

## **ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT**

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

	OF
Product Name:	Smart Phone
Brand Name:	Dell
Model No.:	V04B
Model Difference:	N/A
FCC ID:	E2KV04B001
Report No.:	EH/2011/A0017
Issue Date:	Nov. 14, 2011
FCC Rule Part:	§15.247, Cat: DTS
Prepared for:	Dell Inc. One Dell Way, Round Rock, TX 78682
Prepared by:	SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan.
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Testing Laboratory

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## **VERIFICATION OF COMPLIANCE**

Applicant:	Dell Inc. One Dell Way, Round Rock, TX 78682
Product Name:	Smart Phone
Brand Name:	Dell
FCC ID:	E2KV04B001
Model No.:	V04B
Model Difference:	N/A
File Number:	EH/2011/A0017
Date of test:	Oct. 20, 2011 ~ Nov. 11, 2011
Date of EUT Received:	Oct. 20, 2011

### We hereby certify that:

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

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

Test By:	Marcus Tseng	Date	Nov. 14, 2011
– Prepared By:	Marcus Tseng / Engineer Celine Chou	Date	Nov. 14, 2011
- Approved By: _	Celine Chou / Clerk Jim Chang Jim Chang / Supervisor	Date	Nov. 14, 2011

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## Version

Version No.	Date	Description
00	Nov. 14, 2011	Initial creation of document

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#### **GENERAL INFORMATION** 1

#### **Product Description** 1.1

General:

Product Name:	Smart Phone			
Brand Name:	Dell			
Model No.:	V04B			
Model Difference:	N/A	N/A		
Simple Hands-Free:	Model No.: DA80 525283 FOSTER, Supplier: PCH			
Data Cable / USB Cable:	Model No.: G6YM1, Supplier: PCH			
	3.7Vdc Li-ion battery or 5Vdc by AC/DC power adapter			
Power Supply:	Battery: Model No.: V04B, Supplier: Dell			
	Adapter:	Model No.: 32HD9, Supplier: PCH		

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#### WLAN: 802.11 a/b/g/n

Wi-Fi	Frequency Range	Channels	Rated Power	Modulation Technology	Type of Emission
11b/g	2412 - 2462	11	b: 17.73 dBm g: 20.08 dBm	DSSS, OFDM	b : 11M2G1D g : 16M5G1D
11n (2.4GHz)	HT20 2412 – 2462	11	n: 18.27 dBm	OFDM	16M4G1D
11a	5150 - 5250	4	16.11 dBm	OFDM	16M4G1D
11a	5250 - 5350	4	17.87 dBm	OFDM	16M5G1D
11n	HT20 5150 – 5250	4	HT20: 16.25 dBm	OFDM	16M4G1D
1 1 11	HT20 5250 – 5350	4	HT20: 17.93 dBm	OFDM	16M5G1D
11a	5725 - 5850	5	a: 17.20 dBm	OFDM	16M5G1D
11n (5GHz)	HT20 5725 – 5850	5	HT20: 17.15 dBm	OFDM	16M4G1D
Antenna Designation PIFA Antenna, 2.4GHz: -1.05dBi; 5GHz Gain: -0.05dBi				05dBi	
Modulat	ion type	CCK, DQPSK, DBPSK for DSSS 64QAM. 16QAM, QPSK, BPSK for OFDM			
Transition Rate:		802.11 a: 6/9/12/18/24/36/48/54 Mbps; 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 – 72.2Mbps			

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

The 2.4G max antenna gain is -1.05dBi which was choosing for Radiated Spurious Emission test.

The 5G max antenna gain is -0.05dBi which was choosing for Radiated Spurious Emission test.

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

This report applies for frequency bands: 2412MHz – 2462MHz, 5725MHz – 5850MHz.

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

This submittal(s) (test report) is intended for **FCC ID:** <u>E2KV04B001</u> 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 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

Tested in accordance with Oct 2002 KDB558074 for compliance to FCC 47CFR 15.247 requirements.

#### **1.4 Test Facility**

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

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

#### **1.5 Special Accessories**

Not available for this EUT intended for grant.

#### **1.6 Equipment Modifications**

Not available for this EUT intended for grant.

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## **2** SYSTEM TEST CONFIGURATION

#### 2.1 EUT Configuration

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

#### 2.2 EUT Exercise

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

#### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

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

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

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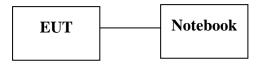
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#### **Configuration of Tested System** 2.4

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.	Notebook	HP	ProBook 4411s	CNU9316V4C	Un-shield	Un-shield

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#### SUMMARY OF TEST RESULTS 3

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

#### 4 **DESCRIPTION OF TEST MODES**

programmed.

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

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

802.11 g mode: Channel low (2412MHz) v 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.

802.11 a mode: Channel low (5745MHz)  $\cdot$  mid (5785MHz) and high (5825MHz) with 6Mbps highest data rate are chosen for full testing.

802.11 n (5GHz) \_20MHz: Lowest (5745MHz), Mid (5785MHz) and high (5825MHz) with 6.5 Mbps highest data rate are chosen for above 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 for 2.4GHz and H position for 5GHz was reported.

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#### **CONDUCTED EMISSION TEST** 5

#### 5.1. **Standard Applicable:**

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

Frequency range		nits (uV)
MHz	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note		

1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

5.2.	Measurement Equipment Used:

	AC Power Line Conducted Emission Test Site										
EQUIPMENT	EQUIPMENT MFR MODEL SER		DEL SERIAL		CAL DUE.						
TYPE		NUMBER	NUMBER	CAL.							
EMI Test Receiver	R&S	ESCS30	828985/004	09/23/2010	09/22/2012						
LISN	Rolf-Heine	NNB-2/16Z	99012	03/31/2011	03/30/2012						
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/31/2011	03/30/2012						
Coaxial Cables	N/A	WK CE Cable	N/A	11/28/2010	11/27/2011						

### 5.3. EUT Setup:

- -

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

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#### 5.4. Measurement Procedure:

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

#### 5.5. Measurement Result:

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

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

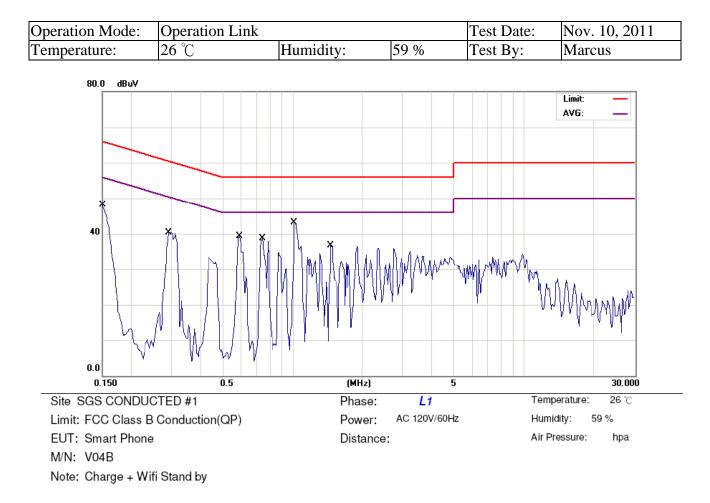
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## AC POWER LINE CONDUCTED EMISSION TEST DATA



No. Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	0.1500	47.88	0.14	48.02	66.00	-17.98	QP	
2	0.2900	40.20	0.12	40.32	60.52	-20.20	QP	
3	0.5900	39.13	0.12	39.25	56.00	-16.75	QP	
4	0.7400	38.65	0.11	38.76	56.00	-17.24	QP	
5 *	1.0200	42.98	0.11	43.09	56.00	-12.91	QP	
6	1.0200	22.52	0.11	22.63	46.00	-23.37	AVG	
7	1.4600	36.52	0.12	36.64	56.00	-19.36	QP	

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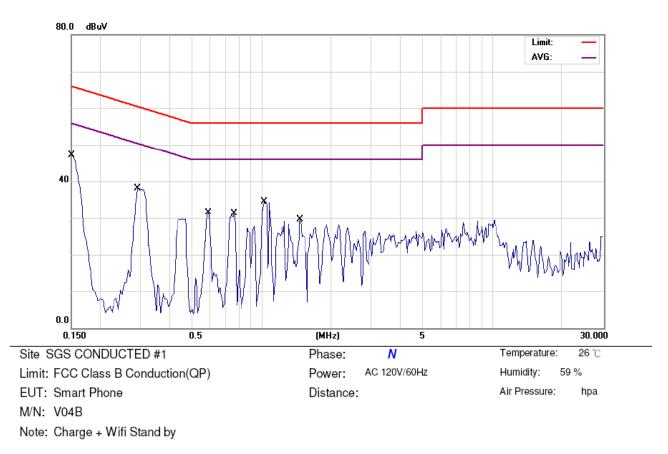
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No. Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.1524	46.55	0.18	46.73	65.87	-19.14	QP	
2	0.2900	37.98	0.16	38.14	60.52	-22.38	QP	
3	0.5900	31.27	0.16	31.43	56.00	-24.57	QP	
4	0.7600	31.23	0.15	31.38	56.00	-24.62	QP	
5	1.0300	34.34	0.15	34.49	56.00	-21.51	QP	
6	1.4700	29.28	0.16	29.44	56.00	-26.56	QP	

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### **6 PEAK OUTPUT POWER MEASUREMENT**

#### 6.1 Standard Applicable:

According to §15.247(a)(2), (b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and
5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

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

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400-2483.5 MHz band that are used exclusively for

fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725-5850 MHz band that are used exclusively for

fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

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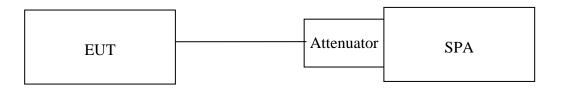


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	Conduct	ted Emission T	est Site		
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.
ТҮРЕ		NUMBER	NUMBER	CAL.	
Power Sensor	Anritsu	MA2411B	917032	01/21/2010	01/20/2012
Power Meter	Anritsu	ML2495A	1005007	02/17/2010	02/16/2012
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2010	04/18/2012
Spectrum Analyzer	Agilent	E4440A	MY45304525	01/25/2011	01/24/2012
DC Block	Agilent	BLK-18	155452	07/05/2011	07/04/2012
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S6W5	001	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S10W5	001	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S20W5	001	01/05/2011	01/04/2012
Splitter	Agilent	11636B	N/A	01/05/2011	01/04/2012

#### 6.2 Measurement Equipment Used:

#### 6.3 .Test Set-up:



#### 6.4 Measurement Procedure:

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

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#### 6.5 Measurement Result:

#### 802.11b

Cab	ble loss = $0$	Peak Power Output(dBm)								
СН	Frequency		Poquired Limit							
CII	(MHz)	1	2	Required Limit						
1	2412	17.33	17.33 17.30 17.27 16.89							
6	2437	17.01	16.90	1 Watt = 30 dBm						
11	2462	16.99	16.91	16.88	16.62	1 Watt = 30 dBm				

Cab	le loss $= 0$	Average Power Output (dBm)								
СН	Frequency		Doquired Limit							
CII	(MHz)	1	2	Required Limit						
1	2412	14.67	14.67 14.35 14.22 13.98							
6	2437	14.49	14.12	14.28	13.68	1 Watt = 30 dBm				
11	2462	14.52	14.34	14.11	13.85	1 Watt = 30 dBm				

#### 802.11g

Cab	le loss $= 0$		Peak Power Output (dBm)								
СН	Frequency			<b>Required Limit</b>							
СП	(MHz)	6	Kequired							Kequireu Linnt	
1	2412	14.77	14.44	13.97	13.74	13.28	12.61	12.02	11.99	1 Watt = 30 dBm	
6	2437	20.08	19.87	19.78	19.17	18.69	18.21	17.56	17.51	1 Watt = 30 dBm	
11	2462	16.42	16.34	15.84	1534	15.15	14.36	13.83	13.59	1 Watt = 30 dBm	

Cab	le loss = $0$		Average Power Output (dBm)								
СН	Frequency	Data Rate								<b>Required Limit</b>	
СП	(MHz)	6	9	12	18	24	36	48	54	Kequireu Liint	
1	2412	11.55	10.49	10.25	9.91	9.75	8.92	8.38	8.32	1 Watt = 30 dBm	
6	2437	16.83	16.46	15.93	15.51	15.37	14.73	14.08	13.90	1 Watt = 30 dBm	
11	2462	13.37	13.22	12.99	12.25	11.92	11.44	10.57	10.42	1 Watt = 30 dBm	

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#### 802.11n\_20M

Cab	ble loss = $0$									
СН	Data Rate		<b>Required Limit</b>							
CII	Data Kate	6.5	6.5 13 19.5 26 39 52 58.5 65 Requi							Kequii eu Linnt
1	2412	13.21	12.55	12.03	11.89	11.74	11.12	10.69	10.34	1 Watt = 30 dBm
6	2437	18.27	17.96	17.66	17.13	16.88	16.41	16.02	15.73	1 Watt = 30 dBm
11	2462	15.18	14.97	14.71	14.20	13.65	13.11	12.74	12.26	1 Watt = 30 dBm

Cab	le loss $= 0$		Average Power Output (dBm)										
СН	Data Rate			Description of Line 4									
Сп	Data Kate	6.5	13	19.5	26	39	52	58.5	65	Required Limit			
1	2412	9.80	9.30	8.77	8.16	7.78	7.50	7.43	7.36	1 Watt = 30 dBm			
6	2437	14.91	14.70	14.56	14.23	13.84	13.44	12.96	12.64	1 Watt = 30 dBm			
11	2462	11.65	11.40	11.24	11.13	10.87	10.65	10.12	9.69	1 Watt = 30 dBm			

#### 802.11a

Cab	le loss = $0$		Peak Power Output(dBm)										
СН	Data Rate												
Сп	Data Kate	6	9	12	18	24	36	48	54	- Required Limit			
149	5745	17.20	16.77	16.72	16.39	16.20	15.76	15.23	15.06	1 Watt = 30 dBm			
157	5785	16.84	16.80	16.62	16.44	16.17	16.15	15.33	14.96	1 Watt = 30 dBm			
165	5825	16.16	16.13	16.11	15.84	15.61	14.83	14.71	14.35	1 Watt = 30 dBm			

Cab	le loss = $0$		Average Power Output (dBm)									
СН	Data Data			Decuived Limit								
CH	Data Rate	6	6 9 12 18 24 36						54	Required Limit		
149	5745	13.57	13.55	13.53	12.96	12.94	12.58	11.86	11.55	1 Watt = 30 dBm		
157	5785	13.31	13.23	13.16	13.05	12.56	12.12	11.51	11.46	1 Watt = 30 dBm		
165	5825	12.62	12.52	12.48	12.02	11.94	11.38	11.33	11.29	1 Watt = 30 dBm		

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802.11n (5GHz)\_20M

Cable loss $= 0$		Peak Power Output(dBm)								
СН	Data Rate	Data Rate								Required Limit
		6.5	13	19.5	26	39	52	58.5	65	Kequireu Linin
149	5745	17.15	16.88	16.65	16.35	16.11	15.84	15.68	15.31	1 Watt = 30 dBm
157	5785	16.78	16.45	16.06	15.89	15.64	15.32	14.99	14.78	1 Watt = 30 dBm
165	5825	16.23	16.08	15.82	15.62	15.13	14.89	14.74	14.42	1 Watt = 30 dBm

Cable loss $= 0$		Average Power Output (dBm)								
СН	Data Rate	Data Rate								Doguinad Limit
		6.5	13	19.5	26	39	52	58.5	65	Required Limit
149	5745	13.91	13.55	13.20	12.78	12.43	12.12	11.86	11.74	1 Watt = 30 dBm
157	5785	13.47	12.89	12.78	12.64	12.10	11.75	11.54	11.28	1 Watt = 30 dBm
165	5825	12.76	12.56	12.50	12.37	11.82	11.42	10.96	10.64	1 Watt = 30 dBm

\*Note: Offset 10.5 dB

Note: Refer to next page for plots.

\* Read Power = Output Power + Cable Loss

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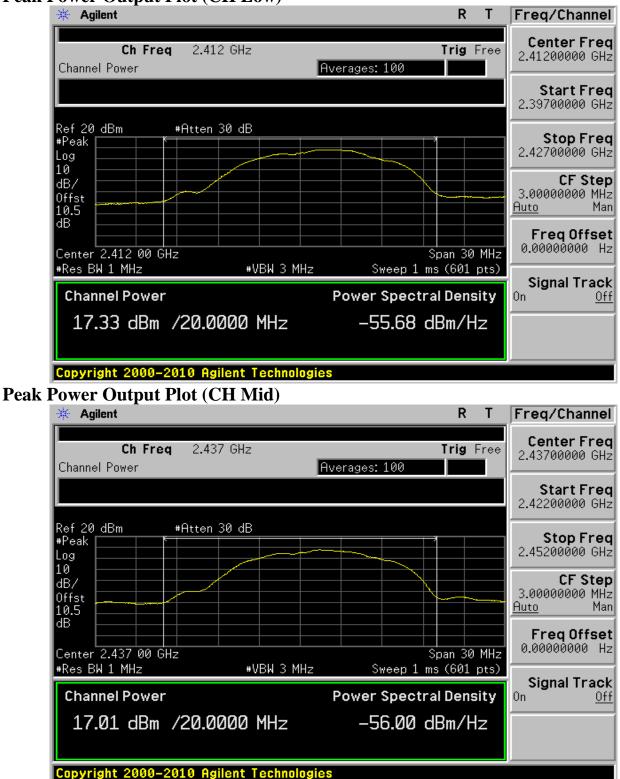
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### 802.11b, 1Mbps Peak Power Output Plot (CH Low)



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dB/

0ffst 10.5

Center 2.412 00 GHz

**Channel Power** 

#Res BW 1 MHz

dB

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## Peak Power Output Plot (CH High)



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14.67 dBm /20.0000 MHz

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#VBW 3 MHz

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CF Step

Man

Off.

3.00000000 MHz

Freq Offset 0.00000000 Hz

Signal Track

Auto

0n

Span 30 MHz

Sweep 1 ms (601 pts)

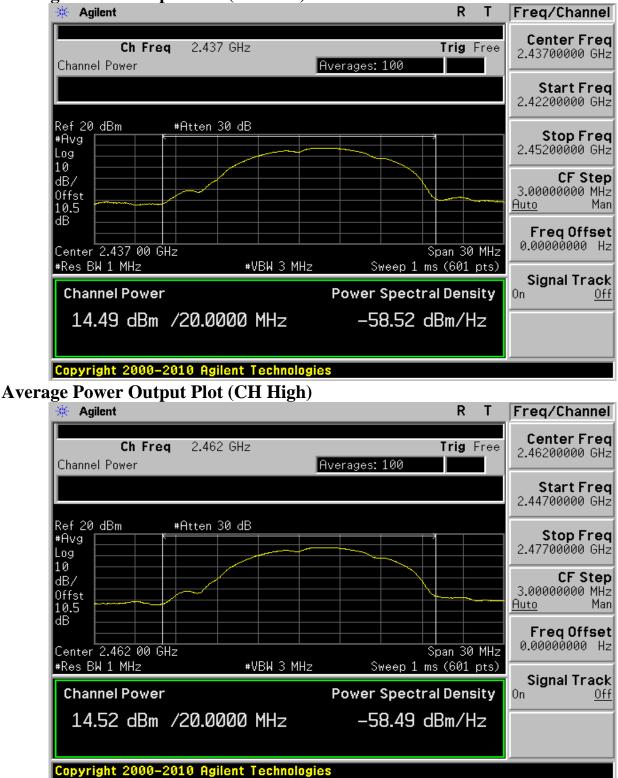
**Power Spectral Density** 

-58.34 dBm/Hz



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



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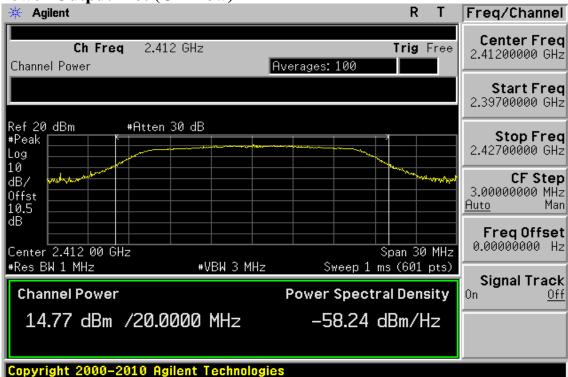
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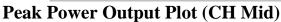
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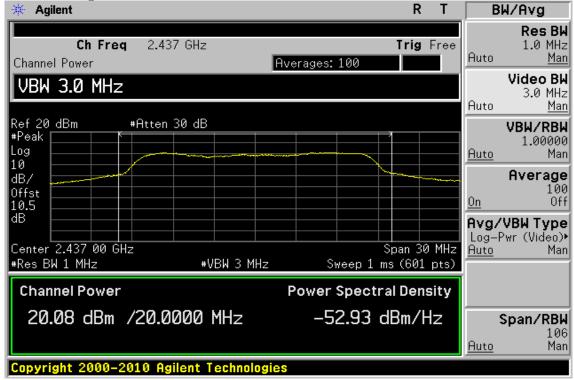


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### 802.11g, 6Mbps Peak Power Output Plot (CH Low)







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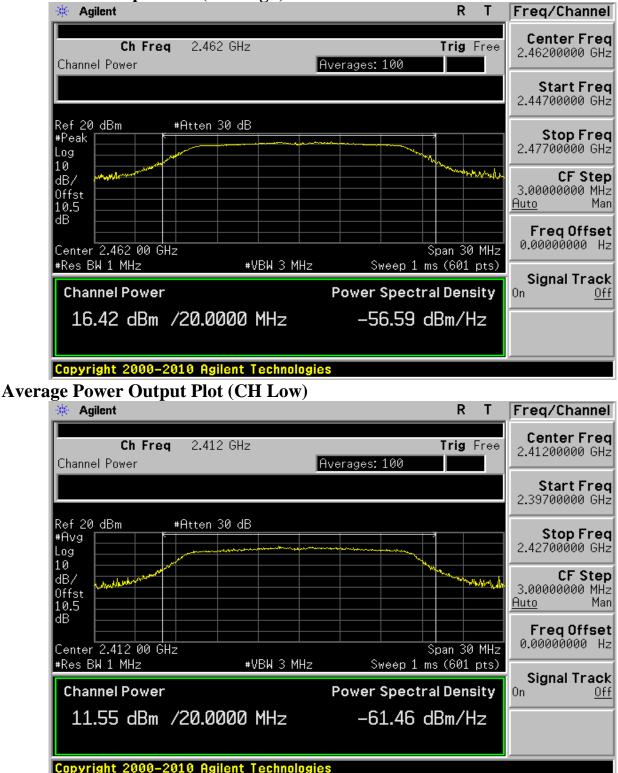
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## Peak Power Output Plot (CH High)



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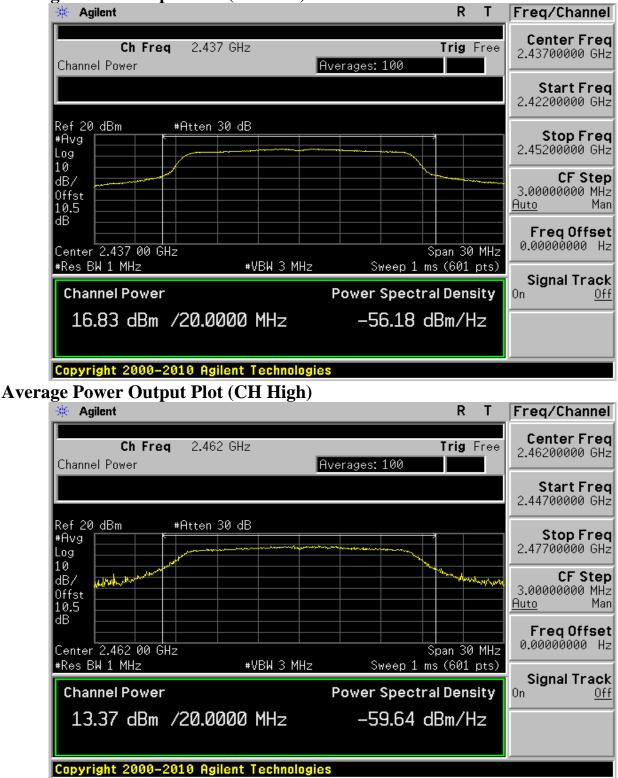
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## **Average Power Output Plot (CH Mid)**



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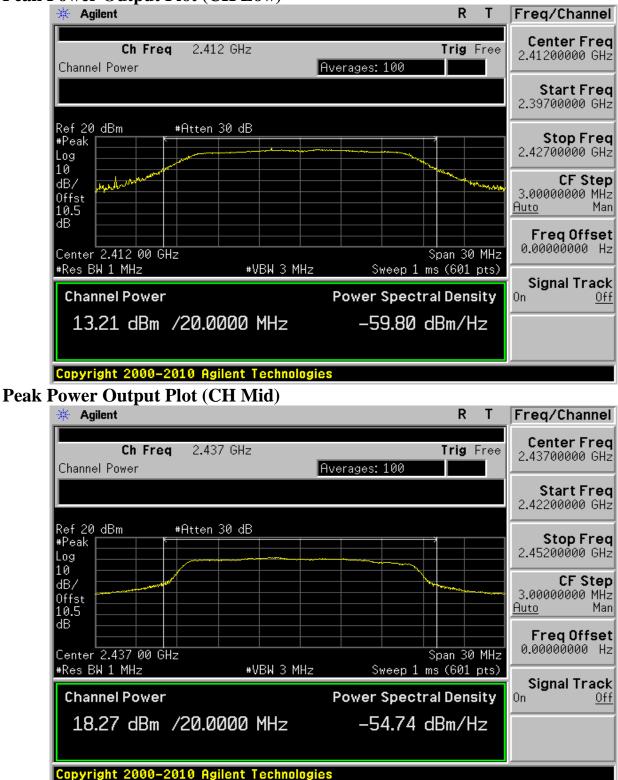
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## 802.11n\_20M, 6.5Mbps **Peak Power Output Plot (CH Low)**



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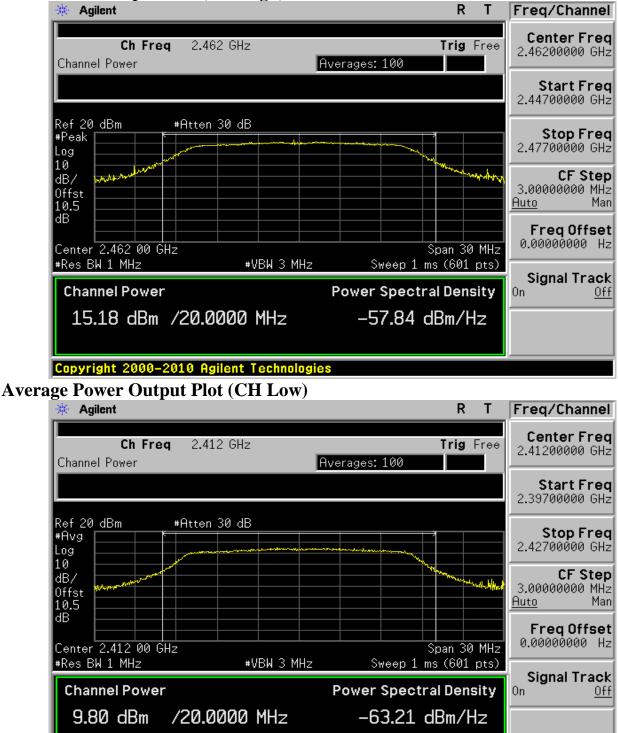
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## Peak Power Output Plot (CH High)



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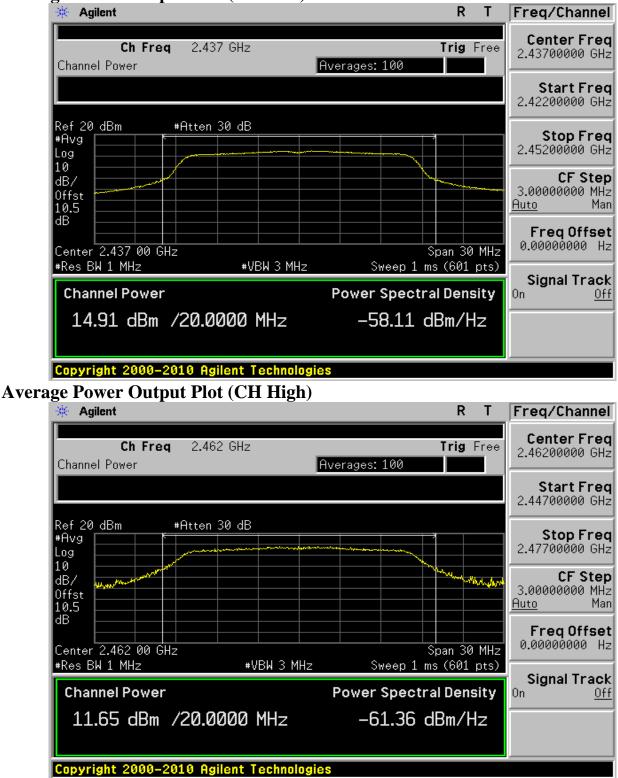
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## **Average Power Output Plot (CH Mid)**



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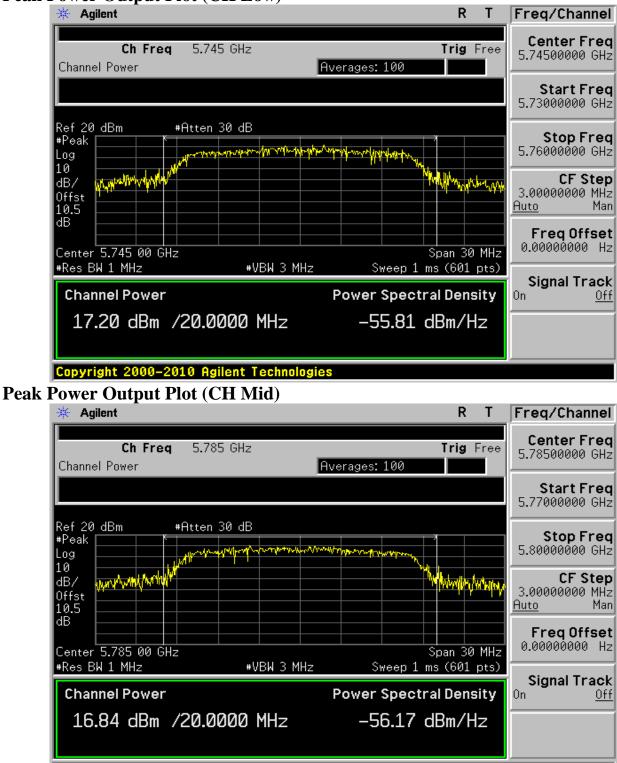
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### 802.11a, 6Mbps Peak Power Output Plot (CH Low)



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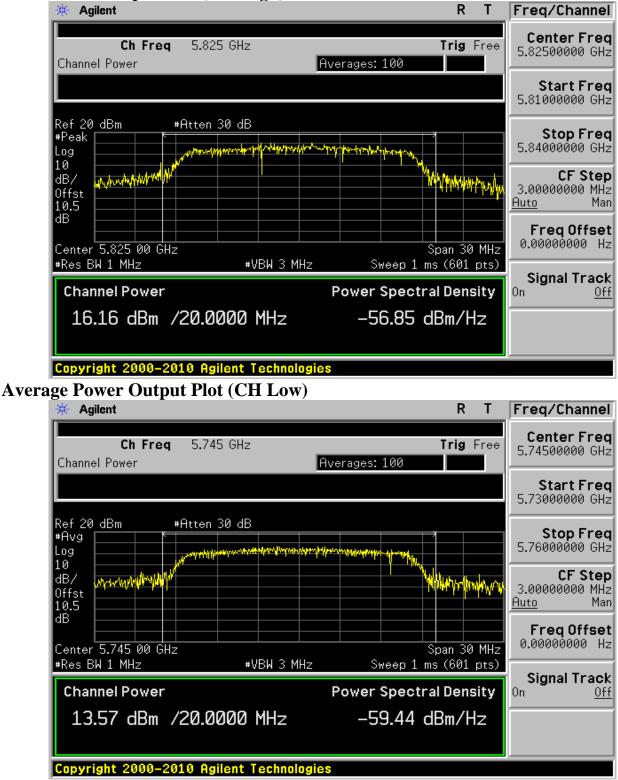
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## Peak Power Output Plot (CH High)



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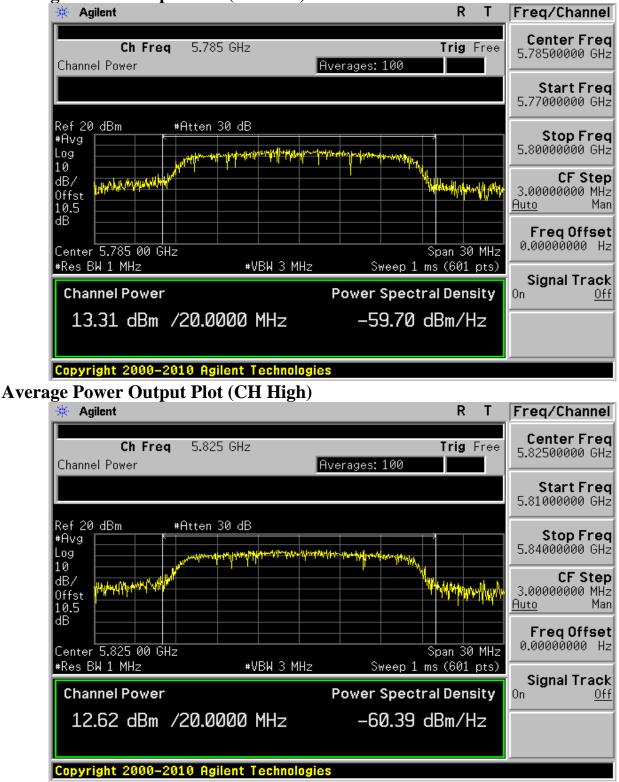
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## **Average Power Output Plot (CH Mid)**



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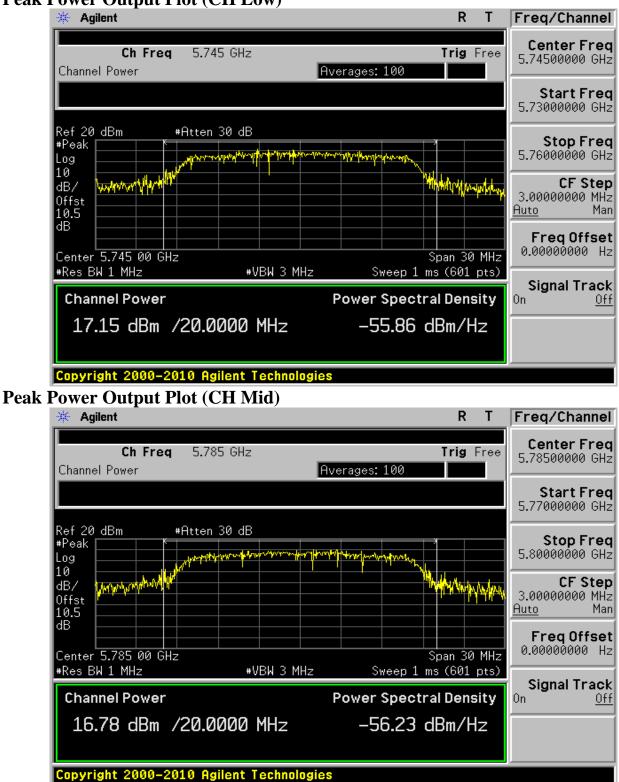
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## 802.11n (5GHz)\_20M, 6.5Mbps Peak Power Output Plot (CH Low)



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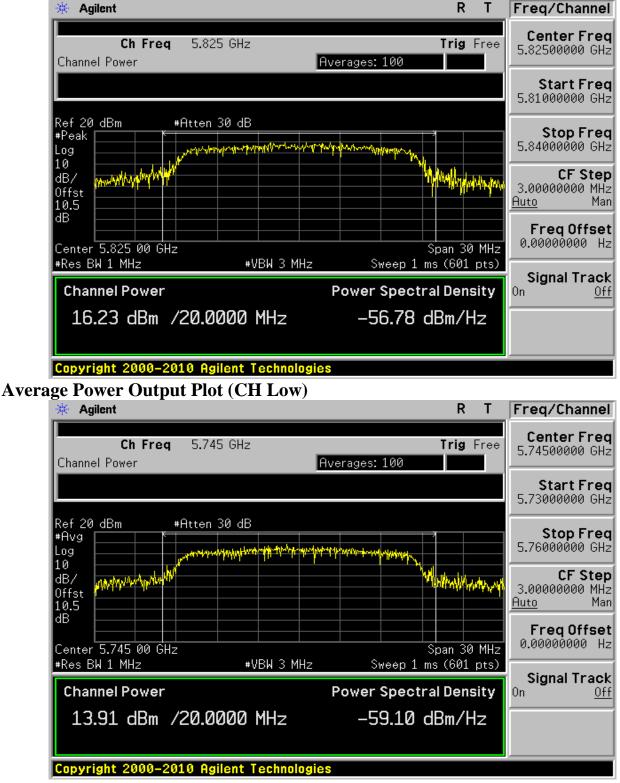
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## Peak Power Output Plot (CH High)



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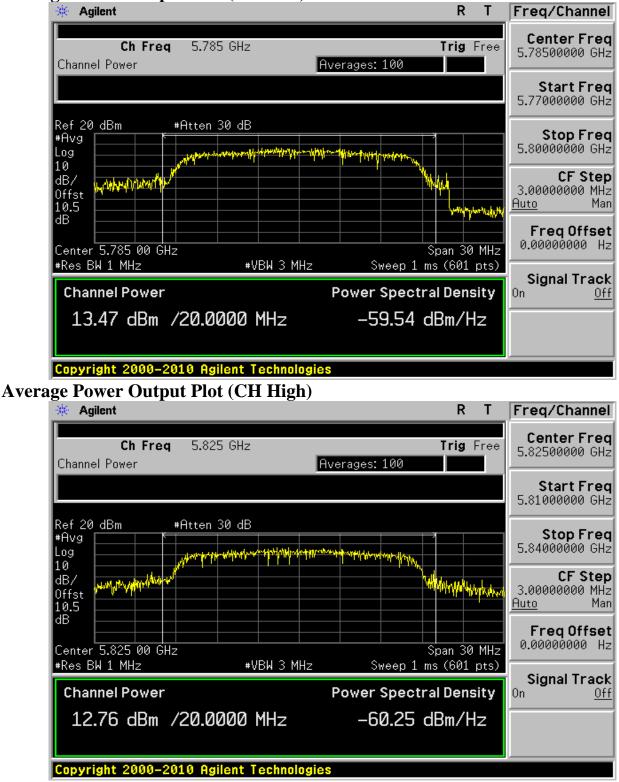
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## **Average Power Output Plot (CH Mid)**



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## 7 6dB BANDWIDTH

#### 7.1 Standard Applicable:

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

#### 7.2 Measurement Equipment Used:

Refer to section 6.2 for details.

#### 7.3 Test Set-up:

Refer to section 6.3 for details.

#### 7.4 Measurement Procedure:

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the 3.antenna port to the spectrum analyzer.
- 3. Set the spectrum analyzer as RBW=100KHz, VBW = 3\*RBW, Span= 30M/50MHz, Sweep=auto
- 4. Mark the peak frequency and –6dB (upper and lower) frequency.
- 5. Repeat above procedures until all frequency measured were complete.

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## 7.5 Measurement Result:

#### 802.11b

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2412	7.150	> 500	PASS
2437	7.517	> 500	PASS
2462	7.634	> 500	PASS

#### 802.11g

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2412	15.249	> 500	PASS
2437	15.253	> 500	PASS
2462	15.197	> 500	PASS

#### 802.11n 20M

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
2412	15.736	> 500	PASS
2437	15.154	> 500	PASS
2462	15.194	> 500	PASS

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## 802.11a

Frequency (MHz)	Bandwidth	Bandwidth	Result	
	(MHz)	(KHz)		
5745	15.163	> 500	PASS	
5785	15.119	> 500	PASS	
5825	13.957	> 500	PASS	

## 802.11n(5GHz)\_20M

Frequency (MHz)	Bandwidth	Bandwidth	Result
	(MHz)	(KHz)	
5745	14.042	> 500	PASS
5785	15.125	> 500	PASS
5825	15.180	> 500	PASS

\*Note: Offset 10.5dB

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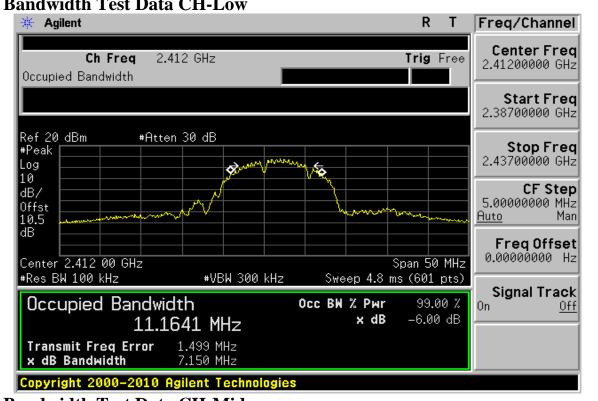
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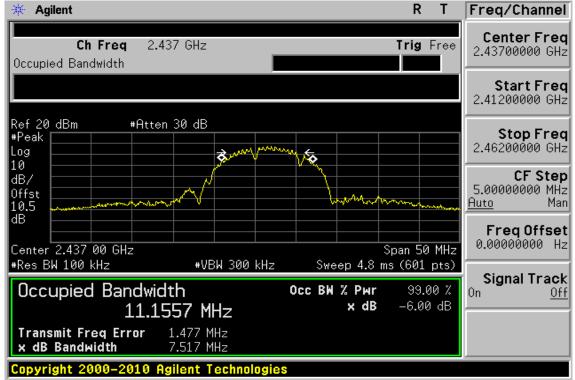


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#### 802.11b 6dB Bandwidth Test Data CH-Low



6dB Bandwidth Test Data CH-Mid



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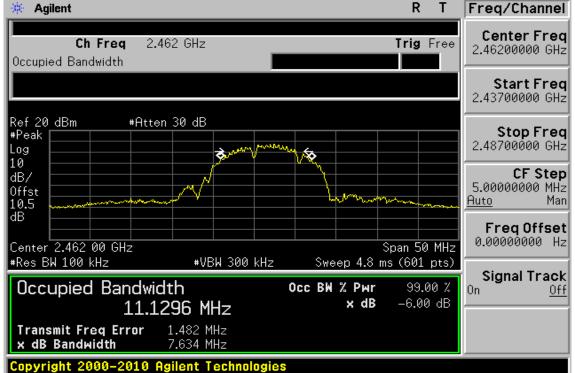
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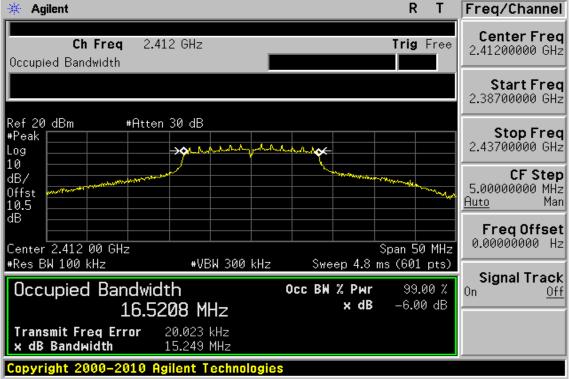
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# 6dB Bandwidth Test Data CH-High



## 802.11g

## 6dB Bandwidth Test Data CH-Low



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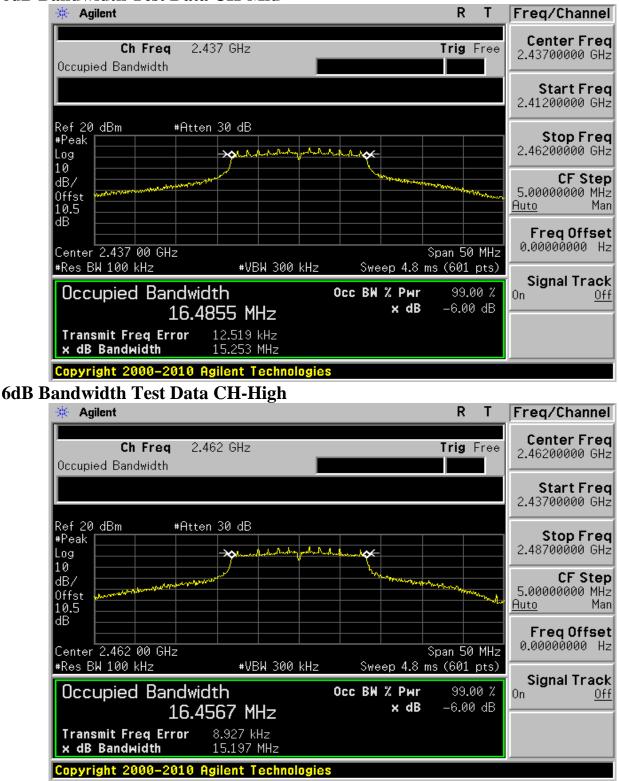
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# 6dB Bandwidth Test Data CH-Mid



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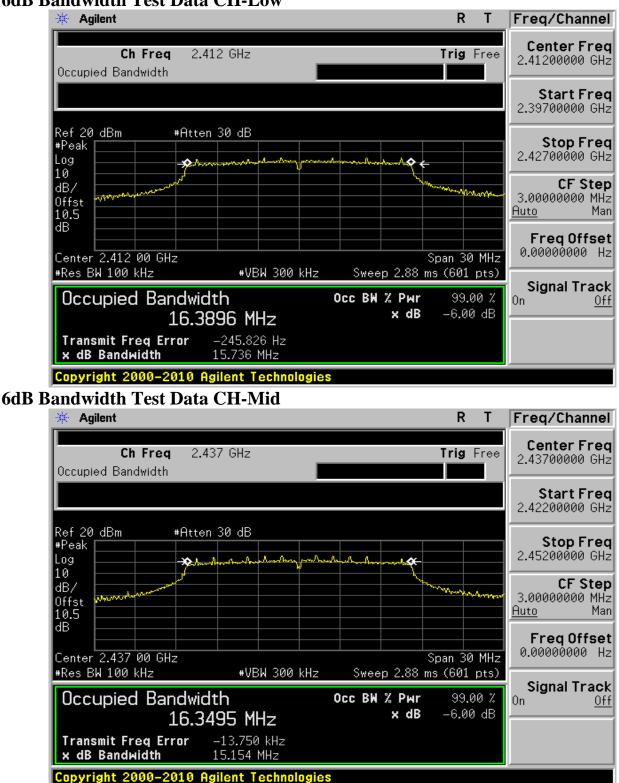
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#### 802.11n\_20M 6dB Bandwidth Test Data CH-Low



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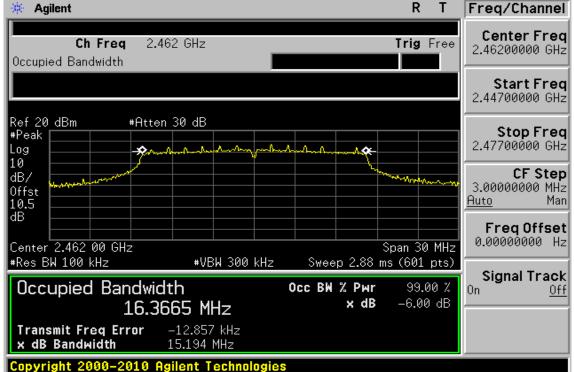
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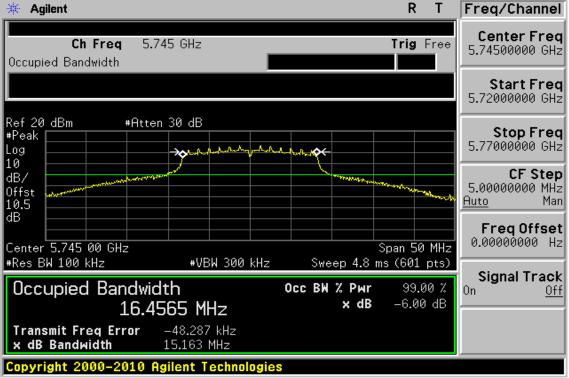
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# 6dB Bandwidth Test Data CH-High



## 802.11a

# 6dB B Bandwidth Test Data CH-Low



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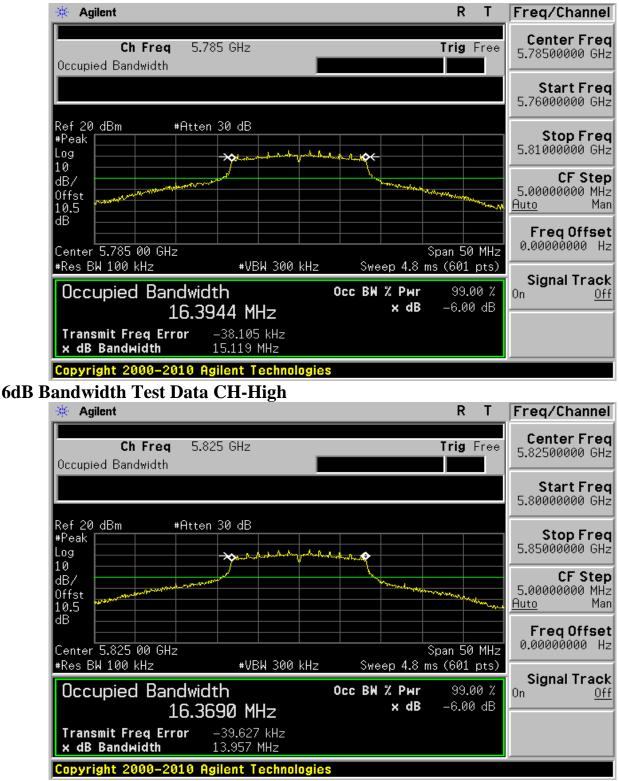
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# 6dB Bandwidth Test Data CH-Mid



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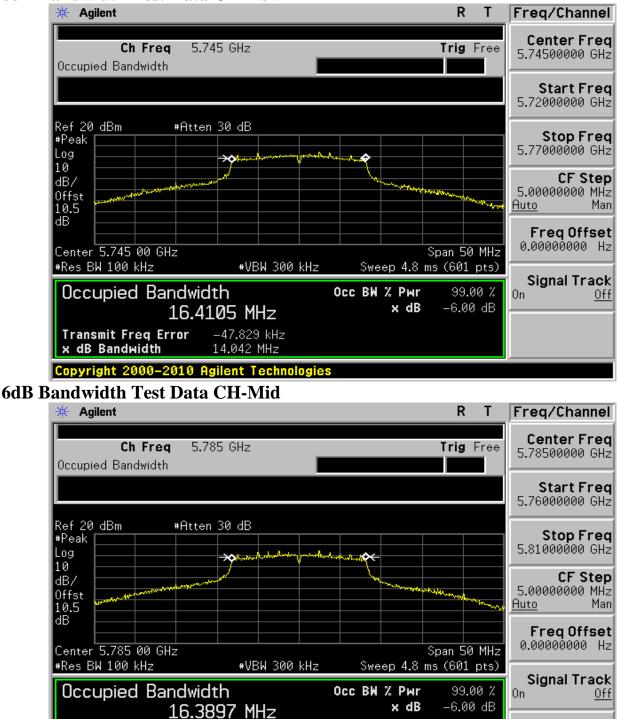
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# 802.11n (5GHz) 20M 6dB Bandwidth Test Data CH-Low



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-44.368 kHz

15.125 MHz

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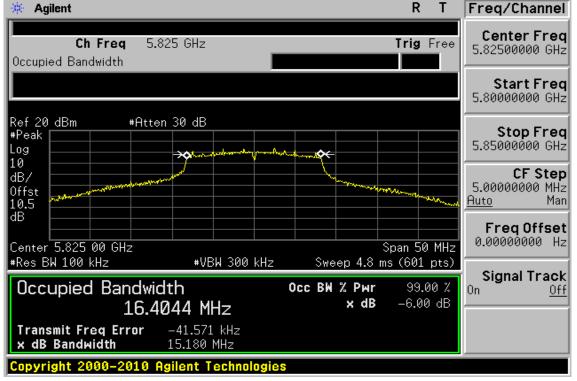
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# 6dB Bandwidth Test Data CH-High



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#### **100KHz BANDWIDTH OF BAND EDGES MEASUREMENT** 8

## 8.1 Standard Applicable:

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

## 8.2 Measurement Equipment Used:

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

Refer to section 6.2 for details.

#### 8.2.2. Radiated emission:

966 Chamber						
EQUIPMENT	MFR	MODEL	SERIAL	LAST	CAL DUE.	
ТҮРЕ		NUMBER	NUMBER	CAL.		
Spectrum Analyzer	R&S	FSP 40	100034	03/30/2011	03/29/2012	
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2010	11/18/2011	
Horn antenna	SCHWAZBECK	BBHA 9120D	309/320	01/22/2010	01/21/2012	
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2010	11/27/2011	
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2011	01/04/2012	
Radio Communication Analyzer	R & S	CMU200	102189	08/12/2010	08/11/2012	
DC Block	Agilent	BLK-18	155452	01/05/2011	01/04/2012	
Turn Table	HD	DT420	N/A	N.C.R	N.C.R	
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R	
Controller	HD	HD100	N/A	N.C.R	N.C.R	
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	01/05/2011	01/04/2012	
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2011	01/04/2012	
3m Site	SGS	966 chamber	N/A	07/15/2011	07/14/2012	

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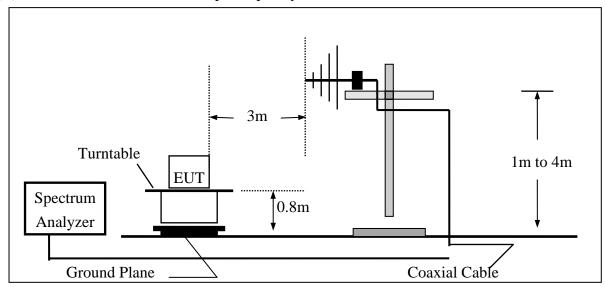
# 8.3 Test SET-UP:

## 8.3.1 Conducted Emission at antenna port:

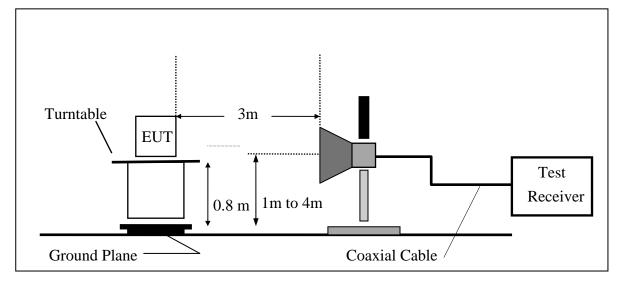
Refer to section 6.3 for details.

## 8.3.2 Radiated emission:

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



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



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# **8.4 Measurement Procedure:**

- 1. Place the EUT on the table and set it in transmitting mode.
- 2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 3. Set center frequency of spectrum analyzer = operating frequency.
- 4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
- 5. Mark Peak, 2.310GHz 2.390GHz and 2.4835GHz 2.500GHz and record the max. level.
- 6. Repeat above procedures until all frequency measured were complete.

# 8.5 Field Strength Calculation:

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

## FS = RA + AF + CL - AG

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

# 8.6 Measurement Result:

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

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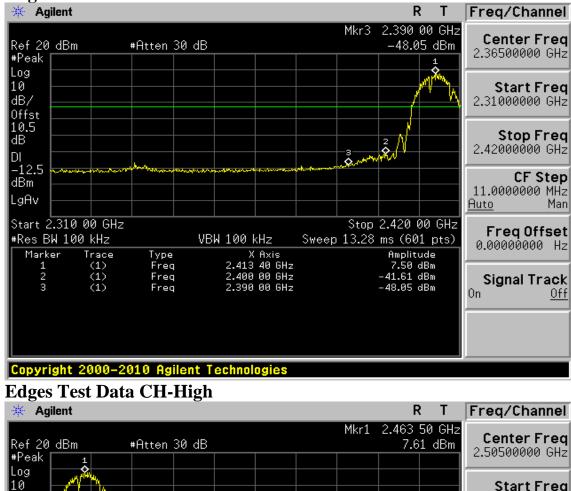
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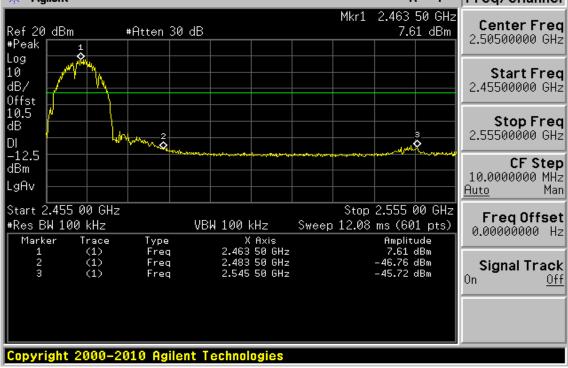


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## 802.11b **Band Edges Test Data CH-Low**







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#### Radiated Emission: 802.11 b mode

Operation Band	:B	Test Date	:2011-10-28
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	Е	Average	43.54	5.17	48.71	54.00	-5.29

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Operation Band	:B	Test Date	:2011-10-28
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	Е	Average	46.71	5.79	52.50	54.00	-1.50
	_	TTTTTage	10171	0119	52.50	51.00	1.00

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Operation Band	:B	Test Date	:2011-10-28
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V\!/m$	dB
2483.50	E	Average	43.80	5.69	49.49	54.00	-4.51
2483.50	Е	Peak	54.73	5.69	60.42	74.00	-13.58

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Operation Band	:B	Test Date	:2011-10-28
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2483.50	E	Average	43.33	6.72	50.05	54.00	-3.95

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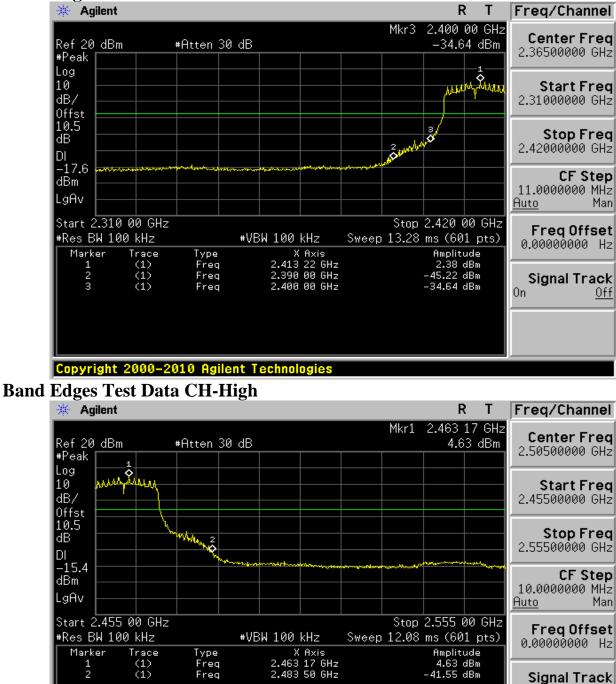
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# 802.11g Band Edges Test Data CH-Low



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#### Radiated Emission: 802.11 g mode

Operation Band	:G	Test Date	:2011-10-28
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	Е	Average	43.76	5.17	48.93	54.00	-5.07

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Operation Band	:G	Test Date	:2011-10-28
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	E	Average	46.44	5.79	52.23	54.00	-1.77
2390.00	Е	Peak	57.19	5.79	62.98	74.00	-11.02

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Operation Band	:G	Test Date	:2011-10-28
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V\!/\!m$	dB
2483.50	E	Average	46.35	5.69	52.04	54.00	-1.96
2483.50	Е	Peak	66.81	5.69	72.50	74.00	-1.50

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Operation Band	:G	Test Date	:2011-10-28
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V\!/\!m$	dB
2483.50	E	Average	46.21	6.72	52.93	54.00	-1.07
2483.50	Е	Peak	63.42	6.72	70.14	74.00	-3.86

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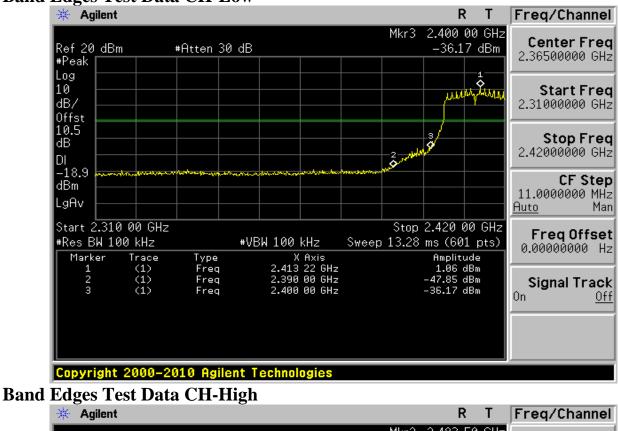
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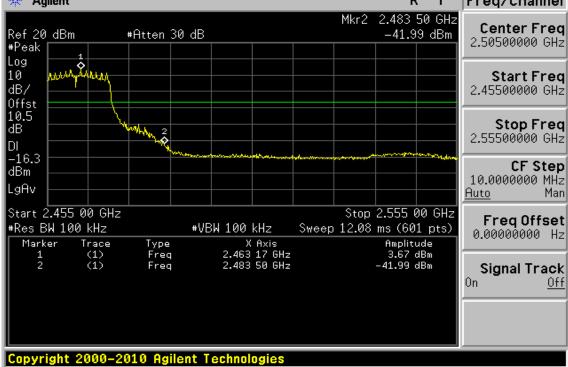
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# 802.11n\_20M Band Edges Test Data CH-Low





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#### Radiated Emission: 802.11n 20M mode

<b>Operation Band</b>	:N	Test Date	:2011-10-28
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	E	Average	43.23	5.17	48.40	54.00	-5.60

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Operation Band	:N	Test Date	:2011-10-28
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2390.00	Е	Average	46.63	5.79	52.42	54.00	-1.58
2390.00				5.79	72.83	74.00	-1.17

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Operation Band	:N	Test Date	:2011-10-28
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V\!/\!m$	dB
2483.50	E	Average	45.54	5.69	51.23	54.00	-2.77
2483.50	Е	Peak	62.85	5.69	68.54	74.00	-5.46

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Operation Band	:N	Test Date	:2011-10-28
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	$dB\mu V/m$	$dB\mu V/m$	dB
2483.50	E	Average	45.33	6.72	52.05	54.00	-1.95
2483.50	Е	Peak	63.62	6.72	70.34	74.00	-3.66

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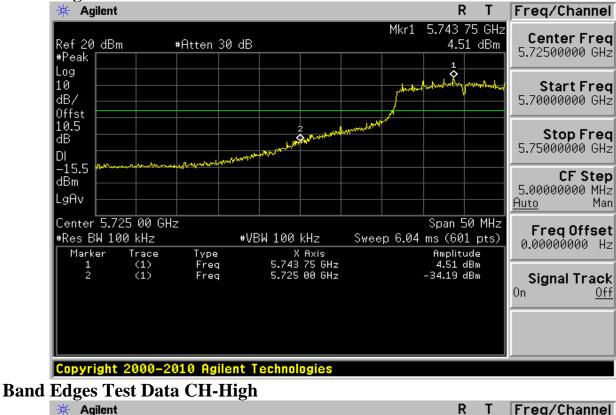
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## 802.11a Band Edges Test Data CH-Low





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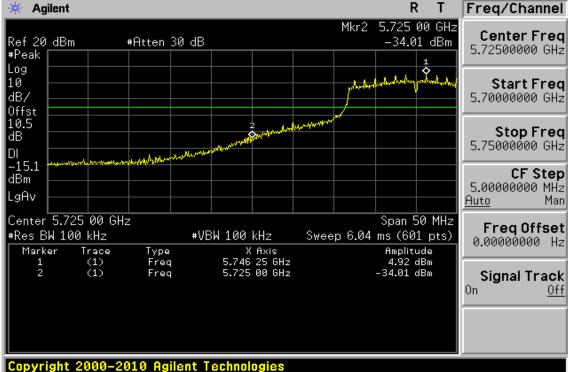
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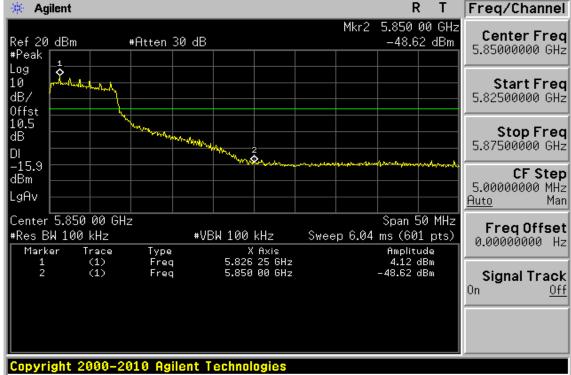


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# 802.11n (5GHz)\_20M Band Edges Test Data CH-Low







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# 9 SPURIOUS RADIATED EMISSION TEST

## 9.1 Standard Applicable

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

## 9.2 Measurement Equipment Used:

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

Refer to section 6.2 for details.

#### 9.2.2. Radiated emission:

Refer to section 7.2 for details.

## 9.3 Test SET-UP:

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

Refer to section 6.3 for details.

#### 9.3.2. Radiated emission:

Refer to section 7.3 for details.

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## 9.4 Measurement Procedure:

## **Radiated Emission:**

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

#### **Conducted Emission:**

- 1. To connect Antenna Port of EUT to Spectrum.
- 2. Set RBW = 100K & VBW = 100K on Spectrum.
- 3. Sweep the frequency to determine spurious emission as seen on spectrum from span of 30M to 3G and 3G to 26.5G for 2.4G, 30M to 6G, 6G to 18G and 18G to 40G for 5G.
- Via Software, combine 5 spans of frequency range into one plot 4.

# 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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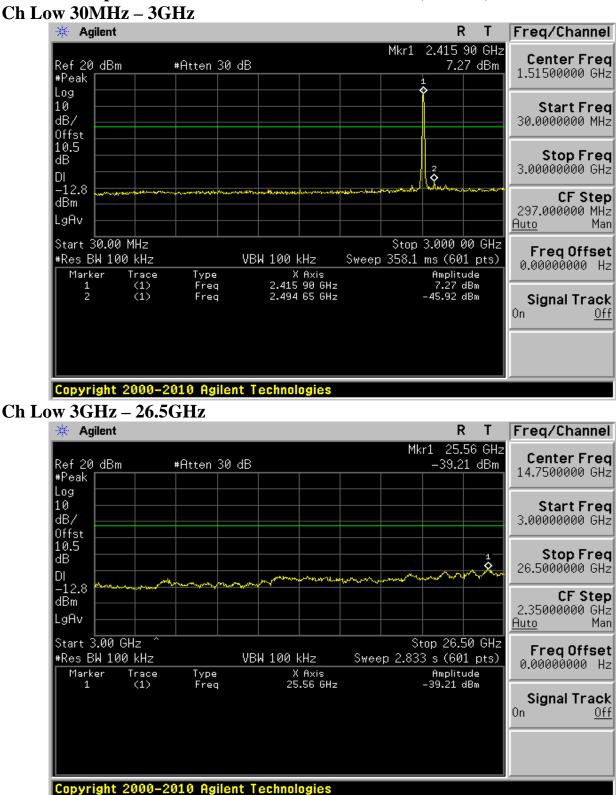
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## **Conducted Spurious Emission Measurement Result (802.11b)** Ch Low 30MHz - 3GHz

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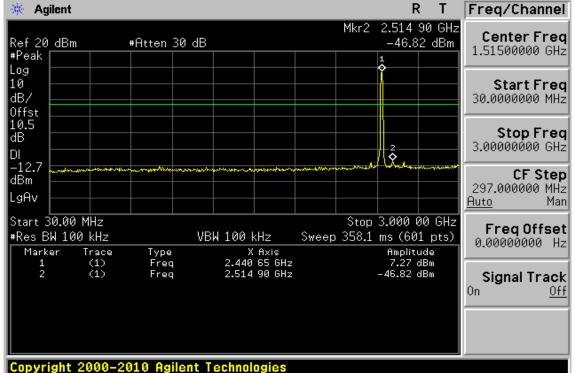
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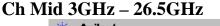
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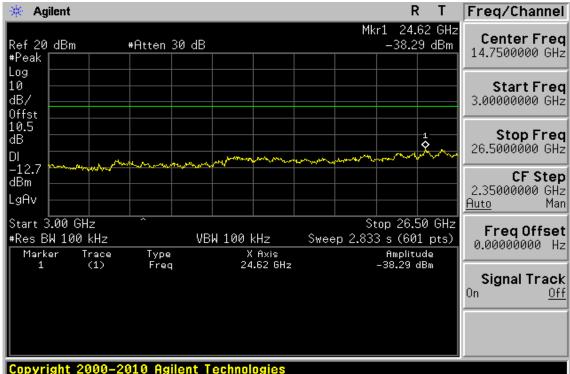


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# Ch Mid 30MHz – 3GHz







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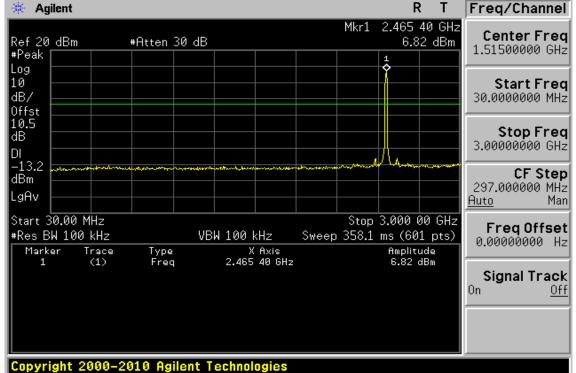
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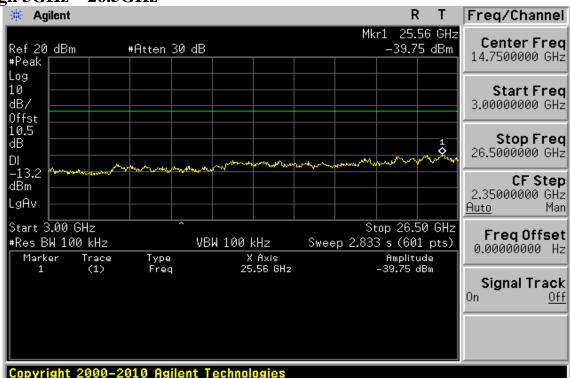


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# Ch High 30MHz – 3GHz







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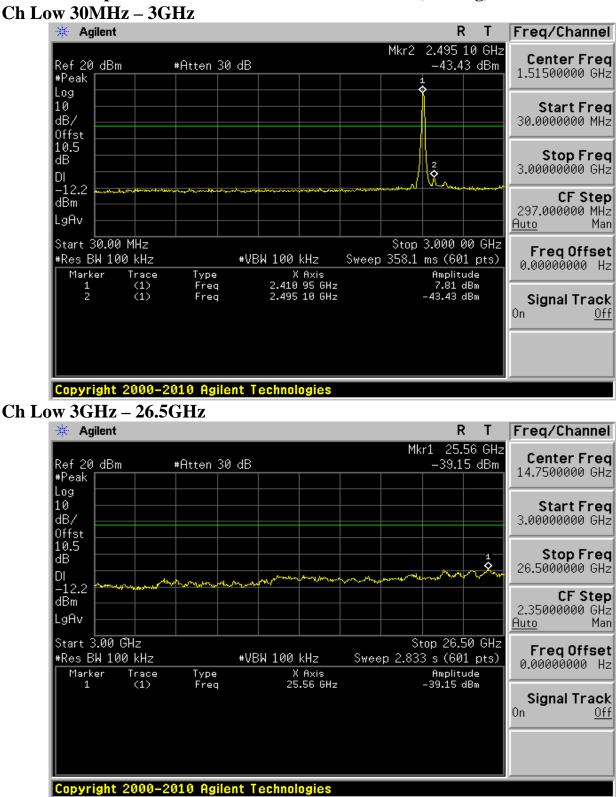
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## **Conducted Spurious Emission Measurement Result (802.11g)** Ch Low 30MHz – 3GHz

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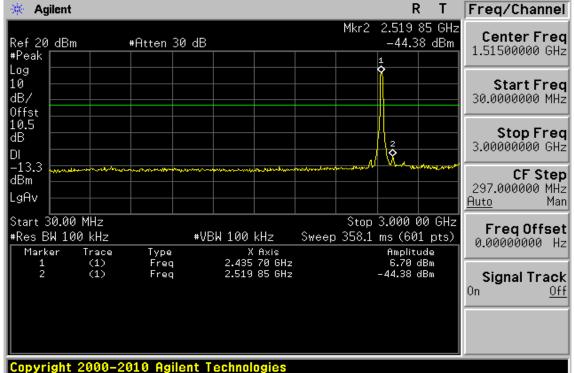
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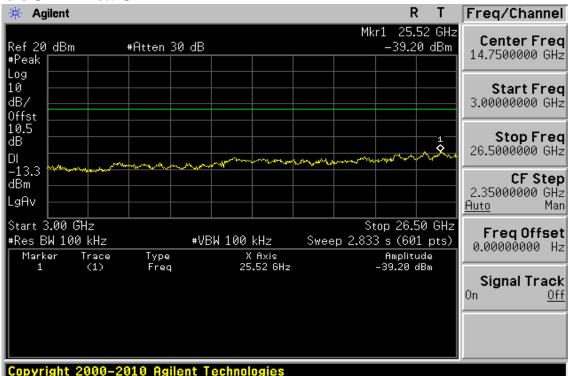


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# Ch Mid 30MHz – 3GHz







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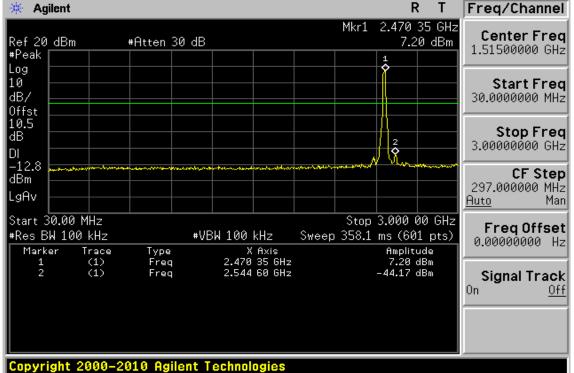
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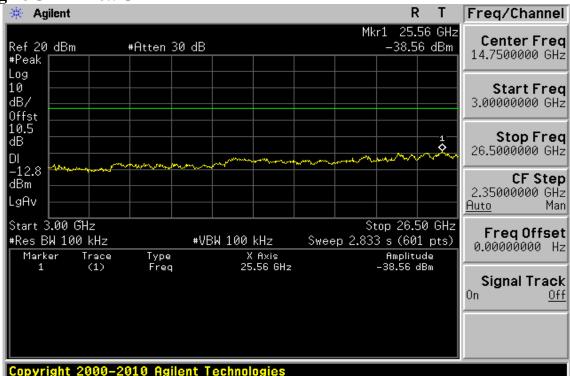


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# Ch High 30MHz – 3GHz







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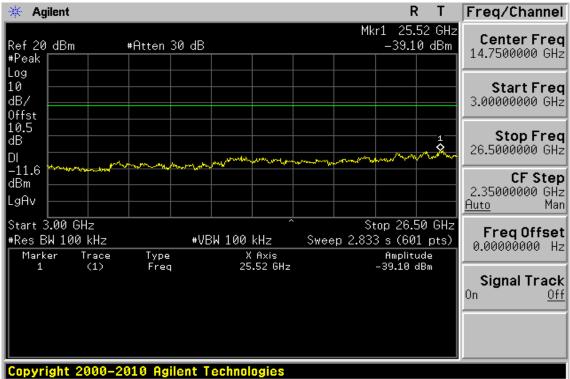


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## Conducted Spurious Emission Measurement Result (802.11n\_20M) Ch Low 30MHz – 3GHz

🔆 Agilent R Т Freq/Channel Mkr1 2.415 90 GHz Center Freq #Atten 30 dB Ref 20 dBm 8.43 dBm 1.51500000 GHz #Peak Log 10 Start Freq dB/ 30.0000000 MHz Offst 10.5 Stop Freq dB 3.00000000 GHz DI 11.6 CF Step dBm 297.000000 MHz LgAv Auto Man Start 30.00 MHz Stop 3.000 00 GHz Freq Offset #Res BW 100 kHz #VBW 100 kHz Sweep 358.1 ms (601 pts) 0.00000000 Hz Amplitude 8.43 dBm Marker Trace Type Frea X Axis 2.415 90 GHz (1)Signal Track 0n Off Copyright 2000-2010 Agilent Technologies





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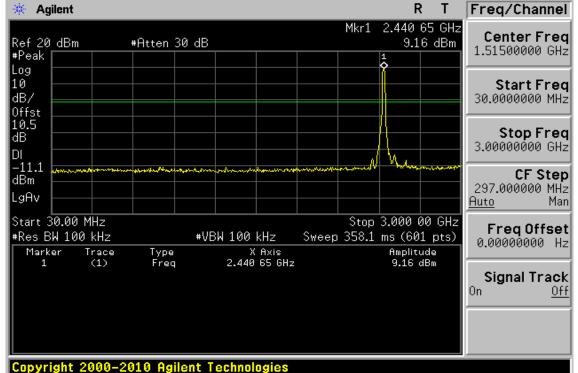
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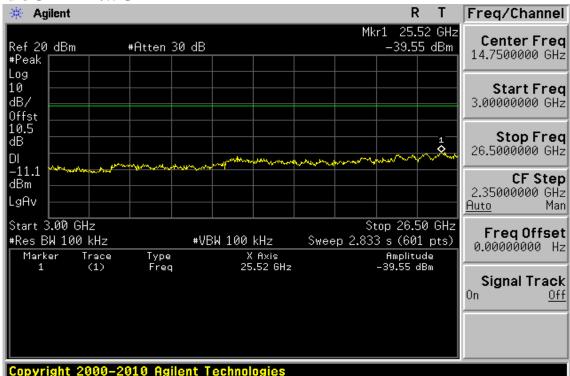


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# Ch Mid 30MHz – 3GHz







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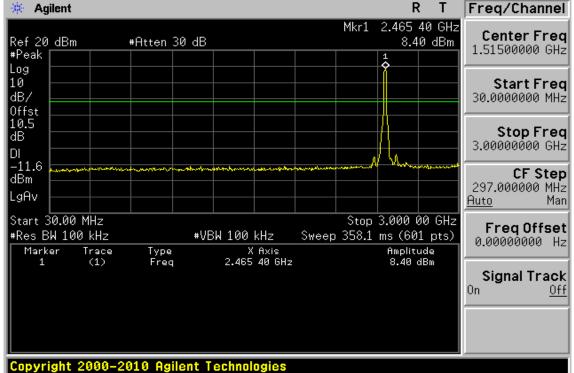
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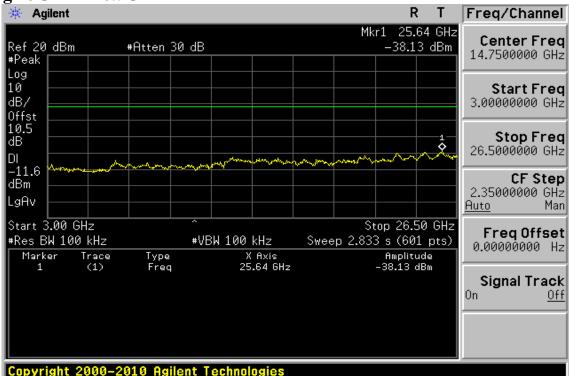


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# Ch High 30MHz – 3GHz







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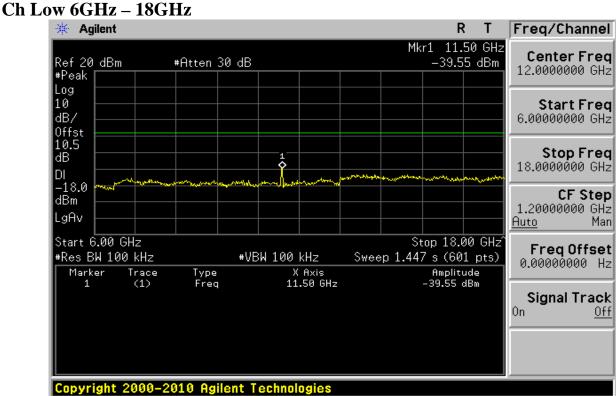


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🔆 Agilent R Т Freq/Channel Mkr1 5.741 GHz Center Freq #Atten 30 dB 2.09 dBm Ref 20 dBm 3.01500000 GHz #Peak Log 10 Start Freq dB/ 30.0000000 MHz Offst 10.5 Stop Freq dB 6.00000000 GHz DI -18.0 CF Step dBm 597.000000 MHz LgAv Auto Man Start 30 MHz Stop 6.000 GHz Freq Offset #Res BW 100 kHz #VBW 100 kHz Sweep 719.8 ms (601 pts) 0.00000000 Hz Amplitude 2.01 dBm Trace (1) X Axis 5.741 GHz Marker Type Frea Signal Track 0n Off





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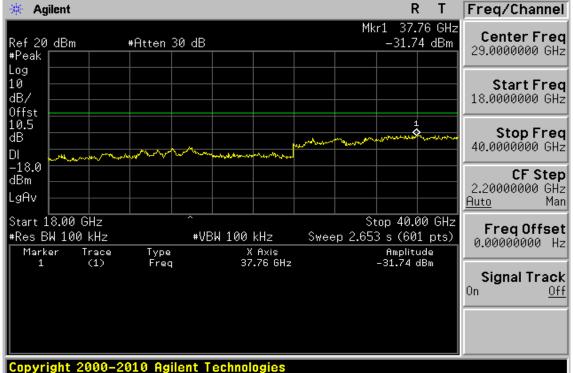
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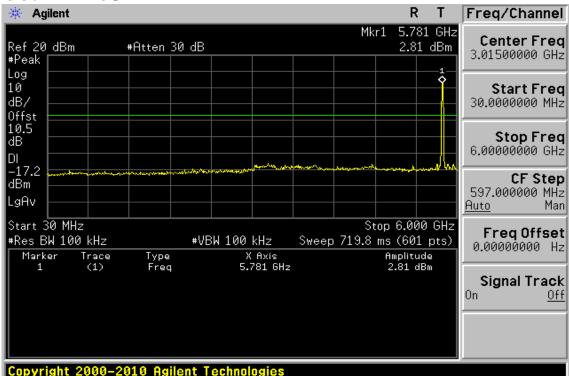


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# Ch Low 18GHz - 40GHz







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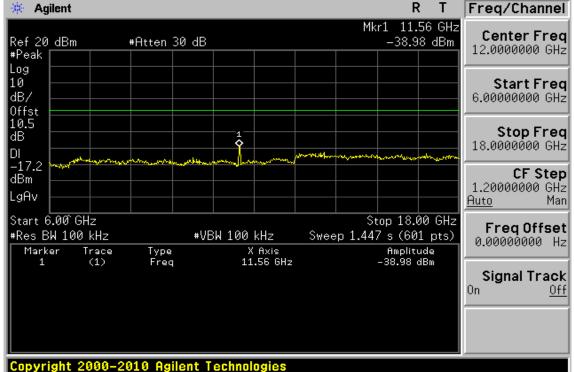
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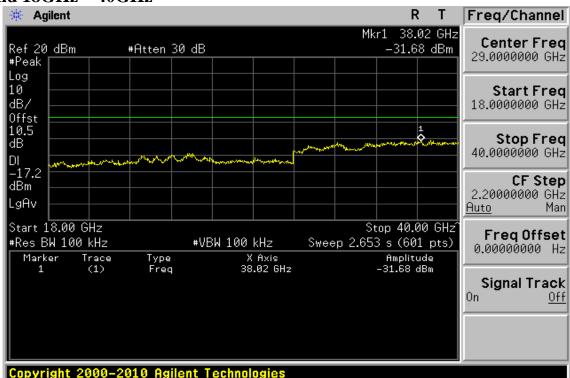


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# Ch Mid 6GHz – 18GHz







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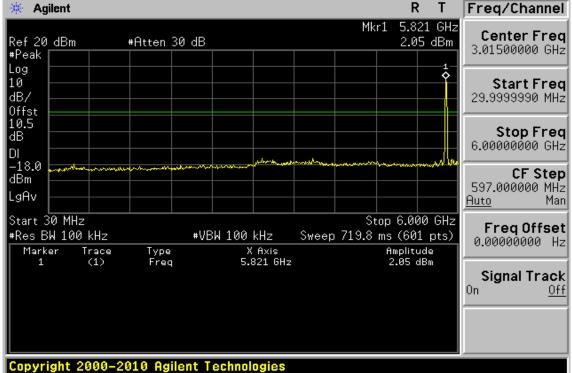
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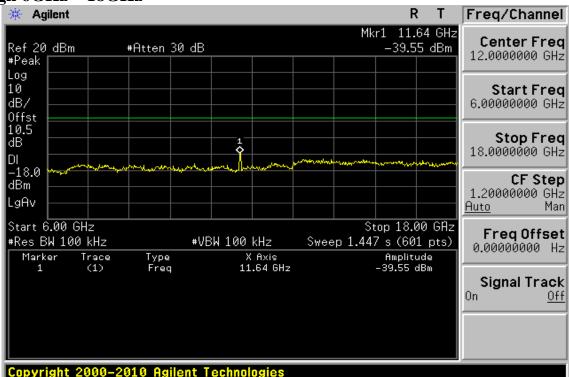


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# Ch High 30MHz – 6GHz







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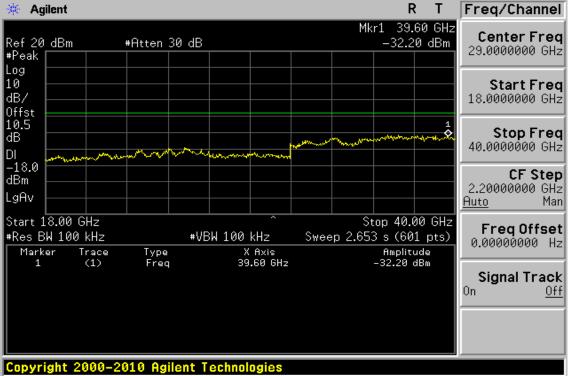
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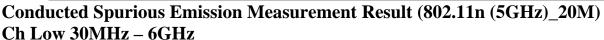
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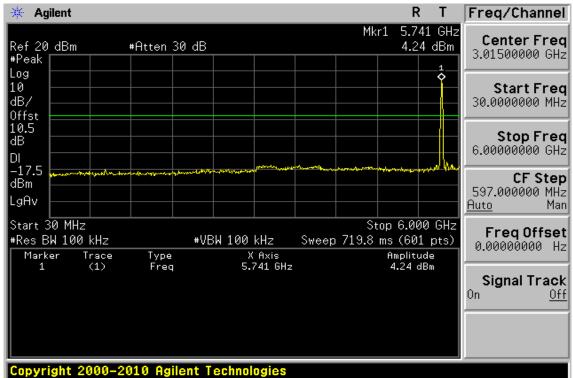


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# Ch High 18GHz – 40GHz







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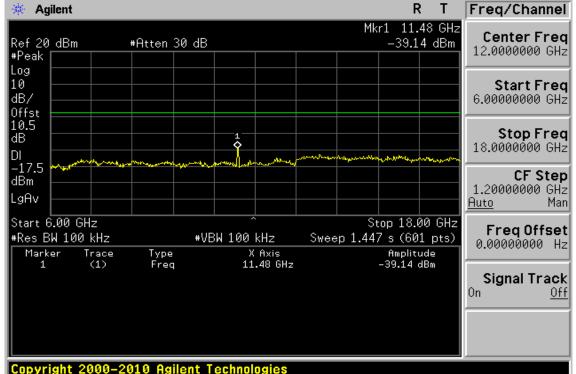
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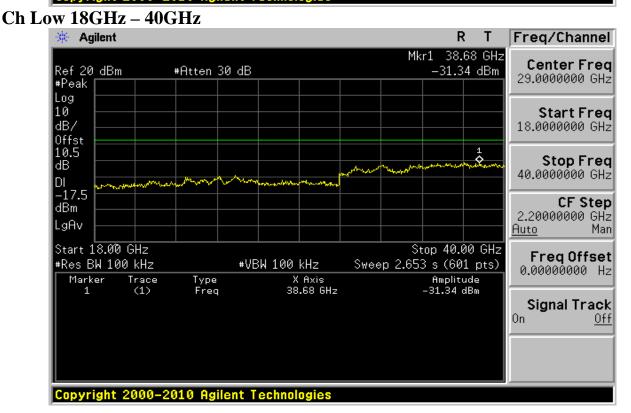
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# Ch Low 6GHz - 18GHz





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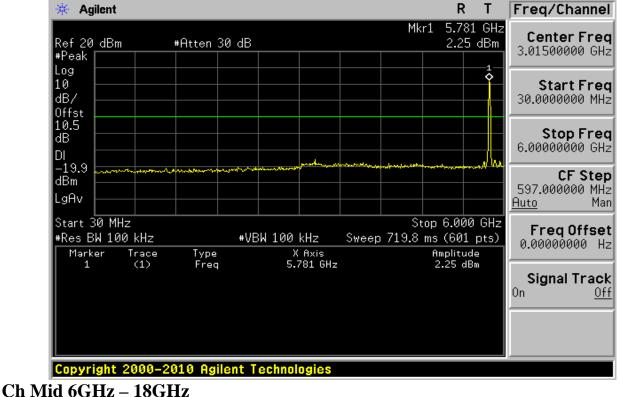
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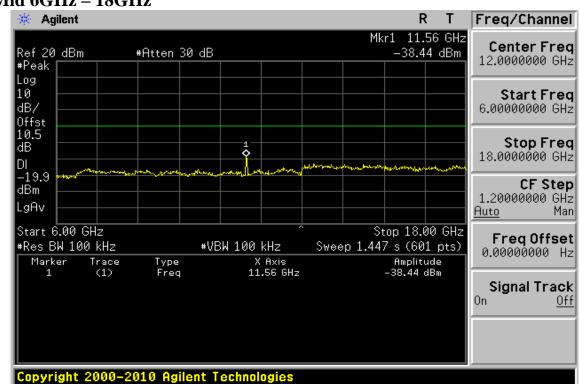
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# Ch Mid 30MHz – 6GHz





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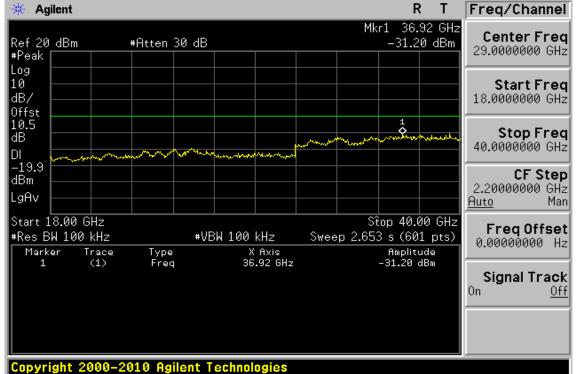
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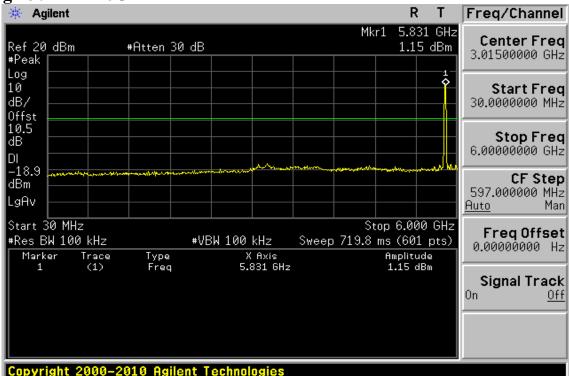


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## Ch Mid 18GHz – 40GHz







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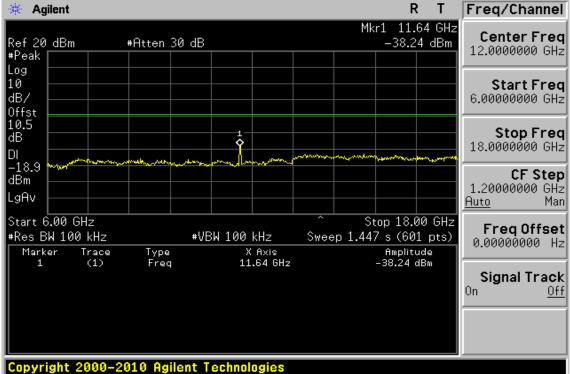
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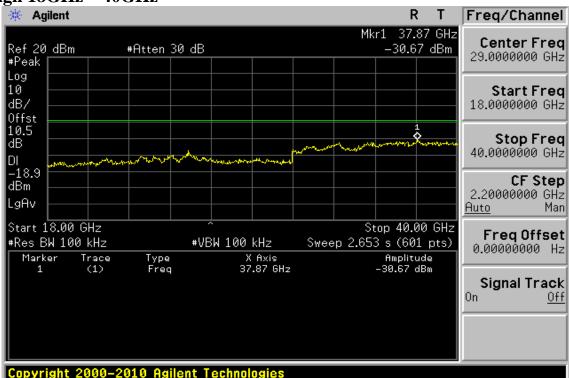


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# Ch High 6GHz – 18GHz







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

Operation Band	:B	Test Date	:2011-11-01
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
168.71	S	Peak	52.38	-12.43	39.95	43.50	-3.55
254.07	S	Peak	49.80	-13.27	36.53	46.00	-9.47
345.25	S	Peak	42.51	-11.12	31.39	46.00	-14.61
448.07	S	Peak	41.03	-9.42	31.61	46.00	-14.39
546.04	S	Peak	45.76	-8.00	37.76	46.00	-8.24
727.43	S	Peak	37.80	-4.52	33.28	46.00	-12.72
1598.00	S	Peak	51.79	1.15	52.94	74.00	-21.06
4824.00	Н	Peak	35.71	10.20	45.91	74.00	-28.09
7236.00							
9648.00							
12060.00							
14472.00							
16884.00							
19296.00							
21708.00							
24120.00							

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Operation Band	:B	Test Date	:2011-11-01
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
167.74	S	Peak	47.01	-12.33	34.68	43.50	-8.82
255.04	S	Peak	52.55	-13.25	39.30	46.00	-6.70
351.07	S	Peak	54.71	-11.06	43.65	46.00	-2.35
447.10	S	Peak	49.71	-9.45	40.26	46.00	-5.74
545.07	S	Peak	43.51	-8.03	35.48	46.00	-10.52
636.25	S	Peak	44.28	-6.07	38.21	46.00	-7.79
1598.00	S	Peak	47.60	1.72	49.32	74.00	-24.68
4824.00	Н	Peak	35.59	9.98	45.57	74.00	-28.43
7236.00							
9648.00							
12060.00							
14472.00							
16884.00							
19296.00							
21708.00							
24120.00							

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Operation Band	:B	Test Date	:2011-11-01
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
167.74	S	Peak	52.23	-12.33	39.90	43.50	-3.60
253.10	S	Peak	51.23	-13.28	37.95	46.00	-8.05
353.98	S	Peak	42.50	-11.00	31.50	46.00	-14.50
449.04	S	Peak	53.81	-9.41	44.40	46.00	-1.60
543.13	S	Peak	46.70	-8.05	38.65	46.00	-7.35
727.43	S	Peak	39.49	-4.52	34.97	46.00	-11.03
1598.00	S	Peak	49.08	1.15	50.23	74.00	-23.77
4874.00	Н	Peak	34.00	10.55	44.55	74.00	-29.45
7311.00							
9748.00							
12185.00							
14622.00							
17059.00							
19496.00							
21933.00							
24370.00							

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Operation Band	:B	Test Date	:2011-11-01
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	46.71	-17.11	29.60	40.00	-10.40
170.65	S	Peak	46.47	-12.57	33.90	43.50	-9.60
254.07	S	Peak	54.34	-13.27	41.07	46.00	-4.93
351.07	S	Peak	49.13	-11.06	38.07	46.00	-7.93
444.19	S	Peak	44.65	-9.50	35.15	46.00	-10.85
644.98	S	Peak	42.40	-5.94	36.46	46.00	-9.54
1591.50	S	Peak	44.97	1.64	46.61	74.00	-27.39
4874.00	Н	Peak	35.23	10.50	45.73	74.00	-28.27
7311.00							
9748.00							
12185.00							
14622.00							
17059.00							
19496.00							
21933.00							
24370.00							

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**Report No.: EH/2011/A0017 Issue Date: Nov. 14, 2011** Page: 91 of 129

Operation Band	:B	Test Date	:2011-11-01
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
32.91	S	Peak	46.65	-13.88	32.77	40.00	-7.23
78.50	S	Peak	47.96	-17.71	30.25	40.00	-9.75
167.74	S	Peak	54.82	-12.33	42.49	43.50	-1.01
447.10	S	Peak	52.26	-9.45	42.81	46.00	-3.19
546.04	S	Peak	48.06	-8.00	40.06	46.00	-5.94
739.07	S	Peak	38.23	-4.35	33.88	46.00	-12.12
1591.50	S	Peak	50.75	1.08	51.83	74.00	-22.17
4924.00	Н	Peak	34.70	10.33	45.03	74.00	-28.97
7386.00							
9848.00							
12310.00							
14772.00							
17234.00							
19696.00							
22158.00							
24620.00							

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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Report No.: EH/2011/A0017 Issue Date: Nov. 14, 2011 Page: 92 of 129

Operation Band	:B	Test Date	:2011-11-01
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	47.17	-17.11	30.06	40.00	-9.94
167.74	S	Peak	44.76	-12.33	32.43	43.50	-11.07
250.19	S	Peak	52.64	-13.35	39.29	46.00	-6.71
355.92	S	Peak	54.60	-10.99	43.61	46.00	-2.39
450.01	S	Peak	50.26	-9.35	40.91	46.00	-5.09
730.34	S	Peak	42.81	-4.48	38.33	46.00	-7.67
1598.00	S	Peak	51.60	1.72	53.32	74.00	-20.68
4924.00	Н	Peak	34.97	10.22	45.19	74.00	-28.81
7386.00							
9848.00							
12310.00							
14772.00							
17234.00							
19696.00							
22158.00							
24620.00							

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

Operation Band	:G	Test Date	:2011-11-01
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
35.82	S	Peak	48.19	-13.67	34.52	40.00	-5.48
78.50	S	Peak	46.10	-17.71	28.39	40.00	-11.61
168.71	S	Peak	51.52	-12.43	39.09	43.50	-4.41
345.25	S	Peak	42.59	-11.12	31.47	46.00	-14.53
453.89	S	Peak	47.17	-9.37	37.80	46.00	-8.20
547.98	S	Peak	47.78	-7.96	39.82	46.00	-6.18
1598.00	S	Peak	49.91	1.15	51.06	74.00	-22.94
4824.00	Н	Peak	34.66	9.94	44.60	74.00	-29.40
7236.00							
9648.00							
12060.00							
14472.00							
16884.00							
19296.00							
21708.00							
24120.00							

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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Report No.: EH/2011/A0017 Issue Date: Nov. 14, 2011 Page: 94 of 129

Operation Band	:G	Test Date	:2011-11-01
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	44.91	-17.11	27.80	40.00	-12.20
168.71	S	Peak	45.24	-12.43	32.81	43.50	-10.69
249.22	S	Peak	50.59	-13.35	37.24	46.00	-8.76
352.04	S	Peak	53.31	-11.04	42.27	46.00	-3.73
446.13	S	Peak	49.41	-9.44	39.97	46.00	-6.03
644.01	S	Peak	38.73	-5.98	32.75	46.00	-13.25
1591.50	S	Peak	50.41	1.64	52.05	74.00	-21.95
4824.00	Н	Peak	35.86	9.98	45.84	74.00	-28.16
7236.00							
9648.00							
12060.00							
14472.00							
16884.00							
19296.00							
21708.00							
24120.00							

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Operation Band	:G	Test Date	:2011-11-01
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88		Peak	50.94	-13.85	37.09	40.00	-2.91
78.50		Peak	48.77	-17.71	31.06	40.00	-8.94
168.71		Peak	53.15	-12.43	40.72	43.50	-2.78
251.16		Peak	48.98	-13.30	35.68	46.00	-10.32
446.13		Peak	52.73	-9.44	43.29	46.00	-2.71
542.16		Peak	46.70	-8.05	38.65	46.00	-7.35
1598.00		Peak	50.46	1.15	51.61	74.00	-22.39
4874.00		Peak	35.09	10.55	45.64	74.00	-28.36
7311.00							
9748.00							
12185.00							
14622.00							
17059.00							
19496.00							
21933.00							
24370.00							

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Operation Band	:G	Test Date	:2011-11-01
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	43.41	-17.11	26.30	40.00	-13.70
169.68	S	Peak	46.80	-12.45	34.35	43.50	-9.15
253.10	S	Peak	48.69	-13.28	35.41	46.00	-10.59
352.04	S	Peak	47.38	-11.04	36.34	46.00	-9.66
451.95	S	Peak	45.76	-9.35	36.41	46.00	-9.59
731.31	S	Peak	39.18	-4.45	34.73	46.00	-11.27
1598.00	S	Peak	46.34	1.72	48.06	74.00	-25.94
4874.00	Н	Peak	35.16	10.50	45.66	74.00	-28.34
7311.00							
9748.00							
12185.00							
14622.00							
17059.00							
19496.00							
21933.00							
24370.00							

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Operation Band	:G	Test Date	:2011-11-01
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
31.94		Peak	48.10	-13.89	34.21	40.00	-5.79
168.71		Peak	53.98	-12.43	41.55	43.50	-1.95
256.01		Peak	51.07	-13.23	37.84	46.00	-8.16
347.19		Peak	42.30	-11.08	31.22	46.00	-14.78
450.98		Peak	44.10	-9.37	34.73	46.00	-11.27
544.10		Peak	47.57	-8.03	39.54	46.00	-6.46
1591.50		Peak	50.62	1.08	51.70	74.00	-22.30
4924.00		Peak	34.30	10.33	44.63	74.00	-29.37
7386.00							
9848.00							
12310.00							
14772.00							
17234.00							
19696.00							
22158.00							
24620.00							

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Operation Band	:G	Test Date	:2011-11-01
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	46.68	-17.11	29.57	40.00	-10.43
169.68	S	Peak	44.52	-12.45	32.07	43.50	-11.43
253.10	S	Peak	51.32	-13.28	38.04	46.00	-7.96
352.04	S	Peak	46.83	-11.04	35.79	46.00	-10.21
451.95	S	Peak	45.14	-9.35	35.79	46.00	-10.21
638.19	S	Peak	38.27	-6.06	32.21	46.00	-13.79
1598.00	S	Peak	46.56	1.72	48.28	74.00	-25.72
4924.00	Н	Peak	34.42	10.22	44.64	74.00	-29.36
7386.00							
9848.00							
12310.00							
14772.00							
17234.00							
19696.00							
22158.00							
24620.00							

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

Operation Band	:N	Test Date	:2011-11-01
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
32.91	S	Peak	48.82	-13.88	34.94	40.00	-5.06
168.71	S	Peak	52.55	-12.43	40.12	43.50	-3.38
250.19	S	Peak	45.99	-13.35	32.64	46.00	-13.36
354.95	S	Peak	41.64	-11.01	30.63	46.00	-15.37
445.16	S	Peak	46.39	-9.43	36.96	46.00	-9.04
547.01	S	Peak	47.36	-7.98	39.38	46.00	-6.62
1598.00	S	Peak	48.02	1.15	49.17	74.00	-24.83
4824.00	Н	Peak	34.80	9.94	44.74	74.00	-29.26
7236.00							
9648.00							
12060.00							
14472.00							
16884.00							
19296.00							
21708.00							
24120.00							

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Report No.: EH/2011/A0017 Issue Date: Nov. 14, 2011 Page: 100 of 129

Operation Band	:N	Test Date	:2011-11-01
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	46.68	-17.11	29.57	40.00	-10.43
168.71	S	Peak	45.49	-12.43	33.06	43.50	-10.44
253.10	S	Peak	51.40	-13.28	38.12	46.00	-7.88
347.19	S	Peak	46.72	-11.08	35.64	46.00	-10.36
446.13	S	Peak	42.88	-9.44	33.44	46.00	-12.56
633.34	S	Peak	38.19	-6.10	32.09	46.00	-13.91
1591.50	S	Peak	49.49	1.64	51.13	74.00	-22.87
4824.00	Н	Peak	34.73	9.98	44.71	74.00	-29.29
7236.00							
9648.00							
12060.00							
14472.00							
16884.00							
19296.00							
21708.00							
24120.00							

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Operation Band	:N	Test Date	:2011-11-01
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
35.82	S	Peak	48.40	-13.67	34.73	40.00	-5.27
169.68	S	Peak	49.17	-12.45	36.72	43.50	-6.78
254.07	S	Peak	43.31	-13.27	30.04	46.00	-15.96
448.07	S	Peak	45.28	-9.42	35.86	46.00	-10.14
554.77	S	Peak	43.87	-7.87	36.00	46.00	-10.00
859.35	S	Peak	32.70	-2.84	29.86	46.00	-16.14
1591.50	S	Peak	52.00	1.08	53.08	74.00	-20.92
4874.00	Н	Peak	35.01	10.55	45.56	74.00	-28.44
7311.00							
9748.00							
12185.00							
14622.00							
17059.00							
19496.00							
21933.00							
24370.00							

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Operation Band	:N	Test Date	:2011-11-01
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	47.07	-17.11	29.96	40.00	-10.04
166.77	S	Peak	41.58	-12.20	29.38	43.50	-14.12
254.07	S	Peak	43.19	-13.27	29.92	46.00	-16.08
353.98	S	Peak	48.11	-11.00	37.11	46.00	-8.89
446.13	S	Peak	48.21	-9.44	38.77	46.00	-7.23
647.89	S	Peak	36.25	-5.95	30.30	46.00	-15.70
1591.50	S	Peak	50.03	1.64	51.67	74.00	-22.33
4874.00	Н	Peak	33.72	10.50	44.22	74.00	-29.78
7311.00							
9748.00							
12185.00							
14622.00							
17059.00							
19496.00							
21933.00							
24370.00							

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Operation Band	:N	Test Date	:2011-11-01
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV∕m	dBµV/m	dB
33.88	S	Peak	50.75	-13.85	36.90	40.00	-3.10
169.68	S	Peak	49.52	-12.45	37.07	43.50	-6.43
254.07	S	Peak	42.63	-13.27	29.36	46.00	-16.64
351.07	S	Peak	40.19	-11.06	29.13	46.00	-16.87
450.98	S	Peak	44.10	-9.37	34.73	46.00	-11.27
547.98	S	Peak	44.09	-7.96	36.13	46.00	-9.87
1591.50	S	Peak	50.66	1.08	51.74	74.00	-22.26
4926.00	Н	Peak	34.32	10.33	44.65	74.00	-29.35
7386.00							
9848.00							
12310.00							
14772.00							
17234.00							
19696.00							
22158.00							

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Operation Band	:N	Test Date	:2011-11-01
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV∕m	dBµV∕m	dB
81.41	S	Peak	46.06	-17.11	28.95	40.00	-11.05
169.68	S	Peak	43.70	-12.45	31.25	43.50	-12.25
253.10	S	Peak	55.11	-13.28	41.83	46.00	-4.17
353.98	S	Peak	52.05	-11.00	41.05	46.00	-4.95
450.98	S	Peak	47.33	-9.37	37.96	46.00	-8.04
647.89	S	Peak	44.21	-5.95	38.26	46.00	-7.74
1591.50	S	Peak	48.10	1.64	49.74	74.00	-24.26
4924.00	Н	Peak	34.62	10.22	44.84	74.00	-29.16
7386.00							
9848.00							
12310.00							
14772.00							
17234.00							
19696.00							
22158.00							

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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#### **Radiated Spurious Emission Measurement Result (802.11a)**

Operation Band	:A	Test Date	:2011-11-01
Fundamental Frequency	:5745	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
34.85	S	Peak	50.63	-13.86	36.77	40.00	-3.23
165.80	S	Peak	53.86	-12.14	41.72	43.50	-1.78
255.04	S	Peak	52.07	-13.25	38.82	46.00	-7.18
353.01	S	Peak	39.94	-10.99	28.95	46.00	-17.05
544.10	S	Peak	38.82	-8.03	30.79	46.00	-15.21
646.92	S	Peak	38.16	-5.94	32.22	46.00	-13.78
1591.50	S	Peak	50.70	0.89	51.59	74.00	-22.41
11490.00	Н	Average	29.49	19.38	48.87	54.00	-5.13
11490.00	Н	Peak	39.86	19.38	59.24	74.00	-14.76
17235.00							
22980.00							
28725.00							
34470.00							
40215.00							
45960.00							

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Report No.: EH/2011/A0017 Issue Date: Nov. 14, 2011 Page: 106 of 129

Operation Band	:A	Test Date	:2011-11-01
Fundamental Frequency	:5745	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:Н	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
169.68	S	Peak	46.73	-12.45	34.28	43.50	-9.22
254.07	S	Peak	52.92	-13.27	39.65	46.00	-6.35
351.07	S	Peak	43.00	-11.06	31.94	46.00	-14.06
443.22	S	Peak	41.68	-9.50	32.18	46.00	-13.82
552.83	S	Peak	37.71	-7.89	29.82	46.00	-16.18
732.28	S	Peak	38.53	-4.46	34.07	46.00	-11.93
1591.50	S	Peak	50.14	1.45	51.59	74.00	-22.41
11490.00	Н	Average	30.25	19.18	49.43	54.00	-4.57
11490.00	Н	Peak	40.67	19.18	59.85	74.00	-14.15
17235.00							
22980.00							
28725.00							
34470.00							
40215.00							
45960.00							

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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**Report No.: EH/2011/A0017** Issue Date: Nov. 14, 2011 Page: 107 of 129

Operation Band	:A	Test Date	:2011-11-01
Fundamental Frequency	:5785	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	50.21	-13.85	36.36	40.00	-3.64
166.77	S	Peak	50.61	-12.20	38.41	43.50	-5.09
253.10	S	Peak	48.26	-13.28	34.98	46.00	-11.02
446.13	S	Peak	42.51	-9.44	33.07	46.00	-12.93
546.04	S	Peak	45.21	-8.00	37.21	46.00	-8.79
778.84	S	Peak	33.64	-3.89	29.75	46.00	-16.25
1591.50	S	Peak	48.59	0.89	49.48	74.00	-24.52
11570.00	Н	Average	31.54	20.24	51.78	54.00	-2.22
11570.00	Н	Peak	43.16	20.24	63.40	74.00	-10.60
17355.00							
23140.00							
28925.00							
34710.00							
40495.00							
46280.00							

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Report No.: EH/2011/A0017 Issue Date: Nov. 14, 2011 Page: 108 of 129

Operation Band	:A	Test Date	:2011-11-01
Fundamental Frequency	:5785	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:Н	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	47.90	-17.11	30.79	40.00	-9.21
166.77	S	Peak	46.89	-12.20	34.69	43.50	-8.81
254.07	S	Peak	55.29	-13.27	42.02	46.00	-3.98
354.95	S	Peak	40.46	-11.01	29.45	46.00	-16.55
450.98	S	Peak	38.78	-9.37	29.41	46.00	-16.59
646.92	S	Peak	30.07	-5.94	24.13	46.00	-21.87
1591.50	S	Peak	50.20	1.45	51.65	74.00	-22.35
11570.00	Н	Average	30.98	20.04	51.02	54.00	-2.98
11570.00	Н	Peak	42.15	20.04	62.19	74.00	-11.81
17355.00							
23140.00							
28925.00							
34710.00							
40495.00							
46280.00							

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Operation Band	:A	Test Date	:2011-11-01
Fundamental Frequency	:5825	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	50.59	-13.85	36.74	40.00	-3.26
166.77	S	Peak	54.53	-12.20	42.33	43.50	-1.17
253.10	S	Peak	54.16	-13.28	40.88	46.00	-5.12
546.04	S	Peak	41.24	-8.00	33.24	46.00	-12.76
645.95	S	Peak	39.15	-5.97	33.18	46.00	-12.82
724.52	S	Peak	37.33	-4.58	32.75	46.00	-13.25
1598.00	S	Peak	51.60	0.96	52.56	74.00	-21.44
11650.00	Н	Average	29.87	19.66	49.53	54.00	-4.47
11650.00	Н	Peak	41.45	19.66	61.11	74.00	-12.89
17475.00							
23300.00							
29125.00							
34950.00							
40775.00							
46600.00							

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Operation Band	:A	Test Date	:2011-11-01
Fundamental Frequency	:5825	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:Н	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
169.68	S	Peak	44.90	-12.45	32.45	43.50	-11.05
252.13	S	Peak	47.41	-13.33	34.08	46.00	-11.92
353.98	S	Peak	40.17	-11.00	29.17	46.00	-16.83
443.22	S	Peak	39.69	-9.50	30.19	46.00	-15.81
637.22	S	Peak	37.79	-6.06	31.73	46.00	-14.27
733.25	S	Peak	36.58	-4.42	32.16	46.00	-13.84
1591.50	S	Peak	48.57	1.45	50.02	74.00	-23.98
11650.00	Н	Average	31.64	19.46	51.10	54.00	-2.90
11650.00	Н	Peak	43.27	19.46	62.73	74.00	-11.27
17475.00							
23300.00							
29125.00							
34950.00							
40775.00							
46600.00							

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#### Radiated Spurious Emission Measurement Result (802.11n(5GHz)\_20M)

Operation Band	:A20	Test Date	:2011-11-01
Fundamental Frequency	:5745	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
34.85	S	Peak	50.63	-13.86	36.77	40.00	-3.23
165.80	S	Peak	53.86	-12.14	41.72	43.50	-1.78
255.04	S	Peak	52.07	-13.25	38.82	46.00	-7.18
353.01	S	Peak	39.94	-10.99	28.95	46.00	-17.05
544.10	S	Peak	38.82	-8.03	30.79	46.00	-15.21
646.92	S	Peak	38.16	-5.94	32.22	46.00	-13.78
1591.50	S	Peak	48.82	0.89	49.71	74.00	-24.29
11490.00	Н	Average	28.93	19.38	48.31	54.00	-5.69
11490.00	Н	Peak	40.63	19.38	60.01	74.00	-13.99
17235.00							
22980.00							
28725.00							
34470.00							
40215.00							
45960.00							

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Operation Band	:A20	Test Date	:2011-11-01
Fundamental Frequency	:5745	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
169.68	S	Peak	46.73	-12.45	34.28	43.50	-9.22
254.07	S	Peak	52.92	-13.27	39.65	46.00	-6.35
351.07	S	Peak	43.00	-11.06	31.94	46.00	-14.06
443.22	S	Peak	41.68	-9.50	32.18	46.00	-13.82
552.83	S	Peak	37.71	-7.89	29.82	46.00	-16.18
732.28	S	Peak	38.53	-4.46	34.07	46.00	-11.93
1591.50	S	Peak	46.71	1.45	48.16	74.00	-25.84
11490.00	Н	Average	29.48	19.18	48.66	54.00	-5.34
11490.00	Н	Peak	41.26	19.18	60.44	74.00	-13.56
17235.00							
22980.00							
28725.00							
34470.00							
40215.00							
45960.00							

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Operation Band	:A20	Test Date	:2011-11-01
Fundamental Frequency	:5785	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	50.21	-13.85	36.36	40.00	-3.64
166.77	S	Peak	50.61	-12.20	38.41	43.50	-5.09
253.10	S	Peak	48.26	-13.28	34.98	46.00	-11.02
446.13	S	Peak	42.51	-9.44	33.07	46.00	-12.93
546.04	S	Peak	45.21	-8.00	37.21	46.00	-8.79
778.84	S	Peak	33.64	-3.89	29.75	46.00	-16.25
1598.00	S	Peak	50.05	0.96	51.01	74.00	-22.99
11570.00	Н	Average	29.63	20.07	49.70	54.00	-4.30
11570.00	Н	Peak	41.29	20.07	61.36	74.00	-12.64
17355.00							
23140.00							
28925.00							
34710.00							
40495.00							
46280.00							

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Operation Band	:A20	Test Date	:2011-11-01
Fundamental Frequency	:5785	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:HORIZONTAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
81.41	S	Peak	47.90	-17.11	30.79	40.00	-9.21
166.77	S	Peak	46.89	-12.20	34.69	43.50	-8.81
254.07	S	Peak	55.29	-13.27	42.02	46.00	-3.98
354.95	S	Peak	40.46	-11.01	29.45	46.00	-16.55
450.98	S	Peak	38.78	-9.37	29.41	46.00	-16.59
646.92	S	Peak	30.07	-5.94	24.13	46.00	-21.87
1598.00	S	Peak	48.83	1.53	50.36	74.00	-23.64
11570.00	Н	Average	31.51	20.04	51.55	54.00	-2.45
11570.00	Н	Peak	43.49	20.04	63.53	74.00	-10.47
17355.00							
23140.00							
28925.00							
34710.00							
40495.00							
46280.00							

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Operation Band	:A20	Test Date	:2011-11-01
Fundamental Frequency	:5825	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:H	Measurement Antenna Pol.	:VERTICAL

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

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

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

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

"---": denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
33.88	S	Peak	50.59	-13.85	36.74	40.00	-3.26
166.77	S	Peak	54.53	-12.20	42.33	43.50	-1.17
253.10	S	Peak	54.16	-13.28	40.88	46.00	-5.12
546.04	S	Peak	41.24	-8.00	33.24	46.00	-12.76
645.95	S	Peak	39.15	-5.97	33.18	46.00	-12.82
724.52	S	Peak	37.33	-4.58	32.75	46.00	-13.25
1598.00	S	Peak	51.45	0.96	52.41	74.00	-21.59
11650.00	Н	Average	29.10	19.66	48.76	54.00	-5.24
11650.00	Н	Peak	41.93	19.66	61.59	74.00	-12.41
17475.00							
23300.00							
29125.00							
34950.00							
40775.00							
46600.00							

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Operation Band	:A20	Test Date	:2011-11-01
Fundamental Frequency	:5825	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:Н	Measurement Antenna Pol.	:HORIZONTAL

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

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

Note : "F" : denotes Fundamental Frequency. ; "H" : denotes Harmonic Frequency. "E" : denotes Band Edge Frequency. ; "S" : denotes Spurious Frequency. "---" : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Safe
		Mode	Reading Level		FS	@3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
169.68	S	Peak	44.90	-12.45	32.45	43.50	-11.05
252.13	S	Peak	47.41	-13.33	34.08	46.00	-11.92
353.98	S	Peak	40.17	-11.00	29.17	46.00	-16.83
443.22	S	Peak	39.69	-9.50	30.19	46.00	-15.81
637.22	S	Peak	37.79	-6.06	31.73	46.00	-14.27
733.25	S	Peak	36.58	-4.42	32.16	46.00	-13.84
1598.00	S	Peak	48.35	1.53	49.88	74.00	-24.12
11650.00	Н	Average	30.26	19.46	49.72	54.00	-4.28
11650.00	Н	Peak	42.91	19.46	62.37	74.00	-11.63
17475.00							
23300.00							
29125.00							
34950.00							
40775.00							
46600.00							

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# **10 PEAK POWER SPECTRAL DENSITY**

#### **10.1 Standard Applicable:**

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

# **10.2 Measurement Equipment Used:**

Refer to section 6.2 for details.

# 10.3 Test Set-up:

Refer to section 6.3 for details.

#### **10.4 Measurement Procedure:**

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

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#### 10.5 **Measurement Result:**

#### 802.11b

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-4.93	-4.93	8
2437	-4.91	-4.91	8
2462	-4.57	-4.57	8

#### 802.11g

Frequency	<b>RF Power Density</b>	<b>RF Power Density</b>	Maximum Limit
MHz	Reading (dBm)	Level (dBm)	(dBm)
2412	-12.29	-12.29	8
2437	-6.54	-6.54	8
2462	-9.64	-9.64	8

#### 802.11n 20M

Frequency	<b>RF Power Density</b>	<b>RF Power Density</b>	Maximum Limit
MHz	Reading (dBm)	Level (dBm)	(dBm)
2412	-13.64	-13.64	8
2437	-6.22	-6.22	8
2462	-10.92	-10.92	8

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#### 802.11a

Frequency	<b>RF Power Density</b>	<b>RF Power Density</b>	Maximum Limit
MHz	Reading (dBm)	Level (dBm)	(dBm)
5745	-8.92	-8.92	8
5785	-9.85	-9.85	8
5825	-12.07	-12.07	8

#### 802.11n (5GHz)\_20M

Frequency	<b>RF Power Density</b>	<b>RF Power Density</b>	Maximum Limit
MHz	Reading (dBm)	Level (dBm)	(dBm)
5745	-10.02	-10.02	8
5785	-9.25	-9.25	8
5825	-10.37	-10.37	8

\*Note: Offset: 10.5 dB

Note: Refer to next page for plots.

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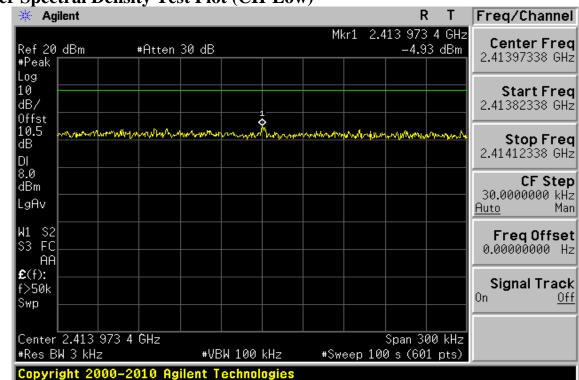
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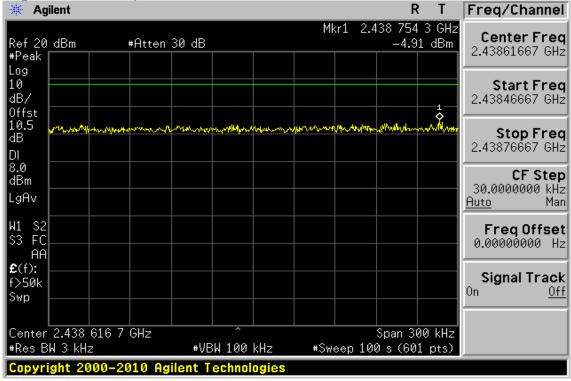
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# 802.11b



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

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



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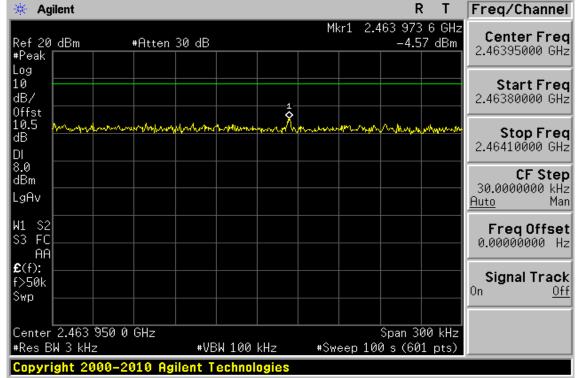
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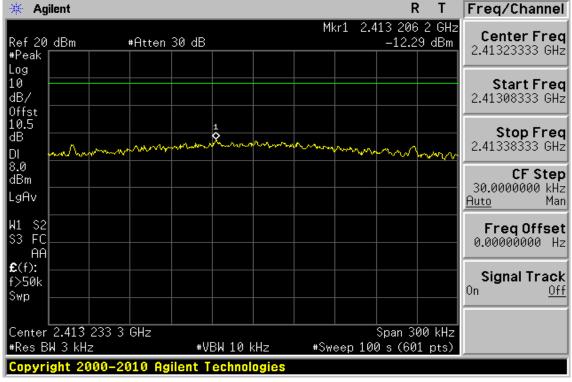
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# **Power Spectral Density Test Plot (CH-High)**



#### 802.11g

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



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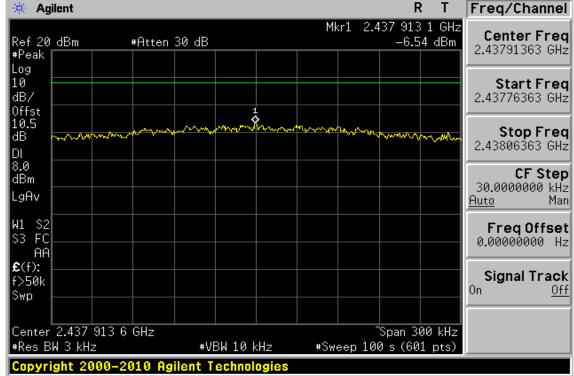
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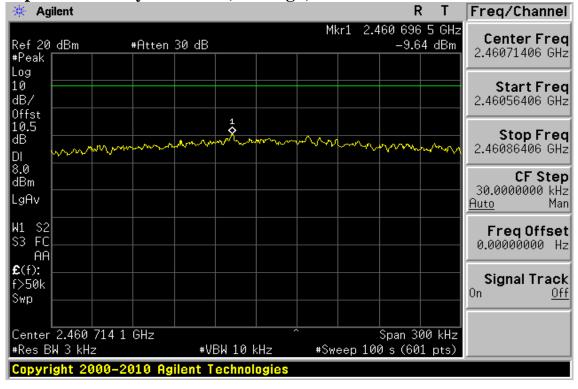


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# **Power Spectral Density Test Plot (CH-Mid)**



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



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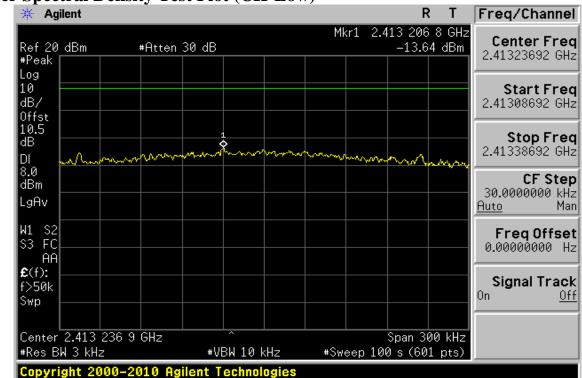
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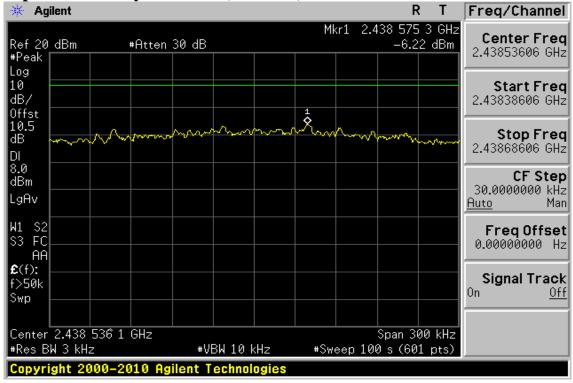
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# 802.11n 20M



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

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



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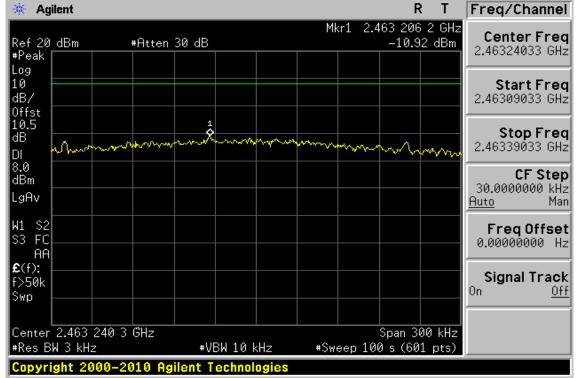
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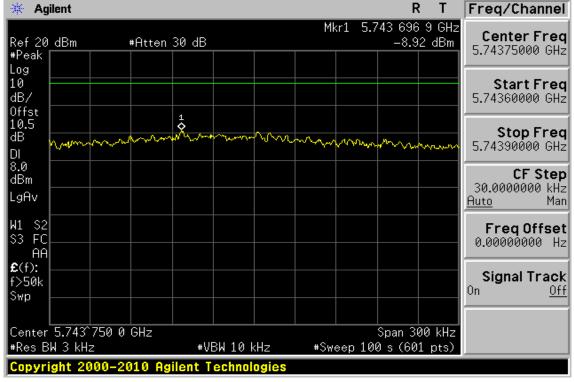
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# **Power Spectral Density Test Plot (CH-High)**



#### 802.11a

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



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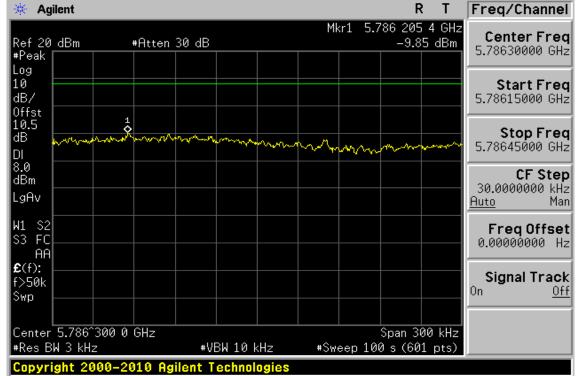
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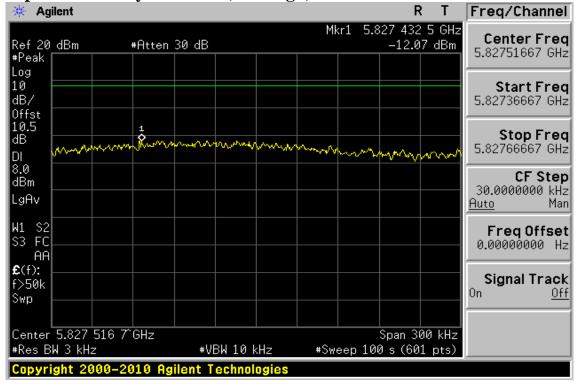


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# **Power Spectral Density Test Plot (CH-Mid)**



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



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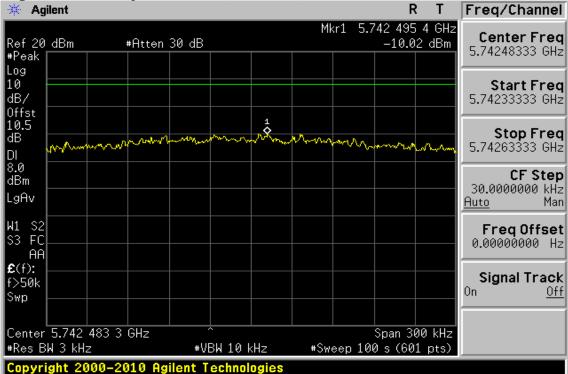
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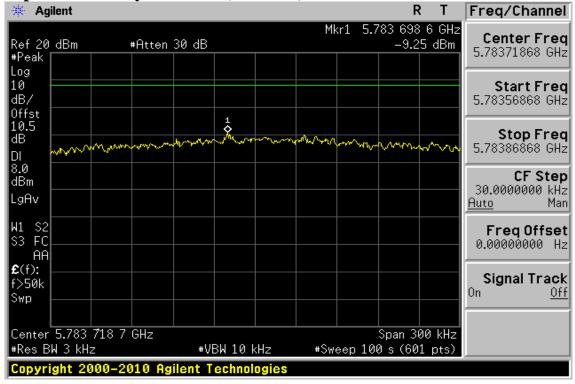


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# 802.11n (5GHz) 20M **Power Spectral Density Test Plot (CH-Low)**



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



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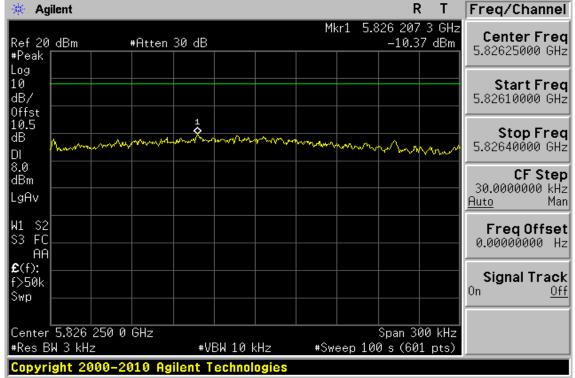
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# **Power Spectral Density Test Plot (CH-High)**



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# **11 ANTENNA REQUIREMENT**

# **11.1. Standard Applicable:**

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be

replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some

field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the

proper antenna is employed so that the limits in this Part are not exceeded.

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.

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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.

# 11.2. Antenna Connected Construction:

The directional gains of antenna used for transmitting is -1.05 dBi (2.4G) and -0.05 dBi (5G), and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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