TEST REPORT

For

Cooper Industries Inc.

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

Date:	July 26, 2010
Report No.:	9871-1E
Revision No.:	1
Project No.:	9871
Equipment:	900MHz Spread Spectrum Data Transceiver Module
Model No.:	LPT-900

ONE STOP GLOBAL CERTIFICATION SOLUTIONS

3133-20800 Westminster Hwy, Richmond, BC
V6V 2W3, Canada
Phone: 604-247-0444
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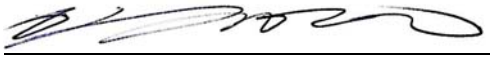
TEST REPORT

FCC15.247:2009 / RSS-210, Issue 7

Report reference No.....:	9871-1E
Report Revision History:	✓ Rev. 0: July 26, 2010 ✓ Rev. 1: Adding PK data for Radiated Spurious and Har.
Tested by (printed name and signature) .....:	Jeremy Lee 
Approved by (printed name and signature) .....:	Kavinder Dhillon, Eng.L 
Date of issue .....:	July 26, 2010

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
FCC Site Registration No......:	444229
IC Site Registration No. .....:	5970B-1
OATS Test Location Name .....:	LabTest Certification Inc.
Address .....:	17325-48Ave., Surrey, BC, Canada
Applicant's Name .....:	Cooper Industries 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 .....:	FCC15.247:2009 / RSS-210, Issue 7, June 2007
Testing	
Date of receipt of test item .....:	July 07, 2010
Date(s) of performance of test .....:	July 07 to 23, 2010
Test item description .....:	
Trademark .....:	N/A
Model and/or type reference .....:	LPT-900
Serial numbers .....:	N/A
Electrical Rating(s) .....:	4 to 18VDC, Typically 6VDC

Product descriptions	
Type of Emission ..... :	Frequency Hopping Spread Spectrum(FHSS)
No. of Hopping Channels ..... :	63 Channels
No. of Radio Channels ..... :	256 Channels
Modulation ..... :	FSK
Data Rates ..... :	4.8 kbps
Dwell time per channel ..... :	< 19.64 ms
Max. time between two instances of use of the same channel ……:	≤ 1.575 sec
Operating Frequency Range:	902.2 to 927.7MHz
Application for ..... :	900MHz Spread Spectrum Data Transceiver Module
Equipment mobility ..... :	Yes
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 ..... :	-30 °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 LPT-900 is a frequency hopped spread spectrum transceiver module designed to be compatible with US and Canadian regulations for license free use in the 900 MHz ISM band.

Frequencies

Module	Description	Frequences
VCTCXO (X2)	TCXO	13 MHz
XTAL (X3)	Crystal	3.6864 MHz
CPU (U11)	SPI clock for the synthesizer	134 kHz
CPU (U11)	Clock for the microcontroller	3.6864 MHz

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

Model No.	Description	Manufacturer	Approvals/Standards
None			

Description of Interface Cables for Testing

Description	Cable Type	Cable length	Ferrite
None			

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
None	

Worst-case configuration and mode of operation during testing

The radio was set up in hopping mode in which it hops on all 64 available channels. The output power was configured to output + 10 dBm. The EUT was operated as continually its hopping sequence during all testing.

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 and 4GHz	Insertion Losses are normal
LCI-001	RF Cable, up to 1GHz	Insertion Losses from 30 to 1,000MHz	Saved data
OC-LMR100A-4	RF Cable, SMA(m) to SMA(m)	Insertion Loss at 30 to 4GHz	Saved data
UNAT-15+	Attenuator	Insertion Loss at 30 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, 300 to 1,000MHz	5.05
Radiated Emission, 1 to 26.5GHz	5.05
Conducted Measurements	2.86

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.

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 – Spurious and Harmonics	15.249, 15.205, 15.209 & RSS-210	ANSI C63.10:2009, Clause 6.5 & 6.6	PASS
Antenna-port Conducted Emissions	15.247(d) & RSS-210	ANSI C63.10:2009, Clause 6.7 & 7.7.10	PASS
Antenna Gain	15.247(b)(4) & RSS-210	N/A	PASS
Occupancy Bandwidth	15.247(a)(1) & (d) & RSS-210	ANSI C63.10:2009, Clause 6.9	PASS
Band Edge	15.247(d) & RSS-210	ANSI C63.10:2009, Clause 6.9 & 7.7.9	PASS
Conducted Output Power	15.247(b)(1) & RSS-210	ANSI C63.10:2009, Clause 6.10	PASS
FHSS			
Carrier Frequency Separation	15.247(a)(1) & RSS-210	ANSI C63.10:2009, Clause 7.7.2	PASS
Number of hopping frequencies	15.247(a)(1) & RSS-210	ANSI C63.10:2009, Clause 7.7.3	PASS
Time of occupancy(Dwell Time)	15.247(a)(1) & RSS-210	ANSI C63.10:2009, Clause 7.7.4	PASS
Pseudorandom frequency-hopping sequence	15.247(a)(1) & RSS-210	ANSI C63.10:2009, Clause 7.7.5	PASS
Equal hopping frequency usage	15.247(a)(1) & RSS-210	ANSI C63.10:2009, Clause 7.7.6	PASS
System receiver input bandwidth	15.247(a)(1) & RSS-210	ANSI C63.10:2009, Clause 7.7.7	PASS
RF Exposure	15.247(i) & RSS-102	FCC1.1310	PASS

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

Conducted Emission

Test Date	July 07, 2010
Sample Number	798115
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 Radiators, Digital Part

Temperature	22.4 to 22.7 °C
Relative Humidity	41.1 to 48.7 %
Barometric Pressure:	100.71 kPa
Test Date	July 02, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	112, 227-1, 228, 272
Reference Equipment (ID) (Calibration not required)	059, 124, 233, 235
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 15.247:2009, FCC 15.31:2009, FCC 15.33:2009, FCC 15.35:2009, and ANSI C63.4:2009, and ANSI C63.10:2009.**

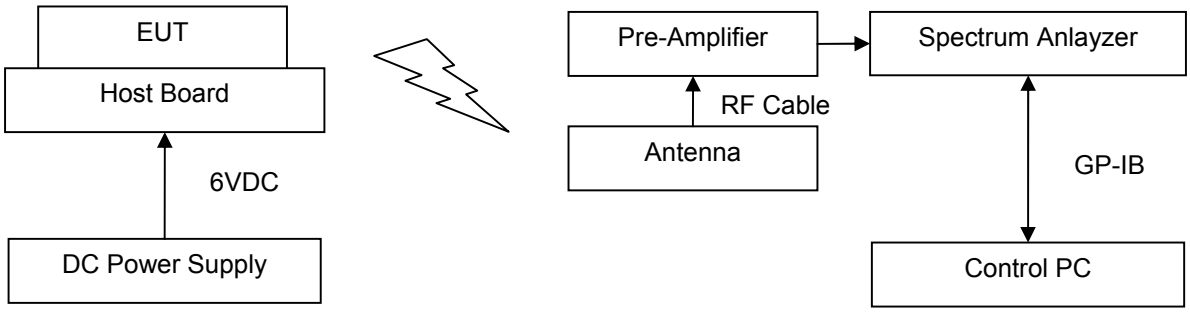
Test procedure is based on the FCC15.31(a)(3) – Other intentional and unintentional radiators are to be measured for compliance using the following procedure excluding sections 4.1.5.2, 5.7, 9 and 14: ANSI C63.4–2003: "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic 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 – 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.

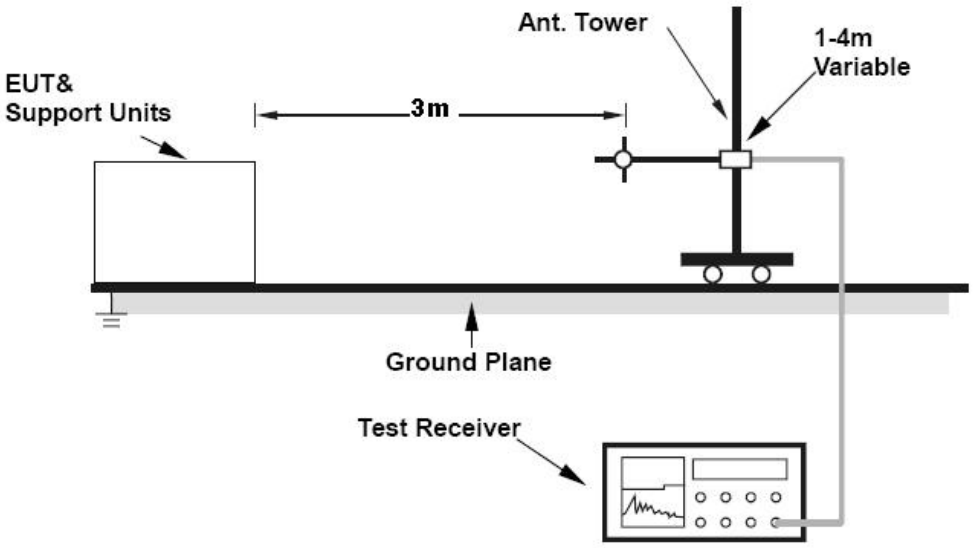
Tests were performed to determine the hopping of the EUT with terminated its Antenna port. The EUT was positioned three different orthogonals and the emissions from the unit were maximized by manipulating the cables, and by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

- The EUT was set-up in hopping mode.
- The following measurements were made with
  - Span = wide enough to fully capture the emission being measured.
  - RBW = 120kHz.
  - VBW ≥ RBW
  - Sweep = Auto
  - Detector Function = peak
  - Trace = Single trace up to capturing the whole range of signal
  - Detecting Method = Quasi peak.

Setup Block Diagram



Test Setup at OATS



Test Result

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

Frequency (MHz)	Measured (dBuV)	AF (dB/m)	CL (dB)	Pre-Amp (dB)	Radiated Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	POL	Results
Orthogonal X with terminated Antenna port									
48.00	38.04	10.30	2.60	33.05	17.90	40.00	22.10	V	PASS
51.65	39.33	10.35	2.70	33.04	19.34		20.66	H	PASS
Orthogonal Y with terminated Antenna port									
48.01	43.40	10.30	2.60	33.05	23.26	40.00	16.74	V	PASS
51.57	35.77	10.36	2.70	33.04	15.79		24.21	H	PASS
Orthogonal Z with terminated Antenna port									
48.07	41.63	10.30	2.61	33.05	21.49	40.00	18.51	V	PASS
51.58	38.80	10.44	2.70	33.04	18.90		21.10	V	PASS

X Pass Fail N/A

- Table of Unintentional Radiated Emissions of Orthogonal X with terminated Antenna port: 300 to1000MHz, Quasi-peak Detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class B, 3 meters, Orthogonal X, Horizontal

Operator: Jeremy Lee
03:08:34 PM, Friday, July 02, 2010

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T degree	Tower cm	Pol
47.91 MHz	36.75	10.88	2.60	-33.05	17.18	40.00	22.82	205.9	100.1	H
51.65 MHz	39.33	10.35	2.70	-33.04	19.34	40.00	20.66	50.3	122.8	H

Project # : 9871, Sample #: 798115
Temp.: 22.4 C, Hum.: 48.7 %
Barometer Pres.:100.71kPa

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class B, 3 meters, Orthogonal X, Vertical

Operator: Jeremy Lee
03:09:01 PM, Friday, July 02, 2010

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T degree	Tower cm	Pol
48.00 MHz	38.04	10.30	2.60	-33.05	17.90	40.00	22.10	358.0	216.9	V
51.59 MHz	35.97	10.44	2.70	-33.04	16.07	40.00	23.93	109.2	151.1	V

Project # : 9871, Sample #: 798115
Temp.: 22.4 C, Hum.: 48.7 %
Barometer Pres.:100.71kPa

- Table of Unintentional Radiated Emissions of Orthogonal Y with terminated Antenna port: 300 to1000MHz, Quasi-peak Detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class B, 3 meters, Orthogonal Y, Horizontal

Operator: Jeremy Lee

04:10:40 PM, Friday, July 02, 2010

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T degree	Tower cm	Pol
48.02 MHz	39.30	10.86	2.60	-33.05	19.71	40.00	20.29	333.0	112.4	H
51.57 MHz	35.77	10.36	2.70	-33.04	15.79	40.00	24.21	192.9	108.8	H

Project # : 9871, Sample #: 798115
Temp.: 22.4 C, Hum.: 48.7 %
Barometer Pres.:100.71kPa

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class B, 3 meters, Orthogonal Y, Vertical

Operator: Jeremy Lee

04:10:40 PM, Friday, July 02, 2010

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T degree	Tower cm	Pol
48.01 MHz	43.40	10.30	2.60	-33.05	23.26	40.00	16.74	10.9	157.8	V
51.57 MHz	35.64	10.44	2.70	-33.04	15.74	40.00	24.26	219.8	139.6	V

Project # : 9871, Sample #: 798115
Temp.: 22.4 C, Hum.: 48.7 %
Barometer Pres.:100.71kPa

- Table of Unintentional Radiated Emissions of Orthogonal Z with terminated Antenna port: 300 to1000MHz, Quasi-peak Detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class B, 3 meters, Orthogonal Z, Horizontal

Operator: Jeremy Lee

04:51:32 PM, Friday, July 02, 2010

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T degree	Tower cm	Pol
47.91 MHz	35.60	10.88	2.60	-33.05	16.03	40.00	23.97	340.8	103.8	H
51.60 MHz	35.24	10.36	2.70	-33.04	15.26	40.00	24.74	94.1	100.3	H

Project # : 9871, Sample #: 798115
Temp.: 22.7 C, Hum.: 41.1 %
Barometer Pres.:100.71kPa

LabTest Certification Inc.
Unintentional Radiated Emissions
FCC15.109, Class B, 3 meters, Orthogonal Z, Vertical

Operator: Jeremy Lee

04:51:32 PM, Friday, July 02, 2010

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Limit dBuV/m	Margin dB	T/T degree	Tower cm	Pol
48.07 MHz	41.63	10.30	2.61	-33.05	21.49	40.00	18.51	171.0	112.8	V
51.58 MHz	38.80	10.44	2.70	-33.04	18.90	40.00	21.10	289.2	105.3	V

Project # : 9871, Sample #: 798115
Temp.: 22.7 C, Hum.: 41.1 %
Barometer Pres.:100.71kPa

Radiated Emissions- Spurious and Harmonics

Temperature	20.4 to 25.6 °C
Relative Humidity	42.0 to 65.4 %
Barometric Pressure:	101.51 to 102.22 kPa
Test Date	July 22 & 23, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	112, 227-1, 227-2, 227-3, 228, 272, 273
Reference Equipment (ID) (Calibration not required)	059, 124, 227-5, 233, 235
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 15.247:2009, FCC 15.31:2009, FCC 15.33:2009, FCC 15.35:2009, 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 C63.4–2003: "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.]

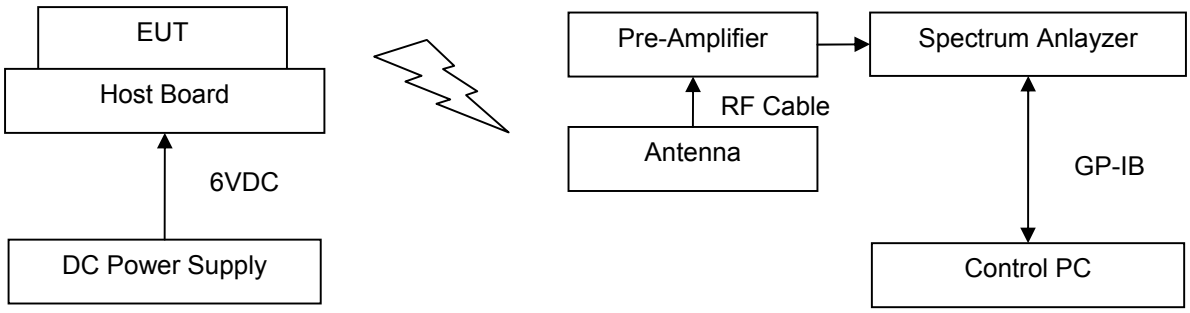
The EUT was placed on a 1 meter by 1.5 meters wide and 0.8-meter high nonconductive table that was placed directly onto a flush mounted turntable. The EUT was connected to its support equipment with any excess I/O cabling bundled to approximately 1 meter. The EUT was set 3 meters away from the interference-receiving 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 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.

Pre-scan 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 by manipulating the cables, and by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable.

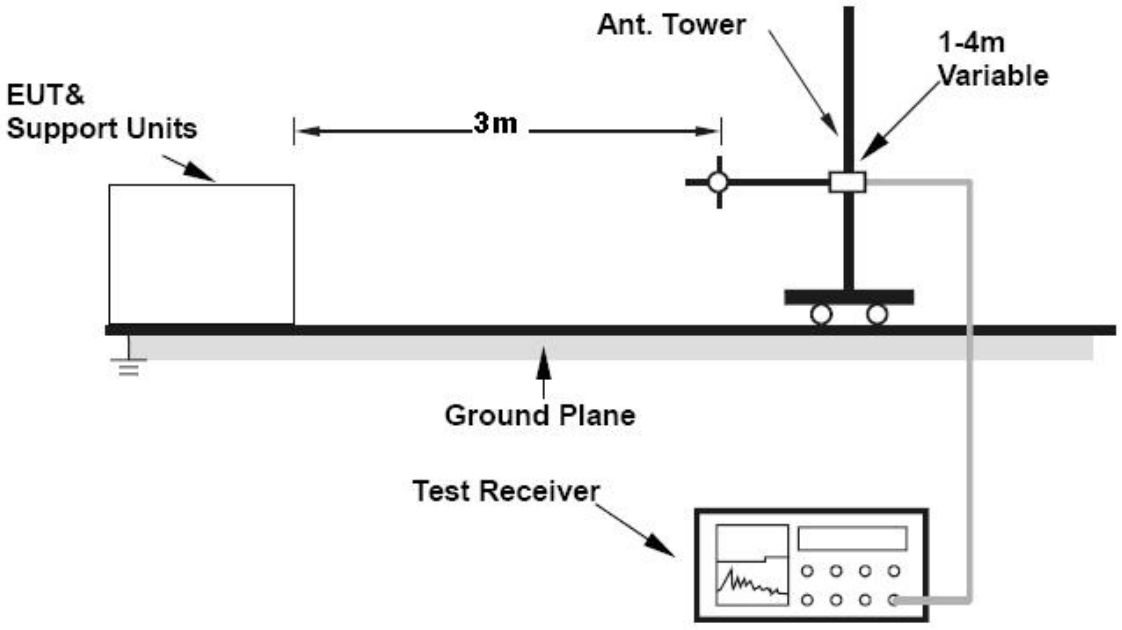
- The EUT was measured in three diferrent transmiting frequencies, low-end, middle, and high-end and each channel was performed three different orthogonals.
- The transmitter was set-up as its maximum power.
- The following measurements were made with
  - Span = wide enough to fully capture the emission being measured.
  - RBW = 100kHz for f < 1GHz, and 1MHz for f ≥ 1GHz
  - VBW ≥ RBW
  - Sweep = Auto

- Detector Function = peak
- Trace = Single trace up to capturing the whole range of signal
- Detecting Method = Peak Detecting

Setup Block Diagram



Test Setup at OATS



Test Result

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

Orthogonal	Description	Frequency (MHz)	Measured (H/V) (dBuV/m)	Difference (dB)	Limit (dB)	Pol	Pass/Fail
Spurious of Low End; Carrier Frequency is 902.2 MHz							
Y	Carrier	902.20	88.16	-	-		-
	Spurious	900.79	58.59	29.57	> 20	H	Pass
		902.73	57.79	30.36	> 20	H	Pass
		903.25	59.98	28.17	> 20	H	Pass
Spurious of Middle; Carrier Frequency is 915.0 MHz							
Z	Carrier	915.00	90.92	-	-	-	-
	Spurious	912.59	60.08	30.84	> 20	H	Pass
		915.83	61.64	29.28	> 20	H	Pass
		919.23	52.71	38.20	> 20	H	Pass
Spurious of High End; Carrier Frequency is 927.7 MHz							
Z	Carrier	927.7	96.07	-	-	-	-
	Spurious	925.62	55.04	41.04	> 20	V	Pass
		926.11	59.38	36.70	> 20	V	Pass
		931.22	53.77		> 20	V	Pass

Orthogonal	Frequency (MHz)	Measured (dBuV)	AF (dB/m)	CL (dB)	Pre-Amp (dB)	Radiated Emission (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Results
Harmonics of Low End; Carrier Frequency is 902.2 MHz									
Z	2,707	43.02	28.98	1.44	33.01	40.44	73.98	33.54	Pass
	3,609	43.28	30.52	1.62	32.85	42.57		31.41	Pass
	4,511	42.49	32.73	1.80	32.42	44.61		29.37	Pass
Harmonics of Middle; Carrier Frequency is 915.0 MHz									
Z	2,745	42.62	29.13	1.45	33.07	40.13	73.98	33.85	Pass
	3,660	43.74	30.77	1.63	32.70	43.44		30.54	Pass
	4,575	41.87	32.94	1.81	32.39	44.24		29.74	Pass
Harmonics of High End; Carrier Frequency is 927.7 MHz									
Z	2,783	42.76	29.28	1.46	33.13	40.36	73.98	33.62	Pass
	3,711	43.35	31.01	1.64	32.57	43.43		30.55	Pass
	4,639	42.31	33.14	1.83	32.36	44.92		29.06	Pass

X Pass Fail N/A

- Table of Radiated Spurious Emissions of Lowend: 300 to1000MHz, Peak Detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Intentional Radiated Emissions
FCC15.247, 3 meters, Spurious, Orthogonal Y, Horizontal

Operator: Jeremy Lee

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

01:22:12 PM, Thursday, December 23, 2010

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Margin dB	T/T degree	Tower cm	Pol
900.79 MHz	56.37	22.52	11.29	-31.60	58.59	29.57	242.0	202.2	H
902.21 MHz	85.89	22.56	11.30	-31.60	88.16	-0.00	242.0	204.7	H
902.70 MHz	55.51	22.58	11.30	-31.60	57.79	30.36	242.0	180.2	H
903.25 MHz	57.68	22.59	11.31	-31.60	59.98	28.17	242.0	115.3	H

Project # : 9871, Sample #: 798115
Temp.: 20.4 C, Hum.: 64.0 %
Barometer Pres.:102.22kPa

- Table of Radiated Spurious Emissions of Middle: 300 to1000MHz, Peak Detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Intentional Radiated Emissions
FCC15.247, 3 meters, Spurious, Orthogonal Z, Horizontal

Operator: Jeremy Lee

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

01:25:35 PM, Thursday, December 23, 2010

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Margin dB	T/T degree	Tower cm	Pol
912.59 MHz	57.45	22.85	11.36	-31.59	60.08	30.84	343.3	219.9	H
915.00 MHz	88.21	22.92	11.37	-31.58	90.92	-0.00	343.3	210.8	H
915.83 MHz	58.90	22.94	11.38	-31.58	61.64	29.28	343.3	220.8	H
919.23 MHz	49.86	23.04	11.39	-31.58	52.71	38.20	343.3	340.2	H

Project # : 9871, Sample #: 798115
Temp.: 21.2 C, Hum.: 65.4 %
Barometer Pres.:102.19kPa

- Table of Radiated Spurious Emissions of Highend: 300 to1000MHz, Peak Detecting, Antenna was used SAS-510-2.

LabTest Certification Inc.
Intentional Radiated Emissions
FCC15.247, 3 meters, Orthogonal Z, Vertical

Operator: Jeremy Lee

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

01:45:58 PM, Thursday, December 23, 2010

Frequency MHz	Measured dBuV	AntFactor dB/m	CableLoss dB	Preamp dB	Emission dBuV/m	Margin dB	T/T degree	Tower cm	Pol
925.65 MHz	51.97	23.21	11.43	-31.57	55.04	41.04	82.0	316.1	V
926.16 MHz	56.30	23.21	11.43	-31.57	59.38	36.70	82.0	337.9	V
927.70 MHz	92.97	23.23	11.44	-31.57	96.07	-0.00	82.0	100.0	V
931.23 MHz	50.57	23.27	11.46	-31.56	53.74	42.33	82.0	373.9	V

Project # : 9871, Sample #: 798115
Temp.: 20.6 C, Hum.: 42.4 %
Barometer Pres.:102.19 kPa

- Table of Radiated Harmonic Emissions of LowEnd: 1 to10GHz, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emissions
FCC 15.247, 3 meters, Harmonics, Orthogonal Z, Horizontal

Operator: Jeremy Lee

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency	Measured	AntFactor	CableLoss	Preamp	Emission	Limit	Margin	T/T	Tower	Pol
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	degree	cm	
2.707 GHz	43.02	28.98	1.44	-33.01	40.44	73.98	33.54	0.0	110.0	H
3.609 GHz	43.28	30.52	1.62	-32.85	42.57	73.98	31.41	0.0	110.0	H
4.511 GHz	42.49	32.73	1.80	-32.42	44.61	73.98	29.37	0.0	110.0	H

Project # : 9871, Sample #: 798115
Temp.: 24.5 C, Hum.: 49.0 %
Barometer Pres.: 102.05 kPa

- Table of Radiated Harmonic Emissions of Middle: 1 to10GHz, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Intentional Radiated Emissions
FCC 15.247, 3 meters, Harmonics, Orthogonal Z, Horizontal

Operator: Jeremy Lee

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency	Measured	AntFactor	CableLoss	Preamp	Emission	Limit	Margin	T/T	Tower	Pol
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	degree	cm	
2.745 GHz	42.62	29.13	1.45	-33.07	40.13	73.98	33.85	0.0	30.9	H
3.660 GHz	43.74	30.77	1.63	-32.70	43.44	73.98	30.54	0.0	30.7	H
4.575 GHz	41.87	32.94	1.81	-32.39	44.24	73.98	29.74	0.0	29.9	H

Project # : 9871, Sample #: 798115
Temp.: 24.5 C, Hum.: 49.0 %
Barometer Pres.: 102.05 kPa

- Table of Radiated Harmonic Emissions of HighEnd: 1 to10GHz, Peak Detecting, Antenna was used SAS-571.

LabTest Certification Inc.
Radiated Emissions
FCC 15.247, 3 meters, Harmonics, Orthogonal Z, Horizontal

Operator: Jeremy Lee

Model #: LPT-900
Contact: Michelle Zuliani
Company: Cooper Industries Inc.

Frequency	Measured	AntFactor	CableLoss	Preamp	Emission	Limit	Margin	T/T	Tower	Pol
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	degree	cm	
2.783 GHz	42.76	29.28	1.46	-33.13	40.36	73.98	33.62	0.0	110.0	H
3.711 GHz	43.35	31.01	1.64	-32.57	43.43	73.98	30.55	0.0	110.0	H
4.639 GHz	42.31	33.14	1.83	-32.36	44.92	73.98	29.06	0.0	110.0	H

Project # : 9871, Sample #: 798115
Temp.: 24.6 C, Hum.: 49.6 %
Barometer Pres.: 102.05 kPa

Antenna-port Conducted Emissions

Temperature	23.5 °C
Relative Humidity	44.3 %
Barometric Pressure:	102.29 kPa
Test Date	July 19, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, N1, N2
Tested By	Jeremy Lee

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

Test Limits

15.247(d)

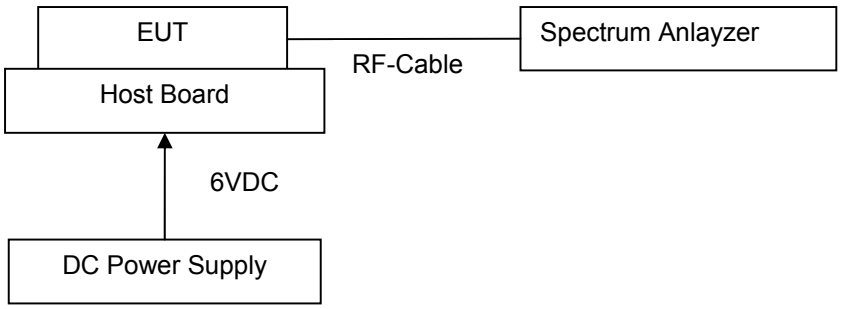
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

- 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:

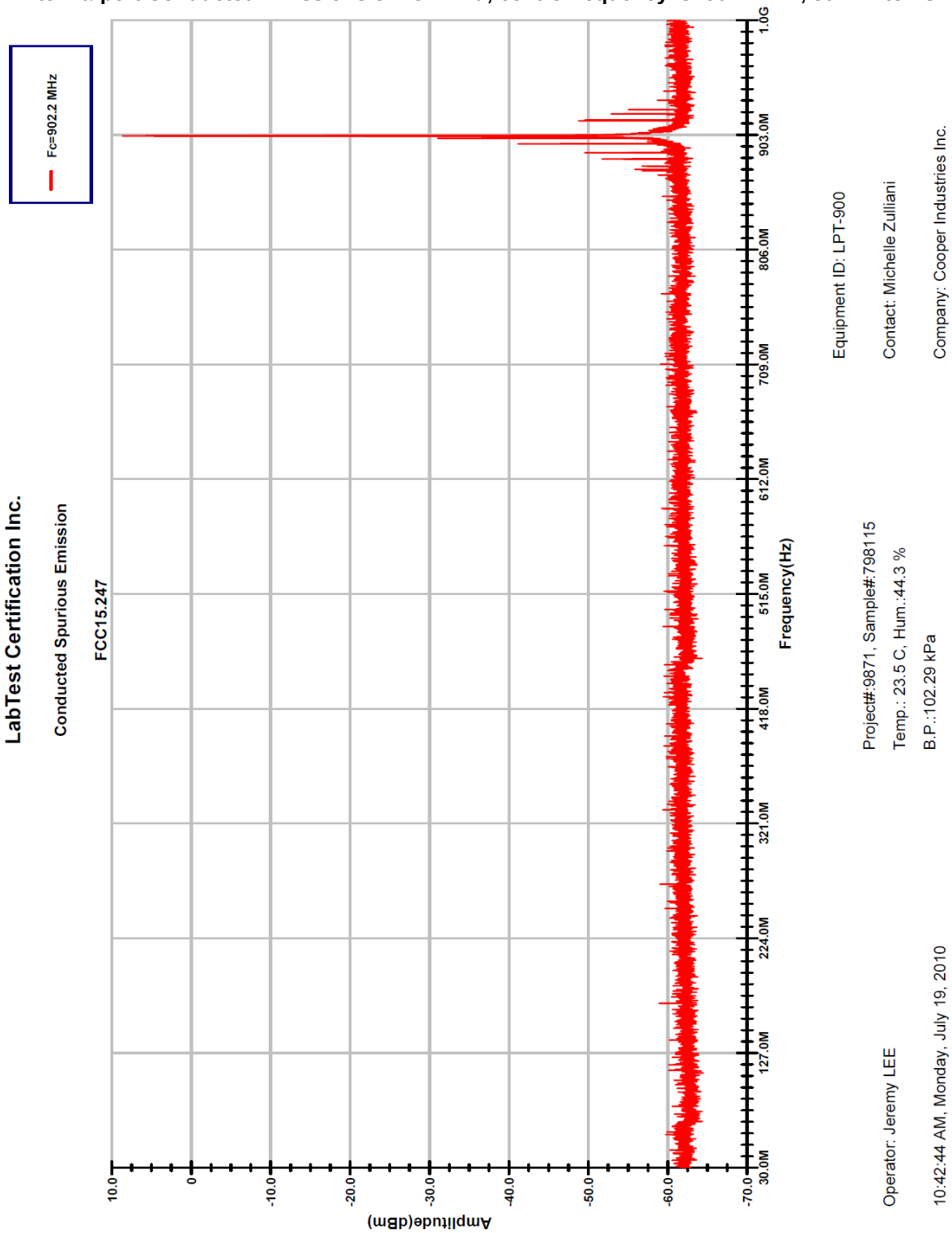
Difference(dB) = Measured Carrier Level(dBm) – Measured Spurious Level(dBm)

Description	Frequency (MHz)	Measured (dBm)	Difference (dB)	Limit (dB)	Pass/Fail
Carrier_Low End	902.2	8.59	-	-	-
Spurious	169.00	- 58.92	67.51	> 20	Pass
	269.78	- 59.05	67.64	> 20	Pass
	768.85	- 59.23	67.82	> 20	Pass
2nd Harmonic	1804.4	- 58.67	67.26	> 20	Pass
3rd Harmonic	2706.6	- 59.83	68.42	> 20	Pass
4th Harmonic	3608.8	- 59.53	68.12	> 20	Pass
5th Harmonic	4511.0	- 58.70	67.29	> 20	Pass
6th Harmonic	5413.2	- 59.67	68.26	> 20	Pass
7th Harmonic	6315.4	- 59.29	67.88	> 20	Pass
8th Harmonic	7217.6	- 58.38	66.97	> 20	Pass
9th Harmonic	8119.8	- 58.41	67.00	> 20	Pass
10th Harmonic	9022.0	- 58.64	67.23	> 20	Pass
Carrier_Middle	915.0	8.77	-	-	-
Spurious	193.54	- 59.47	68.24	> 20	Pass
	447.39	- 59.28	68.05	> 20	Pass
	831.71	- 58.48	67.25	> 20	Pass
2nd Harmonic	1830.0	- 57.42	66.19	> 20	Pass

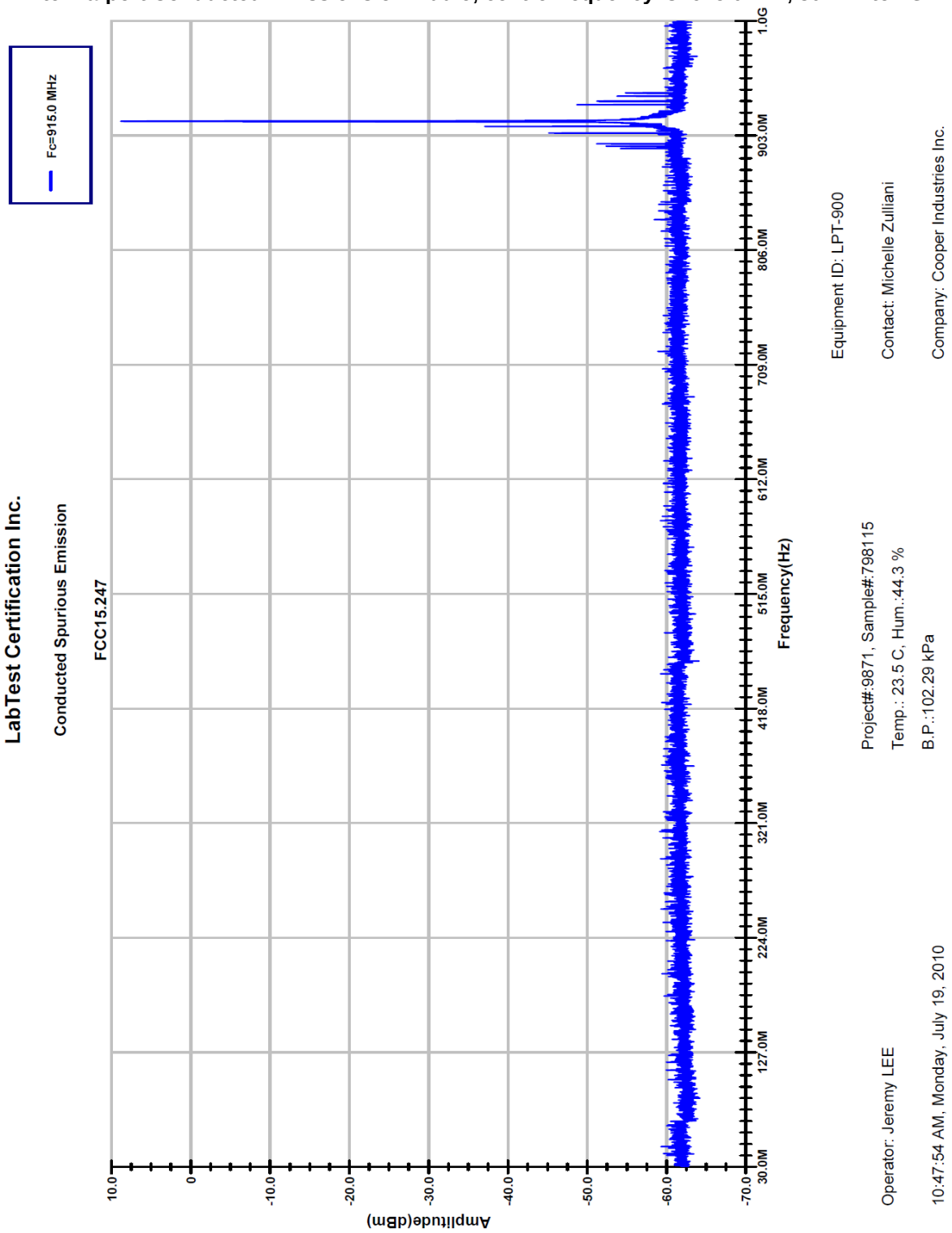
3rd Harmonic	2745.0	- 59.49	68.26	> 20	Pass
4th Harmonic	3660.0	- 59.49	68.26	> 20	Pass
5th Harmonic	4575.0	- 60.16	68.94	> 20	Pass
6th Harmonic	5490.0	- 58.48	67.25	> 20	Pass
7th Harmonic	6405.0	- 58.50	67.27	> 20	Pass
8th Harmonic	7320.0	- 59.06	67.83	> 20	Pass
9th Harmonic	8235.0	- 60.27	69.04	> 20	Pass
10th Harmonic	9150.0	- 59.60	68.37	> 20	Pass
Carrier_High End	927.7	9.13	-	-	-
Spurious	99.55	- 59.75	68.88	> 20	Pass
	428.57	- 58.89	68.02	> 20	Pass
	751.97	- 59.02	68.15	> 20	Pass
2nd Harmonic	1855.4	- 55.96	64.99	> 20	Pass
3rd Harmonic	2783.1	- 59.57	68.70	> 20	Pass
4th Harmonic	3710.8	- 58.28	67.41	> 20	Pass
5th Harmonic	4638.5	- 59.89	69.02	> 20	Pass
6th Harmonic	5566.2	- 59.99	69.12	> 20	Pass
7th Harmonic	6493.9	- 60.70	69.83	> 20	Pass
8th Harmonic	7421.6	- 59.52	68.65	> 20	Pass
9th Harmonic	8349.3	- 59.59	68.72	> 20	Pass
10th Harmonic	9277.0	- 59.94	69.07	> 20	Pass

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

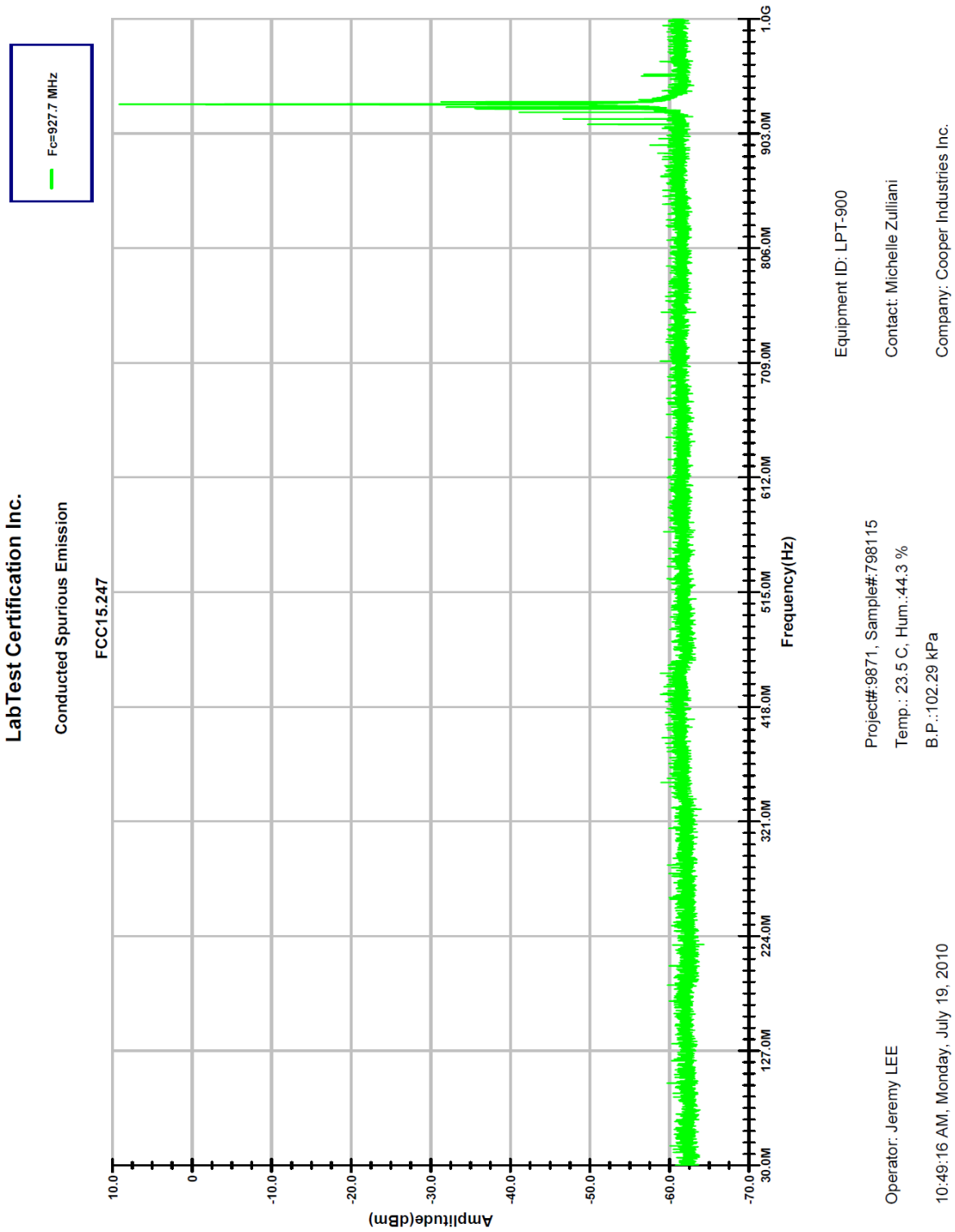
- Antenna-port Conducted Emissions of Low End; centre frequency is: 902.2MHz, 30MHz to 1GHz.



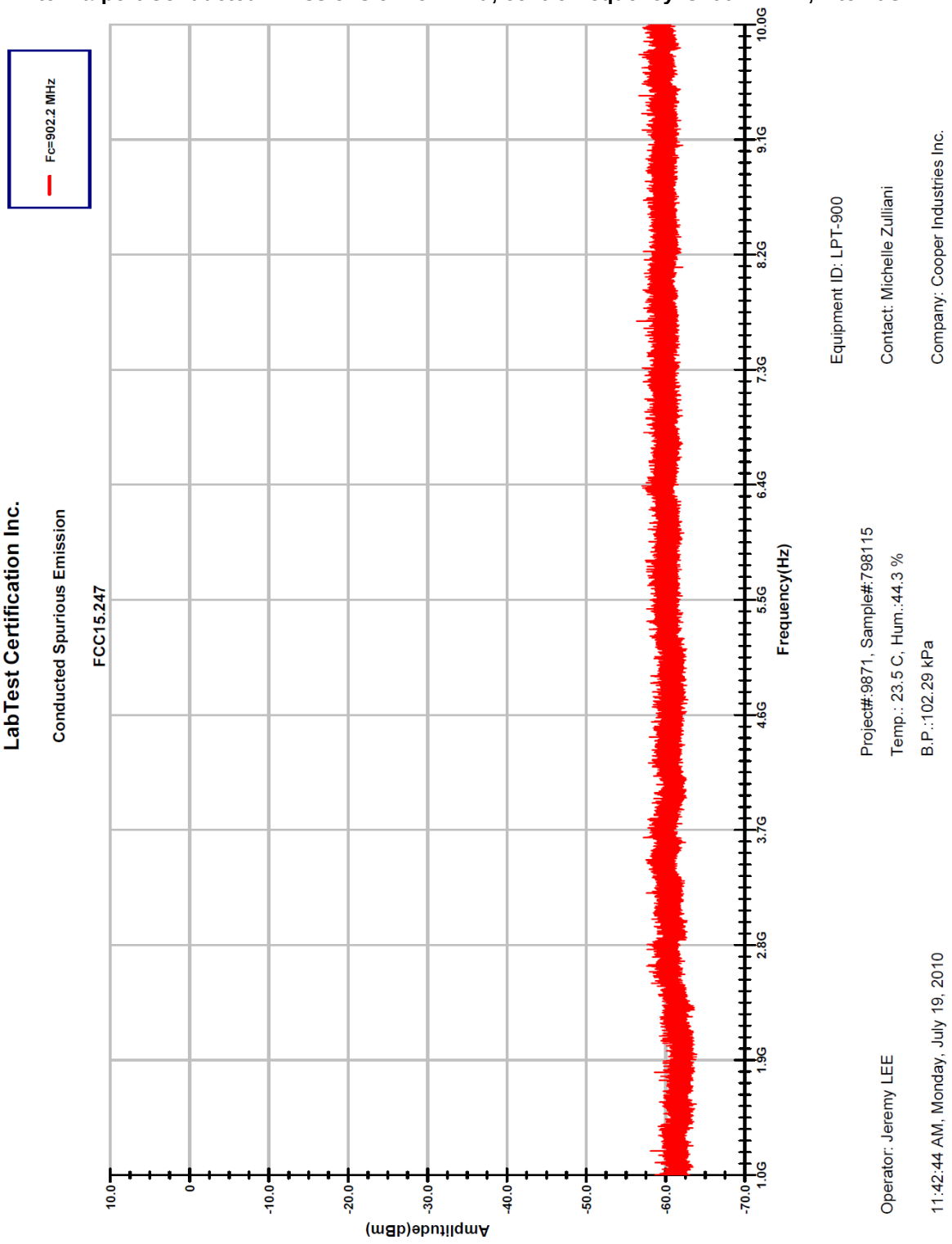
- Antenna-port Conducted Emissions of Middle; centre frequency is: 915.0MHz, 30MHz to 1GHz.



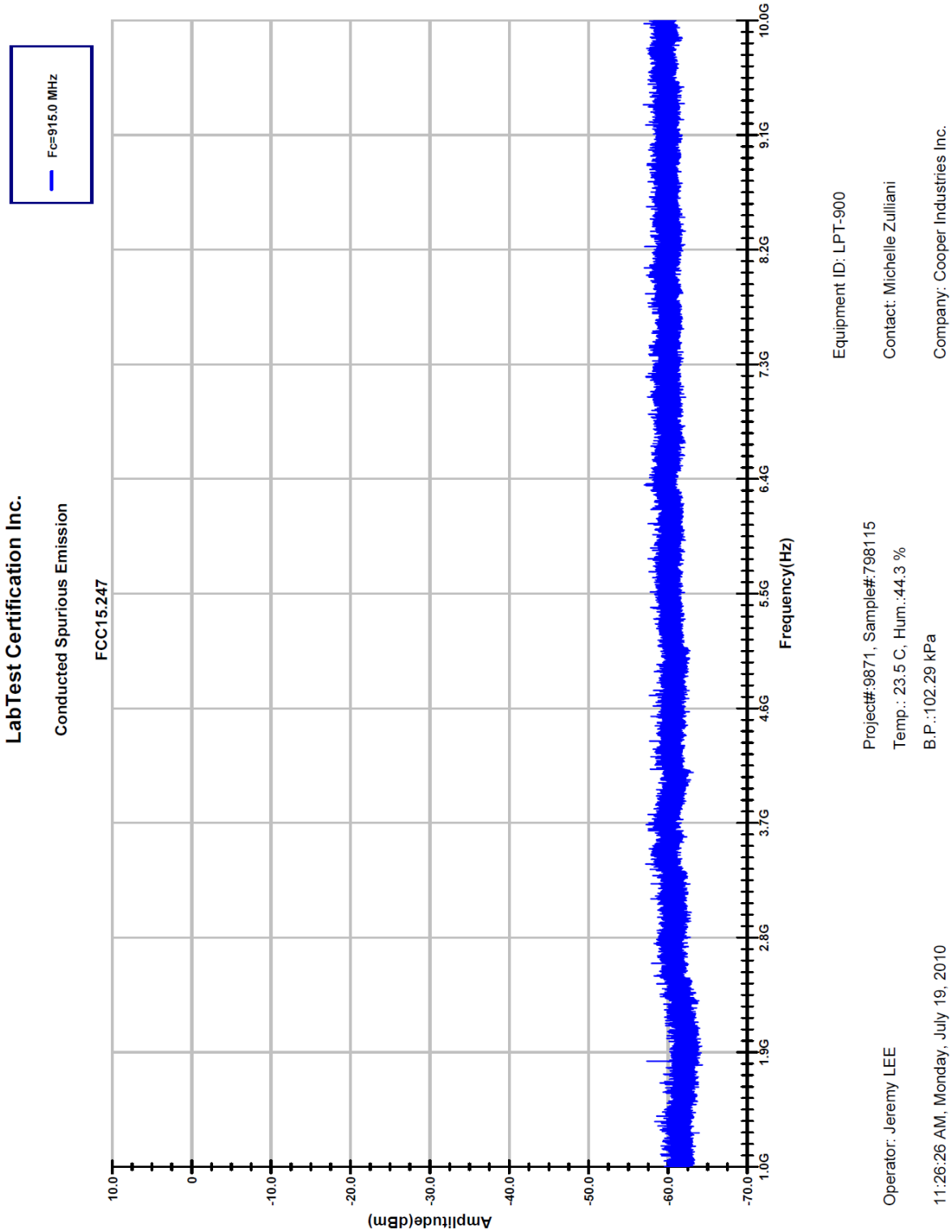
- Antenna-port Conducted Emissions of High End; centre frequency is: 927.7MHz, 30MHz to 1GHz.



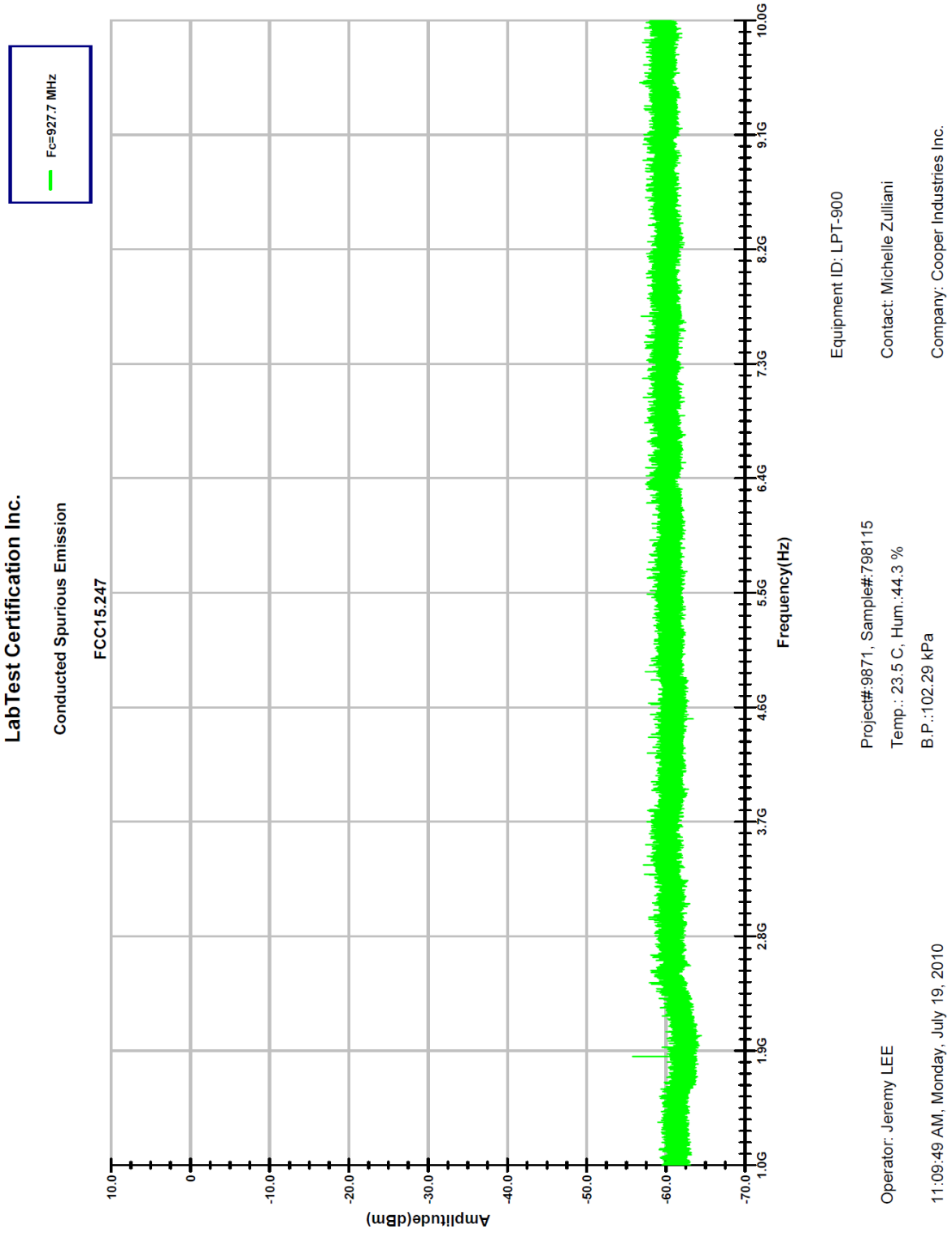
- Antenna-port Conducted Emissions of Low End; centre frequency is: 902.2MHz, 1 to 10GHz.



- Antenna-port Conducted Emissions of Middle; centre frequency is: 915.0MHz, 1 to 10GHz.



- Antenna-port Conducted Emissions of High End; centre frequency is: 927.7MHz, 1 to 10GHz.



Occupied Bandwidth

Temperature	24.5 to 24.8 °C
Relative Humidity	40.2 to 40.5 %
Barometric Pressure:	101.94 kPa
Test Date	July 16, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, N1, N2
Tested By	Jeremy Lee

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

Test Limits

15.247(a)(1)

(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

Test Setup

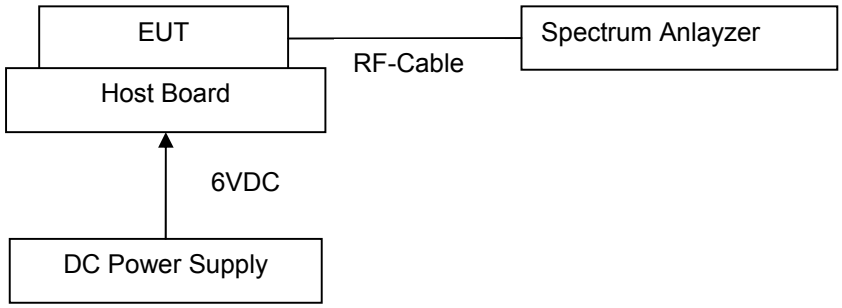
The test was performed in accordance with **FCC 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer.
- 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

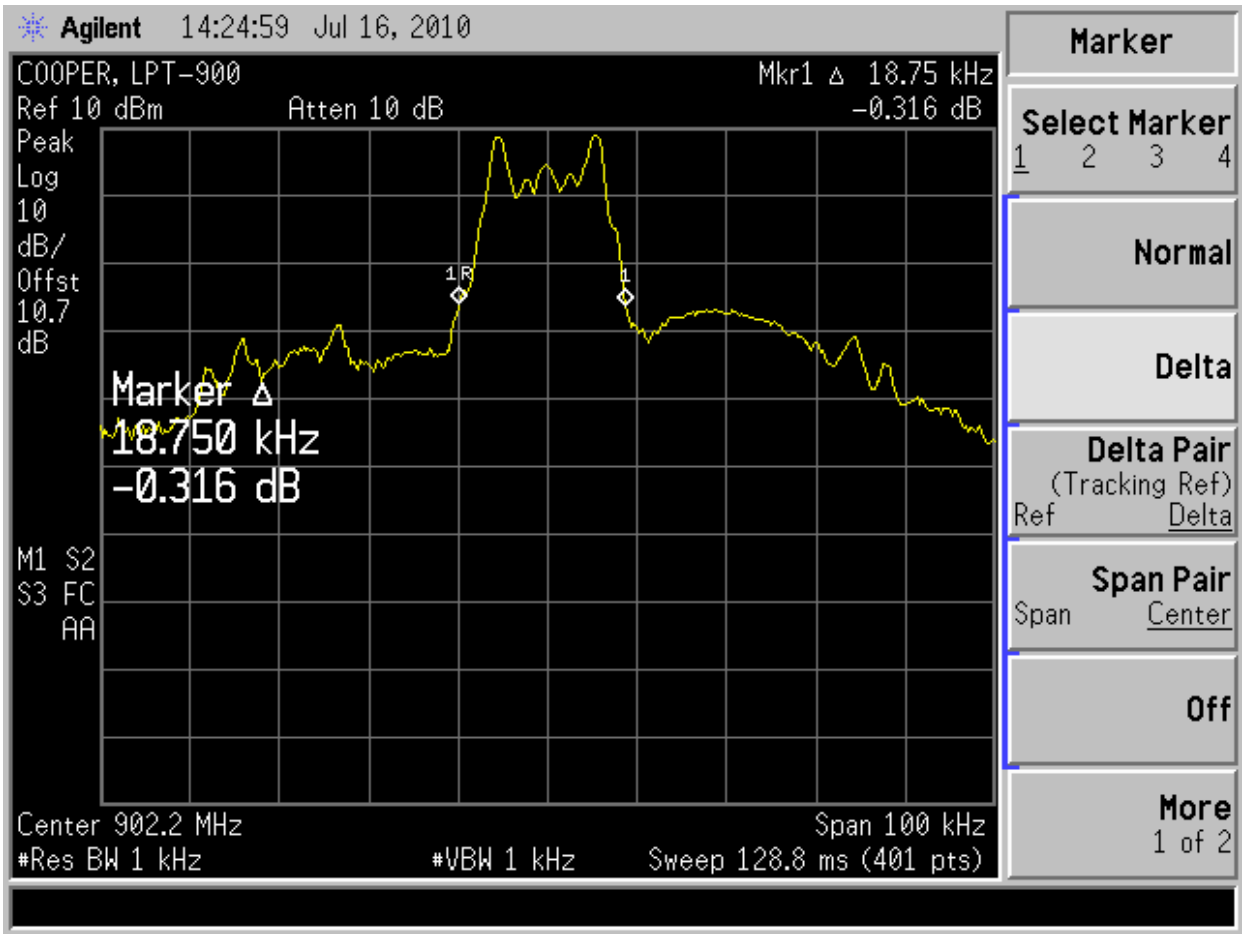


Test Results:

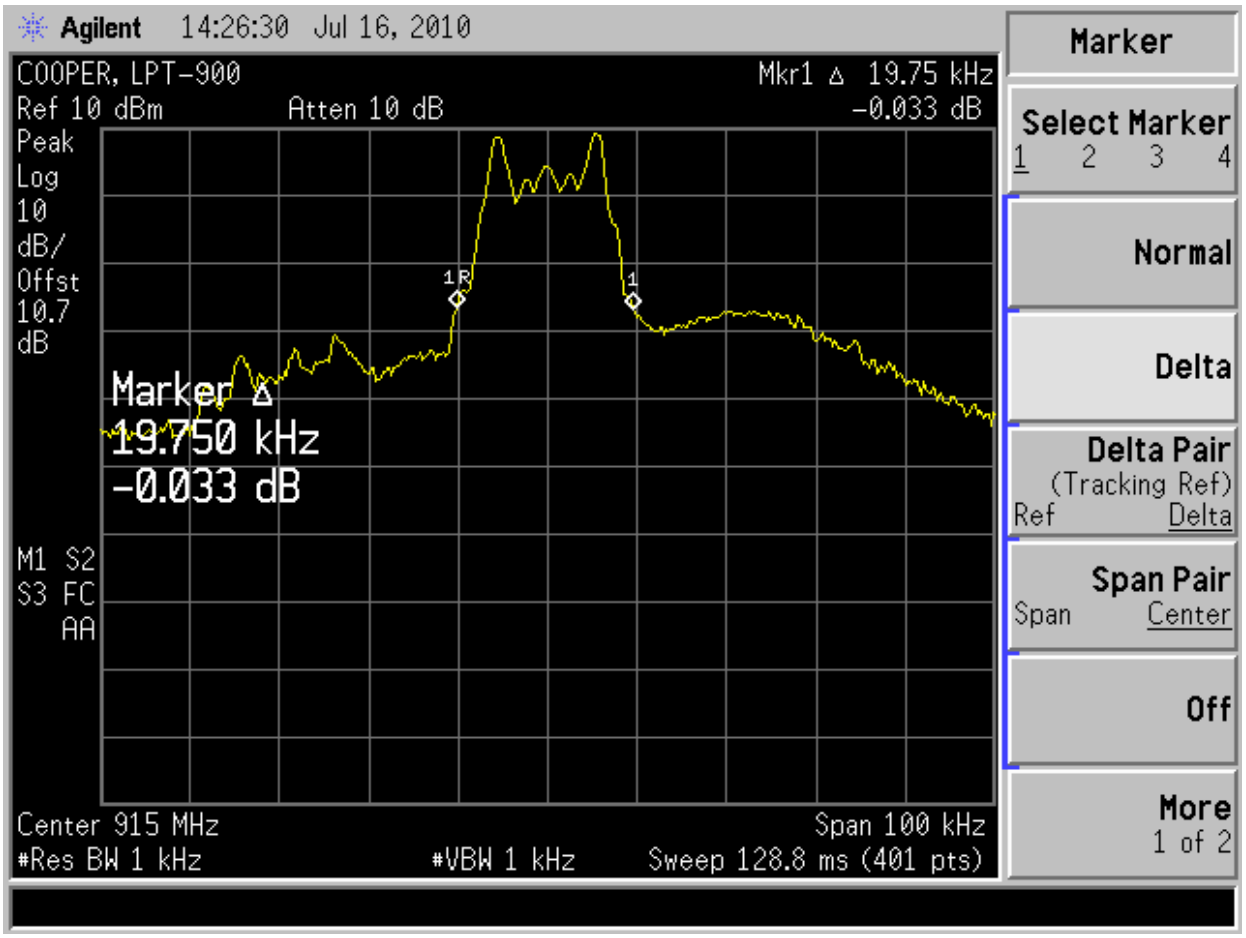
Carrier Frequency(MHz)	20dB BW(kHz)	Limit(kHz)	Pass/Fail
902.2	18.75	N/A	N/A
915.0	19.75	N/A	N/A
927.7	20.25	N/A	N/A

X Pass Fail N/A

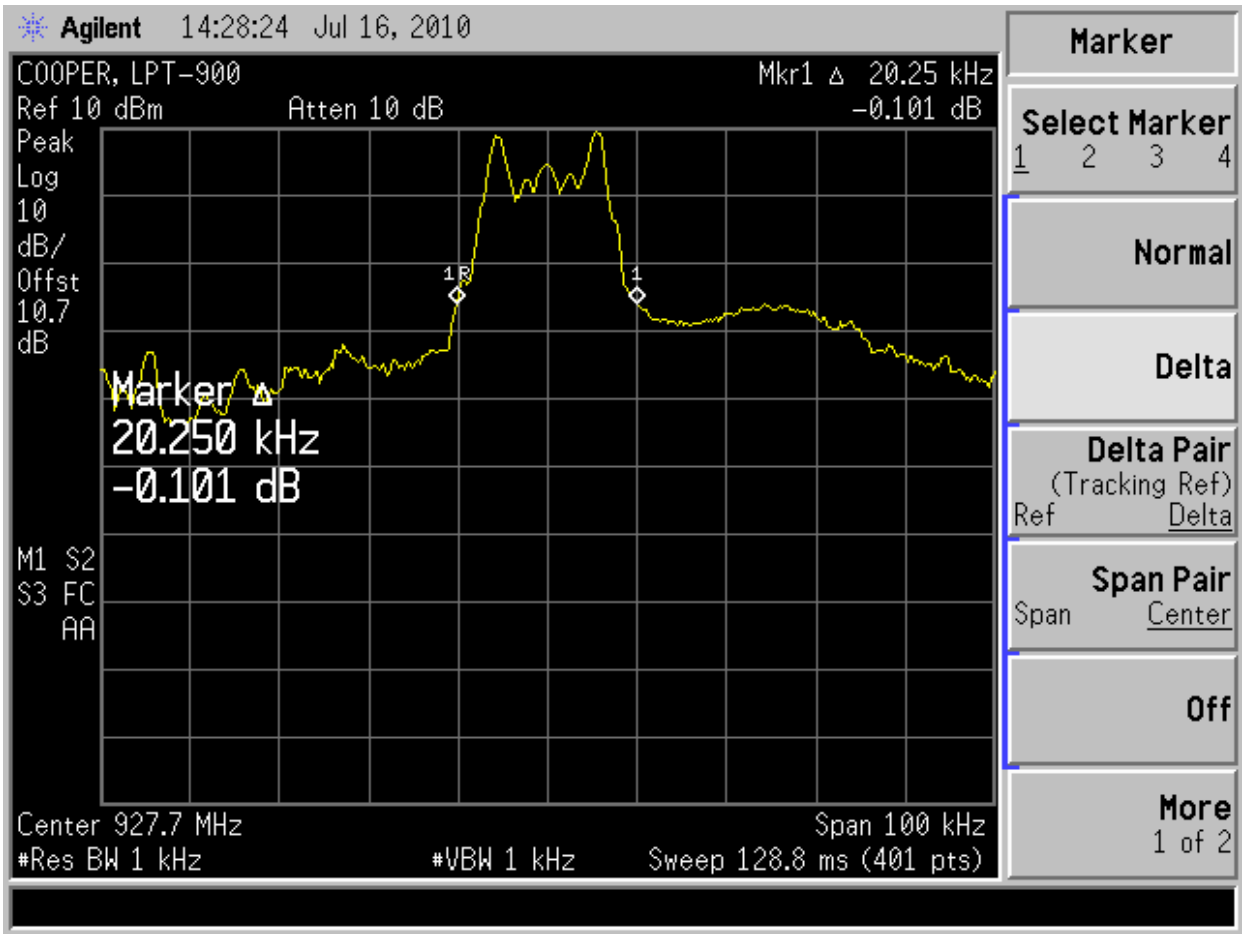
- Channel Separation of Low End; centre frequency is 902.2MHz



- Channel Separation of middle, at centre frequency is 915.0MHz



- Channel Separation of High End, at centre frequency is 927.7MHz



Band-edge Compliance

Temperature	24.9 to 30.7 °C
Relative Humidity	32.0 to 40.0 %
Barometric Pressure:	101.46 to 101.94 kPa
Test Date	July 07 & 16, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, 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.

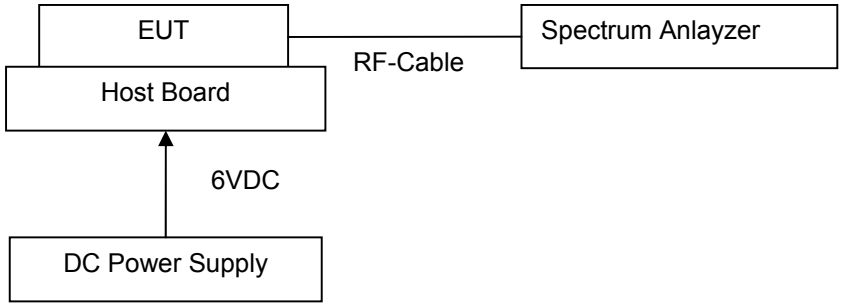
Test Setup

The test was performed in accordance with **FCC 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

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.
- 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

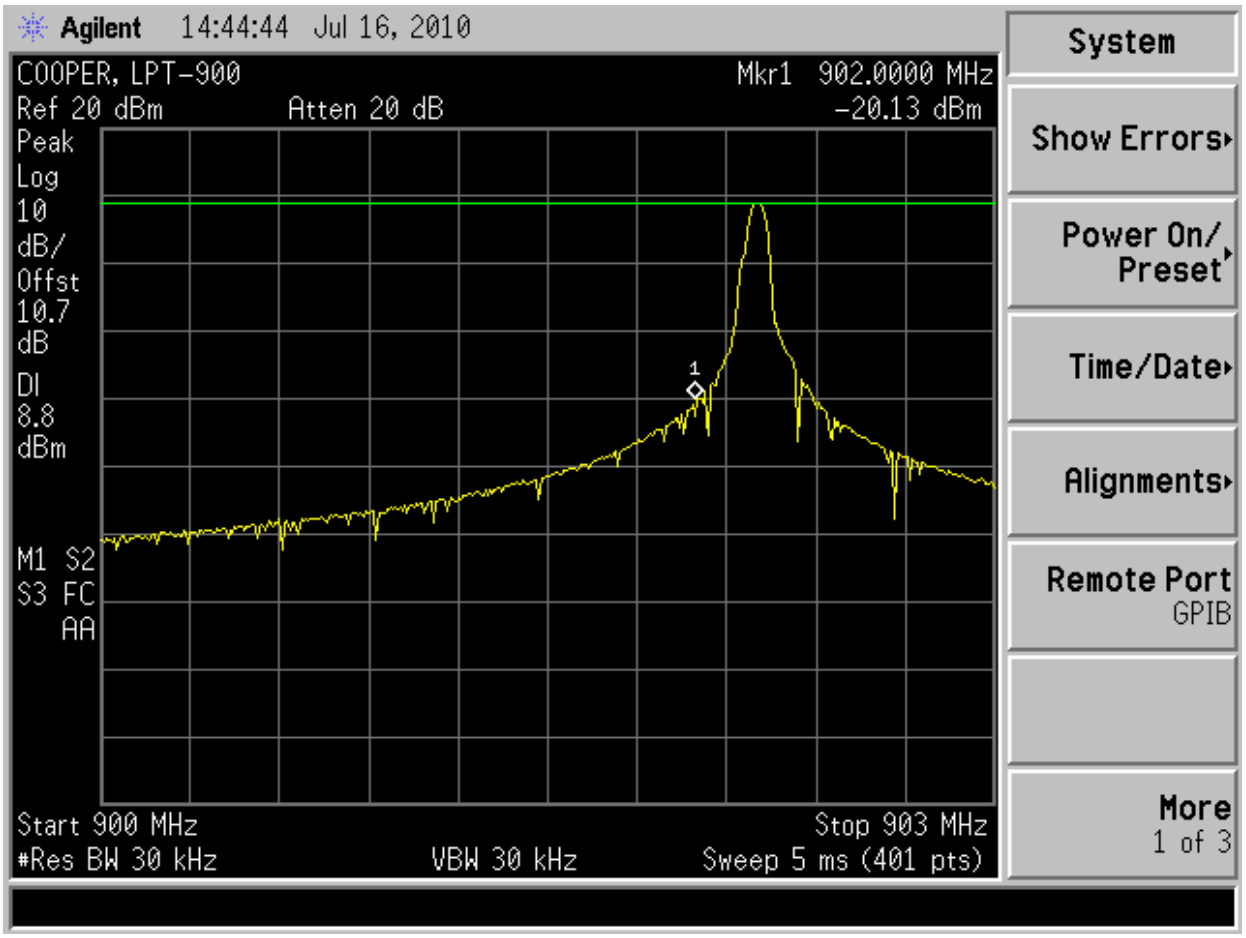


Test Results:

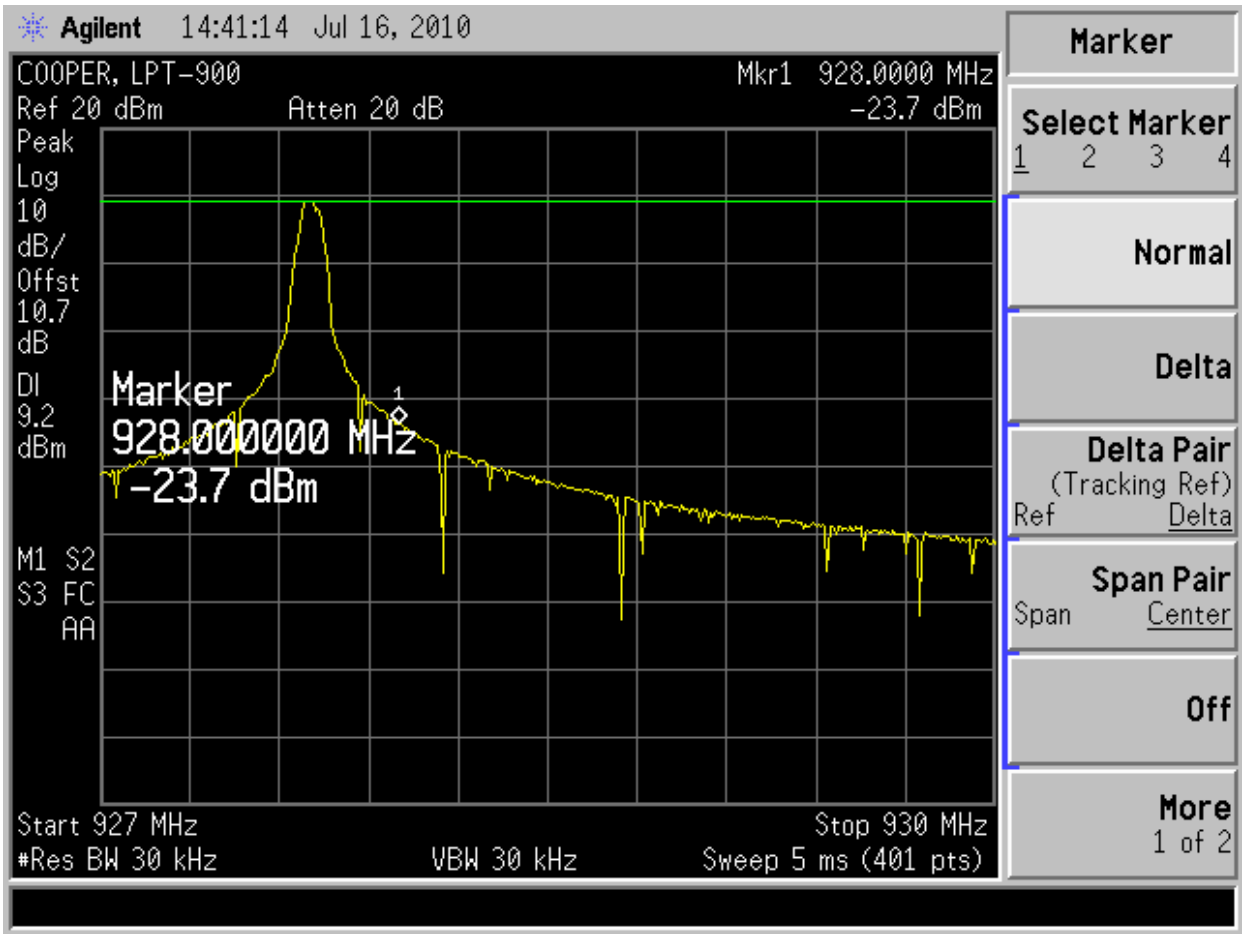
X Pass Fail N/A

Channel Frequency(MHz)	Hopping Mode	Band-edge(dB)	Limit(dB)	Pass/Fail
Low end	No	28.9	≥ 20	Pass
High end	No	32.9	≥ 20	Pass
Low end	Yes	44.3	≥ 20	Pass
High end	Yes	43.7	≥ 20	Pass

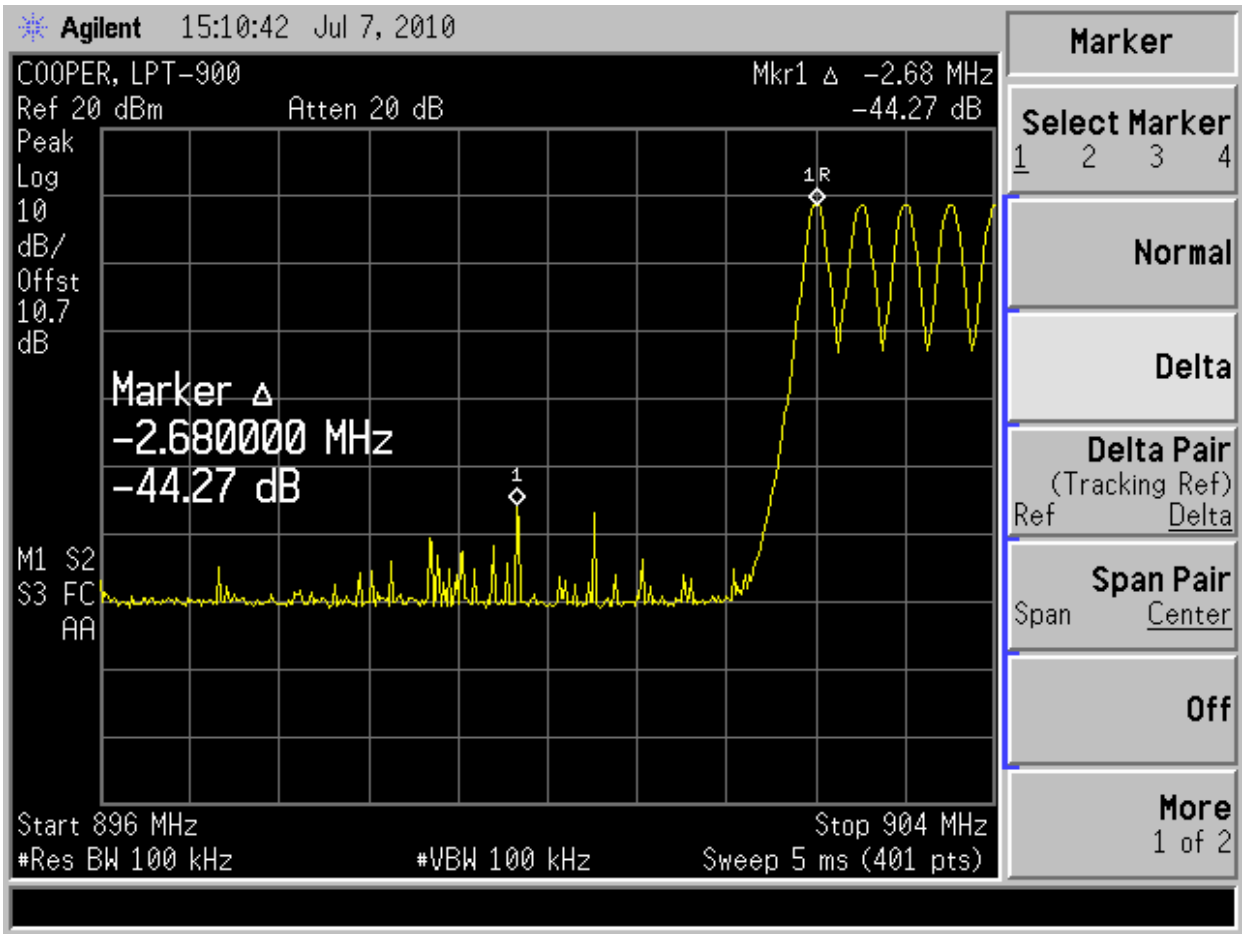
- Band-edge compliance at low-end, no hopping, the Carrier Frequency is 902.2MHz



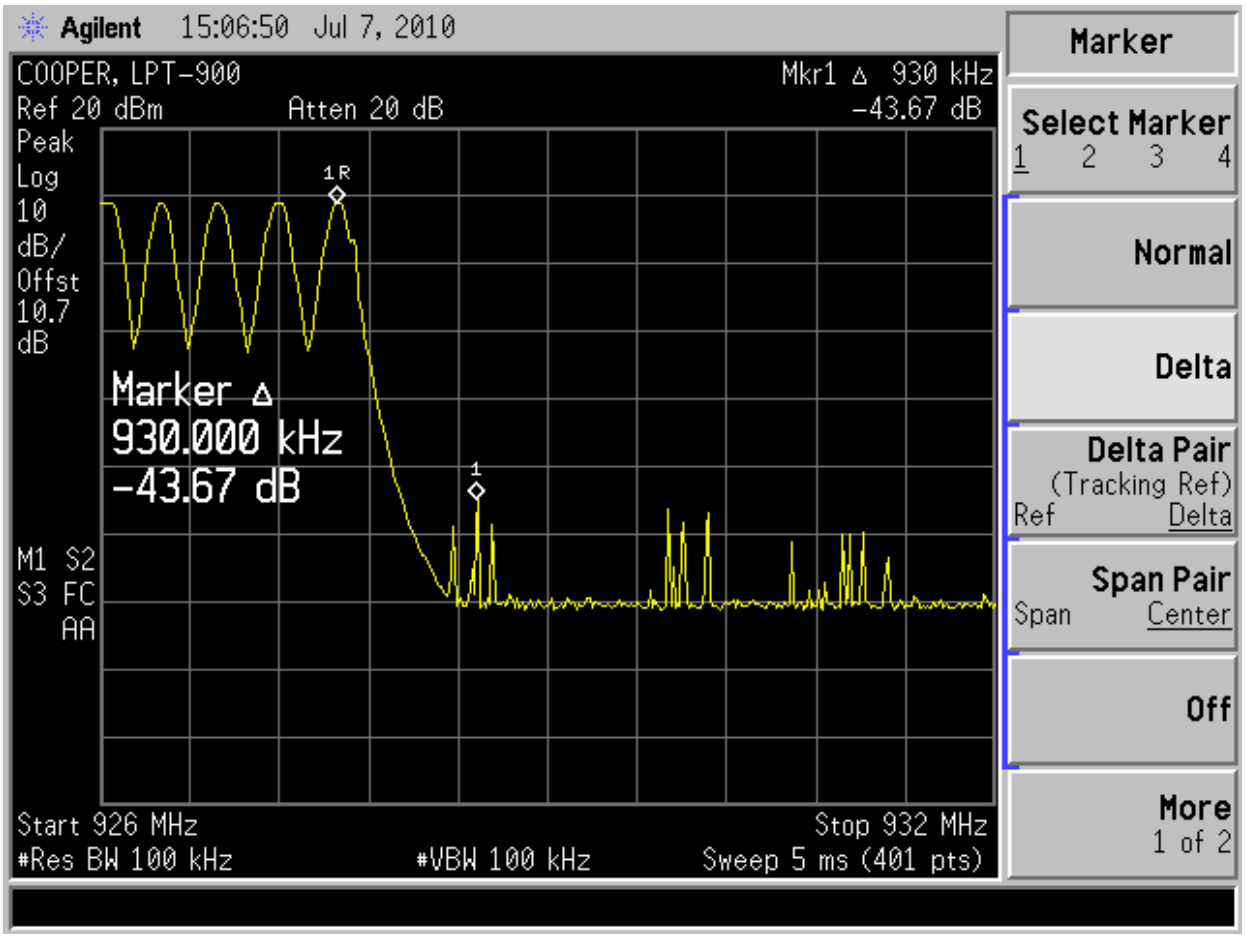
- Band-edge compliance at High-end, no hopping, the Carrier Frequency is 927.7MHz



- Band-edge compliance at low-end, hopping, the lowest centre frequency is 902.4MHz



- Band-edge compliance at High-end, hopping, the highest centre frequency is 927.6MHz



Conducted Output Power

Temperature	24.8 to 25.2 °C
Relative Humidity	40.2 %
Barometric Pressure:	101.94 kPa
Test Date	July 16, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, N1, N2
Tested By	Jeremy Lee

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

Test Limits

15.247(b)

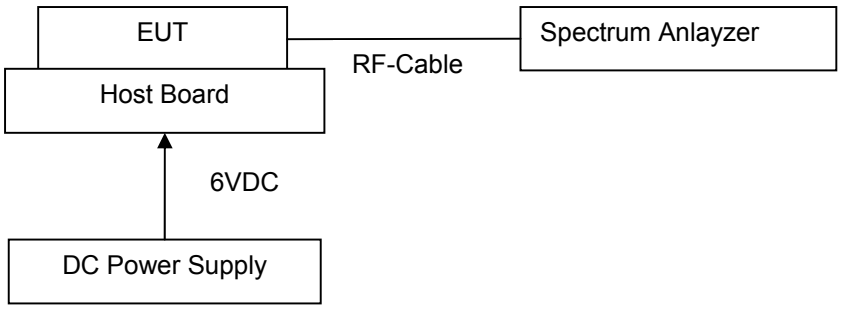
The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt for systems employing at least 50 hopping channels.

Test Setup

The test was performed in accordance with **FCC 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer.
- 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

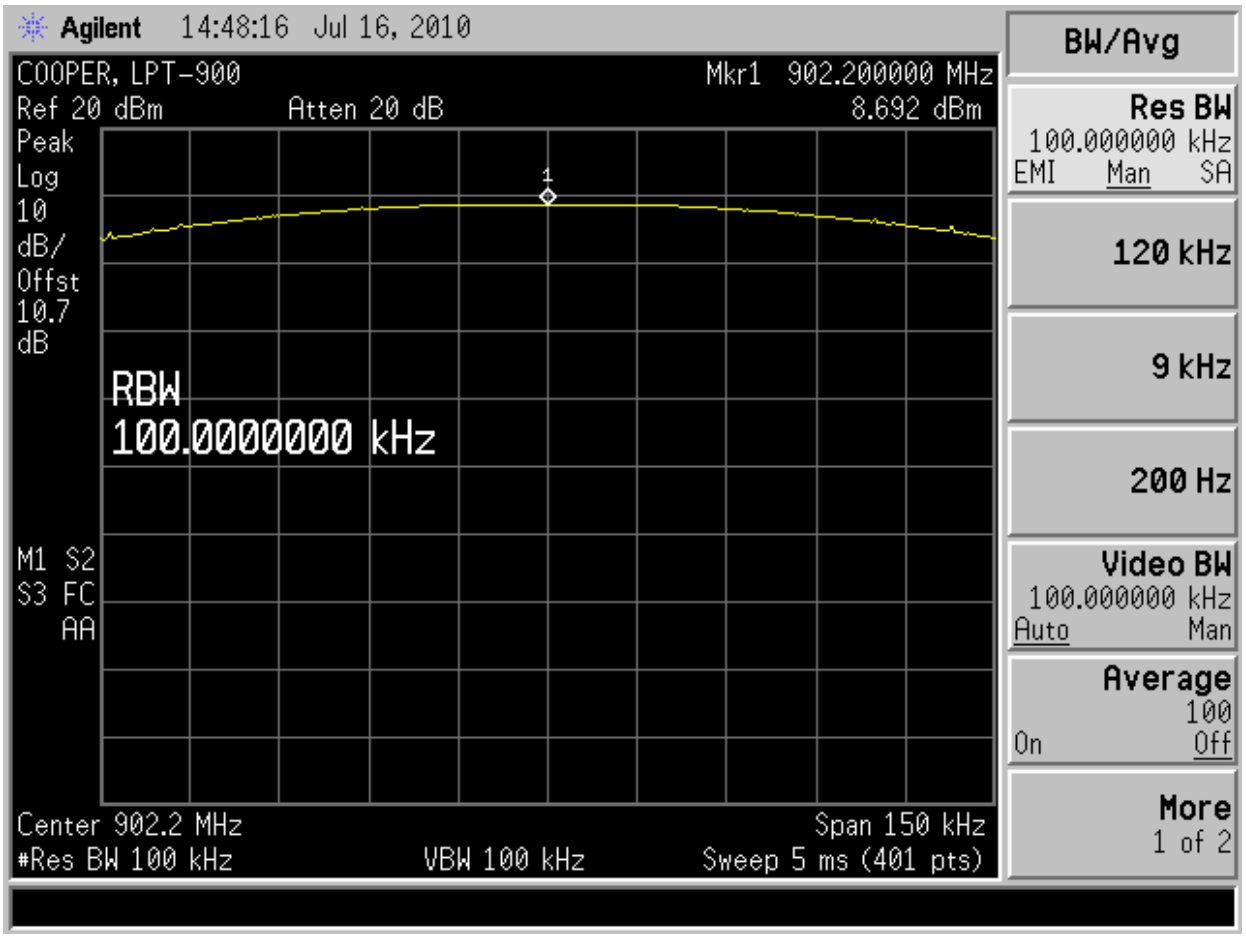


Test Results:

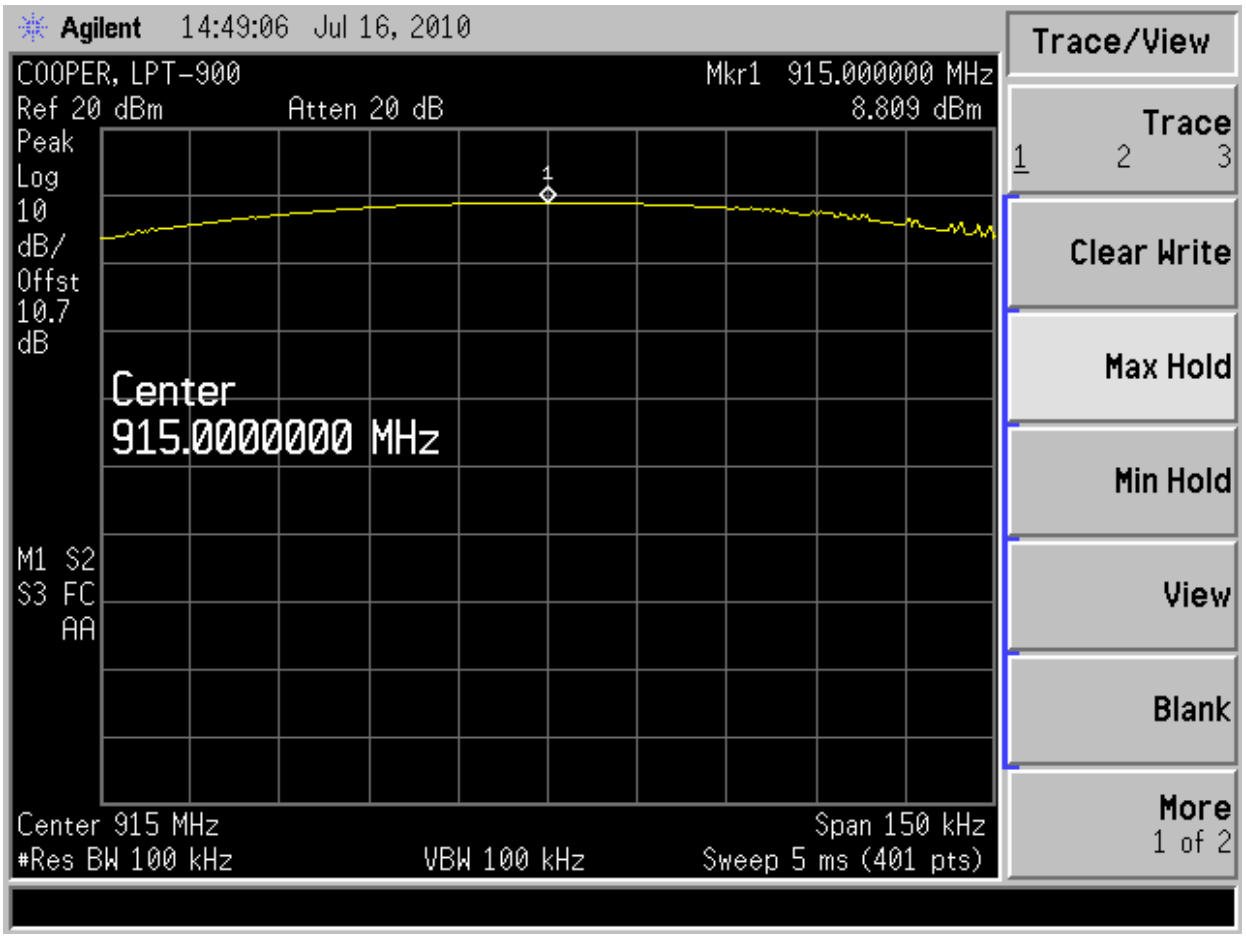
Channel Frequency(MHz)	Peak Power(dBm)	Limit(W/dBm)	Pass/Fail
902.2	8.69	≤ 1 / + 30	Pass
915.0	8.81	≤ 1 / + 30	Pass
927.7	9.09	≤ 1 / + 30	Pass

X Pass Fail N/A

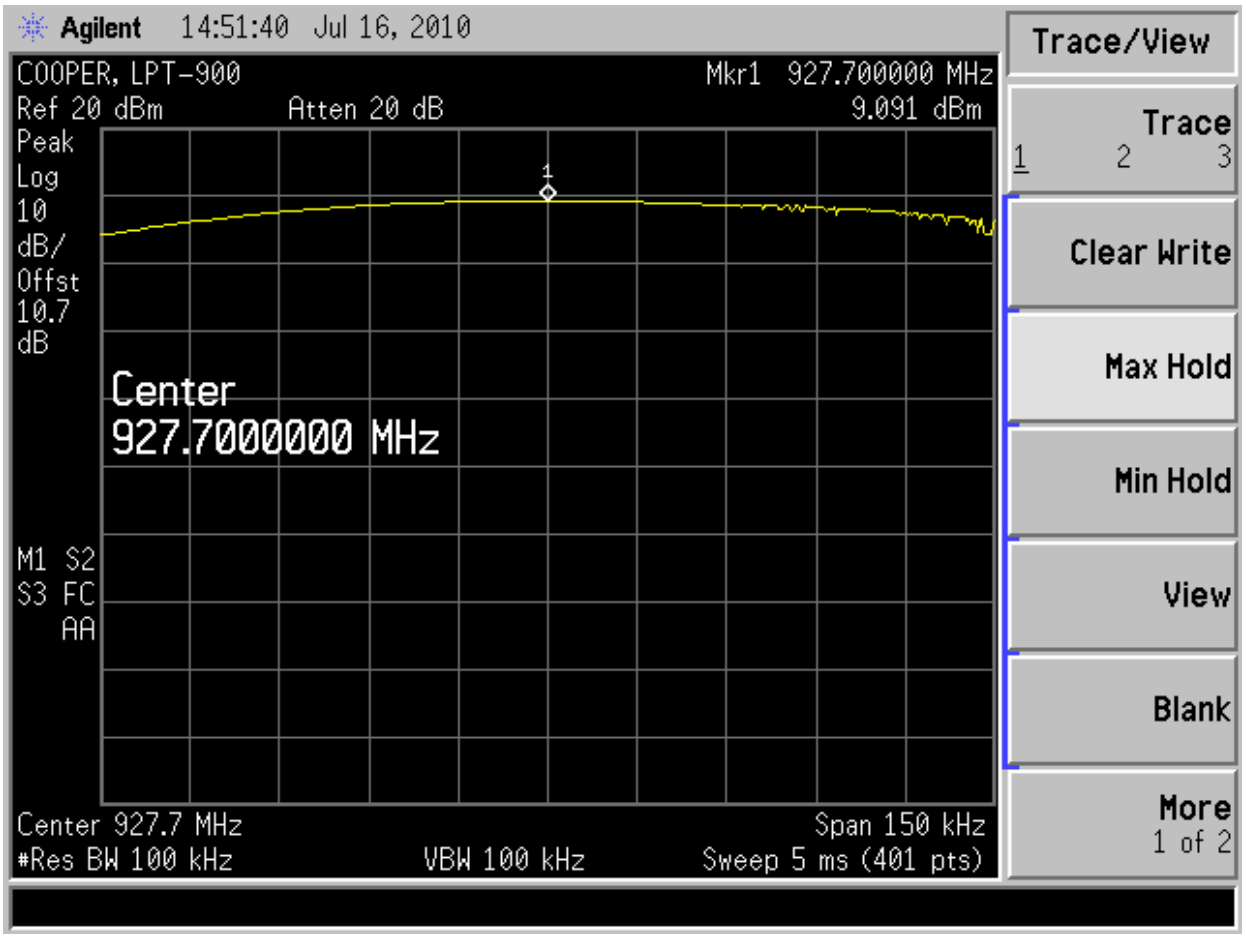
- Conducted maximum power at the Carrier Frequency is 902.2MHz



- Conducted maximum power at the Carrier Frequency is 915.0MHz



- Conducted maximum power at the Carrier Frequency is 927.7MHz



Antenna Gain

Test Date	July 07, 2010
Sample Number	798115
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
Internal Sleeved dipole	1.76	≤ 6	Pass

X Pass Fail N/A

Carrier Frequency Separation

Temperature	29.8 °C
Relative Humidity	35.2 %
Barometric Pressure:	101.52 kPa
Test Date	July 07, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, N1, N2
Tested By	Jeremy Lee

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

Test Limits

15.247(a)

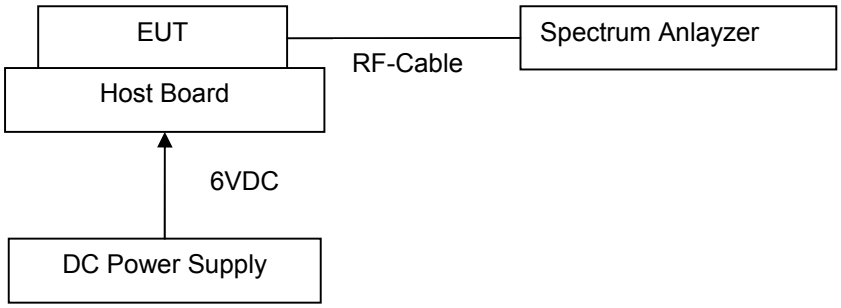
(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Test Setup

The test was performed in accordance with **FCC 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer.
- 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

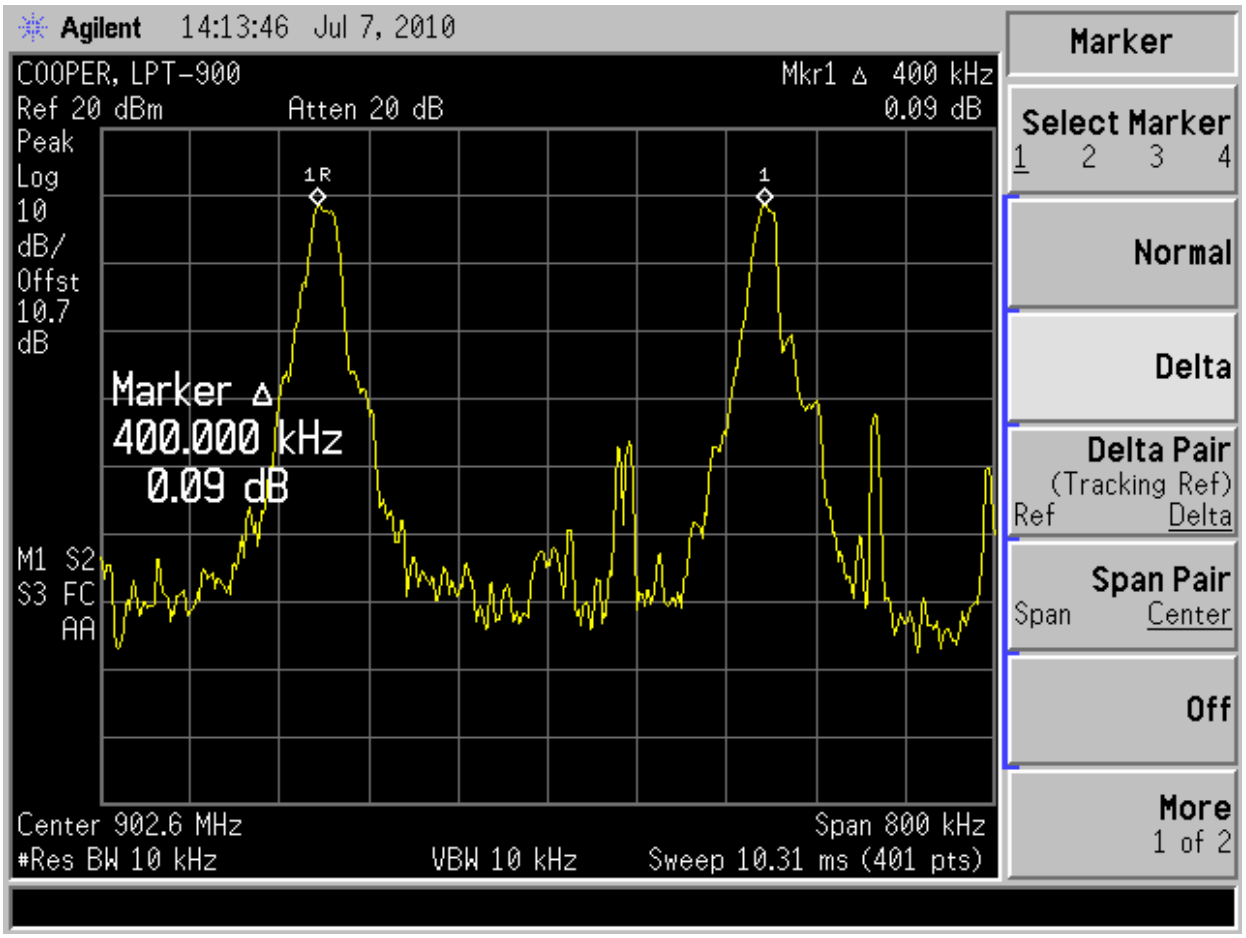


Test Results:

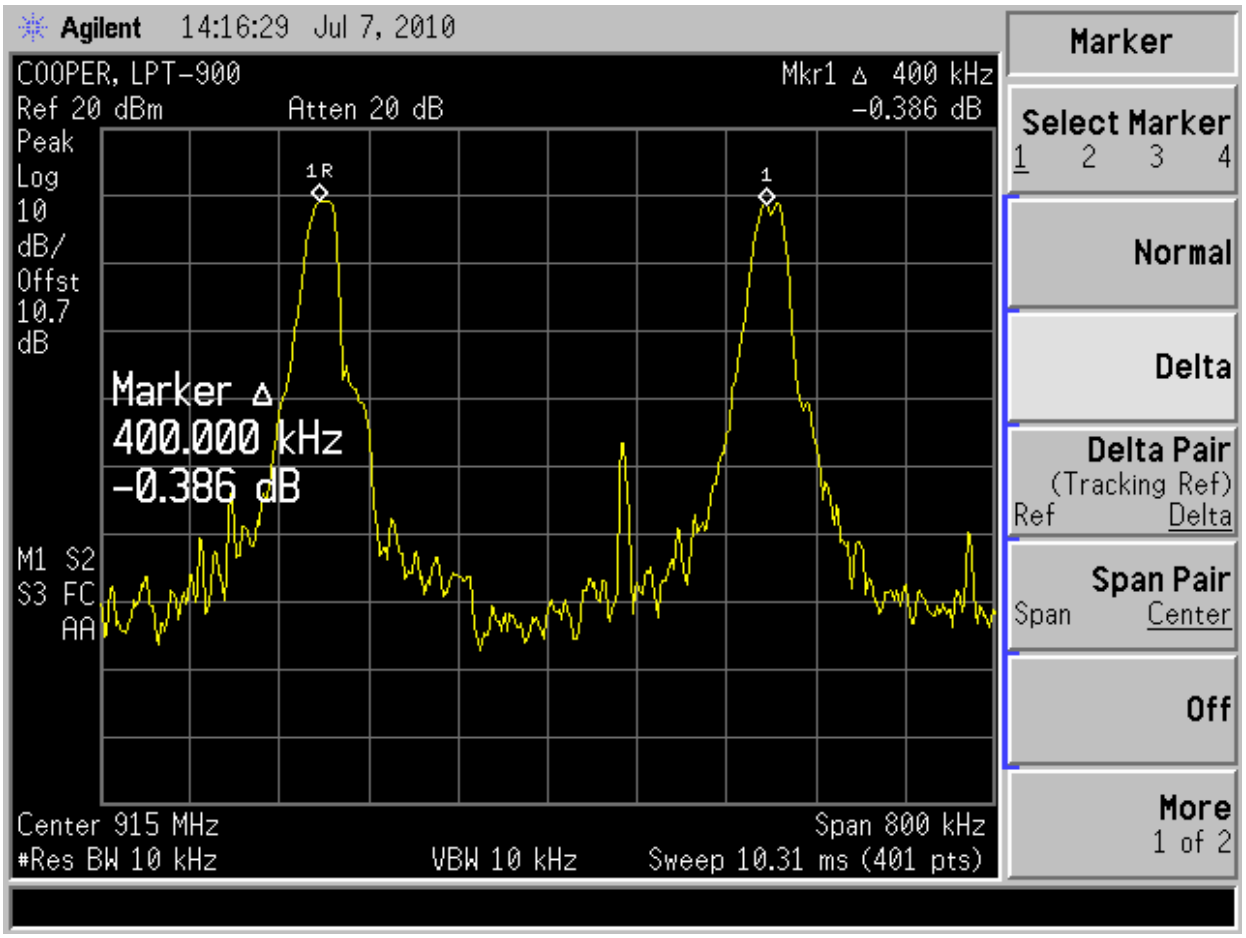
Centre Frequency(MHz)	Carrier Frequency Separation (kHz)	Limit(kHz)	Pass/Fail
902.6	400	≥ 25	Pass
915.0	400	≥ 25	Pass
927.4	400	≥ 25	Pass

X Pass Fail N/A

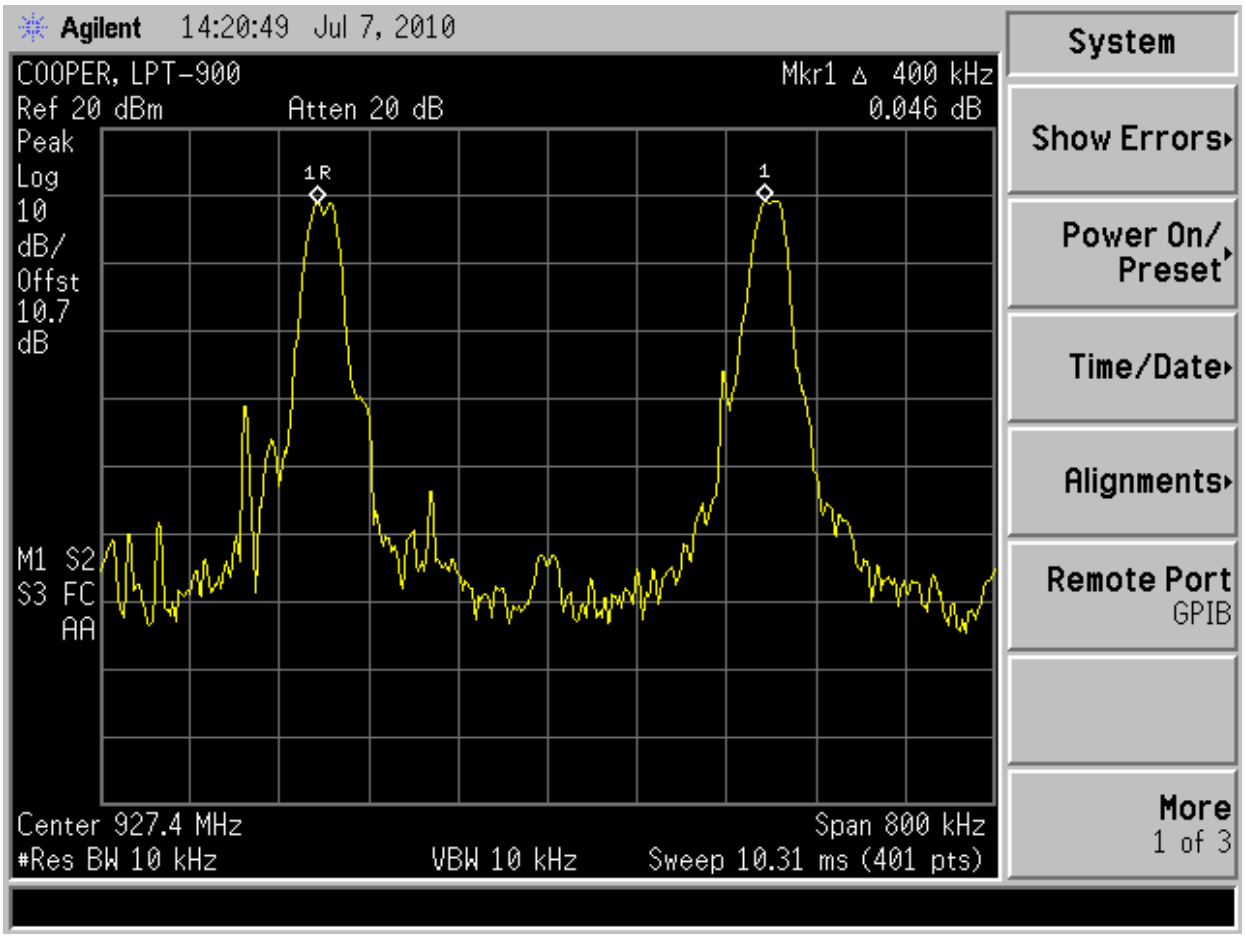
- Carrier Frequency Separation of Low End; centre frequency is 902.6MHz.



- Carrier Frequency Separation of middle; centre frequency is 915.0MHz.



- Carrier Frequency Separation of High End; centre frequency is 927.4MHz.



Number of Hopping Frequencies

Temperature	30.4 to 30.5 °C
Relative Humidity	33.6 to 33.9 %
Barometric Pressure:	101.46 kPa
Test Date	July 07, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, N1, N2
Tested By	Jeremy Lee

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

Test Limits

15.247(a)(1)

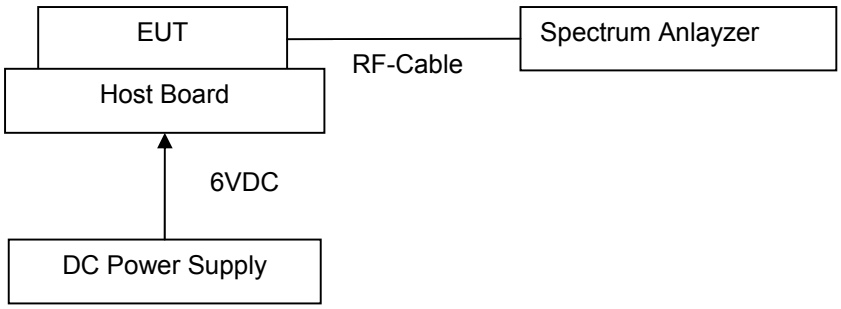
(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.

Test Setup

The test was performed in accordance with **FCC 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer.
- 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

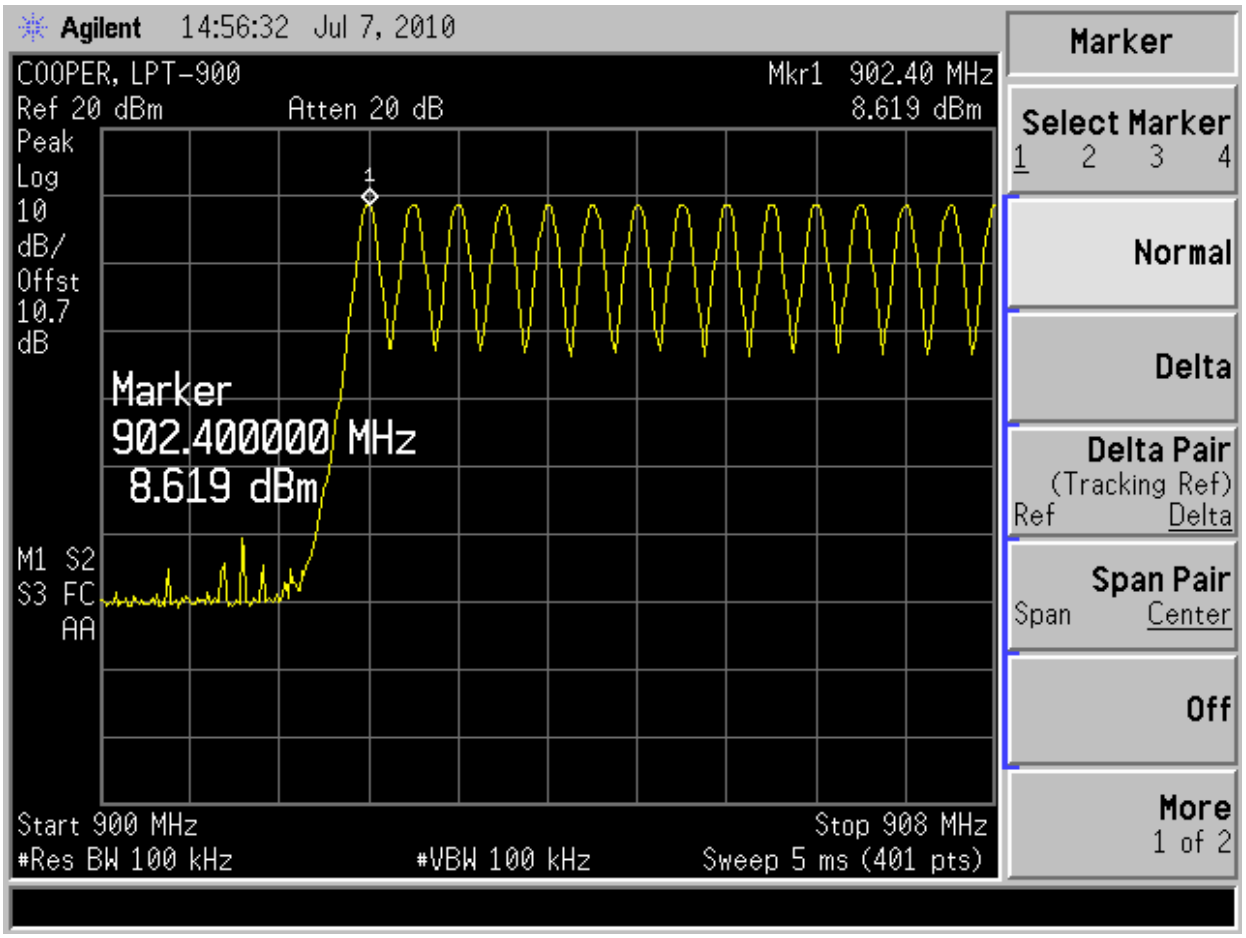


Test Results:

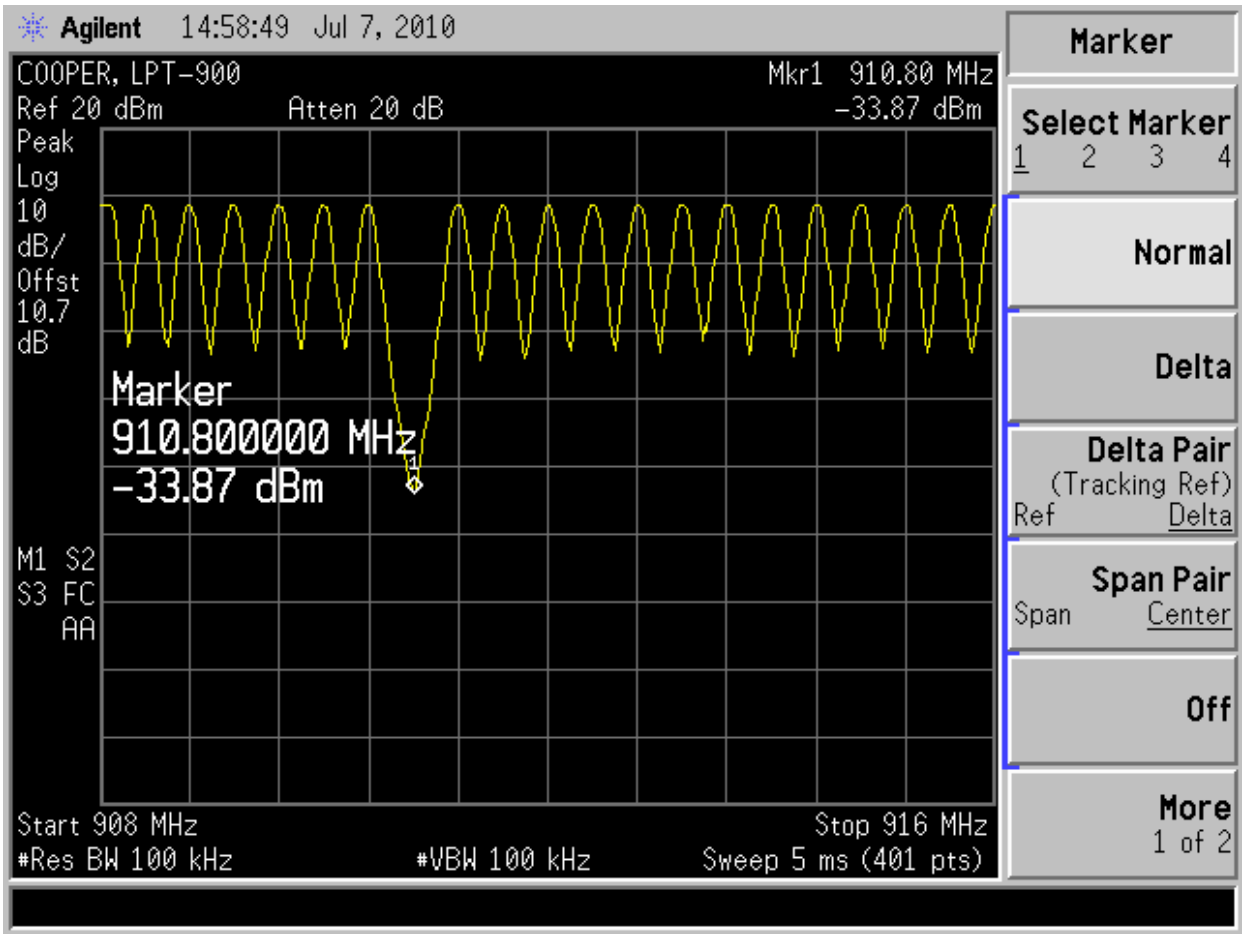
Frequency range (MHz)	Channel Number	Limit	Pass/Fail
902.4 to 927.6	63	≥ 50	Pass

X Pass Fail N/A

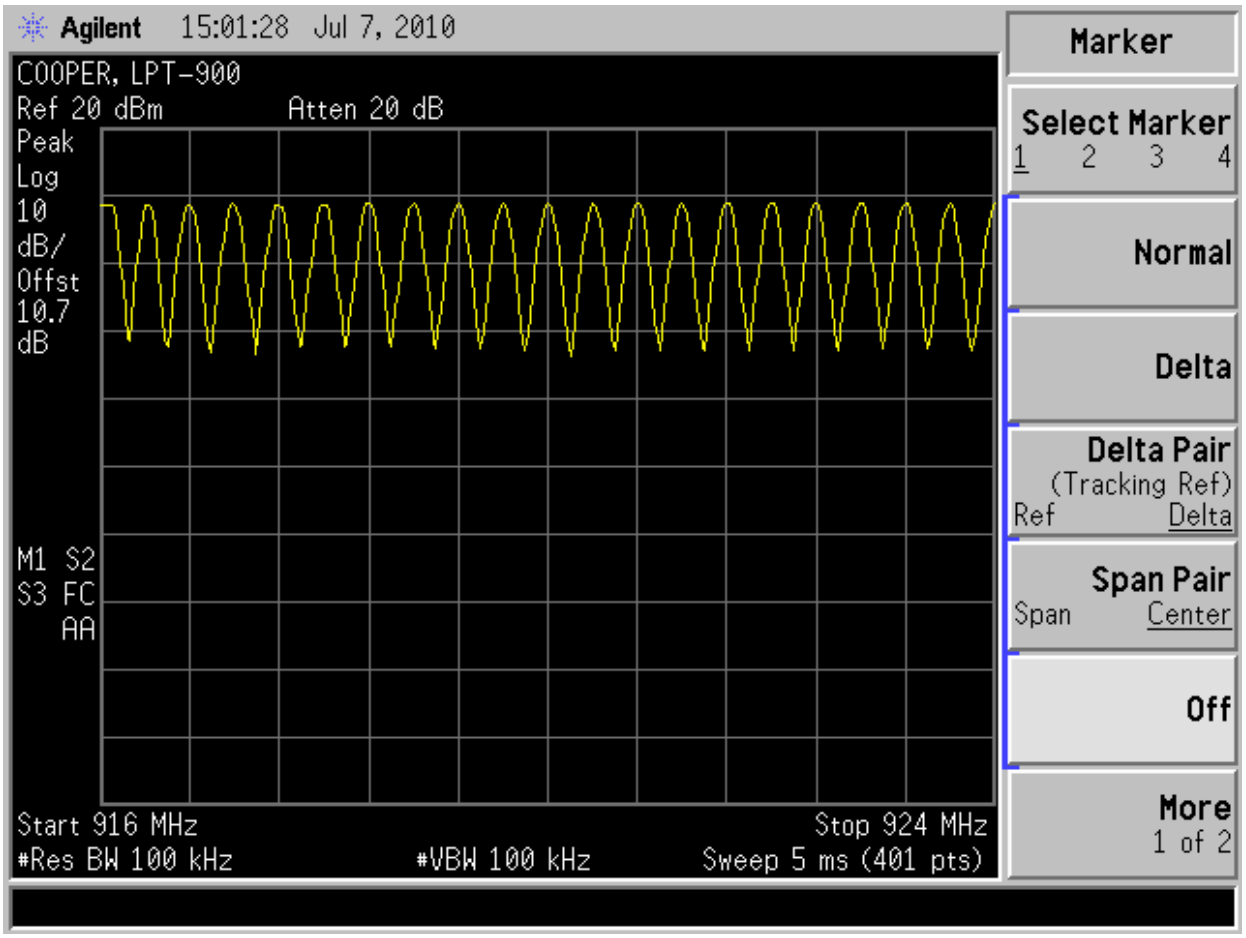
- Number of Channels, plot#1, 15 channels



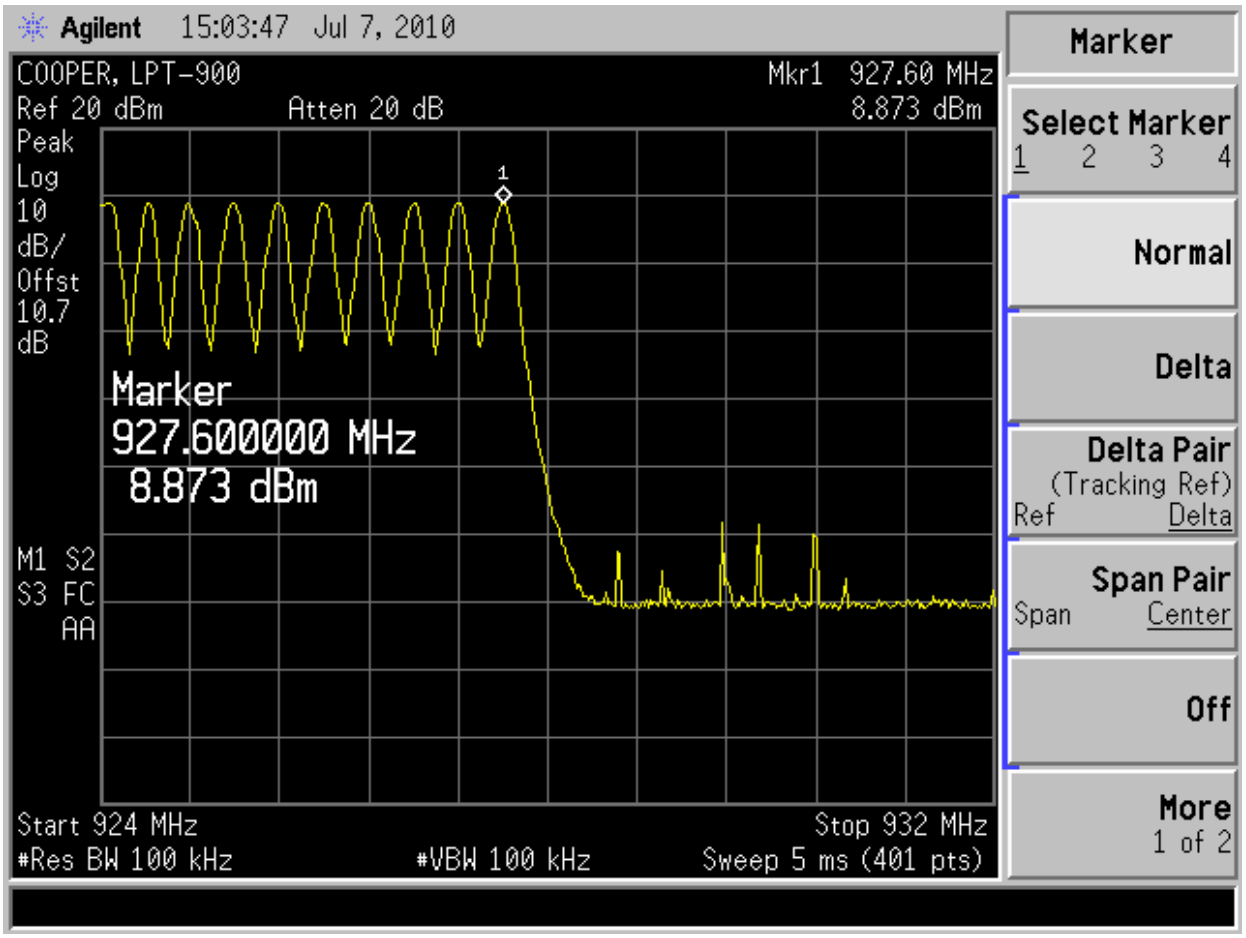
- Number of Channels, plot#2, 19channels



- Number of Channels, plot#3, 20 channels



- Number of Channels, plot#4, 9 channels



Time of Occupancy (Dwell Time)

Temperature	25.0 to 30.0 °C
Relative Humidity	34.7 to 39.8 %
Barometric Pressure:	101.52 to 101.94 kPa
Test Date	July 07 & 16, 2010
Sample Number	798115
Calibrated Test Equipment (ID)	228, 272
Reference Equipment (ID) (Calibration not required)	059, N1, N2
Tested By	Jeremy Lee

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

Test Limits

15.247(a)(1)

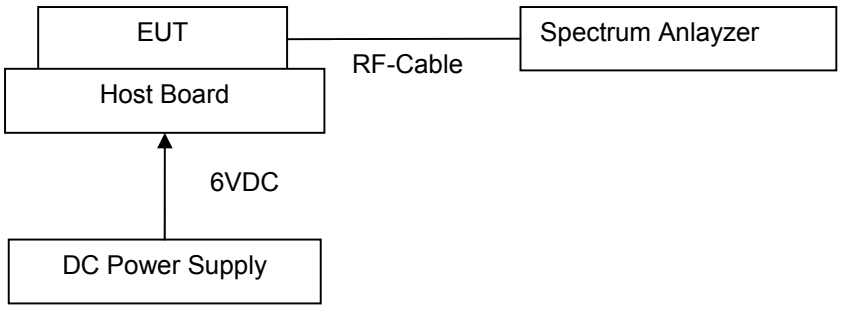
(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

Test Setup

The test was performed in accordance with **FCC 15.247:2009, FCC 15.31:2009 and ANSI C63.10:2009.**

- The RF output of the EUT was connected to the RF input port of the Spectrum Analyzer.
- 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 20 sec or 10.4 sec (10.4 sec is 400ms times 26 channels).

Setup Block Diagram



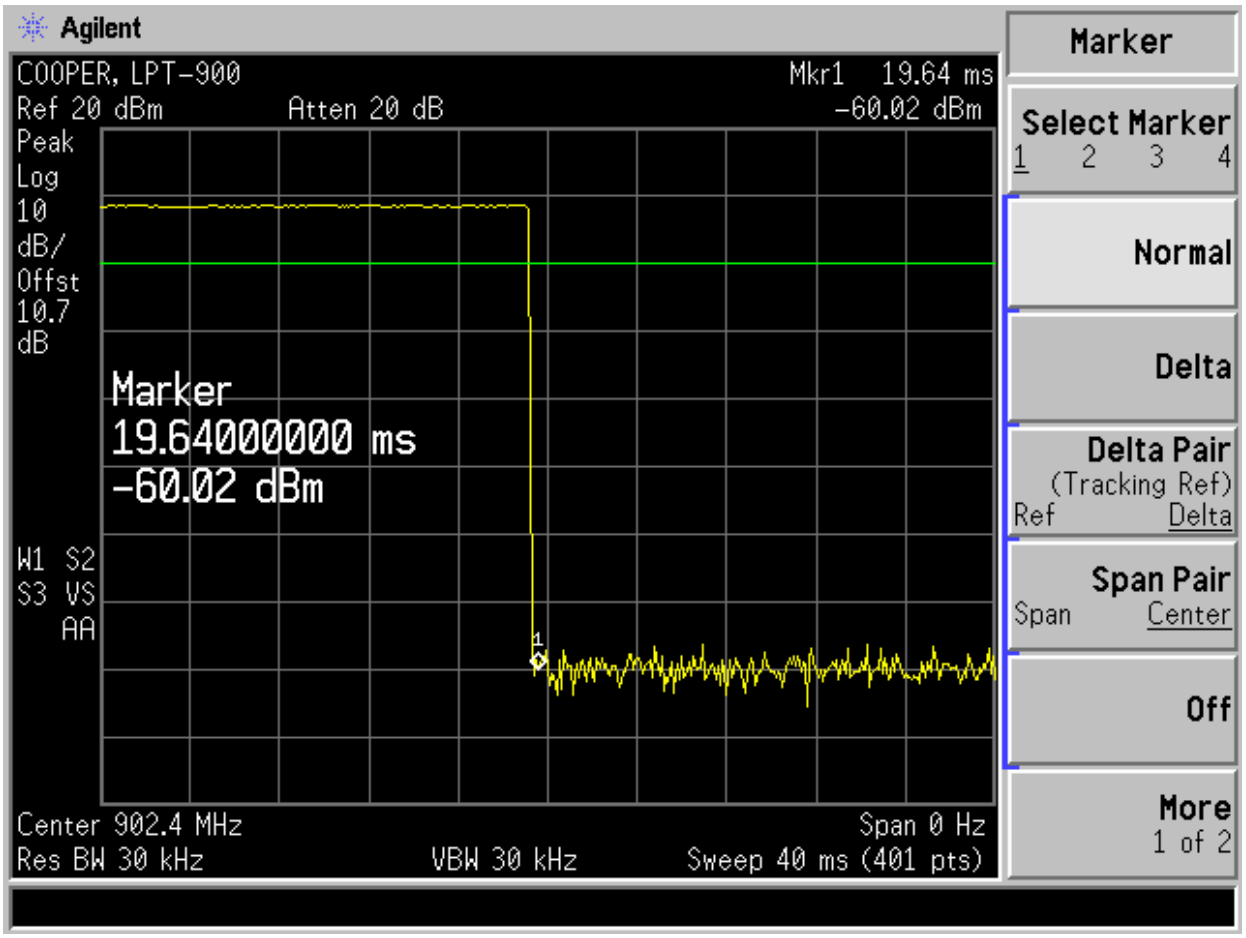
Test Results:

Channel Frequency(MHz)	Dwell Time (ms)	Limit(ms)	Pass/Fail
902.4	255.32 [1)]	< 400	Pass
915.2	255.32 [1)]	< 400	Pass
927.6	255.32 [1)]	< 400	Pass

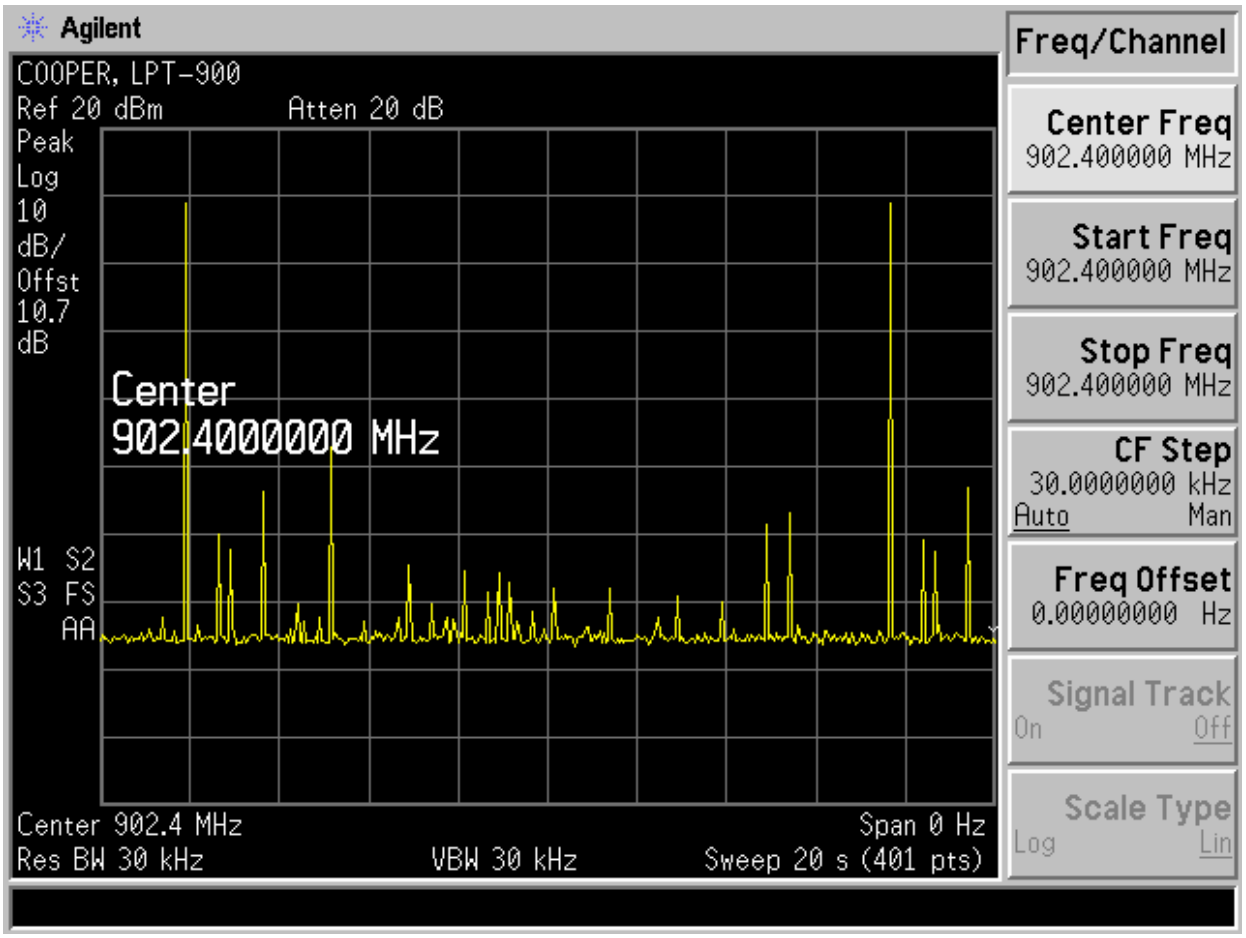
Note 1) Followed by user manual, the full hop cycle takes 1.575sec. So, in 20 second of monitoring time, it is able to detect maximum13 times of hopping. Actual test were less than its maximum number. The dwell time was detected by 13 times 19.64ms, on time of one single hopping channel.

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

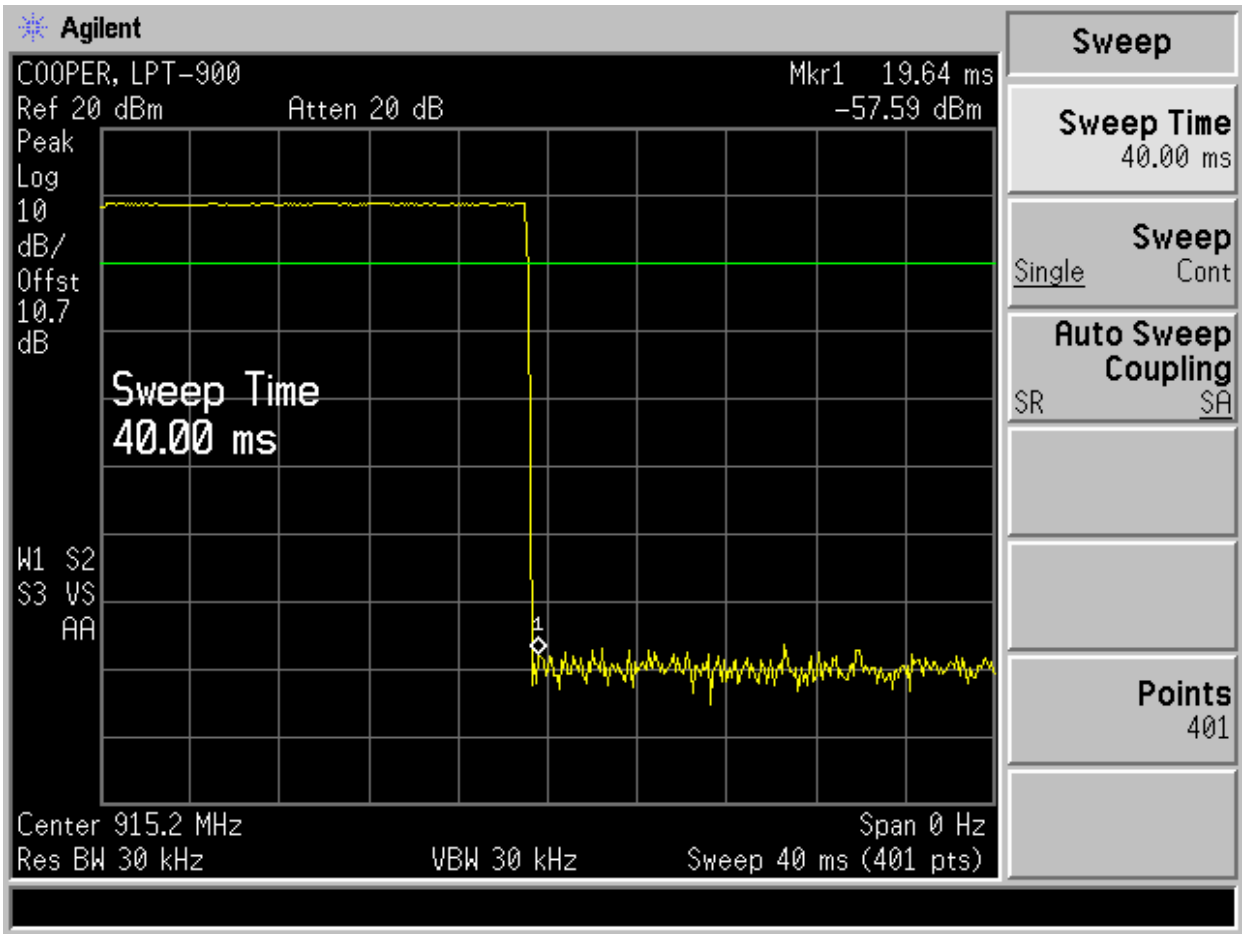
- Dwell time of low end; carrier frequency is 902.4MHz.



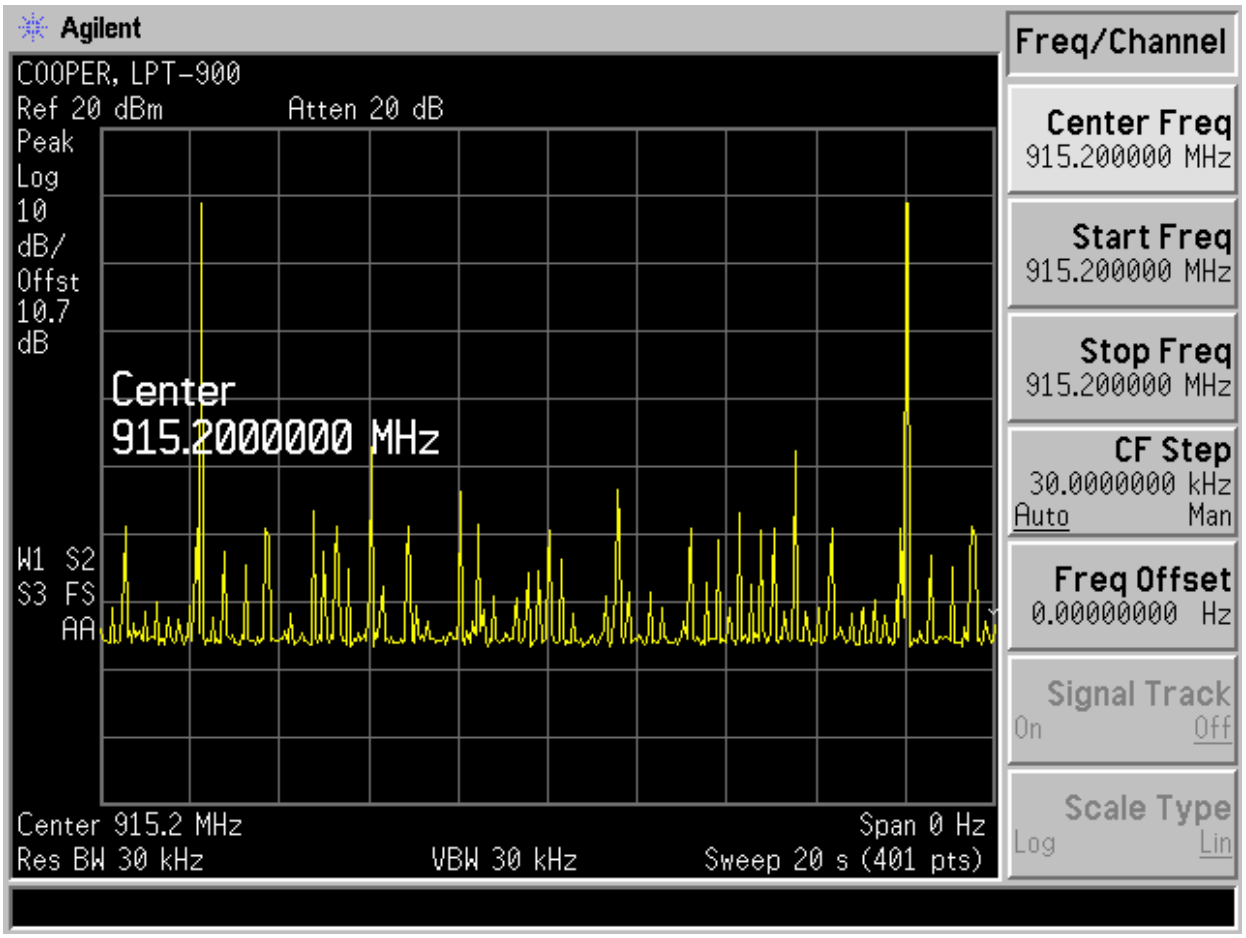
- Channel appearance of low end in 20 seconds; carrier frequency is 902.4MHz.



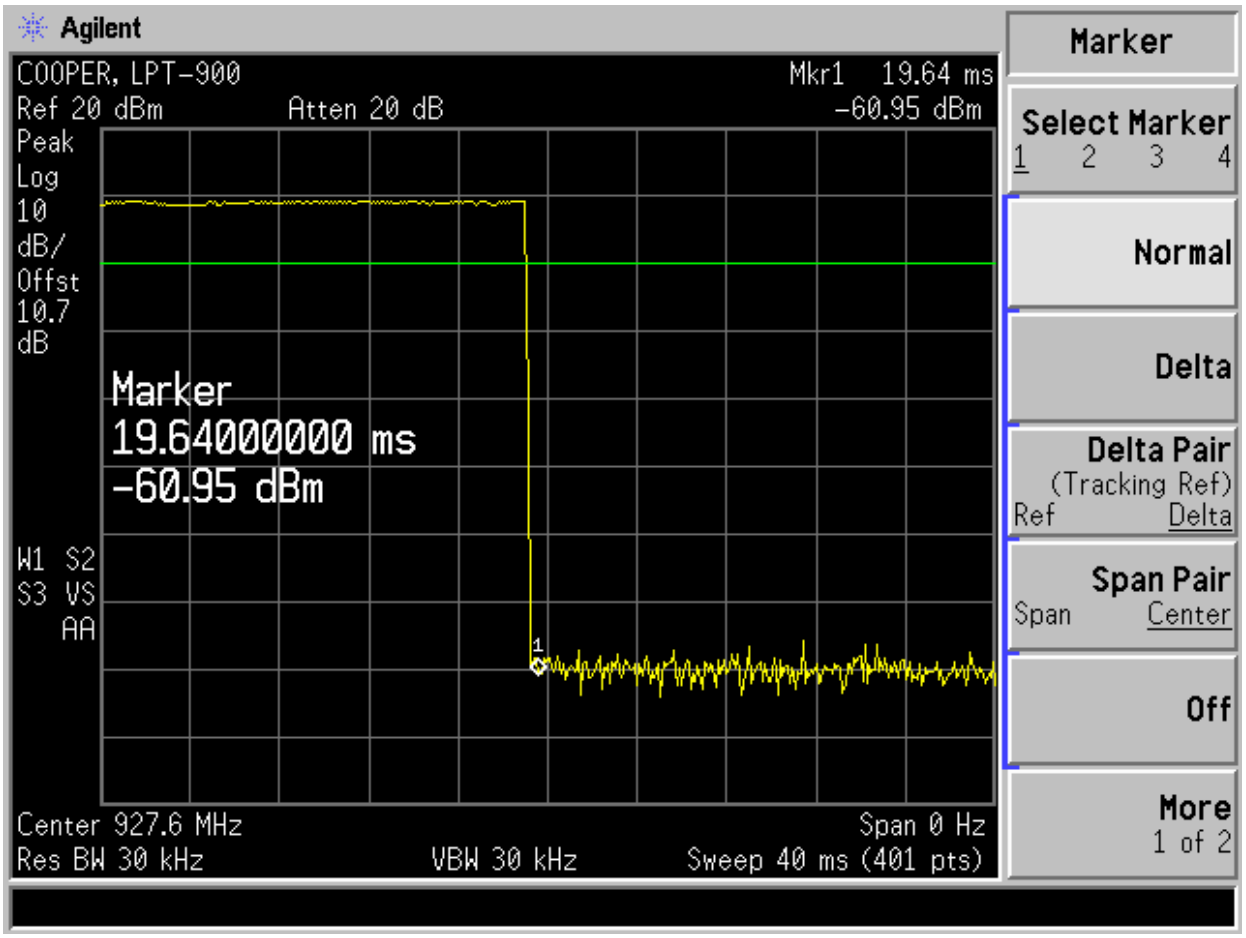
- Dwell time of middle; channel frequency is 915.2MHz.



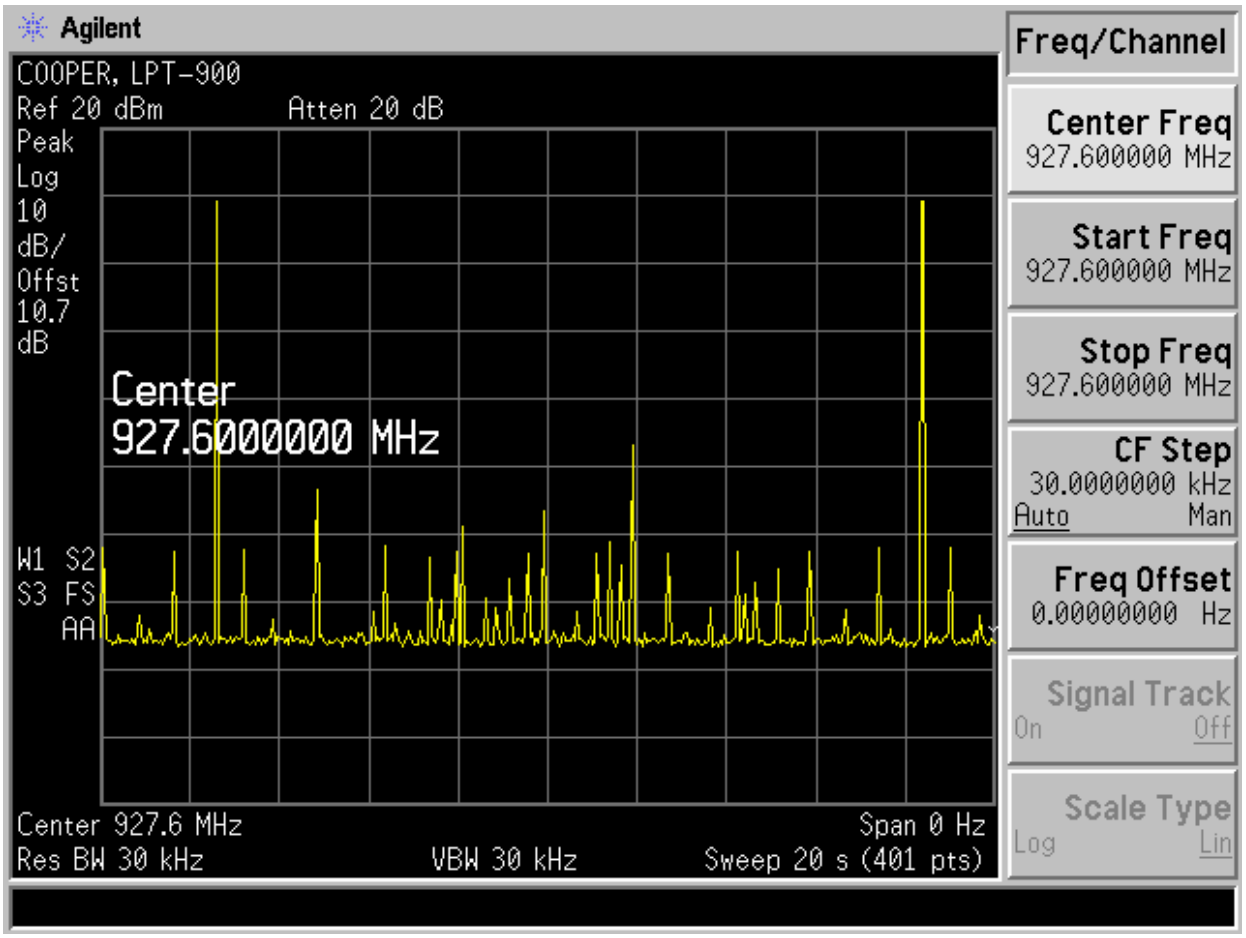
- Channel appearance of low end in 20 seconds; carrier frequency is 915.2MHz.



- Dwell time of high end; channel frequency is 927.6MHz.



- Channel appearance of low end in 20 seconds; carrier frequency is 927.6MHz.



Pseudorandom frequency-hopping sequence

Test Date	July 07, 2010
Sample Number	798115
Tested By	Jeremy Lee

Test Limits

FCC15.247(a)
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 LPT-900 is a frequency hopping spread spectrum (FHSS) transmitter designed to be compatible with FCC Part 15.247 (US) and RSS-210 (Canada) regulations for license free operation in the 900MHz frequency band. The major elements include a frequency agile RF transmitter, a microcontroller that provides control and a power supply.

At each frequency hop one packet is sent by the transmitter which is received by a separate receiver unit. The transmitter generates the baseband waveforms. The microcontroller generates a pseudo random frequency hop sequence of length 256 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	July 07, 2010
Sample Number	798115
Tested By	Jeremy Lee

Test Limits

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

Test Results

The LPT-900 is a frequency hopping spread spectrum 902.2-927.2 MHz transmitter platform specifically designed for industrial remote control applications. The transmitter is capable of accepting a wide range of input voltages and is able to operate across a broad temperature range. This has been designed to withstand ISM band interference while ensuring the integrity of each data packet. This is accomplished via the OMNEX OmUD data protocol.

Frequency hopping spread spectrum technology was originally developed by the U.S. military to prevent interference or interception of radio transmissions on the battlefield. Frequency hopping devices concentrate their full power into a very narrow signal and randomly hop from one frequency to another within a designated frequency band. If they encounter interference on a particular frequency, the devices error checks the affected data, hops to another point on the spectrum, and resumes communications on subsequent hops.

The LPT-900 transmitter module operates on 256 channels with central frequencies between 902.2 and 927.7 MHz. These 256 channels are divided into 4 groups consisting of 64 frequencies. Each radio is configured to hop in one of these 4 groups. In order to link, radios must be configured to operate in the same group. The 64 frequencies are used to generate a pseudo random sequence of 63 frequencies which are equally used. The channels are spaced 100 KHz apart. The channel bandwidth is 37 KHz.

The hop sequence is a sequence of 63 numbers randomly generated with a proprietary algorithm. The unique serial 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 64 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	July 07, 2010
Sample Number	798115
Tested By	Jeremy Lee

Test Limits

FCC15.247(a)

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

The LPT-900 supports a serial interface and can send and receive a series of analogue and digital signal which are routed to the external world through test points (CN3 though CN26) . See schematic diagram DSCH-2238R09 sheet 2

The transmitter over the air data rate is 4.8 kbps.

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

RF Exposure (SAR)

Test Date	July 26, 2010
Sample Number	798115
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=f/1500 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)
902.2	0.601	8.69	1.76	1.21
915.0	0.610	8.81	1.76	1.22
927.7	0.618	9.09	1.76	1.25

Conclusion

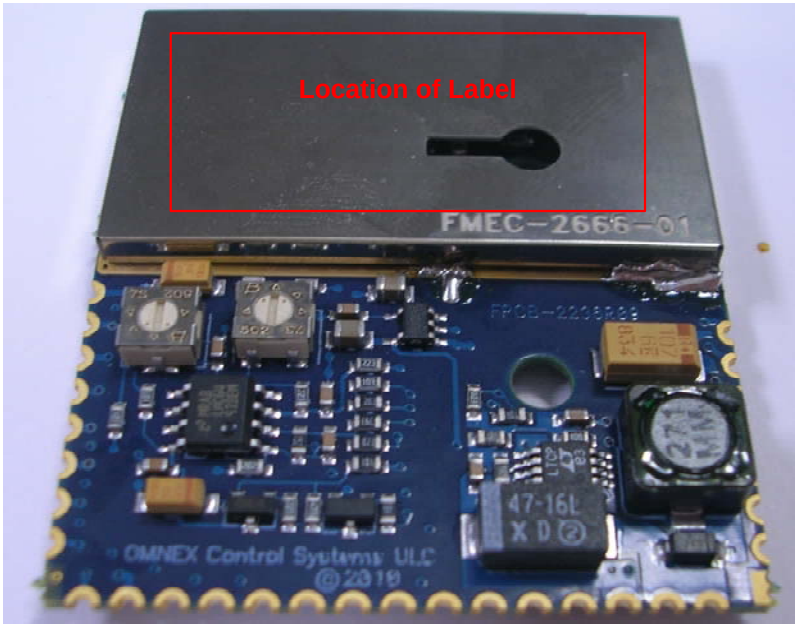
For mobile or fixed location transmitters, the minimum separation distance is 20cm, even if calculations indicate that the MPE distance would be less. Therefore, the minimum safe distance has to be inserted in the EUT's User Manual.

APPENDIX A: Test Equipment Used

ID No.	Description	Manufacturer	Model	Serial No.	Calibration Date	Calibration Due Date	Calibration Certificate No:	Calibration Laboratory
059	Power Supply	California Instruments	5000i	HK51870	N/A	N/A	N/A	N/A
112	GTEM EMC Chamber	Emco	5317	N/A	04-Oct-2005	04-Oct-2010	1000082343	Wescan
124	Pre-Amplifier	Com-Power	PA-103	161118	N/A	N/A	N/A	N/A
227-1	Biconical Antenna	A.H. Systems	SAS-542	716	18-May-2010	18-May-2011	11671EA	A.H. Systems
227-2	LP Antenna	A.H. Systems	SAS-510-2	1262	18-May-2010	18-May-2011	11668EA	A.H. Systems
227-3	Horn Antenna	A.H. Systems	SAS-571	936	18-May-2010	18-May-2011	11670EA	A.H. Systems
227-5	Coaxial RF Cable	A.H. Systems	SAC-26G-3	205	N/A	N/A	N/A	N/A
228	Humidity/ Temperature Logger	Veriteq	SP-2000-20R	07072157	02-Oct-2009	02-Oct-2010	0144511	Veriteq
233	Coaxial RF Cable	N/A	LCI-001	N/A	N/A	N/A	N/A	N/A
235	Turn table /Tower System	Sunol Sciences Co.	SC104V	031407-1	N/A	N/A	N/A	N/A
272	EMC Analyzer	Agilent	E7405A	US41110263	14-Dec-2009	14-Dec-2010	138311901104 084091214	TRS-RenTelco
273	RF Preamplifier	Agilent	8449B	3008A02264	06-Jan-2010	06-Jan-2012	138311901068 042101 6	TRS-RenTelco
N1	Coaxial RF Cable	Belden	OC-LMR100A-4	N/A	N/A	N/A	N/A	N/A
N2	Attenuator	Mini-circuits	UNAT-15+	15542	N/A	N/A	N/A	N/A

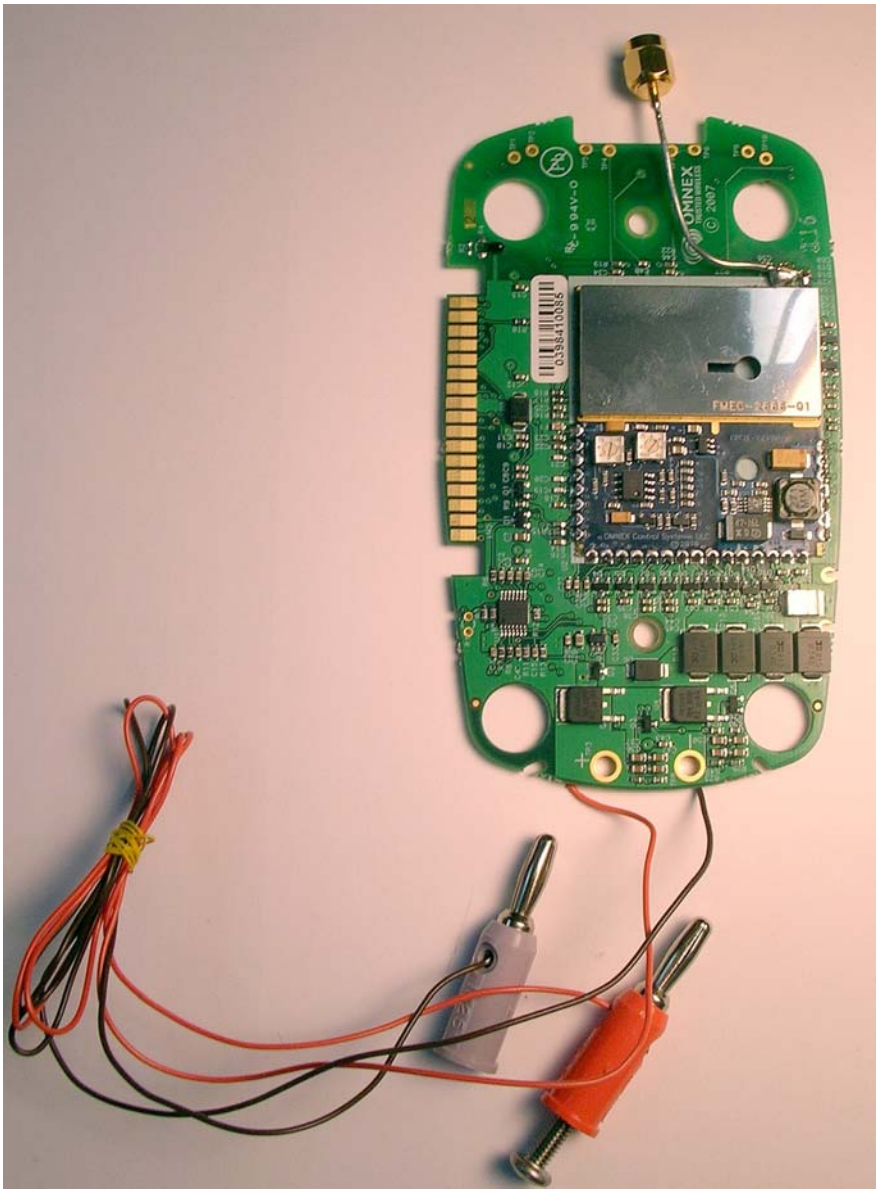
APPENDIX B: EUT photos

- EUT: Top View

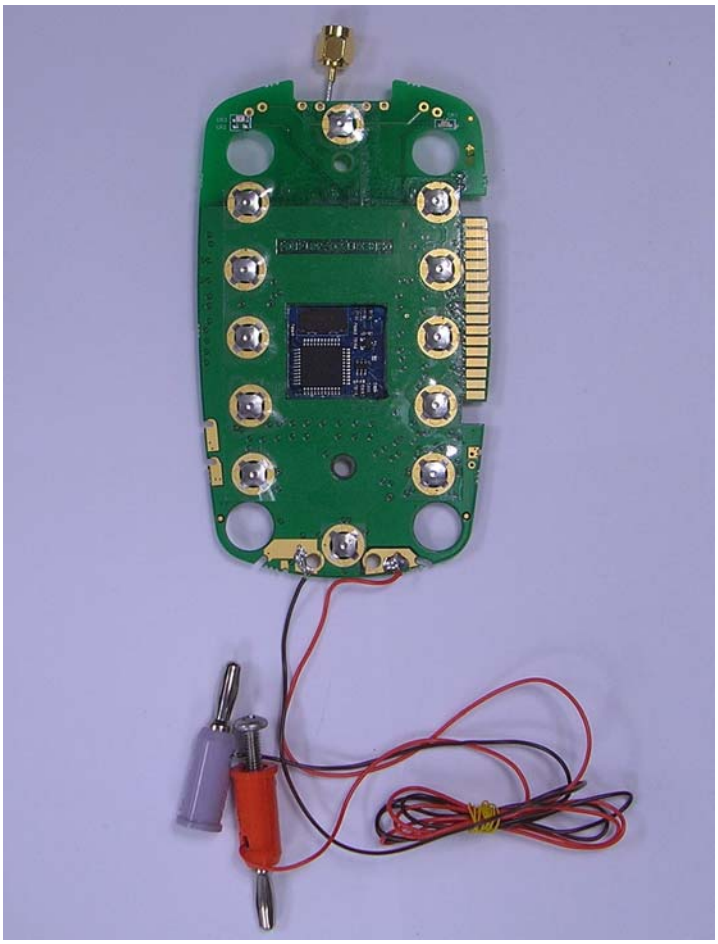


- EUT: Bottom View

- EUT: Top View with Carrier Board

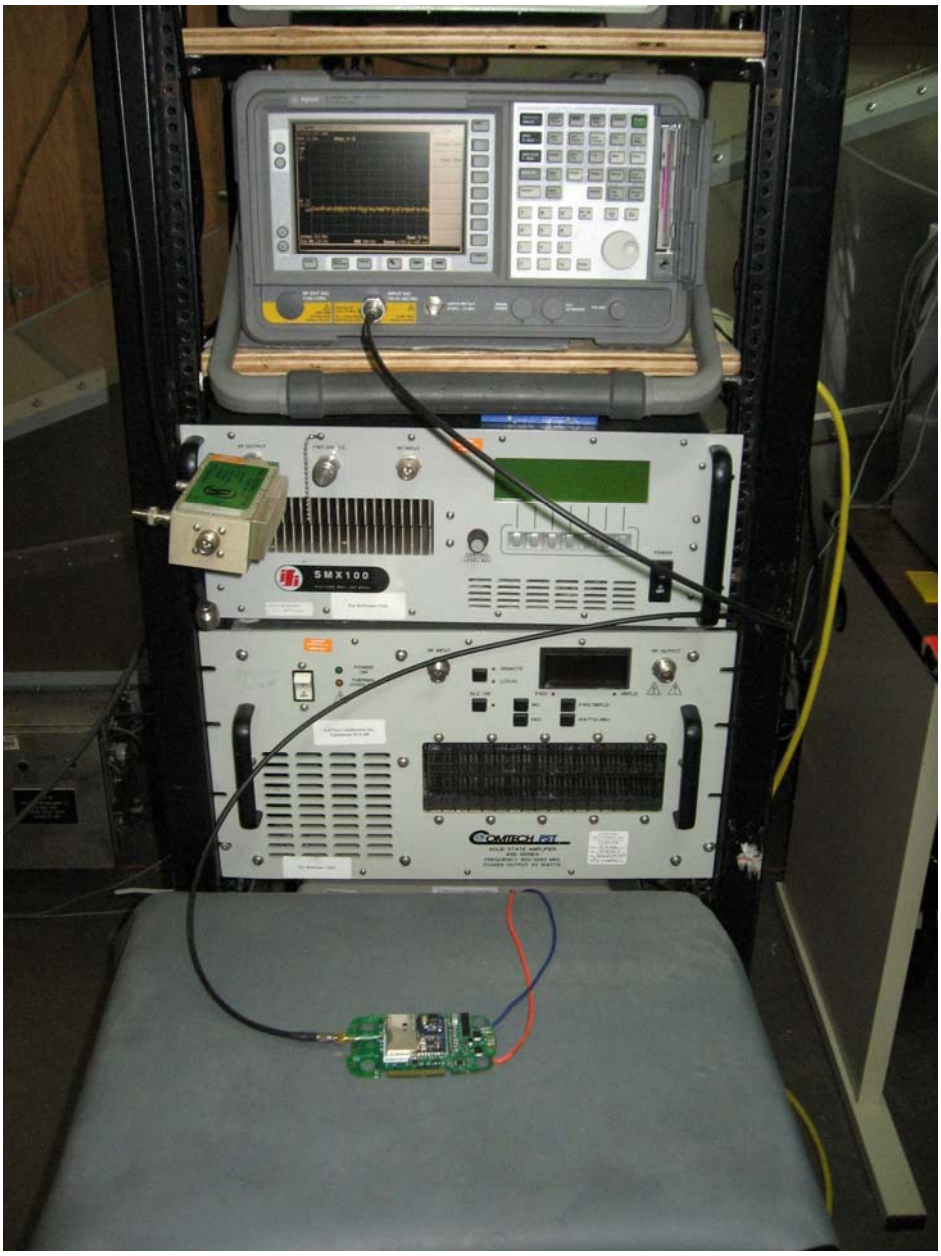


- EUT: Botom View with Carrier Board



APPENDIX C: Test setup photos

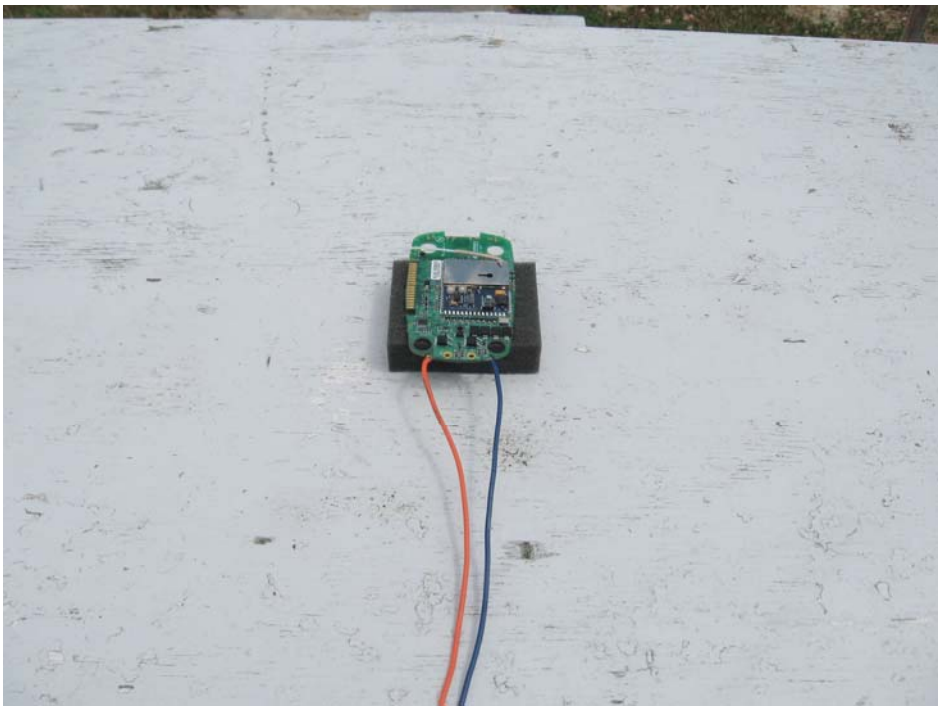
- Test configuration for Conducted measurement



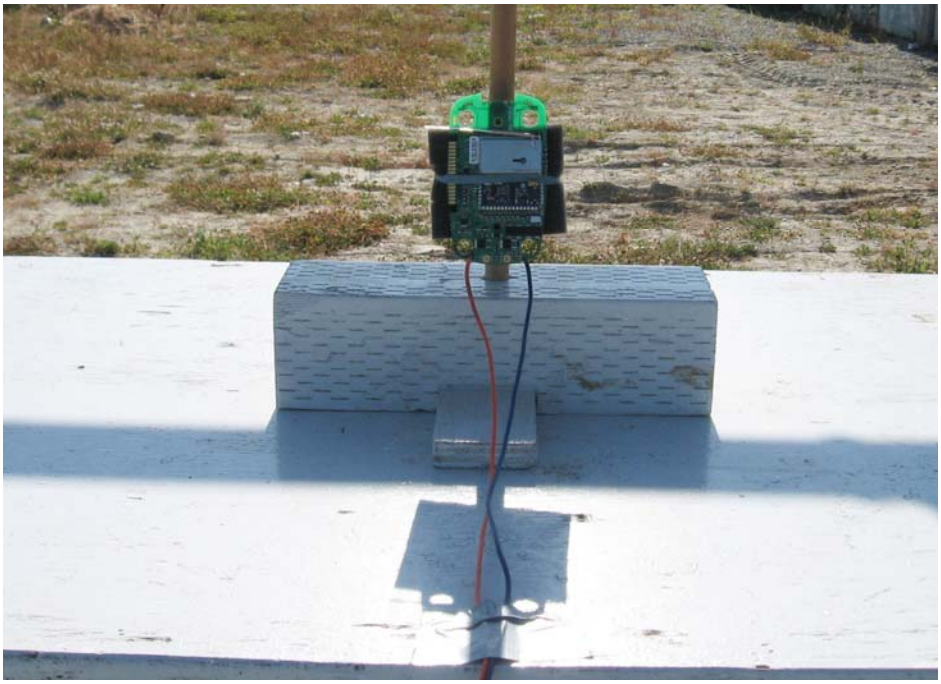
- Test configuration for Radiated Emission at OATS #1

- Test configuration for Radiated Emission at OATS #2

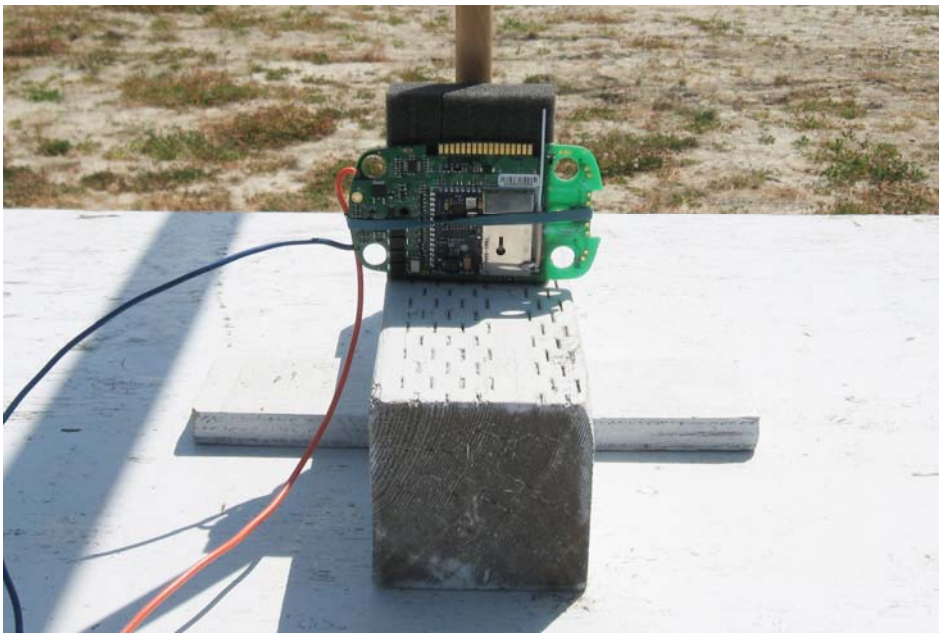
- Test configuration for Radiated Emission at OATS #3; Orthogonal X



- Test configuration for Radiated Emission at OATS #3; Orthogonal Y



- Test configuration for Radiated Emission at OATS #3; Orthogonal Z



END OF REPORT