RF TEST REPORT

Test item	:	Wi-Fi Module
Model No.	:	TWFM-B005D
Order No.	:	DEMC1205-00579, DEMC1205-00580
Date of receipt	:	2012-05-08
Test duration	:	2012-06-01 ~ 2012-06-29
Date of issue	:	2012-07-12
Use of report	:	Class II Permissive Change

Applicant : LG Innotek Co., Ltd.
#978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731, Korea

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

Test specification	:	FCC Part 15 Subpart C 247, RSS-210 Issue 8 ANSI C63.4-2003, KDB558074
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer J.J.LEE	N/A	Technical Director Harvey Sung

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1. GENERAL INFORMATION

Applicant	:	LG Innotek Co., Ltd.
Address	:	#978-1, Jangduk-dong, Gwangsan-gu, Gwangju, 506-731, Korea
FCC ID	:	YZP-TWFMB005D
IC number	:	7414C-TWFMB005D
EUT	:	Wi-Fi Module
Model	:	TWFM-B005D
Additional Model(s)	:	TWFM-B015D, TWFM-B025D
Data of Test	:	2012-06-01 ~ 2012-06-29
Contact person	:	Lee Seong Chul

2. EUT DESCRIPTION

Product	Wi-Fi Module
Model Name	TWFM-B005D
Add Model Name	TWFM-B015D, TWFM-B025D
Power Supply	DC 5.0V
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: 13.95 dBm ▪ 802.11g: 18.21 dBm ▪ 802.11n (HT20): 21.16 dBm ▪ 802.11n (HT40): 18.80 dBm 5GHz Band ▪ 802.11a: 17.70 dBm ▪ 802.11n (HT20): 20.53 dBm ▪ 802.11n (HT40): 19.65 dBm
Modulation Type	802.11b: DSSS/CCK 802.11a/g/n: OFDM
Antenna Specification	PIFA Antenna(2TX 2RX) ▪ 2.4GHz Band Max. peak gain Chain 0 : 2.10dBi, Chain 1 : 1.73dBi ▪ 5GHz Band Max. peak gain Chain 0 : 2.67dBi, Chain 1 : 2.36dBi

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(c)	RSS-210 [A8.5]	Out of Band Emissions / Band Edge	20dBc in any 100kHz BW		**NT Note.2**
15.247(d)	RSS-210 [A8.2]	Transmitter Power Spectral Density	< 8dBm / 3kHz		**NT Note.2**
-	RSS Gen Issue 3	Occupied Bandwidth (99%)	RSS-Gen(4.6.1)		**NT Note.2**
15.205 15.209	RSS-210 [A8.5]	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	< FCC 15.209 limits	Radiated	**C Note.3**
15.207	RSS-Gen [7.2.4]	AC Conducted Emissions	< FCC 15.207 limits	AC Line Conducted	**C**
15.203	RSS-Gen [7.1.2]	Antenna Requirements	FCC 15.203	-	**C**

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

Note 2: According to the manufacturer's declaration, these items were not tested since changes shall not affect to these test items. Please refer to manufacturer's declaration letter for detail changes.

Note 3: 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 C63.4-2003) and KDB558074 D01

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 in Section 13.1.4.1 of ANSI C63.4. (Version :2003) 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: 2003)

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 & RSS-Gen [7.1.2]:
“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 antennas of this E.U.T are permanently attached by means of soldering.
* 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.

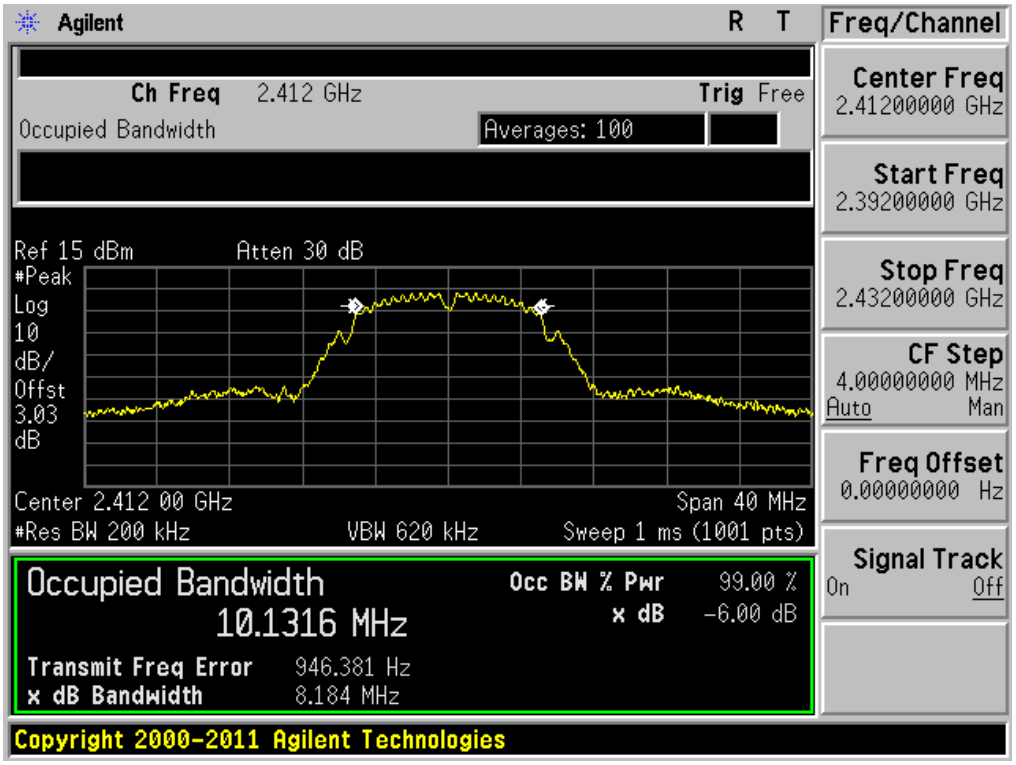
1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by 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. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.

▣ TEST RESULTS: Comply

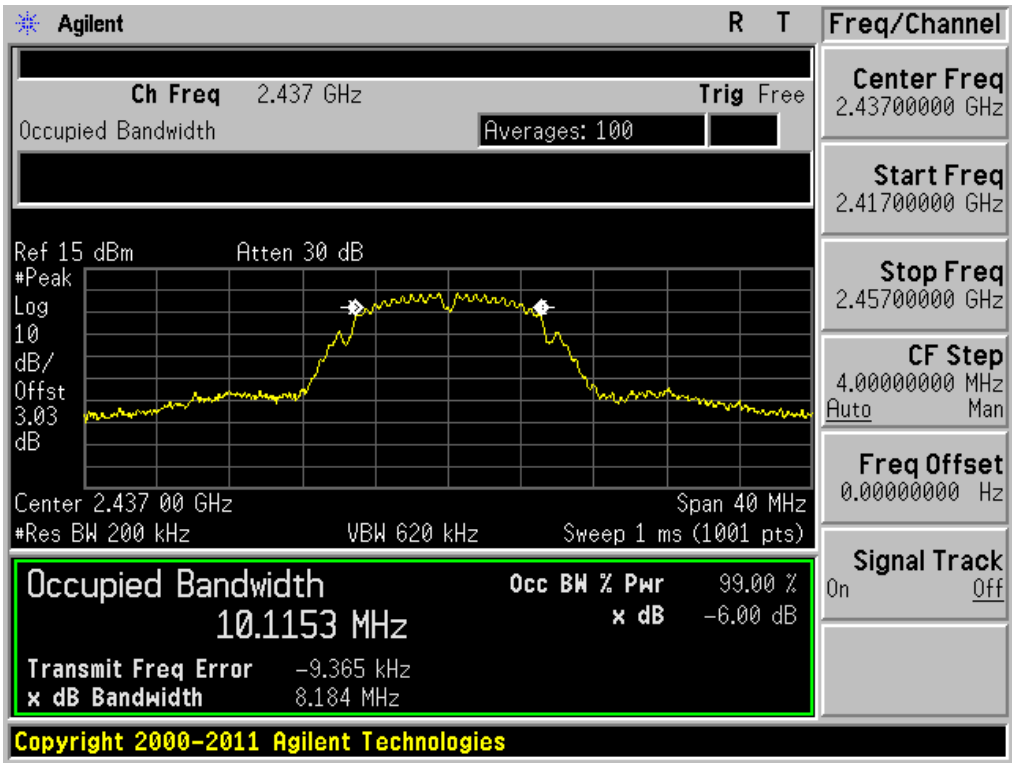
Test Mode	Data Rate	Frequency [MHz]	Test Results [MHz]	
			Chain 0	Chain 1
802.11b	1Mbps	2412	8.184	8.180
		2437	8.184	8.177
		2462	8.198	8.096
802.11g	6Mbps	2412	15.220	15.069
		2437	15.403	15.436
		2462	15.061	15.405
802.11n (20MHz)	MCS 0	2412	16.544	16.377
		2437	16.153	17.089
		2462	16.566	17.148
802.11n (40MHz)	MCS 0	2422	36.434	36.391
		2437	36.086	36.289
		2452	36.389	36.403
802.11a	6Mbps	5745	16.003	15.957
		5785	15.945	15.933
		5825	15.941	15.742
802.11n (20MHz)	MCS 0	5745	16.981	17.068
		5785	17.124	16.993
		5825	17.159	16.635
802.11n (40MHz)	MCS 0	5755	36.342	36.116
		5795	35.720	36.365

▣ RESULT PLOTS

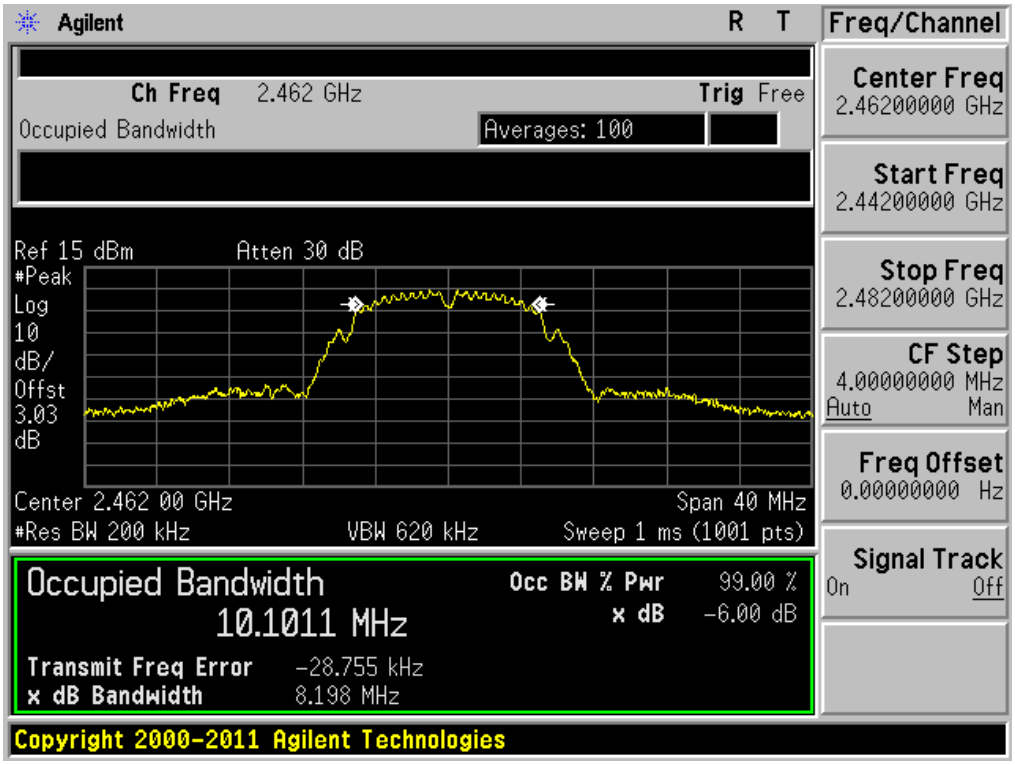
6 dB Bandwidth Test Mode: Chain 0 & 802.11b & 1Mbps & 2412MHz



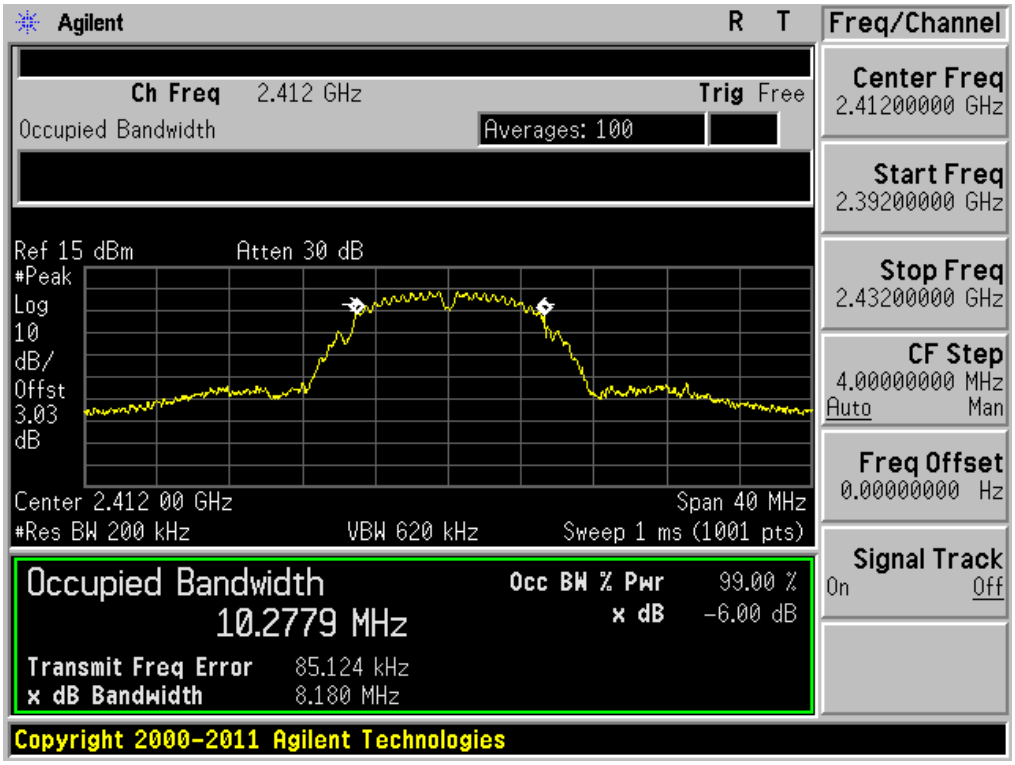
6 dB Bandwidth Test Mode: Chain 0 & 802.11b & 1Mbps & 2437MHz



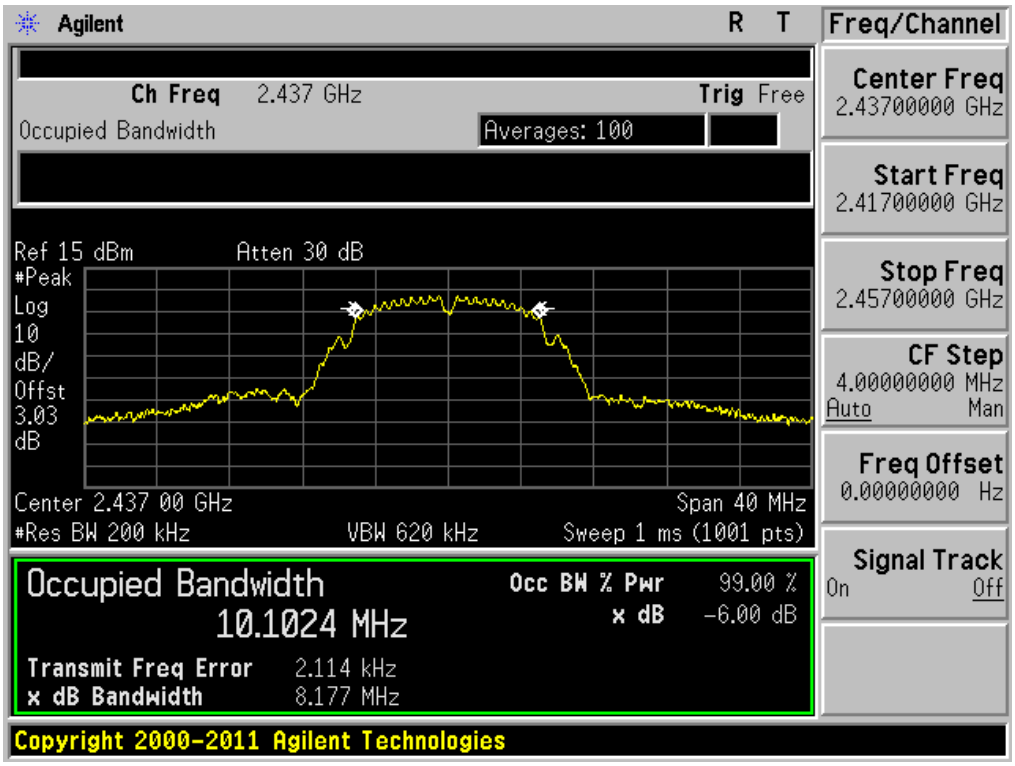
6 dB Bandwidth Test Mode: Chain 0 & 802.11b & 1Mbps & 2462MHz



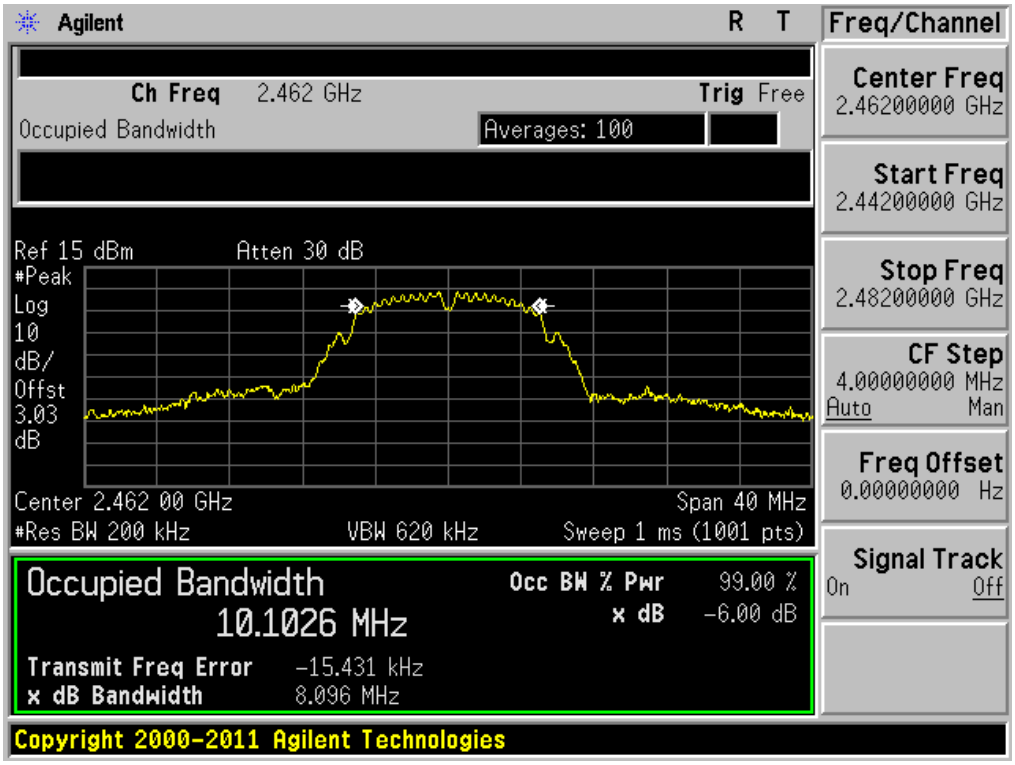
6 dB Bandwidth Test Mode: Chain 1 & 802.11b & 1Mbps & 2412MHz



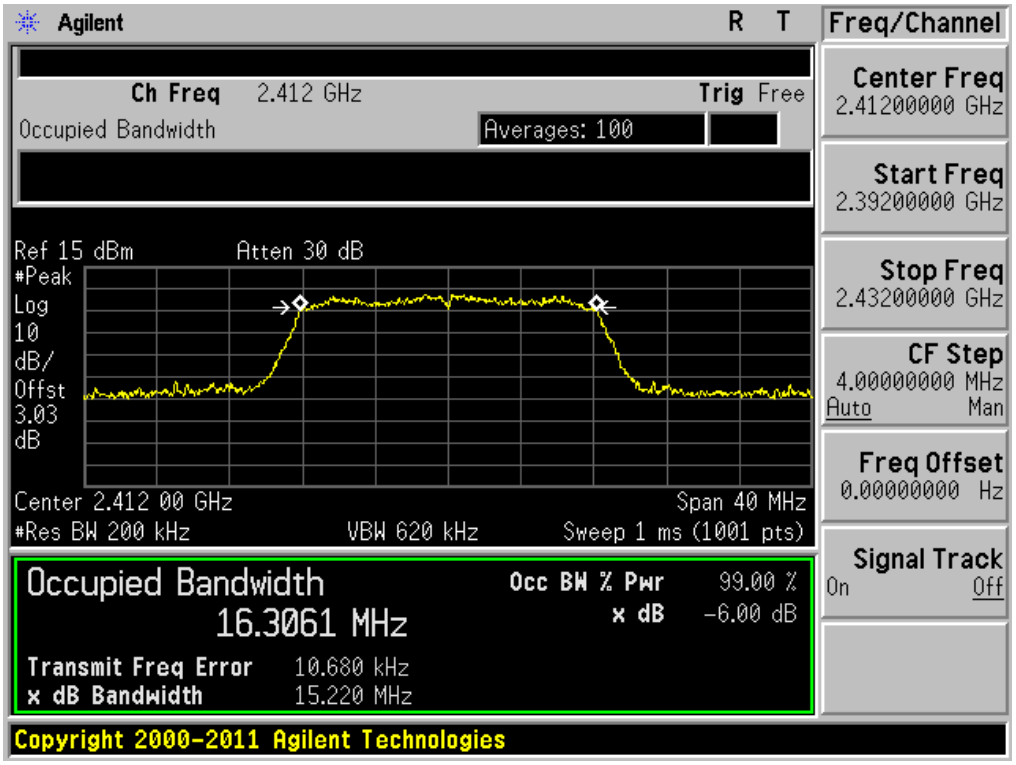
6 dB Bandwidth Test Mode: Chain 1 & 802.11b & 1Mbps & 2437MHz



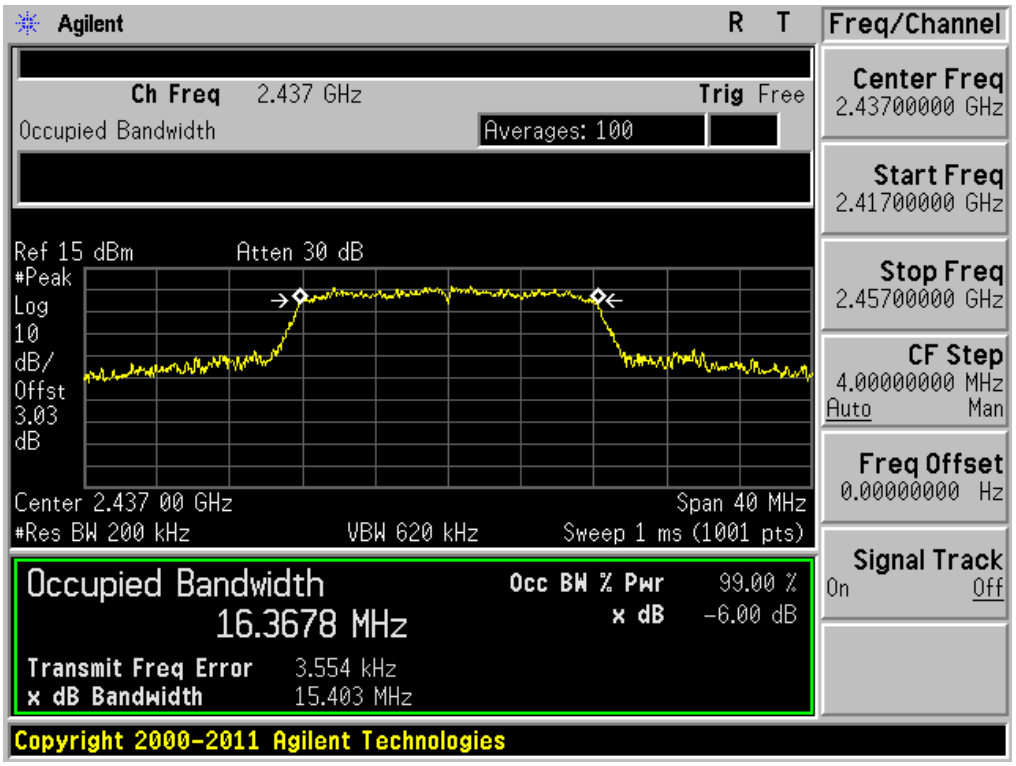
6 dB Bandwidth Test Mode: Chain 1 & 802.11b & 1Mbps & 2462MHz



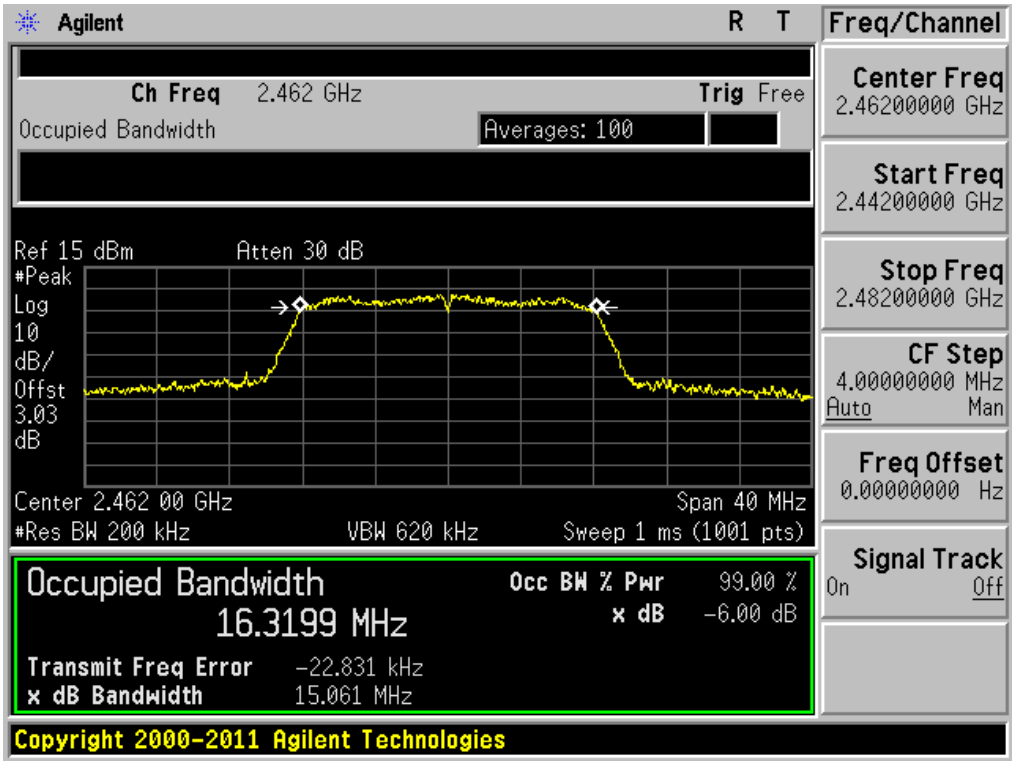
6 dB Bandwidth Test Mode: Chain 0 & 802.11g & 6Mbps & 2412MHz



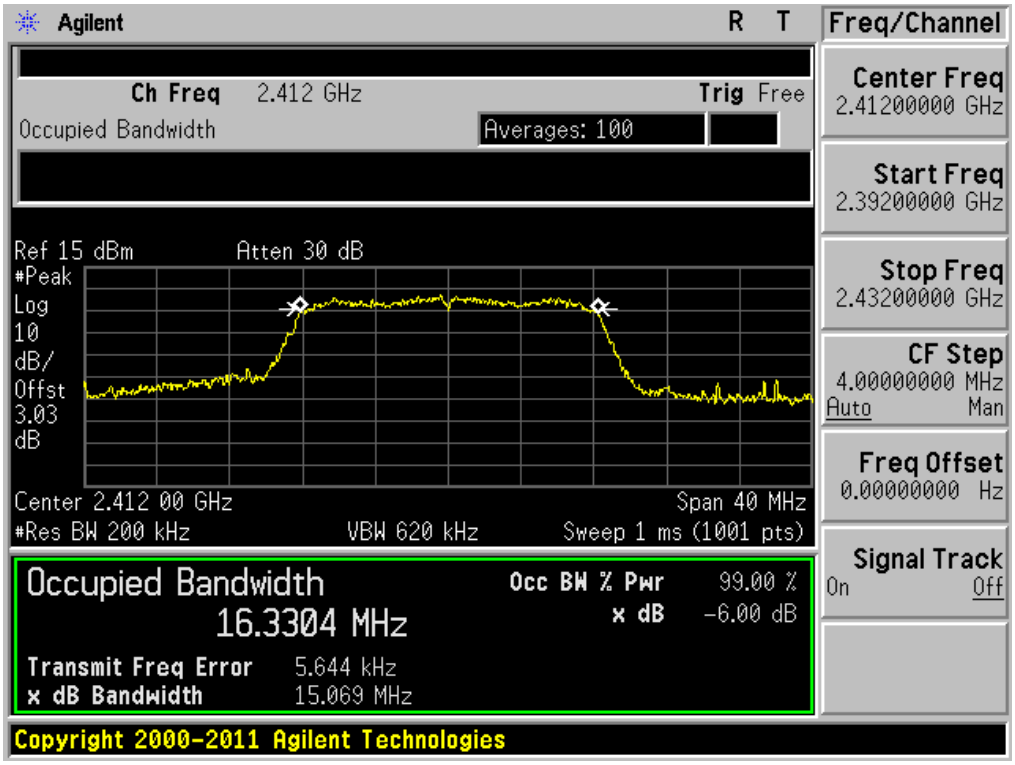
6 dB Bandwidth Test Mode: Chain 0 & 802.11g & 6Mbps & 2437MHz



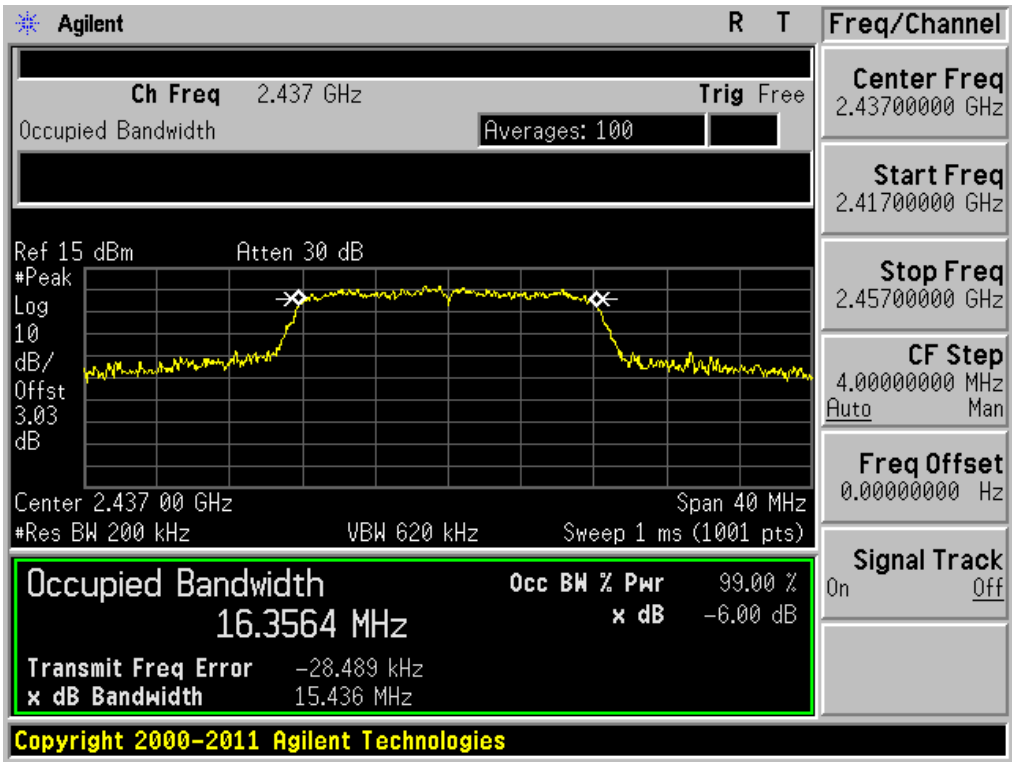
6 dB Bandwidth Test Mode: Chain 0 & 802.11g & 6Mbps & 2462MHz



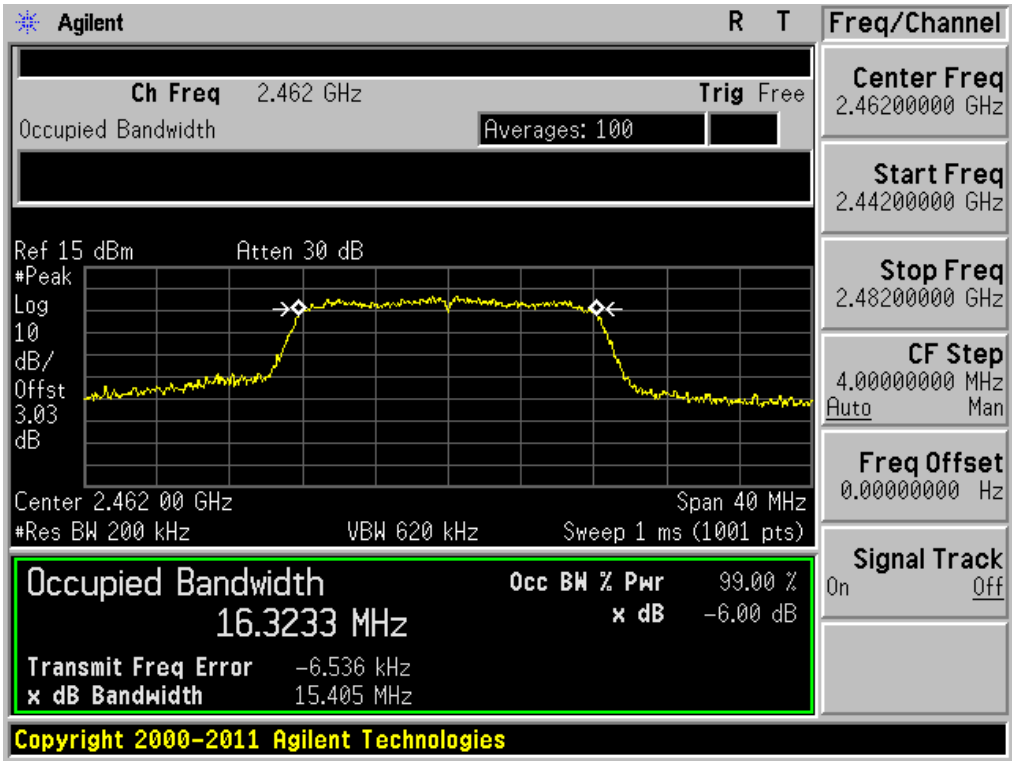
6 dB Bandwidth Test Mode: Chain 1 & 802.11g & 6Mbps & 2412MHz



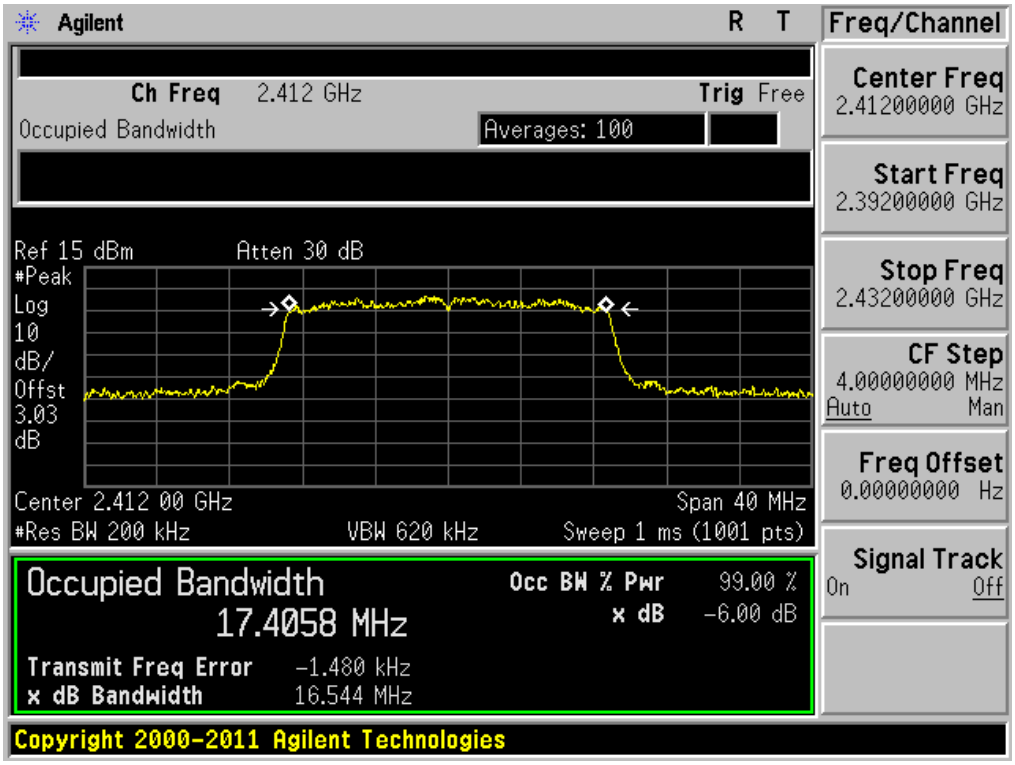
6 dB Bandwidth Test Mode: Chain 1 & 802.11g & 6Mbps & 2437MHz



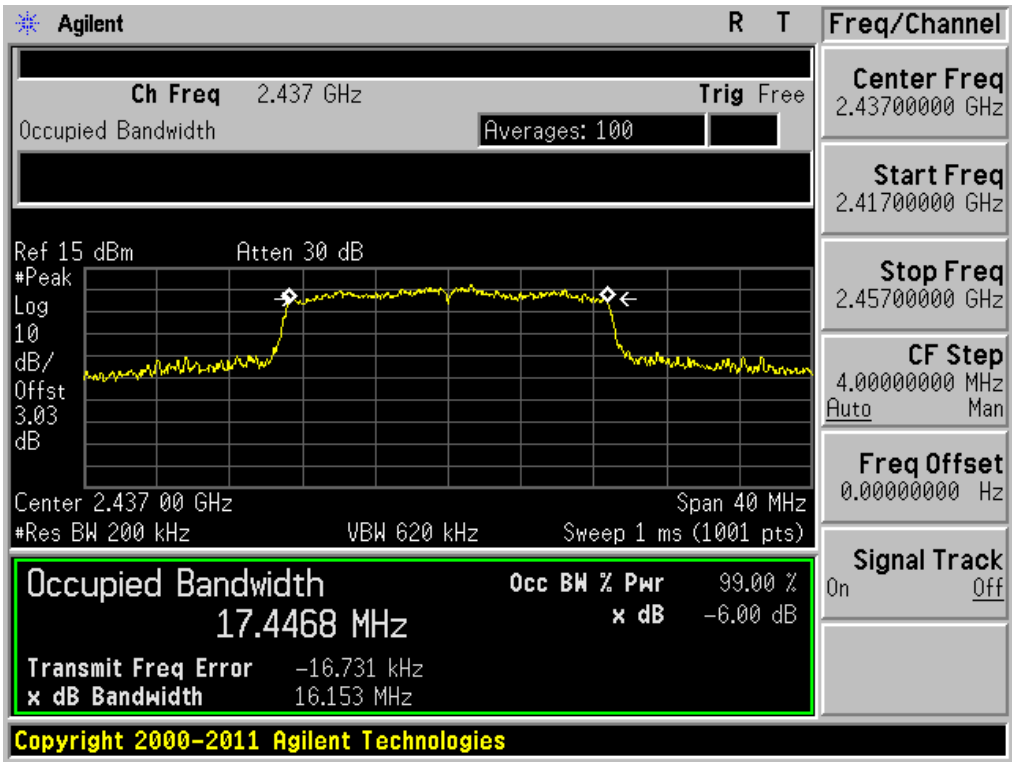
6 dB Bandwidth Test Mode: Chain 1 & 802.11g & 6Mbps & 2462MHz



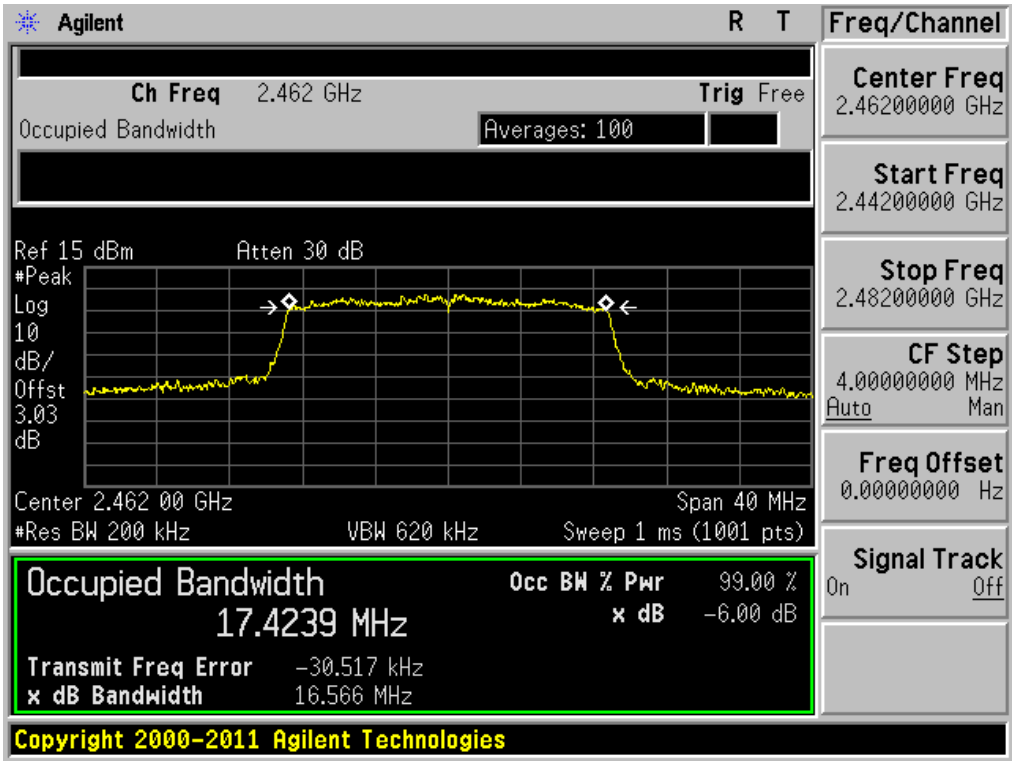
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 2412MHz



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



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



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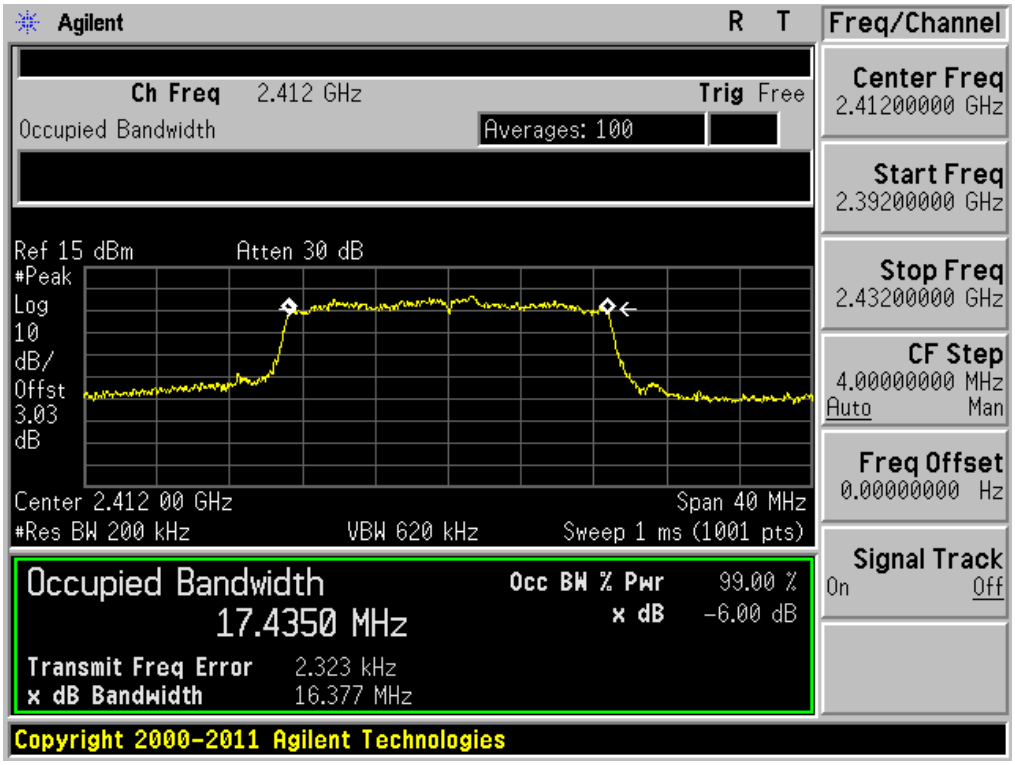
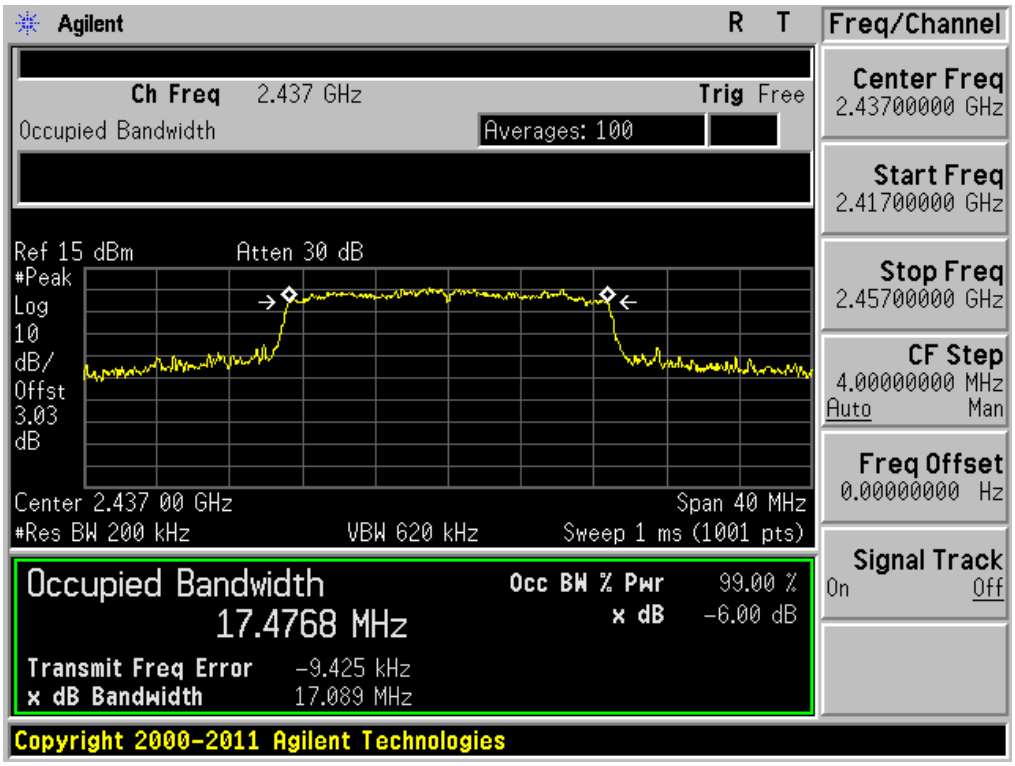


6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 2437MHz



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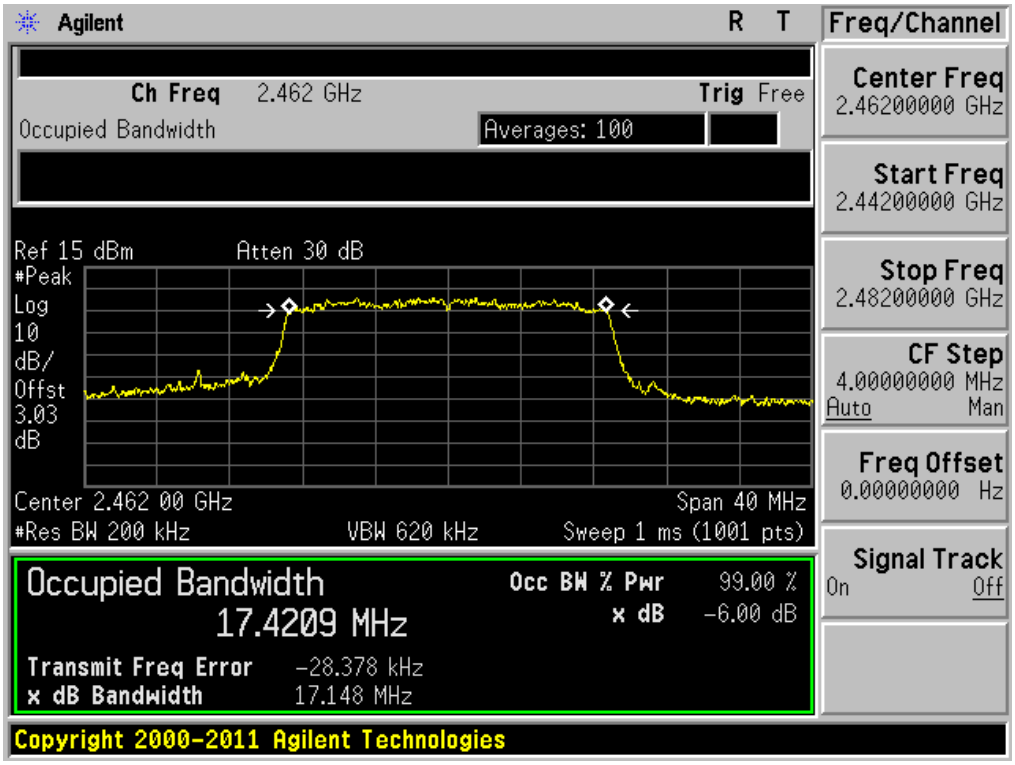

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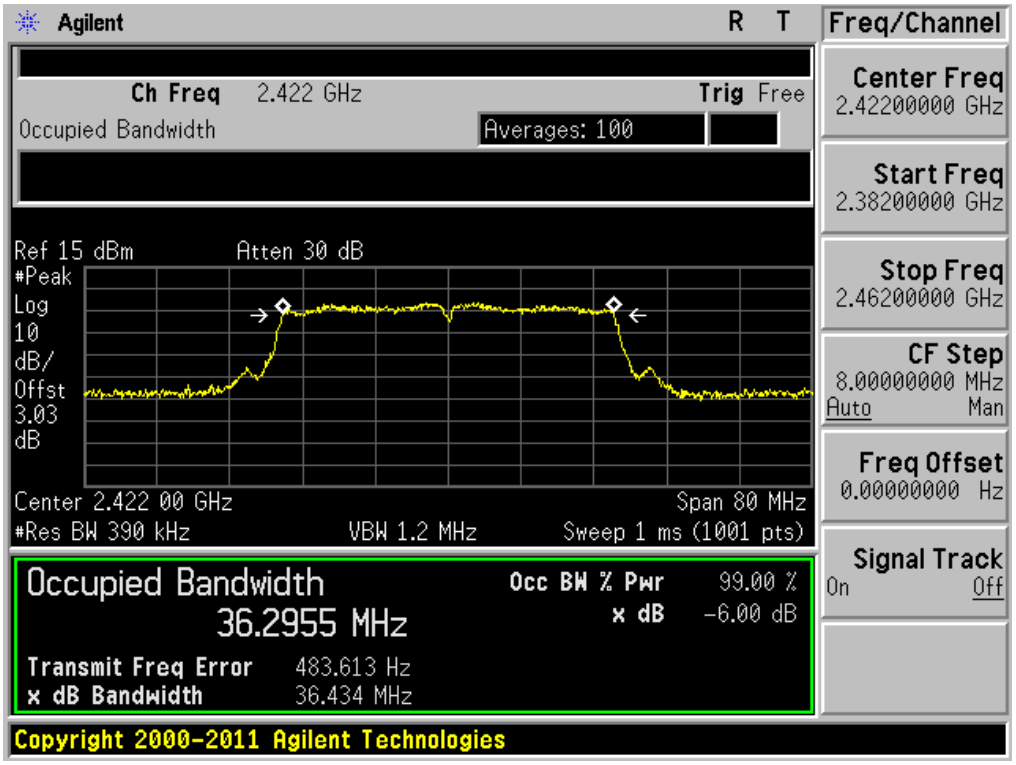

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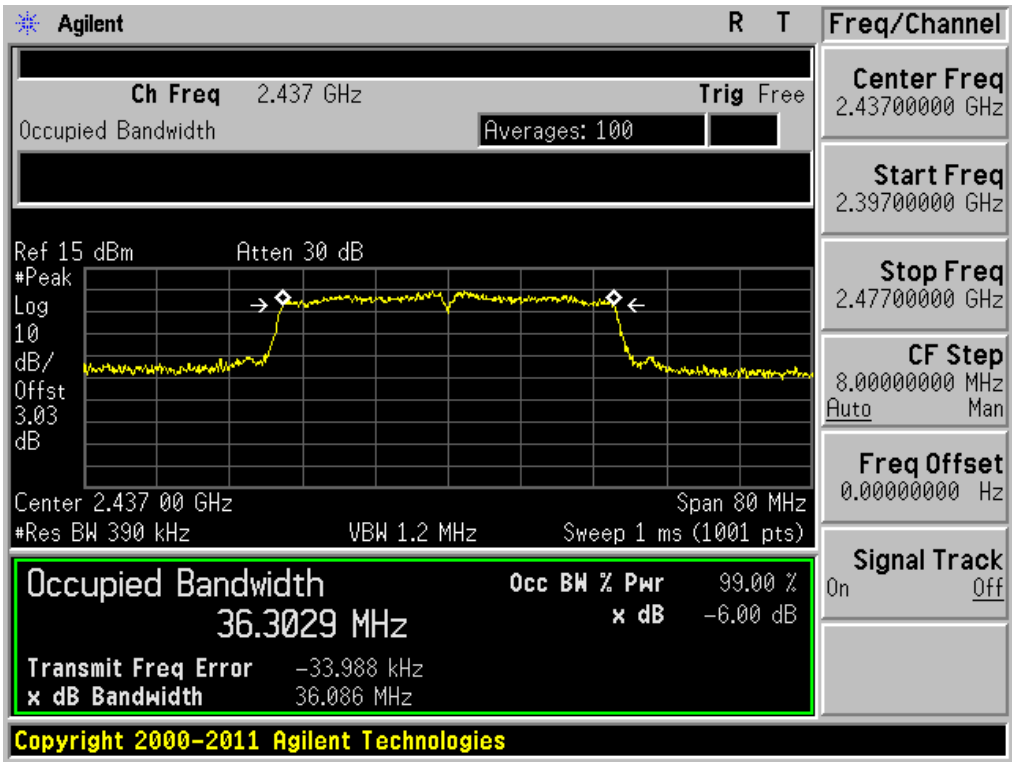

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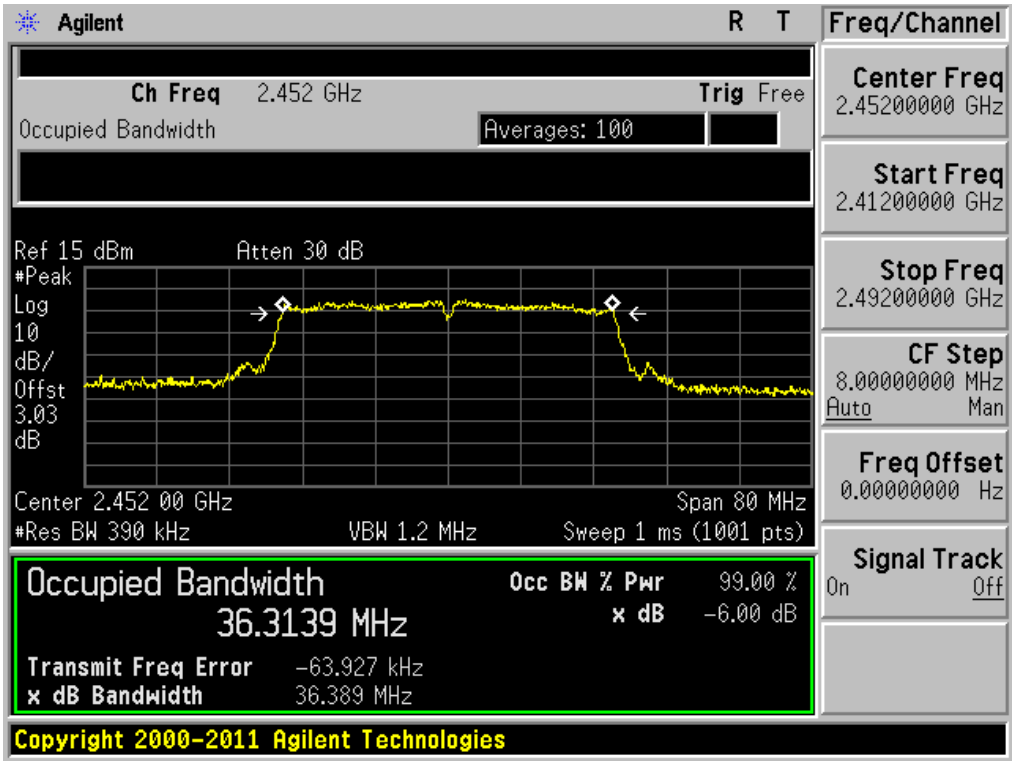

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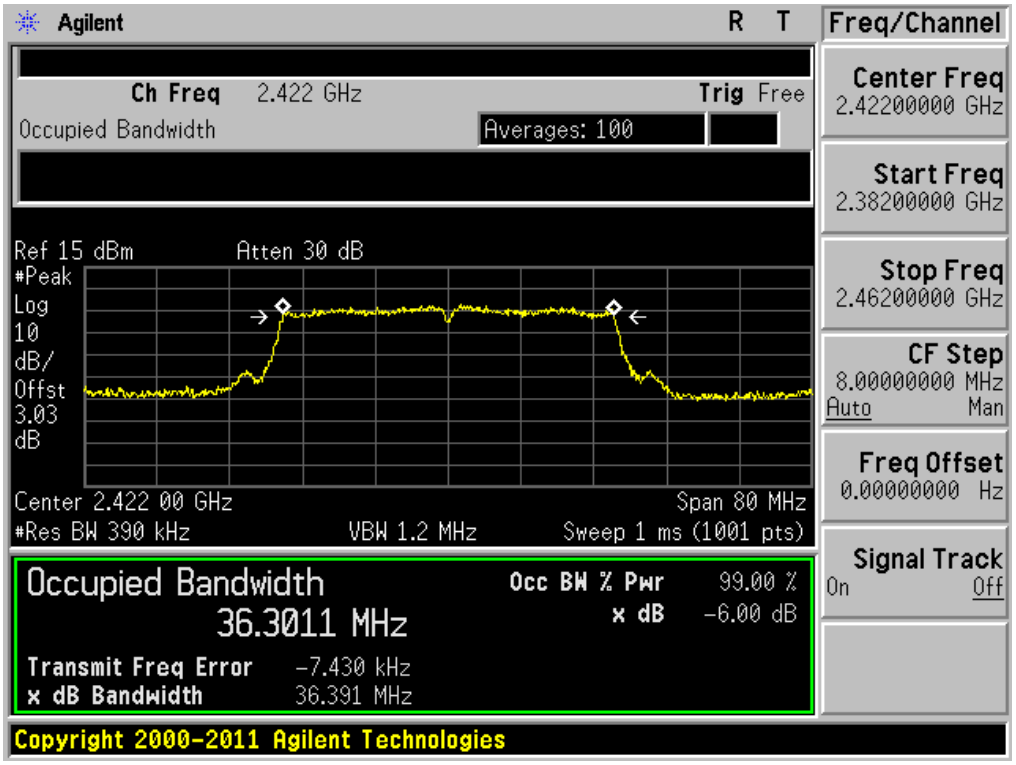

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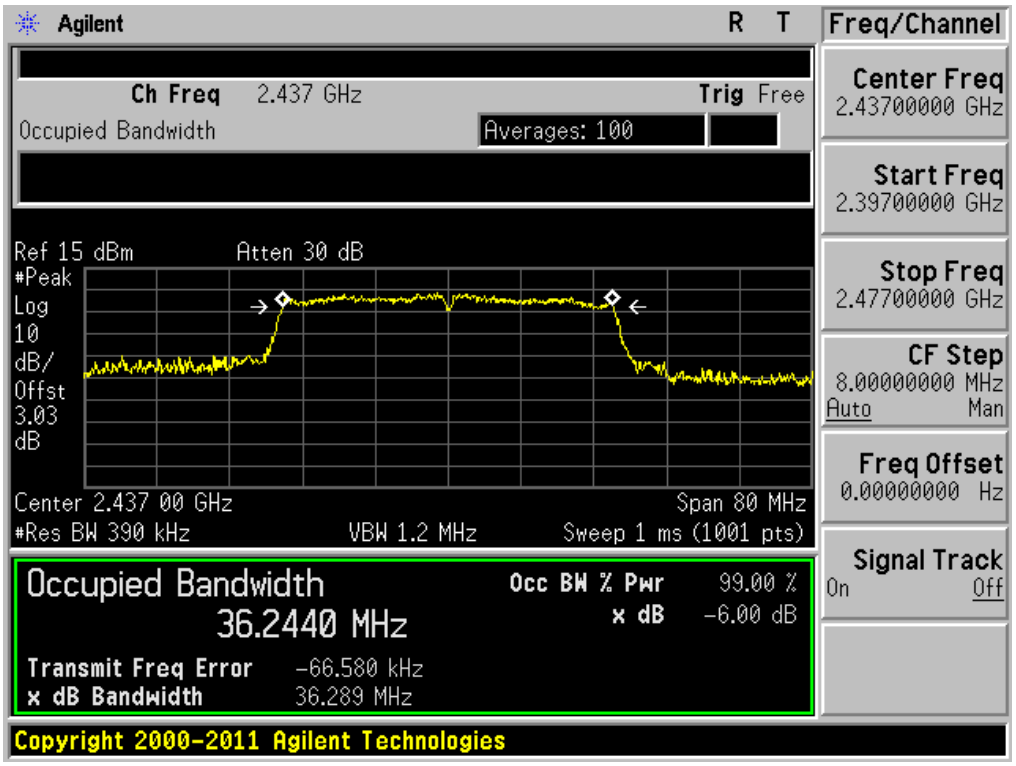
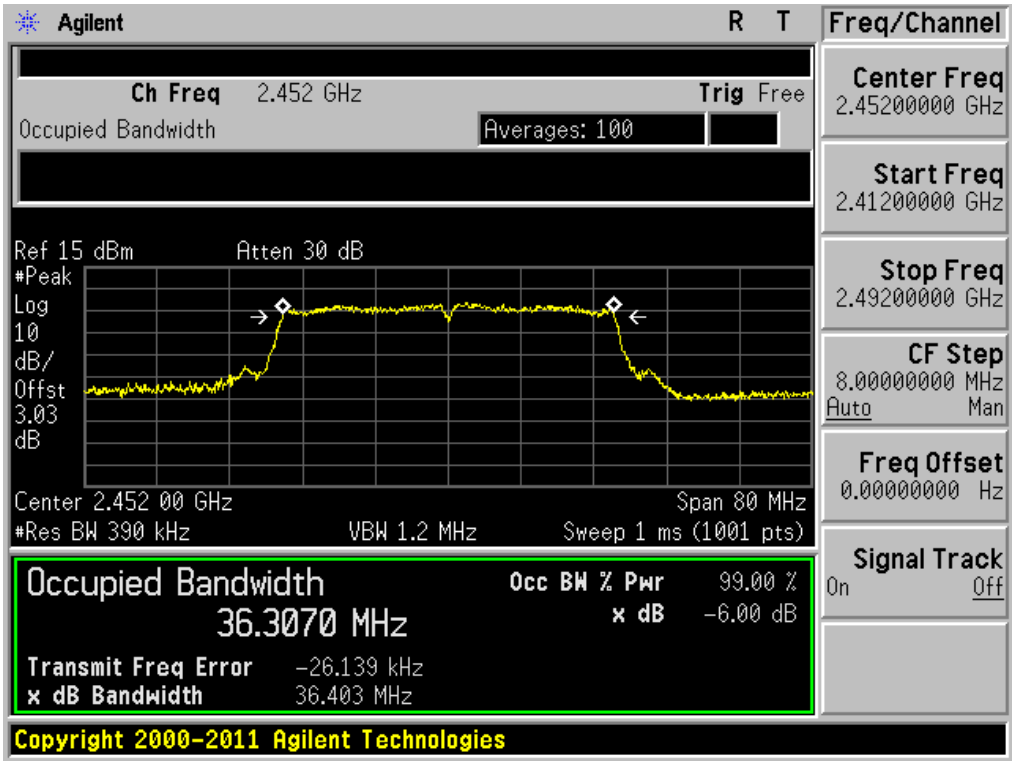
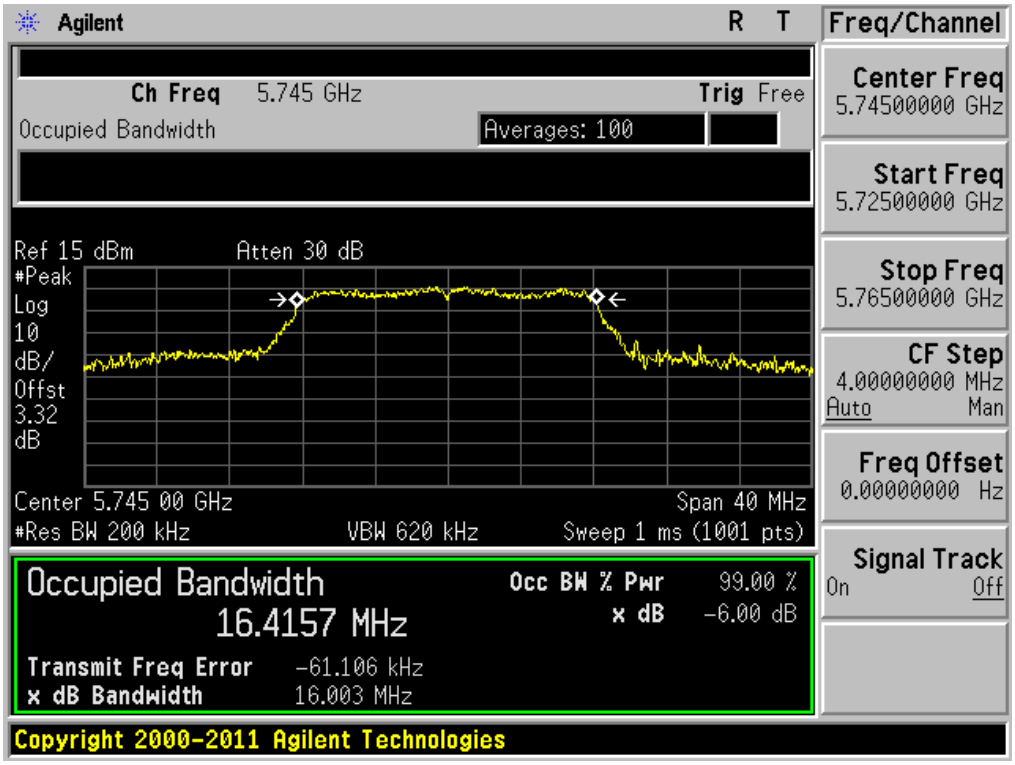


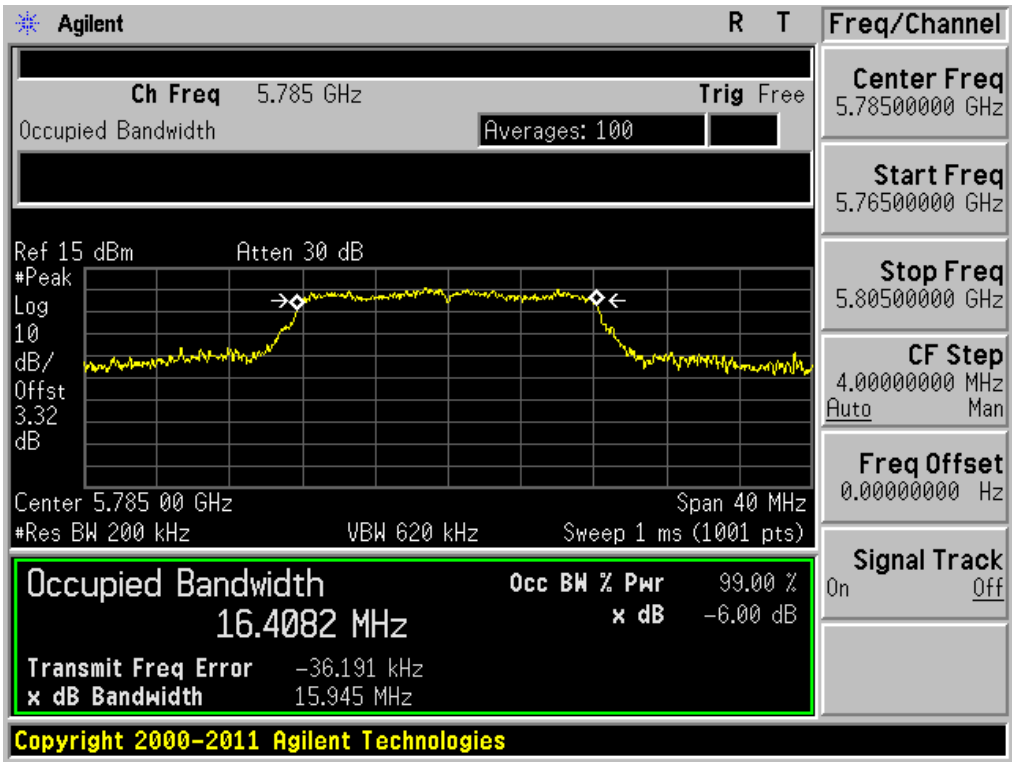
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 2452MHz



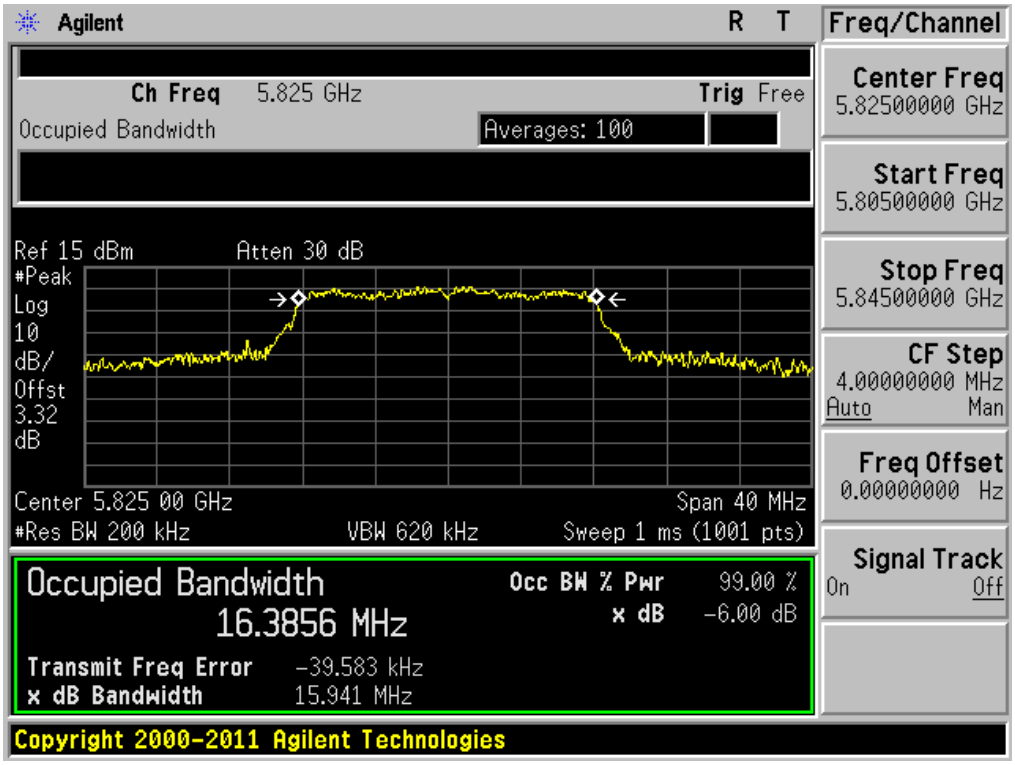
6 dB Bandwidth Test Mode: Chain 0 & 802.11a & 6Mbps & 5745MHz



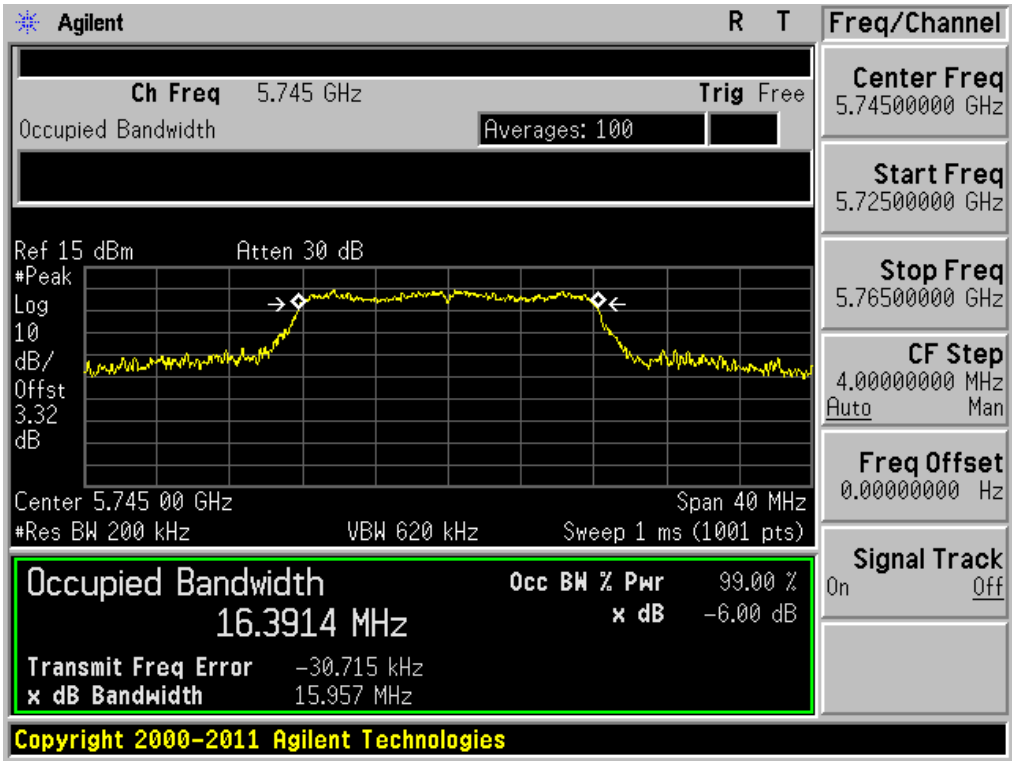
6 dB Bandwidth Test Mode: Chain 0 & 802.11a & 6Mbps & 5785MHz



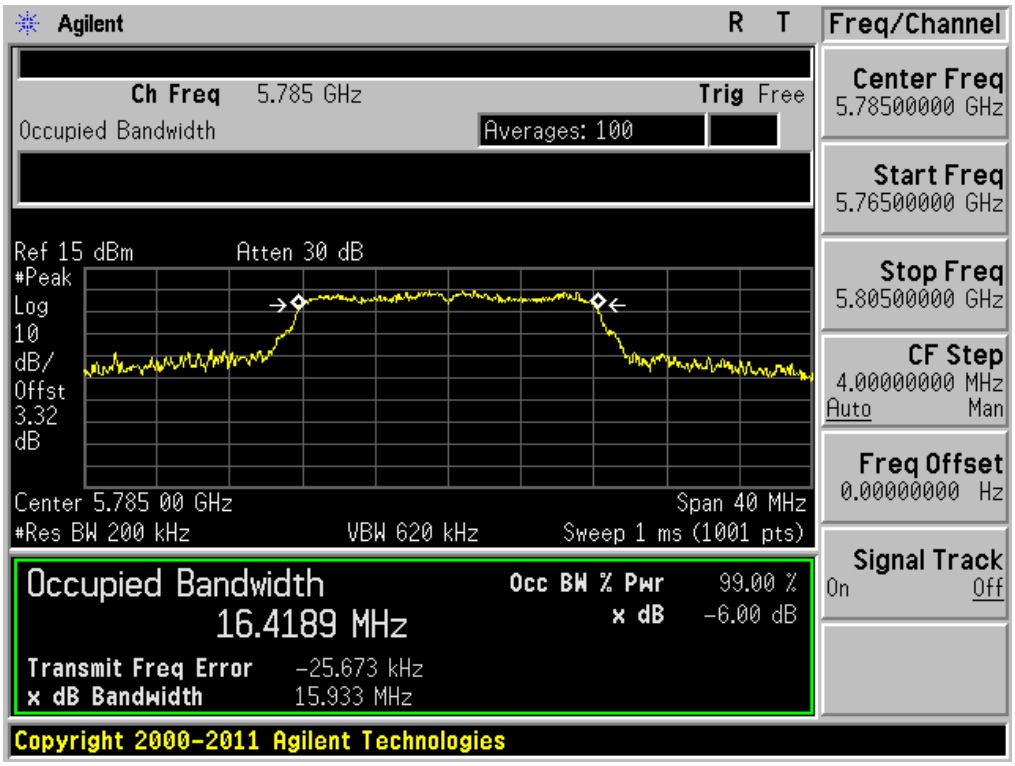
6 dB Bandwidth Test Mode: Chain 0 & 802.11a & 6Mbps & 5825MHz



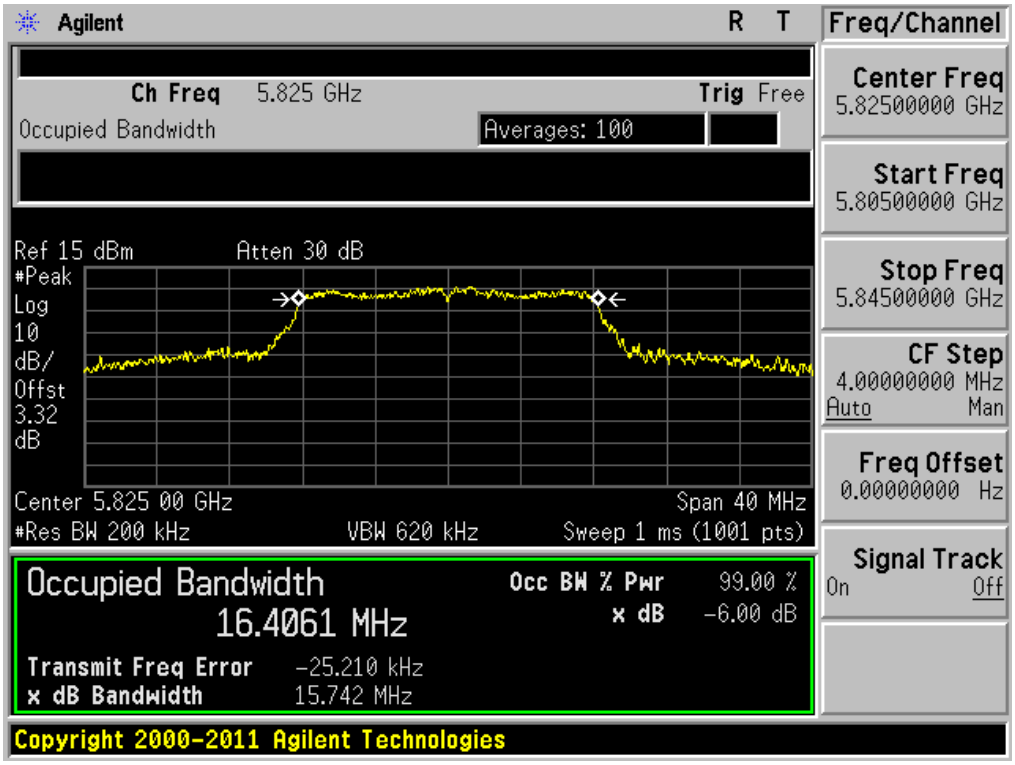
6 dB Bandwidth Test Mode: Chain 1 & 802.11a & 6Mbps & 5745MHz



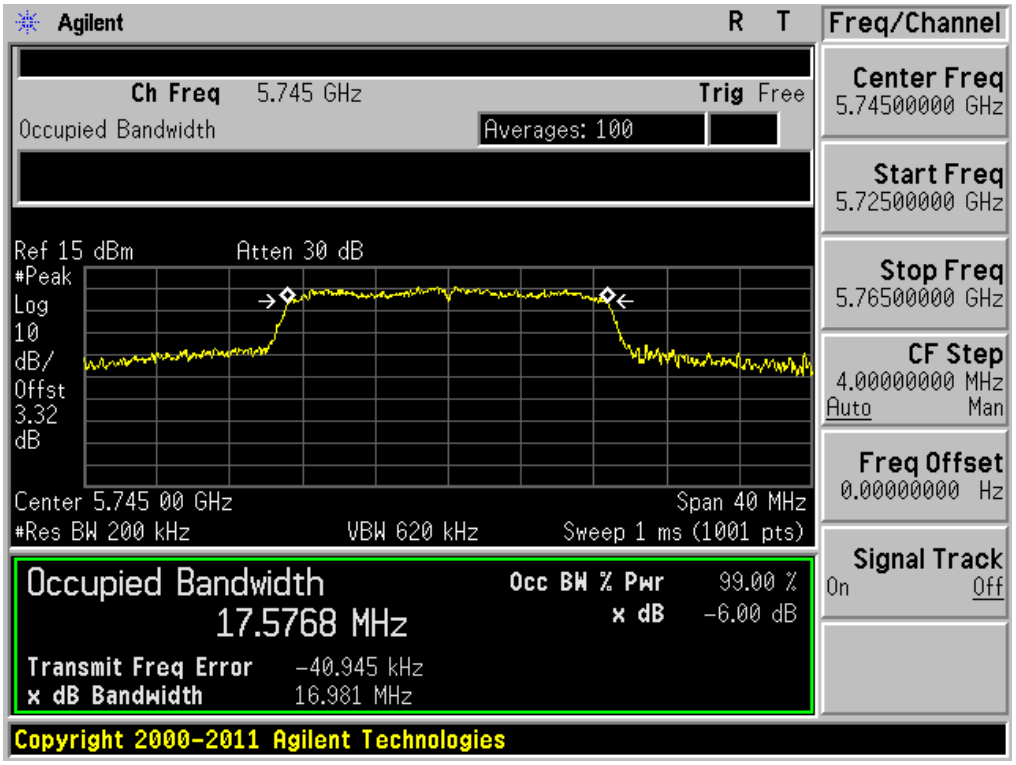
6 dB Bandwidth Test Mode: Chain 1 & 802.11a & 6Mbps & 5785MHz



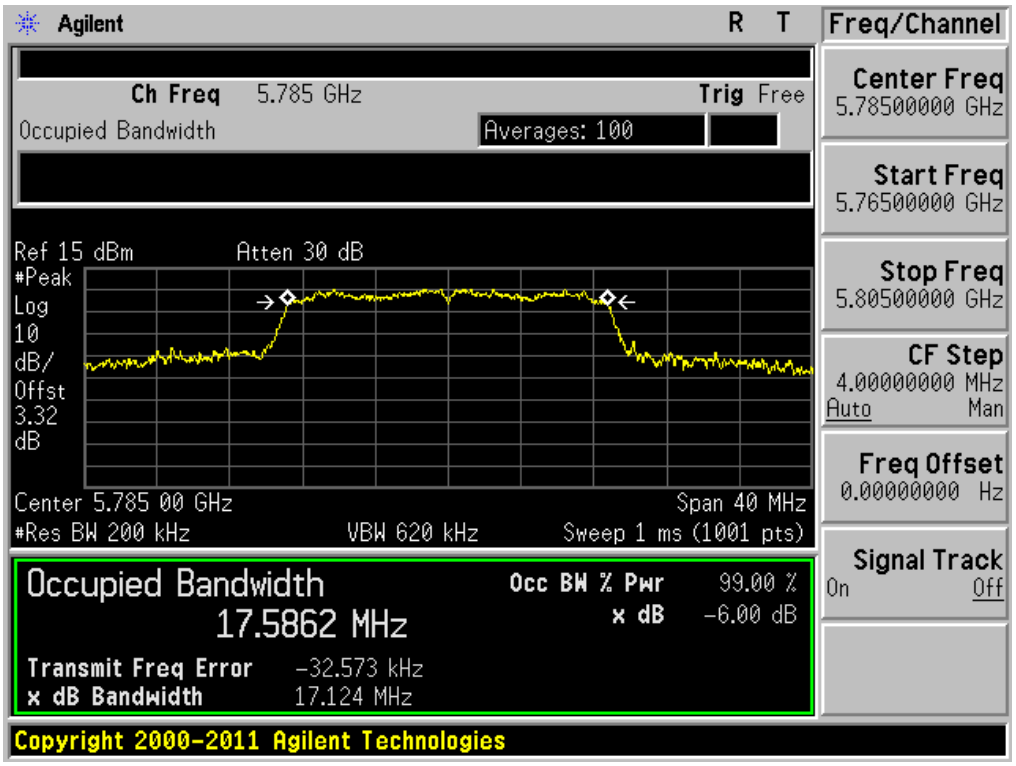
6 dB Bandwidth Test Mode: Chain 1 & 802.11a & 6Mbps & 5825MHz



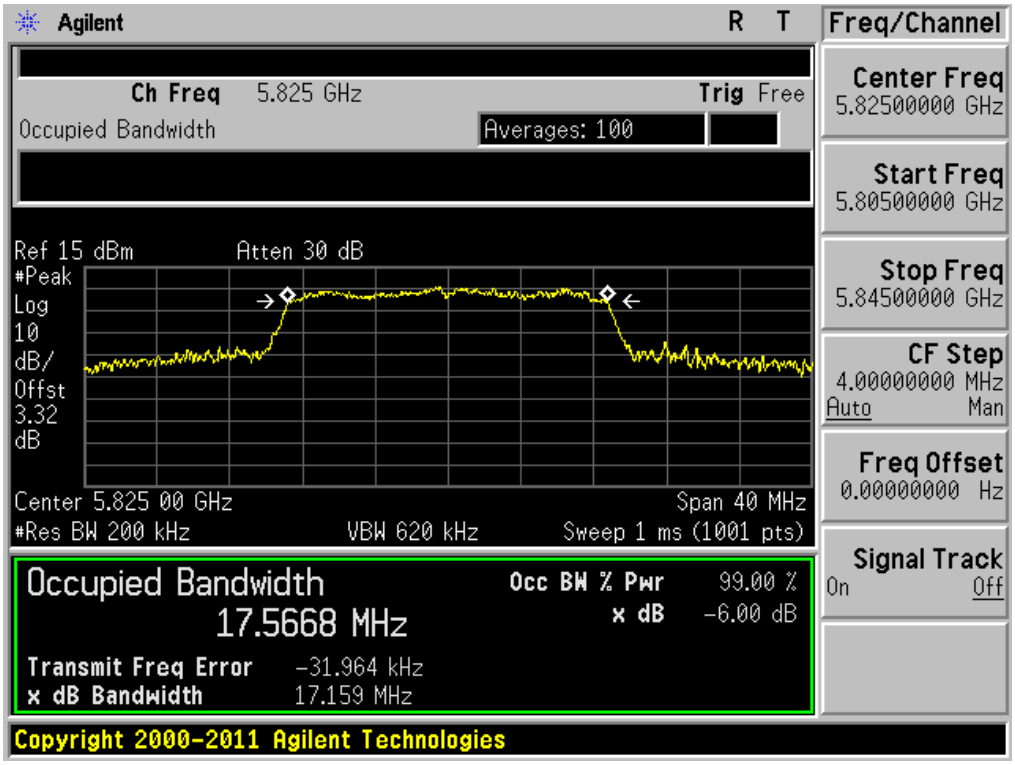
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 5745MHz



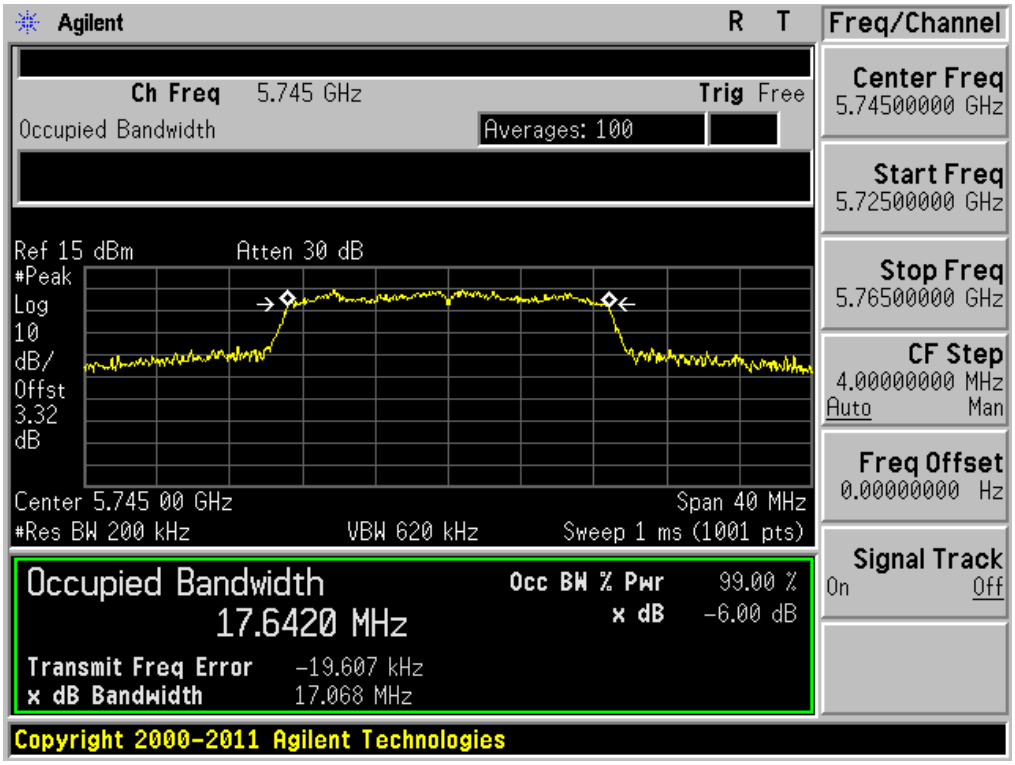
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 5785MHz



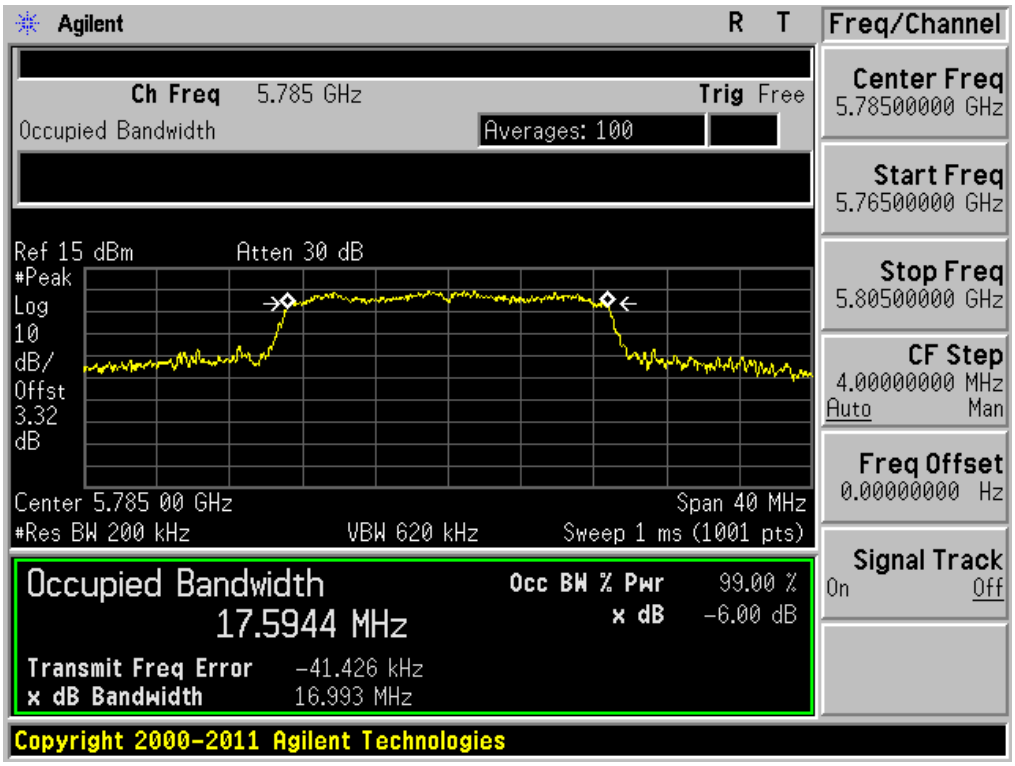
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 5825MHz



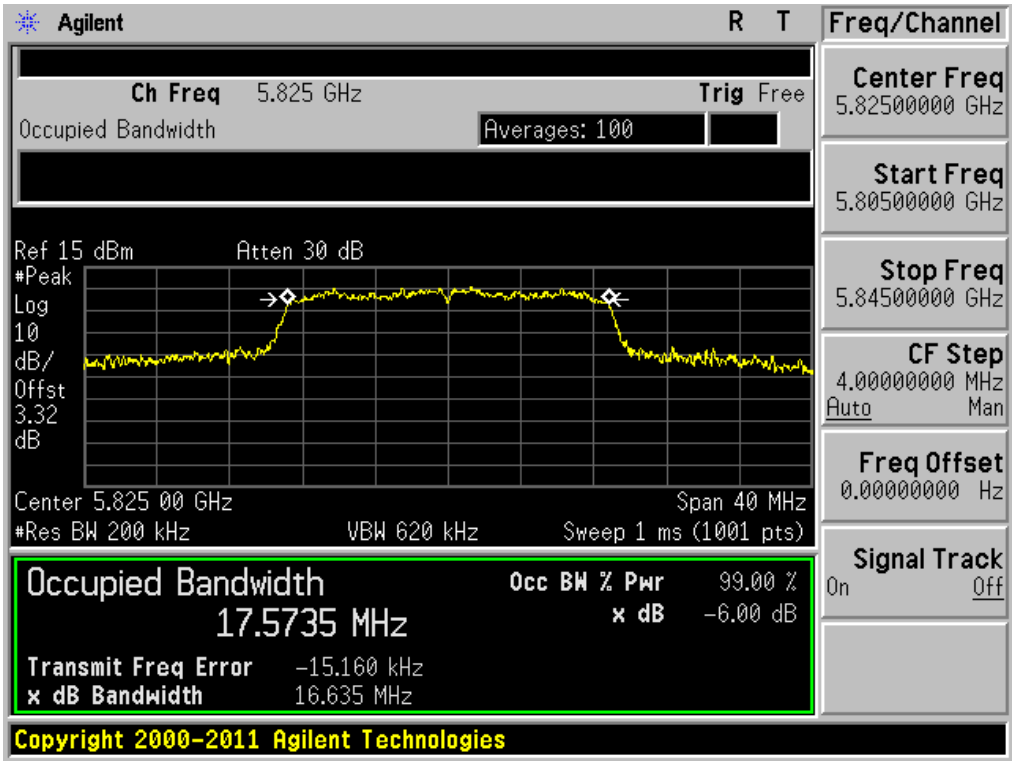
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 5745MHz



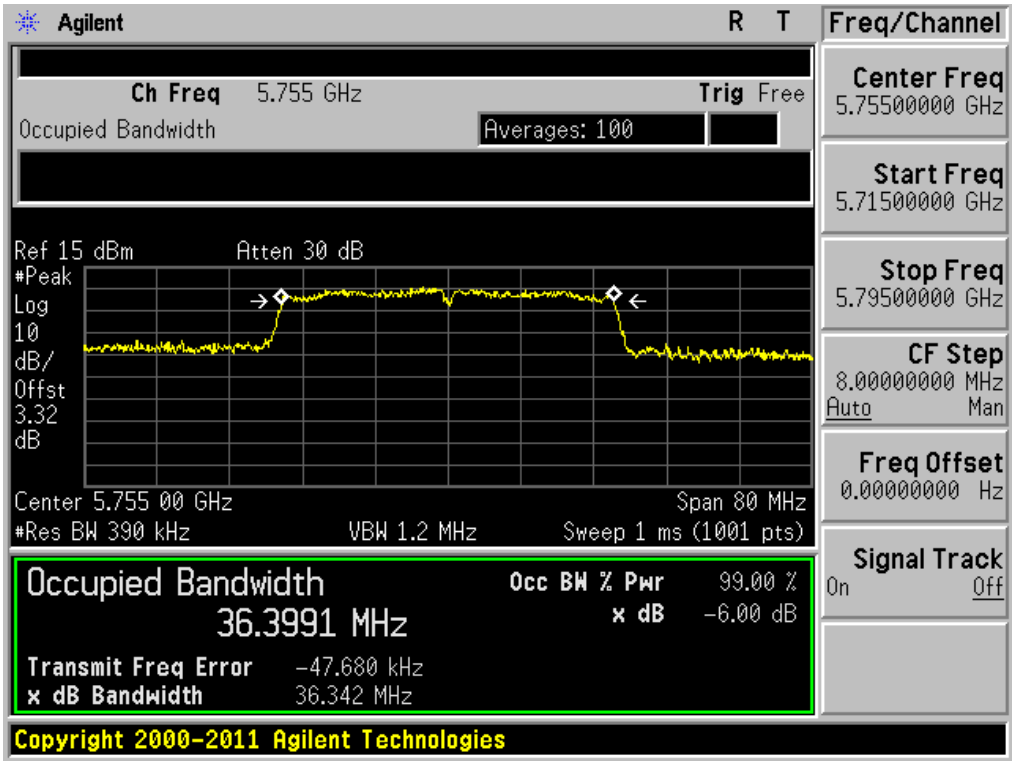
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 5785MHz



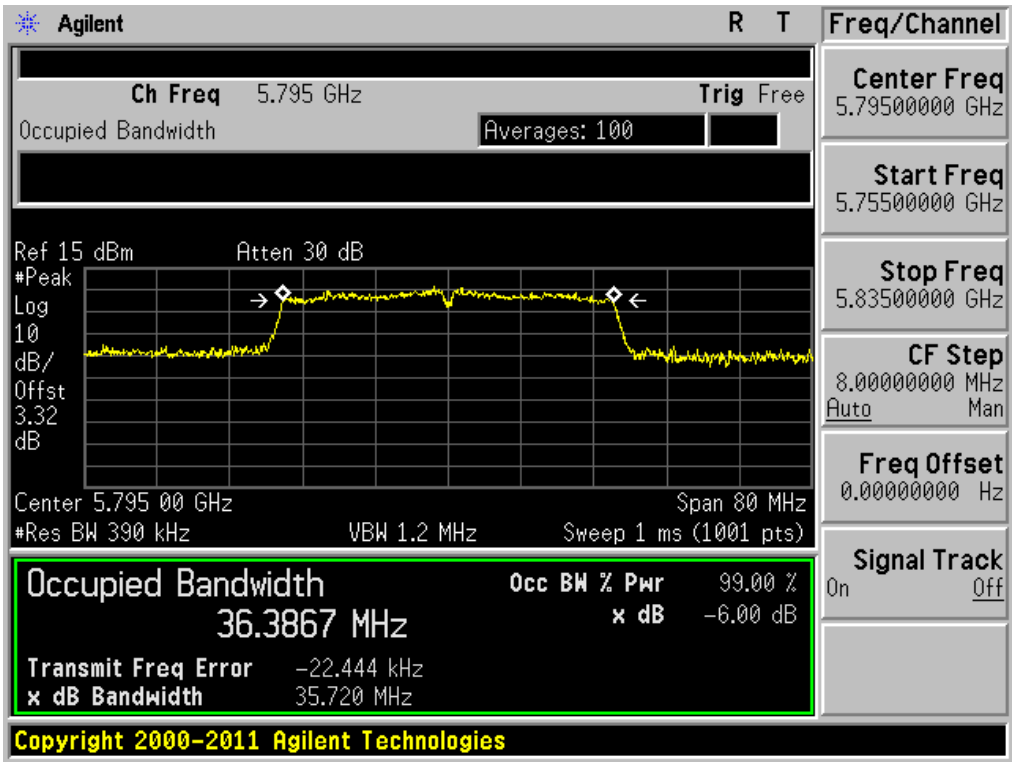
6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 5825MHz



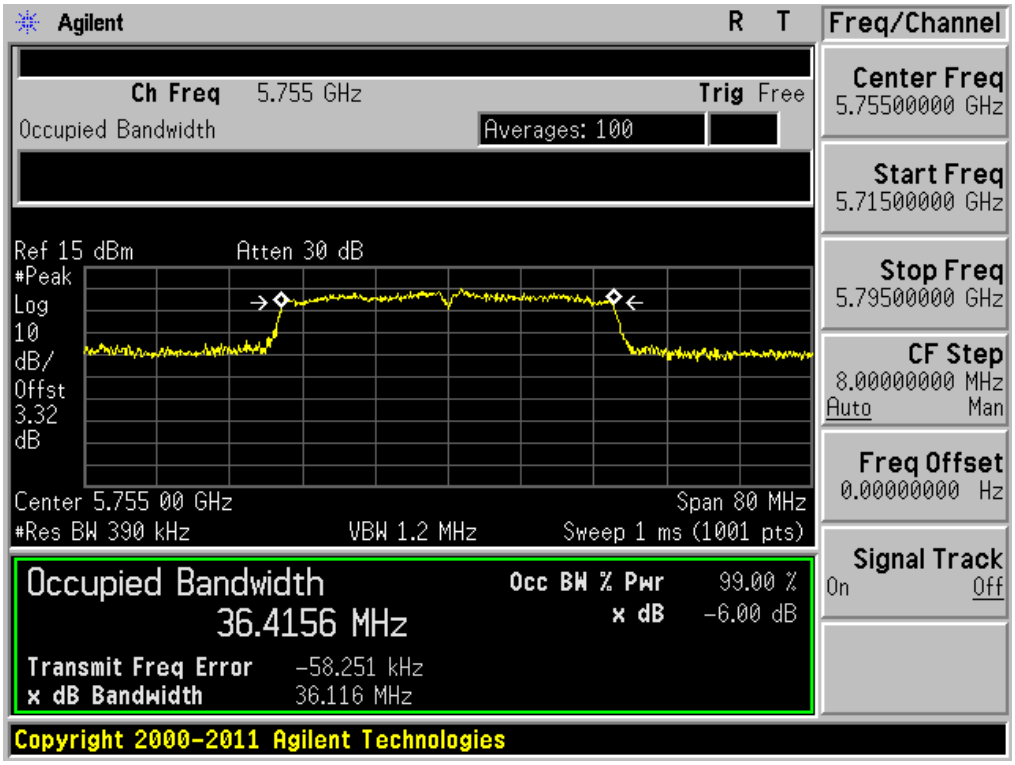
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 5755MHz



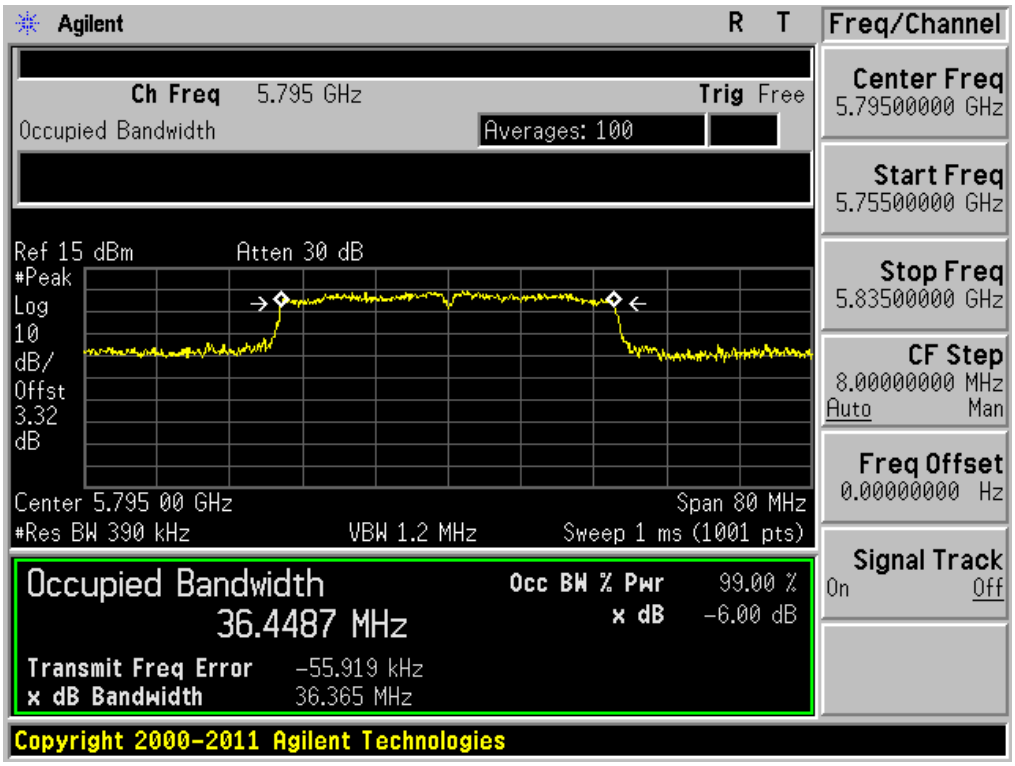
6 dB Bandwidth Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 5795MHz



6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 5755MHz



6 dB Bandwidth Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 5795MHz



8.2 Maximum Peak Conducted Output Power

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

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

The maximum permissible conducted output power is 1 Watt.

▣ TEST CONFIGURATION

Refer to the APPENDIX I.

▣ TEST PROCEDURE (Test Case 1) : Only for comparing output powers with the original equipment

The peak output power was measured RF power sensor. Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.**(Power Output Option 1 of DTS measurement guidance)**

▣ TEST RESULTS : Comply

- **Measurement Data: Comply**

▪ **Single transmitting data**

Mode	Channel	Frequency [MHz]	Test Result			
			Chain 0		Chain 1	
			[dBm]	[W]	[dBm]	[W]
802.11b	1	2412	15.65	0.037	14.50	0.028
	6	2437	16.27	0.042	14.96	0.031
	11	2462	**17.38**	**0.055**	16.10	0.041
802.11g	1	2412	23.09	0.204	22.92	0.196
	6	2437	**24.98**	**0.315**	24.35	0.272
	11	2462	23.23	0.210	22.85	0.193
802.11a	149	5745	23.71	0.235	23.54	0.226
	157	5785	23.92	0.247	23.79	0.239
	165	5825	23.37	0.217	**24.17**	**0.261**

▪ **Multiple transmitting data**

Mode	Channel	Frequency [MHz]	Test Result			
			Chain 0 [dBm]	Chain 1 [dBm]	Aggregate Power[Note1]	
					[dBm]	[W]
802.11n HT20	1	2412	23.29	22.77	26.05	0.4025
	6	2437	24.14	24.34	**27.25**	**0.5311**
	11	2462	23.36	23.20	26.29	0.4257
802.11n HT40	3	2422	20.00	19.19	22.62	0.1830
	6	2437	23.69	23.02	**26.38**	**0.4343**
	9	2452	21.48	20.87	24.20	0.2628
802.11n HT20	149	5745	23.93	23.02	26.51	0.4476
	157	5785	23.83	23.28	**26.57**	**0.4544**
	165	5825	23.68	23.31	26.51	0.4476
802.11n HT40	151	5755	23.35	22.79	26.09	0.4064
	159	5795	23.71	23.03	**26.39**	**0.4359**

Note1: Aggregate power = $10\log(10^{(\frac{\text{chain }0}{10})} + 10^{(\frac{\text{chain }1}{10})})$

-**Output powers of the original certified equipment for reference.**

- **Single transmitting data**

Mode	Channel	Frequency [MHz]	Test Result			
			Chain 0		Chain 1	
			[dBm]	[W]	[dBm]	[W]
802.11b	1	2412	15.90	0.039	15.38	0.035
	6	2437	16.45	0.044	15.85	0.038
	11	2462	**17.83**	**0.061**	16.97	0.050
802.11g	1	2412	23.28	0.213	23.47	0.222
	6	2437	25.12	0.325	**25.22**	**0.333**
	11	2462	23.64	0.231	23.78	0.239
802.11a	149	5745	24.11	0.258	**24.31**	**0.270**
	157	5785	24.13	0.259	24.16	0.260
	165	5825	23.77	0.238	24.19	0.262

- **Multiple transmitting data**

Mode	Channel	Frequency [MHz]	Test Result			
			Chain 0 [dBm]	Chain 1 [dBm]	Aggregate Power[Note1]	
					[dBm]	[W]
802.11n HT20	1	2412	23.30	23.52	26.42	0.4387
	6	2437	24.48	25.17	**27.85**	**0.6094**
	11	2462	23.68	23.88	26.79	0.4777
802.11n HT40	3	2422	20.15	20.04	23.11	0.2044
	6	2437	24.07	23.63	**26.87**	**0.4859**
	9	2452	21.91	21.63	24.78	0.3008
802.11n HT20	149	5745	24.21	24.22	**27.23**	**0.5279**
	157	5785	23.93	24.17	27.06	0.5084
	165	5825	23.80	24.23	27.03	0.5047
802.11n HT40	151	5755	23.98	24.06	**27.03**	**0.5047**
	159	5795	23.97	23.98	26.99	0.4995

Note1: Aggregate power = $10\log(10^{(\frac{\text{chain 0}}{10})} + 10^{(\frac{\text{chain 1}}{10})})$

▣ **TEST PROCEDURE (Test Case 2) :**

Maximum Peak Conducted Output Power is measured using **the Measurement Procedure PK2 of KDB558074**.

1. Set the **RBW = 1 MHz**.
2. Set the **VBW = 3 MHz**.
3. Set the span to a value that is **5-30 %** greater than the EBW.
4. Detector = **peak**.
5. Sweep time = **auto couple**.
6. Trace mode = **max hold**.
7. Allow trace to fully stabilize.
8. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at 1 MHz intervals extending across the EBW of the spectrum.

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

▣ TEST RESULTS: Comply

- **Single transmitting data**

Mode	Data Rate	Frequency [MHz]	Test Result			
			Chain 0		Chain 1	
			[dBm]	[W]	[dBm]	[W]
802.11b	1 Mbps	2412	13.25	0.021	12.40	0.017
		2437	13.20	0.021	12.12	0.016
		2462	**13.95**	**0.025**	13.05	0.020
802.11g	6 Mbps	2412	14.37	0.027	13.67	0.023
		2437	**18.21**	**0.066**	17.78	0.060
		2462	14.11	0.026	13.31	0.021
802.11a	MCS 0	5745	16.85	0.048	16.36	0.043
		5785	16.95	0.050	16.67	0.046
		5825	17.25	0.053	**17.70**	**0.059**

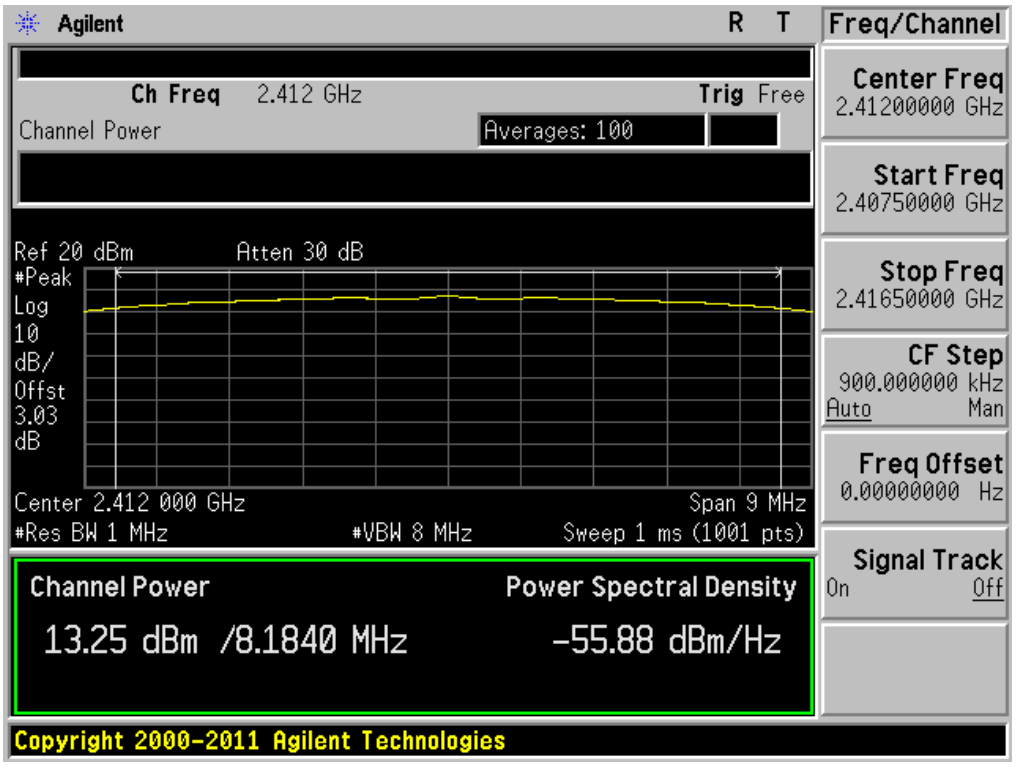
- **Multiple transmitting data**

Mode	Data Rate	Frequency [MHz]	Test Result			
			Chain 0 [dBm]	Chain 1 [dBm]	Aggregate Power[Note1]	
					[dBm]	[W]
802.11n HT20	6 Mbps	2412	13.59	12.58	16.12	0.041
		2437	18.30	17.99	**21.16**	**0.131**
		2462	14.23	13.51	16.90	0.049
802.11n HT40	MCS 0	2422	11.37	10.07	13.78	0.024
		2437	15.95	15.63	**18.80**	**0.076**
		2452	12.22	11.16	14.73	0.030
802.11n HT20	MCS 0	5745	16.85	16.40	19.64	0.092
		5785	16.94	16.71	19.84	0.096
		5825	17.60	17.44	**20.53**	**0.113**
802.11n HT40	MCS 0	5755	16.14	15.96	19.06	0.081
		5795	16.63	16.65	**19.65**	**0.092**

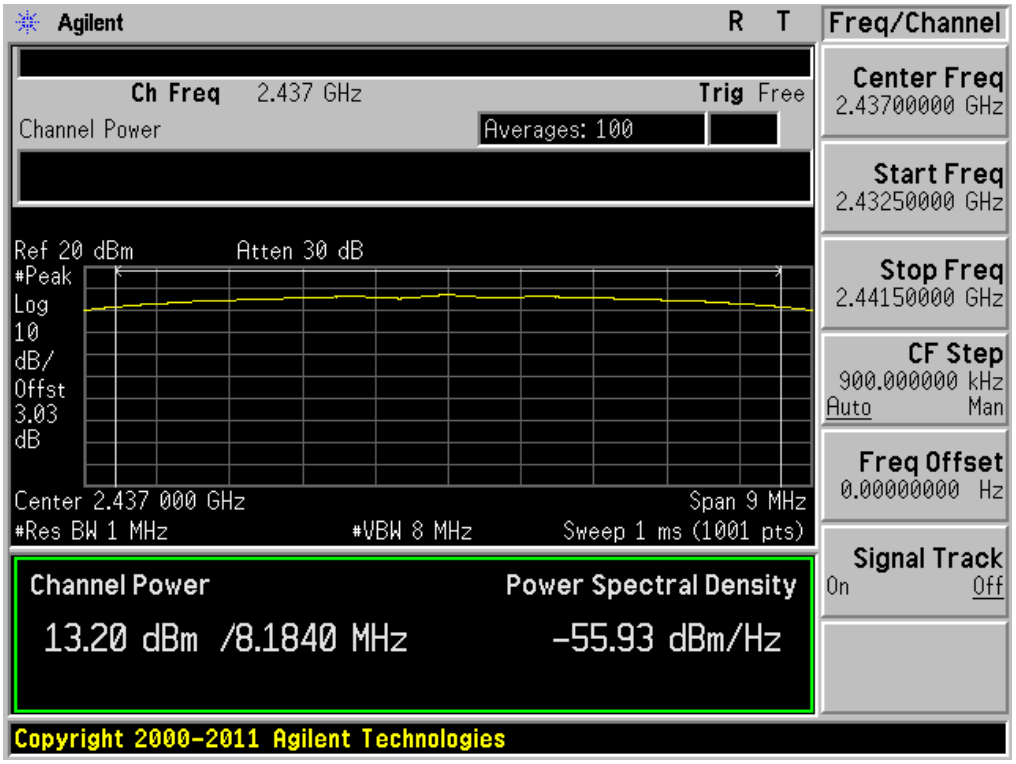
Note1: Aggregate power = $10\log(10^{(\frac{\text{chain 0}}{10})} + 10^{(\frac{\text{chain 1}}{10})})$

▣ RESULT PLOTS

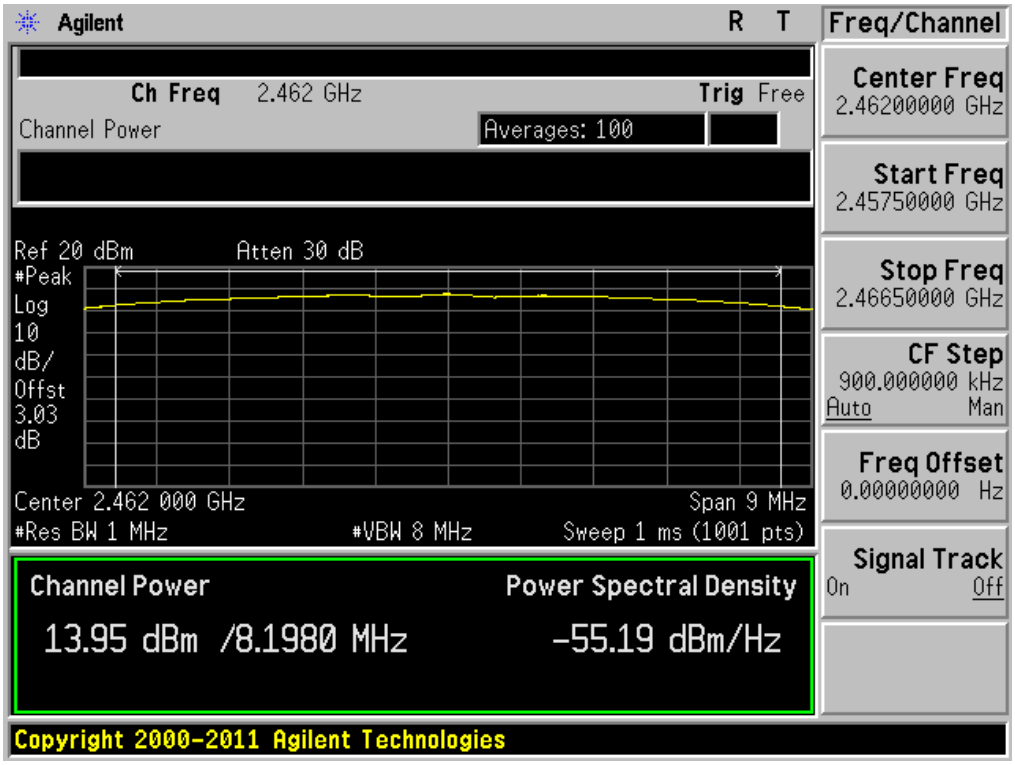
Peak Output Power Test Mode: Chain 0 & 802.11b & 1Mbps & 2412MHz



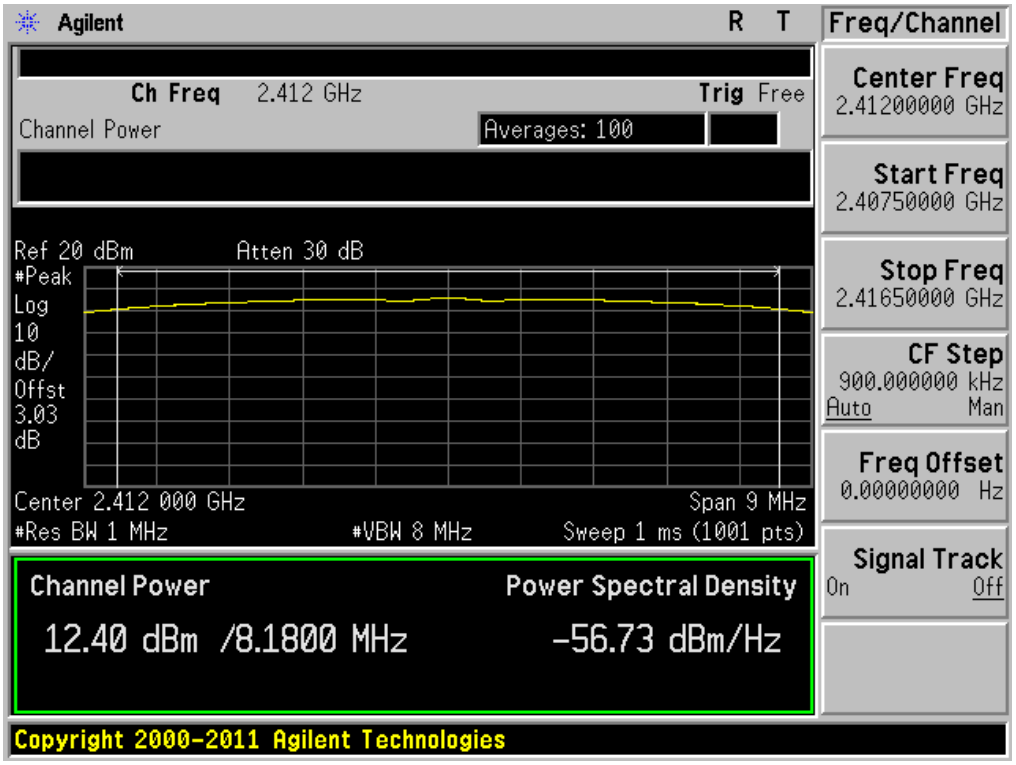
Peak Output Power Test Mode: Chain 0 & 802.11b & 1Mbps & 2437MHz



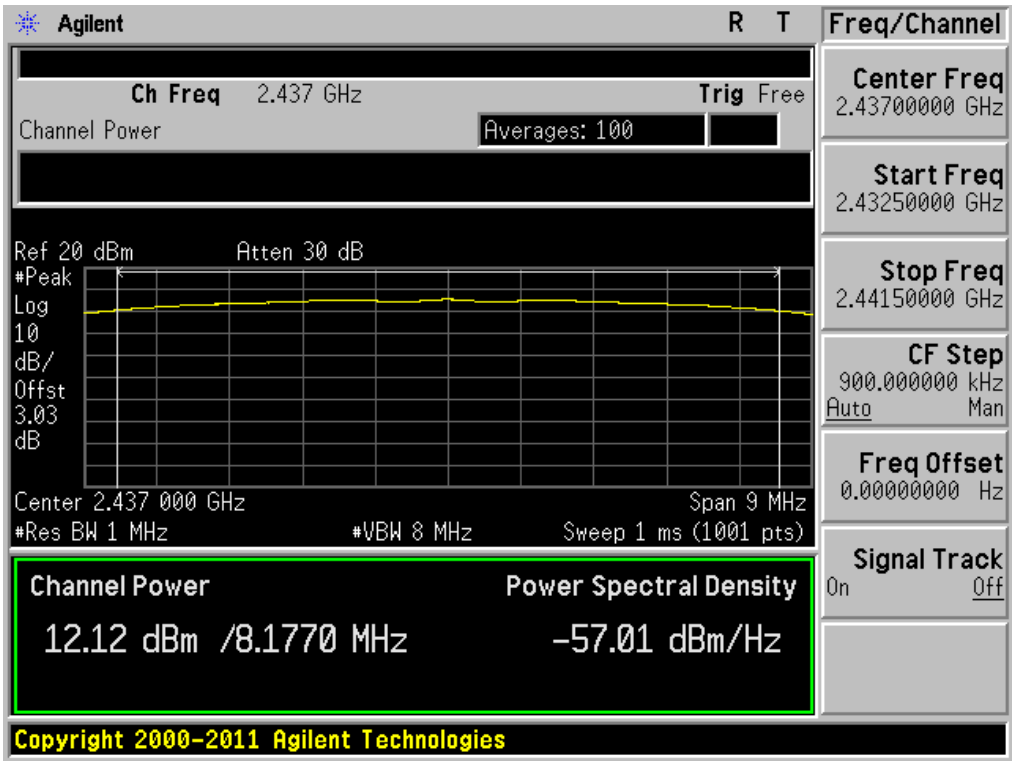
Peak Output Power Test Mode: Chain 0 & 802.11b & 1Mbps & 2462MHz



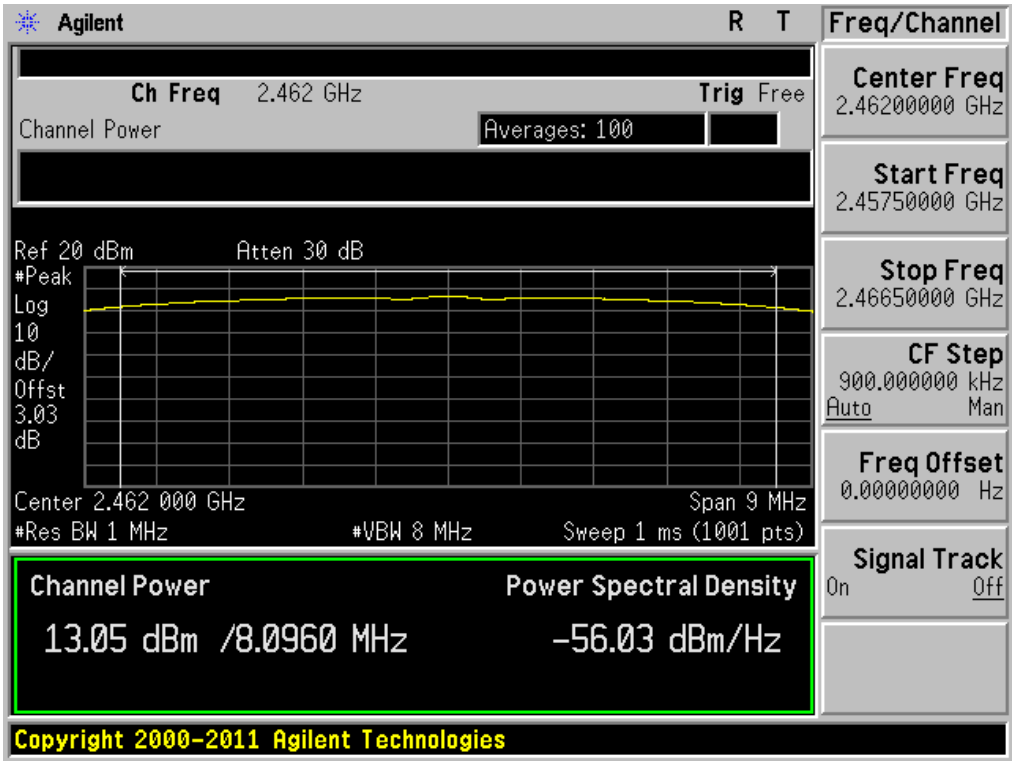
Peak Output Power Test Mode: Chain 1 & 802.11b & 1Mbps & 2412MHz



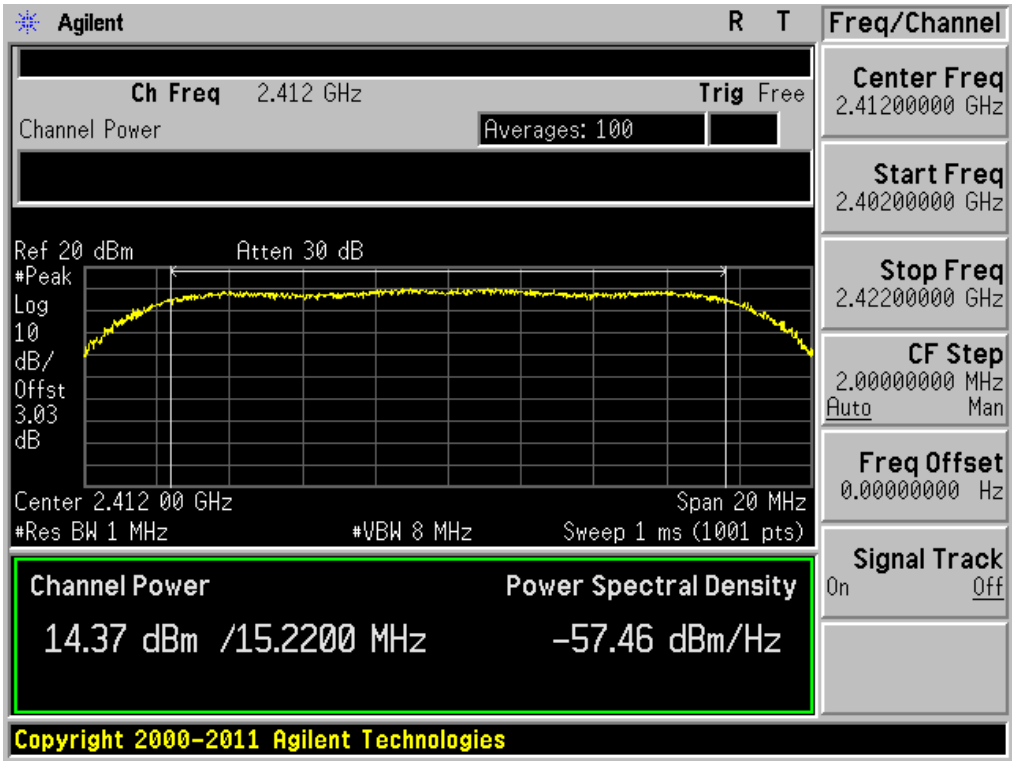
Peak Output Power Test Mode: Chain 1 & 802.11b & 1Mbps & 2437MHz



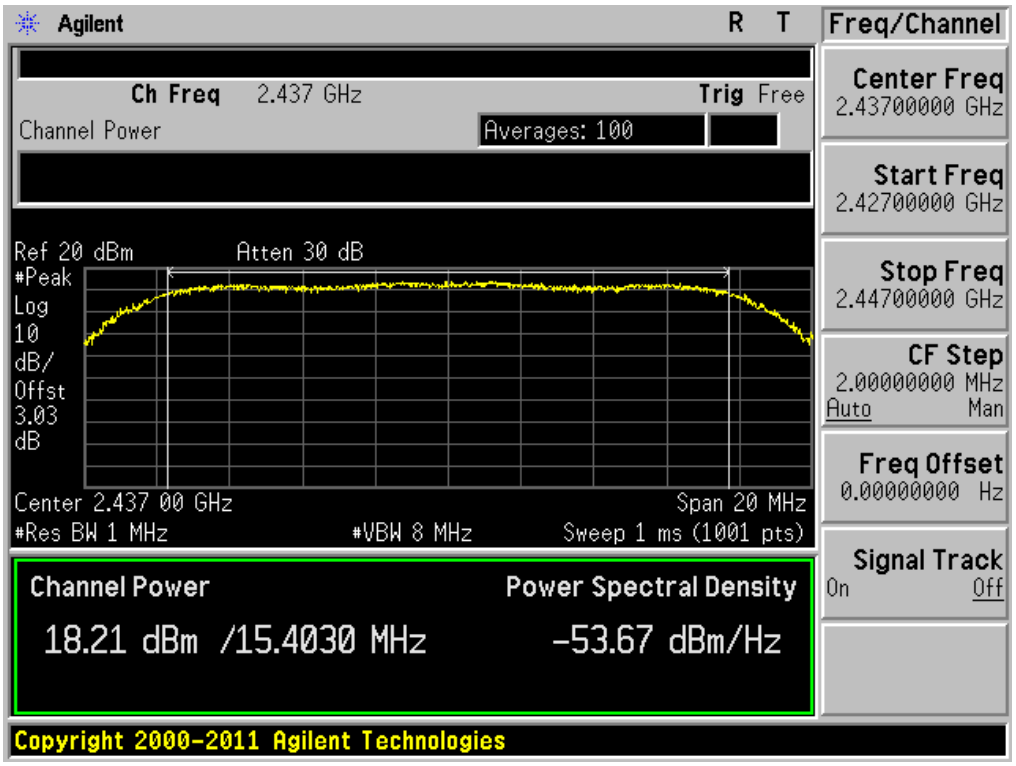
Peak Output Power Test Mode: Chain 1 & 802.11b & 1Mbps & 2462MHz



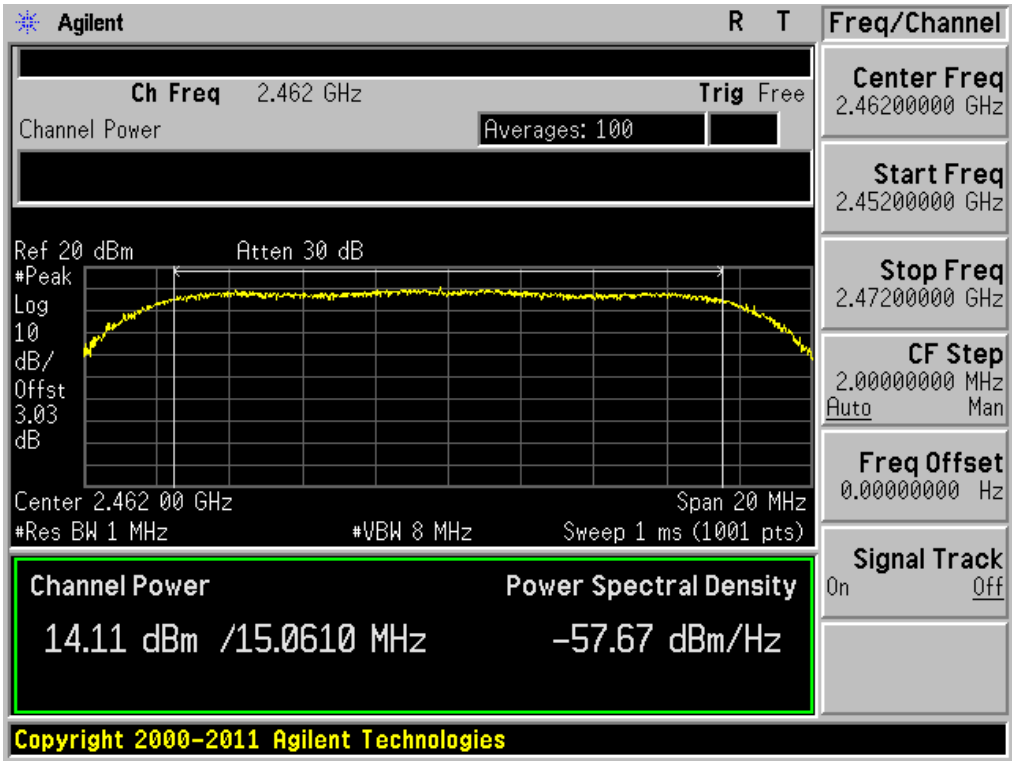
Peak Output Power Test Mode: Chain 0 & 802.11g & 6Mbps & 2412MHz



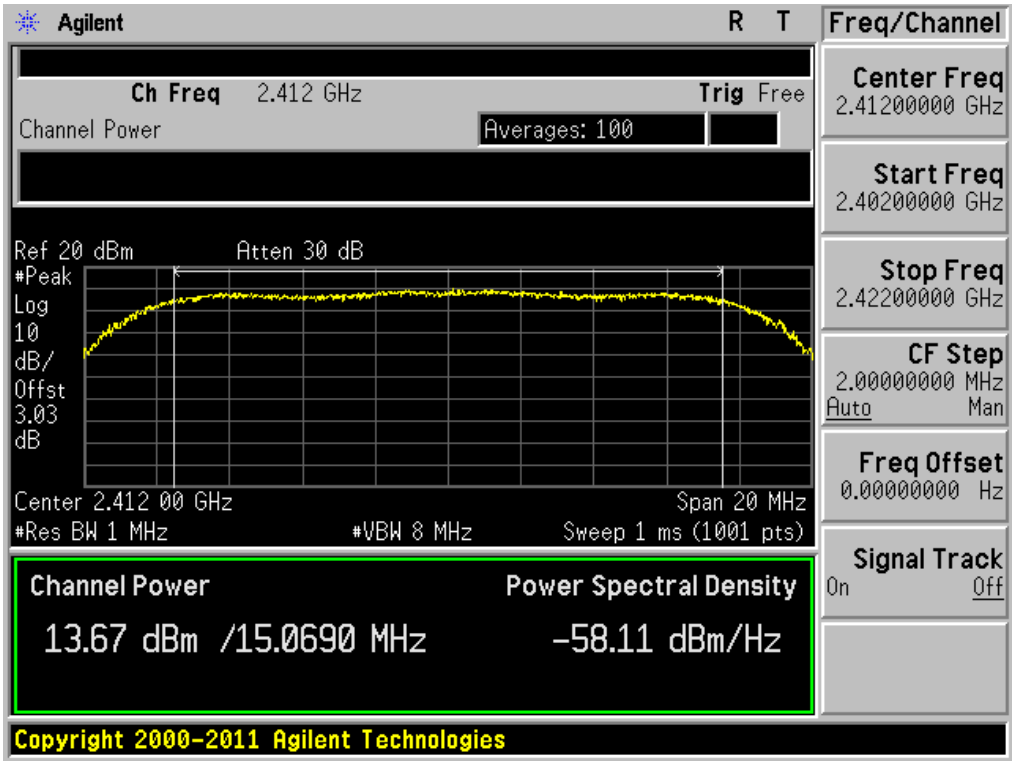
Peak Output Power Test Mode: Chain 0 & 802.11g & 6Mbps & 2437MHz



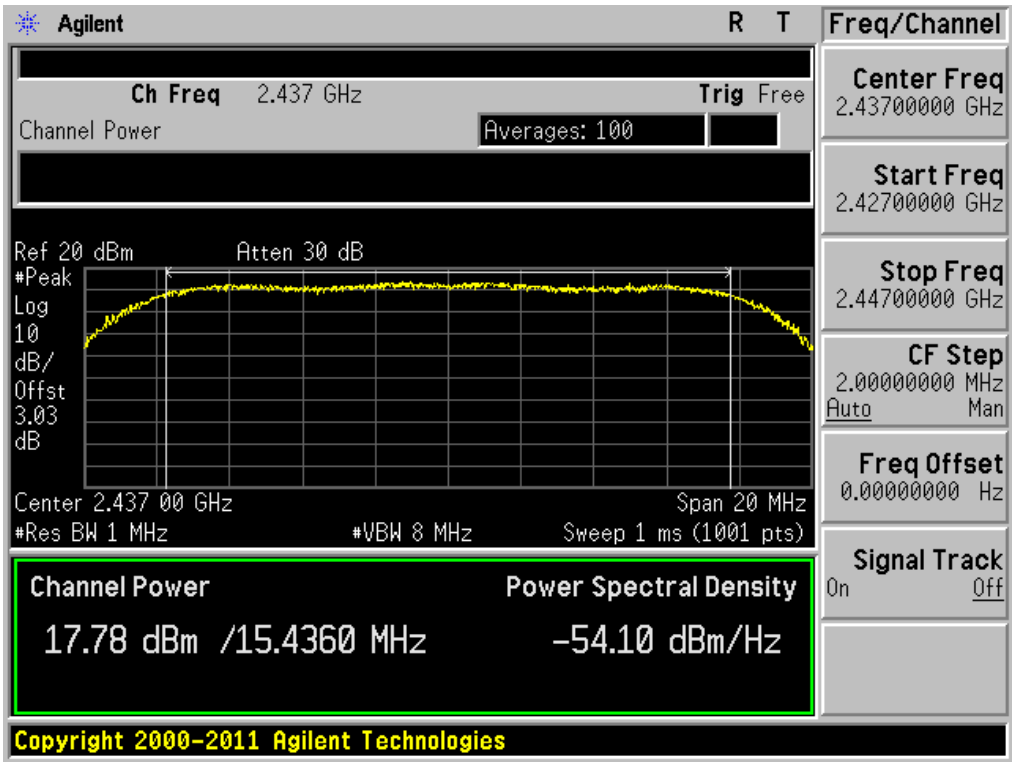
Peak Output Power Test Mode: Chain 0 & 802.11g & 6Mbps & 2462MHz



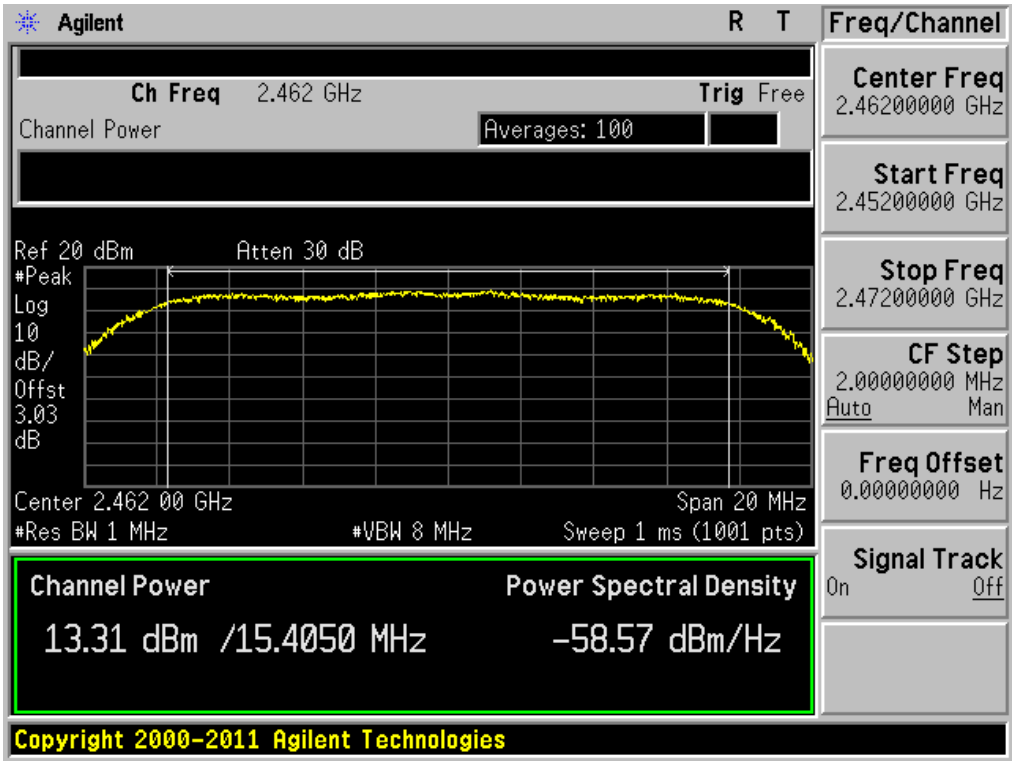
Peak Output Power Test Mode: Chain 1 & 802.11g & 6Mbps & 2412MHz



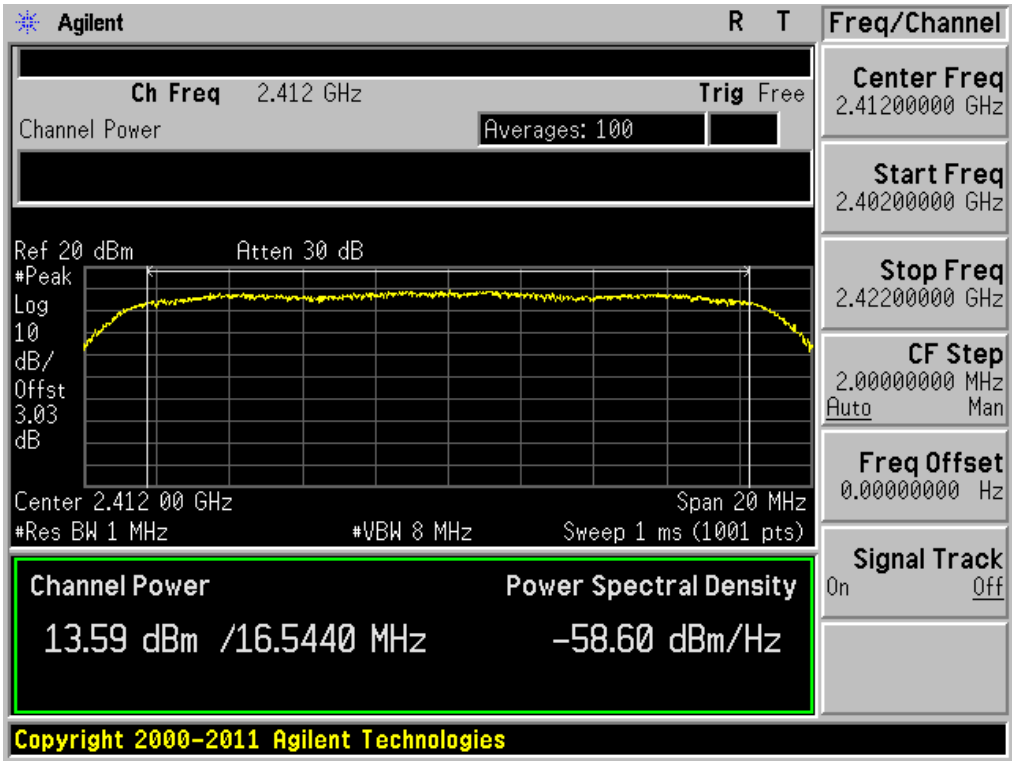
Peak Output Power Test Mode: Chain 1 & 802.11g & 6Mbps & 2437MHz



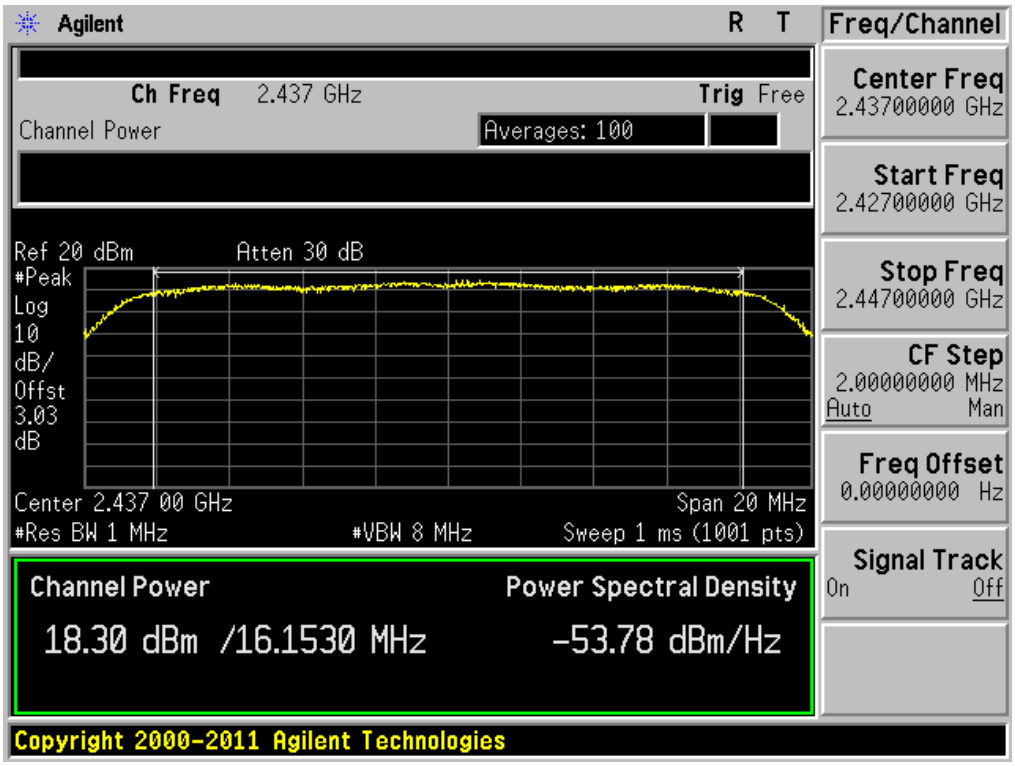
Peak Output Power Test Mode: Chain 1 & 802.11g & 6Mbps & 2462MHz



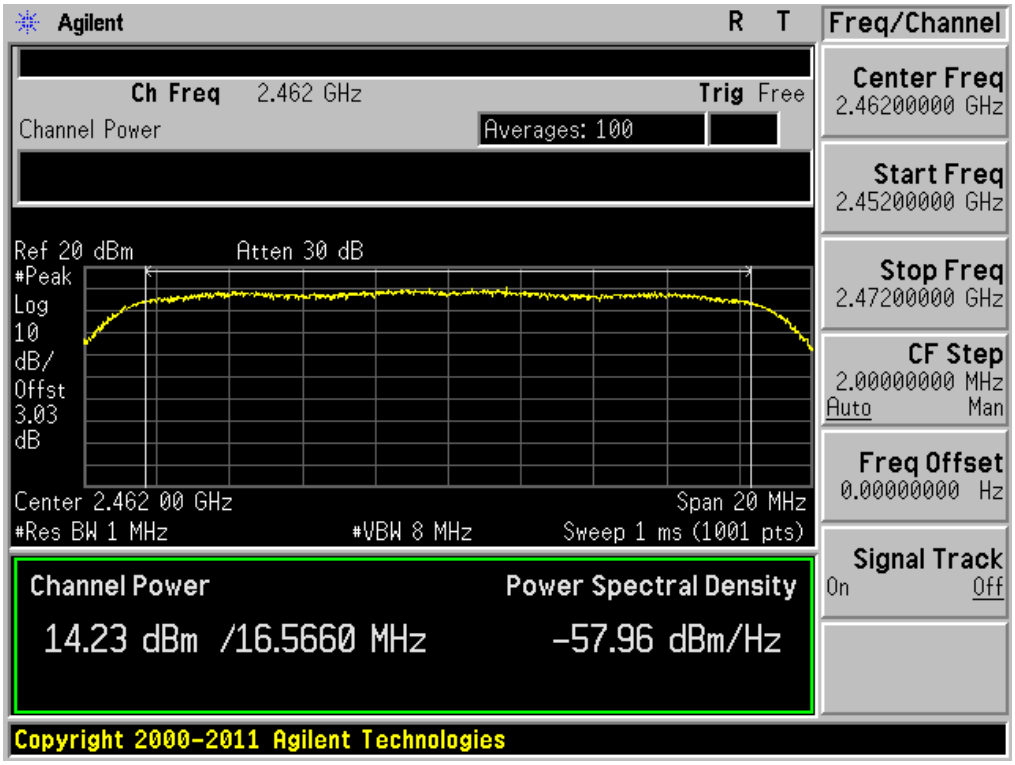
Peak Output Power Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 2412MHz



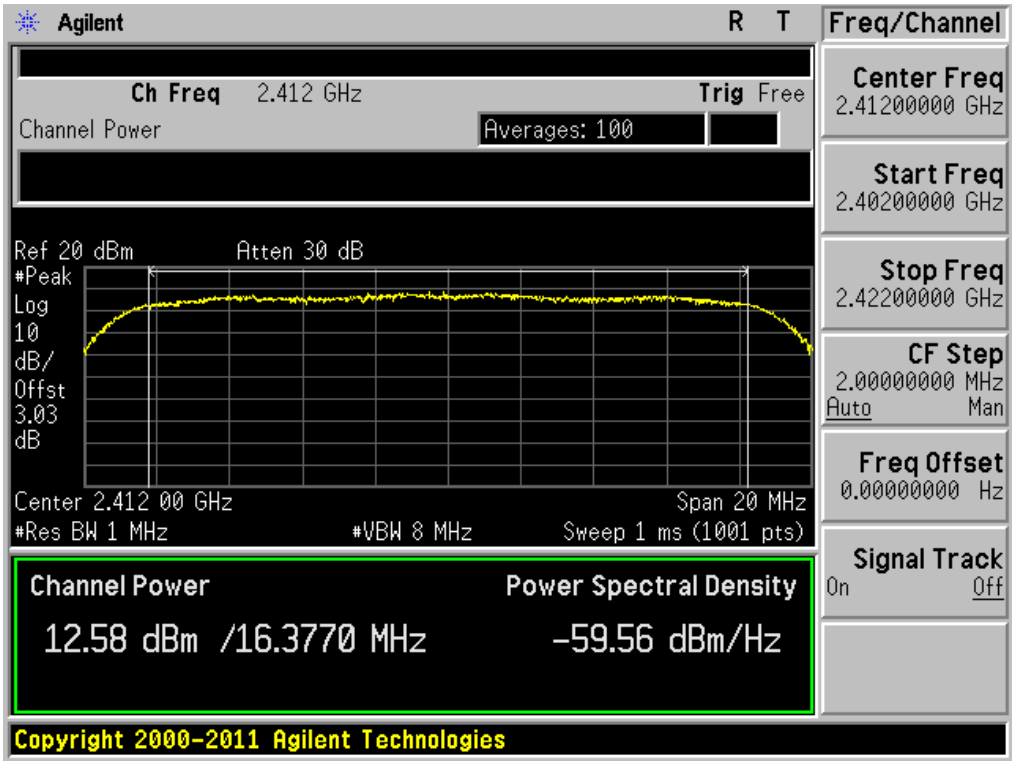
Peak Output Power Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 2437MHz



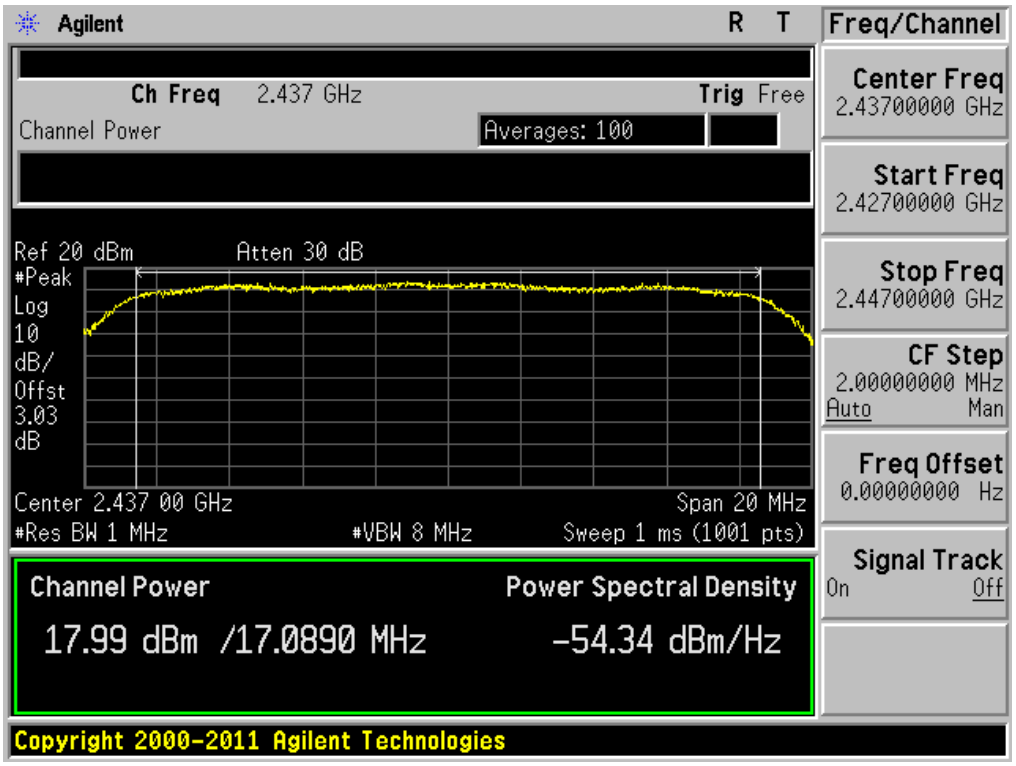
Peak Output Power Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 2462MHz



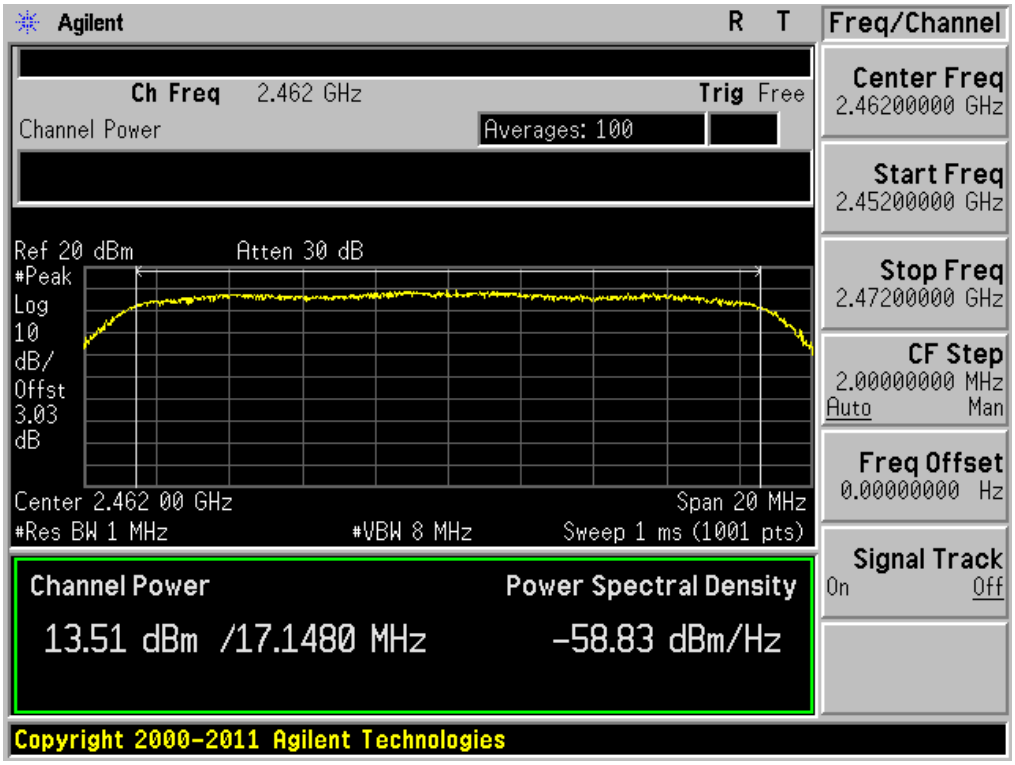
Peak Output Power Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 2412MHz



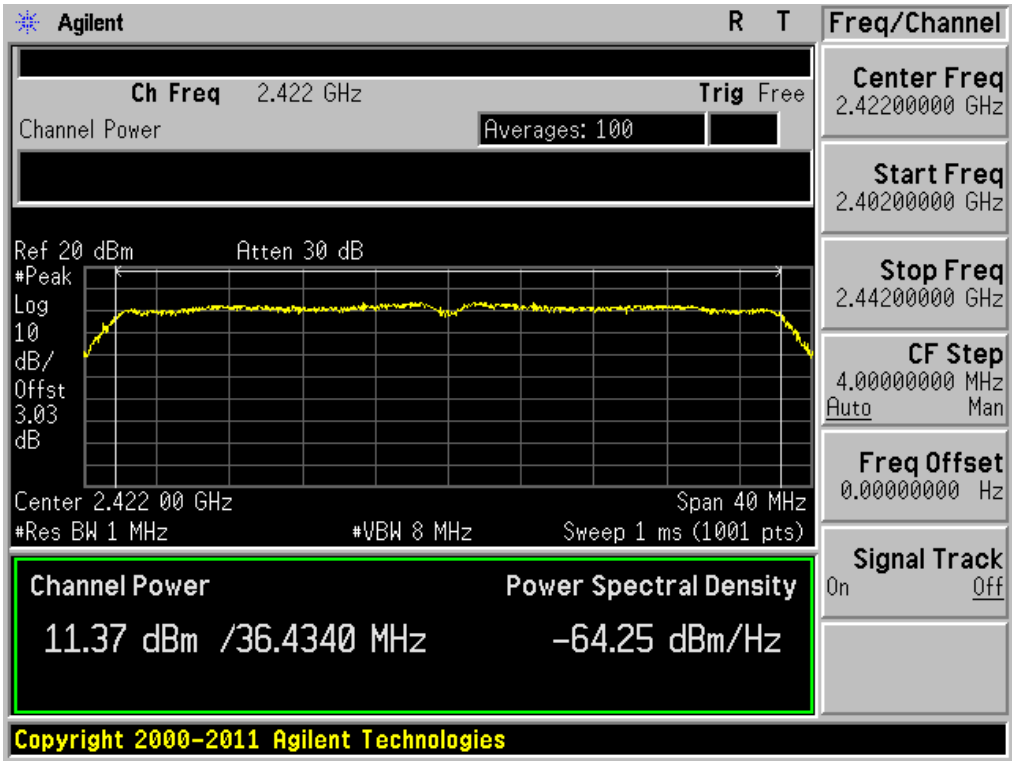
Peak Output Power Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 2437MHz



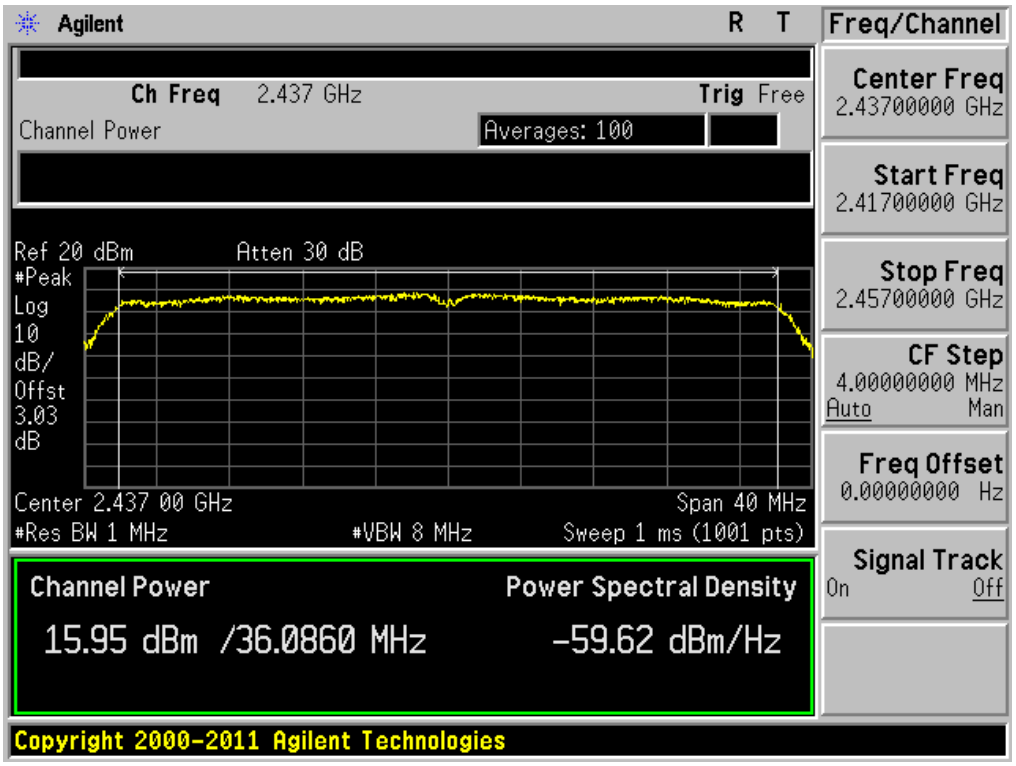
Peak Output Power Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 2462MHz



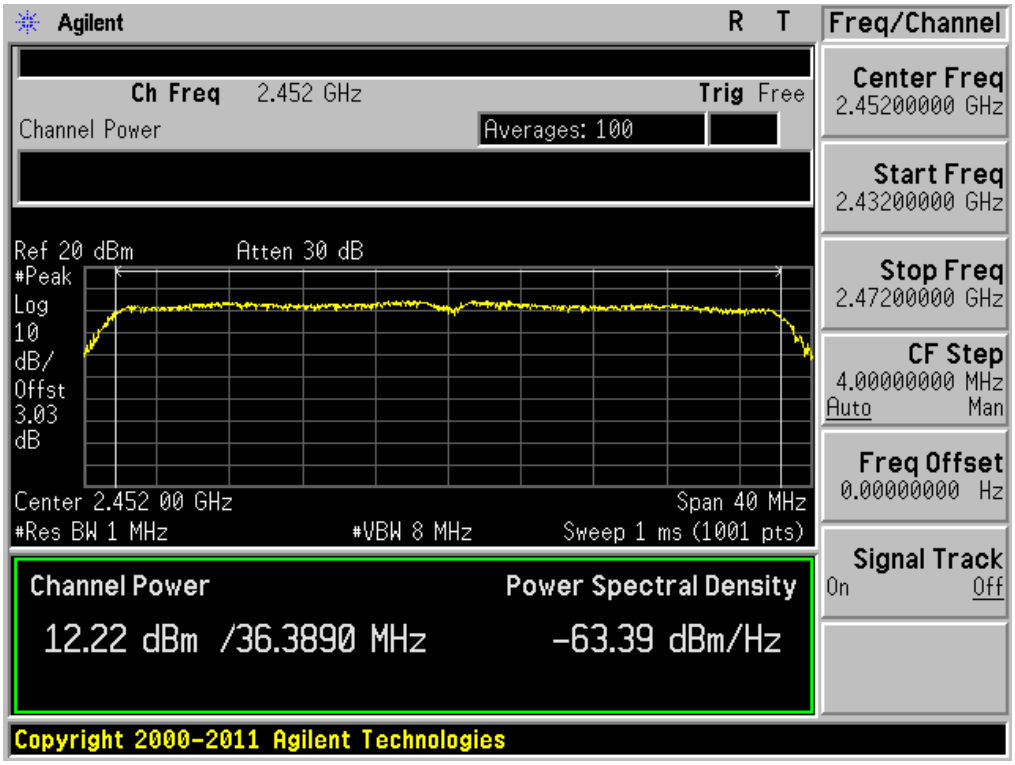
Peak Output Power Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 2422MHz



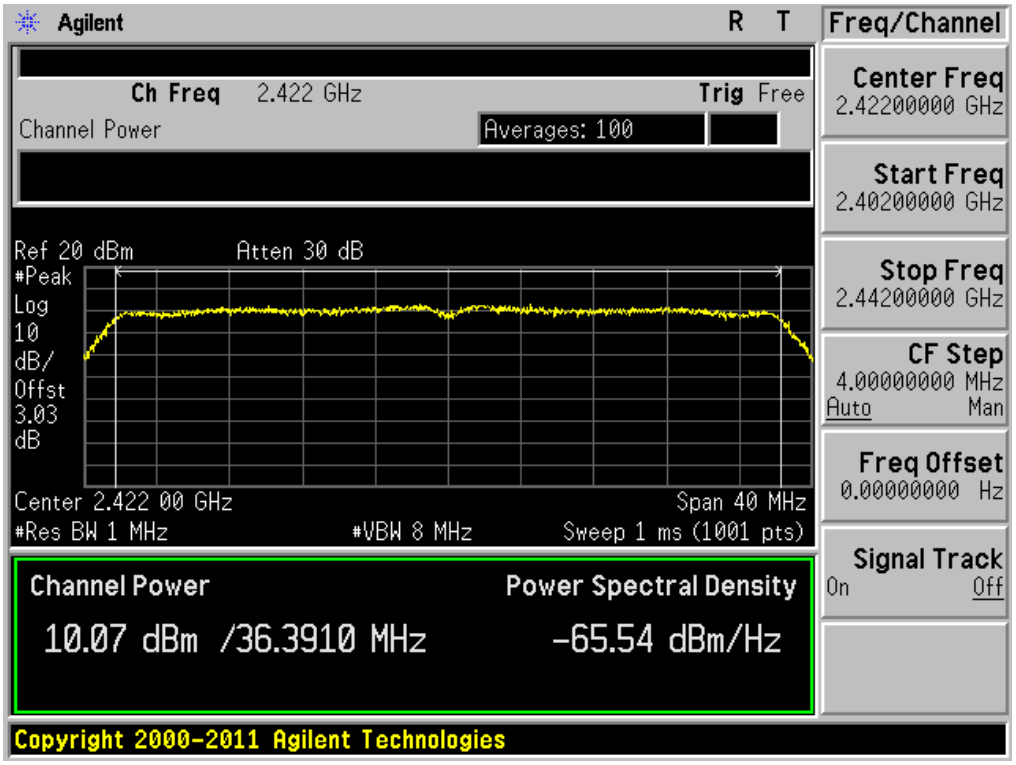
Peak Output Power Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 2437MHz



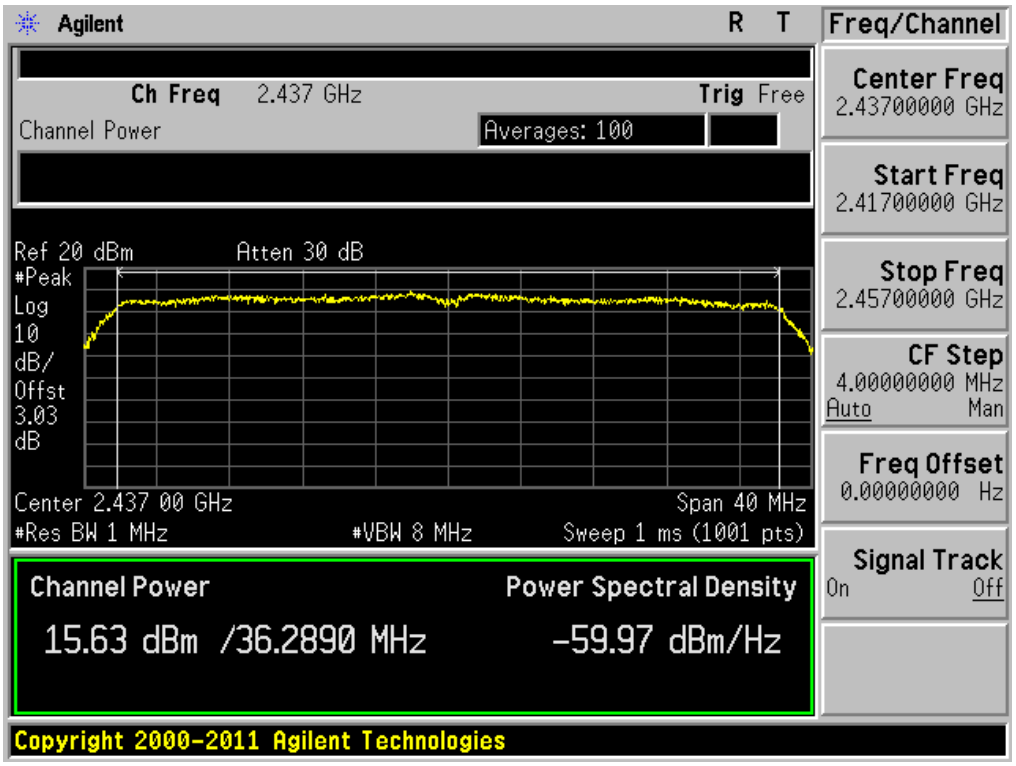
Peak Output Power Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 2452MHz



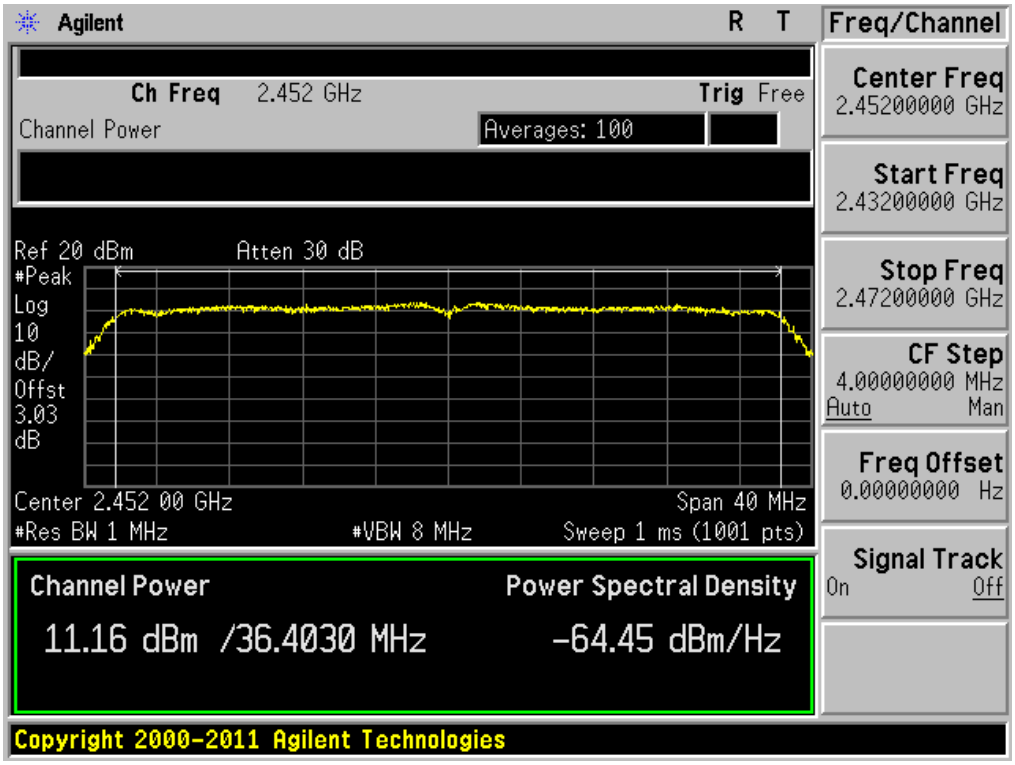
Peak Output Power Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 2422MHz



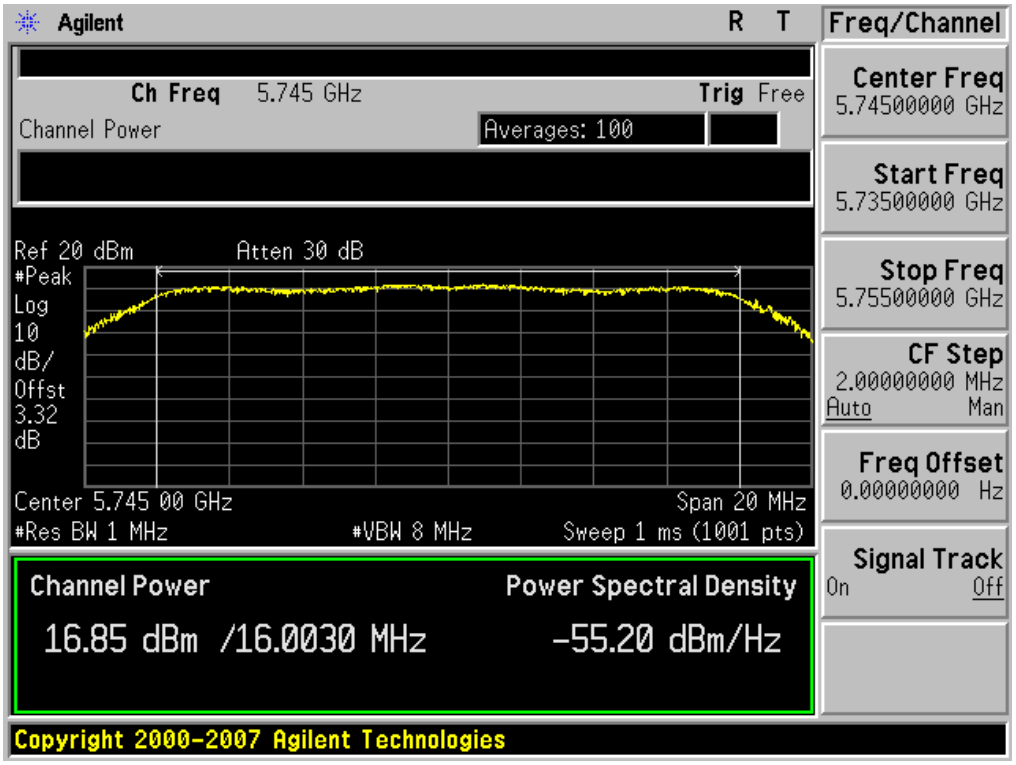
Peak Output Power Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 2437MHz



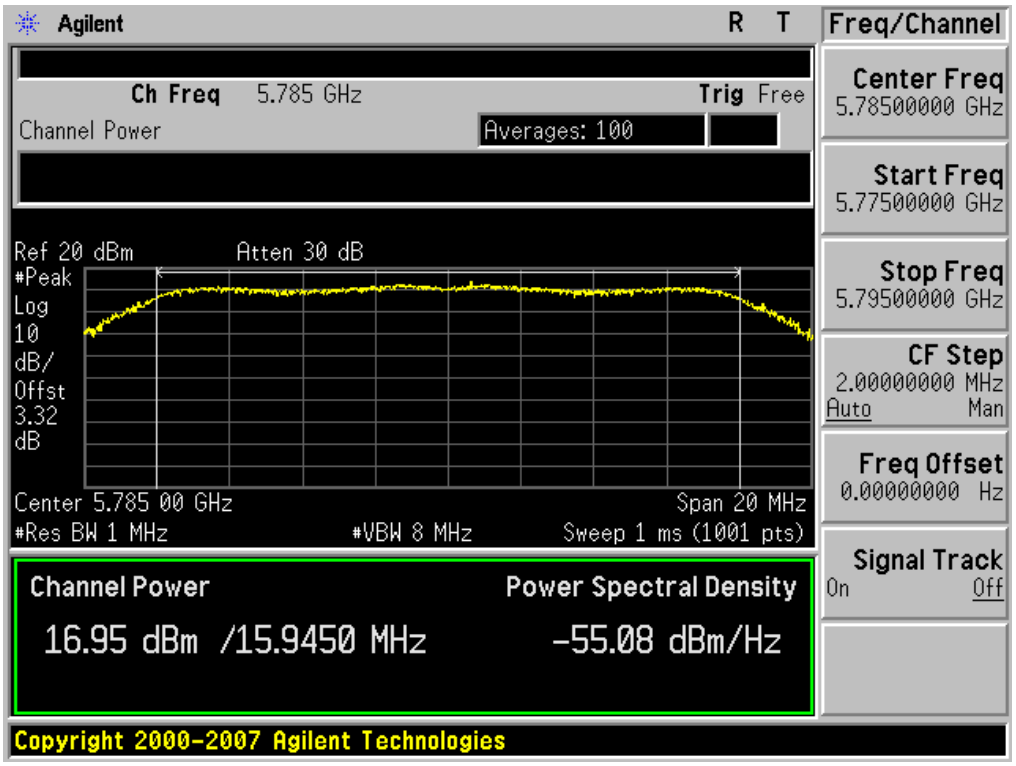
Peak Output Power Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 2452MHz



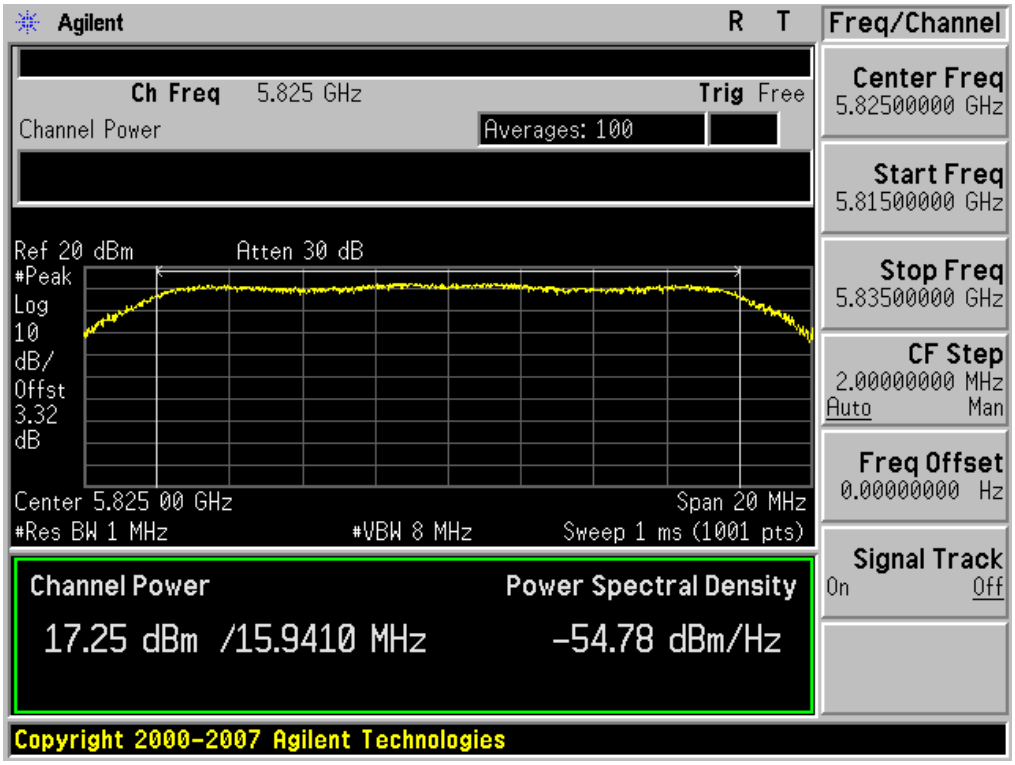
Peak Output Power Test Mode: Chain 0 & 802.11a & 6Mbps & 5745MHz



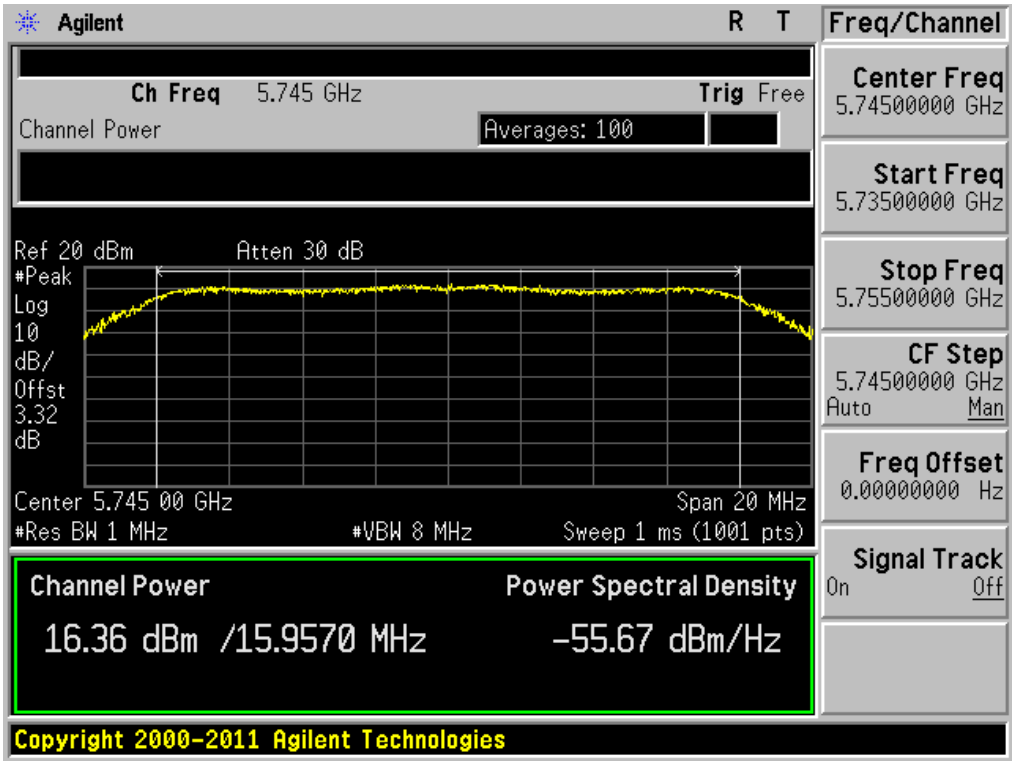
Peak Output Power Test Mode: Chain 0 & 802.11a & 6Mbps & 5785MHz



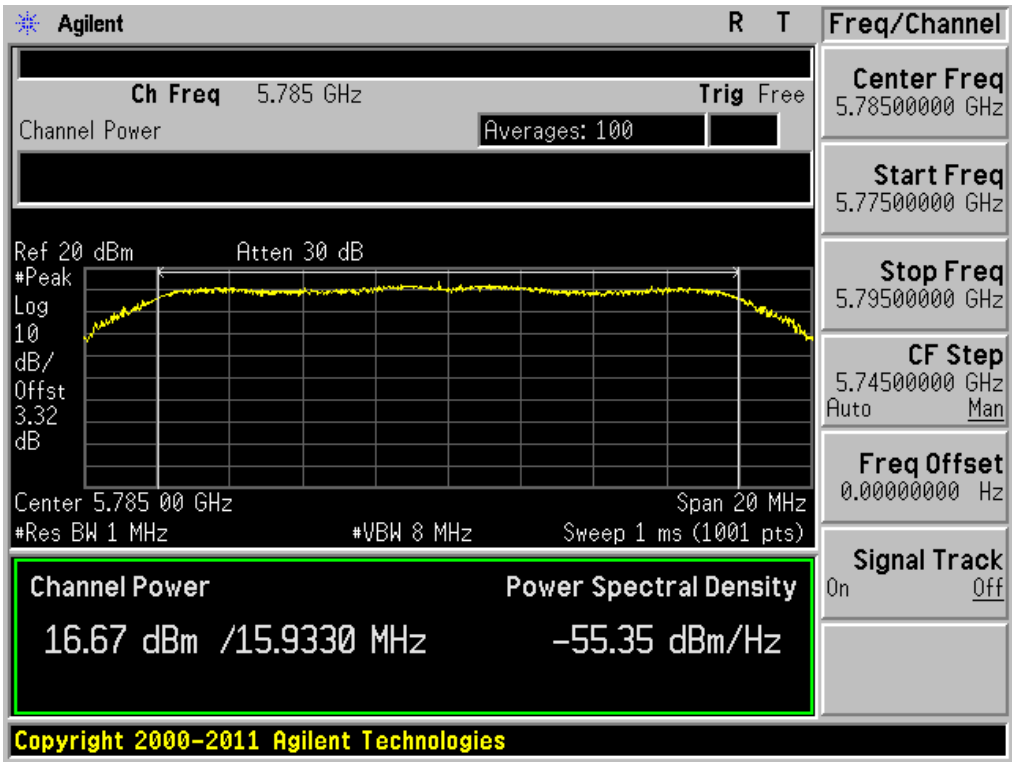
Peak Output Power Test Mode: Chain 0 & 802.11a & 6Mbps & 5825MHz



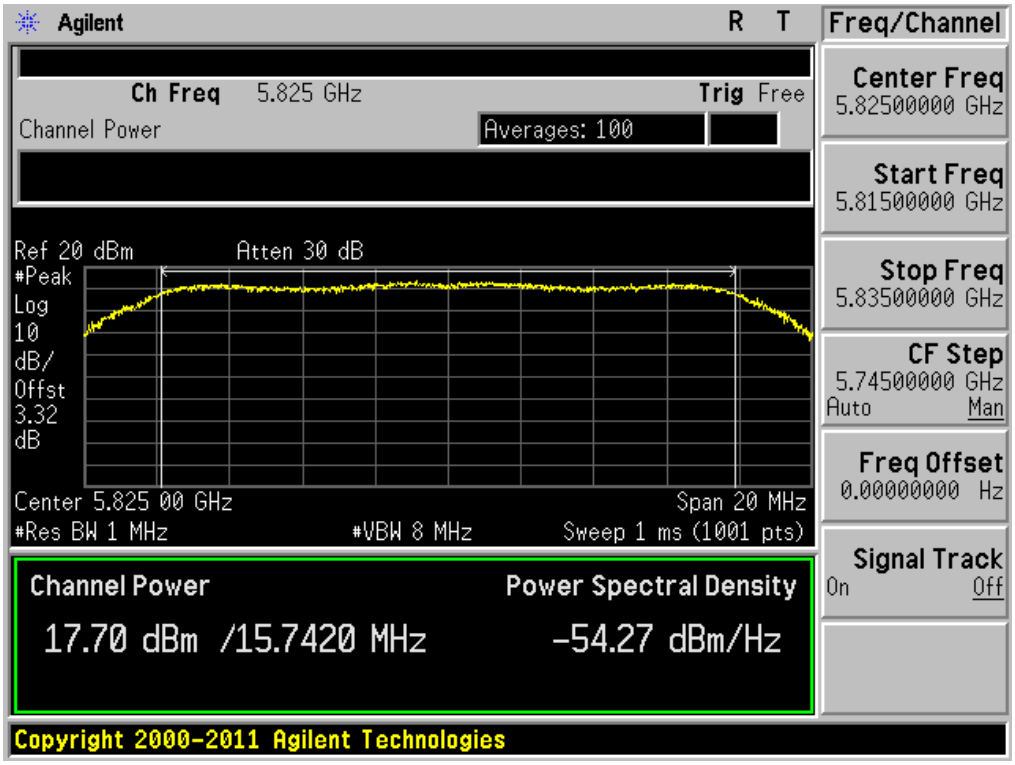
Peak Output Power Test Mode: Chain 1 & 802.11a & 6Mbps & 5745MHz



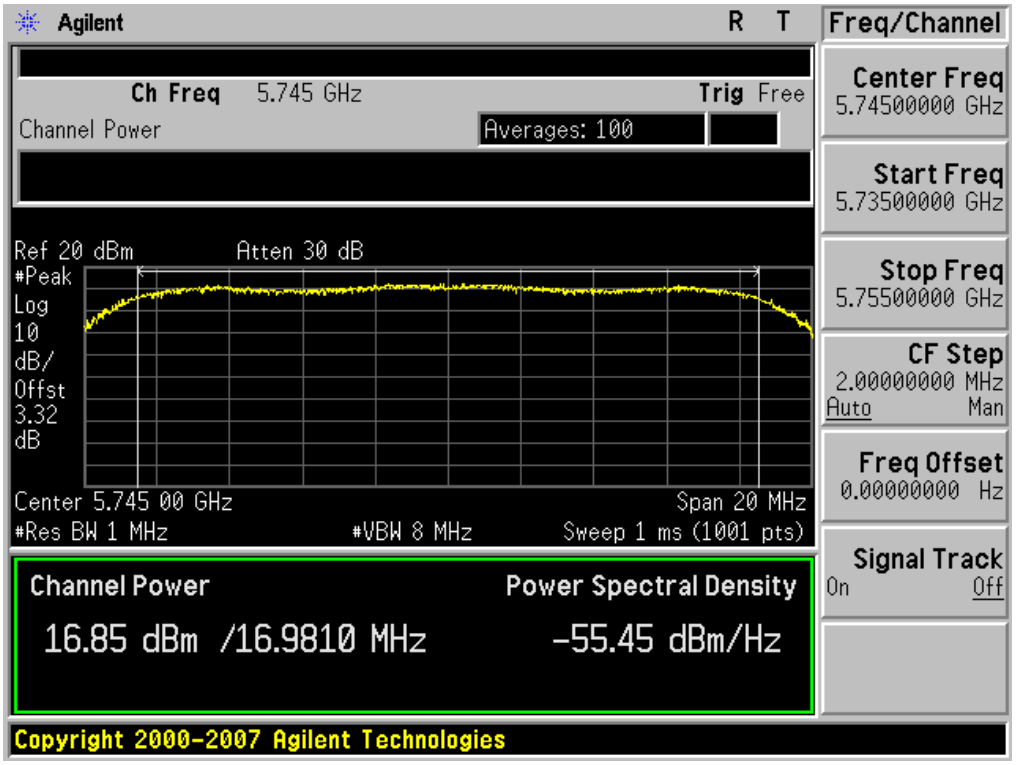
Peak Output Power Test Mode: Chain 1 & 802.11a & 6Mbps & 5785MHz



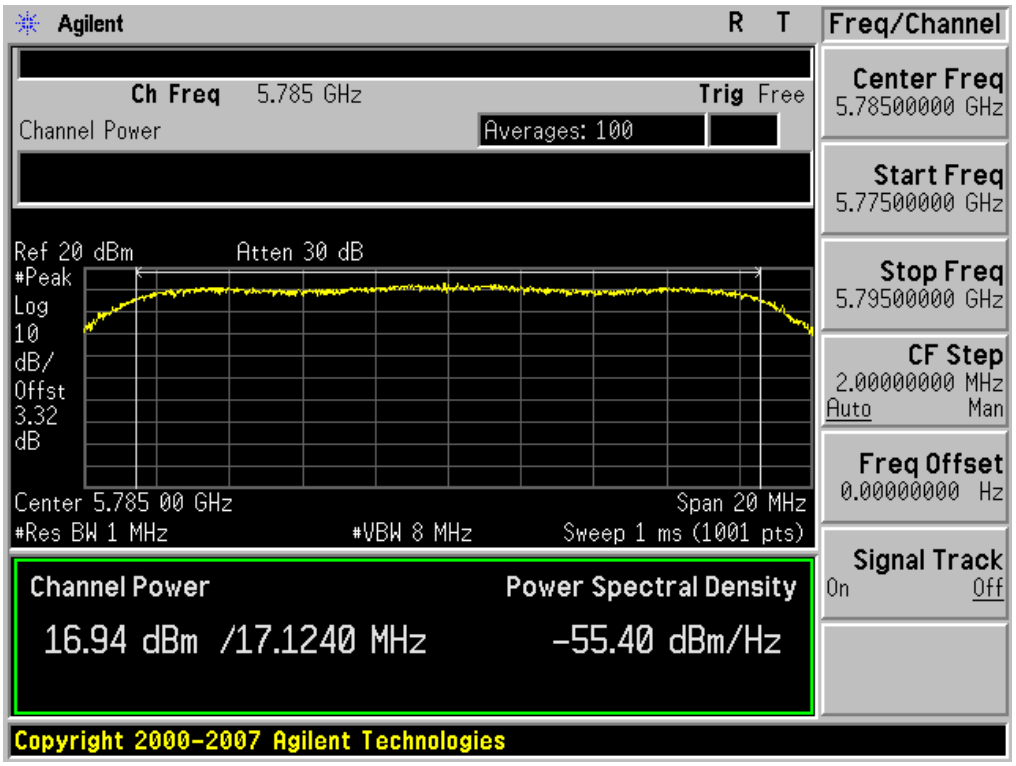
Peak Output Power Test Mode: Chain 1 & 802.11a & 6Mbps & 5825MHz



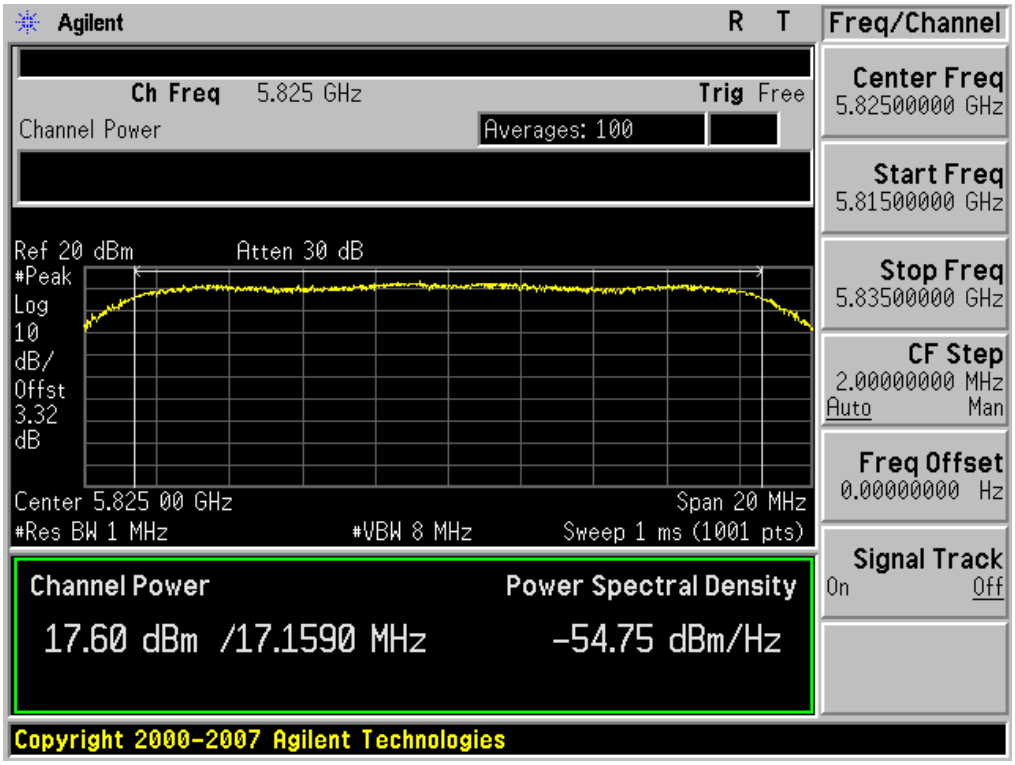
Peak Output Power Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 5745MHz



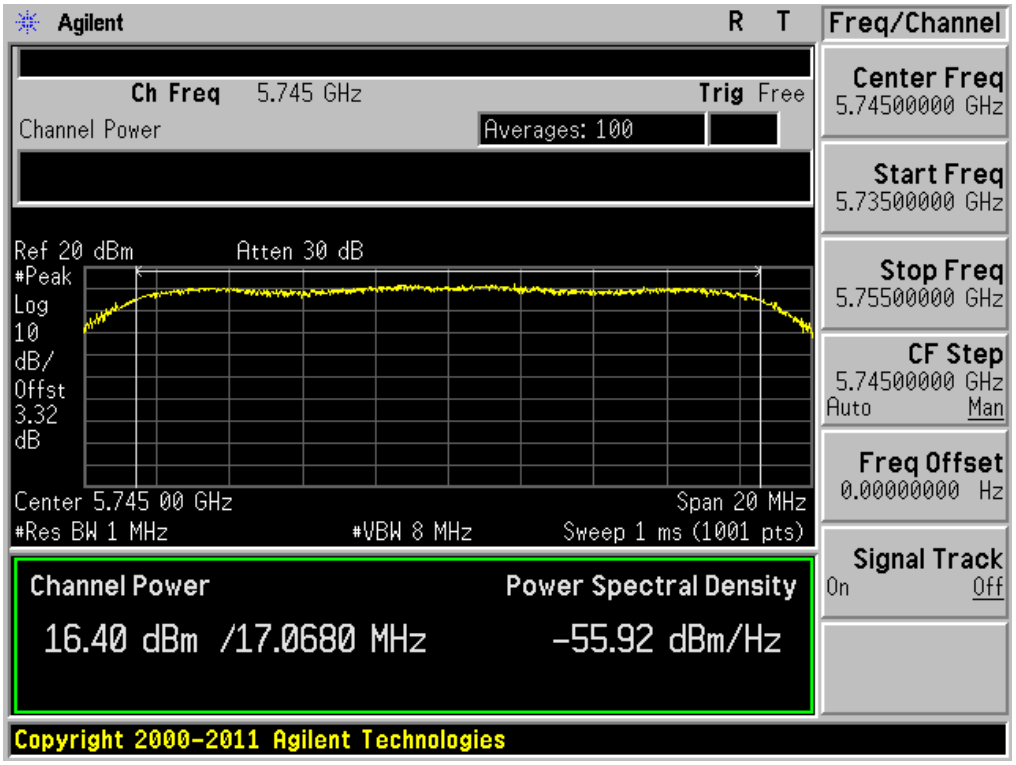
Peak Output Power Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 5785MHz



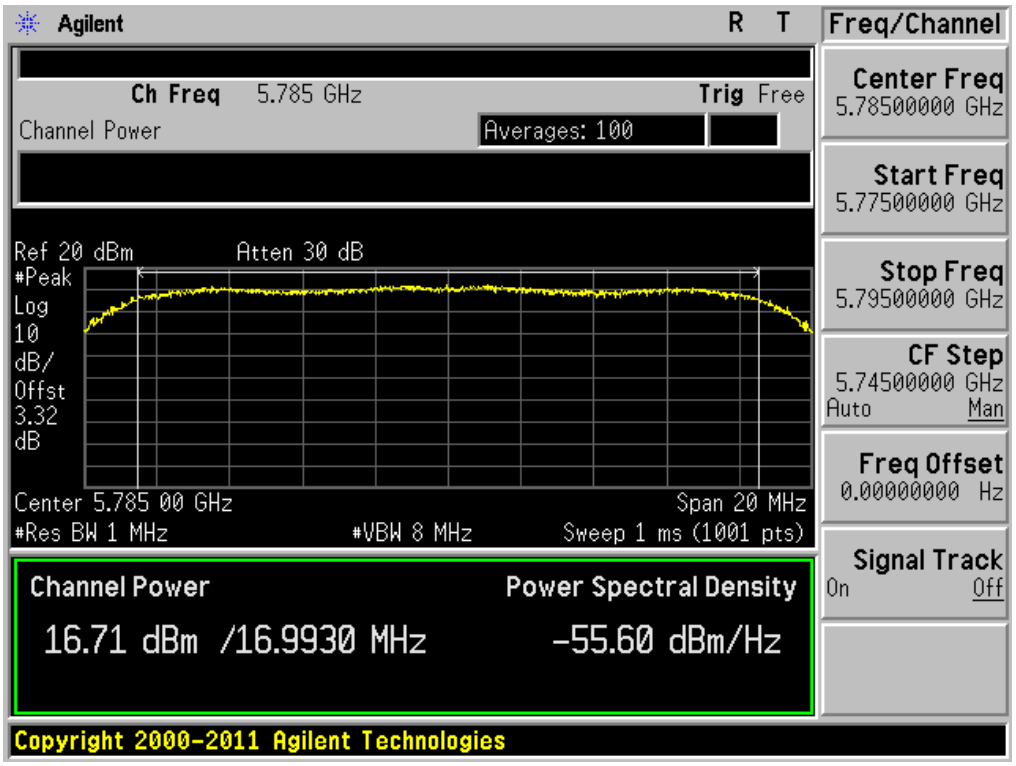
Peak Output Power Test Mode: Chain 0 & 802.11n HT20 & MCS 0 & 5825MHz



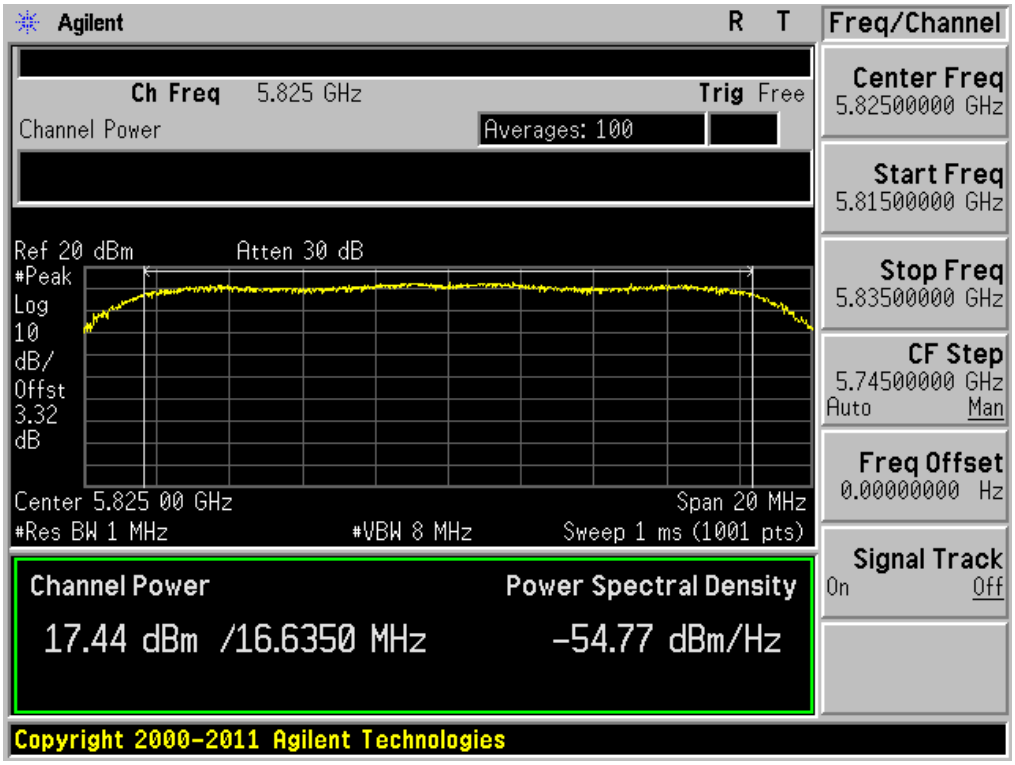
Peak Output Power Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 5745MHz



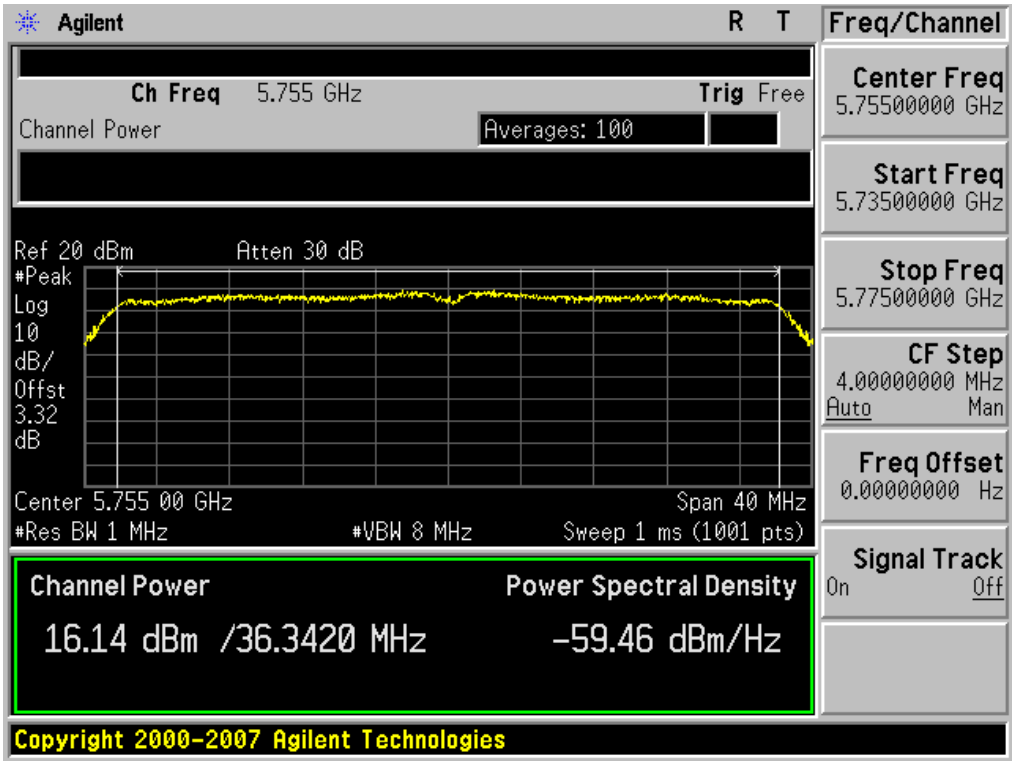
Peak Output Power Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 5785MHz



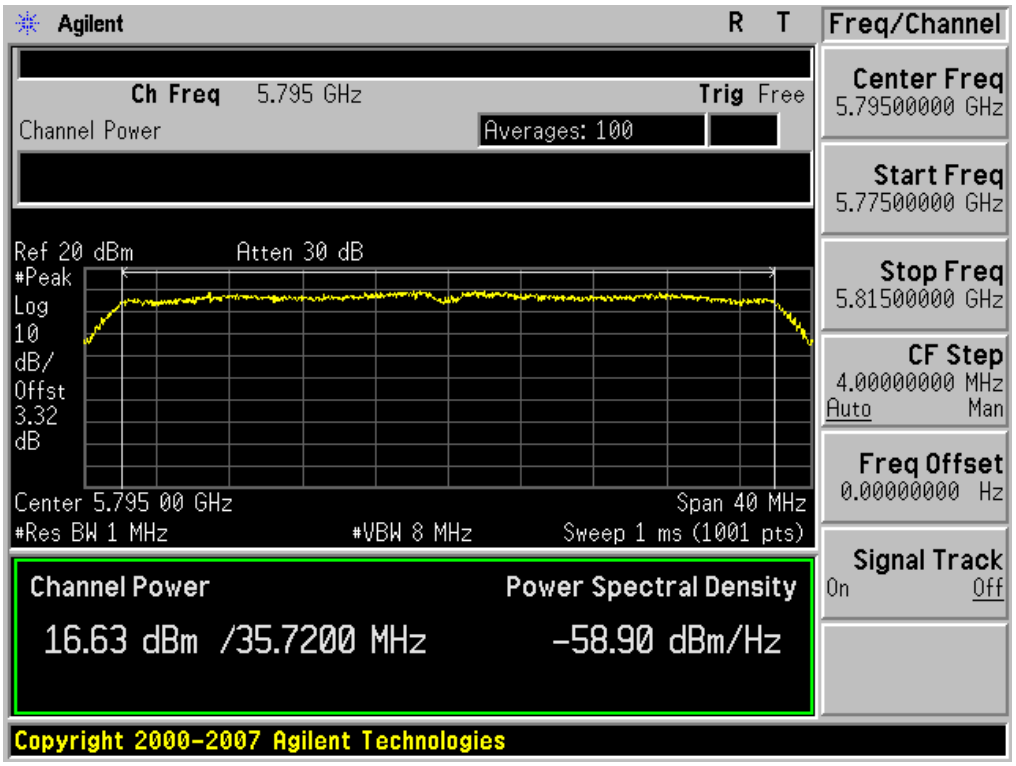
Peak Output Power Test Mode: Chain 1 & 802.11n HT20 & MCS 0 & 5825MHz



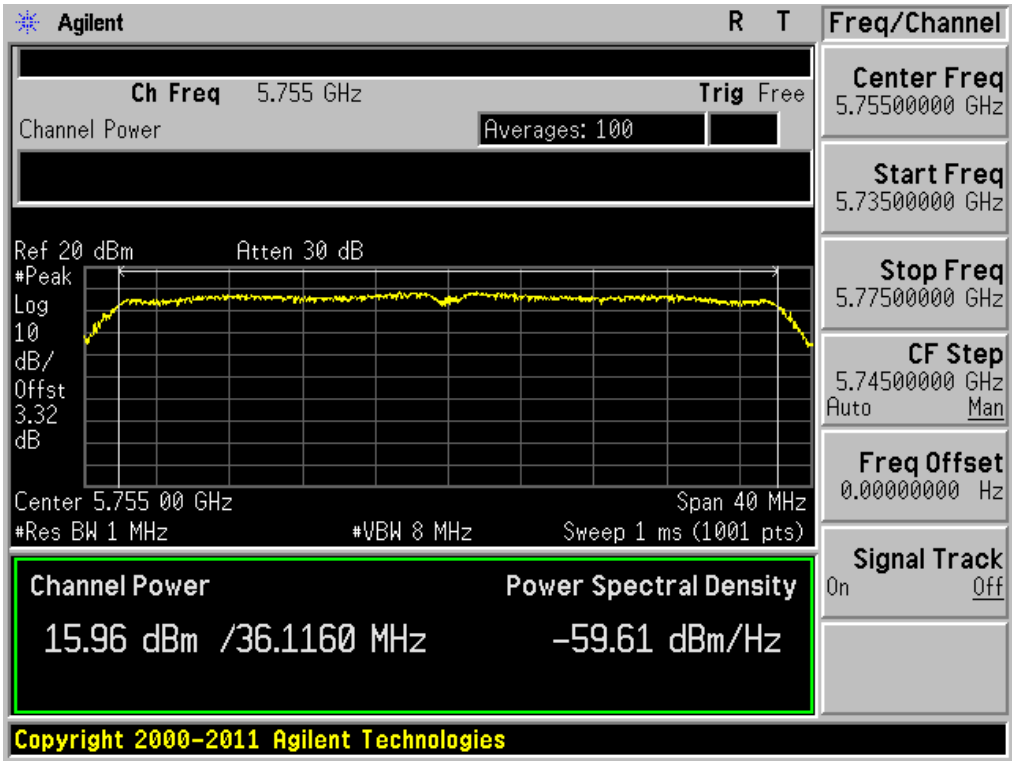
Peak Output Power Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 5755MHz



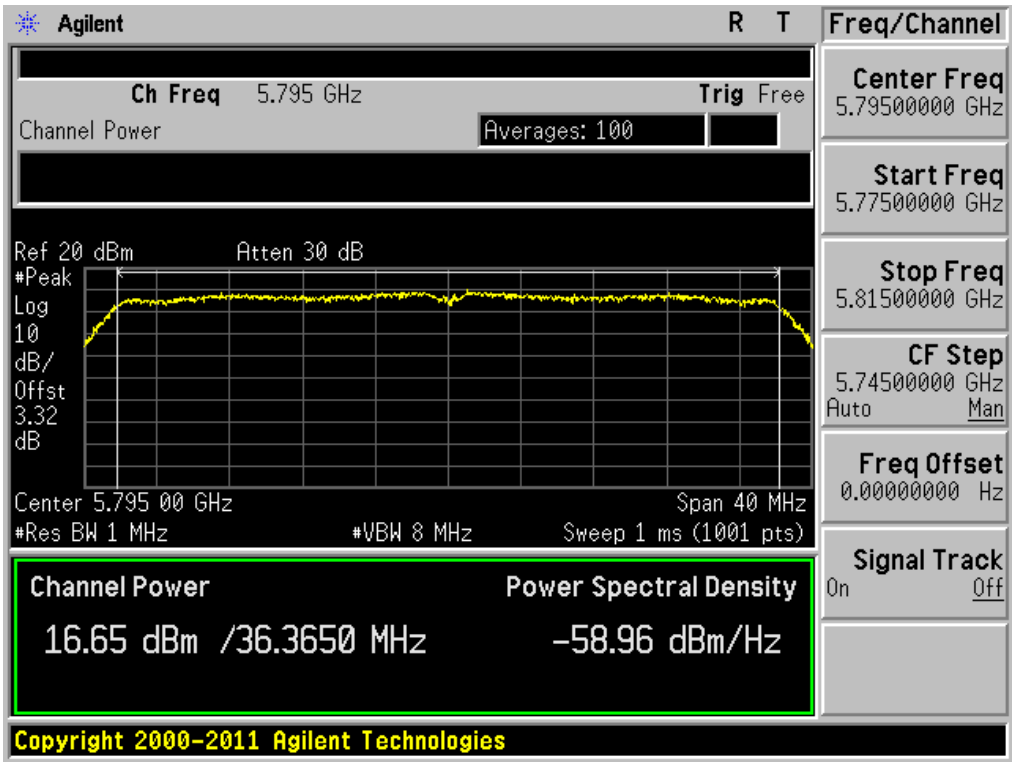
Peak Output Power Test Mode: Chain 0 & 802.11n HT40 & MCS 0 & 5795MHz



Peak Output Power Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 5755MHz



Peak Output Power Test Mode: Chain 1 & 802.11n HT40 & MCS 0 & 5795MHz



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

▣ TEST PROCEDURE:

The Measurement Procedure **PKPSD of KDB558074** is used.

1. Set the **RBW = 100 kHz**.
2. Set the **VBW ≥ 300 kHz**.
3. Set the span to **5-30 %** greater than the EBW.
4. Detector = **peak**.
5. Sweep time = **auto couple**.
6. Trace mode = **max hold**.
7. Allow trace to fully stabilize.
8. Use the **peak marker function** to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
9. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where **BWCF = 10log (3 kHz/100 kHz = -15.2 dB)**.
10. The resulting peak PSD level must be ≤ 8 dBm.

▣ TEST RESULTS: N/T

8.4 Conducted Spurious Emissions

Test requirements and limit, §15.247(d) & RSS-210 [A8.5]

§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

▣ TEST CONFIGURATION

▣ TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

- Measurement Procedure 1 – Reference Level

1. Set the **RBW = 100 kHz**.
2. Set the **VBW ≥ 300 kHz**.
3. Set the span to **5-30 %** greater than the EBW.
4. Detector = **peak**.
5. Sweep time = **auto couple**.
6. Trace mode = **max hold**.
7. Allow trace to fully stabilize.
8. Use the **peak marker function** to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
   Next, **determine the power** in 100 kHz band segments outside of the authorized frequency band using the following measurement:

- Measurement Procedure 2 - Unwanted Emissions

1. Set **RBW = 100 kHz**.
2. Set **VBW ≥ 300 kHz**.
3. Set **span to encompass the spectrum** to be examined.
4. Detector = **peak**.
5. Trace Mode = **max hold**.
6. Sweep = **auto couple**.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

▣ TEST RESULTS: N/T

8.5 Radiated Spurious Emissions

Test Requirements and limit, §15.247(d), §15.205, §15.209 & RSS-210 [A8.5], RSS-Gen [7.2.2]

In any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ **FCC Part 15.209(a) and (b)**

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

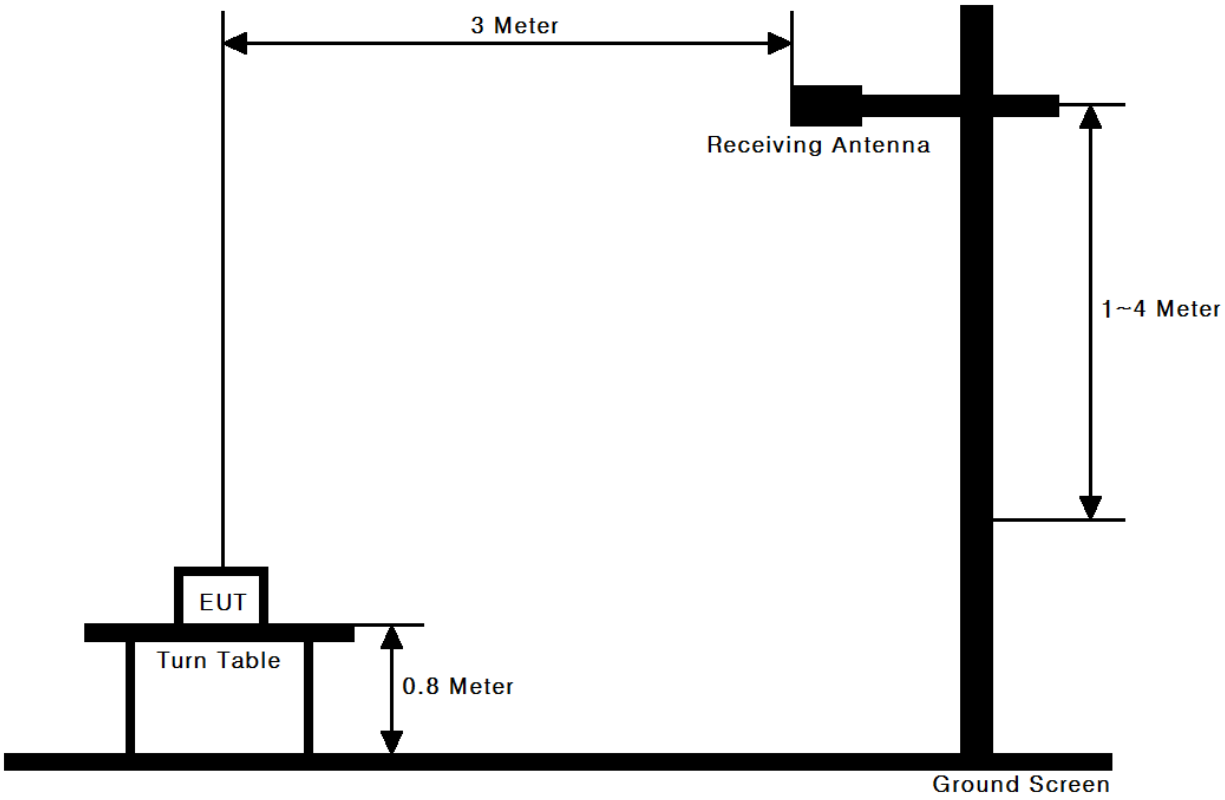
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ **FCC Part 15.205 (a):** Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3600 ~ 4400	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.52025	156.52475 ~	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	12.57675 ~	156.52525	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	12.57725	156.7 ~ 156.9	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	13.36 ~ 13.41	162.0125 ~ 167.17	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.42 ~ 16.423	167.72 ~ 173.2	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	16.69475 ~	240 ~ 285	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	16.69525	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	16.80425 ~	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	16.80475	608 ~ 614	3345.8 ~ 3358		
	25.5 ~ 25.67	960 ~ 1240			
	37.5 ~ 38.25				
	73 ~ 74.6				
	74.8 ~ 75.2				

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

Test Configuration



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

30MHz ~ 25GHz Data(*Chain 0 & 802.11b & 1Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.00	H	X	QP	46.50	-11.80	34.70	43.50	8.80
265.36	H	X	QP	49.92	-8.50	41.42	46.00	4.58
2388.92	H	X	PK	54.00	-2.20	51.80	74.00	22.20
2389.88	H	X	AV	42.15	-2.20	39.95	54.00	14.05
4823.77	V	Z	PK	46.64	6.91	53.55	74.00	20.45
4824.03	V	Z	AV	38.05	6.91	44.96	54.00	9.04

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.44	H	X	QP	47.78	-11.80	35.98	43.50	7.52
264.73	H	X	QP	48.90	-8.50	40.40	46.00	5.60
4874.20	H	Y	PK	44.98	7.30	52.28	74.00	21.72
4874.03	H	Y	AV	37.26	7.30	44.56	54.00	9.44

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.23	H	X	QP	45.84	-11.80	34.04	43.50	9.46
265.36	H	X	QP	48.53	-8.50	40.03	46.00	5.97
2483.50	H	X	PK	53.34	-2.34	51.00	74.00	23.00
2483.50	H	X	AV	41.62	-2.34	39.28	54.00	14.72
4924.26	H	Y	PK	45.22	7.21	52.43	74.00	21.57
4924.00	H	Y	AV	39.22	7.21	46.43	54.00	7.57

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*Chain 1 & 802.11b & 1Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.23	H	X	QP	46.68	-11.80	34.88	43.50	8.62
265.36	H	X	QP	48.36	-8.50	39.86	46.00	6.14
2382.98	V	X	PK	53.95	-2.20	51.75	74.00	22.25
2389.55	V	X	AV	42.57	-2.20	40.37	54.00	13.63
4824.01	H	Y	PK	48.97	6.91	55.88	74.00	18.12
4824.06	H	Y	AV	44.62	6.91	51.53	54.00	2.47

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.35	H	X	QP	46.27	-11.80	34.47	43.50	9.03
265.36	H	X	QP	48.70	-8.50	40.20	46.00	5.80
4874.04	V	Y	PK	47.61	7.30	54.91	74.00	19.09
4874.02	V	Y	AV	42.79	7.30	50.09	54.00	3.91

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.28	H	X	QP	47.20	-11.80	35.40	43.50	8.10
265.41	H	X	QP	49.15	-8.50	40.65	46.00	5.35
2483.74	V	X	PK	54.51	-2.34	52.17	74.00	21.83
2483.50	V	X	AV	44.05	-2.34	41.71	54.00	12.29
4923.35	V	Y	PK	48.04	7.21	55.25	74.00	18.75
4924.01	V	Y	AV	43.58	7.21	50.79	54.00	3.21

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*Chain 0 & 802.11g & 6Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.24	H	X	QP	46.26	-11.80	34.46	43.50	9.04
265.13	H	X	QP	48.47	-8.50	39.97	46.00	6.03
2389.01	V	Y	PK	70.90	-2.20	68.70	74.00	5.30
2390.00	V	Y	AV	53.56	-2.20	51.36	54.00	2.64
4835.65	V	Z	PK	43.53	6.91	50.44	74.00	23.56
4824.30	V	Z	AV	32.71	6.91	39.62	54.00	14.38

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.34	H	X	QP	47.49	-11.80	35.69	43.50	7.81
265.11	H	X	QP	48.62	-8.50	40.12	46.00	5.88
4873.25	V	Z	PK	48.13	7.30	55.43	74.00	18.57
4874.00	V	Z	AV	36.27	7.30	43.57	54.00	10.43

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.34	H	X	QP	46.35	-11.80	34.55	43.50	8.95
265.23	H	X	QP	48.60	-8.50	40.10	46.00	5.90
2483.82	H	Y	PK	72.54	-2.34	70.20	74.00	3.80
2483.50	H	Y	AV	53.03	-2.34	50.69	54.00	3.31
4926.49	V	Z	PK	43.97	7.21	51.18	74.00	22.82
4924.25	V	Z	AV	33.22	7.21	40.43	54.00	13.57

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*Chain 1 & 802.11g & 6Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.33	H	X	QP	47.23	-11.80	35.43	43.50	8.07
265.32	H	X	QP	49.01	-8.50	40.51	46.00	5.49
2389.64	H	X	PK	71.81	-2.20	69.61	74.00	4.39
2385.14	H	X	AV	52.31	-2.20	50.11	54.00	3.89
4825.40	V	Y	PK	45.43	6.91	52.34	74.00	21.66
4824.95	V	Y	AV	33.57	6.91	40.48	54.00	13.52

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.11	H	X	QP	47.39	-11.80	35.59	43.50	7.91
264.89	H	X	QP	48.54	-8.50	40.04	46.00	5.96
4874.65	V	Y	PK	51.84	7.30	59.14	74.00	14.86
4874.00	V	Y	AV	39.28	7.30	46.58	54.00	7.42

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.17	H	X	QP	47.61	-11.80	35.81	43.50	7.69
265.36	H	X	QP	48.97	-8.50	40.47	46.00	5.53
2488.34	H	X	PK	73.14	-2.34	70.80	74.00	3.20
2483.50	H	X	AV	53.89	-2.34	51.55	54.00	2.45
4924.00	V	Y	PK	44.47	7.21	51.68	74.00	22.32
4924.15	V	Y	AV	34.00	7.21	41.21	54.00	12.79

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*2TX (Chain 0, 1) & 802.11n HT20 & MCS 0*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.17	H	X	QP	47.28	-11.80	35.48	43.50	8.02
265.37	H	X	QP	48.65	-8.50	40.15	46.00	5.85
2389.60	V	Y	PK	73.04	-2.20	70.84	74.00	3.16
2390.00	V	Y	AV	53.96	-2.20	51.76	54.00	2.24
2485.05	V	Y	PK	58.02	-2.34	55.68	74.00	18.32
2485.62	V	Y	AV	49.69	-2.34	47.35	54.00	6.65
4823.00	H	Y	PK	45.01	6.91	51.92	74.00	22.08
4824.10	H	Y	AV	33.09	6.91	40.00	54.00	14.00

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.23	H	X	QP	47.36	-11.80	35.56	43.50	7.94
265.23	H	X	QP	48.85	-8.50	40.35	46.00	5.65
2483.73	V	Y	PK	61.68	-2.34	59.34	74.00	14.66
2494.09	V	Y	AV	46.35	-2.34	44.01	54.00	9.99
4871.65	H	Y	PK	51.42	7.30	58.72	74.00	15.28
4872.65	H	Y	AV	38.30	7.30	45.60	54.00	8.40

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.44	H	X	QP	46.21	-11.80	34.41	43.50	9.09
265.36	H	X	QP	48.76	-8.50	40.26	46.00	5.74
2381.76	V	Y	PK	55.88	-2.20	53.68	74.00	20.32
2388.16	V	Y	AV	46.30	-2.20	44.10	54.00	9.90
2484.24	V	Y	PK	70.25	-2.34	67.91	74.00	6.09
2483.51	V	Y	AV	51.99	-2.34	49.65	54.00	4.35
4925.35	H	Y	PK	45.76	7.21	52.97	74.00	21.03
4924.15	H	Y	AV	34.16	7.21	41.37	54.00	12.63

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*2TX (Chain 0, 1) & 802.11n HT40 & MCS 0*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.27	H	X	QP	46.19	-11.80	34.39	43.50	9.11
265.34	H	X	QP	48.95	-8.50	40.45	46.00	5.55
2388.96	H	Z	PK	69.83	-2.20	67.63	74.00	6.37
2390.00	H	Z	AV	51.35	-2.20	49.15	54.00	4.85
4845.18	H	Y	PK	45.84	6.91	52.75	74.00	21.25
4844.03	H	Y	AV	34.02	6.91	40.93	54.00	13.07

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.23	H	X	QP	46.25	-11.80	34.45	43.50	9.05
265.29	H	X	QP	48.75	-8.50	40.25	46.00	5.75
2483.83	V	Y	PK	72.62	-2.34	70.28	74.00	3.72
2483.50	V	Y	AV	52.35	-2.34	50.01	54.00	3.99
4875.68	H	Y	PK	49.72	7.30	57.02	74.00	16.98
4874.10	H	Y	AV	37.16	7.30	44.46	54.00	9.54

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.44	H	X	QP	46.64	-11.80	34.84	43.50	8.66
265.28	H	X	QP	48.69	-8.50	40.19	46.00	5.81
2484.57	H	Y	PK	69.31	-2.34	66.97	74.00	7.03
2484.80	H	Y	AV	51.05	-2.34	48.71	54.00	5.29
4904.36	V	Z	PK	46.27	7.21	53.48	74.00	20.52
4904.05	V	Z	AV	34.96	7.21	42.17	54.00	11.83

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

30MHz ~ 25GHz Data(*Chain 0 & 802.11a & 6Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.44	H	X	QP	46.82	-11.80	35.02	43.50	8.48
264.83	H	X	QP	48.70	-8.50	40.20	46.00	5.80
11490.85	H	Y	PK	49.26	12.73	61.99	74.00	12.01
11489.65	H	Y	AV	36.68	12.73	49.41	54.00	4.59

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.37	H	X	QP	46.77	-11.80	34.97	43.50	8.53
265.27	H	X	QP	48.90	-8.50	40.40	46.00	5.60
11572.20	V	X	PK	48.51	13.54	62.05	74.00	11.95
11565.65	V	X	AV	35.16	13.54	48.70	54.00	5.30

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.25	H	X	QP	46.75	-11.80	34.95	43.50	8.55
265.36	H	X	QP	48.94	-8.50	40.44	46.00	5.56
11651.05	H	Y	PK	50.49	13.99	64.48	74.00	9.52
11649.85	H	Y	AV	36.13	13.99	50.12	54.00	3.88

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

   Note: The total factor above 10GHz shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m.
   Distance extrapolation factor = 20 log (3m/1.5m) dB
   Above 10GHz T.F = AF + CL – AG – 6.02dB

30MHz ~ 25GHz Data(*Chain 1 & 802.11a & 6Mbps*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.10	H	X	QP	46.35	-11.80	34.55	43.50	8.95
265.35	H	X	QP	48.76	-8.50	40.26	46.00	5.74
11495.20	H	Y	PK	55.12	12.73	67.85	74.00	6.15
11489.75	H	Y	AV	37.71	12.73	50.44	54.00	3.56

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.17	H	X	QP	46.31	-11.80	34.51	43.50	8.99
265.28	H	X	QP	49.04	-8.50	40.54	46.00	5.46
11576.10	H	Y	PK	54.58	13.54	68.12	74.00	5.88
11569.90	H	Y	AV	37.50	13.54	51.04	54.00	2.96

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.33	H	X	QP	47.15	-11.80	35.35	43.50	8.15
265.35	H	X	QP	48.59	-8.50	40.09	46.00	5.91
11649.20	H	Y	PK	54.60	13.99	68.59	74.00	5.41
11651.05	H	Y	AV	37.98	13.99	51.97	54.00	2.03

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

Note: The total factor above 10GHz shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m.
Distance extrapolation factor = 20 log (3m/1.5m) dB
Above 10GHz T.F = AF + CL – AG – 6.02dB

30MHz ~ 25GHz Data(*2TX (Chain 0, 1) & 802.11n HT20 & MCS 0*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.36	H	X	QP	46.75	-11.80	34.95	43.50	8.55
265.35	H	X	QP	48.60	-8.50	40.10	46.00	5.90
11492.25	H	Y	PK	53.56	12.73	66.29	74.00	7.71
11489.60	H	Y	AV	38.84	12.73	51.57	54.00	2.43

▪ Middle Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.27	H	X	QP	46.50	-11.80	34.70	43.50	8.80
265.35	H	X	QP	48.64	-8.50	40.14	46.00	5.86
11570.15	H	Y	PK	52.83	13.54	66.37	74.00	7.63
11570.05	H	Y	AV	37.62	13.54	51.16	54.00	2.84

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.26	H	X	QP	46.66	-11.80	34.86	43.50	8.64
265.33	H	X	QP	48.78	-8.50	40.28	46.00	5.72
11651.50	H	Y	PK	54.30	13.99	68.29	74.00	5.71
11650.30	H	Y	AV	37.94	13.99	51.93	54.00	2.07

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

Note: The total factor above 10GHz shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m.
Distance extrapolation factor = 20 log (3m/1.5m) dB
Above 10GHz T.F = AF + CL – AG – 6.02dB

30MHz ~ 25GHz Data(*2TX (Chain 0, 1) & 802.11n HT40 & MCS 0*)

▪ Lowest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.17	H	X	QP	46.18	-11.80	34.38	43.50	9.12
265.29	H	X	QP	48.94	-8.50	40.44	46.00	5.56
11510.48	H	Y	PK	49.86	12.73	62.59	74.00	11.41
11515.20	H	Y	AV	36.14	12.73	48.87	54.00	5.13

▪ Highest Channel

Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
199.16	H	X	QP	46.36	-11.80	34.56	43.50	8.94
265.24	H	X	QP	48.75	-8.50	40.25	46.00	5.75
11589.35	H	Y	PK	51.38	13.99	65.37	74.00	8.63
11590.30	H	Y	AV	36.89	13.99	50.88	54.00	3.12

Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.
   Margin = Limit – Result / Result = Reading + T.F / T.F = AF + CL – AG
   Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

Note: The total factor above 10GHz shall be extrapolated to the specified distance using an extrapolation factor of 20dB/decade from 3m to 1.5m.
Distance extrapolation factor = 20 log (3m/1.5m) dB
Above 10GHz T.F = AF + CL – AG – 6.02dB

8.6 Power-line Conducted Emissions

Test Requirements and limit, §15.207 & RSS-Gen [7.2.2]

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs for the actual connections between EUT and support equipment.

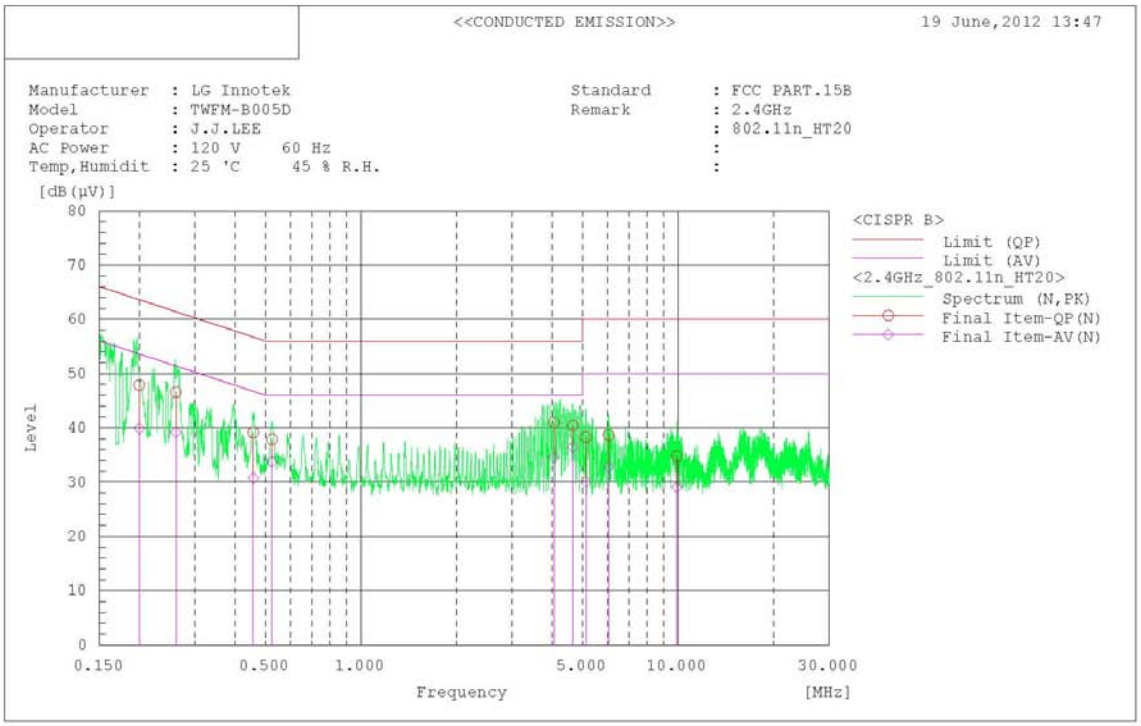
TEST PROCEDURE

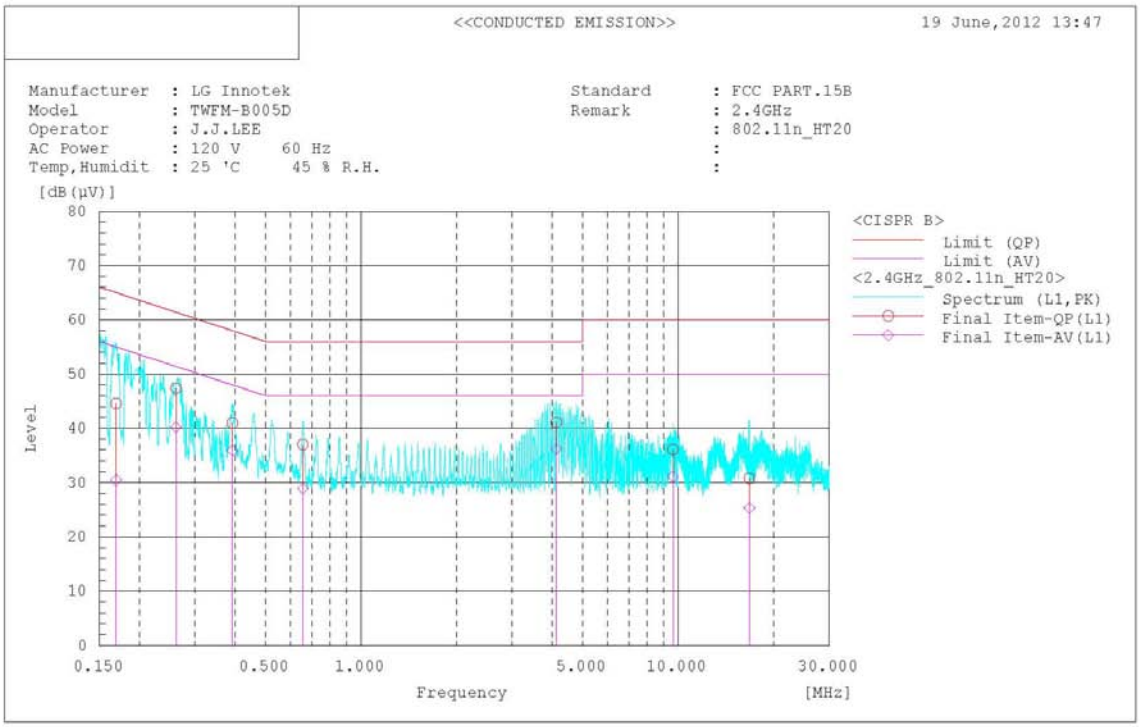
1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

▣ RESULT PLOTS

AC Line Conducted Emissions (Graph)

Test Mode: 802.11n HT20 (2.4GHz Band)





AC Line Conducted Emissions (List)

Test Mode: 802.11n HT20 (2.4GHz Band)

<<CONDUCTED EMISSION>>

19 June,2012 13:47

Standard : FCC PART.15B
Manufacturer : LG Innotek
Model : TWFM-B005D
Operator : J.J.LEE
AC Power : 120 V 60 Hz
Temp,Humidit : 25 °C 45 % R.H.
Remark : 2.4GHz
: 802.11n_HT20
:
:

Final Result

--- N Phase ---

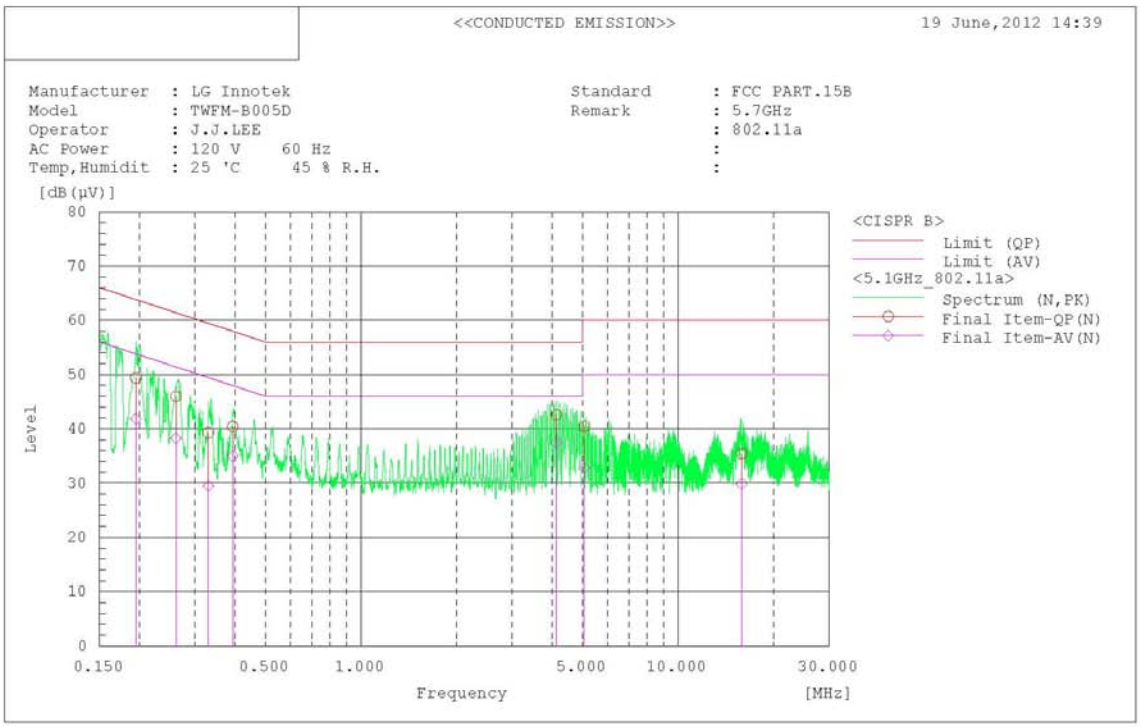
No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]	
1	0.200	37.9	29.9	10.0	47.9	39.9	63.6	53.6	15.7	13.7	
2	0.261	36.6	29.2	10.0	46.6	39.2	61.4	51.4	14.8	12.2	
3	0.458	29.1	20.8	10.0	39.1	30.8	56.7	46.7	17.6	15.9	
4	0.524	27.9	23.8	10.0	37.9	33.8	56.0	46.0	18.1	12.2	
5	4.061	30.9	24.5	10.1	41.0	34.6	56.0	46.0	15.0	11.4	
6	4.654	30.3	26.4	10.1	40.4	36.5	56.0	46.0	15.6	9.5	
7	5.118	28.2	20.0	10.1	38.3	30.1	60.0	50.0	21.7	19.9	
8	6.039	28.5	22.5	10.2	38.7	32.7	60.0	50.0	21.3	17.3	
9	9.901	24.5	18.7	10.3	34.8	29.0	60.0	50.0	25.2	21.0	

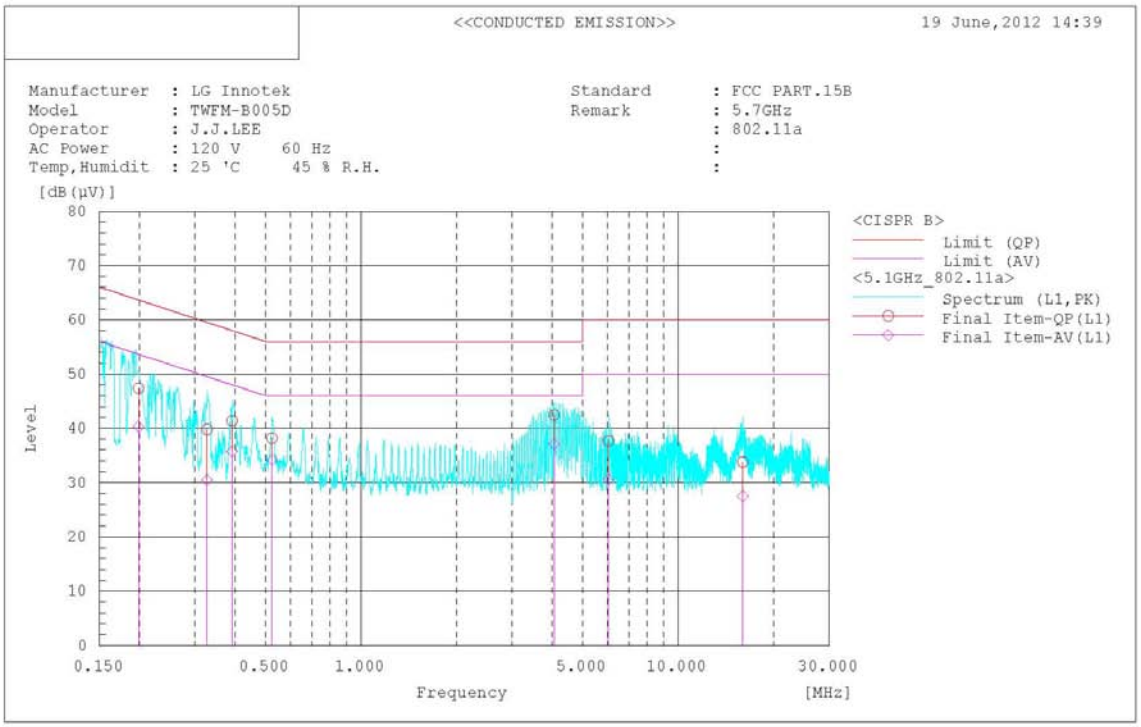
--- L1 Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]	
1	0.169	34.6	20.5	10.0	44.6	30.5	65.0	55.0	20.4	24.5	
2	0.261	37.4	30.2	10.0	47.4	40.2	61.4	51.4	14.0	11.2	
3	0.393	31.0	25.9	10.0	41.0	35.9	58.0	48.0	17.0	12.1	
4	0.656	27.0	18.9	10.0	37.0	28.9	56.0	46.0	19.0	17.1	
5	4.132	30.9	26.0	10.2	41.1	36.2	56.0	46.0	14.9	9.8	
6	9.637	25.8	20.8	10.3	36.1	31.1	60.0	50.0	23.9	18.9	
7	16.784	20.5	15.0	10.3	30.8	25.3	60.0	50.0	29.2	24.7	

AC Line Conducted Emissions (Graph)

Test Mode: 802.11a (5.7GHz Band)





AC Line Conducted Emissions (List)

Test Mode: 802.11a (5.7GHz Band)

<<CONDUCTED EMISSION>>

19 June,2012 14:39

Standard : FCC PART.15B
Manufacturer : LG Innotek
Model : TWFM-B005D
Operator : J.J.LEE
AC Power : 120 V 60 Hz
Temp,Humidit : 25 °C 45 % R.H.
Remark : 5.7GHz
: 802.11a
:
:

Final Result

--- N Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]	
1	0.195	39.4	31.8	10.0	49.4	41.8	63.8	53.8	14.4	12.0	
2	0.261	36.0	28.3	10.0	46.0	38.3	61.4	51.4	15.4	13.1	
3	0.330	29.3	19.5	10.0	39.3	29.5	59.5	49.5	20.2	20.0	
4	0.394	30.4	25.0	10.0	40.4	35.0	58.0	48.0	17.6	13.0	
5	4.132	32.5	27.4	10.1	42.6	37.5	56.0	46.0	13.4	8.5	
6	5.052	30.3	22.7	10.1	40.4	32.8	60.0	50.0	19.6	17.2	
7	15.873	25.0	19.5	10.4	35.4	29.9	60.0	50.0	24.6	20.1	

--- L1 Phase ---

No.	Frequency	Reading QP	Reading AV	c.f	Result QP	Result AV	Limit QP	Limit AV	Margin QP	Margin AV	Remark
	[MHz]	[dB(μV)]	[dB(μV)]	[dB]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB(μV)]	[dB]	[dB]	
1	0.199	37.4	30.3	10.0	47.4	40.3	63.7	53.7	16.3	13.4	
2	0.327	29.8	20.5	10.0	39.8	30.5	59.5	49.5	19.7	19.0	
3	0.392	31.4	25.8	10.0	41.4	35.8	58.0	48.0	16.6	12.2	
4	0.524	28.2	24.2	10.0	38.2	34.2	56.0	46.0	17.8	11.8	
5	4.066	32.3	26.3	10.2	42.5	37.1	56.0	46.0	13.5	8.9	
6	6.037	27.5	20.4	10.2	37.7	30.6	60.0	50.0	22.3	19.4	
7	16.006	23.5	17.2	10.3	33.8	27.5	60.0	50.0	26.2	22.5	

8.7 Occupied Bandwidth

Test Requirements, RSS-Gen [4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

▣ TEST CONFIGURATION

▣ TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.
The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted.
Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

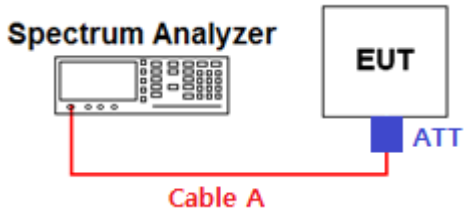
▣ TEST RESULTS: N/T

9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent	E4440A	11/09/30	12/09/30	MY45304199
Spectrum Analyzer	Rohde Schwarz	FSQ26	12/01/09	13/01/09	200445
Digital Multimeter	H.P	34401A	12/03/05	13/03/05	3146A13475, US36122178
Spectrum Analyzer	Agilent	N9020A	12/01/09	13/01/09	MY49100833
Signal Generator	Rohde Schwarz	SMR20	12/03/05	13/03/05	101251
Vector Signal Generator	Rohde Schwarz	SMJ100A	12/01/09	13/01/09	100148
Thermo hygrometer	BODYCOM	BJ5478	12/01/13	13/01/13	090205-2
DC Power Supply	HP	6622A	12/03/05	13/03/05	3448A03760
Wideband Power Sensor	Rohde Schwarz	NRP-Z81	12/06/28	13/06/28	1137.9009.02-101001
High-pass filter	Wainwright	WHNX3.0	11/09/30	12/09/30	9
High-Pass Filter	Wainwright	WHKX8.5	11/09/19	12/09/19	1
BILOG ANTENNA	SCHAFFNER	CBL6112D	10/12/21	12/12/21	22609V
HORN ANT	ETS	3115	12/02/20	13/02/20	6419
HORN ANT	A.H.Systems	SAS-574	11/03/25	13/03/25	154
Attenuator (3dB)	WEINSCHEL	56-3	11/09/30	12/09/30	Y2342
Amplifier (22dB)	H.P	8447E	12/01/09	13/01/09	2945A02865
Amplifier (30dB)	Agilent	8449B	12/03/05	13/03/05	3008A01590
EMI TEST RECEIVER	R&S	ESU	12/03/05	13/03/05	100014
RFI/Field intensity Meter	KYORITSU	KNM-2402	12/07/02	13/07/02	4N-170-3
Spectrum Analyzer	H/P	8591E	12/03/05	13/03/05	3649A05889
SINGLE-PHASE MASTER	NF	4420	11/09/15	12/09/15	3049354420023
Artificial Mains Network	Narda S.T.S. / PMM	PMM L2-16B	12/03/13	13/03/13	000WX20305
10dB Attenuator	Aeroflex/Weinschel	86-10-11	11/09/30	12/09/30	408

APPENDIX I

Test set Diagram & path loss information for 6dB Bandwidth & Maximum Peak Conducted Output Power



Offset value information

Frequency (GHz)	Offset Value (dB)	Frequency (GHz)	Offset Value (dB)
2.412 ~ 2.462	3.03	5.745 ~ 5.825	3.32

Note. 1: The path loss from EUT to Spectrum analyzer was measured and used for test.
Path loss (S/A's offset value) = Cable A + Attenuator (ATT)