FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

802.11g Wireless Network Mini PCI

MODEL NUMBER: WL MP 2554 36A0 B10

FCC ID: KA2DI624MA1

REPORT NUMBER: 04U3115-1, Revision B

ISSUE DATE: DECEMBER 29, 2004

Prepared for
D-LINK CORPORATION
2F, NO 233-2, PAO-CHIAO ROAD
HSIN-TIEN, TAIPEI, TAIWAN ROC

Prepared by
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Revision History

Rev.	Revisions	Revised By
B	Changed FCC ID number, revised MPE Calculations	MH

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: D-Link Corporation
2F, NO 233-2, PAO-CHIAO ROAD
HSIN-TIEN, TAIPEI, TAIWAN ROC

EUT DESCRIPTION: 802.11g Wireless Network Mini PCI

MODEL: WL MP 2554 36A0 B10

SERIAL NUMBER: AV10 – 060 - A0014

DATE TESTED: DECEMBER 14 – 22, 2004

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

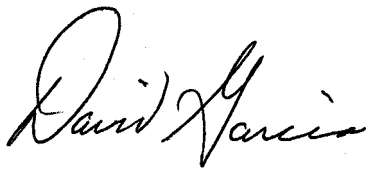
Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

YAN ZHENG
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



DAVID GARCIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. 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."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.1g Wireless Network mini-PCI card module intended for use in an Access Point.

The EUT incorporates a basic beam forming capability. Physically, the card provides two complete transmit and receive chains. Each chain can be connected to one of two antenna elements via an antenna diversity switch.

The EUT can operate in a single chain configuration (only the chain 0 transceiver is operational) or dual chain configuration (both chain 0 and chain 1 transceivers are operational).

When the EUT is in the 802.11b mode, it is always in the single chain configuration.

When the EUT is operating in the 802.11g (including Turbo) mode, it can operate in either configuration. Switching between the single and dual chain configurations is accomplished electronically, with no hardware changes required.

The name, model and FCC ID of the EUT, along with the applicant name and address, have been changed by the client after testing commenced. All data in this report is applicable to the EUT as documented in Section 1 above.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

2400 to 2483.5 MHz Authorized Band, Singal Chain

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	20.98	125.31
2412 - 2462	802.11g	25.88	387.26
2412 - 2462	802.11g Turbo	21.82	152.05

2400 to 2483.5 MHz Authorized Band, Dual Chain

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11g	28.82	762.08
2412 - 2462	802.11g Turbo	22.38	172.98

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizesa two-element phased array antenna. Two of the available antenna elements are permanently attached dipoles, each with a flexible (universal joint style) mount, and each with a maximum gain of 3.39 dBi. The other two available elements are printed directly on the circuit board, each with a maximum gain of 0 dBi. The maximum gain of the antenna array is 3.39 + 10 log (2) = 6.4 dBi.

Each transceiver chain includes a diversity switch that is connected to one dipole antenna element and one printed circuit board antenna element.

In the single chain configuration, the radio utilizes only one antenna element. The selection of the particular element is made via the diversity switch on chain 0. The single chain configuration is used for broadcast purposes and point-to-multipoint operation.

In the dual chain configuration, selected antenna elements form a phased array antenna. Only two of the elements are used at any particular time. Depending on the diversity conditions, the phased array can consist of both dipole elements, both printed circuit elements, the chain 0 dipole element plus the chain 1 printed circuit element, or the chain 0 printed circuit element plus the chain 1 dipole element. The dual chain configuration is used to establish point-to-point communication by directing the beam to a specific client device.

In the dual chain configuration, each chain transmits identical information, but with a relative phase difference. The phase difference is adjusted to direct the beam toward a particular client device, based on feedback from that device regarding the maximum received signal strength as a function of the phase difference. The beam can be redirected to a different client device at a different time, yielding sequential point-to-point operation to establish communication with more than one client device.

5.4. SOFTWARE AND FIRMWARE

The EUT driver installed during testing was AR5002 Anwi Diagnostic Kernel.

The test program installed in the host Laptop during testing was ART, rev. 4.9 build #32

5.5. WORST-CASE CONFIGURATION AND MODE

Preliminary investigations of radiated emission levels with all available antenna element combinations showed that the worst-case antenna array is formed by the two dipole elements. These same investigations indicated that the worst-case single chain configuration was with the dipole antenna.

The relative orientation of the dipole antenna elements on their flexible mounts was varied to further ascertain the worst-case configuration. The worst-case was determined to be with both elements adjusted to the upright vertical orientation.

Additional investigations were made by adjusting the relative phase difference from 0 to 180 degrees, in 30 degree increments. The maximum emissions remained consistent regardless of phase angle.

Additional investigations were made by adjusting the data rate to all possible values. The maximum emissions were highest at 1 Mb/s in the 802.11b mode and remained consistent regardless of data rate in the 802.11g mode.

Based on the preliminary investigations, final tests were made by setting each diversity switch to the dipole element, placing each dipole antenna element in the upright vertical orientation, setting the phase angle to 0 degrees, and setting the data rate to 1 Mb/s in the 802.11b mode and 12 Mb/s in the 802.11g mode.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	IBM	R32 Thinkpad	AK-VRW83	DoC
AC Adapter	IBM	08K8204	V049H844	N/A
DC Power Supply	Agilent	E3633A	MY40001598	N/A

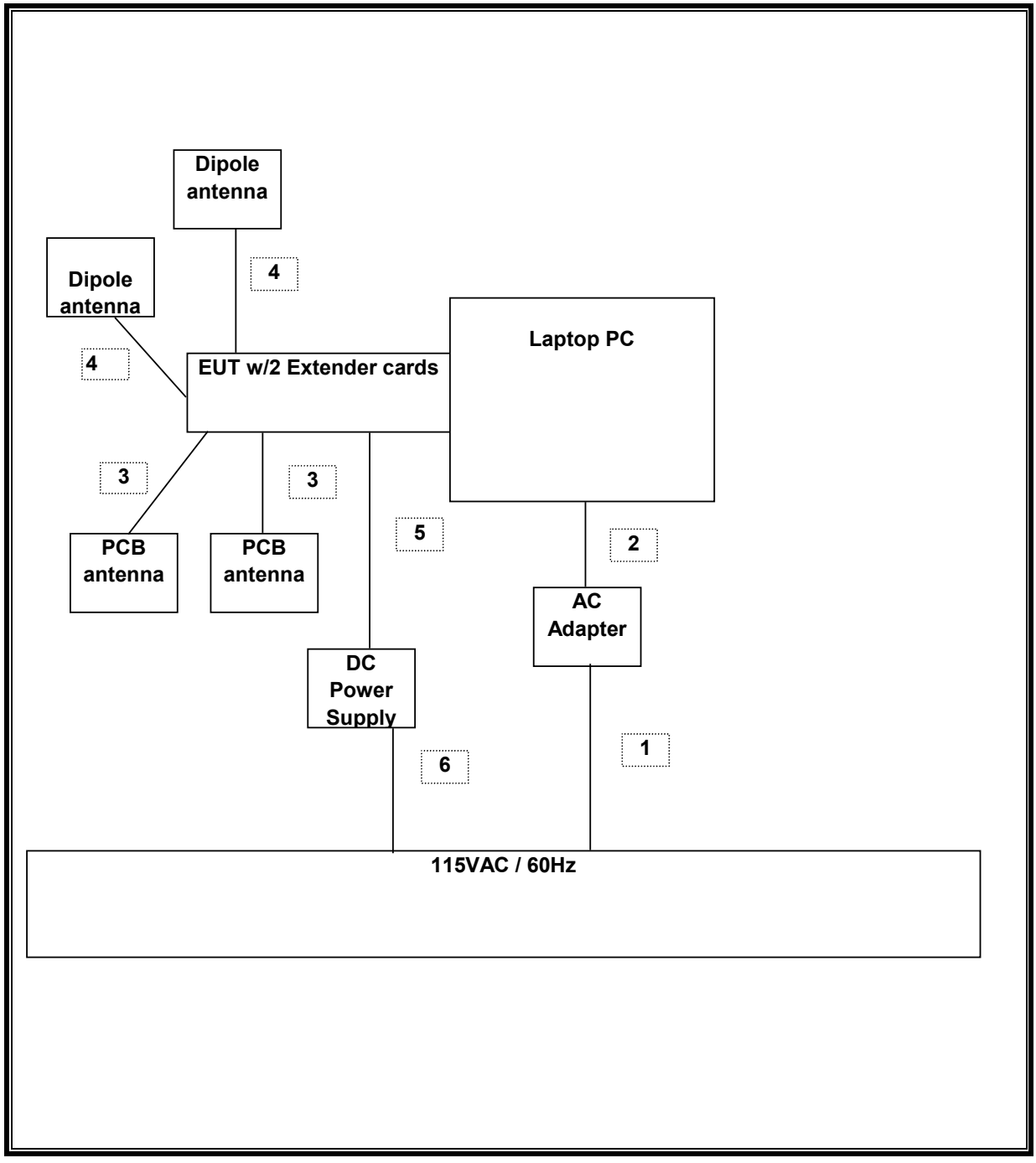
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.5	
2	DC	1	DC	Unshielded	1.8	
3	Antenna	4	UFL	Shielded	0.19	To Dipole Antenna
4	Antenna	4	UFL	Shielded	0.05	To PCB Antenna
5	DC	1	Single pin	Coax	1.0m	
6	AC	1	IEC	Unshielded	1.5m	

TEST SETUP

The EUT is installed in a host laptop computer via a cardbus extender board plus a cardbus-to-miniPCI adapter board during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	1/6/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	9/12/2005
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2005
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	29800	5/13/2005
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2006
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	12/22/2004
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
Spectrum Analyzer 20 Hz ~ 44 GHz	Agilent	E4446A	MY43360112	38365

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND, SINGLE CHAIN

7.1.1. 6 dB BANDWIDTH

LIMIT

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	12083.3	500	11583
Middle	2437	10166.7	500	9667
High	2462	11083.3	500	10583

802.11g Mode Chain 0

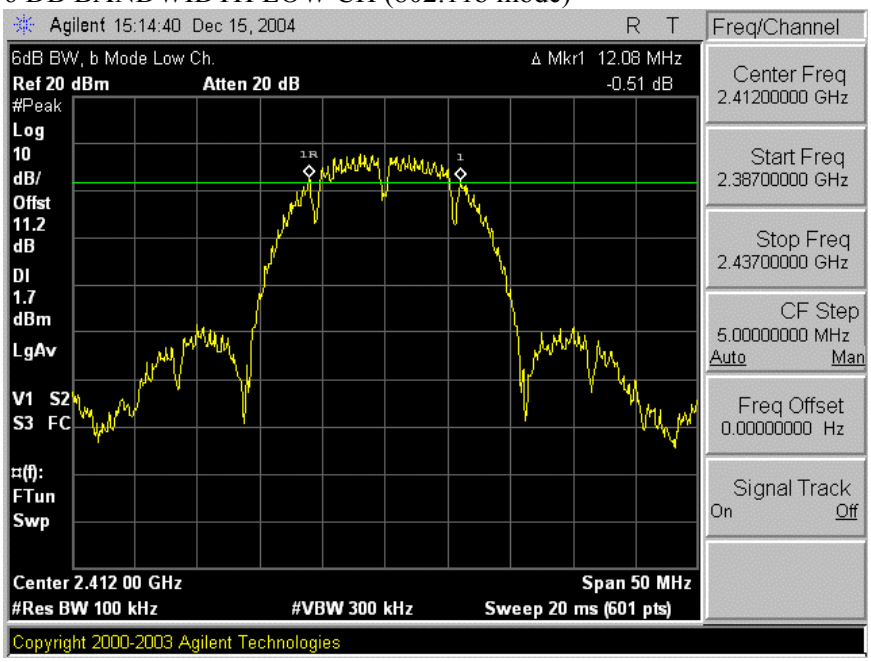
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16333.3	500	15833
Middle	2437	16416.7	500	15917
High	2462	16416.7	500	15917

802.11g Turbo Mode Chain 0

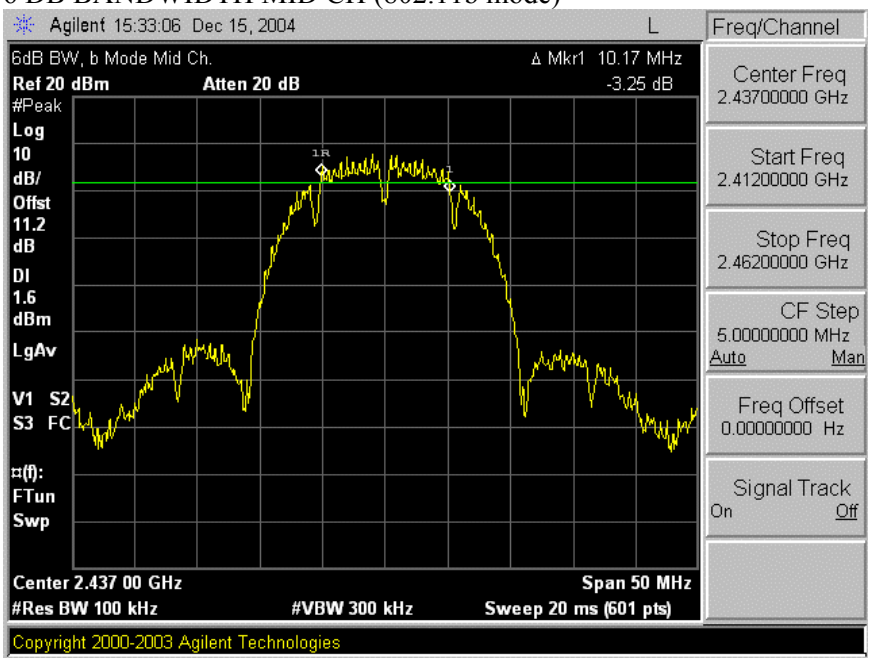
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Middle	2437	31416.7	500	30917

6 DB BANDWIDTH (802.11b MODE)

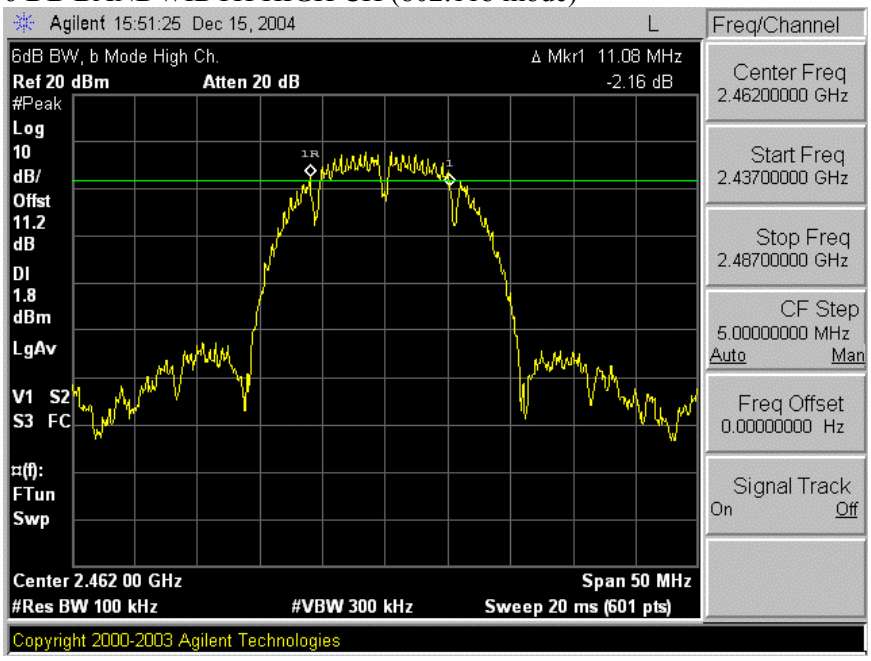
6 DB BANDWIDTH LOW CH (802.11b mode)



6 DB BANDWIDTH MID CH (802.11b mode)

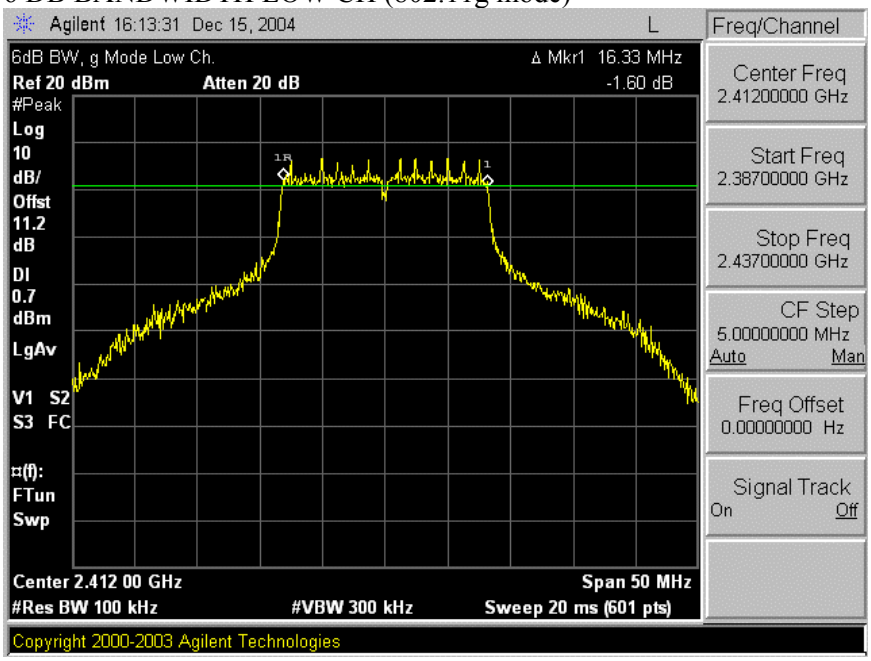


6 DB BANDWIDTH HIGH CH (802.11b mode)

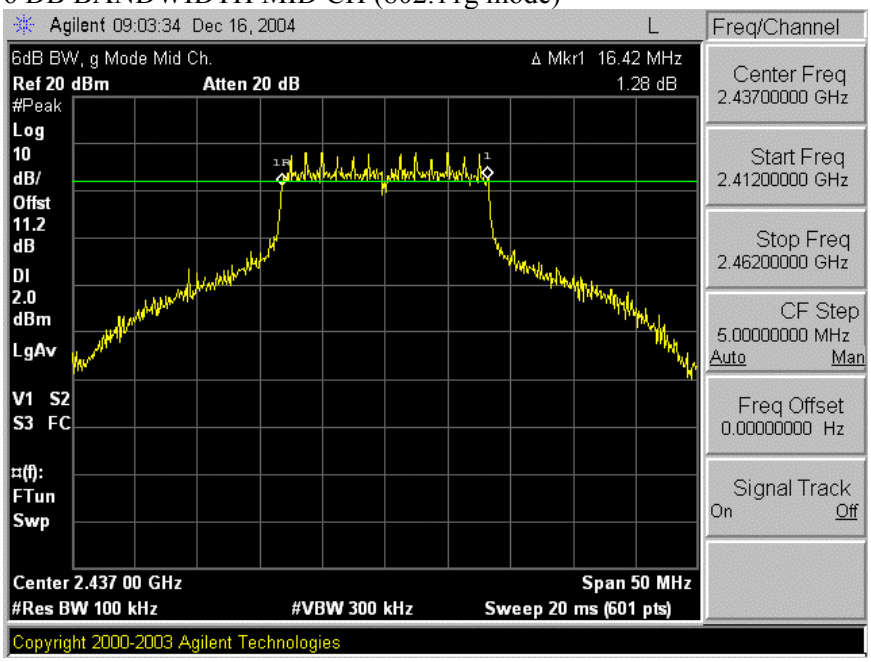


6 DB BANDWIDTH (802.11g MODE; Chain 0)

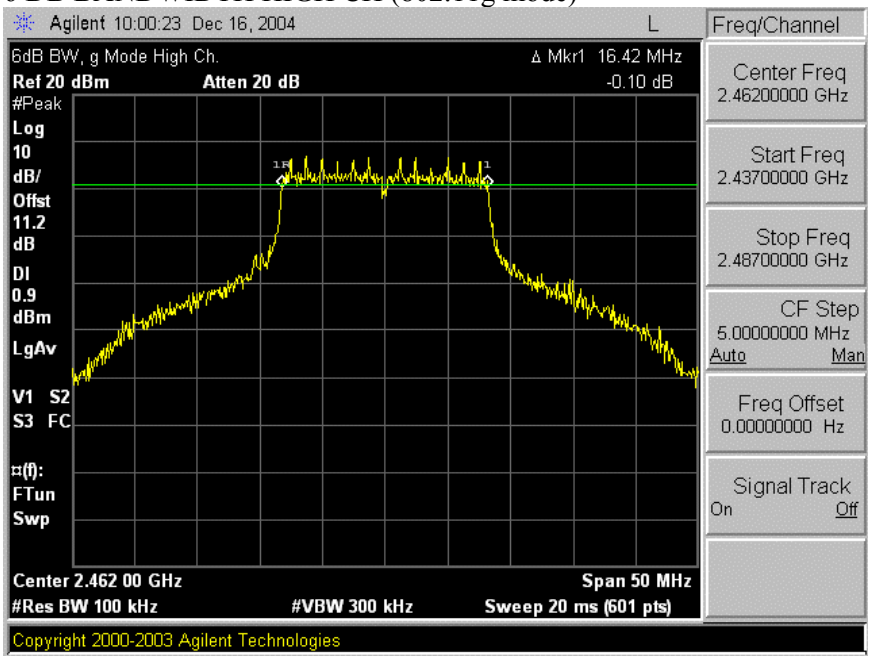
6 DB BANDWIDTH LOW CH (802.11g mode)



6 DB BANDWIDTH MID CH (802.11g mode)

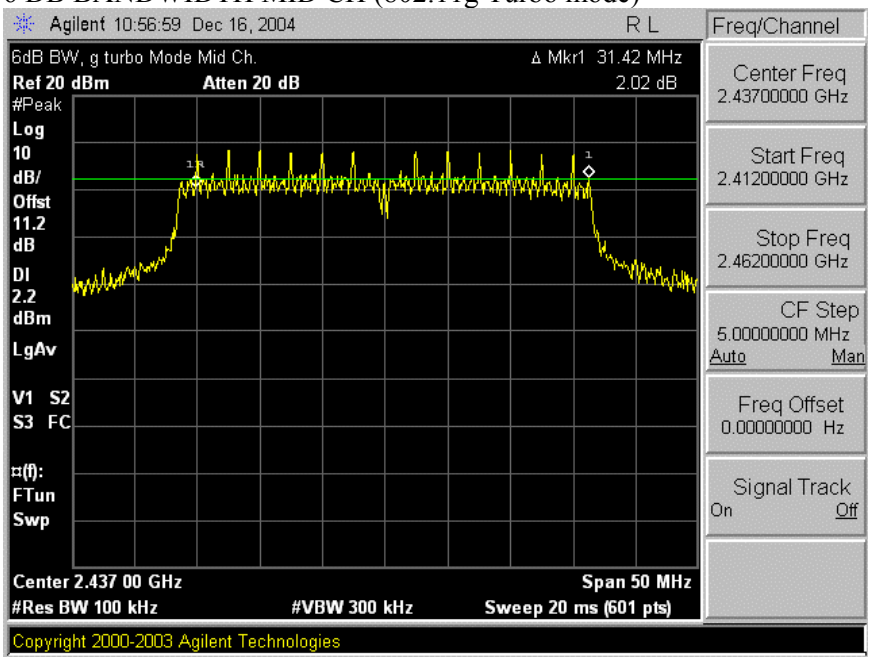


6 DB BANDWIDTH HIGH CH (802.11g mode)



6 DB BANDWIDTH (802.11g TURBO MODE; Chain 0)

6 DB BANDWIDTH MID CH (802.11g Turbo mode)



7.1.2. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.63
Middle	2437	15.562
High	2462	15.53

802.11g Mode Chain 0

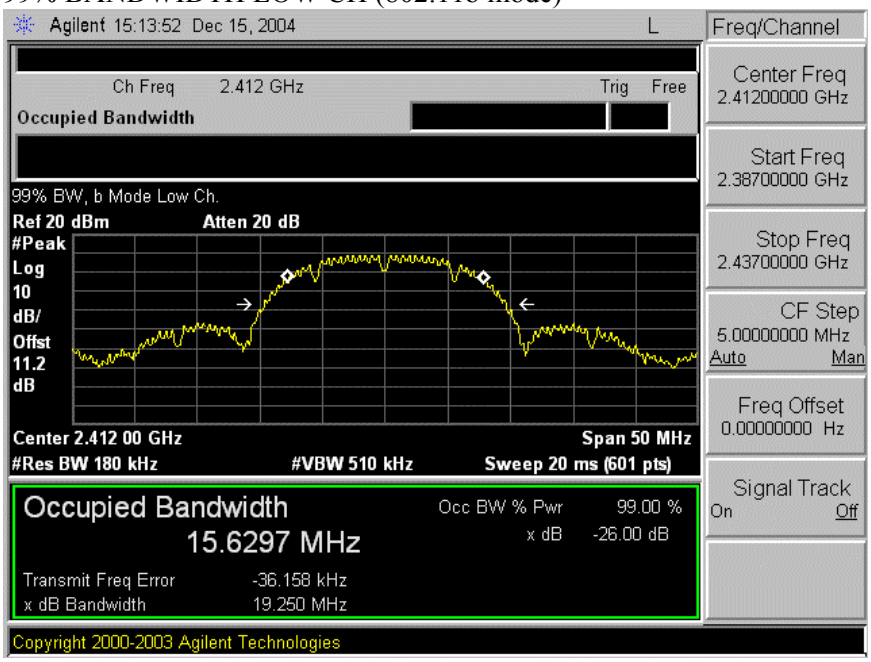
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.8065
	2417	16.8332
	2422	17.2599
	2427	17.2346
Middle	2437	17.353
	2447	16.9298
	2452	16.9188
	2457	16.8351
High	2462	16.7848

802.11g Turbo Mode Chain 0

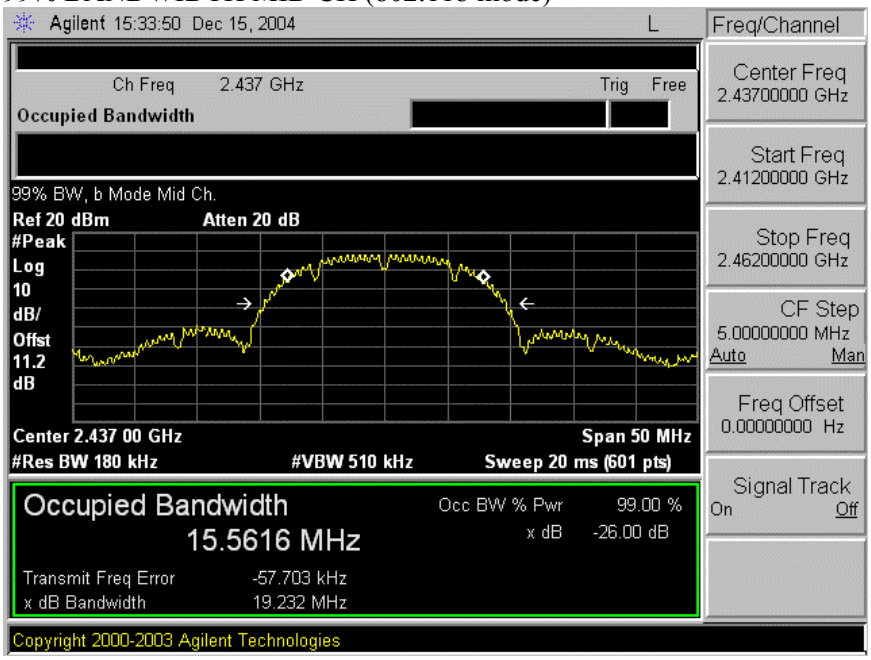
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Middle	2437	33.3788

99% BANDWIDTH (802.11b MODE)

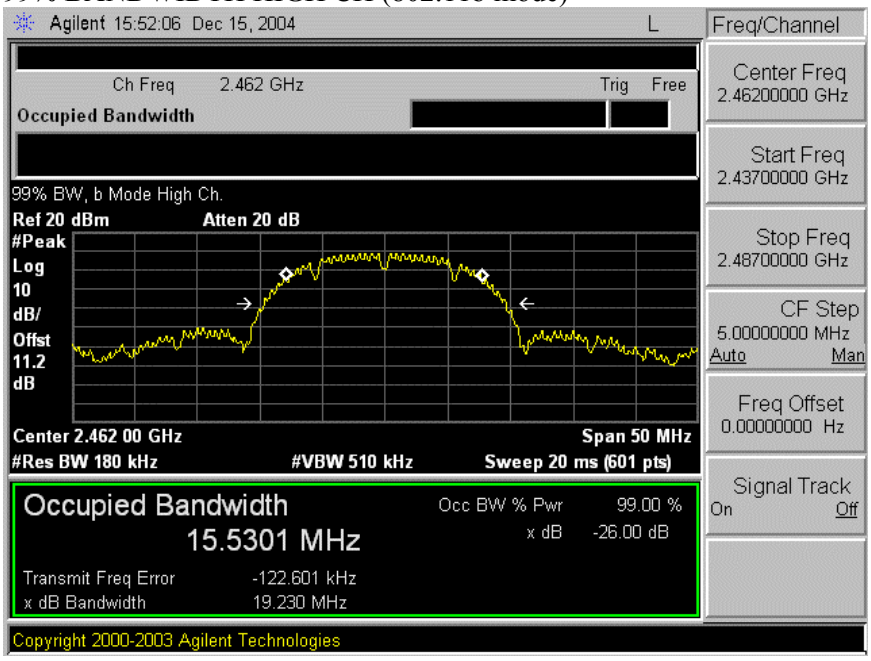
99% BANDWIDTH LOW CH (802.11b mode)



99% BANDWIDTH MID CH (802.11b mode)

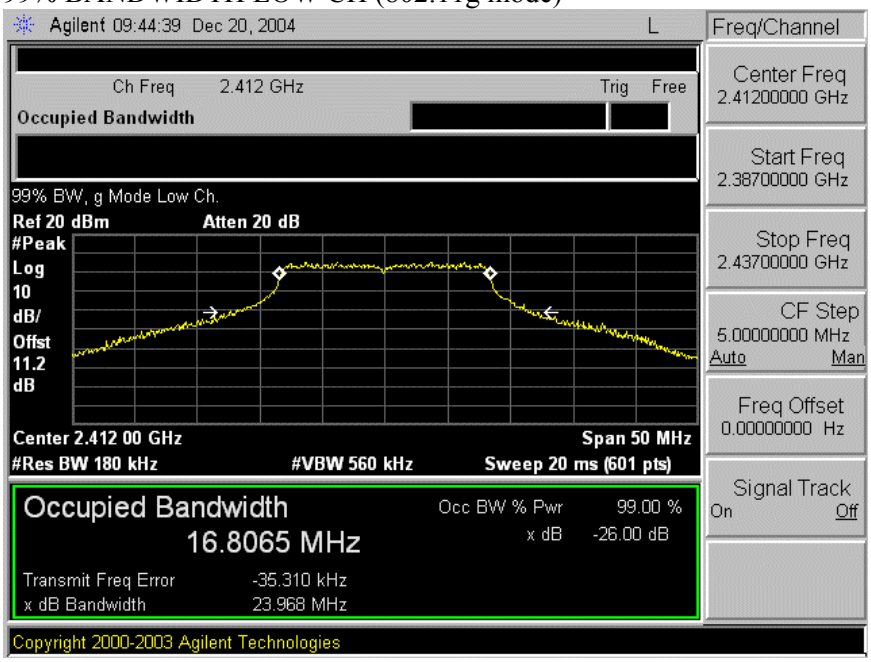


99% BANDWIDTH HIGH CH (802.11b mode)

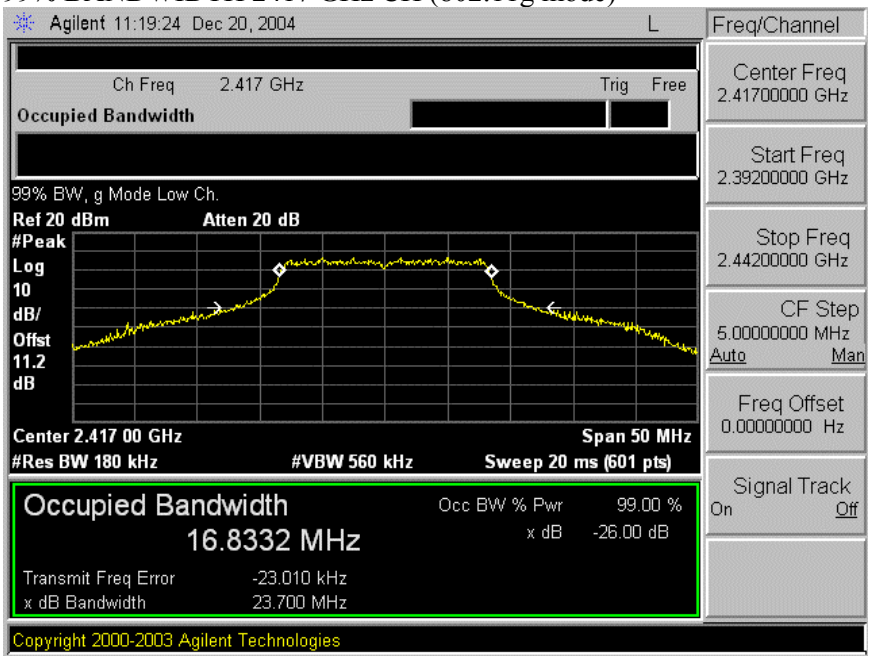


99% BANDWIDTH (802.11g MODE; Chain 0)

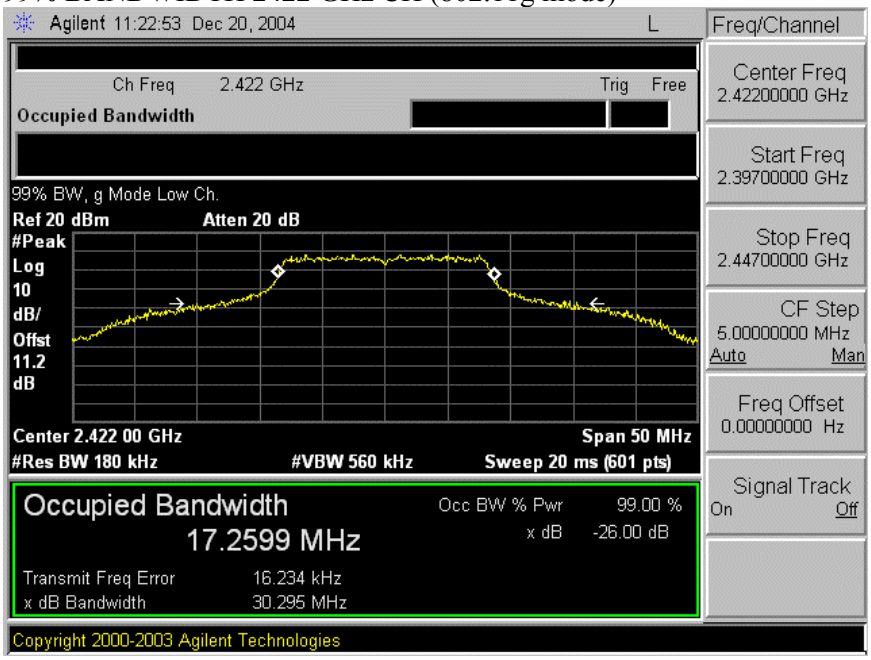
99% BANDWIDTH LOW CH (802.11g mode)



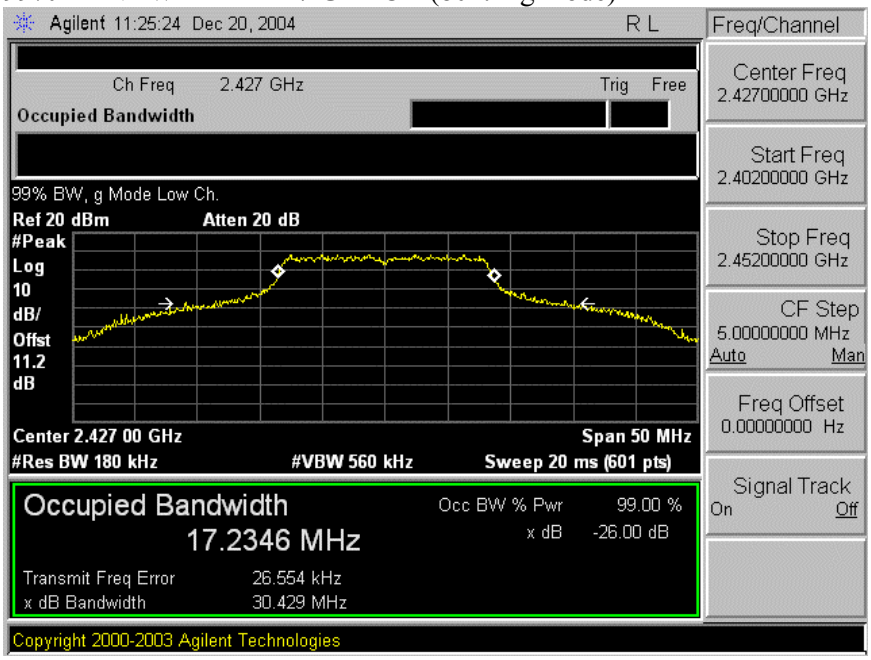
99% BANDWIDTH 2417 GHz CH (802.11g mode)



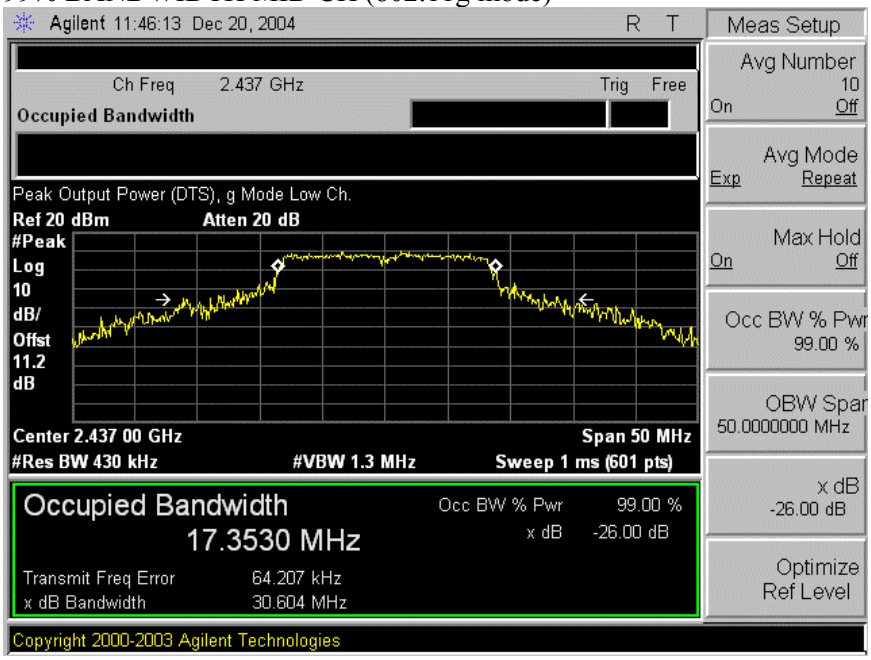
99% BANDWIDTH 2422 GHz CH (802.11g mode)



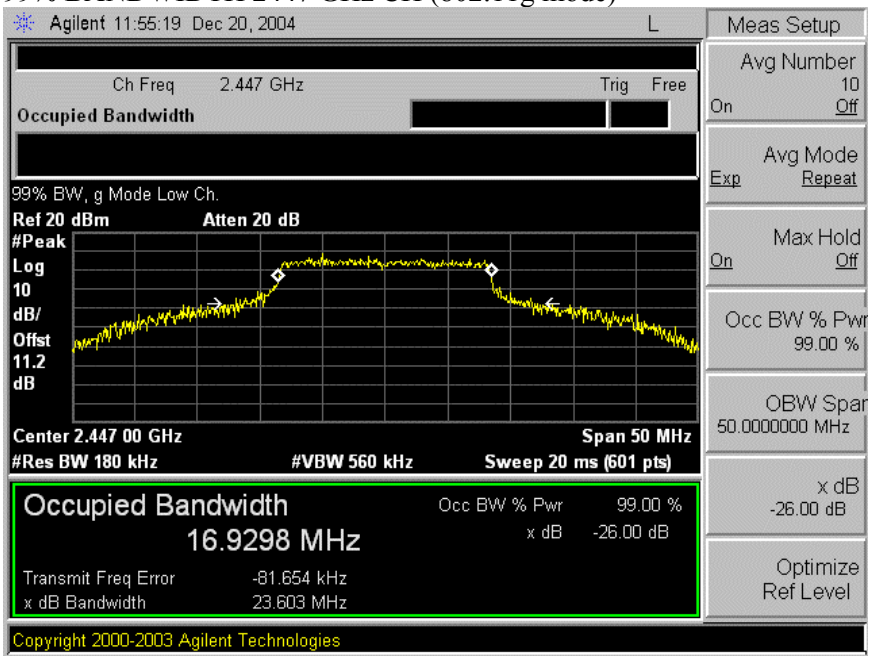
99% BANDWIDTH 2427 GHz CH (802.11g mode)



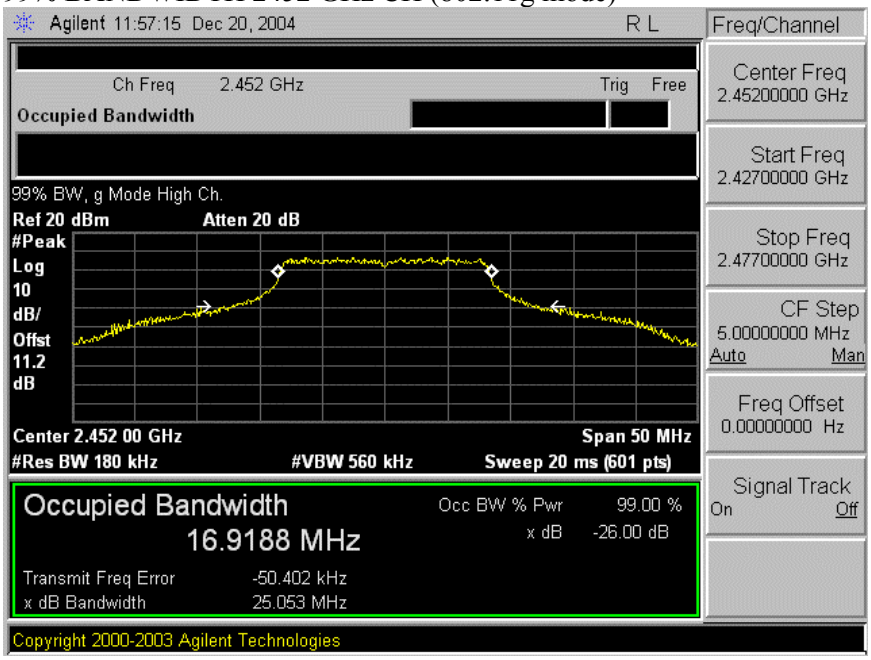
99% BANDWIDTH MID CH (802.11g mode)



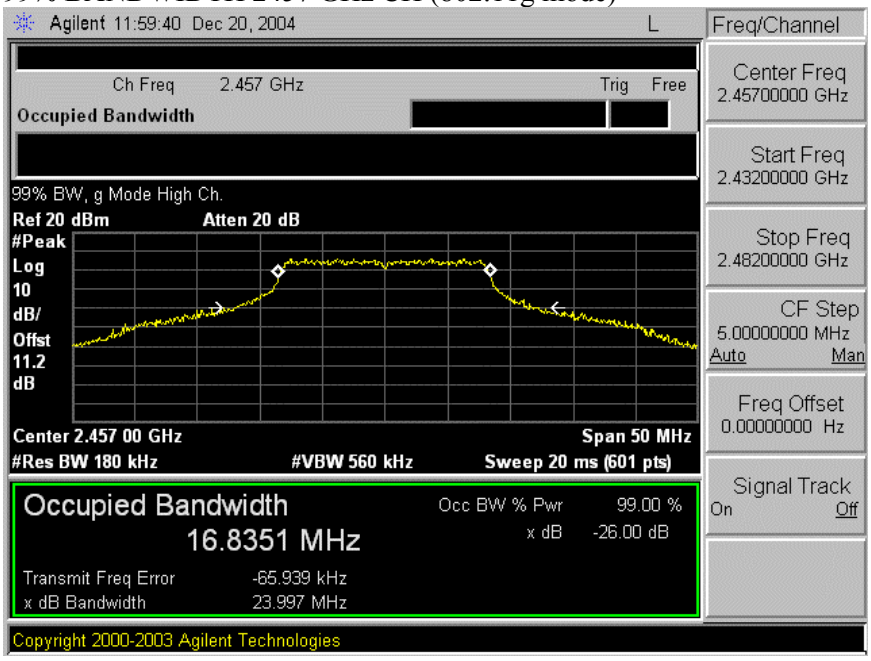
99% BANDWIDTH 2447 GHz CH (802.11g mode)



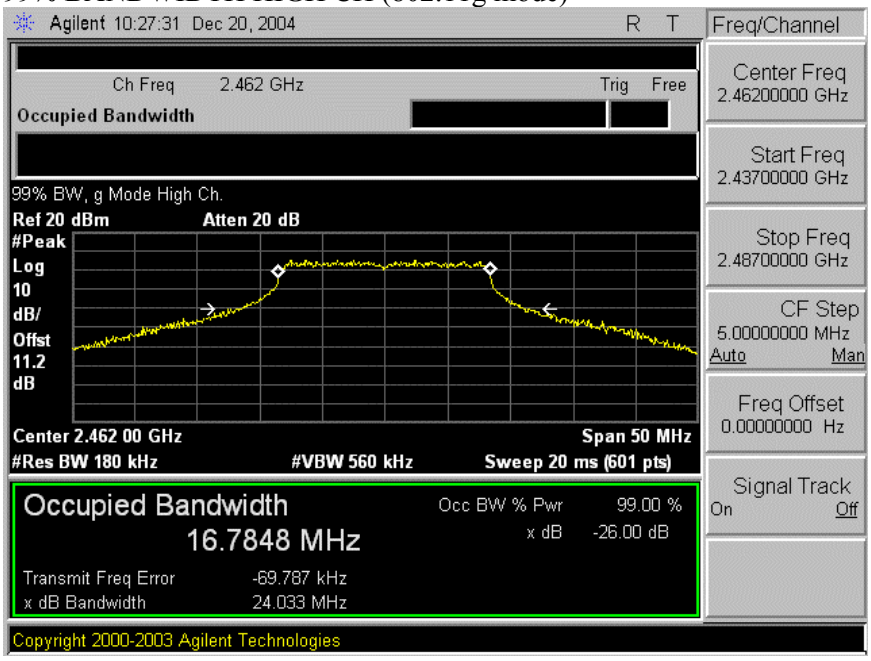
99% BANDWIDTH 2452 GHz CH (802.11g mode)



99% BANDWIDTH 2457 GHz CH (802.11g mode)

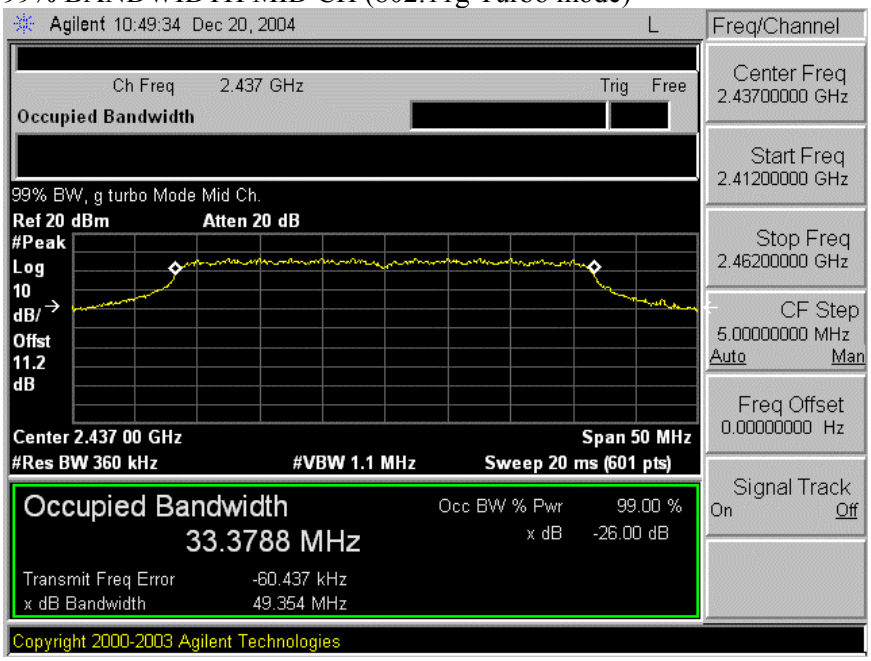


99% BANDWIDTH HIGH CH (802.11g mode)



99% BANDWIDTH (802.11g TURBO MODE; Chain 0)

99% BANDWIDTH MID CH (802.11g Turbo mode)



7.1.3. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(4) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

The maximum gain of a single antenna is 3.39 dBi, for other than fixed, point-to-point operations, the limit is 30 dBm.

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	20.98	30	-9.02
Middle	2437	20.95	30	-9.05
High	2462	20.61	30	-9.39

802.11g Mode, SINGLE CHAIN; Chain 0

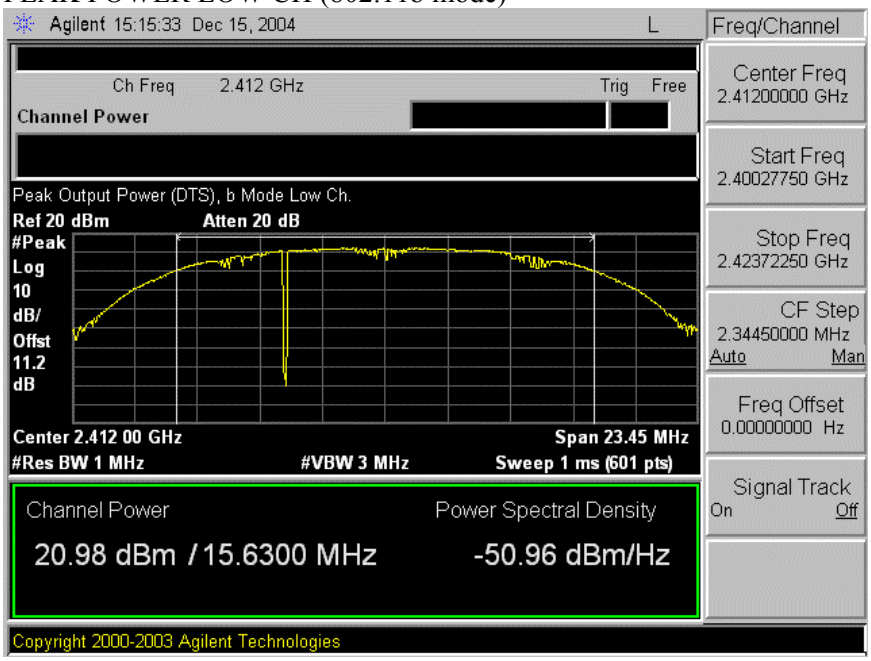
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	21.40	30	-8.60
	2417	22.78	30	-7.22
	2422	24.95	30	-5.05
	2427	24.88	30	-5.12
Middle	2437	25.88	30	-4.12
	2447	24.80	30	-5.20
	2452	23.39	30	-6.61
	2457	22.54	30	-7.46
High	2462	20.96	30	-9.04

802.11g Turbo Mode, SINGLE CHAIN; Chain 0

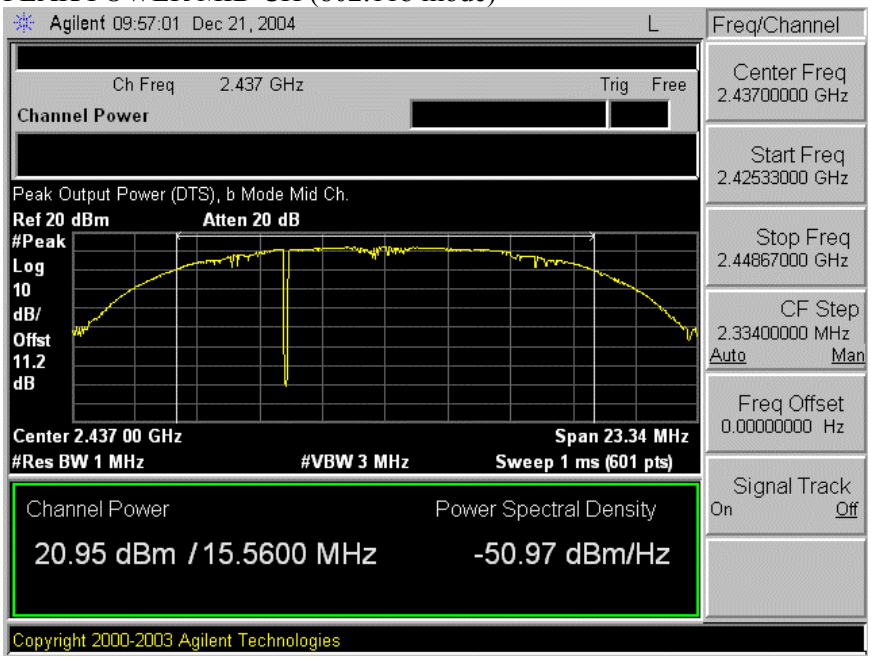
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Middle	2437	21.82	30	-8.18

OUTPUT POWER (802.11b MODE)

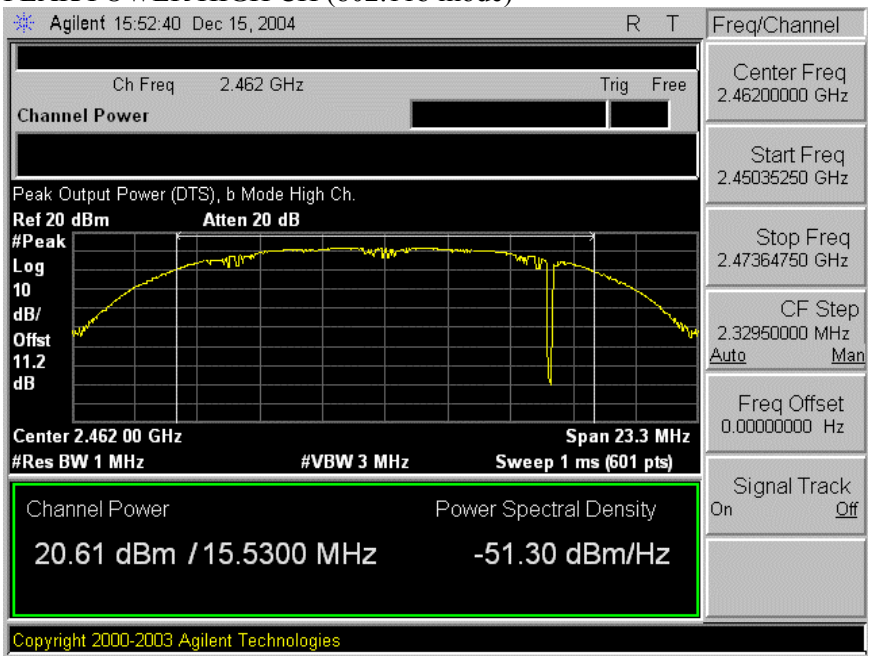
PEAK POWER LOW CH (802.11b mode)



PEAK POWER MID CH (802.11b mode)

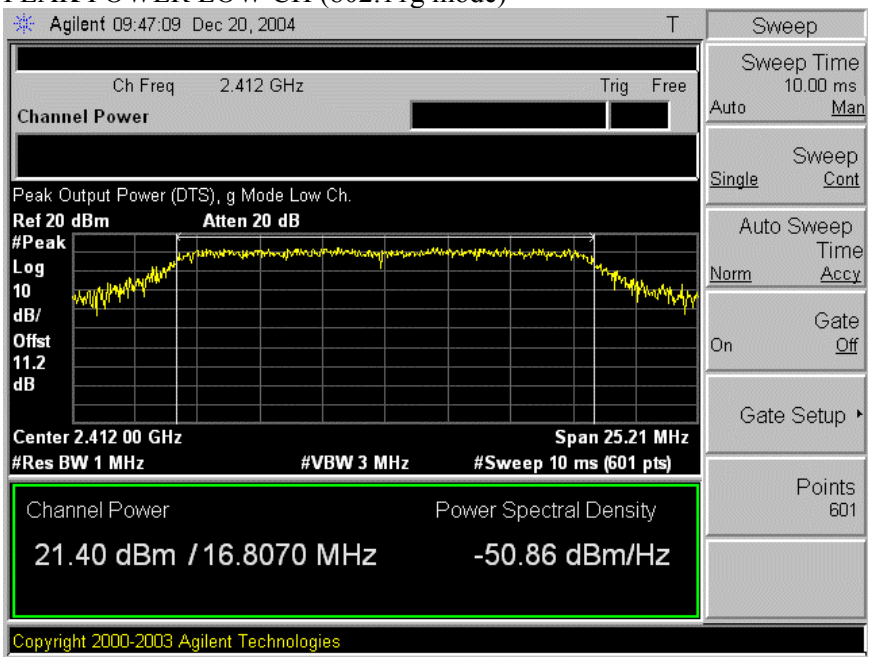


PEAK POWER HIGH CH (802.11b mode)

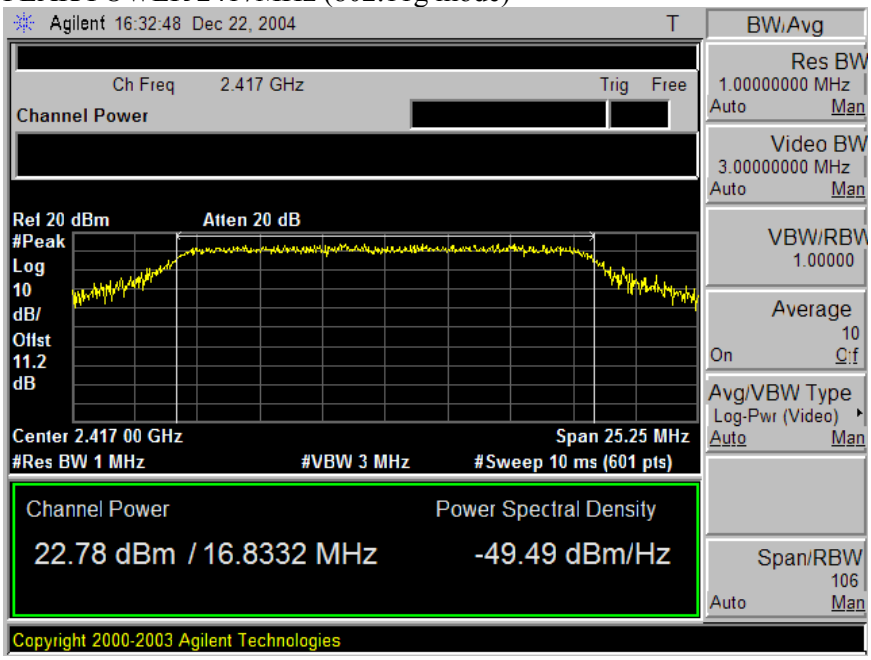


OUTPUT POWER (802.11g MODE, CHAIN 0)

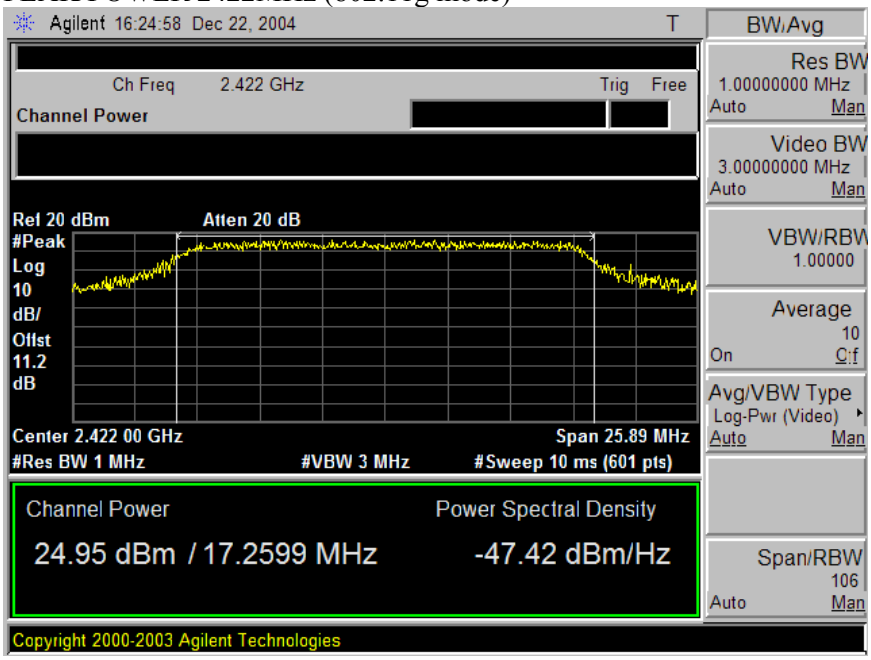
PEAK POWER LOW CH (802.11g mode)



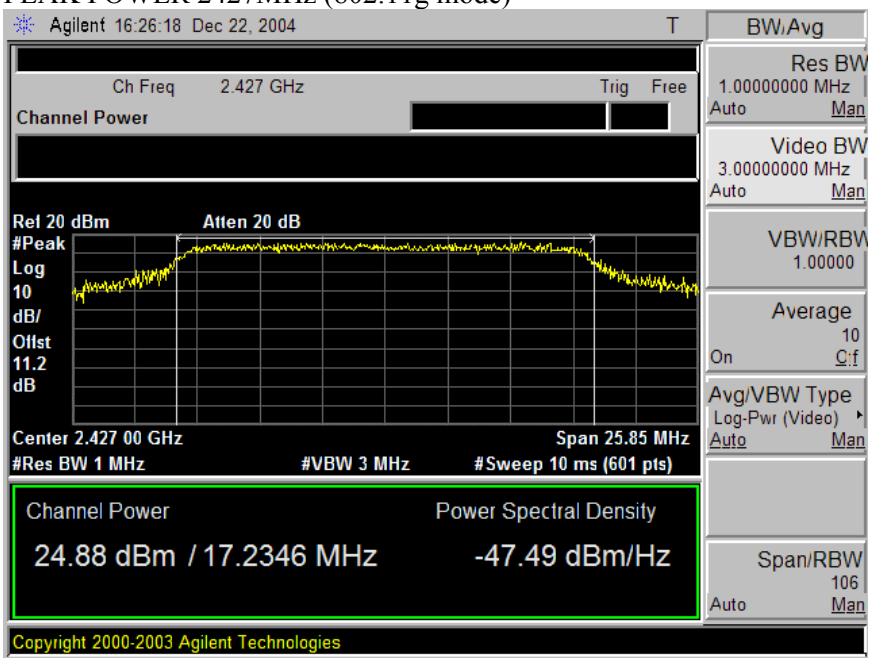
PEAK POWER 2417MHz (802.11g mode)



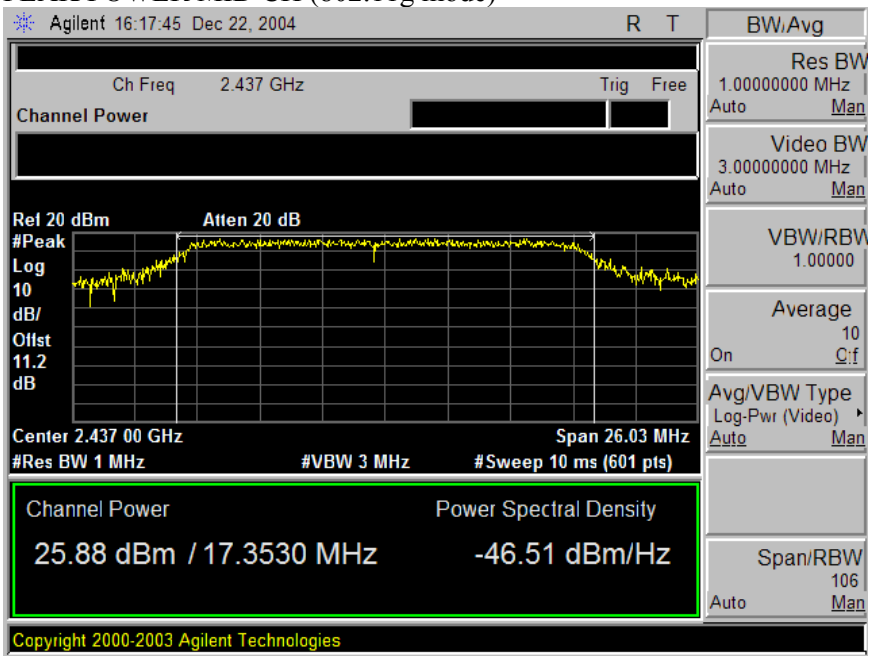
PEAK POWER 2422MHz (802.11g mode)



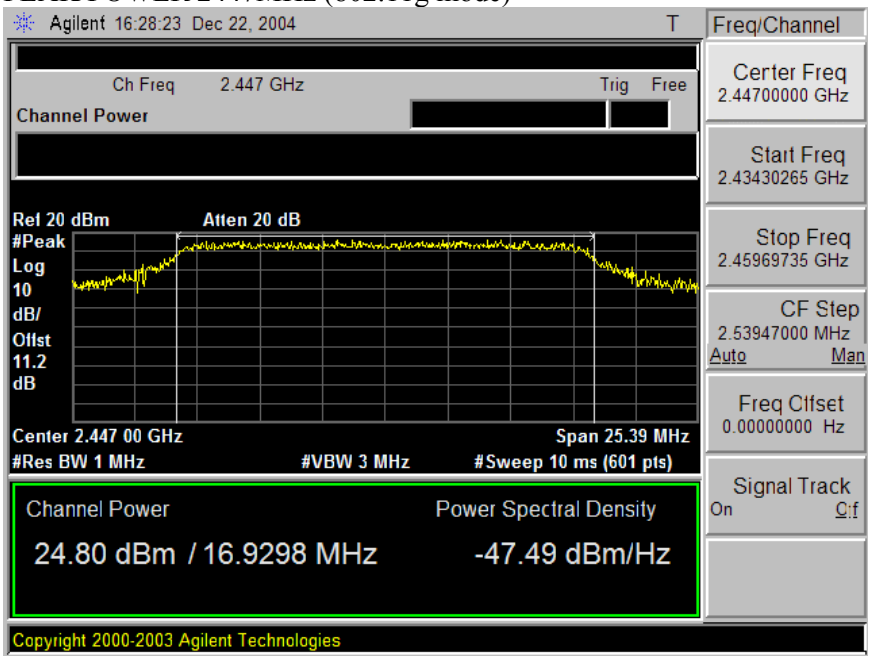
PEAK POWER 2427MHz (802.11g mode)



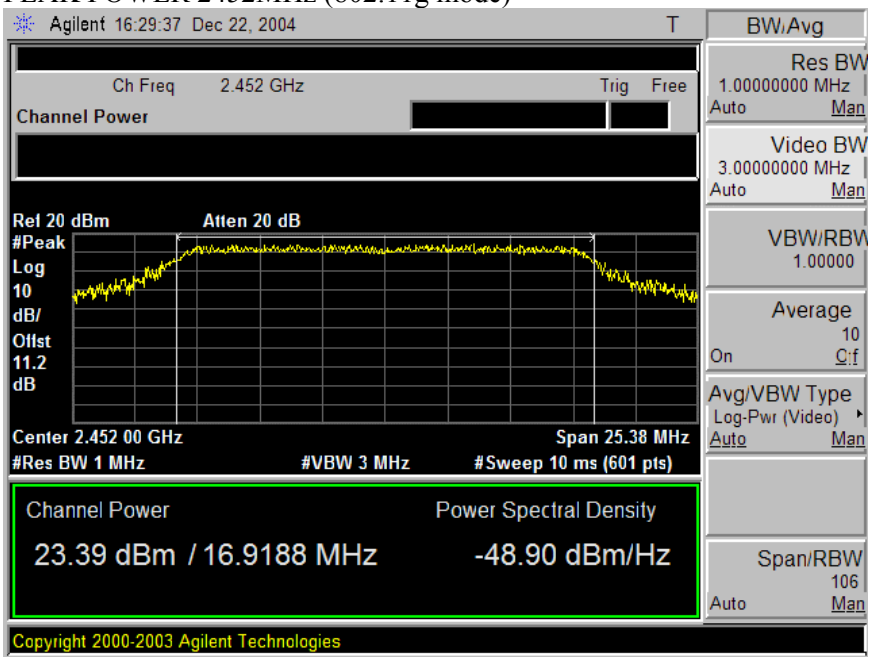
PEAK POWER MID CH (802.11g mode)



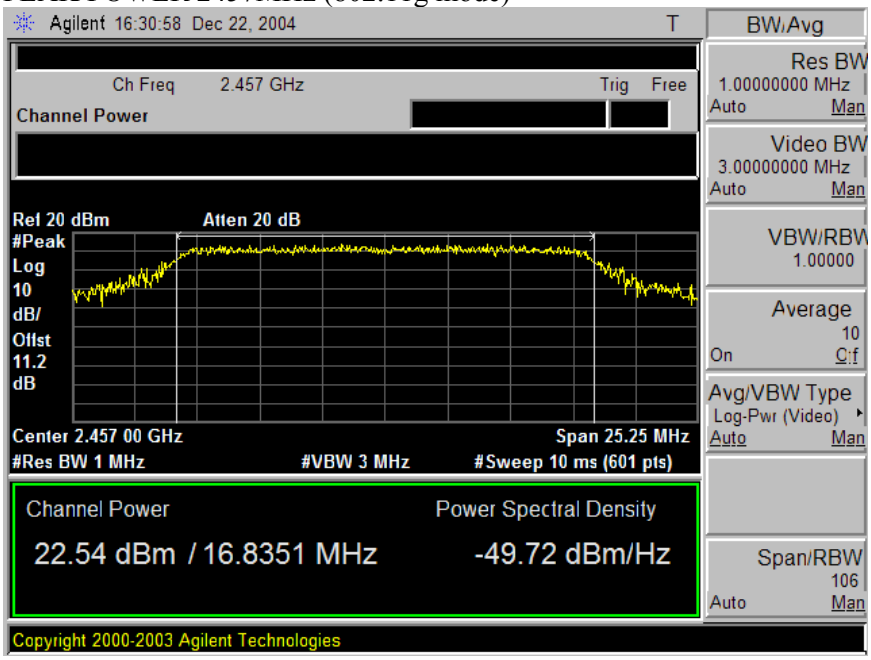
PEAK POWER 2447MHz (802.11g mode)



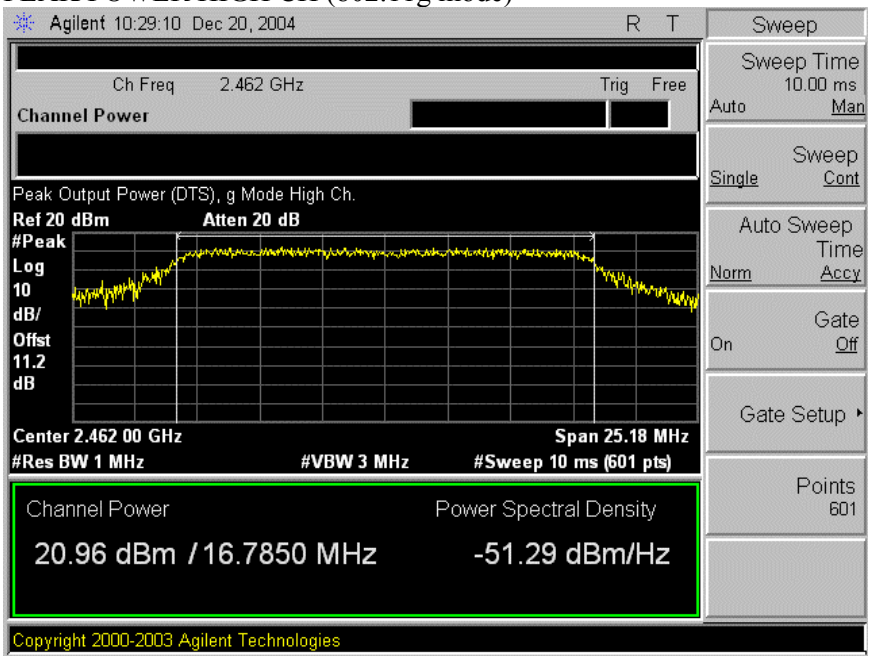
PEAK POWER 2452MHz (802.11g mode)



PEAK POWER 2457MHz (802.11g mode)

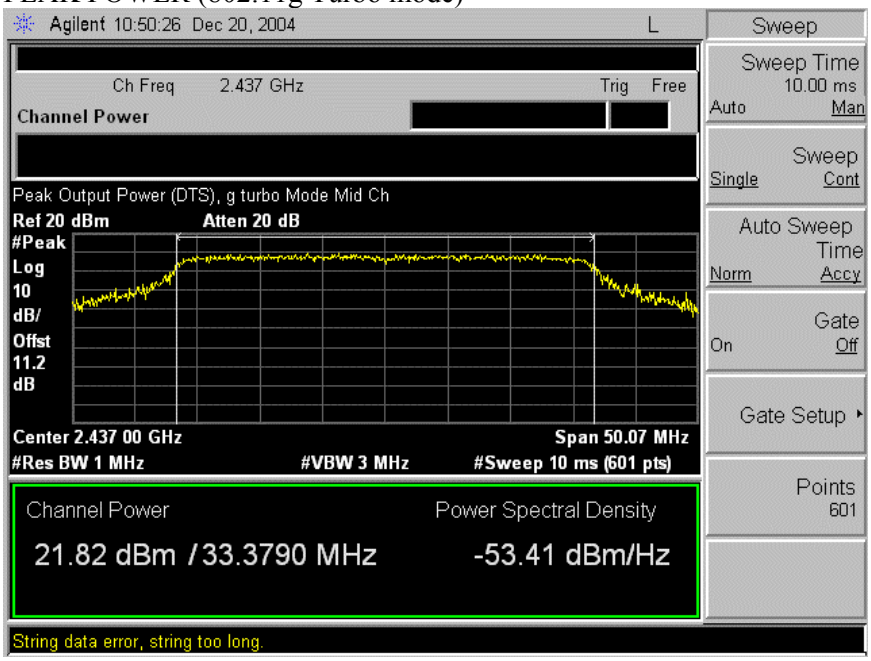


PEAK POWER HIGH CH (802.11g mode)



OUTPUT POWER (802.11g TURBO MODE, CHAIN 0)

PEAK POWER (802.11g Turbo mode)



7.1.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E \wedge 2 / 3770$

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 rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 \wedge ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11b	1.0	20.98	3.39	4.66
802.11g	1.0	25.88	3.39	8.20
802.11g Turbo	1.0	21.82	3.39	5.14

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.1.5. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.18 dB (including 10 dB pad and 1.18 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	18.38
Middle	2437	18.58
High	2462	18.08

802.11g Mode, SINGLE CHAIN ,Chain 0

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	15.88
	2417	17.08
	2422	18.87
	2427	19.08
Middle	2437	19.93
	2447	19.08
	2452	17.74
	2457	16.68
High	2462	15.68

802.11g Turbo Mode, SINGLE CHAIN ; Chain 0

Channel	Frequency (MHz)	Average Power (dBm)
Middle	2437	16.88

7.1.6. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak 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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-5.94	8	-13.94
Middle	2437	-4.32	8	-12.32
High	2462	-4.99	8	-12.99

802.11g Mode; Chain 0

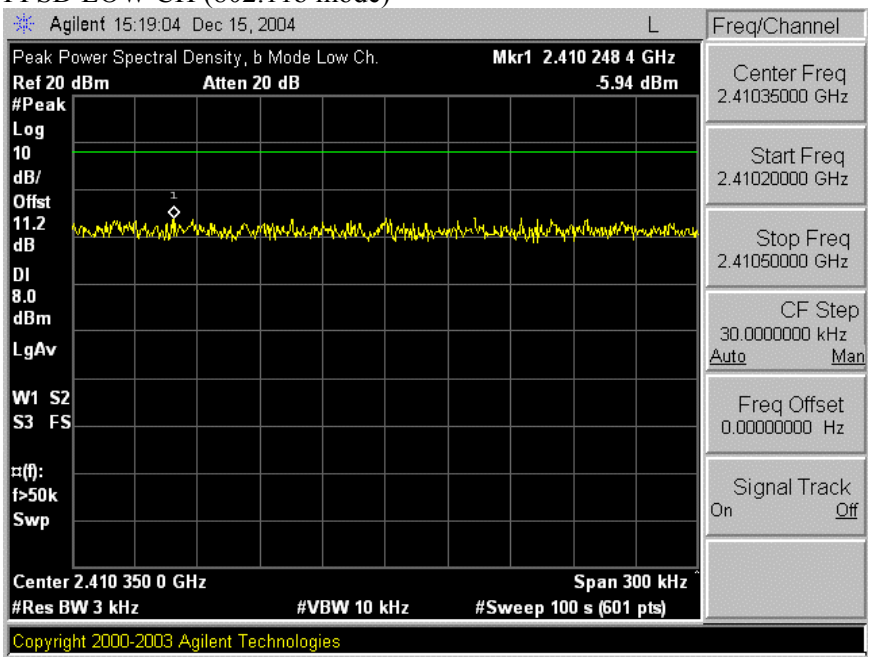
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-6.48	8	-14.48
Middle	2437	-1.67	8	-9.67
High	2462	-6.80	8	-14.80

802.11g Turbo Mode; Chain 0

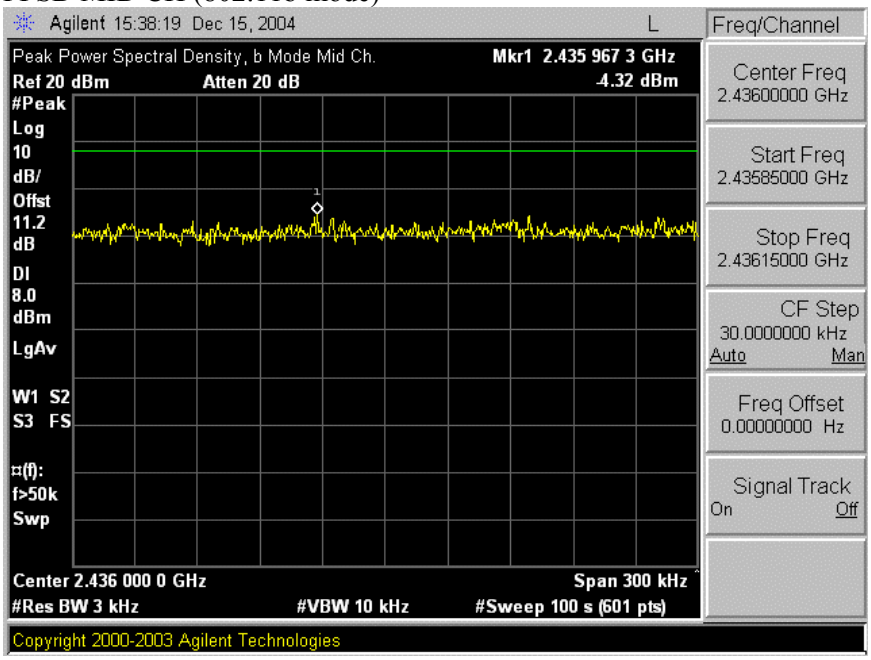
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Middle	2437	-5.47	8	-13.47

PEAK POWER SPECTRAL DENSITY (802.11b MODE)

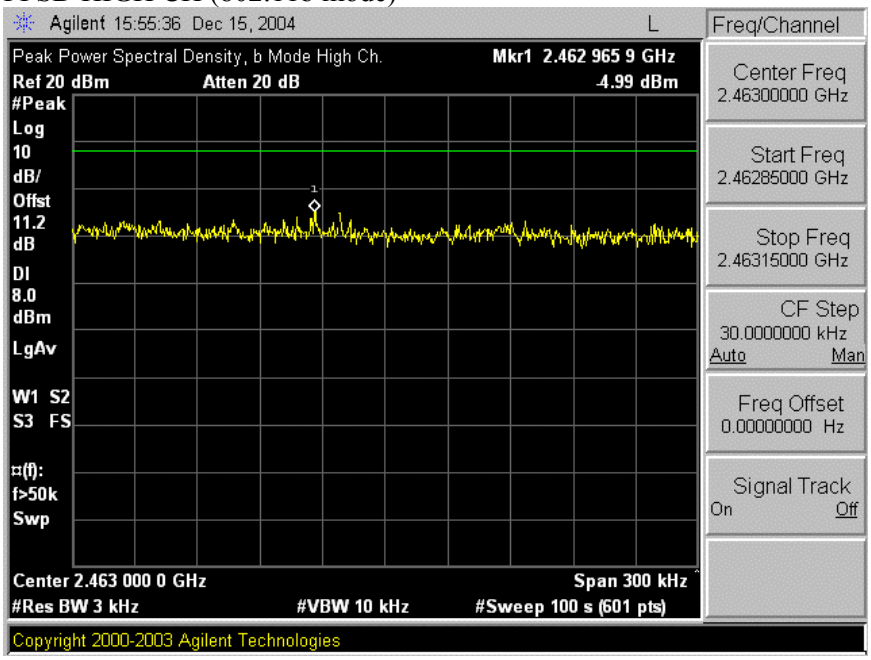
PPSD LOW CH (802.11b mode)



PPSD MID CH (802.11b mode)

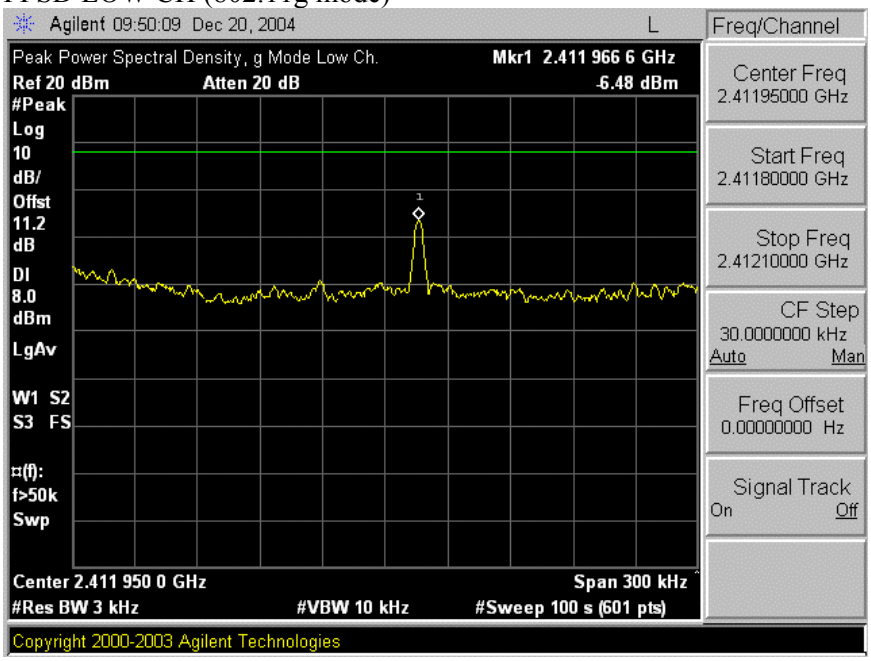


PPSD HIGH CH (802.11b mode)

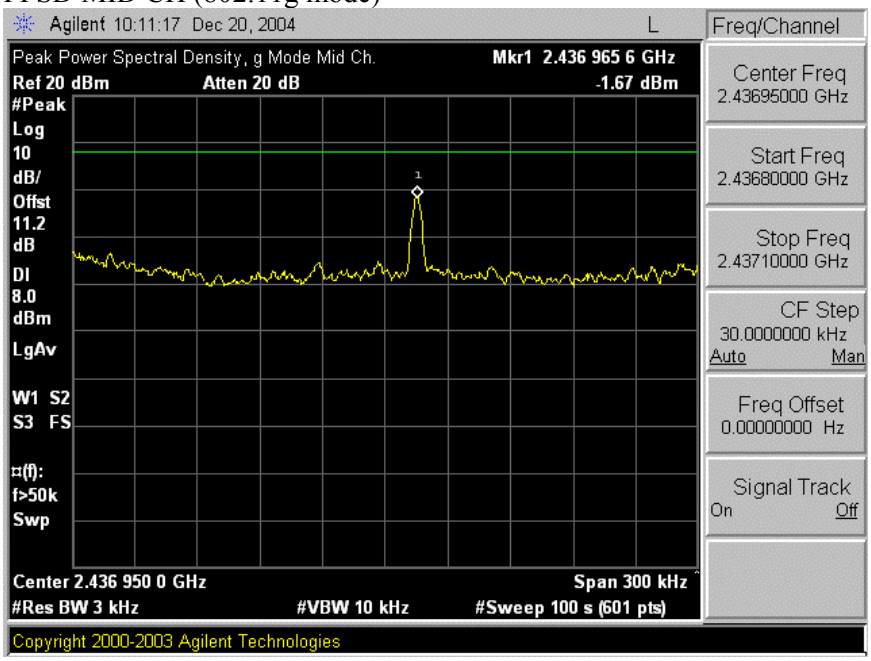


PEAK POWER SPECTRAL DENSITY (802.11g MODE, Chain 0)

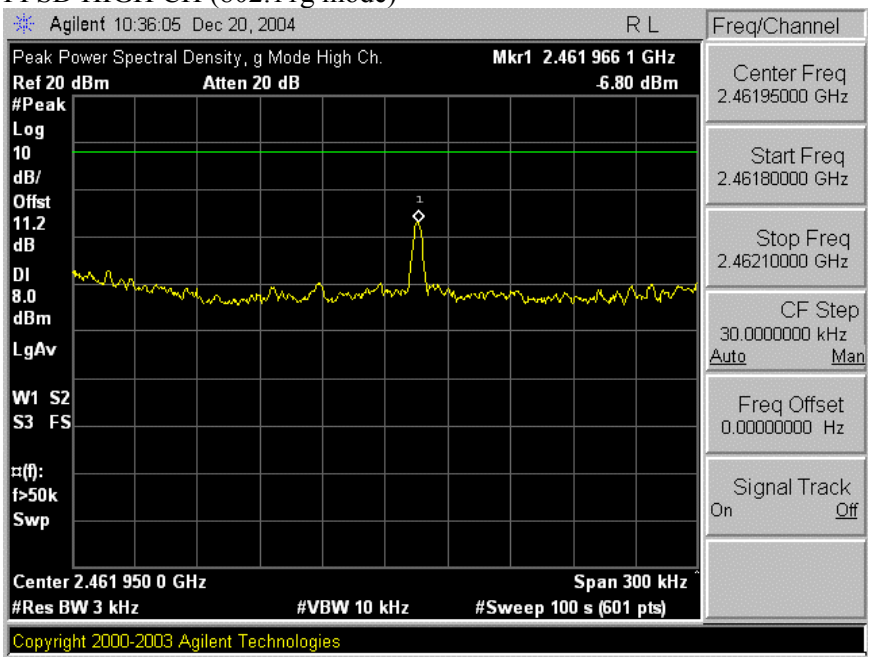
PPSD LOW CH (802.11g mode)



PPSD MID CH (802.11g mode)

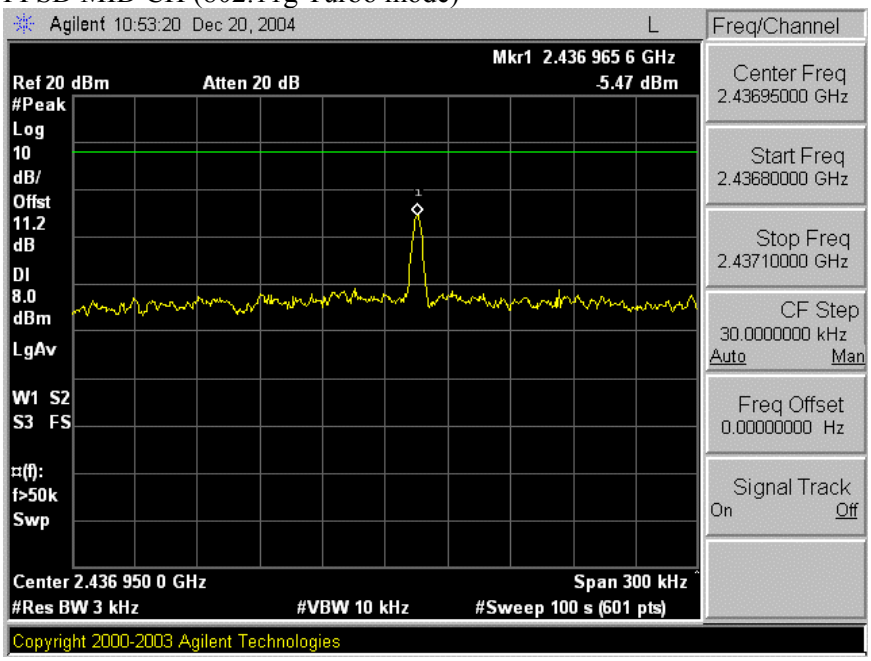


PPSD HIGH CH (802.11g mode)



PEAK POWER SPECTRAL DENSITY (802.11g TURBO MODE; Chain 0)

PPSD MID CH (802.11g Turbo mode)



7.1.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band 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. Attenuation below the general limits specified in §15.209(a) is not required. 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 §15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

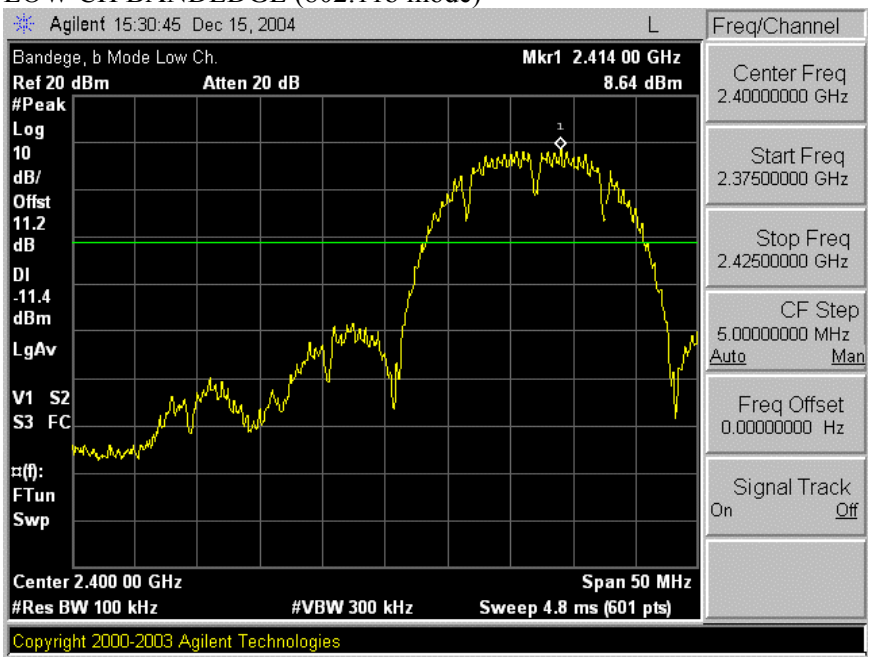
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

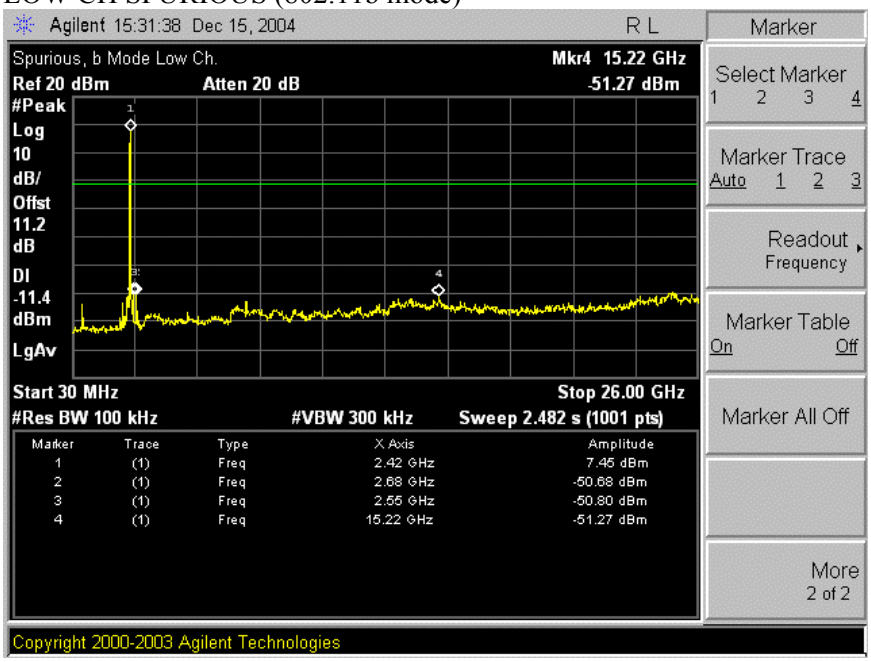
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)

LOW CH BANDEDGE (802.11b mode)

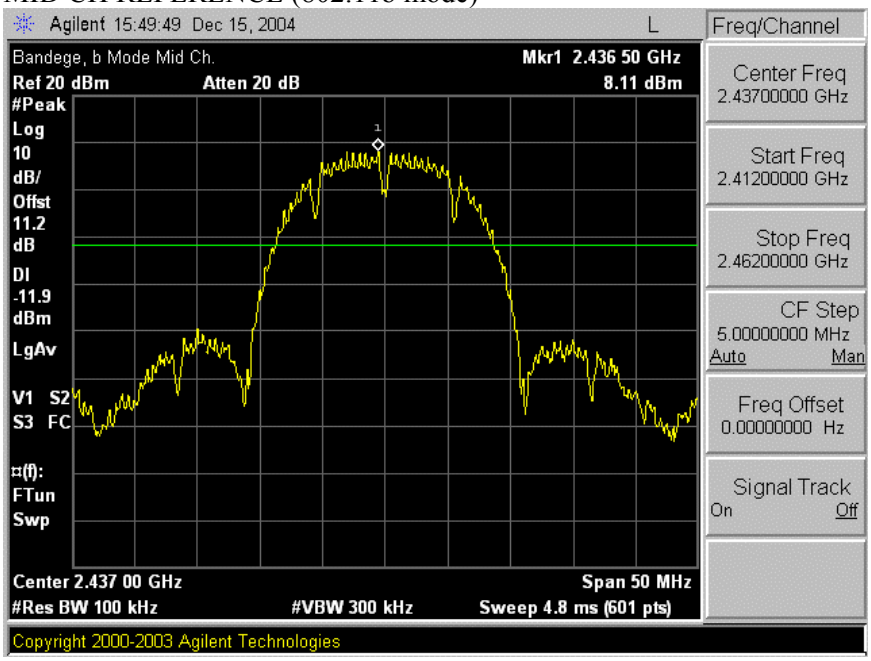


LOW CH SPURIOUS (802.11b mode)

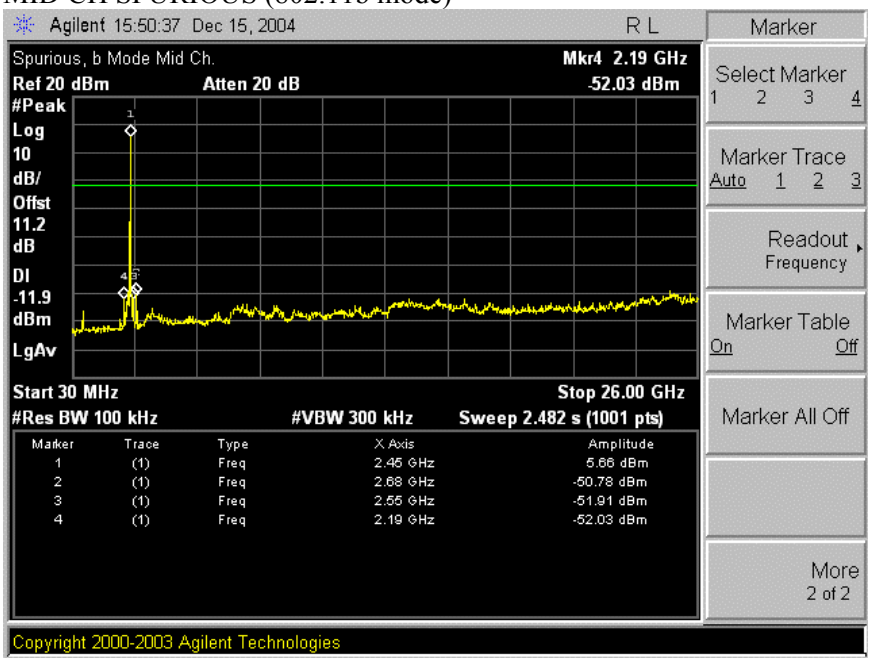


SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

MID CH REFERENCE (802.11b mode)



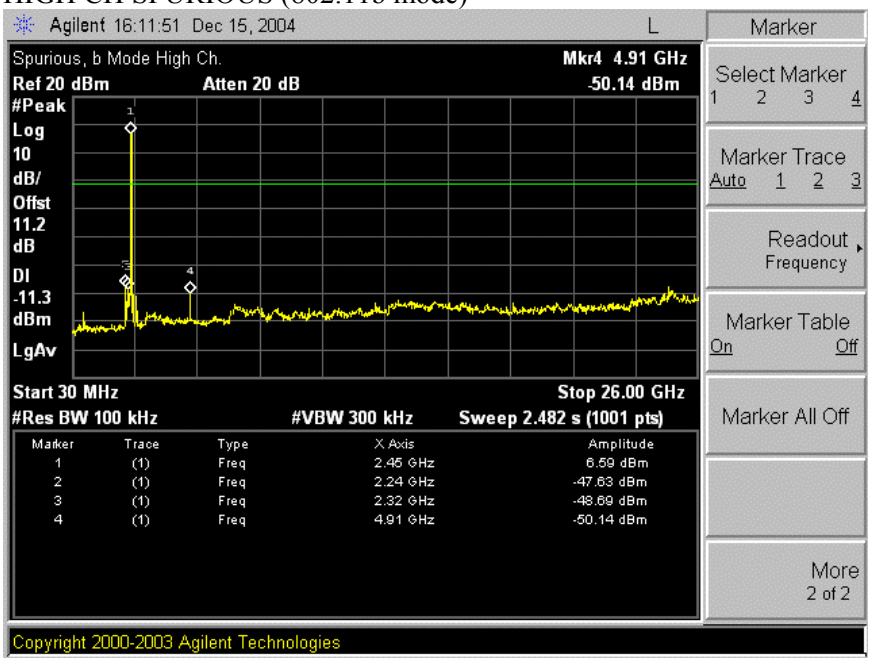
MID CH SPURIOUS (802.11b mode)



SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

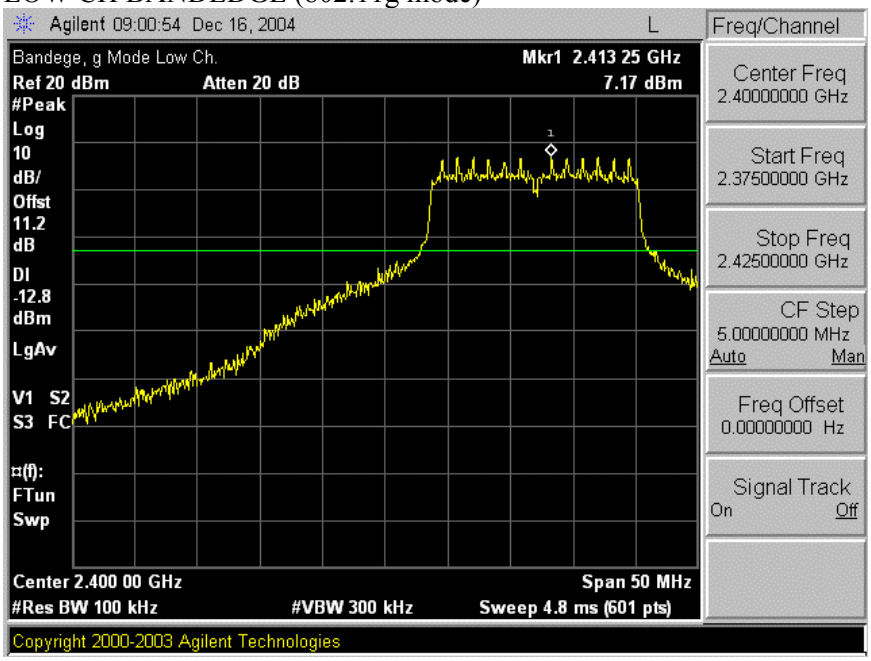
HIGH CH BANDEDGE (802.11b mode)

HIGH CH SPURIOUS (802.11b mode)

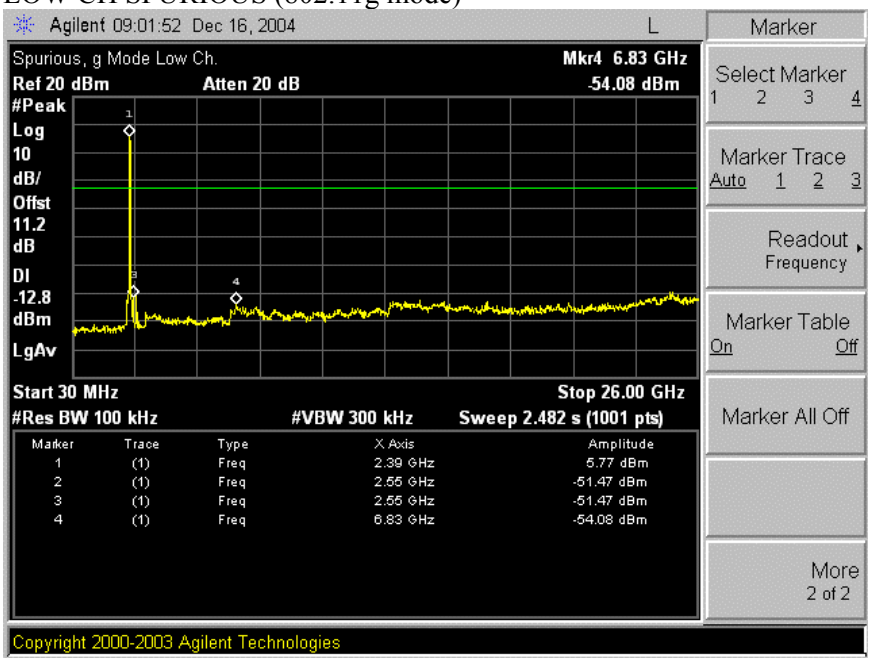


SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE; Chain 0)

LOW CH BANDEDGE (802.11g mode)

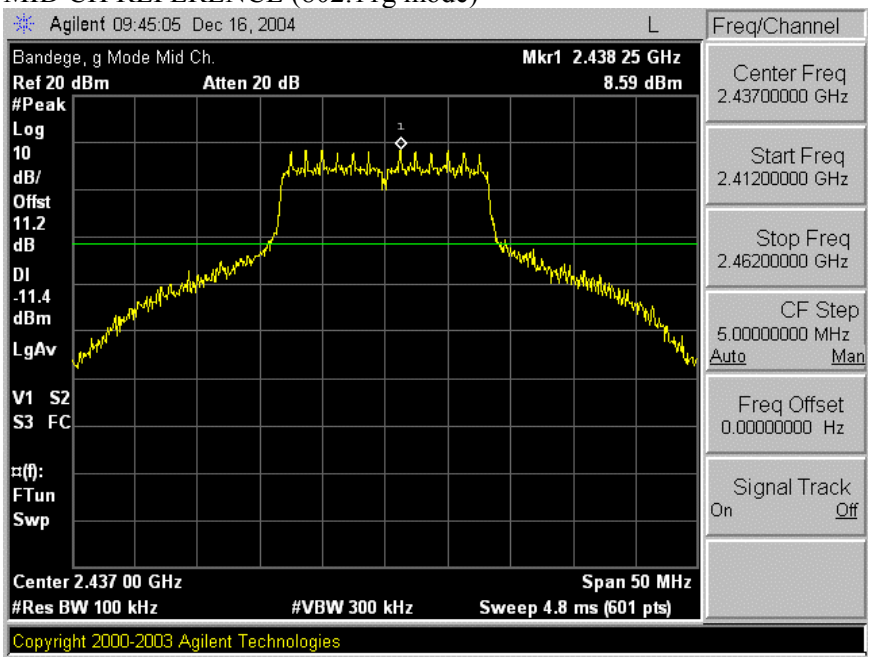


LOW CH SPURIOUS (802.11g mode)

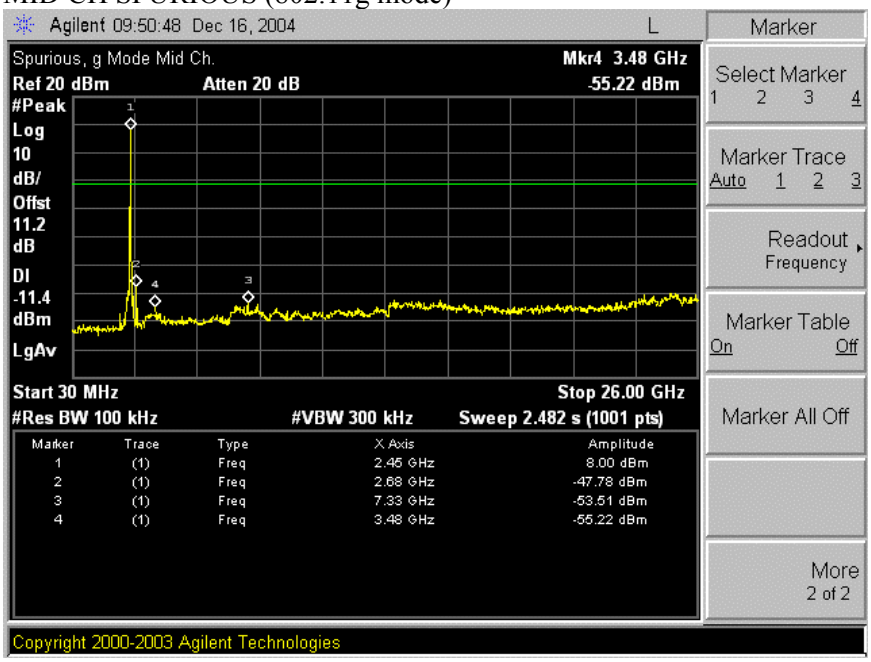


SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE; Chain 0)

MID CH REFERENCE (802.11g mode)

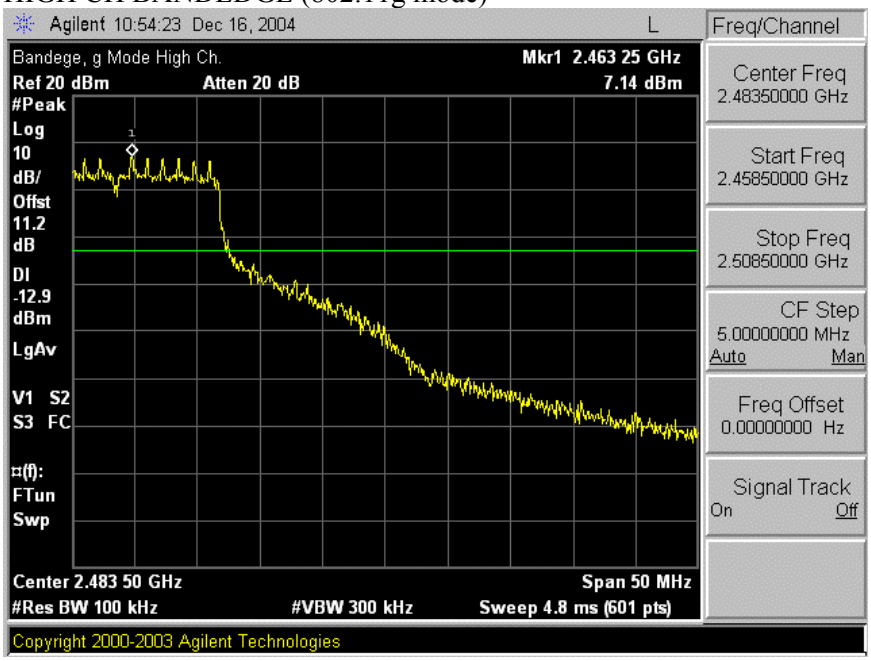


MID CH SPURIOUS (802.11g mode)

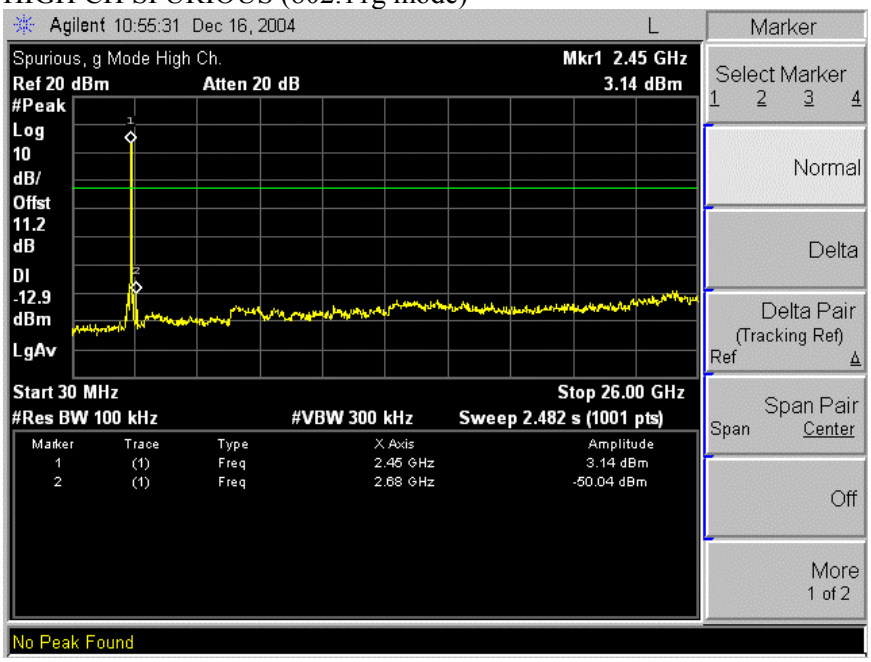


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE; Chain 0)

HIGH CH BANDEDGE (802.11g mode)

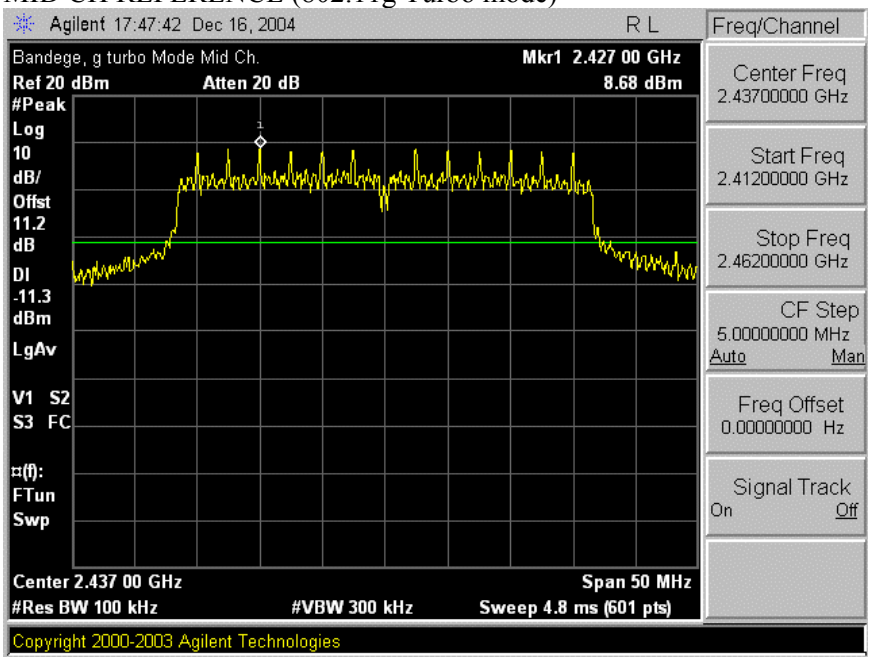


HIGH CH SPURIOUS (802.11g mode)

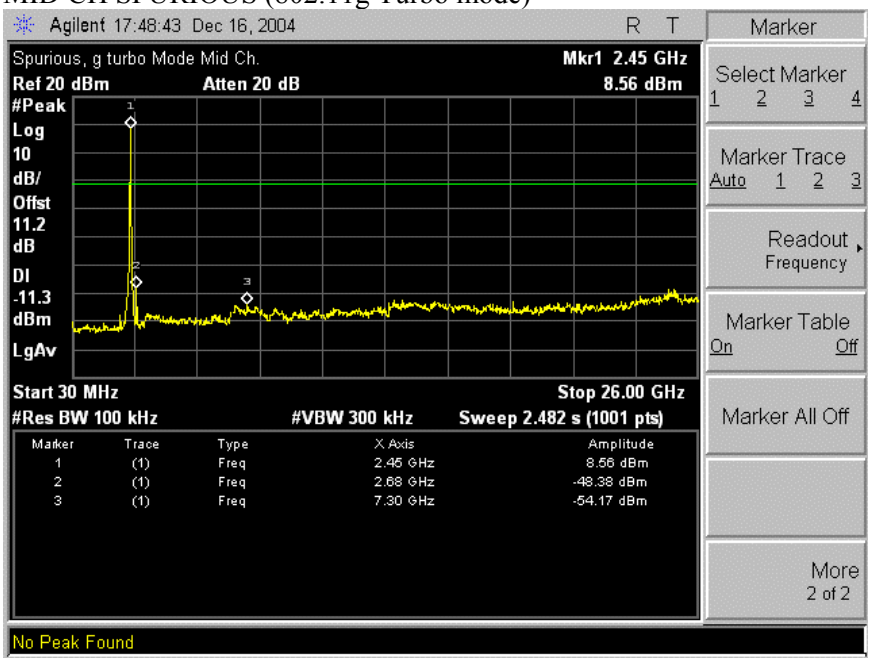


SPURIOUS EMISSIONS, MID CHANNEL (802.11g TURBO MODE; Chain 0)

MID CH REFERENCE (802.11g Turbo mode)



MID CH SPURIOUS (802.11g Turbo mode)



7.2. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND, DUAL CHAIN

7.2.1. 6 dB BANDWIDTH

LIMIT

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

802.11g Mode, Dual Chain

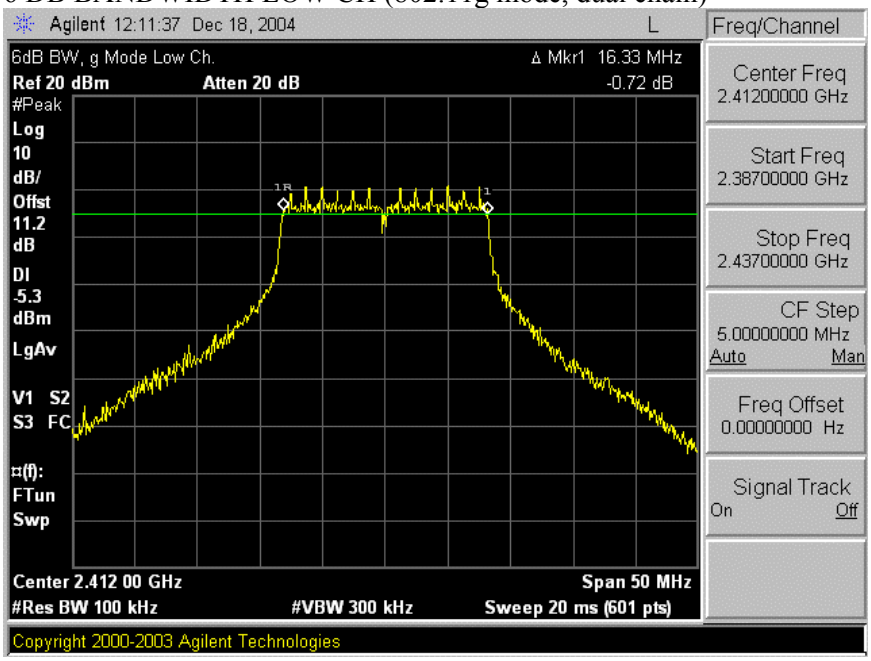
Channel	Frequency (MHz)	6 dB Bandwidth Chain 0 (kHz)	6 dB Bandwidth Chain 1 (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16330.0	16330.0	500	15830
Middle	2437	16250.0	15920.0	500	15420
High	2462	16420.0	16420.0	500	15920

802.11g Turbo Mode, Dual Chain

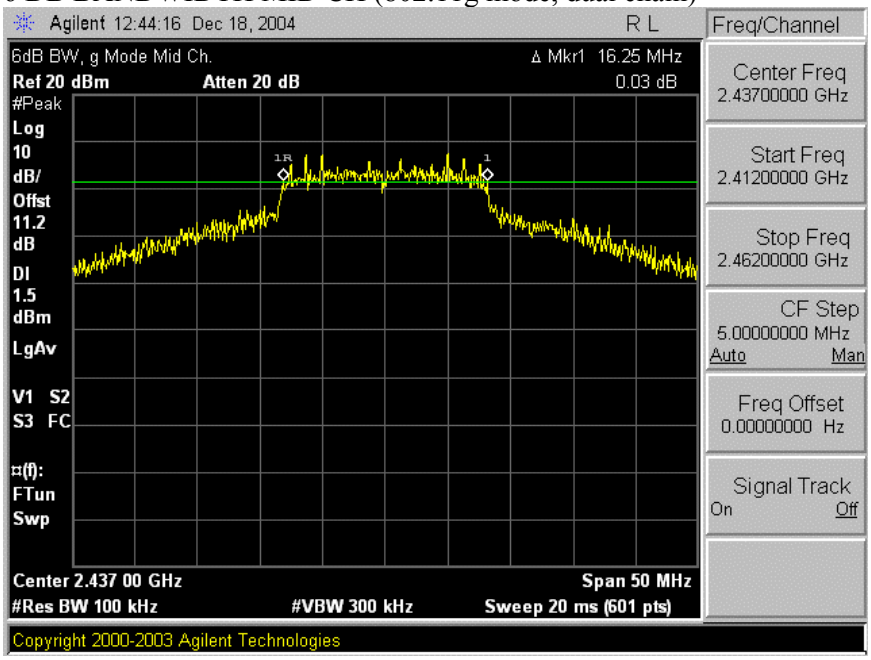
Channel	Frequency (MHz)	6 dB Bandwidth Chain 0 (kHz)	6 dB Bandwidth Chain 1 (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	30670.0	31420.0	500	30170

6 DB BANDWIDTH (802.11g MODE, DUAL CHAIN, Chain 0)

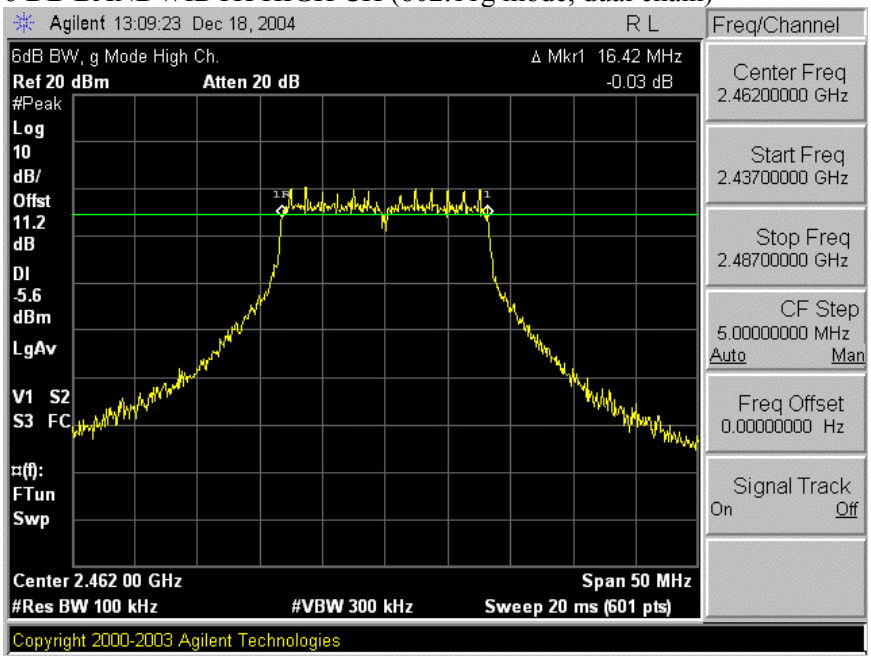
6 DB BANDWIDTH LOW CH (802.11g mode, dual chain)



6 DB BANDWIDTH MID CH (802.11g mode, dual chain)

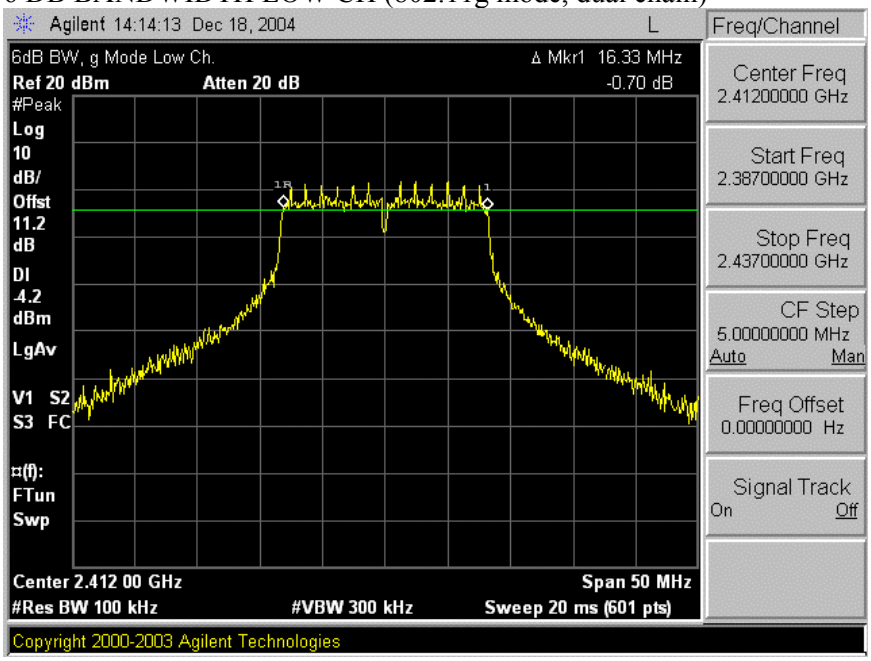


6 DB BANDWIDTH HIGH CH (802.11g mode, dual chain)

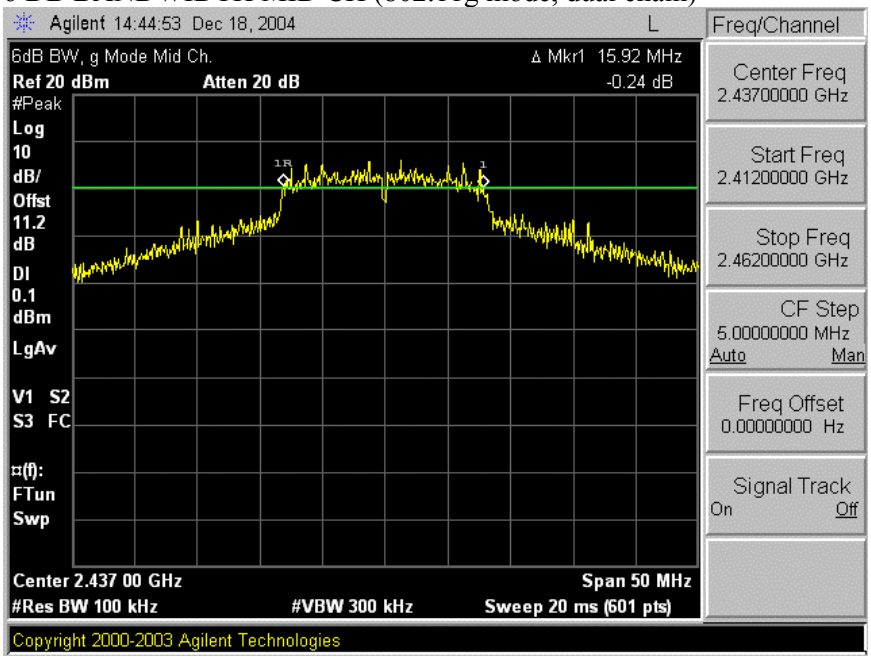


6 DB BANDWIDTH (802.11g MODE, DUAL CHAIN, Chain 1)

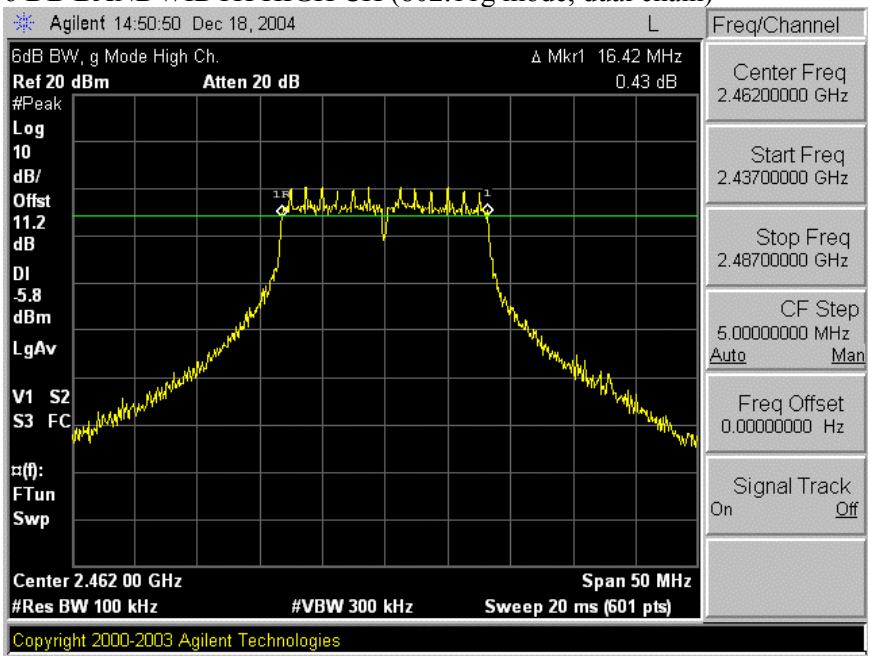
6 DB BANDWIDTH LOW CH (802.11g mode, dual chain)



6 DB BANDWIDTH MID CH (802.11g mode, dual chain)

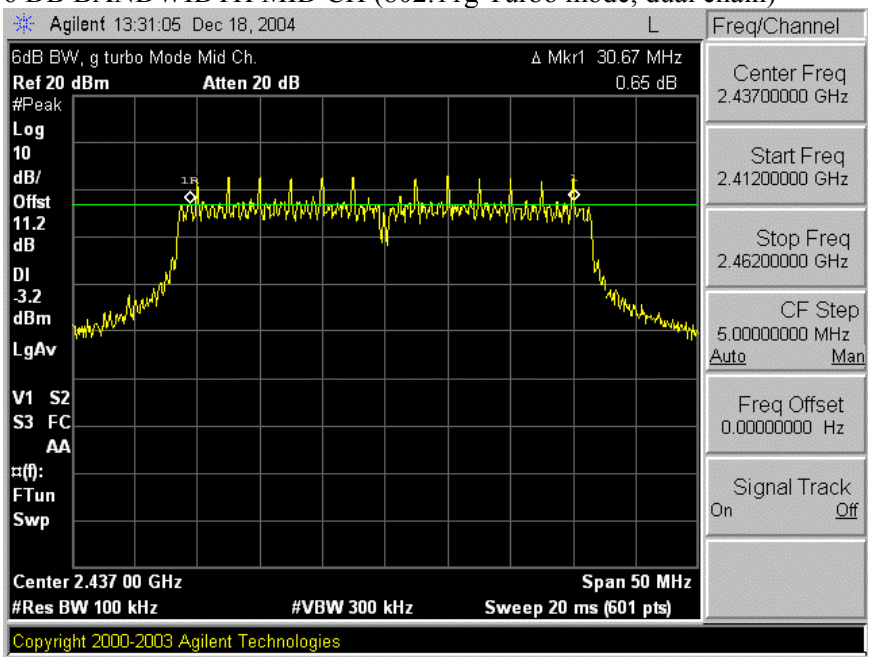


6 DB BANDWIDTH HIGH CH (802.11g mode, dual chain)



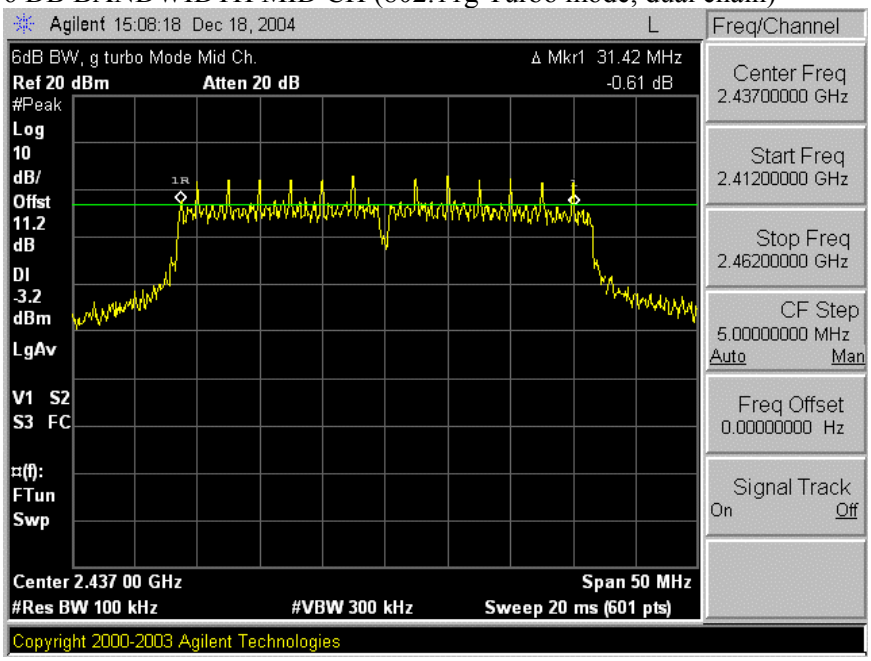
6 DB BANDWIDTH (802.11g TURBO MODE, DUAL CHAIN, Chain 0)

6 DB BANDWIDTH MID CH (802.11g Turbo mode, dual chain)



6 DB BANDWIDTH (802.11g TURBO MODE, DUAL CHIAN, Chain 1)

6 DB BANDWIDTH MID CH (802.11g Turbo mode, dual chain)



7.2.2. 99% BANDWIDTH

LIMIT

None: for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

No non-compliance noted:

802.11g Mode, Dual Chain

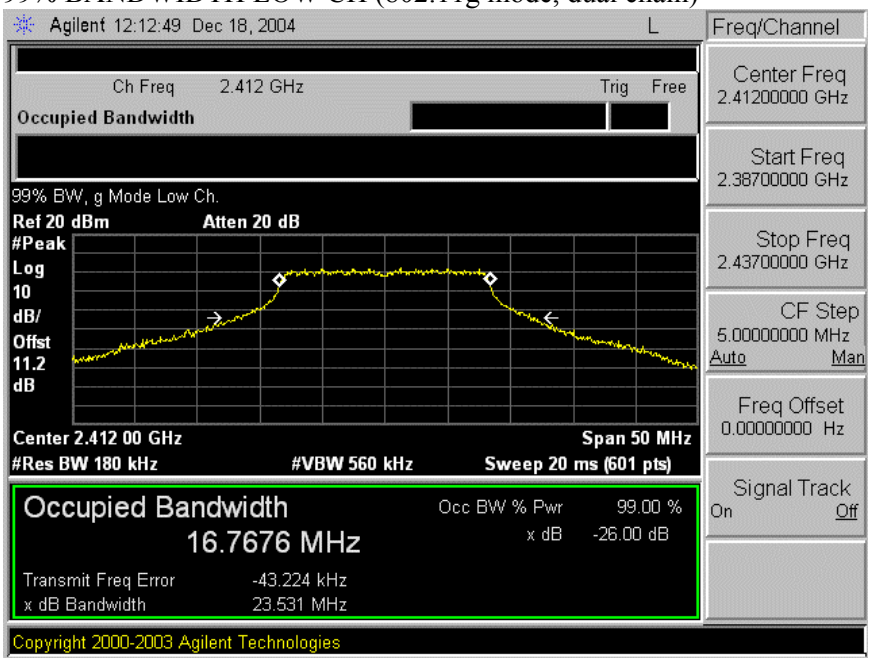
Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Low	2412	16.7676	16.7819
	2417	16.9441	16.8727
	2422	17.0848	17.1848
	2427	17.0811	17.1048
Middle	2437	20.7517	23.1864
	2447	17.2369	17.7263
	2452	17.0852	17.1506
	2457	17.1018	17.1664
High	2462	16.7194	16.7425

802.11g Turbo Mode, Dual Chain

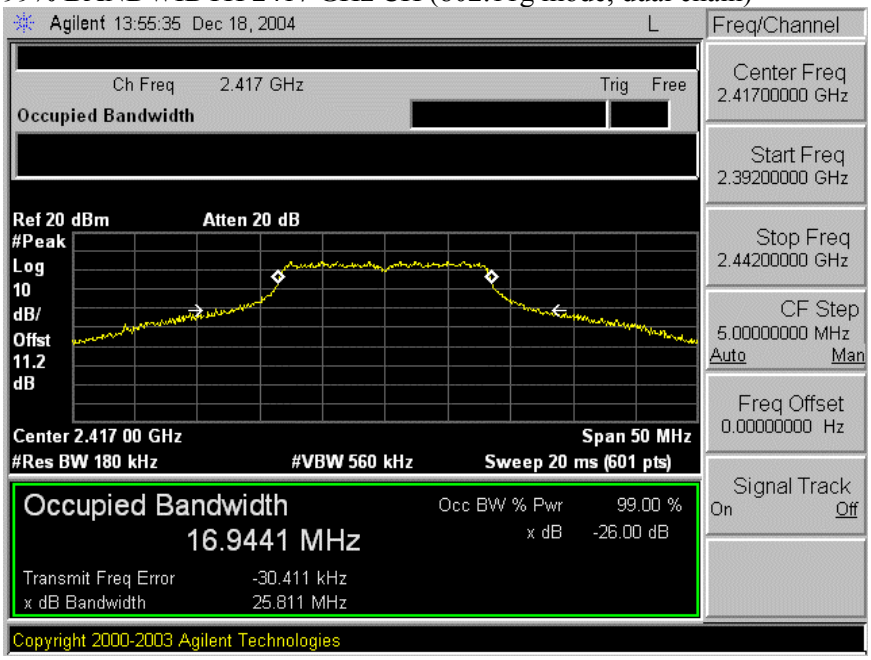
Channel	Frequency (MHz)	99% Bandwidth Chain 0 (MHz)	99% Bandwidth Chain 1 (MHz)
Middle	2437.0	33.3568	34.6672

99% BANDWIDTH (802.11g MODE, DUAL CHAIN, Chain 0)

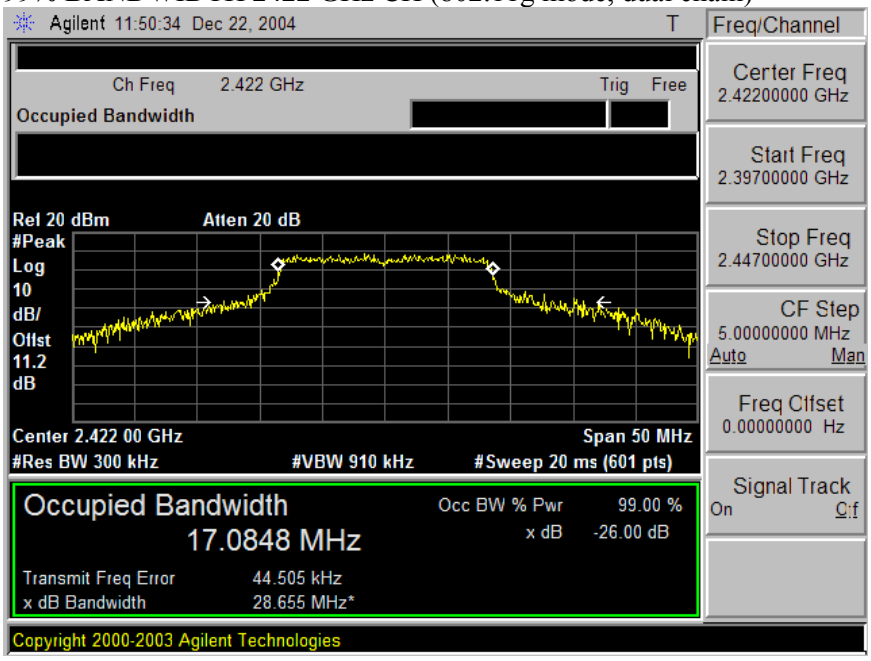
99% BANDWIDTH LOW CH (802.11g mode, dual chain)



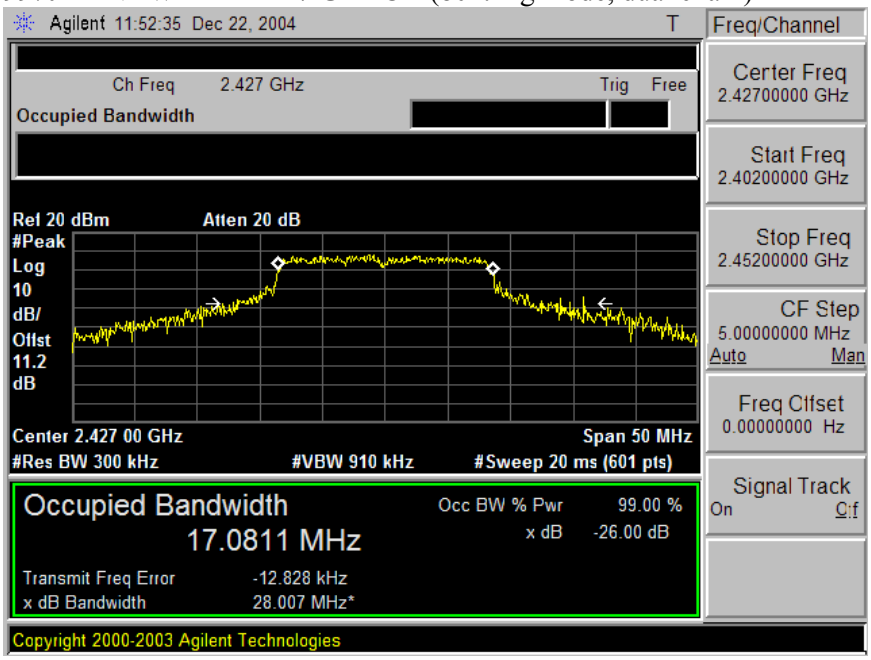
99% BANDWIDTH 2417 GHz CH (802.11g mode, dual chain)



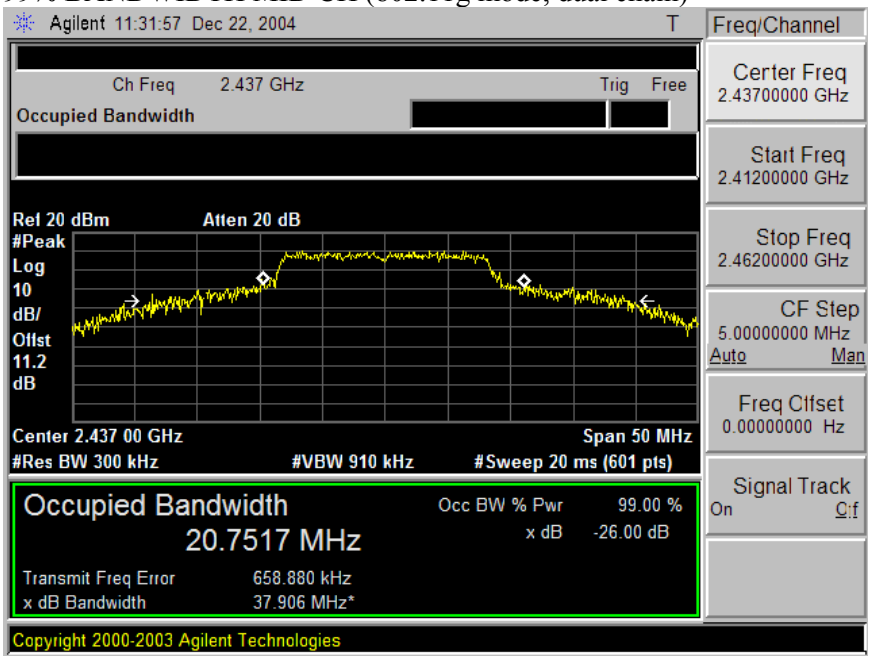
99% BANDWIDTH 2422 GHz CH (802.11g mode, dual chain)



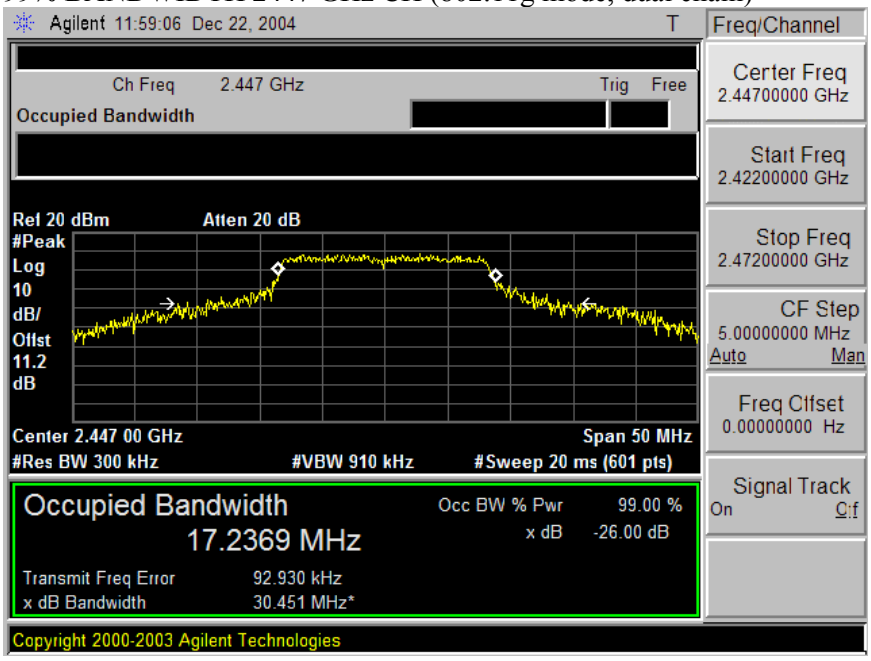
99% BANDWIDTH 2427 GHz CH (802.11g mode, dual chain)



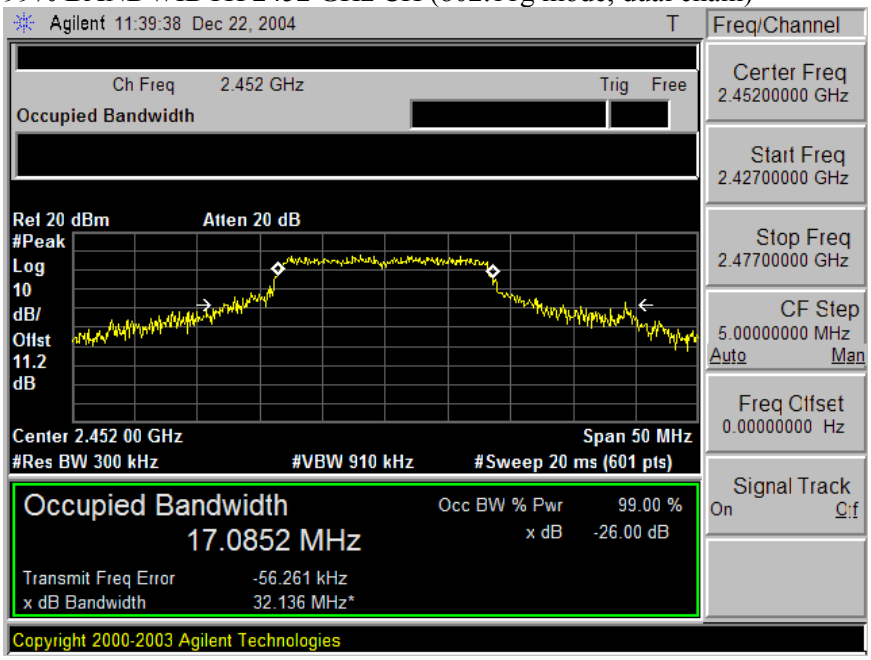
99% BANDWIDTH MID CH (802.11g mode, dual chain)



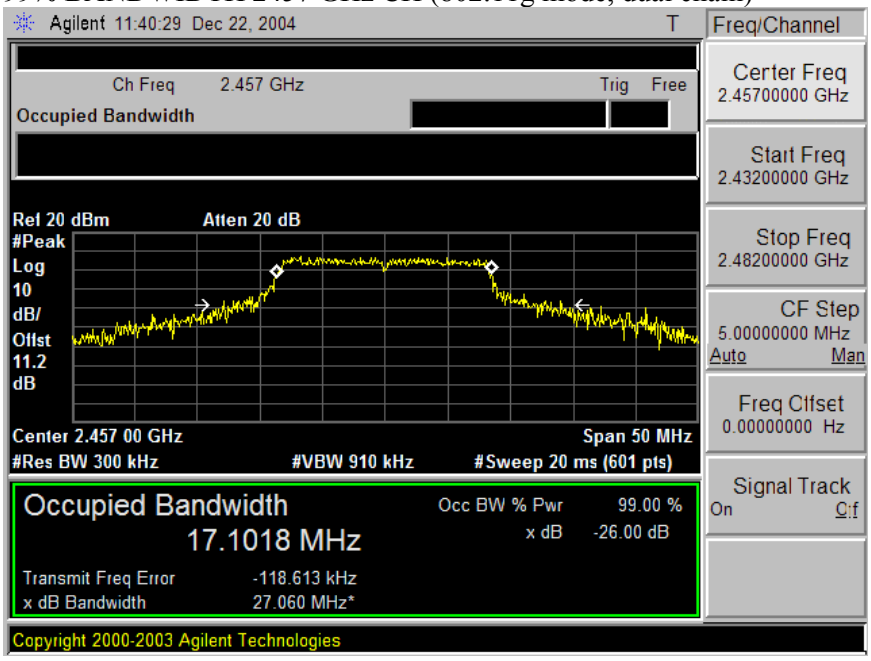
99% BANDWIDTH 2447 GHz CH (802.11g mode, dual chain)



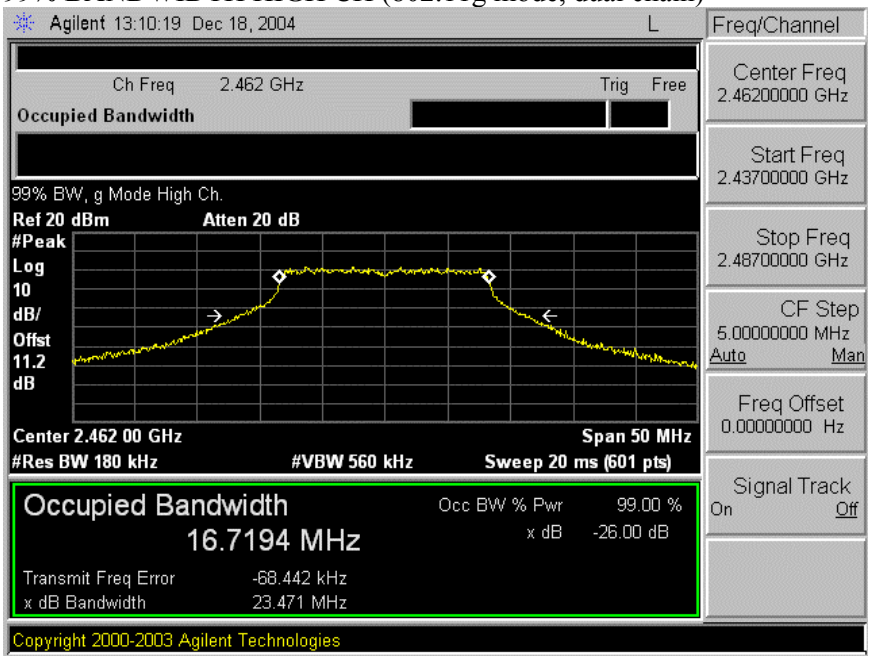
99% BANDWIDTH 2452 GHz CH (802.11g mode, dual chain)



99% BANDWIDTH 2457 GHz CH (802.11g mode, dual chain)

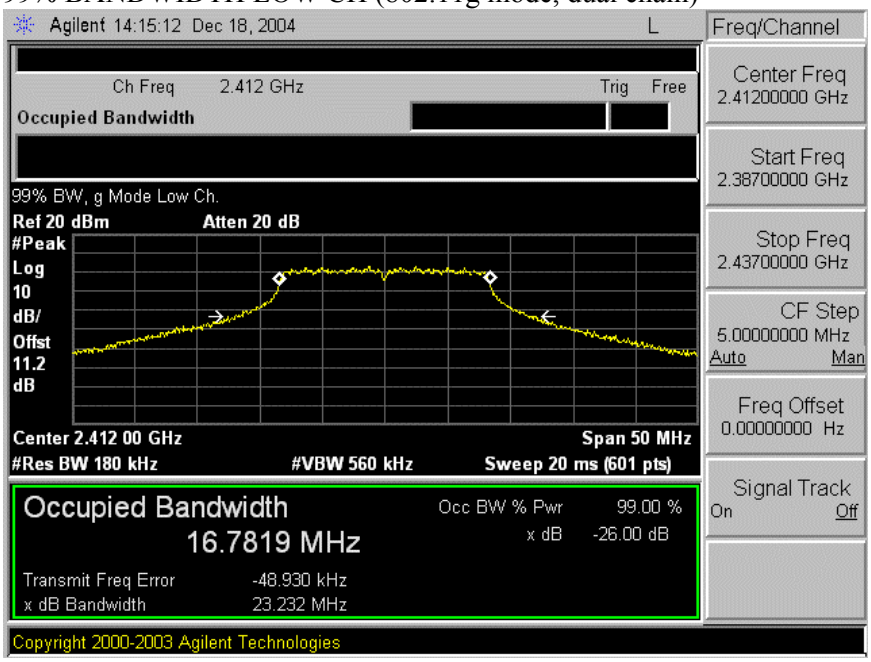


99% BANDWIDTH HIGH CH (802.11g mode, dual chain)

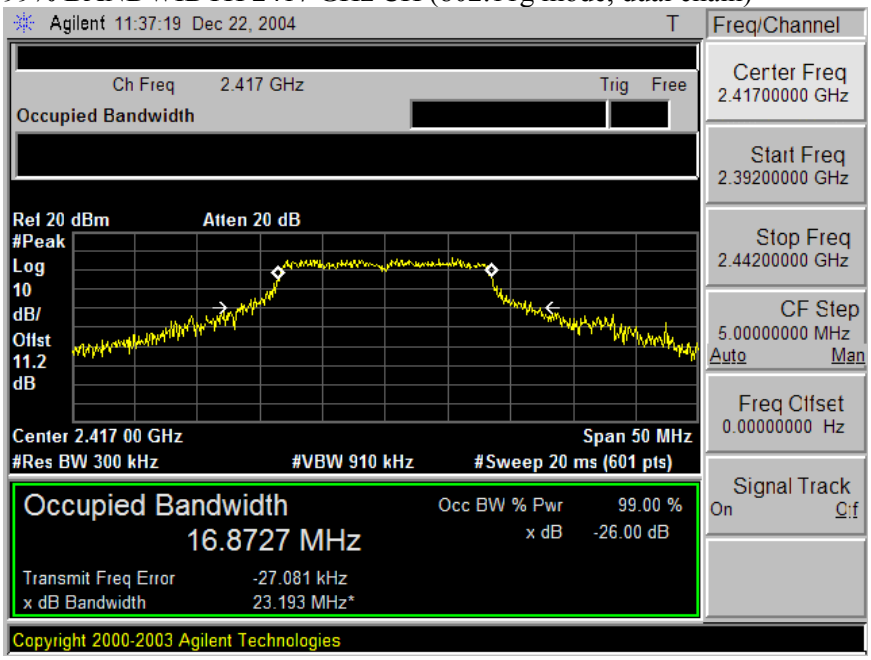


99% BANDWIDTH (802.11g MODE, DUAL CHAIN, Chain 1)

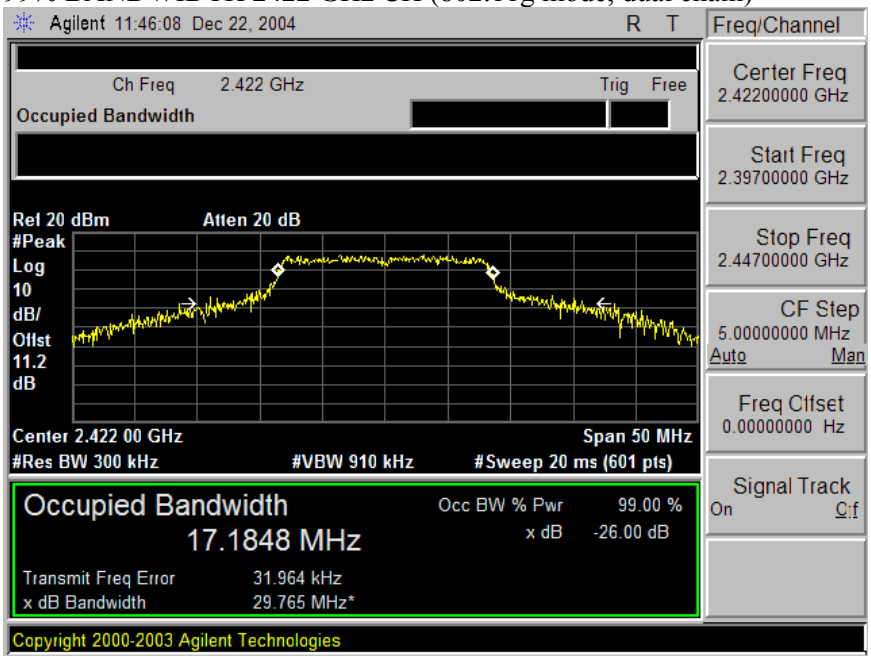
99% BANDWIDTH LOW CH (802.11g mode, dual chain)



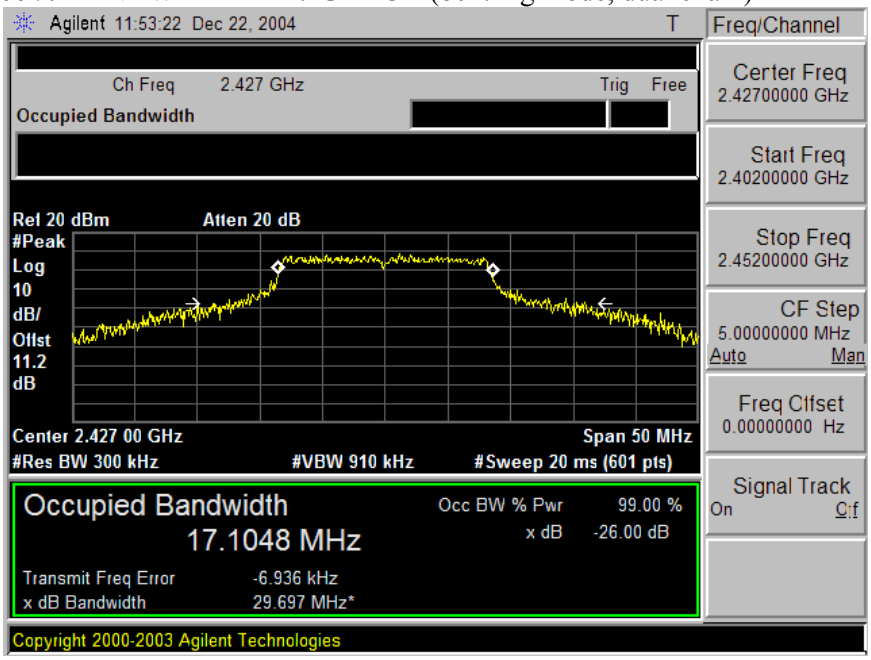
99% BANDWIDTH 2417 GHz CH (802.11g mode, dual chain)



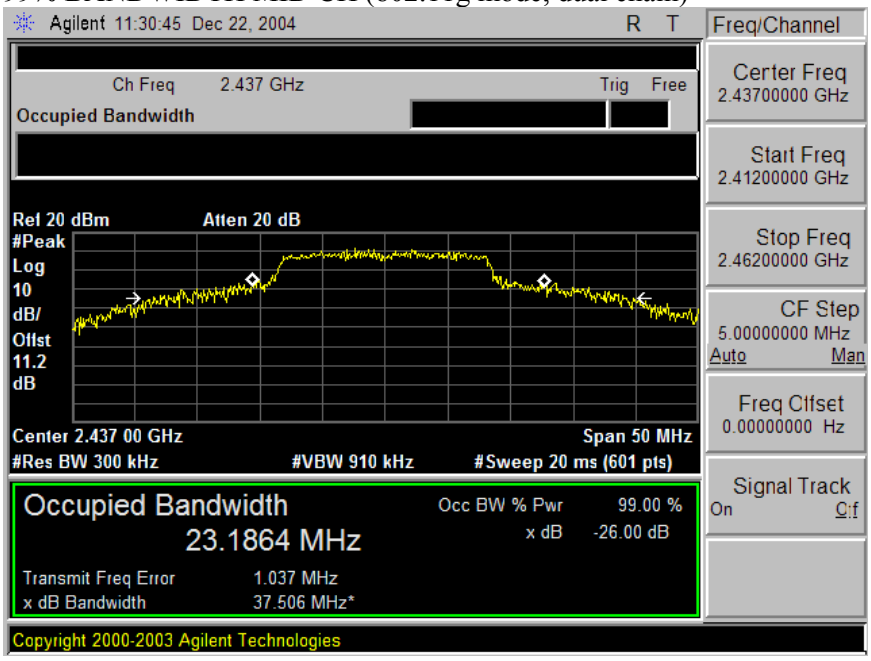
99% BANDWIDTH 2422 GHz CH (802.11g mode, dual chain)



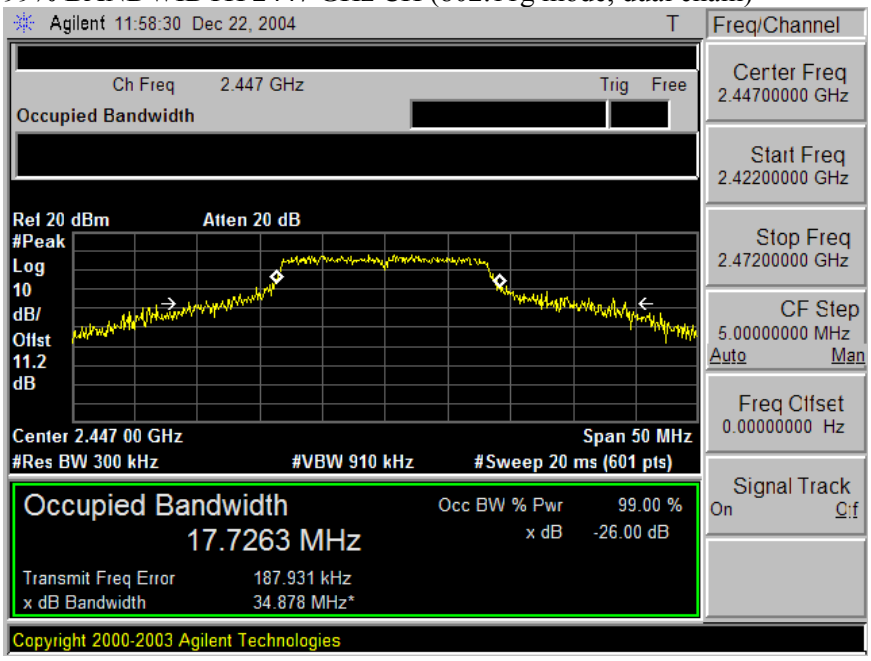
99% BANDWIDTH 2427 GHz CH (802.11g mode, dual chain)



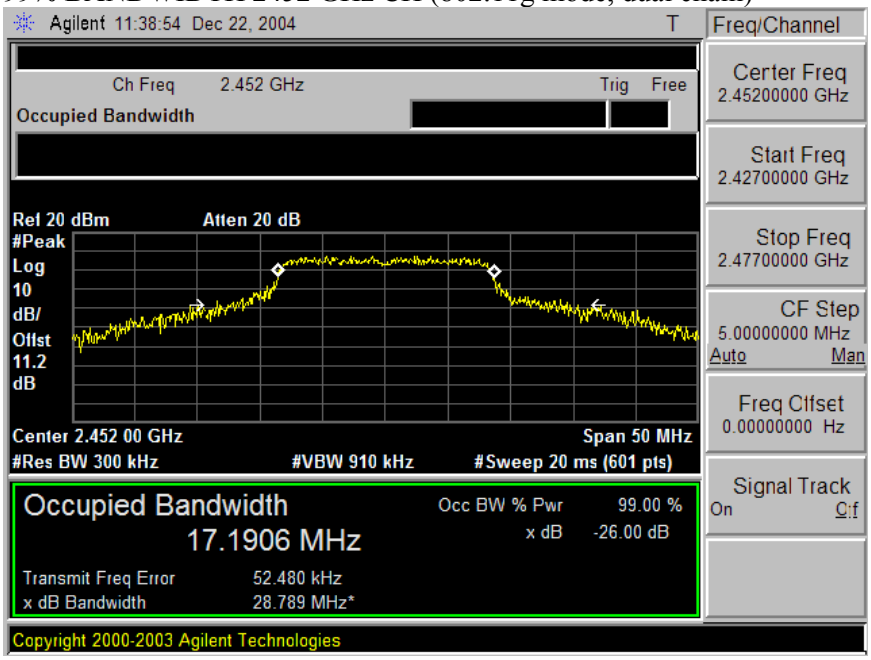
99% BANDWIDTH MID CH (802.11g mode, dual chain)



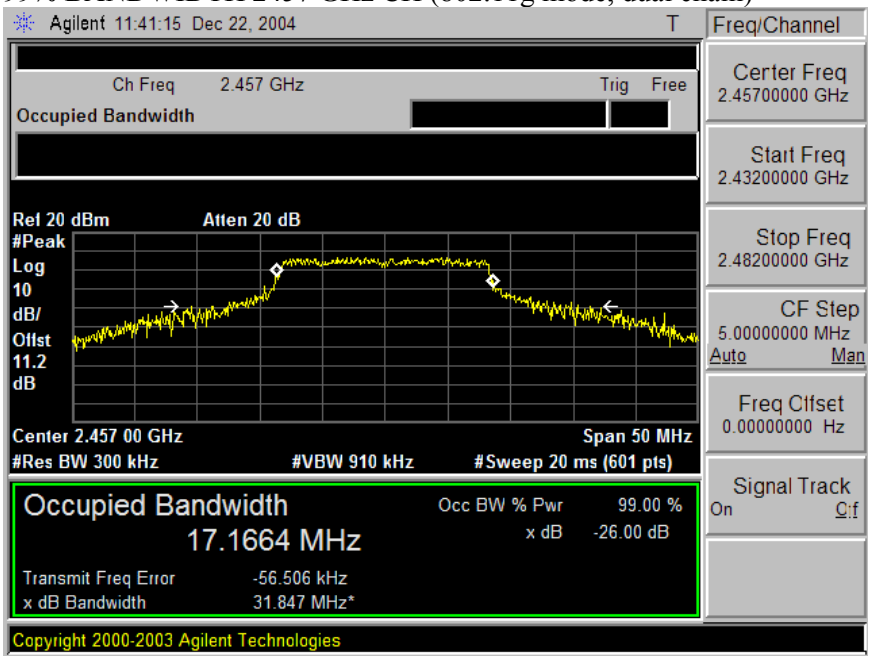
99% BANDWIDTH 2447 GHz CH (802.11g mode, dual chain)



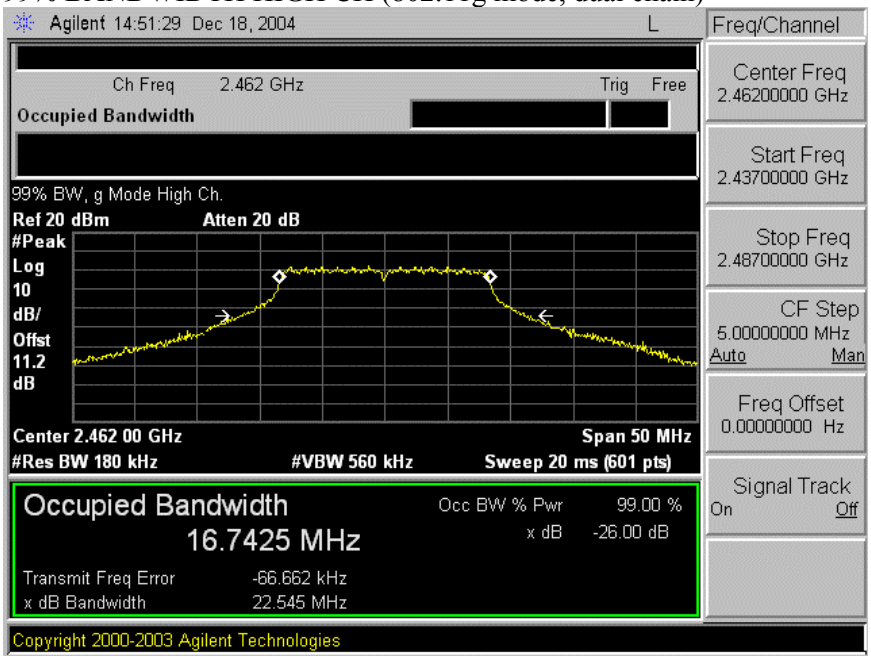
99% BANDWIDTH 2452 GHz CH (802.11g mode, dual chain)



99% BANDWIDTH 2457 GHz CH (802.11g mode, dual chain)

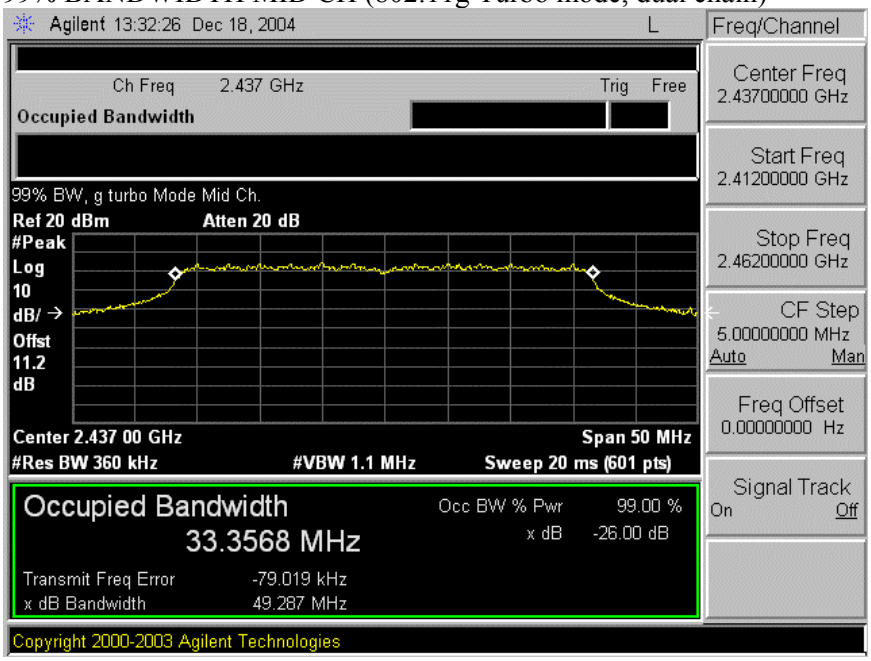


99% BANDWIDTH HIGH CH (802.11g mode, dual chain)



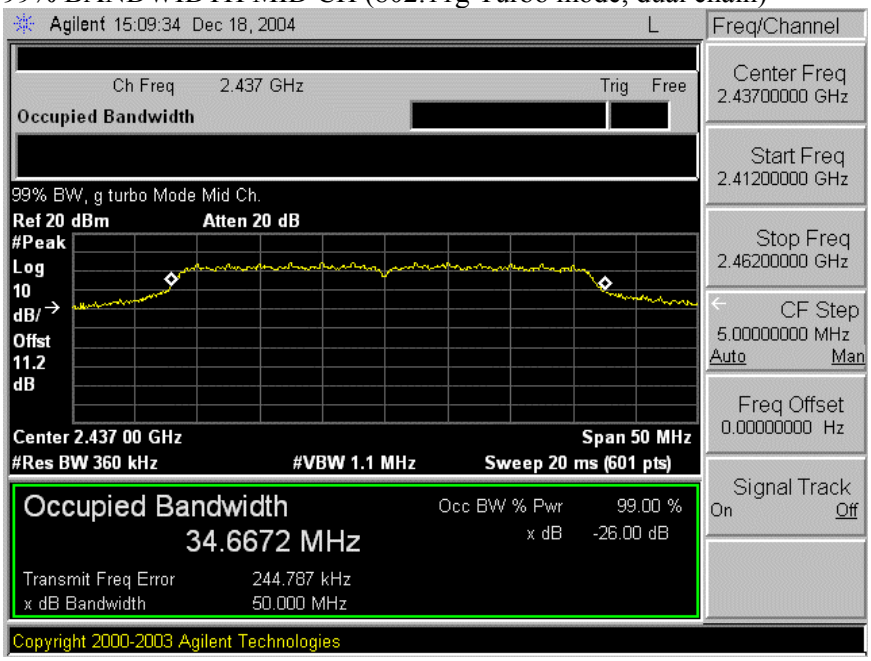
99% BANDWIDTH (802.11g TURBO MODE, DUAL CHIAN, Chain 0)

99% BANDWIDTH MID CH (802.11g Turbo mode, dual chain)



99% BANDWIDTH (802.11g TURBO MODE, DUAL CHAIN, Chain 1)

99% BANDWIDTH MID CH (802.11g Turbo mode, dual chain)



7.2.3. PEAK OUTPUT POWER

PEAK POWER LIMIT

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) Except as shown in paragraphs (b)(4) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

RESULTS

The maximum gain of a single antenna element is 3.39 dBi, the maximum of the Array gain is: 10*log (2*(10^(Antenna gain/10))) = 6.4dBi.

The beam streaming antenna system is classified as point-to-point operation, therefore the limit is 29.87 dBm.

No non-compliance noted:

802.11g Mode, Dual Chain

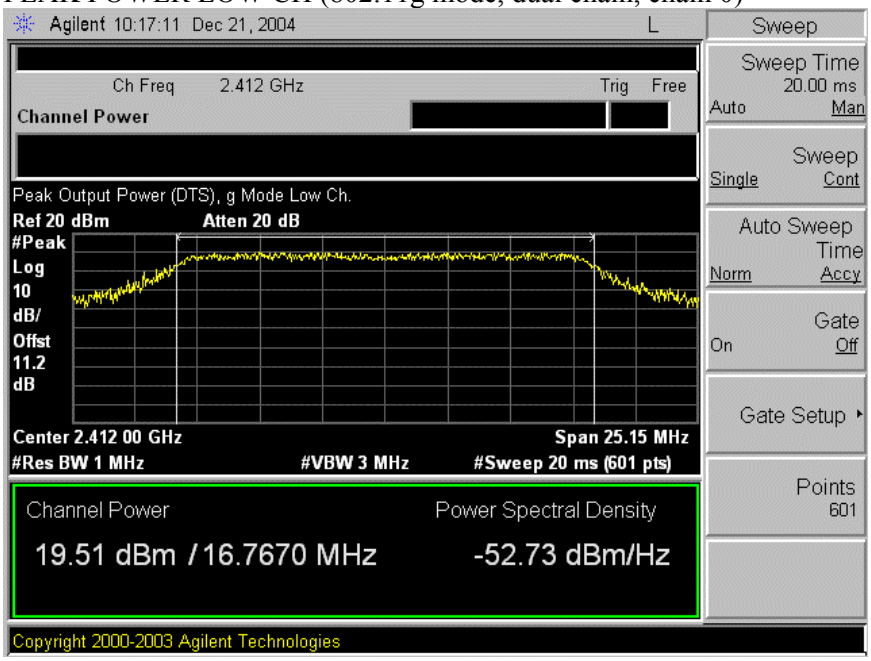
Frequency (MHz)	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Peak Power Total (dBm)	Limit (dBm)	Margin (dB)
2412	19.51	19.20	22.37	29.87	-7.50
2417	21.35	21.24	24.31	29.87	-5.56
2422	23.44	23.47	26.47	29.87	-3.40
2427	24.21	23.63	26.94	29.87	-2.93
2437	25.68	25.94	28.82	29.87	-1.05
2447	23.91	23.52	26.73	29.87	-3.14
2452	22.63	22.75	25.70	29.87	-4.17
2457	22.47	22.75	25.62	29.87	-4.25
2462	19.30	19.15	22.24	29.87	-7.63

802.11g Turbo Mode, Dual Chain

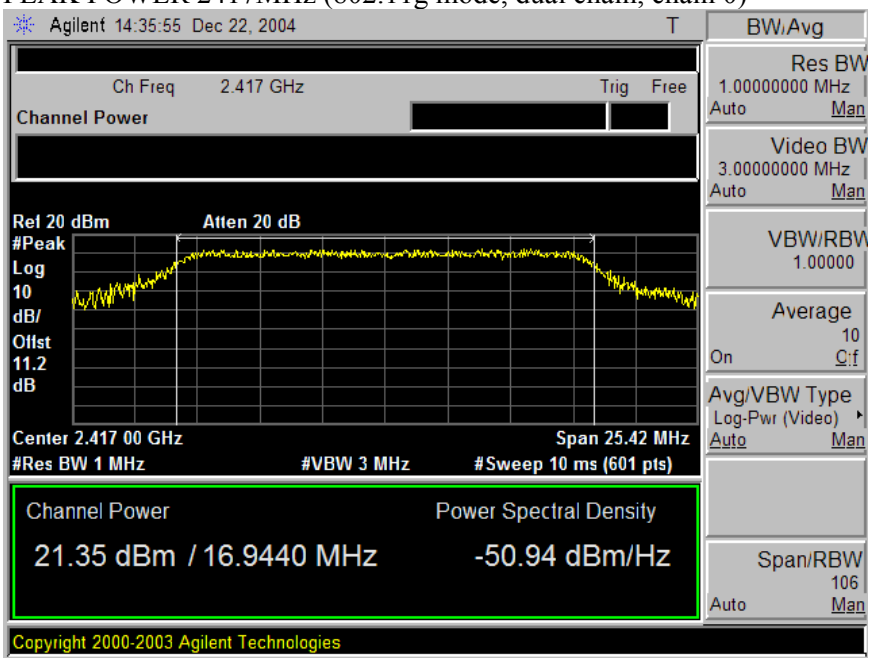
Frequency (MHz)	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Peak Power Total (dBm)	Limit (dBm)	Margin (dB)
2437	19.32	19.42	22.38	29.87	-7.49

OUTPUT POWER (802.11g MODE, DUAL CHAIN, CHAIN 0)

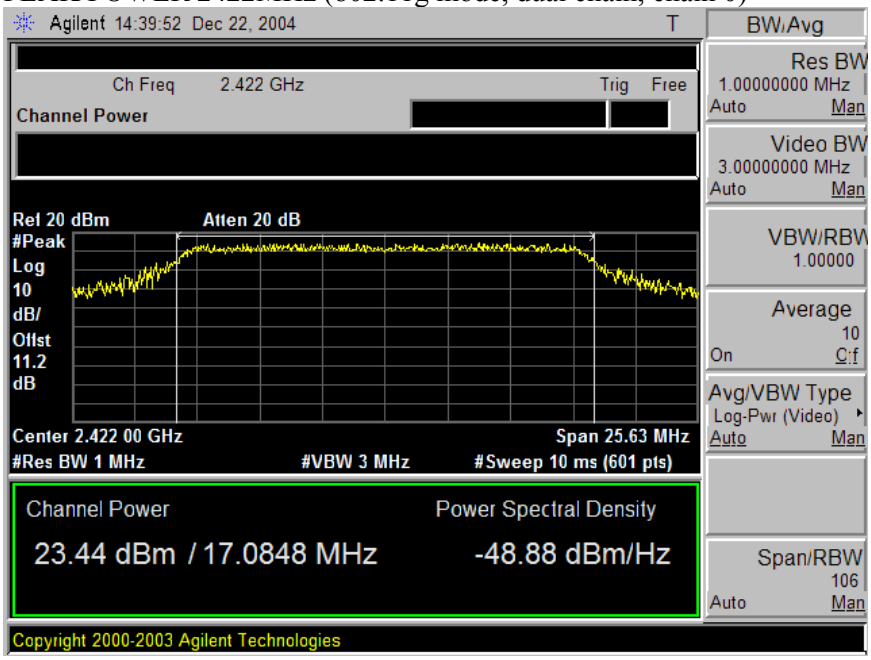
PEAK POWER LOW CH (802.11g mode, dual chain, chain 0)



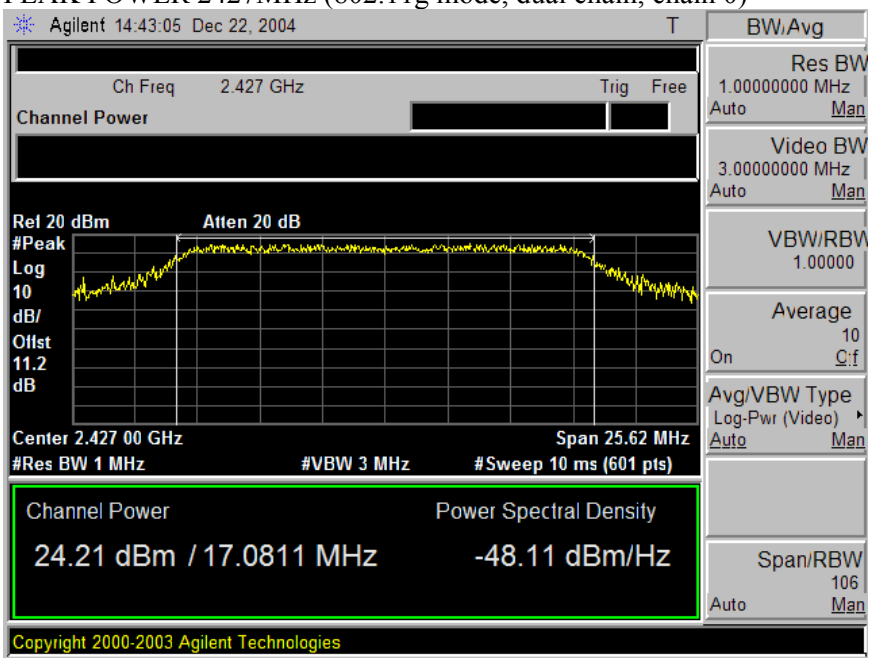
PEAK POWER 2417MHz (802.11g mode, dual chain, chain 0)



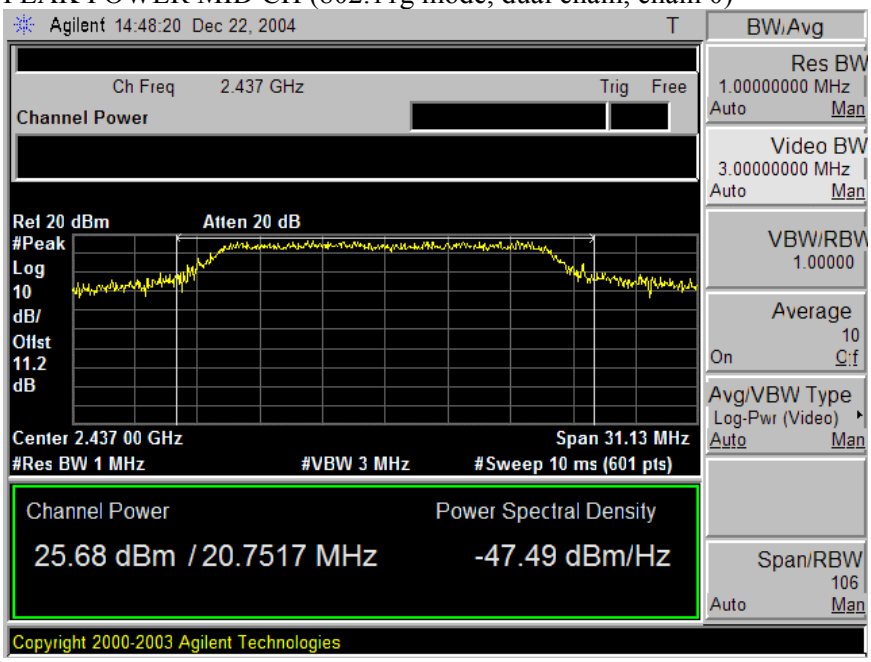
PEAK POWER 2422MHz (802.11g mode, dual chain, chain 0)



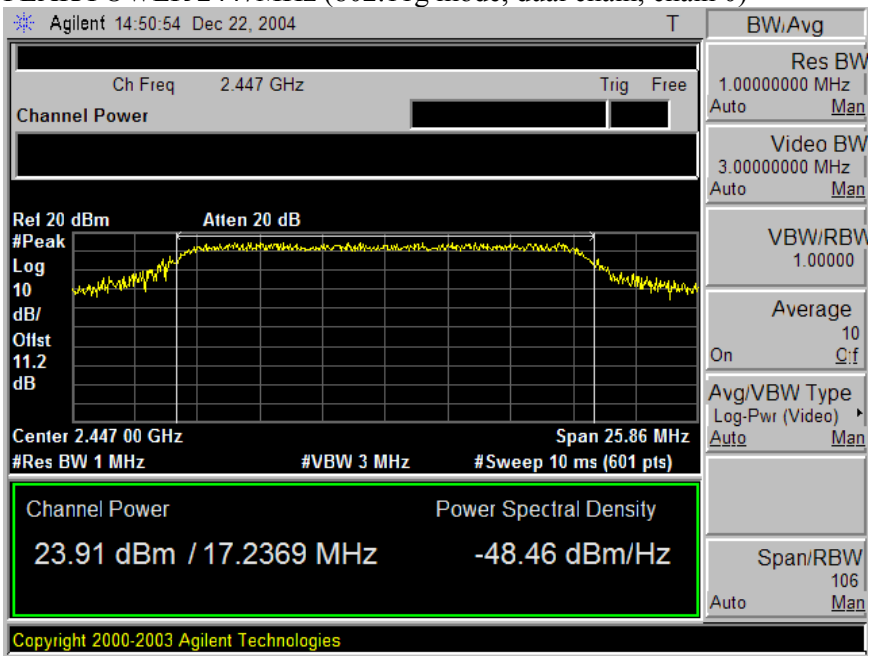
PEAK POWER 2427MHz (802.11g mode, dual chain, chain 0)



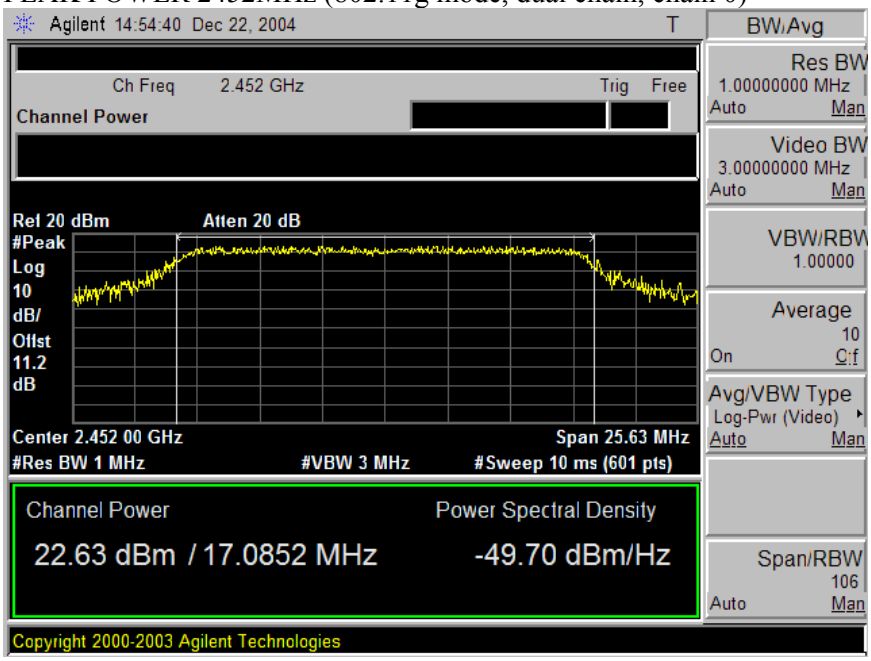
PEAK POWER MID CH (802.11g mode, dual chain, chain 0)



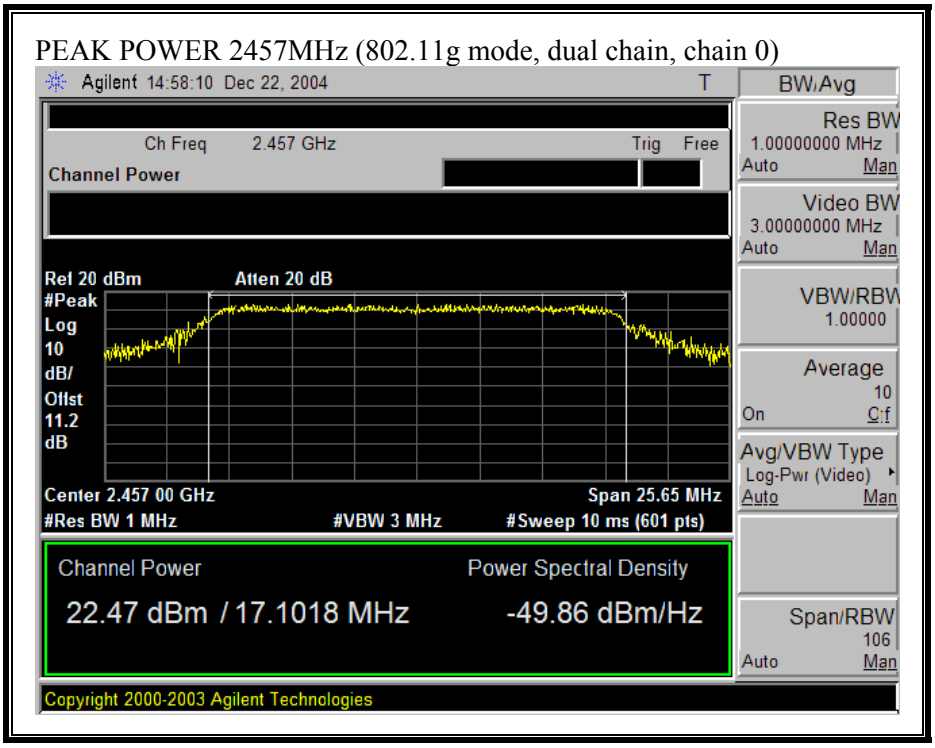
PEAK POWER 2447MHz (802.11g mode, dual chain, chain 0)



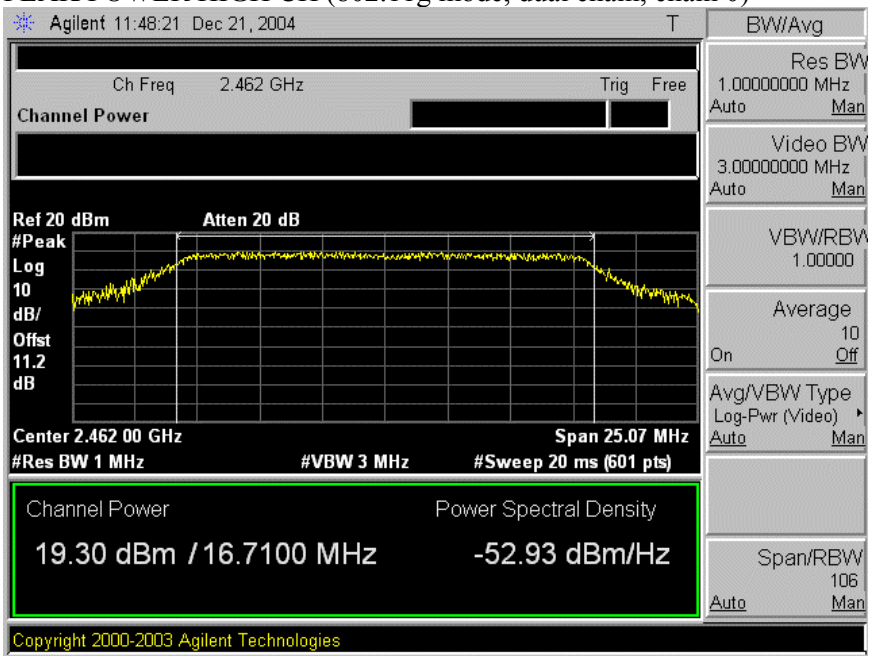
PEAK POWER 2452MHz (802.11g mode, dual chain, chain 0)



PEAK POWER 2457MHz (802.11g mode, dual chain, chain 0)

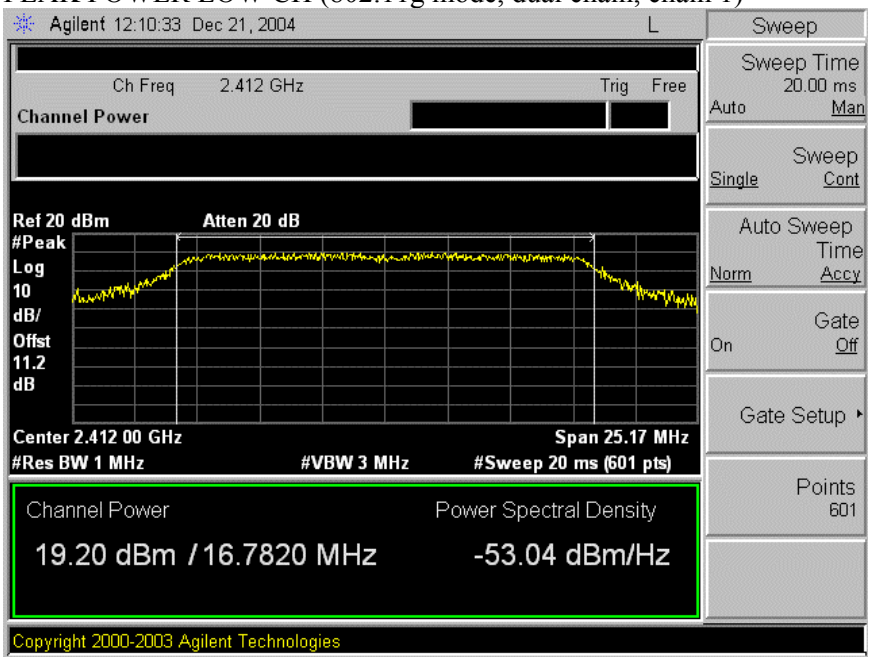


PEAK POWER HIGH CH (802.11g mode, dual chain, chain 0)

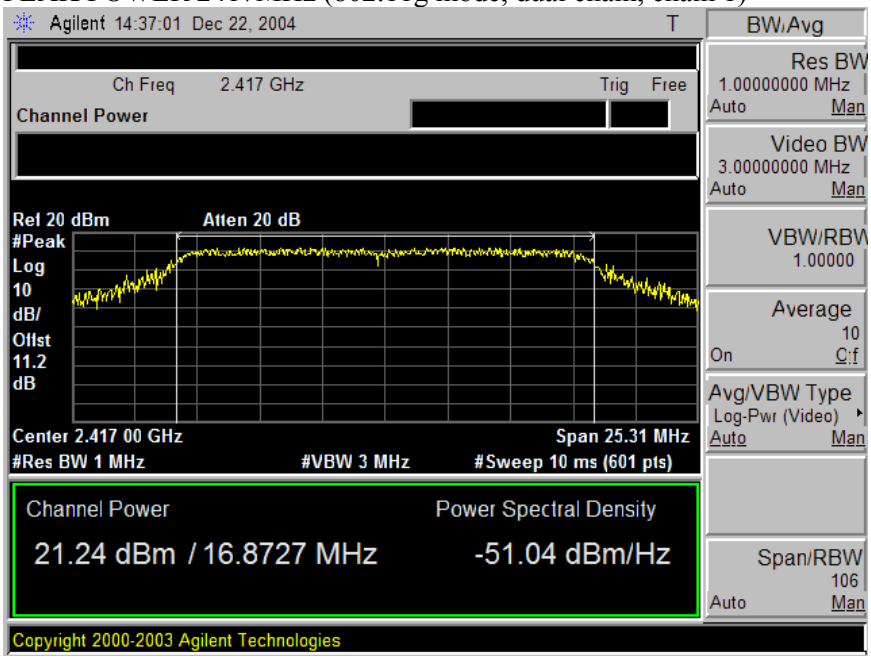


OUTPUT POWER (802.11g MODE, DUAL CHAIN, CHAIN 1)

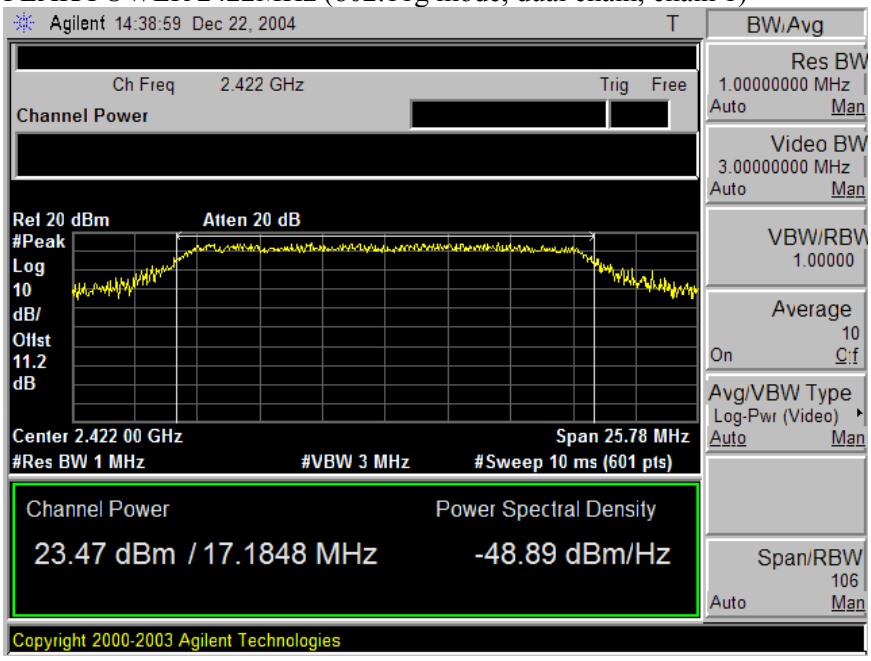
PEAK POWER LOW CH (802.11g mode, dual chain, chain 1)



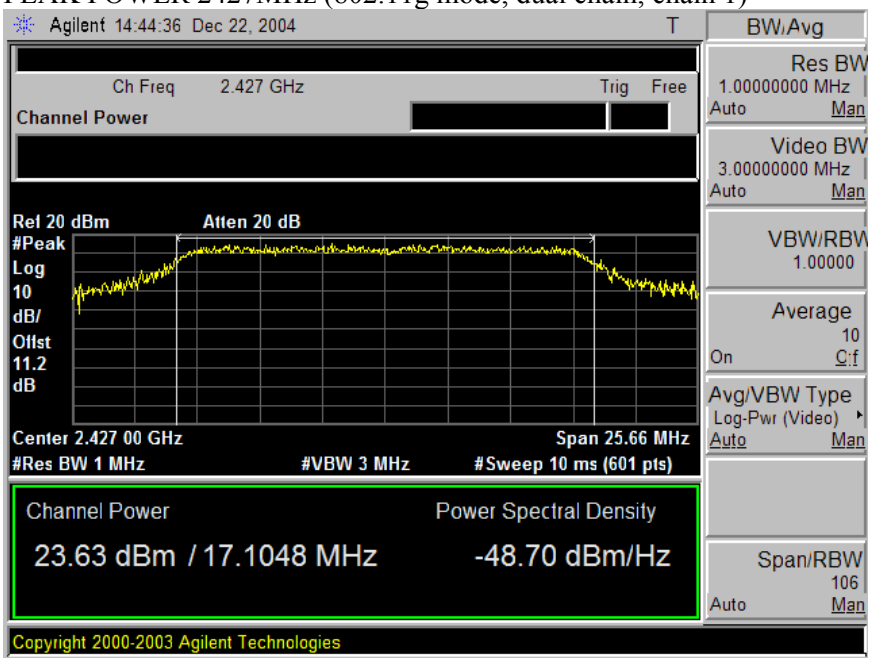
PEAK POWER 2417MHz (802.11g mode, dual chain, chain 1)



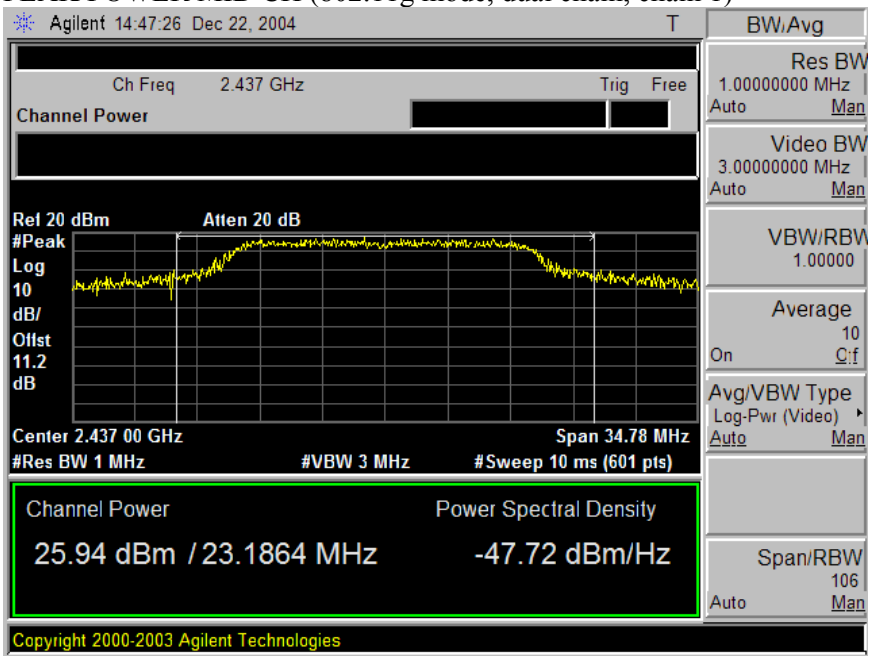
PEAK POWER 2422MHz (802.11g mode, dual chain, chain 1)



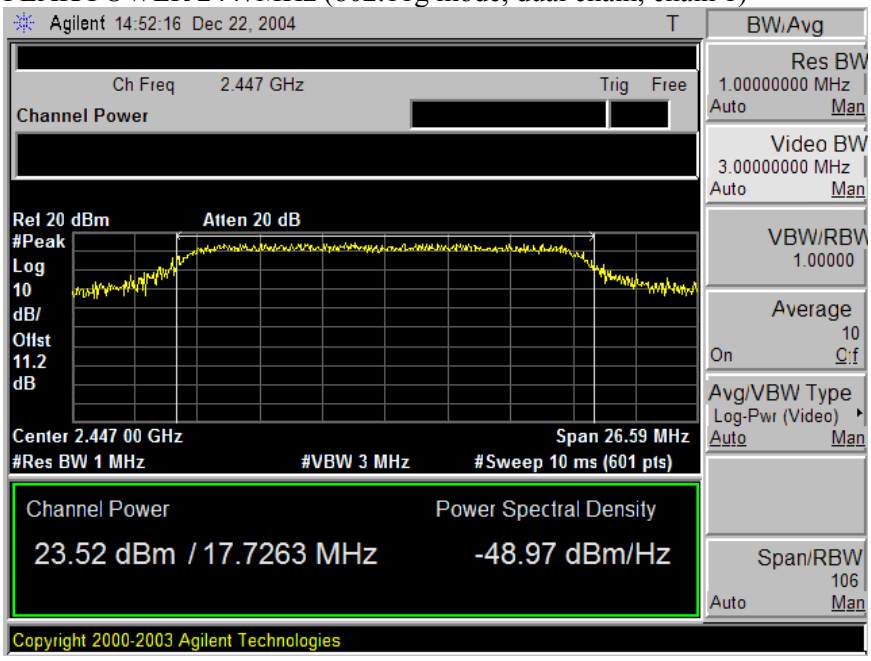
PEAK POWER 2427MHz (802.11g mode, dual chain, chain 1)



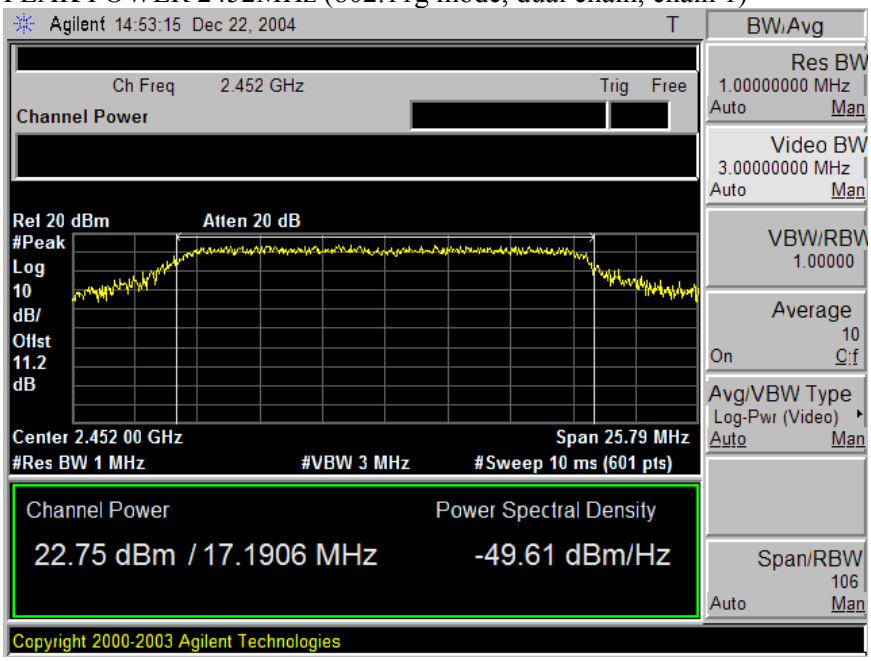
PEAK POWER MID CH (802.11g mode, dual chain, chain 1)



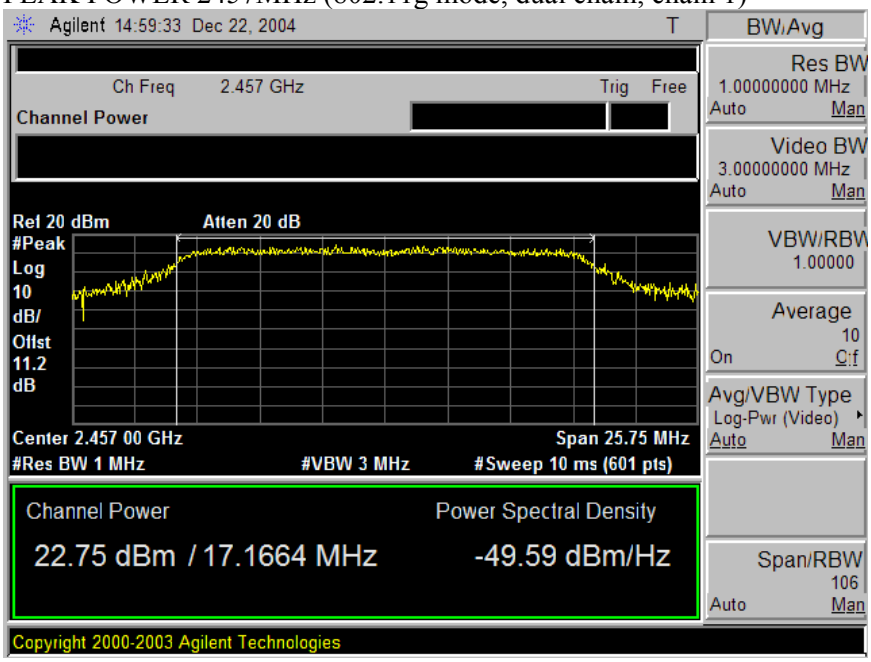
PEAK POWER 2447MHz (802.11g mode, dual chain, chain 1)



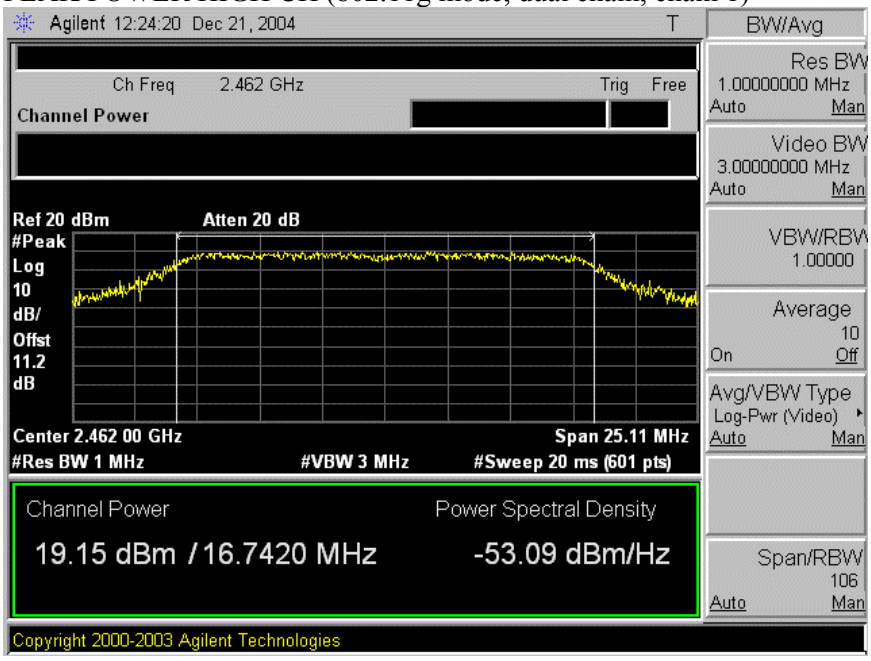
PEAK POWER 2452MHz (802.11g mode, dual chain, chain 1)



PEAK POWER 2457MHz (802.11g mode, dual chain, chain 1)

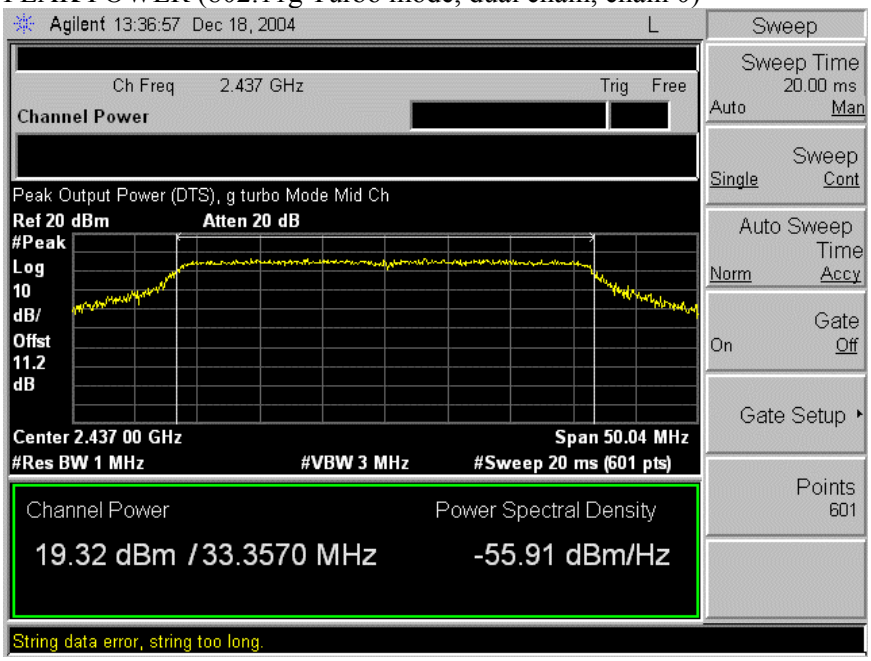


PEAK POWER HIGH CH (802.11g mode, dual chain, chain 1)



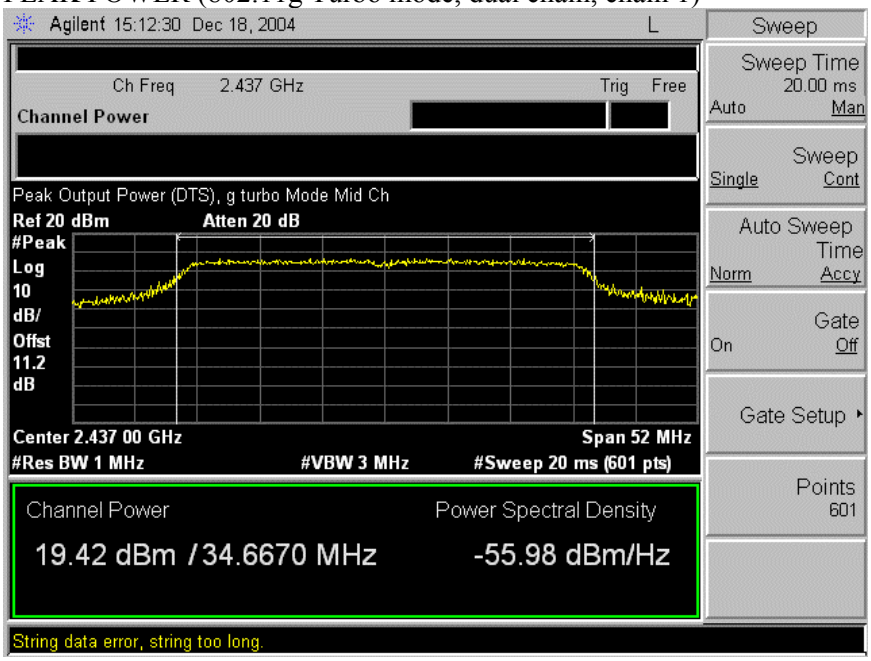
OUTPUT POWER (802.11g TURBO MODE, DUAL CHAIN, CHAIN 0)

PEAK POWER (802.11g Turbo mode, dual chain, chain 0)



OUTPUT POWER (802.11g TURBO MODE, DUAL CHAIN, CHAIN 1)

PEAK POWER (802.11g Turbo mode, dual chain, chain 1)



7.2.4. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E \wedge 2 / 3770$

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 rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Dual chain operation consists of two co-located transmitters operating simultaneously. The total power density for simultaneous co-located transmitters can be calculated by summing the Power * Gain product of each transmitter.

yields

$d = 0.282 * \sqrt{((P1 * G1) + (P2 * G2) + ... + (Pn * Pn)) / S)}$ Equation (1)

where

d = distance in cm
Px = Power of transmitter x in mW
Gx = Numeric gain of antenna x
S = Power Density in mW/cm^2

In the table below, Power and Gain are entered in units of dBm and dBi respectively, then these are converted to their linear forms prior to the summation function.

The conversions from the logarithmic form of power and gain are made using:

P (mW) = 10 ^ (P (dBm) / 10) and Equation (2)

G (numeric) = 10 ^ (G (dBi) / 10) Equation (3)

Equations (1), (2) and (3) and the measured peak powers are used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

802.11 g Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
Chain 0		25.68	3.39	
Chain 1		25.94	3.39	
Combined	1.0			11.50

802.11 g Turbo Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
Chain 0		19.32	3.39	
Chain 1		19.42	3.39	
Combined	1.0			5.48

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.2.5. AVERAGE POWER

AVERAGE POWER LIMIT

None: for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.18 dB (including 10 dB pad and 1.18 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11g Mode, Dual Chain

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 1 (dBm)	Average Power Total (dBm)
Low	2412	13.35	13.78	16.58
	2417	15.50	15.68	18.60
	2422	17.70	17.88	20.80
	2427	18.50	18.28	21.40
Middle	2437	19.73	19.78	22.77
	2447	17.50	17.68	20.60
	2452	16.50	16.78	19.65
	2457	16.30	15.68	19.01
High	2462	13.30	12.78	16.06

802.11g Turbo Mode, Dual Chain

Channel	Frequency (MHz)	Average Power Chain 0 (dBm)	Average Power Chain 1 (dBm)	Average Power Total (dBm)
Middle	2437.0	13.8	13.90	16.86

7.2.6. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.247 (d) For direct sequence systems, the peak 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.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

RESULTS

No non-compliance noted:

802.11g Mode, Dual Chain

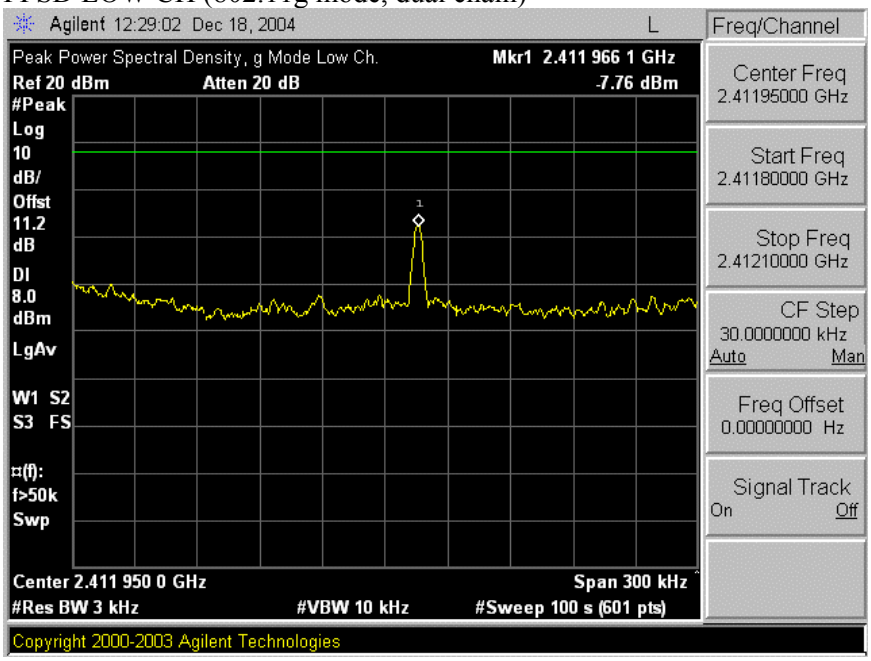
Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-7.76	-11.49	-6.23	8	-14.23
Middle	2437	-1.55	-4.28	0.31	8	-7.69
High	2462	-8.53	-12.58	-7.09	8	-15.09

802.11g Turbo Mode, Dual chain

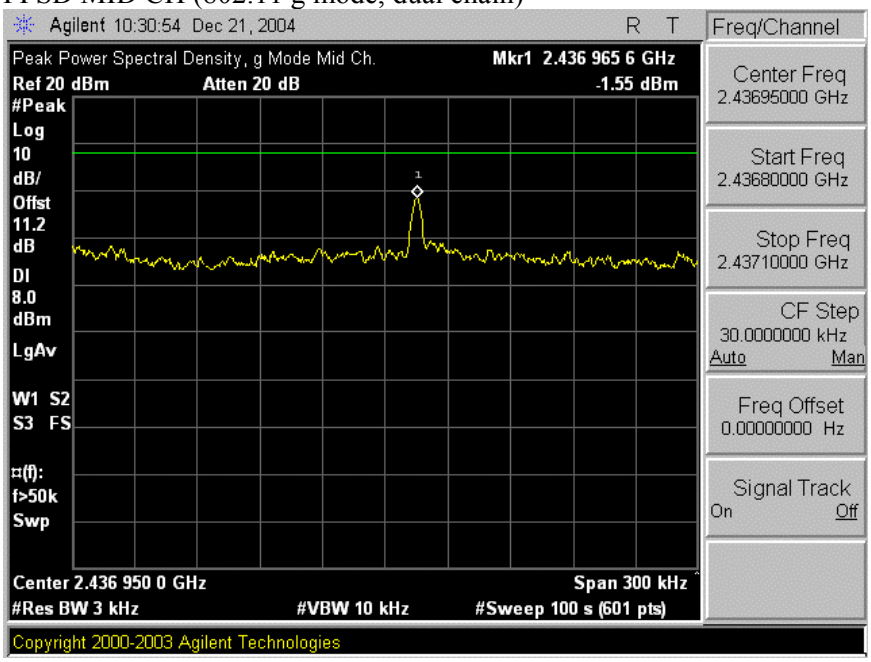
Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Middle	2437	-8.41	-11.74	-6.75	8	-14.75

PEAK POWER SPECTRAL DENSITY (802.11g MODE, DUAL CHAIN, CHAIN 0)

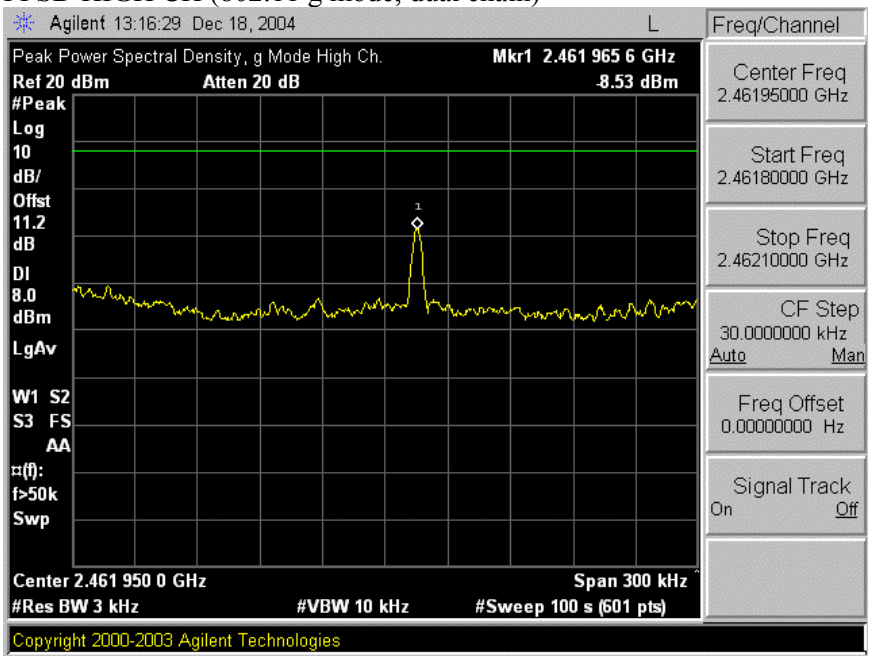
PPSD LOW CH (802.11g mode, dual chain)



PPSD MID CH (802.11 g mode, dual chain)

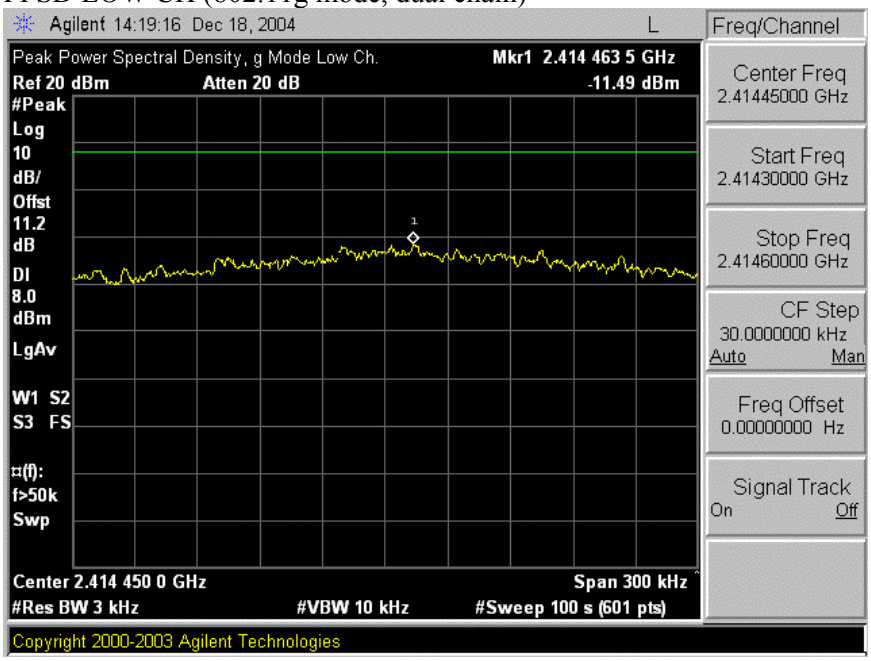


PPSD HIGH CH (802.11 g mode, dual chain)

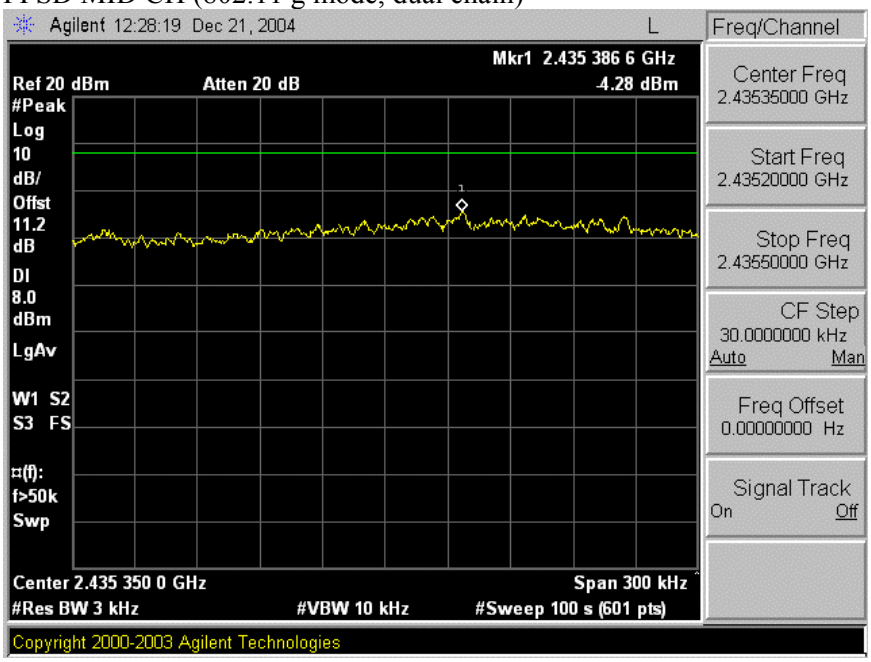


PEAK POWER SPECTRAL DENSITY (802.11g MODE, DUAL CHAIN, CHAIN 1)

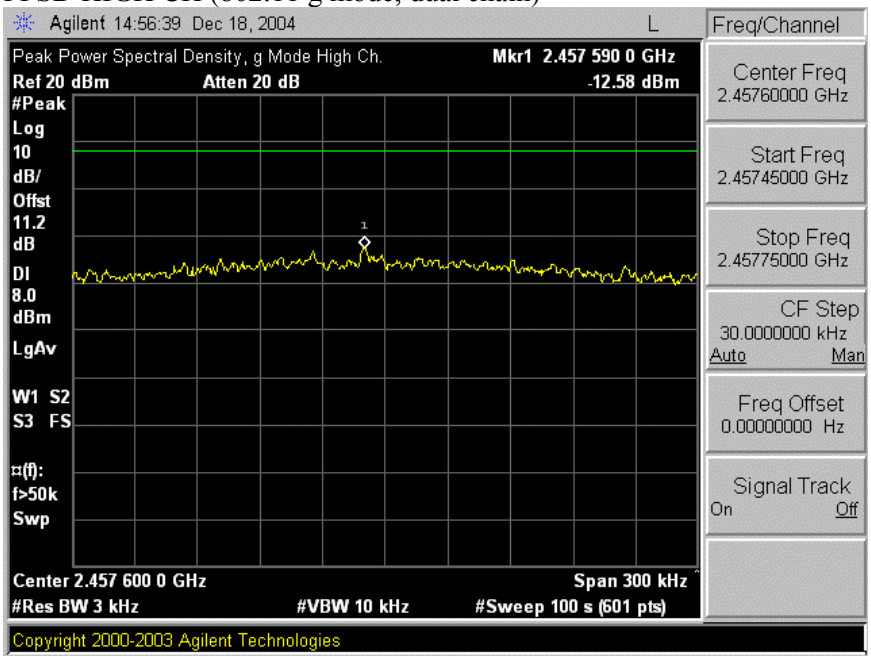
PPSD LOW CH (802.11g mode, dual chain)



PPSD MID CH (802.11 g mode, dual chain)

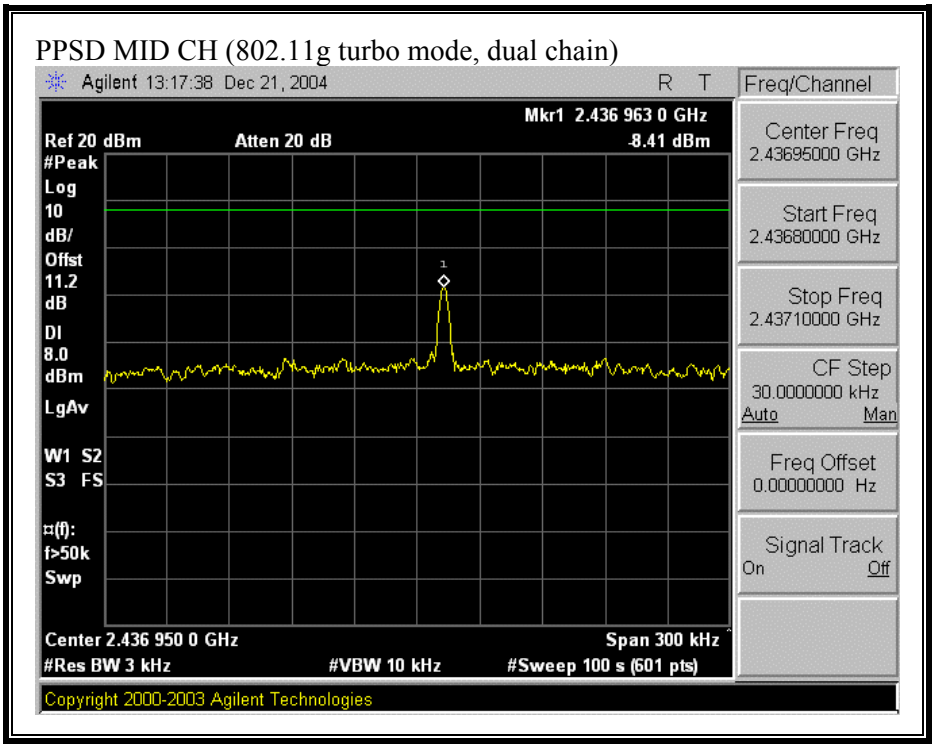


PPSD HIGH CH (802.11 g mode, dual chain)



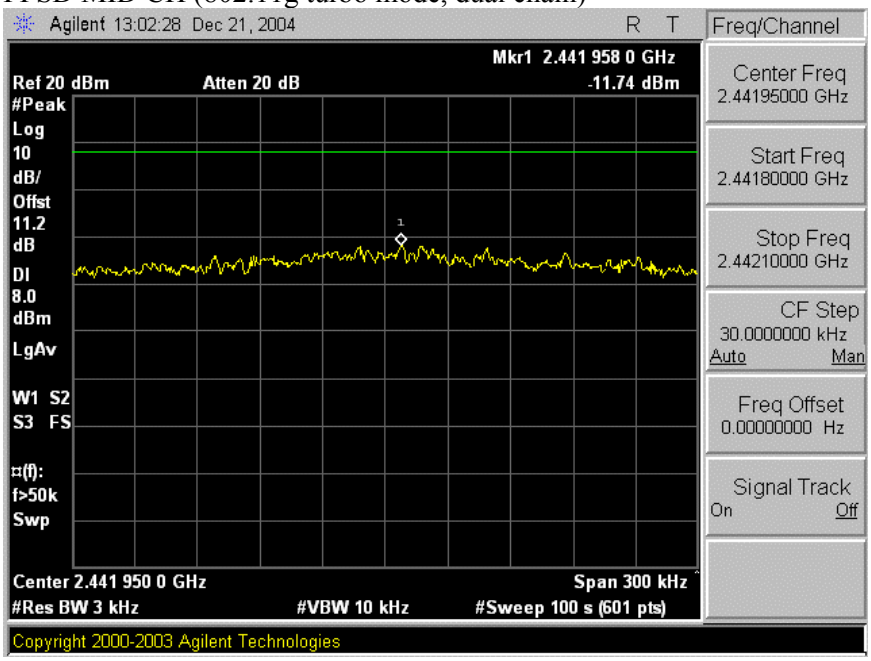
PEAK POWER SPECTRAL DENSITY (802.11g TURBO MODE, DUAL CHAIN, Chain 0)

PPSD MID CH (802.11g turbo mode, dual chain)



PEAK POWER SPECTRAL DENSITY (802.11g TURBO MODE, DUAL CHAIN, Chain 1)

PPSD MID CH (802.11g turbo mode, dual chain)



7.2.7. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.247 (c) In any 100 kHz bandwidth outside the frequency band 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. Attenuation below the general limits specified in §15.209(a) is not required. 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 §15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

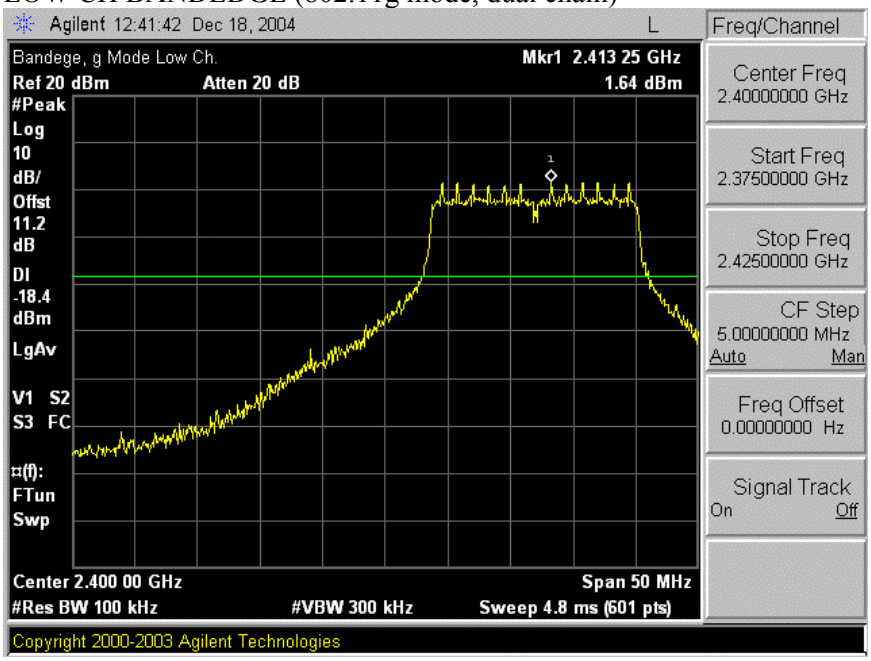
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

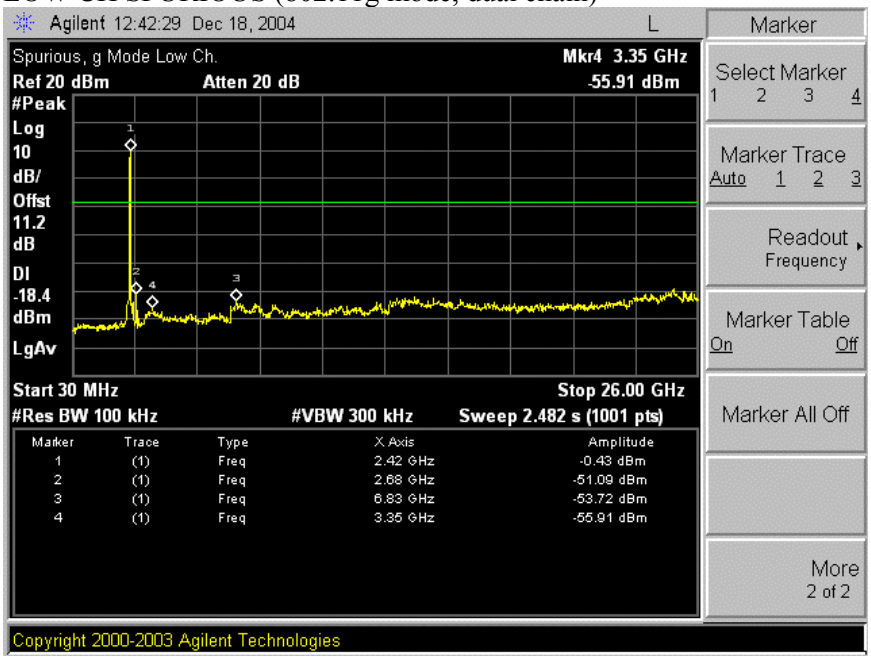
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE, DUAL CHAIN, Chain 0)

LOW CH BANDEDGE (802.11g mode, dual chain)

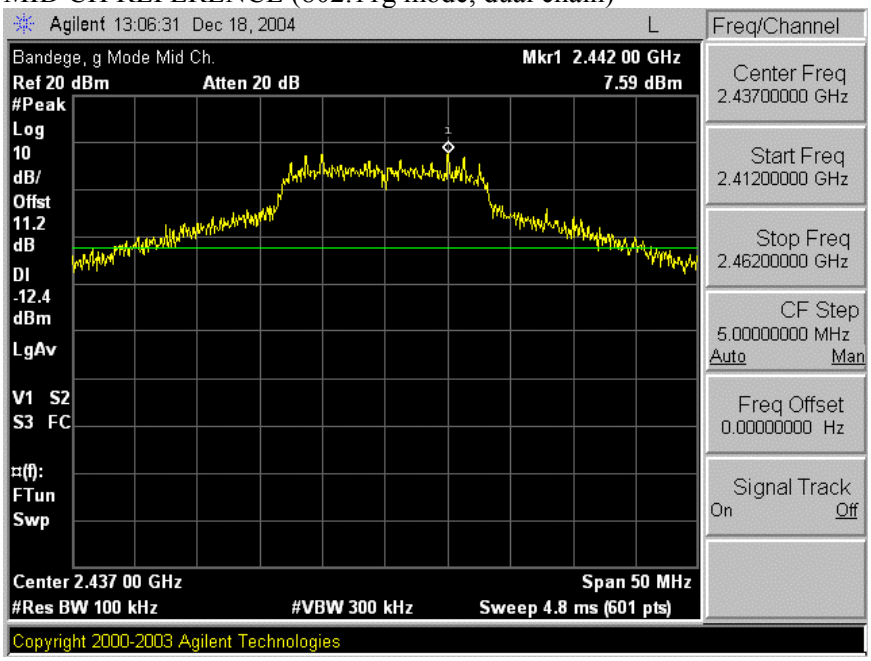


LOW CH SPURIOUS (802.11g mode, dual chain)

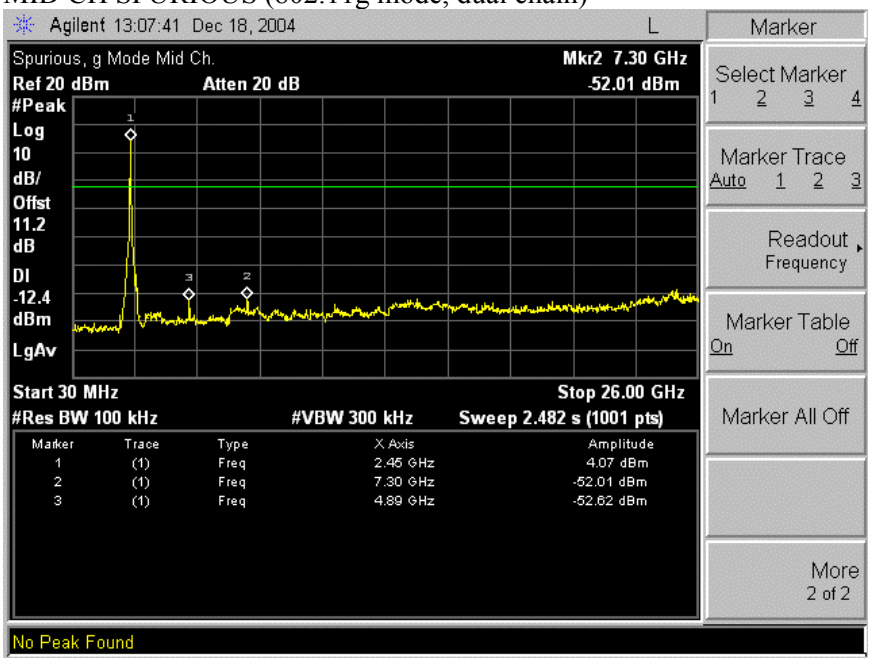


SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE, DUAL CHAIN, Chain 0)

MID CH REFERENCE (802.11g mode, dual chain)

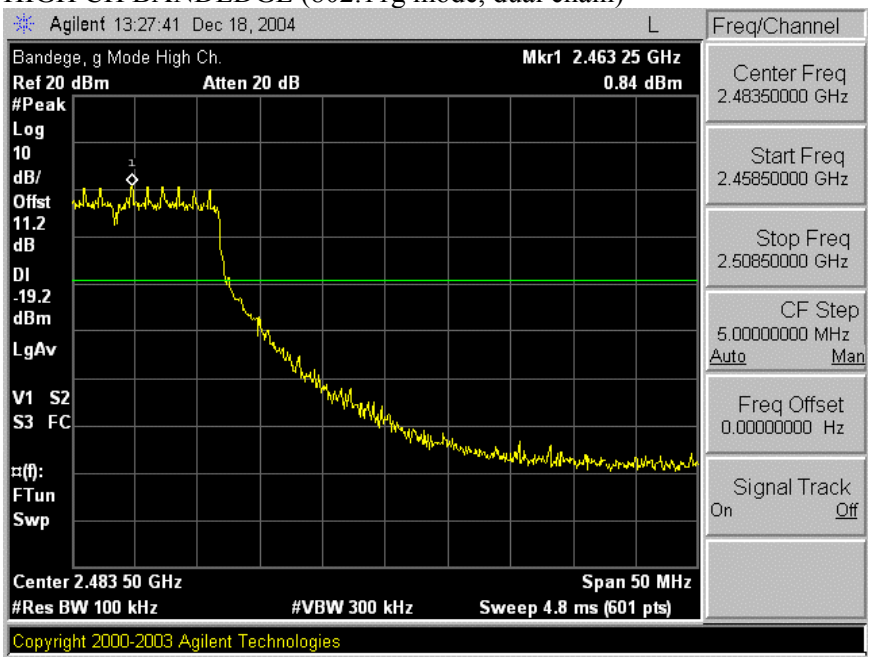


MID CH SPURIOUS (802.11g mode, dual chain)

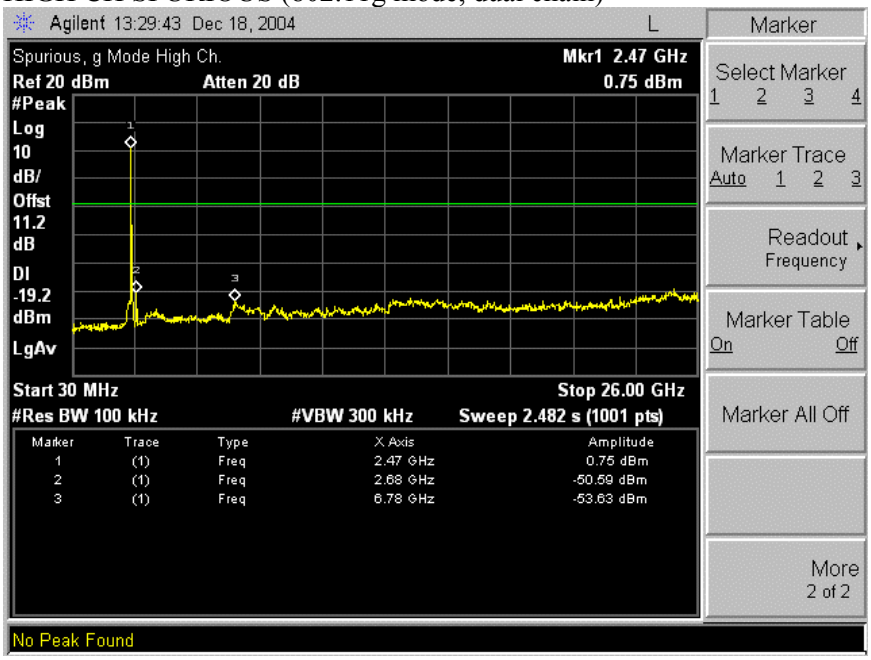


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE, DUAL CHAIN, Chain 0)

HIGH CH BANDEDGE (802.11g mode, dual chain)

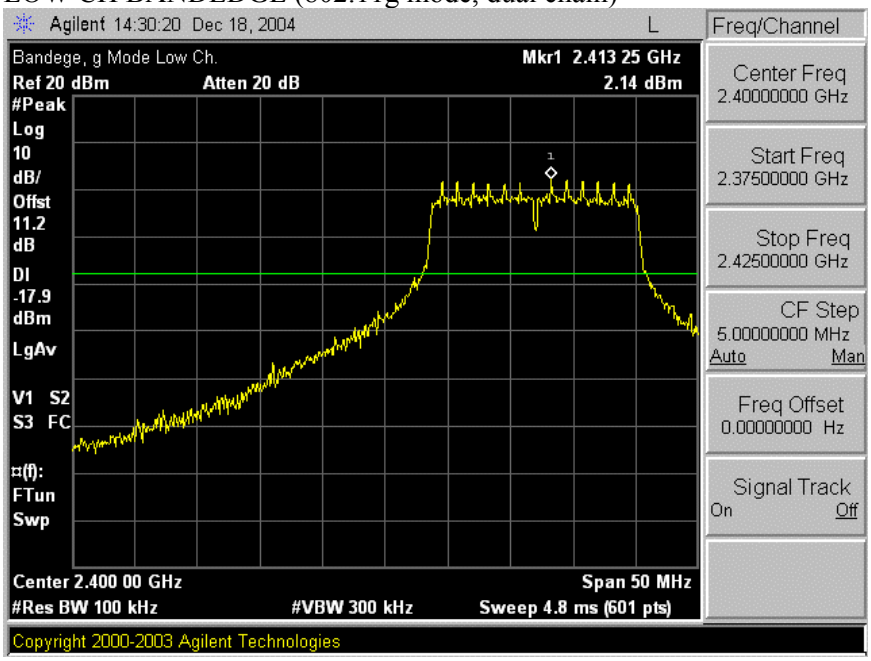


HIGH CH SPURIOUS (802.11g mode, dual chain)

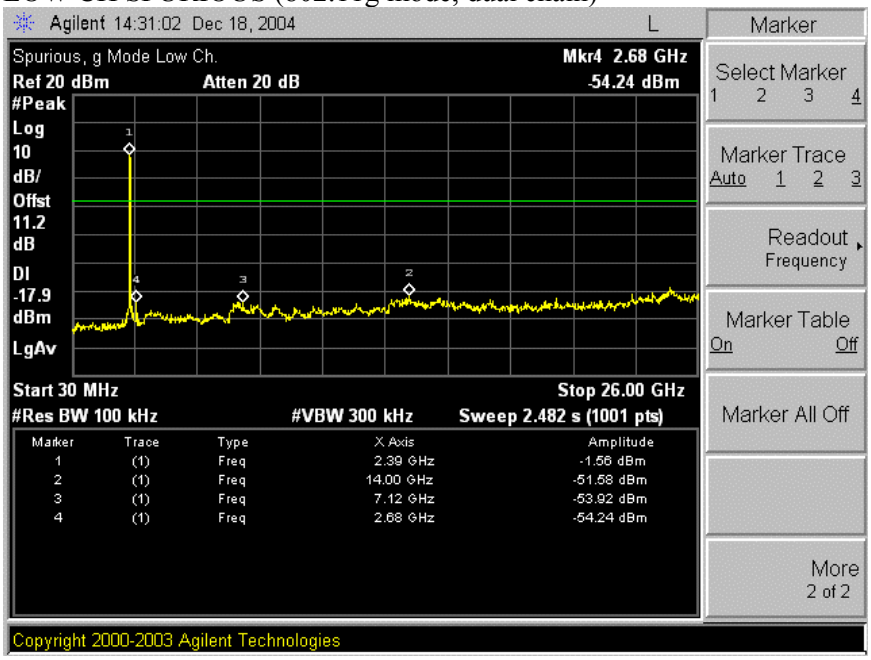


SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE, DUAL CHAIN, Chain 1)

LOW CH BANDEDGE (802.11g mode, dual chain)

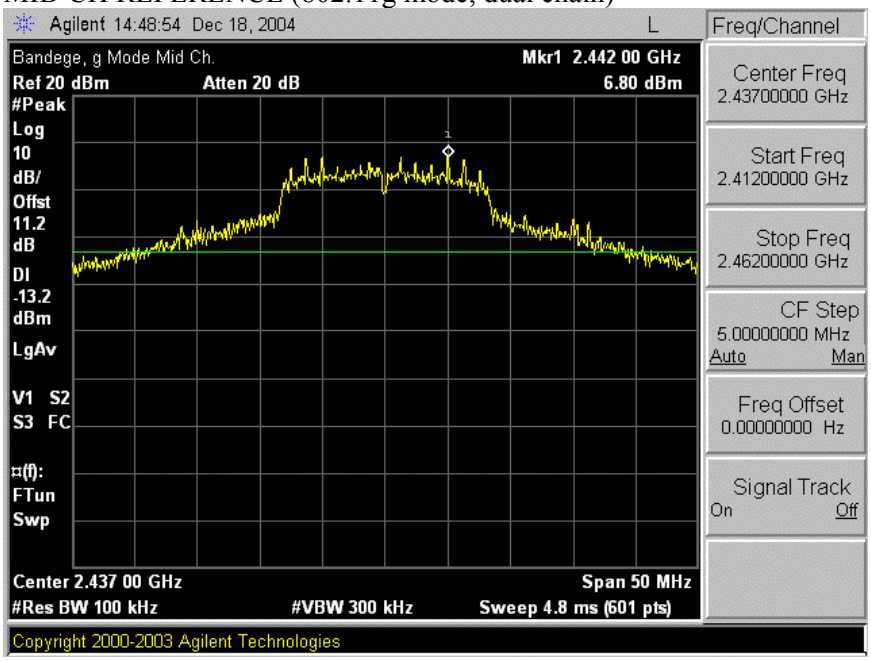


LOW CH SPURIOUS (802.11g mode, dual chain)

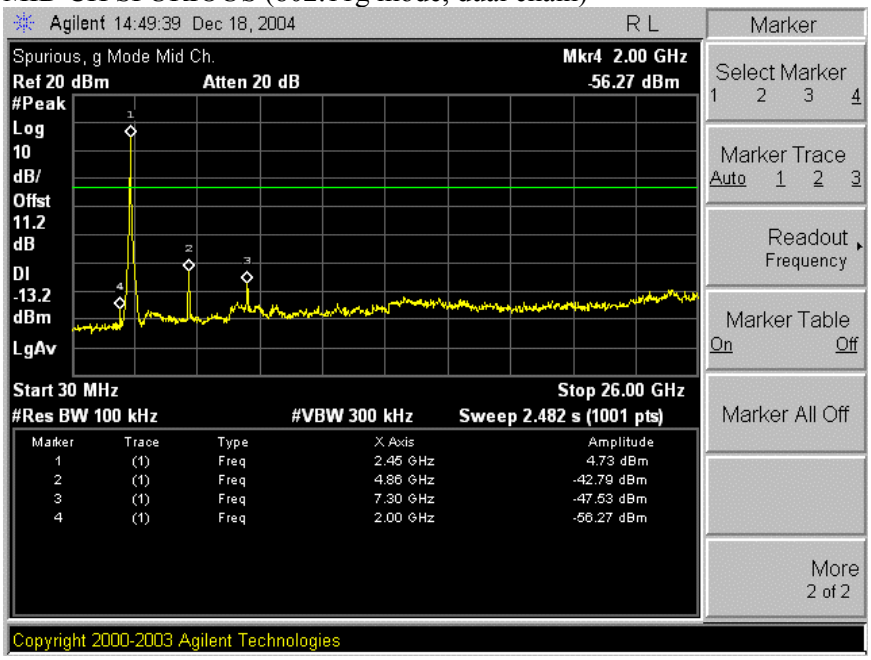


SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE, DUAL CHAIN, Chain 1)

MID CH REFERENCE (802.11g mode, dual chain)

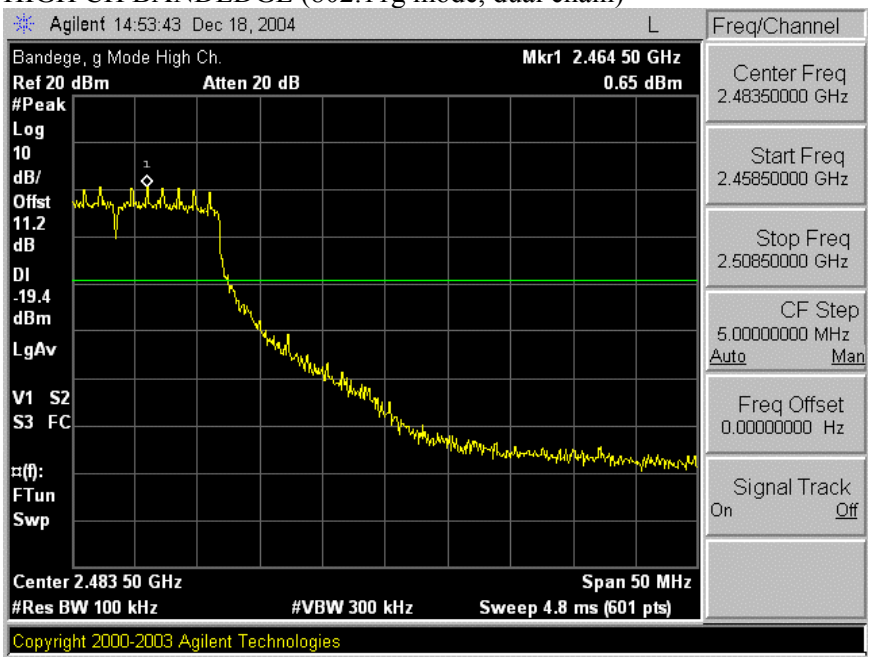


MID CH SPURIOUS (802.11g mode, dual chain)

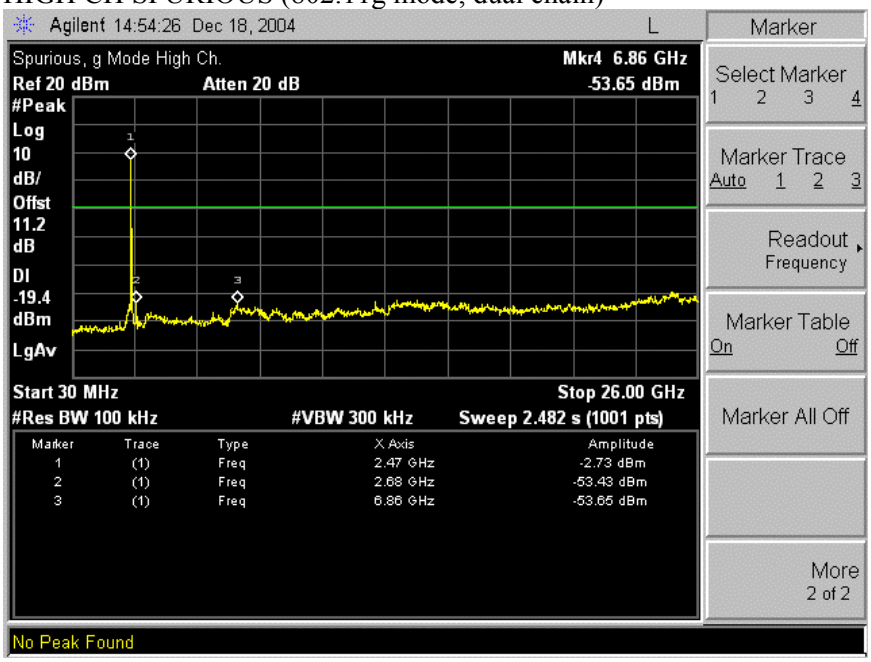


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE, DUAL CHAIN, Chain 1)

HIGH CH BANDEDGE (802.11g mode, dual chain)

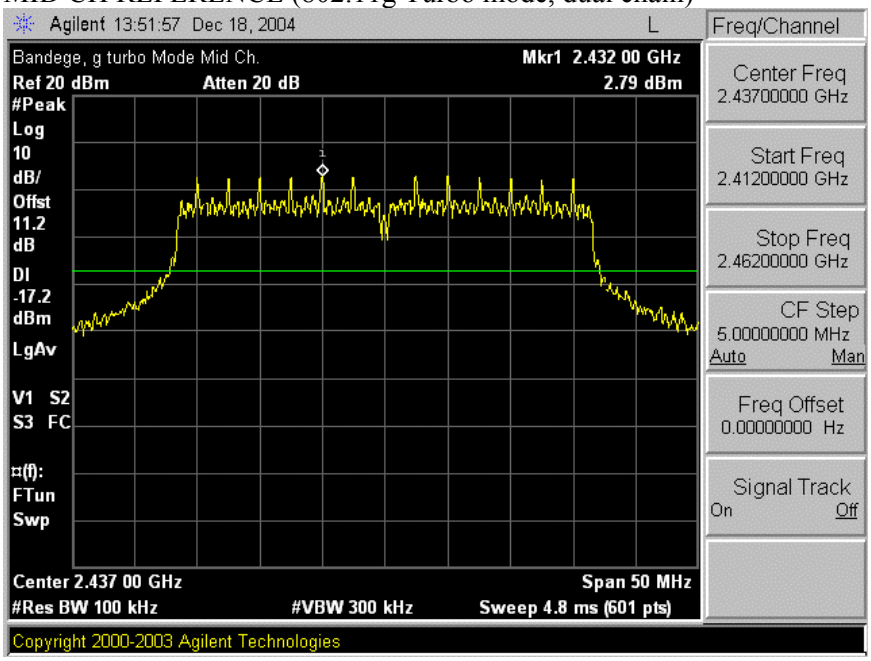


HIGH CH SPURIOUS (802.11g mode, dual chain)

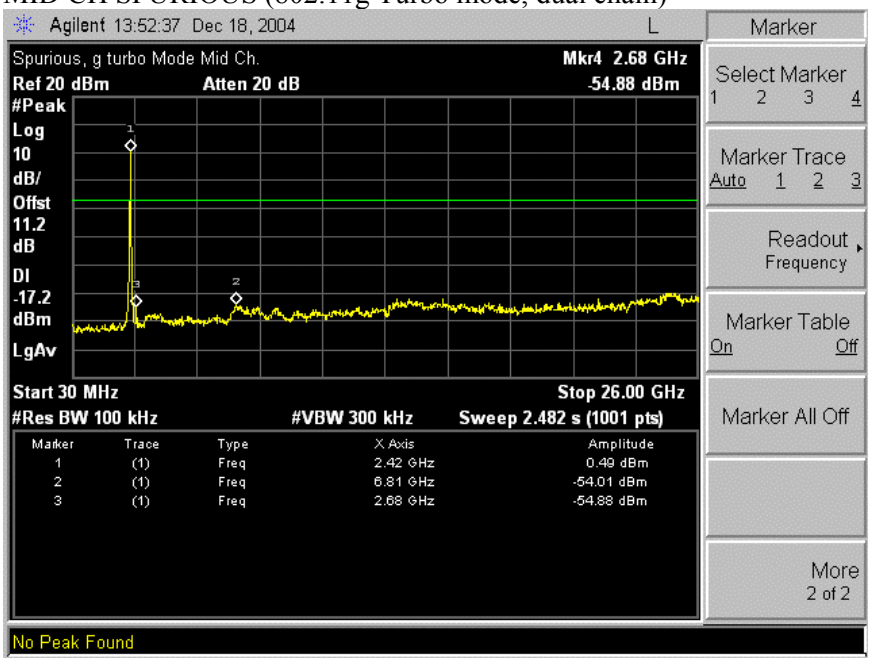


SPURIOUS EMISSIONS, MID CHANNEL (802.11g TURBO MODE, DUAL CHAIN, Chain 0)

MID CH REFERENCE (802.11g Turbo mode, dual chain)

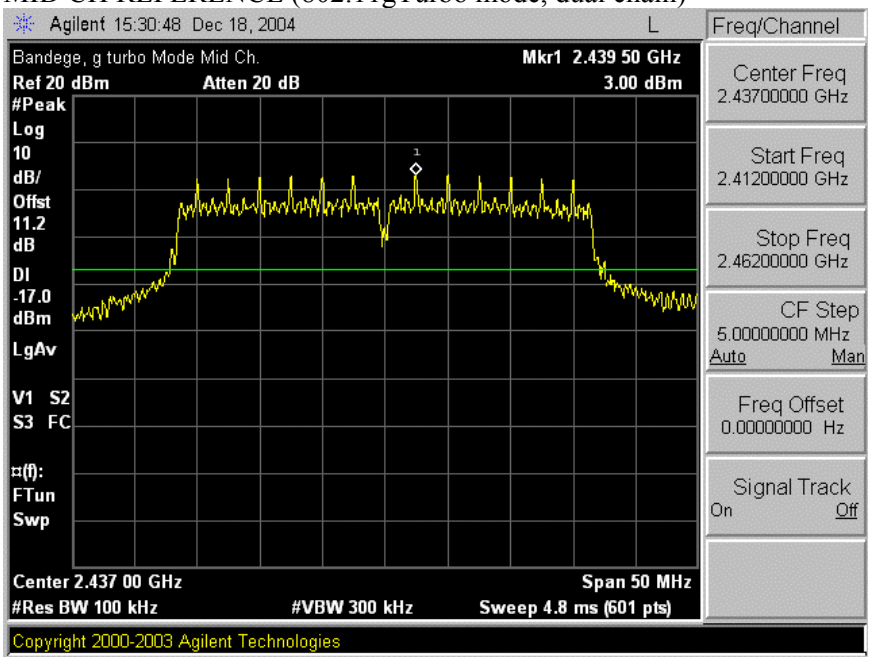


MID CH SPURIOUS (802.11g Turbo mode, dual chain)

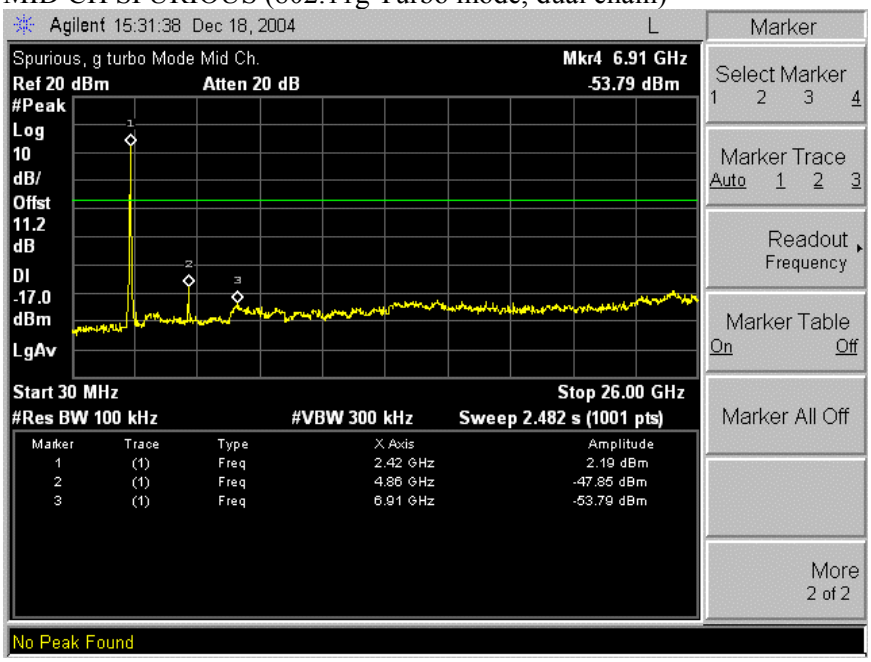


SPURIOUS EMISSIONS, MID CHANNEL (802.11gTURBO MODE, DUAL CHAIN, Chain 1)

MID CH REFERENCE (802.11gTurbo mode, dual chain)



MID CH SPURIOUS (802.11g Turbo mode, dual chain)



7.3. RADIATED EMISSIONS

7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§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 (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** 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.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

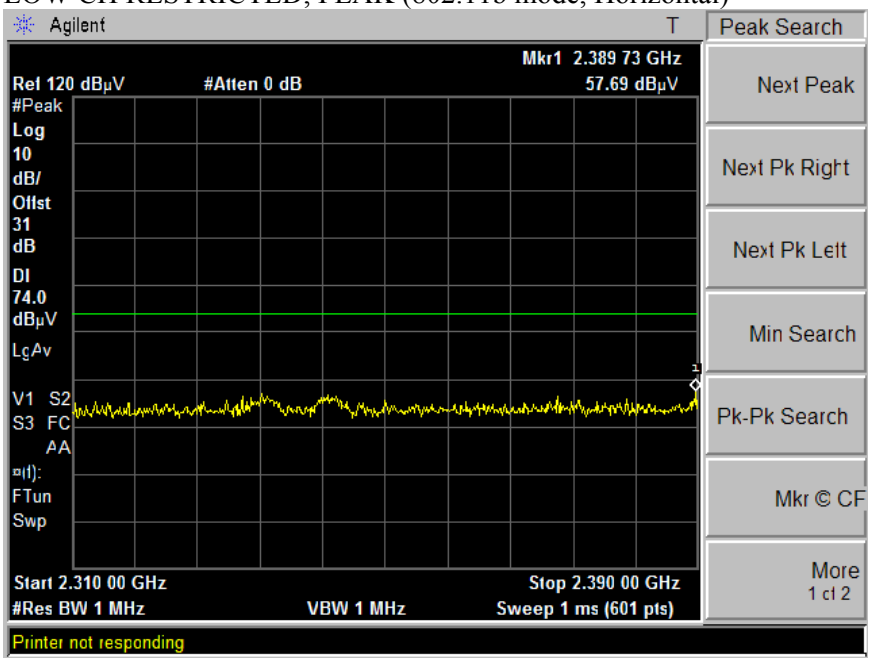
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

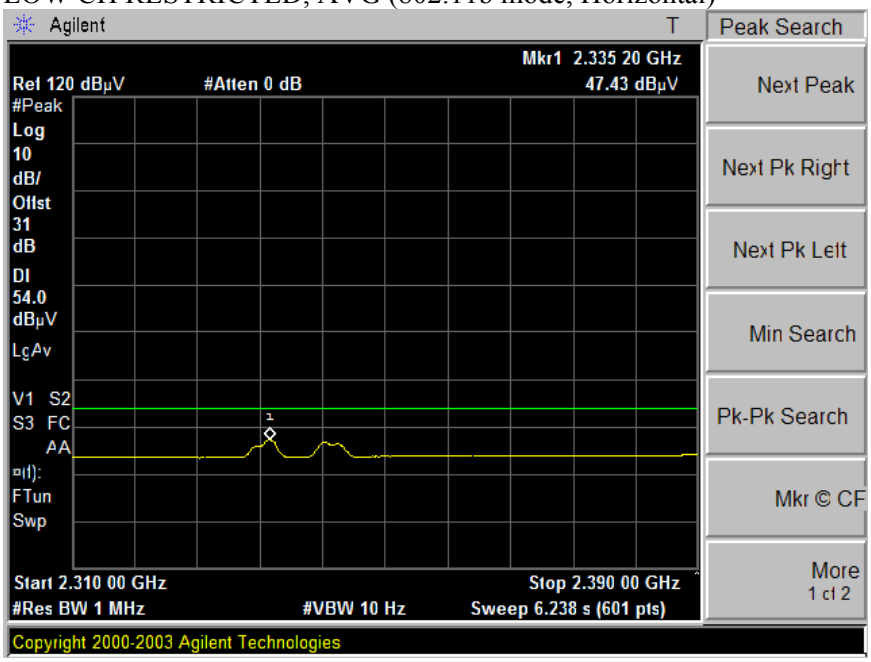
7.3.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND, b MODE

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Horizontal)

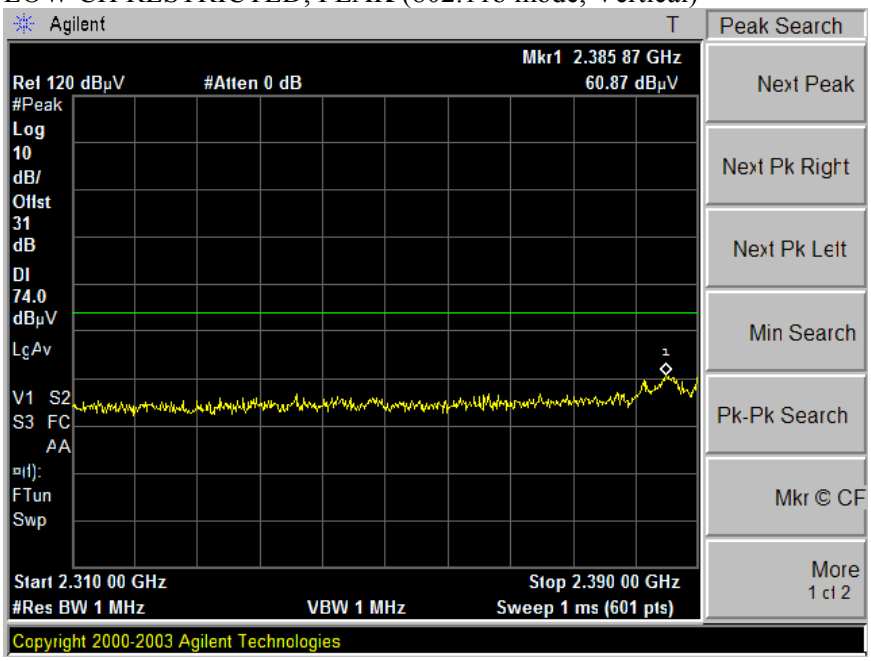


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

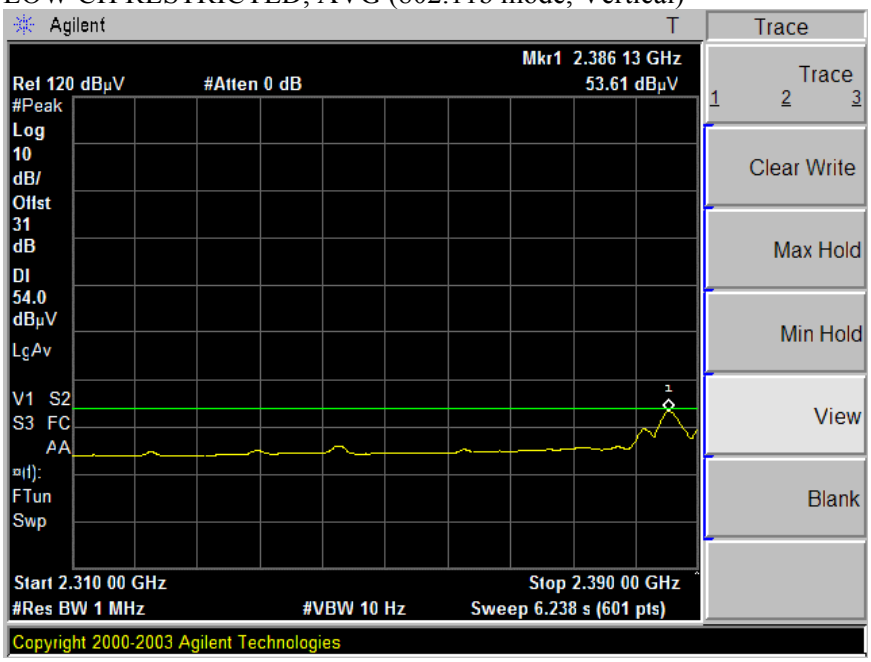


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)

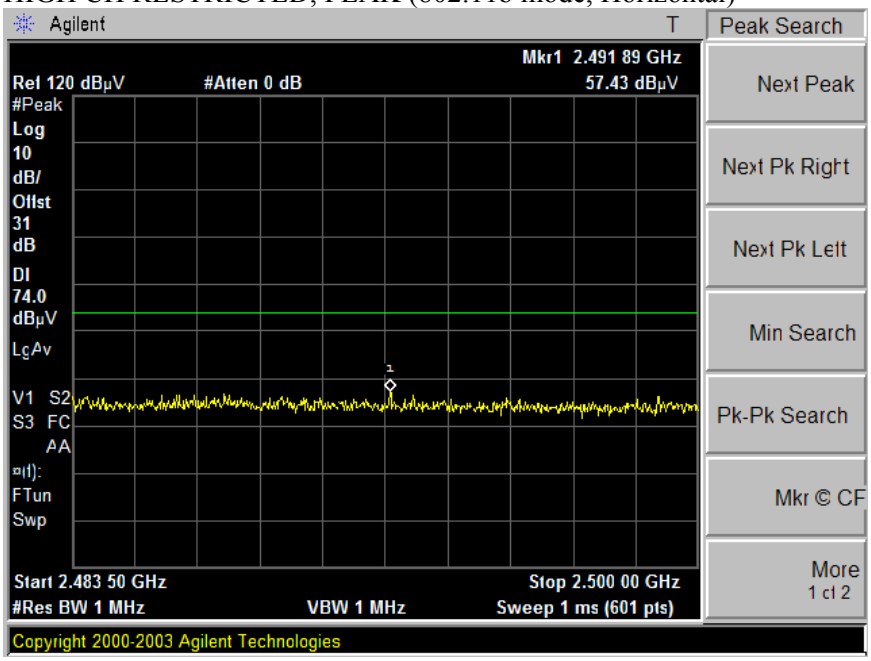


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

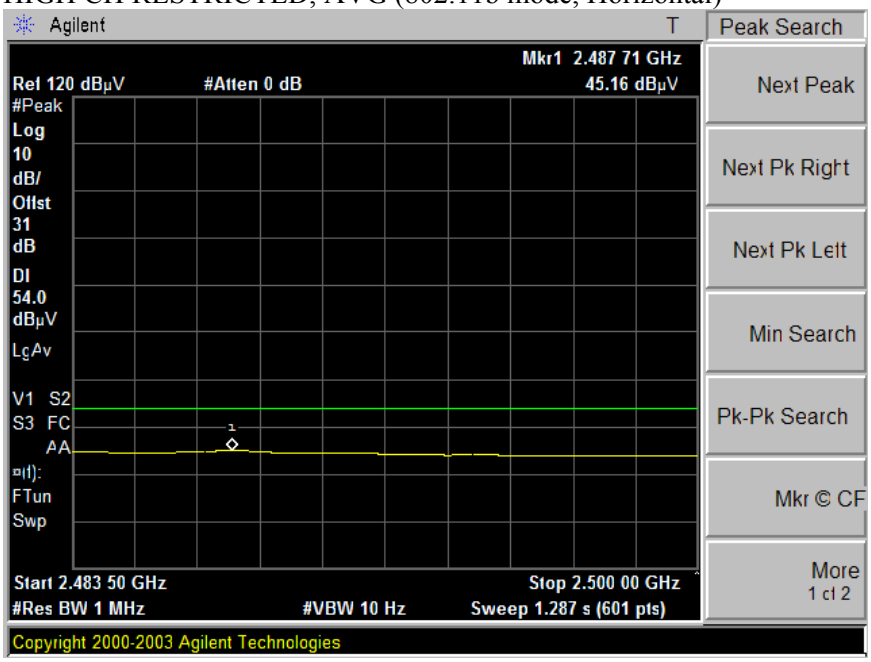


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Horizontal)

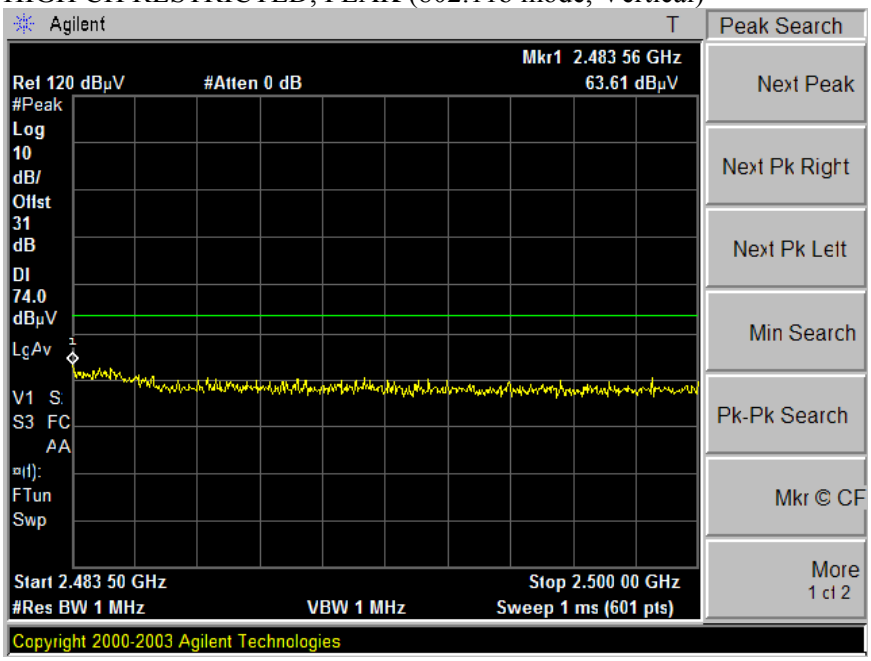


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

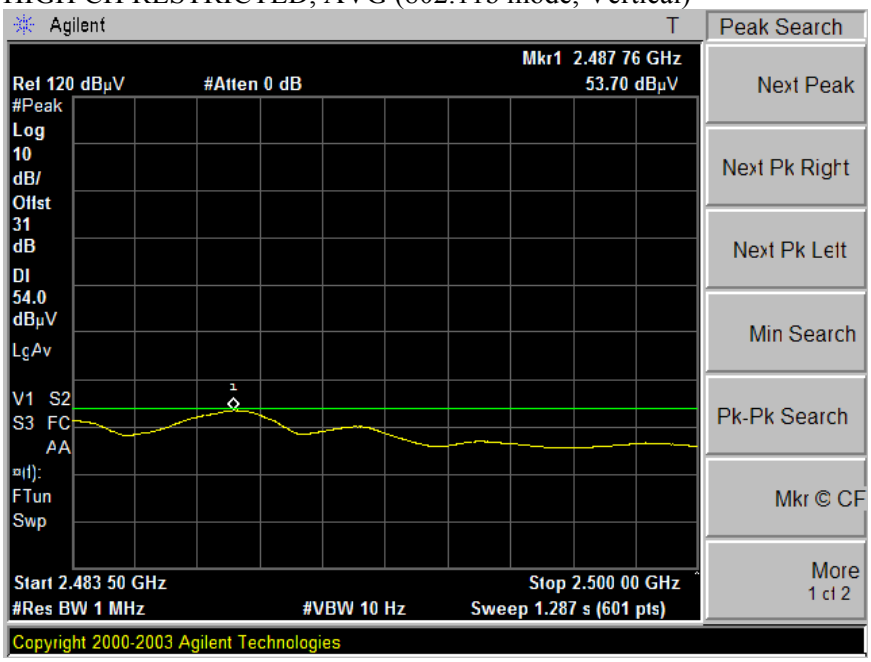


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11b mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11b mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (b MODE)

12/14/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U3115-1
Company: Atheros
EUT Descrip.: 802.11 b/g/g turbo video card
EUT M/N: AV10
Test Target: FCC15.247
Mode Oper: Tx, b mode

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T87 Miteq 924342
Pre-amplifer 26-40GHz:
Horn >18GHz:

Hi Frequency Cables
2 foot cable:
3 foot cable:
4 foot cable: 4_David
12 foot cable: 12_Yan

HPF: HPF_4.0GHz
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

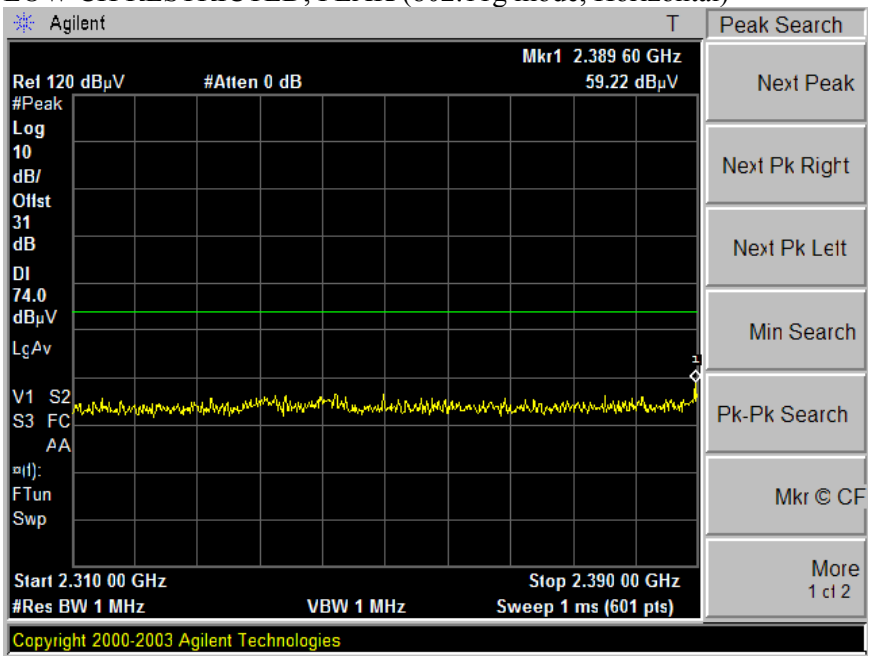
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
2412 Channel, Chain 0															
4.824	3.0	50.9	44.8	32.9	4.8	-39.6	0.0	0.6	49.7	43.6	74	54	-24.3	-10.4	H
14.472	3.0	44.0	34.0	40.2	8.9	-40.5	0.0	0.9	53.4	43.4	74	54	-20.6	-10.6	H
4.824	3.0	49.4	43.0	32.9	4.8	-39.6	0.0	0.6	48.2	41.8	74	54	-25.8	-12.2	V
14.472	3.0	43.6	36.1	40.2	8.9	-40.5	0.0	0.9	53.0	45.5	74	54	-21.0	-8.5	V
2417 Channel, Chain 0															
4.834	3.0	48.0	42.9	32.9	4.8	-39.6	0.0	0.6	46.8	41.7	74	54	-27.2	-12.3	H
4.834	3.0	48.0	43.0	32.9	4.8	-39.6	0.0	0.6	46.8	41.8	74	54	-27.2	-12.2	V
7.251	3.0	46.3	35.6	35.7	5.9	-40.4	0.0	0.6	48.2	37.5	74	54	-25.8	-16.5	V
2437 Channel, Chain 0															
4.874	3.0	51.0	46.8	32.9	4.9	-39.6	0.0	0.6	49.8	45.6	74	54	-24.2	-8.4	H
4.874	3.0	52.3	48.9	32.9	4.9	-39.6	0.0	0.6	51.1	47.7	74	54	-22.9	-6.3	V
7.311	3.0	45.6	35.3	35.8	6.0	-40.3	0.0	0.6	47.7	37.4	74	54	-26.3	-16.6	V
2457 Channel, Chain 0															
4.914	3.0	47.7	44.2	33.0	4.9	-39.7	0.0	0.6	46.5	43.0	74	54	-27.5	-11.0	H
4.914	3.0	53.5	50.5	33.0	4.9	-39.7	0.0	0.6	52.3	49.3	74	54	-21.7	-4.7	V
7.371	3.0	46.3	36.1	35.9	6.0	-40.3	0.0	0.6	48.5	38.3	74	54	-25.5	-15.7	V
2462 Channel, Chain 0															
4.924	3.0	50.7	46.2	33.0	4.9	-39.7	0.0	0.6	49.5	45.0	74	54	-24.5	-9.0	H
4.924	3.0	54.5	52.1	33.0	4.9	-39.7	0.0	0.6	53.3	50.9	74	54	-20.7	-3.1	V
7.386	3.0	46.1	35.8	36.0	6.0	-40.3	0.0	0.6	48.4	38.1	74	54	-25.6	-15.9	V
ART set to 18 for all above readings.															
No further emissions were detected.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

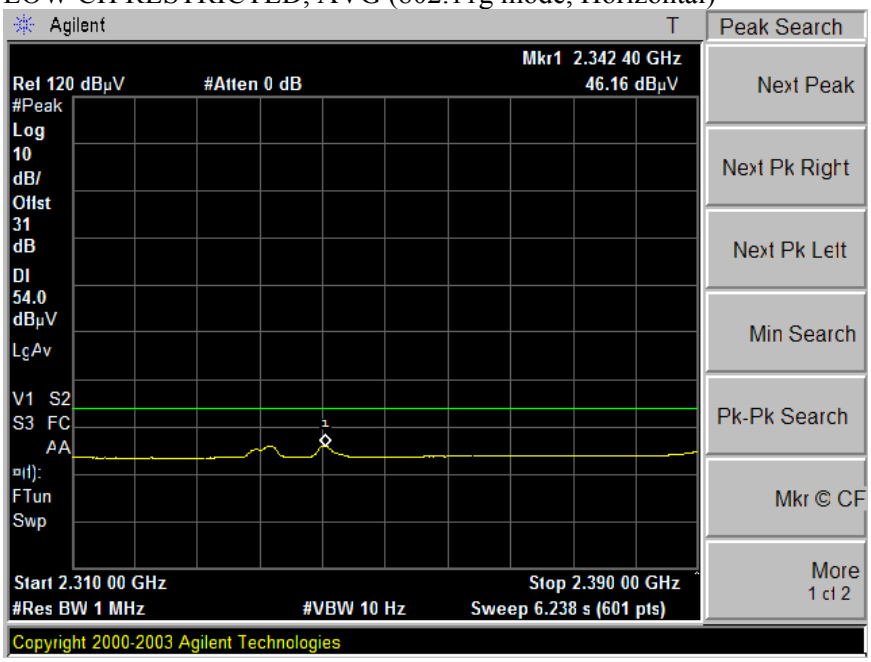
7.3.3. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND, g MODE, SINGLE CHAIN

RESTRICTED BANDEDGE (g MODE, SINGLE CHAIN, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Horizontal)

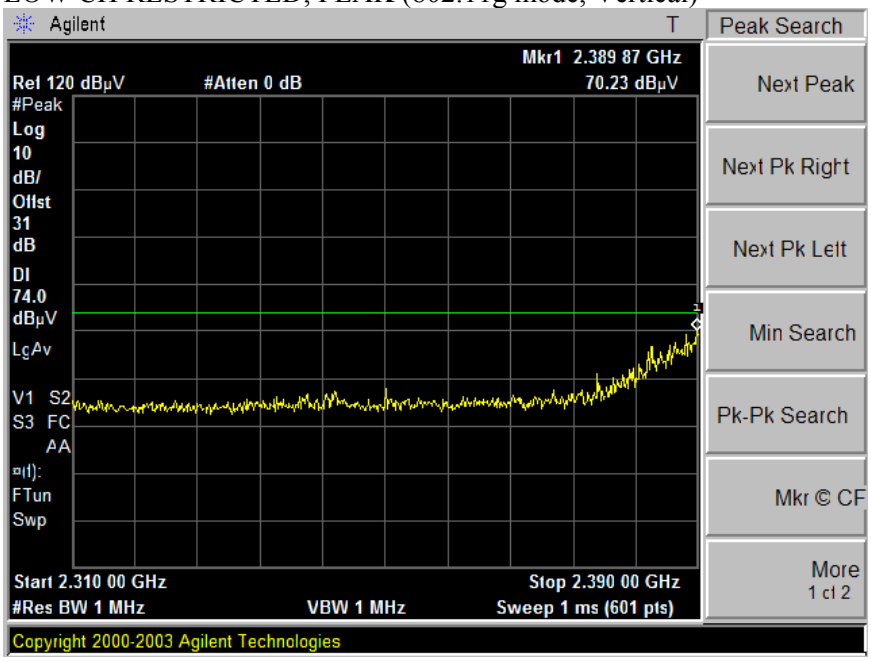


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

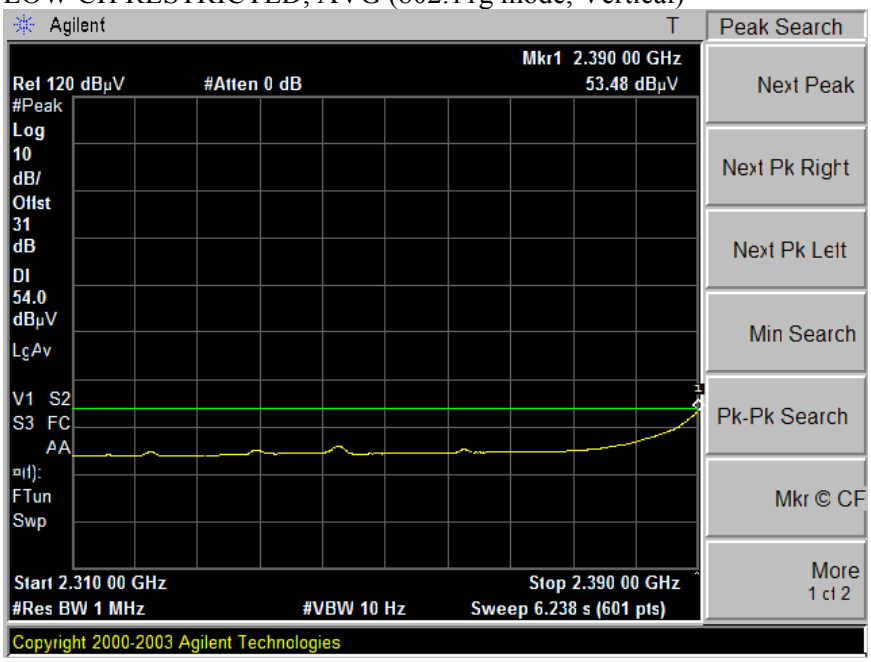


RESTRICTED BANDEDGE (g MODE, SINGLE CHAIN, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Vertical)

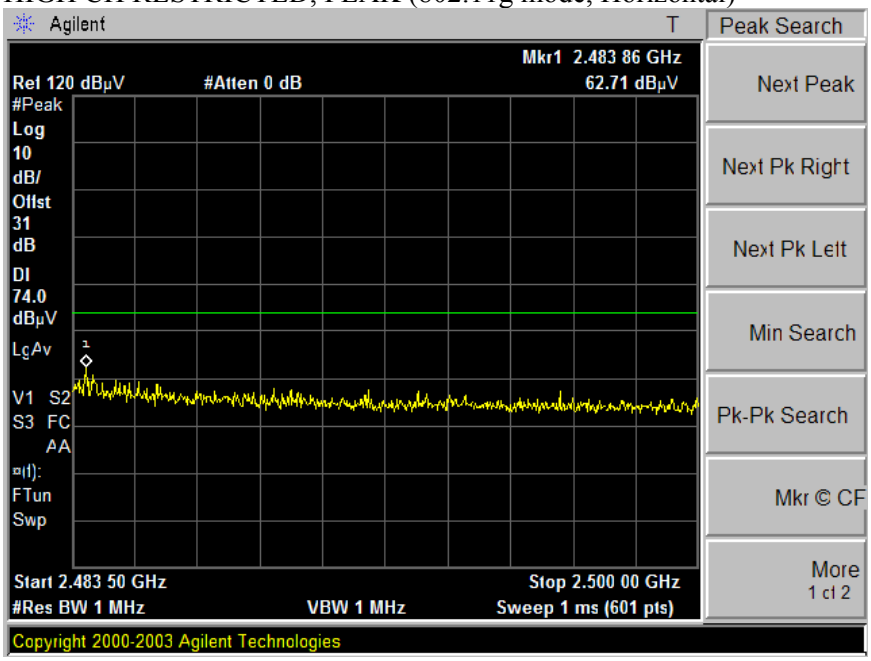


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

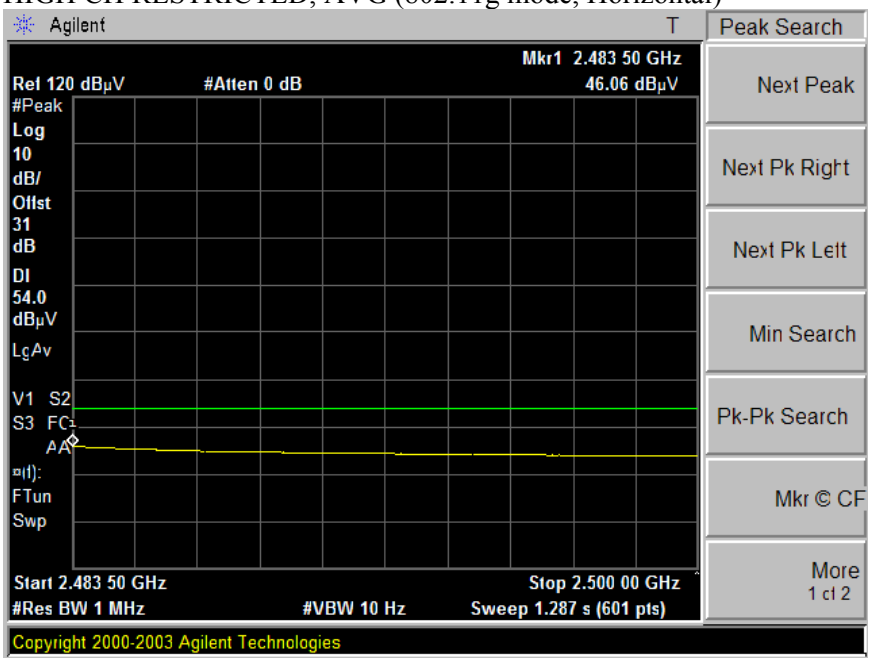


RESTRICTED BANDEDGE (g MODE, SINGLE CHAIN, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Horizontal)

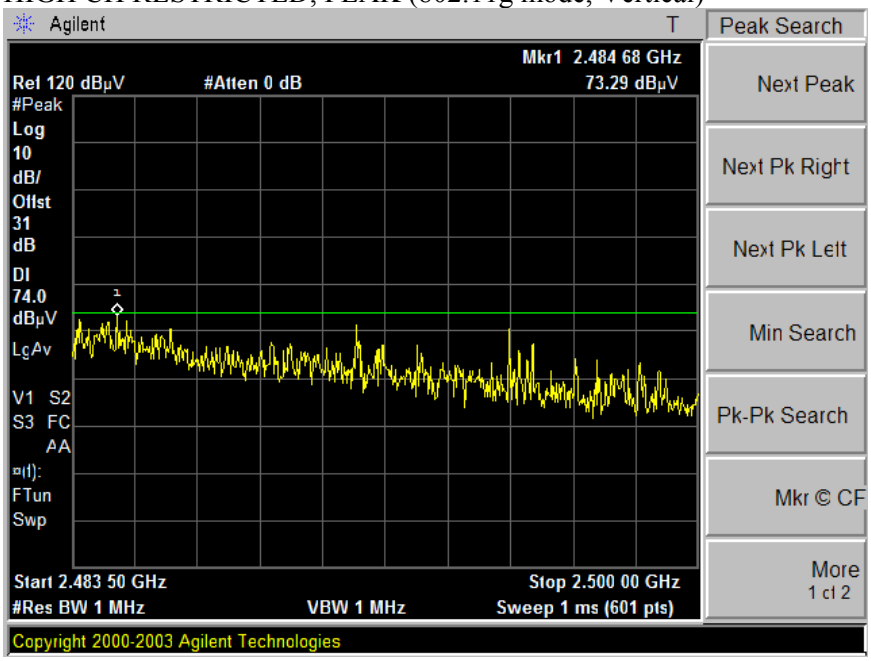


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

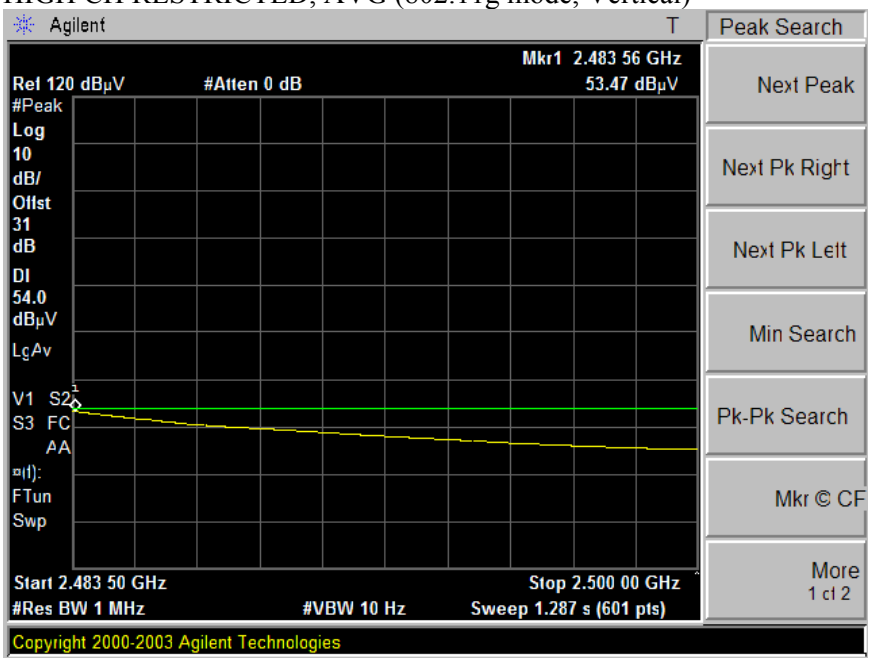


RESTRICTED BANDEDGE (g MODE, SINGLE CHAIN, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (g MODE, SINGLE CHAIN)

12/15/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U3115-1
Company: Atheros
EUT Descrip.: 802.11 b/g/g turbo video card
EUT M/N: AV10
Test Target: FCC15.247
Mode Oper: Tx, g mode

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T87 Miteq 924342
Pre-amplifer 26-40GHz:
Horn >18GHz:

Hi Frequency Cables
2 foot cable:
3 foot cable:
4 foot cable: 4_David
12 foot cable: 12_Yan

HPF: HPF_4.0GHz
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
2412 Channel, Chain 0															
4.824	3.0	46.4	34.8	32.9	4.8	-39.6	0.0	0.6	45.2	33.6	74	54	-28.8	-20.4	H
4.824	3.0	55.8	41.2	32.9	4.8	-39.6	0.0	0.6	54.6	40.0	74	54	-19.4	-14.0	V
2437 Channel, Chain 0															
4.874	3.0	47.6	36.2	32.9	4.9	-39.6	0.0	0.6	46.4	35.0	74	54	-27.6	-19.0	H
4.874	3.0	52.6	40.8	32.9	4.9	-39.6	0.0	0.6	51.4	39.6	74	54	-22.6	-14.4	V
7.311	3.0	45.0	34.1	35.8	6.0	-40.3	0.0	0.6	47.1	36.2	74	54	-26.9	-17.8	V
2462 Channel, Chain 0															
4.924	3.0	46.5	35.0	33.0	4.9	-39.7	0.0	0.6	45.3	33.8	74	54	-28.7	-20.2	H
4.924	3.0	55.6	43.0	33.0	4.9	-39.7	0.0	0.6	54.4	41.8	74	54	-19.6	-12.2	V
7.386	3.0	46.2	35.0	36.0	6.0	-40.3	0.0	0.6	48.5	37.3	74	54	-25.5	-16.7	V
ART set to 19 for all above readings.															
No further emissions were detected.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

HARMONICS AND SPURIOUS EMISSIONS (g TURBO MODE, SINGLE CHAIN)

12/16/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U3115-1
Company: Atheros
EUT Descrip.: 802.11 b/g/g turbo video card
EUT M/N: AV10
Test Target: FCC15.247
Mode Oper: Tx, g turbo mode

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T87 Miteq 924342
Pre-amplifer 26-40GHz:
Horn > 18GHz:

Hi Frequency Cables
2 foot cable:
3 foot cable:
4 foot cable: 4_David
12 foot cable: 12_Yan

HPF: HPF_4.0GHz
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

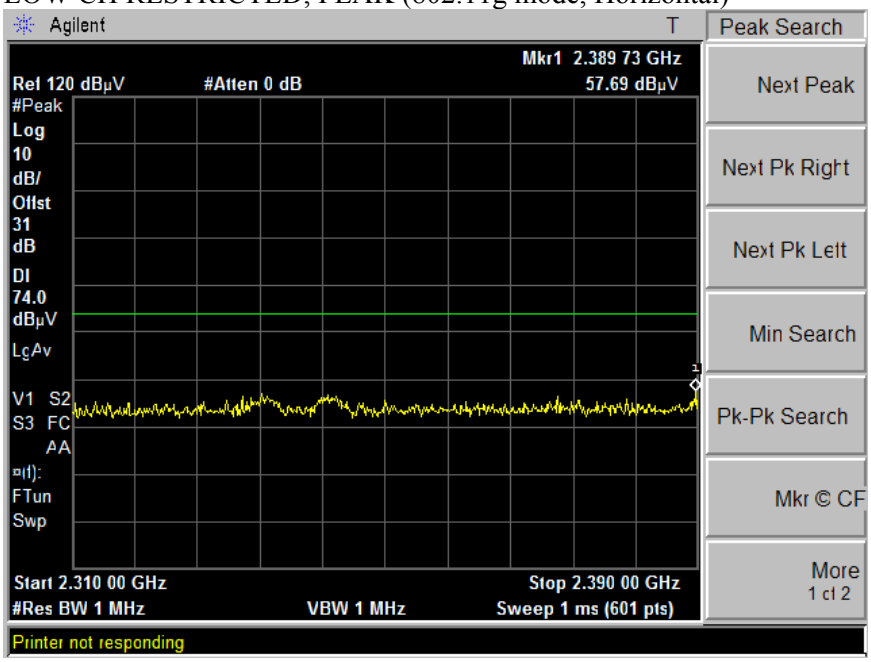
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
2437 Channel, Chain 0															
4.874	3.0	39.4	27.4	32.9	4.9	-39.6	0.0	0.6	38.2	26.2	74	54	-35.8	-27.8	H
4.874	3.0	47.1	34.3	32.9	4.9	-39.6	0.0	0.6	45.9	33.1	74	54	-28.1	-20.9	V
7.311	3.0	39.1	27.7	35.8	6.0	-40.3	0.0	0.6	41.2	29.8	74	54	-32.8	-24.2	V
ART set to 19 for all above readings.															
No further emissions were detected.															

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

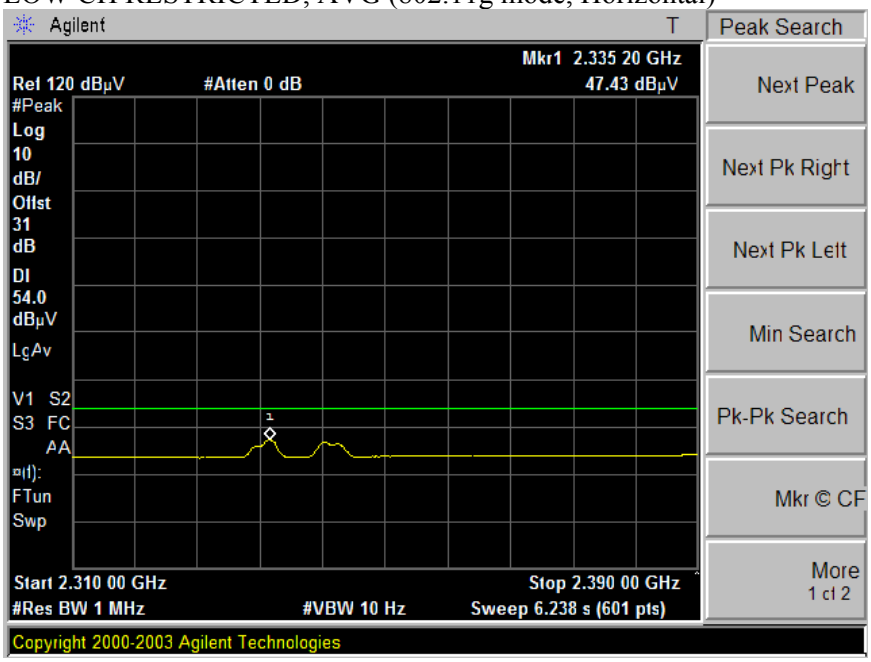
7.3.4. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND, g MODE, DUAL CHAIN

RESTRICTED BANDEDGE (g MODE, DUAL CHAIN, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Horizontal)

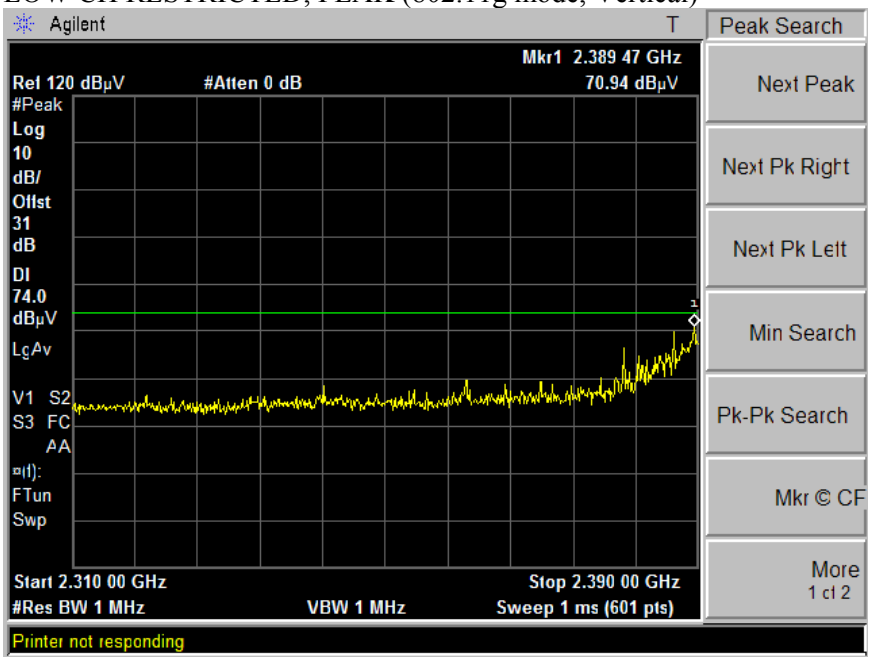


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

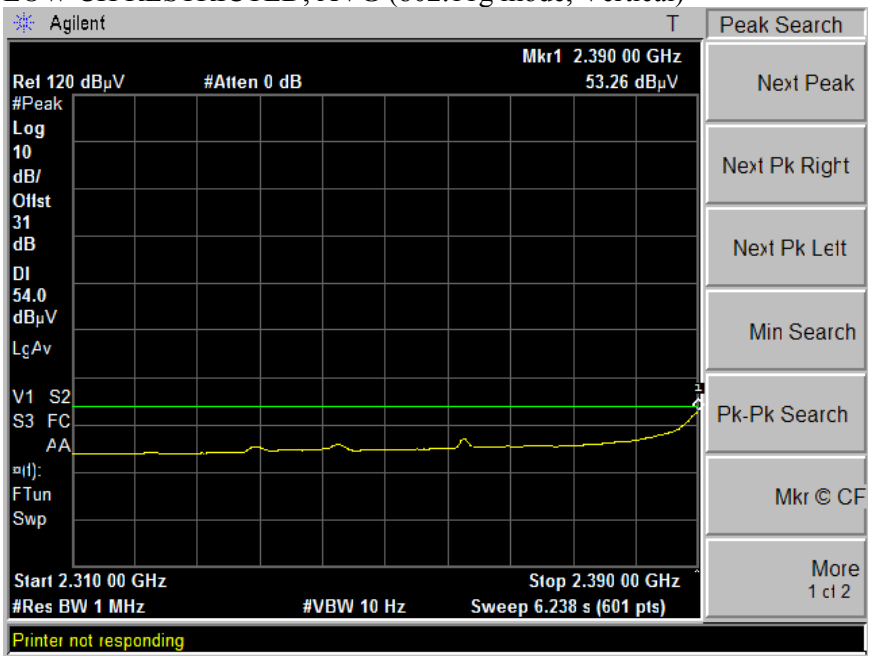


RESTRICTED BANDEDGE (g MODE, DUAL CHAIN, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11g mode, Vertical)

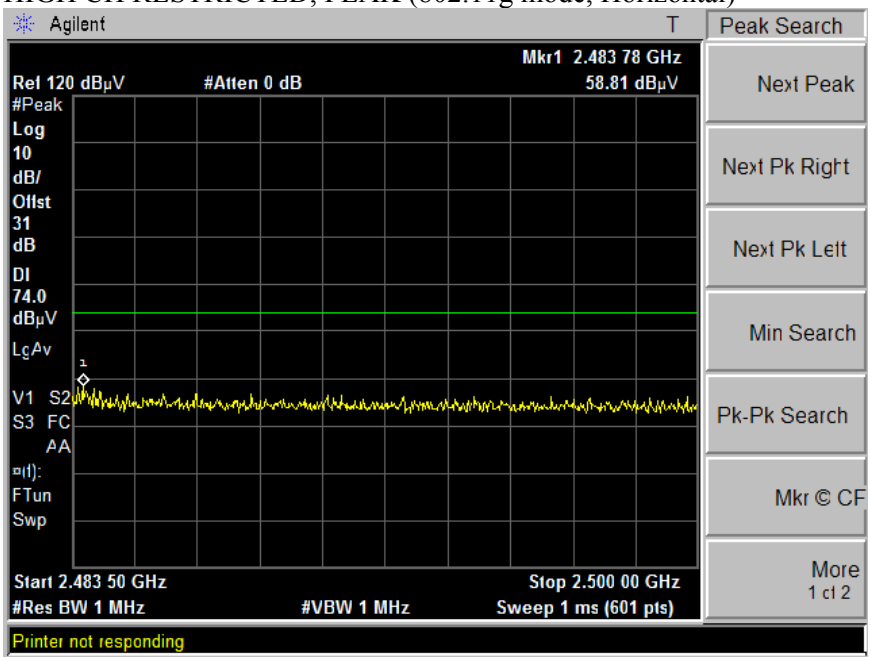


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

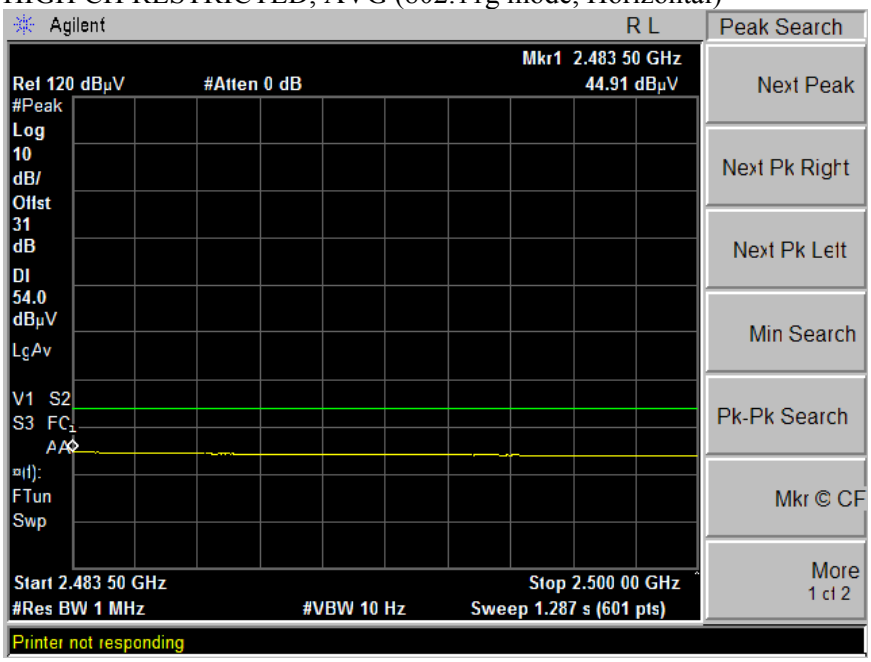


RESTRICTED BANDEDGE (g MODE, DUAL CHAIN, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Horizontal)

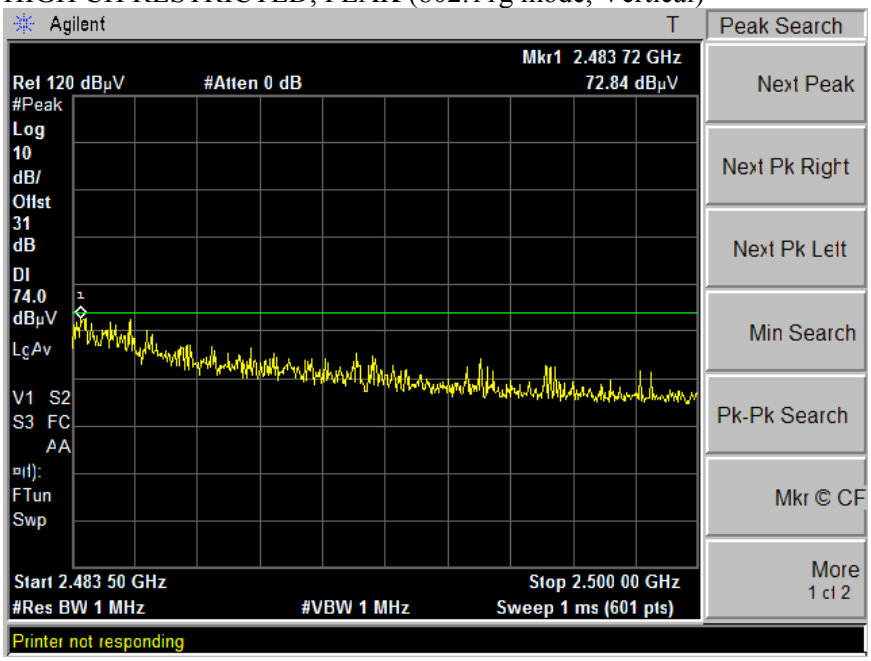


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

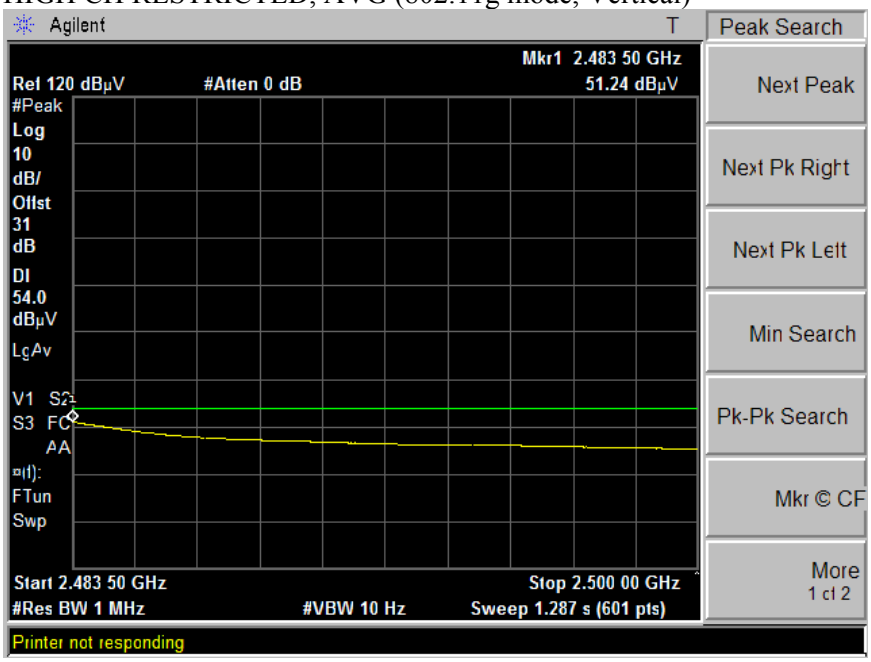


RESTRICTED BANDEDGE (g MODE, DUAL CHAIN, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11g mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11g mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (g MODE, DUAL CHAIN)

12/15/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U3115-1
Company: Atheros
EUT Descrip.: 802.11 b/g/g turbo video card
EUT M/N: AV10
Test Target: FCC15.247
Mode Oper: Tx, g mode, dual mode, Antenna A/Antenna A configuration, 0 phase

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T87 Miteq 924342
Pre-amplifer 26-40GHz:
Horn > 18GHz:

Hi Frequency Cables: 2 foot cable; 3 foot cable; 4 foot cable: 4_David; 12 foot cable: 12_Yan

HPF: HPF_4.0GHz
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

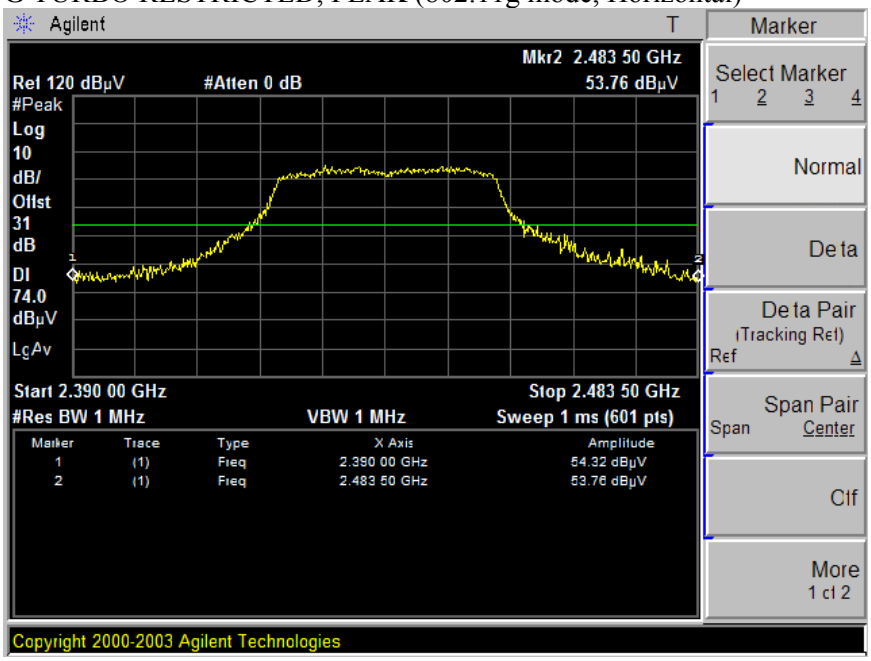
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
2412 Channel															
4.824	3.0	47.3	35.6	32.9	4.8	-39.6	0.0	0.6	46.1	34.4	74	54	-27.9	-19.6	H
4.824	3.0	50.9	39.4	32.9	4.8	-39.6	0.0	0.6	49.7	38.2	74	54	-24.3	-15.8	V
2437 Channel															
4.874	3.0	48.6	36.8	32.9	4.9	-39.6	0.0	0.6	47.4	35.6	74	54	-26.6	-18.4	H
4.874	3.0	58.3	44.9	32.9	4.9	-39.6	0.0	0.6	57.1	43.7	74	54	-16.9	-10.3	V
7.311	3.0	43.9	33.0	35.8	6.0	-40.3	0.0	0.6	46.0	35.1	74	54	-28.0	-18.9	V
2462 Channel															
4.924	3.0	49.1	38.2	33.0	4.9	-39.7	0.0	0.6	47.9	37.0	74	54	-26.1	-17.0	H
7.386	3.0	40.4	29.2	36.0	6.0	-40.3	0.0	0.6	42.7	31.5	74	54	-31.3	-22.5	H
4.924	3.0	59.4	45.8	33.0	4.9	-39.7	0.0	0.6	58.2	44.6	74	54	-15.8	-9.4	V
7.386	3.0	44.3	33.4	36.0	6.0	-40.3	0.0	0.6	46.6	35.7	74	54	-27.4	-18.3	V

Antenna A=Dipole, Antenna B=Printed
No further emissions were detected.

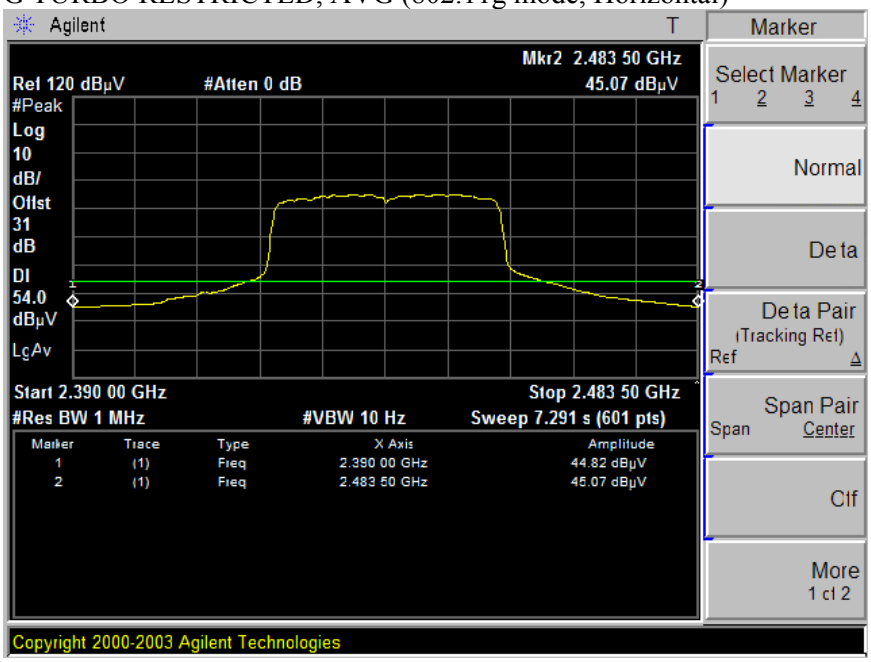
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

RESTRICTED BANDEDGE (g TURBO MODE, DUAL CHAIN, LOW CHANNEL, HORIZONTAL)

G TURBO RESTRICTED, PEAK (802.11g mode, Horizontal)

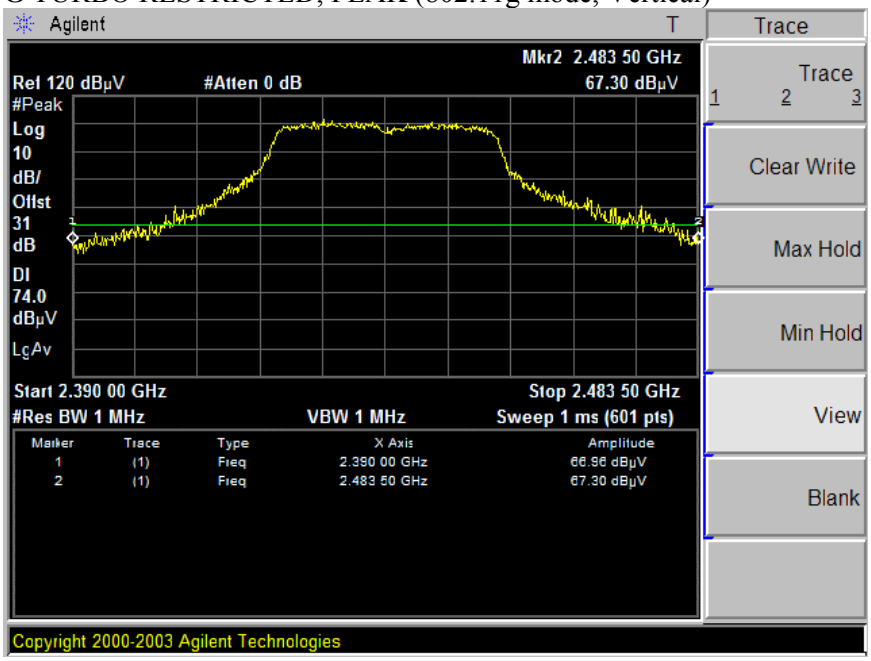


G TURBO RESTRICTED, AVG (802.11g mode, Horizontal)

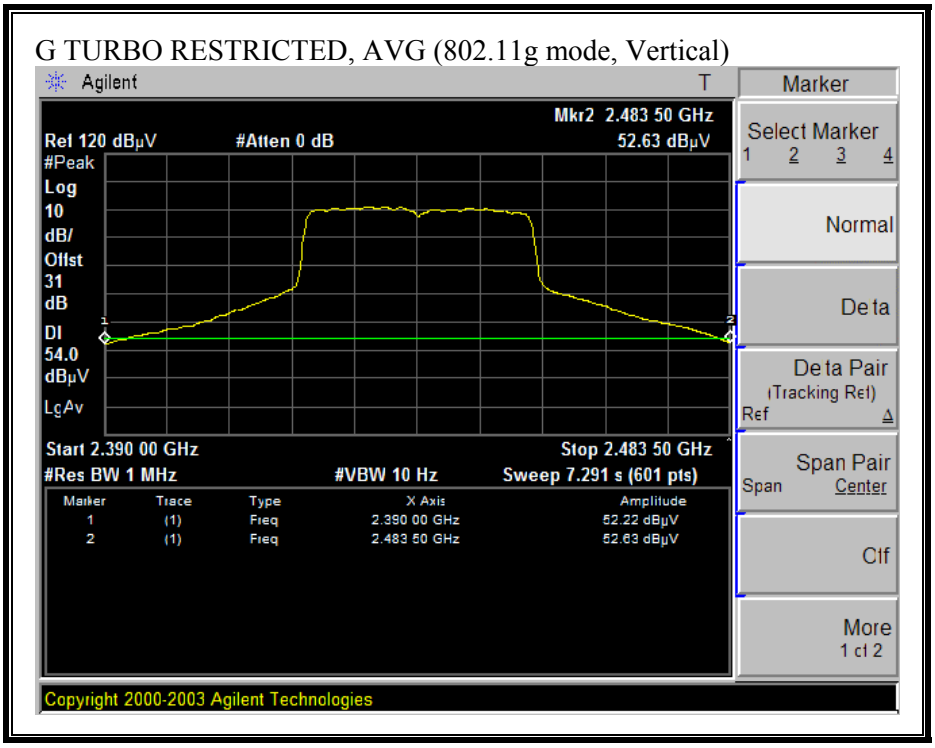


RESTRICTED BANDEDGE (g TURBO MODE, DUAL CHAIN, VERTICAL)

G TURBO RESTRICTED, PEAK (802.11g mode, Vertical)



G TURBO RESTRICTED, AVG (802.11g mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (g TURBO MODE, DUAL CHAIN)

12/16/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U3115-1
Company: Atheros
EUT Descrip.: 802.11 b/g/g turbo video card
EUT M/N: AV10
Test Target: FCC15.247
Mode Oper: Tx, g turbo mode, dual chain

Test Equipment:

EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T87 Miteq 924342
Pre-amplifer 26-40GHz:
Horn > 18GHz:

Hi Frequency Cables
2 foot cable:
3 foot cable:
4 foot cable: 4_David
12 foot cable: 12_Yan

HPF: HPF_4.0GHz
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
2437 Channel, Chain 0															
4.874	3.0	40.1	28.5	32.9	4.9	-39.6	0.0	0.6	38.9	27.3	74	54	-35.1	-26.7	H
4.874	3.0	44.7	33.3	32.9	4.9	-39.6	0.0	0.6	43.5	32.1	74	54	-30.5	-21.9	V
7.311	3.0	38.9	27.7	35.8	6.0	-40.3	0.0	0.6	41.0	29.8	74	54	-33.0	-24.2	V
ART set to 19 for all above readings.															
No other emissions were detected.															

f	Measurement Frequency	Amp	Preamp Gain			Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters			Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m			Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength			Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter				

7.3.5. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

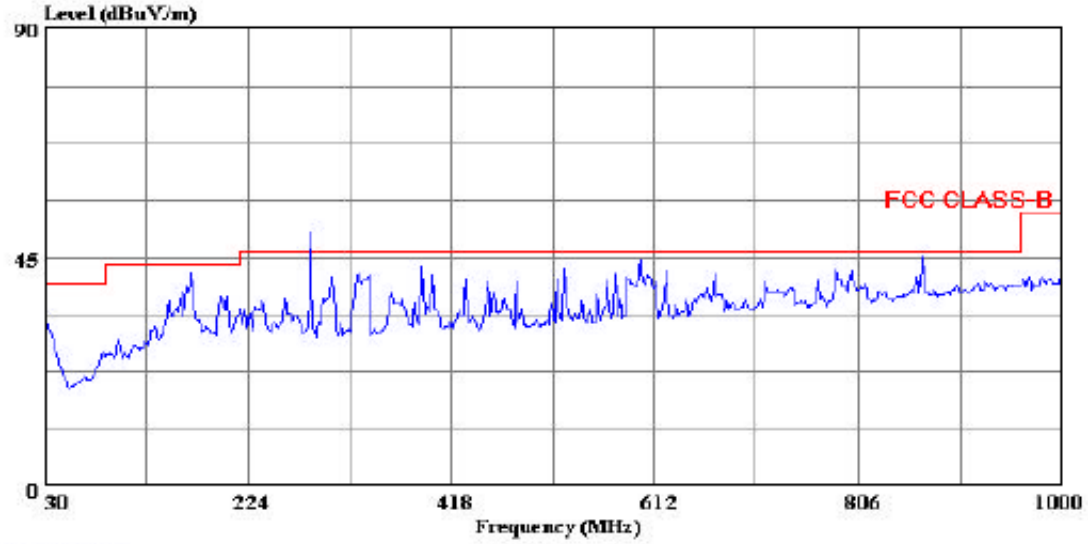
The emission at 284MHz is generated by the laptop and coupled out of the laptop shield by the extender card test fixture. This is not a normal operating configuration for the laptop. The extender card test fixture is utilized in order to test the EUT as a modular device.

SPURIOUS EMISSIONS 30 TO 1000 MHz WITH EUT OFF, HORIZONTAL

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 13 File#: 04u3115.EMI Date: 12-21-2004 Time: 16:36:52



(Audix ATC)

Trace: Ref Trace:

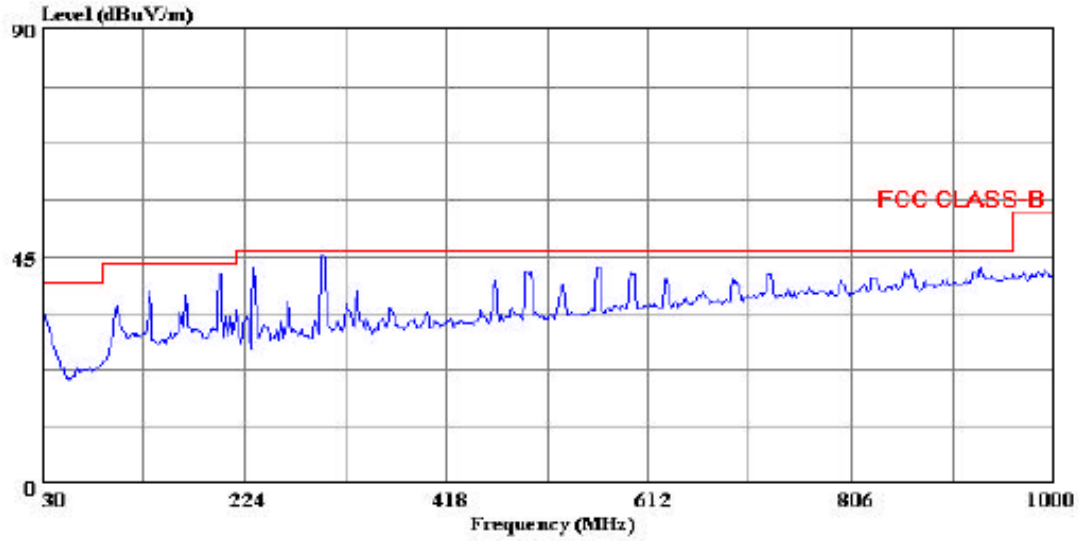
Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Hitesh H. Solanki
Project #: : 04U3115
Company: : Atheros
EUT: : 802.11 a/b/g(with TURBO mode) Video
: Card
Model No: : AV10
Configuration: : EUT / Laptop/extender board
Target of Test: : FCC Class B
Mode of Operation: EUT OFF

SPURIOUS EMISSIONS 30 TO 1000 MHz WITH EUT OFF, VERTICAL

VERTICAL LOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 5 File#: 04u3115.EMI Date: 12-13-2004 Time: 11:09:45



Trace: Ref Trace:

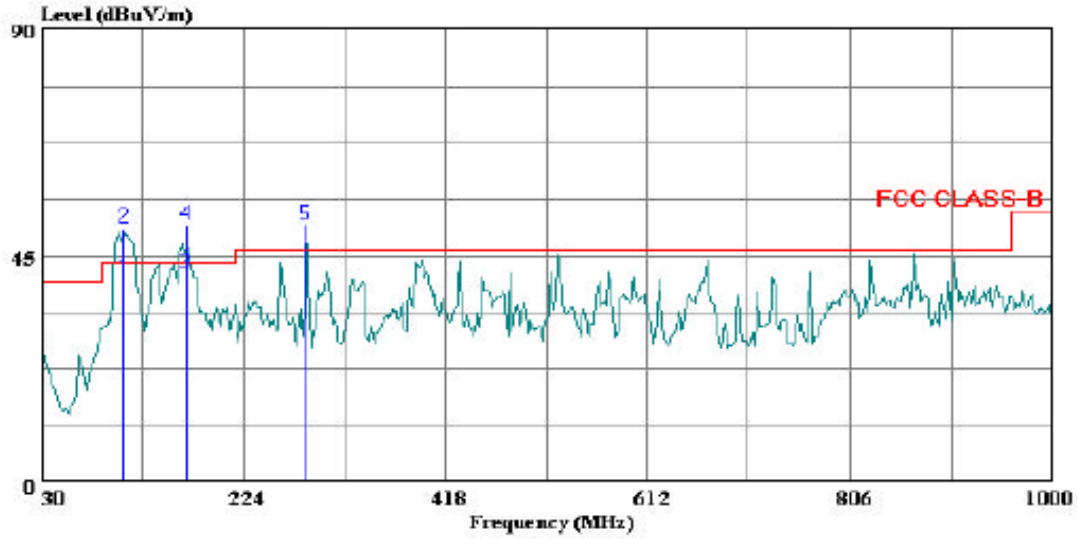
Condition: FCC CLASS-B VERTICAL
Test Operator: : Hitesh H. Solanki
Project #: : 04U3115
Company: : Atheros
EUT: : 802.11 a/b/g(with TURBO mode) Video
: Card
Model No: : AV10
Configuration: : EUT / Laptop/extender board
Target of Test: : FCC Class B
Mode of Operation: EUT OFF

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 19 File#: 04u3115.EMI Date: 12-21-2004 Time: 18:08:42

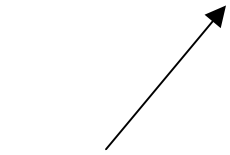


(Audix ATC)
Trace: 10 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Hitesh H. Solanki
Project #: : 04U3115
Company: : Atheros
EUT: : 802.11 a/b/g(with TURBO mode) Video
: Card
Model No: : AV10
Configuration: : EUT / Laptop/extender board
Target of Test: : FCC Class B
Mode of Operation: TX, Worst Case

HORIZONTAL DATA

		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		109.500	54.20	-13.87	40.33	43.50	-3.17	QP
2	*	109.500	64.24	-13.87	50.37	43.50	6.87	Peak
3		168.900	54.68	-13.14	41.54	43.50	-1.96	QP
4	*	168.900	64.18	-13.14	51.04	43.50	7.54	Peak
5	*	284.140	61.84	-10.64	51.20	46.00	5.20	Peak



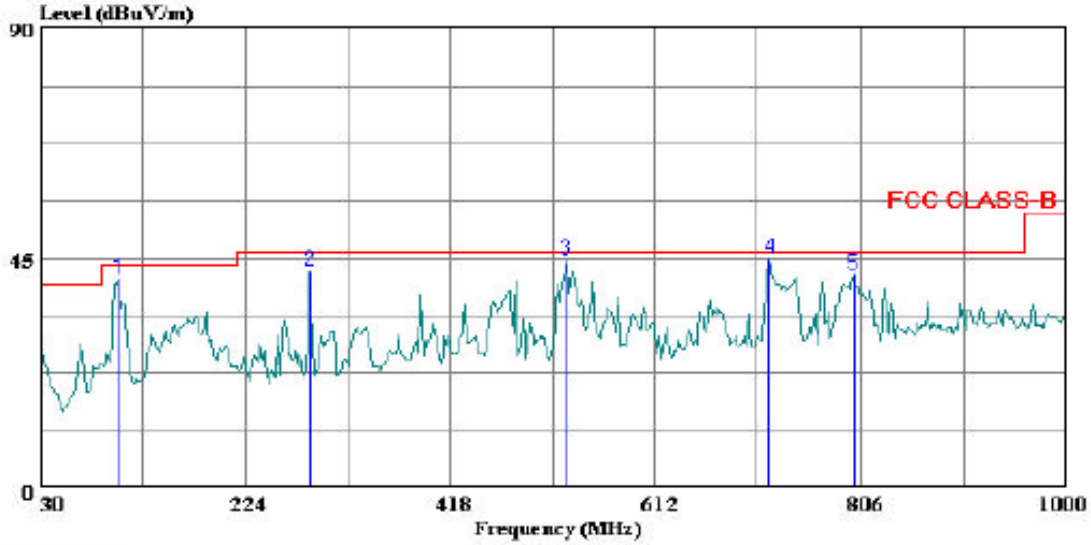
This emission is not generated by the EUT

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 20 File#: 04u3115.EMI Date: 12-21-2004 Time: 18:14:38



(Audix ATC)
Trace: 7 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Hitesh H. Solanki
Project #: : 04U3115
Company: : Atheros
EUT: : 802.11 a/b/g(with TURBO mode) Video
: Card
Model No: : AV10
Configuration: : EUT / Laptop/extender board
Target of Test: : FCC Class B
Mode of Operation: TX, Worst Case

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	104.690	55.59	-14.84	40.75	43.50	-2.75	Peak
2	286.080	53.04	-10.58	42.46	46.00	-3.54	Peak
3	528.580	51.26	-6.58	44.68	46.00	-1.32	Peak
4	720.640	48.28	-3.30	44.98	46.00	-1.02	Peak
5	798.240	44.27	-2.38	41.89	46.00	-4.11	Peak

7.4. POWERLINE CONDUCTED EMISSIONS

LIMIT

§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 of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

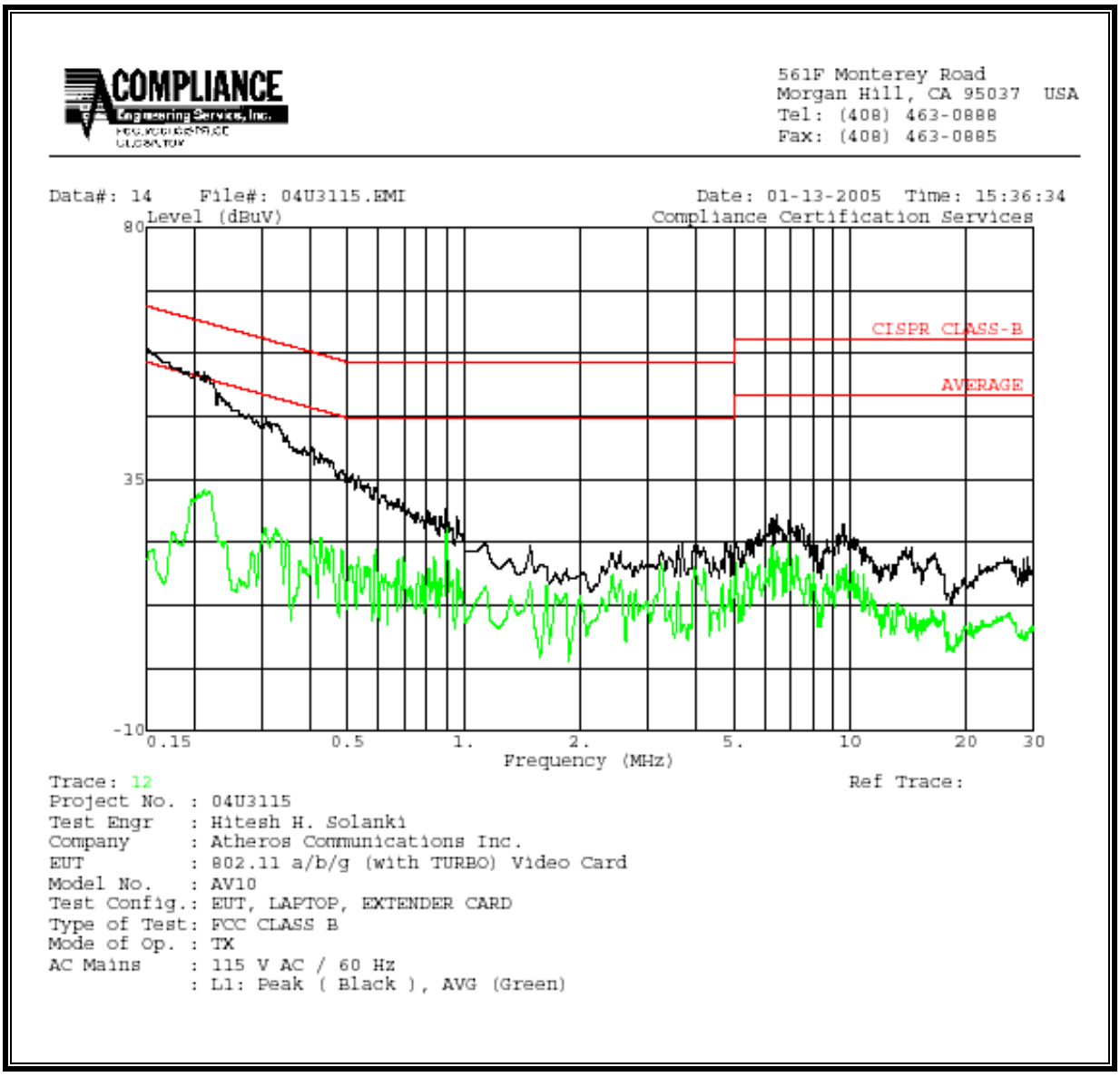
RESULTS

No non-compliance noted:

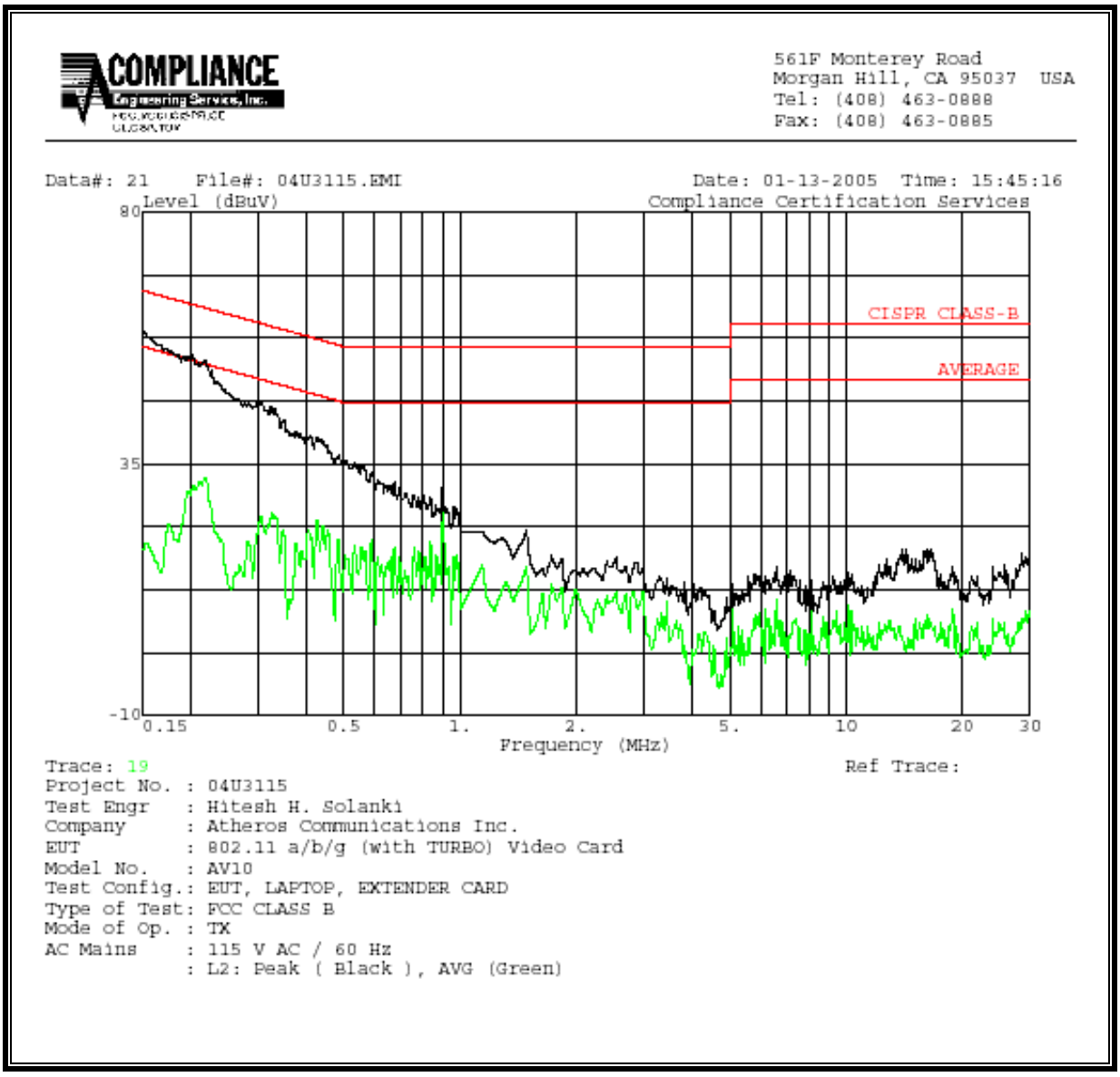
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	58.74	--	20.71	0.00	66.00	56.00	-7.26	-35.29	L1
0.51	34.60	--	19.63	0.00	56.00	46.00	-21.40	-26.37	L1
6.49	28.80	--	22.24	0.00	60.00	50.00	-31.20	-27.76	L1
0.15	58.80	--	19.64	0.00	66.00	56.00	-7.20	-36.36	L2
0.51	35.50	--	18.21	0.00	56.00	46.00	-20.50	-27.79	L2
16.14	19.68	--	5.54	0.00	60.00	50.00	-40.32	-44.46	L2
6 Worst Data									

LINE 1 RESULTS



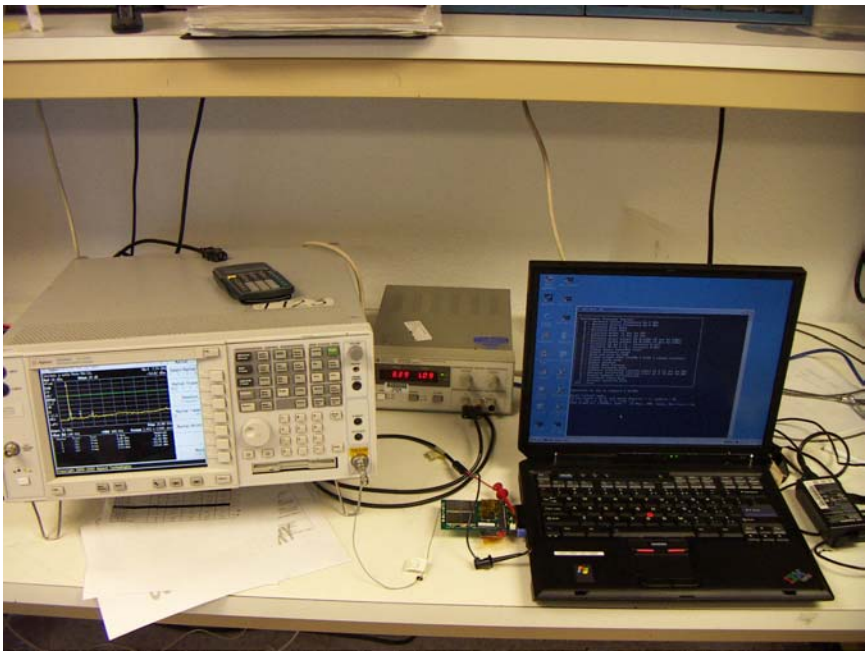
LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT