

**COMPLIANCE WORLDWIDE INC.  
TEST REPORT 173-07R2**

In Accordance with the Requirements of  
**FCC PART 15.247, Subpart C  
INDUSTRY CANADA RSS 210, ISSUE 6, Annex 8**

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

Issued to

**Bluesocket, Inc.  
10 North Avenue  
Burlington, MA 01803  
1-781-328-0888**

for

**BlueSecure™ BSAP-1700**

**Report Issued on July 9, 2007**

Tested by

  
\_\_\_\_\_  
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Reviewed by

  
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## Table of Contents

1. Scope .....	3
2. Product Details .....	3
2.1. Manufacturer.....	3
2.2. Model Number .....	3
2.3. Serial Number.....	3
2.4. Description.....	3
2.5. Power Source .....	3
2.6. EMC Modifications.....	3
3. Product Configuration .....	3
3.1. Support Equipment.....	4
3.2. Cables.....	4
3.3. Operational Characteristics & Software .....	3
3.4. Block Diagram .....	4
4. Measurements Parameters.....	5
4.1. Measurement Equipment Used to Perform Test.....	5
4.2. Measurement & Equipment Setup .....	5
4.3. Test Procedure .....	5
5. Measurement Summary.....	6
6. Measurement Data.....	7
6.1. Radiated EIRP and Maximum Peak Conducted Output Power .....	7
6.2. Minimum 6 dB Bandwidth .....	18
6.3. 99% Bandwidth.....	21
6.4. Operation with directional antenna gains greater than 6 dBi .....	25
6.5. Spurious Radiated Emissions (30 MHz to 1 GHz) .....	25
6.6. Spurious Radiated Emissions (Above 1 GHz) Part 1 .....	26
6.7. Spurious Radiated Emissions (Above 1 GHz) Part 2 .....	27
6.8. Lower and Upper Band Edge Measurements .....	29
6.9. Power Spectral Density .....	33
6.10. Power Line Conducted Emissions.....	34
6.11. Public Exposure to Radio Frequency Energy Levels .....	37
6.12. Determination of Average Factor .....	38
7. Test Site Description .....	41

**1. Scope**

This test report certifies that the Bluesocket BlueSecure™ Access Point 1700, BSAP-1700, as tested, meets the FCC Part 15.247, Subpart C and Industry Canada RSS 210, Issue 6, Annex 8 requirements. 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. This report replaces in full CW Test Report# 173-07.

**2. Product Details**

- 2.1. Manufacturer:** Bluesocket, Inc.
- 2.2. Model Number:** BlueSecure™ BSAP-1700
- 2.3. Serial Number:** None
- 2.4. Description:** The BlueSecure™ Access Point 1700 (BSAP-1700) is the first enterprise-class 802.11a/b/g Wi-Fi certified AP to use MIMO technology. This approach achieves more than 30 percent better range and overall performance, using your existing standard 802.11a/b/g clients, than APs using legacy 802.11 technologies. ISM Channels 12 to 14 and 165 have been disabled.
- 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-0T5326-12961-4C1-5477	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-1700

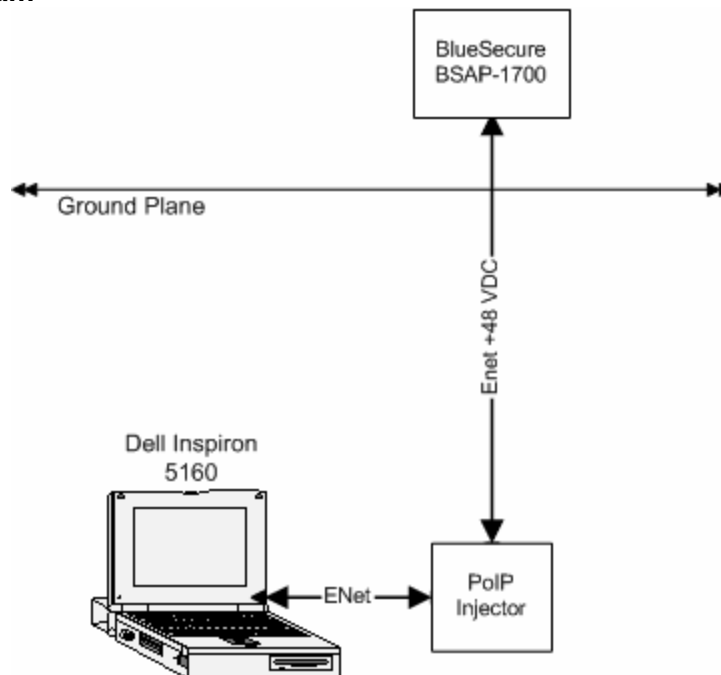
### 3. Product Configuration (continued)

#### 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. Click on the "Run Traffic" icon on the desktop. This will startup the traffic through the AP. When you are finished running the traffic, you can do a Ctrl-c in the window with all the dots.
5. Once you are finished with channel 1, close "Run Traffic", run /home/setup\_channel\_6 on the APs command prompt. Click on the "Run Traffic" icon again. Repeat for other channels.
6. There are multiple scripts on the AP to adjust channel  
 /home/setup\_channel\_1  
 /home/setup\_channel\_6  
 /home/setup\_channel\_11  
 or /home/set\_channel\_24G <values 1-11>  
 /home/set\_channel\_5G <values 36-48 or 149-161>
7. All the transmissions are at full power and at the lowest rate (i.e. 1Mbps for 2.4Ghz and 6.0Mbps for 5Ghz). To adjust the power, use the following commands:  
 /home/set\_power\_24G <dBm level> 27dBm is max.  
 /home/set\_power\_5G <dBm level> 27dBm is max

Note : The 26 dBm setting was used for all measurements.

#### 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
Bilog Antenna	Com-Power	AC220	25509	7/31/2007
Horn Antenna	Electro-Metrics	EM-6961	6337	8/25/2007
Horn Antenna	ComPower	AH-840	03075	8/25/2007
2.4 GHz BP Filter	Micro-Tronics	BRM50702	14	11/16/2007

##### 4.2. Measurement & Equipment Setup

Test Date:	4/21/2007
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, Section 15.247: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz. Radiated emissions testing is based on the requirements detailed in FCC Part 15, Section 15.209: Radiated emission limits, general requirements.

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 15.247 Reference	Test Report Section	Result	Comment
Maximum Peak Conducted Output Power	(b) (3)	6.1	Compliant	< 1 Watt
Minimum 6 dB Bandwidth	(a) (2)	6.2	Compliant	> 500 kHz
99% Bandwidth	N/A	6.3	Compliant	RSS 210
Operation with directional antenna gains greater than 6 dBi	(b) (4)	6.4	N/A	Antenna gains: +3.95 dBi at 2.4 GHz +5.06 dBi at 5.8 GHz
Spurious Radiated Emissions	15.209 15.247 (d)	6.5, 6.6 6.7	Compliant	
Lower and Upper Band Edge	15.247 (d)	6.8	Compliant	
Power Spectral Density	15.247(e)	6.9	Compliant	
Conducted Emissions	15.207	6.10	Compliant	
Public Exposure to Radio Frequency Energy Levels	1.1307 (b) (1)	6.11	Compliant	Calculated from field strength measurement and antenna gain.
Determination of Averaging Factor	15.35 (b)	6.12	Compliant	Averaging factor = 20 dB

**6. Measurement Data**

**6.1. Radiated Equivalent Isotropic Radiated Power (15.247(b)(3))**

**6.1.1. Field Strength 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.

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

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

P = the power in Watts.

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.

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

**6.1.1.1. Radiated Equivalent Isotropic Radiated Power 15.247(b)(3)**

Channel	Channel Frequency	Peak Field Strength <sup>1</sup>	Antenna Gain	Power		Limit		Result
	GHz	dBµV	Numeric	Watts	dBm	Watts	dBm	
1	2412	128.86	2.483	0.929	29.68	1	30	Compliant
6	2437	128.22	2.483	0.802	29.04	1	30	Compliant
11	2462	127.53	2.483	0.684	28.35	1	30	Compliant
149	5745	125.58	3.206	0.338	25.29	1	30	Compliant
153	5765	125.88	3.206	0.362	25.59	1	30	Compliant
161	5805	124.65	3.206	0.273	24.36	1	30	Compliant

<sup>1</sup> Values includes correction factors.

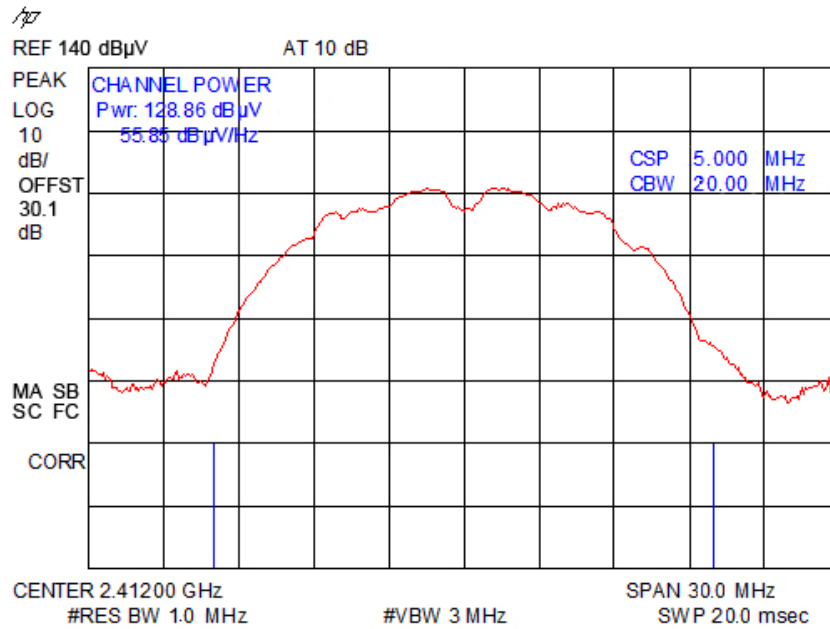
6. Measurement Data (continued)

6.1. Radiated Equivalent Isotropic Radiated Power (15.247(b)(3)) (continued)

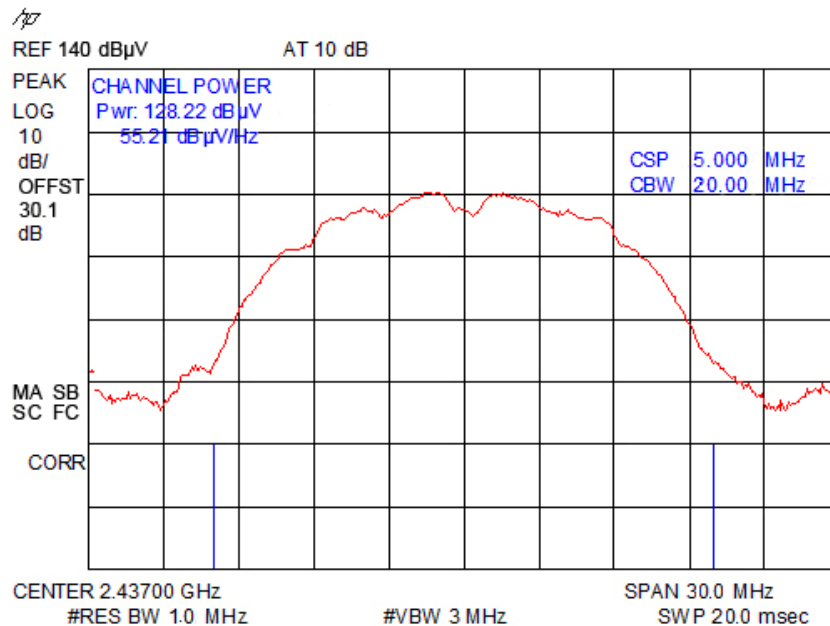
6.1.1. Field Strength Measurements (continued)

6.1.1.2. Radiated Equivalent Isotropic Radiated Power – Plots

6.1.1.2.1. Channel 1



6.1.1.2.2. Channel 6





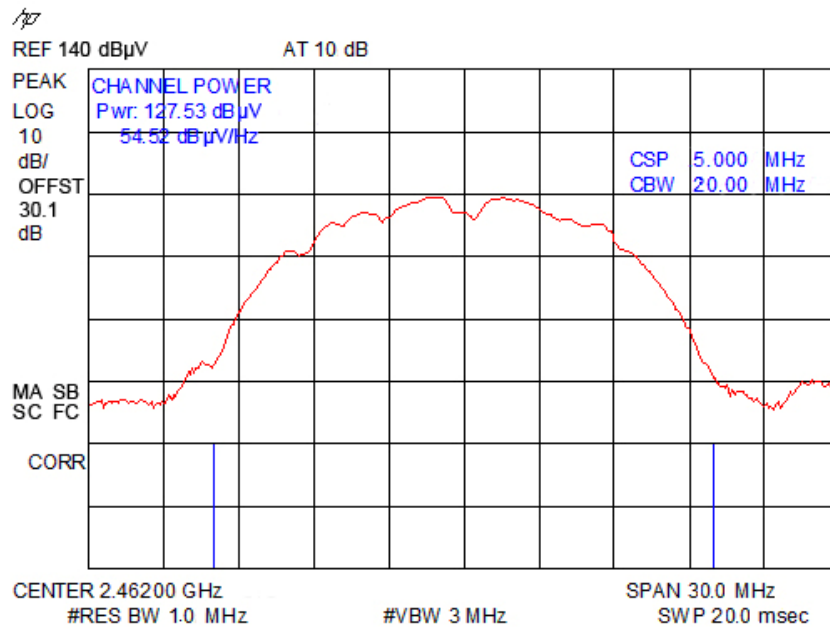
6. Measurement Data (continued)

6.1. Radiated Equivalent Isotropic Radiated Power (15.247(b)(3)) (continued)

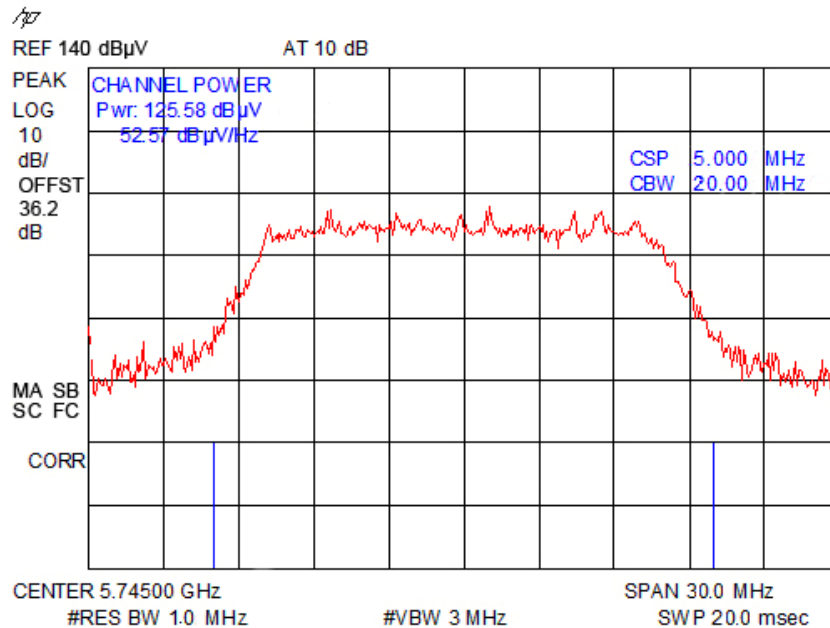
6.1.1. Field Strength Measurements (continued)

6.1.1.2. Radiated Equivalent Isotropic Radiated Power – Plots (continued)

6.1.1.2.3. Channel 11



6.1.1.2.4. Channel 149



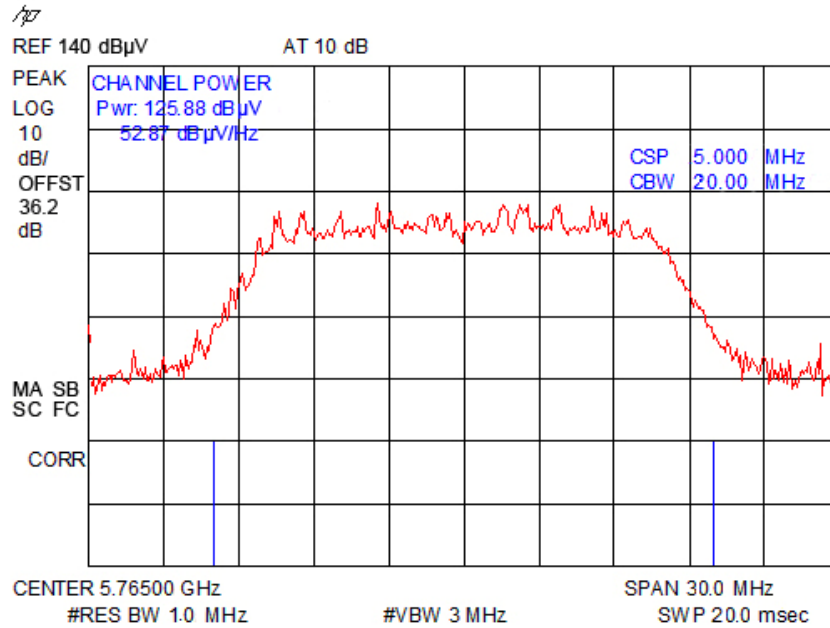
6. Measurement Data (continued)

6.1. Radiated Equivalent Isotropic Radiated Power (15.247(b)(3)) (continued)

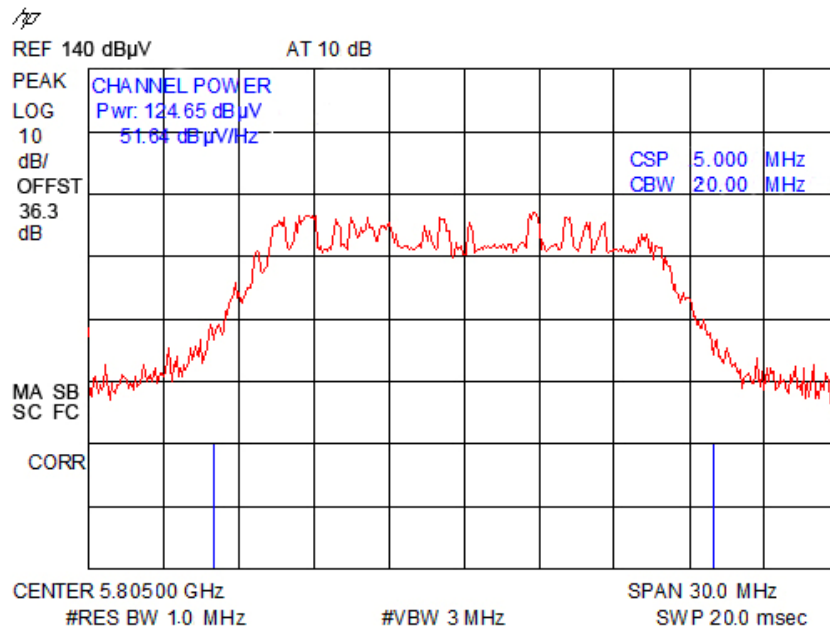
6.1.1. Field Strength Measurements (continued)

6.1.1.2. Radiated Equivalent Isotropic Radiated Power – Plots (continued)

6.1.1.2.5. Channel 153



6.1.1.2.6. Channel 161



## 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 15.247(b)(3)

Channel	Channel Frequency	Power Meas. Chain 0	Power Meas. Chain 2	Power		Limit		Result
	GHz	dBm	dBm	dBm	Watts	dBm	Watts	
1	2412	20.59	20.95	23.78	0.239	30	1	Compliant
6	2437	20.21	20.66	23.45	0.221	30	1	Compliant
11	2462	20.25	21.23	23.78	0.239	30	1	Compliant
149	5745	20.82	19.68	23.30	0.214	30	1	Compliant
153	5765	21.25	19.89	23.63	0.231	30	1	Compliant
161	5805	20.60	19.30	23.01	0.200	30	1	Compliant

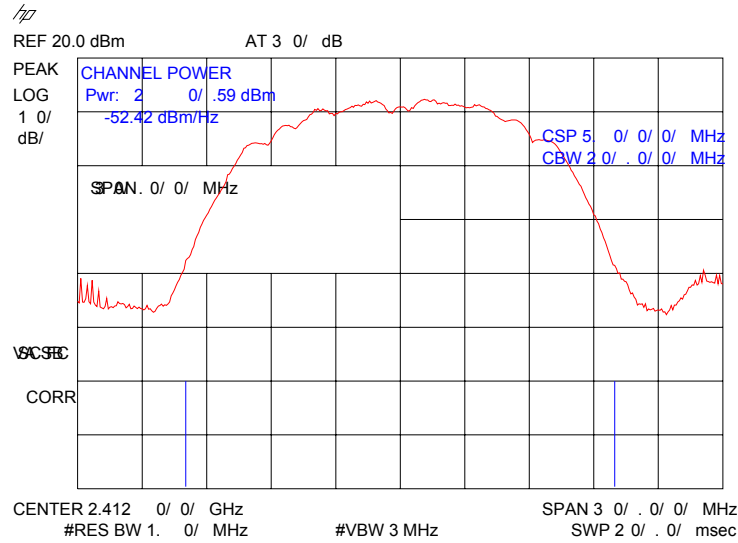
6. Measurement Data (continued)

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

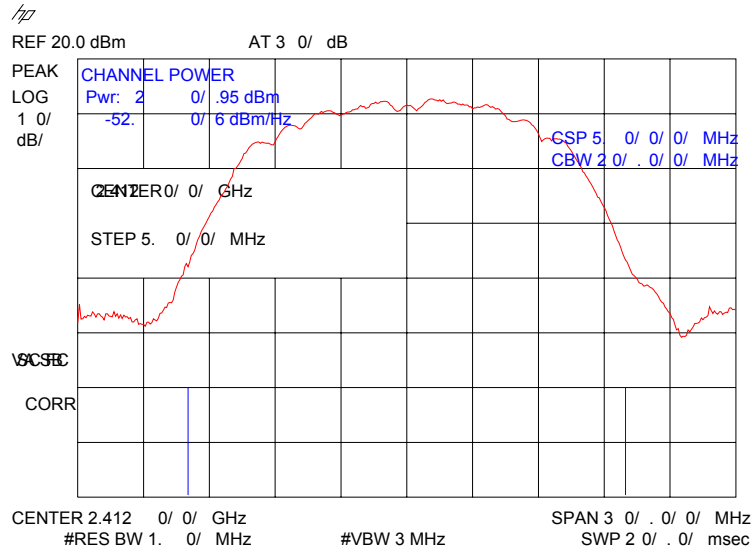
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots

6.1.2.2.1. Channel 1 Chain 0



6.1.2.2.2. Channel 1 Chain 2



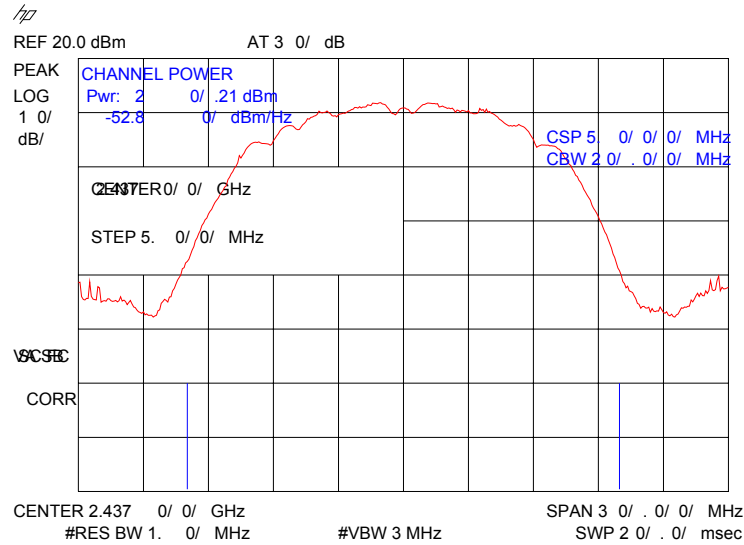
6. Measurement Data (continued)

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

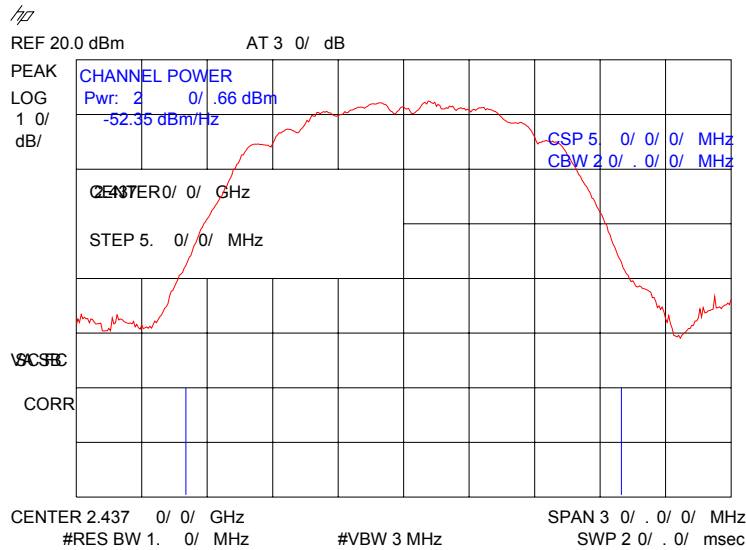
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots (continued)

6.1.2.2.3. Channel 6 Chain 0



6.1.2.2.4. Channel 6 Chain 2



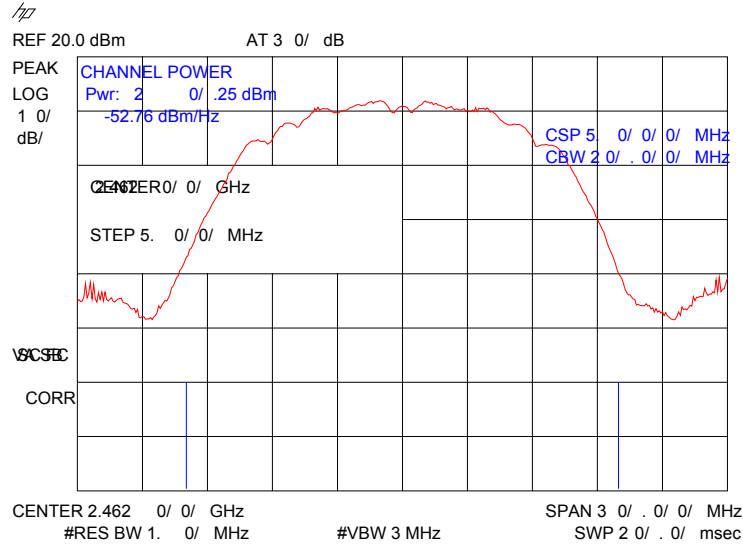
6. Measurement Data (continued)

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

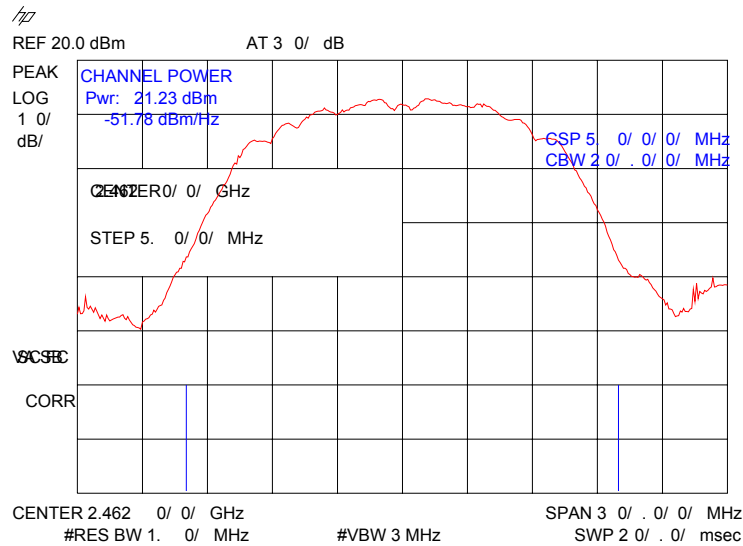
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots (continued)

6.1.2.2.5. Channel 11 Chain 0



6.1.2.2.6. Channel 11 Chain 2



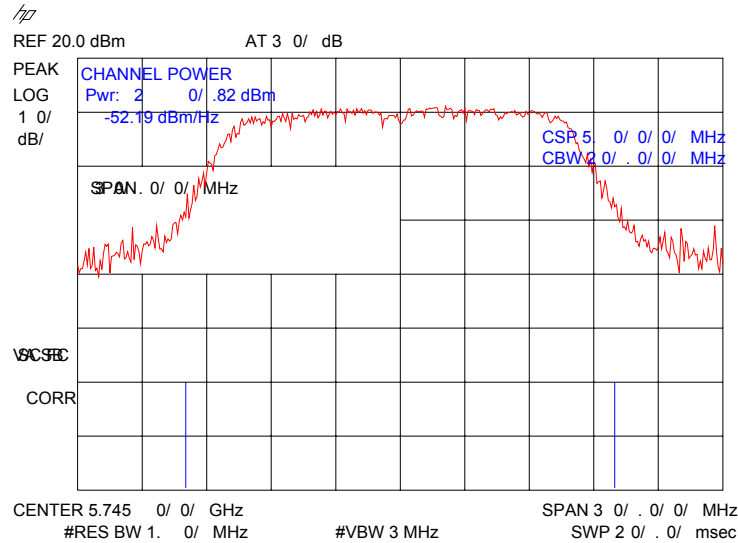
6. Measurement Data (continued)

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

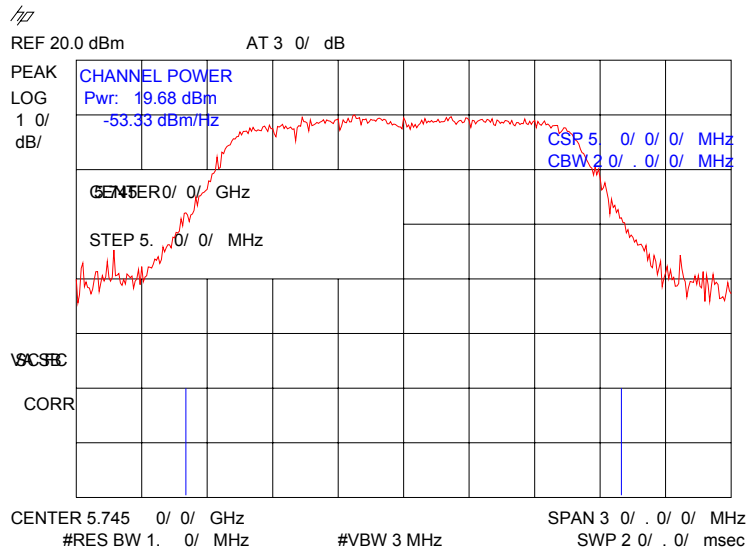
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots (continued)

6.1.2.2.7. Channel 149 Chain 0



6.1.2.2.8. Channel 149 Chain 2



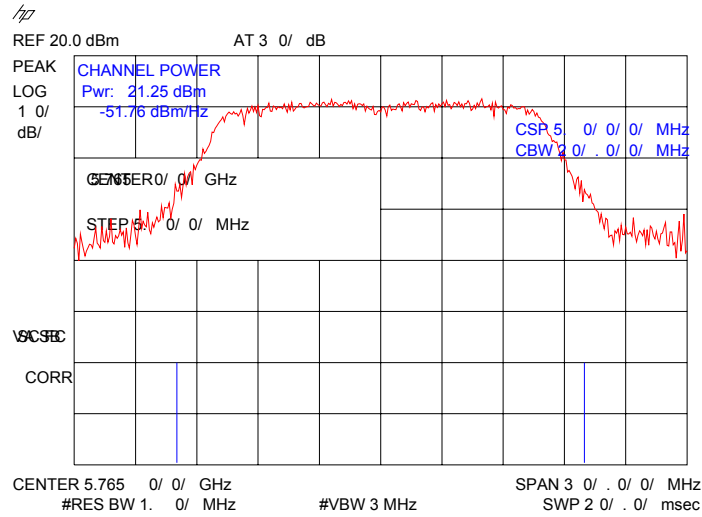
6. Measurement Data (continued)

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

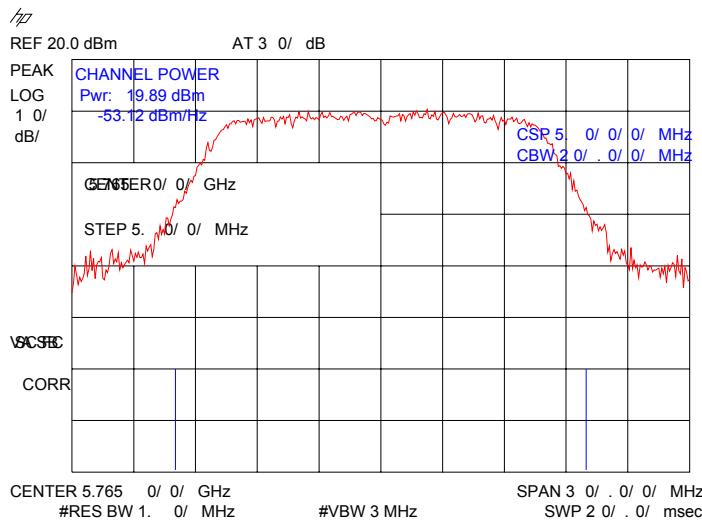
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots (continued)

6.1.2.2.9. Channel 153 Chain 0



6.1.2.2.10. Channel 153 Chain 2





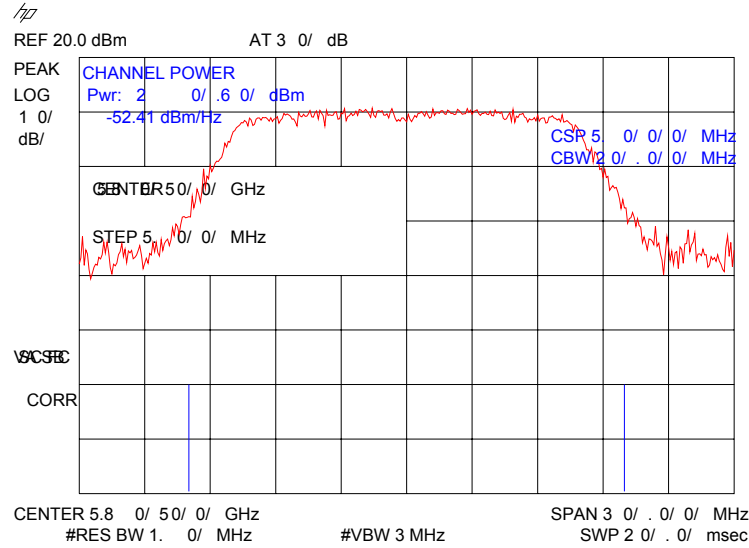
6. Measurement Data (continued)

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

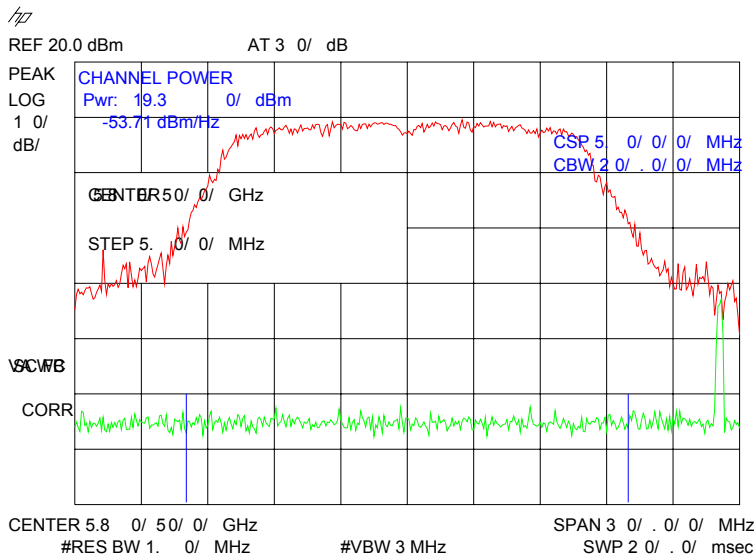
6.1.2. Conducted Mode Measurements (continued)

6.1.2.2. Maximum Peak Conducted Output Power – Plots (continued)

6.1.2.2.11. Channel 161 Chain 0



6.1.2.2.12. Channel 161 Chain 2



## 6. Measurement Data (continued)

### 6.2. Minimum 6 dB Bandwidth (15.247 (a) (2))

Requirement: Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Note: the measurement data plots did not contain a reference level offset for the antenna factor or cable losses.

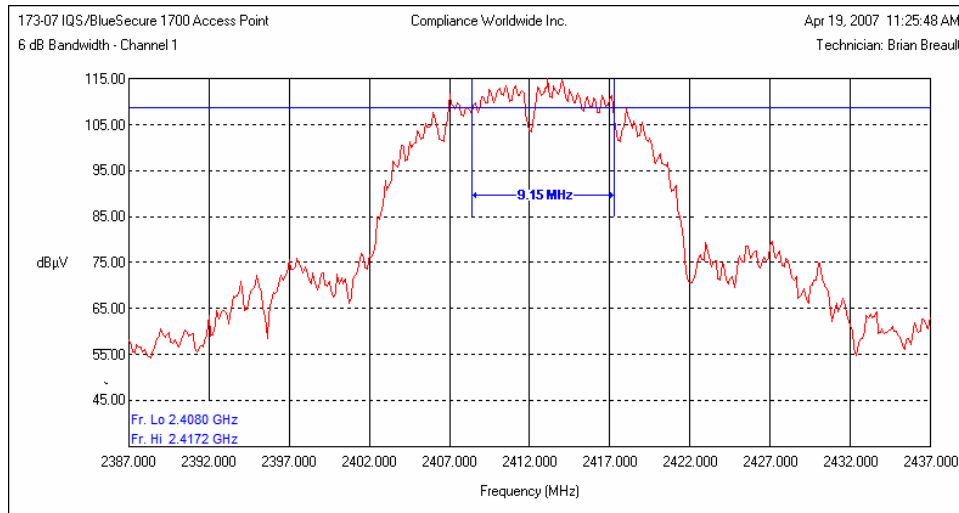
Resolution Bandwidth : 100 kHz  
 Video Bandwidth : 100 kHz  
 Sweep Time : 20 mSec

### 6.2.1 Measurement Results -6dB Bandwidth

Channel	Frequency (MHz)	-6 dB Bandwidth (MHz)	Required -6 dB Bandwidth	Result
1	2412	9.15	≥ 0.5	Compliant
6	2437	9.20	≥ 0.5	Compliant
11	2462	10.3	≥ 0.5	Compliant
149	5745	16.5	≥ 0.5	Compliant
153	5765	16.5	≥ 0.5	Compliant
161	5805	16.5	≥ 0.5	Compliant

### 6.2.2. Measurement Plots

#### 6.2.2.1. Channel 1

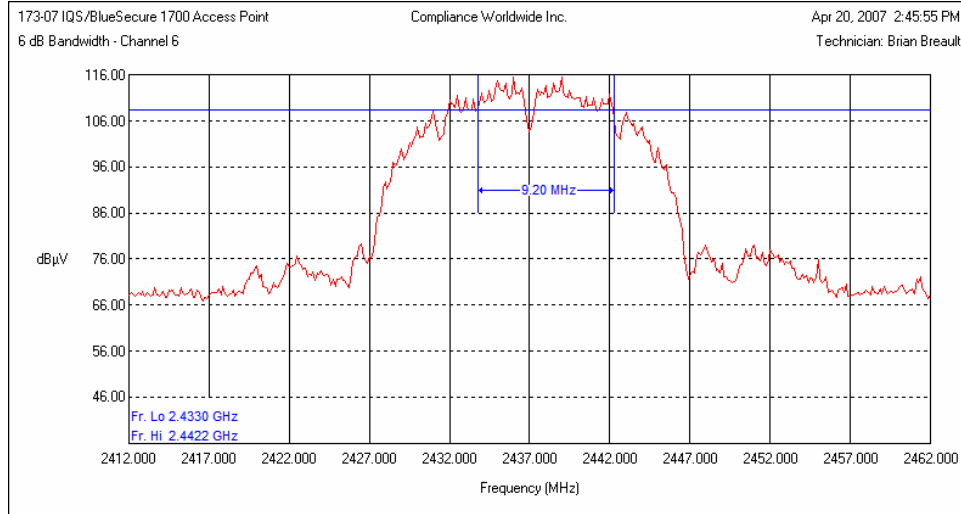


## 6. Measurement Data (continued)

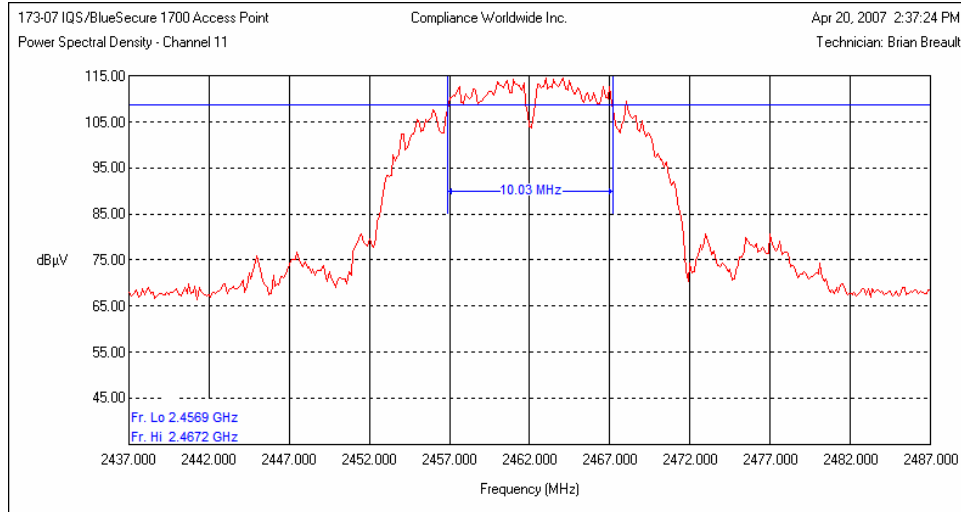
### 6.2. Minimum 6 dB Bandwidth (15.247 (a) (2)) (cont.)

#### 6.2.2. Measurement Plots

##### 6.2.2.2. Channel 6



##### 6.2.2.3. Channel 11

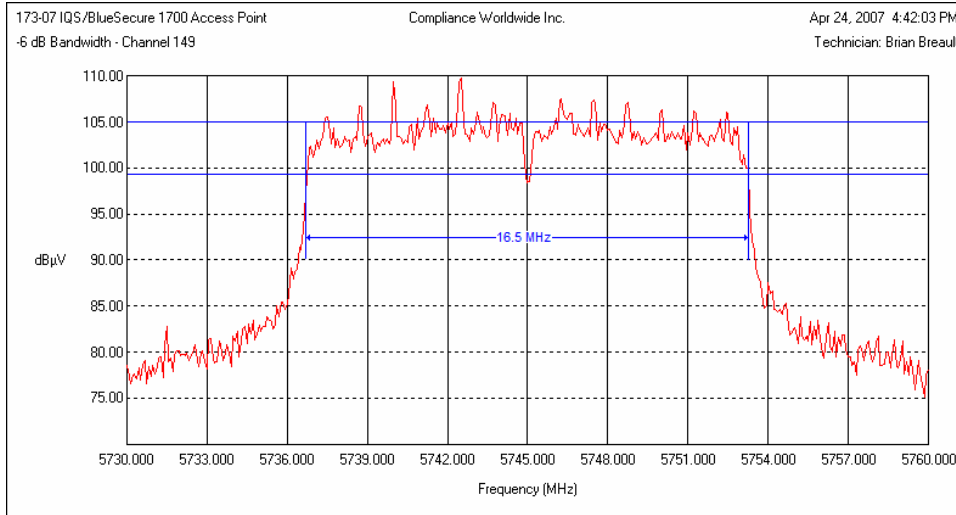


**6. Measurement Data (continued)**

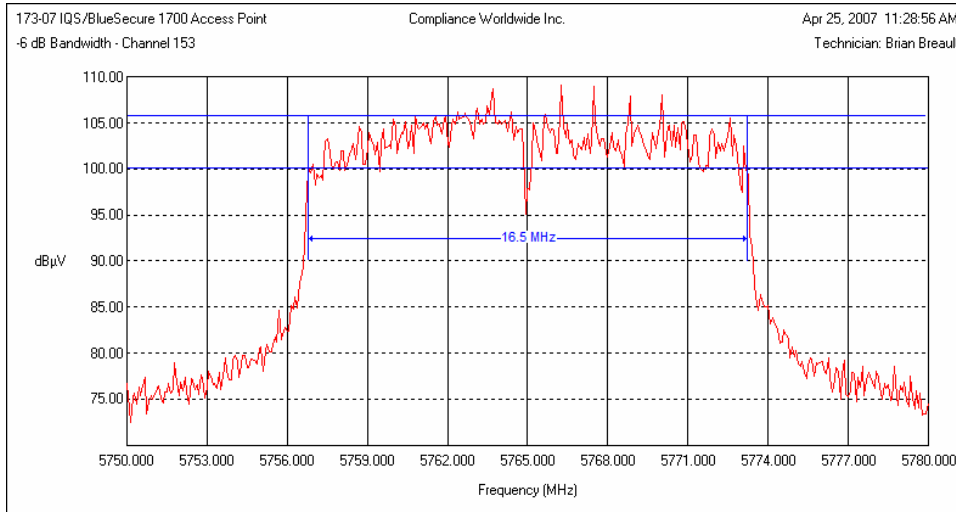
**6.2. Minimum 6 dB Bandwidth (15.247 (a) (2)) (cont.)**

**6.2.2. Measurement Plots**

**6.2.2.4. Channel 149**



**6.2.2.5. Channel 153**

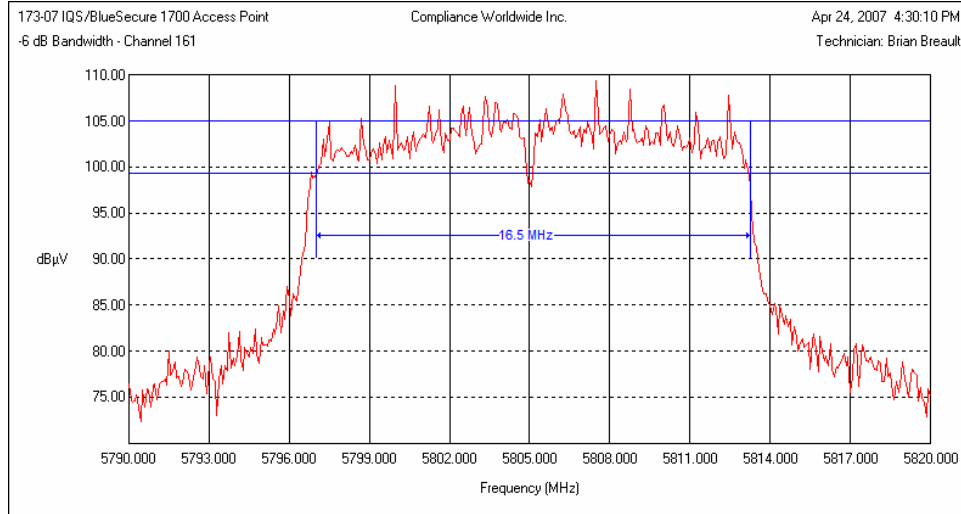


**6. Measurement Data (continued)**

**6.2. Minimum 6 dB Bandwidth (15.247 (a) (2)) (cont.)**

**6.2.2. Measurement Plots (continued)**

**6.2.2.6. Channel 161**



**6. Measurement Data (continued)**

**6.3. 99% Bandwidth (RSS 210)**

**6.3.1. Measurement Results 99% Bandwidth**

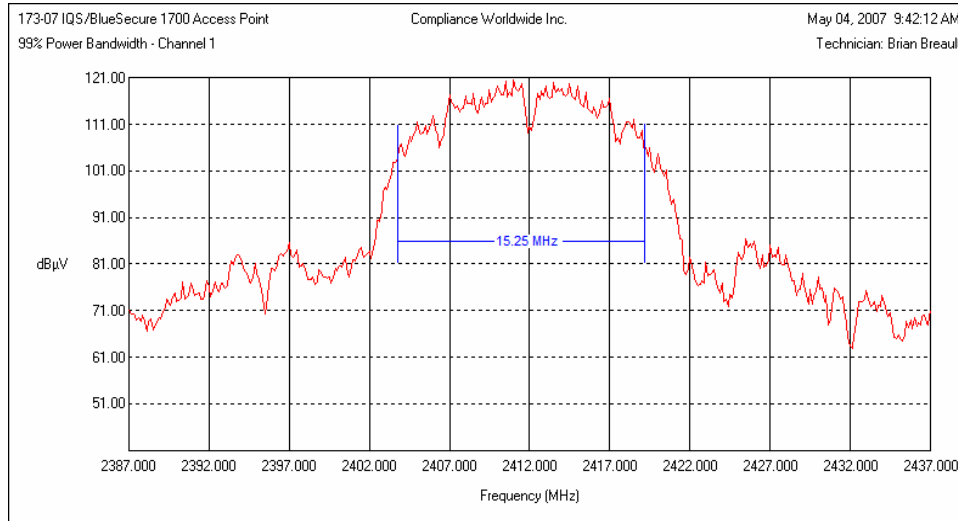
Channel	Frequency (MHz)	99% Bandwidth (MHz)	Result
1	2412	15.25	Compliant
6	2437	15.25	Compliant
11	2462	15.50	Compliant
149	5745	16.63	Compliant
153	5765	16.50	Compliant
161	5805	16.63	Compliant

**6. Measurement Data (continued)**

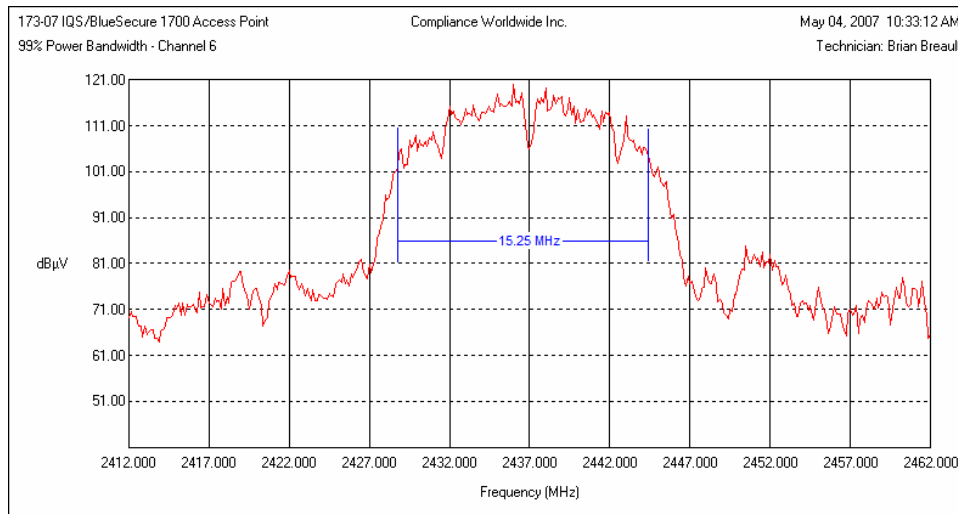
**6.3. 99% Bandwidth (RSS 210) (continued)**

**6.3.2. Measurement Plots**

**6.3.2.1. Channel 1**



**6.3.2.2. Channel 6**

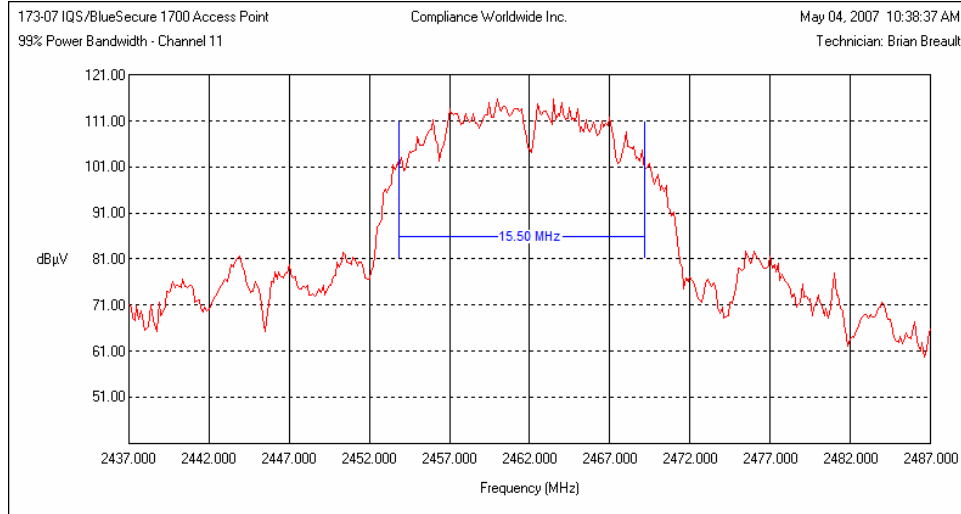


**6. Measurement Data (continued)**

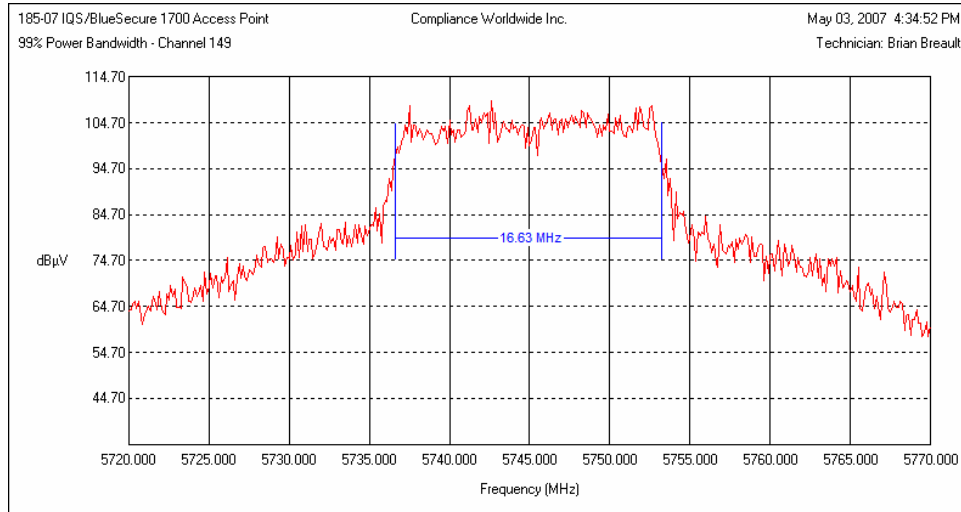
**6.3. 99% Bandwidth (IC RSS 210) (cont.)**

**6.3.2. Measurement Plots (continued)**

**6.3.2.3. Channel 11**



**6.3.2.4. Channel 149**

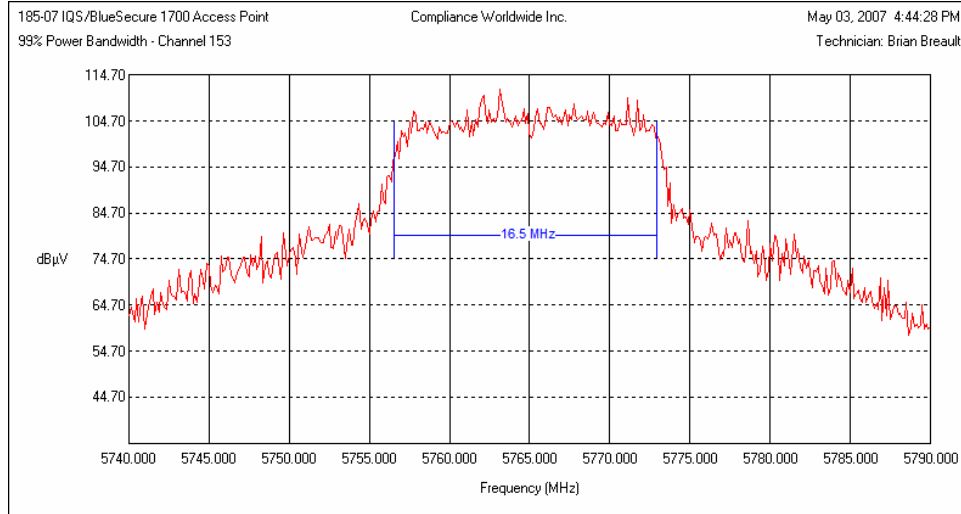


**6. Measurement Data (continued)**

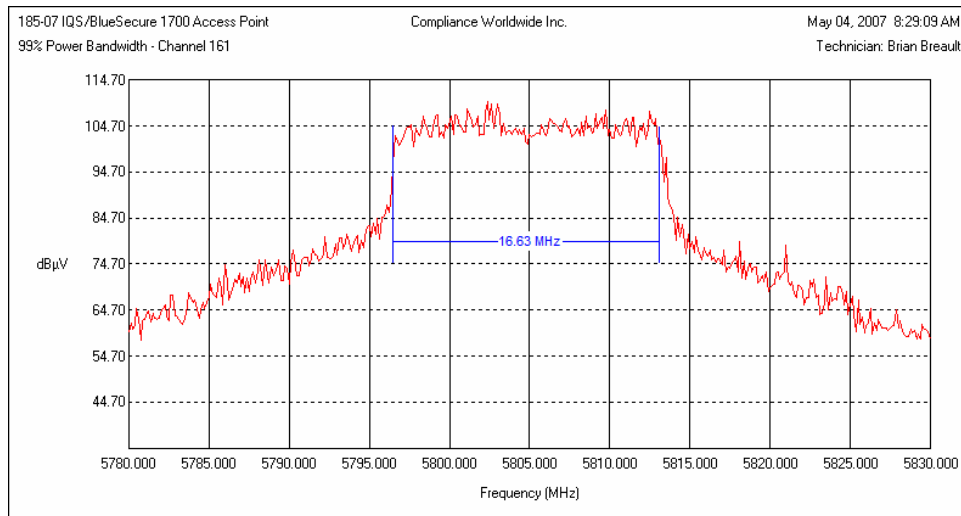
**6.3. 99% Bandwidth (IC RSS 210) (cont.)**

**6.3.2. Measurement Plots (continued)**

**6.3.2.5. Channel 153**



**6.3.2.6. Channel 161**





**6. Measurement Data (continued)**

**6.4. Operation with directional antenna gains greater than 6 dBi (15.247 (b)(4))**

**Requirement:** 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. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**Result:** The manufacturer states that the antennas used in this device has a gain of less than +6 dBi, therefore this requirement does not apply.

**6.5. Spurious Radiated Emissions (30 MHz to 1 GHz)**

**6.5.1. Regulatory Limit: FCC Part 209, Quasi-Peak**

Frequency Range (MHz)	Distance (Meters)	Limit (dBµV/m)
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
960 to 1000	3	54.0

**6.5.2. Measurement Equipment Used to Perform Test**

Device	Manufacturer	Model No.	Serial No.	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	3/14/2008
Bilog Antenna	Com-Power	AC220	25509	7/31/2007

**6.5.3. Measurement & Equipment Setup**

Test Date: 04/30/2007  
 Test Engineer: Brian Breault  
 Site Temperature (°C): 21.3  
 Relative Humidity (%RH): 31  
 Frequency Range: 30 MHz to 1 GHz  
 Measurement Distance: 3 Meters  
 EMI Receiver IF Bandwidth: 120 kHz  
 EMI Receiver Avg Bandwidth: 300 kHz  
 Detector Functions: Peak and Quasi-Peak.  
 Antenna Height: 1 to 4 meters

**6.5.4. Test Procedure**

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

**6.5.5. Test Results**

An emissions comparison of the DUT with and without the transmitter modules was made. There were no measurable emissions that could be attributed to the BlueSecure BSAP-1700 transmitter modules.

## 6. Measurement Data (continued)

### 6.6. Spurious Radiated Emissions (Above 1 GHz) Part 1

#### 6.6.1. Regulatory Limit: FCC Part 209, Average

Frequency Range (MHz)	Distance (Meters)	Limit (dB $\mu$ V/m)
Above 1 GHz	3	54.0

#### 6.6.2. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
Spectrum Analyzer	Hewlett Packard	8593E	3829A03887	3/16/2008
Spectrum Analyzer	Hewlett Packard	8563EC	3946A00623	2/09/2008
Microwave Preamp	Hewlett Packard	8449B	3008A01323	9/21/2008
Horn Antenna	Electro-Metrics	EM-6961	6337	8/25/2007
Horn Antenna	ComPower	AH-840	03075	8/25/2007
Harmonic Mixer	Hewlett Packard	11970A	3003A08210	Not Req'd
Horn Antenna	Alpha Industries	861A/599	324	Not Req'd
2.4 GHz BP Filter	Micro-Tronics	BRM50702	14	11/16/2007

#### 6.6.3. Measurement & Equipment Setup

Test Date:	04/30/2007
Test Engineer:	Brian Breault
Site Temperature (°C):	21.3
Relative Humidity (%RH):	31
Frequency Range:	1 GHz to 40 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	1 MHz
EMI Receiver Avg Bandwidth:	3 MHz
Detector Functions:	Peak and Average
Antenna Height:	1 to 4 meters

#### 6.6.4. Test Procedure

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

#### 6.6.5. Test Results

##### 6.6.5.1. Vertical Polarization

Frequency (MHz)	Pk Amp (dB $\mu$ V/m)	Av Amp (dB $\mu$ V/m)	Av Limit (dB $\mu$ V/m)	Margin (dB)
2966.0000	52.60	46.50	54.0	-7.5
3200.0000	52.40	45.40	54.0	-8.6
3920.0000	54.90	48.50	54.0	-5.5

##### 6.6.5.2. Horizontal Polarization

Frequency (MHz)	Pk Amp (dB $\mu$ V/m)	Av Amp (dB $\mu$ V/m)	Av Limit (dB $\mu$ V/m)	Margin (dB)
3920.0000	54.70	49.10	54.0	-4.9

**6. Measurement Data (continued)**

**6.7. Spurious Radiated Emissions Above 1 GHz) Part 2**

6.7.1. Measurement Results – Channel 1 (2400–2483.5 MHz, 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
2412.000	---	---	---	---	---	---	---	---	---	Fundamental
4824.000 <sup>1</sup>	52.99	32.99	-0.33	32.66	54.00	-21.34	V	134	10	
7236.000	62.92	42.92	4.17	47.09	54.00	-6.91	H	131	300	
9648.000	51.56	31.56	5.40	36.96	54.00	-17.04	H	131	280	
12060.000 <sup>1</sup>	49.44	29.44	7.03	36.47	54.00	-17.53	H	132	80	
14472.000 <sup>1</sup>	49.53	29.53	11.18	40.71	54.00	-13.29	---	---	---	Noise floor
16884.000	49.78	29.78	14.49	44.27	54.00	-9.73	---	---	---	Noise floor
19296.000 <sup>1</sup>	48.67	28.67	9.83	38.50	54.00	-15.50	---	---	---	Noise floor
21708.000	50.44	30.44	11.21	41.65	54.00	-12.35	---	---	---	Noise floor
24120.000	52.12	32.12	14.39	46.51	54.00	-7.49	---	---	---	Noise floor

6.7.2 Measurement Results – Channel 6 (2400–2483.5 MHz, 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
2437.000 <sup>1</sup>	---	---	---	---	---	---	---	---	---	Fundamental
4874.000 <sup>1</sup>	53.73	33.73	-0.22	33.51	54.00	-20.49	V	134	290	
7311.000 <sup>1</sup>	60.40	40.40	4.06	44.46	54.00	-9.54	H	136	280	
9748.000	50.27	30.27	5.51	35.78	54.00	-18.22	V	131	285	
12185.000 <sup>1</sup>	49.16	29.16	7.41	36.57	54.00	-17.43	H	147	300	
14622.000	48.52	28.52	11.63	40.15	54.00	-13.85	---	---	---	Noise floor
17059.000	49.15	29.15	14.73	43.88	54.00	-10.12	---	---	---	Noise floor
19496.000 <sup>1</sup>	50.79	30.79	9.68	40.47	54.00	-13.53	---	---	---	Noise floor
21933.000	51.36	31.36	11.67	43.03	54.00	-10.97	---	---	---	Noise floor
24370.000	53.57	33.57	14.18	47.75	54.00	-6.25	---	---	---	Noise floor

6.7.3 Measurement Results – Channel 11 (2400–2483.5 MHz, 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
2462.000 <sup>1</sup>	---	---	---	---	---	---	---	---	---	Fundamental
4924.000 <sup>1</sup>	52.67	32.67	-0.11	32.56	54.00	-21.44	H	118	285	
7386.000 <sup>1</sup>	64.52	44.52	3.96	48.48	54.00	-5.52	H	120	90	
9848.000	50.47	30.47	5.63	36.10	54.00	-17.90	V	133	280	
12310.000 <sup>1</sup>	48.88	28.88	7.78	36.66	54.00	-17.34	H	120	90	
14772.000	48.99	28.99	12.05	41.04	54.00	-12.96	V	100	225	Noise floor
17234.000	51.29	31.29	15.22	46.51	54.00	-7.49	---	---	---	Noise floor
19696.000 <sup>1</sup>	49.86	29.86	9.53	39.39	54.00	-14.61	---	---	---	Noise floor
22158.000 <sup>1</sup>	51.86	31.86	12.02	43.88	54.00	-10.12	---	---	---	Noise floor
24620.000	54.67	34.67	13.97	48.64	54.00	-5.36	---	---	---	Noise floor

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

**6. Measurement Data (continued)**

**6.7. Spurious Radiated Emissions Above 1 GHz Part 2 (continued)**

**6.7.4. Measurement Results – Channel 149 (5725–5850 MHz, 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
5745.000 <sup>1</sup>	---	---	---	---	---	---	---	---	---	Fundamental
11490.000 <sup>1</sup>	50.77	30.77	7.10	37.87	54.00	-16.13	H	120	90	
17235.000	50.34	30.34	18.03	48.37	54.00	-5.63	H	120	280	
22980.000 <sup>1</sup>	56.48	36.48	9.88	46.36	54.00	-7.64	---	---	---	Noise floor
28725.000	31.07	11.07	36.00	47.07	54.00	-6.93	---	---	---	Noise floor
34470.000	30.73	10.73	36.33	47.06	54.00	-6.94	---	---	---	Noise floor

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

**6.7.5. Measurement Results – Channel 153 (5725–5850 MHz, Middle 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
5765.000 <sup>1</sup>	---	---	---	---	---	---	---	---	---	Fundamental
11530.000 <sup>1</sup>	49.32	29.32	7.10	36.42	54.00	-17.58	H	120	80	
17295.000	50.94	32.94	18.12	51.06	54.00	-4.94	H	120	280	
23060.000 <sup>1</sup>	56.55	36.55	9.88	46.43	54.00	-7.57	---	---	---	Noise floor
28825.000	31.23	11.23	36.00	47.23	54.00	-6.77	---	---	---	Noise floor
34590.000	32.23	12.23	36.39	48.62	54.00	-5.38	---	---	---	Noise floor

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

**6.7.6. Measurement Results – Channel 161 (5725–5850 MHz, High 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
5805.000 <sup>1</sup>	---	---	---	---	---	---	---	---	---	Fundamental
11610.000 <sup>1</sup>	45.74	25.74	7.10	32.84	54.00	-21.16	H	120	80	
17415.000	50.64	30.64	18.29	48.93	54.00	-5.07	H	120	280	
23220.000	50.94	30.94	9.88	40.82	54.00	-13.18	---	---	---	Noise floor
29025.000	30.90	10.90	36.00	46.90	54.00	-7.10	---	---	---	Noise floor
34830.000	31.07	11.07	36.39	47.46	54.00	-6.54	---	---	---	Noise floor

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

**6. Measurement Data (continued)**

**6.8. Lower and Upper Band Edge Measurements (15.247 (d))**

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

**6.8.1. 2400 MHz to 2483.5 MHz**

6.8.1.1. Lower Band Edge

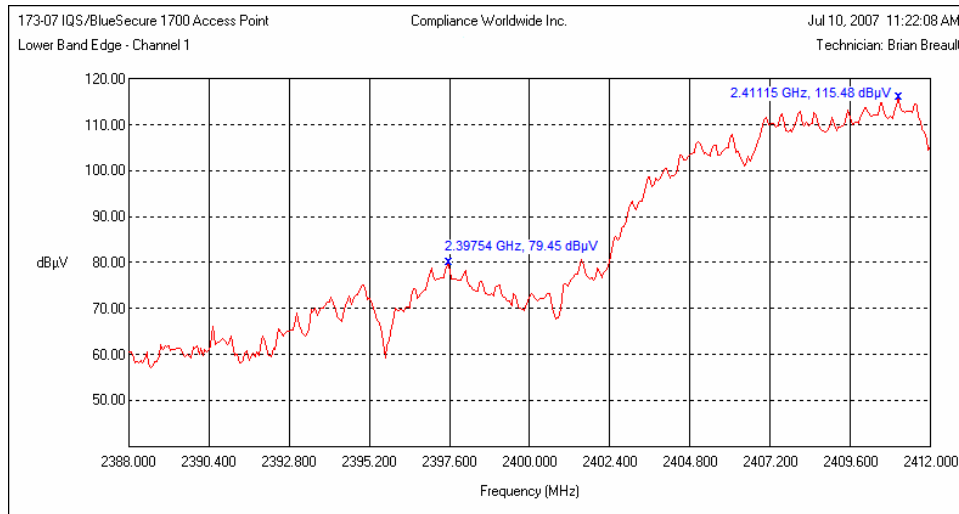
6.8.1.1.1. Measurement Results – Lower Band Edge

Lowest Channel (MHz)	Field Strength (dBµV/m)		Worst Case Out of Band (MHz)	Field Strength (dBµV/m)		Margin (dB)		Result
	Peak	Average		Peak	Average	Peak	Avg	
2412	115.48	---	2.39754	79.45	---	>20 dB	---	Compliant

6.8.1.1.2. Worst Case Measurement – Restricted Out of Band (> 2 BWs, eg >2 MHz)

Frequency (MHz)	Field Strength (dBµV/m)		Limit (dBµV/m)	Margin	Result
	Peak	Average			
2389.8	68.61	48.61	54.0	-5.39	Compliant

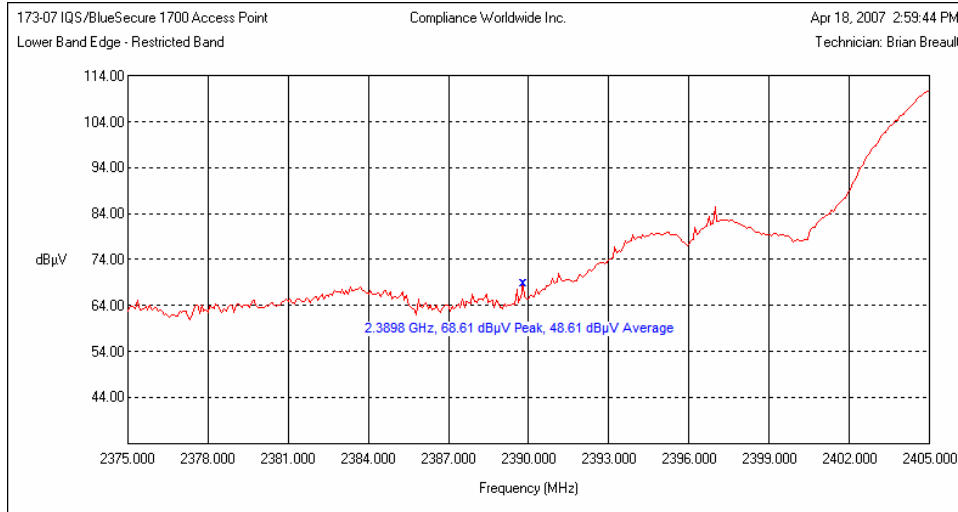
6.8.1.1.3. Lower Band Edge: Band Edge Measurement



6. Measurement Data (continued)

6.8. Lower and Upper Band Edge Measurements (15.247 (d)) (continued)

6.8.1.1.4. Lower Band Edge: Worst Case Measurement – Restricted Out of Band



6.8.1.2. Upper Band Edge

6.8.1.2.1. Measurement Results – Upper Band Edge

Highest Channel (MHz)	Field Strength (dBµV/m)		Band Edge Frequency (MHz)	Field Strength (dBµV/m)		Limit (dBµV/m)	Margin	Result
	Peak	Average		Peak	Average			
2462.000	120.47	100.47	2483.5	67.99	47.99	54.0	-6.01	Compliant

6.8.1.2.2. Worst case measurement – Out of Band (100 kHz BW)

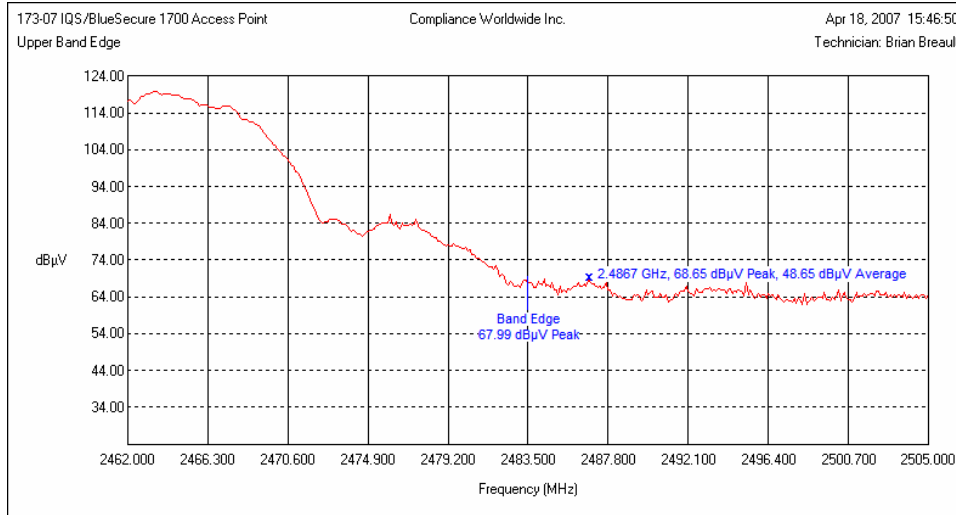
Frequency (MHz)	Field Strength (dBµV/m)		Limit (dBµV/m)	Margin	Result
	Peak	Average			
2486.7	68.65	48.65	54.0	-7.35	Compliant

See the following page for plot.

6. Measurement Data (continued)

6.8. Lower and Upper Band Edge Measurements (15.247 (d)) (continued)

6.8.1.2.3. Upper Band Edge: Worst case measurement – Out of Band (100 kHz BW)



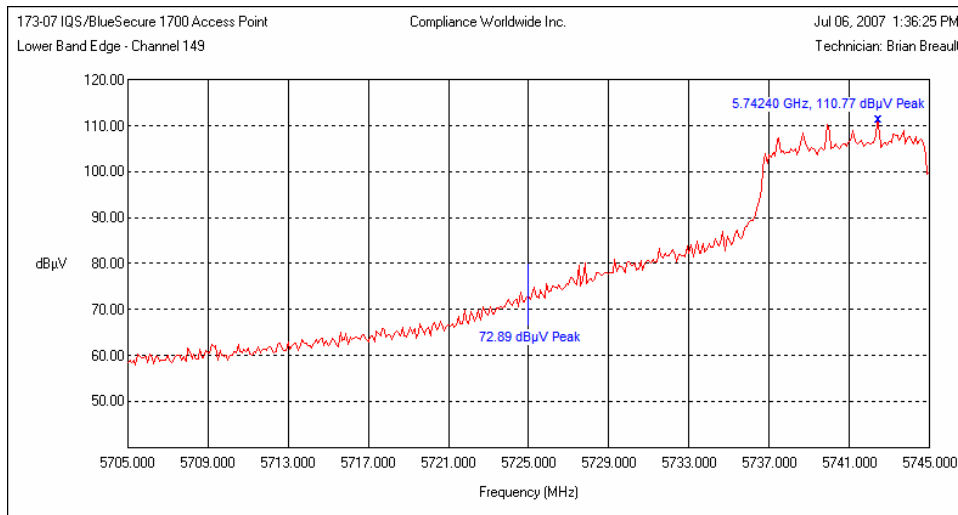
6.8.2. 5725 MHz to 5850 MHz

6.8.2.1. Lower Band Edge

6.8.2.1.1. Measurement Results – Lower Band Edge

Lowest Channel (MHz)	Field Strength (dBµV/m)		Band Edge Frequency (MHz)	Field Strength (dBµV/m)		Margin (dB)		Result
	Peak	Average		Peak	Average	Peak	Avg	
5745	110.77	90.77	5725	72.89	52.89	>20 dB	> 20 dB	Compliant

6.8.2.1.2. Lower Band Edge: Band Edge Measurement



6. Measurement Data (continued)

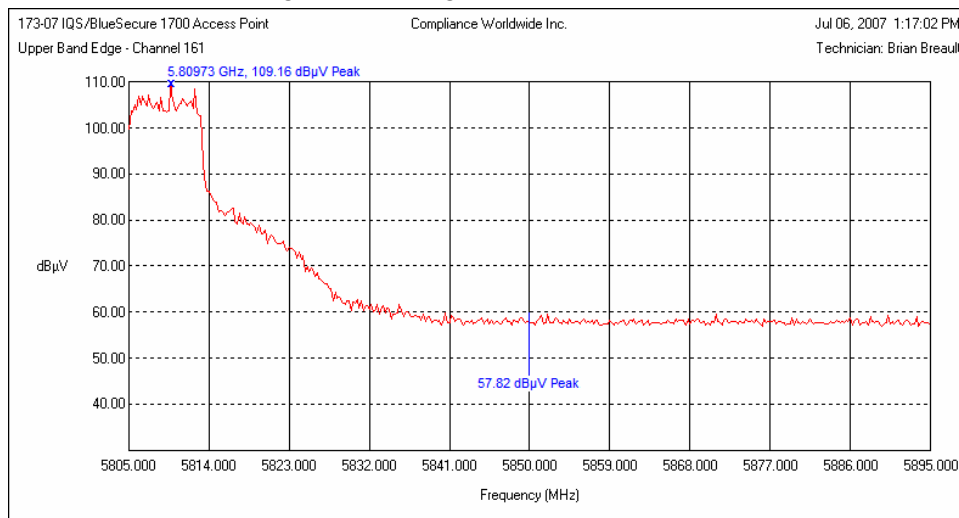
6.8. Lower and Upper Band Edge Measurements (15.247 (d)) (continued)

6.8.2.2. Upper Band Edge

6.8.2.2.1. Measurement Results – Upper Band Edge

Highest Channel (MHz)	Field Strength (dBµV/m)		Band Edge Frequency (MHz)	Field Strength (dBµV/m)		Margin (dB)		Result
	Peak	Average		Peak	Average	Peak	Avg	
5805	109.16	89.16	5850	57.82	37.82	>20 dB	> 20 dB	Compliant

6.8.2.2.2. Upper Band Edge: Band Edge Measurement





## 6. Measurement Data (continued)

### 6.9. Power Spectral Density (15.247(e))

Requirement: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

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 dB $\mu$ V /Hz or dBm/Hz values to a 3 kHz Resolution Bandwidth.

$$\text{dBm} = \text{dB}\mu\text{V} - 107.$$

#### 6.9.1. Measurement Results (From Radiated Measurements)

Channel	Channel Frequency	Noise Power Density	BW Correction Factor	Power Spectral Density	Limit	Result
	GHz	dB $\mu$ V/Hz	dB	dBm	dBm	
1	2.412	55.85	+35	-16.15	+8	Compliant
6	2.437	55.21	+35	-16.75	+8	Compliant
11	2.462	54.52	+35	-17.46	+8	Compliant
149	5.745	52.57	+35	-19.43	+8	Compliant
153	5.765	52.87	+35	-19.13	+8	Compliant
161	5.805	51.64	+35	-20.36	+8	Compliant

#### 6.9.2. 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	
1	2.412	-52.42	-52.06	+35	-14.23	+8	Compliant
6	2.437	-52.80	-52.35	+35	-14.56	+8	Compliant
11	2.462	-52.76	-51.78	+35	-14.23	+8	Compliant
149	5.745	-52.19	-53.33	+35	-14.71	+8	Compliant
153	5.765	-51.76	-53.12	+35	-14.38	+8	Compliant
161	5.805	-52.41	-53.71	+35	-15.00	+8	Compliant

**6. Measurement Data (continued)**

**6.10. Power Line Conducted Emissions (15.207)**

Requirement: 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  $\mu$ H/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.

Test Note: A Globetek, Inc. model GT-21131-7248 power adapter, serial number 034701 19/04 48 volt DC power supply was used to power the .

**6.10.1 Power Line Conducted Emissions Test Setup**

**6.10.1.1 Regulatory Limit: (15.207) (FCC Part 15, Class B)**

Frequency Range (MHz)	Limits (dB $\mu$ V)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50

\* Decreases with the logarithm of the frequency.

**6.10.1.2 Measurement Equipment Used to Perform Test**

Device	Manufacturer	Model	Serial No.	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	3/14/2008
LISN	EMCO	3825/2	9109-1860	1/11/2008

**6.10.1.3 Measurement & Equipment Setup**

Test Date:	04/26/2007
Test Engineer:	Brian Breault
Site Temperature ( $^{\circ}$ C):	20.8
Relative Humidity (%RH):	30
Frequency Range:	0.15 MHz to 30 MHz
EMI Receiver IF Bandwidth:	9 kHz
EMI Receiver Avg Bandwidth:	30 kHz
Detector Functions:	Peak, Quasi-Peak. & Average

**6.10.1.4 Test Procedure**

Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

6. Measurement Data (continued)

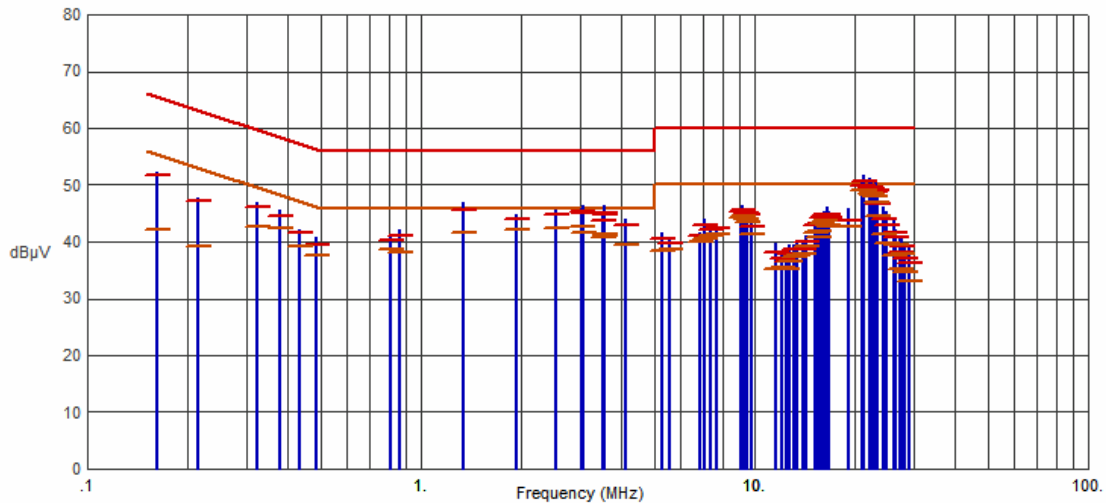
6.10 Power Line Conducted Emissions (15.207) (continued)

6.10.2 Conducted Emissions Test Data

6.10.2.1 120 Volts, 60 Hz Phase

Test No.: 173-07, 120 Volts, 60 Hz Phase

EN55022, Class B



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.3238	46.89	46.21	59.61	-13.40	42.60	49.61	-7.01	
.3768	45.47	44.60	58.35	-13.75	42.50	48.35	-5.85	
.4315	42.21	41.47	57.22	-15.75	39.23	47.22	-7.99	
.8079	41.01	40.32	56.00	-15.68	38.66	46.00	-7.34	
.8639	42.23	41.03	56.00	-14.97	38.08	46.00	-7.92	
1.3475	47.06	45.61	56.00	-10.39	41.61	46.00	-4.39	
1.9416	44.70	43.96	56.00	-12.04	42.07	46.00	-3.93	
2.5339	45.69	44.69	56.00	-11.31	42.50	46.00	-3.50	
3.0196	45.84	45.20	56.00	-10.80	42.56	46.00	-3.44	
3.0751	46.34	45.00	56.00	-11.00	41.67	46.00	-4.33	
3.5054	44.65	43.78	56.00	-12.22	40.80	46.00	-5.20	
3.5581	46.45	45.18	56.00	-10.82	41.38	46.00	-4.62	
3.5584	46.20	44.89	56.00	-11.11	41.10	46.00	-4.90	
4.0975	43.97	42.91	56.00	-13.09	39.39	46.00	-6.61	
9.1342	45.54	45.29	60.00	-14.71	44.31	50.00	-5.69	
9.2299	46.48	45.69	60.00	-14.31	44.58	50.00	-5.42	
9.4220	45.84	45.12	60.00	-14.88	44.09	50.00	-5.91	
9.5189	45.16	44.73	60.00	-15.27	43.58	50.00	-6.42	
15.8657	44.95	44.21	60.00	-15.79	43.15	50.00	-6.85	
16.1539	45.44	44.78	60.00	-15.22	43.65	50.00	-6.35	
16.4415	46.13	44.67	60.00	-15.33	43.02	50.00	-6.98	
19.1364	45.76	43.85	60.00	-16.15	42.68	50.00	-7.32	
20.9626	50.58	49.94	60.00	-10.06	49.19	50.00	-.81	
21.2502	51.78	50.55	60.00	-9.45	49.15	50.00	-.85	
22.2143	51.22	49.73	60.00	-10.27	48.43	50.00	-1.57	
22.5009	50.43	49.44	60.00	-10.56	48.36	50.00	-1.64	
22.7908	49.81	48.93	60.00	-11.07	48.03	50.00	-1.97	
23.0794	50.55	49.09	60.00	-10.91	47.00	50.00	-3.00	

Result: Passed

6. Measurement Data (continued)

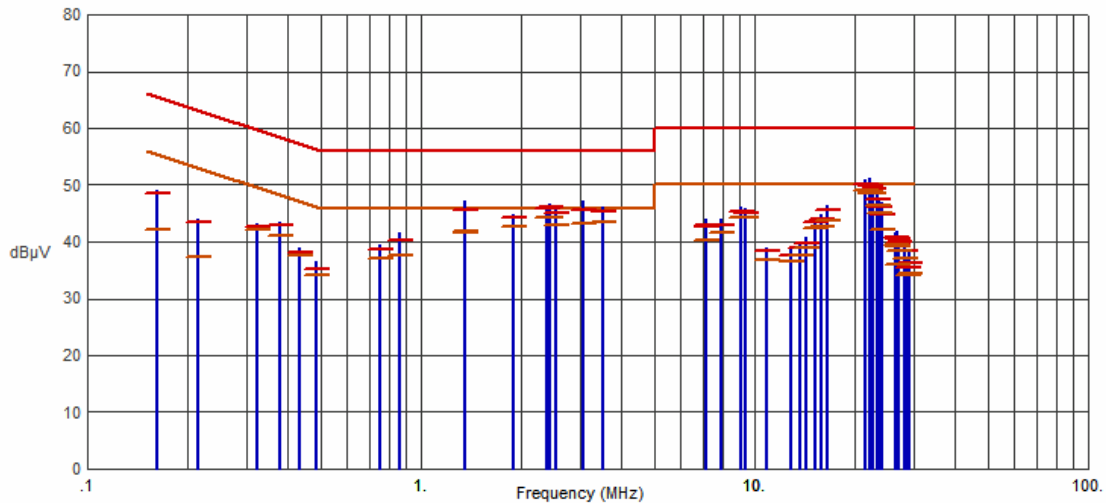
6.10. Power Line Conducted Emissions (15.207) (continued)

6.10.2 Conducted Emissions Test Data (continued)

6.10.2.2 120 Volts, 60 Hz Neutral

Test No.: 173-07, 120 Volts, 60 Hz Neutral

EN55022, Class B



Frequency (MHz)	Pk Amp (dBµV)	QP Amp (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Avg Amp (dBµV)	Avg Limit (dBµV)	Avg Margin (dB)	Comments
.3235	43.25	42.69	59.62	-16.93	42.12	49.62	-7.50	
.3771	43.53	42.82	58.34	-15.52	41.11	48.34	-7.23	
.7549	39.55	38.62	56.00	-17.38	37.15	46.00	-8.85	
.8640	41.63	40.21	56.00	-15.79	37.57	46.00	-8.43	
1.3478	47.01	45.57	56.00	-10.43	41.70	46.00	-4.30	
1.3481	47.23	45.71	56.00	-10.29	41.82	46.00	-4.18	
1.8870	44.84	44.31	56.00	-11.69	42.54	46.00	-3.46	
2.3719	46.51	45.95	56.00	-10.05	44.31	46.00	-1.69	
2.4266	46.76	46.15	56.00	-9.85	44.32	46.00	-1.68	
2.5334	46.38	45.08	56.00	-10.92	42.86	46.00	-3.14	
3.0753	47.24	45.56	56.00	-10.44	43.18	46.00	-2.82	
3.5053	46.08	45.37	56.00	-10.63	43.48	46.00	-2.52	
7.1179	43.90	43.00	60.00	-17.00	40.24	50.00	-9.76	
7.9832	44.02	42.95	60.00	-17.05	41.59	50.00	-8.41	
9.1369	46.06	45.36	60.00	-14.64	44.22	50.00	-5.78	
9.4254	45.84	45.13	60.00	-14.87	44.16	50.00	-5.84	
15.1970	44.34	43.46	60.00	-16.54	42.39	50.00	-7.61	
15.8700	44.73	43.87	60.00	-16.13	42.73	50.00	-7.27	
16.4474	46.39	45.60	60.00	-14.40	43.77	50.00	-6.23	
21.5450	50.86	50.02	60.00	-9.98	49.06	50.00	-.94	
22.2188	51.20	49.95	60.00	-10.05	48.53	50.00	-1.47	
22.2189	51.10	49.85	60.00	-10.15	48.71	50.00	-1.29	
22.5074	50.31	49.36	60.00	-10.64	48.49	50.00	-1.51	
23.3737	48.46	47.40	60.00	-12.60	46.47	50.00	-3.53	
23.6628	47.85	46.12	60.00	-13.88	45.19	50.00	-4.81	
24.0494	46.85	44.83	60.00	-15.17	42.17	50.00	-7.83	

Result: Passed

**6. Measurement Data (continued)**

**6.11. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1))  
RSS-GEN 5.5, RSS 102**

Channel	MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
	(1)	(2)	(3)	(4)	(5)	
1	20	29.68	3.95	0.459	1	Compliant
6	20	29.04	3.95	0.396	1	Compliant
11	20	28.35	3.95	0.338	1	Compliant
149	20	25.29	5.06	0.216	1	Compliant
153	20	25.59	5.06	0.231	1	Compliant
161	20	24.63	5.06	0.185	1	Compliant

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

1. 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.
2. Section 6.1.1 of this test report.
3. Data supplied by the client.
4. Power density is calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

6. Measurement Data (continued)

6.12. Determination of Average Factor

Note: The average factor was determined from the middle channel of each frequency range.

6.12.1. 2.437 GHz

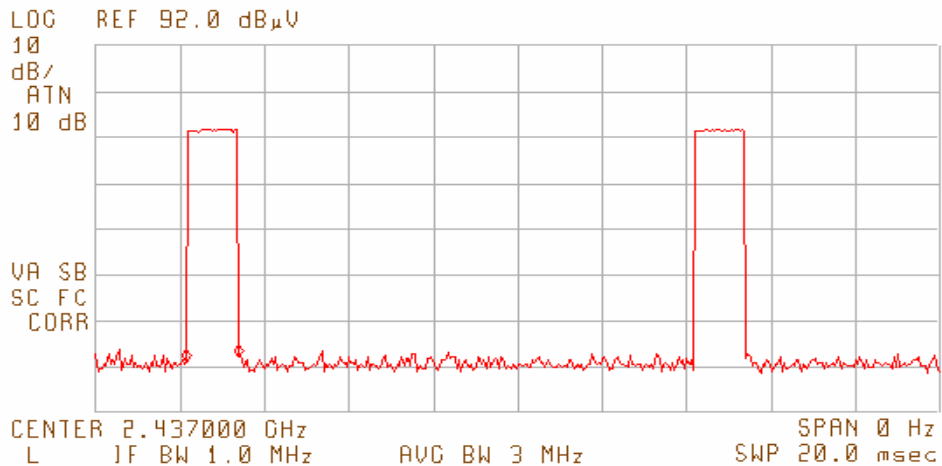
Maximum Duration of 1 cycle: 100 ms  
 Number of pulses per period: 8  
 Single pulse width: 1.25 ms  
 Total On-Time in 1 cycle: 1.25 ms x 8 pulses = 10 ms  
 On-Time divided by cycle: 10 ms / 100 ms = 0.100  
 Average Factor:  $20 \times \log(0.100) = -20 \text{ dB}$   
 FCC and IC maximum allowed average factor is  $-20 \text{ dB}$ .

6.12.1.1. Pulse Width, 2.437 GHz



173-07 Single Pulse Width

ACTV DET: PEAK  
 MEAS DET: PEAK DP AVC  
 MKRΔ 1.2500 msec  
 1.12 dB



6. Measurement Data (continued)

6.12. Determination of Average Factor

6.12.1. 2.437 GHz

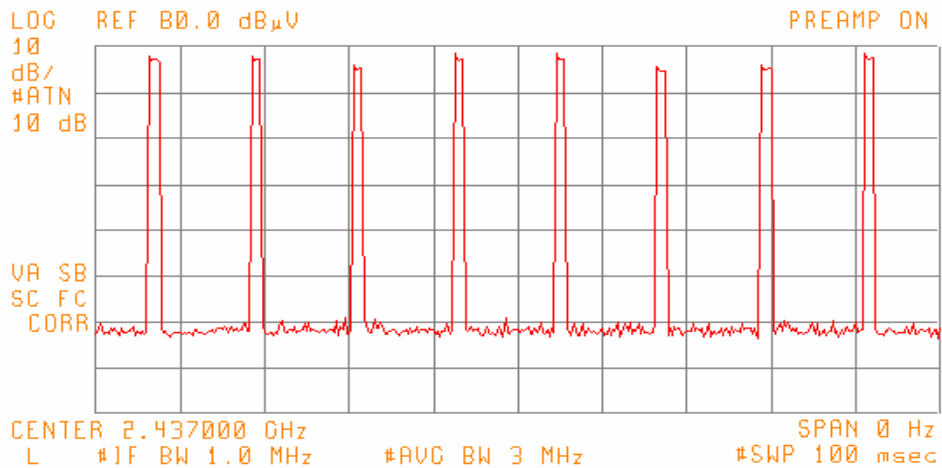
6.12.1.2. Pulses per Period, 2.437 GHz



Number of pulses in 100 ms - Channel 6

SWEPTIME  
100 msec

ACTV DET: PEAK  
MEAS DET: PEAK DP AVG



6.12.2. 5.745 GHz

Maximum duration of 1 cycle:	100 ms
Number of pulses per period:	9
Single pulse width:	0.30 ms
Total On-Time in 1 cycle:	0.30 ms x 9 pulses = 2.70 ms
On-Time divided by cycle:	2.70 ms / 100 ms = 0.027
Average Factor:	20 x log (0.027) = -31.3 dB

FCC and IC maximum allowed average factor is -20 dB.

6. Measurement Data (continued)

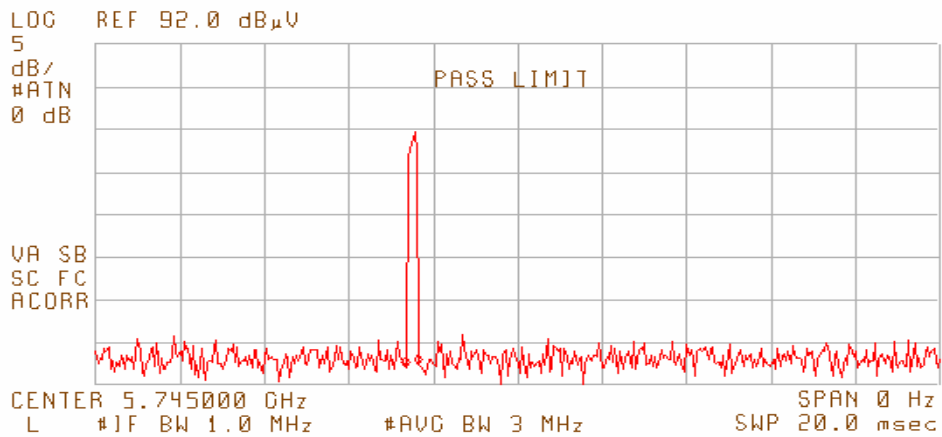
6.12. Determination of Average Factor

6.12.2. 5.745 GHz

6.12.2.1. Pulse Width, 5.745 GHz

11:33:28 APR 27, 2007  
173-07 Single Pulse Width

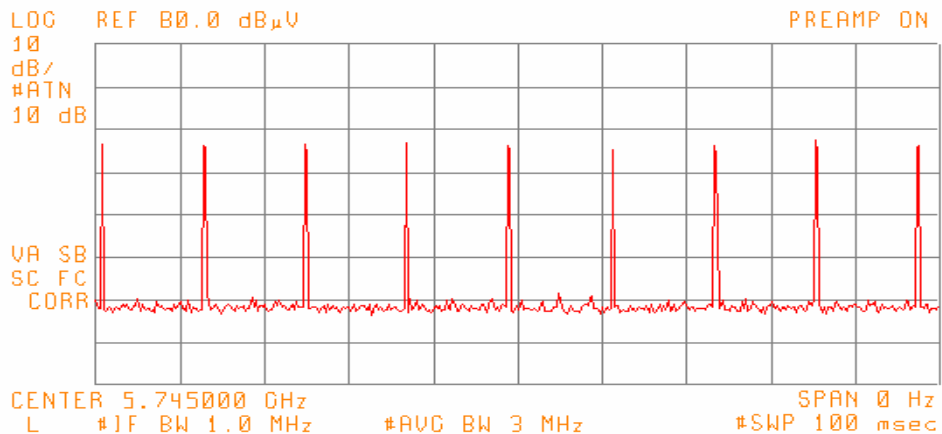
ACTV DET: PEAK  
MEAS DET: PEAK DP  
MKRΔ 300.00 μsec  
.40 dB



6.12.2.2. Pulses per Period, 5.745 GHz

Number of pulses in 100 ms - Channel 149

CENTER 5.745000 GHz ACTV DET: PEAK  
MEAS DET: PEAK DP AVG





## **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 3023A-1**).

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.