

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name:	Data Collection Terminal
Brand Name:	unitech
Model No.:	RH768
Model Difference:	N/A
FCC ID:	HLERH768BTGF
Report No.:	EF/2011/B0015
Issue Date:	Dec. 15, 2011
FCC Rule Part:	§15.247, Cat: DTS
Prepared for:	unitech electronics co., ltd. 5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist., New Taipei City, Taiwan SGS Taiwan Ltd.
Prepared by:	Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan



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VERIFICATION OF COMPLIANCE

Applicant: unitech electronics co., ltd.
5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist.,
New Taipei City, Taiwan

Product Description: Data Collection Terminal

Brand Name: unitech

Model No.: RH768

Model Difference: N/A

FCC ID: HLERH768BTGF

File Number: EF/2011/B0015

Date of test: Nov. 21, 2011 ~ Dec. 14, 2011

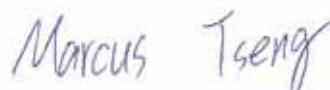
Date of EUT Received: Nov. 21, 2011

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:

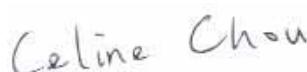


Date

Dec. 15, 2011

Marcus Tseng / Engineer

Prepared By:



Date

Dec. 15, 2011

Celine Chou / Clerk

Approved By:



Date

Dec. 15, 2011

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	Dec. 15, 2011	Initial creation of document

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1 GENERAL INFORMATION

1.1 Product Description

General:

Product Name:	Data Collection Terminal	
Brand Name:	unitech	
Model No.:	RH768	
Model Difference:	N/A	
Data Cable:	Model No.: 1550-602714G, Supplier: SINBON	
Power Supply:	7.4Vdc Lithium Ion battery or 12Vdc by AC/DC power adapter	
	Battery:	Model No.: 1400-900006G, Supplier: Joules Miles Co., Ltd
	Adapter:	Model No.: 3A-242DB12, Supplier: ENG ELECTRONICS CO., LTD.

WLAN: 802.11 b/g

Frequency Range:	2412 – 2462 MHz
Channel number:	11 channels
Max. Output Power:	802.11 b: 19.81 dBm (Peak) 802.11 g: 17.22 dBm (Peak)
Modulation Technology:	DSSS, OFDM
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps
Antenna Designation:	Main: PIFA Antenna, 3.6dBi AUX: PIFA Antenna, 0.9dBi

This report applies for WLAN.

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1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: HLERH768BTGF** filing to comply with Section 15.247 of the FCC Part 15, Subpart E 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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2.4 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	WLAN Test Software	SUMMIT	V3.03.08	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULTS

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

4 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

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

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

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

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5 CONDUCTED EMISSION TEST

5.1 Standard Applicable:

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

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

Note

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

5.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	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	11/28/2011	11/27/2012

5.3 EUT Setup:

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

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5.4 Measurement Procedure:

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

5.5 Measurement Result:

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

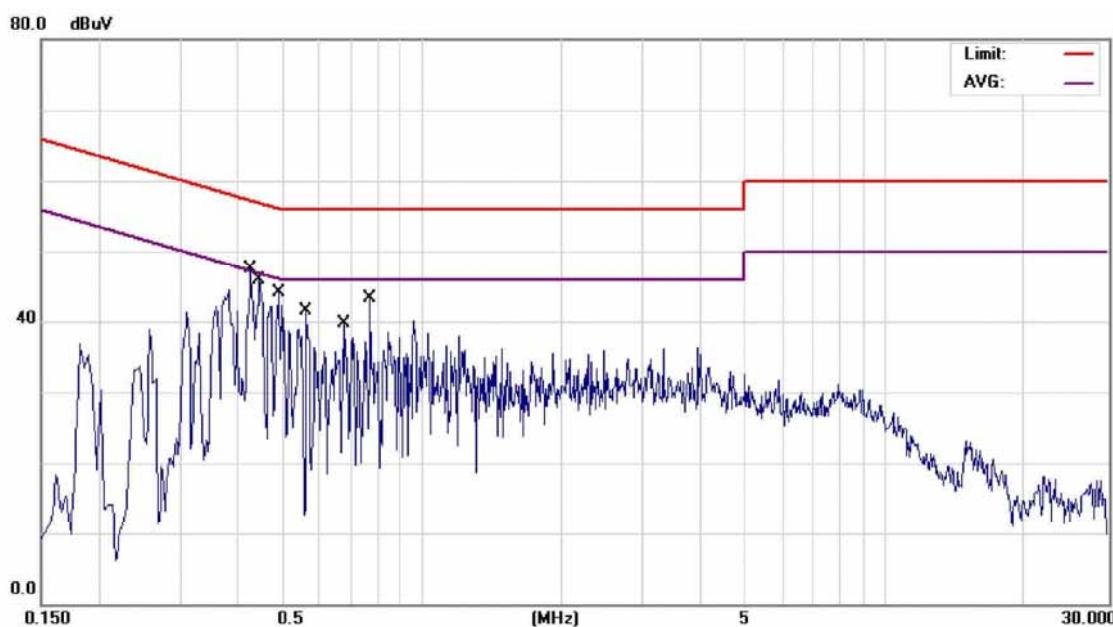
Note: Refer to next page for measurement data and plots.

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Normal mode			Test Date:	Dec. 14, 2011
Temperature:	23	Humidity:	58 %	Test By:	Jay



Site SGS CONDUCTED #1

Phase: **L1**

Temperature: 26 °C

Limit: FCC Class B Conduction(QP)

Power: AC 110V/60Hz

Humidity: 59%

EUT: Data Collection Terminal

Distance:

Air Pressure: 1013 hpa

M/N: RH768

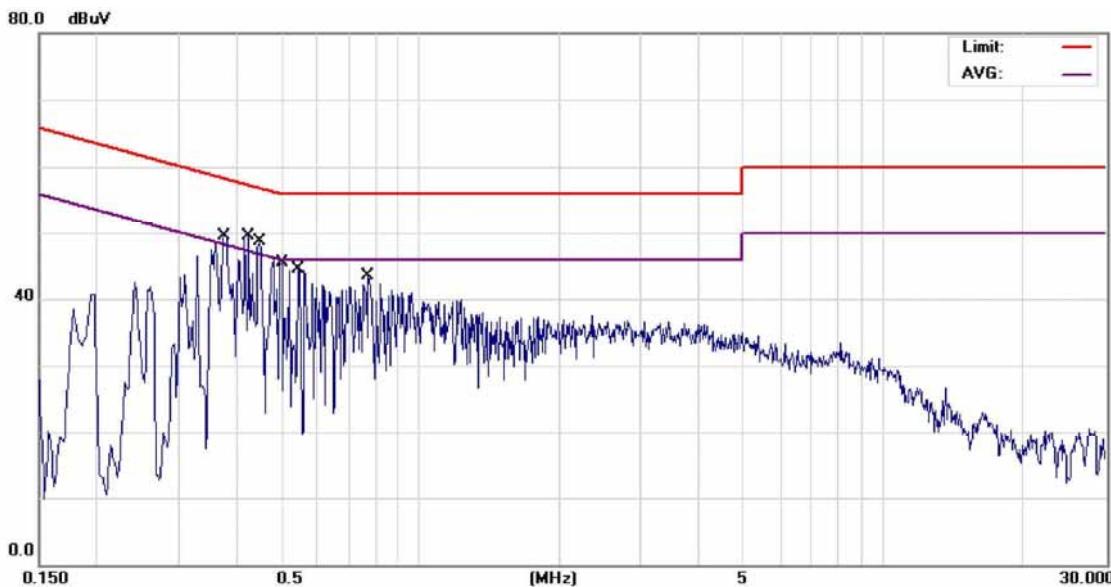
Note: WiFi+RFID

No.	Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over		Comment
							dB	Detector	
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.4260	42.64	0.12	42.76	57.33	-14.57	QP	
2		0.4260	27.55	0.12	27.67	47.33	-19.66	AVG	
3	*	0.4468	45.17	0.12	45.29	56.93	-11.64	QP	
4		0.4900	44.05	0.12	44.17	56.17	-12.00	QP	
5		0.5620	41.46	0.12	41.58	56.00	-14.42	QP	
6		0.6820	39.52	0.12	39.64	56.00	-16.36	QP	
7		0.7740	43.11	0.11	43.22	56.00	-12.78	QP	

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Site: SGS CONDUCTED #1	Phase: N	Temperature: 26 °C
Limit: FCC Class B Conduction(QP)	Power: AC 110V/60Hz	Humidity: 59%
EUT: Data Collection Terminal	Distance:	Air Pressure: hpa
M/N: RH768		
Note: WiFi+RFID		

No.	Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dBuV	Over	
							Detector	Comment
1		0.3780	46.84	0.16	47.00	58.32	-11.32	QP
2		0.3780	31.85	0.16	32.01	48.32	-16.31	AVG
3	*	0.4260	47.09	0.16	47.25	57.33	-10.08	QP
4		0.4260	32.80	0.16	32.96	47.33	-14.37	AVG
5		0.4500	46.20	0.16	46.36	56.88	-10.52	QP
6		0.4500	30.26	0.16	30.42	46.88	-16.46	AVG
7		0.5020	45.30	0.16	45.46	56.00	-10.54	QP
8		0.5460	44.32	0.16	44.48	56.00	-11.52	QP
9		0.7740	43.41	0.15	43.56	56.00	-12.44	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 is the highest total transmit power occurring in any mode.

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

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

(1) Fixed point-to-point operation:

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

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

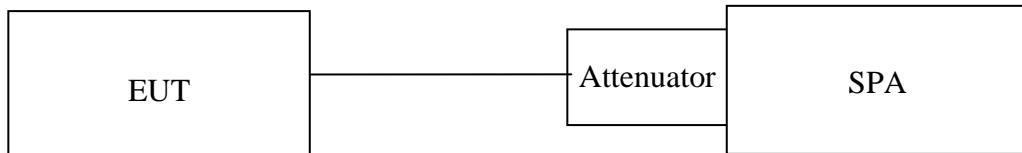
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6.2 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Sensor	Anritsu	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

6.3 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 spectrum.
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:

Cable loss = 0		Peak Power Output(Peak)			
CH	Frequency (MHz)	Data Rate			
		1	2	5.5	11
1	2412	19.51	19.35	19.11	18.99
6	2437	19.81	19.55	19.26	19.03
11	2462	19.55	19.31	19.17	19.01

Cable loss = 0		Average Power Output(Avg)			
CH	Frequency (MHz)	Data Rate			
		1	2	5.5	11
1	2412	17.08	16.95	16.87	16.69
6	2437	17.16	16.98	16.86	16.70
11	2462	17.23	16.99	16.82	16.73

802.11g:

Cable loss = 0		Peak Power Output (Peak)							
CH	Frequency (MHz)	Data Rate							
		6	9	12	18	24	36	48	54
1	2412	17.22	17.02	16.89	16.75	16.62	16.55	16.38	16.20
6	2437	16.28	16.10	16.02	15.87	15.67	15.55	15.42	15.37
11	2462	16.45	16.21	16.02	15.97	15.76	15.63	15.48	15.24

Cable loss = 0		Average Power Output (Avg)							
CH	Frequency (MHz)	Data Rate							
		6	9	12	18	24	36	48	54
1	2412	13.12	13.01	12.95	12.83	12.70	12.59	12.32	12.10
6	2437	12.84	12.74	12.63	12.31	12.20	11.98	11.74	11.26
11	2462	12.80	13.38	12.85	12.68	12.42	12.25	12.06	11.94

*Note: Offset 10.5 dB

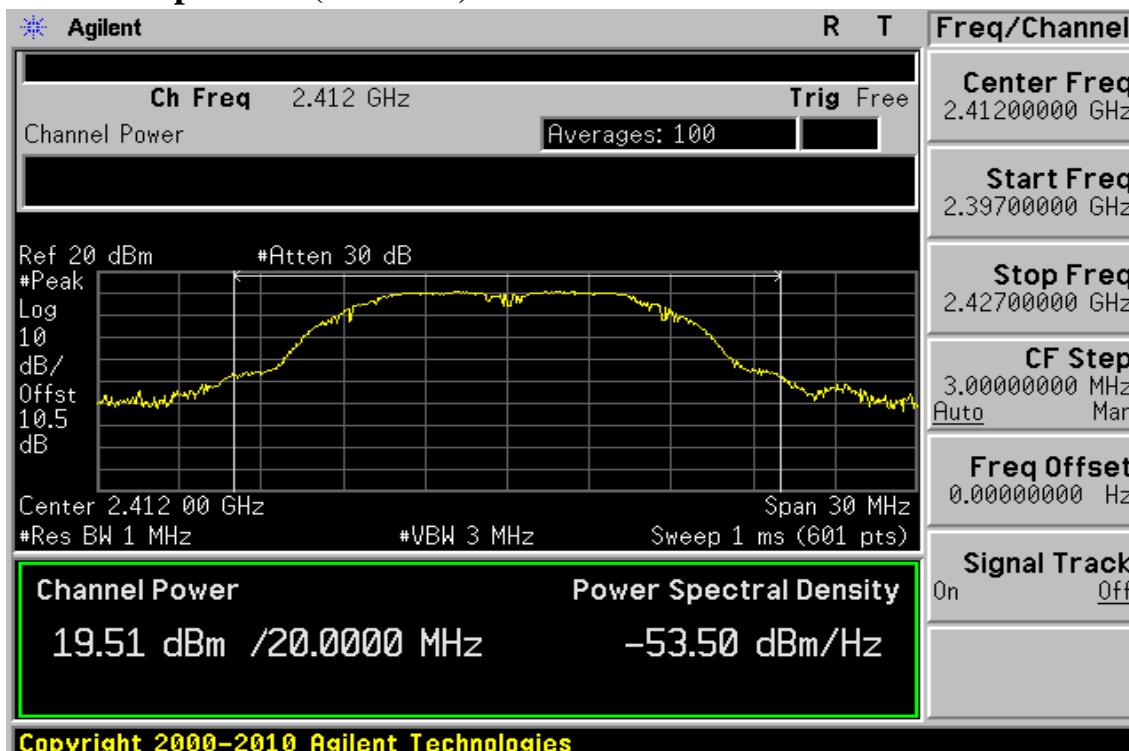
Note: Refer to next page for plots.

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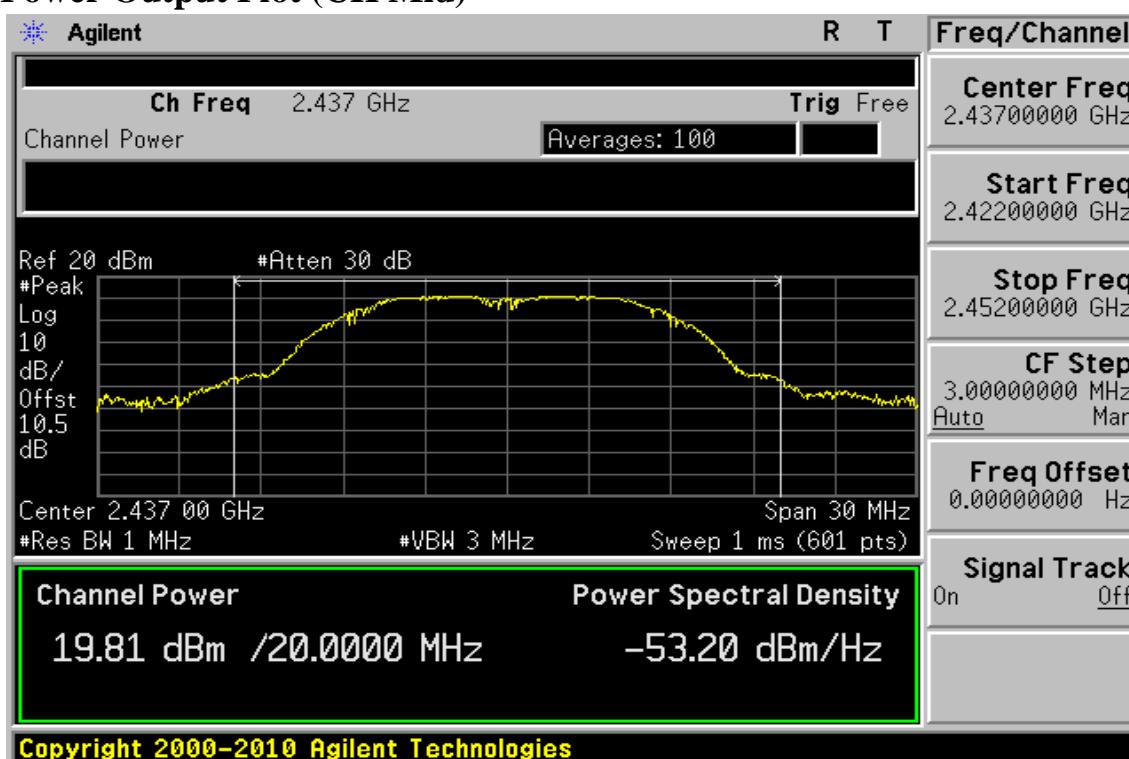
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802.11b, 1Mbps

Peak Power Output Plot (CH Low)

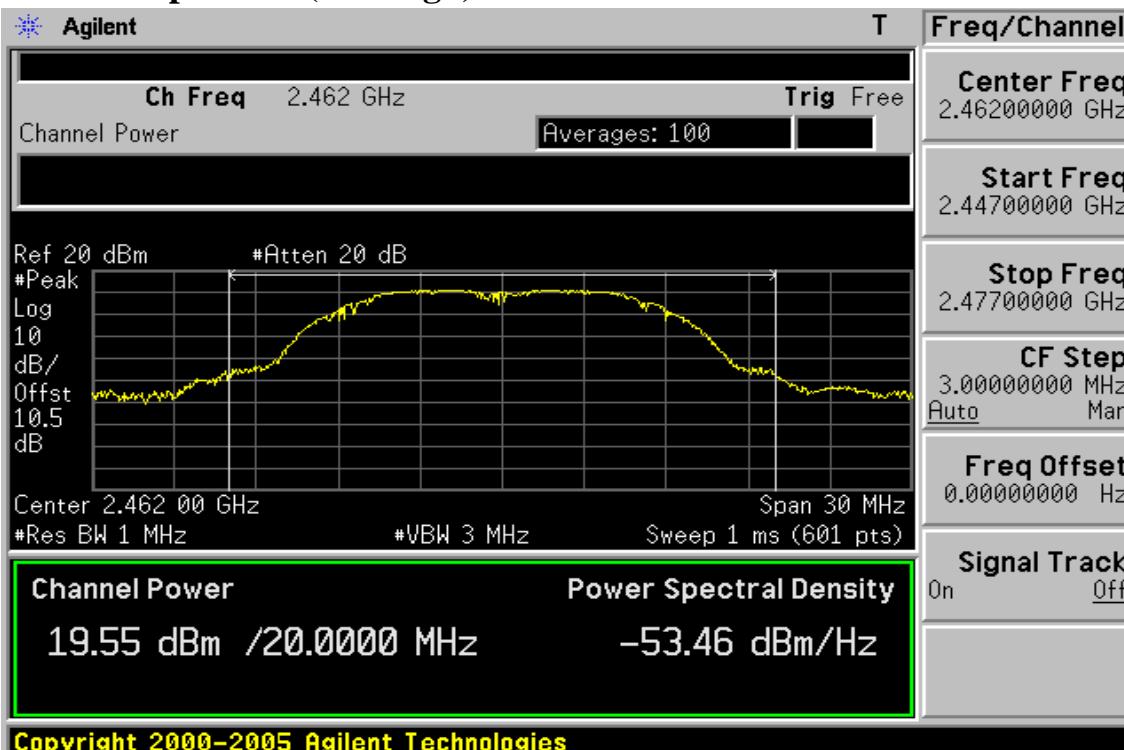
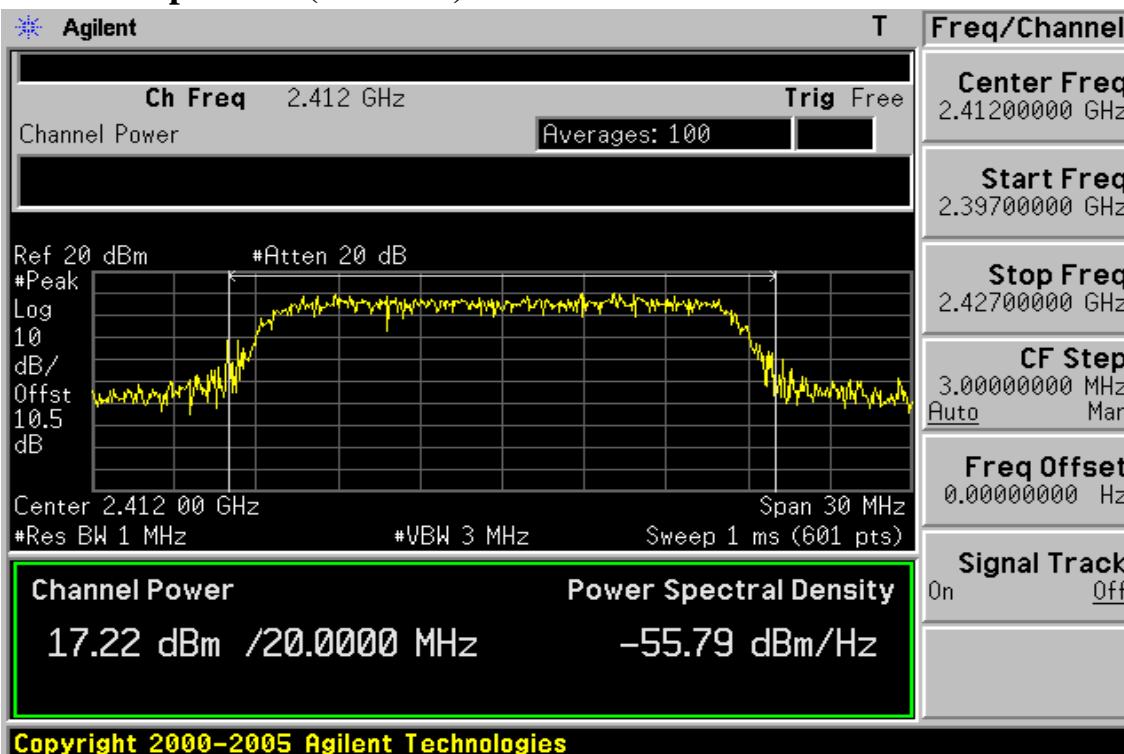


Peak Power Output Plot (CH Mid)



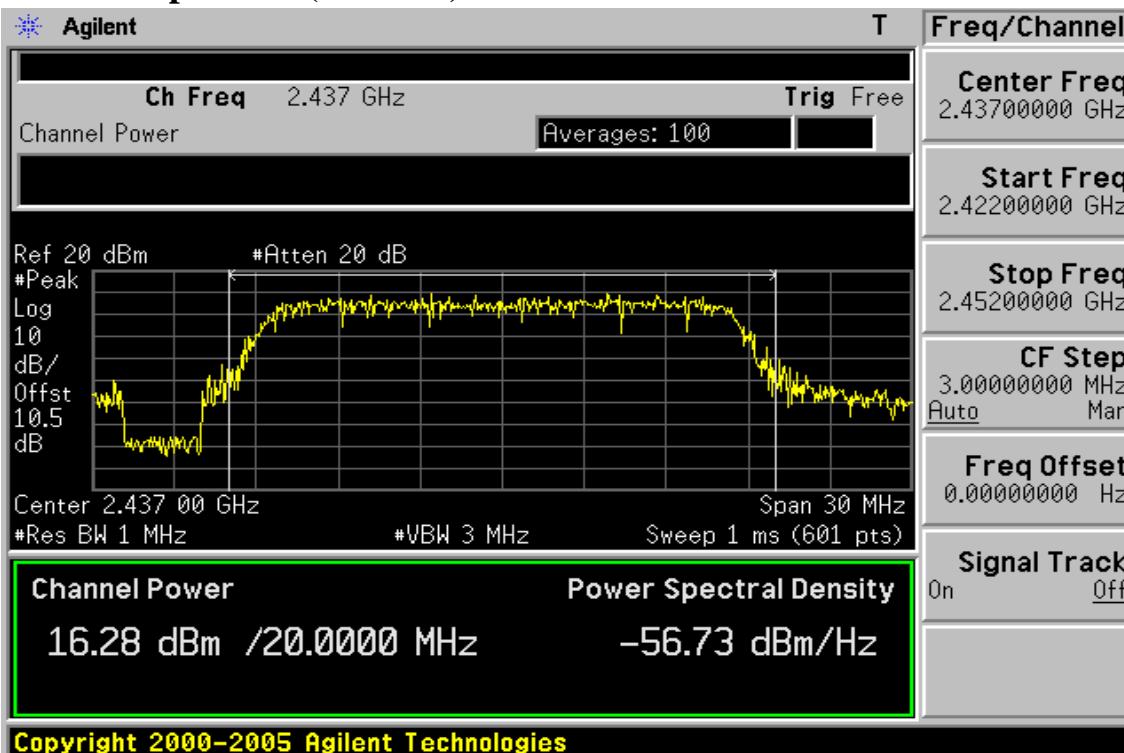
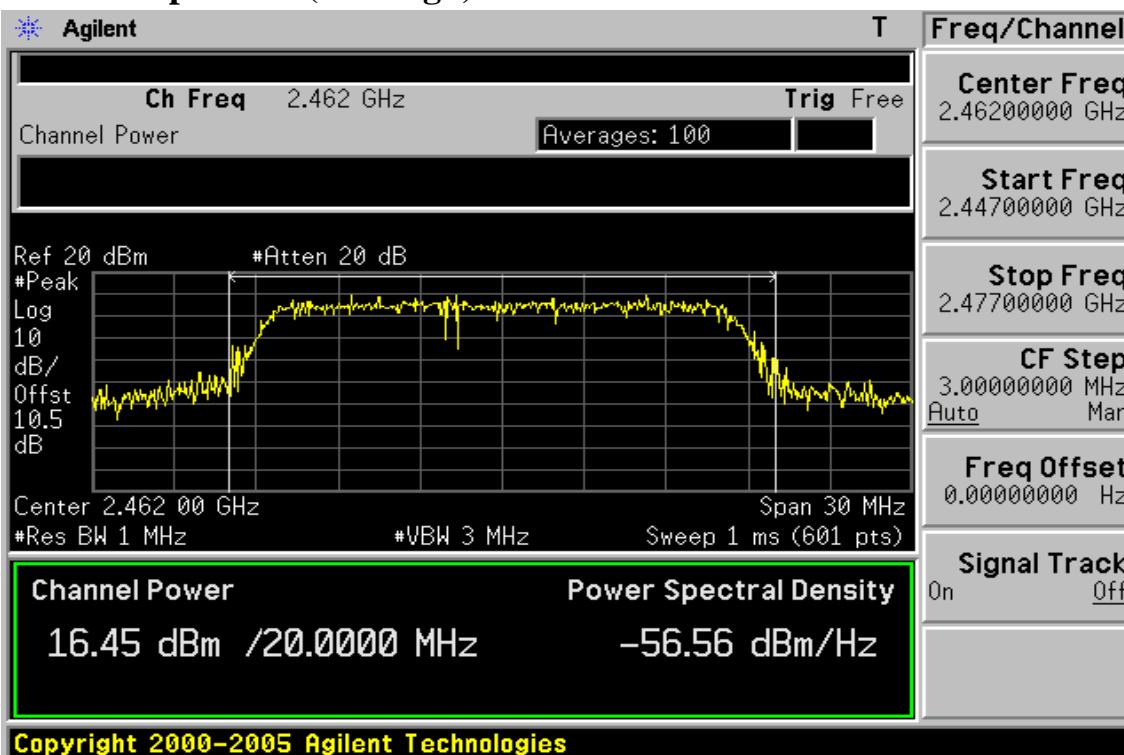
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Peak Power Output Plot (CH High)**802.11g, 6Mbps****Peak Power Output Plot (CH Low)**

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

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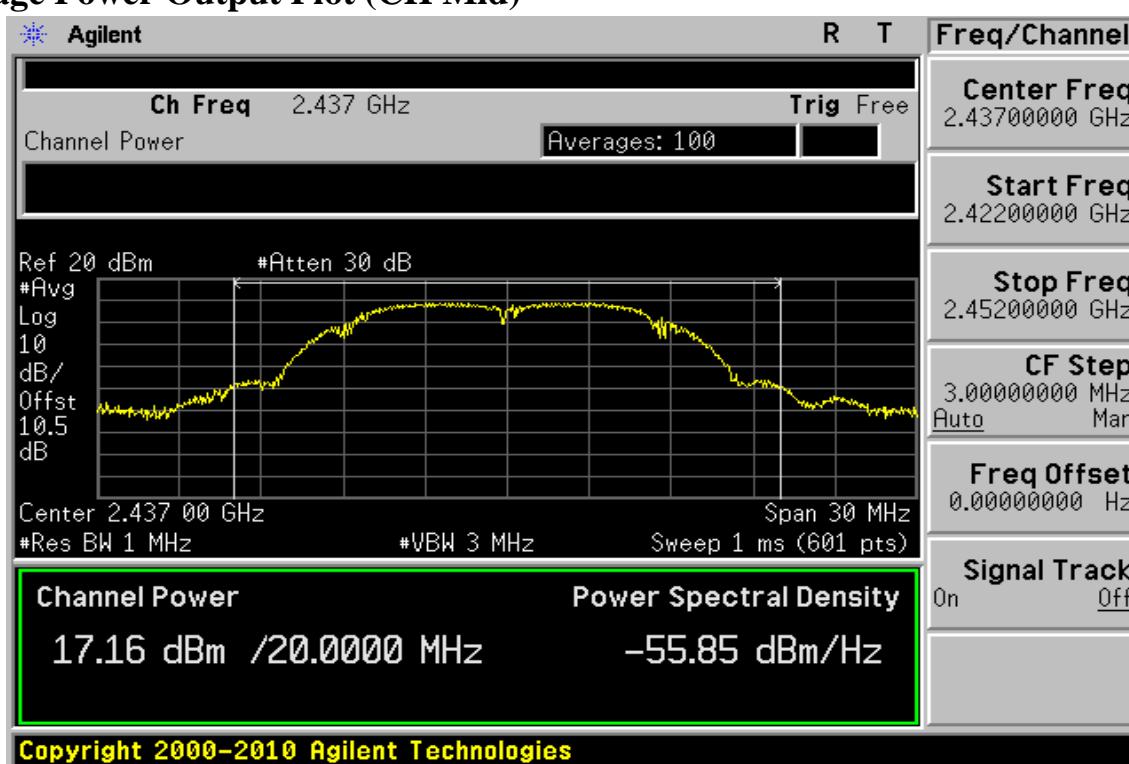
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802.11b, 1Mbps

Average Power Output Plot (CH Low)

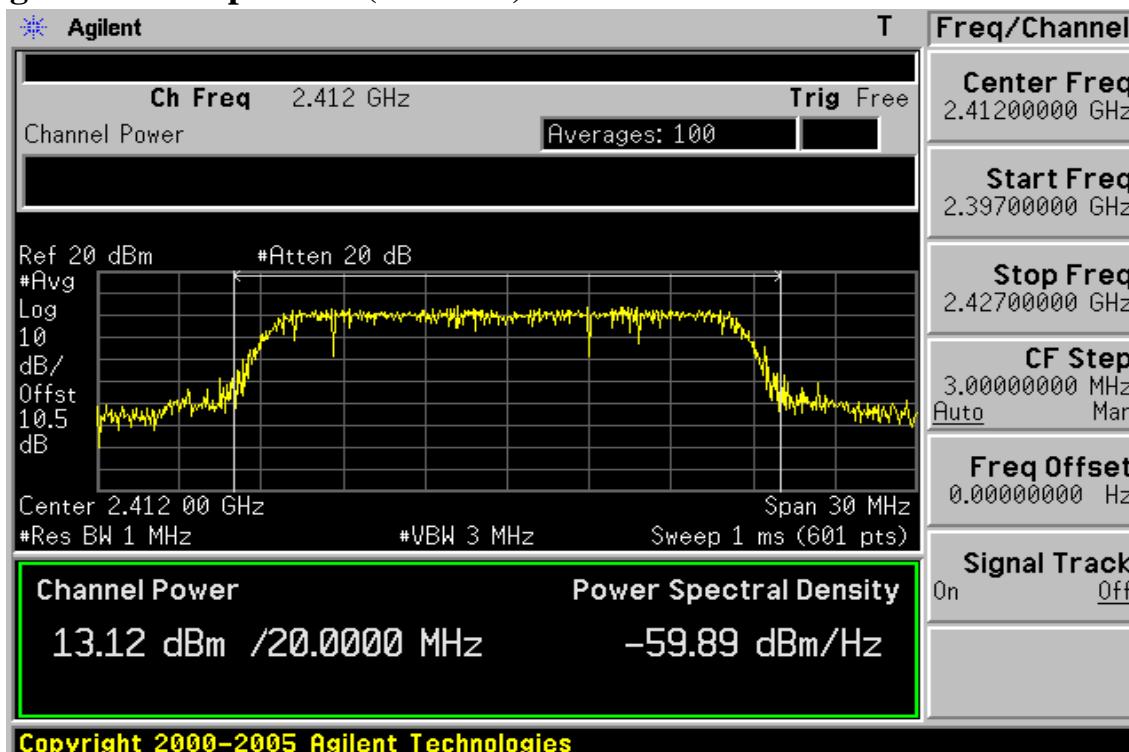


Average Power Output Plot (CH Mid)



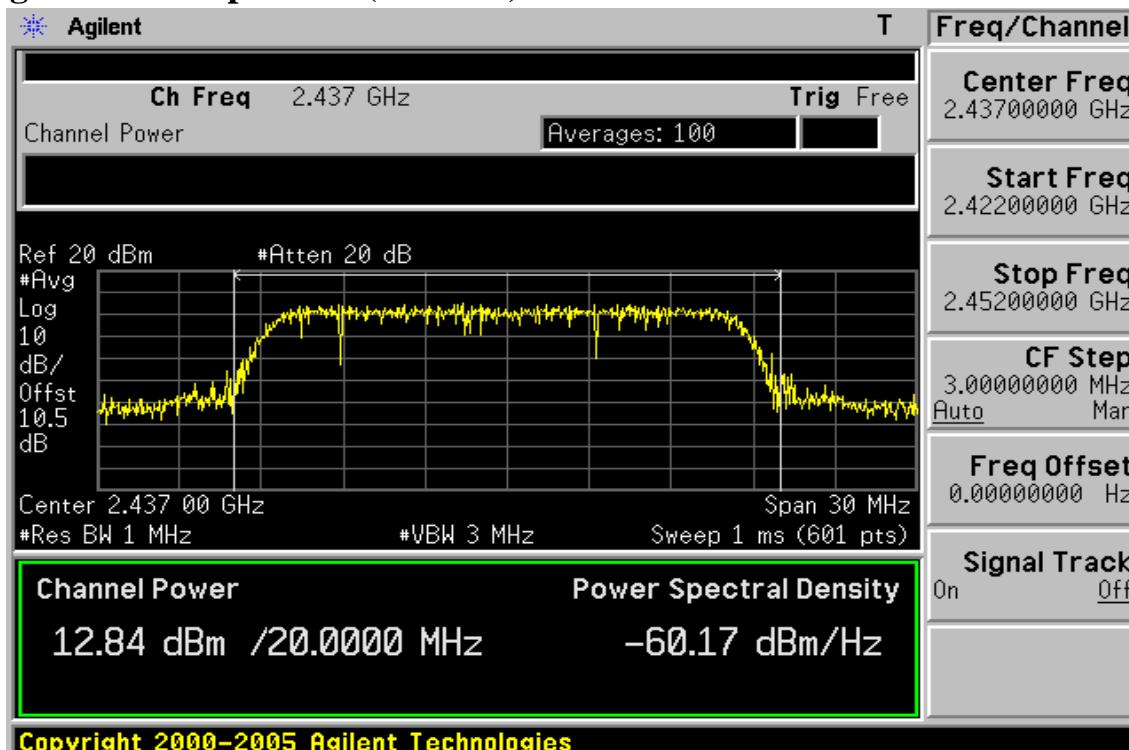
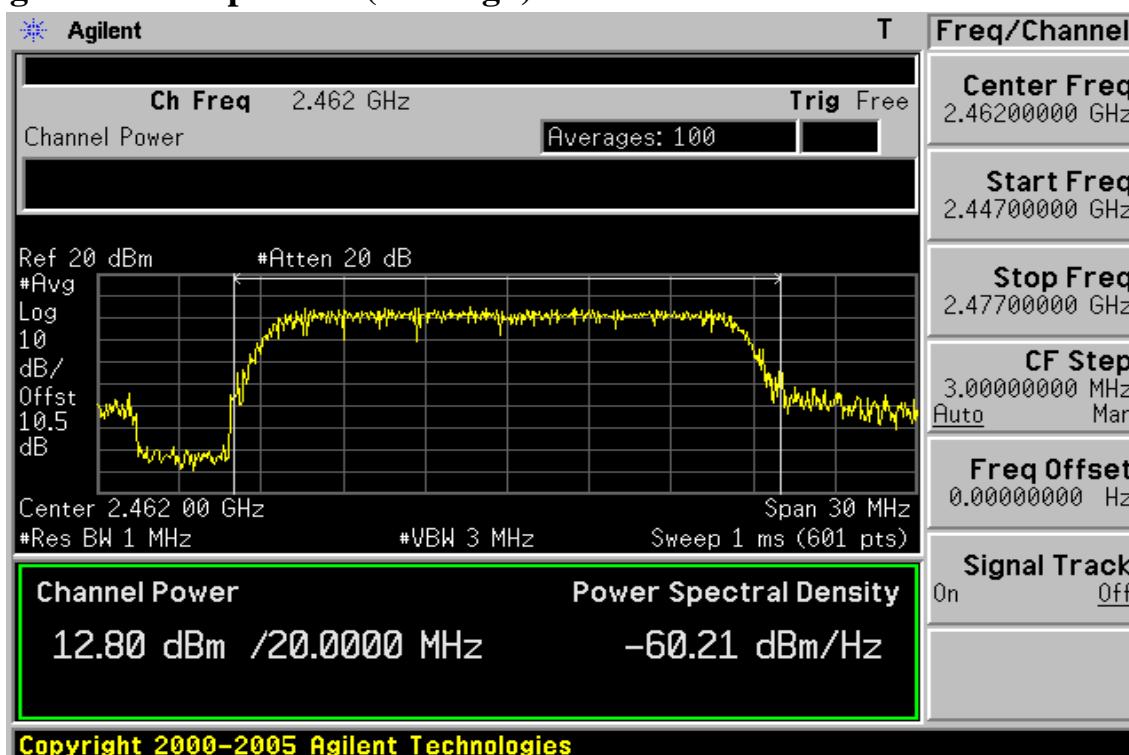
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Average Power Output Plot (CH High)**802.11g, 6Mbps****Average Power Output Plot (CH Low)**

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

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7 6dB Bandwidth

7.1 Standard Applicable:

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

7.2 Measurement Equipment Used:

Refer to section 6.2 for details.

7.3 Test Set-up:

Refer to section 6.3 for details.

7.4 Measurement Procedure:

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

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7.5 Measurement Result:

802.11b

Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	10.204	> 500	PASS
2437	10.153	> 500	PASS
2462	10.169	> 500	PASS

802.11g

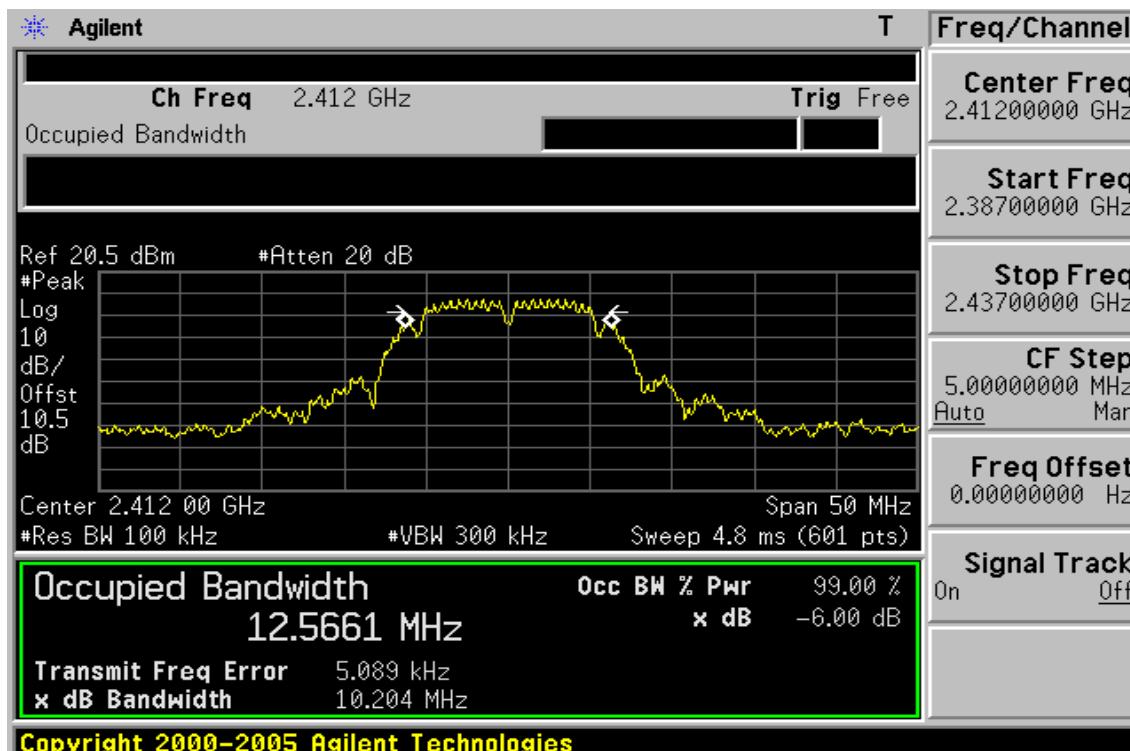
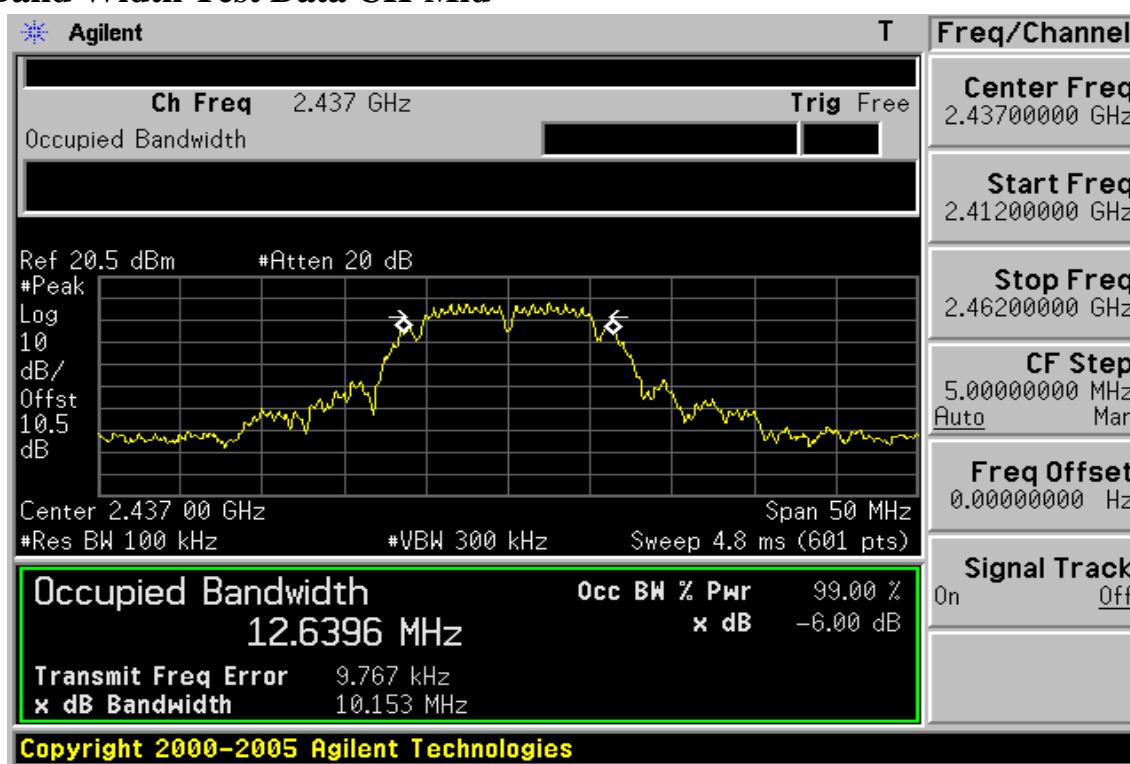
Frequency (MHz)	Bandwidth (MHz)	Bandwidth (KHz)	Result
2412	16.446	> 500	PASS
2437	16.446	> 500	PASS
2462	16.454	> 500	PASS

*Offset 10.5 dB

Note: Refer to next page for plots.

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

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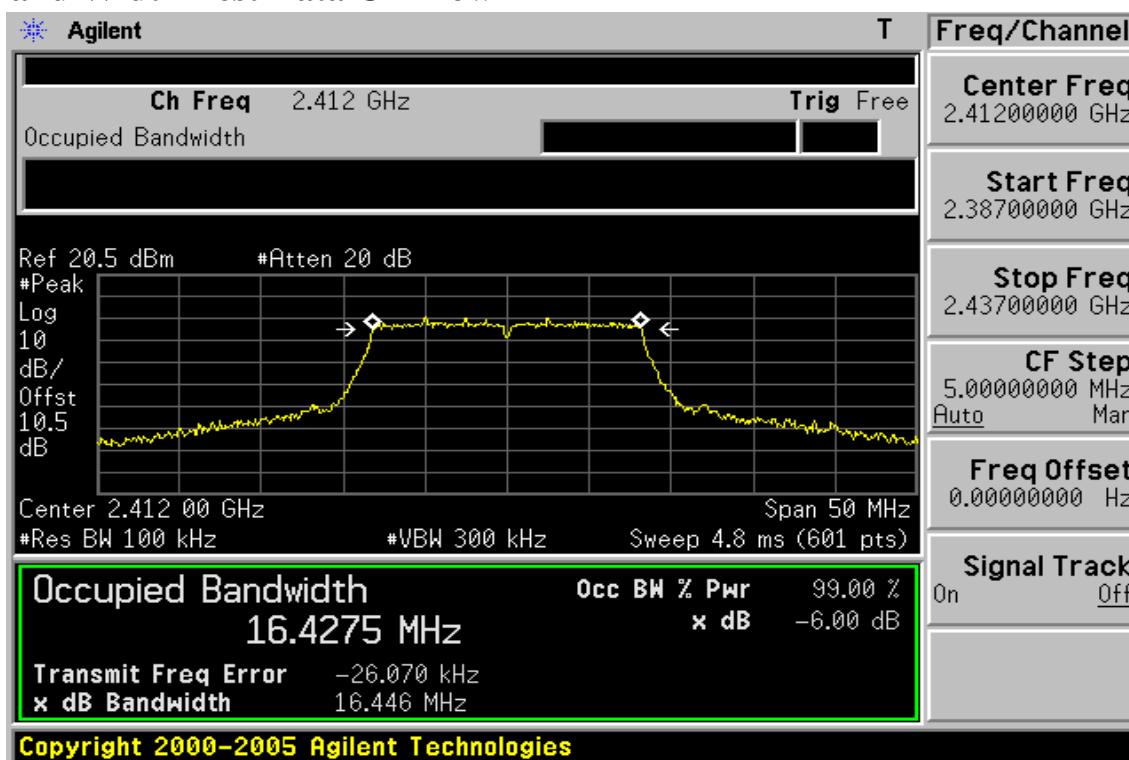
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6dB Band Width Test Data CH-High



802.11g

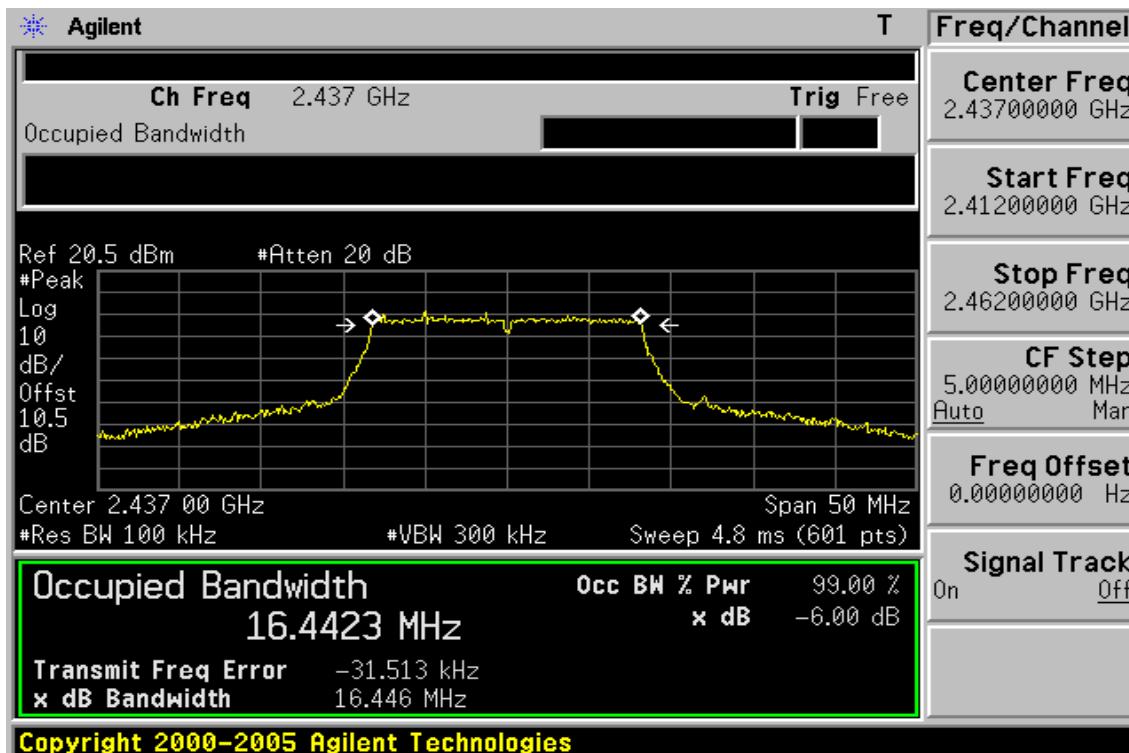
6dB Band Width Test Data CH-Low



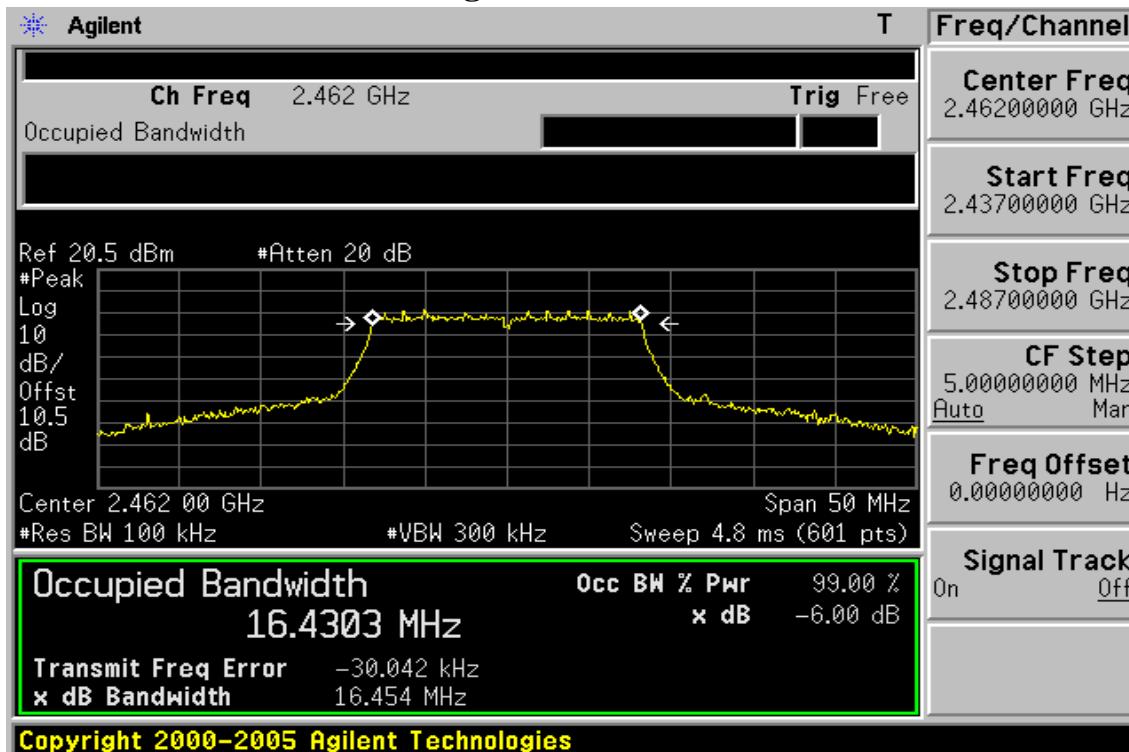
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6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



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8 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1 Standard Applicable:

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

8.2 Measurement Equipment Used:

8.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2 Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	03/30/2011	03/29/2012
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2011	11/18/2012
Horn antenna	SCHWAZBECK	BBHA 9120D	309/320	01/22/2010	01/21/2012
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2011	11/27/2012
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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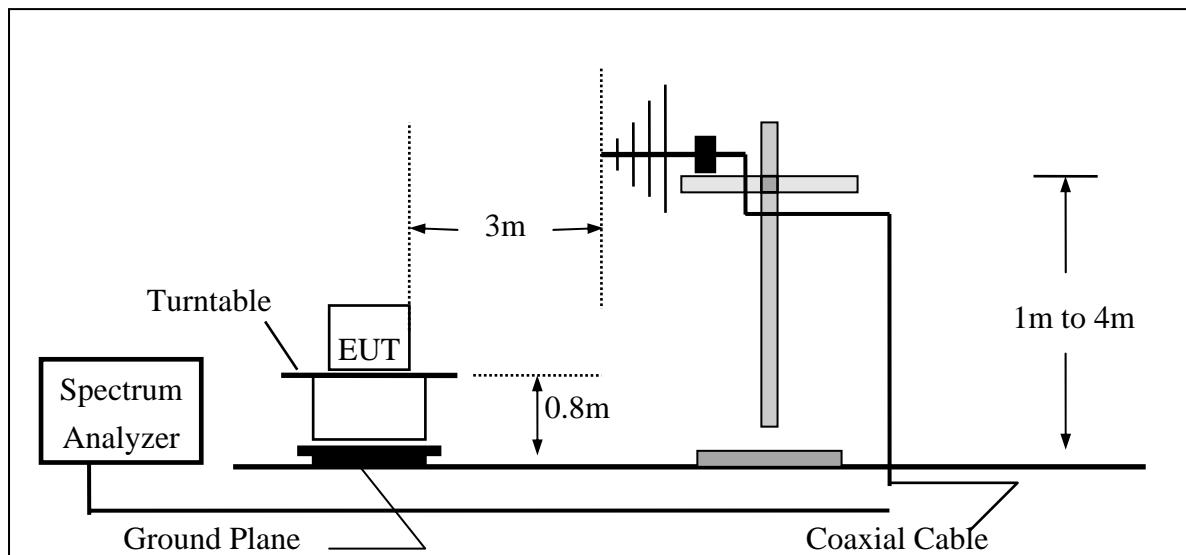
8.3 Test SET-UP:

8.3.1 Conducted Emission at antenna port:

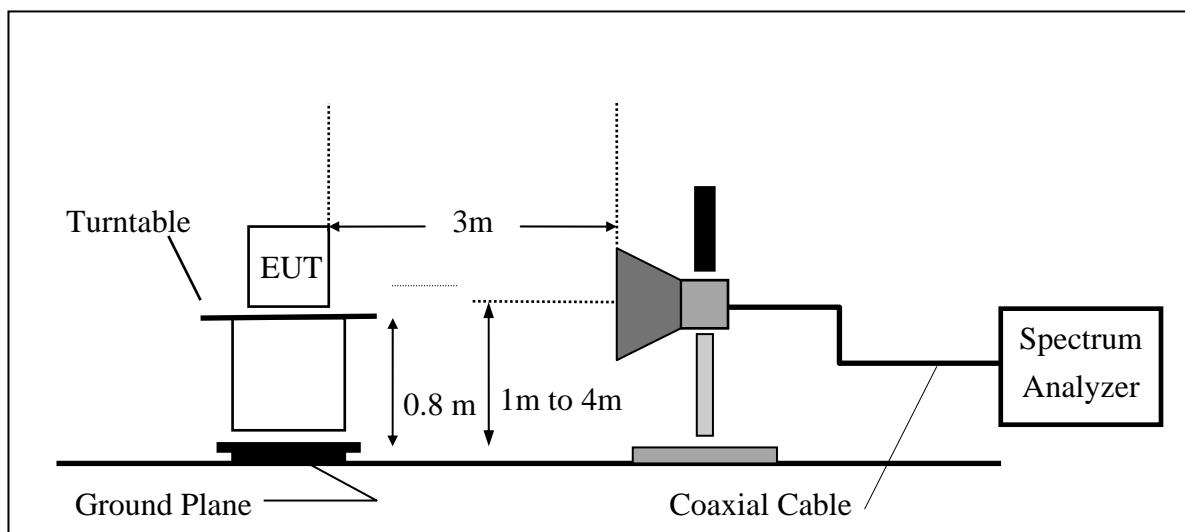
Refer to section 6.3 for details.

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=50MHz, 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:

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

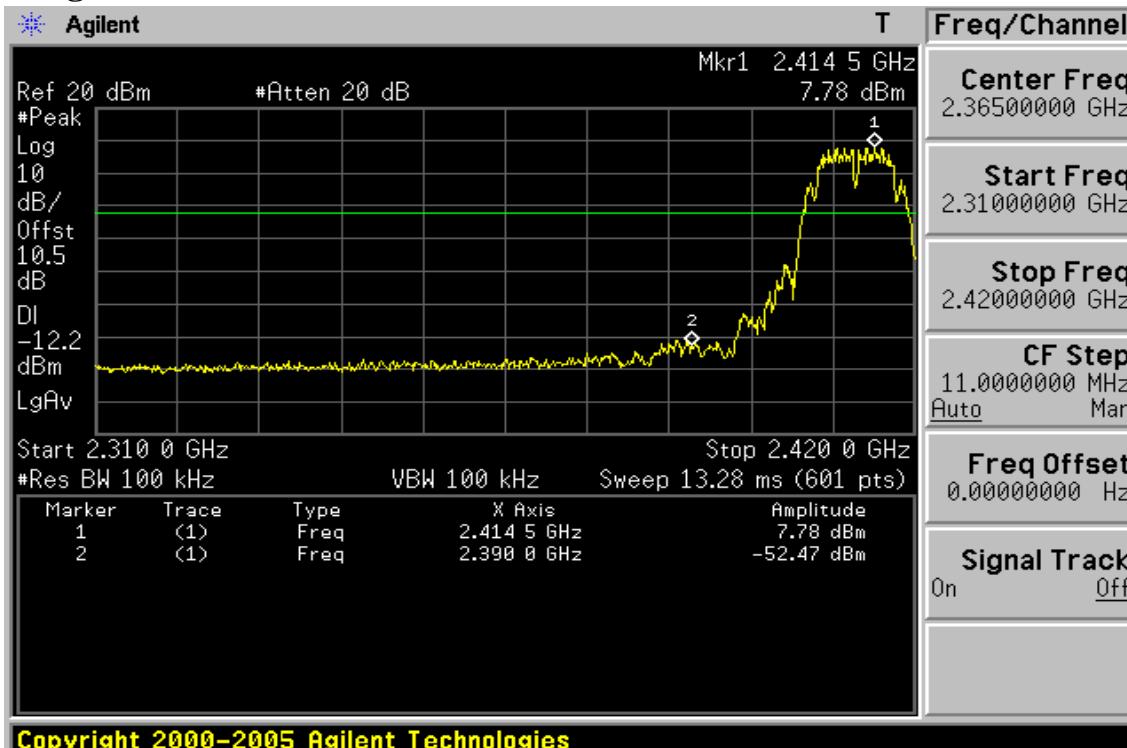
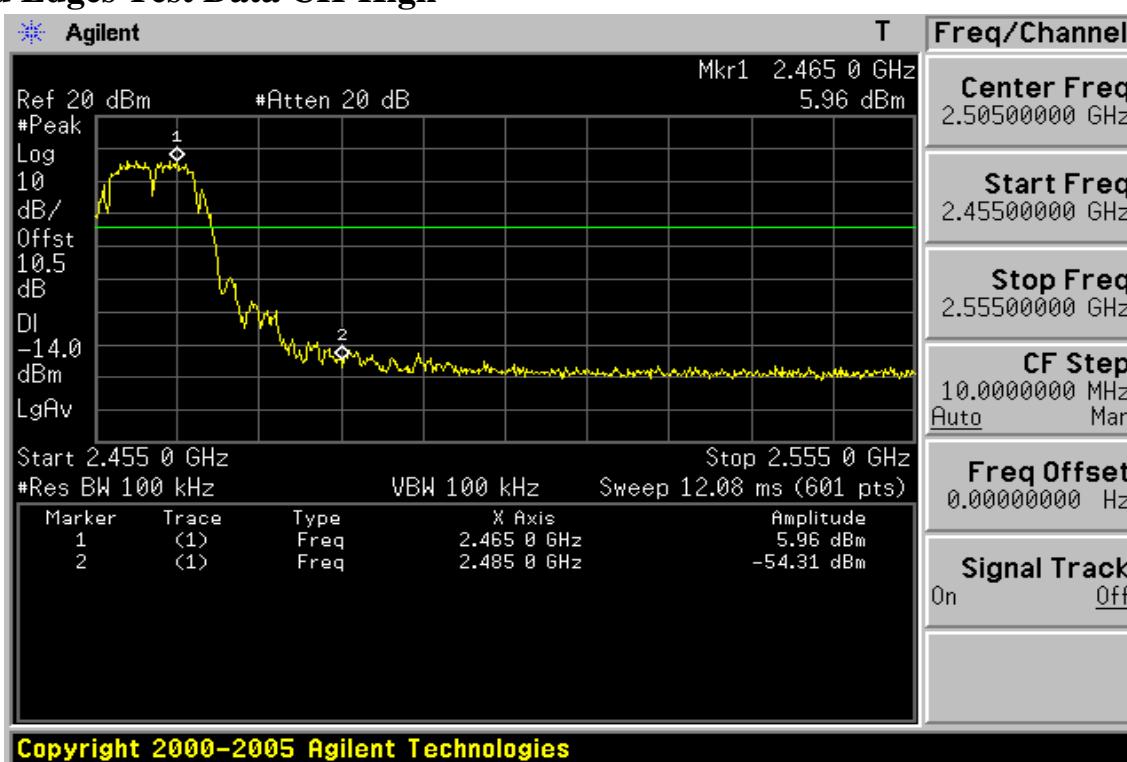
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

8.6 Measurement Result:

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

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

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Radiated Emission: 802.11 b mode

Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2390.00	E	Peak	52.58	5.17	57.75	74.00	-16.25	
2390.00	E	Average	40.62	5.17	45.79	54.00	-8.21	

Operation Band :802.11b Test Date :2011-11-22

Fundamental Frequency :2412 Temp./Humi. :27 deg_C / 66 RH

Operation Mode :TX LOW BANDEDGE Engineer :Marcus

EUT Pol. :E1 Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2390.00	E	Peak	51.75	5.79	57.54	74.00	-16.46	
2390.00	E	Average	39.56	5.79	45.35	54.00	-8.65	

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Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2483.50	E	Peak	51.16	5.69	56.85	74.00	-17.15	
2483.50	E	Average	40.25	5.69	45.94	54.00	-8.06	

Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2483.50	E	Peak	52.79	6.72	59.51	74.00	-14.49	
2483.50	E	Average	40.92	6.72	47.64	54.00	-6.36	

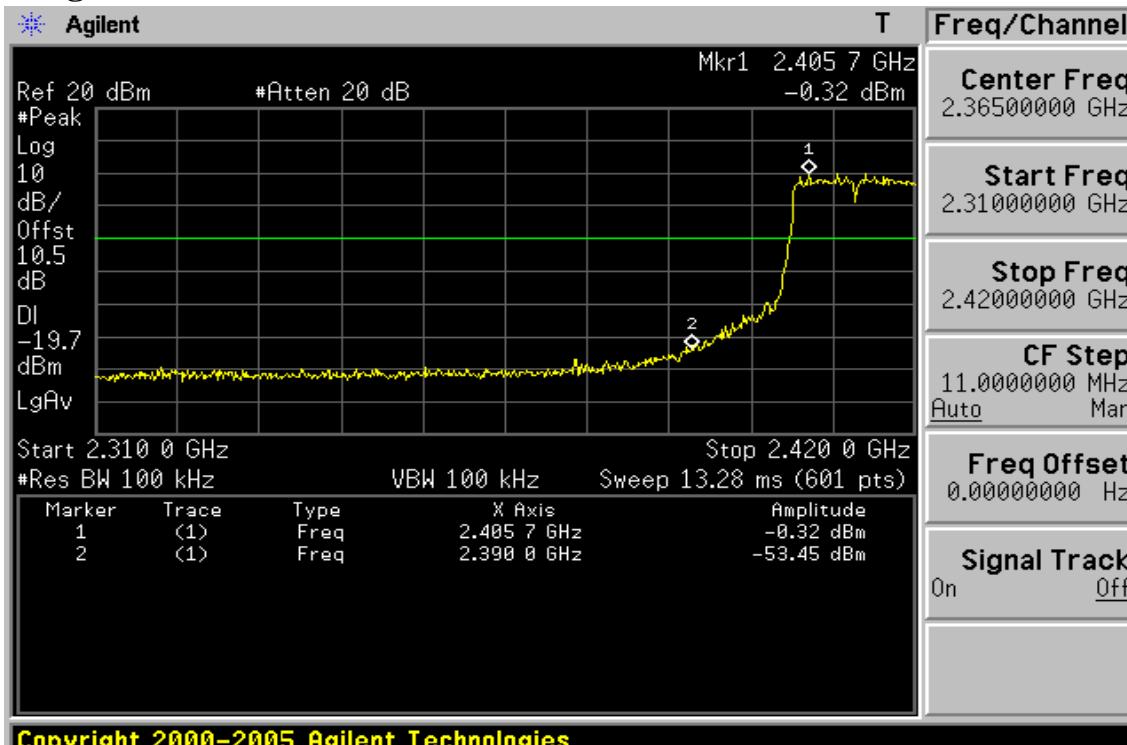
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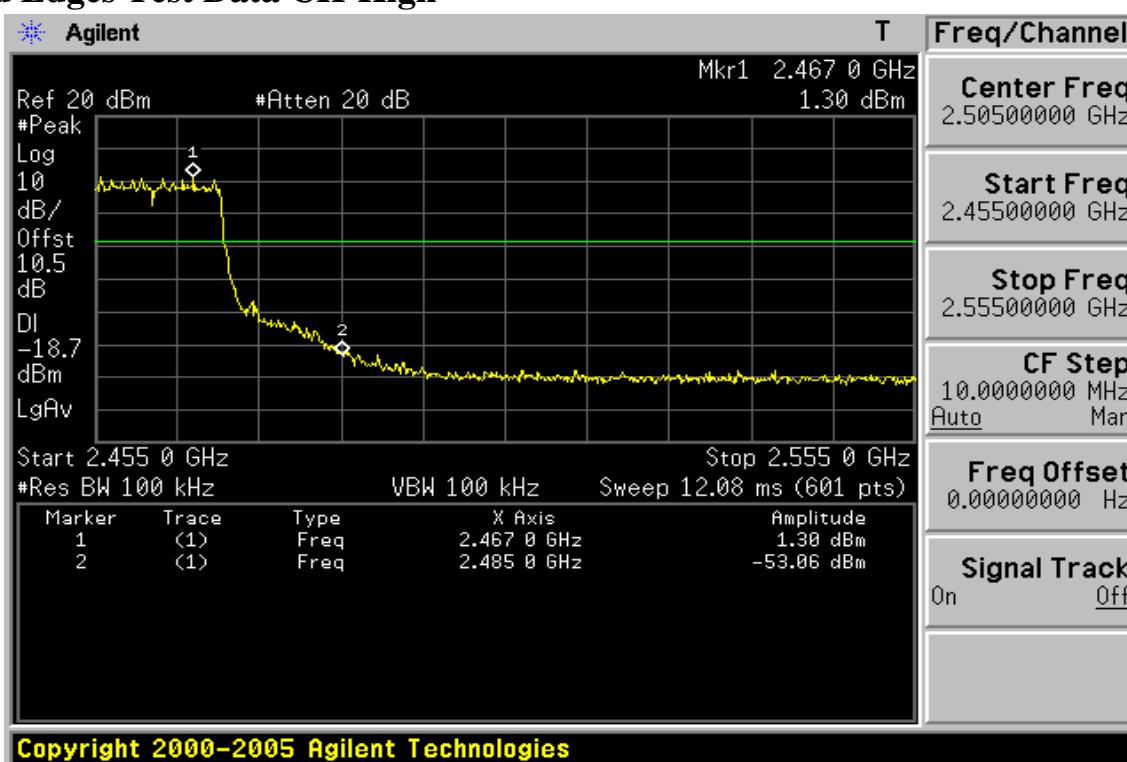
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802.11g

Band Edges Test Data CH-Low



Band Edges Test Data CH-High



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Radiated Emission: 802.11 g mode

Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW BANDEDGE	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2390.00	E	Peak	51.10	5.17	56.27	74.00	-17.73	
2390.00	E	Average	39.97	5.17	45.14	54.00	-8.86	

Operation Band :802.11g Test Date :2011-11-22

Fundamental Frequency :2412 Temp./Humi. :27 deg_C / 66 RH

Operation Mode :TX LOW BANDEDGE Engineer :Marcus

EUT Pol. :E1 Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---” : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2390.00	E	Peak	51.88	5.79	57.67	74.00	-16.33	
2390.00	E	Average	39.58	5.79	45.37	54.00	-8.63	

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Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2483.50	E	Peak	51.59	5.69	57.28	74.00	-16.72	
2483.50	E	Average	39.98	5.69	45.67	54.00	-8.33	

Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH BANDEDGE	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

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

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

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum		Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Safe Margin dB
			PK/QP/AV	Reading Level dB μ V				
2483.50	E	Peak	53.06	6.72	59.78	74.00	-14.22	
2483.50	E	Average	40.39	6.72	47.11	54.00	-6.89	

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9 SPURIOUS RADIATED EMISSION TEST

9.1 Standard Applicable

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

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

9.2.2 Radiated emission:

Refer to section 8.2 for details.

9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2 Radiated emission:

Refer to section 8.3 for details.

9.5 Measurement Procedure:

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

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9.5 Field Strength Calculation

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

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

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

9.6 Measurement Result:

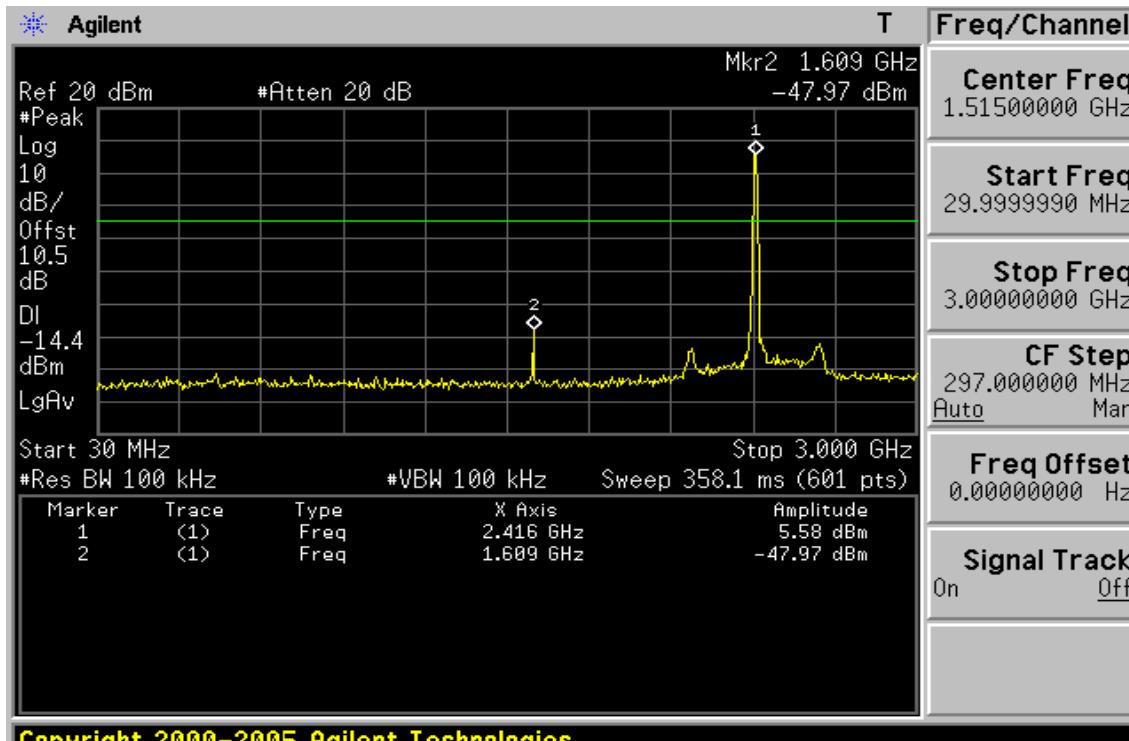
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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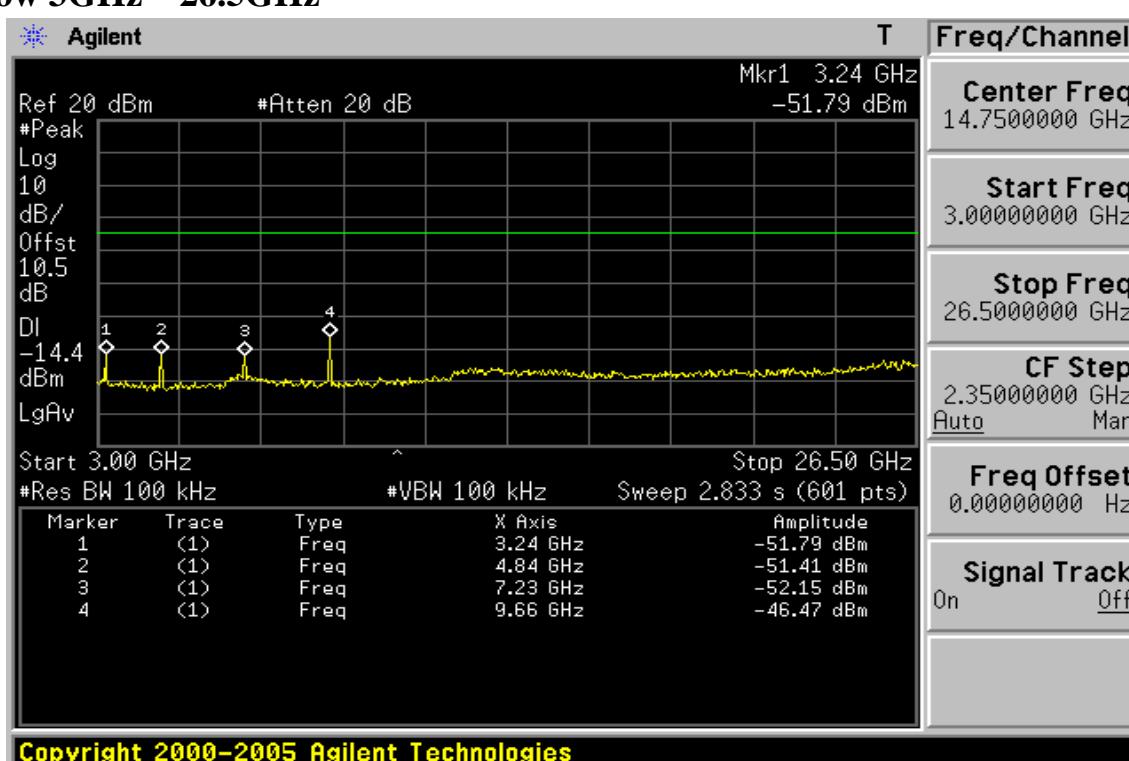
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Conducted Spurious Emission Measurement Result (802.11b)

Ch Low 30MHz – 3GHz

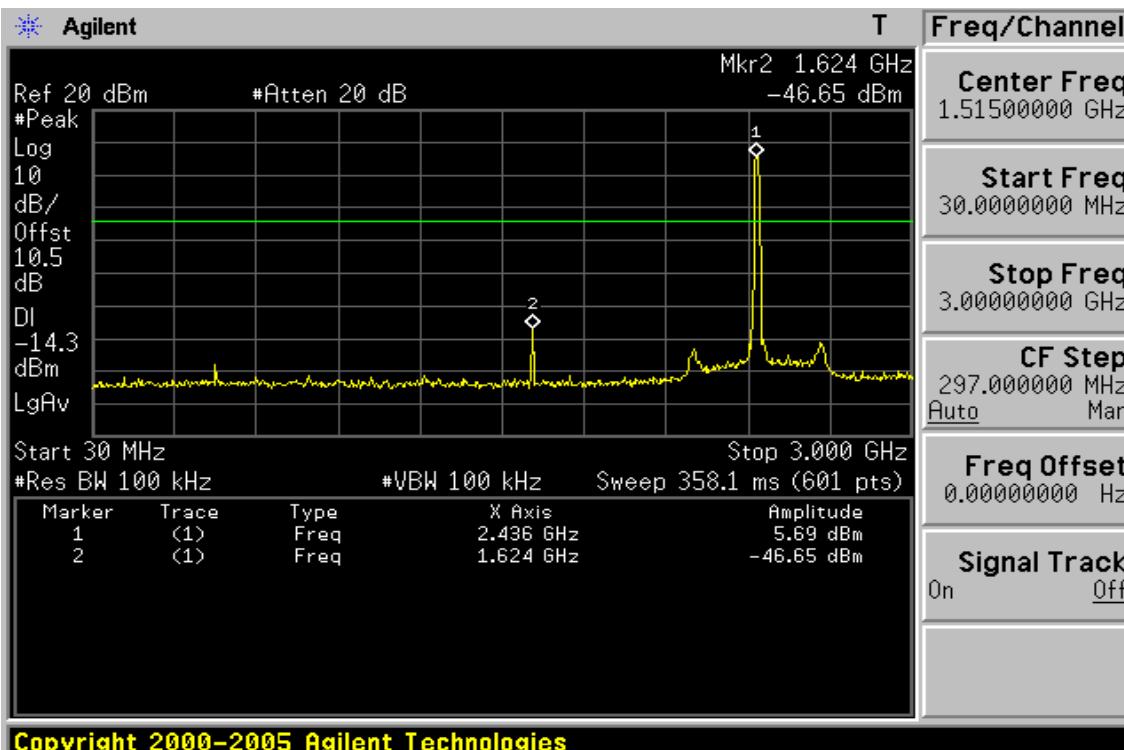
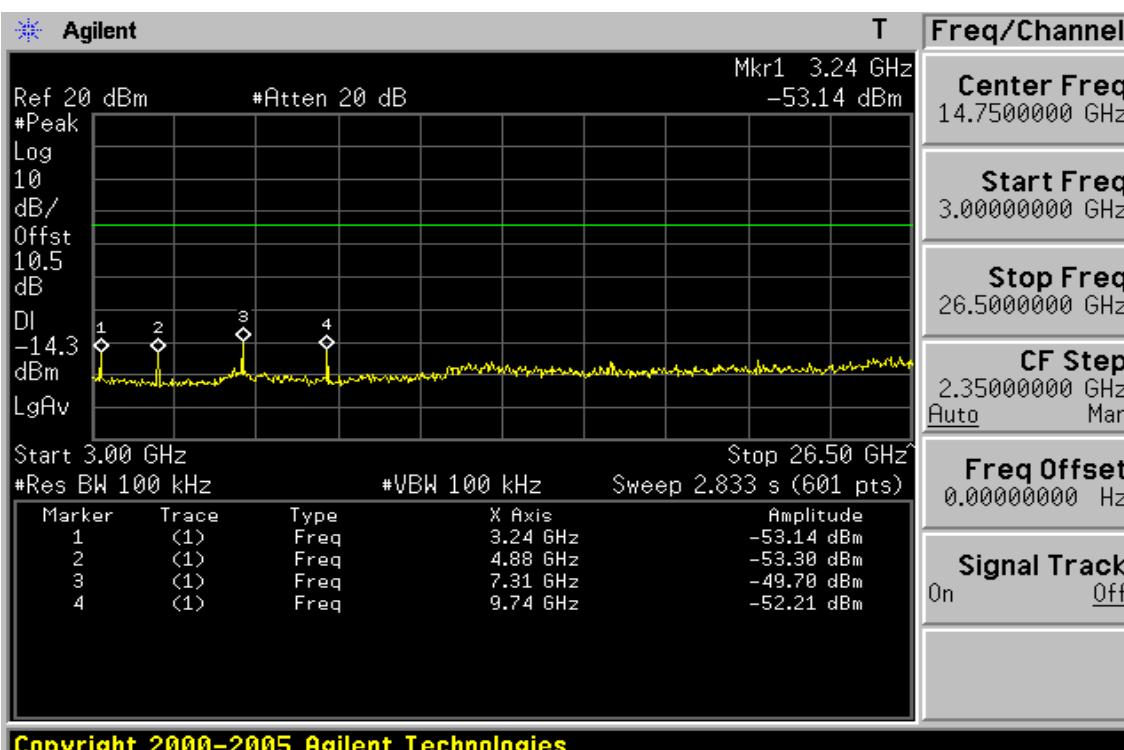


Ch Low 3GHz – 26.5GHz



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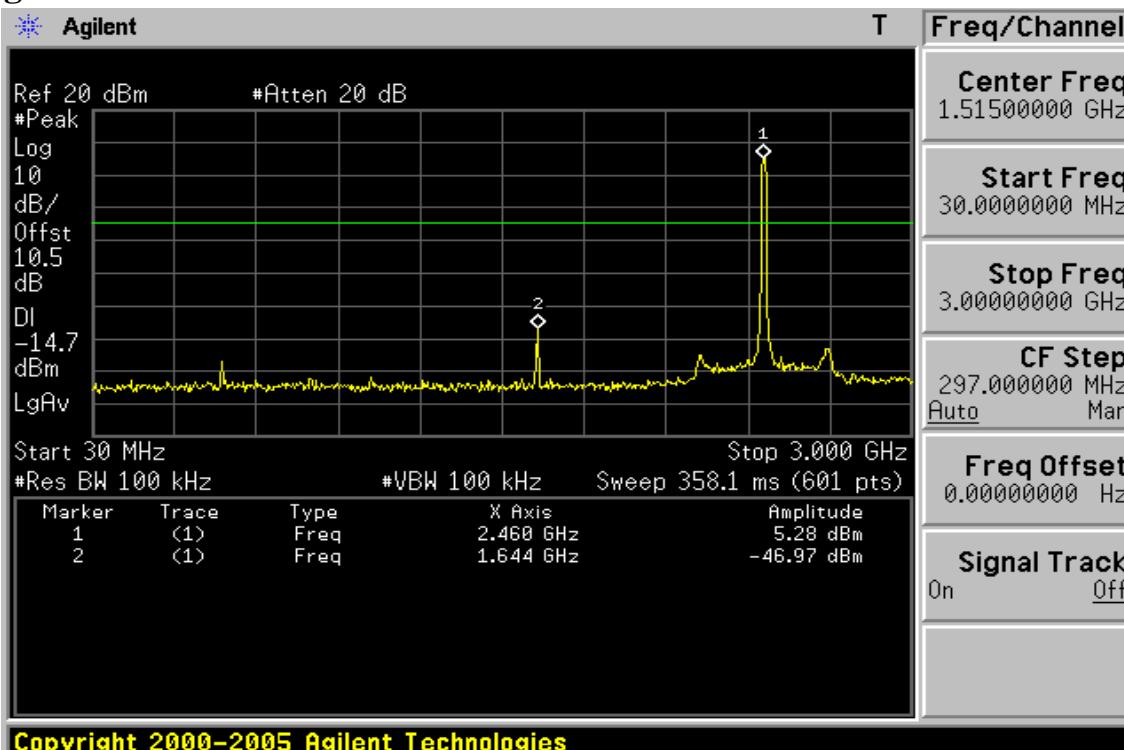
Ch Mid 30MHz – 3GHz

Ch Mid 3GHz – 26.5GHz


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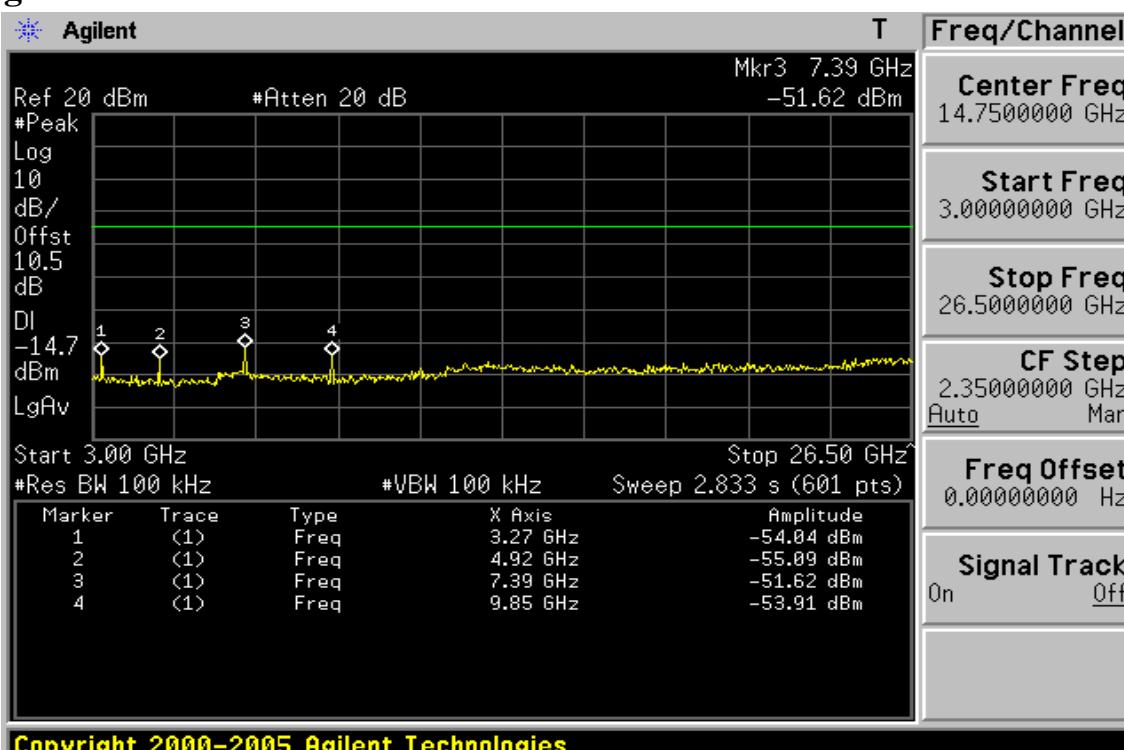
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Ch High 30MHz – 3GHz



Ch High 3GHz – 26.5GHz

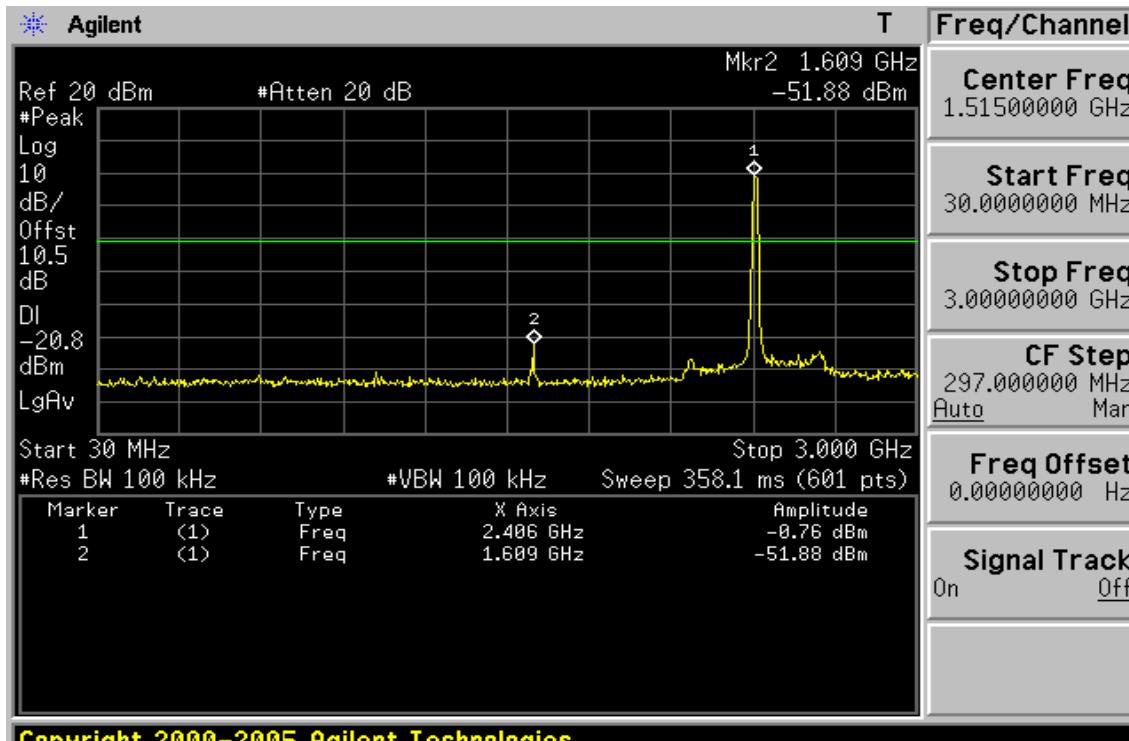


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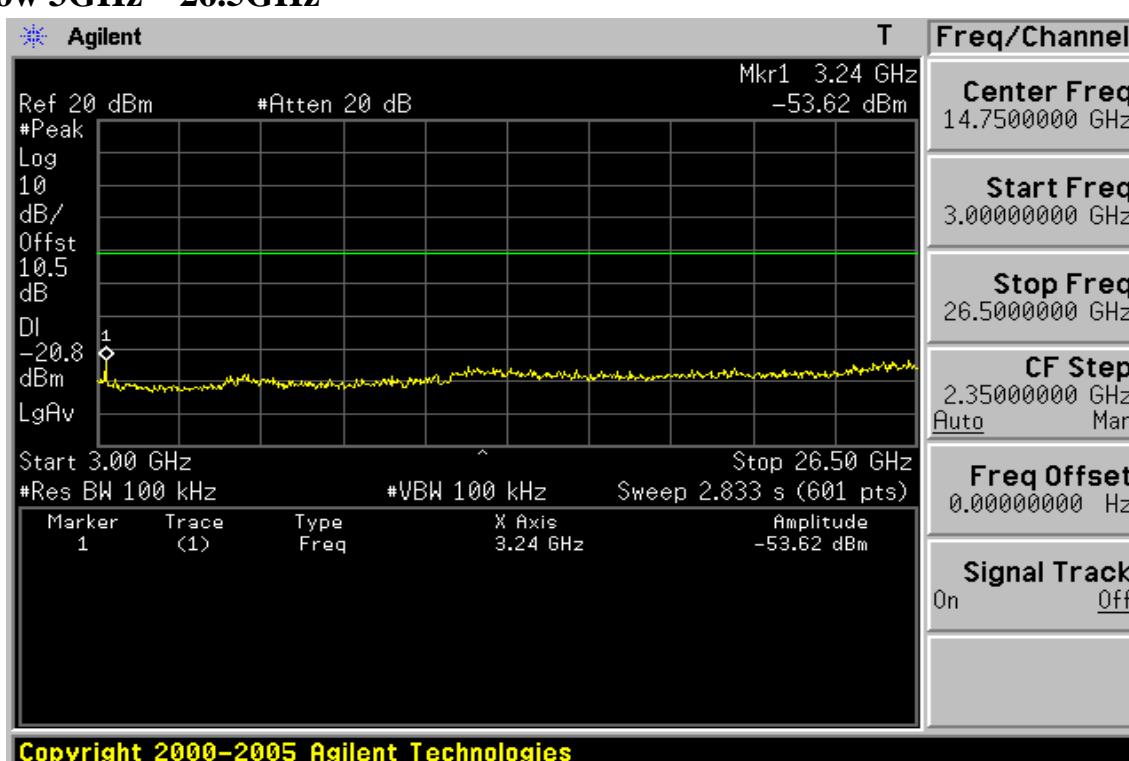
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Conducted Spurious Emission Measurement Result (802.11g)

Ch Low 30MHz – 3GHz

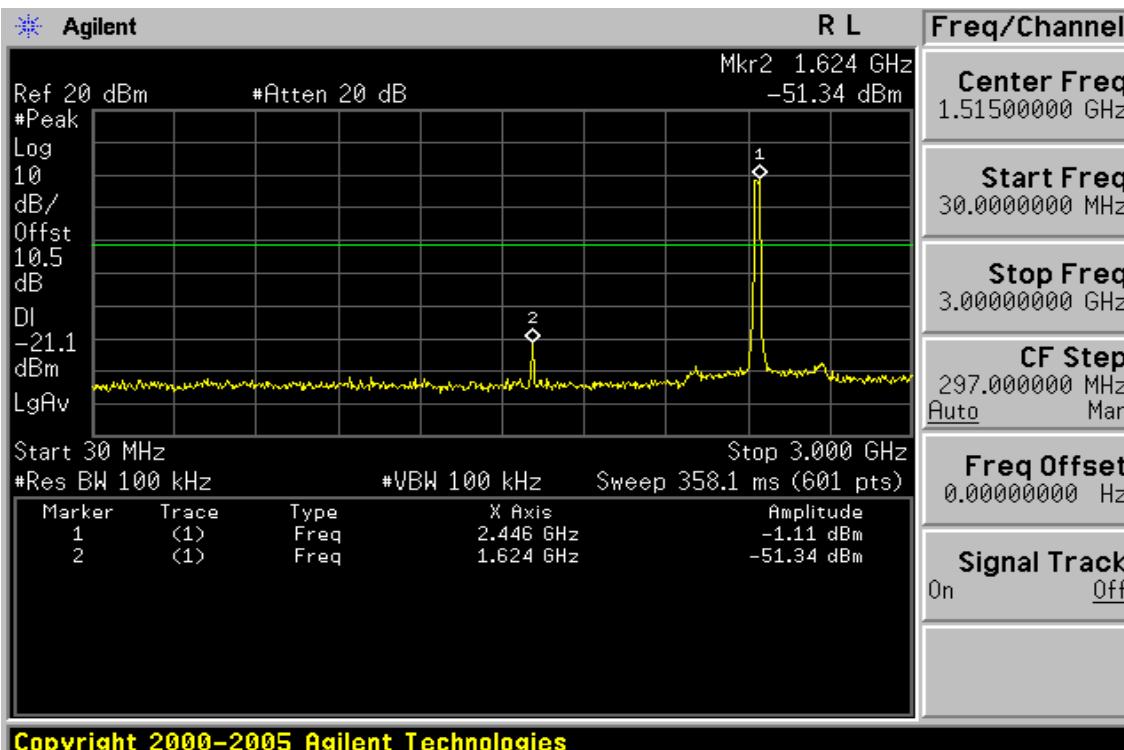
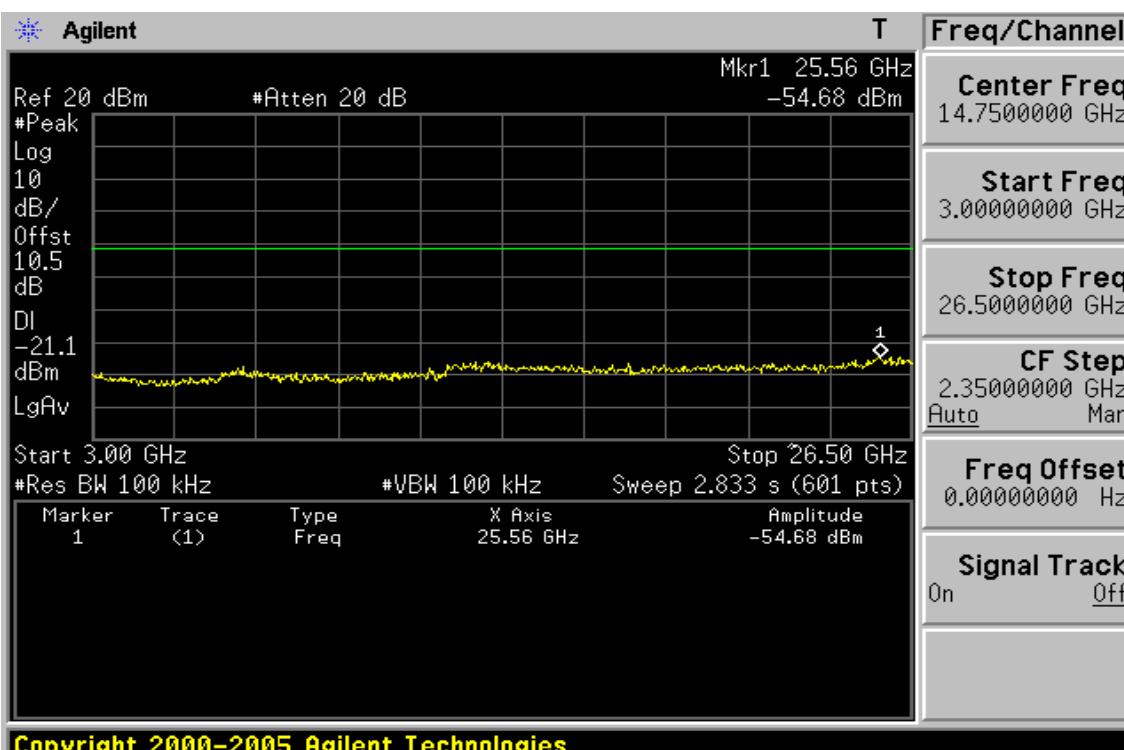


Ch Low 3GHz – 26.5GHz



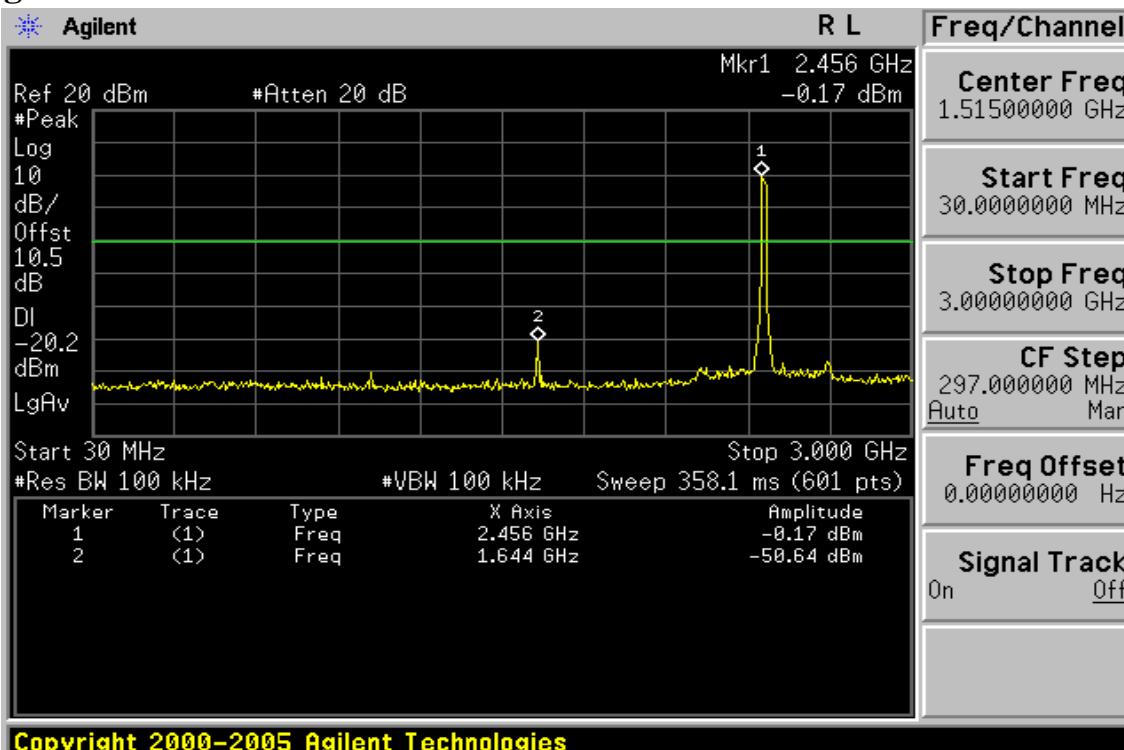
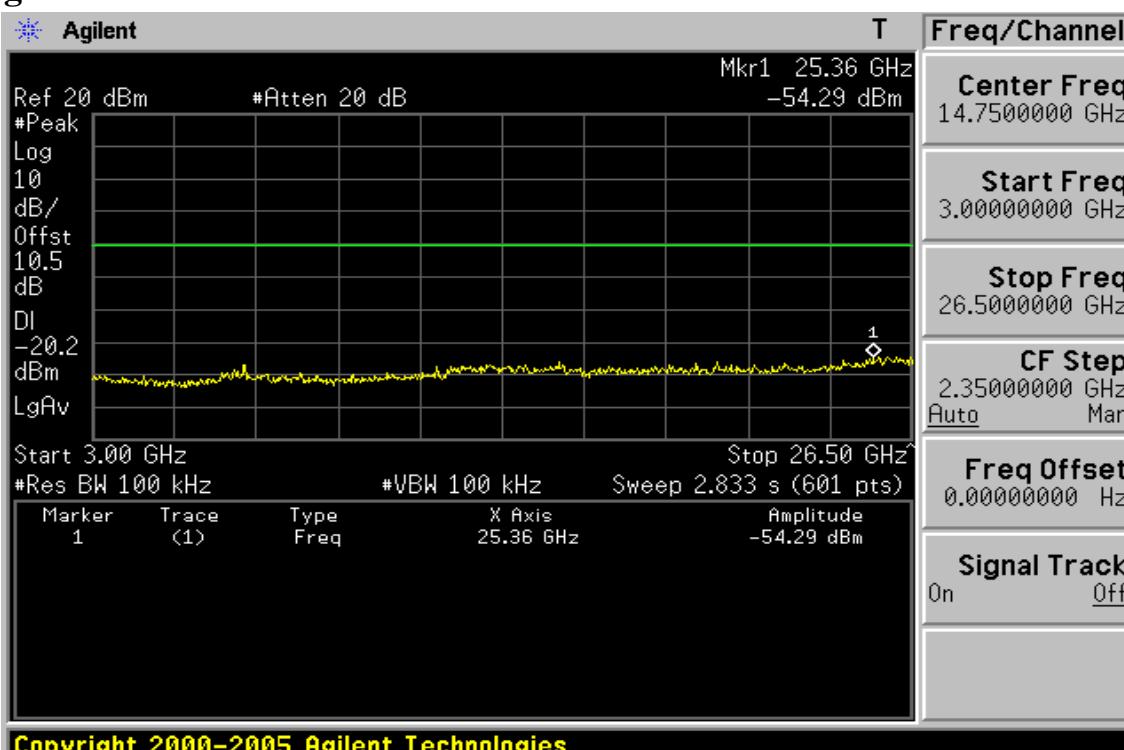
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Ch Mid 30MHz – 3GHz

Ch Mid 3GHz – 26.5GHz


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Ch High 30MHz – 3GHz

Ch High 3GHz – 26.5GHz


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Radiated Spurious Emission Measurement Result (802.11b)

Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
38.73	S	Peak	47.09	-13.18	33.91	40.00	-6.09
73.65	S	Peak	45.02	-17.23	27.79	40.00	-12.21
214.30	S	Peak	52.24	-14.78	37.46	43.50	-6.04
292.87	S	Peak	47.22	-12.01	35.21	46.00	-10.79
409.27	S	Peak	38.58	-10.09	28.49	46.00	-17.51
897.18	S	Peak	29.67	-2.15	27.52	46.00	-18.48
1611.00	S	Peak	40.66	1.27	41.93	74.00	-32.07
2638.00	S	Peak	45.56	6.30	51.86	74.00	-22.14
4824.00	H	Peak	43.39	10.21	53.60	74.00	-20.40
7236.00	---						
9648.00	---						
12060.00	---						
14472.00	---						
16884.00	---						
19296.00	---						
21708.00	---						
24120.00	---						

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Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
110.51	S	Peak	45.82	-14.95	30.87	43.50	-12.63
189.08	S	Peak	52.45	-14.82	37.63	43.50	-5.87
214.30	S	Peak	55.52	-14.78	40.74	43.50	-2.76
253.10	S	Peak	50.82	-13.16	37.66	46.00	-8.34
292.87	S	Peak	56.70	-12.01	44.69	46.00	-1.31
370.47	S	Peak	45.71	-10.58	35.13	46.00	-10.87
1611.00	S	Peak	43.70	1.88	45.58	74.00	-28.42
2638.00	S	Peak	43.39	6.35	49.74	74.00	-24.26
4824.00	H	Peak	40.08	10.22	50.30	74.00	-23.70
7236.00	---						
9648.00	---						
12060.00	---						
14472.00	---						
16884.00	---						
19296.00	---						
21708.00	---						
24120.00	---						

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Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
38.73	S	Peak	47.23	-13.18	34.05	40.00	-5.95
74.62	S	Peak	45.57	-17.36	28.21	40.00	-11.79
214.30	S	Peak	52.41	-14.78	37.63	43.50	-5.87
292.87	S	Peak	47.21	-12.01	35.20	46.00	-10.80
409.27	S	Peak	38.50	-10.09	28.41	46.00	-17.59
475.23	S	Peak	35.51	-9.08	26.43	46.00	-19.57
1624.00	S	Peak	39.88	1.43	41.31	74.00	-32.69
2670.50	S	Peak	44.45	6.66	51.11	74.00	-22.89
4874.00	H	Peak	42.78	10.55	53.33	74.00	-20.67
7311.00	---						
9748.00	---						
12185.00	---						
14622.00	---						
17059.00	---						
19496.00	---						
21933.00	---						
24370.00	---						

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Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
110.51	S	Peak	46.43	-14.95	31.48	43.50	-12.02
190.05	S	Peak	53.52	-14.89	38.63	43.50	-4.87
214.30	S	Peak	55.71	-14.78	40.93	43.50	-2.57
292.87	S	Peak	56.83	-12.01	44.82	46.00	-1.18
370.47	S	Peak	45.40	-10.58	34.82	46.00	-11.18
714.82	S	Peak	37.59	-4.81	32.78	46.00	-13.22
1624.00	S	Peak	45.33	2.08	47.41	74.00	-26.59
2670.50	S	Peak	45.01	6.46	51.47	74.00	-22.53
4874.00	H	Peak	39.57	10.50	50.07	74.00	-23.93
7311.00	---						
9748.00	---						
12185.00	---						
14622.00	---						
17059.00	---						
19496.00	---						
21933.00	---						
24370.00	---						

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Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
37.76	S	Peak	47.83	-13.32	34.51	40.00	-5.49
191.02	S	Peak	49.50	-14.98	34.52	43.50	-8.98
214.30	S	Peak	52.18	-14.78	37.40	43.50	-6.10
292.87	S	Peak	47.22	-12.01	35.21	46.00	-10.79
409.27	S	Peak	38.70	-10.09	28.61	46.00	-17.39
665.35	S	Peak	33.31	-5.65	27.66	46.00	-18.34
1643.50	S	Peak	41.77	1.66	43.43	74.00	-30.57
2696.50	S	Peak	46.63	6.80	53.43	74.00	-20.57
4924.00	H	Peak	43.28	10.31	53.59	74.00	-20.41
7386.00	---						
9848.00	---						
12310.00	---						
14772.00	---						
17234.00	---						
19696.00	---						
22158.00	---						
24620.00	---						

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Operation Band	:802.11b	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"--" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
109.54	S	Peak	47.00	-15.12	31.88	43.50	-11.62
214.30	S	Peak	55.58	-14.78	40.80	43.50	-2.70
292.87	S	Peak	56.61	-12.01	44.60	46.00	-1.40
370.47	S	Peak	44.99	-10.58	34.41	46.00	-11.59
714.82	S	Peak	37.10	-4.81	32.29	46.00	-13.71
884.57	S	Peak	33.09	-2.34	30.75	46.00	-15.25
1643.50	S	Peak	46.47	2.37	48.84	74.00	-25.16
2690.00	S	Peak	42.38	6.54	48.92	74.00	-25.08
4924.00	H	Peak	40.39	10.20	50.59	74.00	-23.41
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 (802.11g)

Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
37.76	S	Peak	49.06	-13.32	35.74	40.00	-4.26
214.30	S	Peak	52.38	-14.78	37.60	43.50	-5.90
292.87	S	Peak	47.44	-12.01	35.43	46.00	-10.57
358.83	S	Peak	41.96	-10.82	31.14	46.00	-14.86
502.39	S	Peak	38.35	-8.72	29.63	46.00	-16.37
779.81	S	Peak	30.25	-3.77	26.48	46.00	-19.52
2638.00	S	Peak	44.92	6.30	51.22	74.00	-22.78
4824.00	H	Peak	39.18	10.21	49.39	74.00	-24.61
7236.00	---						
9648.00	---						
12060.00	---						
14472.00	---						
16884.00	---						
19296.00	---						
21708.00	---						
24120.00	---						

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Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2412	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS	Limit @3m	Safe Margin
			dB μ V		dB μ V/m	dB μ V/m	dB
110.51	S	Peak	45.53	-14.95	30.58	43.50	-12.92
194.90	S	Peak	52.19	-15.13	37.06	43.50	-6.44
214.30	S	Peak	55.43	-14.78	40.65	43.50	-2.85
292.87	S	Peak	56.54	-12.01	44.53	46.00	-1.47
370.47	S	Peak	46.66	-10.58	36.08	46.00	-9.92
714.82	S	Peak	37.68	-4.81	32.87	46.00	-13.13
1611.00	S	Peak	42.17	1.88	44.05	74.00	-29.95
4824.00	H	Peak	36.78	10.22	47.00	74.00	-27.00
7236.00	---						
9648.00	---						
12060.00	---						
14472.00	---						
16884.00	---						
19296.00	---						
21708.00	---						
24120.00	---						

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Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS	Limit @3m	Safe Margin
			dB μ V		dB μ V/m	dB μ V/m	dB
37.76	S	Peak	48.97	-13.32	35.65	40.00	-4.35
194.90	S	Peak	48.69	-15.13	33.56	43.50	-9.94
214.30	S	Peak	51.87	-14.78	37.09	43.50	-6.41
292.87	S	Peak	47.26	-12.01	35.25	46.00	-10.75
409.27	S	Peak	38.48	-10.09	28.39	46.00	-17.61
760.41	S	Peak	31.22	-4.06	27.16	46.00	-18.84
1624.00	S	Peak	39.40	1.43	40.83	74.00	-33.17
4874.00	H	Peak	39.03	10.55	49.58	74.00	-24.42
7311.00	---						
9748.00	---						
12185.00	---						
14622.00	---						
17059.00	---						
19496.00	---						
21933.00	---						
24370.00	---						

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Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2437	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX MID	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS	Limit @3m	Safe Margin
			dB μ V		dB μ V/m	dB μ V/m	dB
110.51	S	Peak	45.49	-14.95	30.54	43.50	-12.96
214.30	S	Peak	55.42	-14.78	40.64	43.50	-2.86
292.87	S	Peak	56.83	-12.01	44.82	46.00	-1.18
370.47	S	Peak	46.59	-10.58	36.01	46.00	-9.99
623.64	S	Peak	34.81	-6.19	28.62	46.00	-17.38
714.82	S	Peak	37.24	-4.81	32.43	46.00	-13.57
1624.00	S	Peak	44.98	2.08	47.06	74.00	-26.94
4874.00	H	Peak	35.69	10.50	46.19	74.00	-27.81
7311.00	---						
9748.00	---						
12185.00	---						
14622.00	---						
17059.00	---						
19496.00	---						
21933.00	---						
24370.00	---						

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Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

"---" : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual FS	Limit @3m	Safe Margin
			dB μ V		dB μ V/m	dB μ V/m	dB
37.76	S	Peak	49.33	-13.32	36.01	40.00	-3.99
214.30	S	Peak	52.26	-14.78	37.48	43.50	-6.02
292.87	S	Peak	47.36	-12.01	35.35	46.00	-10.65
370.47	S	Peak	41.25	-10.58	30.67	46.00	-15.33
523.73	S	Peak	35.09	-8.36	26.73	46.00	-19.27
779.81	S	Peak	31.27	-3.77	27.50	46.00	-18.50
1643.50	S	Peak	40.25	1.66	41.91	74.00	-32.09
4924.00	H	Peak	38.38	10.31	48.69	74.00	-25.31
7386.00	---						
9848.00	---						
12310.00	---						
14772.00	---						
17234.00	---						
19696.00	---						
22158.00	---						
24620.00	---						

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Operation Band	:802.11g	Test Date	:2011-11-22
Fundamental Frequency	:2462	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Marcus
EUT Pol.	:E1	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/m) + Cable Loss(dB) - Pre_Amplifier Gain(dB)

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

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

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode	Spectrum Reading Level	Factor dB	Actual	Limit @3m	Safe Margin
					FS dB μ V	dB μ V/m	dB μ V/m
109.54	S	Peak	44.40	-15.12	29.28	43.50	-14.22
214.30	S	Peak	55.57	-14.78	40.79	43.50	-2.71
292.87	S	Peak	56.59	-12.01	44.58	46.00	-1.42
370.47	S	Peak	46.74	-10.58	36.16	46.00	-9.84
688.63	S	Peak	36.92	-5.28	31.64	46.00	-14.36
714.82	S	Peak	37.05	-4.81	32.24	46.00	-13.76
1643.50	S	Peak	44.79	2.37	47.16	74.00	-26.84
4924.00	H	Peak	36.88	10.20	47.08	74.00	-26.92
7386.00	---						
9848.00	---						
12310.00	---						
14772.00	---						
17234.00	---						
19696.00	---						
22158.00	---						
24620.00	---						

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9 Peak Power Spectral Density

9.1 Standard Applicable:

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

9.2 Measurement Equipment Used:

Refer to section 6.2 for details.

9.3 Test Set-up:

Refer to section 6.3 for details.

9.4 Measurement Procedure:

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

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9.5 Measurement Result:

802.11b

Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-6.10	-6.10	8
2437	-5.81	-5.81	8
2462	-8.18	-8.18	8

802.11g

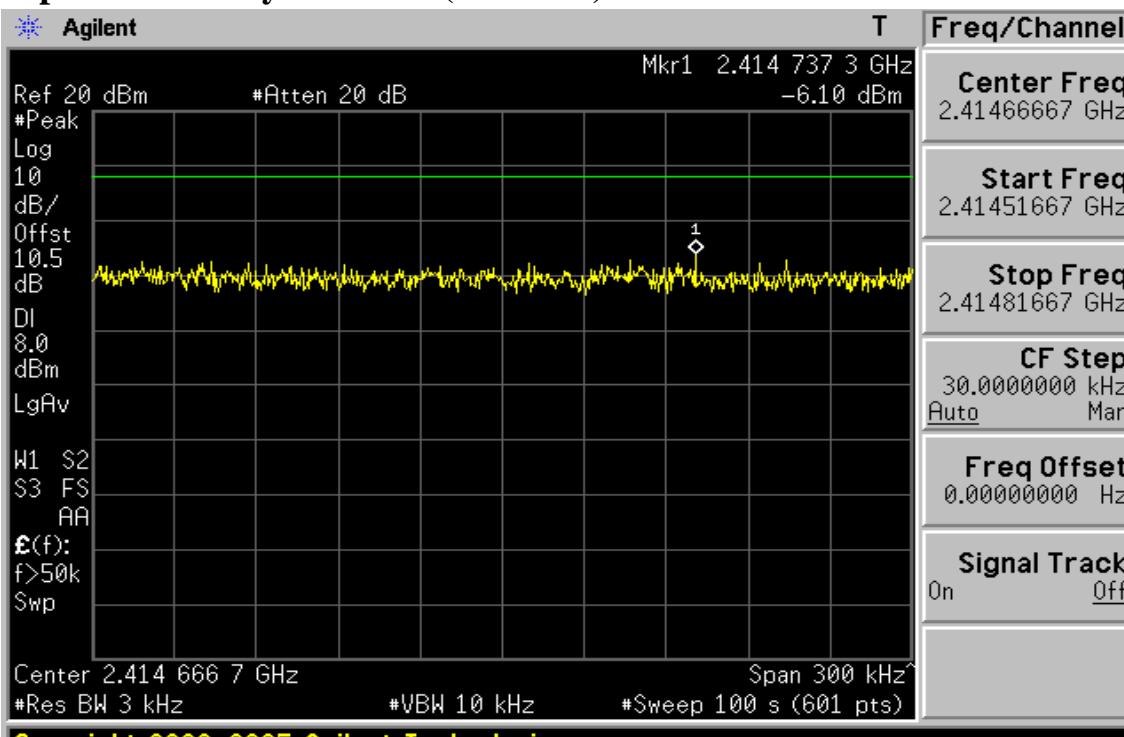
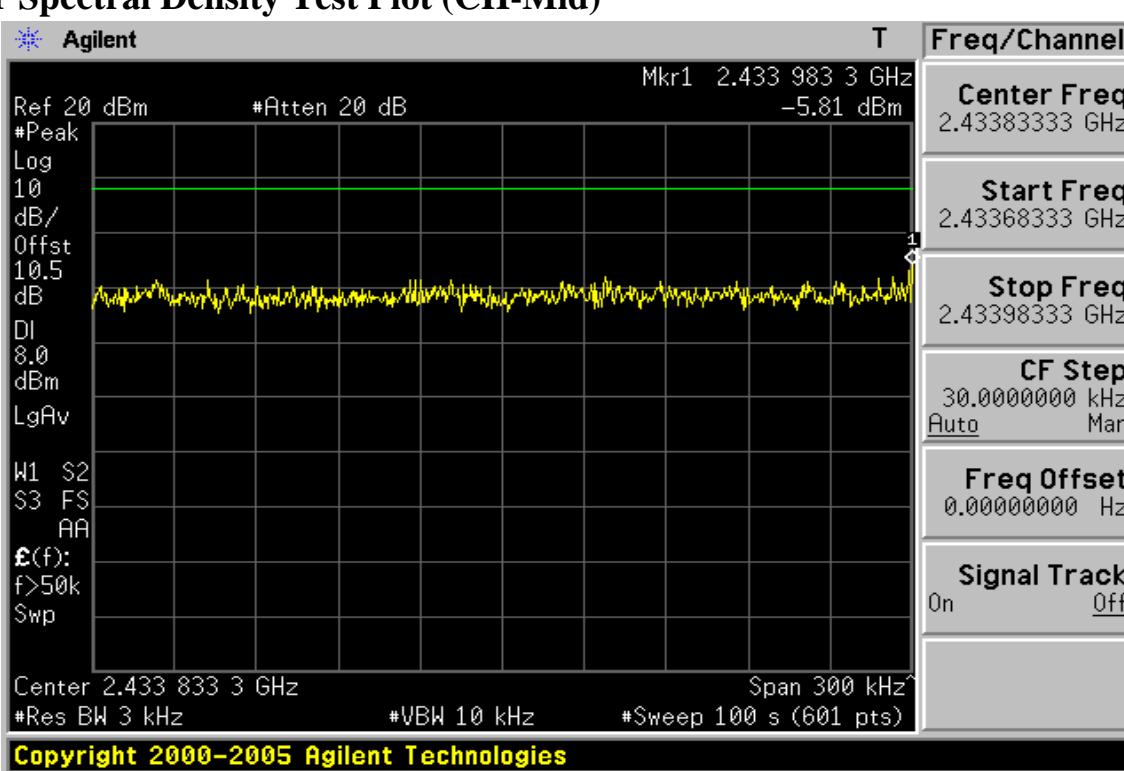
Frequency MHz	RF Power Density Reading (dBm)	RF Power Density Level (dBm)	Maximum Limit (dBm)
2412	-14.19	-14.19	8
2437	-13.95	-13.95	8
2462	-12.65	-12.65	8

*Offset 10.5 dB

Note: Refer to next page for plots.

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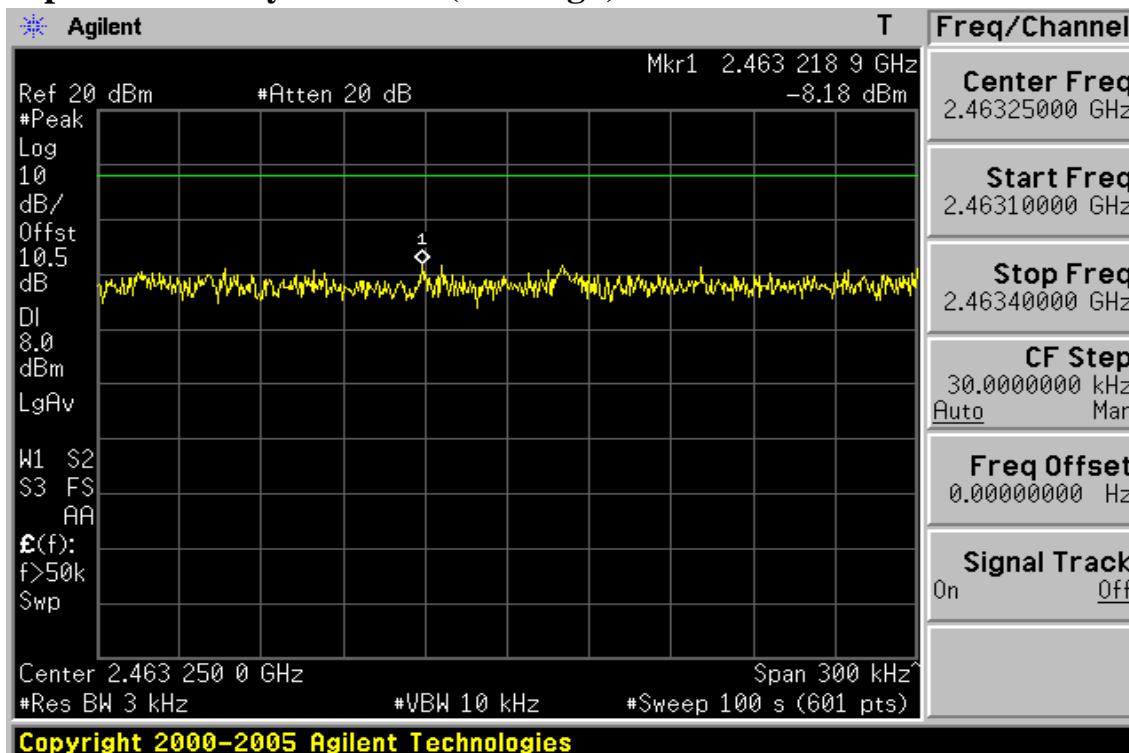
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802.11b**Power Spectral Density Test Plot (CH-Low)****Power Spectral Density Test Plot (CH-Mid)**

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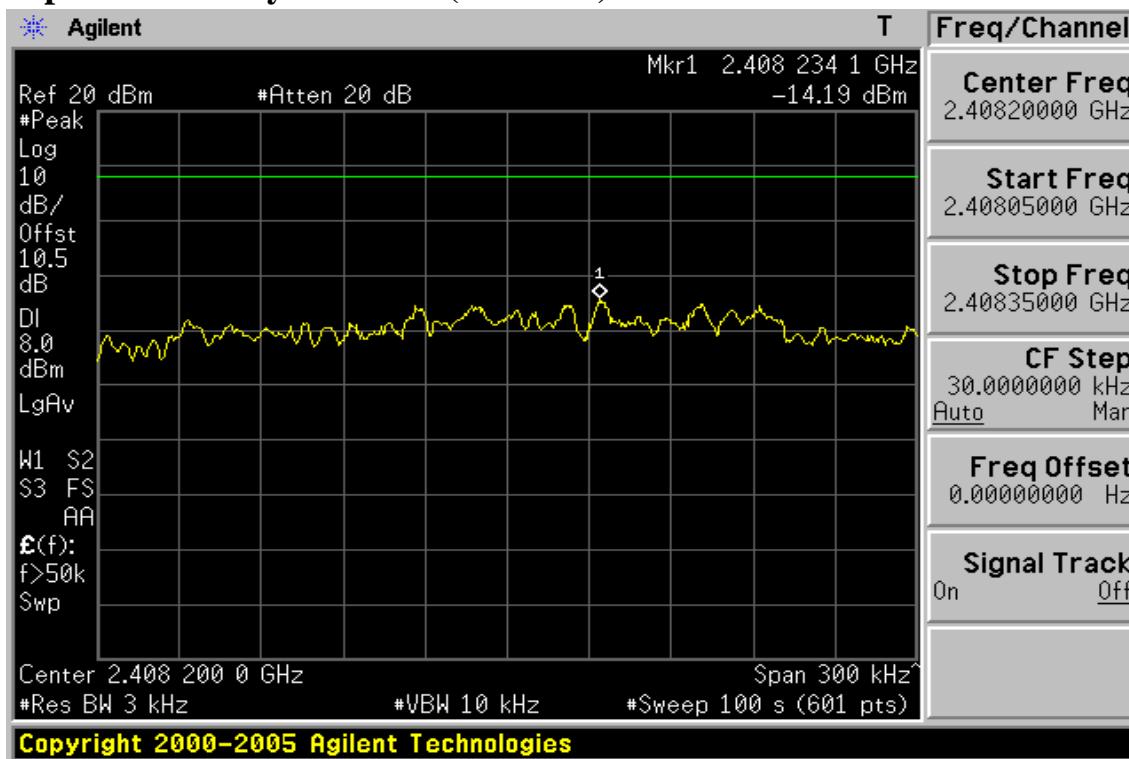
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Power Spectral Density Test Plot (CH-High)



802.11g

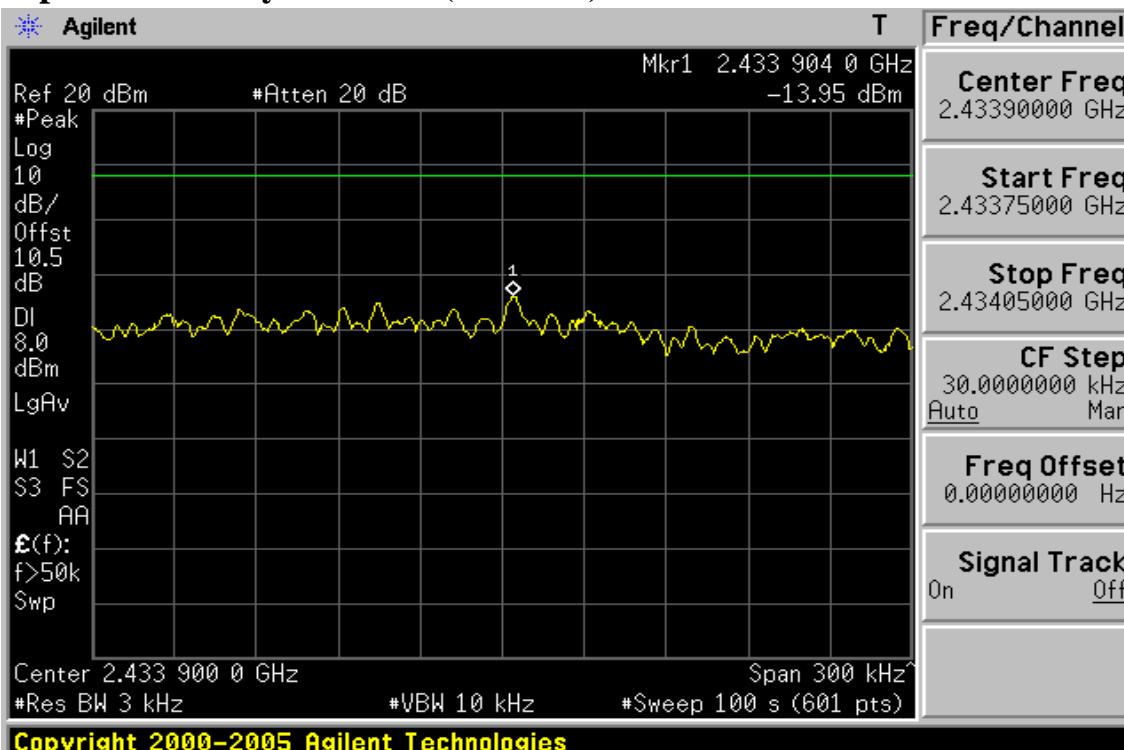
Power Spectral Density Test Plot (CH-Low)



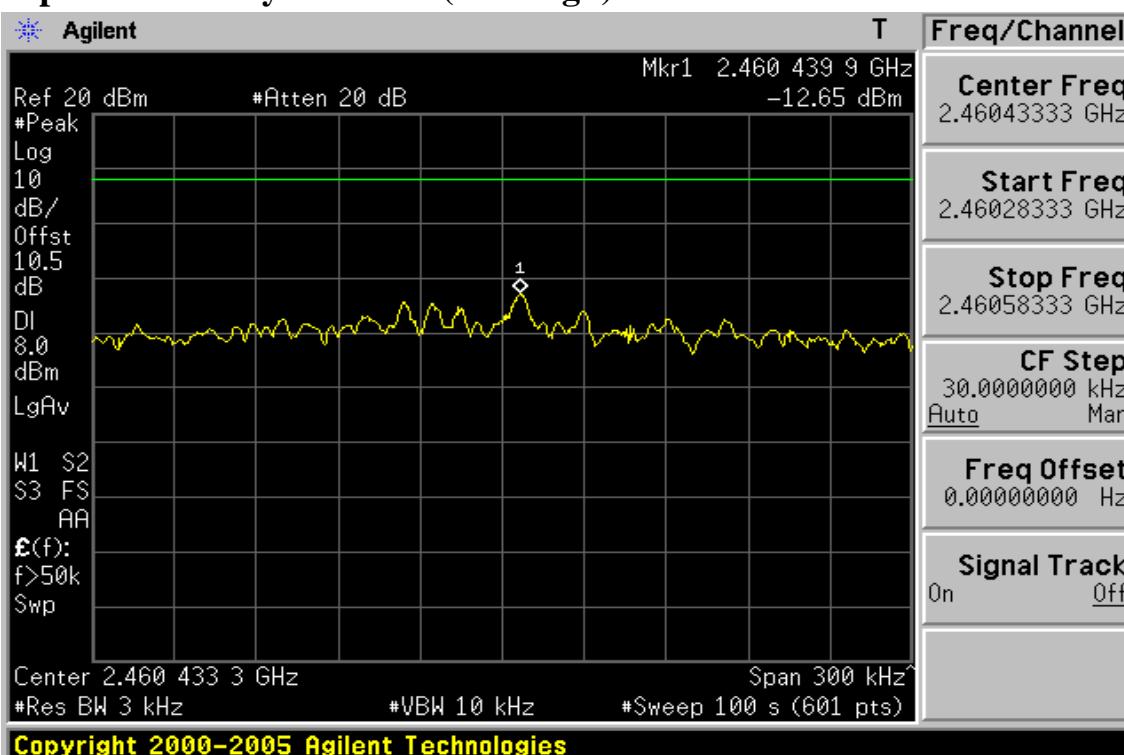
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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10 ANTENNA REQUIREMENT

10.1 Standard Applicable:

According to §15.203, Antenna requirement.

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

10.2 Antenna Connected Construction:

The directional gins of antenna used for transmitting is 3.60dBi, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

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