



FCC TEST REPORT

for

802.11g Wireless ADSL2+ 4-port Gateway

MODEL: P-660HW-D1 v2 ; P-660HW-D3 v2 ;401681

Test Report Number:

KS070423A02-RP

Issued for

ZyXEL Communications Corporation

No. 6, Innovation Rd. II Science Based Industrial Park, Hsin-Chu, Taiwan.

Issued by:

Compliance Certification Services Inc.

Kun shan Laboratory

No.10 Weiye Rd, Innovation park, Eco&Tec,
Development Zone, Kunshan City, Jiangsu, P.R.O.C

TEL: 86-512-57355888

FAX: 86-512-57370818

Issued Date: May 9, 2007



Lab. Code: 200581-0



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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	May 9,2007	Initial Issue	ALL	Miro Chueh



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1 TEST CERTIFICATION

Product: 802.11g Wireless ADSL2+ 4-port Gateway

Model: P-660HW-D1 v2; P-660HW-D3 v2; 401681

Brand: ZyXEL

Tested: April 24, 2006~May 9, 2007

Applicant: ZyXEL Communications Corporation

No. 6, Innovation Rd. II Science Based Industrial Park, Hsin-Chu, Taiwan.

Manufacturer: ZyXEL Communications (WuXi) CO., Ltd

Wuxi New District 60#-E Jiangsu PRC

APPLICABLE STANDARDS

Standard	Test Type	Standard	Test Type
15.207(a)	Power Line Conducted Emissions	15.247(d) 15.209(a)	<ul style="list-style-type: none"> ● 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:

Miro Chueh
Section Manager
Compliance Certification Service Inc.

Reviewed by:

Lin Zhang
EMC Supervisor
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

Product	802.11g Wireless ADSL2+ 4-port Gateway
Trade Name	ZyXEL
Model Number	P-660HW-D1 v2; P-660HW-D3 v2; 401681
Model Discrepancy	All the above models are identical except the model designation for different market.
Wireless LAN module Model Number	ZyAIRG-663
Wireless LAN module Brand name	ZyXEL
Received Date	April 25, 2007
Power Adapter Power Rating	Powered from an AC/DC power adapter Model Number:DV-121AACS Manufacturer: DVE Input: AC 120V, 60Hz, 23W Output: AC 12V, 1000mA
AC Power Cord Type	Unshielded, 1.8m (Detachable) to Power Adapter
DC Power Cable Type	Unshielded, 1.8m (Non-Detachable) at Power Adapter with a core
Frequency Range	2412 ~ 2462 MHz
Transmit Power	IEEE 802.11b: 16.25 dBm IEEE 802.11g: 14.27 dBm
Modulation Technique	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: DSSS (CCK, DQPSK, DBPSK) + OFDM (QPSK, BPSK, 16-QAM, 64-QAM)
Transmit Data Rate	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
Number of Channels	11 Channels
Antenna Specification	PIFA antenna with 3.76dBi 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: **I88P660HWDXV2** 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 had been tested under operating condition.

The EUT comes with two types of adapter for sale. After the preliminary test, the EUT with adapter (Model: DV-121AACS) 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.	Server	ZyXEL	IES-1000	A0100222-539 0020	DoC	N/A	Shielded, 1.8m
2	Notebook	LEO	M285	1824064-1B	DoC	Line cable: Un-Shielded 1.8m LAN cable: Un-Shielded 1.8m	Shielded, 1.8m

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.

USA	FCC,NVLAP
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA,
Taiwan	TAF

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 CISPR 16-4-2:

Measurement	Frequency		Uncertainty
Conducted emissions	9kHz~30MHz		+/- 2.15dB
Radiated emissions	Horizontal	30MHz ~ 200MHz	+/- 2.50dB
		200MHz ~1000MHz	+/- 2.50dB
	Vertical	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	02/11/2008
EMC Analyzer	Agilent	E7402A	US41160329	02/11/2008
LISN	FCC	FCC-LISN-50-50-2-M	01067	02/11/2008
LISN (EUT)	FCC	FCC-LISN-50-50-2-M	01068	02/11/2008
FOUR BALANCED TELECOM PAIRS ISN	FCC	FCC-TLISN-T8-02	20165	07/30/2007
4-WIRE ISN	R&S	ENY41	830663/024	04/08/2008
Double 2-Wire ISN	R&S	ENY22	830661/027	04/08/2008
TRANSIENT LIMITER	SCHAFFNER	CFL9206	1710	03/15/2008
EMI Monitor control box	FCC	0-SVDC	N/A	05/11/2008

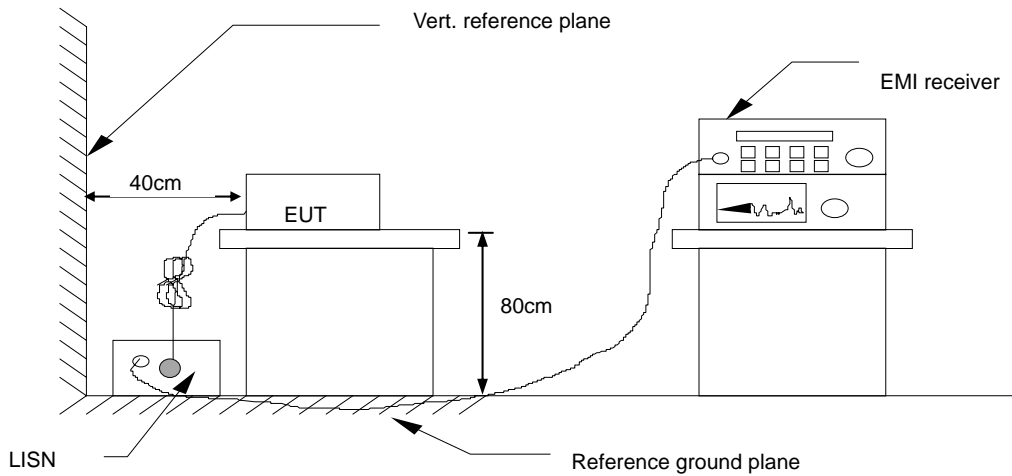
- NOTE:**
- 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 - 2. N.C.R = No Calibration Request.



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
x.xx	31.99	32.72	10.38	42.37	43.1	65.86	55.86	-23.49	-12.76	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

Model No.	P-660HW-D1 v2	Test Mode	Normal Link
Environmental Conditions	25deg.C, 65% RH, 991 hPa	6dB BANDWIDTH	9 kHz
Tested by:	jeff		

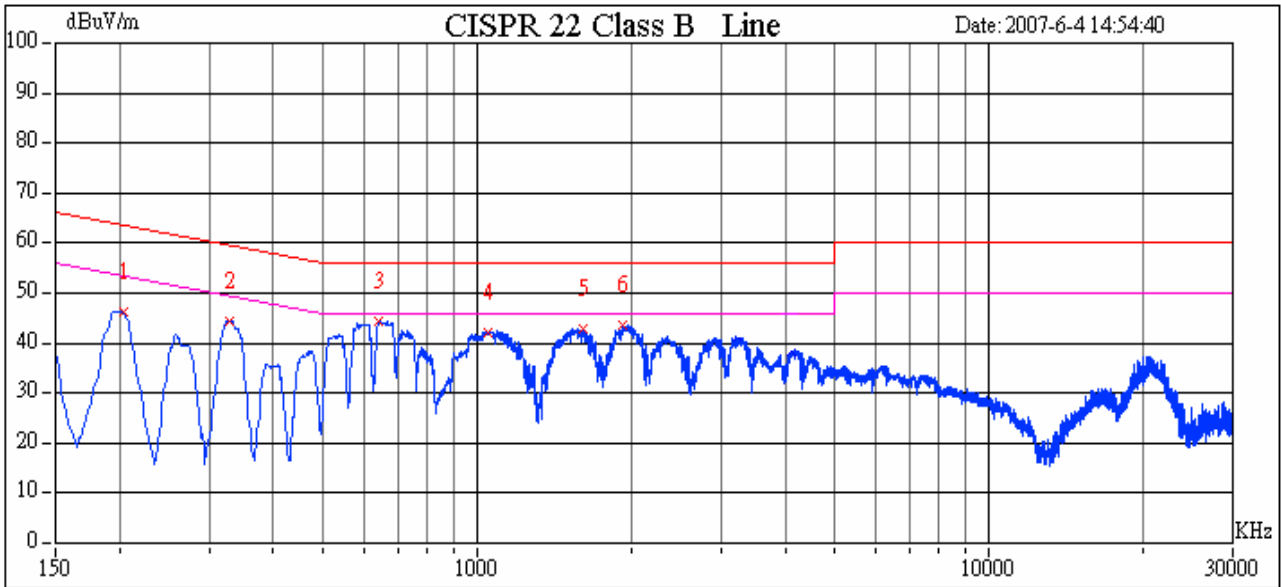
Frequency (KHz)	QP Reading (dBuV)	AV Reading (dBuV)	Corr. factor (dB)	QP Result (dBuV)	AV Result (dBuV)	QP Limit (dBuV)	AV Limit (dBuV)	QP Margin (dB)	AV Margin (dB)	Note
203.7	27.61	27.69	10.36	37.97	38.05	64.47	54.47	-26.50	-16.42	L1
334.5	24.36	24.17	10.4	34.76	34.57	60.73	50.73	-25.97	-16.16	L1
649	18.31	17.83	10.41	28.72	28.24	56.00	46.00	-27.28	-17.76	L1
1047.3	12.04	12.46	10.43	22.47	22.89	56.00	46.00	-33.53	-23.11	L1
1606	13.29	13.21	10.48	23.77	23.69	56.00	46.00	-32.23	-22.31	L1
1952.3	15.29	14.67	10.51	25.8	25.18	56.00	46.00	-30.20	-20.82	L1
322.6	15.05	16.38	10.4	25.45	26.78	61.07	51.07	-35.62	-24.29	L2
746.7	14.57	14.5	10.4	24.97	24.9	56.00	46.00	-31.03	-21.10	L2
1147.9	12.42	12.45	10.43	22.85	22.88	56.00	46.00	-33.15	-23.12	L2
1485	13.61	12.91	10.46	24.07	23.37	56.00	46.00	-31.93	-22.63	L2
2019	8.43	8.47	10.5	18.93	18.97	56.00	46.00	-37.07	-27.03	L2
2414.1	9.67	9.99	10.52	20.19	20.51	56.00	46.00	-35.81	-25.49	L2

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

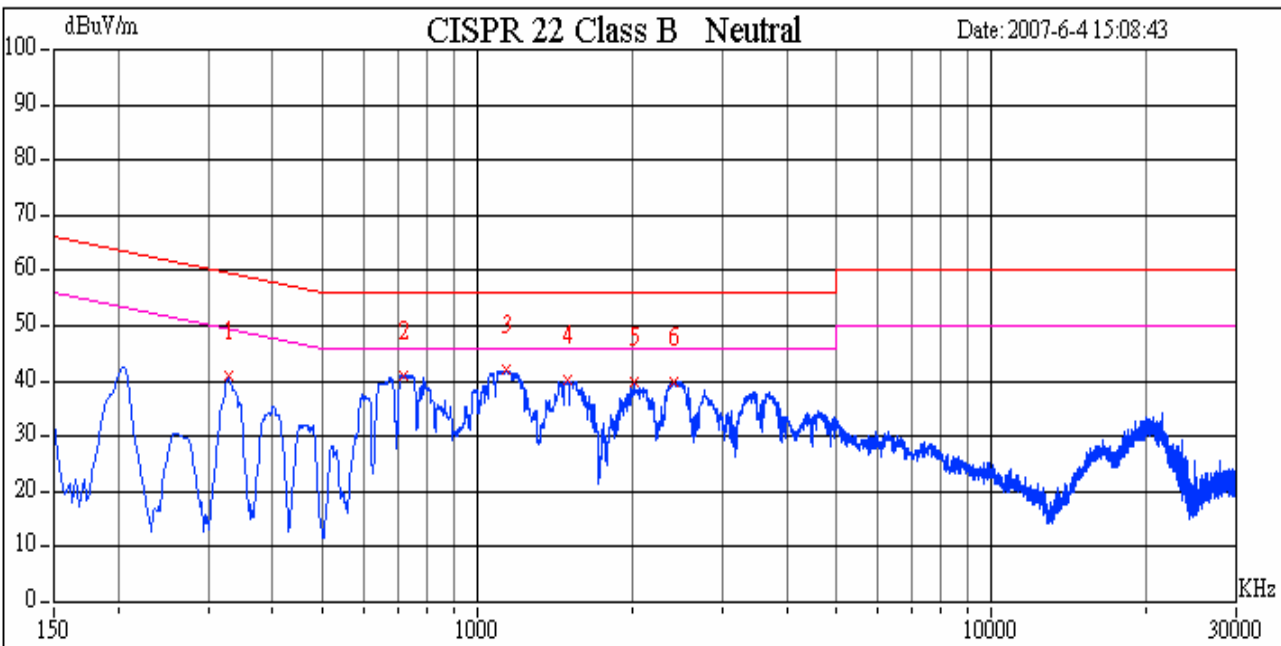


Test Plots

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

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

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.



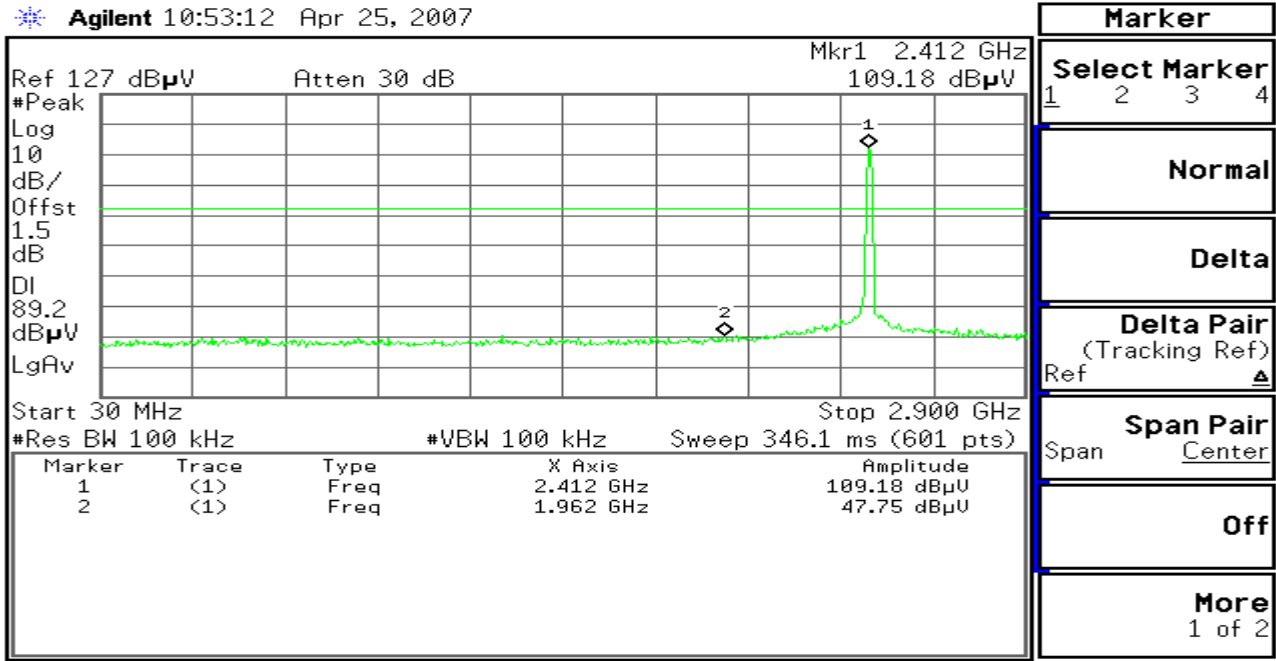
7.2.4. TEST RESULTS

Test Plot (IEEE 802.11b mode)

CH Low

30MHz ~ 2.9GHz

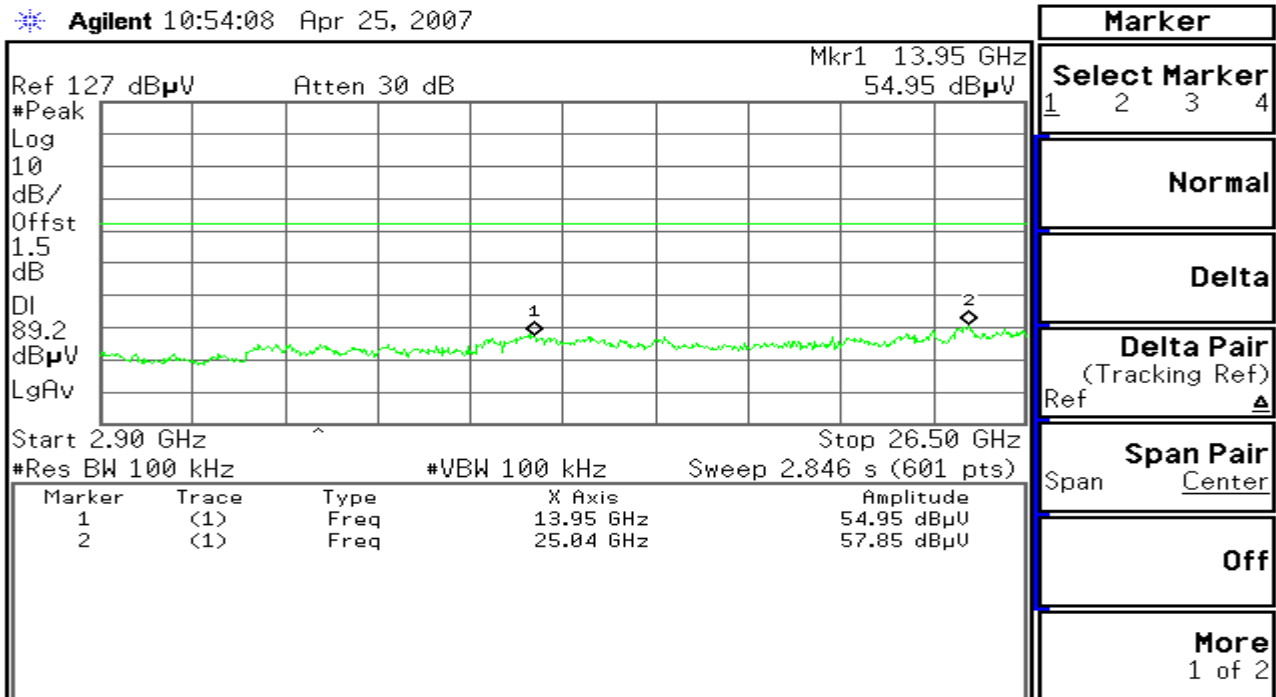
Agilent 10:53:12 Apr 25, 2007



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2.9GHz ~ 26.5GHz

Agilent 10:54:08 Apr 25, 2007



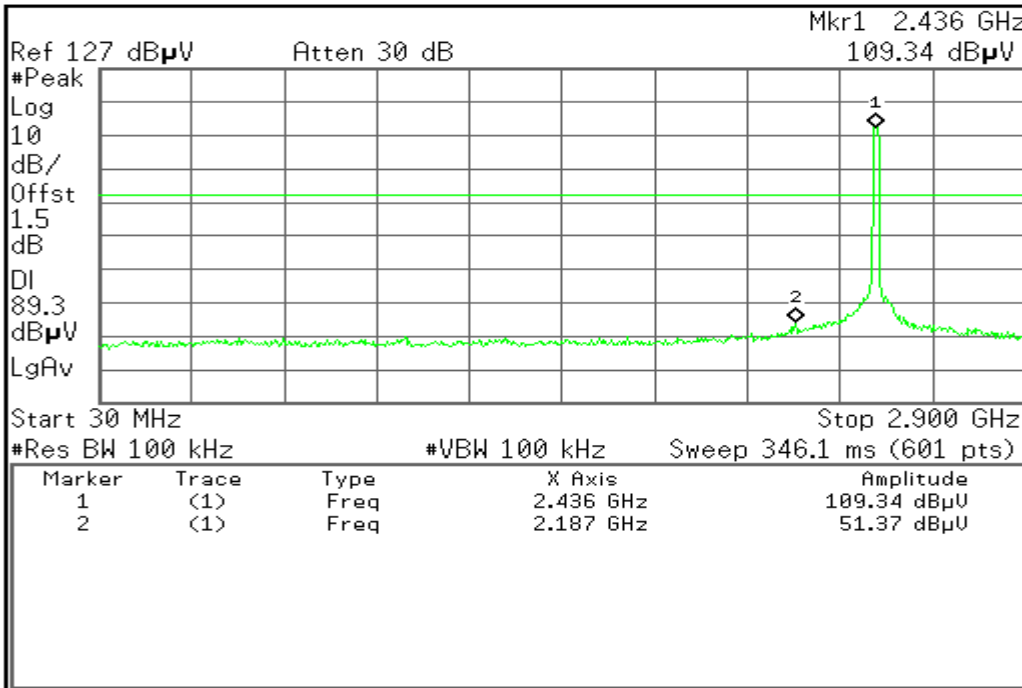
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CH Mid

30MHz ~ 2.9GHz

Agilent 10:51:03 Apr 25, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref ▲

Span Pair Center

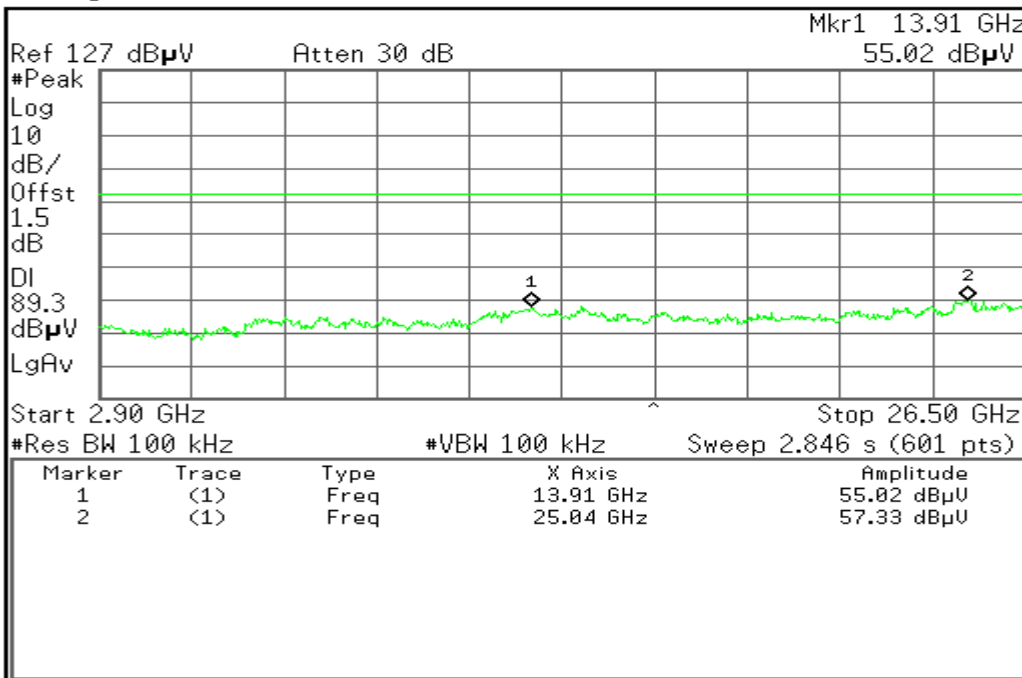
Off

More 1 of 2

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2.9GHz ~ 26.5GHz

Agilent 10:51:54 Apr 25, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref ▲

Span Pair Center

Off

More 1 of 2

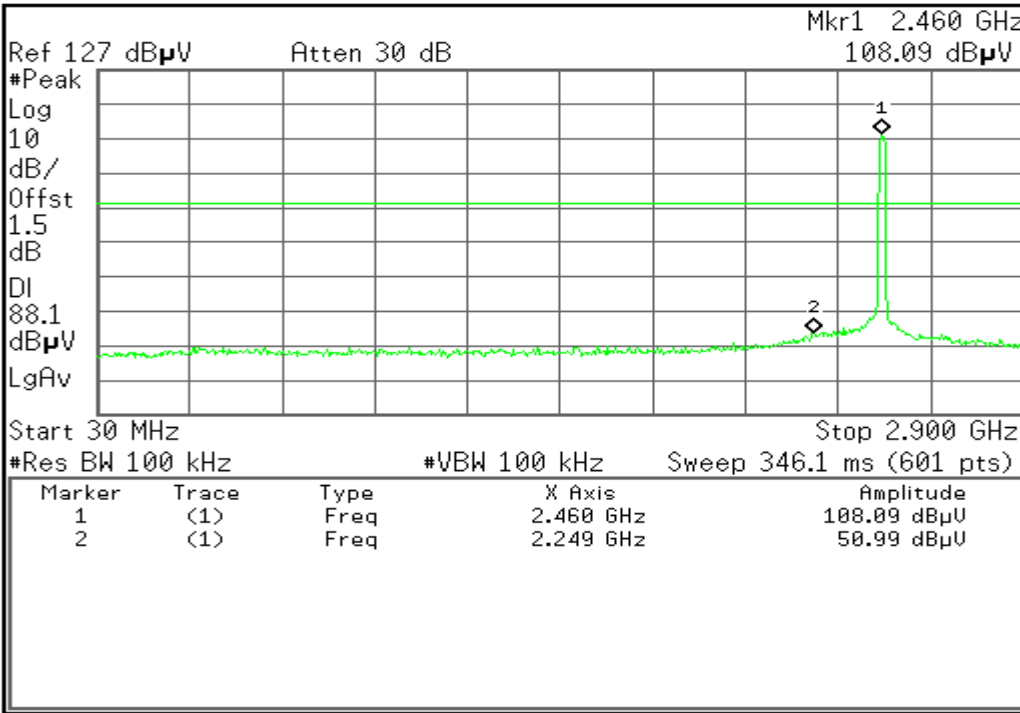
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CH High

30MHz ~ 2.9GHz

Agilent 10:48:32 Apr 25, 2007



Marker

Select Marker
1 2 3 4

Normal

Delta

Delta Pair
(Tracking Ref)
Ref ▲

Span Pair
Span Center

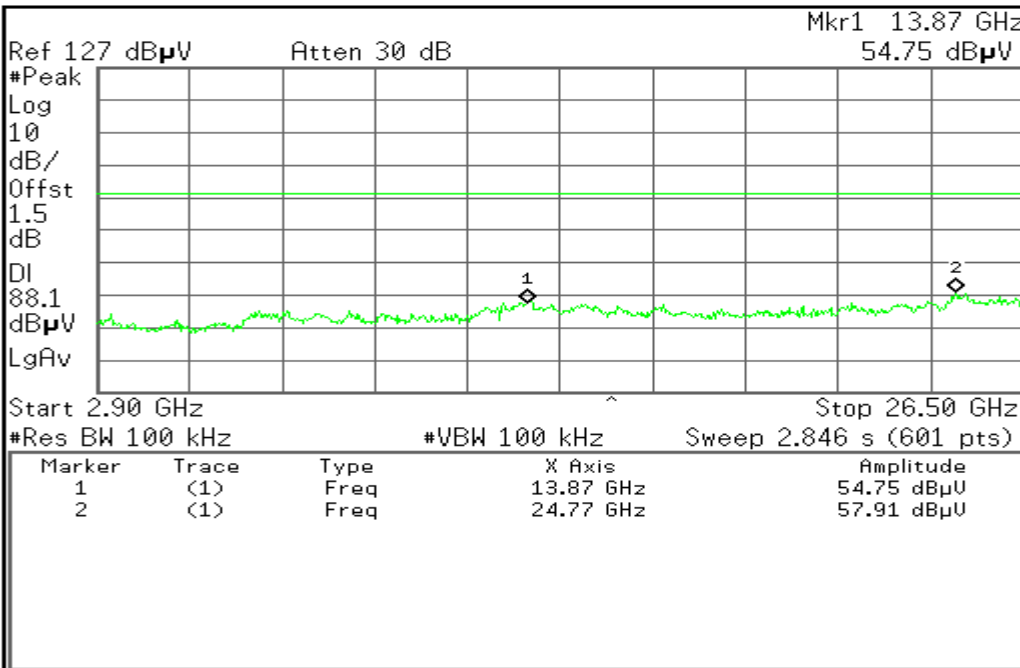
Off

More
1 of 2

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2.9GHz ~ 26.5GHz

Agilent 10:49:48 Apr 25, 2007



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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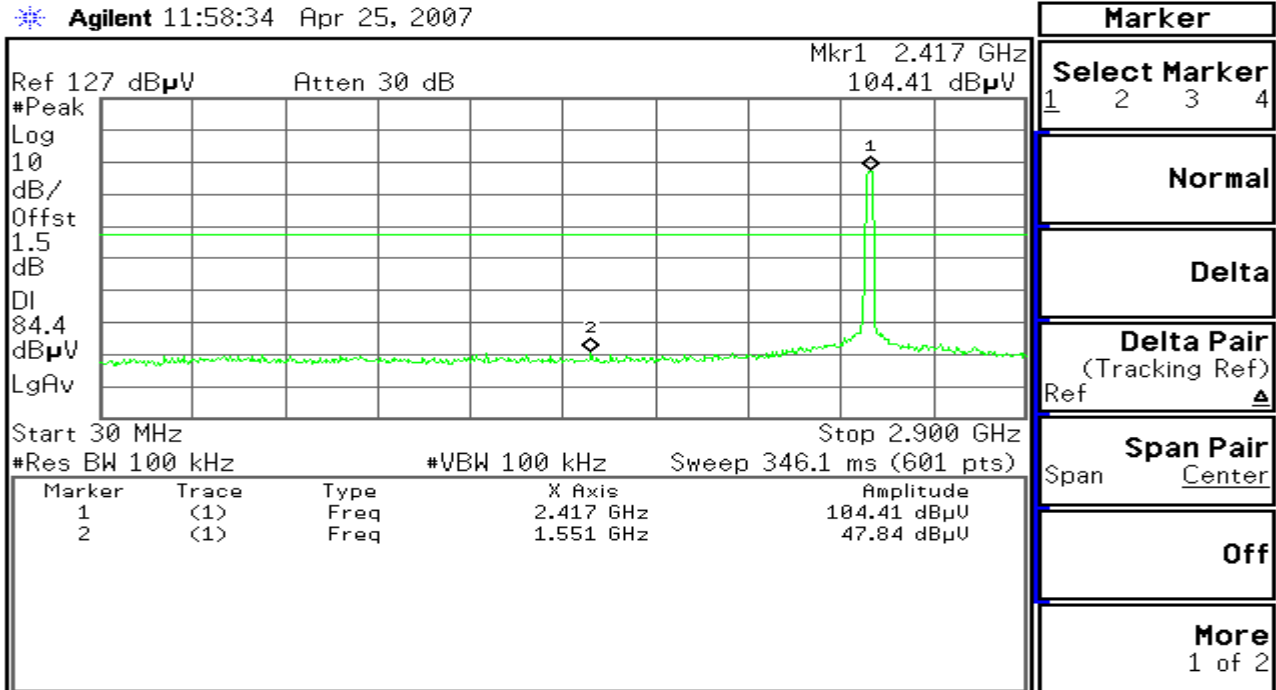


Test Plot (IEEE 802.11g mode)

CH Low

30MHz ~ 2.9GHz

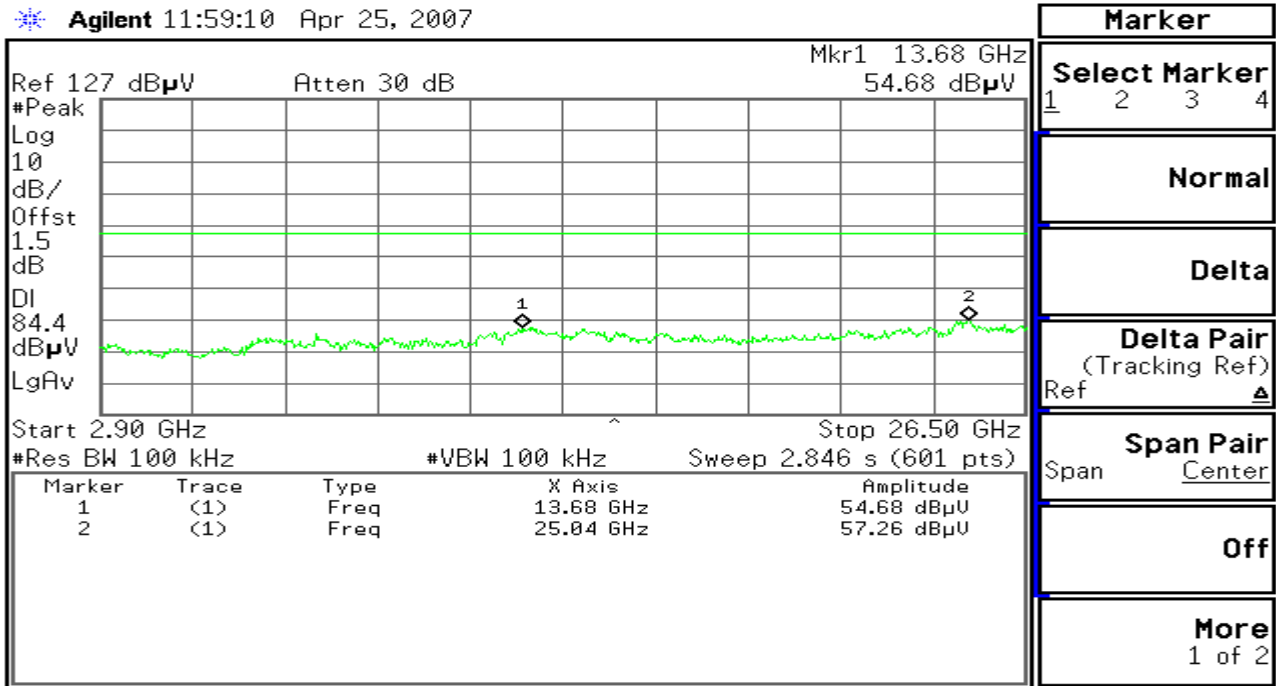
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2.9GHz ~ 26.5GHz

Agilent 11:59:10 Apr 25, 2007



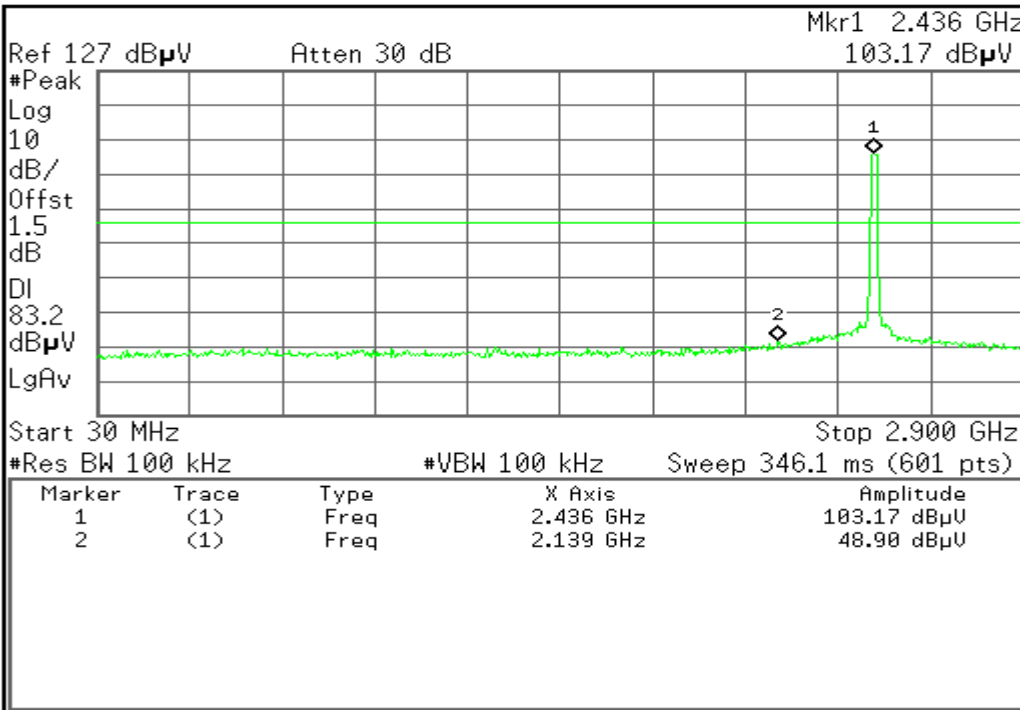
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CH Mid

30MHz ~ 2.9GHz

Agilent 11:54:36 Apr 25, 2007

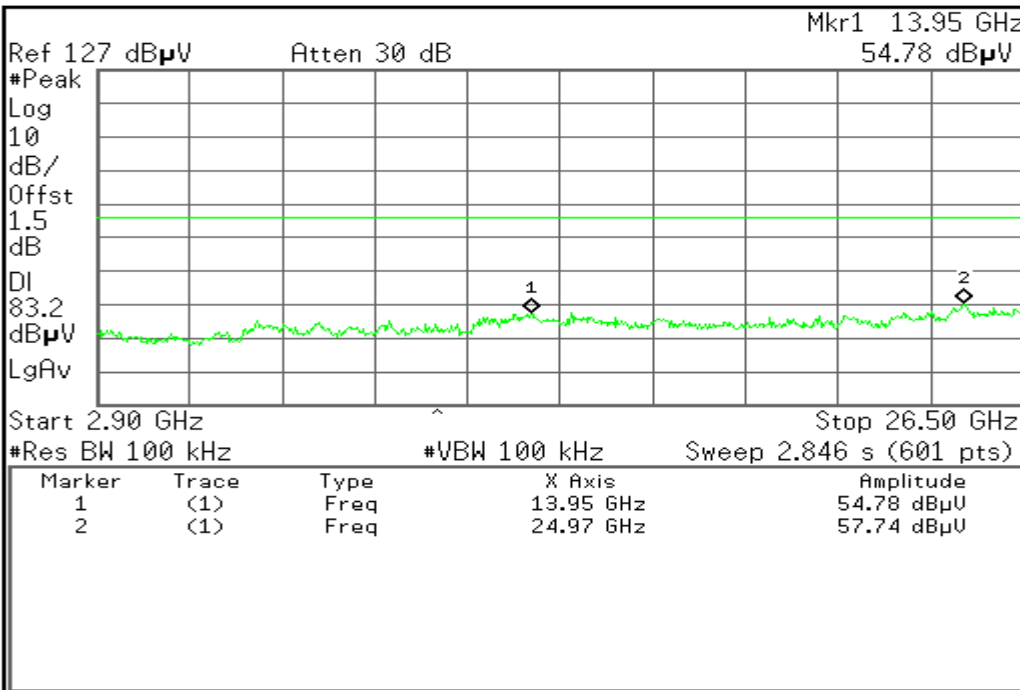


Marker
Select Marker 1 2 3 4
Normal
Delta
Delta Pair (Tracking Ref) Ref ▲
Span Pair Center
Off
More 1 of 2

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2.9GHz ~ 26.5GHz

Agilent 11:56:53 Apr 25, 2007



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

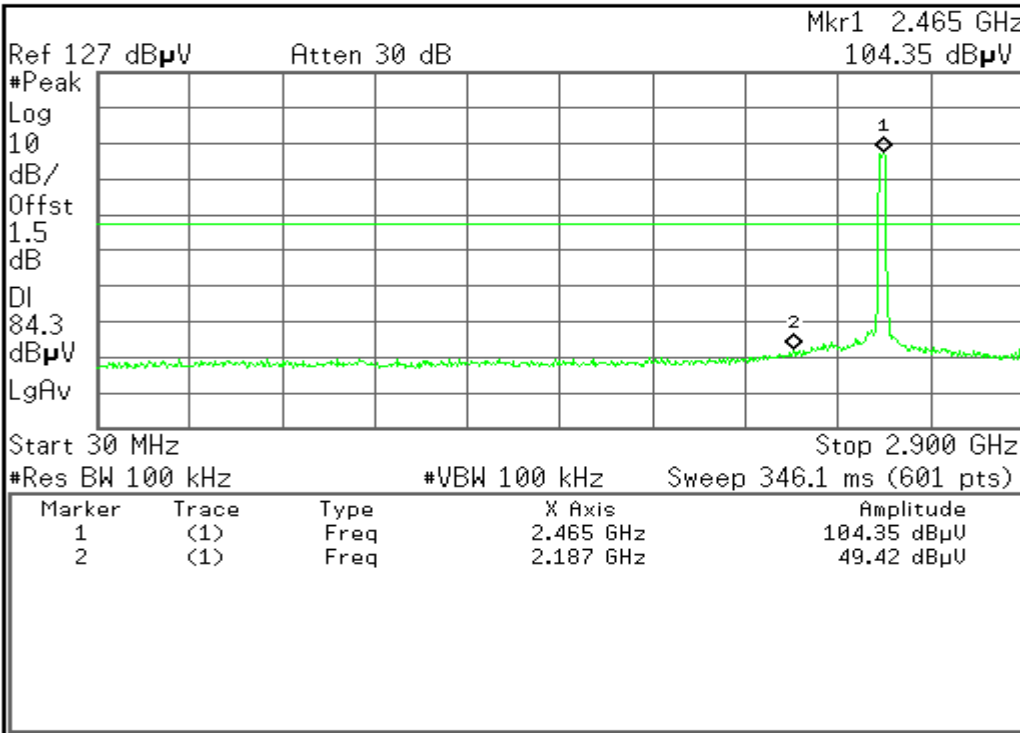
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CH High

30MHz ~ 2.9GHz

Agilent 11:52:02 Apr 25, 2007

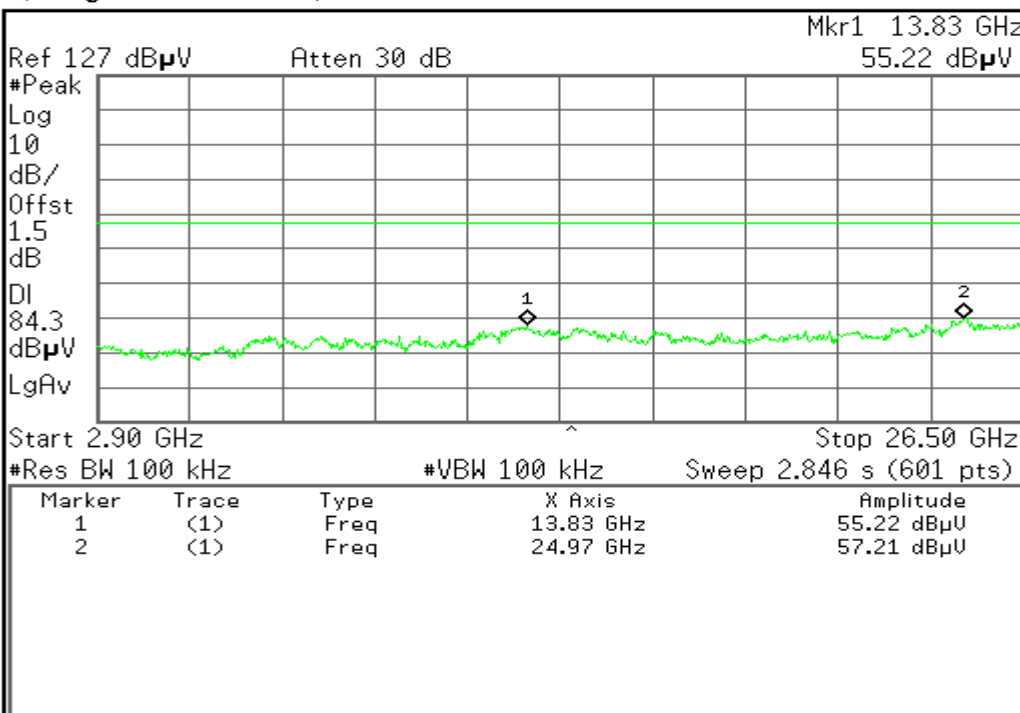


Marker			
<u>1</u>	2	3	4
Select Marker			
Normal			
Delta			
Delta Pair (Tracking Ref)			
Ref ▲			
Span Pair			
Center			
Off			
More 1 of 2			

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2.9GHz ~ 26.5GHz

Agilent 11:53:13 Apr 25, 2007



Marker			
<u>1</u>	2	3	4
Select Marker			
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	11/11/2007
Pre-Amplifier	MINI	ZFL-1000VH2	d041703	12/13/2007
Pre-Amplifier	Miteq	NSP4000-NF	870731	01/28/2008
Bilog Antenna	Sunol	JB1	A110204-2	11/22/2007
Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	02/01/2008
PSG Analog Signal Generator	Agilent	E8257C	MY43321570	12/19/2007
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	04/06/2008

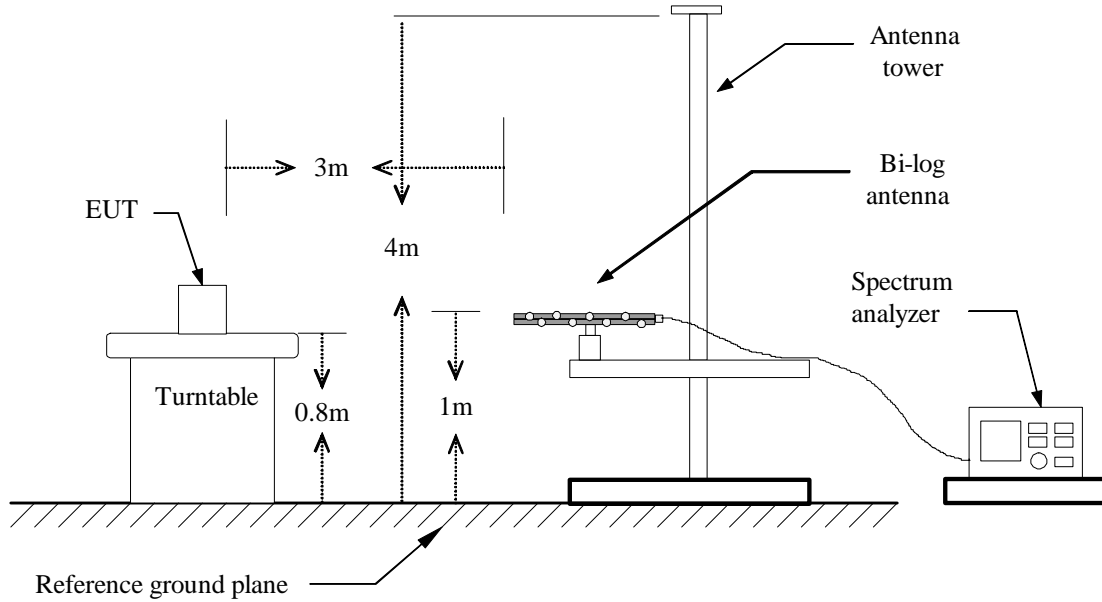
- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The FCC Site Registration number is 93105,90471.
 4. N.C.R = No Calibration Required.

7.2.5.3. TEST PROCEDURE (please refer to measurement standard)

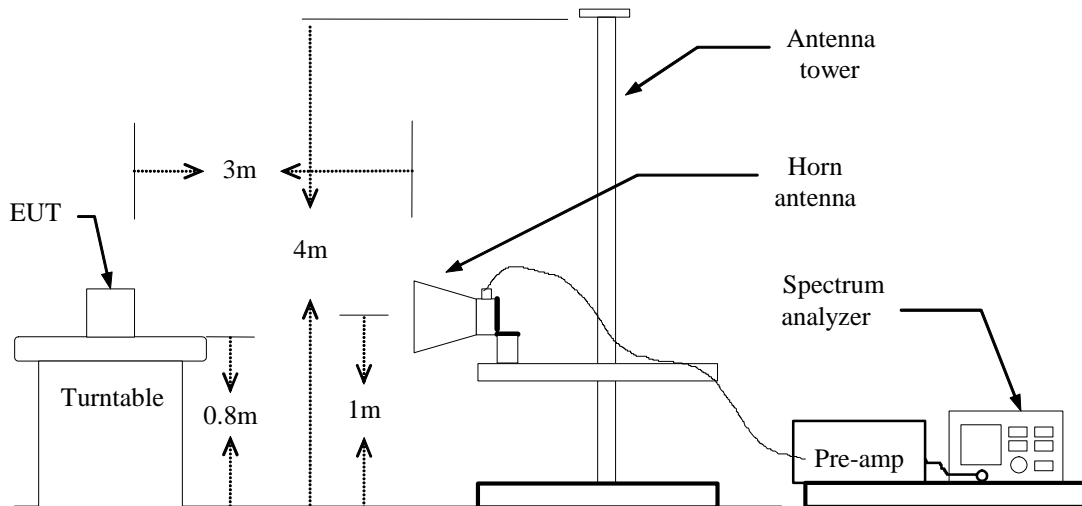
- The EUT is placed on a turntable, which is 0.8m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure 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 (Peak) (dBuV/m)	Margin (dB)	Remark
X.XX	V	12.12	10.21	22.33	37.00	-14.67	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
X.XX	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: May 2, 2007

Temperature: 24°C

Tested by: jeff

Humidity: 53 % RH

Polarity: Ver. / Hor.

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBUV)	Factor (dB)	Actual FS (dBUV/m)	Limit 3m (dBUV/m)	Safe Margin (dB)
99.98	V	Peak	49.24	-13.06	36.18	43.5	-7.32
151.5302	V	Peak	50.16	-10.33	39.83	43.5	-3.67
250.107	V	QP	52.85	-9.36	43.49	46.0	-2.51
375.0184	V	QP	48.02	-5.37	42.65	46.0	-3.35
751.1824	V	QP	42.16	0.12	42.28	46.0	-3.72
877.5351	V	QP	38.76	4.01	42.77	46.0	-3.23
98.0361	H	Peak	50.11	-12.98	37.13	43.5	-6.37
375.013	H	Peak	47.82	-5.37	42.45	46.0	-3.55
480.982	H	QP	44.09	-2.15	41.94	46.0	-4.06
601.503	H	Peak	42.13	-1.04	41.09	46.0	-4.91
750.005	H	QP	41.57	0.11	41.68	46.0	-4.32
877.5351	H	Peak	38.64	4.01	42.65	46.0	-3.35

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: May 2, 2007

Temperature: 24°C

Tested by: jeff

Humidity: 53 % 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
1196.67	V	50.34	44.37	-1.02	49.32	43.35	74.00	54.00	-10.65	AVG
4816.67	V	36.37	31.79	11	47.37	42.79	74.00	54.00	-11.21	AVG
7233.33	V	37.53	32.44	18.46	55.99	50.9	74.00	54.00	-3.10	AVG
N/A										
N/A										
N/A										
1190.00	H	49.52	42.19	-1.05	48.47	41.14	74.00	54.00	-12.86	AVG
4825.33	H	37.51	32.44	11.06	48.57	43.5	74.00	54.00	-10.50	AVG
7240.00	H	38.16	31.45	18.64	56.8	50.09	74.00	54.00	-3.91	AVG
N/A										
N/A										
N/A										

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

Test Date: May 2, 2007

Temperature: 24°C

Tested by: jeff

Humidity: 53 % 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
1463.33	V	45.73	38.75	0.19	45.92	38.94	74.00	54.00	-15.06	AVG
4875.33	V	39.01	32.19	11.64	50.65	43.83	74.00	54.00	-10.17	AVG
7305.67	V	39.26	26.48	18.75	58.01	45.23	74.00	54.00	-8.77	AVG
N/A										
N/A										
N/A										
1200.00	H	45.18	37.92	-1.00	44.18	36.92	74.00	54.00	-17.08	AVG
4868.67	H	38.79	30.88	11.58	50.37	42.46	74.00	54.00	-11.54	AVG
7310.00	H	39.45	27.51	18.78	58.23	46.29	74.00	54.00	-7.71	AVG
N/A										
N/A										
N/A										

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: 24°C
Humidity: 53 % RH

Test Date: May 2, 2007
Tested by: jeff
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
1603.33	V	45.15	39.67	0.4	45.55	40.07	74.00	54.00	-13.93	AVG
4882.33	V	40.11	33.96	12.03	52.14	45.99	74.00	54.00	-8.01	AVG
7322.24	V	38.77	29.45	18.95	57.72	48.4	74.00	54.00	-5.60	AVG
N/A										
N/A										
N/A										
1153.33	H	44.1	37.89	-1.21	42.89	36.68	74.00	54.00	-17.32	AVG
4884.67	H	39.87	32.5	12.09	51.96	44.59	74.00	54.00	-9.41	AVG
7325.00	H	39.12	28.91	18.93	58.05	47.84	74.00	54.00	-6.16	AVG
N/A										
N/A										
N/A										

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 802.11g / CH Low

Test Date: May 2, 2007

Temperature: 24°C

Tested by: jeff

Humidity: 53 % 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
1153.33	V	47.11	40.17	-1.21	45.9	38.96	74.00	54.00	-15.04	AVG
4816.67	V	37.82	31.09	11	48.82	42.09	74.00	54.00	-11.91	AVG
7231.67	V	37.11	25.44	18.44	55.55	43.88	74.00	54.00	-10.12	AVG
N/A										
N/A										
N/A										
1153.33	H	45.22	38.97	-1.21	44.01	37.76	74.00	54.00	-16.24	AVG
4823.33	H	38.14	30.55	11.04	49.18	41.59	74.00	54.00	-12.41	AVG
7236.00	H	38.45	27.49	18.57	57.02	46.06	74.00	54.00	-7.94	AVG
N/A										
N/A										
N/A										

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

Test Date: May 2, 2007

Temperature: 24°C

Tested by: jeff

Humidity: 53 % 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
1196.67	V	52.14	45.21	-1.02	51.12	44.19	74.00	54.00	-9.81	AVG
4874.33	V	39.26	32.85	11.6	50.86	44.45	74.00	54.00	-9.55	AVG
7308.11	V	39.44	30.14	18.82	58.26	48.96	74.00	54.00	-5.04	AVG
N/A										
N/A										
N/A										
1250.00	H	43.85	38.45	-0.57	43.28	37.88	74.00	54.00	-16.12	AVG
4870.35	H	39.08	34.06	11.55	50.63	45.61	74.00	54.00	-8.39	AVG
7312.01	H	39.78	29.58	18.87	58.65	48.45	74.00	54.00	-5.55	AVG
N/A										
N/A										
N/A										

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: 24°C
Humidity: 53 % RH

Test Date: May 2, 2007
Tested by: jeff
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
1863.33	V	43.01	37.68	1.43	44.44	39.11	74.00	54.00	-14.89	AVG
4925.66	V	39.68	32.54	12.46	52.14	45	74.00	54.00	-9.00	AVG
7400.00	V	41.68	31.66	19.22	60.9	50.88	74.00	54.00	-3.12	AVG
N/A										
N/A										
N/A										
1596.67	H	41.73	36.84	4.76	46.49	41.6	74.00	54.00	-12.40	AVG
4924.33	H	40.05	34.15	12.44	52.49	46.59	74.00	54.00	-7.41	AVG
7394.67	H	41.94	30.44	19.18	61.12	49.62	74.00	54.00	-4.38	AVG
N/A										
N/A										
N/A										

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.

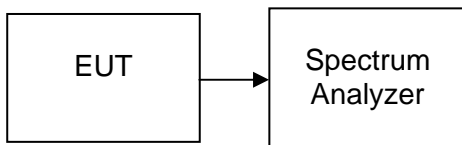
7.3.2. TEST INSTRUMENTS

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

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 = 20MHz, 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	12049	>500	PASS
Mid	2437	12615		PASS
High	2462	12439		PASS

Test Data

Test mode: IEEE 802.11g

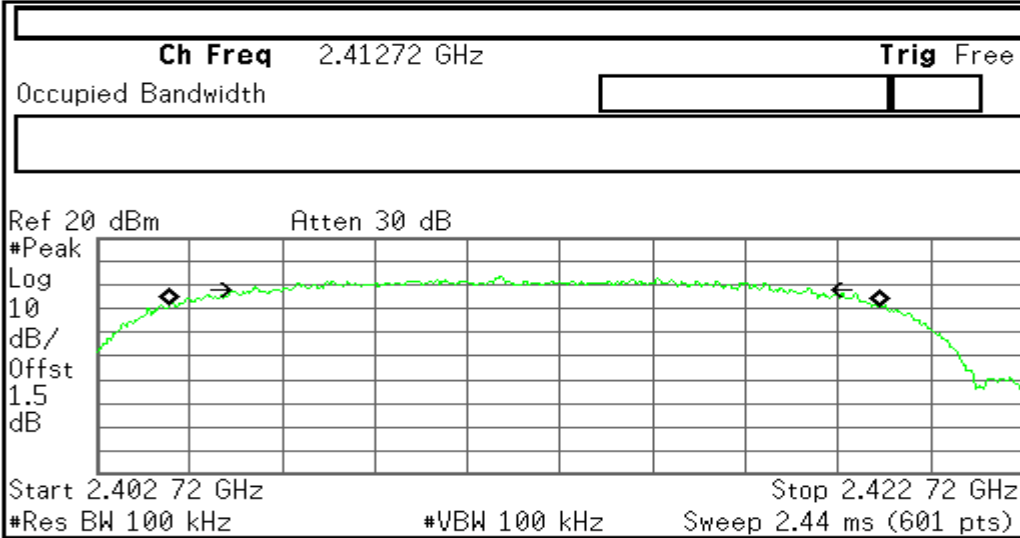
Channel	Frequency (MHz)	Bandwidth (kHz)	Limit (kHz)	Test Result
Low	2412	16481	>500	PASS
Mid	2437	16446		PASS
High	2462	16566		PASS



Test Plot (IEEE 802.11b mode)

6dB Bandwidth (CH Low)

Agilent 11:45:44 Apr 25, 2007



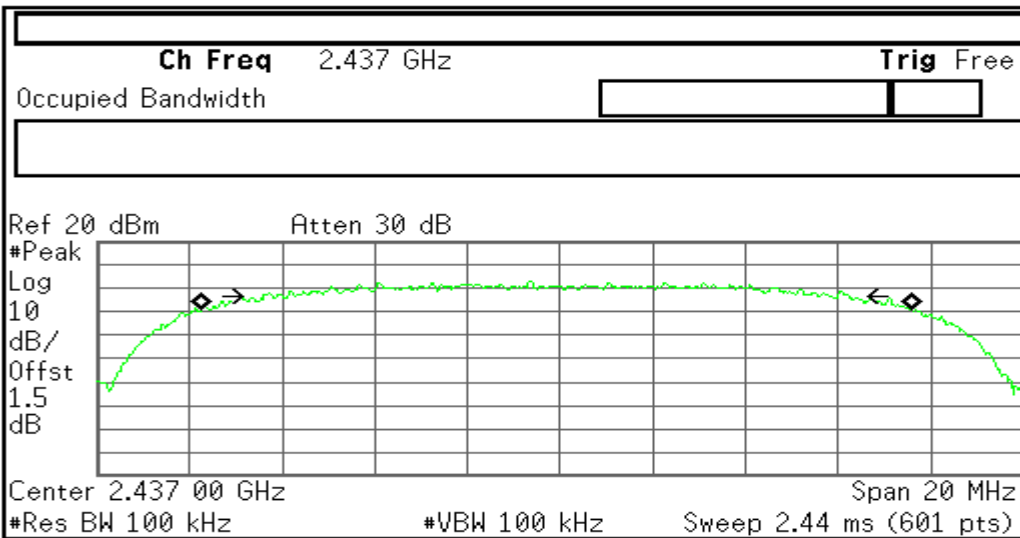
Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.00000000 MHz
x dB	-6.00 dB
Optimize	Ref Level

Occupied Bandwidth	Occ BW % Pwr	99.00 %
15.3232 MHz	x dB	-6.00 dB
Transmit Freq Error	-766.548 kHz	
x dB Bandwidth	12.049 MHz	

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6dB Bandwidth (CH Mid)

Agilent 11:46:27 Apr 25, 2007



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

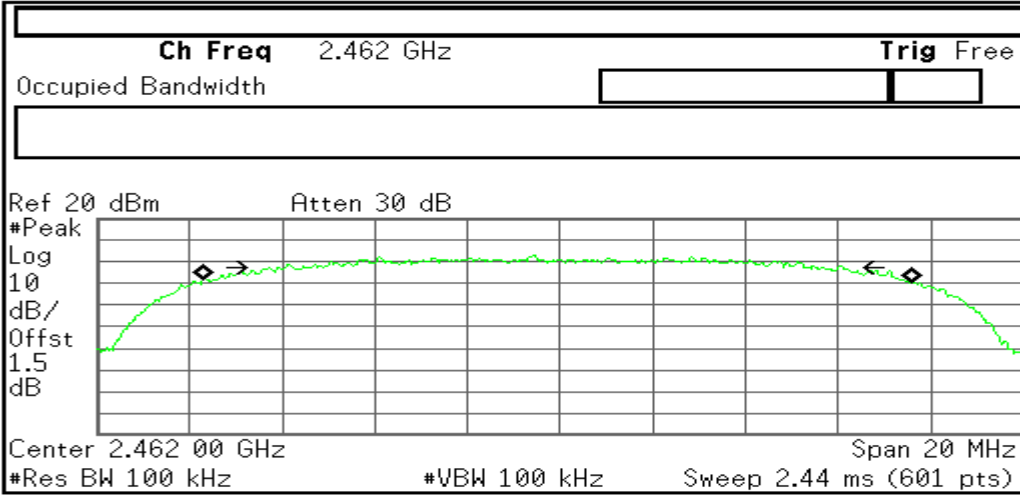
Occupied Bandwidth	Occ BW % Pwr	99.00 %
15.3143 MHz	x dB	-6.00 dB
Transmit Freq Error	-77.545 kHz	
x dB Bandwidth	12.615 MHz	

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6dB Bandwidth (CH High)

Agilent 11:48:00 Apr 25, 2007



Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.0000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

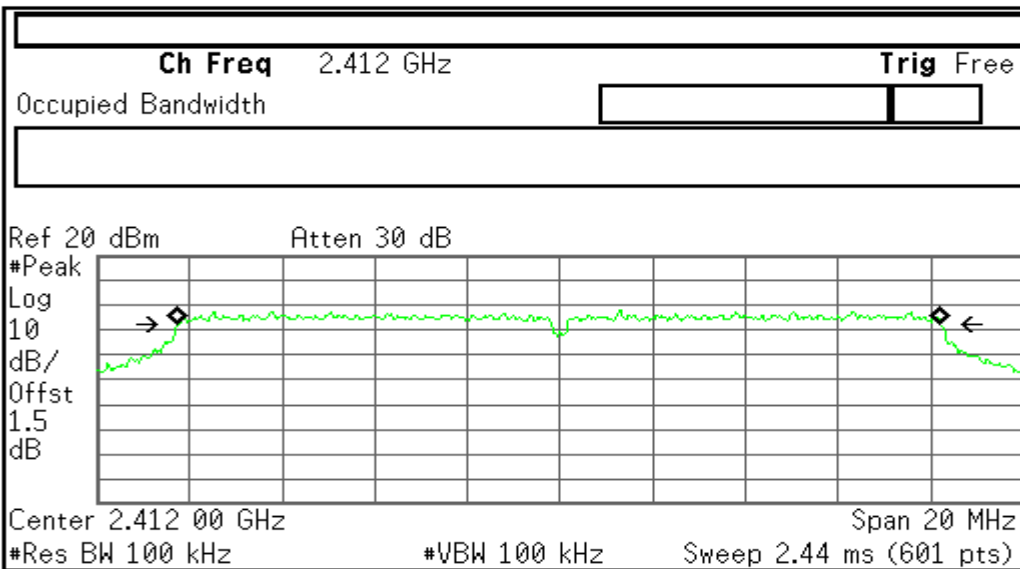
Occupied Bandwidth	Occ BW % Pwr	99.00 %
15.2950 MHz	x dB	-6.00 dB
Transmit Freq Error		-68.551 kHz
x dB Bandwidth		12.439 MHz

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Test Plot (IEEE 802.11g mode)

6dB Bandwidth (CH Low)

Agilent 12:02:19 Apr 25, 2007



Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.0000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

Occupied Bandwidth	Occ BW % Pwr	99.00 %
16.4619 MHz	x dB	-6.00 dB
Transmit Freq Error		-22.256 kHz
x dB Bandwidth		16.481 MHz

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6dB Bandwidth (CH Mid)

Agilent 12:03:18 Apr 25, 2007

Ch Freq 2.437 GHz		Trig Free		
Occupied Bandwidth				
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)		
Occupied Bandwidth		Occ BW % Pwr	99.00 %	
16.4481 MHz		x dB	-6.00 dB	
Transmit Freq Error		-19.896 kHz		
x dB Bandwidth		16.446 MHz		

Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.0000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

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6dB Bandwidth (CH High)

Agilent 12:03:47 Apr 25, 2007

Ch Freq 2.462 GHz		Trig Free		
Occupied Bandwidth				
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)		
Occupied Bandwidth		Occ BW % Pwr	99.00 %	
16.4682 MHz		x dB	-6.00 dB	
Transmit Freq Error		-29.734 kHz		
x dB Bandwidth		16.566 MHz		

Meas Setup	
Avg Number	10
On	Off
Avg Mode	Repeat
Exp	
Max Hold	Off
On	
Occ BW % Pwr	99.00 %
OBW Span	20.0000000 MHz
x dB	-6.00 dB
Optimize Ref Level	

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7.4. PEAK OUTPUT POWER

7.4.1. LIMITS

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

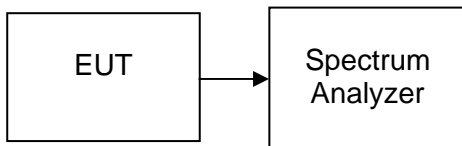
1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains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

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	16.12	0.04093	1	PASS
Mid	2437	16.25	0.04217		PASS
High	2462	15.79	0.03793		PASS

Test mode: IEEE 802.11g

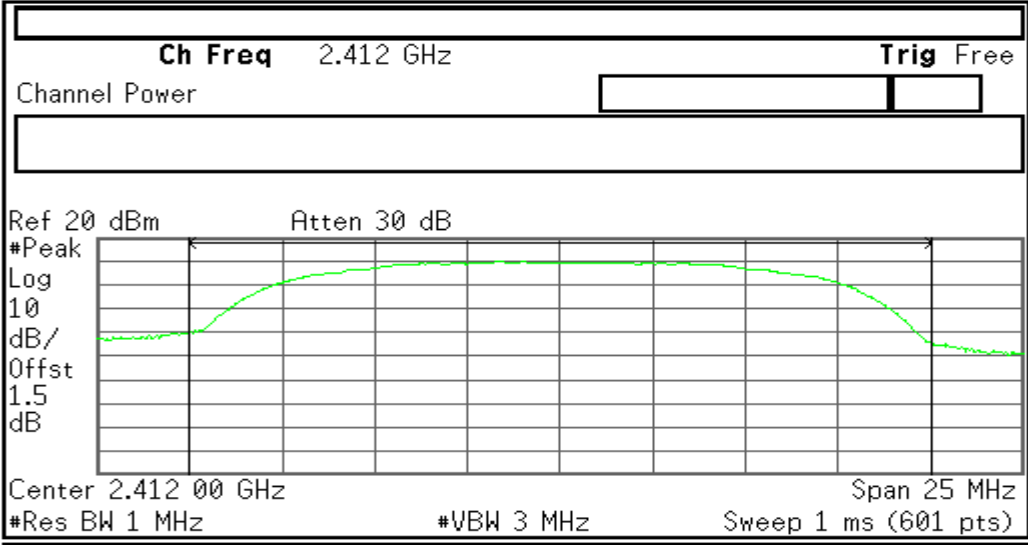
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Limit (W)	Result
Low	2412	14.21	0.02636	1	PASS
Mid	2437	14.27	0.02673		PASS
High	2462	13.64	0.02312		PASS



Test Plot (IEEE 802.11b mode)

Peak Power (CH Low)

Agilent 11:28:10 Apr 25, 2007



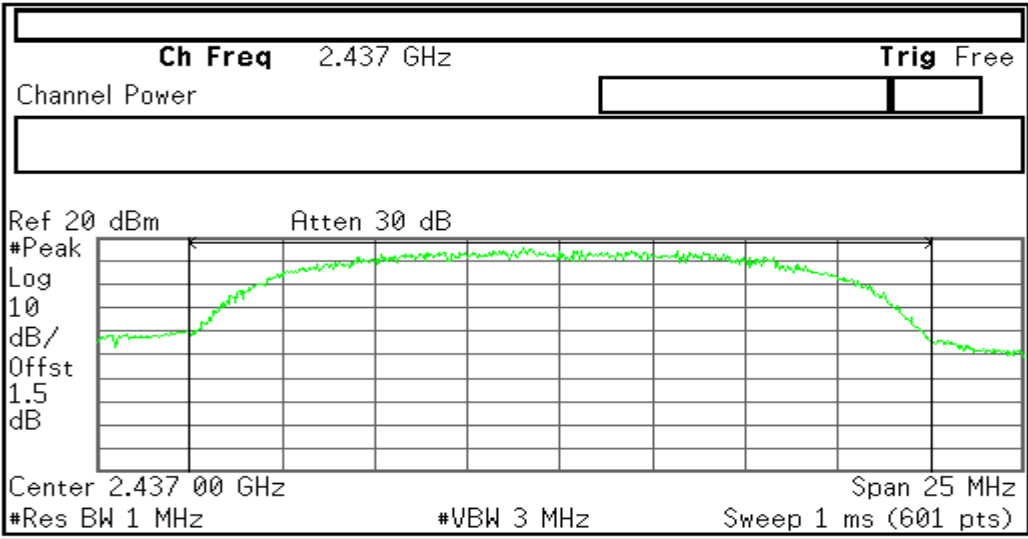
Channel Power	Power Spectral Density
16.12 dBm /20.0000 MHz	-56.89 dBm/Hz

Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

Copyright 2000-2004 Agilent Technologies

Peak Power (CH Mid)

Agilent 11:22:25 Apr 25, 2007



Channel Power	Power Spectral Density
16.25 dBm /20.0000 MHz	-56.76 dBm/Hz

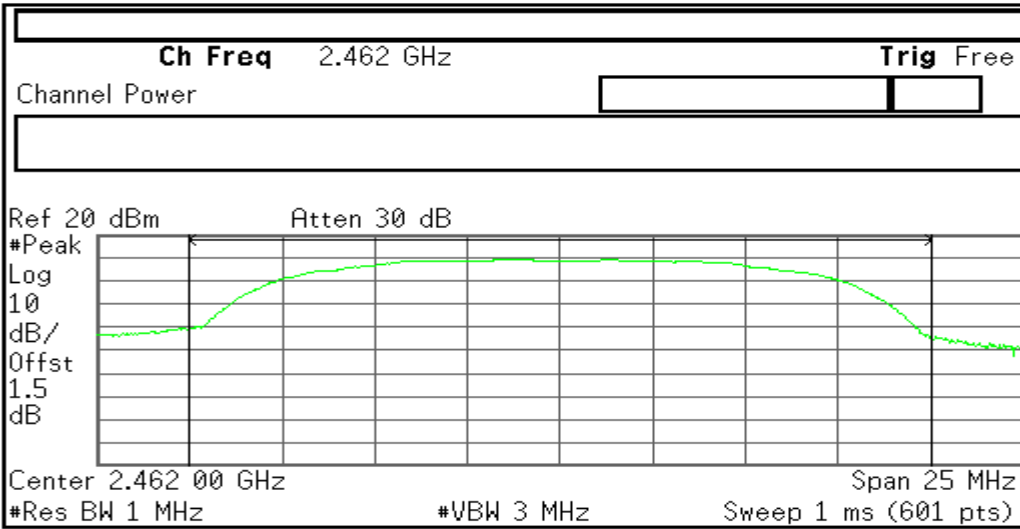
Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

Copyright 2000-2004 Agilent Technologies



Peak Power (CH High)

Agilent 11:34:11 Apr 25, 2007



Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

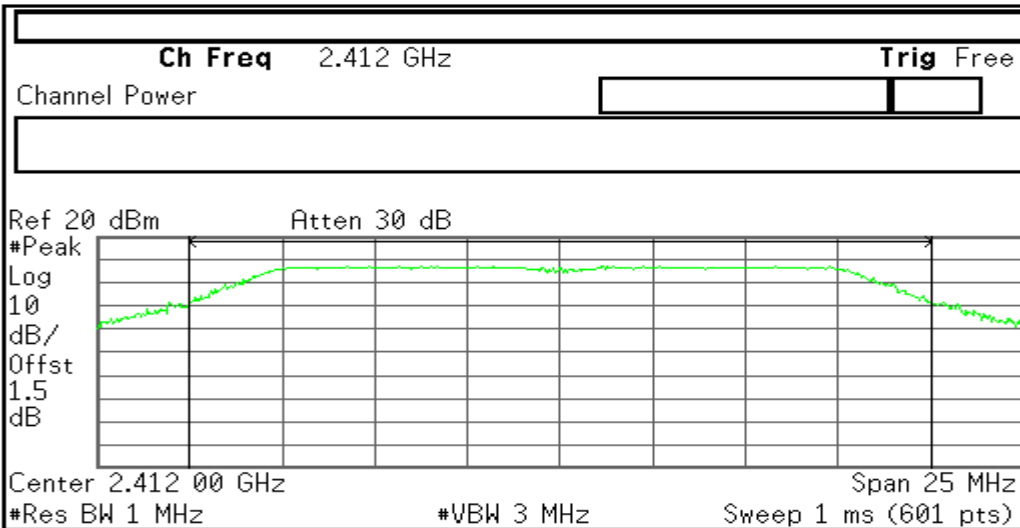
Channel Power	Power Spectral Density
15.79 dBm /20.0000 MHz	-57.22 dBm/Hz

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Test Plot (IEEE 802.11g mode)

Peak Power (CH Low)

Agilent 11:13:56 Apr 25, 2007



Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

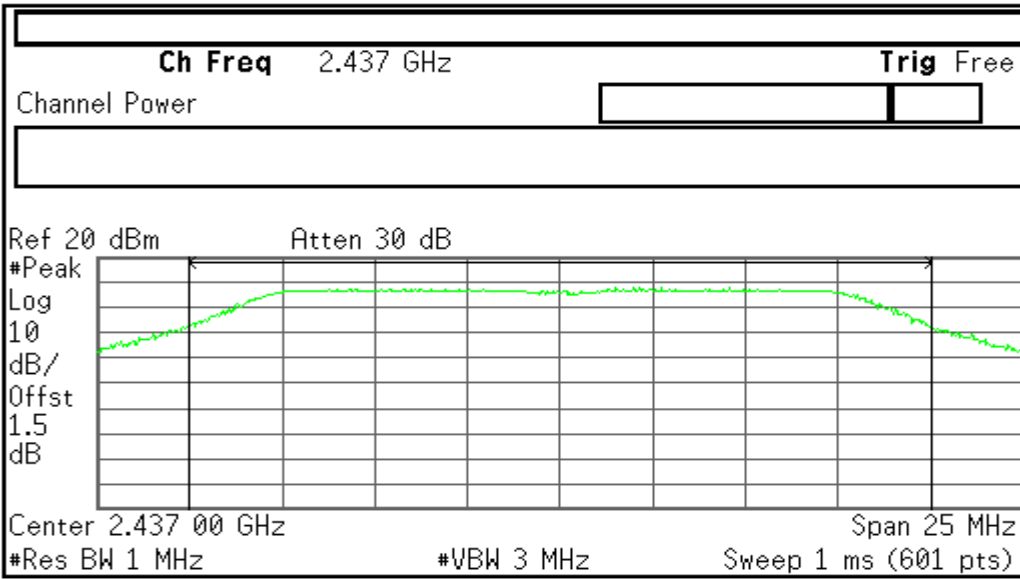
Channel Power	Power Spectral Density
14.21 dBm /20.0000 MHz	-58.80 dBm/Hz

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Peak Power (CH Mid)

Agilent 11:04:44 Apr 25, 2007



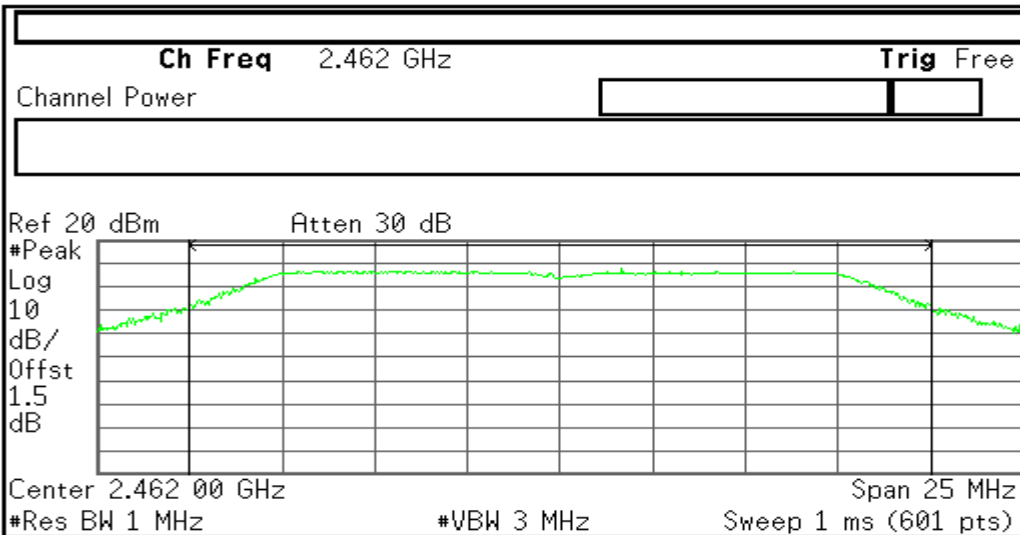
Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

Channel Power 14.27 dBm /20.0000 MHz	Power Spectral Density -58.75 dBm/Hz
--	--

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Peak Power (CH High)

Agilent 11:16:44 Apr 25, 2007



Measure
Meas Off
Channel Power
Occupied BW
ACP
Multi Carrier Power
Power Stat CCDF
More 1 of 2

Channel Power 13.64 dBm /20.0000 MHz	Power Spectral Density -59.37 dBm/Hz
--	--

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7.5. BAND EDGES MEASUREMENT:

7.5.1. 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)).

7.5.2. TEST INSTRUMENTS

7.5.2.1.

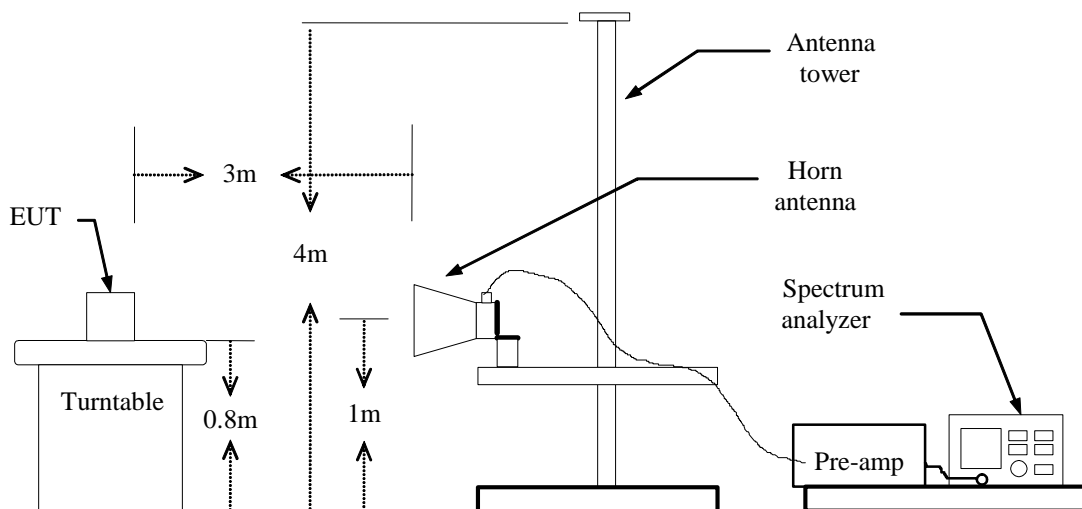
3M Semi Anechoic Chamber (977)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY44020154	08/15/2007
Spectrum Analyzer	Agilent	E4446A	US44300398	07/25/2007
EMI Test Receiver	R&S	ESPI3	101026	11/11/2007
Pre-Amplifier	MINI	ZFL-1000VH2	d041703	12/13/2007
Pre-Amplifier	Miteq	NSP4000-NF	870731	01/28/2008
Bilog Antenna	Sunol	JB1	A110204-2	11/22/2007
Horn-antenna	SCHWARZBECK	BBHA9120D	D:266	02/01/2008
PSG Analog Signal Generator	Agilent	E8257C	MY43321570	12/19/2007
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	04/06/2008

- 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.

7.5.3. 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 measured.

7.5.4. TEST SETUP





7.5.5. TEST RESULTS

Test Plot (IEEE 802.11b mode)

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Peak Margin (dB)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)				
					2390.00	V			66.08	46.98
	V									
2390.00	H	56.68	43.19	4.80	61.48	47.99	74	54	-12.52	-6.01
	H									

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Peak Margin (dB)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)				
					2483.50	V			63.34	45.57
	V									
2483.50	H	59.79	43.82	4.80	64.59	48.62	74	54	-9.41	-5.38
	H									

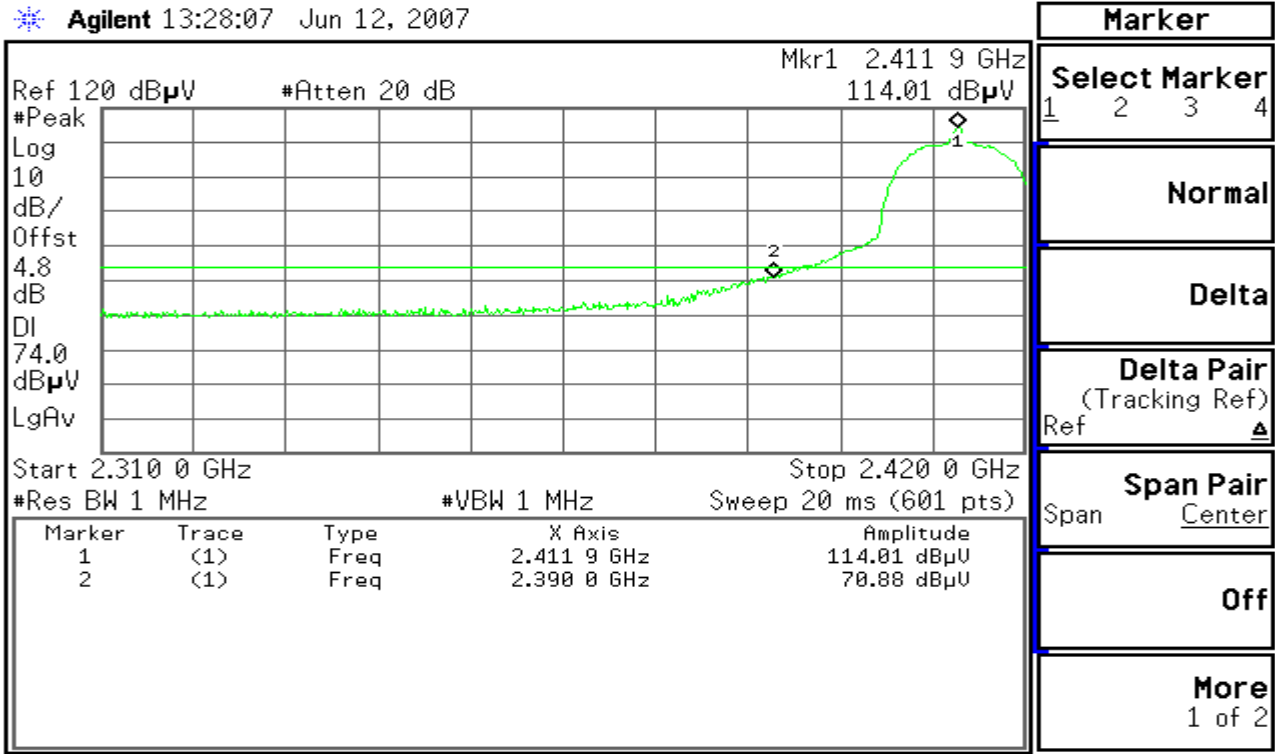


Band Edges (CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 13:28:07 Jun 12, 2007

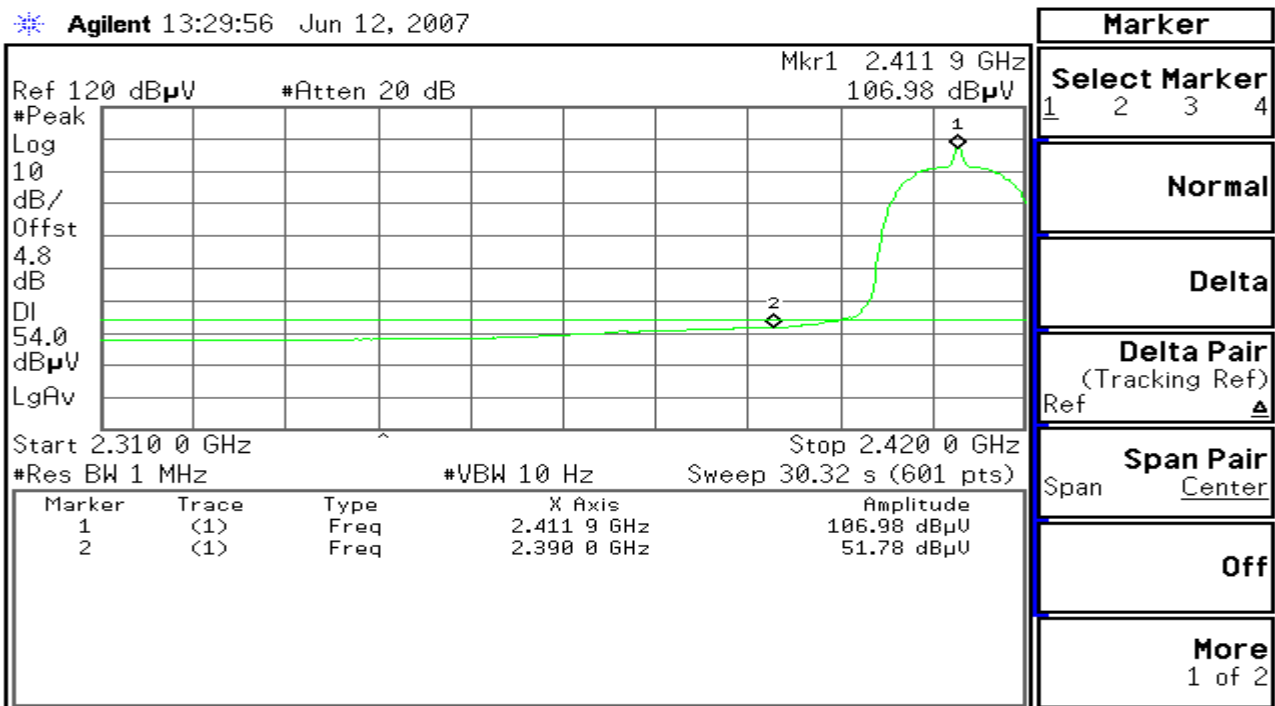


Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Vertical

Agilent 13:29:56 Jun 12, 2007



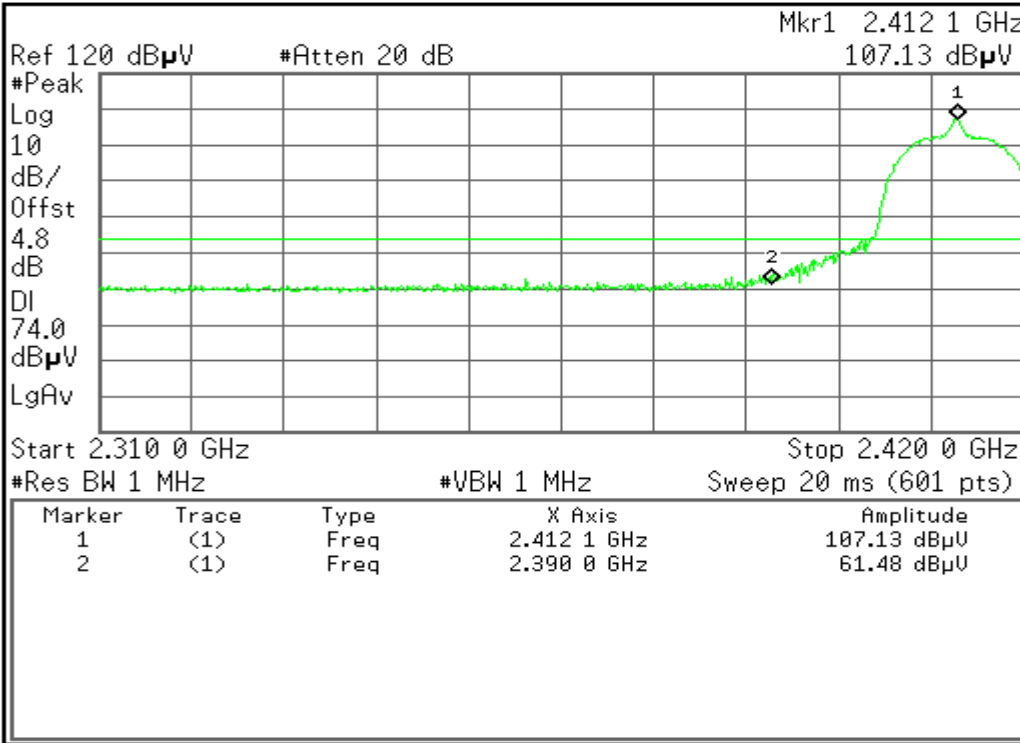
Copyright 2000-2004 Agilent Technologies



Detector mode: Peak

Polarity: Horizontal

Agilent 13:33:40 Jun 12, 2007



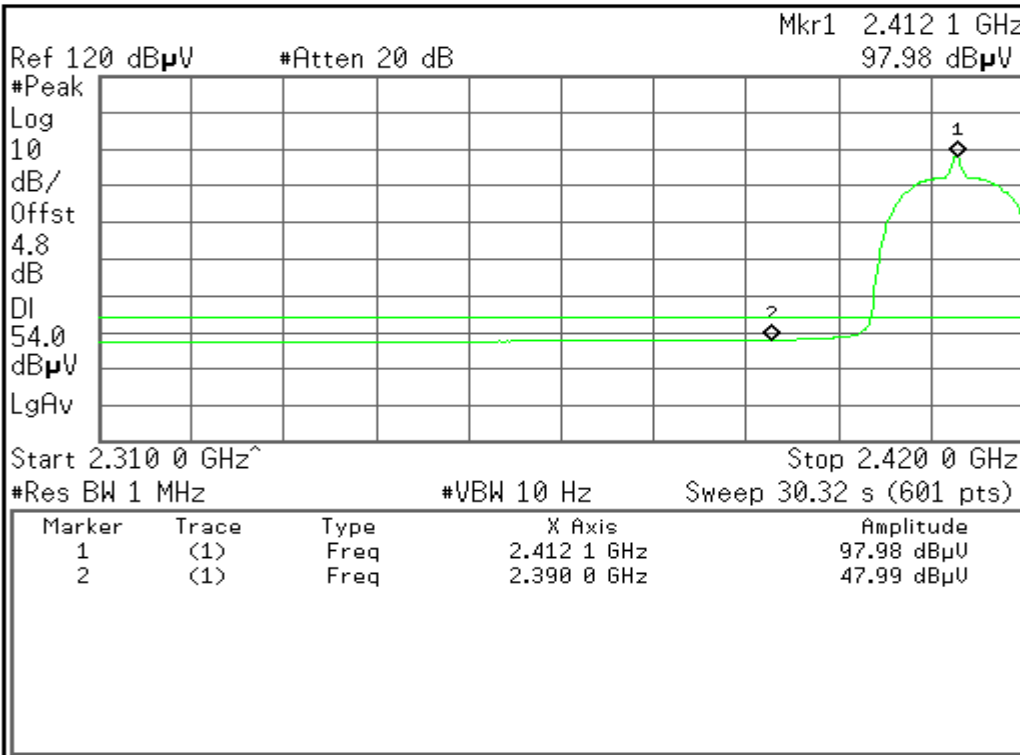
Marker			
Select Marker	1	2	3 4
Normal			
Delta			
Delta Pair (Tracking Ref) Ref ▲			
Span Pair Span Center			
Off			
More 1 of 2			

Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Horizontal

Agilent 13:34:37 Jun 12, 2007



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

Copyright 2000-2004 Agilent Technologies

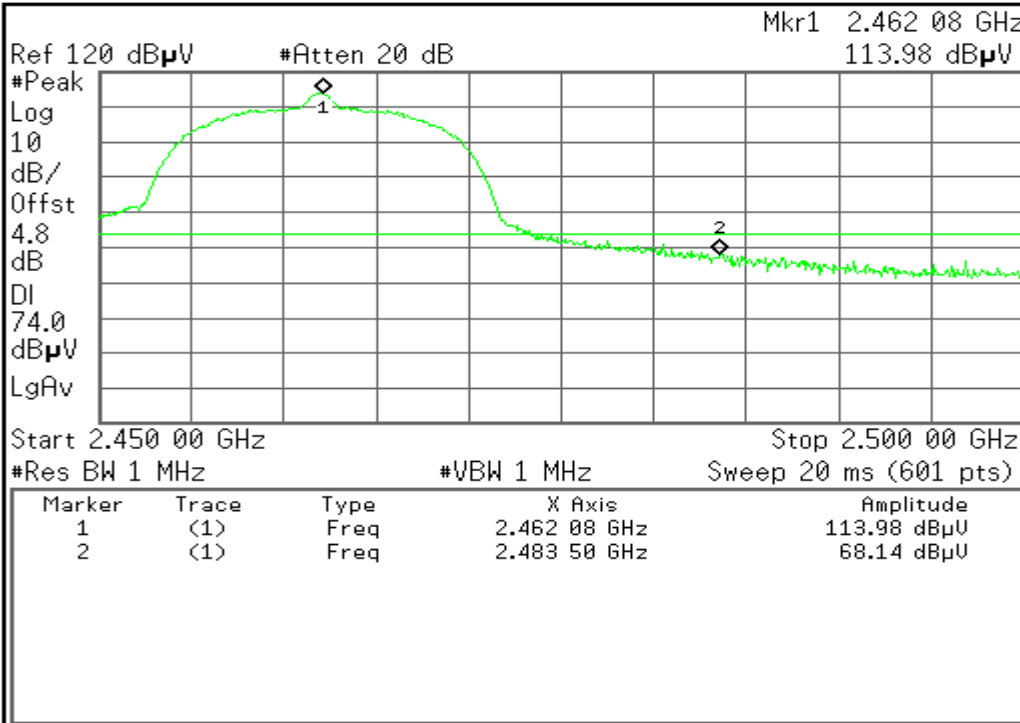


Band Edges (CH High)

Detector mode: Peak

Polarity: Vertical

Agilent 13:40:52 Jun 12, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref Δ

Span Pair Span Center

Off

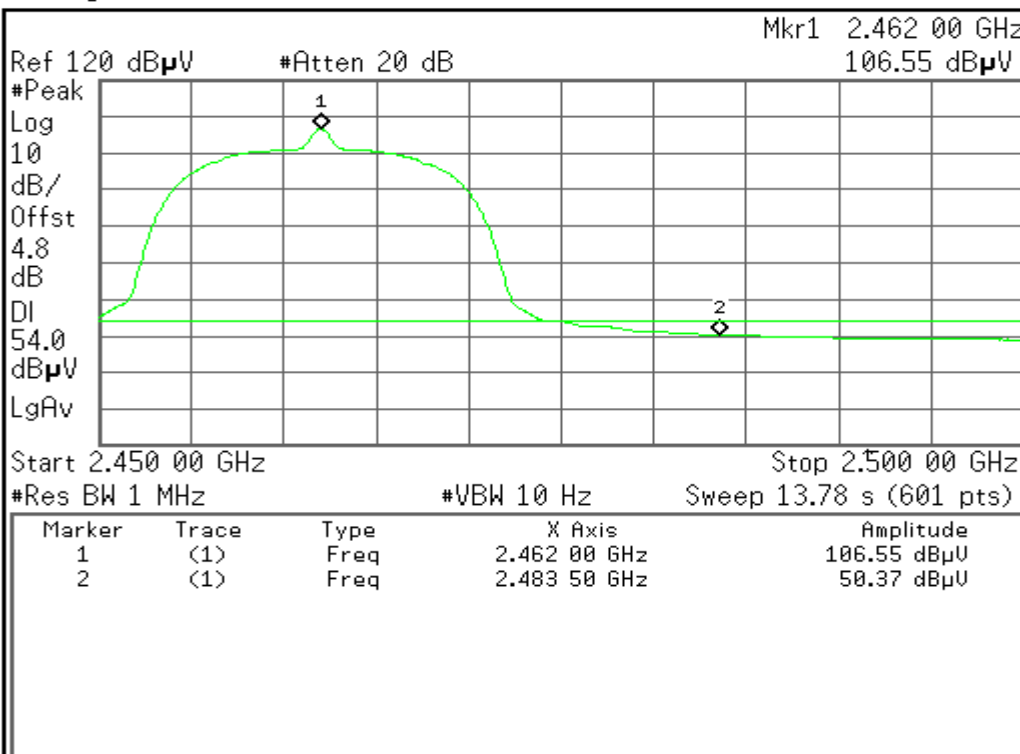
More 1 of 2

Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Vertical

Agilent 13:41:44 Jun 12, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref Δ

Span Pair Span Center

Off

More 1 of 2

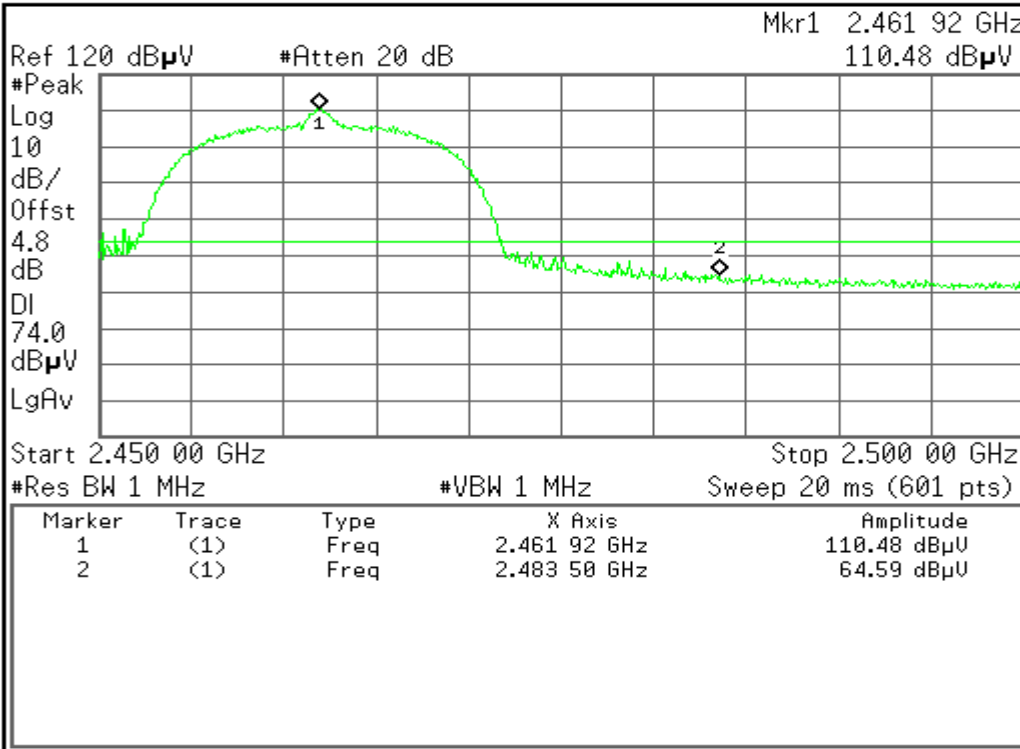
Copyright 2000-2004 Agilent Technologies



Detector mode: Peak

Polarity: Horizontal

Agilent 13:47:19 Jun 12, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref ▲

Span Pair Span Center

Off

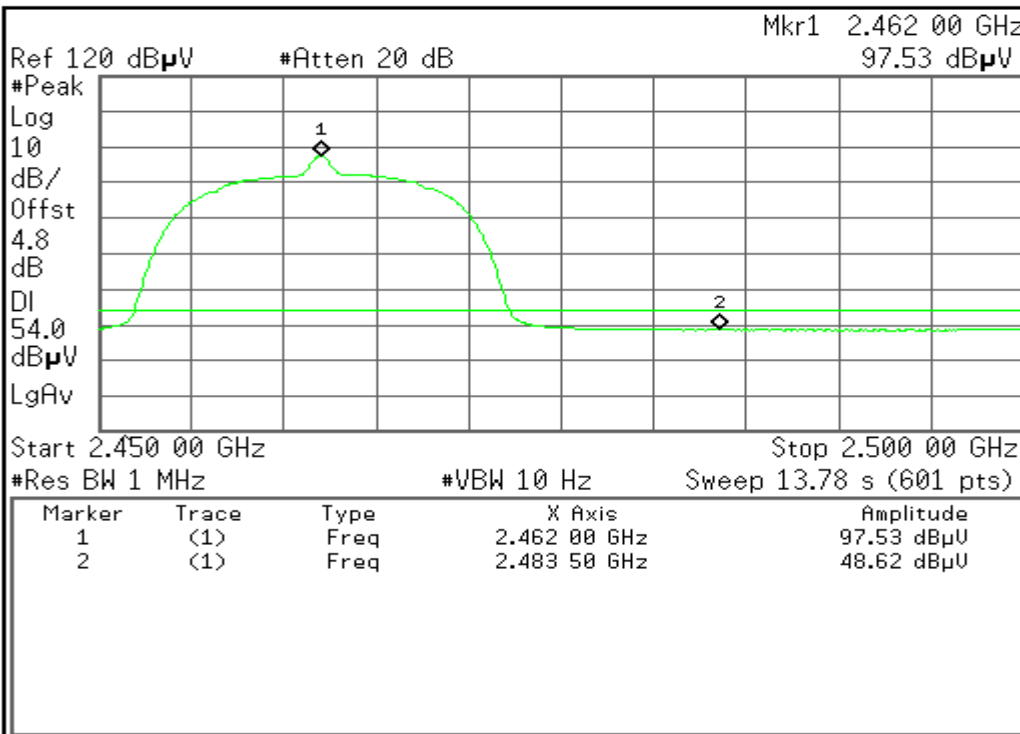
More 1 of 2

Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Horizontal

Agilent 13:48:27 Jun 12, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref ▲

Span Pair Span Center

Off

More 1 of 2

Copyright 2000-2004 Agilent Technologies



Test Plot (IEEE 802.11g mode)

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Peak Margin (dB)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)				
					2390.00	V				
	V									
2390.00	H	55.70	43.74	4.80	60.50	48.54	74	54	-13.50	-5.46
	H									

Freq. (MHz)	Ant. Pol H/V	Peak Reading (dBuV)	AV Reading (dBuV)	Ant. / CL CF (dB)	Actual Fs		Peak Limit (dBuV/m)	AV Limit (dBuV/m)	Peak Margin (dB)	AV Margin (dB)
					Peak (dBuV/m)	AV (dBuV/m)				
					2483.50	V				
	V									
2483.50	H	56.78	43.55	4.80	61.58	48.35	74	54	-12.42	-5.65
	H									

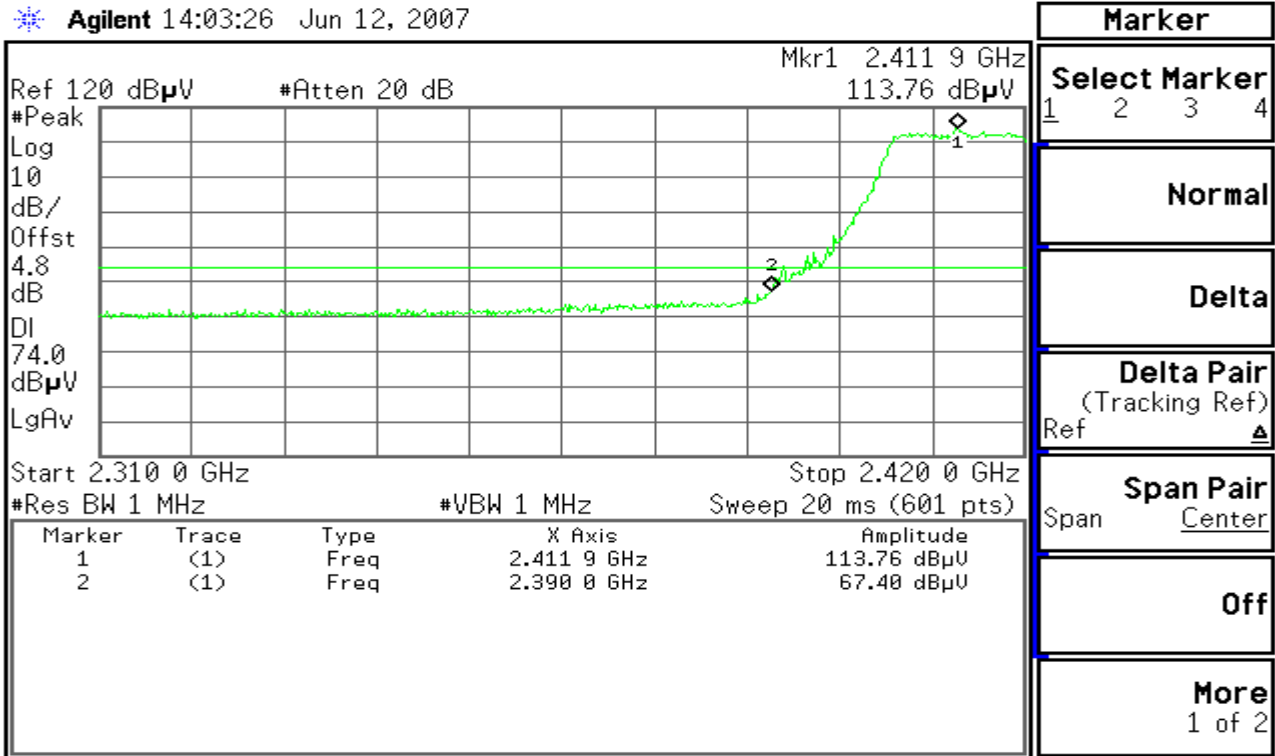


Band Edges (CH Low)

Detector mode: Peak

Polarity: Vertical

Agilent 14:03:26 Jun 12, 2007

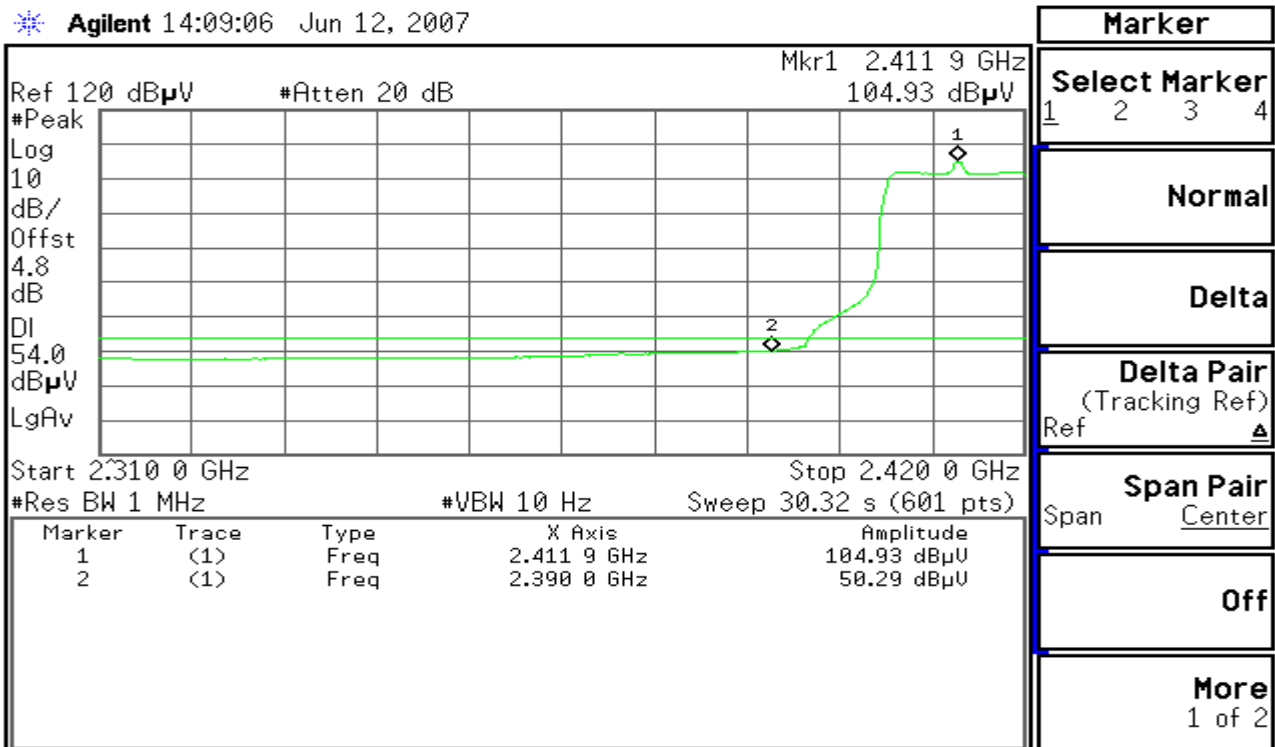


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Detector mode: Average

Polarity: Vertical

Agilent 14:09:06 Jun 12, 2007



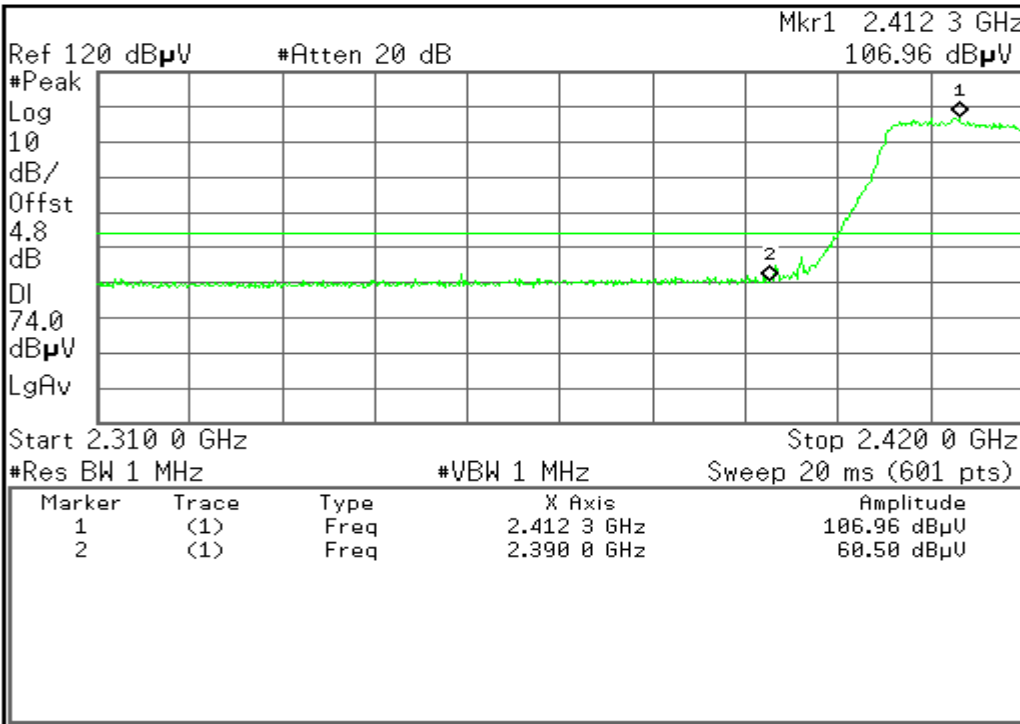
Copyright 2000-2004 Agilent Technologies



Detector mode: Peak

Polarity: Horizontal

Agilent 14:11:08 Jun 12, 2007



Marker

Select Marker
1 2 3 4

Normal

Delta

Delta Pair
(Tracking Ref)
Ref ▲

Span Pair
Span Center

Off

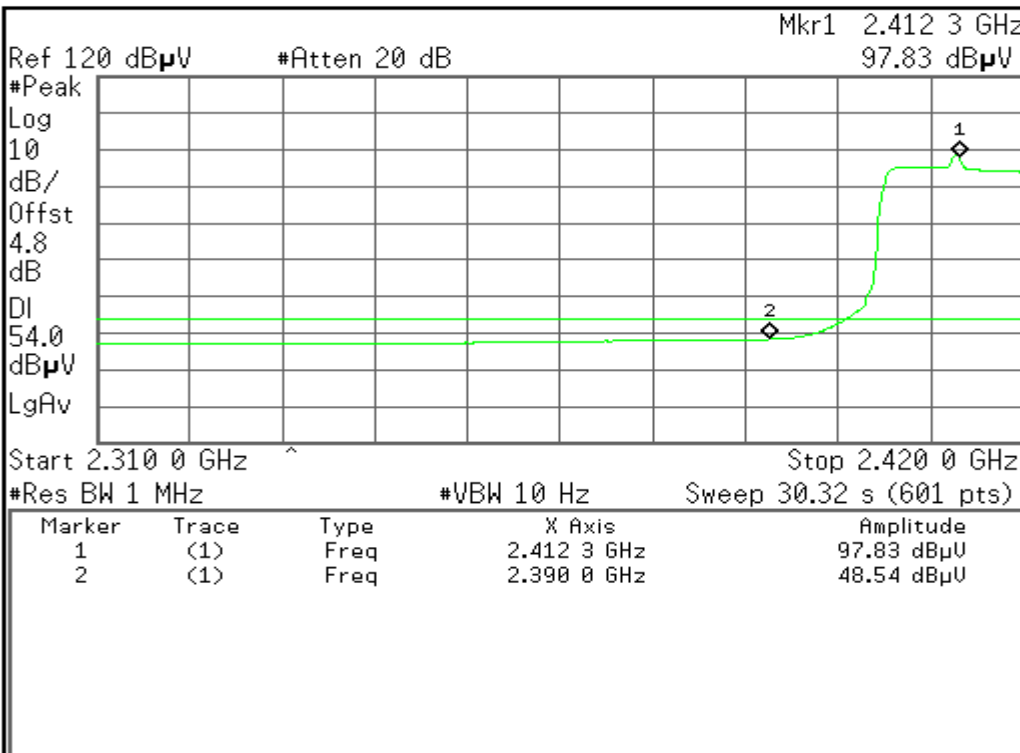
More
1 of 2

Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Horizontal

Agilent 14:12:02 Jun 12, 2007



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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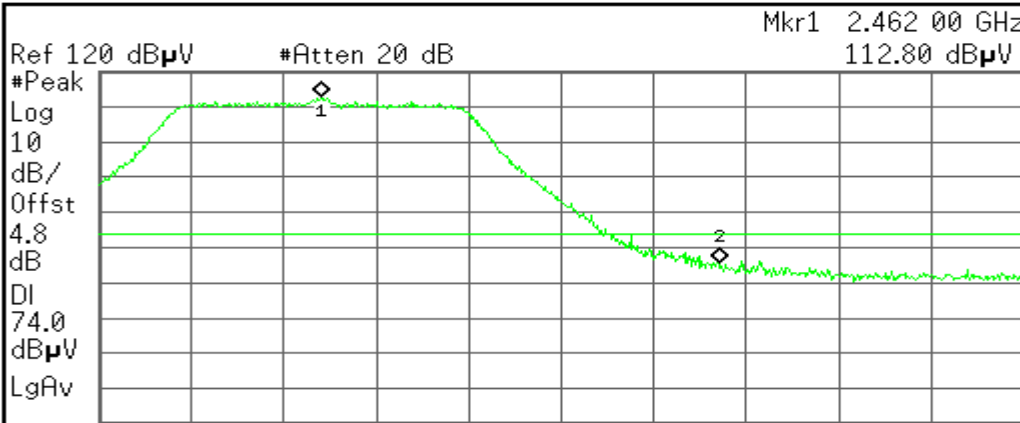


Band Edges (CH High)

Detector mode: Peak

Polarity: Vertical

Agilent 13:53:48 Jun 12, 2007



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

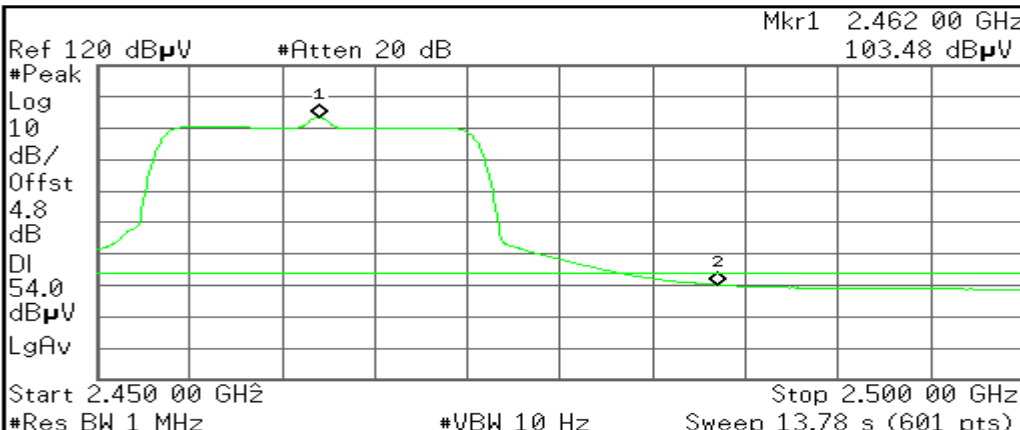
Start	2.450 00 GHz	Stop	2.500 00 GHz		
#Res BW	1 MHz	#VBW	1 MHz	Sweep	20 ms (601 pts)
Marker	Trace	Type	X Axis	Amplitude	
1	(1)	Freq	2.462 00 GHz	112.80 dBµV	
2	(1)	Freq	2.483 50 GHz	65.64 dBµV	

Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Vertical

Agilent 13:54:25 Jun 12, 2007



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

Start	2.450 00 GHz	Stop	2.500 00 GHz		
#Res BW	1 MHz	#VBW	10 Hz	Sweep	13.78 s (601 pts)
Marker	Trace	Type	X Axis	Amplitude	
1	(1)	Freq	2.462 00 GHz	103.48 dBµV	
2	(1)	Freq	2.483 50 GHz	50.31 dBµV	

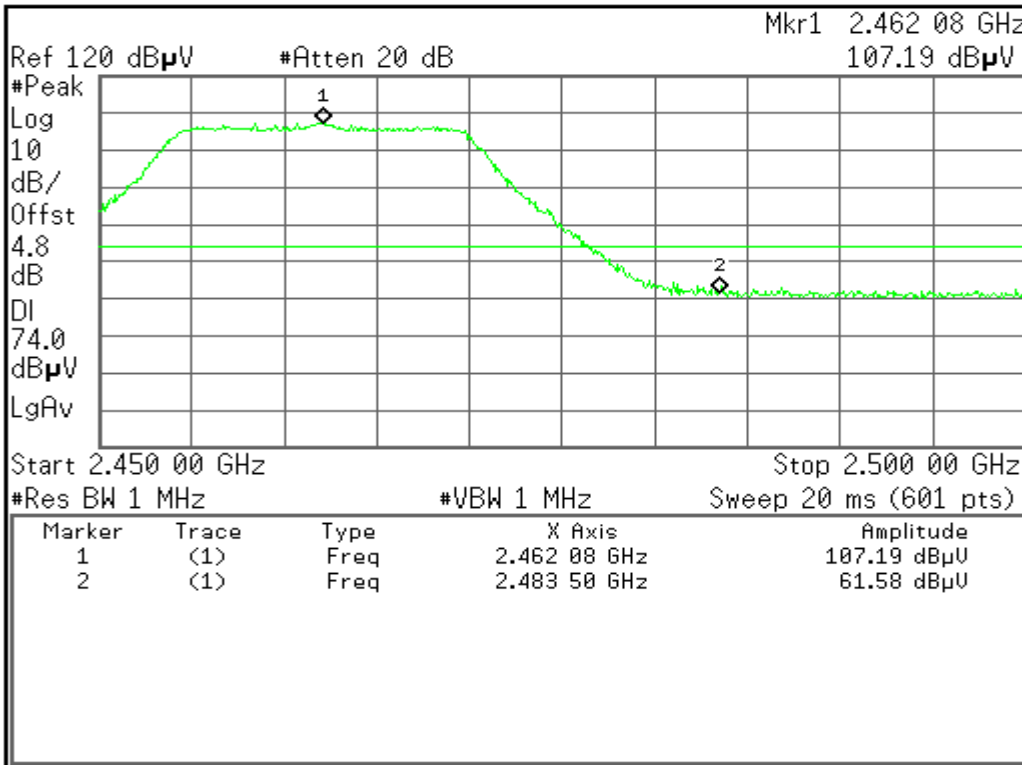
Copyright 2000-2004 Agilent Technologies



Detector mode: Peak

Polarity: Horizontal

Agilent 13:56:34 Jun 12, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref Δ

Span Pair Span Center

Off

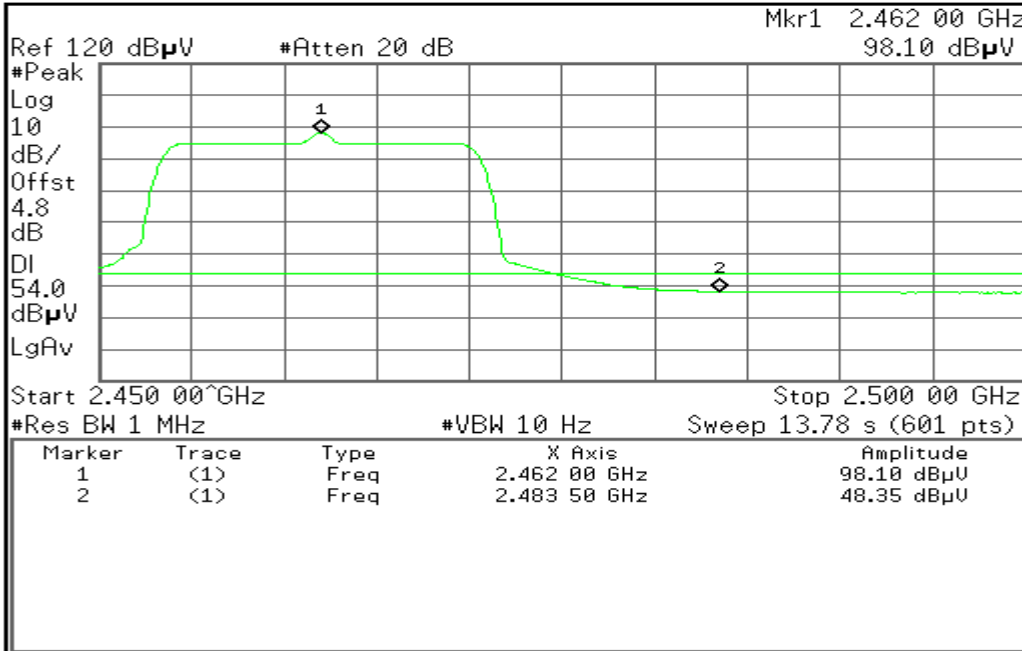
More 1 of 2

Copyright 2000-2004 Agilent Technologies

Detector mode: Average

Polarity: Horizontal

Agilent 13:57:06 Jun 12, 2007



Marker

Select Marker 1 2 3 4

Normal

Delta

Delta Pair (Tracking Ref) Ref Δ

Span Pair Span Center

Off

More 1 of 2

Copyright 2000-2004 Agilent Technologies



7.6. PEAK POWER SPECTRAL DENSITY MEASUREMENT

7.6.1. 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.

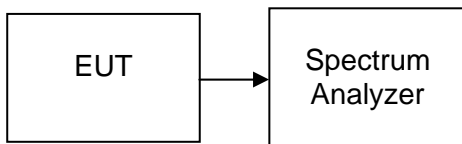
7.6.2. TEST INSTRUMENTS

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

7.6.3. 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.

7.6.4. TEST SETUP





7.6.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-11.36	8.00	PASS
Mid	2437	-11.94		PASS
High	2462	-12.34		PASS

Test Data

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-14.99	8.00	PASS
Mid	2437	-14.95		PASS
High	2462	-15.02		PASS



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

EUT	802.11g Wireless ADSL2+ 4-port Gateway
Frequency band (Operating)	<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>
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<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
Max. output power	IEEE 802.11b: 16.25 dBm (42.17mW) IEEE 802.11g: 14.27 dBm (26.73mW)
Antenna gain (Max)	3.76 dBi (Numeric gain: 2.38)
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

Remark:

1. The maximum output power is 16.25dBm (42.17mW) at 2437MHz (with 2.38 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/cm² 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 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 / cm²

Maximum Permissible Exposure

EUT output power = 42.17mW

Numeric Antenna gain = 2.38

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 / cm²

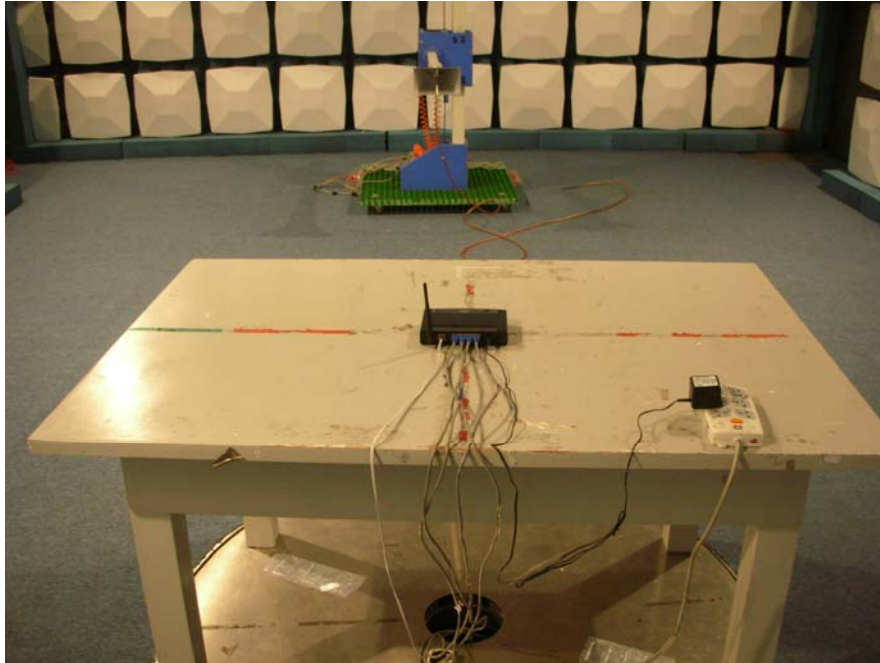
→ Power density = 0.0200mW / cm²

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.)

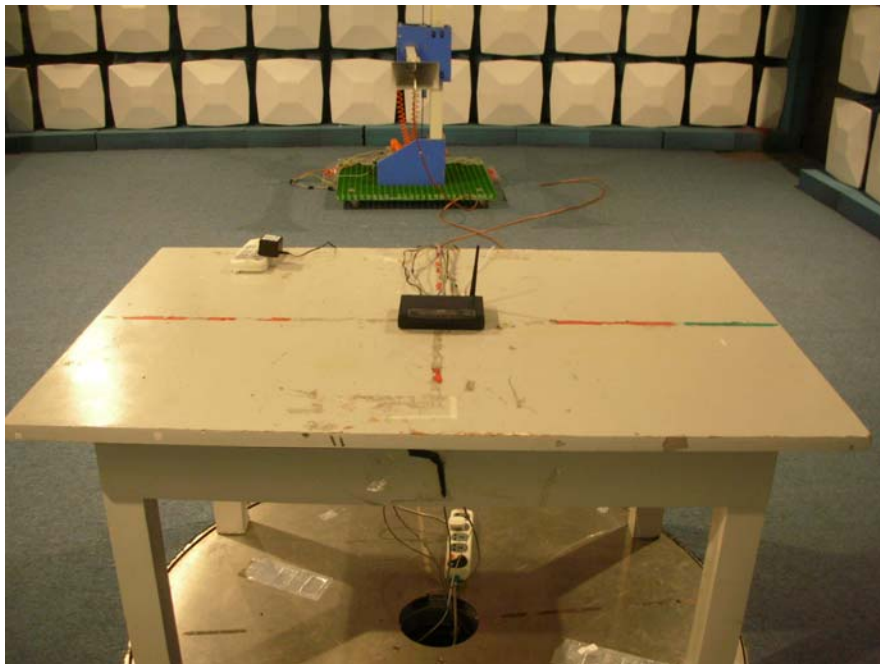
APPENDIX II PHOTOGRAPHS OF THE TEST CONFIGURATION

Radiated Emissions Setup Photos

Front of view

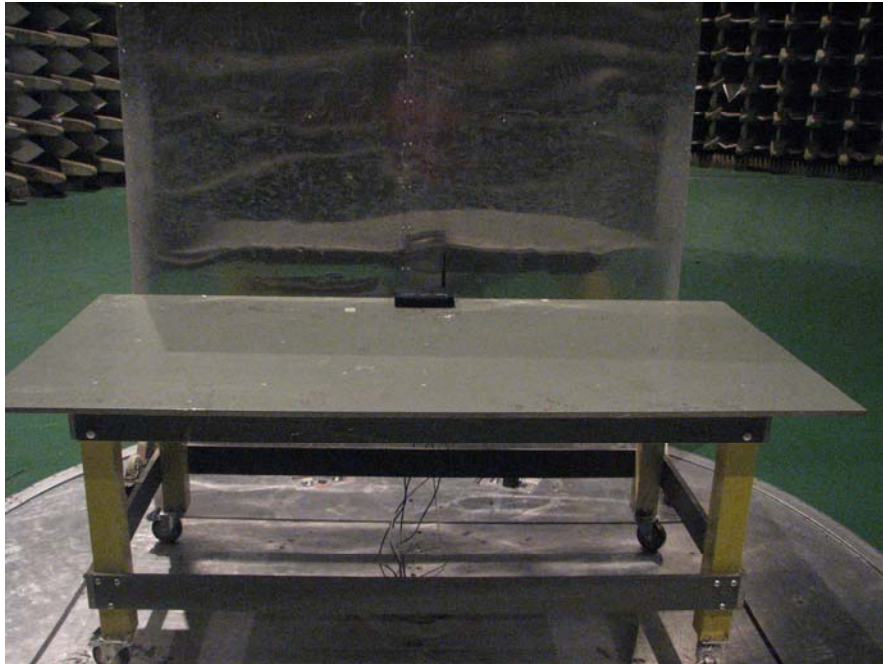


Back of view



Power Line Conducted Emissions Setup Photos

Front of view



Right of view

