TEST REPORT

For

Cooper Industries (Canada) Inc.

Bldg. 74 - 1833 Coast Meridian Road
Port Coquitlam, British Columbia
V3C 6G5, Canada

Date:	January 18, 2013
Report No.:	11106-1E
Revision No.:	0
Project No.:	11106
Equipment:	2400MHz Spread Spectrum Data Transceiver Module
Model No.:	XPD2400

ONE STOP GLOBAL CERTIFICATION SOLUTIONS

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TEST REPORT

FCC15.247:2010 / RSS-210, Issue 8

Report reference No. ..... :	11106-1E
Report Revision History:	✓ Rev. 0: Jan. 18, 2013
Tested by (printed name and signature) ..... :	Jeremy Lee
Approved by (printed name and signature) ..... :	Kavinder Dhillon, Eng.L
Date of issue ..... :	January 18, 2013

Note: By signing this report, both the Testing Technician and the Reviewer hereby declare to abide by the applicable LabTest policies:
1.) Statement of Independence # 3014 (LabTest Employees),
2.) Independence, Impartiality, and Integrity #1039, clause 11 (Engineering Service Subcontractors), or
3.) Independence, Impartiality, and Integrity #1019, clause 3.5 (Testing Subcontractors).

Testing Laboratory Name ..... :	LabTest Certification Inc.
Address ..... :	3133 – 20800 Westminster Hwy, Richmond, B.C. V6V 2W3 Canada
FCC Site Registration No. ..... :	373387
IC Site Registration No. ..... :	5970A-2
Test Location Name ..... :	LabTest Certification Inc.
Address ..... :	3133 – 20800 Westminster Hwy, Richmond, B.C. V6V 2W3 Canada
Applicant's Name ..... :	Cooper Industries (Canada) Inc.
Address ..... :	Bldg. 74 - 1833 Coast Meridian Road, Port Coquitlam, B.C. V3C 6G5, Canada
Manufacturer's Name ..... :	Same as Applicant
Address ..... :	Same as Applicant
Test specification	
Standards ..... :	FCC15.247:2010 / RSS-210, Issue 8, December 2010
Testing	
Date of receipt of test item ..... :	January 02, 2013
Date(s) of performance of test ..... :	January 02 to 10, 2013
Test item description ..... :	
Trademark ..... :	N/A
Model and/or type reference ..... :	XPD2400 FCC ID: IA9XPD2400
Serial numbers ..... :	2B204243
Electrical Rating(s) ..... :	3.3 to 6.5VDC, Typically 6VDC

Product descriptions	
Type of Emission ..... :	Frequency Hopping Spread Spectrum(FHSS)
No. of Hopping Channels ..... :	63 Channels
No. of Radio Channels ..... :	768 Channels
Modulation ..... :	2FSK
Data Rates ..... :	10.4 kbps
Dwell time per channel ..... :	< 192 ms
Max. time between two instances of use of the same channel ……:	≤ 3.46 sec
Operating Frequency Range:	2403 to 2480 MHz
Application for ..... :	2400MHz Frequency Hopped Spread Spectrum Data Transceiver Module
Equipment mobility ..... :	Yes, with Host system.
Nominal Voltages for ..... :	___ stand-alone equipment _X_ combined (or host) equipment __ test jig
Supply Voltage ..... :	_____ AC _____ Amps ____Hz ___6V___ DC ____Amps
If DC Power ..... :	____ Internal Power Supply _X__ Host system is supplied the DC power ____ Battery □ Nickel Cadmium □ Alkaline □ Nickel-Metal Hydride □ Lithium-Ion □ Lead Acid (Vehicle regulated) □ Other
Size of equipment(H X D X W, mm)..... :	
Mass of equipment (g)..... :	N/A
Operating Temperature Range ..... :	-40 °C to +70 °C
Test case verdicts	
Test case does not apply to the test object :	N/A
Test item does meet the requirement ..... :	Pass
Test item does not meet the requirement .. :	Fail

General remarks

"This report is not valid as a CB Test Report unless appended by an approved CB Testing Laboratory and appended to a CB Test Certificate.

The test result presented in this report relate only to the object(s) tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

☐ Throughout this report a comma is used as the decimal separator.

☒ Throughout this report a period is used as the decimal separator.

General product information:

The XPD2400 is a frequency hopping spread spectrum (FHSS) transceiver module designed to be compatible with FCC Part 15.247 (US) and RSS-210 (Canada) regulations for license free operation in the 2400MHz frequency band. The major elements include a frequency agile, RF transmitter and receiver, a chip radio for baseband processing and a microcontroller that commands the chip radio and manages the protocol. Packets of telemetry and control data are transmitted to, and received from, a mating XPD2400 transceiver module.

Frequencies

Module	Description	Frequences
VCTCXO(X2)	TCXO	16 MHz
Integrated Transceiver(U1)	IF	243MHz
Integrated Transceiver(U1)	CMOS Clock	8MHz
Integrated Transceiver(U1)	SPI Clock for data interface	10.4kHz

List of ancillary and/or support equipment provided by the applicant

Model No.	Description	Manufacturer	Approvals/Standards
Host Board	Supply DC power	Cooper	N/A
Debug Board	Set-up the device connected to PC	Cooper	N/A
NMO5E2400B	**Whip Antenna with NMOHF Mount**	Larsen Antennas	N/A

Description of Interface Cables for Testing

Description	Cable Type	Cable length	Ferrite
RS-232, Debug boadr to PC	Unshielded data cable	6 ft	N/A
DC Power, Host board to Power supply	Unshielded twisted power cable	4 ft	N/A

Antenna, Output connector to Antenna	RG 58/U UD TERMINATED WITH SMA	6 ft	N/A

ARRANGEMENT OF INTERFACE CABLES: All interface cables were positioned for worst-case maximum emissions within the manner assumed to be a typical operation condition (please reference photographs).

Software and Firmware

Description	Version
Hyper Terminal	5.1

Worst-case configuration and mode of operation during testing

The worst case was described at each test description.

Modifications Required for Compliance

None

Test Equipment Verified for function

Model #	Description	Checked Function	Results
E7405	Spectrum Analyzer	Frequency and Amplitude	Connected 50MHz and -20dBm Cal_siganl and checked OK.
PA-103	Pre-Amplifier, 1 to 1,000MHz	Gain at 30 and 1,000Mhz	Gains are normal.
8449B	Pre-Amplifier, 1 to 26.5GHz	Gain at 1 to 4GHz	Gains were normal.
SAS-542	Anatenna, 30 to 300MHz	Checked structure	Normal – no damage
SAS-510-2	Anatenna, 300 to 1000MHz	Checked structure	Normal – no damage
SAS-571	Anatenna, 1 to 18GHz	Checked structure	Normal – no damage
SAS-572	Anatenna, 18 to 26.5GHz	Checked structure	Normal – no damage
SAC-26G-0.5	RF Cable, up to 26.5GHz	Insertion Loss at 1 to 4GHz	Insertion Losses are normal
11150F	RF Cable, SMA(m) to SMA(m)	Insertion Loss at 30 MHz to 4GHz	Saved data
UNAT-10+	Attenuator	Insertion Loss at 30 MHz to 4GHz	Saved data

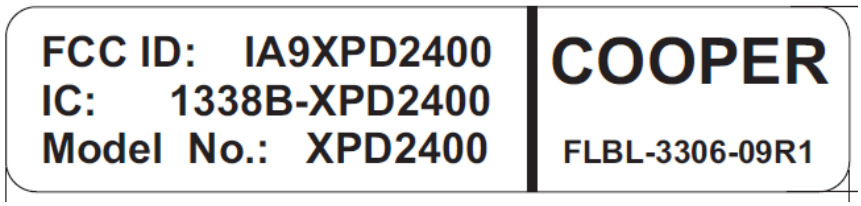
Measurement Uncertainty

Where relevant, the folllowing measurement uncertainty levels have been estimated for tests:

Parameter	Uncertainty(dB)
Radiated Emission, 30 to 300MHz	4.94
Radiated Emission, 1 to 26.5GHz	5.05

Uncertainty figures are valid to a confidence level of 95%.

Markings



You should refer to the clause of FCC Part 2 Section 2.295 & 2.296 and FCC Part 15 Section 15.19 for information to be contained on the label as well as information about the label. Any other statements or labelling requirements may appear on a separate label at the option of the applicant/grantee. The label has to be including FCC IC/IC ID, Product Number and Manufacturer Info.

According to FCC Section 2.925(a),
(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:
(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be a type size large enough to be legible without the aid of magnification.
Example: FCC ID XXX123. XXX-Grantee Code 123-Equipment Product Code”

According to FCC Section 15.19(a)(3),
This device shall bear the following statement in a conspicuous location on the device:
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: Some jurisdictions in Canada require Cautions and Warnings to also be in French. It is the responsibility of the Customer to provide bilingual marking, where applicable, in accordance with the requirements of the local regulatory authorities. It is the responsibility of the Customer to determine this requirement and have bilingual wording added to the "Markings".

Test Summary

When configured and operated as specified in this report, the product was found to comply with the requirements as indicated below.

Test Type	Regulation	Measurement Method	Result
AC Power Line Conducted Emission	15.207(a) RSS-Gen	ANSI C63.4:2009 & ANSI C63.10:2009	N/A[1)]
Radiated Emissions- Unintentional radiators	15.109, Class B & RSS-210	ANSI C63.4:2009 & ANSI C63.10:2009, Clause 6.5	PASS
Radiated Emissions- Intentional radiators, Spurs	15.247, 15.205, 15.209 & RSS-210	DA 00-705	PASS
Radiated Emissions – Intentional radiators, Harmonics	15.247, 15.205, 15.209 & RSS-210	DA 00-705	PASS
Antenna-port Conducted Emissions	15.247(d) & RSS-210	DA 00-705	PASS
Antenna Gain	15.247(b)(4) & RSS-210	N/A	PASS
Occupancy Bandwidth	15.247(a)(1) & RSS-210	DA 00-705	PASS
Band Edge	15.247(d) & RSS-210	DA 00-705	PASS
Conducted Output Power	15.247(b)(1) & RSS-210	DA 00-705	PASS
FHSS			
Carrier Frequency Separation	15.247(a)(1) & RSS-210	DA 00-705	PASS
Number of hopping frequencies	15.247(a)(1) & RSS-210	DA 00-705	PASS
Time of occupancy(Dwell Time)	15.247(a)(1) & RSS-210	DA 00-705	PASS
Pseudorandom frequency-hopping sequence	15.247(a)(1) & RSS-210	DA 00-705	PASS
Equal hopping frequency usage	15.247(a)(1) & RSS-210	DA 00-705	PASS
System receiver input bandwidth	15.247(a)(1) & RSS-210	DA 00-705	PASS
RF Exposure	15.247(i) & RSS-102	DA 00-705	PASS

Note1): The EUT connected to host power system. This test was exempted by no connection to AC Power Line.

Conducted Emission

Test Date	January 14, 2013
Sample Number	1083157
Tested By	Jeremy Lee

Test Limits

FCC 15.207(a):
Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Test Results

The test was exempted because there is no public utility (AC) power line connection.

Radiated Emission: Unintentional-Receive Mode

Temperature	22.6 ℃
Relative Humidity	33.0 %
Barometric Pressure:	101.7 kPa
Test Date	January 09, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272, 371
Reference Equipment (ID) (Calibration not required)	124, 187, 374
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0284

Test Limits

FCC 15.109 (a):
Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (microvolts/ meter)
30–88	100
88–216	150
216–960	200
Above 960	500

Test Setup

The test was performed in accordance with **FCC 15.109:2010, FCC 15.31:2010, FCC 15.33:2010, FCC 15.35:2010, and ANSI C63.4:2009, and ANSI C63.10:2009.**

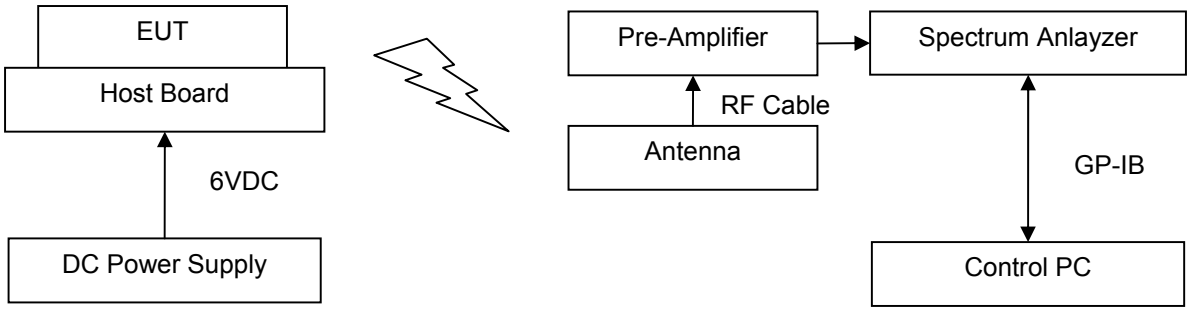
Test procedure is based on the FCC15.31(a)(3) – Other intentional and unintentional radiators are to be measured for compliance using the following procedure excluding sections 4.1.5.2, 5.7, 9 and 14: ANSI C63.4–2009: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see § 15.38). This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51.
NOTE to Paragraph (a)(3): Digital devices tested to show compliance with the provisions of §§ 15.107(e) and 15.109(g) must be tested following the ANSI C63.4 procedure described in paragraph (a)(3) of this section.[As stated in the adopting R&O, ANSI C63.4 is not used for measurements below 30 MHz.]

The EUT was placed on a 1 meter by 1.5 meters wide and 0.8-meter high nonconductive table that was placed directly onto a flush mounted turntable. The EUT was connected to its support equipment with any excess I/O cabling bundled to approximately 1 meter. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter. It is measured with a receiver – the spectrum analyzer, was software controlled. The antennas were balanced dipoles. For frequencies of 80 MHz or above, the antennas were resonant in length, and for frequencies below 80 MHz it had a length equal to the 80 MHz resonant length.

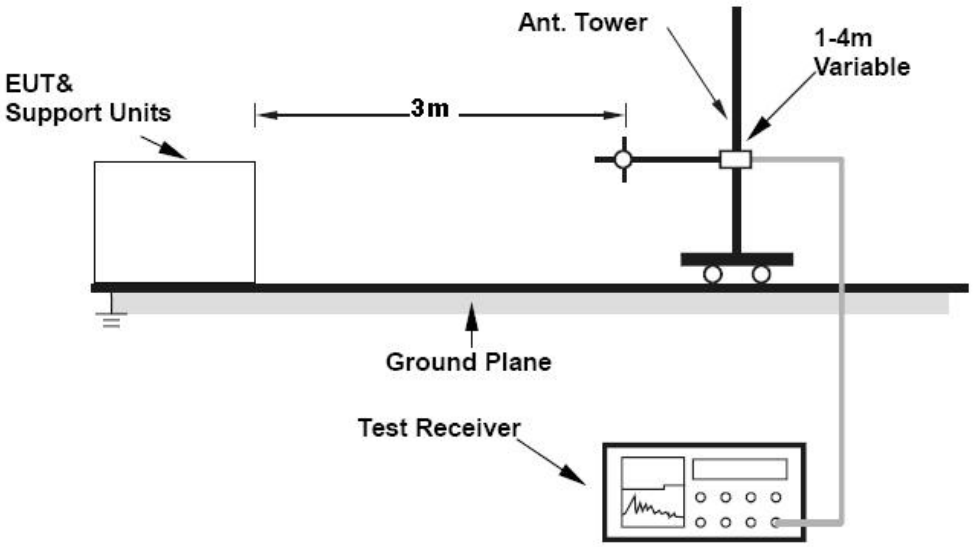
Tests were performed to determine the emissions with Receive mode, Antenna was connected. The EUT was positioned emissions from the unit were maximized by manipulating the cables, and by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

- The EUT was set-up Receive mode.
- The following measurements were made with
  - Span = wide enough to fully capture the emission being measured.
  - RBW = 120 kHz
  - VBW ≥ RBW
  - Sweep = Auto
  - Detector Function = peak
  - Trace = Single trace up to capturing the whole range of signal
  - QP Detecting; there was no strong signal to detect QP level.

Setup Block Diagram



Test Setup in Chamber

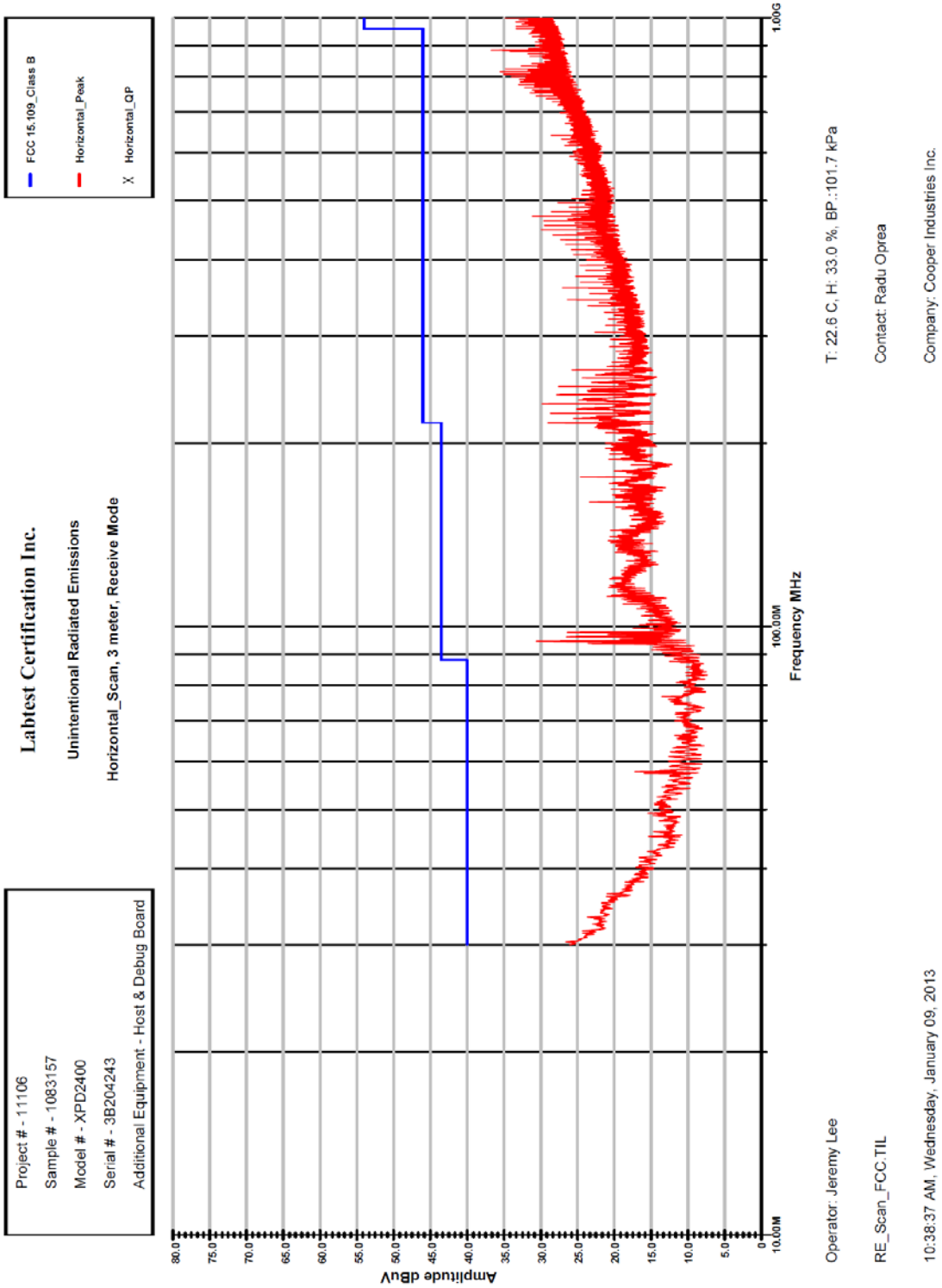


Test Result

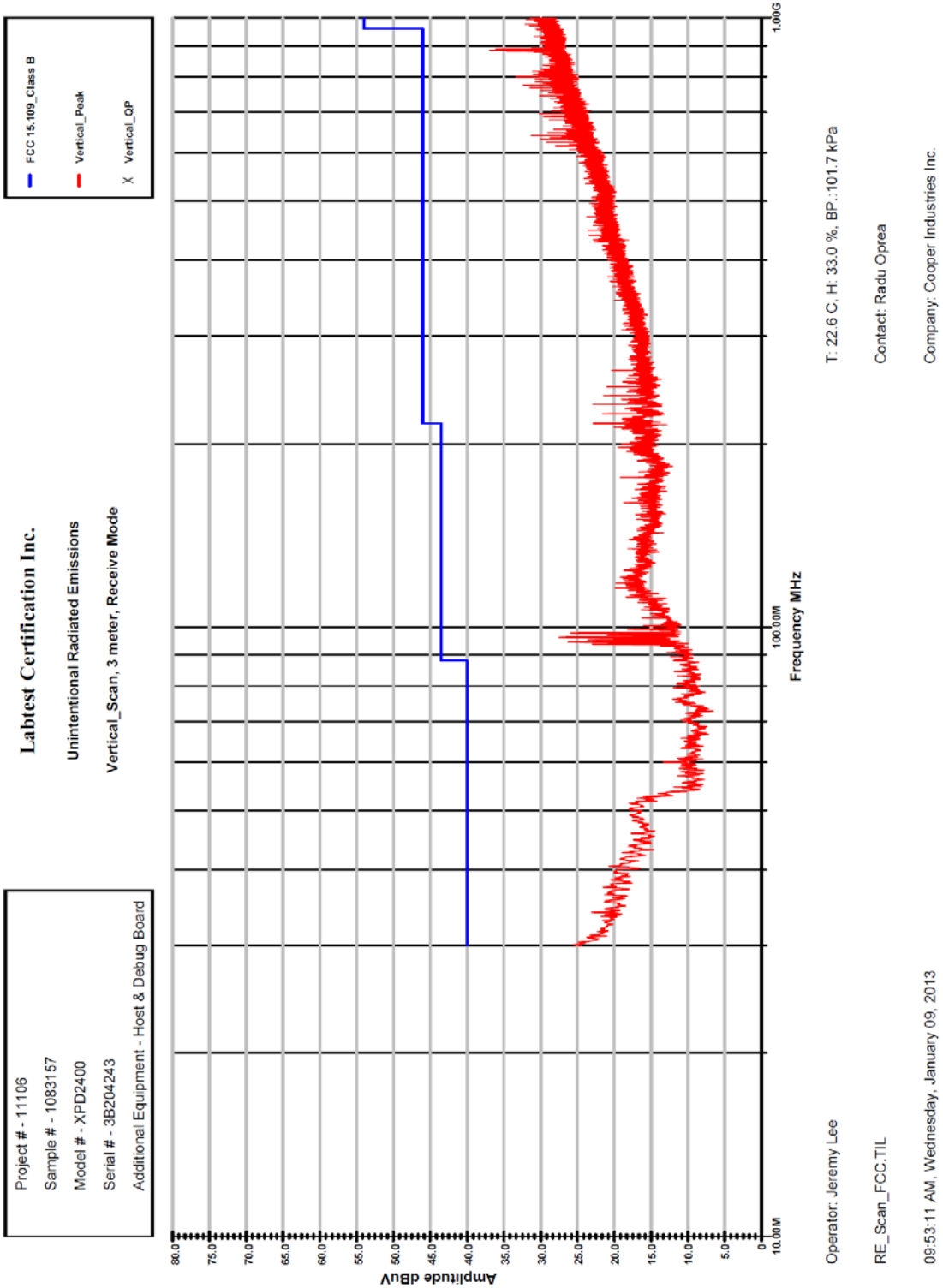
Radiated Emission (dBuV/m) = Measured Emission (dBuV) + Antenna Factor(1/m) + Cable Loss(dB)– Pre-Amplifier Gain(dB)

X Pass **Fail** **N/A**

- Graph of Radiated Emissions of Receive Mode: 30 to1000MHz, Peak Detecting, Antenna was used JB1, the polarization of Antenna was Horizontal.



- Graph of Radiated Emissions of Receive Mode: 30 to1000MHz, Peak Detecting, Antenna was used JB1, the polarization of Antenna was Vertical.



Radiated Emission: Intentional-Transmit Mode, Spurs

Temperature	22.6 to 23.4 ℃
Relative Humidity	31.0 to 34.0 %
Barometric Pressure:	101.8 to 102.0 kPa
Test Date	January 09 & 10, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	227-3, 241, 266, 272, 273, 371
Reference Equipment (ID) (Calibration not required)	124, 187, 374
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0284

Test Limits

15.247(d)

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

15.205(a)

Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

15.209(a)

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permltted under other sections of this part, e.g., §§ 15.231 and 15.241.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, 15.209:2010, FCC 15.31:2010, FCC 15.33:2010, FCC 15.35:2010, and DA 00-705.**

Test procedure is based on the FCC15.31(a)(3) – Other intentional and unintentional radiators are to be measured for compliance using the following procedure excluding sections 4.1.5.2, 5.7, 9 and 14: ANSI C63.4–2009: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see § 15.38). This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51.
NOTE to Paragraph (a)(3): Digital devices tested to show compliance with the provisions of §§ 15.107(e) and 15.109(g) must be tested following the ANSI C63.4 procedure described in paragraph (a)(3) of this section.[As stated in the adopting R&O, ANSI C63.4 is not used for measurements below 30 MHz.]

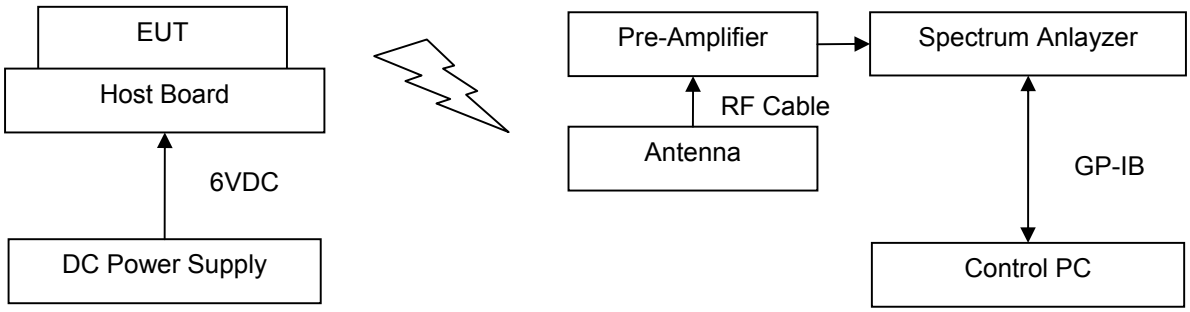
The EUT was placed on a 1 meter by 1.5 meters wide and 0.8-meter high nonconductive table that was placed directly onto a flush mounted turntable. The EUT was connected to its support equipment with any excess I/O cabling bundled to approximately 1 meter. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter. It is measured with a receiver – the spectrum analyzer, was software controlled. The antennas were balanced dipoles. For frequencies of 80 MHz or above, the antennas were resonant in length, and for frequencies below 80 MHz it had a length equal to the 80 MHz resonant length.

Tests were performed to determine the emissions with Transmit mode, Hopping mode. Antenna was connected to output port. The EUT was positioned emissions from the unit were maximized by manipulating the cables, and by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

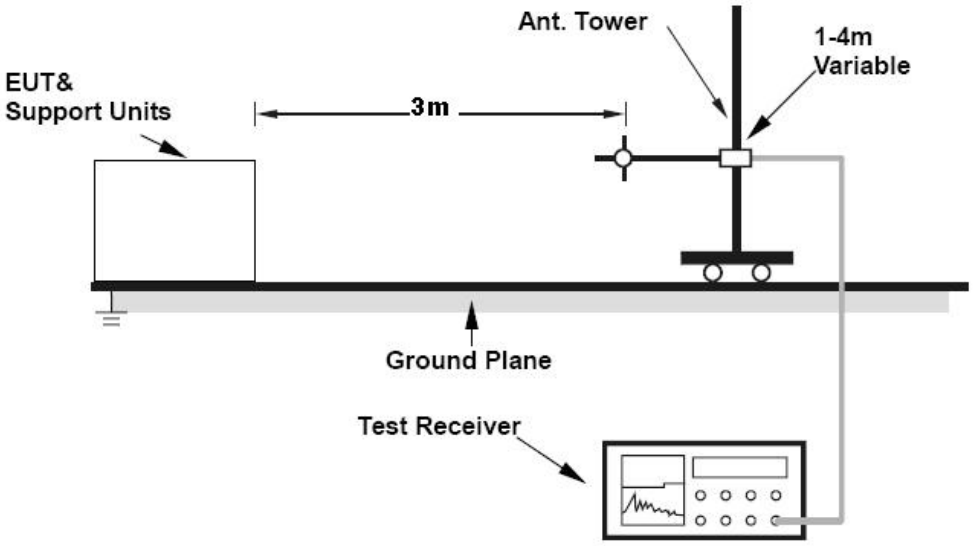
- The EUT was set-up Transmit mode, Hopping.
- The transmitter was set-up as its maximum power with Antenna connected.
- The following measurements were made with
  - Span = wide enough to fully capture the emission being measured.
  - RBW = 9kHz, 120 kHz & 1MHz
  - VBW ≥ RBW
  - Sweep = Auto

- Detector Function = Peak an QP, there was no strong signal in range to use the Averaging detector
- Trace = Single trace up to capturing the whole range of signal

Setup Block Diagram



Test Setup in Chamber



Test Result

Radiated Emission (dBuV/m) = Measured Emission (dBuV) + Antenna Factor(1/m) + Cable Loss(dB)– Pre-Amplifier Gain(dB)

X Pass **Fail** **N/A**

- Table of Radiated Emissions of Transmit Mode: 30 to1000MHz, Peak Detecting, Antenna was used JB1, the polarization of Antenna was Horizontal.

LabTest Certification Inc.
Intentional Radiated Emissions_Spurs
FCC15.209, 3 meters, Hopping Mode, Horizontal

Operator: Jeremy Lee

11:55:30 AM, Wednesday, January 09, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured	AntFactor	PathLoss	Emission	Limit	Margin	T/T	Tower	POL
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
833.7922 MHz	28.76	22.28	-27.89	23.14	47.46	24.32	284.0	101.2	H

Project # : 11106, Sample #: 1083157
Temp.: 22.8 C, Hum.: 34.0 %
Barometer Pres.: 101.8 kPa

- Table of Radiated Emissions of Transmit Mode: 30 to1000MHz, Peak Detecting, Antenna was used JB1, the polarization of Antenna was Vertical.

LabTest Certification Inc.
Intentional Radiated Emissions_Spurs
FCC15.209, 3 meters, Hopping Mode, Vertical

Operator: Jeremy Lee

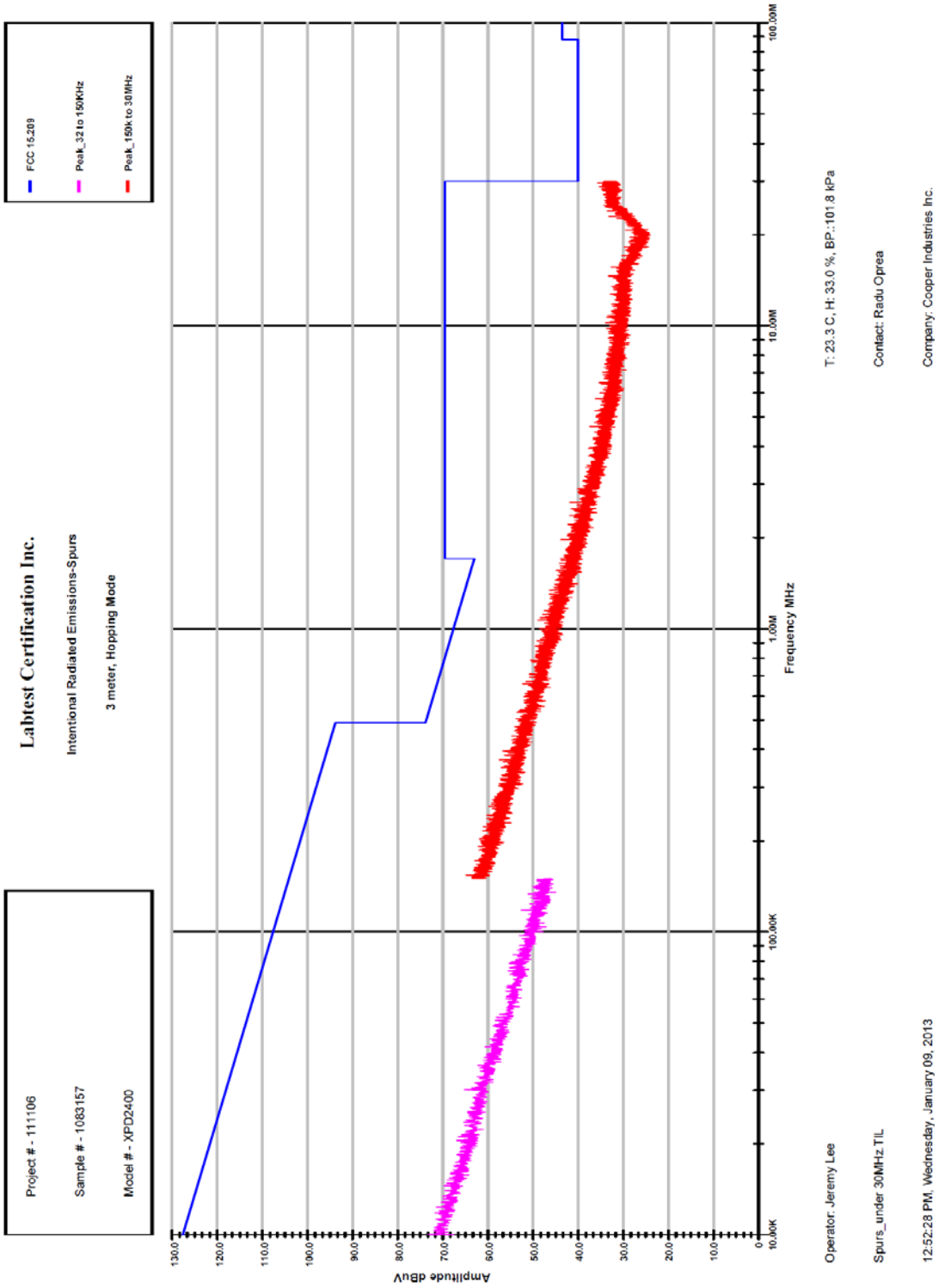
11:55:30 AM, Wednesday, January 09, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

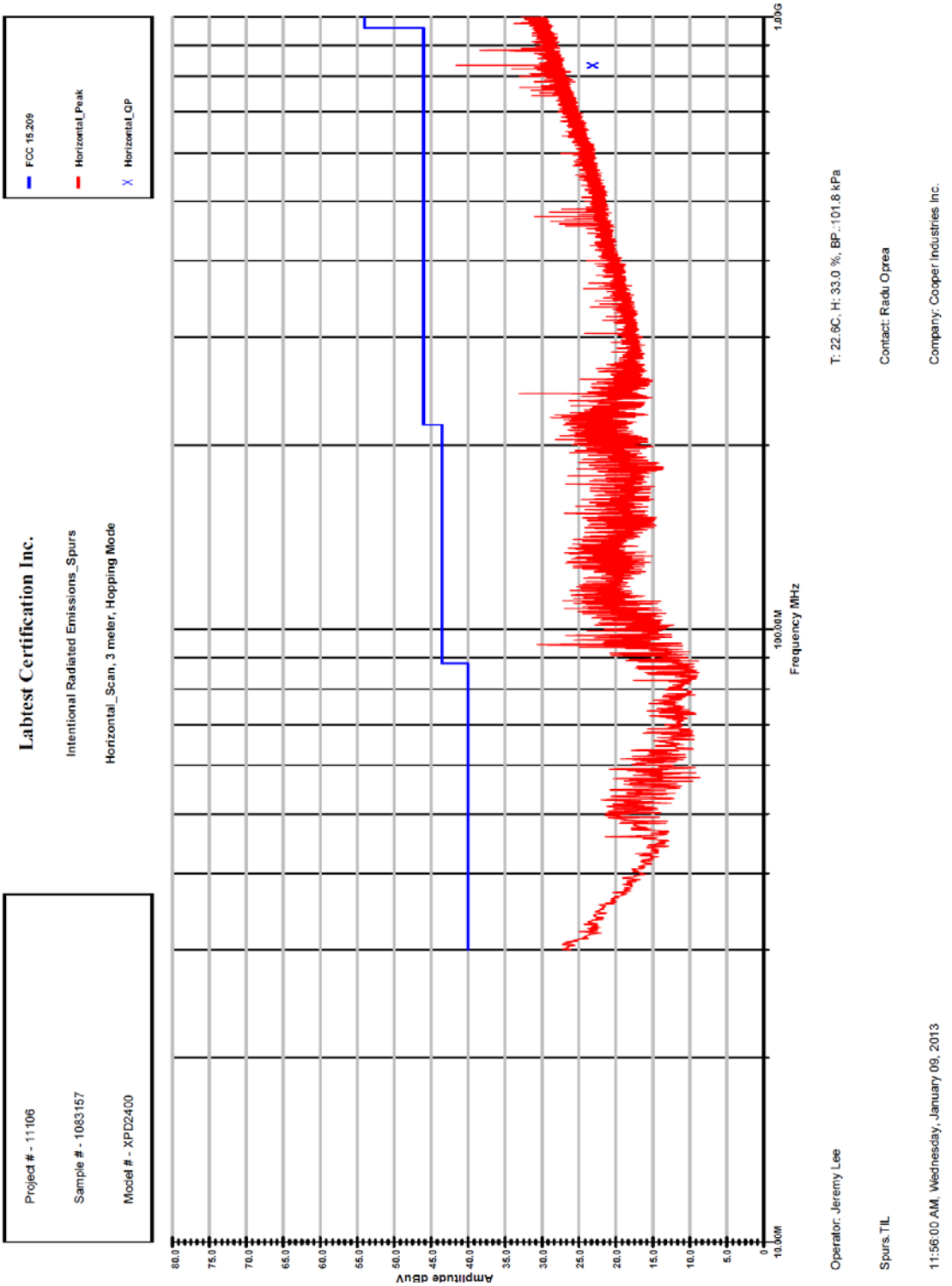
Frequency	Measured	AntFactor	PathLoss	Emission	Limit	Margin	T/T	Tower	POL
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
883.5478 MHz	37.32	22.17	-27.66	31.84	47.46	15.62	315.0	101.1	V

Project # : 11106, Sample #: 1083157
Temp.: 22.8 C, Hum.: 34.0 %
Barometer Pres.: 101.8 kPa

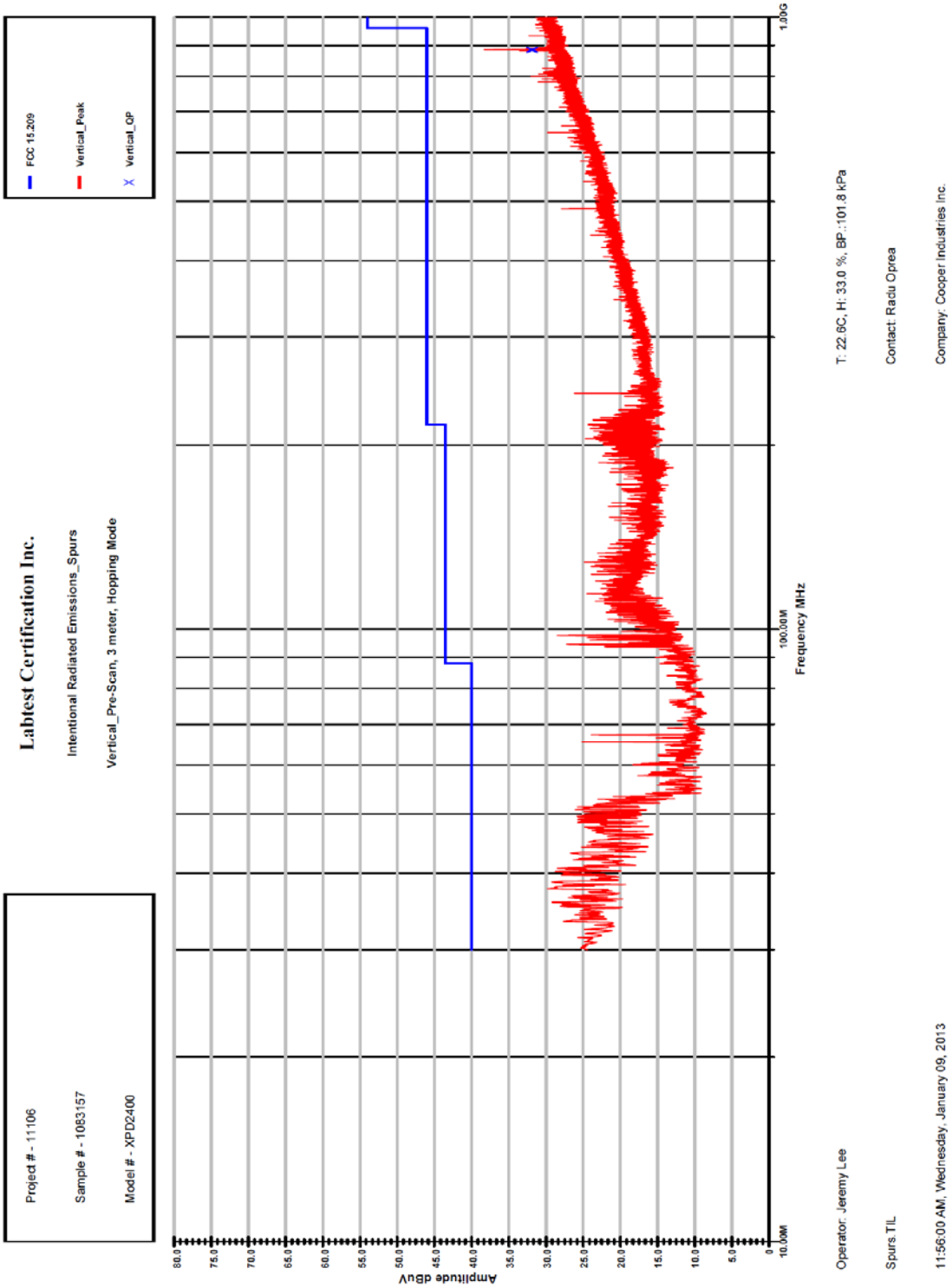
- Graph of Radiated Emissions of Transmit Mode: 10kHz to30MHz, Peak Detecting, Antenna was used AL-160.



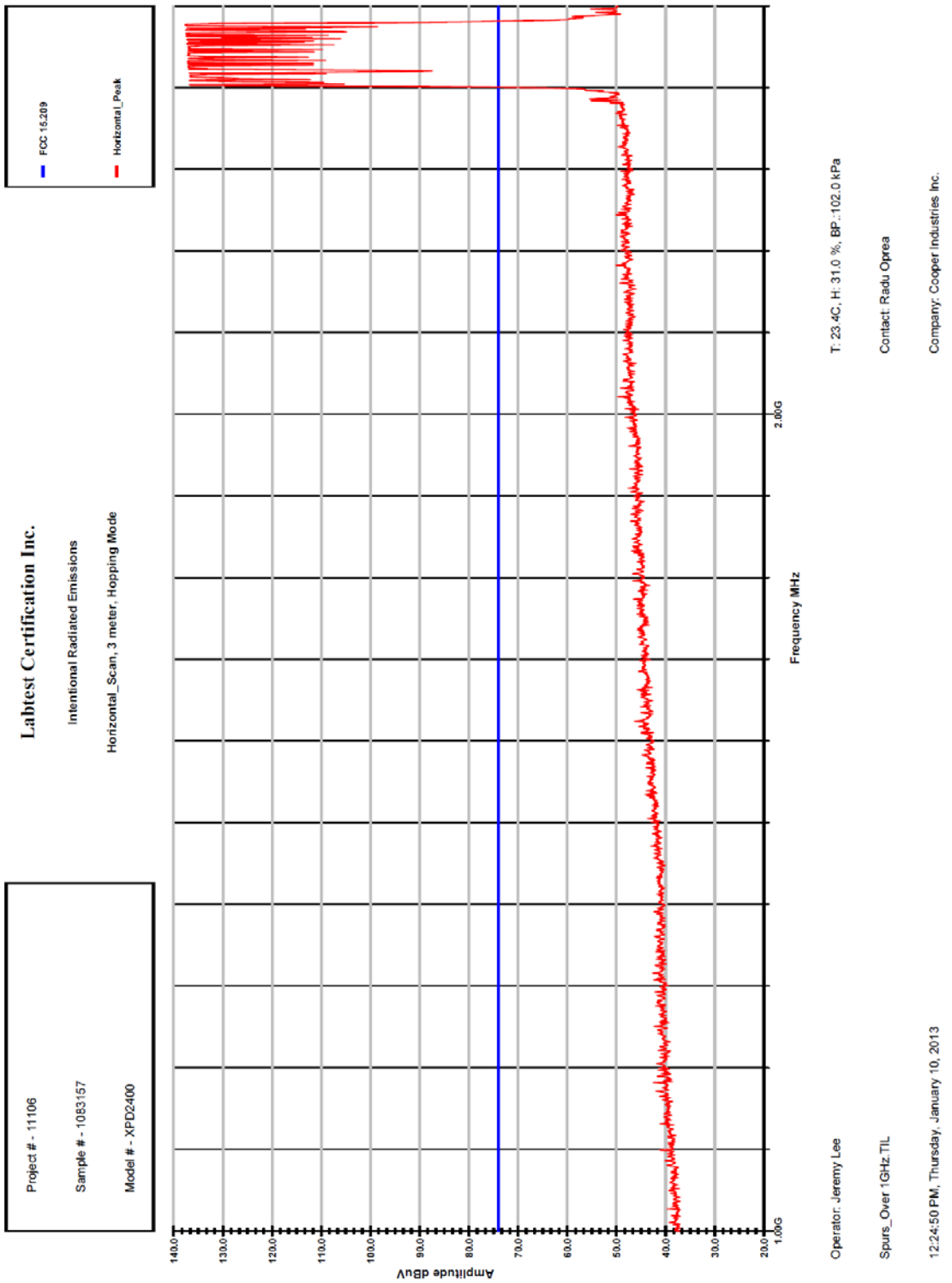
- Graph of Radiated Emissions of Transmit Mode: 30 to1000MHz, Peak Detecting, Antenna was used JB1, the polarization of Antenna was Horizontal.



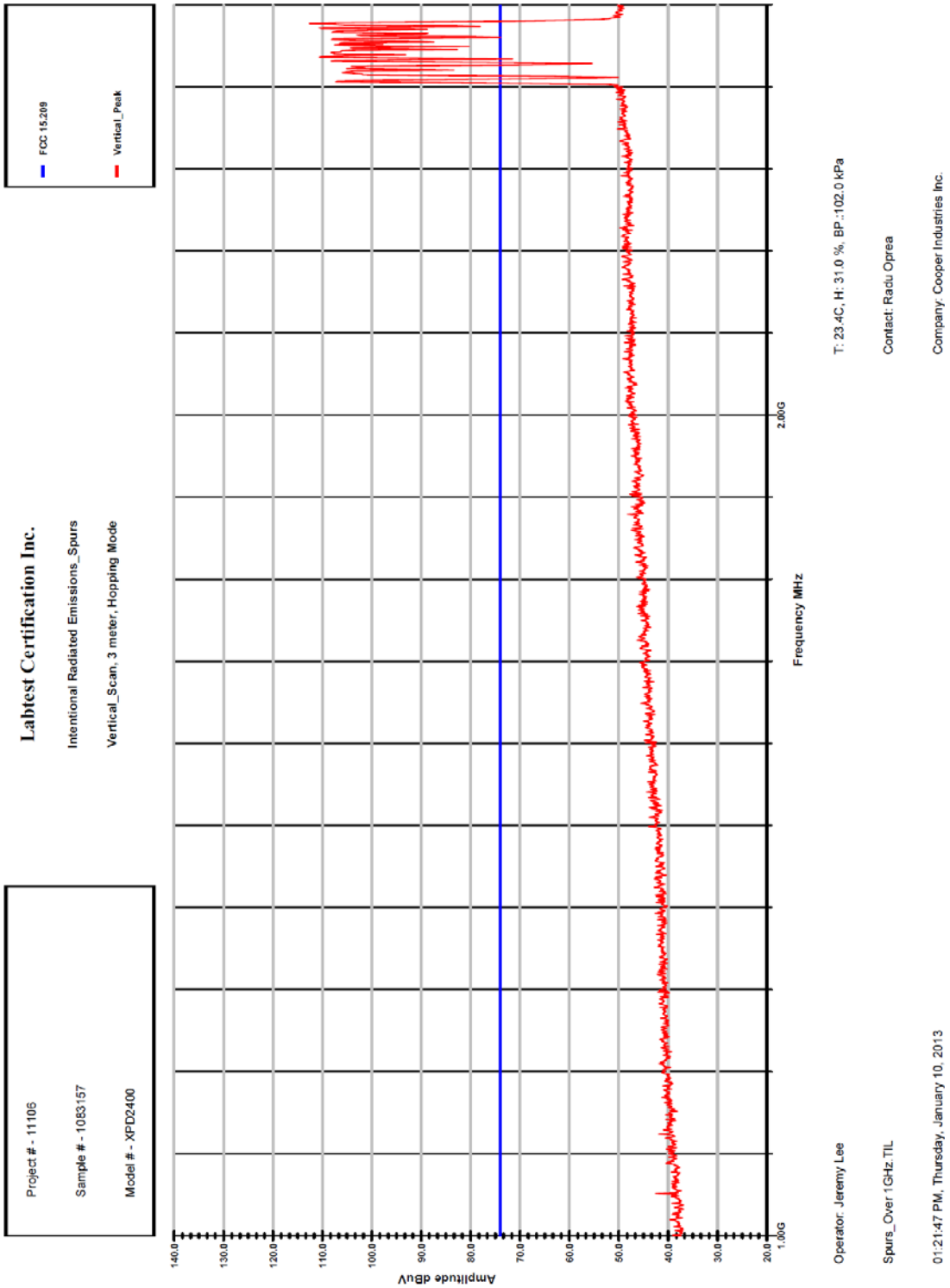
- Graph of Radiated Emissions of Transmit Mode: 30 to1000MHz, Peak Detecting, Antenna was used JB1, the polarization of Antenna was Vertical.



- Graph of Radiated Emissions of Transmit Mode: 1 to 2.5GHz, Peak Detecting, Antenna was used SAS-571, the polarization of Antenna was Horizontal.



- Graph of Radiated Emissions of Receive Mode: 1 to 2.5GHz, Peak Detecting, Antenna was used SAS-571, the polarization of Antenna was Vertical.



Radiated Emissions: Intentional-Transmit Mode, Harmonics

Temperature	23.5 ℃
Relative Humidity	30.0 %
Barometric Pressure:	102.0 kPa
Test Date	January 14, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	227-3, 227-4, 266, 272, 273
Reference Equipment (ID) (Calibration not required)	137, 187, 374
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0284

Test Limits

15.247(d)

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

15.205(a)

Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1] 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	([2])
13.36–13.41.			

[1] Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.
[2] Above 38.6

15.209(a)

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permltted under other sections of this part, e.g., §§ 15.231 and 15.241.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010, FCC 15.33:2010, FCC 15.35:2010, and DA 00-705.**

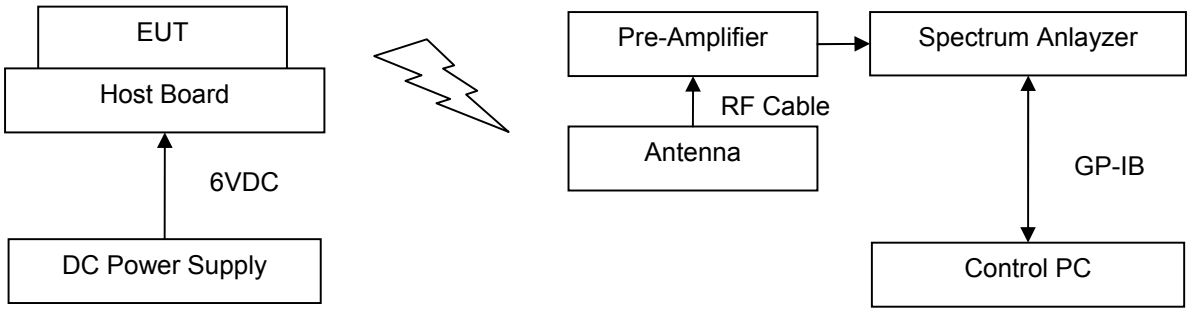
Test procedure is based on the FCC15.31(a)(3) – Other intentional and unintentional radiators are to be measured for compliance using the following procedure excluding sections 4.1.5.2, 5.7, 9 and 14: ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" (incorporated by reference, see § 15.38). This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR Part 51.
NOTE to Paragraph (a)(3): Digital devices tested to show compliance with the provisions of §§ 15.107(e) and 15.109(g) must be tested following the ANSI C63.4 procedure described in paragraph (a)(3) of this section.[As stated in the adopting R&O, ANSI C63.4 is not used for measurements below 30 MHz.]

The EUT was placed on a 1 meter by 1.5 meters wide and 0.8-meter high nonconductive table that was placed directly onto a flush mounted turntable. The EUT was connected to its support equipment with any excess I/O cabling bundled to approximately 1 meter. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna supporter. It is measured with a receiver – spectrum analyzer, was software controlled. The antennas were Horn Antennas.

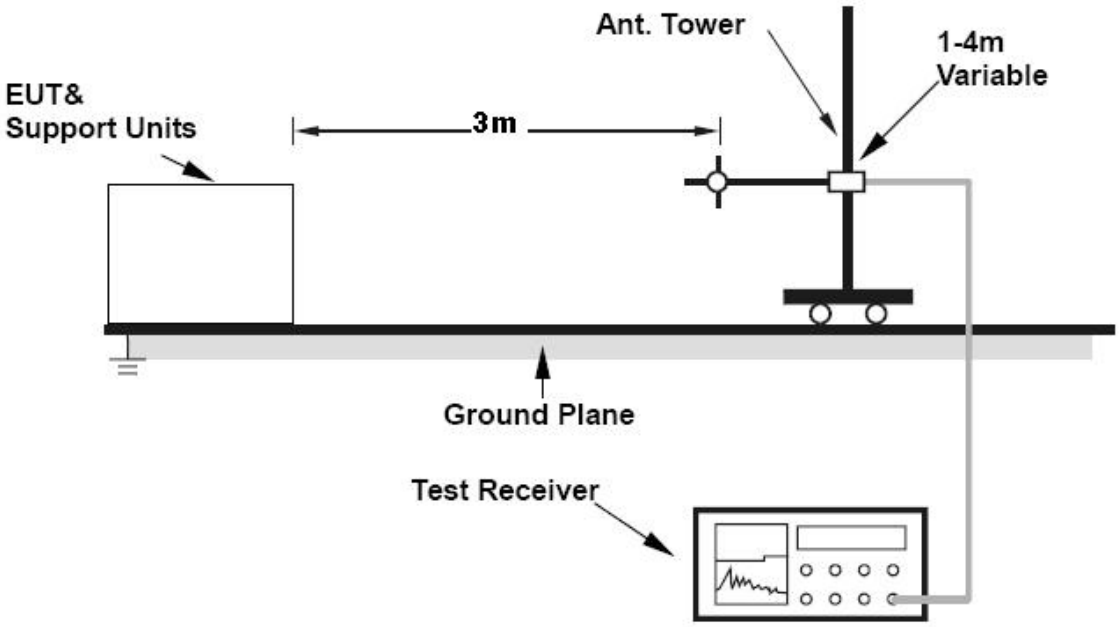
The tests were performed to determine the "worst-case" orientation of the EUT. With the EUT positioned in the "worst case" orientation, emissions from the unit were maximized, and by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

- The EUT was measured in three diferrent transmiting frequencies, low-end, middle, and high-end.
- The transmitter was set-up as its maximum power and terminated via 30dB attenuator.
- The following measurements were made with
  - Span = wide enough to fully capture the emission being measured.
  - RBW = 1MHz
  - VBW ≥ RBW
  - Sweep = Auto
  - Detector Function = Averaging and Peak
  - Trace = Single trace up to capturing the whole range of signal

Setup Block Diagram



Test Setup in Chamber



Test Result

Radiated Emission (dBuV/m) = Measured Emission (dBuV) + Antenna Factor(1/m) + Cable Loss(dB)– Pre-Amplifier Gain(dB)

Frequency (GHz)	Radiated Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (AVG/PK)	Pol(H/V)	Results
Low End, Fc: 2403.1 MHz						

4.8062	48.52	53.98	5.46	AVG	VER	Pass
12.0155	43.35		10.63	AVG	HOR	Pass
19.2248	41.87		12.11	AVG	VER	Pass
Middle, Fc: 2441.4 MHz						
4.8828	43.90	53.98	10.08	AVG	VER	Pass
7.3242	53.44		0.54	AVG	VER	Pass
12.207	48.83		5.15	AVG	VER	Pass
19.5312	43.21		10.77	AVG	VER	Pass
High End, Fc: 2479.8 MHz						
4.9596	49.54	53.98	4.44	AVG	VER	Pass
7.4394	50.81		3.17	AVG	HOR	Pass
12.399	46.84		7.14	AVG	VER	Pass
19.8384	43.26		10.72	AVG	HOR	Pass
22.3182	45.19		8.79	AVG	HOR	Pass

X Pass Fail N/A

- Table of Radiated Harmonic Emissions of LowEnd: 1 to 25GHz, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Peak Detector_Low End_Horizontal

Operator: Jeremy Lee

04:47:29 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured_PK	AntFactor	PathLoss	Emission_PK	Limit_PK	Margin_PK	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8062000 GHz	51.85	32.98	-28.14	56.70	73.98	17.28	10.0	120.0	H
12.0155000 GHz	46.78	39.50	-26.60	59.68	73.98	14.30	10.0	120.0	H
19.2248000 GHz	42.67	37.65	-25.80	54.52	73.98	19.46	10.0	120.0	H

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Peak Detector_Low End_Vertical

Operator: Jeremy Lee

04:47:29 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured_PK	AntFactor	PathLoss	Emission_PK	Limit_PK	Margin_PK	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8062000 GHz	53.81	33.17	-28.14	58.84	73.98	15.14	110.0	120.0	V
12.0155000 GHz	42.00	39.58	-26.60	54.98	73.98	19.00	110.0	120.0	V
19.2248000 GHz	42.97	37.65	-25.80	54.82	73.98	19.16	110.0	120.0	V

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

- Table of Radiated Harmonic Emissions of Middle: 1 to 25GHz, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Peak Detector_Middle_Horizontal

Operator: Jeremy Lee

05:37:31 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured_PK	AntFactor	PathLoss	Emission_PK	Limit_PK	Margin_PK	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8828000 GHz	44.84	33.22	-28.12	49.94	73.98	24.04	10.0	120.0	H
7.3242000 GHz	46.10	37.44	-27.64	55.90	73.98	18.08	10.0	120.0	H
12.2070000 GHz	41.84	40.43	-26.56	55.72	73.98	18.26	10.0	120.0	H
19.5312000 GHz	43.42	37.37	-25.79	54.99	73.98	18.99	10.0	120.0	H

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Peak Detector_Middle_Vertical

Operator: Jeremy Lee

05:38:32 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured_PK	AntFactor	PathLoss	Emission_PK	Limit_PK	Margin_PK	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8828000 GHz	49.20	33.26	-28.12	54.33	73.98	19.65	110.0	120.0	V
7.3242000 GHz	54.50	37.48	-27.64	64.35	73.98	9.63	110.0	120.0	V
12.2070000 GHz	43.67	40.51	-26.56	57.62	73.98	16.36	110.0	120.0	V
19.5312000 GHz	44.04	37.37	-25.79	55.61	73.98	18.37	110.0	120.0	V

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

- Table of Radiated Harmonic Emissions of HighEnd: 1 to 25GHz, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Peak Detector_High End_Horizontal

Operator: Jeremy Lee

05:35:20 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency Hz	Measured_PK dBuV	AntFactor dB/m	PathLoss dB	Emission_PK dBuV/m	Limit_PK dBuV/m	Margin_PK dB	T/T Degree	Tower cm	POL
4.9596000 GHz	49.16	33.41	-28.11	54.46	73.98	19.52	10.0	120.0	H
7.4394000 GHz	46.77	37.13	-27.61	56.29	73.98	17.69	10.0	120.0	H
12.3990000 GHz	42.00	40.87	-26.52	56.35	73.98	17.63	10.0	120.0	H
19.8384000 GHz	44.19	37.28	-25.73	55.73	73.98	18.25	10.0	120.0	H
22.3182000 GHz	45.77	37.63	-25.44	57.96	73.98	16.02	10.0	120.0	H

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Peak Detector_High End_Vertical

Operator: Jeremy Lee

05:33:51 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency Hz	Measured_PK dBuV	AntFactor dB/m	PathLoss dB	Emission_PK dBuV/m	Limit_PK dBuV/m	Margin_PK dB	T/T Degree	Tower cm	POL
4.9596000 GHz	54.64	33.41	-28.11	59.94	73.98	14.04	110.0	120.0	V
7.4394000 GHz	51.99	37.18	-27.61	61.56	73.98	12.42	110.0	120.0	V
12.3990000 GHz	43.70	40.97	-26.52	58.15	73.98	15.83	110.0	120.0	V
19.8384000 GHz	43.83	37.28	-25.73	55.37	73.98	18.61	110.0	120.0	V
22.3182000 GHz	45.74	37.63	-25.44	57.93	73.98	16.05	110.0	120.0	V

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

- Table of Radiated Harmonic Emissions of LowEnd: 1 to 25GHz, Average Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meter, Averaging Detector_Low End_Horizontal

Operator: Jeremy Lee

04:47:29 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured_AVG	AntFactor	PathLoss	Emission_AVG	Limit_AVG	Margin_AVG	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8062000 GHz	42.64	32.98	-28.14	47.49	53.98	6.49	10.0	120.0	H
12.0155000 GHz	30.45	39.50	-26.60	43.35	53.98	10.63	10.0	120.0	H
19.2248000 GHz	29.83	37.65	-25.80	41.68	53.98	12.30	10.0	120.0	H

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Averaging Detector_Low End_Vertical

Operator: Jeremy Lee

04:47:29 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured+AVG	AntFactor	PathLoss	Emission_AVG	Limit_AVG	Margin_AVG	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8062000 GHz	43.49	33.17	-28.14	48.52	53.98	5.46	110.0	120.0	V
12.0155000 GHz	30.19	39.58	-26.60	43.17	53.98	10.81	110.0	120.0	V
19.2248000 GHz	30.02	37.65	-25.80	41.87	53.98	12.11	110.0	120.0	V

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

- Table of Radiated Harmonic Emissions of Middle: 1 to 25GHz, Average Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meter, Averaging Detector_Middle_Horizontal

Operator: Jeremy Lee

05:37:31 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured_AVG	AntFactor	PathLoss	Emission_AVG	Limit_AVG	Margin_AVG	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8828000 GHz	36.40	33.22	-28.12	41.50	53.98	12.48	10.0	120.0	H
7.3242000 GHz	38.20	37.44	-27.64	48.00	53.98	5.98	10.0	120.0	H
12.2070000 GHz	29.92	40.43	-26.56	43.80	53.98	10.18	10.0	120.0	H
19.5312000 GHz	31.63	37.37	-25.79	43.20	53.98	10.78	10.0	120.0	H

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Averaging Detector_Middle_Vertical

Operator: Jeremy Lee

05:38:32 PM, Monday, January 14, 2013

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

Frequency	Measured+AVG	AntFactor	PathLoss	Emission_AVG	Limit_AVG	Margin_AVG	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.8828000 GHz	38.77	33.26	-28.12	43.90	53.98	10.08	110.0	120.0	V
7.3242000 GHz	43.59	37.48	-27.64	53.44	53.98	0.54	110.0	120.0	V
12.2070000 GHz	34.88	40.51	-26.56	48.83	53.98	5.15	110.0	120.0	V
19.5312000 GHz	31.64	37.37	-25.79	43.21	53.98	10.77	110.0	120.0	V

Project # : 11106, Sample #: 1083157
Temp.: 23.5 C, Hum.: 30.0 %
Barometer Pres.:102.0 kPa

- Table of Radiated Harmonic Emissions of HighEnd: 1 to 25GHz, Average Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meter, Averaging Detector_High End_Horizontal

Operator: Jeremy Lee

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

05:35:20 PM, Monday, January 14, 2013

Frequency	Measured_AVG	AntFactor	PathLoss	Emission_AVG	Limit_AVG	Margin_AVG	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.9596000 GHz	42.68	33.41	-28.11	47.98	53.98	6.00	10.0	120.0	H
7.4394000 GHz	41.29	37.13	-27.61	50.81	53.98	3.17	10.0	120.0	H
12.3990000 GHz	29.88	40.87	-26.52	44.23	53.98	9.75	10.0	120.0	H
19.8384000 GHz	31.72	37.28	-25.73	43.26	53.98	10.72	10.0	120.0	H
22.3182000 GHz	33.00	37.63	-25.44	45.19	53.98	8.79	10.0	120.0	H
Project # : 11106, Sample #: 1083157									
Temp.: 23.5 C, Hum.: 30.0 %									
Barometer Pres.:102.0 kPa									

LabTest Certification Inc.
Intentional Radiated Emission-Harmonics
FCC15.247, 205 & 209, 3 meters, Averaging Detector_High End_Vertical

Operator: Jeremy Lee

Model #: XPD2400
Contact: Radu Oprea
Company: Cooper Industries Inc.

05:33:51 PM, Monday, January 14, 2013

Frequency	Measured+AVG	AntFactor	PathLoss	Emission_AVG	Limit_AVG	Margin_AVG	T/T	Tower	POL
Hz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	Degree	cm	
4.9596000 GHz	44.24	33.41	-28.11	49.54	53.98	4.44	110.0	120.0	V
7.4394000 GHz	40.54	37.18	-27.61	50.11	53.98	3.87	110.0	120.0	V
12.3990000 GHz	32.39	40.97	-26.52	46.84	53.98	7.14	110.0	120.0	V
19.8384000 GHz	31.54	37.28	-25.73	43.08	53.98	10.90	110.0	120.0	V
22.3182000 GHz	32.71	37.63	-25.44	44.90	53.98	9.08	110.0	120.0	V
Project # : 11106, Sample #: 1083157									
Temp.: 23.5 C, Hum.: 30.0 %									
Barometer Pres.:102.0 kPa									

Antenna-port Conducted Emissions

Temperature	23.5 ℃
Relative Humidity	30.0 to 35.0 %
Barometric Pressure:	102.0 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0248

Test Limits

15.247(d)

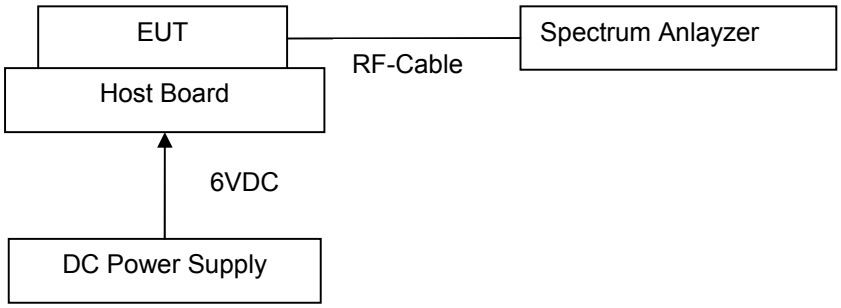
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer.
- The EUT was set-up in three different transmiting modes, low-end, middle, and high-end.
- The transmitter was set to output its maximum power.
- The following measurements were made with
  - Span = wide enough to capture the peak level of the in-band emission and all spurious emissions(e.g., harmonics) from the lowest frequency generated in the EUT up through the 10^{th} harmonic.
  - RBW = 100kHz up to 1GHz, 1MHz over 1GHz.
  - VBW ≥ RBW
  - Sweep = Auto
  - Detector Function = peak
  - Trace = Single trace up to capturing the whole range of signal
  - Allowed the trace to stabilize.
- Set the marker on the peak of any spurious emission recorded.

Setup Block Diagram



Test Results:

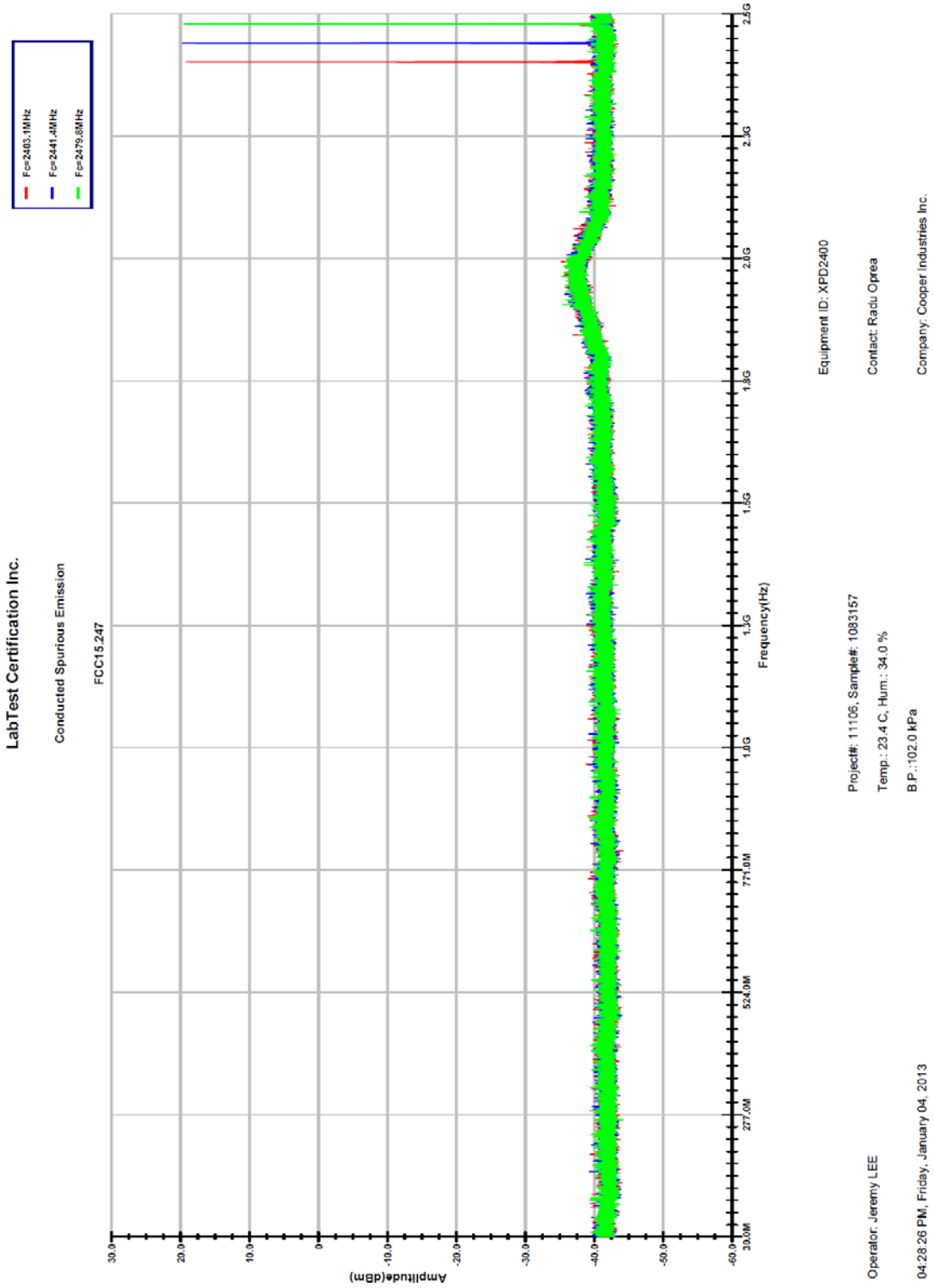
Difference(dB) = Measured Carrier Level(dBm) – Measured Spurious Level(dBm)

Description	Frequency (MHz)	Measured (dBm)	Difference (dB)	Limit (dB)	Pass/Fail
Carrier_Low End	2403.1	+19.08	-	-	-
Spurious	1999.427	-35.26	54.34	> 20	Pass
2nd Harmonic	4806.2	Under noise floor	Over 40	> 20	Pass
3rd Harmonic	7209.3			> 20	Pass
4th Harmonic	9612.4			> 20	Pass
5th Harmonic	12015.5			> 20	Pass
6th Harmonic	14418.6			> 20	Pass
7th Harmonic	16821.7			> 20	Pass
8th Harmonic	19224.8			> 20	Pass
9th Harmonic	21627.9			> 20	Pass
10th Harmonic	24031.0			> 20	Pass
Carrier_Middle	2441.4	+19.59	-	-	-
Spurious	1969.348	-35.71	55.3	> 20	Pass
2nd Harmonic	4882.8	Under noise floor	Over 40	> 20	Pass
3rd Harmonic	7324.2			> 20	Pass
4th Harmonic	9765.6			> 20	Pass
5th Harmonic	12207.0			> 20	Pass
6th Harmonic	14648.4			> 20	Pass

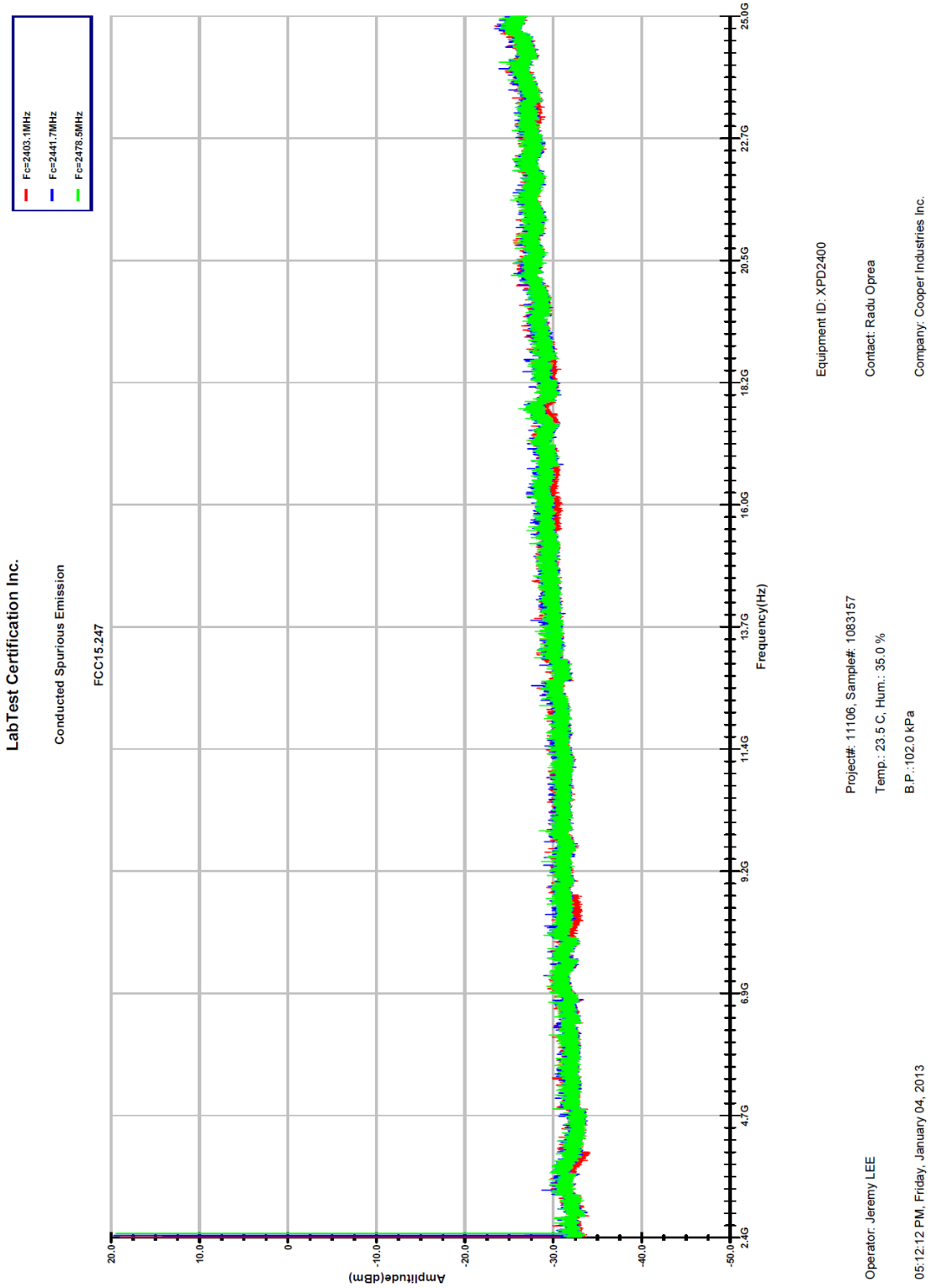
7th Harmonic	17089.8			> 20	Pass
8th Harmonic	19531.2			> 20	Pass
9th Harmonic	21972.6			> 20	Pass
10th Harmonic	24414.0			> 20	Pass
Carrier_High End	2479.8	+19.43	-	-	-
Spurious	1970.046	-35.33	54.76	> 20	Pass
2nd Harmonic	4959.6	Under noise floor	Over 40	> 20	Pass
3rd Harmonic	7439.4			> 20	Pass
4th Harmonic	9919.2			> 20	Pass
5th Harmonic	12399.0			> 20	Pass
6th Harmonic	14878.8			> 20	Pass
7th Harmonic	17358.6			> 20	Pass
8th Harmonic	19838.4			> 20	Pass
9th Harmonic	22318.2			> 20	Pass
10th Harmonic	24798.0			> 20	Pass

X Pass Fail N/A

- Antenna-port Conducted Emissions; 30MHz to 2.5GHz.



- Antenna-port Conducted Emissions: 2.4 to 25 GHz.



Occupied Bandwidth

Temperature	23.4 ℃
Relative Humidity	34.0 %
Barometric Pressure:	102.6 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0248

Test Limits

15.247(a)(1)

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

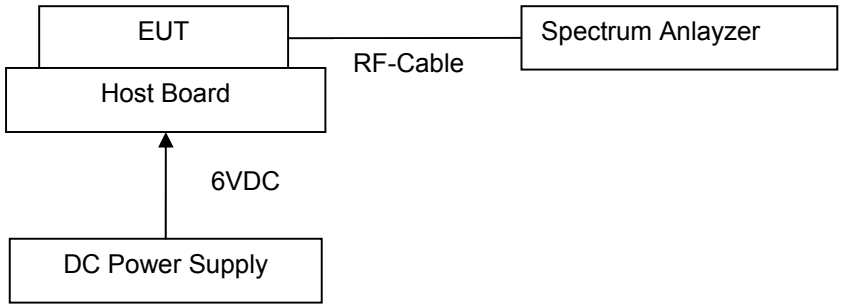
Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer via attenuator.
- The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the unlicensed wireless device at either the fundamental frequency or the first-order modulation products in all typical modes of operation, including the un-modulated carrier, even if atypical. Once the reference level is established, the equipment is conditioned with typical modulating signals to produce the worst-case (i.e., the widest) bandwidth. Unless otherwise specified for an unlicensed wireless device, measure the bandwidth at the –20 dB levels with respect to the reference level.
- To measure the modulated signal properly, a resolution bandwidth that is small compared with the bandwidth required by the procuring or regulatory agency shall be used on the measuring instrument.
    1) The span range for the SA display shall be between two times and five times the OBW.
    2) The nominal IF filter bandwidth (3 dB RBW) should be approximately 1 % to 5 % of the OBW, unless otherwise specified, depending on the applicable requirement.
    3) The dynamic range of the SA at the selected RBW shall be more than 10 dB below the target “dB down” (attenuation) requirement, i.e., if the requirement calls for measuring the –20 dB OBW, the SA noise floor at the selected RBW shall be at least 30 dB below the largest measured value on the display
- Supply the EUT with nominal ac voltage, or install a new or fully charged battery in the EUT. Turn the EUT on, and set it to a frequency within its operating range and within regulatory requirements. Set a reference level on the measuring instrument at any level that will allow measuring the specified bandwidth (e.g., –20 dB below the un-modulated carrier).
- Supply the EUT with modulation. Devices modulated from internal sources shall be tested with typical modulation applied. If a device is equipped with input connectors for external modulation, typical modulating signals shall be applied at the maximum-rated input level for the device. Observe and record with plotted graphs or photographs the worst-case (i.e., widest) occupied bandwidth produced by these different modulation sources.

- Set a reference level on the measuring instrument equal to the highest amplitude signal observed from the unlicensed wireless device at either the fundamental frequency or the first-order modulation products in all typical modes of operation, including the un-modulated carrier, even if atypical.
- Measure the frequencies of the modulated signal from the EUT, where it is the specified number of decibels below the reference level. The result is the occupied bandwidth.

Setup Block Diagram

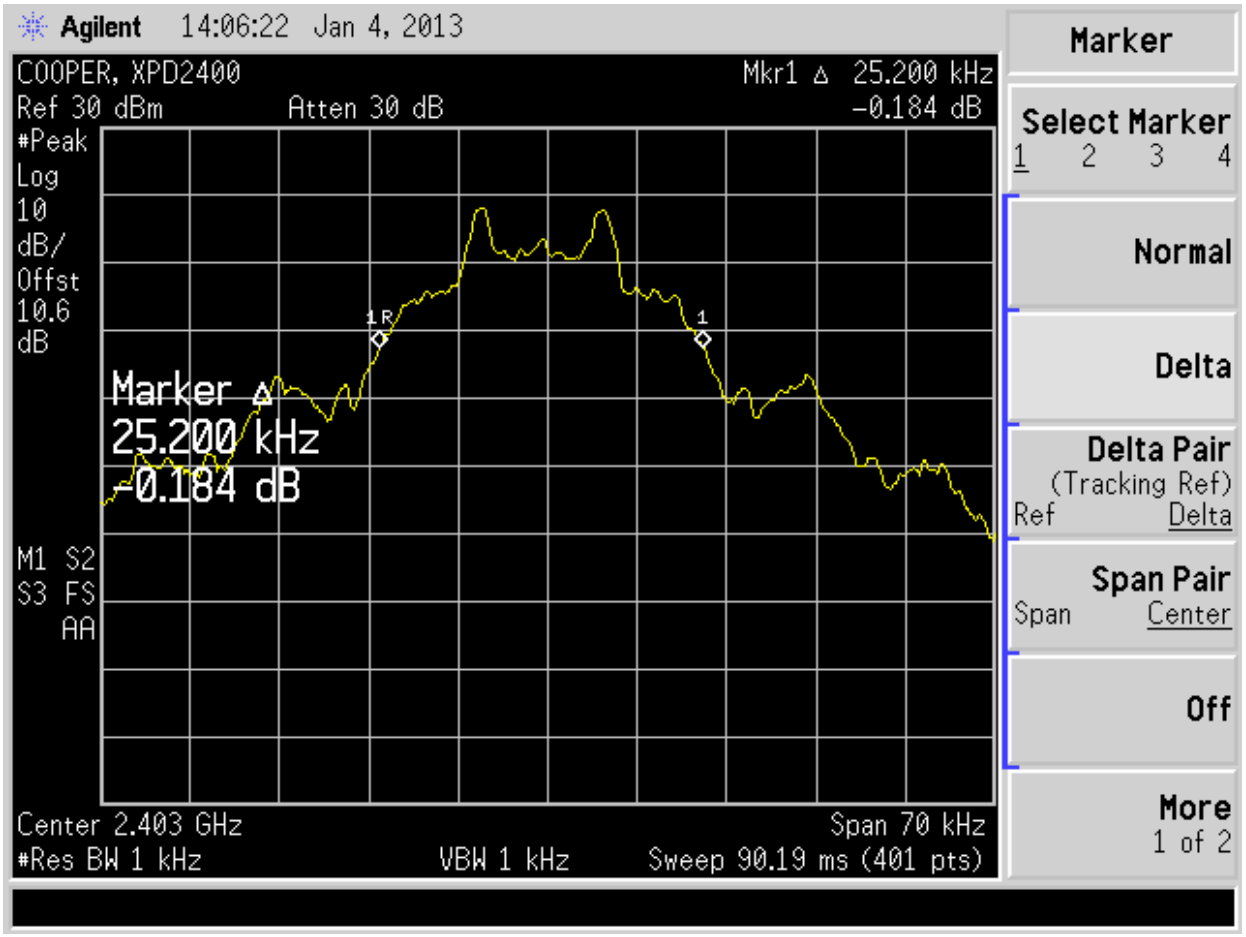


Test Results:

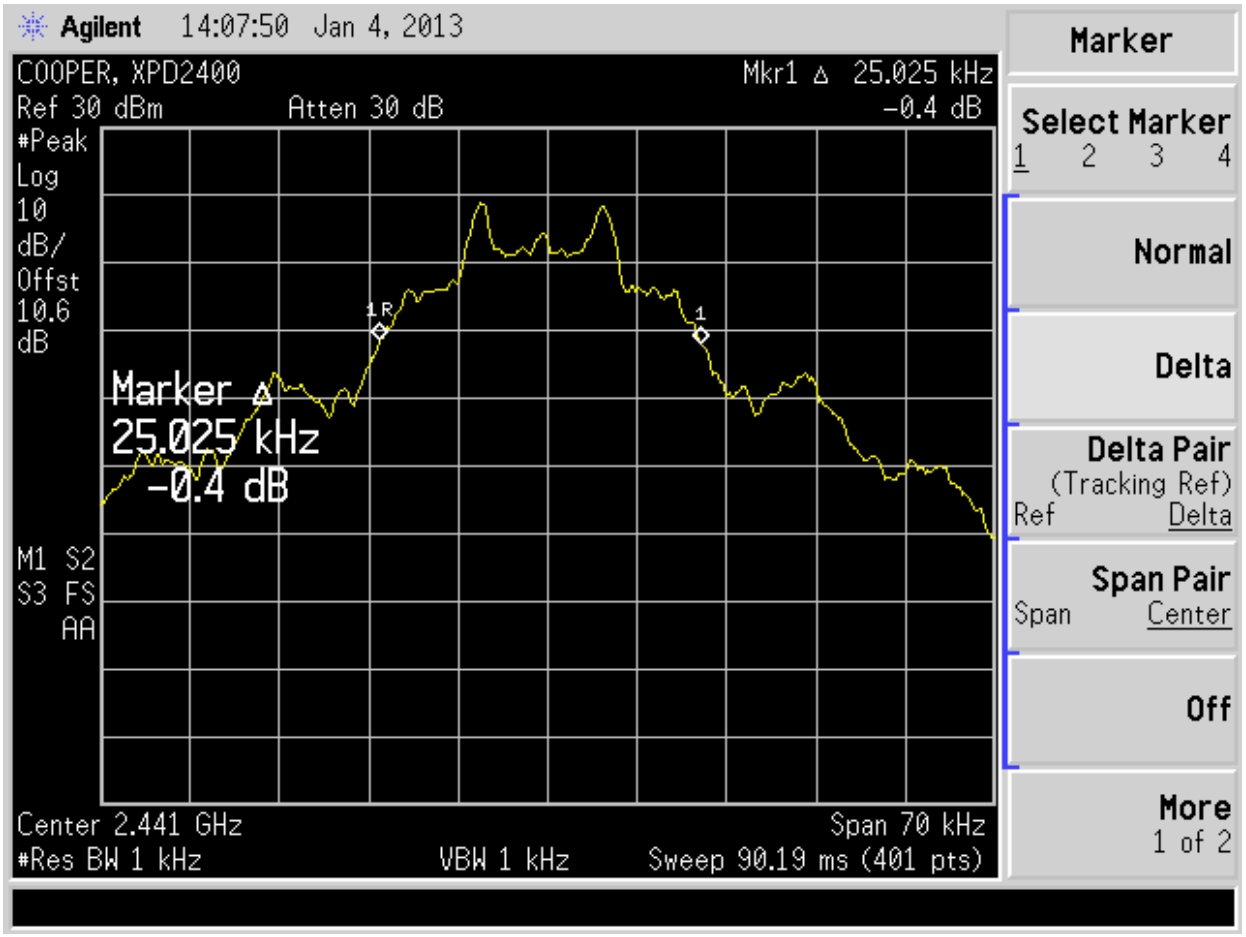
Carrier Frequency(MHz)	20dB BW(kHz)	Limit(kHz)	Pass/Fail
2403.1	25.2	N/A	N/A
2441.4	25.025	N/A	N/A
2479.8	25.7	N/A	N/A

Pass Fail X N/A

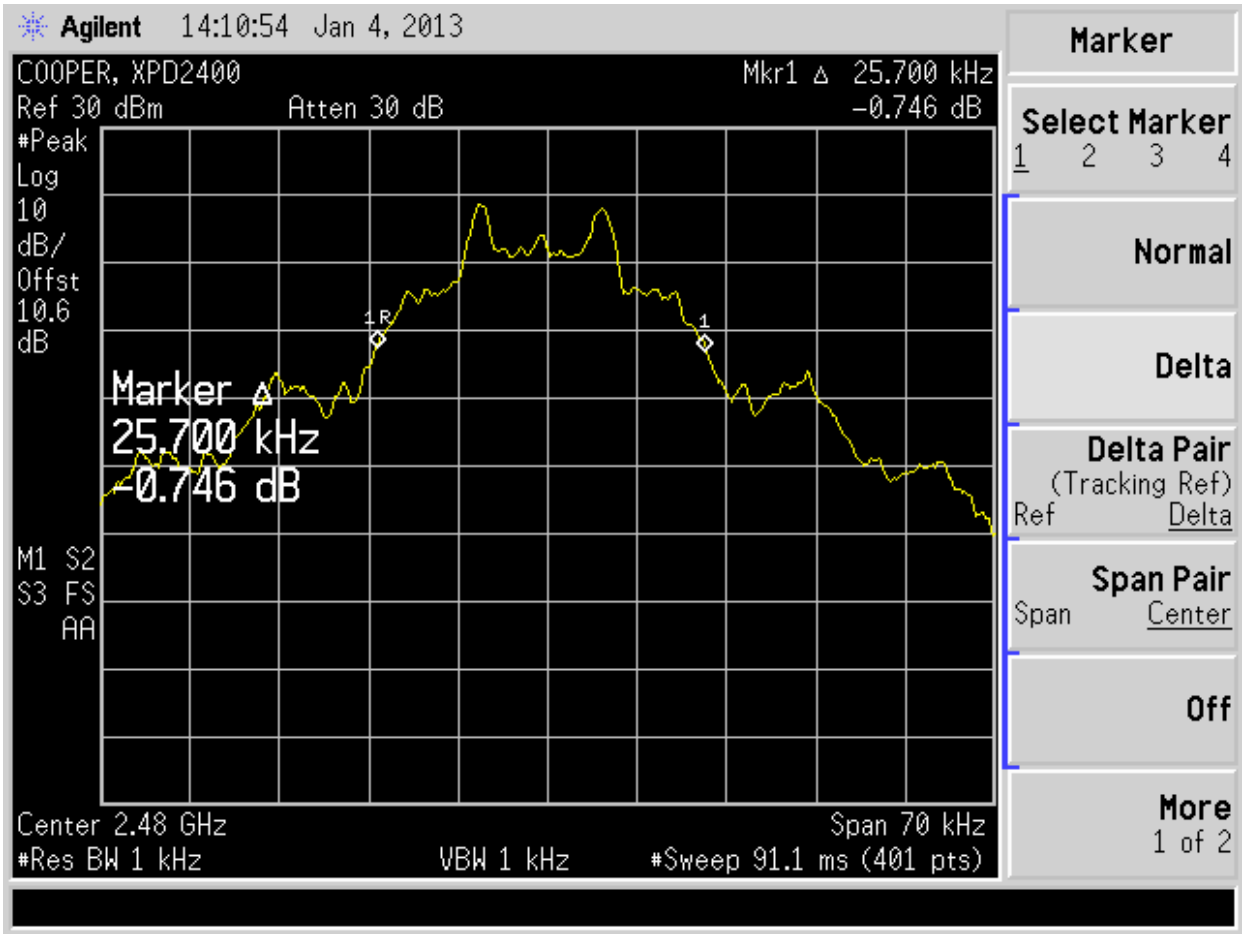
- Channel Separation of Low End; centre frequency is 2403.1 MHz



- Channel Separation of middle, at centre frequency is 2441.4 MHz



- Channel Separation of High End, at centre frequency is 2479.8 MHz



Band-edge Compliance

Temperature	23.4 ℃
Relative Humidity	34.0 %
Barometric Pressure:	102.6 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0284

Test Limits

15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

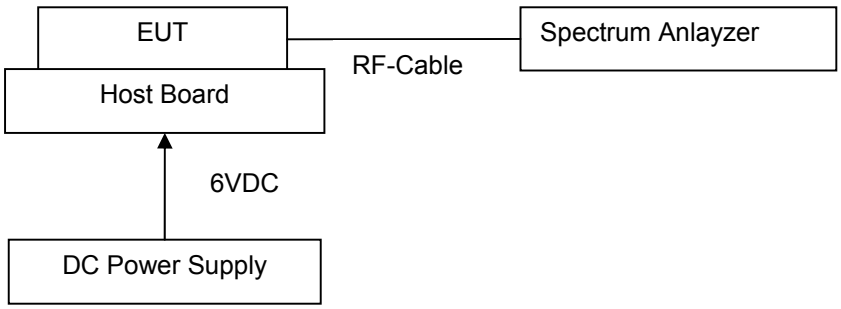
Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

This procedure is applicable for determining compliance at authorized band edges, but not at restricted band edges.

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer via attenuator.
- The transmitter was transmitting at its maximum data rate and maximum power.
- The following measurements were made with
  - Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
  - RBW ≥ 1% of spectrum analyzer display span
  - VBW ≥ RBW
  - Sweep = Auto
  - Detector Function = peak
  - Trace = Max Hold
  - Allowed the trace to stabilize.
- Set the marker on the emission at the bandedge, or on the highest modulation product outside of band, if this level is greater than that at the band edge.
- Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission.
- Now, using the same instrumentation settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

Setup Block Diagram

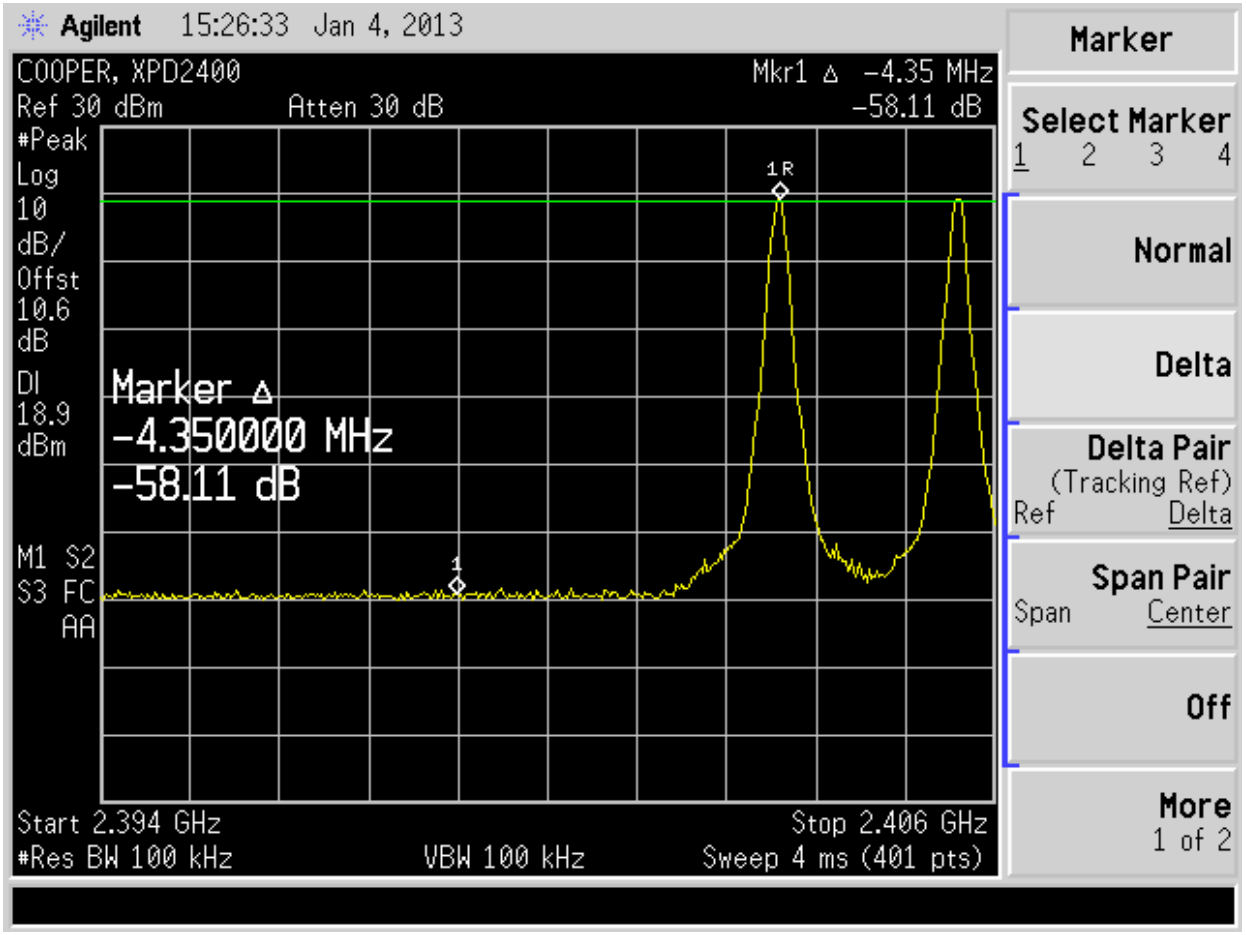


Test Results:

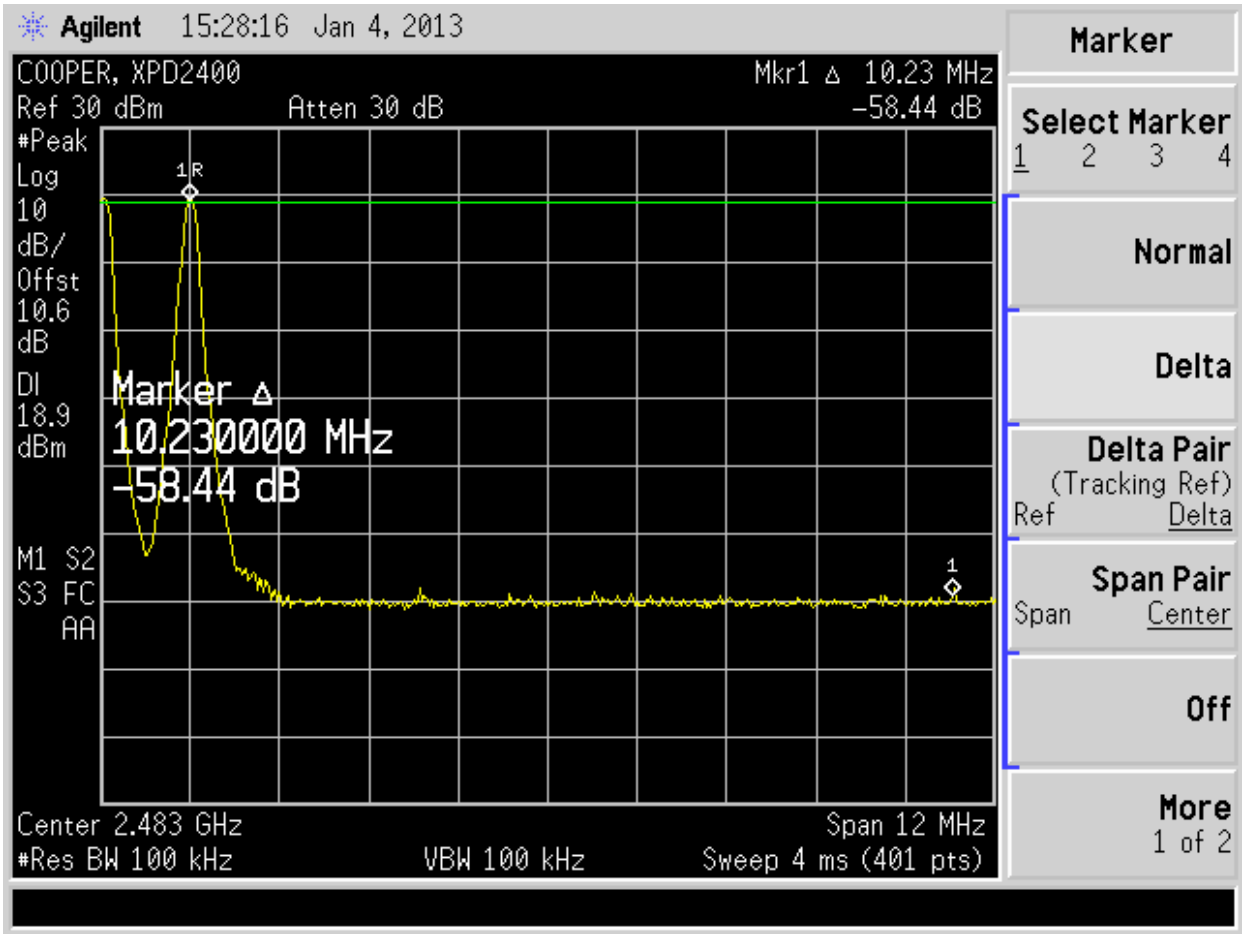
X Pass Fail N/A

Channel Frequency(MHz)	Hopping Mode	Band-edge(dB)	Limit(dB)	Pass/Fail
Low end	No	58.11	≥ 20	Pass
High end	No	58.44	≥ 20	Pass

- Band-edge compliance at low-end, no hopping, the Carrier Frequency is 2403.1 MHz



- Band-edge compliance at High-end, no hopping, the Carrier Frequency is 2479.8 MHz



Conducted Output Power

Temperature	23.4 ℃
Relative Humidity	34.0 %
Barometric Pressure:	102.6 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0248

Test Limits

15.247(b)

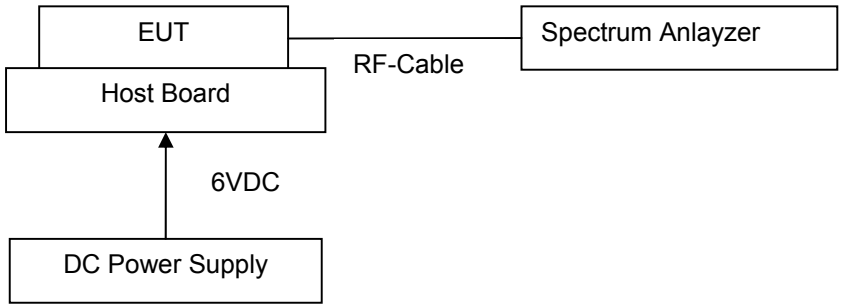
The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer via attenuator.
- The EUT was measured at three differrent transmitting frequencies, low-end, middle, and high-end.
- The transmitter was set-up as its maximum power.
- The following measurements were made with
  - Span = approximately five times the 20 dB BW, centered on a hopping channel
  - RBW > 20dB BW of the emission being measured
  - VBW ≥ RBW
  - Sweep = auto
  - Detector Function = peak
  - Trace = max hold
- Allowed the trace to stabilize.
- Use the marker-to-peak function to set the marker to the peak of the emission.
- The indicated level is the peak conductyed output power(with the addition of the cable loss).

Setup Block Diagram

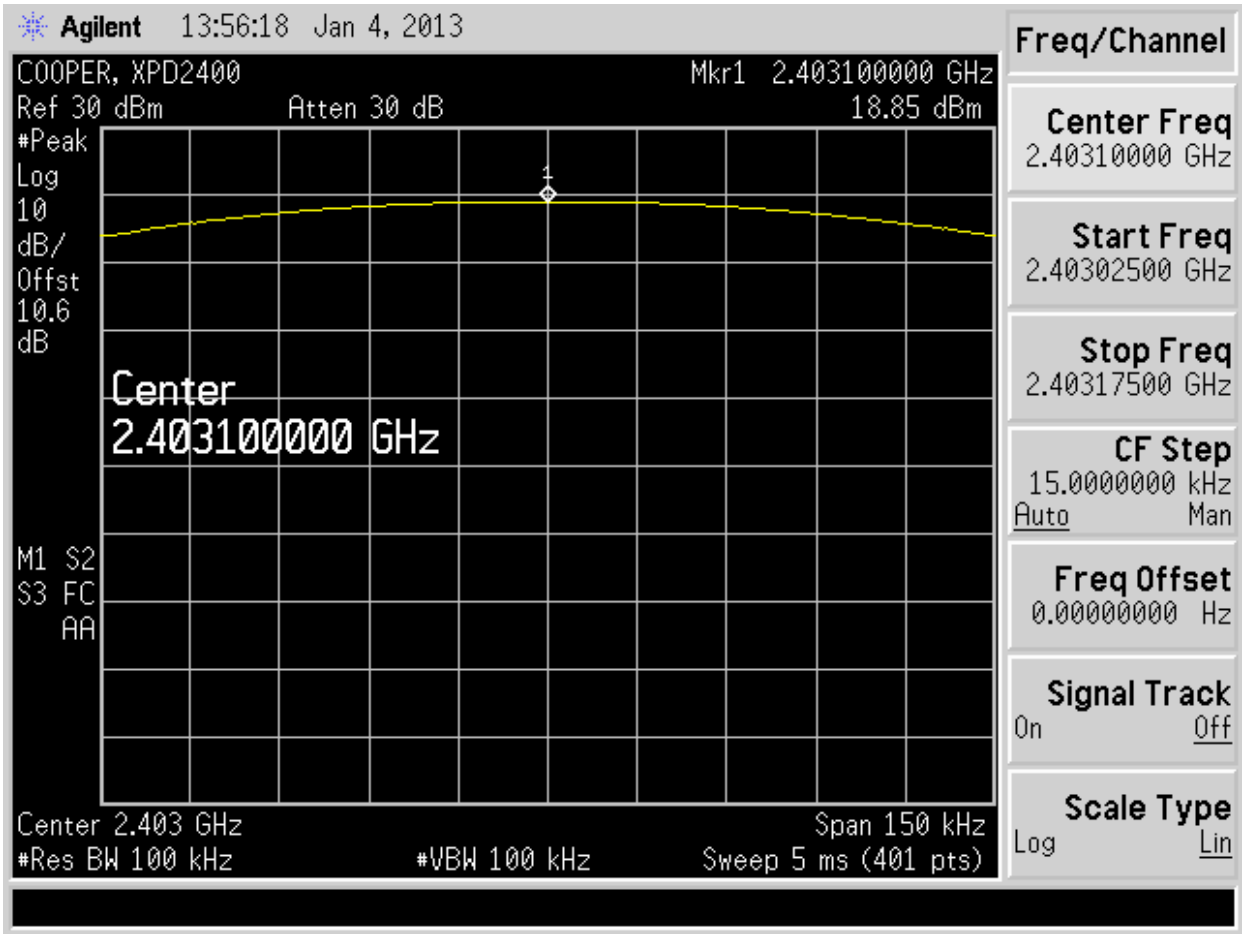


Test Results:

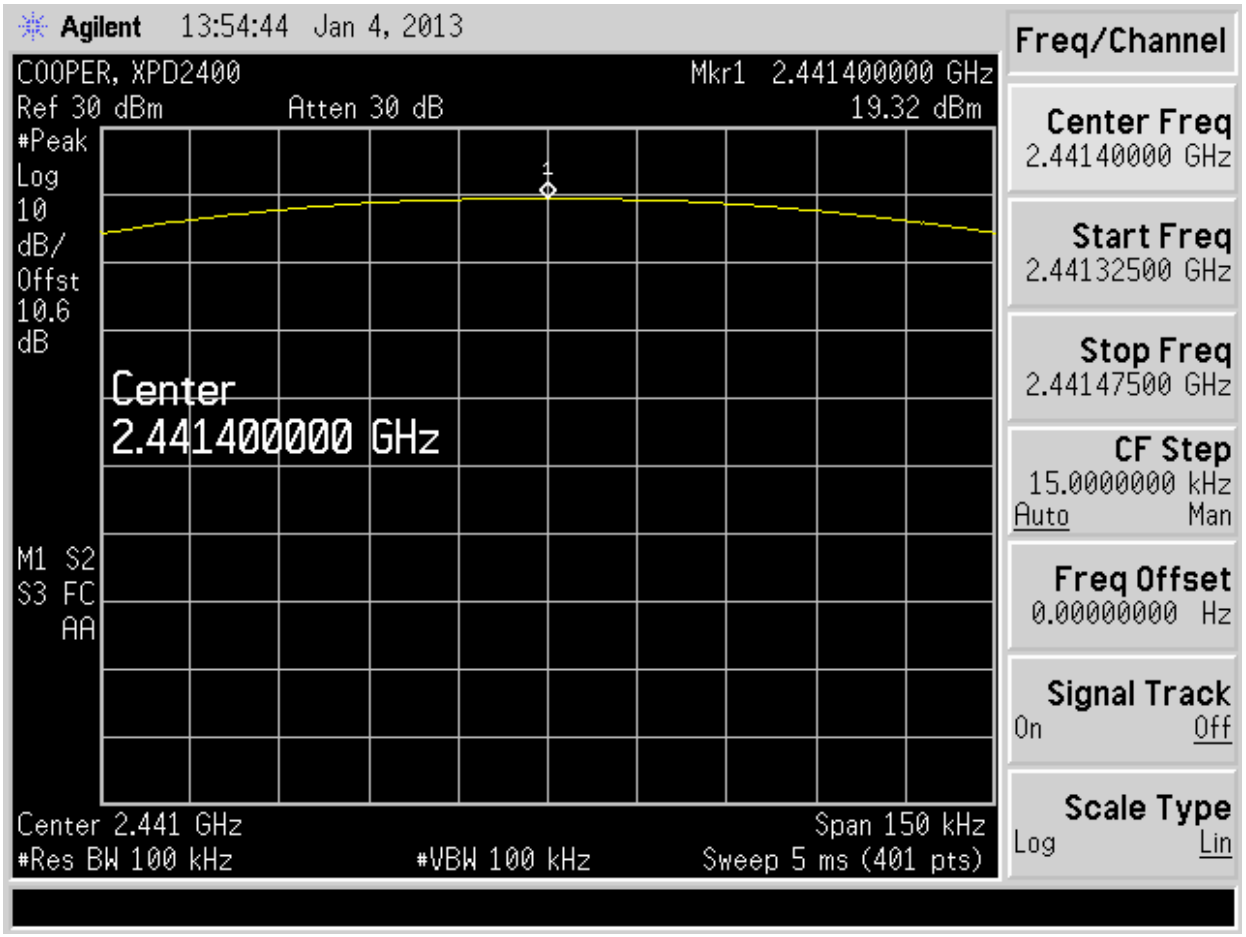
Channel Frequency(MHz)	Peak Power(dBm)	Limit(W/dBm)	Pass/Fail
2403.1	18.85	≤ 0.125 / + 20	Pass
2441.4	19.32	≤ 0.125 / + 20	Pass
2479.8	19.04	≤ 0.125 / + 20	Pass

X Pass Fail N/A

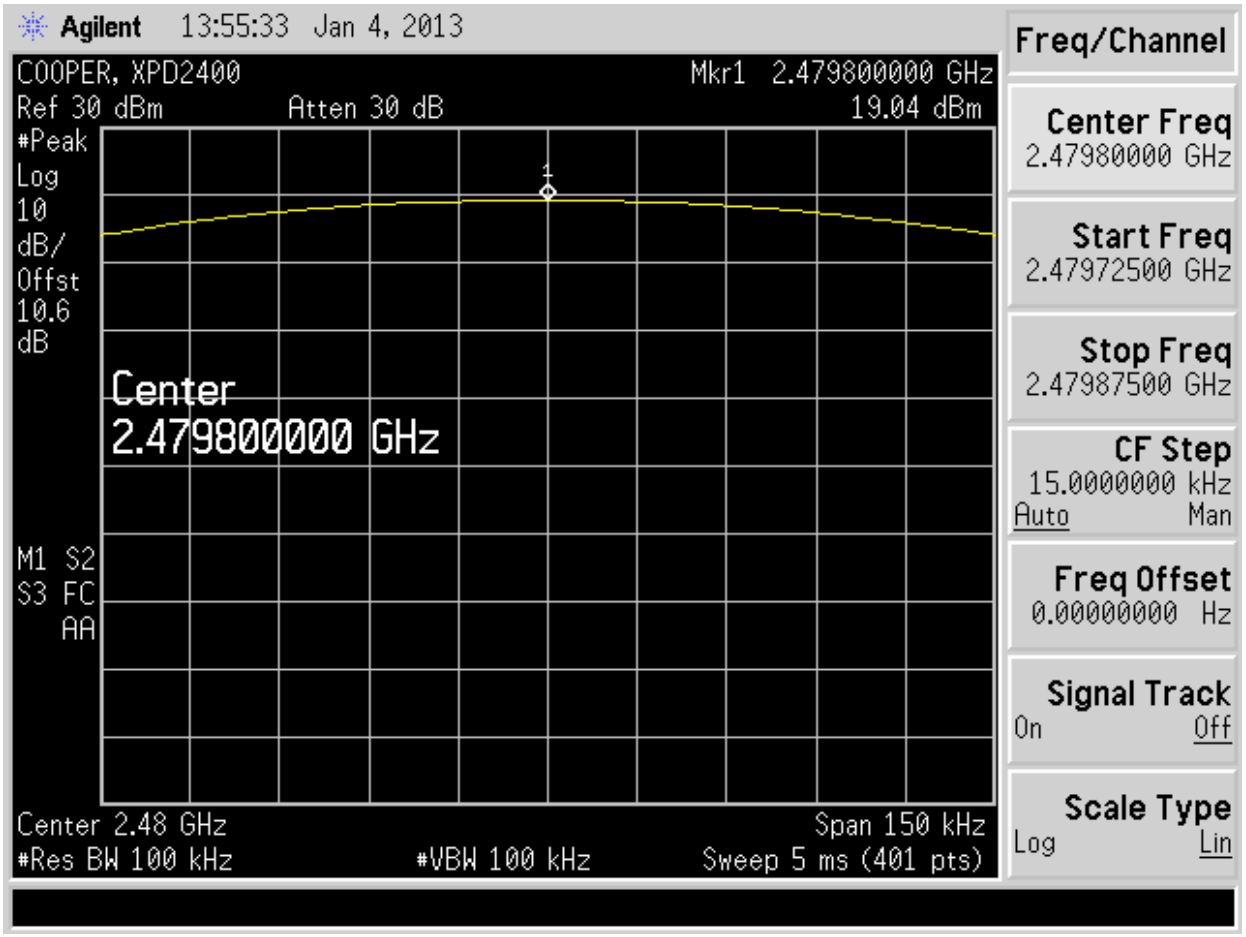
- Conducted maximum power at the Carrier Frequency is 2403.1 MHz



- Conducted maximum power at the Carrier Frequency is 2441.4 MHz



- Conducted maximum power at the Carrier Frequency is 2479.8 MHz



Antenna Gain

Test Date	January 14, 2013
Sample Number	1083157
Tested By	Jeremy Lee

Test Limits

15.247(b)
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi.

Test Results:

Antenna description	Peak Antenna Gain(dBi)	Limit(dBi)	Pass/Fail
Whip Antenna with NMOHF Mount	5 dBi without Cable	≤ 6	Pass

X Pass Fail N/A

Carrier Frequency Separation

Temperature	23.4 ℃
Relative Humidity	34.0 %
Barometric Pressure:	102.6 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0248

Test Limits

15.247(a)

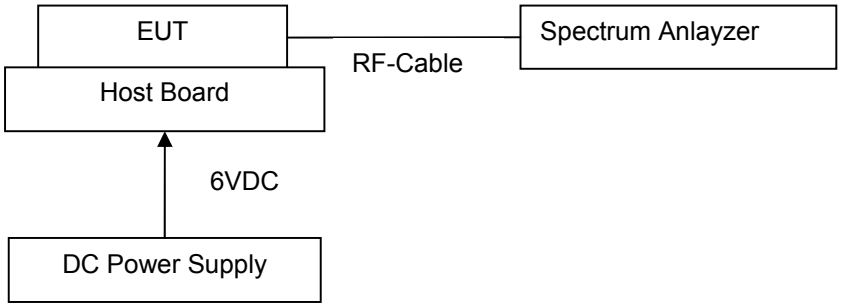
(1) Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer via attenuator.
- The EUT 's hopping function was enabled.
- The transmitter was transmitting at its maximum data rate and power.
- The following measurements were made with
  - Span = wide enough to capture the peaks of two adjacent channels.
  - RBW ≥ 1% of each span
  - VBW ≥ RBW
  - Sweep = auto
  - Detector Function = peak
  - Trace = max hold
  - Allowed the trace to stabilize.
- Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

Setup Block Diagram

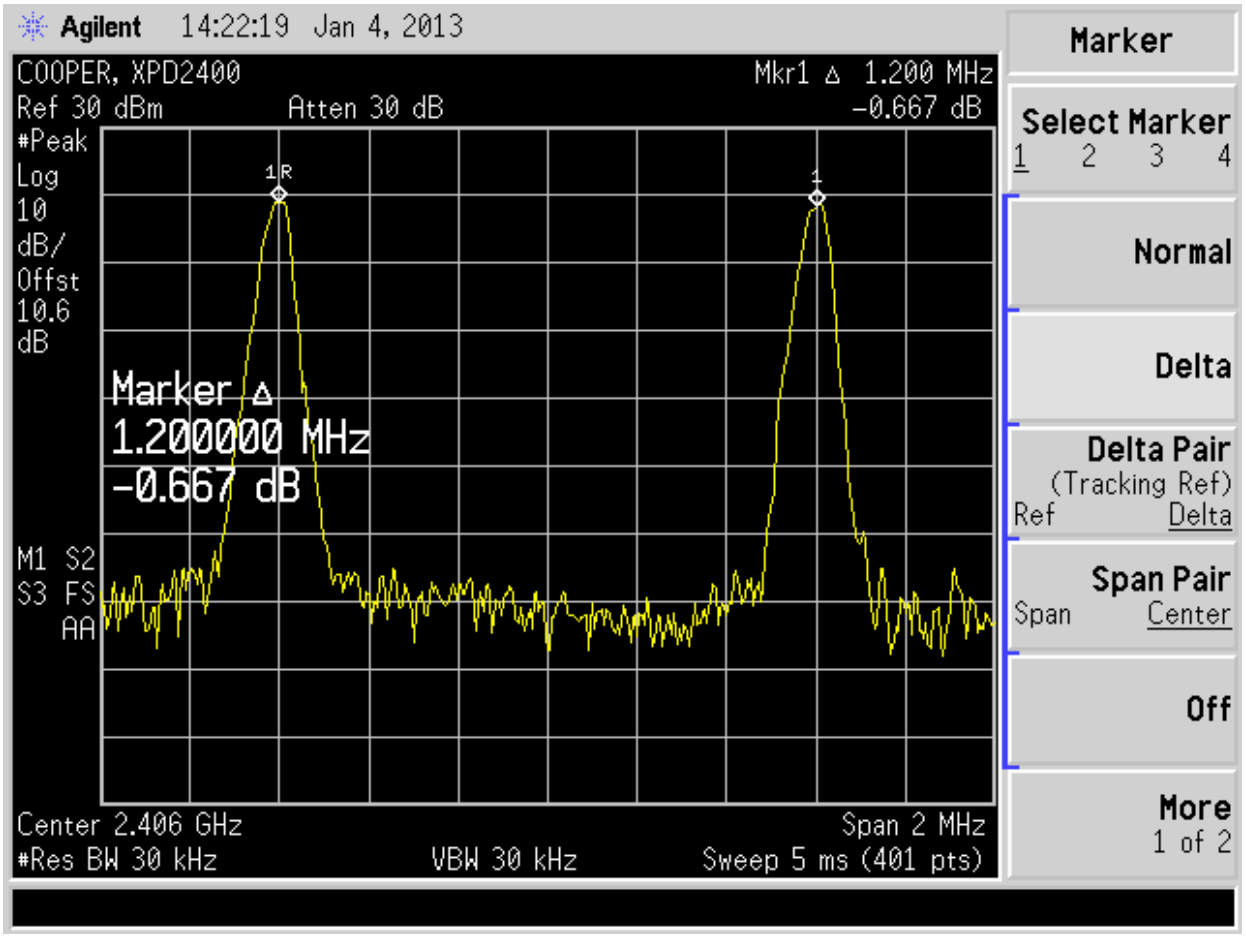


Test Results:

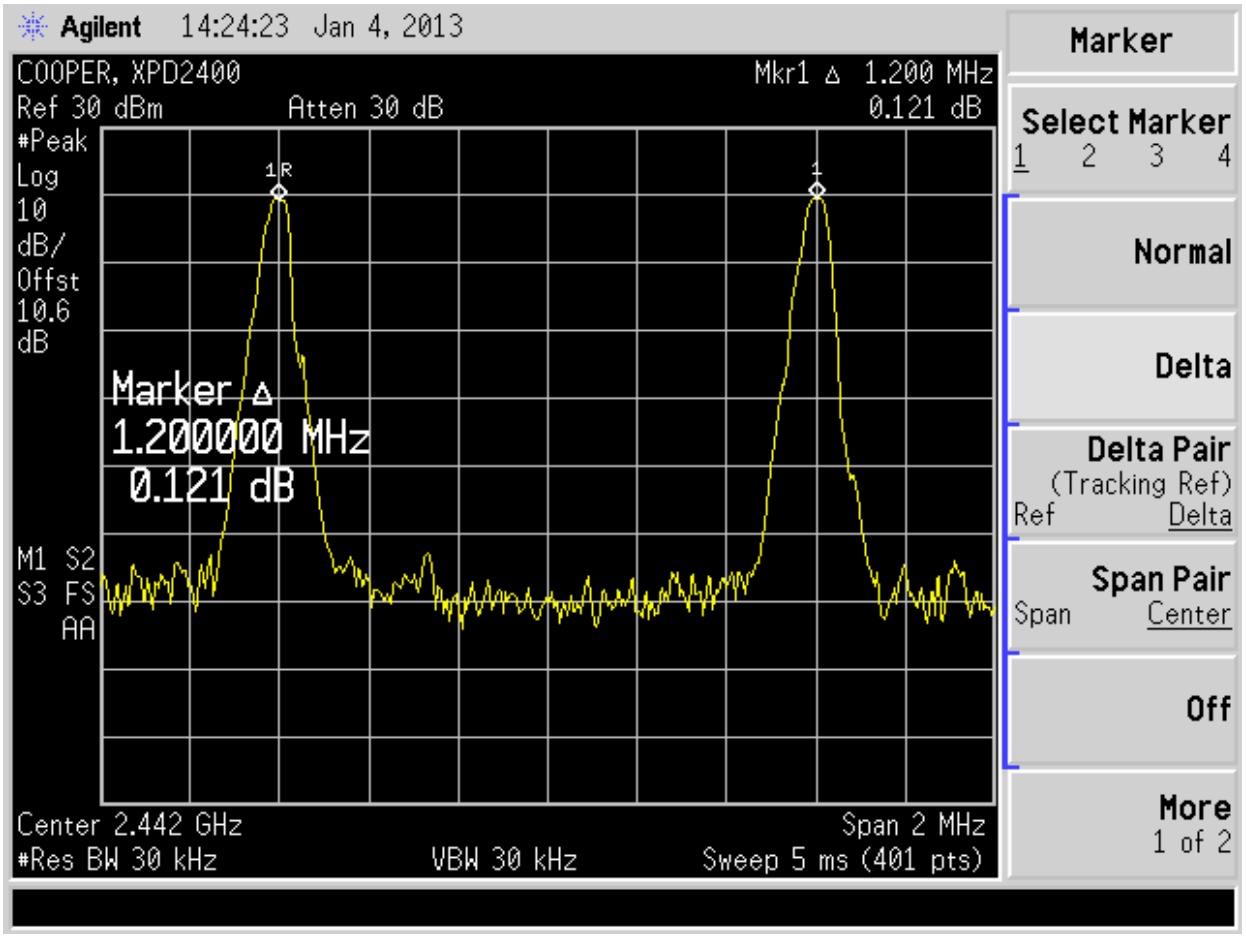
Centre Frequency(MHz)	Carrier Frequency Separation (kHz)	Limit(kHz)	Pass/Fail
2403.1	12,000	≥ 25	Pass
2440.4	12,000	≥ 25	Pass
2479.8	12,000	≥ 25	Pass

X Pass Fail N/A

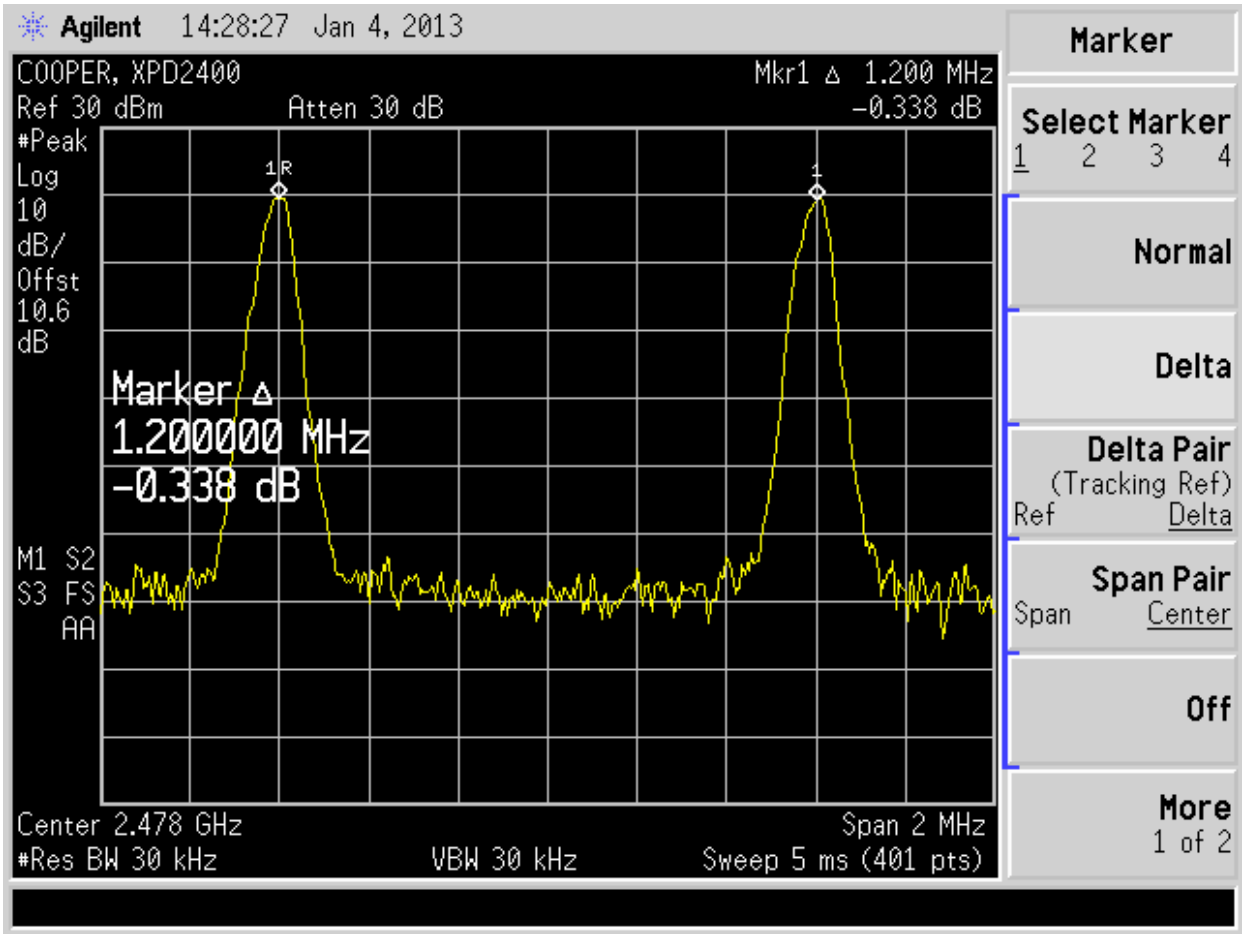
- Carrier Frequency Separation of Low End; centre frequency is 2406 MHz.



- Carrier Frequency Separation of middle; centre frequency is 2442 MHz.



- Carrier Frequency Separation of High End; centre frequency is 2478 MHz.



Number of Hopping Frequencies

Temperature	23.4 ℃
Relative Humidity	34.0 %
Barometric Pressure:	102.6 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0248

Test Limits

15.247(a)(1)

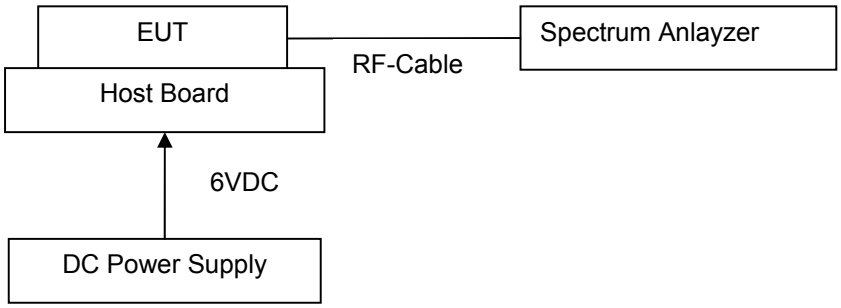
(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer via attenuator.
- The EUT had its hopping function enabled.
- The transmitter was transmitting at its maximum data rate and maximum power.
- The following measurements were made with
  - Span = the frequency band of operation.
  - RBW ≥ 1% of the span
  - VBW ≥ RBW
  - Sweep = auto
  - Detector Function = peak
  - Trace = max hold
  - Allowed the trace to stabilize.
- Count to the peak detected signals.

Setup Block Diagram

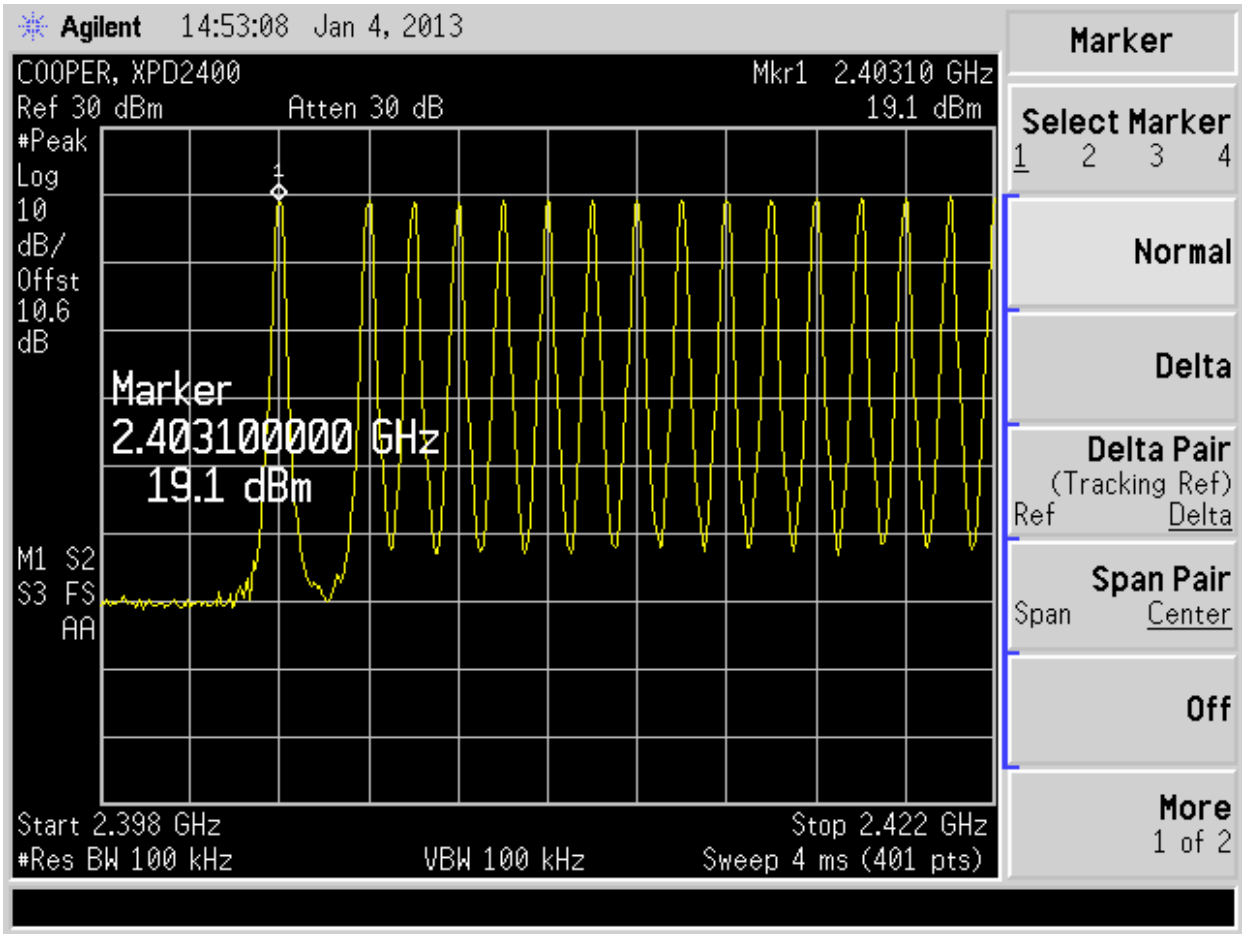


Test Results:

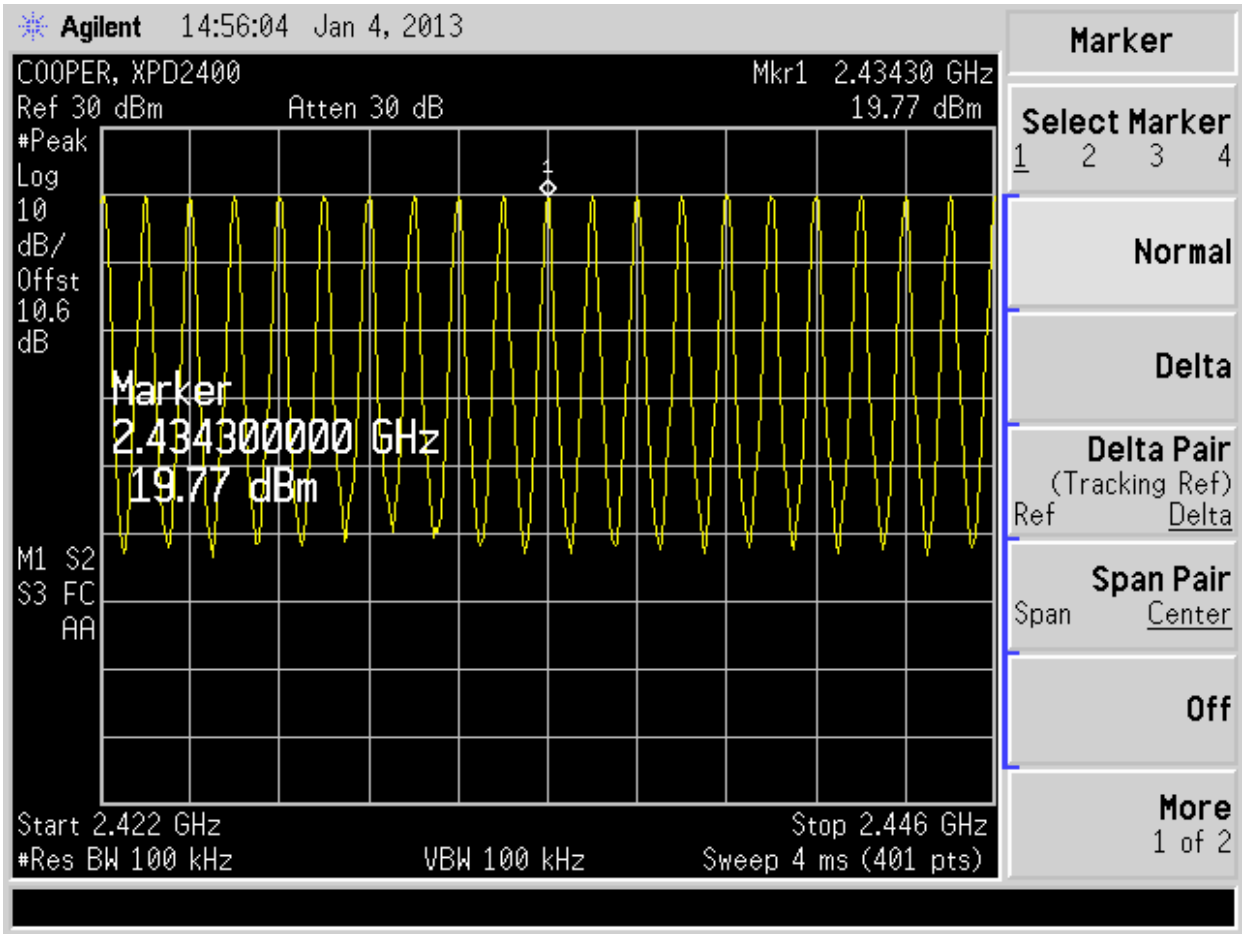
Frequency range (MHz)	Channel Number	Limit	Pass/Fail
2403 to 2480	63	≥ 15	Pass

X Pass **Fail** **N/A**

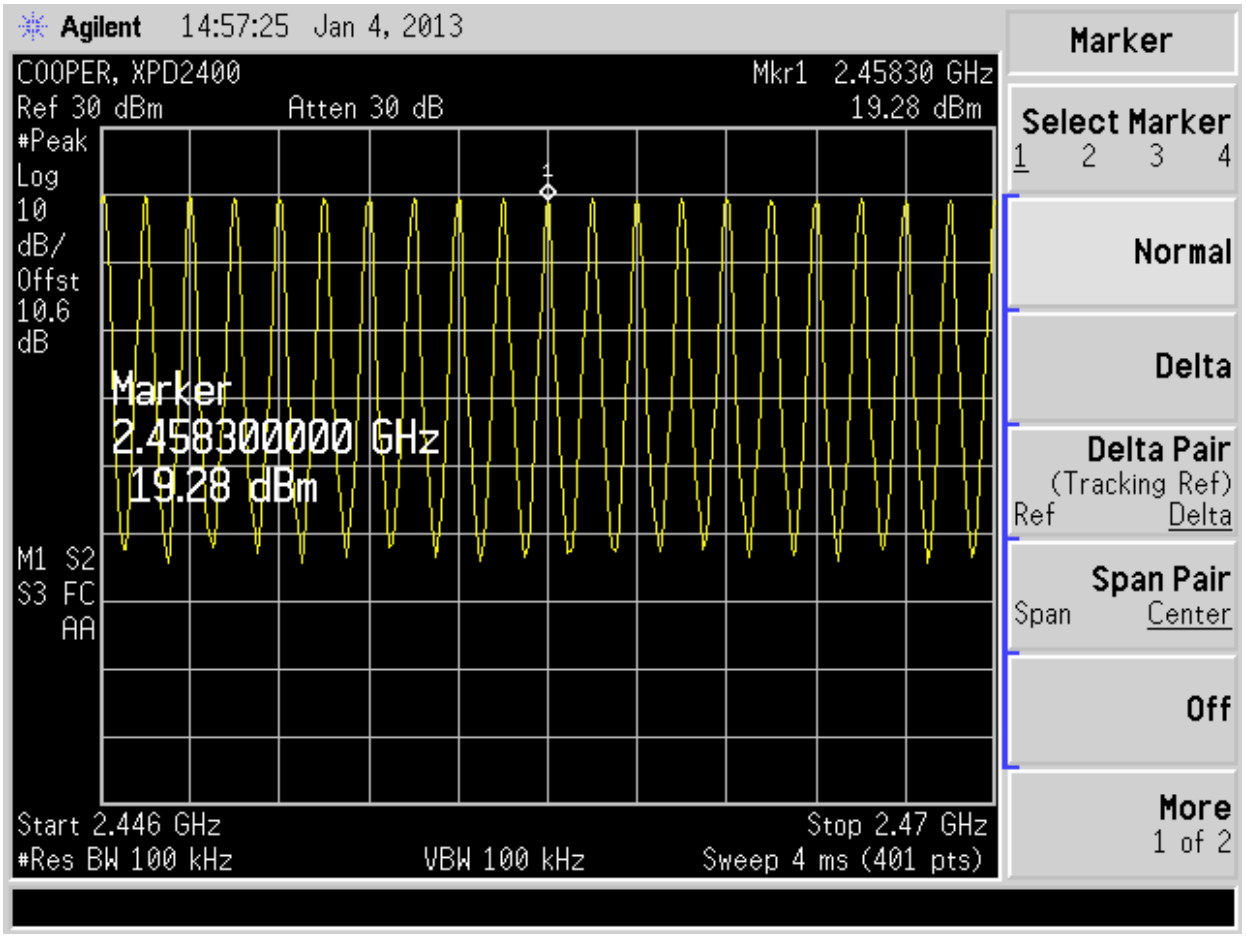
- Number of Channels, plot#1, 16 channels



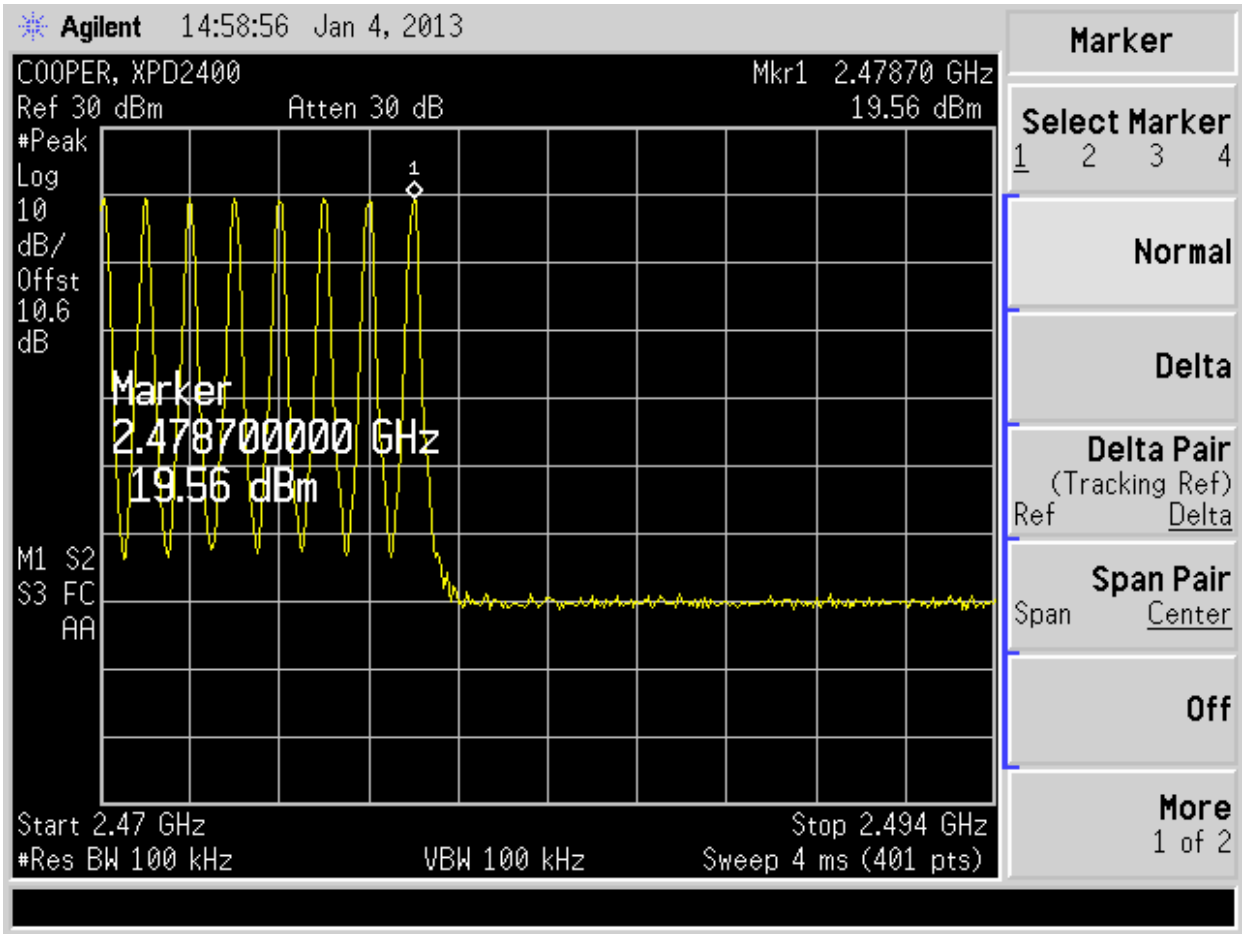
- Number of Channels, plot#2, 20 channels



- Number of Channels, plot#3, 20 channels



- Number of Channels, plot#4, 7 channels



Time of Occupancy (Dwell Time)

Temperature	23.4 ℃
Relative Humidity	34.0 %
Barometric Pressure:	102.6 kPa
Test Date	January 04, 2013
Sample Number	1083157
Calibrated Test Equipment (ID)	266, 272
Reference Equipment (ID) (Calibration not required)	187, N1, N2
Tested By	Jeremy Lee

Use the barometric pressure reported at: http://www.theweathernetwork.com/weather/cabc0248

Test Limits

15.247(a)(1)

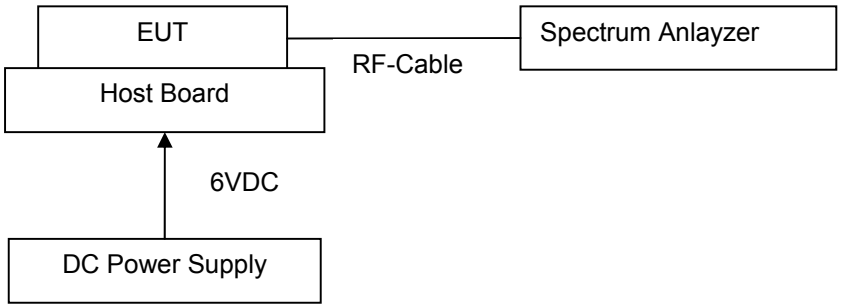
(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Setup

The test was performed in accordance with **FCC 15.247:2010, FCC 15.31:2010 and DA 00-705.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer via attenuator.
- The EUT had its hopping function enabled.
- The transmitter was transmitting at its maximum data rate and maximum power.
- The following measurements were made with
  - Span = zero span, centered on a hopping channel.
  - RBW = 1MHz
  - VBW ≥ RBW
  - Sweep = as necessary to capture the entire dwell time per hopping channel
  - Detector Function = peak
  - Trace = max hold
- Use the marker function to determine the dwell time.
- Repeat this test for each different mode of operation (data rate, modulation format, etc.)
- The Dwell Time is the delta reading in time between two markers multiplied by the number of times they appearance in 25.2 sec (25.2 sec is 0.4s times 63 channels).

Setup Block Diagram



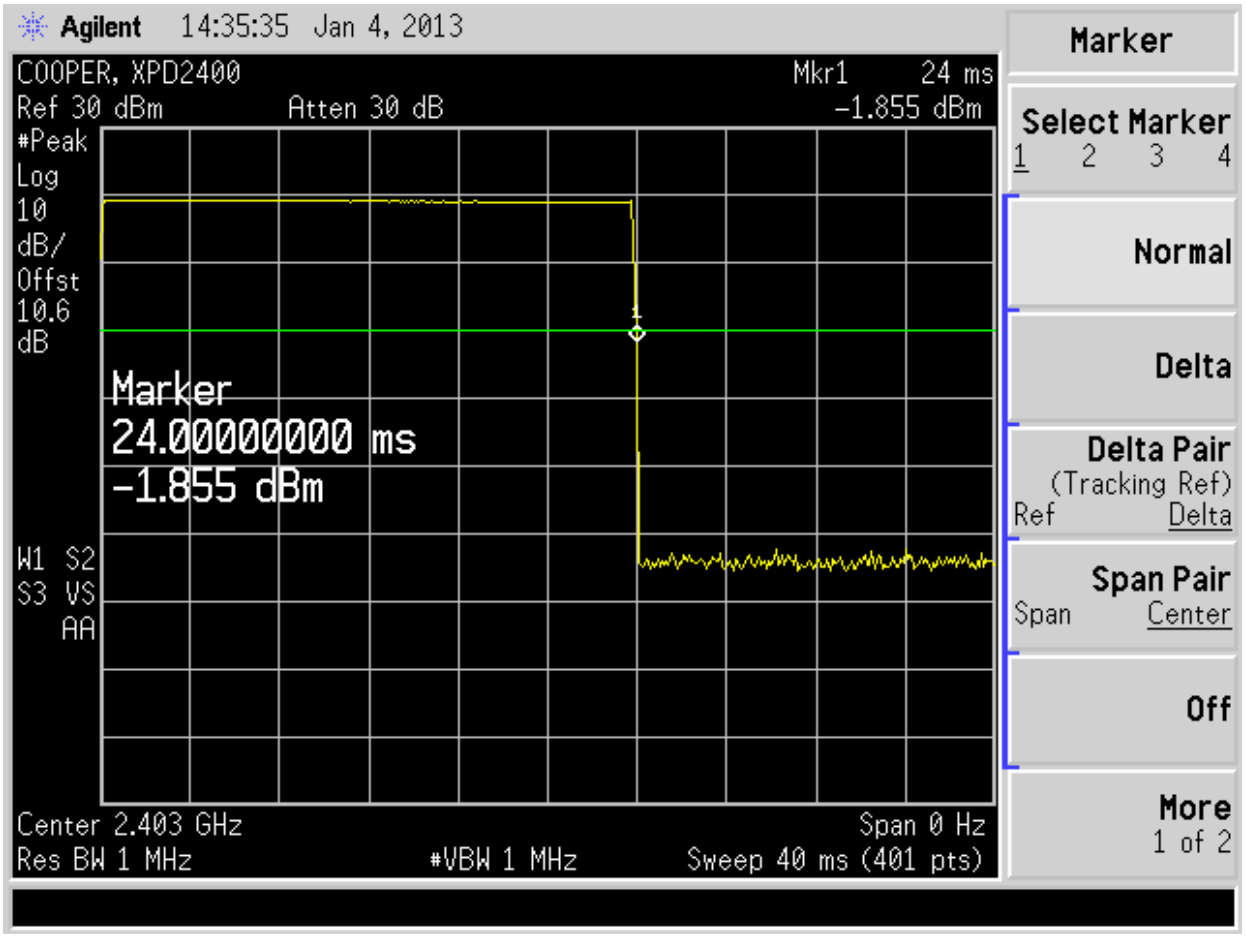
Test Results:

Channel Frequency(MHz)	Dwell Time (ms)	Limit(ms)	Pass/Fail
2403.1	192 [1)]	< 400	Pass
2441.4	192 [1)]	< 400	Pass
2479.8	192 [1)]	< 400	Pass

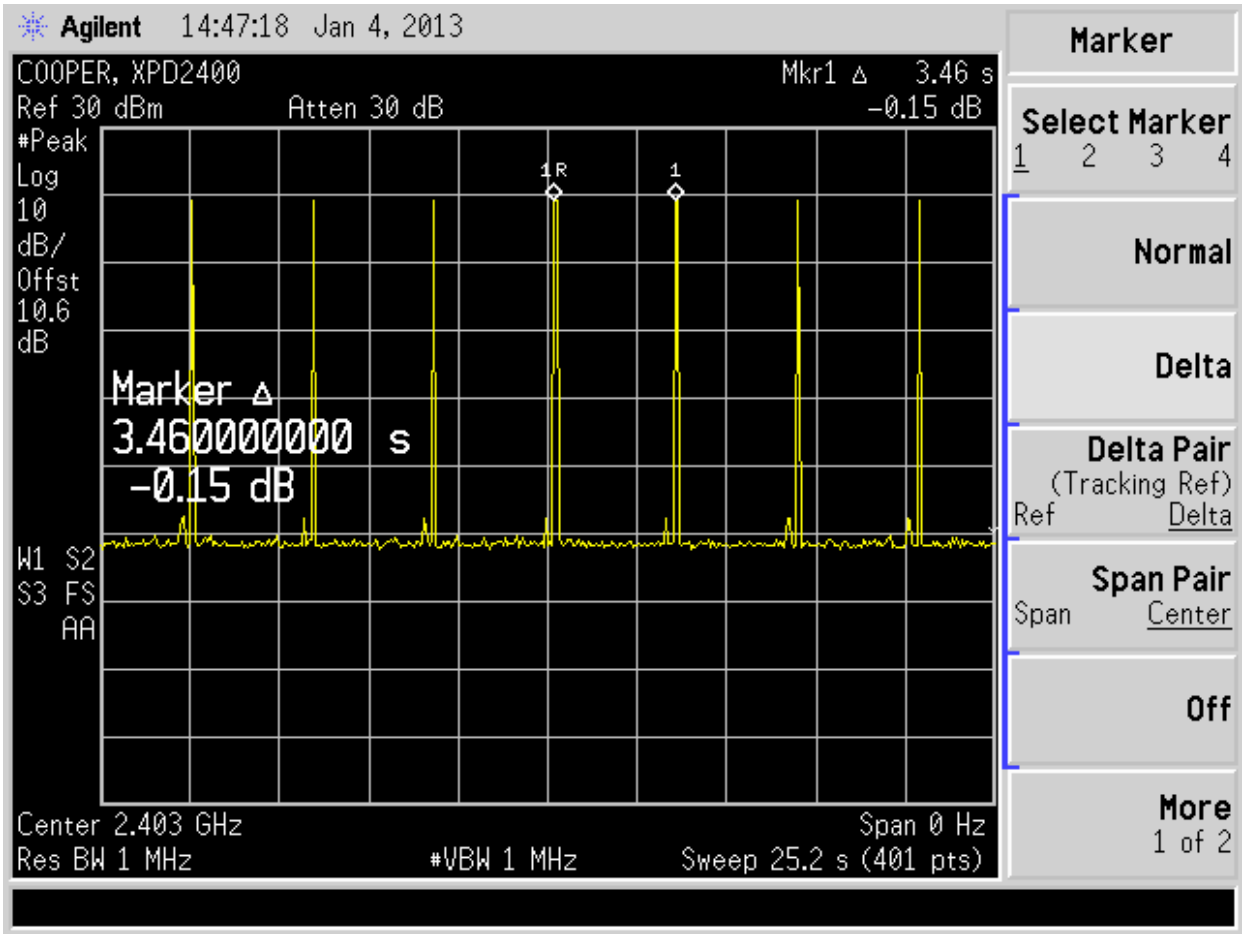
Note 1) In 25.2 second of monitoring time, it is able to detect maximum 8 times of hopping. The dwell time was detected by 8 times 24ms, on time of one single hopping channel.

X Pass Fail N/A

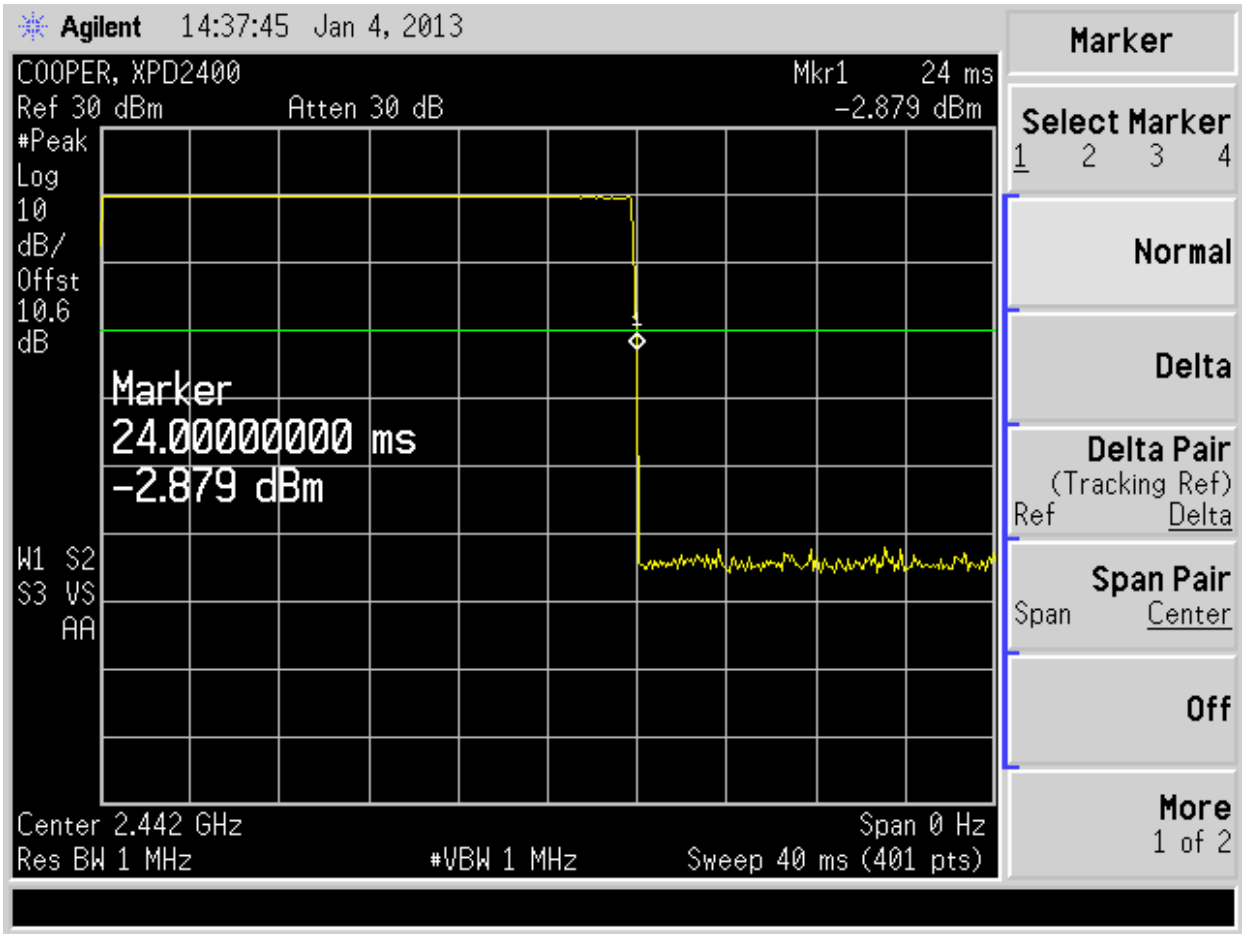
- Dwell time of low end; carrier frequency is 2403.1 MHz.



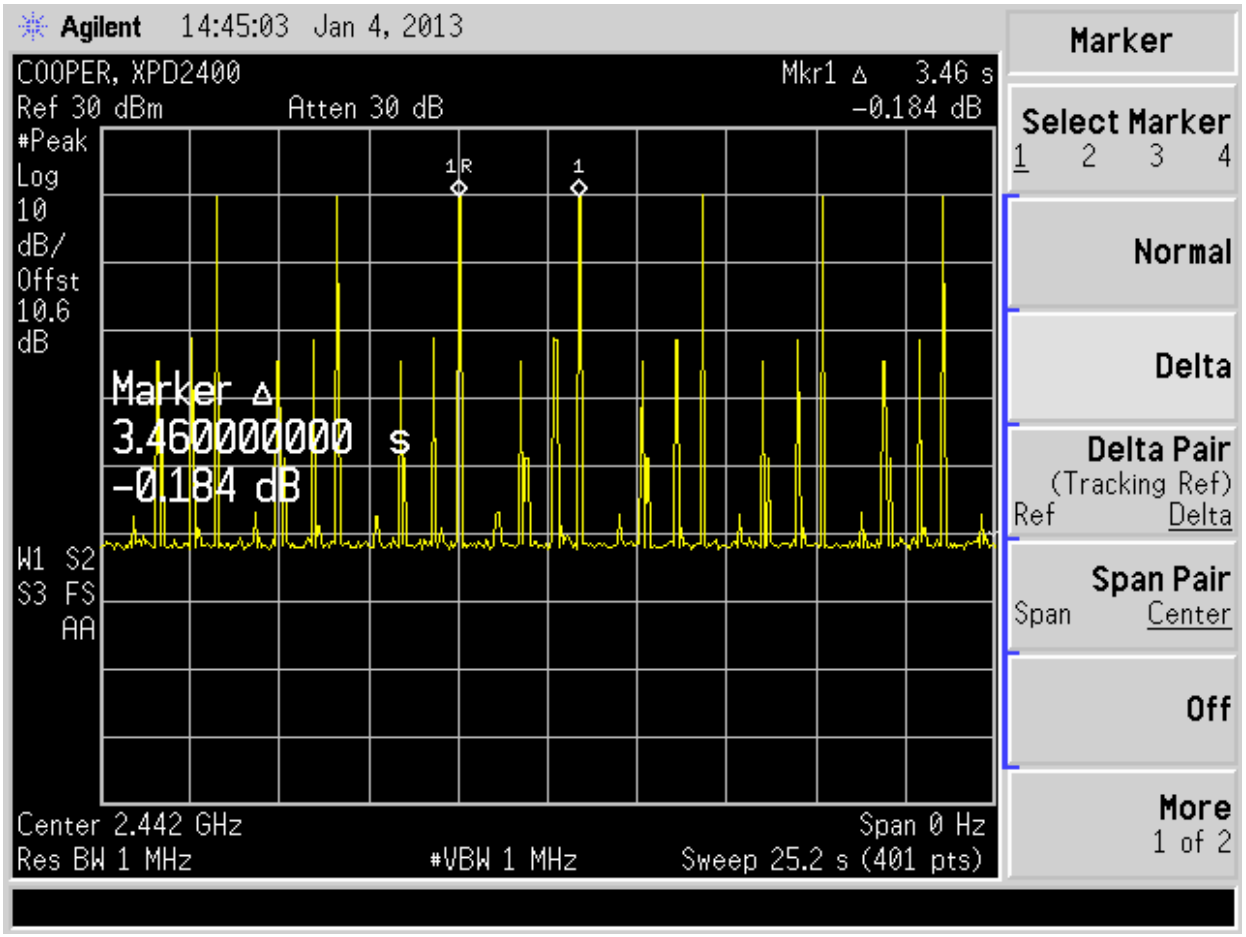
- Channel appearance of low end in 25.2 seconds; carrier frequency is 2403.1 MHz.



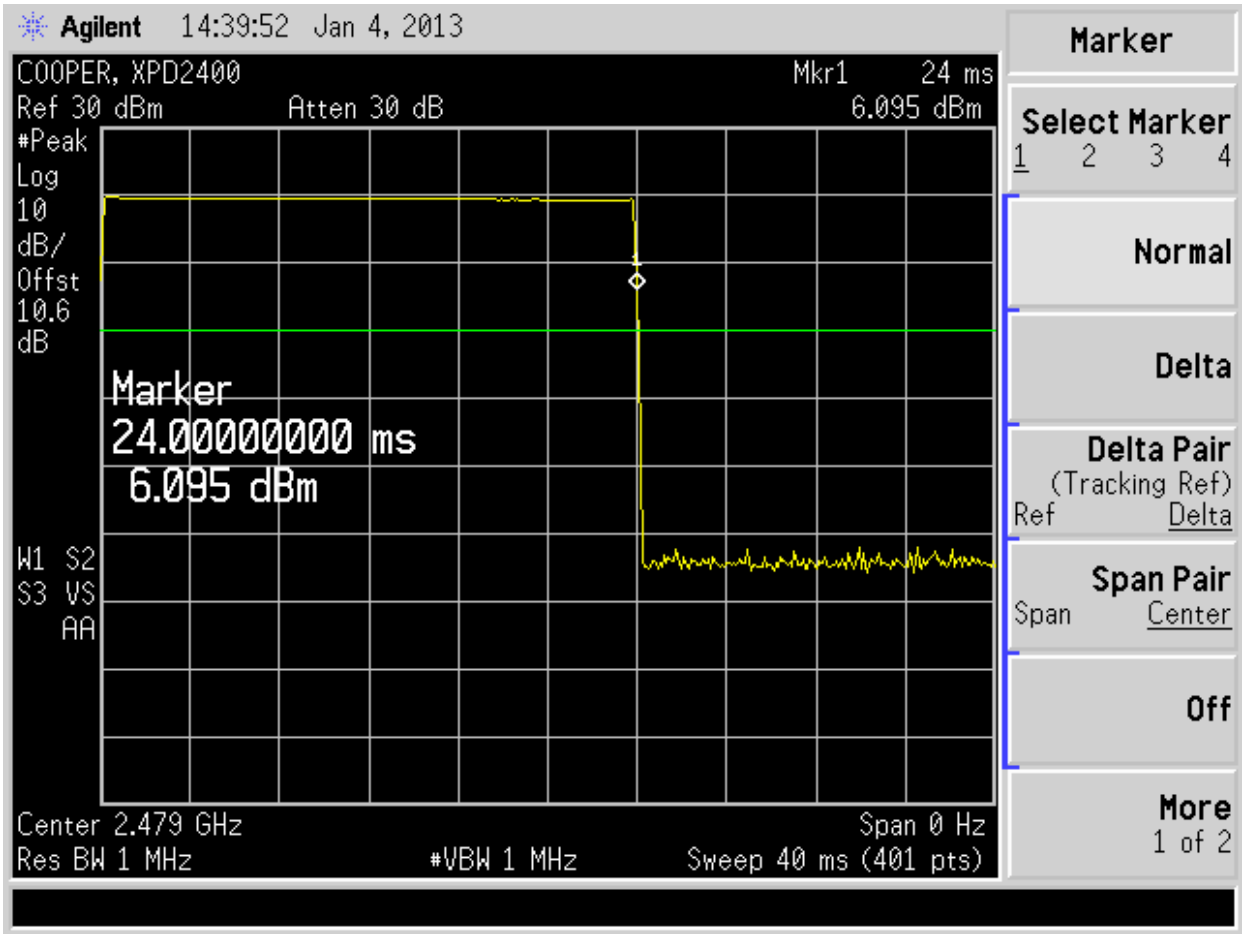
- Dwell time of middle; channel frequency is 2441.4 MHz.



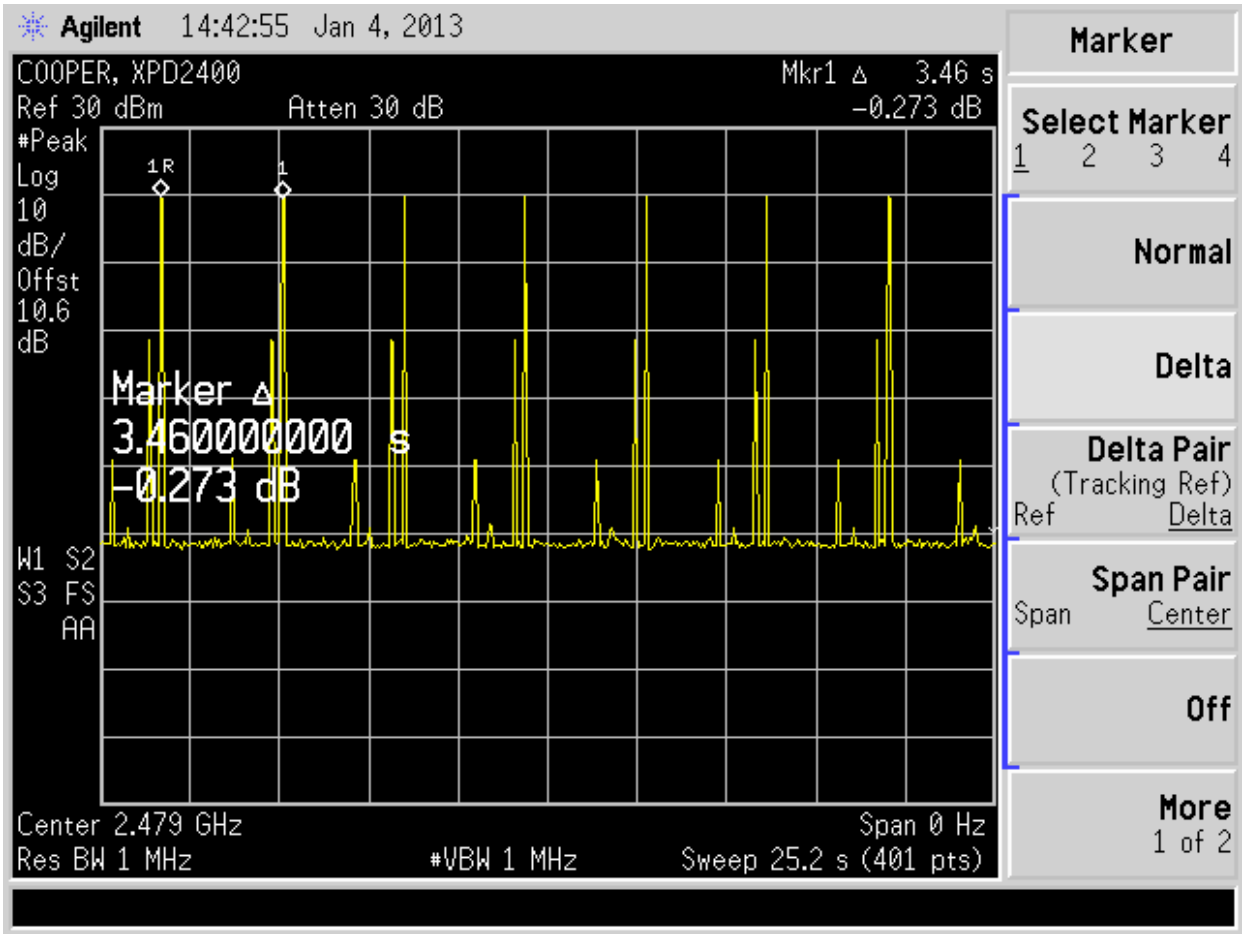
- Channel appearance of middle in 25.2 seconds; carrier frequency is 2441.4 MHz.



- Dwell time of high end; channel frequency is 2479.8 MHz.



- Channel appearance of High end in 20 seconds; carrier frequency is 2479.8 MHz.



Pseudorandom frequency-hopping sequence

Test Date	January 14, 2013
Sample Number	1083157
Tested By	Jeremy Lee

Test Limits

FCC15.247(a)(1)
The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

Test Results

The XPD2400 is a frequency hopping spread spectrum (FHSS) transceiver module designed to be compatible with FCC Part 15.247 (US) and RSS-210 (Canada) regulations for license free operation in the 2400MHz frequency band. The major elements include a frequency agile, RF transmitter and receiver, a chip radio for baseband processing and a microcontroller that commands the chip radio and manages the protocol. Packets of telemetry and control data are transmitted to, and received from, a mating XPD2400 transceiver module.
At each frequency hop one packet is sent by the master unit and one packet is expected to be received. A slave unit performs the mirror operation, at each hop it receives one packet and it may transmit another packet if it has data to be transmitted. The chip radio generates the baseband waveforms and detects the data from the received baseband samples. The microcontroller generates a pseudo random frequency hop sequence of length 63 based on a memorized table. The band is utilized in equally spaced 100 kHz channels.

X Pass **Fail** **N/A**

Equal Hopping Frequency Usage

Test Date	January 14, 2013
Sample Number	1083157
Tested By	Jeremy Lee

Test Limits

FCC15.247(a)(1)
Each frequency must be used equally on the average by each transmitter.

Test Results

The XPD2400 transceiver module operates on 63 channels with central frequencies between 2.4031 and 2.4799 GHz. These 768 channels, spaced at 100 kHz, are divided into 12 groups consisting of 64 frequencies and each radio is configured to hop in one of these 12 groups. In order to link, radios must be configured to operate in the same group.
Out of 64 frequencies, 63 frequencies are used equally in a pseudo random sequence. The hop sequence is a sequence of 63 numbers randomly generated with a proprietary algorithm. The unique ID number of the transmitter is used as a seed to the random number generator. The random number generator creates a list of 63 channels from the 63 available channels. This list of 63 channels is used to lookup in the frequency table to determine the next frequency.

X Pass **Fail** **N/A**

System Receiver Input Bandwidth

Test Date	January 14, 2013
Sample Number	1083157
Tested By	Jeremy Lee

Test Limits

FCC15.247(a)(1)
The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Results

In receive mode, the signal presented at the antenna connector is filtered through the low pass filters (LPF1). The signal then passes through a switch (RF_SW1), is filtered through a 2.4 GHz band-pass filter (BPF1) and amplified by a low noise amplifier (LNA1). The output of the LNA1 is filtered by the image reject filter (BFP2) and then sent to the down converting mixer (MIX1) where the signal is frequency translated to 243MHz. The LO is generated by an integrated synthesizer and VCO (SYNTH1) which is referenced by a 16 MHz VCTCXO1. The down converted signal is filtered for spurious by (BPF3) and then fed to the ADF7021 (integrated transceiver) for demodulation and baseband processing. The data is then transferred from the ADF7021 to the microcontroller so it can be passed outside the module via a serial interface.
In transmit mode, the data is received from the serial interface, transferred to the microcontroller and sent to the ADF7021 for baseband processing and modulation. The ADF7021 generates a 243 MHz IF signal which is sent to the up converting chip (MIX2) where it is up converted to RF and amplified. The LO is generated by an integrated synthesizer and VCO (SYNTH1) which is fed by a 16 MHz VCTCXO1. The RF signal is filtered for spurious (BPF4 and BPF5) and amplified by a pre-driver (AMP2) so that the signal delivered to the PA has a power of about 0 dBm. The output of the pre-driver (AMP2) is sent to the PA whose output power is controlled by the voltage of the power line PA_PWR. The voltage is controlled by the microcontroller via DAC1. The PA output is passed through a switch (RF_SW1) filtered by LPF1 and sent to the antenna connector. See schematic diagram.

The transmitter over the air data rate is 10.4 kbps.

X Pass **Fail** **N/A**

RF Exposure (SAR)

Test Date	January 14, 2013
Sample Number	1083157
Tested By	Jeremy Lee

Test Limits

FCC15.247(i)

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. *See* § 1.1307(b)(1) of this chapter.

FCC1.1310

The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of § 2.1093 of this chapter. Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, ''Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation.''

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Included are calculations that determine the minimum distance from the transmitter antenna that will ensure an exposure limit at or below the guidelines given in Table 1 of Section 1.1310 for the general population. The formula for these calculations are taken from OET Bulletin 65, edition 97-01, August 1997; "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".

Calculations

Per Table 1 of Section 1.1310, the limit for General Population/Uncontrolled Exposure at 2400 to 2483.5MHz is 1 mW/cm^2.
Per OET Bulletin 65, Edition 97-01, the formula for calculating power density is: $S=P*G/4\pi d^2$ with:

Given

E=√(30*P*G)/d

and

S=E^2/3770

where

E=Field Strength in Volts/meter
P=Power in Watts
G=Numeric antenna gain
D=Distance in meters
S=Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

d=√ ((30*P*G)/(3770*S)

Changing to units of Power to mW and Distance to cm, using:

P(mW)=P(W)/1000 and
D(cm)=100*d(m)

yields

d=100*√30*(P/1000)*G)/(3770*S))
d=0.282*√(P*G/S)

where

d=distance in cm
P=Power in mW
G=Numeric antenna gain
S=Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P(mW)=10^(P(dBm)/10) and
G(numeric)=10^(G(dBi)/10)

yields

d=0.282*10^((P+G)/20)/ √S Equation(1)

where

d=MPE distance in cm
P=Power in dBm
G=Antenna Gain in dBi
S=Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

Limits

From §1.1310 Table 1 (B), S= 1.0 mW/cm^2

Results

No non-compliance noted:

Channel Frequency(MHz)	Power Density Limit (mW/cm^2)	Output Power (dBm)	Gain of Antenna (dBi)	MPE distance (cm)
2403.1	1.0	18.85	5	4.39
2440.4	1.0	19.32	5	4.64
2479.8	1.0	19.04	5	4.49

Conclusion

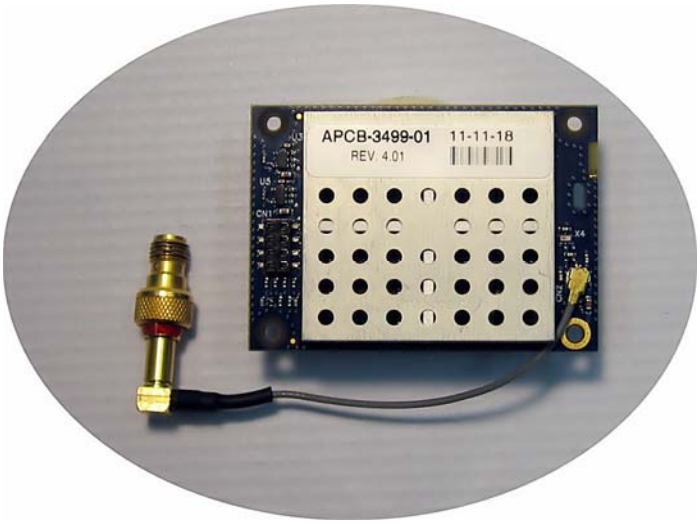
For mobile or fixed location transmitters, the minimum separation distance is 20cm, even if calculations indicate that the MPE distance would be less. Therefore, the minimum safe distance has to be inserted in the EUT's User Manual.

APPENDIX A: Test Equipment Used

ID No.	Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due Date	Calibration Certificate No:	Calibration Laboratory
124	Pre-Amplifier	Com-Power	PA-103	161118	N/A	N/A	N/A	N/A
137	30dB Attenuator	BIRD	150-FSA-FFN-30	N/A	N/A	N/A	N/A	N/A
187	DC Power Supply	BK Precision	1670A	N961316871	N/A	N/A	N/A	N/A
227-3	Horn Antenna	A.H. Systems	SAS-571	936	12-Jul-2012	12-Jul-2014	2012062215	Liberty Labs
227-4	Horn Antenna	A.H. Systems	SAS-572	233	12-Jul-2012	12-Jul-2014	2012062215	Liberty Labs
241	Active Loop Antenna	AL-130	Com-Power	17075	01-Nov-2011	01-Nov-2013	071075A	Com-Power
266	Humidity/ Temperature Logger	Onset HOBO	U14-001	2436907	02-Jan-2013	02-Jan-2014	345135	Wescan
272	EMC Analyzer	Agilent	E7405A	US41110263	11-May-2012	11-May-2013	1-4321111743-1	Agilent
273	RF Preamplifier	Agilent	8449B	3008A02264	28-Mar-2012	28-Mar-2013	2008120104207	Micro Precision
371	EMC Broadband Antenna	Sunol	JB1	A022012	07-Mar-2012	07-Mar-2014	2012022808	Liberty Labs
374	EMC Shielded Enclosure	USC	USC-26	111811	N/A	N/A	N/A	N/A
N1	Coaxial RF Cable	HP	11500F	N/A	N/A	N/A	N/A	N/A
N2	10dB Attenuator	Mini-circuits	UNAT-10+	15542	N/A	N/A	N/A	N/A

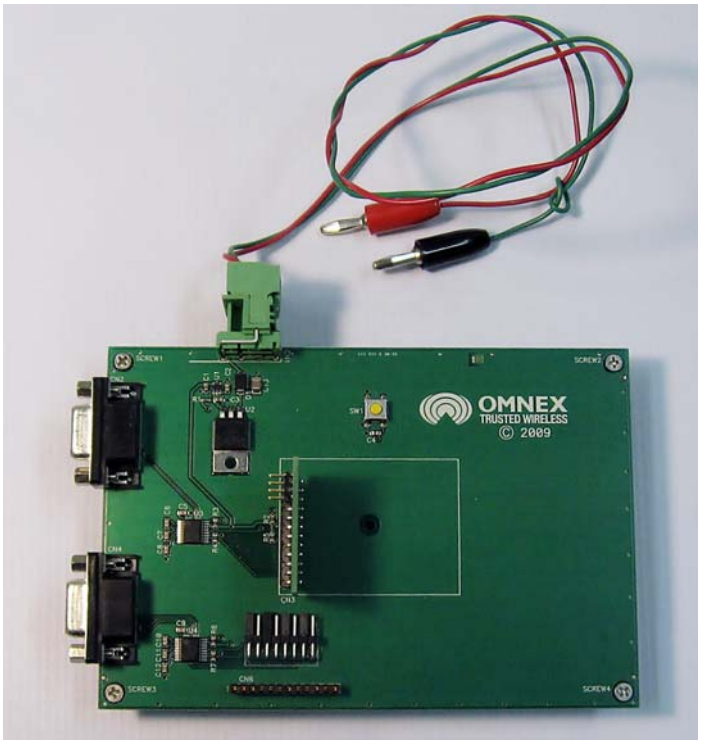
APPENDIX B: EUT photos

- EUT: Top View

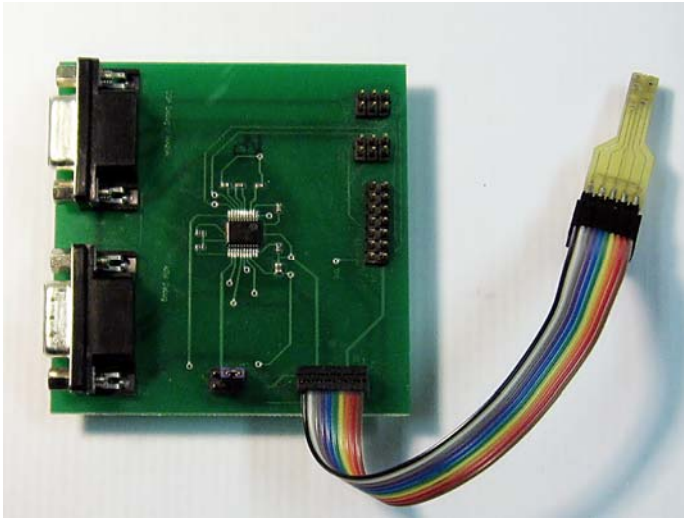


- EUT: Bottom View

- EUT: Top View of Host Board

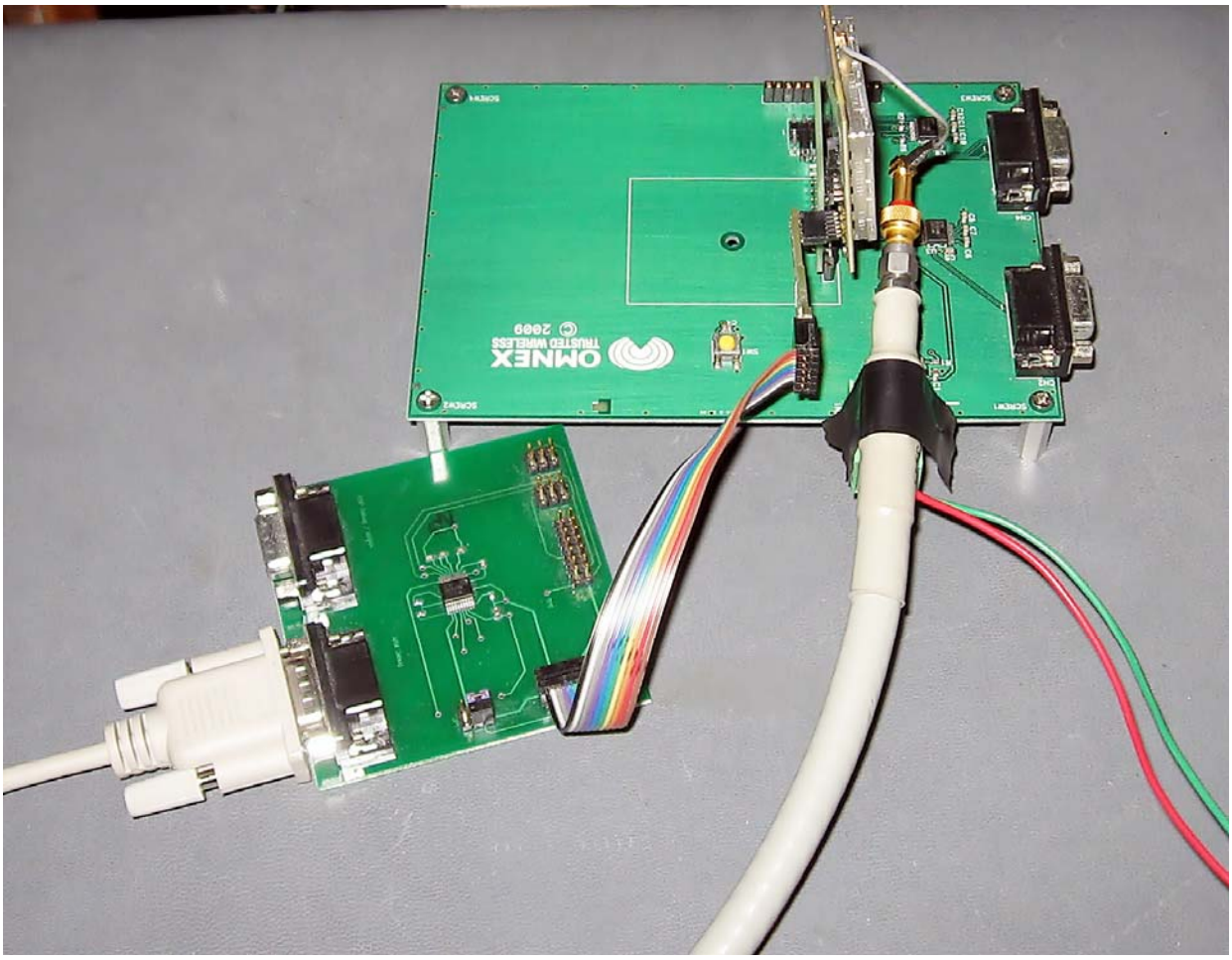


- EUT: Top View of Debug Board

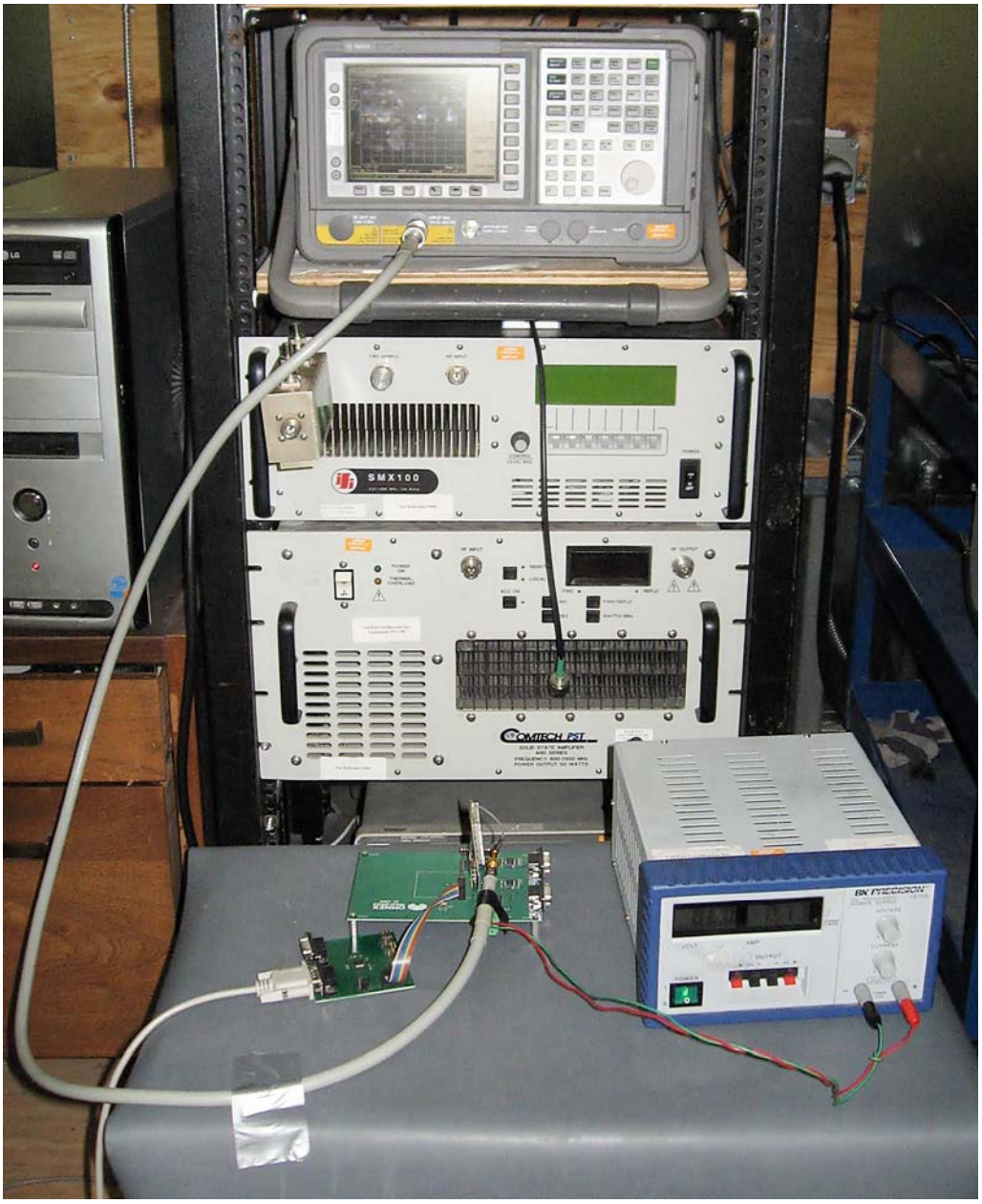


APPENDIX C: Test setup photos

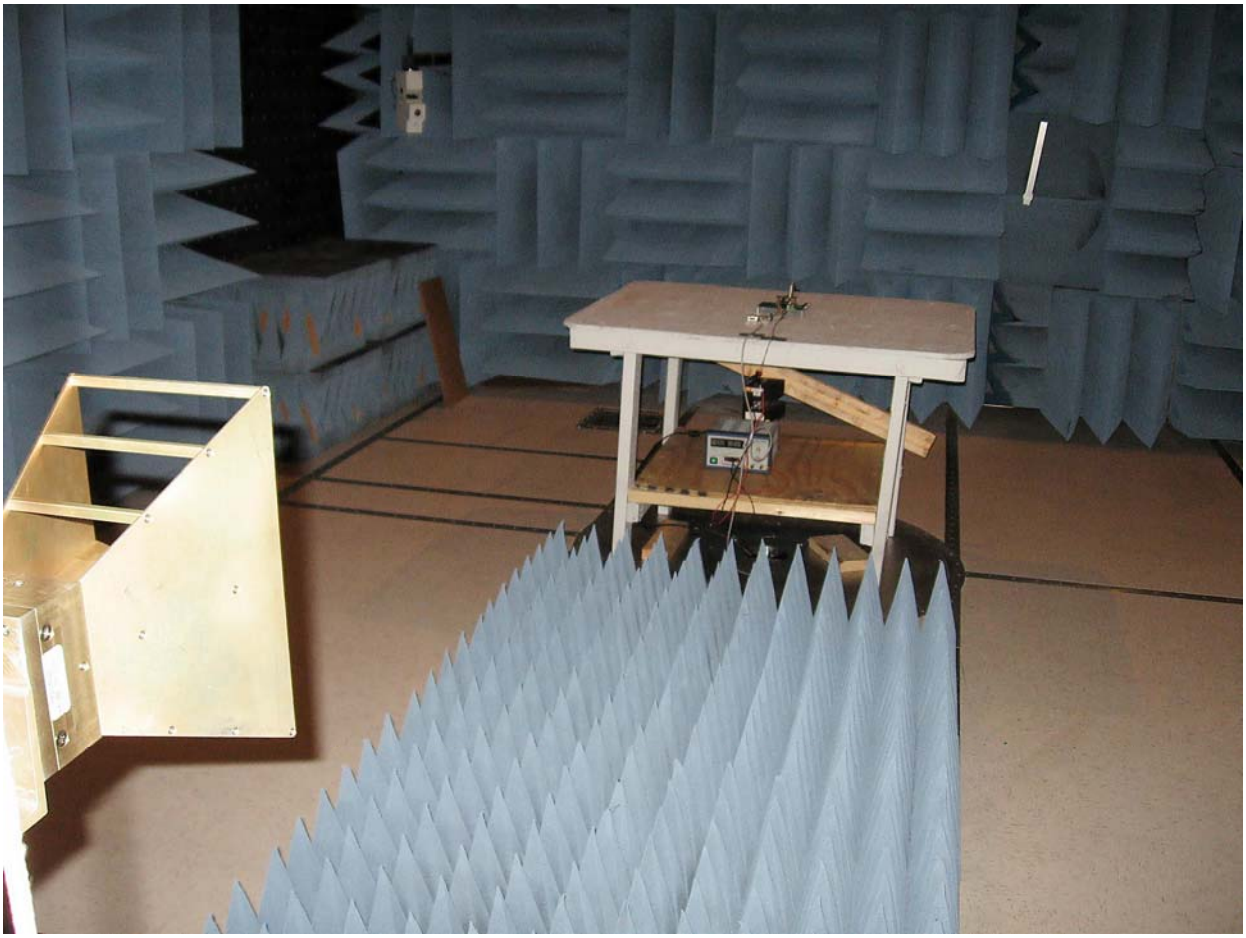
- Test Seup with Host and Debug Board



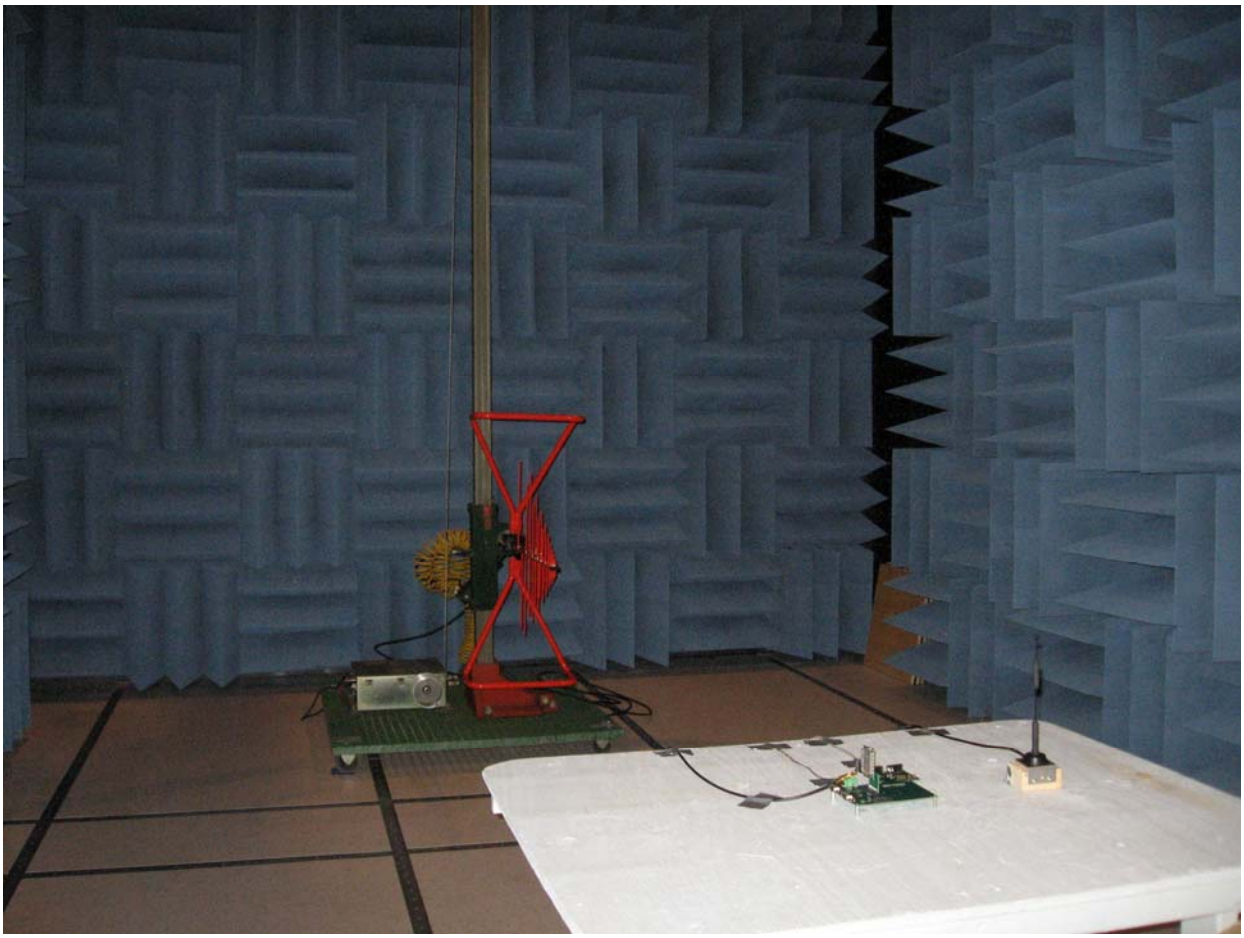
- Test configuration for Conducted measurement



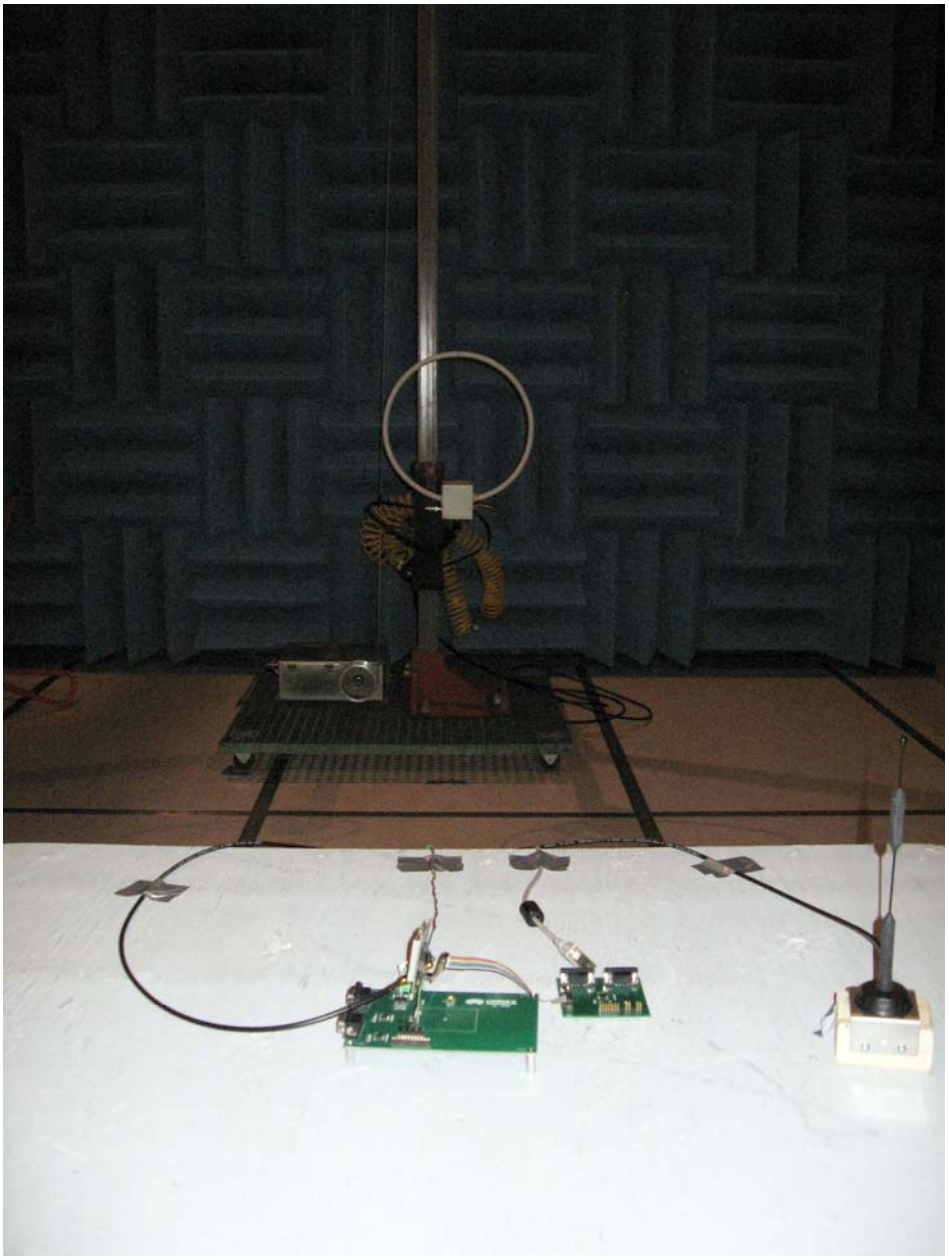
- Test configuration for Radiated measurement, over 1 GHz for Harmonics



- Test configuration for Radiated measurement, 30 MHz to1 GHz for Spurious and Receive Mode



- Test configuration for Radiated measurement, under 30MHz for Intentional Emissions



APPENDIX D: ISO 17025:2005 Accreditation Certificate

International Accreditation Service

CERTIFICATE OF ACCREDITATION

This is to signify that

LABTEST CERTIFICATION, INC.
3133-20800 WESTMINSTER HIGHWAY
RICHMOND, BRITISH COLUMBIA V6V 2W3
CANADA

Testing Laboratory TL-367
(Revised May 9, 2012)

has met the requirements of the IAS Accreditation Criteria for Testing Laboratories (AC89), has demonstrated compliance with ANS/ISO/IEC Standard 17025:2005, *General requirements for the competence of testing and calibration laboratories*, and has been accredited, commencing May 5, 2011, for the test methods listed in the approved scope of accreditation.

Patrick V. McCullen
Vice President

C. P. Ramani, P.E.
President

ilac-MRA

IAS ACCREDITED

(see attached scope of accreditation for fields of testing and accredited test methods)

Print Date: 05/23/2012

Page 1 of 4

This accreditation certificate supersedes any IAS accreditation certificate bearing an earlier date. The certificate becomes invalid upon suspension, cancellation or revocation of accreditation. See the IAS Accreditation Listings on the web at www.iasonline.org for current accreditation information, or contact IAS directly at (562) 364-8201.

11-04577

International Accreditation Service

SCOPE OF ACCREDITATION

LabTest Certification, Inc. TL-367
(Revised May 9, 2012)

LabTest Certification, Inc.
3133-20800 Westminster Hwy.
Richmond, British Columbia V6V 2W3
Canada

Kavinder Dhillon
QMS Manager
(604) 247-0444

FIELDS OF TESTING	ACCREDITED TEST METHODS
Gas and Plumbing	ANSI Standards Z21.1, Z21.15, Z21.19/1.6, Z21 50, Z21.57, Z21.58. Z21.97 and Z21.89/CGA1.18; CSA Standards B45 Series, B125, B140.0, B140.1, B140.3, B140.4, B140.8 and B140.9.3; CGA 1.16; AS 4551/Ag101, AS 4553/AG 103, AS 4563 and AS 2658; EN Standards 30-1-1, 30-1-2, 30-1-3, 30-1-4, 30-2-1 and 30-2-2
Electrical, EMC and Electro-mechanical	AS 4268.1, 4268.2; AS/NZS 1044, 1053, 2064, 3548, 3652, 4051, 4251.1, 4251.2, 62040.2; 60335.1; AS/NZS 60598.1, AS/NZS 60950.1, AS/NZS 60745.1, AS/NZS 60730.1; CISPR 11 / EN55011; CISPR 14 / EN55014, CISPR 15 / EN55015, CISPR 22 / EN55022, CISPR 24 / EN55024, EN 12895, 301 489, 300 386, 50083-2, 50090-2-2, 50091-2, 50121-1, 50121-2, 50121-3-1, 50121-3-2, 50121-4, 50121-5, 50130-4, 50263, 50270, 50293, 50295, 50370-1, 50370-2, 50428, 50470-1, 55012, 55013, 55103-1, 55103-1, 55103-2, 55103-2, 60204-31, 60439-1, 60669-2-1, 60669-2-1, 60669-2-2, 60669-2-3, 60730-1, 60730-2-11, 60730-2-13, 60730-2-14, 60730-2-18, 60730-2-5, 60730-2-6, 60730-2-7, 60730-2-8, 60730-2-9, 60870-2-1, 60945, 61204-3, 61326, 61347-1 Part 1, 61543, 61547, 61547, 617:2001, 618, 619, 620 and 62040-2; FCC Part 15, 18; GB 13837 (CISPR 13); GB 4943, 9254, 7000.1, 7000.10, 7000.11, 7000.12, 2313, 8898, 15143, 14045, 17743, 13836 and 13837; GB/T 9383; GB/T 17618; GB 17625.1, 2; GB/T 17626.2 and 17626.4 and 17626.5

May 5, 2011
Commencement Date

ACCREDITED

C. P. Ramani, P.E.
President

Print Date: 05/23/2012

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11-04680

International Accreditation Service

SCOPE OF ACCREDITATION

LabTest Certification, Inc. TL-367
(Revised May 9, 2012)

FIELDS OF TESTING	ACCREDITED TEST METHODS
Electrical, EMC and Electro-mechanical (cont)	GB/T 176262.6, 176262.8, 176262.11; GB 4343.1 (CISPR 14.1), 4343.2 (CISPR 14.2), GB 4824; HKTA 1001, 1005, 1007 and 1022; ICES-001, 003; JIS T 0601-1-2; IEC/EN/AS/KN: 60601-1-2; IEC/EN/AS/KN/JIS C: 61000-3-2, 61000-3-3, 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-8, 61000-4-9, 61000-4-11, 61000-4-12, 61000-4-13, 61000-6-1, 61000-6-2, 61000-6-3 and 61000-6-4; IEC/EN/AS/KN: 61326; RSS-130, 136, 138, 182, 187, 210, 213, 215, 243 and 310; MIL-STD-461E; MIL-STD-462D; KN60601-1-2; KN301 489; KN22, 24; YD 1032; YD/T 965, 968, 993, 1103; CSA Standards C22.2 No. 0, .1, .17, .4, 6, 8, 9, 10, 12, 14, 15, 18, 24, 36, 37, 40, 43, 53, 61, 66-1-06, 63, 64, 66.1, 66.2, 66.3, 68, 71.1, 71.2, 72, 73, 81, 85, 89, 94, 99, 100, 101, 104, 107.1, 107.2, 108, 109, 110, 112, 113, 114, 117, 122, 125, 139, 141, 147, 148, 149, 156, 157, 158, 164, 166, 167, 168, 169, 173, 177, 184, 187, 191, 195, 205, 207, 213, 217, 218.1, 218.2, 223, 224, 225, 231, 234, 236, 243, 247, 250 and 60065; CSA Standards E60079-0, -1 (except Explosión Proof Test), -6, -11, -15, E60335-1, -2, E60730-1, -2, E60745-1, -2, E61010-1, -2, E742, Z240 RV Series 08; IEC/EN Standards 60335-1, -2, 60730-1, -2, 60745-1, -2; 61010-1, -2, 60601-1, -2, 60065, 60079-0, -6, -11, -15 and 60950-1, -2; IEC/EN 60529; 60945, 60598-1, -2, 61347-1; UL Standards 48, 50, 73, 197, 499, 507, 508, 508A, 676, 745-1, 751, 763, 778, 858, 867, 875, 924, 935, 982, 987, 998, 1004, 1012, 1026, 1261, 1310, 1431, 1472, 5085-2_1; 5085-3; 1563, 1564, 1585, 1598, 1647, 1795, 1993, 1995, UL/CSA 5085-1_1

May 5, 2011
Commencement Date

ACCREDITED

C. P. Ramani, P.E.
President

Print Date: 05/23/2012

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11-04680

International Accreditation Service

SCOPE OF ACCREDITATION

LabTest Certification, Inc. TL-367
(Revised May 9, 2012)

FIELDS OF TESTING	ACCREDITED TEST METHODS
Electrical, EMC and Electro-mechanical (cont)	6500, 8750, 2388; 60079-0, 60079-1, 60079-6, 60079-11, 60079-15, 60335-1, 60335-2, 60601-1, 60601-2, 60730-1, 60730-2, 60745-1, 60745-2, 60950-1, 61010-1 and 61010-2; ISO EN Standards 60601-1-2 Part 1-2, 61000-3-2 (Equipment input current less than or equal to 16 Amps/Phase) and 61000-4-3; ANSI Standards C63.4 and C63.7 (only to 26.5GHz)
Environmental and Energy	IEC/EN Standards 60068-2-1, 2-2, 2-6, 2-30, 2-27, 2-14, 2-64, 60092-101, 60695-2-2; MIL-STD-810: Method 500.4, 501.4, 502.4, 503.4, 506.4, 507.4, 510.4, 512.4 and 514.5; RTCA-DO-160E: Section 4, 5, 6, 7.2, 8, 10, 12, 16, 17 and 25; CSA Standard P4; CAN/CSA Standards C-300 and C-814; Qualification Criteria for Bottled Water Cooler Version 1.1 - May 2004; Qualification Criteria for Compact Fluorescent Lamps Version 3.0 - October 2003; Qualification Criteria for Decorative Light Strings Version 1.3 - March 9, 2007; Qualification Criteria for Residential Light Fixtures Version 4.0; Qualification Criteria for Home Audio and DVD Equipment; ISO Standards 9806-1, 9806-2 and 9806-3; SRCC 100-08, SRCC TM-1, SRCC-150; CSA Standards F378 and F379, EN Standards 12975-1 and 12975-2
Maritime	ABYC Standards A-3, A-7, A-26, A-27, A-28, A-30, A-31, E-2, E-11, H-2, P-14, P-17, P-18, P-21, P-22, P-24 and P-27; EN Standards 28846, 28848, 28849, 29775, 60092-507; EN ISO 10133, 12216, 13297, 13929, 14895, 15083, 8847, 8849, 10239, 10240, 10592: 1995/A1, 11105, 11192 and 9097:1994/A1; IACS E1 – E21; 21005; DNV 2.4, BV: Rules for Classification of Steel Ships – Part C, Chapter 3, Section 6.2 Type Approval; ABS Part 4, Chapter 9, Section 7, Lloyds Type Approval Systems – Test Specification Number 1; GL VI-Part 7 Section 3 – Section – B Test Requirements, Chapter 2
Appliances	CSA Standard B 140.0-3

May 5, 2011
Commencement Date

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President

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END OF REPORT