

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** SD WLAN Card with microSD slot

**Brand Name:** Cloud flash

**Marketing Name:** SPECTEC

**Model No.:** SDW-829

**Model Difference:** N/A

**FCC ID:** S2Y-SDWLAN11BGN

**Report No.:** ER/2012/70006

**Issue Date:** Nov. 23, 2012

**FCC Rule Part:** §15.247, Cat: DTS

**Prepared for:** SPECTEC COMPUTER CO., LTD.  
6F. No.92. Nanking E. Rd. Sec. 5, Taipei, Taiwan.  
SGS Taiwan Ltd.  
Electronics & Communication Laboratory

**Prepared by:** No.134, Wu Kung Road, New Taipei Industrial  
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24803



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## VERIFICATION OF COMPLIANCE

**Applicant:** SPECTEC COMPUTER CO., LTD.  
6F. No.92. Nanking E. Rd. Sec. 5, Taipei, Taiwan.

**Product Name:** SD WLAN Card with microSD slot

**Marketing Name:** Cloud flash

**Brand Name:** SPECTEC

**Model No.:** SDW-829

**Model Difference:** N/A

**File Number:** ER/2012/70006

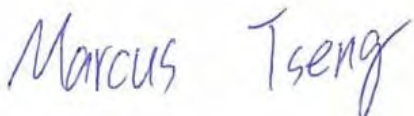
**Date of test:** July.17, 2012 ~ Nov. 23, 2012

**Date of EUT Received:** July.17, 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 C63.4:2009 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** Nov. 22, 2012

*Marcus Tseng / Engineer*

**Prepared By:**  **Date** Nov. 22, 2012

*Cherry Chen / Clerk*

**Approved By:**  **Date** Nov. 22, 2012

*Jim Chang / Supervisor*

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## Version

Version No.	Date	Description
00	Nov. 22, 2012	Initial creation of document

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# 1 GENERAL INFORMATION

## 1.1 Product Description

General:

Product Name:	SD WLAN Card with microSD slot
Marketing Name:	Cloud flash
Brand Name:	SPECTEC
Model No.:	SDW-829
Model Difference:	N/A
Power Supply:	3.3 Vdc

WLAN:

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology
11b/g	2412-2462	11	b: 12.93dBm g: 12.31dBm	DSSS, OFDM
11n	HT20 2412-2462	11	n: 12.32dBm	OFDM
Antenna Designation:			Ceramic Antenna / Gain: 2dBi	
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: 6.5 – 65Mbps	

The EUT is compliance with IEEE 802.11 b/g/n Standard.

This report applies for frequency bands: 2412MHz – 2462MHz

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

This submittal(s) (test report) is intended for **FCC ID: S2Y-SDWLAN11BGN** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a Doc procedure.

## 1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2009. 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: 2009. 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 7.3.1 of ANSI C63.4-2009. 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 C63.4-2009.

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## 2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

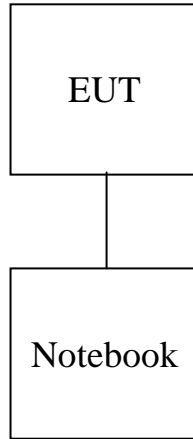


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2.	Notebook	Lenovo	L420	LR-7HXZA	N/A	N/A

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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 11Mbps data rate are chosen for full testing.

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

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

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case E2 position was reported.

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## 5 MEASUREMENT UNCERTAINTY FOR FIELD STRENGTH OF SPURIOUS RADIATION

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: 3.37dB
	180MHz -417MHz: 3.19dB
	0.417GHz-1GHz: 3.19dB
	1GHz - 18GHz: 4.04dB
	18GHz - 40GHz: 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 180MHz: 3.37dB
	180MHz -417MHz: 3.19dB
	0.417GHz-1GHz: 3.19dB
	1GHz - 18GHz: 4.08dB
	18GHz - 40GHz: 4.08dB

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## 6 CONDUCTED EMISSION TEST

### 6.1 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

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

### 6.2 Measurement Equipment Used:

AC Power Line 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
EMI Receiver	R&S	ESCS 30	828985/004	09/23/2012	09/22/2013
LISN	Rolf-Heine	NNB-2/16Z	99012	03/23/2012	03/22/2013
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/23/2012	03/22/2013
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2012	01/04/2013

### 6.3 EUT Setup:

- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
- The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120Vac/60Hz power source.

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#### 6.4 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.

#### 6.5 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.

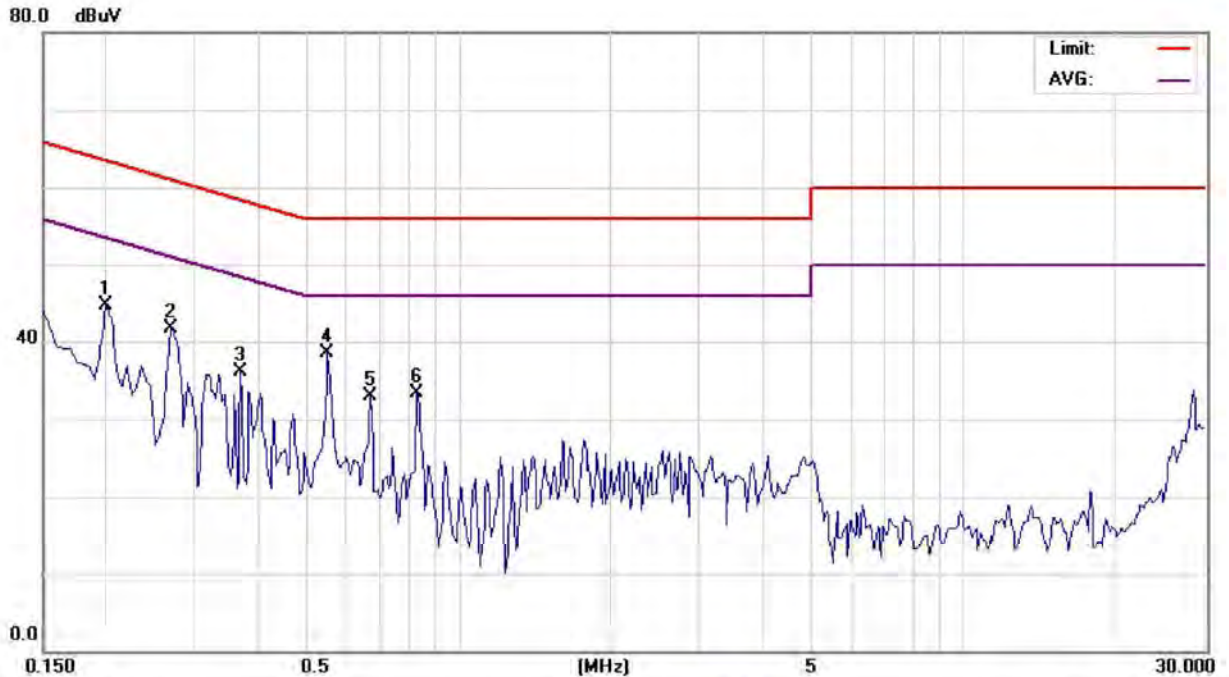
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### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation	Test Date:	Nov. 19, 2012
Temperature:	24 °C	Humidity:	60%
		Test By:	Marcus



Site: ConductionRoom	Phase: L1	Temperature: 24 °C
Limit: FCC Class B Conduction(QP)	Power: AC 120V/60Hz	Humidity: 60%
EUT: SD WLAN Card with microSD slot	Distance:	
MN: SDW-829		
Mode: Operationmode		
Note:		

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2000	44.55	0.12	44.67	63.61	-18.94	peak	
2		0.2700	41.56	0.12	41.68	61.12	-19.44	peak	
3		0.3700	35.98	0.12	36.10	58.50	-22.40	peak	
4	*	0.5500	38.37	0.12	38.49	56.00	-17.51	peak	
5		0.6700	32.81	0.12	32.93	56.00	-23.07	peak	
6		0.8300	33.10	0.12	33.22	56.00	-22.78	peak	

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Site: ConductionRoom  
 Limit: FCC Class B Conduction(QP)  
 EUT: SD WLAN Card with microSD slot  
 M/N: SDW-829  
 Mode: Operationmode  
 Note:

Phase: N  
 Power: AC 120V/60Hz  
 Distance:

Temperature: 24 °C  
 Humidity: 60%

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.2000	45.98	0.13	46.11	63.61	-17.50	peak	
2		0.2700	41.48	0.13	41.61	61.12	-19.51	peak	
3		0.3500	38.05	0.12	38.17	58.96	-20.79	peak	
4		0.5500	38.17	0.12	38.29	56.00	-17.71	peak	
5		0.8300	33.28	0.13	33.41	56.00	-22.59	peak	
6		1.7800	28.06	0.15	28.21	56.00	-27.79	peak	

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## 7 PEAK OUTPUT POWER MEASUREMENT

### 7.1 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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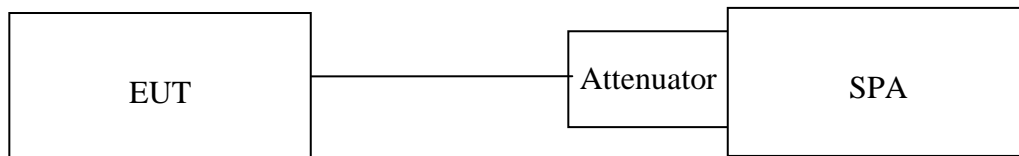
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## 7.2 Measurement Equipment Used:

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	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013
Splitter	Agilent	11636B	N/A	02/28/2012	02/27/2013

## 7.3 .Test Set-up:



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## 7.4 Measurement Procedure: Peak Power:

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 or spectrum. (Channel power function, RBW = 1MHz, VBW = 3MHz, span  $\geq$ 30% of EBW, where Bandwidth = 26dB occupied Bandwidth, Detector = peak, Sweep = Auto)
3. Using integrated band power measurement function by setting limit equal to EBW's band edges
4. Record the max. reading.
5. Repeat above procedures until all measurement of required selective channel (low, mid, high) is completed.
6. For MIMO operation, measurement is done per chain basis, and then sum the simultaneous transmitting output in linear

## Average Power:

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 or spectrum. (Channel power function, RBW = 1MHz, VBW = 3MHz, span  $\geq$ 30% of EBW, where Bandwidth = 26dB occupied Bandwidth, Detector = power average, Sweep = Auto)
3. Set average trace = 100 times in power average mode
4. Using integrated band power measurement function by setting limit equal to EBW's band edges
5. Record the max. reading.
6. Repeat above procedures until all measurement of required selective channel (low, mid, high) is completed.
7. For MIMO operation, measurement is done per chain basis, and then sum the simultaneous transmitting output in linear

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**7.5 Measurement Result:**

**802.11b**

Cable loss = 0		Peak Power Output (dBm)					Required Limit
CH	Frequency (MHz)	Data Rate					
		1	2	5.5	11		
1	2412	12.60	12.47	12.71	<b>12.93</b>	1 Watt = 30 dBm	
6	2437	12.26	12.19	12.46	12.74	1 Watt = 30 dBm	
11	2462	12.11	12.14	12.32	12.35	1 Watt = 30 dBm	

Cable loss = 0		Average Power Output (dBm)					Required Limit
CH	Frequency (MHz)	Data Rate					
		1	2	5.5	11		
1	2412	9.86	9.88	9.85	9.79	1 Watt = 30 dBm	
6	2437	9.52	9.54	9.57	9.46	1 Watt = 30 dBm	
11	2462	9.42	9.45	9.45	9.31	1 Watt = 30 dBm	

**802.11g**

Cable loss = 0		Peak Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		6	9	12	18	24	36	48	54	
1	2412	<b>12.31</b>	12.12	11.70	11.84	11.58	11.48	11.15	11.32	1 Watt = 30 dBm
6	2437	12.29	12.09	12.22	12.16	11.45	11.29	10.95	10.76	1 Watt = 30 dBm
11	2462	12.24	12.20	11.86	12.21	10.93	10.96	10.82	10.87	1 Watt = 30 dBm

Cable loss = 0		Average Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		6	9	12	18	24	36	48	54	
1	2412	8.58	8.35	8.32	8.29	7.76	7.72	7.72	7.68	1 Watt = 30 dBm
6	2437	8.71	8.54	8.50	8.59	8.06	7.96	7.37	7.29	1 Watt = 30 dBm
11	2462	8.62	8.53	8.50	8.43	7.34	7.20	7.27	7.01	1 Watt = 30 dBm

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**802.11n\_20M**

Cable loss = 0		Peak Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	12.16	12.07	11.95	11.63	11.35	11.16	11.04	10.97	1 Watt = 30 dBm
6	2437	12.32	12.22	12.13	11.59	11.24	10.93	10.98	10.99	1 Watt = 30 dBm
11	2462	12.17	12.14	12.00	10.92	10.76	10.75	10.74	10.67	1 Watt = 30 dBm

Cable loss = 0		Average Power Output(dBm)								Required Limit
CH	Frequency (MHz)	Data Rate								
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	8.55	8.26	8.38	7.77	7.68	7.66	7.65	7.63	1 Watt = 30 dBm
6	2437	8.67	8.48	8.12	7.61	7.53	7.42	7.37	7.29	1 Watt = 30 dBm
11	2462	8.66	8.40	8.43	7.38	7.41	7.23	7.03	6.95	1 Watt = 30 dBm

\*Note: Offset 10.5 dB

Note: Refer to next page for plots.

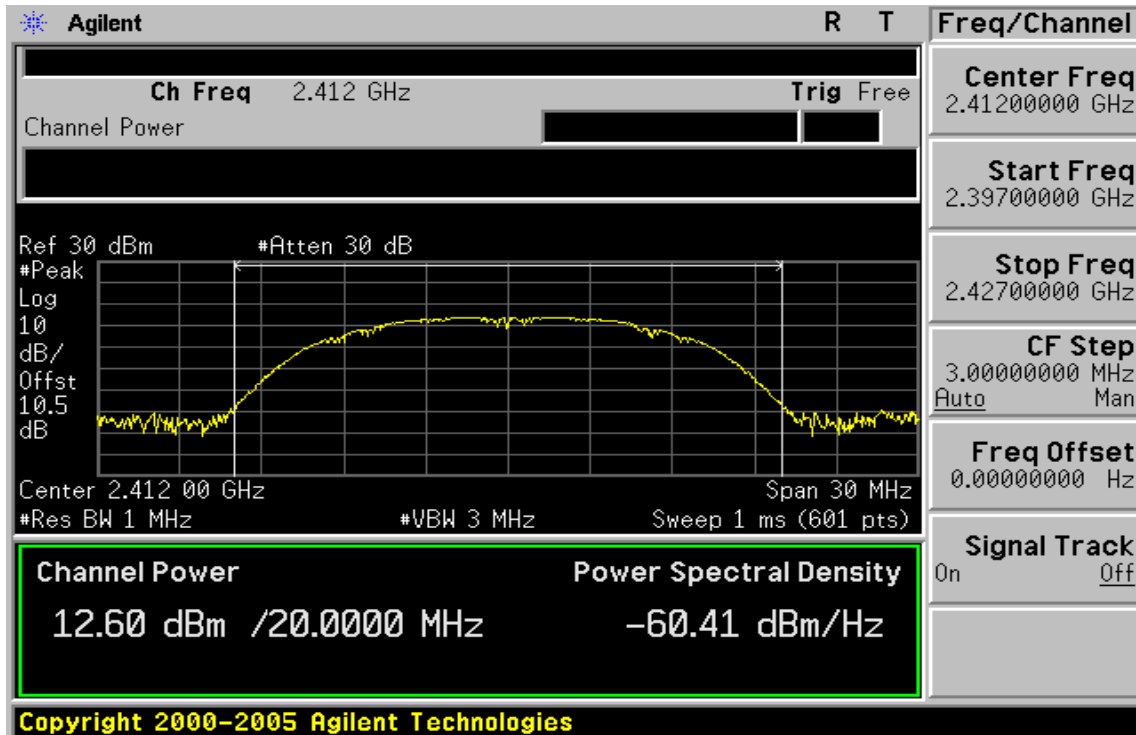
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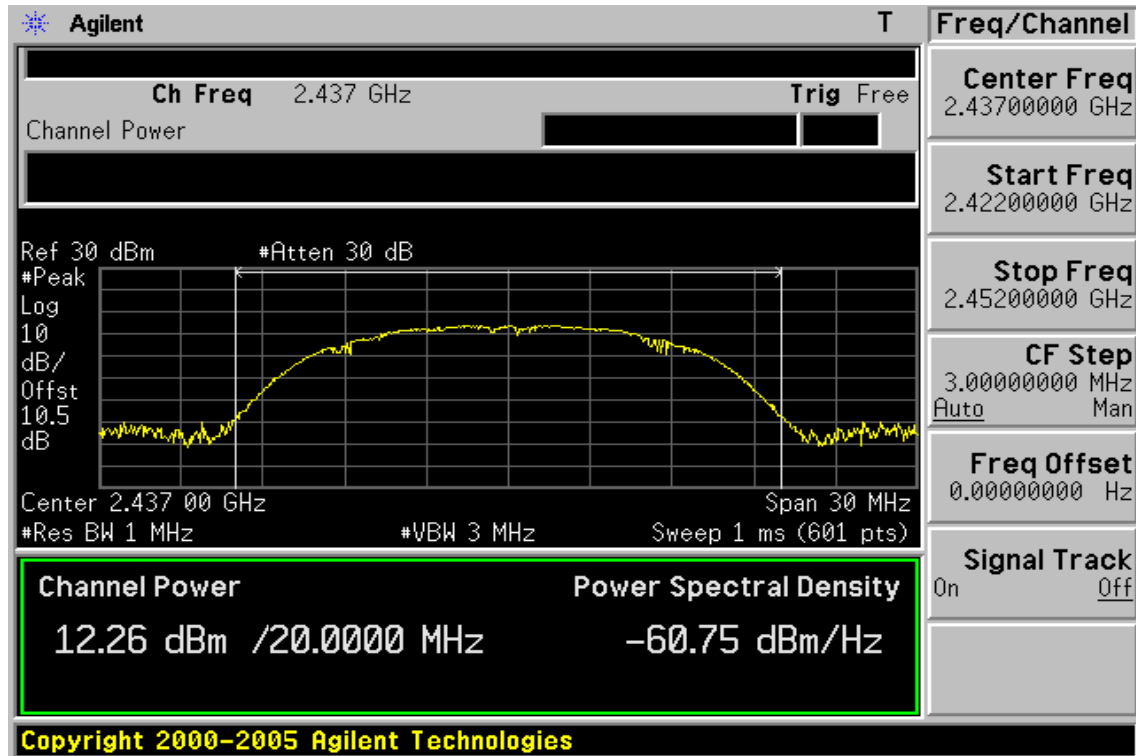
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### 802.11b, 1Mbps

#### Peak Power Output Plot (CH Low)



#### Peak Power Output Plot (CH Mid)

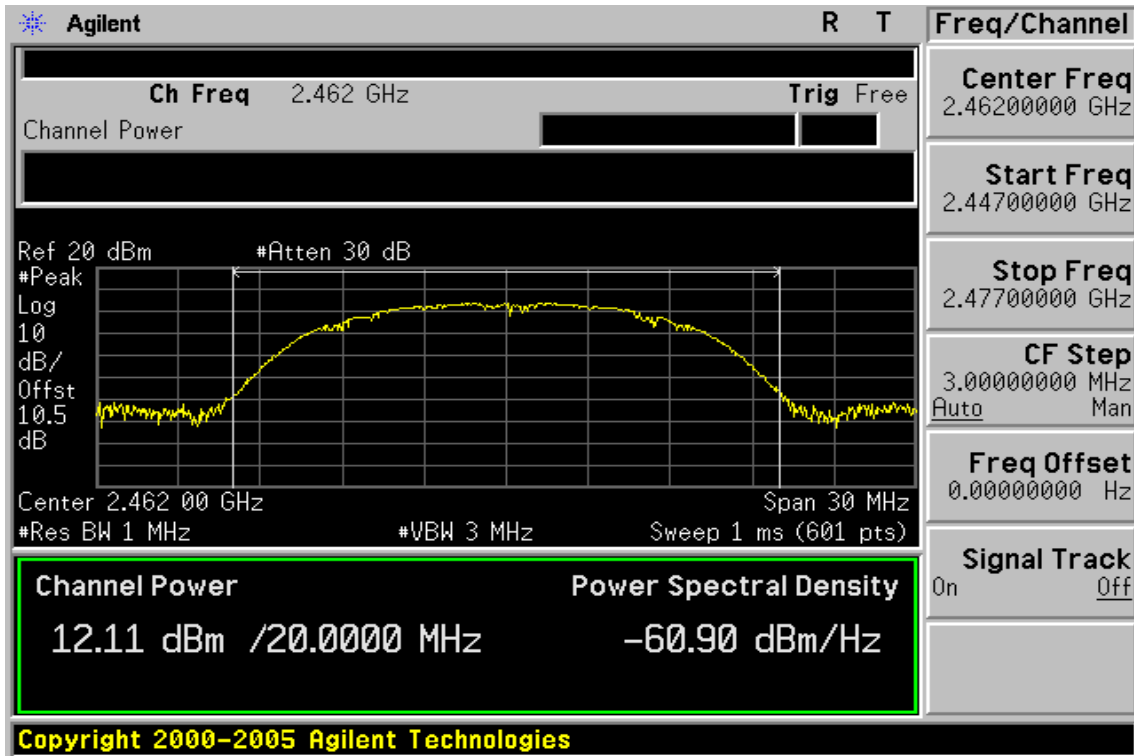


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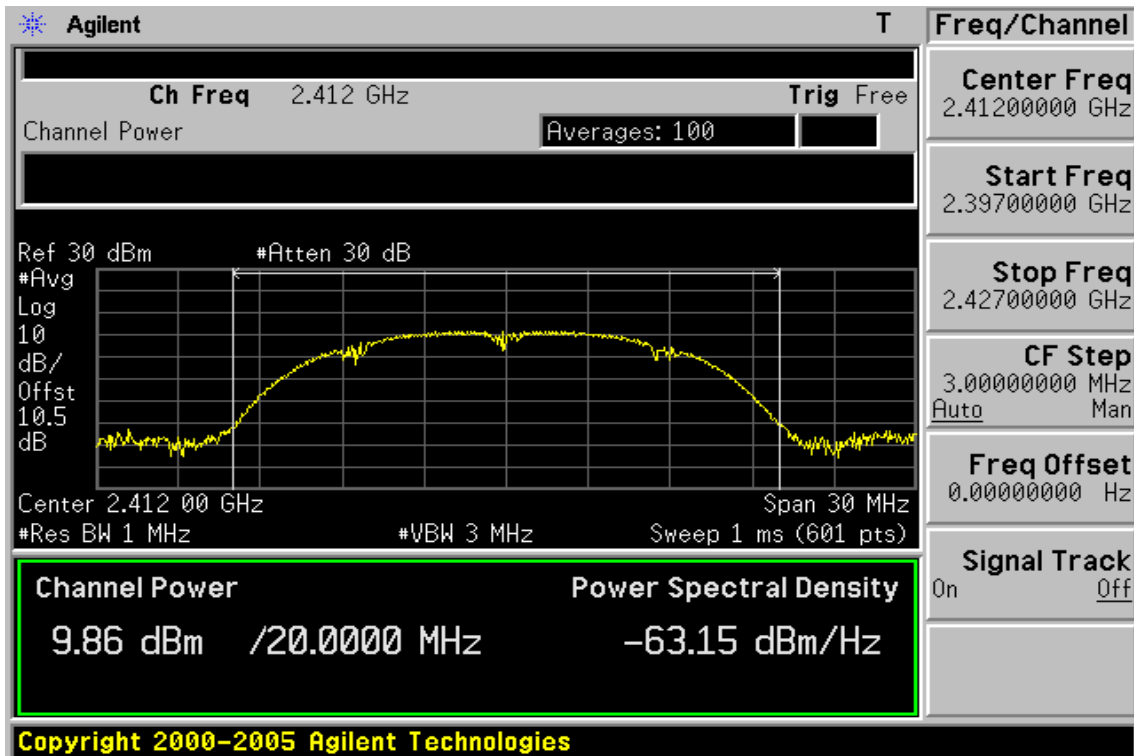
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**Peak Power Output Plot (CH High)**



**Average Power Output Plot (CH Low)**

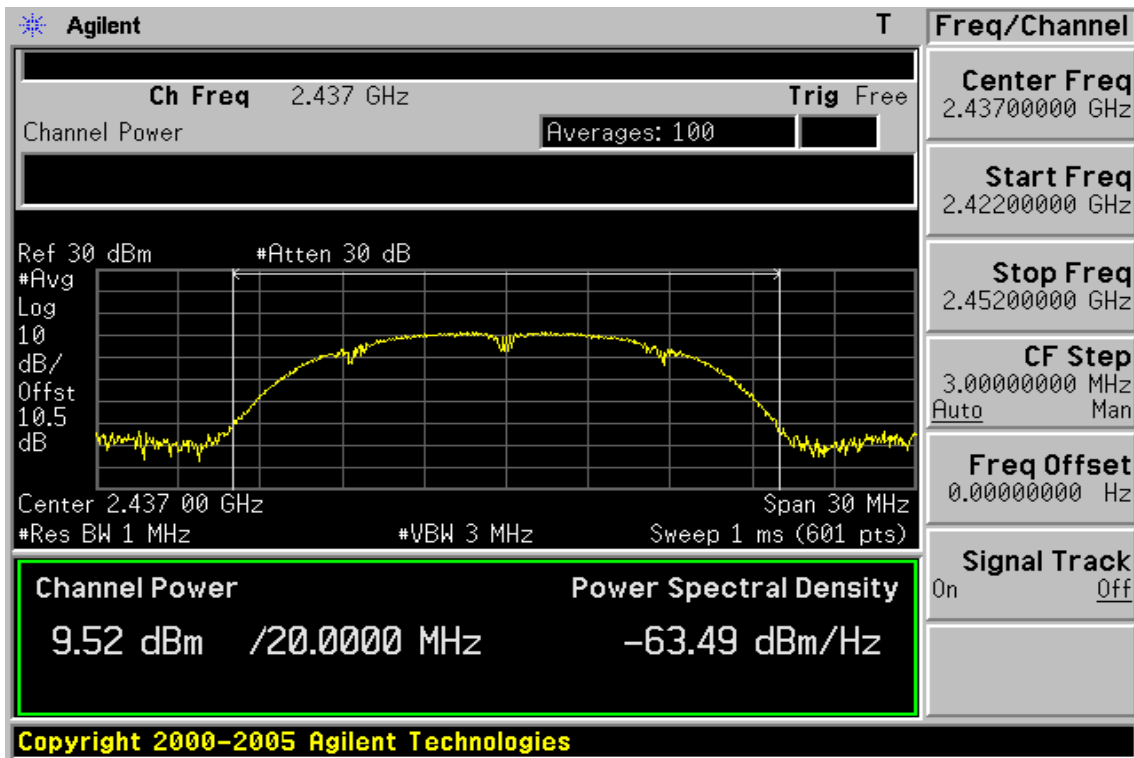


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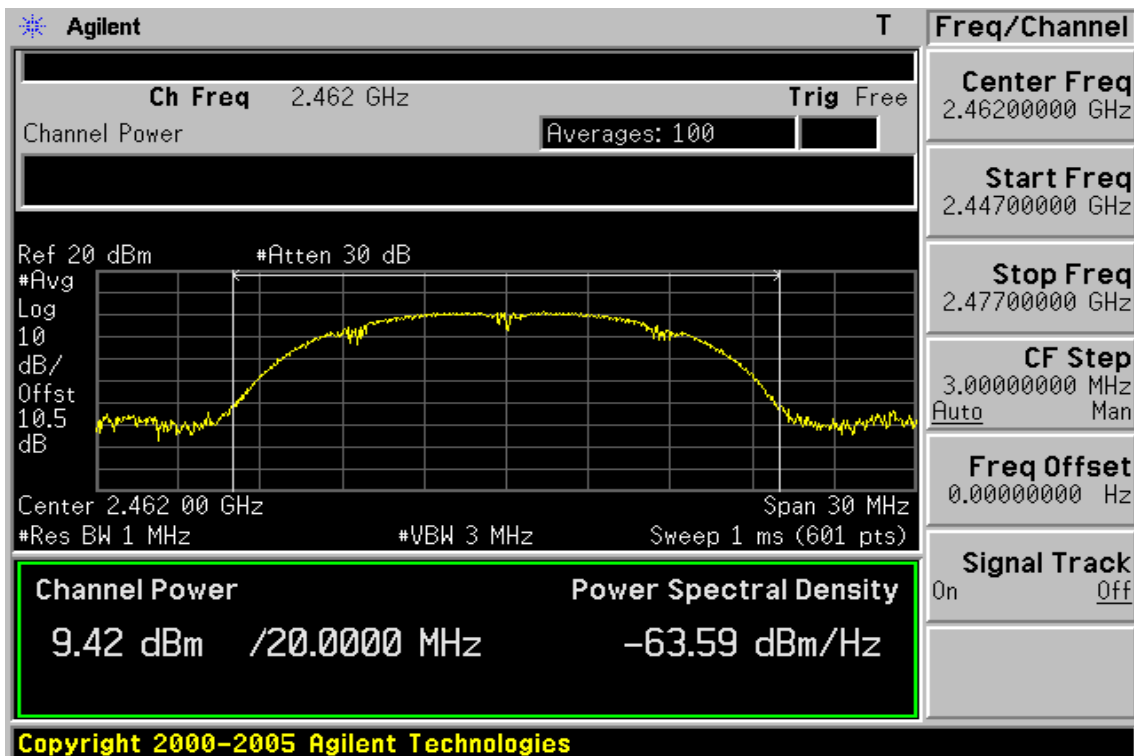
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**Average Power Output Plot (CH Mid)**



**Average Power Output Plot (CH High)**



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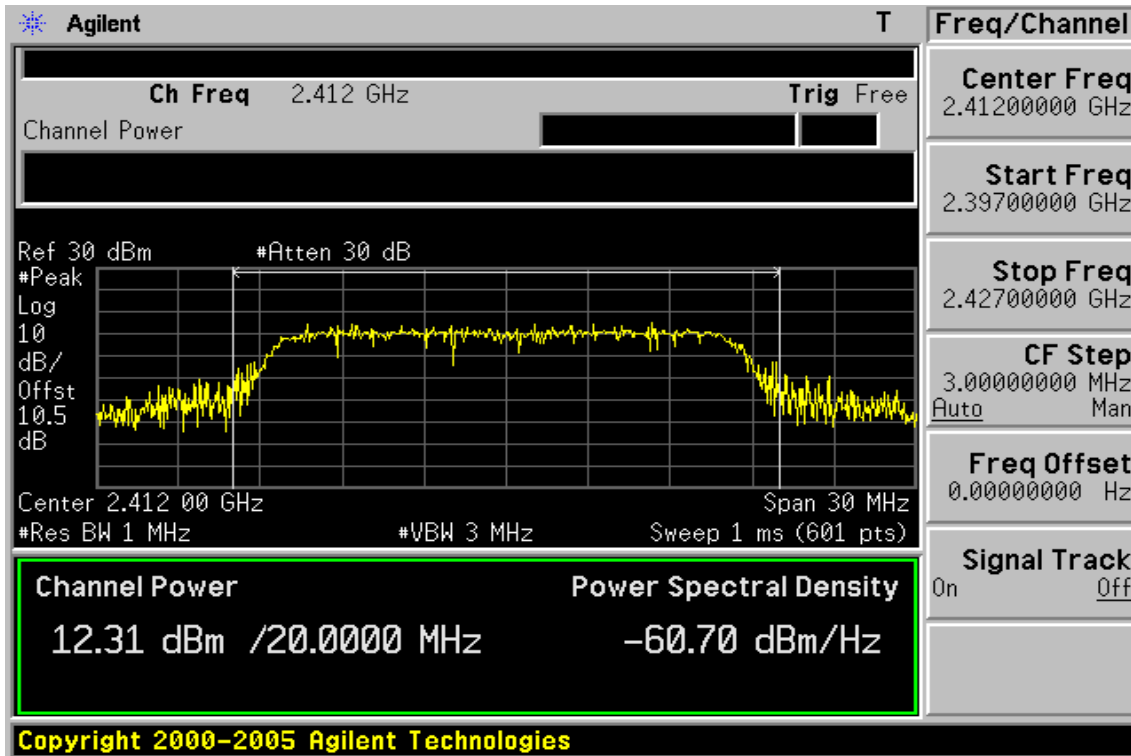
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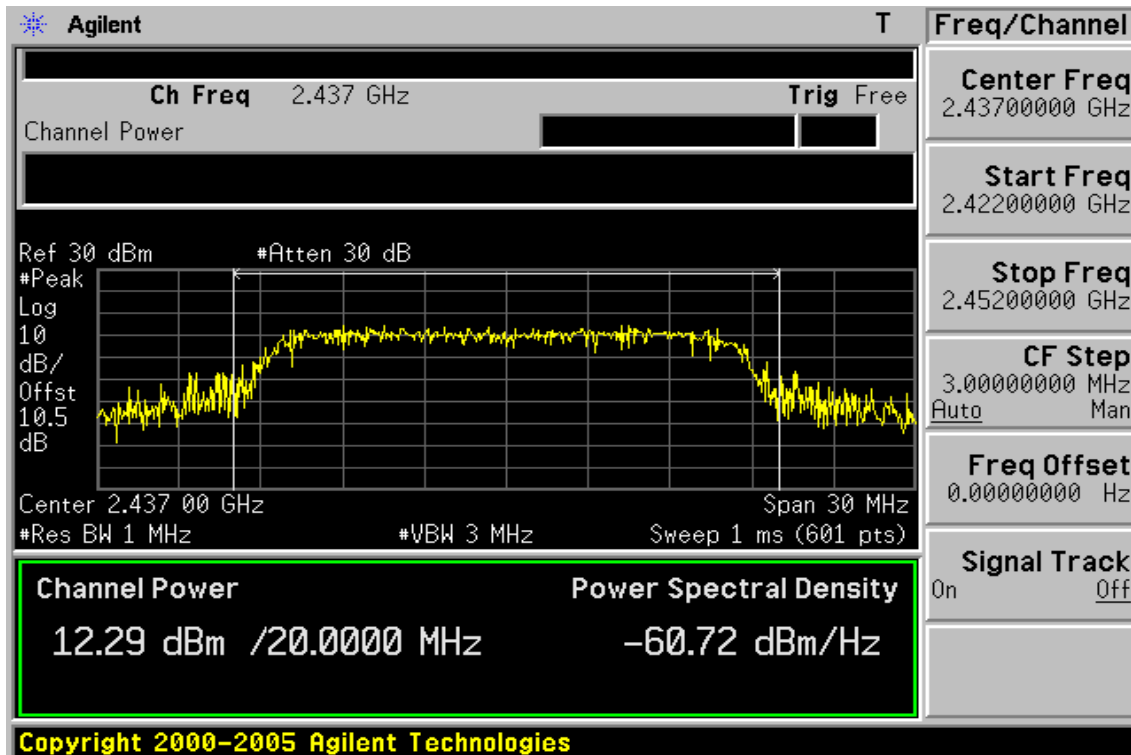


### 802.11g, 6Mbps

#### Peak Power Output Plot (CH Low)



#### Peak Power Output Plot (CH Mid)

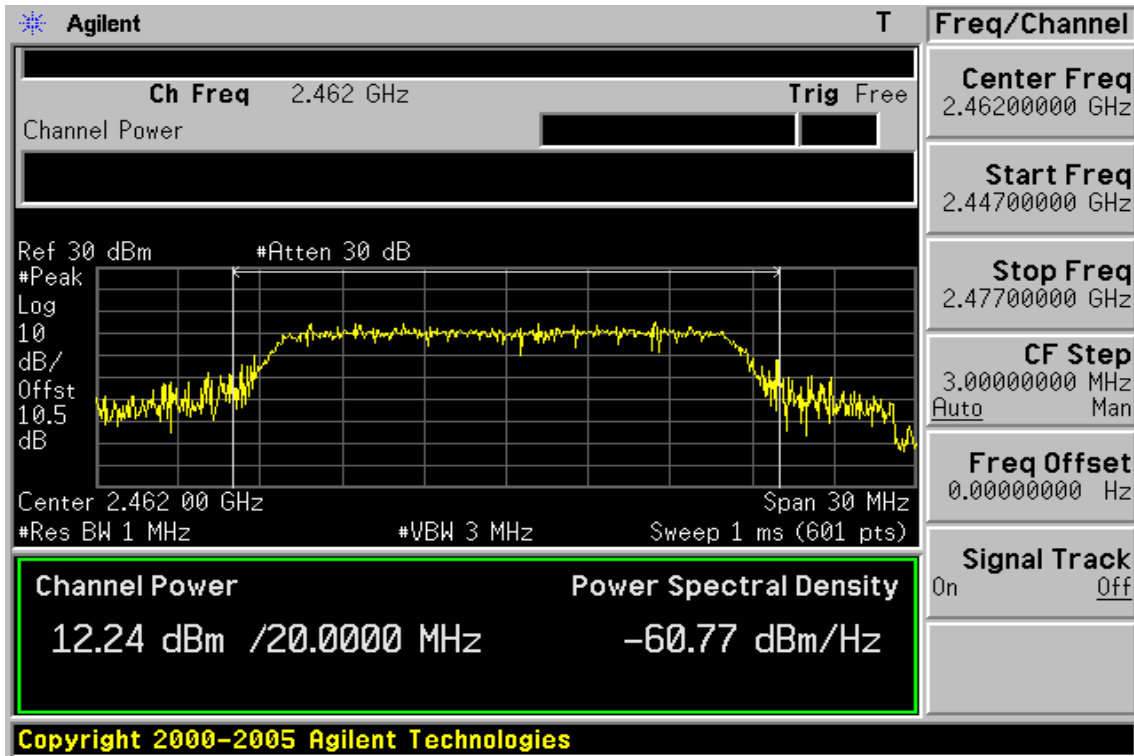


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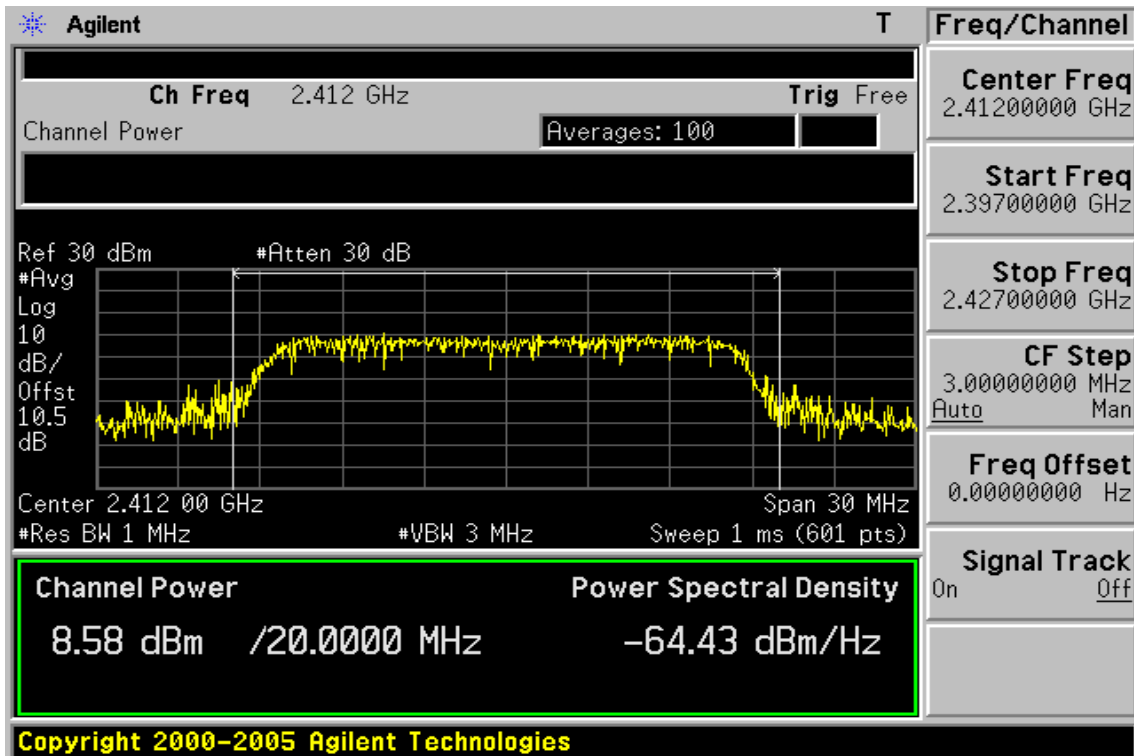
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**Peak Power Output Plot (CH High)**



**Average Power Output Plot (CH Low)**

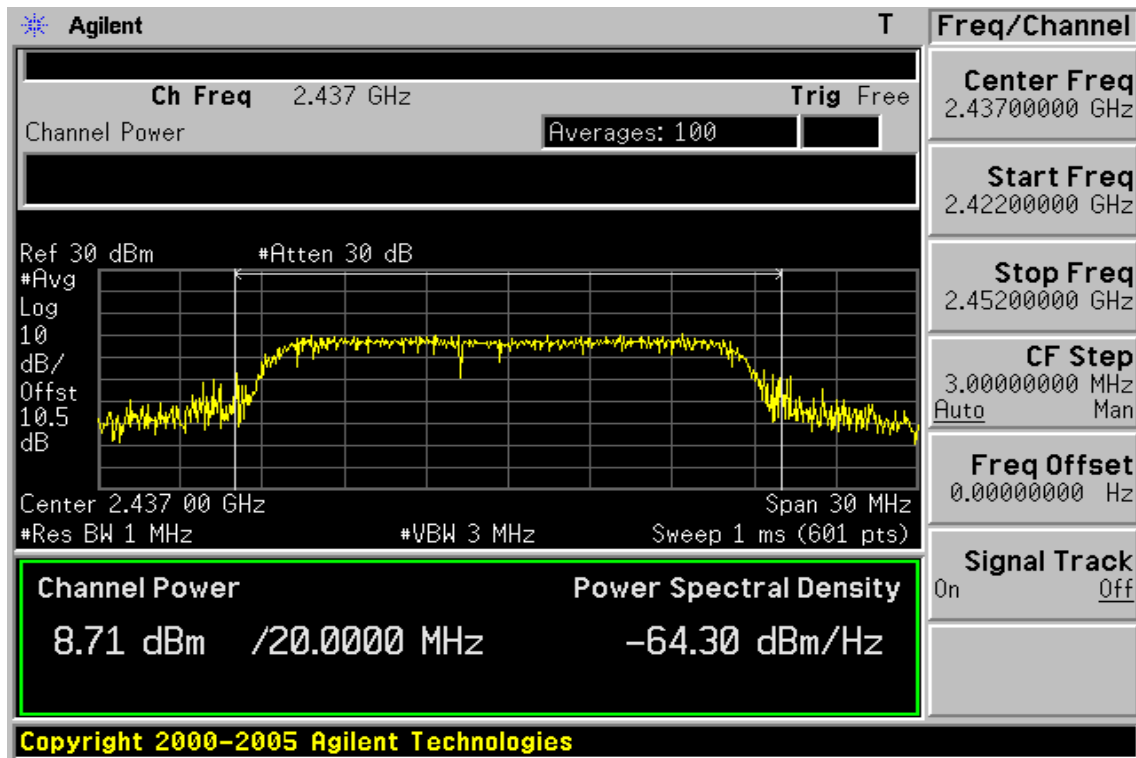


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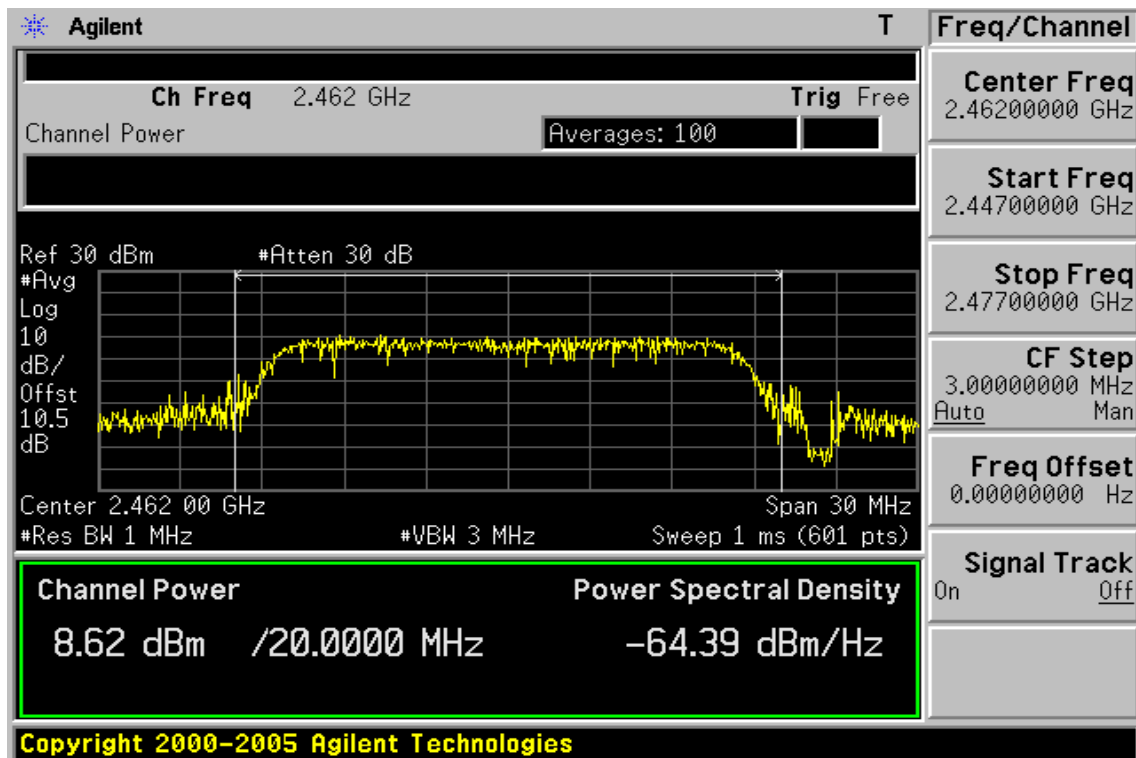
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**Average Power Output Plot (CH Mid)**



**Average Power Output Plot (CH High)**



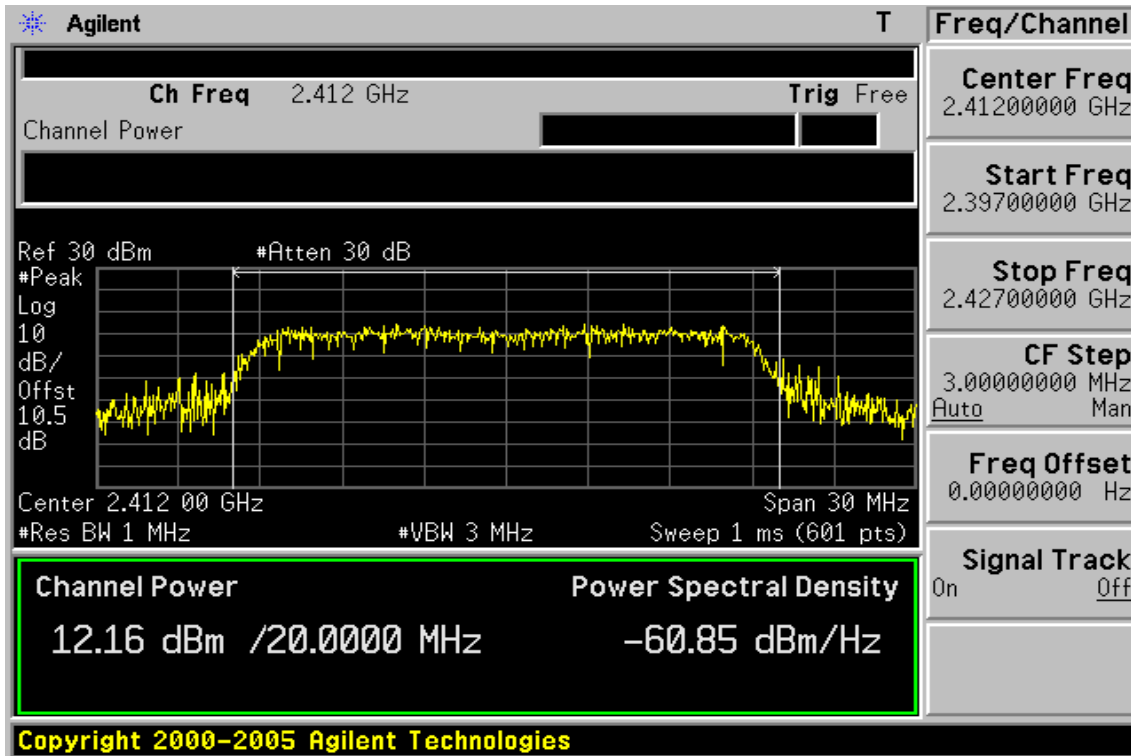
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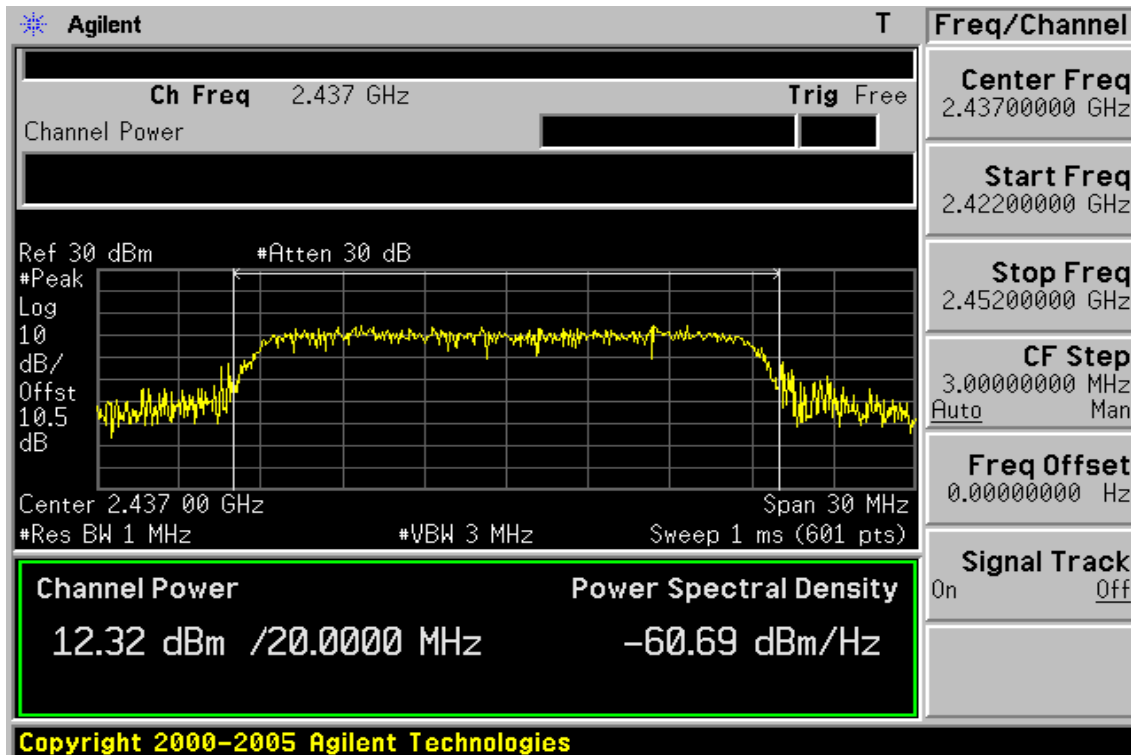
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### 802.11n\_20M, 6.5Mbps

#### Peak Power Output Plot (CH Low)



#### Peak Power Output Plot (CH Mid)

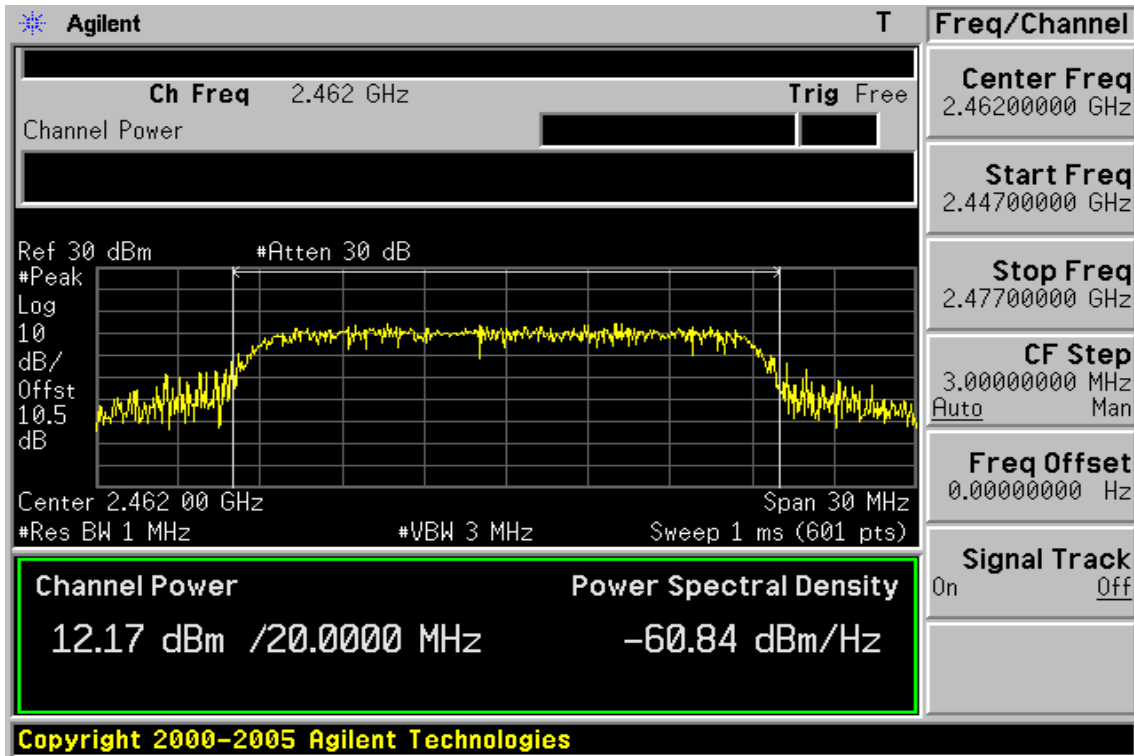


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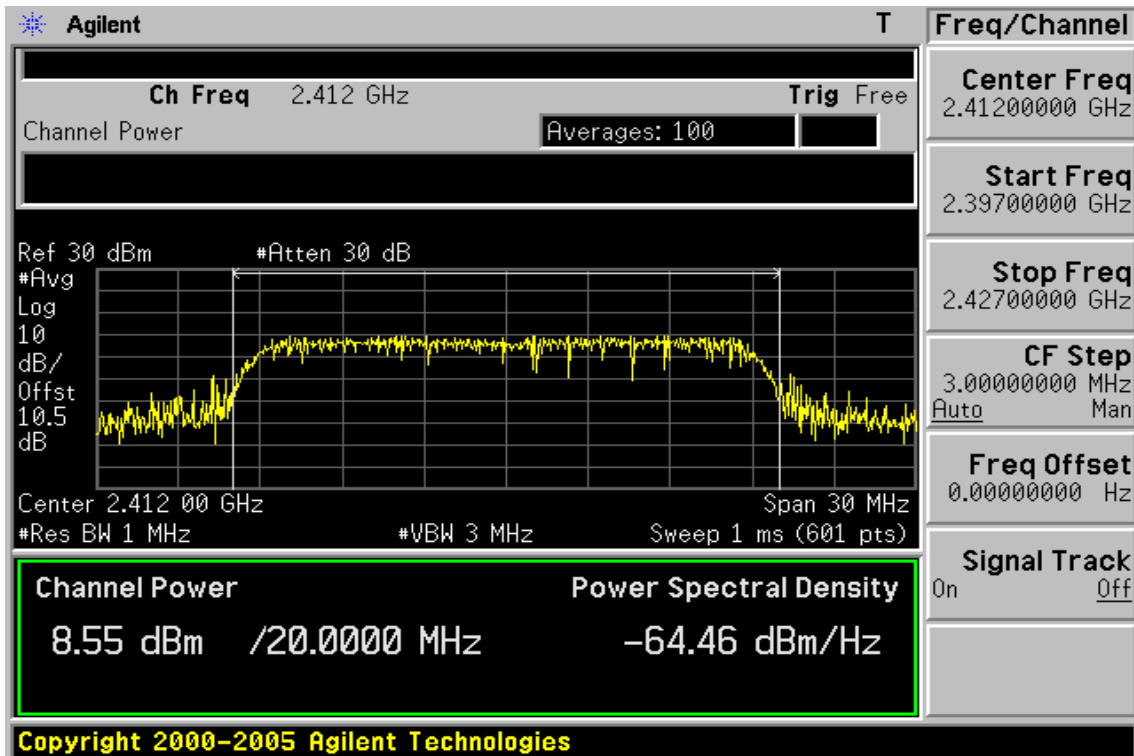
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**Peak Power Output Plot (CH High)**



**Average Power Output Plot (CH Low)**

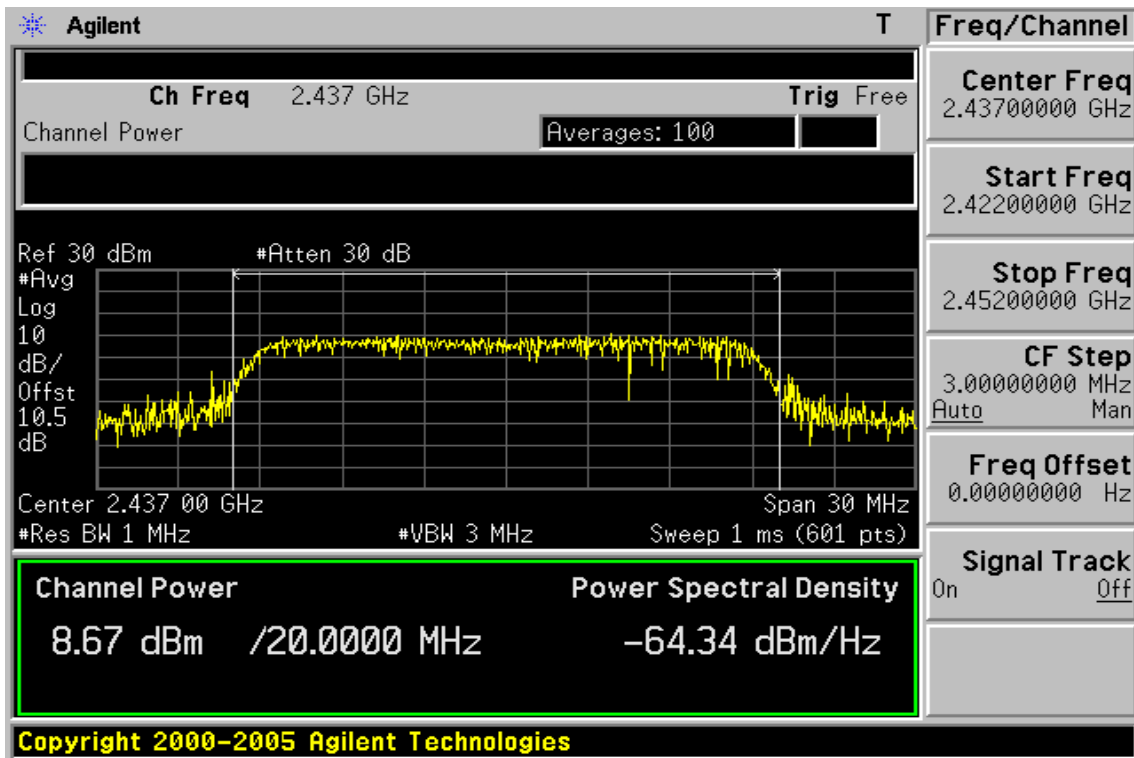


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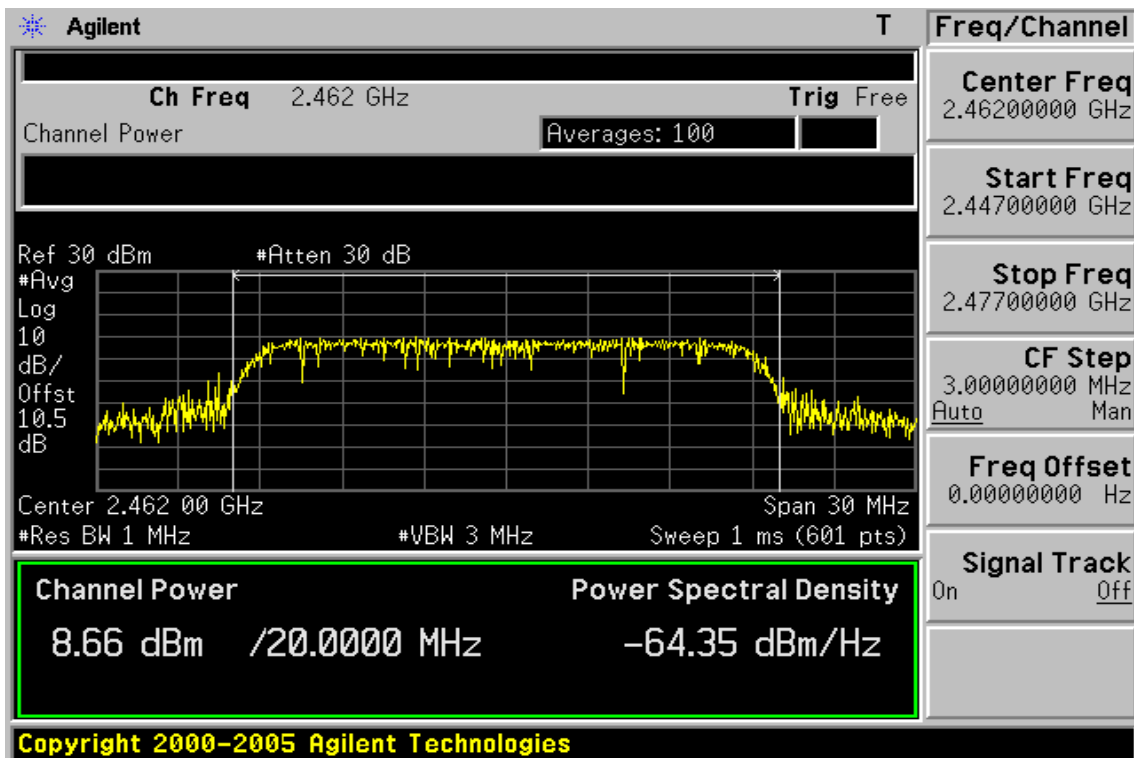
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**Average Power Output Plot (CH Mid)**



**Average Power Output Plot (CH High)**



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## 8 6dB BANDWIDTH

### 8.1 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.

### 8.2 Measurement Equipment Used:

Refer to Section 7.2 for details.

### 8.3 Test Set-up:

Refer to Section 7.3 for details.

### 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 3. antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=200KHz, VBW = 3\*RBW, Span= 30M/50MHz, Sweep=auto
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all measurement of required selective channel (low, mid, high) is completed.

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**8.5 Measurement Result:**

**802.11b**

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	10.214	> 500	PASS
2437	10.217	> 500	PASS
2462	10.199	> 500	PASS

**802.11g**

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	16.410	> 500	PASS
2437	16.418	> 500	PASS
2462	16.412	> 500	PASS

**802.11n\_20M**

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	17.595	> 500	PASS
2437	17.565	> 500	PASS
2462	17.612	> 500	PASS

*\*Offset 10.5dB*

Note: Refer to next page for plots.

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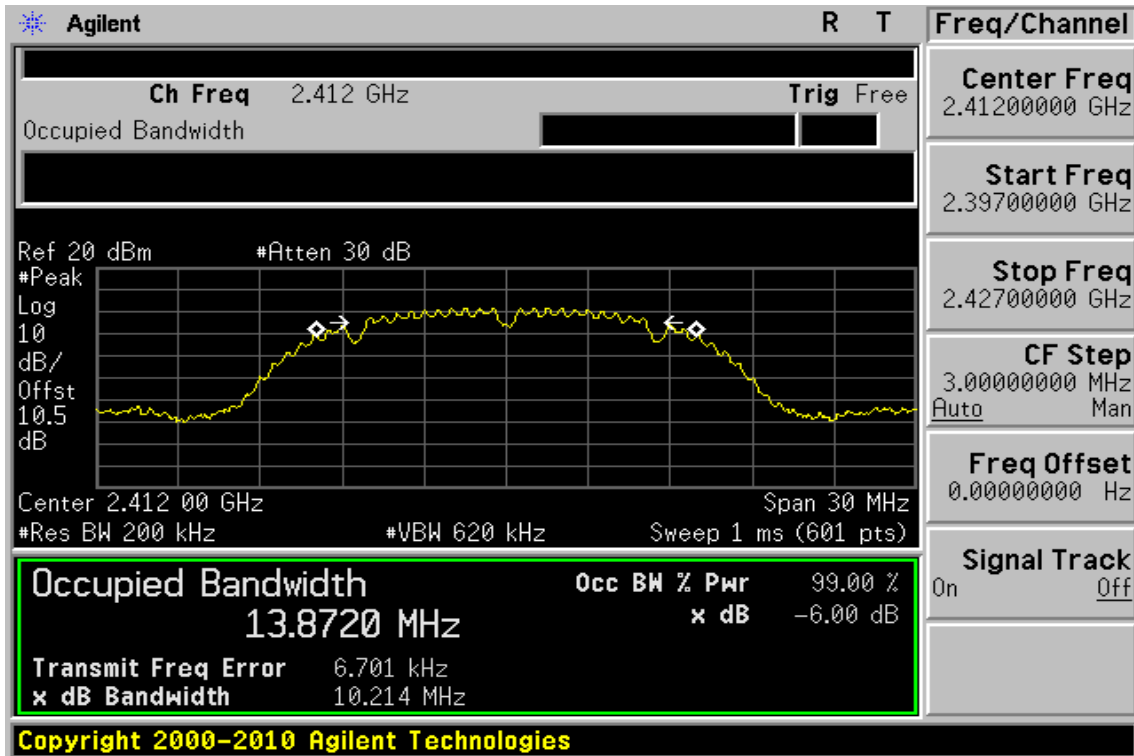
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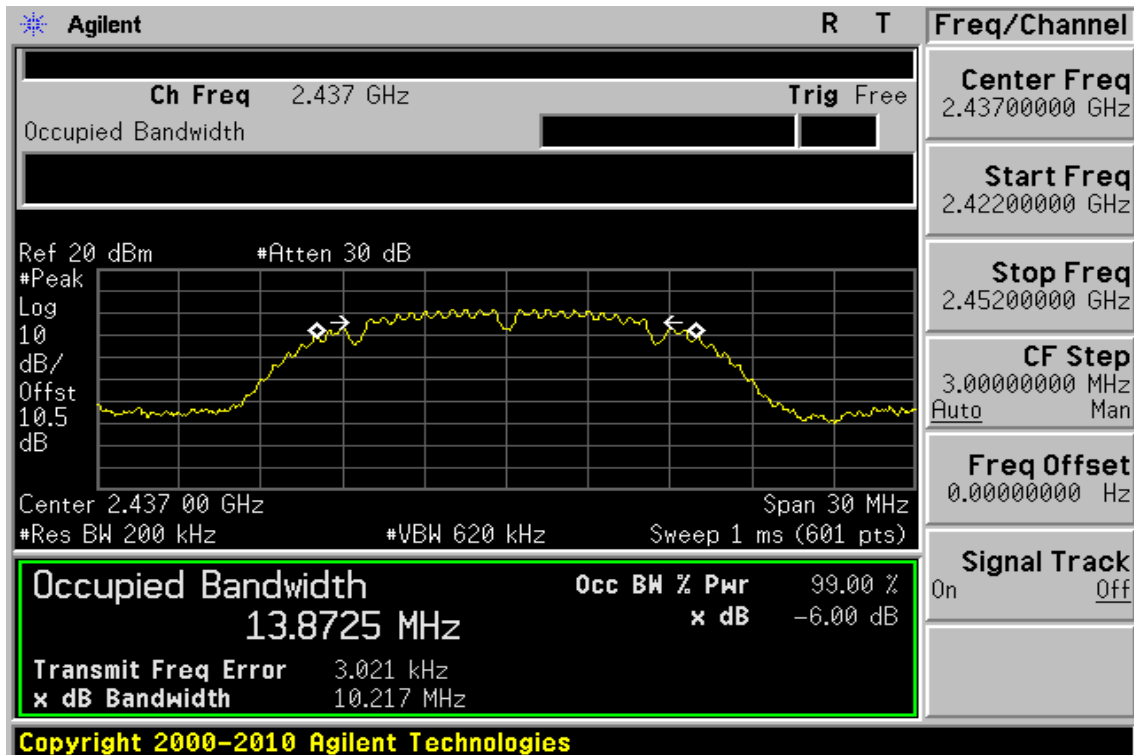


802.11b

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid

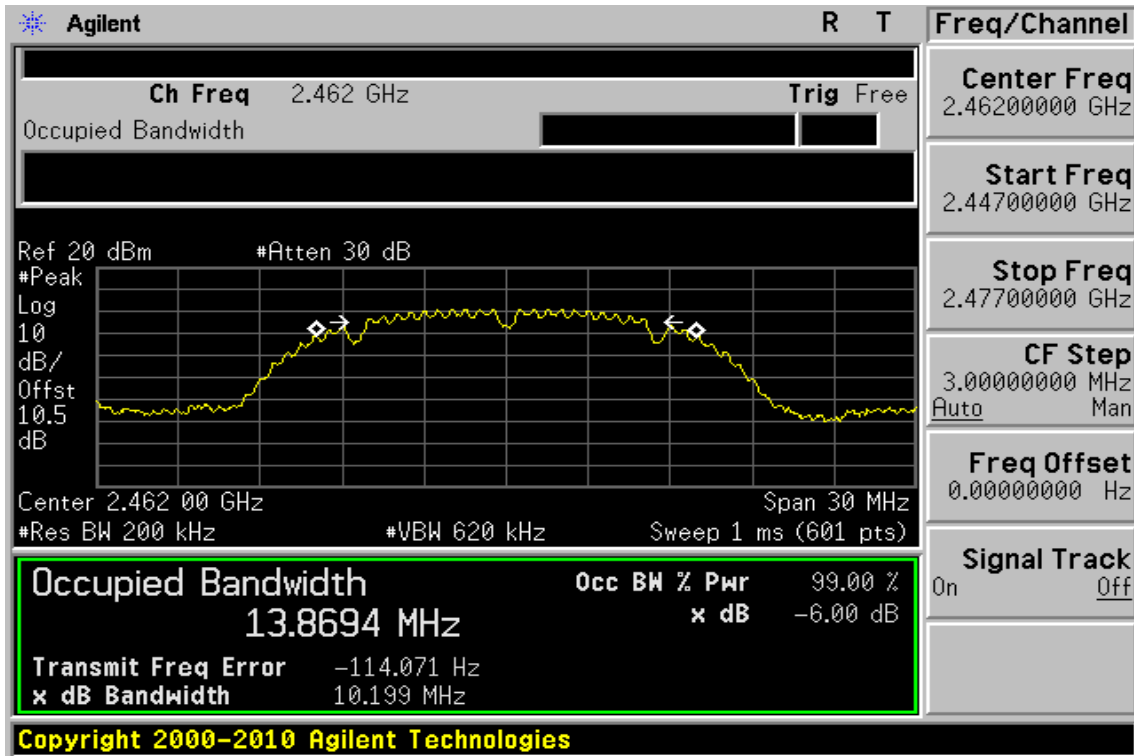


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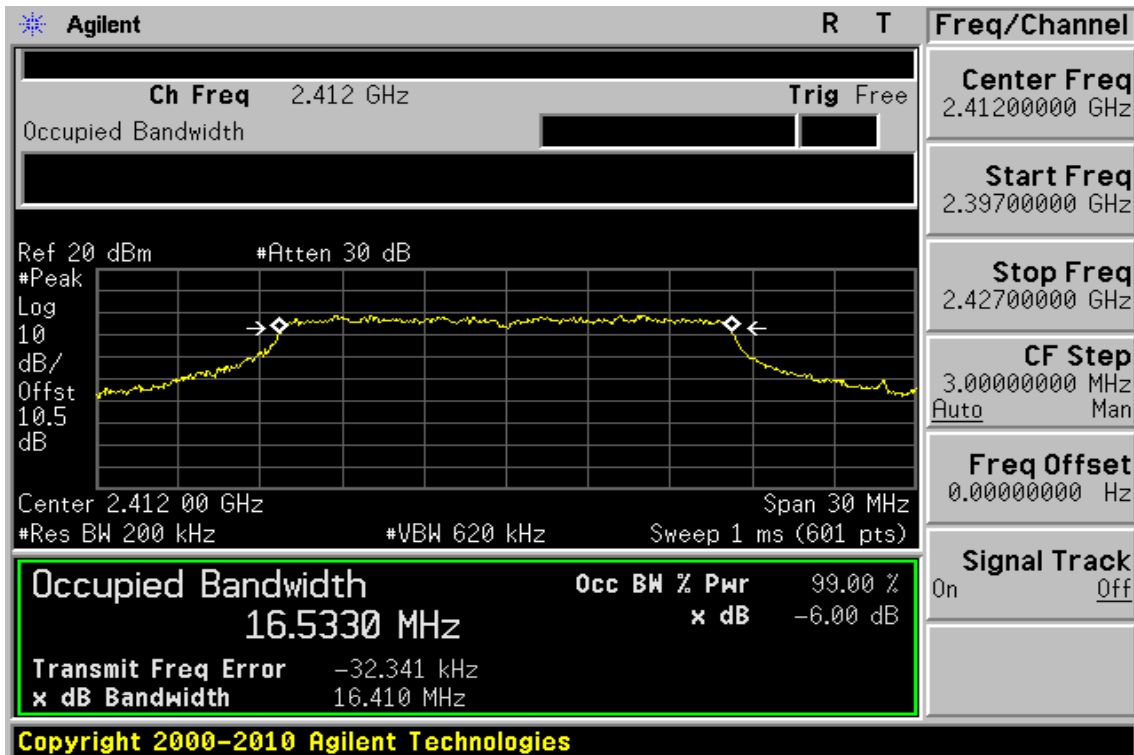
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### 6dB Band Width Test Data CH-High



### 802.11g

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

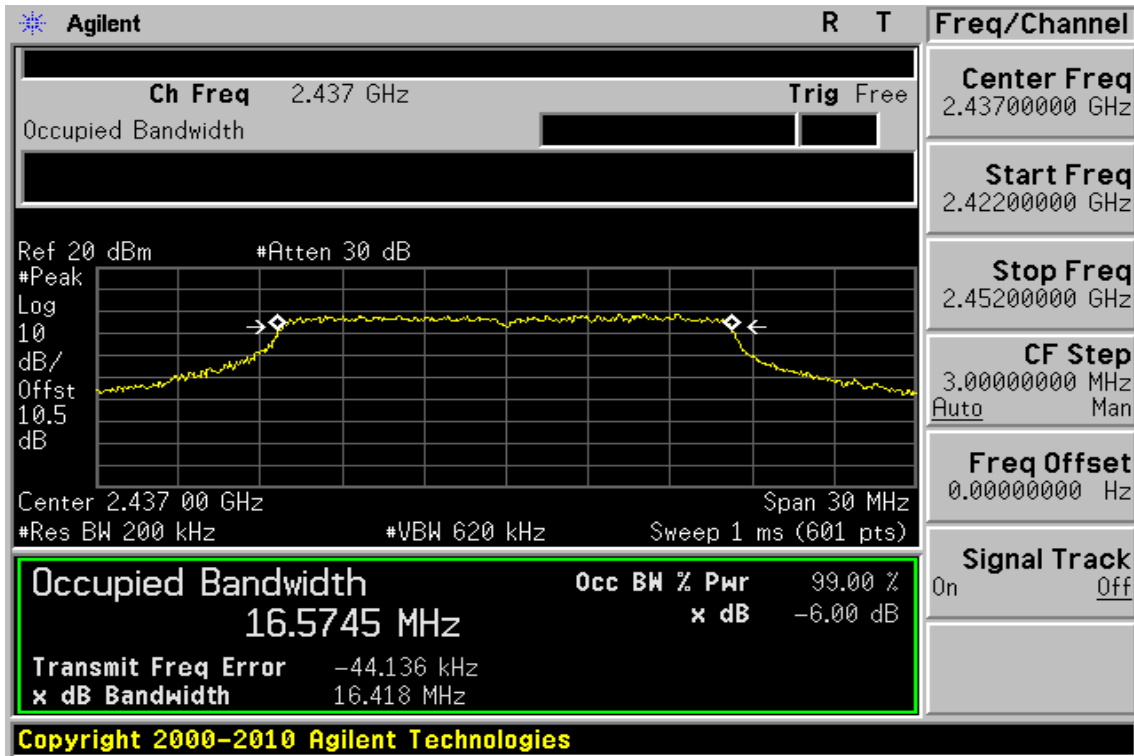


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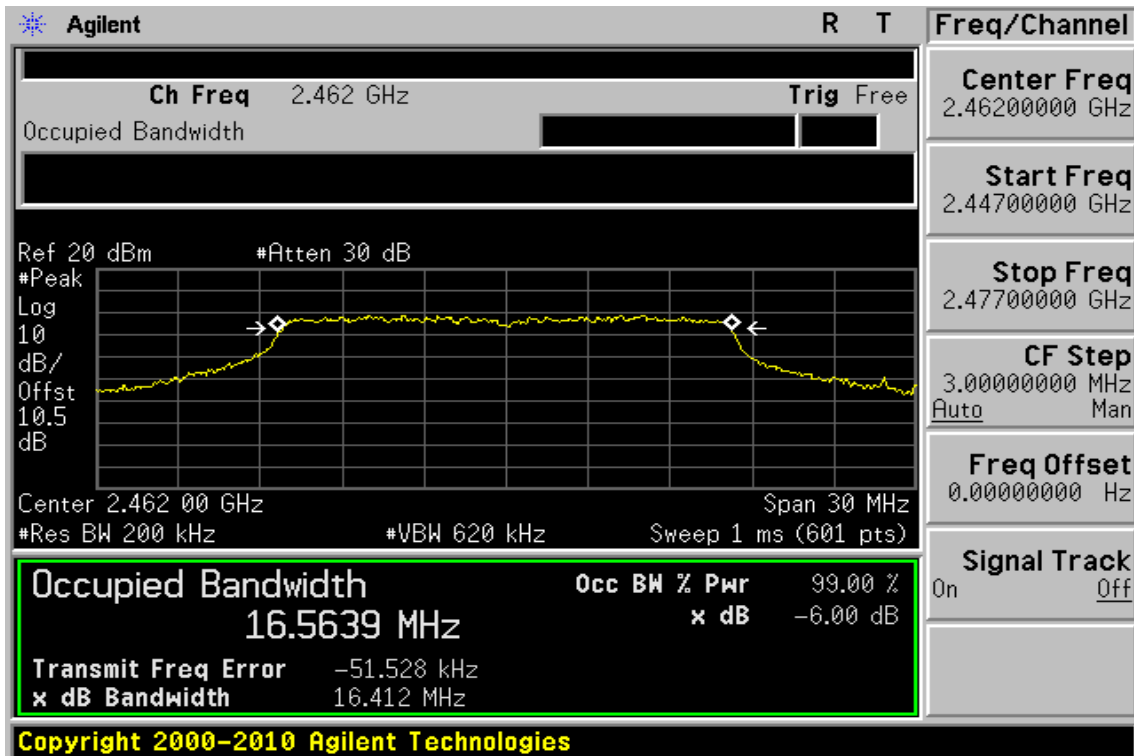
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### 6dB Band Width Test Data CH-Mid



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



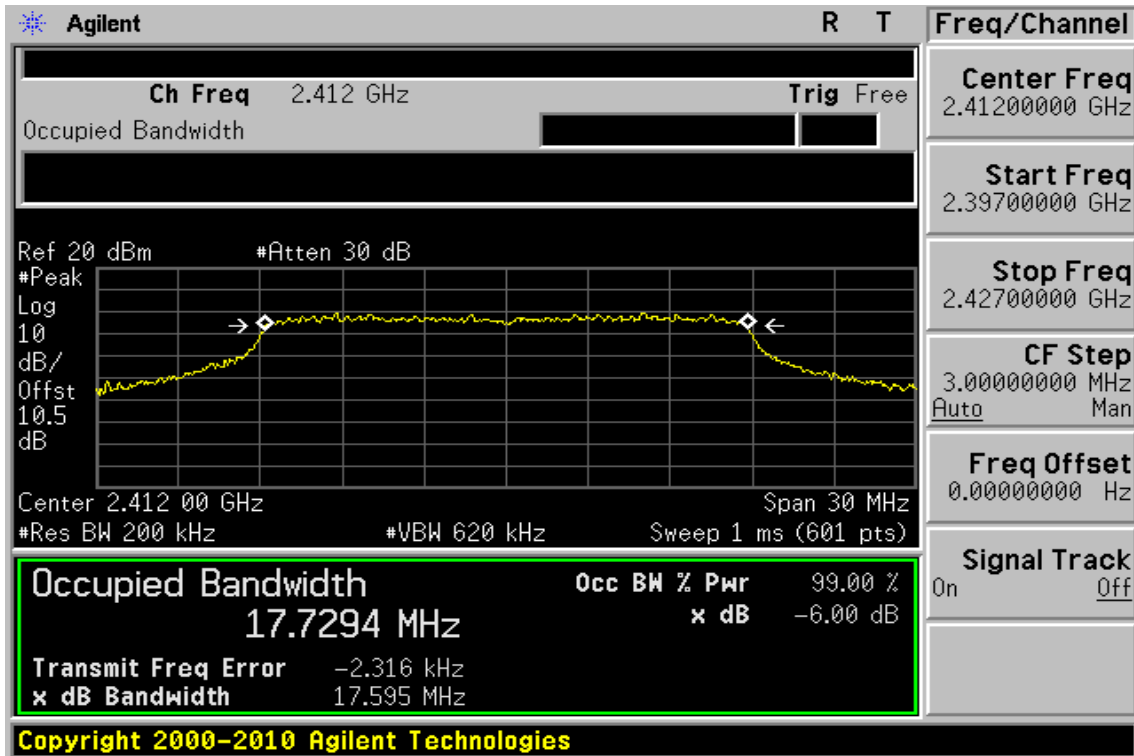
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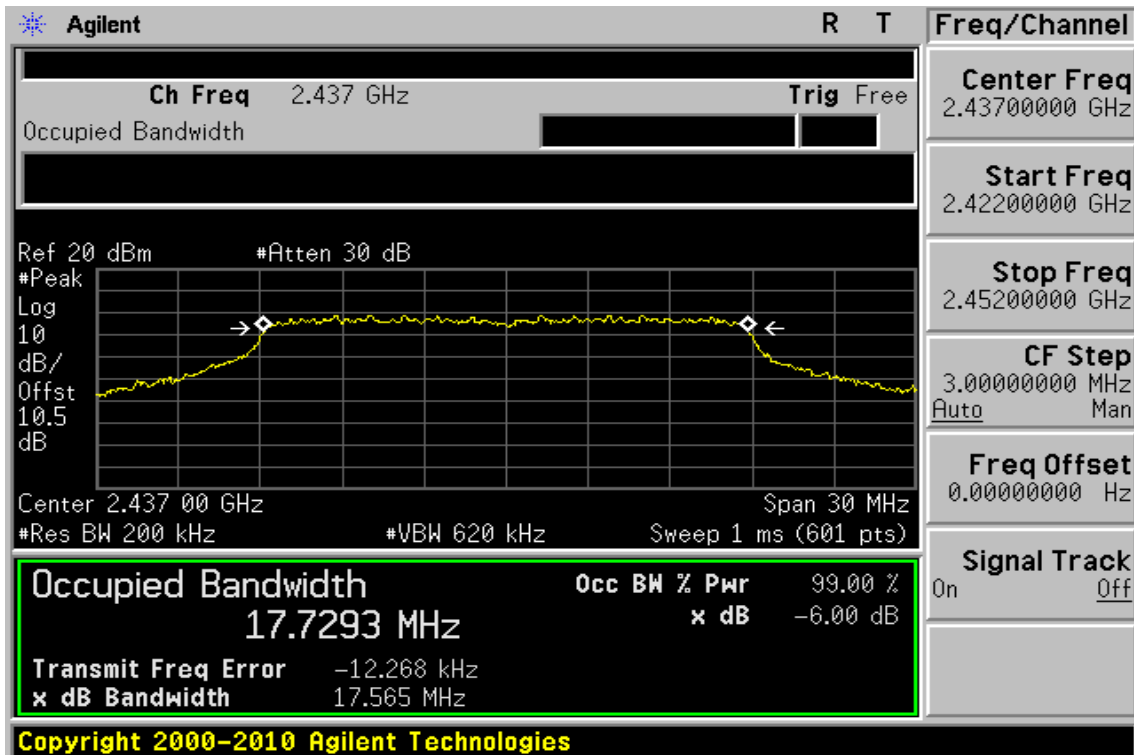
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802.11n\_20M

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid

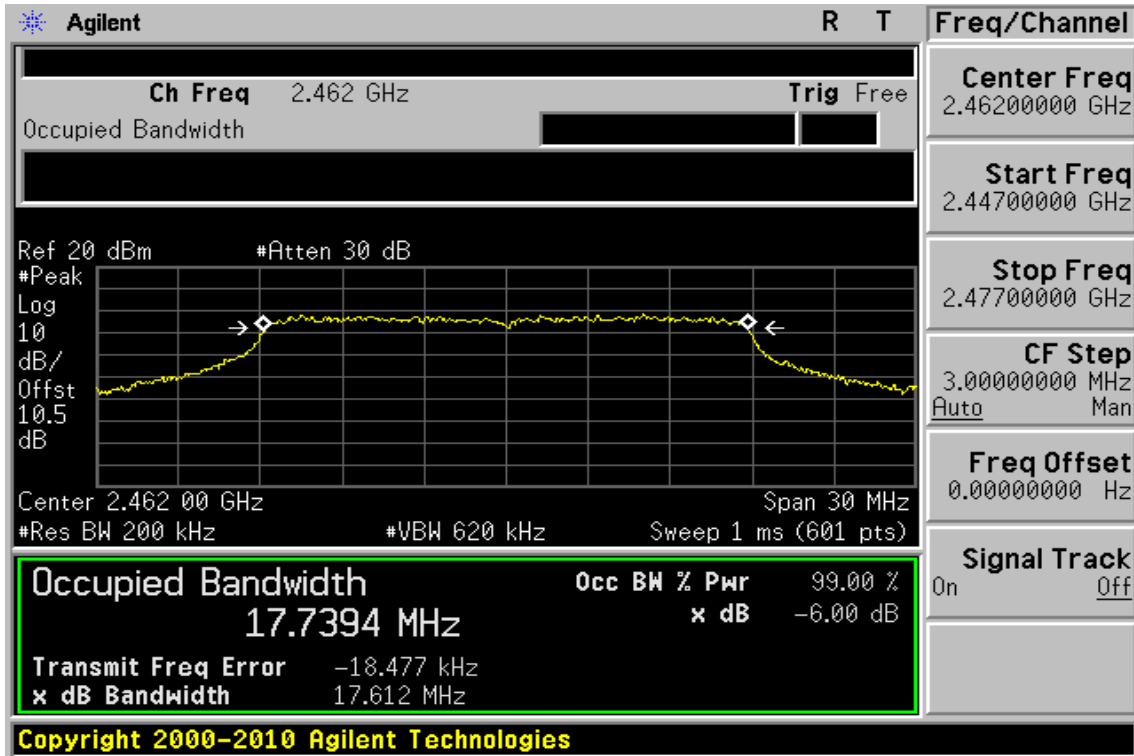


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### 6dB Band Width Test Data CH-High



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## 9 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

### 9.1 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).

### 9.2 Measurement Equipment Used:

#### 9.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

#### 9.2.2. Radiated emission:

966 Chamber					
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	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013
Splitter	Agilent	11636B	N/A	02/28/2012	02/27/2013
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	03/17/2012	03/16/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2012	02/27/2013
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2012	01/04/2013
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2012	02/27/2013
Splitter	Agilent	11636B	N/A	02/28/2012	02/27/2013

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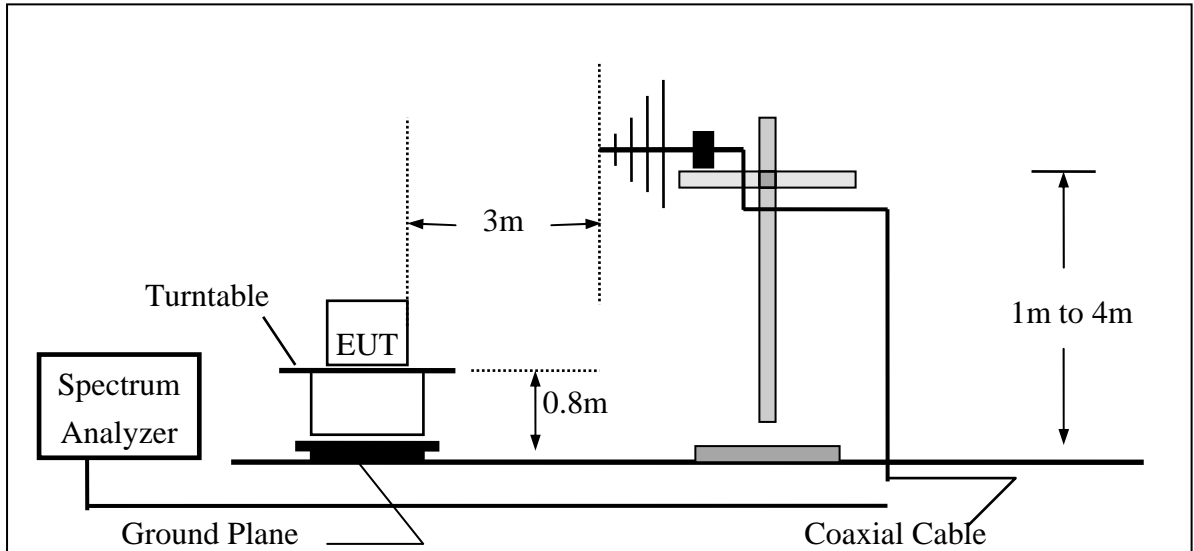
**9.3 Test SET-UP:**

**9.3.1 Conducted Emission at antenna port:**

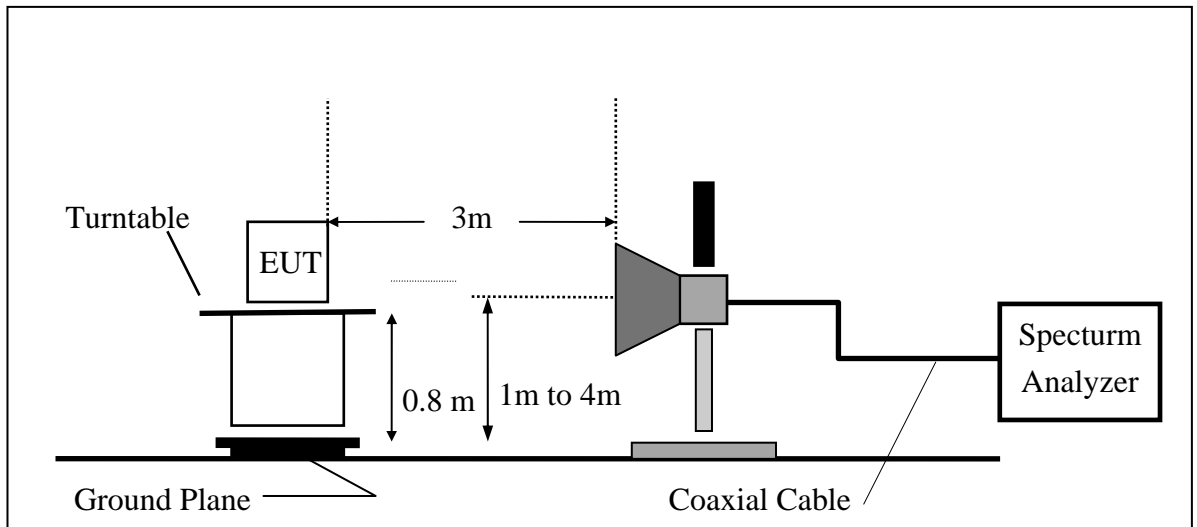
Refer to section 7.3 for details.

**9.3.2 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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## 9.4 Measurement Procedure:

### Conducted Emission Test:

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= 1 MHz, VBW  $\geq$  3 MHz
5. Ensure that the number of measurement points in the sweep  $\geq 2 \times$  (span/RBW).
6. Set sweep time = auto couple
7. Detector = sample.
8. Employ trace averaging over a minimum of 100 traces.
9. Mark Peak, 2.3999GHz and 2.4835GHz and record the max. level.
10. Repeat above procedures until all frequency measured were complete.

### Radiated Emission Test:

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 = 1MHz, VBW=3MHz, Span=50MHz, Sweep = "Auto" couple for peak reading measurement, and then change VBW =10Hz, and detector = average for average reading measurement
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. 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:

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

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.

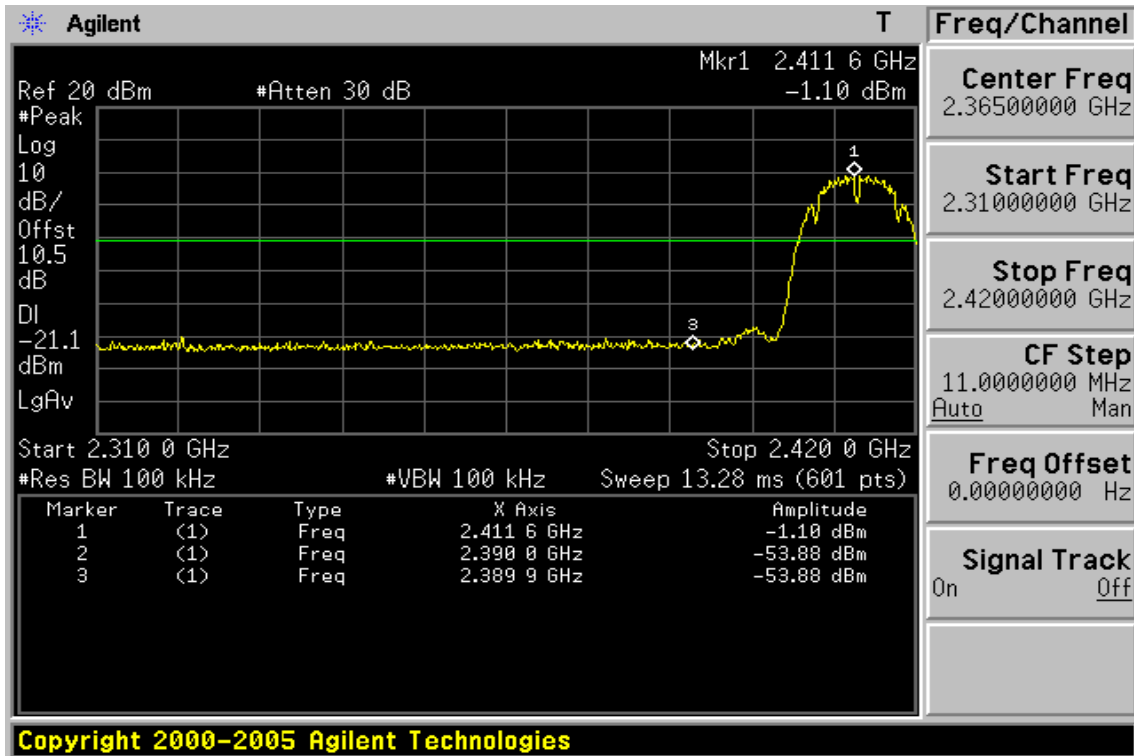
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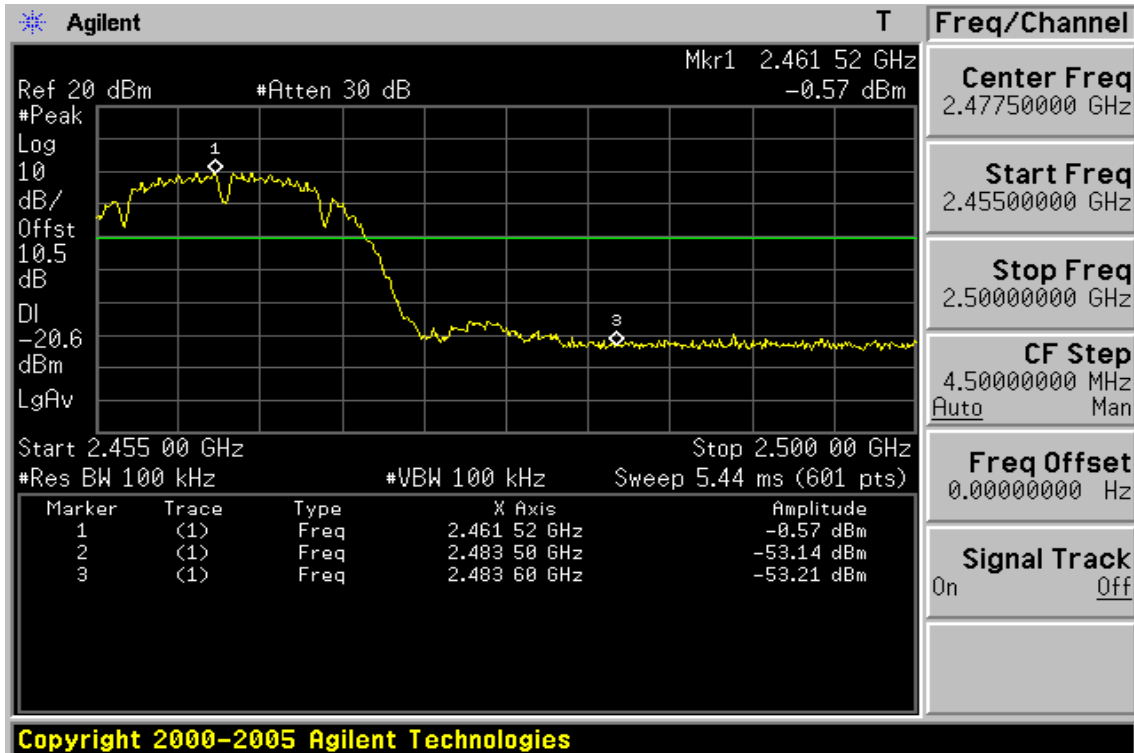
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802.11b

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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**Radiated Emission: 802.11 b mode**

Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	40.34	2.12	42.46	54.00	-11.54
2390.00	E	Peak	51.20	2.12	53.32	74.00	-20.68

Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	40.33	2.74	43.07	54.00	-10.93
2390.00	E	Peak	51.83	2.74	54.57	74.00	-19.43

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Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	40.42	2.53	42.95	54.00	-11.05
2483.50	E	Peak	51.52	2.53	54.05	74.00	-19.95

Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	E	Average	41.12	3.56	44.68	54.00	-9.32
2483.50	E	Peak	51.91	3.56	55.47	74.00	-18.53

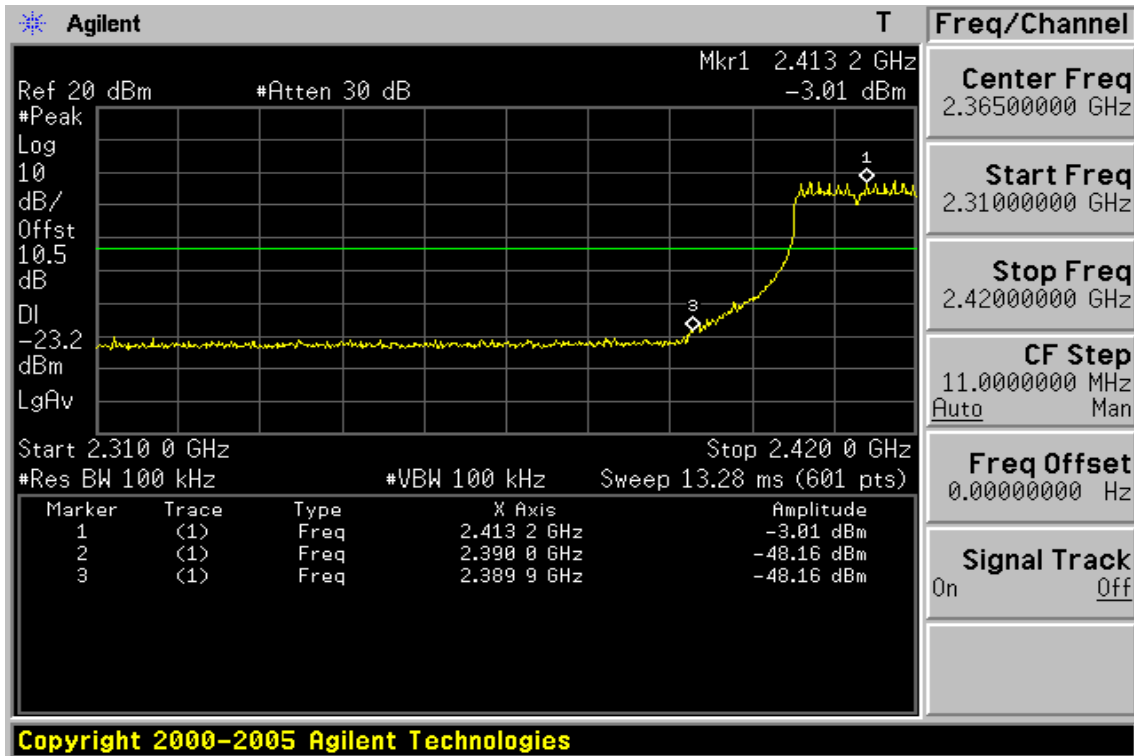
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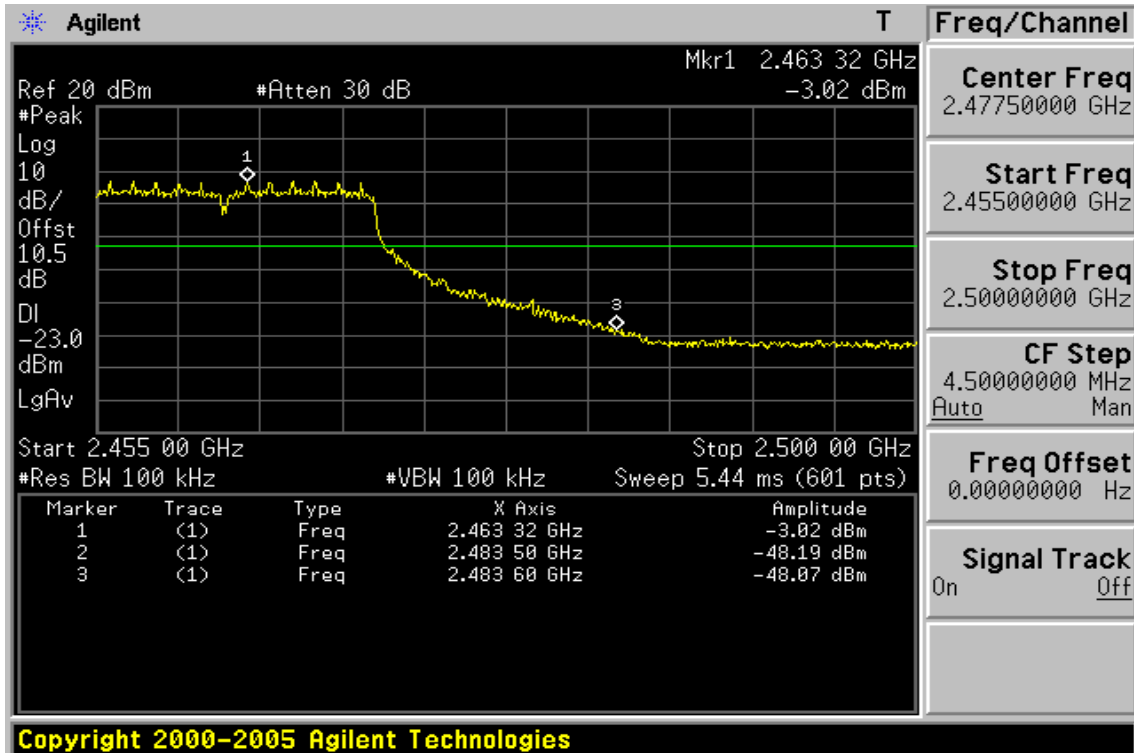
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### 802.11g

#### Band Edges Test Data CH-Low



#### Band Edges Test Data CH-High



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**Radiated Emission: 802.11 g mode**

Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	41.32	2.12	43.44	54.00	-10.56
2390.00	E	Peak	54.61	2.12	56.73	74.00	-17.27

Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	42.21	2.74	44.95	54.00	-9.05
2390.00	E	Peak	56.73	2.74	59.47	74.00	-14.53

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Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	41.13	2.53	43.66	54.00	-10.34
2483.50	E	Peak	53.85	2.53	56.38	74.00	-17.62

Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	42.72	3.56	46.28	54.00	-7.72
2483.50	E	Peak	58.43	3.56	61.99	74.00	-12.01

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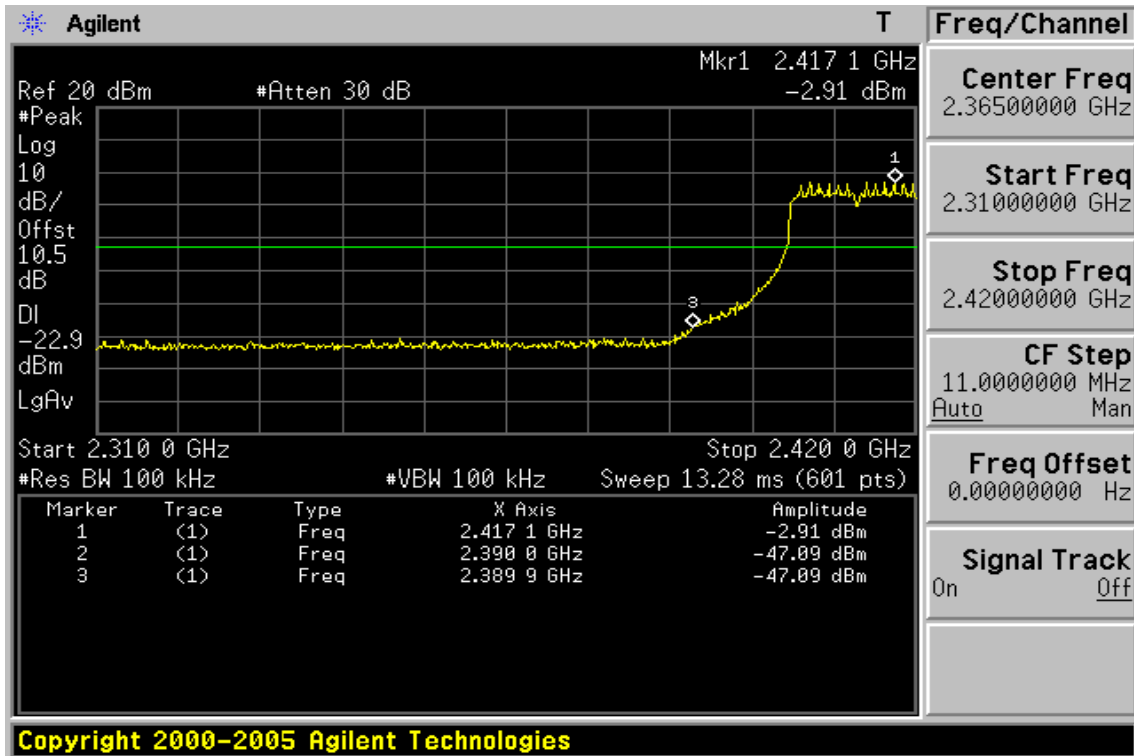
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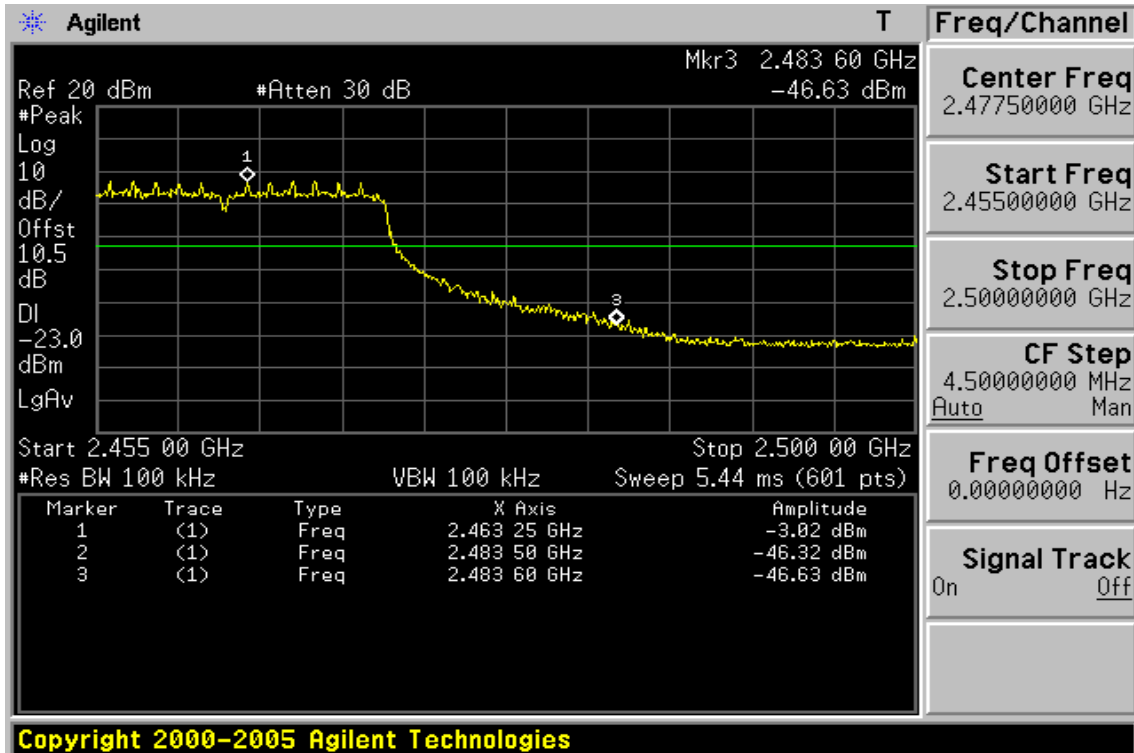


### 802.11n\_20M

#### Band Edges Test Data CH-Low



#### Band Edges Test Data CH-High



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**Radiated Emission: 802.11 n\_20M mode**

Operation Band	:802.11n 20M	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	42.62	2.12	44.74	54.00	-9.26
2390.00	E	Peak	57.92	2.12	60.04	74.00	-13.96

Operation Band	:802.11n 20M	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:26.2 deg_C / 29 RH
Operation Mode	:BANDEDGE LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	E	Average	43.88	2.74	46.62	54.00	-7.38
2390.00	E	Peak	61.95	2.74	64.69	74.00	-9.31

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Operation Band :802.11n 20M Test Date :2012-11-14  
 Fundamental Frequency :2462 MHz Temp./Humi. :26.2 deg\_C / 29 RH  
 Operation Mode :BANDEDGE HIGH Engineer :Marcus  
 EUT Pol. :E2 PLAN Measurement Antenna Pol. :VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	41.74	2.53	44.27	54.00	-9.73
2483.50	E	Peak	55.94	2.53	58.47	74.00	-15.53

Operation Band :802.11n 20M Test Date :2012-11-14  
 Fundamental Frequency :2462 MHz Temp./Humi. :26.2 deg\_C / 29 RH  
 Operation Mode :BANDEDGE HIGH Engineer :Marcus  
 EUT Pol. :E2 PLAN Measurement Antenna Pol. :HORIZONTAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.

The trace on RE(radiation emission) plot is as colored blue, and the detection manner we’ve employed is peak detector.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	E	Average	43.88	3.56	47.44	54.00	-6.56
2483.50	E	Peak	56.22	3.56	59.78	74.00	-14.22

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## 10 SPURIOUS RADIATED EMISSION TEST

### 10.1 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.

### 10.2 Measurement Equipment Used:

#### 10.2.1. Conducted Emission at antenna port:

Refer to section 7.2 for details.

#### 10.2.2. Radiated emission:

Refer to section 9.2.2 for details.

### 10.3 Test SET-UP:

#### 10.3.1. Conducted Emission at antenna port:

Refer to section 7.3 for details.

#### 10.3.2. Radiated emission:

Refer to section 9.3.2 for details.

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## 10.4 Measurement Procedure:

### Radiated Emission:

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.

### Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 100K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30M to 3G and 3G to 26.5G for 2.4G, 30M to 6G, 6G to 18G and 18G to 40G for 5G.
4. Via Software, combine 5 spans of frequency range into one plot
5. 802.11n MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the emission for 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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## 10.5 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	

## 10.6 Measurement Result:

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

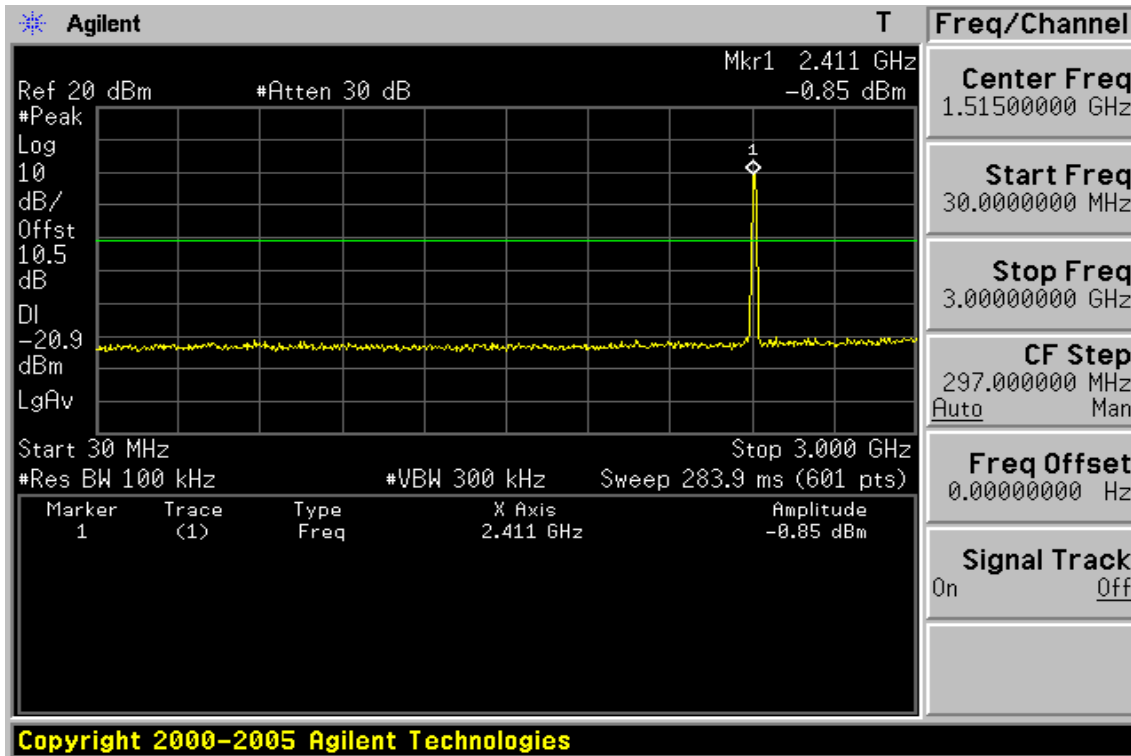
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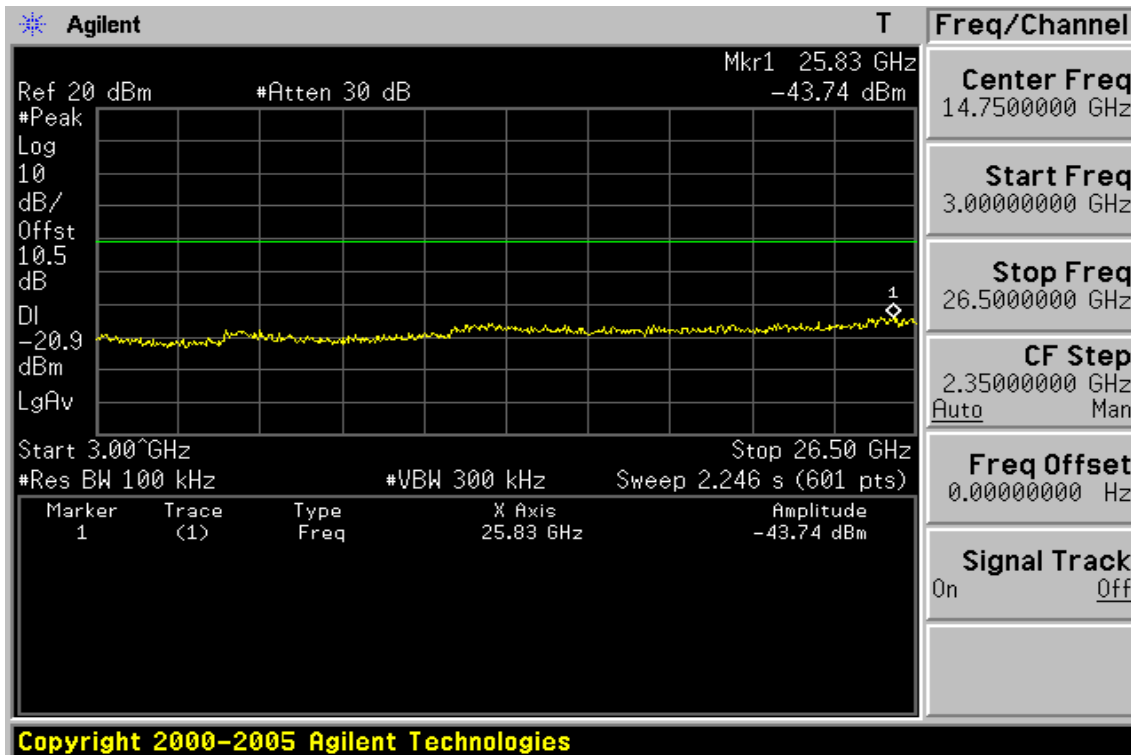
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### Conducted Spurious Emission Measurement Result (802.11b)

#### Ch Low 30MHz – 3GHz



#### Ch Low 3GHz – 26.5GHz

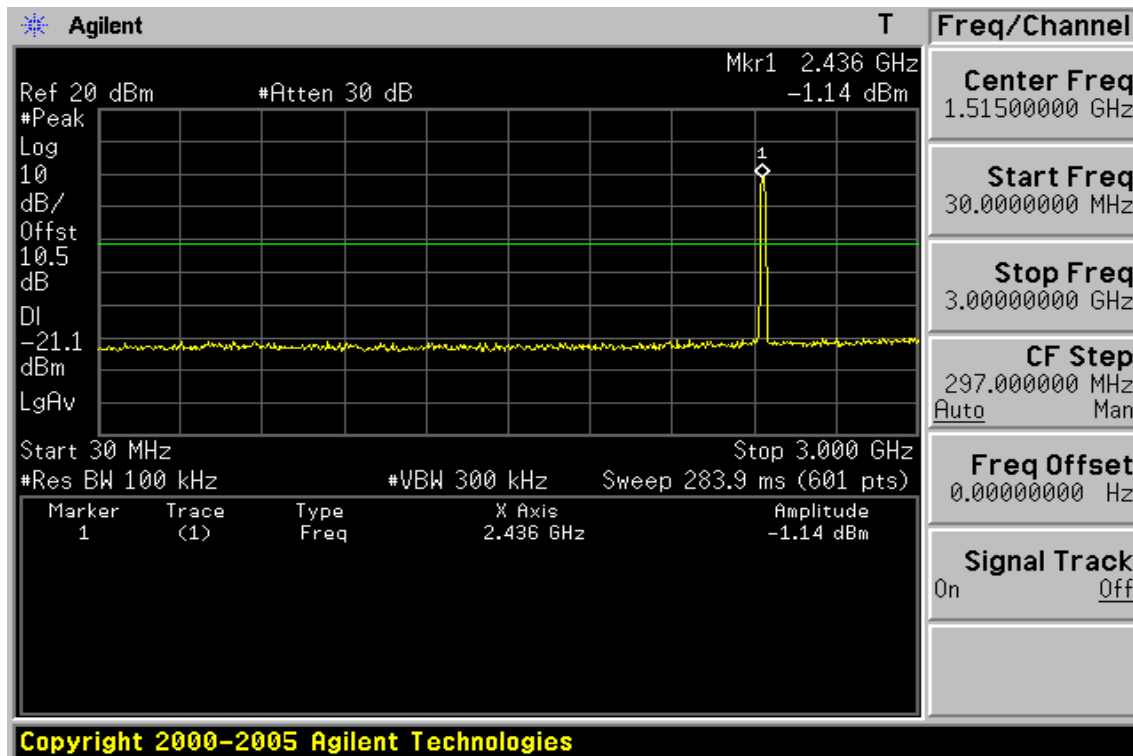


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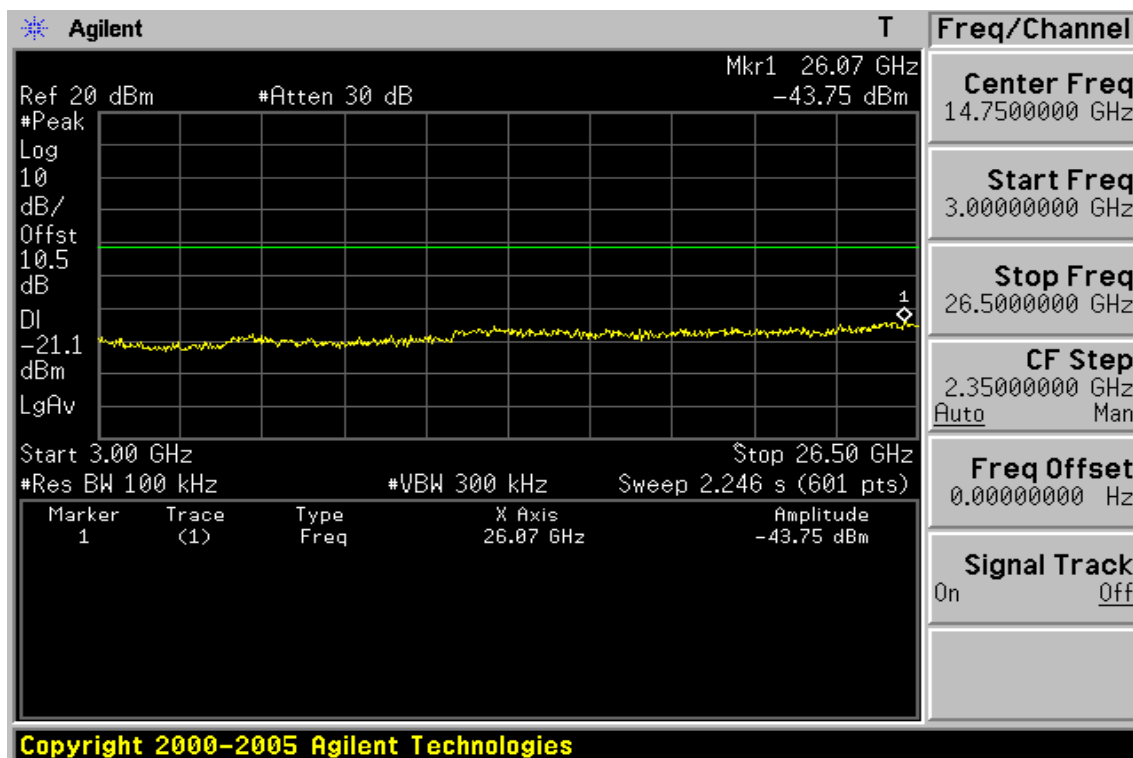
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

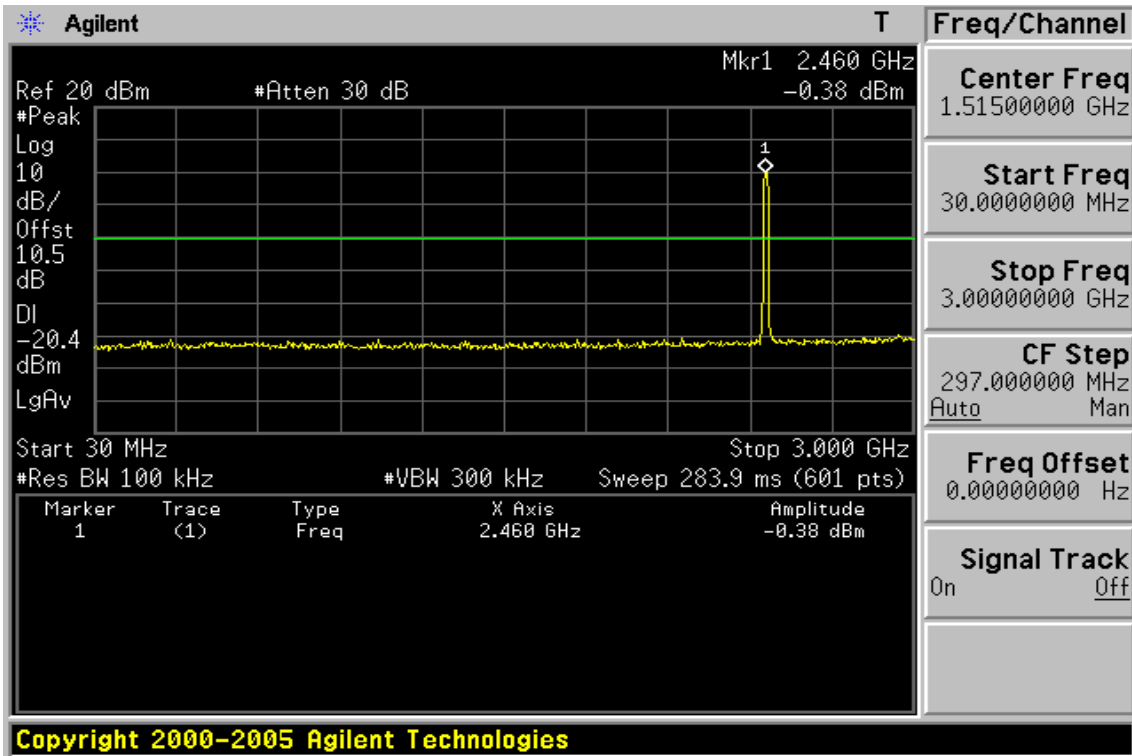


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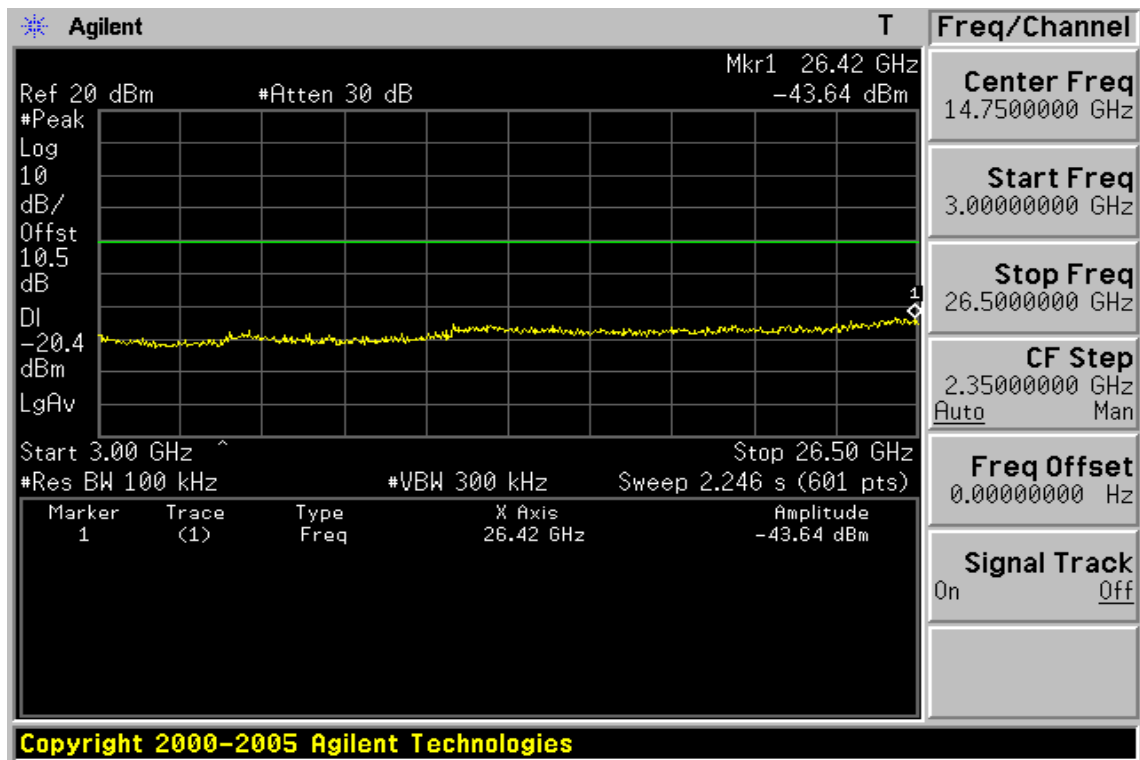
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



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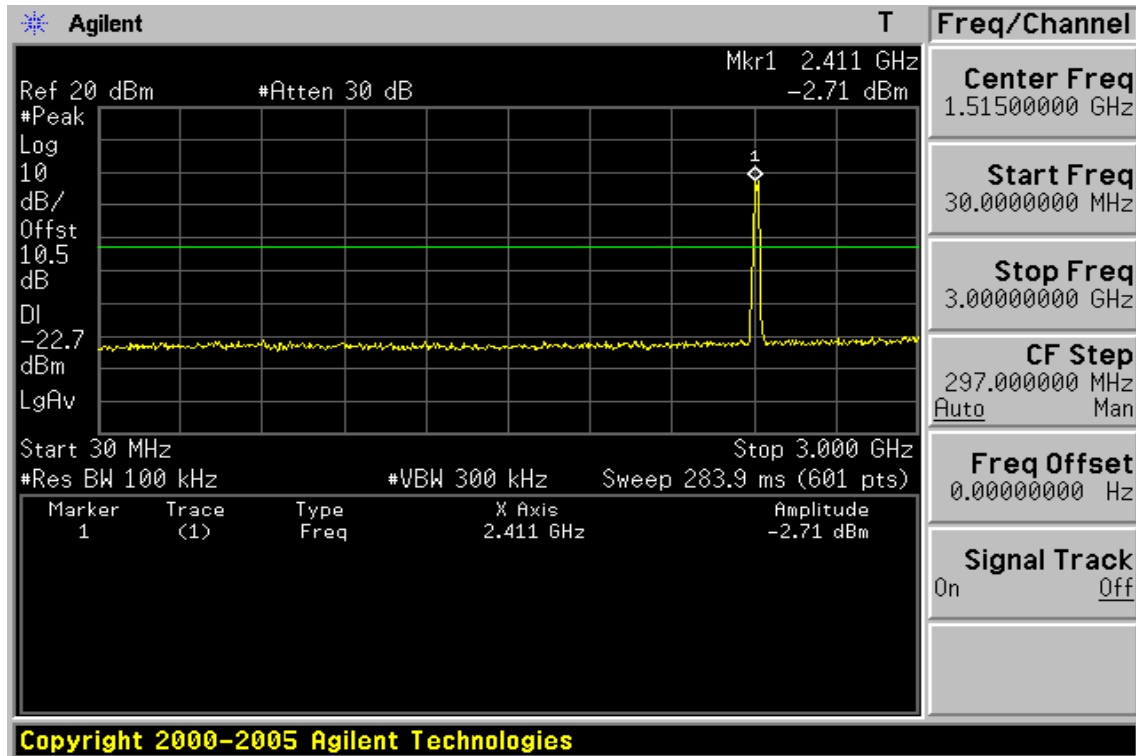
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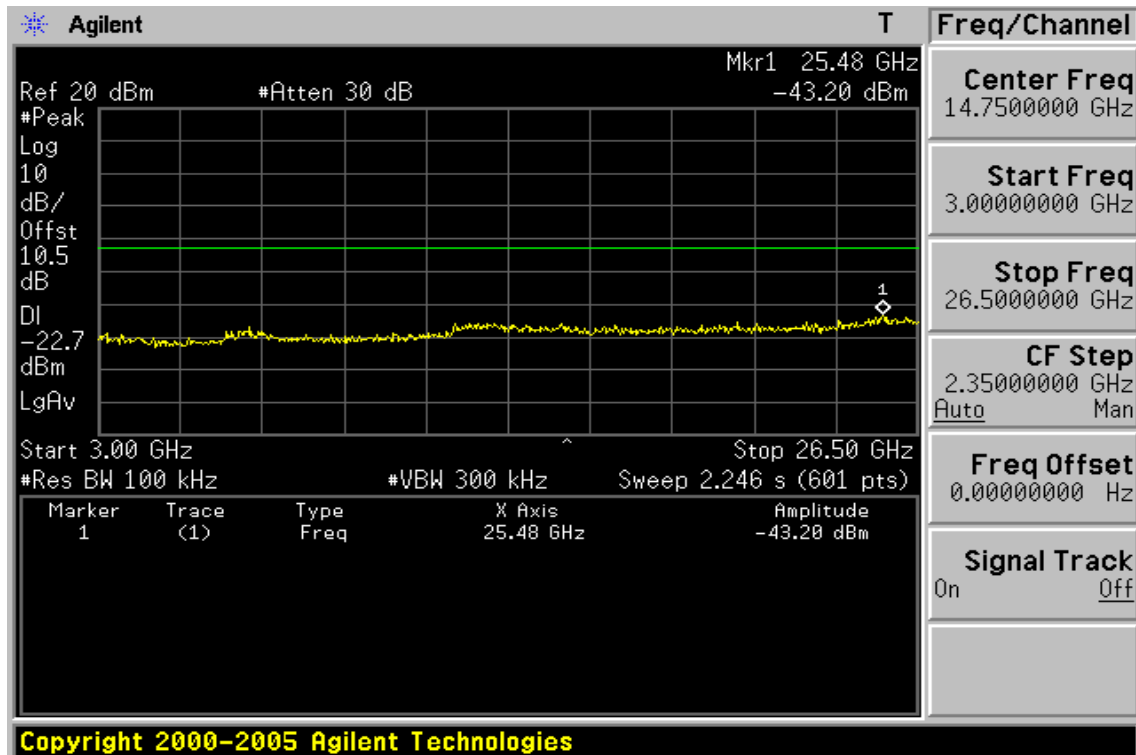


### Conducted Spurious Emission Measurement Result (802.11g)

#### Ch Low 30MHz – 3GHz



#### Ch Low 3GHz – 26.5GHz

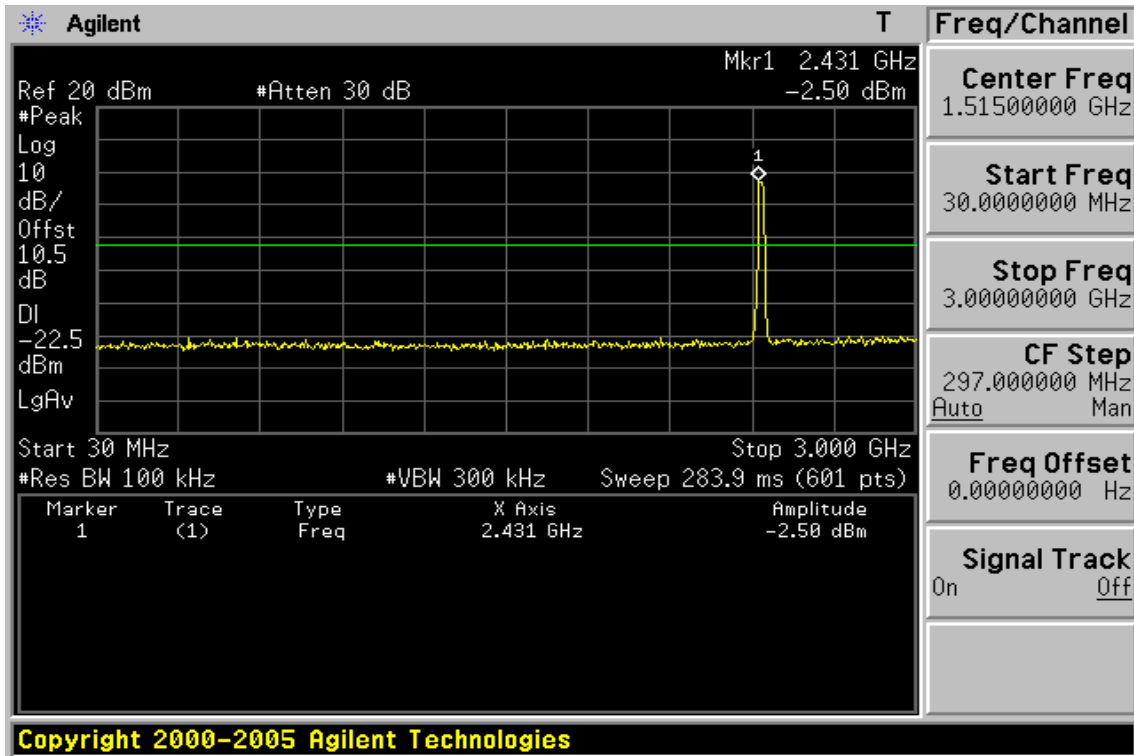


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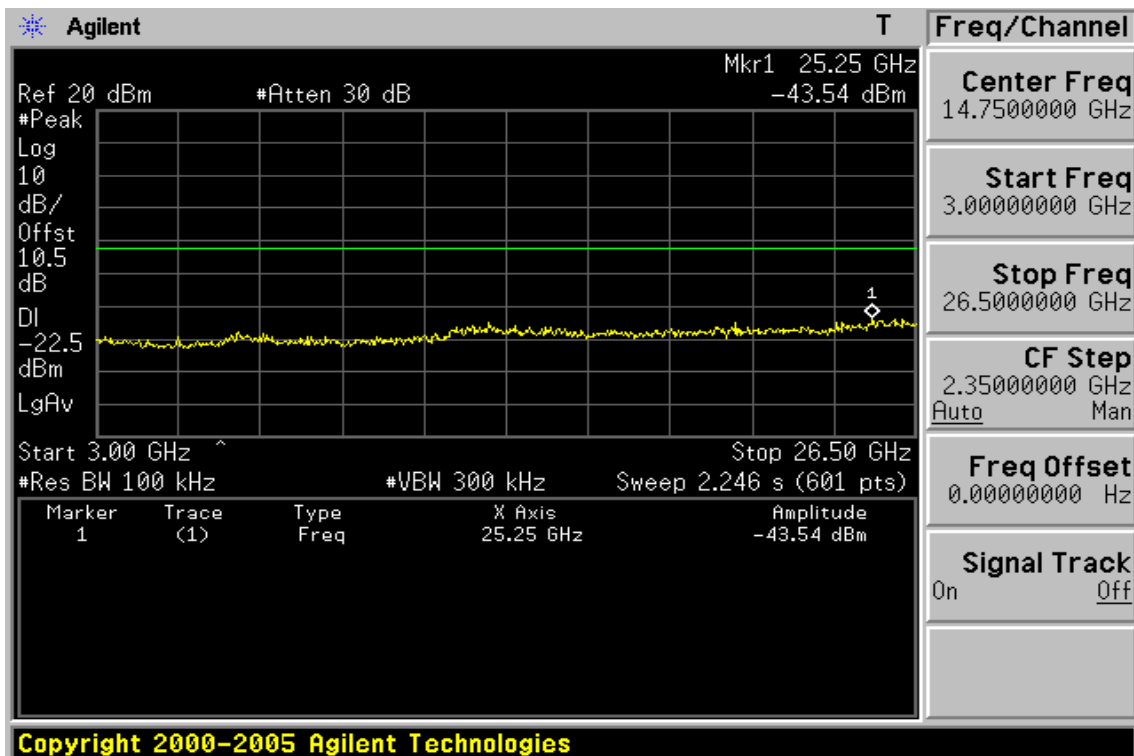
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Ch Mid 30MHz – 3GHz



Ch Mid 3GHz – 26.5GHz

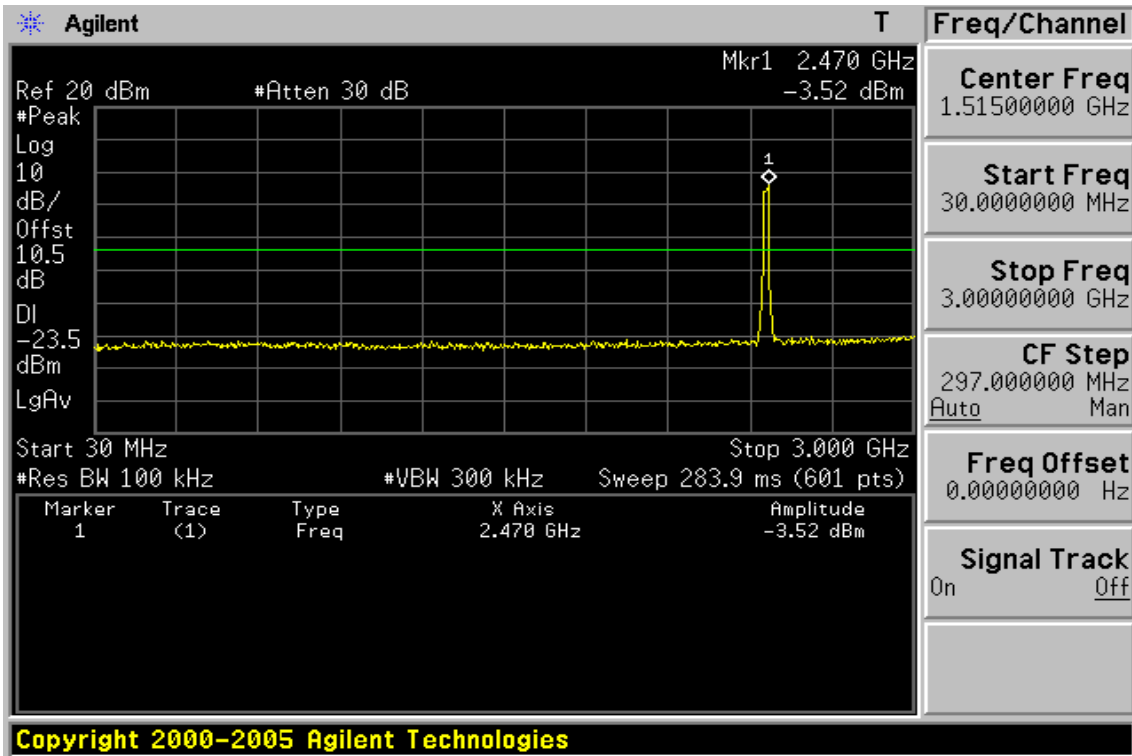


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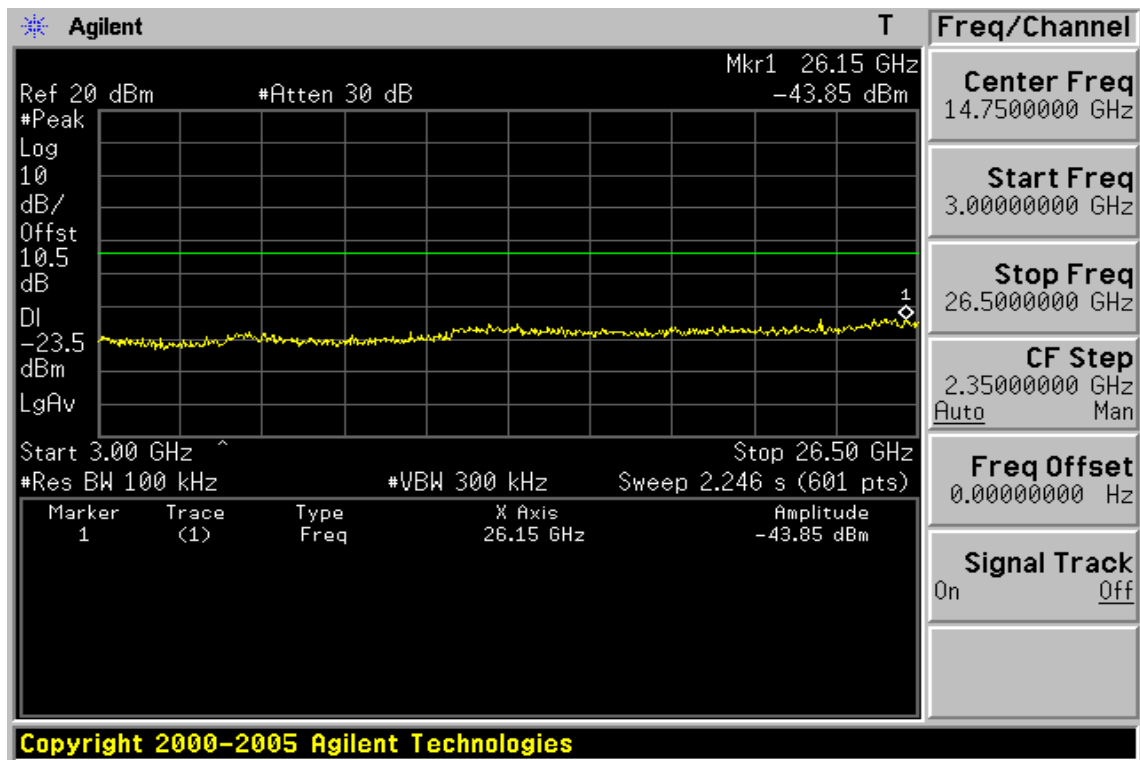
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



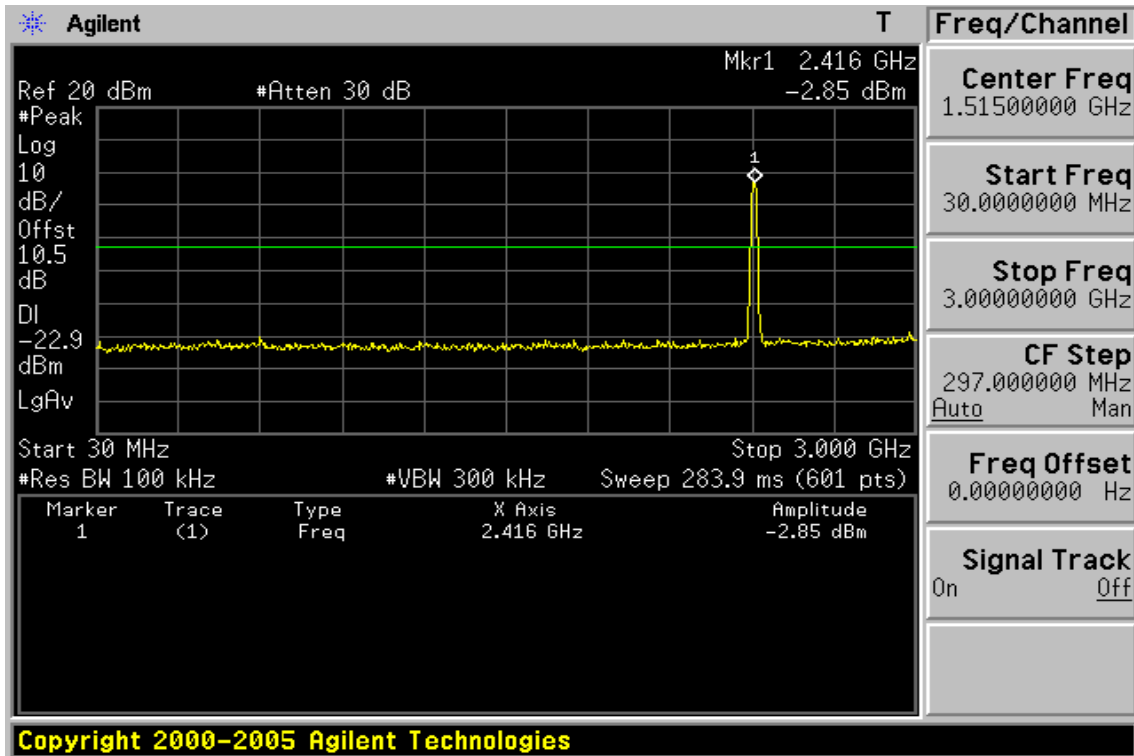
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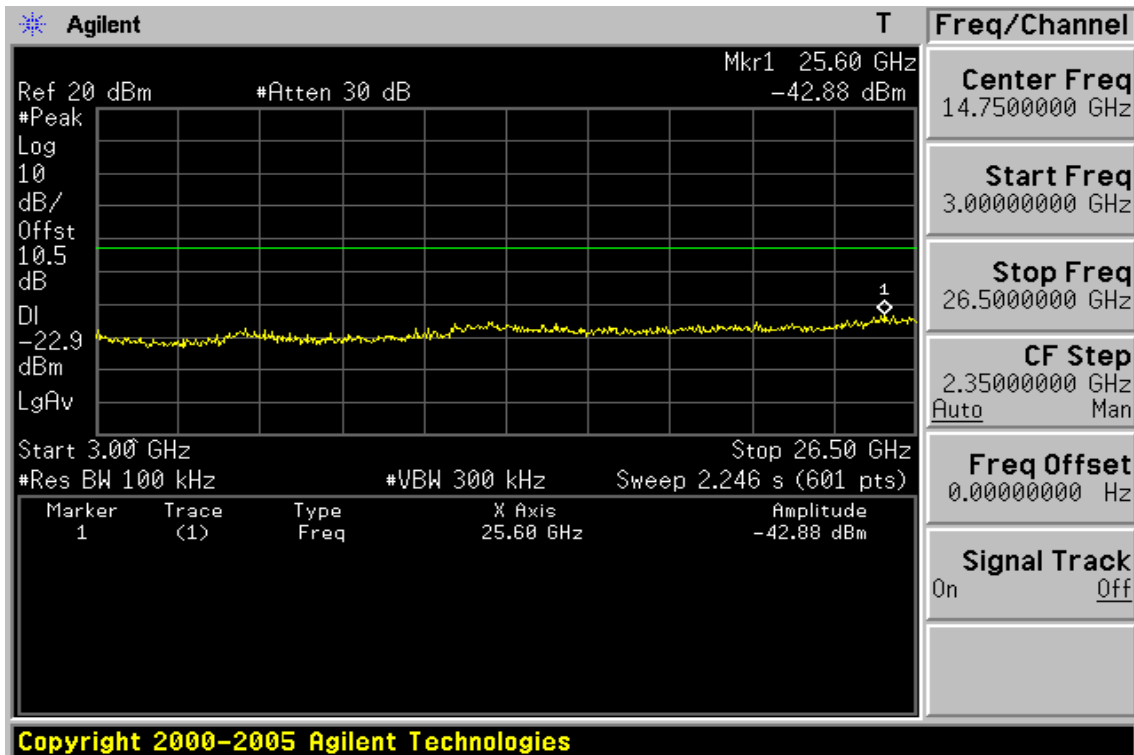
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### Conducted Spurious Emission Measurement Result (802.11n\_20M)

#### Ch Low 30MHz – 3GHz



#### Ch Low 3GHz – 26.5GHz

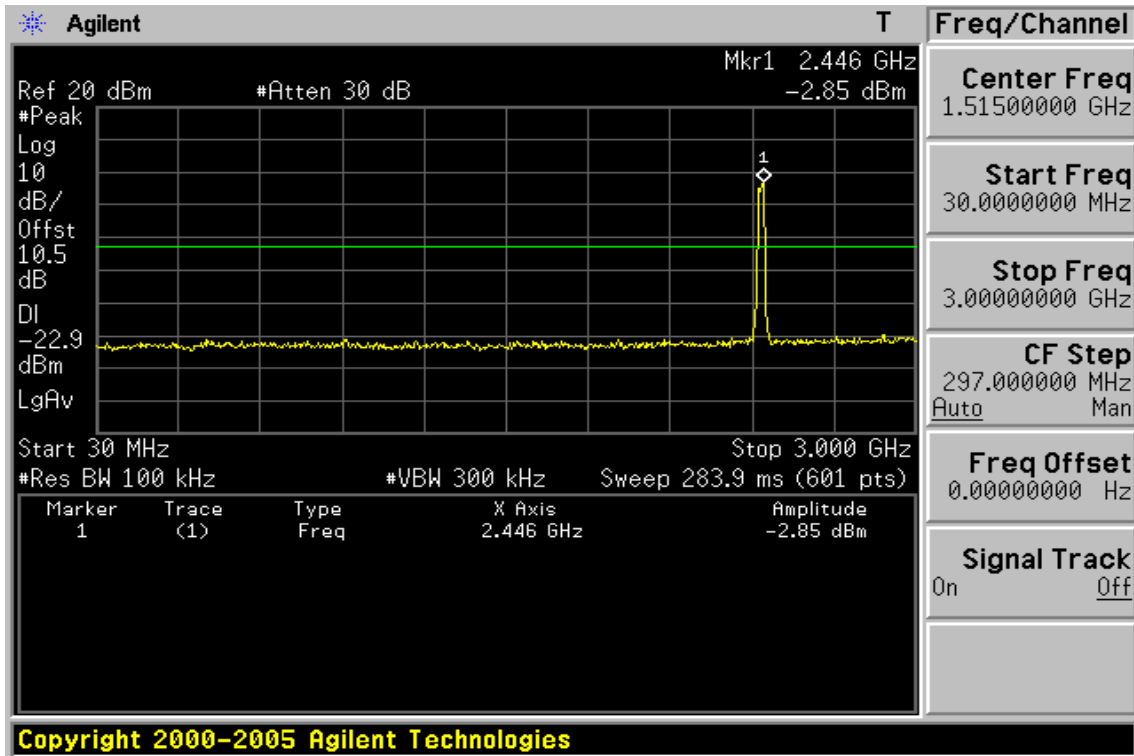


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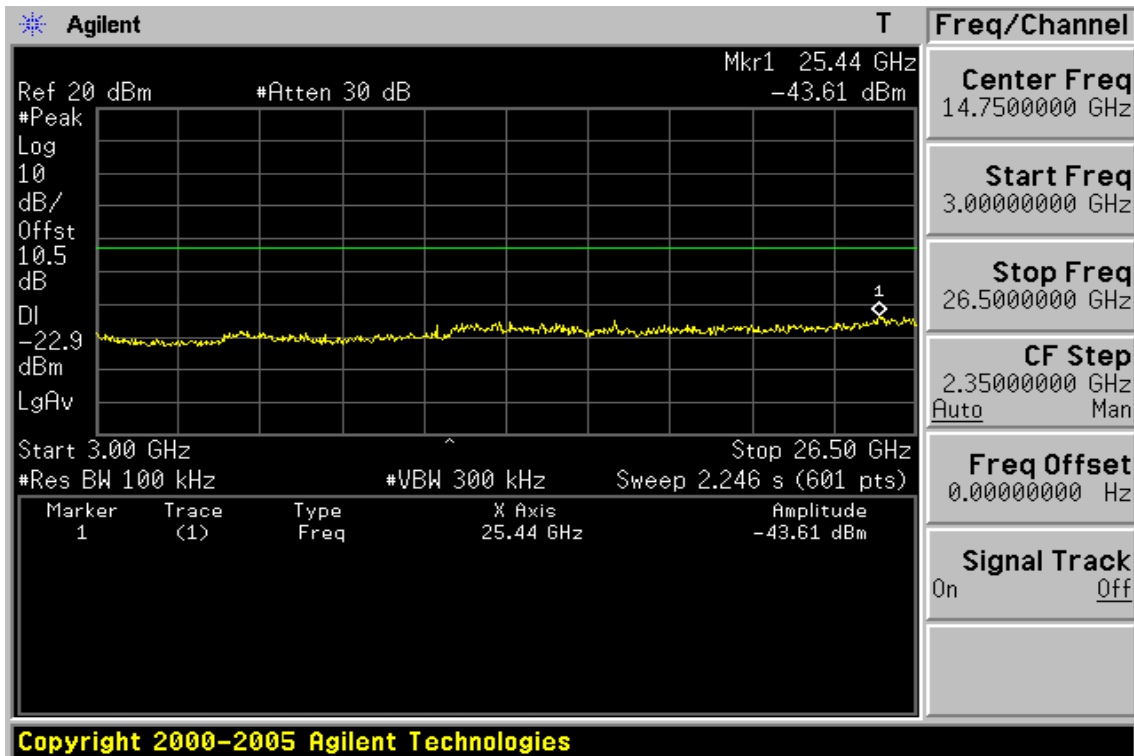
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

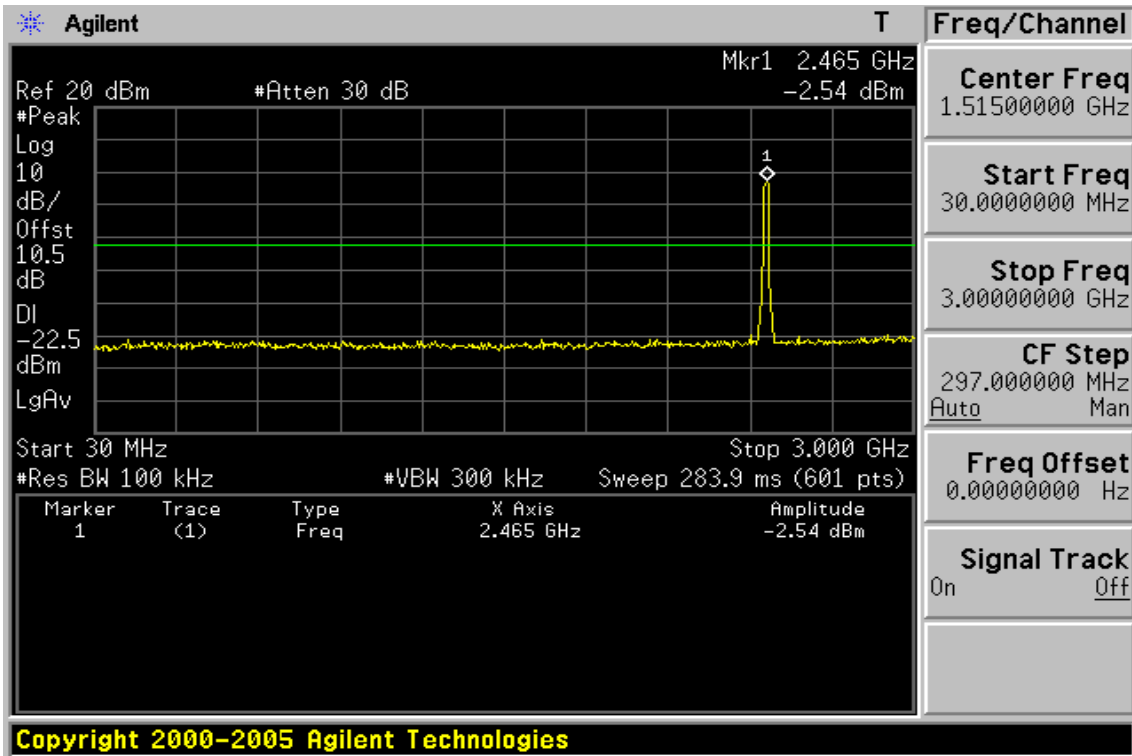


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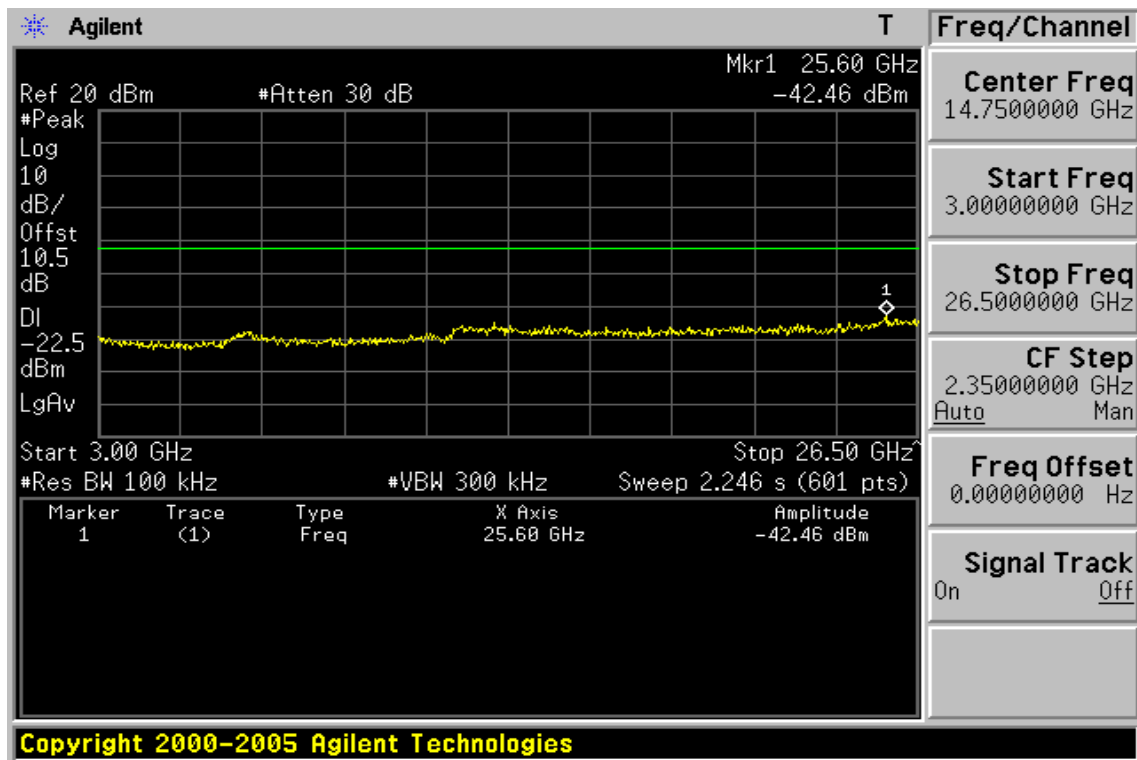
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



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**Radiated Spurious Emission Measurement Result (802.11b)**

Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
162.89	S	Peak	36.28	-12.52	23.76	43.50	-19.74
227.88	S	Peak	38.66	-14.65	24.01	46.00	-21.99
259.89	S	Peak	40.30	-13.75	26.55	46.00	-19.45
324.88	S	Peak	40.48	-11.99	28.49	46.00	-17.51
389.87	S	Peak	37.44	-11.18	26.26	46.00	-19.74
455.83	S	Peak	41.75	-9.99	31.76	46.00	-14.24
4824.00	H	Average	35.52	7.07	42.59	54.00	-11.41
4824.00	H	Peak	40.37	7.07	47.44	74.00	-26.56
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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Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
227.88	S	Peak	40.45	-14.65	25.80	46.00	-20.20
259.89	S	Peak	45.52	-13.75	31.77	46.00	-14.23
324.88	S	Peak	47.26	-11.99	35.27	46.00	-10.73
357.86	S	Peak	41.69	-11.58	30.11	46.00	-15.89
390.84	S	Peak	37.42	-11.16	26.26	46.00	-19.74
455.83	S	Peak	35.78	-9.99	25.79	46.00	-20.21
4824.00	H	Average	34.22	7.08	41.30	54.00	-12.70
4824.00	H	Peak	38.18	7.08	45.26	74.00	-28.74
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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Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
162.89	S	Peak	36.52	-12.52	24.00	43.50	-19.50
260.86	S	Peak	40.22	-13.70	26.52	46.00	-19.48
325.85	S	Peak	40.12	-11.98	28.14	46.00	-17.86
389.87	S	Peak	37.71	-11.18	26.53	46.00	-19.47
454.86	S	Peak	41.36	-9.99	31.37	46.00	-14.63
914.64	S	Peak	32.98	-2.53	30.45	46.00	-15.55
4874.00	H	Average	34.81	7.14	41.95	54.00	-12.05
4874.00	H	Peak	38.34	7.14	45.48	74.00	-28.52
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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Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
195.87	S	Peak	39.23	-15.92	23.31	43.50	-20.19
260.86	S	Peak	44.90	-13.70	31.20	46.00	-14.80
292.87	S	Peak	47.15	-12.74	34.41	46.00	-11.59
325.85	S	Peak	45.46	-11.98	33.48	46.00	-12.52
358.83	S	Peak	43.39	-11.56	31.83	46.00	-14.17
423.82	S	Peak	37.20	-10.56	26.64	46.00	-19.36
4874.00	H	Average	34.27	7.09	41.36	54.00	-12.64
4874.00	H	Peak	38.19	7.09	45.28	74.00	-28.72
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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Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
260.86	S	Peak	45.20	-13.70	31.50	46.00	-14.50
292.87	S	Peak	47.92	-12.74	35.18	46.00	-10.82
325.85	S	Peak	46.52	-11.98	34.54	46.00	-11.46
423.82	S	Peak	36.44	-10.56	25.88	46.00	-20.12
455.83	S	Peak	35.87	-9.99	25.88	46.00	-20.12
997.09	S	Peak	31.40	-1.85	29.55	54.00	-24.45
4924.00	H	Average	33.54	7.19	40.73	54.00	-13.27
4924.00	H	Peak	37.62	7.19	44.81	74.00	-29.19
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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Operation Band	:802.11b	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
227.88	S	Peak	40.24	-14.65	25.59	46.00	-20.41
260.86	S	Peak	45.21	-13.70	31.51	46.00	-14.49
325.85	S	Peak	48.56	-11.98	36.58	46.00	-9.42
357.86	S	Peak	41.80	-11.58	30.22	46.00	-15.78
390.84	S	Peak	38.82	-11.16	27.66	46.00	-18.34
455.83	S	Peak	35.78	-9.99	25.79	46.00	-20.21
4924.00	H	Average	34.17	7.08	41.25	54.00	-12.75
4924.00	H	Peak	37.37	7.08	44.45	74.00	-29.55
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 (802.11g)**

Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBµV		dBµV/m	dBµV/m	
162.89	S	Peak	36.11	-12.52	23.59	43.50	-19.91
227.88	S	Peak	38.83	-14.65	24.18	46.00	-21.82
259.89	S	Peak	40.61	-13.75	26.86	46.00	-19.14
325.85	S	Peak	39.95	-11.98	27.97	46.00	-18.03
455.83	S	Peak	41.43	-9.99	31.44	46.00	-14.56
617.82	S	Peak	32.69	-7.18	25.51	46.00	-20.49
4824.00	H	Average	37.02	7.04	44.06	54.00	-9.94
4824.00	H	Peak	41.07	7.04	48.11	74.00	-25.89
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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Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
227.88	S	Peak	41.47	-14.65	26.82	46.00	-19.18
259.89	S	Peak	45.10	-13.75	31.35	46.00	-14.65
292.87	S	Peak	44.16	-12.74	31.42	46.00	-14.58
325.85	S	Peak	48.15	-11.98	36.17	46.00	-9.83
358.83	S	Peak	42.78	-11.56	31.22	46.00	-14.78
390.84	S	Peak	37.73	-11.16	26.57	46.00	-19.43
4824.00	H	Average	32.84	7.08	39.92	54.00	-14.08
4824.00	H	Peak	36.20	7.08	43.28	74.00	-30.72
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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Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
162.89	S	Peak	35.94	-12.52	23.42	43.50	-20.08
227.88	S	Peak	38.23	-14.65	23.58	46.00	-22.42
260.86	S	Peak	40.38	-13.70	26.68	46.00	-19.32
325.85	S	Peak	39.72	-11.98	27.74	46.00	-18.26
454.86	S	Peak	42.12	-9.99	32.13	46.00	-13.87
487.84	S	Peak	37.90	-9.73	28.17	46.00	-17.83
4874.00	H	Average	37.61	7.14	44.75	54.00	-9.25
4874.00	H	Peak	40.74	7.14	47.88	74.00	-26.12
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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Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
227.88	S	Peak	40.85	-14.65	26.20	46.00	-19.80
259.89	S	Peak	44.93	-13.75	31.18	46.00	-14.82
325.85	S	Peak	47.89	-11.98	35.91	46.00	-10.09
357.86	S	Peak	41.92	-11.58	30.34	46.00	-15.66
389.87	S	Peak	36.48	-11.18	25.30	46.00	-20.70
553.80	S	Peak	31.25	-8.51	22.74	46.00	-23.26
4874.00	H	Average	33.20	7.09	40.29	54.00	-13.71
4874.00	H	Peak	37.58	7.09	44.67	74.00	-29.33
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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Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
162.89	S	Peak	37.23	-12.52	24.71	43.50	-18.79
259.89	S	Peak	40.32	-13.75	26.57	46.00	-19.43
324.88	S	Peak	40.70	-11.99	28.71	46.00	-17.29
389.87	S	Peak	37.53	-11.18	26.35	46.00	-19.65
454.86	S	Peak	40.82	-9.99	30.83	46.00	-15.17
617.82	S	Peak	32.70	-7.18	25.52	46.00	-20.48
4924.00	H	Average	36.67	7.19	43.86	54.00	-10.14
4924.00	H	Peak	39.36	7.19	46.55	74.00	-27.45
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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Operation Band	:802.11g	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
227.88	S	Peak	41.07	-14.65	26.42	46.00	-19.58
259.89	S	Peak	45.34	-13.75	31.59	46.00	-14.41
324.88	S	Peak	47.91	-11.99	35.92	46.00	-10.08
390.84	S	Peak	38.03	-11.16	26.87	46.00	-19.13
454.86	S	Peak	34.71	-9.99	24.72	46.00	-21.28
553.80	S	Peak	32.00	-8.51	23.49	46.00	-22.51
4924.00	H	Average	33.23	7.08	40.31	54.00	-13.69
4924.00	H	Peak	37.88	7.08	44.96	74.00	-29.04
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 (802.11n\_20M)**

Operation Band	:802.11n 20	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBµV/m) = SPA. Reading level(dBµV) + Factor(dB)

Factor(dB) = Antenna Factor(dBµV/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 PK/QP/AV	Spectrum Reading Level dBµV	Factor dB	Actual FS dBµV/m	Limit @3m dBµV/m	Margin dB
162.89	S	Peak	36.63	-12.52	24.11	43.50	-19.39
260.86	S	Peak	40.09	-13.70	26.39	46.00	-19.61
324.88	S	Peak	40.84	-11.99	28.85	46.00	-17.15
390.84	S	Peak	37.94	-11.16	26.78	46.00	-19.22
455.83	S	Peak	41.12	-9.99	31.13	46.00	-14.87
552.83	S	Peak	34.47	-8.53	25.94	46.00	-20.06
4824.00	H	Average	37.41	7.08	44.49	54.00	-9.51
4824.00	H	Peak	40.33	7.08	47.41	74.00	-26.59
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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Operation Band	:802.11n 20	Test Date	:2012-11-14
Fundamental Frequency	:2412 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
227.88	S	Peak	41.14	-14.65	26.49	46.00	-19.51
259.89	S	Peak	44.86	-13.75	31.11	46.00	-14.89
292.87	S	Peak	44.45	-12.74	31.71	46.00	-14.29
324.88	S	Peak	48.42	-11.99	36.43	46.00	-9.57
357.86	S	Peak	42.18	-11.58	30.60	46.00	-15.40
422.85	S	Peak	35.52	-10.58	24.94	46.00	-21.06
4824.00	H	Average	36.12	7.07	43.19	54.00	-10.81
4824.00	H	Peak	39.77	7.07	46.84	74.00	-27.16
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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Operation Band	:802.11n 20	Test Date	:2012-11-14
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
162.89	S	Peak	36.71	-12.52	24.19	43.50	-19.31
259.89	S	Peak	40.18	-13.75	26.43	46.00	-19.57
324.88	S	Peak	40.22	-11.99	28.23	46.00	-17.77
455.83	S	Peak	41.64	-9.99	31.65	46.00	-14.35
488.81	S	Peak	38.20	-9.72	28.48	46.00	-17.52
553.80	S	Peak	34.52	-8.51	26.01	46.00	-19.99
4874.00	H	Average	36.42	7.13	43.55	54.00	-10.45
4874.00	H	Peak	39.70	7.13	46.83	74.00	-27.17
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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Operation Band	:802.11n 20	Test Date	:2012-11-14
Fundamental Frequency	:2437 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
227.88	S	Peak	40.41	-14.65	25.76	46.00	-20.24
259.89	S	Peak	45.33	-13.75	31.58	46.00	-14.42
292.87	S	Peak	43.96	-12.74	31.22	46.00	-14.78
325.85	S	Peak	48.08	-11.98	36.10	46.00	-9.90
357.86	S	Peak	41.84	-11.58	30.26	46.00	-15.74
455.83	S	Peak	35.25	-9.99	25.26	46.00	-20.74
4874.00	H	Average	33.80	7.09	40.89	54.00	-13.11
4874.00	H	Peak	37.90	7.09	44.99	74.00	-29.01
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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Operation Band	:802.11n 20	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
162.89	S	Peak	36.18	-12.52	23.66	43.50	-19.84
259.89	S	Peak	40.93	-13.75	27.18	46.00	-18.82
324.88	S	Peak	39.97	-11.99	27.98	46.00	-18.02
390.84	S	Peak	37.21	-11.16	26.05	46.00	-19.95
454.86	S	Peak	41.29	-9.99	31.30	46.00	-14.70
487.84	S	Peak	37.81	-9.73	28.08	46.00	-17.92
4924.00	H	Average	37.40	7.19	44.59	54.00	-9.41
4924.00	H	Peak	40.15	7.19	47.34	74.00	-26.66
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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Operation Band	:802.11n 20	Test Date	:2012-11-14
Fundamental Frequency	:2462 MHz	Temp./Humi.	:22.8deg_C/60RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2 PLAN	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/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.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
227.88	S	Peak	40.91	-14.65	26.26	46.00	-19.74
260.86	S	Peak	45.48	-13.70	31.78	46.00	-14.22
292.87	S	Peak	44.45	-12.74	31.71	46.00	-14.29
324.88	S	Peak	46.87	-11.99	34.88	46.00	-11.12
357.86	S	Peak	41.18	-11.58	29.60	46.00	-16.40
390.84	S	Peak	38.33	-11.16	27.17	46.00	-18.83
4924.00	H	Average	34.51	7.08	41.59	54.00	-12.41
4924.00	H	Peak	37.70	7.08	44.78	74.00	-29.22
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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## 11 PEAK POWER SPECTRAL DENSITY

### 11.1 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.

### 11.2 Measurement Equipment Used:

Refer to section 7.2 for details.

### 11.3 Test Set-up:

Refer to section 7.3 for details.

### 11.4 Measurement Procedure:

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW  $\geq$  300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where  $BWCF = 10\log(3 \text{ kHz}/100 \text{ kHz} = -15.2 \text{ dB})$ .
11. The resulting peak PSD level must be  $\leq 8 \text{ dBm}$ .
12. 802.11n MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the PSD for 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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11.5 Measurement Result:

802.11b

Frequency MHz	RF Power Density Reading (dBm)	BWCF dBm	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-0.61	-15.20	-15.81	8
2437	-1.28	-15.20	-16.48	8
2462	-0.03	-15.20	-15.23	8

802.11g

Frequency MHz	RF Power Density Reading (dBm)	BWCF dBm	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-2.39	-15.20	-17.59	8
2437	-2.29	-15.20	-17.49	8
2462	-2.33	-15.20	-17.53	8

802.11n 20M

Frequency MHz	RF Power Density Reading (dBm)	BWCF dB	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-2.48	-15.20	-17.68	8
2437	-2.45	-15.20	-17.65	8
2462	-2.35	-15.20	-17.55	8

*\*Offset 10.5dB*

Note: Refer to next page for plots.

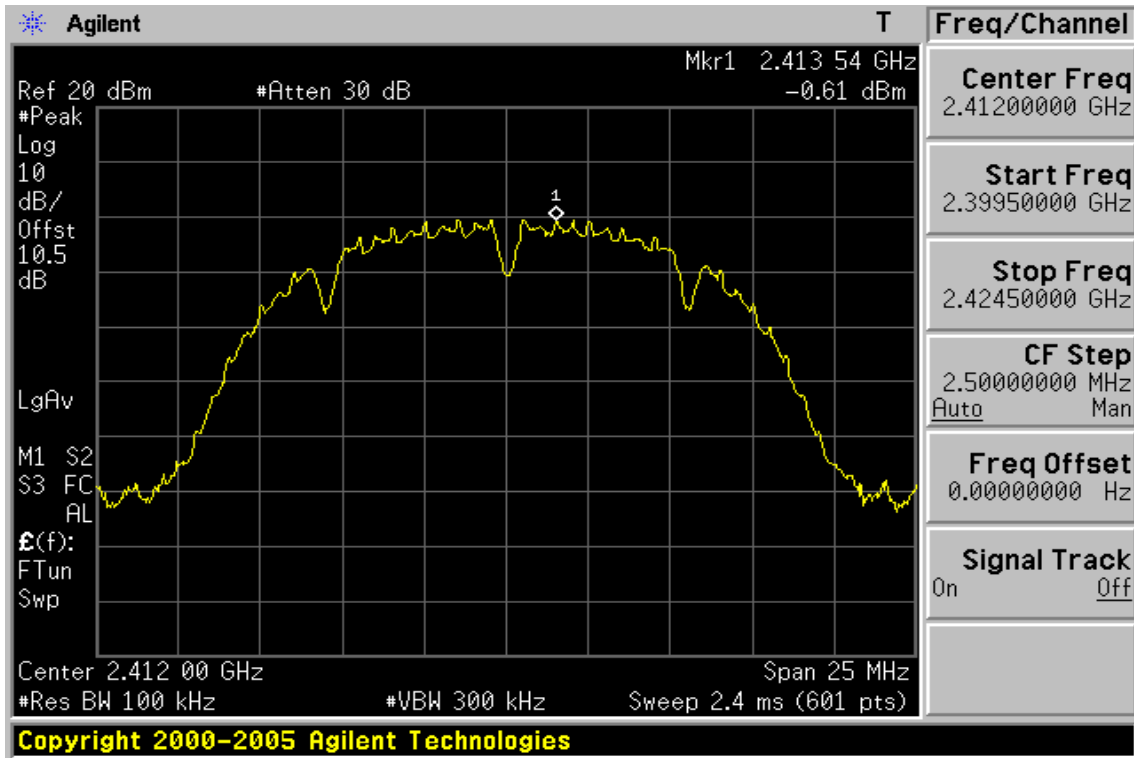
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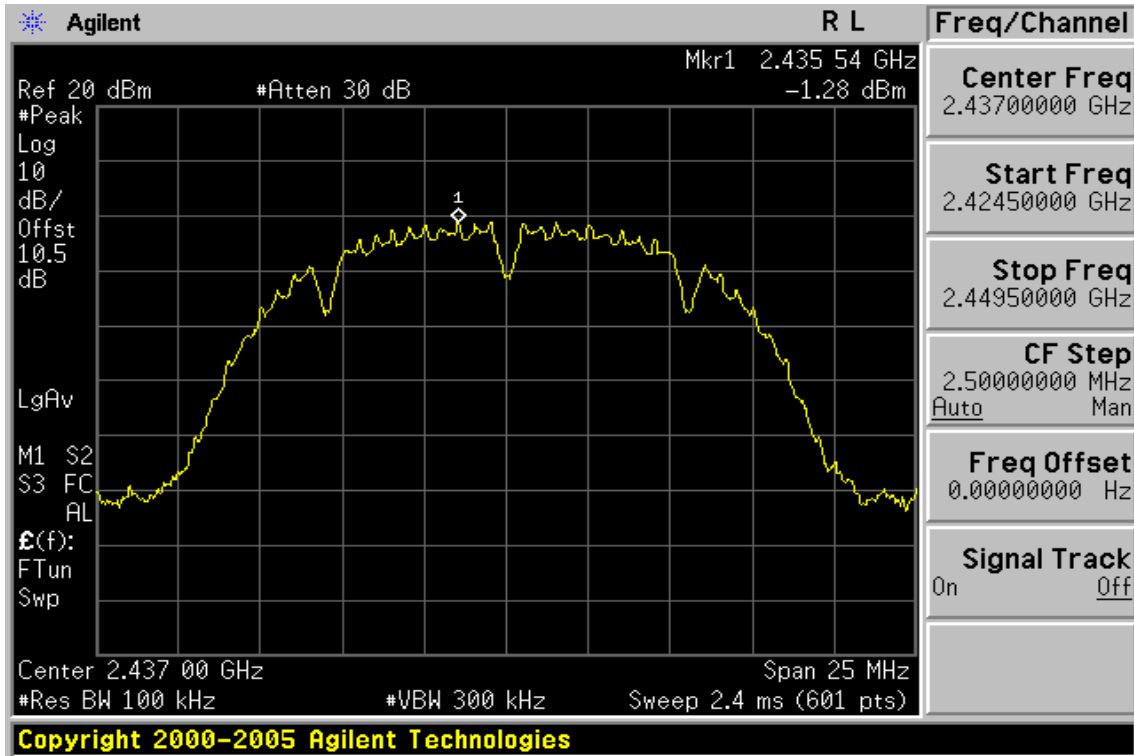
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802.11b

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)

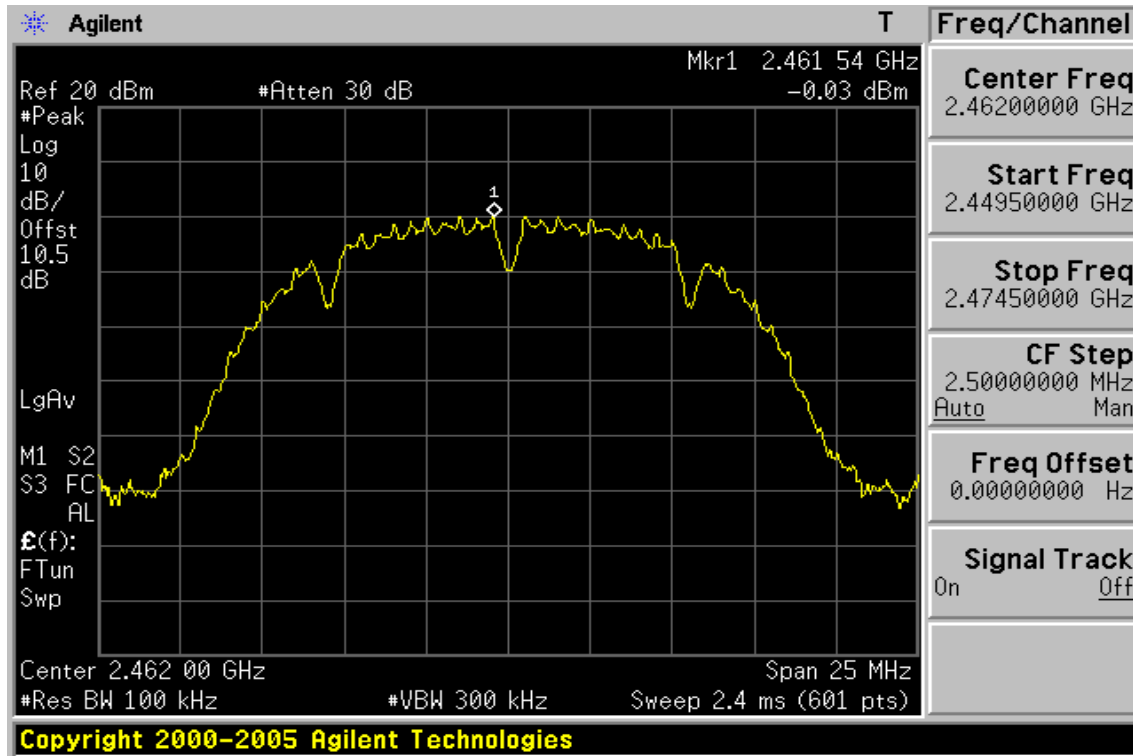


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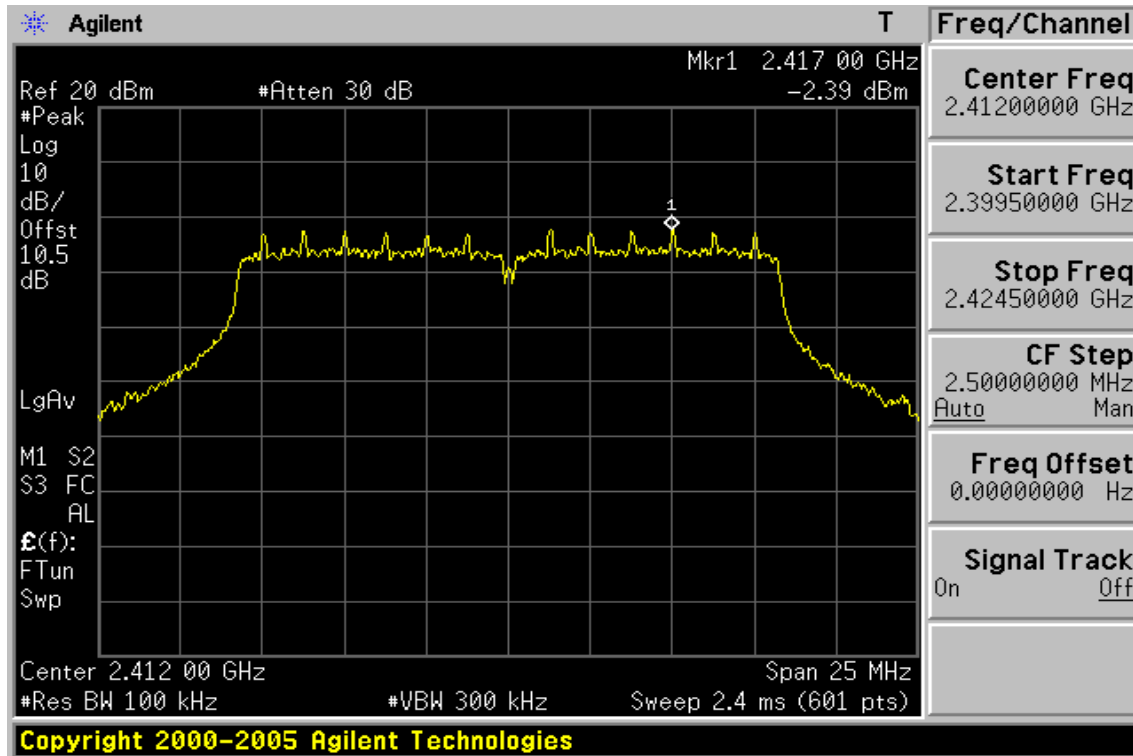
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**Power Spectral Density Test Plot (CH-High)**



802.11g

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

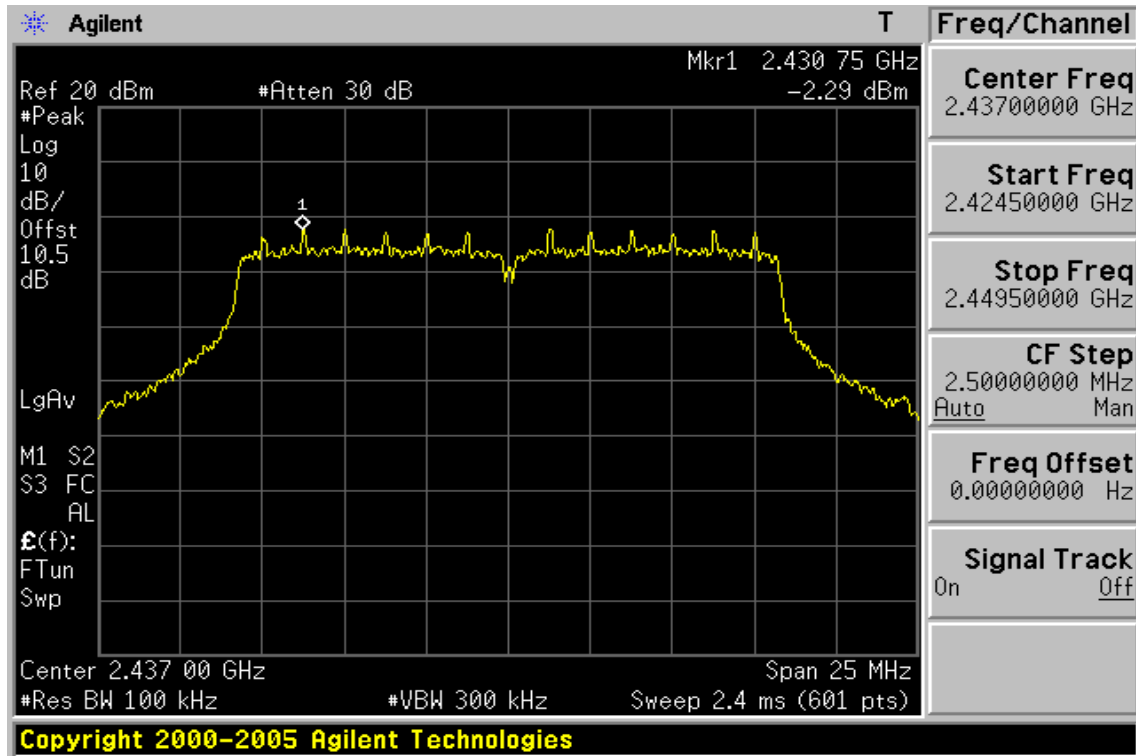


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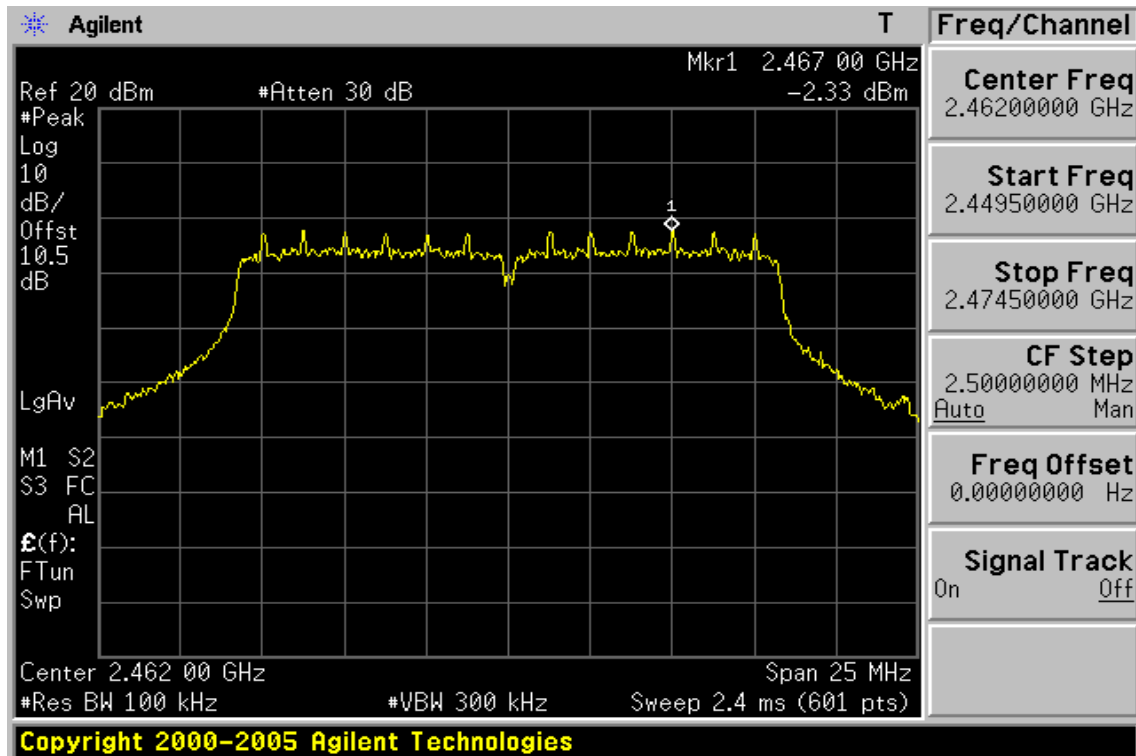
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**Power Spectral Density Test Plot (CH-Mid)**



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



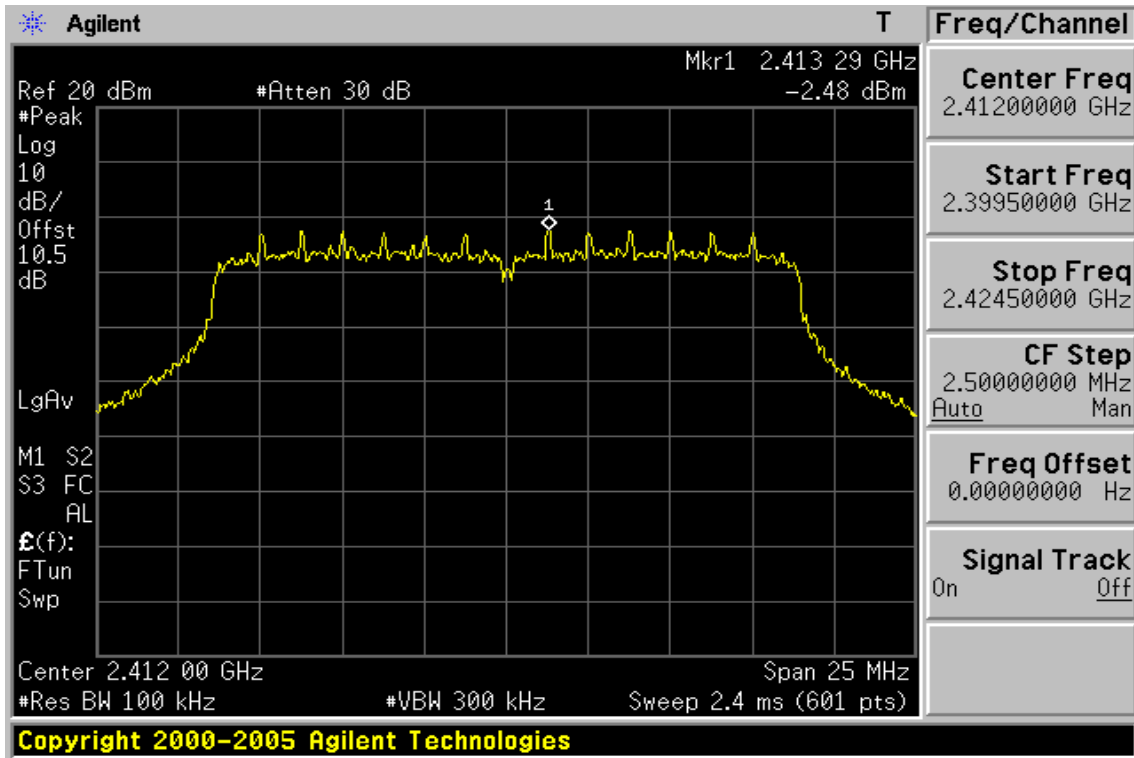
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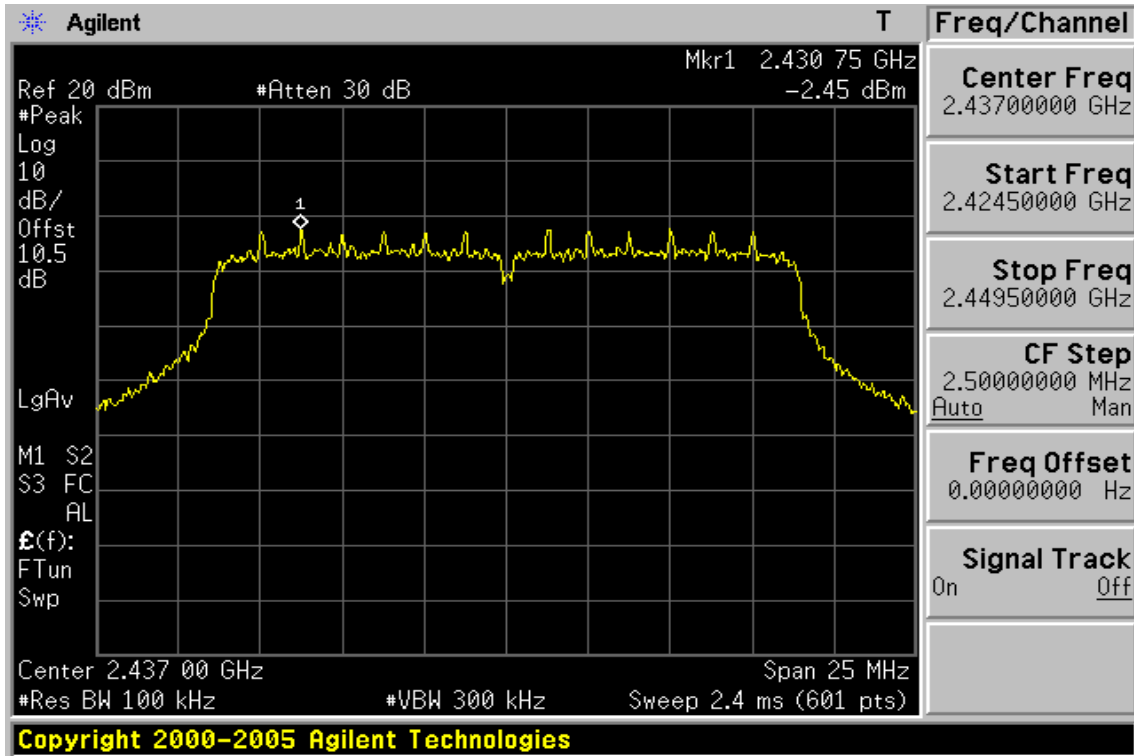
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### 802.11n\_20M

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



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

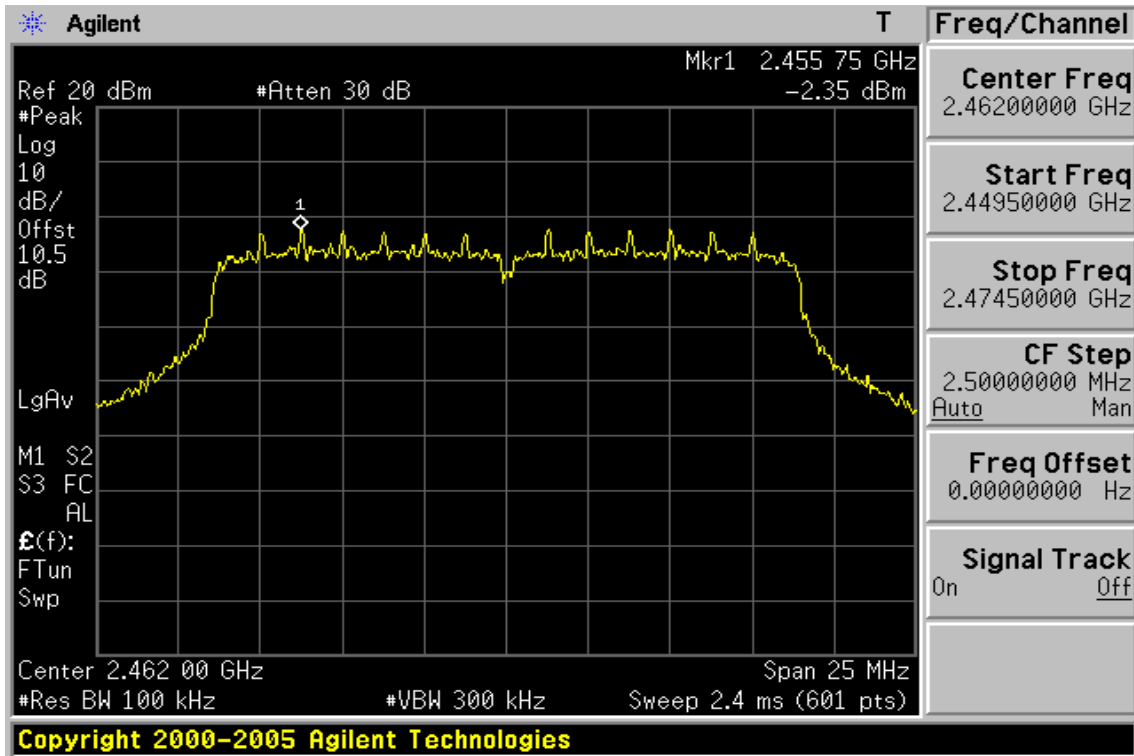


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**Power Spectral Density Test Plot (CH-High)**



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## 12 ANTENNA REQUIREMENT

### 12.1 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.

### 12.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 2 dBi and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

*~ End of Report ~*

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