HCT CO.,LTD

HCT CO., LTD.

CERTIFICATE OF COMPLIANCE

Applicant Name:
LG Electronics MobileComm U.S.A., Inc.
Address:
10101 Old Grove Road, San Diego, CA 92131

Date of Issue:
December 05, 2011
Test Site/Location:
HCT CO., LTD., 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, Korea
Report No.: HCTR1112FR04
HCT FRN: 0005866421

FCC ID:	**ZNFMS840**
APPLICANT:	**LG Electronics MobileComm U.S.A., Inc.**

FCC Model(s):	MS840
EUT Type:	CDMA/LTE/AWS Phone
Max. RF Output Power:	Wi-Fi 802.11b(19.83 dBm) / Wi-Fi 802.11g (19.75 dBm)) / Wi-Fi 802.11n (18.67 dBm)
Frequency Range:	2412 MHz -2462 MHz
Modulation type	CCK/DSSS/OFDM
FCC Classification:	Digital Transmission System(DTS)
FCC Rule Part(s):	Part 15.247

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Jong Seok Lee

Report prepared by
: Jong Seok Lee
Test engineer of RF Team

Sang Jun Lee

Approved by
: Sang Jun Lee
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTR1112FR04	December 05, 2011	- First Approval Report

Table of Contents

1. GENERAL INFORMATION

Applicant:	LG Electronics MobileComm U.S.A., Inc.
Address:	10101 Old Grove Road, San Diego, CA 92131
FCC ID:	ZNFMS840
EUT Type:	CDMA/LTE/AWS Phone
Model Name:	MS840
Date(s) of Tests:	November 15, 2011 ~ December 02, 2011
Contact person:	Name: Oh Boum Kwon Phone #: +82-2-2033-1124
Place of Tests:	HCT Co., Ltd. 105-1, Jangam-ri , Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, KOREA. (IC Recognition No. : 5944A-3)

2. EUT DESCRIPTION

EUT Type	CDMA/LTE/AWS Phone
Model Name	MS840
Power Supply	DC 3.7 V
Battery type	Li-ion Battery(Standard)
Frequency Range	TX: 2412 MHz ~ 2462 MHz RX: 2412 MHz ~ 2462 MHz
Max. RF Output Power:	Wi-Fi 802.11b(19.83 dBm) / Wi-Fi 802.11g (19.75 dBm)) / Wi-Fi 802.11n (18.67 dBm)
Modulation Type	DSSS/CCK(802.11b), OFDM(802.11g, 802.11n)
Antenna Specification	Manufacturer: Mobitech Antenna type: Internal Antenna Peak Gain : -0.87 dBi

3. 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)

3.1 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.

3.2 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.

3.3 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)

3.4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) is chosen for full testing.

4. 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.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

The SAC(Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at the 105-1, Jangam-ri, Majang-Myeon, Icheon-si, Kyunggi-Do, 467-811, Korea. The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2003) and CISPR Publication 22. Detailed description of test facility was submitted to the Commission and accepted dated March 02, 2011 (Registration Number: 90661)

5.2 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 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.”

6. 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 antennas of this E.U.T are permanently attached.

*The E.U.T Complies with the requirement of §15.203

7. SUMMARY TEST OF RESULTS

Test Description	FCC Part Section(s)	Test Limit	Test Condition	Test Result
6 dB Bandwidth	§15.247(a)(2)	> 500 kHz	CONDUCTED	PASS
Conducted Maximum Peak Output Power	§15.247(b)(3)	< 1 Watt		PASS
Power Spectral Density	§15.247(e)	< 8 dBm / 3 kHz Band		PASS
Band Edge(Out of Band Emissions)	§15.247(d)	Conducted < 20 dBc		PASS
AC Power line Conducted Emissions	§15.207	cf. Section 8.6		PASS
Radiated Spurious Emissions	§15.205, 15.209	cf. Section 8.5.1	RADIATED	PASS
Radiated Restricted Band Edge	§15.247(d), 15.205, 15.209	cf. Section 8.5.2		PASS

8. TEST RESULT

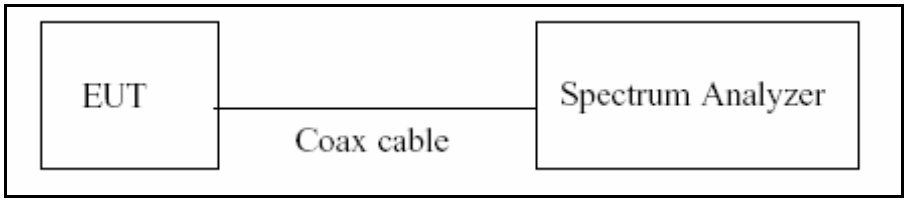
8.1 6dB BANDWIDTH MEASUREMENT (802.11b/g/n)

Test Requirements and limit, §15.247(a)(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



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to

RBW: 100 kHz

VBW: 100 kHz

SPAN: 40 MHz

▣ TEST RESULTS

Conducted 6dB Bandwidth Measurements for 802.11b

802.11b Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	6.967	0.5	Pass
2437	6	7.097	0.5	Pass
2462	11	6.873	0.5	Pass

Conducted 6dB Bandwidth Measurements for 802.11g

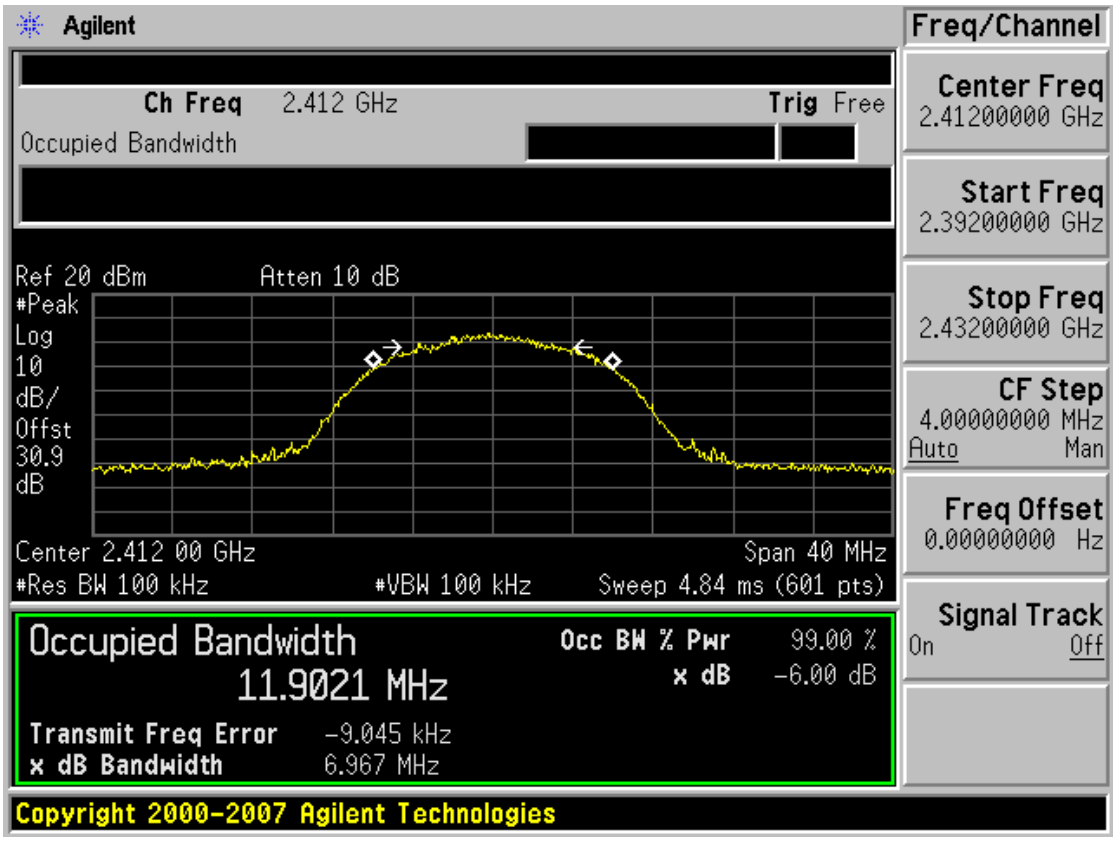
802.11g Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	15.172	0.5	Pass
2437	6	15.147	0.5	Pass
2462	11	15.147	0.5	Pass

Conducted 6dB Bandwidth Measurements for 802.11n

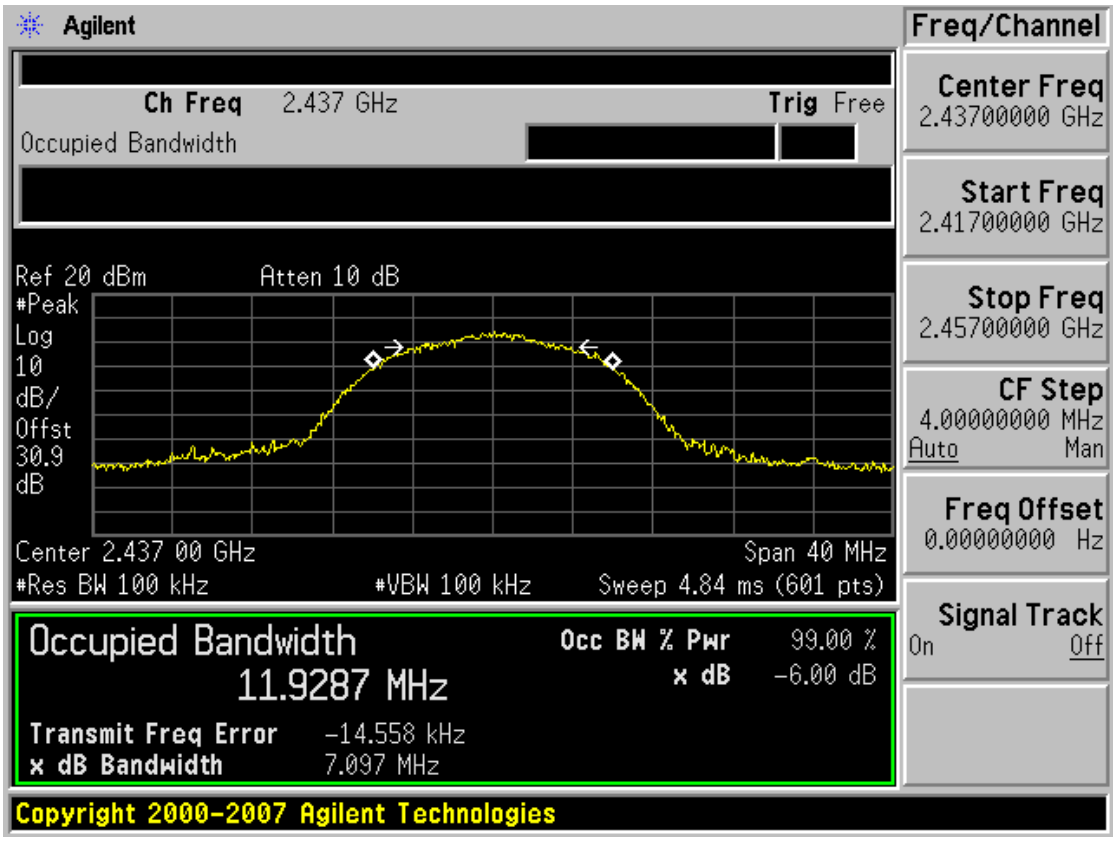
802.11n Mode		Measured Bandwidth [MHz]	Minimum Bandwidth [MHz]	Pass / Fail
Frequency [MHz]	Channel No.			
2412	1	16.362	0.5	Pass
2437	6	15.998	0.5	Pass
2462	11	15.149	0.5	Pass

▣ RESULT PLOTS

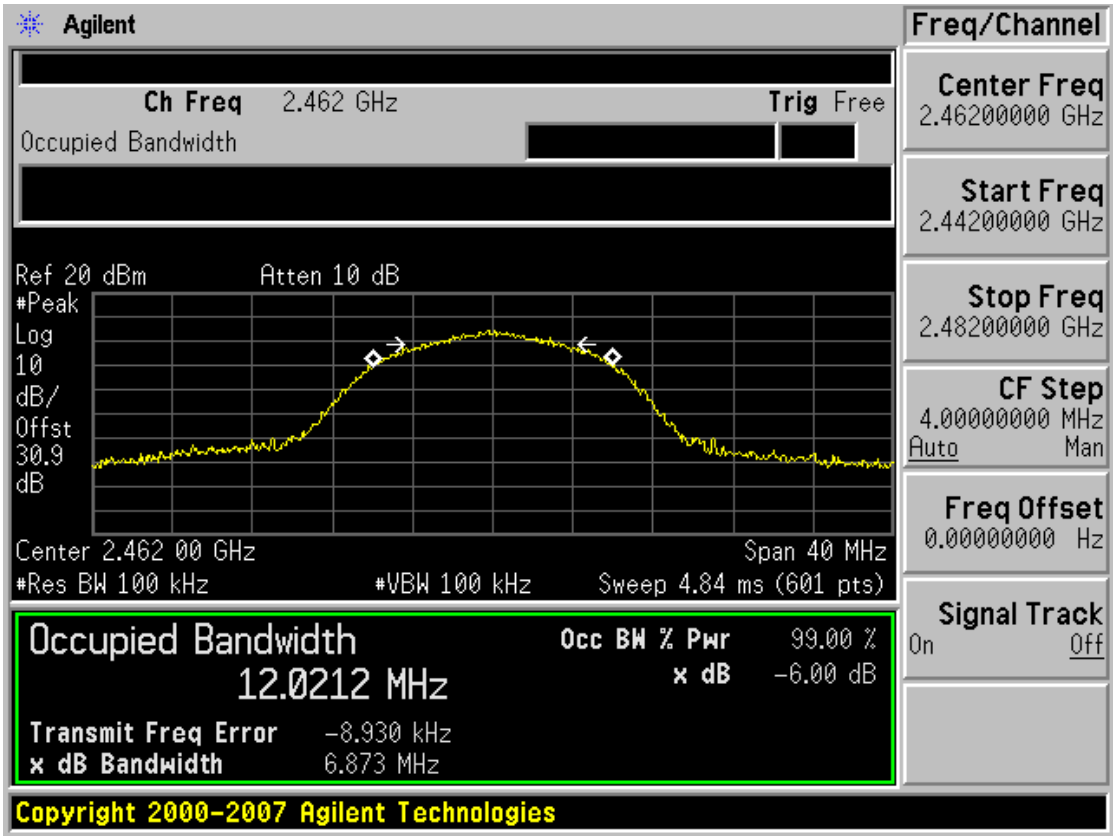
6dB Bandwidth plot (802.11b-CH 1)



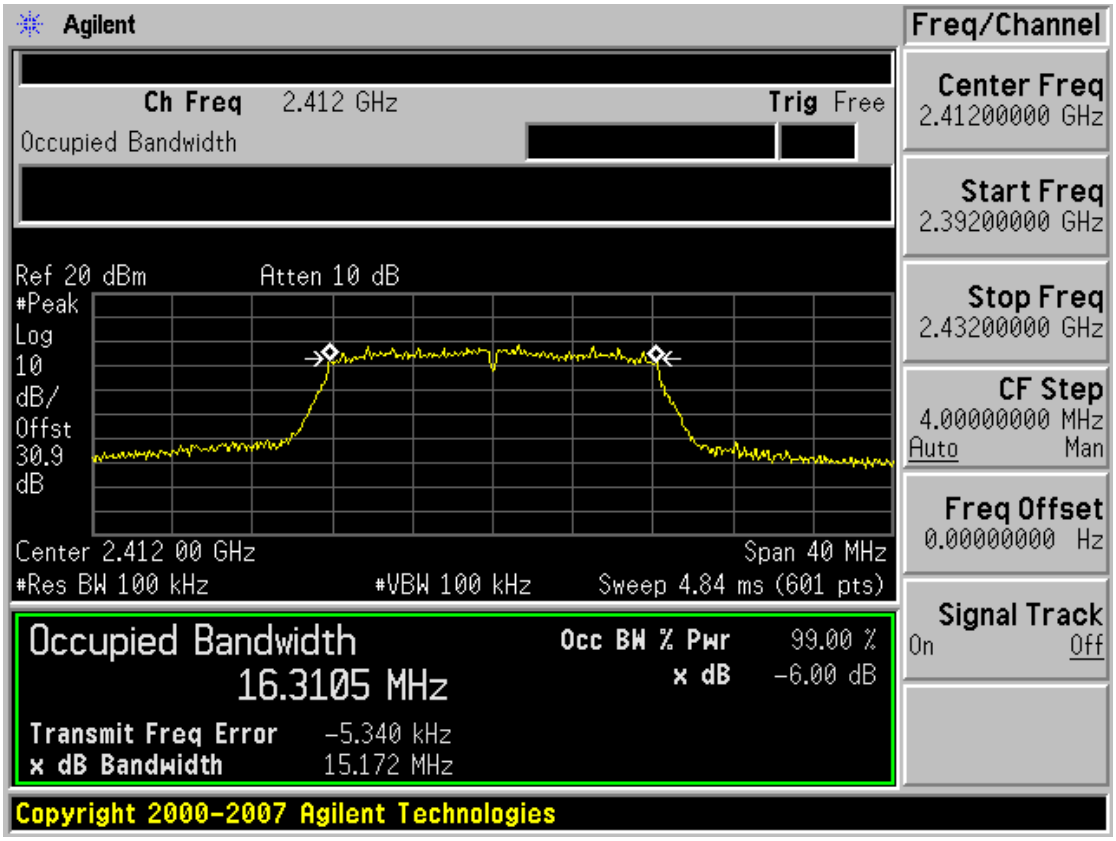
6dB Bandwidth plot (802.11b-CH 6)



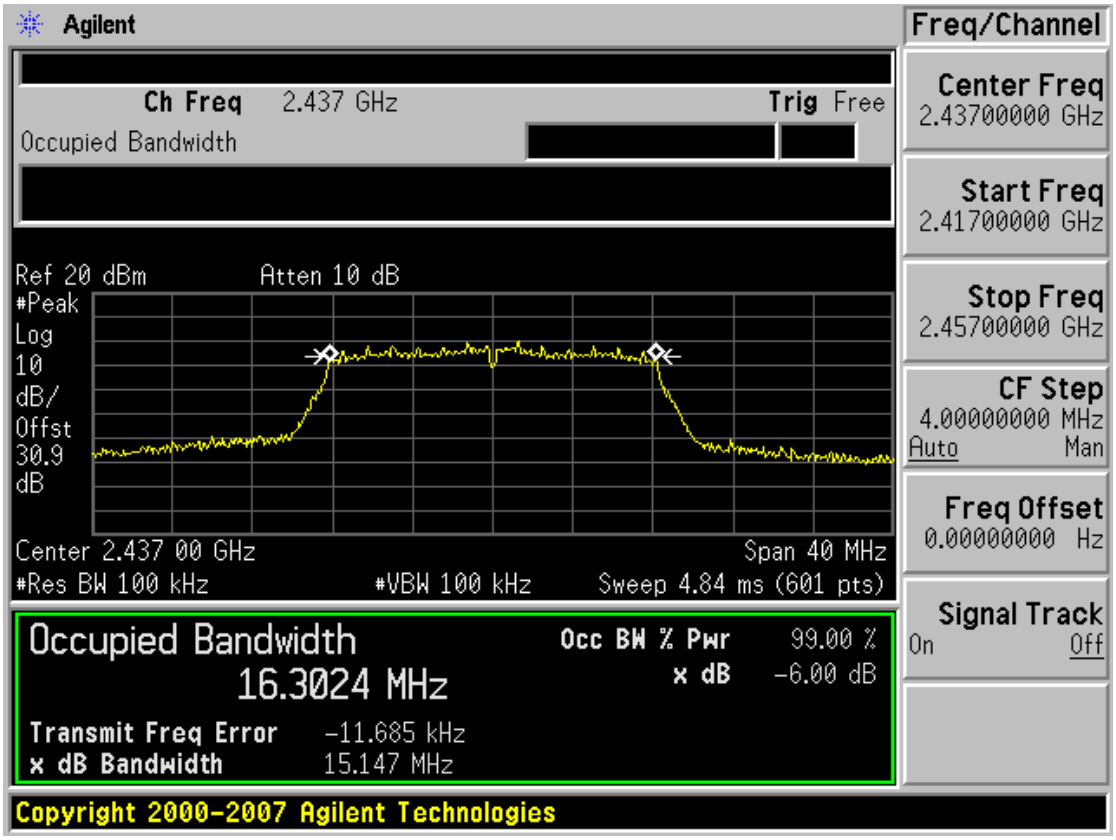
6dB Bandwidth plot (802.11b-CH 11)



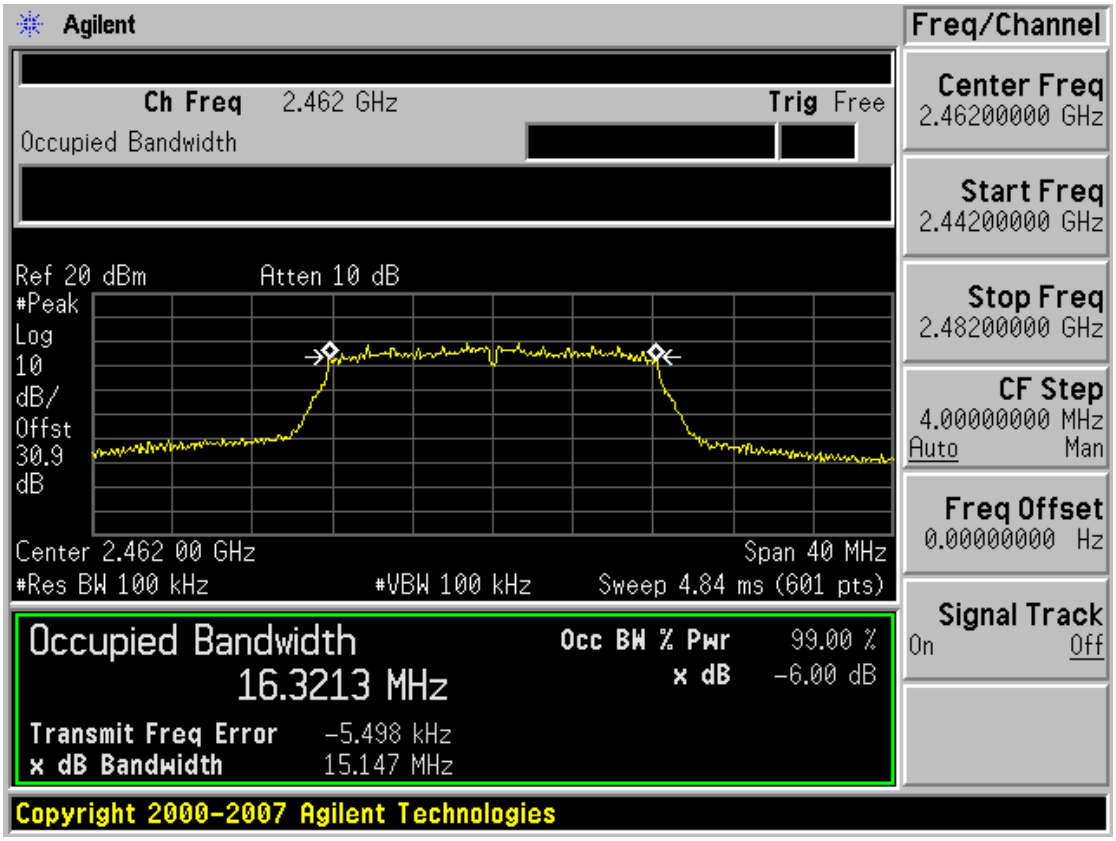
6dB Bandwidth plot (802.11g-CH 1)



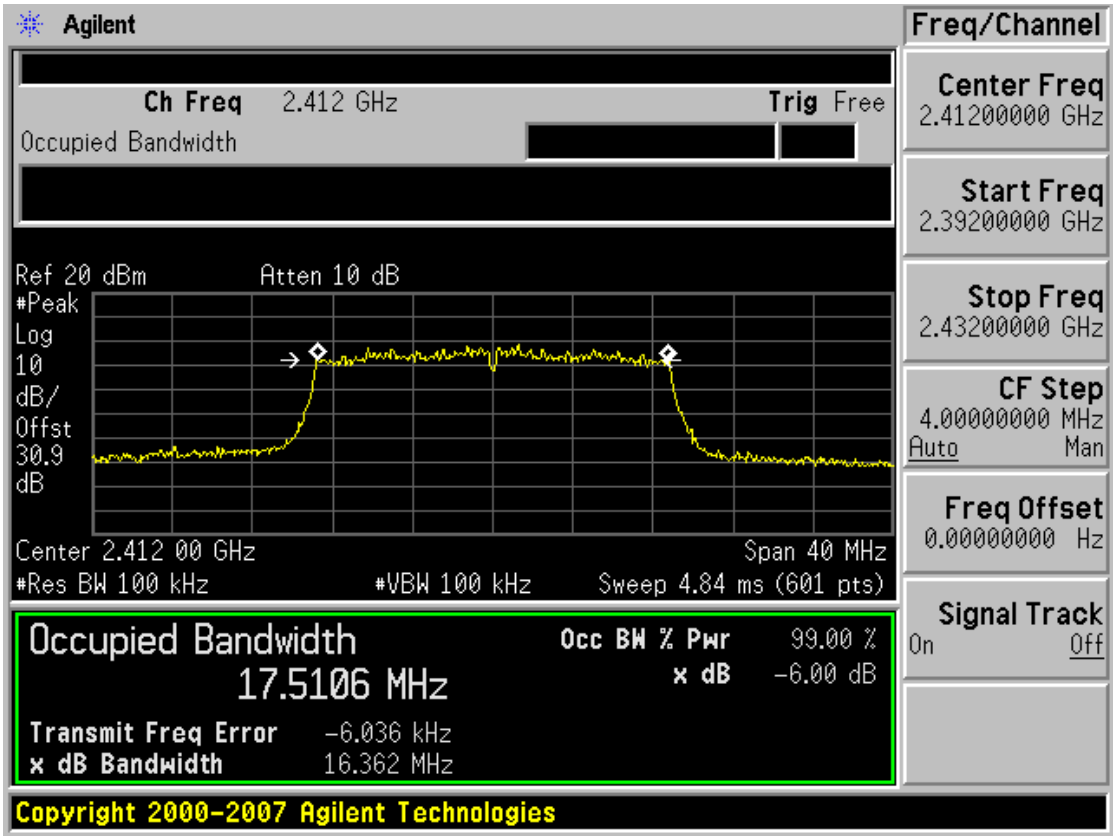
6dB Bandwidth plot (802.11g-CH 6)



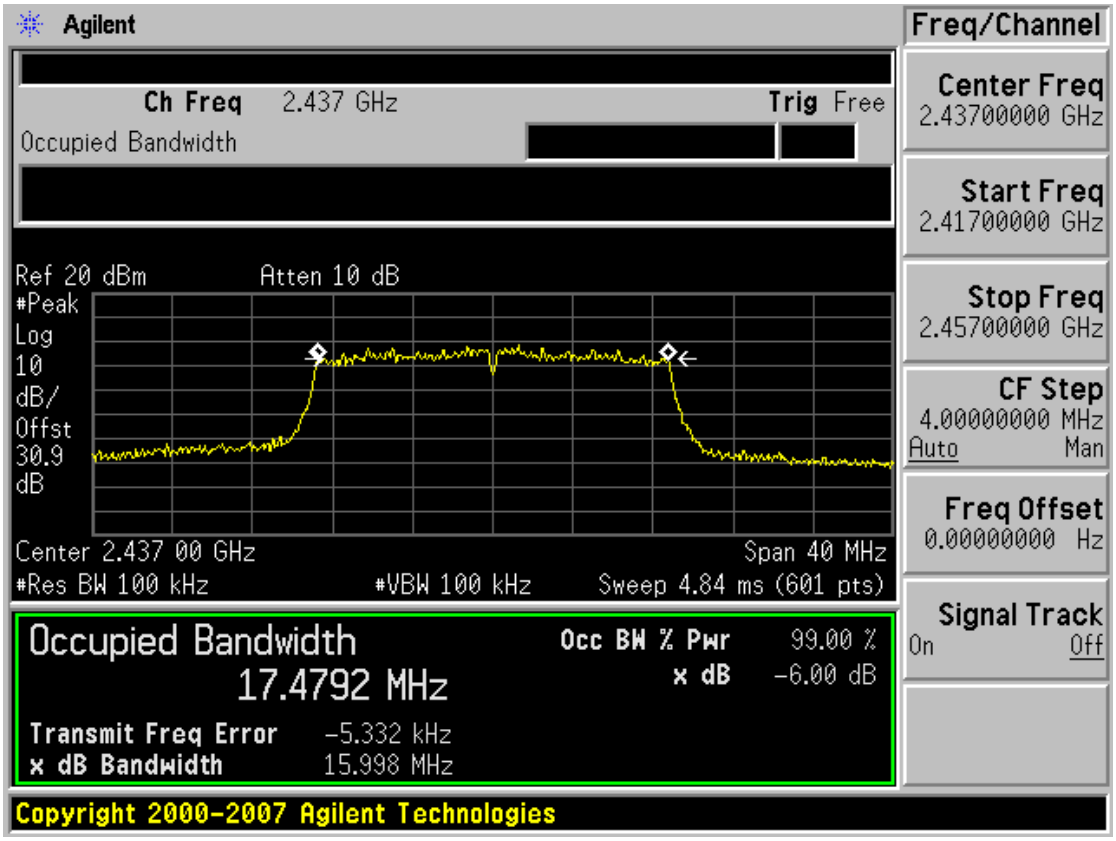
6dB Bandwidth plot (802.11g-CH 11)



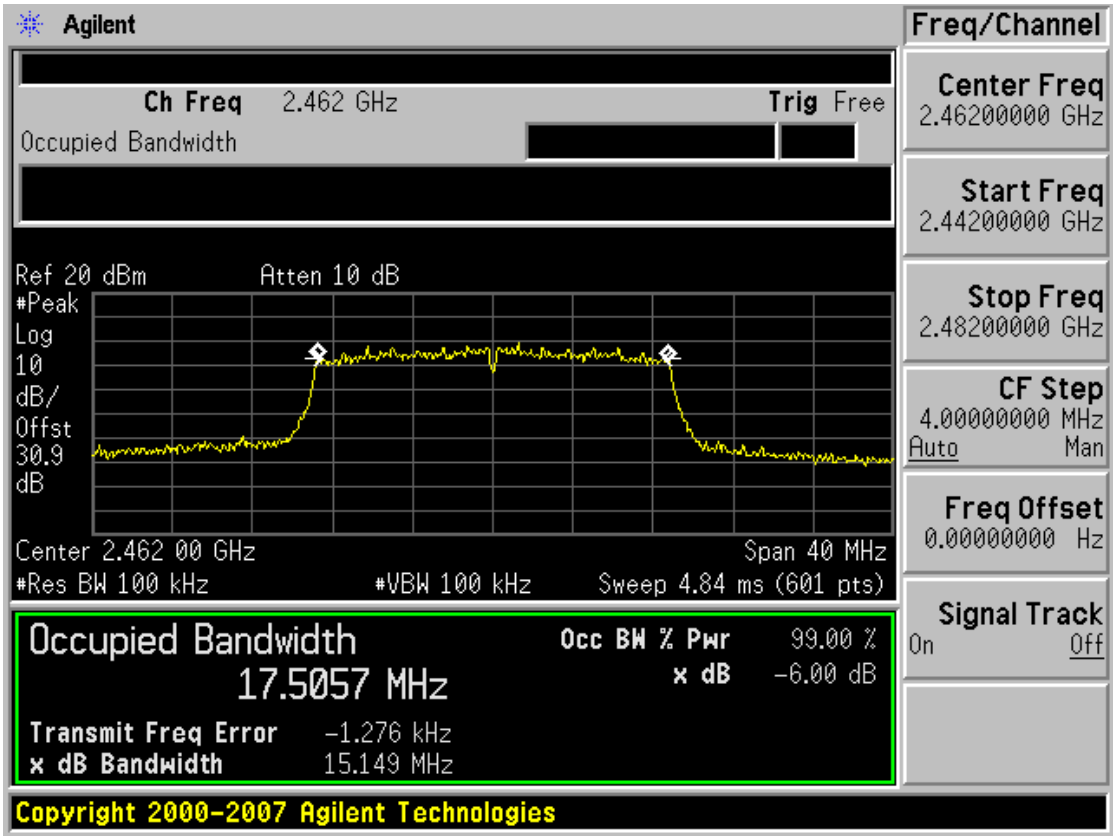
6dB Bandwidth plot (802.11n-CH 1)



6dB Bandwidth plot (802.11n-CH 6)



6dB Bandwidth plot (802.11n-CH 11)



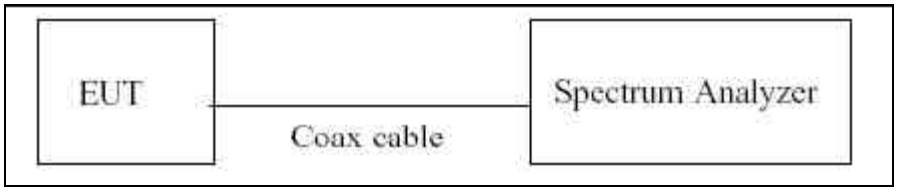
8.2 OUTPUT POWER MEASUREMENT (802.11b/g/n)

Test Requirements and limit, §15.247(b)(3)

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



▣ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. We use the spectrum analyzer's integrated band power measurement function. We tested according to 718828 DTS Measurement Guidance DR01.

The Spectrum Analyzer is set to

Peak Power

RBW = 1 MHz

VBW = 3 MHz

SPAN = 5 – 30 % greater than the EBW

Detector Mode = Peak

Integrated bandwidth = EBW

▣ TEST RESULTS

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	1 Mbps	15.60	30
		2 Mbps	15.93	30
		5.5 Mbps	17.61	30
		11 Mbps	19.36	30
2437	6	1 Mbps	15.93	30
		2 Mbps	16.25	30
		5.5 Mbps	17.92	30
		11 Mbps	19.62	30
2462	11	1 Mbps	16.04	30
		2 Mbps	16.41	30
		5.5 Mbps	18.12	30
		11 Mbps	19.83	30

Conducted Output Power Measurements (802.11g Mode)

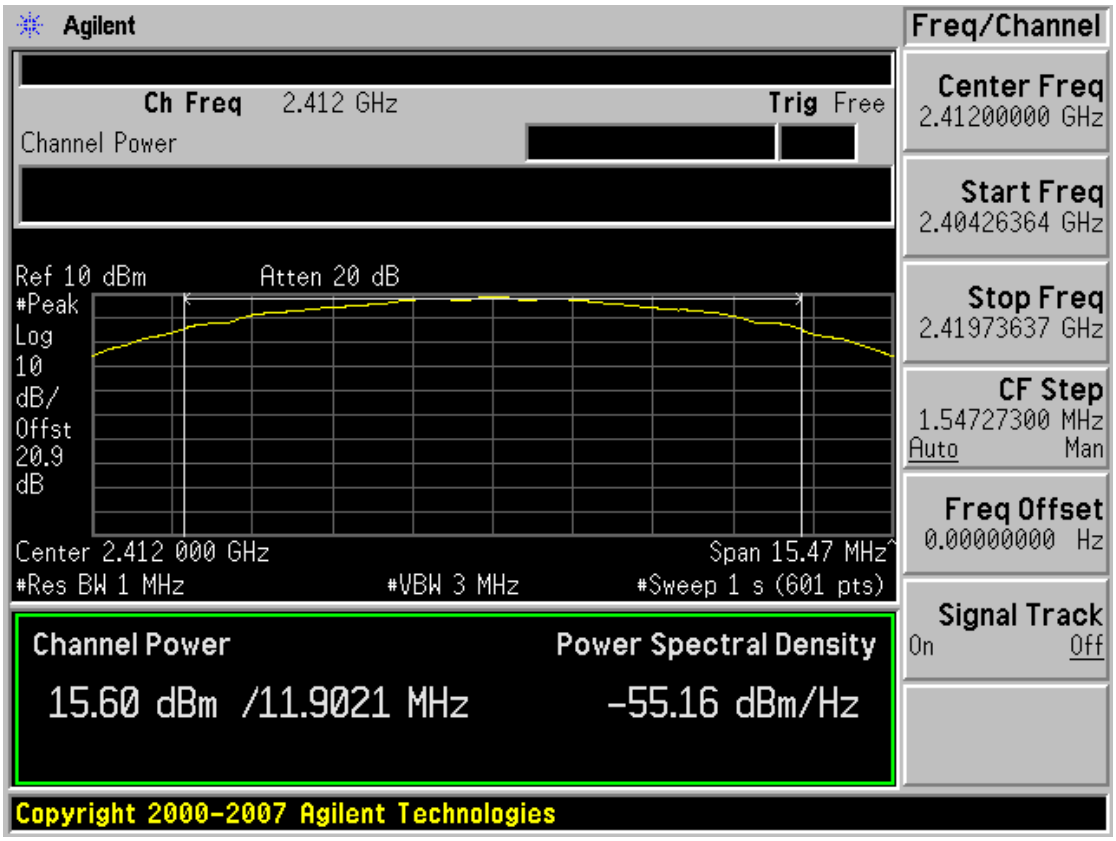
802.11g Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	6 Mbps	18.75	30
		9 Mbps	18.71	30
		12 Mbps	18.77	30
		18 Mbps	18.75	30
		24 Mbps	19.25	30
		36 Mbps	19.28	30
		48 Mbps	19.32	30
		54 Mbps	19.33	30
2437	6	6 Mbps	19.00	30
		9 Mbps	18.98	30
		12 Mbps	19.01	30
		18 Mbps	19.04	30
		24 Mbps	19.55	30
		36 Mbps	19.55	30
		48 Mbps	19.56	30
		54 Mbps	19.62	30
2462	11	6 Mbps	19.21	30
		9 Mbps	19.18	30
		12 Mbps	19.26	30
		18 Mbps	19.17	30
		24 Mbps	19.75	30
		36 Mbps	19.65	30
		48 Mbps	19.66	30
		54 Mbps	19.72	30

Conducted Output Power Measurements (802.11n Mode)

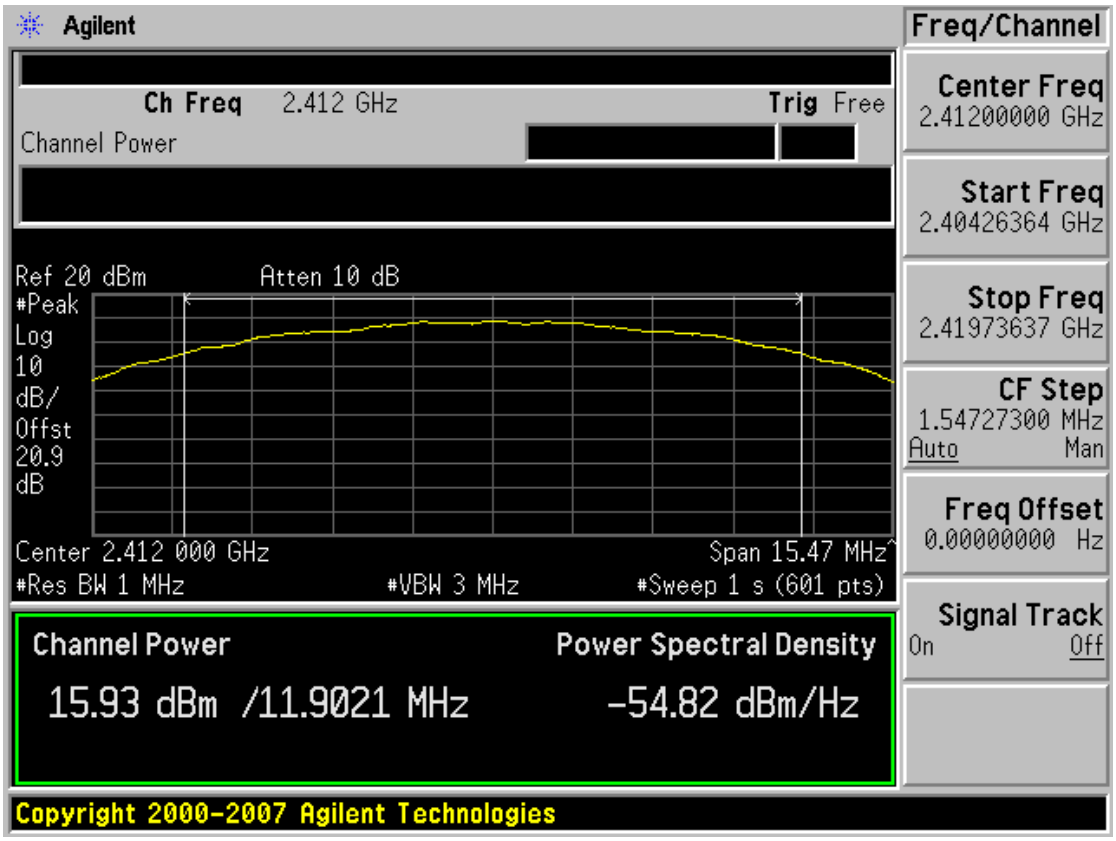
802.11n Mode		Rate	Measured	Limit
Frequency[MHz]	Channel No.	(Mbps)	Power(dBm)	(dBm)
2412	1	6.5 Mbps	17.79	30
		13 Mbps	17.81	30
		19.5 Mbps	17.77	30
		26 Mbps	18.25	30
		39 Mbps	18.27	30
		52 Mbps	18.28	30
		58.5 Mbps	18.27	30
		65 Mbps	18.33	30
2437	6	6.5 Mbps	18.08	30
		13 Mbps	18.00	30
		19.5 Mbps	17.99	30
		26 Mbps	18.49	30
		39 Mbps	18.47	30
		52 Mbps	18.49	30
		58.5 Mbps	18.53	30
		65 Mbps	18.45	30
2462	11	6.5 Mbps	18.20	30
		13 Mbps	18.12	30
		19.5 Mbps	18.01	30
		26 Mbps	18.55	30
		39 Mbps	18.58	30
		52 Mbps	18.62	30
		58.5 Mbps	18.67	30
		65 Mbps	18.47	30

▣ RESULT PLOTS

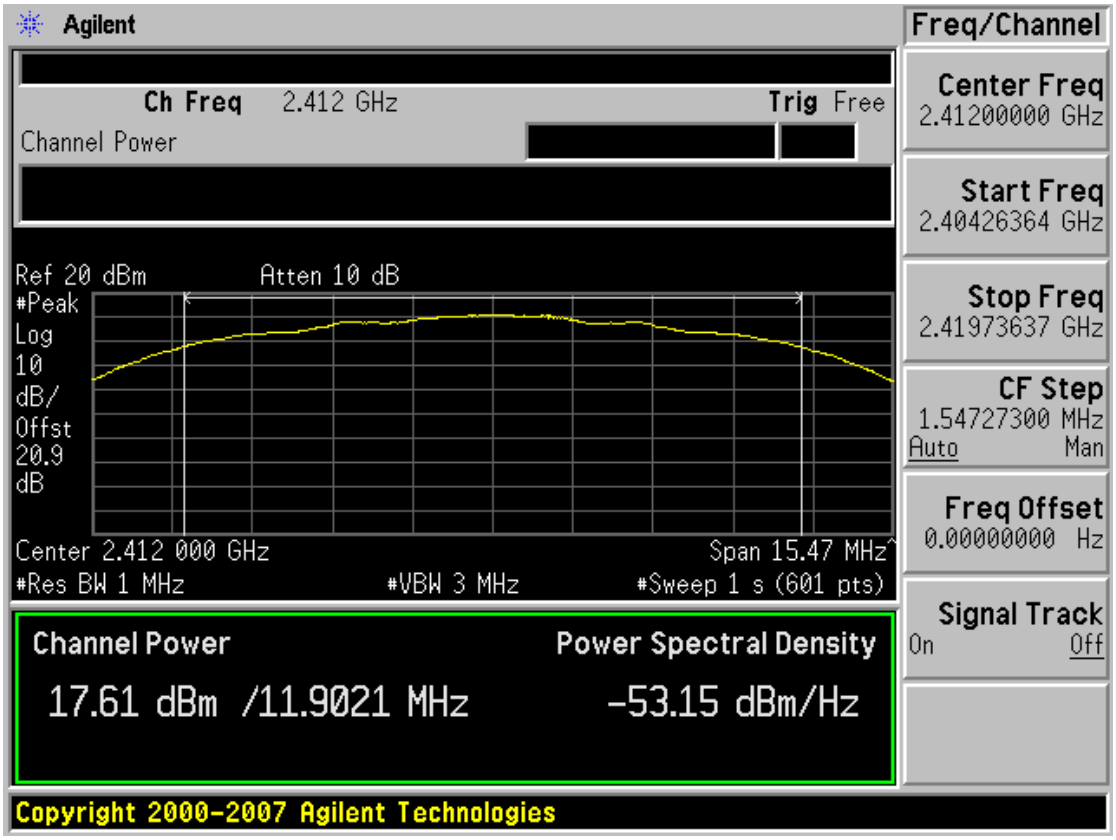
Conducted Output Power (802.11b-CH 1) 1Mbps



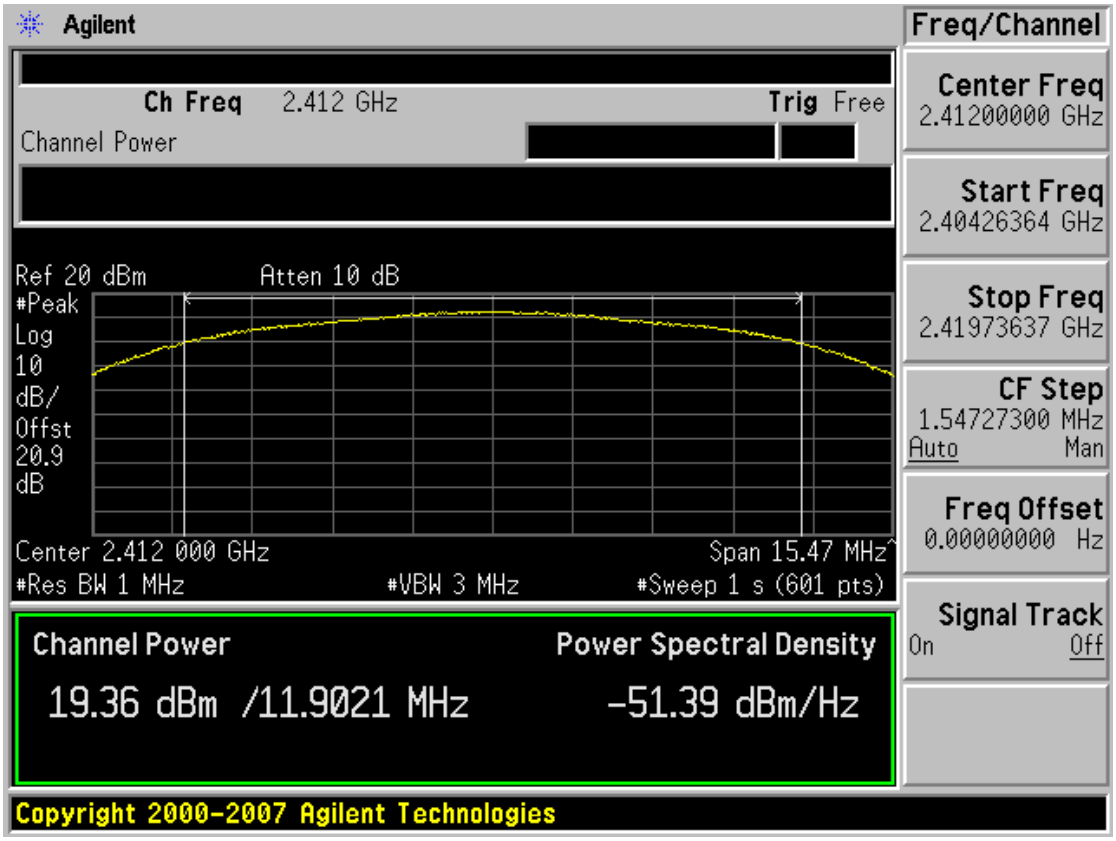
Conducted Output Power (802.11b-CH 1) 2Mbps



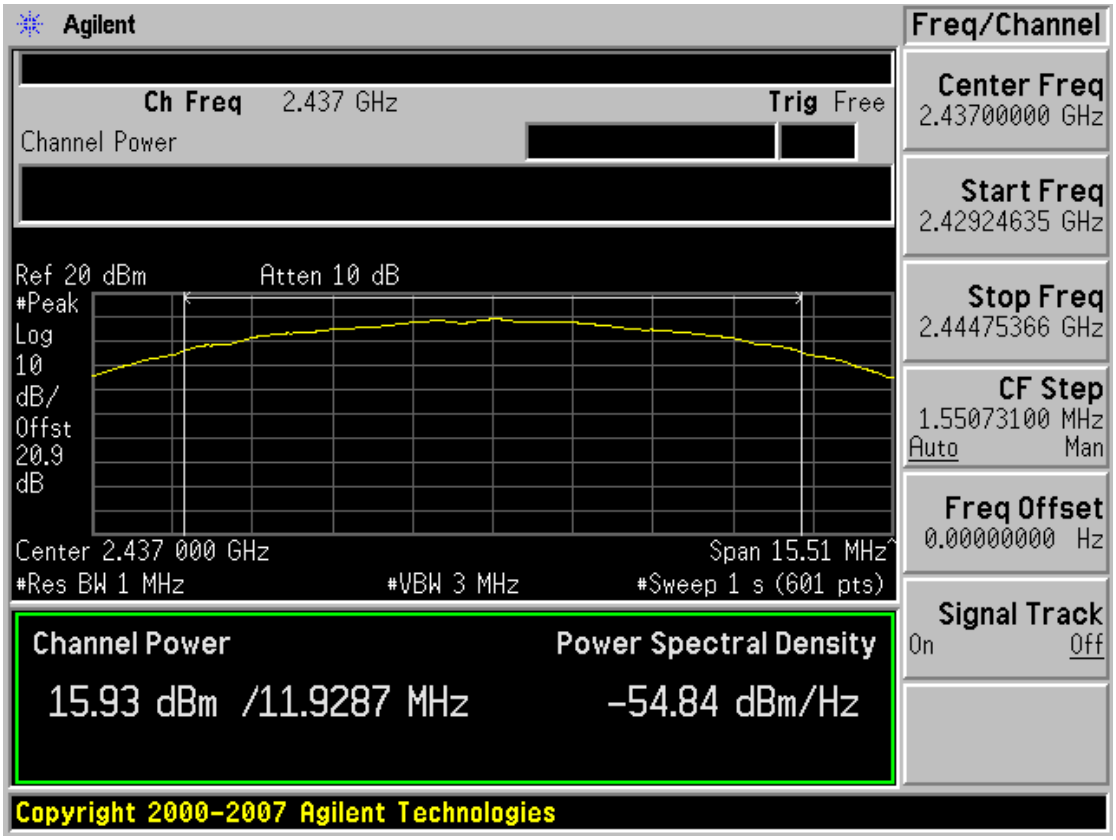
Conducted Output Power (802.11b-CH 1) 5.5Mbps



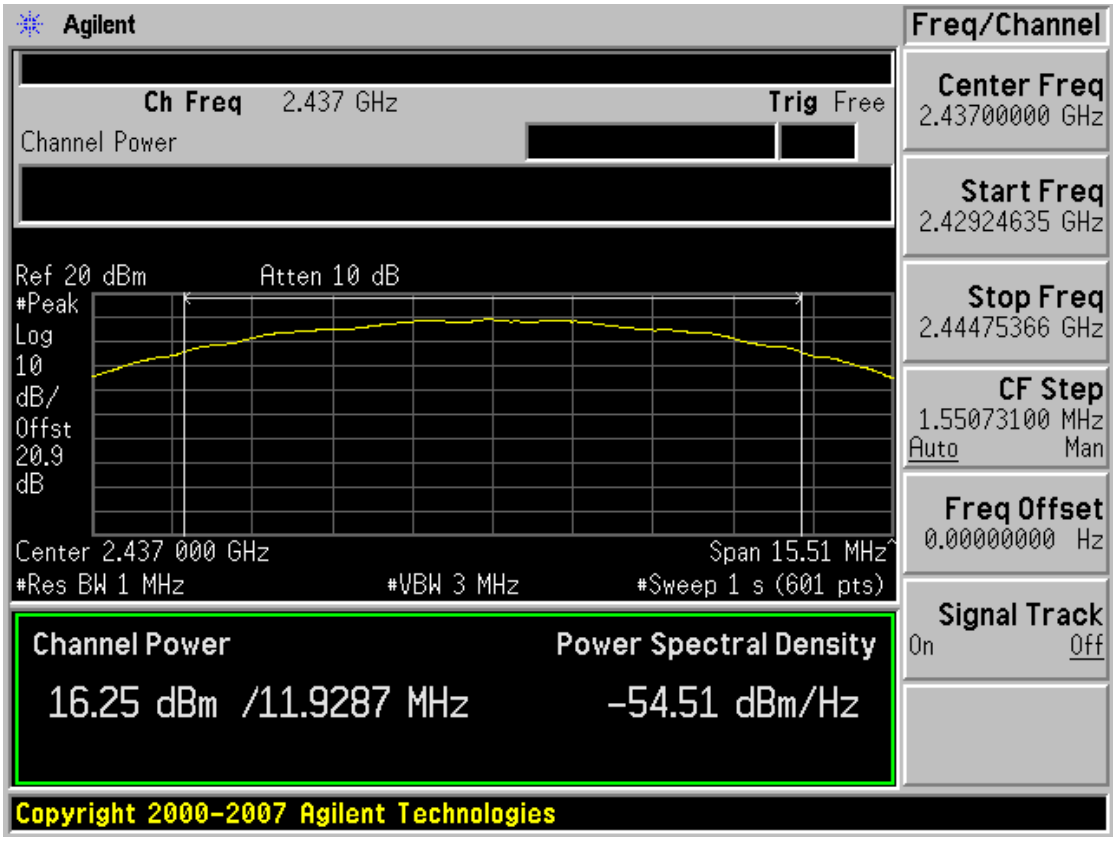
Conducted Output Power (802.11b-CH 1) 11Mbps



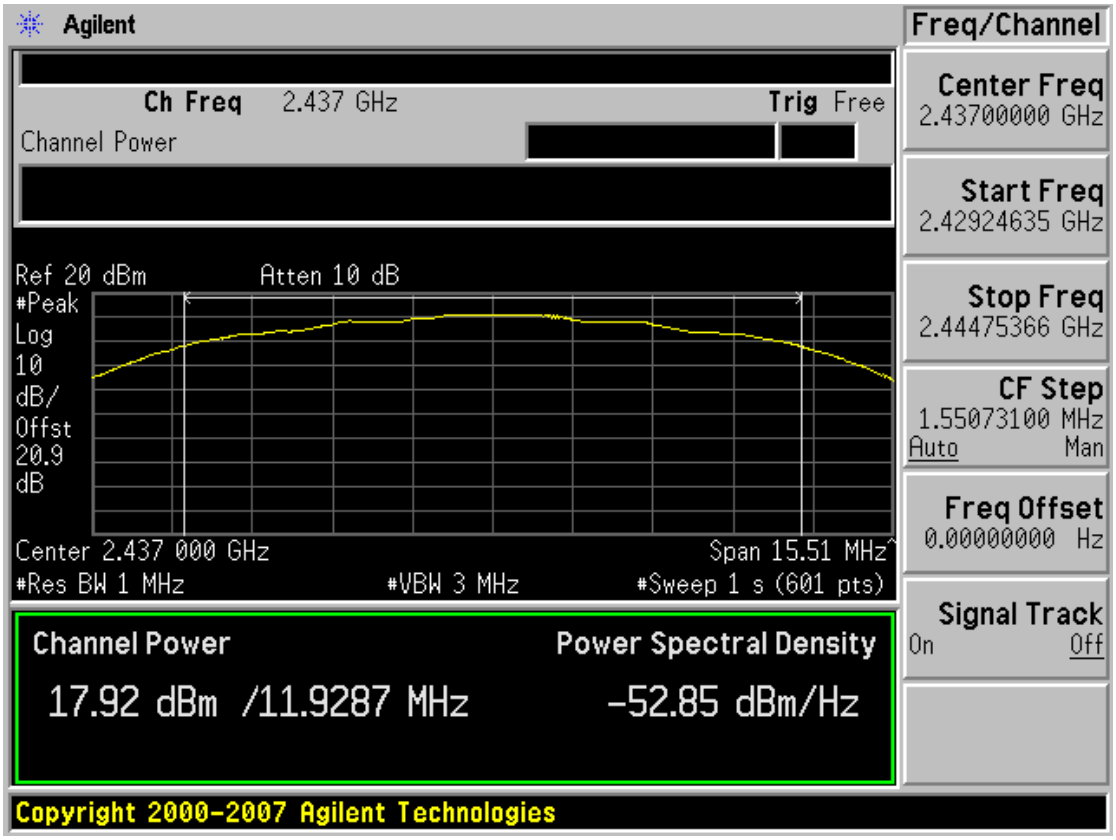
Conducted Output Power (802.11b-CH 6) 1Mbps



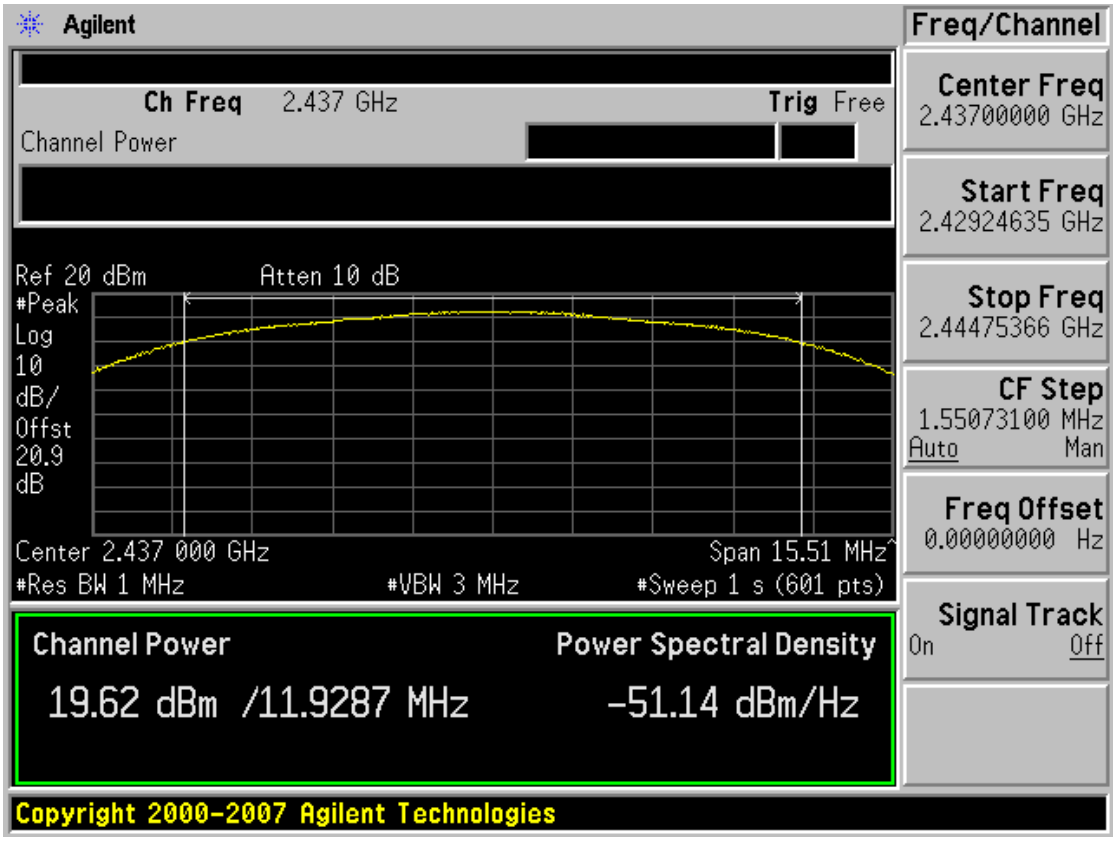
Conducted Output Power (802.11b-CH 6) 2Mbps



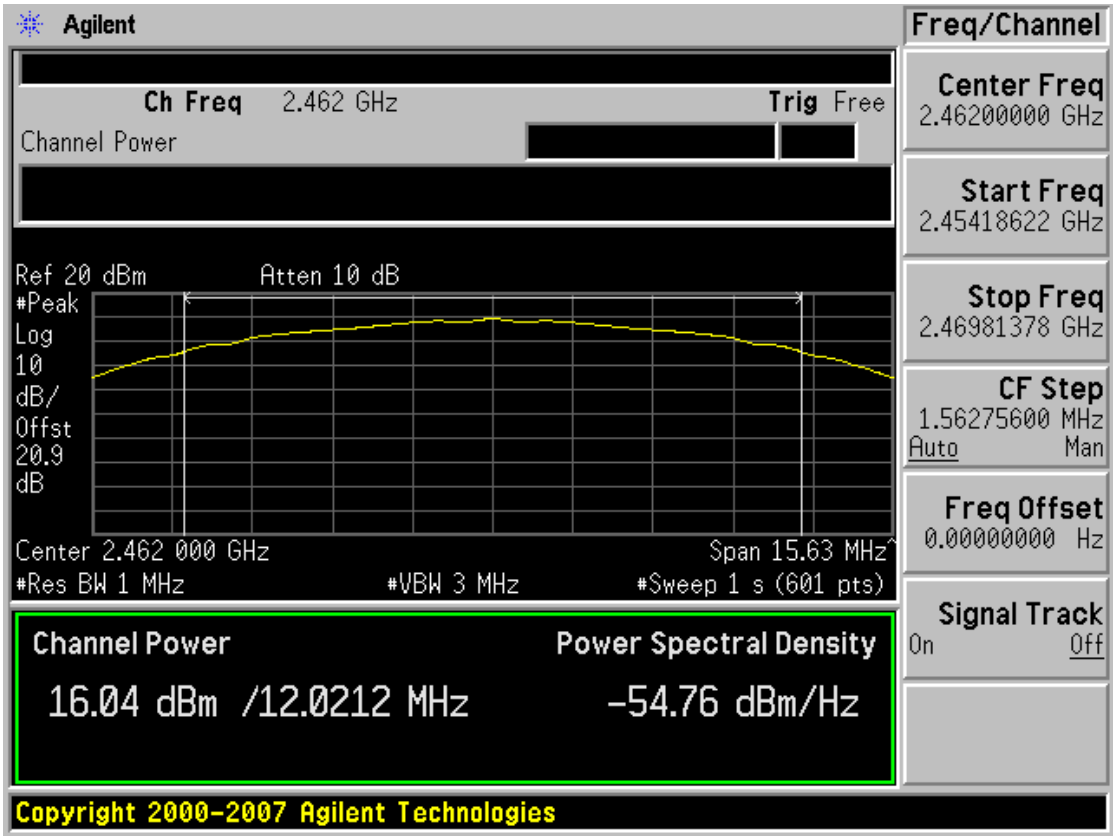
Conducted Output Power (802.11b-CH 6) 5.5Mbps



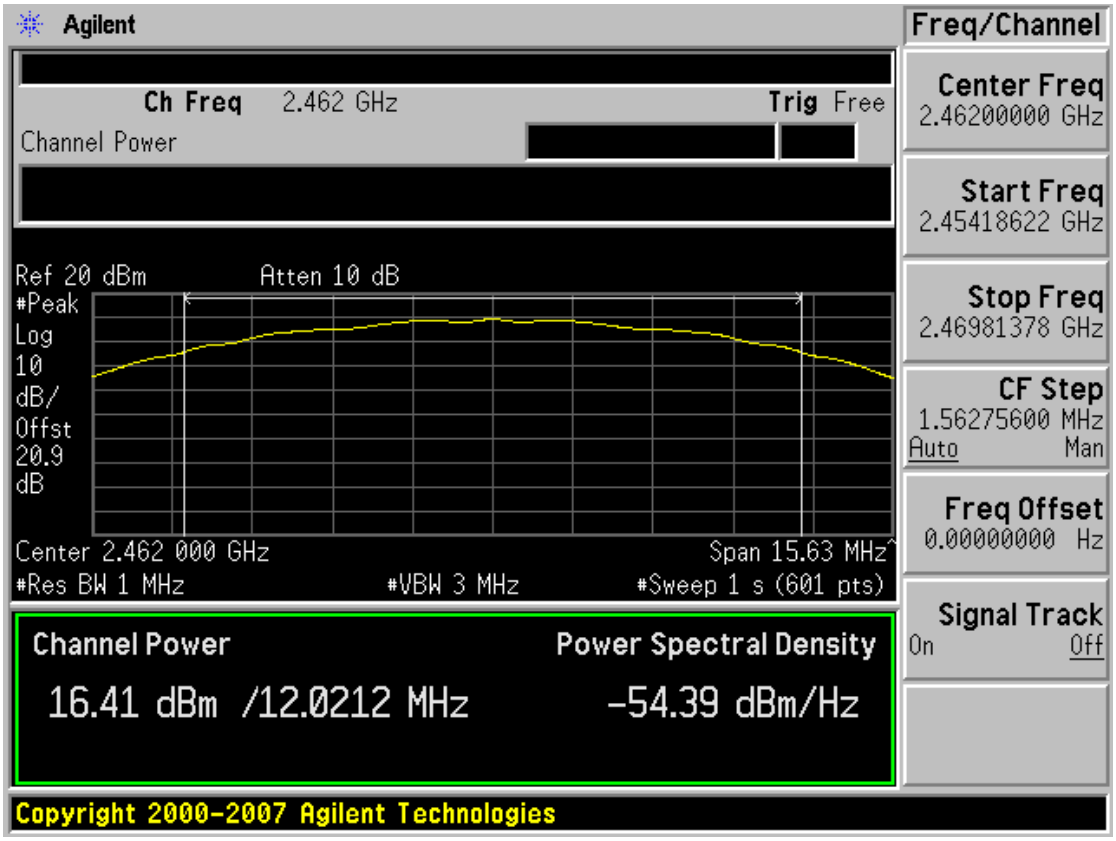
Conducted Output Power (802.11b-CH 6) 11Mbps



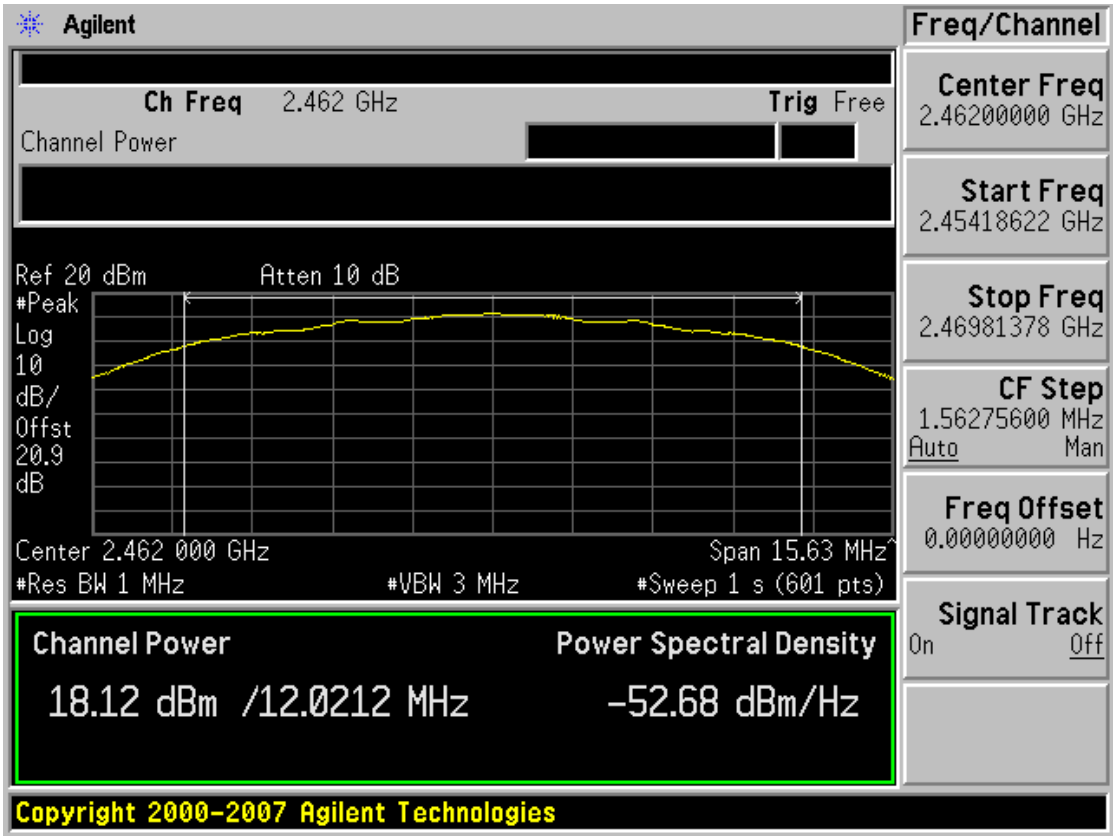
Conducted Output Power (802.11b-CH 11) 1Mbps



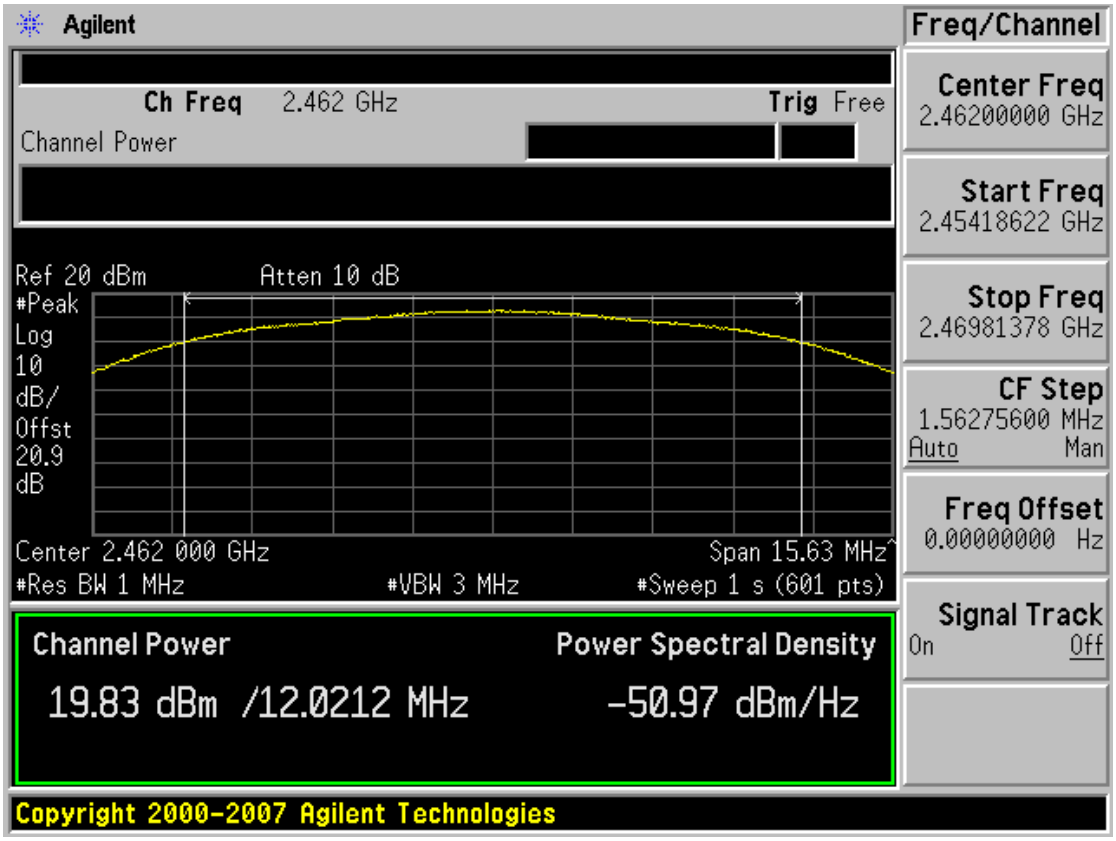
Conducted Output Power (802.11b-CH 11) 2Mbps



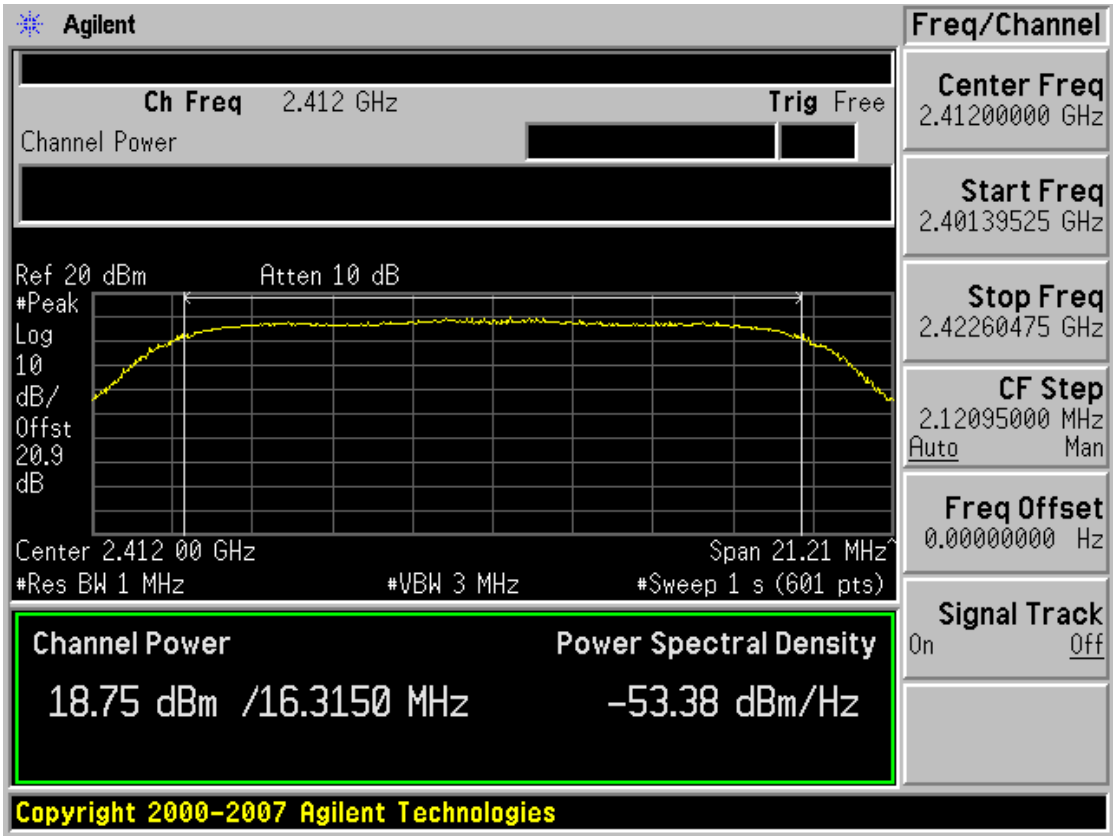
Conducted Output Power (802.11b-CH 11) 5.5Mbps



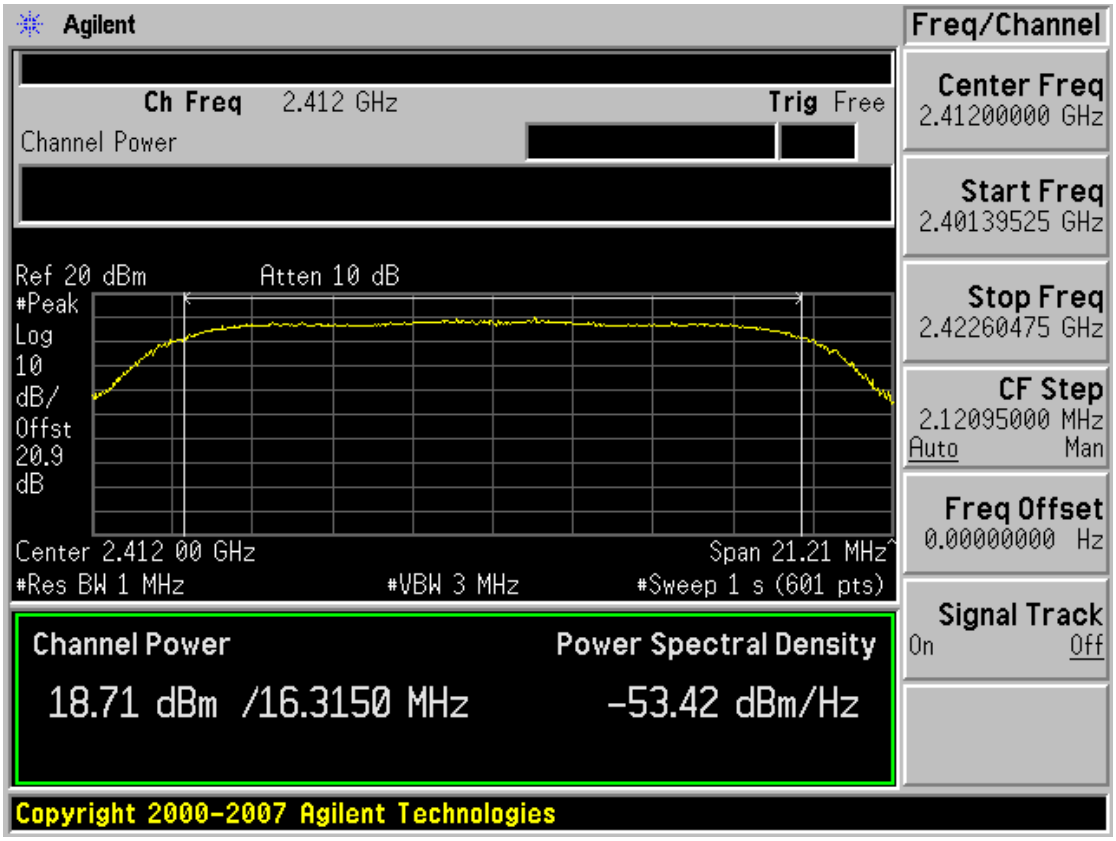
Conducted Output Power (802.11b-CH 11) 11Mbps



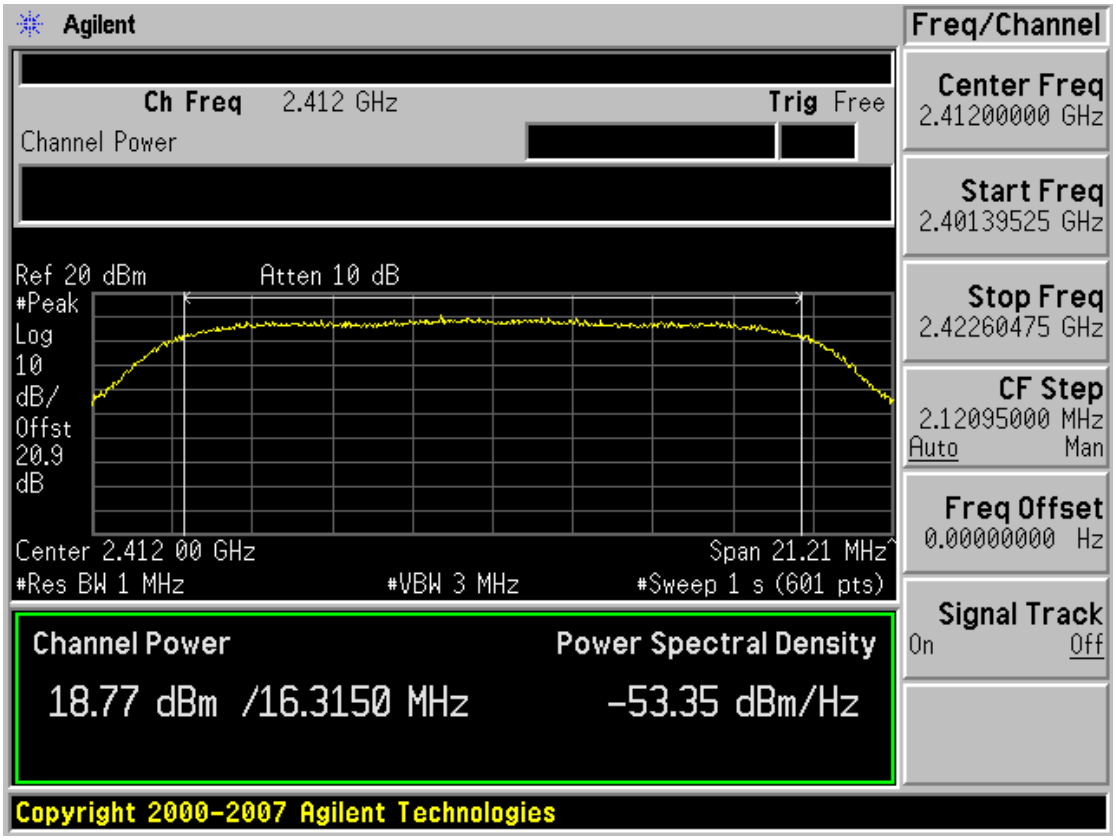
Conducted Output Power (802.11g-CH 1) 6Mbps



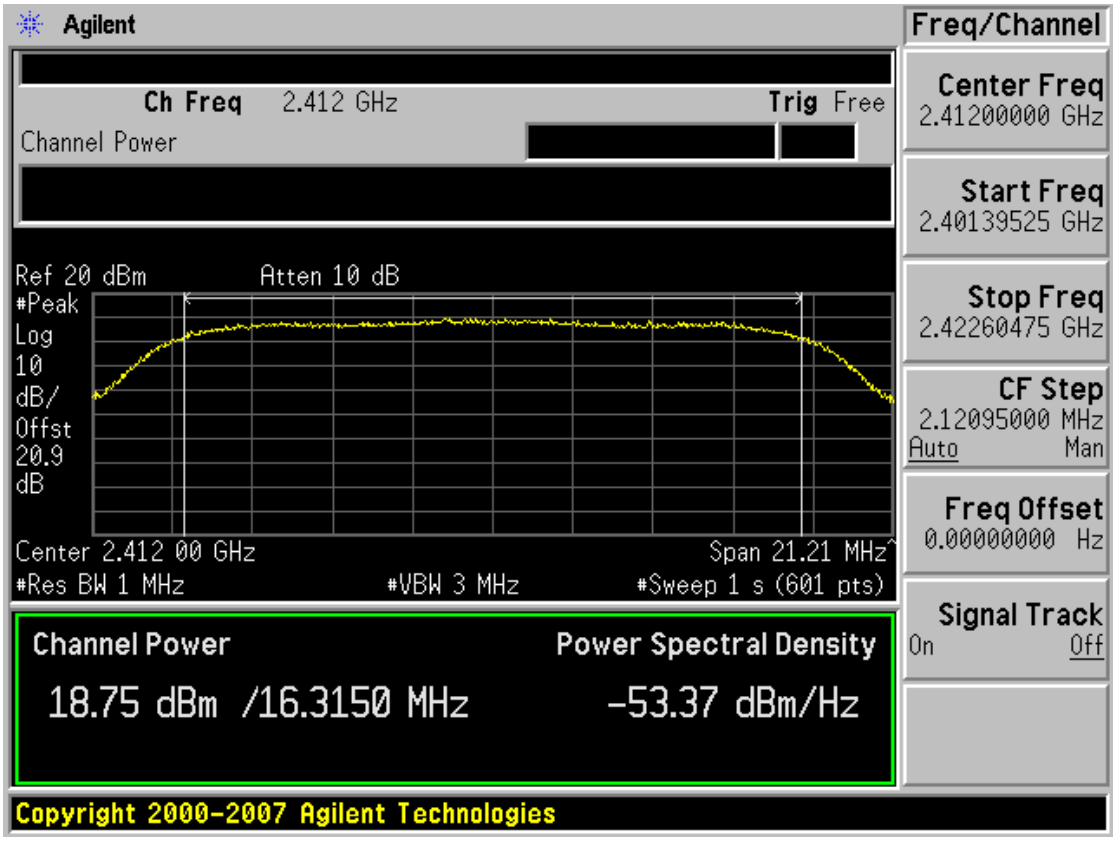
Conducted Output Power (802.11g-CH 1) 9Mbps



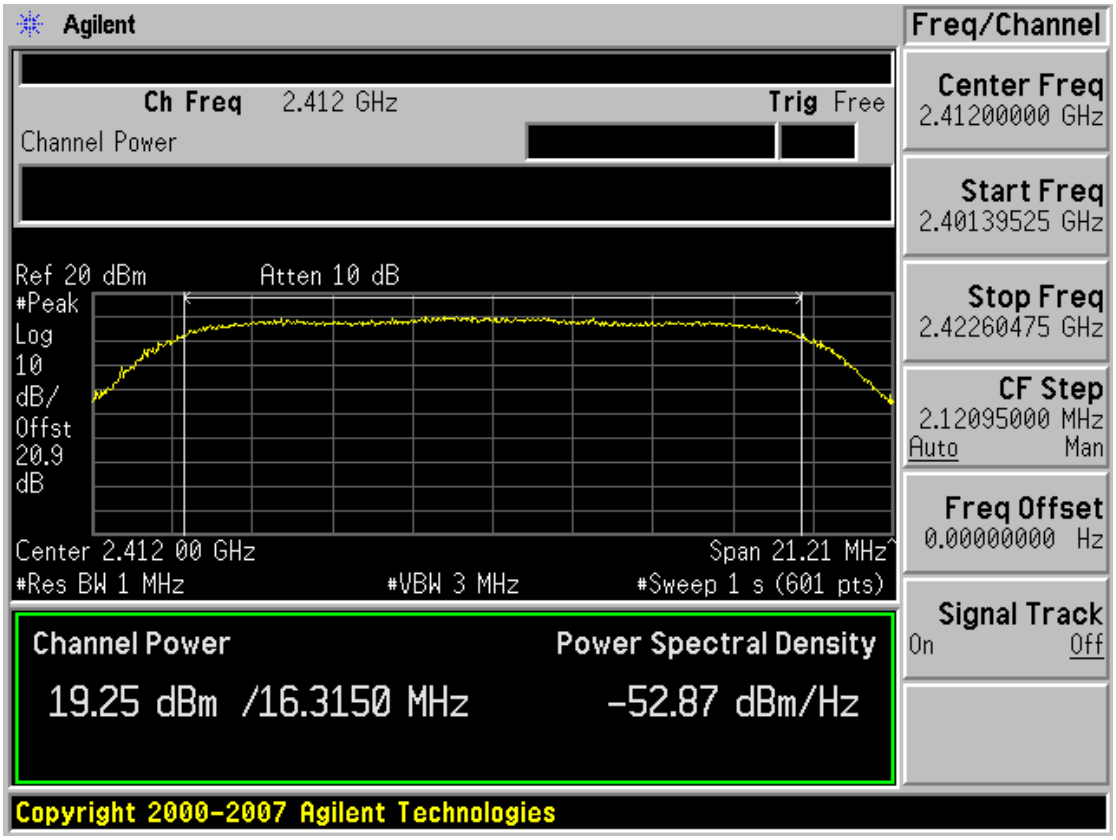
Conducted Output Power (802.11g-CH 1) 12Mbps



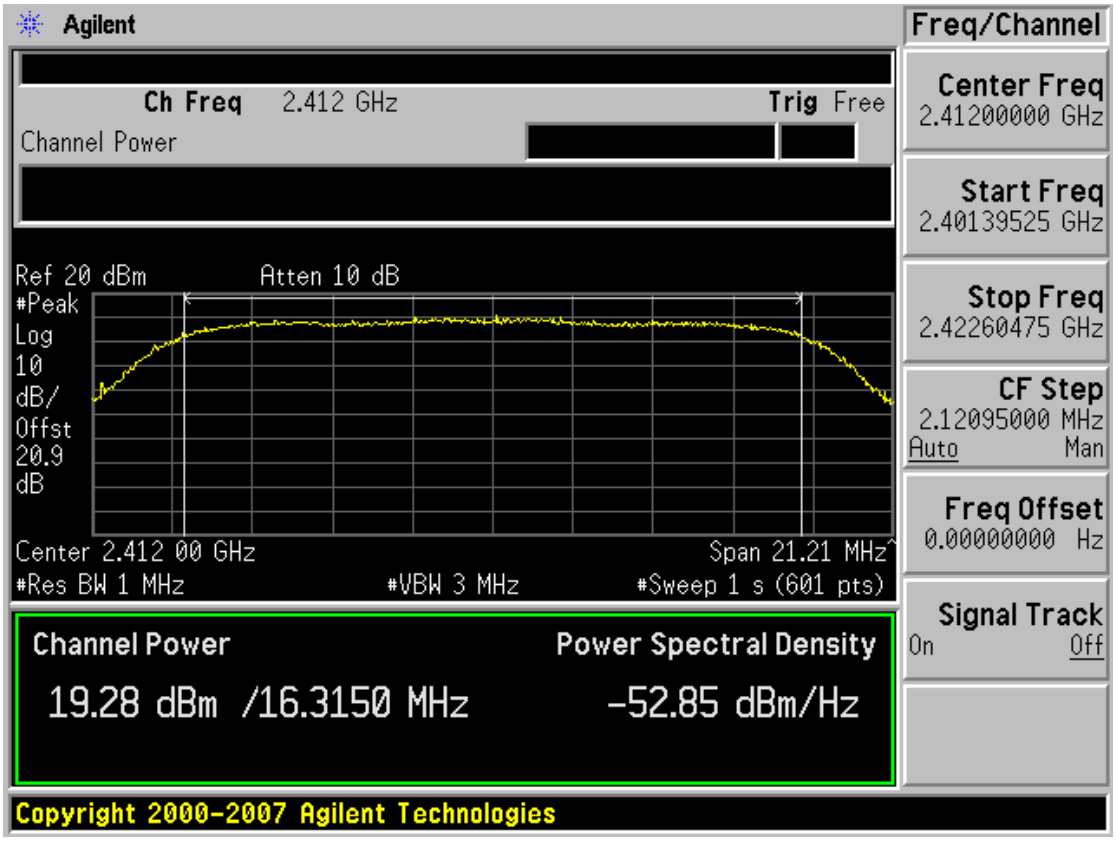
Conducted Output Power (802.11g-CH 1) 18Mbps



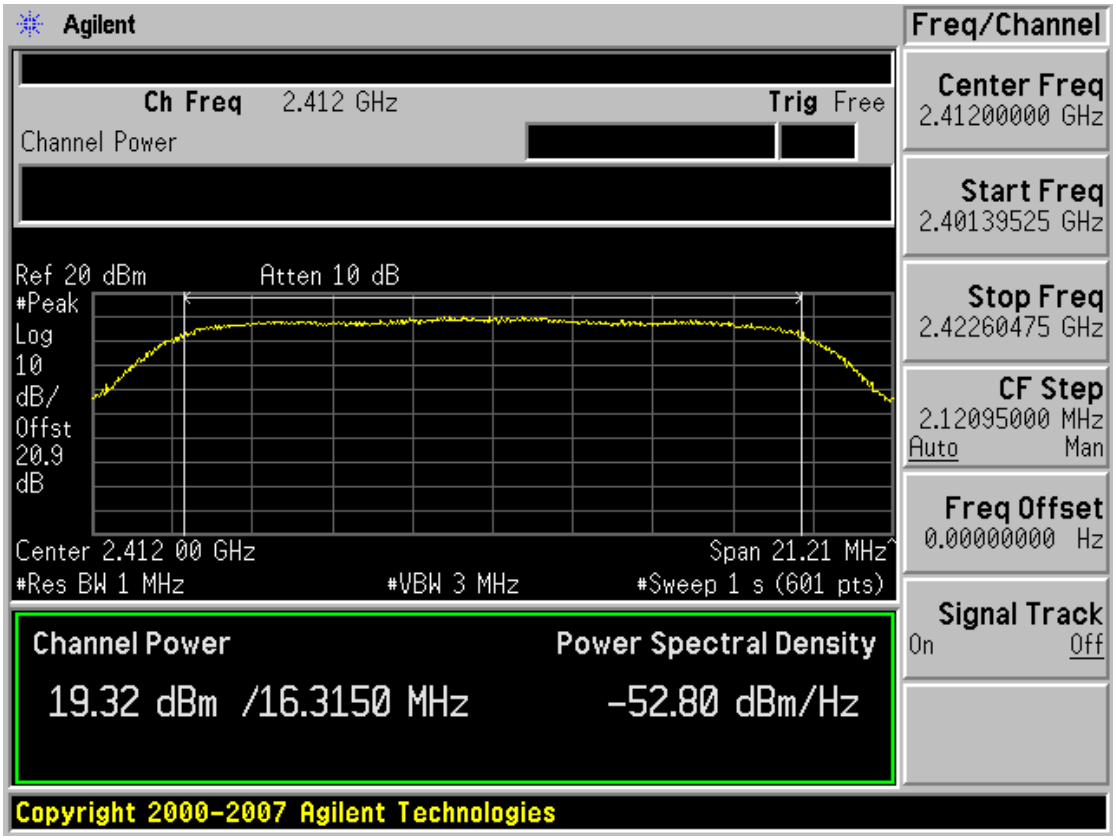
Conducted Output Power (802.11g-CH 1) 24Mbps



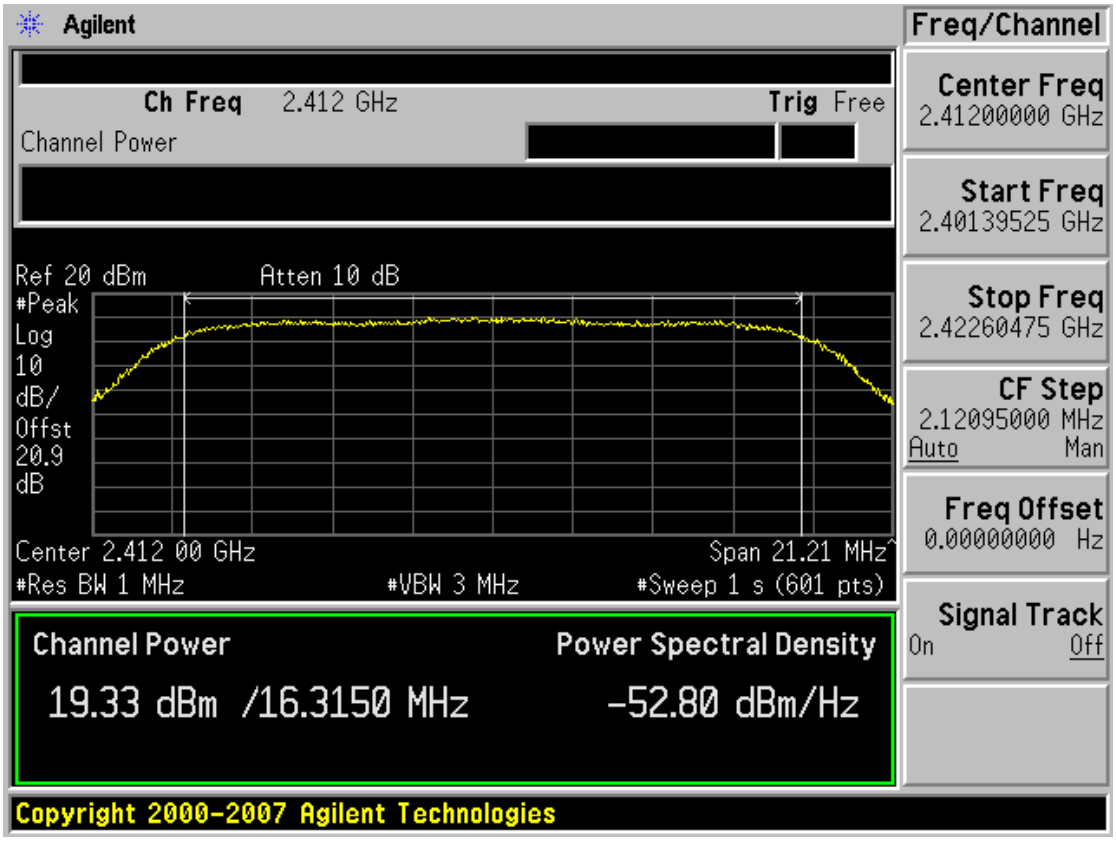
Conducted Output Power (802.11g-CH 1) 36Mbps



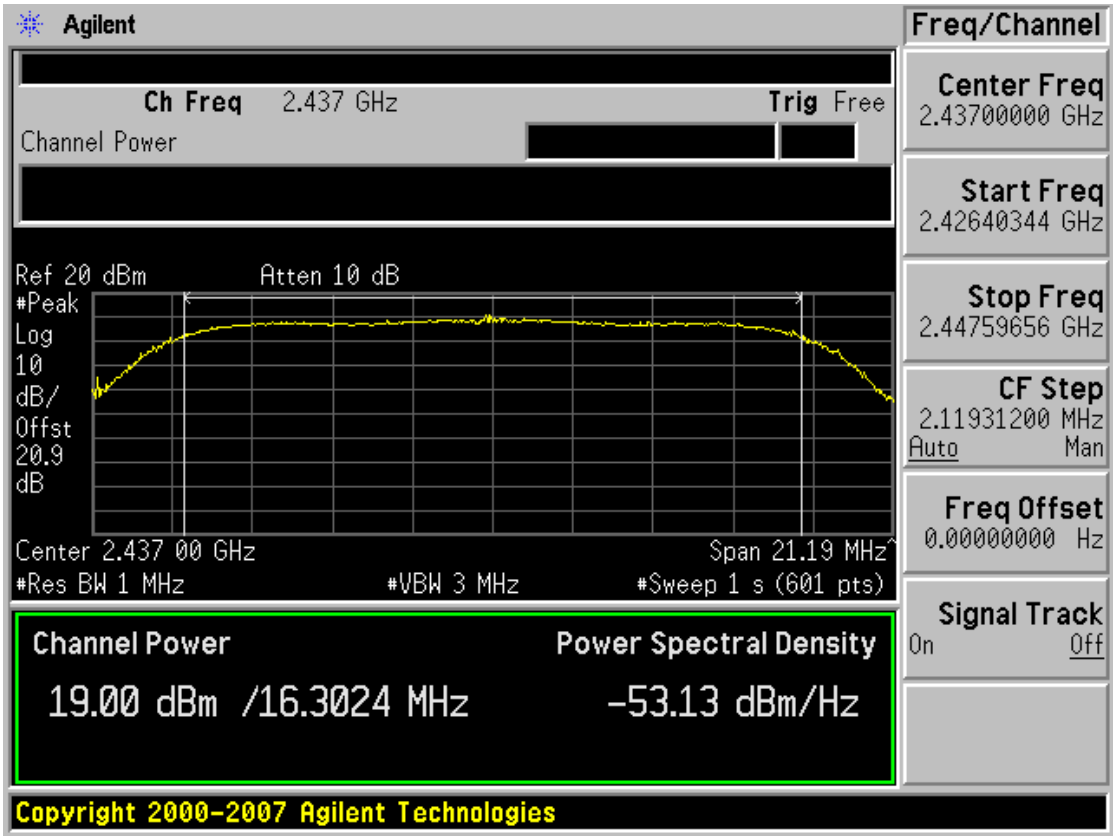
Conducted Output Power (802.11g-CH 1) 48Mbps



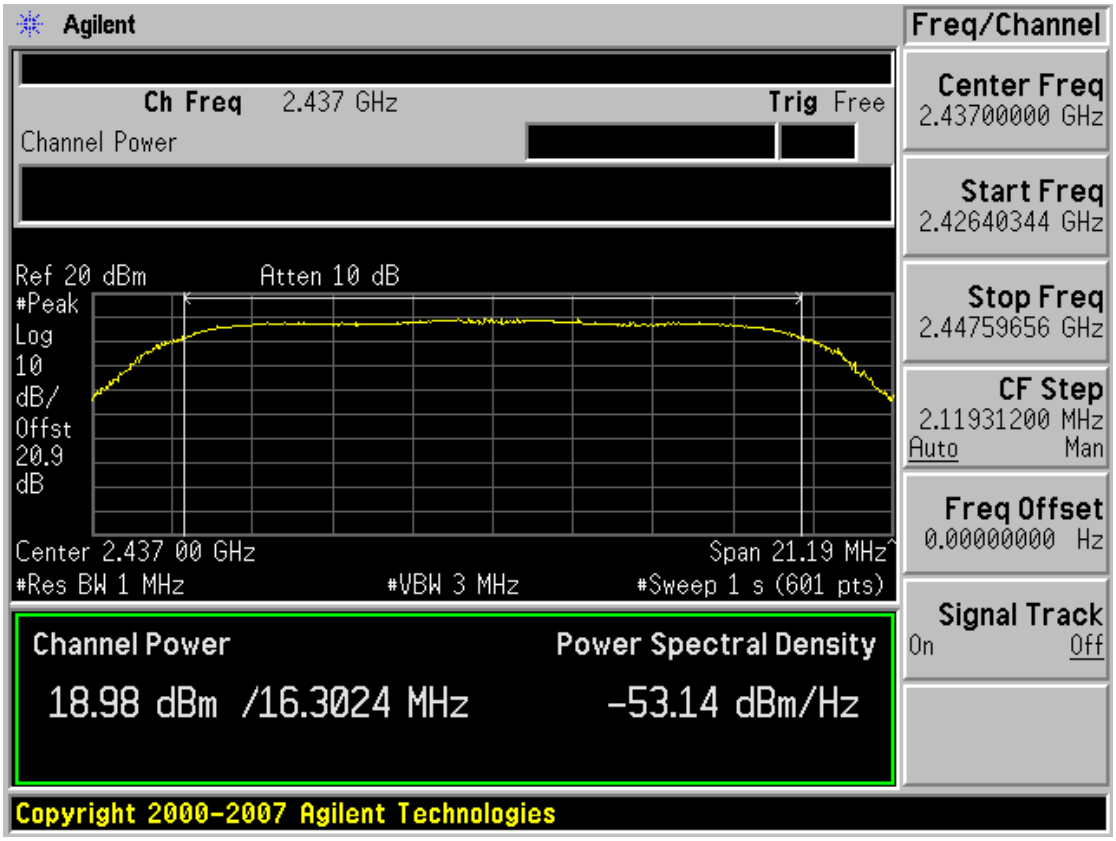
Conducted Output Power (802.11g-CH 1) 54Mbps



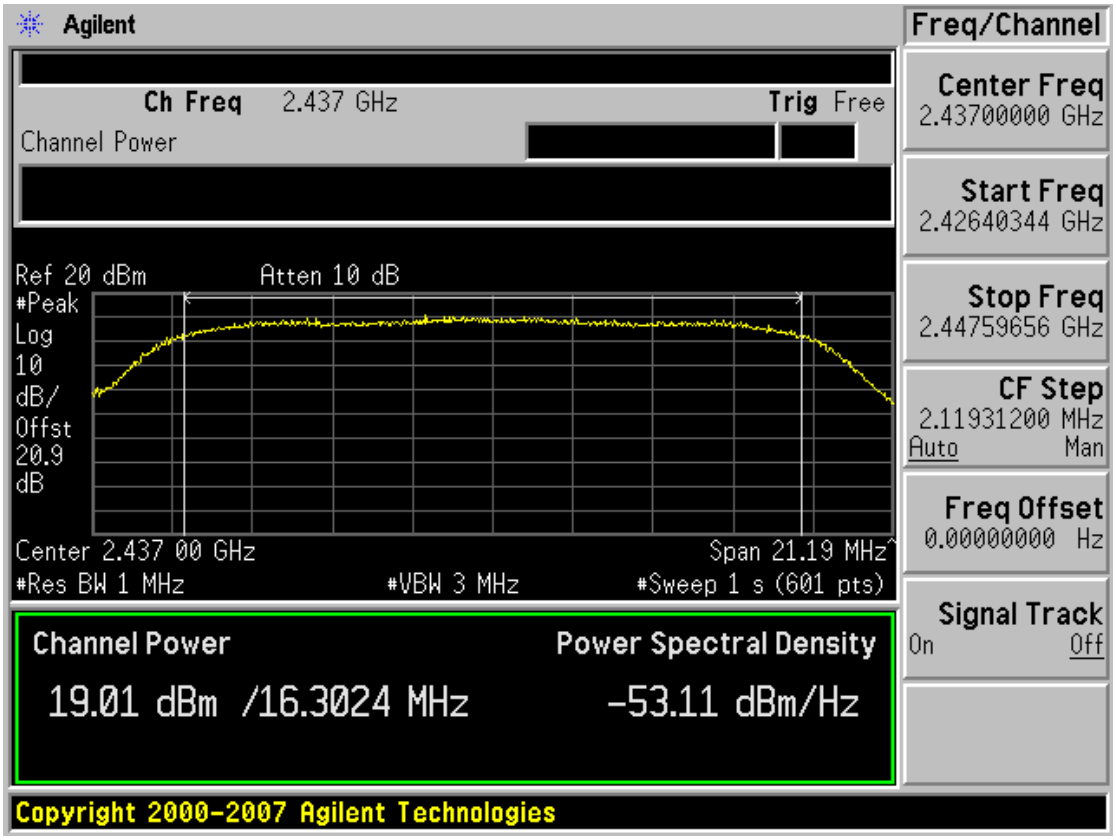
Conducted Output Power (802.11g-CH 6) 6Mbps



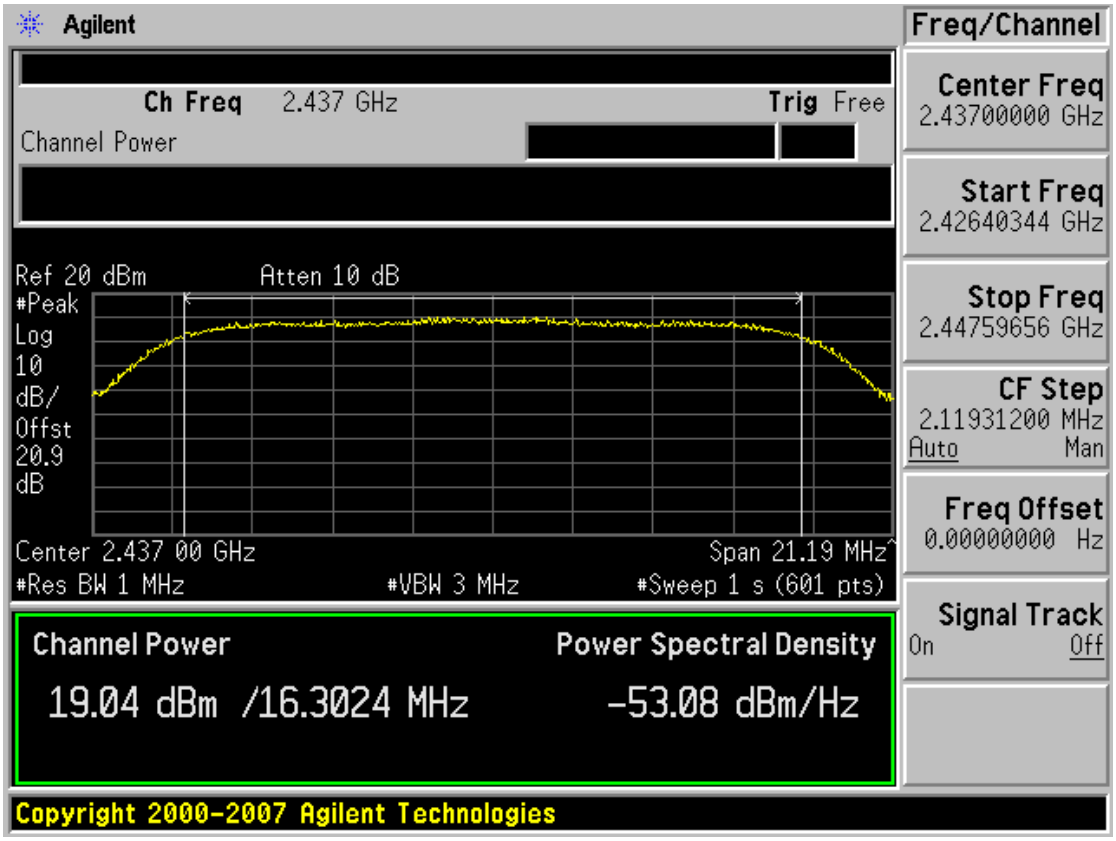
Conducted Output Power (802.11g-CH 6) 9Mbps



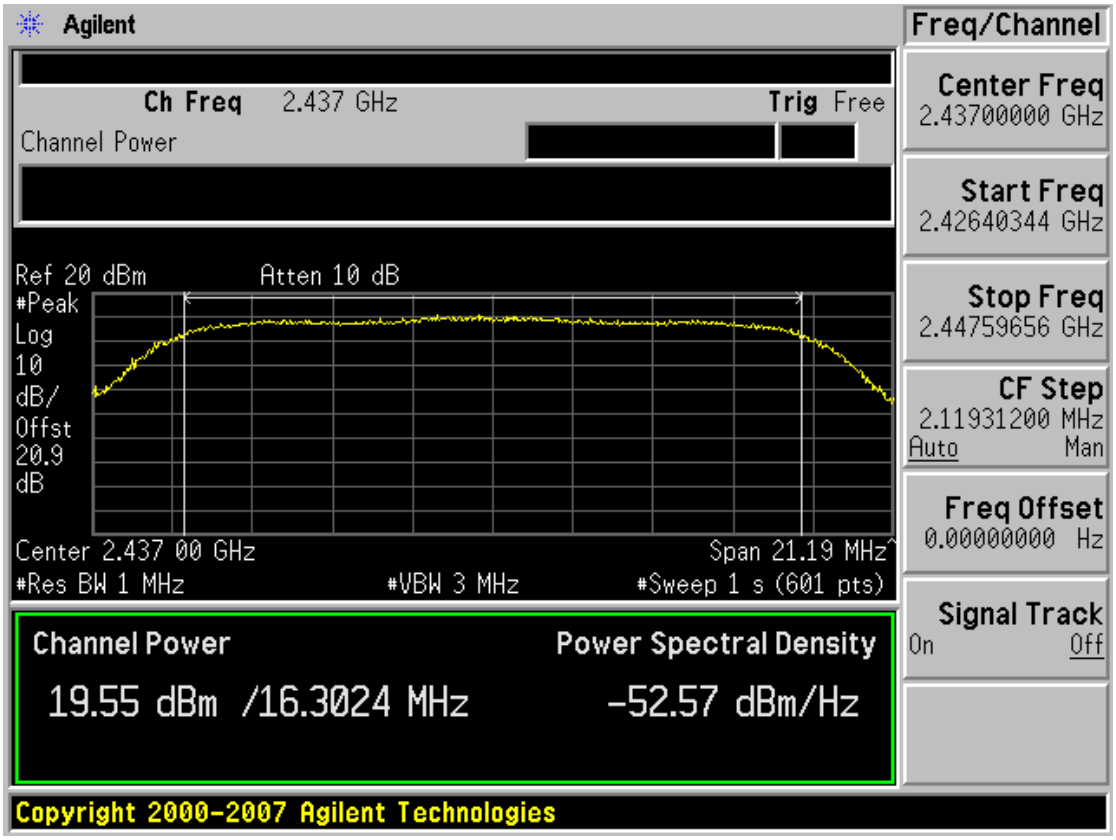
Conducted Output Power (802.11g-CH 6) 12Mbps



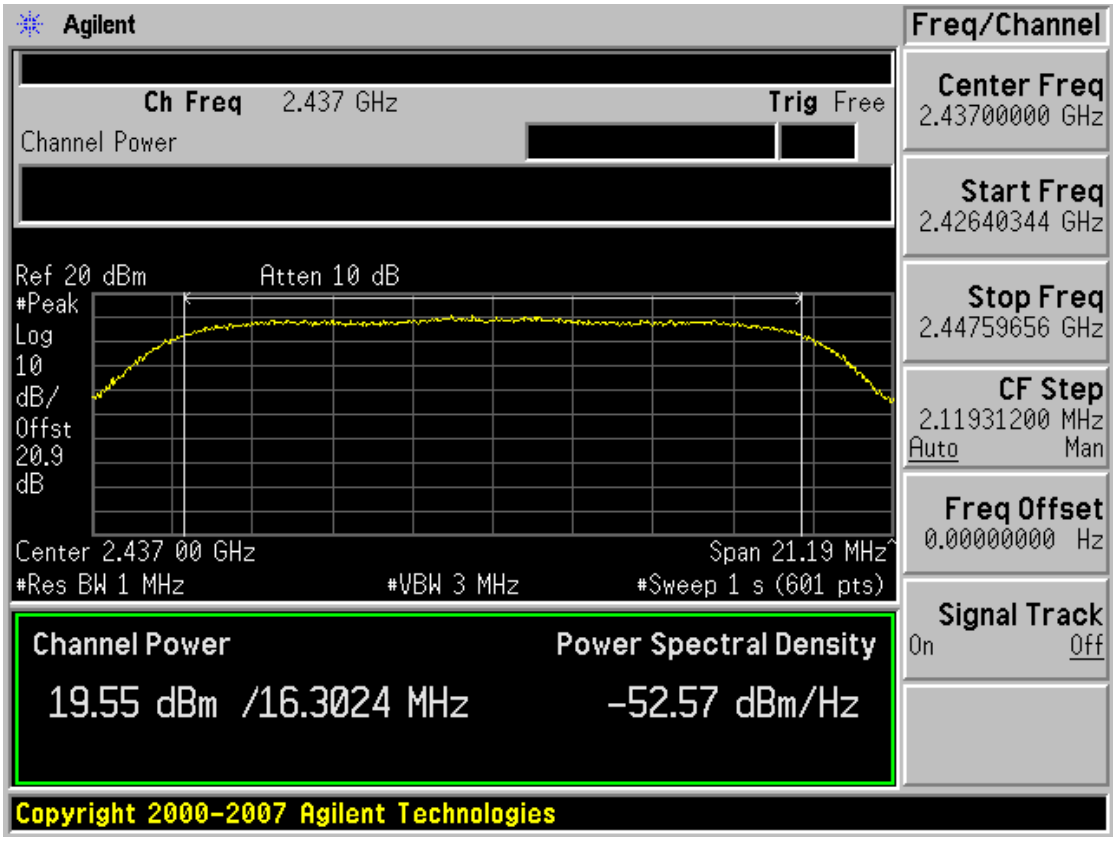
Conducted Output Power (802.11g-CH 6) 18Mbps



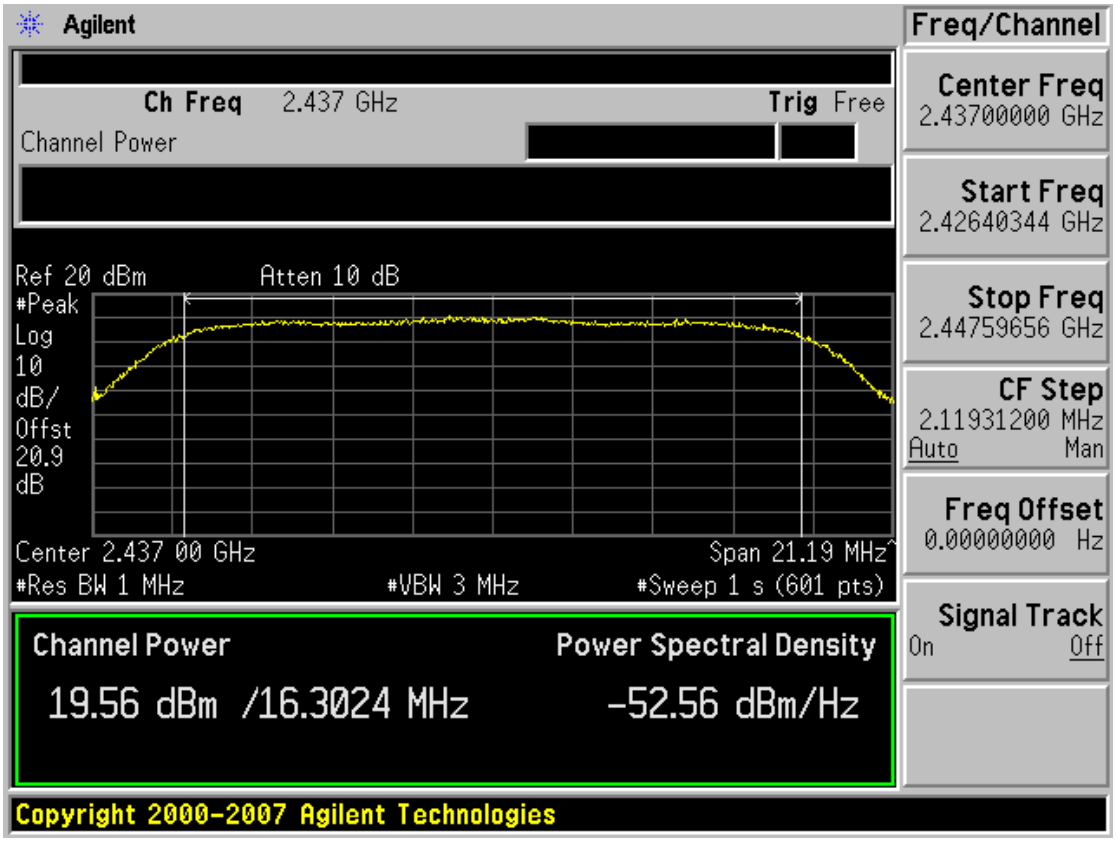
Conducted Output Power (802.11g-CH 6) 24Mbps



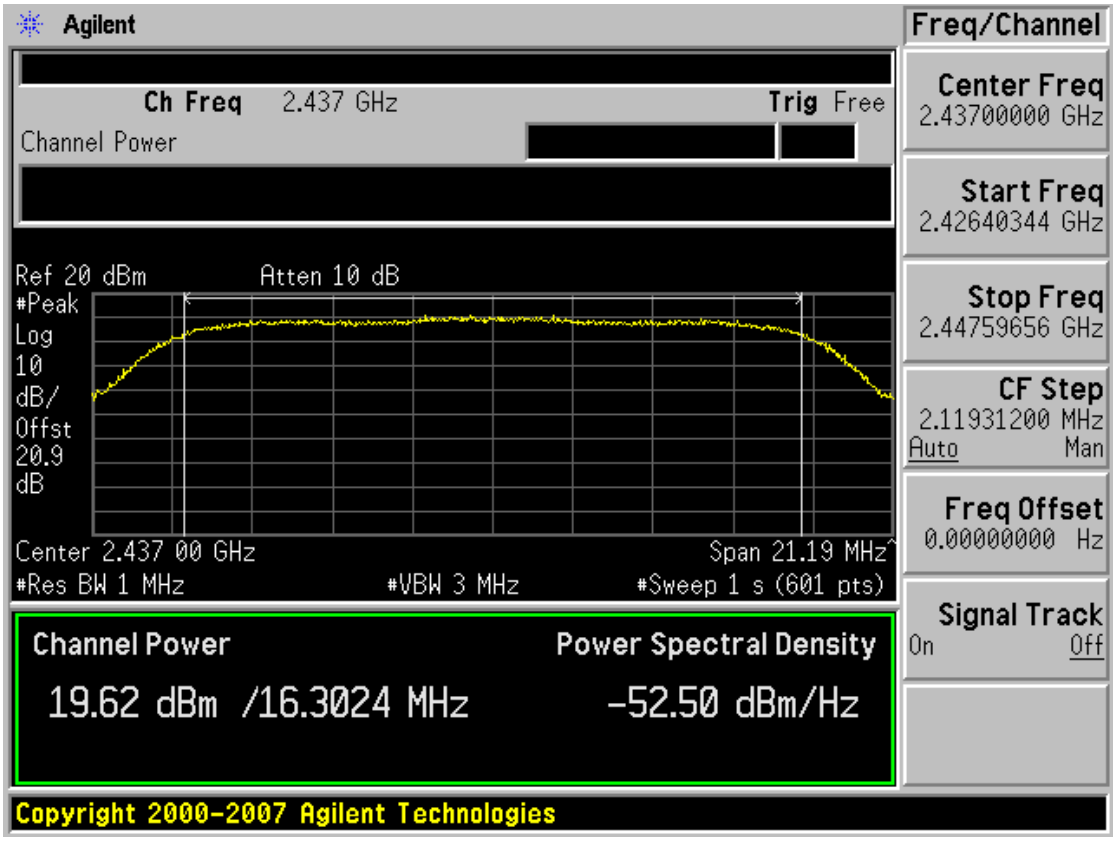
Conducted Output Power (802.11g-CH 6) 36Mbps



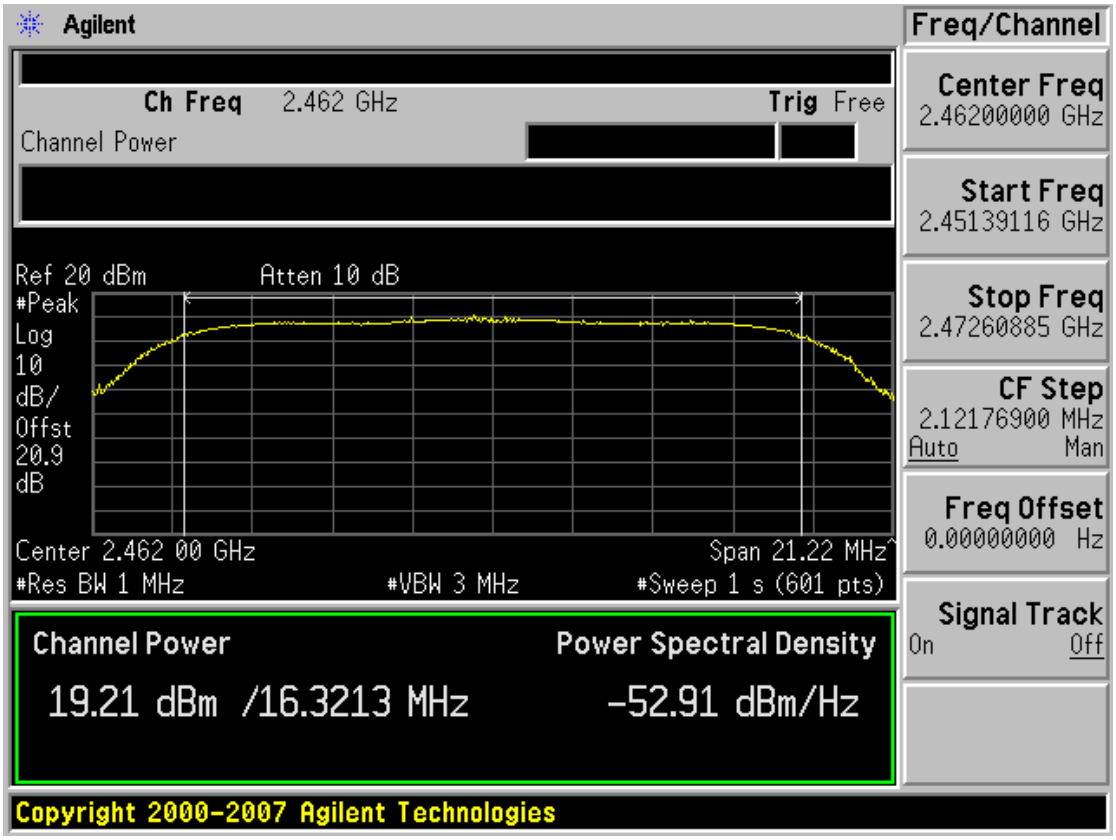
Conducted Output Power (802.11g-CH 6) 48Mbps



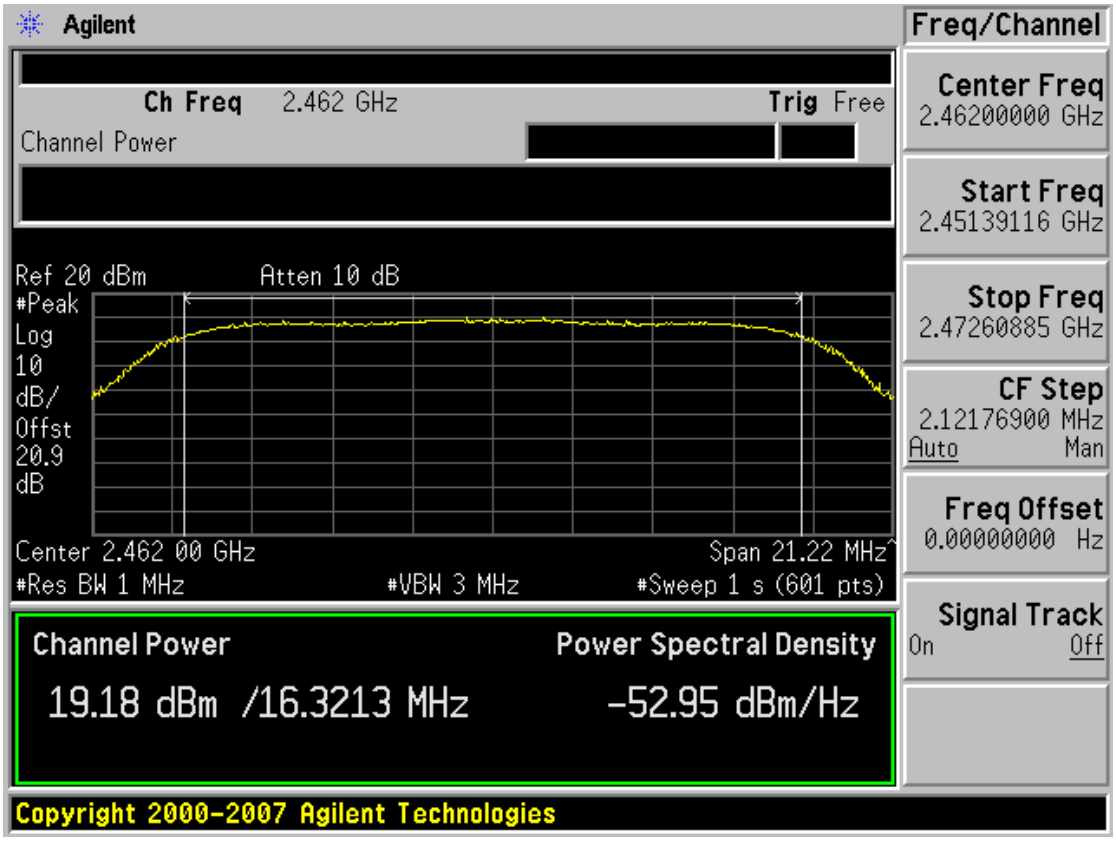
Conducted Output Power (802.11g-CH 6) 54Mbps



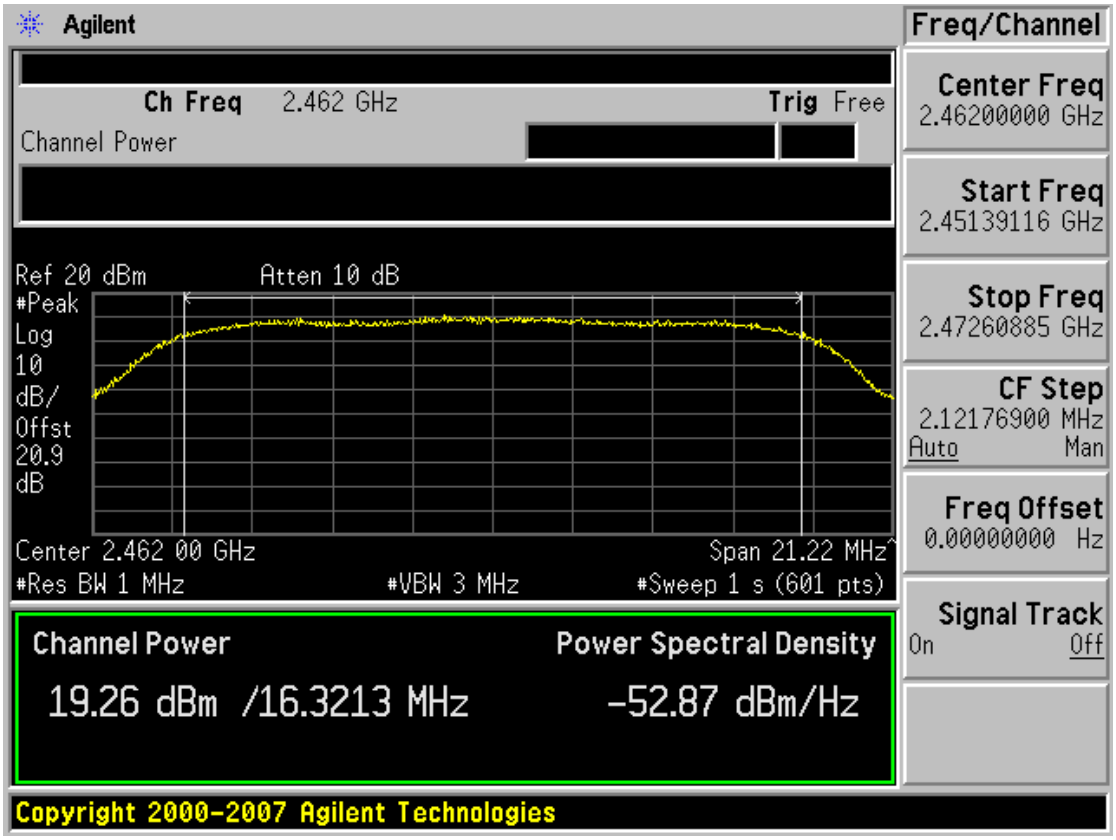
Conducted Output Power (802.11g-CH 11) 6Mbps



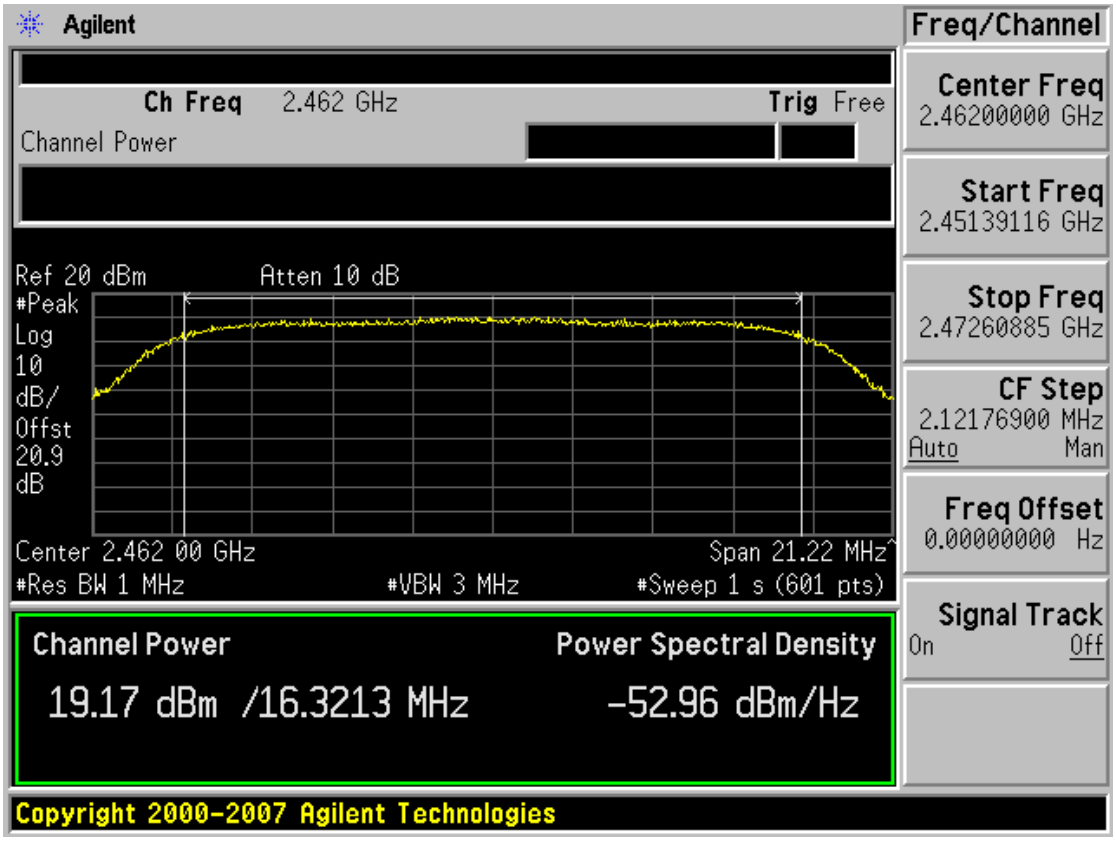
Conducted Output Power (802.11g-CH 11) 9Mbps



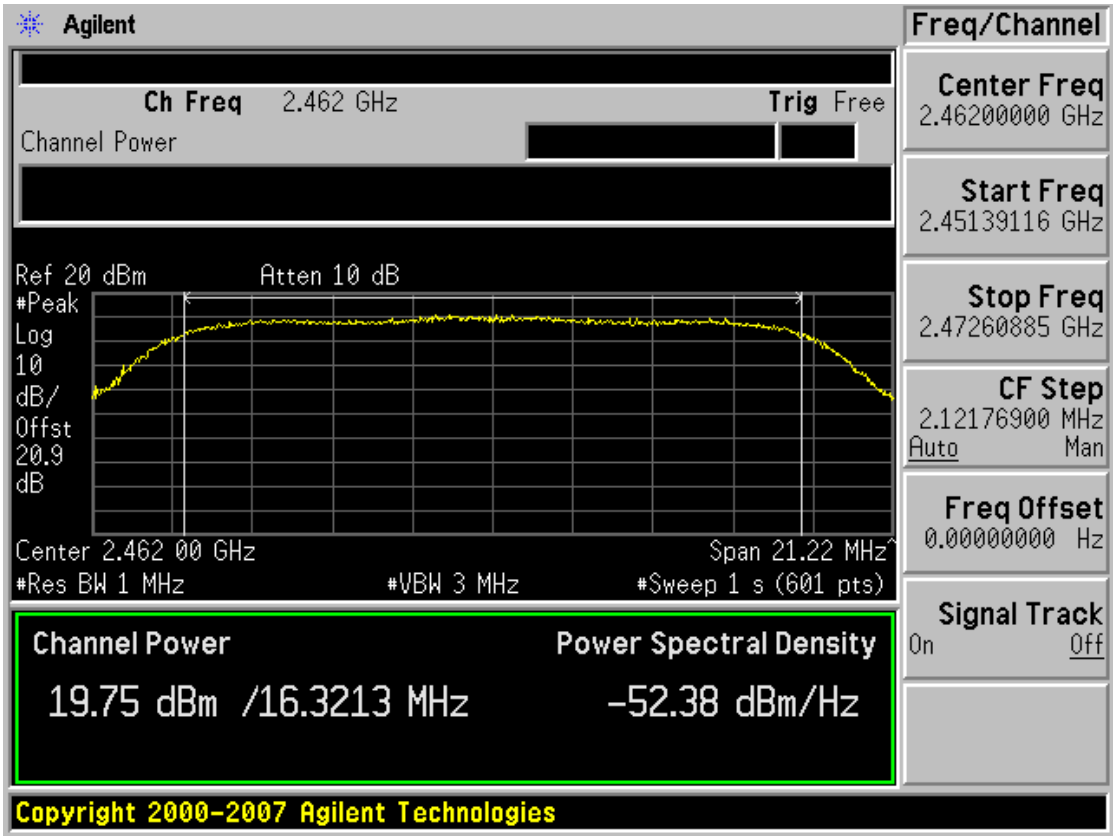
Conducted Output Power (802.11g-CH 11) 12Mbps



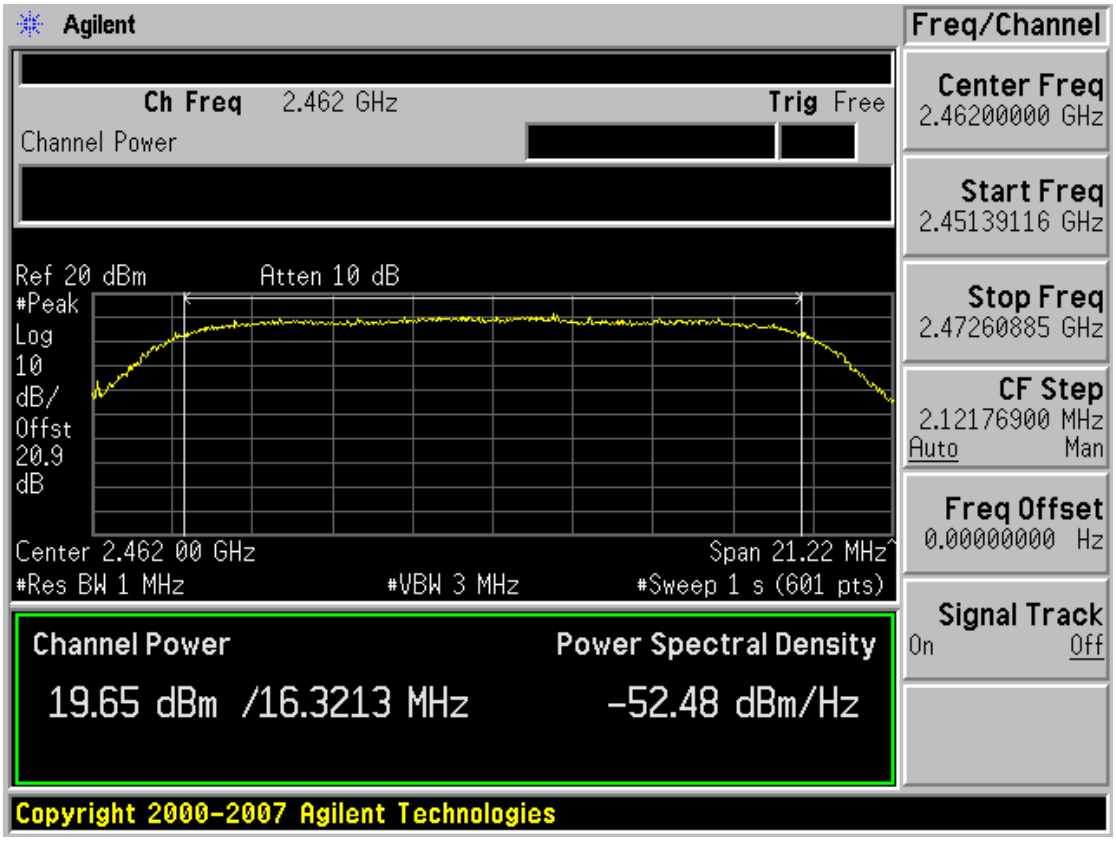
Conducted Output Power (802.11g-CH 11) 18Mbps



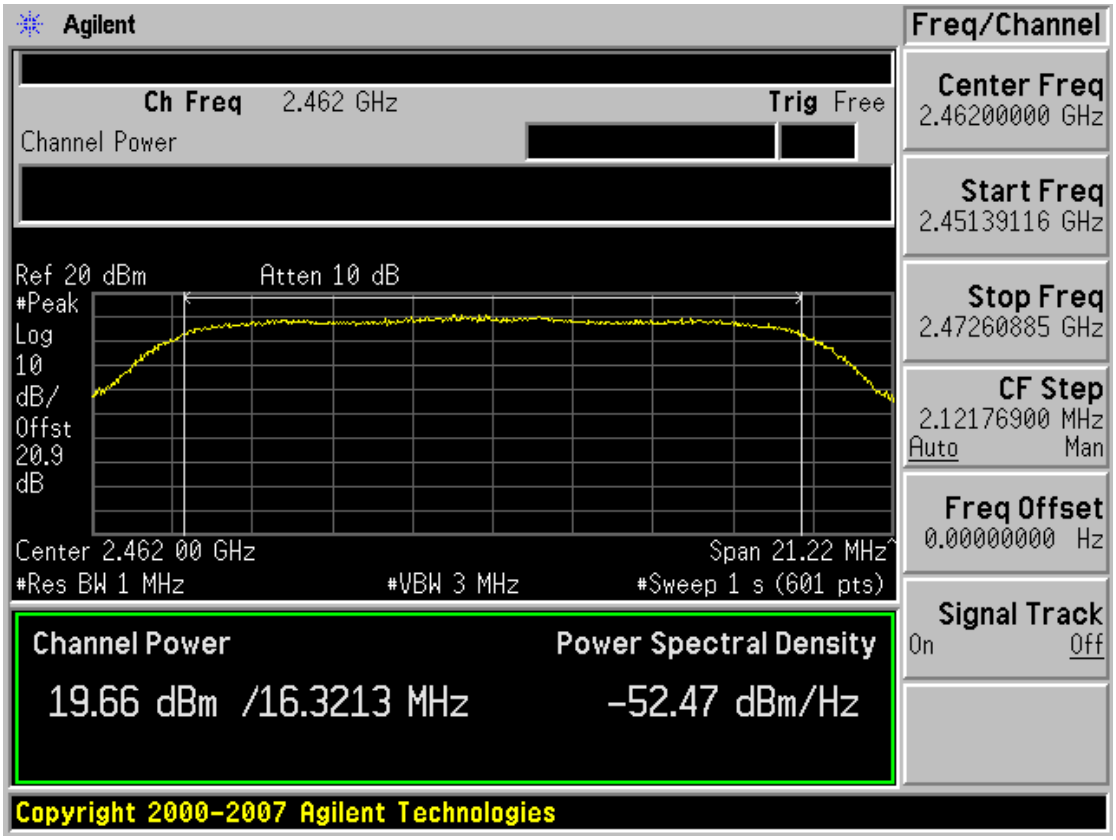
Conducted Output Power (802.11g-CH 11) 24Mbps



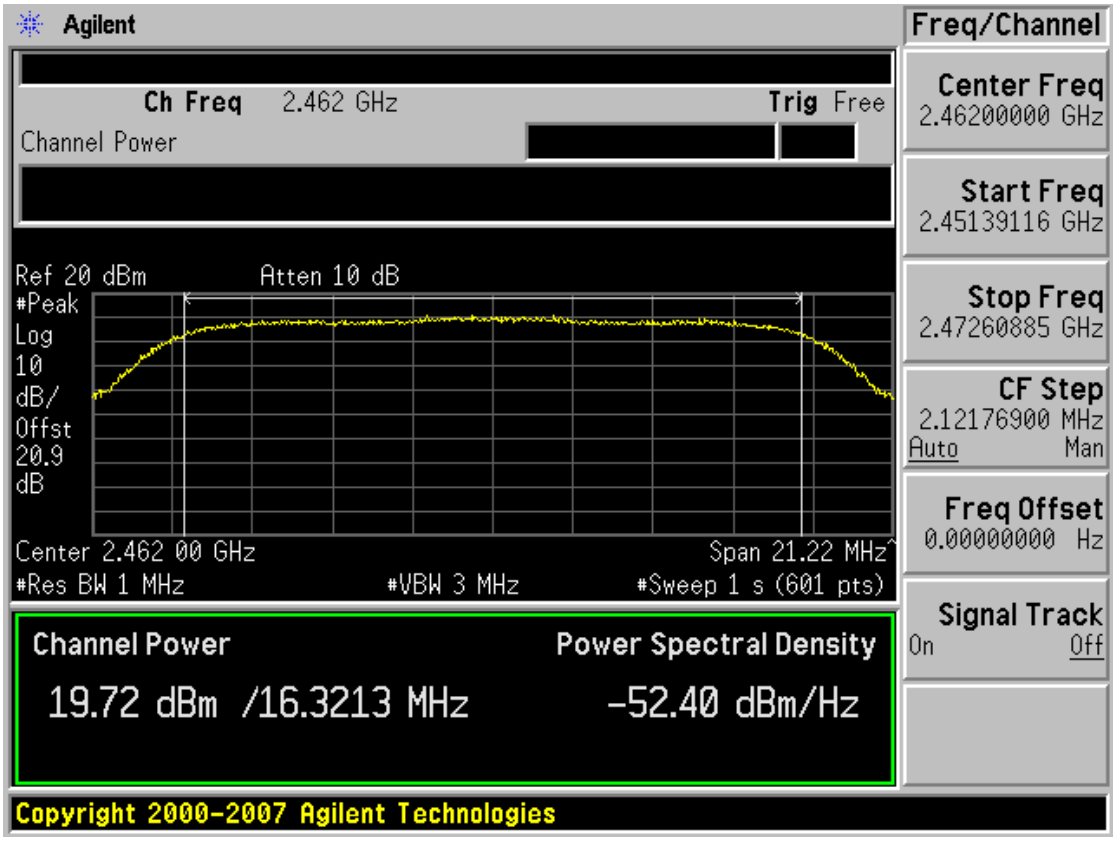
Conducted Output Power (802.11g-CH 11) 36Mbps



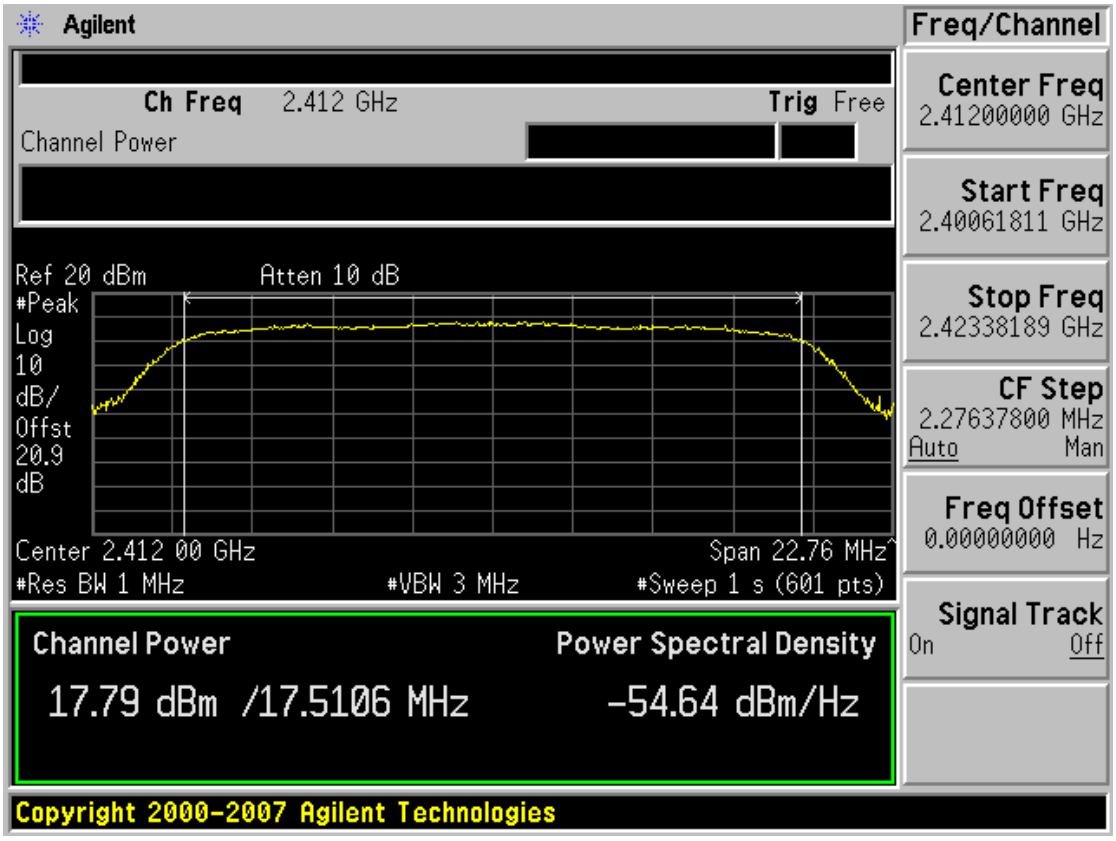
Conducted Output Power (802.11g-CH 11) 48Mbps



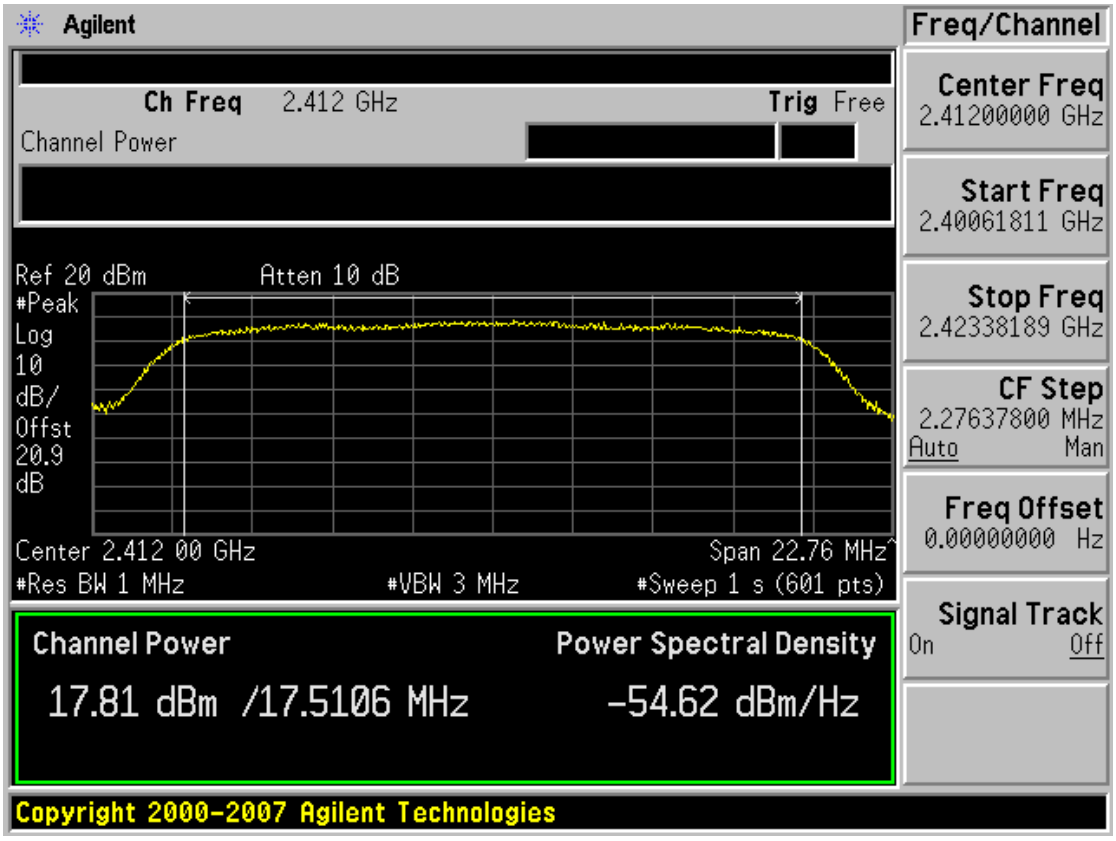
Conducted Output Power (802.11g-CH 11) 54Mbps



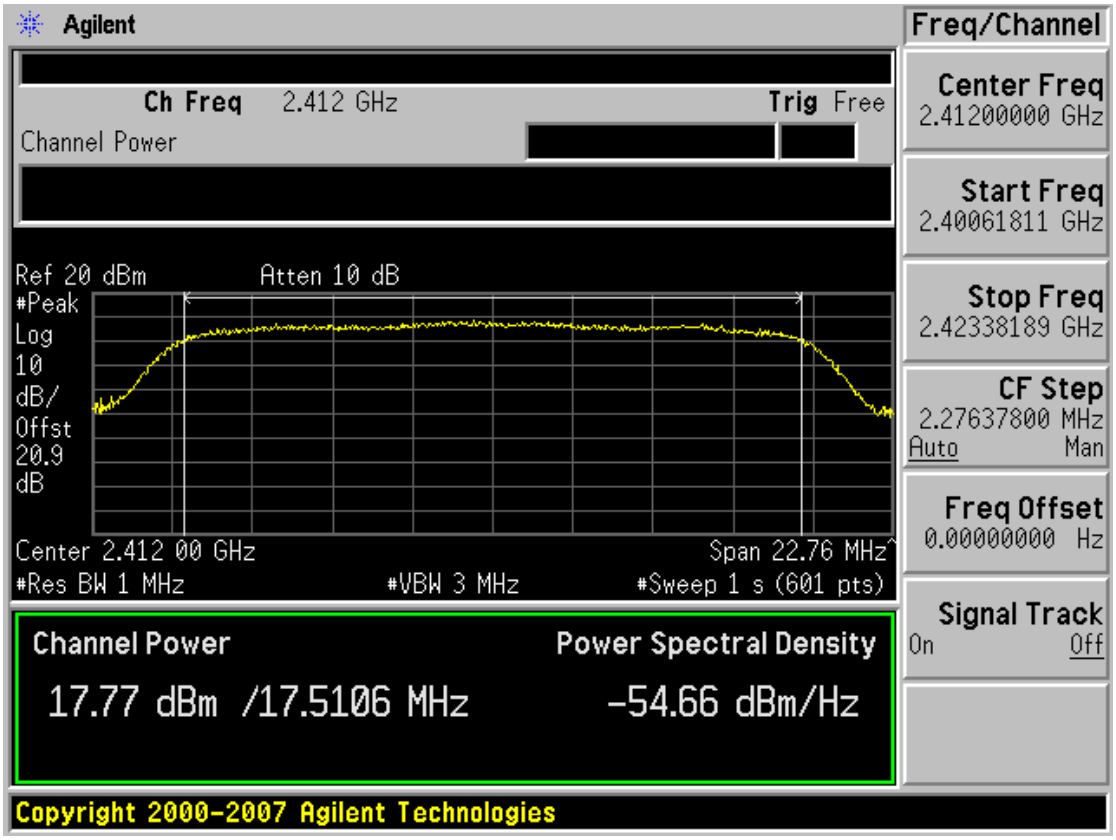
Conducted Output Power (802.11n-CH 1) 6.5Mbps



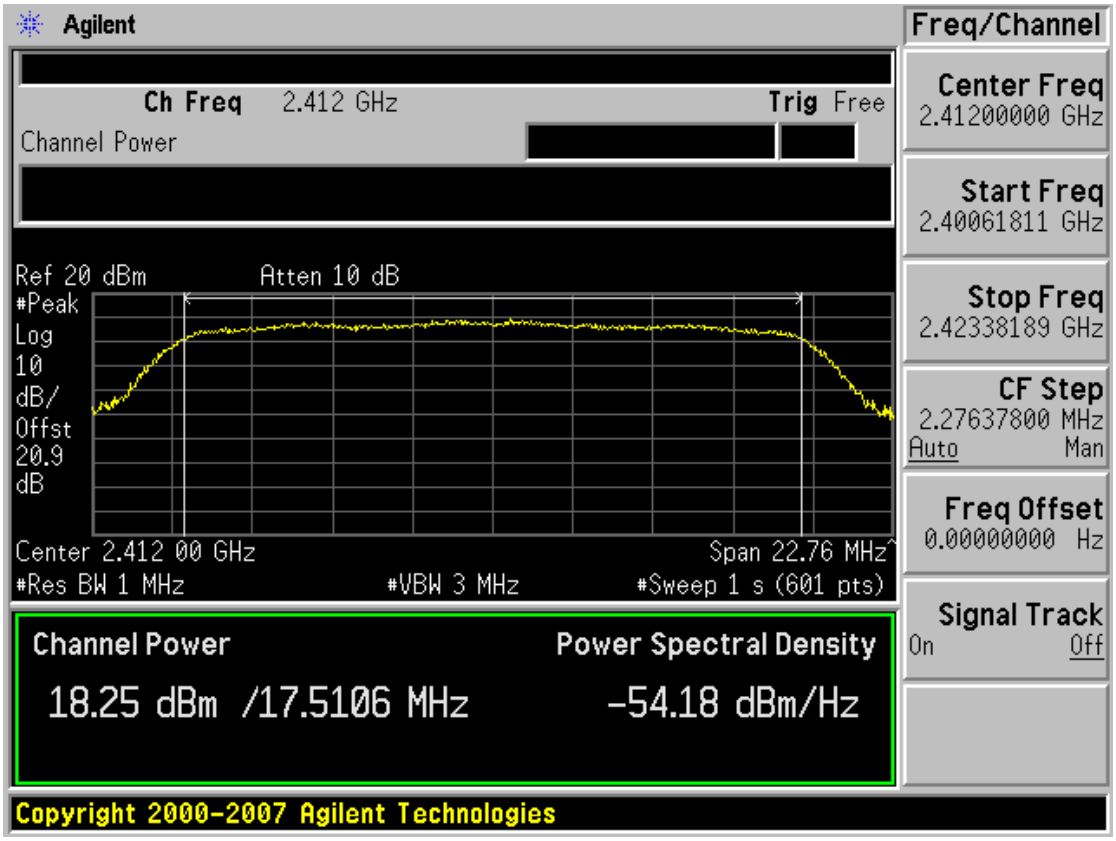
Conducted Output Power (802.11n-CH 1) 13Mbps



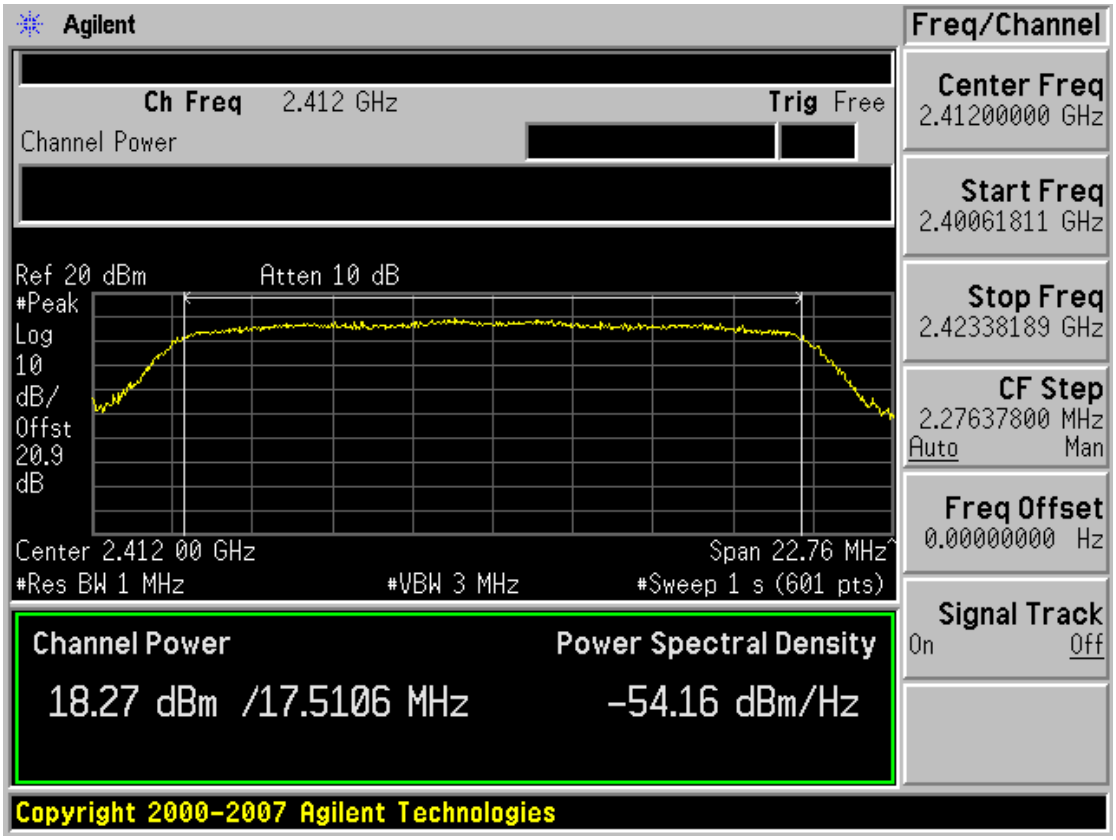
Conducted Output Power (802.11n-CH 1) 19.5Mbps



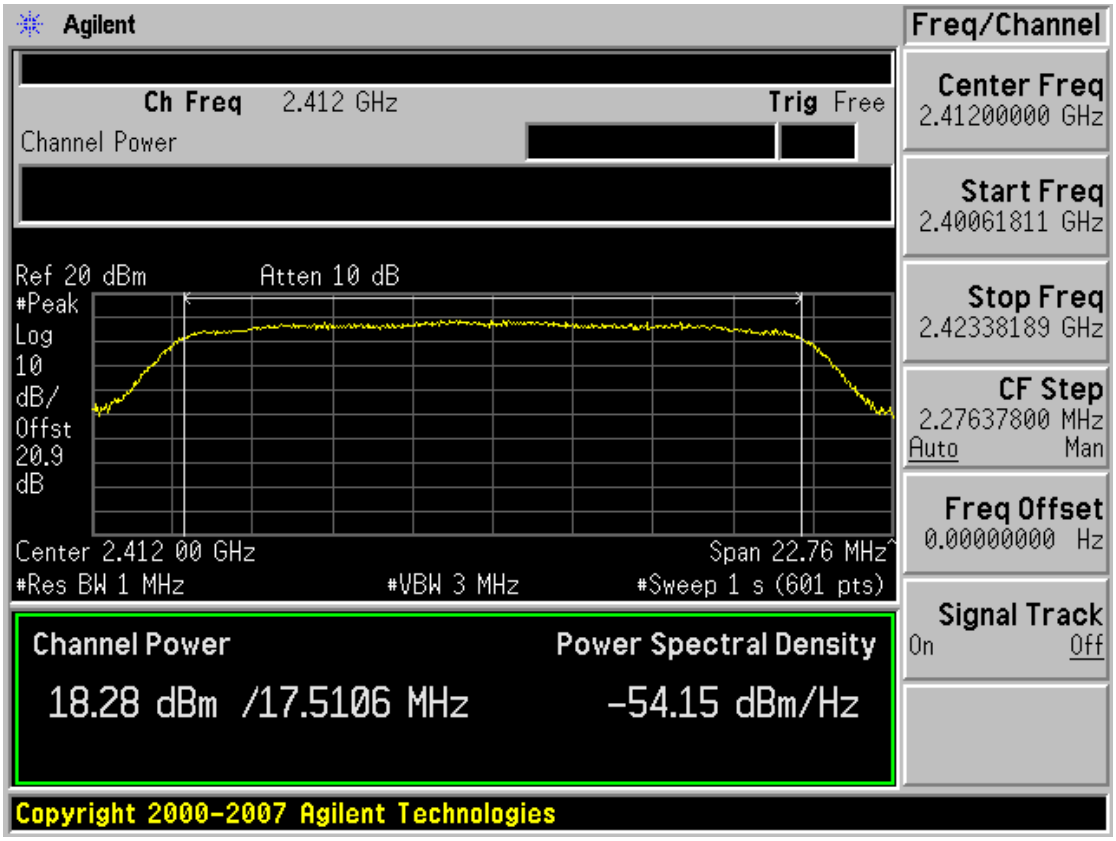
Conducted Output Power (802.11n-CH 1) 26Mbps



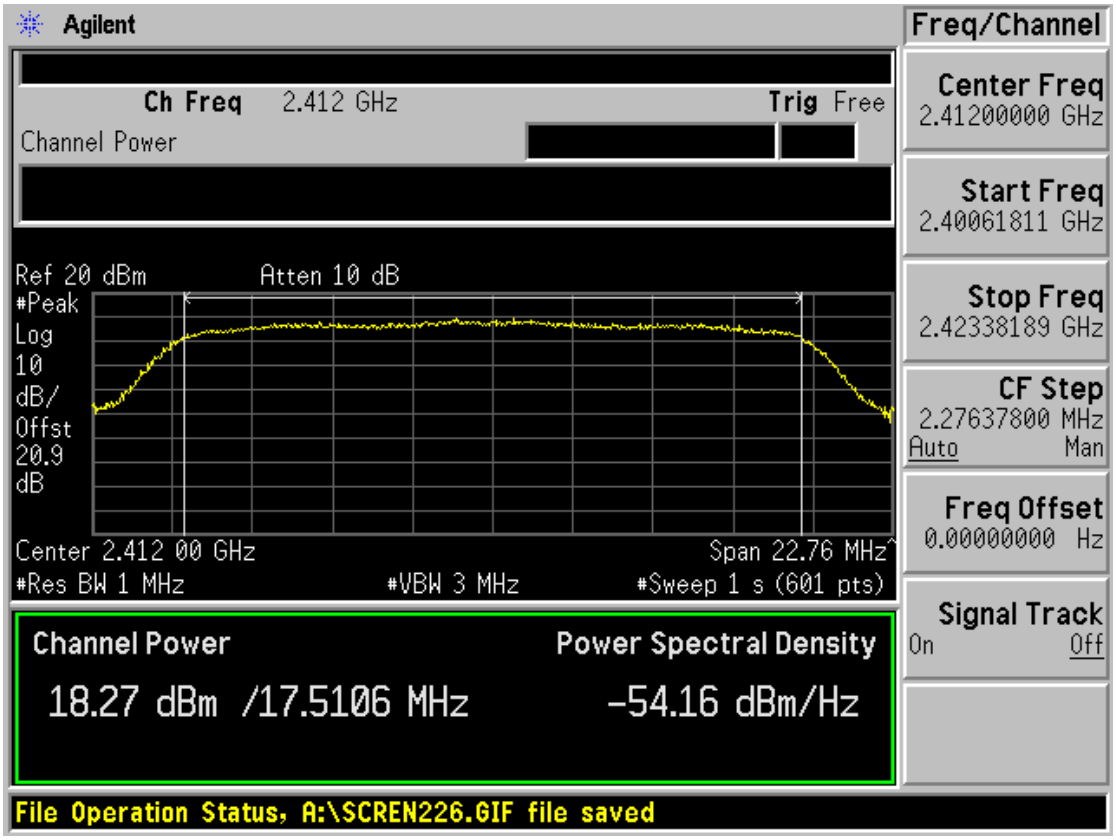
Conducted Output Power (802.11n-CH 1) 39Mbps



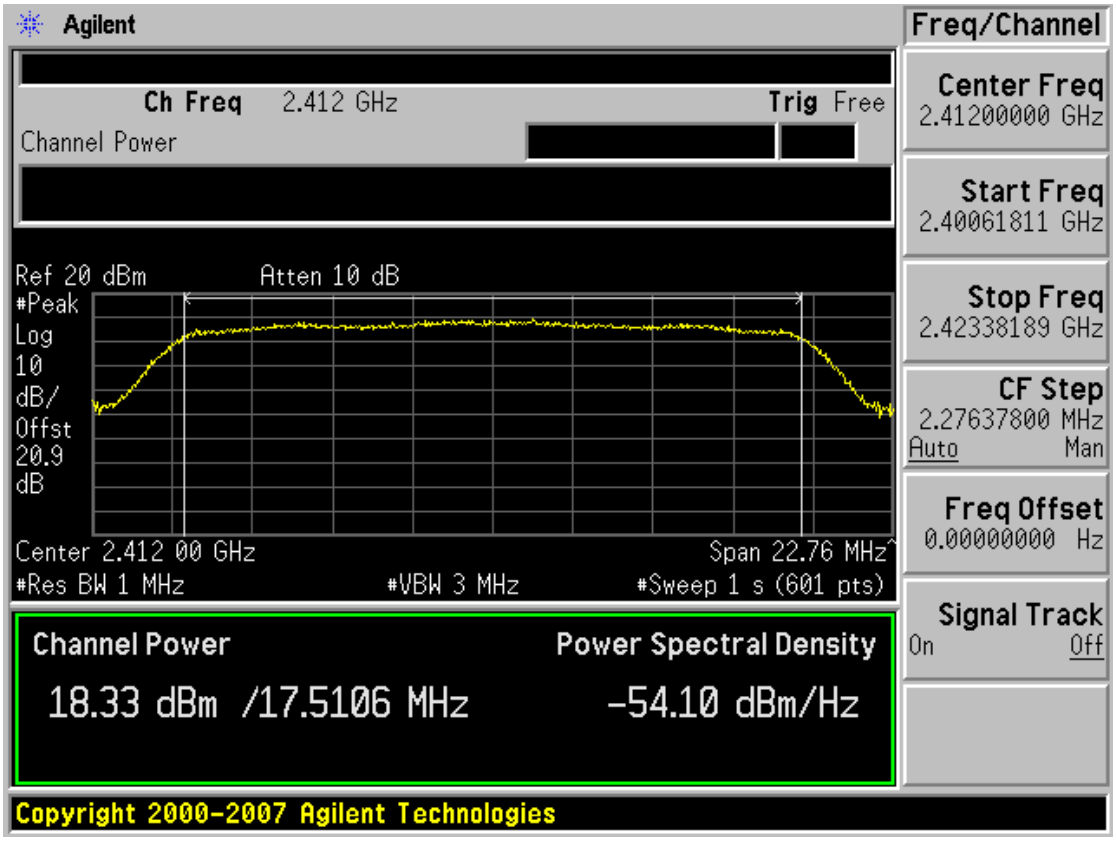
Conducted Output Power (802.11n-CH 1) 52Mbps



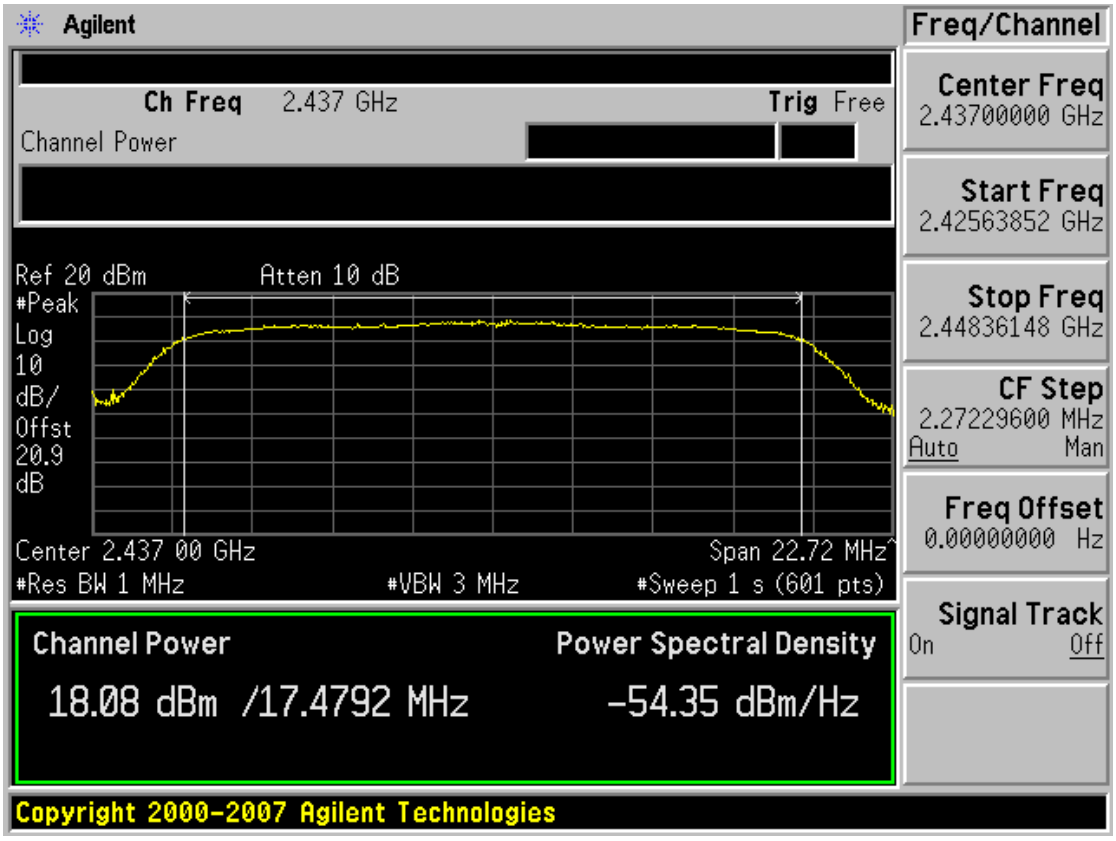
Conducted Output Power (802.11n-CH 1) 58.5Mbps



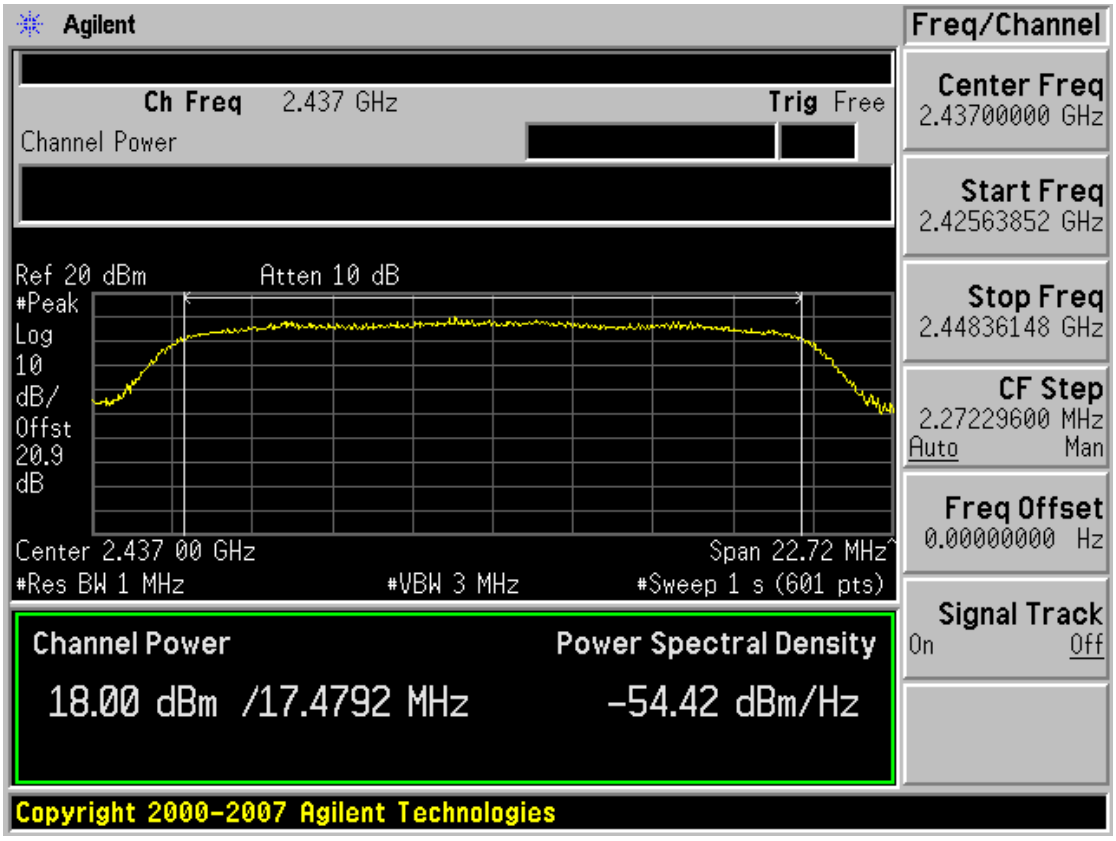
Conducted Output Power (802.11n-CH 1) 65Mbps



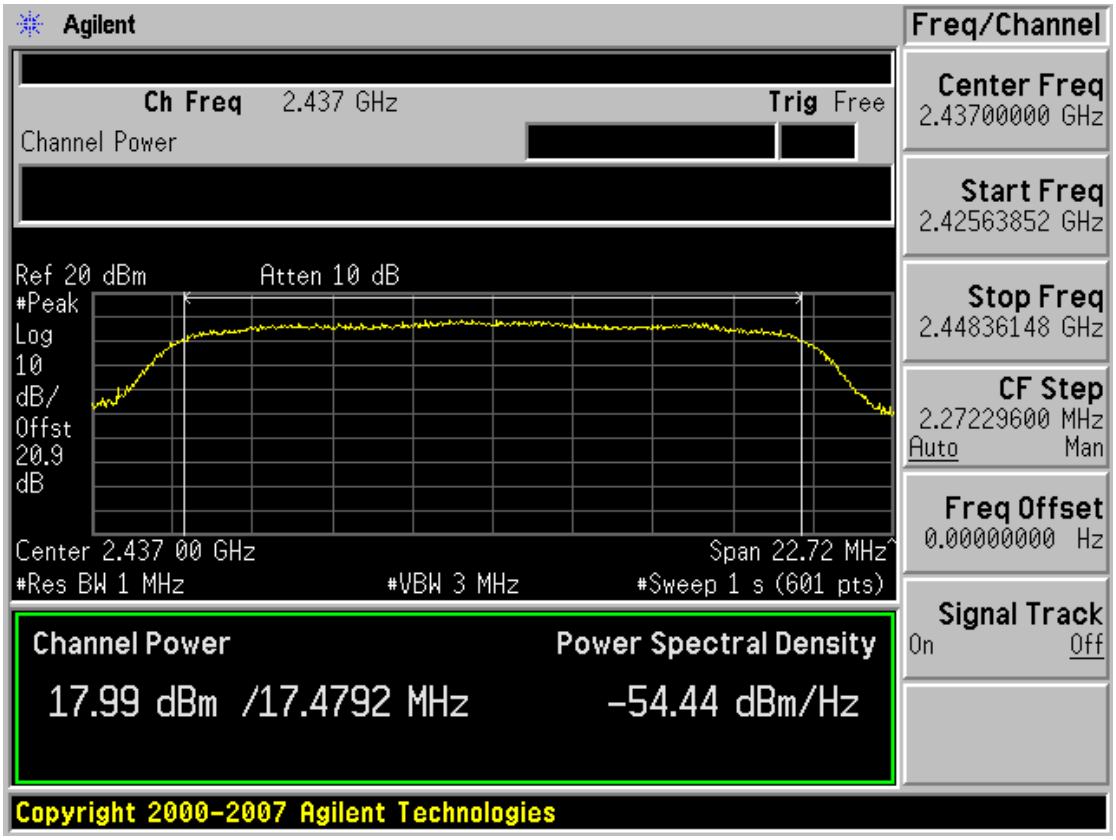
Conducted Output Power (802.11n-CH 6) 6.5Mbps



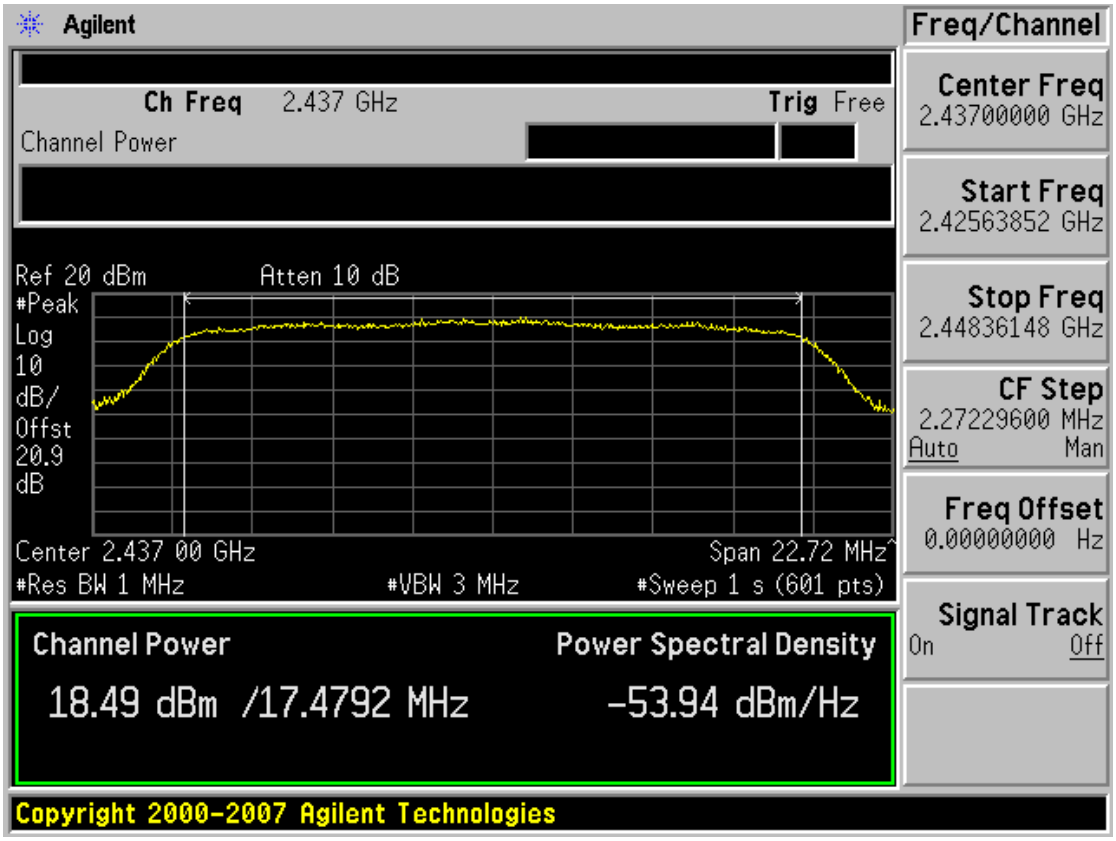
Conducted Output Power (802.11n-CH 6) 13Mbps



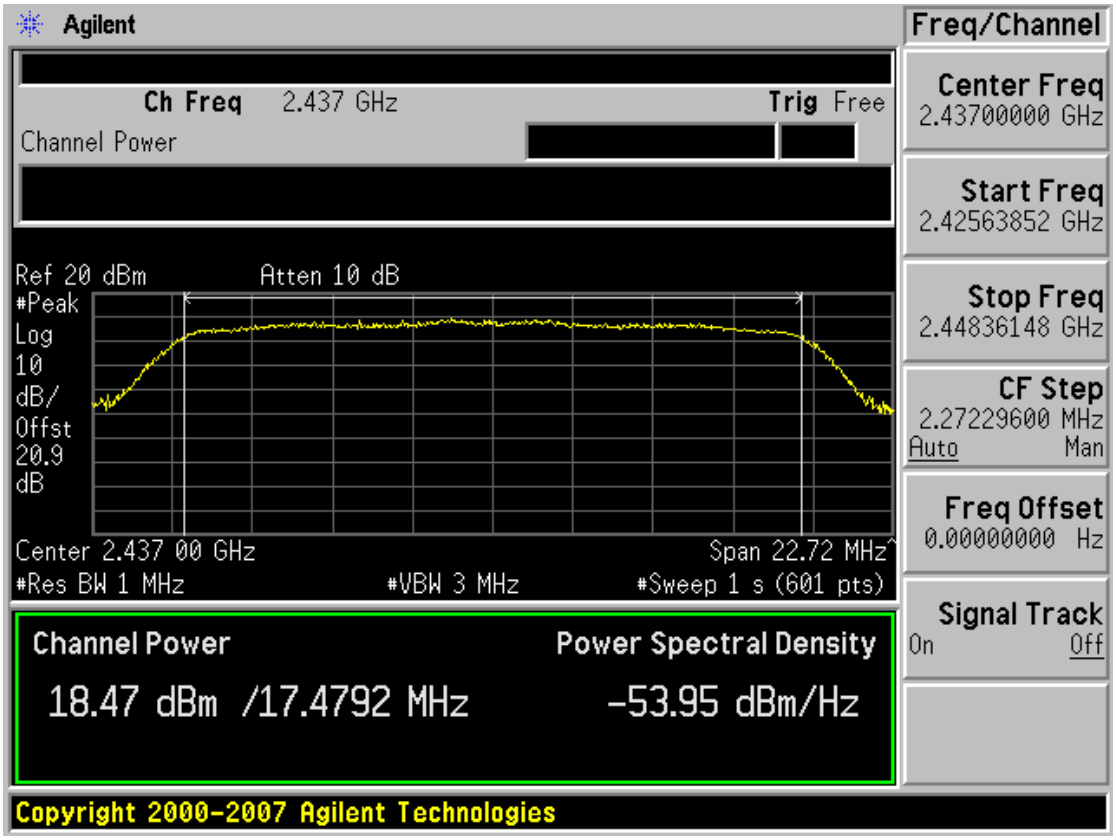
Conducted Output Power (802.11n-CH 6) 19.5Mbps



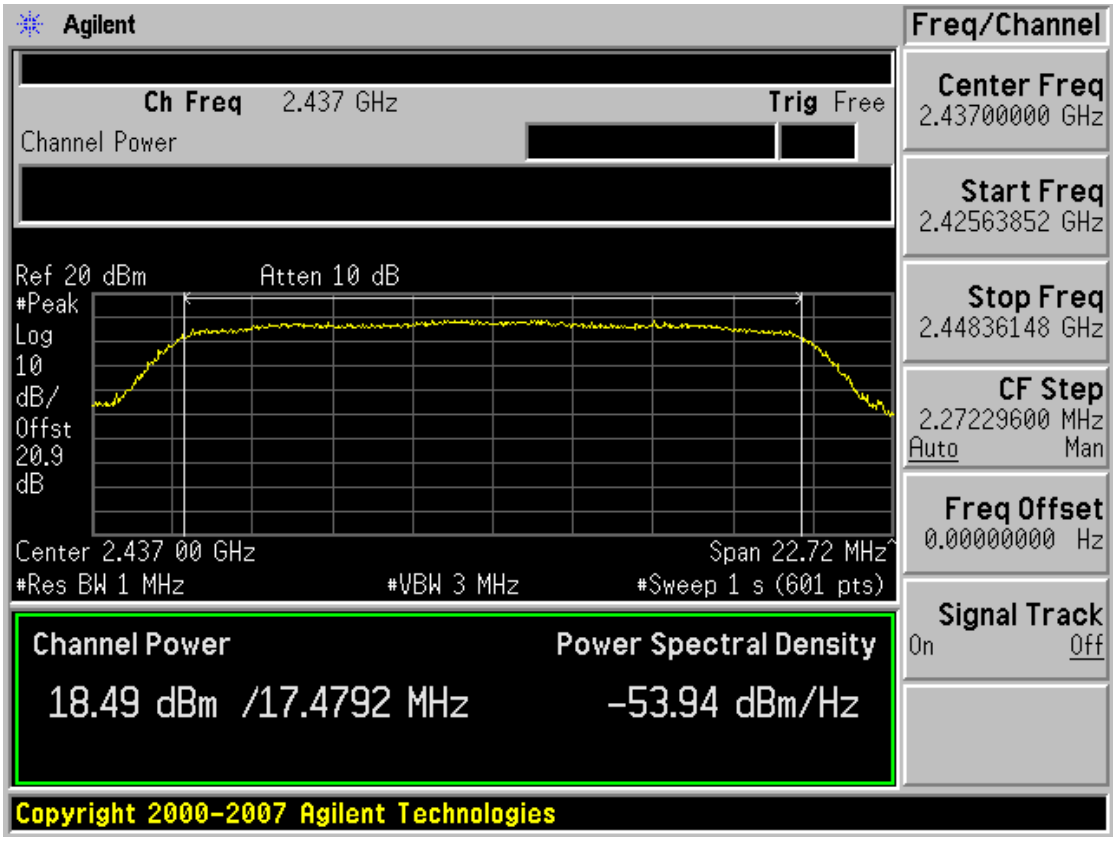
Conducted Output Power (802.11n-CH 6) 26Mbps



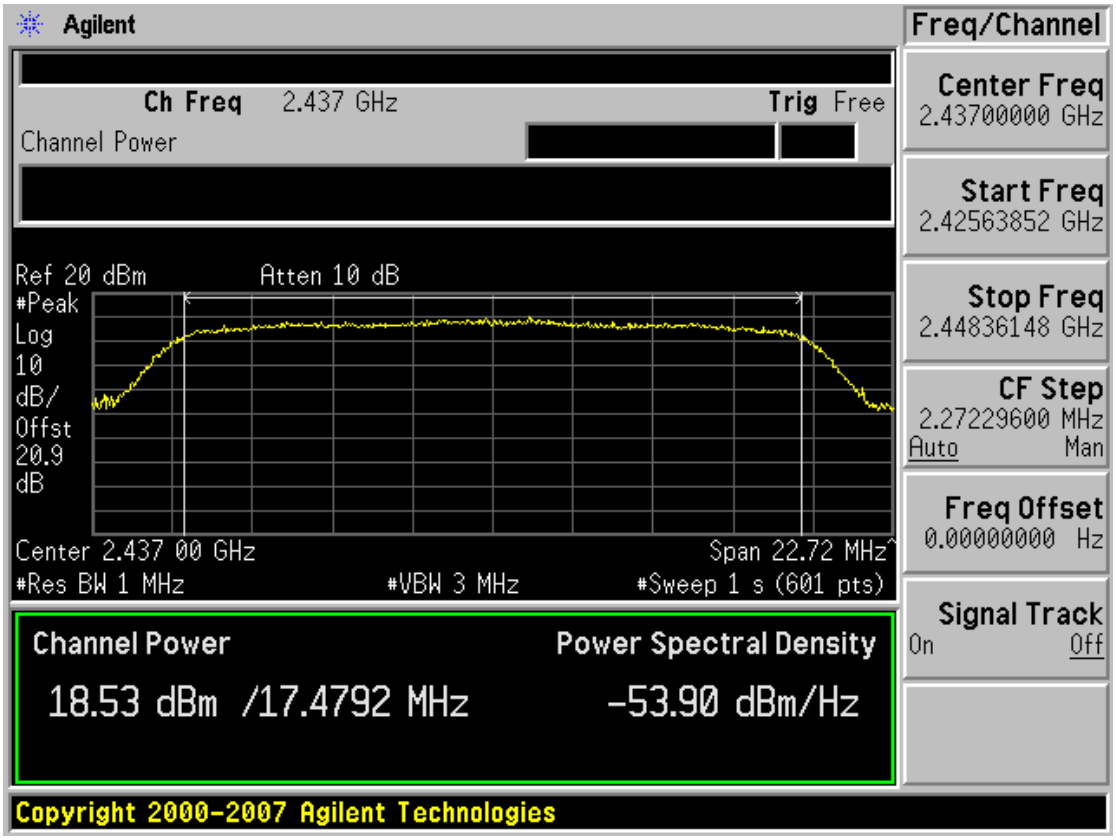
Conducted Output Power (802.11n-CH 6) 39Mbps



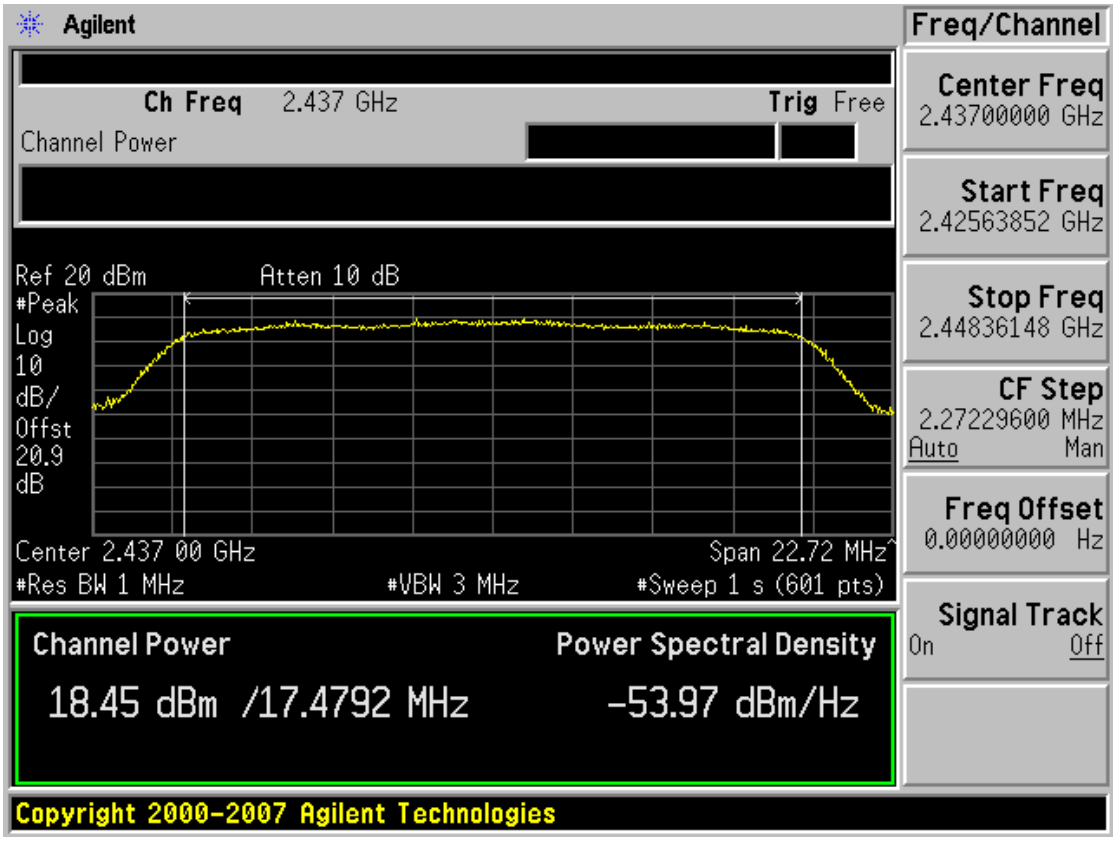
Conducted Output Power (802.11n-CH 6) 52Mbps



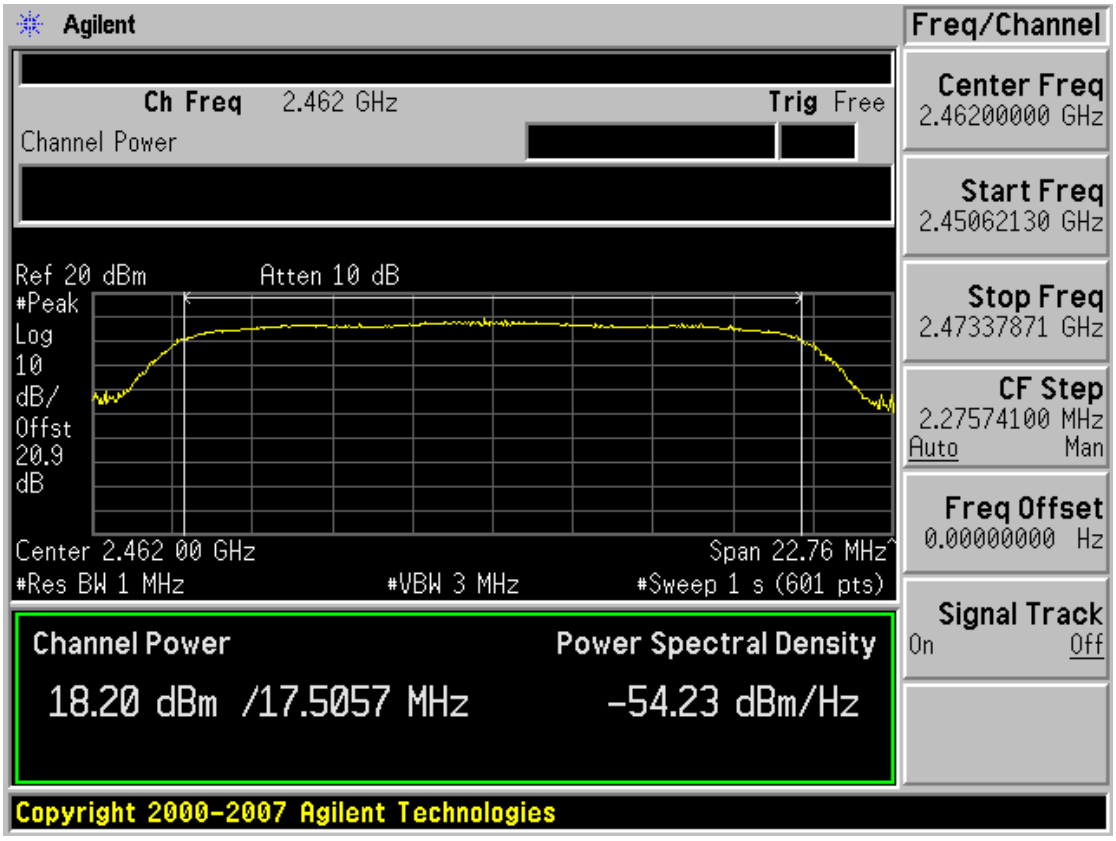
Conducted Output Power (802.11n-CH 6) 58.5Mbps



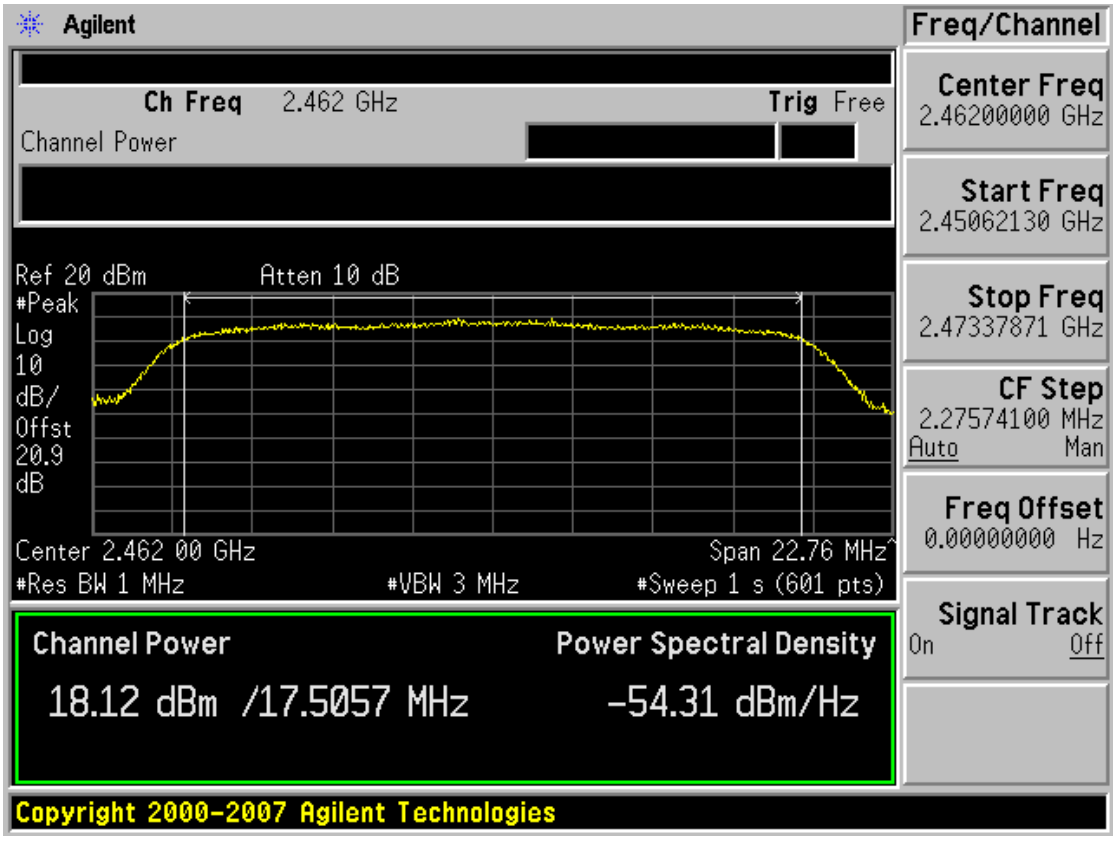
Conducted Output Power (802.11n-CH 6) 65Mbps



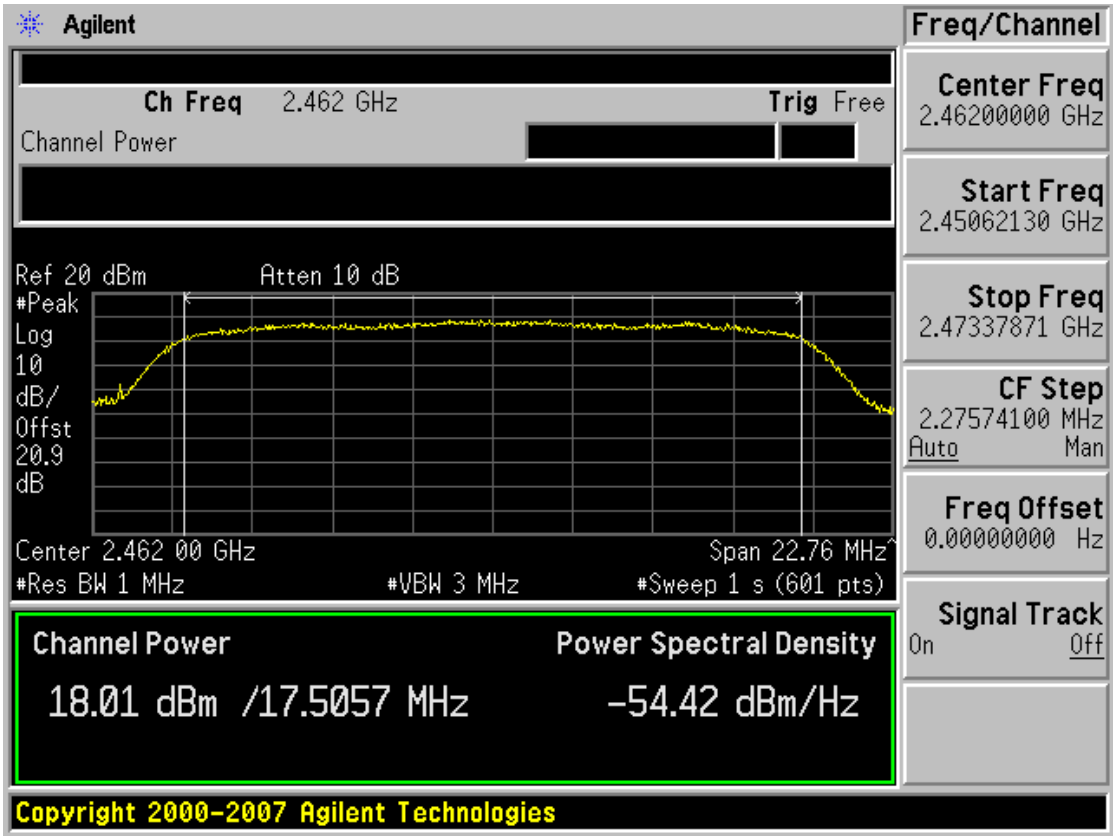
Conducted Output Power (802.11n-CH 11) 6.5Mbps



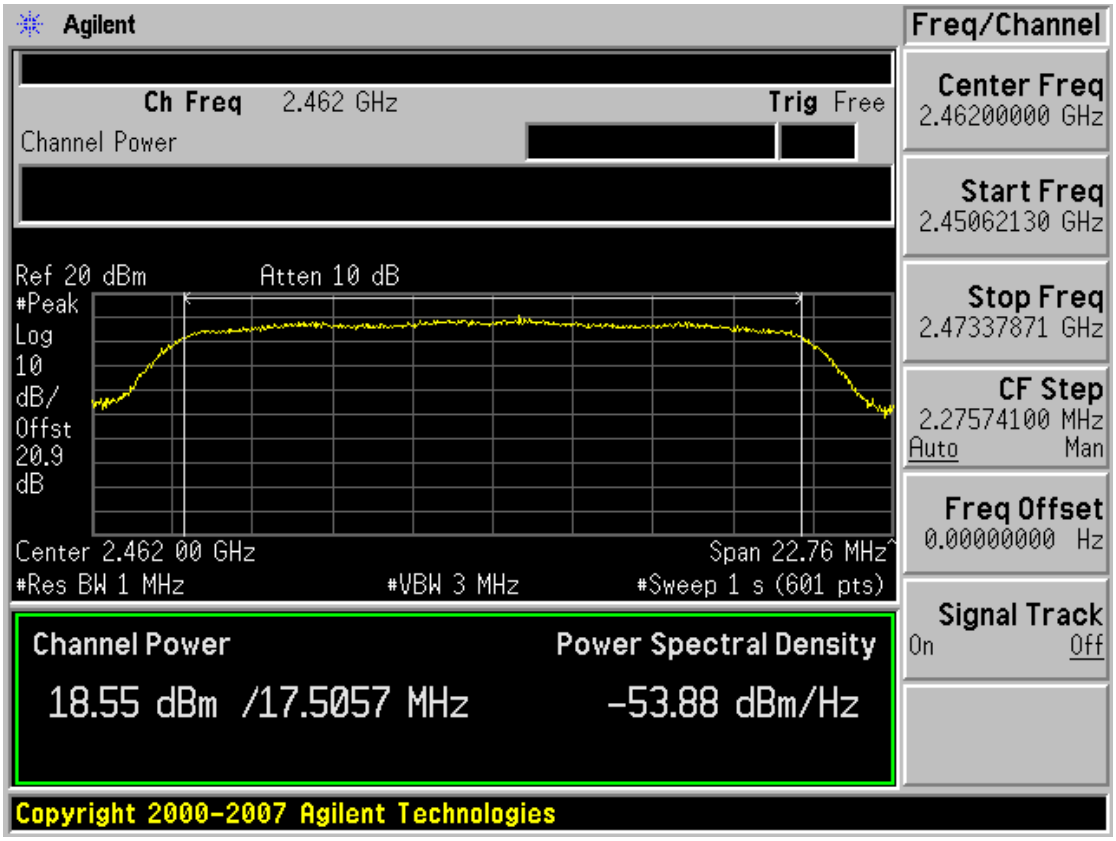
Conducted Output Power (802.11n-CH 11) 13Mbps



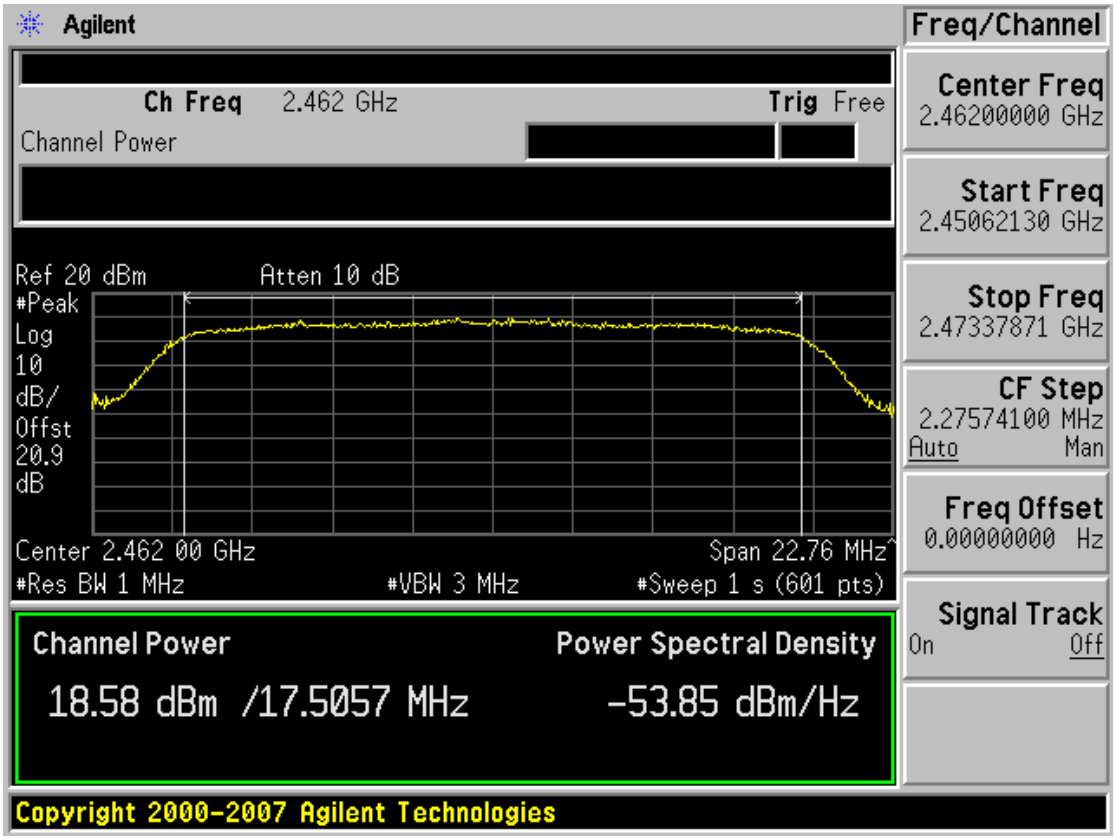
Conducted Output Power (802.11n-CH 11) 19.5Mbps



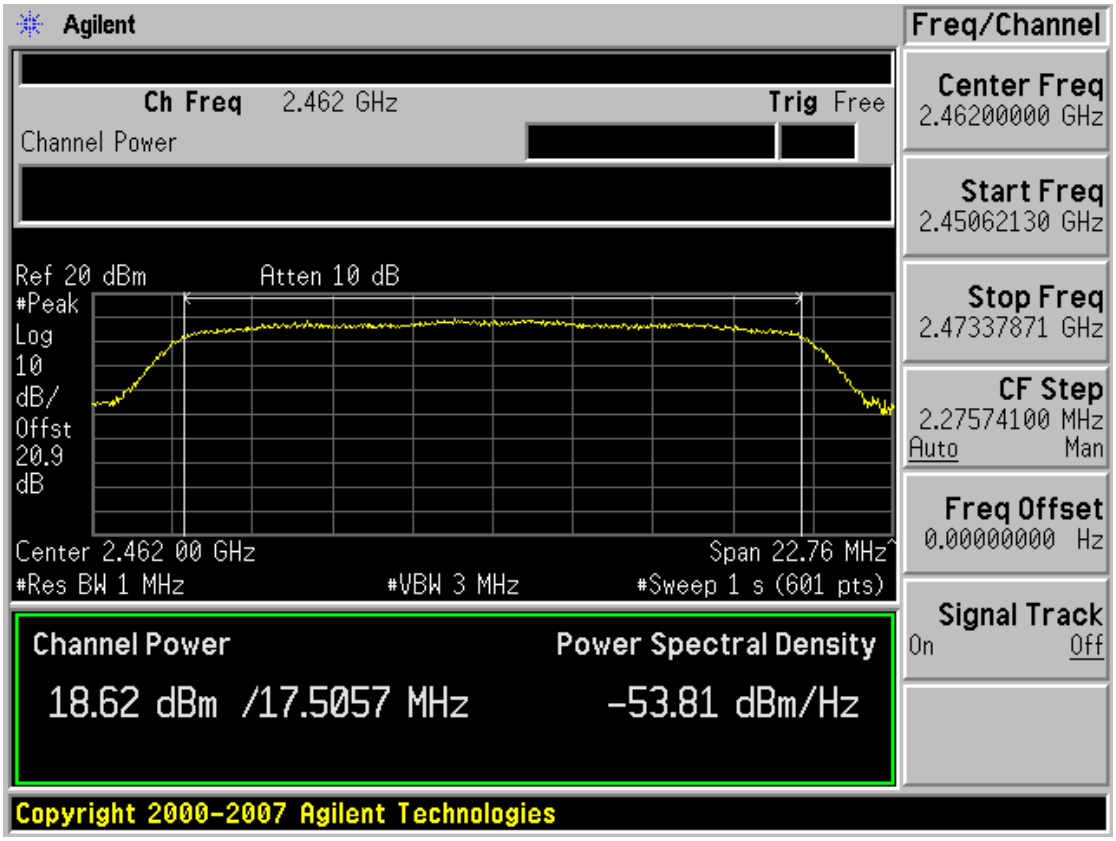
Conducted Output Power (802.11n-CH 11) 26Mbps



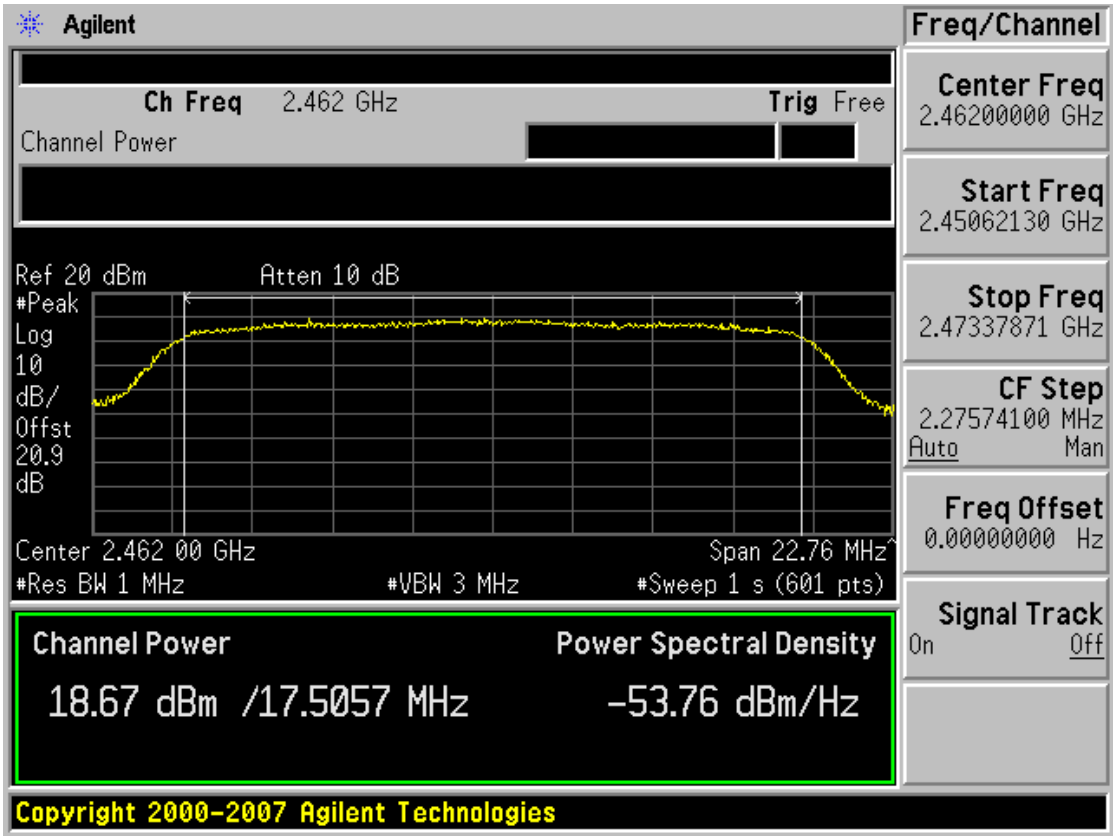
Conducted Output Power (802.11n-CH 11) 39Mbps



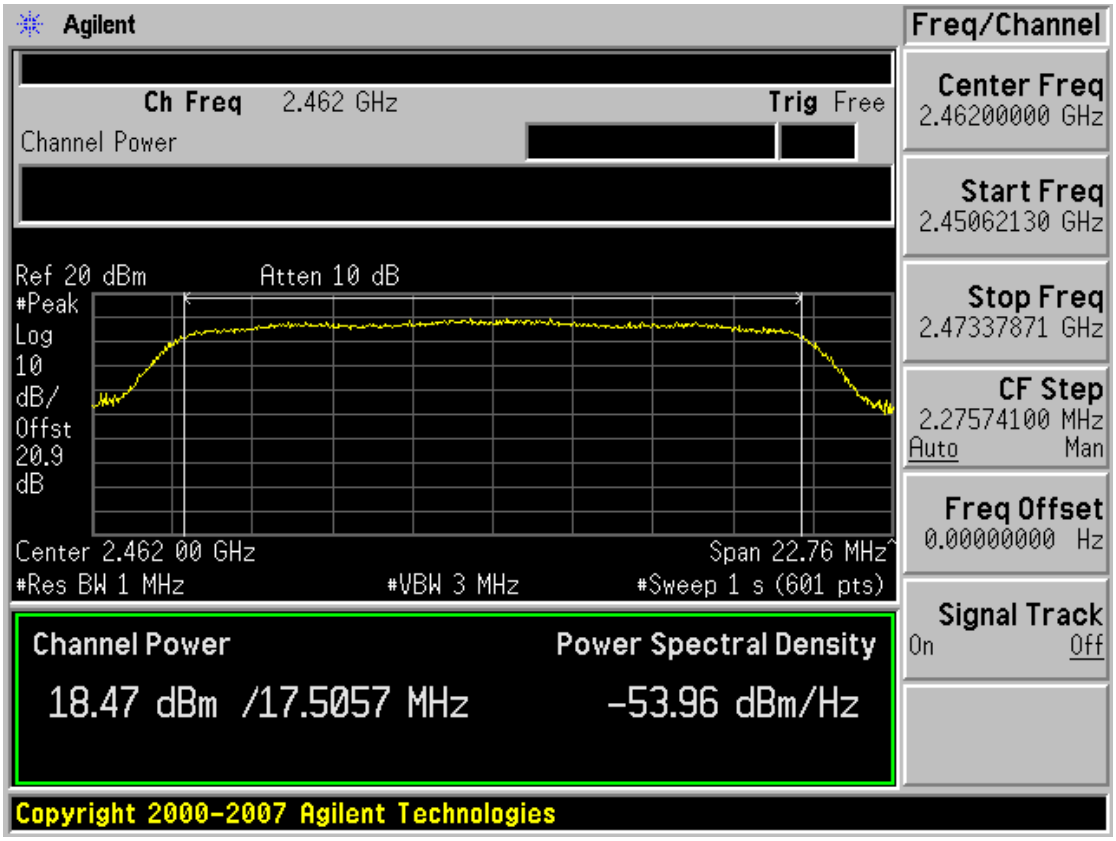
Conducted Output Power (802.11n-CH 11) 52Mbps



Conducted Output Power (802.11n-CH 11) 58.5Mbps



Conducted Output Power (802.11n-CH 11) 65Mbps



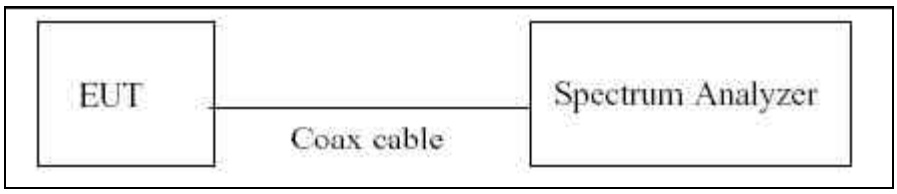
8.3 POWER SPECTRAL DENSITY (802.11b/g/n)

Test Requirements and limit, §15.247(e)

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 – The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The spectrum analyzer is set to :

1. Span = 300 kHz
2. RBW = 3 kHz (7dB/div)
3. VBW = 3 kHz
4. Sweep = 100 sec
5. Detector Mode = Peak

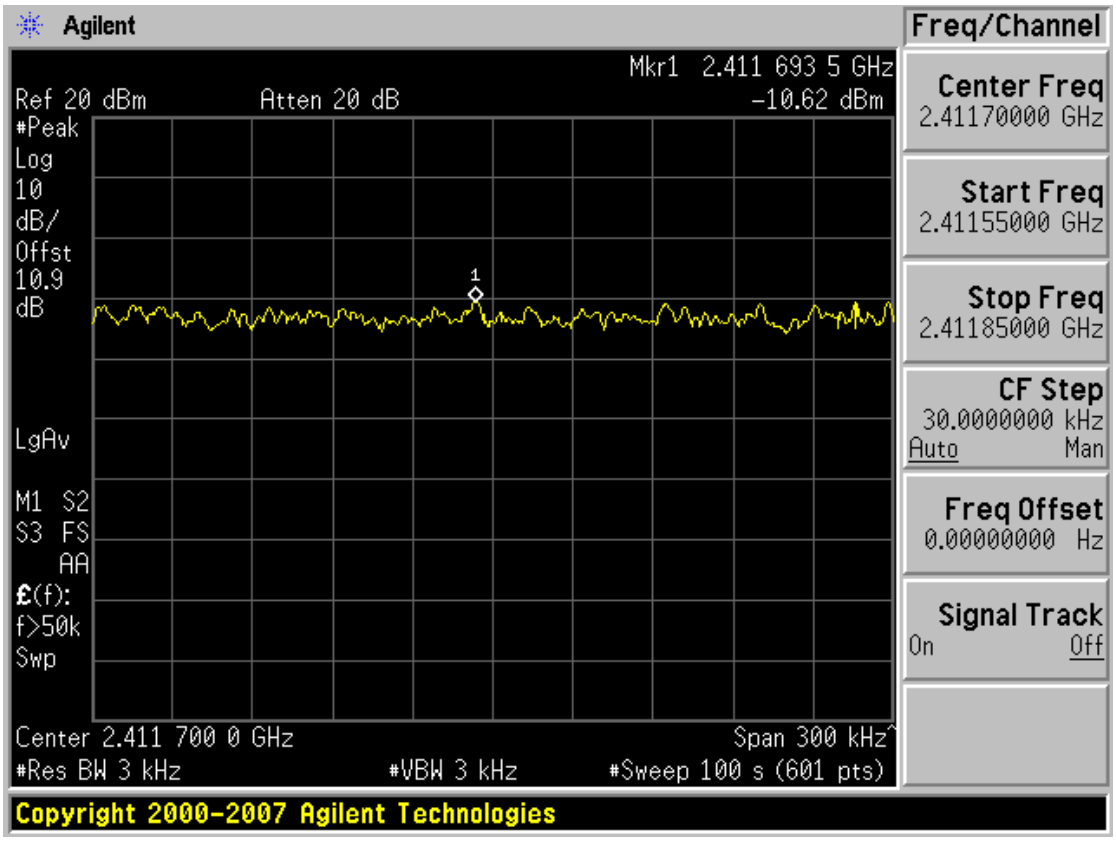
▣ TEST RESULTS

Conducted Power Density Measurements

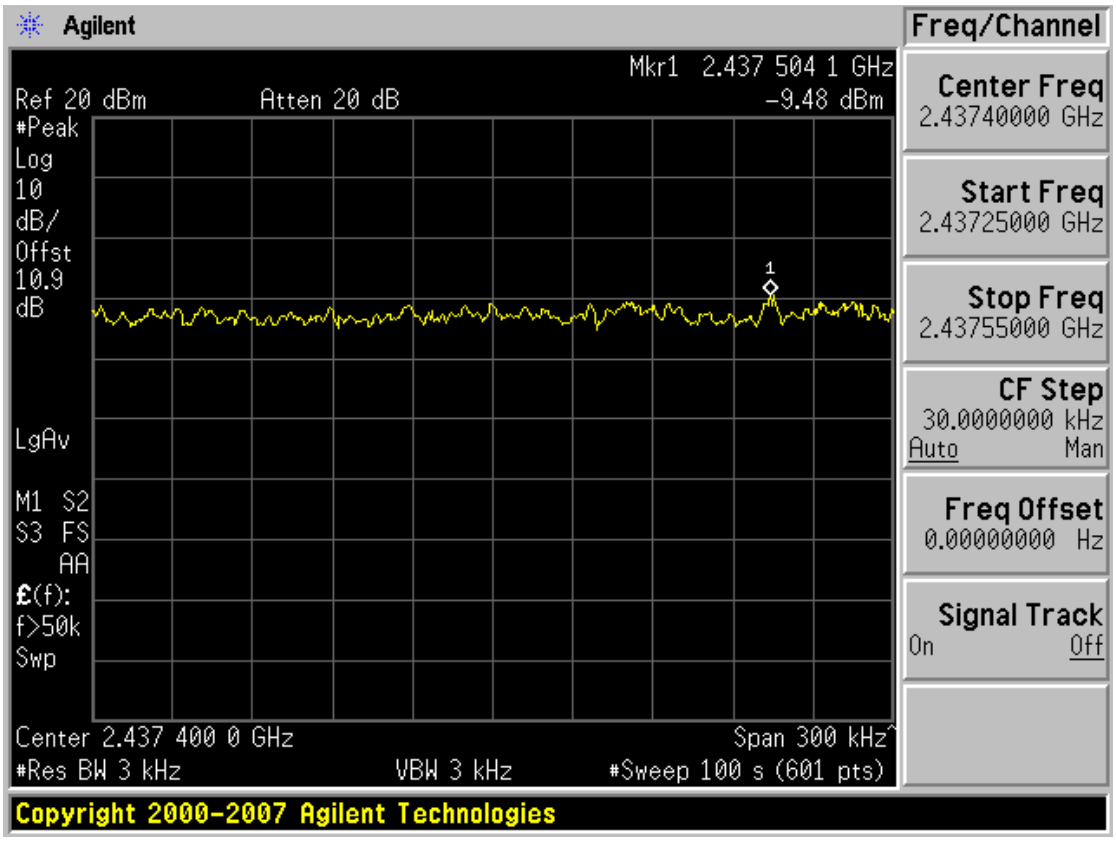
Frequency (MHz)	Channel No.	Mode	Test Result	
			Power Density (dBm)	Pass/Fail
2412	1	802.11b	-10.62	Pass
2437	6		-9.48	Pass
2462	11		-9.56	Pass
2412	1	802.11g	-14.73	Pass
2437	6		-15.58	Pass
2462	11		-14.44	Pass
2412	1	802.11n	-16.72	Pass
2437	6		-15.87	Pass
2462	11		-16.23	Pass

▣ RESULT PLOTS

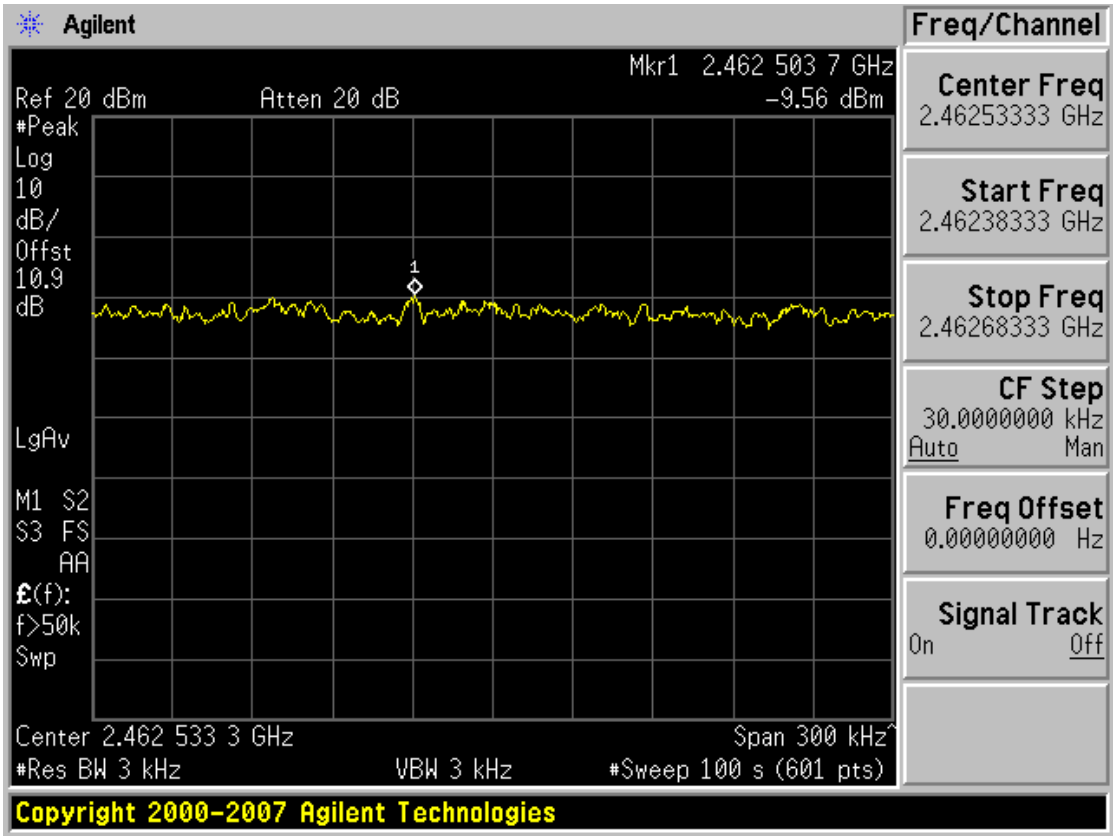
Power Spectral Density (802.11b-CH 1)



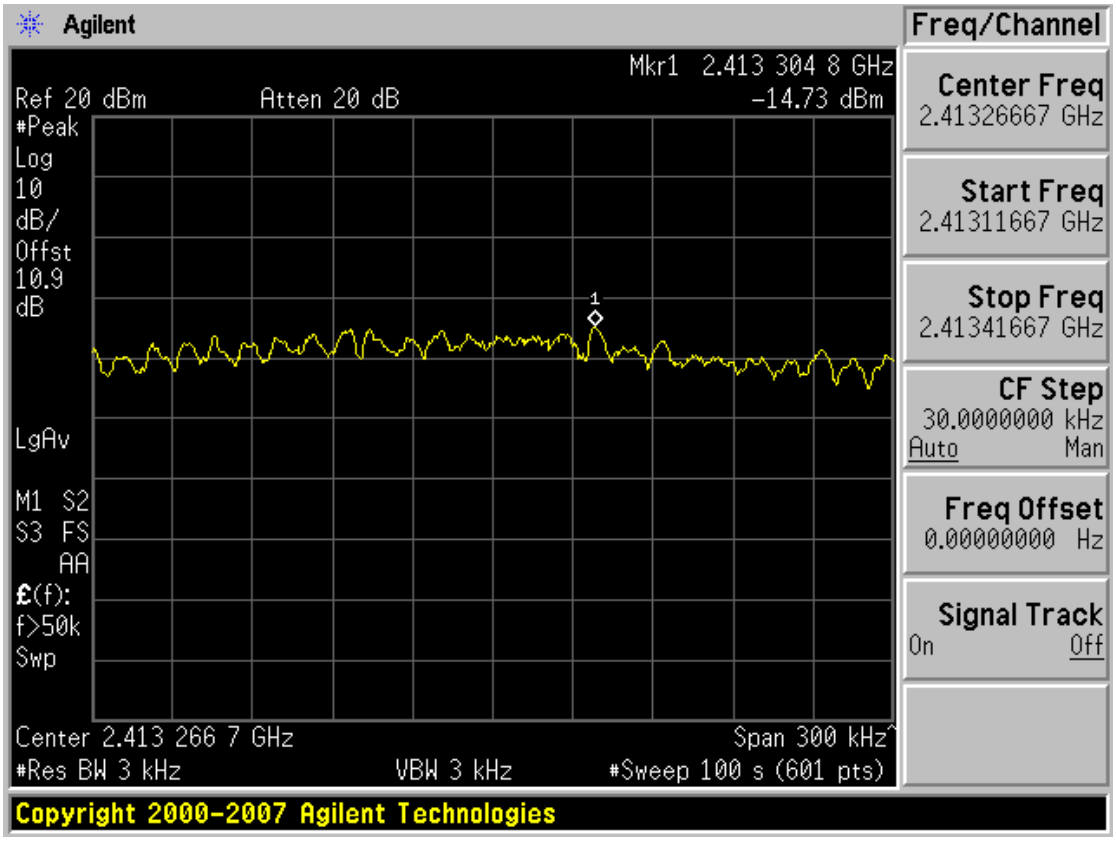
Power Spectral Density (802.11b-CH 6)



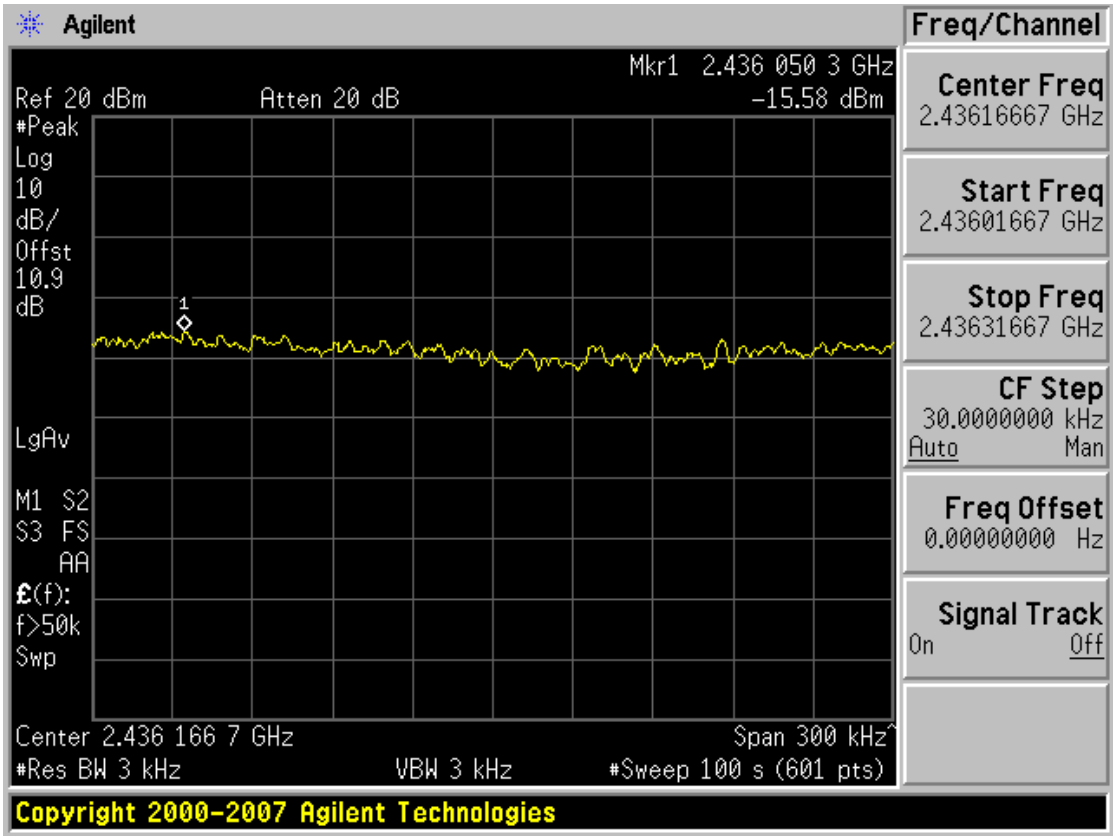
Power Spectral Density (802.11b-CH 11)



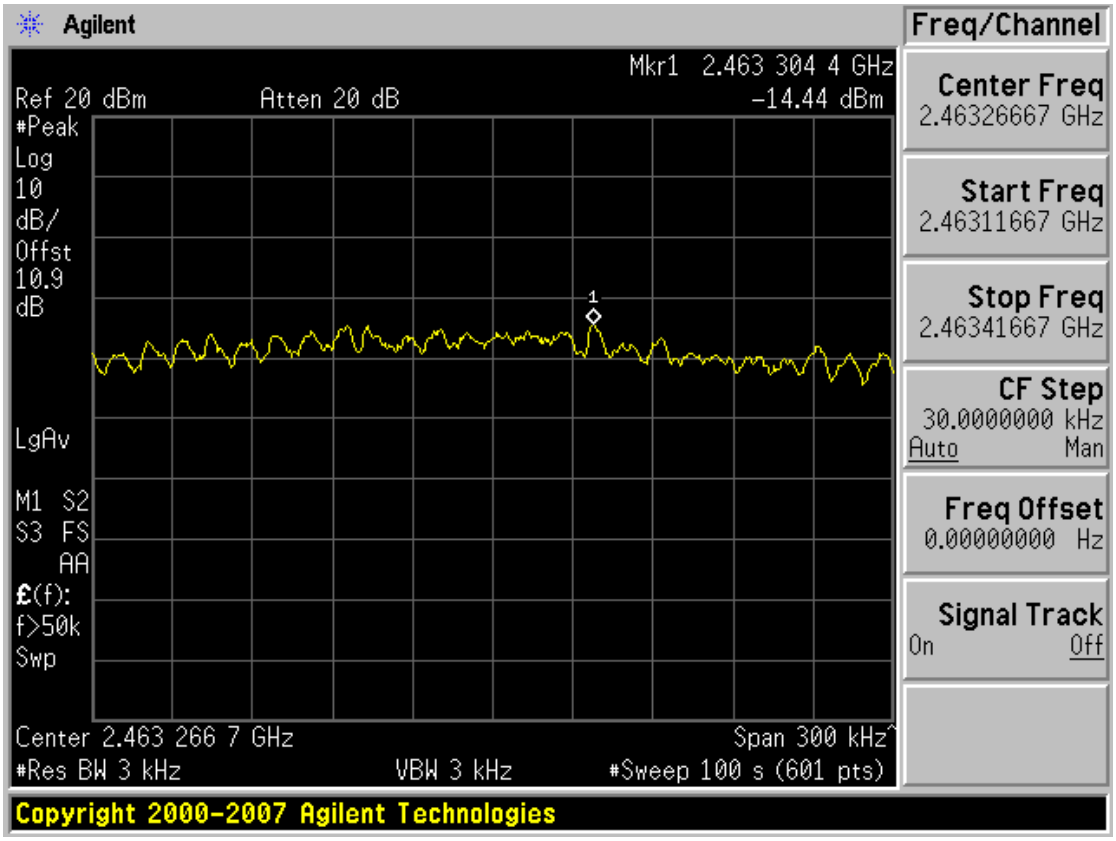
Power Spectral Density (802.11g-CH 1)



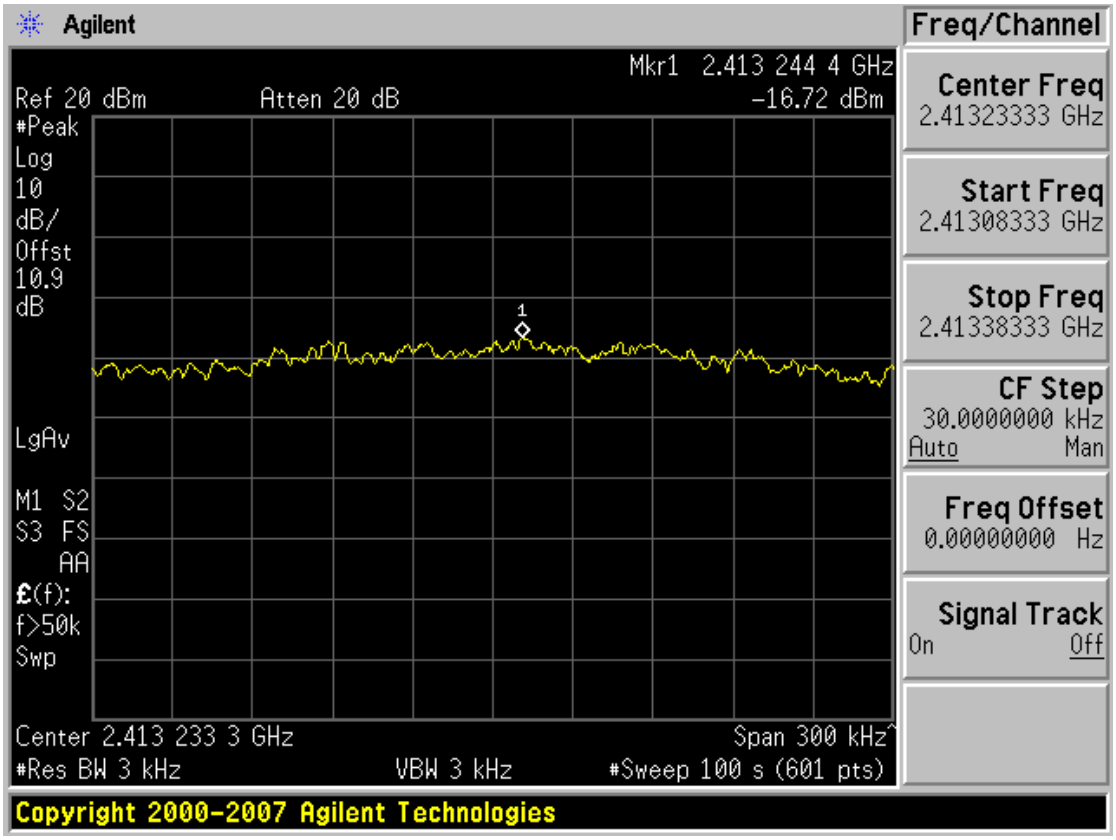
Power Spectral Density (802.11g-CH 6)



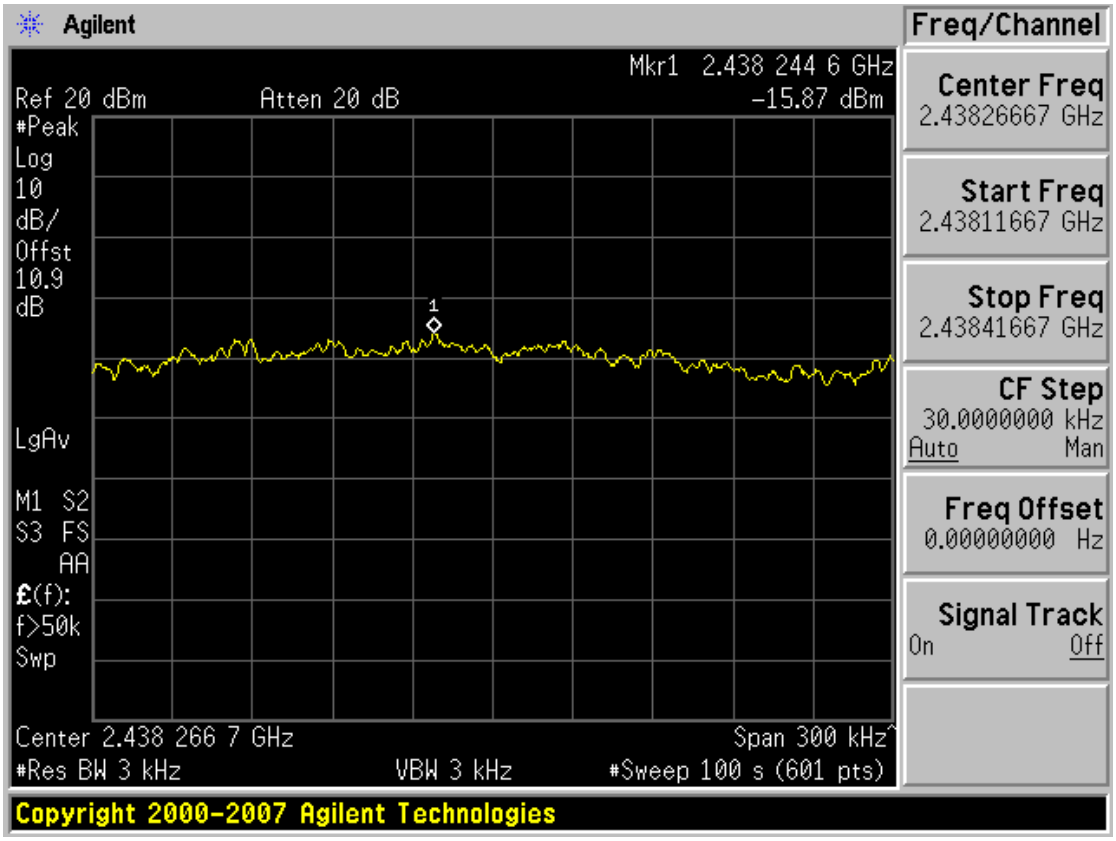
Power Spectral Density (802.11g-CH11)



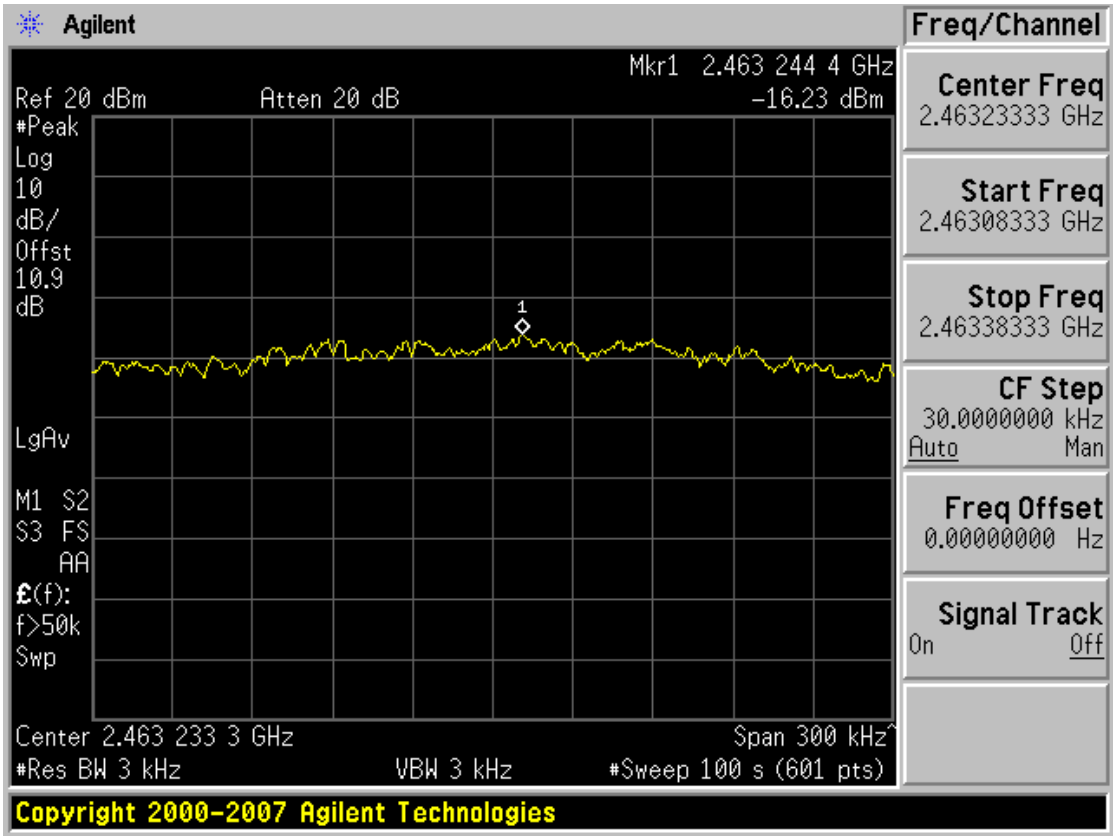
Power Spectral Density (802.11n-CH 1)



Power Spectral Density (802.11n-CH 6)



Power Spectral Density (802.11n-CH11)

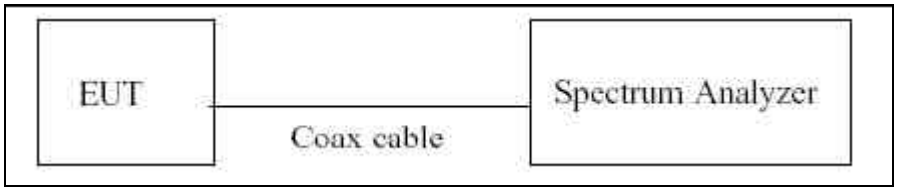


8.4 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§ 15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

▣ TEST CONFIGURATION



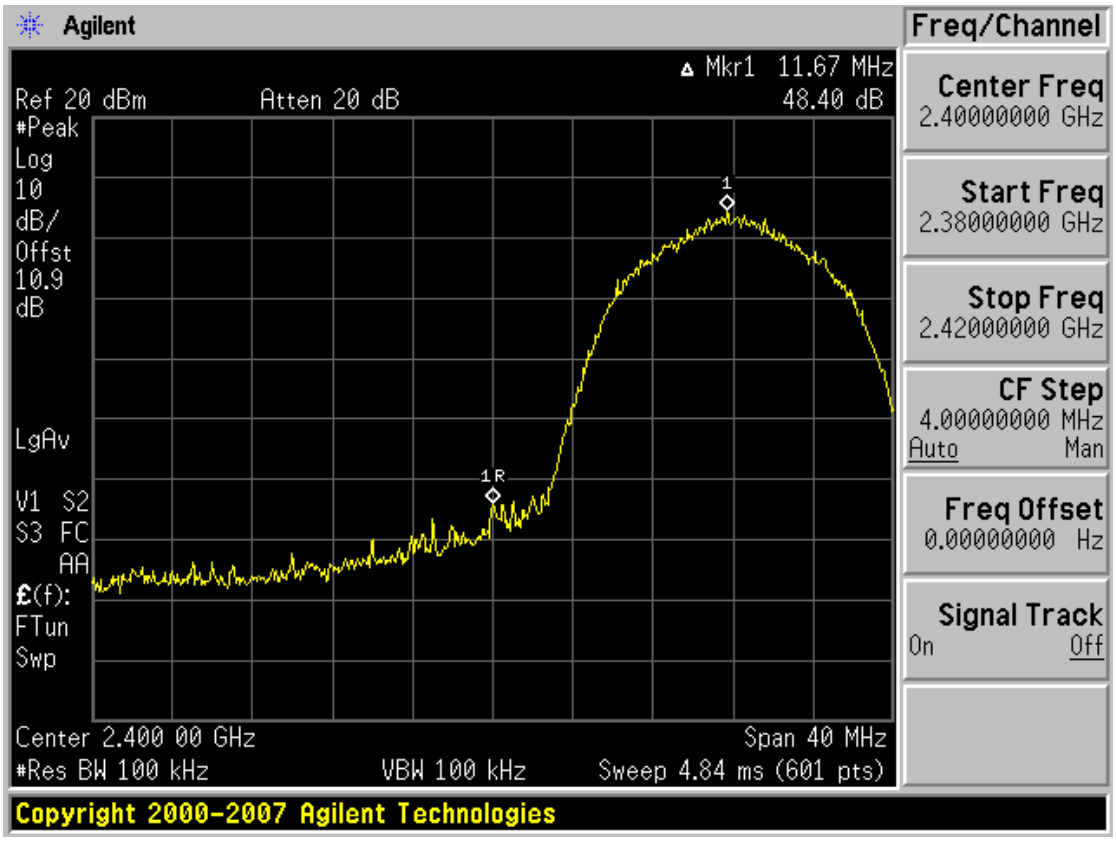
▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
Detector Mode is set to a peak detector Mode.

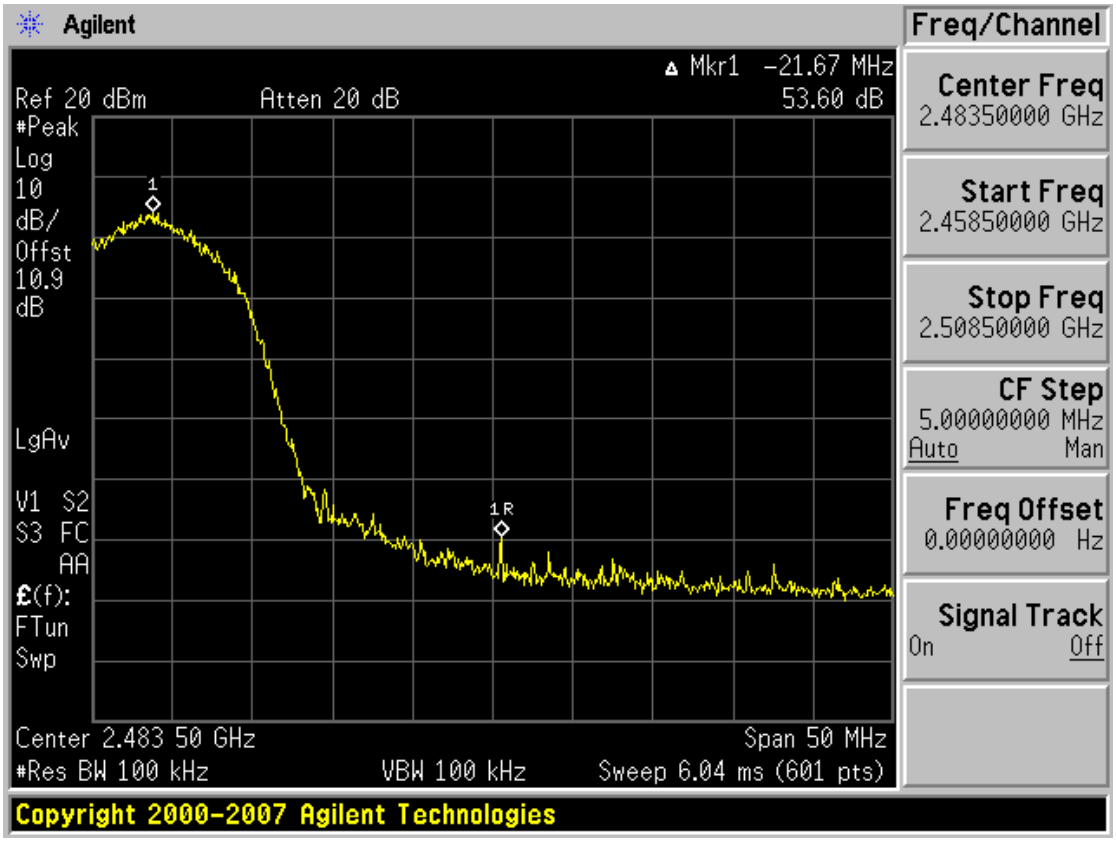
Measurements are made over the 30 MHz to 26 GHz range with the transmitter set to the lowest, middle, and highest channels.

▣ RESULT PLOTS

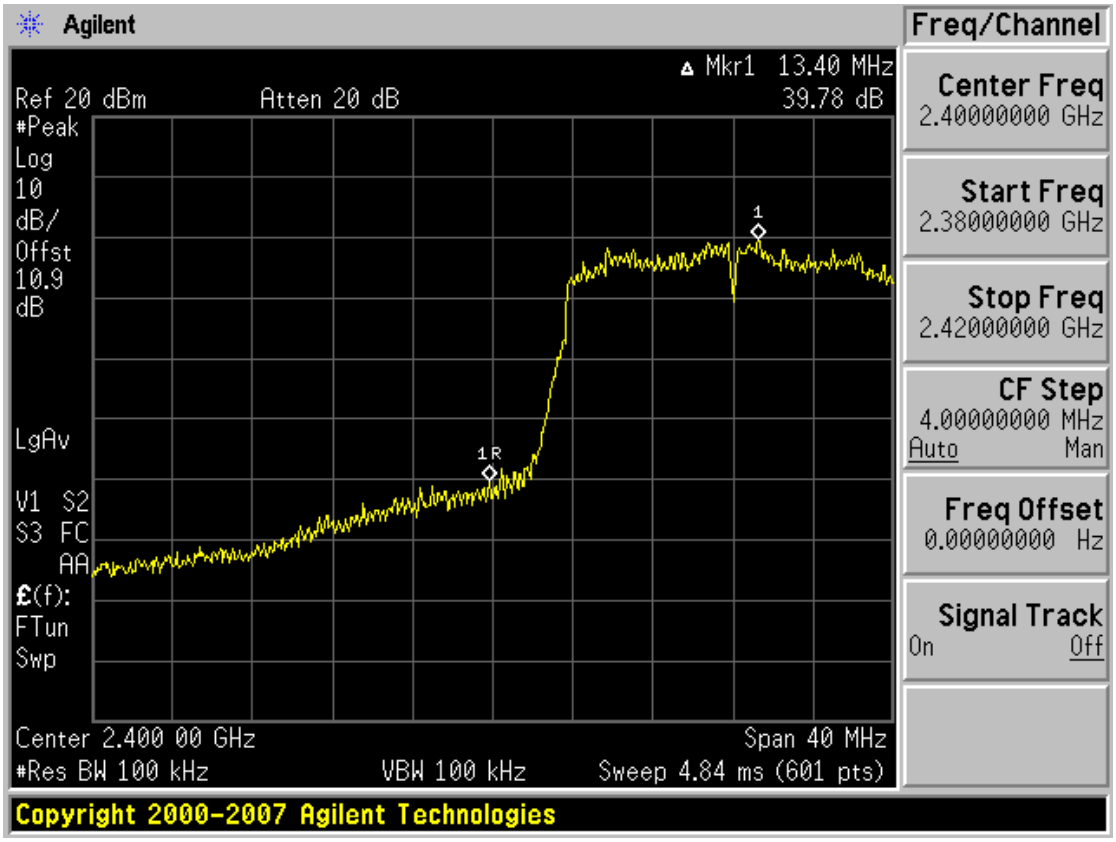
BandEdge (802.11b-CH1)



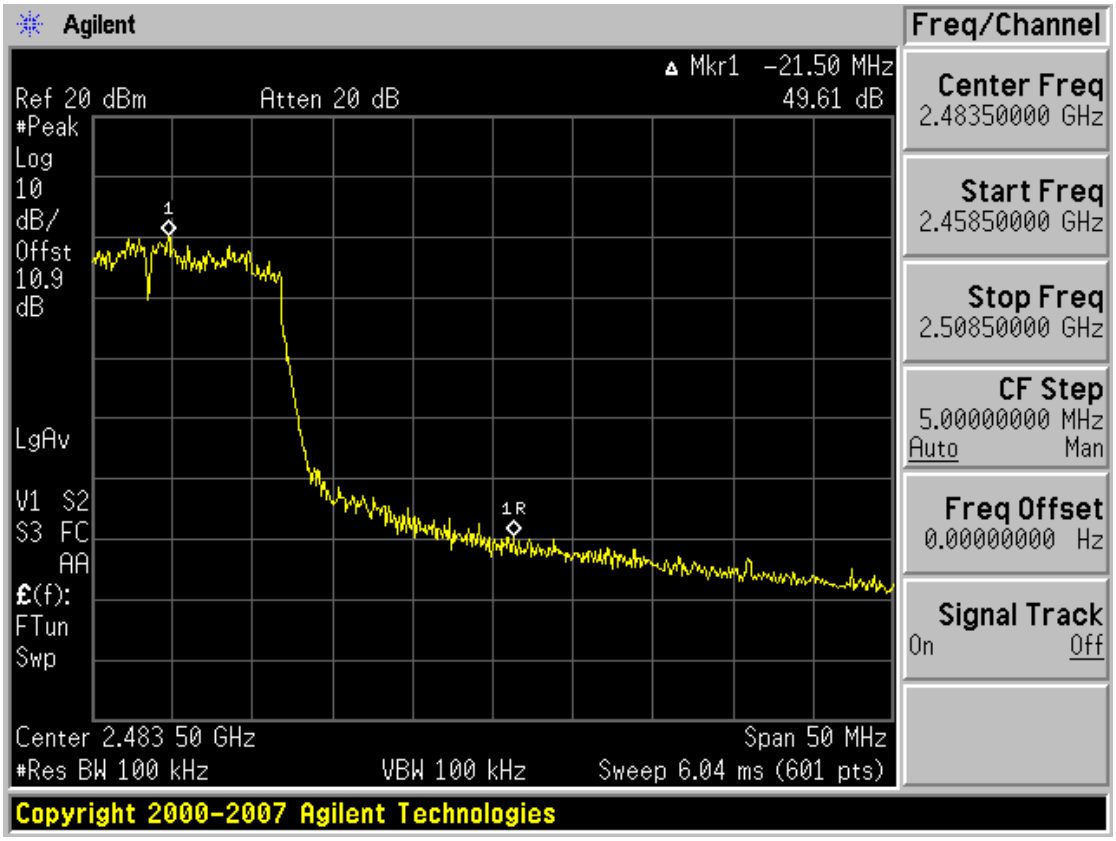
BandEdge (802.11b-CH11)



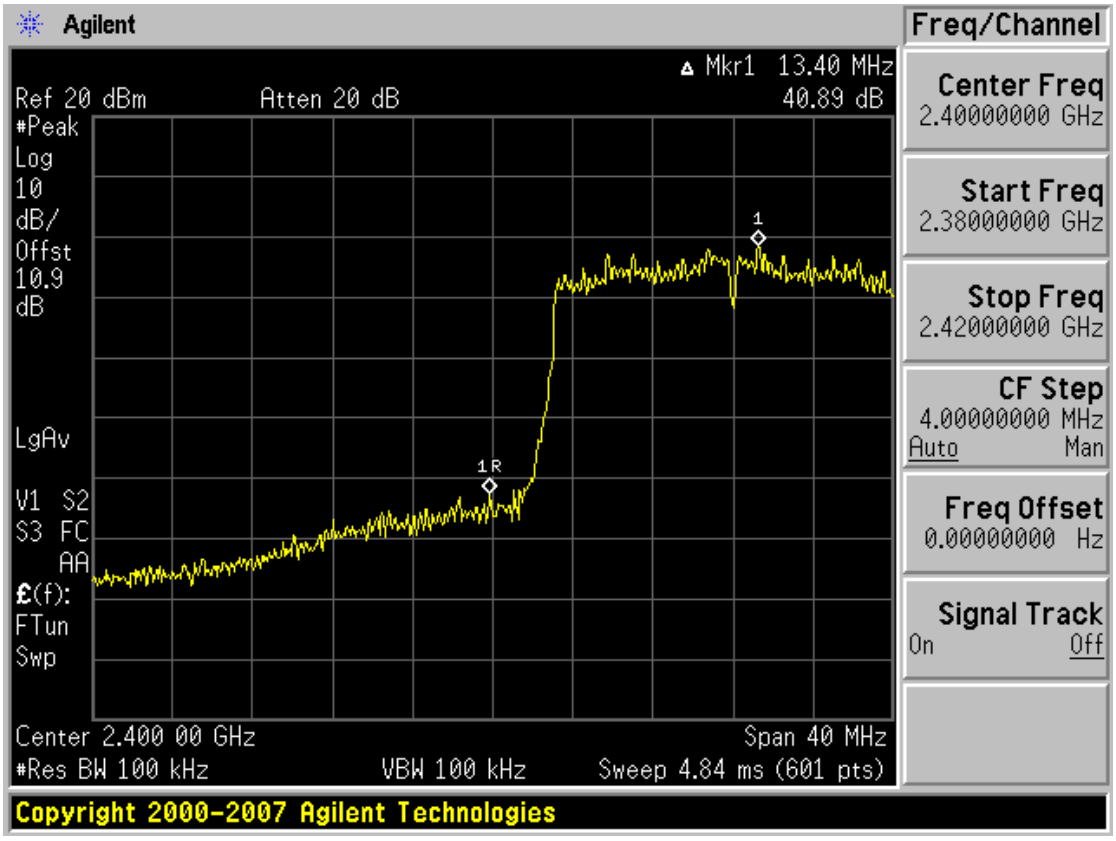
BandEdge (802.11g-CH1)



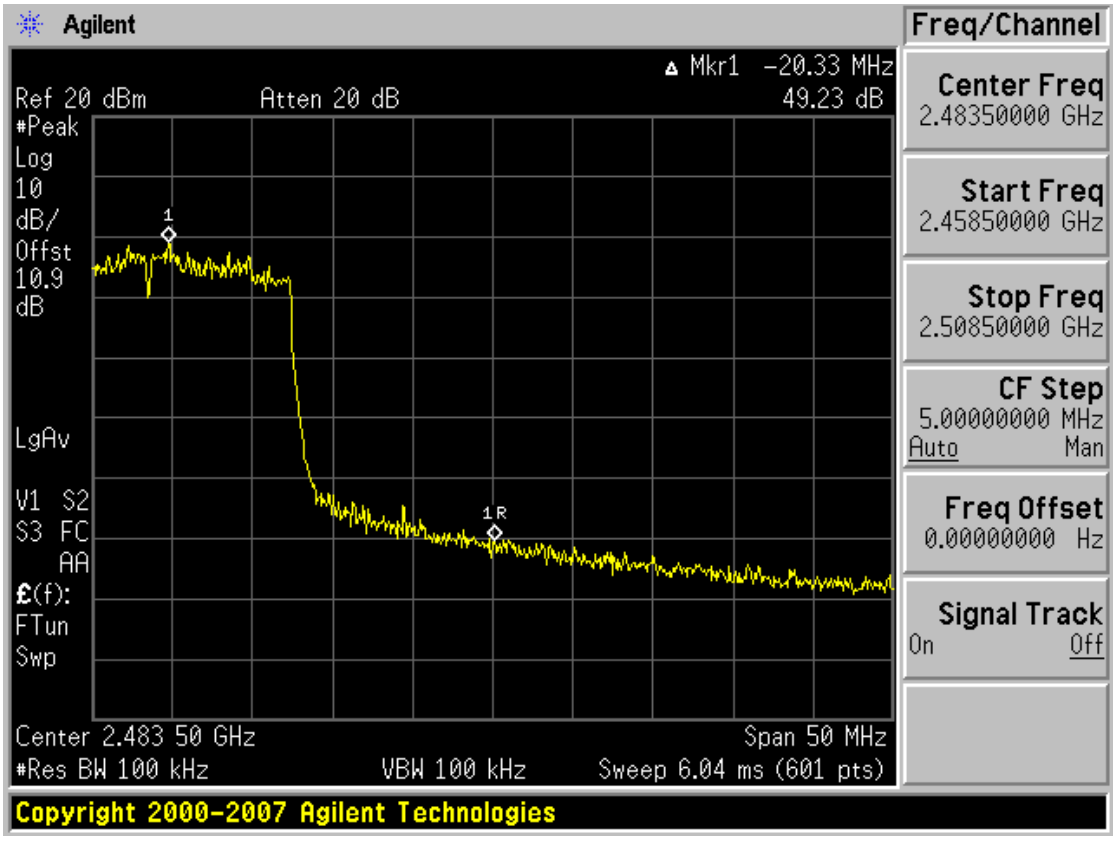
BandEdge (802.11g-CH11)



BandEdge (802.11n-CH1)

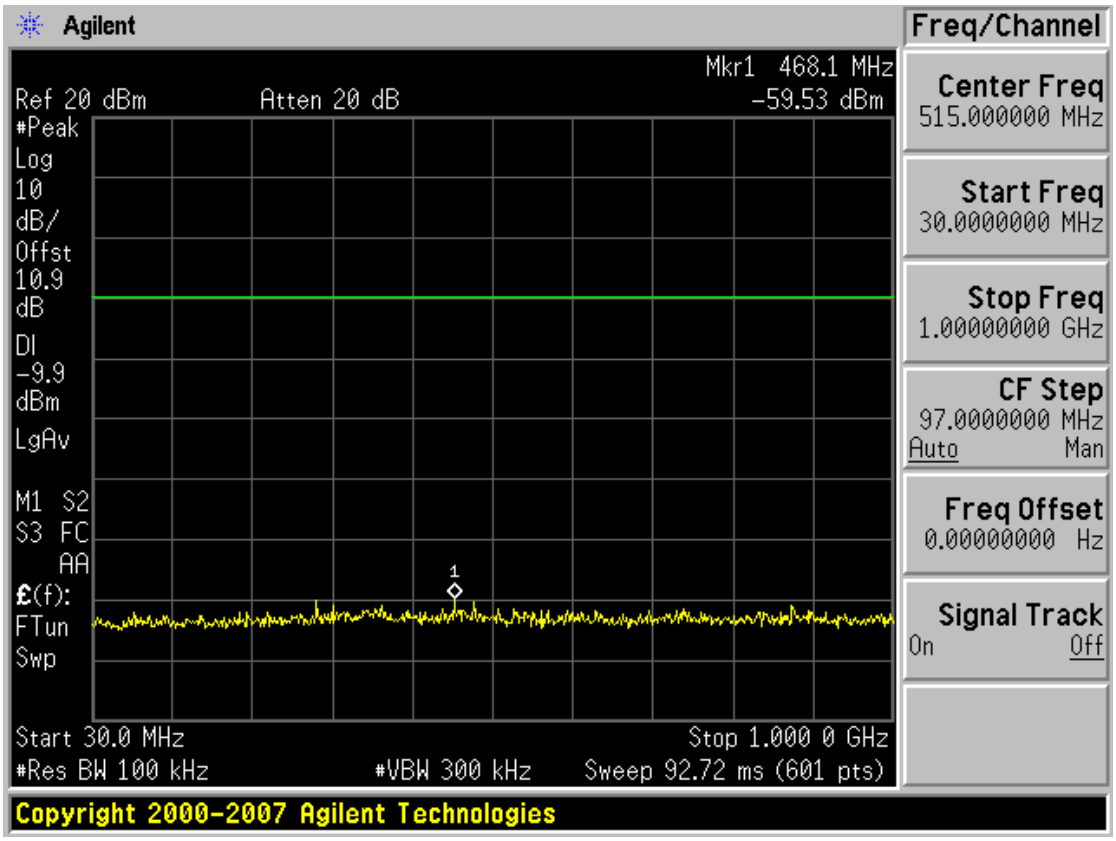


BandEdge (802.11n-CH11)

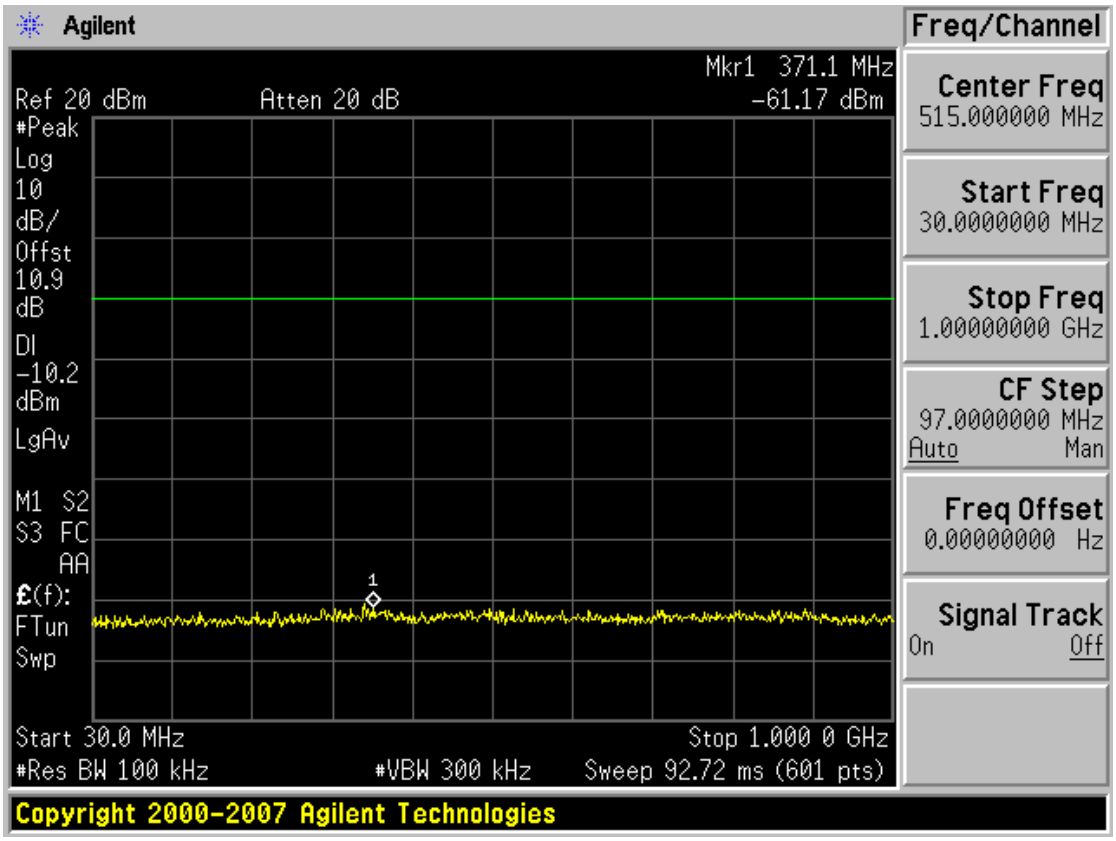


30 MHz ~ 1 GHz

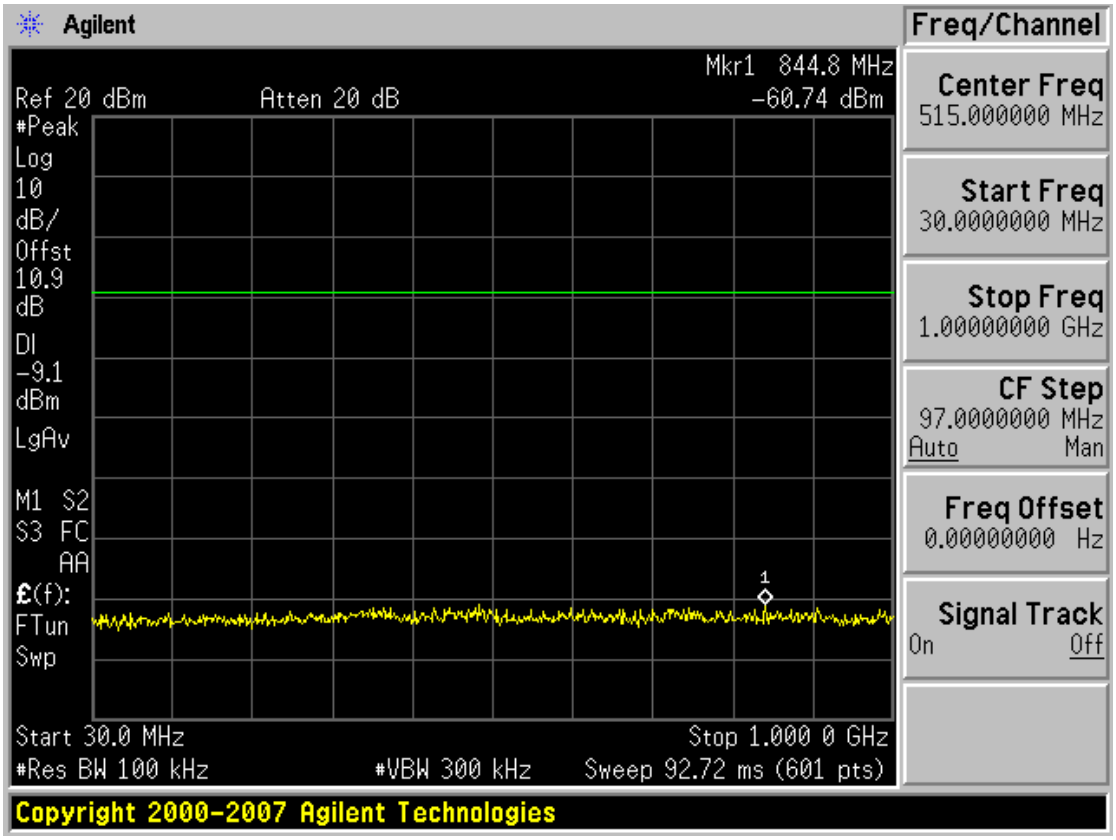
Conducted Spurious Emission (802.11b-CH1)



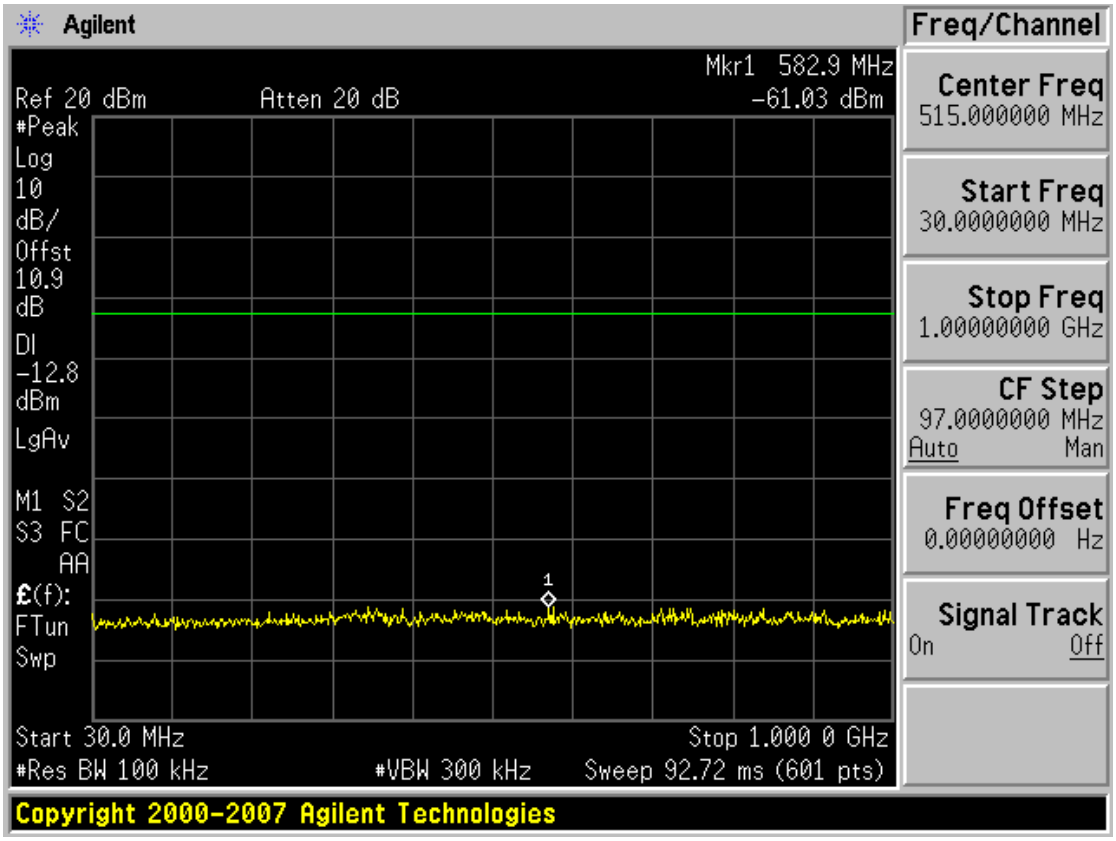
Conducted Spurious Emission (802.11b-CH6)



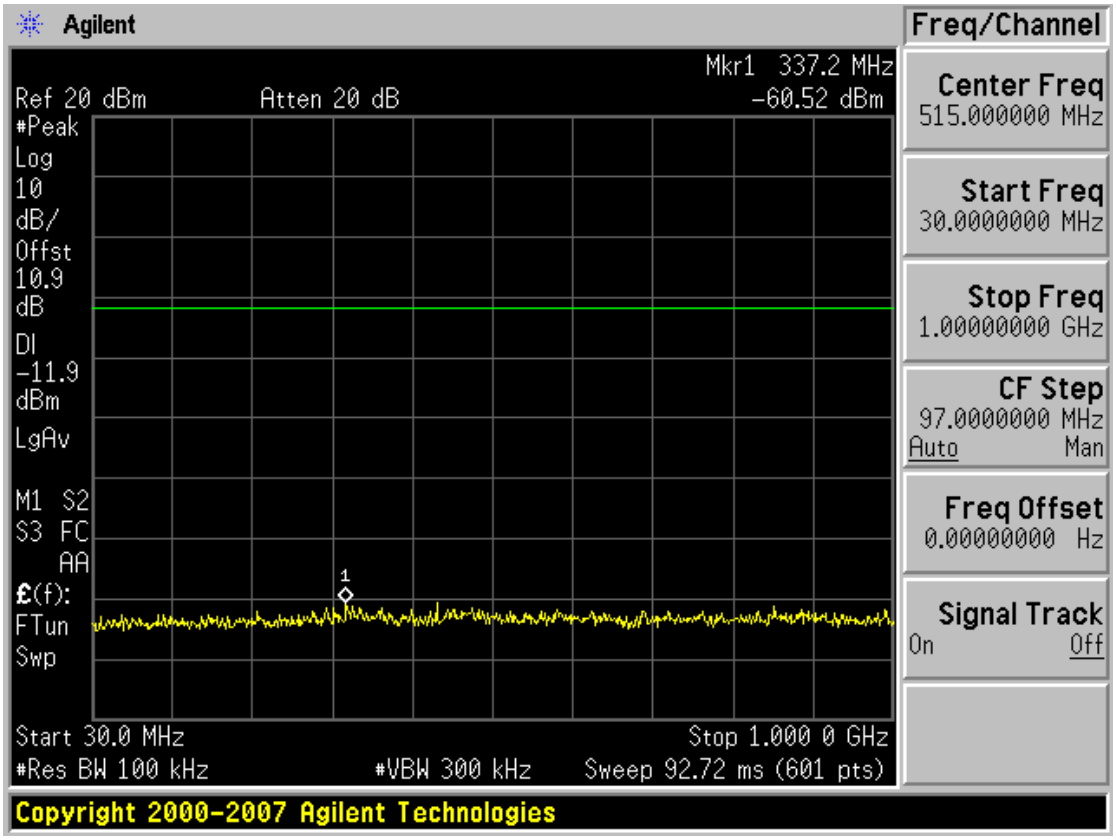
Conducted Spurious Emission (802.11b-CH11)



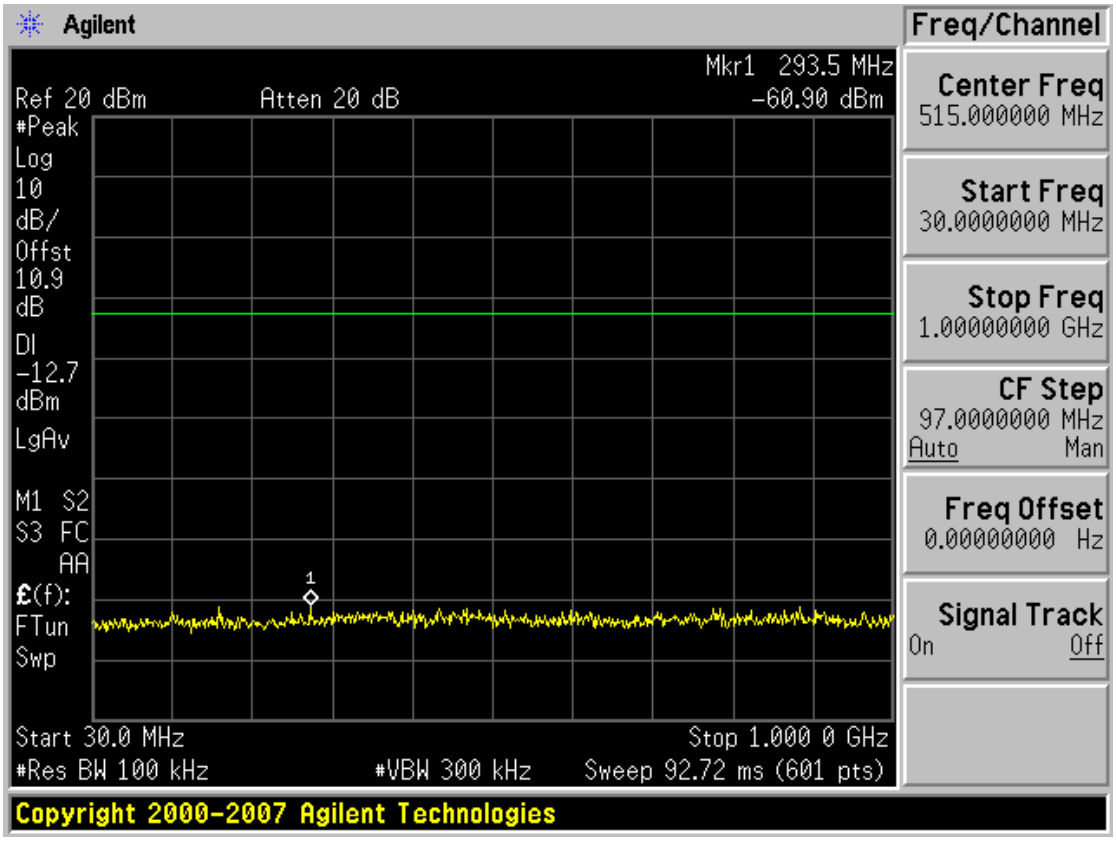
Conducted Spurious Emission (802.11g-CH1)



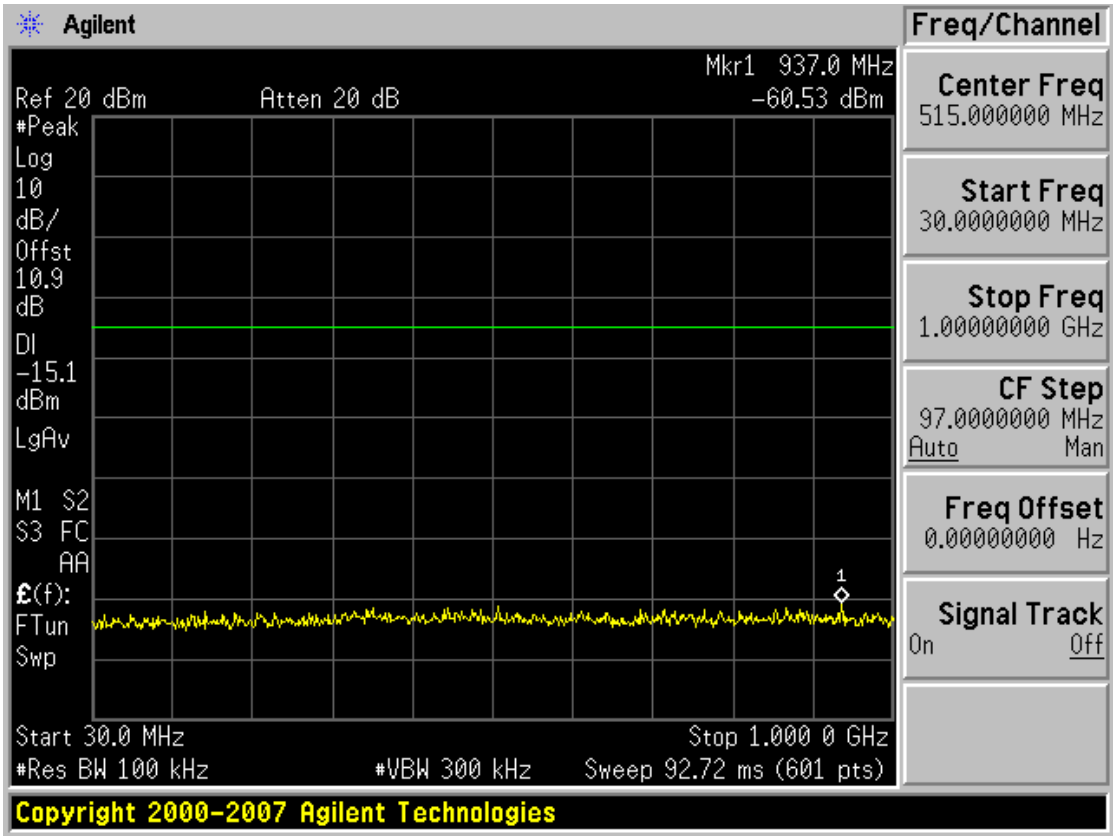
Conducted Spurious Emission (802.11g-CH6)



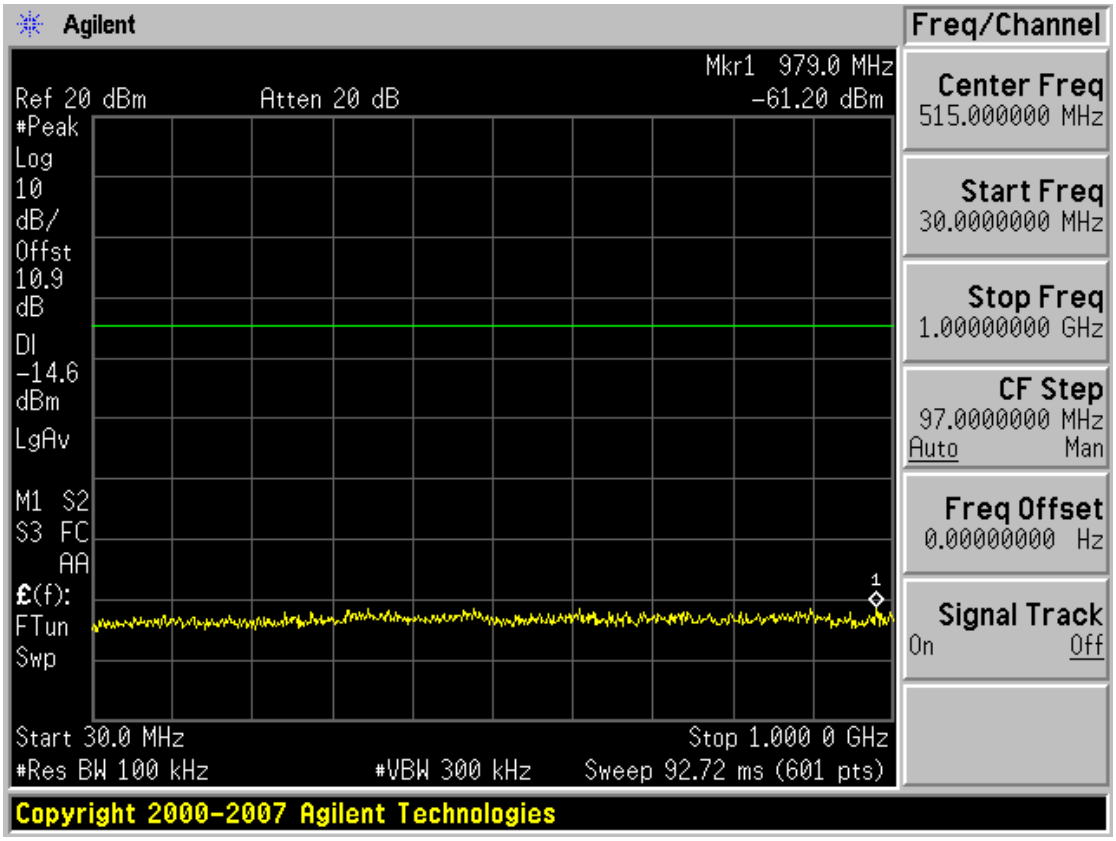
Conducted Spurious Emission (802.11g-CH11)



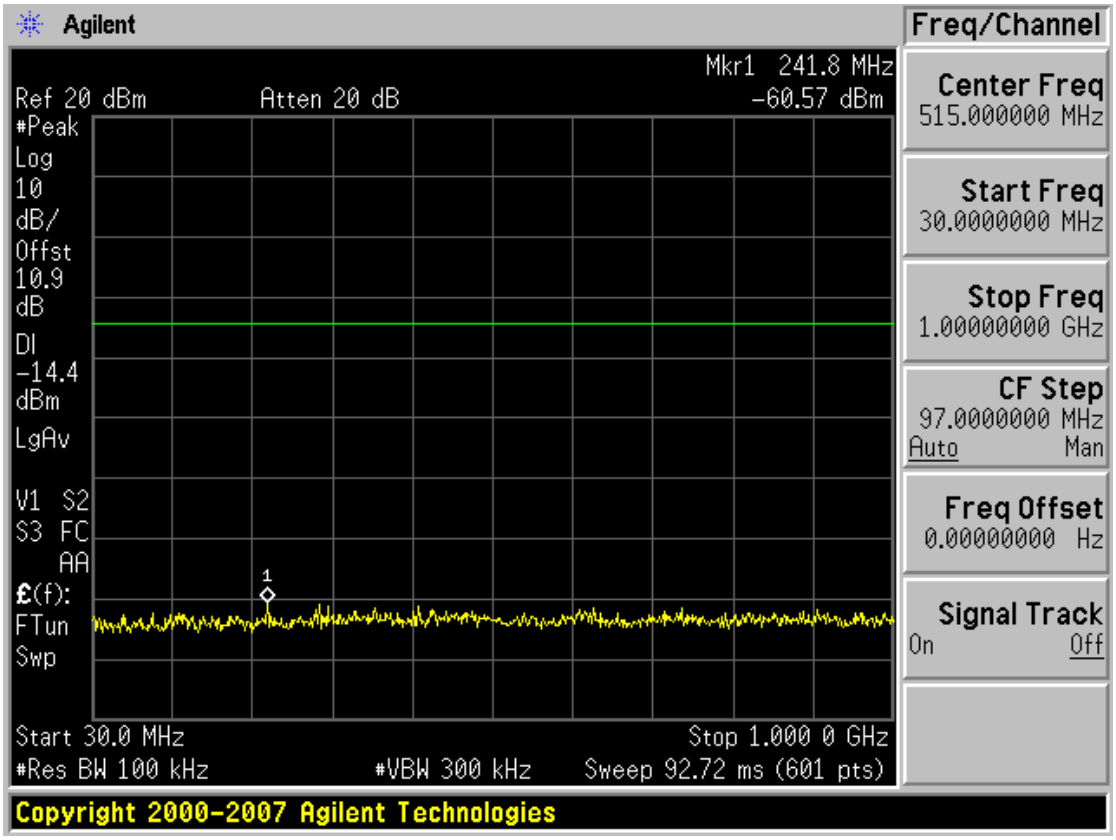
Conducted Spurious Emission (802.11n-CH1)



Conducted Spurious Emission (802.11n-CH6)

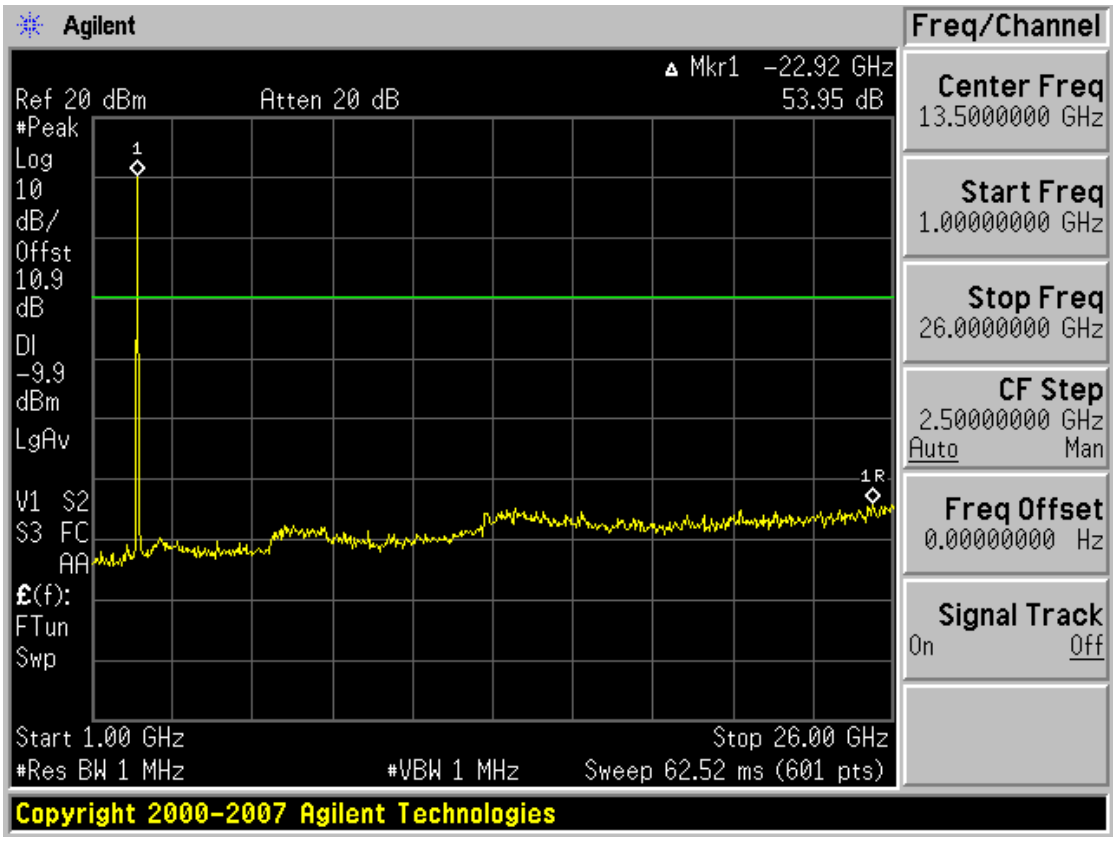


Conducted Spurious Emission (802.11n-CH11)

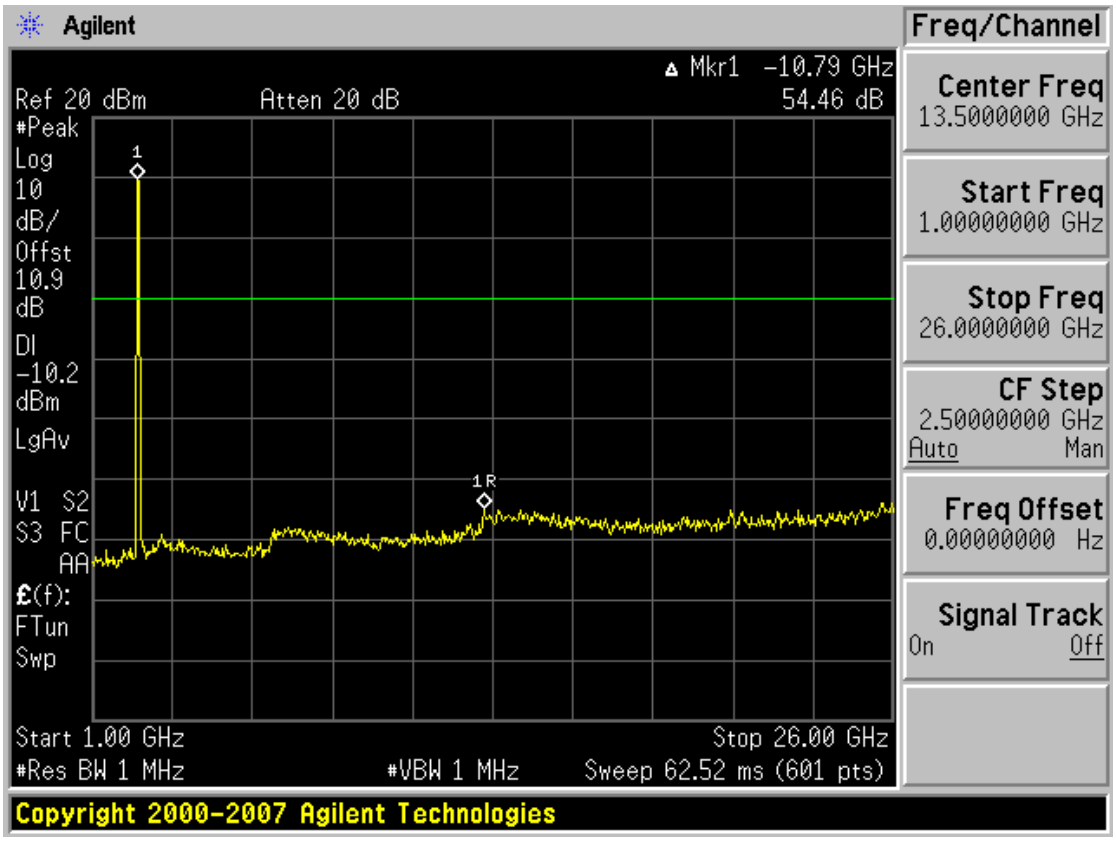


1 GHz ~ 26 GHz

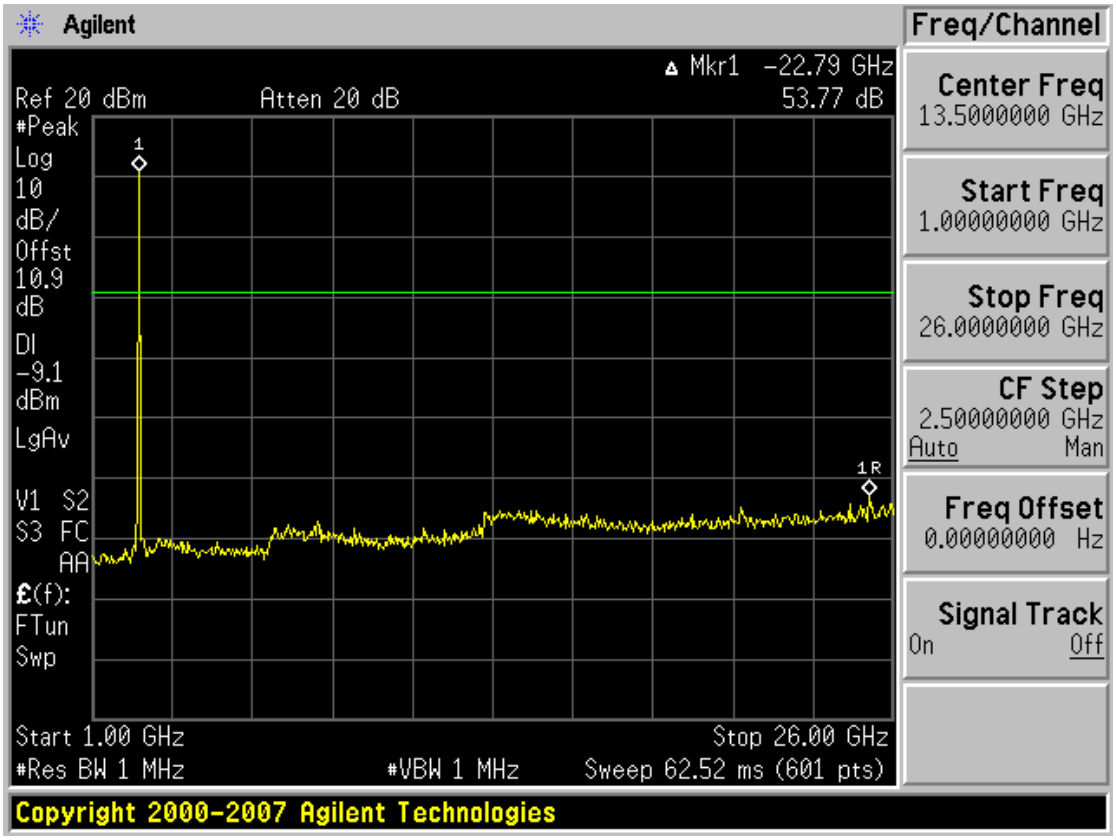
Conducted Spurious Emission (802.11b-CH1)



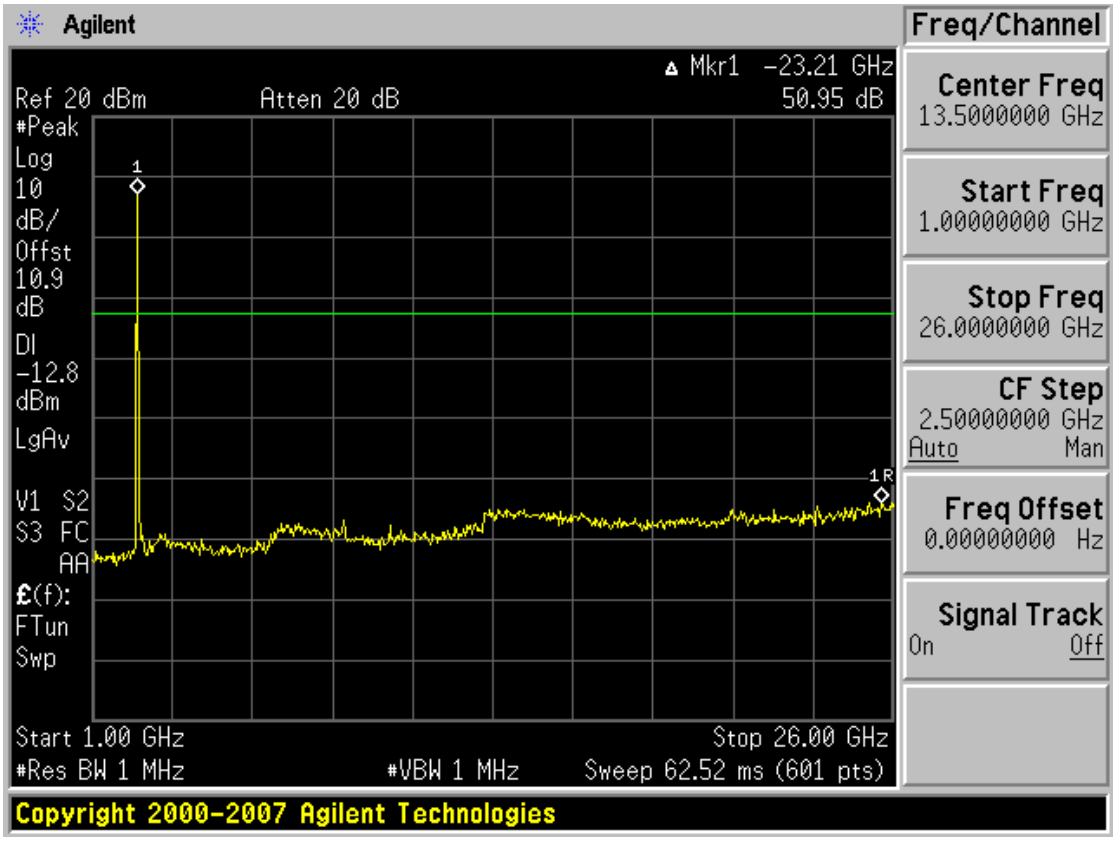
Conducted Spurious Emission (802.11b-CH6)



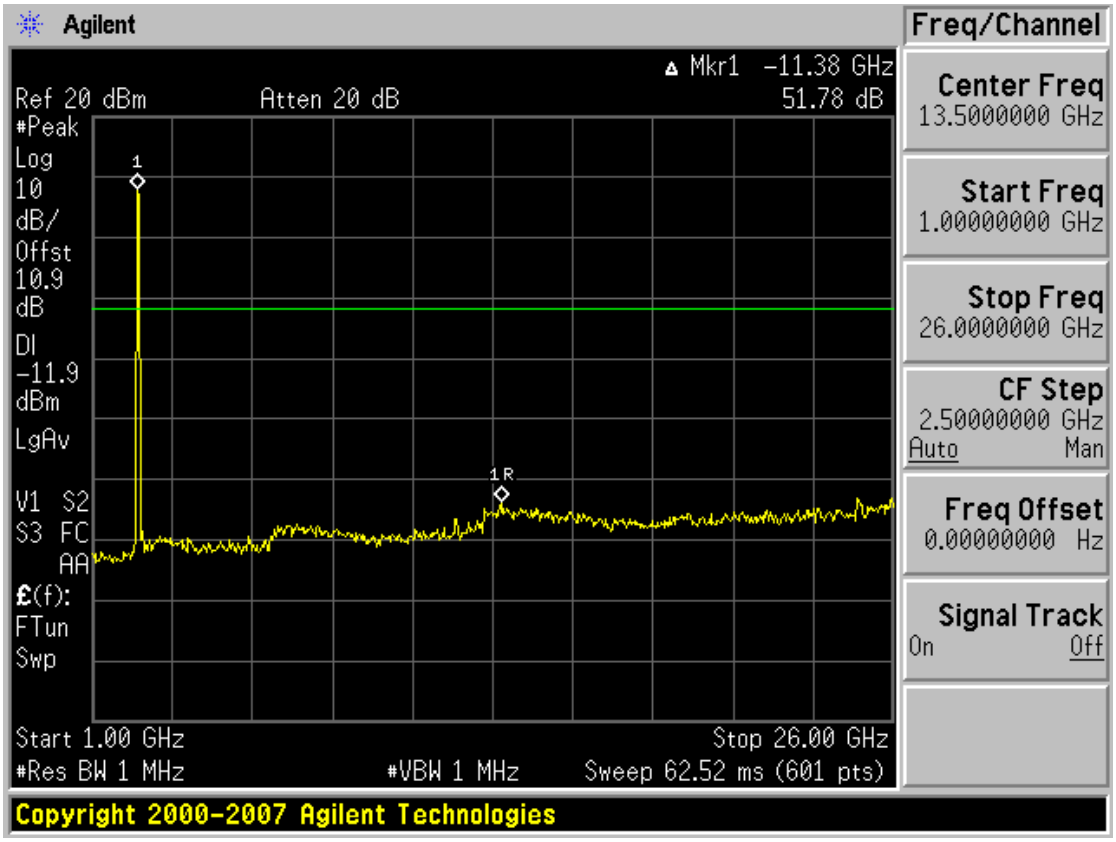
Conducted Spurious Emission (802.11b-CH11)



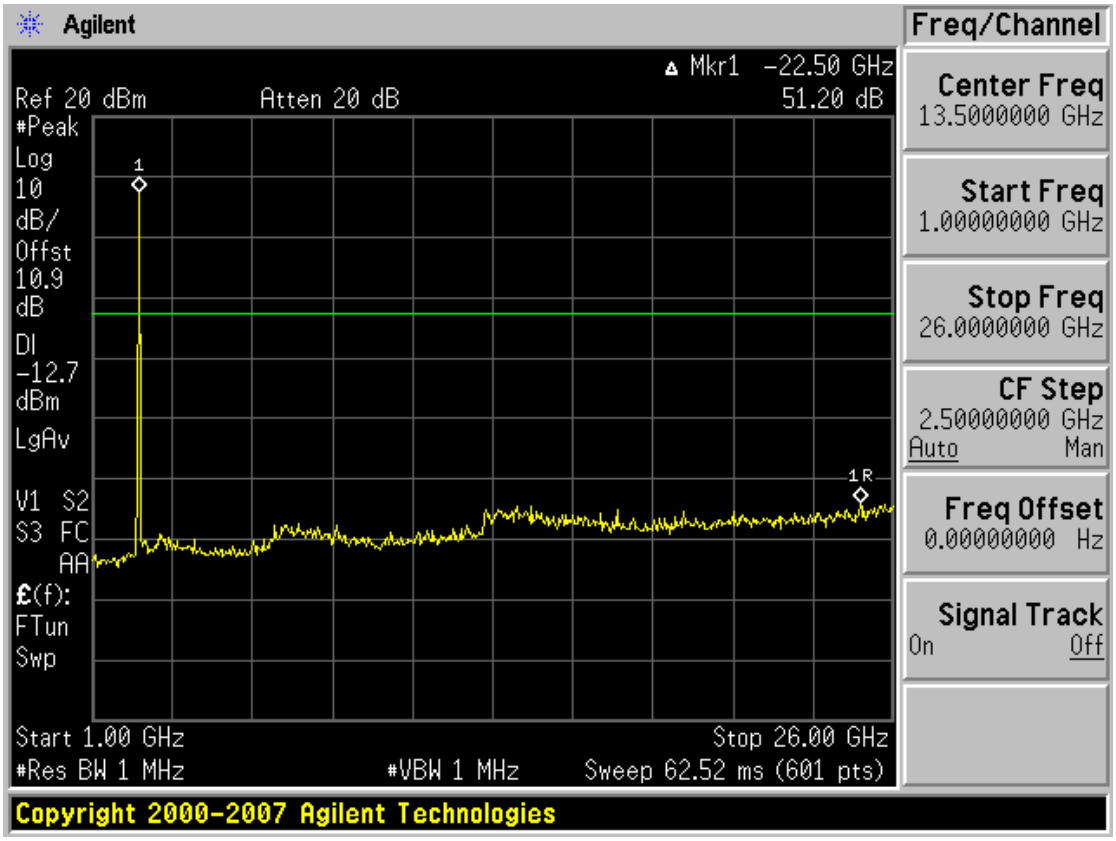
Conducted Spurious Emission (802.11g-CH1)



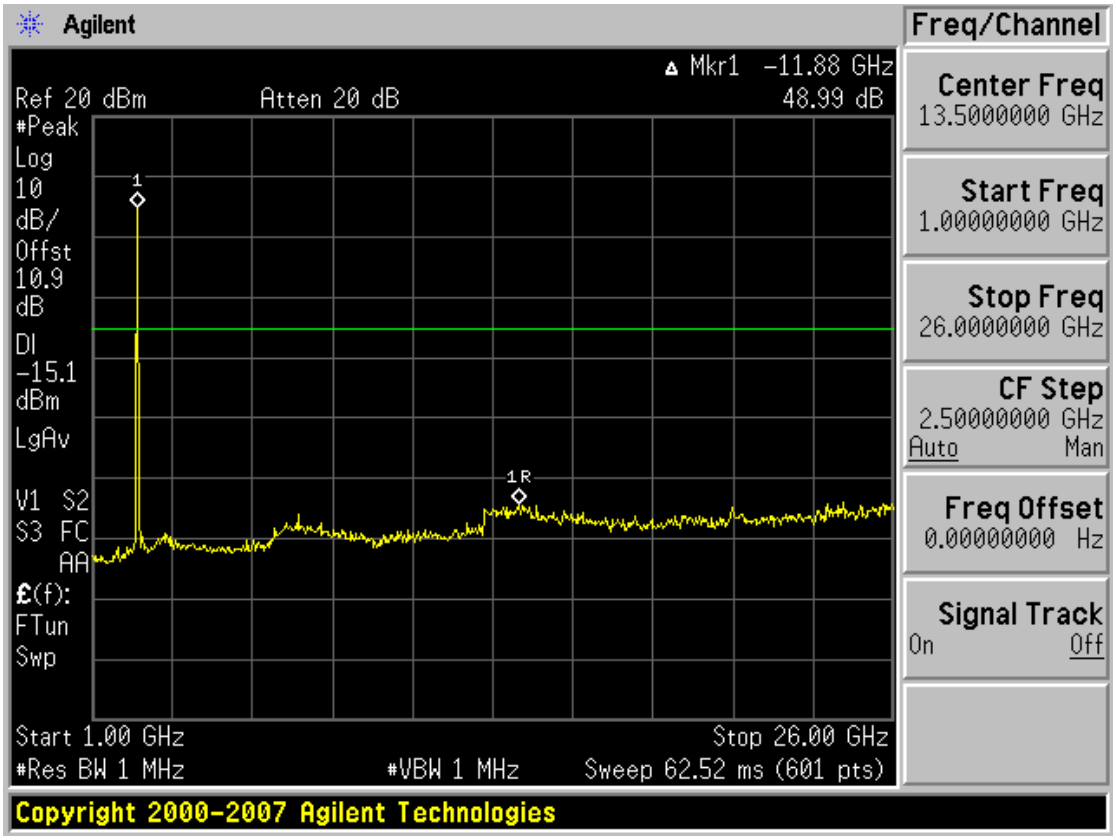
Conducted Spurious Emission (802.11g-CH6)



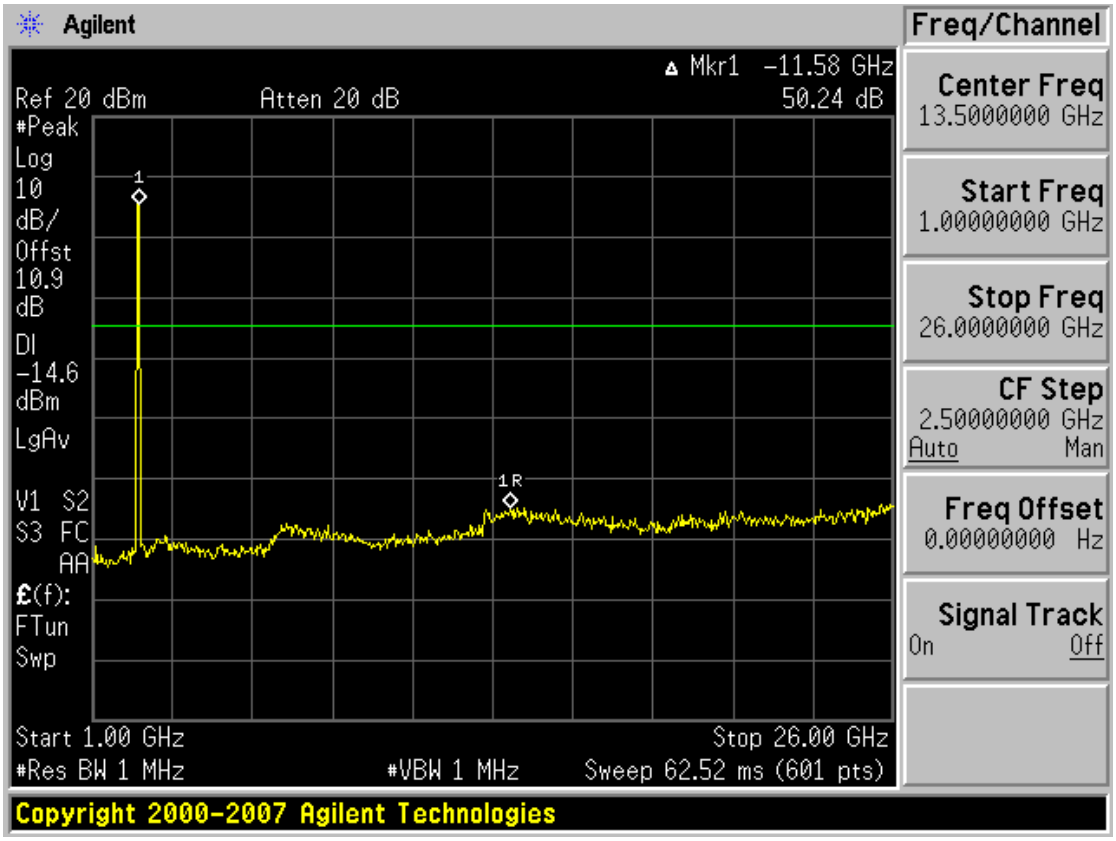
Conducted Spurious Emission (802.11g-CH11)



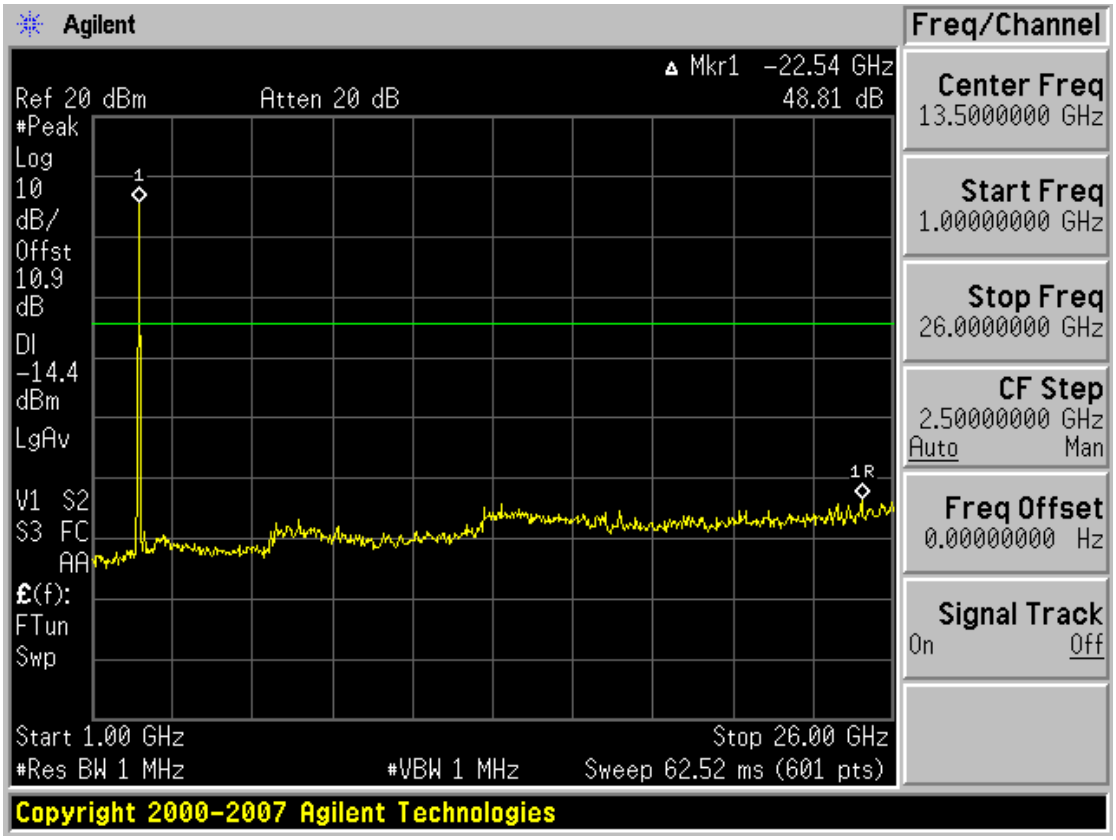
Conducted Spurious Emission (802.11n-CH1)



Conducted Spurious Emission (802.11n-CH6)



Conducted Spurious Emission (802.11n-CH11)



8.5 RADIATED MEASUREMENT.

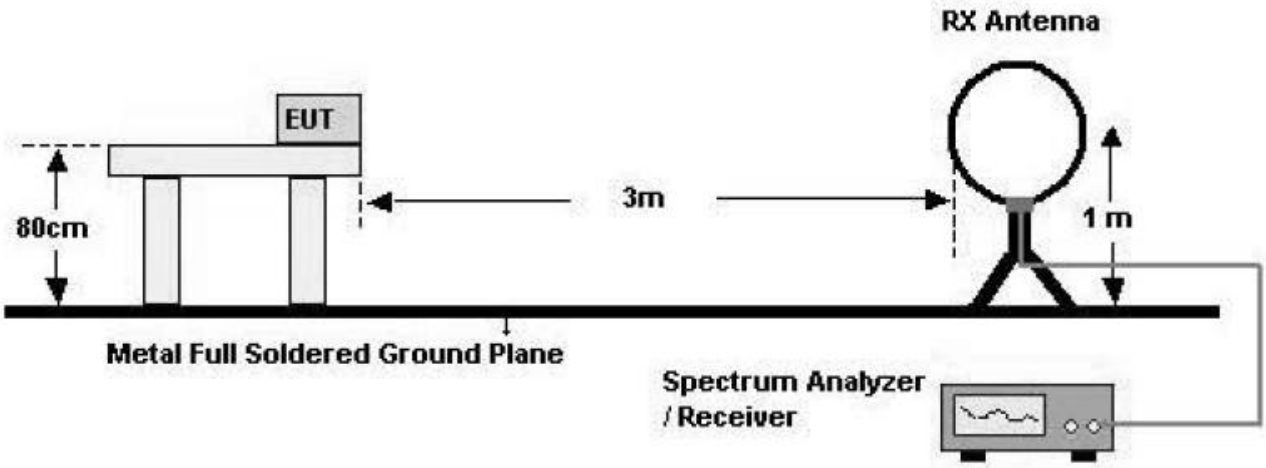
8.5.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209

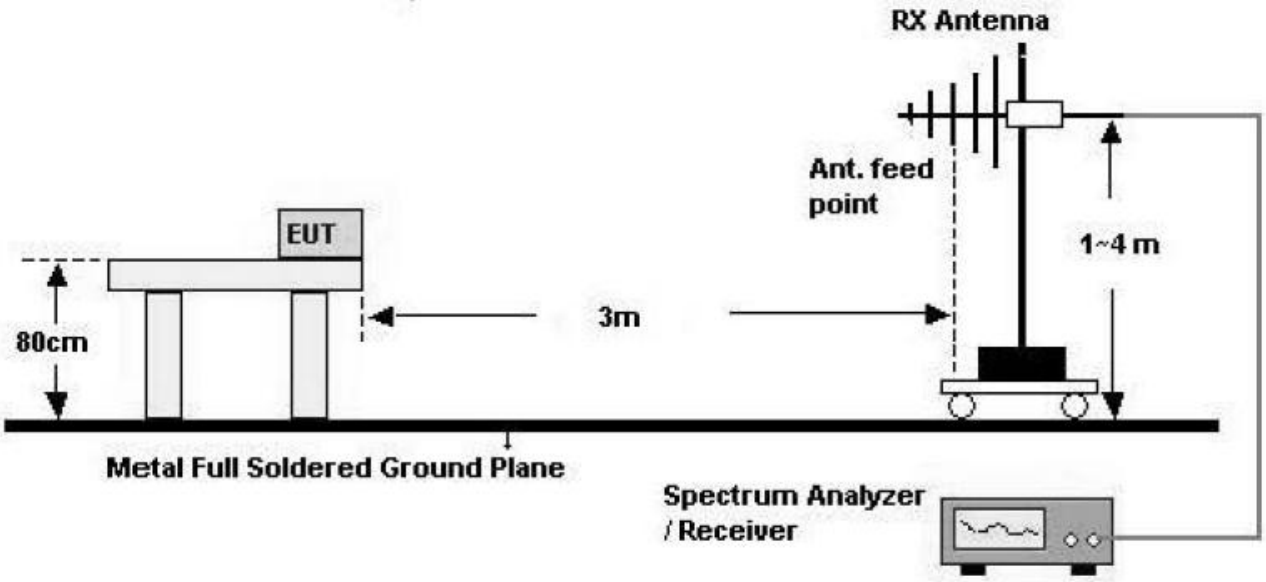
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

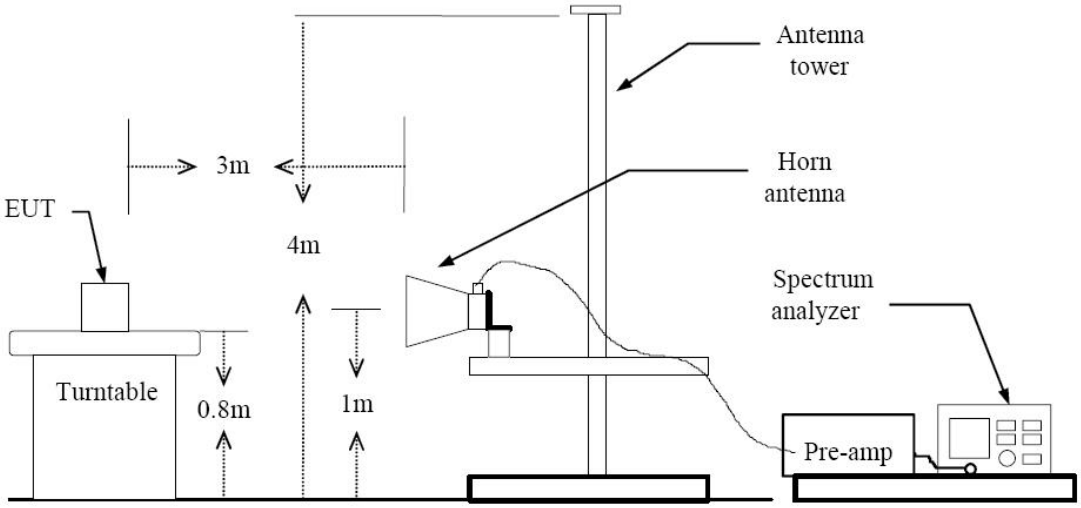
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



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.

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor

TEST RESULTS

Below 1 GHz

Operation Mode: 802.11b Mode (Channel : 11 , Data rate : 11 Mbps)

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
81.0	12.22	9.3	0.9	V	22.4	40.0	17.6
128.1	23.53	11.6	1.1	V	36.3	43.5	7.2
193.4	13.60	10.7	1.4	H	25.7	43.5	17.8
375.2	21.25	10.1	2.1	H	33.4	46.0	12.6
596.8	14.42	19.7	2.8	V	36.9	46.0	9.1
758.0	7.96	21.6	3.1	H	32.7	46.0	13.3

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done 802.11b Mode, 802.11g and 802.11n mode test. Worst case of EUT is 802.11b Mode.

Above 1 GHz

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2412
Channel No.	01 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4824	49.73	-0.10	V	49.63	74	24.37	PK
4824	39.02	-0.10	V	38.92	54	15.08	AV
7236	48.51	10.13	V	58.64	74	15.36	PK
7236	35.48	10.13	V	45.61	54	8.39	AV
4824	49.82	-0.10	H	49.72	74	24.28	PK
4824	37.03	-0.10	H	36.93	54	17.07	AV
7236	47.33	10.13	H	57.46	74	16.54	PK
7236	34.12	10.13	H	44.25	54	9.75	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
5. We have done 802.11b, 802.11g and 802.11n test. Worst case of EUT is 1 Mbps in 802.11b.

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4874	50.31	0.13	V	50.44	74	23.56	PK
4874	38.15	0.13	V	38.28	54	15.72	AV
7311	48.74	10.01	V	58.75	74	15.25	PK
7311	34.95	10.01	V	44.96	54	9.04	AV
4874	49.50	0.13	H	49.63	74	24.37	PK
4874	36.95	0.13	H	37.08	54	16.92	AV
7311	48.07	10.01	H	58.08	74	15.92	PK
7311	34.50	10.01	H	44.51	54	9.49	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
5. We have done 802.11b, 802.11g and 802.11n test. Worst case of EUT is 1 Mbps in 802.11b.

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4924	49.71	0.45	V	50.16	74	23.84	PK
4924	37.85	0.45	V	38.30	54	15.70	AV
7386	47.73	10.17	V	57.90	74	16.10	PK
7386	34.33	10.17	V	44.50	54	9.50	AV
4924	49.18	0.45	H	49.63	74	24.37	PK
4924	36.96	0.45	H	37.41	54	16.59	AV
7386	47.52	10.17	H	57.69	74	16.31	PK
7386	33.94	10.17	H	44.11	54	9.89	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MH.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
5. We have done 802.11b, 802.11g and 802.11n test. Worst case of EUT is 1 Mbps in 802.11b.

8.5.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

Test Requirements and limit, §15.247(d) §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Operation Mode:	802.11 g
Transfer Rate:	6 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2390.0	35.15	33.86	H	69.01	74	4.99	PK
2390.0	17.44	33.86	H	51.30	54	2.70	AV
2390.0	28.70	33.86	V	62.56	74	11.44	PK
2390.0	13.66	33.86	V	47.52	54	6.48	AV
2483.5	32.72	34.02	H	66.74	74	7.26	PK
2483.5	17.24	34.02	H	51.26	54	2.74	AV
2483.5	25.82	34.02	V	59.84	74	14.16	PK
2483.5	11.96	34.02	V	45.98	54	8.02	AV

Notes:

1. Spectrum setting:
   a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
   b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.
2. We have done 802.11b, 802.11g and 802.11n test. Worst case of EUT is 6 Mbps in 802.11g.

8.6 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

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)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

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 attached in Appendix 1 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 groundplane.
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

Conducted Emissions (Line 1)

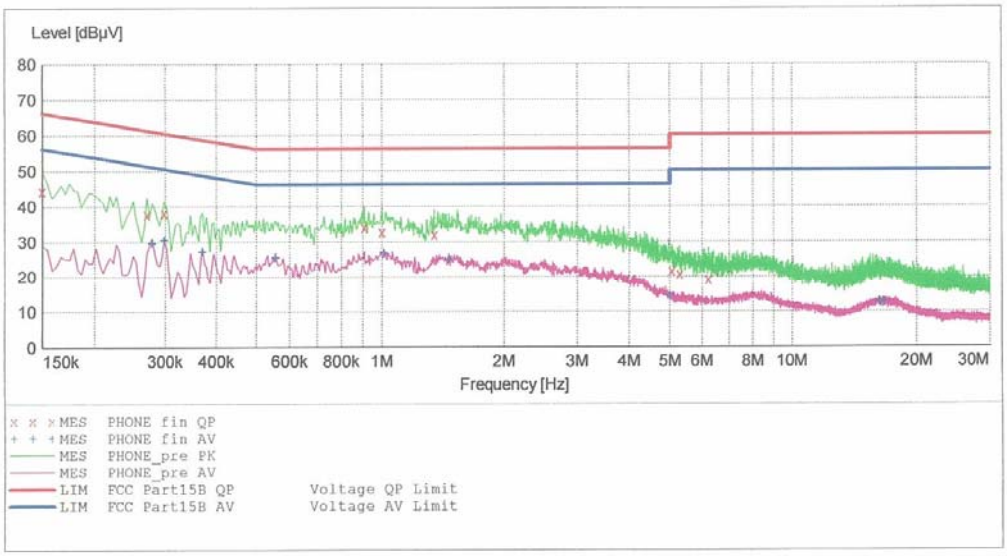
HCT

EMC

```
EUT:                    MS840
Manufacturer:           LG
Operating Condition:    WLAN MODE
Test Site:              SHIELD ROOM
Operator:               JS LEE
Test Specification:     FCC PART15 CLASS B
Comment:                N
```

SCAN TABLE: "FCC PART 15 B(N)"

```
  Short Description:                FCC PART 15 CLASS B
  Start       Stop        Step      Detector  Meas.     IF       Transducer
  Frequency   Frequency   Width               Time      Bandw.
  150.0 kHz   500.0 kHz   4.0 kHz   MaxPeak   10.0 ms   9 kHz    None
                                    Average
  500.0 kHz   5.0 MHz     4.0 kHz   MaxPeak   10.0 ms   9 kHz    None
                                    Average
  5.0 MHz     30.0 MHz    4.0 kHz   MaxPeak   10.0 ms   9 kHz    None
                                    Average
```



MEASUREMENT RESULT: "PHONE_fin QP"

11/22/2011 11:47AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.150010	44.20	10.3	66	21.8	---	---
0.270010	37.50	10.3	61	23.6	---	---
0.298010	38.00	10.3	60	22.3	---	---
0.908000	33.90	10.4	56	22.1	---	---
1.004000	32.50	10.4	56	23.5	---	---
1.348000	31.90	10.4	56	24.1	---	---
5.056000	21.60	10.7	60	38.4	---	---
5.284000	20.70	10.8	60	39.3	---	---
6.224000	19.10	10.9	60	40.9	---	---

Page 1/2 11/22/2011 11:47AM PHONE

MEASUREMENT RESULT: "PHONE_fin AV"

11/22/2011 11:47AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.278010	29.40	10.3	51	21.5	---	---
0.298010	30.20	10.3	50	20.1	---	---
0.370010	27.10	10.3	49	21.4	---	---
0.556000	25.30	10.3	46	20.7	---	---
1.016000	26.70	10.4	46	19.3	---	---
1.468000	24.70	10.4	46	21.3	---	---
5.000000	14.30	10.7	46	31.7	---	---
16.260000	12.50	11.5	50	37.5	---	---
16.672000	12.50	11.5	50	37.5	---	---

Page 2/2 11/22/2011 11:47AM PHONE

Conducted Emissions (Line 2)

HCT

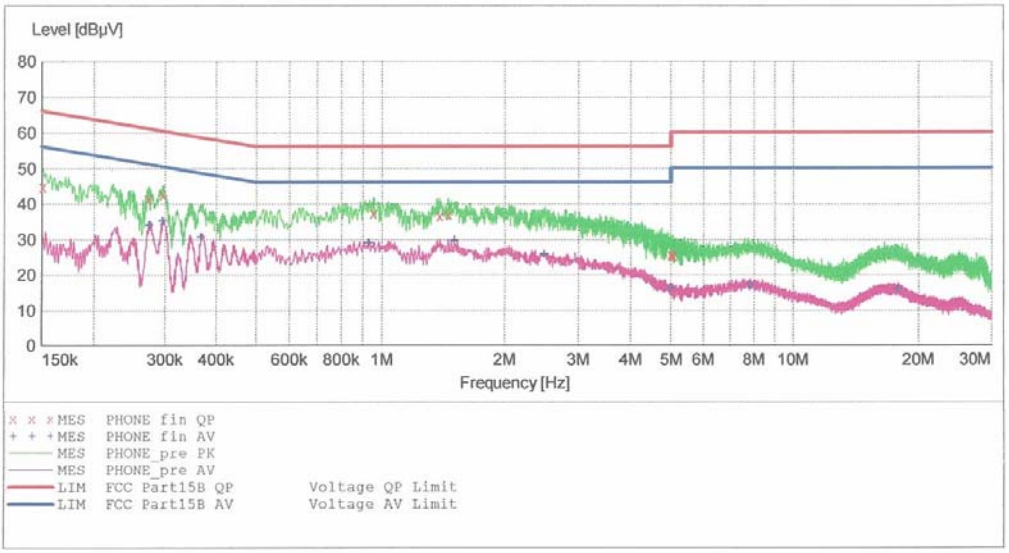
EMC

```
EUT:                    MS840
Manufacturer:           LG
Operating Condition:    WLAN MODE
Test Site:              SHIELD ROOM
Operator:               JS LEE
Test Specification:     FCC PART15 CLASS B
Comment:                H
```

SCAN TABLE: "FCC PART 15 B(H)"

Short Description: FCC PART 15 CLASS B

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	1.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "PHONE_fin QP"

11/22/2011 11:44AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.151010	44.60	10.1	66	21.3	---	---
0.273010	41.50	10.1	61	19.5	---	---
0.296010	42.60	10.1	60	17.8	---	---
0.956000	37.20	10.1	56	18.8	---	---
1.388000	36.50	10.2	56	19.5	---	---
1.460000	36.90	10.2	56	19.1	---	---
5.000000	25.60	10.5	56	30.4	---	---
5.052000	25.40	10.5	60	34.6	---	---
5.060000	25.30	10.5	60	34.7	---	---

Page 1/2 11/22/2011 11:44AM PHONE

MEASUREMENT RESULT: "PHONE_fin AV"

11/22/2011 11:44AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.274010	33.90	10.1	51	17.1	---	---
0.296010	35.00	10.1	50	15.3	---	---
0.367010	30.60	10.1	49	18.0	---	---
0.932000	28.90	10.1	46	17.1	---	---
1.508000	29.50	10.2	46	16.5	---	---
2.488000	25.80	10.2	46	20.2	---	---
5.000000	16.30	10.5	46	29.7	---	---
7.828000	17.20	10.8	50	32.8	---	---
17.872000	15.90	11.7	50	34.1	---	---

Page 2/2 11/22/2011 11:44AM PHONE

9. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Rohde & Schwarz	ESH2-Z5/ LISN	Annual	02/01/2012	861741/013
Schwarzbeck	VULB 9168/ TRILOG Antenna	Biennial	02/09/2013	200
Rohde & Schwarz	ESI 40 / EMI TEST RECEIVER	Annual	05/26/2012	831564103
Agilent	E4440A/ Spectrum Analyzer	Annual	05/02/2012	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	Annual	09/23/2012	MY51110020
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	ESH3-Z2/ PULSE LIMITER	Annual	08/01/2012	375.8810.352
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	Annual	09/19/2012	10094
MITEQ	AFS44-00102650-42-10P-44-PS/ POWER AMP	Annual	09/23/2012	1532439
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	10/17/2013	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	Biennial	10/26/2012	BBHA9170342
Rohde & Schwarz	FSP / Spectrum Analyzer	Annual	03/23/2012	839117/011
Agilent	E4440A / Spectrum Analyzer	Annual	05/02/2012	US45303008
Agilent	E4416A /Power Meter	Annual	11/07/2012	GB41291412
Agilent	E9327A /POWER SENSOR	Annual	05/02/2012	MY4442009
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	05/02/2012	1
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	Annual	05/02/2012	1
Hewlett Packard	11636B/Power Divider	Annual	11/07/2012	11377
Hewlett Packard	11667B / Power Splitter	Annual	11/04/2012	10126
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	01/04/2012	3110117
ITECH	IT6720 / DC POWER SUPPLY	Annual	11/07/2012	010002156287001199
TESCOM	TC-3000C / BLUETOOTH TESTER	Annual	04/01/2012	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	Annual	05/02/2012	100422
EMCO	6502.LOOP ANTENNA	Biennial	01/13/2012	9009-2536