

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Product Name:** WLAN 11n Router**Brand Name:** CC&C**Model No.:** WA-6212**Model Difference:** N/A**FCC ID:** PANWA6212**Report No.:** ER/2012/10002**Issue Date:** Jan. 19, 2012**FCC Rule Part:** §15.247, Cat: DTS**Prepared for:** CC&C Technologies, Inc.**8F, No. 150, Jian Yi Road, Zhonghe District,  
New Taipei City, Taiwan 235, R.O.C.****Prepared by:** SGS Taiwan Ltd.**Electronics & Communication Laboratory  
No. 134, Wu Kung Rd., Wuku Industrial  
Zone, Taipei County, Taiwan**

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## VERIFICATION OF COMPLIANCE

**Applicant:** CC&C Technologies, Inc.  
8F, No. 150, Jian Yi Road, Zhonghe District, New Taipei City, Taiwan  
235, R.O.C.

**Product Name:** WLAN 11n Router

**FCC ID:** PANWA6212

**Brand Name:** CC&C

**Model No.:** WA-6212

**Model Difference:** N/A

**File Number:** ER/2011/10002

**Date of test:** Jan. 02, 2012 ~ Jan. 18, 2012

**Date of EUT Received:** Jan. 02, 2012

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.247.

The test results of this report relate only to the tested sample identified in this report.

*Test By:*



*Date*

Jan. 19, 2012

*Lion Wang / Engineer*

*Prepared By:*

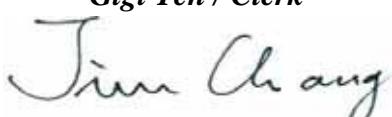


*Date*

Jan. 19, 2012

*Gigi Yeh / Clerk*

*Approved By:*



*Date*

Jan. 19, 2012

*Jim Chang / Supervisor*

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## Version

Version No.	Date	Description
00	Jan. 19, 2012	Initial creation of document

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## 1 GENERAL INFORMATION

### 1.1 Product Description

#### General:

Product Name:	WLAN 11n Router
Brand Name:	CC&C
Model No.:	WA-6212
Model Difference:	N/A
Hardware Version:	289G129704-B0
Software Version:	00-029700-01[F/W,WA-6212]
Power Supply:	5V from AC/DC adapter, model: DSC-6PFC-05FUS, Supplier: DVE

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**WLAN: 802.11 b/g/n**

Frequency Range:	802.11b / g / n_20MHz: 2412 – 2462 MHz 802.11 n_40MHz: 2422 – 2452 MHz
Channel number:	802.11b / g / n_20MHz: 11 channels 802.11 n_40MHz: 9 channels
Max. Output Power:	802.11 b: 20.09 dBm (Peak) 802.11 g: 18.25 dBm (Peak) 802.11 n_20MHz: 13.23dBm (Peak) 802.11 n_40MHz: 13.57dBm (Peak) 802.11 n_20MHz(MIMO): 16.04dBm (Peak) 802.11 n_40MHz(MIMO): 16.40dBm (Peak)
Modulation Technology:	DSSS, OFDM
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 7.2 – 144.4Mbps 802.11 n_40MHz: 15 – 300Mbps
Antenna Spec:	2.4G Dipole Antenna 30G000036-00 Antenna 80mm: 2 dBi 30G000025-07 Antenna 140mm: 2 dBi
Antenna Designation:	2.4G Dipole Antenna 2dBi+10log(2)=5.01 dBi
Type of Emission:	802.11 b : 15M0G1D 802.11 g : 16M5G1D 802.11 n_20MHz : 17M7G1D 802.11 n_40MHz : 36M0G1D

This report applies for WLAN.

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

This submittal(s) (test report) is intended for **FCC ID: PANWA6212** filing to comply with Section 15.247 of the FCC Part 15, Subpart E Rules.

## 1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Jan 2012 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

## 1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 & 10 meters) and FCC Registration Number: 94644.

## 1.5 Special Accessories

Not available for this EUT intended for grant.

## 1.6 Equipment Modifications

Not available for this EUT intended for grant.

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## 2 SYSTEM TEST CONFIGURATION

### 2.1 EUT Configuration

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

### 2.2 EUT Exercise

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

#### 2.3.2 Radiated Emissions

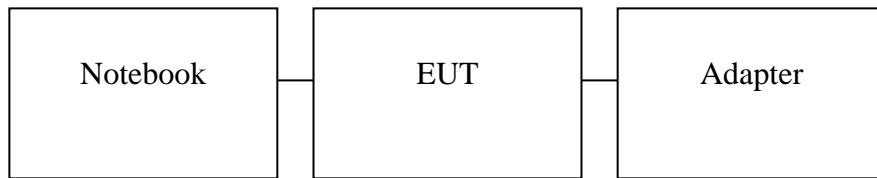
The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to 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 and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

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## 2.4 Configuration of Tested System

Fig. 2-1 AC Power line and Radiated Emission Configuration



**Table 2-1 Equipment Used in Tested System**

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	DELL	E5400	3704625136	Shielded	Un-shielded
2.	AC Adapter	DVE	DSC-5PFC-05FUS	N/A	N/A	180cm, Un-shielded

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### 3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3),(4)(c)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Bandwidth	Compliant
§15.247(d)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.247(d)	Spurious Emission	Compliant
§15.247(e)	Peak Power Density	Compliant
§15.203	Antenna Requirement	Compliant

### 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.

802.11 b mode: Channel low (2412MHz), mid (2437MHz) and high (2462MHz) with 1Mbps data rate are chosen for above testing.

802.11 g mode: Channel low (2412MHz), mid (2437MHz) and high (2462MHz) with 6Mbps data rate are chosen for above testing.

802.11 n\_20MHz mode: Channel low (2412MHz), mid (2437MHz) and high (2462MHz) with 6.5Mbps data rate are chosen for above testing.

802.11 n mode(40M): Channel low (2422MHz) 、 mid (2437MHz) and high (2452MHz) with 13.5 Mbps data rate are chosen for conducted power testing.

In comparison with which EUT deposits on the surface of turned table. The X plane is found to be the worst case.

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## 5 CONDUCTED EMISSION TEST

### 5.1 Standard Applicable:

According to §15.207, frequency range within 150KHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	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

Note

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 5.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
LISN	Rolf-Heine	NNB-2/16Z	99012	03/31/2011	03/30/2012
LISN	FCC	FCC-LISN-50/250- 25-2-01	04034	03/31/2011	03/30/2012
Coaxial Cables	N/A	WK CE Cable	N/A	01/04/2011	01/05/2013

### 5.3 EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2003.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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#### 5.4 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

#### 5.5 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Note: Refer to next page for measurement data and plots.

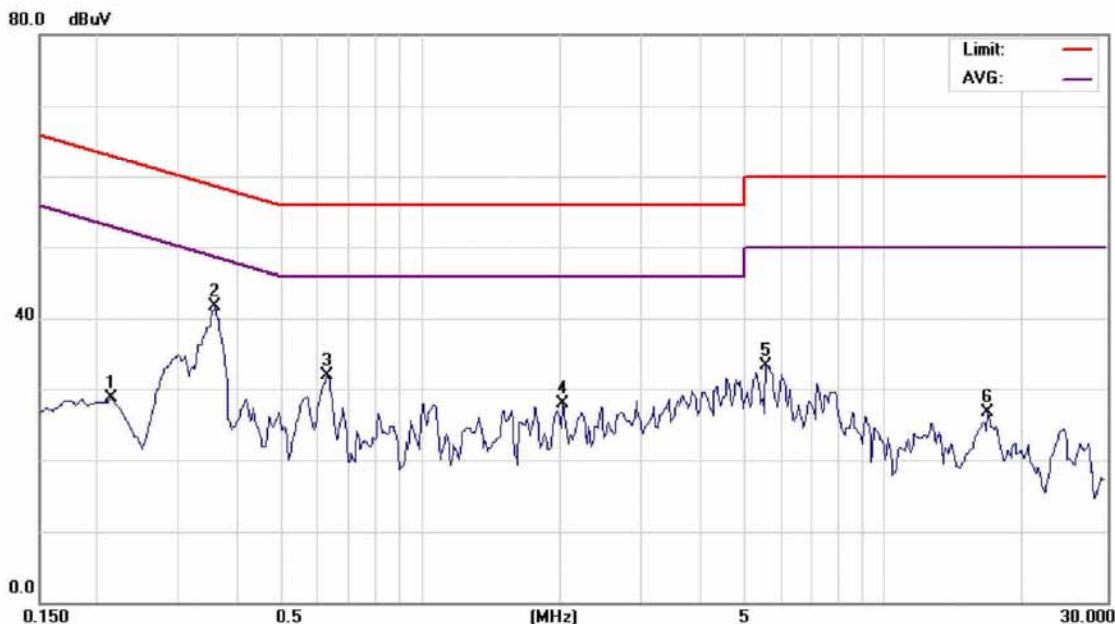
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Normal mode	Test Date:	Jul. 28, 2011
Temperature:	23	Humidity:	58%

### Conducted Emission Measurement



Site: SGS CONDUCTED #1	Phase: <b>L1</b>	Temperature: 26 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 59%
EUT: WLAN 11n Router	Distance:	Air Pressure: hPa
M/N: WA-6212		
Note: WLANLINK		

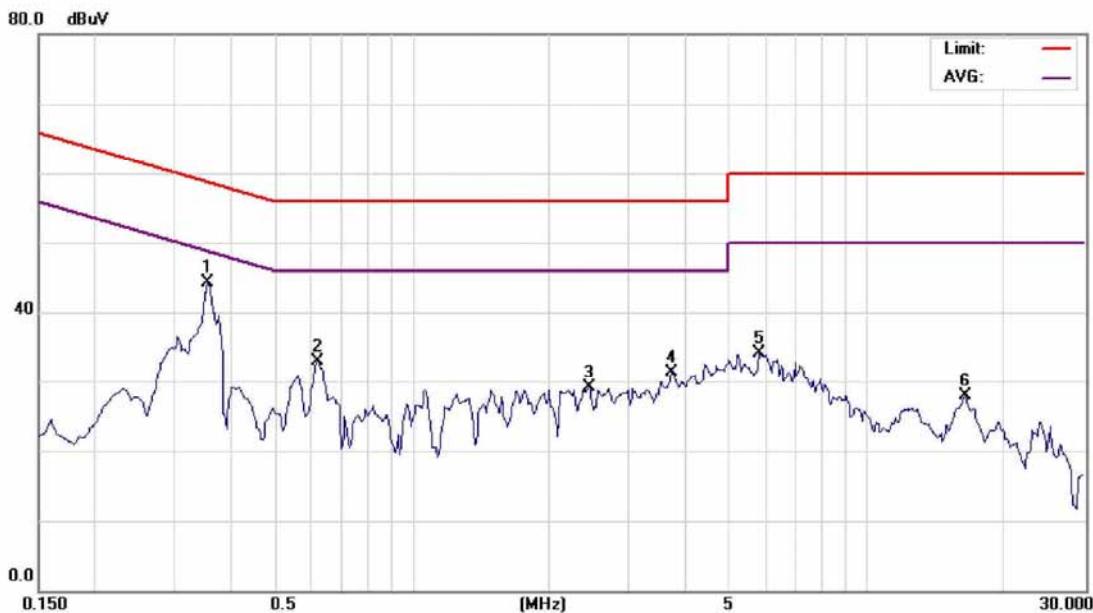
No.	Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		
							dB	Detector	Comment
1		0.2150	28.56	0.09	28.65	63.01	-34.36	peak	
2 *		0.3600	41.58	0.08	41.66	58.73	-17.07	peak	
3		0.6300	31.80	0.08	31.88	56.00	-24.12	peak	
4		2.0300	27.86	0.10	27.96	56.00	-28.04	peak	
5		5.5800	33.19	0.14	33.33	60.00	-26.67	peak	
6		16.7800	26.54	0.23	26.77	60.00	-33.23	peak	

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## Conducted Emission Measurement



Site: SGS CONDUCTED #1  
 Phase: **N**  
 Temperature: 26 °C  
 Limit: FCC Class B Conduction(QP)  
 Power: AC 120V/60Hz  
 Humidity: 59%  
 EUT: WLAN 11n Router  
 Distance:  
 Air Pressure: hPa  
 M/N: WA-6212  
 Note: WLANLINK

No.	Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		
							dB	Detector	Comment
MHz		dBuV		dB	dBuV				
1	*	0.3550	44.12	0.12	44.24	58.84	-14.60	peak	
2		0.6200	32.82	0.12	32.94	56.00	-23.06	peak	
3		2.4600	28.88	0.13	29.01	56.00	-26.99	peak	
4		3.7300	31.06	0.16	31.22	56.00	-24.78	peak	
5		5.8200	33.84	0.17	34.01	60.00	-25.99	peak	
6		16.5400	27.68	0.28	27.96	60.00	-32.04	peak	

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## 6 PEAK OUTPUT POWER MEASUREMENT

### 6.1 Standard Applicable:

According to §15.247(a)(2), (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

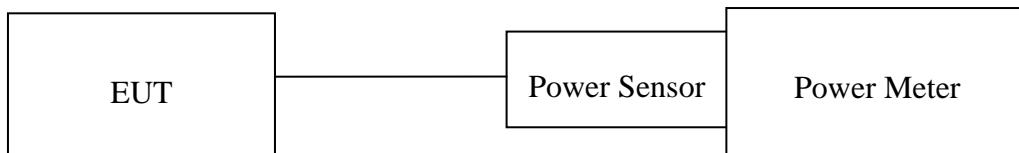
(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

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**6.2 Measurement Equipment Used:**

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Sensor	Anritsu	ML2495A	1005007	02/08/2012	02/07/2014
Power Meter	Anritsu	MA2411B	917032	02/08/2012	02/07/2014
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
Spectrum Analyzer	Agilent	E4440A	MY45304525	01/25/2011	01/24/2013
DC Block	Agilent	BLK-18	155452	07/05/2012	07/04/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S6W5	001	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W5	001	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S20W5	001	01/05/2012	01/04/2013
Splitter	Agilent	11636B	N/A	01/05/2012	01/04/2013

**6.3 Test Set-up:**

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#### 6.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

\* Please be noted that the unit to be shown on the following tables is dBm.

*Note: For MIMO operation, directional gain and limit are subject to be varied as per 15.247 c)1)i), and RSS-210 A8.4 4)5)*

*Due to correlation of two transmitting signal antenna, directional gain = Gain + 10 Log (N) dBi is used in determination of total power being transmitting while MIMO mode is enabled.*

*For the measurement of MIMO operation complying with the conducted bandedge test item, Aux with 3dB offset on HT\_20 and main with 3dB offset on HT\_40 is measured out, and its corresponding resultant plot is captured, respectively. Following the higher emission generated by respective port while signal is being transmitted singularly, 3dB offset with higher value yields worsen and representative data. While measuring HT\_20 at single transmission of Aux port, Aux is observed and test out to obtain worsen outcome. Likewise, HT\_40 at Main results the worsen data while undertaking single transmission, and therefore offset 3dB would results worsen emission.*

*Note: Following “measure and add 10 Log (N)” as per KDB 662911 by adding 10 Log (N) on spectrum to measure the conducted emission at MIMO mode.*

*Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.*

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## 6.5 Measurement Result:

### 802.11b

Cable loss = 0		Peak Power Output				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	19.90	19.75	19.83	19.73	1 Watt = 30 dBm
6	2437	20.03	20.02	20.01	19.98	1 Watt = 30 dBm
11	2462	20.09	20.06	20.02	20.00	1 Watt = 30 dBm

### 802.11b

Cable loss = 0		Average Power Output				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	17.35	17.33	17.19	17.1	1 Watt = 30 dBm
6	2437	17.53	17.49	17.4	17.37	1 Watt = 30 dBm
11	2462	17.46	17.4	17.33	17.27	1 Watt = 30 dBm

### 802.11g

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	17.77	17.73	17.65	17.44	17.37	17.25	17.2	17.14	1 Watt = 30 dBm
6	2437	18.05	18	17.92	17.76	17.72	17.63	17.59	17.54	1 Watt = 30 dBm
11	2462	18.25	18.2	18.23	18.11	18.02	17.91	17.86	17.8	1 Watt = 30 dBm

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**802.11g**

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	14.59	14.58	14.57	14.55	14.54	14.52	14.5	14.47	1 Watt = 30 dBm
6	2437	14.69	14.65	14.63	14.61	14.57	14.53	14.5	14.48	1 Watt = 30 dBm
11	2462	14.93	14.86	14.83	14.76	14.67	14.6	14.54	14.5	1 Watt = 30 dBm

**802.11n\_20M (Aux)**

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2412	13.23	13.20	13.15	13.11	13.06	13.02	12.97	12.93	1 Watt = 30 dBm
6	2437	12.75	12.71	12.66	12.60	12.55	12.51	12.47	12.43	1 Watt = 30 dBm
11	2462	12.22	12.20	12.15	12.13	12.10	12.00	11.94	11.89	1 Watt = 30 dBm

**802.11n\_20M (Aux)**

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2412	9.53	9.50	9.46	9.40	9.34	9.30	9.28	9.24	1 Watt = 30 dBm
6	2437	9.19	9.15	9.13	9.10	9.06	9.03	9.00	8.96	1 Watt = 30 dBm
11	2462	8.57	8.55	8.50	8.49	8.47	8.43	8.40	8.36	1 Watt = 30 dBm

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**802.11n\_20M (Main)**

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2412	12.81	12.75	12.67	12.65	12.64	12.60	12.57	12.55	1 Watt = 30 dBm
6	2437	12.96	12.90	12.84	12.82	12.79	12.75	12.71	12.68	1 Watt = 30 dBm
11	2462	12.95	12.90	12.88	12.84	12.80	12.79	12.77	12.74	1 Watt = 30 dBm

**802.11n\_20M (Main)**

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2412	9.60	9.57	9.55	9.51	9.47	9.44	9.40	9.36	1 Watt = 30 dBm
6	2437	9.68	9.66	9.60	9.58	9.52	9.48	9.43	9.40	1 Watt = 30 dBm
11	2462	9.54	9.50	9.48	9.46	9.43	9.40	9.36	9.34	1 Watt = 30 dBm

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**802.11n\_40M (Aux)**

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2422	13.57	13.55	13.53	13.50	13.46	13.45	13.41	13.37	1 Watt = 30 dBm
6	2437	13.33	13.30	13.26	13.21	13.20	13.16	13.13	13.11	1 Watt = 30 dBm
11	2452	12.95	12.90	12.88	12.87	12.84	12.80	12.76	12.71	1 Watt = 30 dBm

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		180	240	270	300					
1	2422	13.35	13.33	13.30	13.26					1 Watt = 30 dBm
6	2437	13.08	13.05	13.03	13.00					1 Watt = 30 dBm
11	2452	12.68	12.65	12.60	12.56					1 Watt = 30 dBm

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**802.11n\_40M (Aux)**

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2422	10.11	10.08	10.02	10.00	9.94	9.90	9.85	9.81	1 Watt = 30 dBm
6	2437	9.87	9.84	9.80	9.77	9.73	9.70	9.63	9.60	1 Watt = 30 dBm
11	2452	9.39	9.35	9.31	9.28	9.26	9.21	9.19	9.14	1 Watt = 30 dBm

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		180	240	270	300					
1	2422	9.74	9.70	9.65	9.60					1 Watt = 30 dBm
6	2437	9.55	9.52	9.47	9.43					1 Watt = 30 dBm
11	2452	9.10	9.06	9.03	9.00					1 Watt = 30 dBm

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**802.11n\_40M (Main)**

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2422	13.21	13.18	13.13	13.10	13.06	13.02	13.00	12.97	1 Watt = 30 dBm
6	2437	13.30	13.25	13.21	13.17	13.14	13.11	13.08	13.04	1 Watt = 30 dBm
11	2452	13.35	13.31	13.28	13.24	13.22	13.19	13.15	13.11	1 Watt = 30 dBm

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		180	240	270	300					
1	2422	12.93	12.90	12.88	12.84					1 Watt = 30 dBm
6	2437	13.01	12.97	12.93	12.90					1 Watt = 30 dBm
11	2452	13.07	13.01	12.97	12.91					1 Watt = 30 dBm

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**802.11n\_40M (Main)**

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		15	30	45	60	90	120	135	150	
1	2422	10.05	10.01	9.97	9.91	9.86	9.81	9.79	9.75	1 Watt = 30 dBm
6	2437	9.94	9.90	9.88	9.84	9.82	9.79	9.75	9.71	1 Watt = 30 dBm
11	2452	9.94	9.91	9.89	9.82	9.80	9.77	9.73	9.70	1 Watt = 30 dBm

Cable loss = 0		Average Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		180	240	270	300					
1	2422	9.73	9.70	9.66	9.61					1 Watt = 30 dBm
6	2437	9.68	9.66	9.60	9.57					1 Watt = 30 dBm
11	2452	9.66	9.65	9.61	9.55					1 Watt = 30 dBm

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**802.11n HT20 Mode 6.5M data rate (MIMO Mode)**

Frequency (MHz)	Reading Power (dBm)			Output Power (W)			Limit (W)
	Chain 0	Chain 1	Combine	Chain 0	Chain 1	Combine	
2412.00	13.23	12.81	16.04	0.02104	0.01910	0.04018	0.79
2437.00	12.75	12.96	15.87	0.01884	0.01977	0.03864	0.79
2462.00	12.22	12.95	15.61	0.01667	0.01667	0.03639	0.79

**802.11n HT40 Mode 15M data rate (MIMO Mode)**

Frequency (MHz)	Reading Power (dBm)			Output Power (W)			Limit (W)
	Chain 0	Chain 1	Combine	Chain 0	Chain 1	Combine	
2422.00	13.57	13.21	16.40	0.02275	0.02094	0.04365	0.79
2437.00	13.33	13.30	16.33	0.02153	0.02138	0.04295	0.79
2452.00	12.95	13.35	16.16	0.01972	0.02163	0.00100	0.79

**802.11n HT20 Mode 6.5M data rate (MIMO Mode)**

Frequency (MHz)	Output Power					Limit (W)
	Chain 0	Chain 1	Combine	EIRP (dBm)	EIRP (W)	
2412.00	13.23	12.81	16.04	18.24	0.06668	4
2437.00	12.75	12.96	15.87	17.97	0.06266	4
2462.00	12.22	12.95	15.61	17.96	0.06252	4

**802.11n HT40 Mode 15M data rate (MIMO Mode)**

Frequency (MHz)	Output Power					Limit (W)
	Chain 0	Chain 1	Combine	EIRP (dBm)	EIRP (W)	
2422.00	13.57	13.21	16.40	18.58	0.07211	4
2437.00	13.33	13.30	16.33	18.34	0.06823	4
2452.00	12.95	13.35	16.16	18.36	0.06855	4

Note: Antenna Gain:  $2 \text{ dBi} + 10 \log (2) = 5.01 \text{ dBi}$

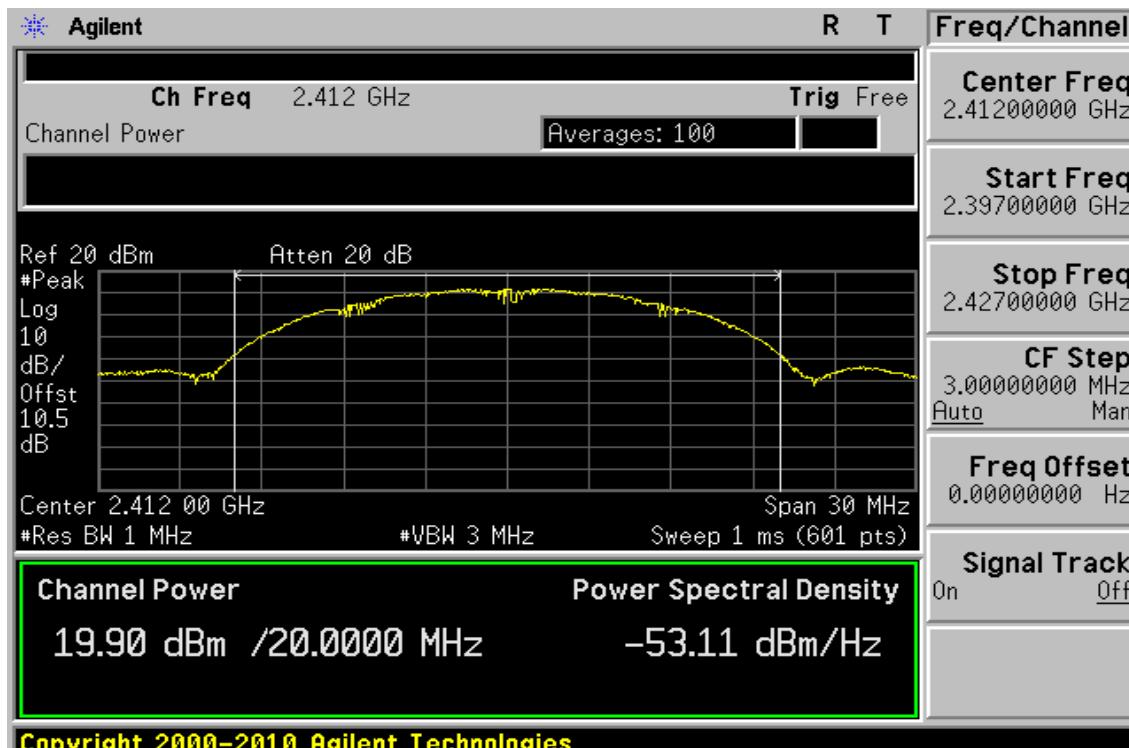
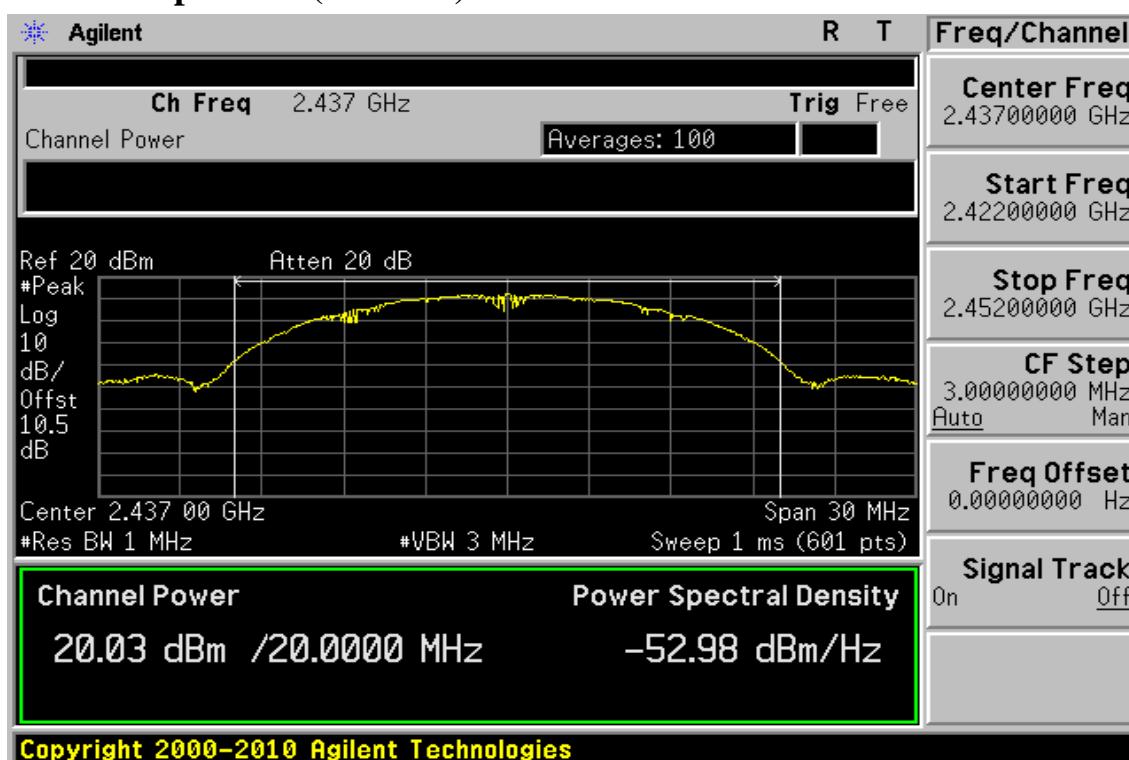
FCC Limit:  $(30 \text{ dB} - (5.01 - 6 \text{ dBi})) = 29.01 \text{ dB} = 0.796 \text{ W}$  (applies for MIMO mode as above table)

RSS Limit: 4W (applies for MIMO mode as above table)

Note: Refer to next page for plots.

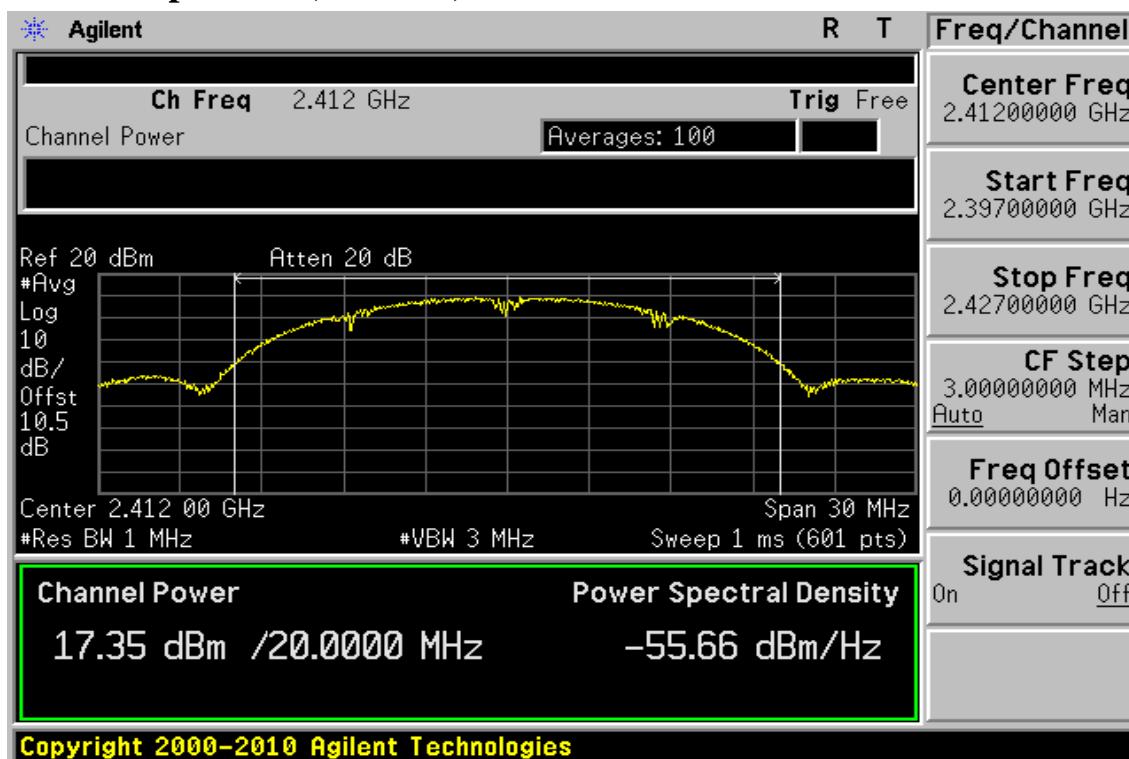
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**802.11b, 1Mbps****Peak Power Output Plot (CH Low)****Peak Power Output Plot (CH Mid)**

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**Peak Power Output Plot (CH High)****Avg. Power Output Plot (CH Low)**

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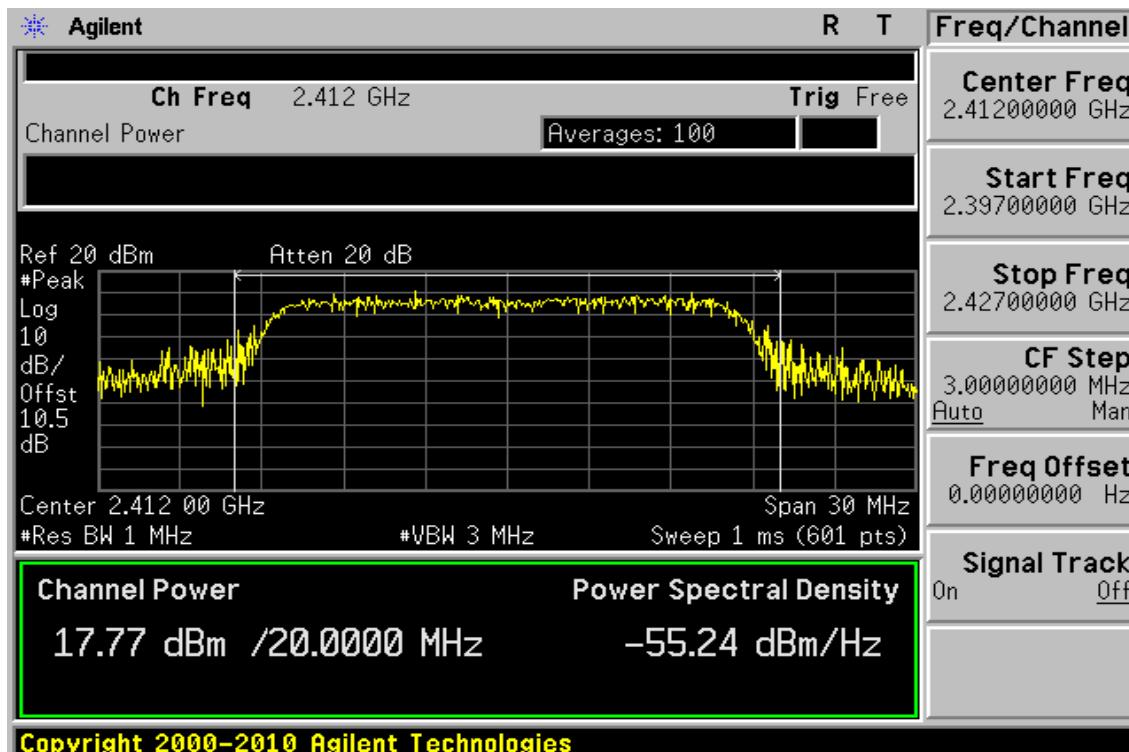
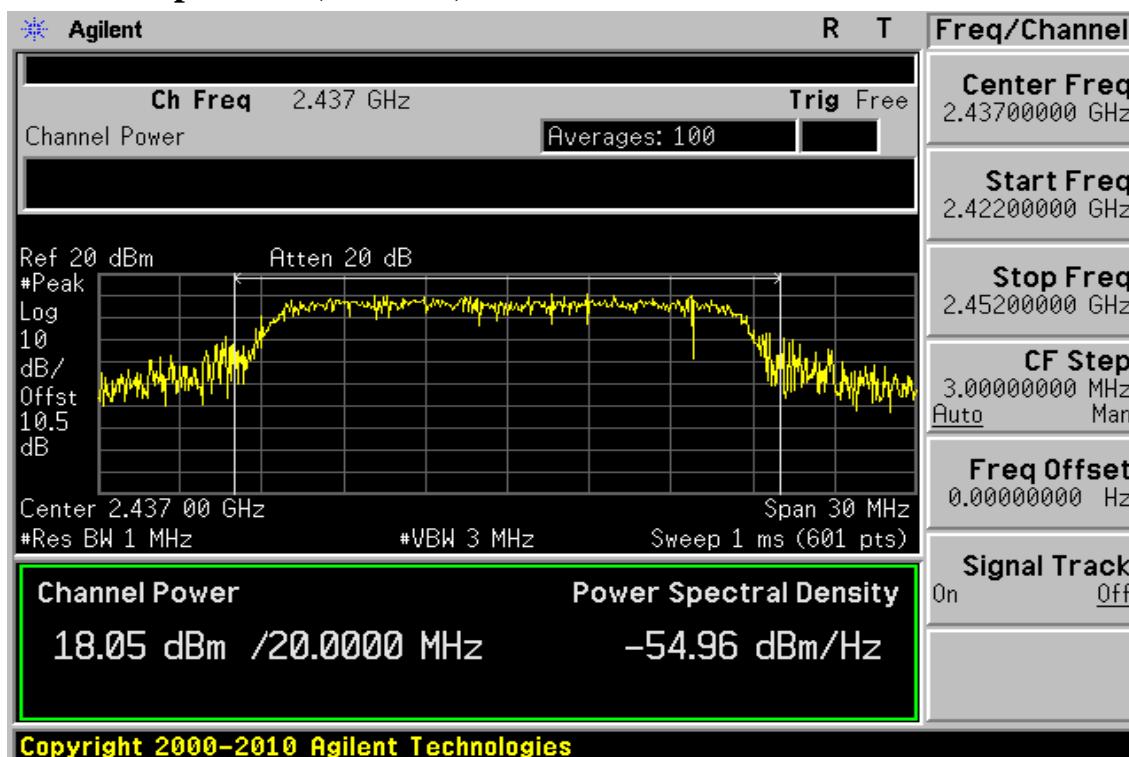
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**Avg. Power Output Plot (CH Mid)****Avg. Power Output Plot (CH High)**

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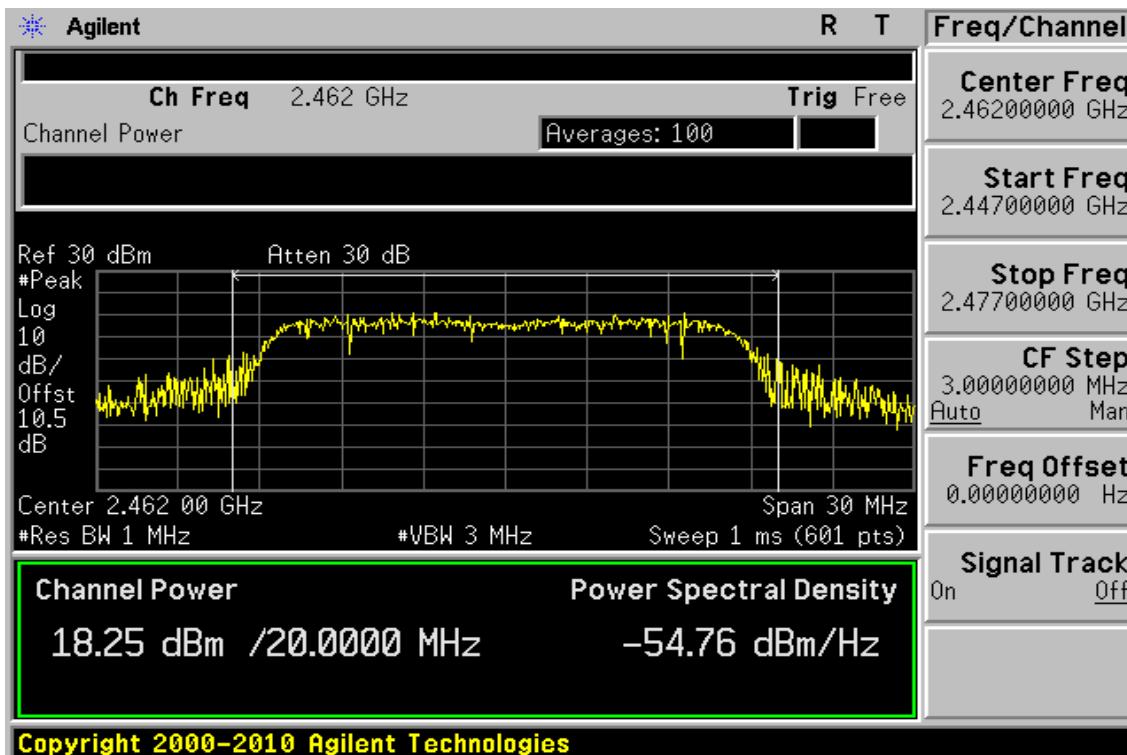
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**802.11g, 6Mbps****Peak Power Output Plot (CH Low)****Peak Power Output Plot (CH Mid)**

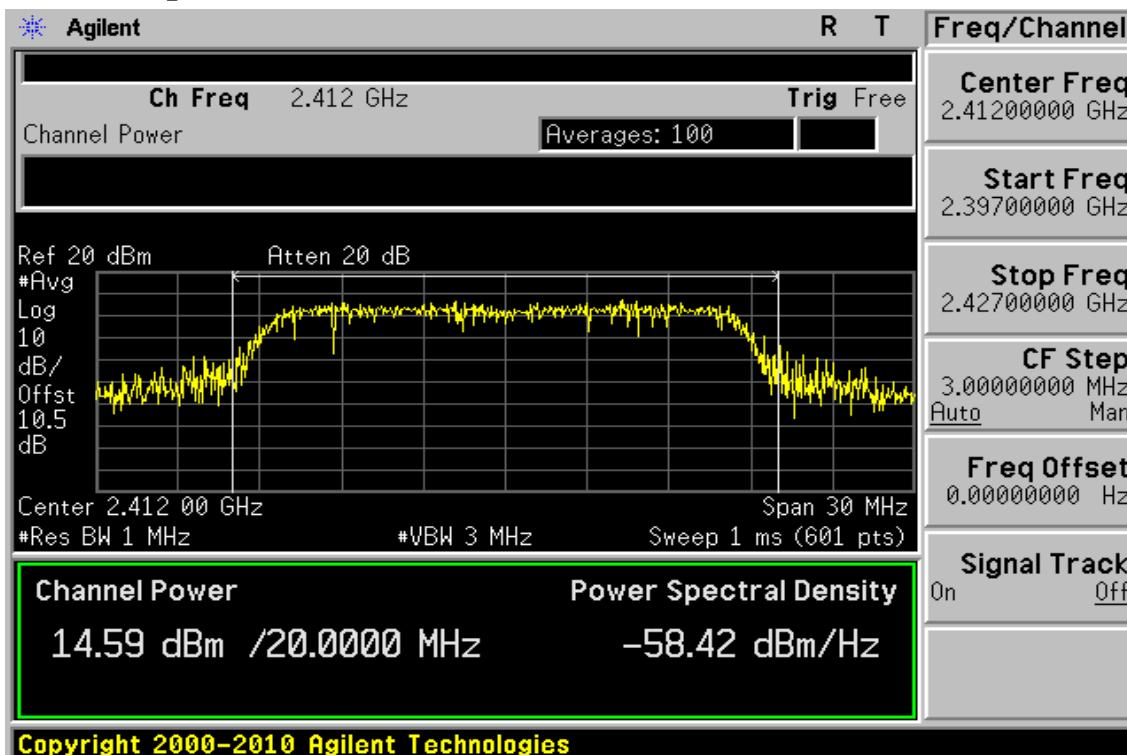
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## Peak Power Output Plot (CH High)

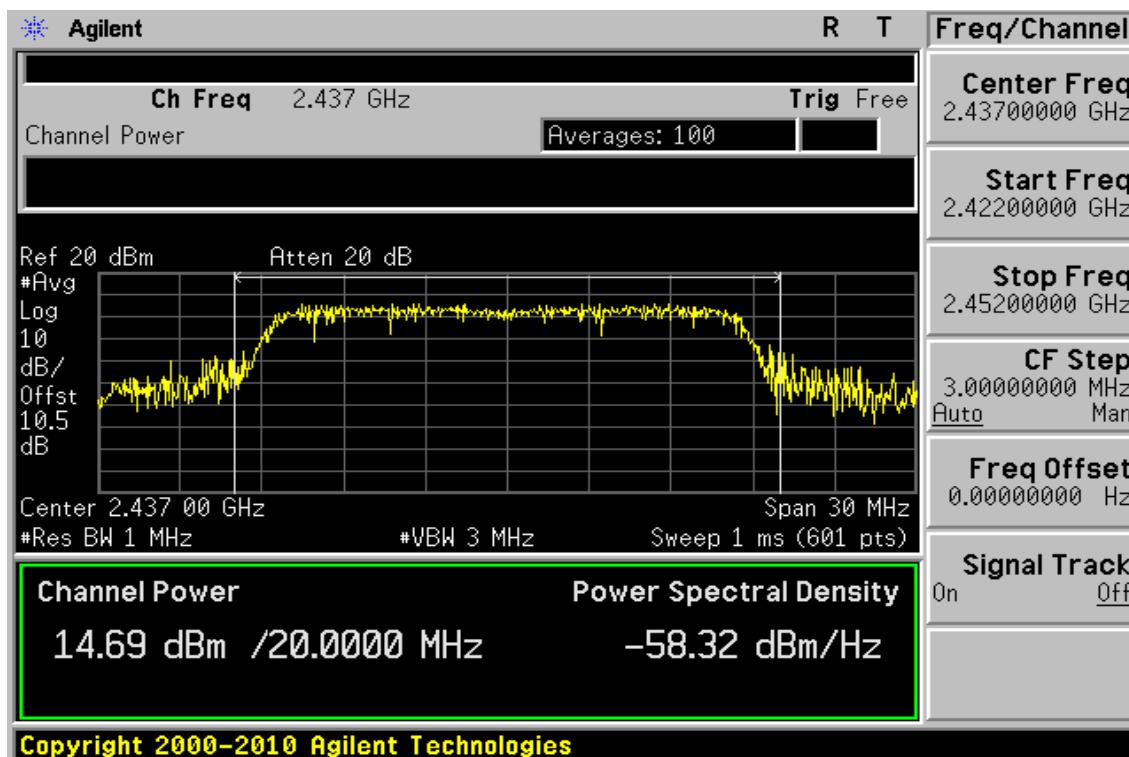
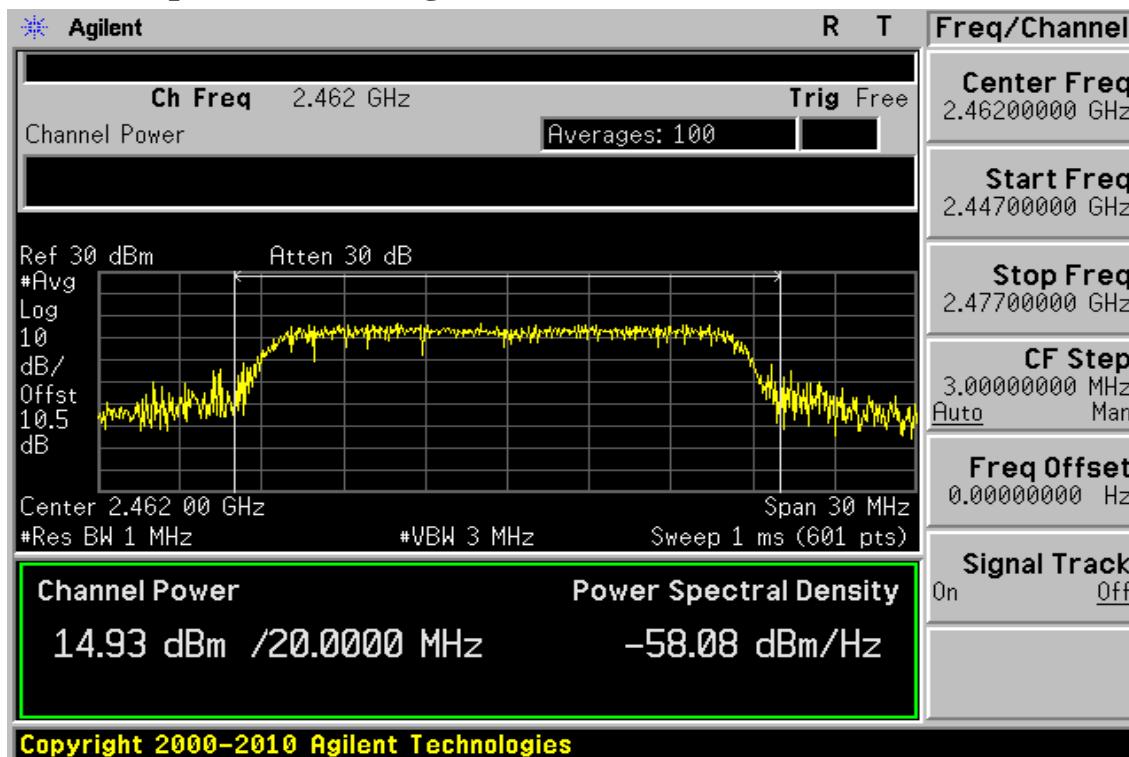


### Avg. Power Output Plot (CH Low)



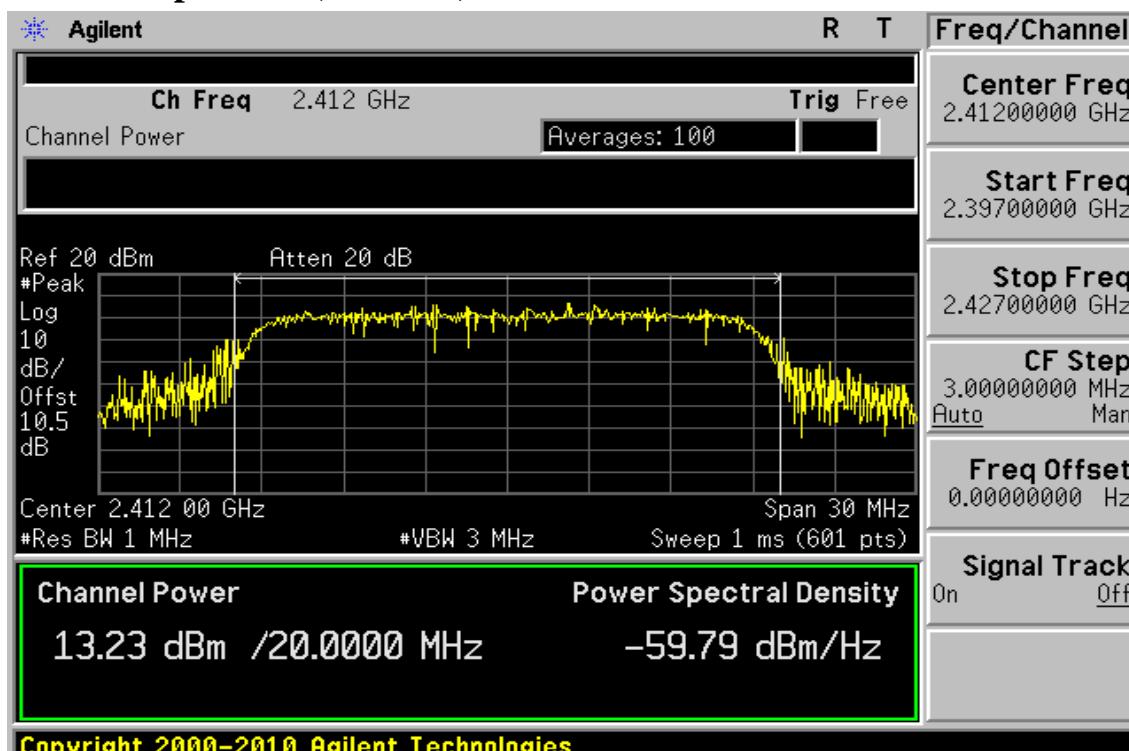
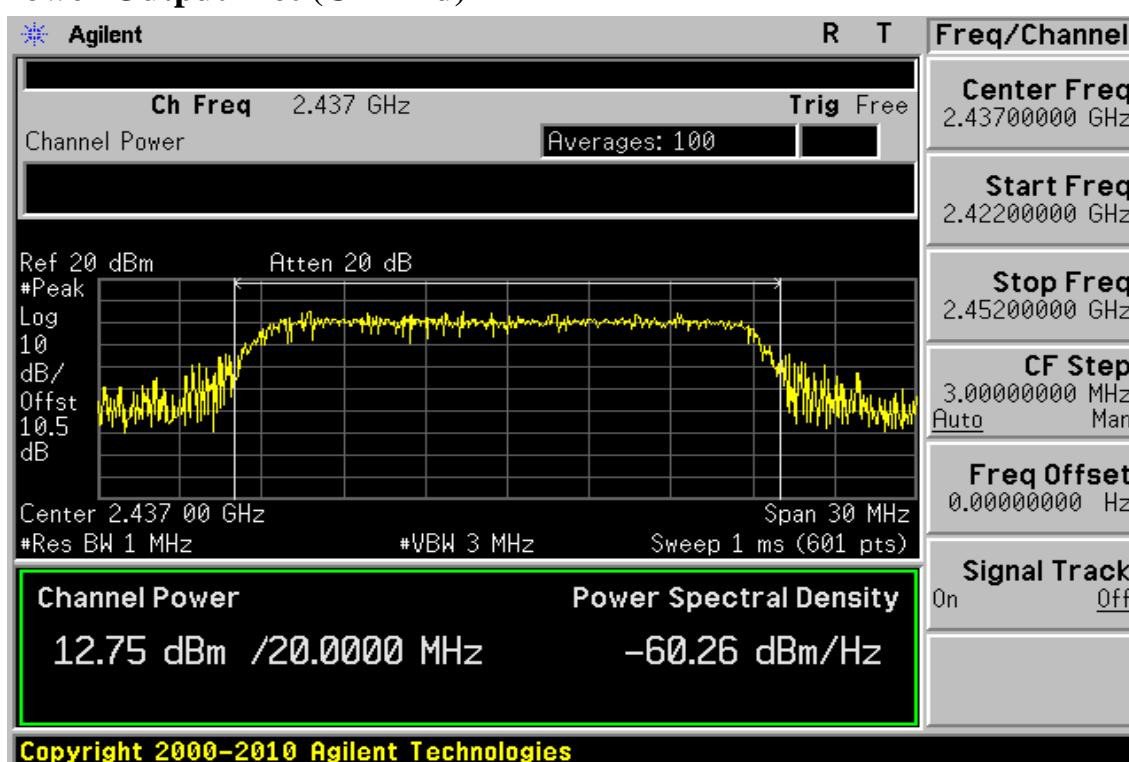
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**Avg. Power Output Plot (CH Mid)****Avg. Power Output Plot (CH High)**

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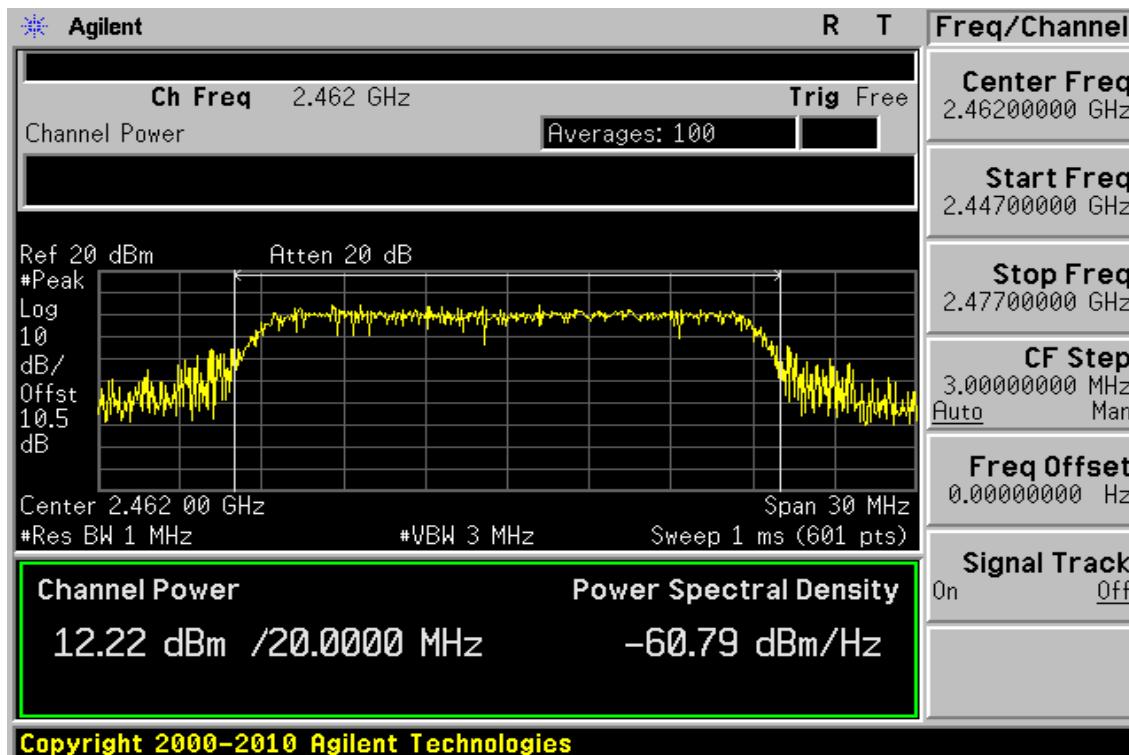
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**802.11n\_20M, 6.5Mbps (Aux)****Peak Power Output Plot (CH Low)****Peak Power Output Plot (CH Mid)**

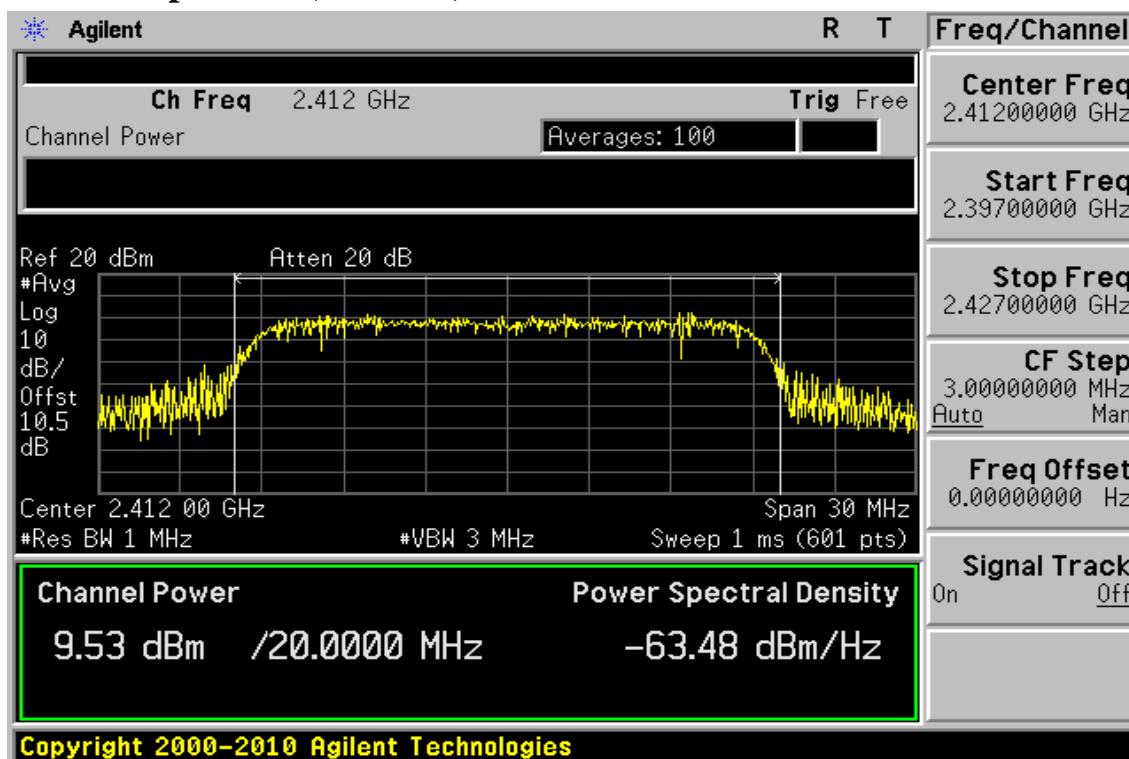
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## Peak Power Output Plot (CH High)

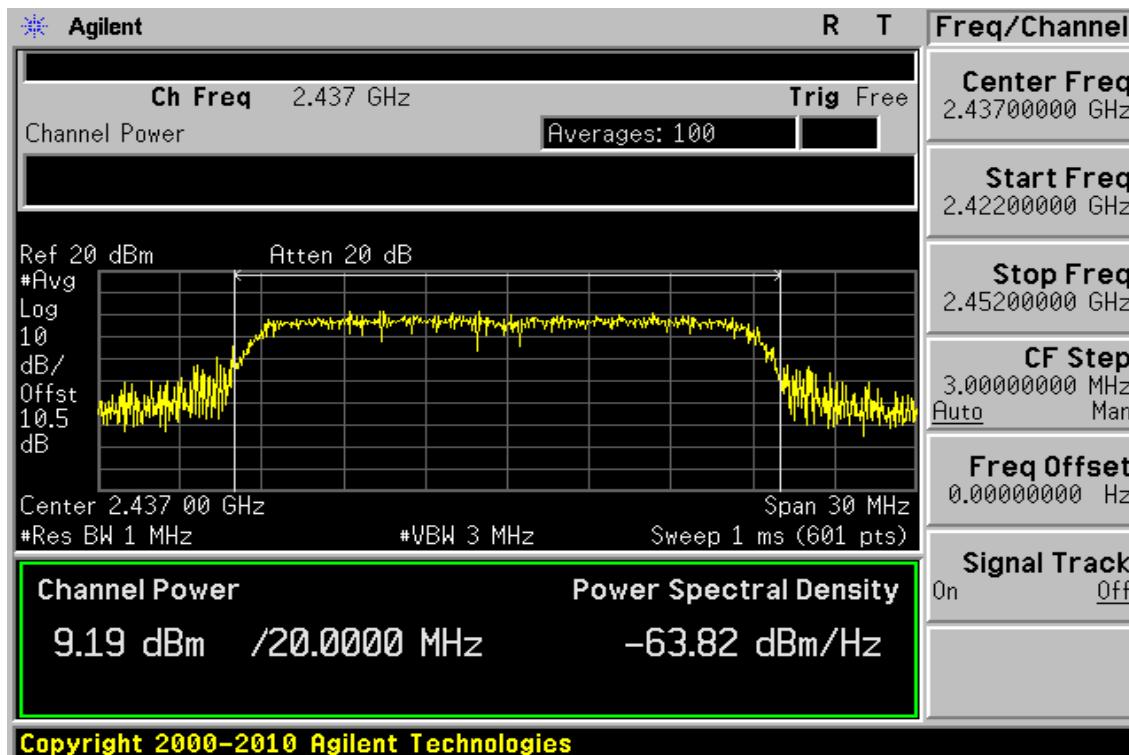
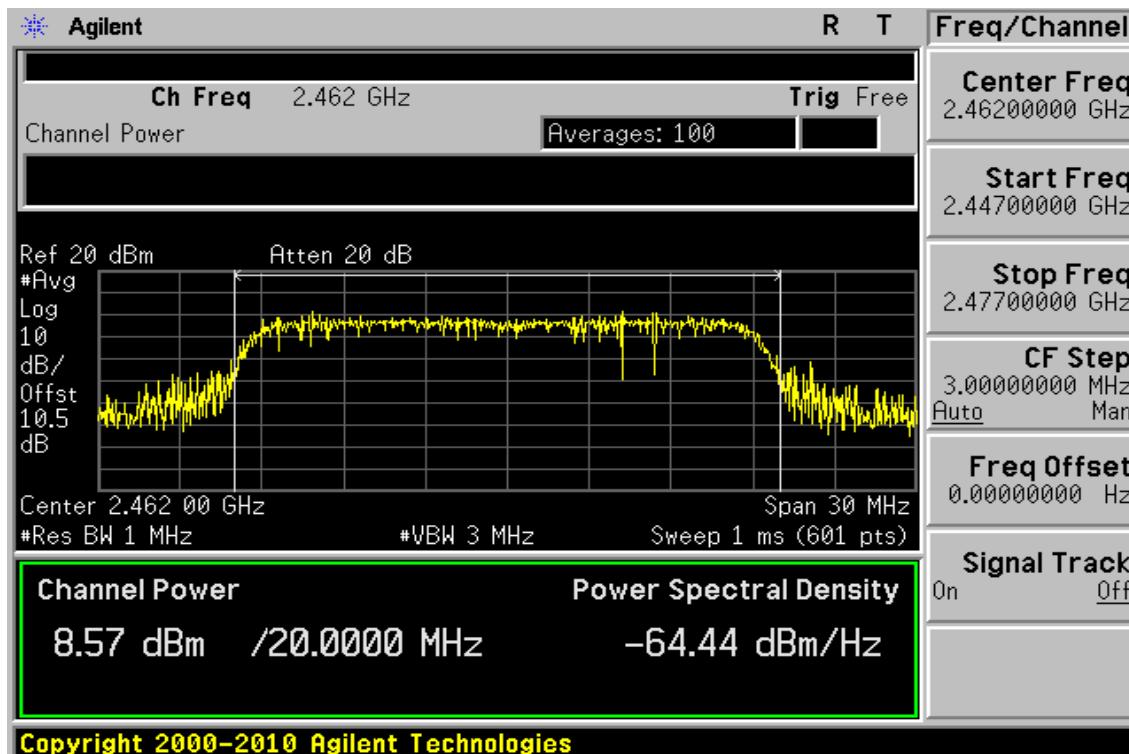


## Avg. Power Output Plot (CH Low)



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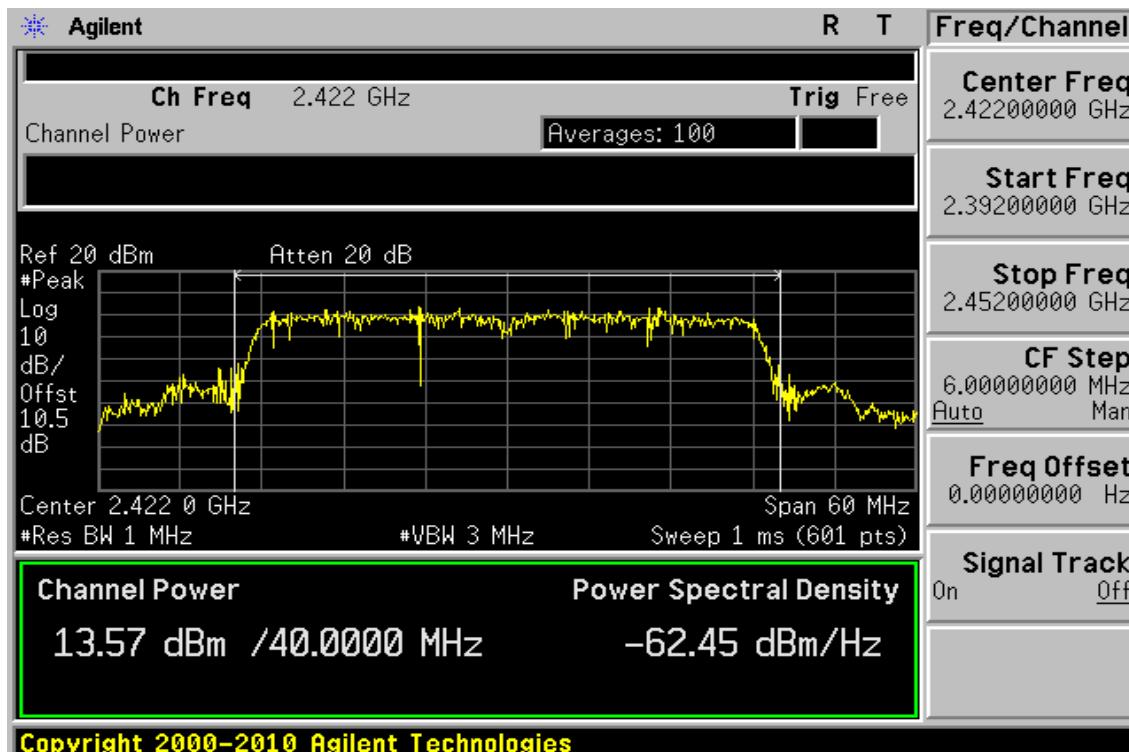
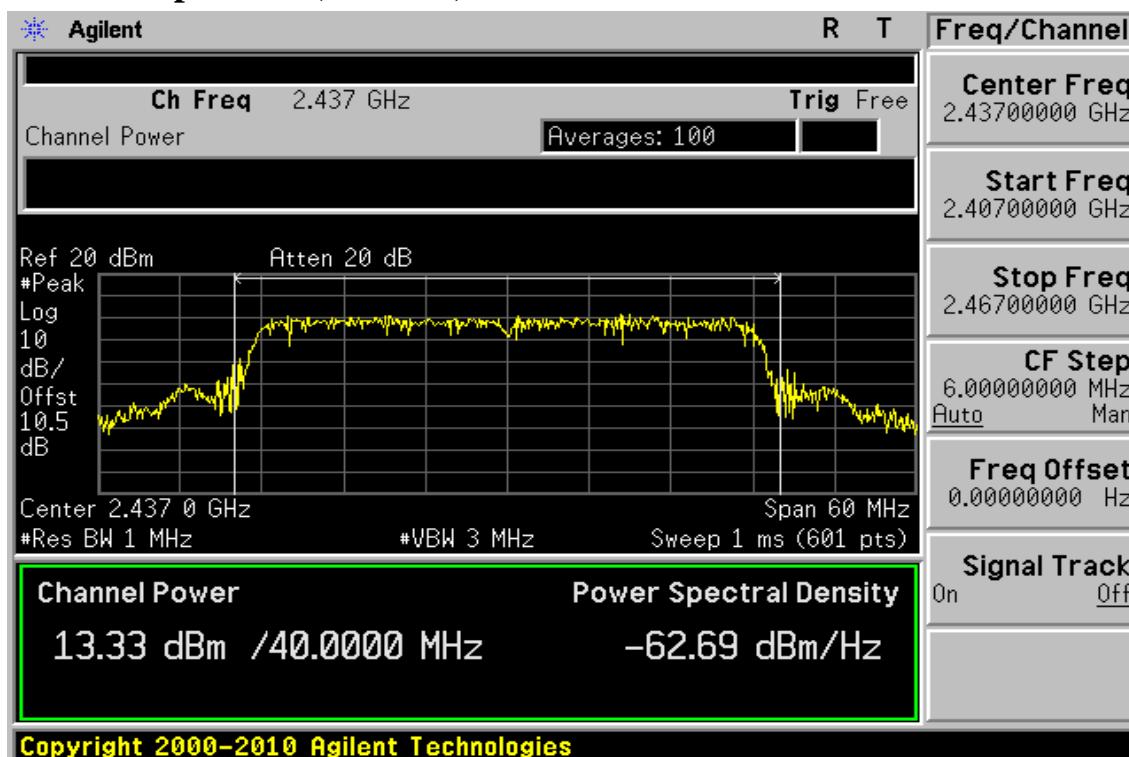
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**Avg. Power Output Plot (CH Mid)****Avg. Power Output Plot (CH High)**

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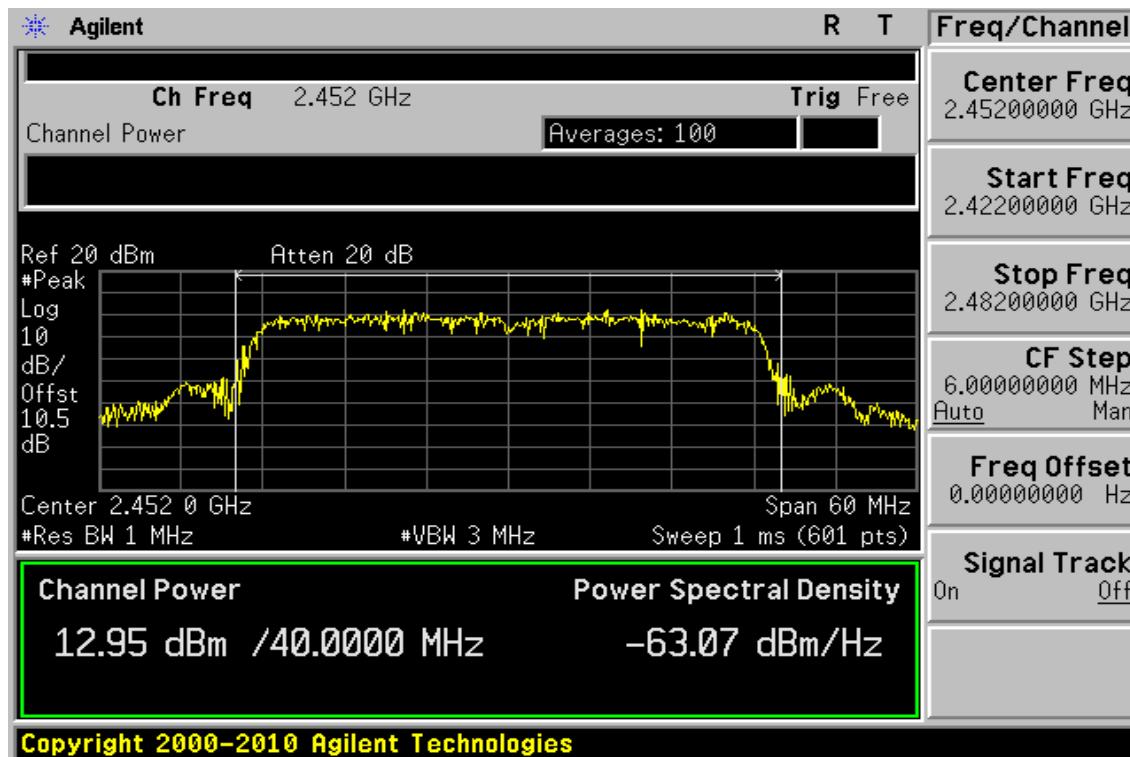
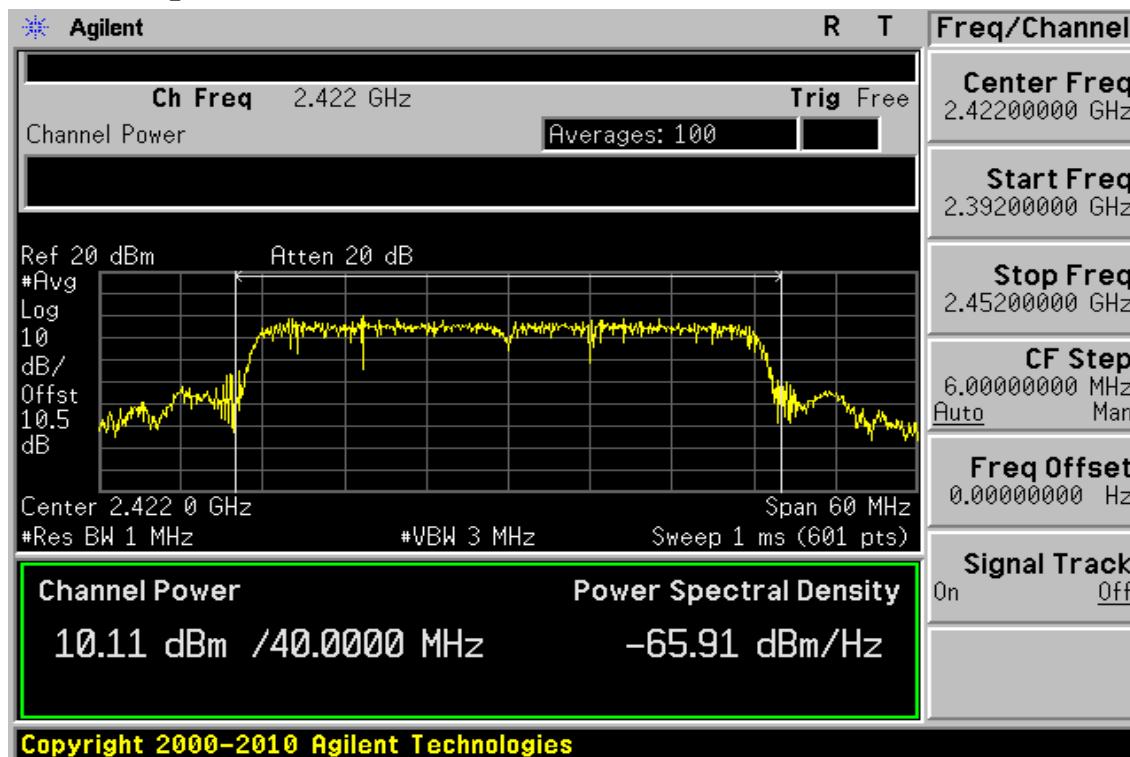
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**802.11n\_40M, 13.5Mbps (Aux)**  
**Peak Power Output Plot (CH Low)****Peak Power Output Plot (CH Mid)**

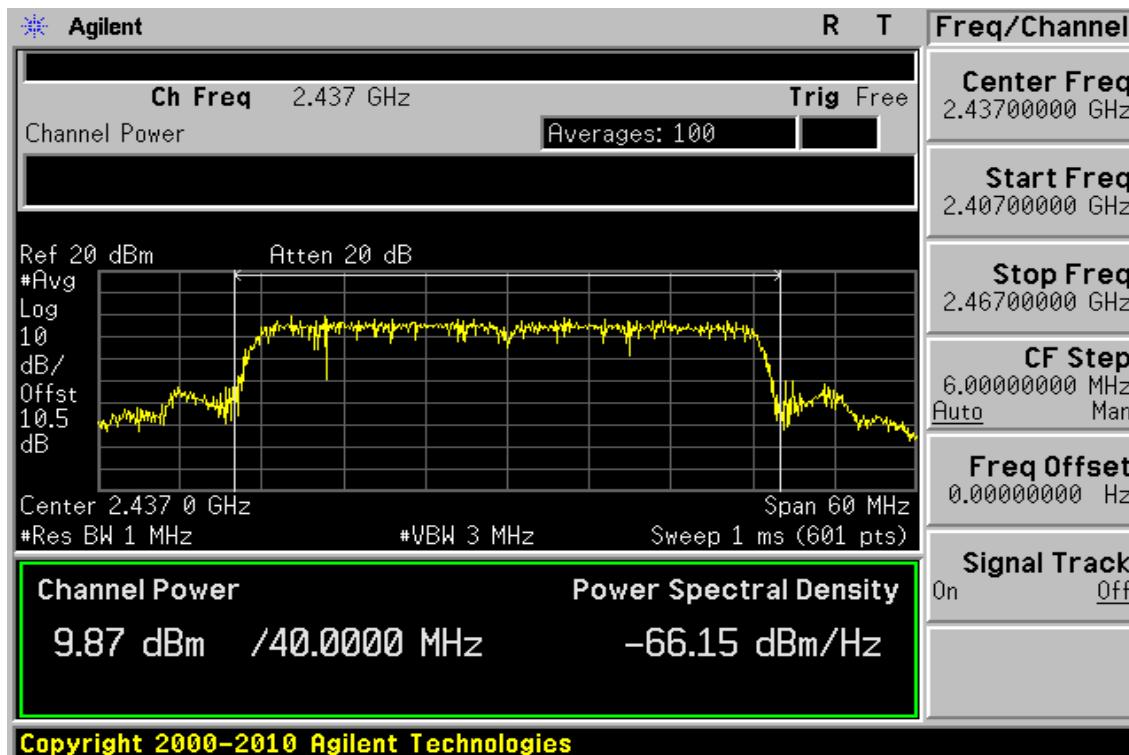
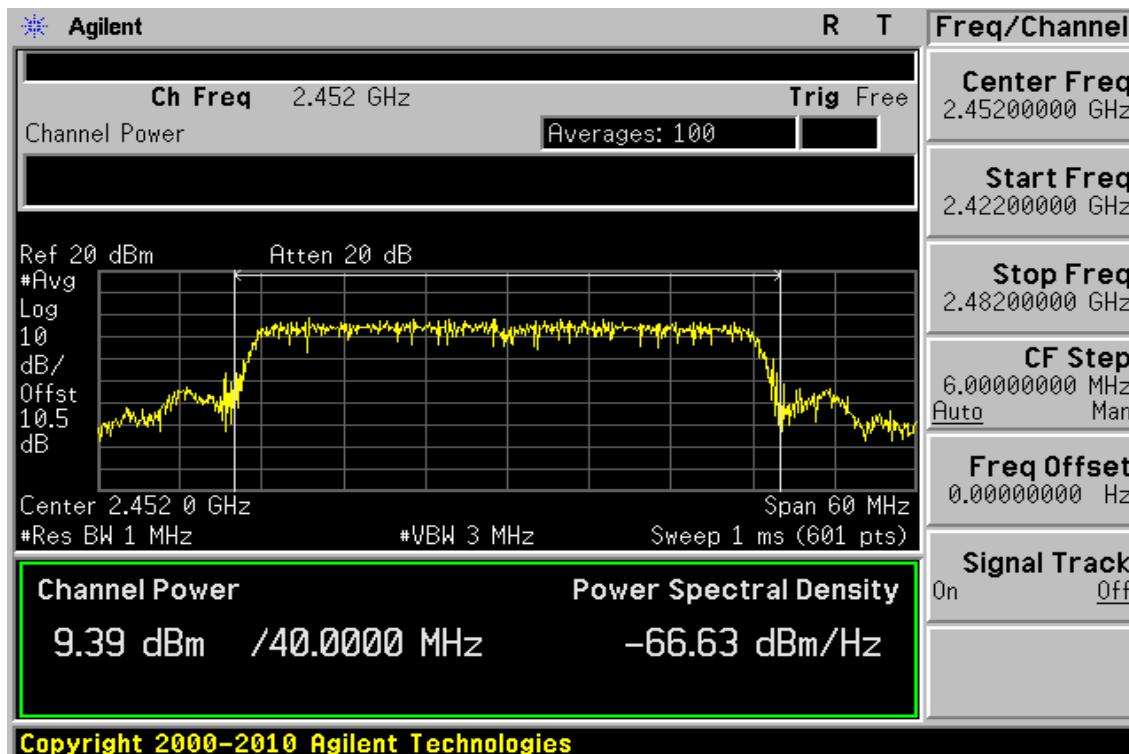
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**Peak Power Output Plot (CH High)****Avg. Power Output Plot (CH Low)**

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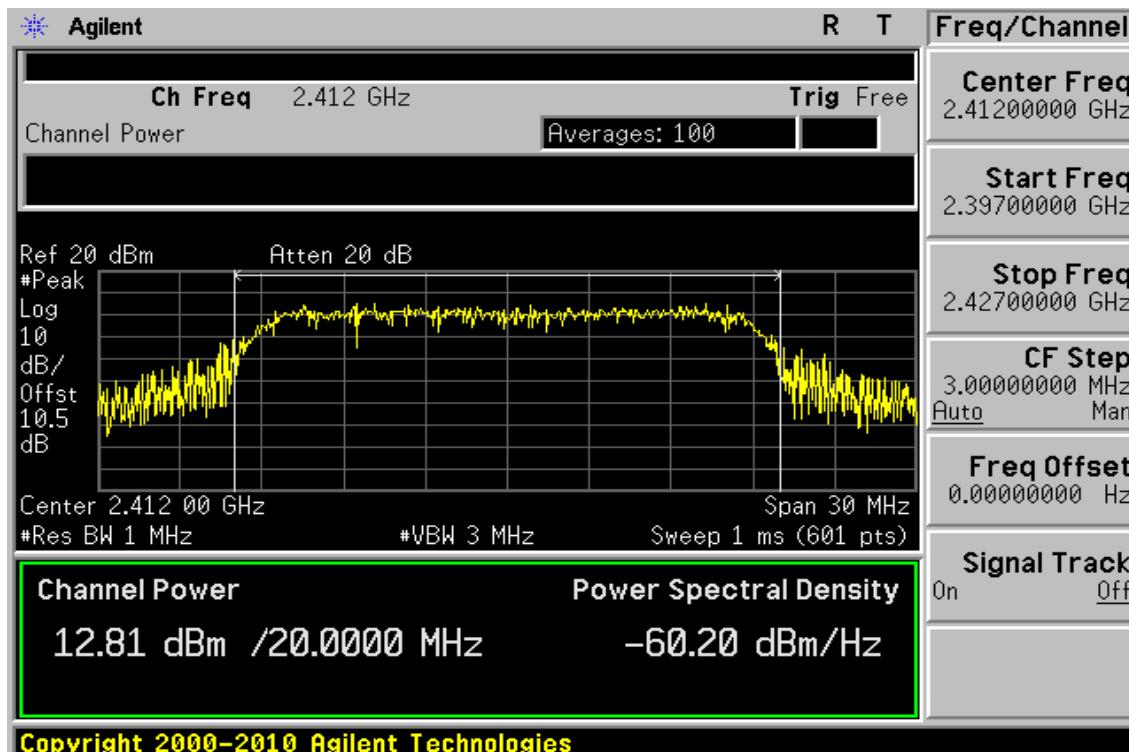
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**Avg. Power Output Plot (CH Mid)****Avg. Power Output Plot (CH High)**

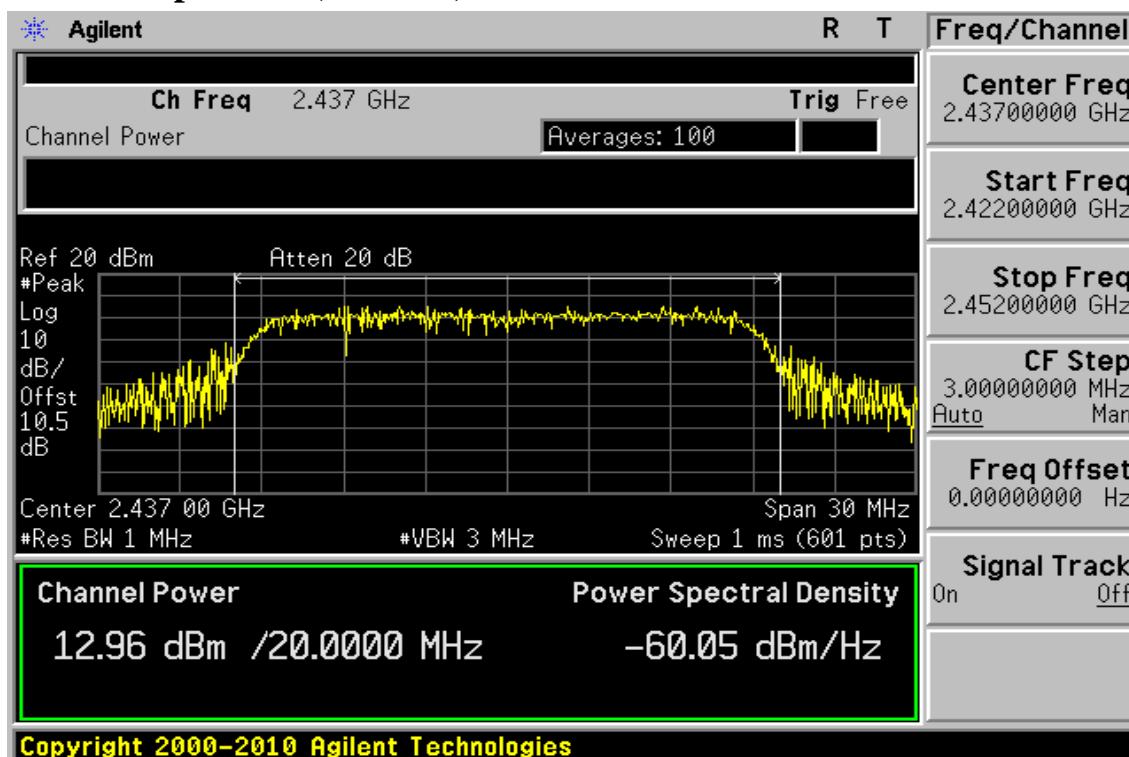
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## 802.11n\_20M, 6.5Mbps (Main) Peak Power Output Plot (CH Low)

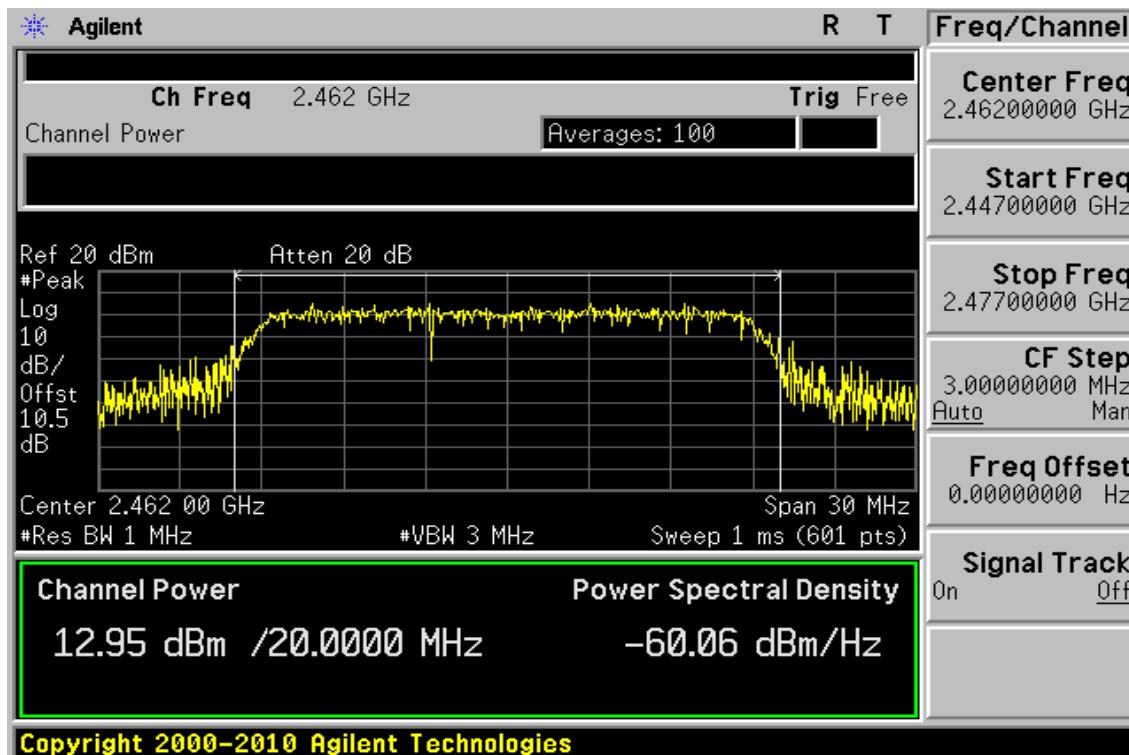
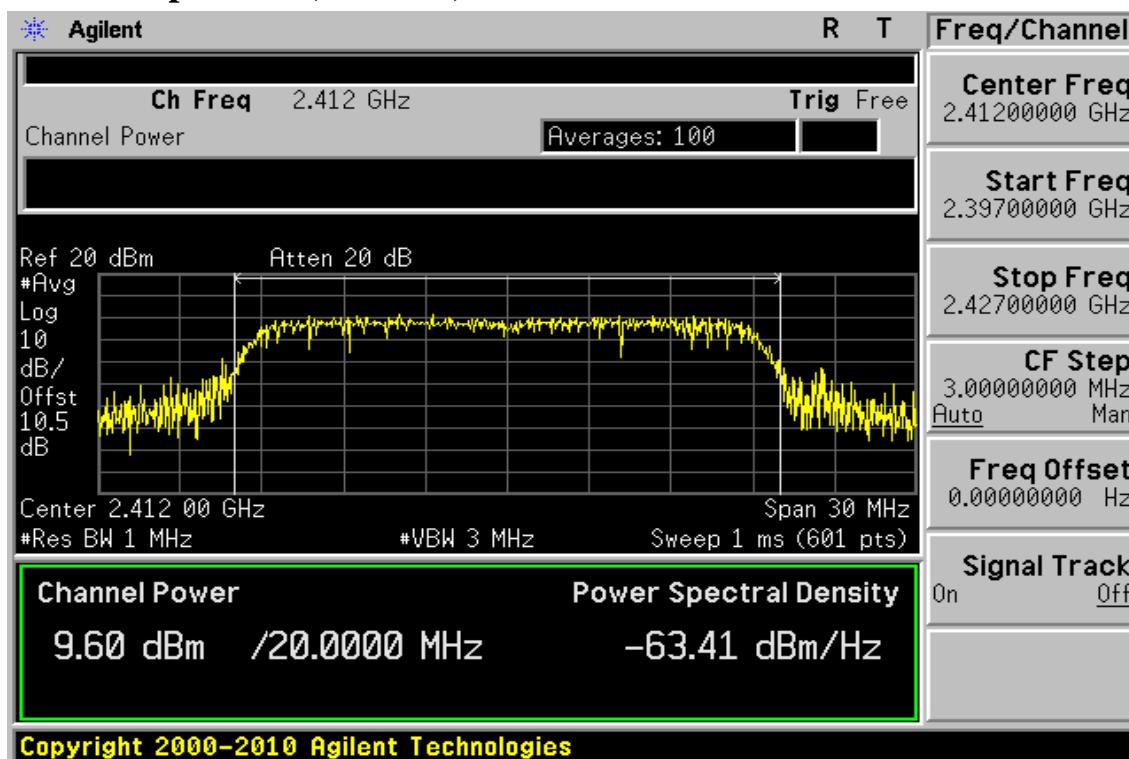


## Peak Power Output Plot (CH Mid)



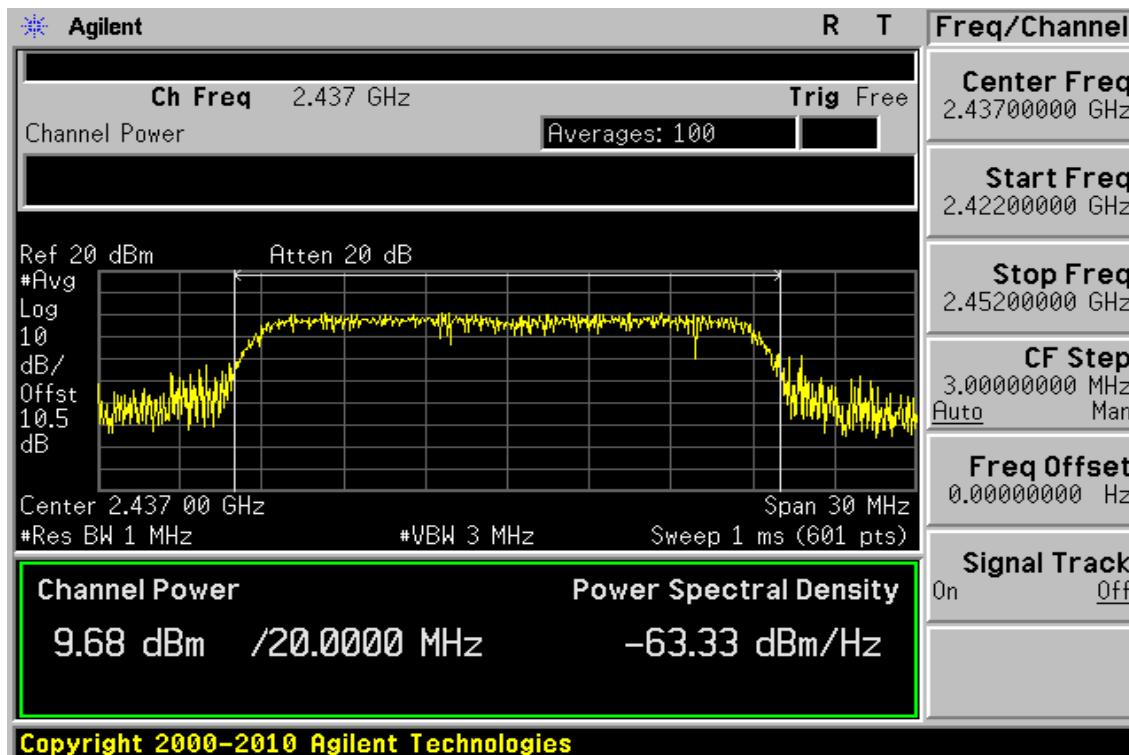
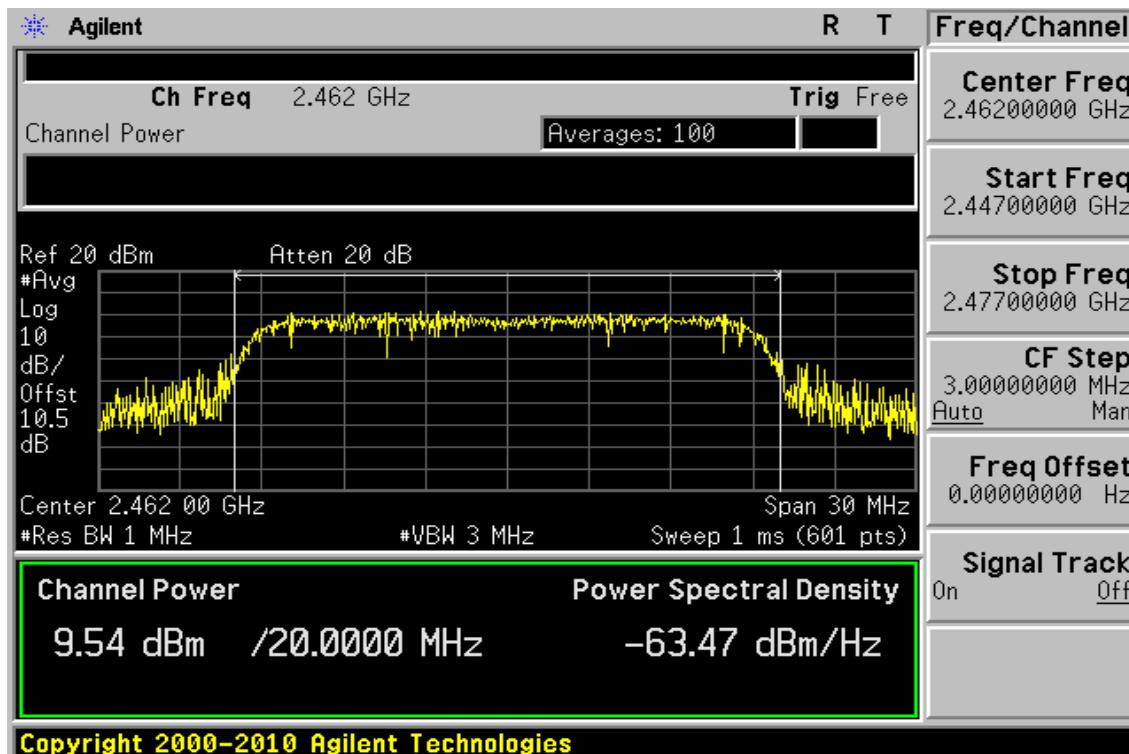
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**Peak Power Output Plot (CH High)****Avg. Power Output Plot (CH Low)**

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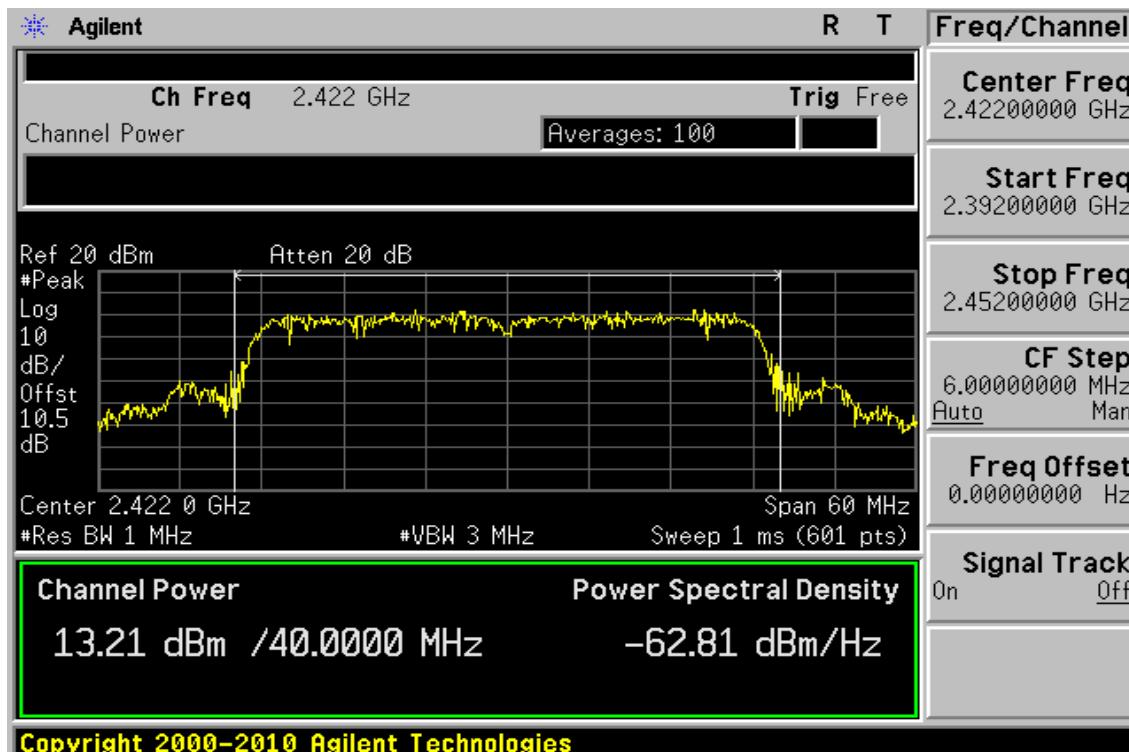
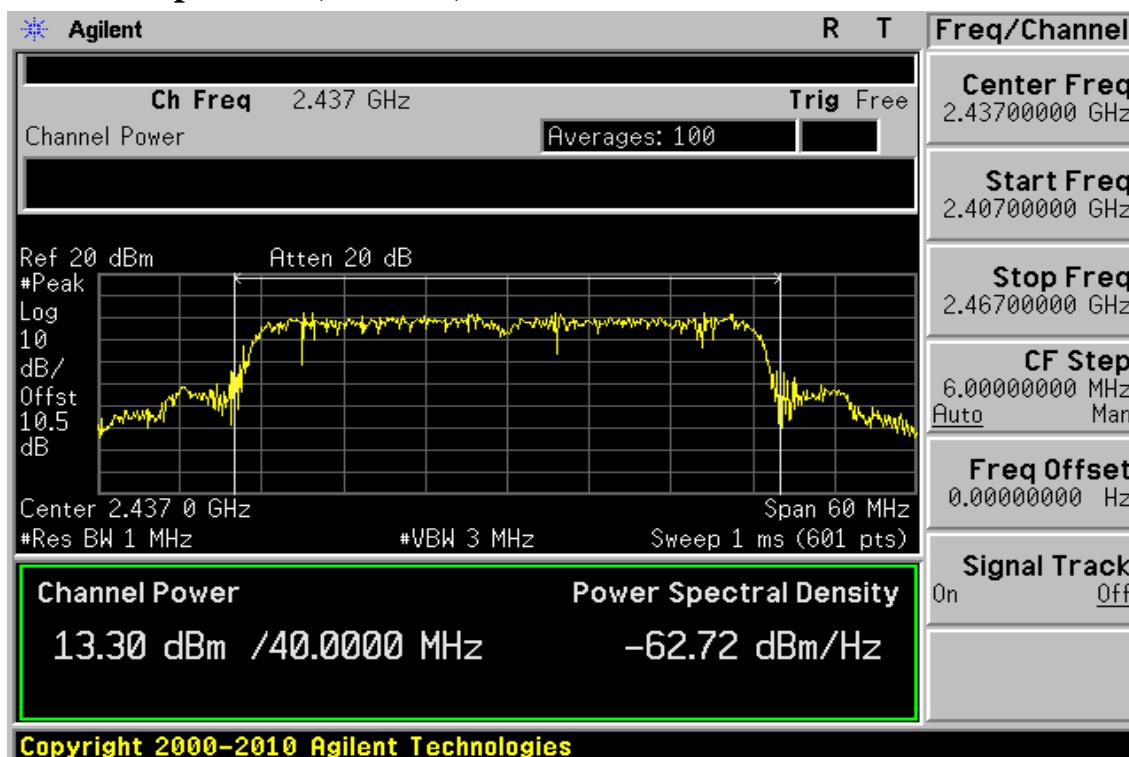
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**Avg. Power Output Plot (CH Mid)****Avg. Power Output Plot (CH High)**

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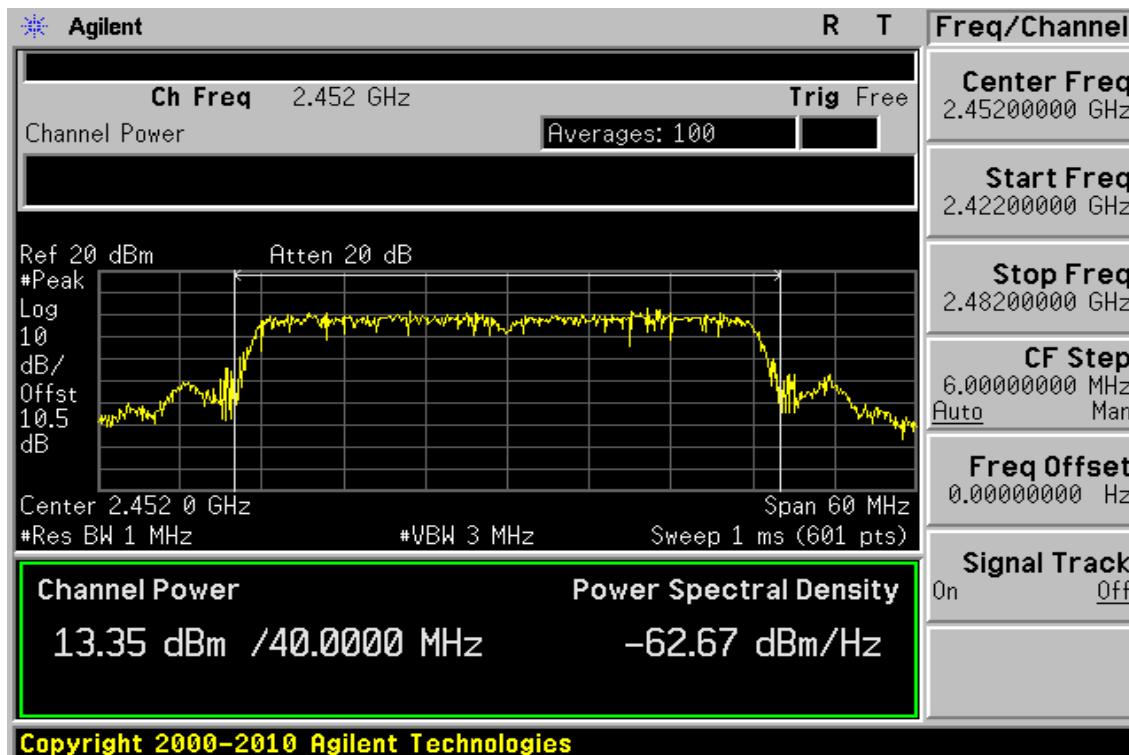
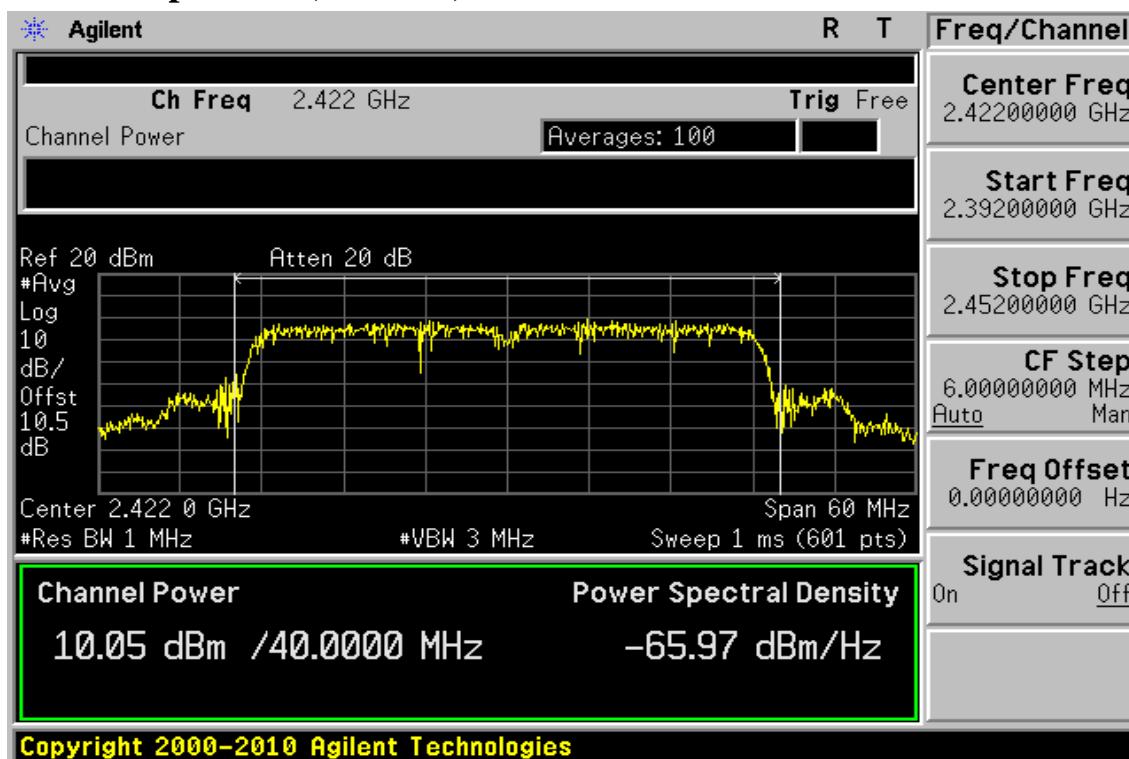
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**802.11n\_40M, 13.5Mbps (Main)****Peak Power Output Plot (CH Low)****Peak Power Output Plot (CH Mid)**

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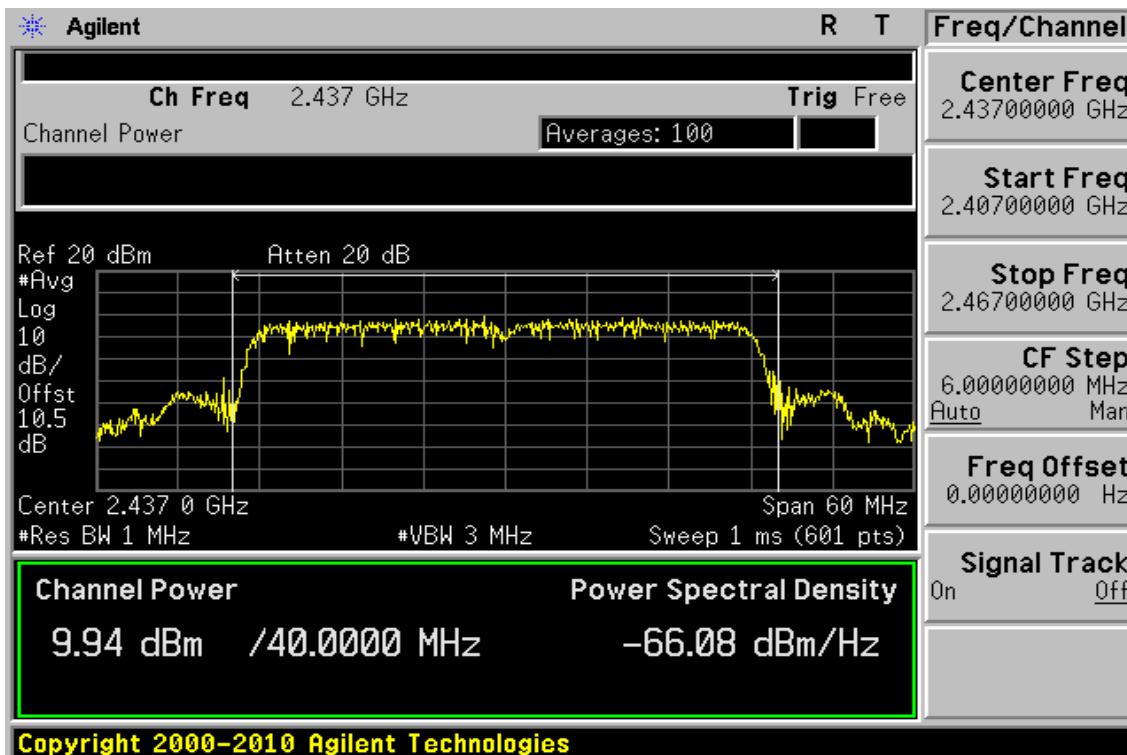
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**Peak Power Output Plot (CH High)****Avg. Power Output Plot (CH Low)**

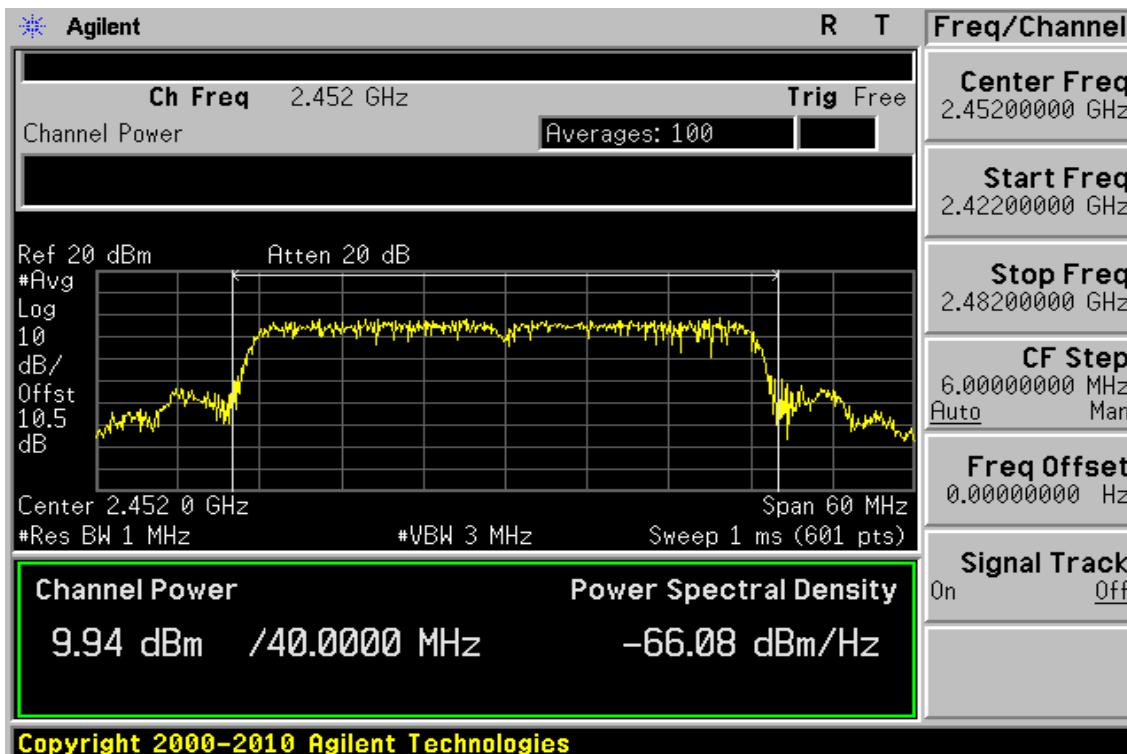
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### Avg. Power Output Plot (CH Mid)



### Avg. Power Output Plot (CH High)



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## 7 6dB Bandwidth

### 7.1 Standard Applicable:

According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500kHz.

### 7.2 Measurement Equipment Used:

Refer to section 6.2 for details.

### 7.3 Test Set-up:

Refer to section 6.3 for details.

### 7.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the 3.antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=100KHz, VBW = 3\*RBW, Span= 50MHz, Sweep=auto
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

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## 7.5 Measurement Result:

### 802.11b

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2412	10.164	> 500	PASS
2437	10.146	> 500	PASS
2462	10.178	> 500	PASS

### 802.11g

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2412	16.602	> 500	PASS
2437	16.581	> 500	PASS
2462	16.598	> 500	PASS

### 802.11n\_20M (Aux)

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2412	17.782	> 500	PASS
2437	17.767	> 500	PASS
2462	17.779	> 500	PASS

### 802.11n\_40M (Aux)

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2422	36.415	> 500	PASS
2437	36.415	> 500	PASS
2452	36.407	> 500	PASS

\*Offset 10.5 dB

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**802.11n\_20M (Main)**

<b>Frequency (MHz)</b>	<b>Bandwidth</b>	<b>Bandwidth</b>	<b>Result</b>
	<b>(MHz)</b>	<b>(KHz)</b>	
2412	17.824	> 500	PASS
2437	17.846	> 500	PASS
2462	17.840	> 500	PASS

**802.11n\_40M (Main)**

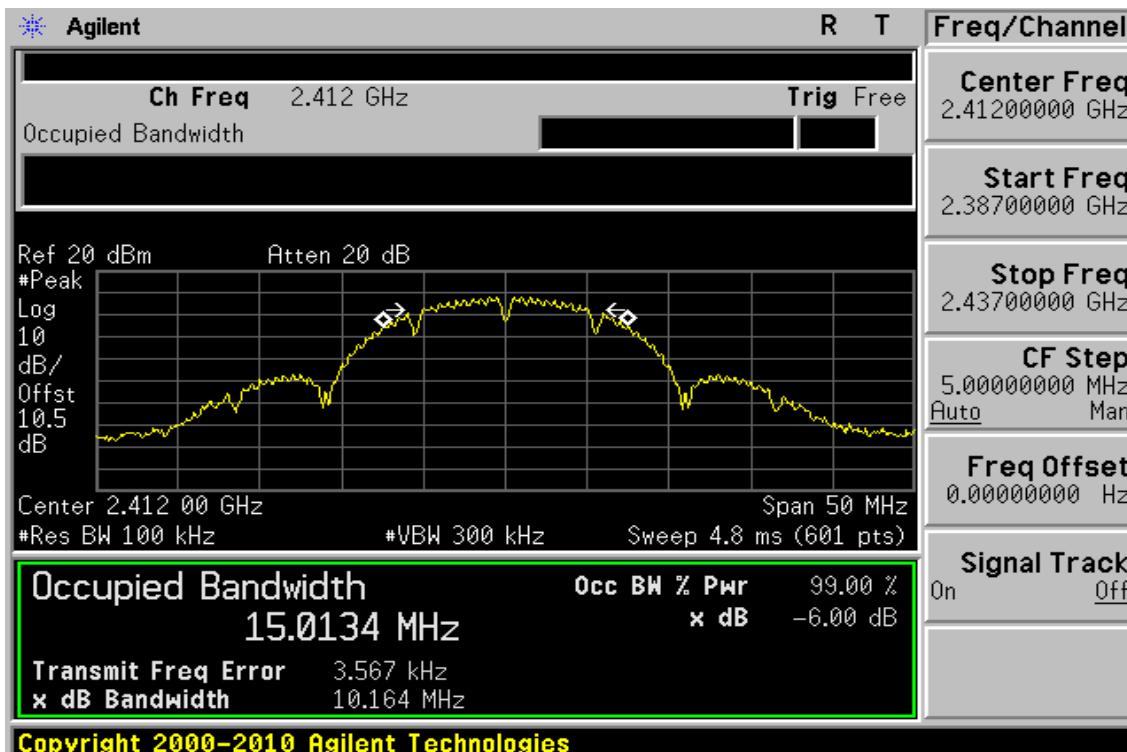
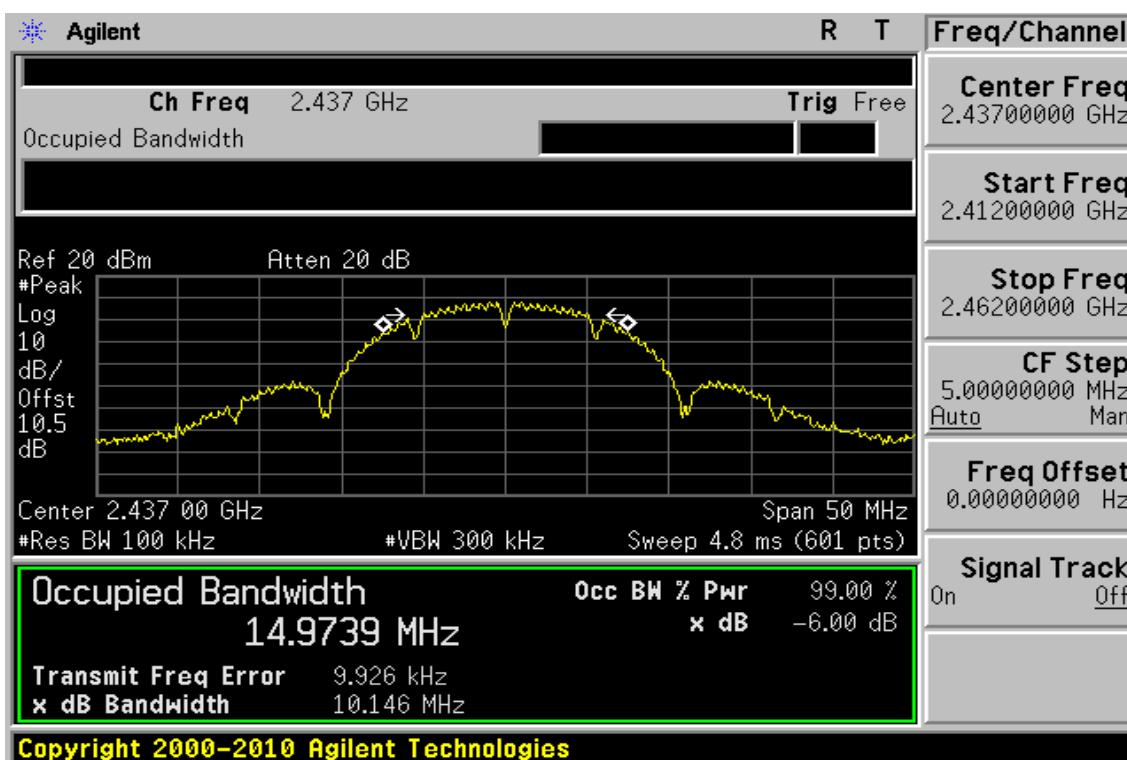
<b>Frequency (MHz)</b>	<b>Bandwidth</b>	<b>Bandwidth</b>	<b>Result</b>
	<b>(MHz)</b>	<b>(KHz)</b>	
2422	36.431	> 500	PASS
2437	36.471	> 500	PASS
2452	36.453	> 500	PASS

*\*Offset 10.5 dB*

Note: Refer to next page for plots.

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**802.11b****6dB Band Width Test Data CH-Low****6dB Band Width Test Data CH-Mid**

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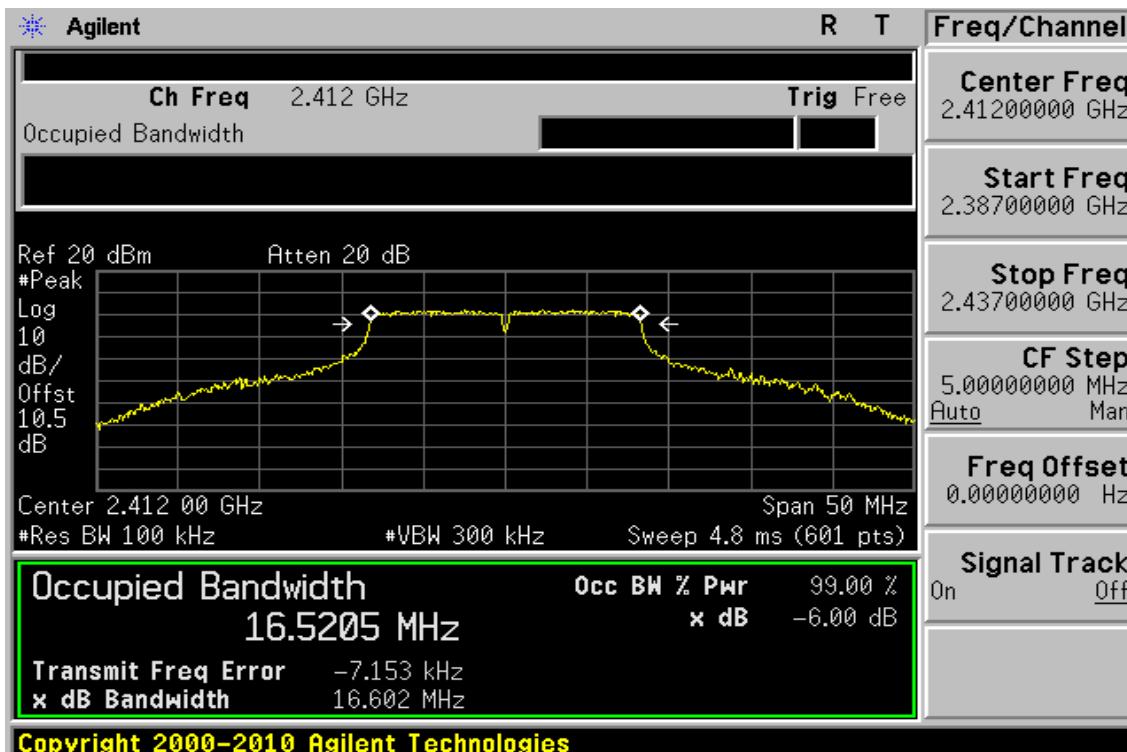
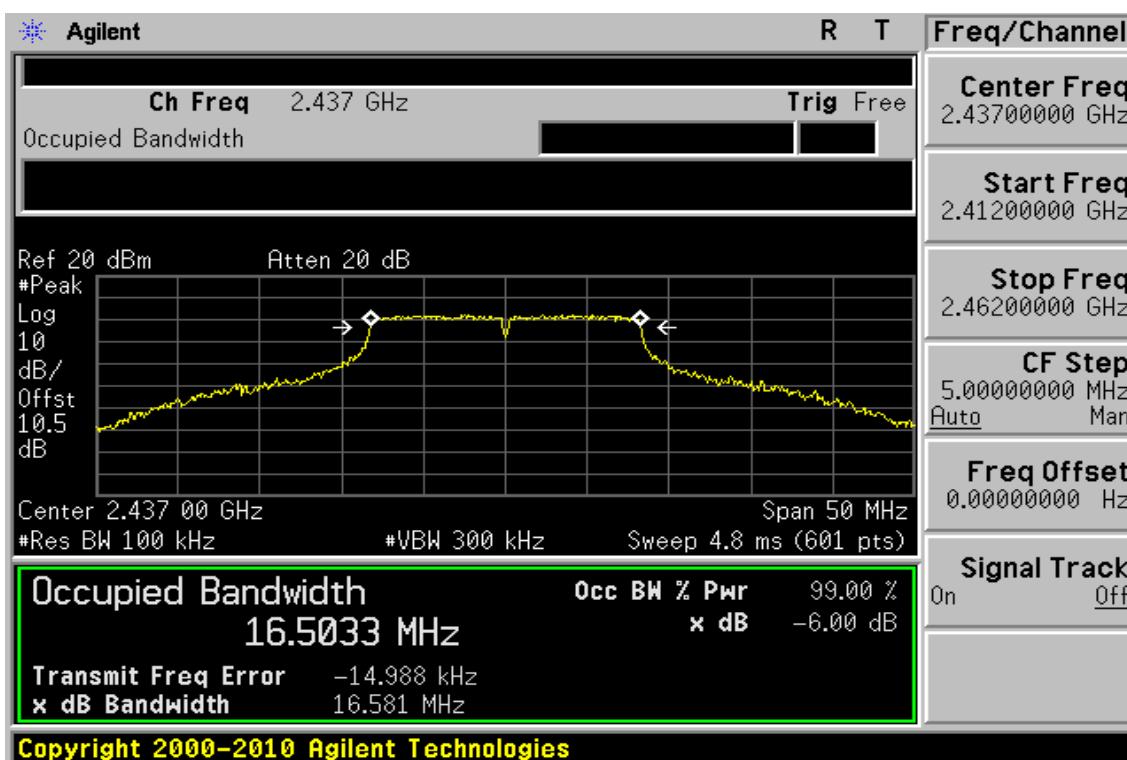
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**6dB Band Width Test Data CH-High**

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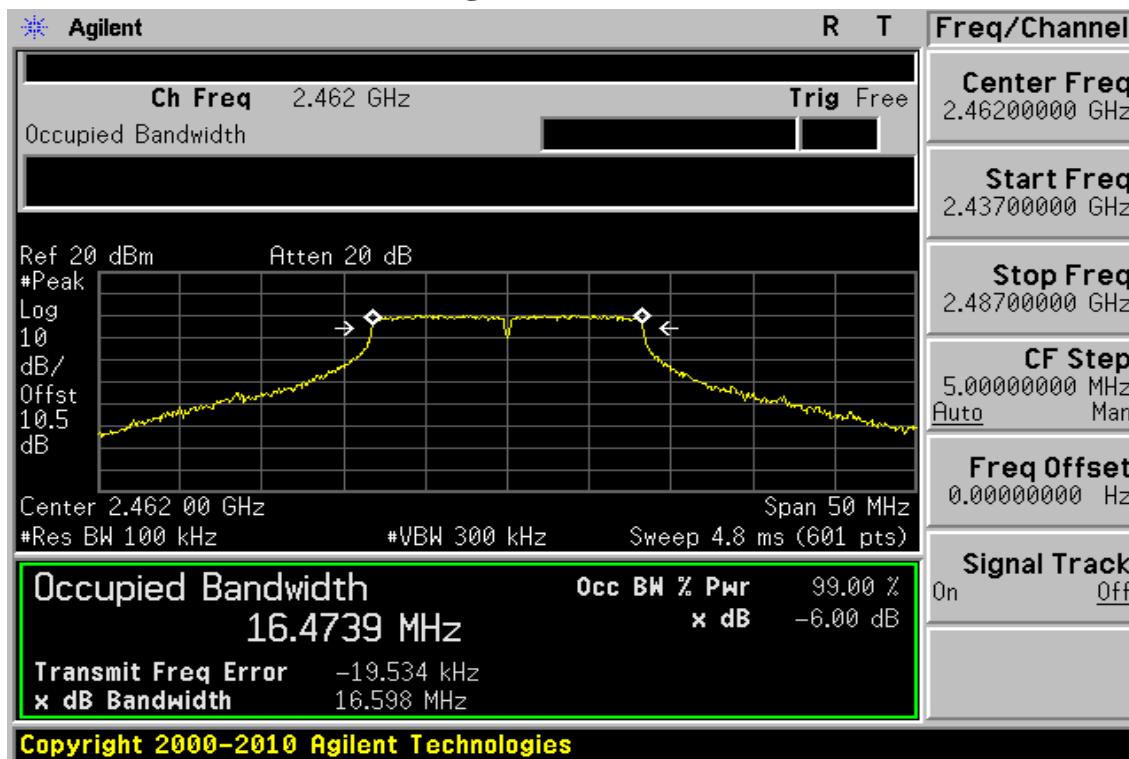
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**802.11g****6dB Band Width Test Data CH-Low****6dB Band Width Test Data CH-Mid**

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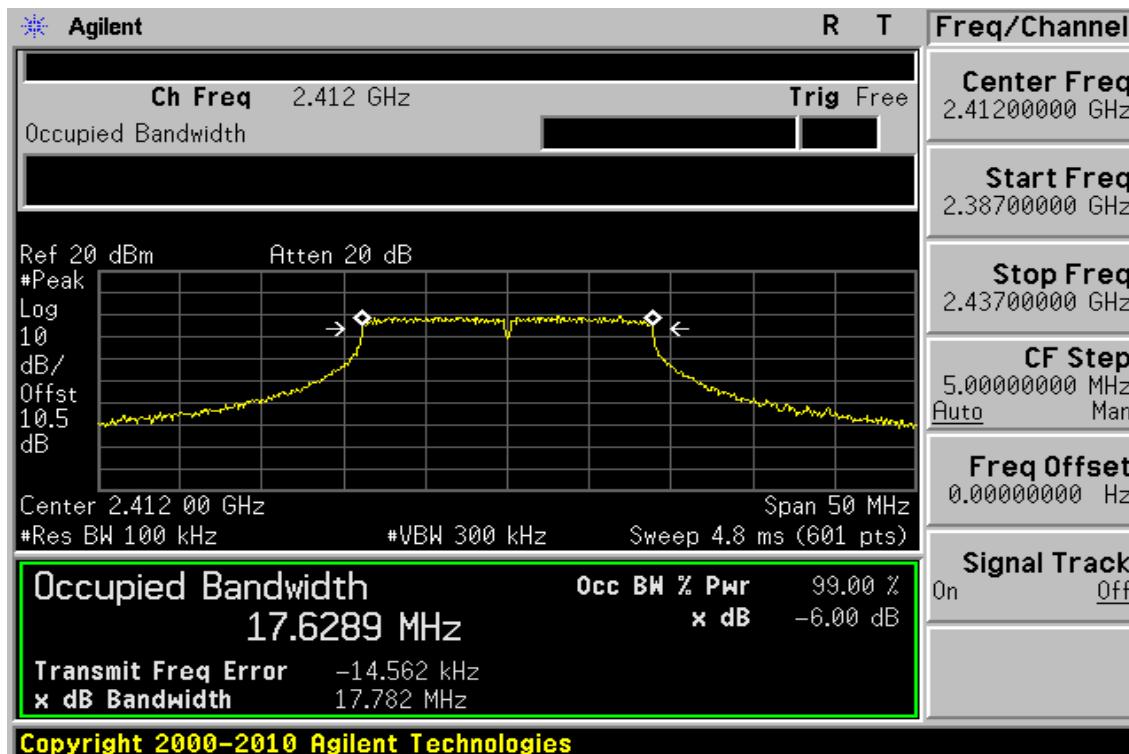
**6dB Band Width Test Data CH-High**

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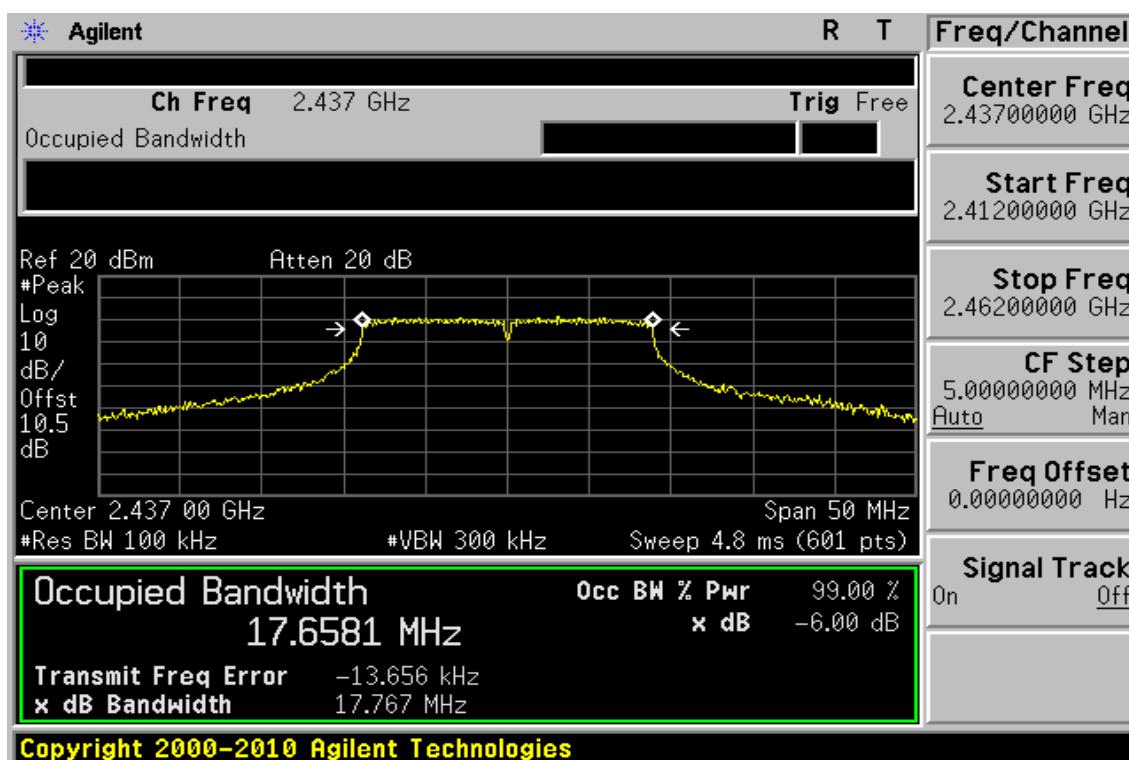
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## 802.11n\_20M (Aux)

### 6dB Band Width Test Data CH-Low



### 6dB Band Width Test Data CH-Mid

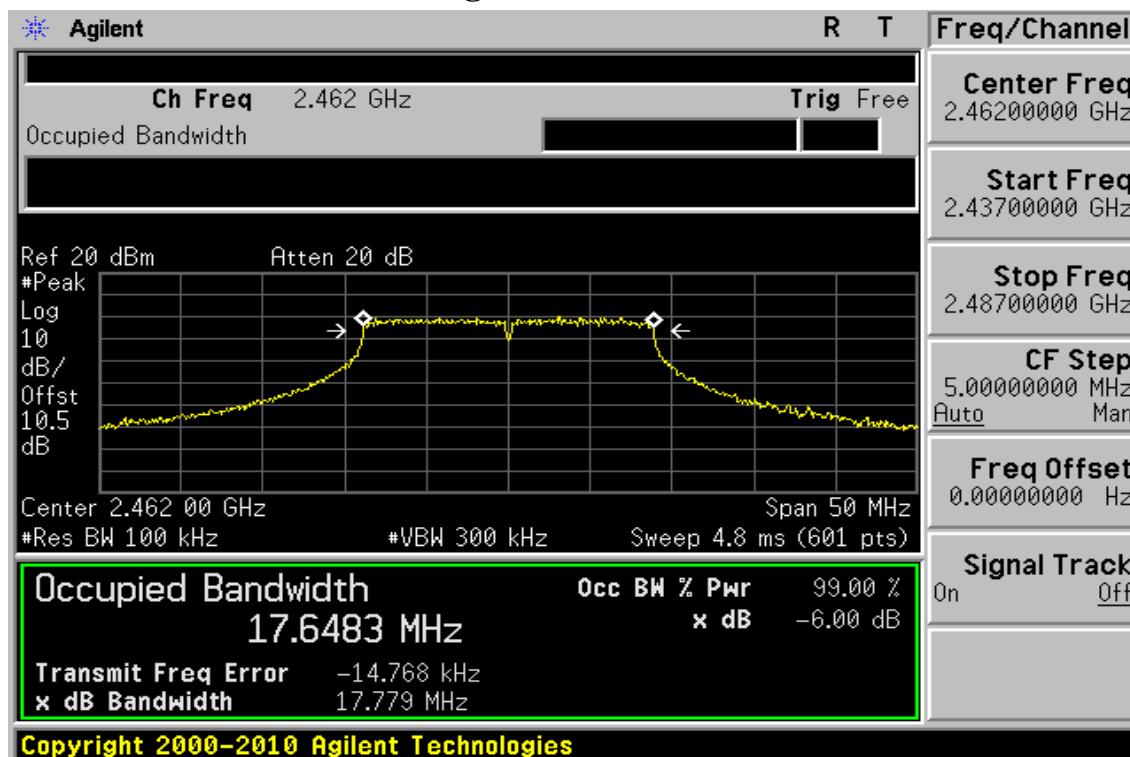


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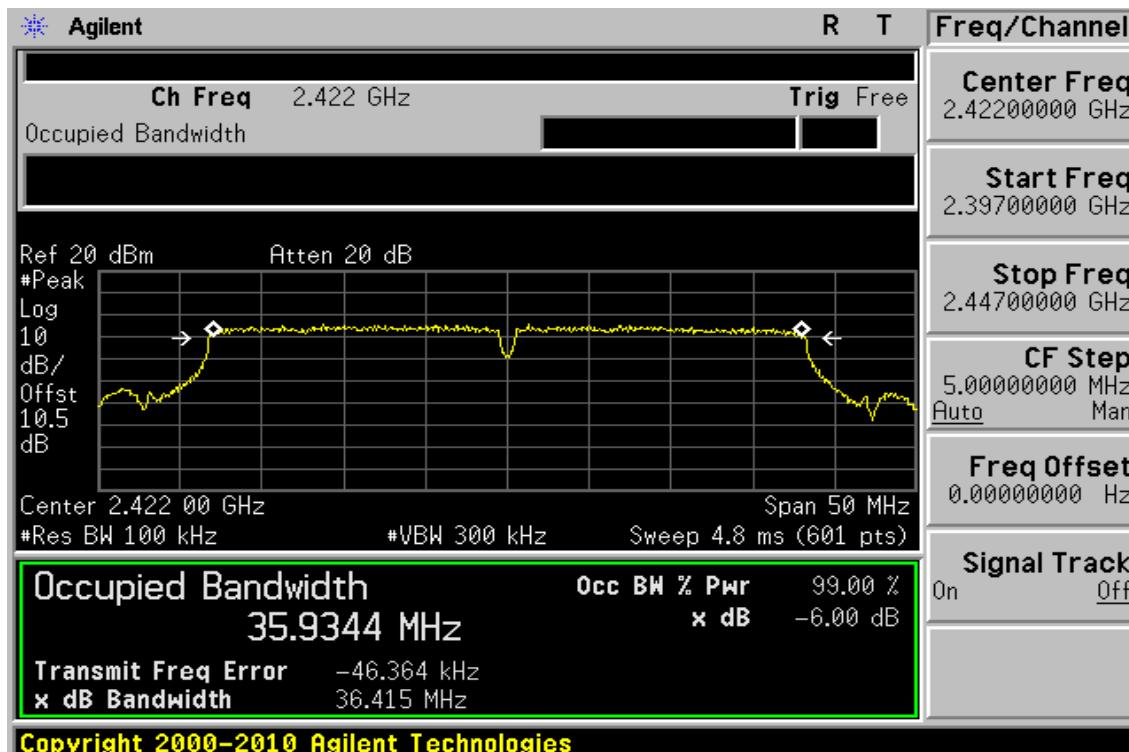
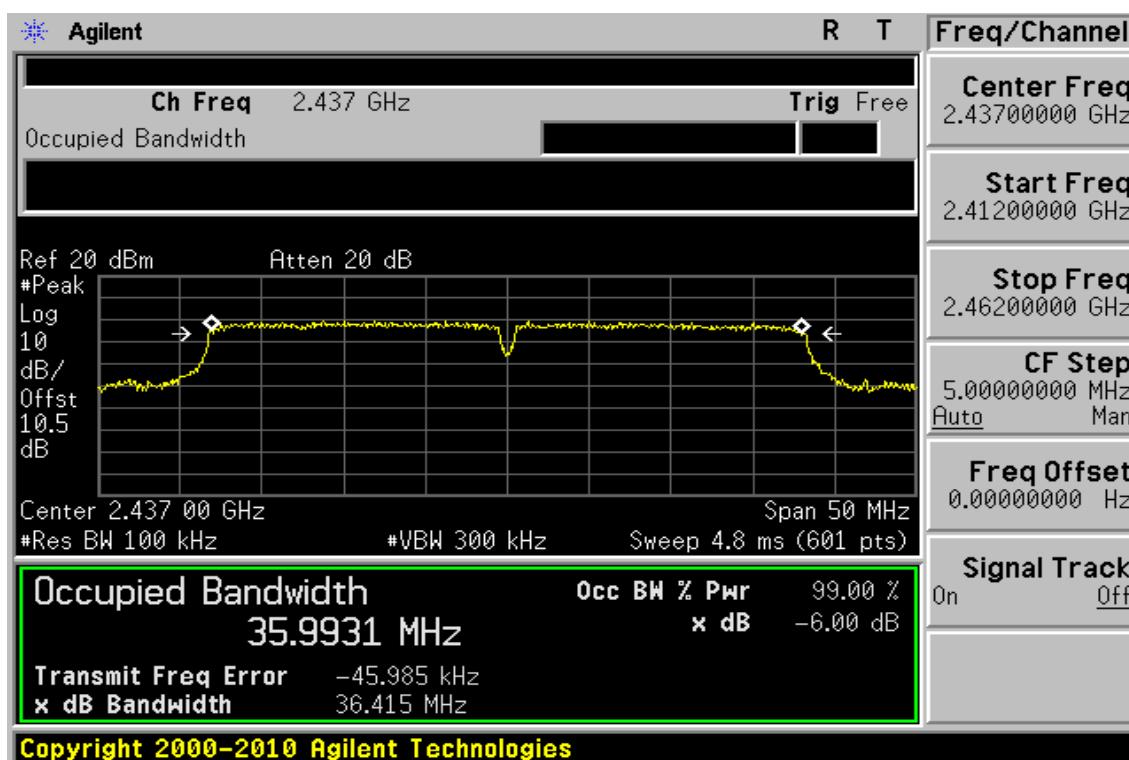
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## 6dB Band Width Test Data CH-High



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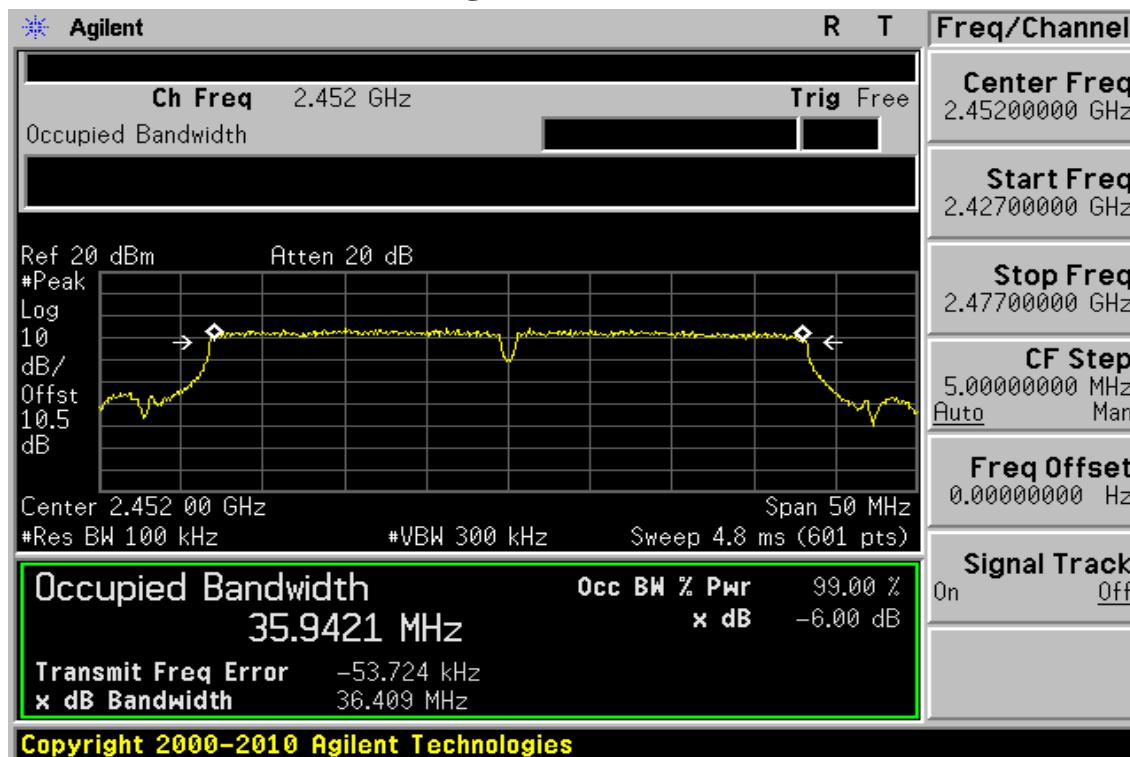
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**802.11n\_40M (Aux)****6dB Band Width Test Data CH-Low****6dB Band Width Test Data CH-Mid**

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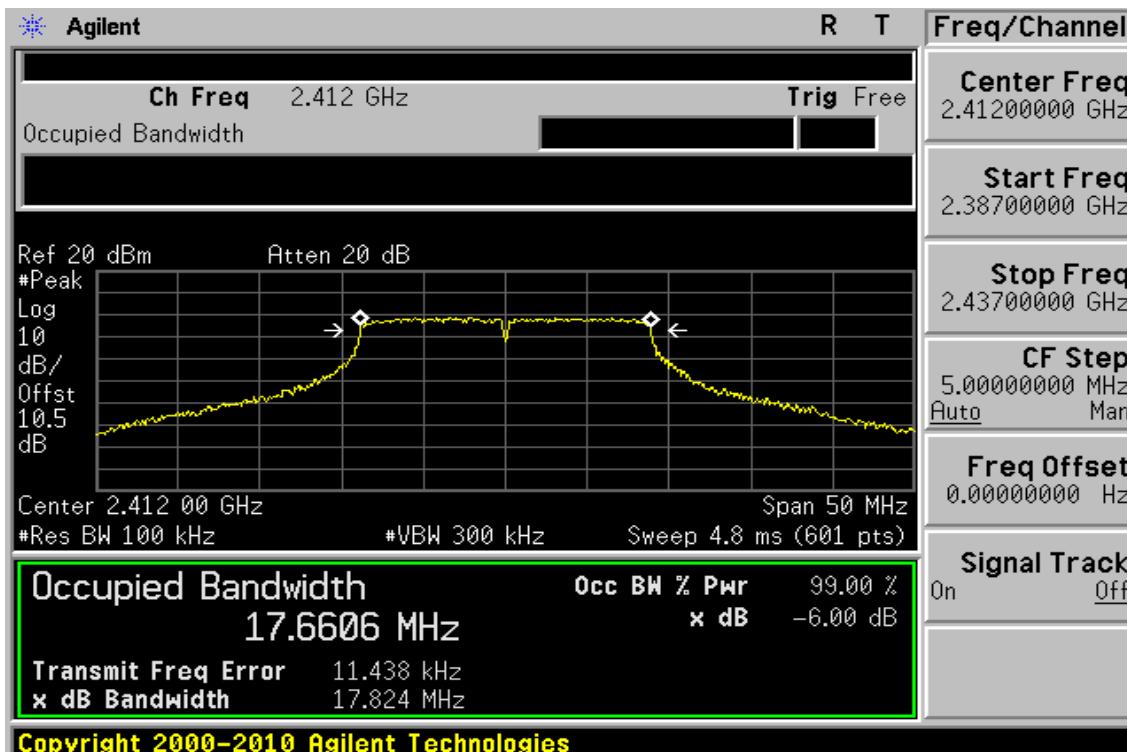
**6dB Band Width Test Data CH-High**

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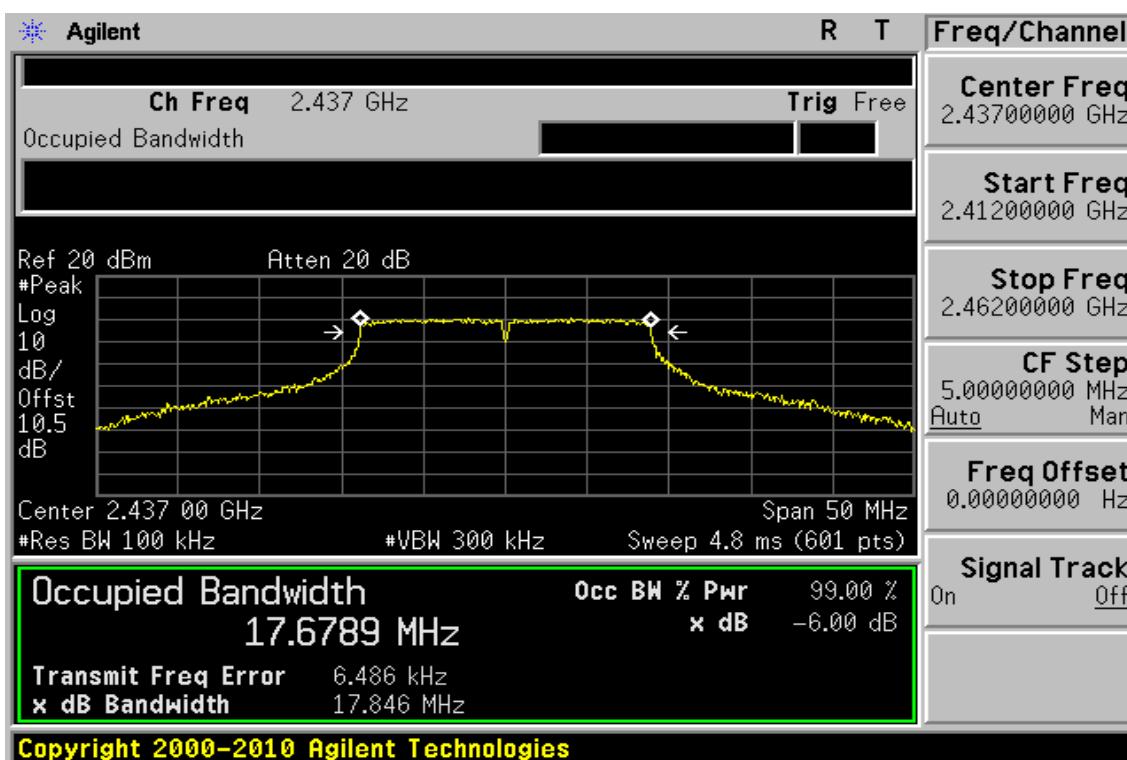
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## 802.11n\_20M (Main)

### 6dB Band Width Test Data CH-Low



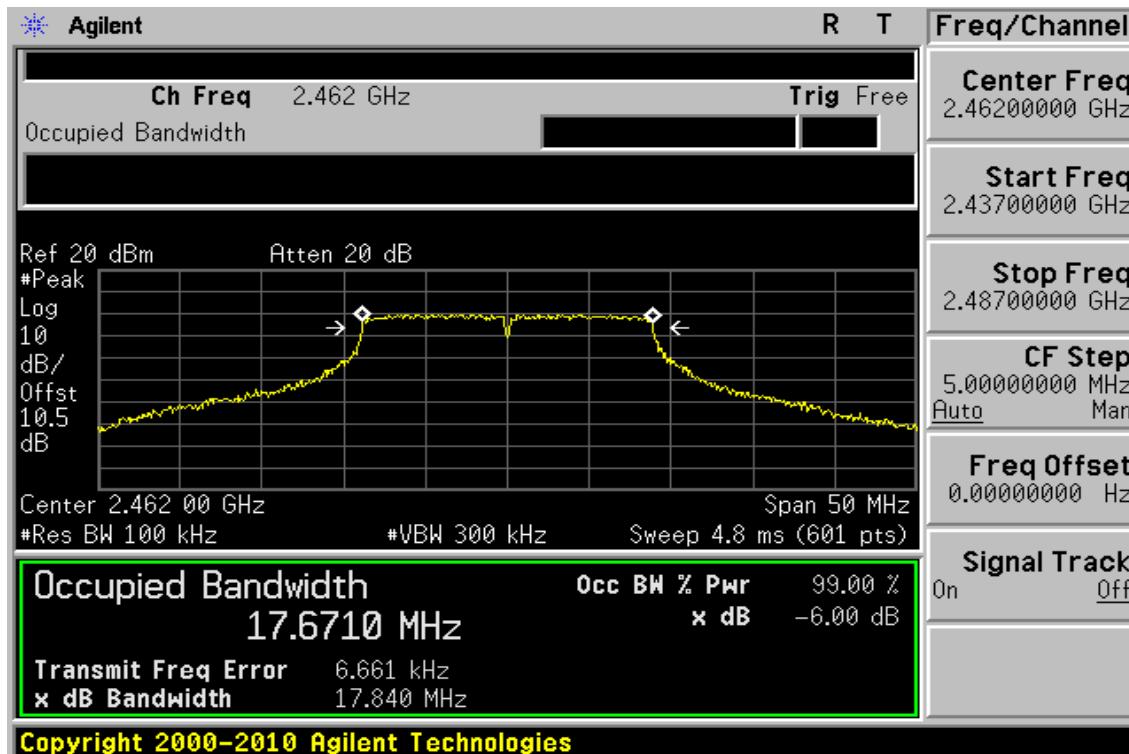
### 6dB Band Width Test Data CH-Mid



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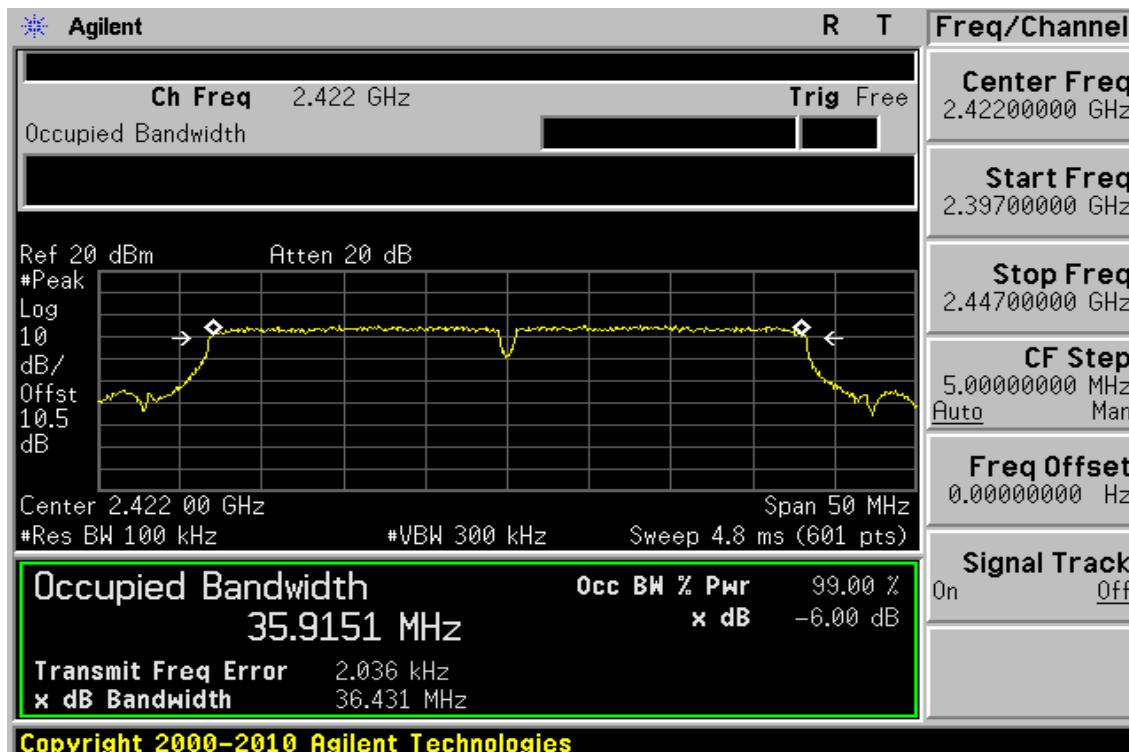
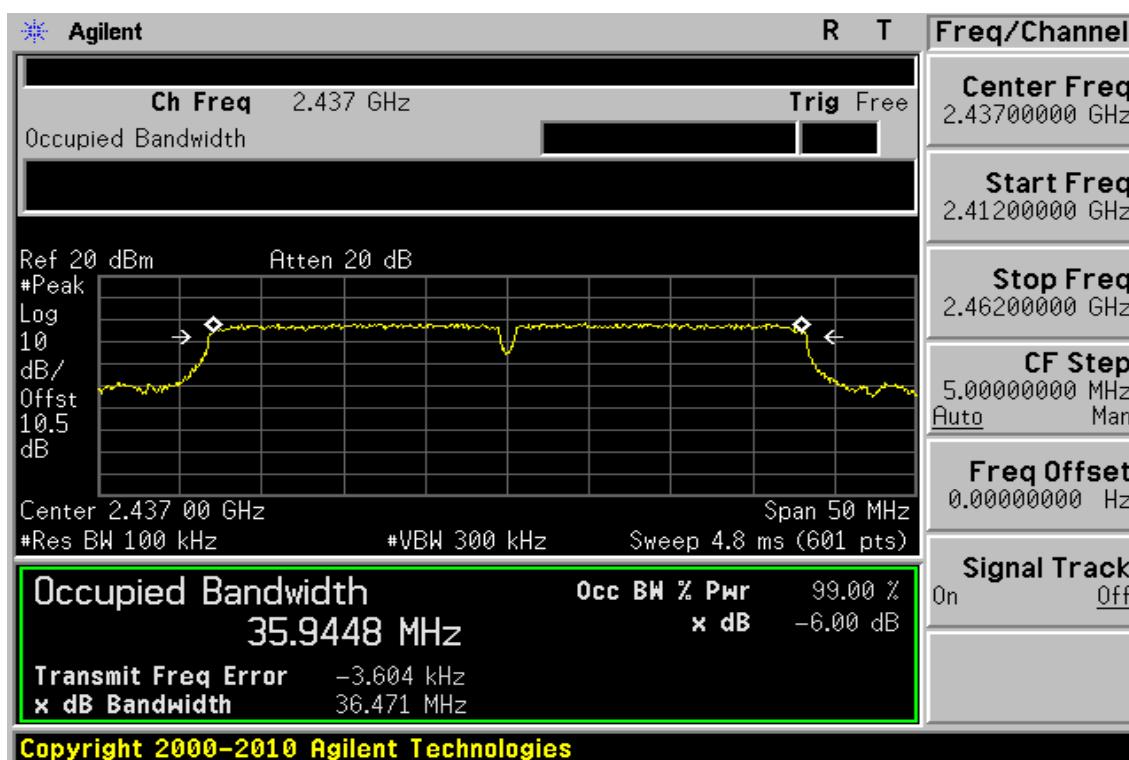
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**6dB Band Width Test Data CH-High**

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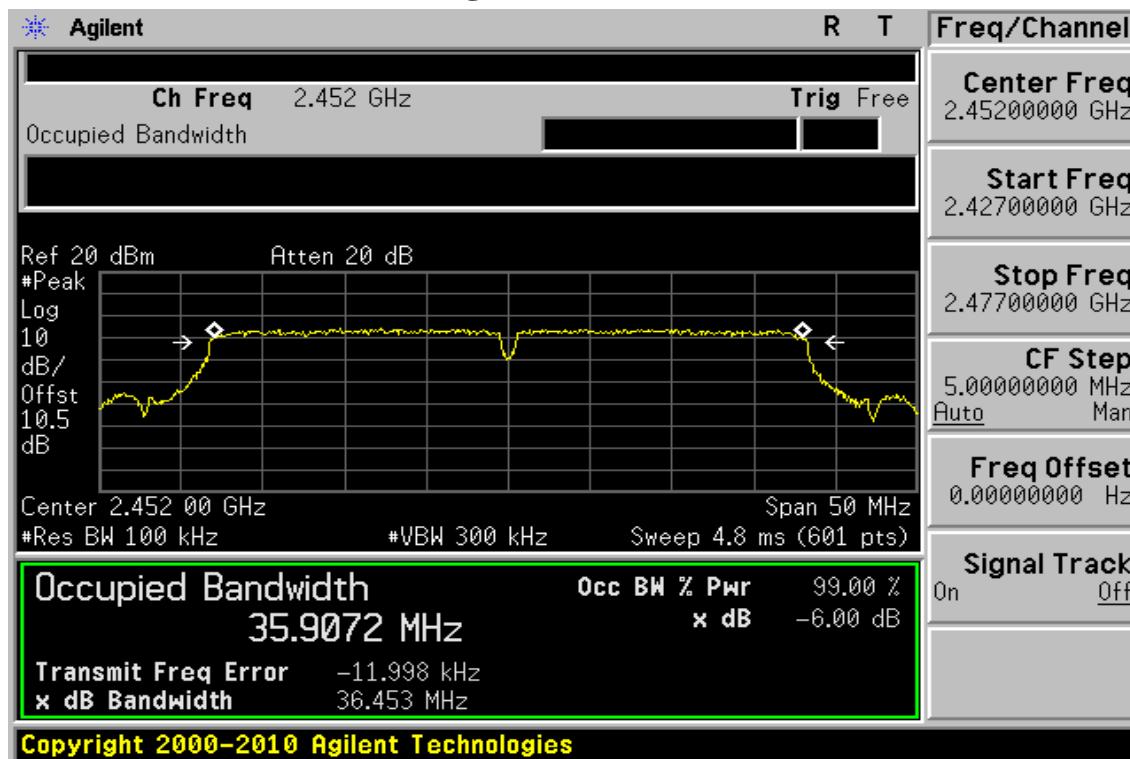
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**802.11n\_40M (Main)****6dB Band Width Test Data CH-Low****6dB Band Width Test Data CH-Mid**

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**6dB Band Width Test Data CH-High**

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## 8 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

### 8.1 Standard Applicable:

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands 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 100KHz bandwidth within the band that contains the highest level of the desired power. 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).

### 8.2 Measurement Equipment Used:

#### 8.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

#### 8.2.2 Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/15/2011	02/14/2013
Spectrum Analyzer	R&S	FSV-30	101398	10/18/2011	10/17/2013
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014
Horn antenna	ETS.LINDGREN	3117	123995	03/19/2011	03/18/2013
Pre-Amplifier	Agilent	8447D	1937A02834	01/05/2012	01/04/2013
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2012	01/04/2013
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/05/2012	01/04/2013
Radio Communication Analyzer	R & S	CMU200	102189	08/12/2010	08/11/2012
DC Block	Agilent	BLK-18	155452	01/05/2012	01/04/2013
Low Loss Cable	HUBER+SUHNE R	SUCOFLEX 104PEA-10 M	10m	01/05/2012	01/04/2013
Low Loss Cable	HUBER+SUHNE R	SUCOFLEX 104PEA-3M	3m	01/05/2012	01/04/2013
3m Site	SGS	966 chamber	N/A	07/15/2011	07/14/2012

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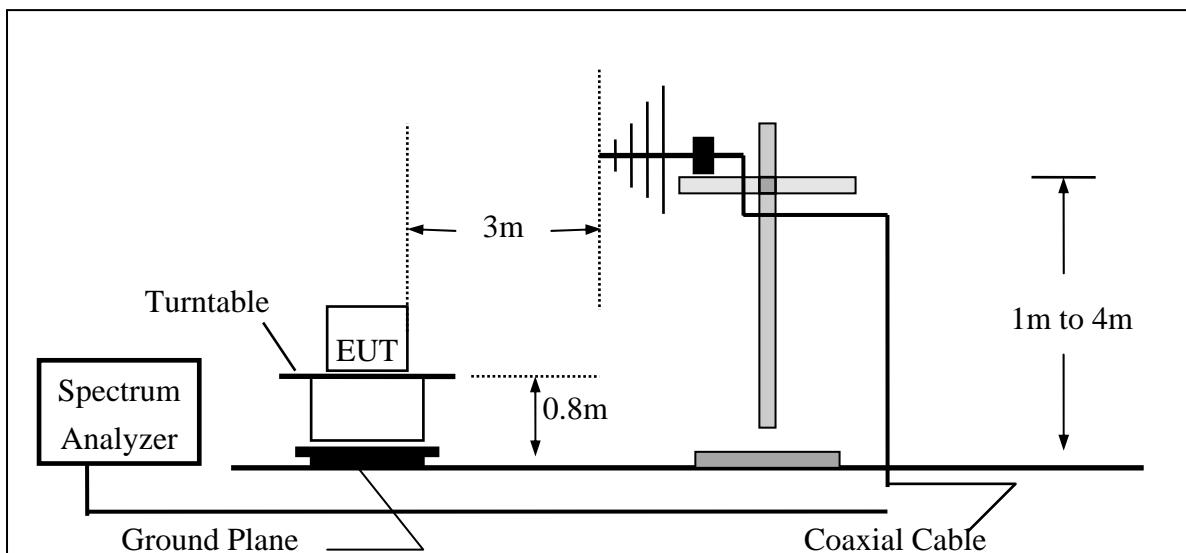
### 8.3 Test SET-UP:

#### 8.3.1 Conducted Emission at antenna port:

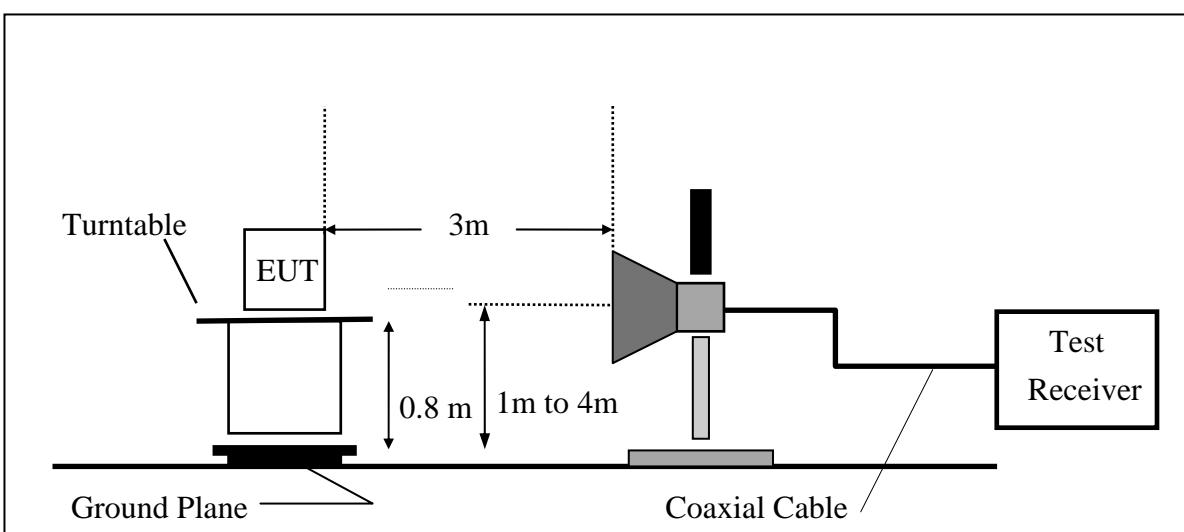
Refer to section 6.3 for details.

#### 8.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



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#### 8.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

#### 8.5 Field Strength Calculation:

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

#### 8.6 Measurement Result:

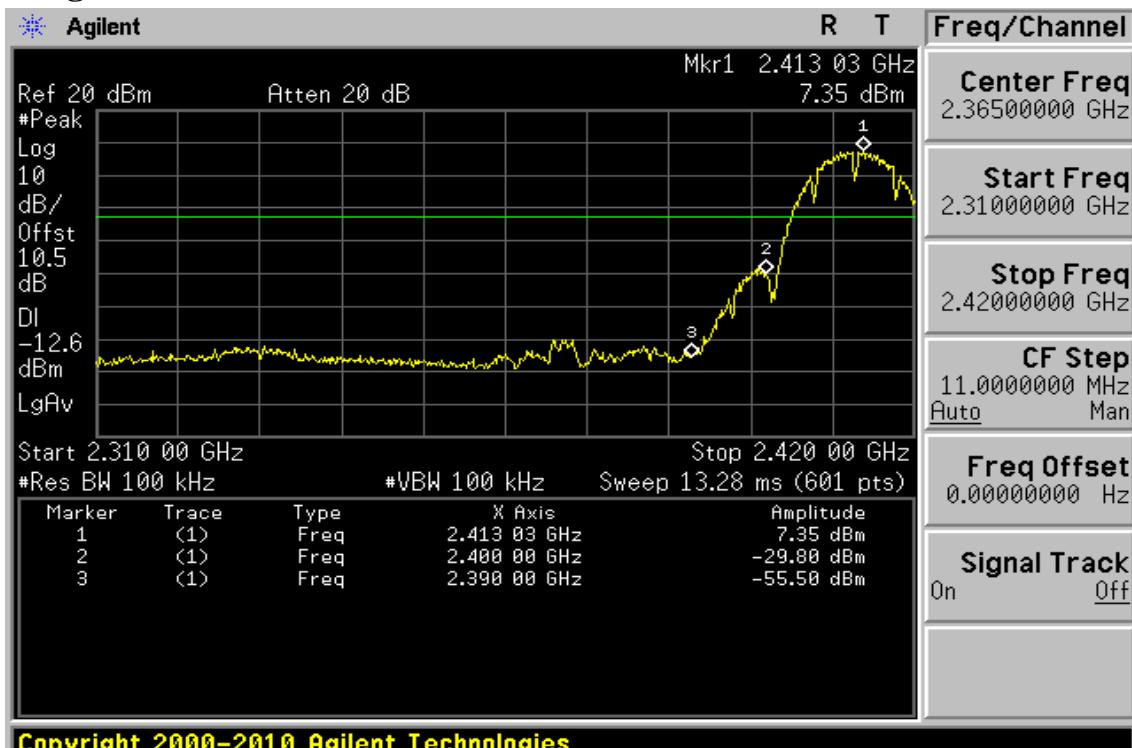
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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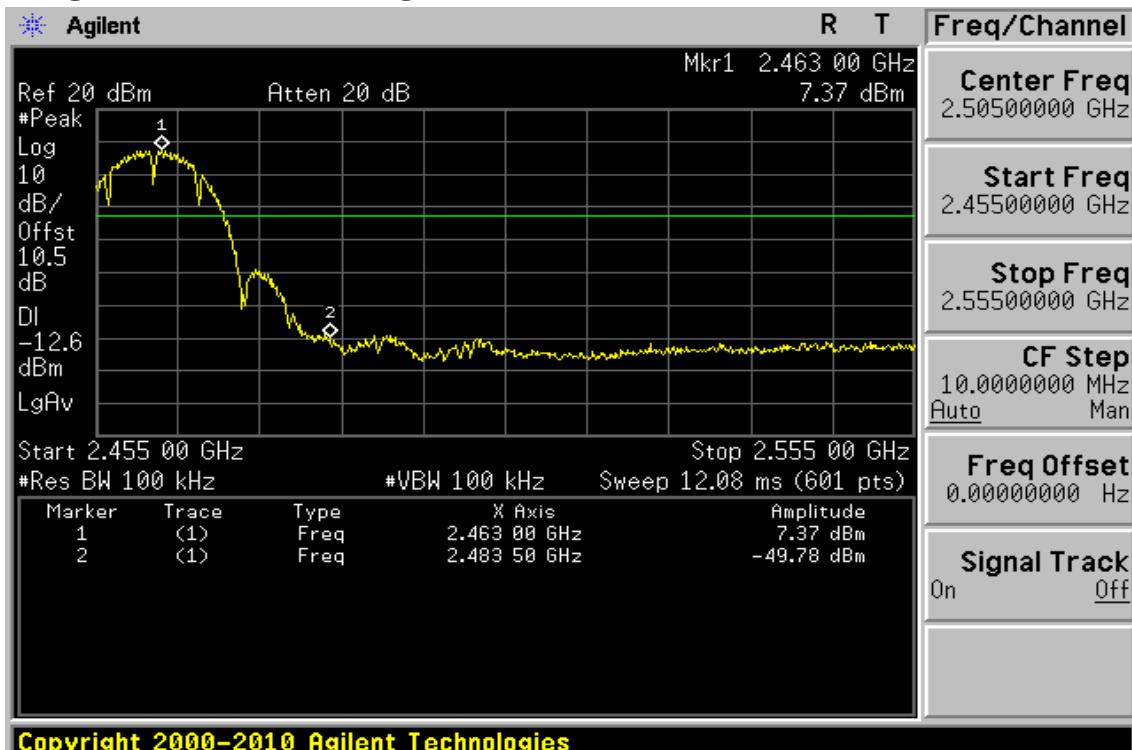
## 802.11b

### Band Edges Test Data CH-Low



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### Band Edges Test Data CH-High



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**Radiated Emission: 802.11 b mode**

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2412 MHz	Test By	Lion
Temperature	27 °C	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2390.00	E	Average	42.12	5.17	47.29	54.00	-6.71
2390.00	E	Peak	55.08	5.17	60.25	74.00	-13.75

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2412 MHz	Test By	Lion
Temperature	27 °C	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2390.00	E	Average	39.21	5.79	45.00	54.00	-9.00
2390.00	E	Peak	52.22	5.79	58.01	74.00	-15.99

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

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**Radiated Emission: 802.11 b mode**

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2462 MHz	Test By	Lion
Temperature	27 °C	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2483.50	E	Average	43.45	5.69	49.14	54.00	-4.86
2483.50	E	Peak	56.28	5.69	61.97	74.00	-12.03

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2462 MHz	Test By	Lion
Temperature	27 °C	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2483.50	E	Average	41.20	6.72	47.92	54.00	-6.08
2483.50	E	Peak	52.24	6.72	58.96	74.00	-15.04

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

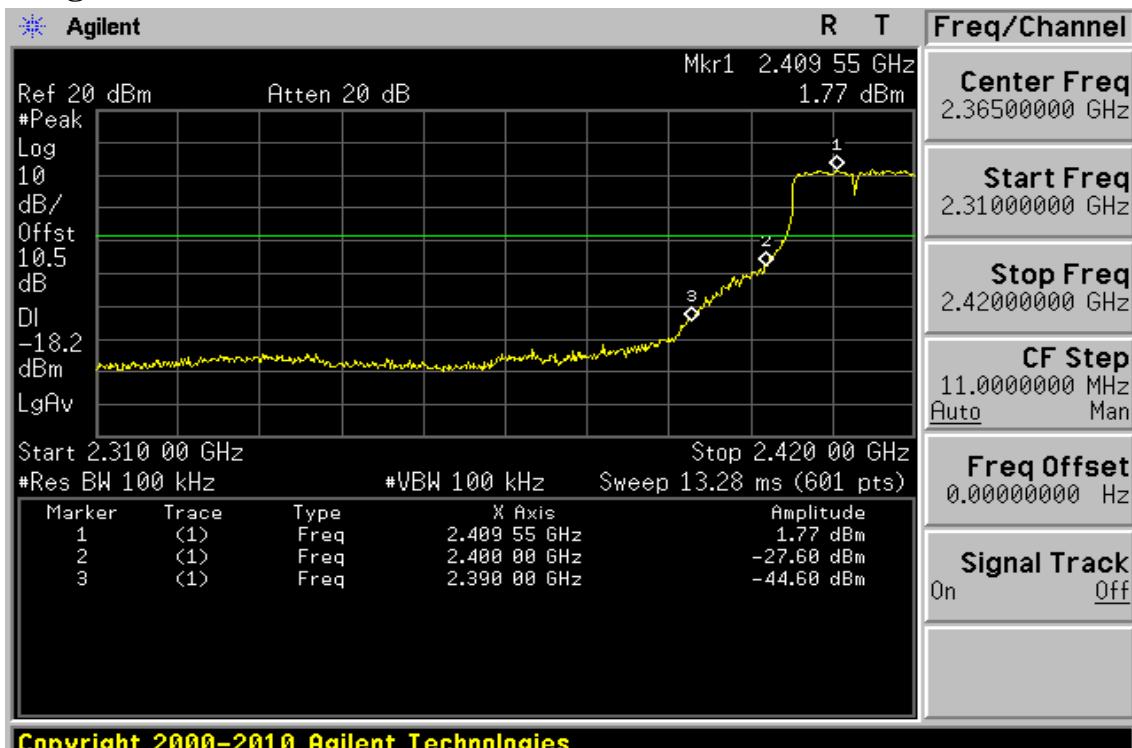
“--“ : denotes Noise Floor.

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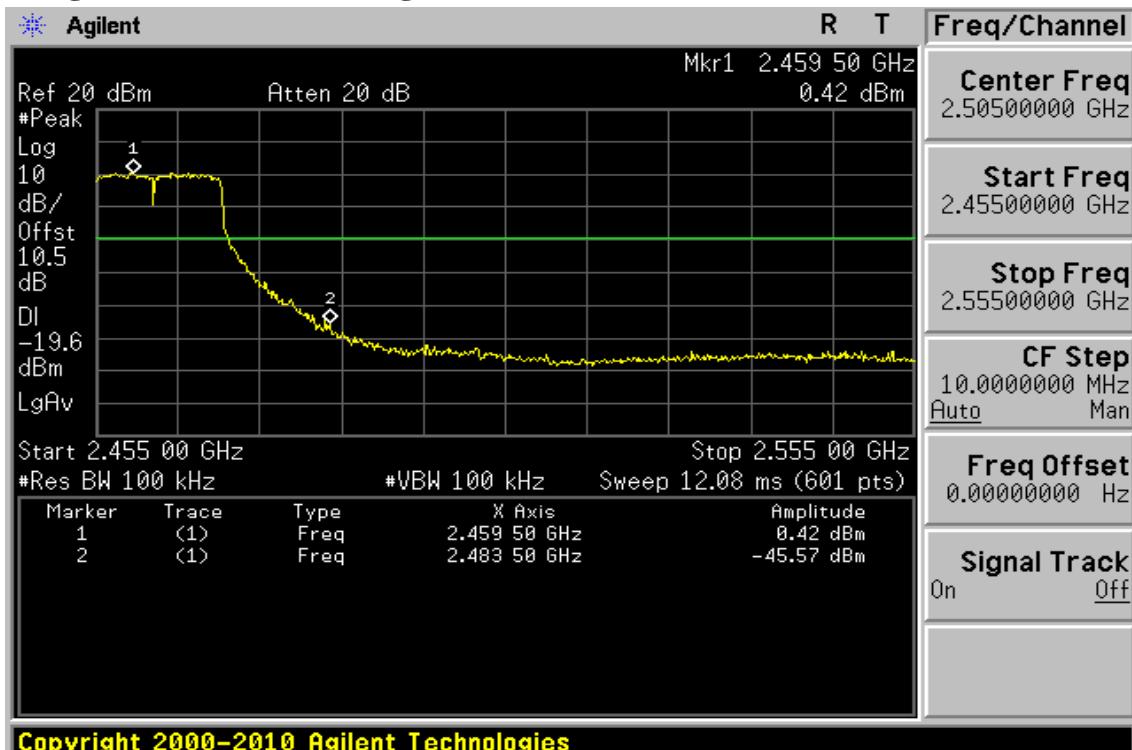
## 802.11g

### Band Edges Test Data CH-Low



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### Band Edges Test Data CH-High



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**Radiated Emission: 802.11 g mode**

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2412 MHz	Test By	Lion
Temperature	27 °C	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2390.00	E	Average	45.46	5.17	50.63	54.00	-3.37
2390.00	E	Peak	64.91	5.17	70.08	74.00	-3.92

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2412 MHz	Test By	Lion
Temperature	27 °C	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2390.00	E	Average	41.72	5.79	47.51	54.00	-6.49
2390.00	E	Peak	53.87	5.79	59.66	74.00	-14.34

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

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**Radiated Emission: 802.11 g mode**

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2462 MHz	Test By	Lion
Temperature	27 °C	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2483.50	E	Average	44.65	5.69	50.34	54.00	-3.66
2483.50	E	Peak	65.02	5.69	70.71	74.00	-3.29

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2462 MHz	Test By	Lion
Temperature	27 °C	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor dB	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2483.50	E	Average	41.70	6.72	48.42	54.00	-5.58
2483.50	E	Peak	59.94	6.72	66.66	74.00	-7.34

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

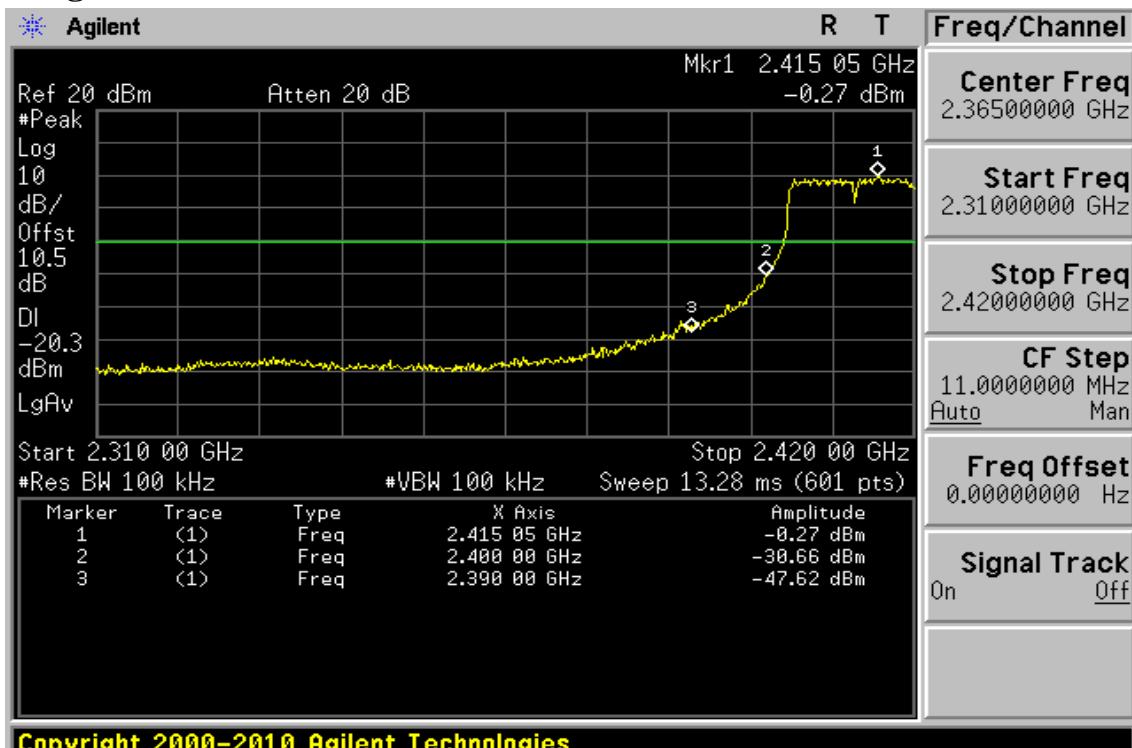
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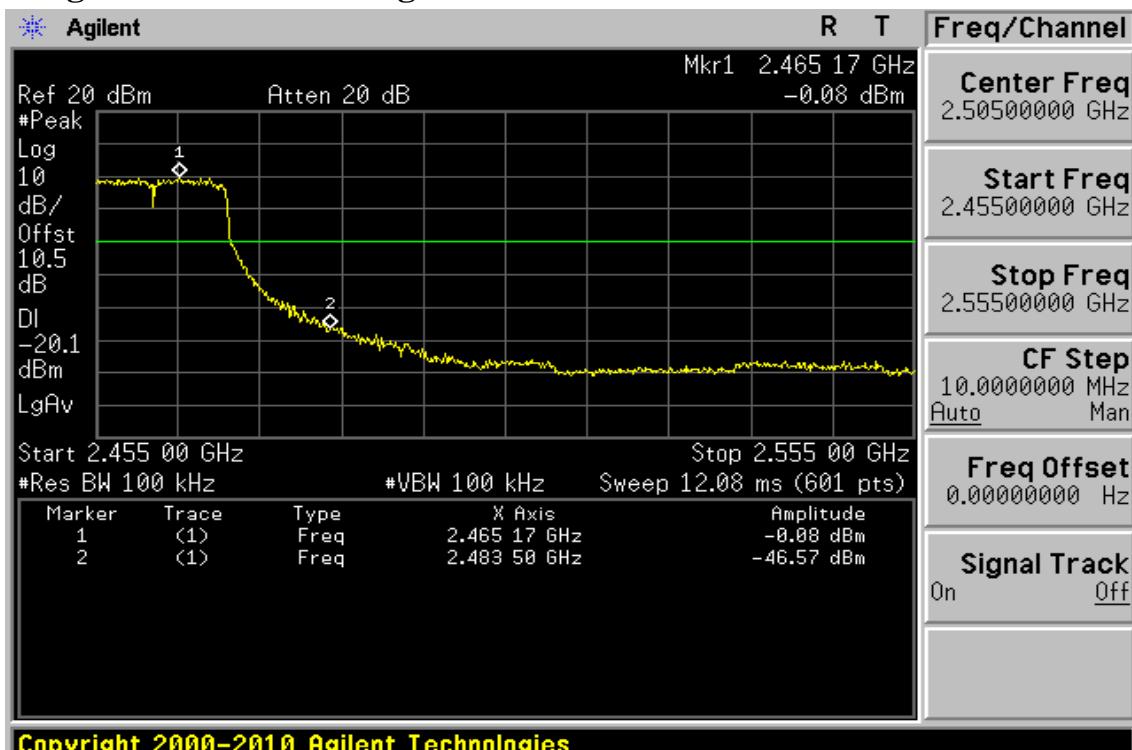
## 802.11n\_20M (Aux)

### Band Edges Test Data CH-Low



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### Band Edges Test Data CH-High



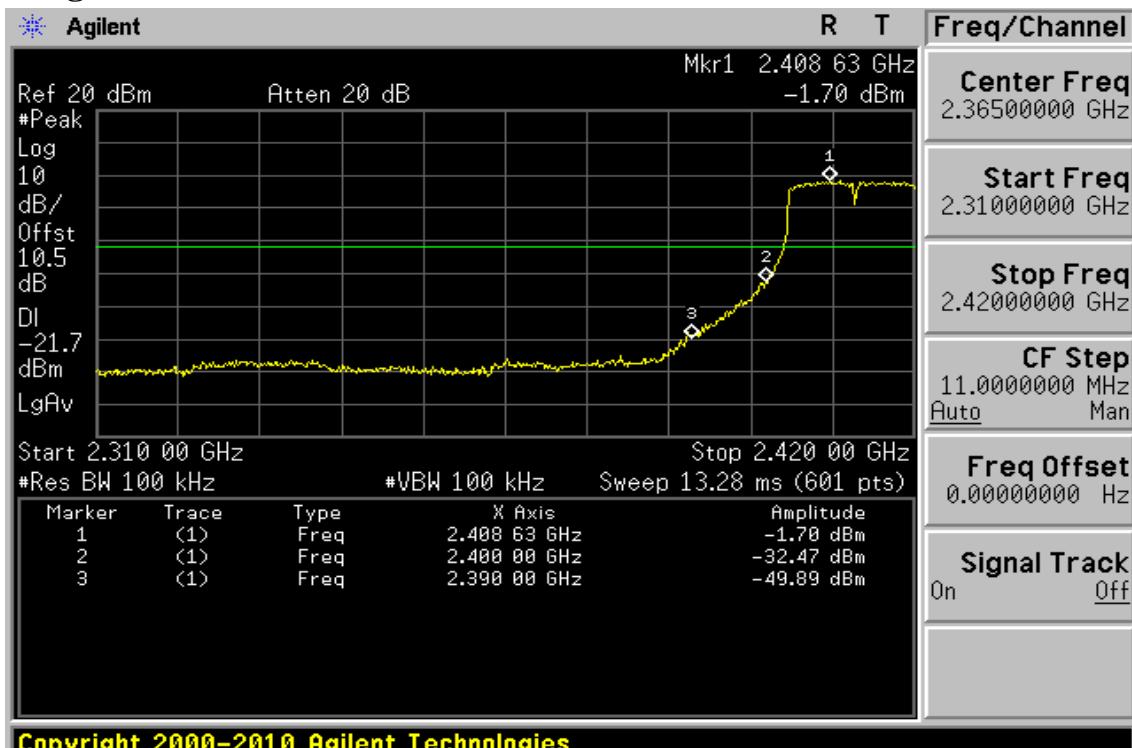
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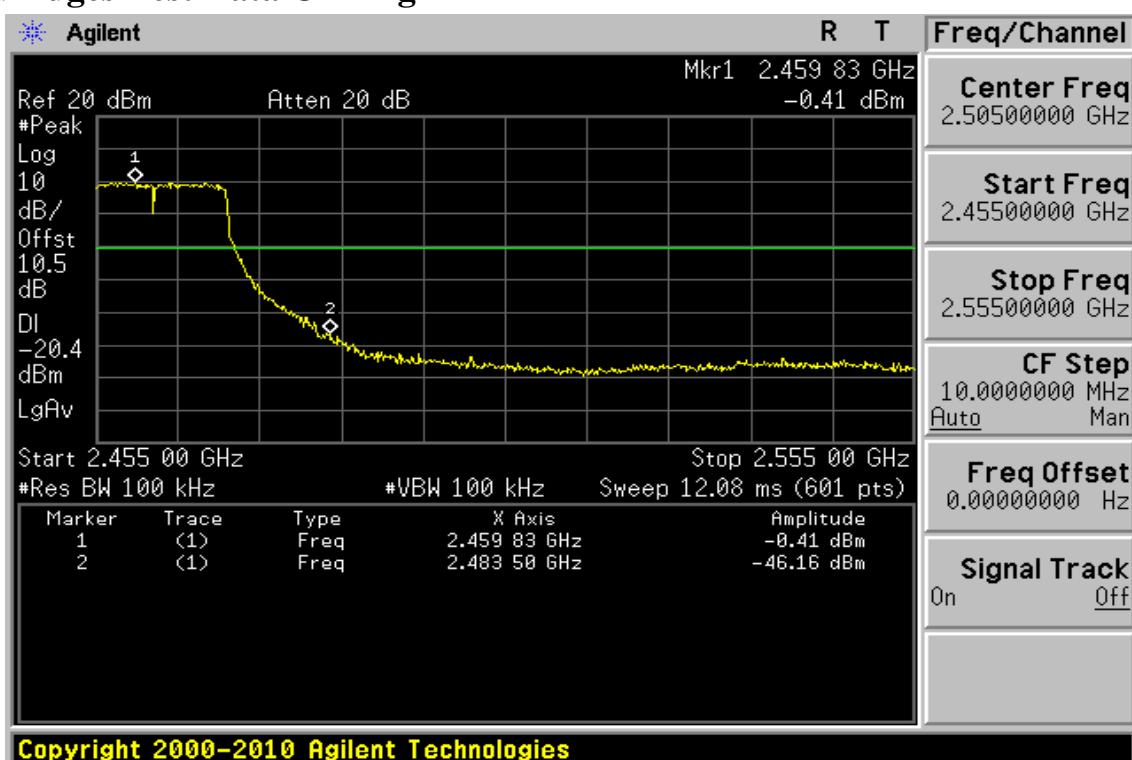
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## 802.11n\_20M (Main)

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



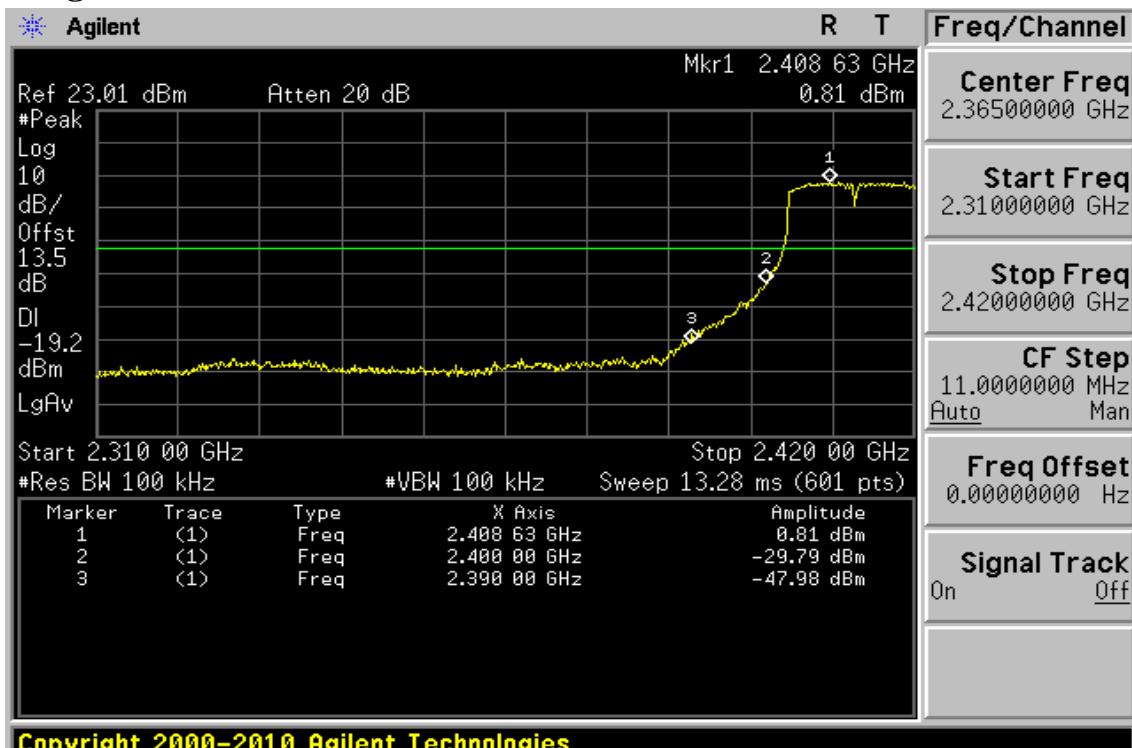
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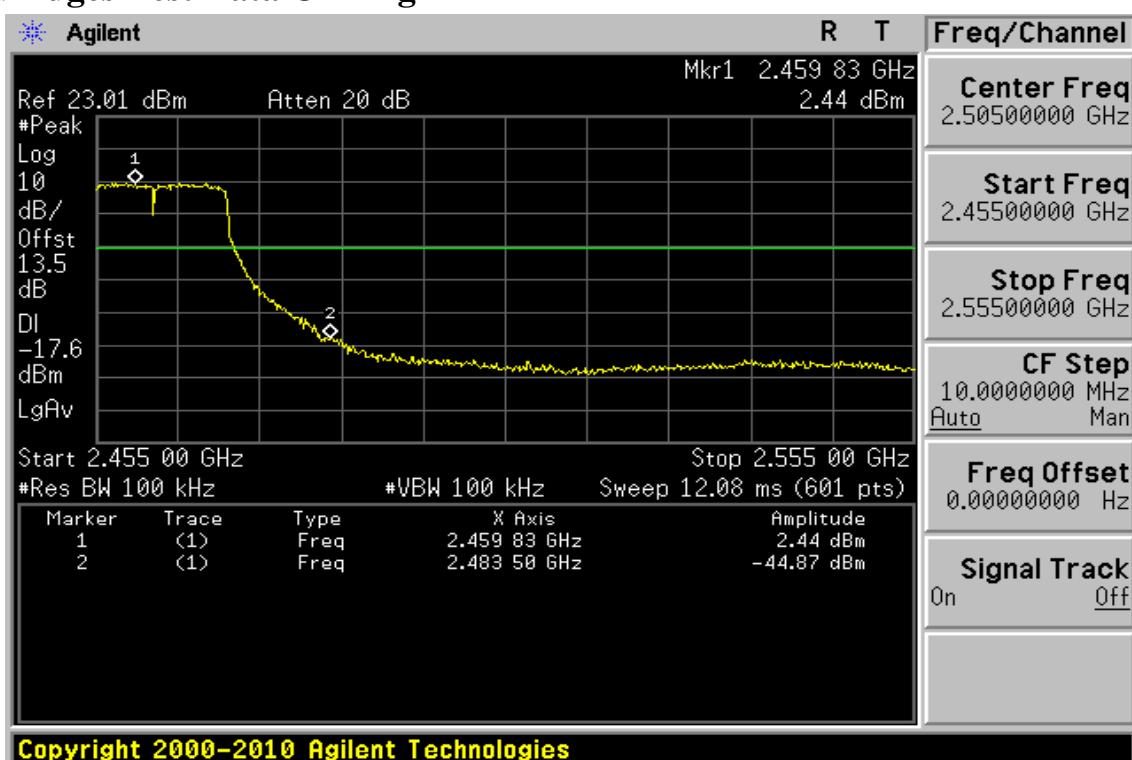
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## 802.11n\_20M (MIMO)

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



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**Radiated Emission: 802.11n\_20M mode (MIMO)**

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2412 MHz	Test By	Lion
Temperature	27	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB $\mu$ V	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2390.00	E	Average	45.08	5.17	50.25	54.00	-3.75
2390.00	E	Peak	63.15	5.17	68.32	74.00	-5.68

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2412 MHz	Test By	Lion
Temperature	27	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB $\mu$ V	Limit @3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				

2390.00	E	Average	41.69	5.79	47.48	54.00	-6.52
2390.00	E	Peak	58.02	5.79	63.81	74.00	-10.19

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

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**Radiated Emission: 802.11n\_20M mode (MIMO)**

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2462 MHz	Test By	Lion
Temperature	27	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB $\mu$ V	@3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				
2483.50	E	Average	44.23	5.69	49.92	54.00	-4.08	
2483.50	E	Peak	64.41	5.69	70.10	74.00	-3.90	

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2462 MHz	Test By	Lion
Temperature	27	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum		Factor	Actual FS dB $\mu$ V	@3m dB $\mu$ V/m	Safe Margin dB
			Mode	Reading Level dB $\mu$ V				
2483.50	E	Average	42.55	6.72	49.27	54.00	-4.73	
2483.50	E	Peak	61.01	6.72	67.73	74.00	-6.27	

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“--“ : denotes Noise Floor.

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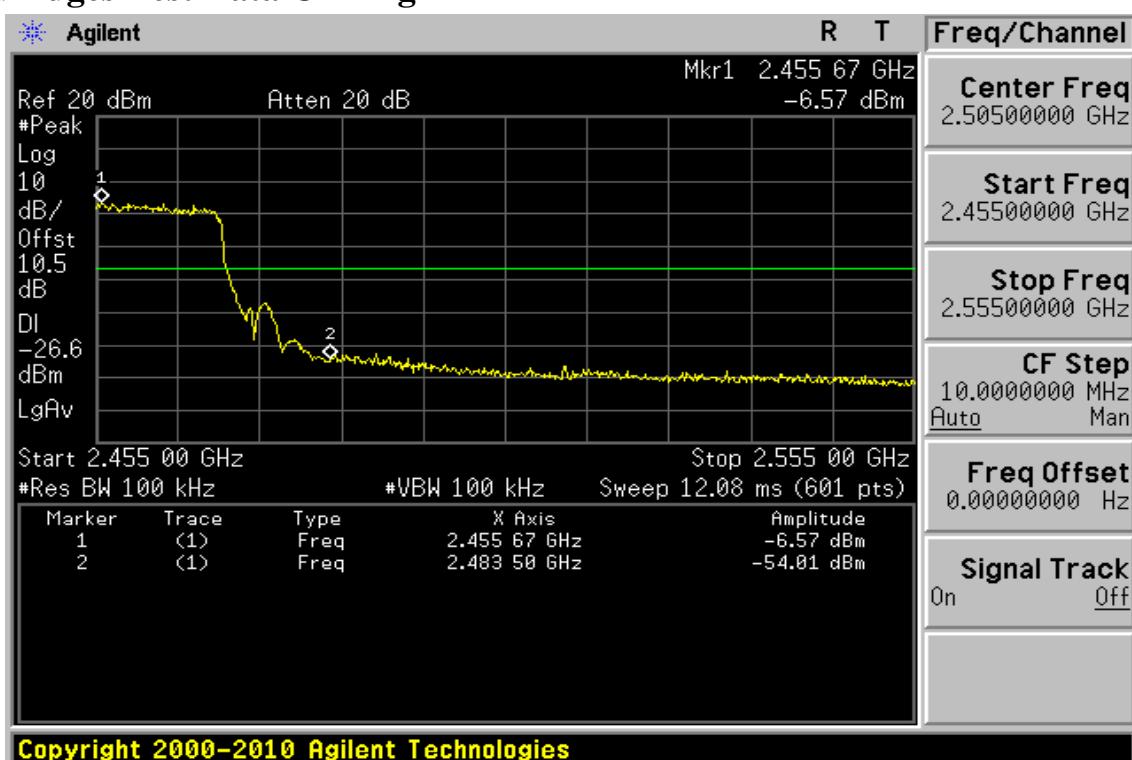
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## 802.11n\_40M (Aux)

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High

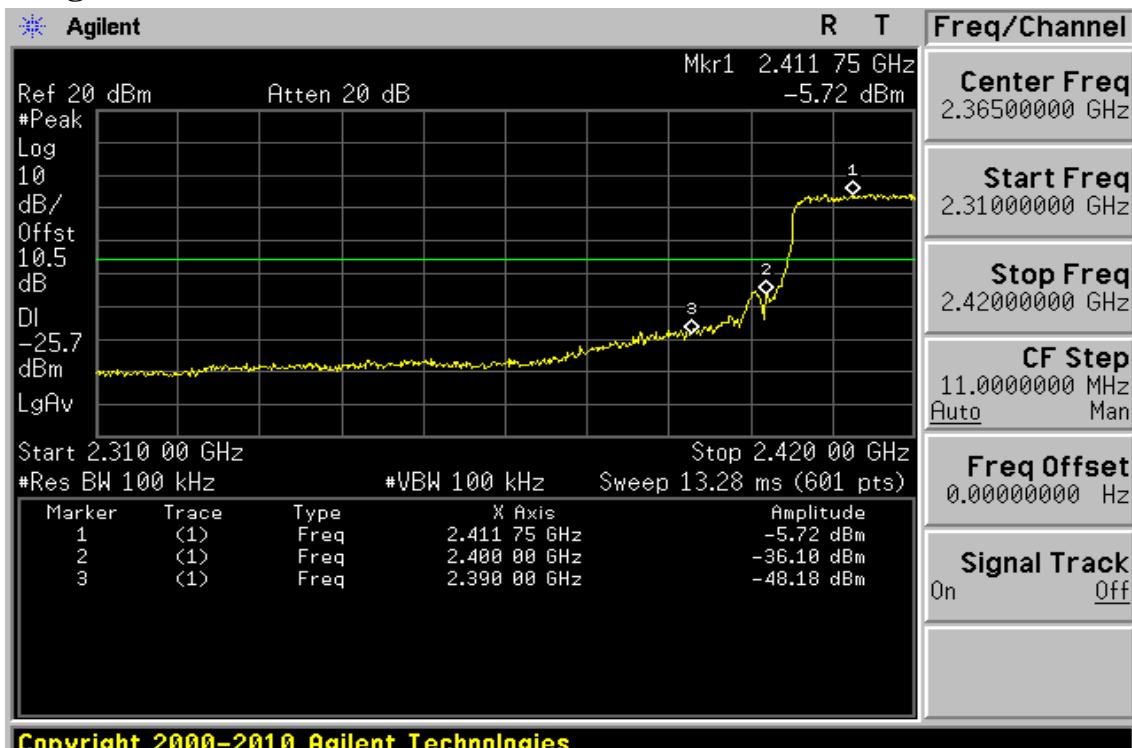


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## 802.11n\_40M (MAIN)

### Band Edges Test Data CH-Low



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### Band Edges Test Data CH-High



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## 802.11n\_40M (MIMO)

### Band Edges Test Data CH-Low



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### Band Edges Test Data CH-High



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**Radiated Emission: 802.11 n\_40M mode (MIMO)**

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2422 MHz	Test By	Lion
Temperature	27 °C	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB $\mu$ V				

2390.00	E	Average	45.61	5.17	50.78	54.00	-3.22
2390.00	E	Peak	65.62	5.17	70.79	74.00	-3.21

Operation Mode	TX CH Low	Test Date	2012-01-09
Fundamental Frequency	2442 MHz	Test By	Lion
Temperature	27 °C	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB $\mu$ V				

2390.00	E	Average	42.11	5.79	47.90	54.00	-6.10
2390.00	E	Peak	58.44	5.79	64.23	74.00	-9.77

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

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**Radiated Emission: 802.11 n\_40M mode (MIMO)**

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2452 MHz	Test By	Lion
Temperature	27 °C	Pol	Ver.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB $\mu$ V				

2483.50	E	Average	43.93	5.69	49.62	54.00	-4.38
2483.50	E	Peak	64.47	5.69	70.16	74.00	-3.84

Operation Mode	TX CH High	Test Date	2012-01-09
Fundamental Frequency	2452 MHz	Test By	Lion
Temperature	27 °C	Pol	Hor.
Humidity	66 %		

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor	Actual FS dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB $\mu$ V				

2483.50	E	Average	40.87	6.72	47.59	54.00	-6.41
2483.50	E	Peak	58.68	6.72	65.40	74.00	-8.60

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

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## 9 SPURIOUS RADIATED EMISSION TEST

### 9.1 Standard Applicable

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

### 9.2 Measurement Equipment Used:

#### 9.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

#### 9.2.2 Radiated emission:

Refer to section 8.2 for details.

### 9.3 Test SET-UP:

#### 9.3.1 Conducted Emission at antenna port:

Refer to section 6.3 for details.

#### 9.3.2 Radiated emission:

Refer to section 8.3 for details.

### 9.5 Measurement Procedure:

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

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## 9.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$\mathbf{FS = RA + AF - CL - AG}$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

## 9.6 Measurement Result:

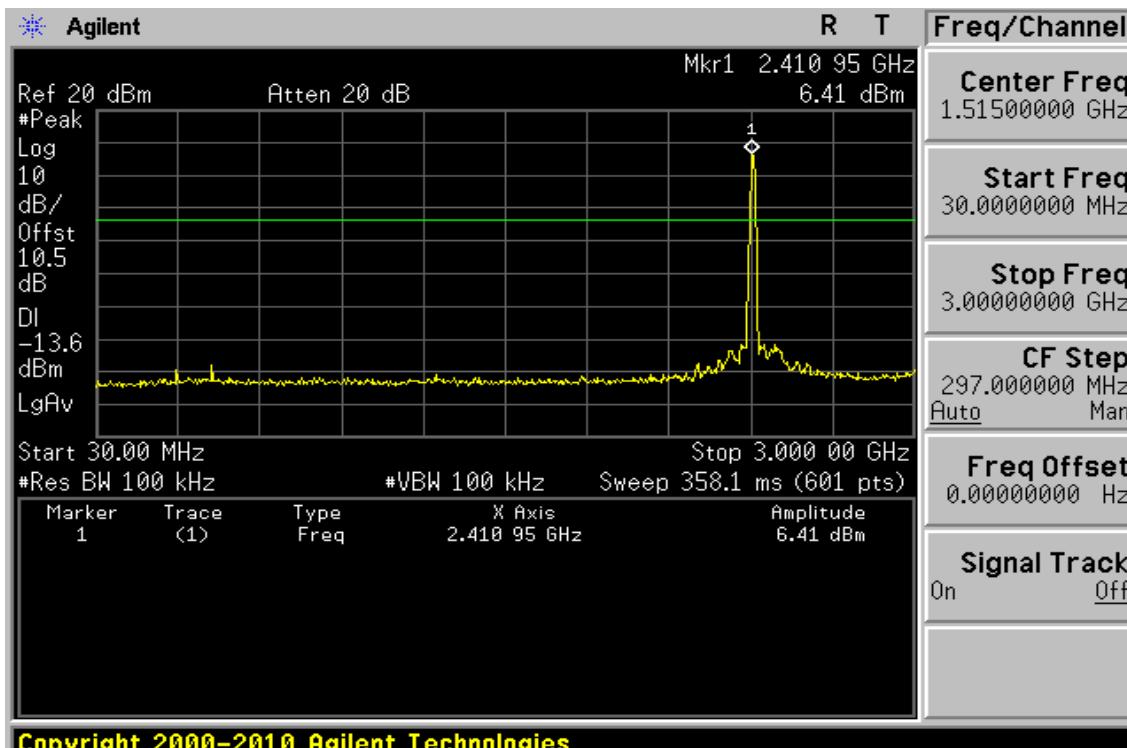
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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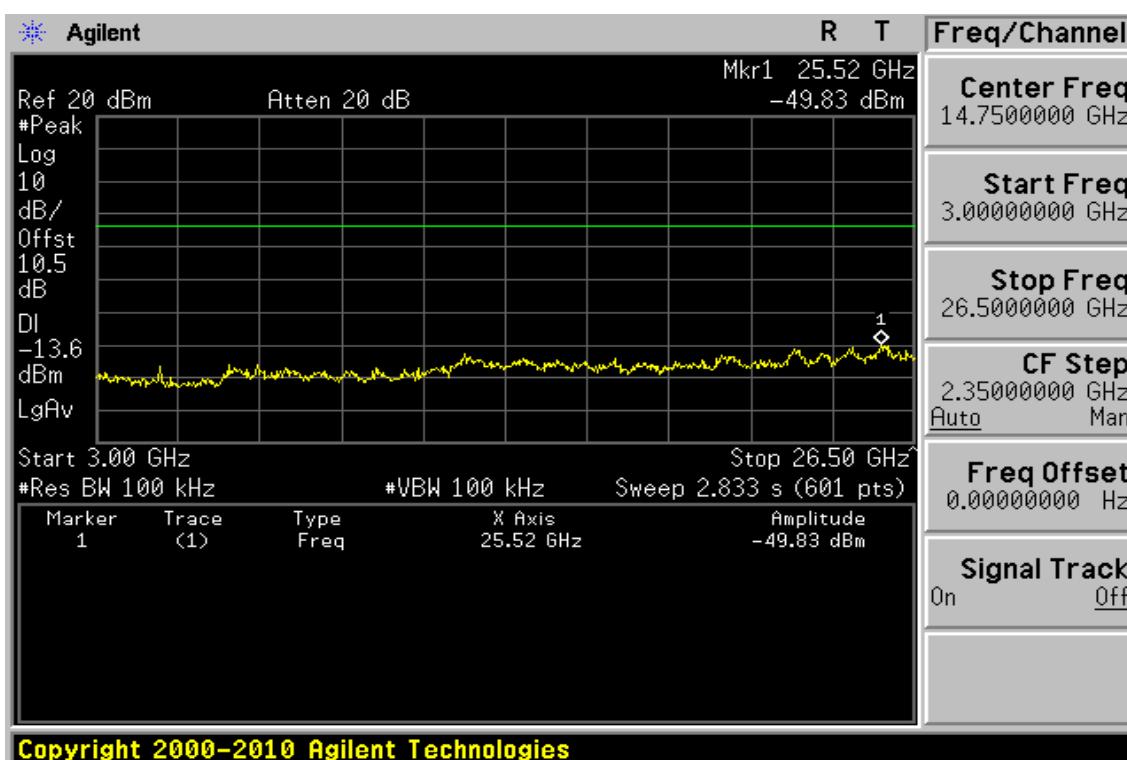
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## Conducted Spurious Emission Measurement Result (802.11b)

### Ch Low 30MHz – 3GHz



### Ch Low 3GHz – 26.5GHz

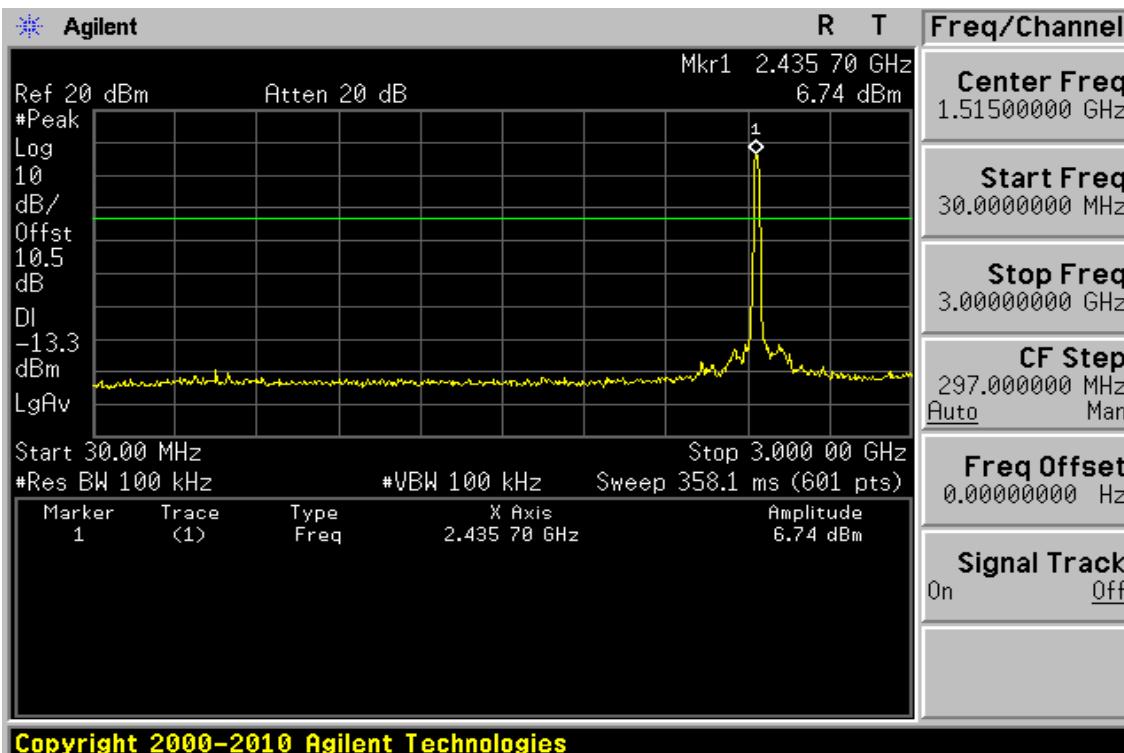


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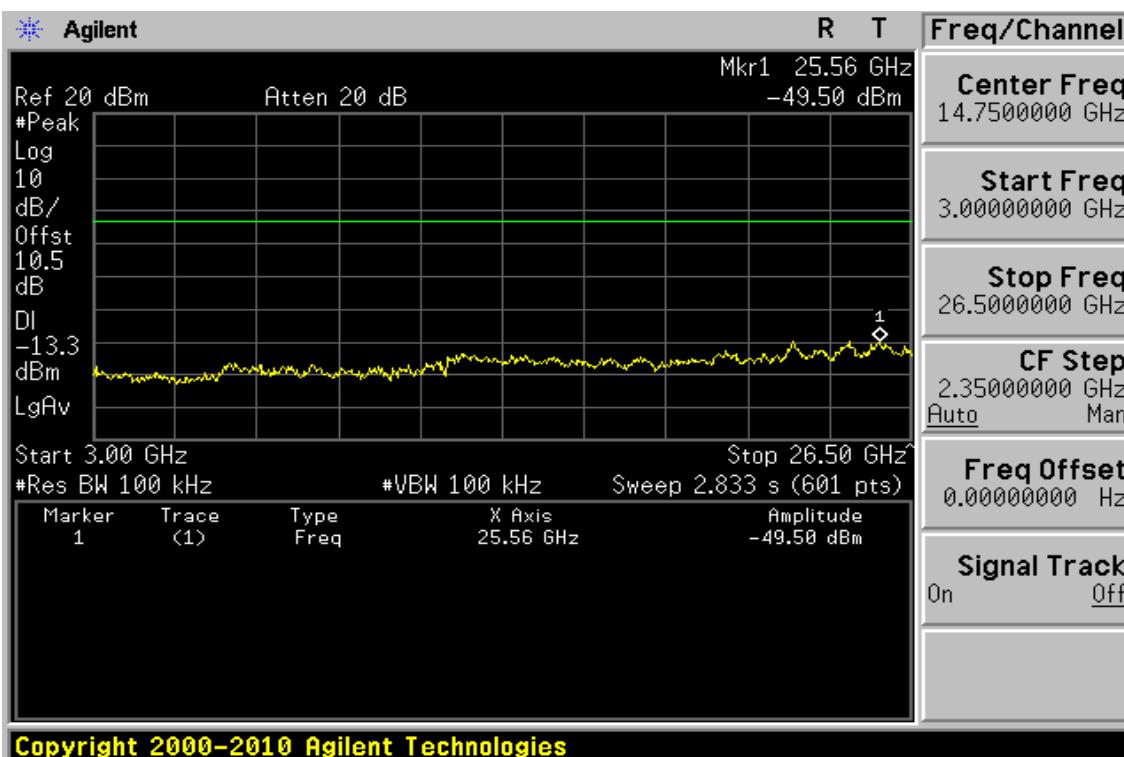
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

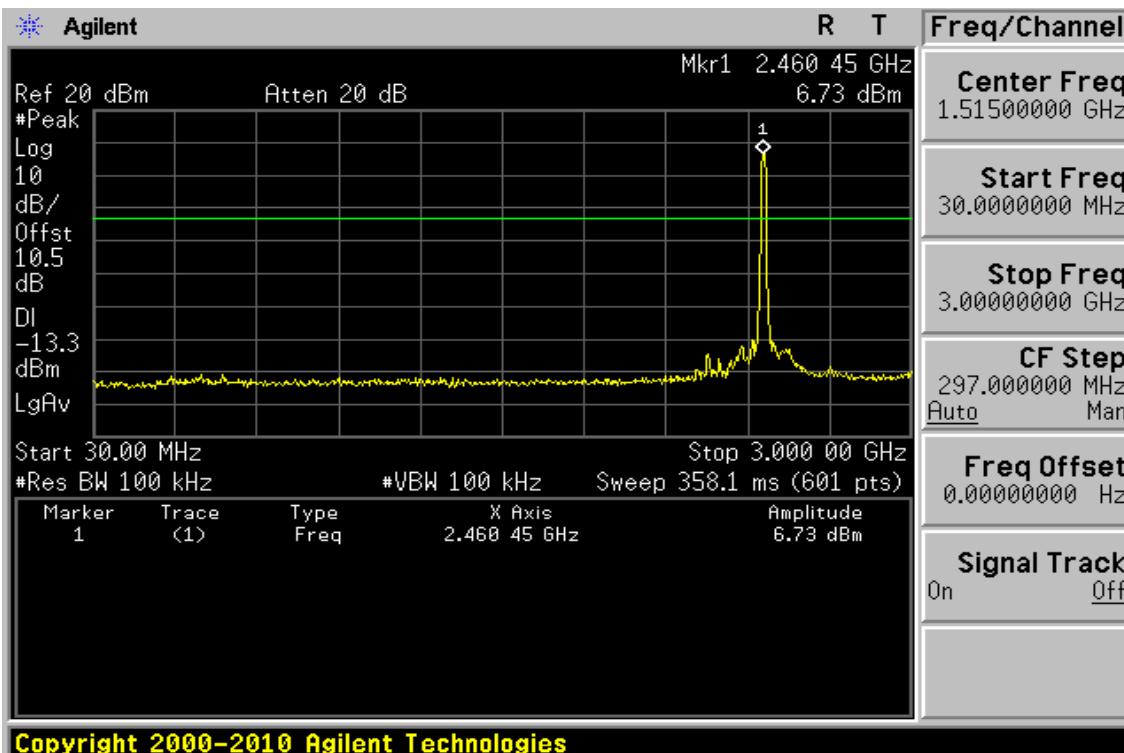


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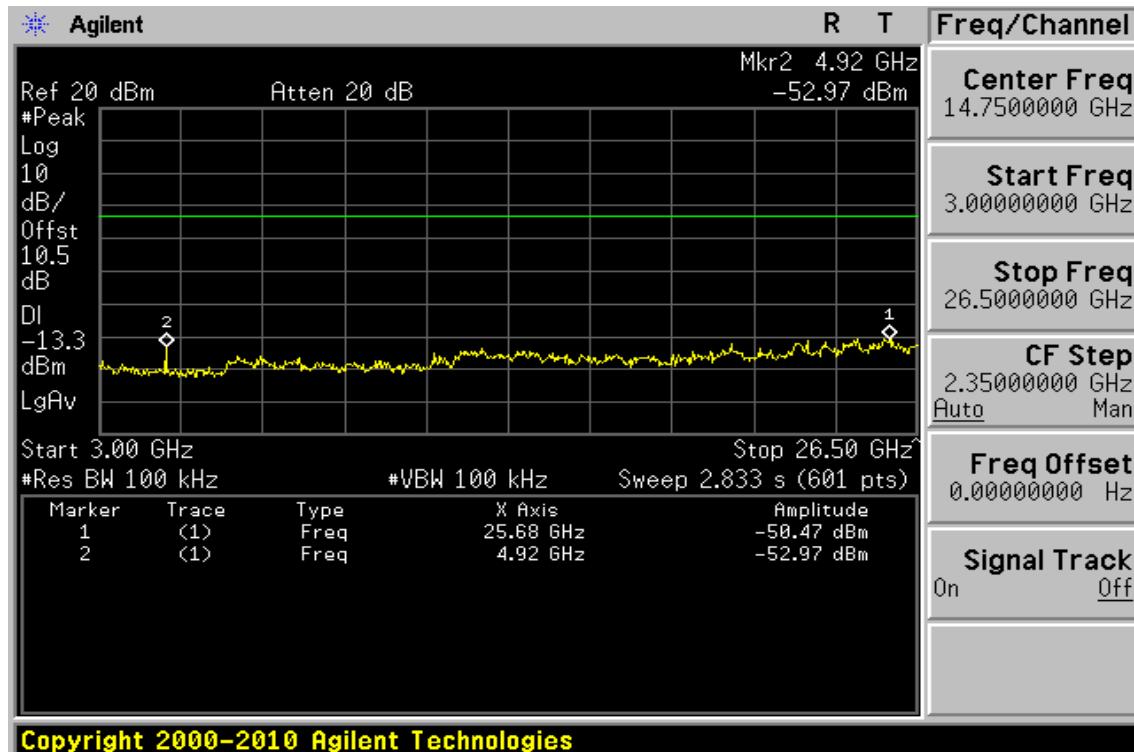
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## Ch High 30MHz – 3GHz



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## Ch High 3GHz – 26.5GHz

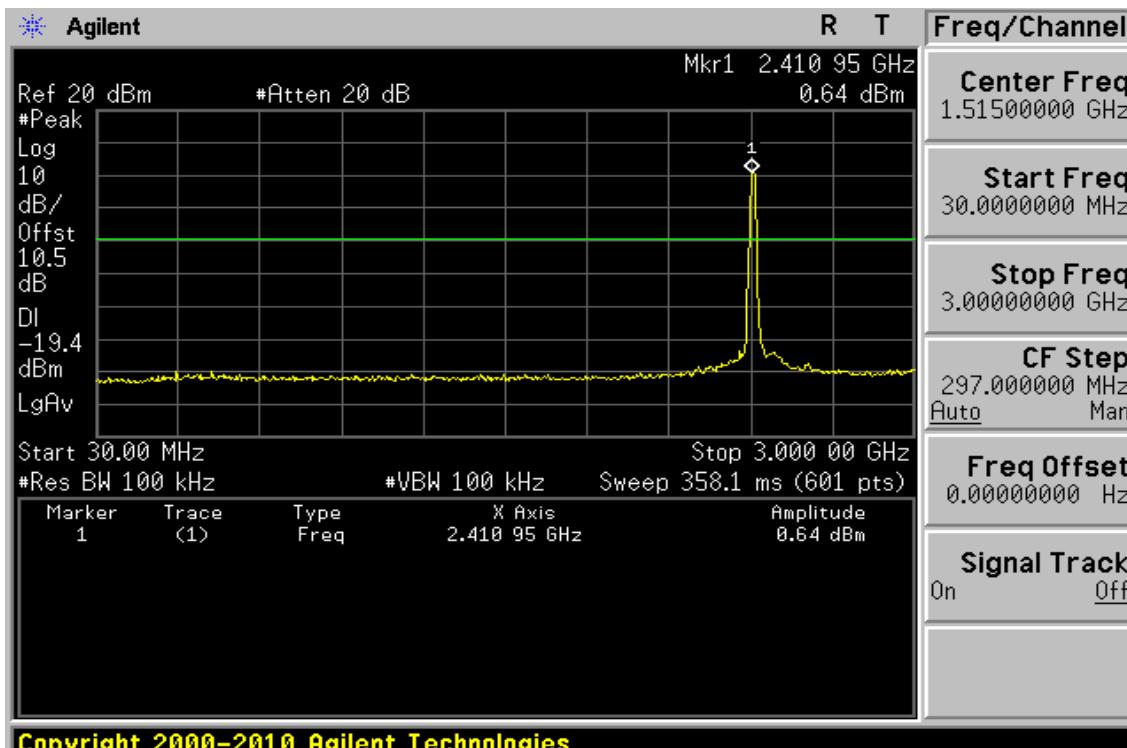


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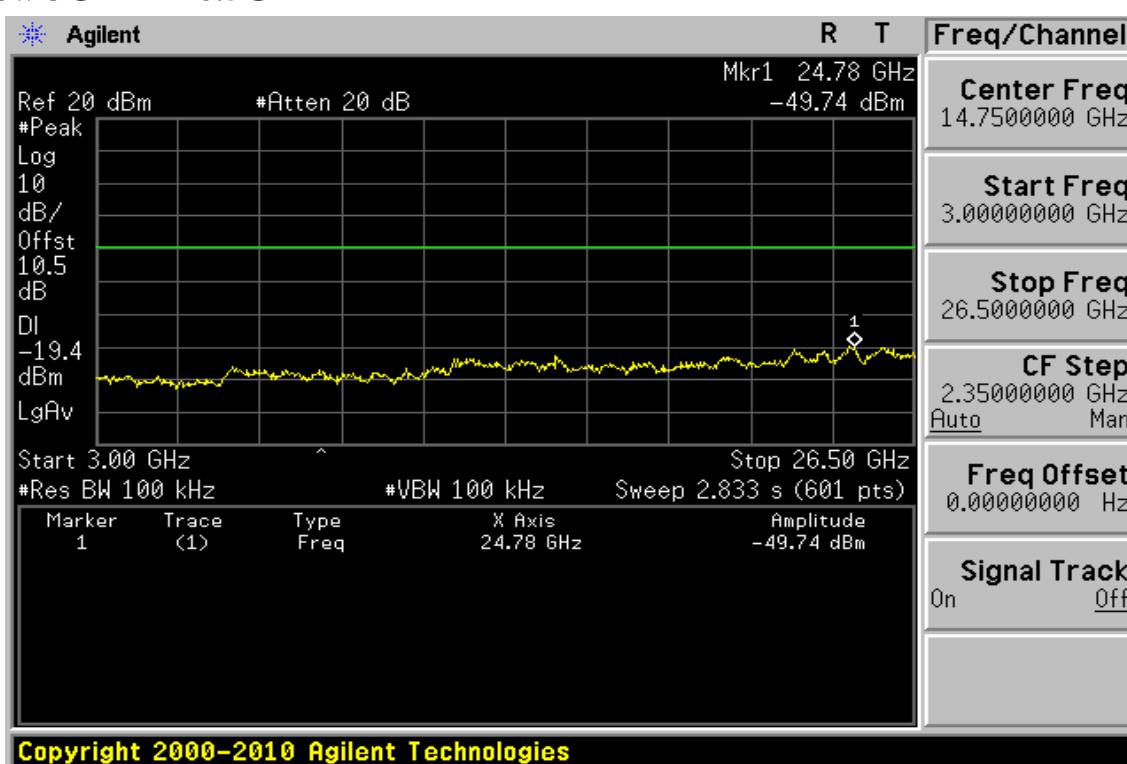
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## Conducted Spurious Emission Measurement Result (802.11g) Ch Low 30MHz – 3GHz



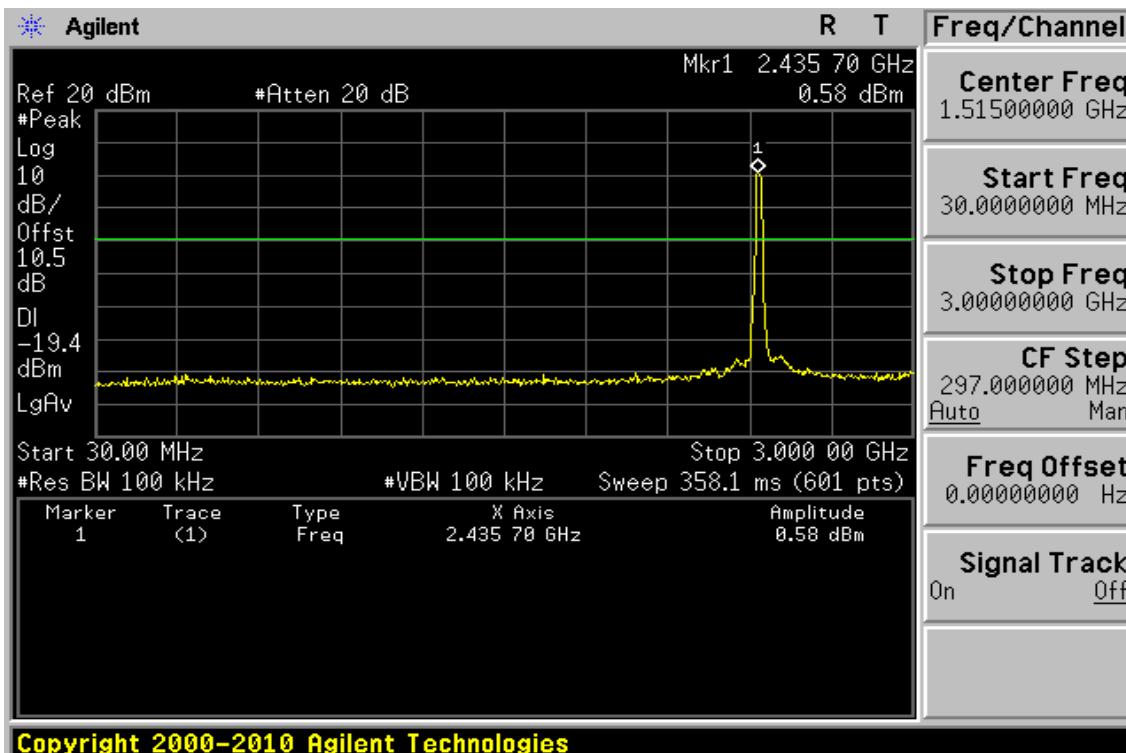
## Ch Low 3GHz – 26.5GHz



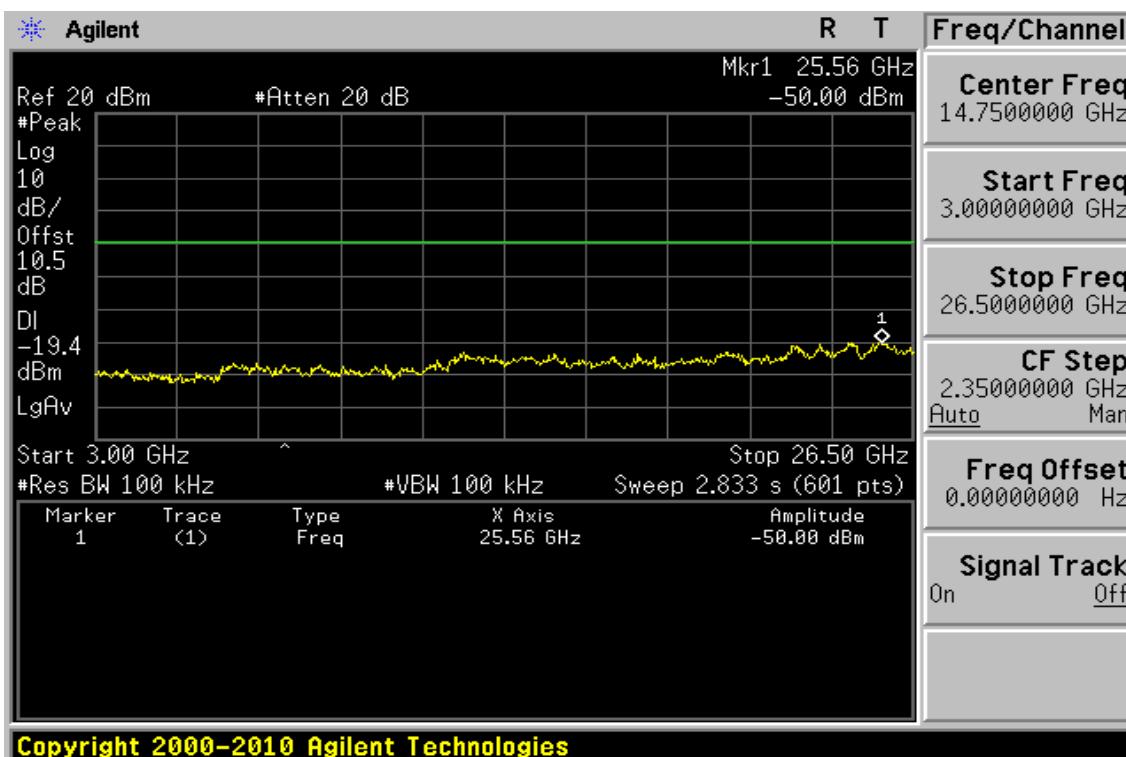
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## Ch Mid 30MHz – 3GHz



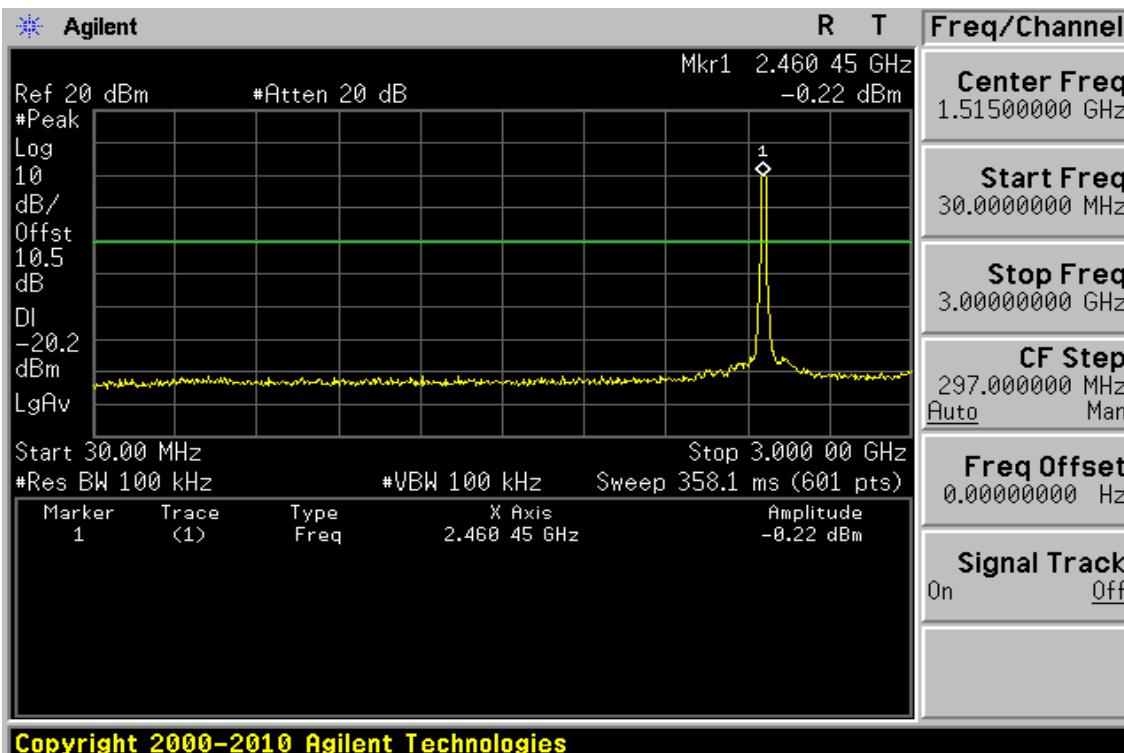
## Ch Mid 3GHz – 26.5GHz



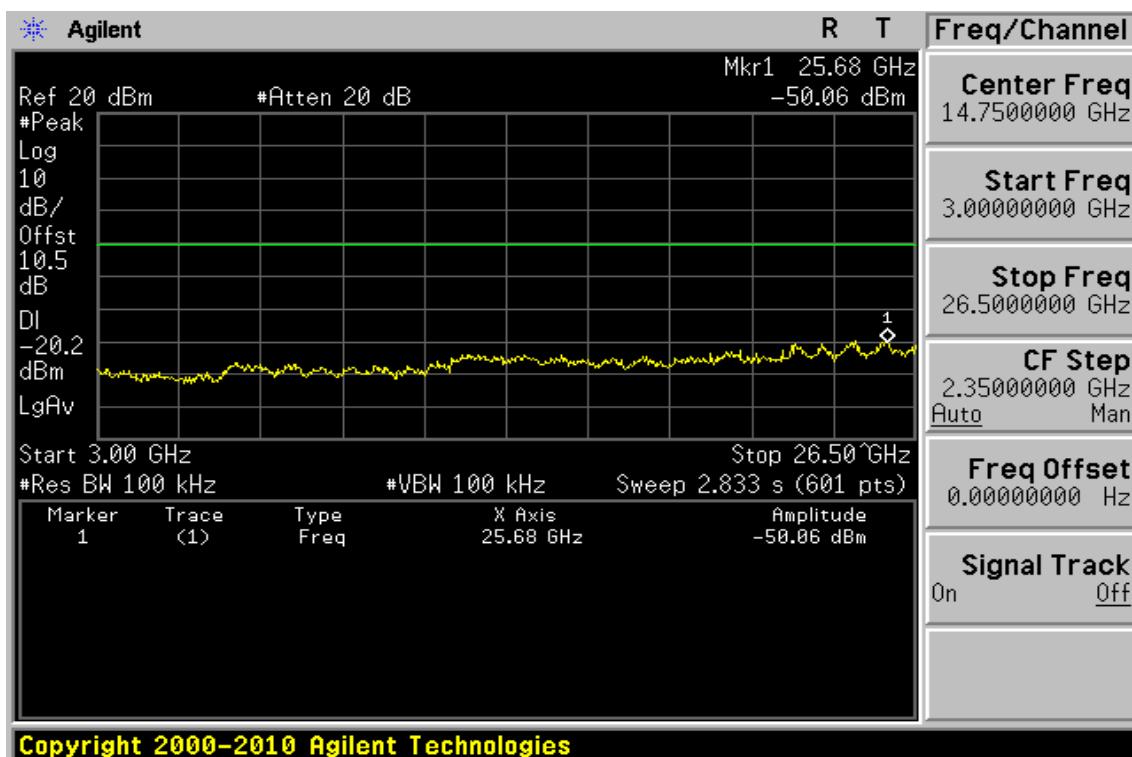
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## Ch High 30MHz – 3GHz

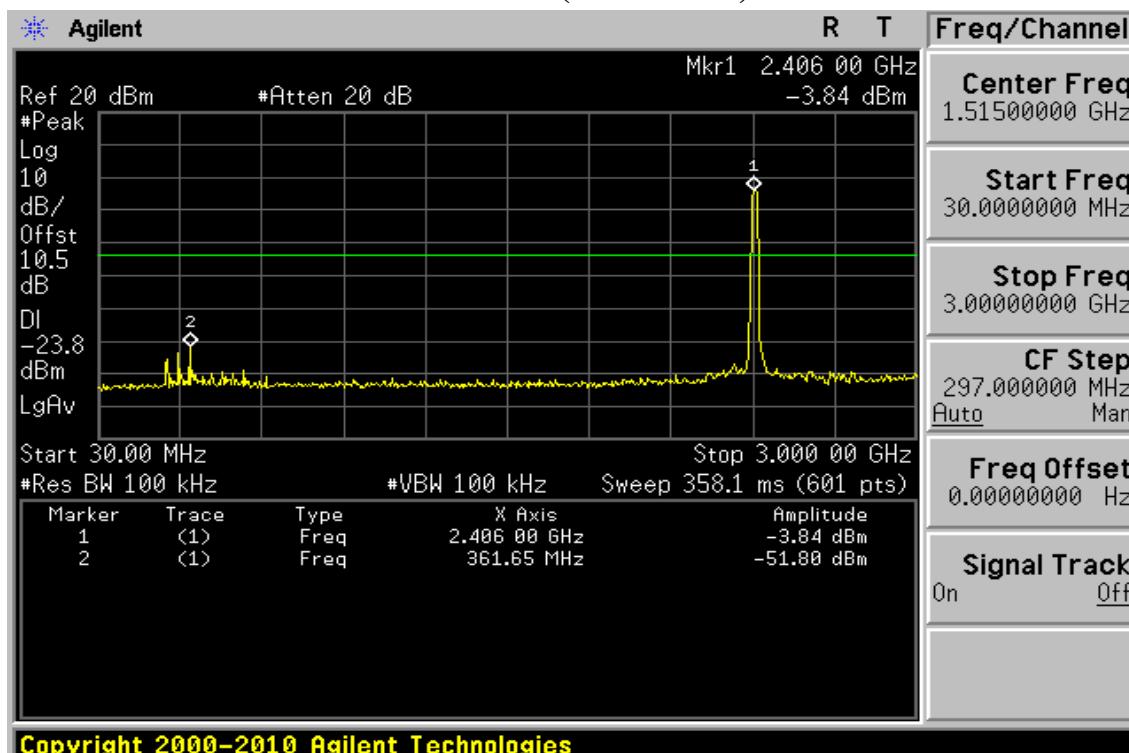
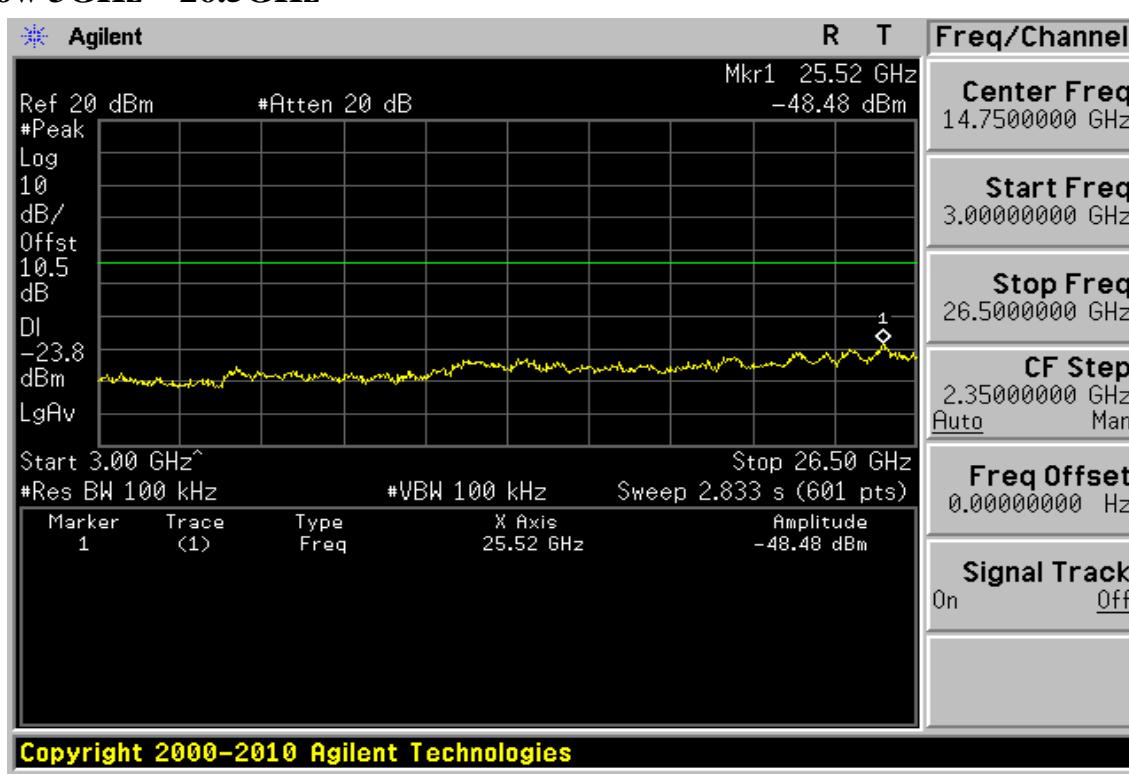


## Ch High 3GHz – 26.5GHz



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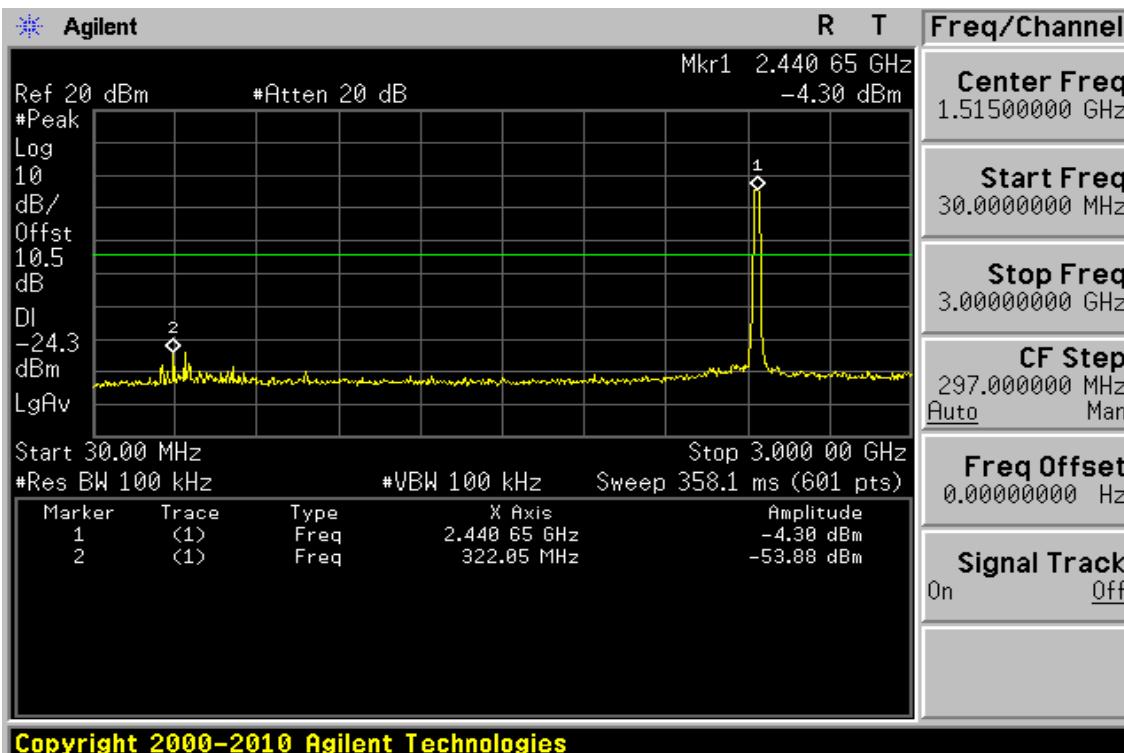
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**Conducted Spurious Emission Measurement Result (802.11n\_20M)****Ch Low 30MHz – 3GHz – Aux Antenna (worse case)****Ch Low 3GHz – 26.5GHz**

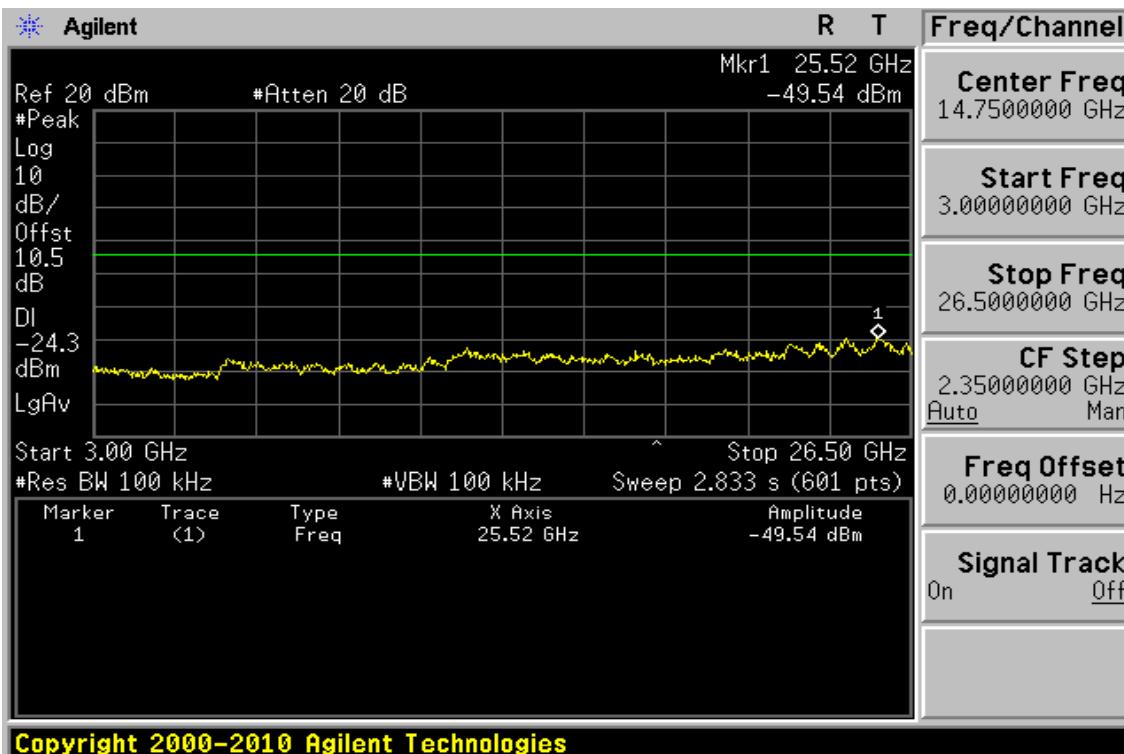
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

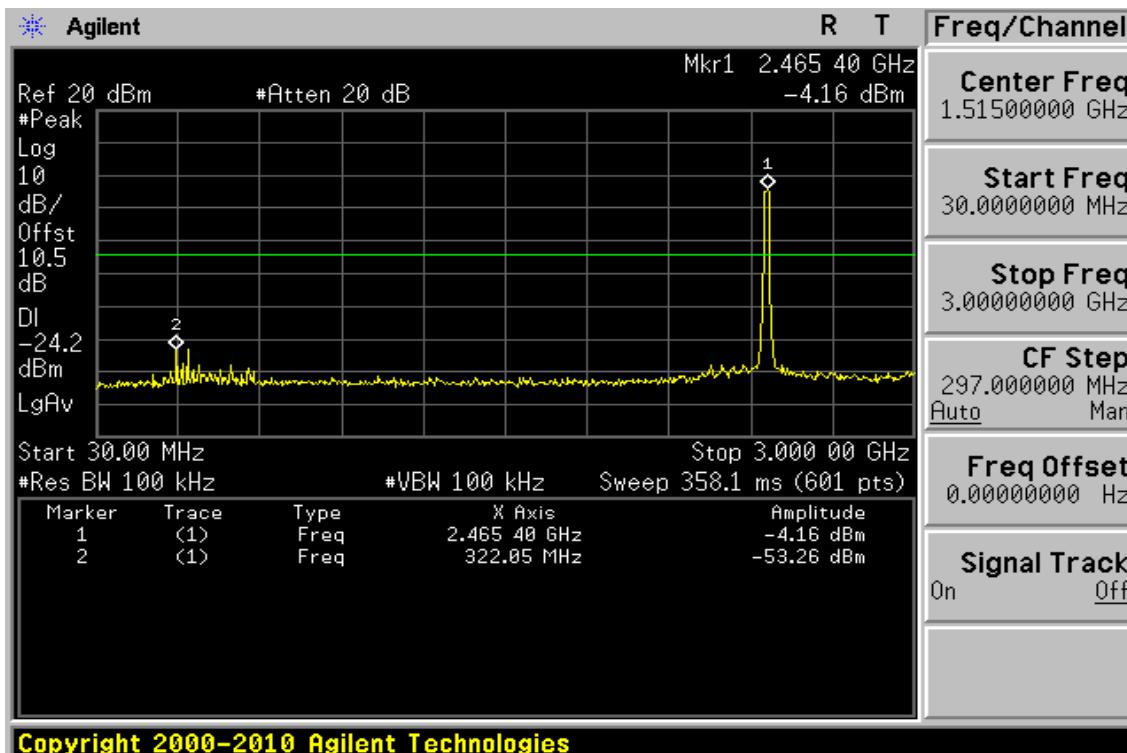


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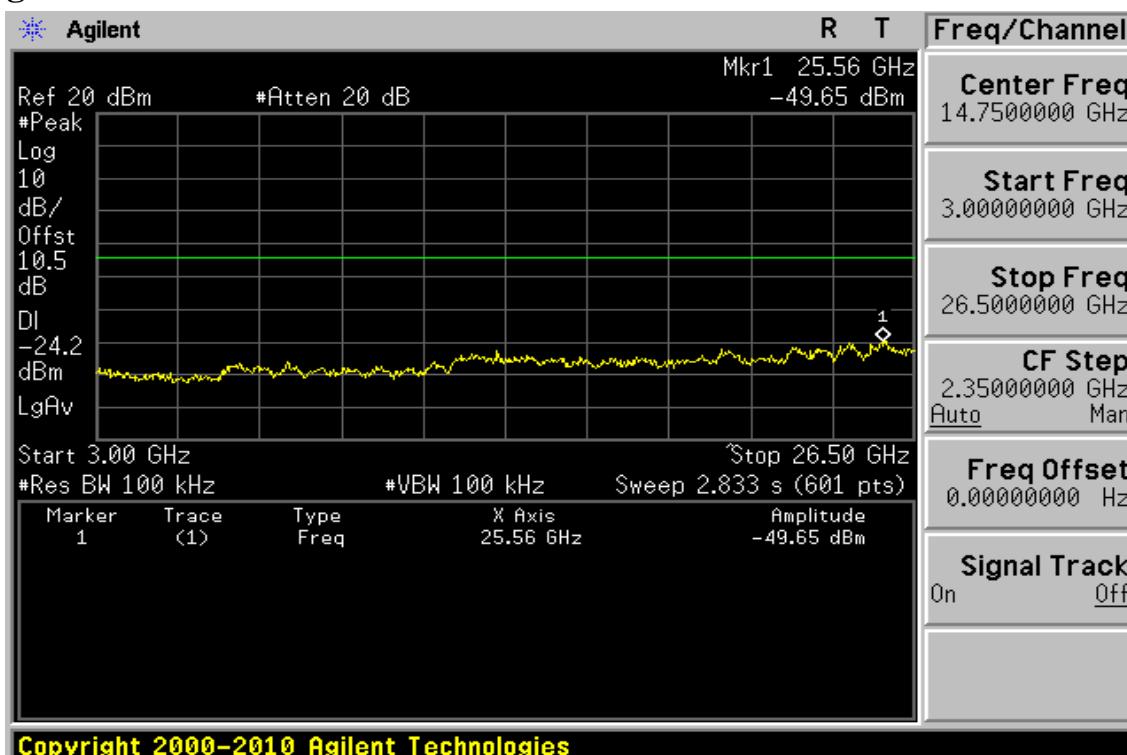
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz

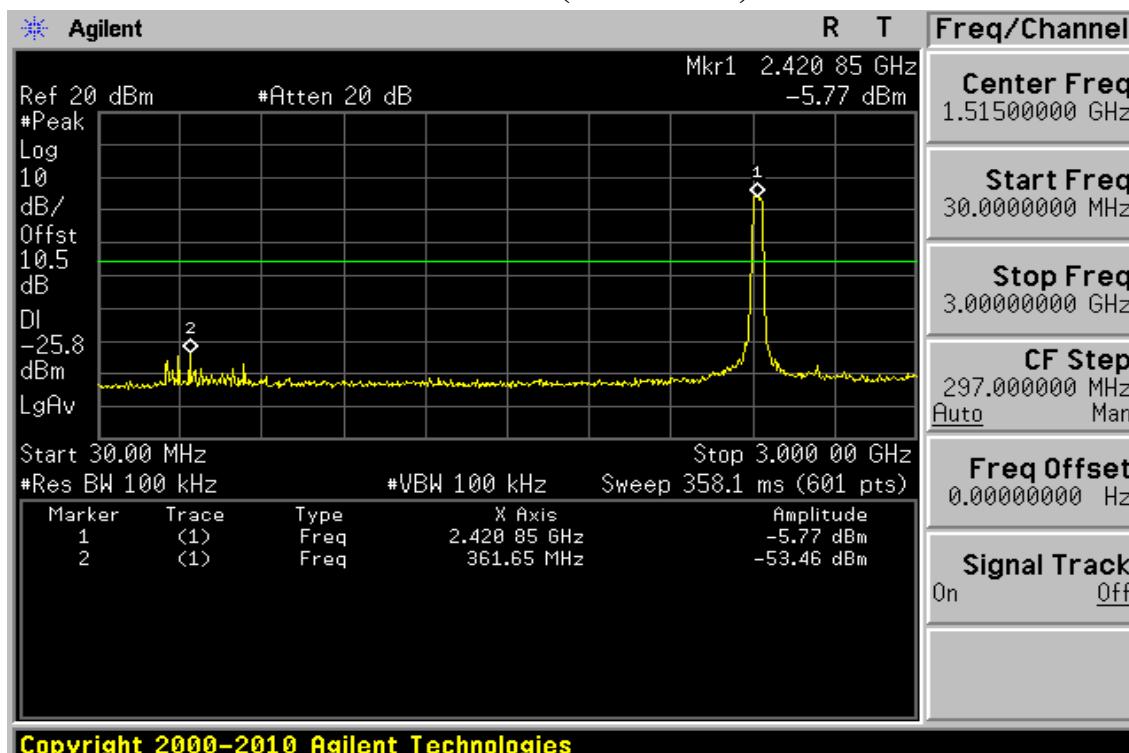


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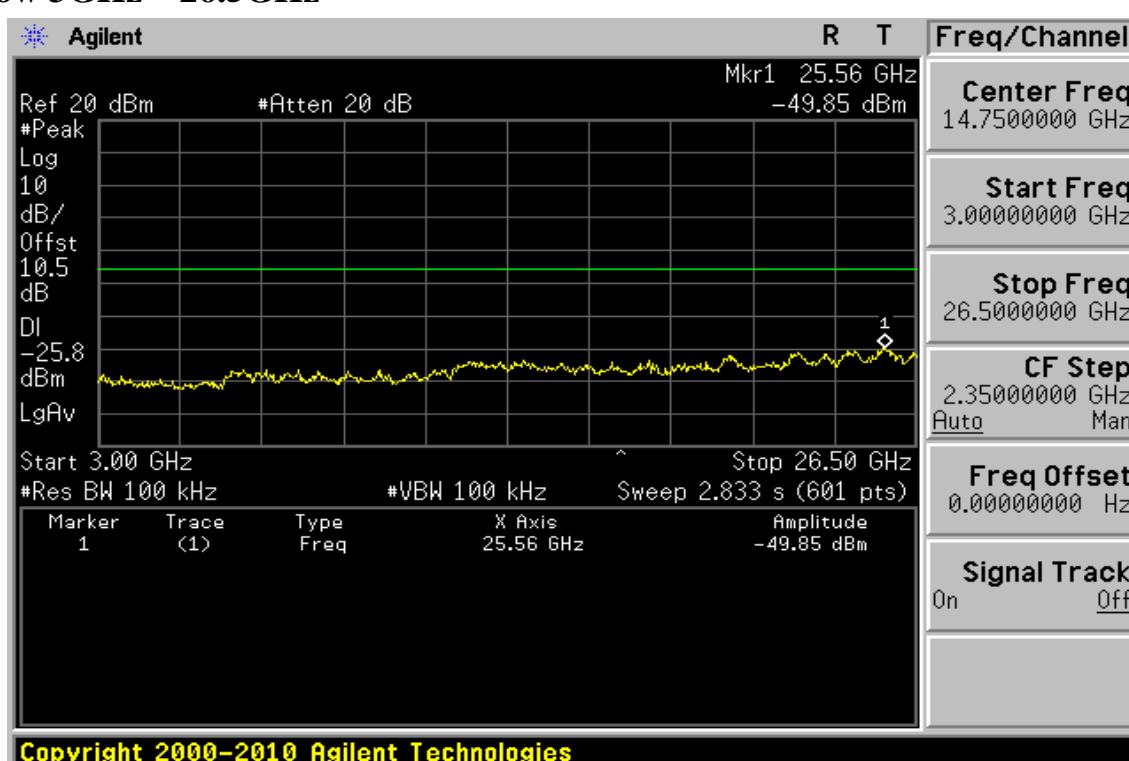
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## Conducted Spurious Emission Measurement Result (802.11n\_40M)

### Ch Low 30MHz – 3GHz – Aux Antenna (worse case)



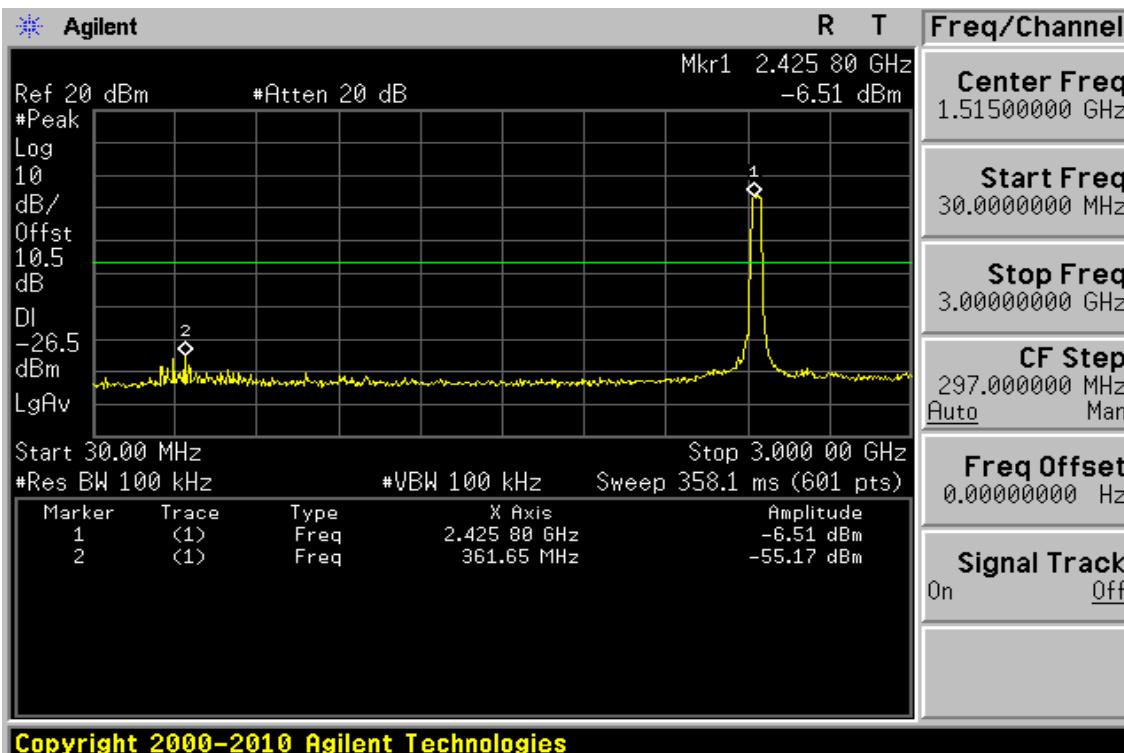
### Ch Low 3GHz – 26.5GHz



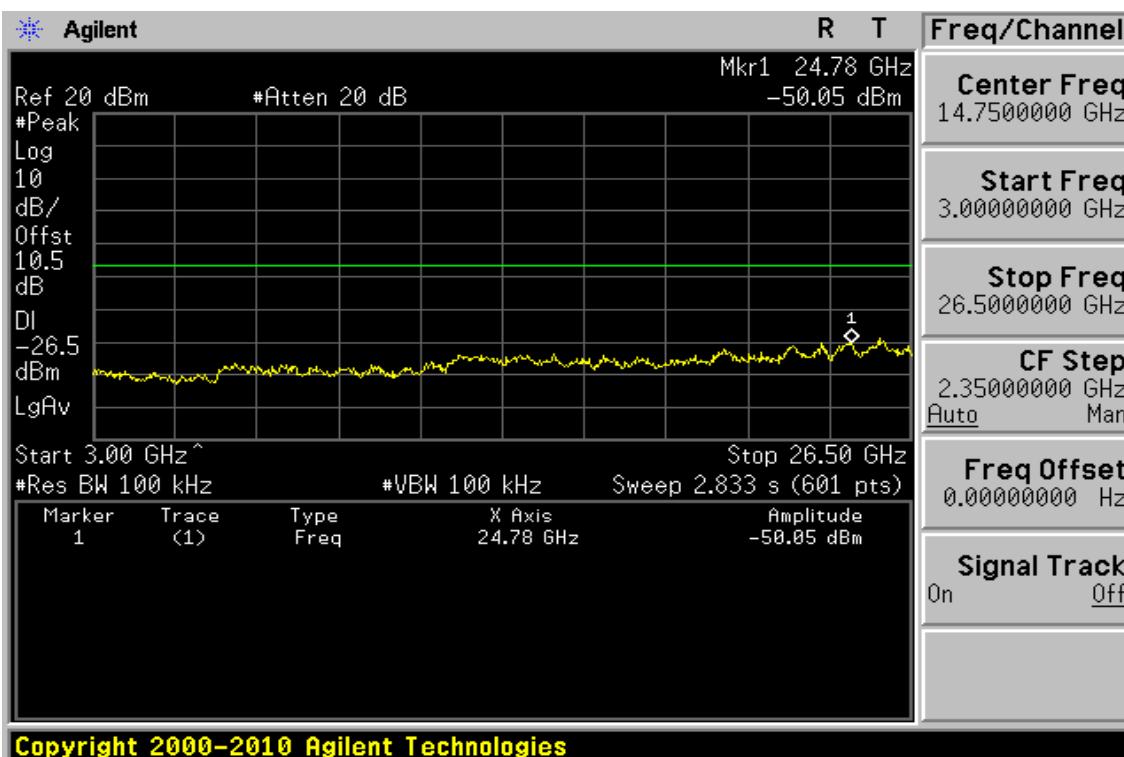
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## Ch Mid 30MHz – 3GHz



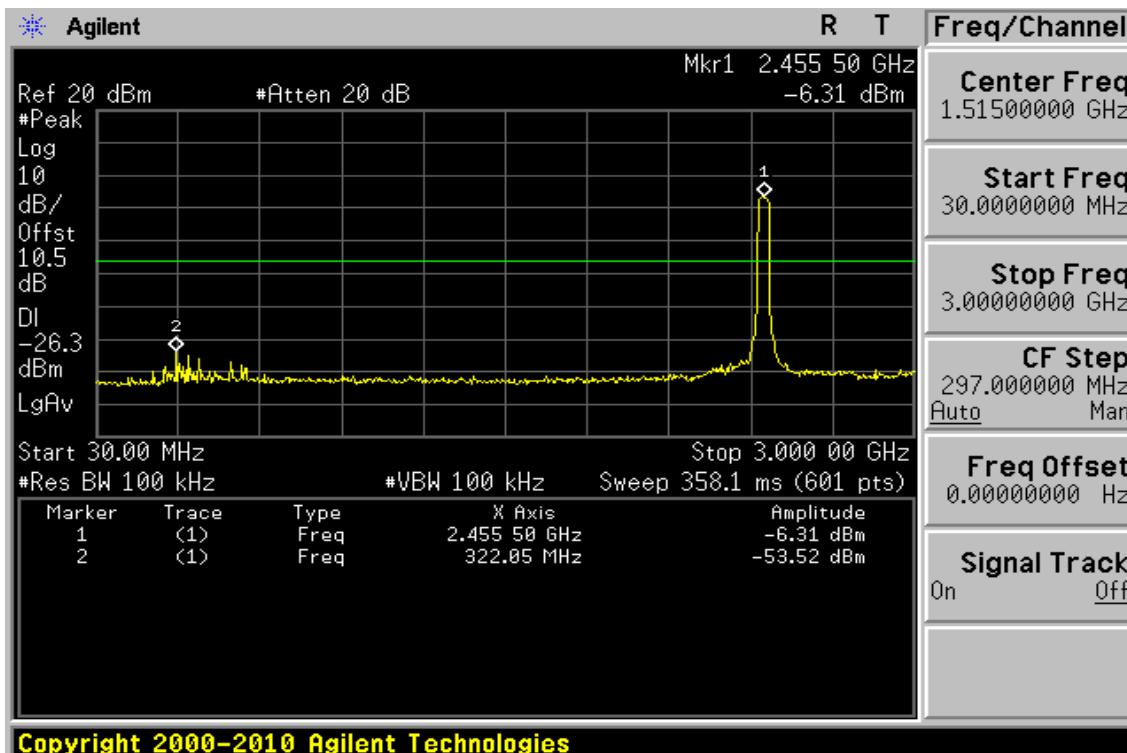
## Ch Mid 3GHz – 26.5GHz



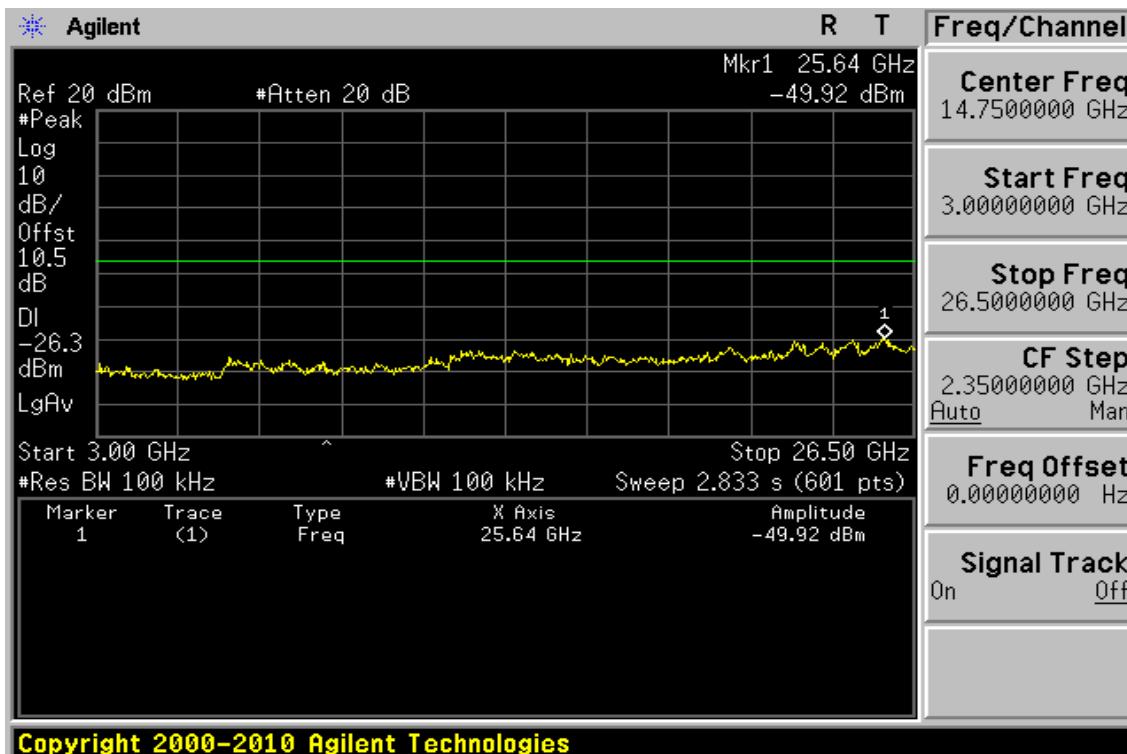
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



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**Radiated Spurious Emission Measurement Result (below 1GHz) (802.11b)**

Operation Band	:802.11b	Test Date	:2012-01-12
Fundamental Frequency	:2412MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.83	-16.37	29.46	43.50	-14.04
156.10	S	Peak	40.55	-11.64	28.91	43.50	-14.59
312.27	S	Peak	43.09	-11.48	31.61	46.00	-14.39
468.44	S	Peak	50.54	-9.17	41.37	46.00	-4.63
624.61	S	Peak	39.68	-6.15	33.53	46.00	-12.47
780.78	S	Peak	45.30	-3.73	41.57	46.00	-4.43
4824.00	H	Peak	39.66	10.20	49.86	74.00	-24.14
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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**Radiated Spurious Emission Measurement Result (below 1GHz) (802.11b)**

Operation Band	:802.11b	Test Date	:2012-01-12
Fundamental Frequency	:2412MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.52	-16.37	29.15	43.50	-14.35
156.10	S	Peak	40.07	-11.64	28.43	43.50	-15.07
312.27	S	Peak	52.10	-11.48	40.62	46.00	-5.38
468.44	S	Peak	51.65	-9.17	42.48	46.00	-3.52
624.61	S	Peak	37.78	-6.15	31.63	46.00	-14.37
780.78	S	Peak	45.32	-3.73	41.59	46.00	-4.41
4824.00	H	Peak	34.70	10.21	44.91	74.00	-29.09
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11b	Test Date	:2012-01-12
Fundamental Frequency	:2437MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.43	-16.37	29.06	43.50	-14.44
156.10	S	Peak	40.52	-11.64	28.88	43.50	-14.62
312.27	S	Peak	43.10	-11.48	31.62	46.00	-14.38
468.44	S	Peak	50.49	-9.17	41.32	46.00	-4.68
624.61	S	Peak	39.48	-6.15	33.33	46.00	-12.67
780.78	S	Peak	45.24	-3.73	41.51	46.00	-4.49
4874.00	H	Peak	40.43	10.55	50.98	74.00	-23.02
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11b	Test Date	:2012-01-12
Fundamental Frequency	:2437MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB $\mu$ V	@3m dB $\mu$ V/m	Margin dB
99.84	S	Peak	45.60	-16.37	29.23	43.50	-14.27
156.10	S	Peak	40.96	-11.64	29.32	43.50	-14.18
312.27	S	Peak	52.26	-11.48	40.78	46.00	-5.22
468.44	S	Peak	49.67	-9.17	40.50	46.00	-5.50
624.61	S	Peak	38.10	-6.15	31.95	46.00	-14.05
780.78	S	Peak	44.28	-3.73	40.55	46.00	-5.45
4874.00	H	Peak	35.44	10.50	45.94	74.00	-28.06
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11b	Test Date	:2012-01-12
Fundamental Frequency	:2462MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.51	-16.37	29.14	43.50	-14.36
156.10	S	Peak	40.04	-11.64	28.40	43.50	-15.10
312.27	S	Peak	43.62	-11.48	32.14	46.00	-13.86
468.44	S	Peak	50.41	-9.17	41.24	46.00	-4.76
624.61	S	Peak	39.29	-6.15	33.14	46.00	-12.86
780.78	S	Peak	45.17	-3.73	41.44	46.00	-4.56
4924.00	H	Peak	39.94	10.33	50.27	74.00	-23.73
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11b	Test Date	:2012-01-12
Fundamental Frequency	:2462MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.35	-16.37	28.98	43.50	-14.52
156.10	S	Peak	40.77	-11.64	29.13	43.50	-14.37
312.27	S	Peak	52.36	-11.48	40.88	46.00	-5.12
468.44	S	Peak	49.64	-9.17	40.47	46.00	-5.53
624.61	S	Peak	37.21	-6.15	31.06	46.00	-14.94
780.78	S	Peak	44.16	-3.73	40.43	46.00	-5.57
4924.00	H	Peak	35.13	10.22	45.35	74.00	-28.65
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11g	Test Date	:2012-01-12
Fundamental Frequency	:2412MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.59	-16.37	29.22	43.50	-14.28
156.10	S	Peak	40.45	-11.64	28.81	43.50	-14.69
312.27	S	Peak	43.13	-11.48	31.65	46.00	-14.35
468.44	S	Peak	50.45	-9.17	41.28	46.00	-4.72
624.61	S	Peak	39.90	-6.15	33.75	46.00	-12.25
780.78	S	Peak	44.19	-3.73	40.46	46.00	-5.54
4824.00	H	Peak	36.47	10.20	46.67	74.00	-27.33
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11g	Test Date	:2012-01-12
Fundamental Frequency	:2412MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.59	-16.37	29.22	43.50	-14.28
156.10	S	Peak	39.44	-11.64	27.80	43.50	-15.70
312.27	S	Peak	52.18	-11.48	40.70	46.00	-5.30
468.44	S	Peak	50.65	-9.17	41.48	46.00	-4.52
624.61	S	Peak	38.06	-6.15	31.91	46.00	-14.09
780.78	S	Peak	44.23	-3.73	40.50	46.00	-5.50
4824.00	H	Peak	34.30	10.21	44.51	74.00	-29.49
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11g	Test Date	:2012-01-12
Fundamental Frequency	:2437MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.71	-16.37	29.34	43.50	-14.16
156.10	S	Peak	40.71	-11.64	29.07	43.50	-14.43
312.27	S	Peak	43.09	-11.48	31.61	46.00	-14.39
468.44	S	Peak	50.43	-9.17	41.26	46.00	-4.74
624.61	S	Peak	39.68	-6.15	33.53	46.00	-12.47
780.78	S	Peak	44.25	-3.73	40.52	46.00	-5.48
4874.00	H	Peak	33.92	10.55	44.47	74.00	-29.53
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11g	Test Date	:2012-01-12
Fundamental Frequency	:2437MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.06	-16.37	28.69	43.50	-14.81
156.10	S	Peak	39.85	-11.64	28.21	43.50	-15.29
312.27	S	Peak	52.28	-11.48	40.80	46.00	-5.20
468.44	S	Peak	50.63	-9.17	41.46	46.00	-4.54
624.61	S	Peak	37.53	-6.15	31.38	46.00	-14.62
780.78	S	Peak	44.09	-3.73	40.36	46.00	-5.64
4874.00	H	Peak	33.44	10.50	43.94	74.00	-30.06
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11g	Test Date	:2012-01-12
Fundamental Frequency	:2462MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.46	-16.37	29.09	43.50	-14.41
156.10	S	Peak	39.53	-11.64	27.89	43.50	-15.61
312.27	S	Peak	52.13	-11.48	40.65	46.00	-5.35
468.44	S	Peak	49.62	-9.17	40.45	46.00	-5.55
624.61	S	Peak	37.89	-6.15	31.74	46.00	-14.26
780.78	S	Peak	44.17	-3.73	40.44	46.00	-5.56
4924.00	H	Peak	34.52	10.22	44.74	74.00	-29.26
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11n20M	Test Date	:2012-01-12
Fundamental Frequency	:2412MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.36	-16.37	28.99	43.50	-14.51
156.10	S	Peak	40.52	-11.64	28.88	43.50	-14.62
312.27	S	Peak	43.40	-11.48	31.92	46.00	-14.08
468.44	S	Peak	50.44	-9.17	41.27	46.00	-4.73
624.61	S	Peak	39.62	-6.15	33.47	46.00	-12.53
780.78	S	Peak	44.31	-3.73	40.58	46.00	-5.42
4824.00	H	Peak	35.79	10.20	45.99	74.00	-28.01
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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**Radiated Spurious Emission Measurement Result**

Operation Band	:802.11n20M	Test Date	:2012-01-12
Fundamental Frequency	:2412MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.25	-16.37	28.88	43.50	-14.62
156.10	S	Peak	39.67	-11.64	28.03	43.50	-15.47
312.27	S	Peak	52.38	-11.48	40.90	46.00	-5.10
468.44	S	Peak	50.55	-9.17	41.38	46.00	-4.62
624.61	S	Peak	37.63	-6.15	31.48	46.00	-14.52
780.78	S	Peak	44.17	-3.73	40.44	46.00	-5.56
4824.00	H	Peak	34.50	10.21	44.71	74.00	-29.29
7236.00	H	---					
9648.00	H	---					
12060.00	H	---					
14472.00	H	---					
16884.00	H	---					
19296.00	H	---					
21708.00	H	---					
24120.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11n20M	Test Date	:2012-01-12
Fundamental Frequency	:2437MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	46.54	-16.37	30.17	43.50	-13.33
156.10	S	Peak	41.01	-11.64	29.37	43.50	-14.13
312.27	S	Peak	43.34	-11.48	31.86	46.00	-14.14
468.44	S	Peak	50.41	-9.17	41.24	46.00	-4.76
624.61	S	Peak	39.68	-6.15	33.53	46.00	-12.47
780.78	S	Peak	44.39	-3.73	40.66	46.00	-5.34
4874.00	H	Peak	33.75	10.55	44.30	74.00	-29.70
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11n20M	Test Date	:2012-01-12
Fundamental Frequency	:2437MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.36	-16.37	28.99	43.50	-14.51
156.10	S	Peak	40.62	-11.64	28.98	43.50	-14.52
312.27	S	Peak	52.27	-11.48	40.79	46.00	-5.21
468.44	S	Peak	49.54	-9.17	40.37	46.00	-5.63
624.61	S	Peak	37.30	-6.15	31.15	46.00	-14.85
781.75	S	Peak	44.99	-3.77	41.22	46.00	-4.78
4874.00	H	Peak	33.92	10.50	44.42	74.00	-29.58
7311.00	H	---					
9748.00	H	---					
12185.00	H	---					
14622.00	H	---					
17059.00	H	---					
19496.00	H	---					
21933.00	H	---					
24370.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11n20M	Test Date	:2012-01-12
Fundamental Frequency	:2462MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.47	-16.37	29.10	43.50	-14.40
156.10	S	Peak	40.01	-11.64	28.37	43.50	-15.13
312.27	S	Peak	43.50	-11.48	32.02	46.00	-13.98
468.44	S	Peak	49.51	-9.17	40.34	46.00	-5.66
624.61	S	Peak	39.37	-6.15	33.22	46.00	-12.78
780.78	S	Peak	44.35	-3.73	40.62	46.00	-5.38
4924.00	H	Peak	34.81	10.33	45.14	74.00	-28.86
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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## Radiated Spurious Emission Measurement Result

Operation Band	:802.11n20M	Test Date	:2012-01-12
Fundamental Frequency	:2462MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Lion
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dB $\mu$ V/m) = SPA. Reading level(dB $\mu$ V) + Factor(dB)

Factor(dB) = Antenna Factor(dB $\mu$ V/m) + Cable Loss(dB) - Pre\_Amplifier Gain(dB)

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency.

"E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency.

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB $\mu$ V	dB $\mu$ V/m	dB $\mu$ V/m
99.84	S	Peak	45.00	-16.37	28.63	43.50	-14.87
156.10	S	Peak	40.36	-11.64	28.72	43.50	-14.78
312.27	S	Peak	52.20	-11.48	40.72	46.00	-5.28
468.44	S	Peak	49.66	-9.17	40.49	46.00	-5.51
624.61	S	Peak	37.44	-6.15	31.29	46.00	-14.71
781.75	S	Peak	45.06	-3.77	41.29	46.00	-4.71
4924.00	H	Peak	33.73	10.22	43.95	74.00	-30.05
7386.00	H	---					
9848.00	H	---					
12310.00	H	---					
14772.00	H	---					
17234.00	H	---					
19696.00	H	---					
22158.00	H	---					
24620.00	H	---					

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## 9 Peak Power Spectral Density

### 9.1 Standard Applicable:

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 9.2 Measurement Equipment Used:

Refer to section 6.2 for details.

### 9.3 Test Set-up:

Refer to section 6.3 for details.

### 9.4 Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 10KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

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## 9.5 Measurement Result:

### 802.11b

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-13.23	-13.23	8
2437	-13.59	-13.59	8
2462	-13.59	-13.59	8

### 802.11g

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-10.53	-10.53	8
2437	-11.65	-11.65	8
2462	-15.14	-15.14	8

### 802.11n\_20M - Aux Antenna

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-18.72	-18.72	8
2437	-19.52	-19.52	8
2462	-21.05	-21.05	8

### 802.11n\_40M - Aux Antenna

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-16.30	-16.30	8
2437	-16.17	-16.17	8
2462	-16.05	-16.05	8

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**802.11n\_20M (MIMO)**

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-16.30	-16.30	8
2437	-16.17	-16.17	8
2462	-16.05	-16.05	8

**802.11n\_40M (MIMO)**

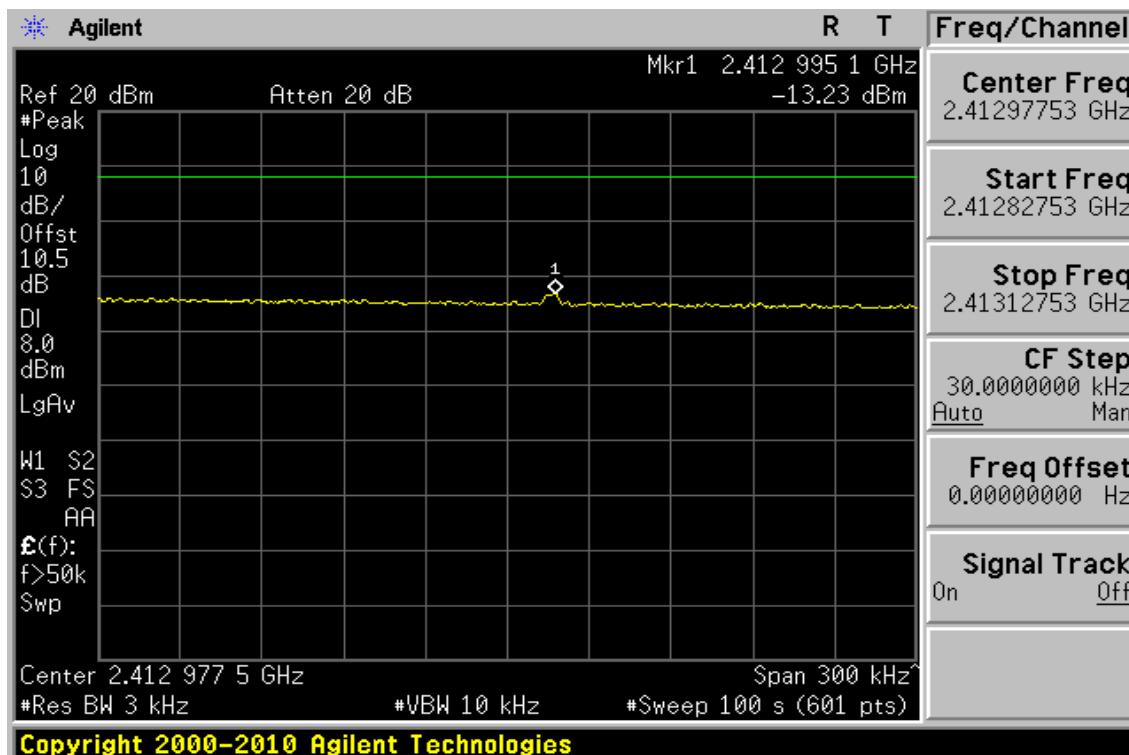
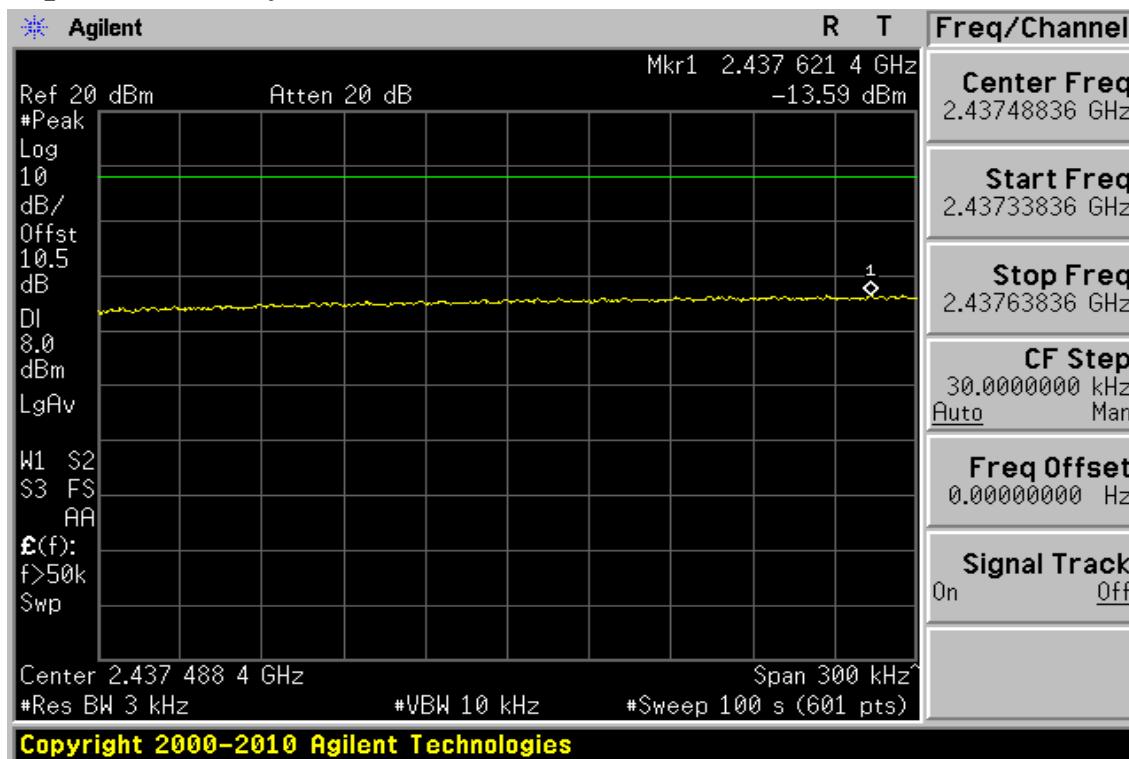
Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-18.74	-18.74	8
2437	-18.96	-18.96	8
2462	-18.71	-18.71	8

*\*Note: offset=class loss+10 log 2=6.5dBm+3.01dBm=9.51dBm*

Note: Refer to next page for plots.

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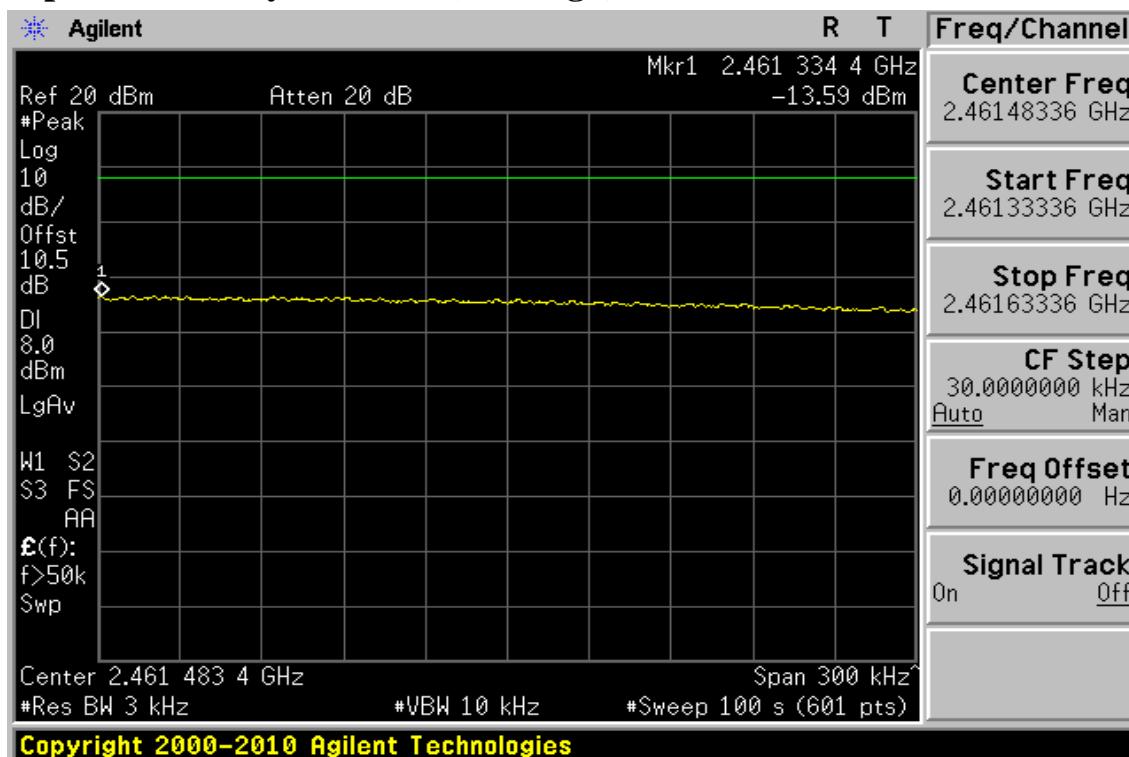
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**802.11b****Power Spectral Density Test Plot (CH-Low)****Power Spectral Density Test Plot (CH-Mid)**

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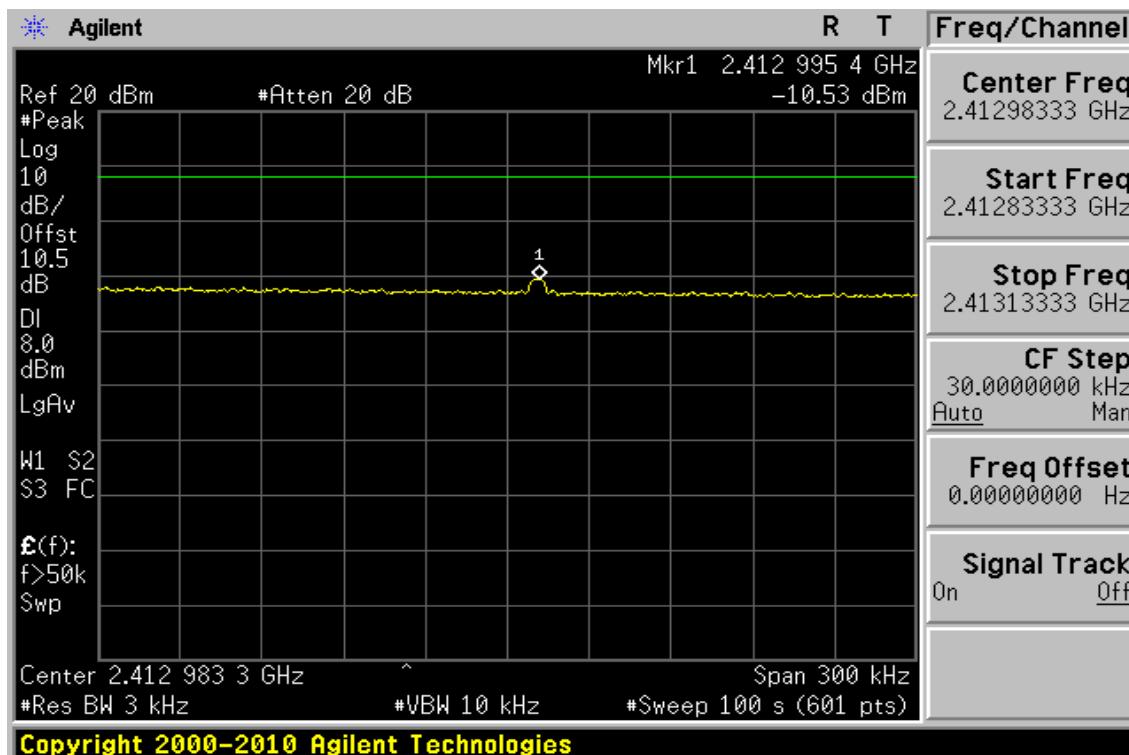
**Power Spectral Density Test Plot (CH-High)**

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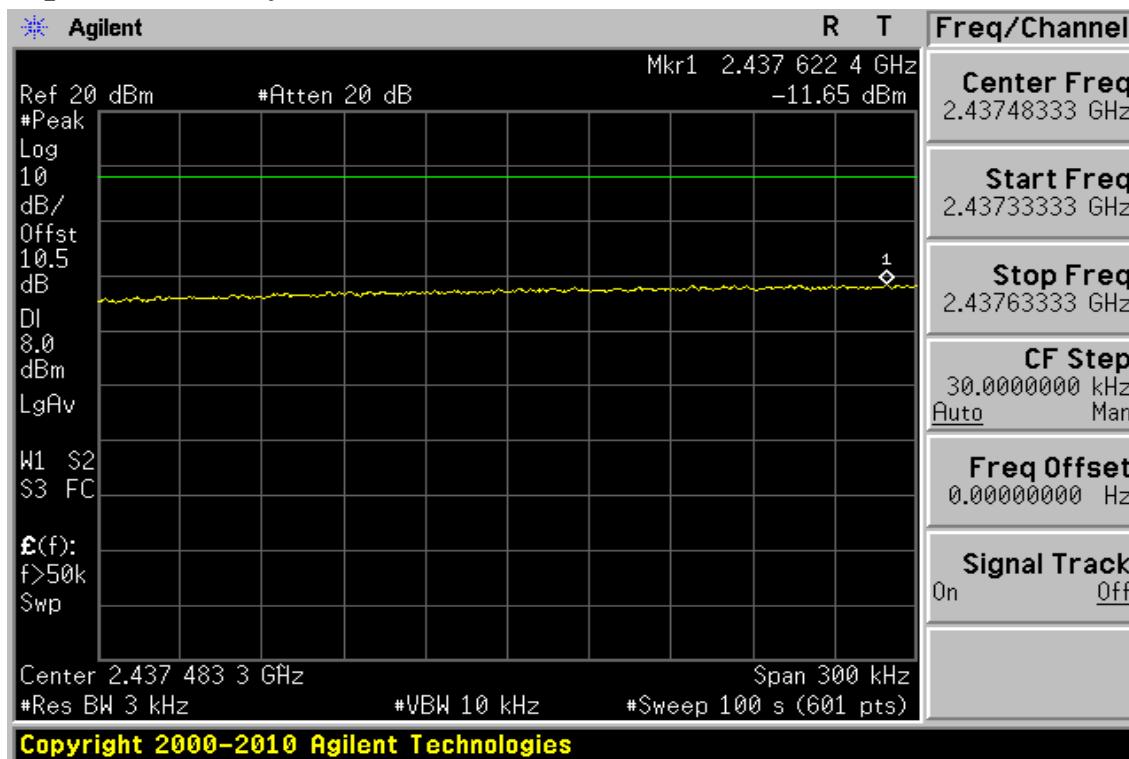
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## 802.11g

### Power Spectral Density Test Plot (CH-Low)

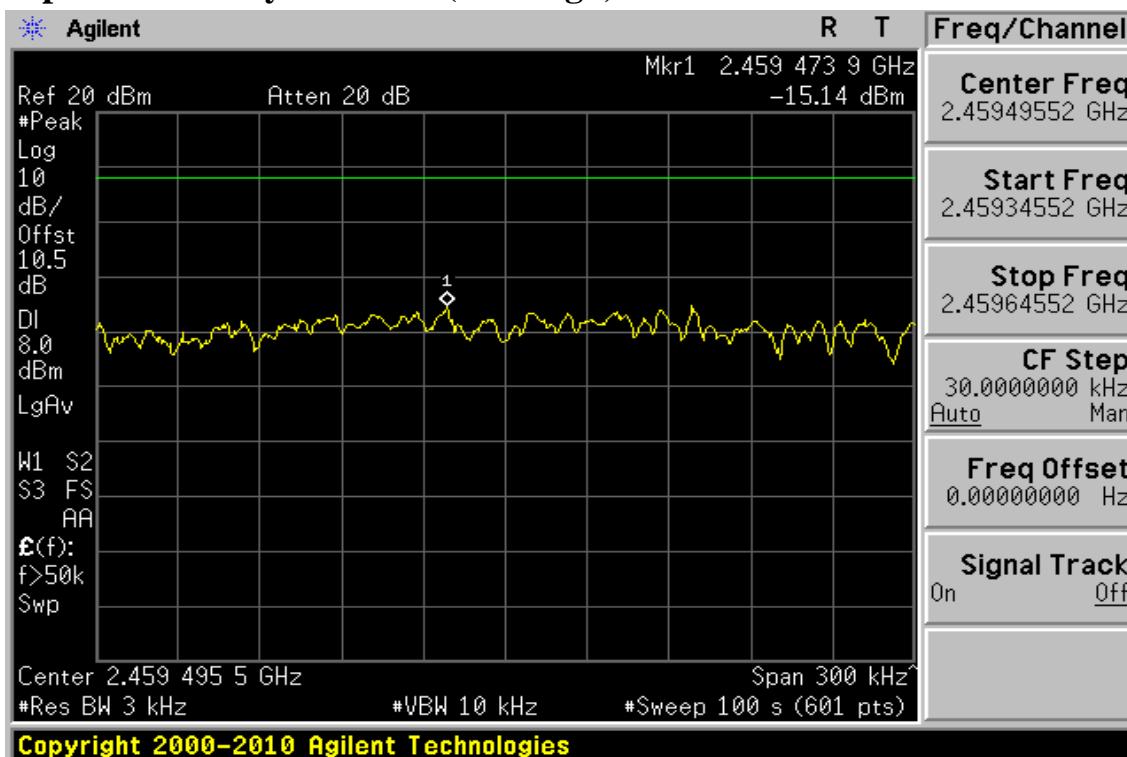


### Power Spectral Density Test Plot (CH-Mid)



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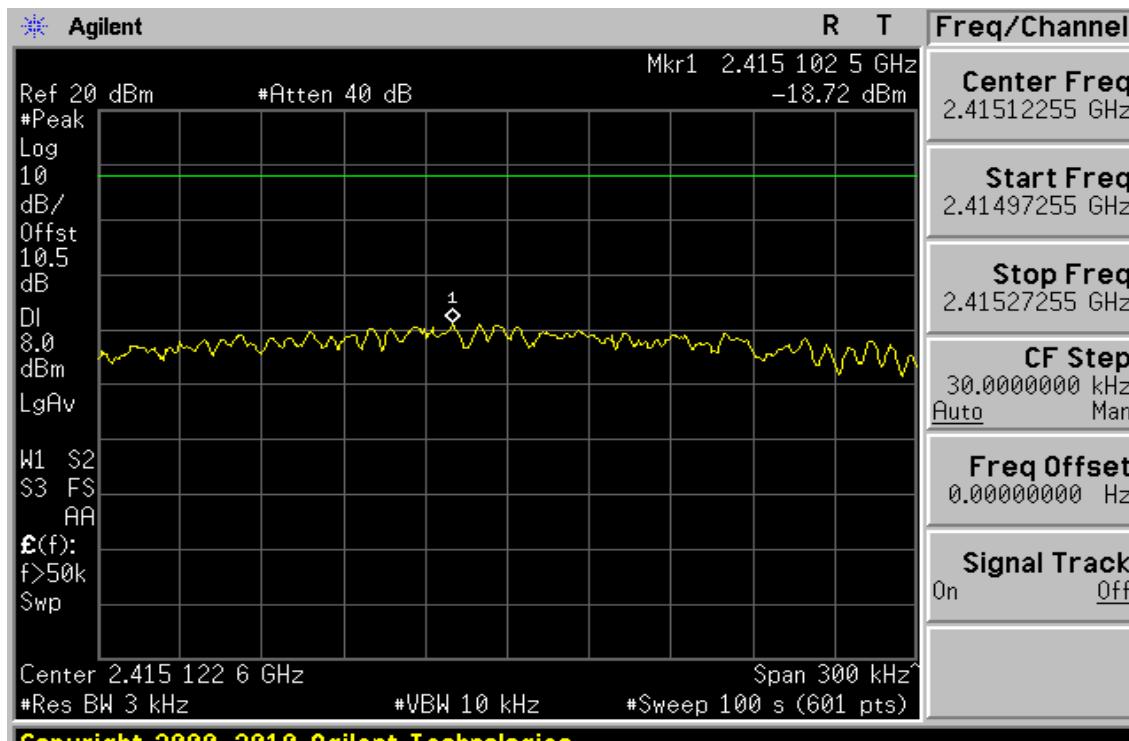
**Power Spectral Density Test Plot (CH-High)**

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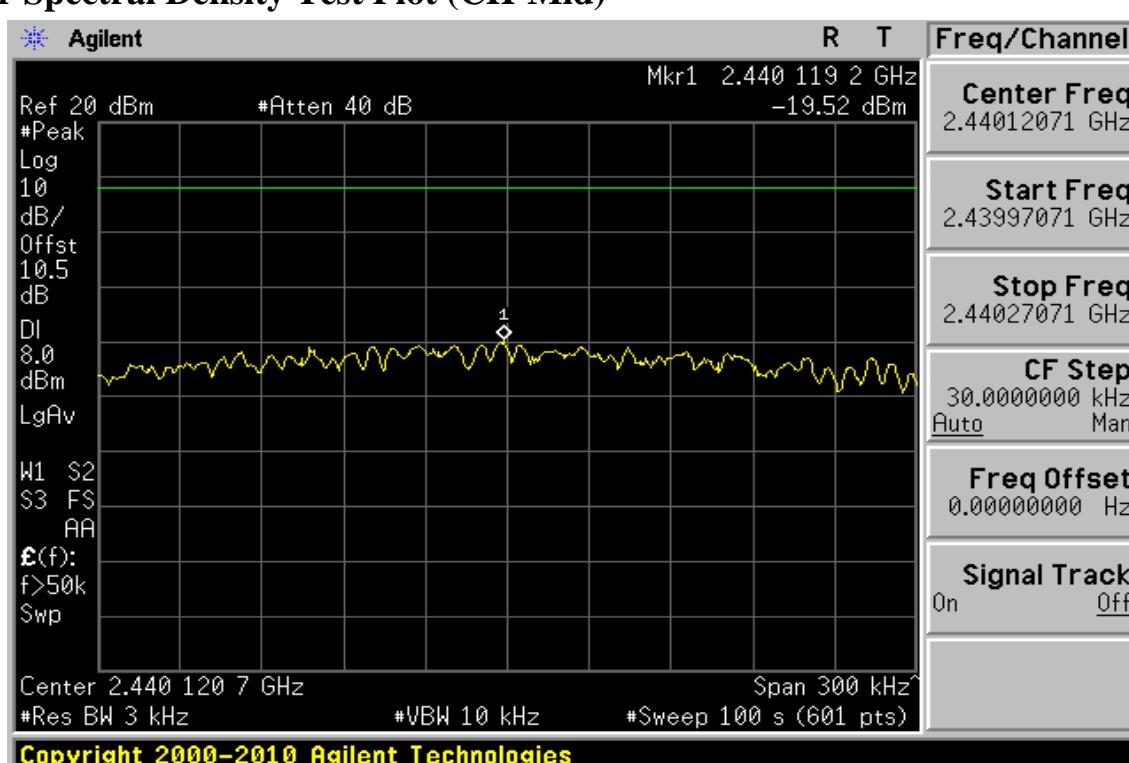
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## 802.11n\_20M (Aux Mode)

### Power Spectral Density Test Plot (CH-Low)

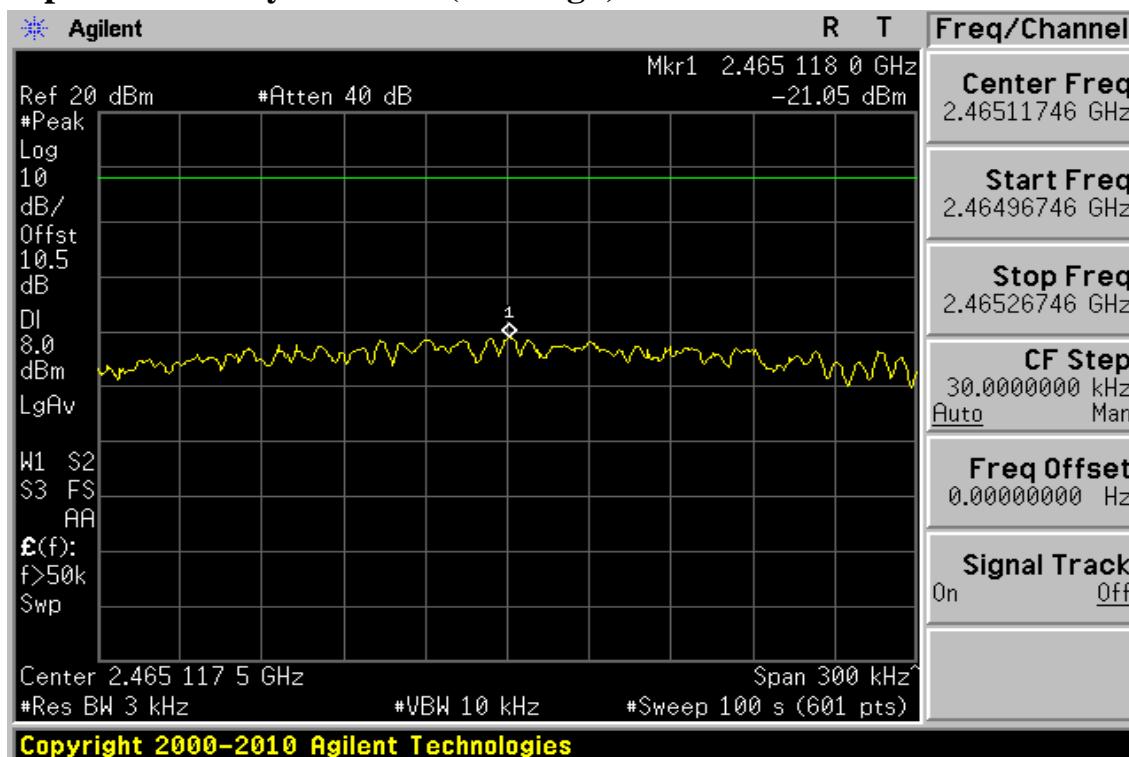


### Power Spectral Density Test Plot (CH-Mid)



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**Power Spectral Density Test Plot (CH-High)**

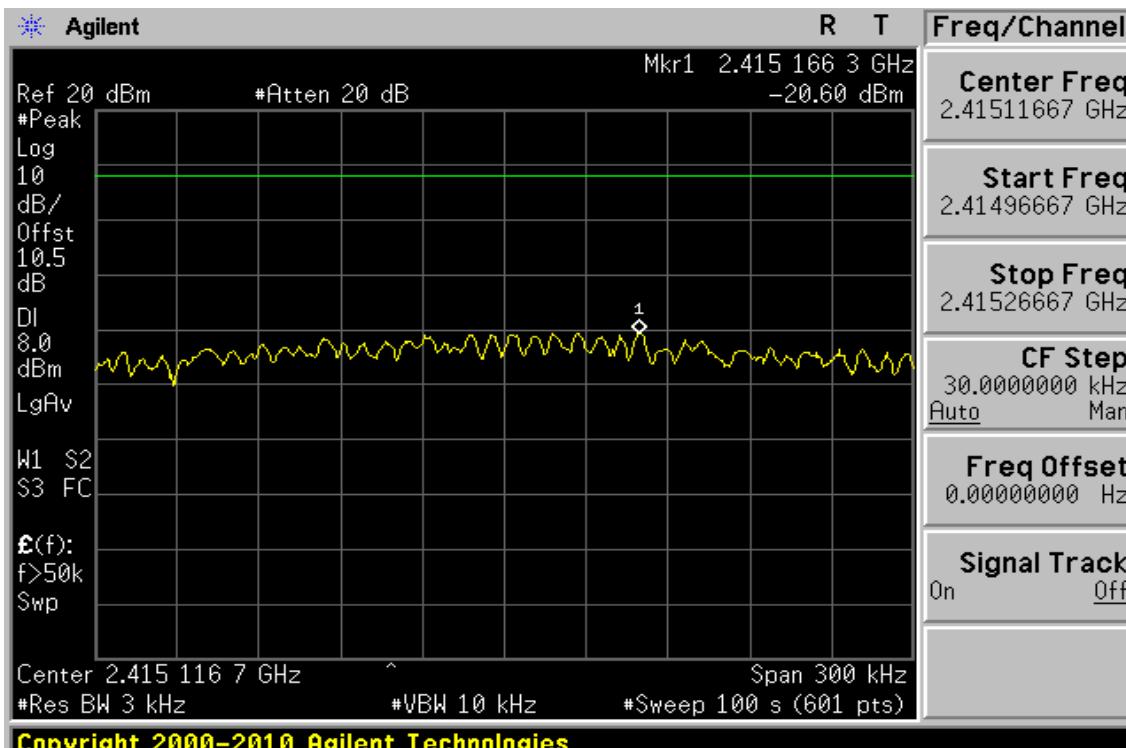
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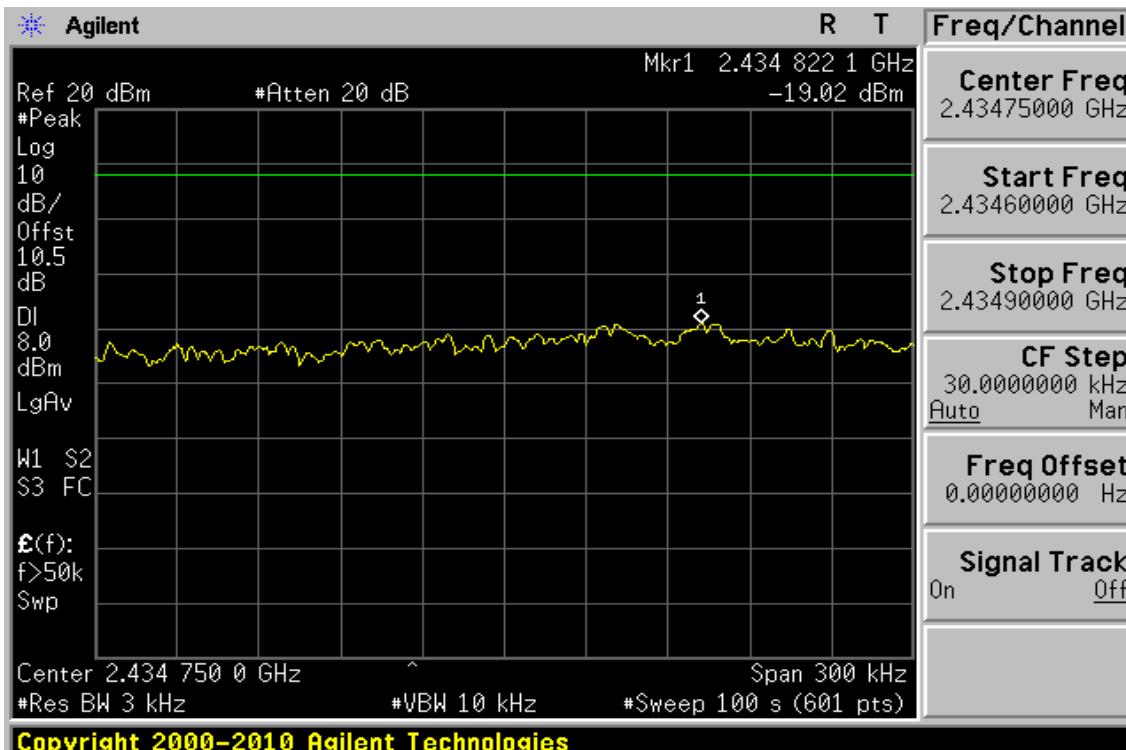
## 802.11n\_20M (Main Mode)

### Power Spectral Density Test Plot (CH-Low)



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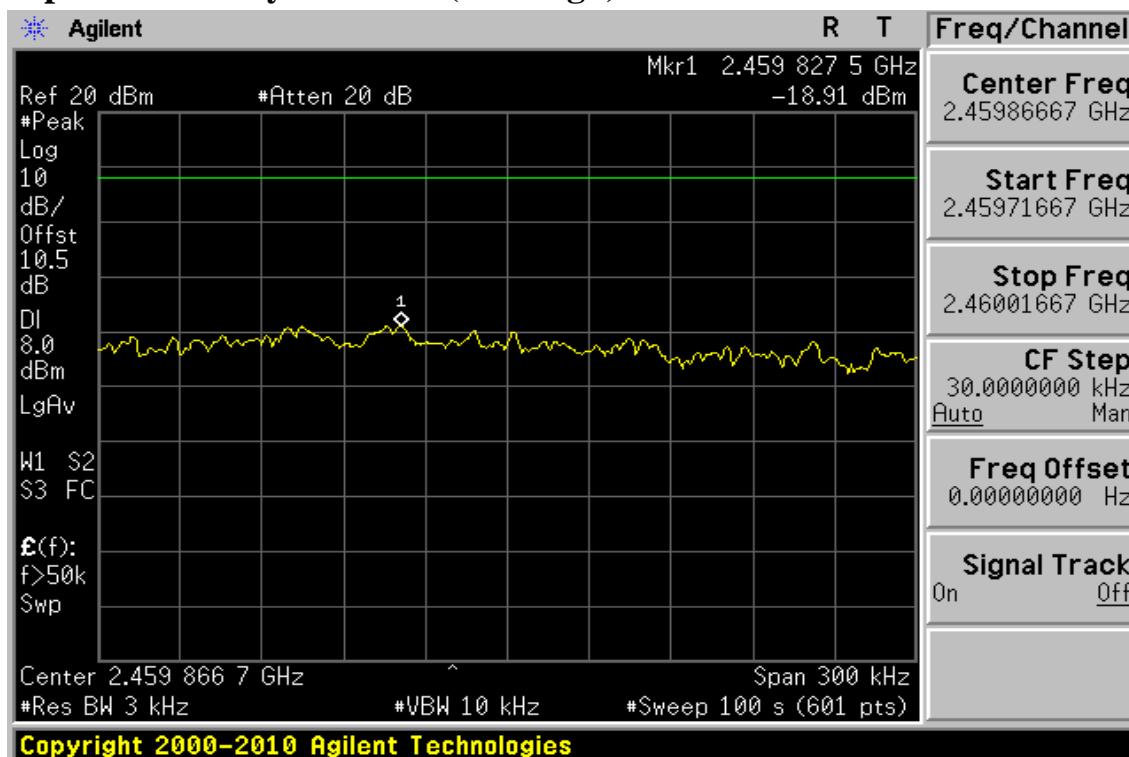
### Power Spectral Density Test Plot (CH-Mid)



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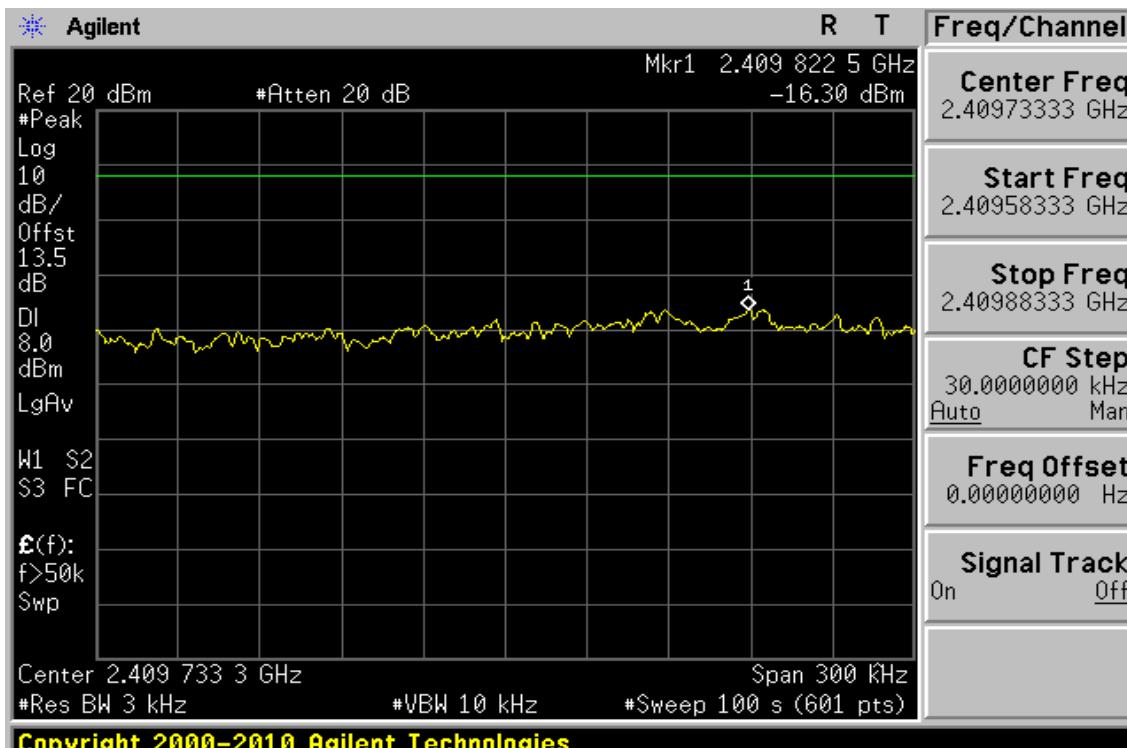
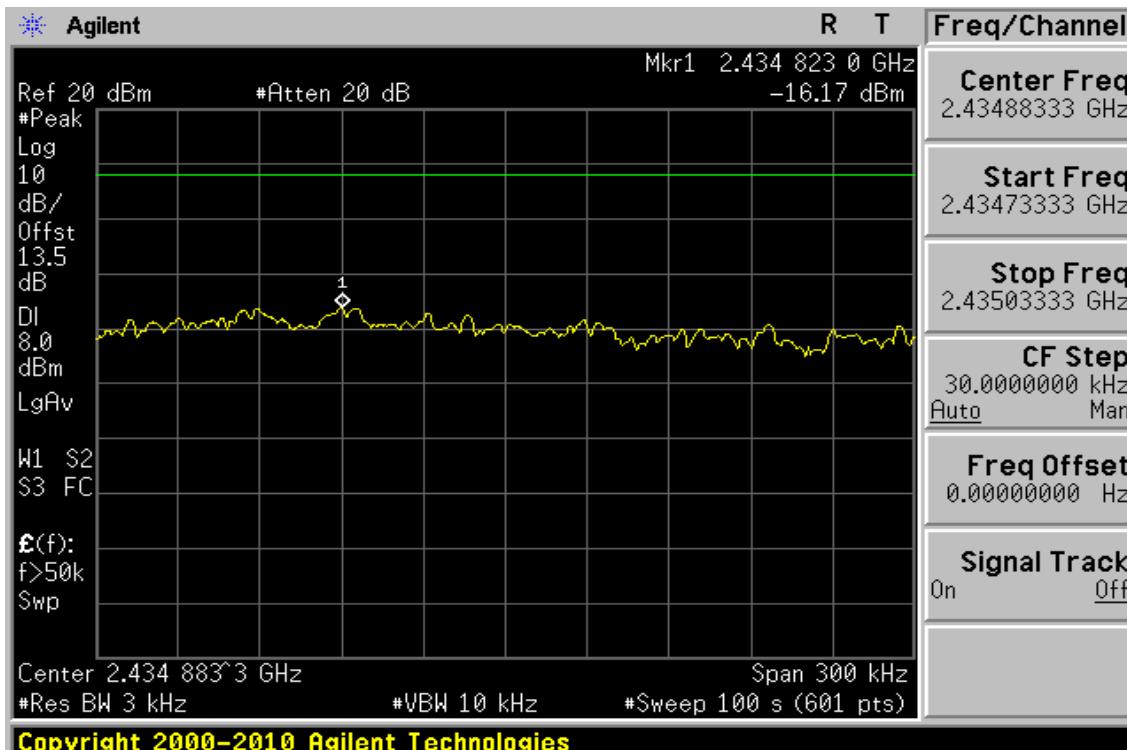
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**Power Spectral Density Test Plot (CH-High)**

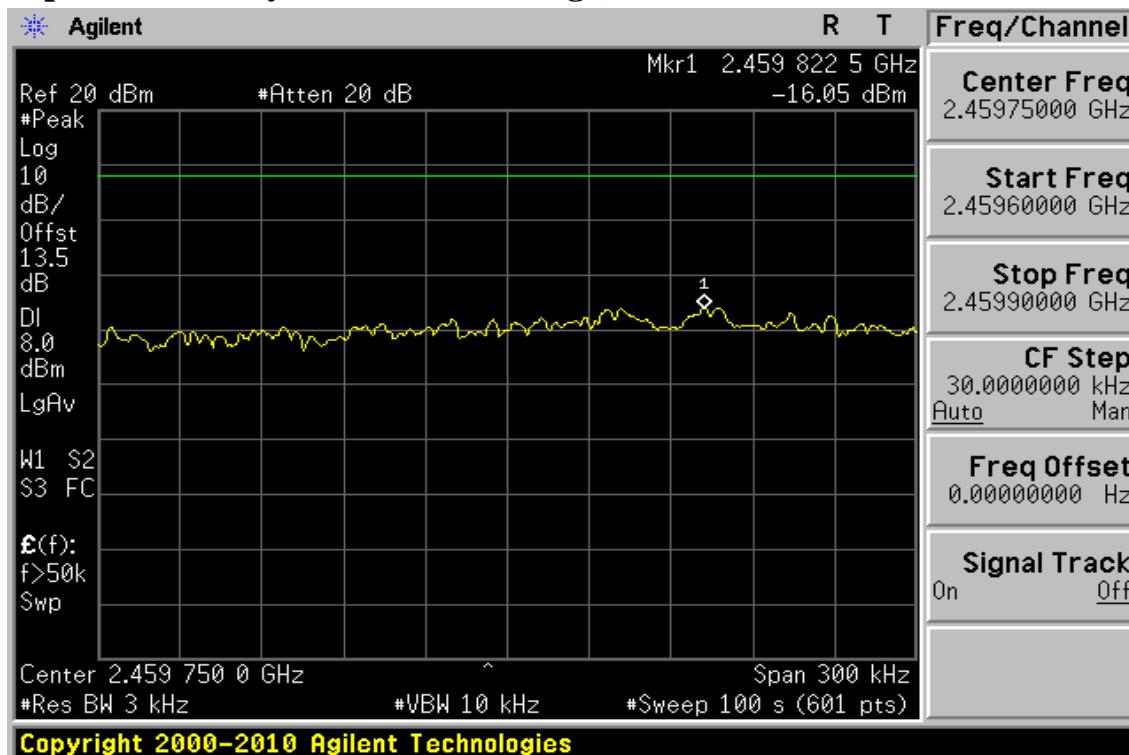
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**802.11n\_20M (MIMO Mode)****Power Spectral Density Test Plot (CH-Low)****Copyright 2000-2010 Agilent Technologies****Power Spectral Density Test Plot (CH-Mid)****Copyright 2000-2010 Agilent Technologies**

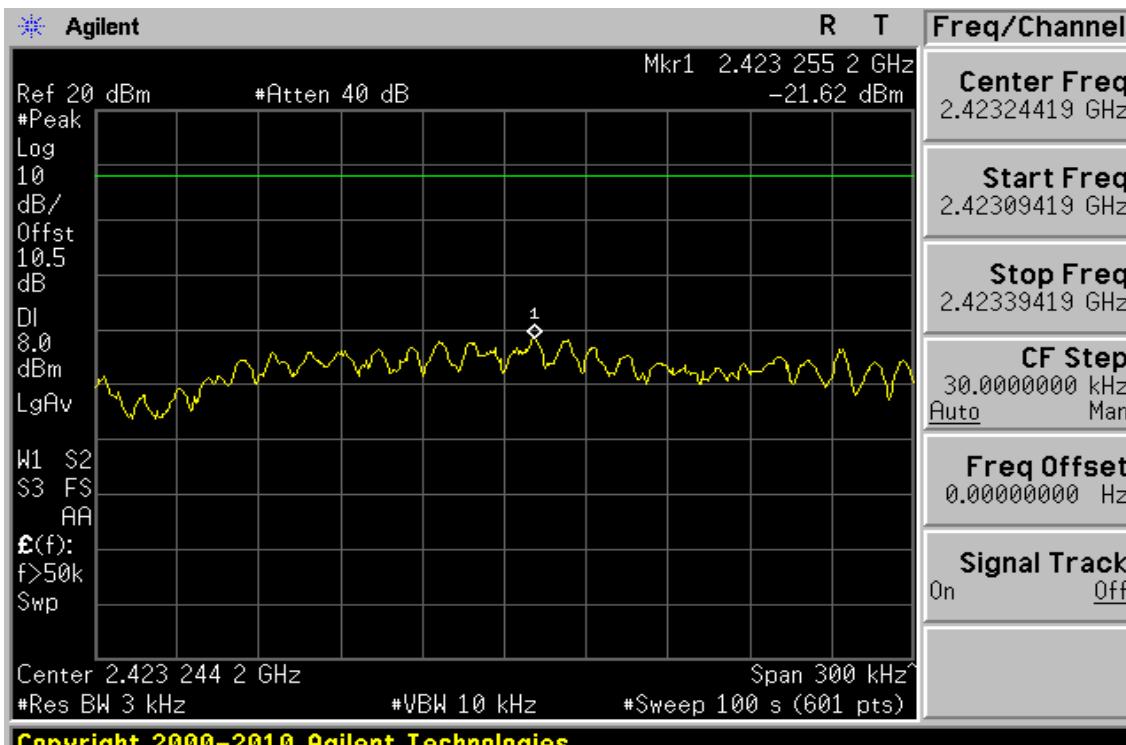
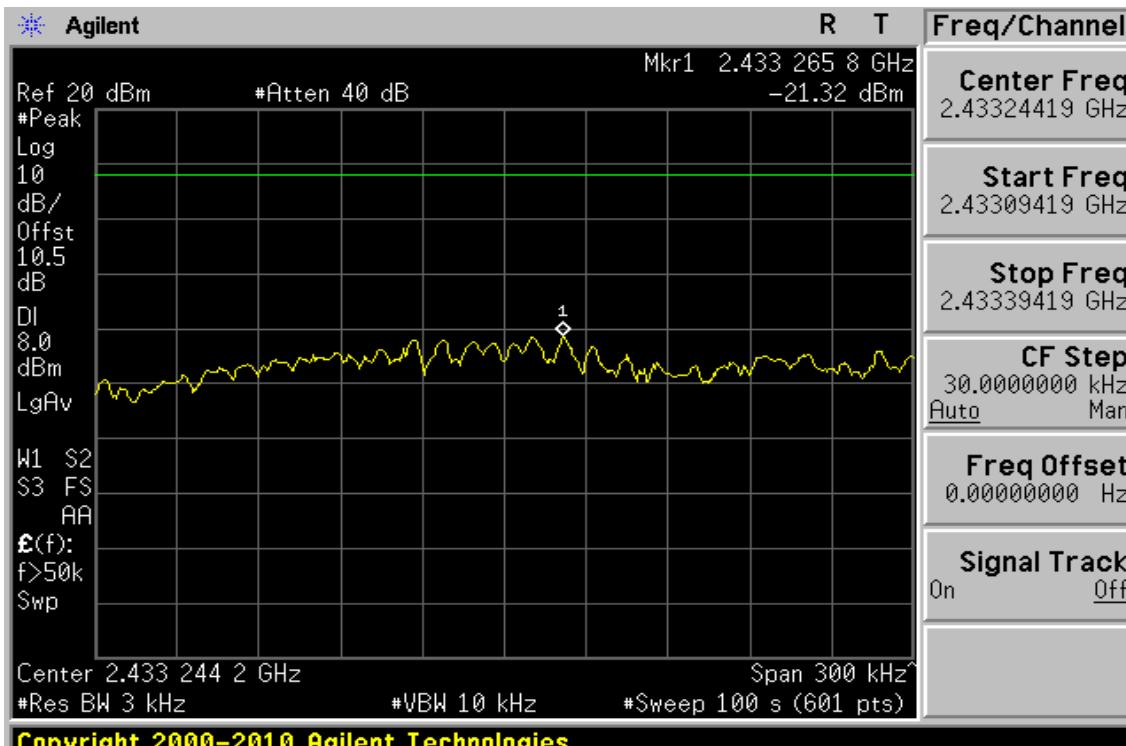
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**Power Spectral Density Test Plot (CH-High)**

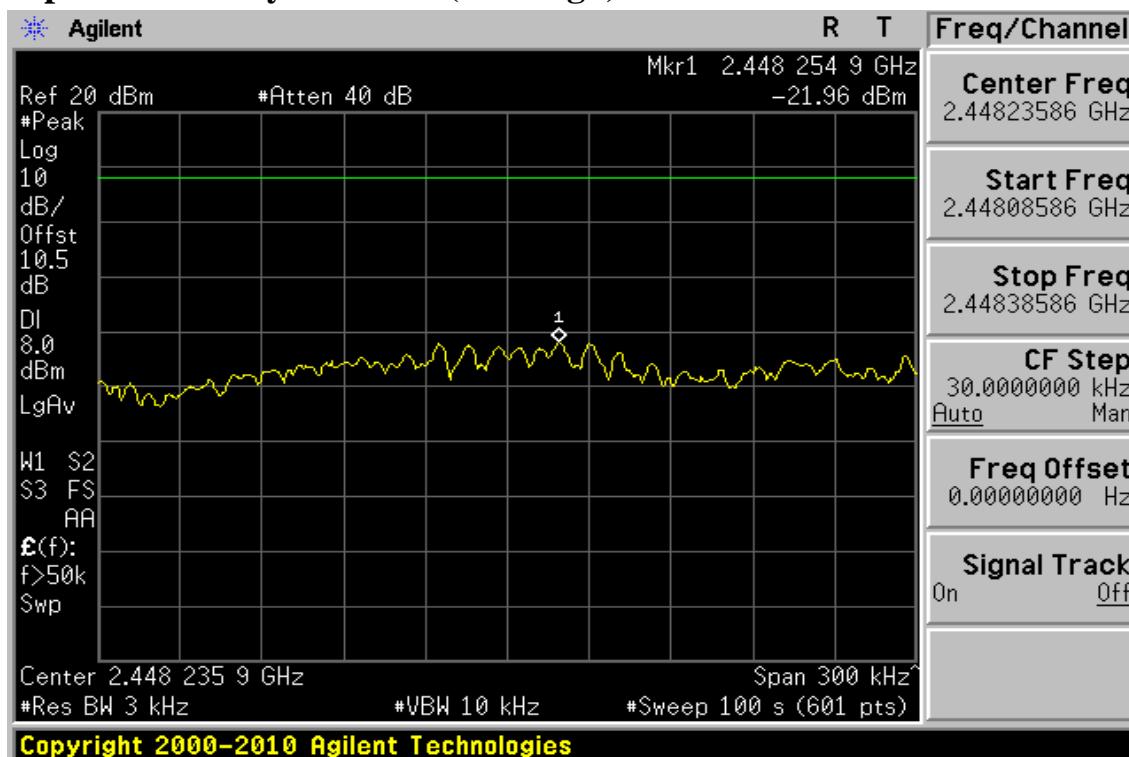
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**802.11n\_40M (Aux Mode)****Power Spectral Density Test Plot (CH-Low)****Copyright 2000-2010 Agilent Technologies****Power Spectral Density Test Plot (CH-Mid)****Copyright 2000-2010 Agilent Technologies**

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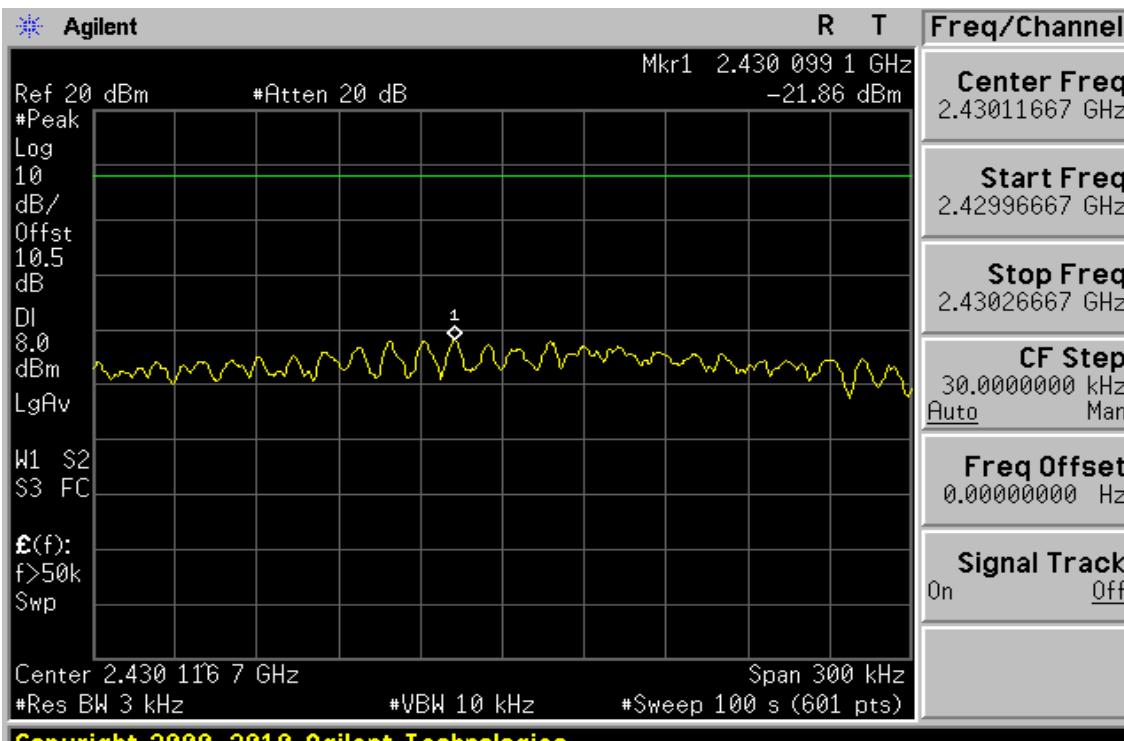
**Power Spectral Density Test Plot (CH-High)**

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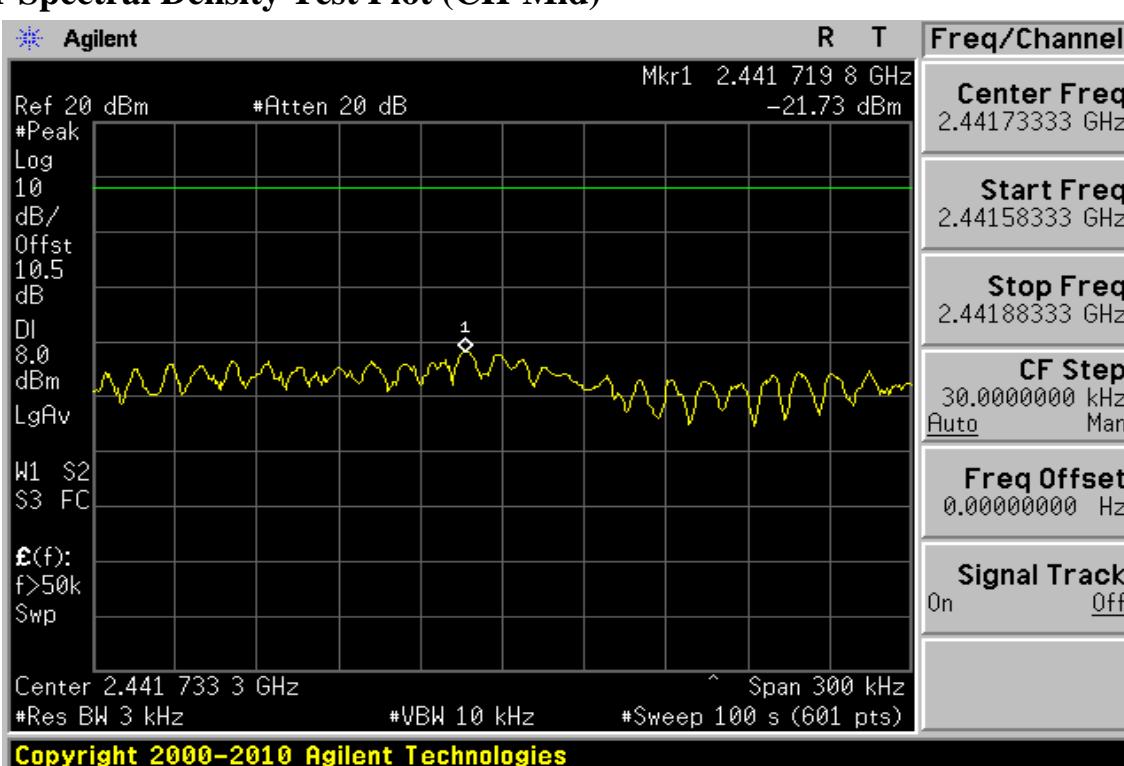
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## 802.11n\_40M (Main Mode)

### Power Spectral Density Test Plot (CH-Low)



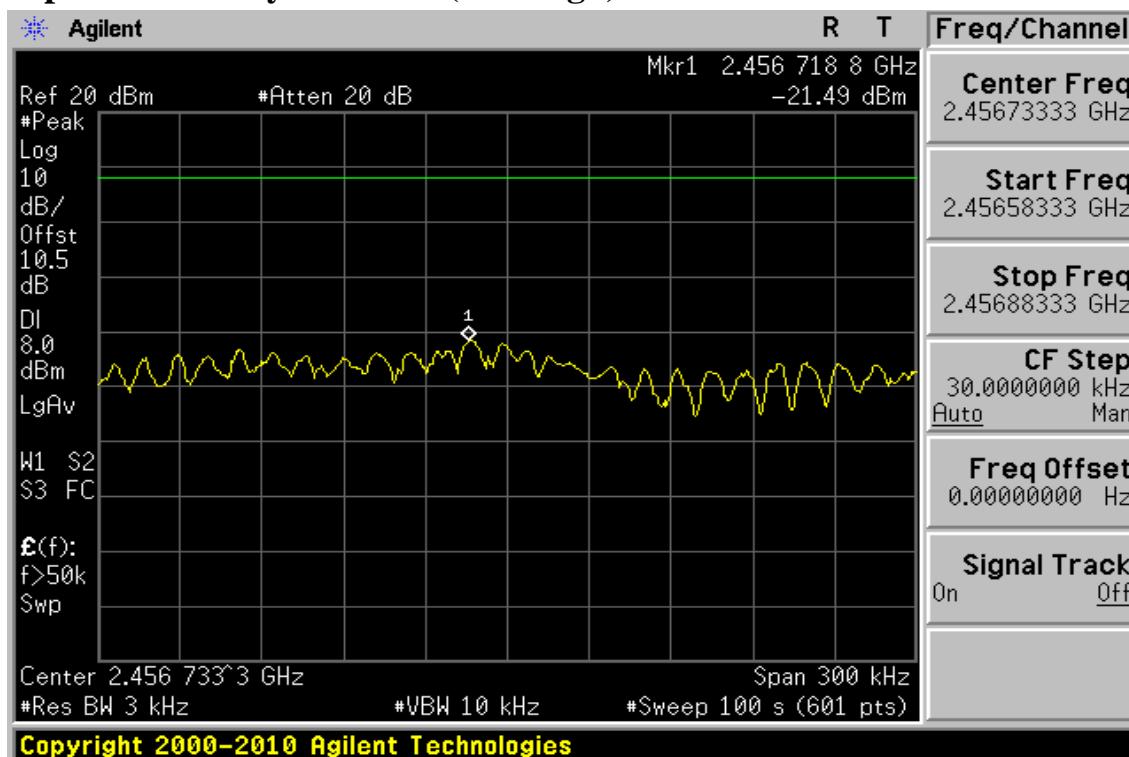
### Power Spectral Density Test Plot (CH-Mid)



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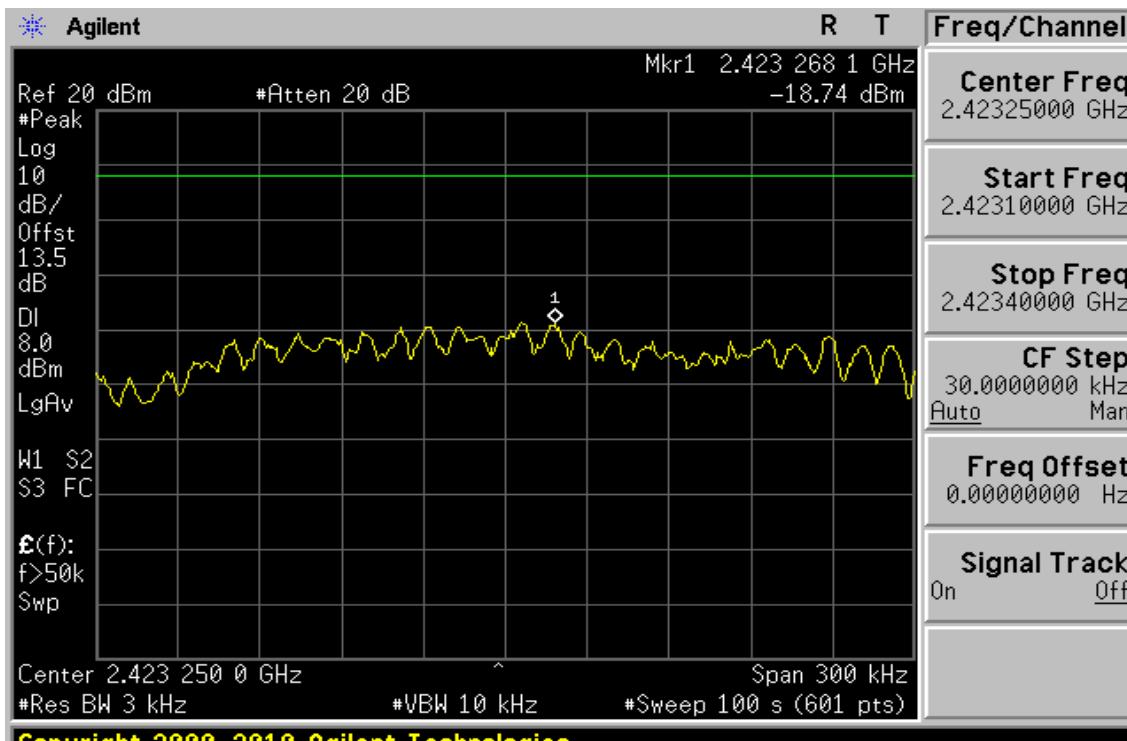
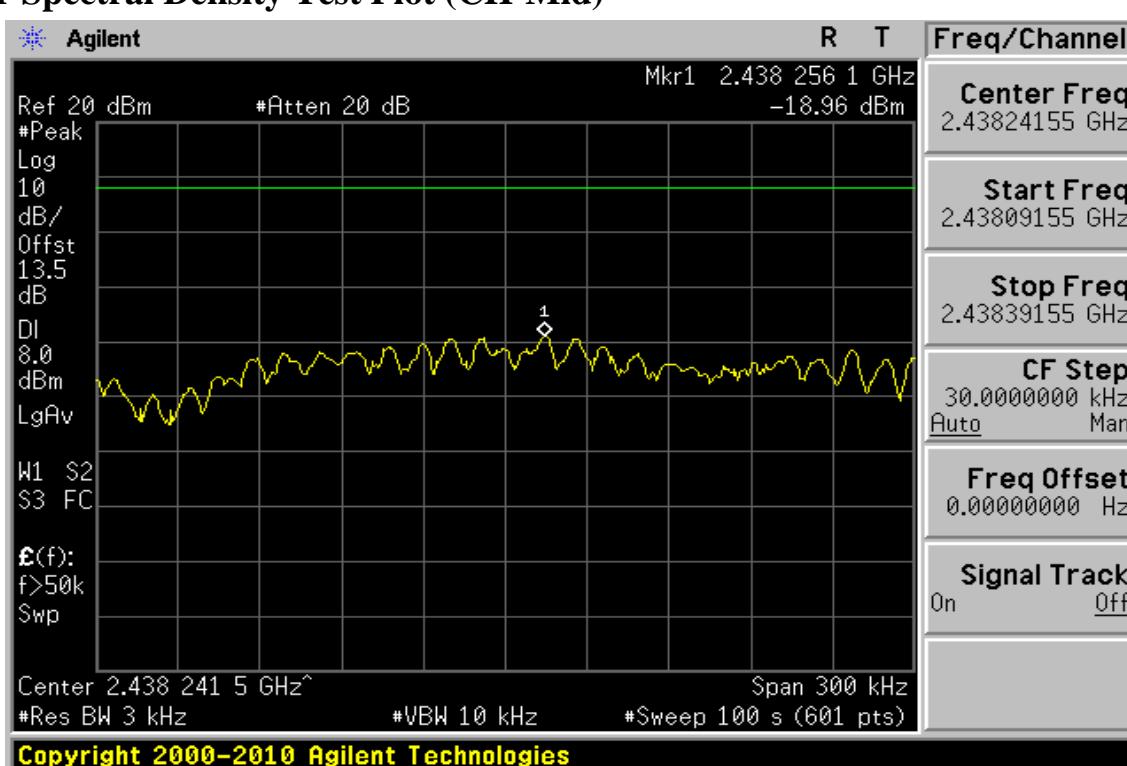
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**Power Spectral Density Test Plot (CH-High)**

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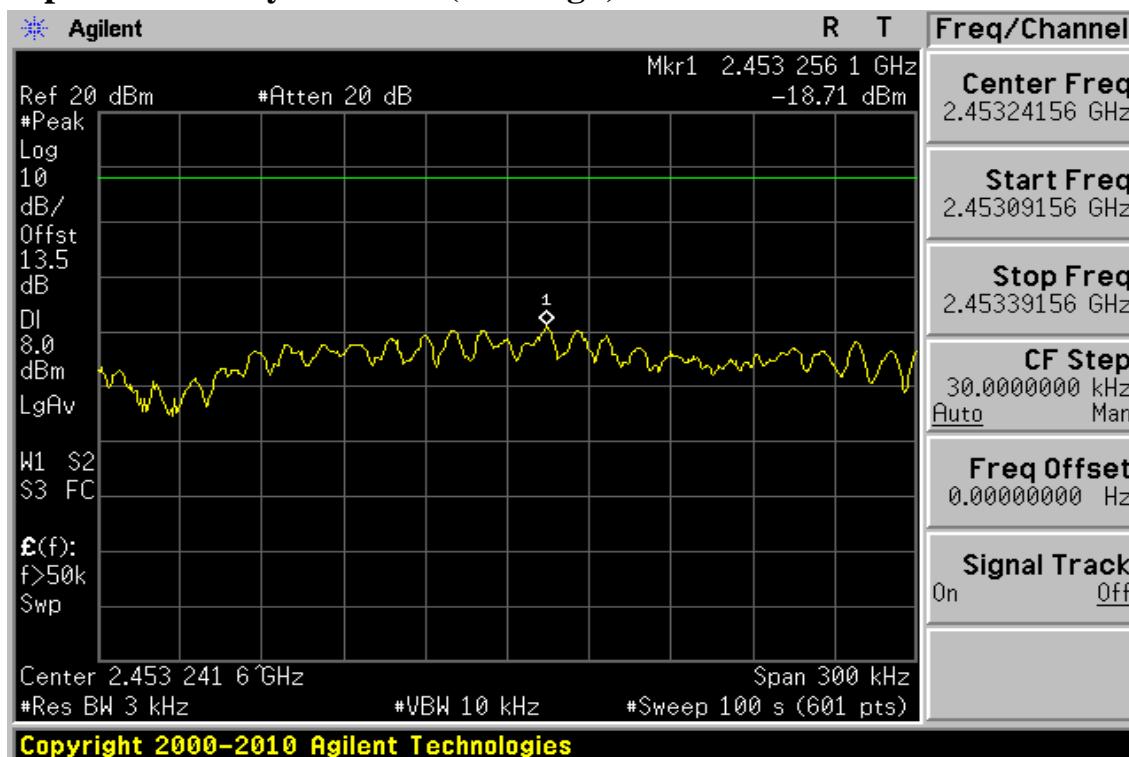
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**802.11n\_40M (MIMO Mode)****Power Spectral Density Test Plot (CH-Low)****Power Spectral Density Test Plot (CH-Mid)**

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**Power Spectral Density Test Plot (CH-High)**

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## 10 ANTENNA REQUIREMENT

### 10.1 Standard Applicable:

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

### 10.2 Antenna Connected Construction:

The directional gins of antenna used for transmitting is 2.0 dBi, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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