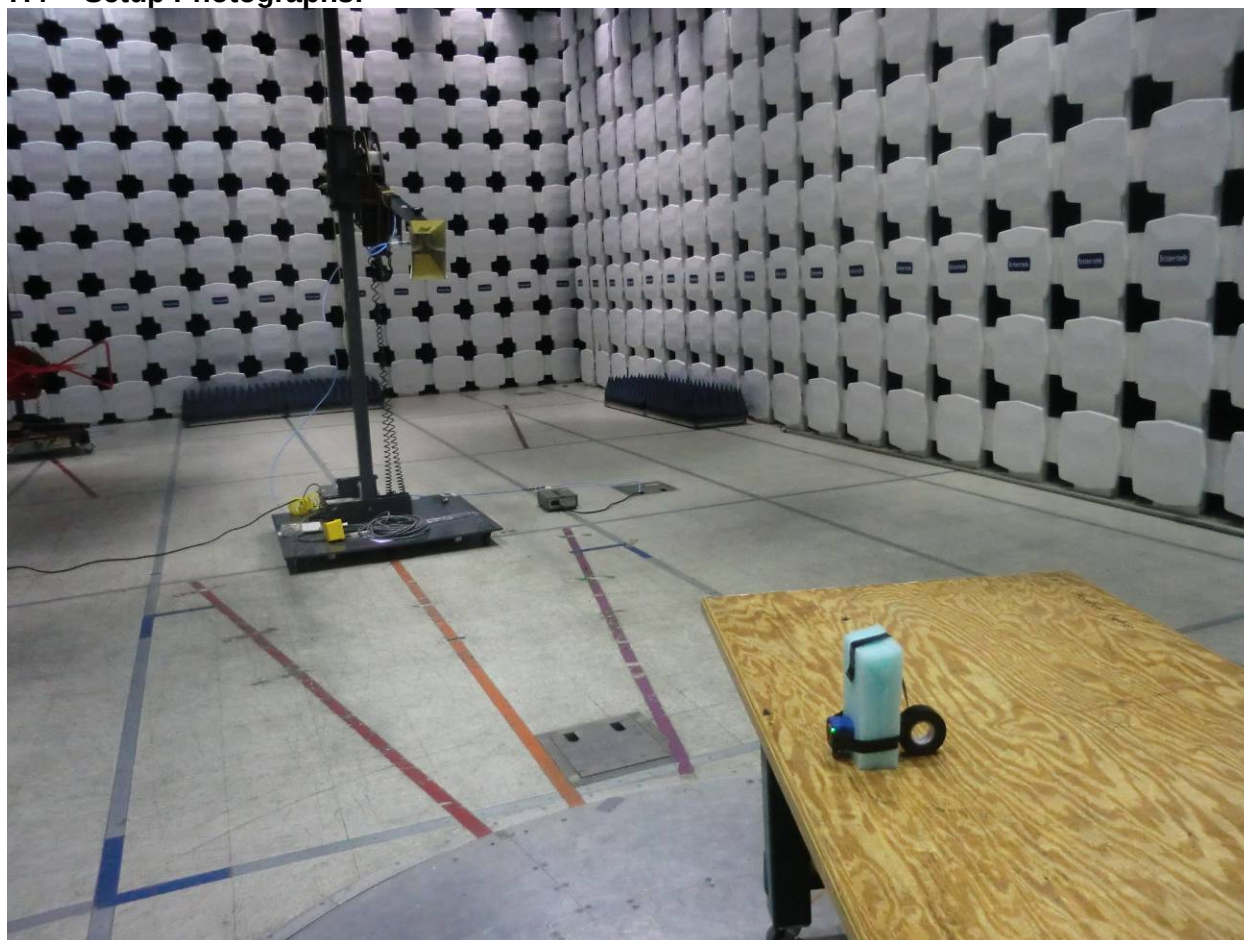
Cut Guide Pod

Channel	6 dB Bandwidth	99% Power Bandwidth
Channel 11 (2405 MHz)	1.492 MHz	3.888 MHz
Channel 18 (2440 MHz)	1.442 MHz	3.487 MHz
Channel 26 (2480 MHz)	1.456 MHz	4.211 MHz

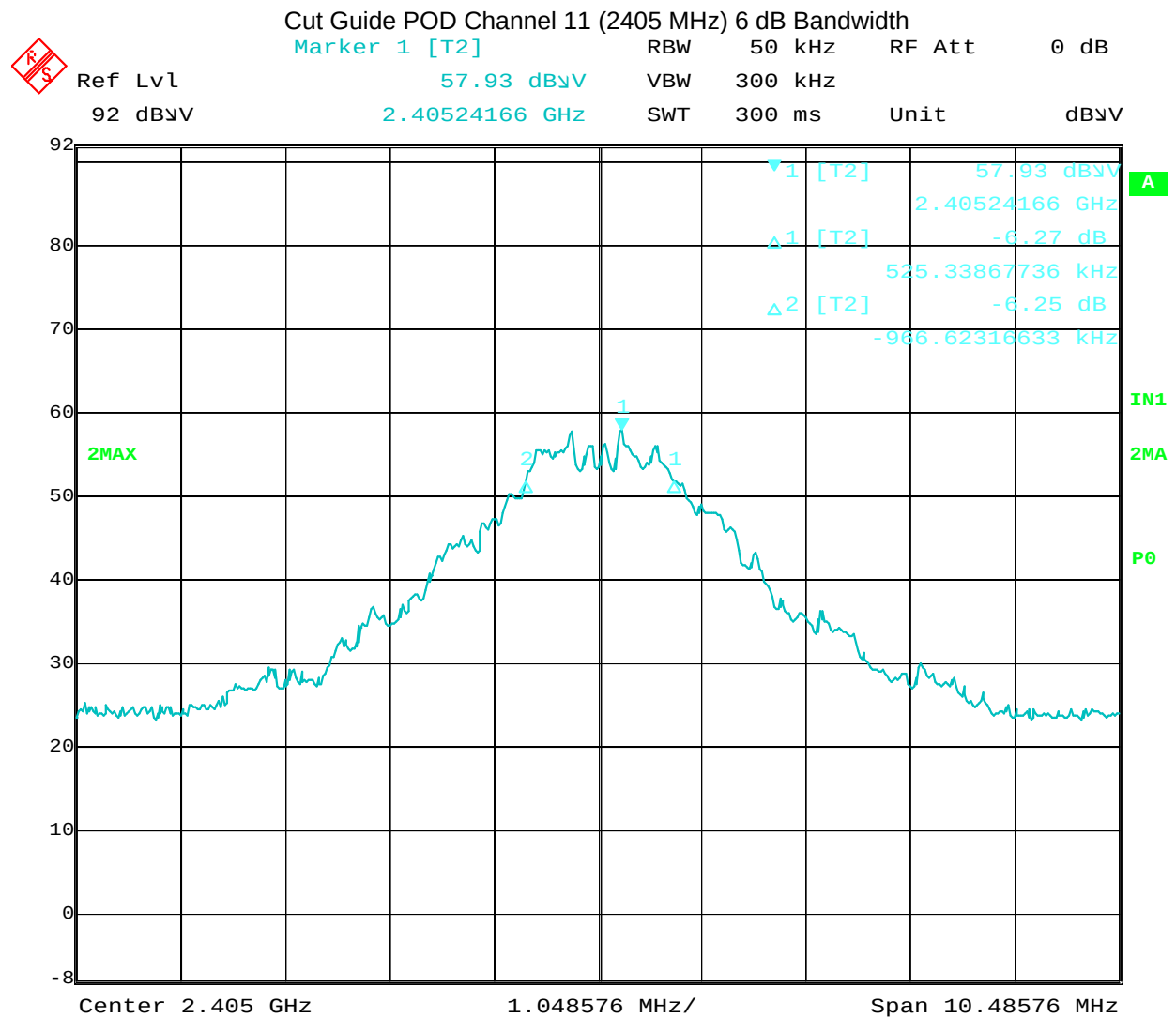
Reference Pod

Channel	6 dB Bandwidth	99% Power Bandwidth
Channel 11 (2405 MHz)	1.563 MHz	3.788 MHz
Channel 18 (2440 MHz)	1.583 MHz	3.687 MHz
Channel 26 (2480 MHz)	1.543 MHz	3.647 MHz

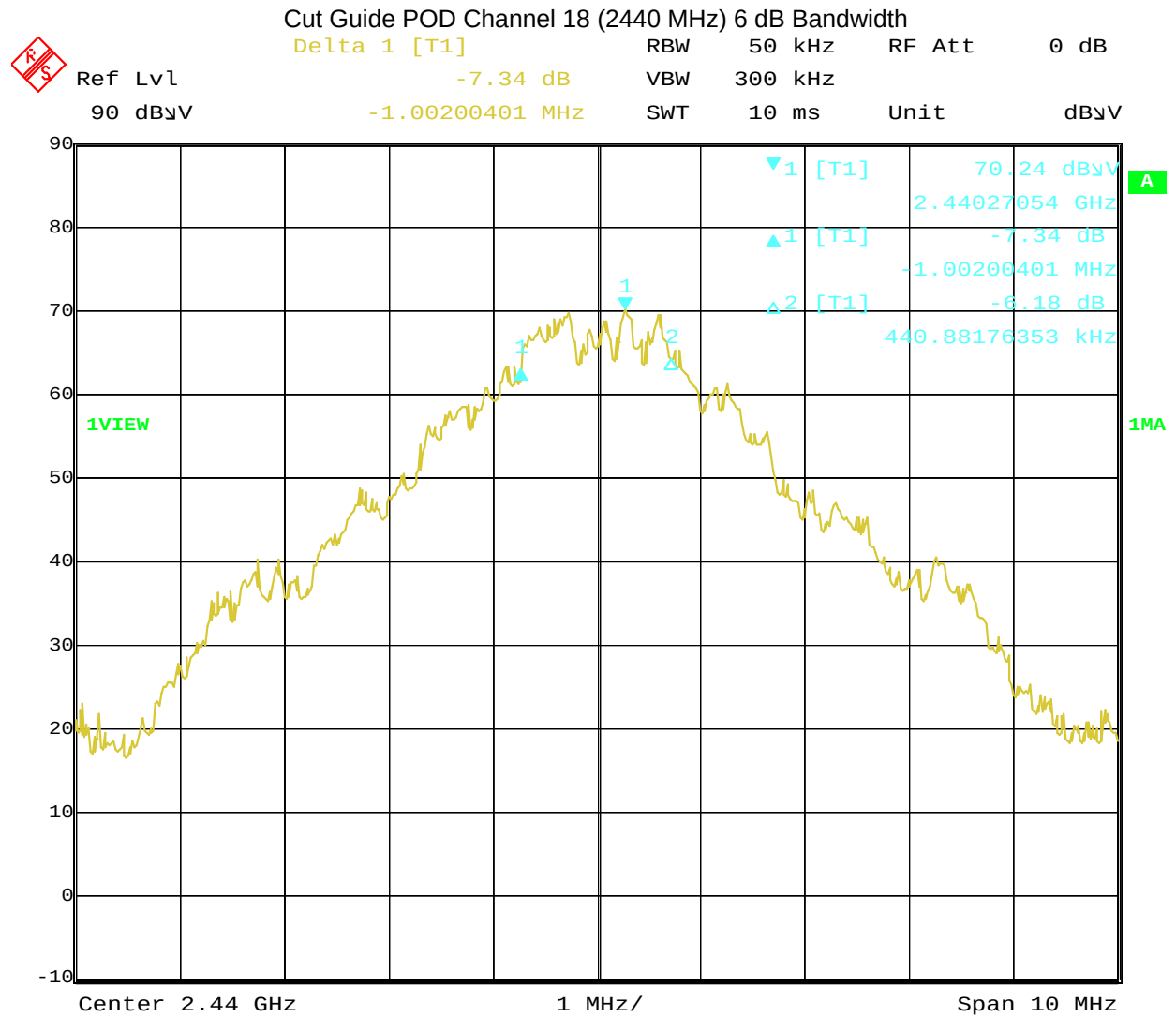
Plots were taken using an RBW of ~1-5% of the measured emission bandwidth, per KDB 558074v01 01/18/2012 and IC RSS-Gen Section 4.6.2.

7.4 Setup Photographs:

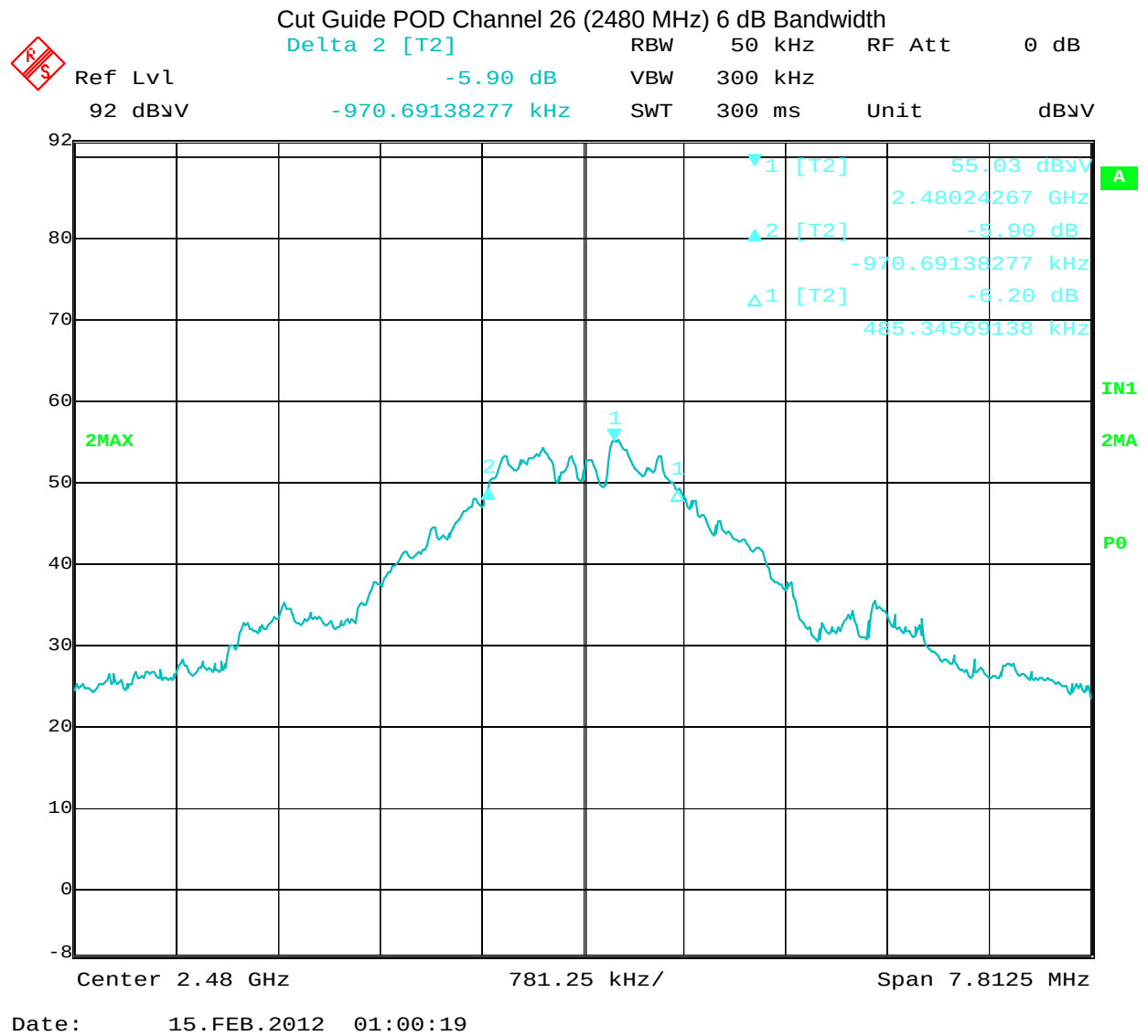
7.5 Plots/Data:

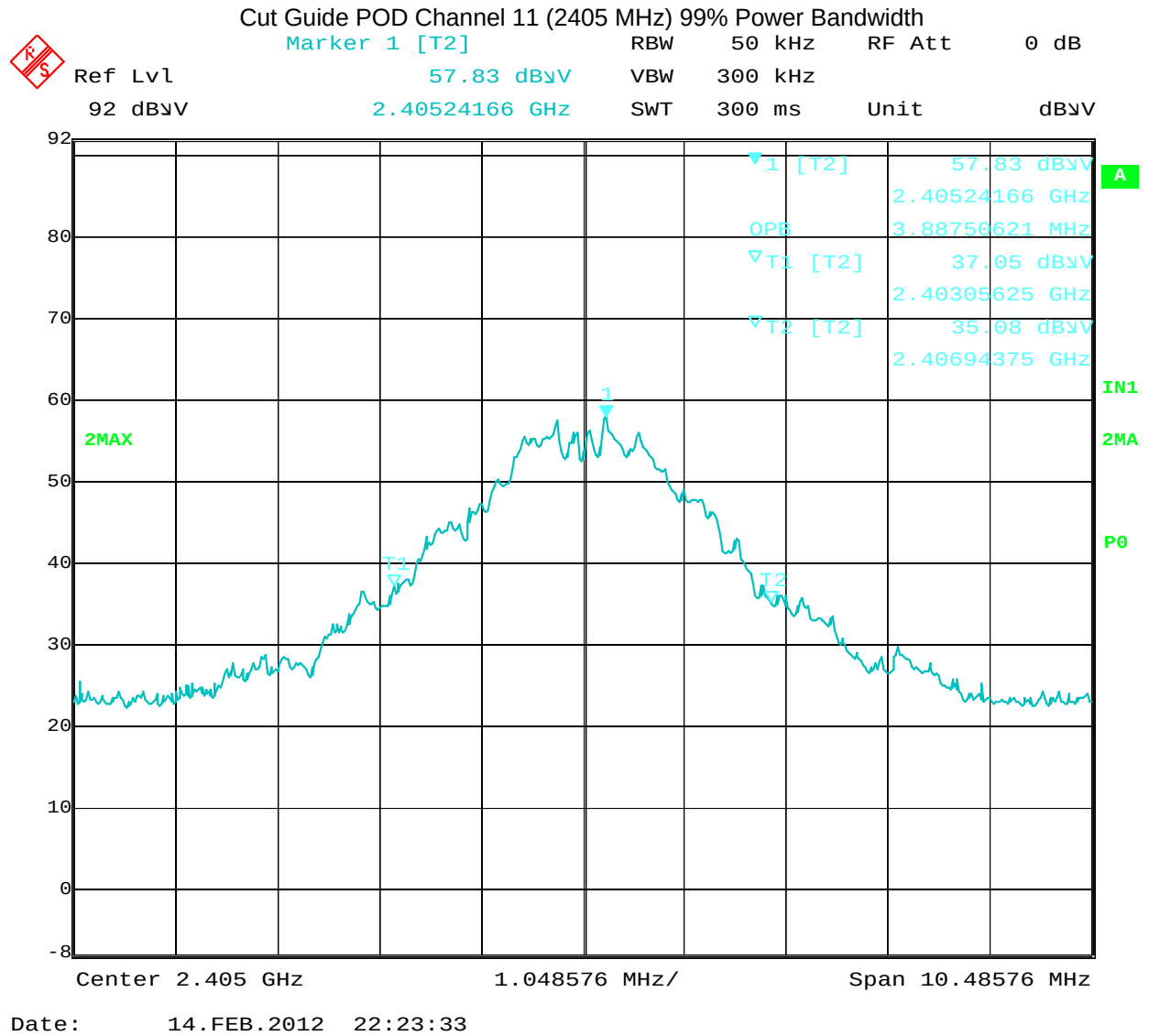


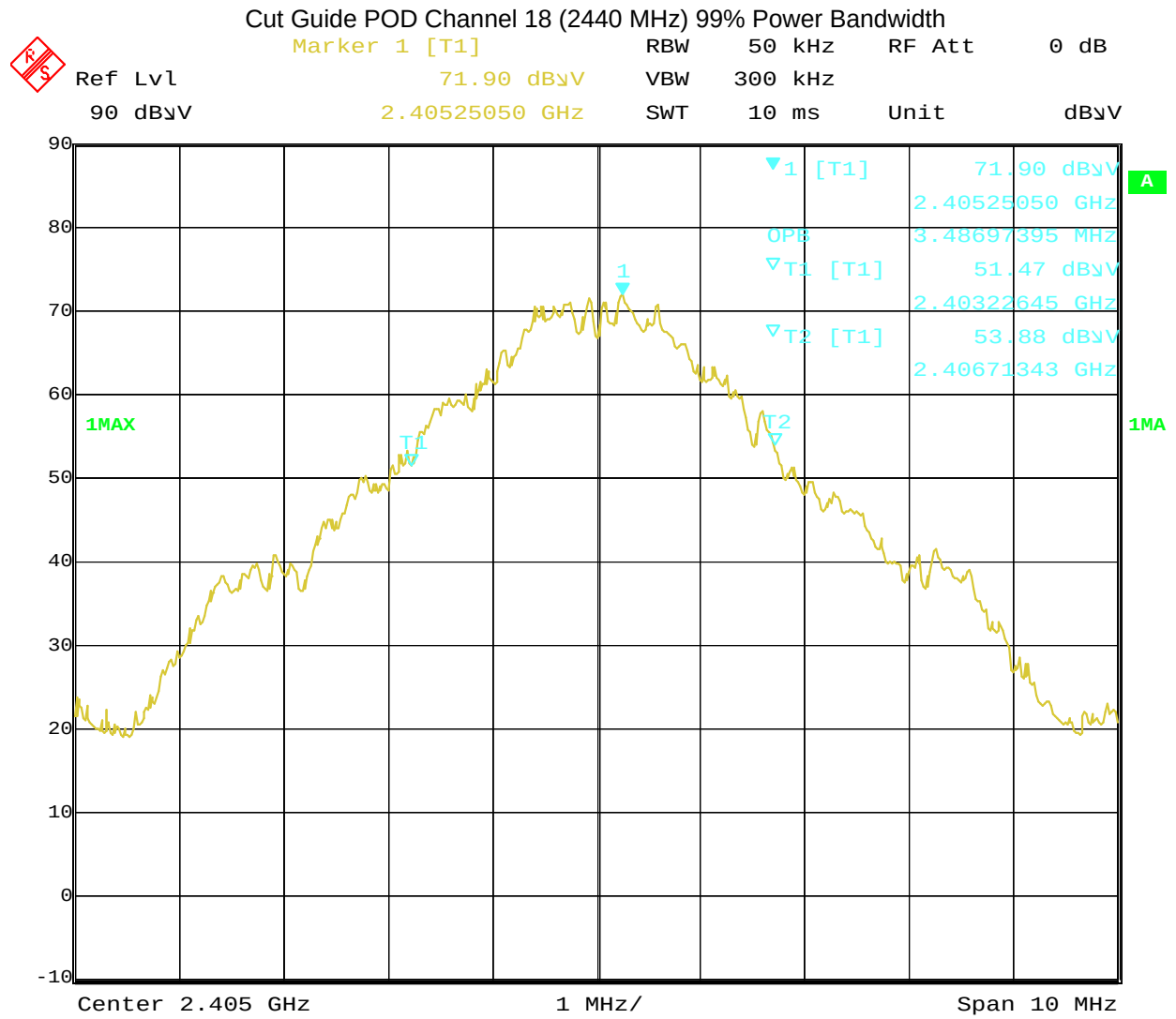
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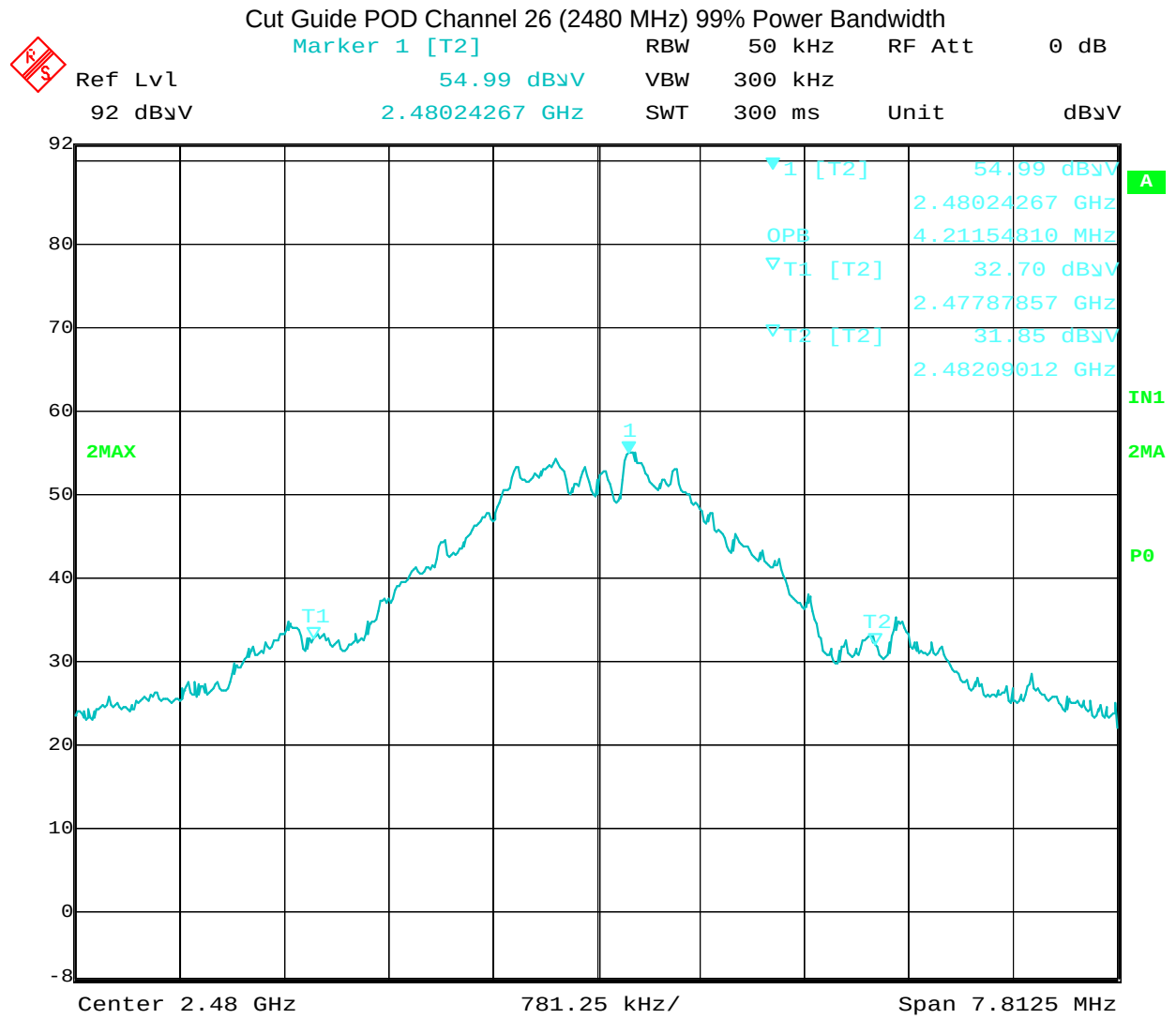
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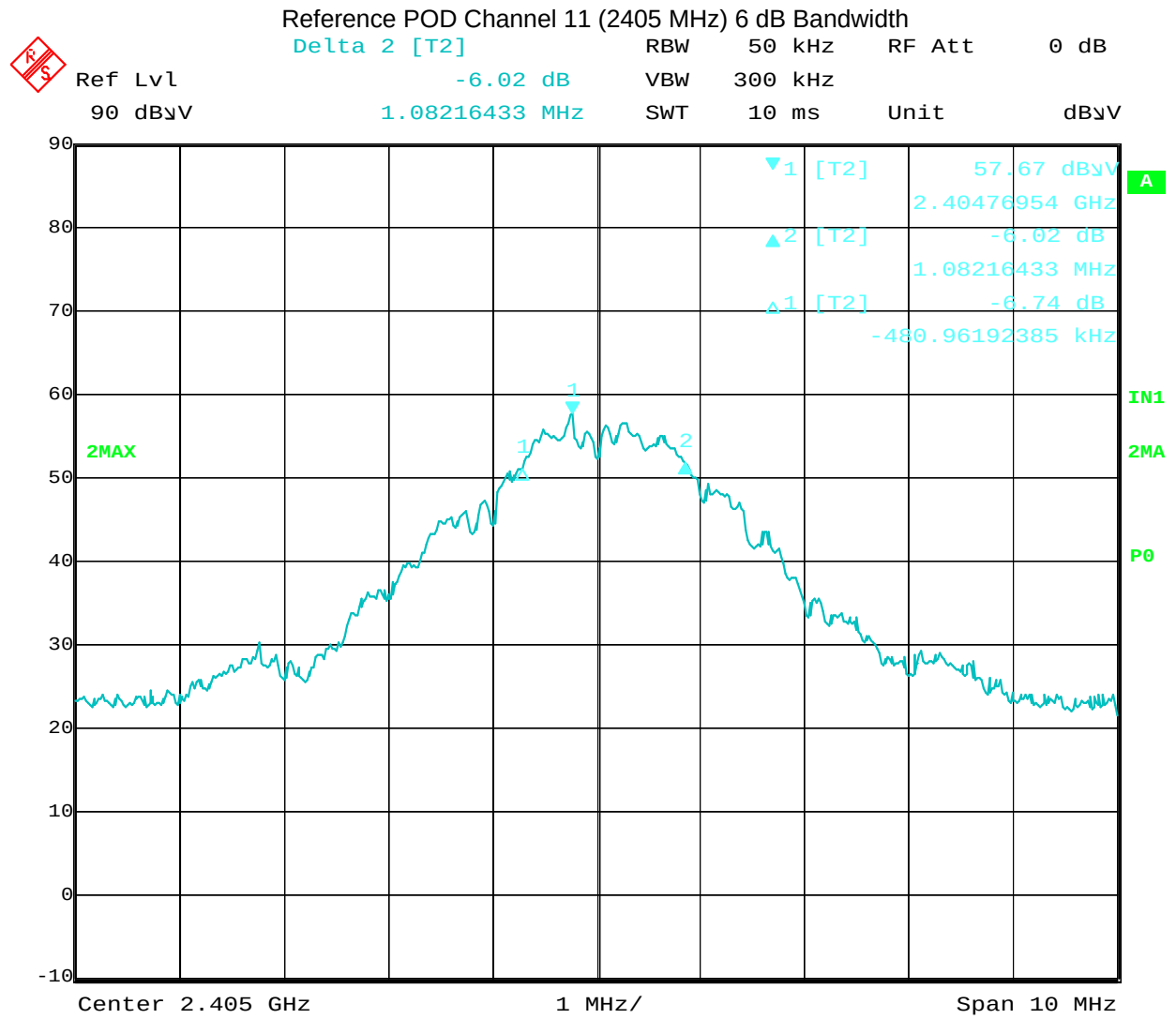




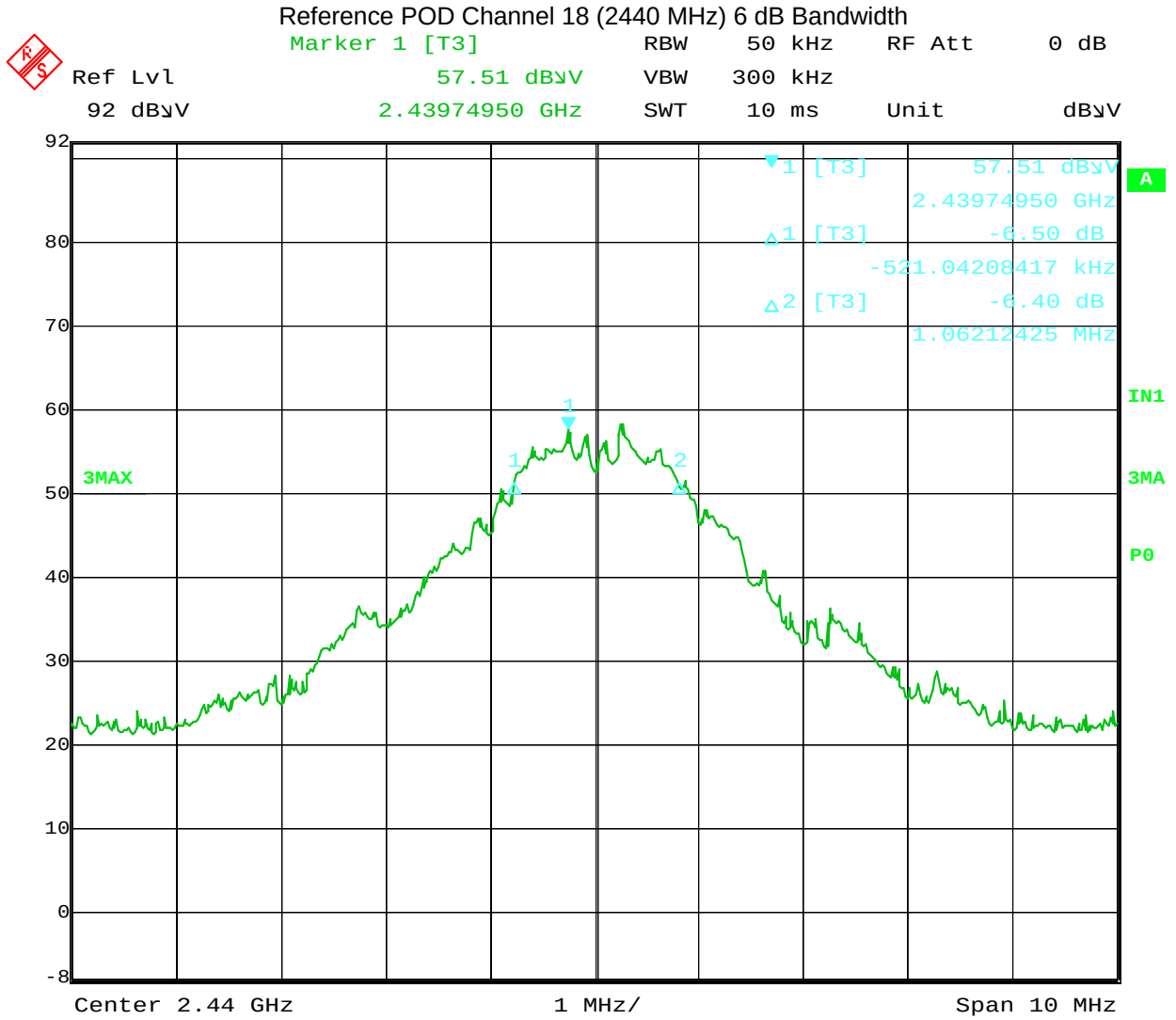
Date: 23.FEB.2012 22:28:39



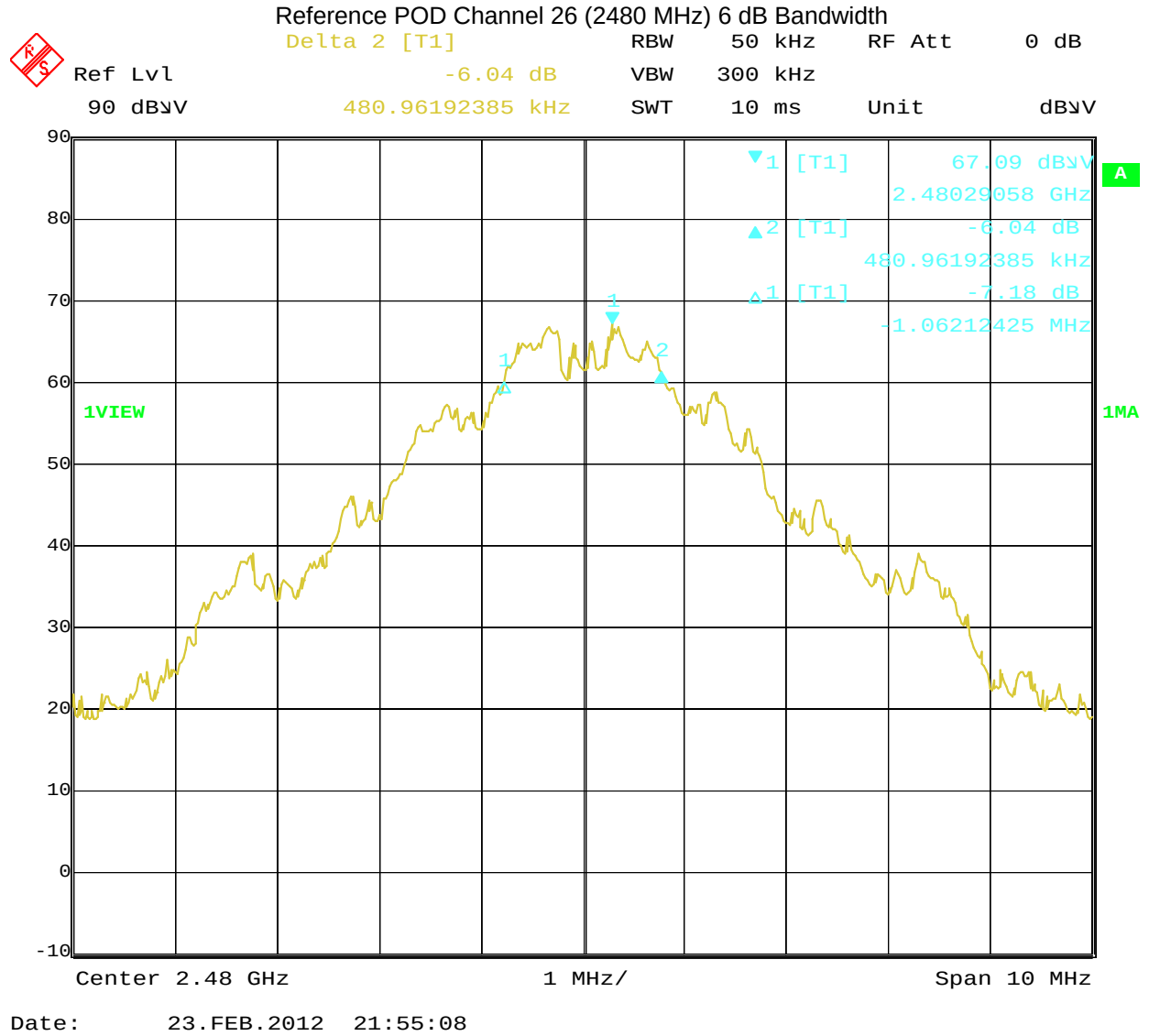
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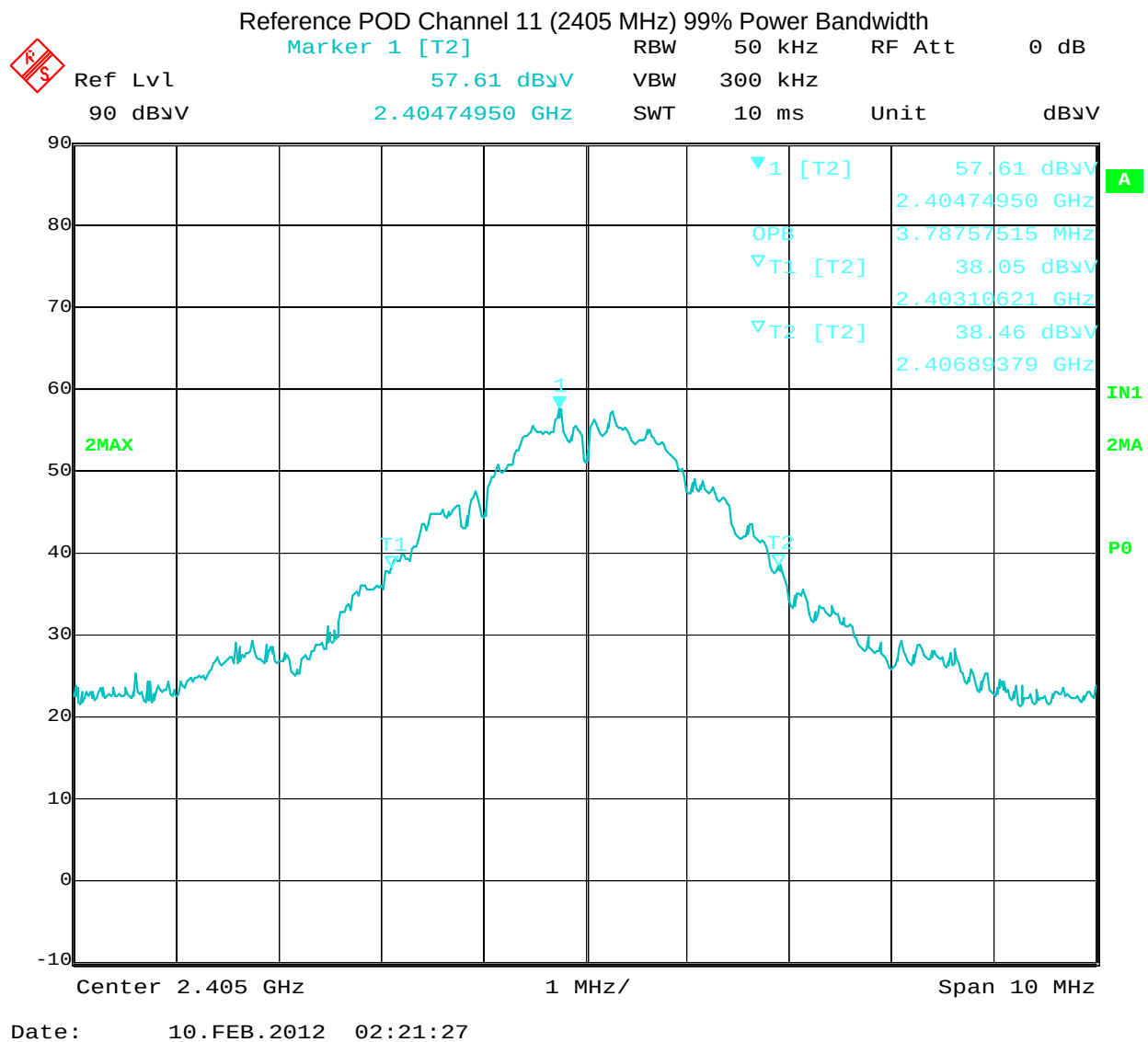


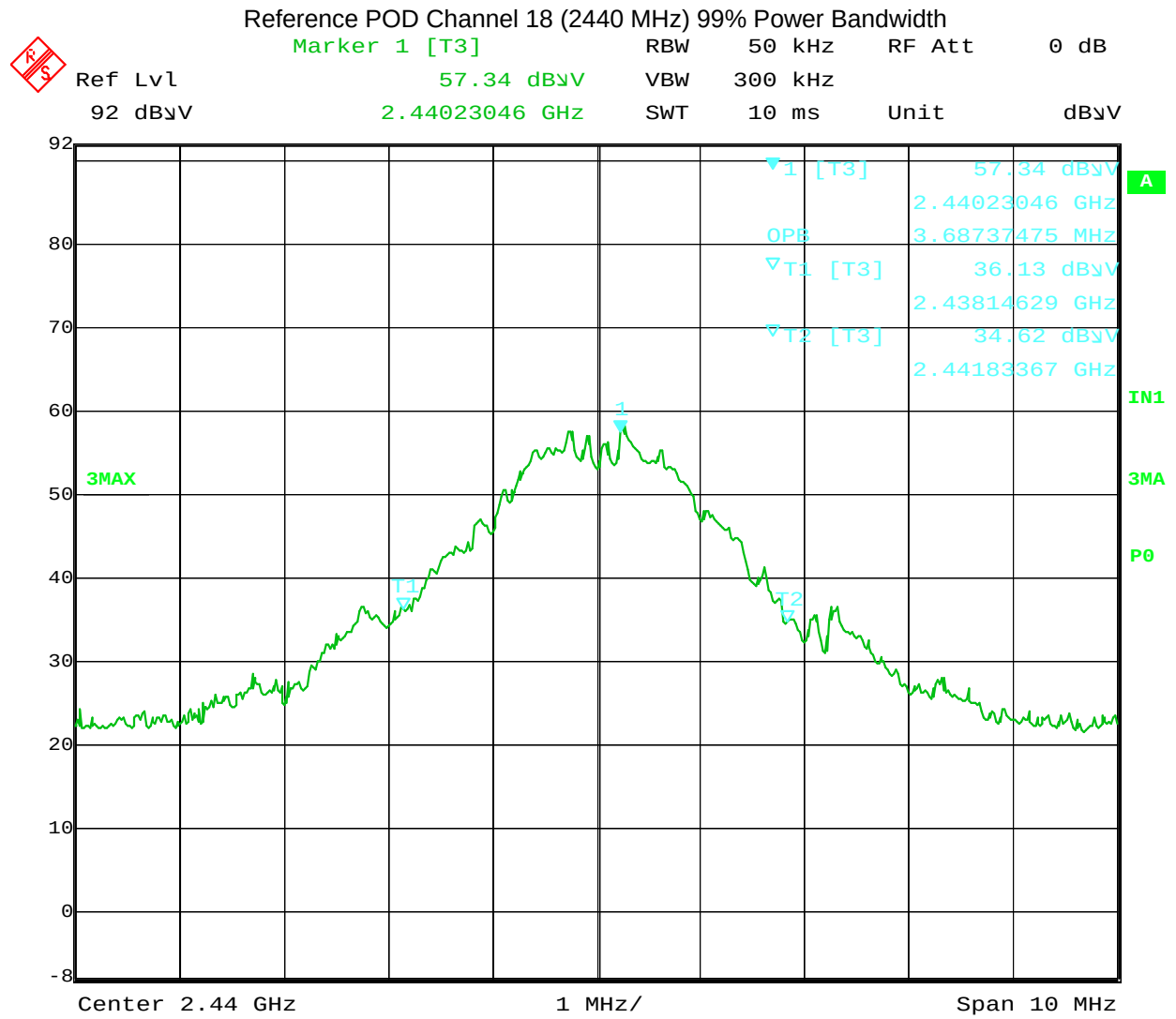
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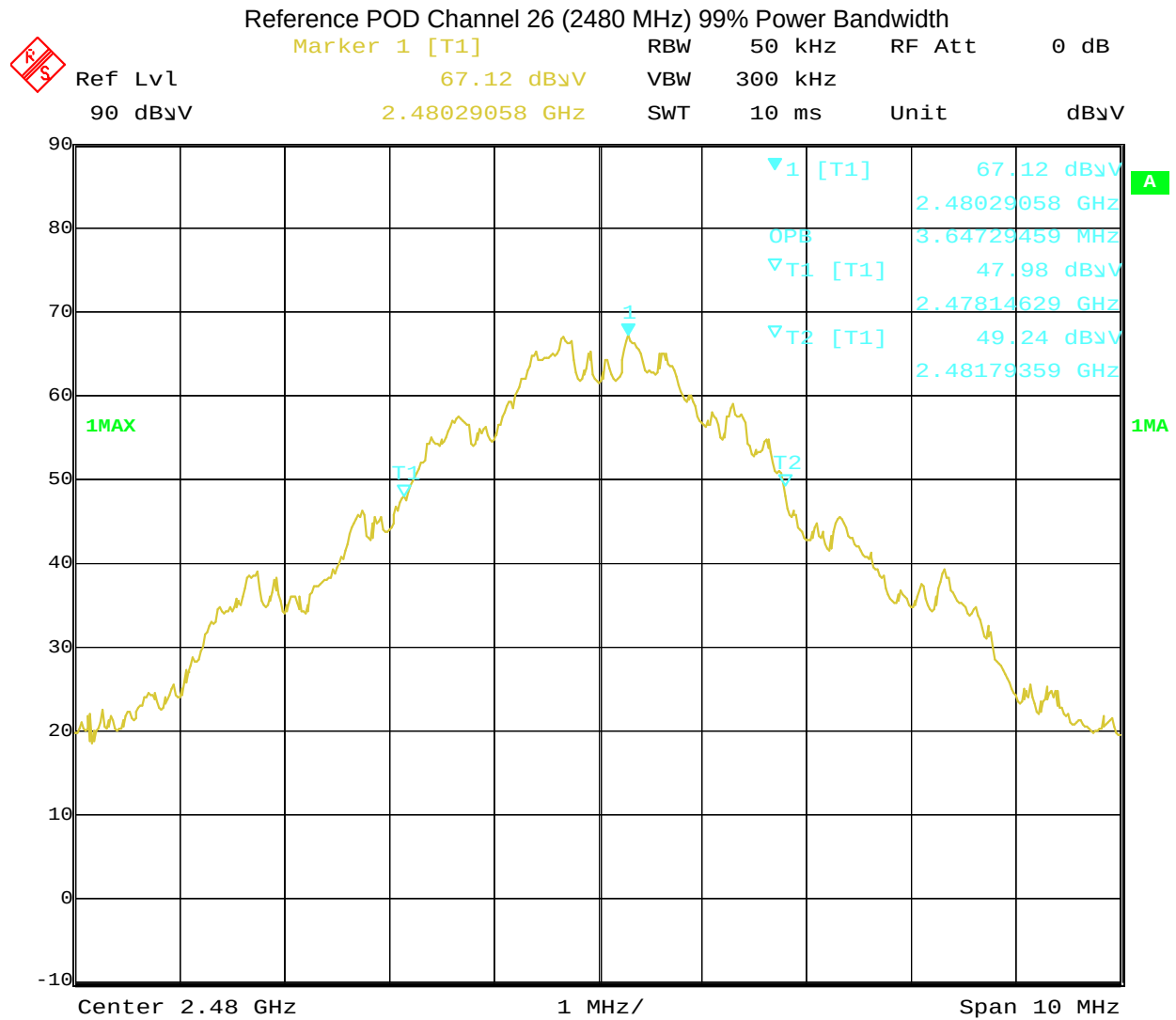
Date: 2.FEB.2012 21:55:07







Date: 2.FEB.2012 21:53:20



Date: 23.FEB.2012 21:50:52

Test Personnel: Vathana Ven *VSV*

Supervising/Reviewing Engineer: _____

(Where Applicable) N/A

Product Standard: FCC Part 15 Subpart C

Input Voltage: 15.247; IC RSS-210 Annex 8

Pretest Verification w/ Ambient Signals or BB Source: 3.3VDC

BB Source: Ambient

Test Date: 02/23/2012

Test Levels: See section 7.3

Ambient Temperature: 20 °C

Relative Humidity: 24 %

Atmospheric Pressure: 1010 mbars

Deviations, Additions, or Exclusions: None

8 Peak Power Spectral Density

8.1 Method

Tests are performed in accordance with FCC 15 Subpart C Section 15.247 (e), RSS-210 Issue 8 December 2010, A8.2 (b), KDB 558074 Section 5.3.

TEST SITE: 10m ALSE

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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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003	Weather Station	Davis Instruments	7400	PE80529A39 A	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:

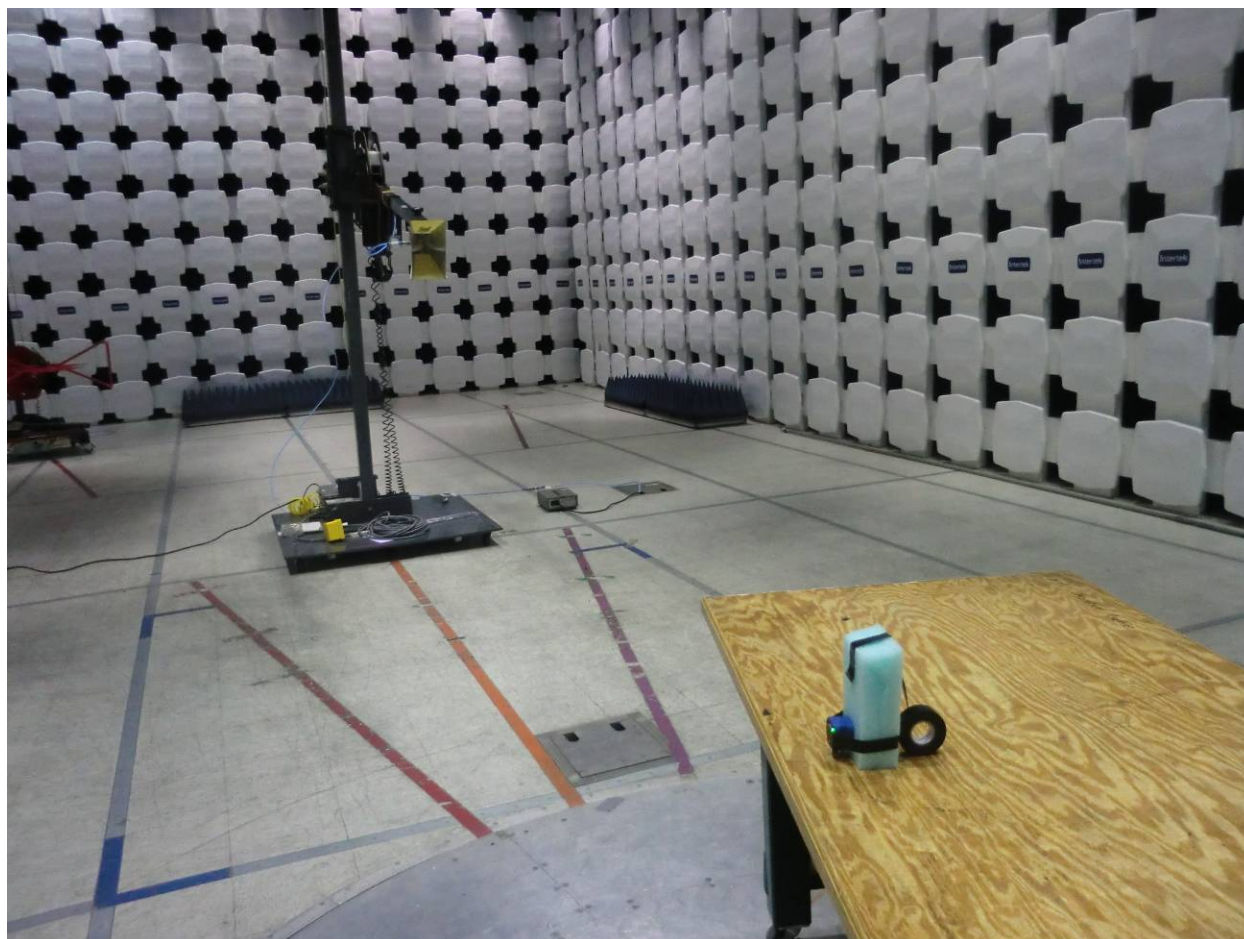
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

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 Photographs:



8.5 Plots/Data:

Cut Guide POD Radiated Emissions

Company: Zimmer CAS
 Model #: 20-8011-000-02
 Serial #: Z204004
 Engineers: Vathana Ven
 Project #: G100652281 Date(s): 02/15/12
 Standard: FCC Part 15 Subpart C 15.247/RSS-210
 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: 3.3VDC 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

Antenna & Cables: N Bands: N, LF, HF, SHF
 Antenna: HORN3 V3m 03-28-2012.txt HORN3 H3m 03-28-2012.txt
 Cable(s): 145-416 3mTrkB 09-04-2012.txt NONE.
 Location: 10m Chamber Barometer: DAV003 Filter: NONE
 Temp/Humidity/Pressure: 20c 24% 1010mB

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	V	2405.000	55.87	28.68	5.93	0.00	0.00	-19.94	8.00	-27.94	100/300 kHz
PK	V	2440.000	54.90	28.73	5.98	0.00	0.00	-20.82	8.00	-28.82	100/300 kHz
PK	V	2480.000	57.35	28.78	6.03	0.00	0.00	-18.26	8.00	-26.26	100/300 kHz
Note: Power Density measured in a 3 kHz RBW											
PK	V	2405.000	45.28	28.68	5.93	0.00	0.00	-15.33	8.00	-23.33	3/10 kHz
PK	V	2440.000	44.62	28.73	5.98	0.00	0.00	-15.90	8.00	-23.90	3/10 kHz
PK	V	2480.000	44.24	28.78	6.03	0.00	0.00	-16.17	8.00	-24.17	3/10 kHz

FCC IC

Reference POD

Radiated Emissions

Company: Zimmer CAS
 Model #: 20-8011-000-01
 Serial #: Z204001
 Engineers: Vathana Ven
 Project #: G100652281
 Standard: FCC Part 15 Subpart C 15.247/RSS-210
 Receiver: R&S ESI (145128) 08-23-2012
 PreAmp: PRE145014 12-16-2012.txt
 Antenna & Cables: N
 Bands: N, LF, HF, SHF
 Antenna: HORN3 V3m 03-28-2012.txt
 Cable(s): 145-416 3m TrkB 09-04-2012.txt
 NONE
 Location: 10m Chamber
 Barometer: DAV003
 Filter: NONE
 Date(s): 02/15/12
 Temp/Humidity/Pressure: 20c 21% 1012mB
 Limit Distance (m): 3
 Test Distance (m): 3
 Voltage/Frequency: 3.3VDC
 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	Harmonic?
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	V	2405.000	56.60	28.68	5.93	0.00	0.00	-19.21	8.00	-27.21	100/300 kHz			
PK	H	2440.000	56.96	28.77	5.98	0.00	0.00	-18.71	8.00	-26.71	100/300 kHz			
PK	H	2480.000	56.05	28.82	6.03	0.00	0.00	-19.51	8.00	-27.51	100/300 kHz			
Note: Power Density measured in a 3 kHz RBW														
PK	V	2405.000	42.84	28.68	5.93	0.00	0.00	-17.77	8.00	-25.77	3/10 kHz			
PK	H	2440.000	41.28	28.77	5.98	0.00	0.00	-19.19	8.00	-27.19	3/10 kHz			
PK	H	2480.000	42.27	28.82	6.03	0.00	0.00	-18.09	8.00	-26.09	3/10 kHz			

Test Personnel: Vathana Ven
 Supervising/Reviewing Engineer:
 (Where Applicable)
 Product Standard: FCC Part 15 Subpart C 15.247; IC RSS-210 Annex 8
 Input Voltage: 3.3VDC
 Pretest Verification w/ Ambient Signals or BB Source: Ambient

Test Date: 02/15/2012

Test Levels: See table

Ambient Temperature: 21 °C

Relative Humidity: 21 %

Atmospheric Pressure: 1012 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 (d), RSS-210 Issue 8 December 2010, A8.5, KDB 558074v01 01/18/2012 Section 5.4.2.2.4.

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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where UF = Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

9.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003	Weather Station	Davis Instruments	7400	PE80529A39 A	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:

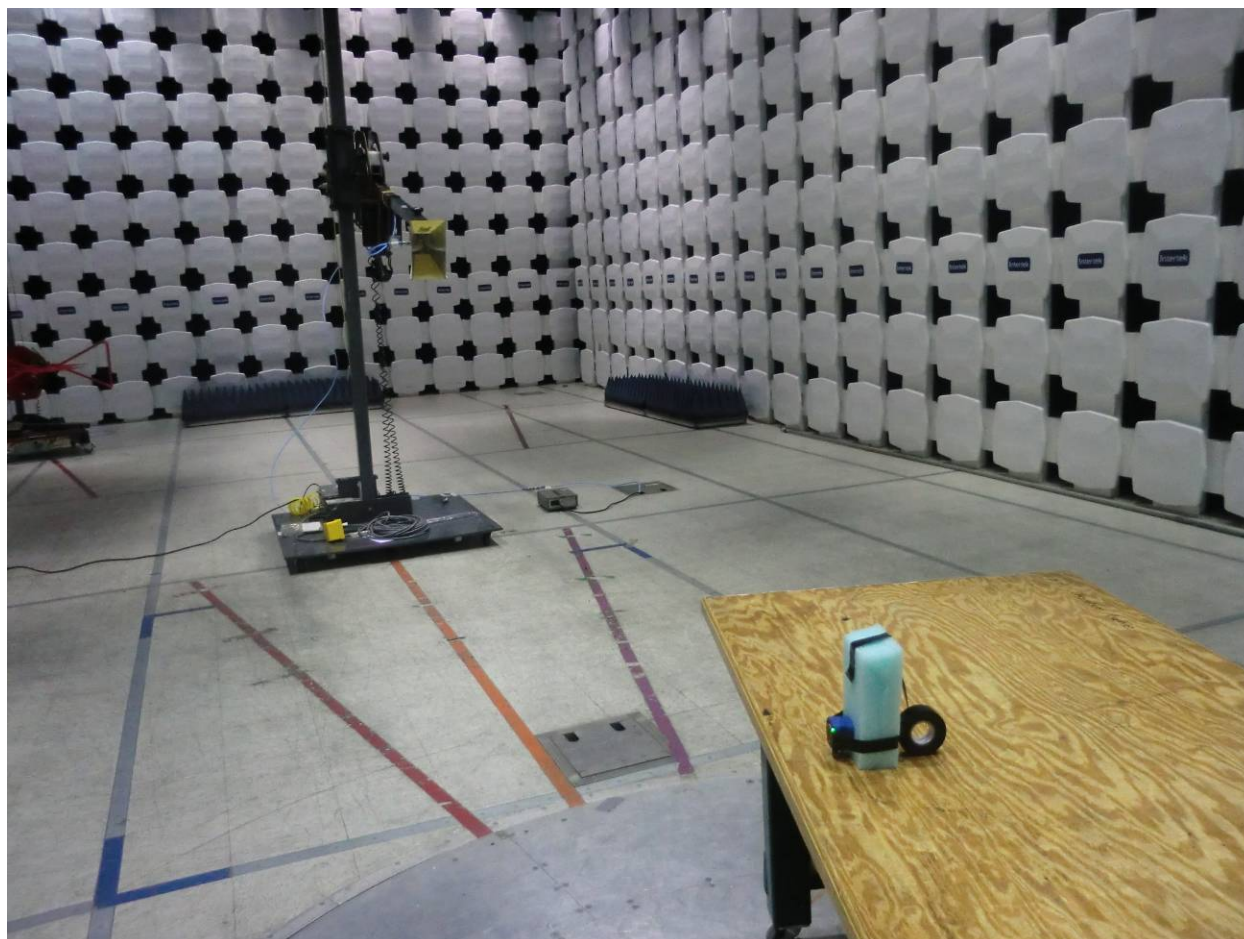
Name	Manufacturer	Version
EMI Boxborough.xls	Intertek	08/27/2010

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 Photographs:



9.5 Plots/Data:

Cut Guide POD Special Radiated Emissions

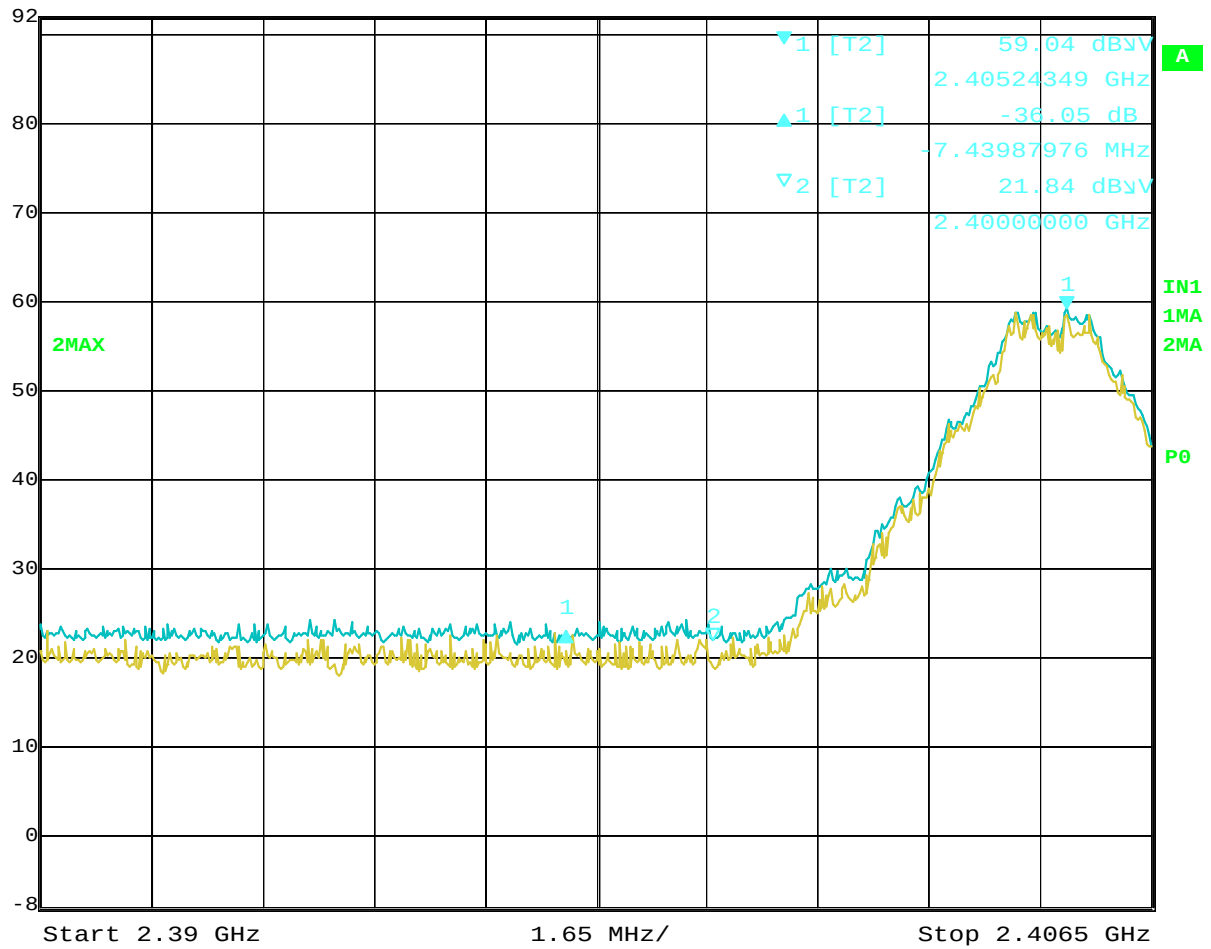
Company: Zimmer CAS Antenna & Cables: N Bands: N, LF, HF, SHF
 Model #: 20-8011-000-02 Antenna: HORN3 V3m 03-28-2012.txt HORN3 H3m 03-28-2012.txt
 Serial #: Z204004 Cable(s): 145-416 3mTrkB 09-04-2012.txt NONE
 Engineers: Vathana Ven Location: 10m Chamber Barometer: DAV003 Filter: NONE
 Project #: G100652281 Date(s): 02/15/12
 Standard: FCC Part 15 Subpart C 15.247/RSS-210 Temp/Humidity/Pressure: 19c 11% 1007mB
 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): Y Voltage/Frequency: 3.3VDC 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	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: Spurious Emissions Reference													
PK	H	2405.000	59.69	28.73	5.93	0.00	0.00	94.35	-	-	100/300 kHz		
PK	H	2440.000	58.84	28.77	5.98	0.00	0.00	93.59	-	-	100/300 kHz		
PK	V	2480.000	57.37	28.78	6.03	0.00	0.00	92.18	-	-	100/300 kHz		
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent													
PK	H	2484.000	30.40	28.83	6.04	0.00	0.00	65.27	74.00	-8.73	10 kHz/30 kHz	RB	
AVG	H	2484.000	13.77	28.83	6.04	0.00	0.00	48.64	54.00	-5.36	10 kHz/30 kHz	RB	
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent													
PK	H	2484.000	31.17	28.83	6.04	0.00	0.00	66.04	74.00	-7.96	100/300kHz	RB	
AVG	H	2484.000	14.54	28.83	6.04	0.00	0.00	49.41	54.00	-4.59	100/300kHz	RB	
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent													
PK	H	2484.000	31.80	28.83	6.04	0.00	0.00	66.67	74.00	-7.33	500kHz/3MHz	RB	
AVG	H	2484.000	15.17	28.83	6.04	0.00	0.00	50.04	54.00	-3.96	500kHz/3MHz	RB	
Note: Upper Band Edge Compliance, 100 kHz Marker Delta Method (-29.96 dB delta)													
PK	H	2480.000	57.37	28.82	6.03	0.00	0.00	92.23	-	-	1/3 MHz		
PK	V	2483.500	27.42	28.79	6.04	0.00	0.00	62.24	74.00	-11.76	1/3 MHz	RB	
AVG	V	2483.500	10.79	28.79	6.04	0.00	0.00	45.61	54.00	-8.39	1/3 MHz	RB	

Delta Marker and Integration methods were used



Ref Lvl	Delta 1 [T2]	RBW	100 kHz	RF Att	0 dB
92 dBμV	-36.05 dB	VBW	300 kHz		
	-7.43987976 MHz	SWT	300 ms	Unit	dBμV



Date: 14.FEB.2012 22:59:07

Lower BEC, Cut Guide POD



Reference POD
Special Radiated Emissions

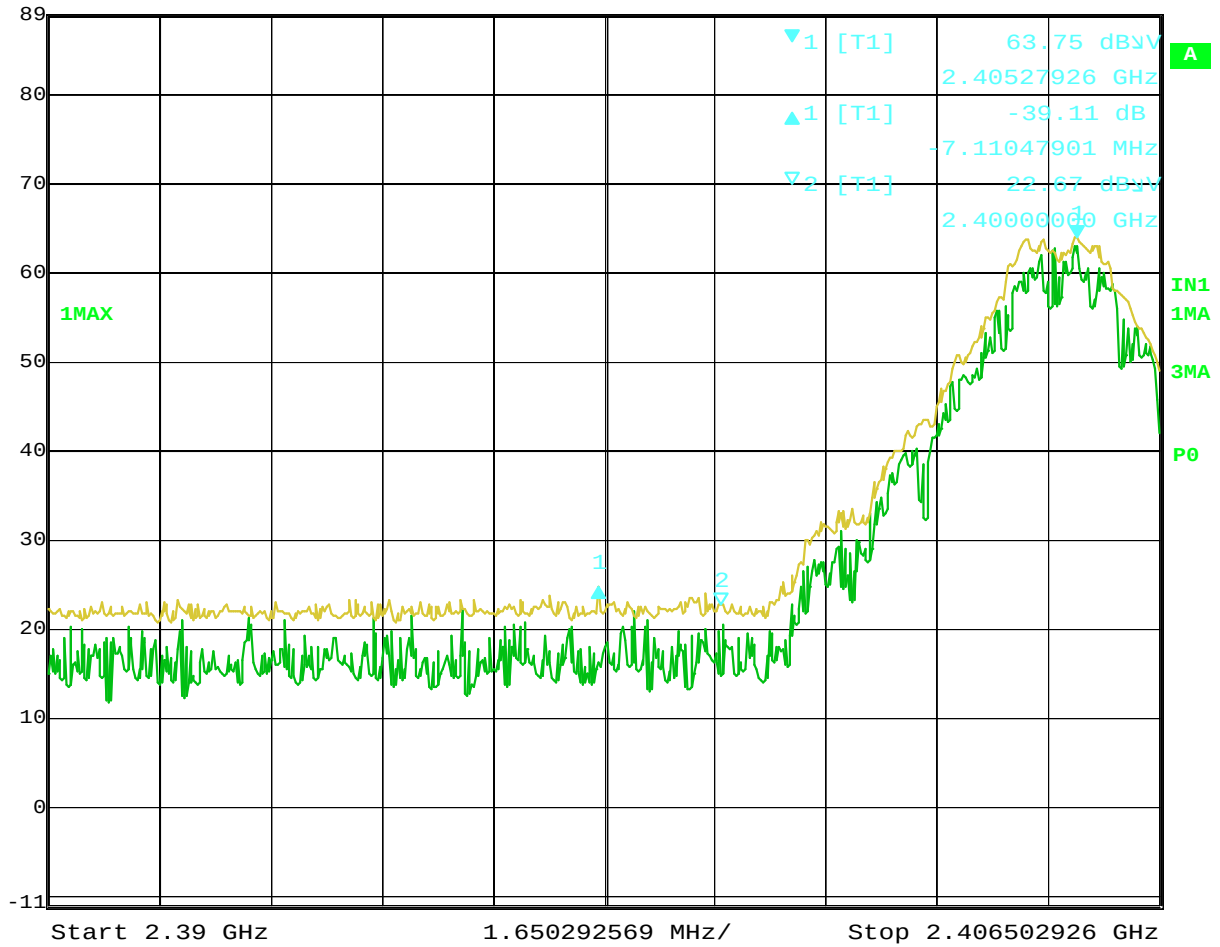
Company: Zimmer CAS Antenna & Cables: N Bands: N, LF, HF, SHF
 Model #: 20-8011-000-01 Antenna: HORN3 V3m 03-28-2012.txt HORN3 H3m 03-28-2012.txt
 Serial #: Z204001 Cable(s): 145-416 3mTrkB 09-04-2012.txt NONE.
 Engineers: Vathana Ven Location: 10m Chamber Barometer: DAV003 Filter: NONE
 Project #: G100652281 Date(s): 02/15/12
 Standard: FCC Part 15 Subpart C 15.247/RSS-210 Temp/Humidity/Pressure: 19c 11% 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): Y Voltage/Frequency: 3.3VDC 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(μV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(μV/m)	Limit dB(μV/m)	Margin dB	Bandwidth	FCC
Note: Spurious Emissions Reference												
PK	V	2405.000	58.90	28.68	5.93	0.00	0.00	93.51	-	-	100/300 kHz	
PK	H	2440.000	59.00	28.77	5.98	0.00	0.00	93.75	-	-	100/300 kHz	
PK	H	2480.000	58.70	28.82	6.03	0.00	0.00	93.56	-	-	100/300 kHz	
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent												
PK	H	2484.000	30.34	28.83	6.04	0.00	0.00	65.21	74.00	-8.79	10 kHz/30 kHz	RB
AVG	H	2484.000	13.71	28.83	6.04	0.00	0.00	48.58	54.00	-5.42	10 kHz/30 kHz	RB
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent												
PK	H	2484.000	31.11	28.83	6.04	0.00	0.00	65.98	74.00	-8.02	100/300kHz	RB
AVG	H	2484.000	14.48	28.83	6.04	0.00	0.00	49.35	54.00	-4.65	100/300kHz	RB
Note: Upper Band Edge Compliance, Integrated to 1 MHz RBW Equivalent												
PK	H	2484.000	32.31	28.83	6.04	0.00	0.00	67.18	74.00	-6.82	500kHz/3MHz	RB
AVG	H	2484.000	15.68	28.83	6.04	0.00	0.00	50.55	54.00	-3.45	500kHz/3MHz	RB
Note: Upper Band Edge Compliance, 100 kHz Marker Delta Method (-27.65 dB delta)												
PK	H	2480.000	58.70	28.82	6.03	0.00	0.00	93.56	-	-	1/3 MHz	
PK	H	2483.500	27.10	28.79	6.04	0.00	0.00	61.92	74.00	-12.08	1/3 MHz	RB
AVG	H	2483.500	10.47	28.79	6.04	0.00	0.00	45.29	54.00	-8.71	1/3 MHz	RB

Delta Marker and Integration methods were used



Delta 1 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl -39.11 dB VBW 300 kHz
 89 dBμV -7.11047901 MHz SWT 5 ms Unit dBμV

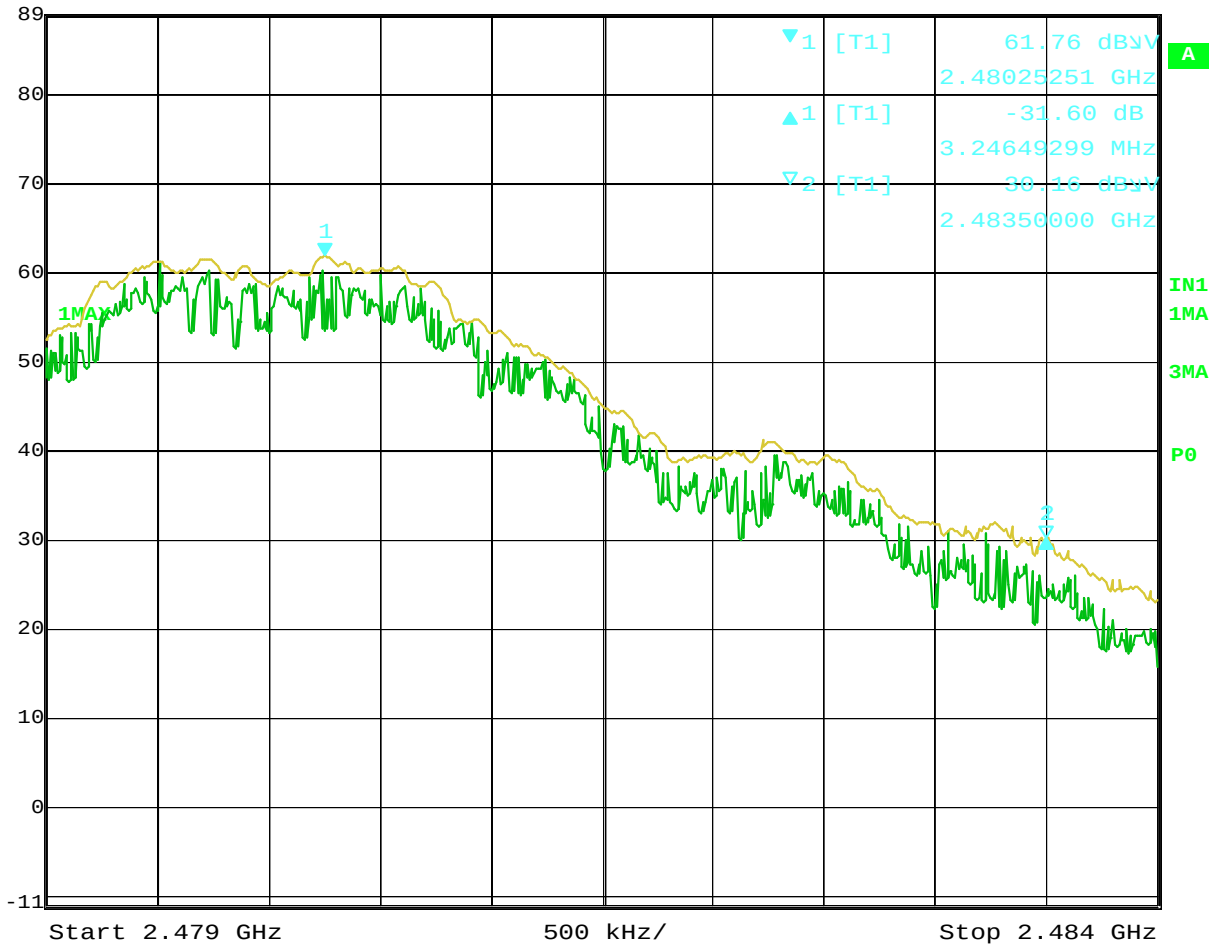


Date: 2.FEB.2012 23:15:07

Lower BEC, Reference POD



Delta 1 [T1] RBW 100 kHz RF Att 0 dB
 Ref Lvl -31.60 dB VBW 300 kHz
 89 dBμV 3.24649299 MHz SWT 5 ms Unit dBμV



Date: 2.FEB.2012 23:57:18

Upper BEC, Reference POD

Test Personnel: Vathana Ven
 Supervising/Reviewing Engineer:
 (Where Applicable)
 Product Standard: FCC Part 15 Subpart C
 15.247; IC RSS-210 Annex 8
 Input Voltage: 3.3VDC
 Pretest Verification w/
 Ambient Signals or
 BB Source: Ambient

Test Date: 02/02/2012, 02/15/2012

Test Levels: See table

Ambient Temperature: 19 °C

Relative Humidity: 11 %

Atmospheric Pressure: 1001 mbars

Deviations, Additions, or Exclusions: None

10 Transmitter Radiated Spurious Emissions

10.1 Method

Tests are performed in accordance with CFR47 FCC Part 15 Subpart C 15.247(d), IC RSS-210 A8.5, KDB 558074v01 01/18/2012 Section 5.4.

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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

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

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$

NF = Net Reading in dB μ V

Example:

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

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

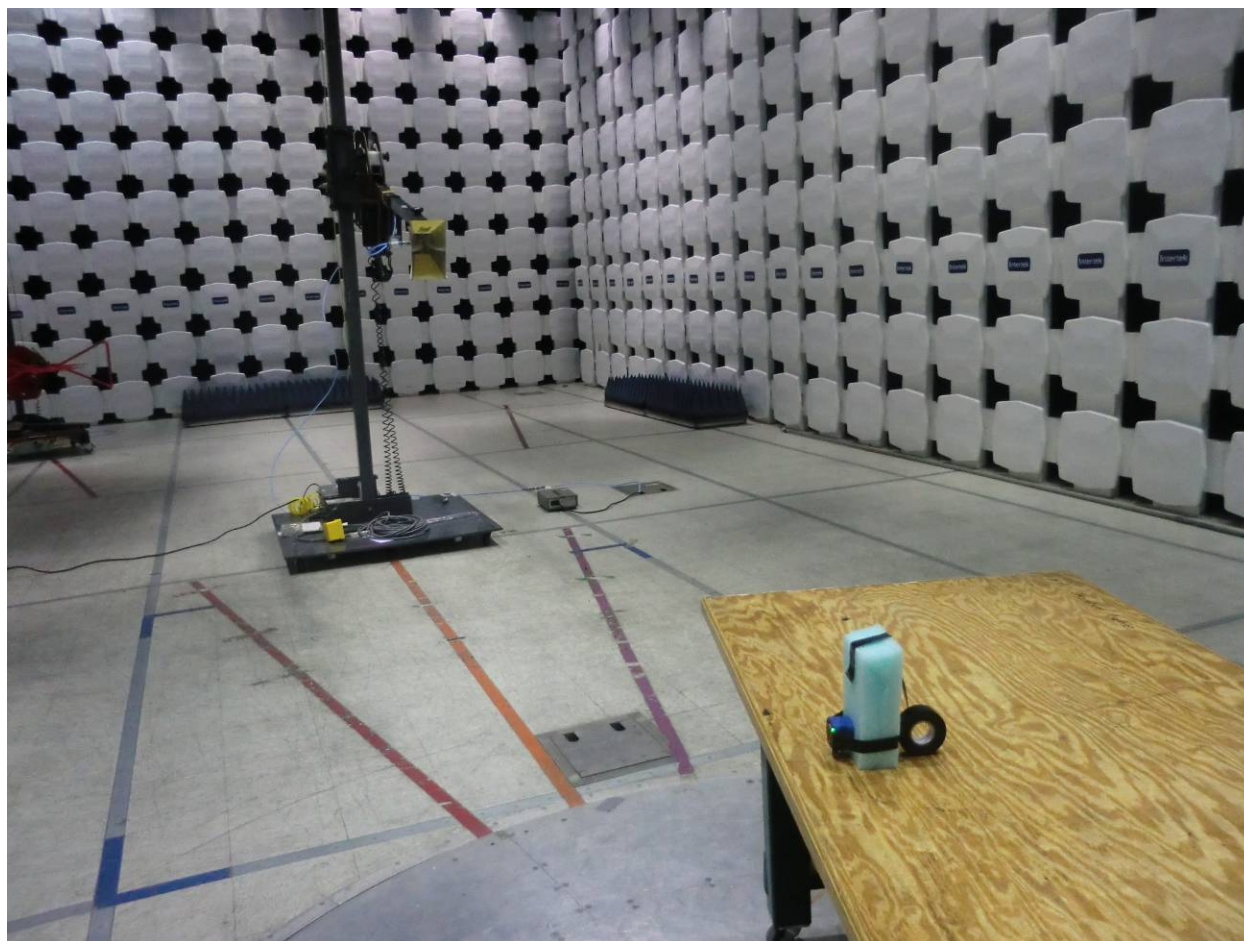
10.3 Results:

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:





10.5 Plots/Data:

Spurious Emissions 30-1000MHz

Cut Guide POD

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-02 (Cut Guide POD)

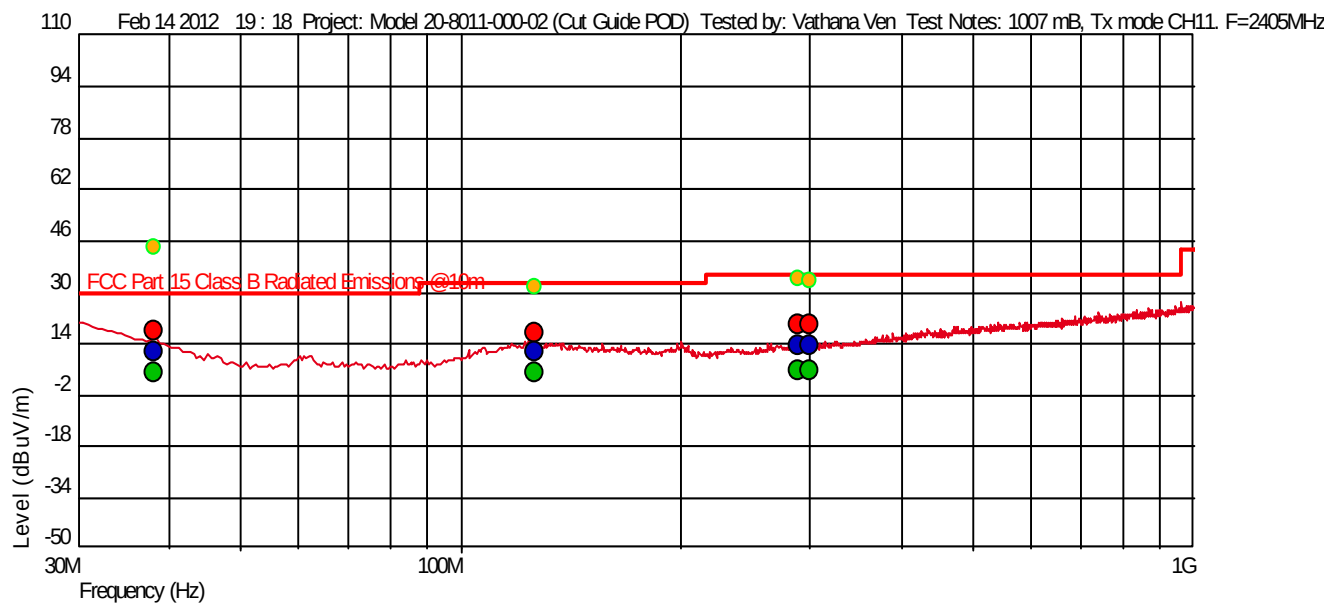
1007 mB, Tx mode CH11. F=2405MHz

19 deg C

11%

Vathana Ven

Feb 14 2012 19 : 18



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)
38.059919976 M	11.32	15.352	-26.085	29.54	-18.22		281	3.33	QP	120 k
126.209775116 M	11.56	13.821	-24.968	33.04	-21.48		122	1.96	QP	120 k
287.938053878 M	13.32	13.459	-24.132	35.54	-22.22		121	1.54	QP	120 k
299.975885094 M	13.20	13.700	-24.115	35.54	-22.34		28	1.66	QP	120 k

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-02 (Cut Guide POD)

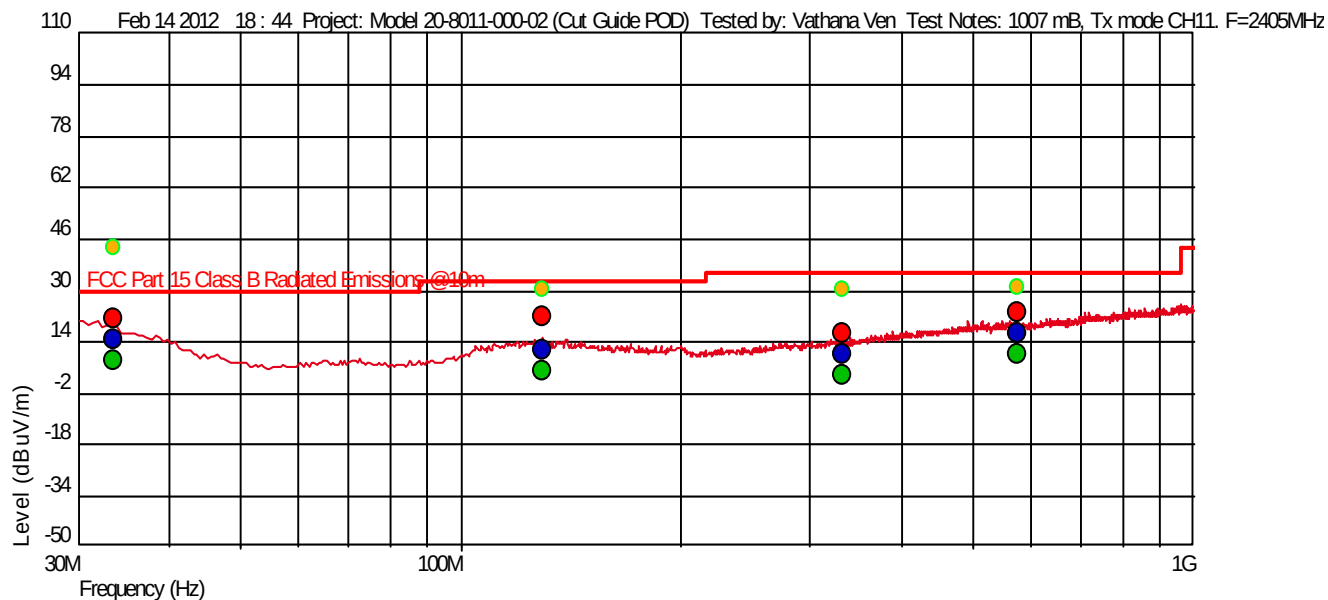
1007 mB, Tx mode CH11. F=2405MHz

19 deg C

11%

Vathana Ven

Feb 14 2012 18 : 44



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)

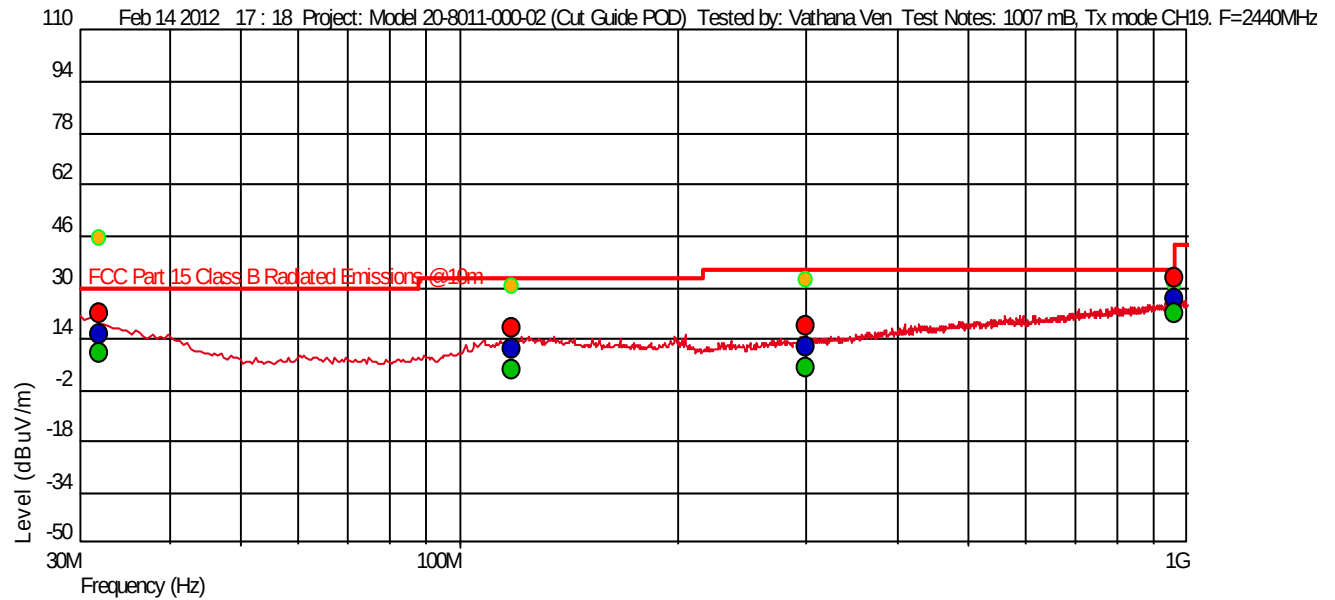
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
33.587642058 M	14.47	18.747	-26.098	29.54	-15.07	--	34	1.92	QP	120 k
129.375907353 M	11.64	13.962	-24.928	33.04	-21.40	--	304	1.67	QP	120 k
332.384079321 M	10.37	14.100	-24.016	35.54	-25.17	--	12	3.23	QP	120 k
573.884235251 M	16.45	18.778	-24.024	35.54	-19.09	--	172	1.29	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-02 (Cut Guide POD)
 Test Notes: 1007 mB, Tx mode CH18. F=2440MHz
 Temperature: 19 deg C
 Humidity: 11%
 Tested by: Vathana Ven
 Test Started: Feb 14 2012 17 : 18



- 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)

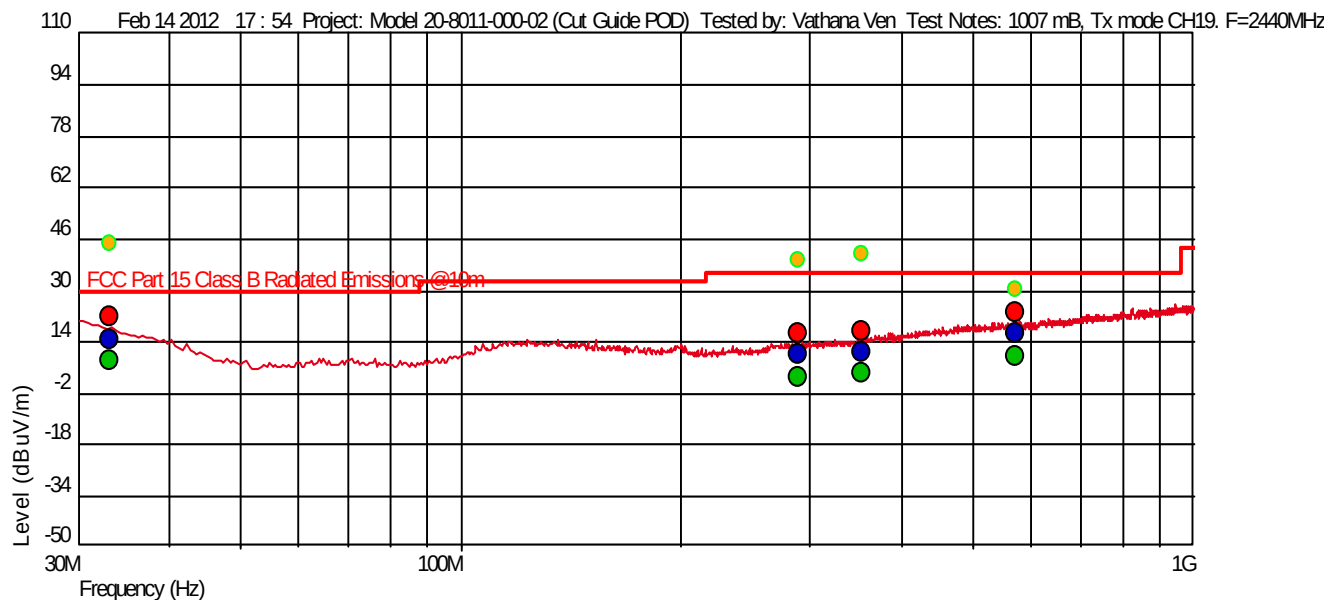
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
31.877866766 M	15.25	19.298	-26.103	29.54	-14.29		42	3.59	QP	120 k
117.884413373 M	11.11	13.588	-25.080	33.04	-21.93		172	2.62	QP	120 k
299.950857319 M	11.52	13.699	-24.115	35.54	-24.02		359	2.40	QP	120 k
960.012781134 M	26.73	23.400	-22.396	43.54	-16.81		121	1.65	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-02 (Cut Guide POD)
 Test Notes: 1007 mB, Tx mode CH18. F=2440MHz
 Temperature: 19 deg C
 Humidity: 11%
 Tested by: Vathana Ven
 Test Started: Feb 14 2012 17 : 54



- 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)

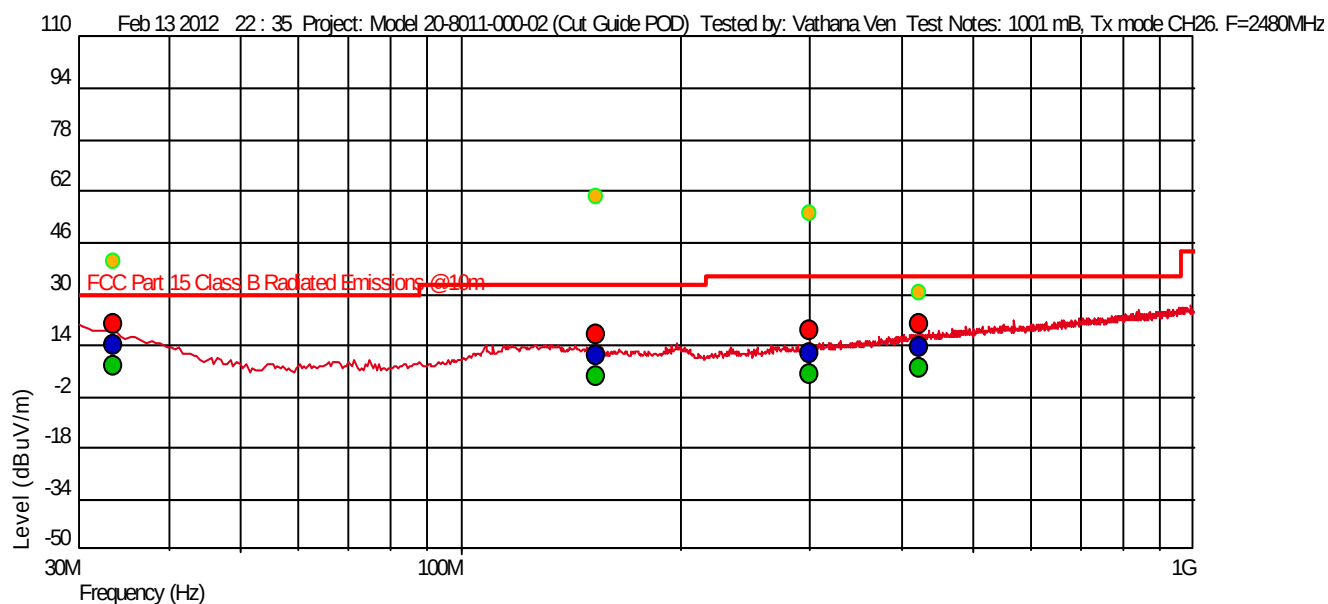
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
33.091226846 M	14.88	19.045	-26.099	29.54	-14.66	--	312	3.34	QP	120 k
288.489646064 M	9.86	13.430	-24.131	35.54	-25.68	--	207	3.40	QP	120 k
352.092941419 M	11.04	14.584	-23.963	35.54	-24.50	--	220	1.59	QP	120 k
571.263215144 M	16.40	18.725	-24.022	35.54	-19.14	--	126	3.49	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-02 (Cut Guide POD)
 Test Notes: 1001 mB, Tx mode CH26, F=2480MHz
 Temperature: 19 deg C
 Humidity: 11%
 Tested by: Vathana Ven
 Test Started: Feb 13 2012 22 : 35



- 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)

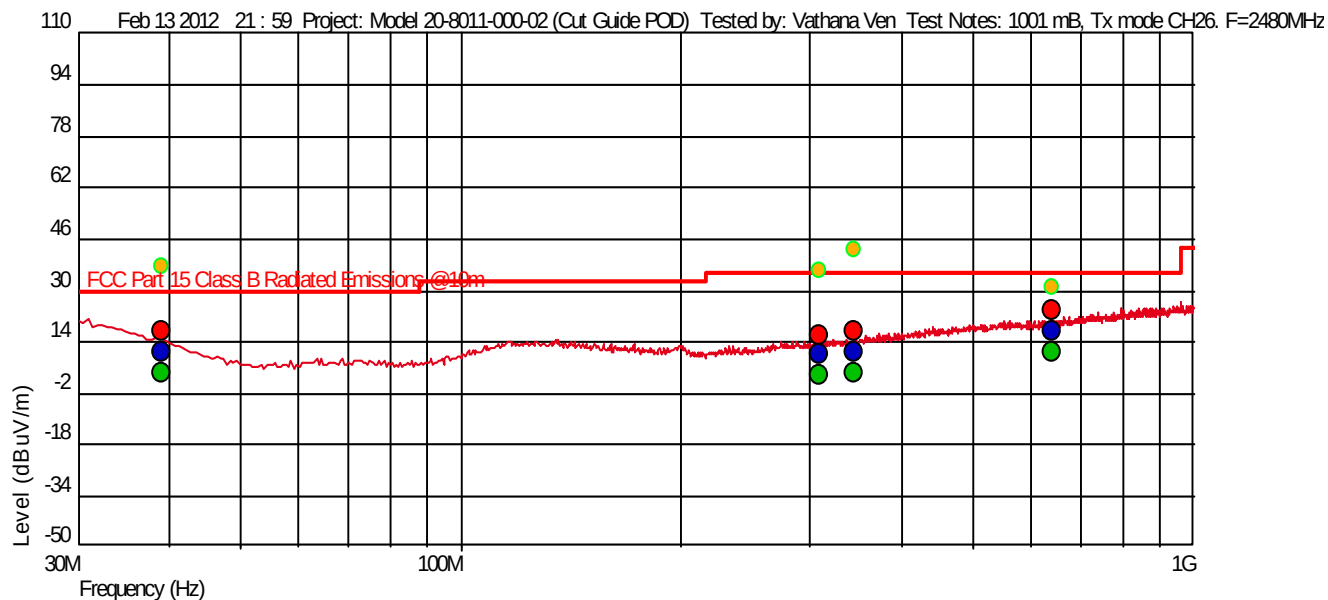
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
33.592407108 M	14.01	18.285	-26.098	29.54	-15.53		55	3.11	QP	120 k
152.58465811 M	10.49	12.442	-24.664	33.04	-22.55		311	1.59	QP	120 k
299.879826387 M	11.63	13.698	-24.115	35.54	-23.91		250	1.90	QP	120 k
422.982431535 M	13.35	16.460	-23.930	35.54	-22.19		346	2.54	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-02 (Cut Guide POD)
 Test Notes: 1001 mB, Tx mode CH26. F=2480MHz
 Temperature: 19 deg C
 Humidity: 11%
 Tested by: Vathana Ven
 Test Started: Feb 13 2012 21 : 59



- 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)
38.909418942 M	10.96	14.882	-26.083	29.54	-18.58	--	157	2.65	QP	120 k
308.698842022 M	10.04	13.848	-24.088	35.54	-25.50	--	186	1.19	QP	120 k
343.964595928 M	10.83	14.259	-23.983	35.54	-24.71	--	125	1.19	QP	120 k
641.532665389 M	17.26	19.700	-23.905	35.54	-18.28	--	155	2.25	QP	120 k

Spurious Emissions above 1GHz

Special Radiated Emissions

Company: Zimmer CAS
 Model #: 20-8011-000-02
 Serial #: Z204004
 Engineers: Vathana Ven
 Project #: G100625074
 Standard: FCC Part 15 Subpart C 15.247/RSS-210
 Receiver: R&S ESI (145128) 08-23-2012
 PreAmp: PRE145014 12-16-2012.txt
 Antenna & Cables: N Bands: N, LF, HF, SHF
 Antenna: HORN3 V3m 03-28-2012.txt HORN3 H3m 03-28-2012.txt
 Cable(s): 145-416 3mTrkB 09-04-2012.txt NONE
 Location: 10m Chamber Barometer: DAV003 Filter: NONE
 Date(s): 02/15/12
 Temp/Humidity/Pressure: 19c 11% 1007mB
 Limit Distance (m): 3
 Test Distance (m): 3
 PreAmp Used? (Y or N): Y Voltage/Frequency: 3.3VDC 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	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
Note: Spurious Emissions Reference														
PK	H	2405.000	59.69	28.73	5.93	0.00	0.00	94.35	-	-	100/300 kHz			
PK	H	2440.000	58.84	28.77	5.98	0.00	0.00	93.59	-	-	100/300 kHz			
PK	V	2480.000	57.37	28.78	6.03	0.00	0.00	92.18	-	-	100/300 kHz			
Cut Guide POD, Tx CH 11, F = 2405 MHz, Spurious emissions														
PK	H	4810.000	48.44	33.60	9.17	34.54	0.00	56.67	74.00	-17.33	1/3 MHz	RB		
AVG	H	4810.000	31.81	33.60	9.17	34.54	0.00	40.04	54.00	-13.96	1/3 MHz	RB		
PK	V	7215.000	28.33	36.28	10.85	35.66	9.54	30.27	74.35	-44.08	100/300 kHz		Noise Floor	1 meter
PK	V	9620.000	28.67	39.28	13.16	35.85	9.54	35.72	74.35	-38.63	100/300 kHz		Noise Floor	1 meter
PK	V	12025.000	37.18	39.52	14.97	35.38	9.54	46.75	74.00	-27.25	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	12025.000	24.65	39.52	14.97	35.38	9.54	34.22	54.00	-19.78	1/3 MHz	RB	Noise Floor	1 meter
PK	V	14430.000	25.20	42.68	15.16	34.64	9.54	38.86	74.35	-35.49	100/300 kHz		Noise Floor	1 meter
PK	V	16835.000	24.21	40.16	25.50	37.74	9.54	42.59	74.35	-31.76	100/300 kHz		Noise Floor	1 meter
Cut Guide POD, Tx CH 18, F = 2440 MHz, Spurious emissions														
PK	V	4889.000	49.03	33.73	9.29	34.39	0.00	57.67	74.00	-16.33	1/3 MHz	RB		
AVG	V	4889.000	32.40	33.73	9.29	34.39	0.00	41.04	54.00	-12.96	1/3 MHz	RB	Noise Floor	1 meter
PK	V	7320.000	38.16	36.78	10.97	35.73	9.54	40.64	74.00	-33.36	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	7320.000	26.37	36.78	10.97	35.73	9.54	28.85	54.00	-25.15	1/3 MHz	RB	Noise Floor	1 meter
PK	V	9760.000	27.44	39.59	13.35	35.35	9.54	35.49	73.59	-38.10	100/300 kHz		Noise Floor	1 meter
PK	V	12200.000	35.90	39.31	14.88	35.45	9.54	45.11	74.00	-28.89	1/3 MHz		Noise Floor	1 meter
AVG	V	12200.000	24.50	39.31	14.88	35.45	9.54	33.71	54.00	-20.29	1/3 MHz		Noise Floor	1 meter
PK	V	14640.000	25.73	43.62	15.25	34.87	9.54	40.19	73.59	-33.40	100/300 kHz		Noise Floor	1 meter
PK	V	17080.000	23.97	41.70	18.66	37.60	9.54	37.19	73.59	-36.40	100/300 kHz		Noise Floor	1 meter
Cut Guide POD, Tx CH 26, F = 2480 MHz, Spurious emissions														
PK	V	4960.000	51.52	33.92	9.41	34.25	0.00	60.60	74.00	-13.40	1/3 MHz	RB		
AVG	V	4960.000	34.89	33.92	9.41	34.25	0.00	43.97	54.00	-10.03	1/3 MHz	RB		
PK	V	7440.000	42.69	36.85	11.10	35.81	9.54	45.29	74.00	-28.71	1/3 MHz	RB	Noise Floor	1 meter
AVG	V	7440.000	30.00	36.85	11.10	35.81	9.54	32.60	54.00	-21.40	1/3 MHz	RB	Noise Floor	1 meter
PK	V	9920.000	30.45	39.94	13.57	34.78	9.54	39.64	72.18	-32.54	100/300 kHz		Noise Floor	1 meter
PK	V	12400.000	41.20	39.15	14.79	35.52	9.54	50.08	74.00	-23.92	1/3 MHz		Noise Floor	1 meter
AVG	V	12400.000	29.90	39.15	14.79	35.52	9.54	38.78	54.00	-15.22	1/3 MHz		Noise Floor	1 meter
PK	V	14880.000	23.82	43.54	15.75	35.32	9.54	38.25	72.18	-33.93	100/300 kHz		Noise Floor	1 meter
PK	V	17360.000	26.30	44.04	23.22	36.91	9.54	47.11	54.00	-6.89	100/300 kHz		Noise Floor	1 meter

Average factor of 16.63 dB was applied to Peak readings to get Average readings

Spurious Emissions 30-1000MHz

Reference POD

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-01 (POD Reference)

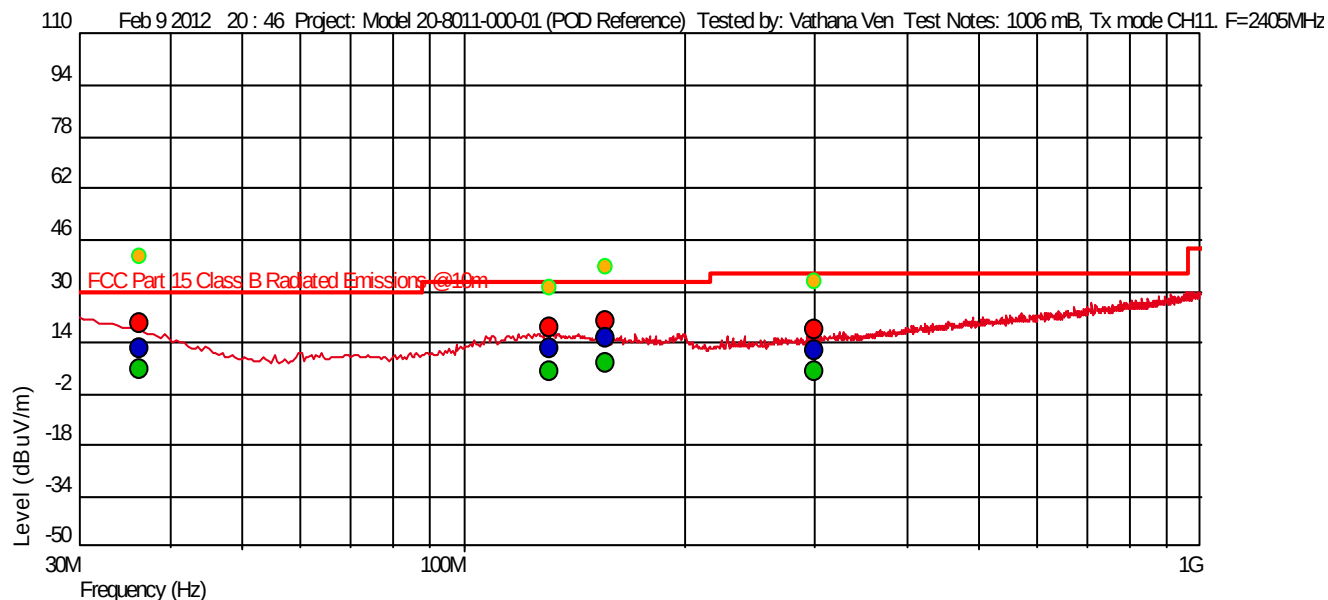
1006 mB, Tx mode CH11. F=2405MHz

20 deg C

12%

Vathana Ven

Feb 9 2012 20 : 46



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)

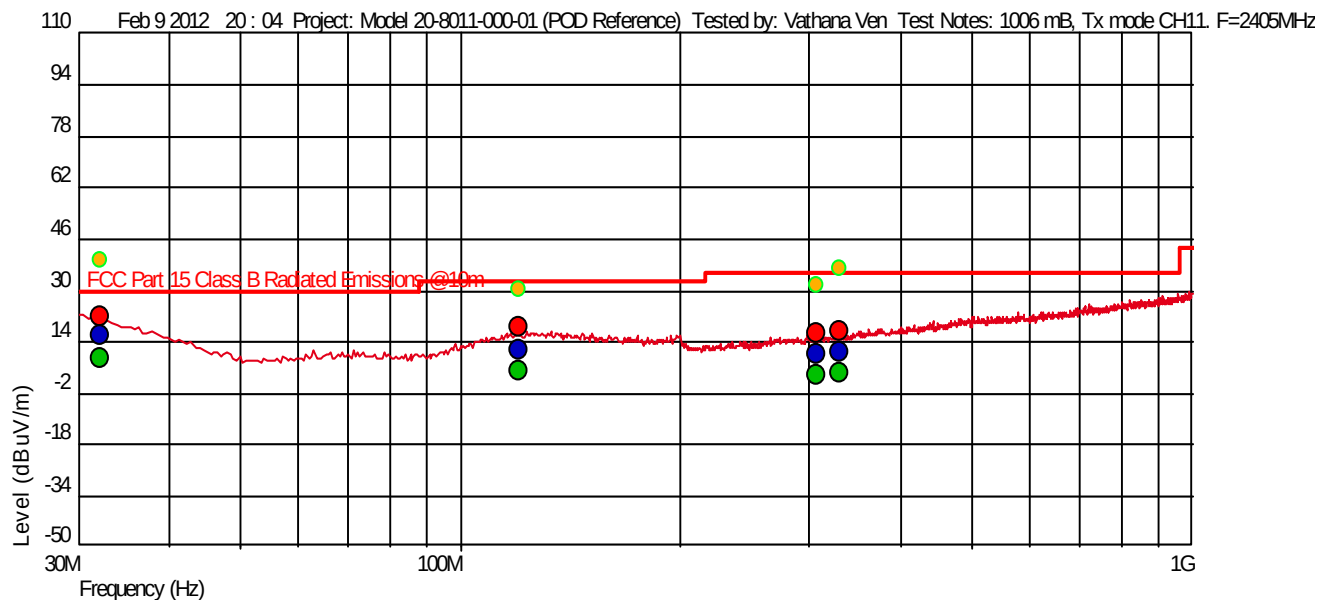
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
36.186105537 M	12.36	16.633	-26.090	29.54	-17.18		337	3.39	QP	120 k
131.115876351 M	11.79	13.988	-24.906	33.04	-21.25		312	2.46	QP	120 k
155.928857778 M	15.18	12.400	-24.636	33.04	-17.86		151	2.43	QP	120 k
299.931975064 M	11.75	13.699	-24.115	35.54	-23.79		40	2.16	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-01 (POD Reference)
 Test Notes: 1006 mB, Tx mode CH11. F=2405MHz
 Temperature: 20 deg C
 Humidity: 12%
 Tested by: Vathana Ven
 Test Started: Feb 9 2012 20 : 04



- 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)
32.063794104 M	15.72	19.662	-26.102	29.54	-13.82	--	332	2.56	QP	120 k
120.137675349 M	11.37	13.814	-25.049	33.04	-21.67	--	23	3.31	QP	120 k
307.081652192 M	9.97	13.783	-24.093	35.54	-25.57	--	145	2.74	QP	120 k
329.762057521 M	10.50	14.105	-24.024	35.54	-25.04	--	10	1.54	QP	120 k

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-01 (POD Reference)

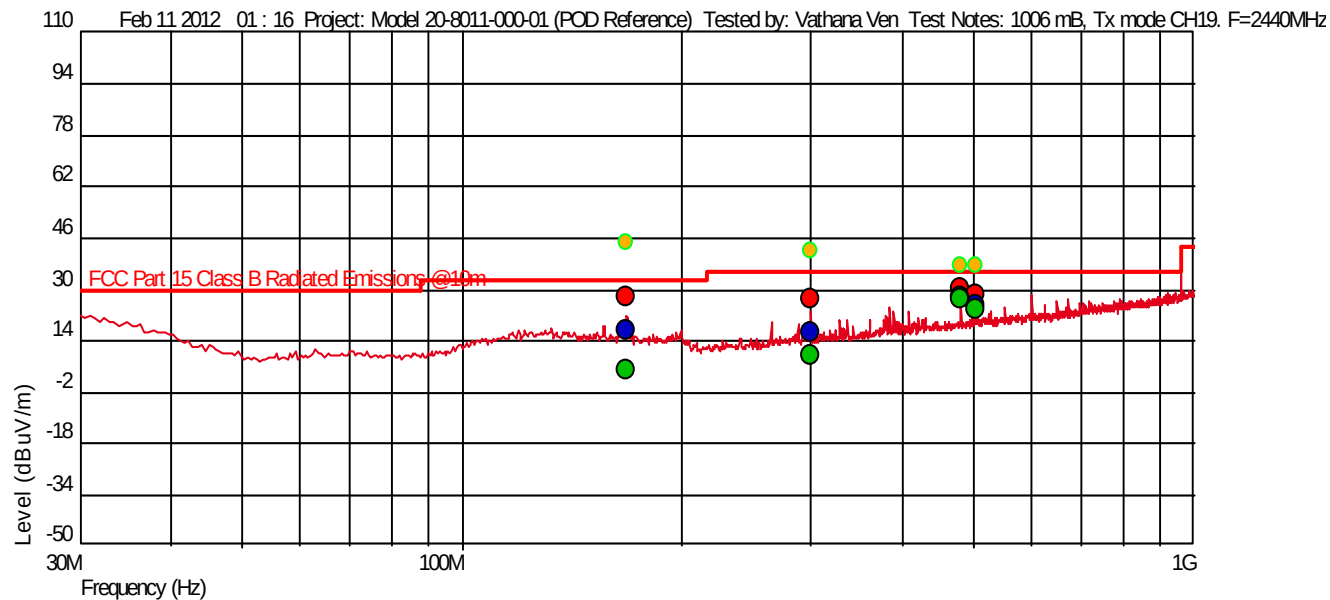
1006 mB, Tx mode CH19. F=2440MHz

20 deg C

12%

Vathana Ven

Feb 11 2012 01 : 16



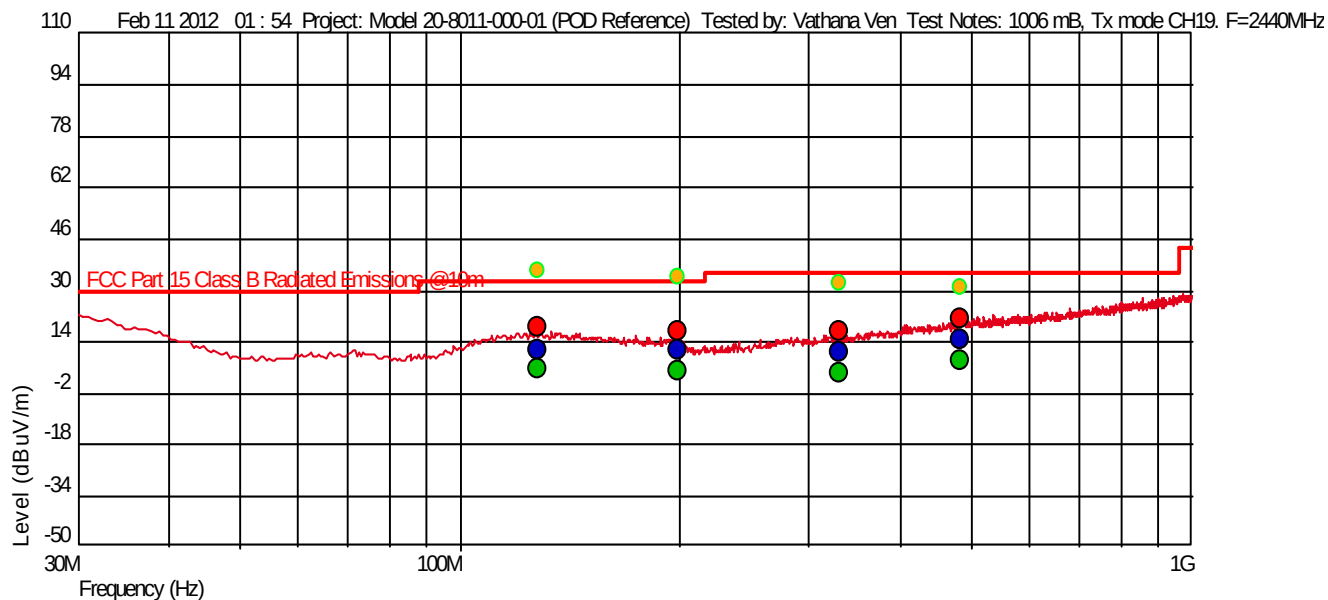
- Measured Peak Value
- Measured Quasi Peak Value
- Measured Average Value
- Maximum Value of Mast and Turntable
- Level (dBuV/m) = AF + CL + PA + Raw
- AF = Antenna Factor
- CL = Cable Losses
- PA = Pre-Amplifier
- Raw = Raw Instrument Reading (Not listed on Spot Tables)

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)
167.990380762 M	17.61	12.001	-24.541	33.04	-15.43		145	1.30	QP	120 k
299.973836675 M	16.82	13.699	-24.115	35.54	-18.72		27	1.70	QP	120 k
479.992696607 M	27.84	17.600	-24.018	35.54	-7.70		153	1.17	QP	120 k
504.550679188 M	25.34	17.791	-24.047	35.54	-10.20		150	1.19	QP	120 k

Test Information

Test Details	User Input
Project:	Model 20-8011-000-01 (POD Reference)
Test Notes:	1006 mB, Tx mode CH19. F=2440MHz
Temperature:	20 deg C
Humidity:	12%
Tested by:	Vathana Ven
Test Started:	Feb 11 2012 01 : 54



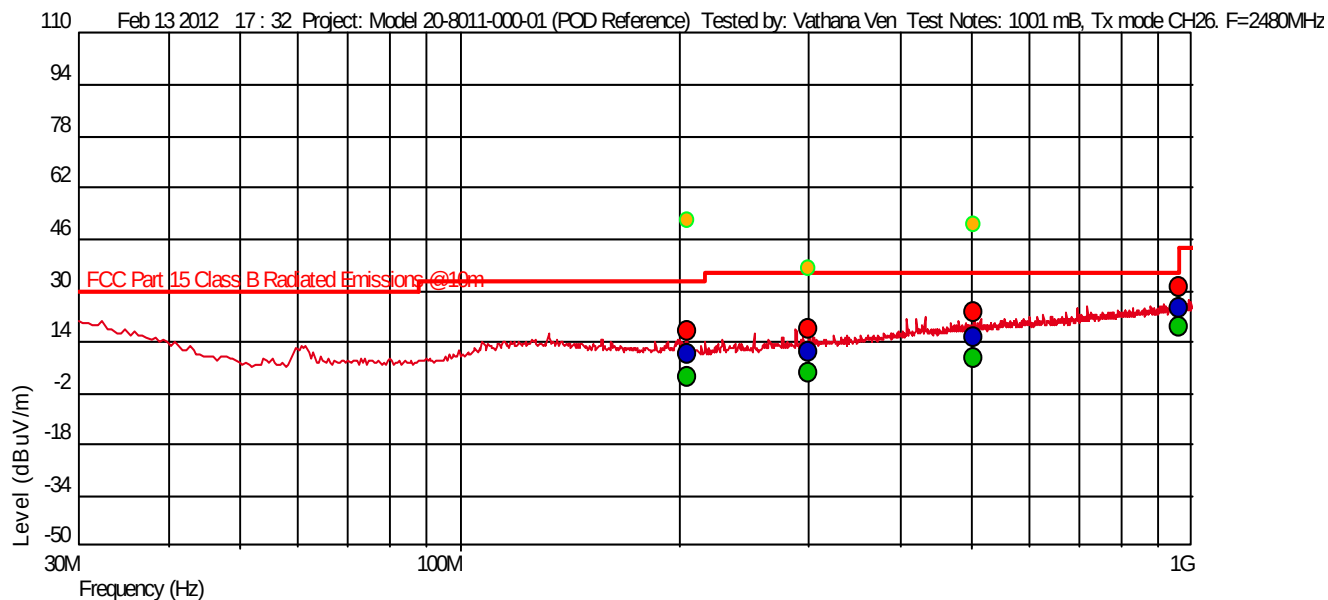
- Measured Peak Value
 - Measured Quasi Peak Value
 - Measured Average Value
 - Maximum Value of Mast and Turntable
- Level (dBuV/m) = AF + CL + PA + Raw
 AF = Antenna Factor
 CL = Cable Losses
 PA = Pre-Amplifier
 Raw = Raw Instrument Reading (Not listed on Spot Tables)

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)
127.541126549 M	11.71	13.946	-24.951	33.04	-21.33	--	61	3.59	QP	120 k
198.242952603 M	11.22	12.524	-24.331	33.04	-21.82	--	101	3.31	QP	120 k
330.234847481 M	10.50	14.100	-24.022	35.54	-25.04	--	73	1.96	QP	120 k
483.613337978 M	15.03	17.845	-24.024	35.54	-20.51	--	266	3.26	QP	120 k

Test Information

Test Details	User Input
Project:	Model 20-8011-000-01 (POD Reference)
Test Notes:	1001 mB, Tx mode CH26. F=2480MHz
Temperature:	19 deg C
Humidity:	11%
Tested by:	Vathana Ven
Test Started:	Feb 13 2012 17 : 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)

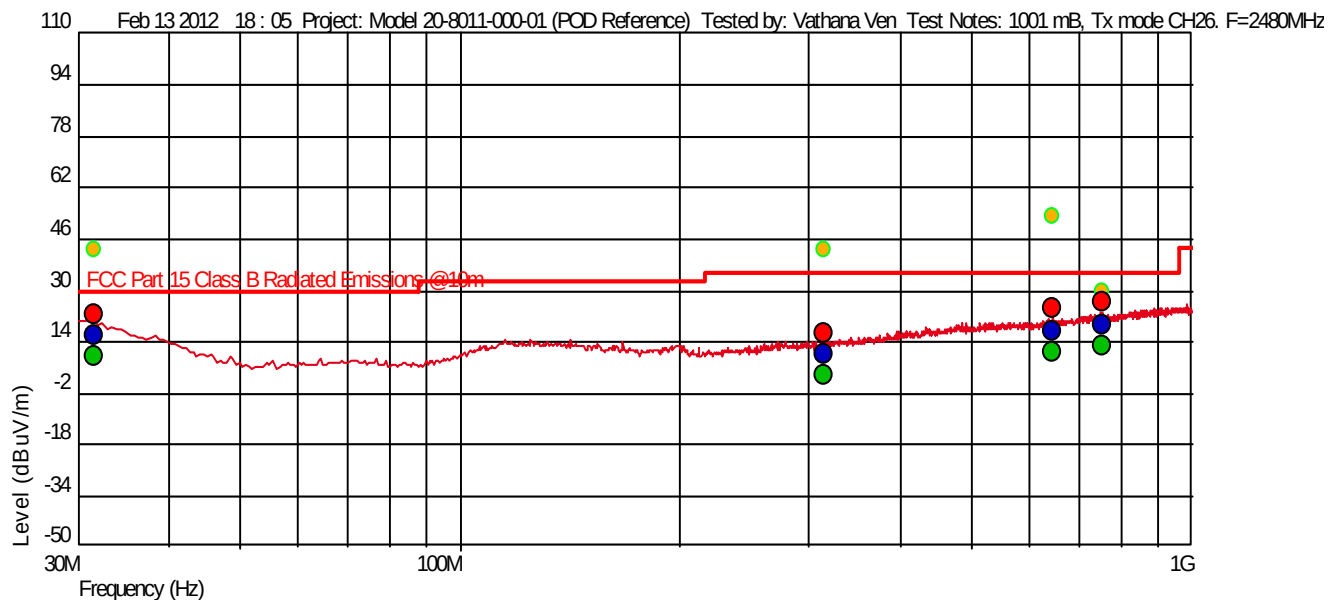
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
204.042440363 M	10.48	11.968	-24.308	33.04	-22.56		59	1.43	QP	120 k
299.859830719 M	10.92	13.697	-24.115	35.54	-24.62		254	1.70	QP	120 k
504.690069024 M	15.33	17.794	-24.047	35.54	-20.21		248	2.17	QP	120 k
959.990247178 M	24.71	23.400	-22.396	35.54	-10.83		337	2.71	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-01 (POD Reference)
 Test Notes: 1001 mB, Tx mode CH26. F=2480MHz
 Temperature: 19 deg C
 Humidity: 11%
 Tested by: Vathana Ven
 Test Started: Feb 13 2012 18 : 05



- 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)
31.674081607 M	15.88	19.928	-26.104	29.54	-13.66	--	245	3.32	QP	120 k
314.526920613 M	10.29	14.081	-24.069	35.54	-25.25	--	249	1.18	QP	120 k
645.838811112 M	17.27	19.700	-23.890	35.54	-18.27	--	316	1.42	QP	120 k
755.684123896 M	19.27	20.714	-23.379	35.54	-16.27	--	120	2.02	QP	120 k

Spurious Emissions above 1GHz
Special Radiated Emissions

Company: Zimmer CAS
Model #: 20-8011-000-01
Serial #: Z204001
Engineers: Vathana Ven
Project #: G100652281
Standard: FCC Part 15 Subpart C 15.247/RSS-210
Receiver: R&S ESI (145128) 08-23-2012
PreAmp: PRE145014 12-16-2012.txt
Antenna & Cables: N
Antenna: HORN3 V3m 03-28-2012.txt
Cable(s): 145-416 3mTrkB 09-04-2012.txt
Location: 10m Chamber
Barometer: DAV003
Filter: NONE
Date(s): 02/13/12
Temp/Humidity/Pressure: 19c 11% 1001mB
Limit Distance (m): 3
Test Distance (m): 3
PreAmp Used? (Y or N): Y
Voltage/Frequency: 3.3VDC
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	V	2405.000	58.90	28.68	5.93	0.00	0.00	93.51	-	-	100/300 kHz			
PK	H	2440.000	59.00	28.77	5.98	0.00	0.00	93.75	-	-	100/300 kHz			
PK	H	2480.000	58.70	28.82	6.03	0.00	0.00	93.56	-	-	100/300 kHz			
Reference POD, CH 11, F = 2405 MHz, Spurious emissions														
PK	H	4810.000	52.50	33.60	9.17	34.54	0.00	60.73	74.00	-13.27	1/3 MHz	RB	RB	
AVG	H	4810.000	35.87	33.60	9.17	34.54	0.00	44.10	54.00	-9.90	1/3 MHz	RB		
PK	V	7215.000	28.76	36.28	10.85	35.66	0.00	40.24	73.51	-33.27	100/300 kHz			
PK	V	9620.000	27.00	39.28	13.16	35.85	0.00	43.59	73.51	-29.92	100/300 kHz			
PK	V	12025.000	35.60	39.52	14.97	35.38	9.54	45.17	74.00	-28.83	1/3 MHz	RB		Noise Floor 1meter
AVG	V	12025.000	25.32	39.52	14.97	35.38	9.54	34.89	54.00	-19.11	1/3 MHz	RB		Noise Floor 1meter
PK	V	14430.000	26.84	42.68	15.16	34.64	9.54	40.50	73.51	-33.01	100/300 kHz			Noise Floor 1meter
PK	V	16835.000	23.70	40.16	25.50	37.74	9.54	42.08	73.51	-31.43	100/300 kHz			Noise Floor 1meter
Reference POD, CH 18, F = 2440 MHz, Spurious emissions														
PK	H	4880.000	51.00	33.79	9.29	34.39	0.00	59.69	74.00	-14.31	1/3 MHz	RB	RB	
AVG	H	4880.000	34.37	33.79	9.29	34.39	0.00	43.06	54.00	-10.94	1/3 MHz	RB		
PK	V	7320.000	38.95	36.78	10.97	35.73	9.54	41.43	74.00	-32.57	1/3 MHz	RB		Noise Floor 1meter
AVG	V	7320.000	27.00	36.78	10.97	35.73	9.54	29.48	54.00	-24.52	1/3 MHz	RB		Noise Floor 1meter
PK	V	9760.000	26.20	39.59	13.35	35.35	9.54	34.25	73.75	-39.50	100/300 kHz			Noise Floor 1meter
PK	V	12200.000	35.80	39.31	14.88	35.45	9.54	45.01	74.00	-28.99	1/3 MHz	RB		Noise Floor 1meter
AVG	V	12200.000	25.60	39.31	14.88	35.45	9.54	34.81	54.00	-19.19	1/3 MHz	RB		Noise Floor 1meter
PK	V	14640.000	23.72	43.62	15.25	34.87	9.54	38.18	73.75	-35.57	100/300 kHz			Noise Floor 1meter
PK	V	17080.000	21.40	41.70	18.66	37.60	9.54	34.62	73.75	-39.13	100/300 kHz			Noise Floor 1meter
Reference POD, Tx CH 26, F = 2480 MHz, Spurious emissions														
PK	V	4960.000	53.40	33.92	9.41	34.25	0.00	62.48	74.00	-11.52	1/3 MHz	RB		
AVG	V	4960.000	36.77	33.92	9.41	34.25	0.00	45.85	54.00	-8.15	1/3 MHz	RB		
PK	V	7440.000	38.58	36.85	11.10	35.81	9.54	41.18	74.00	-32.82	1/3 MHz	RB		Noise Floor 1 meter
AVG	V	7440.000	26.51	36.85	11.10	35.81	9.54	29.11	54.00	-24.89	1/3 MHz	RB		Noise Floor 1 meter
PK	V	9920.000	26.50	39.94	13.57	34.78	9.54	35.69	73.56	-37.87	100/300 kHz			Noise Floor 1 meter
PK	V	12400.000	37.42	39.15	14.79	35.52	9.54	46.30	74.00	-27.70	1/3 MHz			Noise Floor 1 meter
AVG	V	12400.000	25.16	39.15	14.79	35.52	9.54	34.04	54.00	-19.96	1/3 MHz			Noise Floor 1 meter
PK	V	14880.000	23.37	43.54	15.75	35.32	9.54	37.80	73.56	-35.76	100/300 kHz			Noise Floor 1 meter
PK	V	17360.000	26.30	44.04	23.22	36.91	9.54	47.11	73.56	-26.45	100/300 kHz			Noise Floor 1 meter

Average factor of 16.63 dB was applied to Peak readings to get Average readings

Test Personnel: Vathana Ven
Supervising/Reviewing Engineer: _____
(Where Applicable)
FCC Part 15 Subpart C
Product Standard: 15.247; IC RSS-210 Annex 8
Input Voltage: 3.3VDC
Pretest Verification w/ Ambient Signals or BB Source: Ambient

Test Date: 02/09/2012, 02/13-02/15/2012

Test Levels: See tables

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 dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- 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 dB μ V 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 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB/m}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = 32 \text{ dB}\mu\text{V/m}$$

To convert from dB μ V to μ V or mV the following was used:

$$UF = 10^{(NF / 20)} \text{ where } UF = \text{Net Reading in } \mu\text{V}$$
$$NF = \text{Net Reading in dB}\mu\text{V}$$

Example:

$$FS = RA + AF + CF - AG = 52.0 + 7.4 + 1.6 - 29.0 = 32.0$$

$$UF = 10^{(32 \text{ dB}\mu\text{V} / 20)} = 39.8 \mu\text{V/m}$$

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	ESL	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:

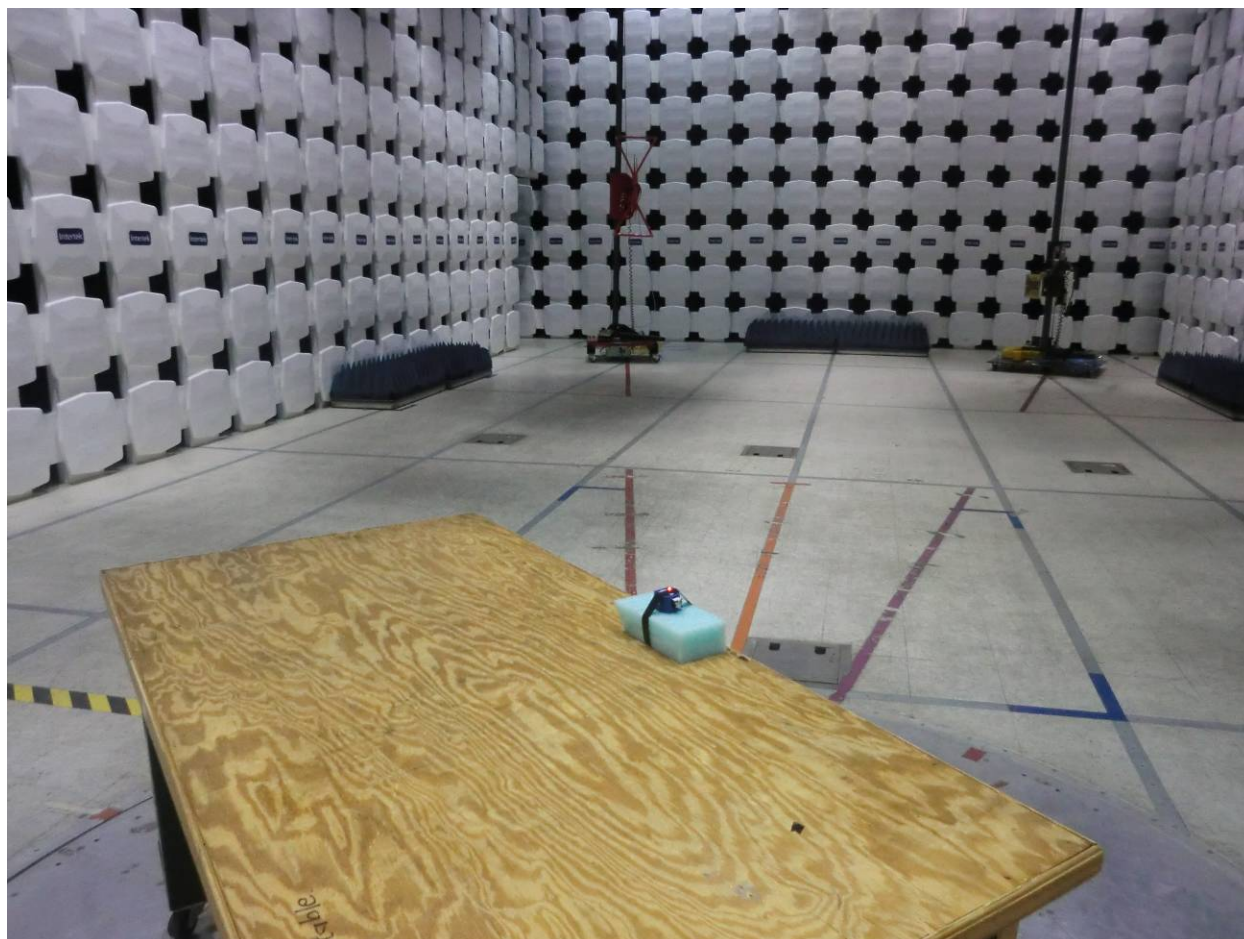
Name	Manufacturer	Version
C5	Teseq	Build 5.26.00.3

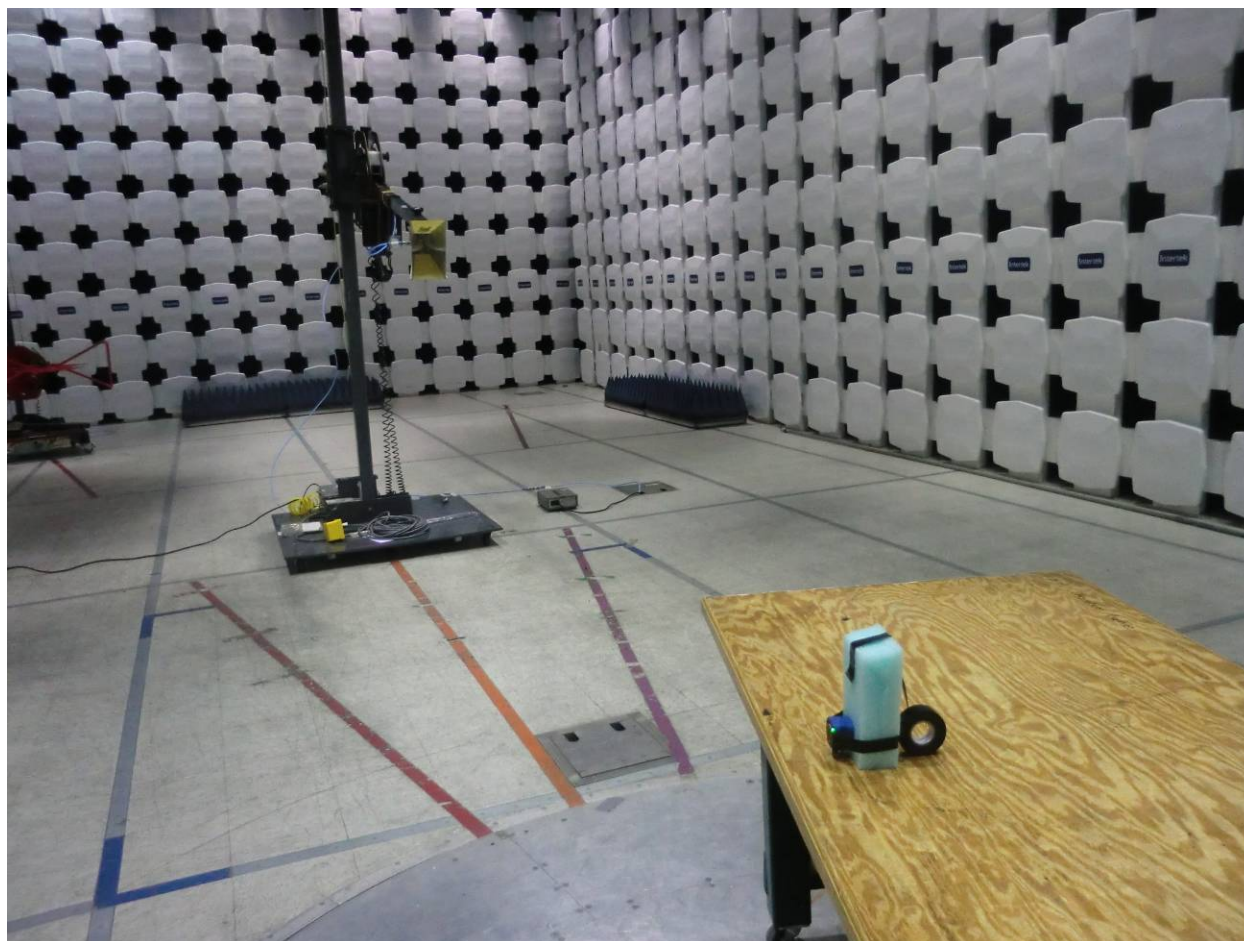
11.3 Results:

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:





11.5 Plots/Data:

Rx Spurious Emissions 30-1000MHz

Cut Guide POD

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-02

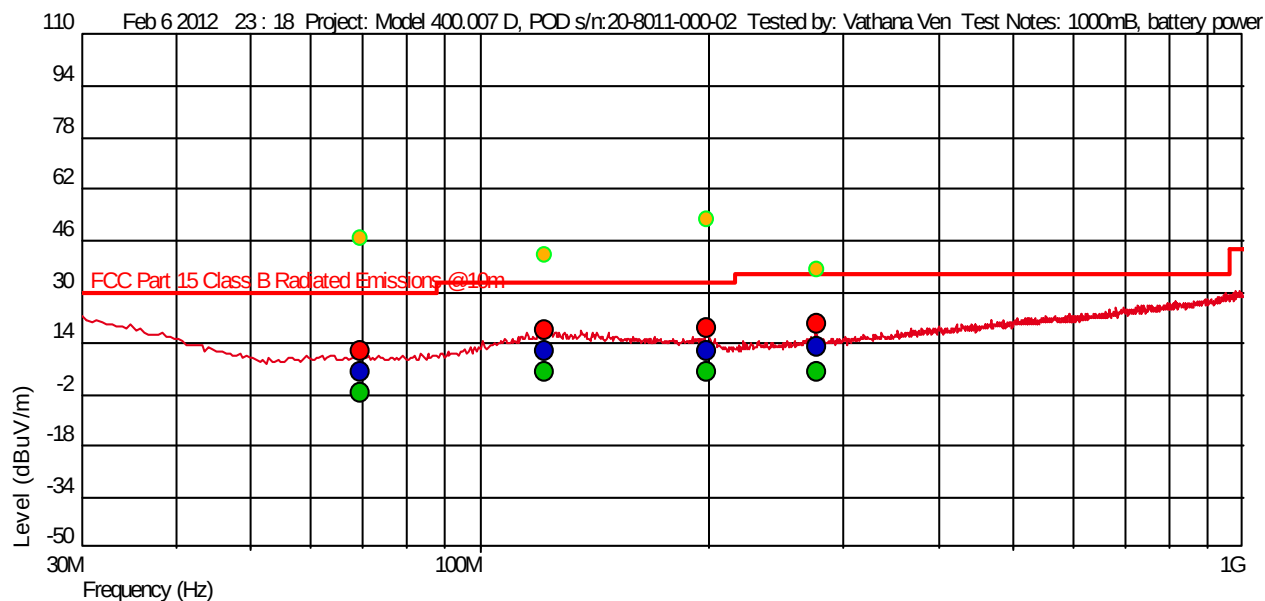
1000mB, battery power, Rx mode

20 deg C

15%

Vathana Ven

Feb 6 2012 23 : 18



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)

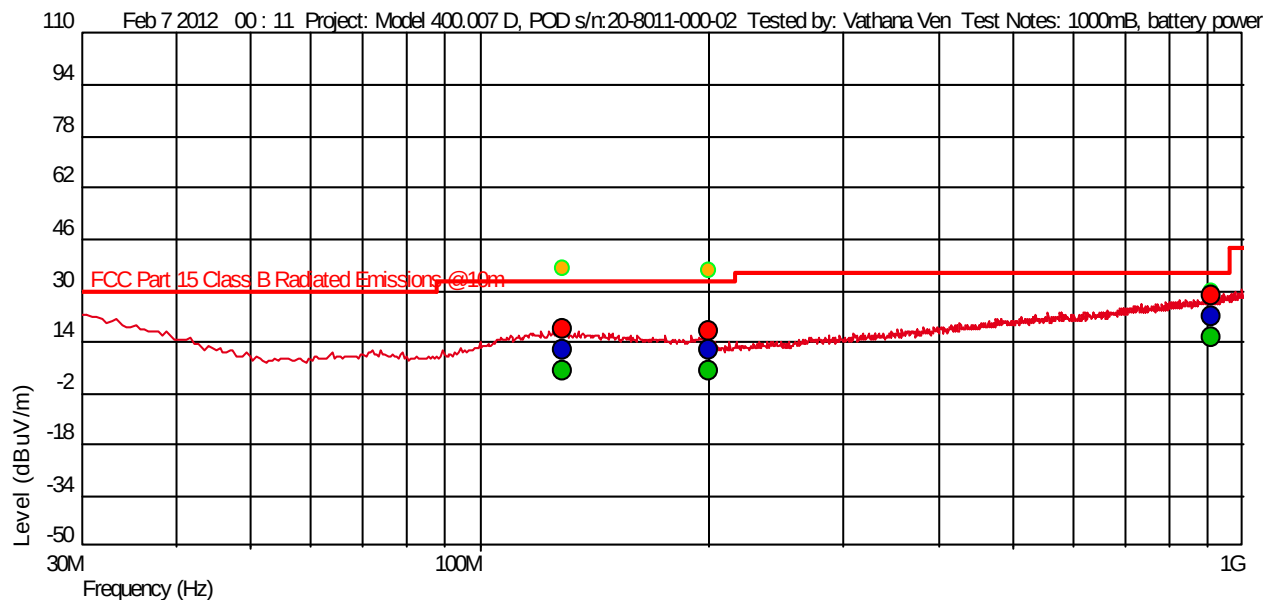
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
69.814317411 M	4.79	8.000	-	25.814	-24.75		204	2.03	QP	120 k
121.562569754 M	11.42	13.844	-	25.030	-21.62		59	3.22	QP	120 k
198.44021388 M	11.48	12.788	-	24.330	-21.56		251	1.81	QP	120 k
275.944978741 M	12.48	13.500	-	24.149	-23.06		42	1.18	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-02
 Test Notes: 1000mB, battery power, Rx mode
 Temperature: 20 deg C
 Humidity: 15%
 Tested by: Vathana Ven
 Test Started: Feb 7 2012 00 : 11



- 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)
128.13687382 M	11.68	13.914	-24.944	33.04	-21.36	--	112	3.85	QP	120 k
199.955399601 M	11.40	12.696	-24.320	33.04	-21.64	--	21	1.74	QP	120 k
911.641906082 M	22.02	22.367	-22.619	35.54	-13.52	--	228	1.55	QP	120 k

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-02

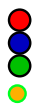
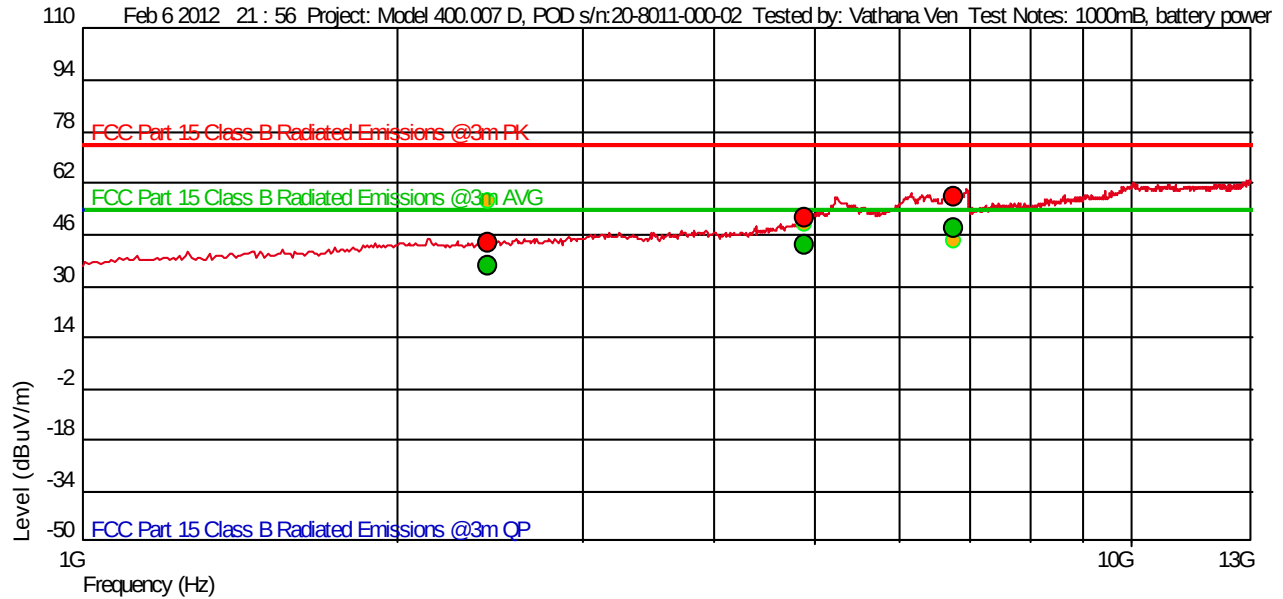
1000mB, battery power

20 deg C

15%

Vathana Ven

Feb 6 2012 21 : 56



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)
2.43366733 G	43.53	28.764	-28.226	74.00	-30.47		7	1.19	PEAK	1 M
4.8897613 G	51.21	33.789	-25.077	74.00	-22.79		359	1.63	PEAK	1 M
6.759885104 G	57.71	35.151	-24.504	74.00	-16.29	--	60	1.19	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)
2.43366733 G	35.96	28.764	-28.226	54.00	-18.04		7	1.19	AVERAGE	1 M
4.8897613 G	42.70	33.789	-25.077	54.00	-11.30		359	1.63	AVERAGE	1 M
6.759885104 G	47.75	35.151	-24.504	54.00	-6.25	--	60	1.19	AVERAGE	1 M

Reference POD

Test Information

Test Details

Project:

Test Notes:

Temperature:

Humidity:

Tested by:

Test Started:

User Input

Model 20-8011-000-01 (POD Reference)

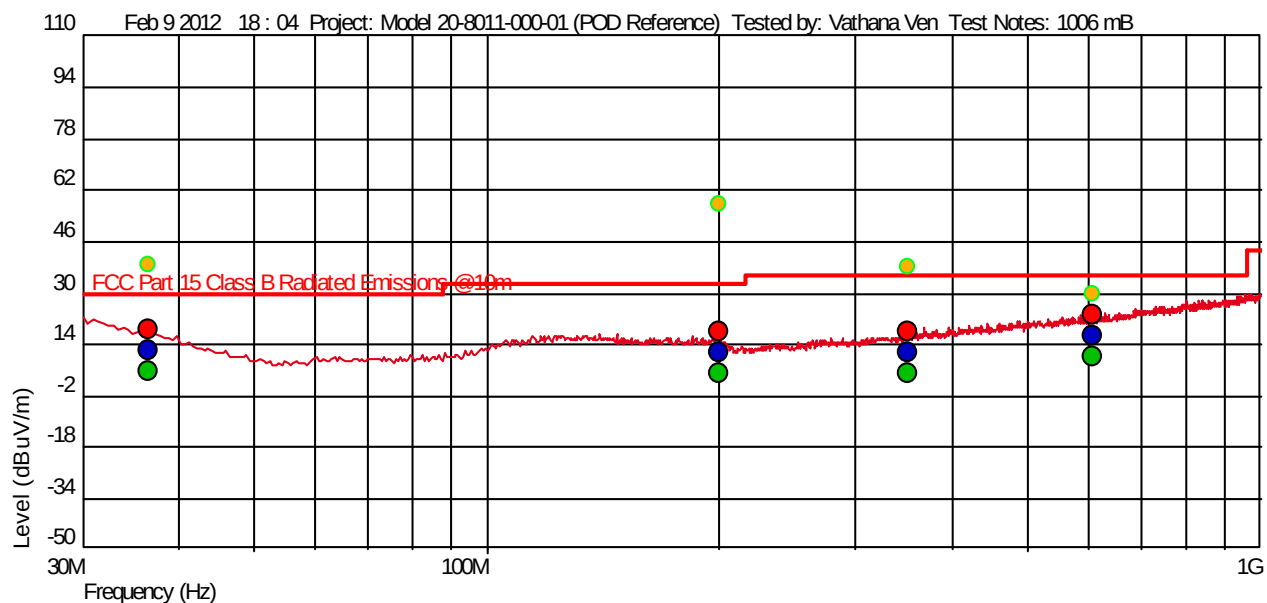
1006 mB, Rx mode

20 deg C

12%

Vathana Ven

Feb 9 2012 18 : 04



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)

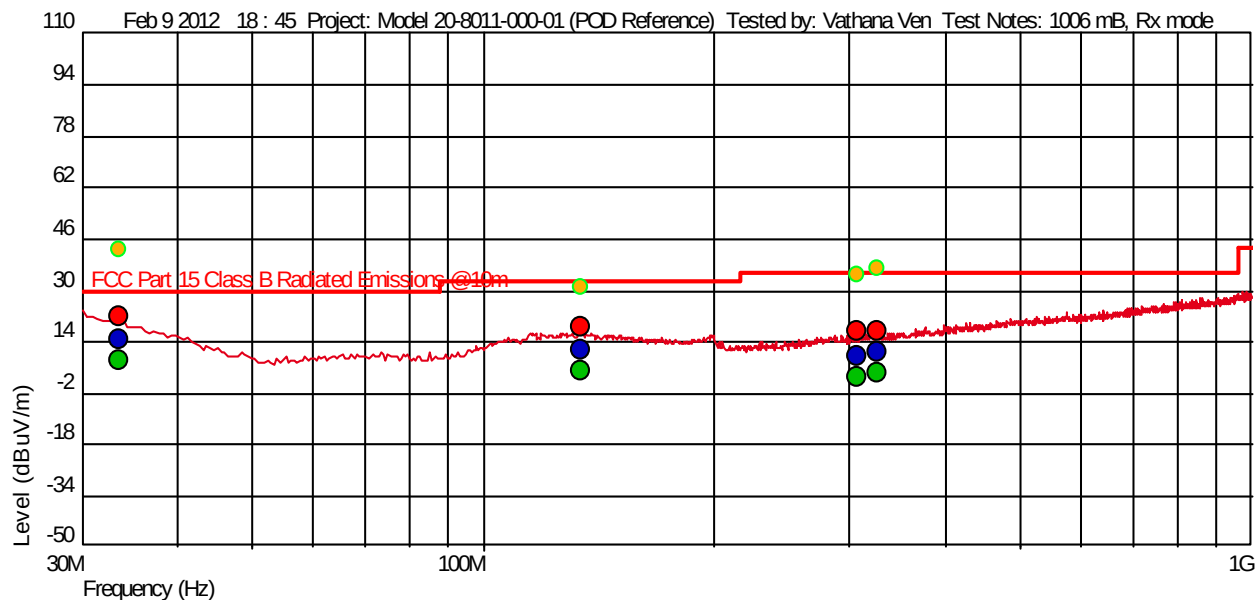
Measured: QP

Frequency (Hz)	Level (dBuV/m)	AF	PA+CL	Limit (dBuV/m)	Margin (dB)	Hor (--), Ver ()	Angle (Deg)	Mast Height (m)	Detector	RBW (Hz)
36.469004808 M	12.11	16.378	-26.089	29.54	-17.43		324	3.28	QP	120 k
199.813137527 M	11.76	13.063	-24.321	33.04	-21.28		299	1.65	QP	120 k
351.144756098 M	11.24	14.646	-23.965	35.54	-24.30		101	1.59	QP	120 k
607.845379593 M	16.85	19.057	-24.022	35.54	-18.69		232	2.45	QP	120 k

Test Information

Test Details

Project: Model 20-8011-000-01 (POD Reference)
 Test Notes: 1006 mB, Rx mode
 Temperature: 20 deg C
 Humidity: 12%
 Tested by: Vathana Ven
 Test Started: Feb 9 2012 18 : 45



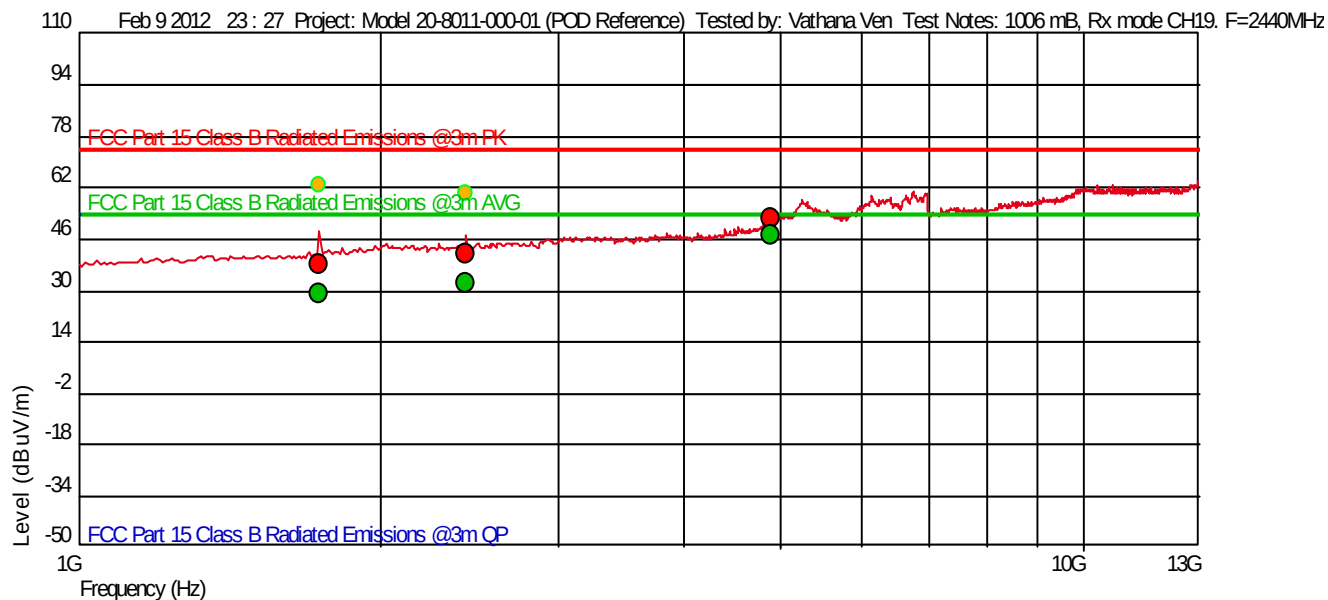
- Measured Peak Value
 - Measured Quasi Peak Value
 - Measured Average Value
 - Maximum Value of Mast and Turntable
- Level (dBuV/m) = AF + CL + PA + Raw
 AF = Antenna Factor
 CL = Cable Losses
 PA = Pre-Amplifier
 Raw = Raw Instrument Reading (Not listed on Spot Tables)

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)
33.604542337 M	14.58	18.737	-26.098	29.54	-14.96	--	266	2.71	QP	120 k
133.675862874 M	11.71	13.765	-24.874	33.04	-21.33	--	66	3.73	QP	120 k
305.845557884 M	9.78	13.734	-24.097	35.54	-25.76	--	278	1.20	QP	120 k
326.185860517 M	10.56	14.176	-24.034	35.54	-24.98	--	279	1.19	QP	120 k

Test Information

Test Details
Project: Model 20-8011-000-01 (POD Reference)
Test Notes: 1006 mB, Rx mode CH19. F=2440MHz
Temperature: 20 deg C
Humidity: 12%
Tested by: Vathana Ven
Test Started: Feb 9 2012 23 : 27



- 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)
1.731068359 G	38.43	26.474	-28.590	74.00	-35.57		246	1.57	PEAK	1 M
2.432178134 G	41.21	28.762	-28.227	74.00	-32.79		41	2.30	PEAK	1 M
4.889914496 G	52.69	33.790	-25.076	74.00	-21.31	--	54	1.37	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)
1.731068359 G	28.71	26.474	-28.590	54.00	-25.29		246	1.57	AVERAGE	1 M
2.432178134 G	32.47	28.762	-28.227	54.00	-21.53		41	2.30	AVERAGE	1 M
4.889914496 G	46.95	33.790	-25.076	54.00	-7.05	--	54	1.37	AVERAGE	1 M

Test Personnel: Vathana Ven *VSV*
Supervising/Reviewing
Engineer:
(Where Applicable)
FCC Part 15 Subpart B; IC
RSS-210, IC RSS-Gen, IC
Product Standard: ICES-003
Input Voltage: 3.3VDC
Pretest Verification w/
Ambient Signals or
BB Source: Ambient

Test Date: 02/06, 02/07, 02/09/2012

Test Levels: Class B

Ambient Temperature: See data tables

Relative Humidity: See data tables

Atmospheric Pressure: See data tables

Deviations, Additions, or Exclusions: None

12 Revision History

Revision Level	Date	Report Number	Notes
0	02/29/2012	100652281BOX-001	Original Issue