

**COMPLIANCE WORLDWIDE INC.
TEST REPORT 260-07**

In Accordance with the Requirements of
**FCC PART 15.407, Subpart E
CLASS II PERMISSIVE CHANGE**

**Low Power License-Exempt Radio Communication Devices
Intentional Radiators**

Issued to

**Bluesocket, Inc.
10 North Avenue
Burlington, MA 01803
(781) 328-0888**

for

BlueSecure™ BSAP-1540

Report Issued on August 14, 2007

Tested by



Brian F. Breault

Reviewed by



Larry K. Stillings

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1. Scope

This test report certifies that the Bluesocket BlueSecure™ Access Point 1540, BSAP-1540, as tested, meets the FCC Part 15.407, Subpart E. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required. In addition, the scope of this test report is limited to the 802.11a low channels (36 – 44).

The 99% bandwidth measurements detailed in section 6.4 of this report were included for the client's information with respect to the Industry Canada RSS 210, Issue 9, Annex 9 requirements.

2. Product Details

- 2.1. Manufacturer:** Bluesocket, Inc.
- 2.2. Model Number:** BlueSecure™ BSAP-1540
- 2.3. Serial Number:** None
- 2.4. Description:** The BlueSecure™ BSAP-1540 Access Point is the next-generation, "thin" access point (AP) that works in conjunction with BlueSecure Controllers for enterprise wireless LAN (WLAN) deployments. The BlueSecure Access Point features dual radios supporting 802.11 a/b/g in a plenum-rated housing with dual external antennas.
- 2.5. Power Source:** 48 Volts DC via Power Over Ethernet or 48 Volts DC Power Adapter
- 2.6. EMC Modifications:** None

3. Product Configuration

3.1. Support Equipment

Device	Manufacturer	Model	Serial No.	Comment
Notebook PC	Dell	Inspiron 5160	CN-0T5326-12961-4C6-5298	Remotely located
PoE Injector	PowerDsine	3001	R06416050041283801	Remotely located

3.2. Cables

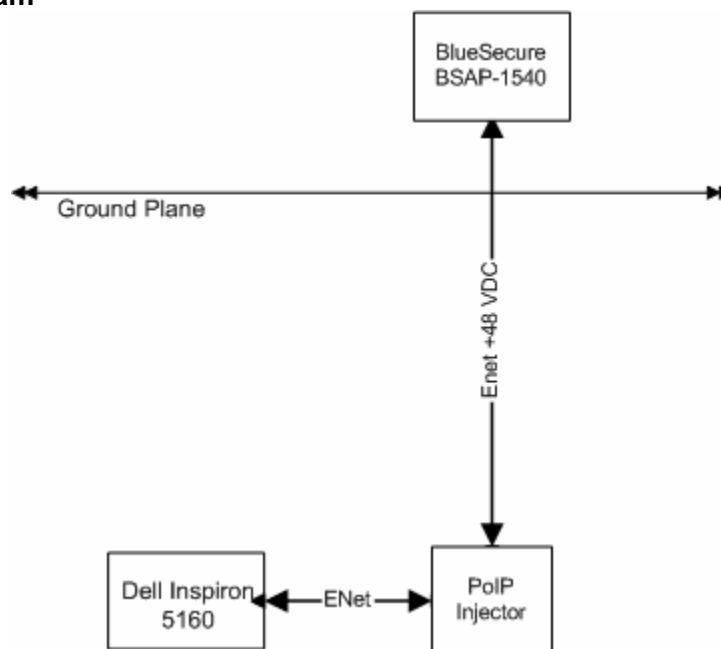
Cable Type	Length	Shield	From	To
CAT 5 Ethernet (UTP)	1.5 Meters	No	Notebook PC	PoE Injector
CAT 5 Ethernet (UTP)	10 Meters	No	PoIP Injector	BSAP-1540

3. Product Configuration (continued)

3.3. Operational Characteristics & Software

1. Click on the Login AP icon on the desktop. Type wg1000 as the pass phrase.
2. Navigate through the CLI to the command prompt (Enter option 6, then enter option 1)
3. At the command prompt, type /home/setup_ap
(This will configure the AP – there will be a delay of 30 seconds before the prompt returns)
4. At the command prompt, type /home/setup_11a_txpower 3
(This will configure the AP transmit power to a safe margin in order to meet the Subpart E requirements.)
5. At the command prompt, type iwpriv ath1 channel <channel> (36, 40, 44)
(This will configure the AP channel: 36 = 5.18 GHz, 40 = 5.20 GHz, 44 = 5.22 GHz)
6. Click on the "Traffic Generator" icon.

3.4. Block Diagram



4. Measurements Parameters

4.1. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	3/14/2008
Spectrum Analyzer	Hewlett Packard	8593E	3829A03887	3/8/2008
Microwave Preamp	Hewlett Packard	8449B	3008A01323	9/21/2008
Horn Antenna	Electro-Metrics	EM-6961	6337	8/25/2007
6 GHz HP Filter	Micro-Tronics	HPM50112	014	8/03/2007

4.2. Measurement & Equipment Setup

Test Date: 8/8/2007
 Test Engineer: Brian Breault
 Normal Site Temperature (15 - 35°C): 21.6
 Relative Humidity (20 -75%RH): 25
 Frequency Range: 30 MHz to 24.830.GHz
 Measurement Distance: 3 Meters

4.3. Test Procedure

The test measurements contained in this report are based on the requirements detailed in FCC Part 15, Subpart E—Unlicensed National Information Infrastructure Devices, operating in the 5.15–5.35 GHz, 5.47–5.725 GHz and 5.725–5.825 GHz bands.

The test methods used to generate the data in this test report are in accordance with ANSI C63.4: 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

In accordance with ANSI C63.4-2003, section 13.1.4.1, c, the device under test was rotated through three orthogonal axes to determine which attitude produced the highest emission relative to the limit. The attitude that produced the highest emission relative to the limit was used for all radiated emission measurements.

5. Measurement Summary

Test Requirement	FCC Part 15.407 Reference	Test Report Section	Result	Comment
Maximum Conducted Output Power	15.407(a)(1) 15.407(a)(3)	6.1	Compliant	
Peak Power Spectral Density	15.407(a)(5)	6.2	Compliant	
26 dB Emission Bandwidth	15.407(a)(1)	6.3	N/A	
99% Power Bandwidth	N/A	6.4	N/A	IC RSS 210
Peak Excursion of the Modulation Envelope	15.407(a)(6)	6.5	Compliant	
Spurious Radiated Emissions	15.209 15.407(b)(1) 15.407(b)(4)	6.6	Compliant	
Lower and Upper Band Edges	15.407(b)(1) 15.215 (c) 15.407(b)(4)	6.7	Compliant	
Public Exposure to RF Energy Levels	15.407(f)	6.8	Compliant	(1.1307 (b)(1)) RSS-GEN 5.5, RSS 102

6. Measurement Data

6.1. Maximum Conducted Output Power

6.1.1. Field Strength Measurements

Note: The following equation was used to determine the output power from the measured field strength:

$$P = \frac{(E \times d)^2}{(30 \times G)}$$

E = the measured maximum field in V/m

G = the numeric gain of the transmitting antenna over an isotropic radiator.

d = the distance in meters of the field strength measurement.

P = the power in Watts.

Resolution Bandwidth : 1 MHz
 Video Bandwidth : 3 MHz
 Sweep Time : 20 mSec

6.1.1.1. Maximum Peak Conducted Output Power 15.407(a)(1)

Requirement: For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or [4 dBm + 10 log B], where B is the 26–dB emission bandwidth in MHz.

Channel	Channel Frequency	Peak Field Strength	Antenna Gain	Power		Limit		Result
	GHz	dBµV	Numeric	mW	dBm	mW	dBm	
36	5.180	111.25	2.818	14.19647	11.522	50.00	16.99	Compliant
40	5.200	111.12	2.818	13.77781	11.392	50.00	16.99	Compliant
44	5.220	112.96	2.818	21.04652	13.232	50.00	16.99	Compliant

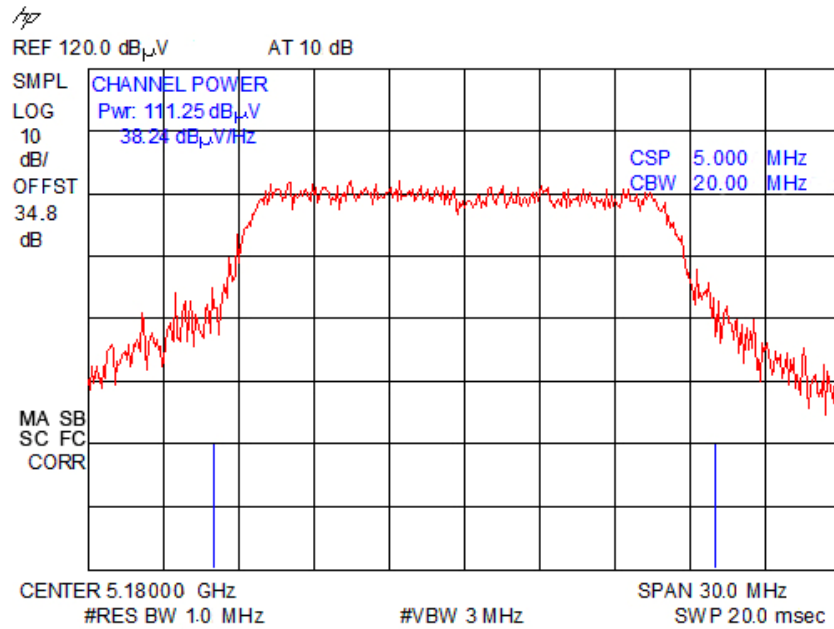
6. Measurement Data (continued)

6.1. Maximum Conducted Output Power

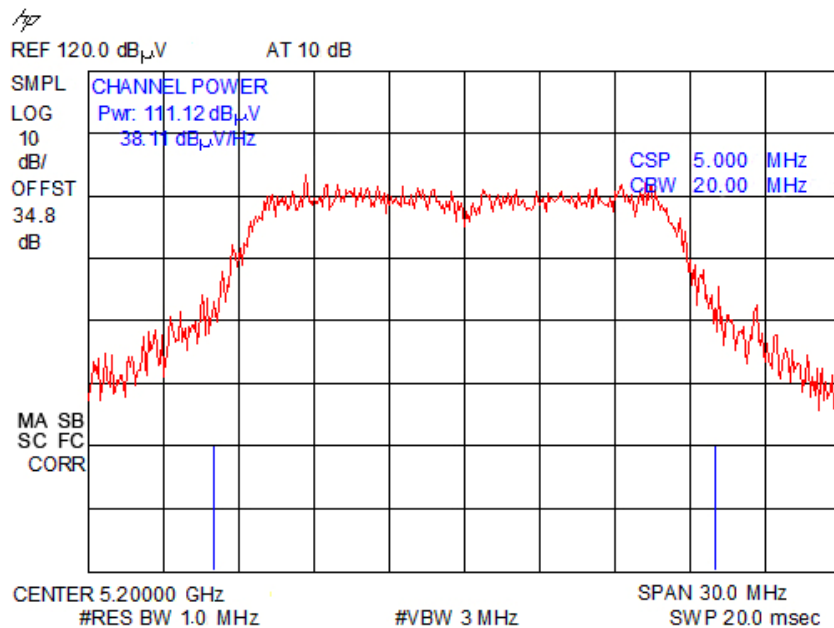
6.1.1. Field Strength Measurements

6.1.1.2. Maximum Peak Conducted Output Power – Plots

6.1.1.2.1. Channel 36



6.1.1.2.2. Channel 40



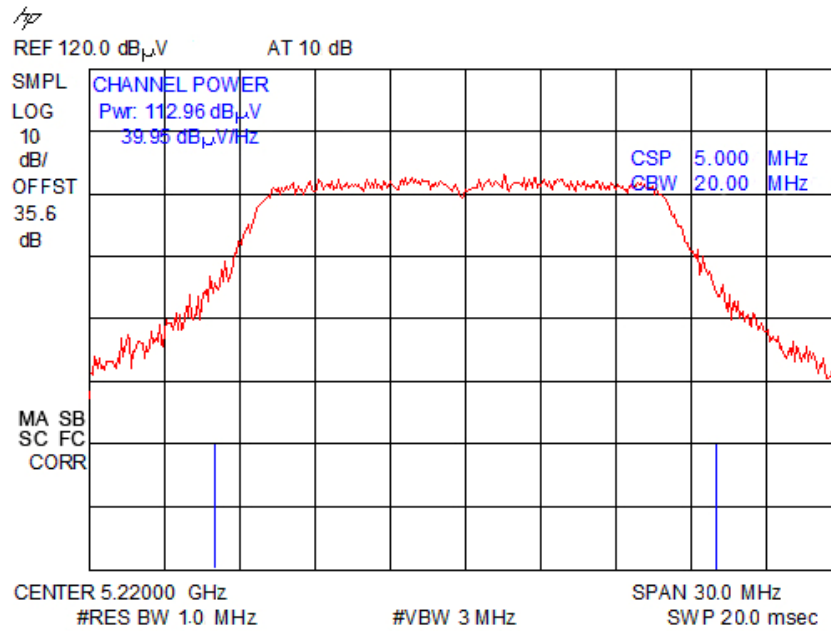
6. Measurement Data (continued)

6.1. Maximum Conducted Output Power

6.1.1. Field Strength Measurements

6.1.1.2. Maximum Peak Conducted Output Power – Plots

6.1.1.2.3. Channel 44



6. Measurement Data

6.1. Maximum Peak Conducted Output Power (15.247(b)(3))

6.1.2. Conducted Mode Measurements

Requirement: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the maximum conducted output power over the frequency band of operation shall not exceed: 1 Watt.

The EUT consists of two transmitters and three receivers for the 2x3 MIMO array. Each transmitter was measured and the power was summed below mathematically.

The power was calculated using the spectrum analyzer power integration function with the following settings:

- Resolution Bandwidth : 1 MHz
- Video Bandwidth : 3 MHz
- Frequency Span : 30 MHz
- Channel Bandwidth : 20 MHz
- Sweep Time : 20 mSec

$$\text{Total Power (dBm)} = 10 \text{ LOG } ((10^{(\text{Chain 0 Power}/10)}) + (10^{(\text{Chain 2 Power}/10)}))$$

6.1.2.1. Maximum Peak Conducted Output Power 15.407(a)(1)

Requirement: For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or [4 dBm + 10 log B], where B is the 26–dB emission bandwidth in MHz.

Channel	Channel Frequency	Power Meas. Chain 0	Power Meas. Chain 2	Power		Limit		Result
	GHz	dBm	dBm	dBm	mW	dBm	mW	
36	5.180	11.79	10.75	14.31	26.986	16.99	50.00	Compliant
40	5.200	12.08	10.67	14.44	27.812	16.99	50.00	Compliant
44	5.220	12.31	10.84	14.65	29.155	16.99	50.00	Compliant

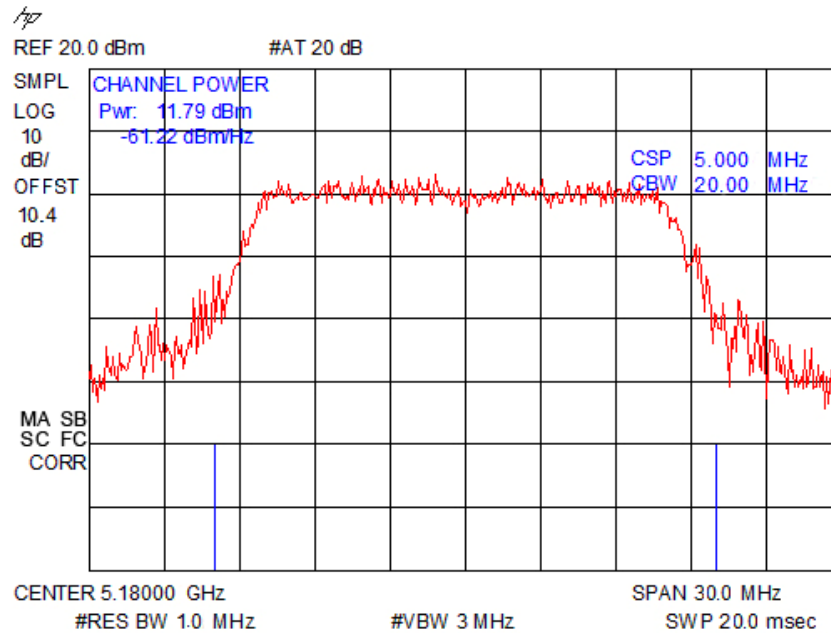
6. Measurement Data (continued)

6.1. Maximum Peak Conducted Output Power (15.247(b)(3)) (continued)

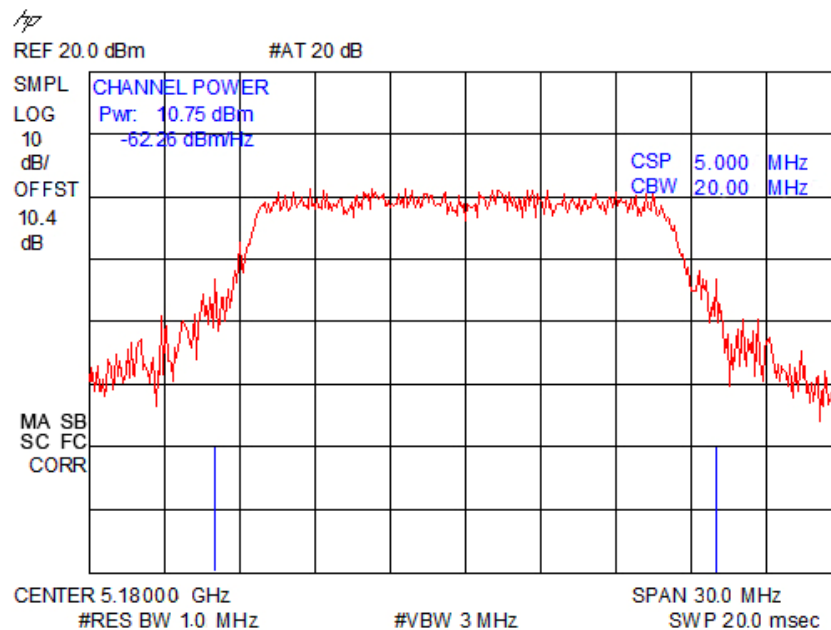
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots

6.1.2.2.1. Channel 36 Chain 0



6.1.2.2.2. Channel 36 Chain 1



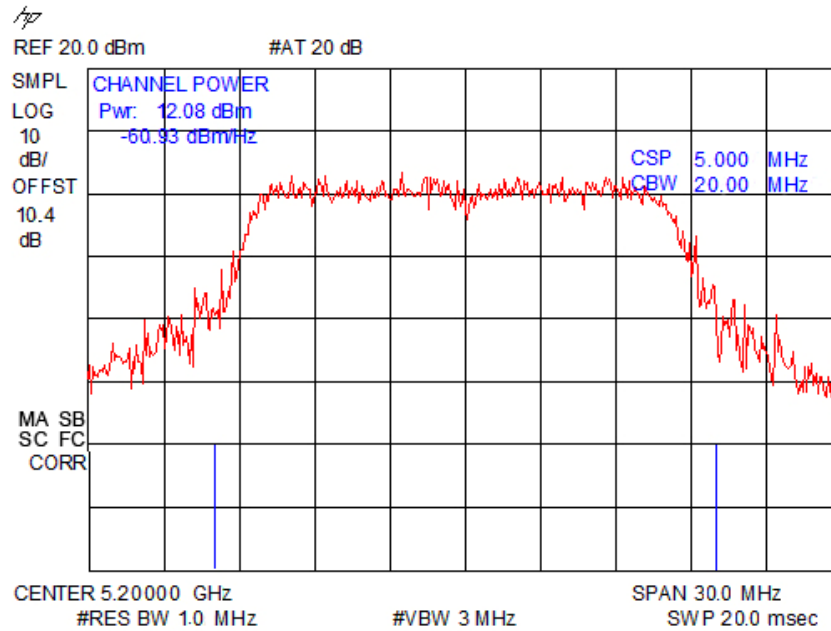
6. Measurement Data (continued)

6.1. Maximum Peak Conducted Output Power (15.247(b)(3)) (continued)

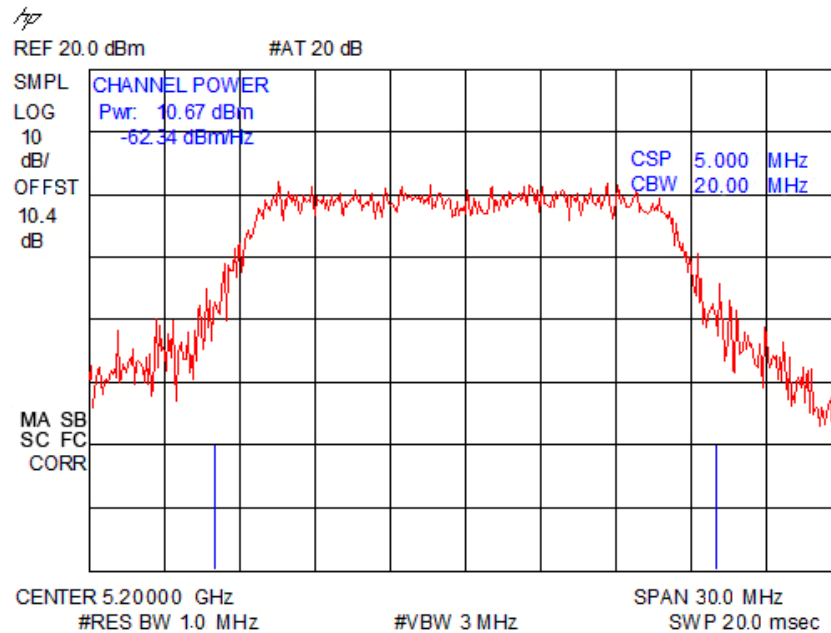
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots

6.1.2.2.3. Channel 40 Chain 0



6.1.2.2.4. Channel 40 Chain 1



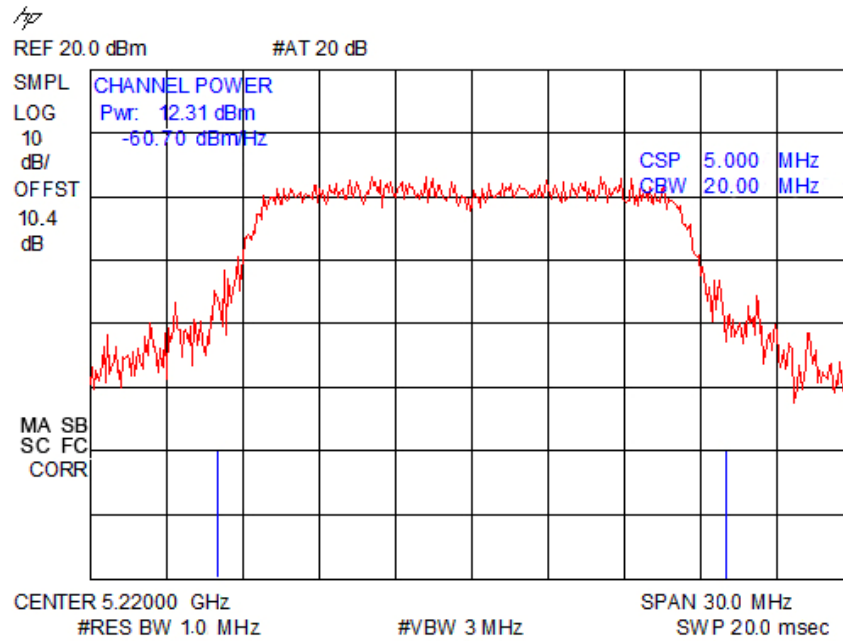
6. Measurement Data (continued)

6.1. Maximum Peak Conducted Output Power (15.247(b)(3)) (continued)

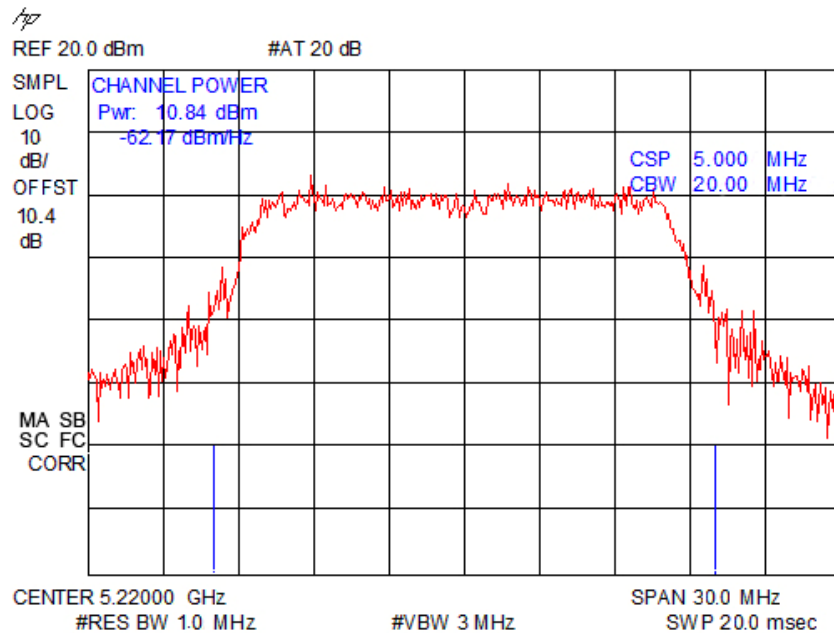
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots

6.1.2.2.5. Channel 44 Chain 0



6.1.2.2.6. Channel 44 Chain 1



6. Measurement Data (continued)

6.2. Power Spectral Density (15.407(a)(1)) (15.407(a)(3))

Requirement: (15.407(a)(1)) For the band 5.15–5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band.

(15.407(a)(3)) For the band For the 5.725–5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1–MHz band.

Note: This test was performed in accordance with the information outlined in Measurement of Digital Transmission Systems Operating under Section 15.247, March 23 2005, Section 15.247(d): Power spectral density (PSD), PSD Option 1. Refer to the graphs in Section 6.1.2 of this report for the noise power density values used for the following table. A 35 dB correction factor was used to convert dBμV /Hz or dBm/Hz values to a 3 kHz Resolution Bandwidth.

$dBm = dB\mu V - 107.$

6.2.1. Measurement Results (From Radiated Measurements)

Channel	Channel Frequency	Noise Power Density	BW Correction Factor	Power Spectral Density	Limit	Result
	GHz	dBμV/Hz	dB	dBm	dBm	
36	5.180	38.24	+60	-8.76	+4	Compliant
40	5.200	38.11	+60	-8.89	+4	Compliant
44	5.220	39.95	+60	-7.05	+4	Compliant

6.2.2. Measurement Results (From Conducted Measurements)

Channel	Channel Frequency	Noise Power Density Chain 0	Noise Power Density Chain 2	BW Correction Factor	Power Spectral Density	Limit	Result
	GHz	dBm/Hz	dBm/Hz	dB	dBm	dBm	
36	5.180	-61.22	-62.26	+60	-6.63	+4	Compliant
40	5.200	-60.93	-62.34	+60	-5.47	+4	Compliant
44	5.220	-60.70	-62.17	+60	-4.87	+4	Compliant

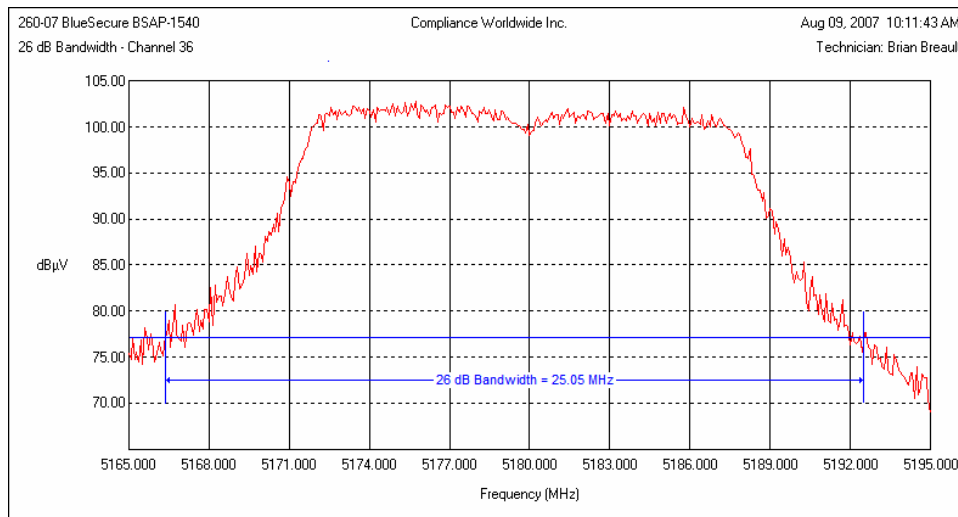
6. Measurement Data (continued)

6.3. 26 dB Emission Bandwidth (15.407(a)(1))

Channel	Channel Frequency	Emission Bandwidth
	GHz	MHz
36	5.180	25.05
40	5.200	25.13
44	5.220	23.70

6.3.1. 26 dB Emission Bandwidth – Measurement Plots (continued)

6.3.1.1. Channel 36

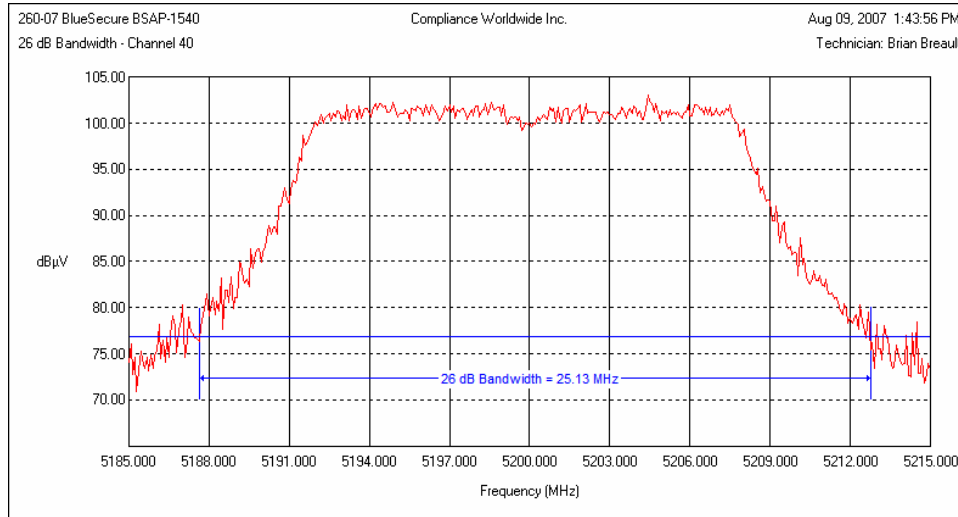


6. Measurement Data (continued)

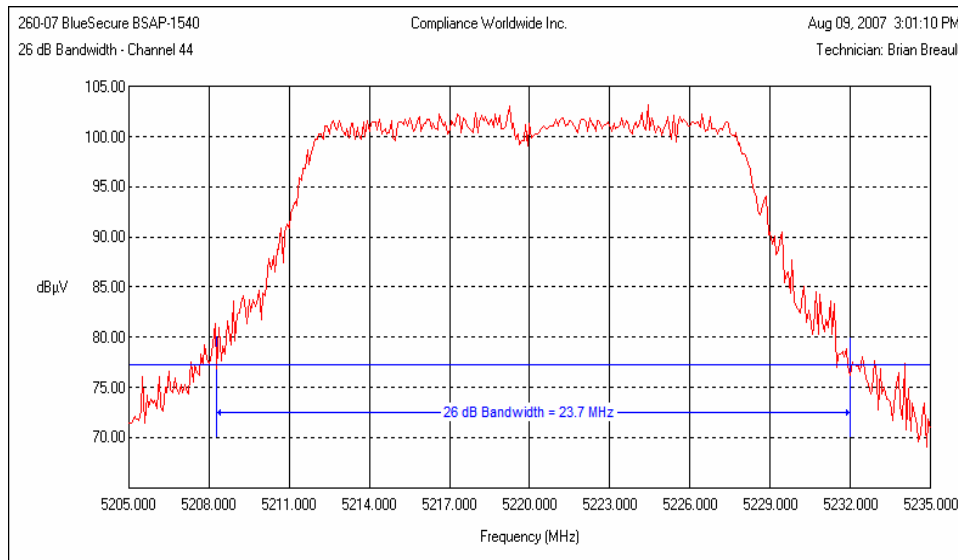
6.3. 26 dB Emission Bandwidth (15.407(a)(1)) (continued)

6.3.1. 26 dB Emission Bandwidth – Measurement Plots (continued)

6.3.1.2. Channel 40



6.3.1.3. Channel 44



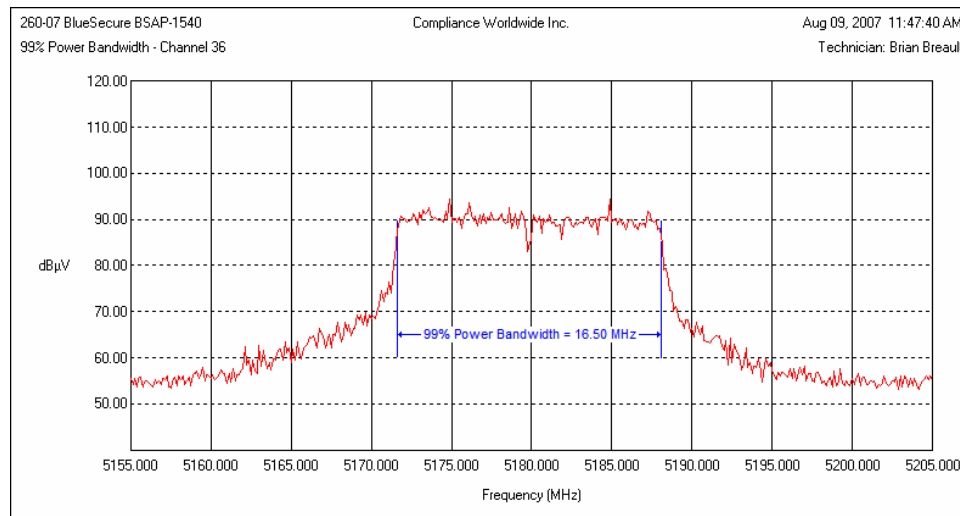
6. Measurement Data (continued)

6.4. 99% Power Bandwidth (IC RSS 210)

Channel	Channel Frequency	99% Power Bandwidth
	GHz	MHz
36	5.180	16.50
40	5.200	16.50
44	5.220	16.50

6.4.1. 99% Power Bandwidth Emission Bandwidth – Measurement Plots

6.4.1.1. Channel 36

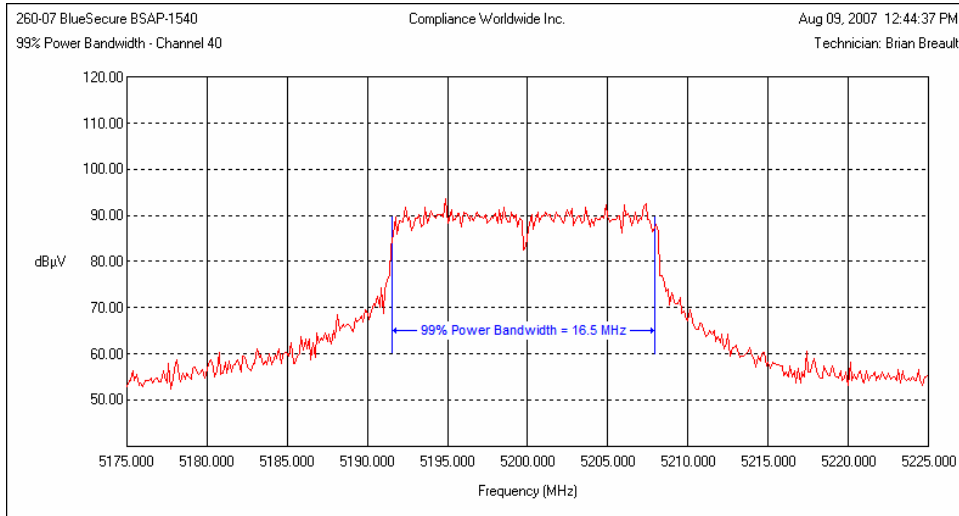


6. Measurement Data (continued)

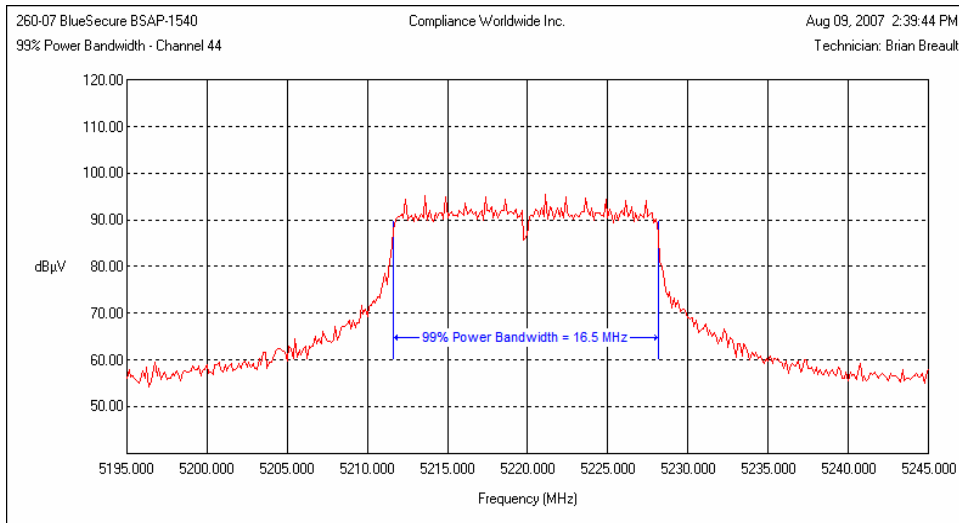
6.4. 99% Power Bandwidth (IC RSS 210) (continued)

6.4.1. 99% Power Bandwidth Emission Bandwidth – Measurement Plots

6.4.1.2. Channel 40



6.4.1.3. Channel 44



6. Measurement Data (continued)

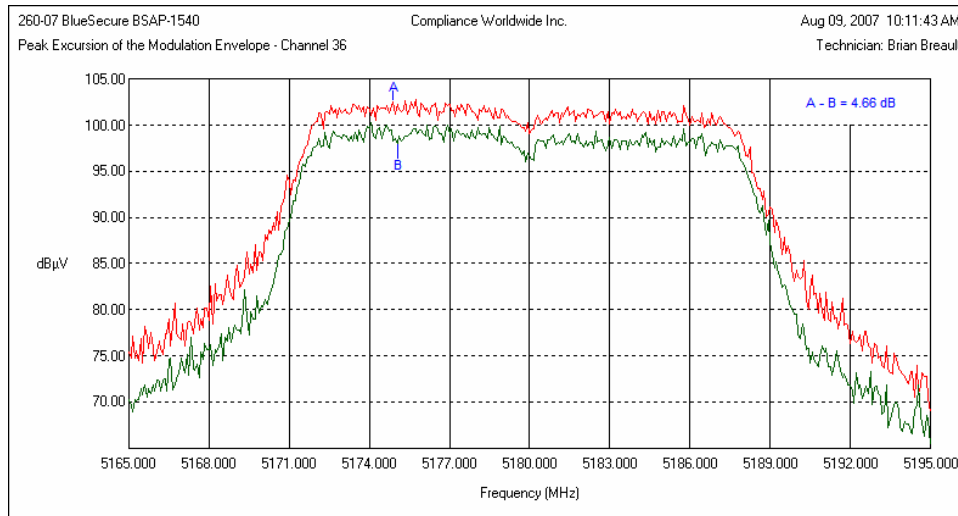
6.5. Peak Excursion of the Modulation Envelope (15.407(a)(6))

Requirement: The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission band-width whichever is less.

Channel	Channel Frequency	Peak Excursion	Limit	Result
	GHz	dB	dB	
36	5.180	4.66	13	Compliant
40	5.200	3.87	13	Compliant
44	5.220	5.12	13	Compliant

6.5.1. Peak Excursion of the Modulation Envelope – Measurement Plots

6.5.1.1. Channel 36

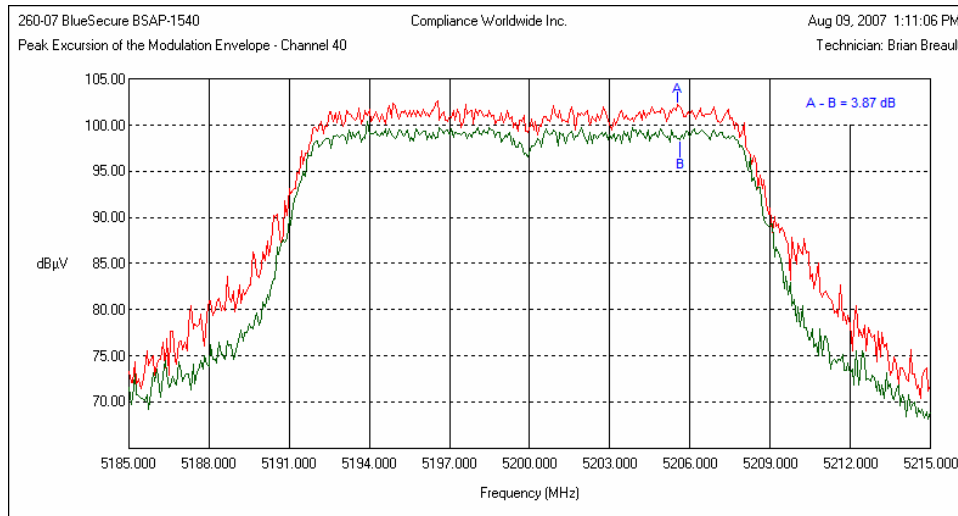


6. Measurement Data (continued)

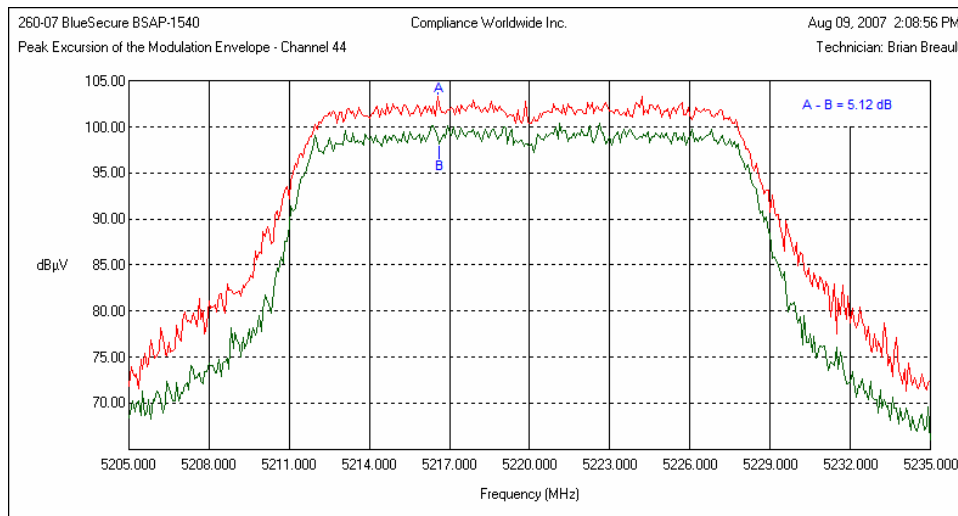
6.5. Peak Excursion of the Modulation Envelope (15.407(a)(6)) (continued)

6.5.1. Peak Excursion of the Modulation Envelope – Measurement Plots

6.5.1.2. Channel 40



6.5.1.3. Channel 44



6. Measurement Data (continued)

6.6. Spurious Radiated Emissions (> GHz) Test Data

6.6.1. Measurement Results – Channel 36 (5.15 GHz–5.25 GHz, Low Channel)

Frequency (MHz)	Peak (dBµV)	Avg (dBµV)	Corr Factor (dB)	Average (dBµV/m)	Limit (dB)	Margin (dB)	Polarity (H/V)	Height (cm)	TT Pos (Deg)	Note
5180.000	---	---	---	---	---	---	---	---	---	Fundamental
10360.000	58.66	39.31	6.42	45.73	54.00	-8.27	V	128	270	
15540.000 ¹	52.01	35.39	12.73	48.12	54.00	-5.88	H	126	270	
20720.000 ¹	51.01	31.01	9.24	40.25	54.00	-13.75	---	---	---	Noise floor
25900.000	54.06	34.06	15.02	49.08	54.00	-4.92	---	---	---	Noise floor
31080.000	30.90	10.90	35.92	46.82	54.00	-7.18	---	---	---	Noise floor
36260.000	31.23	11.23	36.62	47.85	54.00	-6.15	---	---	---	Noise floor

6.6.2 Measurement Results – Channel 40 (5.15 GHz–5.25 GHz, Middle Channel)

Frequency (MHz)	Peak (dBµV)	Avg (dBµV)	Corr Factor (dB)	Avg (dBµV/m)	Limit (dB)	Margin (dB)	Polarity (H/V)	Height (cm)	TT Pos (Deg)	Note
5200.000	---	---	---	---	---	---	---	---	---	Fundamental
10400.000	48.23	35.43	6.44	41.87	54.00	-12.13	H	126	270	
15600.000 ¹	51.22	35.71	12.99	48.70	54.00	-5.30	H	126	270	
20800.000 ¹	51.97	31.97	9.32	41.29	54.00	-12.71	---	---	---	Noise floor
26000.000	54.84	34.84	15.20	50.04	54.00	-3.96	---	---	---	Noise floor
31200.000 ¹	31.40	11.40	35.93	47.33	54.00	-6.67	---	---	---	Noise floor
36400.000	31.23	11.23	36.65	47.88	54.00	-6.12	---	---	---	Noise floor

6.6.3 Measurement Results – Channel 44 (5.15 GHz–5.25 GHz, High Channel)

Frequency (MHz)	Peak (dBµV)	Avg (dBµV)	Corr Factor (dB)	Avg (dBµV/m)	Limit (dB)	Margin (dB)	Polarity (H/V)	Height (cm)	TT Pos (Deg)	Note
5240.000	---	---	---	---	---	---	---	---	---	Fundamental
10440.000	48.23	33.42	6.44	39.86	54.00	-14.14	H	127	270	
15660.000 ¹	49.18	35.19	13.48	48.67	54.00	-5.33	H	127	270	
20880.000 ¹	51.48	31.48	9.44	40.92	54.00	-13.08	---	---	---	Noise floor
26100.000	54.67	34.67	15.19	49.86	54.00	-4.14	---	---	---	Noise floor
31320.000 ¹	30.40	10.40	35.94	46.34	54.00	-7.66	---	---	---	Noise floor
36540.000	29.90	9.90	36.70	46.60	54.00	-7.40	---	---	---	Noise floor

¹ Frequency falls within the Restricted Bands of Operation. See FCC Part 15, Section 15.205 for additional information.

6. Measurement Data (continued)

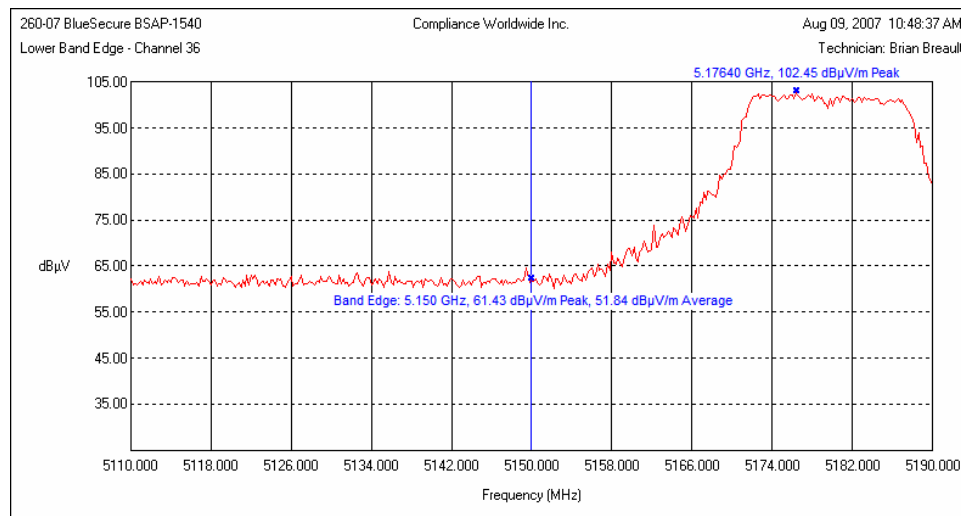
6.7. Band Edge Measurements

6.7.1. Lower and Upper Band Edge (15.407(b)(1)), 15.215(c)

Requirement: For transmitters operating in the 5.15–5.25 GHz band: All emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. In addition, the provisions of § 15.205 apply to intentional radiators operating under this section. Also under 15.215(c) the emission at the band edge shall be 20 dB down from the carrier.

Chan.	Chan. Freq. GHz	Field Strength Peak dBµV/m	Band Edge GHz	Field Strength Average dBµV/m	15.407 Limit		15.205 Limit Average	Result
					EIRP	dBµV/m	dBµV/m	
36	5.180	102.45	5.150	51.80	-27 dBm/MHz	68.30	54.0	Compliant
44	5.220	102.25	5.250	48.85	-27 dBm/MHz	68.30	54.0	Compliant

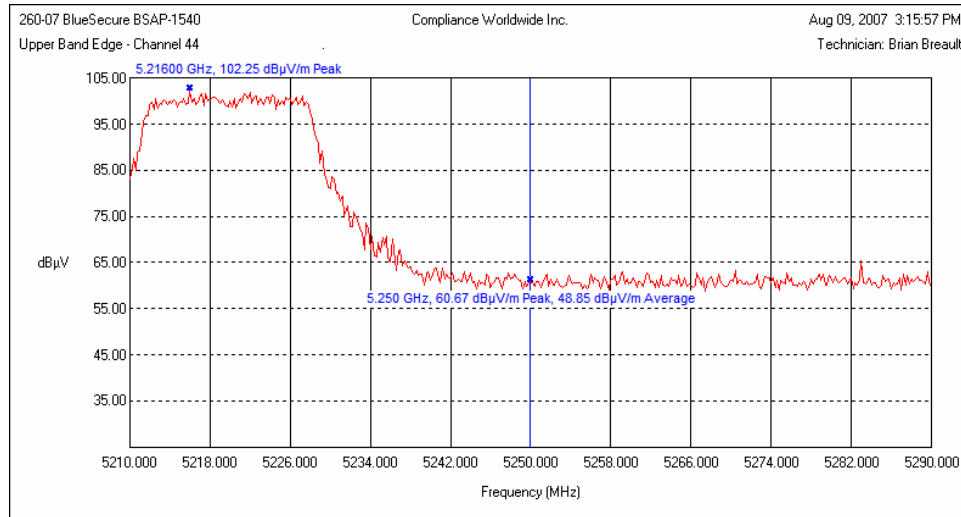
6.7.1.1. Lower Band Edge – Measurement Plot



6. Measurement Data (continued)

6.7. Band Edge Measurements (continued)

6.7.1.2. Upper Band Edge – Measurement Plot



6.8. Public Exposure to Radio Frequency Energy Levels (15.407(f))

Channel	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
	(1)	(2)	(3)	(4)	(5)	
36	20	14.31	4.5	0.0151	1	Compliant
40	20	14.44	4.5	0.0156	1	Compliant
44	20	14.65	4.5	0.0163	1	Compliant

$$PD = \frac{OP + AG}{(4 \times \pi \times d^2)}$$

- Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.
- Sections 6.1.1 and 6.1.2 .of this test report.
- Data supplied by the client.
- Power density is calculated from field strength measurement and antenna gain.
- Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

7. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023**).

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.