

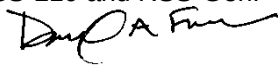


Engineering Solutions & Electromagnetic Compatibility Services

**Certification Application Report
FCC Part 15.247 & Industry Canada RSS-210**

Test Lab: Rhein Tech Laboratories, Inc. Phone: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 www.rheintech.com Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com		Applicant: Vocollect, Inc. Phone: 412-349-2580 703 Rodi Road Fax: 412-829-1063 Pittsburgh, PA 15235 Contact: Joe Lesik	
FCC/IC ID	MQO-TAP900-01 2570A-TAP90001	Test Report Date	July 25, 2013
Platform	N/A	RTL Work Order #	2013095
Model #'s	TAP910-01, TAP920-01, TAP930-01	RTL Quote #	QRTL13-095A
American National Standard Institute:	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		
FCC Classification:	DTS – Part 15 Digital Transmission System (WLAN portion)		
FCC Rule Part(s):	FCC Rules Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System (10-01-12)		
Industry Canada:	RSS-210 Issue 8: Low Power License-Exempt Communications Devices RSS-Gen Issue 3: General Requirements and Information for the Certification of Radio Apparatus		
Digital Interface Information	Digital Interface was found to be compliant		
Frequency Range (MHz)	Output Power (W)	Frequency Tolerance	Emission Designator
2412-2462	0.048	N/A	10M3G7D
2412-2462	0.031	N/A	16M3G7D
2412-2462	0.031	N/A	17M5G7D
5745-5825	0.032	N/A	16M6G7D
5745-5825	0.030	N/A	16M4G7D

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, ANSI C63.4, and Industry Canada RSS-210 and RSS-Gen.

Signature: 

Date: July 25, 2013

Typed/Printed Name: Desmond A. Fraser

Position: President

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

This report may not be reproduced, except in full, without the written approval of Rhein Tech Laboratories, Inc. and Vocollect, Inc. The test results relate only to the item(s) tested.

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1 General Information

1.1 Scope

Applicable Standards:

- FCC Rules Part 15.247: 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.
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices

1.2 Description of EUT

Equipment Under Test	A700 Series Terminal
Model #'s	TAP910-01, TAP920-01, TAP930-01
Power Supply	Battery operated
Modulation Type	DBPSK; DQPSK; BPSK; QPSK; 16-QAM; 64-QAM
Transfer Rate	1, 2, 5.5, 11, 6, 12, 18, 24, 36, 48, 54, 6.5, 7.2, 13, 14.4, 19.5, 21.7, 26, 28.9, 39, 43.3, 52, 57.8, 58.5, 65, 72.2
Frequency Range	2412 – 2462 MHz, 5745 – 5825 MHz
Antenna Connector Type	Internal
Antenna Types	2.18 dBi (2.4 GHz), 4.3 dBi (5 GHz)

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 an original certification application for Vocollect, Inc. A700 Series Terminal, Model #'s: TAP910-01, TAP920-01, TAP930-01, FCC ID: MQO-TAP900-01, IC: 2570A-TAP90001. IC will require a family certification.

The three models are electrically identical from an intentional radiator standpoint. The differences in the three models are the end caps, and only impact digital unintentional emissions. RF exposure (SAR) has been addressed for all three models individually.

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 for DSSS – 802.11b (11 Mbps); 802.11g (18 Mbps)

Channel	Frequency (MHz)
1	2412
6	2437
11	2462

Table 2-2: Channels Tested for DSSS – 802.11a (12 Mbps); 802.11n (14.4 Mbps)

Channel	Frequency (MHz)
149	5745
157	5785
165	5825

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 Result Summary

Table 2-3: Test Result Summary – FCC Part 15, Subpart C (Section 15.247) – DSSS WLAN

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

2.4 Test System Details

The test sample was received on July 17, 2013. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following tables.

Table 2-4: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
A700 Series Terminal	Vocollect, Inc.	TAP-920-01	6213234004	MQO-TAP900-01	N/A	21212
A700 Series Terminal	Vocollect, Inc.	TAP-910-01	6213270002	MQO-TAP900-01	N/A	21214
A700 Series Terminal	Vocollect, Inc.	TAP-930-01	5913224022	MQO-TAP900-01	N/A	21222
3.7VDC Lithium Ion Battery	Vocollect, Inc.	BT-902 (730044)	351309002900	N/A	N/A	21213
3.7VDC Lithium Ion Battery	Vocollect, Inc.	BT-902 (730044)	351309005500	N/A	N/A	21239
3.7VDC Lithium Ion Battery	Vocollect, Inc.	BT-902 (730044)	351228002500	N/A	N/A	21236

Table 2-5: Support Equipment

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Headset	Vocollect, Inc.	N/A	N/A	N/A	N/A	20904

2.5 Configuration of Tested System

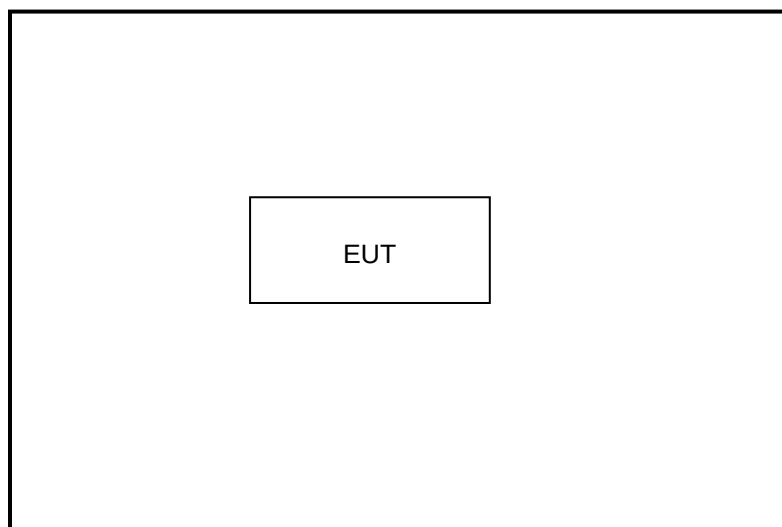


Figure 2-1: Configuration of System Under Test

3 Peak Output Power – FCC 15.247(b)(1); RSS-210 A8.4(4)

3.1 Power Output Test Procedure

A conducted power measurement of the EUT was taken using an Agilent N9010A EXA Signal Analyzer with a 50 ohm attenuator.

Table 3-1: Power Output Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/16/14
901139	Weinschel Corporation	48-20-34 DC-18GHz	Attenuator, 100W 20dB	BK5859	3/25/16

3.2 Power Output Test Data

Table 3-2: Power Output Test Data – 802.11a

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
149	5745	15.0
157	5785	14.7
165	5825	14.6

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

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	16.5
6	2437	16.7
11	2462	16.8

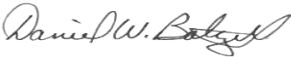
Table 3-4: Power Output Test Data – 802.11g

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	14.7
6	2437	14.8
11	2462	14.9

Table 3-5: Power Output Test Data – 802.11n

Channel	Frequency (MHz)	Peak Power Conducted Output (dBm)
1	2412	14.5
6	2437	14.7
11	2462	14.9
149	5745	14.8
157	5785	14.6
165	5825	14.4

Test Personnel:

Daniel W. Baltzell		July 24, 2013
Test Engineer	Signature	Date of Test

4 Compliance with the Band Edge – FCC 15.247(d); RSS-210 2.2

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) corrected radiated measurements were taken within the restricted band to show compliance, also 20 dBc limit of radiated in-band plots are presented.

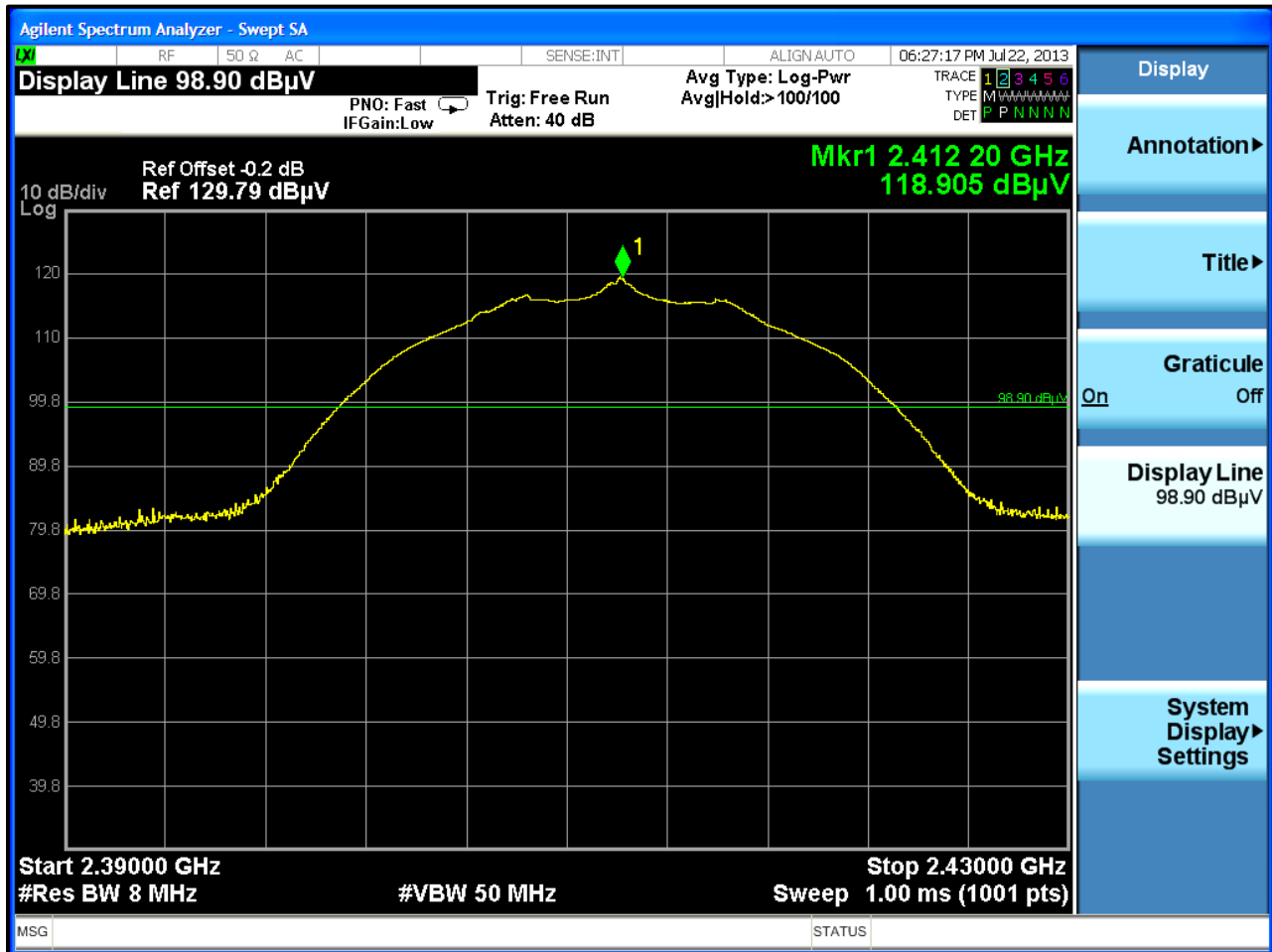
Table 4-1: Band Edge Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/16/13
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	4/19/14
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/16/14
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	3/18/14
900932	Hewlett Packard	8449B	Preamplifier		8/10/13
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/16/13

4.2 Restricted Band Edge Test Results

4.2.1 Lower Band Edge – 802.11b

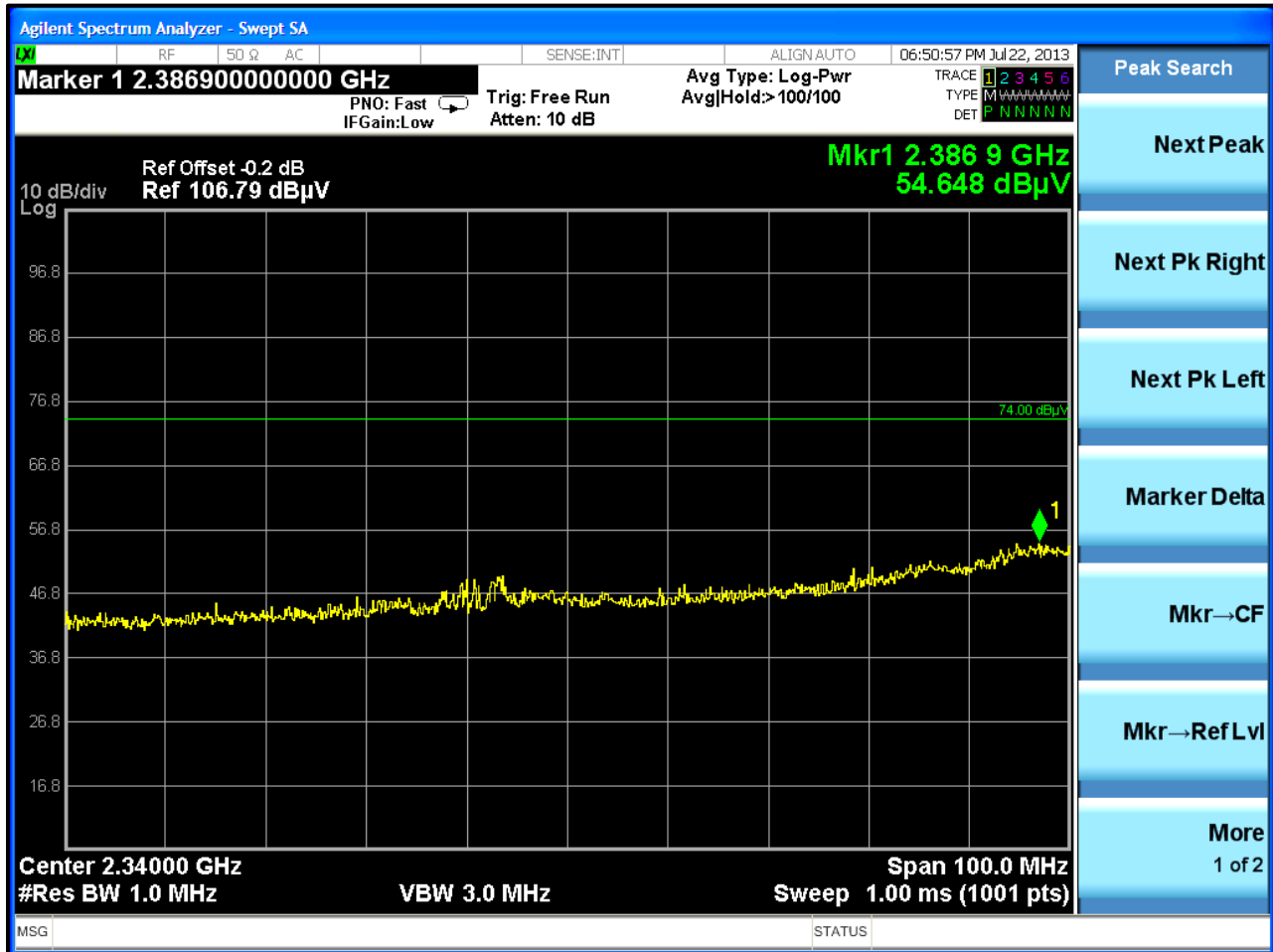
Plot 4-1: In Band Emissions - Channel 1 (2412 MHz); 802.11b (11 Mbps)



Plot 4-2: Lower Band Edge Average: 802.11b (11 Mbps)

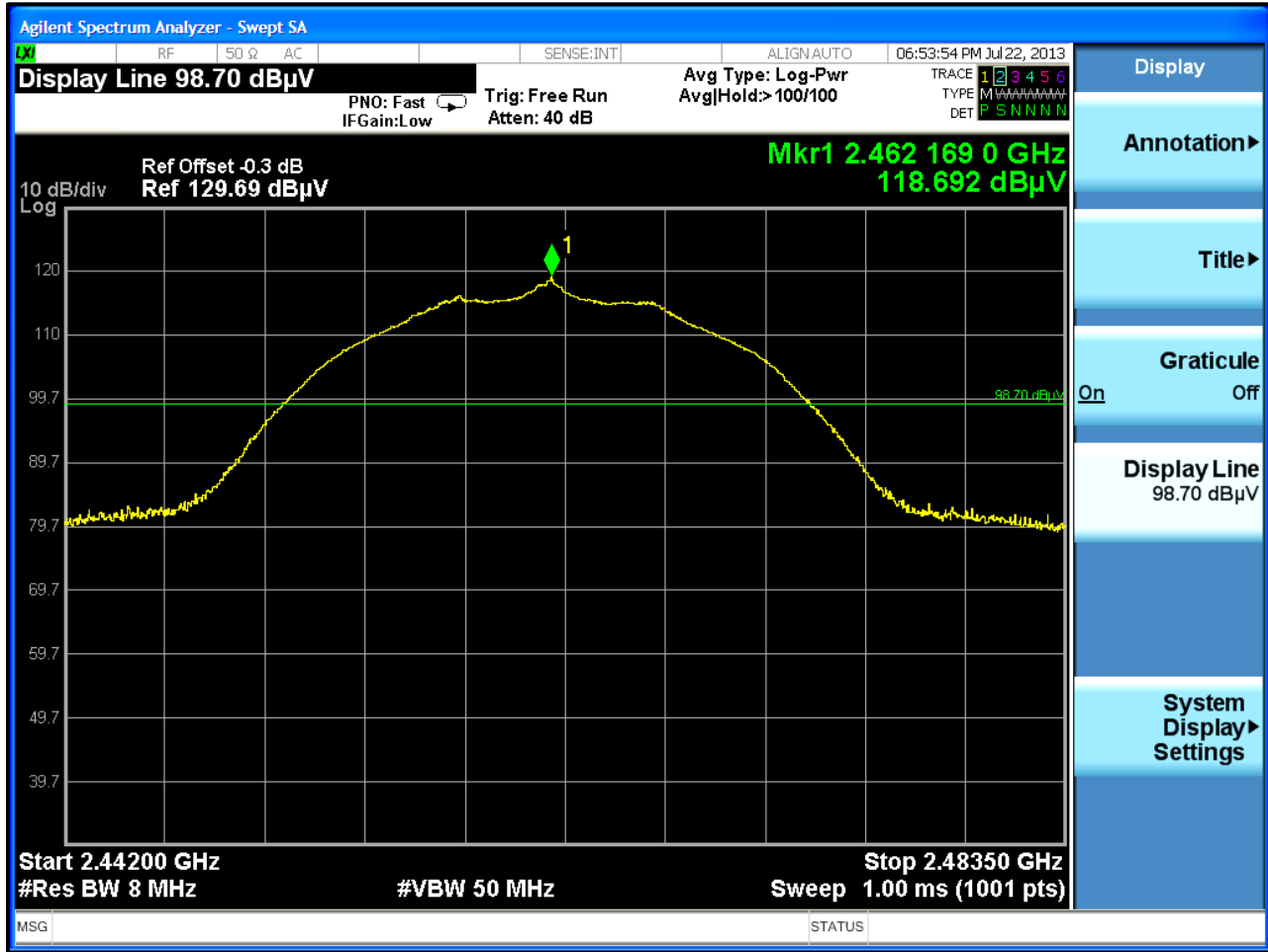


Plot 4-3: Lower Band Edge Peak: 802.11b (11 Mbps)

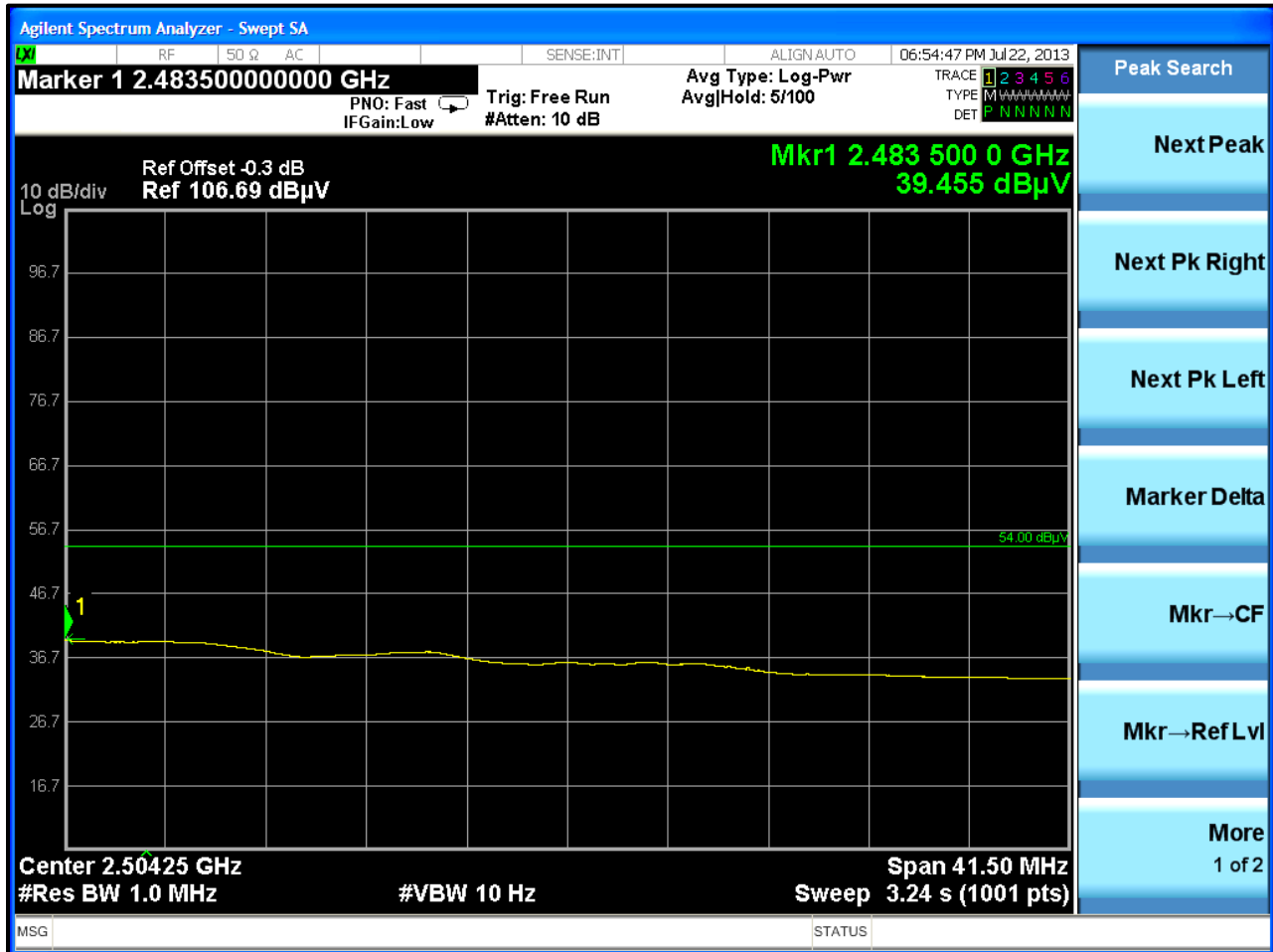


4.2.2 Upper Band Edge – 802.11b

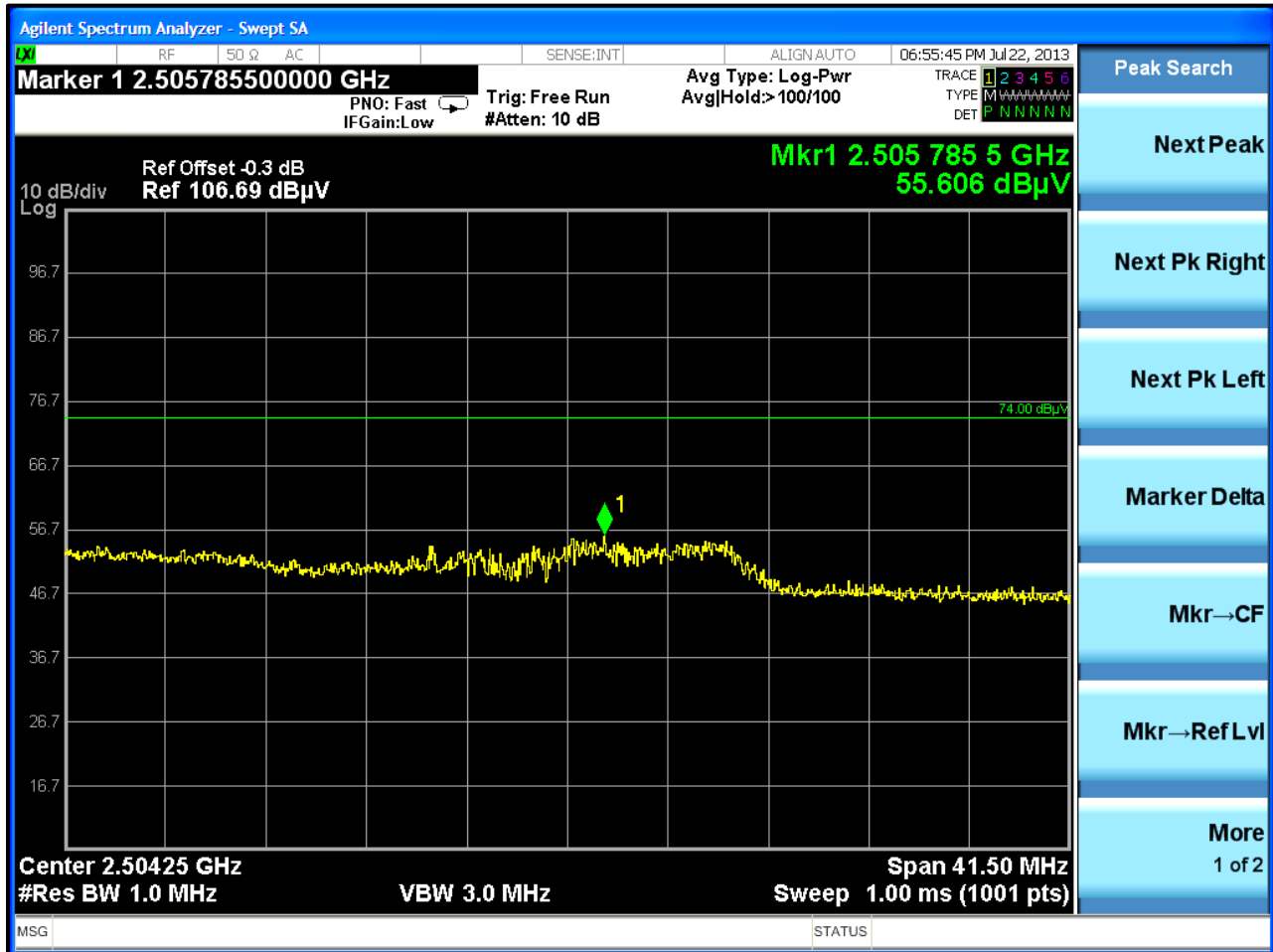
Plot 4-4: In Band Emissions - Channel 11 (2462 MHz); 802.11b (11 Mbps)



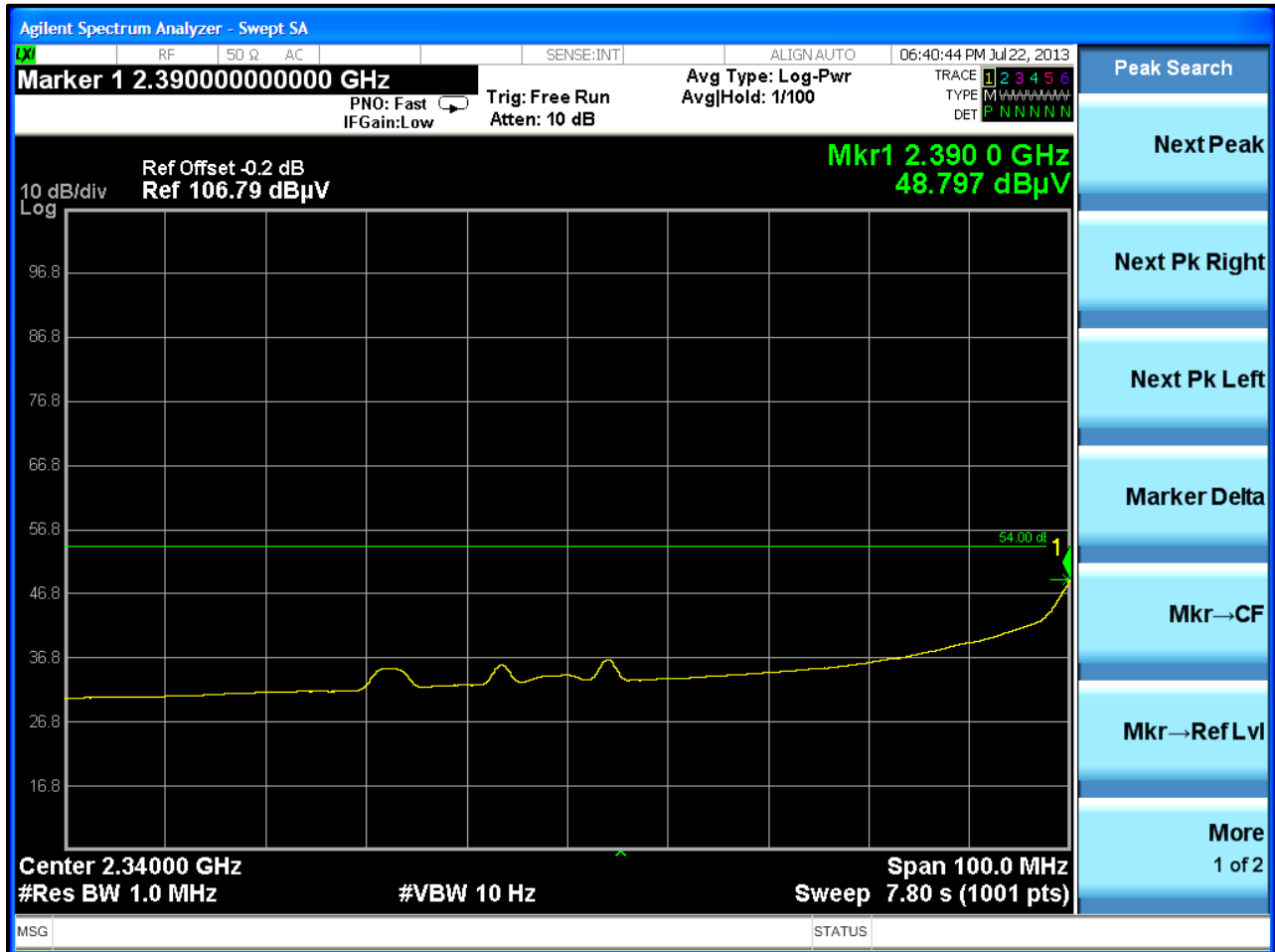
Plot 4-5: Upper Band Edge Average: 802.11b (11 Mbps)



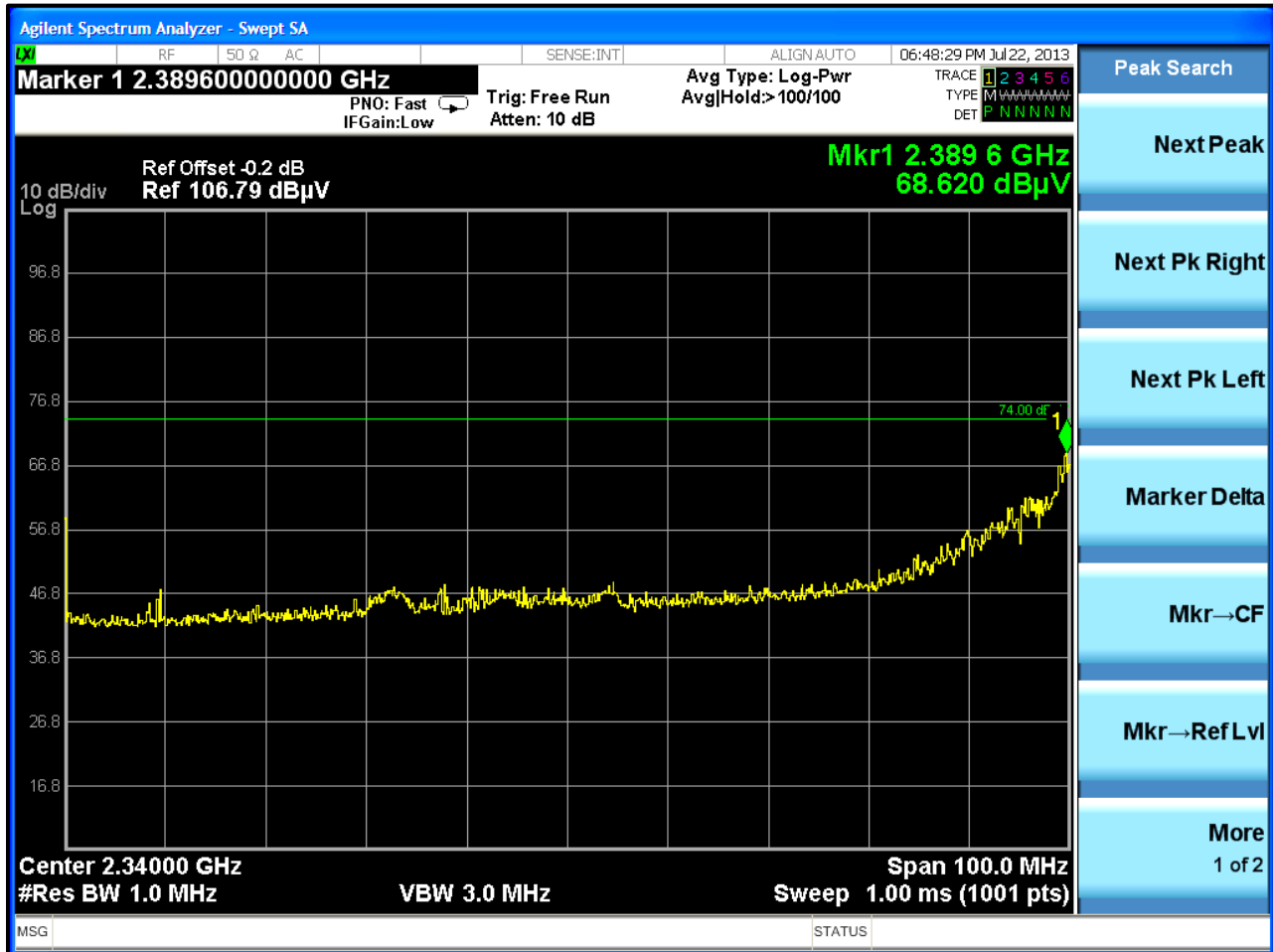
Plot 4-6: Upper Band Edge Peak: 802.11b (11 Mbps)



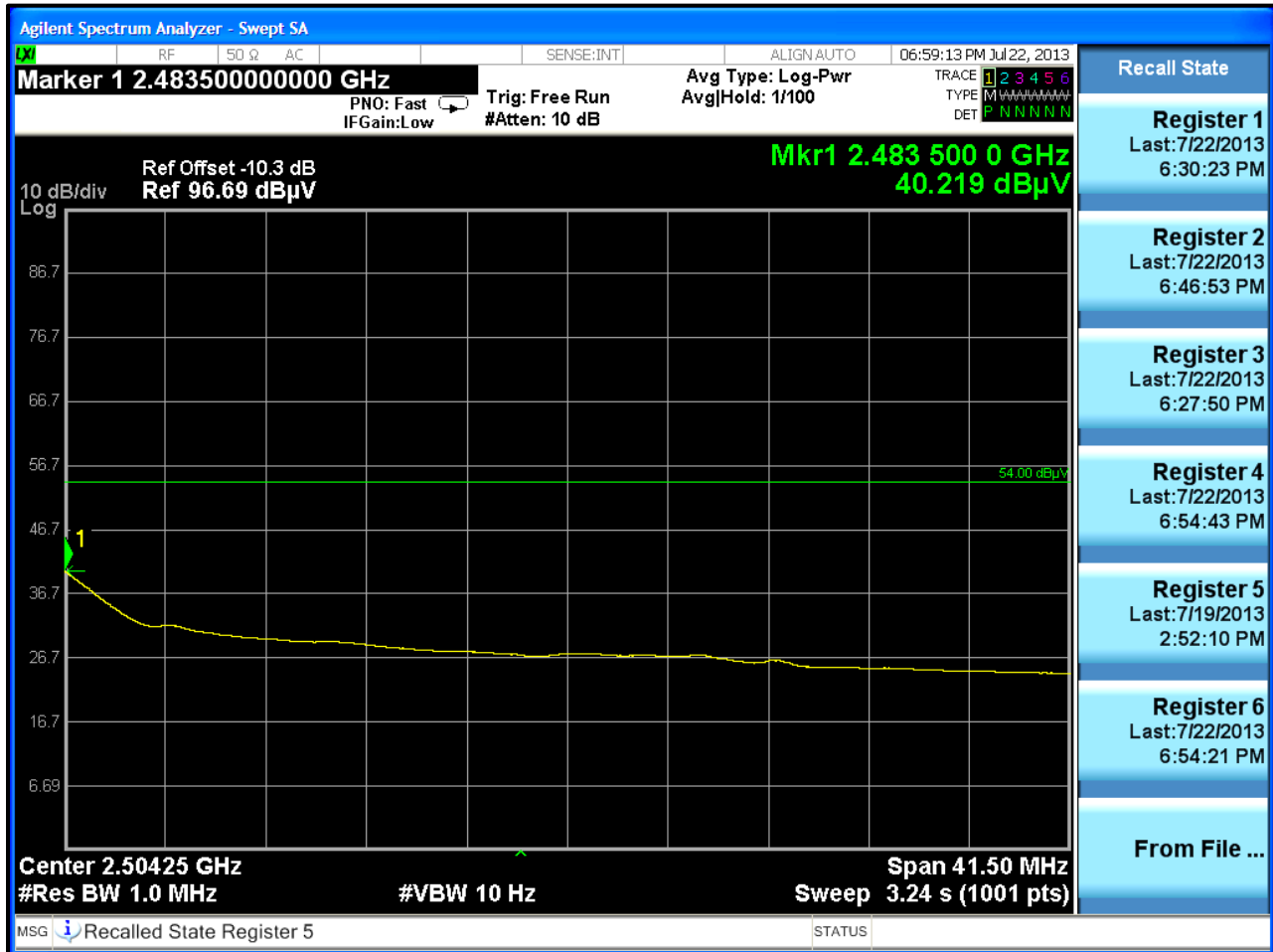
Plot 4-8: Lower Band Edge Average: 802.11g (18 Mbps)



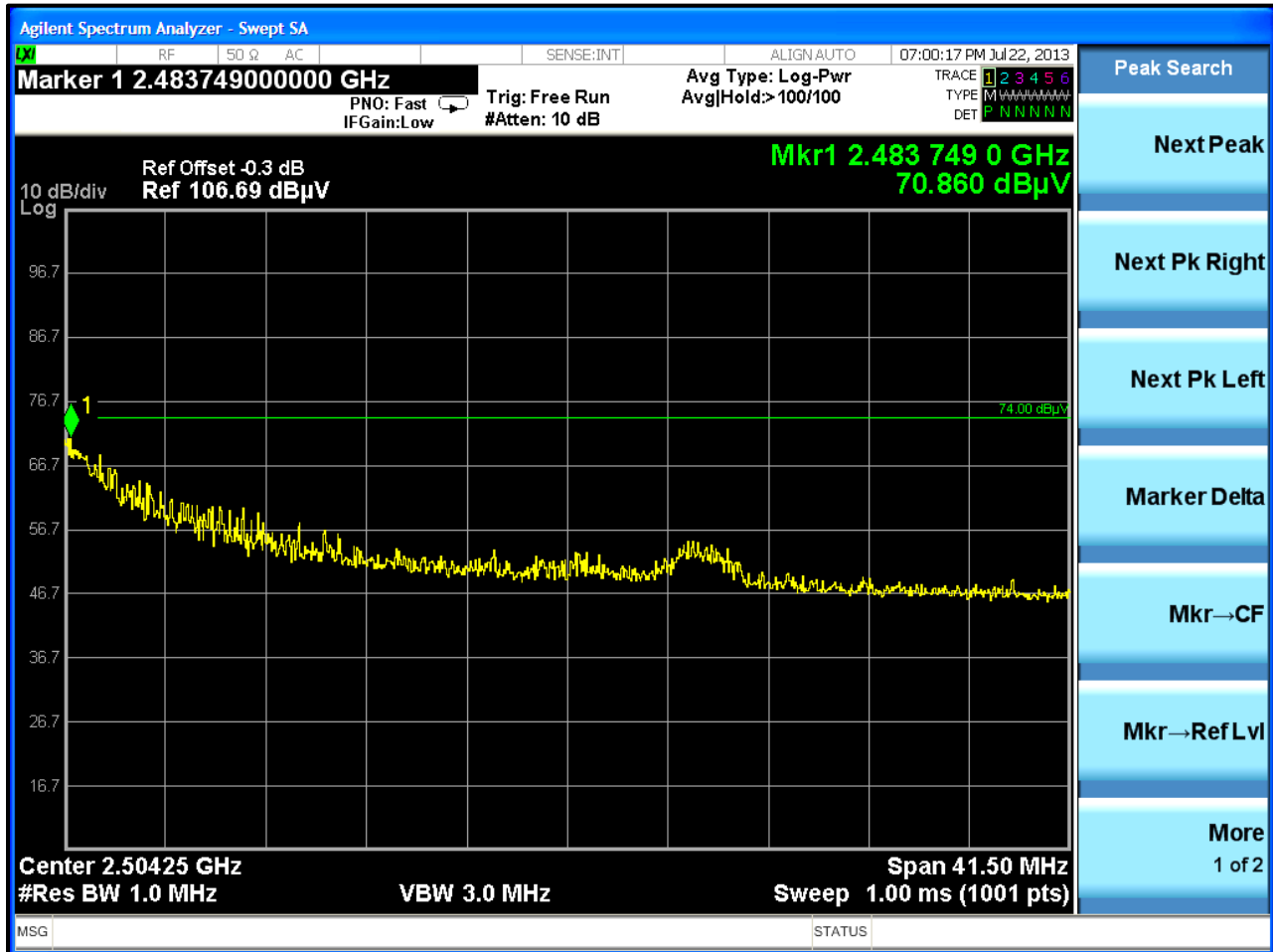
Plot 4-9: Lower Band Edge Peak: 802.11g (18 Mbps)



Plot 4-11: Upper Band Edge Average: 802.11g (18 Mbps)

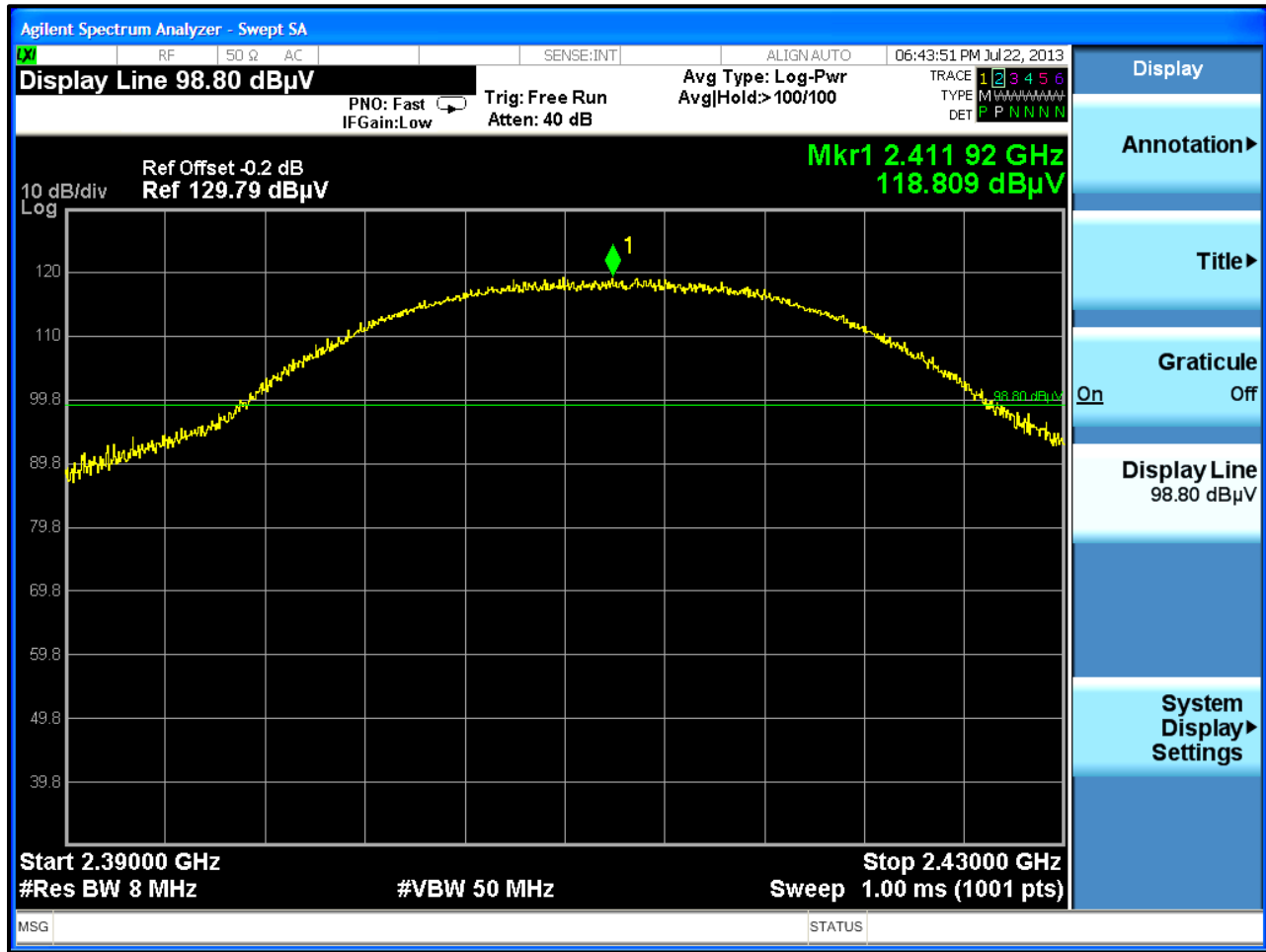


Plot 4-12: Upper Band Edge Peak: 802.11g (18 Mbps)

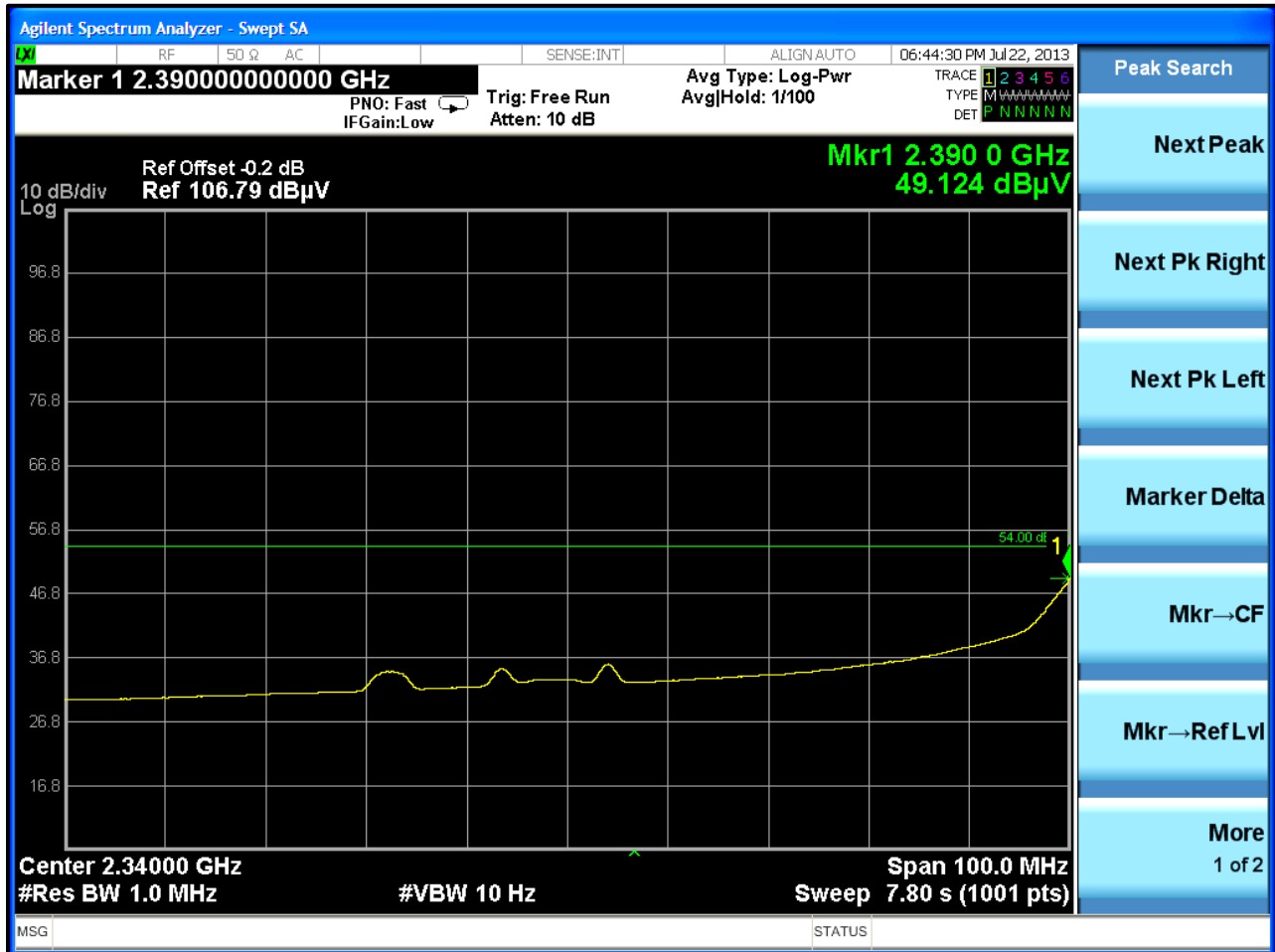


4.2.5 Lower Band Edge – 802.11n

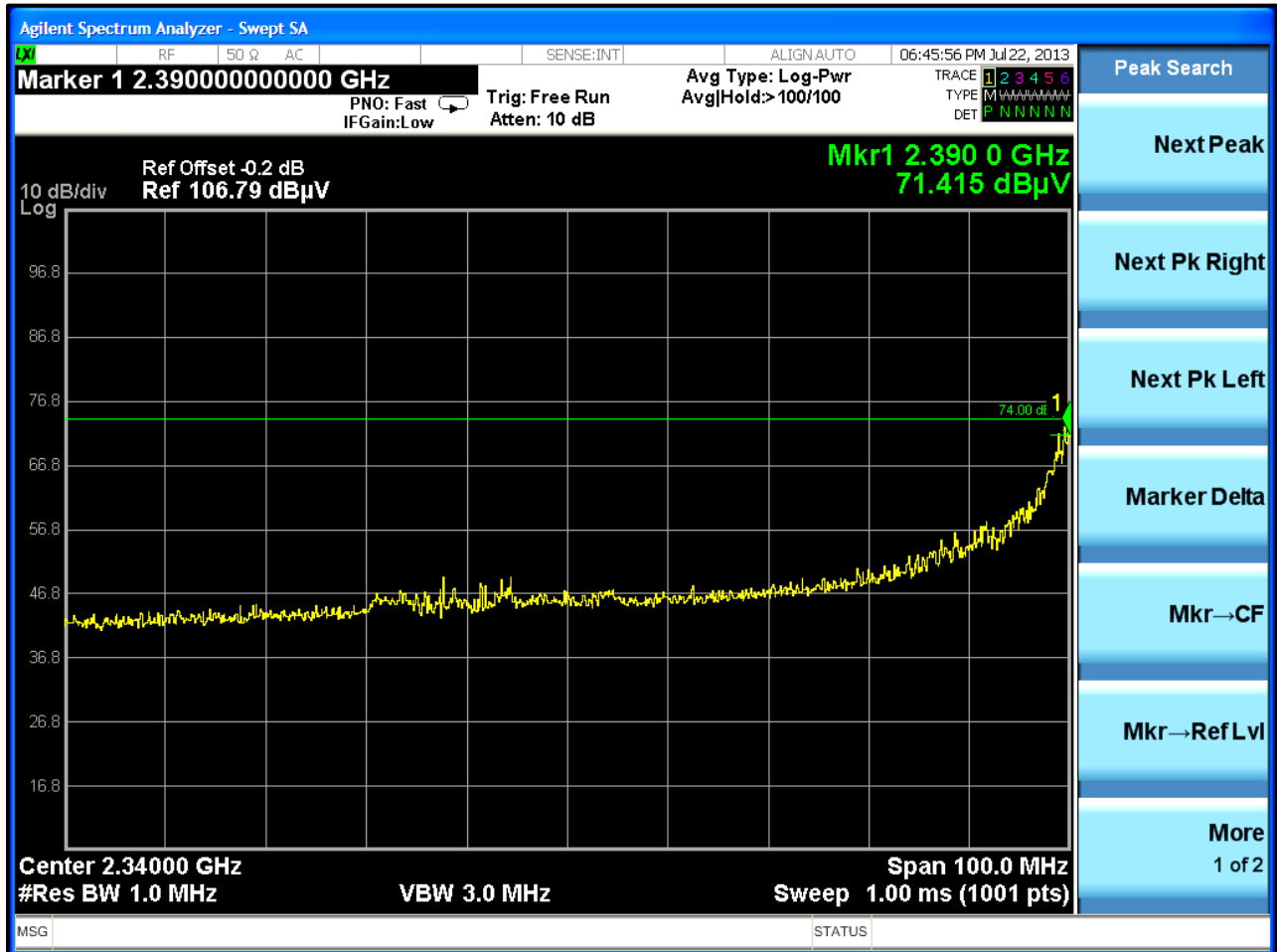
Plot 4-13: In Band Emissions - Channel 1 (2412 MHz); 802.11n (14.4 Mbps)



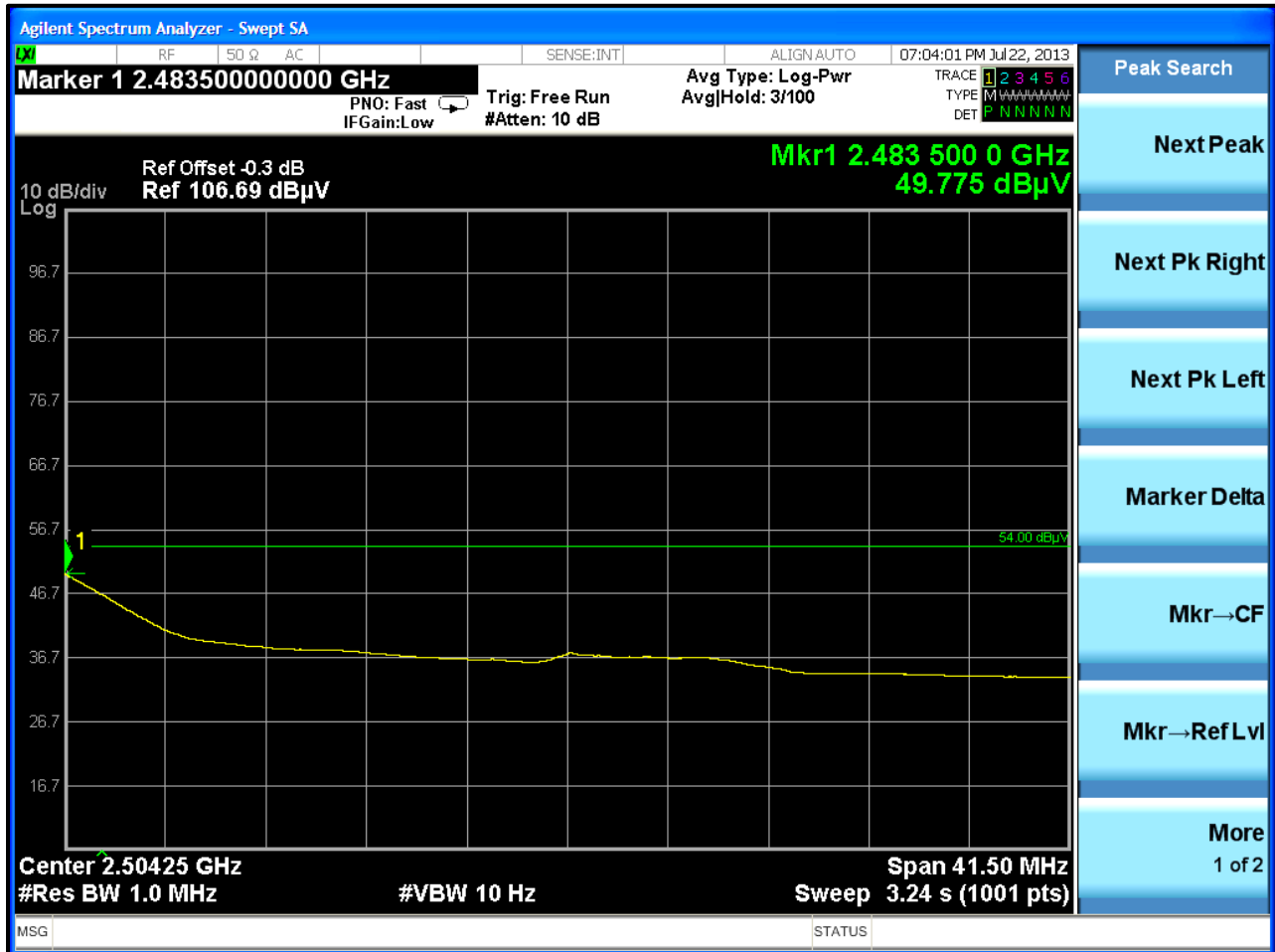
Plot 4-14: Lower Band Edge Average: 802.11n (14.4 Mbps)



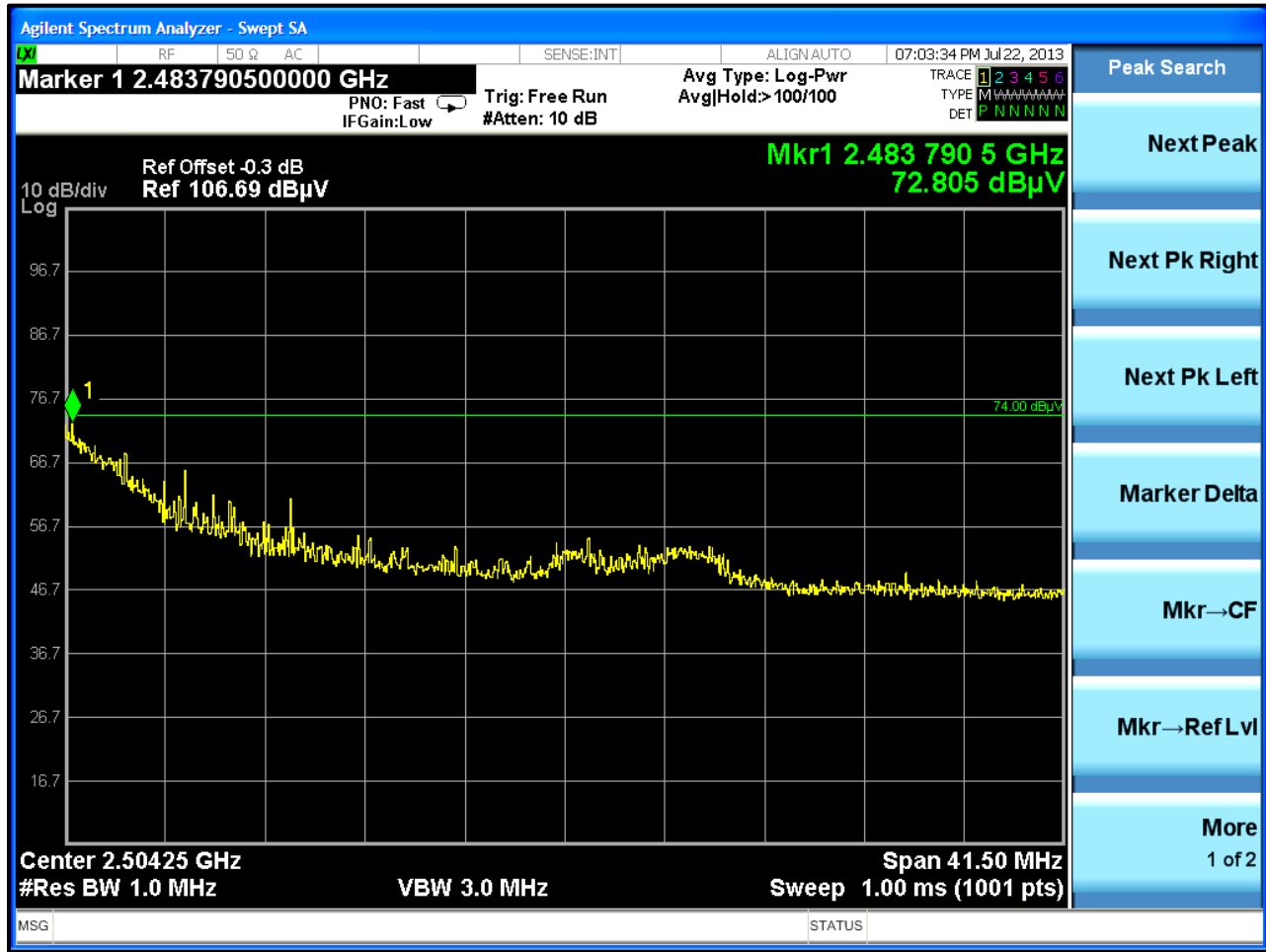
Plot 4-15: Lower Band Edge Peak: 802.11n (14.4 Mbps)



Plot 4-17: Upper Band Edge Average: 802.11n (14.4 Mbps)

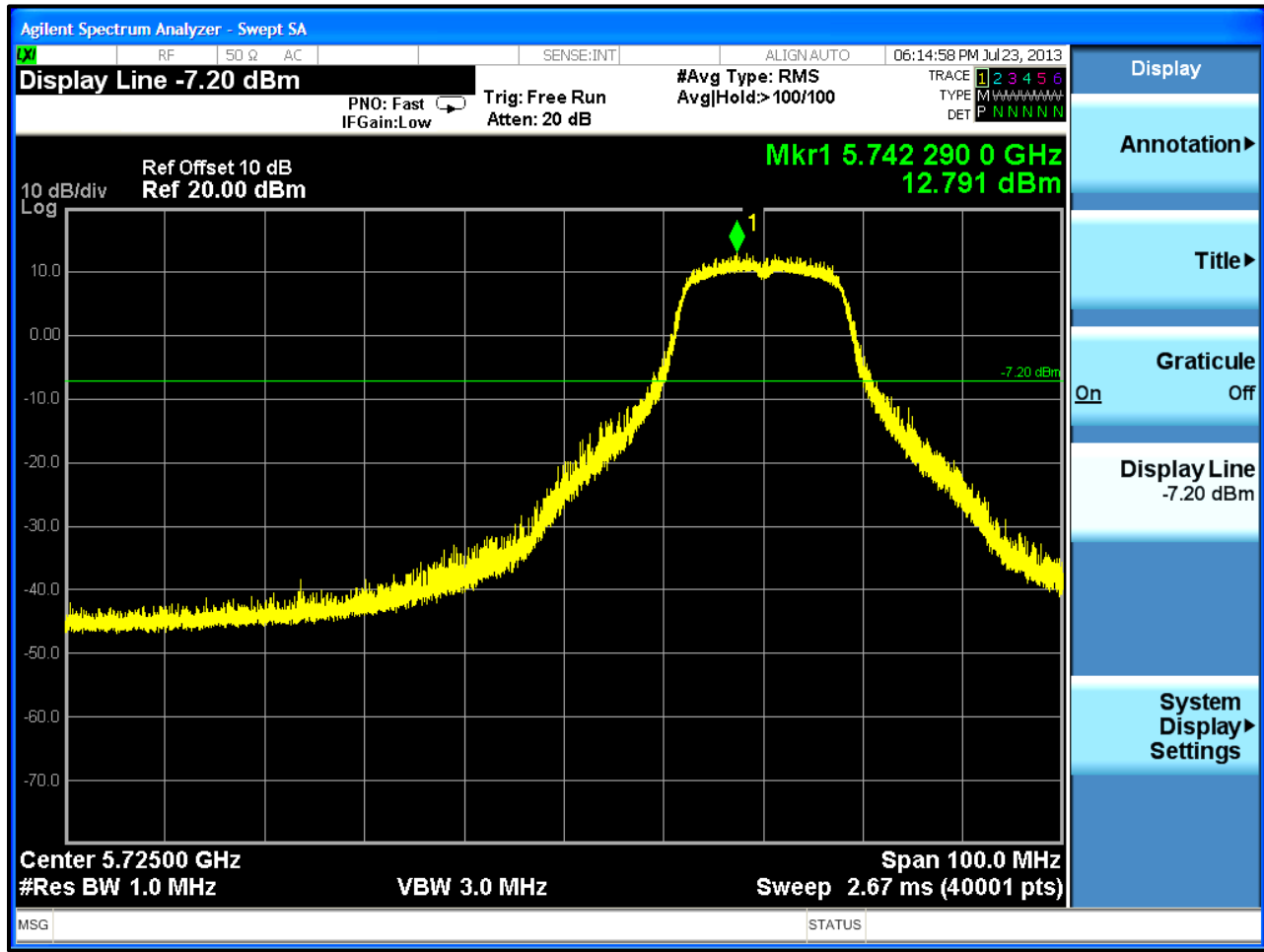


Plot 4-18: Upper Band Edge Peak: 802.11n (14.4 Mbps)

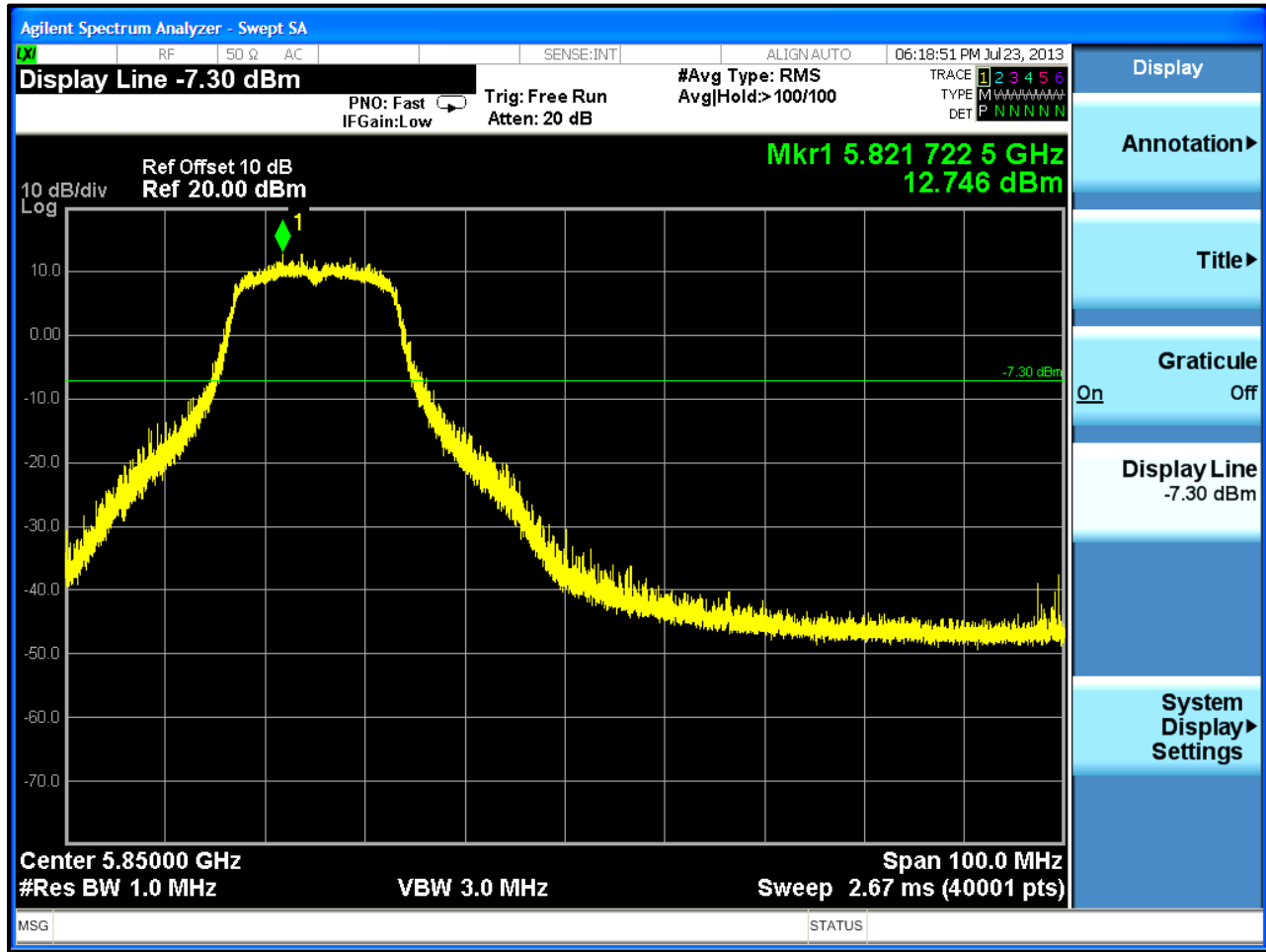


4.2.7 Band Edge – 802.11a and 802.11n

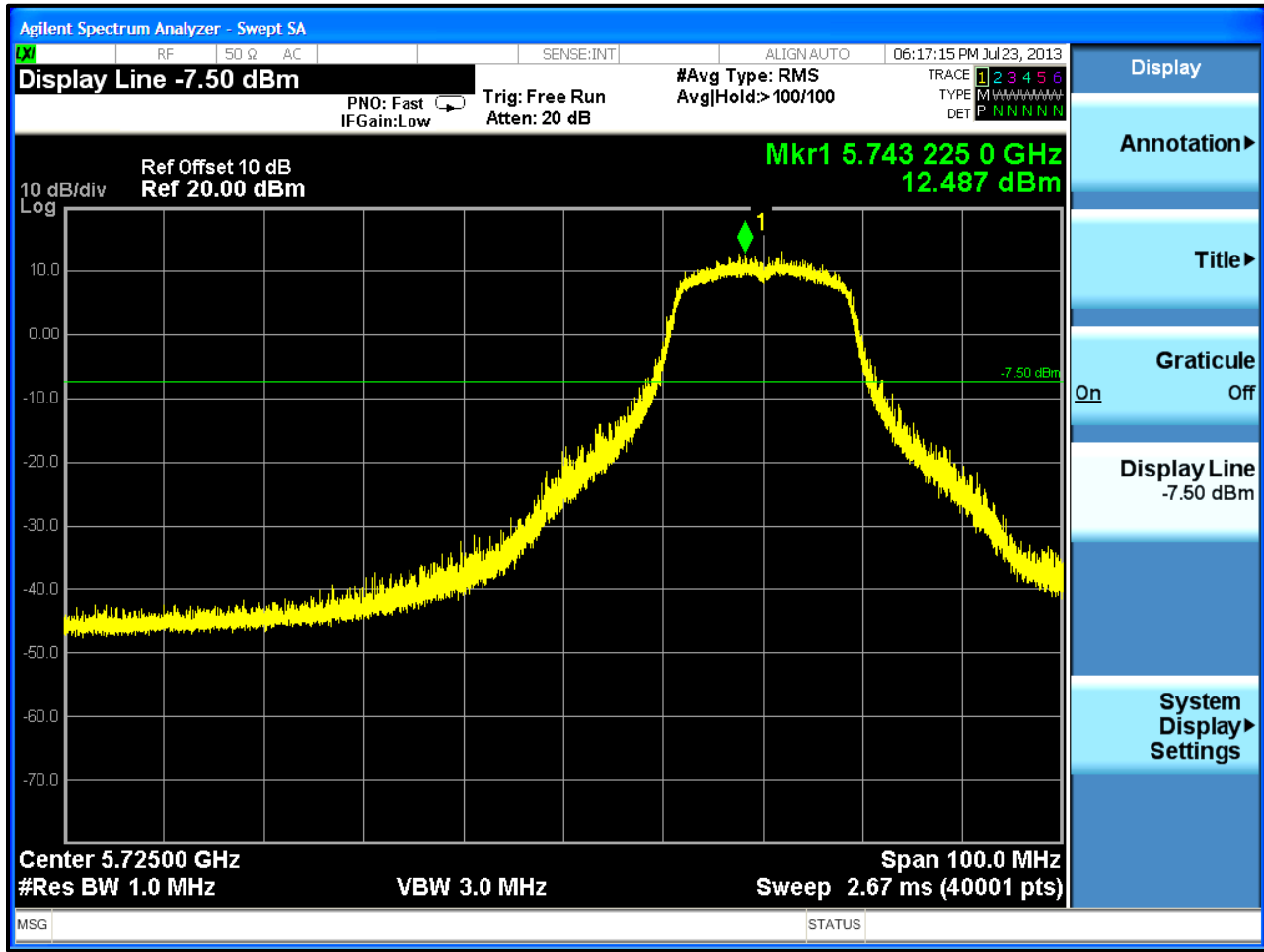
Plot 4-19: Lower Band Edge: Channel 149 (TX Frequency 5745 MHz); 802.11a (18 Mbps)



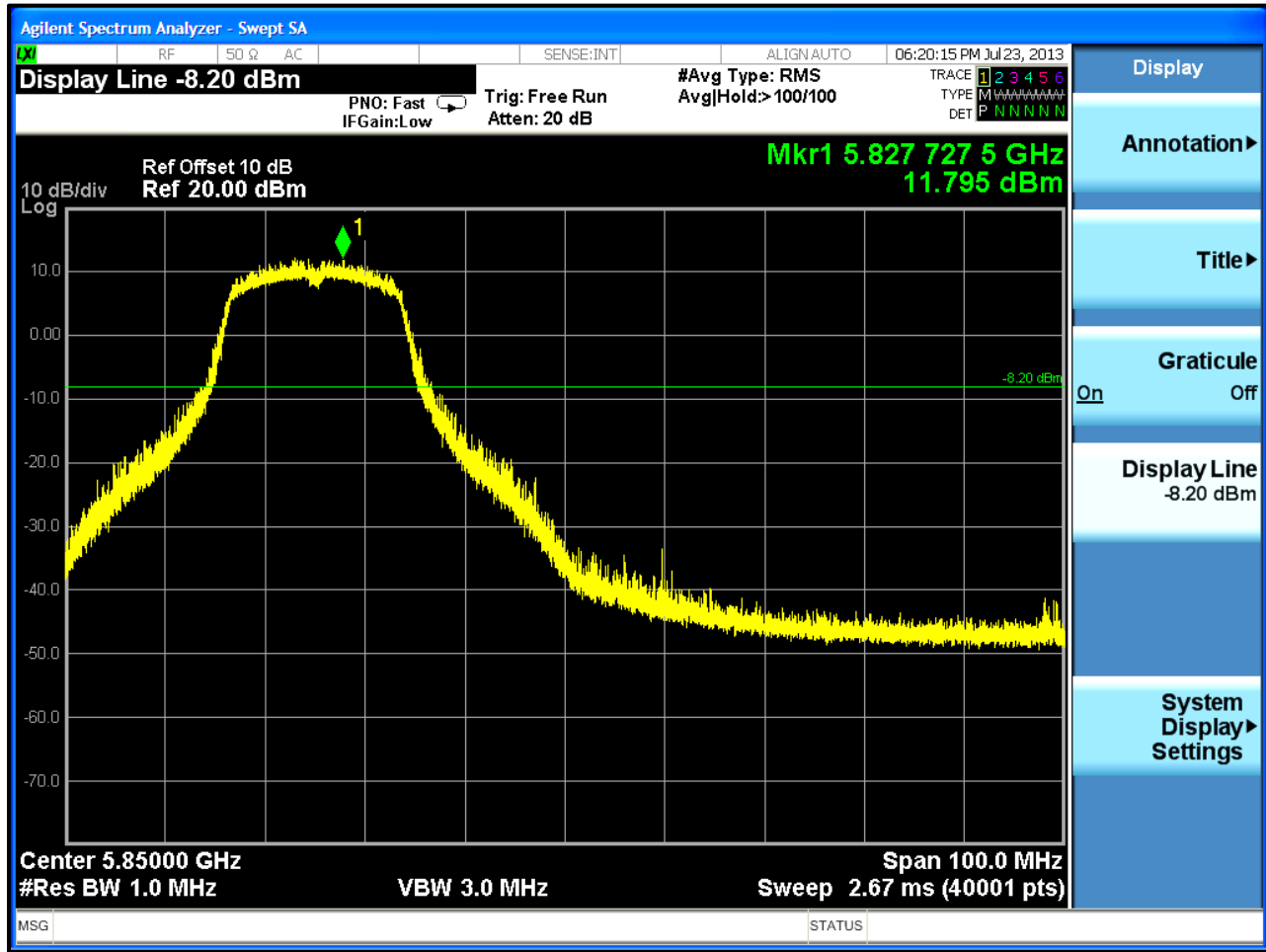
Plot 4-20: Upper Band Edge: Channel 165 (TX Frequency 5825 MHz); 802.11a (18 Mbps)



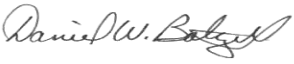
Plot 4-21: Lower Band Edge: Channel 149 (TX Frequency 5745 MHz) ; 802.11n (14.4 Mbps)



Plot 4-22: Upper Band Edge: Channel 165 (TX Frequency 5825 MHz); 802.11n (14.4 Mbps)



Test Personnel:

Daniel W. Baltzell Test Engineer	 Signature	July 22-23, 2013 Dates of Test
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5 Antenna Conducted Spurious Emissions – FCC 15.247(d); RSS-Gen

5.1 Antenna Conducted Spurious Emissions Test Procedures

Antenna spurious emissions per FCC 15.247(d) were measured from the EUT antenna port using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier was identified at the following frequencies: 2412 MHz, 2437 MHz and 2462 MHz, and 5745 MHz, 5785 MHz and 5825 MHz.

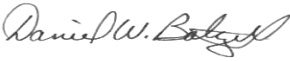
5.2 Antenna Conducted Spurious Emissions Test Results

No harmonics or spurs were found within 20 dB (note that we are reporting power as peak) of the carrier level from the carrier to the 10th harmonic of the carrier frequency. Per FCC 15.31(o), no data is being reported.

Table 5-1: Antenna Conducted Spurious Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due 1
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/16/14

Test Personnel:

Daniel W. Baltzell		July 21, 2013
Test Engineer	Signature	Date of Test

6 6 dB Bandwidth – FCC 15.247(a)(2); RSS-210 A8.2

6.1 6 dB Bandwidth Test Procedure – Minimum 6 dB Bandwidth

The minimum 6 dB bandwidths per FCC 15.247(a)(2) were measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at $\geq 3 \times \text{RBW}$. The device was modulated. The minimum 6 dB bandwidths are presented below.

Table 6-1: 6 dB Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/16/14
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	3/18/14

6.2 6 dB Bandwidth Test Results

Table 6-2: 6 dB Bandwidth Test Data – 802.11a (18 Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
149	5745	15.4	0.5	Pass
157	5785	15.5	0.5	Pass
165	5825	16.6	0.5	Pass

Table 6-3: 6 dB Bandwidth Test Data – 802.11b (11 Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
1	2412	9.9	0.5	Pass
6	2437	9.8	0.5	Pass
11	2462	10.3	0.5	Pass

Table 6-4: 6 dB Bandwidth Test Data – 802.11g (18 Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
1	2412	16.3	0.5	Pass
6	2437	16.3	0.5	Pass
11	2462	16.3	0.5	Pass

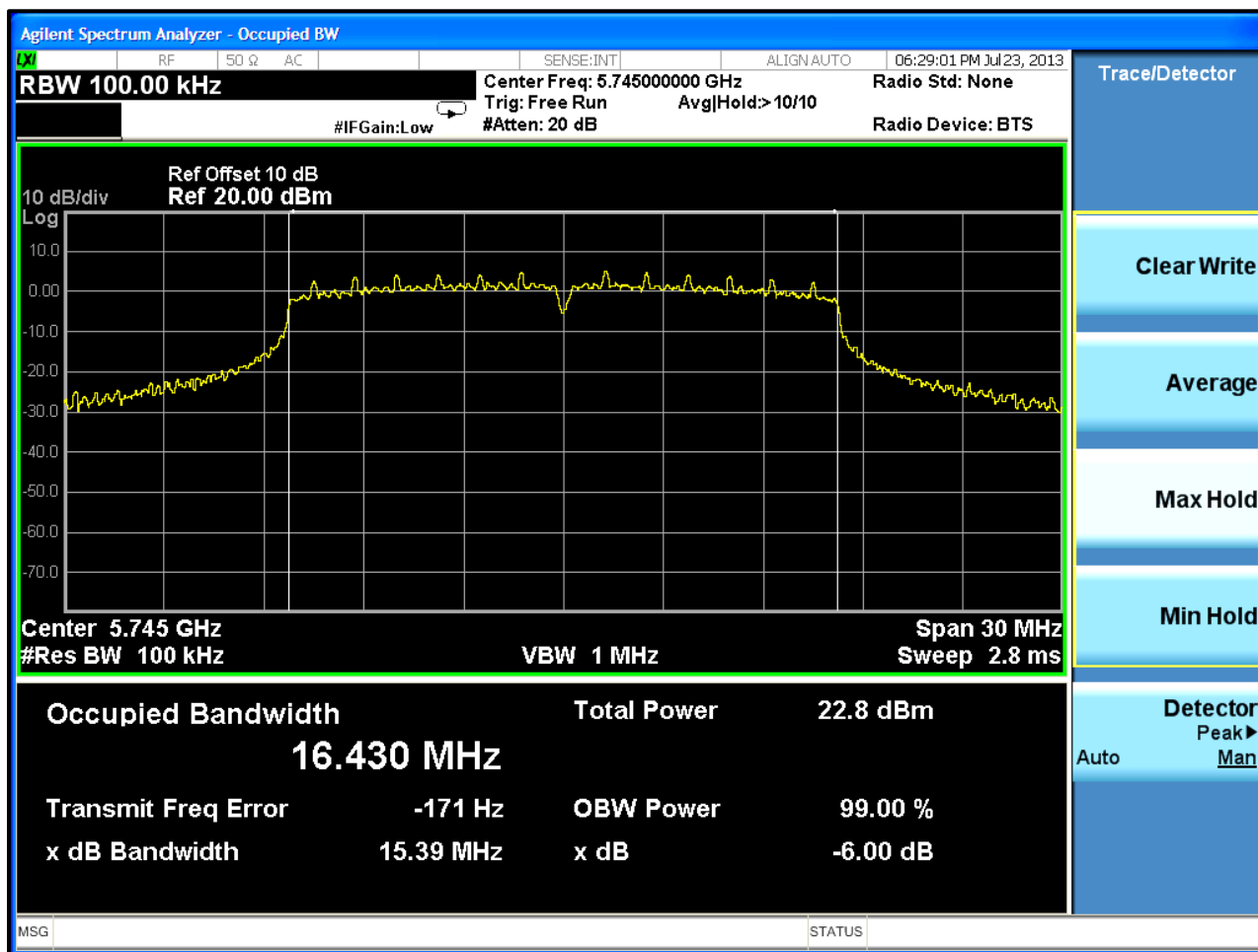
Table 6-5: 6 dB Bandwidth Test Data – 802.11n (14.4 Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
1	2412	17.5	0.5	Pass
6	2437	17.5	0.5	Pass
11	2462	17.3	0.5	Pass

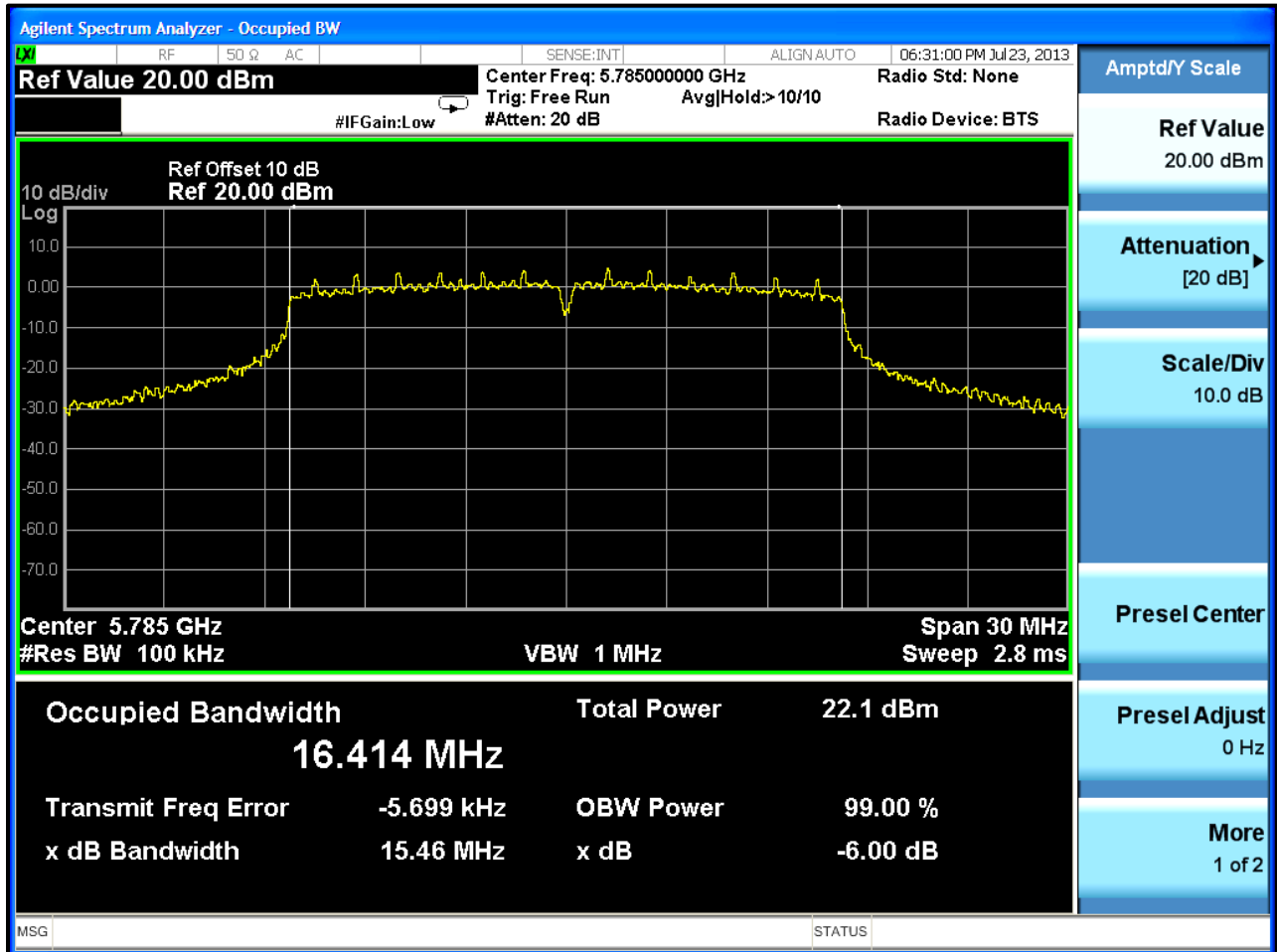
Table 6-6: 6 dB Bandwidth Test Data – 802.11n (14.4 Mbps)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass/Fail
149	5745	16.1	0.5	Pass
157	5785	16.4	0.5	Pass
165	5825	16.4	0.5	Pass

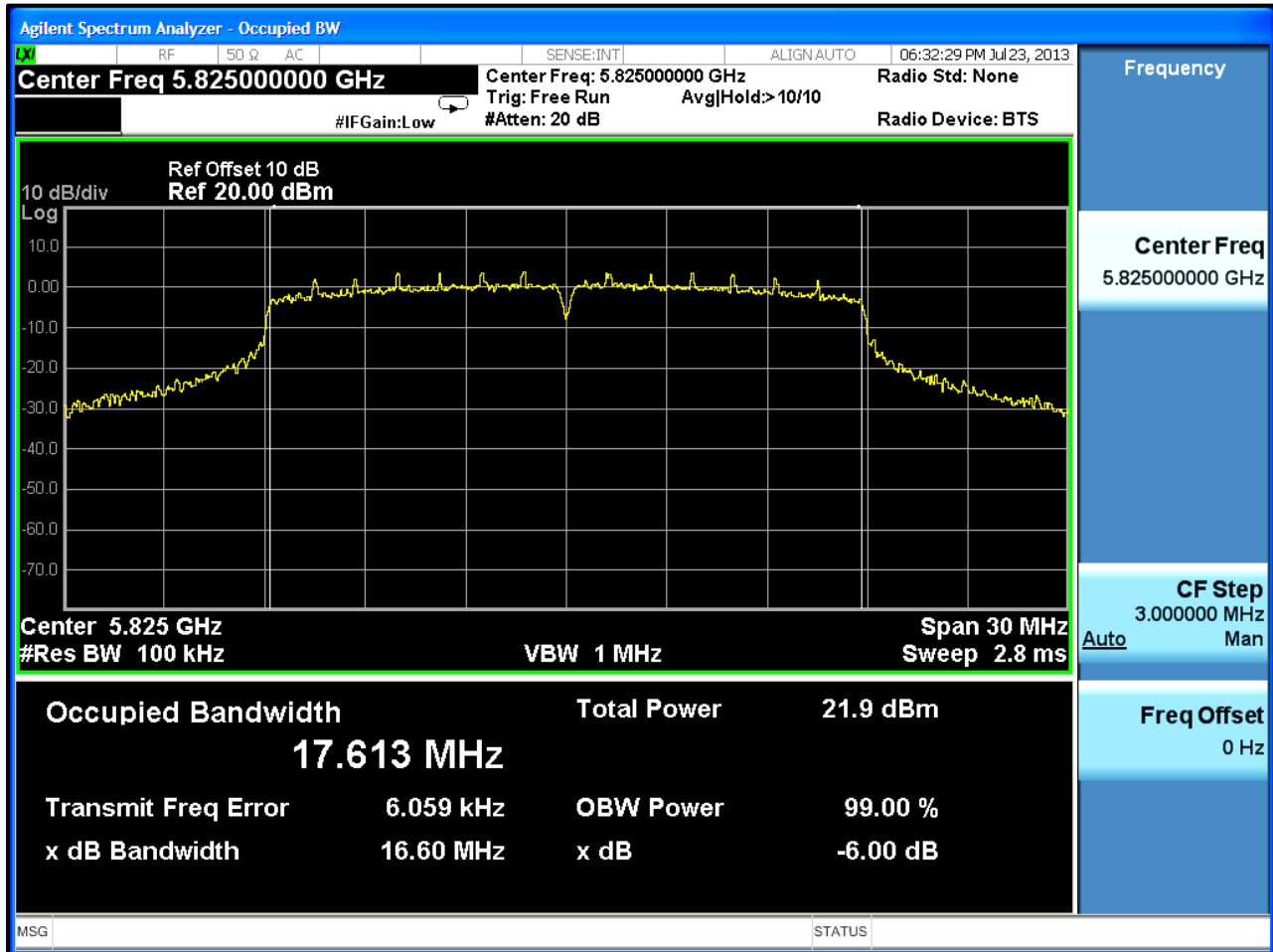
Plot 6-1: 6 dB Bandwidth Channel 149 (TX Frequency 5745 MHz) - 802.11a



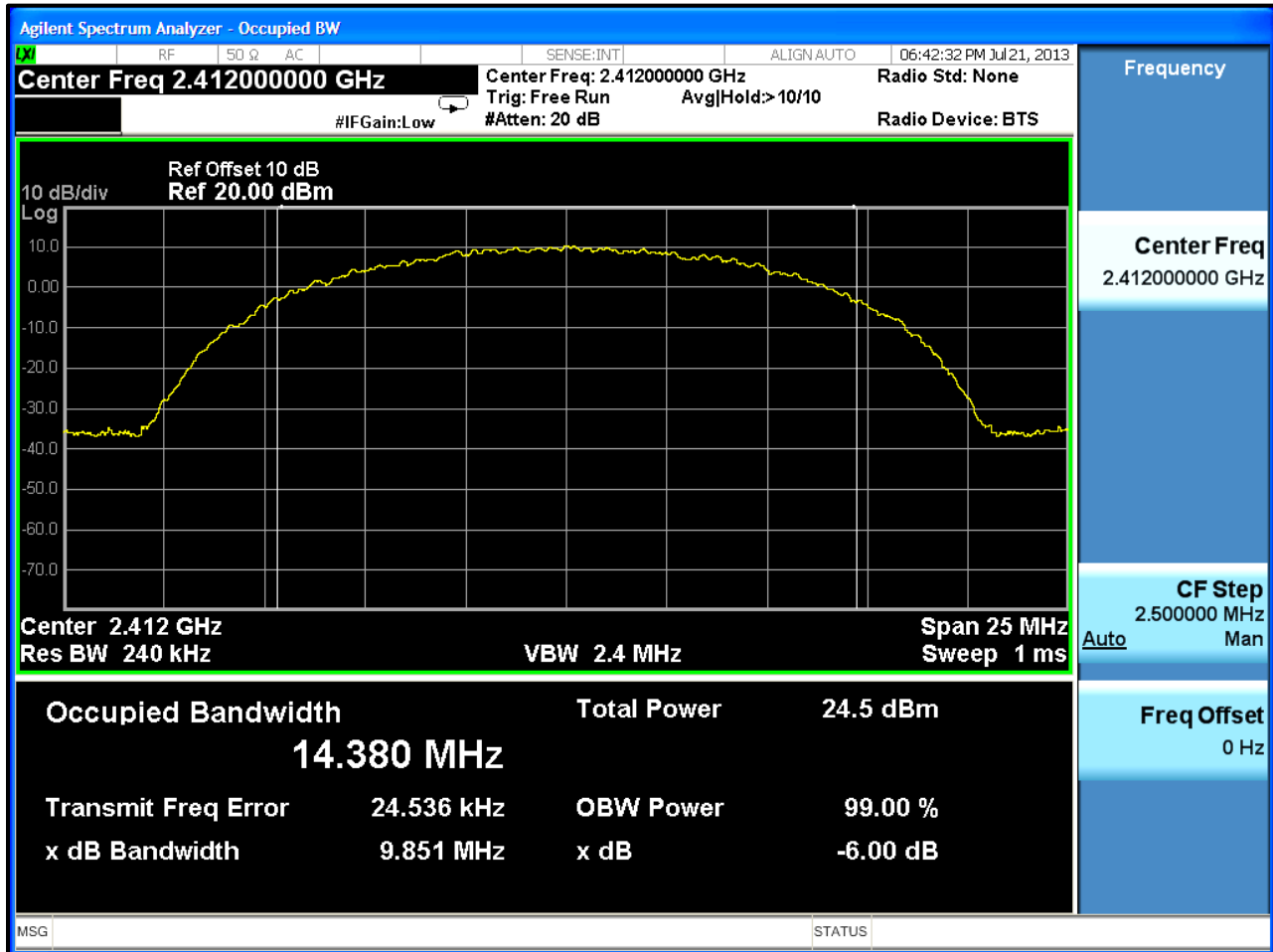
Plot 6-2: 6 dB Bandwidth Channel 157 (TX Frequency 5785 MHz) - 802.11a



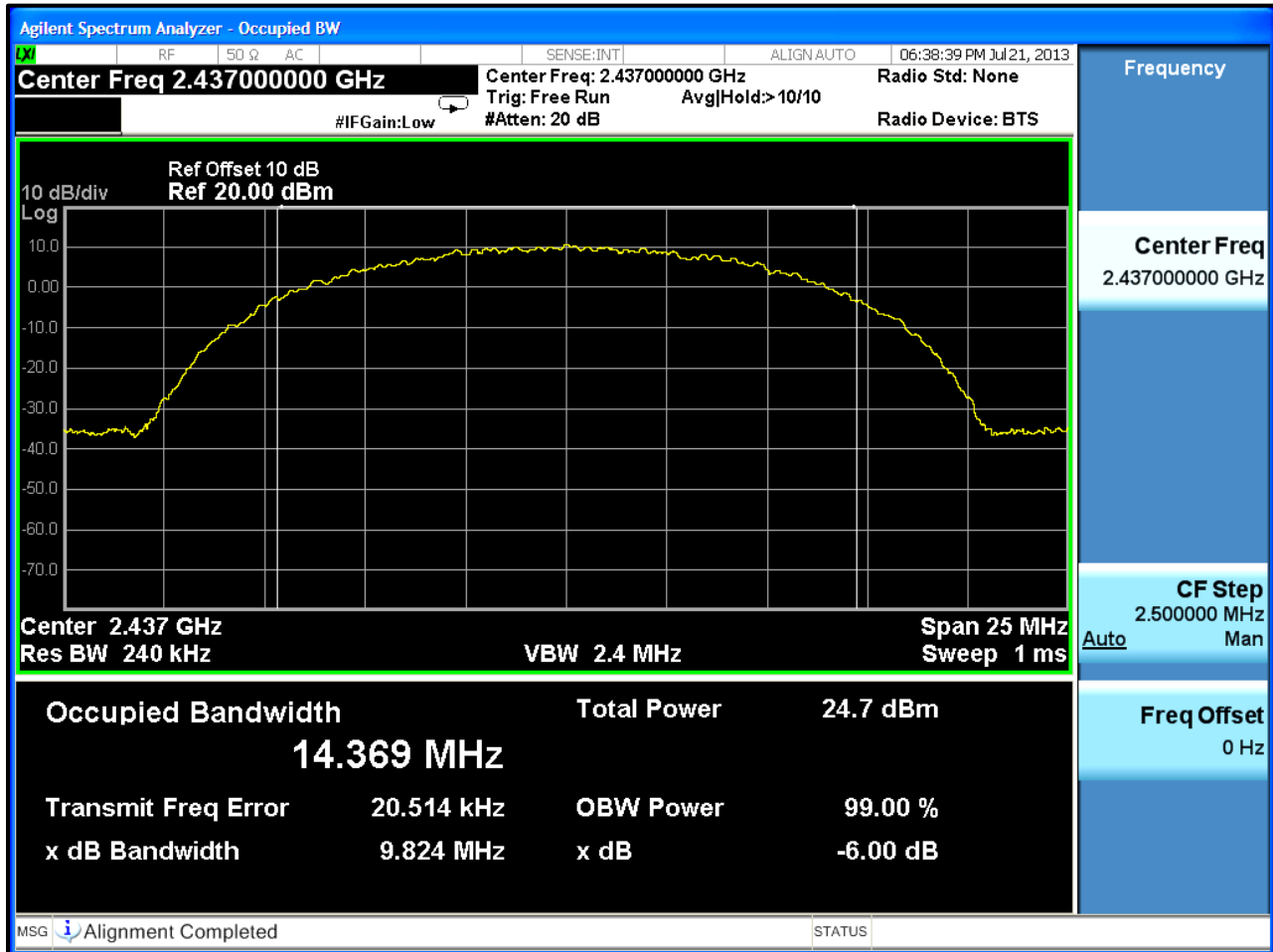
Plot 6-3: 6 dB Bandwidth Channel 165 (TX Frequency 5825 MHz) - 802.11a



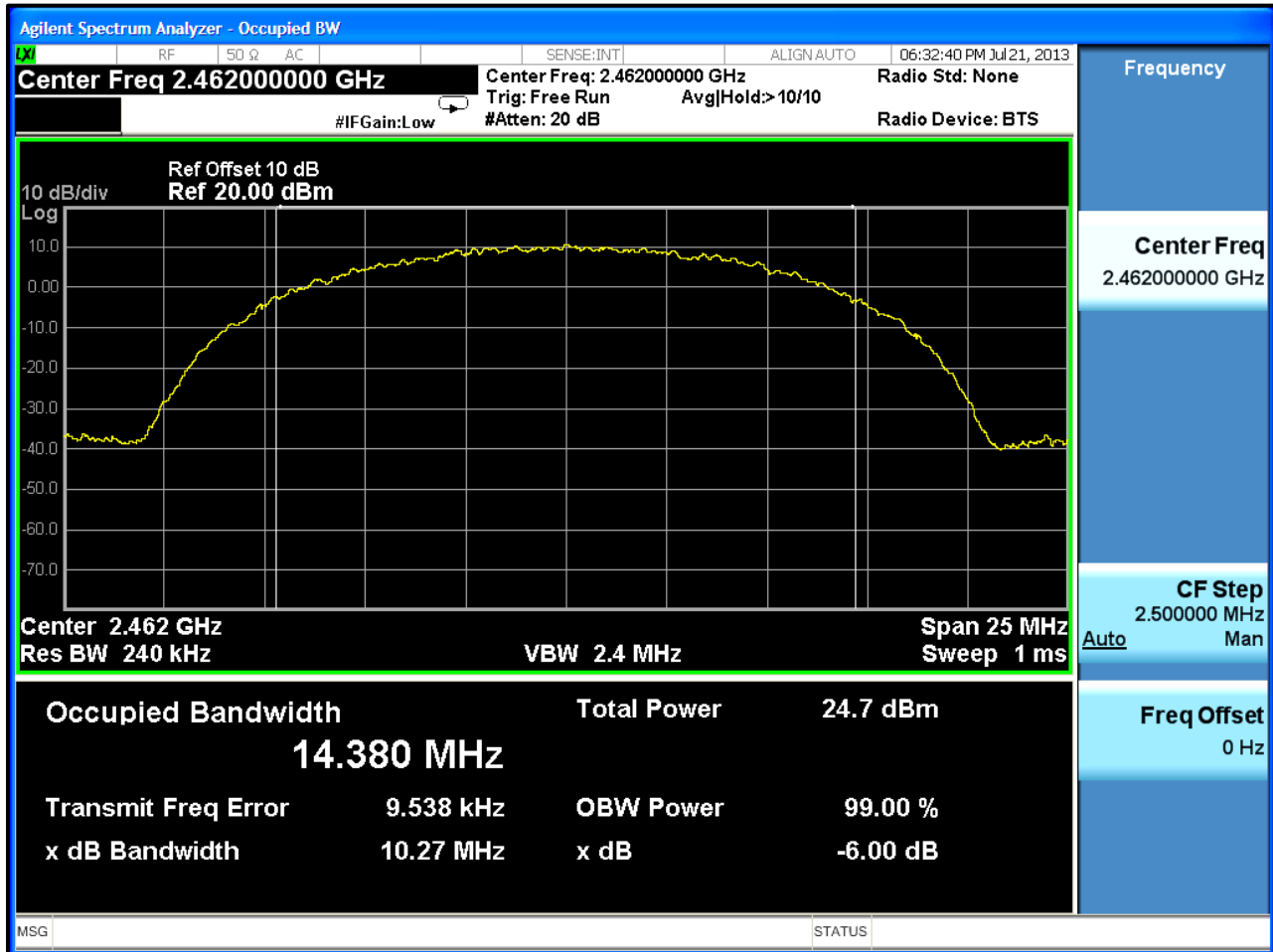
Plot 6-4: 6 dB Bandwidth Channel 1 (TX Frequency 2412 MHz) - 802.11b



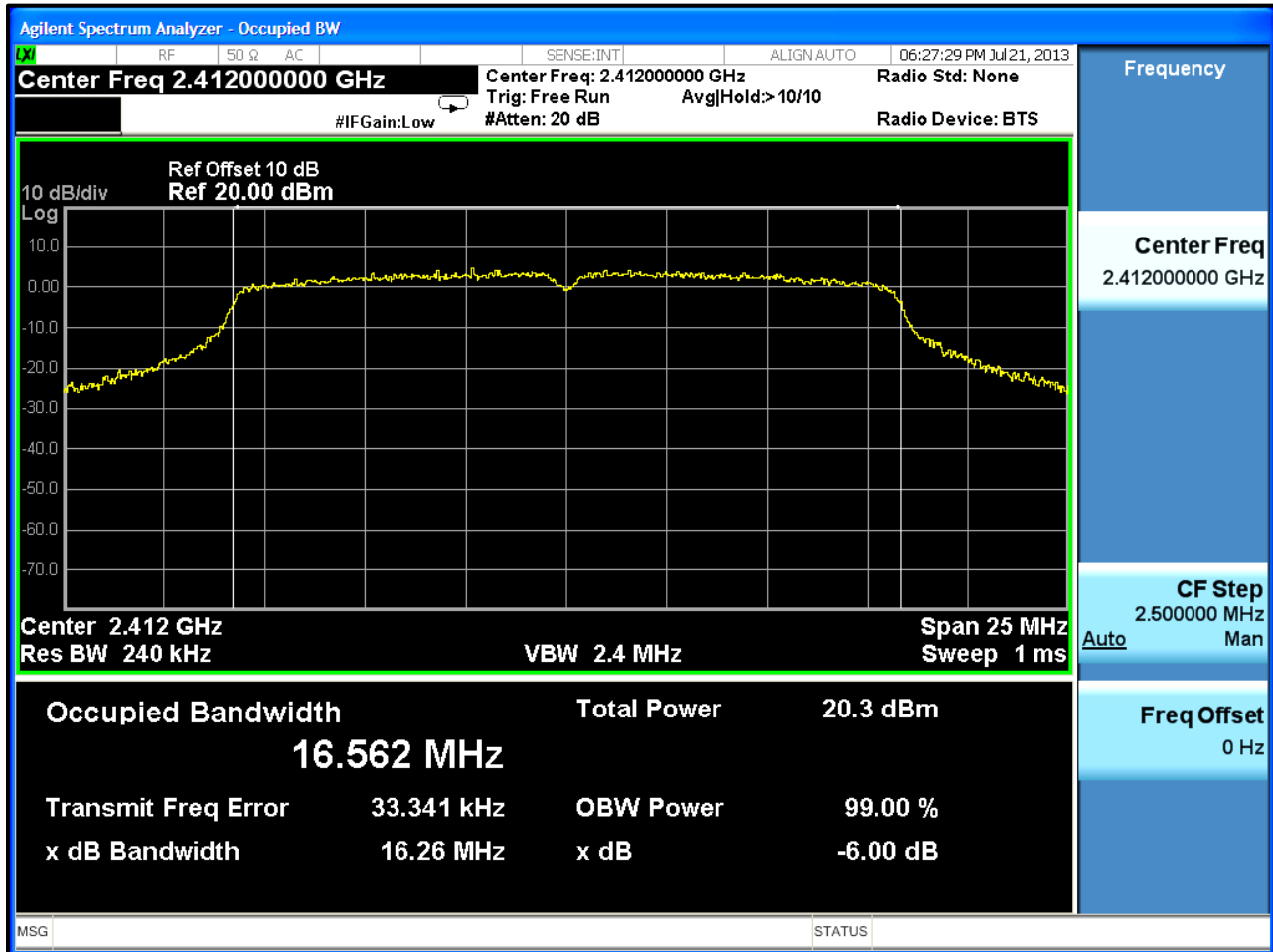
Plot 6-5: 6 dB Bandwidth Channel 6 (TX Frequency 2437 MHz) - 802.11b



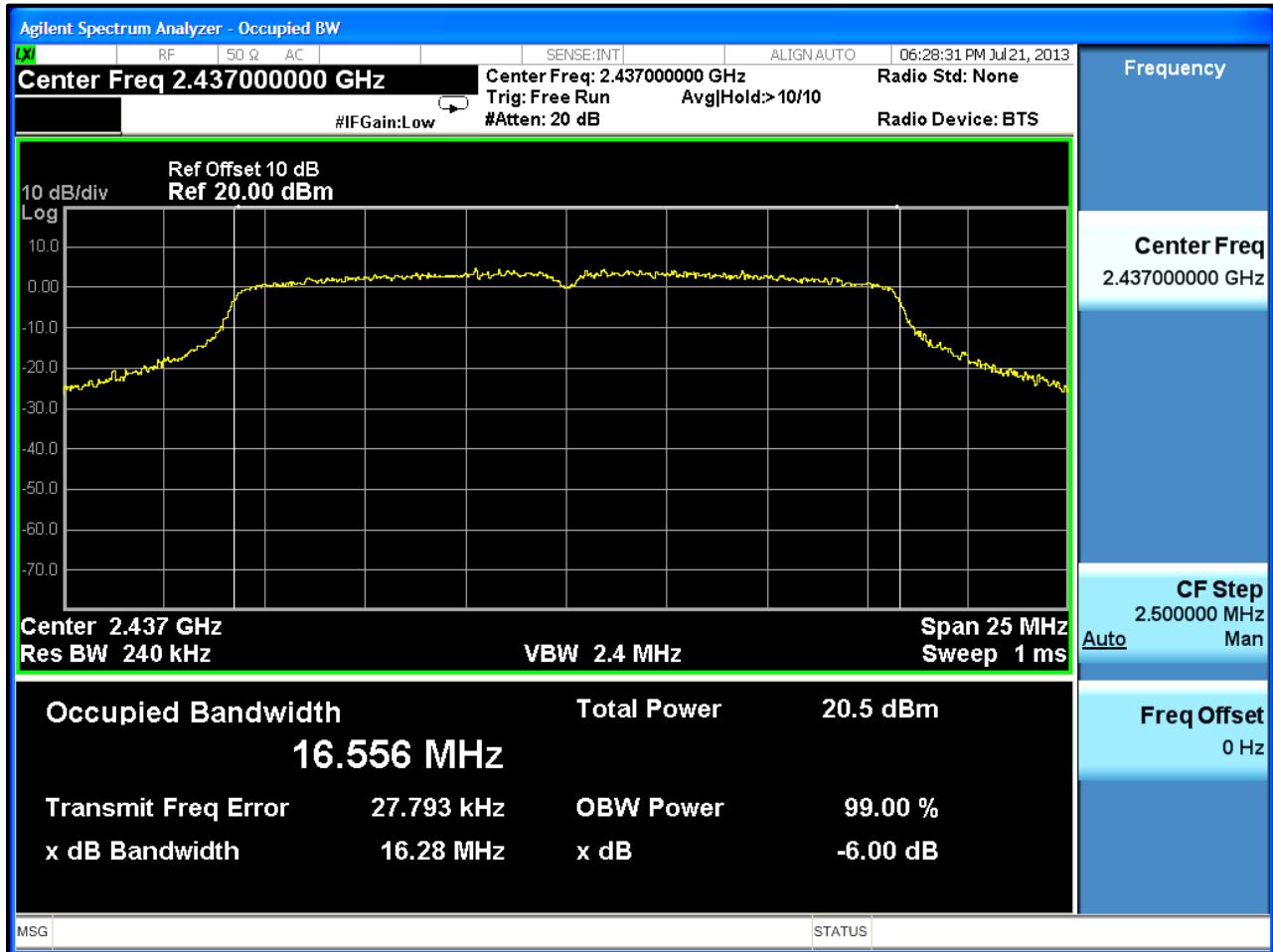
Plot 6-6: 6 dB Bandwidth Channel 11 (TX Frequency 2462 MHz) - 802.11b



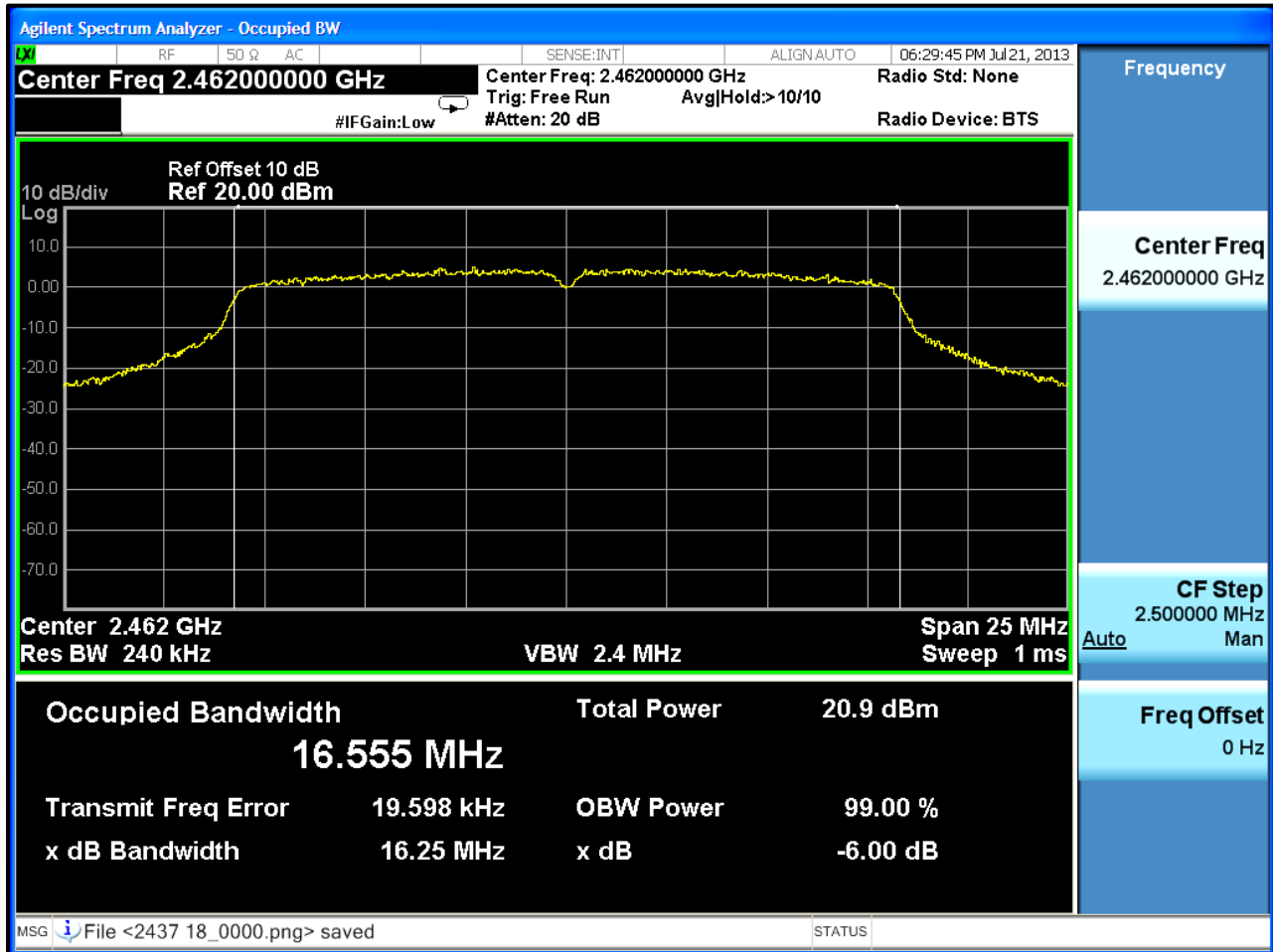
Plot 6-7: 6 dB Bandwidth Channel 1 (TX Frequency 2412 MHz) - 802.11g



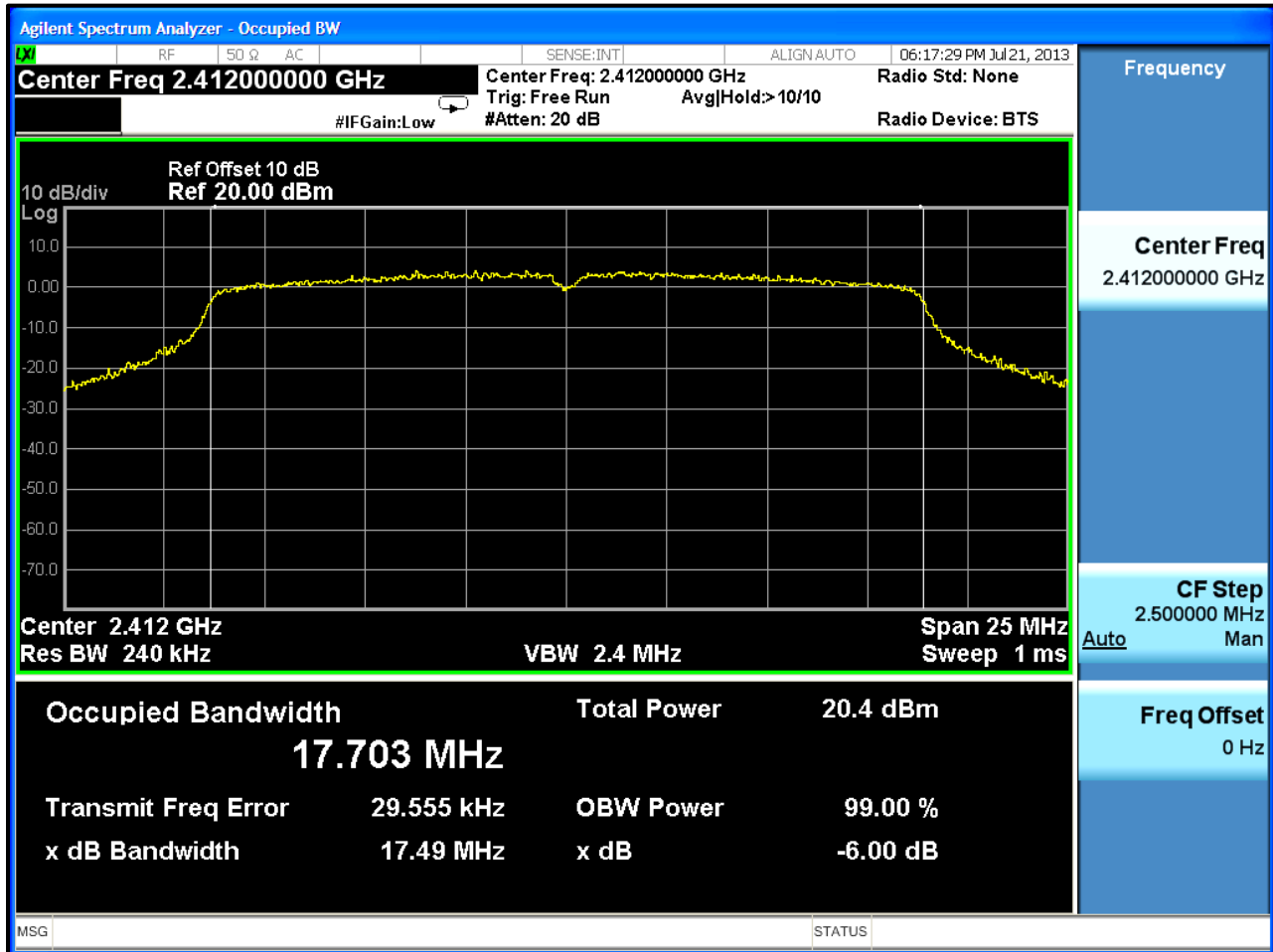
Plot 6-8: 6 dB Bandwidth Channel 6 (TX Frequency 2437 MHz) - 802.11g



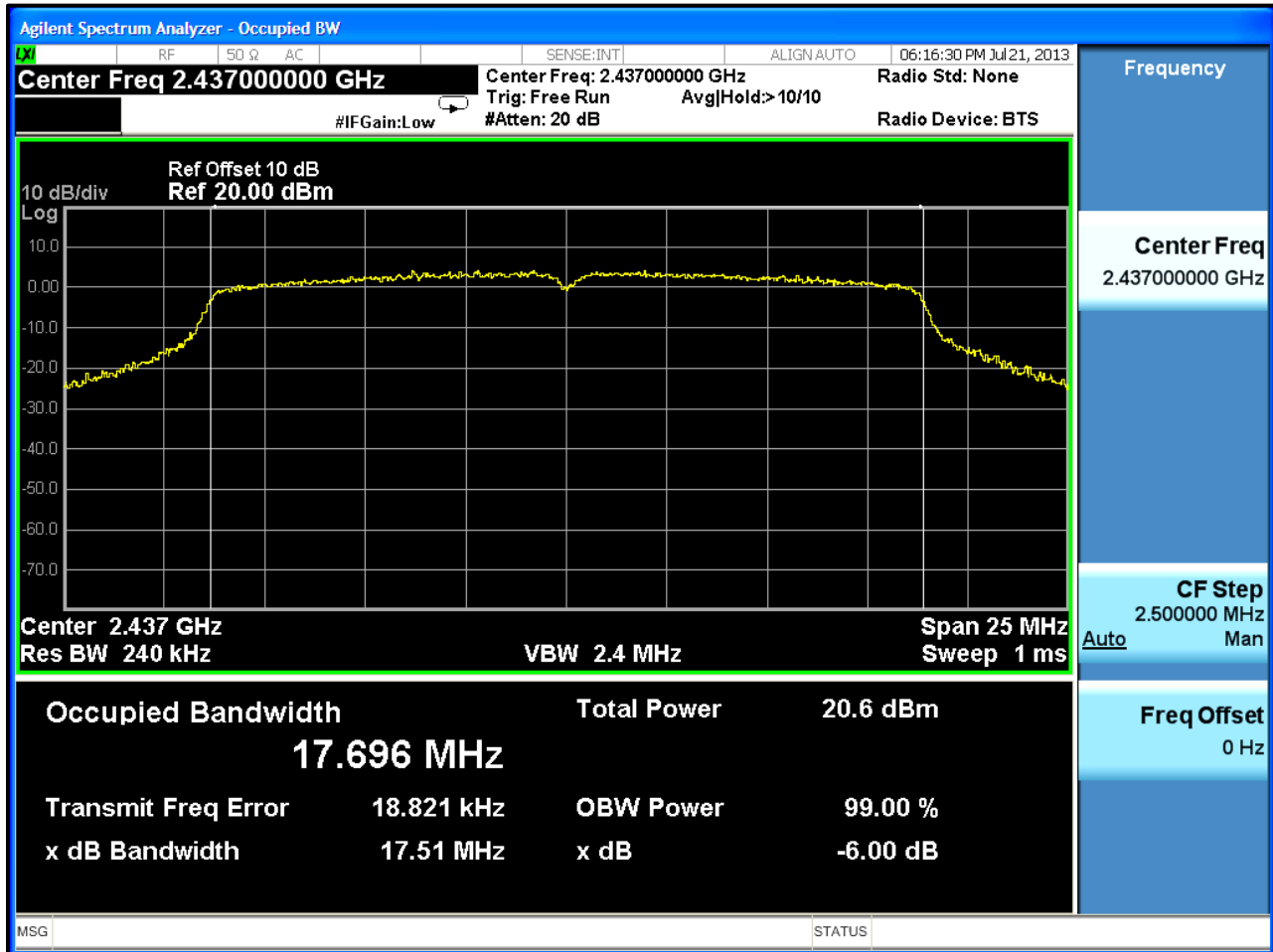
Plot 6-9: 6 dB Bandwidth Channel 11 (TX Frequency 2462 MHz) - 802.11g



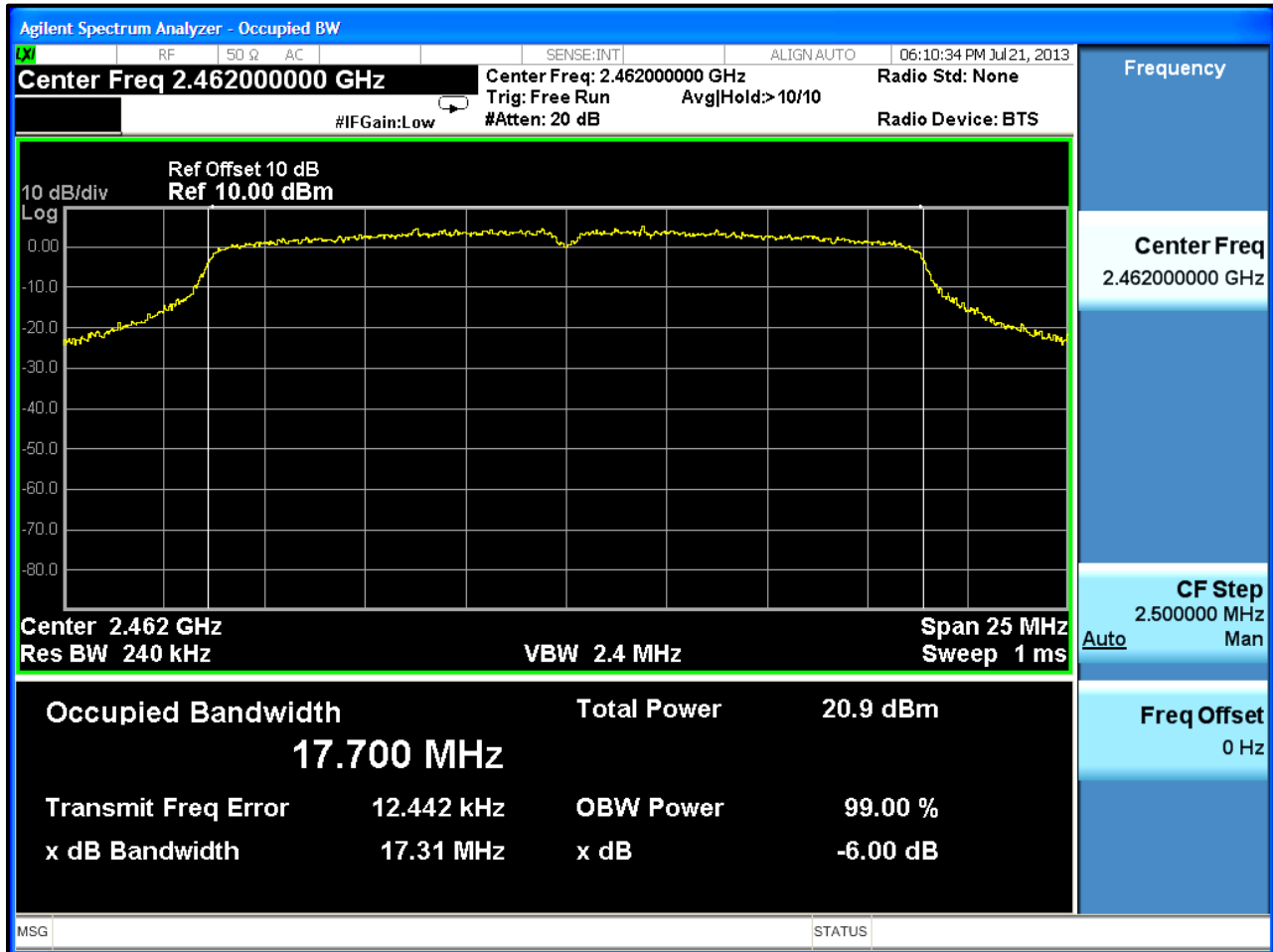
Plot 6-10: 6 dB Bandwidth Channel 1 (TX Frequency 2412 MHz) - 802.11n



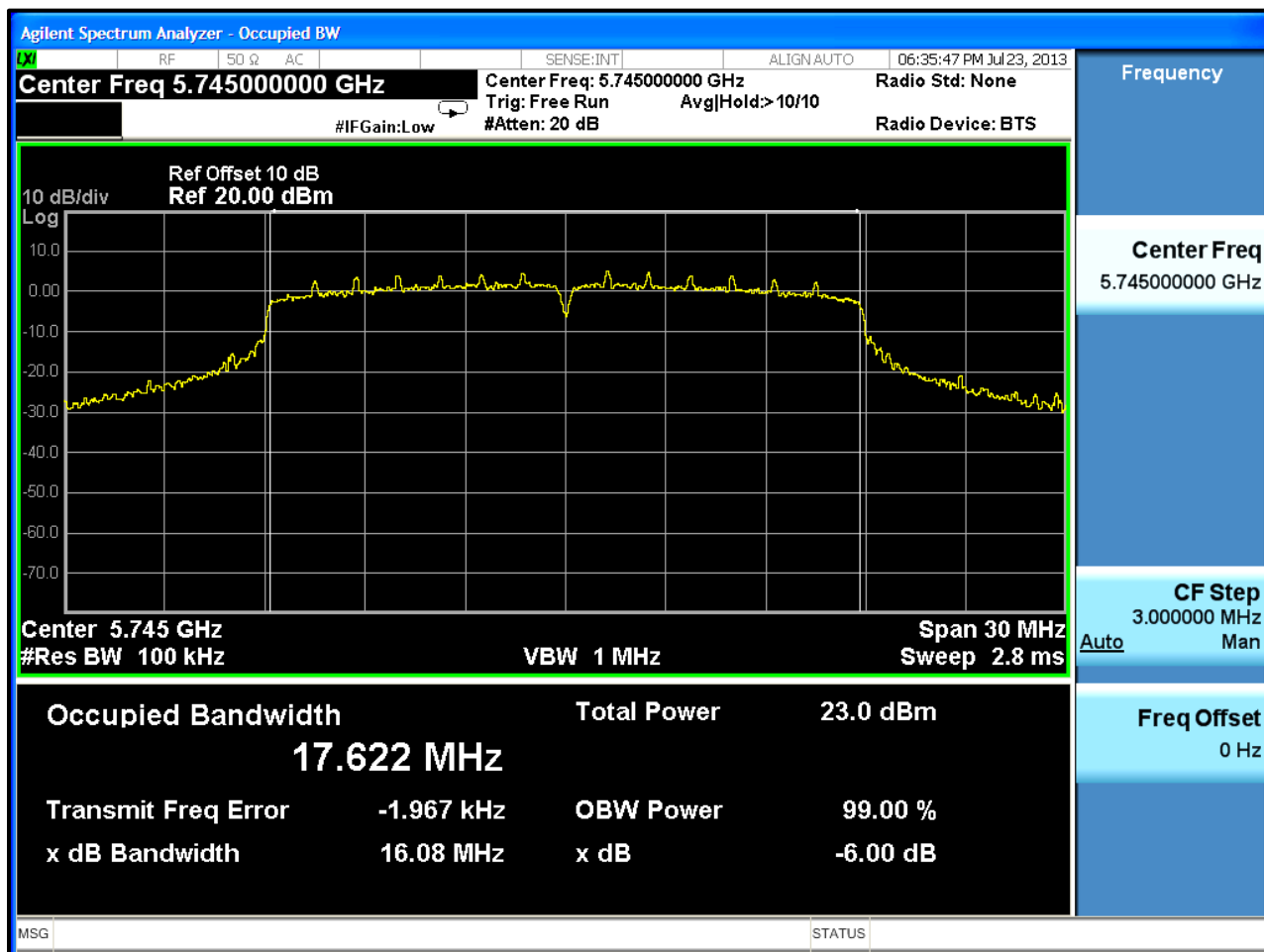
Plot 6-11: 6 dB Bandwidth Channel 6 (TX Frequency 2437 MHz) - 802.11n



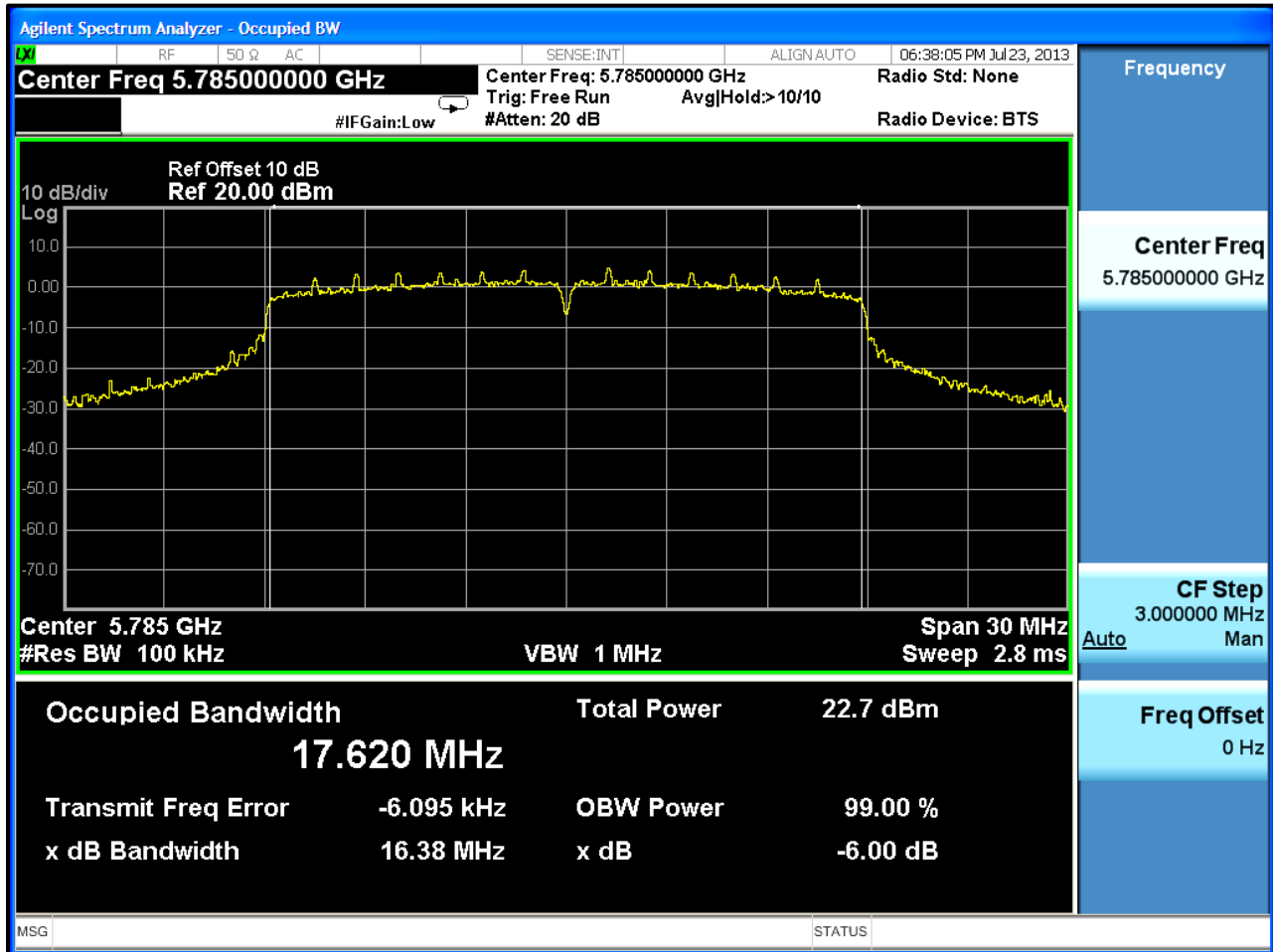
Plot 6-12: 6 dB Bandwidth Channel 11 (TX Frequency 2462 MHz) - 802.11n



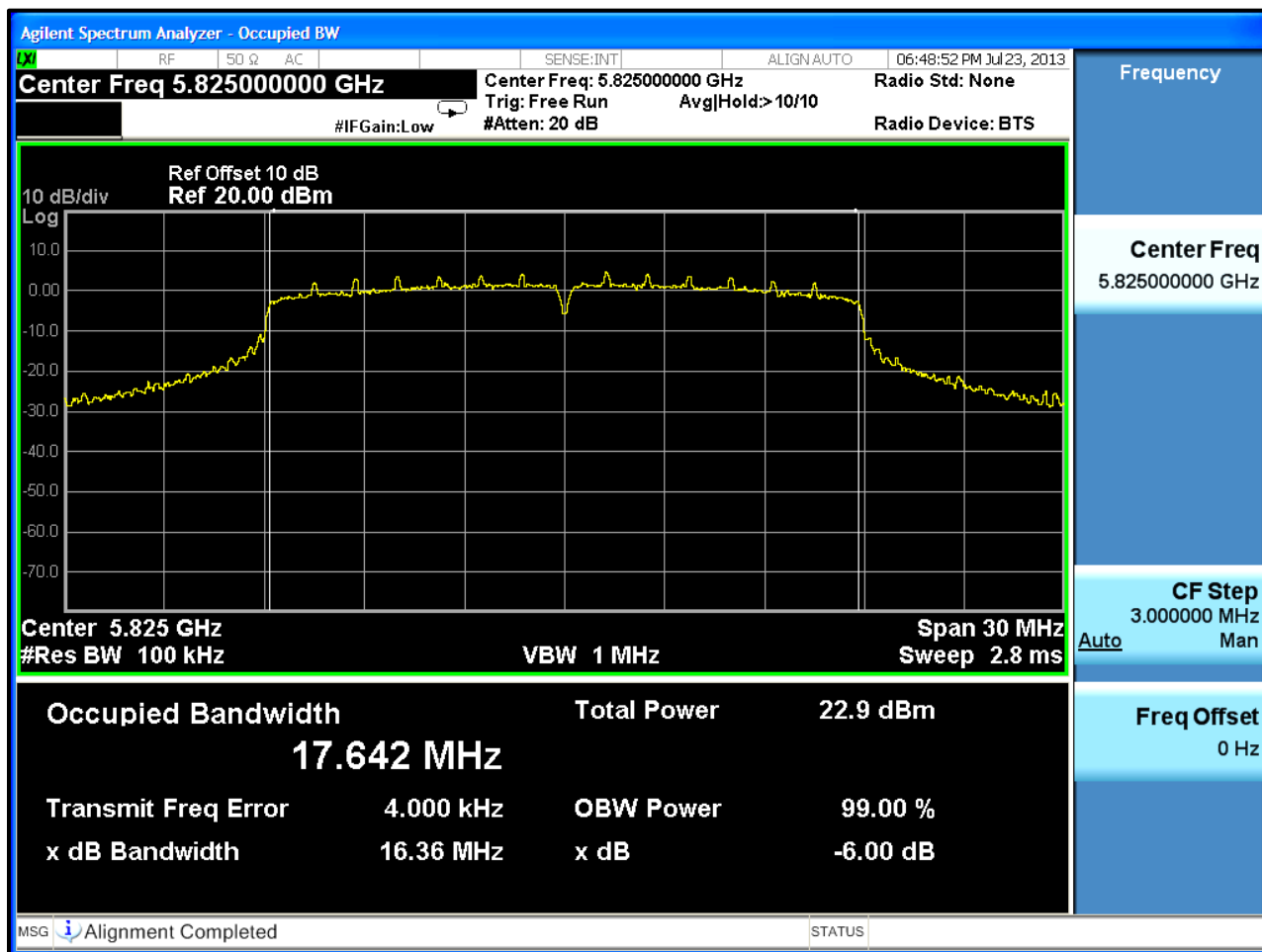
Plot 6-13: 6 dB Bandwidth Channel 149 (TX Frequency 5745 MHz) - 802.11a



Plot 6-14: 6 dB Bandwidth Channel 157 (TX Frequency 5785 MHz) - 802.11n



Plot 6-15: 6 dB Bandwidth Channel 165 (TX Frequency 5825 MHz) - 802.11n



Test Personnel:

Daniel W. Baltzell
Test Engineer

Daniel W. Baltzell
Signature

July 21 & 23, 2013
Dates of Test

7 Power Spectral Density – FCC 15.247(e); RSS-210 A8.2

7.1 Power Spectral Density Test Procedure

The power spectral density per FCC 15.247(e) was measured using a 50-ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 30 kHz, and the auto sweep time. The spectral lines were resolved for the modulated carriers at 2412 MHz, 2437 MHz, 2462, 5745, 5785, and 5825 MHz respectively. These levels are below the +8 dBm limit. See the power spectral density table and plots.

Table 7-1: Power Spectral Density Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/16/14
900948	Weinschel Corporation	47-10-43	Attenuator DC-18 GHz 10 dB 50W	BH1487	3/18/14

7.2 Power Spectral Density Test Data – DSSS WLAN

Table 7-2: Power Spectral Density Test Data – 802.11a (12 Mbps)

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
149	5745	-11.4	8	Pass
157	5785	-11.8	8	Pass
165	5825	-12.2	8	Pass

Table 7-3: Power Spectral Density Test Data – 802.11b (11 Mbps)

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-10.0	8	Pass
6	2437	-9.1	8	Pass
11	2462	-9.1	8	Pass

Table 7-4: Power Spectral Density Test Data – 802.11g (18 Mbps)

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-11.5	8	Pass
6	2437	-11.2	8	Pass
11	2462	-11.0	8	Pass

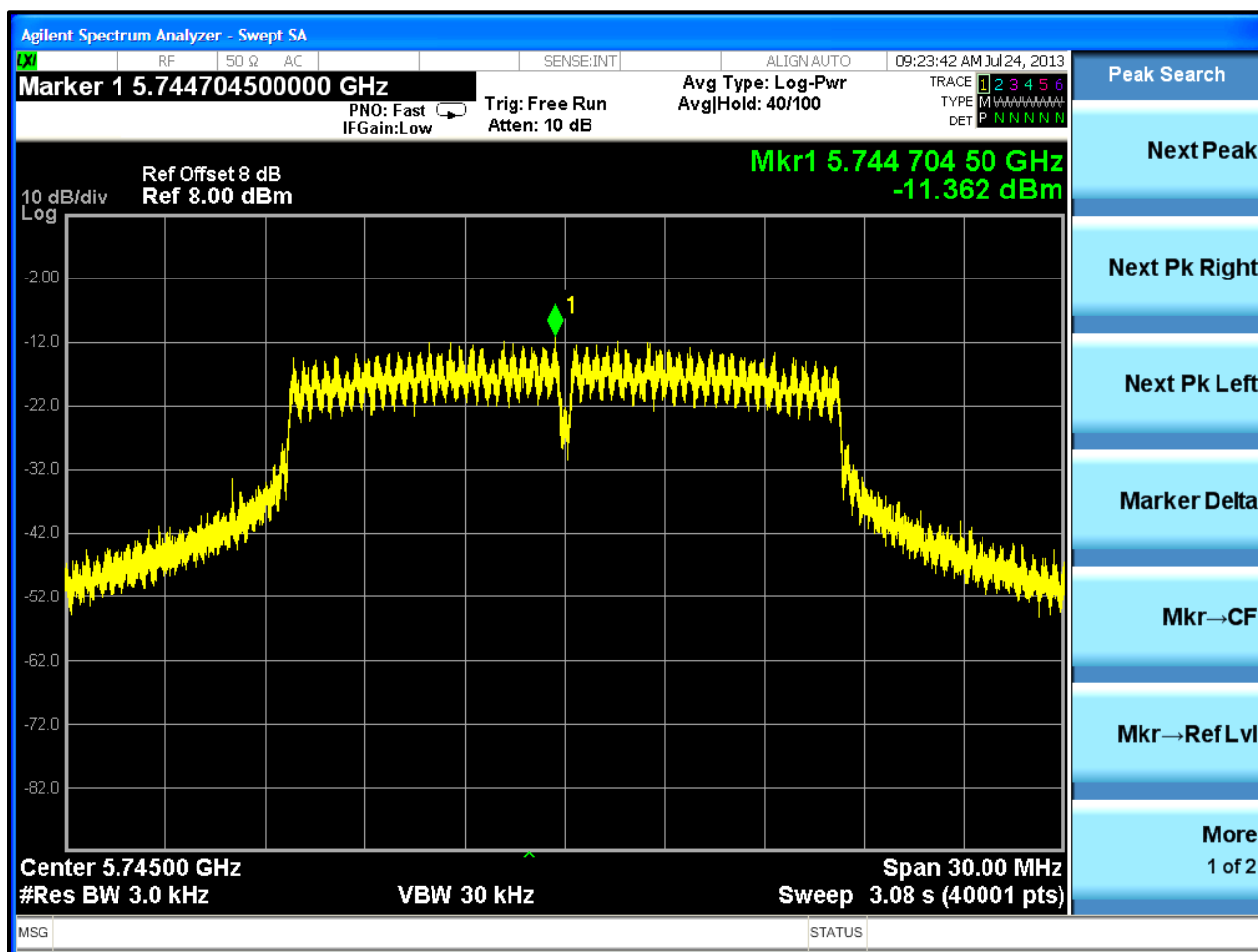
Table 7-5: Power Spectral Density Test Data – 802.11n (14.4 Mbps)

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	2412	-12.6	8	Pass
6	2437	-11.8	8	Pass
11	2462	-12.0	8	Pass

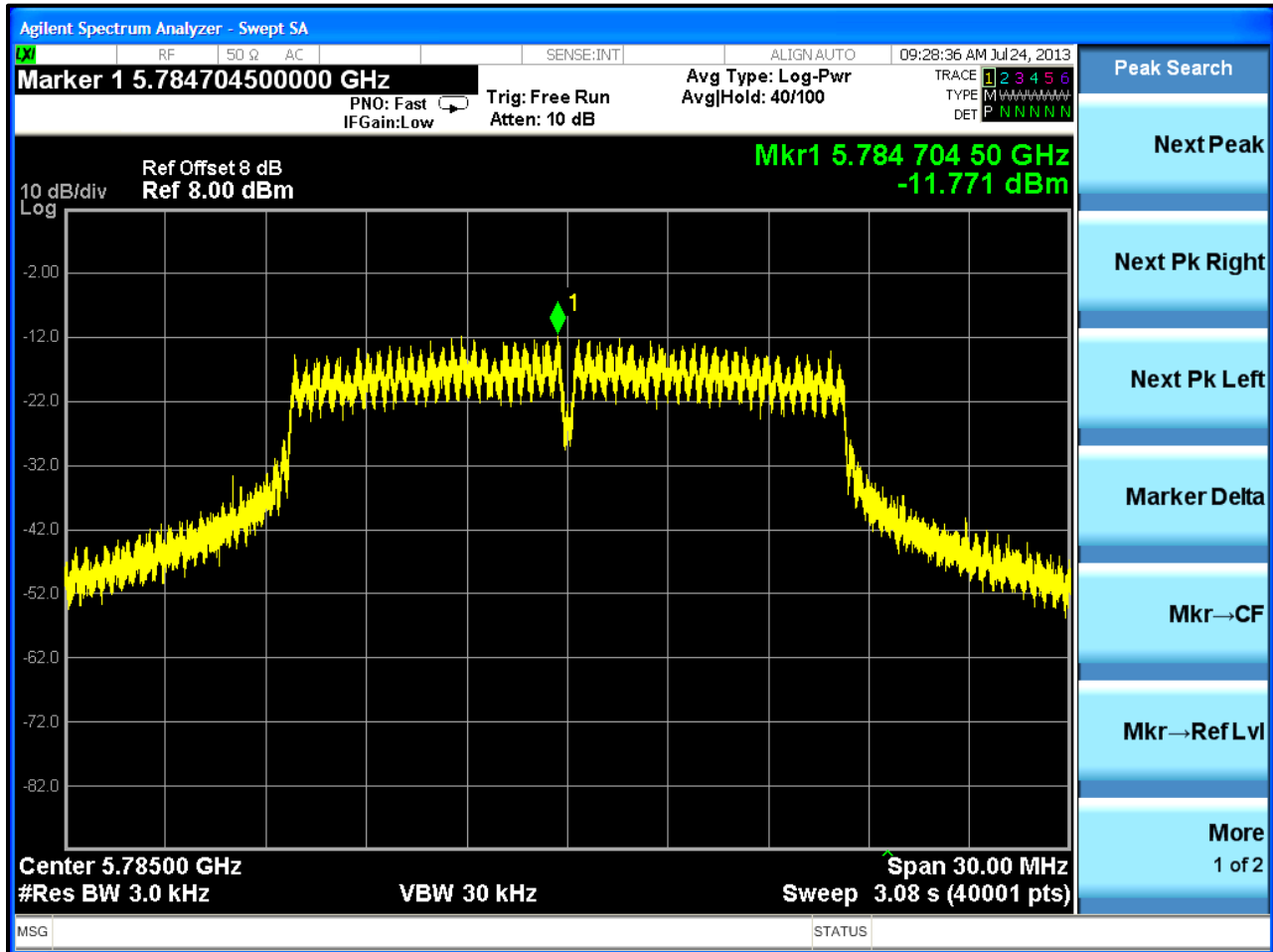
Table 7-6: Power Spectral Density Test Data – 802.11n (14.4 Mbps)

Channel	Frequency (MHz)	RF Power Level (dBm)	Maximum Limit +8dBm	Pass/Fail
1	5745	-12.9	8	Pass
6	5785	-11.9	8	Pass
11	5825	-12.6	8	Pass

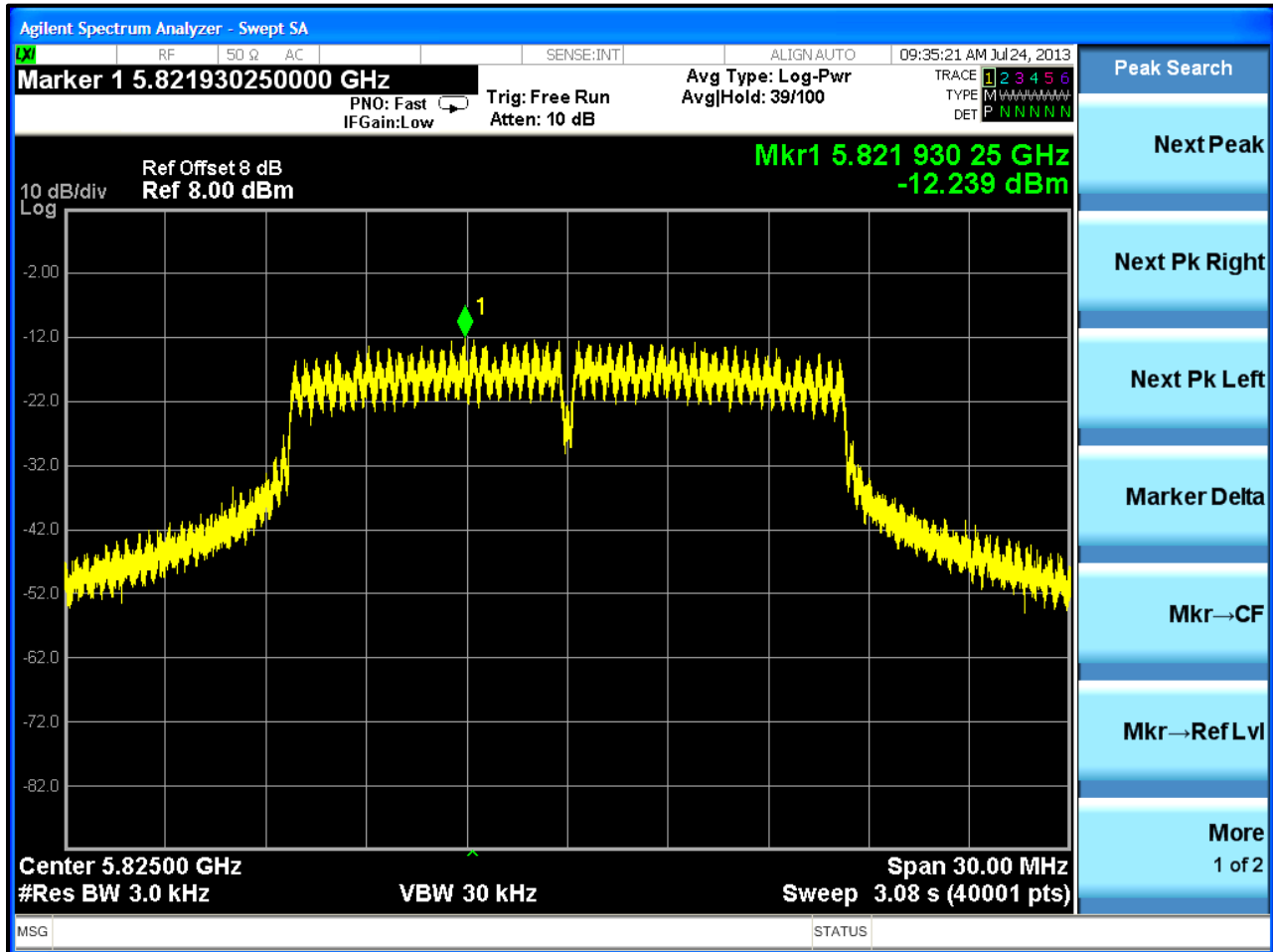
Plot 7-1: Power Spectral Density: Channel 149 (5745 MHz); 802.11a (18 Mbps)



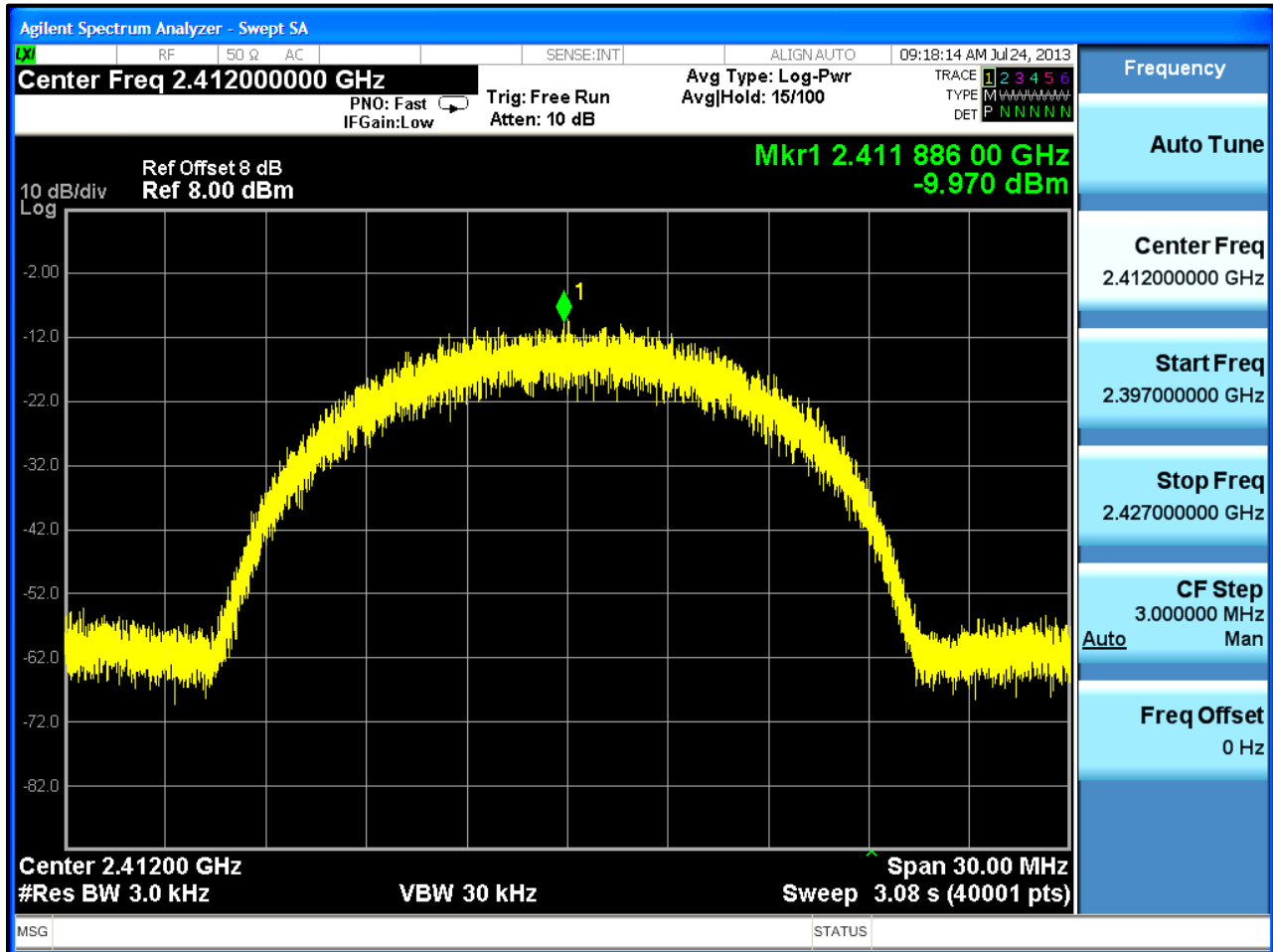
Plot 7-2: Power Spectral Density: Channel 157 (5785 MHz); 802.11a (18 Mbps)



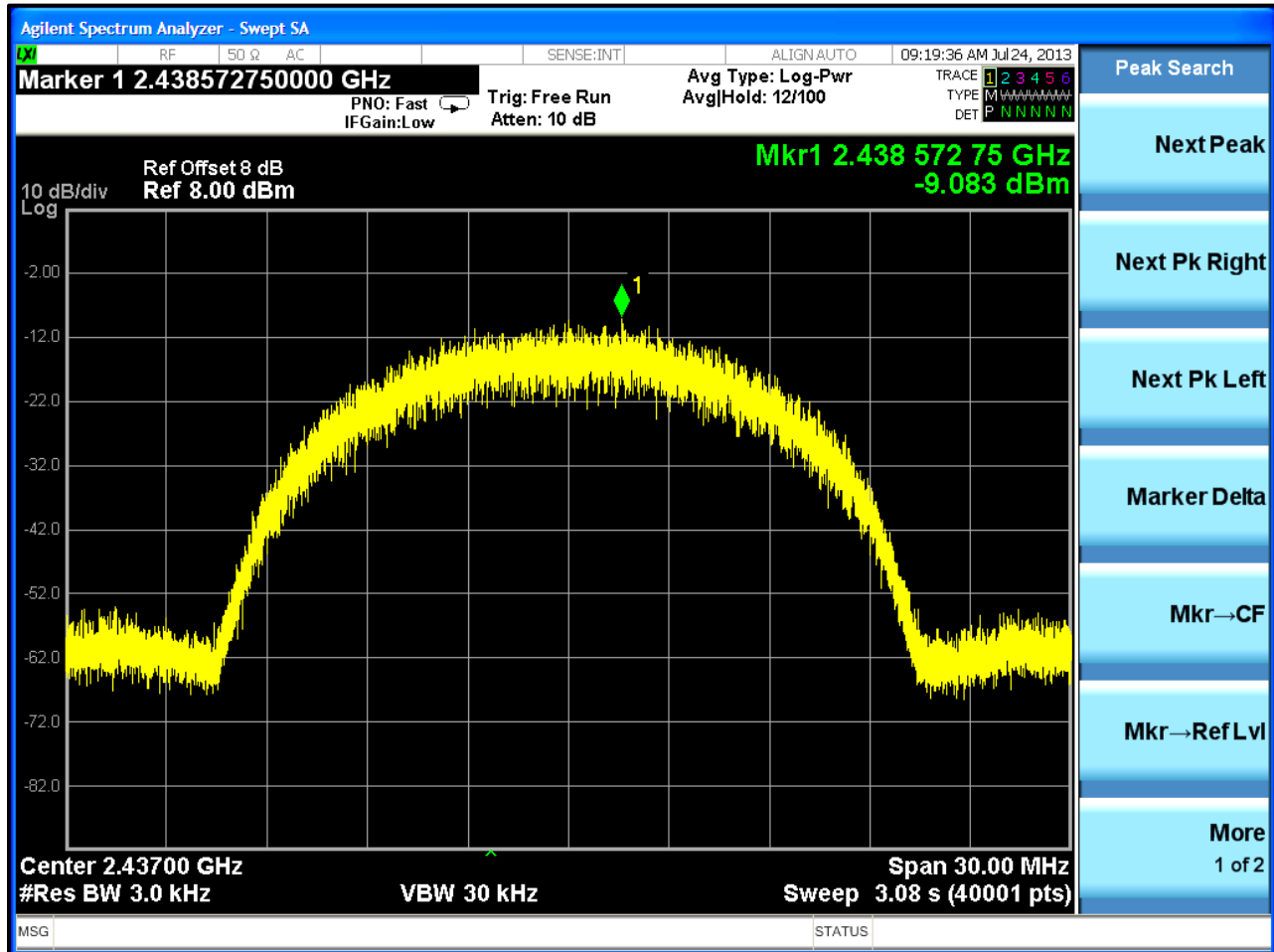
Plot 7-3: Power Spectral Density: Channel 165 (5825 MHz); 802.11a (18 Mbps)



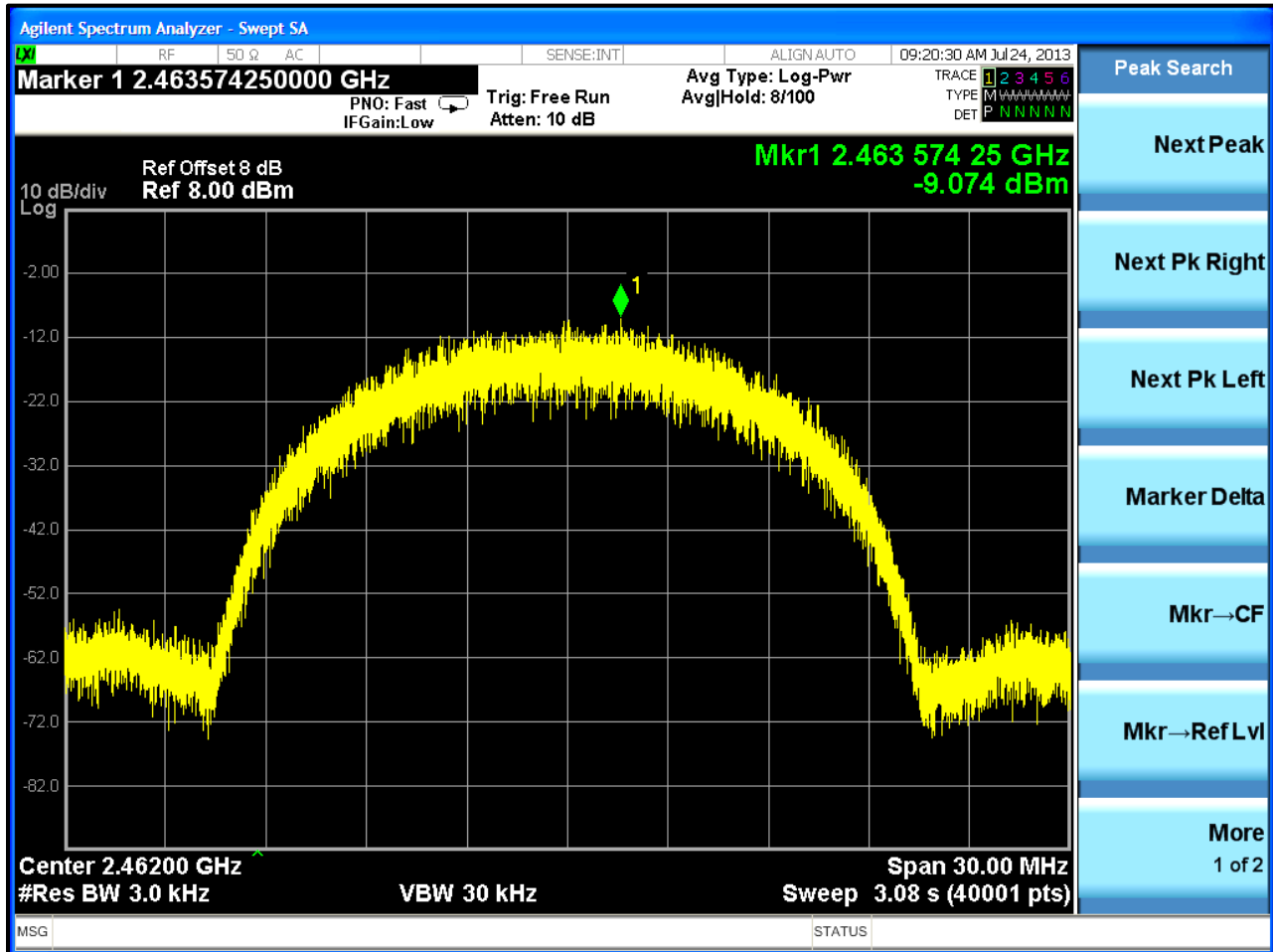
Plot 7-4: Power Spectral Density: Channel 1 (2412 MHz); 802.11b (11 Mbps)



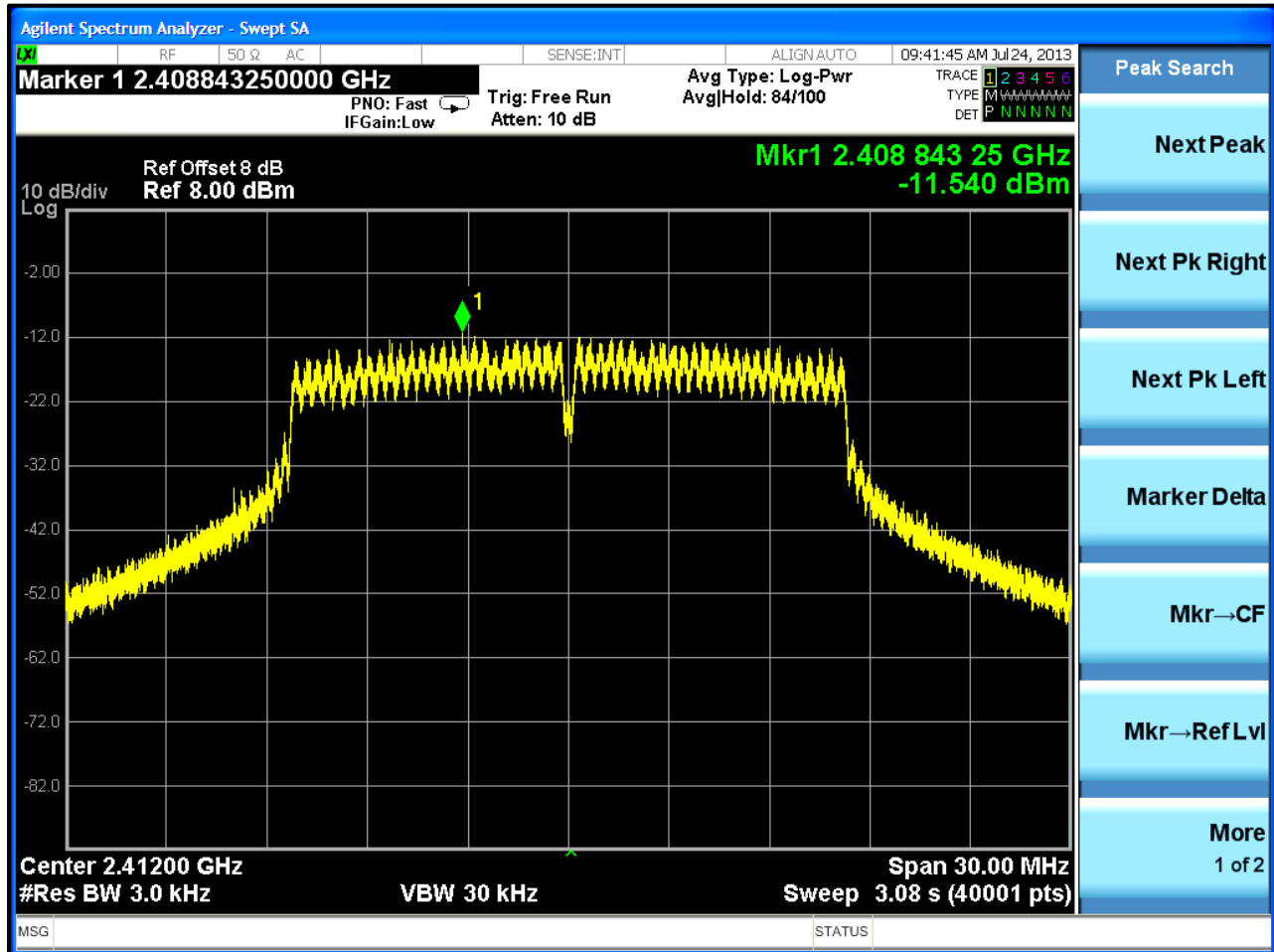
Plot 7-5: Power Spectral Density: Channel 6 (2437 MHz); 802.11b (11 Mbps)



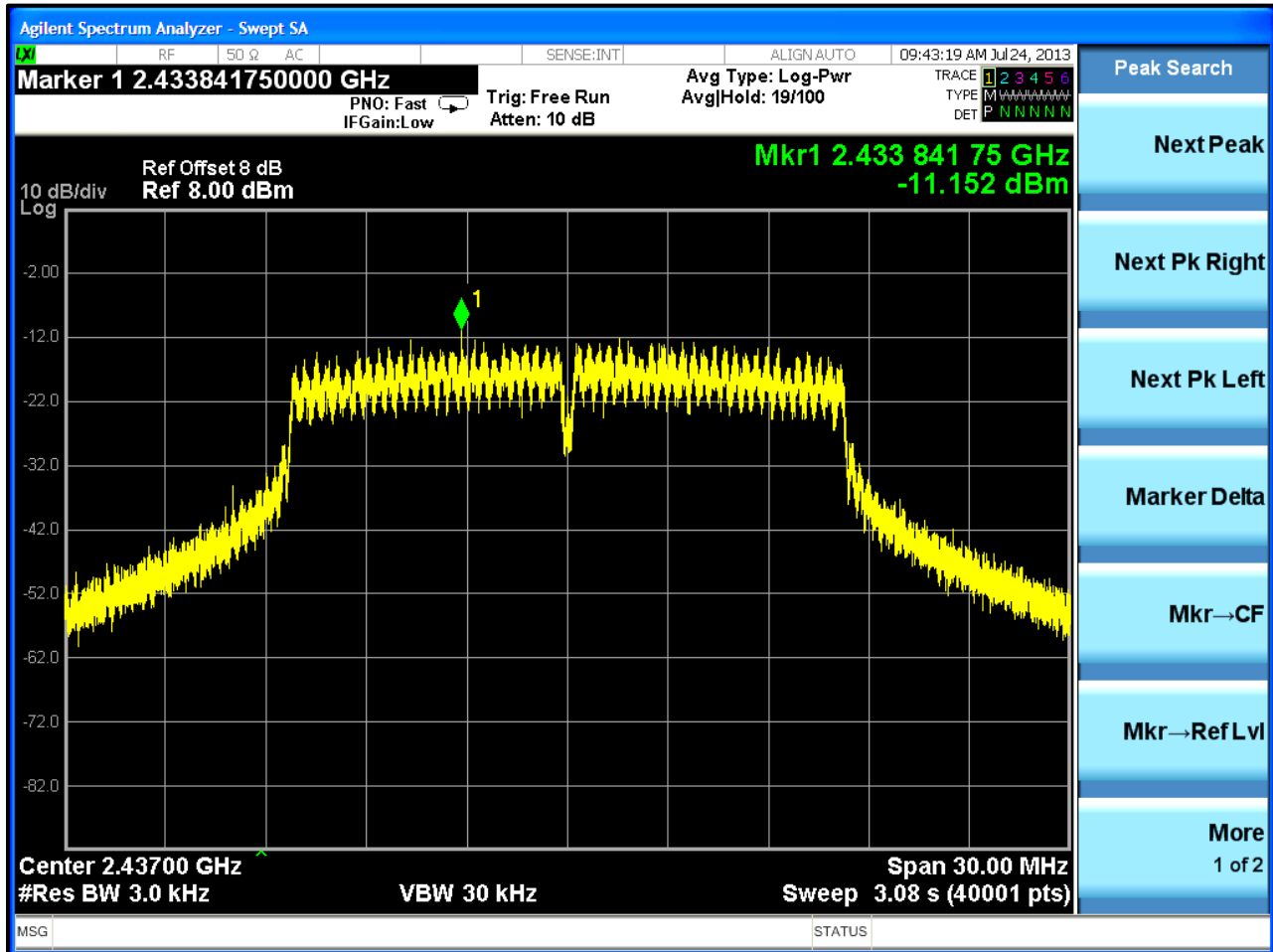
Plot 7-6: Power Spectral Density: Channel 11 (2462 MHz); 802.11b (11 Mbps)



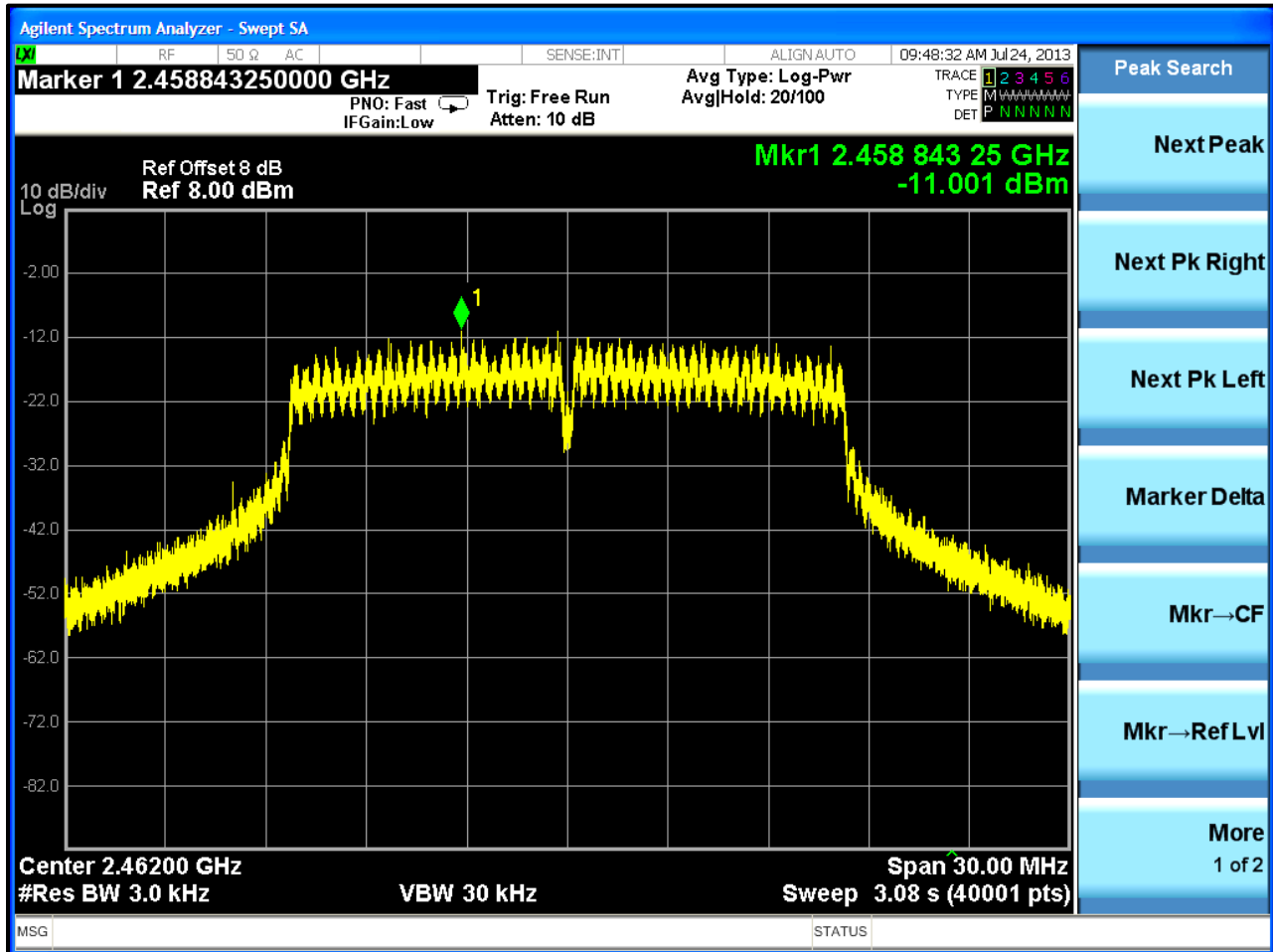
Plot 7-7: Power Spectral Density: Channel 1 (2412 MHz); 802.11g (18 Mbps)



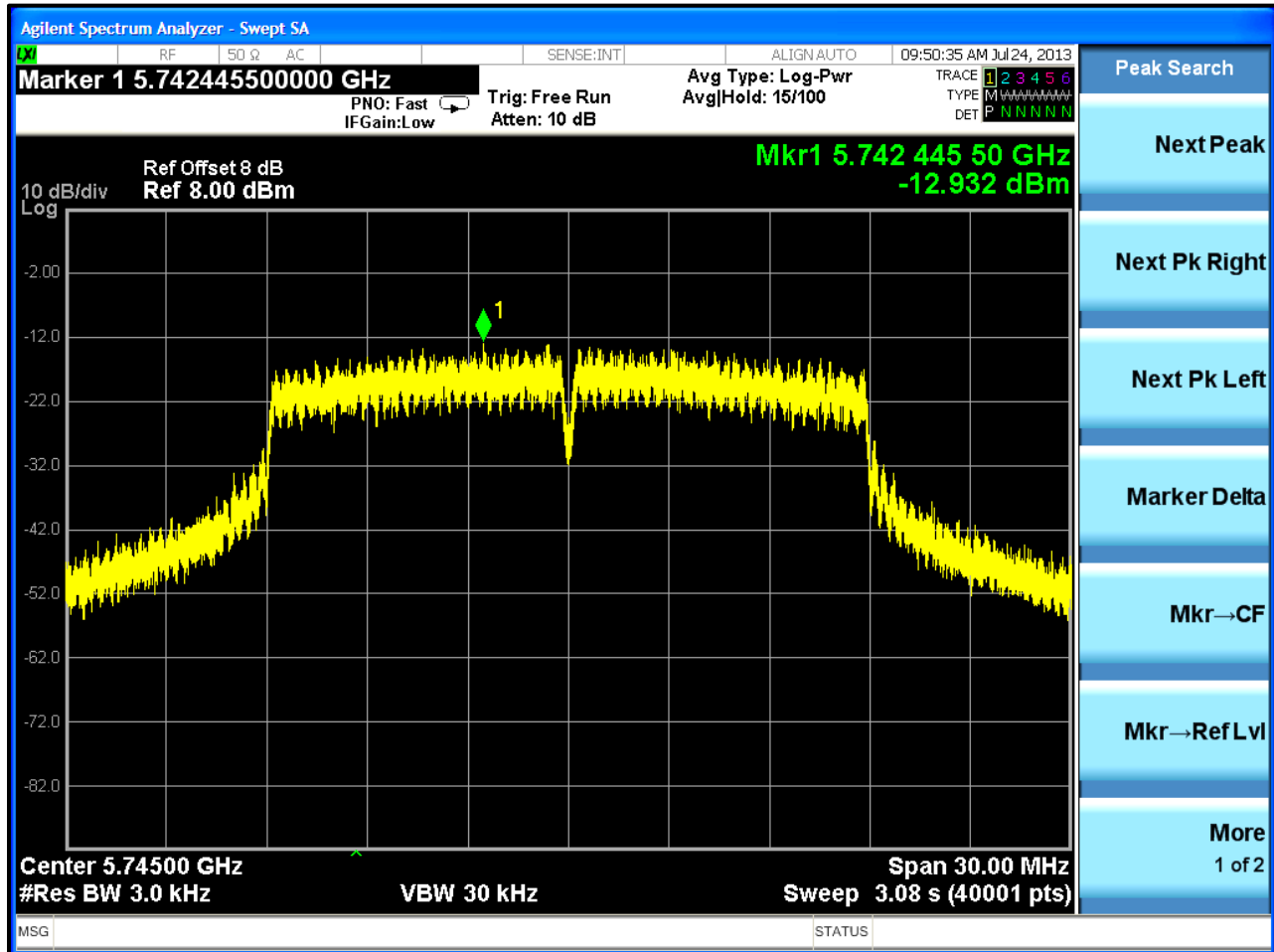
Plot 7-8: Power Spectral Density: Channel 6 (2437 MHz); 802.11g (18 Mbps)



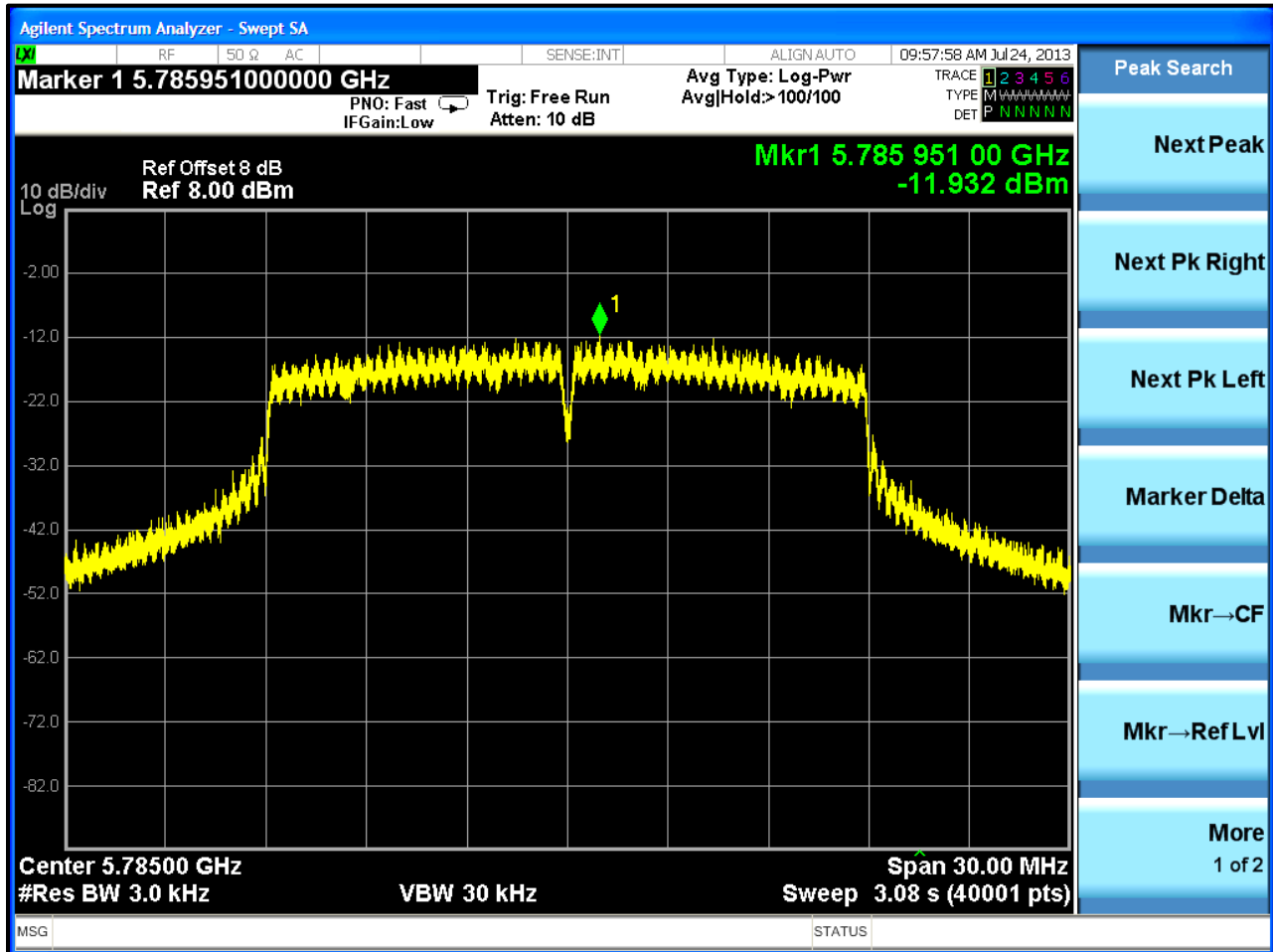
Plot 7-9: Power Spectral Density: Channel 11 (2462 MHz); 802.11g (18 Mbps)



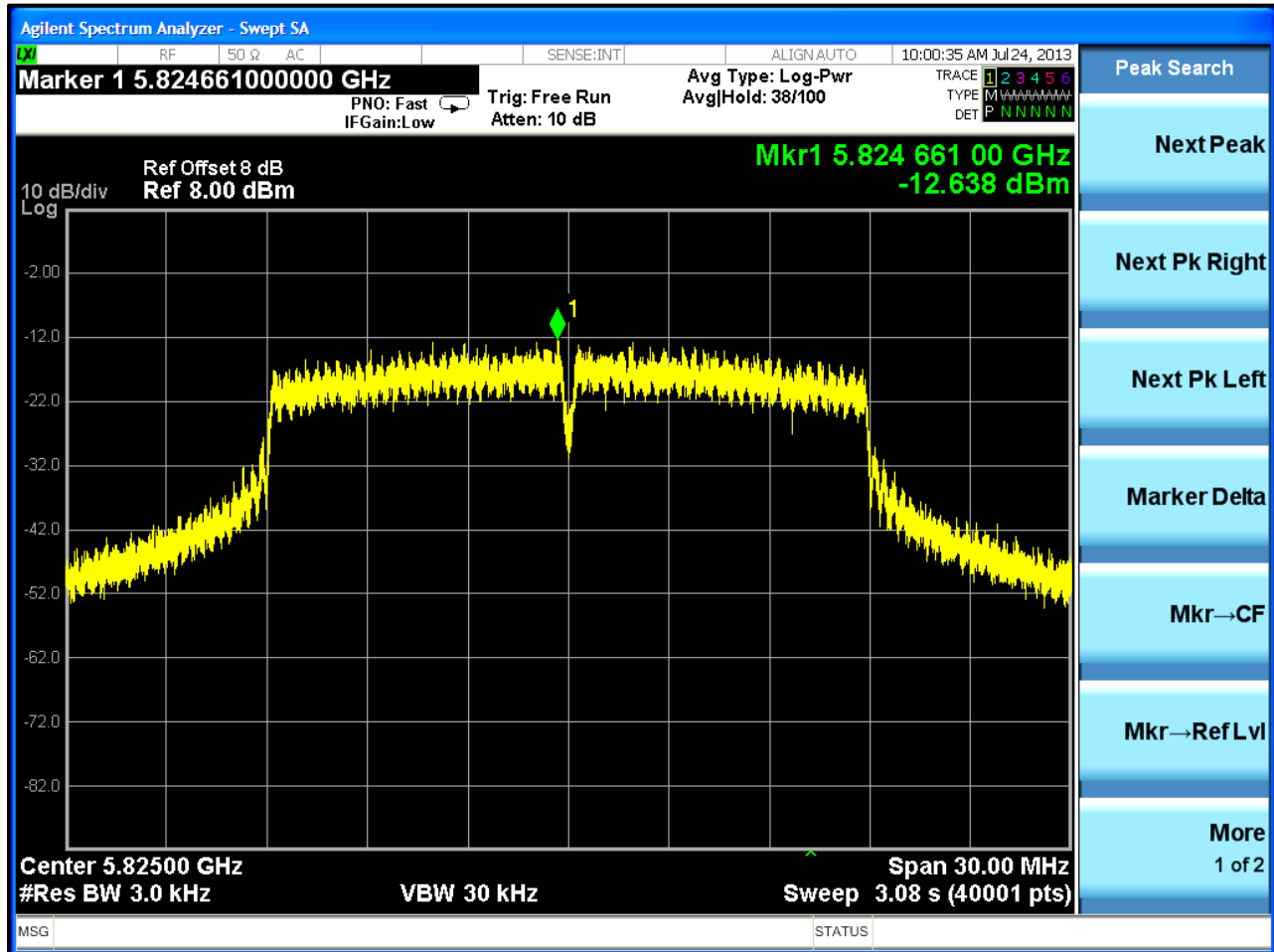
Plot 7-10: Power Spectral Density: Channel 149 (5745 MHz); 802.11n (14.4 Mbps)



Plot 7-11: Power Spectral Density: Channel 157 (5785 MHz); 802.11n (14.4 Mbps)



Plot 7-12: Power Spectral Density: Channel 165 (5825 MHz); 802.11n (14.4 Mbps)



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Daniel W. Baltzell

Signature

July 24, 2013
 Date of Test

8 Radiated Emissions – FCC 15.209; RSS-210 A8.5 and RSS-Gen

8.1 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.

8.2 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 10th harmonic of the highest fundamental transmitter frequency (24.8 GHz) for the 2.4 GHz band and 40 GHz for the 5 GHz band.

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 8-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Antenna (Loop, 9 kHz-30 MHz)	827525/019	10/1/13
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1-26.5 GHz)	3008A00505	8/10/13
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40 dB (30 MHz–2 GHz)	1006	8/20/13
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901592	Insulated Wire Inc.	KPS-1503-3600-KPR	SMK RF Cables 20'	NA	8/16/13
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/16/13
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900772	EMCO	3161-02	Horn Antenna (2-4 GHz)	9804-1044	4/19/14
900321	EMCO	3161-03	Horn Antennas (4-8,2 GHz)	9508-1020	4/19/14
900323	EMCO	3160-7	Horn Antennas (8,2-12,4 GHz)	9605-1054	4/19/14
900356	EMCO	3160-08	Horn Antenna (12.4-18 GHz)	9607-1044	4/19/14
900325	EMCO	3160-9	Horn Antennas (18-26.5 GHz)	9605-1051	4/19/14
901303	EMCO	3160-10	Horn Antenna 26.5-40.0 GHz WR-28	960452-007	1/23/14
900791	Chase	CBL6111B	Bilog Antenna (30 MHz–2000 MHz)	N/A	2/2/14
901583	Agilent Technologies	N9010A	EXA Signal Analyzer (10 Hz-26.5 GHz)	MY51250846	4/16/14
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz–6.5 GHz)	3325A00159	9/20/13
900914	Hewlett Packard	85460A	RF Filter Section (100 kHz-6.5 GHz)	3330A00107	9/20/13

8.3 Radiated Emissions Test Results

8.3.1 Radiated Emissions Digital/Receiver Test Data

Table 8-2: Digital/Receiver Radiated Emissions

Temperature: 87°F						Humidity: 87%				
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
30.307	Qp	H	0	1.0	30.4	-15.0	15.4	40.0	-24.6	Pass
32.941	Qp	H	0	1.0	30.1	-16.3	13.8	40.0	-26.2	Pass
35.574	Qp	V	0	1.0	35.0	-17.6	17.4	40.0	-22.6	Pass
40.680	Qp	H	0	1.0	32.7	-20.1	12.6	40.0	-27.4	Pass
55.330	Qp	H	0	1.0	40.2	-24.6	15.6	40.0	-24.4	Pass
81.670	Qp	H	0	1.0	34.8	-24.4	10.4	40.0	-29.6	Pass
144.000	Qp	V	0	1.0	40.4	-21.2	19.2	43.5	-24.3	Pass
499.200	Qp	V	0	1.0	37.6	-12.5	25.1	46.0	-20.9	Pass

Test Personnel:

Daniel W. Baltzell
Test Engineer


Signature

July 11, 2013
Date of Test

8.3.2 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11b)

Table 8-3: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz)

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)
4824.0	53.0	40.3	-1.1	39.2	54.0	-14.8
12060.0	37.7	26.0	10.2	36.2	54.0	-17.8
14472.0	38.4	27.5	14.7	42.2	54.0	-11.8
19296.0	32.8	19.4	20.5	39.9	54.0	-14.1

Table 8-4: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz)

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	47.9	38.4	-1.0	37.4	54.0	-16.6
7311.0	51.9	37.2	0.9	38.1	54.0	-15.9
12185.0	38.5	24.9	11.1	36.0	54.0	-18.0
19496.0	31.0	19.4	20.2	39.6	54.0	-14.4

Table 8-5: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz)

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)
4924.0	51.1	38.1	-1.0	37.1	54.0	-16.9
7386.0	50.7	37.2	1.0	38.2	54.0	-15.8
12310.0	38.0	23.6	12.0	35.6	54.0	-18.4
19696.0	33.7	19.3	20.4	39.7	54.0	-14.3
22158.0	33.8	19.5	21.9	41.4	54.0	-12.6
24620.0	34.8	20.1	21.8	41.9	54.0	-12.1

8.3.3 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11g)

Table 8-6: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz)

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)
4824.0	51.0	38.3	-1.1	37.2	54.0	-16.8
12060.0	37.3	25.9	10.2	36.1	54.0	-17.9
14472.0	41.1	27.3	14.7	42.0	54.0	-12.0
19296.0	39.9	19.2	20.5	39.7	54.0	-14.3

Table 8-7: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz)

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	52.7	38.1	-1.0	37.1	54.0	-16.9
7311.0	51.4	37.0	0.9	37.9	54.0	-16.1
12185.0	38.1	24.9	11.1	36.0	54.0	-18.0
19496.0	33.8	19.2	20.2	39.4	54.0	-14.6

Table 8-8: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz)

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)
4924.0	51.7	38.6	-1.0	37.6	54.0	-16.4
7386.0	52.9	36.9	1.0	37.9	54.0	-16.1
12310.0	37.5	23.3	12.0	35.3	54.0	-18.7
19696.0	33.1	19.3	20.4	39.7	54.0	-14.3
22158.0	34.0	19.6	21.9	41.5	54.0	-12.5
24620.0	34.0	20.0	21.8	41.8	54.0	-12.2

8.3.4 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11n)

Table 8-9: Radiated Emissions Harmonics/Spurious Channel 1 (TX Frequency: 2412 MHz)

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)
4824.0	43.9	30.7	-1.1	29.6	54.0	-24.4
12060.0	39.5	26.4	10.2	36.6	54.0	-17.4
14472.0	40.0	27.4	14.7	42.1	54.0	-11.9
19296.0	32.0	19.2	20.5	39.7	54.0	-14.3

Table 8-10: Radiated Emissions Harmonics/Spurious Channel 6 (TX Frequency: 2437 MHz)

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	43.3	30.5	-1.0	29.5	54.0	-24.5
7311.0	38.4	29.0	0.9	29.9	54.0	-24.1
12185.0	38.9	25.2	11.1	36.3	54.0	-17.7
19496.0	32.6	19.0	20.2	39.2	54.0	-14.8

Table 8-11: Radiated Emissions Harmonics/Spurious Channel 11 (TX Frequency: 2462 MHz)

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)
4924.0	45.1	30.3	-1.0	29.3	54.0	-24.7
7386.0	44.0	29.0	1.0	30.0	54.0	-24.0
12310.0	34.3	24.4	12.0	36.4	54.0	-17.6
19696.0	31.7	19.6	20.4	40.0	54.0	-14.0
22158.0	31.7	19.3	21.9	41.2	54.0	-12.8
24620.0	32.3	20.2	21.8	42.0	54.0	-12.0

8.3.5 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11a)

Table 8-12: Radiated Emissions Harmonics/Spurious Channel 149 (TX Frequency: 5745 MHz)

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)
11490.0	39.7	28.4	9.9	38.3	54.0	-15.7
22980.0	33.0	20.2	22.2	42.4	54.0	-11.6

Table 8-13: Radiated Emissions Harmonics/Spurious Channel 157 (TX Frequency: 5785 MHz)

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)
11570.0	41.6	27.8	9.9	37.7	54.0	-16.3

Table 8-14: Radiated Emissions Harmonics/Spurious Channel 165 (TX Frequency: 5825 MHz)

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)
11650.0	41.0	27.1	9.9	37.0	54.0	-17.0

8.3.6 Radiated Emissions Harmonics/Spurious Test Data - WLAN DSSS (802.11n)

Table 8-15: Radiated Emissions Harmonics/Spurious Channel 149 (TX Frequency: 5745 MHz)

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)
11490.0	39.7	28.3	9.9	38.2	54.0	-15.8
22980.0	33.3	19.3	22.2	41.5	54.0	-12.5

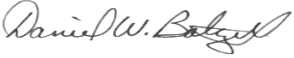
Table 8-16: Radiated Emissions Harmonics/Spurious Channel 157 (TX Frequency: 5785 MHz)

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)
11570.0	41.6	27.9	9.9	37.8	54.0	-16.2

Table 8-17: Radiated Emissions Harmonics/Spurious Channel 165 (TX Frequency: 5825 MHz)

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)
11650.0	41.0	27.1	9.9	37.0	54.0	-17.0

Test Personnel:

Daniel W. Baltzell		July 23, 2013
Test Engineer	Signature	Date of Test

9 Conclusion

The data in this measurement report shows that the EUT as tested, Vocollect, Inc. A700 Series Terminal Model #'s TAP910-01, TAP920-01, TAP930-01, FCC ID: MQO-TAP900-01, IC: 2570A-TAP90001, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and IC RSS-210 and RSS-Gen.