

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT****INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT**

OF

**Product Name:** WiFi SD Card with micro SD slot**Marketing Name:** Wing**Brand Name:** UPRTEK**Model No.:** WS001N**Model Difference:** N/A**FCC ID:** P7SWS001N**Report No.:** ER/2013/B0020**Issue Date:** Dec. 25, 2013**FCC Rule Part:** §15.247, Cat: DTS**Prepared for:** UNITED POWER RESEARCH TECHNOLOGY CORP.  
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## VERIFICATION OF COMPLIANCE

**Applicant:** UNITED POWER RESEARCH TECHNOLOGY CORP.  
No.38, Keyih St., Jhunan, Miaoli County 350, Taiwan, R.O.C.

**Product Name:** WiFi SD Card with micro SD slot

**Marketing Name:** Wing

**Brand Name:** UPRTEK

**Model No.:** WS001N

**Model Difference:** N/A

**File Number:** ER/2013/B0020

**Date of test:** July.17, 2012 ~ Dec. 19, 2013

**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:

Marcus Tseng

Date

Dec. 25, 2013

Marcus Tseng / Engineer

Prepared By:

Violetta Tang

Date

Dec. 25, 2013

Violetta Tang / Clerk

Approved By:

Jim Chang

Date

Dec. 25, 2013

Jim Chang / Supervisor

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## Version

Version No.	Date	Description
00	Dec. 25, 2013	Initial creation of document

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## 1 GENERAL INFORMATION

### 1.1 Product Description

General:

Product Name:	WiFi SD Card with micro SD slot
Marketing Name:	Wing
Brand Name:	UPRTEK
Model No.:	WS001N
Model Difference:	N/A
Power Supply:	3.3 Vdc

WLAN:

Wi-Fi	Frequency Range	Channels	Rated Power (Peak)	Modulation Technology
11b/g	2412-2462	11	b: 12.97dBm g: 12.39dBm	DSSS, OFDM
11n	HT20 2412-2462	11	n: 12.40dBm	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: P7SWS001N** 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 Apr 2013 KDB558074 D01 V03 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 Road, Wuku Industrial Zone, Taipei County, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2009. FCC Registration Number is: 990257. 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

There are no special accessories used while test was conducted.

## 1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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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

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the general criterion in Section 7.1 of ANSI C63.4:2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz, and the measurement procedure 7.3 in ANSI 63.4:2009 & 6.2.2 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

#### 2.3.2 Radiated Emissions

The EUT is placed on a 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 and of ANSI C63.4:2009, & Section 6.3, 6.4, 6.5.

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## 2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System

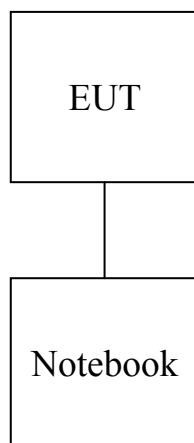


Table 2-1 Equipment Used in Tested System

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)	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

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 1.55dB (for Spectrum) +/- 1.42 dB (for Power Meter)
6dB Bandwidth	+/- 123.36 Hz
100 KHz Bandwidth Of Frequency Band Edges	+/- 1.55 dB
Peak Power Density	+/- 1.55 dB
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC=+/- 0.2%

Radiated Spurious Emission:

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 - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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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		
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.		

### 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:

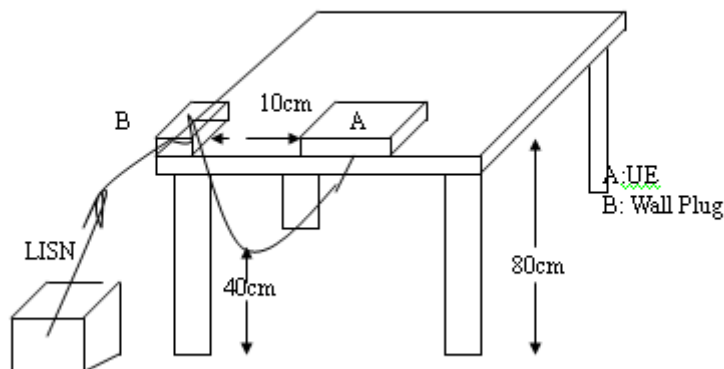
1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2009.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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#### 6.4 Test SET-UP (Block Diagram of Configuration)



#### 6.5 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.

#### 6.6 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.

Note2: The \* reveals the worst-case results that closet to the limit

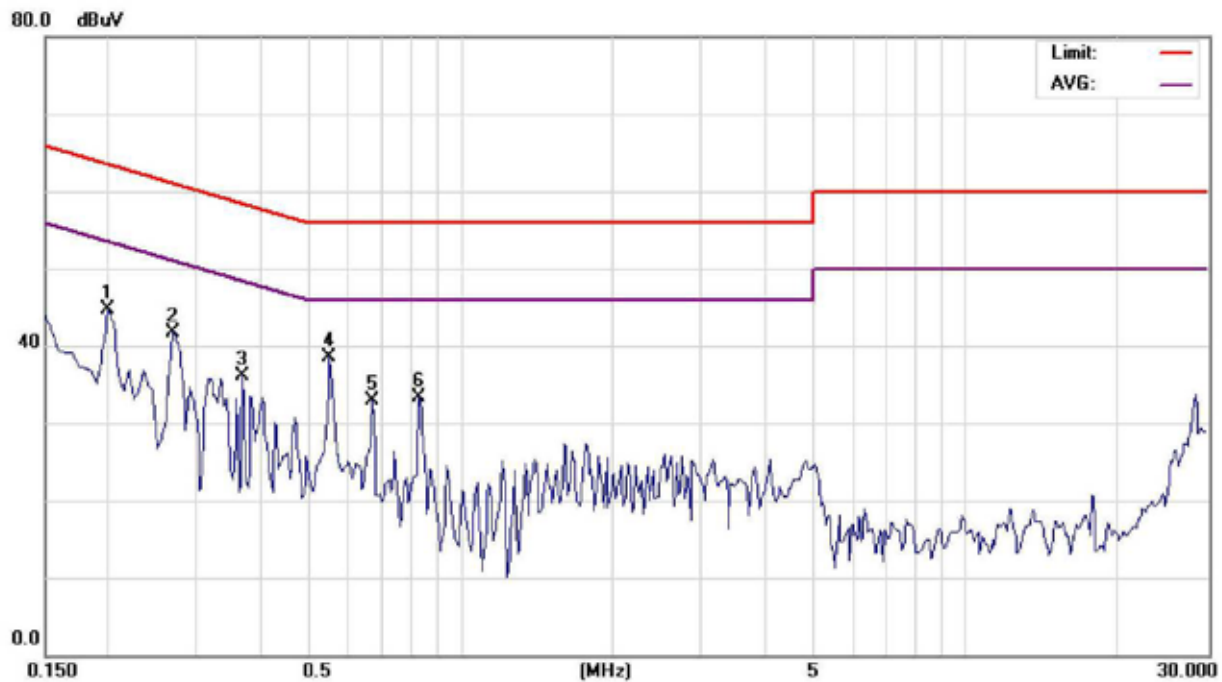
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

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: WiFi SD Card with micro SD slot

Distance:

M/N: WS001N

Mode: Operationmode

Note:

No.	Mk.	Freq. MHz	Reading Level dBμV	Correct Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector	Comment
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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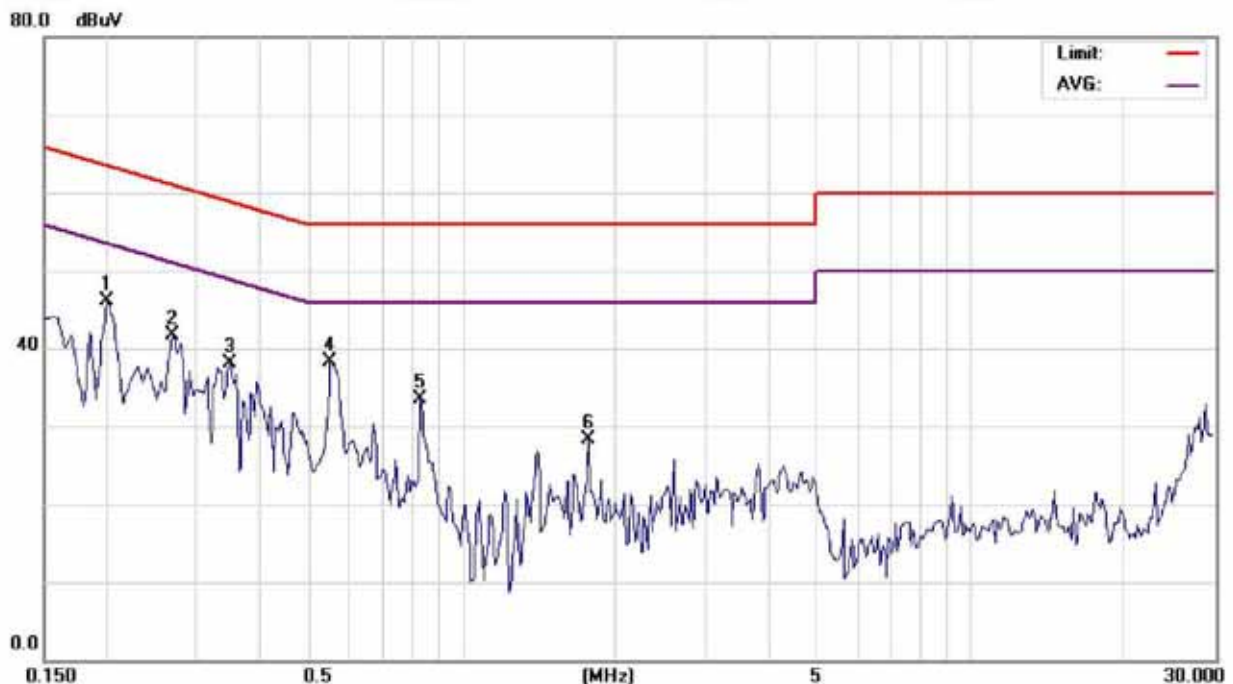
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Site ConductionRoom

Phase: **N**

Temperature: 24 °C

Limit: FCC Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 60%

EUT: WiFi SD Card with micro SD slot  
M/N: WS001N

Distance:

Mode: Operationmode

Note:

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 (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.

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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

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY51100003	05/30/2013	05/29/2014
DC Block	Mini-Circuits	BLK-18-S+	1	02/28/2013	02/27/2014
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2013	01/04/2014
Attenuator	Mini-Circuit	BW-S10W2+	002	02/28/2013	02/27/2014
Splitter	Agilent	11636B	N/A	02/28/2013	02/27/2014

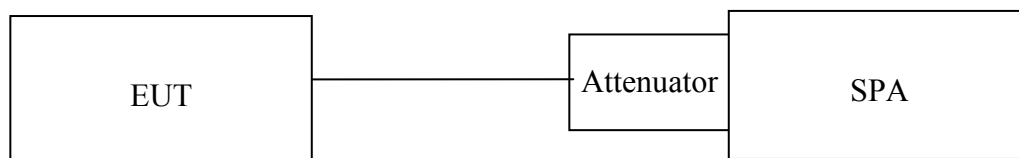
*Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown above indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.*

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### 7.3 Test Set-up:



### 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 antenna port to the power meter or spectrum. (**Peak power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector = peak, Sweep = Auto. Setting on spectrum is adjusted based on the mandatory procedure in 9.1.2 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.1.3 in KDB558074 is followed.  
(**Avg. power setting on Spectrum:** Channel power function, RBW = 1MHz, VBW = 3MHz, Span: 30/60MHz, Detector = Avg., Trace avg = 100, Sweep = Auto, Setting on spectrum is adjusted based on the mandatory procedure in 9.2.2.4 of the KDB558074). Power Meter is used as the auxiliary test equipment to conduct the output power measurement. 9.2.3, option 3 in KDB558074 is followed.
3. Record the max. Reading as observed from Spectrum or Power Meter.
4. Repeat above procedures until all frequency of interest measured was complete.

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*Pre-analysis Check: While conducting average power measurement, duty cycle of each mode (b/g/n\_ht20) shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle. All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones. b = 99%, g = 98.09%, n\_ht\_20 = 98.09%, where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.*

**Formula:**

$$\text{Duty Cycle} = T_{on} / (T_{on} + T_{off})$$

**Test Procedure:**

Set span = 0, RBW = 8MHz, VBW = 8MHz, Detector = Peak

Duty Cycle:

	Duty Cycle	Duty Factor (dB)
802.11b	99%	0.04
802.11g	98.09%	0.08
802.11n_20 (2.4G)	98.09%	0.08

Factor:  $10 * \log(1) = 0$

Duty Cycle:  $10 * \log(\text{Duty Factor})$

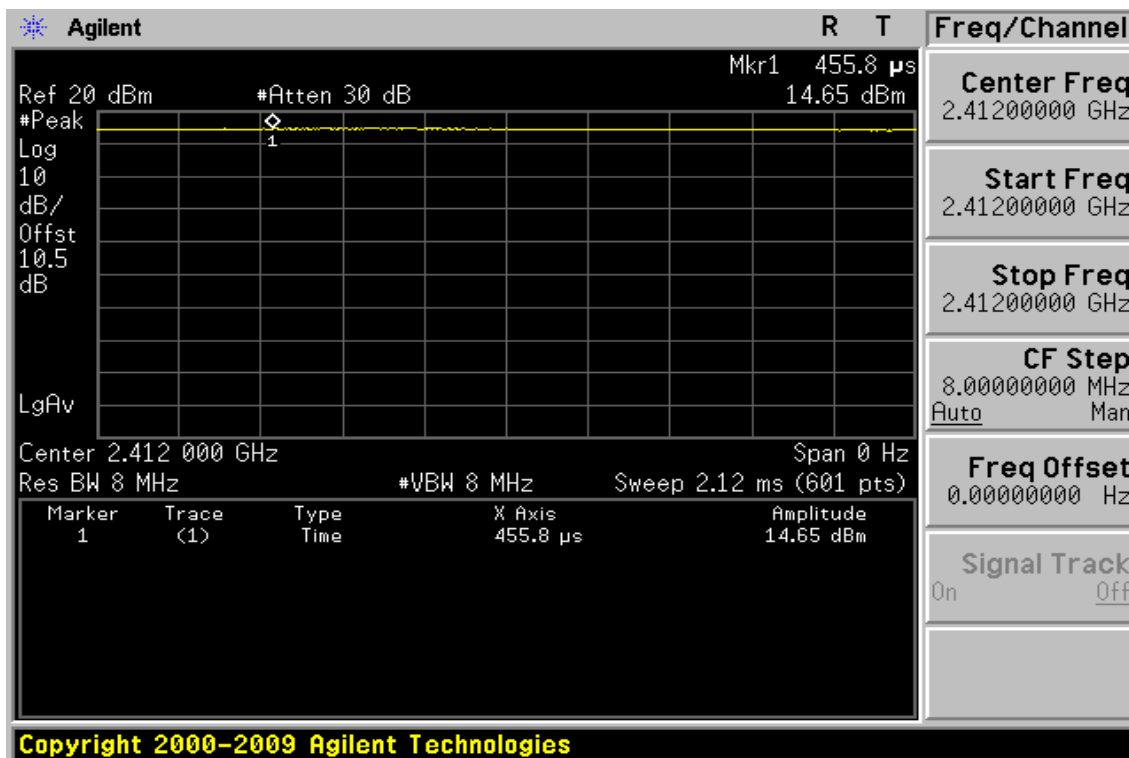
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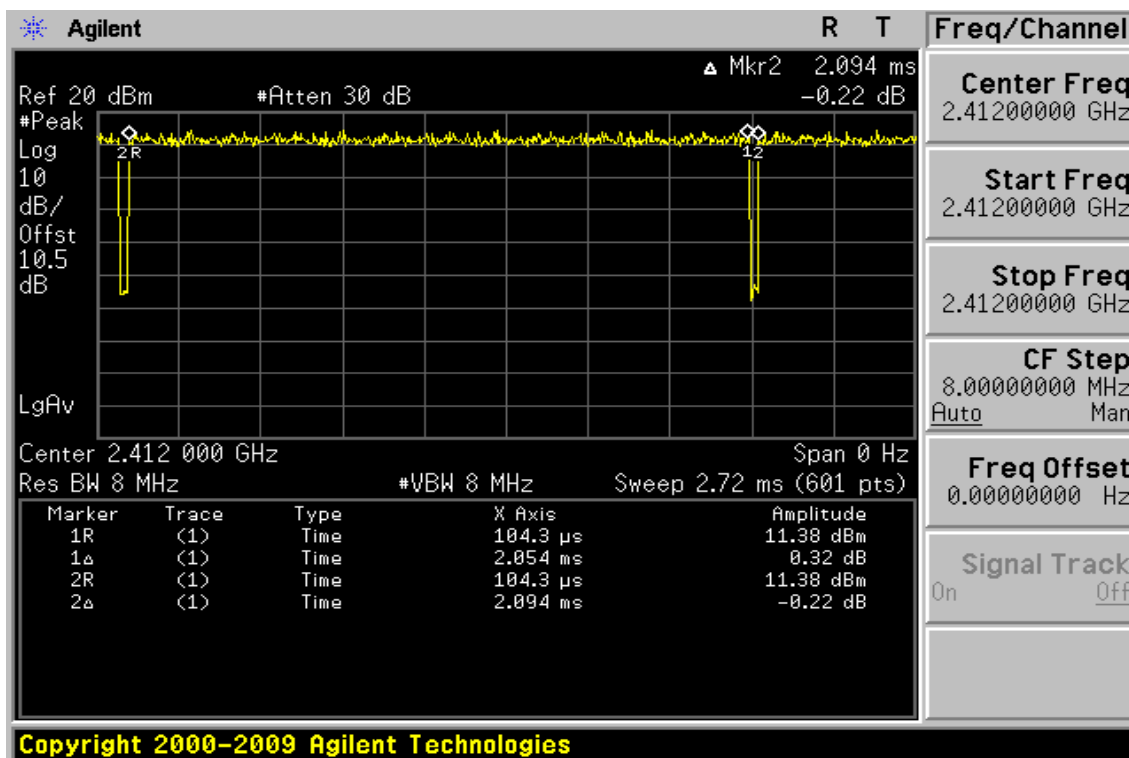
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## Duty Factor:

802.11 b



802.11 g

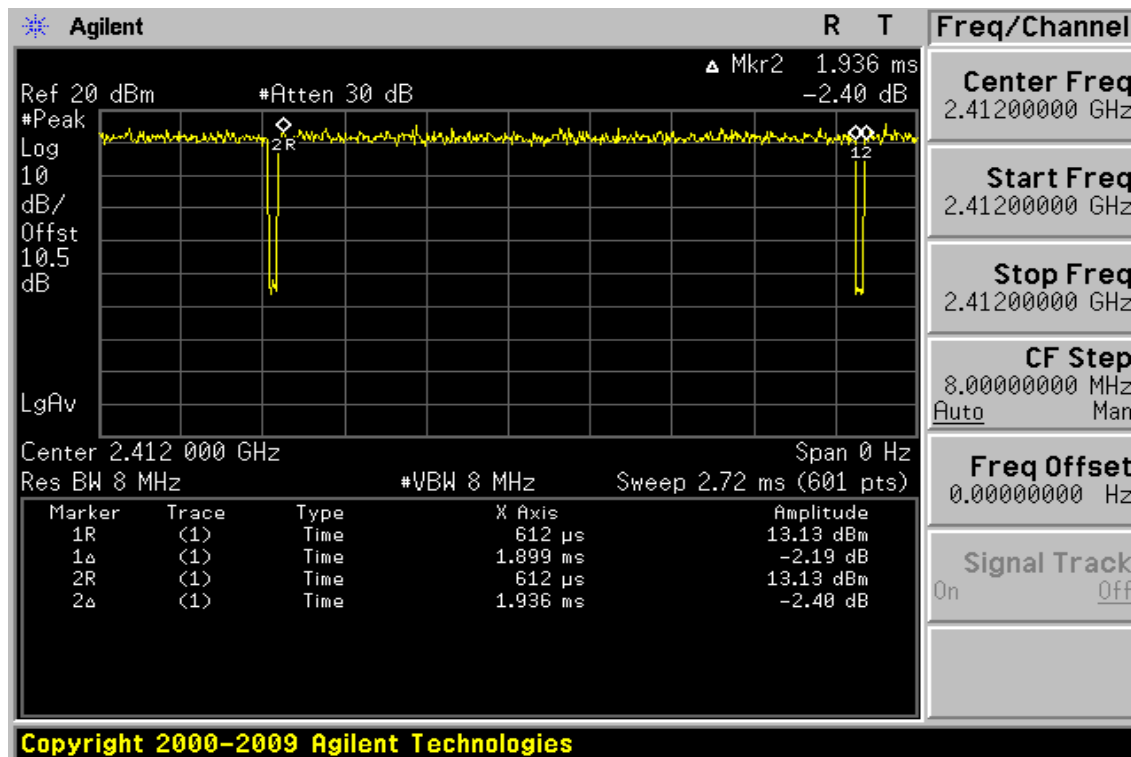


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## 802.11 n\_20 MHz



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## 7.5 Measurement Result:

### 802.11b

Cable loss = 0		Peak Power Output (dBm)				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	12.60	12.47	12.71	12.93	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		Peak Power Output (dBm) with Duty Factor				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	12.64	12.51	12.75	12.97	1 Watt = 30 dBm
6	2437	12.30	12.23	12.50	12.78	1 Watt = 30 dBm
11	2462	12.15	12.18	12.36	12.39	1 Watt = 30 dBm

Cable loss = 0		Average Power Output (dBm)				
CH	Frequency (MHz)	Data Rate				Required Limit
		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

Cable loss = 0		Average Power Output (dBm) with Duty Factor				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	9.90	9.92	9.89	9.83	1 Watt = 30 dBm
6	2437	9.56	9.58	9.61	9.50	1 Watt = 30 dBm
11	2462	9.46	9.49	9.49	9.35	1 Watt = 30 dBm

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**802.11g**

Cable loss = 0		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	12.31	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		Peak Power Output(dBm) with Duty Factor								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	12.39	12.20	11.78	11.92	11.66	11.56	11.23	11.40	1 Watt = 30 dBm
6	2437	12.37	12.17	12.30	12.24	11.53	11.37	11.03	10.84	1 Watt = 30 dBm
11	2462	12.32	12.28	11.94	12.29	11.01	11.04	10.90	10.95	1 Watt = 30 dBm

Cable loss = 0		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		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

Cable loss = 0		Average Power Output(dBm) with Duty Factor								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	8.66	8.43	8.40	8.37	7.84	7.80	7.80	7.76	1 Watt = 30 dBm
6	2437	8.79	8.62	8.58	8.67	8.14	8.04	7.45	7.37	1 Watt = 30 dBm
11	2462	8.70	8.61	8.58	8.51	7.42	7.28	7.35	7.09	1 Watt = 30 dBm

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## 802.11n\_20M

Cable loss = 0		Peak Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		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		Peak Power Output(dBm) with Duty Factor								
CH	Frequency (MHz)	Data Rate								Required Limit
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	12.24	12.15	12.03	11.71	11.43	11.24	11.12	11.05	1 Watt = 30 dBm
6	2437	12.40	12.30	12.21	11.67	11.32	11.01	11.06	11.07	1 Watt = 30 dBm
11	2462	12.25	12.22	12.08	11.00	10.84	10.83	10.82	10.75	1 Watt = 30 dBm

Cable loss = 0		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Required Limit
		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

Cable loss = 0		Average Power Output(dBm) with Duty Factor								
CH	Frequency (MHz)	Data Rate								Required Limit
		6.5	13	19.5	26	39	52	58.5	65	
1	2412	8.63	8.34	8.46	7.85	7.76	7.74	7.73	7.71	1 Watt = 30 dBm
6	2437	8.75	8.56	8.20	7.69	7.61	7.50	7.45	7.37	1 Watt = 30 dBm
11	2462	8.74	8.48	8.51	7.46	7.49	7.31	7.11	7.03	1 Watt = 30 dBm

\*Note: Offset 10.5 dB

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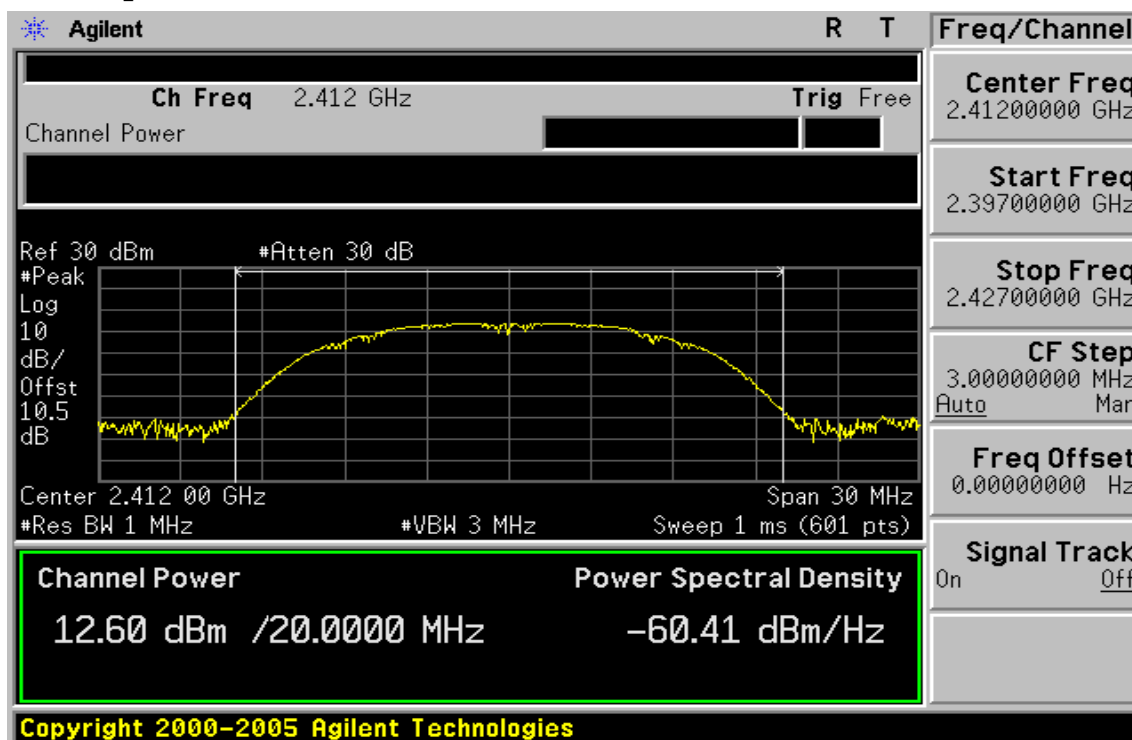
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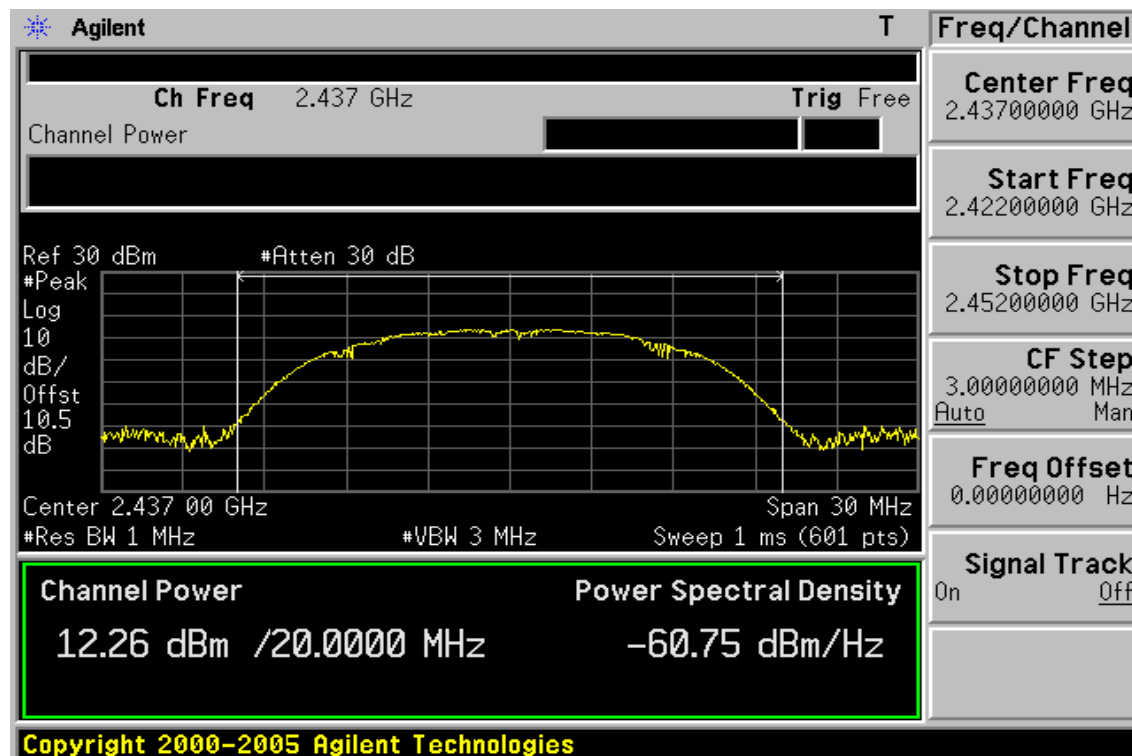


## 802.11b, 1Mbps

### Peak Power Output Plot (CH Low)



### Peak Power Output Plot (CH Mid)

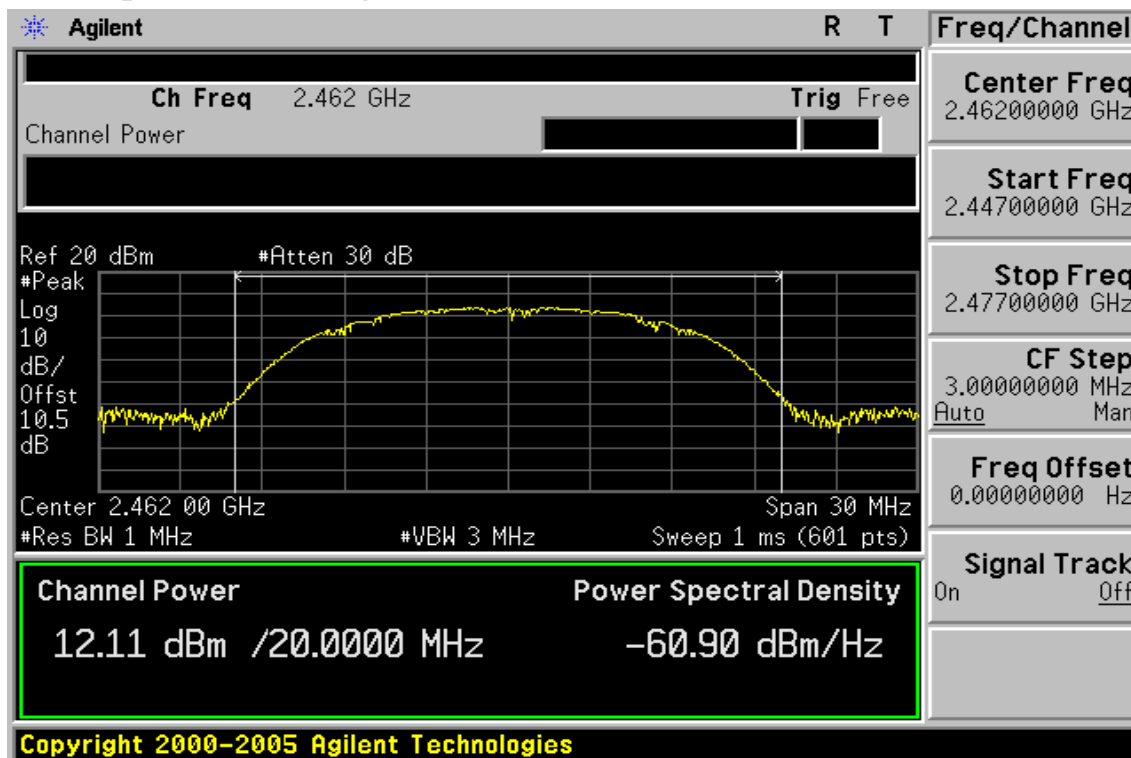


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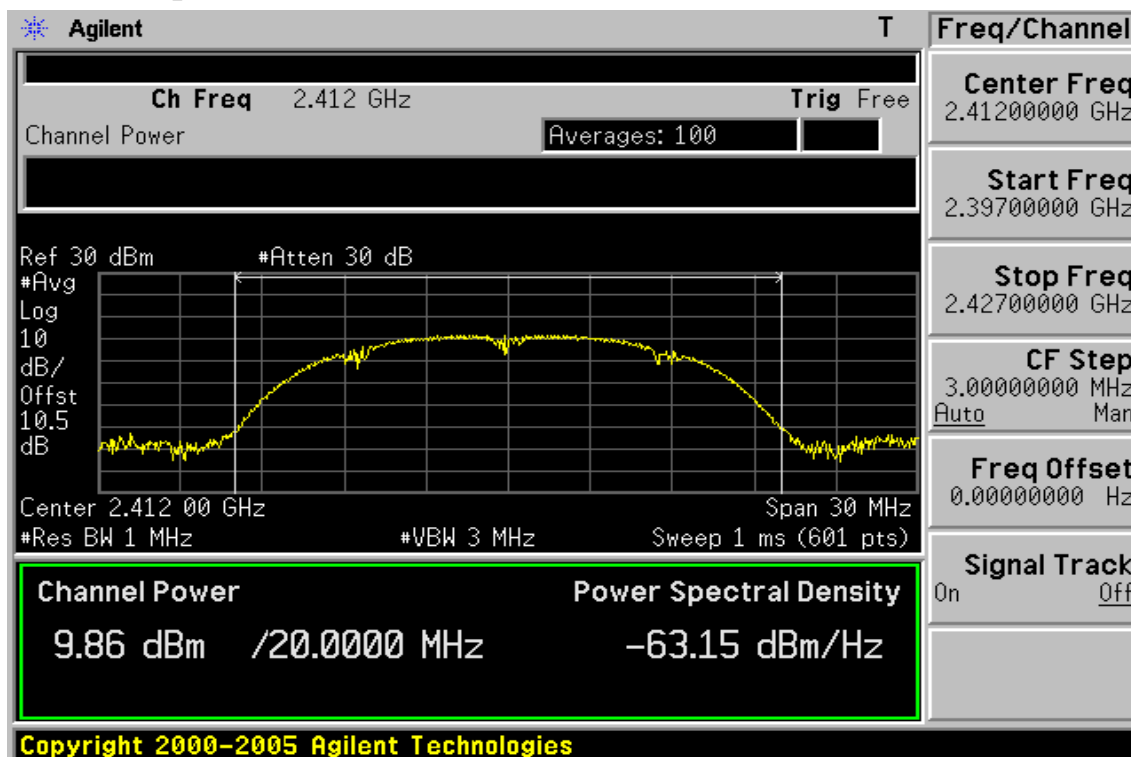
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## Peak Power Output Plot (CH High)



## Average Power Output Plot (CH Low)

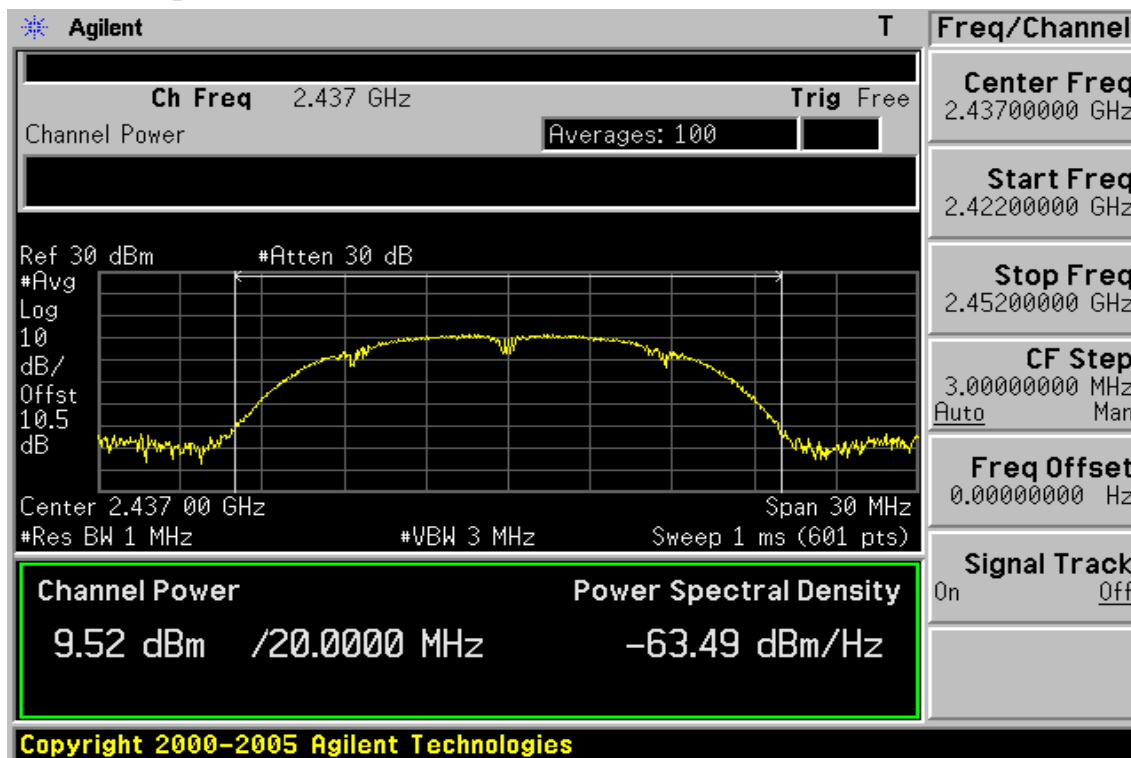


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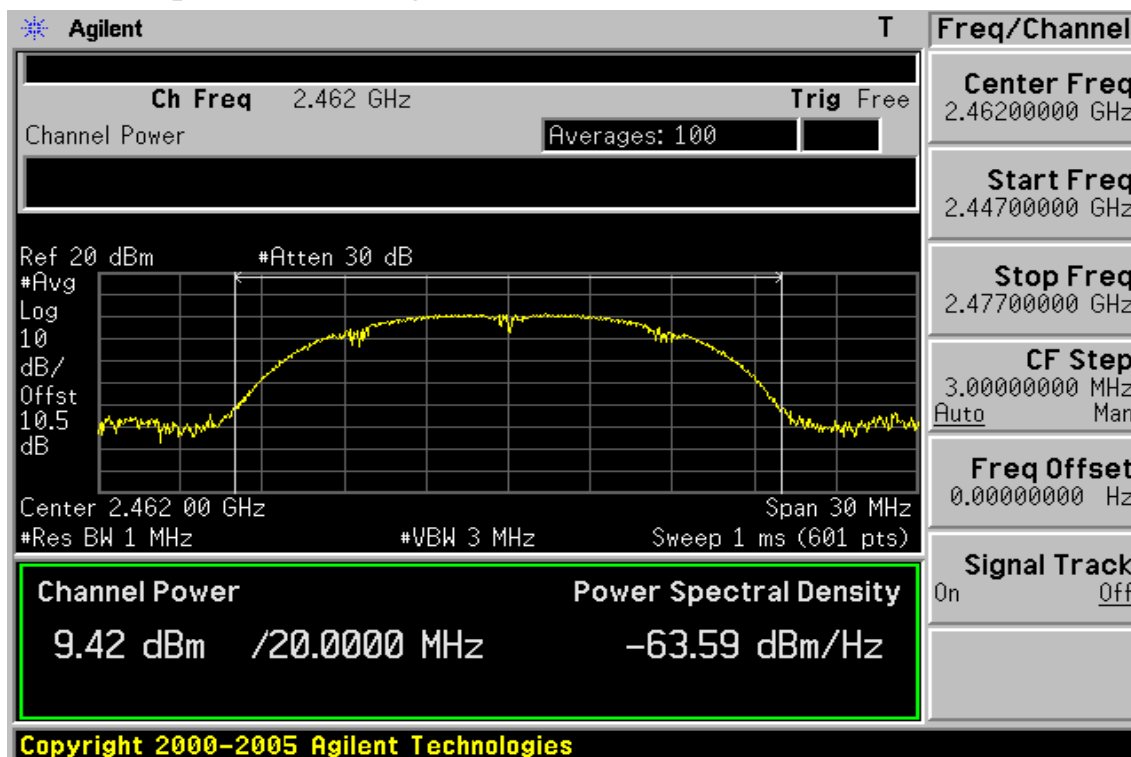
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## Average Power Output Plot (CH Mid)



## Average Power Output Plot (CH High)



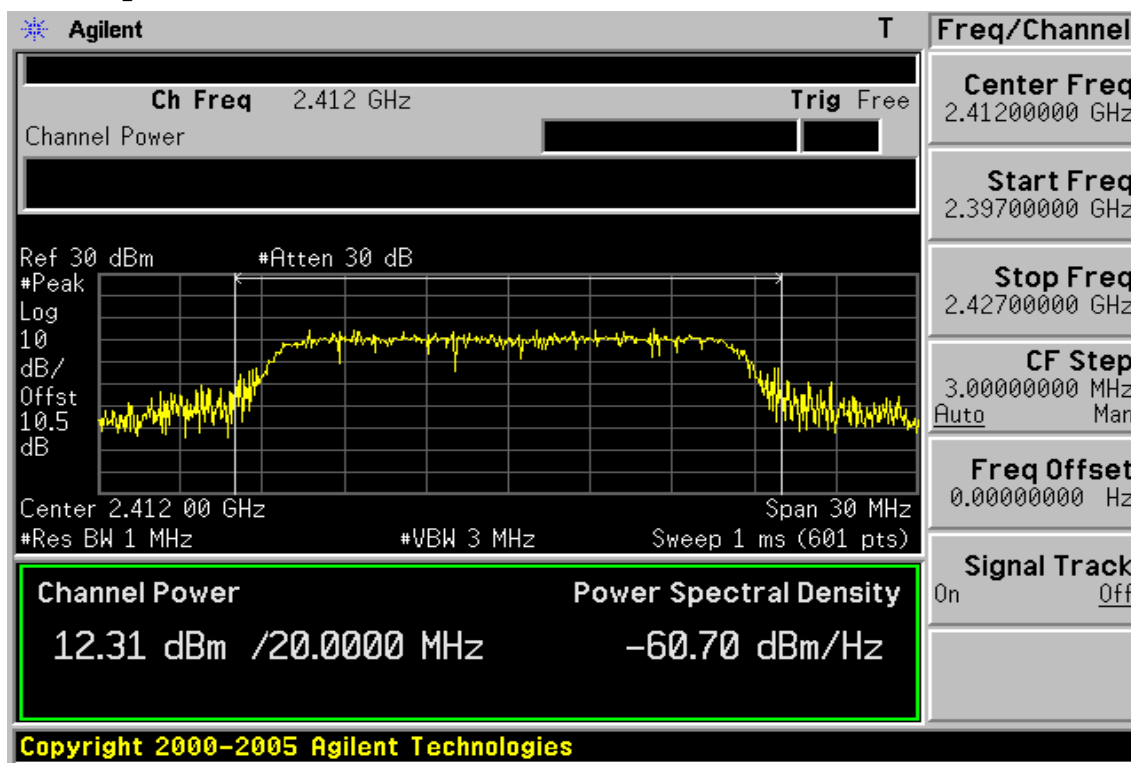
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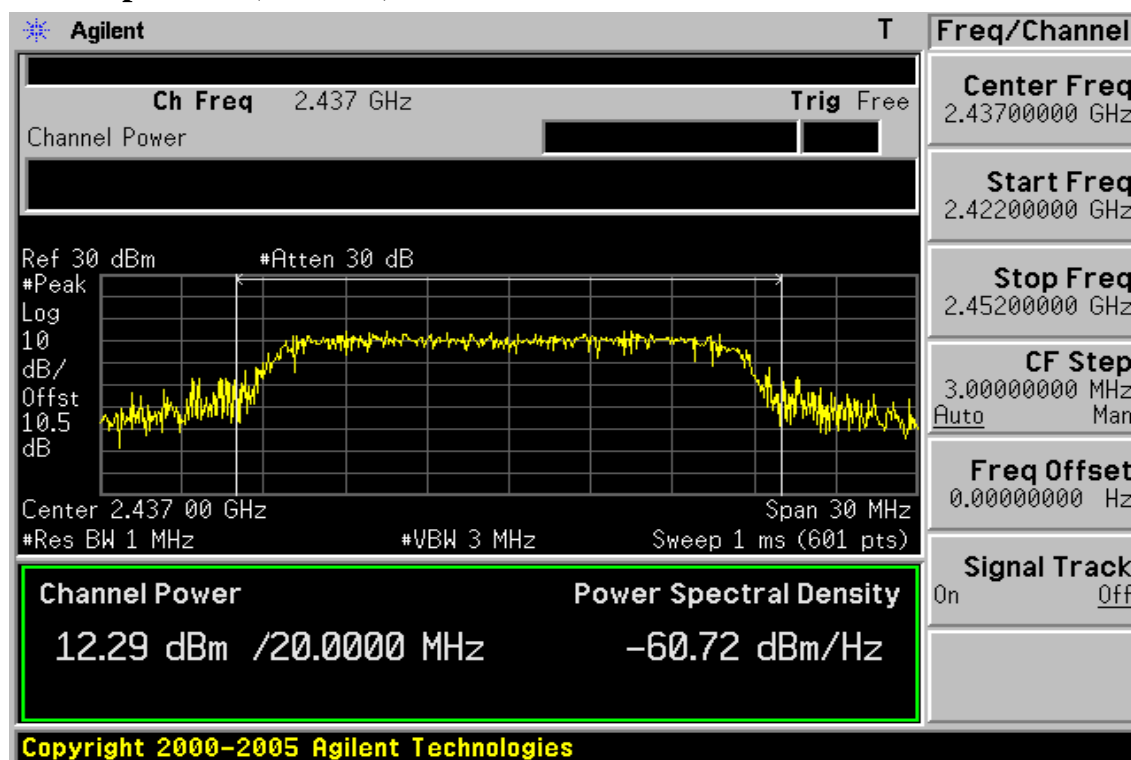
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## 802.11g, 6Mbps

### Peak Power Output Plot (CH Low)



### Peak Power Output Plot (CH Mid)



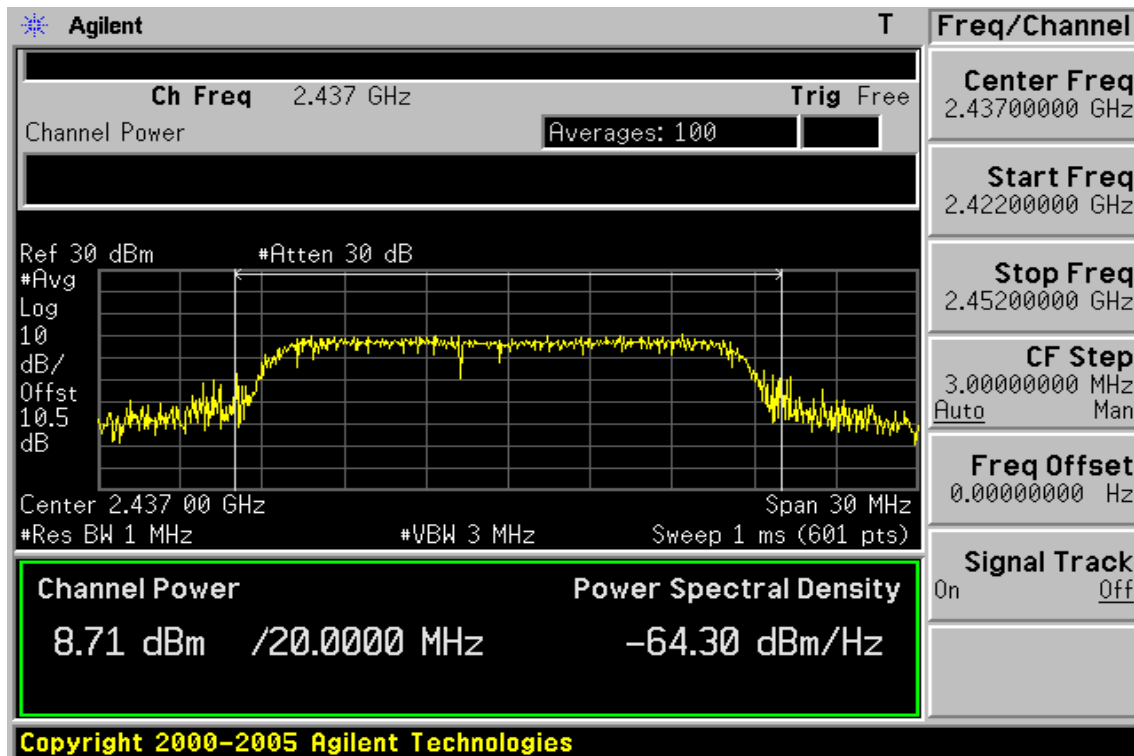
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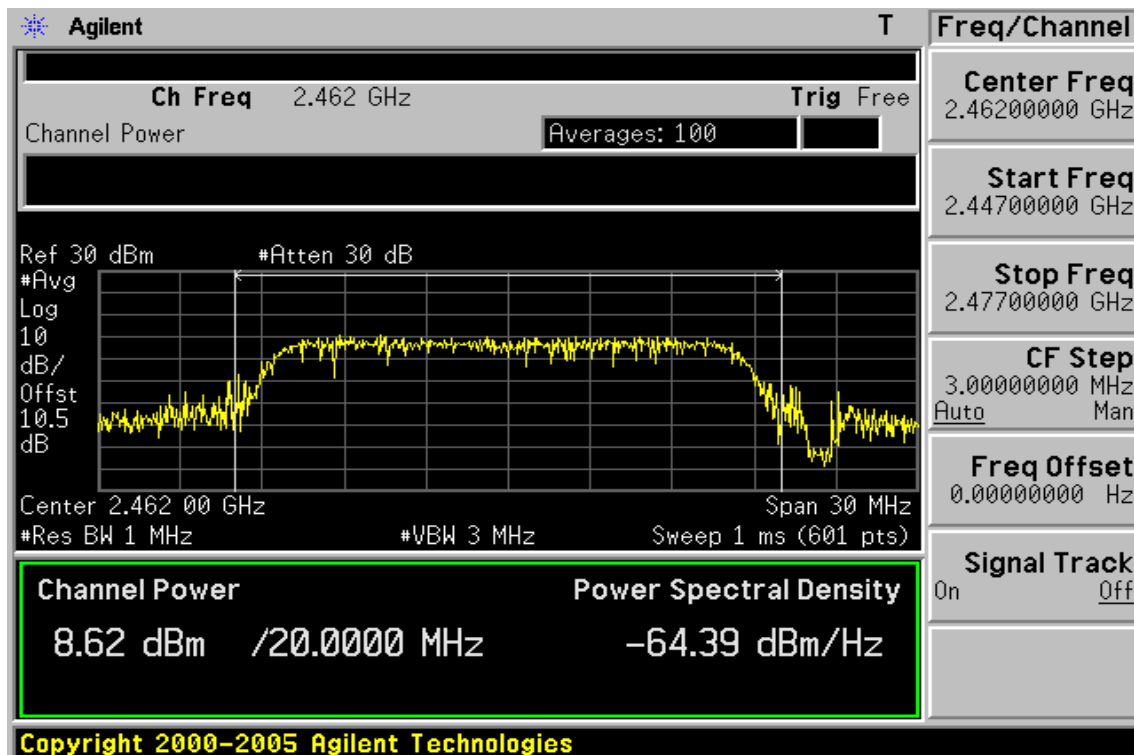
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## Average Power Output Plot (CH Mid)



## Average Power Output Plot (CH High)



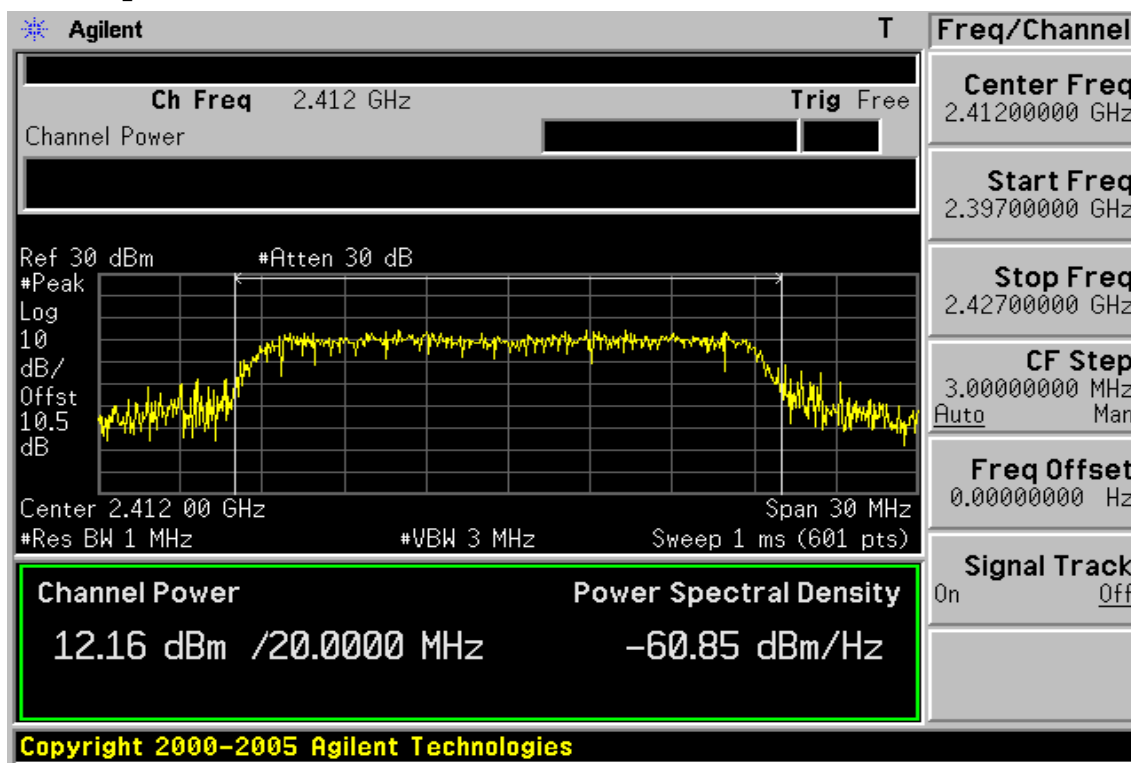
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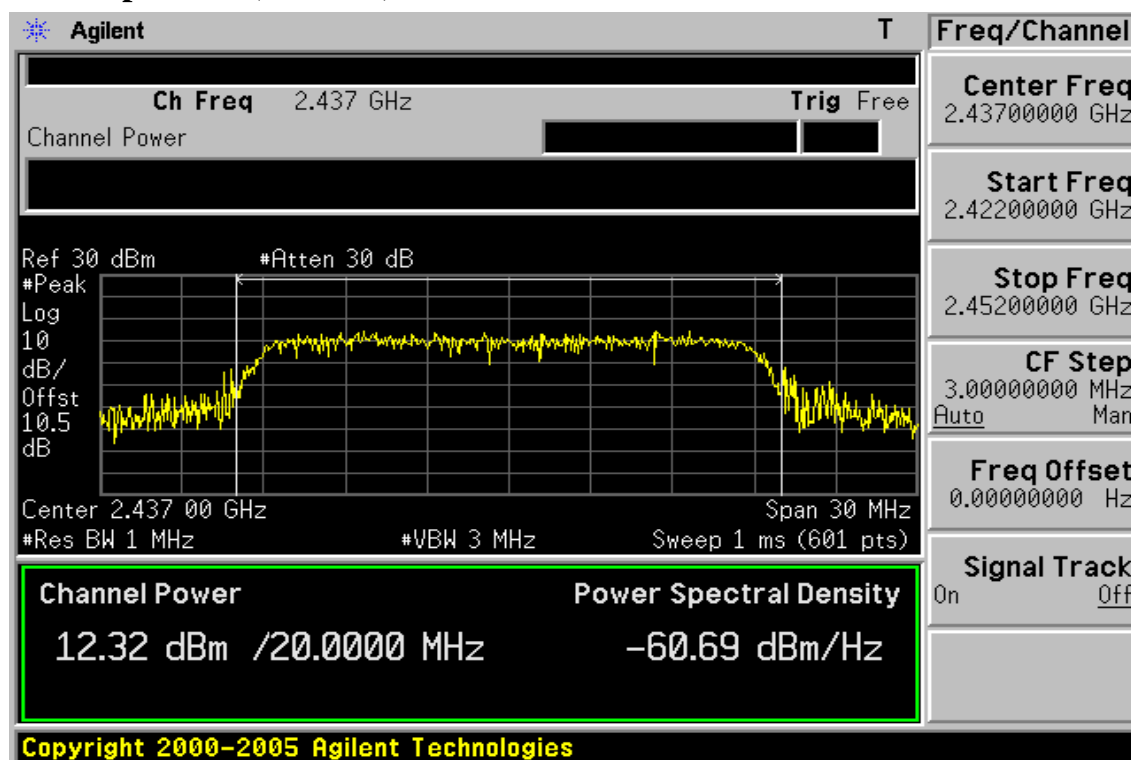
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## 802.11n\_20M, 6.5Mbps

### Peak Power Output Plot (CH Low)



### Peak Power Output Plot (CH Mid)



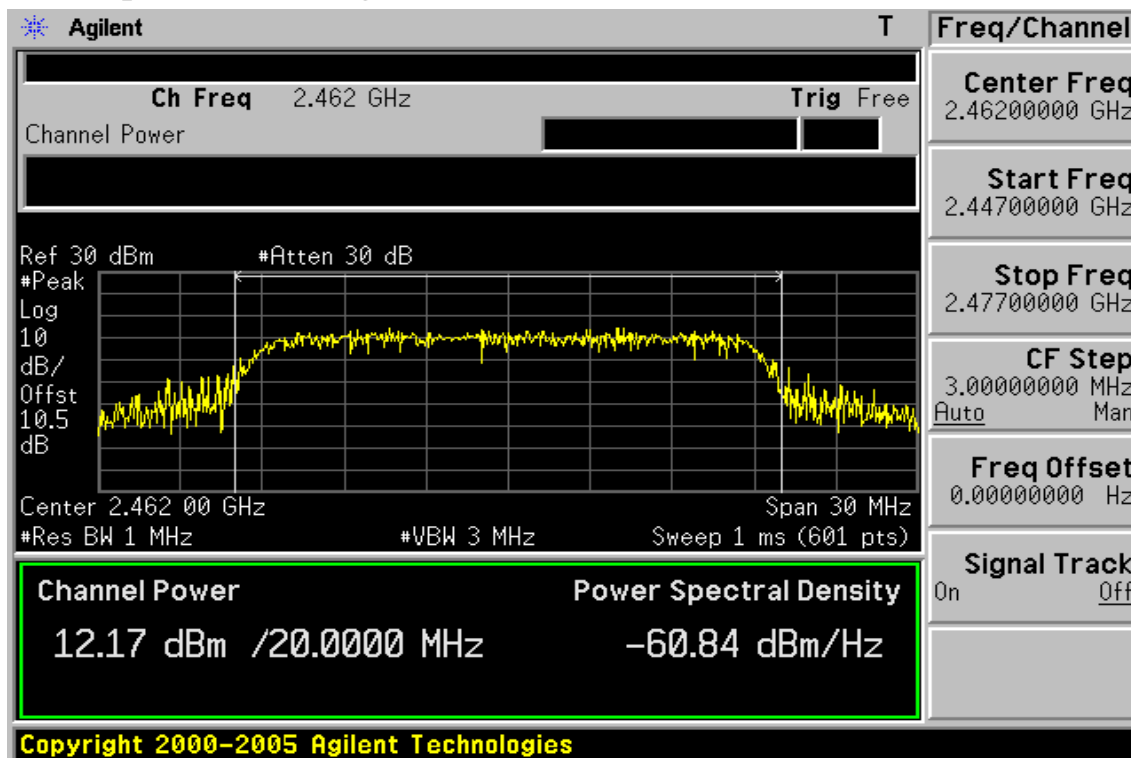
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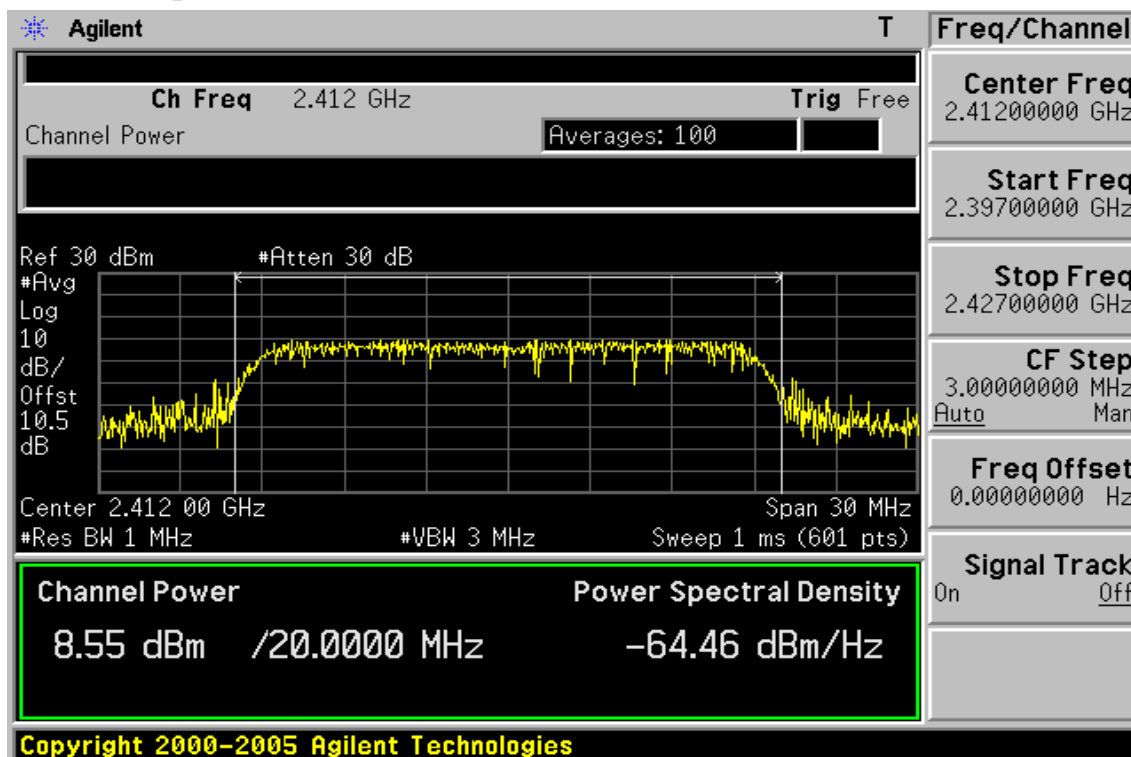
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## Peak Power Output Plot (CH High)



## Average Power Output Plot (CH Low)



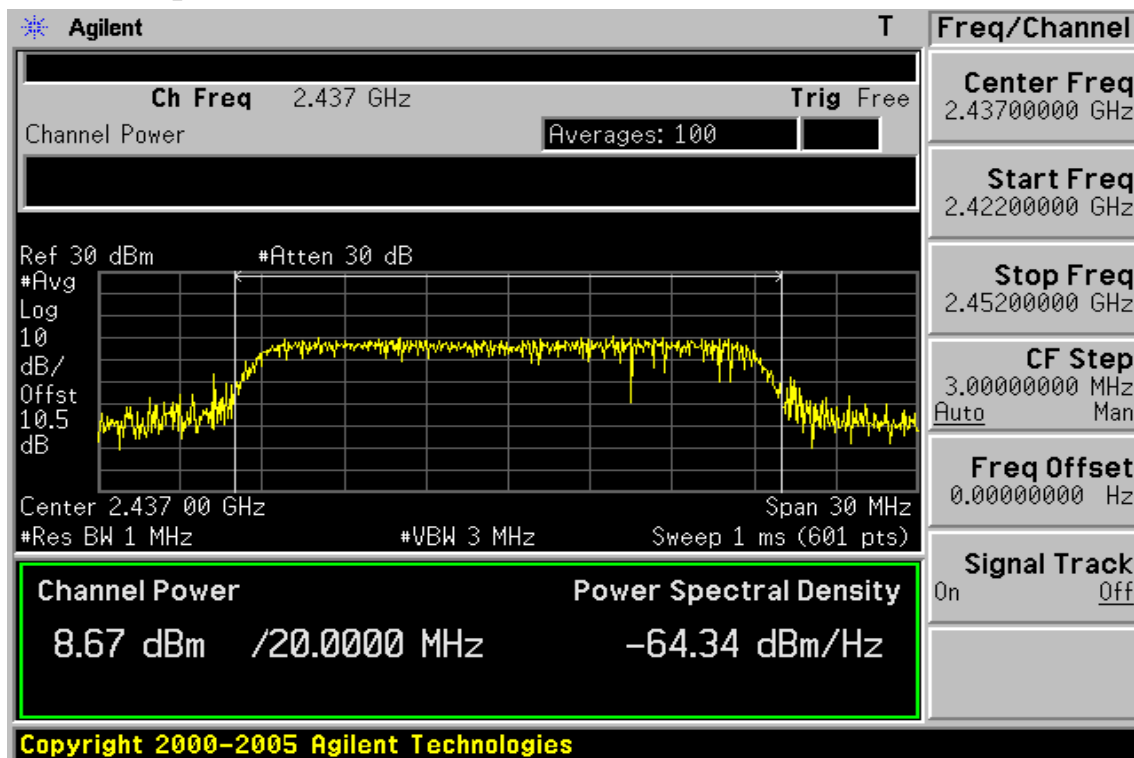
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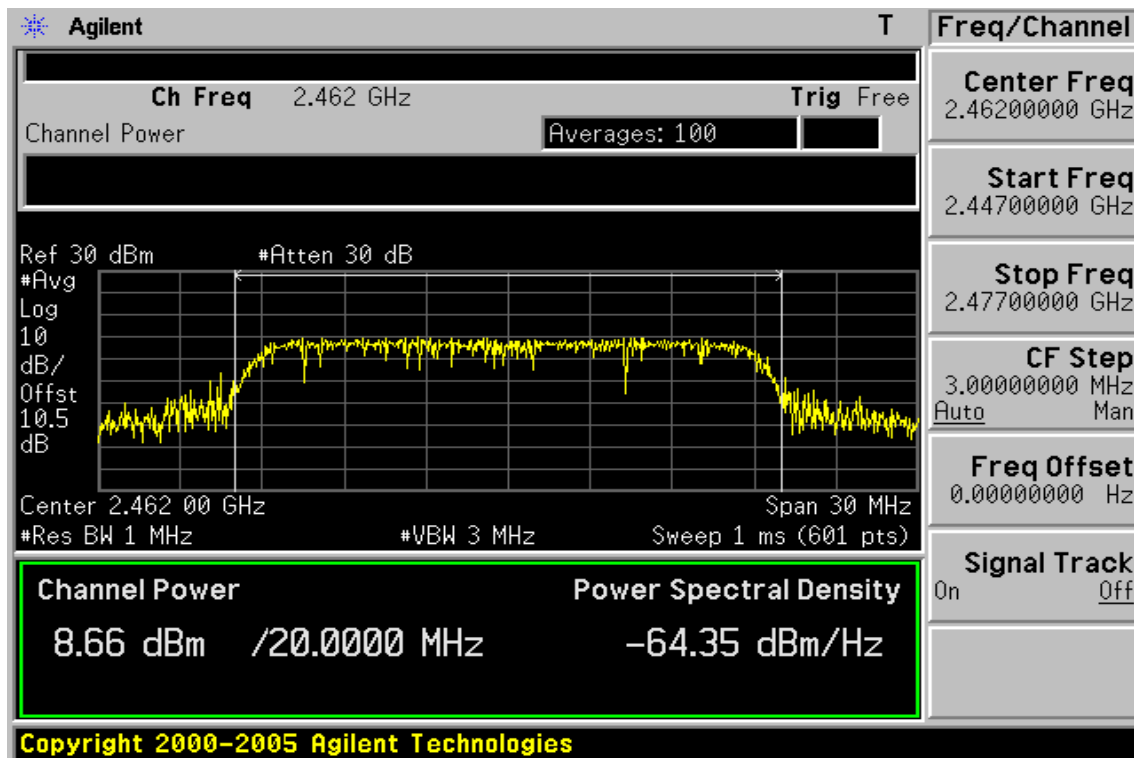
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## Average Power Output Plot (CH Mid)



## 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 antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 100 kHz, VBW = 3\*RBW, Span = 10M, Detector=Peak, Sweep=auto, the setting on spectrum is adjusted based on the procedure as guide in 8.1 option 1 of KDB558074.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat above procedures until all frequency of interest measured was complete.

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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.

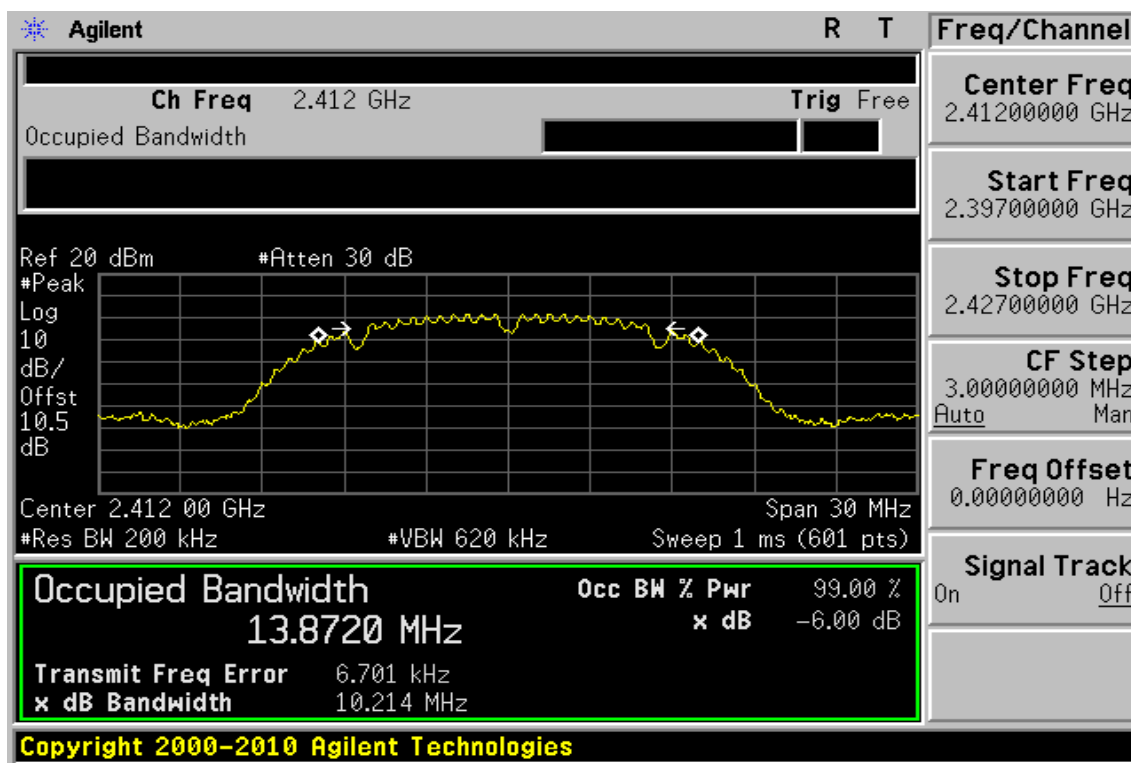
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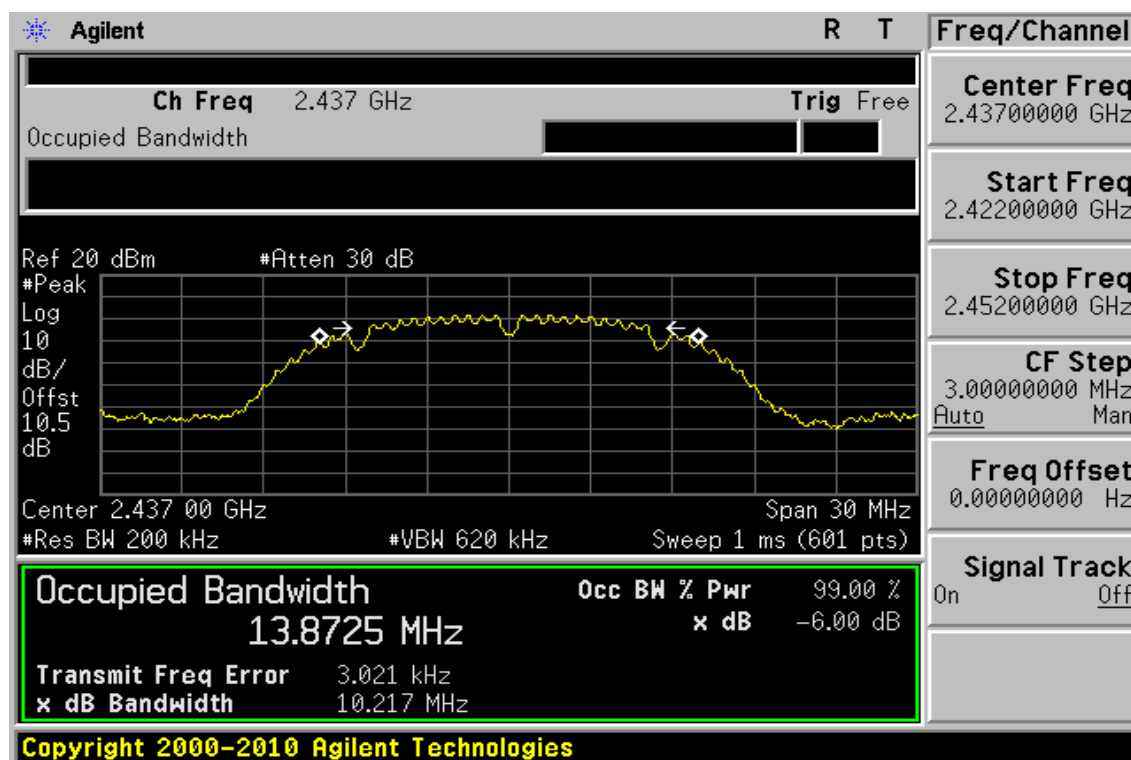
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## 802.11b

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



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

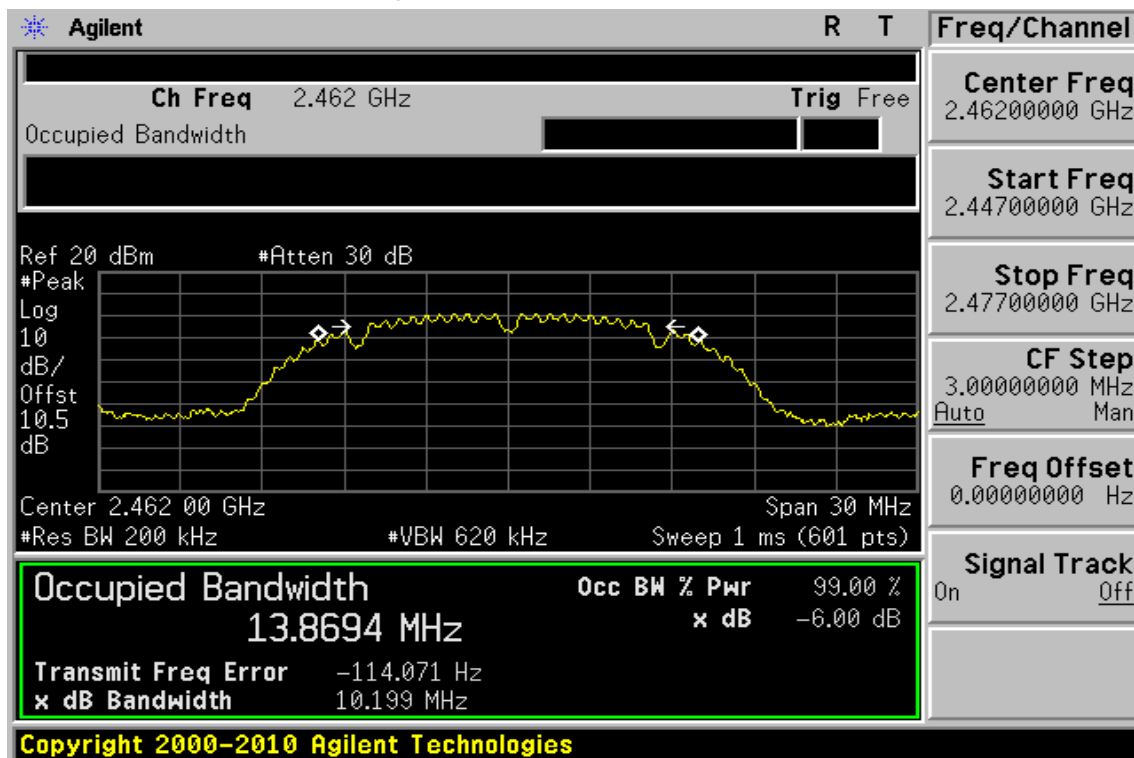


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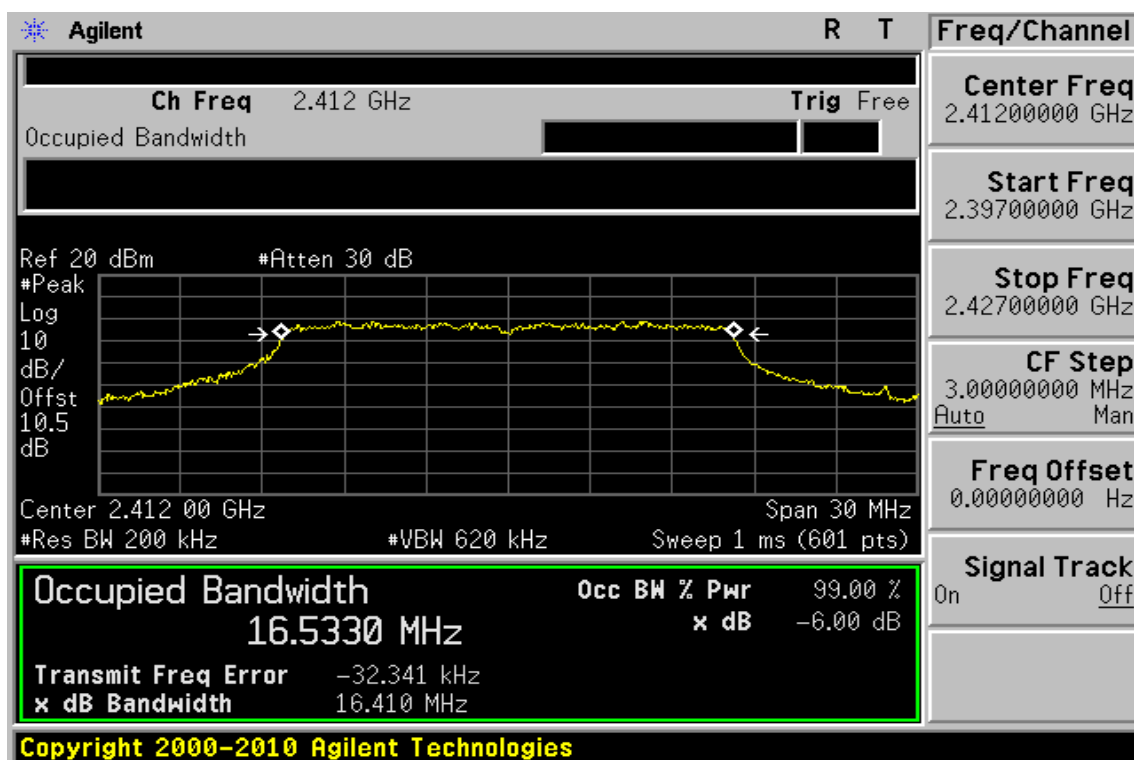
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## 6dB Band Width Test Data CH-High



802.11g

## 6dB Band Width Test Data CH-Low

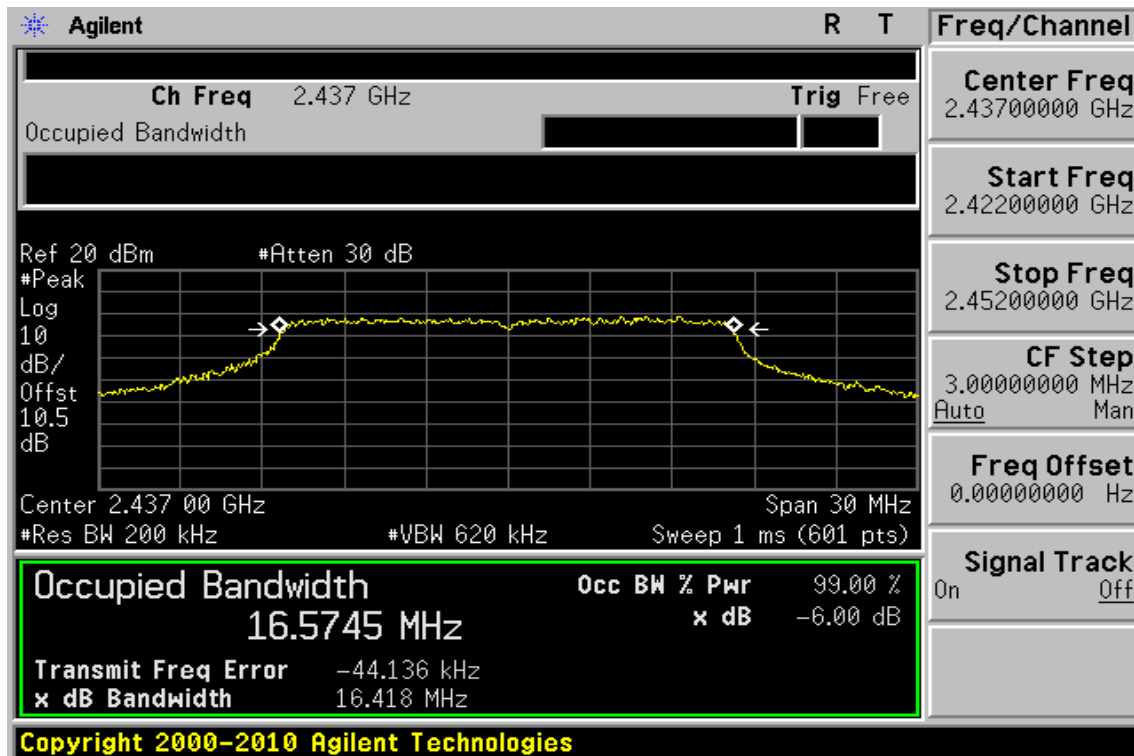


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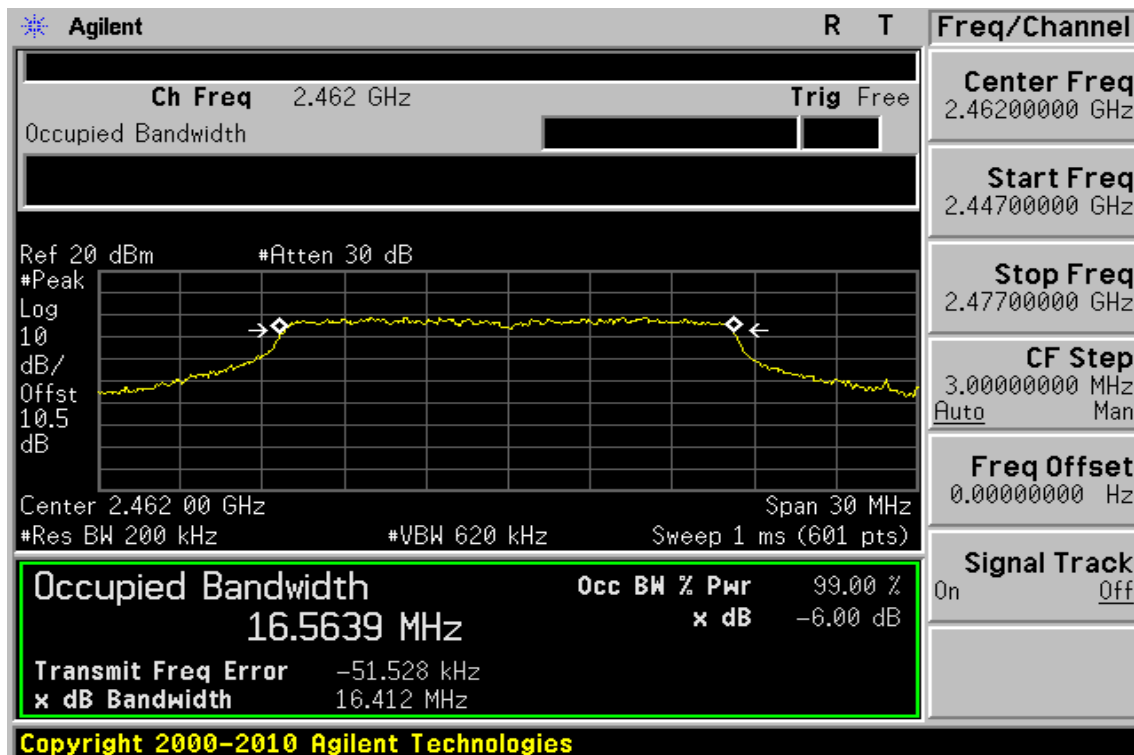
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## 6dB Band Width Test Data CH-Mid



## 6dB Band Width Test Data CH-High



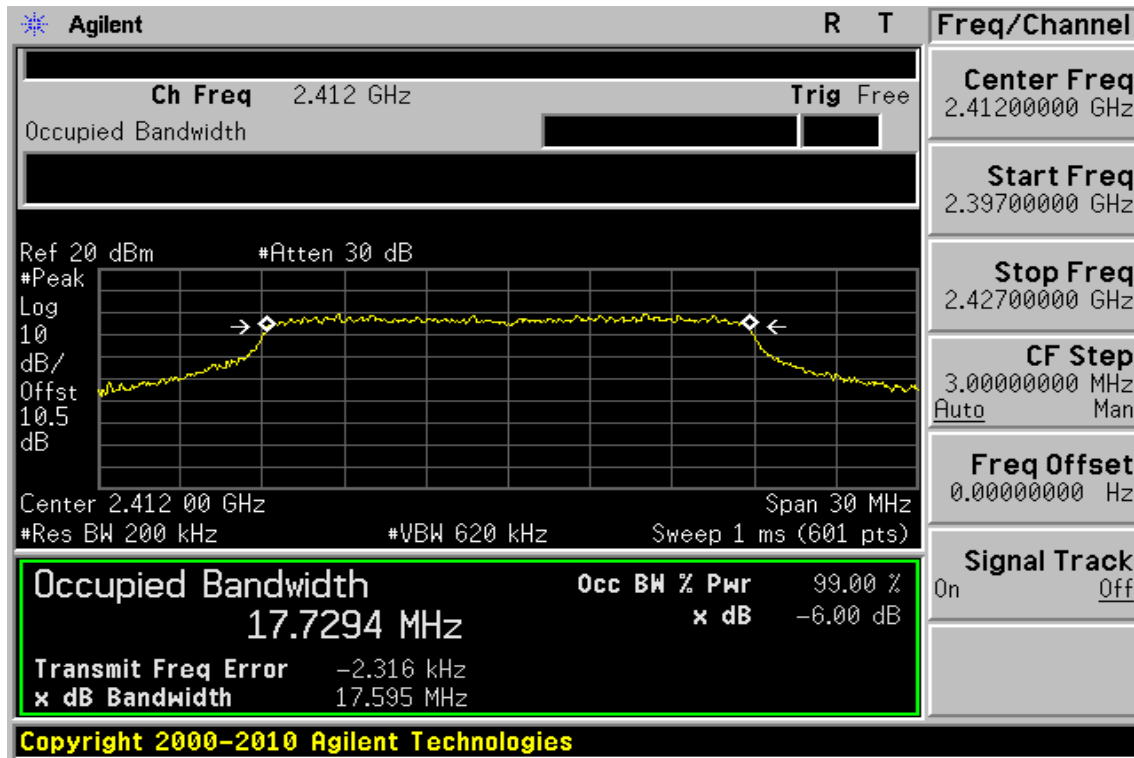
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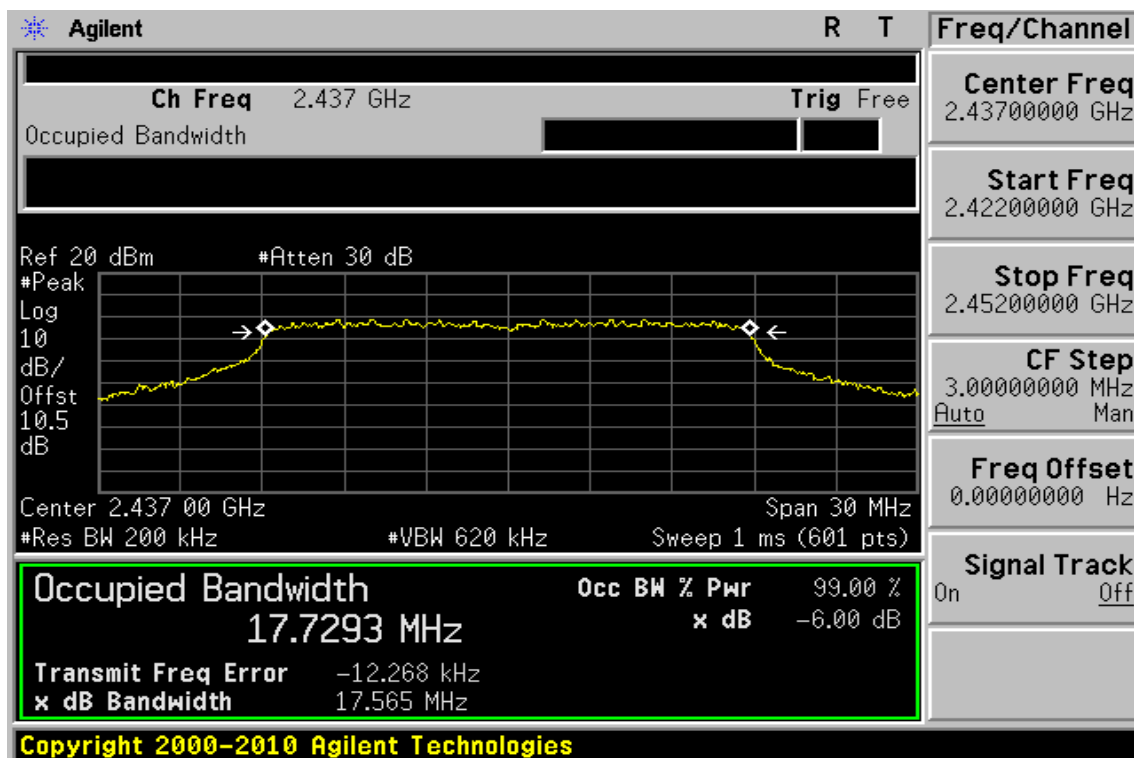
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## 802.11n\_20M

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



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

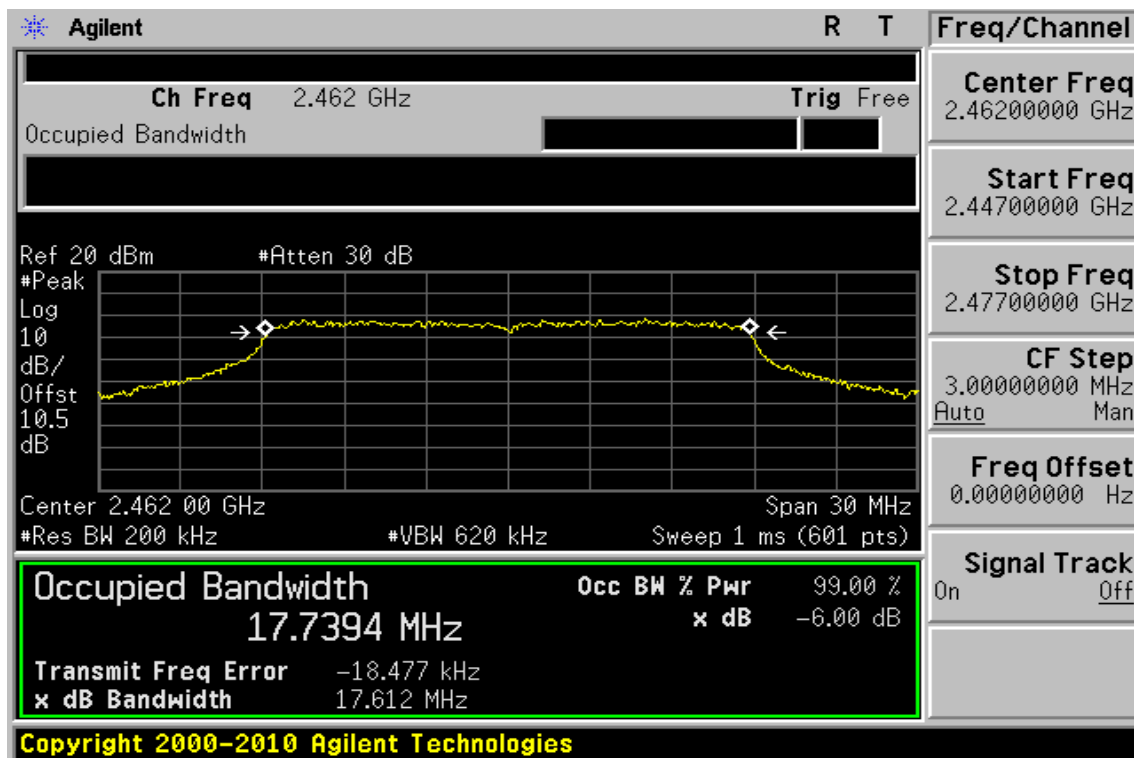


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## 6dB Band Width Test Data CH-High



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## 9 BAND EDGES MEASUREMENT

### 9.1 Standard Applicable:

According to §15.247(d), 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 100 kHz 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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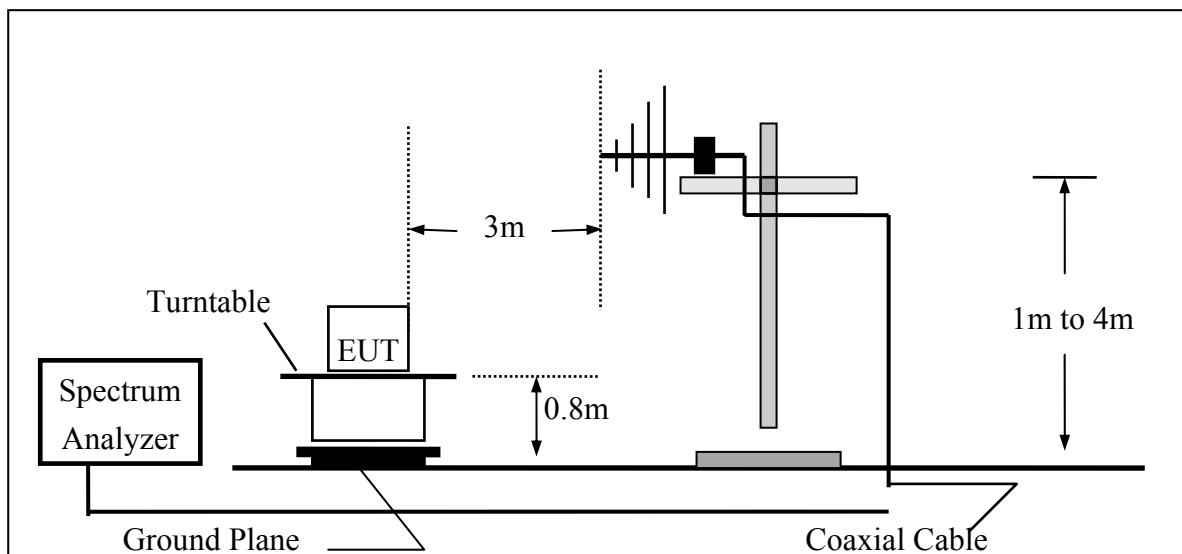
### 9.3 Test SET-UP:

#### 9.3.1 Conducted Emission at antenna port:

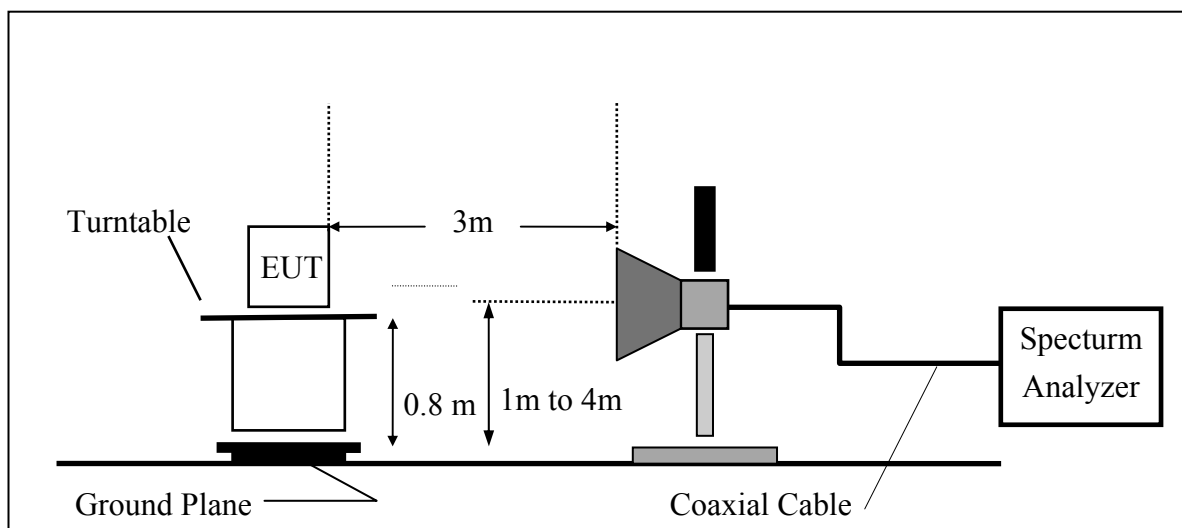
Refer to section 7.3 for details.

#### 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:

Unwanted Emissions into Non-Restricted Frequency Bands, Measurement Procedure followed by 11.1 of KDB558074 D01

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 start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
4. Set the spectrum analyzer as RBW, VBW=300KHz, Detector = Peak, Sweep = auto
5. Mark the highest reading of the emission as the reference level measurement.
6. Set DL as the limit = reading on marker 1 – 20dBm
7. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 KHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
8. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Unwanted Emission falling into Restricted Frequency Bands, Measurement Procedure followed by 12.1 of KDB558074 D01

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. On spectrum, following 8.1.2, and RBW = 1MHz, VBW = 3MHz, & Marker 2390MHz, and 2483.5MHz (Peak Measurement). Average Measurement: following 8.2 with the modification span to 1MHz, & RBW = 1MHz, VBW = 3MHz and peak marker function to obtain the highest reading on 2390, and 2483.5MHz.
8. Repeat above procedures until all default test channel (low, middle, and high) was 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.

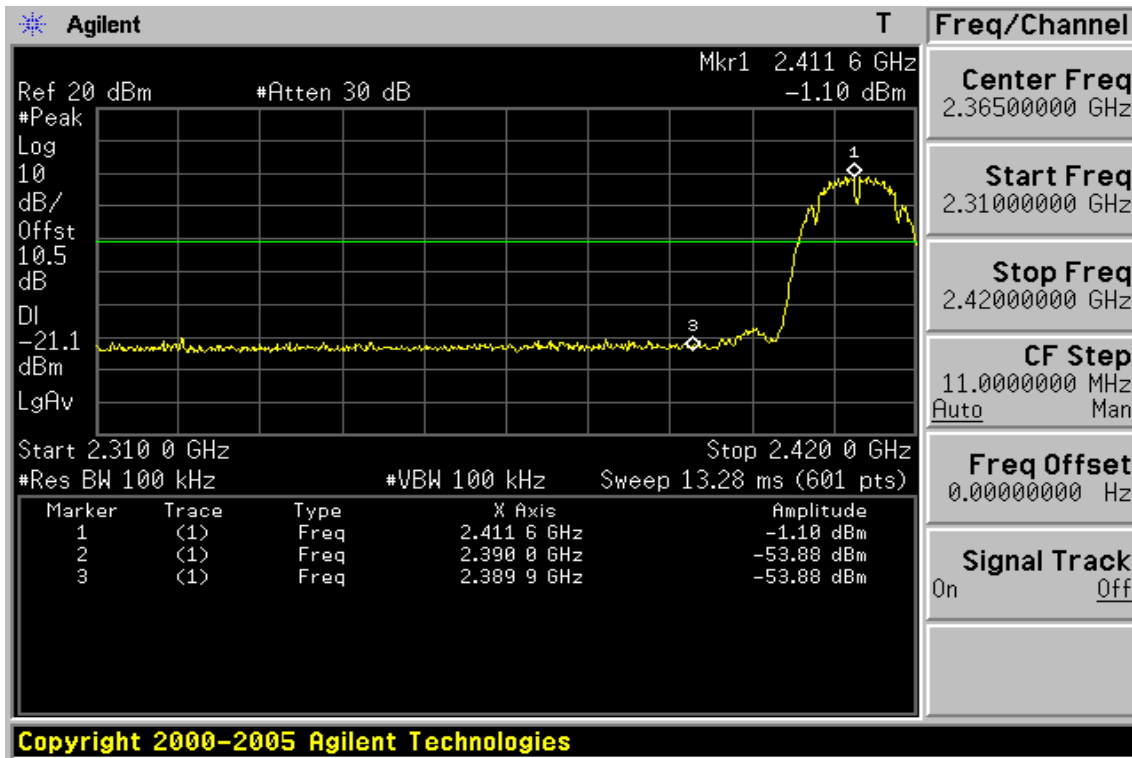
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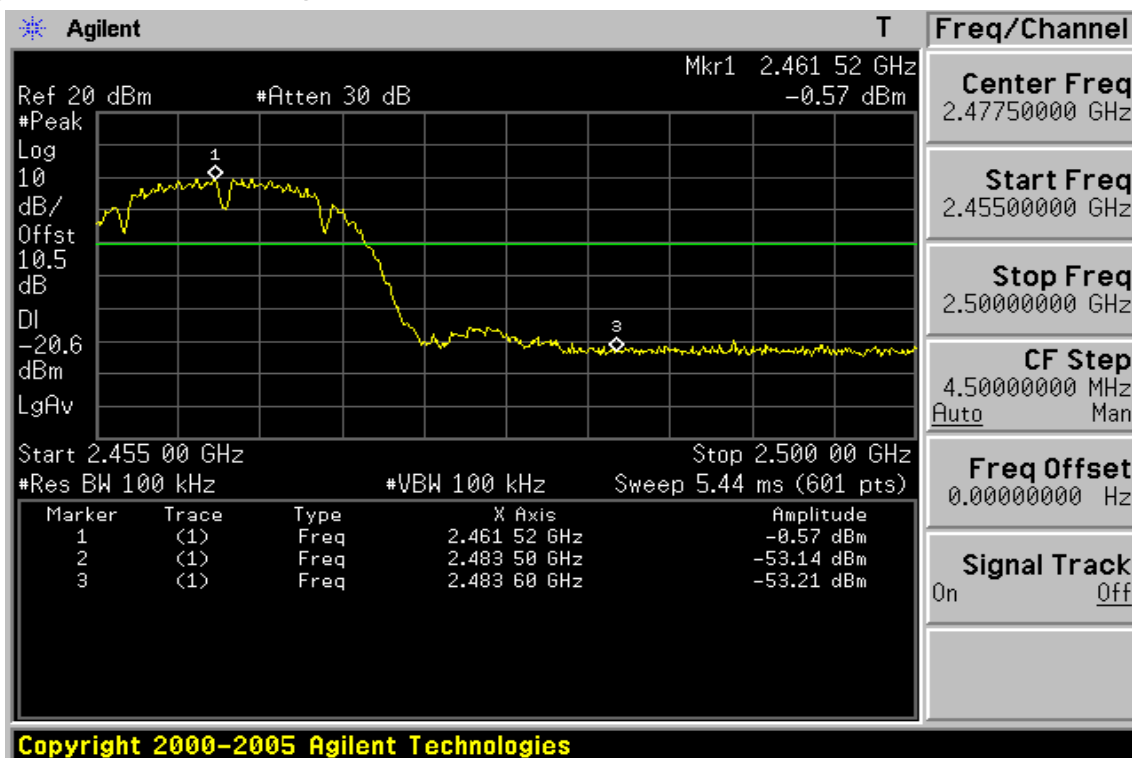
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## 802.11b

### 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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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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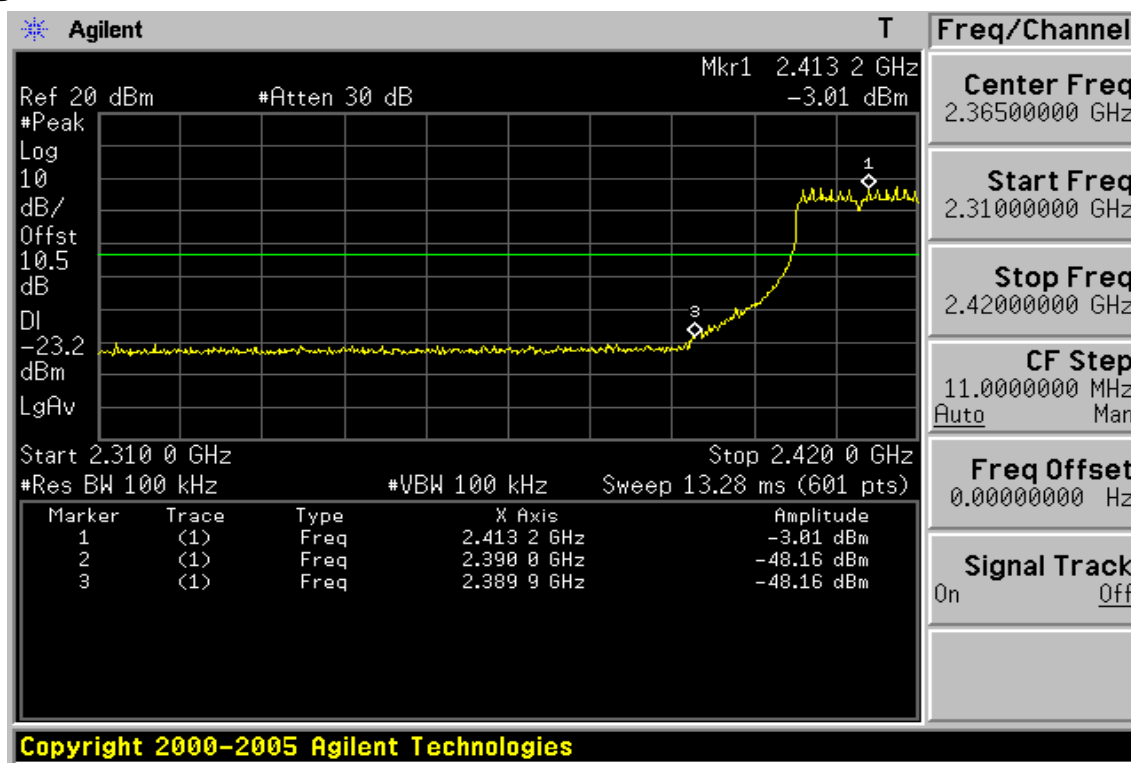
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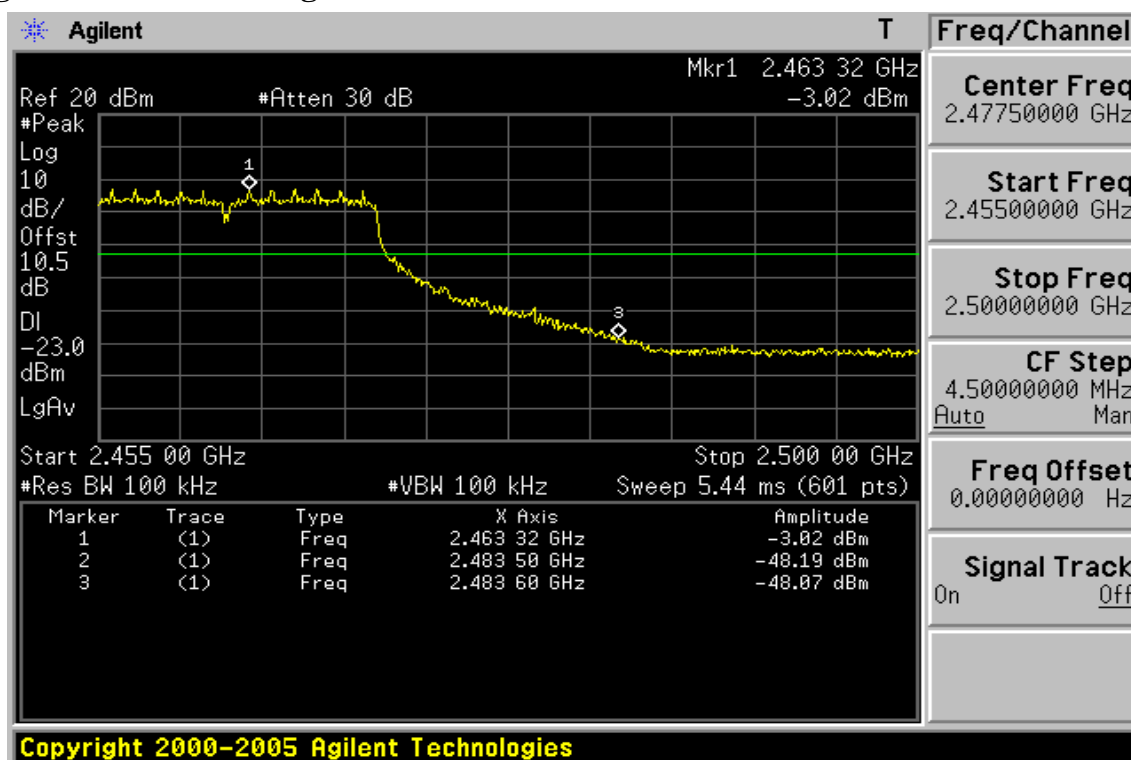


## 802.11g

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



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### Radiated Emission: 802.11g 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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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

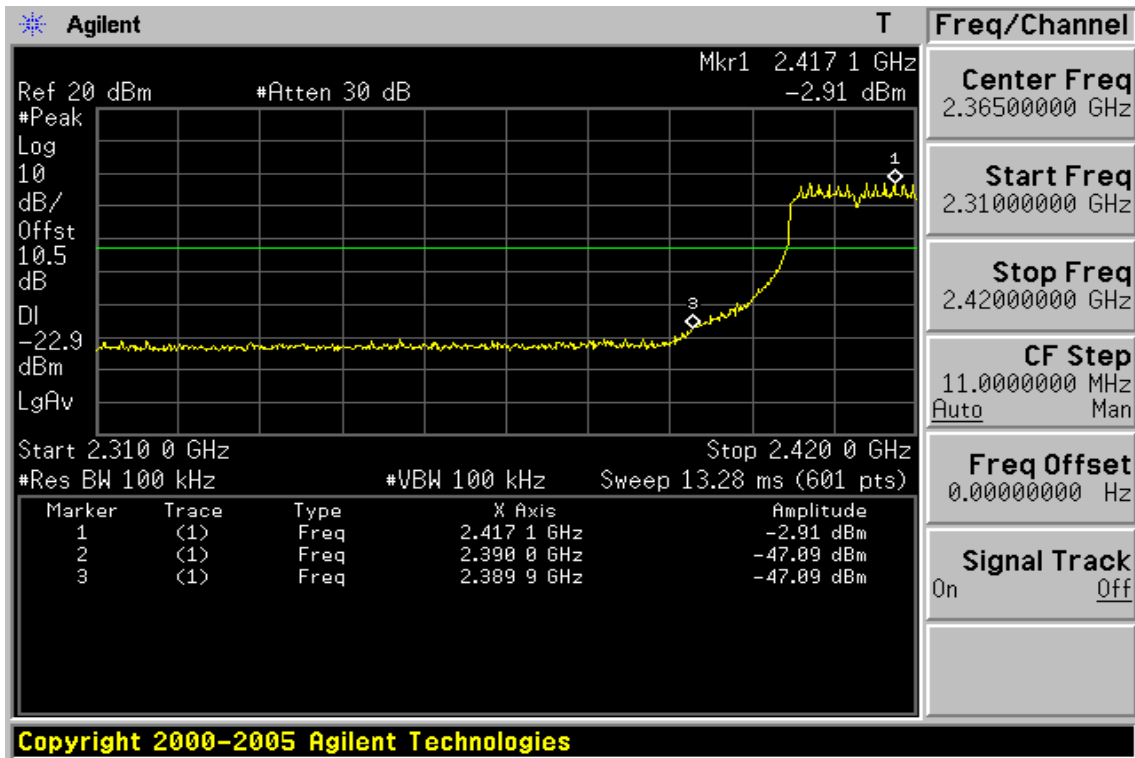
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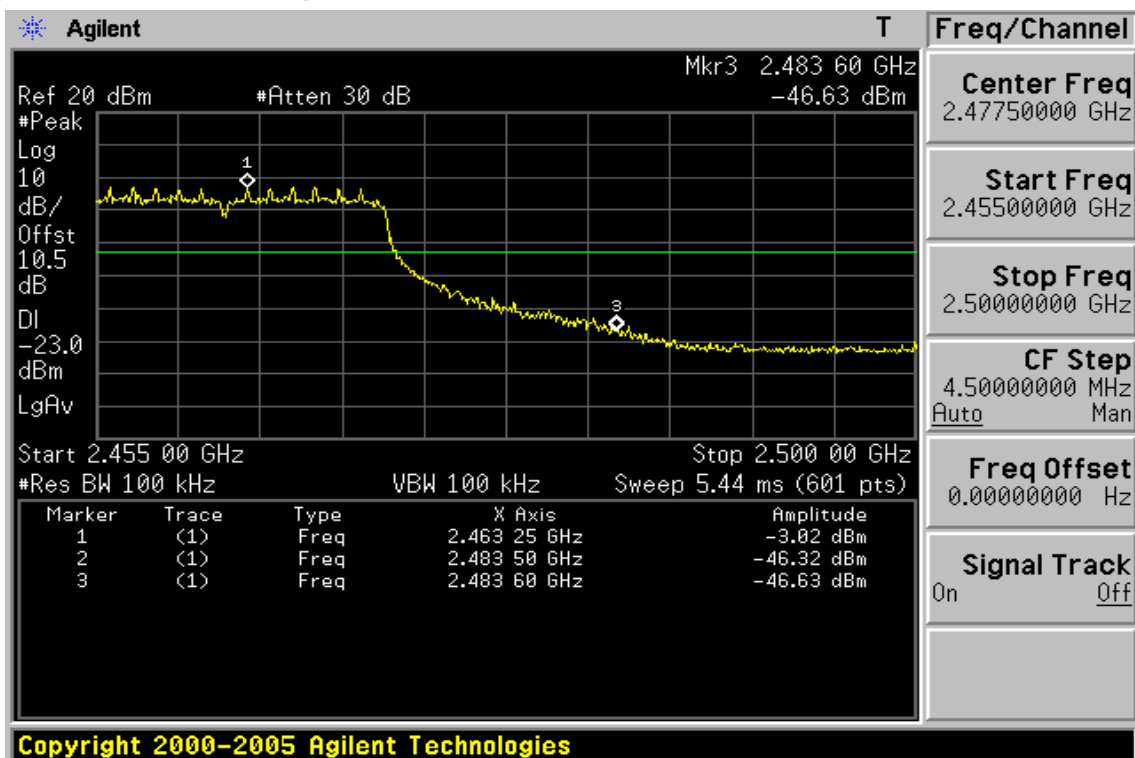
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## 802.11n\_20M

## 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 EMISSION TEST

### 10.1 Standard Applicable

According to §15.247(d),

Emission at antenna port:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Radiated Spurious Emission

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

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. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
7. Repeat above procedures until all default test channel measured were complete.

### Conducted Emission:

1. To connect Antenna Port of EUT to Spectrum.
2. Set RBW = 100K & VBW = 300K on Spectrum.
3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30 to 3G, 3G to 8G, 8G to 13G, 13G to 18G and 18G to 26.5GHz, 18G to 40GHz (applicable if operation mode is 5GHz)
4. Via Software, combine 5 spans of frequency range into one plot
5. Repeat above procedures until all default test channel measured were complete.

## 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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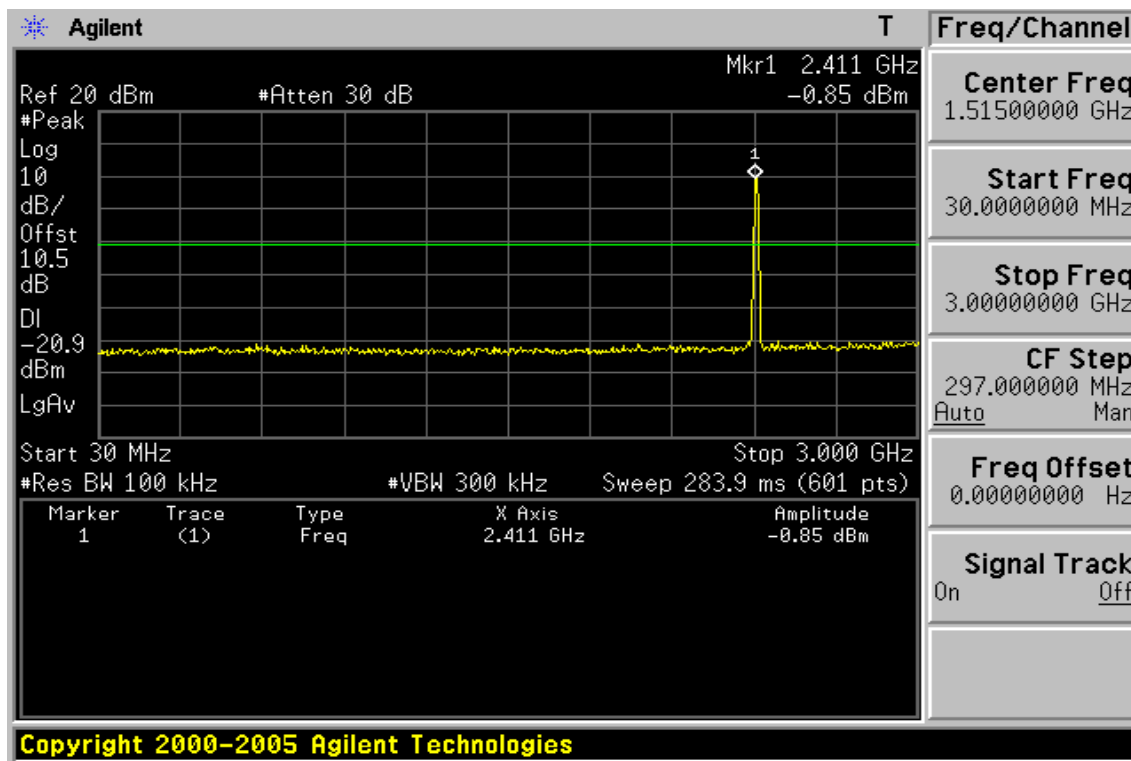
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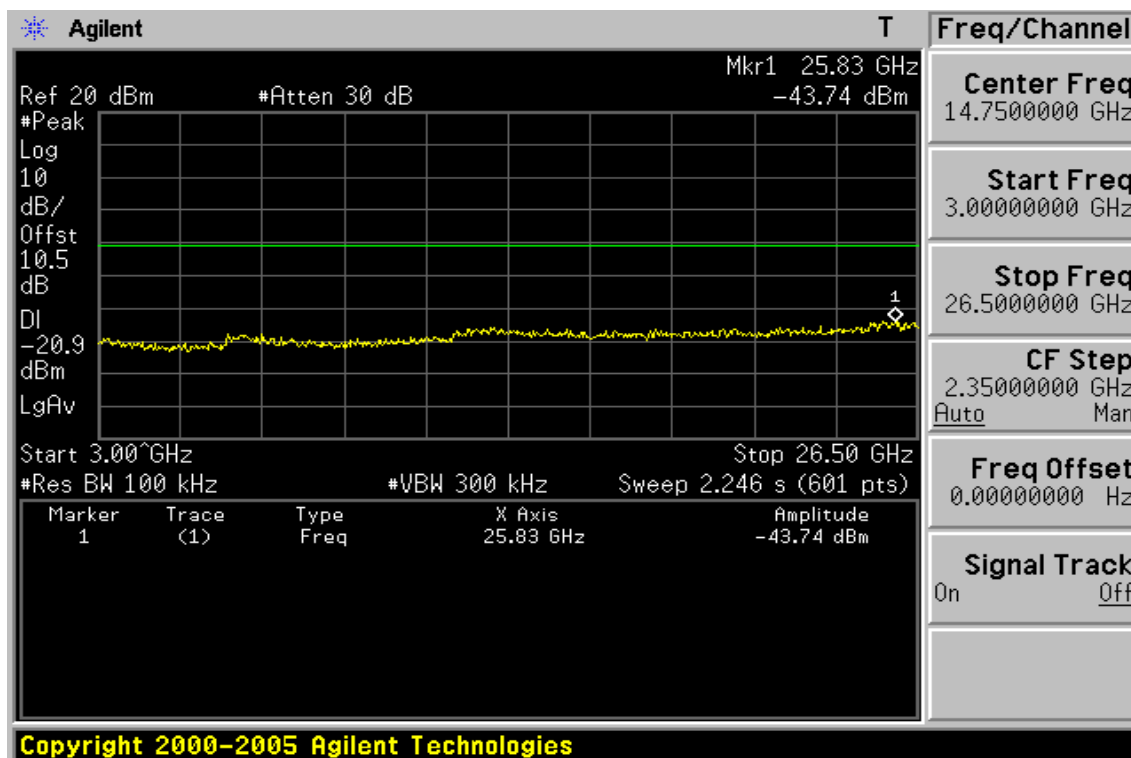


## Conducted Spurious Emission Measurement Result (802.11b)

### Ch Low 30MHz – 3GHz



### Ch Low 3GHz – 26.5GHz



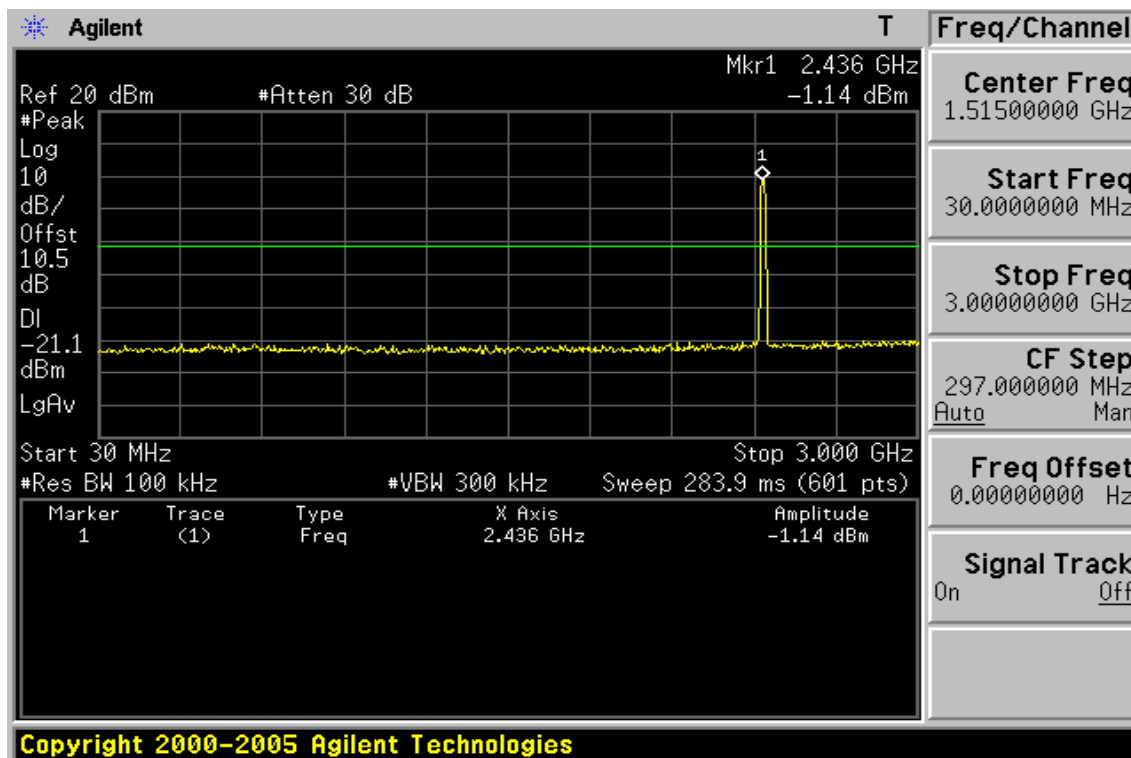
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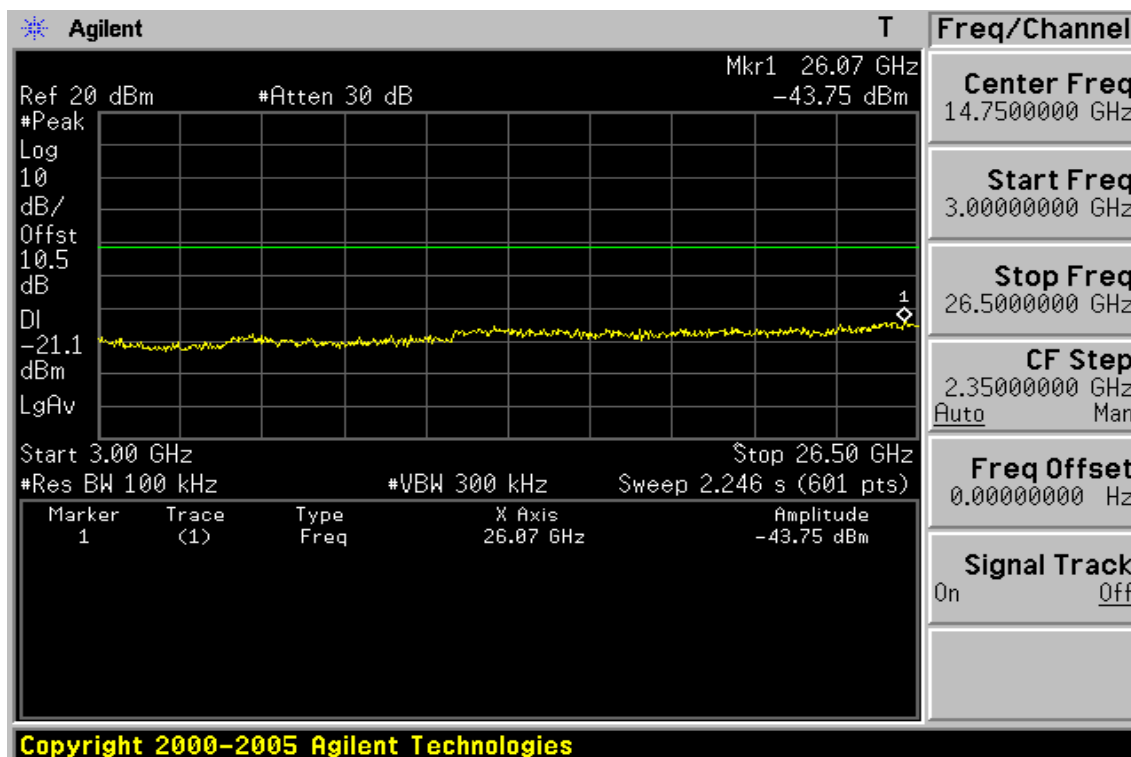
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

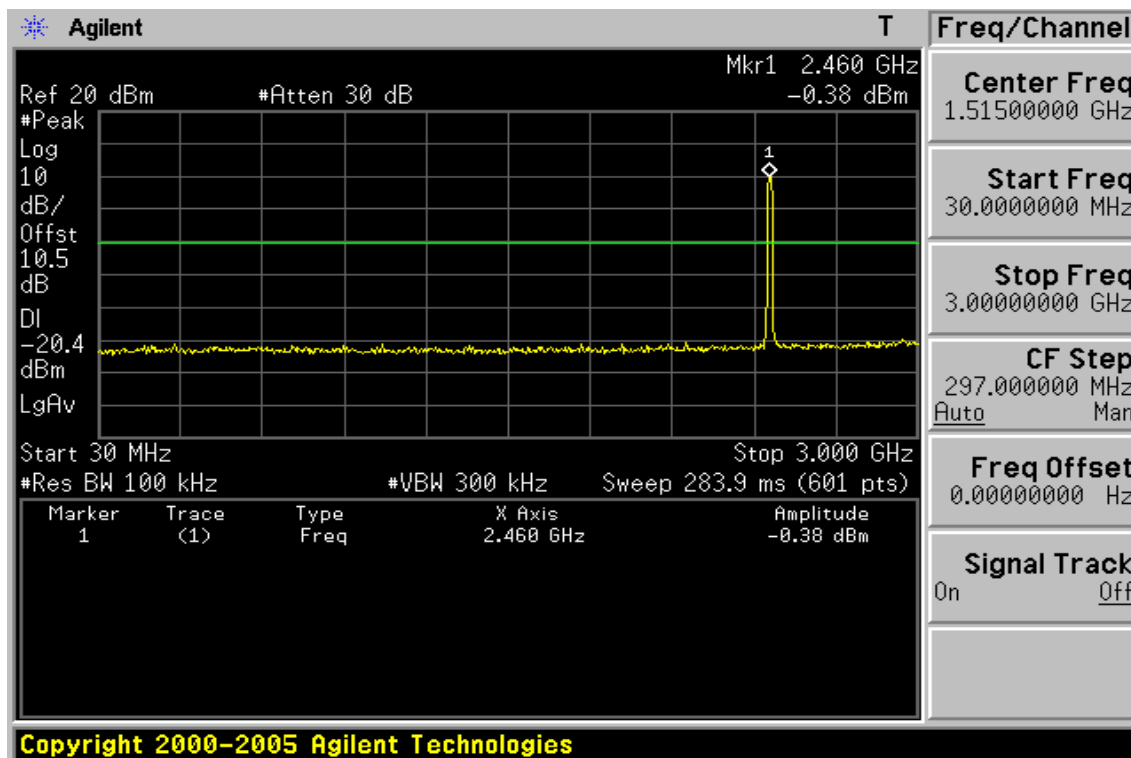


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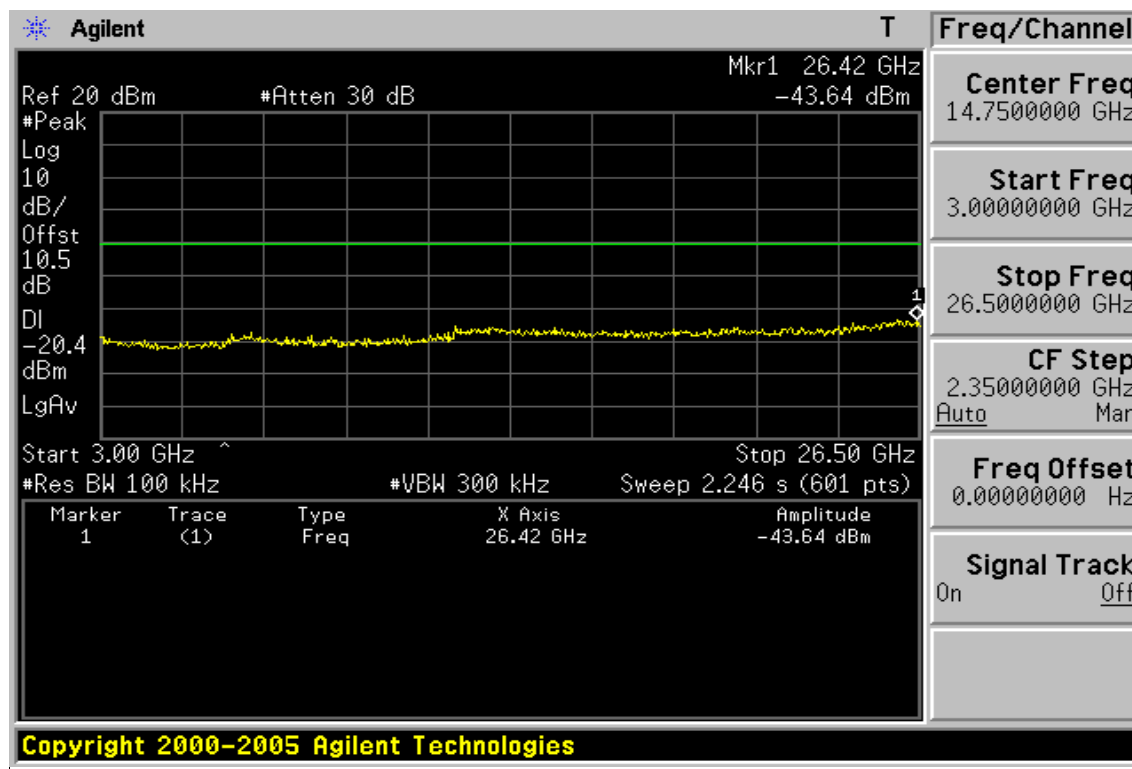
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



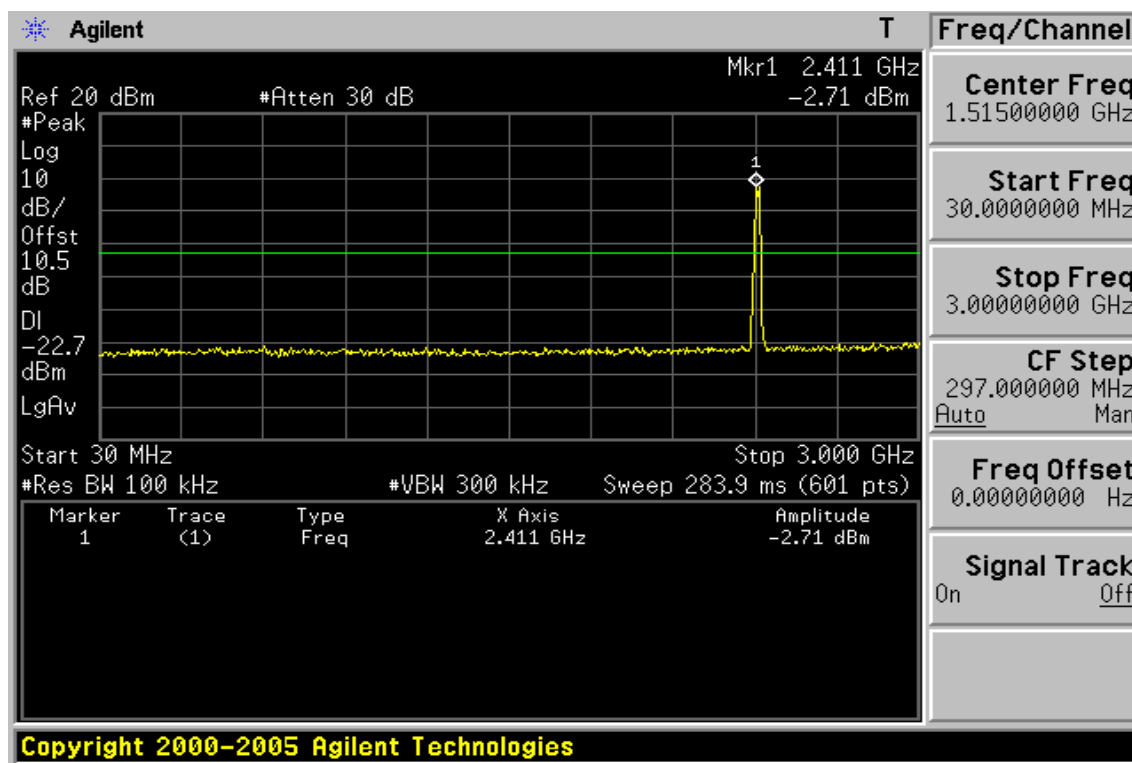
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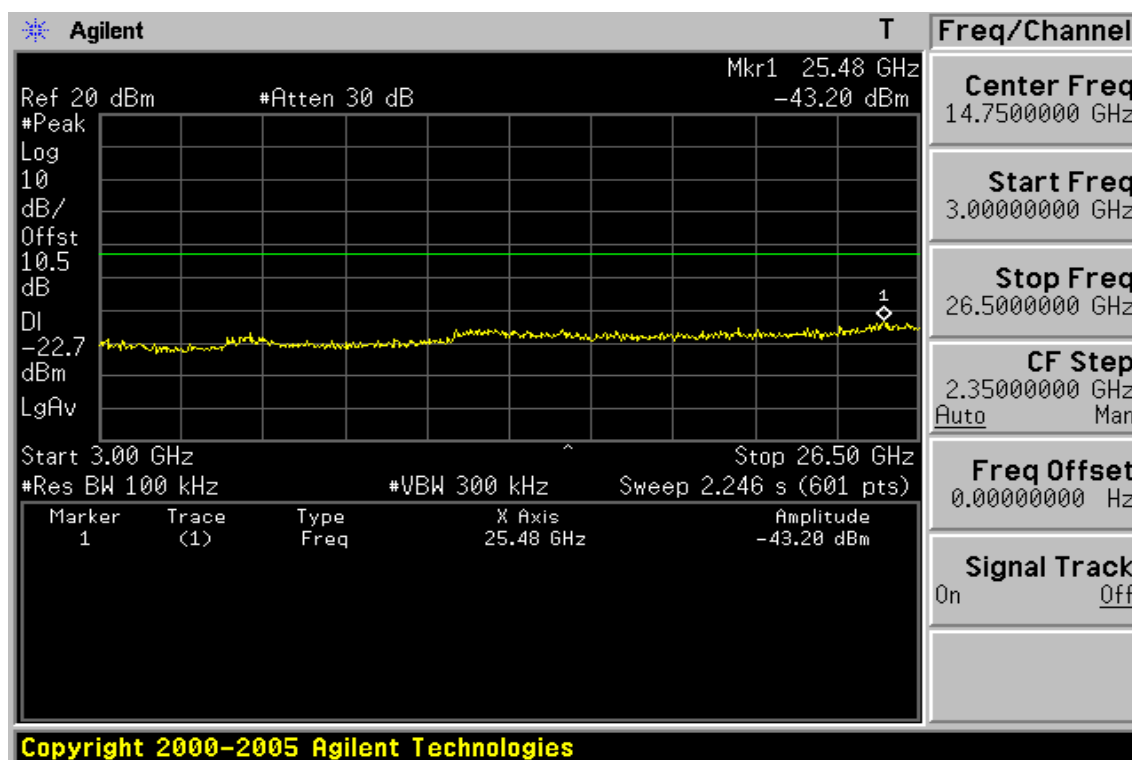
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## Conducted Spurious Emission Measurement Result (802.11g)

### Ch Low 30MHz – 3GHz



### Ch Low 3GHz – 26.5GHz

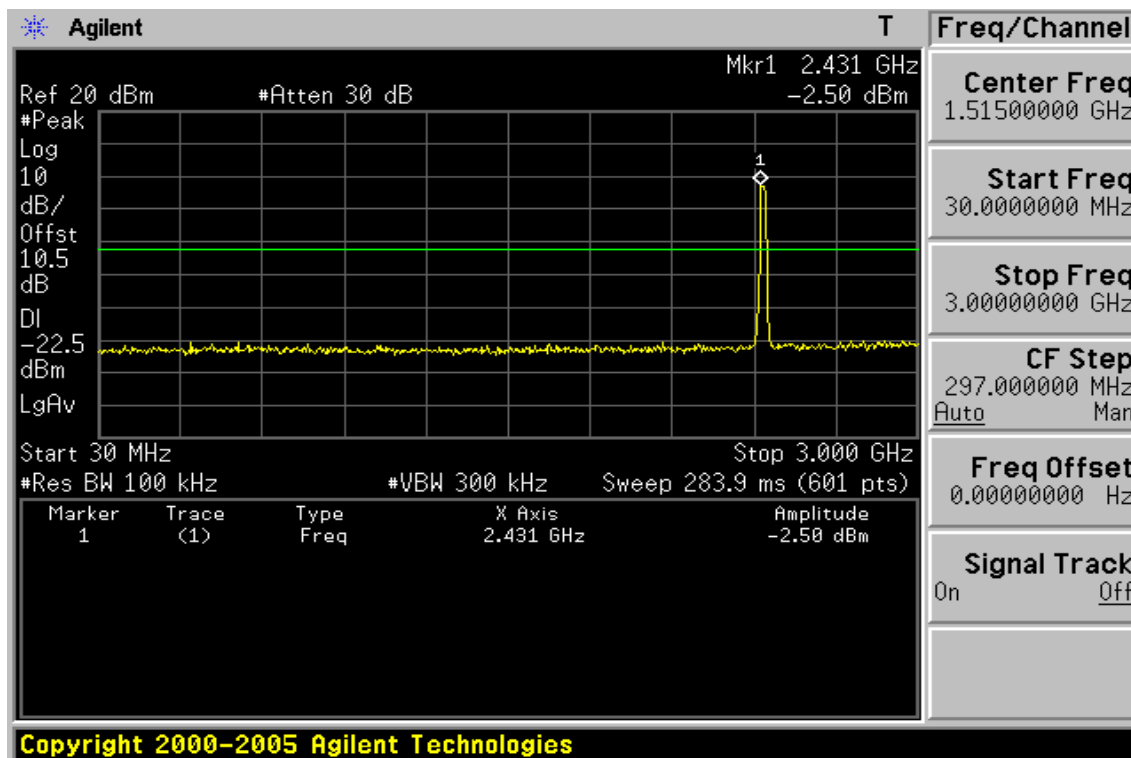


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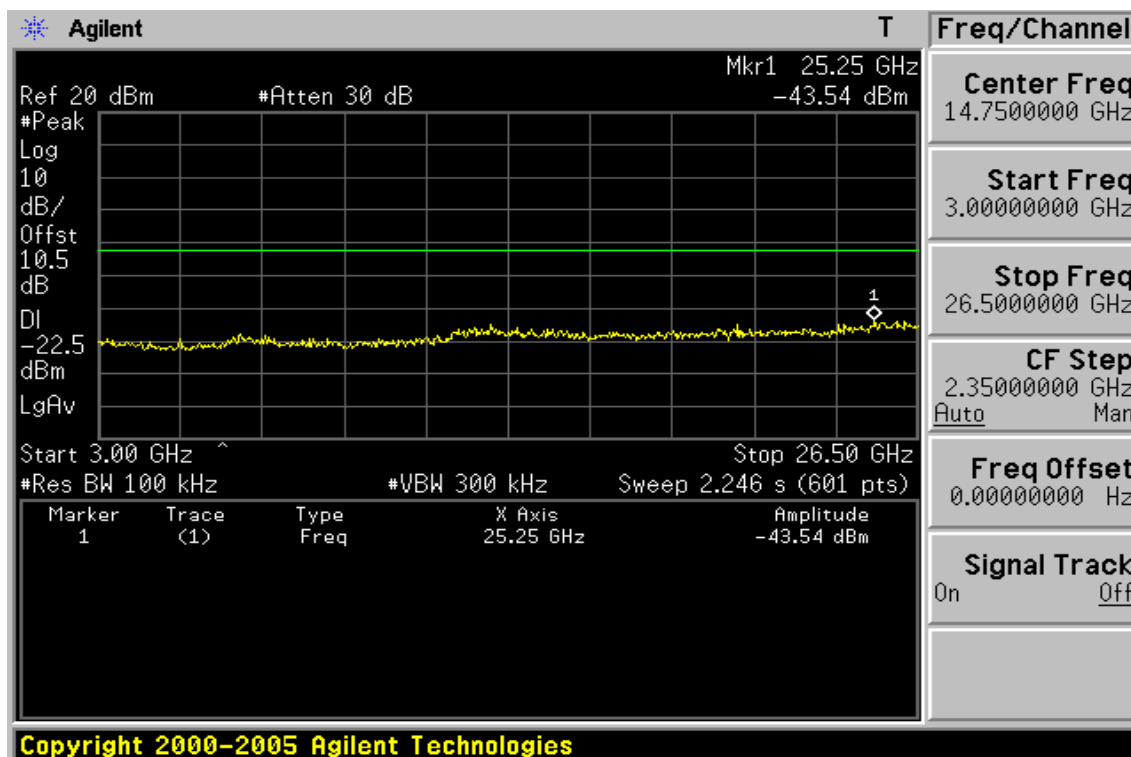
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

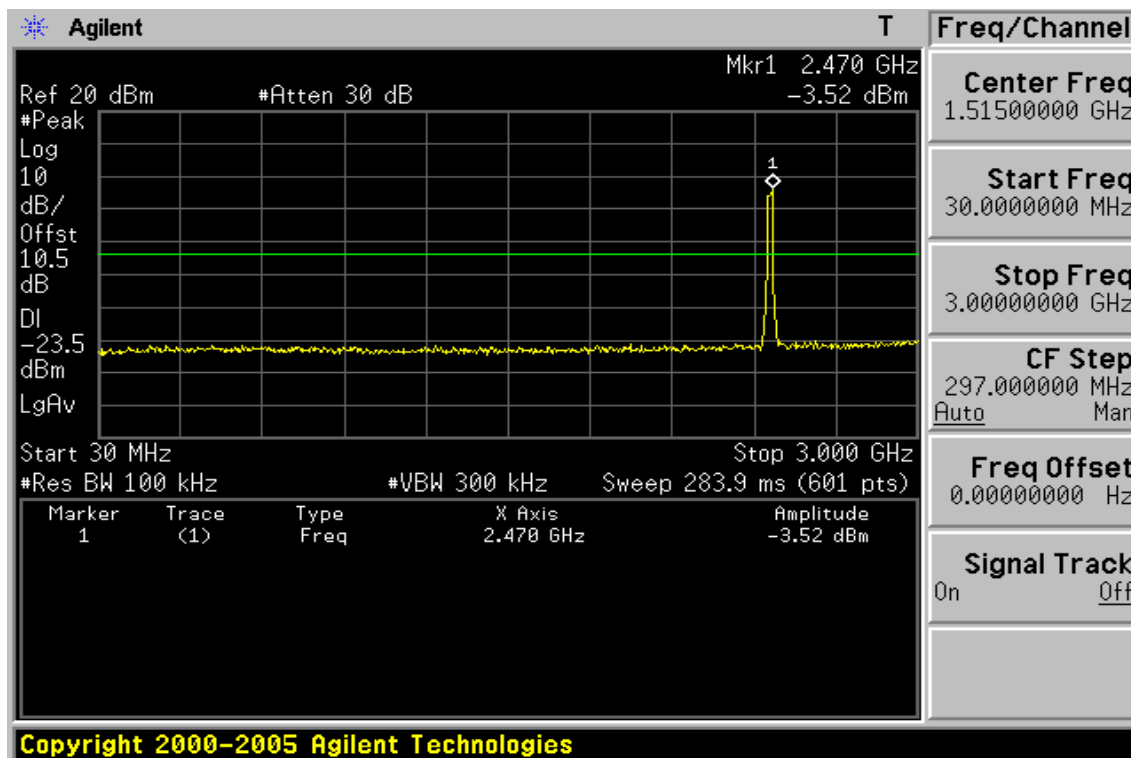


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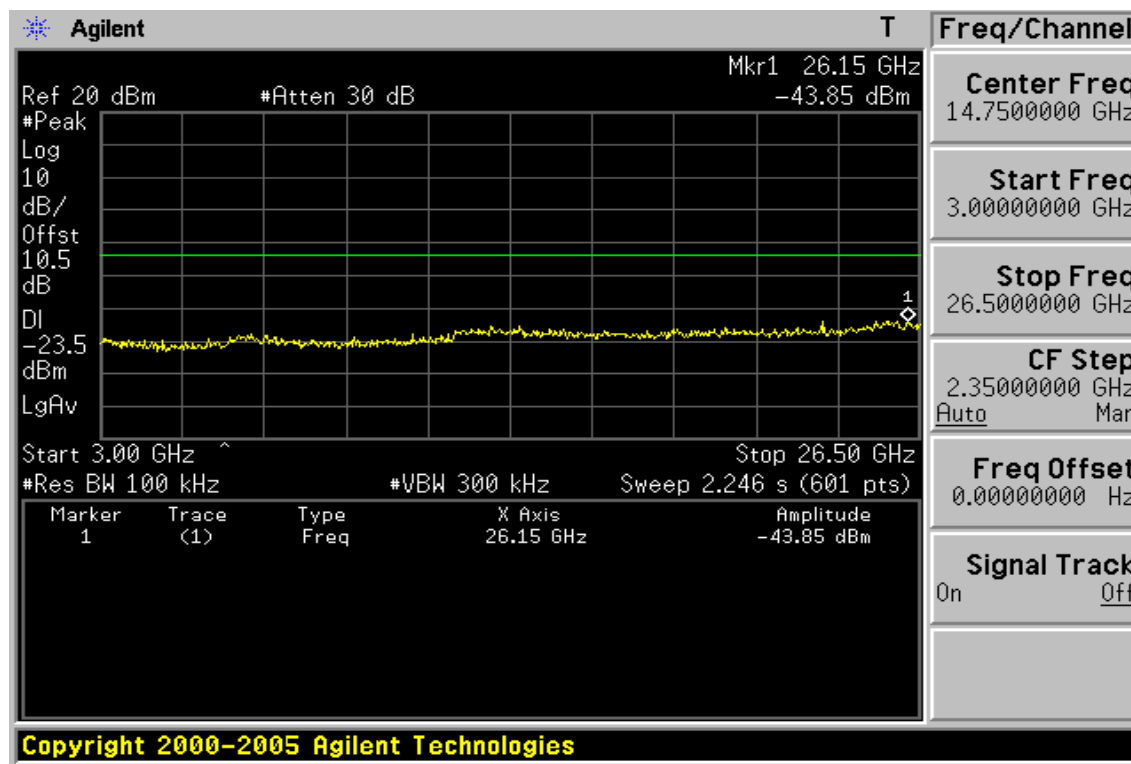
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



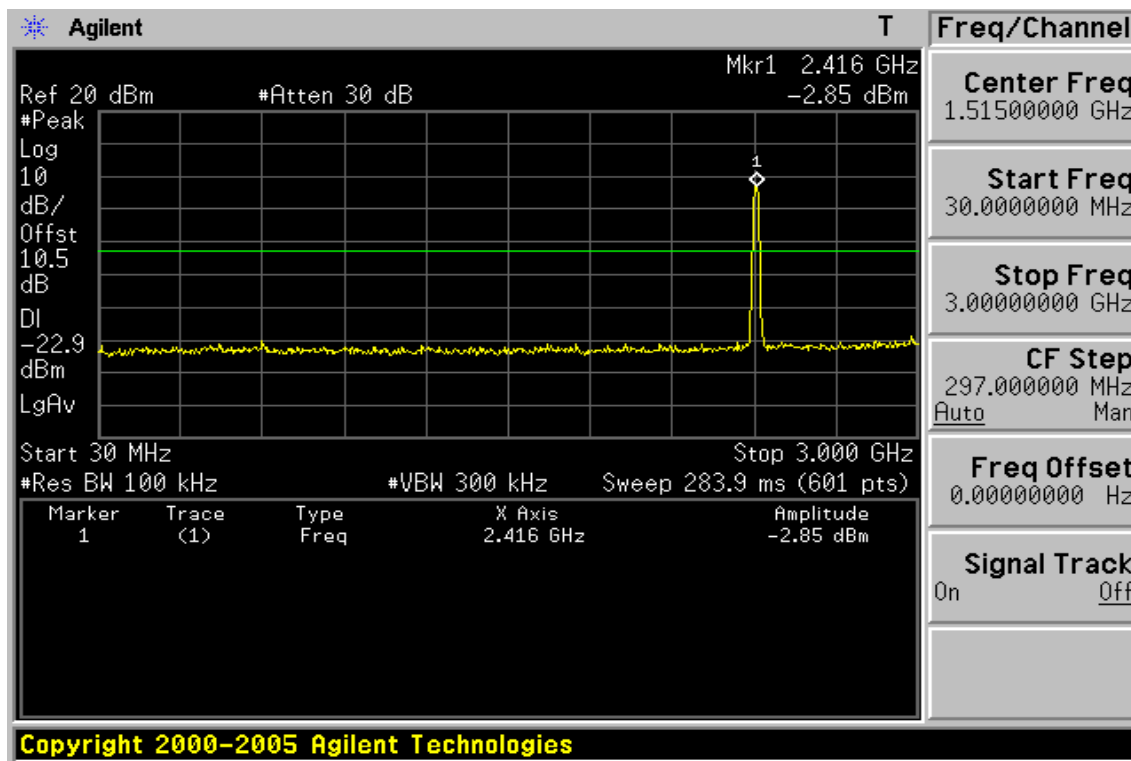
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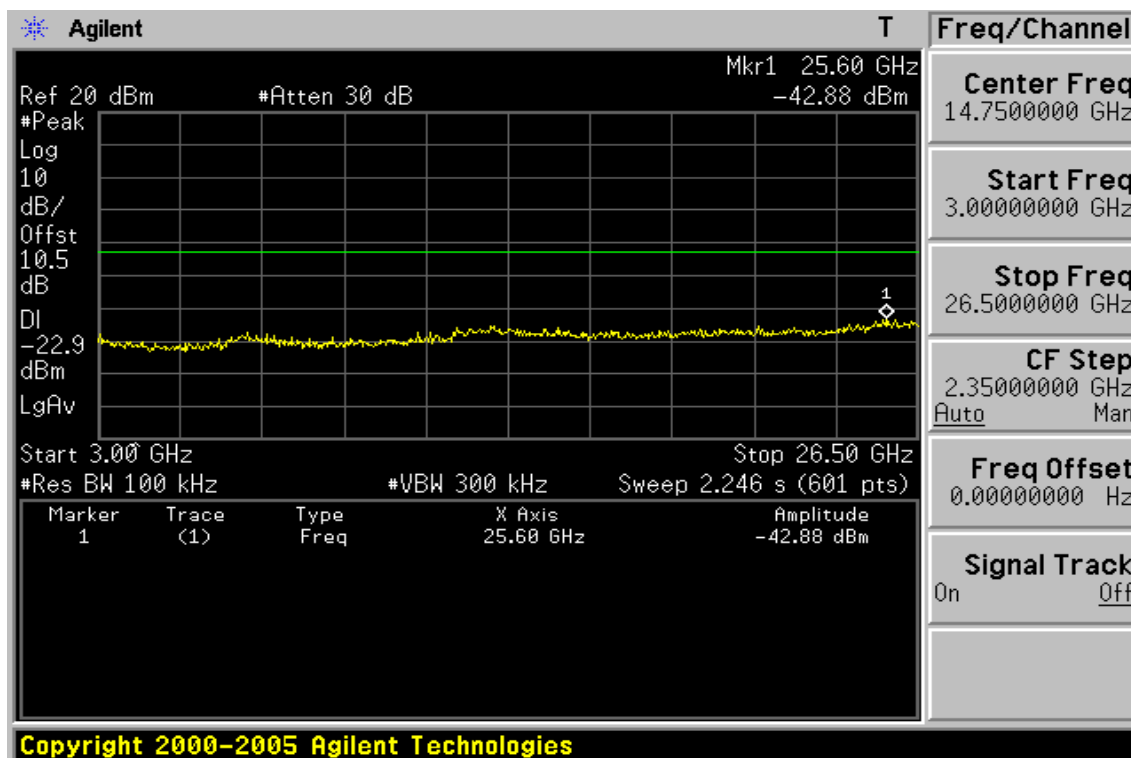
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## Conducted Spurious Emission Measurement Result (802.11n\_20M)

### Ch Low 30MHz – 3GHz



### Ch Low 3GHz – 26.5GHz

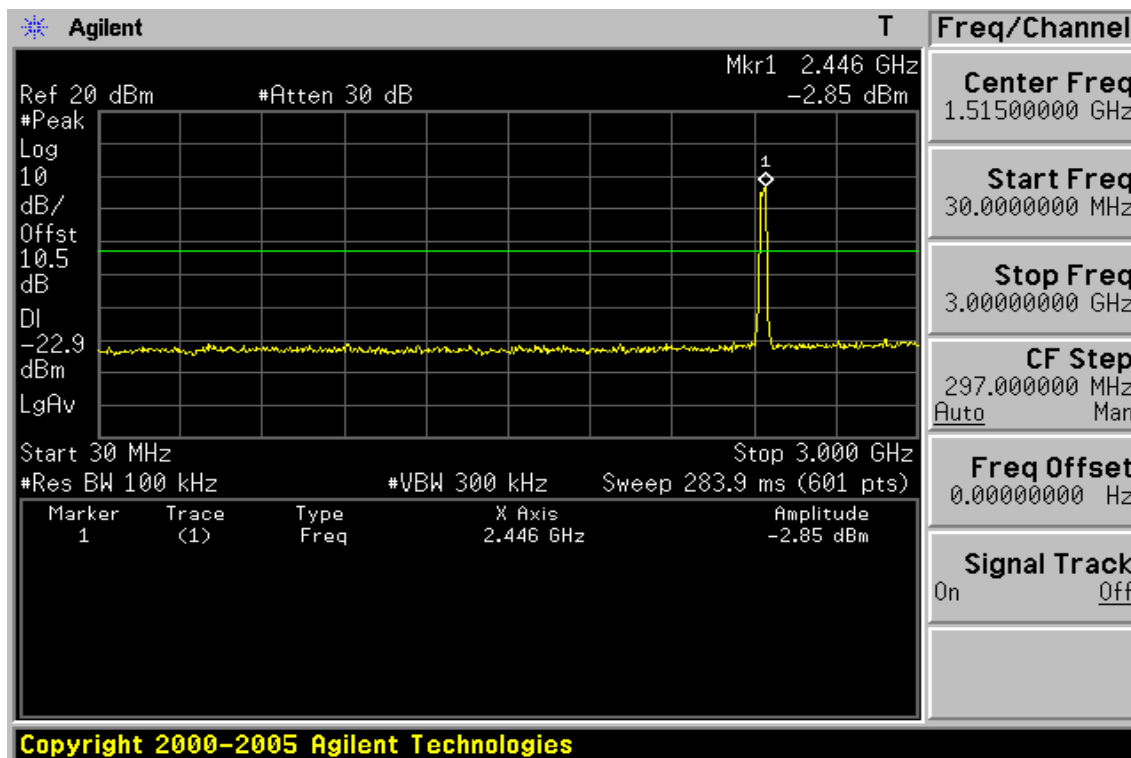


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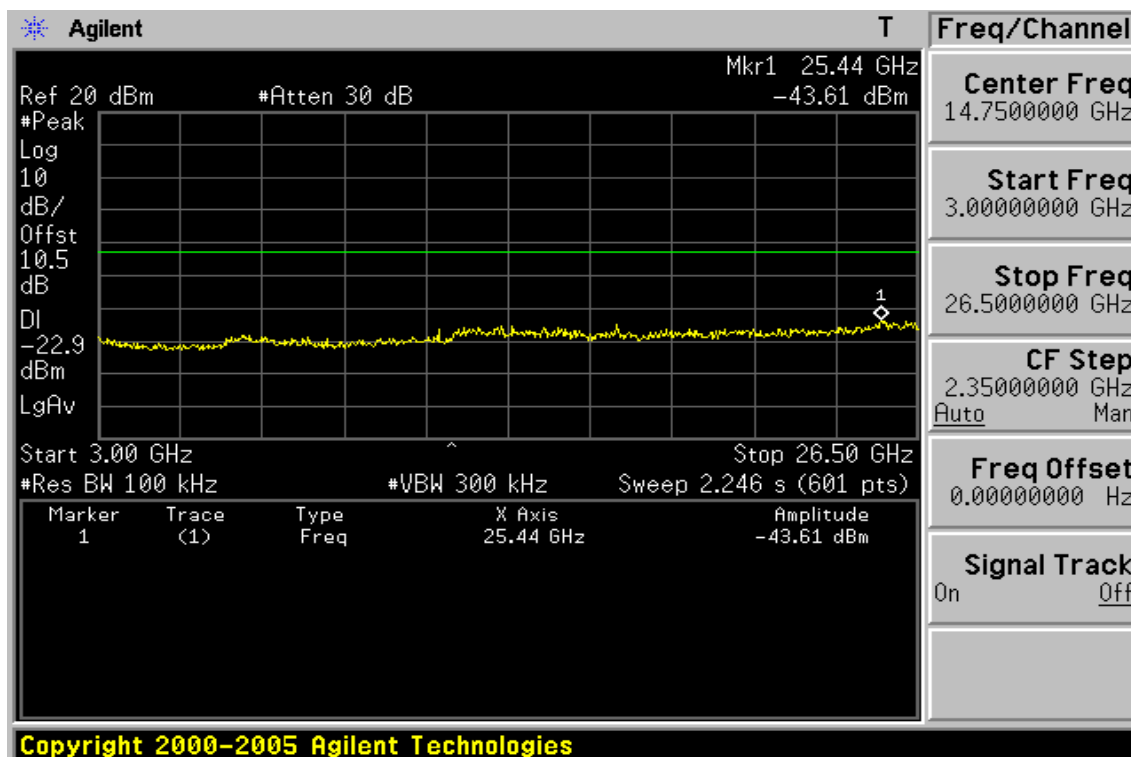
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

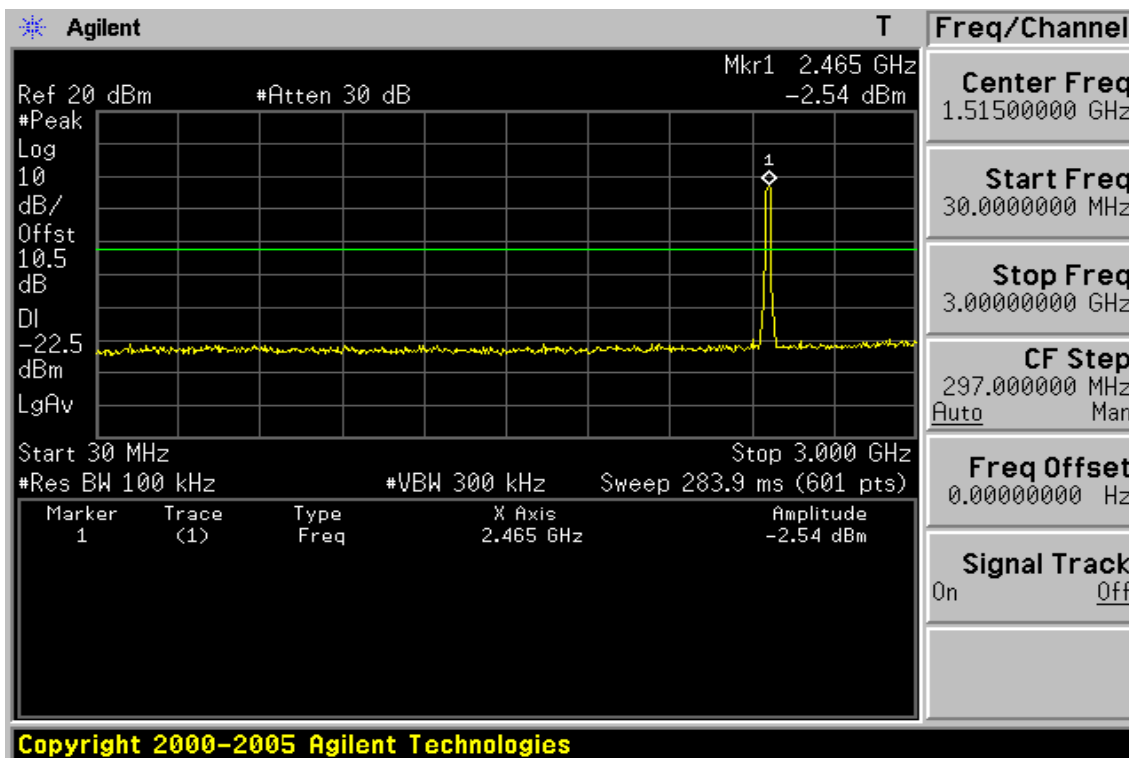


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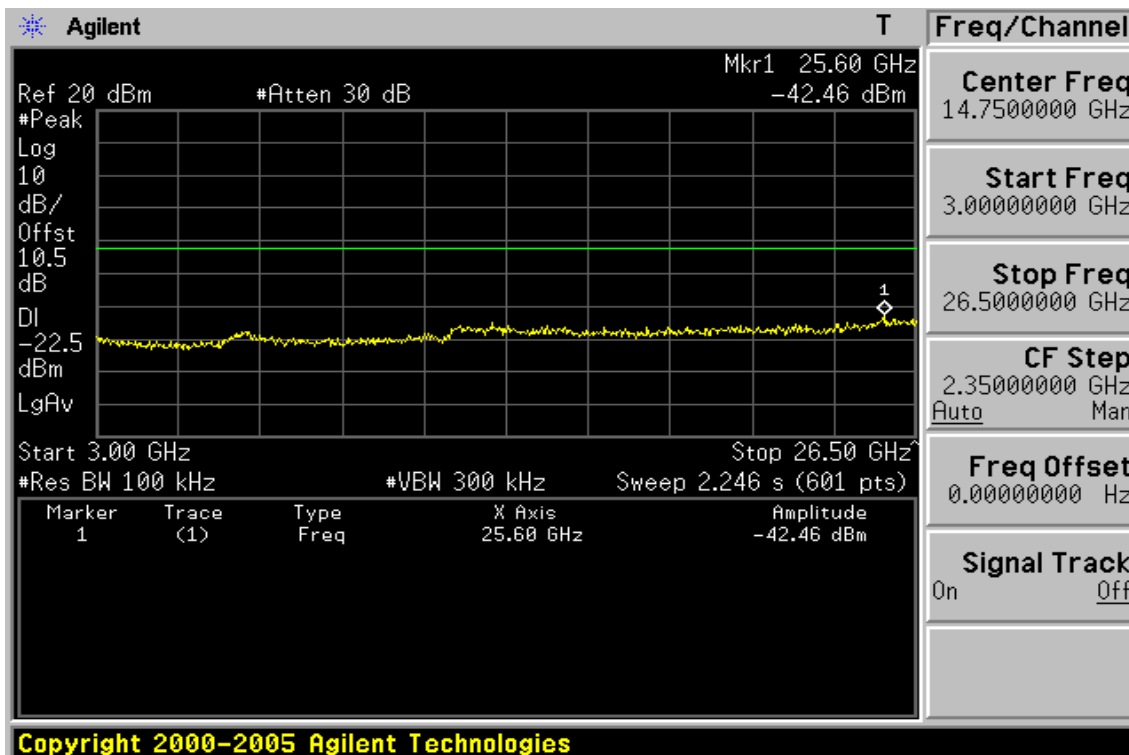
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## Ch High 30MHz – 3GHz



## 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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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 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	40.45	-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
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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 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	41.07	-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.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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
		Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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	Spectrum	Factor	Actual	Limit	Margin
		Mode	Reading Level		FS	@3m	
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 8dBm 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 (following the measurement procedure 10.2 of KDB558074):

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW  $\geq 3$  kHz.
4. Set the VBW  $\geq 3 \times$  RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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## 11.5 Measurement Result:

### 802.11b

Frequency MHz	RF Power Density	Maximum Limit
	Reading (dBm)	(dBm)
2412	-18.06	8
2437	-17.54	8
2462	-17.42	8

### 802.11g

Frequency MHz	RF Power Density	Maximum Limit
	Reading (dBm)	(dBm)
2412	-19.36	8
2437	-19.11	8
2462	-18.89	8

### 802.11n\_20M

Frequency MHz	RF Power Density	Maximum Limit
	Reading (dBm)	(dBm)
2412	-19.46	8
2437	-19.45	8
2462	-18.35	8

\* Note: Offset 10.5dB for 2.4G 802.11b/g/n\_20

Note: Refer to next page for plots.

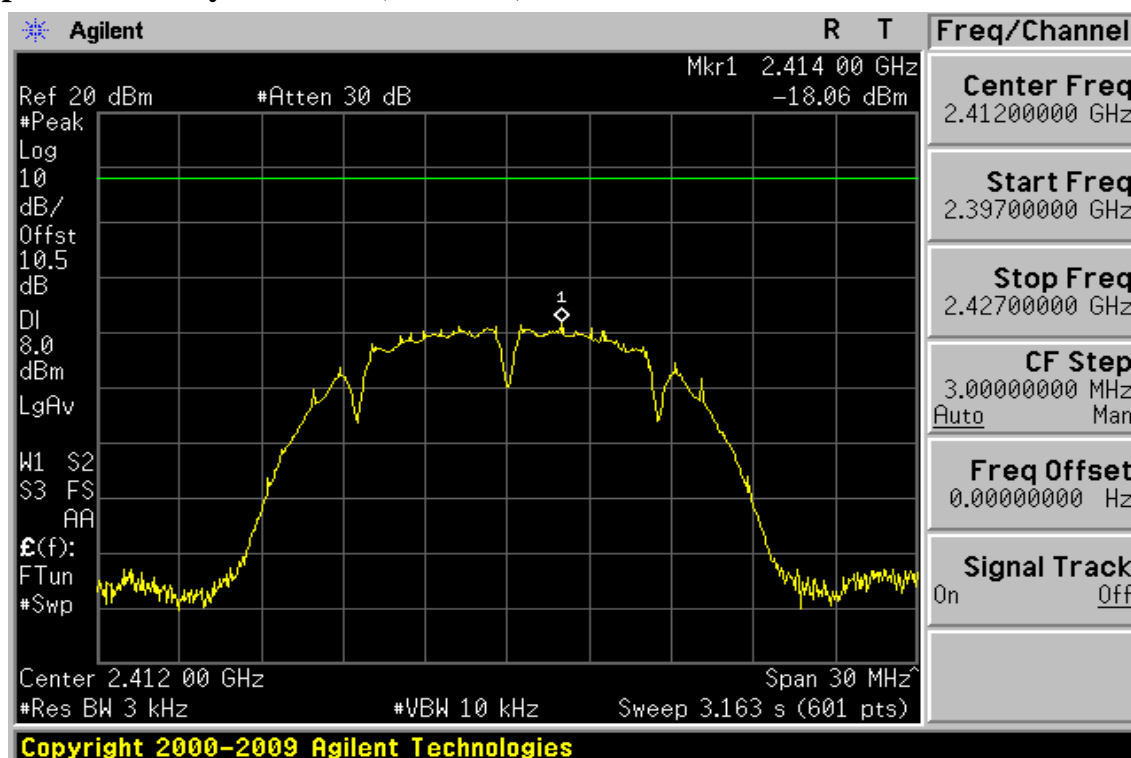
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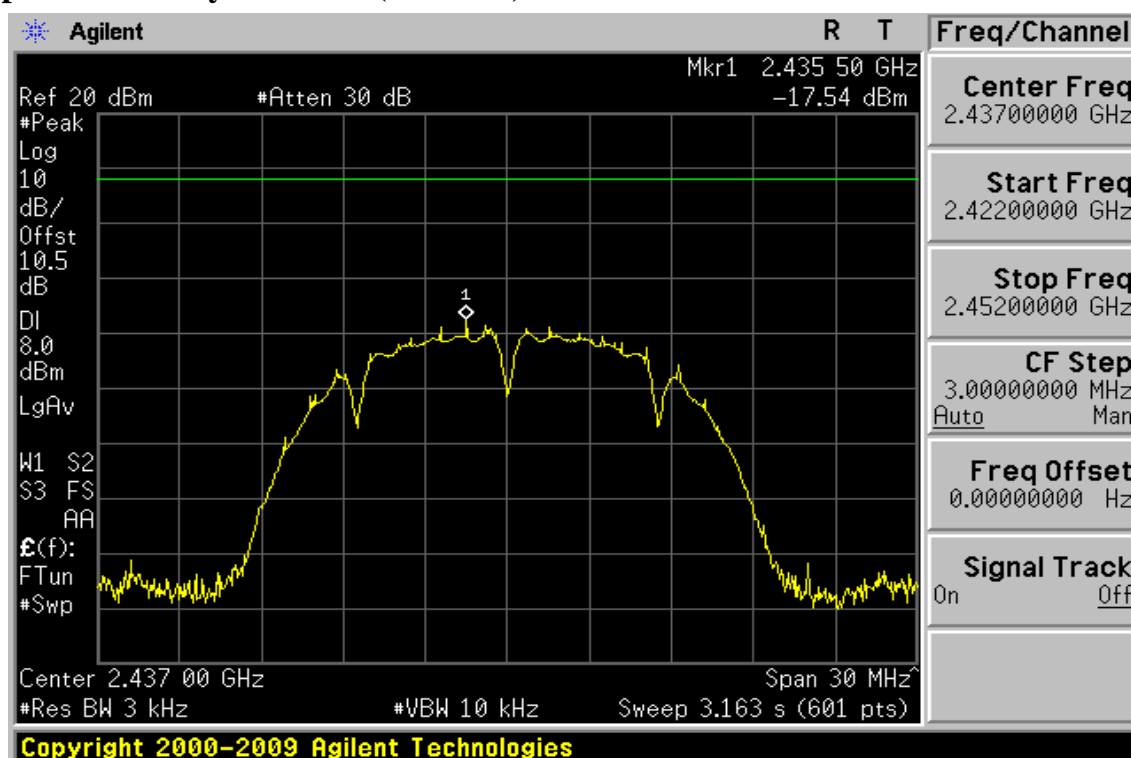
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## 802.11b

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



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

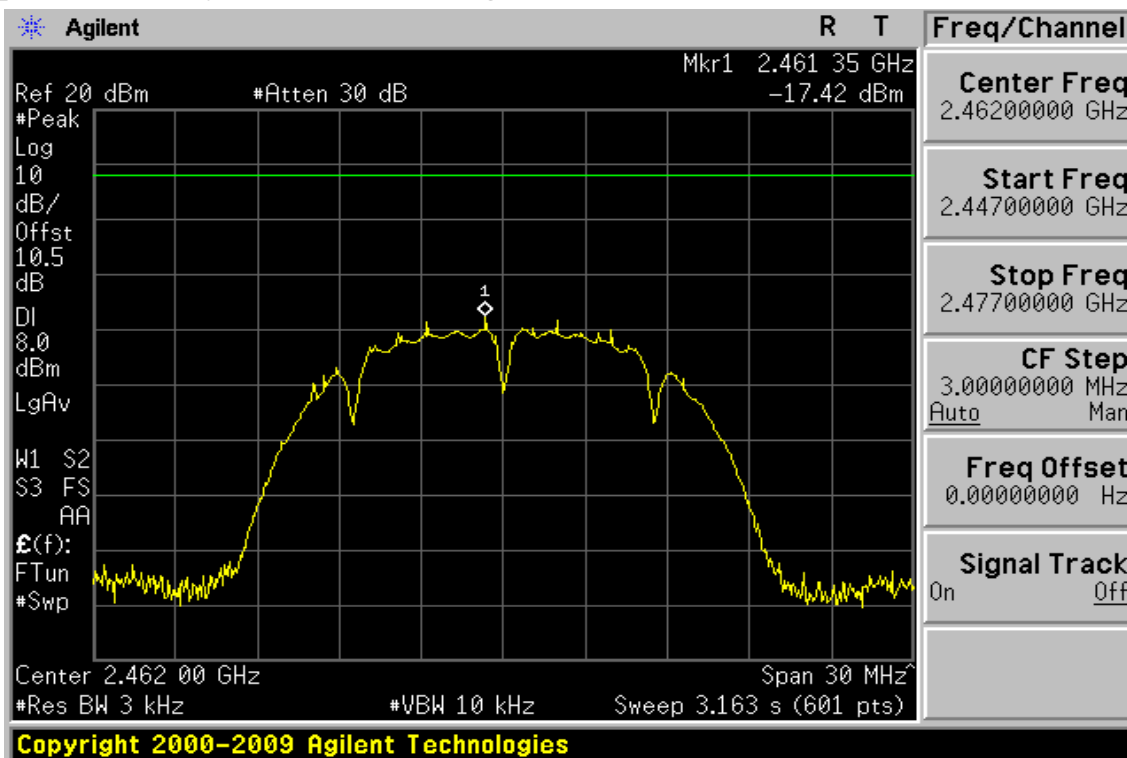


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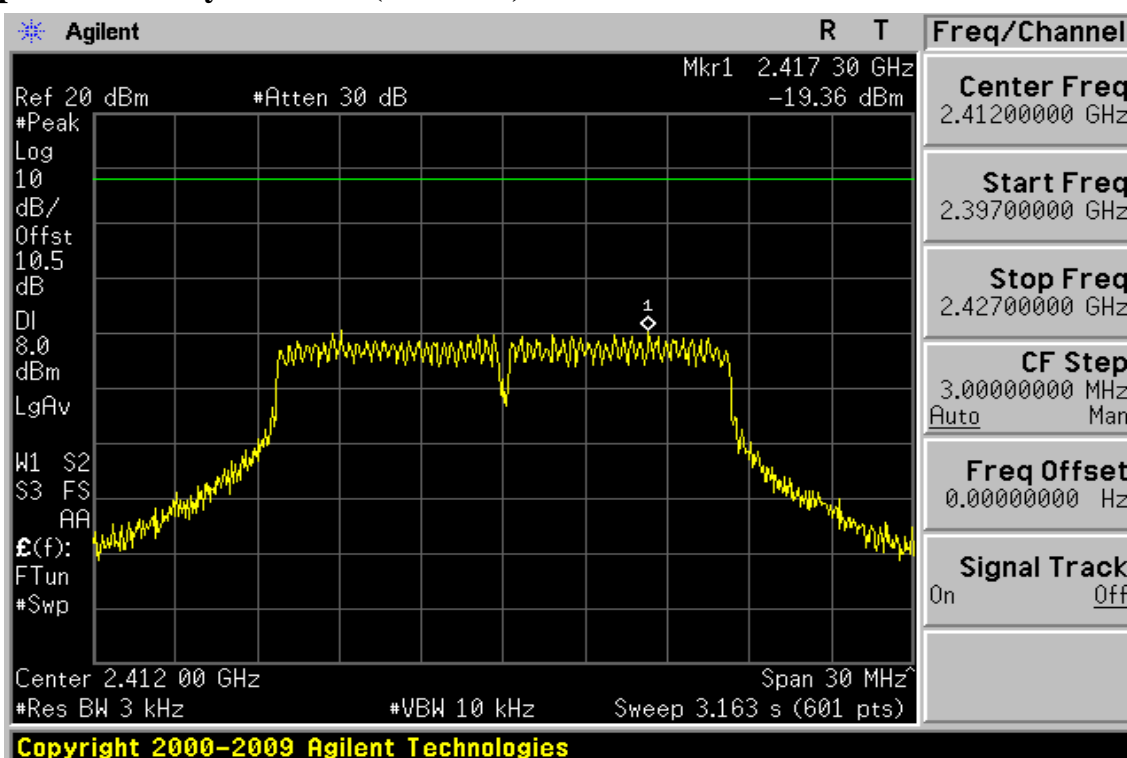
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## Power Spectral Density Test Plot (CH-High)



802.11g

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

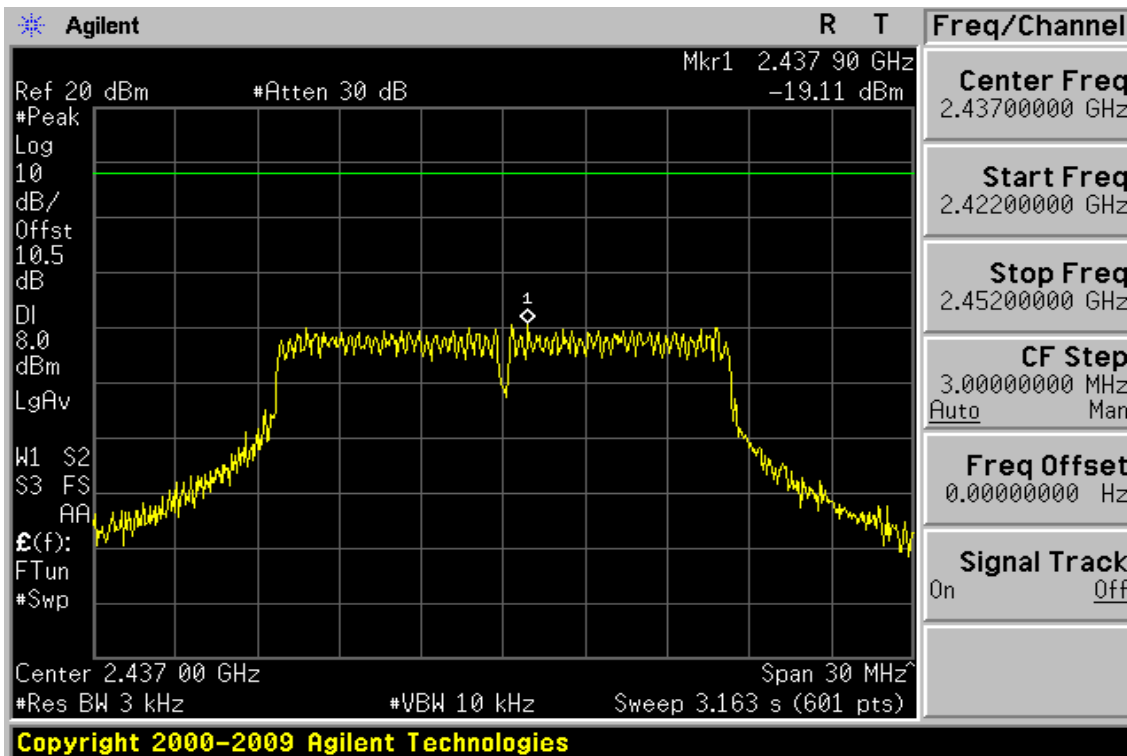


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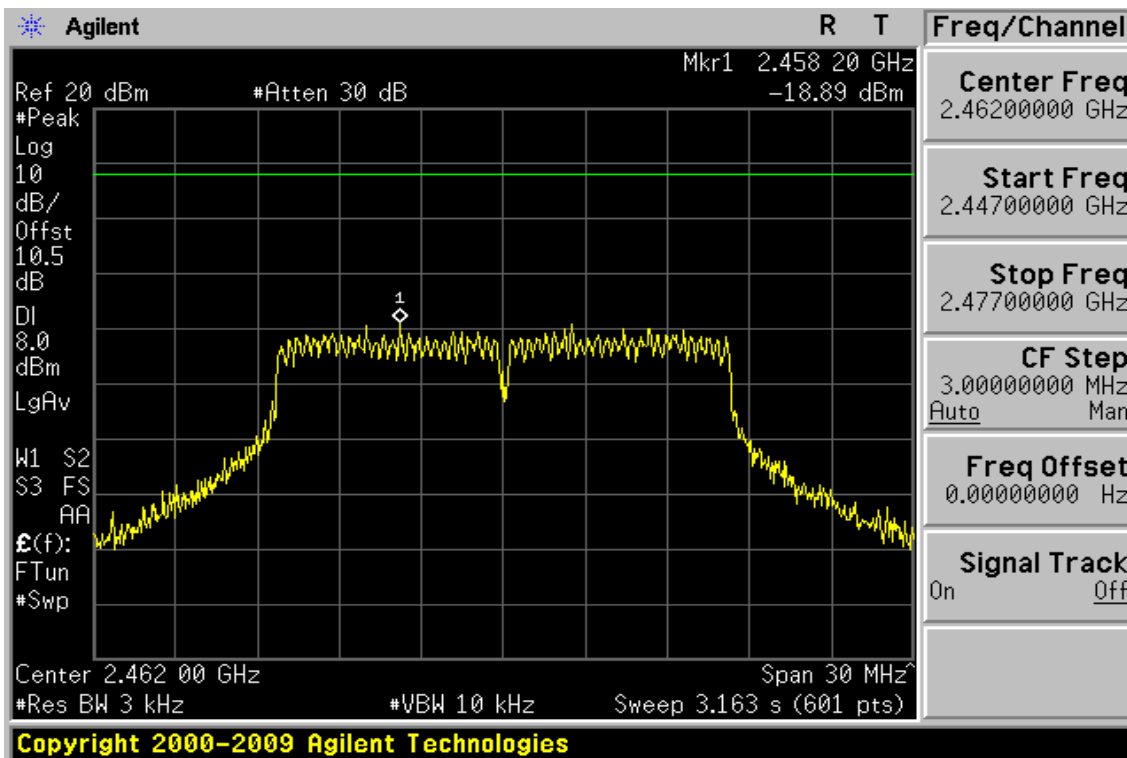
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## Power Spectral Density Test Plot (CH-Mid)



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



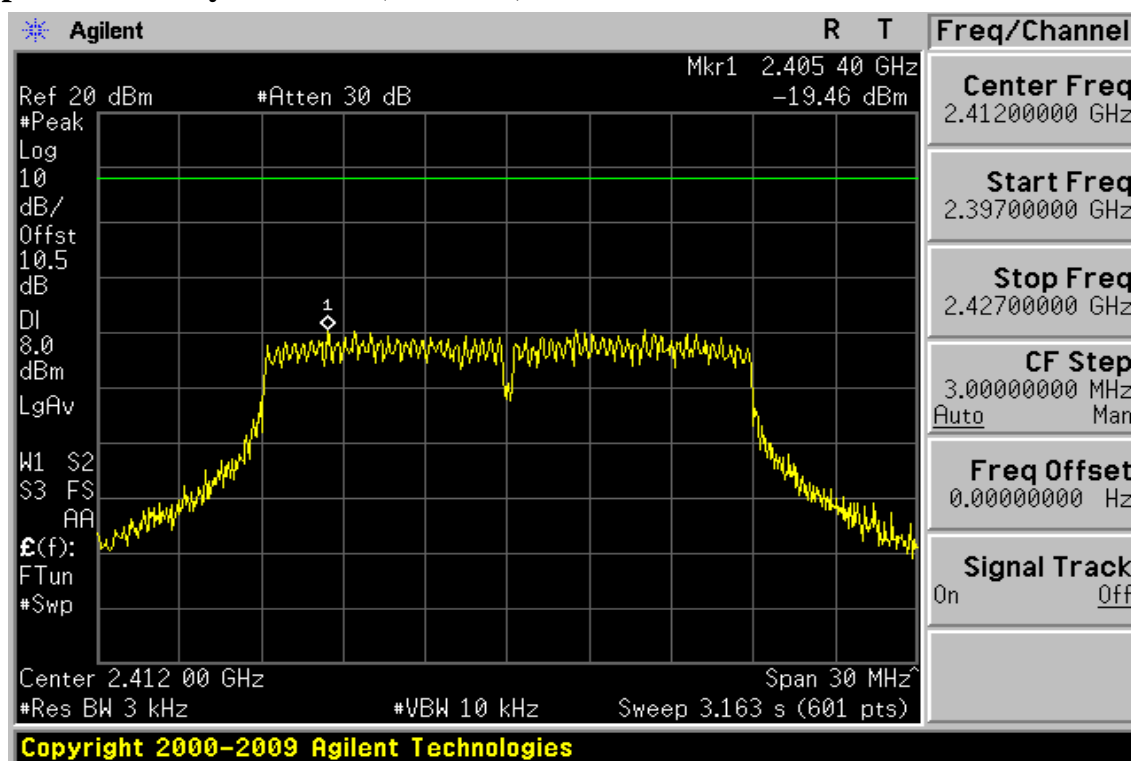
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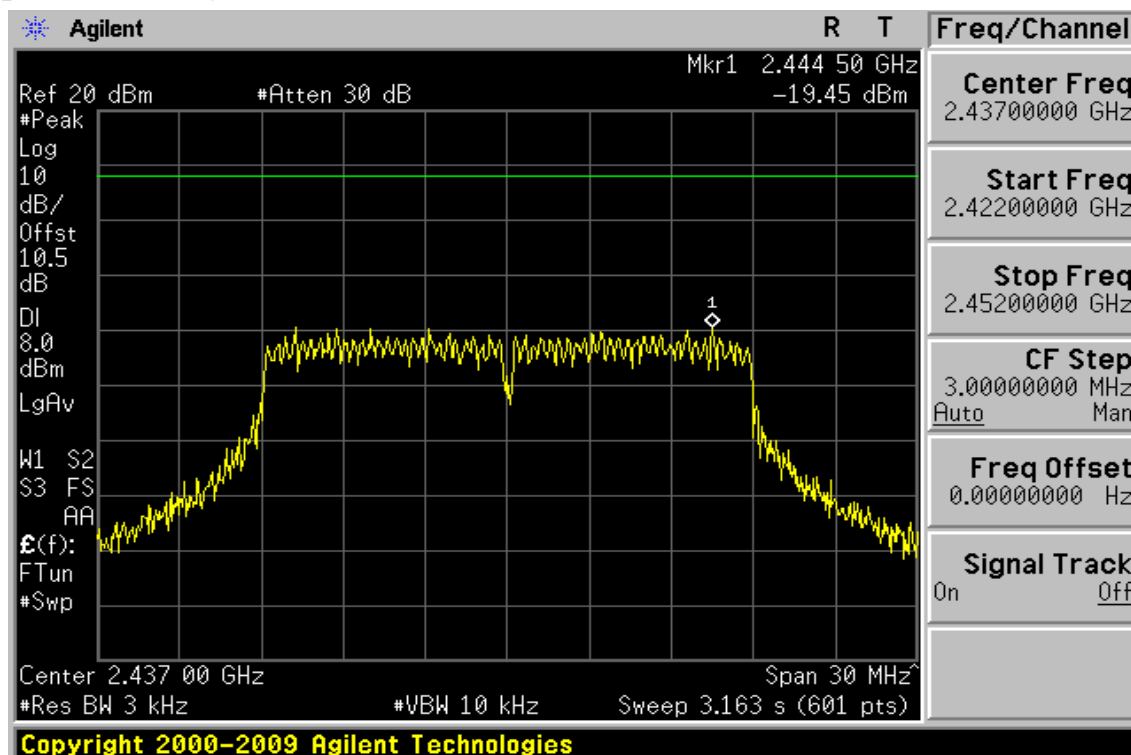
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802.11n\_20M

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



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



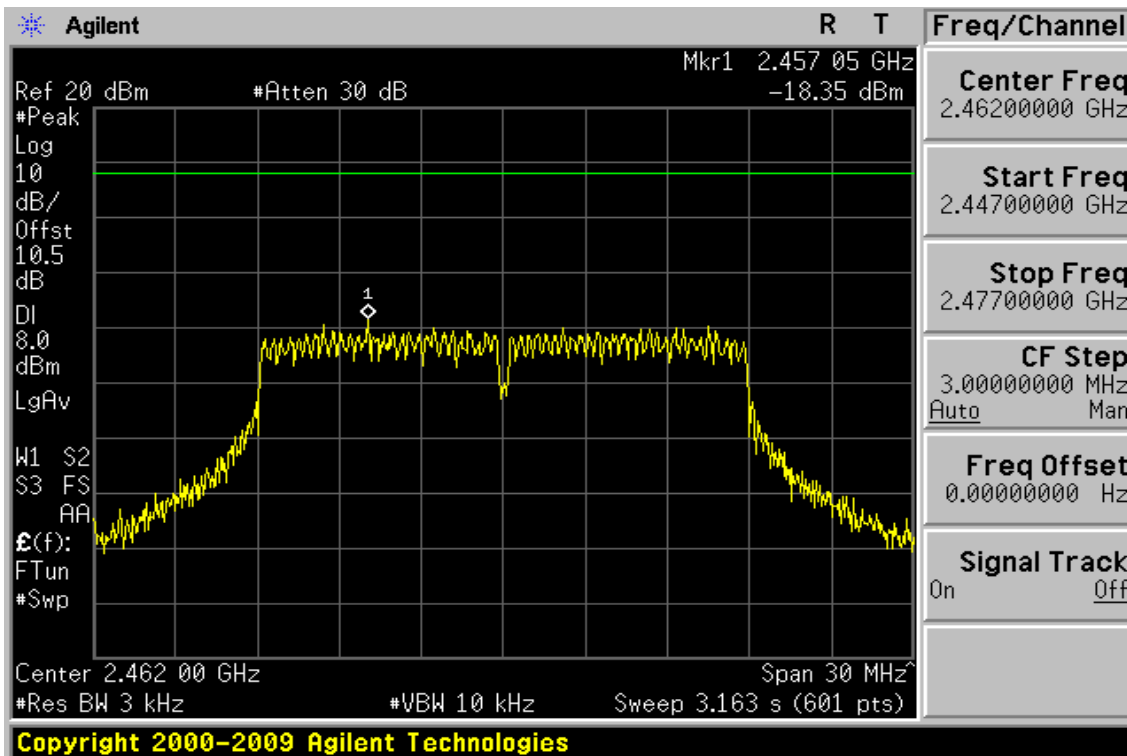
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## Power Spectral Density Test Plot (CH-High)



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## 12 ANTENNA REQUIREMENT

### 12.1 Standard Applicable:

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

### 12.2 Antenna Connected Construction:

The directional gains of antenna used for transmitting is 2.00dBi. In addition, 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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## 13 RF EXPOSURE

### 13.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in the manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Portable device with its physical nature to be used nearby, the distance between radiating structure and human is less than 20cm.

As per KDB 447498 D01 §4.3.1.1, The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm, and  $\leq 5$  m (not to exceed) are determined by:

$$\left[ \frac{(\text{max. power of channel, including tune-up tolerance, mW})}{(\text{min. test separation distance, mm})} \right] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

*f (GHz) is the RF channel transmit frequency in GHz*

*Power and distance are rounded to the nearest mW and mm before calculation*

The operational distance is 20mm with the verification of KDB inquiry, WiFi SD Card with micro SD slot, that KDB941225 D07 can be referred and used to evaluate the most proper way how RF exposure concern shall be met.

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## 13.2 Measurement Result:

## IEEE 802.11b/g/n\_20MHz

## 802.11b

Cable loss = 0		Average Power Output (dBm)				
CH	Frequency (MHz)	Data Rate				Power (mW)
		1	2	5.5	11	
1	2412	9.90	9.92	9.89	9.83	9.82
6	2437	9.56	9.58	9.61	9.50	9.08
11	2462	9.46	9.49	9.49	9.35	8.89

## 802.11g

Cable loss = 0		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Power (mW)
		6	9	12	18	24	36	48	54	
1	2412	8.66	8.43	8.40	8.37	7.84	7.80	7.80	7.76	7.35
6	2437	8.79	8.62	8.58	8.67	8.14	8.04	7.45	7.37	7.57
11	2462	8.70	8.61	8.58	8.51	7.42	7.28	7.35	7.09	7.41

## 802.11n\_20M

Cable loss = 0		Average Power Output(dBm)								
CH	Frequency (MHz)	Data Rate								Power (mW)
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	
1	2412	8.63	8.34	8.46	7.85	7.76	7.74	7.73	7.71	7.29
6	2437	8.75	8.56	8.20	7.69	7.61	7.50	7.45	7.37	7.50
11	2462	8.74	8.48	8.51	7.46	7.49	7.31	7.11	7.03	7.48

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Step 1: ( $\leq 20\text{mm}$ )

This is a portable device and the Max output power is (9.92mW) lower than the threshold given and derived as formula given above, where

Wifi 802.11b/g/n\_20MHz:

Mode	Frequency	Power (avg in dBm)	Power (avg mw)	Distance (mm)	Threshold ( $<20\text{mm}$ )
802.11b	2412	9.92	9.81747943	20	0.762357463
802.11g	2437	8.79	7.56832895	20	0.590741891
802.11n	2437	8.75	7.498942093	20	0.585325937

## Conclusion:

As the result of calculation result indicates, the RF exposure generating from given transmitter (transmitter employed digital modulation) can be excluded from SAR measurement, ( $<0.3$ ), and therefore is deemed compliant with RF exposure as per KDB 447498 D01, FCC.

~ End of Report ~

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