



# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** Wireless Data Collection Terminal

**Brand Name:** unitech

**Model Name:** PA600 Phone Edition

**Model Difference:** N/A

**FCC ID:** HLEPA600BTGP

**Report No.:** EH/2008/90015

**Issue Date:** Oct. 30, 2008

**FCC Rule Part:** §15.247

**Prepared for:** unitech electronics co., ltd  
8Fl., No. 118, Lane 235, Pao-Chiao Rd.,  
Hsin-Tien City, Taipei Hsien, Taiwan 231,  
R.O.C.

**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No. 134, Wu Kung Rd., Wuku Industrial  
Zone, Taipei County, Taiwan



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## VERIFICATION OF COMPLIANCE

**Applicant:** unitech electronics co., ltd  
8Fl., No. 118, Lane 235, Pao-Chiao Rd., Hsin-Tien City, Taipei Hsien,  
Taiwan 231, R.O.C.

**Equipment Under Test:** Wireless Data Collection Terminal

**Brand Name:** unitech

**Model No.:** PA600 Phone Edition

**Model Difference:** N/A

**FCC ID:** HLEPA600BTGP

**File Number:** EH/2008/90015

**Date of test:** Sep. 16, 2008 ~ Oct. 24, 2008

**Date of EUT Received:** Sep. 16, 2008

**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. 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:**

Sky Wang

**Date**

Oct. 30, 2008

Sky Wang/Asst. Supervisor

**Prepared By:**

Alex Hsieh

**Date**

Oct. 30, 2008

Alex Hsieh / Sr. Engineer

**Approved By:**

Vincent Su

**Date**

Oct. 30, 2008

Vincent Su / Manager

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## Version

Version No.	Date	Description
00	Oct. 30, 2008	Initial creation of document
01	Nov. 27, 2008	Correct licensed frequency range

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## 1. GENERAL INFORMATION

### General:

Product Name:	Wireless Data Collection Terminal	
Brand Name:	unitech	
Model Name:	PA600 Phone Edition	
Model Difference:	N/A	
USB cable	One provide, Model: N/A	
Power Supply	3.7 Vdc re-chargeable battery or 5Vdc by AC/DC power adapter	
	Battery:	Model: 1400-203047G
	Adapter 1:	Model: 3A-181WP05A, supplier: ENG

### GSM

Cellular Phone Standards Frequency Range and Power	E-GSM/GSM 850 Class 8,10,12	824.2 MHz– 848.8MHz	33 dBm
	E-GSM/GPRS 900 Class 8,10,12	880MHz – 915MHz	33 dBm
	E-GSM/GPRS 1800 Class 8,10,12	1710MHz-1785MHz	30 dBm
	E-GSM/GSM 1900 Class 8,10,12	1850.2MHz – 1909.8MHz	30 dBm
Final amplifier voltage and current information		DC voltage (V)	DC current (mA)
	GSM 850	5.0Vdc	330
	GSM 1900	5.0Vdc	318
	GPRS 850	5.0Vdc	328
	GPRS 1900	5.0Vdc	317
	EGPRS 850	5.0Vdc	312
	EGPRS 1900	5.0Vdc	304
Type of Emission	GSM 850: 242KGXW GSM 1900 :240KGXW EDGE 850: 239KG7W EDGE 1900:239KG7W		
Software Version	120045_001_001		
Hardware Version	V_02		
IMEI	355634008128850		
Antenna Type	PIFA Antenna		

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**WLAN:**

Frequency Range:	2412 – 2462 MHz
Channel number:	11 channels
Max. Output Power:	802.11 b: 15.35 dBm (Peak) 802.11 g: 10.41 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:	PIFA Antenna, -3.16dBi
Type of Emission	16M51M7D

**Bluetooth:**

Bluetooth Version	<input type="checkbox"/> V1.1 (GFSK) <input type="checkbox"/> V1.2 (GFSK) <input type="checkbox"/> V2.0 (GFSK) <input checked="" type="checkbox"/> V2.0 + EDR (GFSK + /4DQPSK + 8DPSK) <input type="checkbox"/> V2.1 + EDR (GFSK + /4DQPSK + 8DPSK)
Frequency Range	2402 – 2480MHz
Channel number	79 channels max.
Rated Power	BDR mode 0.25 dBm (Peak) EDR mode 2.12 dBm (Peak)
Modulation type	Frequency Hopping Spread Spectrum
Antenna Designation	PIFA Antenna / 1.71dBi.
Type of Emission	1M27F1D

The EUT is compliance with Bluetooth 2.0 with EDR.

This test report applies for 802.11b and 802.11g WLAN.

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### 1.1. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **HLEPA600BTGP** 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.

### 1.2. Test Methodology

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

### 1.3. 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-1

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.

### 1.4. Special Accessories

Not available for this EUT intended for grant.

### 1.5. 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 placed on a 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 30 MHz using CISPR Quasi-Peak and Average detector mode.

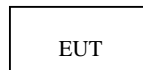
#### 2.3.2 Radiated Emissions

The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna. according to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4-2003.

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## 2.4. Configuration of Tested System

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



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

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1	WiFi Software	Marvell	SD8686PN	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 data rate are chosen for full testing.

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

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 WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

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## 5. CONDUCTED EMISSION TEST

### 5.1. Standard Applicable

According to §15.207, frequency 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. 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 rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The LISN was connected with 110Vac/60Hz power source.

### 5.3. 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.

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#### 5.4. 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	09/16/2008	09/15/2009
LISN	Rolf-Heine	NNB-2/16Z	99012	02/18/2008	02/17/2009
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	02/18/2008	02/17/2009
Coaxial Cables	N/A	WK CE Cable	N/A	11/30/2007	11/29/2008

#### 5.5. Measurement Result

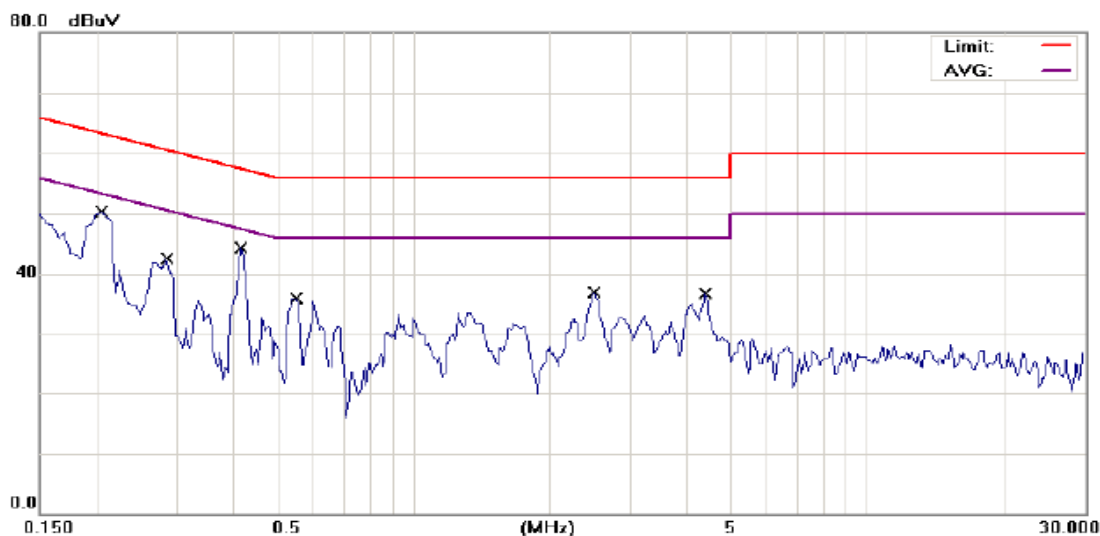
The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	WLAN Operating			Test Date:	Oct. 12, 2008
Temperature:	26 °C	Humidity:	61%	Test By:	Sky



Site SGS CONDUCTED #1

Limit: CISPR22 Class B Conduction(QP)

EUT: Wireless Data Collection Terminal

M/N: PA600II

Note: WLAN operating

Phase: L1

Power: AC 120V/60Hz

Distance:

Temperature: 26 °C

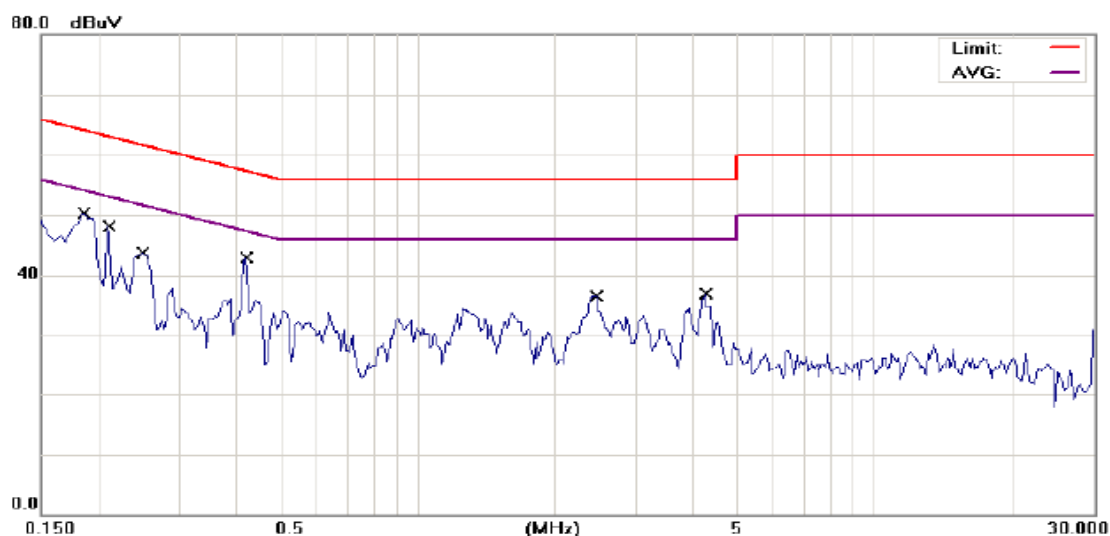
Humidity: 62 %

Air Pressure: hpa

No.	Mk.	Freq. MHz	Reading Level dBμV	Factor dB	Measure- ment dBμV	Limit dBμV	Over dB	Detector	Comment
1		0.2049	39.54	0.14	39.68	63.41	-23.73	QP	
2		0.2049	29.41	0.14	29.55	53.41	-23.86	AVG	
3		0.2850	31.42	0.11	31.53	60.67	-29.14	QP	
4		0.2850	30.10	0.11	30.21	50.67	-20.46	AVG	
5		0.4154	38.75	0.08	38.83	57.54	-18.71	QP	
6	*	0.4154	37.57	0.08	37.65	47.54	-9.89	AVG	
7		0.5500	25.21	0.05	25.26	56.00	-30.74	QP	
8		0.5500	20.65	0.05	20.70	46.00	-25.30	AVG	
9		2.5000	33.05	0.03	33.08	56.00	-22.92	QP	
10		2.5000	22.78	0.03	22.81	46.00	-23.19	AVG	
11		4.3900	21.22	0.05	21.27	56.00	-34.73	QP	
12		4.3900	20.17	0.05	20.22	46.00	-25.78	AVG	

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Site SGS CONDUCTED #1

Limit: CISPR22 Class B Conduction(QP)

EUT: Wireless Data Collection Terminal

M/N: PA600II

Note: WLAN operating

Phase: N

Power: AC 120V/60Hz

Distance:

Temperature: 26 °C

Humidity: 62 %

Air Pressure: hpa

No. Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	0.1850	45.42	0.22	45.64	64.26	-18.62	QP	
2	0.1850	32.41	0.22	32.63	54.26	-21.63	AVG	
3	0.2100	36.30	0.14	36.44	63.21	-26.77	QP	
4	0.2100	27.41	0.14	27.55	53.21	-25.66	AVG	
5	0.2500	33.34	0.13	33.47	61.76	-28.29	QP	
6	0.2500	26.08	0.13	26.21	51.76	-25.55	AVG	
7	0.4200	39.71	0.07	39.78	57.45	-17.67	QP	
8 *	0.4200	36.71	0.07	36.78	47.45	-10.67	AVG	
9	2.4600	31.78	0.03	31.81	56.00	-24.19	QP	
10	2.4600	25.40	0.03	25.43	46.00	-20.57	AVG	
11	4.2700	27.45	0.05	27.50	56.00	-28.50	QP	
12	4.2700	17.58	0.05	17.63	46.00	-28.37	AVG	

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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 Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Channel power function, RBW= 1MHz, VBW = 3MHz, Bandwidth=26dB occupied Bandwidth)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

## 6.3. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2008	07/03/2009
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2008	02/21/2009
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2008	01/04/2009
Attenuator	Mini-Circuit	BW-S6W5	N/A	07/05/2008	07/04/2009

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## 6.4. Measurement Result

### 802.11b

Cable loss = 0		Peak Power Output				
CH	Frequency (MHz)	Data Rate				Required Limit
		1	2	5.5	11	
1	2412	15.35	14.73	14.18	13.58	30 dBm
6	2437	14.96	14.32	13.66	13.18	30 dBm
11	2462	15.01	14.52	14.07	13.25	30 dBm

### 802.11g

Cable loss = 0		Peak Power Output								
CH	Frequency (MHz)	Data Rate								Required Limit
		6	9	12	18	24	36	48	54	
1	2412	10.11	9.72	9.3	8.95	8.64	8.42	8.2	8.01	30 dBm
6	2437	10.41	10.05	9.62	9.26	8.96	8.74	8.48	8.23	30 dBm
11	2462	10.29	9.83	9.41	9.08	8.8	8.61	8.38	8.11	30 dBm

Cable loss = 0

*\*Note: Offset 10.8dB*

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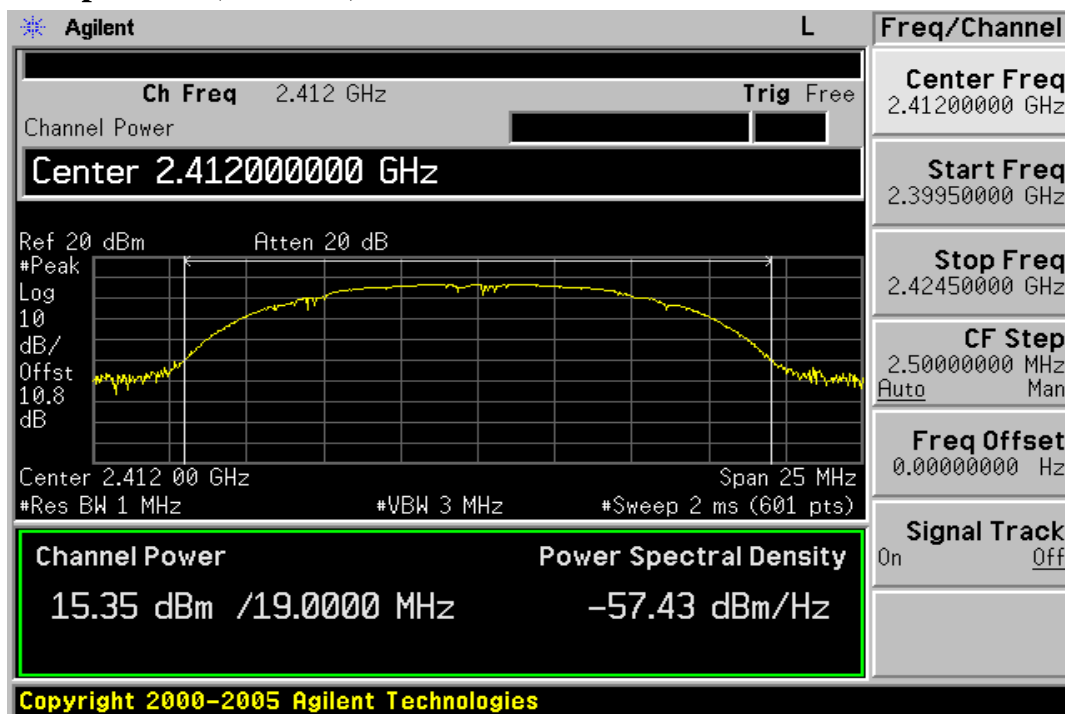
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台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 [www.sgs.com.tw](http://www.sgs.com.tw)

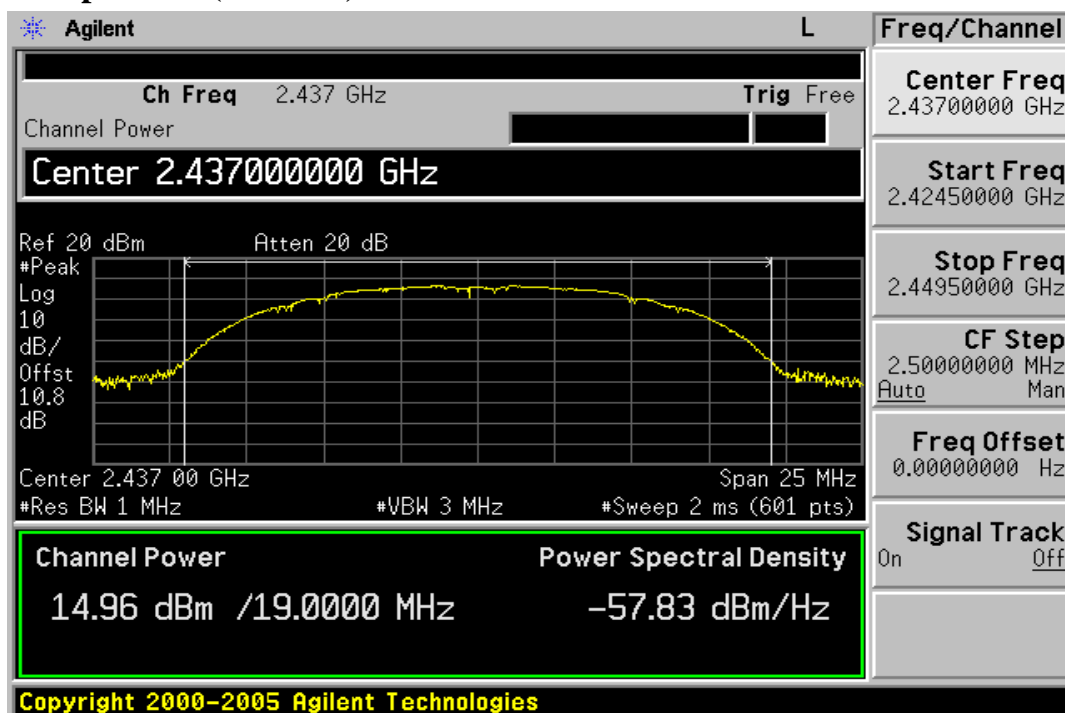
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## 802.11b, 1Mbps

### Power Output Plot (CH Low)



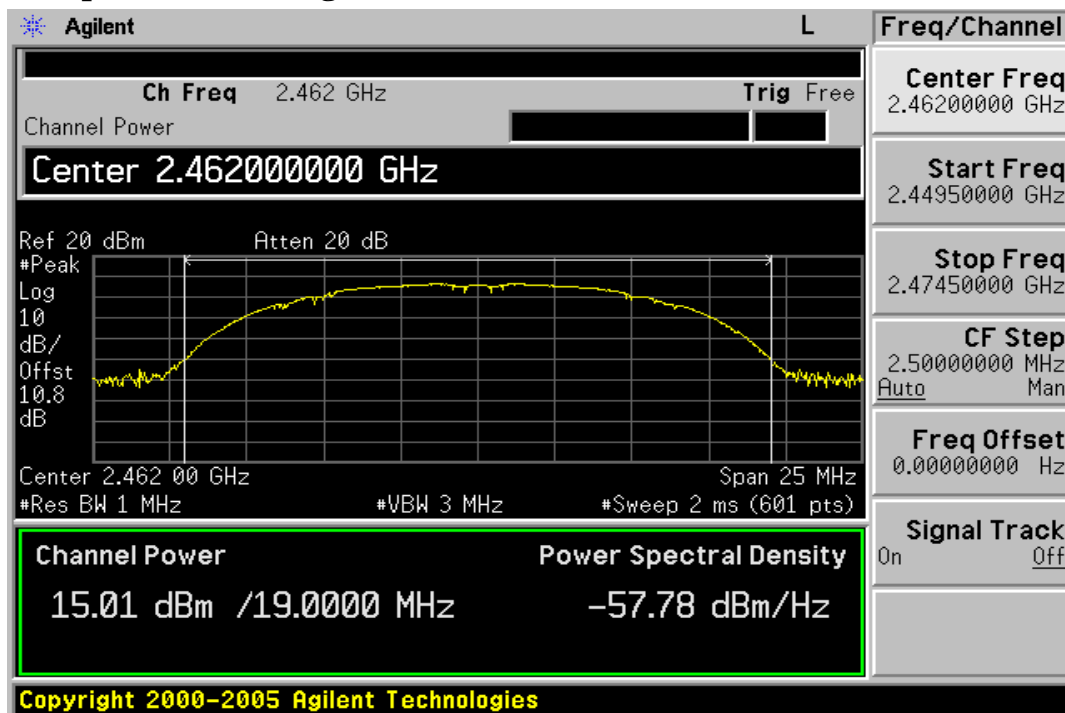
### Power Output Plot (CH Mid)



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## Power Output Plot (CH High)

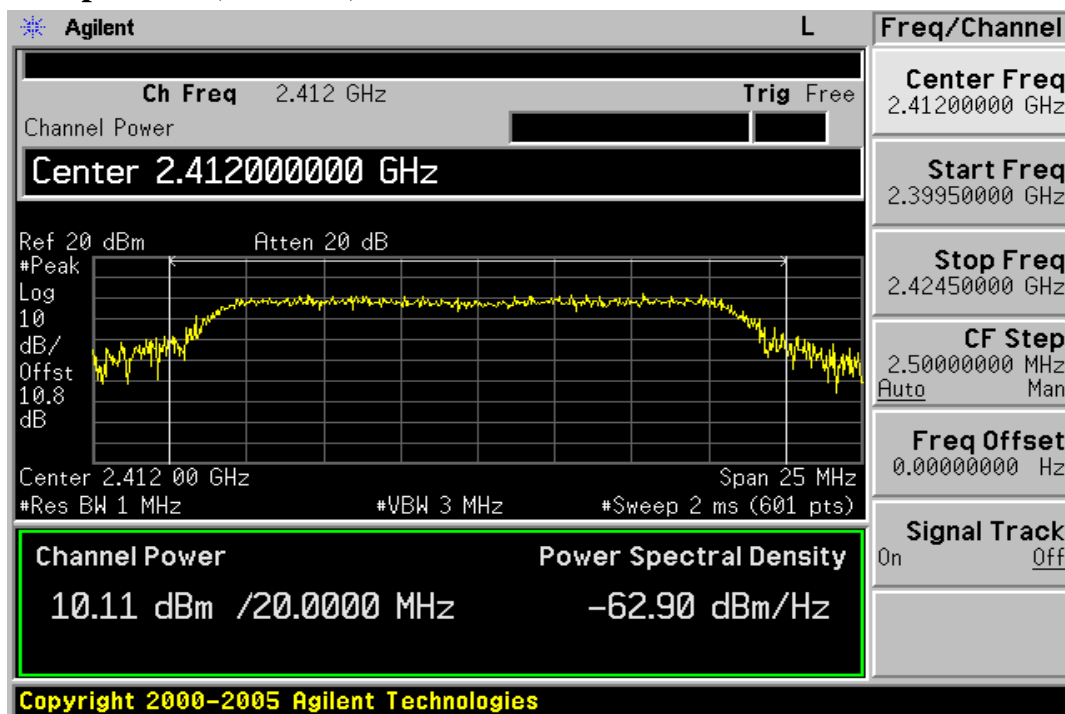


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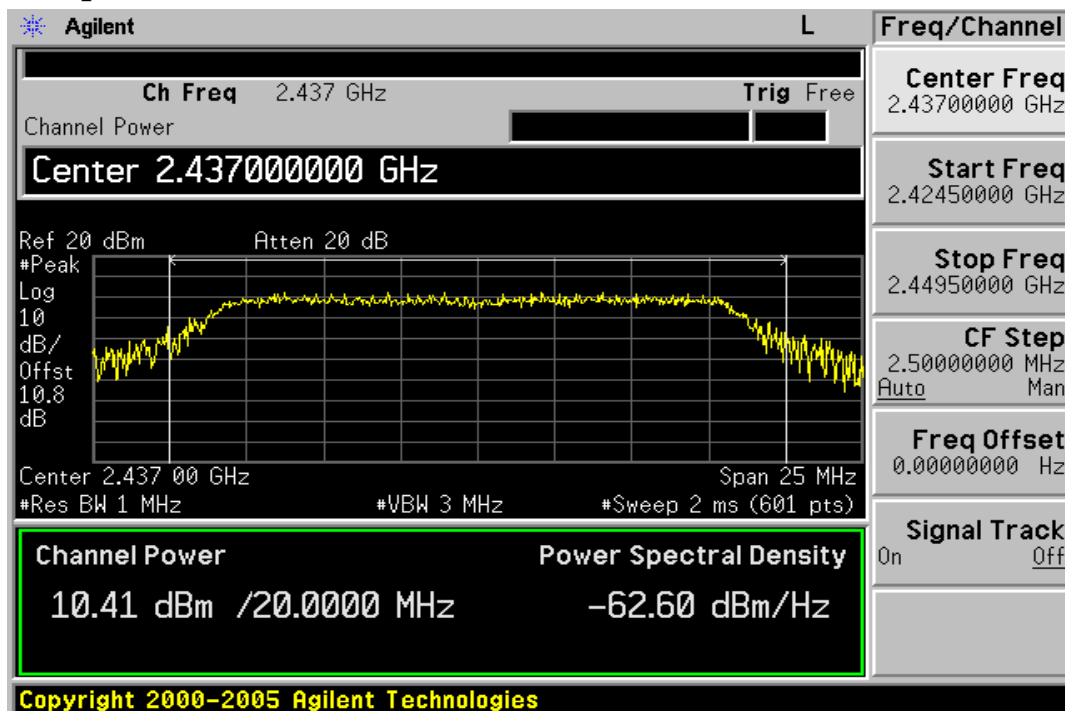
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## 802.11g, 6Mbps

### Power Output Plot (CH Low)



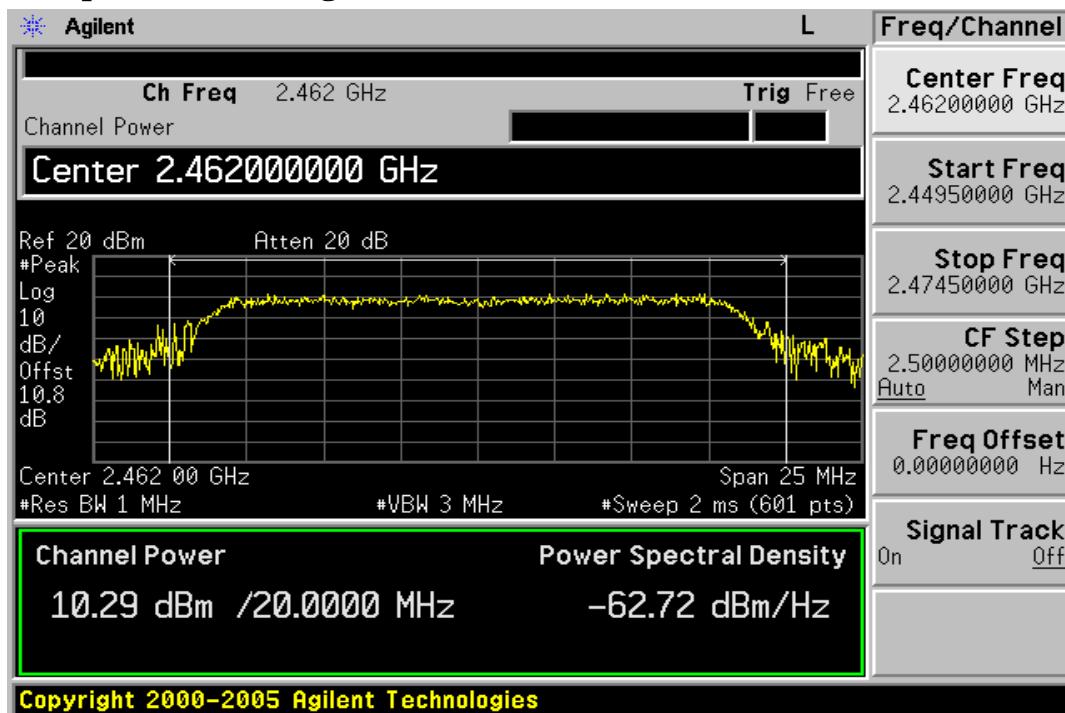
### Power Output Plot (CH Mid)



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## 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 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=1% bandwidth, 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.

### 7.3. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2008	07/03/2009
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2008	02/21/2009
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2008	01/04/2009
Attenuator	Mini-Circuit	BW-S6W5	N/A	07/05/2008	07/04/2009

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## 7.4. Measurement Result

### 802.11b

CH	Bandwidth (MHz)	Bandwidth (KHz)	Result
Lower	13.732	> 500	PASS
Mid	13.764	> 500	PASS
Higher	13.766	> 500	PASS

*\*Offset 10.5dB*

### 802.11g

CH	Bandwidth (MHz)	Bandwidth (KHz)	Result
Lower	16.514	> 500	PASS
Mid	16.514	> 500	PASS
Higher	16.509	> 500	PASS

*\*Offset 10.5dB*

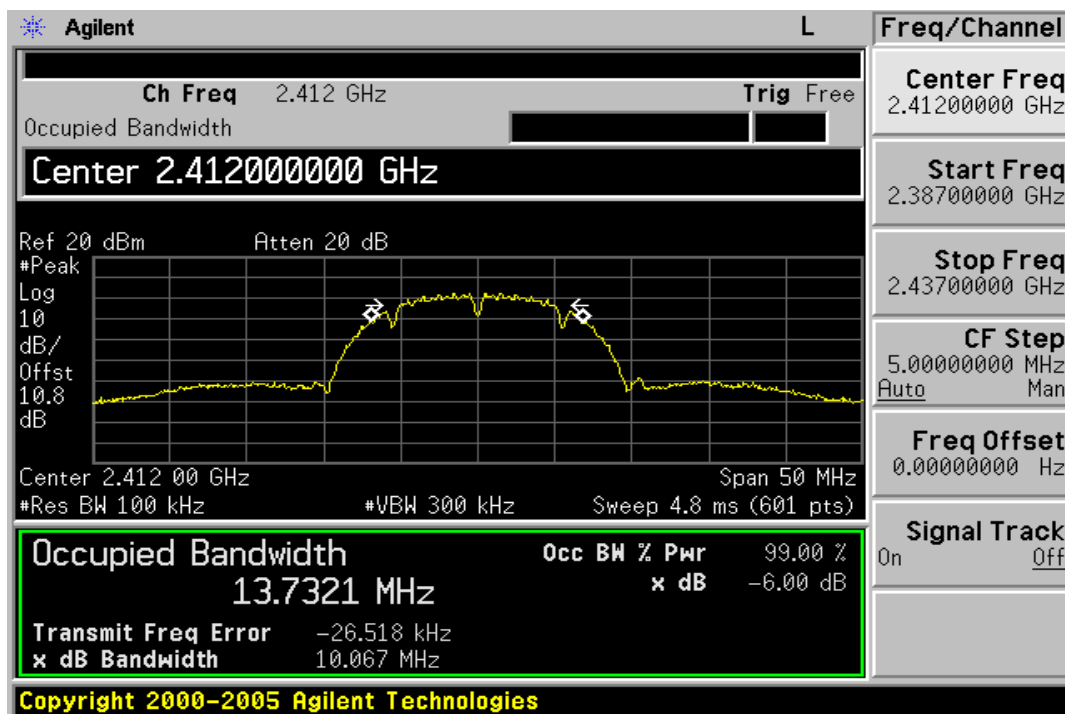
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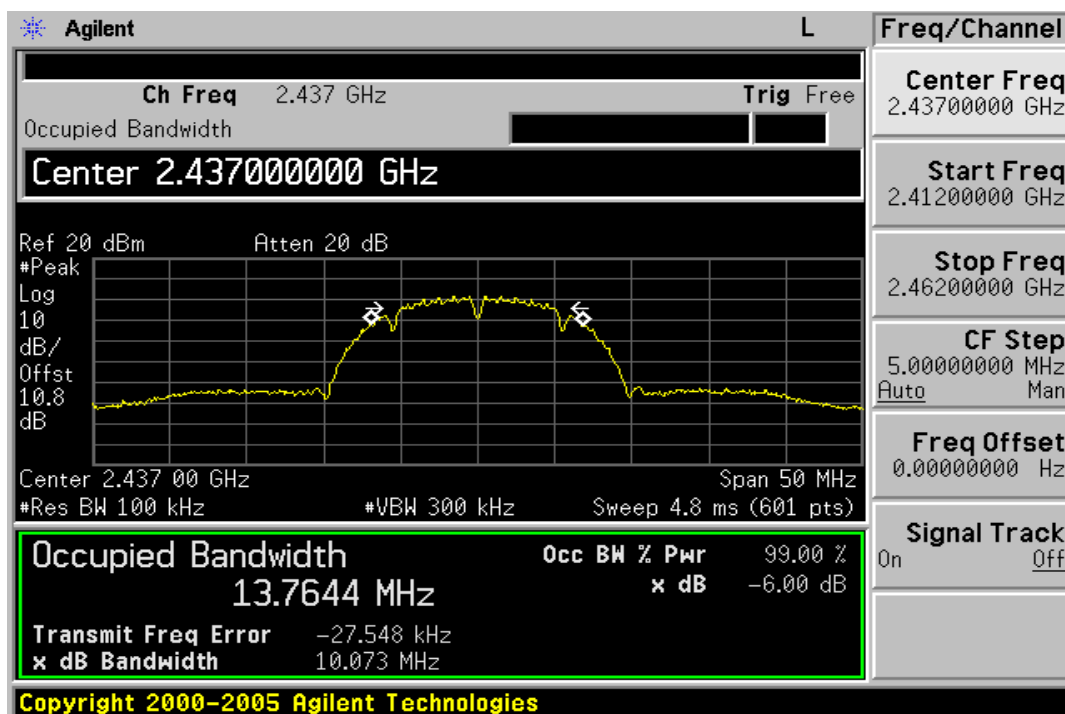


## 802.11b

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



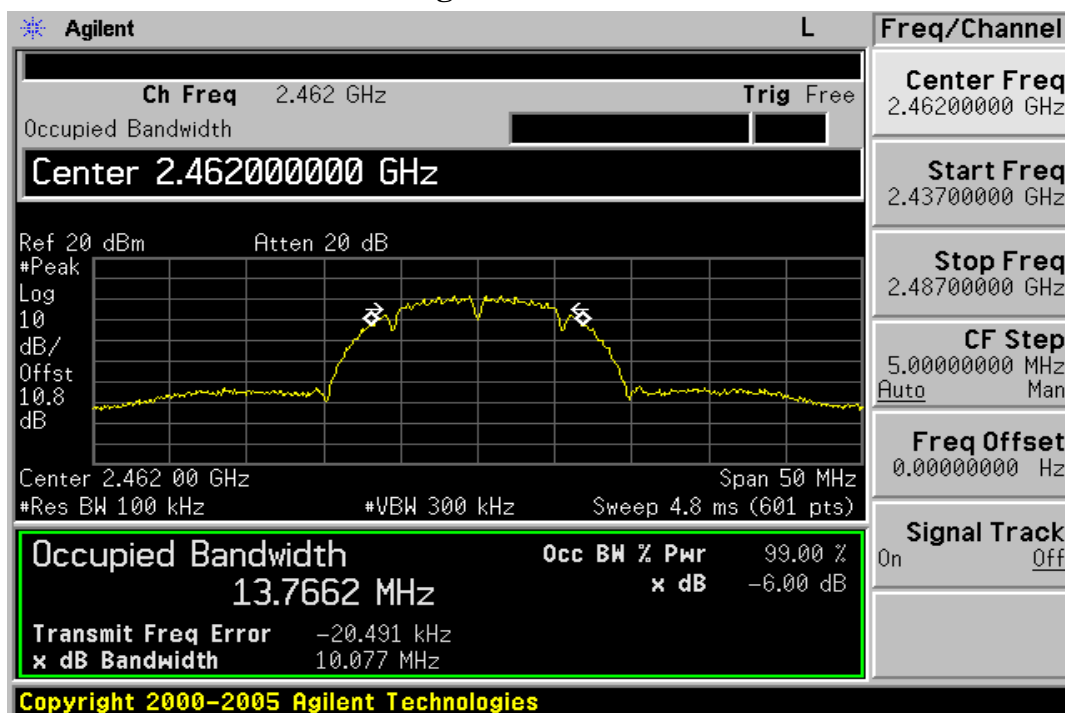
### 6dB Band Width Test Data CH-Mid



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## 6dB Band Width Test Data CH-High

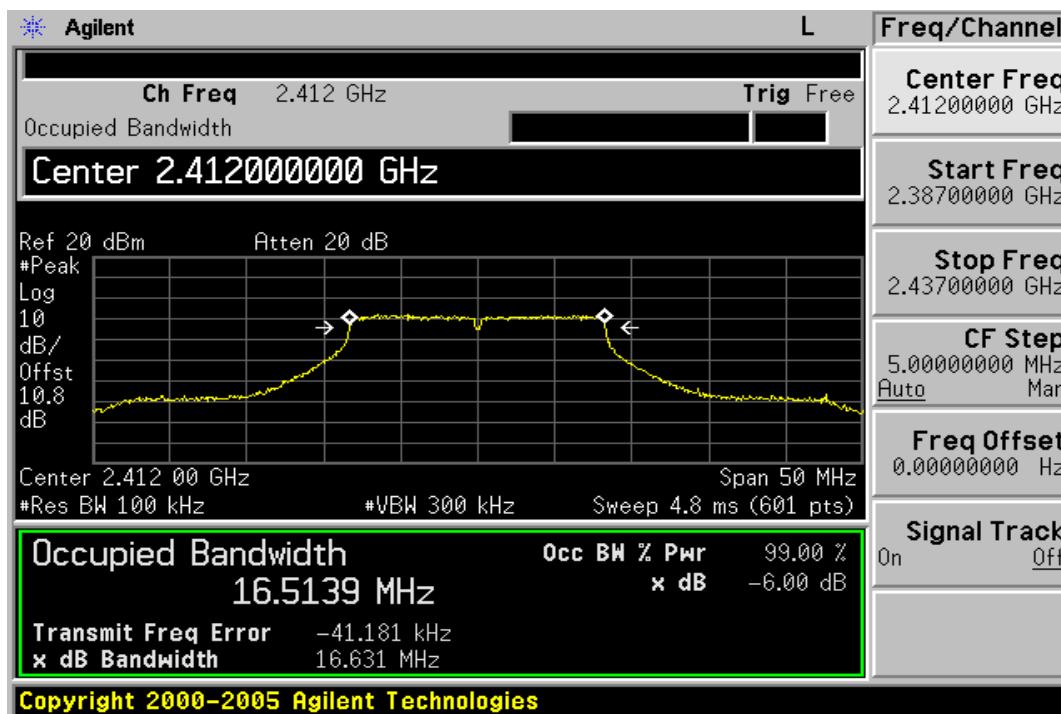


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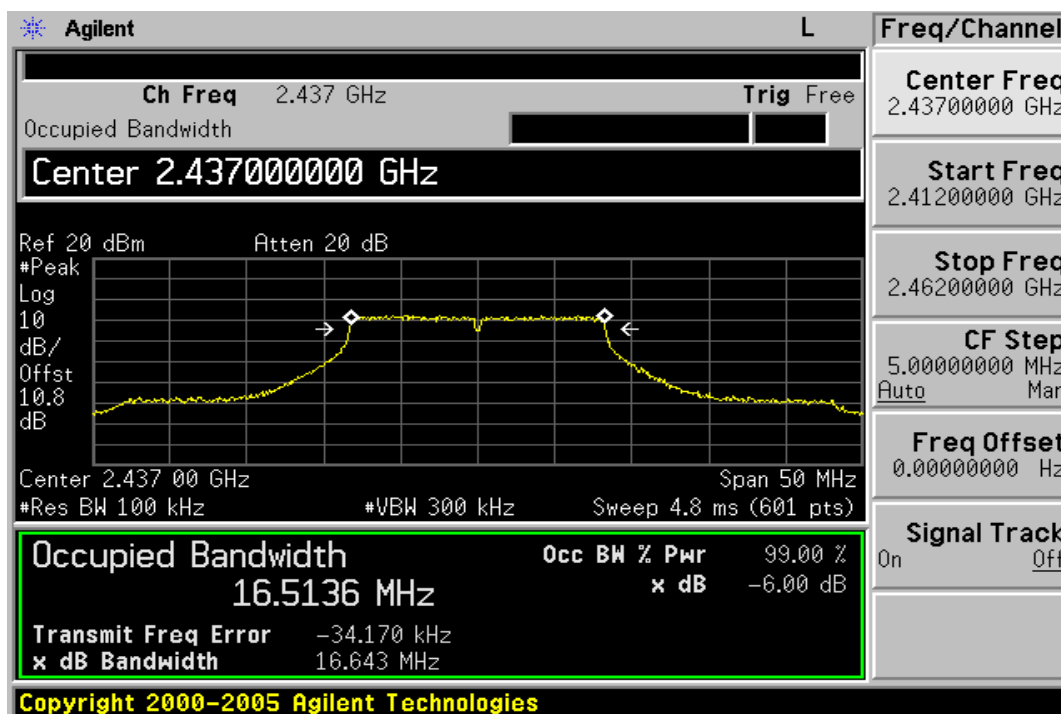
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802.11g

## 6dB Band Width Test Data CH-Low



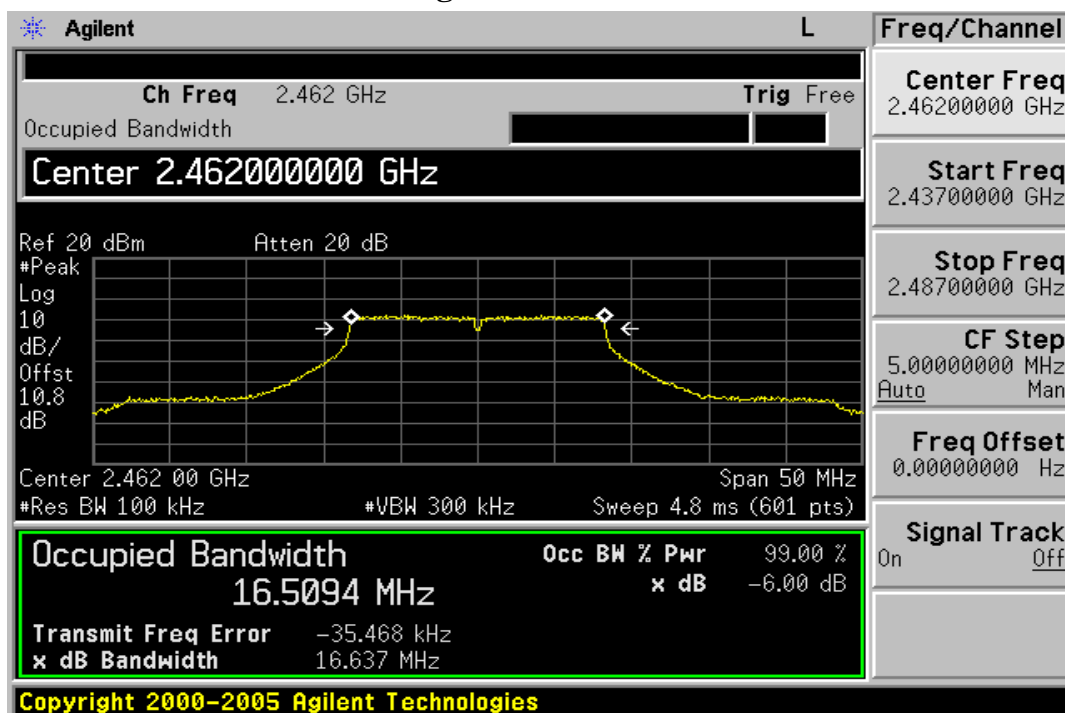
## 6dB Band Width Test Data CH-Mid



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## 6dB Band Width Test Data CH-High



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## 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 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=30MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

### 8.3. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2008	07/03/2009
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2008	02/21/2009
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2008	01/04/2009
Attenuator	Mini-Circuit	BW-S6W5	N/A	07/05/2008	07/04/2009

### 8.4. Measurement Result

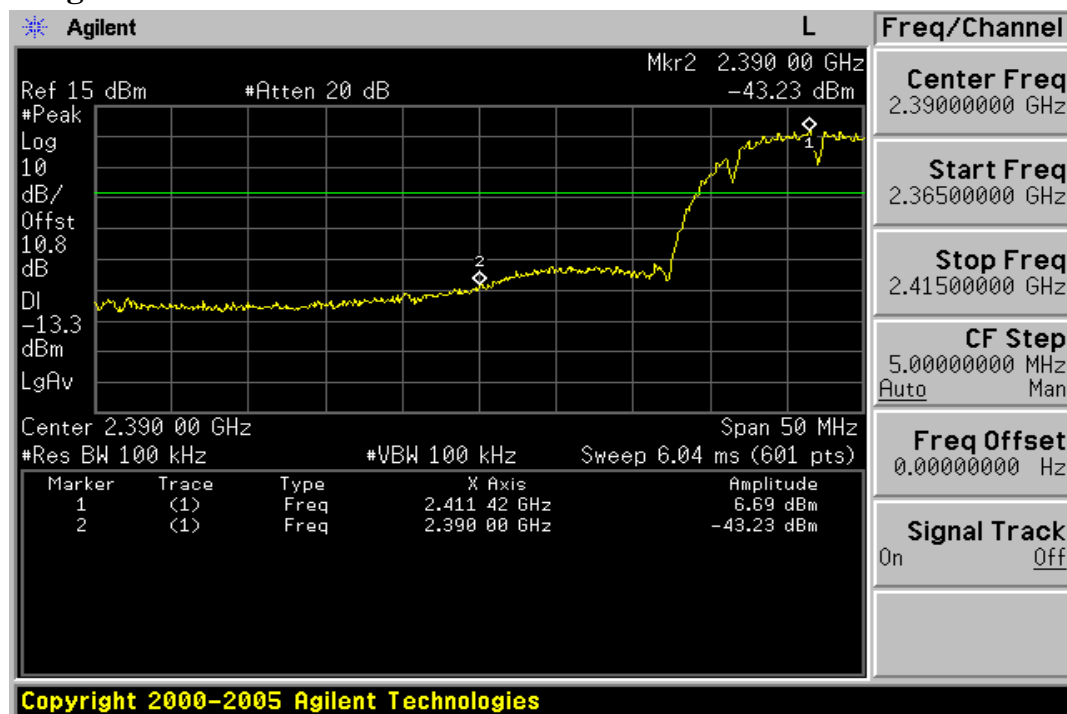
Refer to attach spectrum analyzer data chart.

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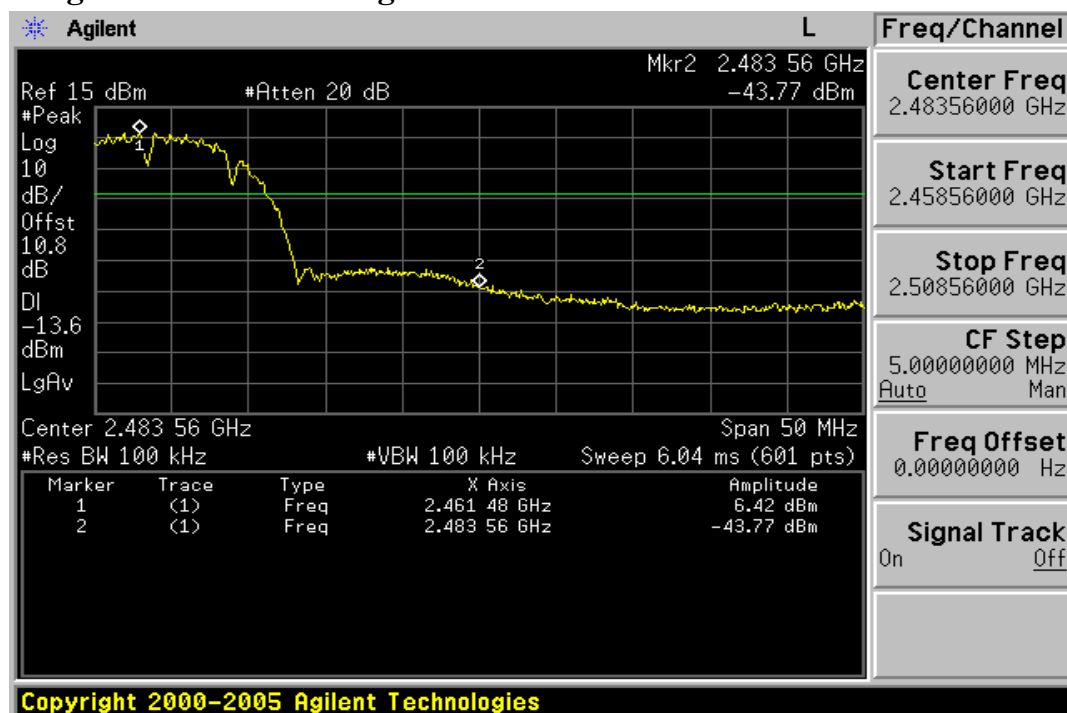
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## 802.11b

## Band Edges Test Data CH-Low



## Band Edges Test Data CH-High



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### Radiated Emission: 802.11 b mode

Operation Mode TX CH Low  
Fundamental Frequency 2412 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2390.00	46.89	---	-10.76	36.13	---	74.00	54.00	-17.87	Peak

Operation Mode TX CH Low  
Fundamental Frequency 2412 MHz  
Temperature 25  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2390.00	56.69	---	-10.76	45.93	---	74.00	54.00	-8.07	Peak

#### Remark :

- (1) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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### Radiated Emission: 802.11 b mode

Operation Mode TX CH High  
Fundamental Frequency 2462 MHz  
Temperature 25  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2483.50	48.50	---	-10.46	38.04	---	74.00	54.00	-15.96	Peak

Operation Mode TX CH High  
Fundamental Frequency 2462 MHz  
Temperature 25  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2483.50	57.80	---	-10.46	47.34	---	74.00	54.00	-6.66	Peak

#### Remark :

- (1) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (3) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

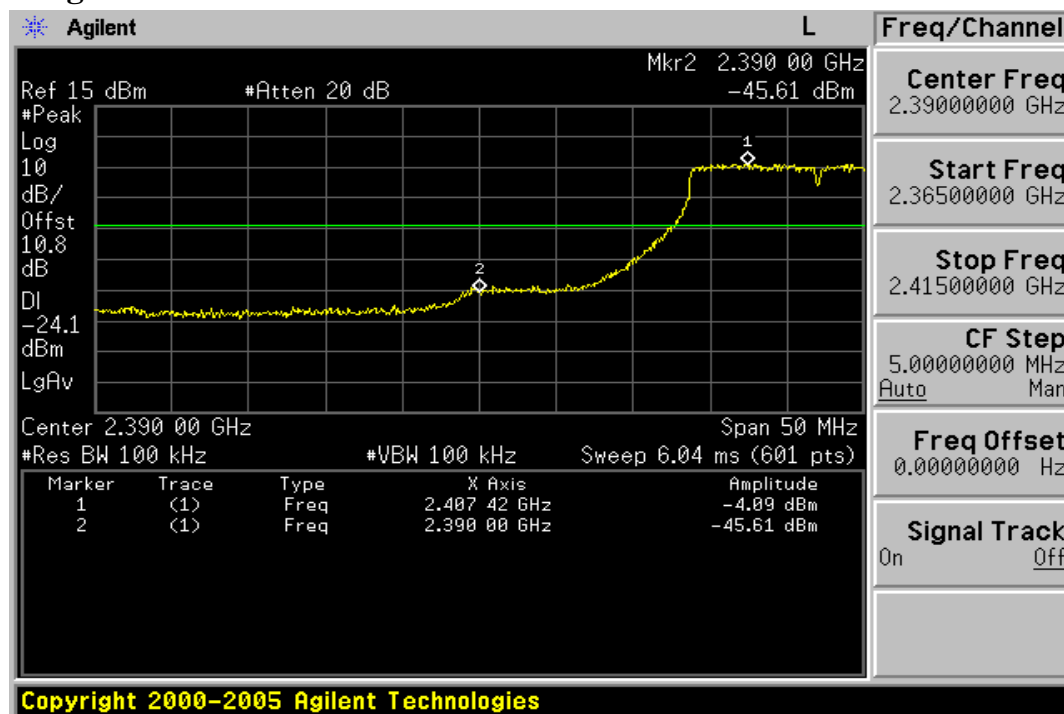
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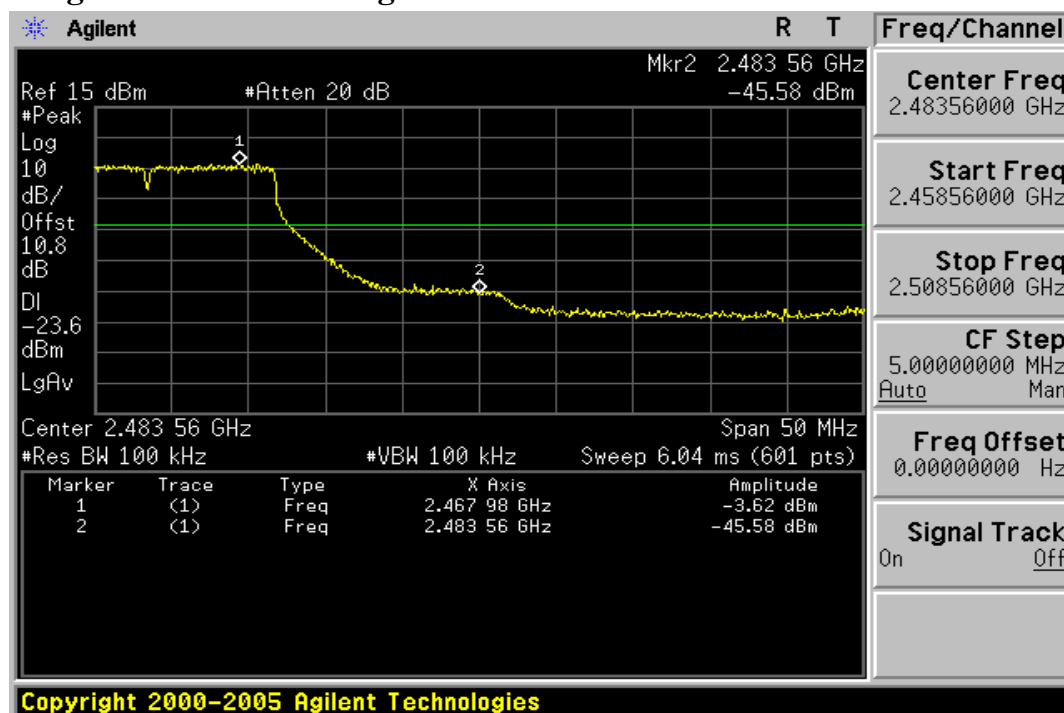


## 802.11g

### Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



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### Radiated Emission: 802.11 g mode

Operation Mode TX CH Low  
Fundamental Frequency 2412 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2390.00	47.74	---	-10.76	36.98	---	74.00	54.00	-17.02	Peak

Operation Mode TX CH Low  
Fundamental Frequency 2412 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2390.00	56.93	---	-10.76	46.17	---	74.00	54.00	-7.83	Peak

#### Remark :

- (1) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (3) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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### Radiated Emission: 802.11 g mode

Operation Mode TX CH High  
Fundamental Frequency 2462 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Ver.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2483.50	49.04	---	-10.46	38.58	---	74.00	54.00	-15.42	Peak

Operation Mode TX CH High  
Fundamental Frequency 2462 MHz  
Temperature 25 °C  
Humidity 65 %

Test Date Oct. 12, 2008  
Test By Sky  
Pol Hor.

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS Peak (dBuV/m)	AV (dBuV/m)	Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	Remark
2483.50	57.84	---	-10.46	47.38	---	74.00	54.00	-6.62	Peak

#### Remark :

- (1) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (2) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (3) Spectrum Peak Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (4) Spectrum AV Setting: 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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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. EUT Setup

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-2003.
2. The EUT was put in the front of the test table. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The spacing between the peripherals was 10 centimeters.
4. External I/O cables were draped along the edge of the test table and bundle when necessary.

### 9.3. Measurement Procedure

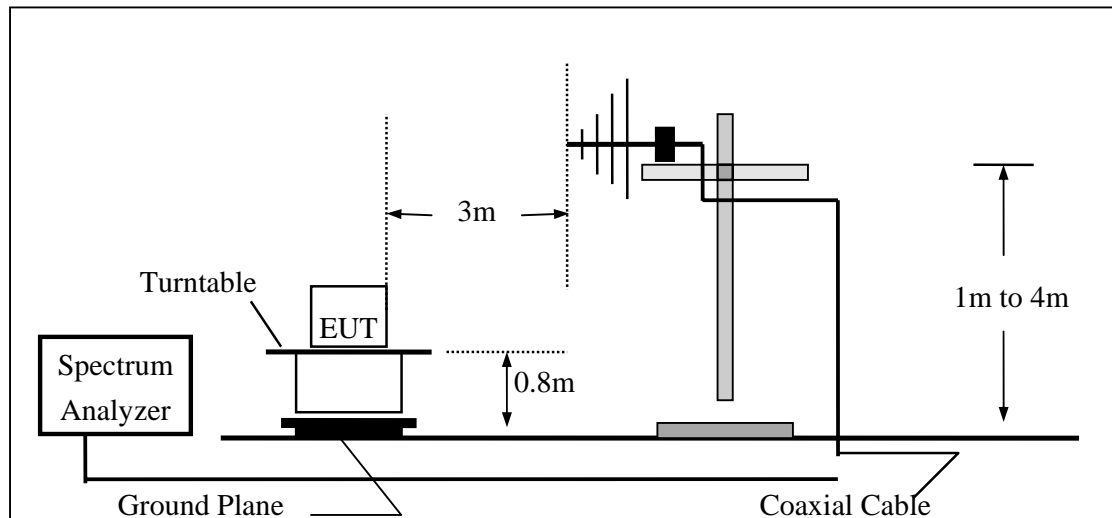
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until all frequency measured were complete.

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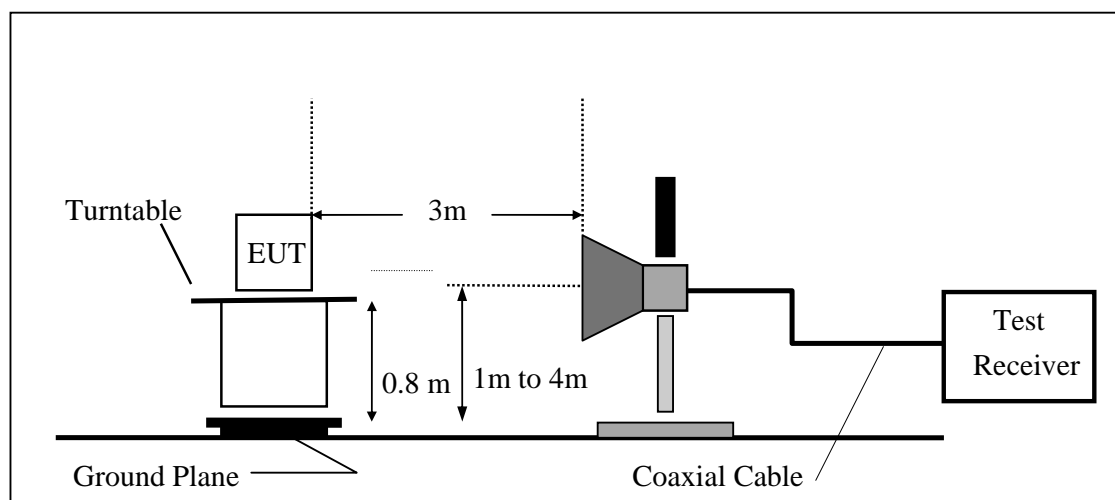
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## 9.4. Test SET-UP (Block Diagram of Configuration)

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



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



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### 9.5. Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2008	02/21/2009
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2007	07/03/2009
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010
Bilog Antenna	SCHWAZBECK	VULB9160	9160-3158	11/29/2007	11/28/2008
Horn antenna	Schwarzbeck	BBHA 9120D	309/320	05/09/2008	05/10/2010
Horn antenna	Schwarzbeck	BBHA 9170	184/185	12/31/2007	12/30/2008
Pre-Amplifier	HP	8447F	3113A06892	01/05/2008	01/04/2009
Pre-Amplifier	HP	8449B	3008A01973	01/05/2008	01/04/2009
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	01/05/2008	01/04/2009
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2008	01/04/2009

### 9.6. 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:

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

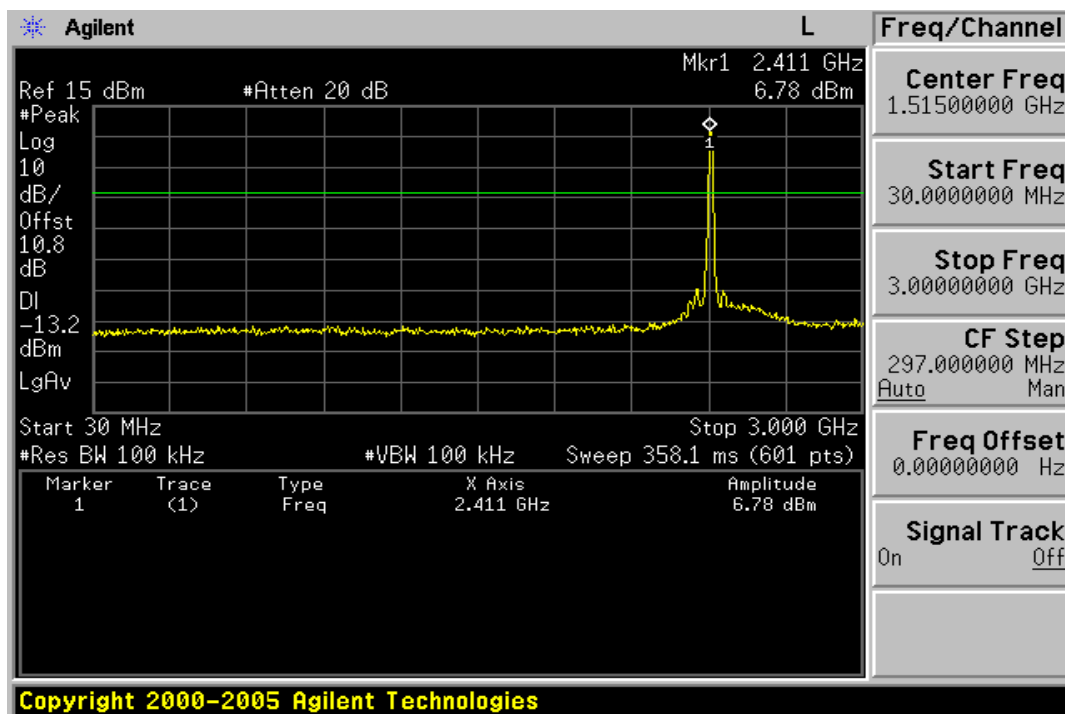
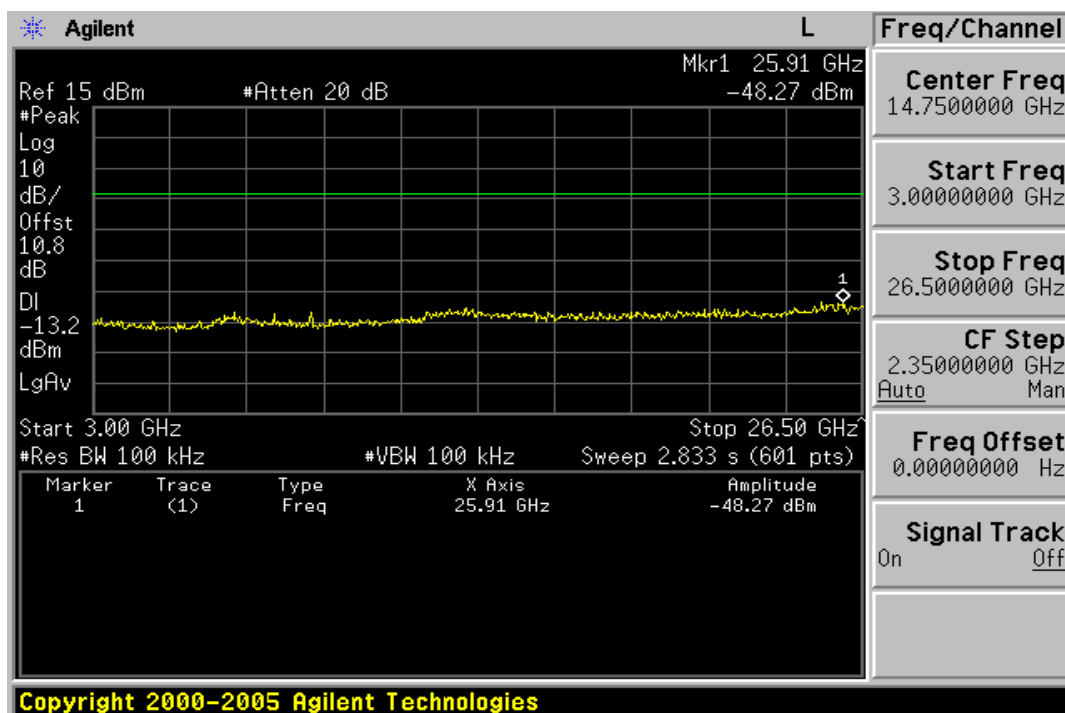
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

### 9.7. Measurement Result

Refer to attach tabular data sheets.

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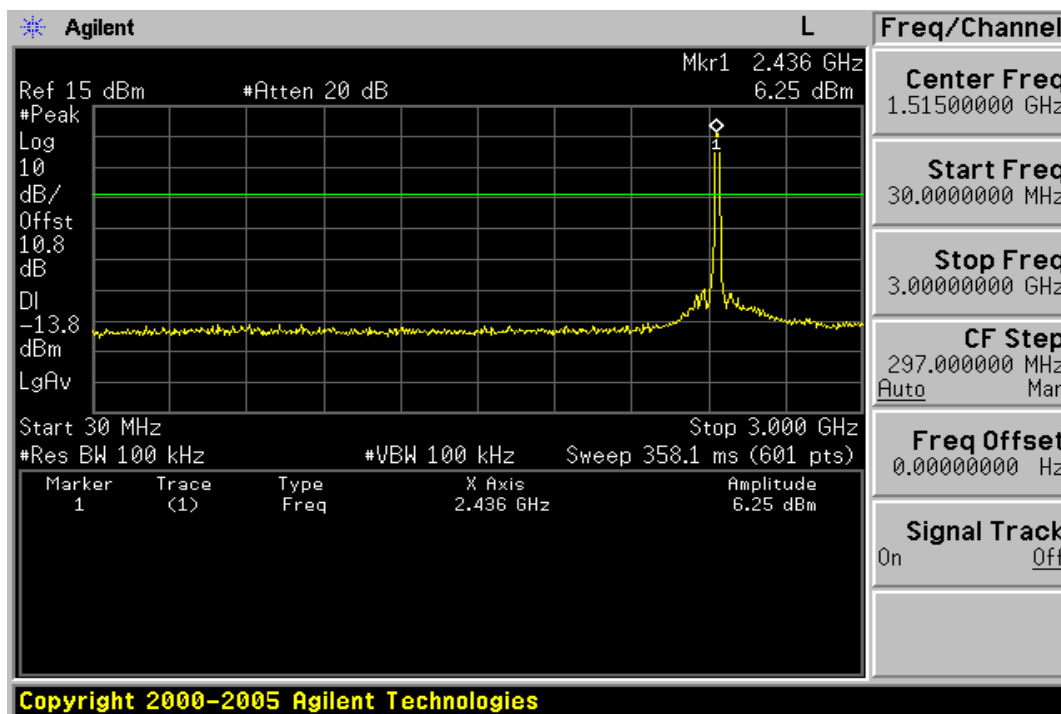
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**Conducted Spurious Emission Measurement Result (802.11b)****Ch Low 30MHz – 3GHz****Ch Low 3GHz – 26.5GHz**

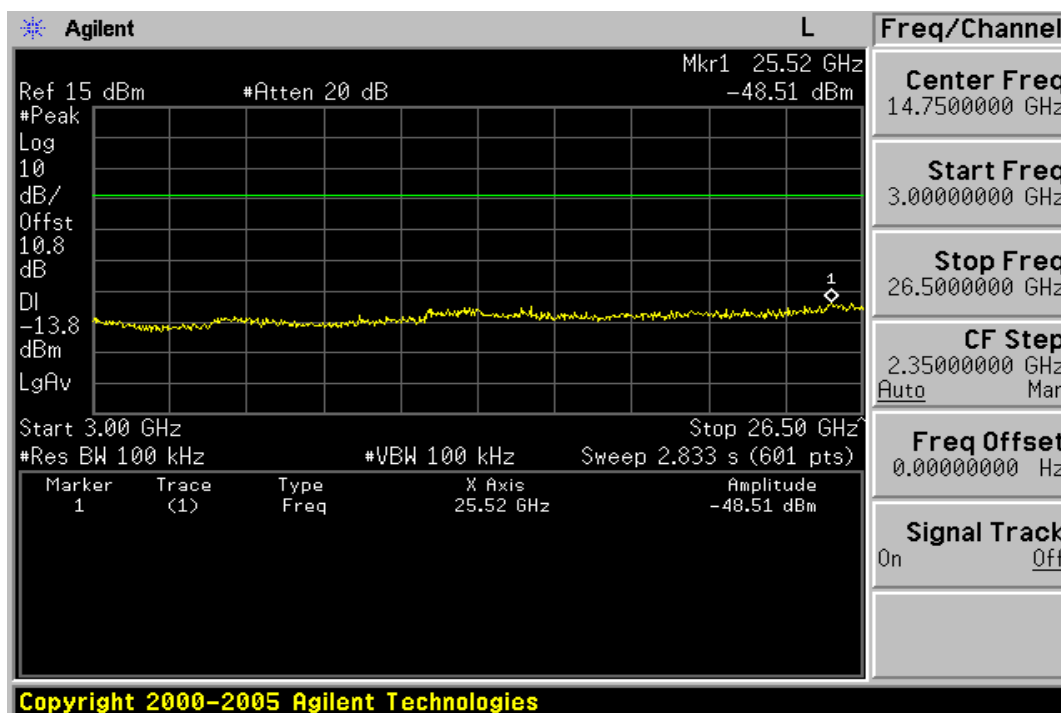
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## Ch Mid 30MHz – 3GHz



## Ch Mid 3GHz – 26.5GHz

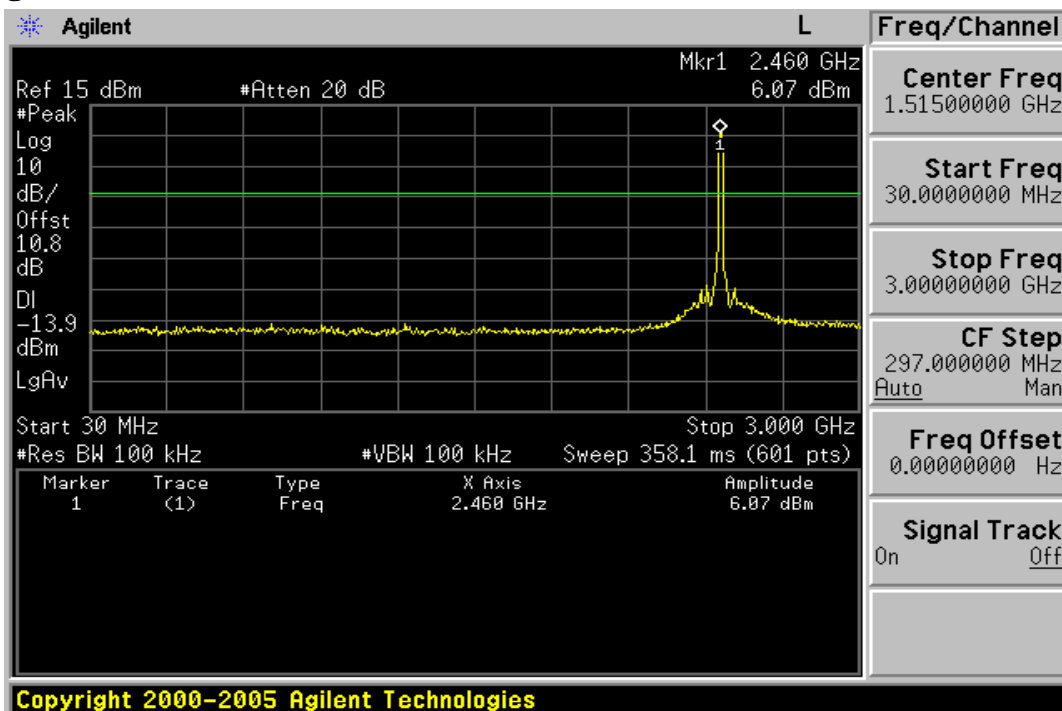


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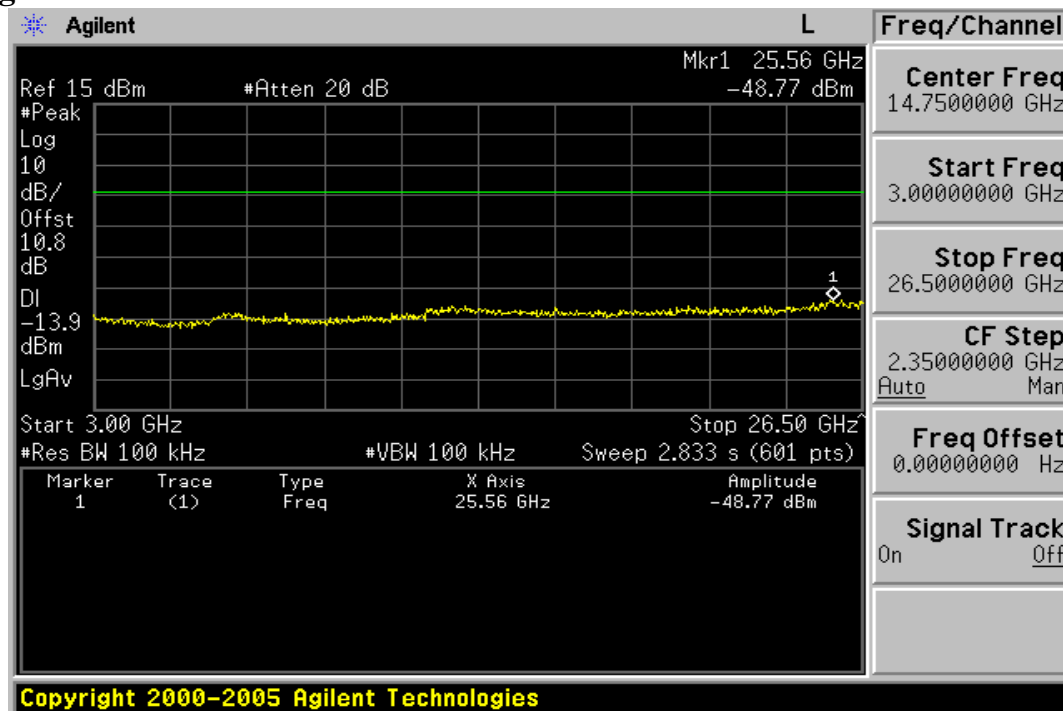
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz

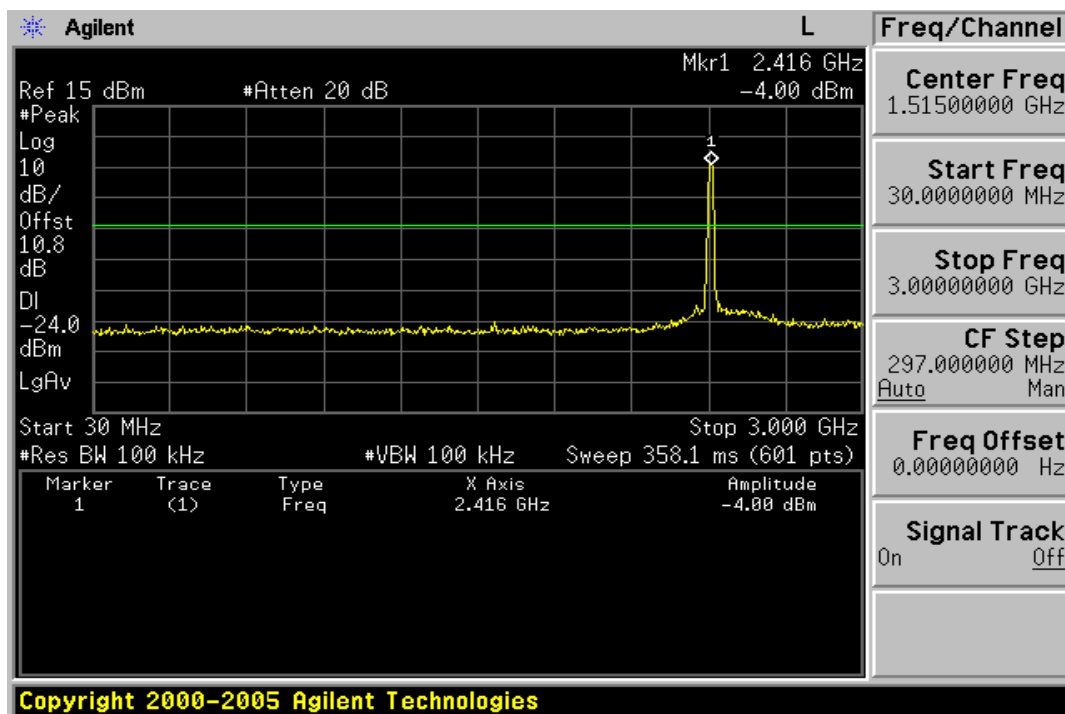


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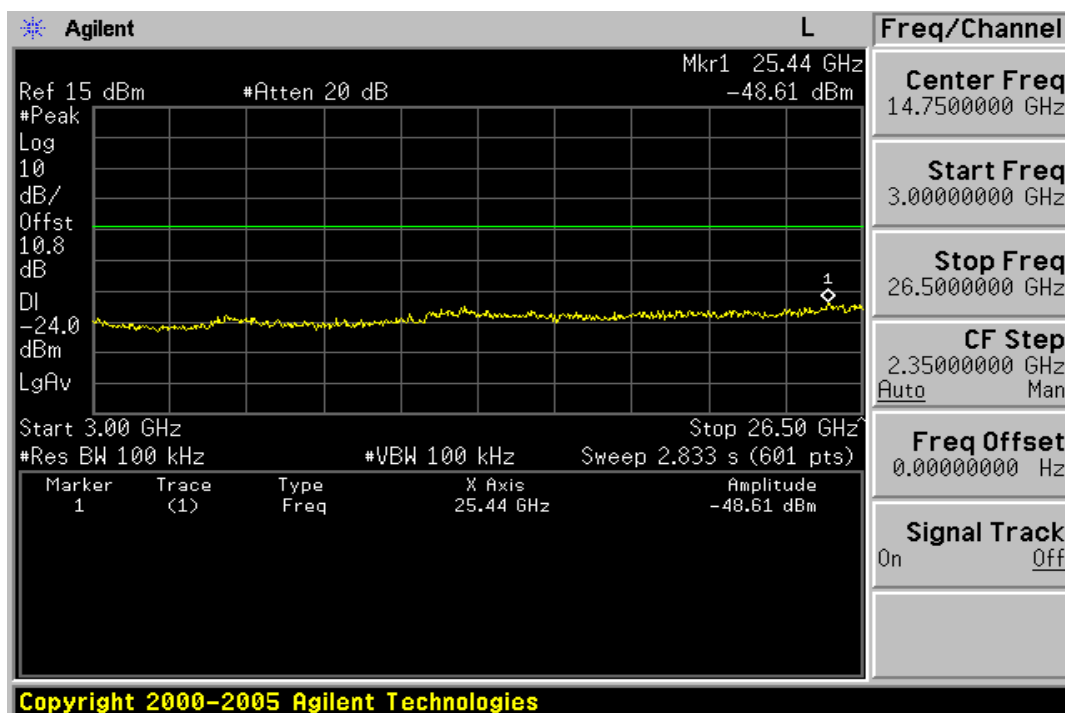
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## Conducted Spurious Emission Measurement Result (802.11g)

### Ch Low 30MHz – 3GHz



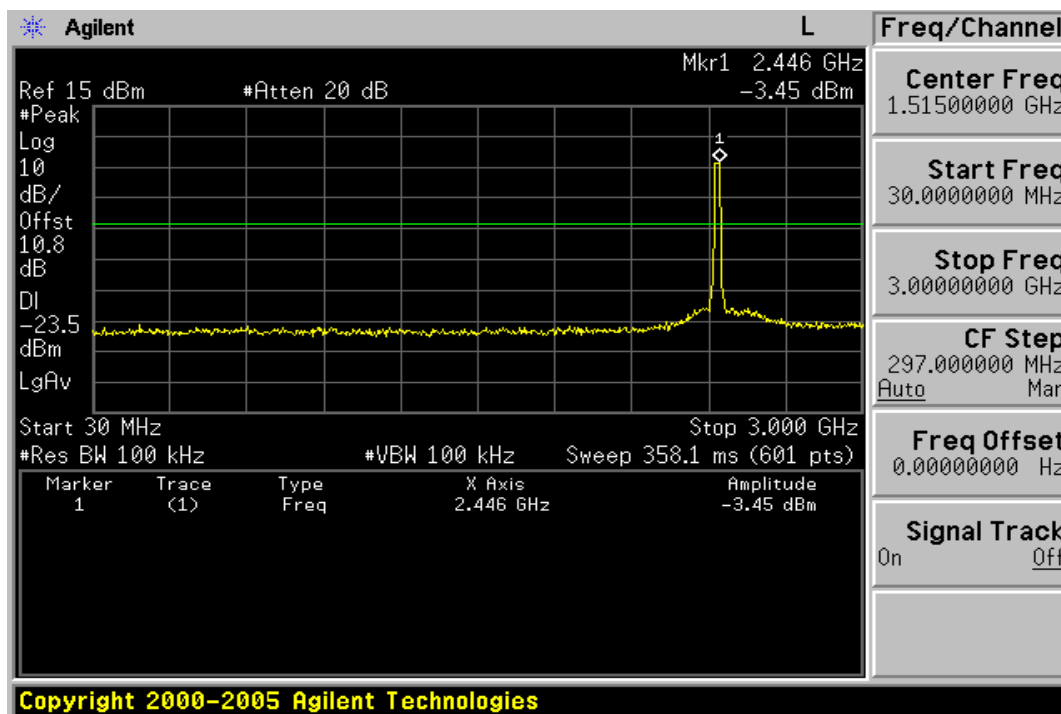
### Ch Low 3GHz – 26.5GHz



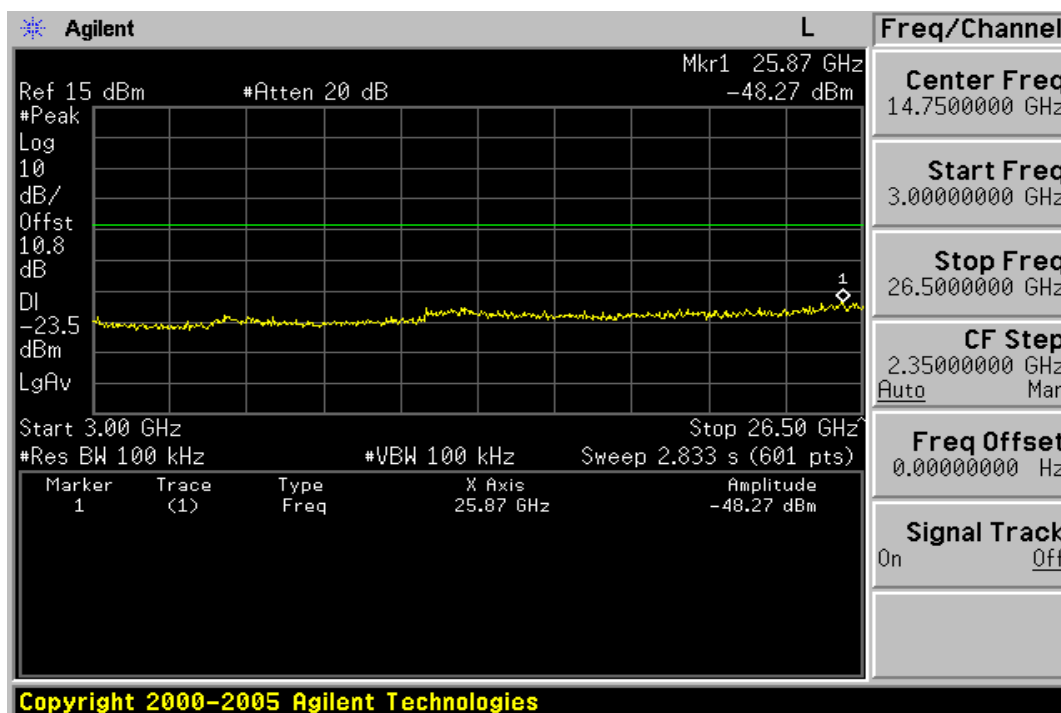
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## Ch Mid 30MHz – 3GHz



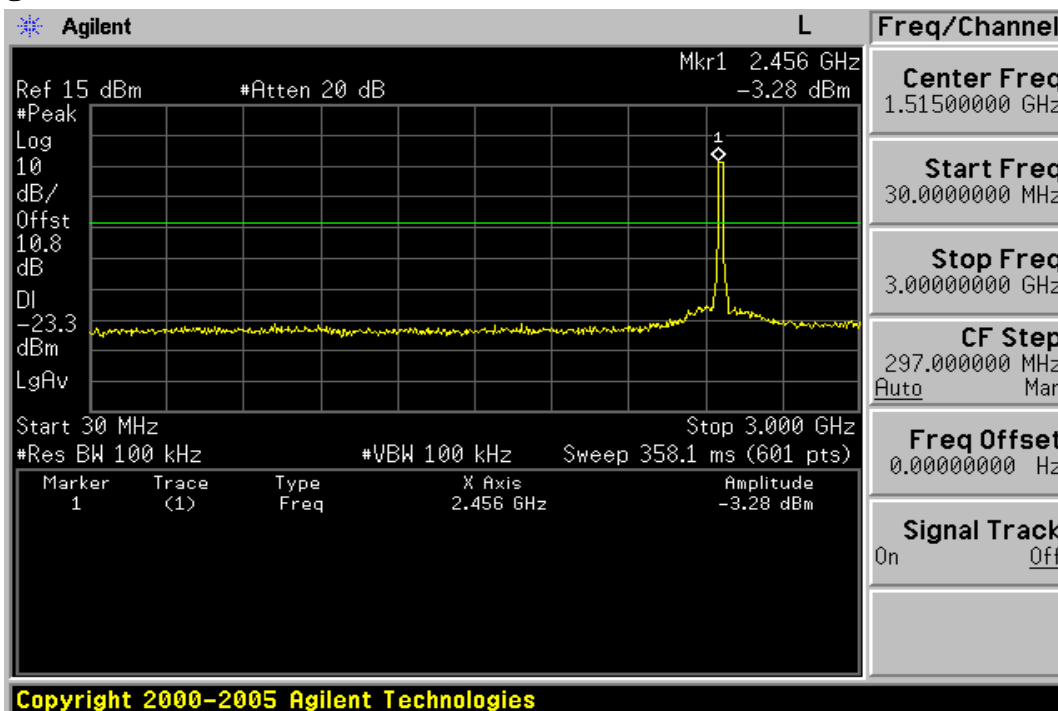
## Ch Mid 3GHz – 26.5GHz



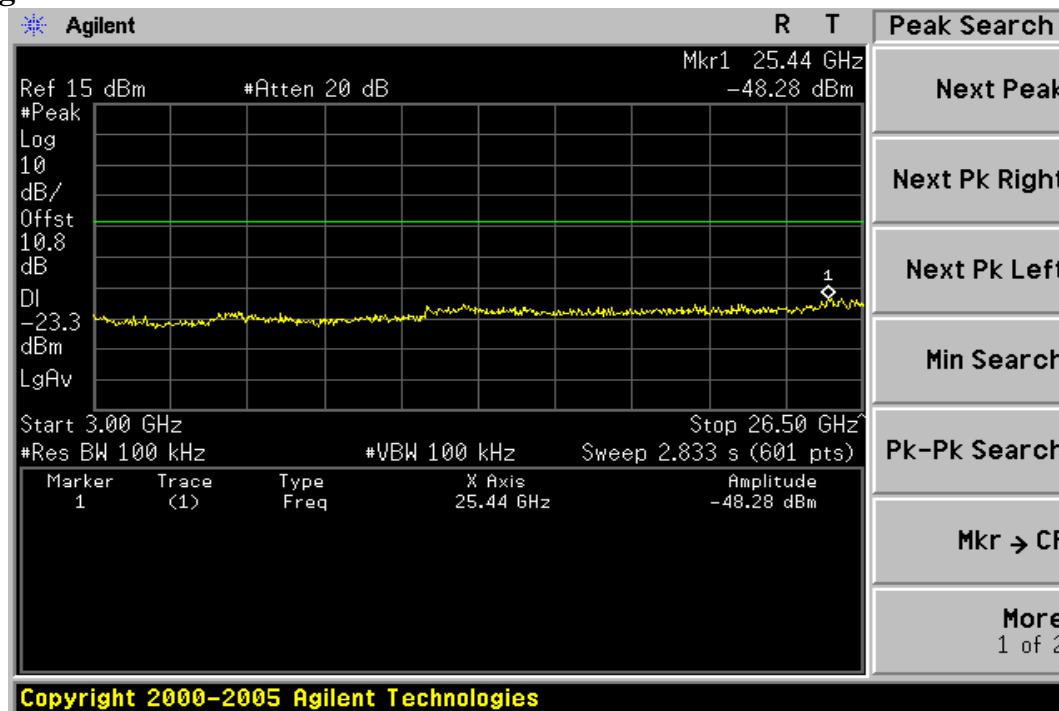
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## Ch High 30MHz – 3GHz



## Ch High 3GHz – 26.5GHz



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

Operation Mode	802.11b TX CH Low	Test Date	Oct. 12, 2008
Fundamental Frequency	2412MHz	Test By	Sky
Temperature	25	Pol	Ver./Hor
Humidity	60 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Mar- gin (dB)
58.13	V	Peak	57.23	-26.67	30.56	40.00	-9.44
119.24	V	Peak	61.71	-28.89	32.82	43.50	-10.68
138.64	V	Peak	59.64	-27.58	32.06	43.50	-11.44
279.29	V	Peak	59.25	-28.97	30.28	46.00	-15.72
318.09	V	Peak	55.89	-27.86	28.03	46.00	-17.97
337.49	V	Peak	54.91	-27.41	27.50	46.00	-18.50
135.73	H	Peak	55.92	-27.87	28.05	43.50	-15.45
148.34	H	Peak	56.88	-27.10	29.78	43.50	-13.72
252.13	H	Peak	55.17	-29.83	25.34	46.00	-20.66
259.89	H	Peak	55.07	-29.67	25.40	46.00	-20.60
337.49	H	Peak	50.52	-27.41	23.11	46.00	-22.89
417.03	H	Peak	47.70	-25.64	22.06	46.00	-23.94

**Remark :**

- (1) Measuring frequencies from 30 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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

Operation Mode	802.11b TX CH Mid	Test Date	Oct. 12, 2008
Fundamental Frequency	2437MHz	Test By	Sky
Temperature	25	Pol	Ver./Hor
Humidity	60 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Mar- gin (dB)
58.13	V	Peak	57.41	-26.67	30.74	40.00	-9.26
126.03	V	Peak	62.30	-28.38	33.92	43.50	-9.58
259.89	V	Peak	60.41	-29.67	30.74	46.00	-15.26
269.59	V	Peak	59.12	-29.35	29.77	46.00	-16.23
298.69	V	Peak	55.89	-28.54	27.35	46.00	-18.65
324.88	V	Peak	53.03	-27.71	25.32	46.00	-20.68
36.79	H	Peak	49.80	-25.94	23.86	40.00	-16.14
138.64	H	Peak	56.87	-27.58	29.29	43.50	-14.21
148.34	H	Peak	55.51	-27.10	28.41	43.50	-15.09
337.49	H	Peak	51.80	-27.41	24.39	46.00	-21.61
344.28	H	Peak	53.25	-27.28	25.97	46.00	-20.03
417.03	H	Peak	48.34	-25.64	22.70	46.00	-23.30

**Remark :**

- (1) Measuring frequencies from 30 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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

Operation Mode	802.11b TX CH High	Test Date	Oct. 12, 2008
Fundamental Frequency	2462MHz	Test By	Sky
Temperature	25	Pol	Ver./Hor
Humidity	60 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Mar- gin (dB)
58.13	V	Peak	57.45	-26.67	30.78	40.00	-9.22
128.94	V	Peak	62.07	-28.27	33.80	43.50	-9.70
259.89	V	Peak	60.81	-29.67	31.14	46.00	-14.86
269.59	V	Peak	58.05	-29.35	28.70	46.00	-17.30
327.79	V	Peak	53.93	-27.68	26.25	46.00	-19.75
383.08	V	Peak	50.64	-26.33	24.31	46.00	-21.69
128.94	H	Peak	55.03	-28.27	26.76	43.50	-16.74
138.64	H	Peak	56.78	-27.58	29.20	43.50	-14.30
250.19	H	Peak	51.60	-29.87	21.73	46.00	-24.27
337.49	H	Peak	51.01	-27.41	23.60	46.00	-22.40
347.19	H	Peak	51.17	-27.25	23.92	46.00	-22.08
693.48	H	Peak	44.89	-21.32	23.57	46.00	-22.43

**Remark :**

- (1) Measuring frequencies from 30 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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

Operation Mode	802.11g TX CH Low	Test Date	Oct. 12, 2008
Fundamental Frequency	2412MHz	Test By	Sky
Temperature	25	Pol	Ver./Hor
Humidity	60 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Mar- gin (dB)
58.13	V	Peak	57.17	-26.67	30.50	40.00	-9.50
119.24	V	Peak	60.94	-28.89	32.05	43.50	-11.45
259.89	V	Peak	59.95	-29.67	30.28	46.00	-15.72
279.29	V	Peak	58.22	-28.97	29.25	46.00	-16.75
337.49	V	Peak	56.66	-27.41	29.25	46.00	-16.75
444.19	V	Peak	46.13	-25.15	20.98	46.00	-25.02
31.94	H	Peak	49.62	-26.05	23.57	40.00	-16.43
135.73	H	Peak	54.37	-27.87	26.50	43.50	-17.00
145.43	H	Peak	53.60	-27.36	26.24	43.50	-17.26
213.33	H	Peak	60.45	-31.01	29.44	43.50	-14.06
259.89	H	Peak	55.35	-29.67	25.68	46.00	-20.32
337.49	H	Peak	50.11	-27.41	22.70	46.00	-23.30

**Remark :**

- (1) Measuring frequencies from 30 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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

Operation Mode	802.11g TX CH Mid	Test Date	Oct. 12, 2008
Fundamental Frequency	2437MHz	Test By	Sky
Temperature	25	Pol	Ver./Hor
Humidity	60 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Mar- gin (dB)
58.13	V	Peak	56.95	-26.67	30.28	40.00	-9.72
119.24	V	Peak	60.55	-28.89	31.66	43.50	-11.84
128.94	V	Peak	58.55	-28.27	30.28	43.50	-13.22
259.89	V	Peak	59.70	-29.67	30.03	46.00	-15.97
327.79	V	Peak	55.67	-27.68	27.99	46.00	-18.01
337.49	V	Peak	56.55	-27.41	29.14	46.00	-16.86
31.94	H	Peak	49.10	-26.05	23.05	40.00	-16.95
135.73	H	Peak	53.37	-27.87	25.50	43.50	-18.00
148.34	H	Peak	54.00	-27.10	26.90	43.50	-16.60
213.33	H	Peak	60.21	-31.01	29.20	43.50	-14.30
252.13	H	Peak	55.59	-29.83	25.76	46.00	-20.24
337.49	H	Peak	50.61	-27.41	23.20	46.00	-22.80
58.13	V	Peak	56.95	-26.67	30.28	40.00	-9.72

**Remark :**

- (1) Measuring frequencies from 30 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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

Operation Mode	802.11g TX CH High	Test Date	Oct. 12, 2008
Fundamental Frequency	2462MHz	Test By	Sky
Temperature	25	Pol	Ver./Hor
Humidity	60 %		

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Mar- gin (dB)
58.13	V	Peak	57.73	-26.67	31.06	40.00	-8.94
119.24	V	Peak	59.63	-28.89	30.74	43.50	-12.76
135.73	V	Peak	57.48	-27.87	29.61	43.50	-13.89
259.89	V	Peak	60.58	-29.67	30.91	46.00	-15.09
318.09	V	Peak	55.54	-27.86	27.68	46.00	-18.32
337.49	V	Peak	55.70	-27.41	28.29	46.00	-17.71
33.88	H	Peak	48.28	-26.00	22.28	40.00	-17.72
119.24	H	Peak	54.01	-28.89	25.12	43.50	-18.38
135.73	H	Peak	54.38	-27.87	26.51	43.50	-16.99
213.33	H	Peak	59.95	-32.01	27.94	43.50	-15.56
259.89	H	Peak	54.30	-29.67	24.63	46.00	-21.37
337.49	H	Peak	50.86	-27.41	23.45	46.00	-22.55

**Remark :**

- (1) Measuring frequencies from 30 MHz to the 1GHz.
- (2) Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- (3) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (4) The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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

Operation Mode	802.11b TX CH Low	Test Date	Oct. 12, 2008
Fundamental Frequency	2412MHz	Test By	Sky
Temperature	23	Pol	Ver.
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin	
				Peak (dBuV/m)	AV (dBuV/m)			(dB)	(dB)
4824.0	44.11	---	-5.98	38.13	---	74.00	54.00	-15.87	Peak
7236.0	----					74.00	54.00		
9648.0	----					74.00	54.00		
12060.0	----					74.00	54.00		
14472.0	----					74.00	54.00		
16884.0	----					74.00	54.00		
19296.0	----					74.00	54.00		
21708.0	----					74.00	54.00		
24120.0	----					74.00	54.00		

**Remark:**

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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

Operation Mode	802.11b TX CH Low	Test Date	Oct. 12, 2008
Fundamental Frequency	2412MHz	Test By	Sky
Temperature	23	Pol	Hor
Humidity	54 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)	
4824.0	43.84	---	-5.98	37.86	---	74.00	54.00	-16.14
7236.0	----					74.00	54.00	
9648.0	----					74.00	54.00	
12060.0	----					74.00	54.00	
14472.0	----					74.00	54.00	
16884.0	----					74.00	54.00	
19296.0	----					74.00	54.00	
21708.0	----					74.00	54.00	
24120.0	----					74.00	54.00	

**Remark:**

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11b)

Operation Mode	802.11b TX CH Mid	Test Date	Oct. 12, 2008
Fundamental Frequency	2437MHz	Test By	Sky
Temperature	23	Pol	Ver
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	
				Peak (dBuV/m)	AV (dBuV/m)				
4874.0	42.40	---	-5.93	36.47	---	74.00	54.00	-17.53	Peak
7311.0	----					74.00	54.00		
9748.0	----					74.00	54.00		
12185.0	----					74.00	54.00		
14622.0	----					74.00	54.00		
17059.0	----					74.00	54.00		
19496.0	----					74.00	54.00		
21933.0	----					74.00	54.00		
24370.0	----					74.00	54.00		

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11b)

Operation Mode	802.11b TX CH Mid	Test Date	Oct. 12, 2008
Fundamental Frequency	2437MHz	Test By	Sky
Temperature	23	Pol	Hor
Humidity	54 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)	
4874.0	43.73	---	-5.93	37.80	---	74.00	54.00	-16.20
7311.0	----					74.00	54.00	
9748.0	----					74.00	54.00	
12185.0	----					74.00	54.00	
14622.0	----					74.00	54.00	
17059.0	----					74.00	54.00	
19496.0	----					74.00	54.00	
21933.0	----					74.00	54.00	
24370.0	----					74.00	54.00	

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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

Operation Mode	802.11b TX CH High	Test Date	Oct. 12, 2008
Fundamental Frequency	2462MHz	Test By	Sky
Temperature	23	Pol	Ver
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	
				Peak (dBuV/m)	AV (dBuV/m)				
4924.0	42.66	---	-5.91	36.75	---	74.00	54.00	-17.25	Peak
7386.0	----					74.00	54.00		
9848.0	----					74.00	54.00		
12310.0	----					74.00	54.00		
14772.0	----					74.00	54.00		
17234.0	----					74.00	54.00		
19696.0	----					74.00	54.00		
22158.0	----					74.00	54.00		
24620.0	----					74.00	54.00		

**Remark:**

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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

Operation Mode	802.11b TX CH High	Test Date	Oct. 12, 2008
Fundamental Frequency	2462MHz	Test By	Sky
Temperature	23	Pol	Hor
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)	
				Peak (dBuV/m)	AV (dBuV/m)				
4924.0	43.31	---	-5.91	37.40	---	74.00	54.00	-16.60	Peak
7386.0	----					74.00	54.00		
9848.0	----					74.00	54.00		
12310.0	----					74.00	54.00		
14772.0	----					74.00	54.00		
17234.0	----					74.00	54.00		
19696.0	----					74.00	54.00		
22158.0	----					74.00	54.00		
24620.0	----					74.00	54.00		

**Remark:**

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11g)

Operation Mode	802.11g TX CH Low	Test Date	Oct. 12, 2008
Fundamental Frequency	2412MHz	Test By	Sky
Temperature	25	Pol	Ver.
Humidity	60 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)	
4824.0	43.11	---	-5.98	37.13	---	74.00	54.00	-16.87
7236.0	----					74.00	54.00	
9648.0	----					74.00	54.00	
12060.0	----					74.00	54.00	
14472.0	----					74.00	54.00	
16884.0	----					74.00	54.00	
19296.0	----					74.00	54.00	
21708.0	----					74.00	54.00	
24120.0	----					74.00	54.00	

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11g)

Operation Mode	802.11g TX CH Low	Test Date	Oct. 12, 2008
Fundamental Frequency	2412MHz	Test By	Sky
Temperature	23	Pol	Hor
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
				Peak (dBuV/m)	AV (dBuV/m)			
4824.0	42.46	---	-5.98	36.48	---	74.00	54.00	-17.52
7236.0	----					74.00	54.00	
9648.0	----					74.00	54.00	
12060.0	----					74.00	54.00	
14472.0	----					74.00	54.00	
16884.0	----					74.00	54.00	
19296.0	----					74.00	54.00	
21708.0	----					74.00	54.00	
24120.0	----					74.00	54.00	

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11g)

Operation Mode	802.11g TX CH Mid	Test Date	Oct. 12, 2008
Fundamental Frequency	2437MHz	Test By	Sky
Temperature	23	Pol	Ver
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
				Peak (dBuV/m)	AV (dBuV/m)			
4874.0	----					74.00	54.00	
7311.0	----					74.00	54.00	
9748.0	----					74.00	54.00	
12185.0	----					74.00	54.00	
14622.0	----					74.00	54.00	
17059.0	----					74.00	54.00	
19496.0	----					74.00	54.00	
21933.0	----					74.00	54.00	
24370.0	----					74.00	54.00	

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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**Radiated Spurious Emission Measurement Result (above 1GHz) (802.11g)**

Operation Mode	802.11g TX CH Mid	Test Date	Oct. 12, 2008
Fundamental Frequency	2437MHz	Test By	Sky
Temperature	23	Pol	Hor
Humidity	54 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)	
4874.0	42.10	---	-5.93	36.17	---	74.00	54.00	-17.83
7311.0	----					74.00	54.00	
9748.0	----					74.00	54.00	
12185.0	----					74.00	54.00	
14622.0	----					74.00	54.00	
17059.0	----					74.00	54.00	
19496.0	----					74.00	54.00	
21933.0	----					74.00	54.00	
24370.0	----					74.00	54.00	

**Remark:**

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11g)

Operation Mode	802.11g TX CH High	Test Date	Oct. 12, 2008
Fundamental Frequency	2462MHz	Test By	Sky
Temperature	23	Pol	Ver
Humidity	54 %		

Freq. (MHz)	Peak Reading	AV Reading	Ant./CL CF(dB)	Actual FS		Peak Limit	AV Limit	Margin (dB)
	(dBuV)	(dBuV)		Peak (dBuV/m)	AV (dBuV/m)	(dBuV/m)	(dBuV/m)	
4924.0	43.47	---	-5.91	37.56	---	74.00	54.00	-16.44
7386.0	----					74.00	54.00	
9848.0	----					74.00	54.00	
12310.0	----					74.00	54.00	
14772.0	----					74.00	54.00	
17234.0	----					74.00	54.00	
19696.0	----					74.00	54.00	
22158.0	----					74.00	54.00	
24620.0	----					74.00	54.00	

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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# Radiated Spurious Emission Measurement Result (above 1GHz) (802.11g)

Operation Mode	802.11g TX CH High	Test Date	Oct. 12, 2008
Fundamental Frequency	2462MHz	Test By	Sky
Temperature	23 °C	Pol	Hor
Humidity	54 %		

Freq. (MHz)	Peak Reading (dBuV)	AV Reading (dBuV)	Ant./CL CF(dB)	Actual FS		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Margin (dB)
				Peak (dBuV/m)	AV (dBuV/m)			
4924.0	42.72	---	-5.91	36.81	---	74.00	54.00	-17.19
7386.0	----					74.00	54.00	
9848.0	----					74.00	54.00	
12310.0	----					74.00	54.00	
14772.0	----					74.00	54.00	
17234.0	----					74.00	54.00	
19696.0	----					74.00	54.00	
22158.0	----					74.00	54.00	
24620.0	----					74.00	54.00	

## Remark:

- (1) Measuring frequencies scanned from 1GHz to the 10th harmonic of highest fundamental frequency.
- (2) Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (3) Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- (4) Spectrum Peak Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 3MHz, Sweep time= 200 ms.
- (5) Spectrum AV Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

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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 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 = 1.5MHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

### 10.3. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2008	04/18/2010
Spectrum Analyzer	Agilent	E7405A	US41160416	07/04/2008	07/03/2009
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2008	02/21/2009
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2008	01/04/2009
Attenuator	Mini-Circuit	BW-S6W5	N/A	07/05/2008	07/04/2009

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## 10.4. Measurement Result

### 802.11b

CH	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
Low	-12.01	0.00	-12.01	8
Mid	-12.26	0.00	-12.26	8
High	-12.43	0.00	-12.43	8

### 802.11g

CH	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
Low	-16.29	0.00	-16.29	8
Mid	-17.42	0.00	-17.42	8
High	-18.15	0.00	-18.15	8

*Note: offset 10.8 dB*

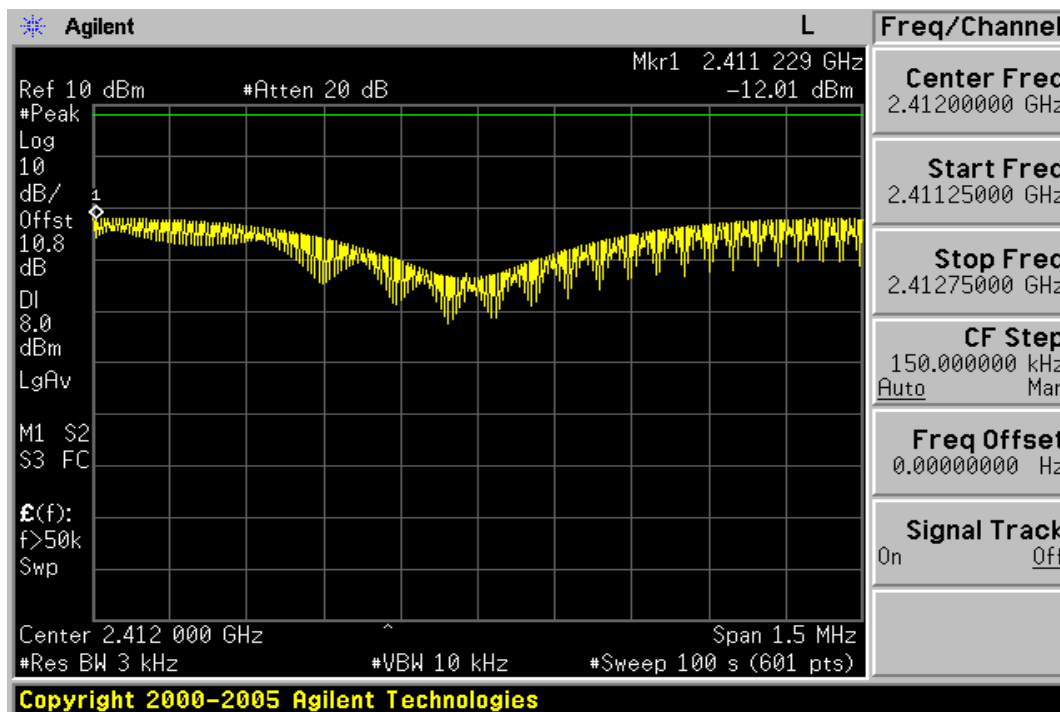
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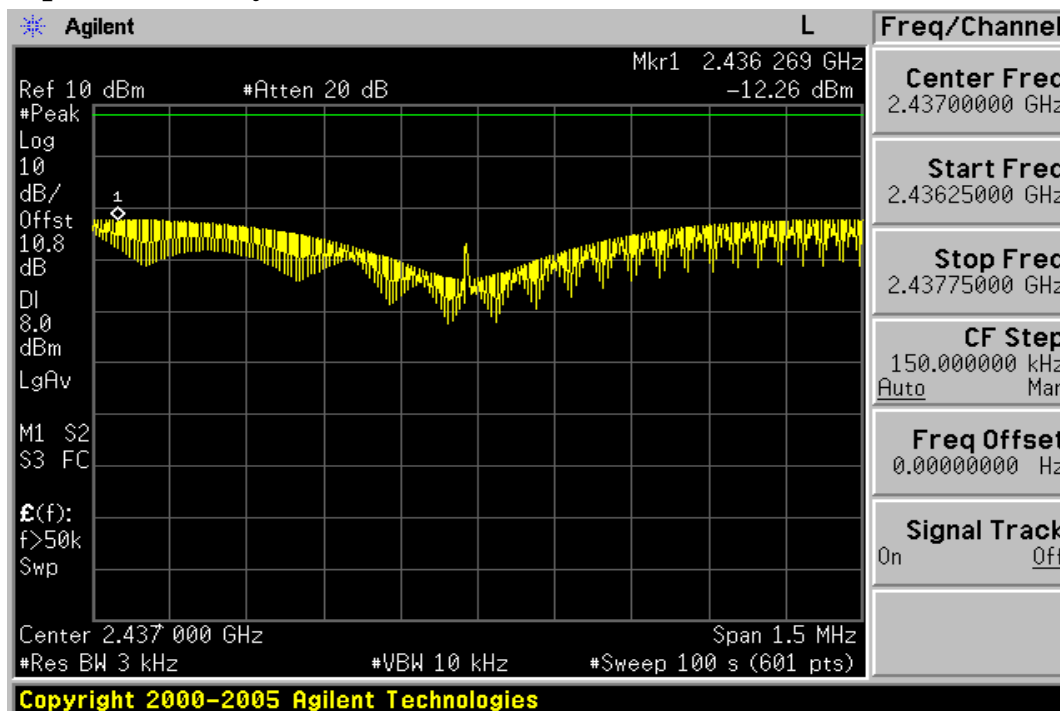


## 802.11b

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



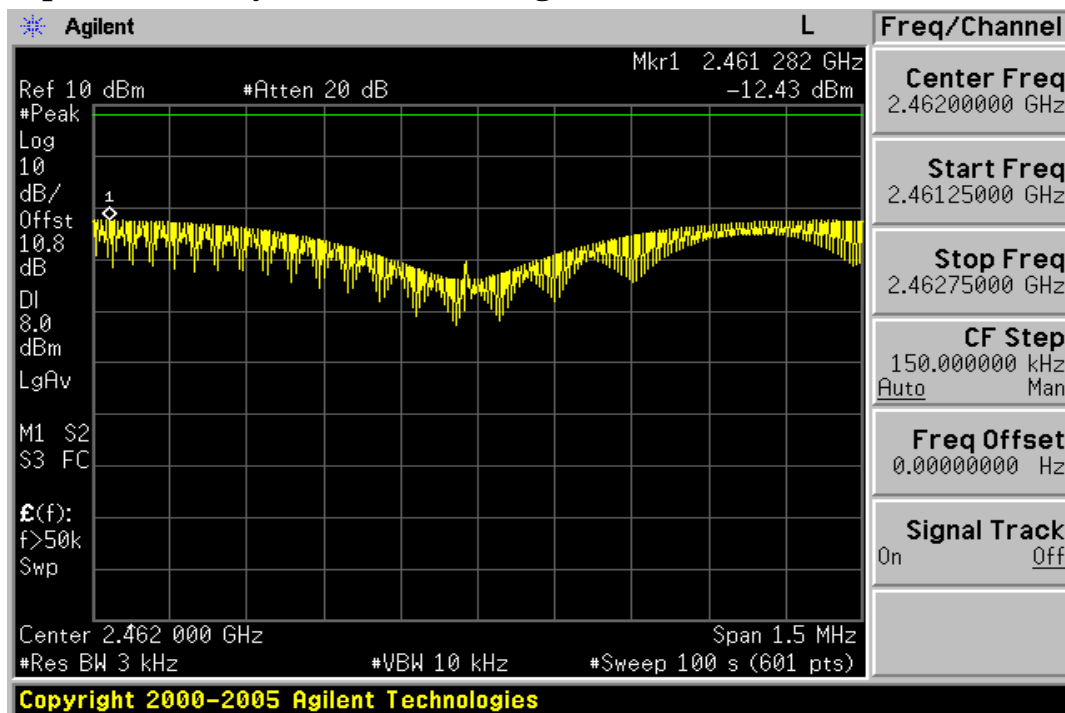
### Power Spectral Density Test Plot (CH-Mid)



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

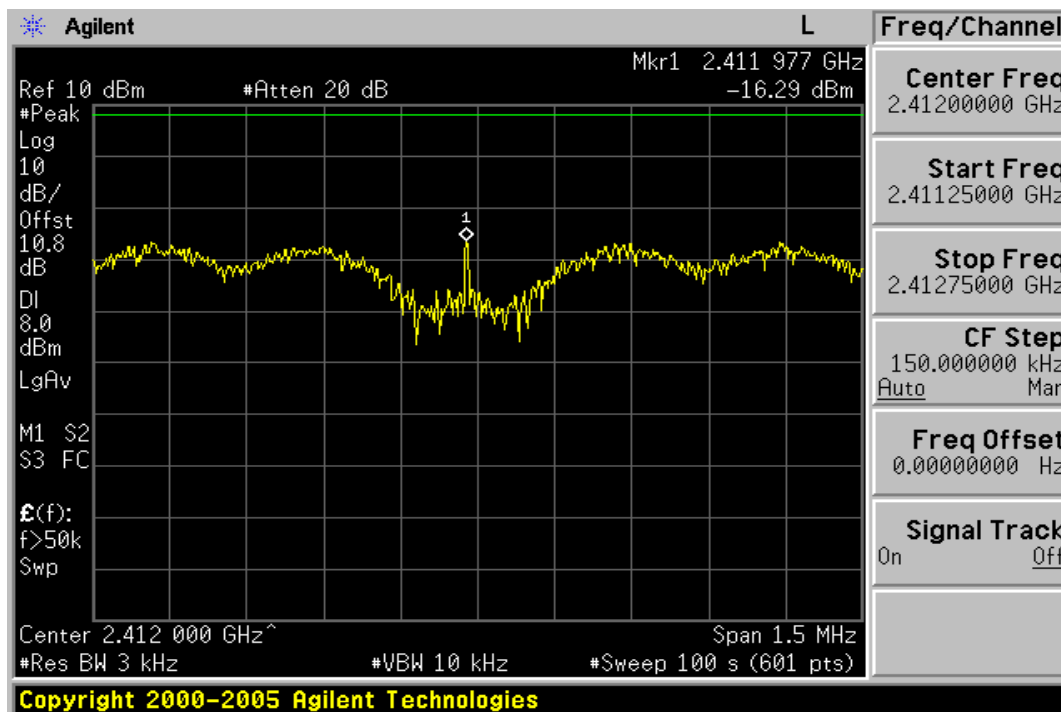


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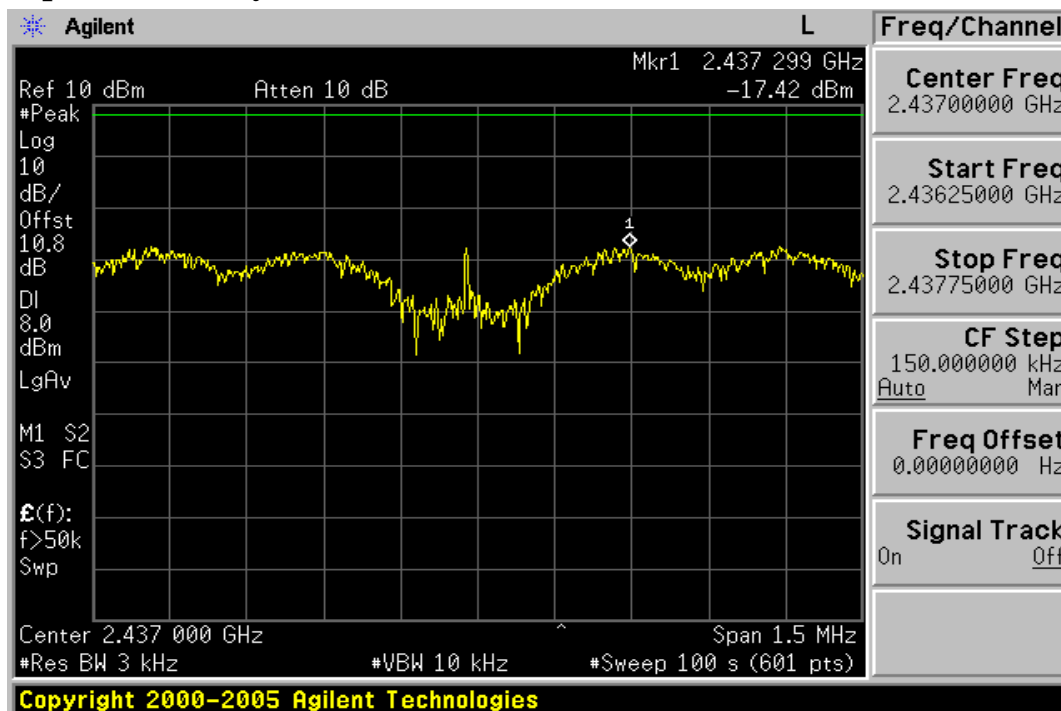
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802.11g

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



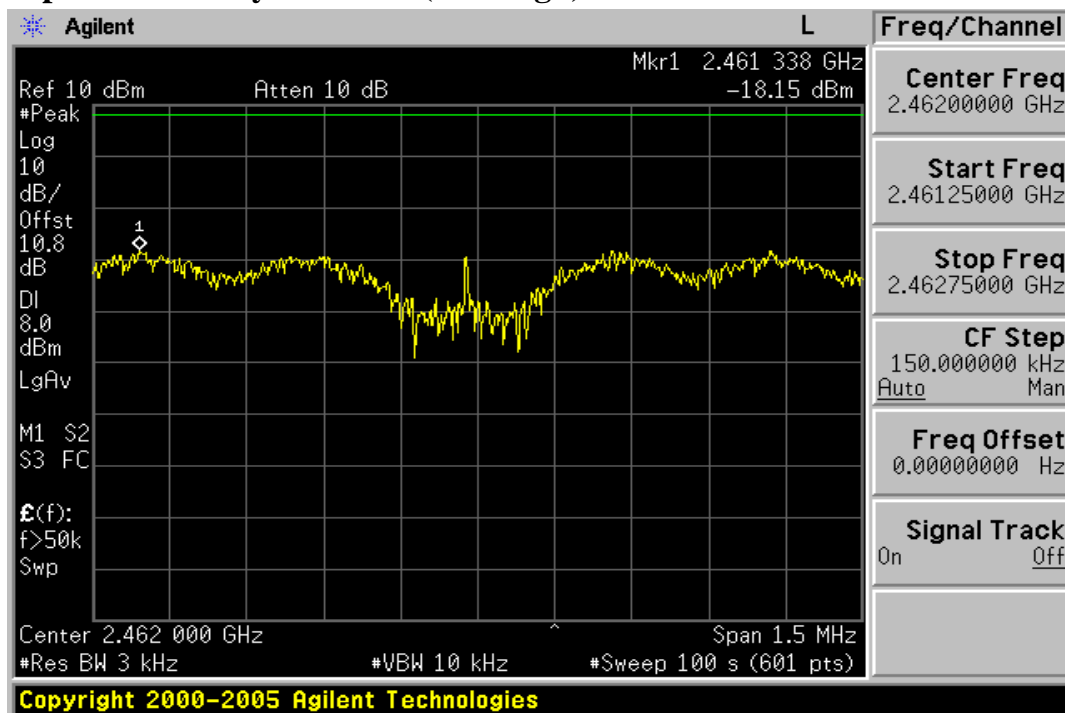
## Power Spectral Density Test Plot (CH-Mid)



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



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## 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.

### 11.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is -3.16 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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