



Engineering and Testing for EMC and Safety Compliance



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### Class II Permissive Change Report FCC Part 15.247

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<b>FCC ID/</b>	WS7-HS28V10	<b>Test Report Date:</b>	November 13, 2008
<b>Platform:</b>	N/A	<b>RTL Work Order Number:</b>	2008188
<b>Model Name:</b>	HouseSpot	<b>RTL Quote Number:</b>	QRTL08-392
<b>American National Standard Institute:</b>	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		
<b>FCC Classification:</b>	DTS – Part 15 Digital Transmission System		
<b>FCC Rule Part(s):</b>	FCC Rules Part 15.247 (9-20-07): Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System		
<b>Digital Interface Information:</b>	Digital Interface was found to be compliant		
<b>Frequency Range (MHz)</b>	<b>Output Power (W)</b>	<b>Frequency Tolerance</b>	<b>Emission Designator</b>
2412-2462	0.083	N/A	N/A

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, FCC 97-114, ANSI C63.4.

Signature: Desmond A. Fraser

Date: November 13, 2008

Typed/Printed Name: Desmond A. Fraser

Position: President

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## 1 General Information

### 1.1 Scope

Applicable Standards:

- FCC Rules Part 15.247 (9-20-07): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

### 1.2 Description of EUT

Equipment Under Test	Point-to-Point Access Point/Antenna
Model Name/Number	HouseSpot
Power Supply	Power over Ethernet
Modulation Type	DSSS
Transfer Rate	1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps
Frequency Range	2412 – 2462 MHz
Antenna Connector Type	Internal
Antenna Types	14 dBi Patch

### 1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 2003).

### 1.4 Related Submittal(s)/Grant(s)

This is a Class II permissive change application for OMNI-WiFi, LLC, Model: HouseSpot, FCC ID: WS7-HS28V10.

### 1.5 Modifications

No modifications were required for compliance.

## 2 Test Information

### 2.1 Description of Test Modes

In accordance with FCC 15.31(m), and because the EUT utilizes an operating band greater than 10 MHz, the following frequencies were tested:

**Table 2-1: Channels Tested – 802.11b**

Channel	Frequency
3	2422
6	2437
8	2447

**Table 2-2: Channels Tested – 802.11g**

Channel	Frequency
6	2437

### 2.2 Exercising the EUT

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. The EUT was provided with software to continuously transmit during testing. The carrier was also checked to verify that information was being transmitted. There were no deviations from the test standard(s) and/or methods. The test results reported relate only to the item tested.

### 2.3 Test Results Summary

**Table 2-3: Test Results Summary – FCC Part 15, Subpart C (Section 15.247)**

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	N/A
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	6 dB Bandwidth	N/A
FCC 15.247(b)	Maximum Peak Power Output	Pass
FCC 15.247(d)	Antenna Conducted Spurious Emissions	N/A
FCC 15.247(e)	Power Spectral Density	N/A
FCC 15.247(d)	Band Edge Measurement	Pass

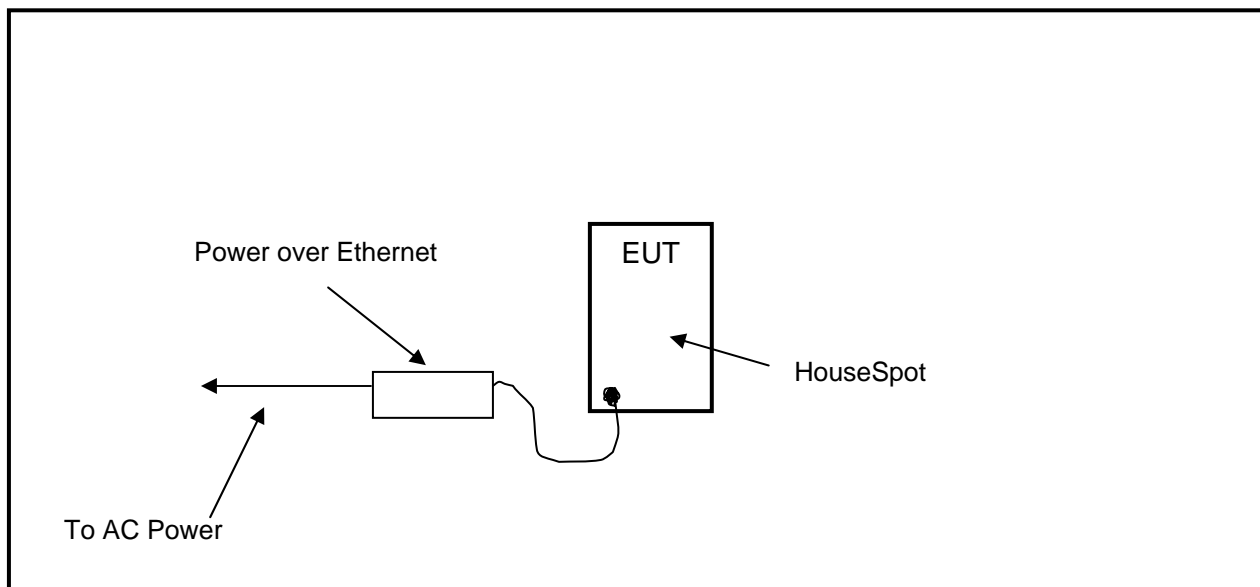
## 2.4 Test System Details

The test samples were received on November 7, 2008. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

**Table 2-4: Equipment Under Test**

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Access Point/Antenna	OMNI-WiFi, LLC	HouseSpot	N/A	WS7-HS28V10	N/A	18703
Power over Ethernet adapter	N/A	BP0EA5-18-V	R00081700201	N/A	50' unshielded ethernet power, 2' unshielded ethernet data, 6' unshielded power	18702

## 2.5 Configuration of Tested System



**Figure 2-1: Configuration of System Under Test**

### 3 Peak Output Power - §15.247(b)(3)

#### 3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor.

**Table 3-1: Power Output Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	11/5/09
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	11/5/09

#### 3.2 Power Output Test Data

**Table 3-2: Power Output Test Data – 802.11b**

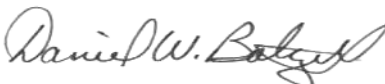
Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
3	2422	17.9
6	2437	18.5
8	2447	18.6

**Table 3-3: Power Output Test Data – 802.11g**

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
6	2437	19.4

#### Test Personnel:

Daniel Baltzell  
Test Engineer



Signature

November 12, 2008  
Date Of Test

#### 4 Compliance with the Band Edge – FCC §15.247(d)

##### 4.1 Band Edge Test Procedure

The transmitter output was connected to its appropriate antenna. Peak (1 MHz RBW/VBW) and average (1 MHz RBW/10 Hz VBW) radiated measurements were taken with a suitable span to encompass the peak of the fundamental. A delta measurement was performed from the highest peak in the restricted band to the peak of the fundamental, and subtracted from the field strength; the result was compared to the limit in the restricted band (54 dBuV/m).

**Table 4-1: Band Edge Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901413	Agilent Technologies	E4448A	Spectrum Analyzer (3 Hz – 50 GHz)	US440203416	7/31/09
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/17/09
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/15/10



## 4.2 Restricted Band Edge Test Results

### 4.2.1 Calculation of Lower Band Edge

#### **802.11b; Channel 3; 2422 MHz**

114.2 dBuV/m is the field strength measurement, from which the delta measurement of 60.3 dB is subtracted (reference plots), resulting in a level of 53.9 dB. This level has a margin of 0.1 dB below the limit of 54 dBuV/m.

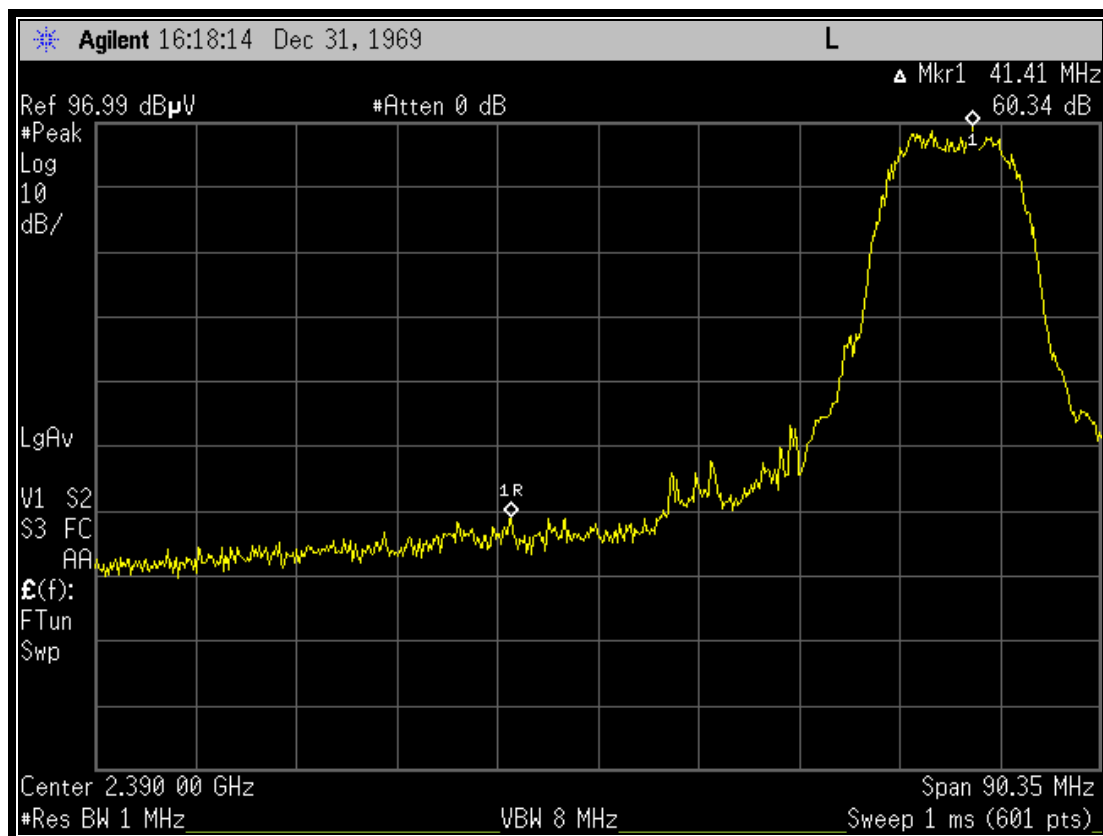
Calculation:  $114.2 \text{ dBuV/m} - 60.3 \text{ dB} - 54 \text{ dBuV/m} = -0.1 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 122.0 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 114.2 dBuV/m

Delta measurement = 60.3 dB

**Plot 4-1: Lower Band Edge: Average Measurement Channel 3 (TX Frequency: 2422 MHz); 802.11b**



### 802.11g; Channel 6; 2437 MHz

111.6 dBuV/m is the field strength measurement, from which the delta measurement of 58.5 dB is subtracted (reference plots), resulting in a level of 53.1 dB. This level has a margin of 0.9 dB below the limit of 54 dBuV/m.

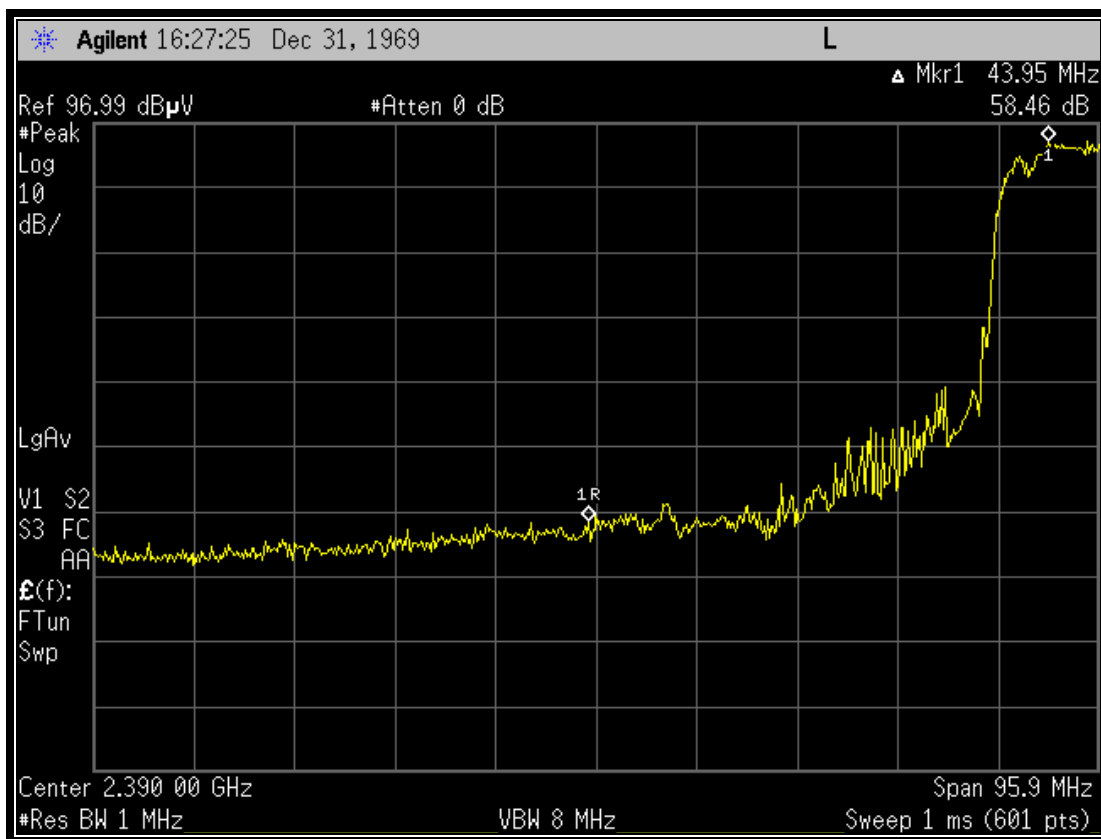
Calculation:  $111.6 \text{ dBuV/m} - 58.5 \text{ dB} - 54 \text{ dBuV/m} = -0.9 \text{ dB}$

Peak Field Strength of Lower Band Edge (1 MHz RBW/1 MHz VBW) = 119.4 dBuV/m

Average Field Strength of Lower Band Edge (1 MHz RBW/10 Hz VBW) = 111.6 dBuV/m

Delta measurement = 58.5 dB

**Plot 4-2: Lower Band Edge: Average Measurement Channel 6 (TX Frequency: 2437 MHz); 802.11g**



#### 4.2.2 Calculation of Upper Band Edge

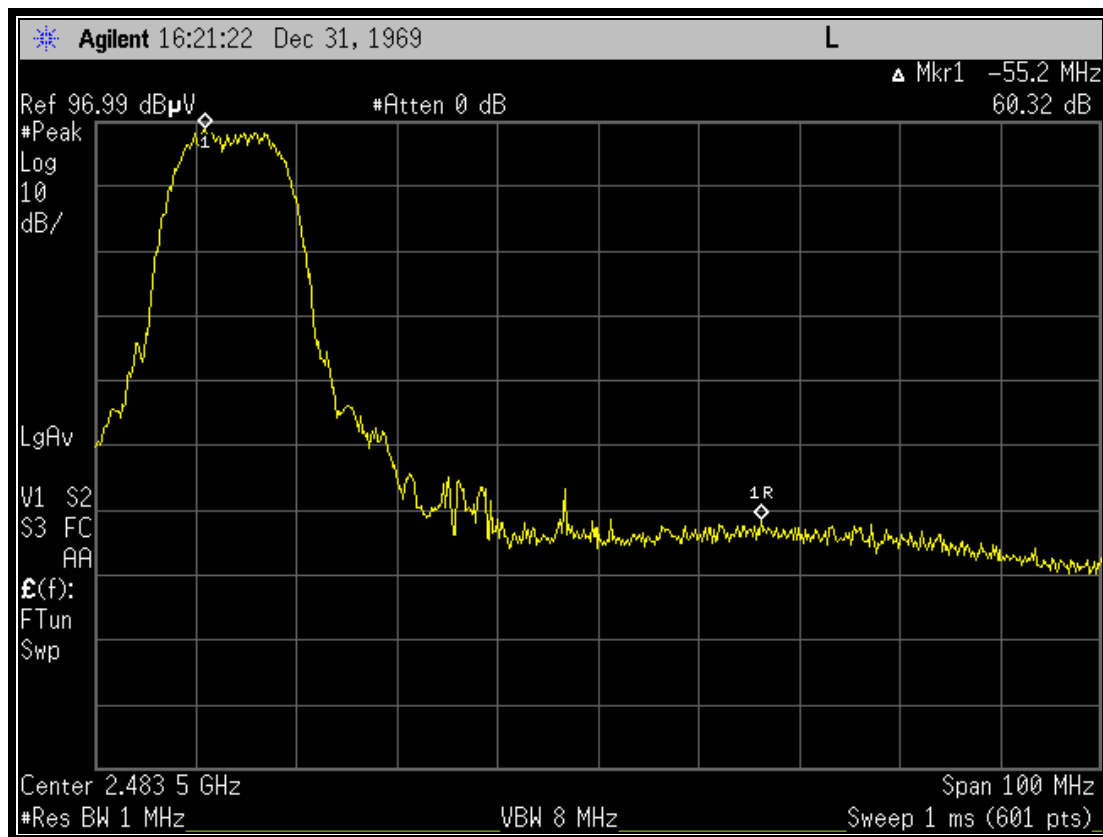
##### 802.11b; Channel 8; 2447 MHz

113.7 dBuV/m is the field strength measurement, from which the delta measurement of 60.3 dB is subtracted (reference plots), resulting in a level of 53.4 dB. This level has a margin of 0.6 dB below the limit of 54 dBuV/m.

Calculation:  $113.7 \text{ dBuV/m} - 60.3 \text{ dB} = 53.4 \text{ dB}$

Peak Field Strength of Upper Band Edge (1 MHz RBW/1 MHz VBW) = 121.5 dBuV/m  
Average Field Strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 113.7 dBuV/m  
Delta measurement = 60.3 dB

**Plot 4-3: Upper Band Edge: Channel 8 (TX Frequency: 2447 MHz); 802.11b**



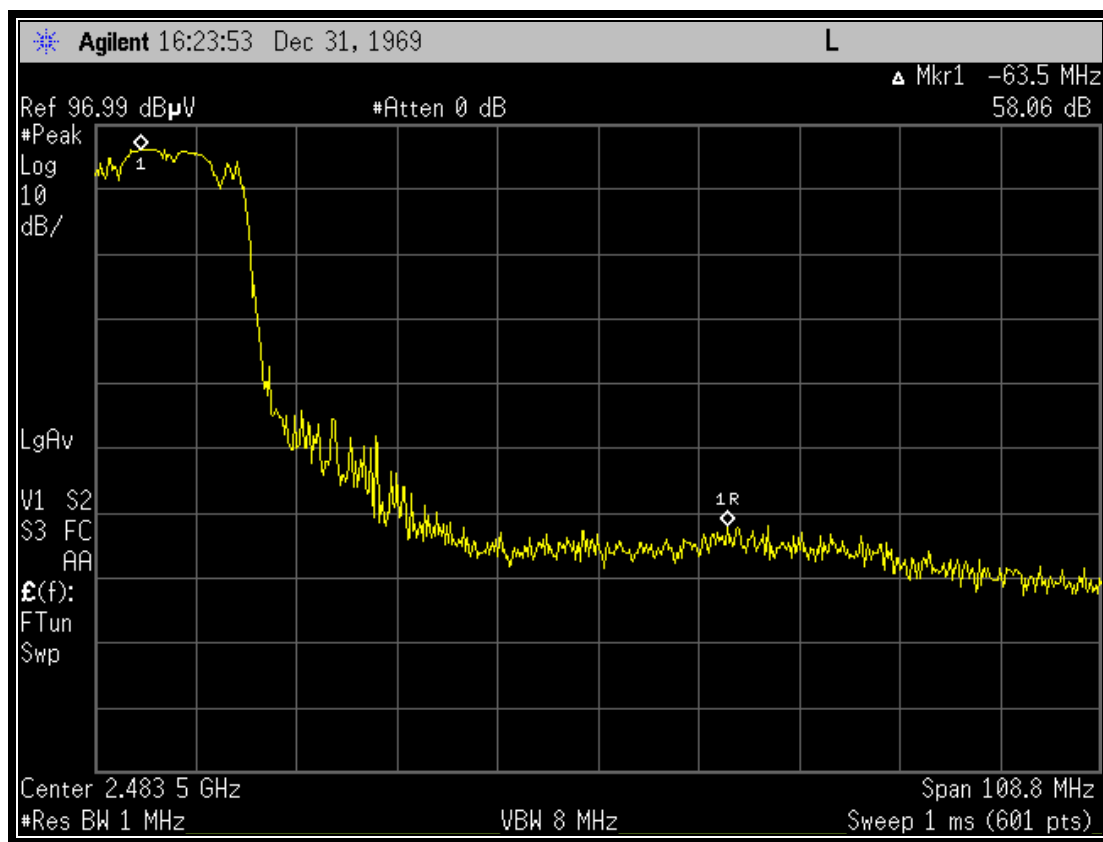
### 802.11g; Channel 6; 2437 MHz

111.6 dBuV/m is the field strength measurement, from which the delta measurement of 58.1 dB is subtracted (reference plots), resulting in a level of 53.5 dB. This level has a margin of 0.5 dB below the limit of 54 dBuV/m.

Calculation:  $111.6 \text{ dBuV/m} - 58.1 \text{ dB} - 54 \text{ dBuV/m} = -0.5 \text{ dB}$

Peak Field Strength of Upper Band Edge (1 MHz RBW/1 MHz VBW) = 119.4 dBuV/m  
Average Field Strength of Upper Band Edge (1 MHz RBW/10 Hz VBW) = 111.6 dBuV/m  
Delta measurement = 58.1 dB

**Plot 4-4: Upper Band Edge: Average Measurement Channel 6 (TX Frequency: 2437 MHz); 802.11g**



### Test Personnel:

Daniel Baltzell  
Test Engineer

*Daniel W. Baltzell*

Signature

November 12, 2008  
Date Of Tests

## 5 Radiated Emissions - §15.209

### 5.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/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

As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any circumstances of modulation.

### 5.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter, open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 10<sup>th</sup> harmonic of the highest fundamental transmitter frequency (24.8 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

**Table 5-1: Radiated Emissions Test Equipment**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	9/15/09
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09
901365	MITEQ	JS4-00102600-41-5P	Amplifier, 0.1-26 GHz, 30dB gain	N/A	2/15/09
900878	Rhein Tech Labs	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/17/09
901242	Rhein Tech Labs	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	6/14/10
900321	EMCO	3161-03	Horn Antennas (4 - 8,2 GHz)	9508-1020	6/14/10
900323	EMCO	3160-7	Horn Antennas (8,2 - 12,4 GHz)	9605-1054	6/14/10
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	6/14/10
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051	6/14/10

### 5.3 Radiated Emissions Harmonics/Spurious Test Data

**Table 5-2: Radiated Emissions Harmonics/Spurious Channel 3 (TX Frequency: 2422 MHz) 802.11b**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4844.0	58.8	51.0	-0.8	50.2	54.0	-3.8
7266.0	43.0	35.2	1.9	37.1	54.0	-16.9
9688.0	42.2	34.4	9.2	43.6	94.2	-50.6
12110.0	44.5	36.7	10.1	46.8	54.0	-7.2
14532.0	37.9	30.1	12.9	43.0	94.2	-51.2
16954.0	26.9	19.1	12.0	31.1	94.2	-63.1
19376.0	25.9	18.1	18.8	36.9	54.0	-17.1
21798.0	23.7	15.9	21.0	36.9	94.2	-57.3
24220.0	27.9	20.1	23.7	43.8	94.2	-50.4

**Table 5-3: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz) 802.11b**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4874.0	47.8	40.0	-0.3	39.7	54.0	-14.3
7311.0	49.1	41.3	1.4	42.7	54.0	-11.3
9748.0	38.3	30.5	9.1	39.6	98.2	-58.6
12185.0	40.0	32.2	10.4	42.6	54.0	-11.4
14622.0	32.1	24.3	12.7	37.0	98.2	-61.2
17059.0	25.9	18.1	13.0	31.1	98.2	-67.1
19496.0	30.0	22.2	18.1	40.3	54.0	-13.7
21933.0	29.8	22.0	21.0	43.0	98.2	-55.2
24370.0	31.2	23.4	25.2	48.6	98.2	-49.6

**Table 5-4: Radiated Emissions Harmonics/Spurious Channel 8 (TX Frequency: 2447 MHz) 802.11b**

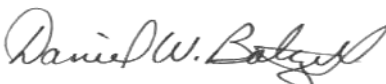
Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4894.0	53.8	46.0	-0.2	45.8	54.0	-8.2
7341.0	45.1	37.3	2.3	39.6	54.0	-14.4
9788.0	38.2	30.4	9.3	39.7	93.7	-54.0
12235.0	38.4	30.6	9.4	40.0	54.0	-14.0
14682.0	38.1	30.3	12.6	42.9	93.7	-50.8
17129.0	28.3	20.5	12.6	33.1	93.7	-60.6
19576.0	24.2	16.4	19.2	35.6	54.0	-18.4
22023.0	24.0	16.2	21.1	37.3	54.0	-16.7
24470.0	25.8	18.0	26.2	44.2	54.0	-9.8

**Table 5-5: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz) 802.11g**

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV) (1 MHz RBW/VBW)	Average Analyzer Reading (dBuV) (1 MHz RBW/ 10 Hz VBW)	Site Correction Factor (dB/m)	Average Emission Level (dBuV/m)	Average Limit (dBuV/m)	Average Margin (dB)
4874.0	46.7	38.9	-0.3	38.6	54.0	-15.4
7311.0	45.8	38.0	1.4	39.4	54.0	-14.6
9748.0	39.0	31.2	9.1	40.3	95.1	-54.8
12185.0	40.0	32.2	10.4	42.6	54.0	-11.4
14622.0	25.8	18.0	12.7	30.7	95.1	-64.4
17059.0	24.8	17.0	13.0	30.0	95.1	-65.1
19496.0	29.4	21.6	18.1	39.7	54.0	-14.3
21933.0	29.6	21.8	21.0	42.8	95.1	-52.3
24370.0	30.3	22.5	25.2	47.7	95.1	-47.4

**Test Personnel:**

Daniel Baltzell  
Test Engineer



Signature

November 4 and 12, 2008  
Dates Of Tests



## **6 Conclusion**

The data in this measurement report shows that the EUT as tested, OMNI-WiFi, LLC Model HouseSpot, FCC ID: WS7-HS28V10, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations.