

# FCC TEST REPORT

for

Notebook

MODEL:PTB50,AMILO Pa1538, AMILO Pa1539,  
PTB50 series, AMILO Pa1538-x series,  
AMILO Pa1539-x series, AMILO Pa1538 series,  
AMILO Pa1539 series

Test Report Number:  
KS060803A01-RP

Issued for

First International Computer, Inc.  
No.300, YangGuang st., NeiHu, Taipei, Taiwan, 114

Issued by:

Compliance Certification Services Inc.  
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Issued Date: August 19, 2006



Lab. Code: 200581-0



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00		Initial Issue	ALL	



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# 1 TEST CERTIFICATION

**Product:** Notebook

**Model:** PTB50,AMILO Pa1538, AMILO Pa1539, PTB50 series, AMILO Pa1538-x series, AMILO Pa1539-x series, AMILO Pa1538 series, AMILO Pa1539 series

**Brand:** FIC, FUJITSU SIEMENS COMPUTERS

**Tested:** August 16~18, 2006

**Applicant:** First International Computer, Inc.

No.300,YangGuang st., NeiHu, Taipei, 114

**Manufacturer:** FIC (Suzhou) Inc.

Export Processing Zone, No 200, Central Suhong Road, SuZhou Industrial Park JiangSu,P.R.China

## APPLICABLE STANDARDS

Standard	Test Type	Standard	Test Type
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	● Spurious Emissions ● Conducted Measurement ● Radiated Emissions
15.247(a)(2)	6dB Bandwidth Measurement	15.247(b)(3) 15.247(b)(4)	Peak Power Measurement
15.247(d)	Band Edges Measurement	15.247(e)	Peak Power Spectral Density

## DEVIATION FROM APPLICABLE STANDARD

None

The above equipment was tested by Compliance Certification Services Inc. 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 the requirements of FCC Rules Part 15.207, 15.209, 15.247.

**Approved by:**

**Reviewed by:**

Tony Houg  
General Manager  
Compliance Certification Service Inc.

Miro Chueh  
Section Manger  
Compliance Certification Service Inc.



## 2 TEST RESULT SUMMARY

APPLICABLE STANDARDS			
Standard	Test Type	Result	Remark
15.247(a)(2)	6dB Bandwidth Measurement	Pass	Meet the requirement of limit.
15.247(b)(3) 15.247(b)(4)	Peak Power Measurement	Pass	Meet the requirement of limit.
15.247(d)	Band Edges Measurement	Pass	Meet the requirement of limit.
15.247(e)	Peak Power Spectral Density	Pass	Meet the requirement of limit.
15.247(d) 15.209(a)	Spurious Emissions ● Conducted Measurement ● Radiated Emissions	Pass	Meet the requirement of limit.
15.207(a)	Power line Conducted Emissions	Pass	Meet the requirement of limit.

Note: 1. The test result judgment is decided by the limit of test standard  
 2. The information of measurement uncertainty is available upon the customer's request.



### 3 EUT DESCRIPTION

<b>Product</b>	Notebook
<b>Trade Name</b>	FIC, FUJITSU SIEMENS COMPUTERS
<b>Model Number</b>	PTB50, AMILO Pa1538, AMILO Pa1539
<b>Model Discrepancy</b>	All the above models are identical except the model designation for different market.
<b>Serial Number</b>	TB50 series, AMILO Pa1538-x series, AMILO Pa1539-x series, AMILO Pa1538 series, AMILO Pa1539 series
<b>Wireless LAN module Model Number</b>	WN6301A-F4
<b>Wireless LAN module Brand name</b>	Liteon
<b>Received Date</b>	August 18, 2006
<b>Power Supply</b>	Powered from Power Adapter
<b>Power Adapter Power Rating</b>	Powered from an AC/DC power adapter Model Number:(1) LSE0202D2090 Manufacturer: LISHIN Input: AC 100-240V, 50-60Hz, 1.5A Output: DC 20V, 4.5A Model Number:(2) ADP-90SB AD Manufacturer: Delta Input: AC 100-240V, 50-60Hz, 1.5A Output: DC 20V, 4.5A
<b>AC Power Cord Type</b>	Unshielded, 1.8m (Detachable) to Power Adapter
<b>DC Power Cable Type</b>	Unshielded, 1.8m (Non-Detachable) at Power Adapter with a core
<b>Frequency Range</b>	2412 ~ 2462 MHz
<b>Transmit Power</b>	IEEE 802.11b: 16.64 dBm IEEE 802.11g: 15.51 dBm
<b>Modulation Technique</b>	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
<b>Transmit Data Rate</b>	IEEE 802.11b: 11, 5.5, 2, 1 Mbps IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1 Mbps
<b>Number of Channels</b>	11 Channels
<b>Antenna Specification</b>	PIFA antenna with 2.80dBi gain (Max)

**Note:** 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.

2. This submittal(s) (test report) is intended for FCC ID: EUNPTB50L filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



## **4 TEST METHODOLOGY**

### **4.1. DESCRIPTION OF TEST MODES**

The EUT (model: PTB50) had been tested under operating condition.

The EUT (model: PTB50) comes with two types of adapter for sale. After the preliminary test, the EUT with adapter (Model: LSE0202D2090 and ADP-90SB AD) was found to emit the worst emissions and therefore had been tested under operating condition.

Software used to control the EUT for staying in continuous transmitting mode was programmed.

After verification, all tests were carried out with the worst case test modes as shown below except radiated spurious emission below 1GHz, which worst case was in normal link mode only.

IEEE802.11b: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with preliminary test 11, 5.5, 2, and 1, After the preliminary scan , the following test mode 11Mbps highest data rate (the worst case) are chosen for the final testing.

IEEE802.11g: Channel 1(2412MHz), Channel 6(2437MHz) and Channel 11(2462MHz) with preliminary test 54/48/36/24/18/12/9/6, After the preliminary scan , the following test mode 6Mbps data rate (the worst case) are chosen for the final testing.



## 5 SETUP OF EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Device Type	Brand	Model	Series No.	FCC ID	Data Cable	Power Cord
1.	USB Keyboard	DELL	KU-9985	2D41500275B	ID NO.	Shielded, 1.2m	N/A
2.	USB Mouse	HP	MO19UCA	020440964	ID NO.	Shielded, 1.8m	N/A

**Note:**

- 1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
- 2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

### 5.2. CONFIGURATION OF SYSTEM UNDER TEST

See test photographs attached in Appendix II for the actual connections between EUT and support equipment.





## 6 FACILITIES AND ACCREDITATIONS

### 6.1. FACILITIES

All measurement facilities used to collect the measurement data are located at  
 **No.10Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, P.R.O.C**

The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### 6.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

<b>USA</b>	FCC,NVLAP
<b>Germany</b>	TUV Rheinland
<b>Japan</b>	VCCI
<b>Norway</b>	NEMKO
<b>Canada</b>	INDUSTRY CANADA,
<b>Taiwan</b>	TAF, BSMI, DGT

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccsemc.com>.

### 6.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in ETR 028:

Measurement	Frequency	Uncertainty
Conducted emissions	9kHz~30MHz	+/- 2.15dB
Radiated emissions	30MHz ~ 200MHz	+/- 2.50dB
	200MHz ~1000MHz	+/- 2.50dB

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



## 7 LIMITS AND RESULTS

### 7.1. POWER LINE CONDUCTED EMISSIONS MEASUREMENT

#### 7.1.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

According to §15.207(a), except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Limits (dBµV)	
	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 in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
- (3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### TEST INSTRUMENTS

Conducted Emission Test Site A (10m chamber)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	R&S	ESI26	100068	02/11/2007
EMC Analyzer	Agilent	E7402A	US41160329	02/11/2007
LISN	FCC	FCC-LISN-50-50-2-M	01067	02/11/2007
LISN (EUT)	FCC	FCC-LISN-50-50-2-M	01068	02/11/2007
FOUR BALANCED TELECOM PAIRS ISN	FCC	FCC-TLISN-T8-02	20165	07/30/2006
4-WIRE ISN	R&S	ENY41	830663/024	04/08/2007
Double 2-Wire ISN	R&S	ENY22	830661/027	04/08/2007
TRANSIENT LIMITER	SCHAFFNER	CFL9206	1710	03/15/2007
EMI Monitor control box	FCC	0-SVDC	N/A	05/11/2007

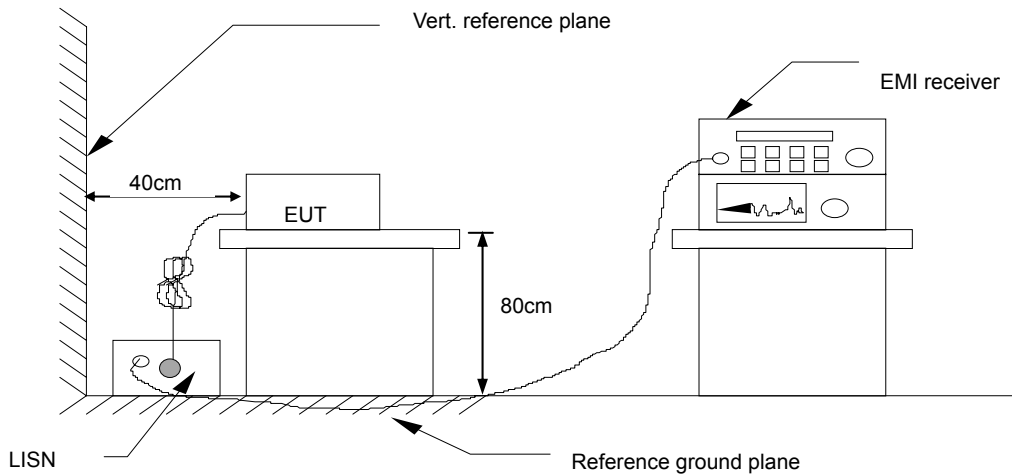
- NOTE:**
- 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  - 2. N.C.R = No Calibration Request.



**7.1.2. TEST PROCEDURES** (please refer to measurement standard)

- The EUT and Support equipment, if needed, was placed on a non-conducted table, which is 0.8m above the ground plane and 0.4m away from the conducted wall.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane. All support equipment power received from a second LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The frequency range from 150 kHz to 30 MHz was searched. The test data of the worst-case condition(s) was recorded. Emission levels under limit 20dB were not recorded.

**7.1.3. TEST SETUP**



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

**7.1.4. Data Sample:**

Frequency (MHz)	QP Reading (dBuV)	AV Reading (dBuV)	Correction factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
0.20	37.58	35.11	0.10	37.68	35.21	63.49	53.49	-25.81	-18.28	L1

Frequency (MHz) = Emission frequency in MHz  
 Reading (dBuV) = Uncorrected Analyzer/Receiver reading  
 Correction factor (dB) = Insertion loss of LISN  
 Limit (dBuV) = Limit stated in standard  
 Margin (dB) = Reading (dBuV) – Limit (dBuV)  
 Note = Current carrying line of reading



**7.1.5. TEST RESULTS**

<b>Model No.</b>	PTB50	<b>Test Mode</b>	Normal Link
<b>Environmental Conditions</b>	25deg.C, 65% RH, 991 hPa	<b>6dB BANDWIDTH</b>	9 kHz
<b>Tested by:</b>	Spring	<b>FOR FSC DELTA ADAPTER</b>	

Frequency (KHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
152.2	19.62	16.6	10.38	30	26.98	65.94	55.94	-35.94	-28.96	L1
627.3	3.1	4.9	10.41	13.51	15.31	56.00	46.00	-42.49	-30.69	L1
1432.2	10.33	9.64	10.46	20.79	20.1	56.00	46.00	-35.21	-25.90	L1
2391.1	12.52	12.89	10.54	23.06	23.43	56.00	46.00	-32.94	-22.57	L1
6916.1	15.37	13.22	10.88	26.25	24.1	60.00	50.00	-33.75	-25.90	L1
22475.1	10.8	9.02	12.55	23.35	21.57	60.00	50.00	-36.65	-28.43	L1
153.7	25.71	22.34	10.42	36.13	32.76	65.89	55.89	-29.76	-23.13	L2
460.8	18.4	18.74	10.39	28.79	29.13	57.12	47.12	-28.33	-17.99	L2
603.25	14.76	15.61	10.4	25.16	26.01	56.00	46.00	-30.84	-19.99	L2
1413.55	7.17	7.46	10.45	17.62	17.91	56.00	46.00	-38.38	-28.09	L2
2418.1	16.51	15.76	10.53	27.04	26.29	56.00	46.00	-28.96	-19.71	L2
24903.363	16.83	10.78	13.29	30.12	24.07	60.00	50.00	-29.88	-25.93	L2

**REMARKS:** L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

<b>Model No.</b>	PTB50	<b>Test Mode</b>	Normal Link
<b>Environmental Conditions</b>	25deg.C, 65% RH, 991 hPa	<b>6dB BANDWIDTH</b>	9 kHz
<b>Tested by:</b>	Spring	<b>FOR FSC LI SHIN ADAPTER</b>	

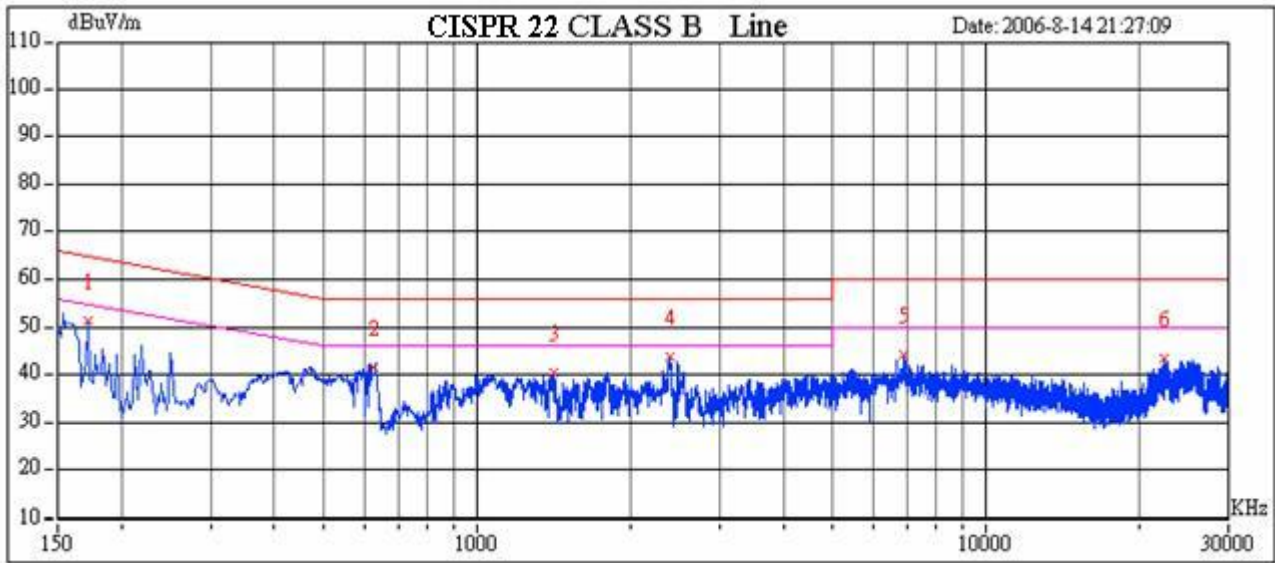
Frequency (KHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
211.6	17.45	16.8	10.36	27.81	27.16	64.24	54.24	-36.43	-27.08	L1
311	10.1	11.81	10.4	20.5	22.21	61.40	51.40	-40.90	-29.19	L1
616.2	10.02	5.95	10.41	20.43	16.36	56.00	46.00	-35.57	-29.64	L1
1060	7.74	5.69	10.43	18.17	16.12	56.00	46.00	-37.83	-29.88	L1
2009.5	3.54	5.39	10.51	14.05	15.9	60.00	50.00	-45.95	-34.10	L1
12401.8	21.43	20.82	11.47	32.9	32.29	60.00	50.00	-27.10	-17.71	L1
164.8	12.54	12.69	10.41	22.95	23.1	65.58	55.58	-42.63	-32.48	L2
211.1	12.26	11.12	10.39	22.65	21.51	64.25	54.25	-41.60	-32.74	L2
611.2	3.96	3.01	10.4	14.36	13.41	56.00	46.00	-41.64	-32.59	L2
1154.2	6.18	7.73	10.43	16.61	18.16	56.00	46.00	-39.39	-27.84	L2
1977.6	9.67	9.88	10.5	20.17	20.38	56.00	46.00	-35.83	-25.62	L2
12611.8	17.35	16.46	11.66	29.01	28.12	60.00	50.00	-30.99	-21.88	L2

**REMARKS:** L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)

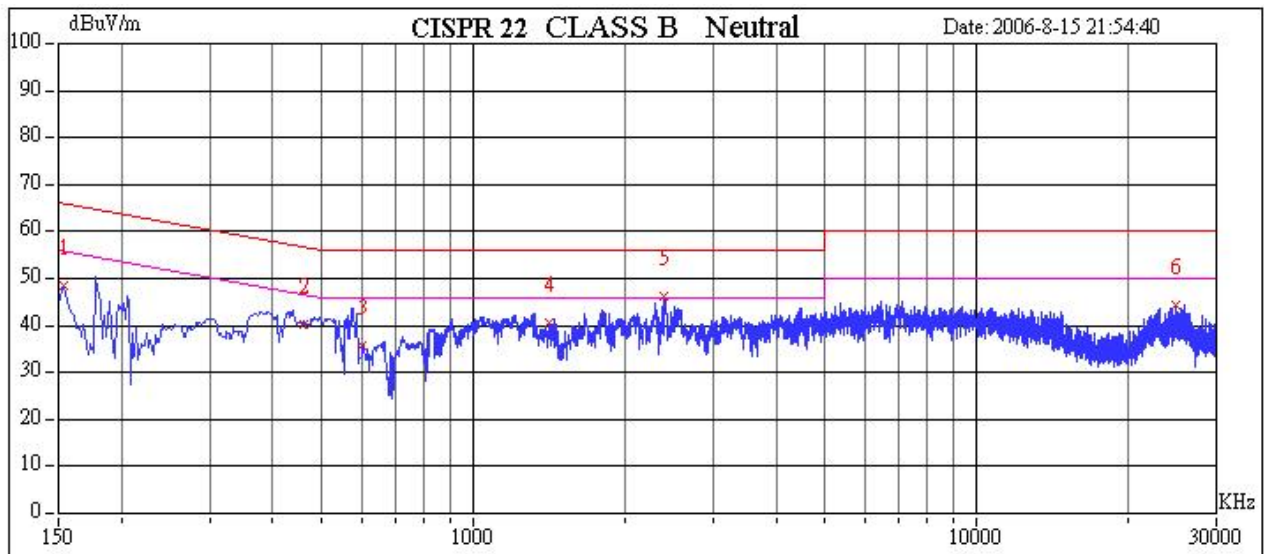


**Test Plots(FOR FSC DELTA ADAPTER)**

**Conducted emissions (Line 1)**



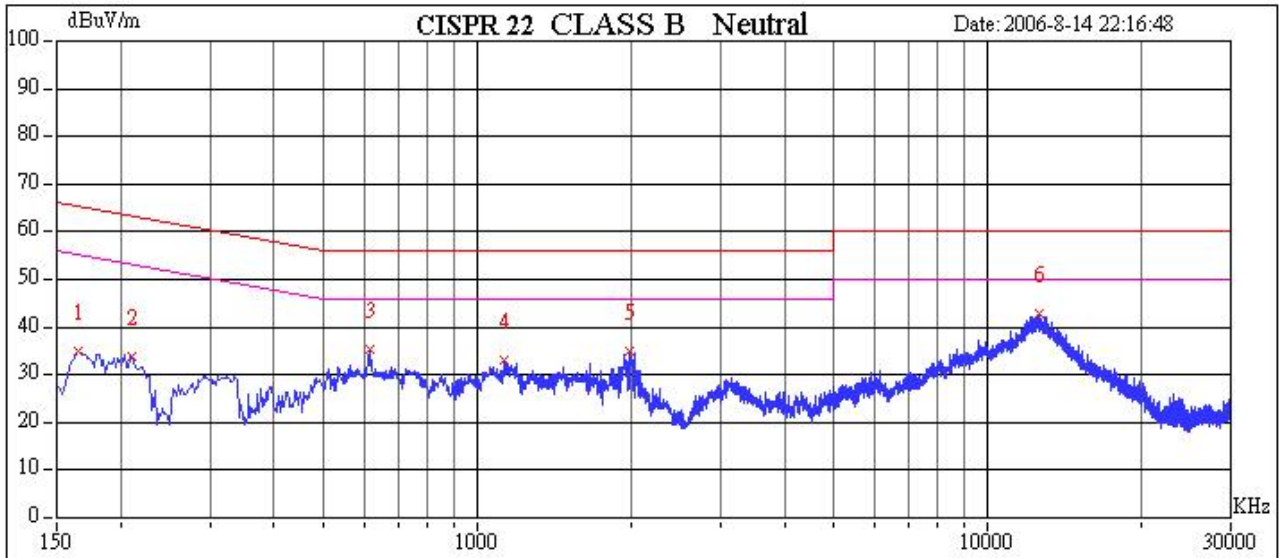
**Conducted emissions (Line 2)**



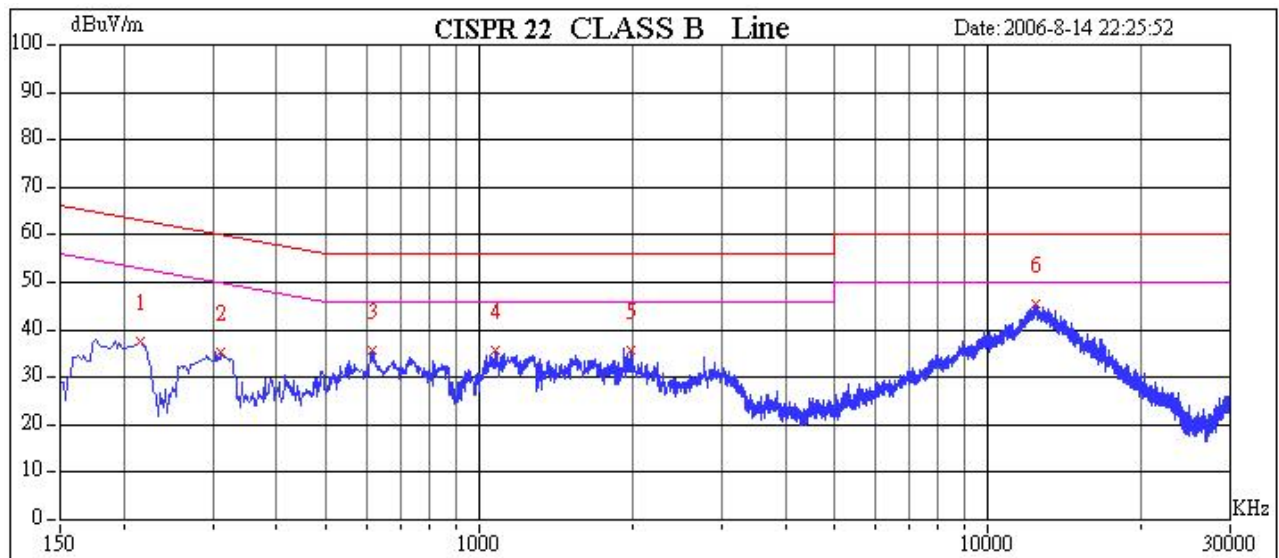


**Test Plots(FOR FSC LI SHIN ADAPTER)**

**Conducted emissions (Line 1)**



**Conducted emissions (Line 2)**





## **7.2. SPURIOUS EMISSIONS MEASUREMENT**

### **7.2.1. LIMITS OF CONDUCTED EMISSIONS MEASUREMENT**

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

### **7.2.2. TEST INSTRUMENTS**

<b>Conducted Emissions Test Site</b>				
<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007

### **7.2.3. TEST PROCEDURE** (please refer to measurement standard)

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site. The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz. Measurements are made over the 30MHz to 26GHz range with the transmitter set to the lowest, middle, and highest channels.





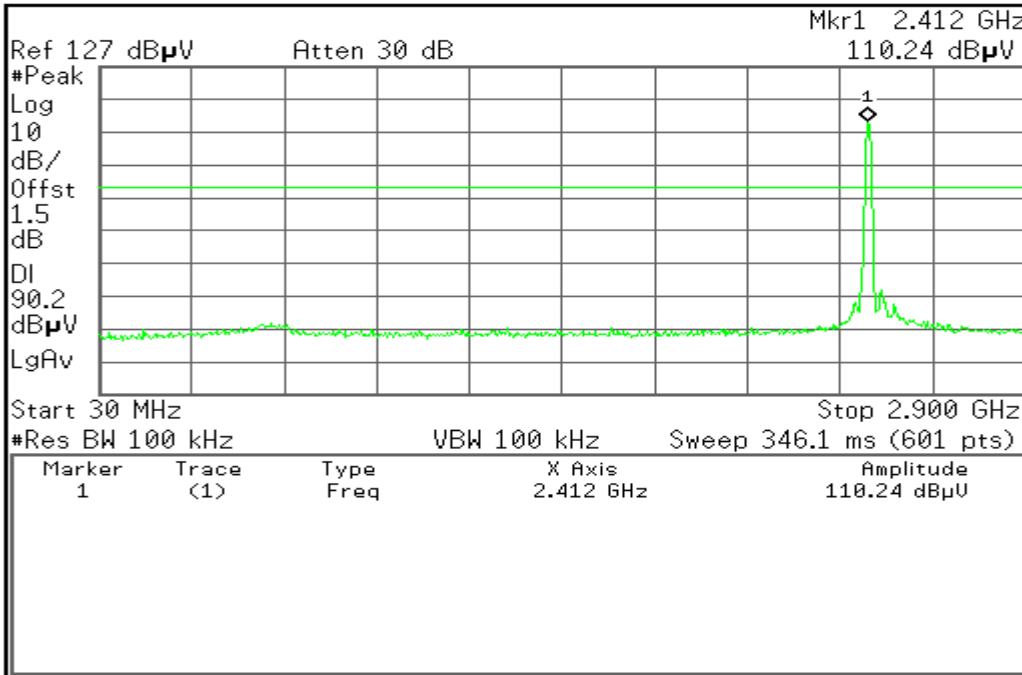
### 7.2.4. TEST RESULTS

#### Test Plot (IEEE 802.11b mode)

#### CH Low

#### 30MHz ~ 2.9GHz

Agilent 14:10:30 Aug 15, 2006

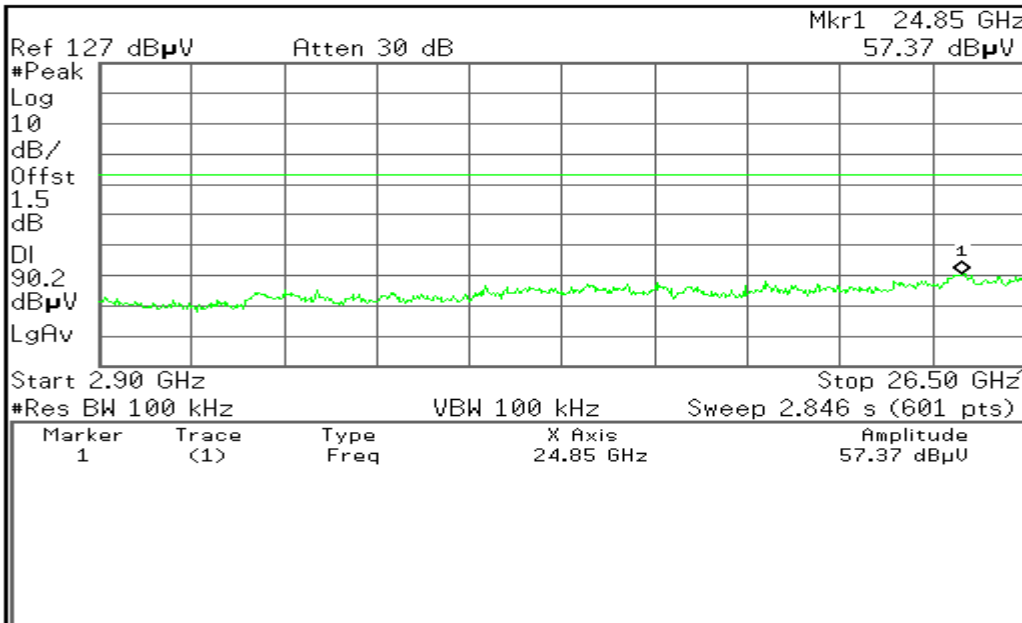


Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More 1 of 2

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#### 2.9GHz ~ 26.5GHz

Agilent 14:11:32 Aug 15, 2006



Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref ▲
Span Pair Span Center
Off
More 1 of 2

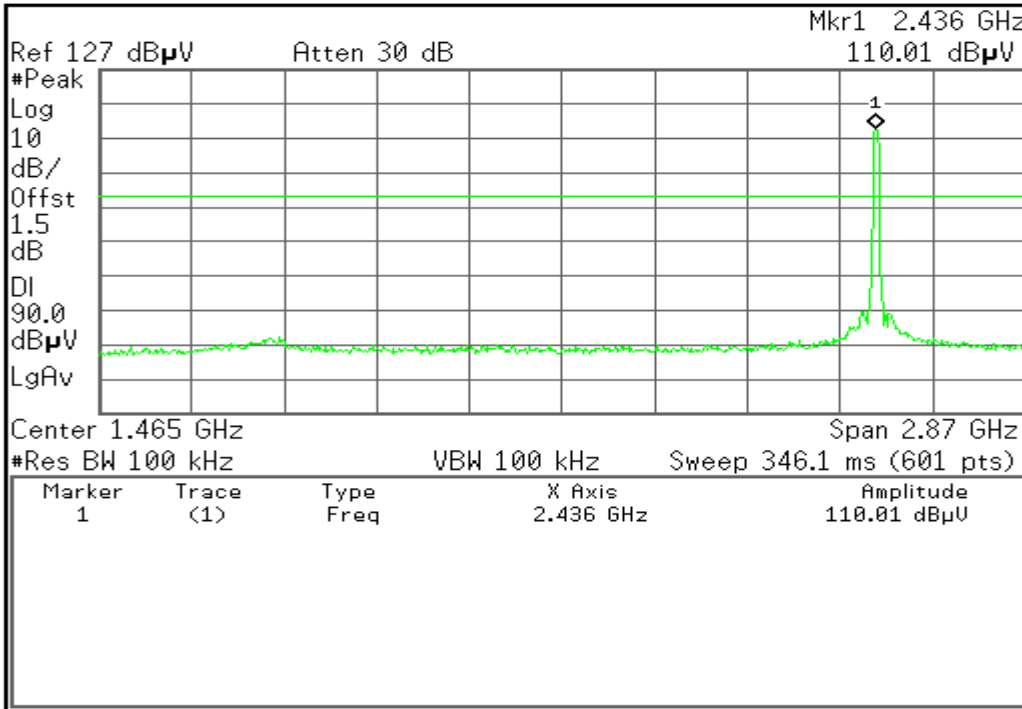
File Operation Status, A:\SCREN410.GIF file saved



**CH Mid**

**30MHz ~ 2.9GHz**

Agilent 14:08:34 Aug 15, 2006



**Marker**

Select Marker  
1 2 3 4

Normal

Delta

Delta Pair  
(Tracking Ref)  
Ref ▲

Span Pair  
Span Center

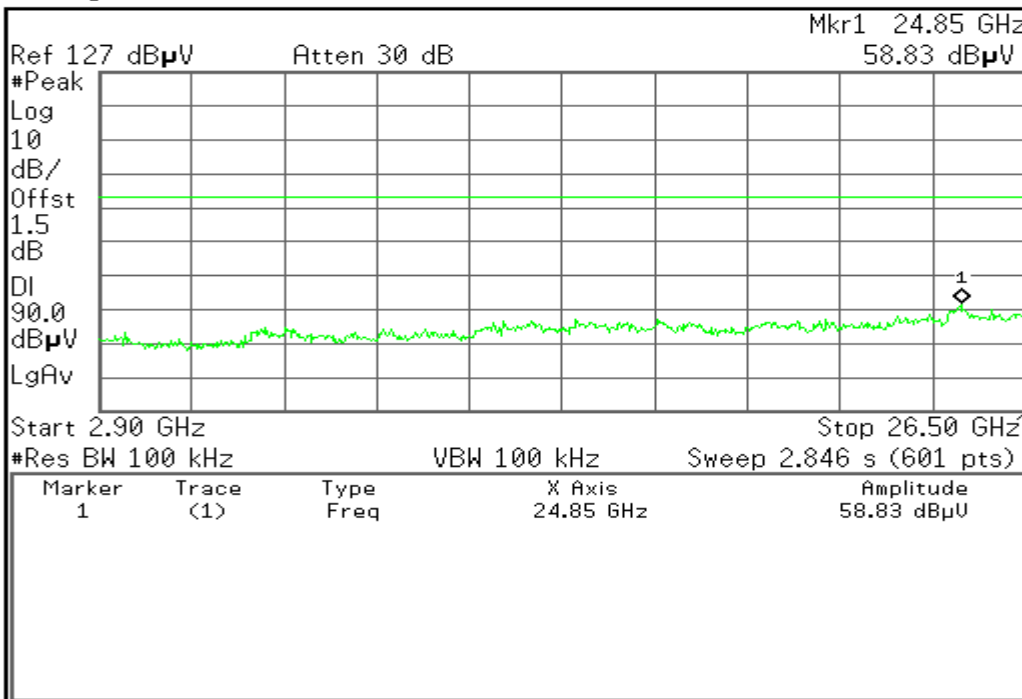
Off

More  
1 of 2

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**2.9GHz ~ 26.5GHz**

Agilent 14:09:16 Aug 15, 2006



**Peak Search**

Next Peak

Next Pk Right

Next Pk Left

Min Search

Pk-Pk Search

Mkr → CF

More  
1 of 2

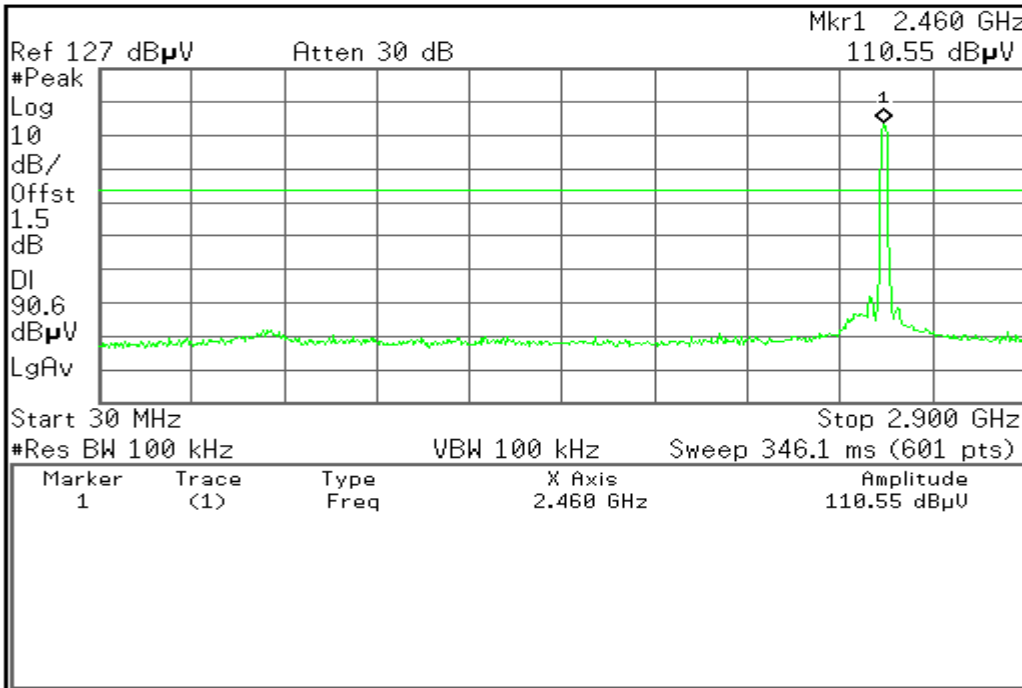
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**CH High**

**30MHz ~ 2.9GHz**

Agilent 14:07:04 Aug 15, 2006



**Peak Search**

Next Peak

Next Pk Right

Next Pk Left

Min Search

Pk-Pk Search

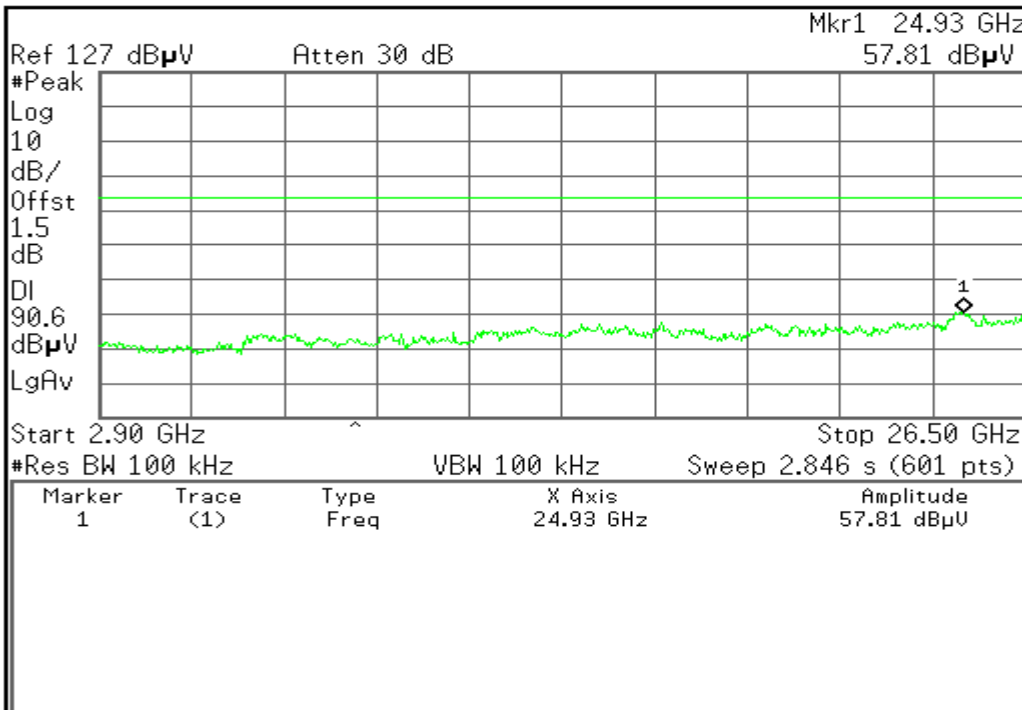
Mkr → CF

More  
1 of 2

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**2.9GHz ~ 26.5GHz**

Agilent 14:06:15 Aug 15, 2006



**Peak Search**

Next Peak

Next Pk Right

Next Pk Left

Min Search

Pk-Pk Search

Mkr → CF

More  
1 of 2

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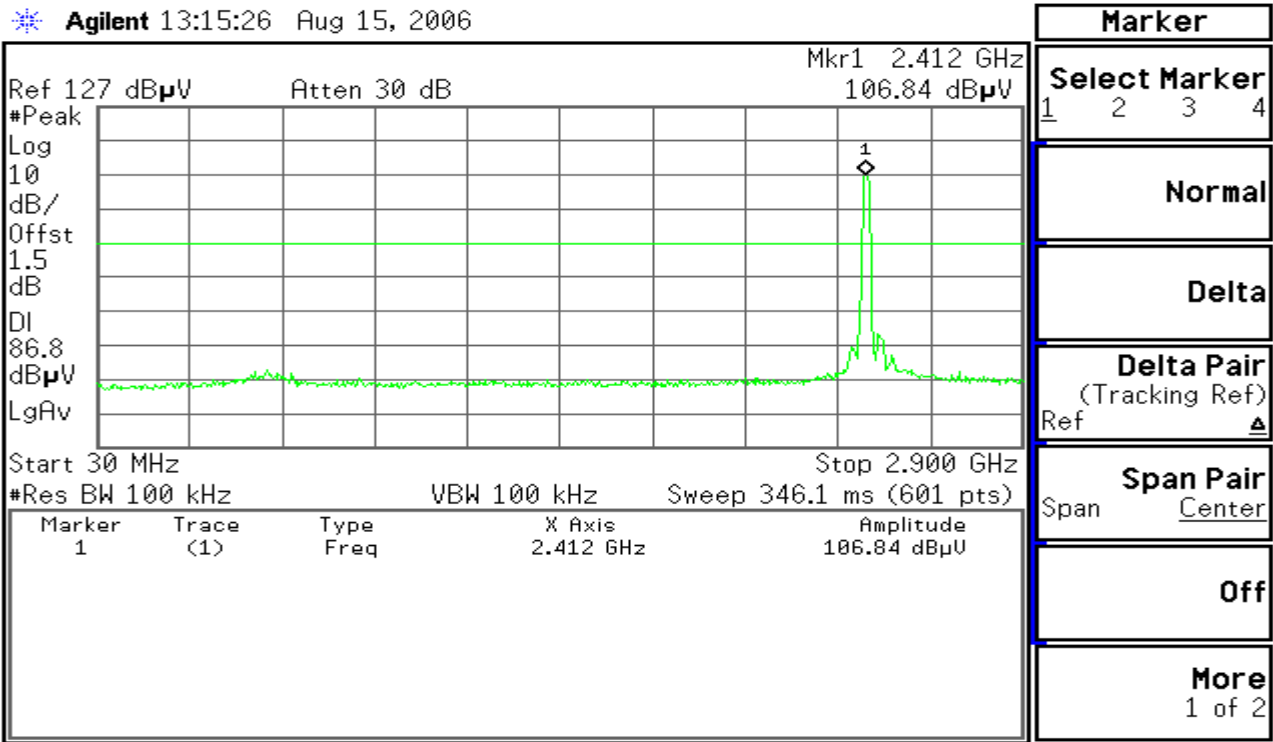


Test Plot (IEEE 802.11g mode)

CH Low

30MHz ~ 2.9GHz

Agilent 13:15:26 Aug 15, 2006



**Marker**

Select Marker  
1 2 3 4

Normal

Delta

Delta Pair  
(Tracking Ref)  
Ref ▲

Span Pair  
Span Center

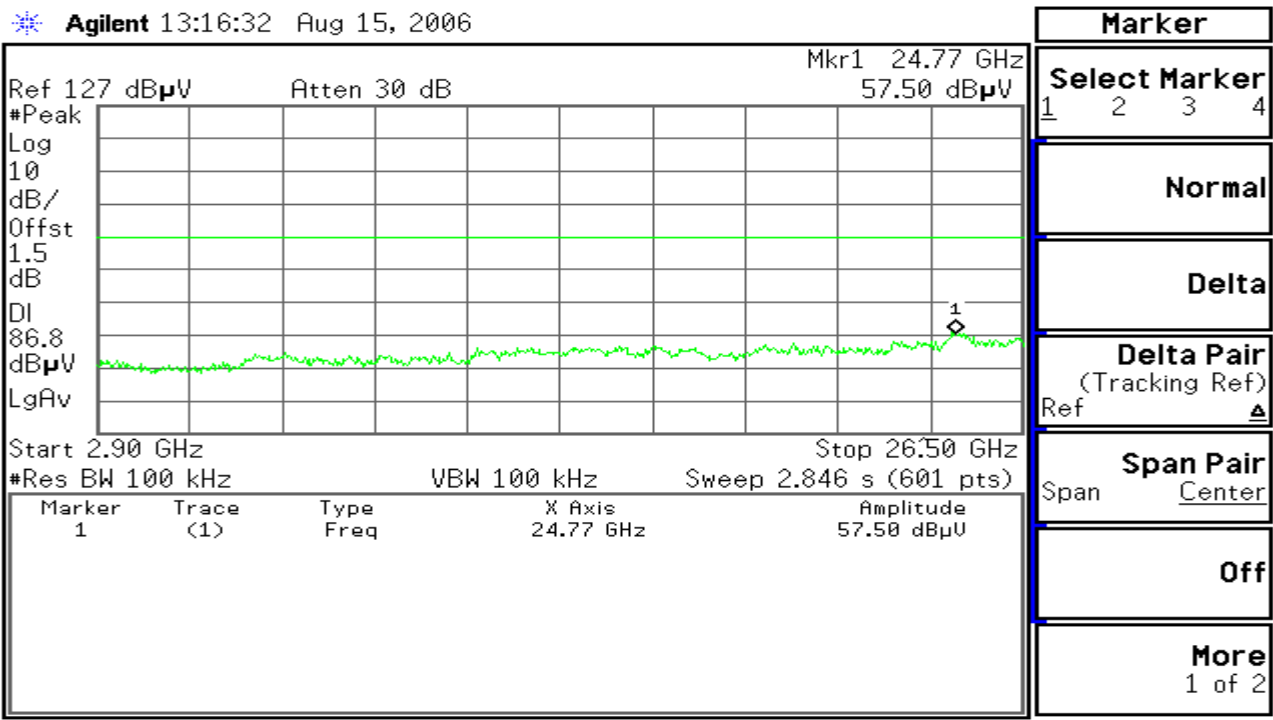
Off

More  
1 of 2

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2.9GHz ~ 26.5GHz

Agilent 13:16:32 Aug 15, 2006



**Marker**

Select Marker  
1 2 3 4

Normal

Delta

Delta Pair  
(Tracking Ref)  
Ref ▲

Span Pair  
Span Center

Off

More  
1 of 2

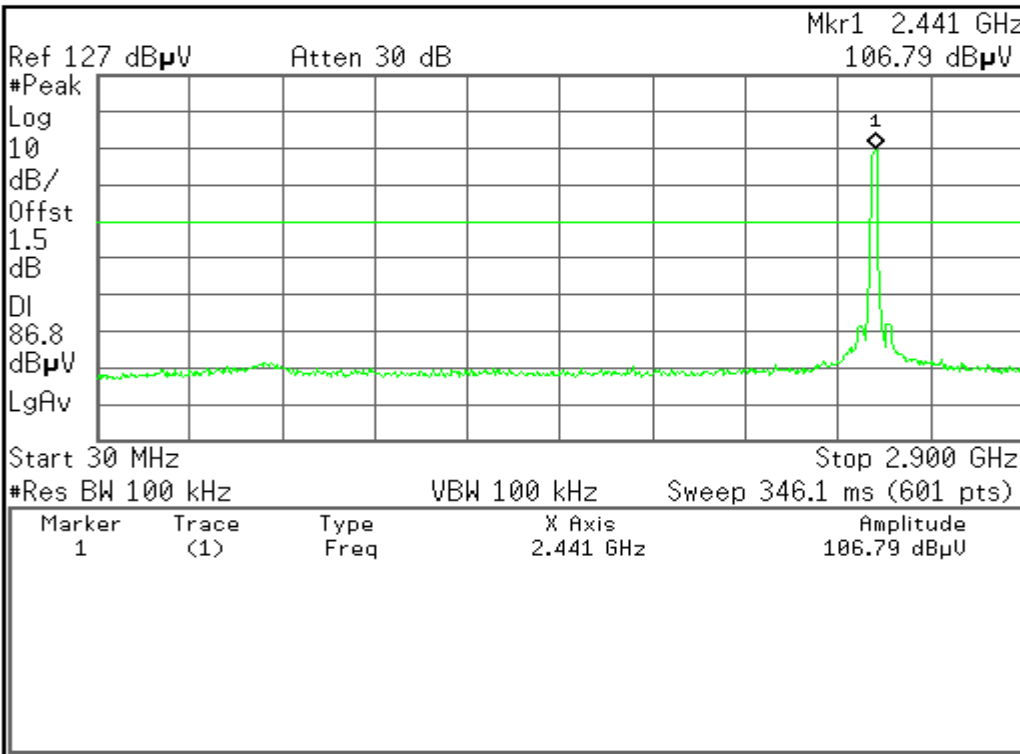
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**CH Mid**

**30MHz ~ 2.9GHz**

Agilent 13:18:17 Aug 15, 2006

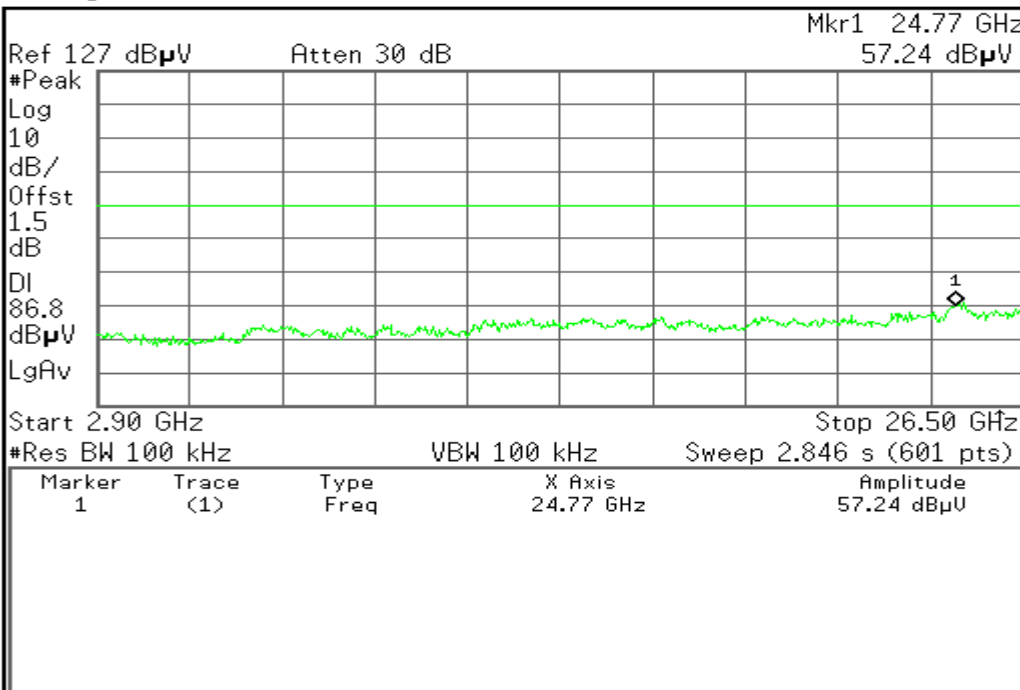


<b>Marker</b>			
<b>Select Marker</b>	1	2	3 4
<b>Normal</b>			
<b>Delta</b>			
<b>Delta Pair</b> (Tracking Ref) Ref $\blacktriangle$			
<b>Span Pair</b> Span <u>Center</u>			
<b>Off</b>			
<b>More</b> 1 of 2			

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**2.9GHz ~ 26.5GHz**

Agilent 13:18:45 Aug 15, 2006



<b>Marker</b>			
<b>Select Marker</b>	1	2	3 4
<b>Normal</b>			
<b>Delta</b>			
<b>Delta Pair</b> (Tracking Ref) Ref $\blacktriangle$			
<b>Span Pair</b> Span <u>Center</u>			
<b>Off</b>			
<b>More</b> 1 of 2			

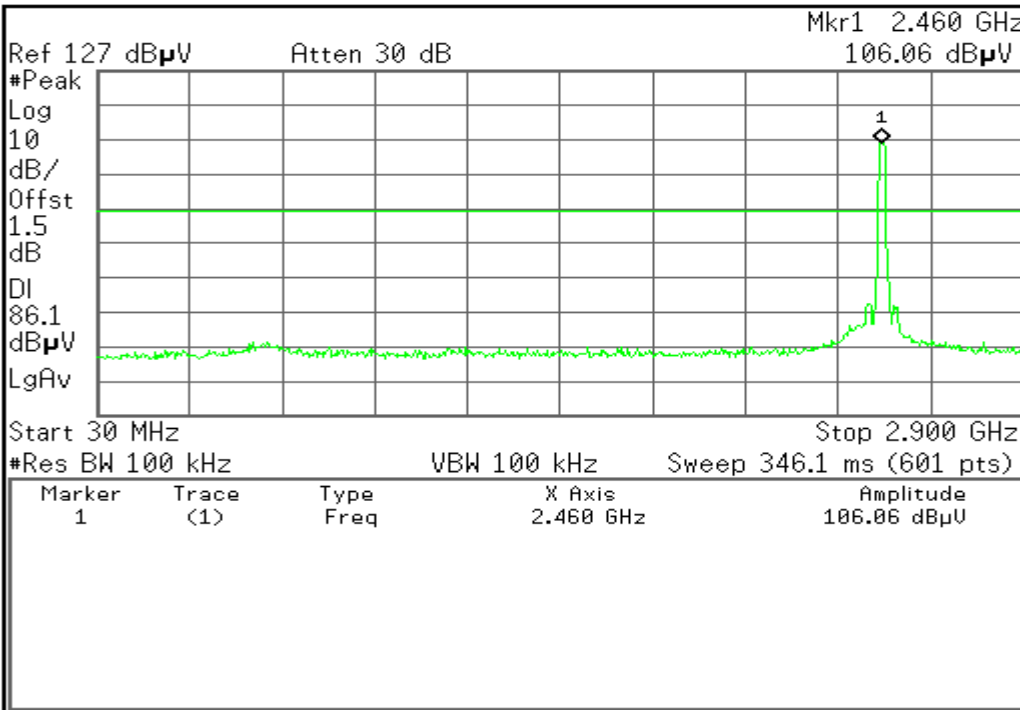
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**CH High**

**30MHz ~ 2.9GHz**

Agilent 13:19:59 Aug 15, 2006

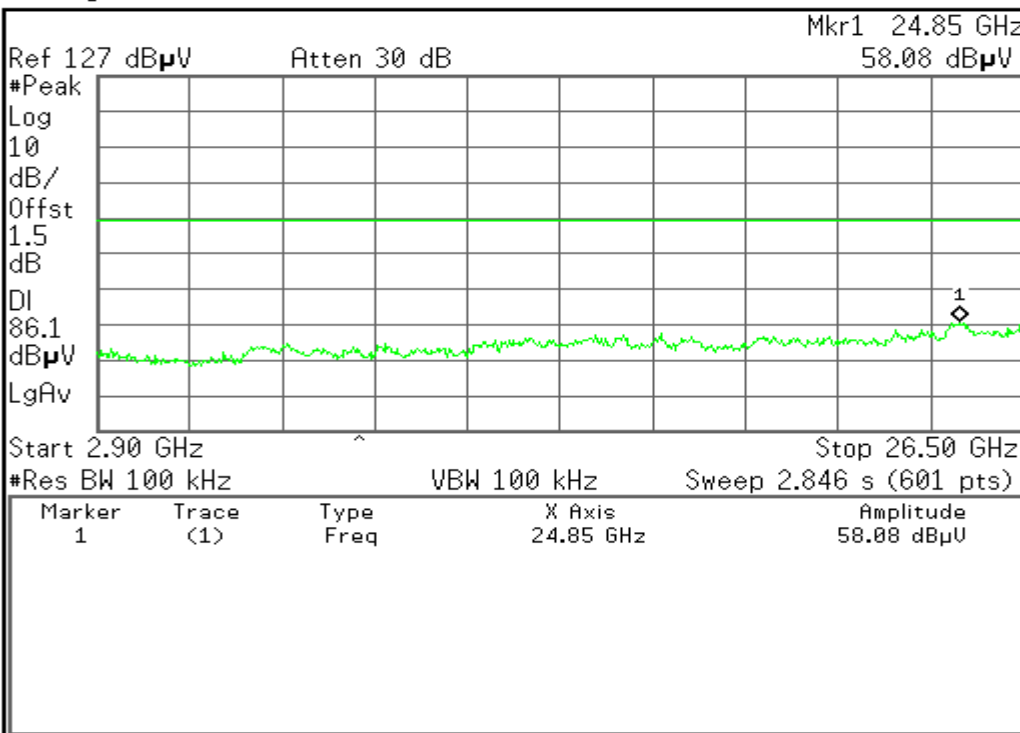


<b>Marker</b>
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref
Span Pair Center
Off
More 1 of 2

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**2.9GHz ~ 26.5GHz**

Agilent 13:20:54 Aug 15, 2006



<b>Marker</b>
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref
Span Pair Center
Off
More 1 of 2

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7.2.5. Radiated Emissions

7.2.5.1. LIMITS OF RADIATED EMISSIONS MEASUREMENT

1. According to §15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance (m)
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

**Remark:** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

2. In the emission table above, the tighter limit applies at the band edges.

Frequency (MHz)	Field Strength (µV/m at 3-meter)	Field Strength (dBµV/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

**NOTE:** (1) The lower limit shall apply at the transition frequencies.  
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).



7.2.5.2. TEST INSTRUMENTS

3M Semi Anechoic Chamber (977)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007
EMI Test Receiver	R&S	ESPI3	101026	11/11/2006
Pre-Amplifier	MINI	ZFL-1000VH2	d041703	12/13/2006
Pre-Amplifier	Miteq	NSP4000-NF	870731	01/28/2007
Bilog Antenna	Sunol	JB1	A110204-2	11/22/2006
Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	02/01/2007
PSG Analog Signal Generator	Agilent	E8257C	MY43321570	12/19/2006
Turn Table	CT	CT123	4165	N.C.R
Antenna Tower	CT	CTERG23	3256	N.C.R
Controller	CT	CT100	95637	N.C.R
Site NSA	CCS	N/A	N/A	04/06/2007

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The FCC Site Registration number is 93105,90471.  
 4. N.C.R = No Calibration Required.

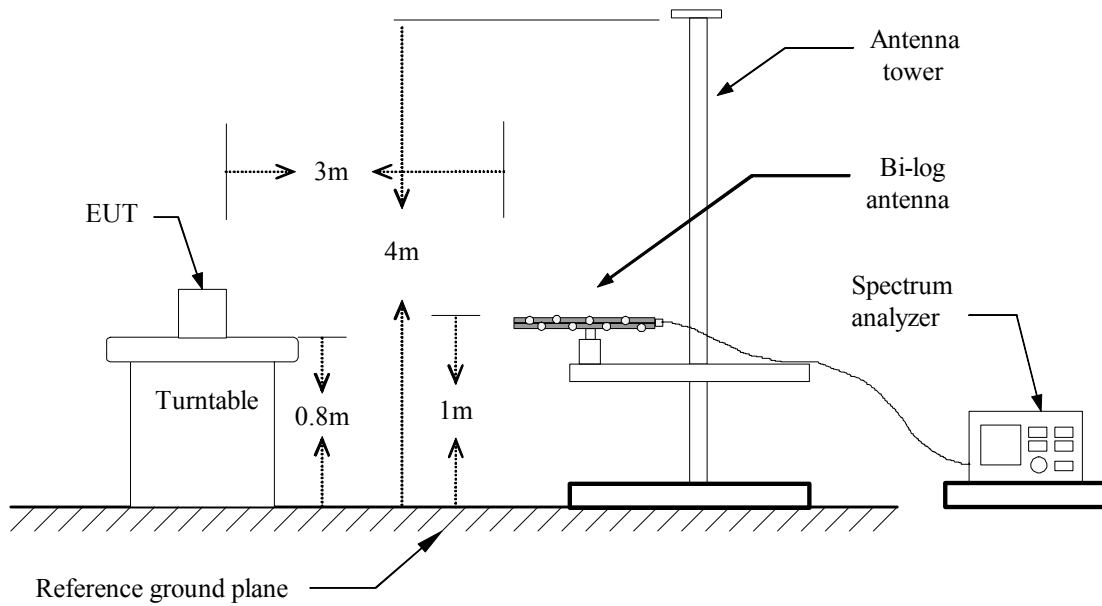
7.2.5.3. TEST PROCEDURE (please refer to measurement standard)

- The EUT is placed on a turntable, which is 0.8m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Set the spectrum analyzer in the following setting as:  
 Below 1GHz:  
     RBW=100kHz / VBW=300kHz / Sweep=AUTO  
 Above 1GHz:  
     (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO  
     (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
- Repeat above procedures until the measurements for all frequencies are complete.

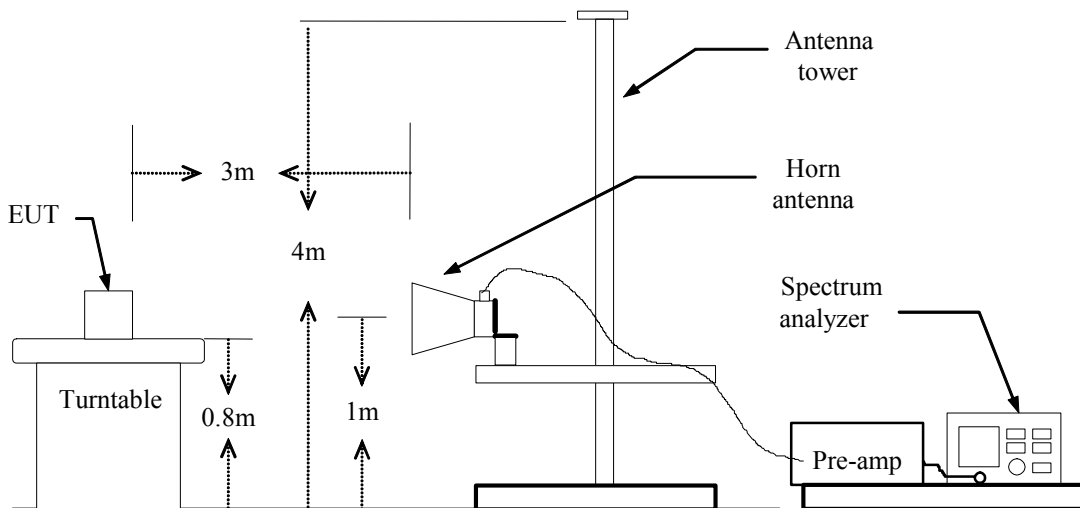


**7.2.5.4. TEST SETUP**

**Below 1 GHz**



**Above 1 GHz**



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



7.2.5.5. Data Sample:

**Below 1 GHz**

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Remark) (dBuV)	Correction Factor (dB/m)	Result (Remark) (dBuV/m)	Limit (QP) (dBuV/m)	Margin (dB)	Remark
	V						Peak

**Above 1 GHz**

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
1603.00	V	65.45	63.00	-11.12	54.33	51.88	74.00	54.00	-2.12	AVG

- Frequency (MHz) = Emission frequency in MHz
- Ant.Pol. (H/V) = Antenna polarization
- Reading (dBuV) = Uncorrected Analyzer / Receiver reading
- Correction Factor (dB/m) = Antenna factor + Cable loss – Amplifier gain
- Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)
- Limit (dBuV/m) = Limit stated in standard
- Margin (dB) = Remark Result (dBuV/m) – Limit (dBuV/m)
- Peak = Peak Reading
- QP = Quasi-peak Reading
- AVG = Average Reading



7.2.5.6. TEST RESULTS

Below 1 GHz

Operation Mode: Normal Link

Test Date: August 16, 2006

Temperature: 20°C

Tested by: Spring

Humidity: 70 % RH

Polarity: Ver. / Hor.

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (QP) (dBuV/m)	Margin (dB)	Remark
77.67	V	30.15	-5.71	24.44	40.00	-15.56	Peak
146.87	V	30.42	-1.50	28.92	43.50	-14.58	Peak
323.85	V	31.78	-2.29	29.49	46.00	-16.51	Peak
431.86	V	32.64	3.35	35.99	46.00	-10.01	Peak
539.88	V	34.48	3.16	37.64	46.00	-8.36	Peak
757.31	V	29.75	8.82	38.57	46.00	-7.43	Peak
83.57	H	30.78	-7.17	23.61	40.00	-16.39	Peak
182.58	H	26.72	-4.90	21.82	43.50	-21.68	Peak
216.67	H	28.43	-5.09	23.34	46.00	-22.66	Peak
431.86	H	30.47	-2.17	28.30	46.00	-17.70	Peak
539.88	H	35.54	2.16	37.70	46.00	-8.30	Peak
751.70	H	29.27	2.70	31.97	46.00	-14.03	Peak

REMARKS:

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/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).



**Above 1 GHz**

**Operation Mode:** TX / IEEE 802.11b / CH Low

**Test Date:** August 16, 2006

**Temperature:** 20°C

**Tested by:** Spring

**Humidity:** 70 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
3891.67	V	35.71	---	8.03	43.74	---	74.00	54.00	-30.26	Peak
4824.25	V	32.47	---	9.65	42.12	---	74.00	54.00	-31.88	Peak
7315.36	V	34.35	---	15.32	49.67	---	74.00	54.00	-24.33	Peak
N/A										Peak
N/A										Peak
N/A										Peak
3725.00	H	36.45	---	7.85	44.3	---	74.00	54.00	-29.7	Peak
4875.00	H	35.67	---	10.51	46.18	---	74.00	54.00	-27.82	Peak
7341.67	H	34.47	---	15.93	50.4	---	74.00	54.00	-23.6	Peak
N/A										Peak
N/A										Peak
N/A										Peak

**REMARKS:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11b / CH Mid  
Temperature: 20°C  
Humidity: 70 % RH

Test Date: August 16, 2006  
Tested by: Spring  
Polarity: Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
3862.25	V	36.46	---	8.03	44.49	---	74.00	54.00	-29.51	Peak
4883.33	V	33.76	---	10.56	44.32	---	74.00	54.00	-29.68	Peak
7375.00	V	30.57	---	16.11	46.68	---	74.00	54.00	-27.32	Peak
N/A										Peak
N/A										Peak
N/A										Peak
3725.00	H	36.69	---	7.85	44.54	---	74.00	54.00	-29.46	Peak
4875.00	H	35.49	---	10.51	46	---	74.00	54.00	-28	Peak
7341.67	H	30.47	---	15.93	46.4	---	74.00	54.00	-27.6	Peak
N/A										Peak
N/A										Peak
N/A										Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11b / CH High
Temperature: 20°C
Humidity: 70 % RH

Test Date: August 16, 2006
Tested by: Spring
Polarity: Ver. / Hor.

Table with 11 columns: Frequency (MHz), Ant. Pol. (H/V), Reading (Peak) (dBuV), Reading (Average) (dBuV), Correction Factor (dB/m), Result (Peak) (dBuV/m), Result (Average) (dBuV/m), Limit (Peak) (dBuV/m), Limit (Average) (dBuV/m), Margin (dB), Remark. Rows include frequencies like 3862.25, 4883.33, 7375.00, 3725.00, 4875.00, 7341.67 and N/A entries.

REMARKS:

- 1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. 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.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



**Above 1 GHz**

**Operation Mode:** TX / IEEE 802.11g / CH Low

**Test Date:** August 16, 2006

**Temperature:** 20°C

**Tested by:** Spring

**Humidity:** 70 % RH

**Polarity:** Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
3782.96	V	36.44	---	8.03	44.47	---	74.00	54.00	-29.53	Peak
4825.36	V	35.82	---	9.65	45.47	---	74.00	54.00	-28.53	Peak
7248.25	V	30.38	---	15.32	45.7	---	74.00	54.00	-28.3	Peak
N/A										Peak
N/A										Peak
N/A										Peak
3775.00	H	34.25	---	7.85	42.1	---	74.00	54.00	-31.9	Peak
4825.36	H	35.02	---	10.51	45.53	---	74.00	54.00	-28.47	Peak
7246.52	H	29.36	---	15.93	45.29	---	74.00	54.00	-28.71	Peak
N/A										Peak
N/A										Peak
N/A										Peak

**REMARKS:**

7. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
8. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
9. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
10. 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.
11. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
12. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



Operation Mode: TX / IEEE 802.11g / CH Mid
Temperature: 20°C
Humidity: 70 % RH

Test Date: August 16, 2006
Tested by: Spring
Polarity: Ver. / Hor.

Table with 11 columns: Frequency (MHz), Ant. Pol. (H/V), Reading (Peak) (dBuV), Reading (Average) (dBuV), Correction Factor (dB/m), Result (Peak) (dBuV/m), Result (Average) (dBuV/m), Limit (Peak) (dBuV/m), Limit (Average) (dBuV/m), Margin (dB), Remark. Rows include frequencies like 3775.00, 4883.33, 7325.00, 3783.33, 4875.00, 7333.33 and N/A entries.

REMARKS:

- 7. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
8. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
9. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
10. 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.
11. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
12. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).





Operation Mode: TX / IEEE 802.11g / CH High  
Temperature: 20°C  
Humidity: 70 % RH

Test Date: August 16, 2006  
Tested by: Spring  
Polarity: Ver. / Hor.

Frequency (MHz)	Ant.Pol. (H/V)	Reading (Peak) (dBuV)	Reading (Average) (dBuV)	Correction Factor (dB/m)	Result (Peak) (dBuV/m)	Result (Average) (dBuV/m)	Limit (Peak) (dBuV/m)	Limit (Average) (dBuV/m)	Margin (dB)	Remark
3725.35	V	38.74	---	8.03	46.77	---	74.00	54.00	-27.23	Peak
4941.67	V	37.42	---	10.56	47.98	---	74.00	54.00	-26.02	Peak
7341.67	V	34.57	---	16.11	50.68	---	74.00	54.00	-23.32	Peak
N/A										Peak
N/A										Peak
N/A										Peak
3875.56	H	41.57	---	7.85	49.42	---	74.00	54.00	-24.58	Peak
4941.67	H	38.41	---	10.51	48.92	---	74.00	54.00	-25.08	Peak
7341.67	H	30.45	---	15.93	46.38	---	74.00	54.00	-27.62	Peak
N/A										Peak
N/A										Peak
N/A										Peak

REMARKS:

7. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
8. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
9. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
10. 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.
11. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
12. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



### 7.3. 6dB BANDWIDTH MEASUREMENT

#### 7.3.1. LIMITS

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 500 kHz.

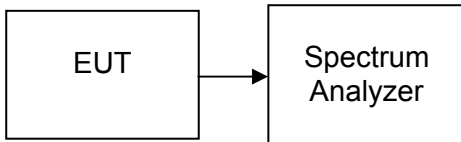
#### 7.3.2. TEST INSTRUMENTS

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007

#### 7.3.3. TEST PROCEDURES (please refer to measurement standard)

1. Place the EUT on the table and set it in the 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 = 100kHz, VBW = RBW, Span = 50MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

#### 7.3.4. TEST SETUP





7.3.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	11732	>500	PASS
Mid	2437	12143		PASS
High	2462	12155		PASS

Test Data

Test mode: IEEE 802.11g

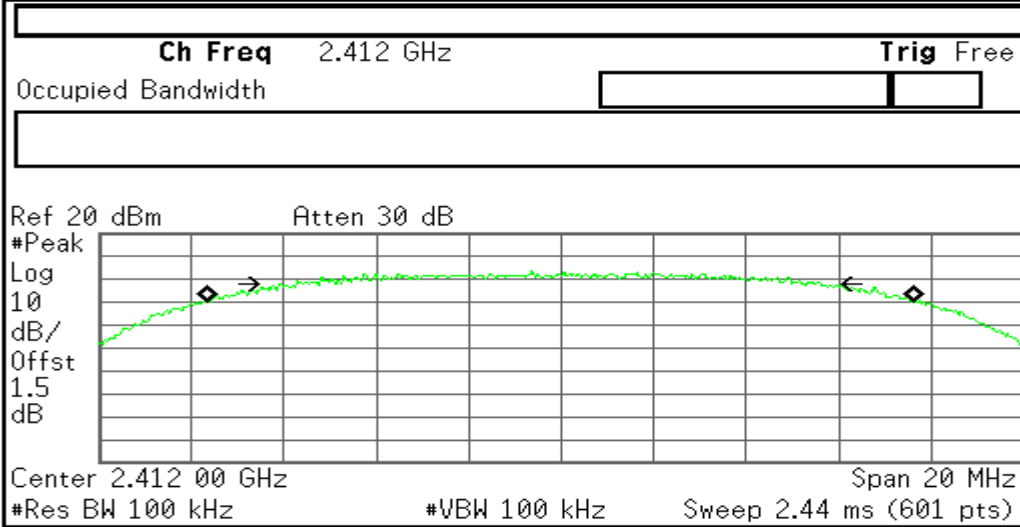
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16412	>500	PASS
Mid	2437	16385		PASS
High	2462	16394		PASS



**Test Plot (IEEE 802.11b mode)**

**6dB Bandwidth (CH Low)**

Agilent 13:02:41 Aug 15, 2006



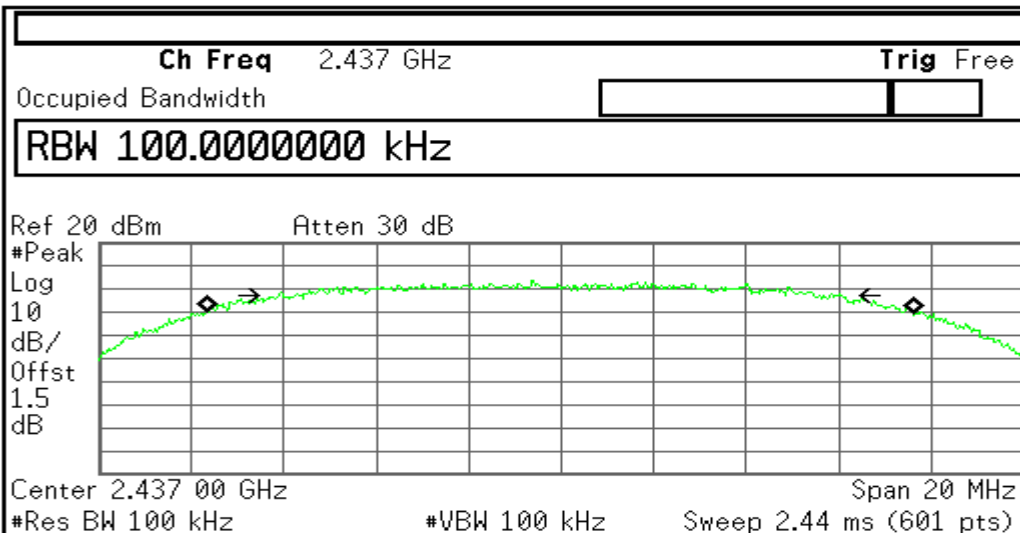
Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.00000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

Occupied Bandwidth	Occ BW % Pwr	99.00 %
15.3012 MHz	x dB	-6.00 dB
Transmit Freq Error		-15.987 kHz
x dB Bandwidth		11.732 MHz

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**6dB Bandwidth (CH Mid)**

Agilent 13:03:45 Aug 15, 2006



Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.00000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

Occupied Bandwidth	Occ BW % Pwr	99.00 %
15.2882 MHz	x dB	-6.00 dB
Transmit Freq Error		-11.723 kHz
x dB Bandwidth		12.143 MHz

File Operation Status, A:\SCREN386.GIF file saved



6dB Bandwidth (CH High)

Agilent 13:04:58 Aug 15, 2006

Ch Freq 2.462 GHz Trig Free

Occupied Bandwidth

Center 2.462000000 GHz

Ref 20 dBm Atten 30 dB

Center 2.462 00 GHz Span 20 MHz  
#Res BW 100 kHz #VBW 100 kHz Sweep 2.44 ms (601 pts)

<b>Occupied Bandwidth</b>	<b>Occ BW % Pwr</b>	99.00 %
15.3201 MHz	<b>x dB</b>	-6.00 dB
<b>Transmit Freq Error</b>		-1.264 kHz
<b>x dB Bandwidth</b>		12.155 MHz

Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.00000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

File Operation Status, A:\SCREN388.GIF file saved

Test Plot (IEEE 802.11g mode)

6dB Bandwidth (CH Low)

Agilent 13:08:12 Aug 15, 2006

Ch Freq 2.412 GHz Trig Free

Occupied Bandwidth

Center 2.412000000 GHz

Ref 20 dBm Atten 30 dB

Center 2.412 00 GHz Span 20 MHz  
#Res BW 100 kHz #VBW 100 kHz Sweep 2.44 ms (601 pts)

<b>Occupied Bandwidth</b>	<b>Occ BW % Pwr</b>	99.00 %
16.4554 MHz	<b>x dB</b>	-6.00 dB
<b>Transmit Freq Error</b>		13.541 kHz
<b>x dB Bandwidth</b>		16.412 MHz

Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.00000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

File Operation Status, A:\SCREN391.GIF file saved



### 6dB Bandwidth (CH High)

Agilent 13:07:31 Aug 15, 2006

<b>Ch Freq</b> 2.437 GHz		<b>Trig</b> Free	
Occupied Bandwidth			
<b>Center</b> 2.437000000 GHz			
Ref 20 dBm		Atten 30 dB	
#Peak	→ ◆ ←		
Log			
10			
dB/			
Offst			
1.5			
dB			
Center 2.437 00 GHz		Span 20 MHz	
#Res BW 100 kHz		#VBW 100 kHz Sweep 2.44 ms (601 pts)	
<b>Occupied Bandwidth</b>		<b>Occ BW % Pwr</b> 99.00 %	
16.4445 MHz		<b>x dB</b> -6.00 dB	
<b>Transmit Freq Error</b> 4.014 kHz			
<b>x dB Bandwidth</b> 16.385 MHz			

Meas Setup	
<b>Avg Number</b>	10
On	Off
<b>Avg Mode</b>	Repeat
Exp	
<b>Max Hold</b>	Off
On	Off
<b>Occ BW % Pwr</b>	99.00 %
<b>OBW Span</b>	20.00000000 MHz
<b>x dB</b>	-6.00 dB
<b>Optimize</b>	Ref Level

File Operation Status, A:\SCREN390.GIF file saved

### 6dB Bandwidth (CH Mid)

Agilent 13:06:44 Aug 15, 2006

<b>Ch Freq</b> 2.462 GHz		<b>Trig</b> Free	
Occupied Bandwidth			
<b>Center</b> 2.462000000 GHz			
Ref 20 dBm		Atten 30 dB	
#Peak	→ ◆ ←		
Log			
10			
dB/			
Offst			
1.5			
dB			
Center 2.462 00 GHz		Span 20 MHz	
#Res BW 100 kHz		#VBW 100 kHz Sweep 2.44 ms (601 pts)	
<b>Occupied Bandwidth</b>		<b>Occ BW % Pwr</b> 99.00 %	
16.4322 MHz		<b>x dB</b> -6.00 dB	
<b>Transmit Freq Error</b> 9.614 kHz			
<b>x dB Bandwidth</b> 16.394 MHz			

Meas Setup	
<b>Avg Number</b>	10
On	Off
<b>Avg Mode</b>	Repeat
Exp	
<b>Max Hold</b>	Off
On	Off
<b>Occ BW % Pwr</b>	99.00 %
<b>OBW Span</b>	20.00000000 MHz
<b>x dB</b>	-6.00 dB
<b>Optimize</b>	Ref Level

File Operation Status, A:\SCREN389.GIF file saved



## 7.4. PEAK OUTPUT POWER

### 7.4.1. LIMITS

The maximum peak output power of the intentional radiator shall not exceed the following:

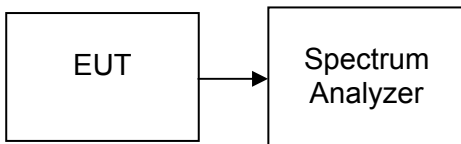
1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains 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.

### 7.4.2. TEST INSTRUMENTS

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007

### 7.4.3. TEST PROCEDURES (please refer to measurement standard)

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the peak power detection.



### 7.4.4. TEST SETUP



7.4.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	16.64	0.04613	1	PASS
Mid	2437	16.57	0.04539		PASS
High	2462	16.49	0.04457		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	15.42	0.03483	1	PASS
Mid	2437	15.51	0.03556		PASS
High	2462	15.16	0.03281		PASS

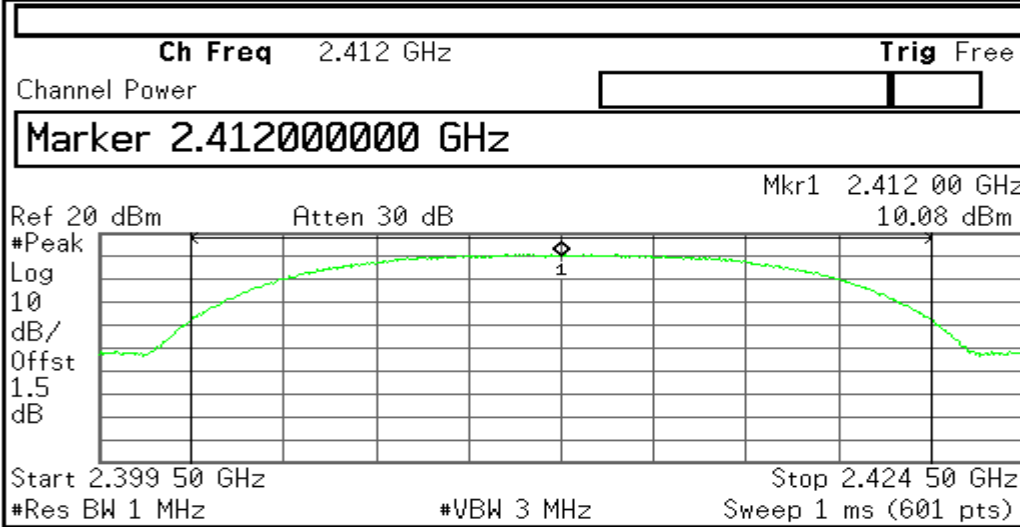




**Test Plot (IEEE 802.11b mode)**

**Peak Power (CH Low)**

Agilent 11:55:38 Aug 15, 2006



Marker	
Select Marker	1 2 3 4
Normal	
Delta	
Delta Pair (Tracking Ref)	Ref ▲
Span Pair	Span Center
Off	
More	1 of 2

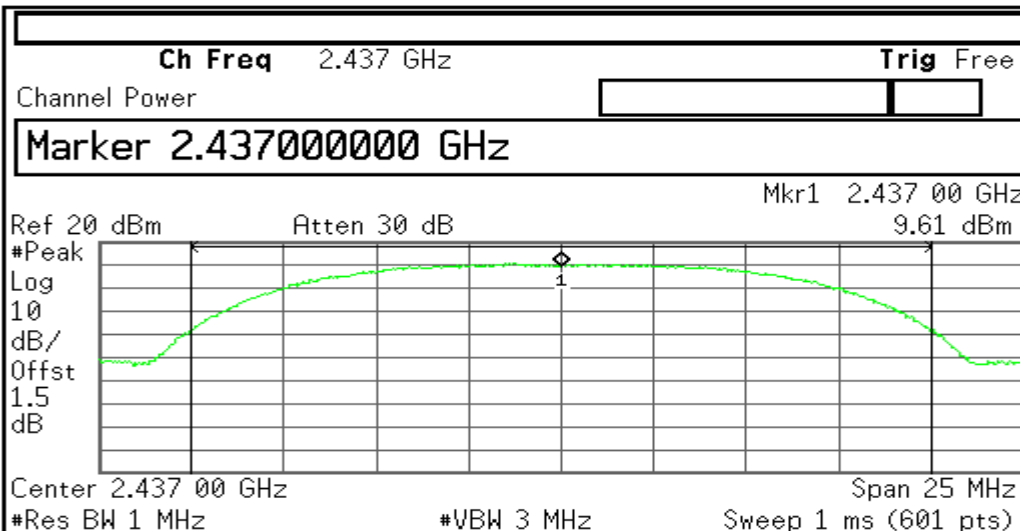
**Channel Power** **Power Spectral Density**

16.64 dBm /20.0000 MHz -56.37 dBm/Hz

File Operation Status, A:\SCREN379.GIF file saved

**Peak Power (CH Mid)**

Agilent 11:58:04 Aug 15, 2006



Marker	
Select Marker	1 2 3 4
Normal	
Delta	
Delta Pair (Tracking Ref)	Ref ▲
Span Pair	Span Center
Off	
More	1 of 2

**Channel Power** **Power Spectral Density**

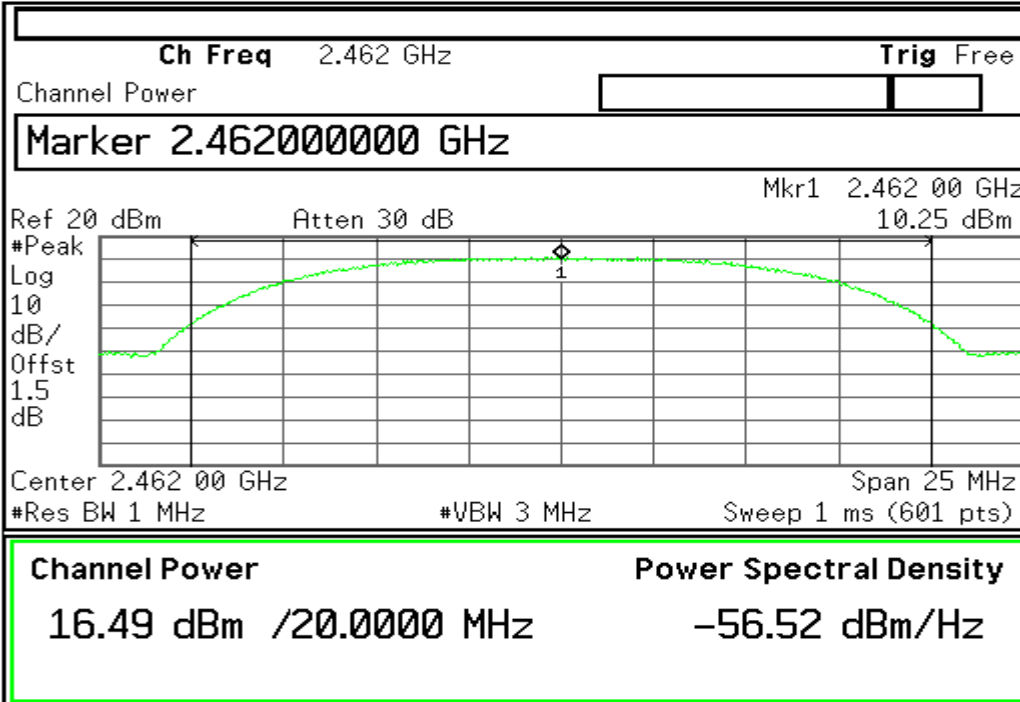
16.57 dBm /20.0000 MHz -56.44 dBm/Hz

File Operation Status, A:\SCREN382.GIF file saved



Peak Power (CH High)

Agilent 11:58:29 Aug 15, 2006



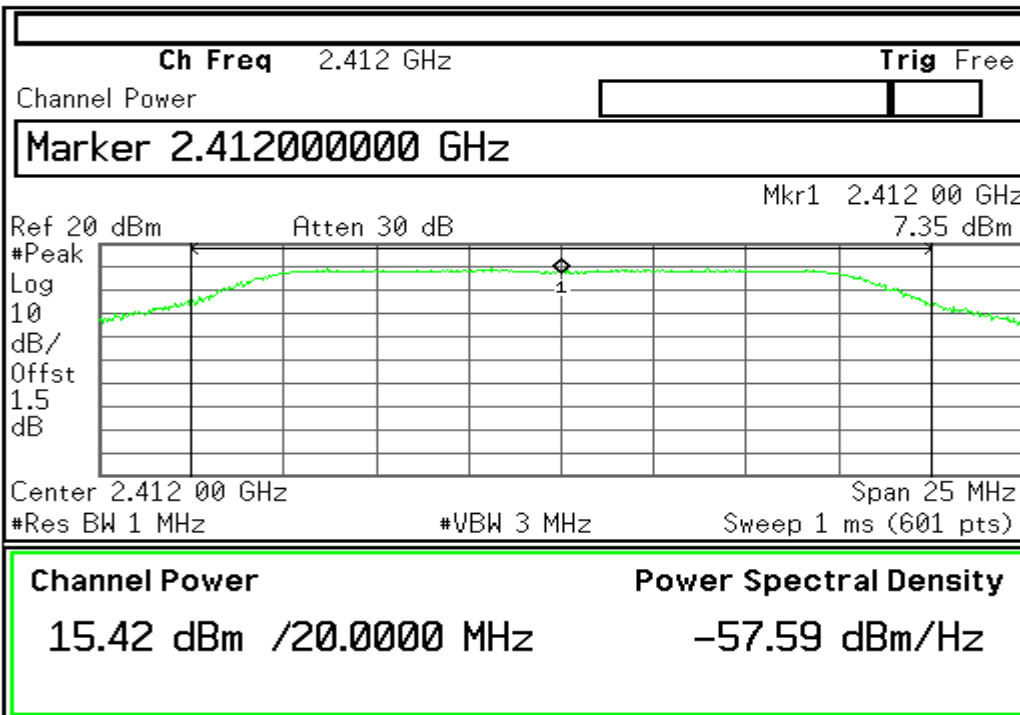
Marker	
Select Marker	1 2 3 4
Normal	
Delta	
Delta Pair (Tracking Ref)	Ref ▲
Span Pair	Span Center
Off	
More	1 of 2

File Operation Status, A:\SCREN383.GIF file saved

Test Plot (IEEE 802.11g mode)

Peak Power (CH Low)

Agilent 11:47:23 Aug 15, 2006



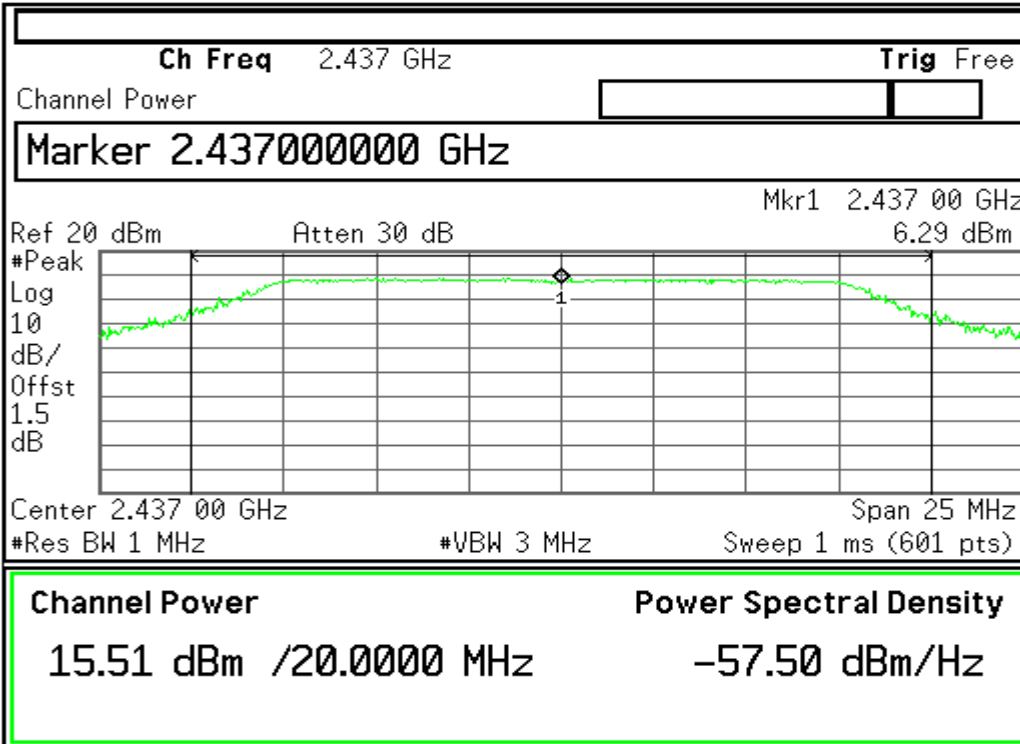
Marker	
Select Marker	1 2 3 4
Normal	
Delta	
Delta Pair (Tracking Ref)	Ref ▲
Span Pair	Span Center
Off	
More	1 of 2

File Operation Status, A:\SCREN373.GIF file saved



Peak Power (CH Mid)

Agilent 11:50:31 Aug 15, 2006

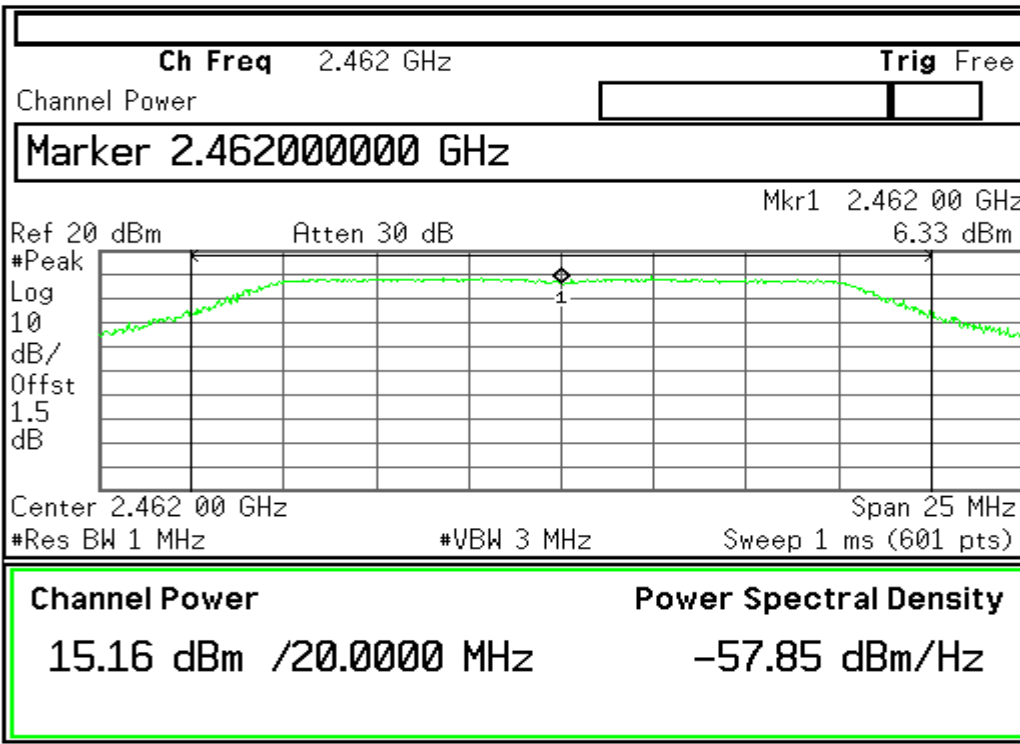


Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref				
Span Pair				
Span				
Off				
More				
1 of 2				

File Operation Status, A:\SCREN376.GIF file saved

Peak Power (CH High)

Agilent 11:51:13 Aug 15, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref				
Span Pair				
Span				
Off				
More				
1 of 2				

File Operation Status, A:\SCREN377.GIF file saved



## 7.5. AVERAGE OUTPUT POWER

### 7.5.1. LIMITS

None; for reporting purposes only.

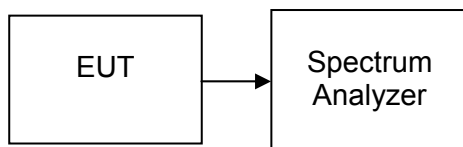
### 7.5.2. TEST INSTRUMENTS

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007

### 7.5.3. TEST PROCEDURES (please refer to measurement standard)

The transmitter output is connected to the Spectrum analyzer. The Spectrum analyzer is set to the average power detection.

### 7.5.4. TEST SETUP





**7.5.5. TEST RESULTS**

**Test Data**

**Test mode: IEEE 802.11b**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Output Power (dBm)</b>	<b>Output Power (W)</b>
Low	2412	13.49	0.02234
Mid	2437	13.50	0.02239
High	2462	13.58	0.02280

**Test mode: IEEE 802.11g**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Output Power (dBm)</b>	<b>Output Power (W)</b>
Low	2412	11.56	0.01432
Mid	2437	11.15	0.01303
High	2462	11.62	0.01452



**Test Plot (IEEE 802.11b mode)**

**Average Power (CH Low)**

Agilent 11:56:04 Aug 15, 2006

Ch Freq 2.412 GHz		Trig Free	
Channel Power			
Marker 2.412000000 GHz			
Ref 20 dBm		Mkr1 2.412 00 GHz	
Atten 30 dB		7.38 dBm	
#Avg			
Log			
10			
dB/			
Offst			
1.5			
dB			
Start 2.399 50 GHz	Stop 2.424 50 GHz		
#Res BW 1 MHz	#VBW 3 MHz	Sweep 1 ms (601 pts)	
<b>Channel Power</b>	<b>Power Spectral Density</b>		
13.49 dBm /20.0000 MHz	-59.52 dBm/Hz		
File Operation Status, A:\SCREN380.GIF file saved			

Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Span Pair				
Off				
More				

**Average Power (CH Mid)**

Agilent 11:57:34 Aug 15, 2006

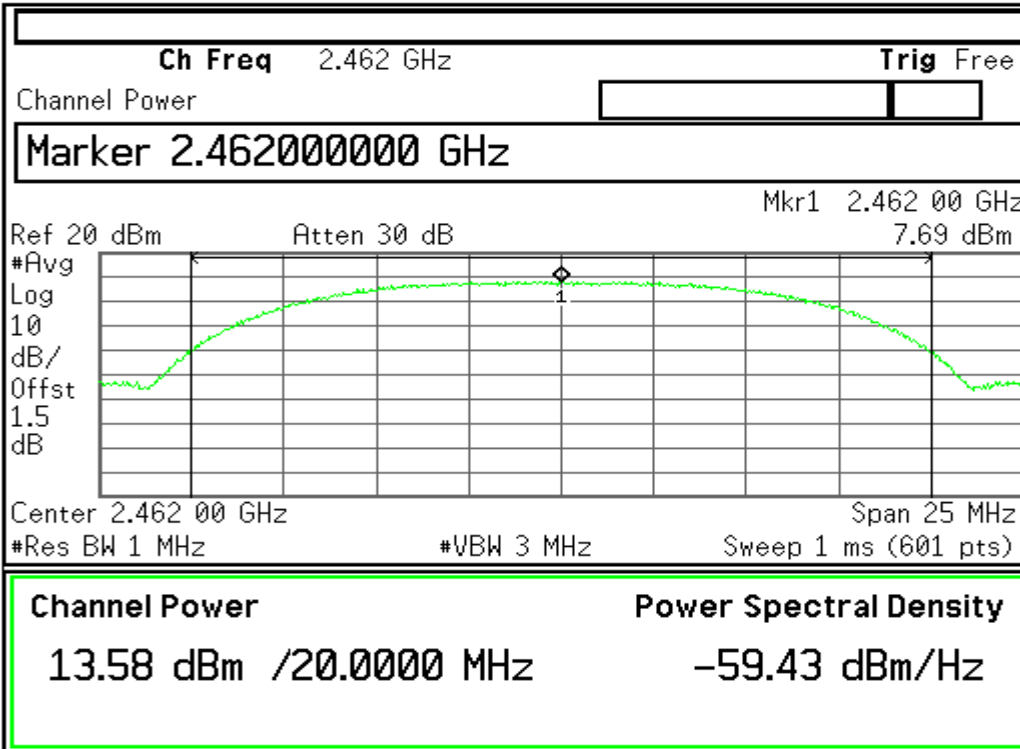
Ch Freq 2.437 GHz		Trig Free	
Channel Power			
Marker 2.437000000 GHz			
Ref 20 dBm		Mkr1 2.437 00 GHz	
Atten 30 dB		7.88 dBm	
#Avg			
Log			
10			
dB/			
Offst			
1.5			
dB			
Center 2.437 00 GHz	Span 25 MHz		
#Res BW 1 MHz	#VBW 3 MHz	Sweep 1 ms (601 pts)	
<b>Channel Power</b>	<b>Power Spectral Density</b>		
13.50 dBm /20.0000 MHz	-59.51 dBm/Hz		
File Operation Status, A:\SCREN381.GIF file saved			

Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Span Pair				
Off				
More				



Average Power (CH High)

Agilent 11:58:53 Aug 15, 2006



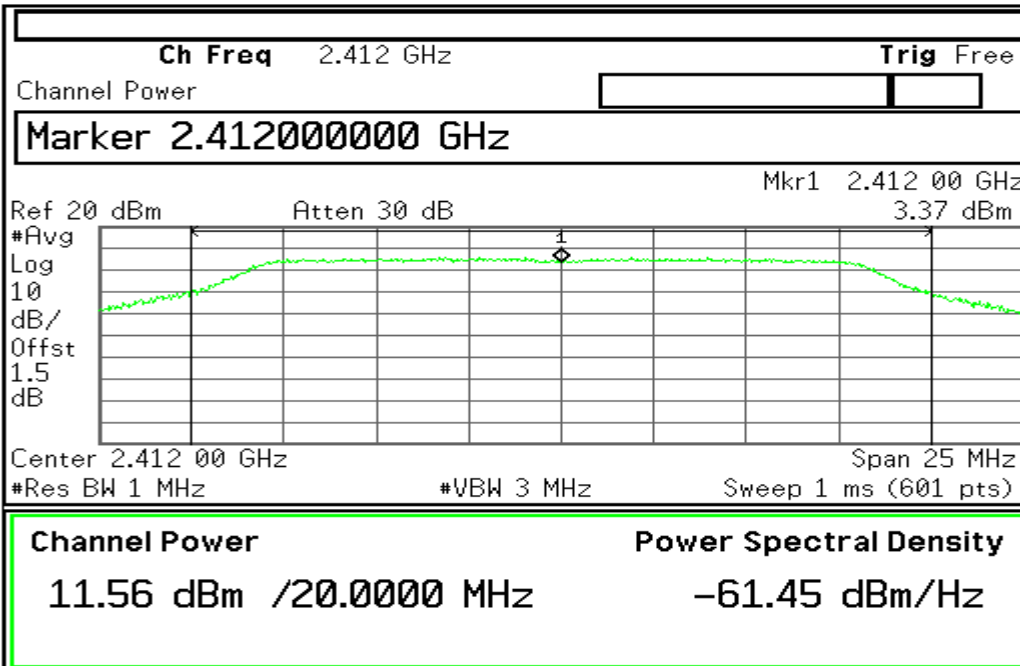
Marker			
Select Marker	1	2	3 4
Normal			
Delta			
Delta Pair (Tracking Ref)			
Span Pair			
Off			
More			

File Operation Status, A:\SCREN384.GIF file saved

Test Plot (IEEE 802.11g mode)

Average Power (CH Low)

Agilent 11:48:52 Aug 15, 2006



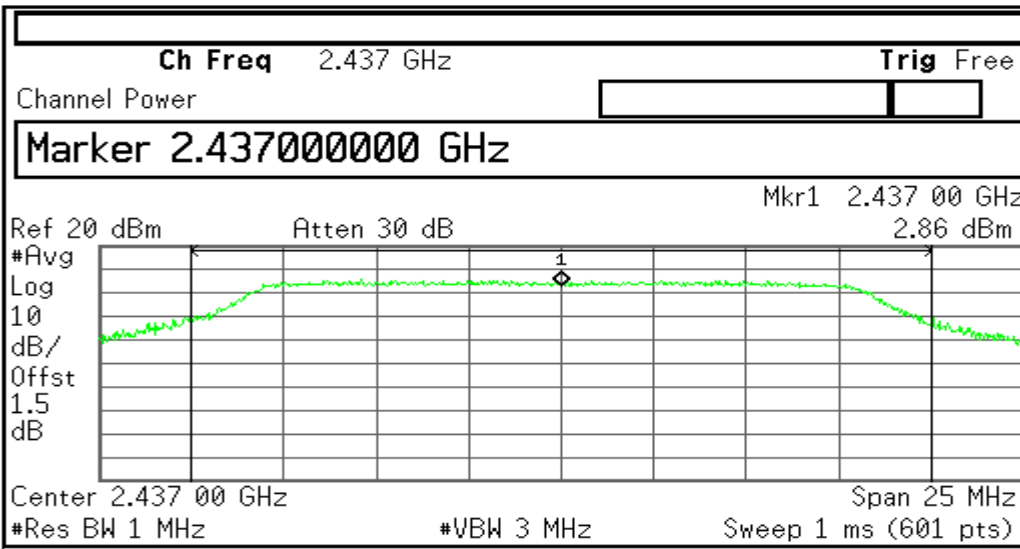
Marker			
Select Marker	1	2	3 4
Normal			
Delta			
Delta Pair (Tracking Ref)			
Span Pair			
Off			
More			

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### Average Power (CH Mid)

Agilent 11:50:06 Aug 15, 2006



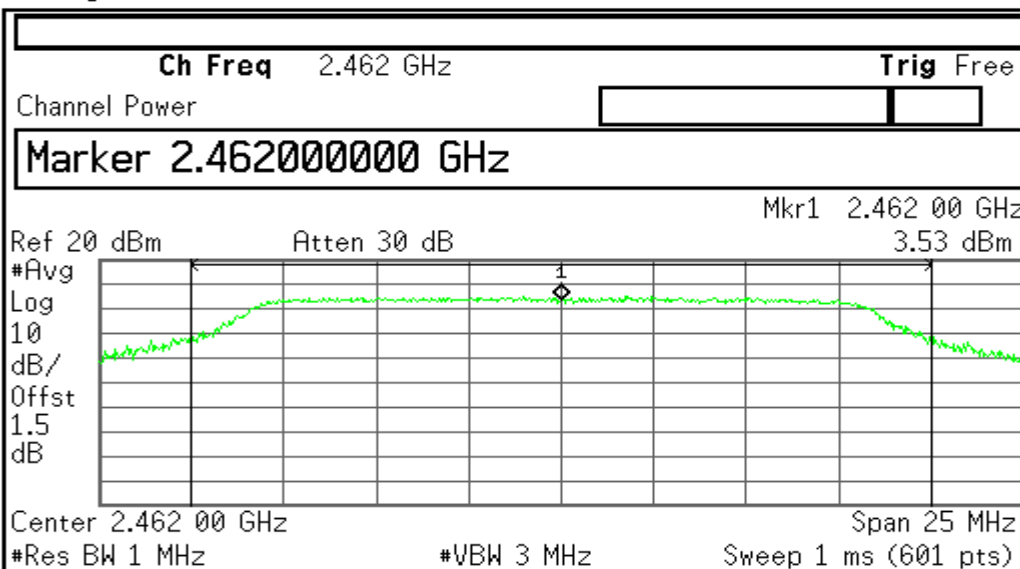
Marker			
Select Marker	1	2	3 4
Normal			
Delta			
Delta Pair (Tracking Ref)	Ref ▲		
Span Pair	Span Center		
Off			
More 1 of 2			

<b>Channel Power</b>	<b>Power Spectral Density</b>
11.15 dBm /20.0000 MHz	-61.86 dBm/Hz

File Operation Status, A:\SCREN375.GIF file saved

### Average Power (CH High)

Agilent 11:51:44 Aug 15, 2006



Marker			
Select Marker	1	2	3 4
Normal			
Delta			
Delta Pair (Tracking Ref)	Ref ▲		
Span Pair	Span Center		
Off			
More 1 of 2			

<b>Channel Power</b>	<b>Power Spectral Density</b>
11.62 dBm /20.0000 MHz	-61.39 dBm/Hz

File Operation Status, A:\SCREN378.GIF file saved





**7.6. BAND EDGES MEASUREMENT:**

**7.6.1. LIMITS**

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)).

**7.6.2. TEST INSTRUMENTS**

**7.6.2.1.**

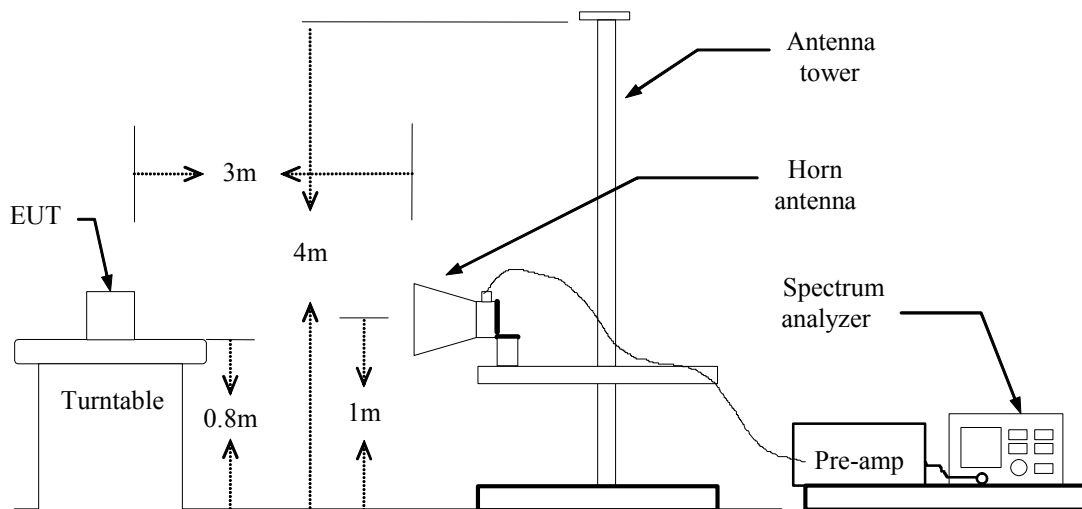
3M Semi Anechoic Chamber (977)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007
EMI Test Receiver	R&S	ESPI3	101026	11/11/2006
Pre-Amplifier	MINI	ZFL-1000VH2	d041703	12/13/2006
Pre-Amplifier	Miteq	NSP4000-NF	870731	01/28/2007
Bilog Antenna	Sunol	JB1	A110204-2	11/22/2006
Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	02/01/2007
PSG Analog Signal Generator	Agilent	E8257C	MY43321570	12/19/2006
Turn Table	CT	CT123	4165	N.C.R
Antenna Tower	CT	CTERG23	3256	N.C.R
Controller	CT	CT100	95637	N.C.R
Site NSA	CCS	N/A	N/A	04/06/2007

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 2. The FCC Site Registration number is 93105,90471.  
 4. N.C.R = No Calibration Required.

**7.6.3. TEST PROCEDURES** (please refer to measurement standard)

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
  - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
  - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are

**7.6.4. TEST SETUP**





### 7.6.5. TEST RESULTS

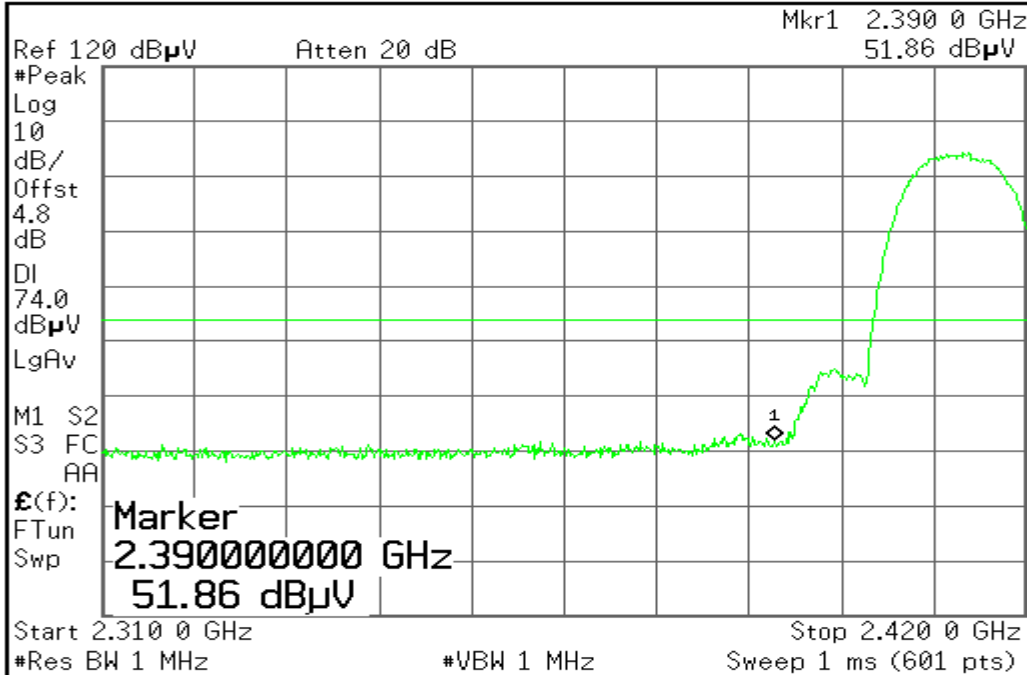
Test Plot (IEEE 802.11b mode)

Band Edges (CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 21:41:08 Aug 18, 2006



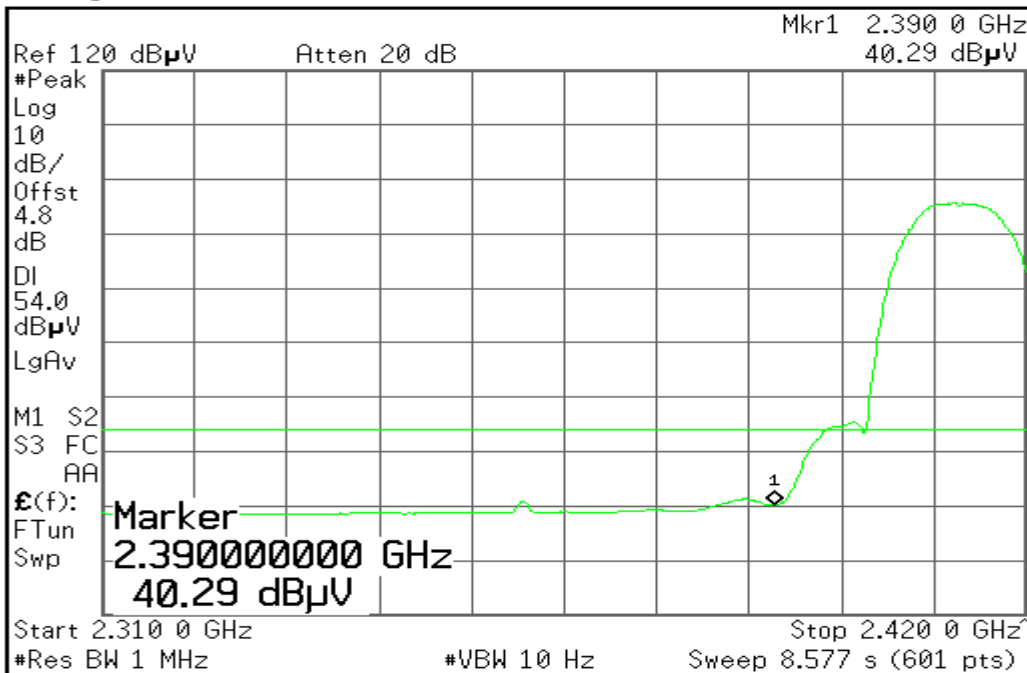
Marker			
Select Marker	1	2	3
Normal			
Delta			
Delta Pair (Tracking Ref)			
Ref	▲		
Span Pair			
Span	Center		
Off			
More 1 of 2			

File Operation Status, A:\SCREN213.GIF file saved

Detector mode: Average

Polarity: Vertical

Agilent 21:41:56 Aug 18, 2006



Marker			
Select Marker	1	2	3
Normal			
Delta			
Delta Pair (Tracking Ref)			
Ref	▲		
Span Pair			
Span	Center		
Off			
More 1 of 2			

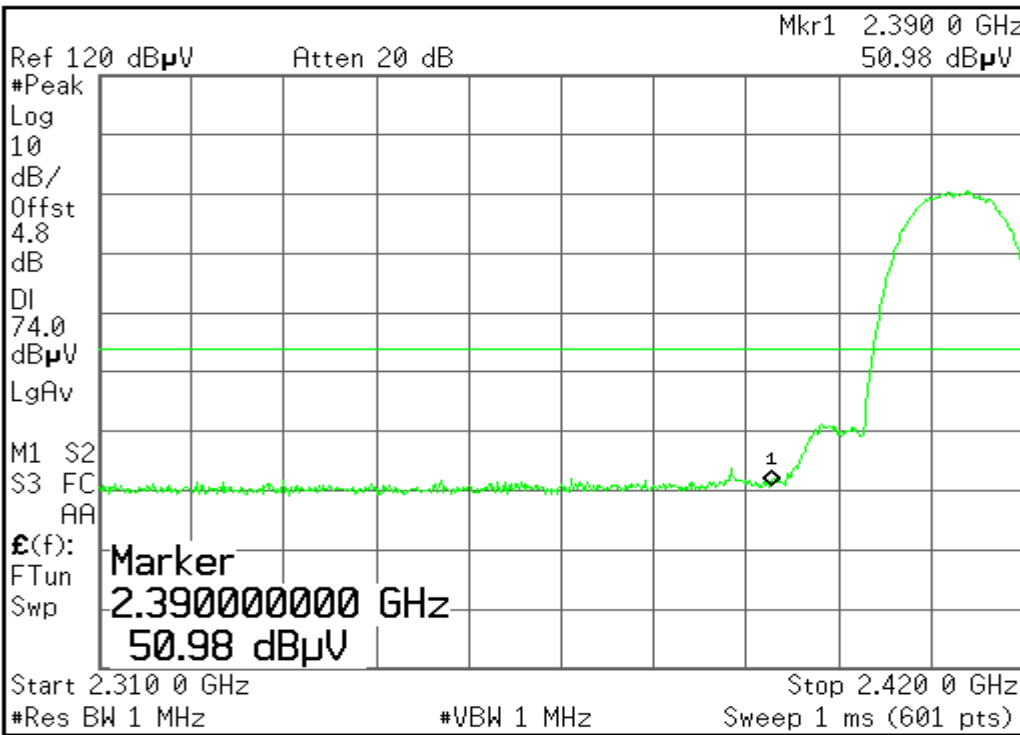
File Operation Status, A:\SCREN216.GIF file saved



Detector mode: Peak

Polarity: Horizontal

Agilent 21:37:03 Aug 18, 2006



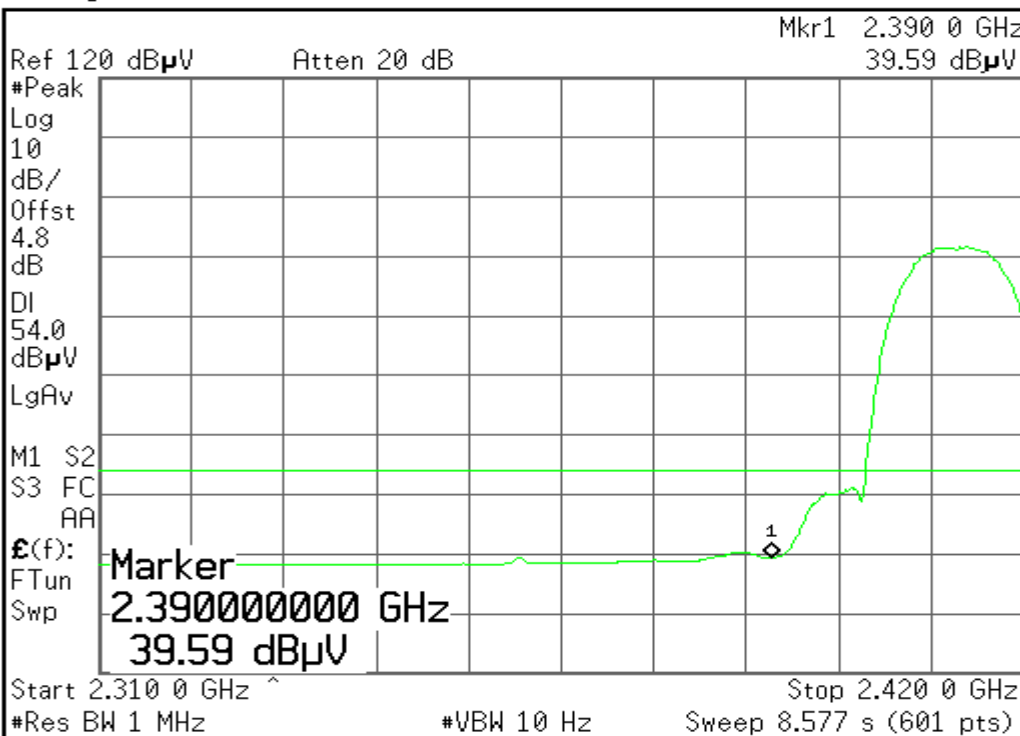
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref	▲			
Span Pair				
Span	Center			
Off				
More 1 of 2				

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Detector mode: Average

Polarity: Horizontal

Agilent 21:37:46 Aug 18, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref	▲			
Span Pair				
Span	Center			
Off				
More 1 of 2				

File Operation Status, A:\SCREN212.GIF file saved

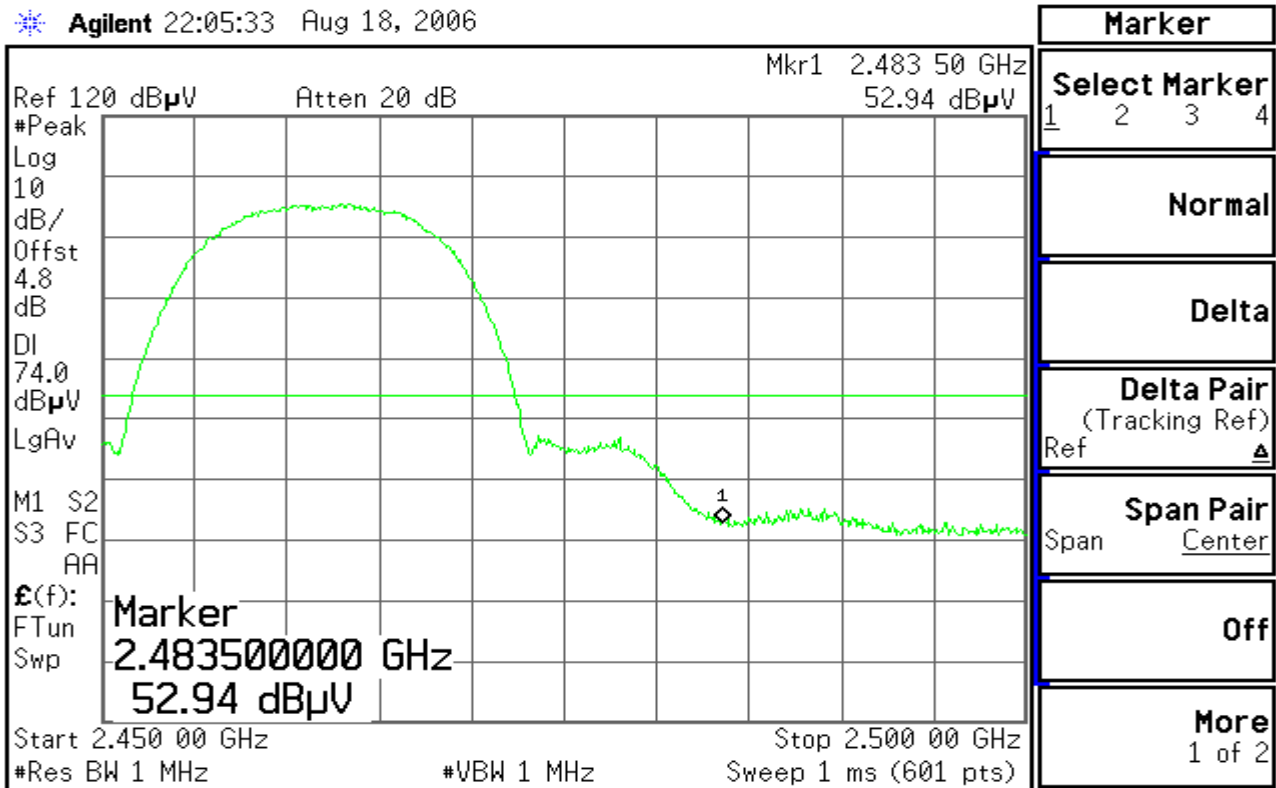


### Band Edges (CH High)

Detector mode: Peak

Polarity: Vertical

Agilent 22:05:33 Aug 18, 2006

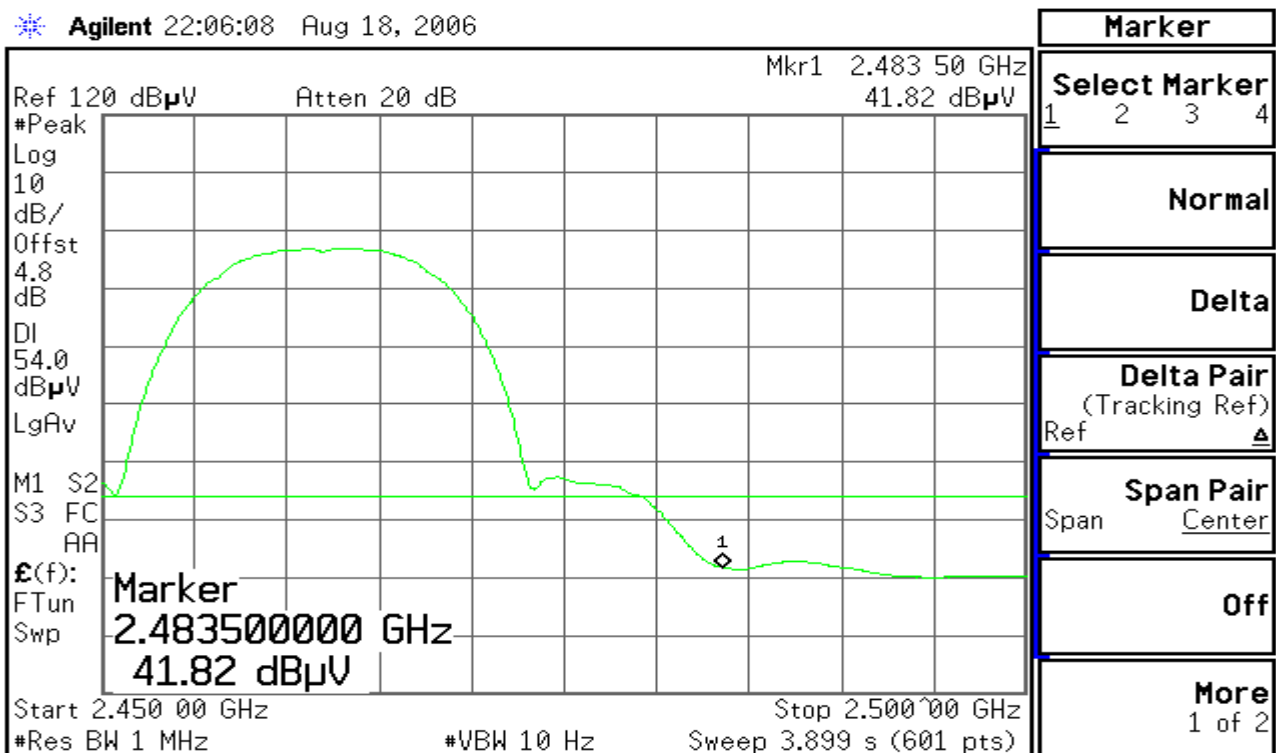


File Operation Status, A:\SCREN225.GIF file saved

Detector mode: Average

Polarity: Vertical

Agilent 22:06:08 Aug 18, 2006



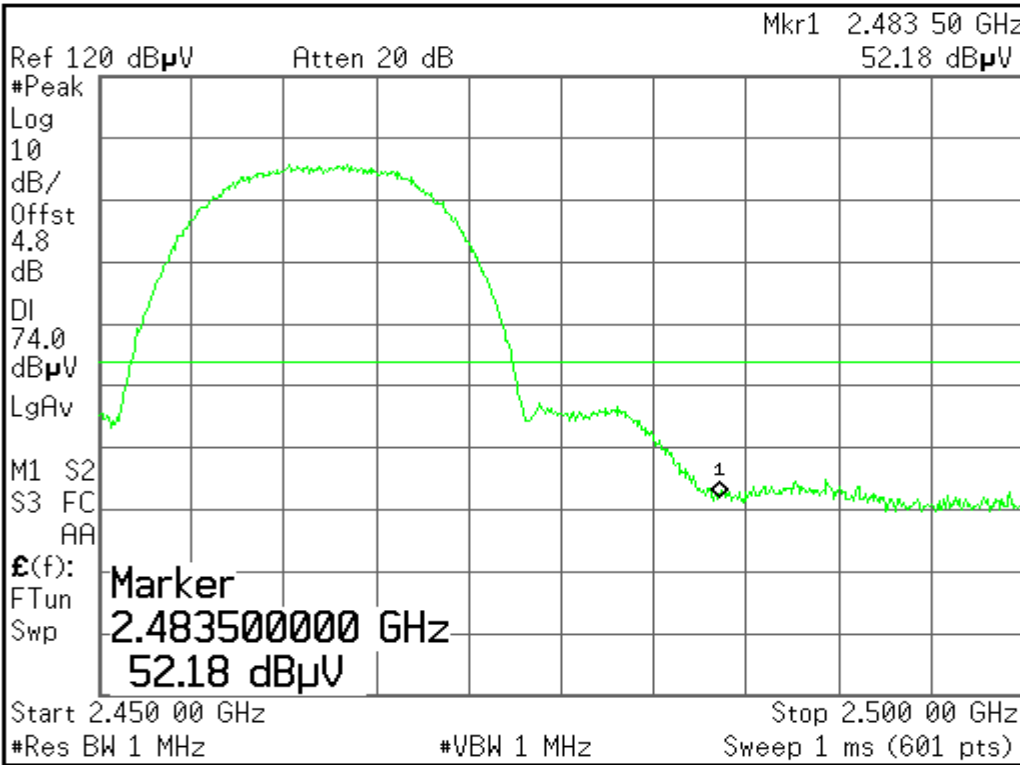
File Operation Status, A:\SCREN226.GIF file saved



Detector mode: Peak

Polarity: Horizontal

Agilent 22:08:59 Aug 18, 2006



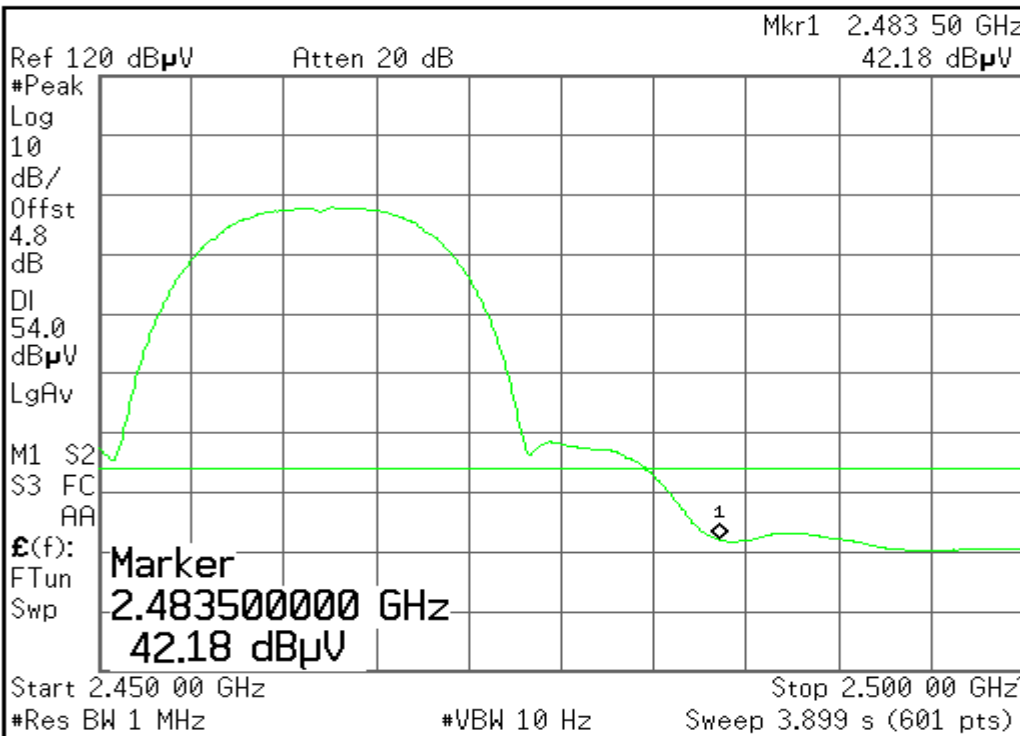
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref) Ref $\blacktriangle$				
Span Pair Span      Center				
Off				
More 1 of 2				

File Operation Status, A:\SCREN228.GIF file saved

Detector mode: Average

Polarity: Horizontal

Agilent 22:09:29 Aug 18, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref) Ref $\blacktriangle$				
Span Pair Span      Center				
Off				
More 1 of 2				

File Operation Status, A:\SCREN229.GIF file saved



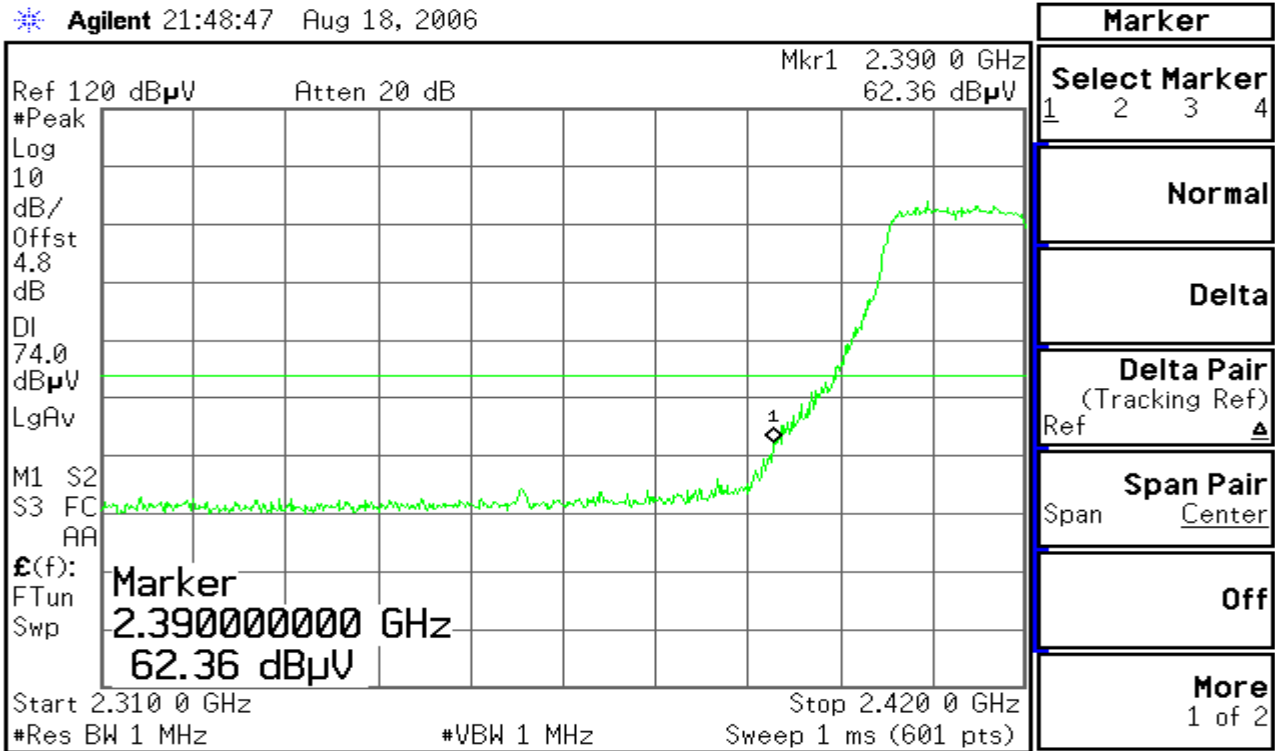
Test Plot (IEEE 802.11b mode)

Band Edges (CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 21:48:47 Aug 18, 2006

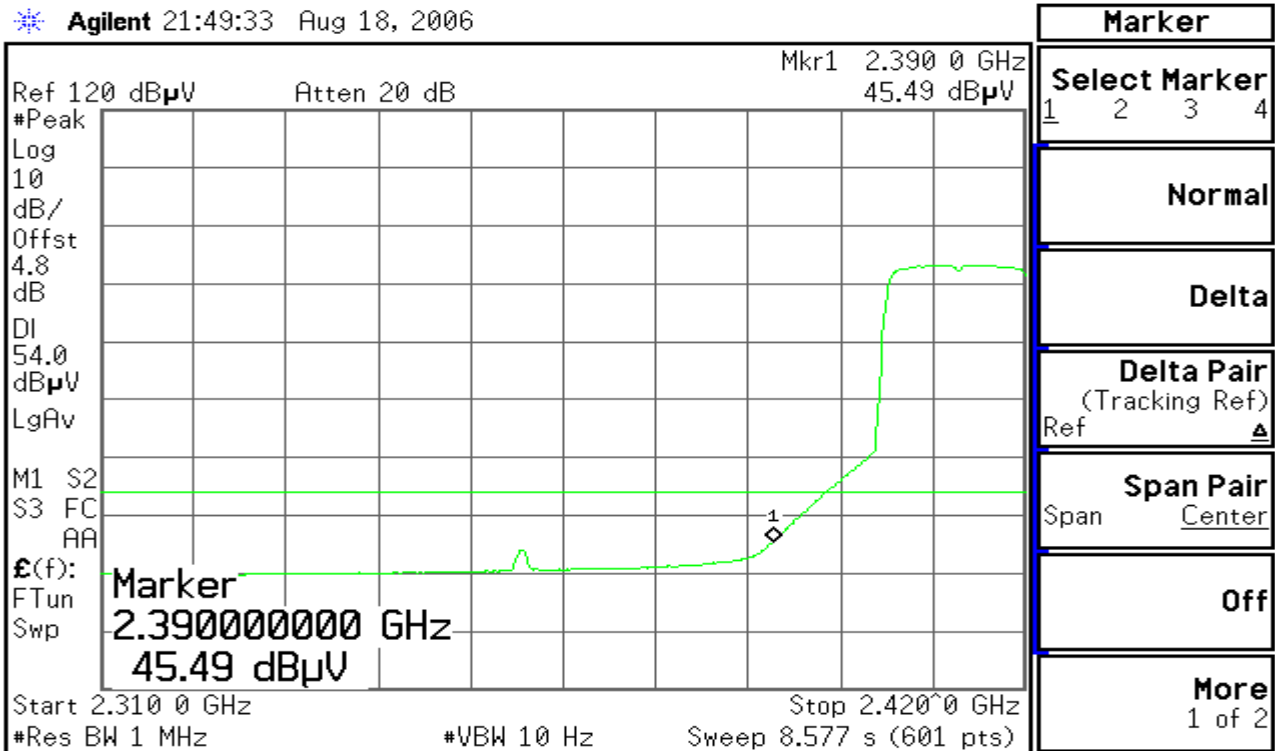


File Operation Status, A:\SCREN217.GIF file saved

Detector mode: Average

Polarity: Vertical

Agilent 21:49:33 Aug 18, 2006



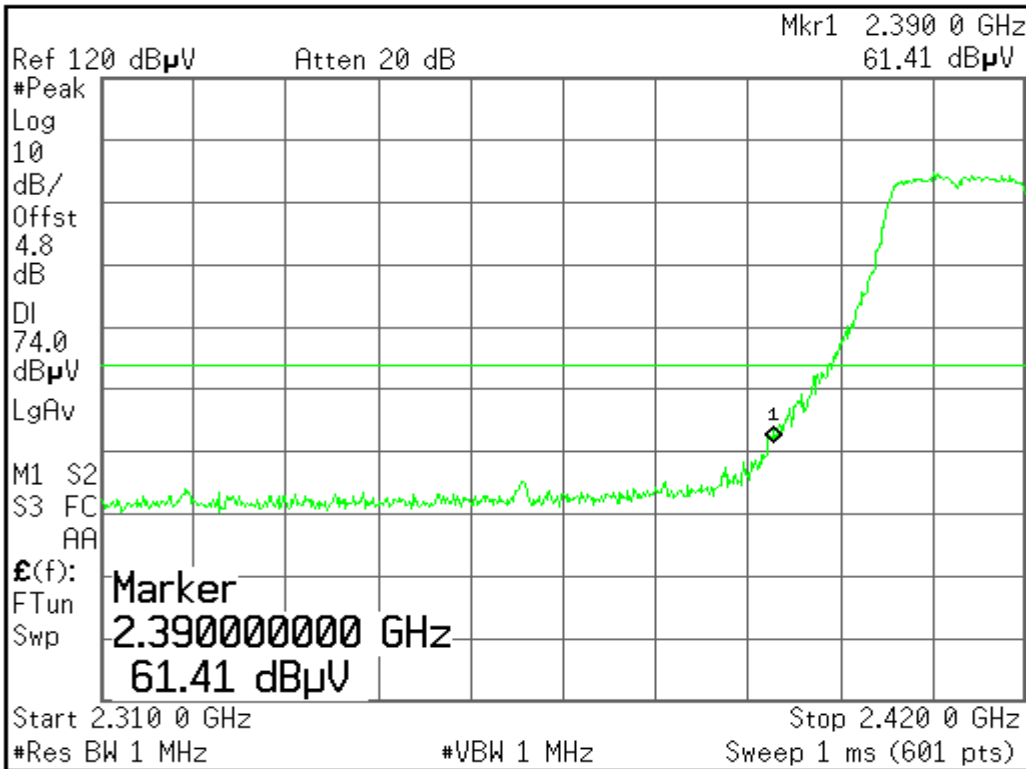
File Operation Status, A:\SCREN218.GIF file saved



Detector mode: Peak

Polarity: Horizontal

Agilent 21:52:05 Aug 18, 2006



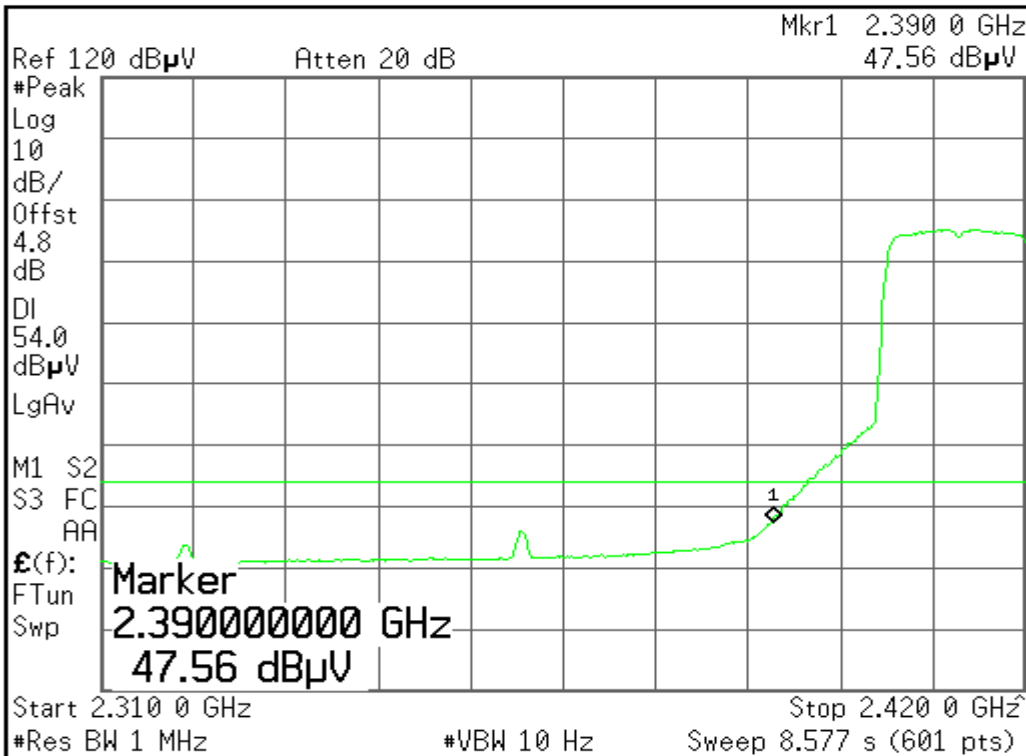
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref				
Span Pair				
Span		Center		
Off				
More 1 of 2				

File Operation Status, A:\SCREN219.GIF file saved

Detector mode: Average

Polarity: Horizontal

Agilent 21:52:39 Aug 18, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref				
Span Pair				
Span		Center		
Off				
More 1 of 2				

File Operation Status, A:\SCREN220.GIF file saved



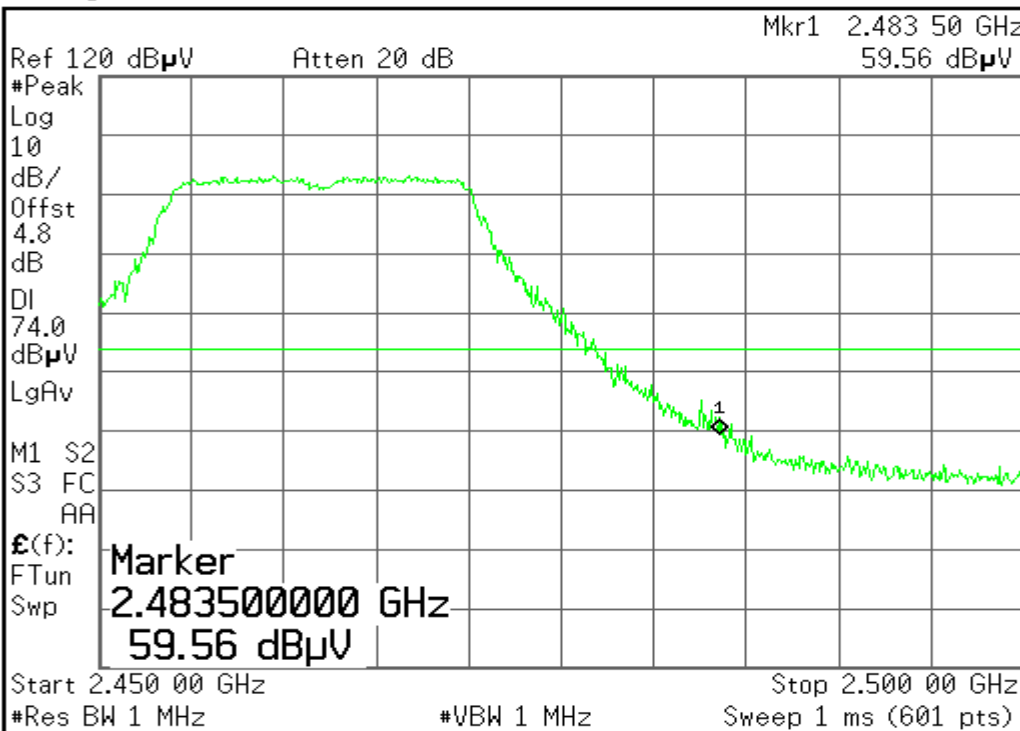


### Band Edges (CH High)

Detector mode: Peak

Polarity: Vertical

Agilent 21:59:50 Aug 18, 2006



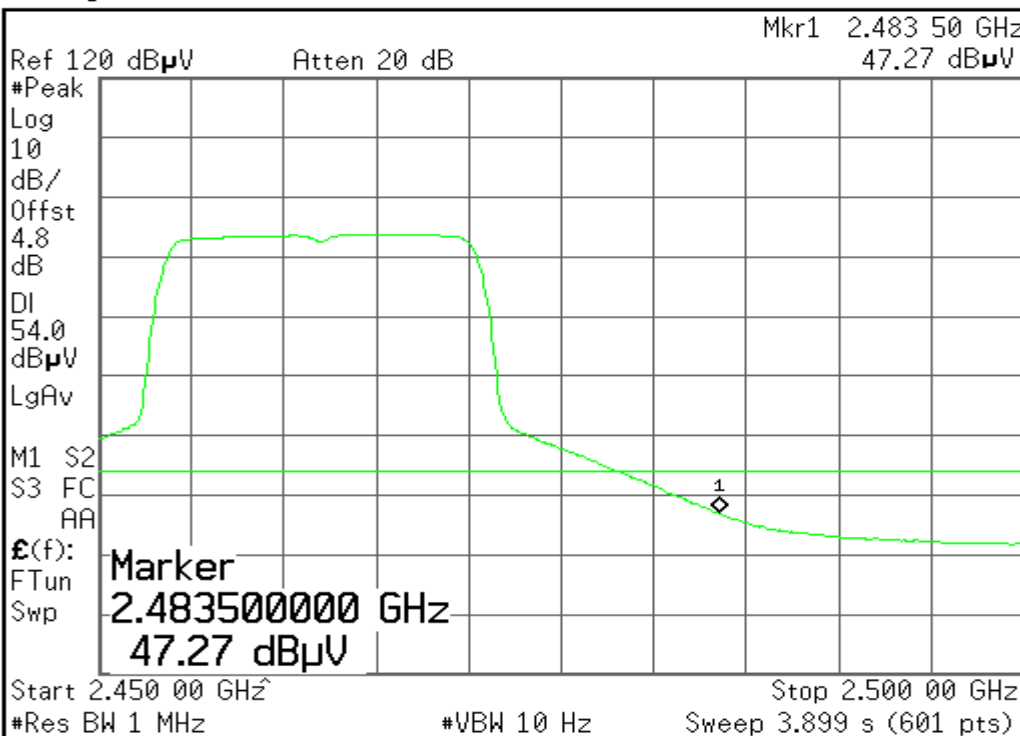
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref	▲			
Span Pair				
Span	Center			
Off				
More 1 of 2				

File Operation Status, A:\SCREN223.GIF file saved

Detector mode: Average

Polarity: Vertical

Agilent 22:00:20 Aug 18, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref	▲			
Span Pair				
Span	Center			
Off				
More 1 of 2				

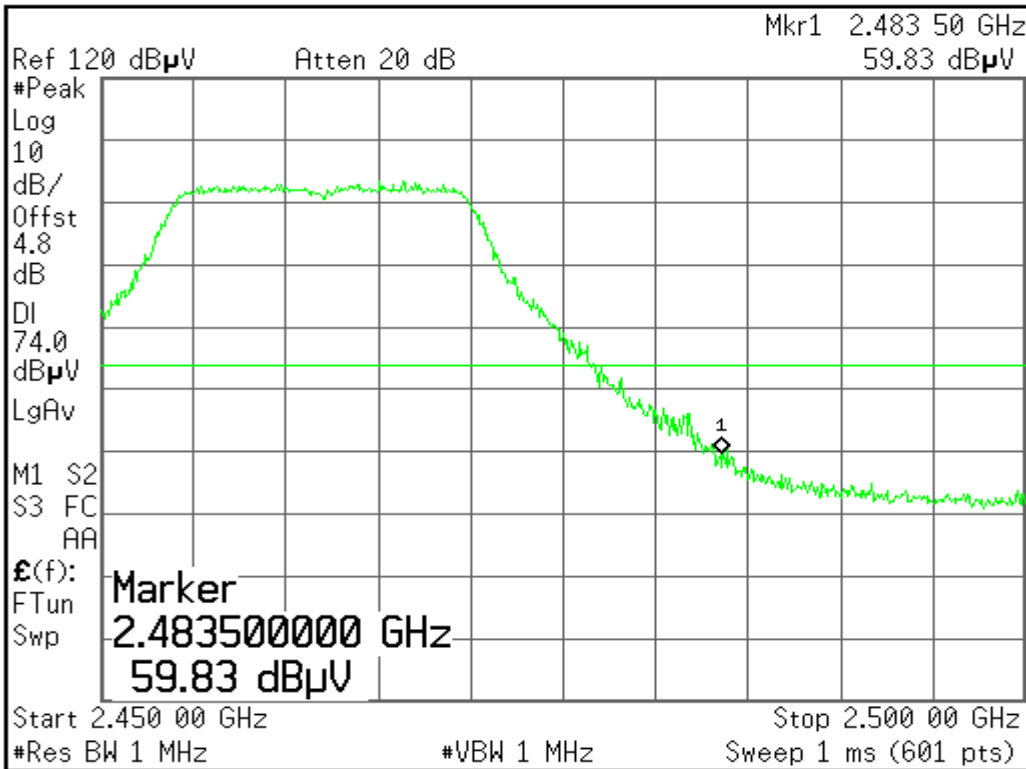
File Operation Status, A:\SCREN224.GIF file saved



Detector mode: Peak

Polarity: Horizontal

Agilent 21:57:36 Aug 18, 2006



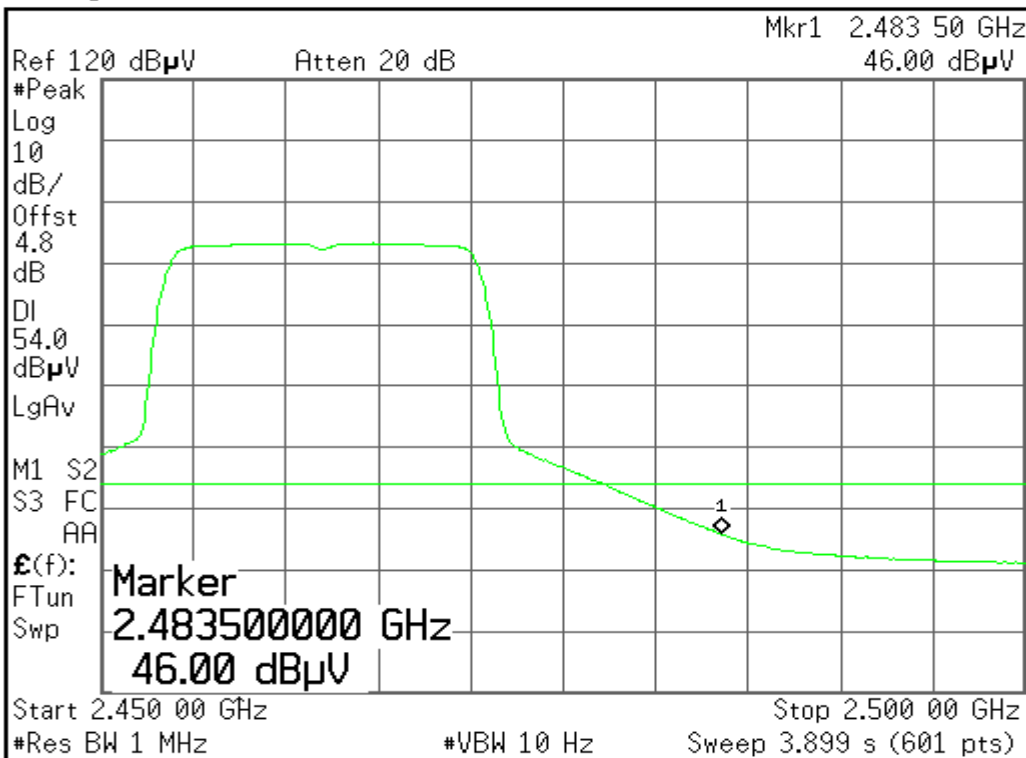
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref				
Span Pair Center				
Off				
More 1 of 2				

File Operation Status, A:\SCREN221.GIF file saved

Detector mode: Average

Polarity: Horizontal

Agilent 21:58:12 Aug 18, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref)				
Ref				
Span Pair Center				
Off				
More 1 of 2				

File Operation Status, A:\SCREN222.GIF file saved

**7.7. PEAK POWER SPECTRAL DENSITY MEASUREMENT**

**7.7.1. LIMITS**

1. 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.
2. According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

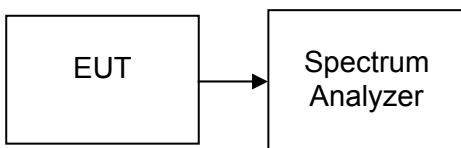
**7.7.2. TEST INSTRUMENTS**

Conducted Emissions Test Site				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007

**7.7.3. TEST PROCEDURES** (please refer to measurement standard)

1. Place the EUT on the table and set it in transmitting mode.  
Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

**7.7.4. TEST SETUP**





7.7.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-9.54	8.00	PASS
Mid	2437	-10.34		PASS
High	2462	-7.39		PASS

Test Data

Test mode: IEEE 802.11g

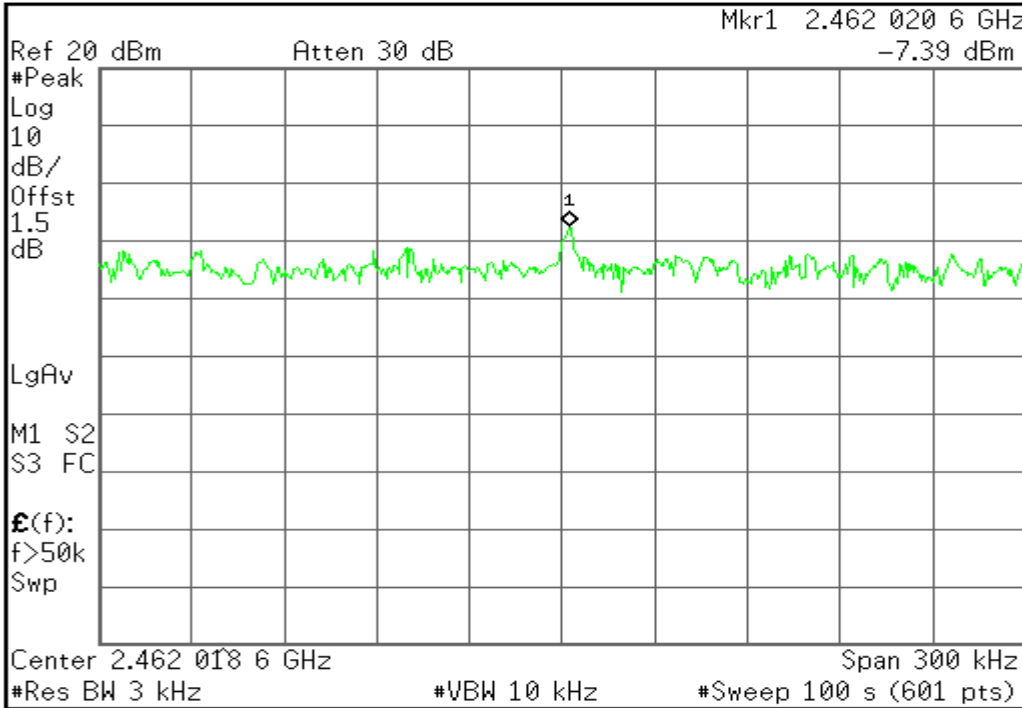
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-14.50	8.00	PASS
Mid	2437	-13.06		PASS
High	2462	-13.05		PASS





PPSD (CH High)

Agilent 14:33:58 Aug 15, 2006



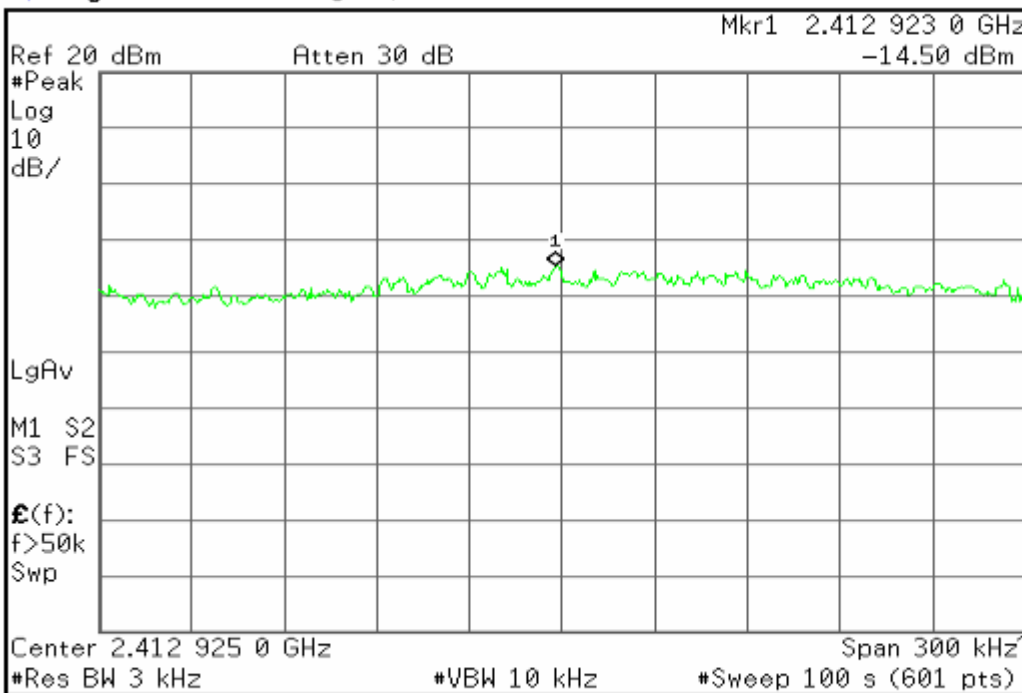
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref) Ref				
Span Pair Span      Center				
Off				
More 1 of 2				

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Test Plot (IEEE 802.11g mode)

PPSD (CH Low)

Agilent 14:55:06 Aug 15, 2006



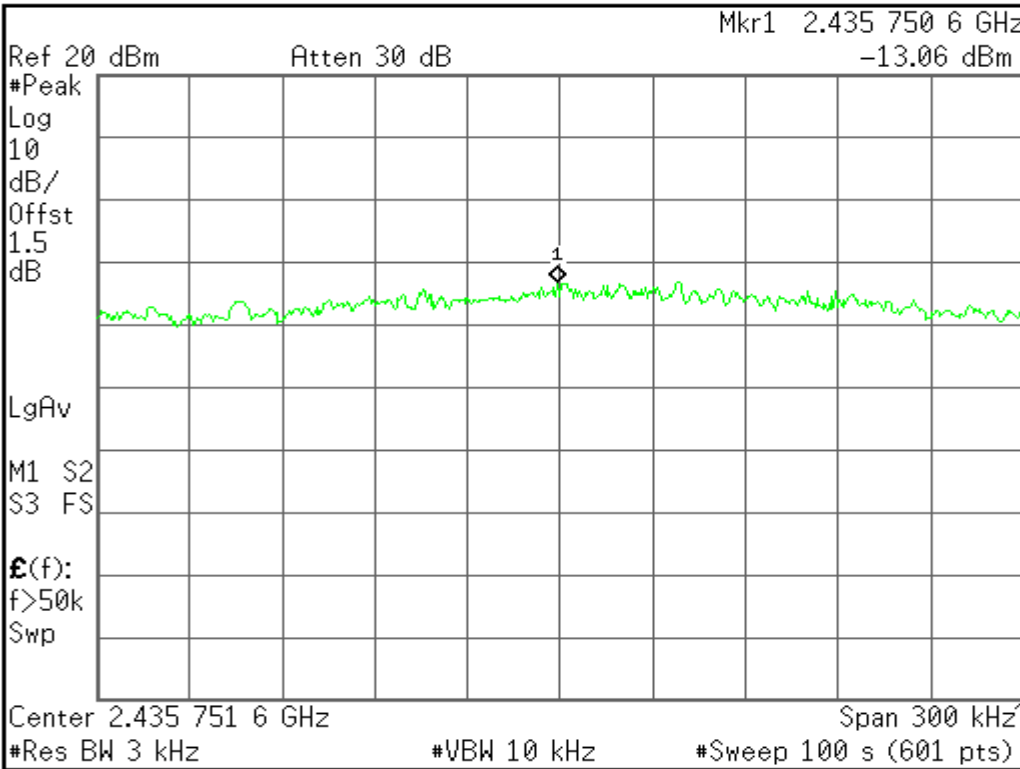
Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref) Ref				
Span Pair Span      Center				
Off				
More 1 of 2				

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PPSD (CH Mid)

Agilent 14:46:28 Aug 15, 2006

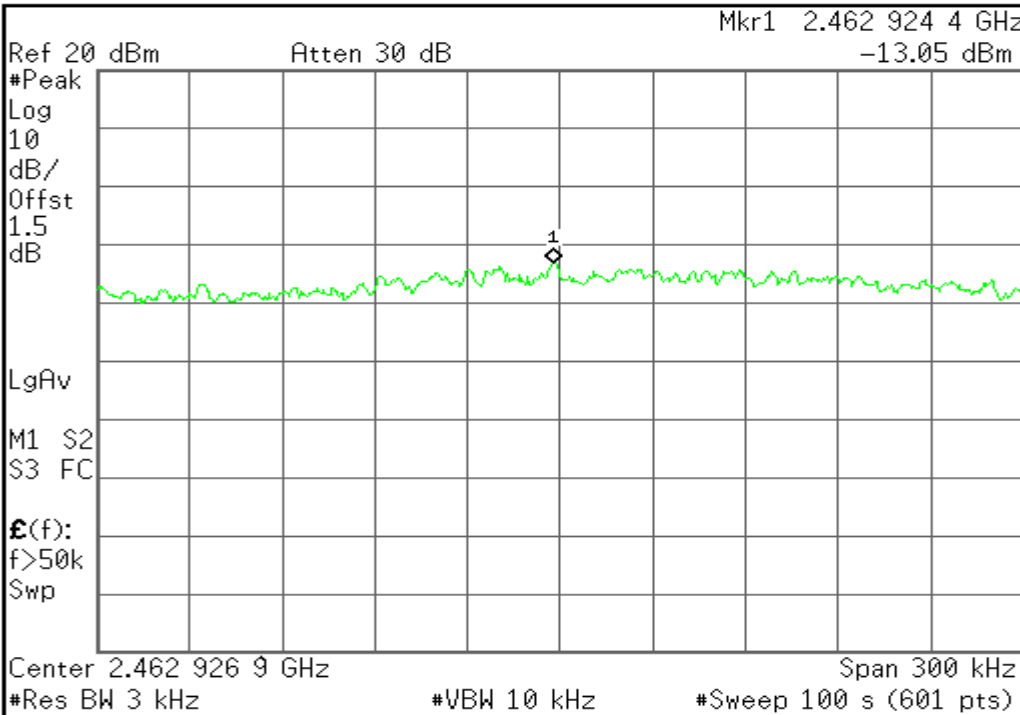


Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref) Ref				
Span Pair Span <u>Center</u>				
Off				
More 1 of 2				

File Operation Status, A:\SCREN416.GIF file saved

PPSD (CH High)

Agilent 14:40:42 Aug 15, 2006



Marker				
Select Marker	1	2	3	4
Normal				
Delta				
Delta Pair (Tracking Ref) Ref				
Span Pair Span <u>Center</u>				
Off				
More 1 of 2				

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# APPENDIX I RADIO FREQUENCY EXPOSURE

## LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

## EUT Specification

<b>EUT</b>	Notebook
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5.825GHz <input type="checkbox"/> Bluetooth: <u>2.402GHz ~ 2.480 GHz</u>
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna diversity</b>	<input type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	IEEE 802.11b: 16.64 dBm (46.13mW) IEEE 802.11g: 15.51 dBm (35.56mW)
<b>Antenna gain (Max)</b>	2.80 dBi (Numeric gain: 1.91)
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

### Remark:

1. The maximum output power is 16.64dBm (46.13mW) at 2412MHz (with 1.91 numeric antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.





**TEST RESULTS**

No non-compliance noted.

**Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{3770}$

Where  $E$  = Field strength in Volts / meter

$P$  = Power in Watts

$G$  = Numeric antenna gain

$d$  = Distance in meters

$S$  = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P (mW) = P (W) / 1000 \text{ and}$$

$$d (cm) = d(m) / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

**Maximum Permissible Exposure**

EUT output power = 46.13mW

Numeric Antenna gain = 1.91

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where  $P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

→ Power density = 0.0175mW / cm<sup>2</sup>

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm<sup>2</sup> even if the calculation indicates that the power density would be larger.)

## **APPENDIX II PHOTOGRAPHS OF THE TEST CONFIGURATION**

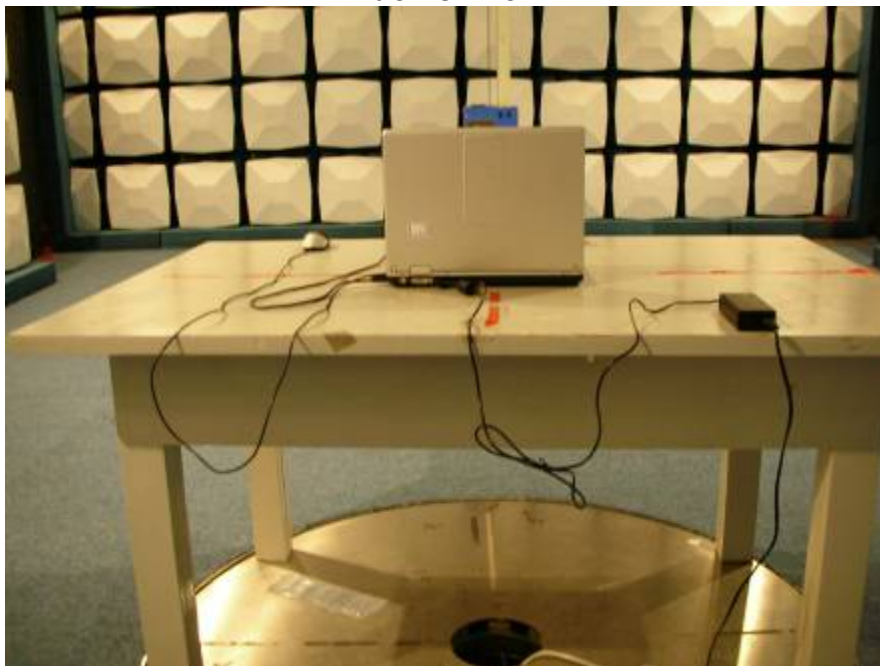
**Conducted Emissions Setup Photo**



**Radiated Emissions Setup Photos**  
*Front of view*



*Back of view*



**Power Line Conducted Emissions Setup Photos**

*Front of view*



*Right of view*

