RF TEST REPORT

Test item	:	Notebook PC
Model No.	:	NP900X3F, NP900X3E
Order No.	:	DEMC1303-00944, DEMC1303-00945
Date of receipt	:	2013-03-11
Test duration	:	2013-04-01 ~ 2013-04-30
Date of issue	:	2013-05-03
Use of report	:	FCC & IC Original Grant

Applicant : Samsung Electronics Co Ltd
19 Chapin Rd., Building D Pine Brook, United States, NJ 07058

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 449-080, Korea

Test specification	:	FCC Part 15 Subpart C 247 KDB558074 v03r01 RSS-210 Issue 8: 2010
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer HyunSu Son	N/A	Technical Director Harvey Sung

Test Report Version

Test Report No.	Date	Description
DRTFCC1305-0431	May. 03, 2013	Initial issue

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1. GENERAL INFORMATION

Applicant	:	Samsung Electronics Co Ltd
Address	:	19 Chapin Rd., Building D Pine Brook, United States, NJ 07058
FCC ID	:	A3LNP900X3F
IC number	:	649E-NP900X3F
EUT	:	Notebook PC
Model	:	NP900X3F
Additional Model(s)	:	NP900X3E
Data of Test	:	2013-04-01 ~ 2013-04-30
Contact person	:	Sang Kyung Ra (Peter)

2. EUT DESCRIPTION

Product	Notebook PC
Model Name	NP900X3F, NP900X3E ※ 2 models are same mechanical, electrical and functional. ※ The only difference is the model name, which are changed for marketing purpose.
Power Supply	DC 7.5 V
Frequency Range	2.4GHz Band ▪ 802.11b/g/n(20MHz): 2412 ~ 2462 MHz ▪ 802.11n(40MHz): 2422~2452 MHz 5GHz Band ▪ 802.11a/n(20MHz): 5745~5825 MHz ▪ 802.11n(40MHz): 5755~5795 MHz
Max. RF Output Power	2.4GHz Band ▪ 802.11b: 18.67 dBm ▪ 802.11g: 26.36 dBm ▪ 802.11n (HT20): 26.92 dBm ▪ 802.11n (HT40): 27.00 dBm 5GHz Band ▪ 802.11a: 19.84 dBm ▪ 802.11n (HT20): 21.70 dBm ▪ 802.11n (HT40): 21.35 dBm
Modulation Type	802.11b: DSSS/CCK 802.11a/g/n: OFDM
Antenna Specification	PIFA Antenna (1TX/2RX : 802.11 b/g/a & 802.11n (MCS0 ~7), 2TX/2RX : 802.11n(MCS8 ~ 15)) ▪ 2.4GHz Band Max. peak gain Chain 0 : 1.28dBi, Chain 1 : -0.87dBi ▪ 5GHz Band Max. peak gain Chain 0 : 0.92dBi, Chain 1 : 3.12dBi

3. SUMMARY OF TESTS

FCC Part Section(s)	RSS Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Transmitter Mode (TX)					
15.247(a)	RSS-210 [A8.2]	6 dB Bandwidth	> 500 kHz	Conducted	**C**
15.247(b)	RSS-210 [A8.4]	Transmitter Output Power	< 1Watt		**C**
15.247(d)	RSS-210 [A8.5]	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW		**C**
15.247(e)	RSS-210 [A8.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz		**C**
-	RSS Gen [4.6.1]	Occupied Bandwidth (99%)	RSS-Gen 4.6.1		**C**
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	**C**
15.207	RSS-Gen [7.2.2]	AC Conducted Emissions	< FCC 15.207 limits	AC Line Conducted	**C**
15.203	-	Antenna Requirements	FCC 15.203	-	**C**

Note 1: **C**=Comply **NC**=Not Comply **NT**=Not Tested **NA**=Not Applicable

Note 2: This test item was performed in each axis and the worst case data was reported.

4. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz(ANSI C63.4-2009) and KDB558074

4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

4.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements of ANSI C63.4. (Version :2009), conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2009)

4.4 DESCRIPTION OF TEST MODES

The EUT has been tested with several operating conditions for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.

5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

6. FACILITIES AND ACCREDITATIONS

6.1 FACILITIES

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 683-3, Yubang-Dong, Yongin-Si, Gyunggi-Do, 449-080, South Korea. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number : 678747

6.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.
All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

7. ANTENNA REQUIREMENTS

According to FCC 47 CFR §15.203
“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

* The internal antennas of this E.U.T are permanently attached using the unique connectors.
* Therefore this E.U.T Complies with the requirement of §15.203

8. TEST RESULT

8.1 6dB Bandwidth

Test Requirements and limit, §15.247(a) & RSS-210 [A8.2]

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6dB bandwidth is 500 kHz.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074.

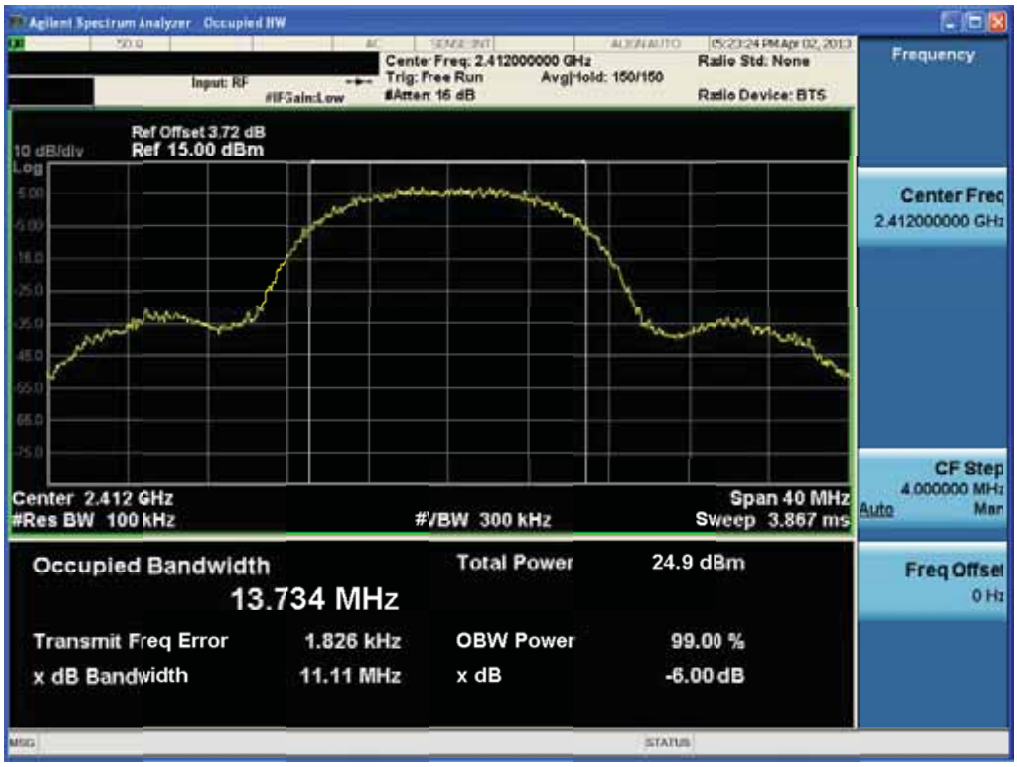
1. Set resolution bandwidth (RBW) = 100 KHz
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
   (RBW:100KHz/VBW:300KHz)
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

▣ TEST RESULTS: Comply

Test Mode	Data Rate	Frequency [MHz]	Test Results [MHz]	
			Chain 0	Chain 1
802.11b	11Mbps	2412	11.110	-
		2437	10.770	-
		2462	11.100	-
802.11g	24Mbps	2412	16.500	-
		2437	16.520	-
		2462	16.540	-
802.11n (20MHz)	MCS 8	2412	17.600	17.600
		2437	17.590	17.580
		2462	17.670	17.610
802.11n (40MHz)	MCS 8	2422	36.400	36.400
		2437	36.420	36.400
		2452	36.410	36.400
802.11a	24Mbps	5745	16.510	-
		5785	16.520	-
		5825	16.500	-
802.11n (20MHz)	MCS 8	5745	17.600	17.590
		5785	17.590	17.600
		5825	17.600	17.600
802.11n (40MHz)	MCS 11	5755	35.220	35.190
		5795	35.180	35.210

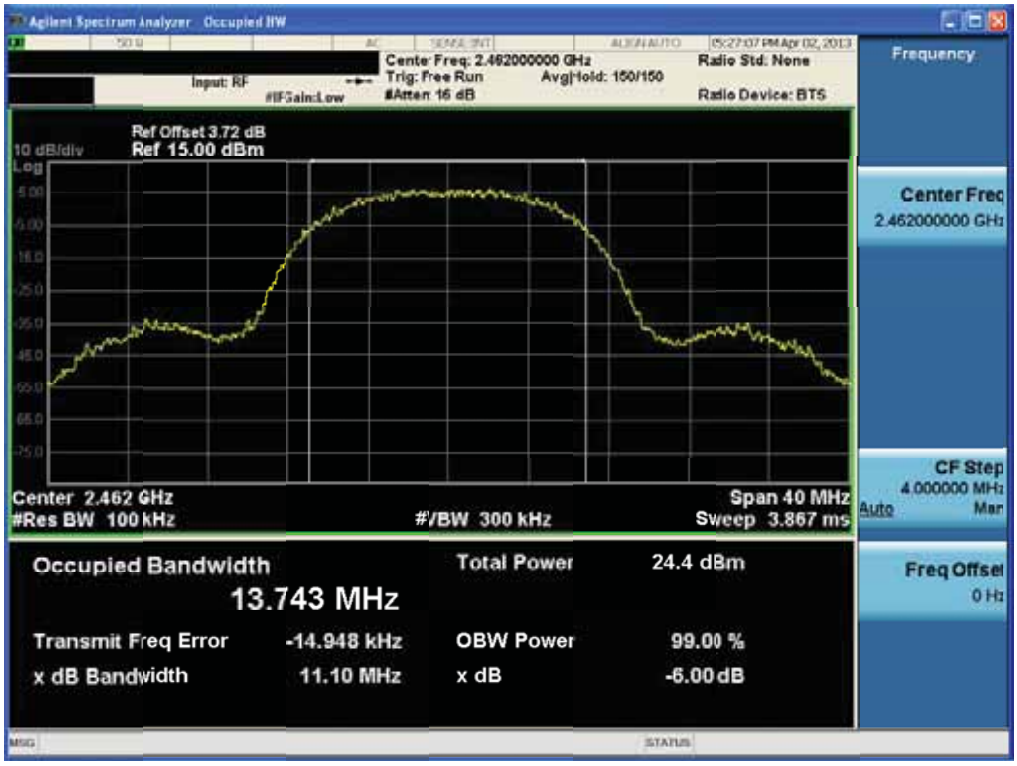
▣ RESULT PLOTS

6 dB Bandwidth Test Mode: Chain 0 & 802.11b & 11Mbps & 2412MHz

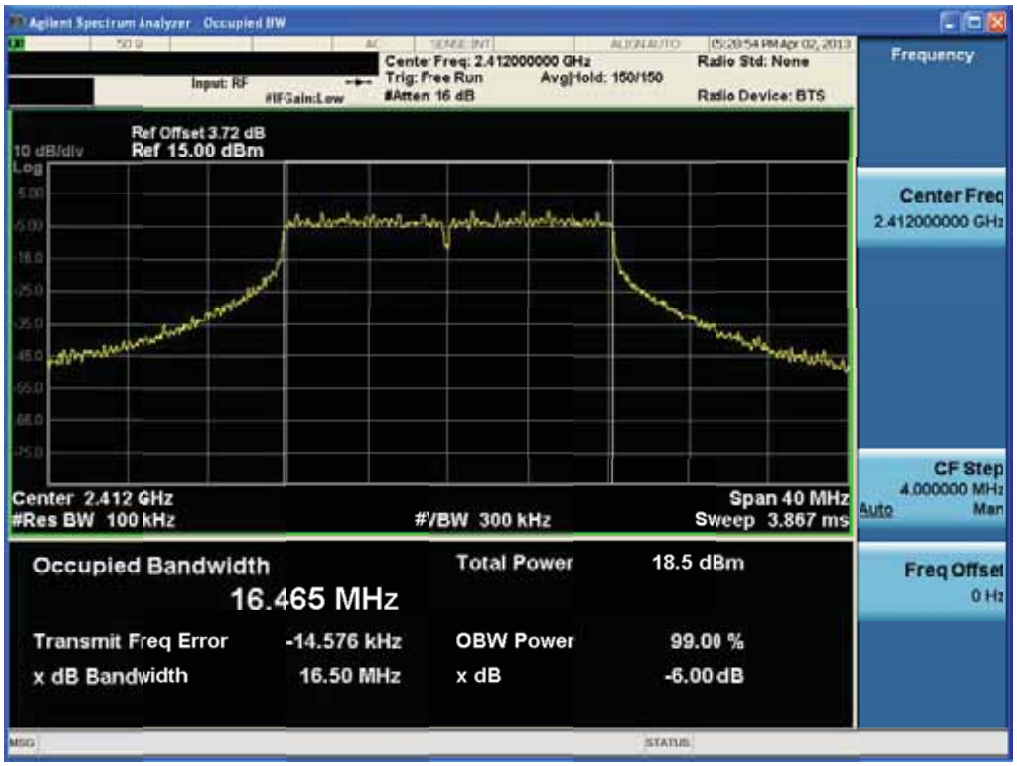


6 dB Bandwidth Test Mode: Chain 0 & 802.11b & 11Mbps & 2437MHz

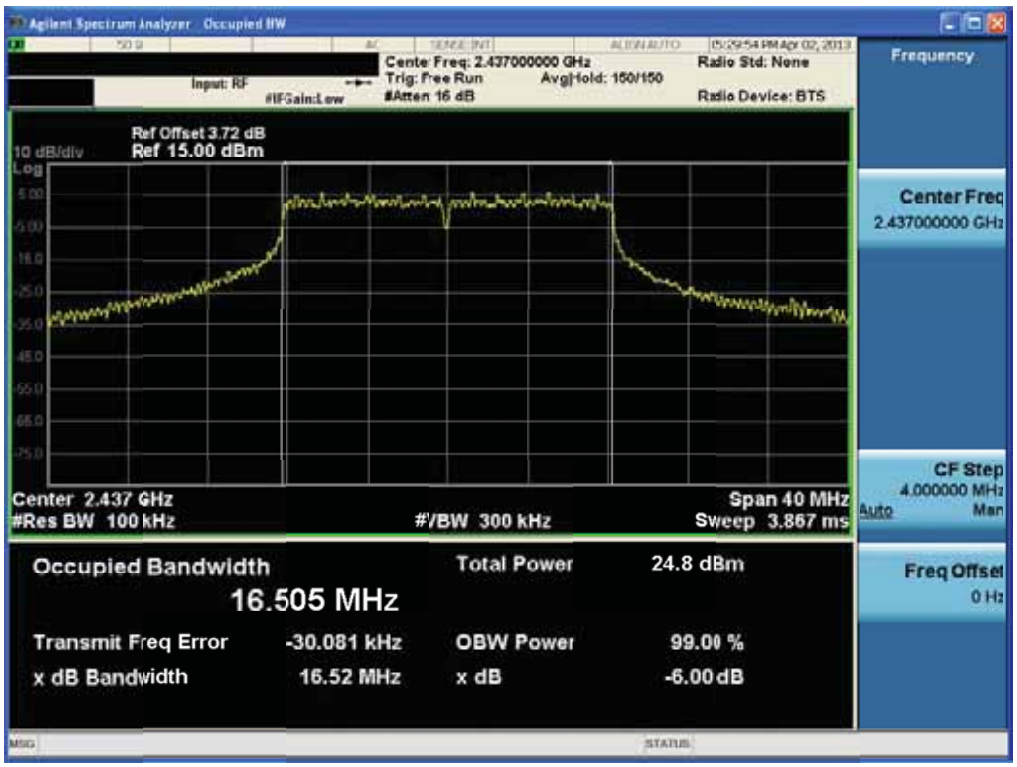
6 dB Bandwidth Test Mode: Chain 0 & 802.11b & 11Mbps & 2462MHz



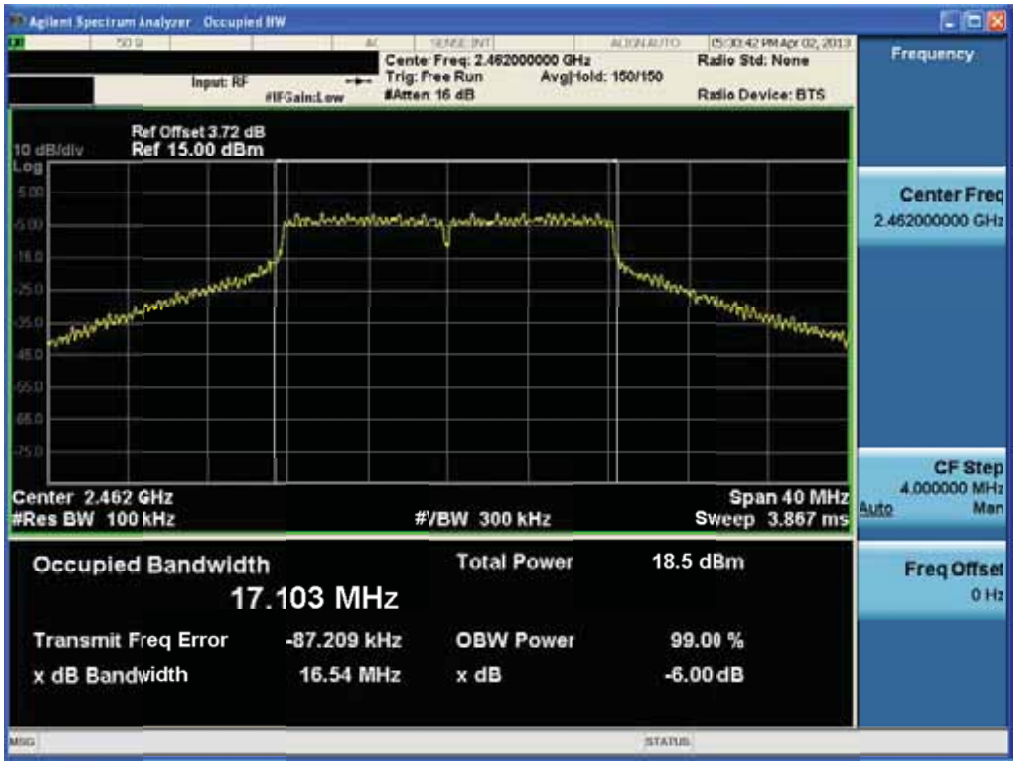
6 dB Bandwidth Test Mode: Chain 0 & 802.11g & 24Mbps & 2412MHz



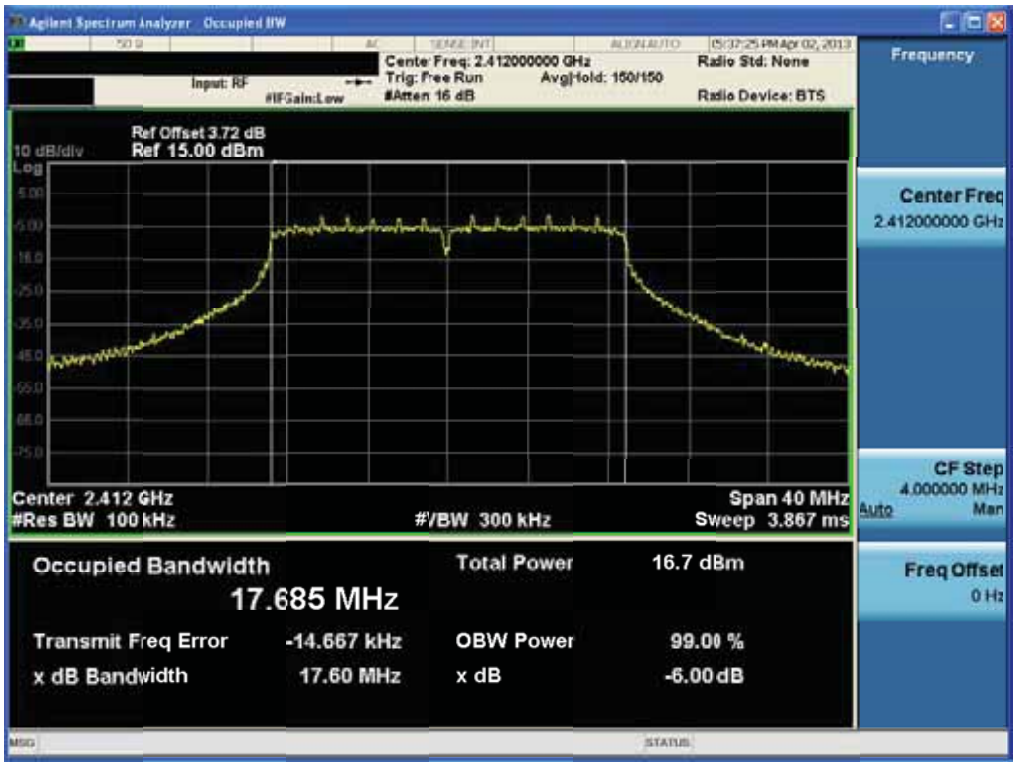
6 dB Bandwidth Test Mode: Chain 0 & 802.11g & 24Mbps & 2437MHz



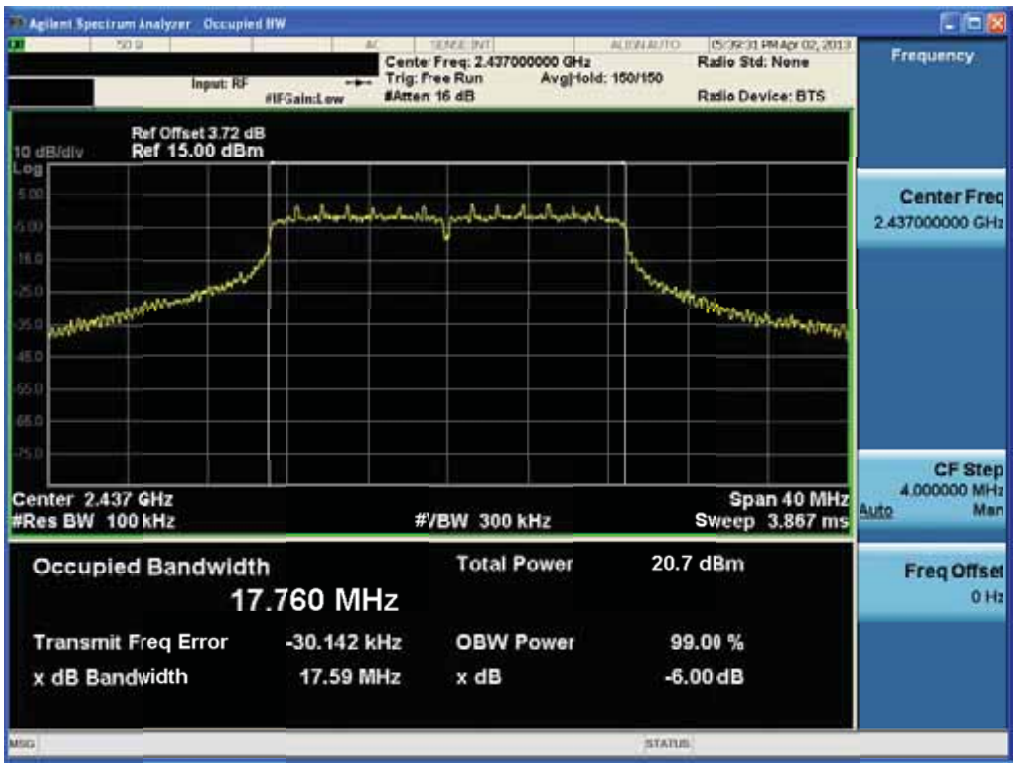
6 dB Bandwidth Test Mode: Chain 0 & 802.11g & 24Mbps & 2462MHz



6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 2412MHz

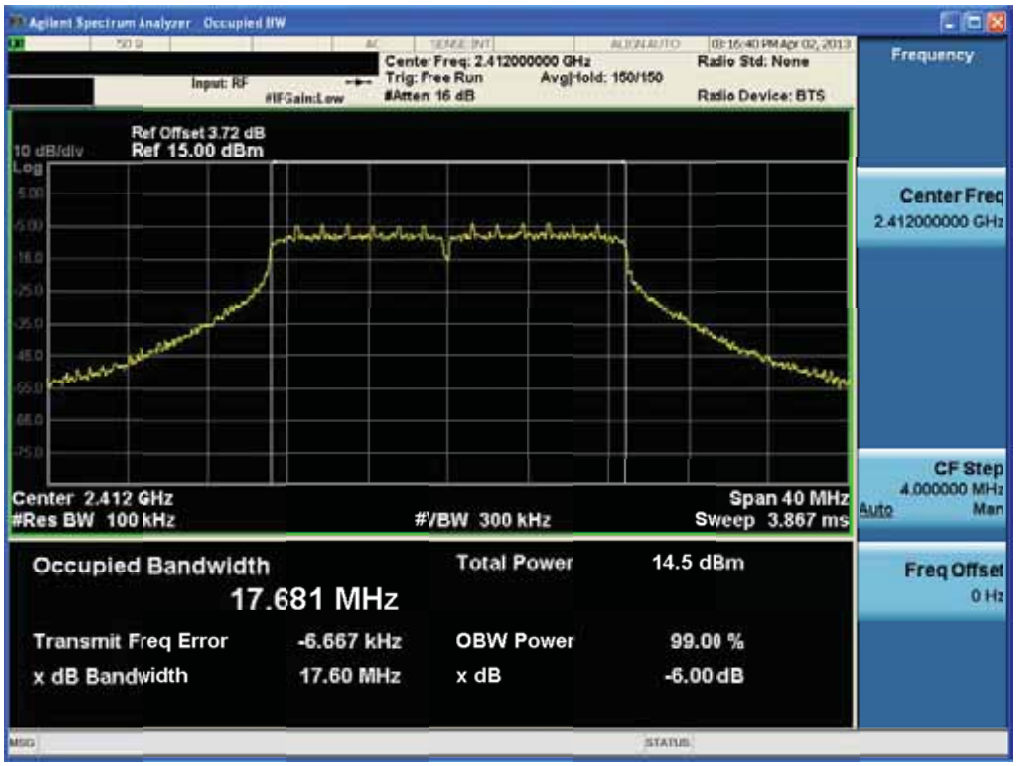


6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 2437MHz

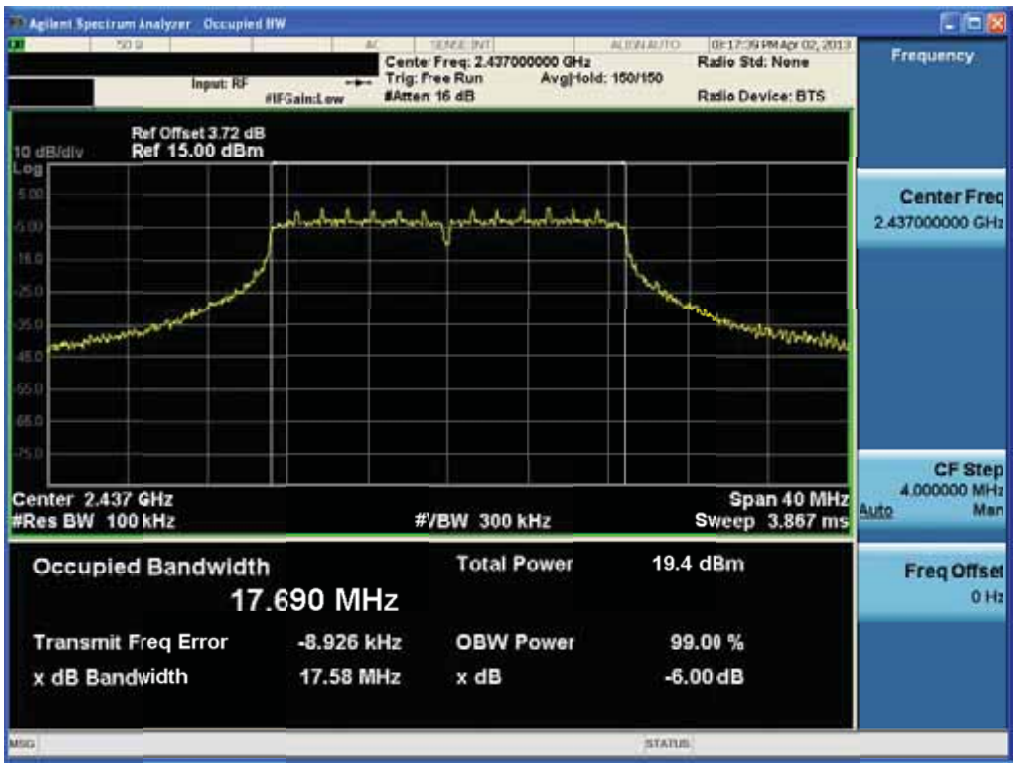


6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 2462MHz

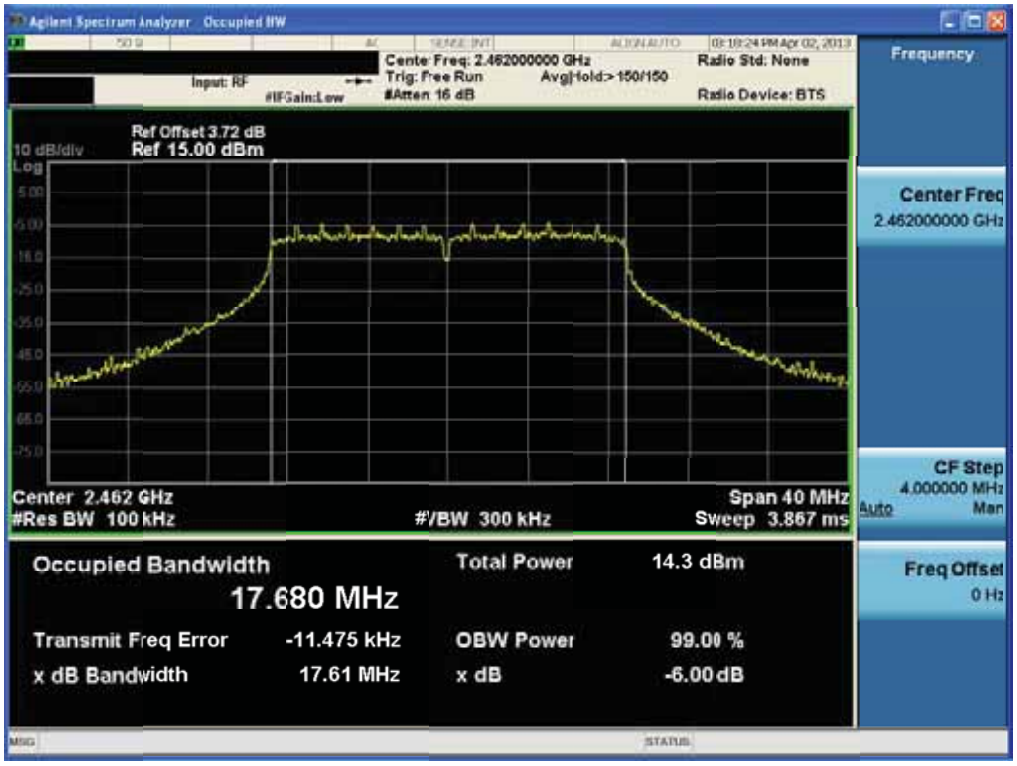
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 2412MHz



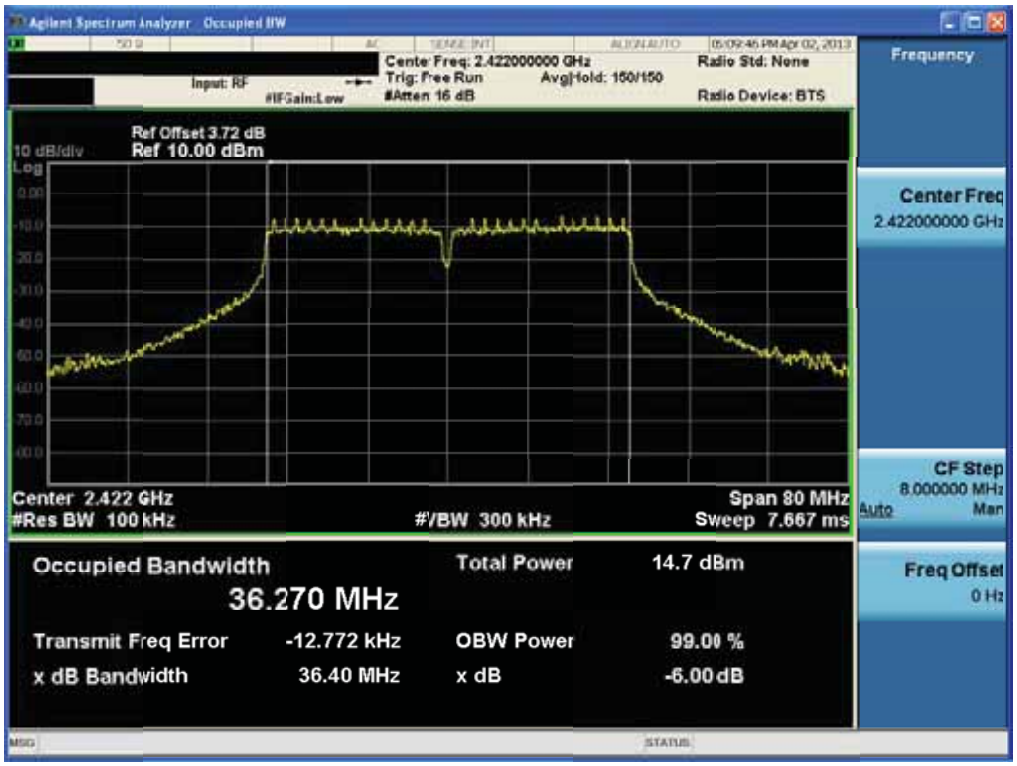
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 2437MHz



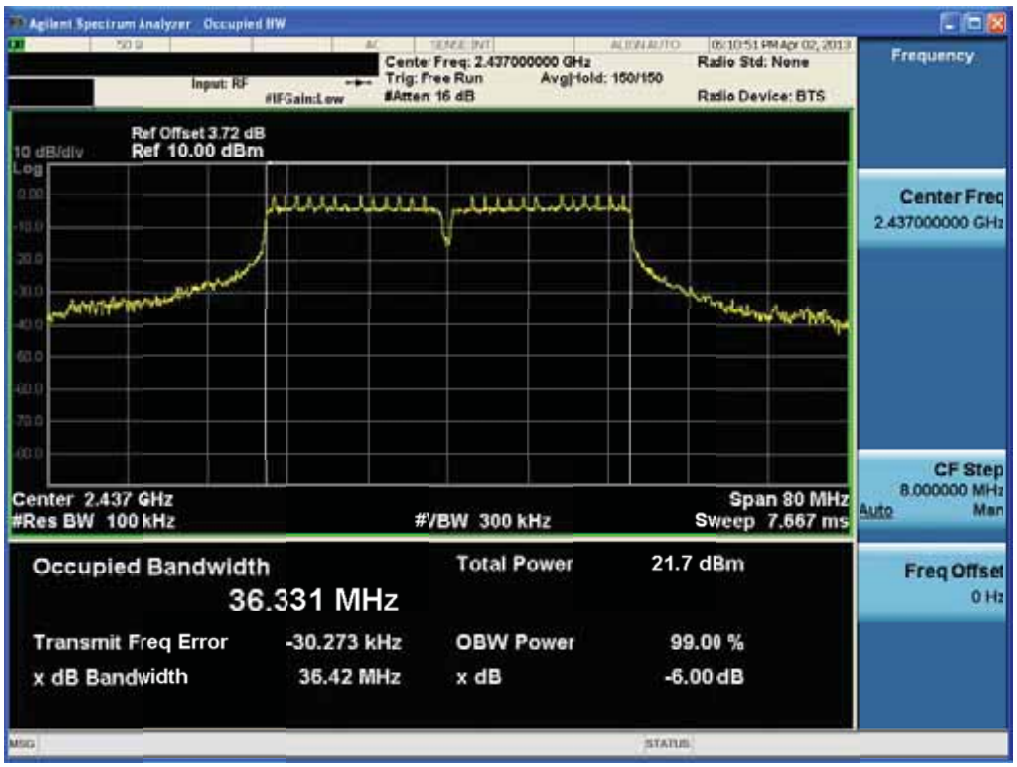
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 2462MHz



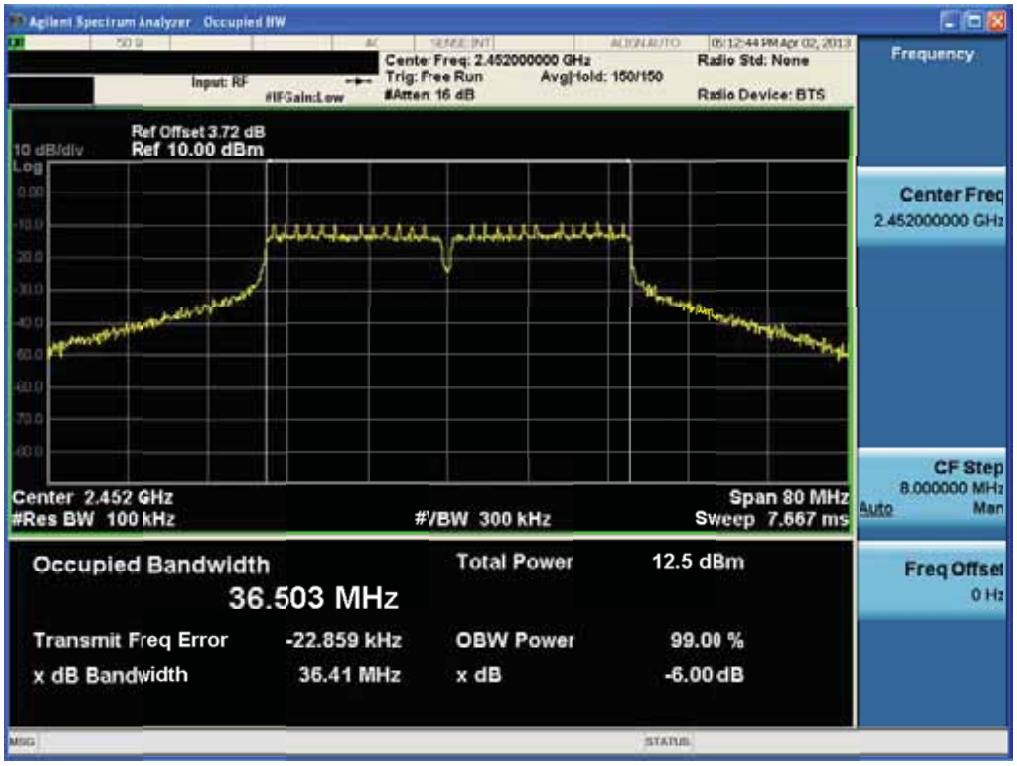
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 8 & 2422MHz



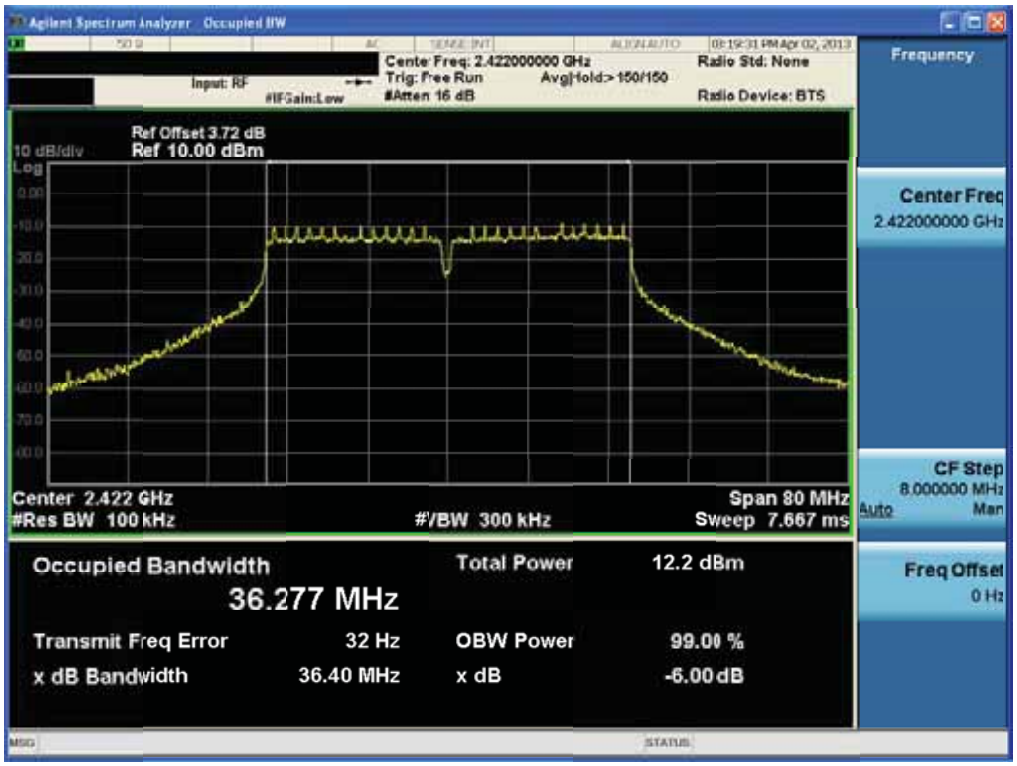
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 8 & 2437MHz



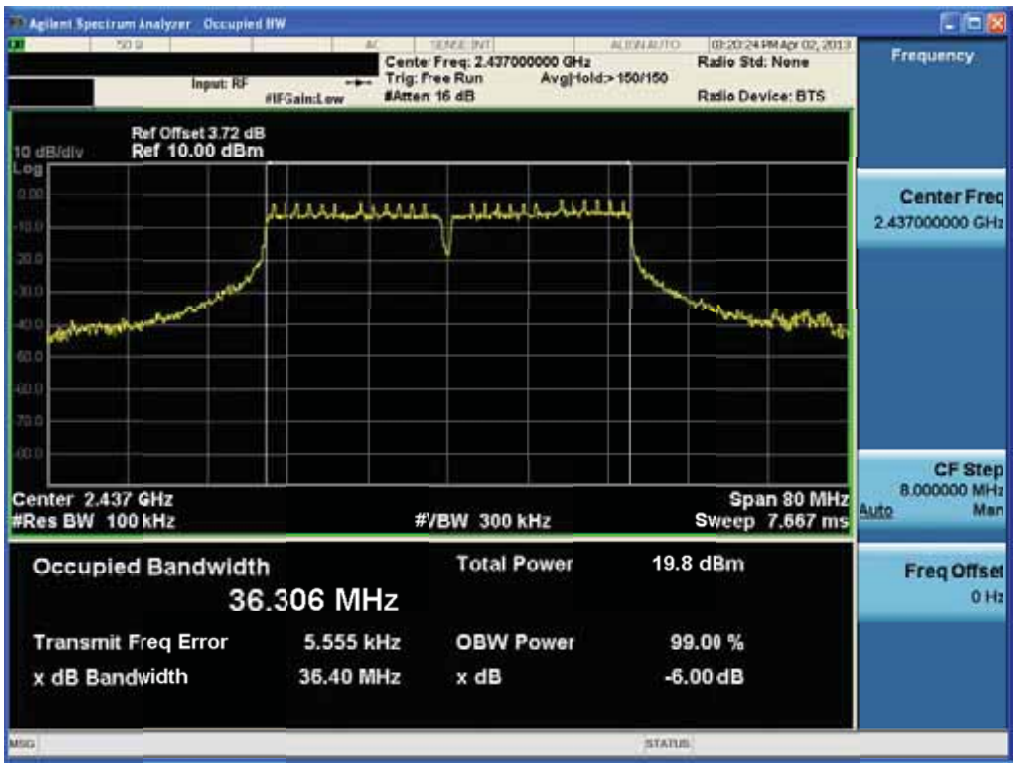
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 8 & 2452MHz



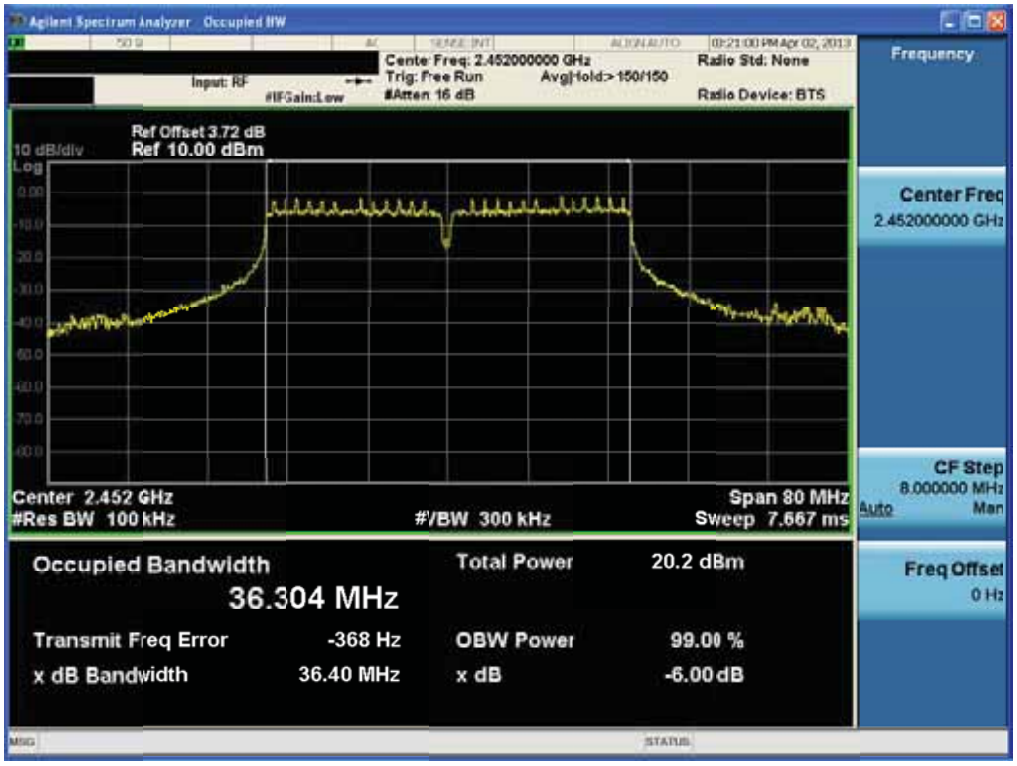
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 8 & 2422MHz



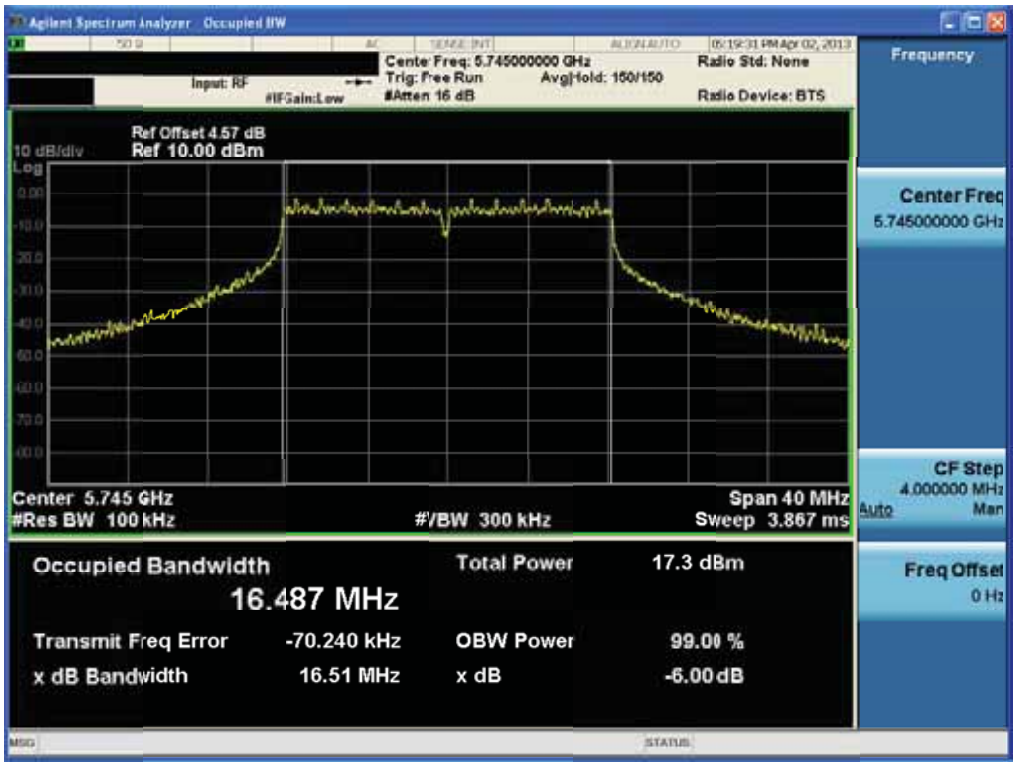
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 8 & 2437MHz



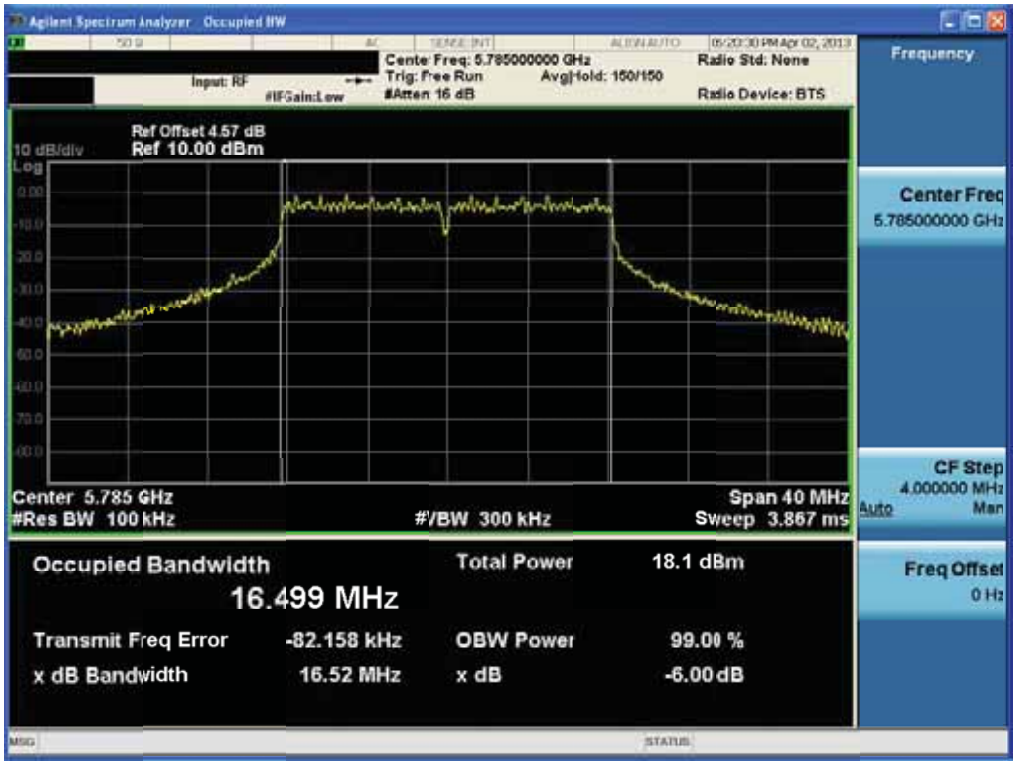
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 8 & 2452MHz



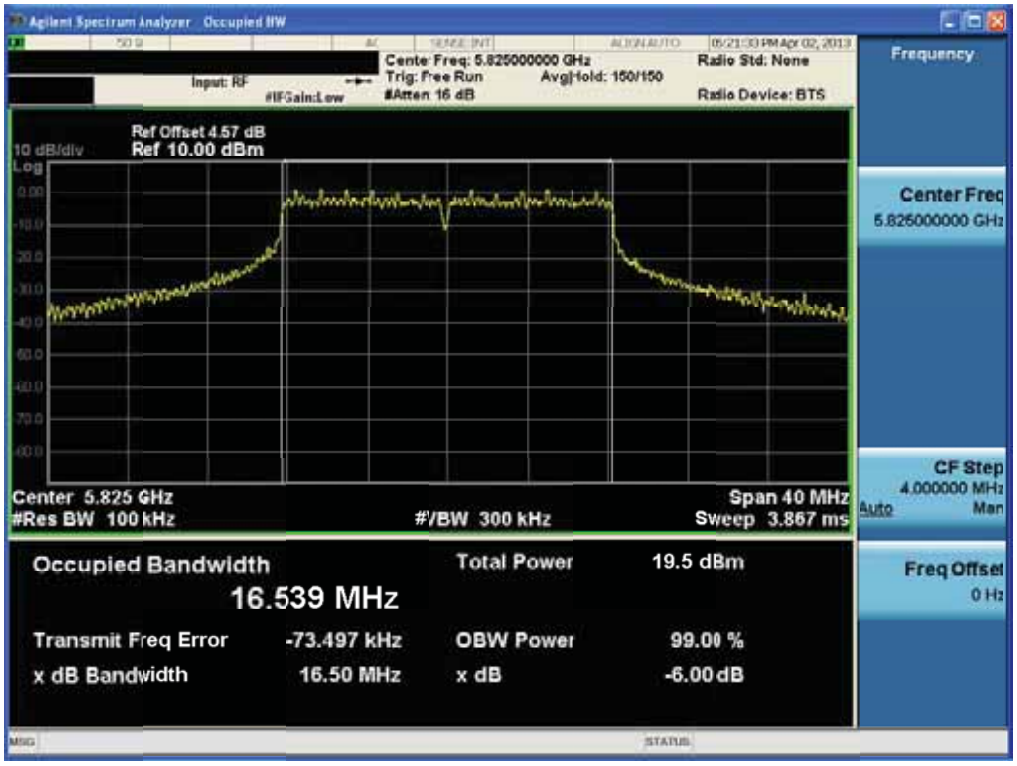
6 dB Bandwidth Test Mode: Chain 0 & 802.11a & 24Mbps & 5745MHz



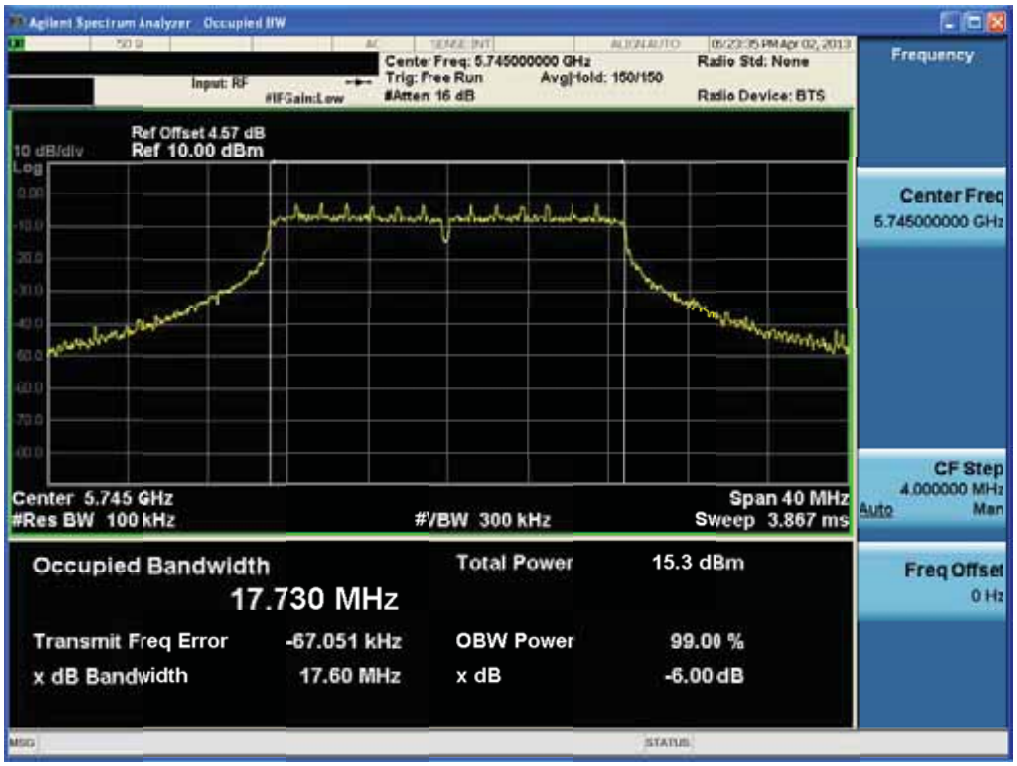
6 dB Bandwidth Test Mode: Chain 0 & 802.11a & 24Mbps & 5785MHz



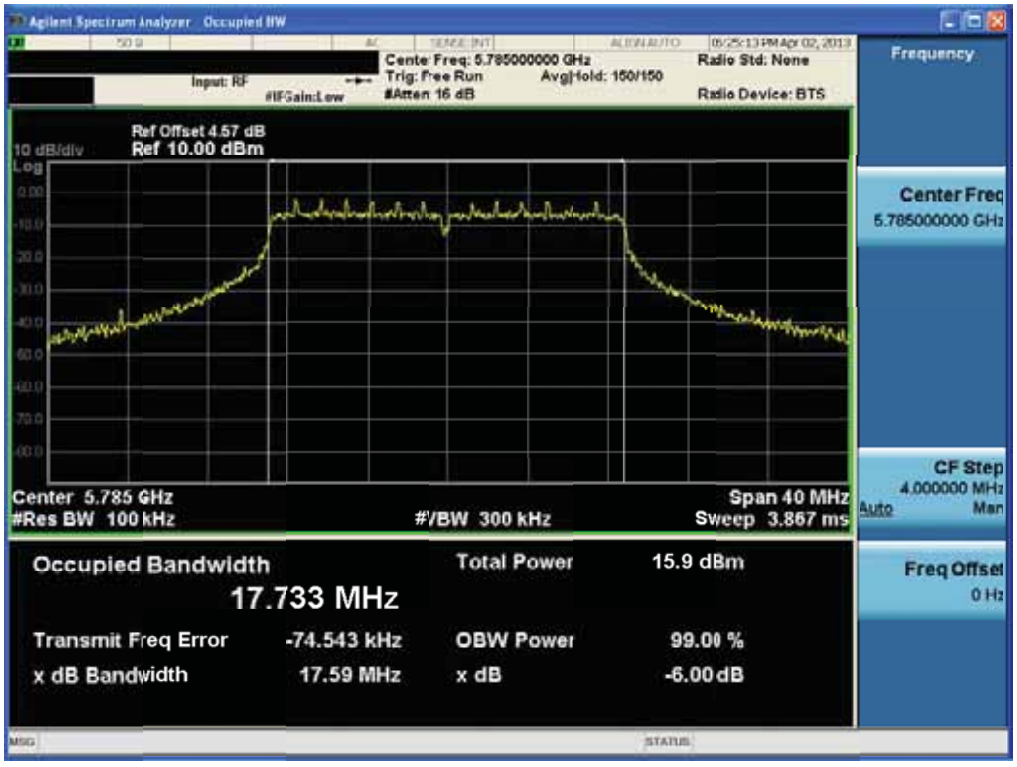
6 dB Bandwidth Test Mode: Chain 0 & 802.11a & 24Mbps & 5825MHz



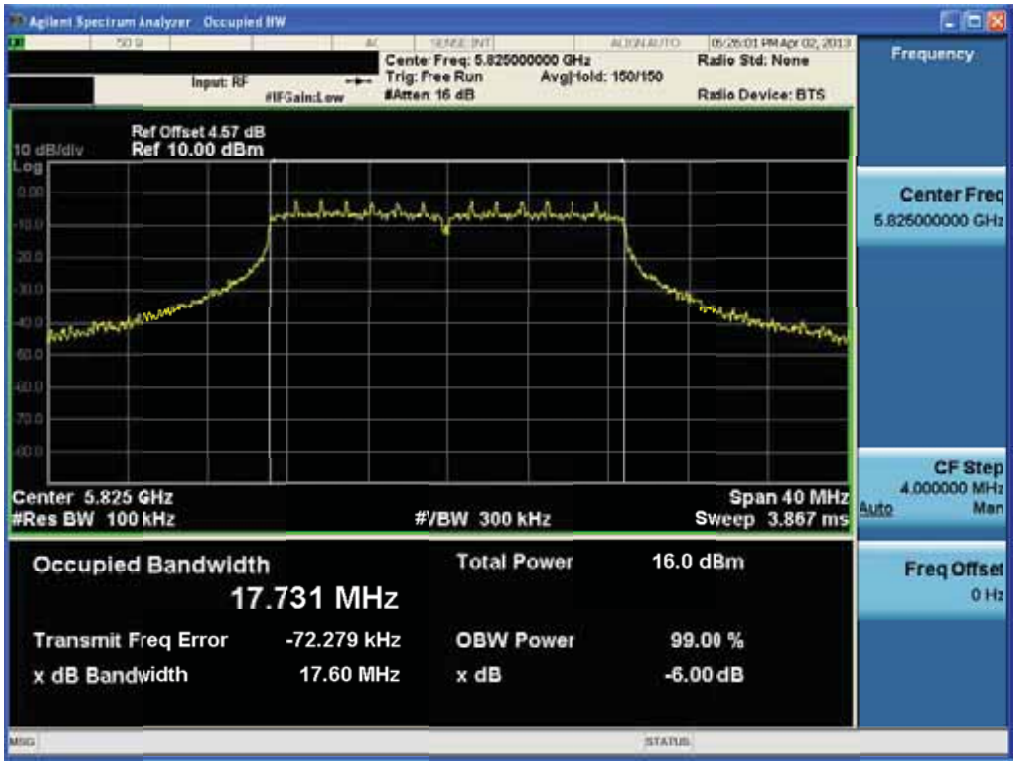
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 5745MHz



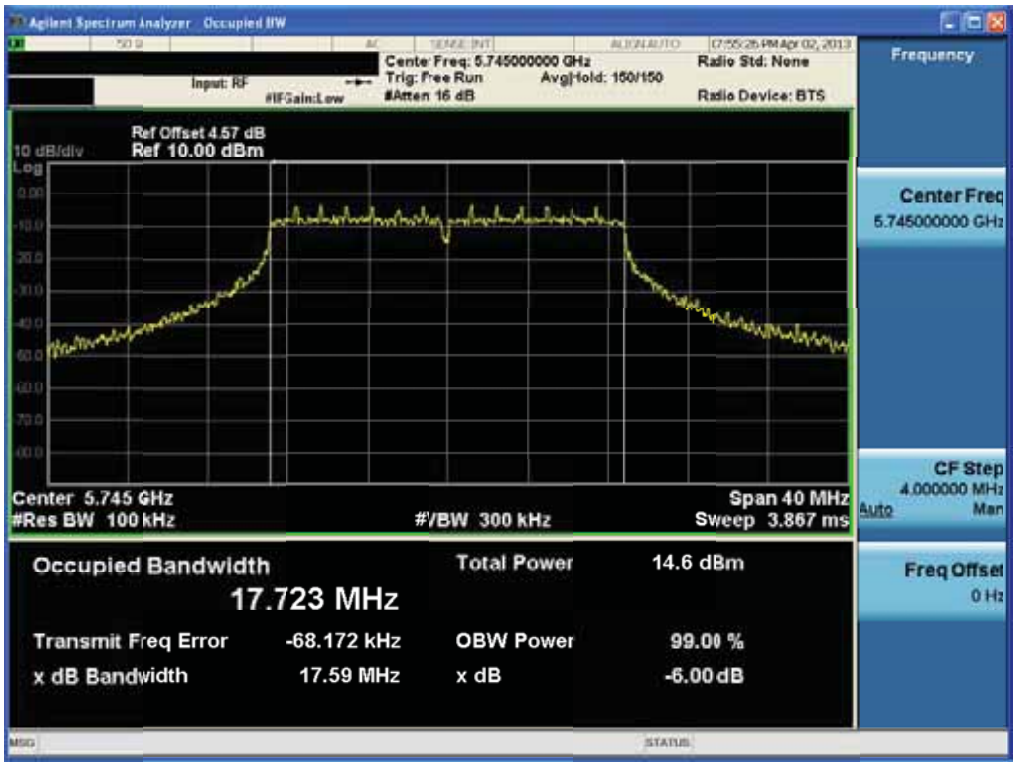
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 5785MHz



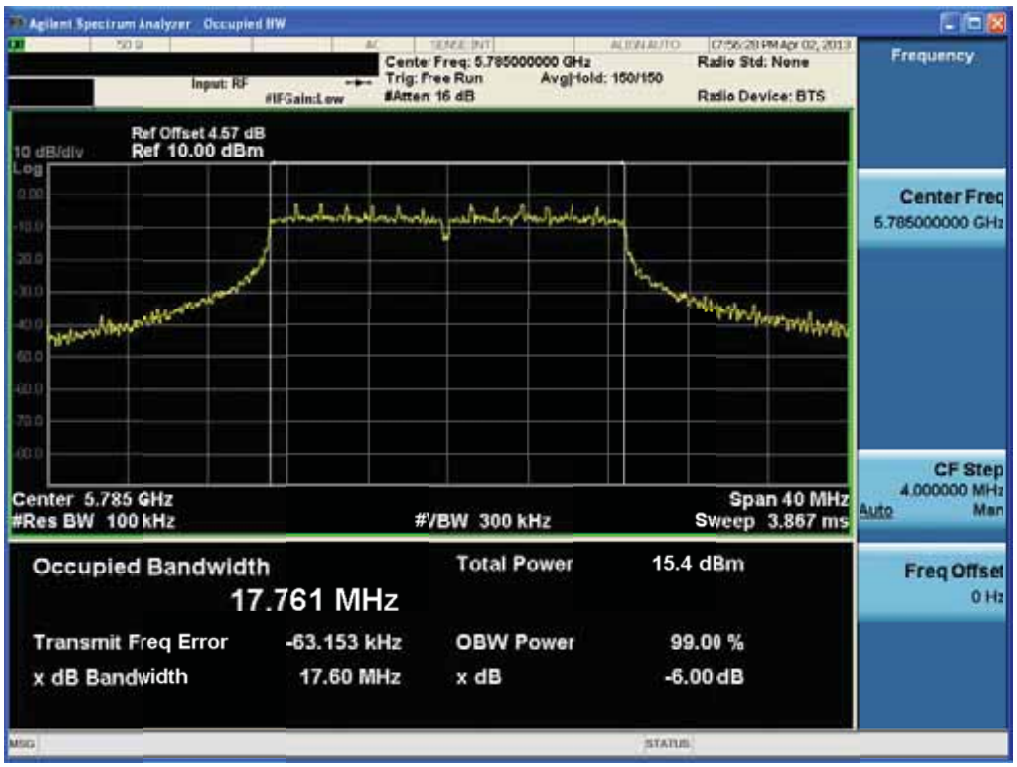
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 5825MHz



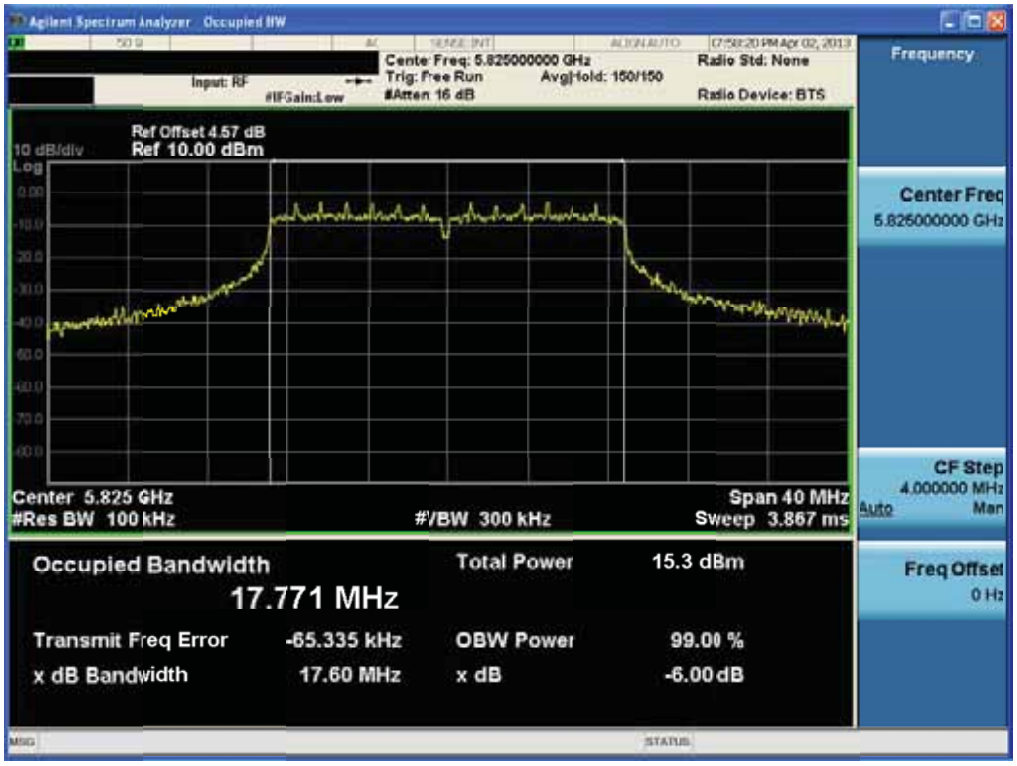
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 5745MHz



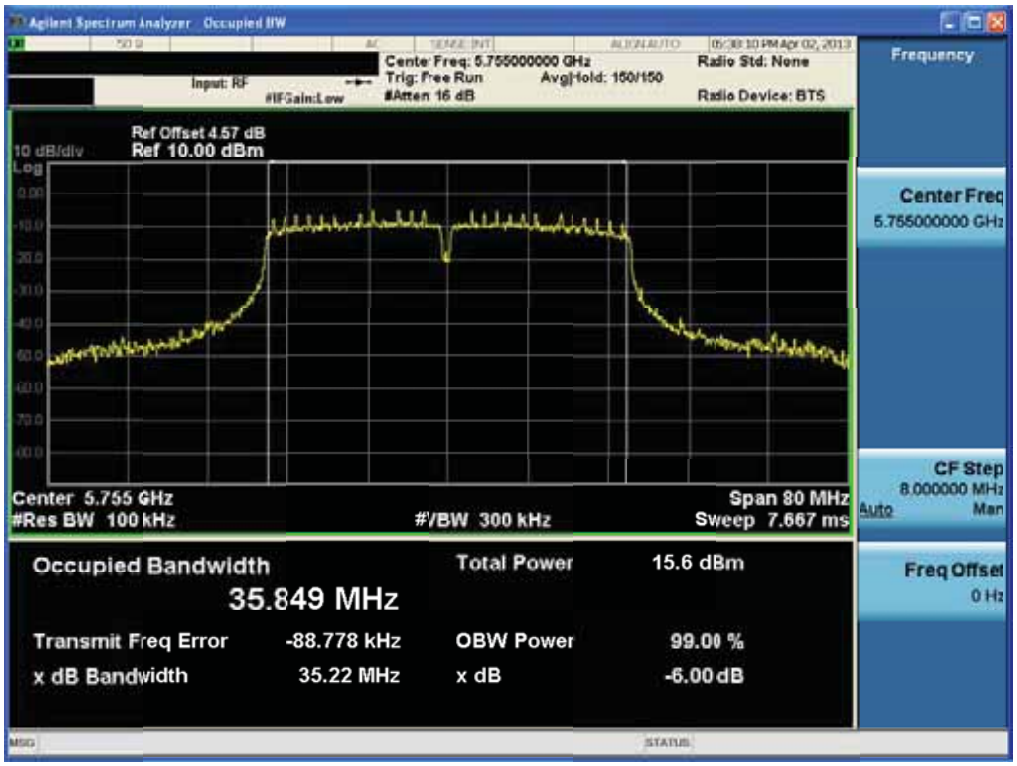
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 5785MHz



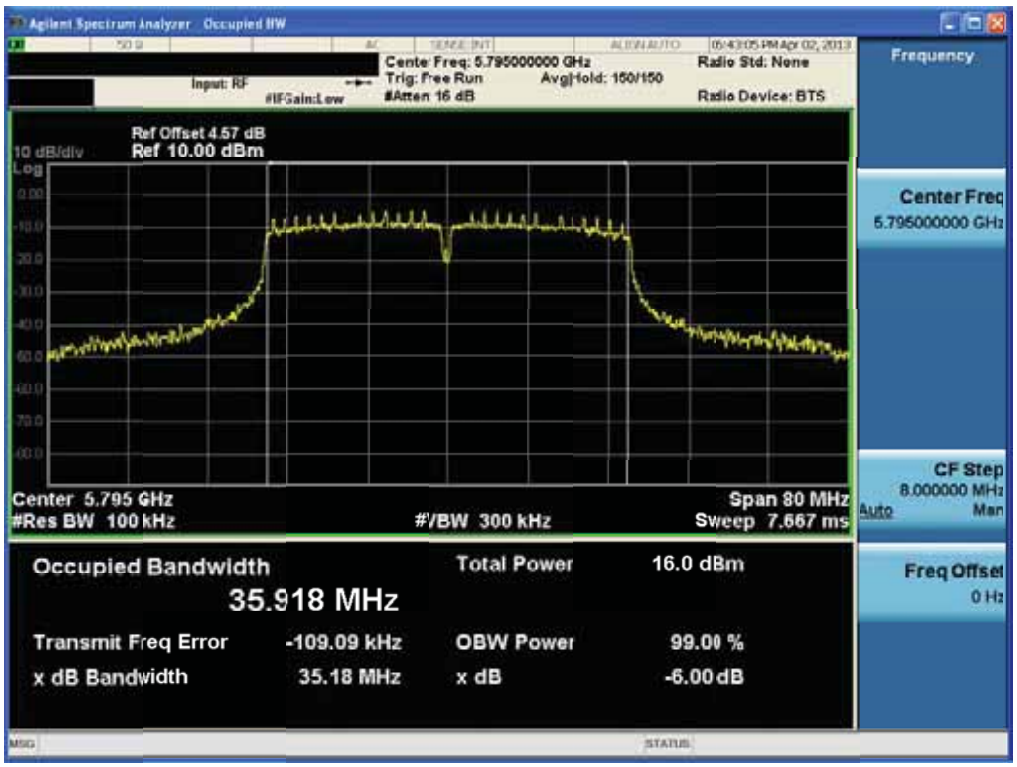
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 5825MHz



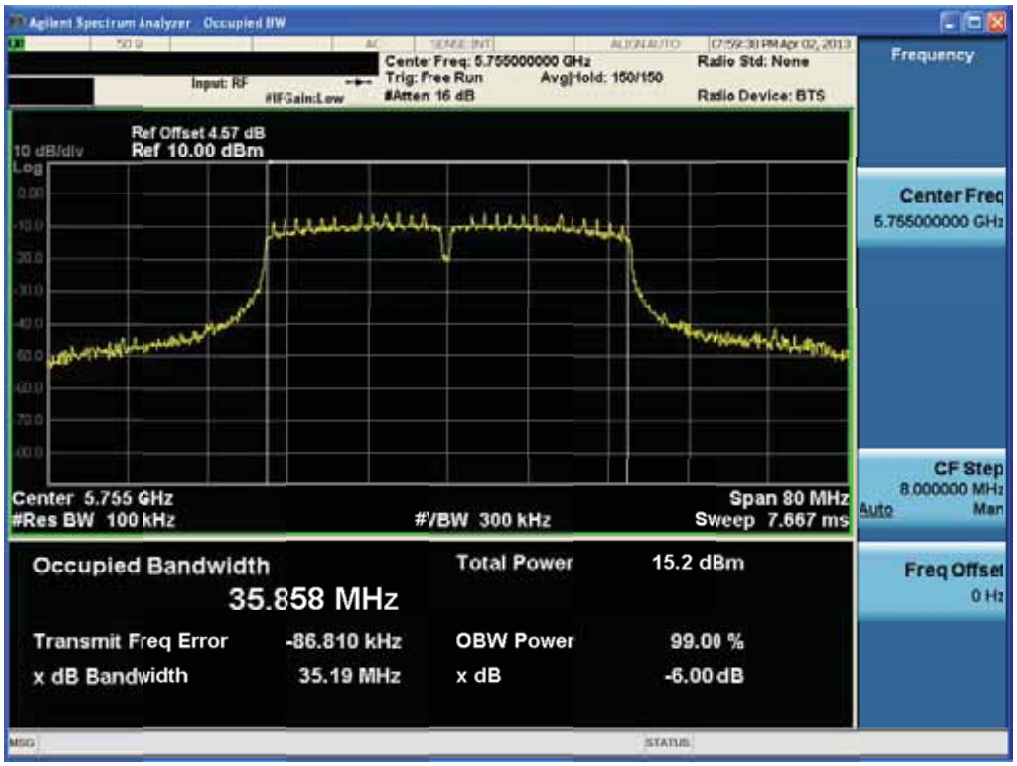
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 11 & 5755MHz



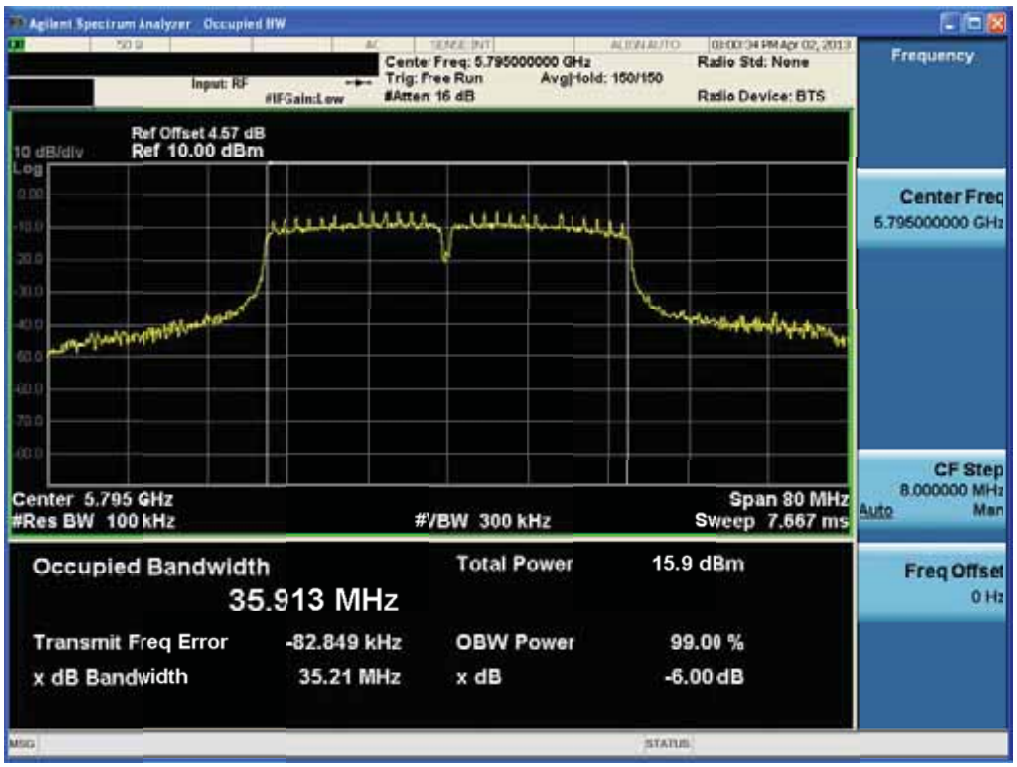
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 11 & 5795MHz



6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 11 & 5755MHz



6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 11 & 5795MHz

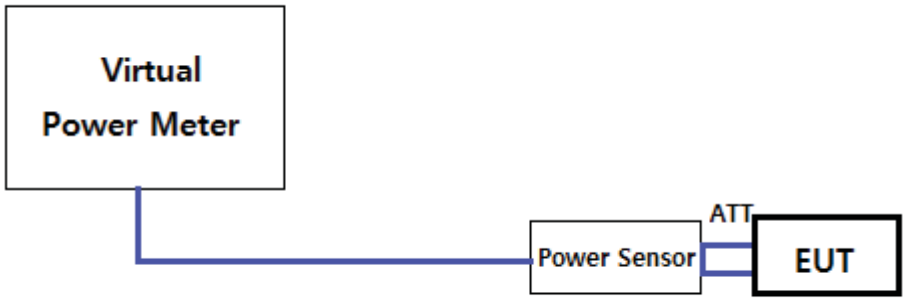


8.2 Maximum Peak Conducted Output Power

Test Requirements and limit, §15.247(b) & RSS-210 [A8.4]

The maximum permissible conducted output power is **1 Watt.**

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

A transmitter antenna terminal of EUT is connected to the input of a power sensor using an appropriate attenuator and the total path loss between EUT and a Power Sensor was corrected on the final measurement data using a power meter's internal function.

Measurements are made with a broadband power meter capable of making peak and average measurements while the EUT is operating in transmission mode at the appropriate frequencies.

Note 1 : Tests were performed all possible data rates and the worst case data were reported.

Note 2 : The directional antenna gains for MIMO with correlated signals.

Bands	Ant 0 [dBi]	Ant 1 [dBi]	Directional Gain for correlated signals [dBi]
2.4 G	1.28	-0.87	3.28 < 6
5.7 G	0.92	3.12	5.10 < 6

Note : Directional gain = 10 log[$(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})2 / N_{ANT}$] dBi for correlated signals

▣ TEST RESULTS: Comply

▪ **Single transmitting data**

Mode	Data Rate	Frequency [MHz]	Test Result			
			Chain 0		Chain 1	
			[dBm]	[W]	[dBm]	[W]
802.11b	11 Mbps	2412	**18.67**	**0.074**	-	-
		2437	17.93	0.062	-	-
		2462	17.67	0.058	-	-
802.11g	24 Mbps	2412	21.74	0.149	-	-
		2437	**26.36**	**0.433**	-	-
		2462	20.50	0.112	-	-
802.11a	24 Mbps	5745	19.35	0.086	-	-
		5785	19.60	0.091	-	-
		5825	**19.84**	**0.096**	-	-

▪ **Multiple transmitting data**

Mode	Data Rate	Frequency [MHz]	Test Result			
			Chain 0 [dBm]	Chain 1 [dBm]	Aggregate Power[Note1]	
					[dBm]	[W]
802.11n HT20	MCS 8	2412	20.18	19.09	22.68	0.185
		2437	24.46	23.27	**26.92**	**0.492**
		2462	19.52	19.22	22.38	0.173
802.11n HT40	MCS 8	2422	17.97	17.29	20.65	0.116
		2437	24.70	23.15	**27.00**	**0.502**
		2452	18.30	14.97	19.96	0.099
802.11n HT20	MCS 8	5745	18.83	18.06	21.47	0.140
		5785	19.04	18.16	21.63	0.146
		5825	19.17	18.15	**21.70**	**0.148**
802.11n HT40	MCS 11	5755	18.39	17.63	21.04	0.127
		5795	18.79	17.83	**21.35**	**0.136**

Note1: Aggregate power = $10\log(10^{(\frac{\text{chain0}}{10})} + 10^{(\frac{\text{chain1}}{10})})$

8.3 Maximum Power Spectral Density

Test requirements and limit, §15.247(e) & RSS-210 [A8.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard –specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE:

The Measurement Procedure **Method PKPSD of KDB558074** is used.
1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to **1.5 times** the DTS bandwidth.
3. Set the RBW to: **3 kHz ≤ RBW ≤ 100 kHz**.
4. Set the VBW ≥ **3 x RBW.**
5. Detector = **peak.**
6. Sweep time = **auto couple.**
7. Trace mode = **max hold.**
8. Allow trace to fully stabilize.
9. Use the **peak marker function** to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

▣ TEST RESULTS: Comply

- **Single transmitting data**

Mode	Data Rate	Frequency [MHz]	RBW	PPSD	
				Chain 0	Chain 1
				[dBm]	[dBm]
802.11b	11 Mbps	2412	3 kHz	**-6.86**	-
		2437	3 kHz	-7.66	-
		2462	3 kHz	-7.95	-
802.11g	24 Mbps	2412	3 kHz	-14.20	-
		2437	3 kHz	**-8.64**	-
		2462	3 kHz	-14.68	-
802.11a	24 Mbps	5745	3 kHz	-15.37	-
		5785	3 kHz	-15.15	-
		5825	3 kHz	**-12.93**	-

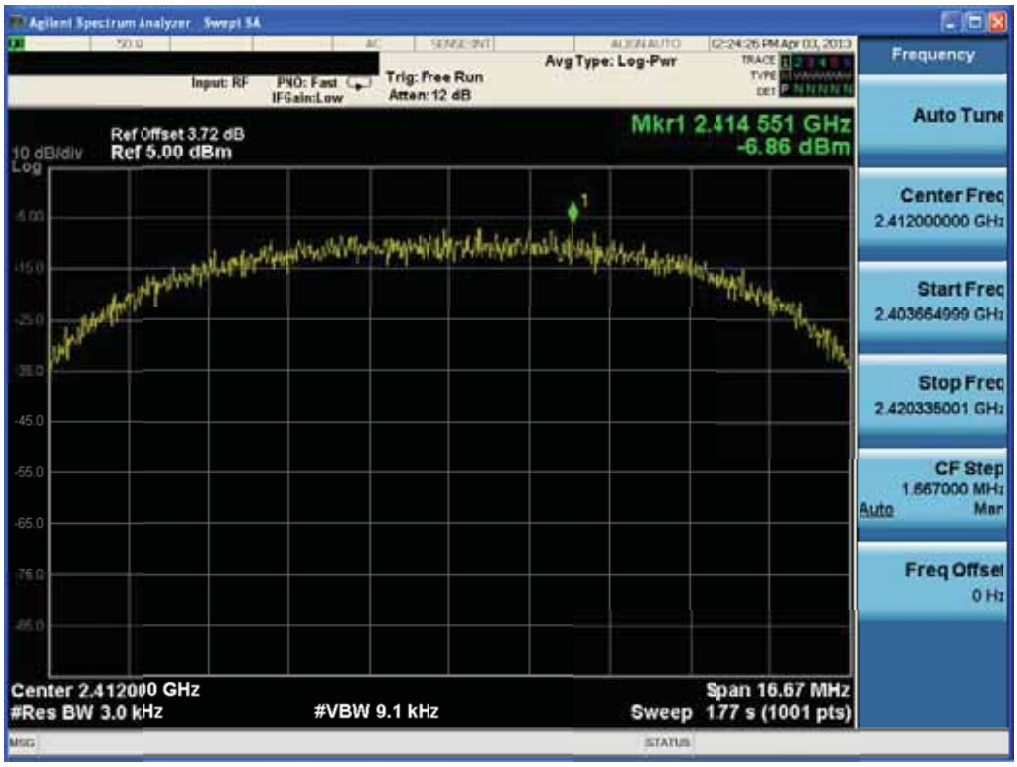
- **Multiple transmitting data**

Mode	Data Rate	Frequency [MHz]	RBW	PPSD		
				Chain 0 [dBm]	Chain 1 [dBm]	Aggregate PPSD[Note1] [dBm]
802.11n HT20	MCS 8	2412	3 kHz	-15.87	-17.95	-13.78
		2437	3 kHz	-11.74	-12.96	**-9.30**
		2462	3 kHz	-16.34	-17.80	-14.00
802.11n HT40	MCS 8	2422	3 kHz	-21.60	-23.06	-19.26
		2437	3 kHz	-13.82	-14.83	**-11.29**
		2452	3 kHz	-23.42	-24.36	-20.85
802.11n HT20	MCS 8	5745	3 kHz	-17.13	-17.41	-14.26
		5785	3 kHz	-15.88	-16.86	**-13.33**
		5825	3 kHz	-16.76	-16.95	-13.84
802.11n HT40	MCS 11	5755	3 kHz	-20.18	-19.99	-17.07
		5795	3 kHz	-19.73	-20.03	**-16.87**

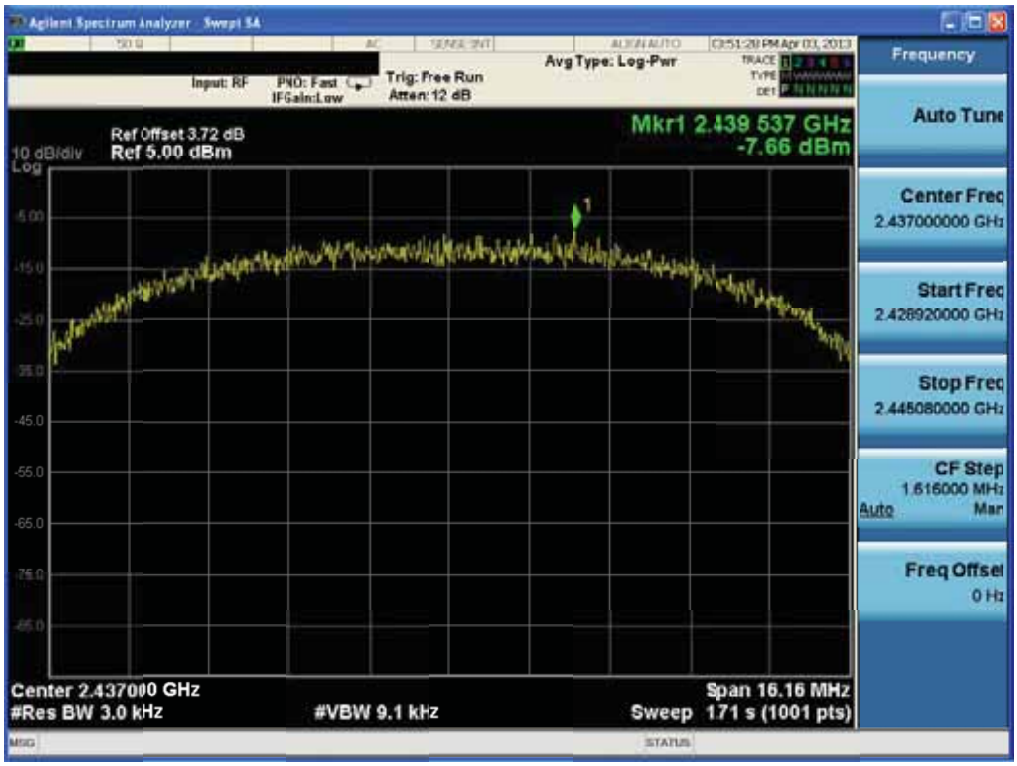
Note1: Aggregate PPSD $= 10\log\left(10^{\left(\frac{\text{chain0}}{10}\right)} + 10^{\left(\frac{\text{chain1}}{10}\right)}\right)$

▣ RESULT PLOTS

Maximum PPSD Test Mode: Chain 0 & 802.11b & 11Mbps & 2412MHz

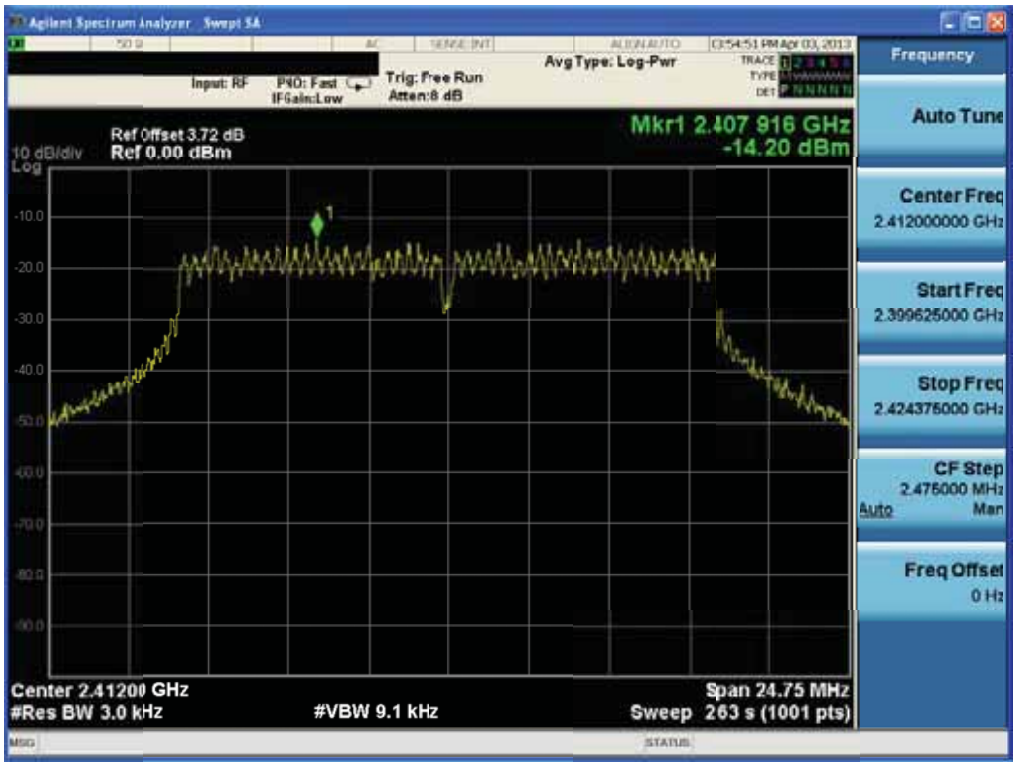


Maximum PPSD Test Mode: Chain 0 & 802.11b & 11Mbps & 2437MHz

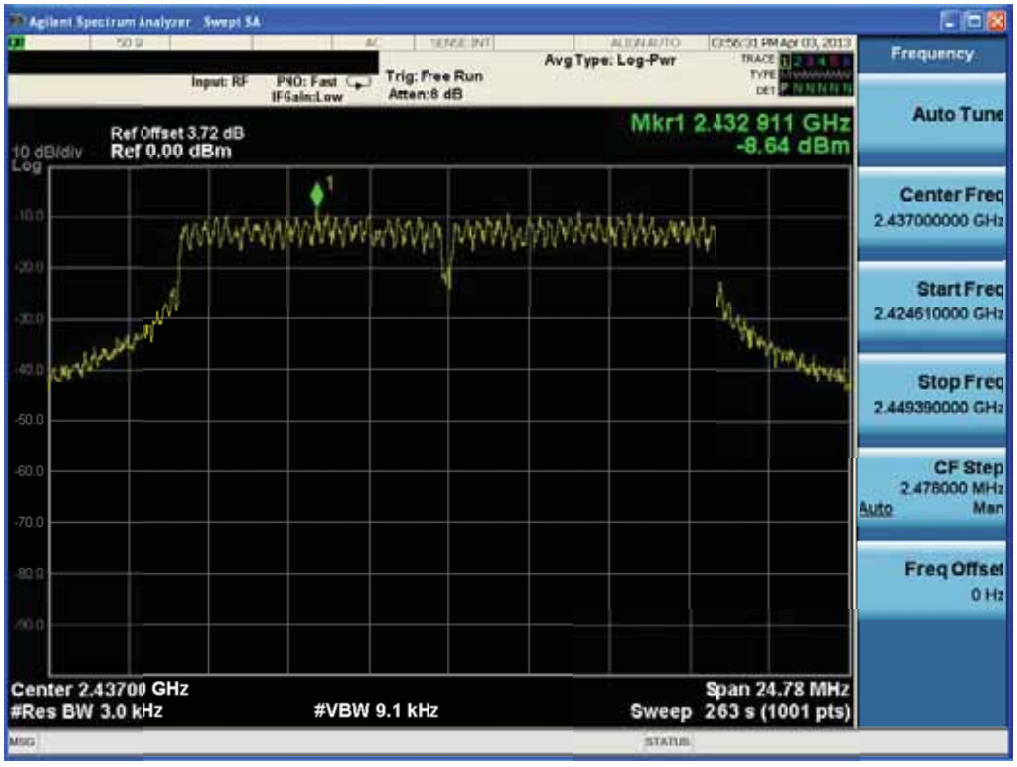


Maximum PPSD Test Mode: Chain 0 & 802.11b & 11Mbps & 2462MHz

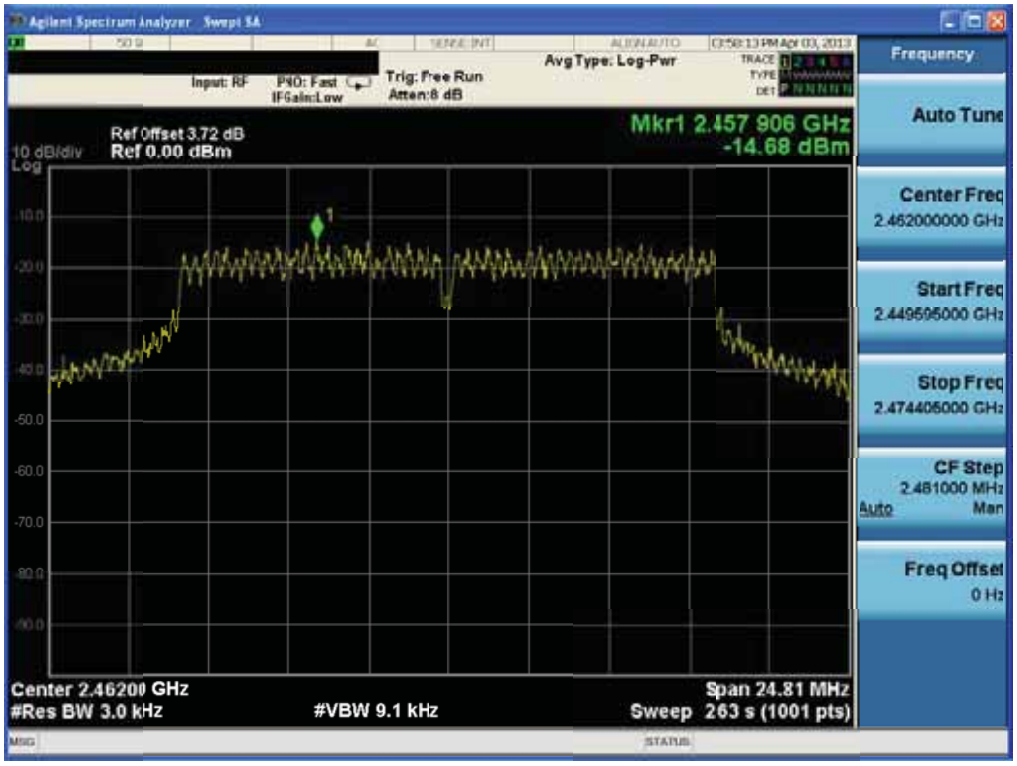
Maximum PPSD Test Mode: Chain 0 & 802.11g & 24Mbps & 2412MHz



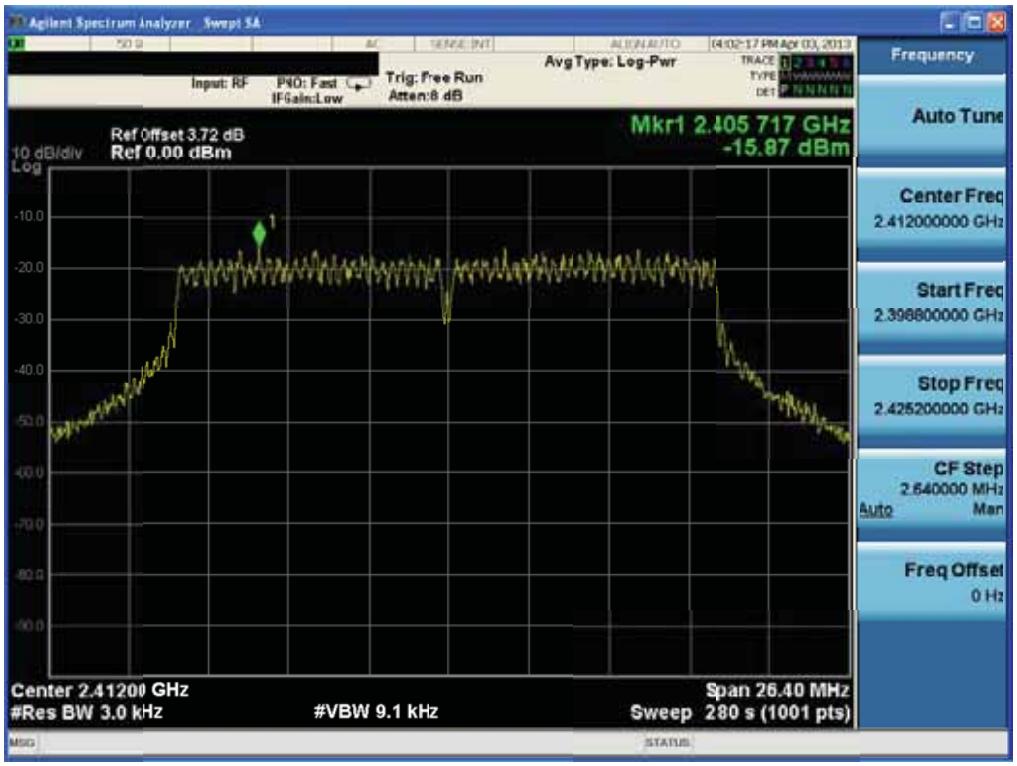
Maximum PPSD Test Mode: Chain 0 & 802.11g & 24Mbps & 2437MHz



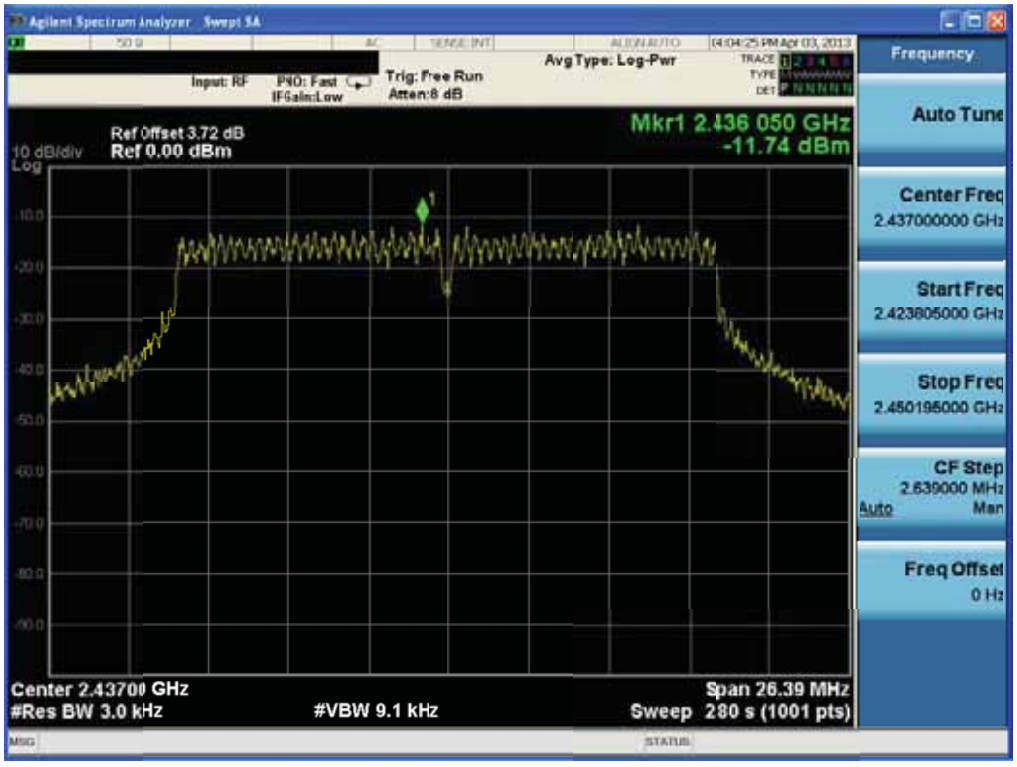
Maximum PPSD Test Mode: Chain 0 & 802.11g & 24Mbps & 2462MHz



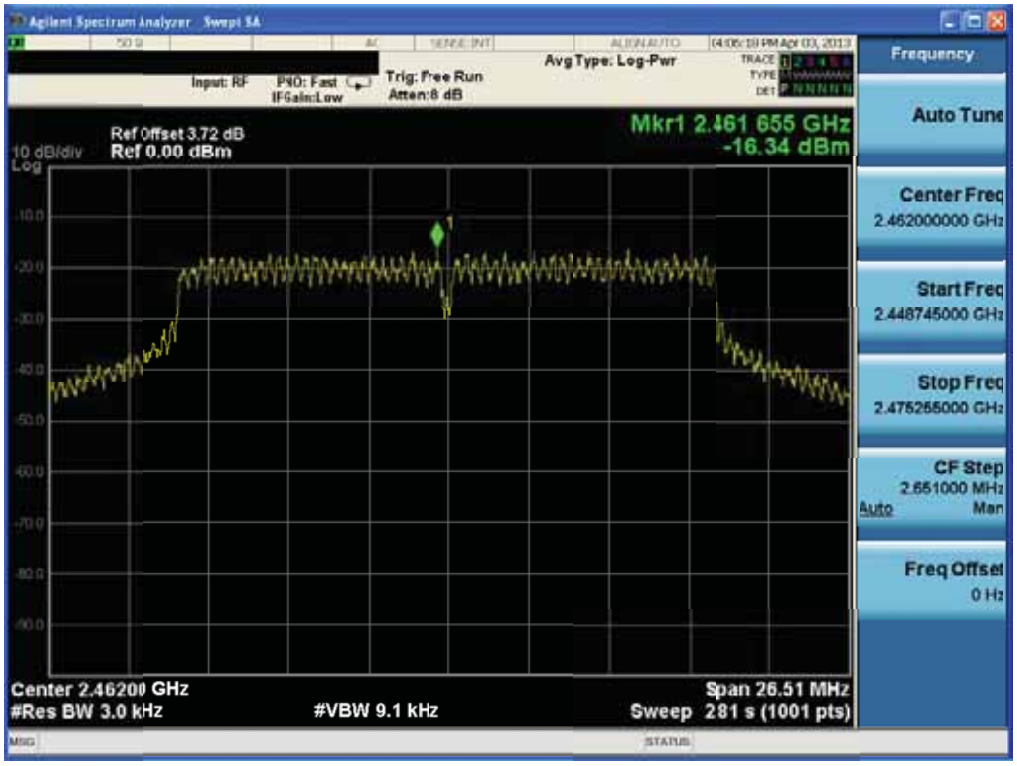
Maximum PPSD Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 2412MHz



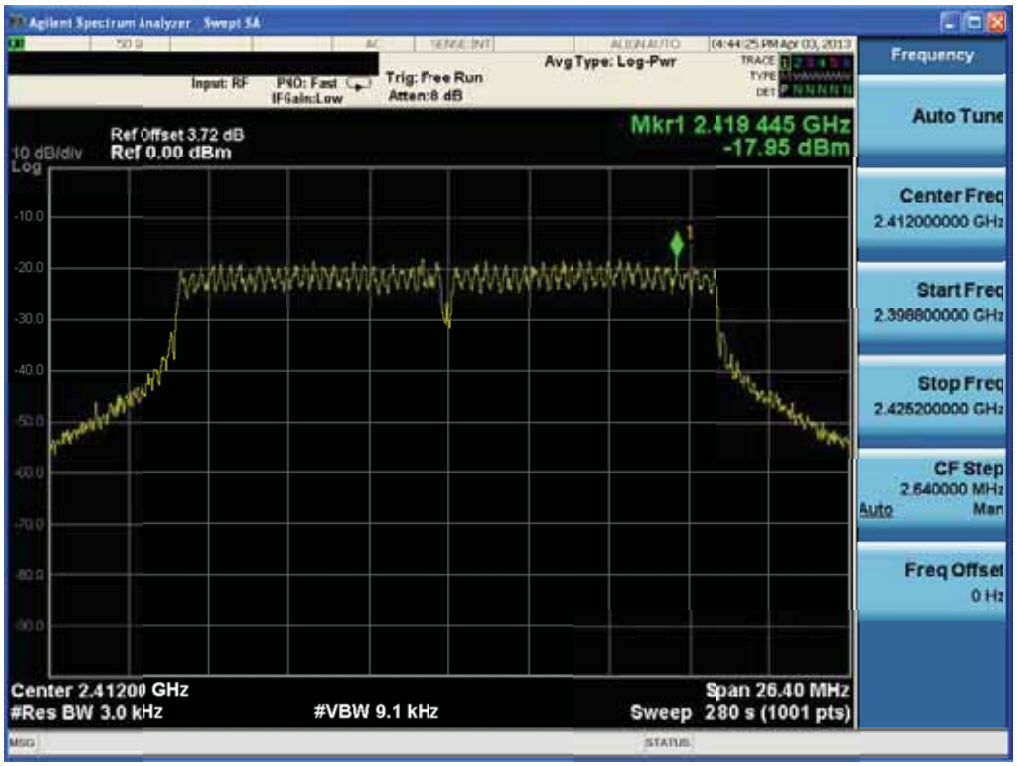
Maximum PPSD Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 2437MHz



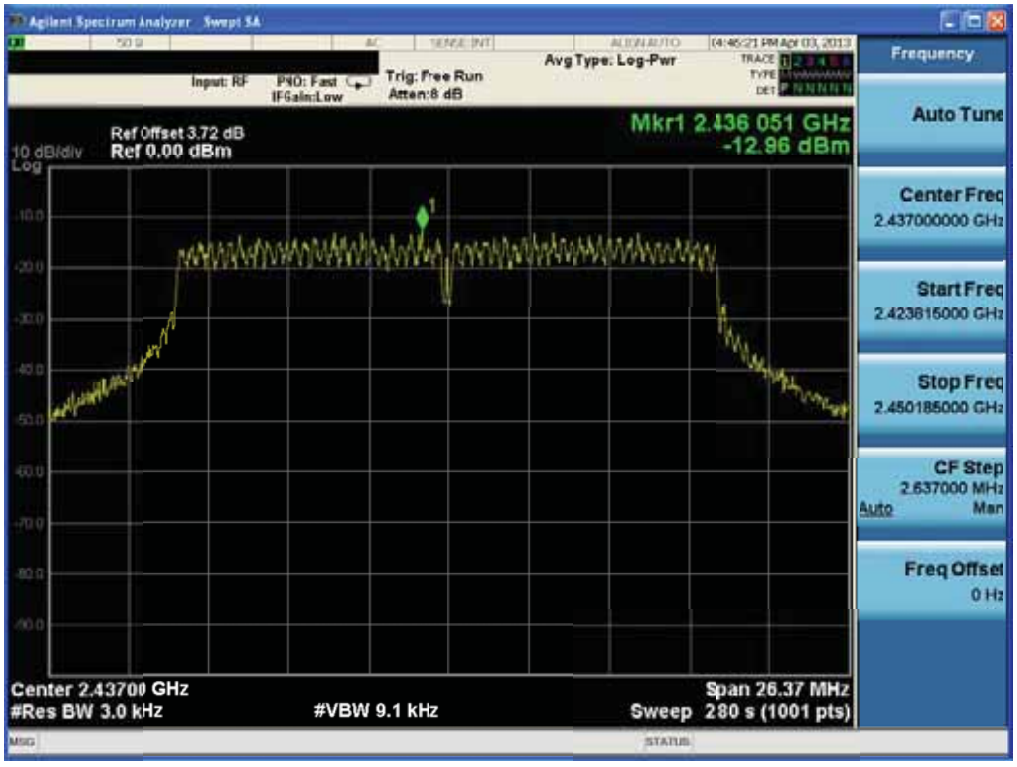
Maximum PPSD Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 2462MHz



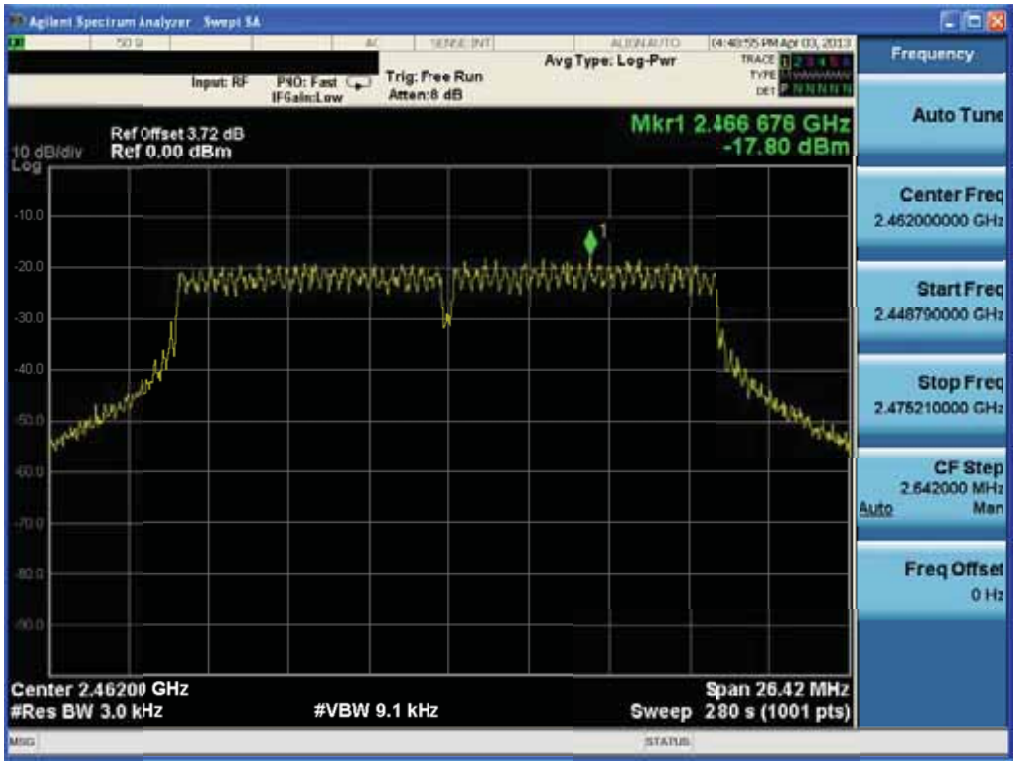
Maximum PPSD Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 2412MHz



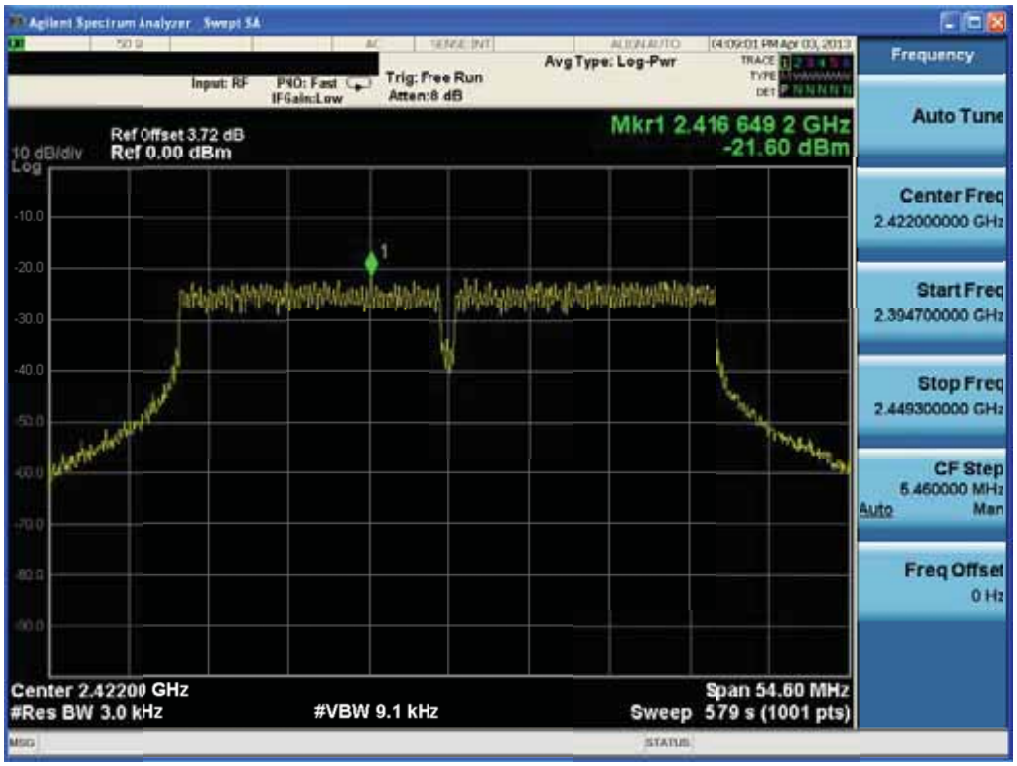
Maximum PPSD Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 2437MHz



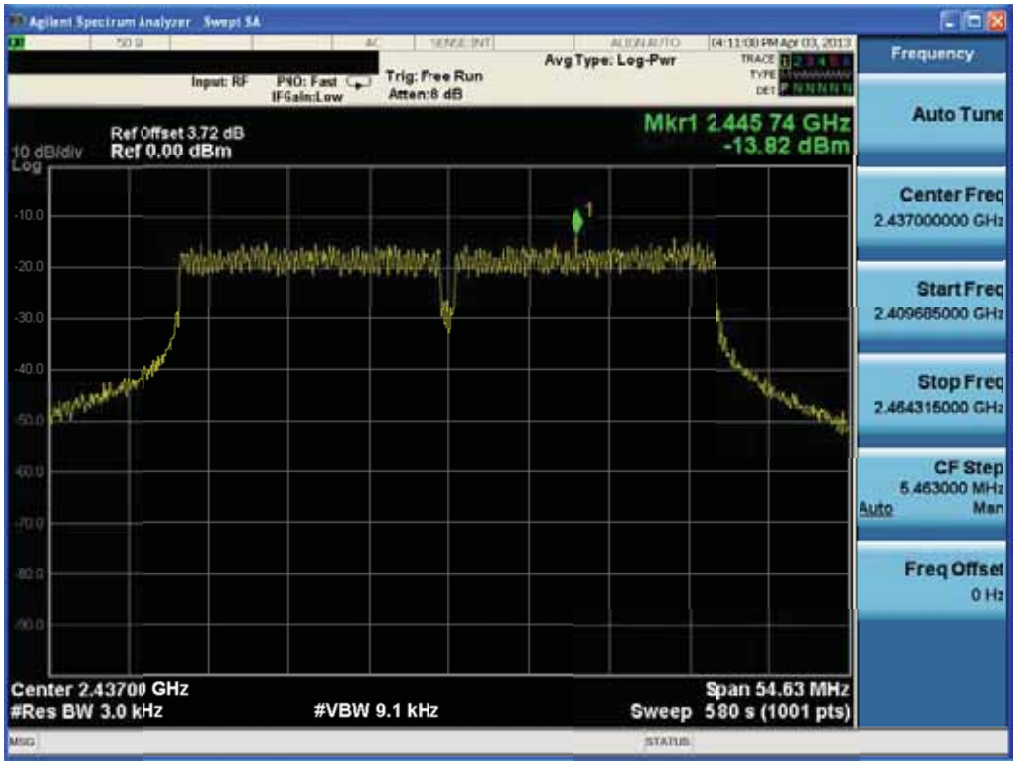
Maximum PPSD Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 2462MHz



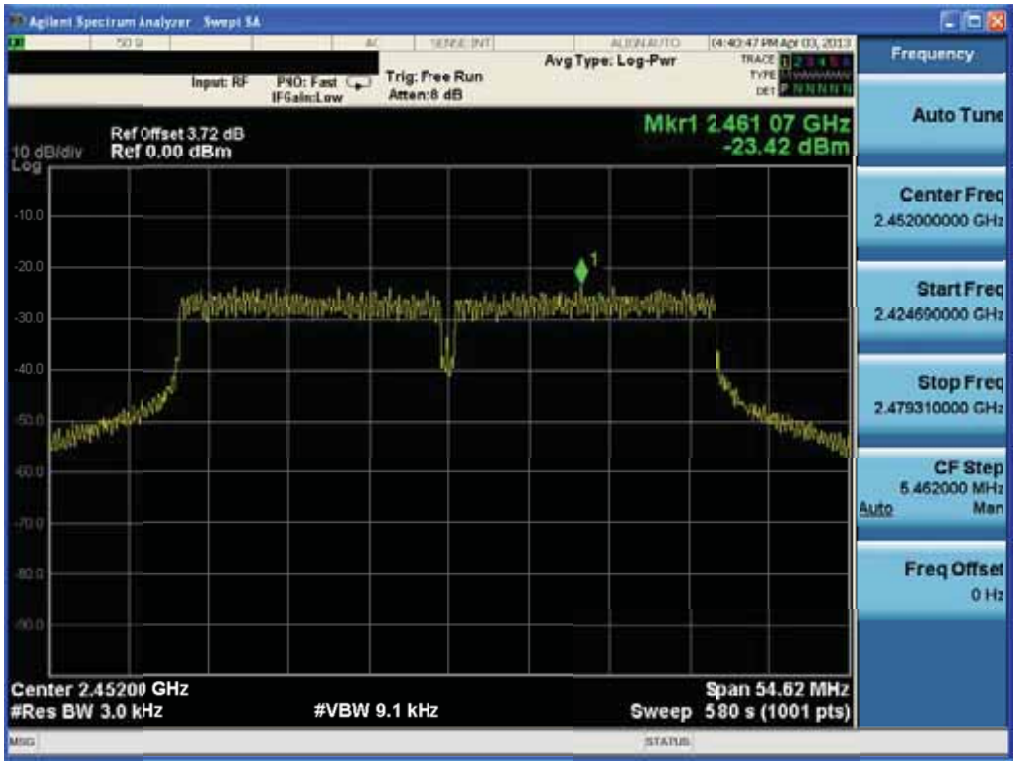
Maximum PPSD Test Mode: Chain 0 & 802.11n HT40 & MCS 8 & 2422MHz



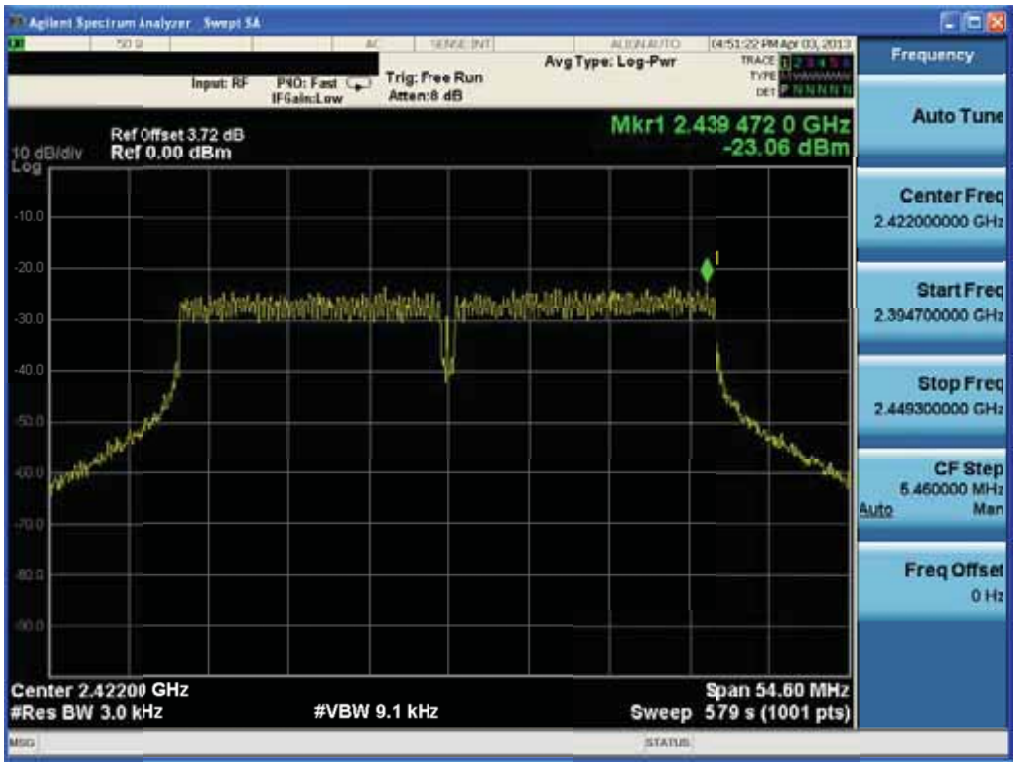
Maximum PPSD Test Mode: Chain 0 & 802.11n HT40 & MCS 8 & 2437MHz



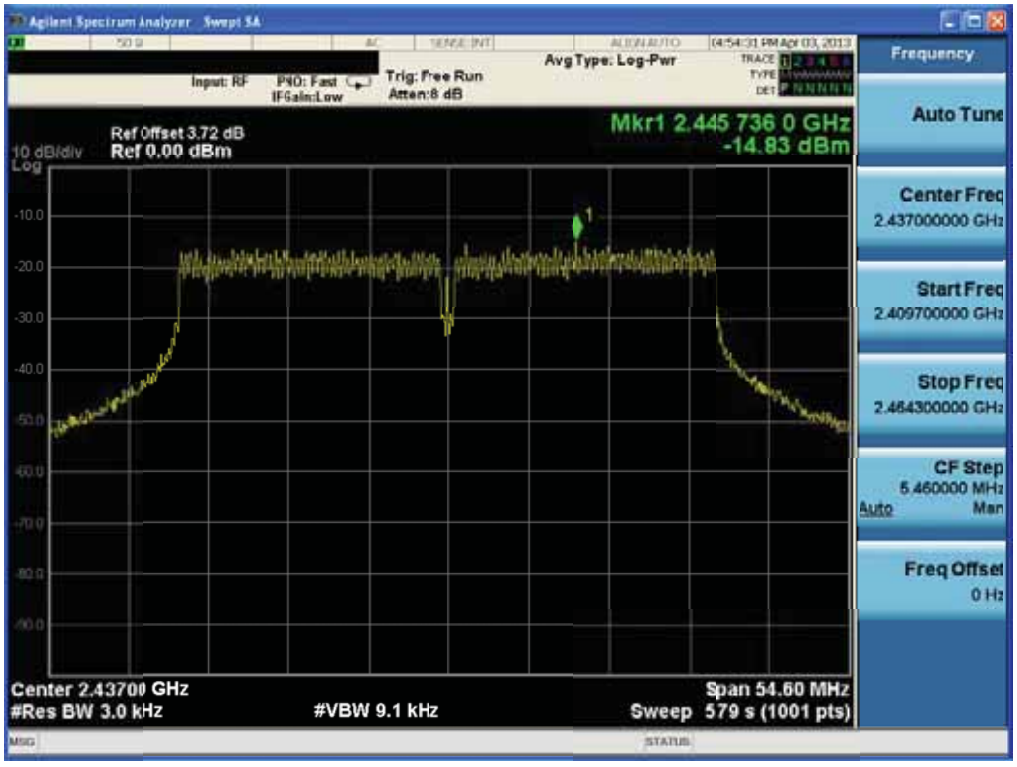
Maximum PPSD Test Mode: Chain 0 & 802.11n HT40 & MCS 8 & 2452MHz



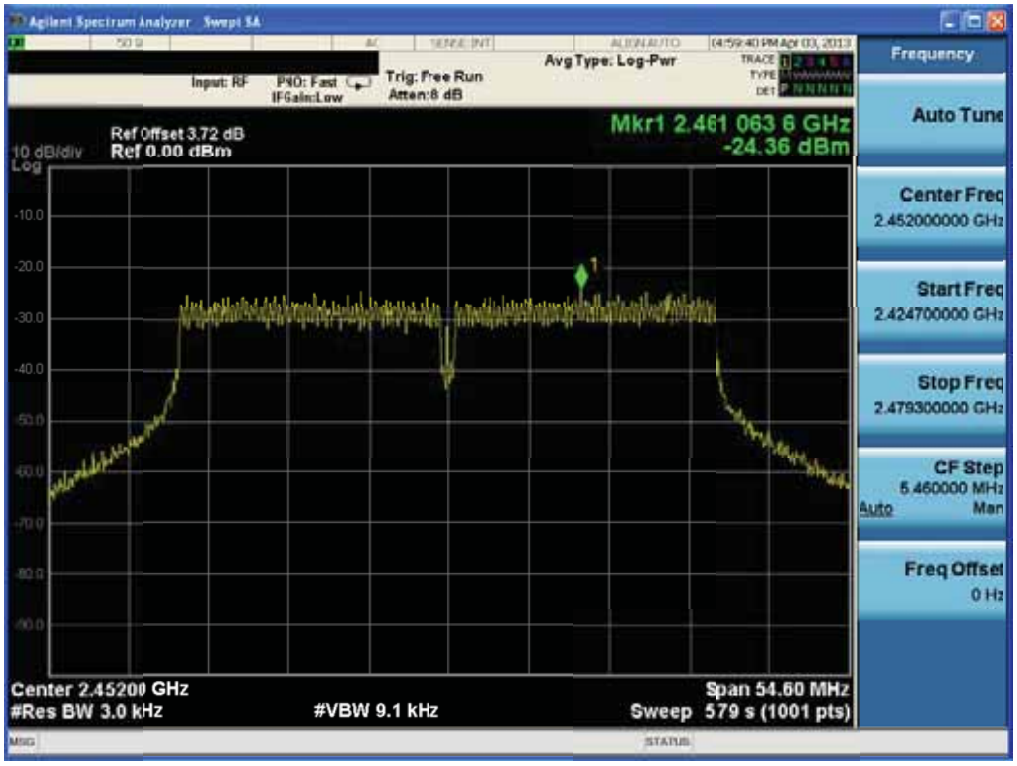
Maximum PPSD Test Mode: Chain 1 & 802.11n HT40 & MCS 8 & 2422MHz



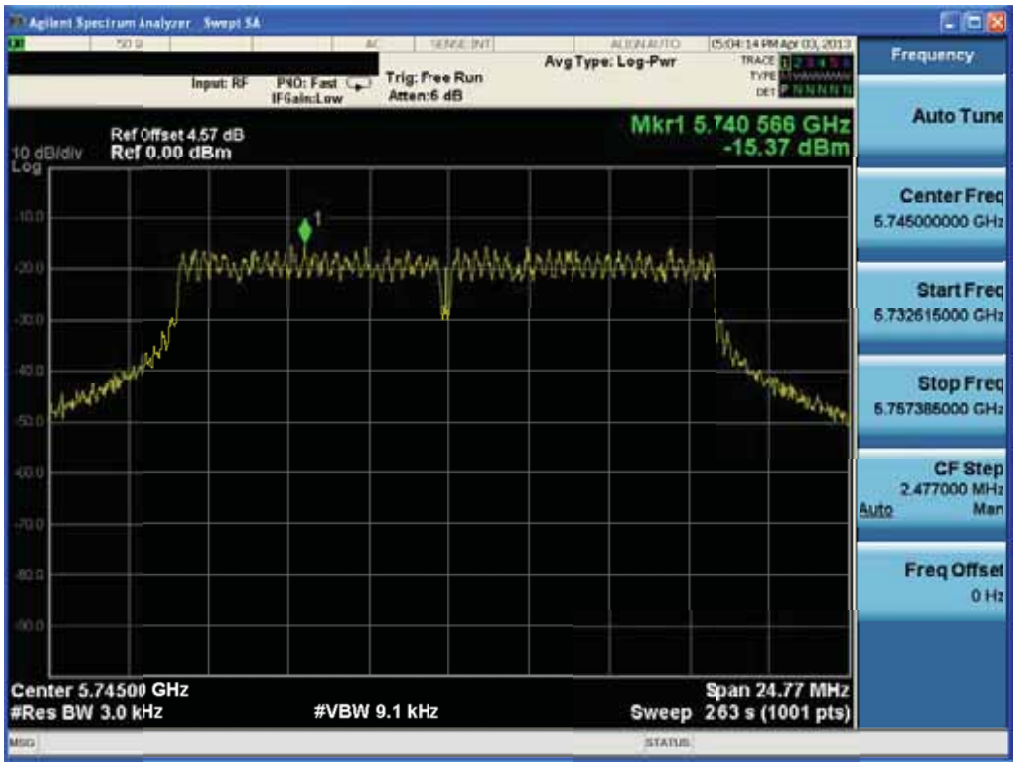
Maximum PPSD Test Mode: Chain 1 & 802.11n HT40 & MCS 8 & 2437MHz



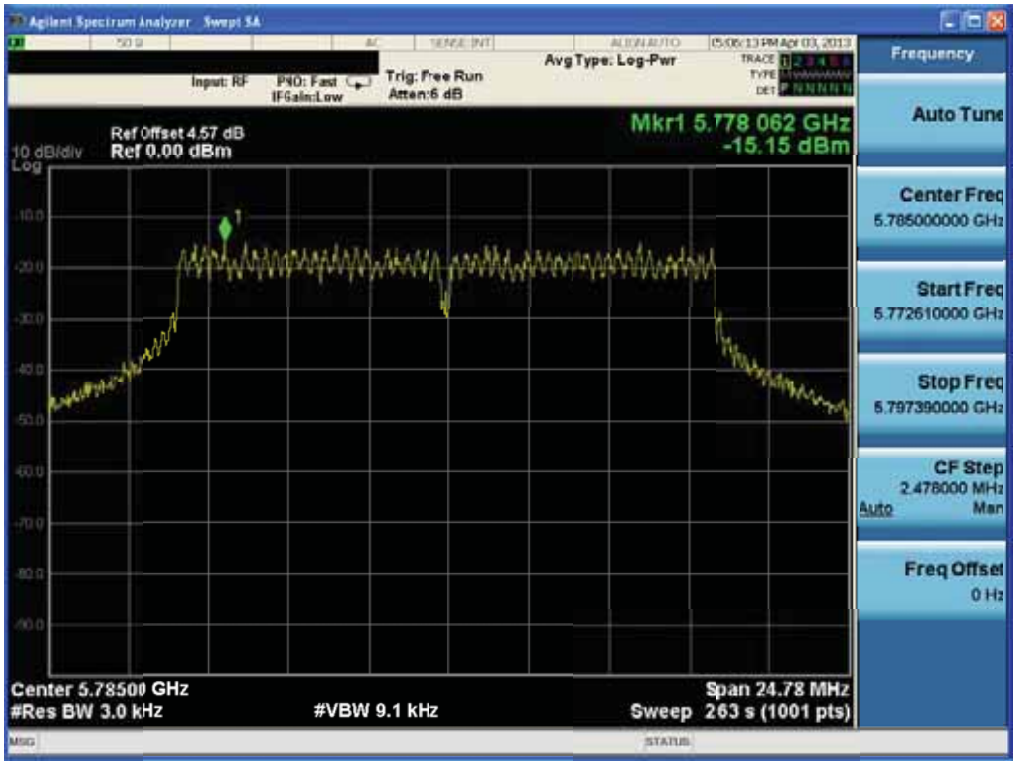
Maximum PPSD Test Mode: Chain 1 & 802.11n HT40 & MCS 8 & 2452MHz



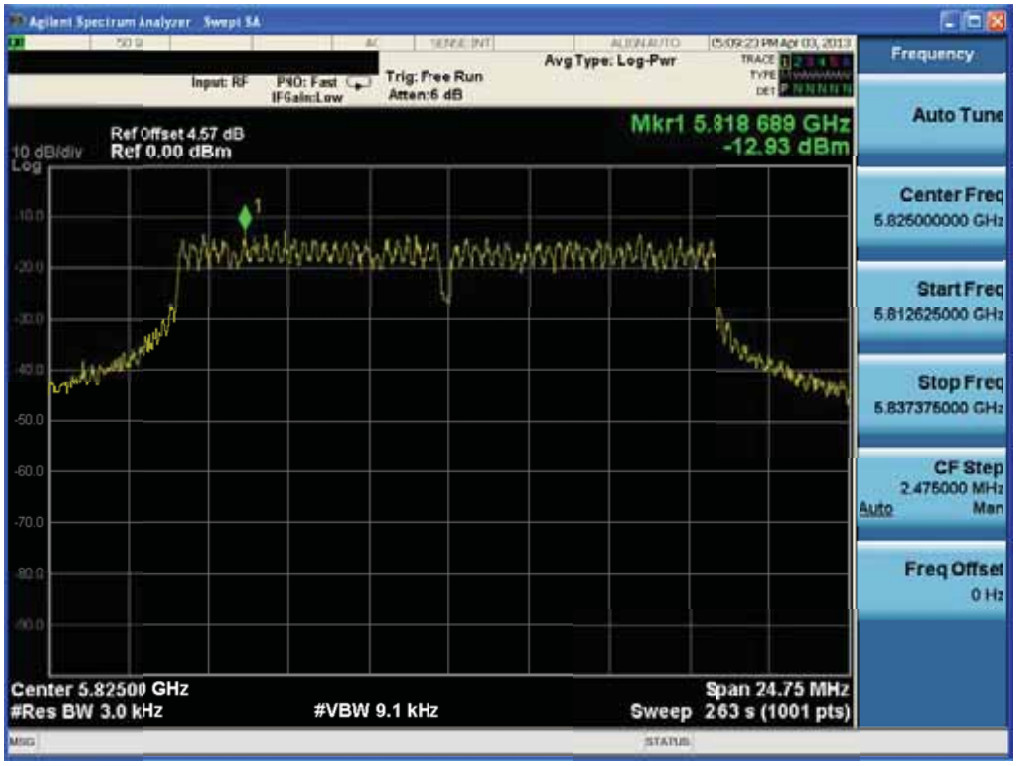
Maximum PPSD Test Mode: Chain 0 & 802.11a & 24Mbps & 5745MHz



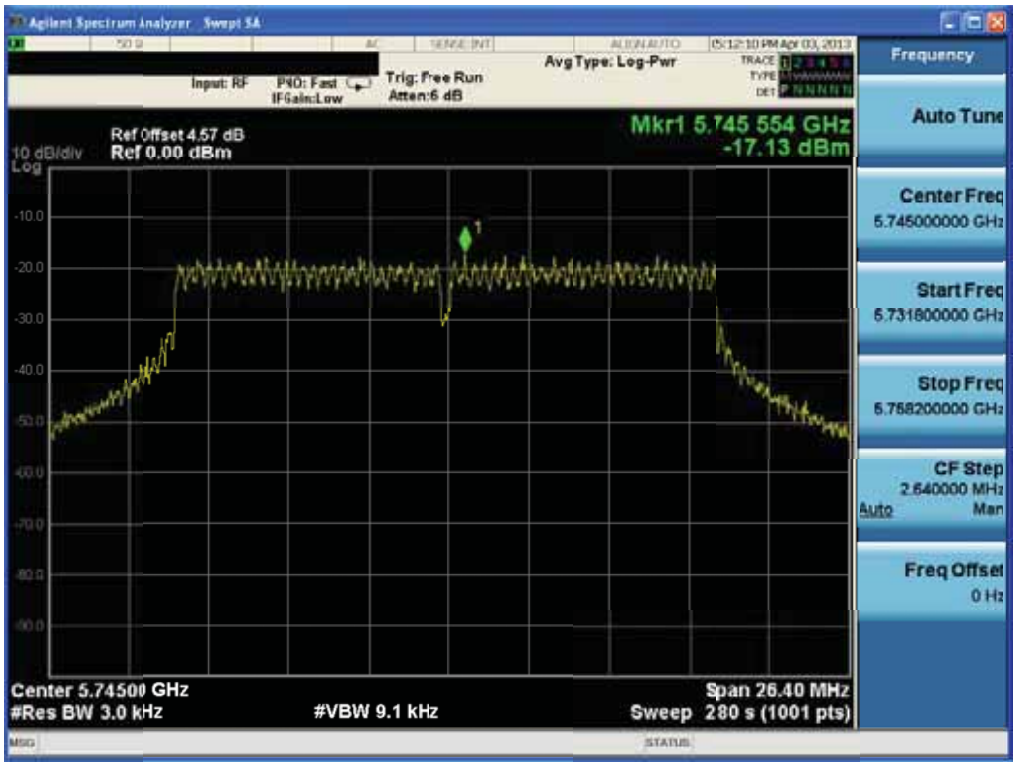
Maximum PPSD Test Mode: Chain 0 & 802.11a & 24Mbps & 5785MHz



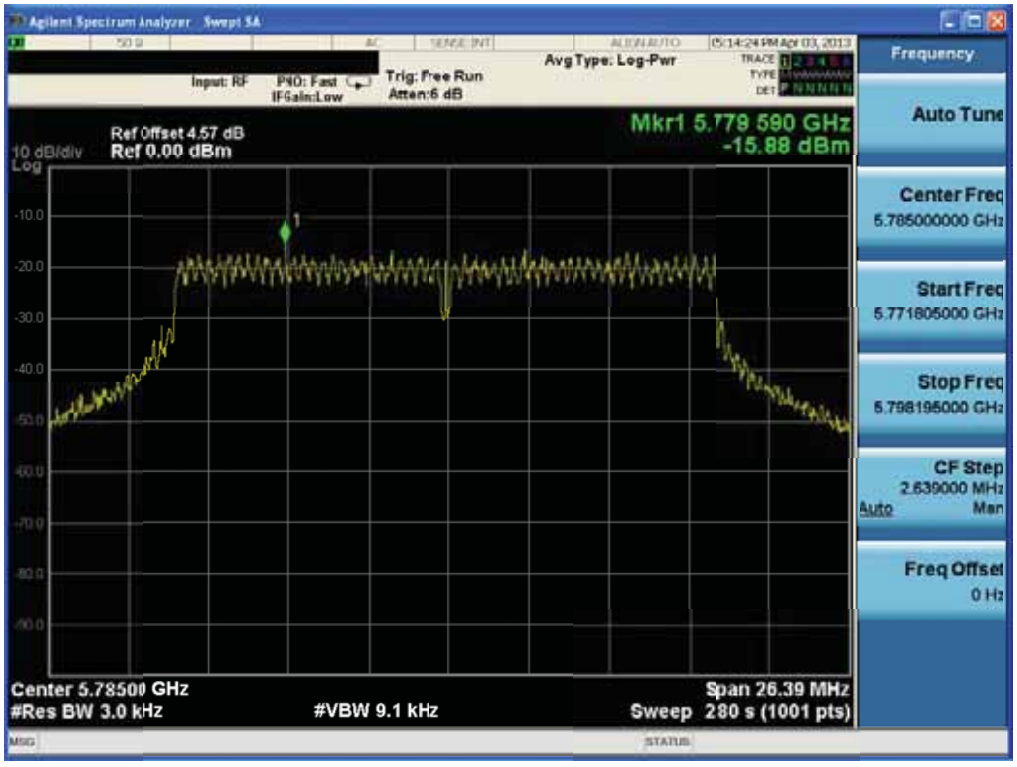
Maximum PPSD Test Mode: Chain 0 & 802.11a & 24Mbps & 5825MHz



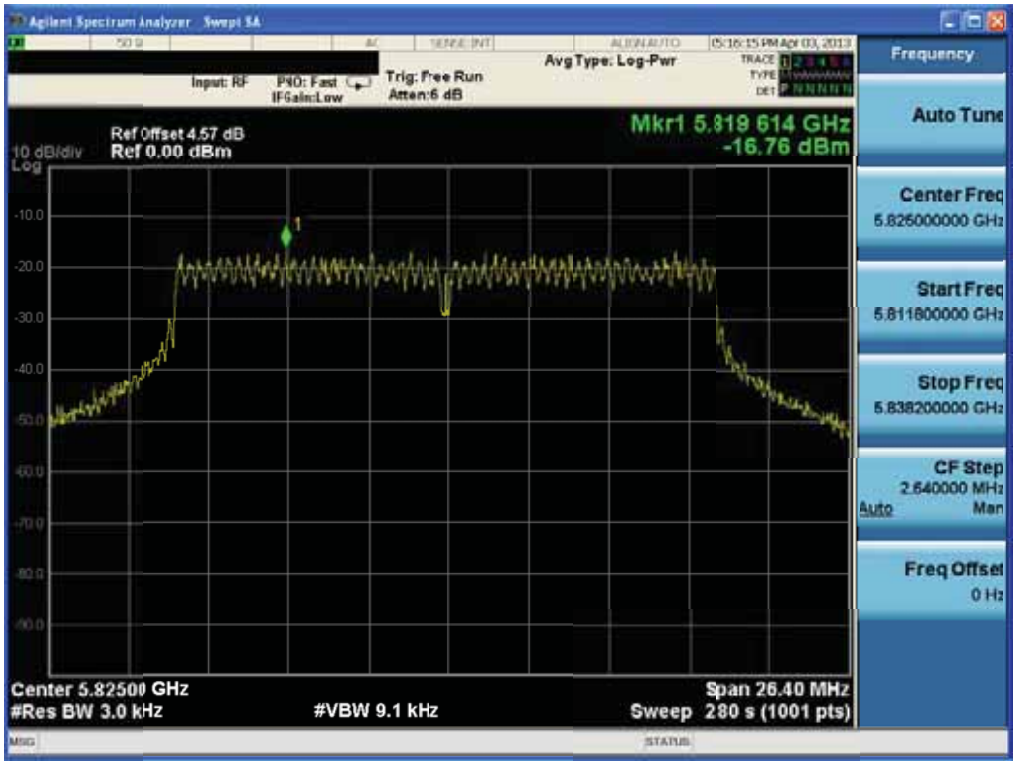
Maximum PPSD Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 5745MHz



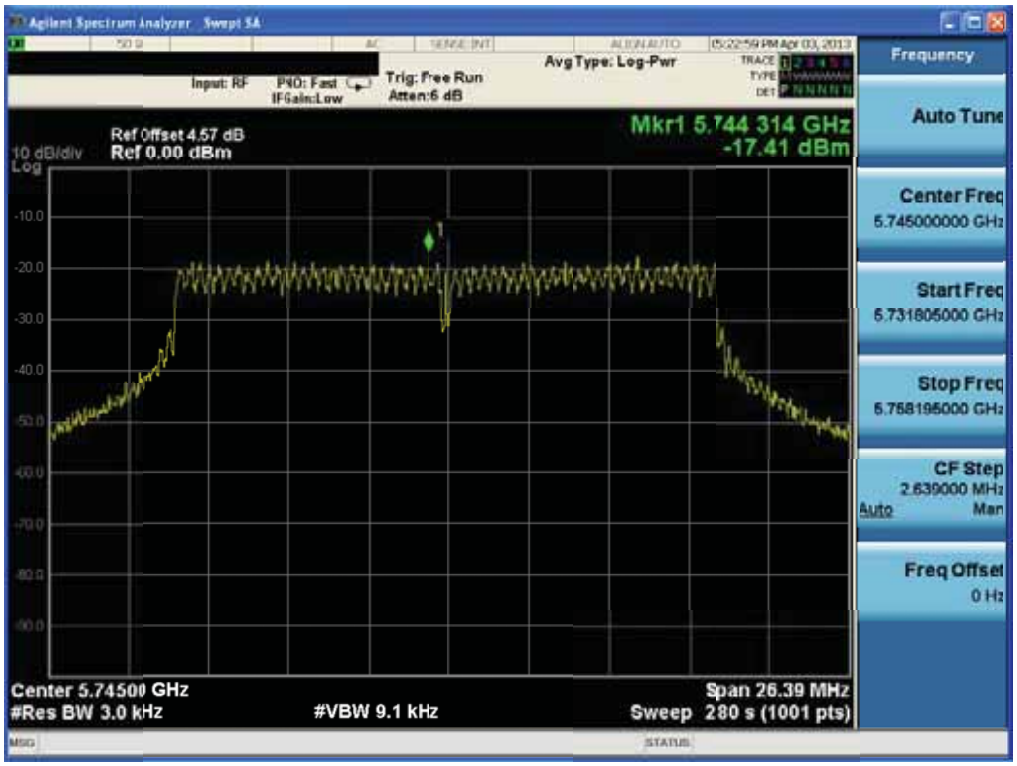
Maximum PPSD Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 5785MHz



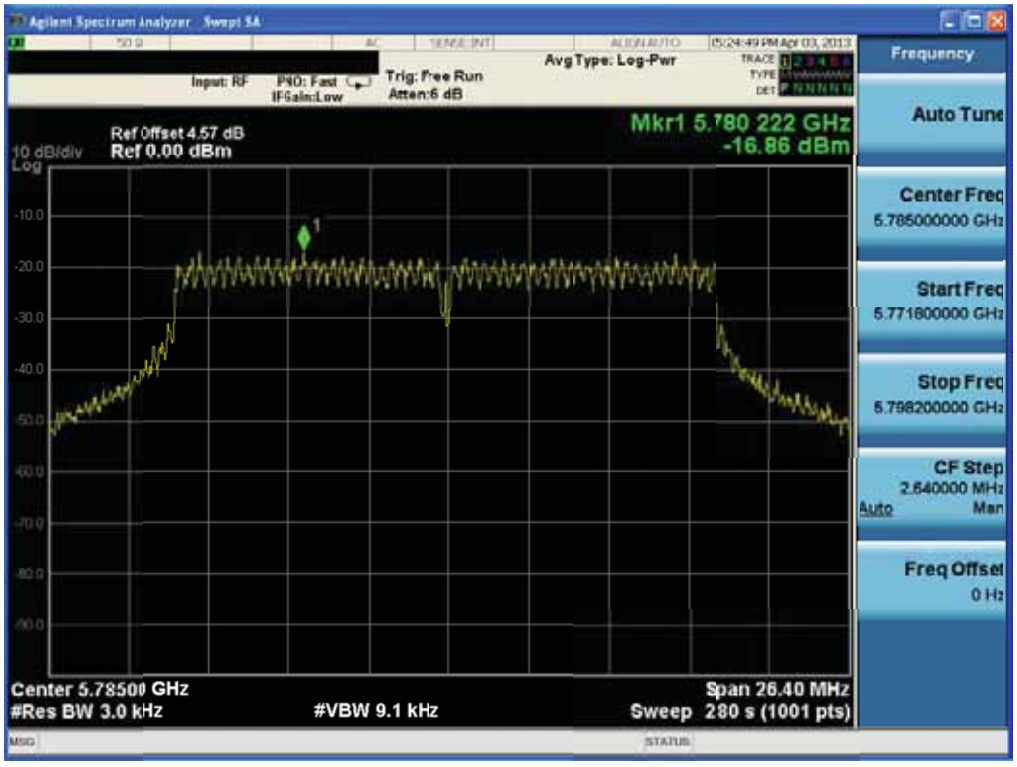
Maximum PPSD Test Mode: Chain 0 & 802.11n HT20 & MCS 8 & 5825MHz



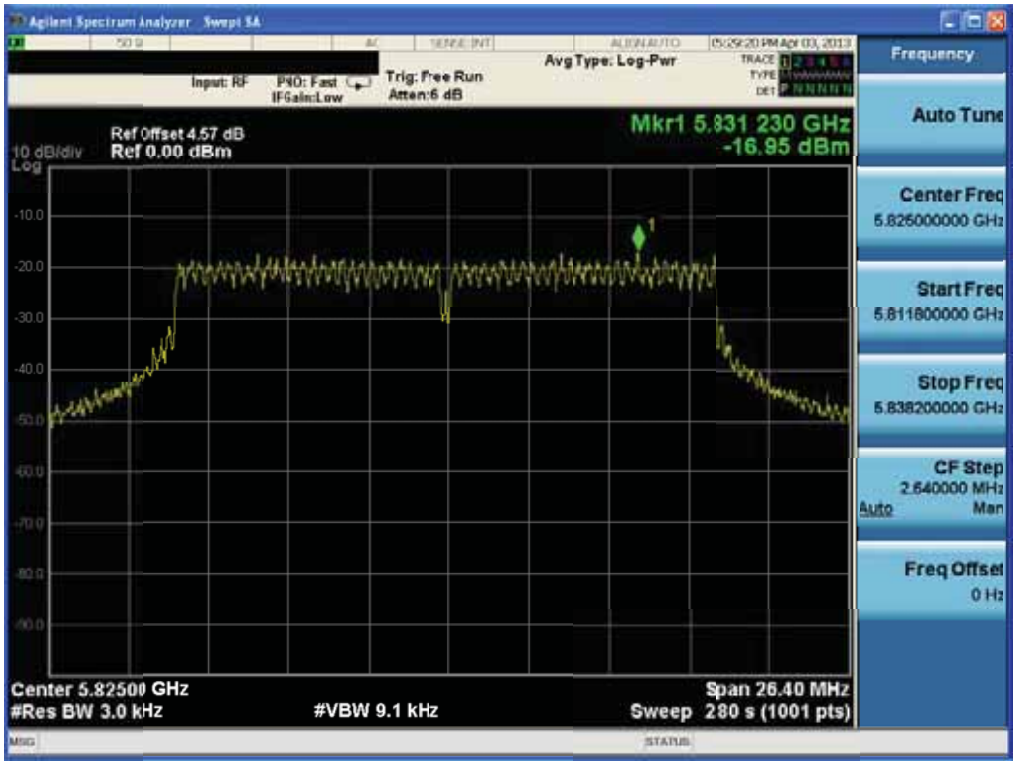
Maximum PPSD Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 5745MHz



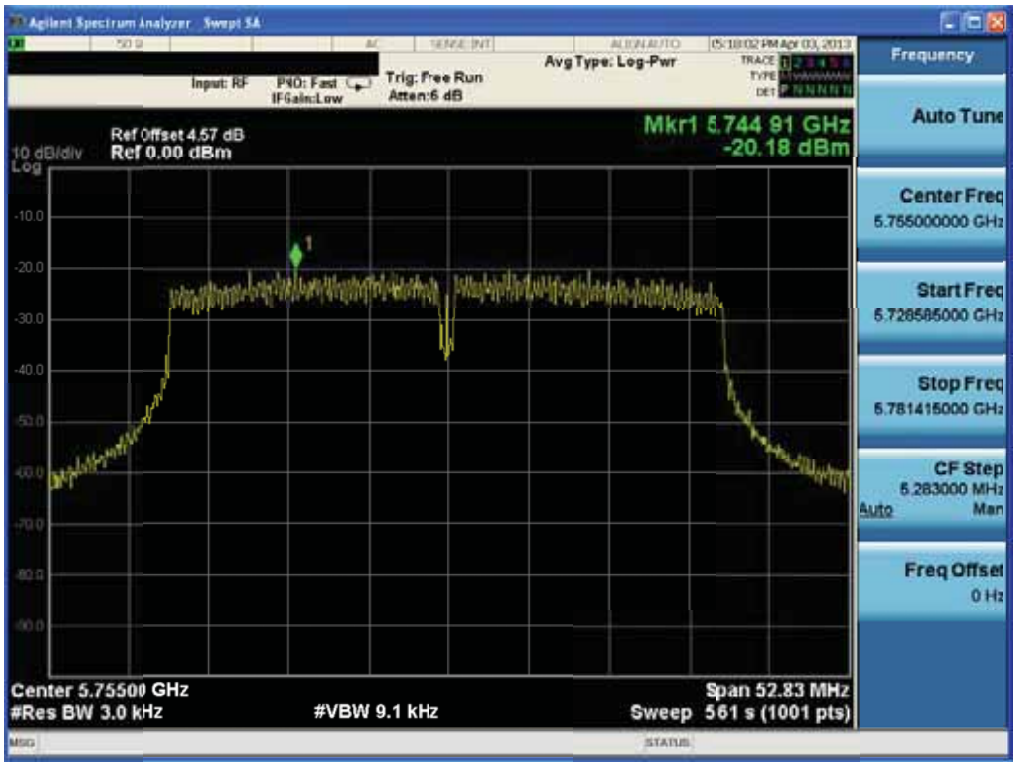
Maximum PPSD Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 5785MHz



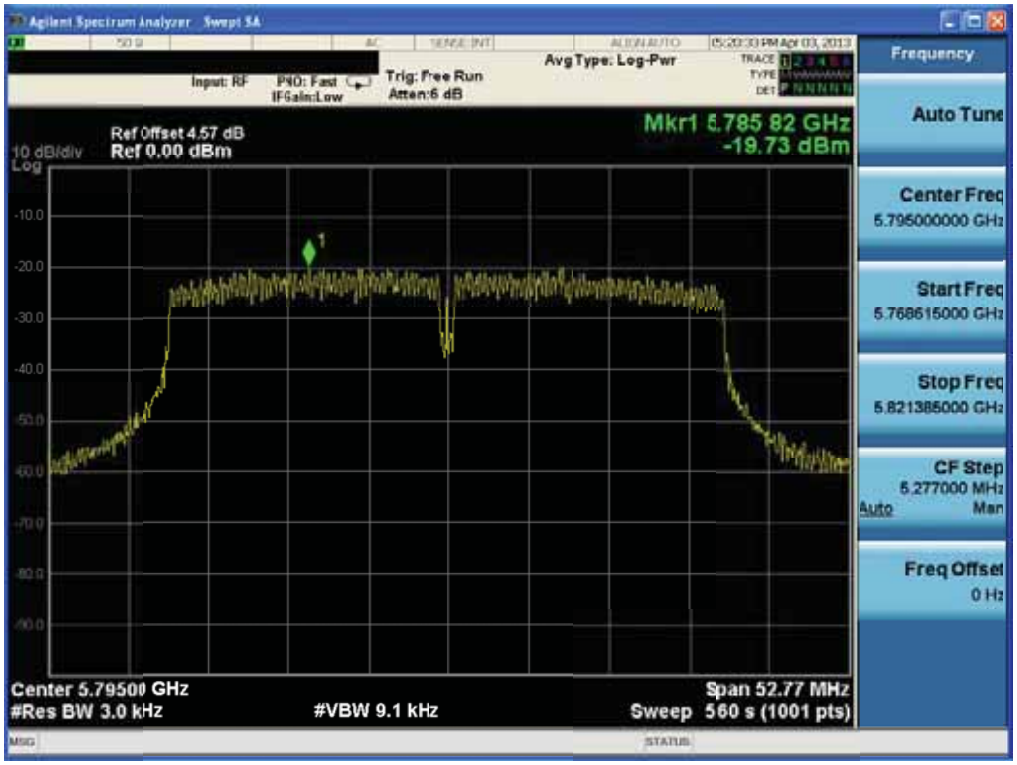
Maximum PPSD Test Mode: Chain 1 & 802.11n HT20 & MCS 8 & 5825MHz



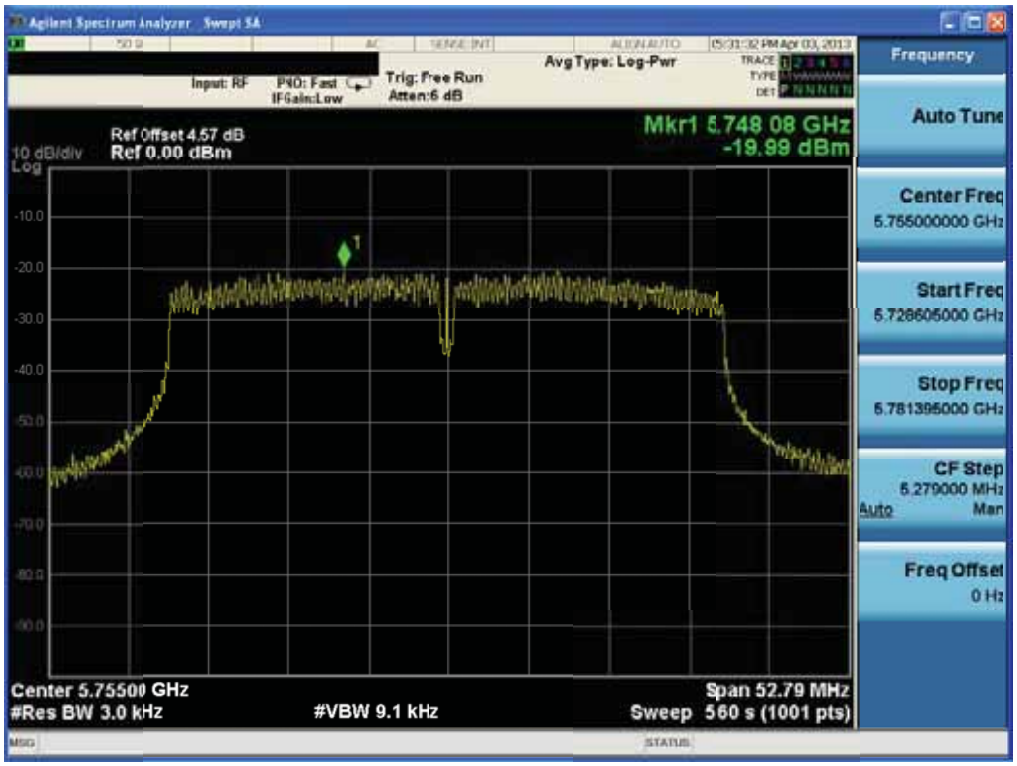
Maximum PPSD Test Mode: Chain 0 & 802.11n HT40 & MCS 11 & 5755MHz



Maximum PPSD Test Mode: Chain 0 & 802.11n HT40 & MCS 11 & 5795MHz



Maximum PPSD Test Mode: Chain 1 & 802.11n HT40 & MCS 11 & 5755MHz



Maximum PPSD Test Mode: Chain 1 & 802.11n HT40 & MCS 11 & 5795MHz