FCC CFR47 PART 15 SUBPART C CERTIFICATION

TEST REPORT

FOR

802.11a/b/g MINI PCI TYPE 3B CARD

MODEL NUMBER: PA3375U-1MPC

FCC ID: CJ6UPA3375WL

REPORT NUMBER: 04U2843-1

ISSUE DATE: JULY 20, 2004

Prepared for

TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY
2-9, SUEHIRO-CHO
OME, TOKYO 198-8710
JAPAN

Prepared by

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TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

COMPANY NAME: TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY
2-9, SUEHIRO-CHO
OME, TOKYO 198-8710
JAPAN

EUT DESCRIPTION: 802.11a/b/g MINI PCI TYPE 3B CARD

MODEL: PA3375U-1MPC

DATE TESTED: JUNE 11 TO JULY 7, 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: This document reports conditions under which testing was conducted and results of tests performed. 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.

Note: The 2.4 and 5.8 GHz bands are applicable to this report; another band of operation (5.2 GHz) is documented in a separate report.

Approved & Released For CCS By:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

DAVID GARCIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is an 802.11a/b/g transceiver Mini PCI card installed in a Toshiba Tablet host laptop computer, including co-location with the Toshiba PA3232U-1BTM Bluetooth radio card.

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

Frequency Band (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	19.24	83.95
2412 - 2462	802.11g	24.10	257.04
5745 - 5825	802.11a	21.00	125.89

The radio utilizes two identical film antennas for diversity (main and auxiliary). Three antenna models are available: Hitachi model HTL017, Hitachi model HTL008 and Tyco model TIAN01.

The HTL017 has the highest gain in the 2.4 GHz band and the TIAN01 has the highest gain in the 5.8 GHz band. The HTL008 has lower gain, in both bands, than either of the other two antennas.

Final compliance tests were performed with two host computers; one system was equipped with HTL017 antennas and the other system was equipped with TIAN01 antennas.

The Bluetooth radio card has a modular approval, FCC ID: CJ6UPA3232BT. The Bluetooth radio utilizes a film antenna with a maximum gain of 1.22 dBi.

TIAN01 ANTENNA
This antenna model has a maximum assembly gain of 2.0 dBi in the 2.4 GHz band and –1.9 dBi in the 5.8 GHz band.

HTL-017 ANTENNA
This antenna model has a maximum assembly gain of 2.2 dBi in the 2.4 GHz band and 1.0 dBi in the 5.8 GHz band.

The host computer can be configured as a laptop-style notebook computer or as a tablet-style notebook computer. The display section is rotated and inverted to change between these configurations.

In the laptop configuration, the system is a mobile transmitter. In the tablet configuration, the system is a hand-held portable transmitter.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2001, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. 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.

No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

5. CALIBRATION AND UNCERTAINTY

5.1. 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.

5.2. 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%.

5.3. 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 Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/21/2004
RF Filter Section	HP	85420E	3705A00256	11/21/04
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	12/22/04
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/05
Spectrum Analyzer	Agilent	E4446A	MY43360112	1/13/05
Preamplifier, 1 ~ 26 GHz	Miteq	NSP10023988	646456	4/25/05
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/04
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	10/13/04
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/13/04
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/04
AC Power Source, 10KVA	ACS	AFC-10K-AFC-2	J1568	CNR
10dB Pad	Weinschel	56-10	M251	CNR
PreAmplifier 26-40 GHz	Miteq	NSP4000-SP2	924343	6/1/05
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	12/3/04
Antenna, Horn, 18 ~ 26 GHz	ARA	MWH-1826/B	1013	2/4/05
Hi Pass Filter_4GHz	Micro_Tronic	HPM13351	4	N/A
Hi Pass Filter_7.6GHz	Micro_Tronic	HPM13195	1	N/A

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

Description	Manufacturer	Model	Serial Number	FCC ID
LAPTOP	TOSHIBA	PPM20U-AAA8	Z3044588JU	DOC
LAPTOP	TOSHIBA	PPM20U-AAA8	Z3044587JU	DOC
AC ADAPTER	TOSHIBA	PA3282U-1ACA	O148662	DOC
AC ADAPTER	TOSHIBA	PA3282U-1ACA	O654860	DOC

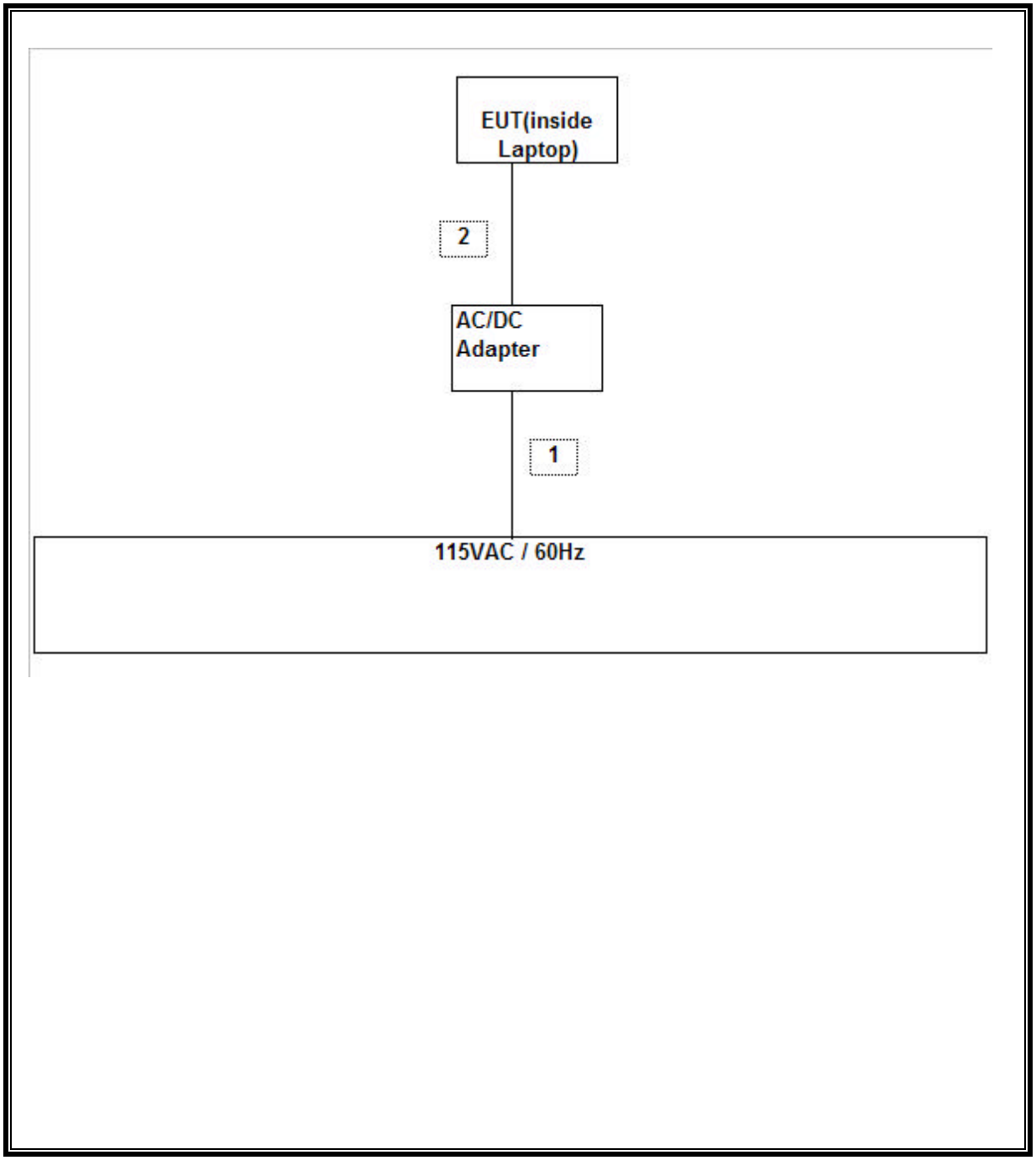
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	1m	No
2	DC	1	DC	Un-shielded	2m	No

TEST SETUP

The EUT is installed in a host laptop computer. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 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 100 kHz. The sweep time is coupled.

2.4 GHz BAND RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	9580	500	9080
Middle	2437	8170	500	7670
High	2462	8580	500	8080

802.11g Mode

Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16080	500	15580
Middle	2437	16250	500	15750
High	2462	15170	500	14670

5.8 GHz BAND RESULTS

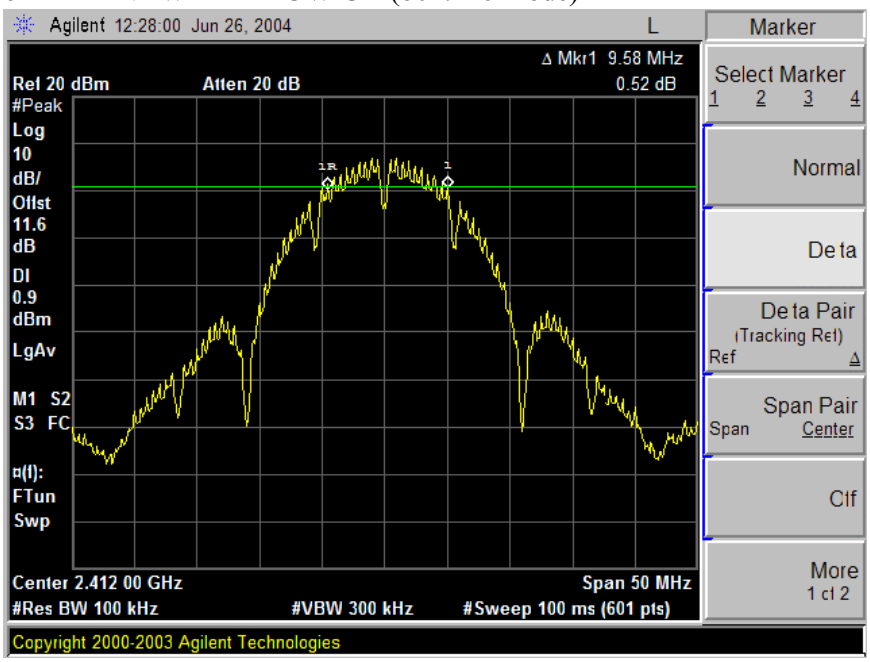
No non-compliance noted:

802.11a Mode

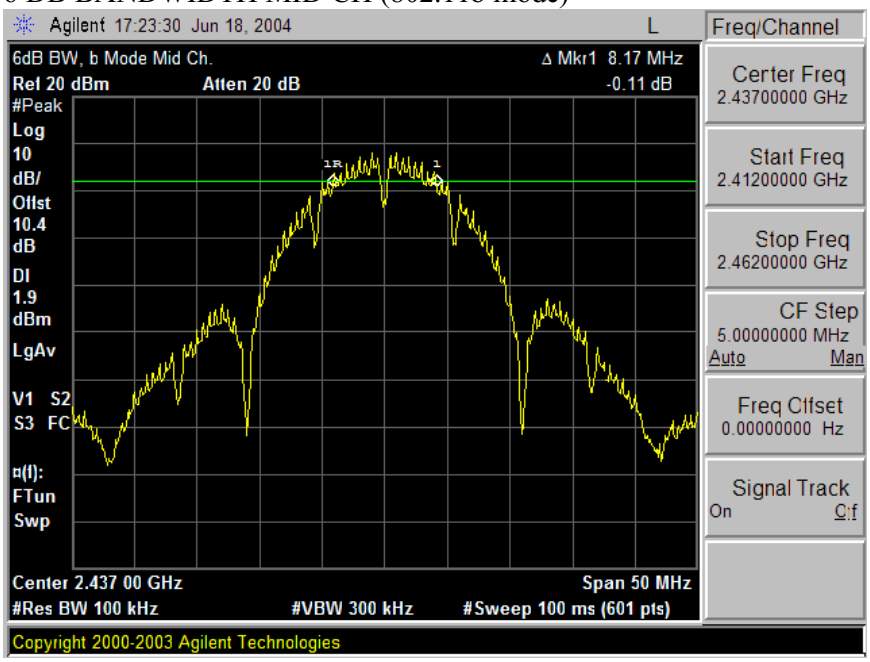
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	5745	15580	500	15080
Middle	5785	15750	500	15250
High	5825	15750	500	15250

6 DB BANDWIDTH (802.11b MODE)

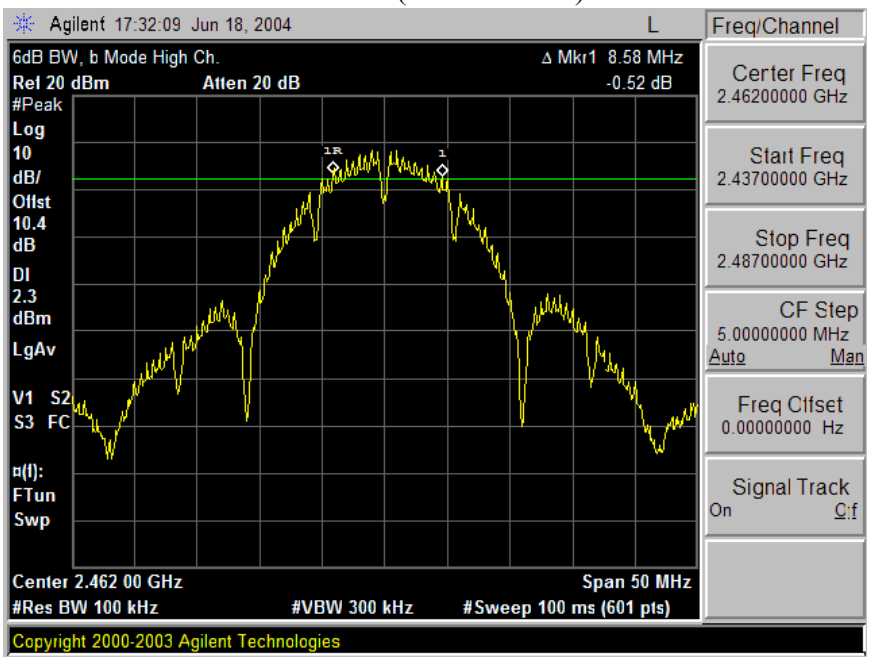
6 DB BANDWIDTH LOW CH (802.11b mode)



6 DB BANDWIDTH MID CH (802.11b mode)

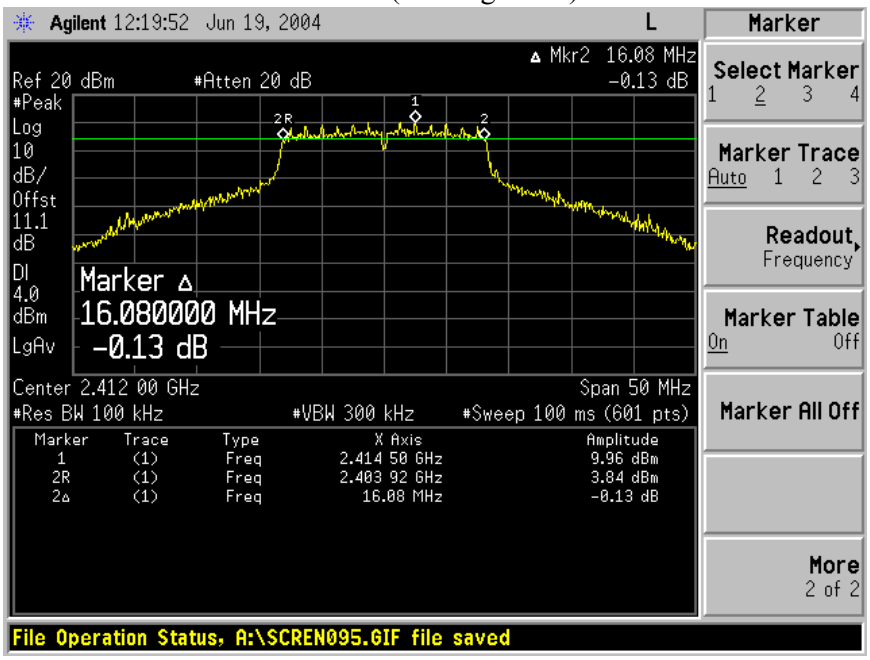


6 DB BANDWIDTH HIGH CH (802.11b mode)

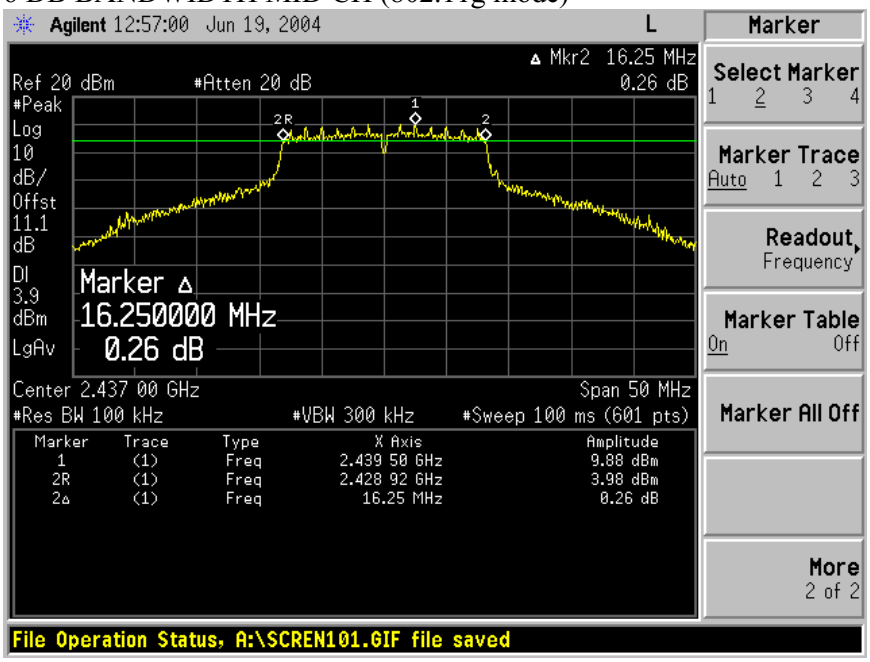


6 DB BANDWIDTH (802.11g MODE)

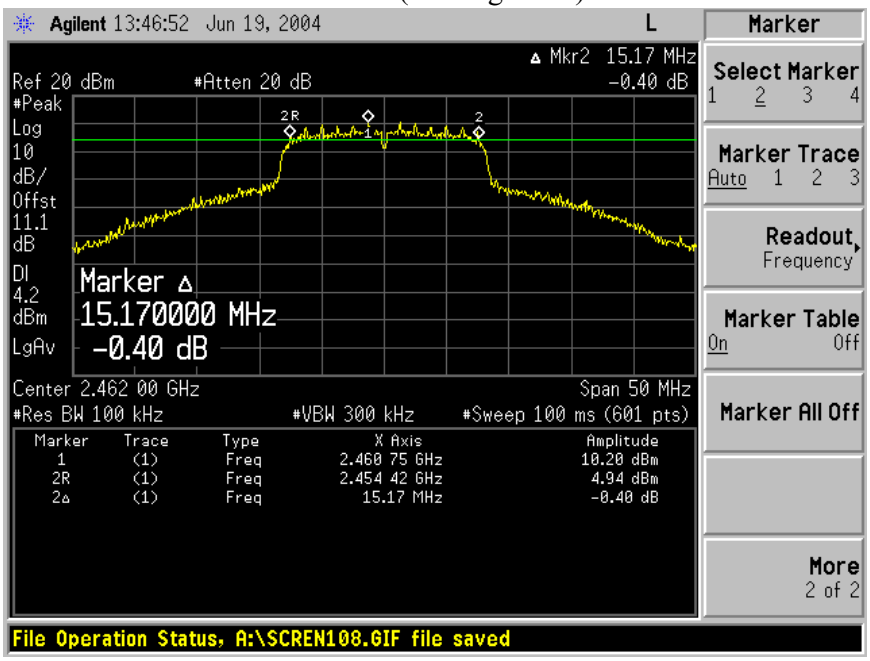
6 DB BANDWIDTH LOW CH (802.11g mode)



6 DB BANDWIDTH MID CH (802.11g mode)

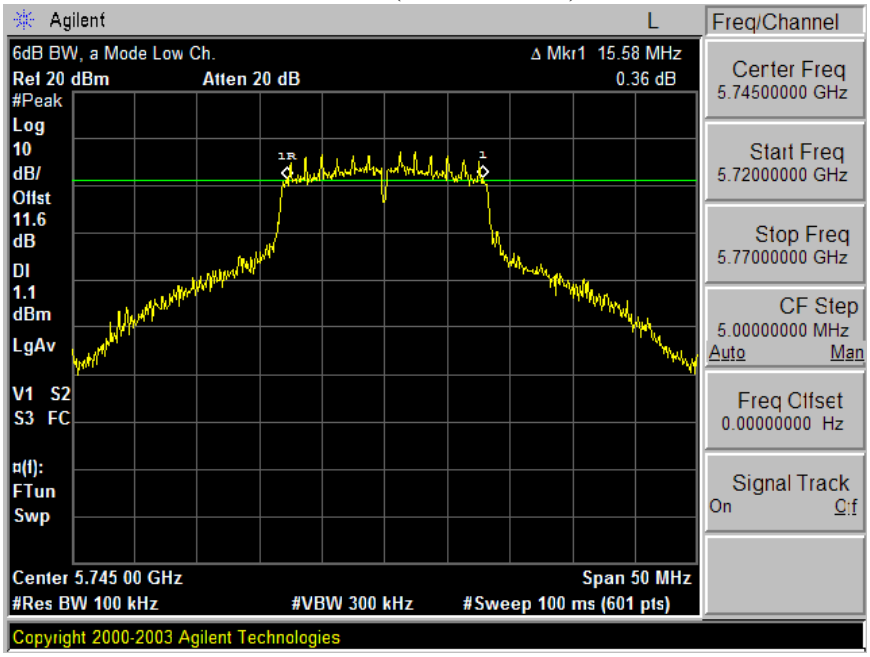


6 DB BANDWIDTH HIGH CH (802.11g mode)

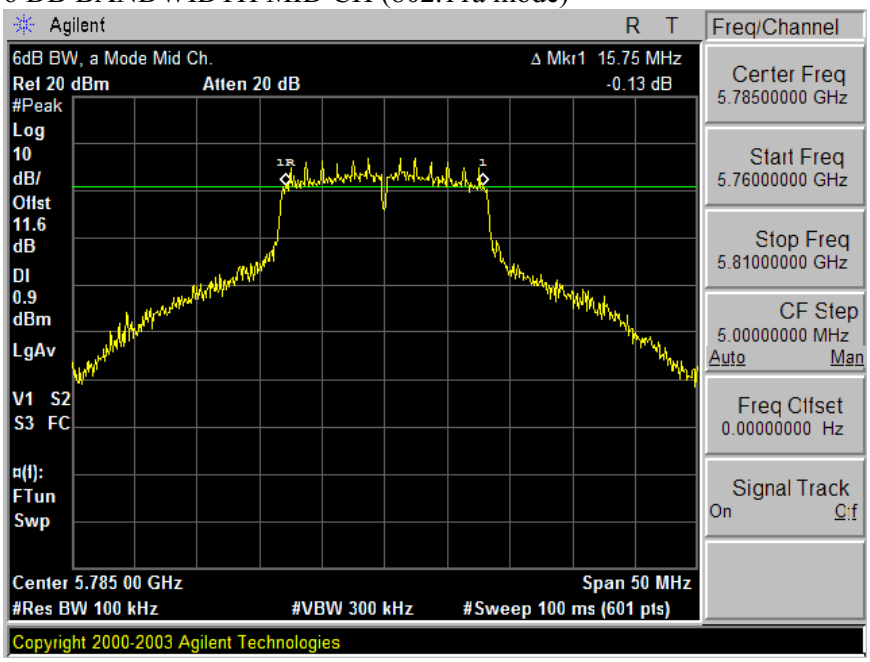


6 DB BANDWIDTH (802.11a MODE)

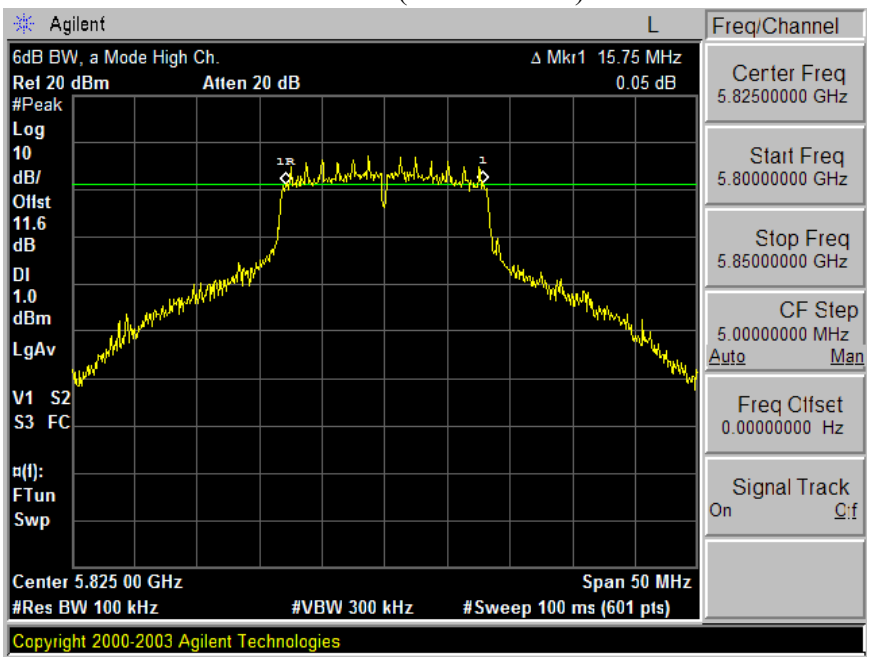
6 DB BANDWIDTH LOW CH (802.11a mode)



6 DB BANDWIDTH MID CH (802.11a mode)



6 DB BANDWIDTH HIGH CH (802.11a mode)



7.2. 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.

2.4 GHz BAND RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	14.9257
Middle	2437	14.7842
High	2462	14.7074

802.11g Mode

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.5049
Middle	2437	16.6365
High	2462	16.2288

5.8 GHz BAND RESULTS

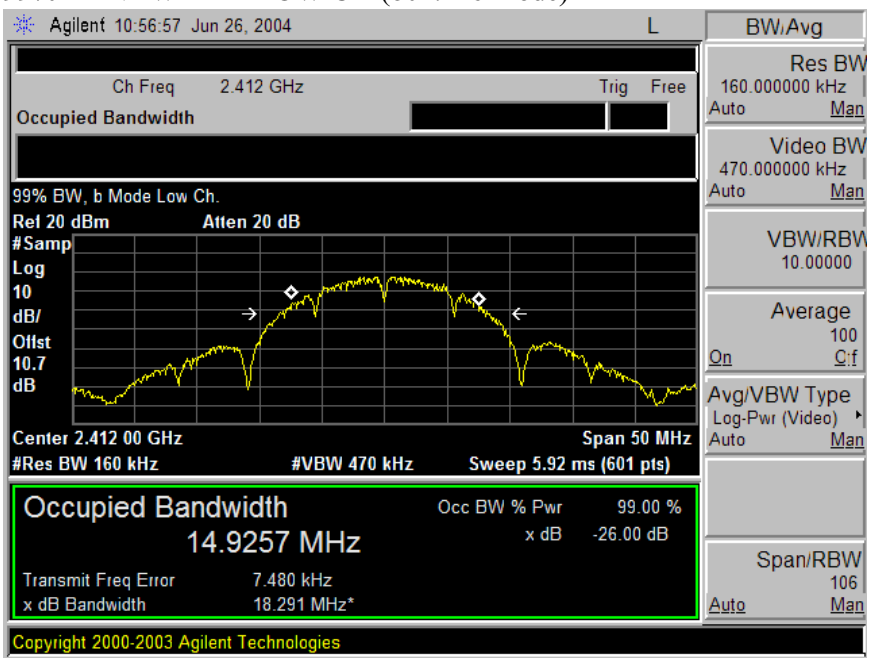
No non-compliance noted:

802.11a Mode

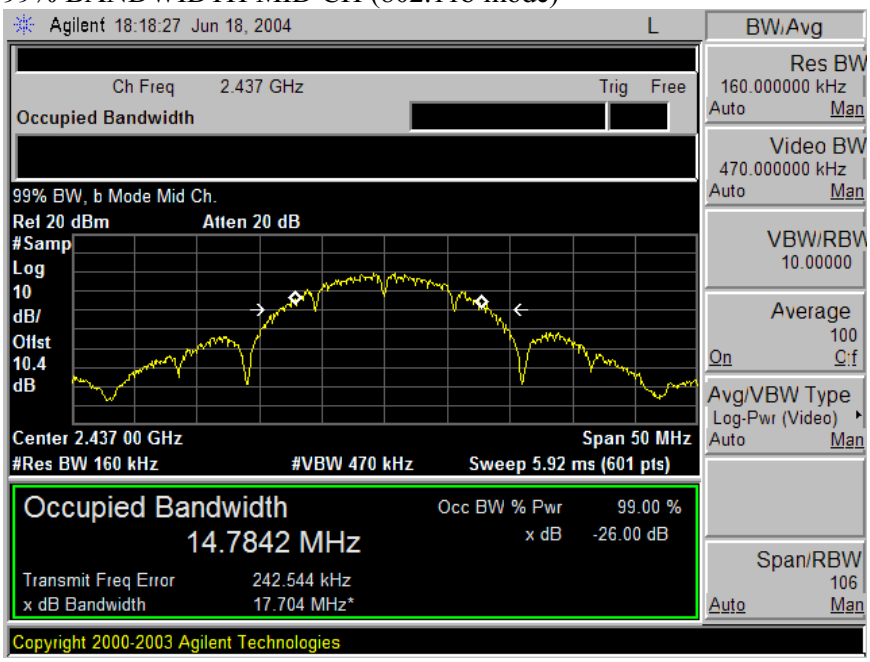
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.525
Middle	5785	16.5651
High	5825	16.4861

99% BANDWIDTH (802.11b MODE)

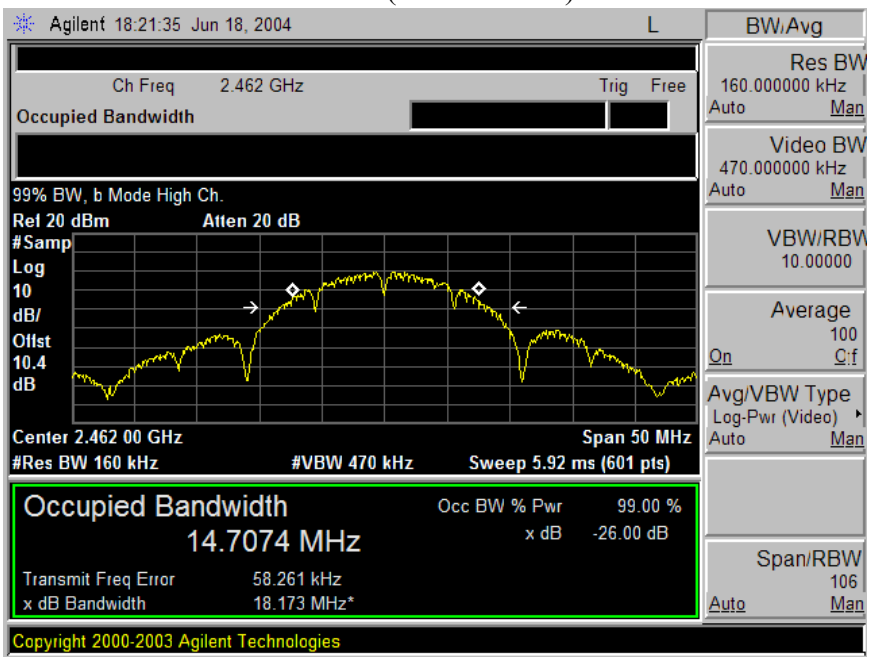
99% BANDWIDTH LOW CH (802.11b mode)



99% BANDWIDTH MID CH (802.11b mode)

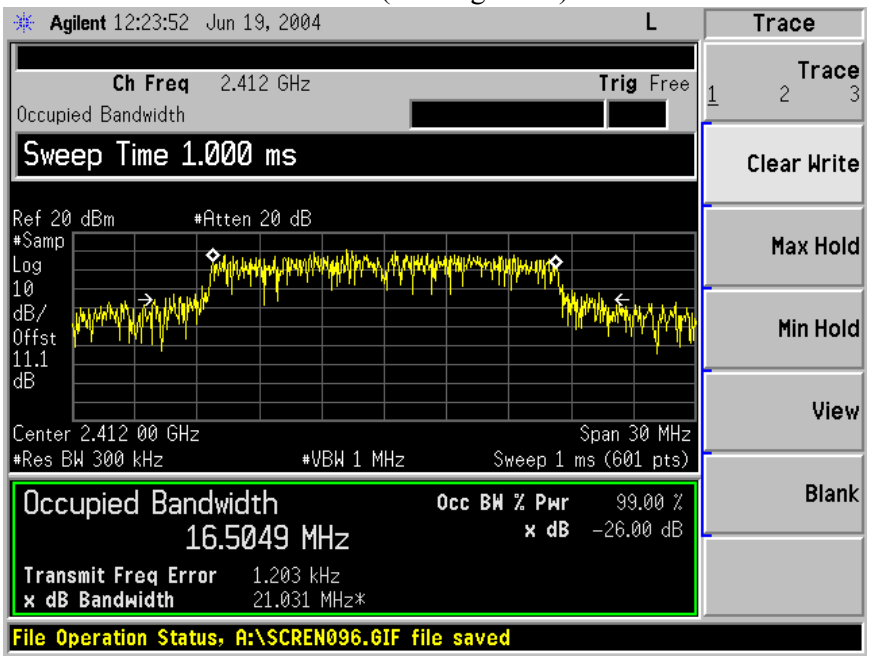


99% BANDWIDTH HIGH CH (802.11b mode)

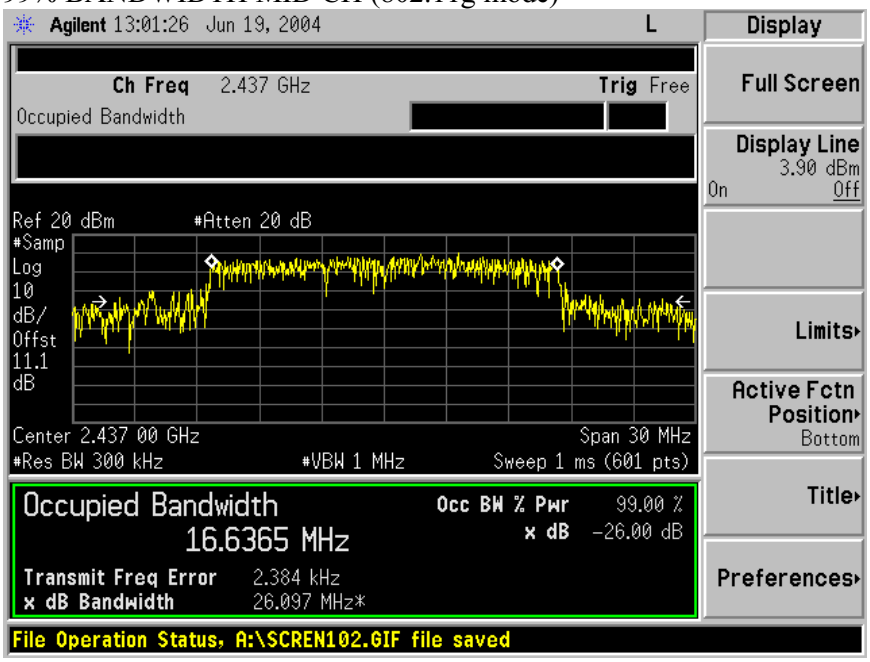


99% BANDWIDTH (802.11g MODE)

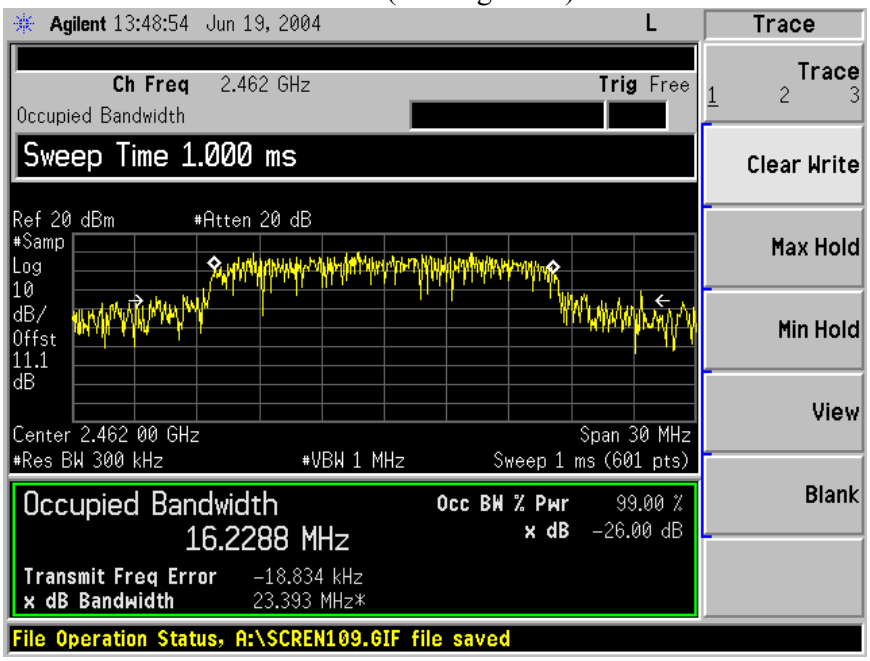
99% BANDWIDTH LOW CH (802.11g mode)



99% BANDWIDTH MID CH (802.11g mode)

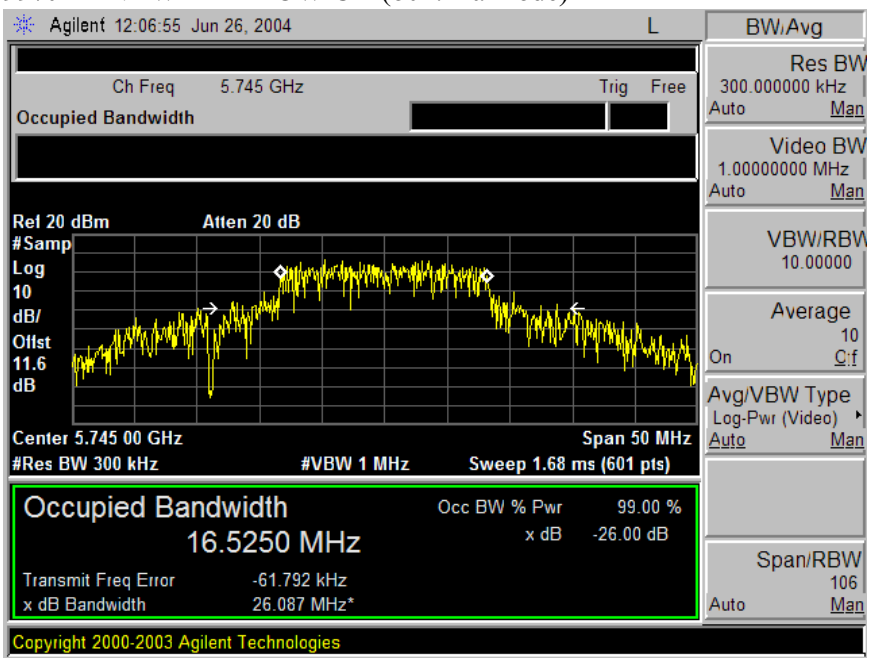


99% BANDWIDTH HIGH CH (802.11g mode)

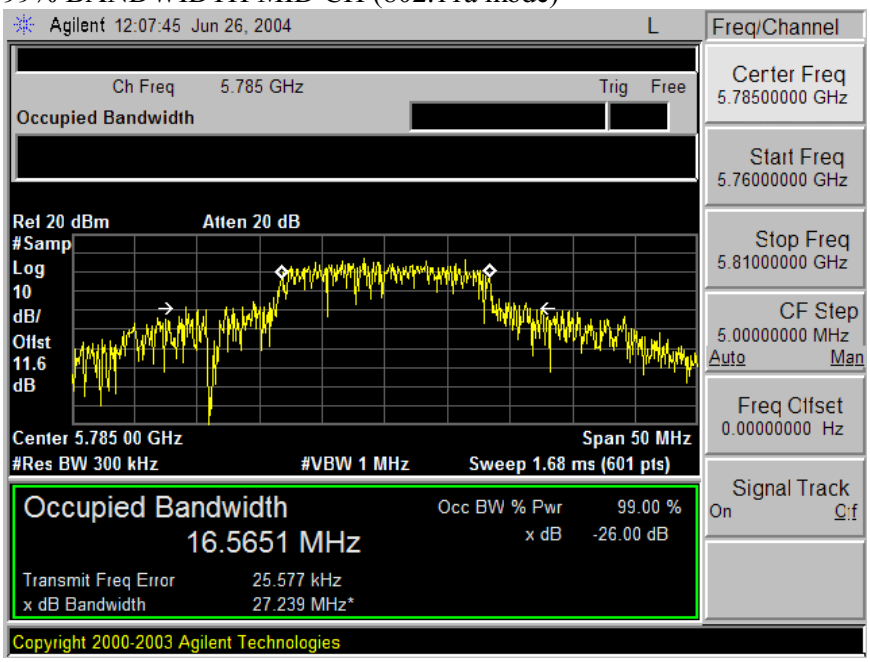


99% BANDWIDTH (802.11a MODE)

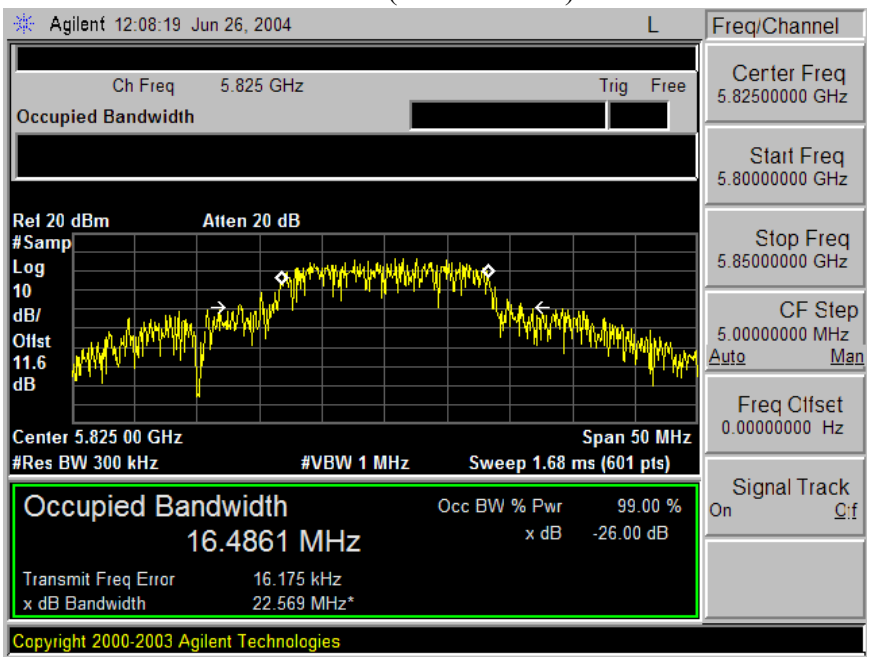
99% BANDWIDTH LOW CH (802.11a mode)



99% BANDWIDTH MID CH (802.11a mode)



99% BANDWIDTH HIGH CH (802.11a mode)



7.3. 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)(3) (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.

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.

2.4 GHZ BAND RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	17.24	30	-12.76
Middle	2437	18.91	30	-11.09
High	2462	19.24	30	-10.76

802.11g Mode

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	24.10	30	-5.90
Middle	2437	24.06	30	-5.94
High	2462	23.97	30	-6.03

5.8 GHZ BAND RESULTS

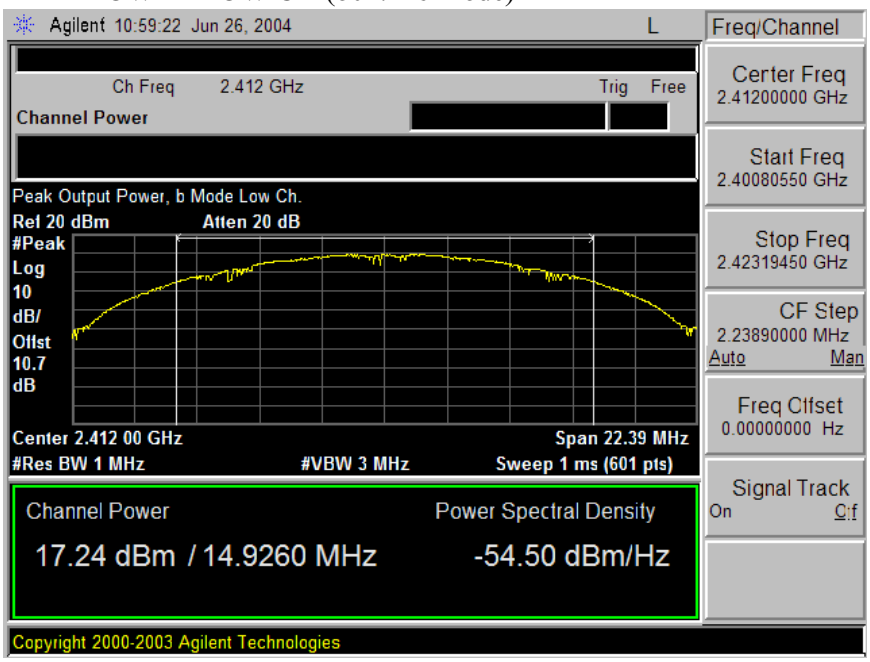
No non-compliance noted:

802.11a Mode

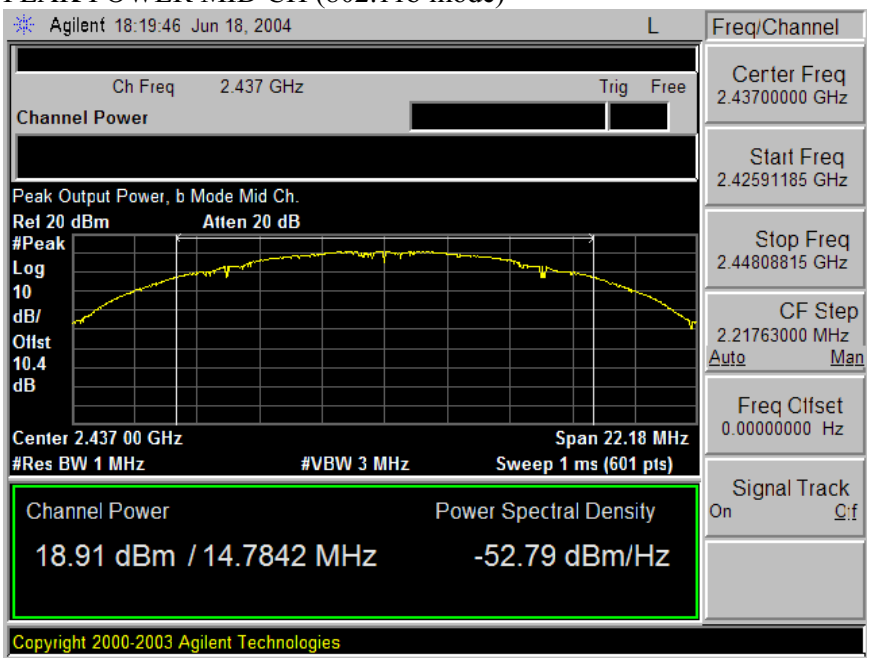
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	21.00	30	-9.00
Middle	5785	20.59	30	-9.41
High	5825	20.65	30	-9.35

OUTPUT POWER (802.11b MODE)

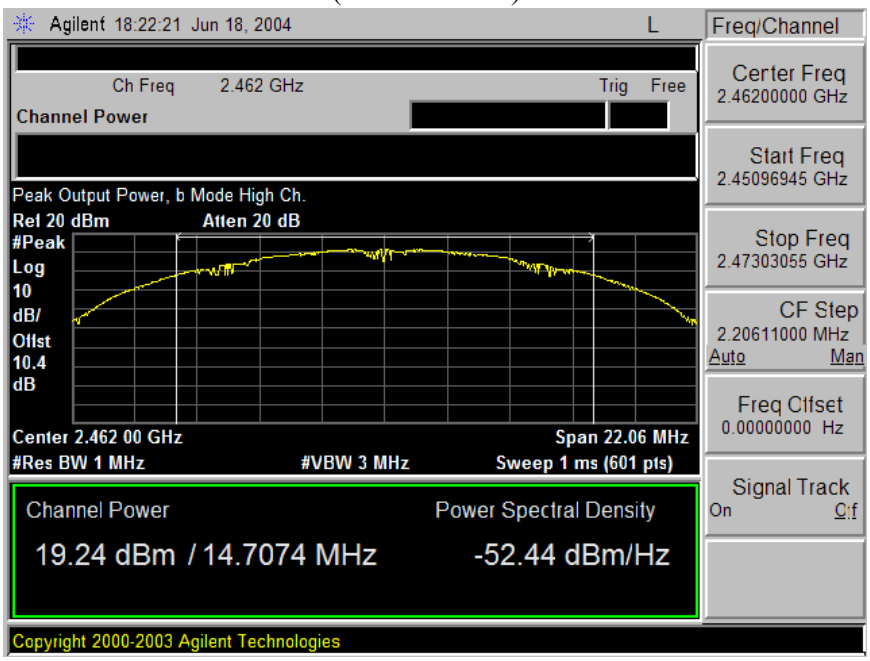
PEAK POWER LOW CH (802.11b mode)



PEAK POWER MID CH (802.11b mode)

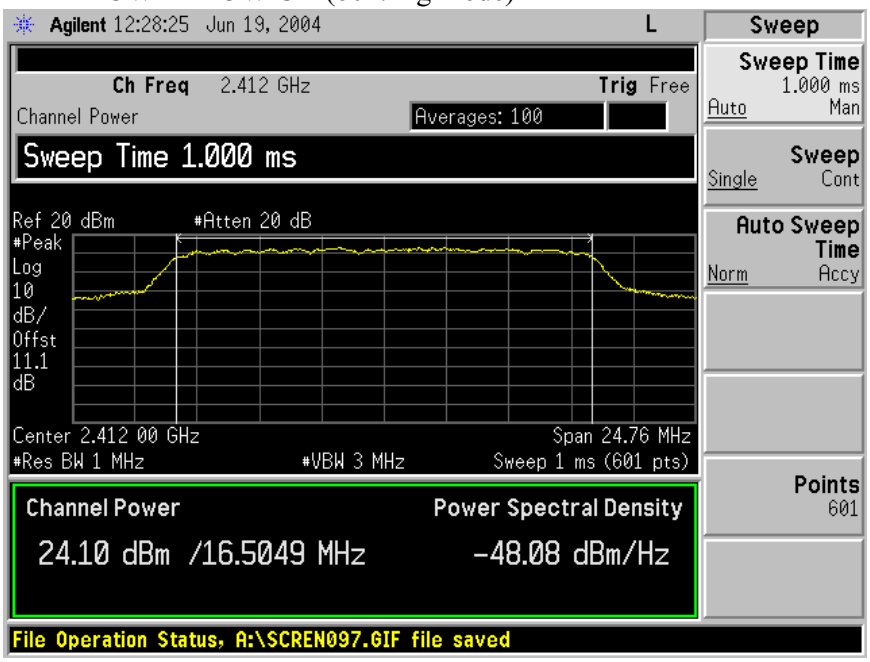


PEAK POWER HIGH CH (802.11b mode)

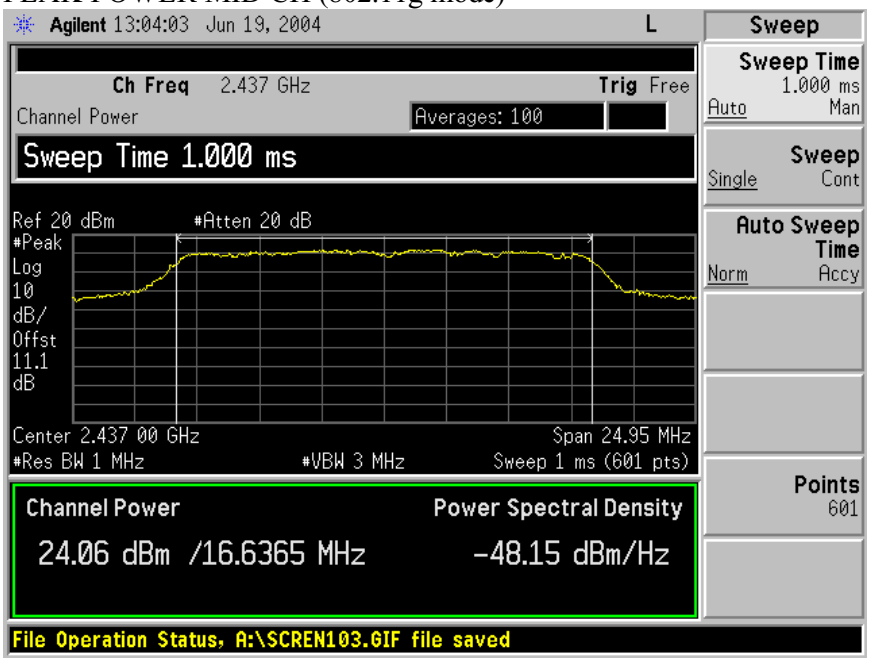


OUTPUT POWER (802.11g MODE)

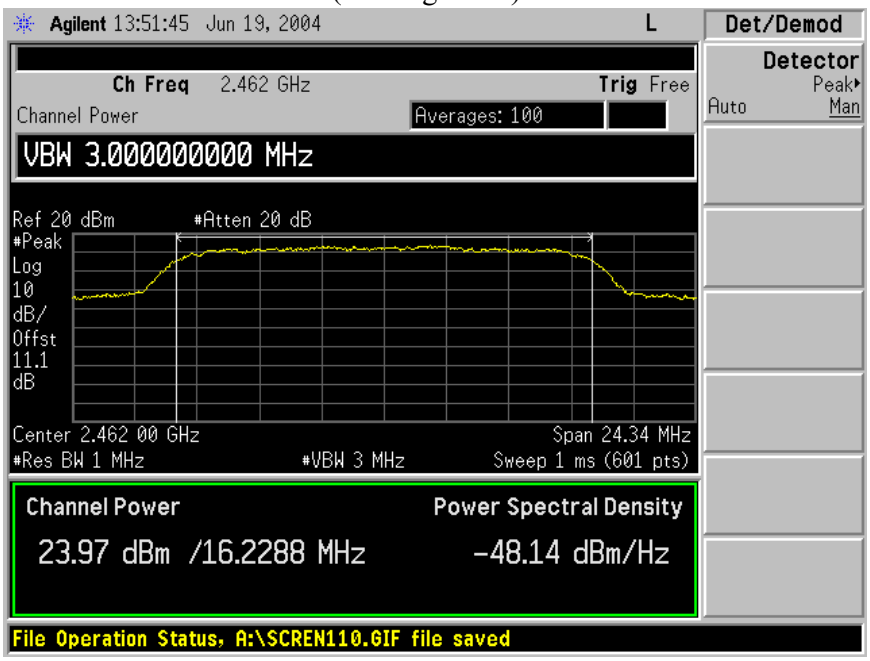
PEAK POWER LOW CH (802.11g mode)



PEAK POWER MID CH (802.11g mode)

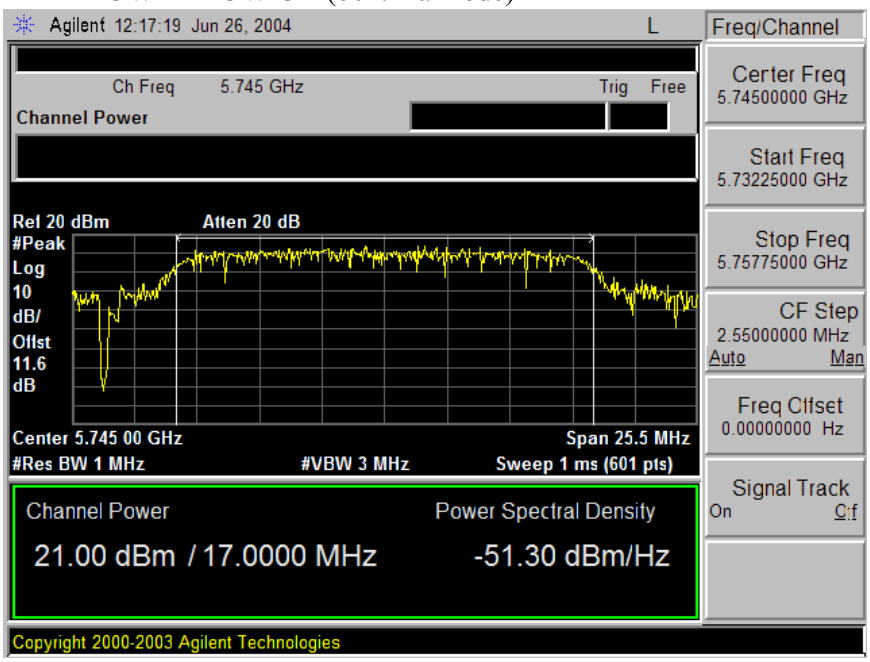


PEAK POWER HIGH CH (802.11g mode)

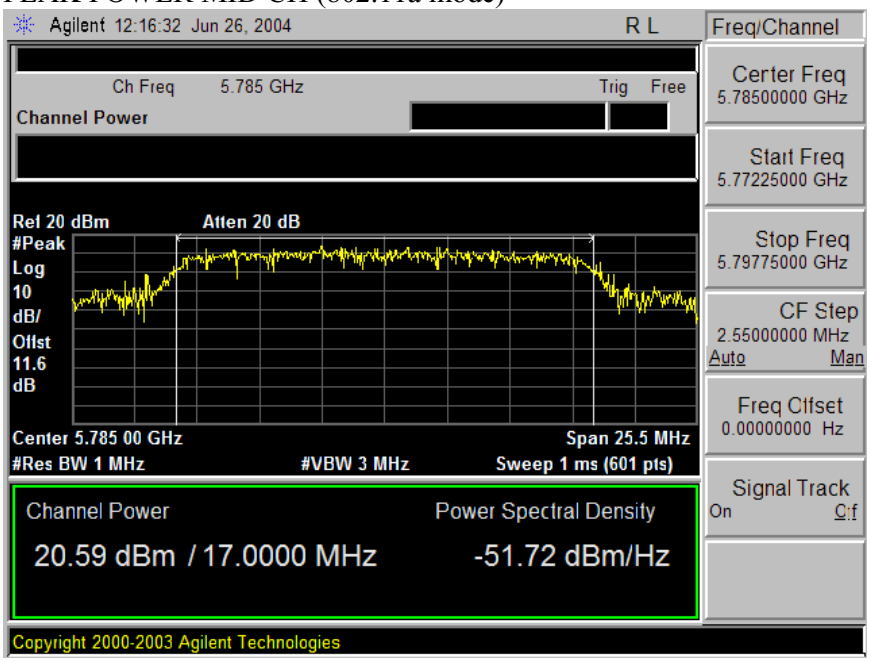


OUTPUT POWER (802.11a MODE)

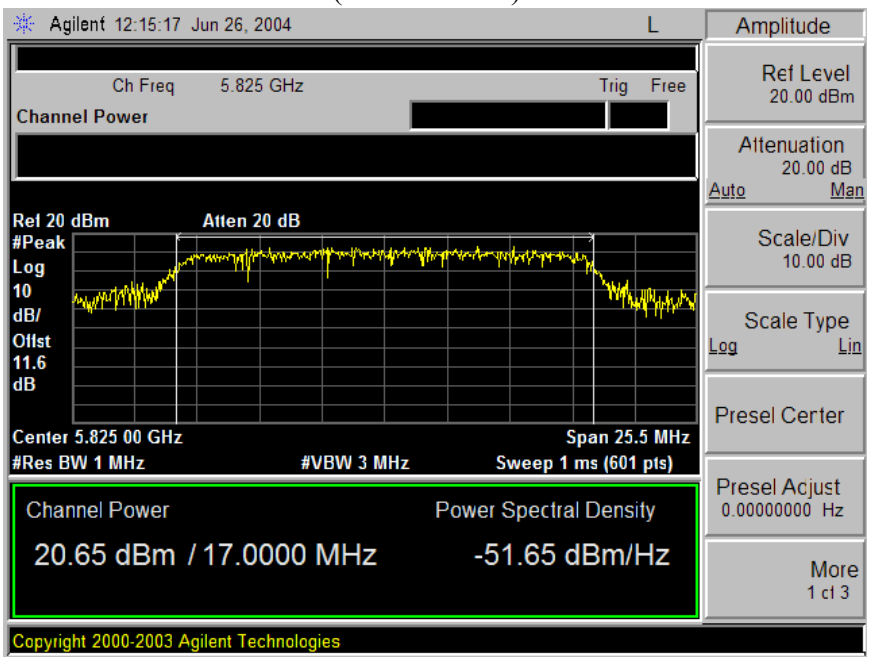
PEAK POWER LOW CH (802.11a mode)



PEAK POWER MID CH (802.11a mode)



PEAK POWER HIGH CH (802.11a mode)



7.4. MAXIMUM PERMISSIBLE EXPOSURE, MOBILE CONFIGURATION

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

$S = E ^ 2 / 3770$

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

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

2.4 GHz BAND 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	19.24	2.20	3.33
802.11g	1.0	24.10	2.20	5.82

5.8 GHz BAND RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11a	1.0	21.00	1.00	3.55

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.

7.5. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

2.4 GHZ BAND RESULTS

No non-compliance noted:

The cable assembly insertion loss of 10.7 dB (including 10 dB pad and 0.7 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	15.40
Middle	2437	17.30
High	2462	17.10

802.11g Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	2412	15.50
Middle	2437	15.50
High	2462	15.30

5.8 GHZ BAND RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.6 dB (including 10 dB pad and 1.6 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	5745	17.20
Middle	5785	17.10
High	5825	17.10

7.6. 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.

2.4 GHz BAND RESULTS

No non-compliance noted:

802.11b Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.54	8	-17.54
Middle	2437	-6.93	8	-14.93
High	2462	-8.56	8	-16.56

802.11g Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-4.93	8	-12.93
Middle	2437	-5.25	8	-13.25
High	2462	-4.80	8	-12.80

5.8 GHz BAND RESULTS

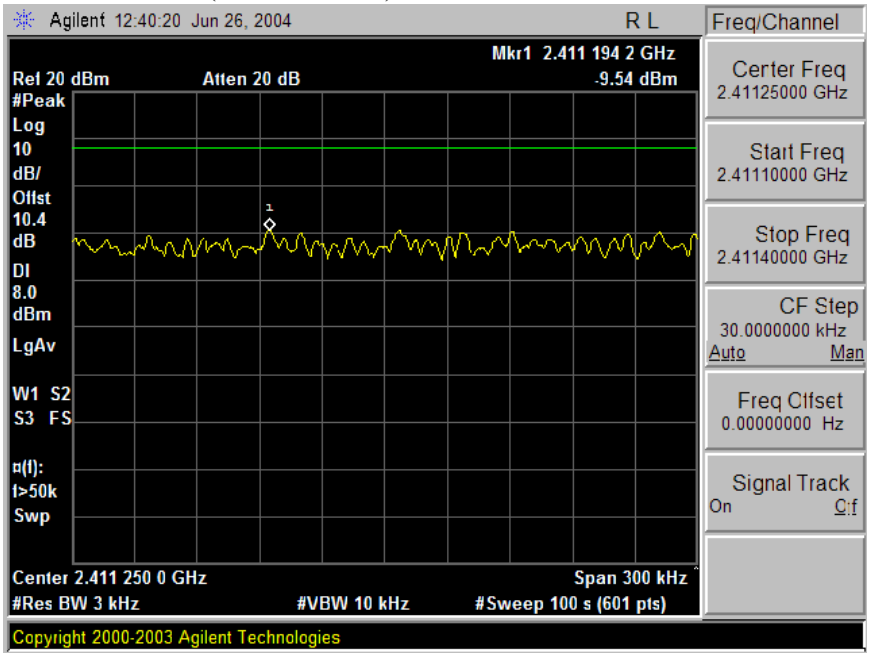
No non-compliance noted:

802.11a Mode

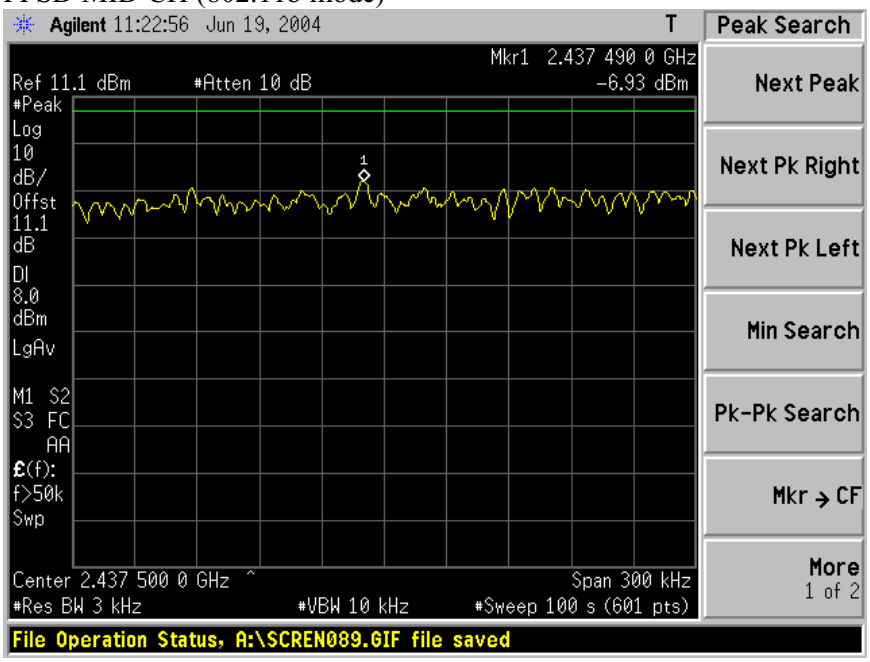
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-8.02	8	-16.02
Middle	5785	-7.73	8	-15.73
High	5825	-6.43	8	-14.43

PEAK POWER SPECTRAL DENSITY (802.11b MODE)

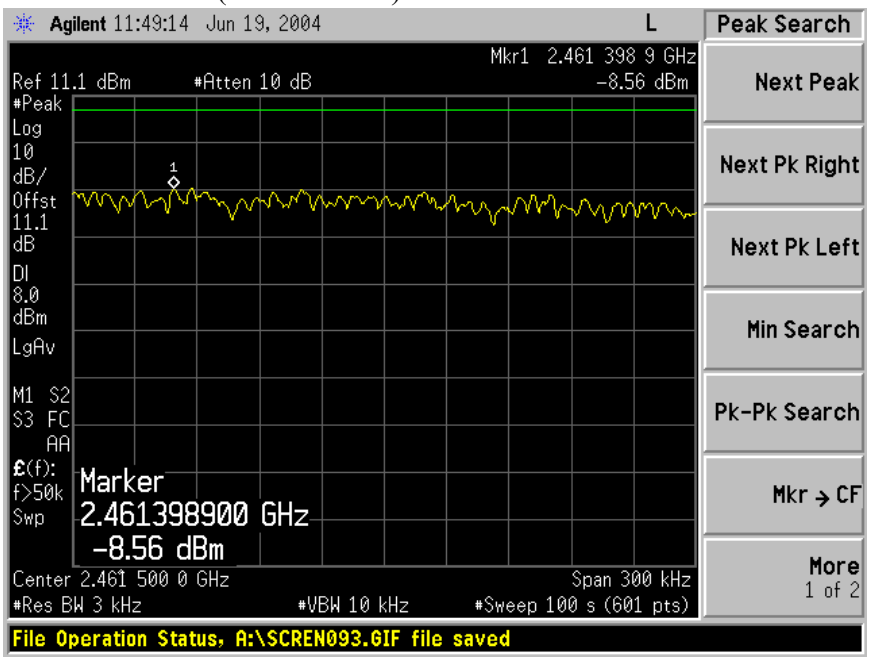
PPSD LOW CH (802.11b mode)



PPSD MID CH (802.11b mode)

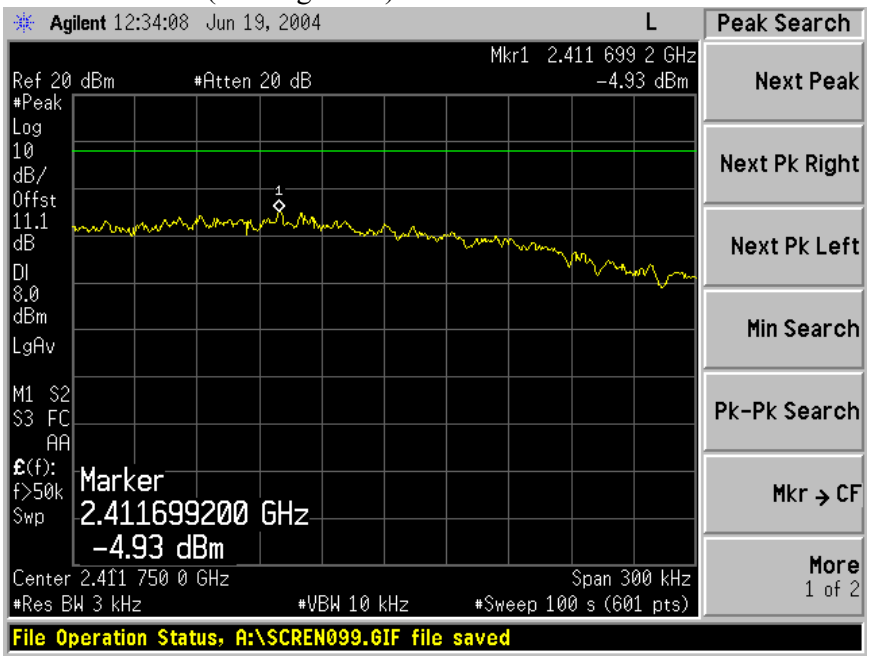


PPSD HIGH CH (802.11b mode)

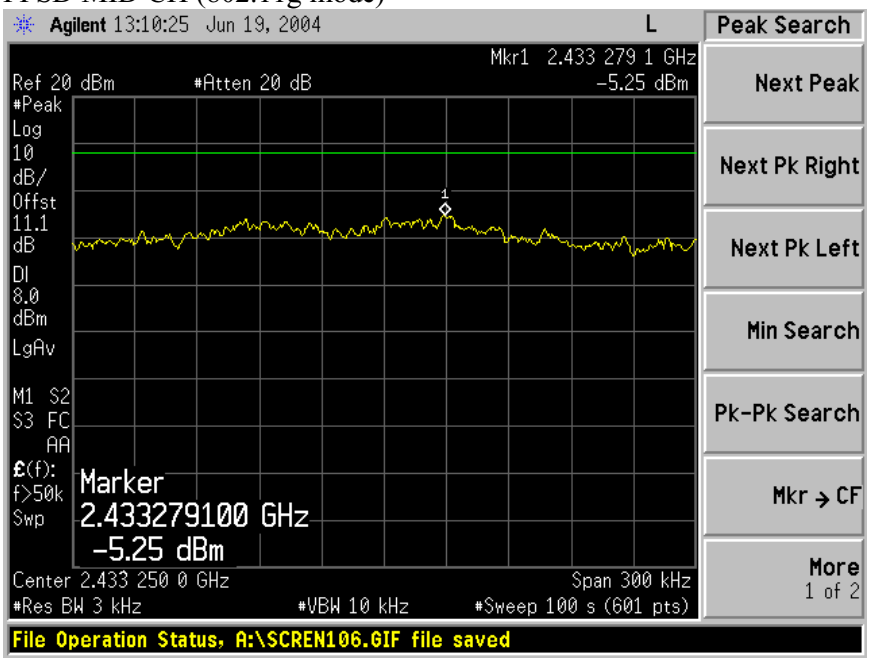


PEAK POWER SPECTRAL DENSITY (802.11g MODE)

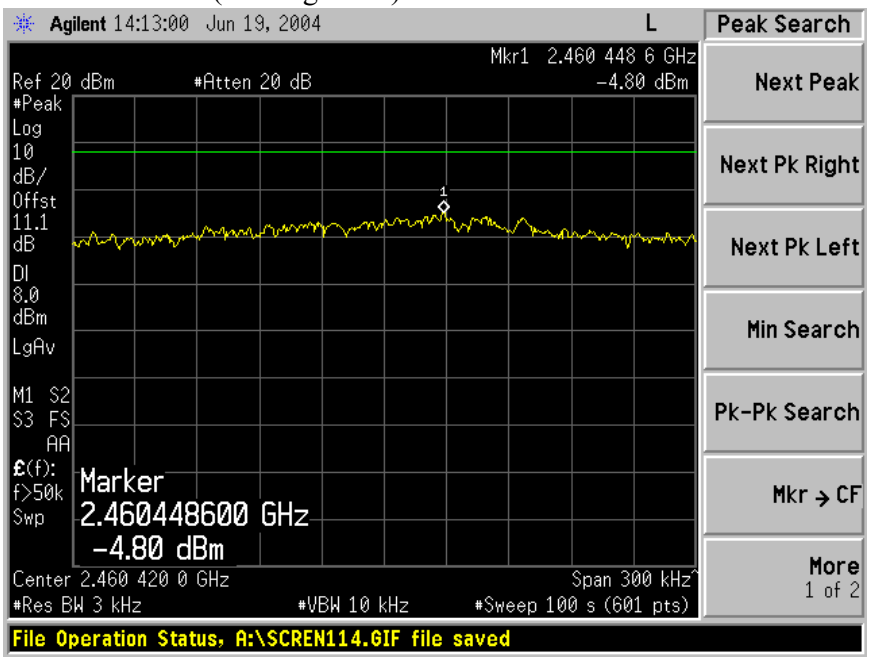
PPSD LOW CH (802.11g mode)



PPSD MID CH (802.11g mode)

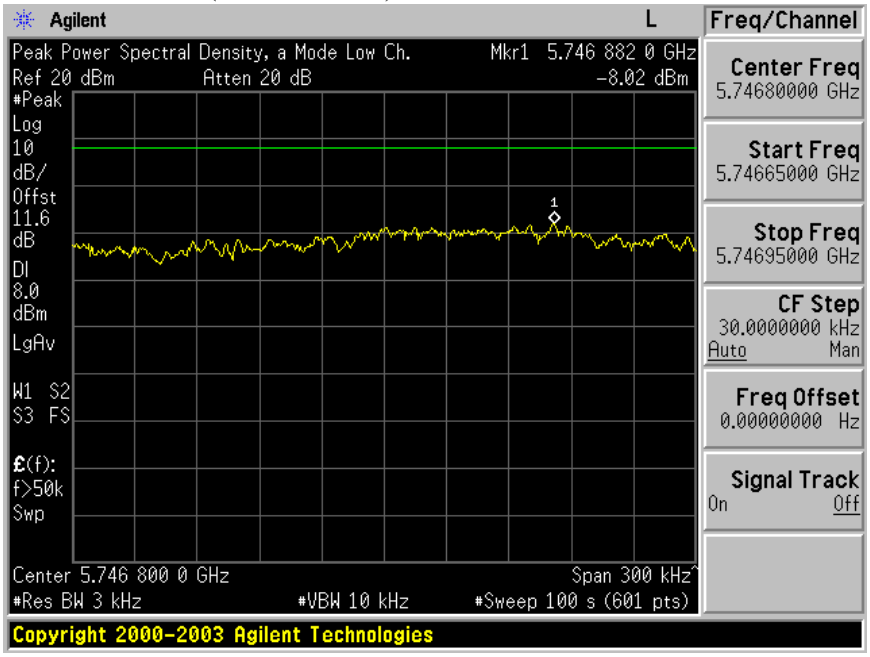


PPSD HIGH CH (802.11g mode)

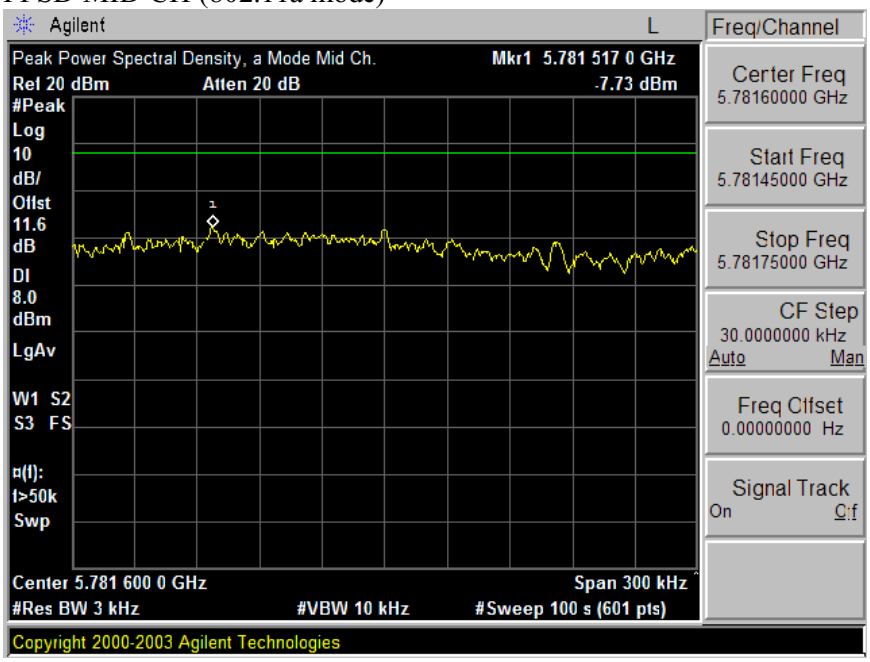


PEAK POWER SPECTRAL DENSITY (802.11a MODE)

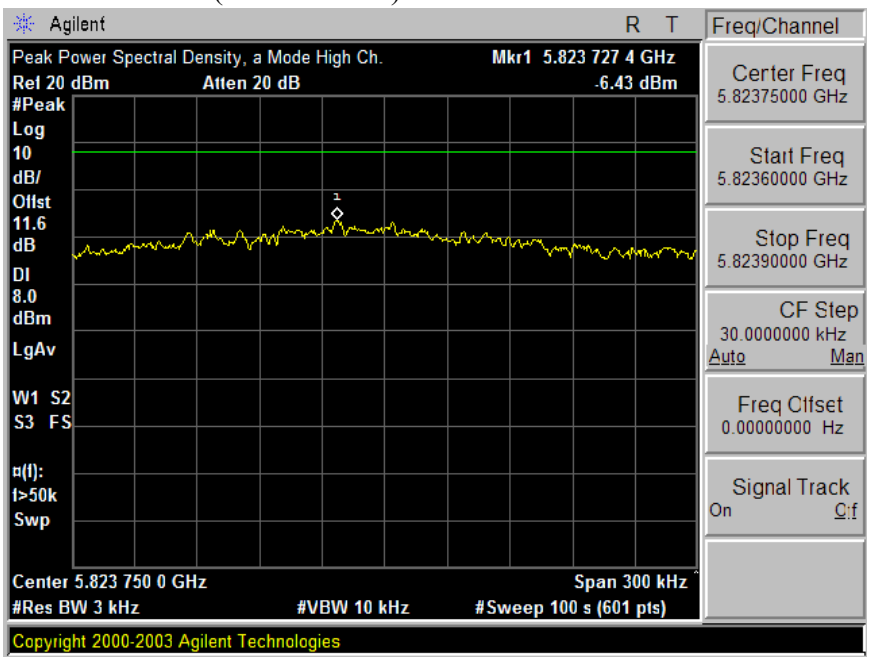
PPSD LOW CH (802.11a mode)



PPSD MID CH (802.11a mode)



PPSD HIGH CH (802.11a mode)



7.7. 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 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 the 5.8 GHz band.

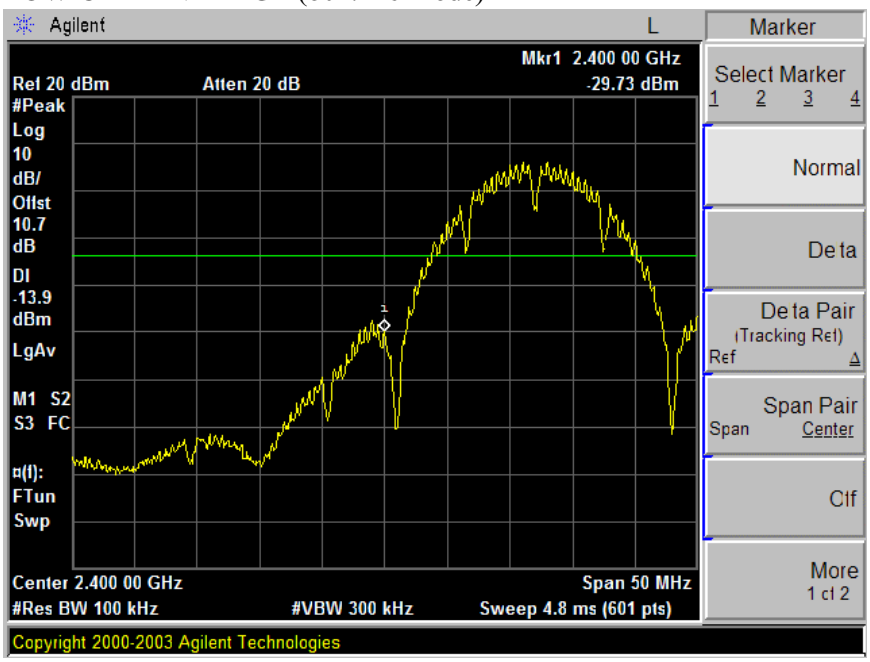
RESULTS

The maximum antenna gain without cable loss is used to evaluate the conducted spurious performance. The actual antenna assembly gain (with integral cable) is always less.

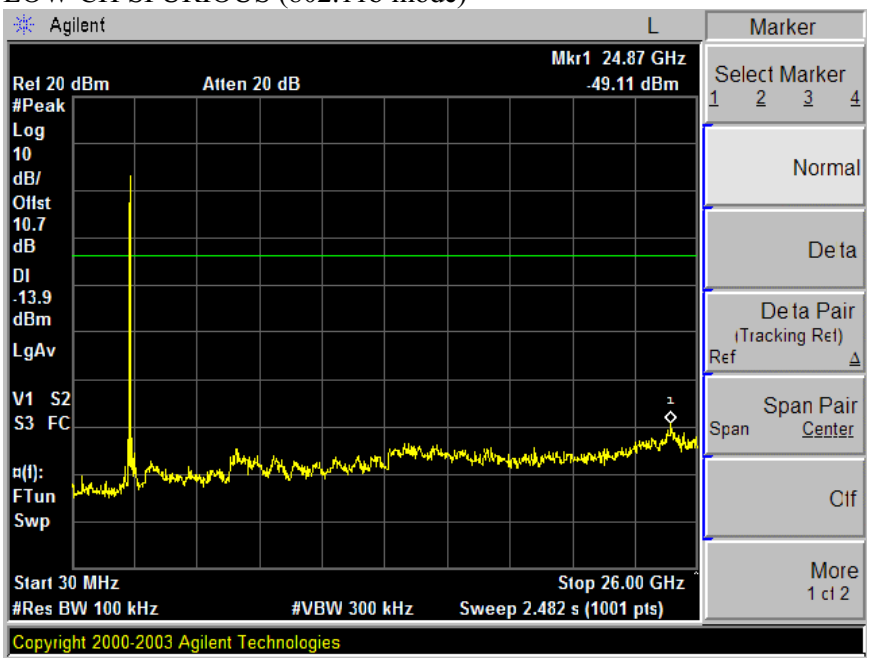
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)

LOW CH BANDEDGE (802.11b mode)

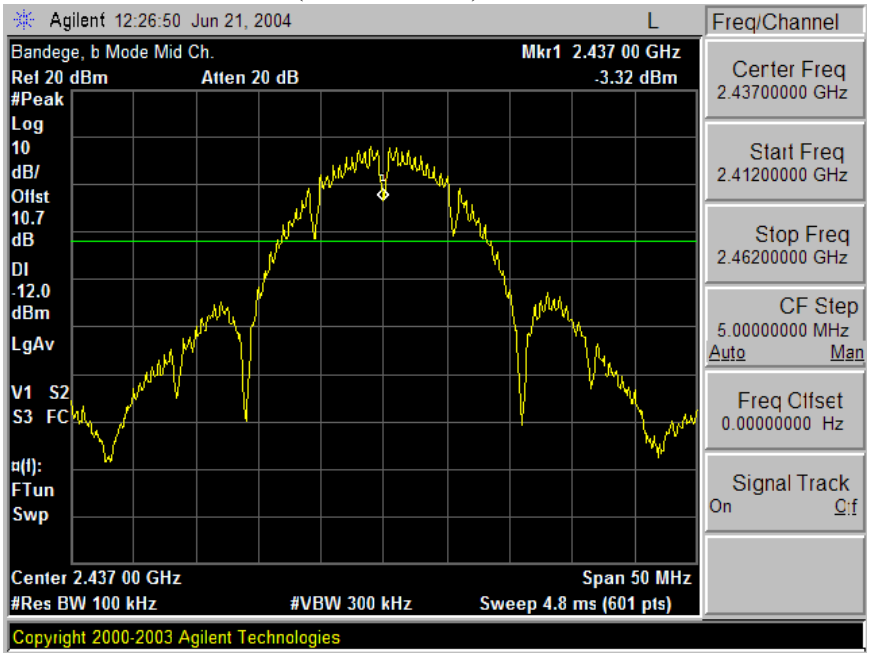


LOW CH SPURIOUS (802.11b mode)

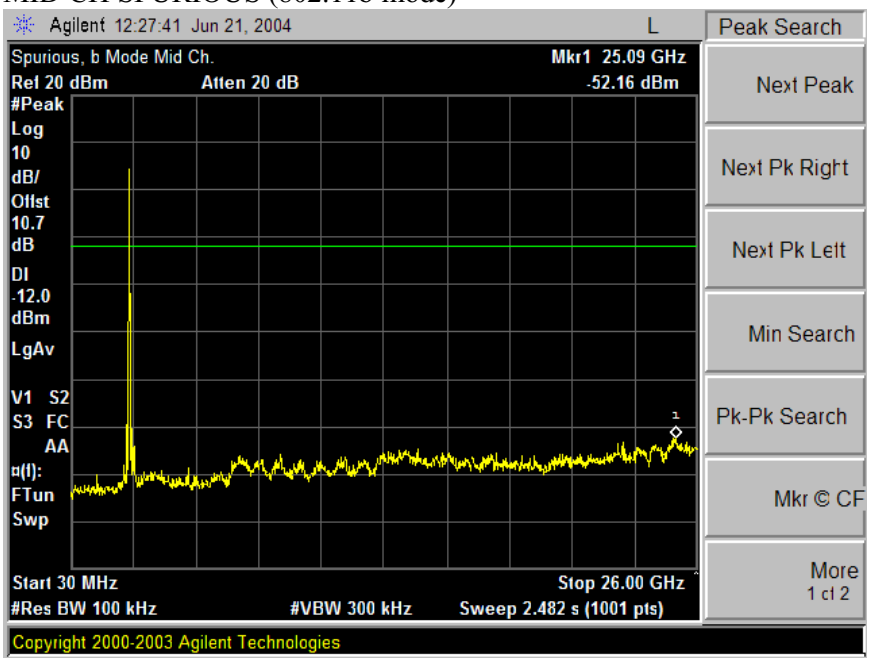


SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

MID CH REFERENCE (802.11b mode)



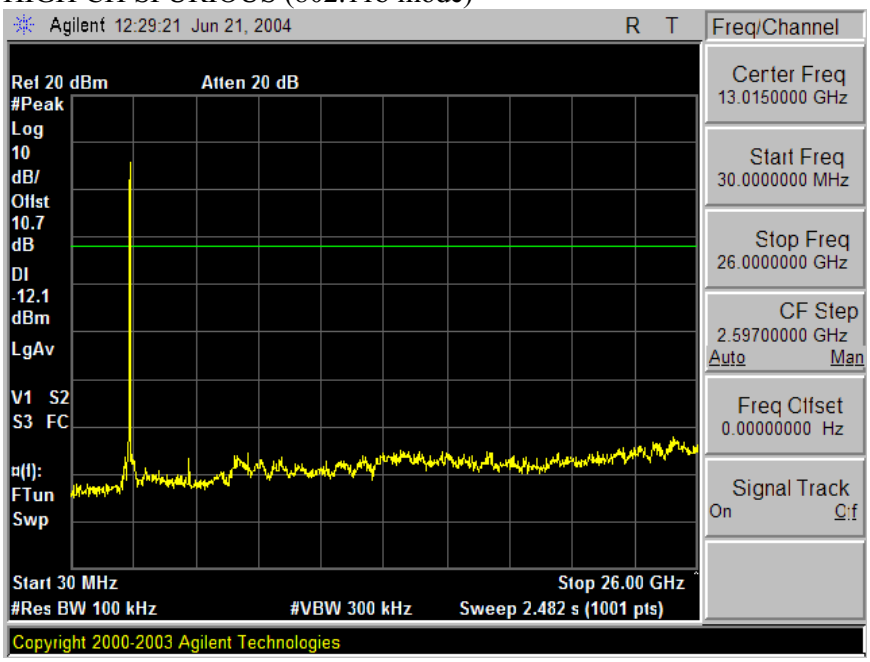
MID CH SPURIOUS (802.11b mode)



SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

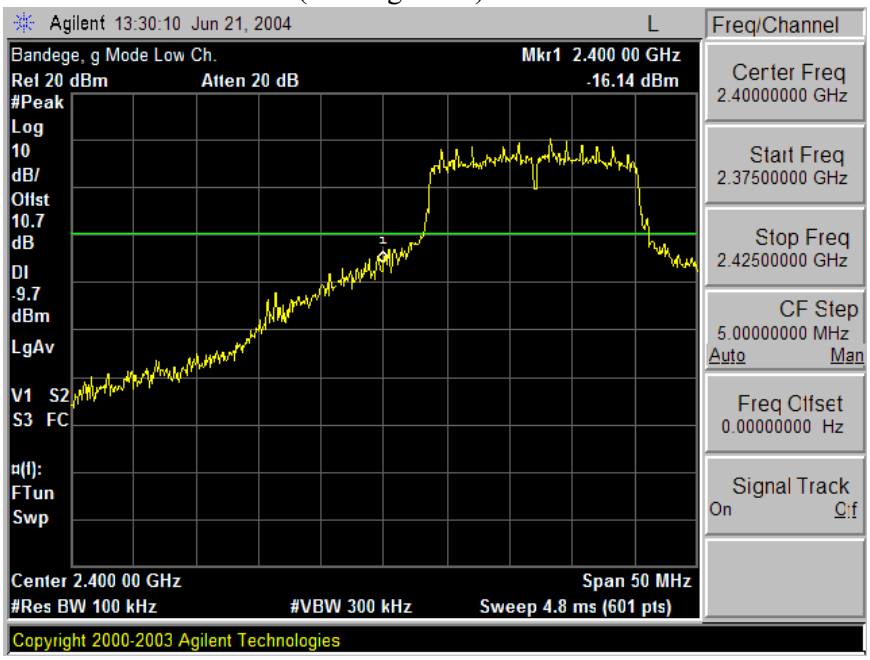
HIGH CH BANDEDGE (802.11b mode)

HIGH CH SPURIOUS (802.11b mode)

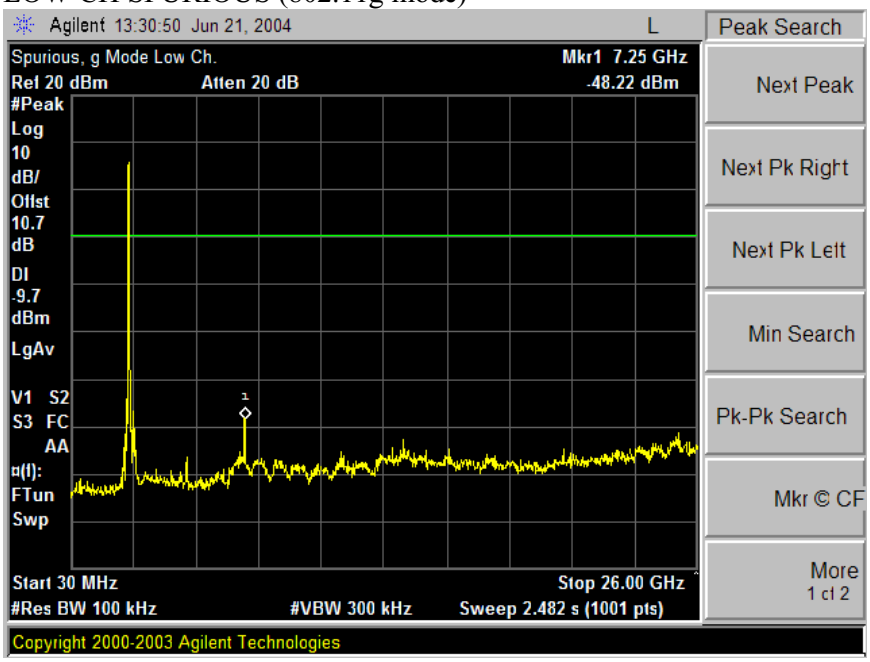


SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)

LOW CH BANDEDGE (802.11g mode)

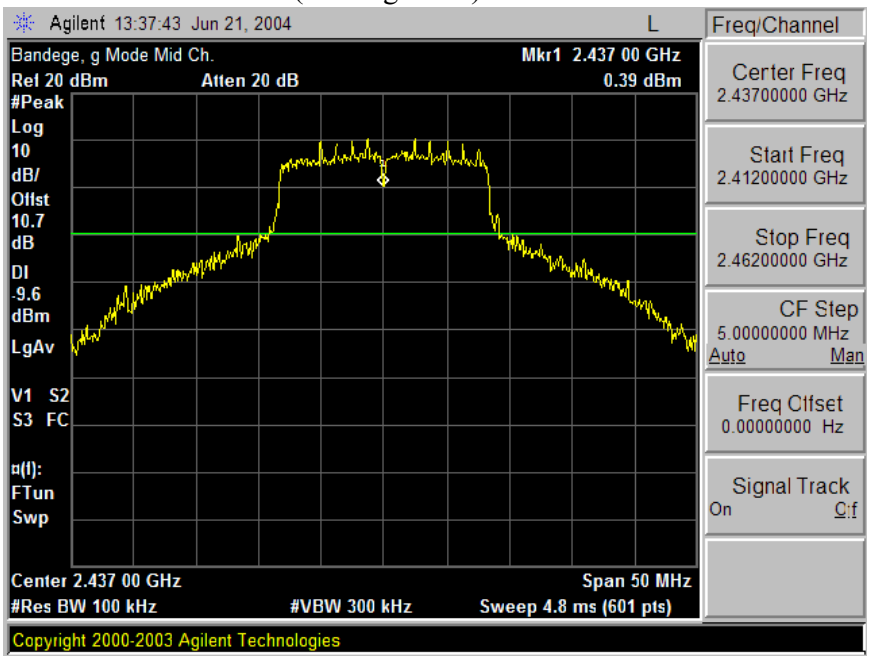


LOW CH SPURIOUS (802.11g mode)

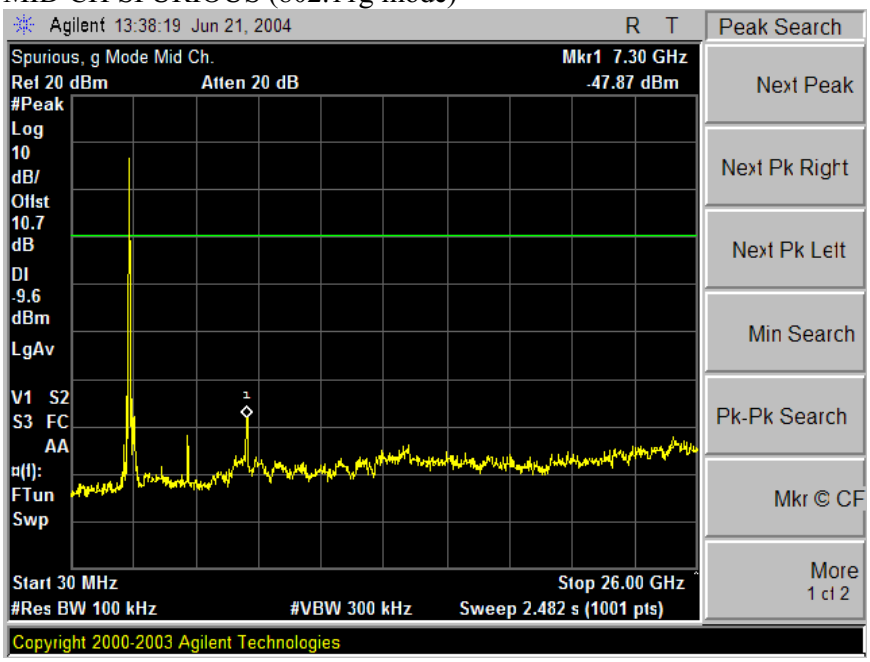


SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)

MID CH REFERENCE (802.11g mode)

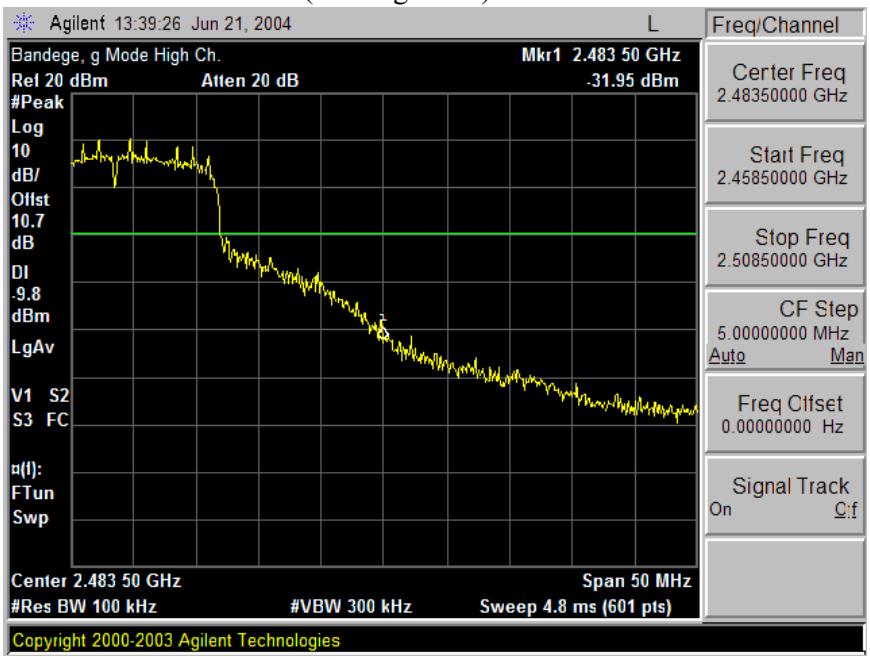


MID CH SPURIOUS (802.11g mode)

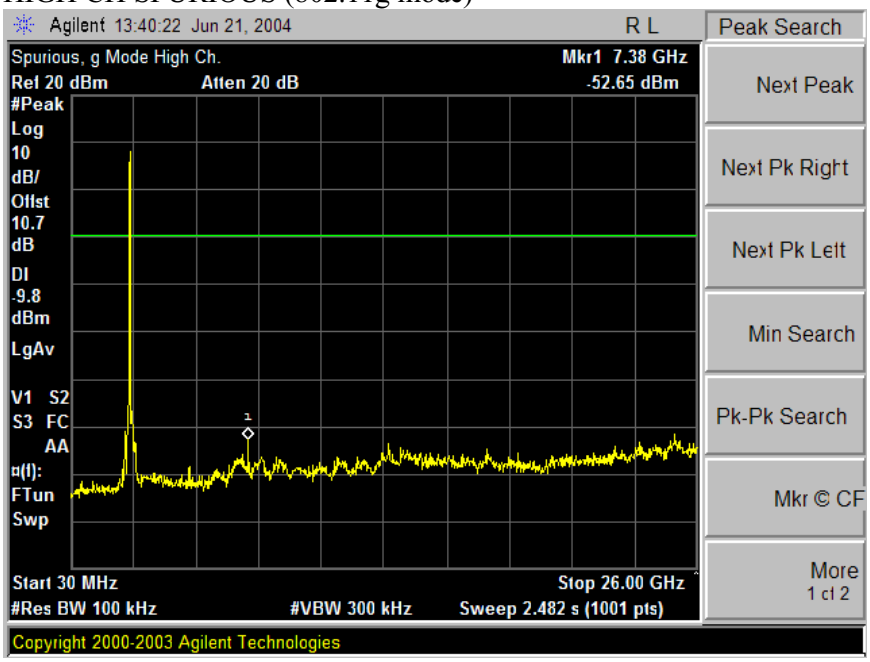


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)

HIGH CH BANDEDGE (802.11g mode)

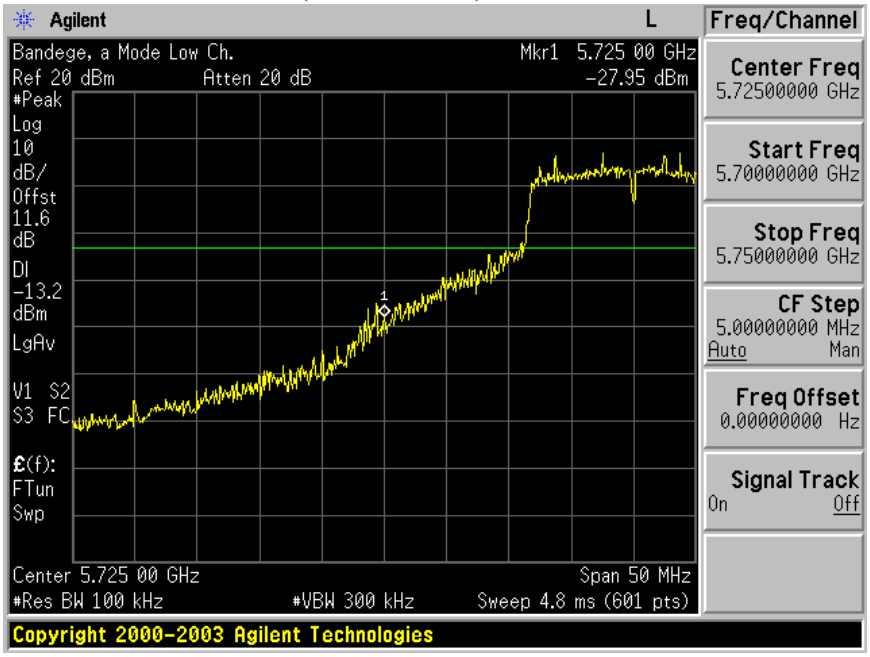


HIGH CH SPURIOUS (802.11g mode)

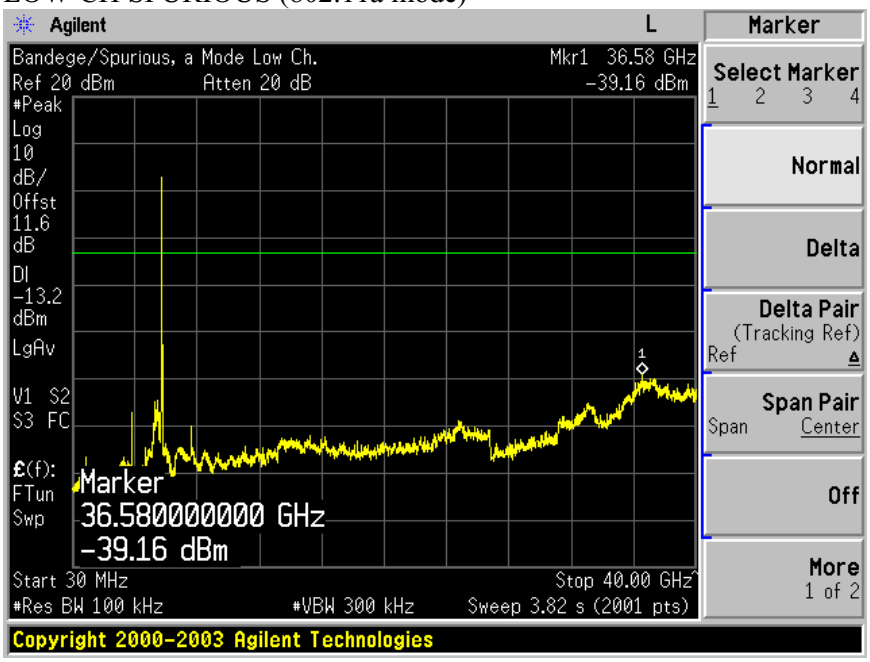


SPURIOUS EMISSIONS, LOW CHANNEL (802.11a MODE)

LOW CH BANDEDGE (802.11a mode)

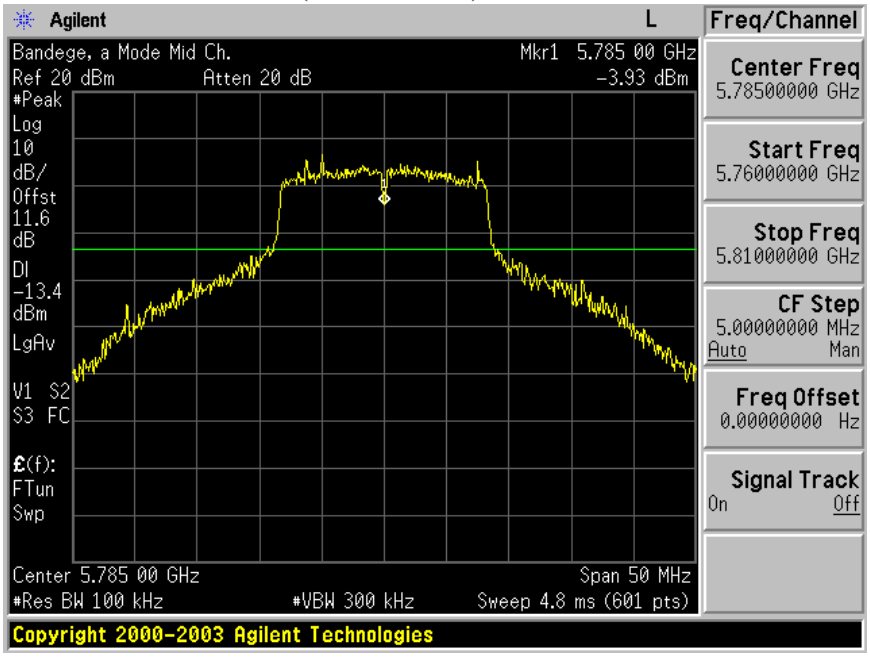


LOW CH SPURIOUS (802.11a mode)

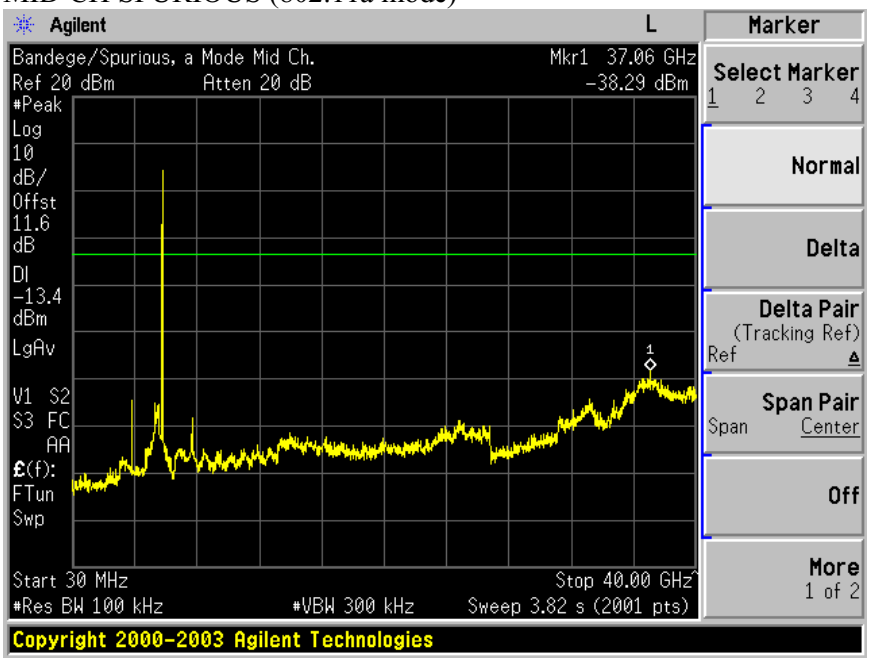


SPURIOUS EMISSIONS, MID CHANNEL (802.11a MODE)

MID CH REFERENCE (802.11a mode)

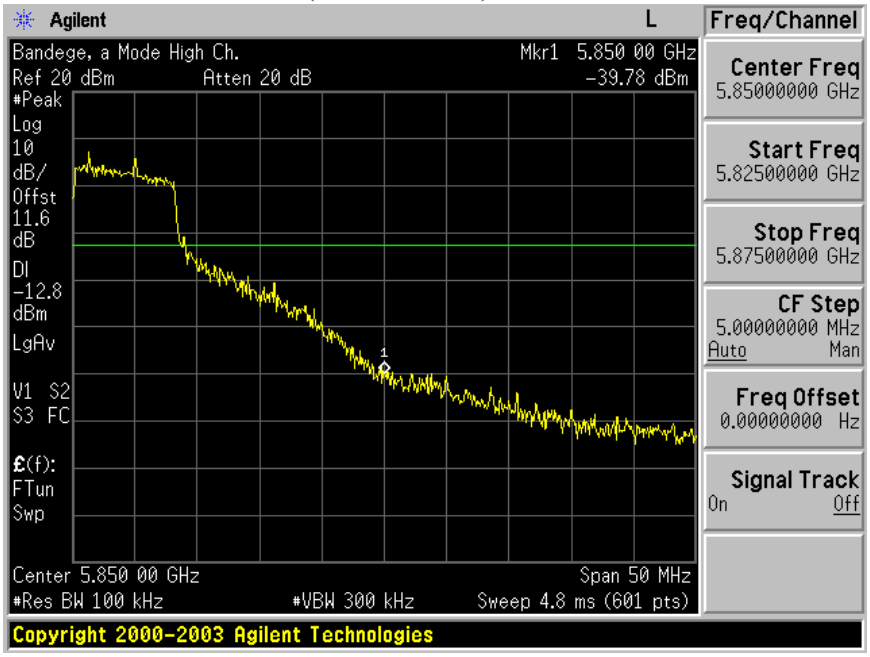


MID CH SPURIOUS (802.11a mode)

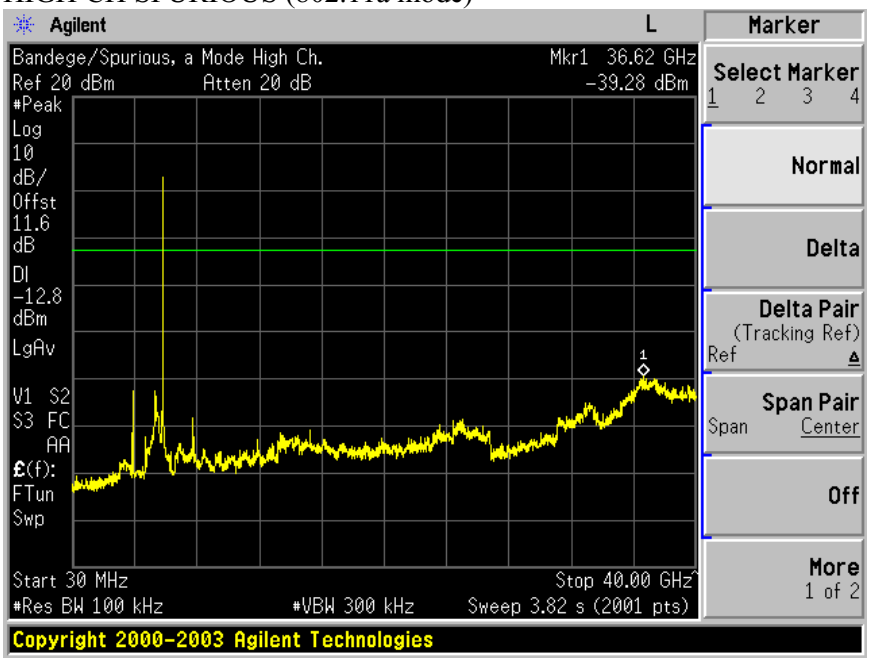


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11a MODE)

HIGH CH BANDEDGE (802.11a mode)



HIGH CH SPURIOUS (802.11a mode)



7.8. RADIATED EMISSIONS

7.8.1. 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 of 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 of the 5.8 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.

Preliminary measurements in the handheld portable configuration are made in three orthogonal orientations (X, Y, Z). Results in the worst-case orientation are reported.

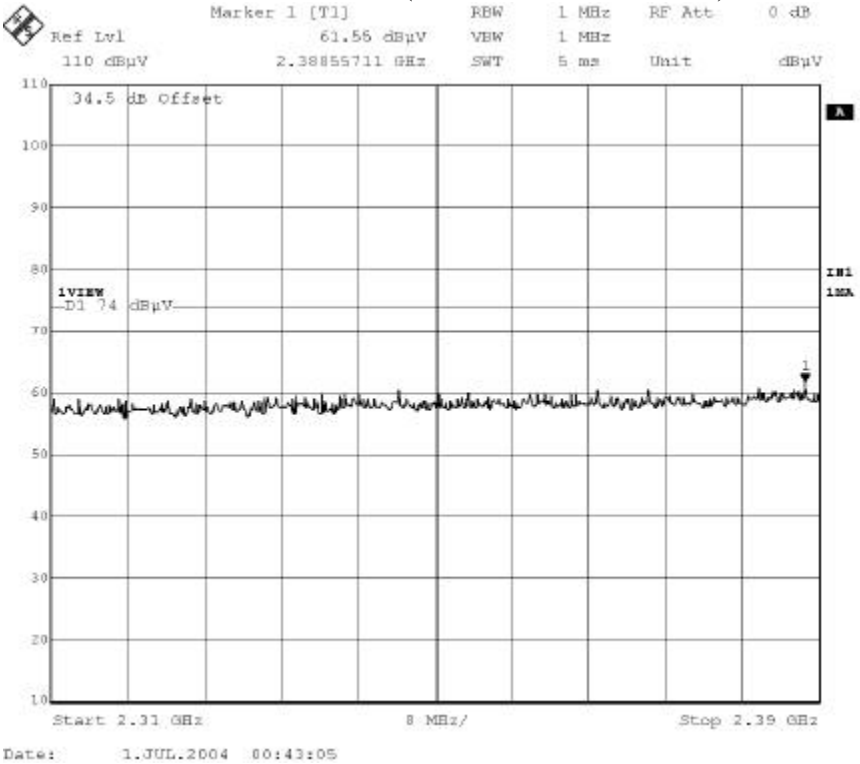
RESULTS

No non-compliance noted:

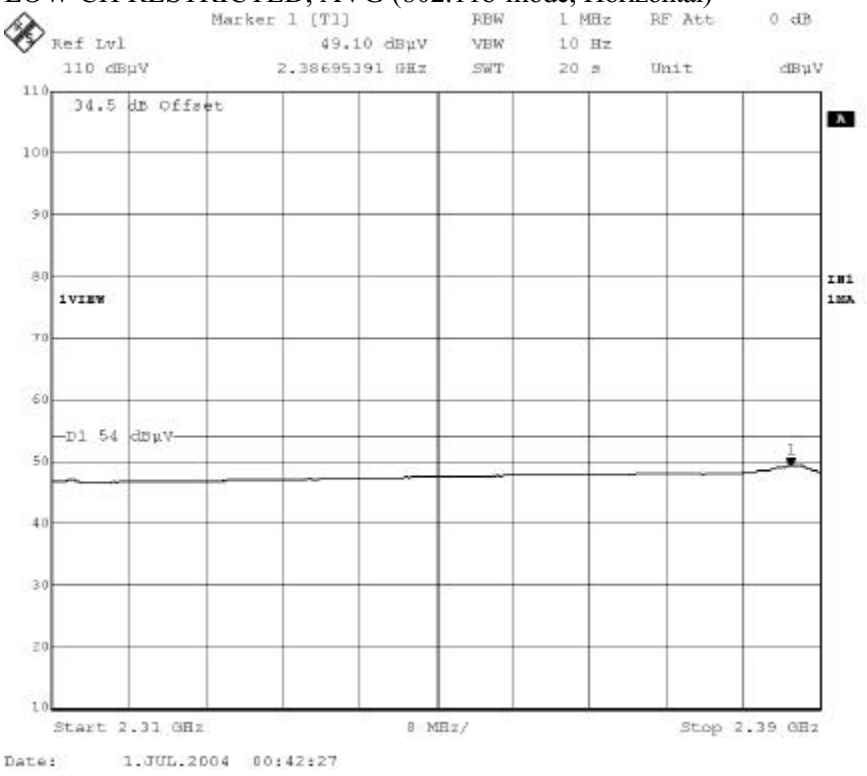
7.8.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz, MOBILE LAPTOP CONFIGURATION, TIAN01 ANTENNA SET

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

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

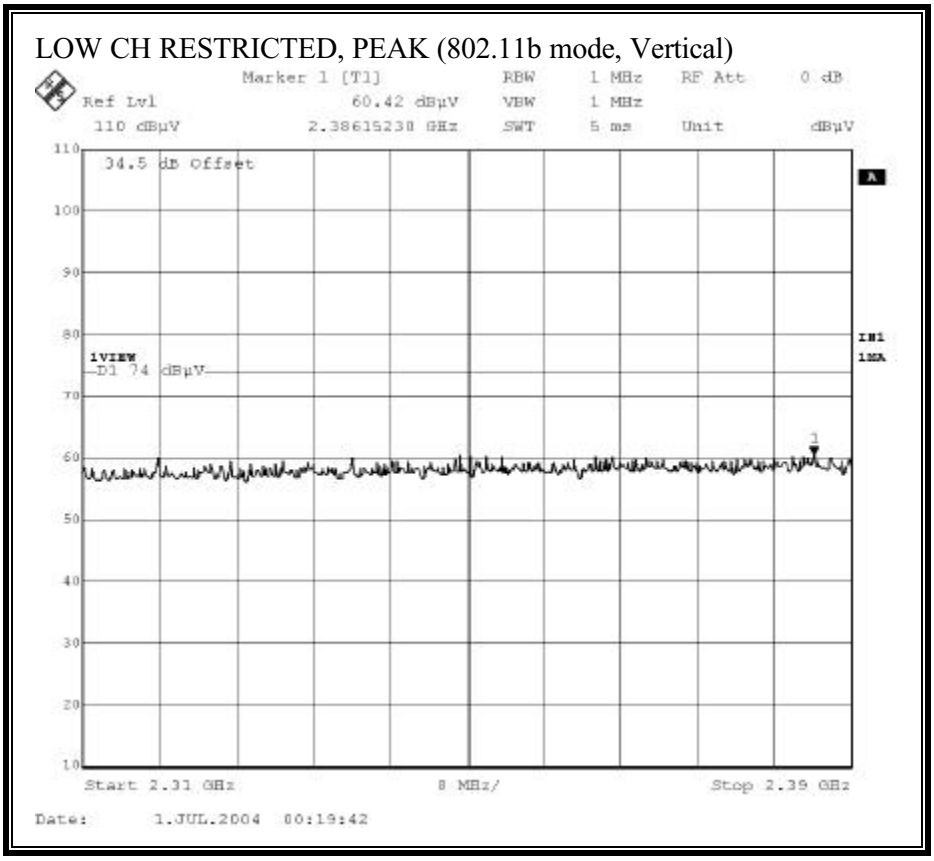


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

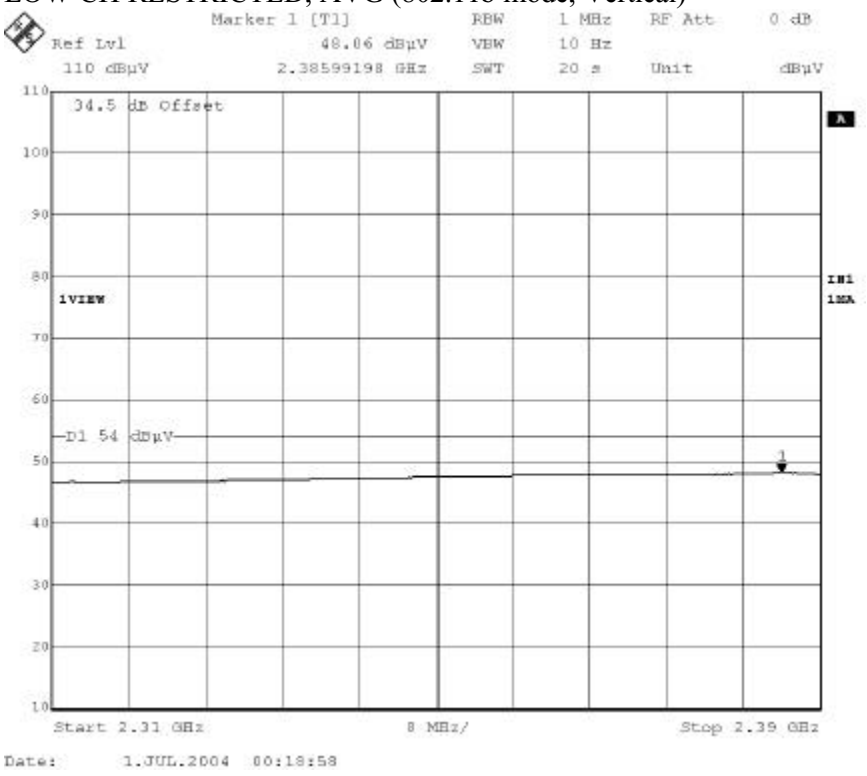


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

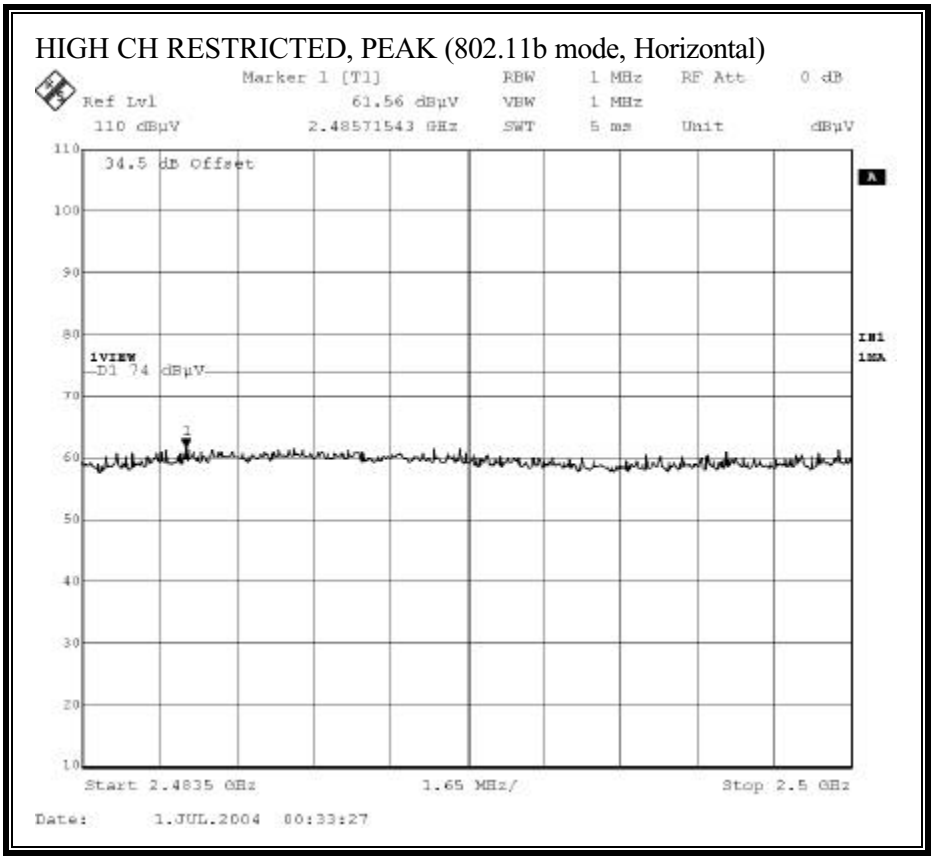
LOW CH RESTRICTED, PEAK (802.11b mode, Vertical)



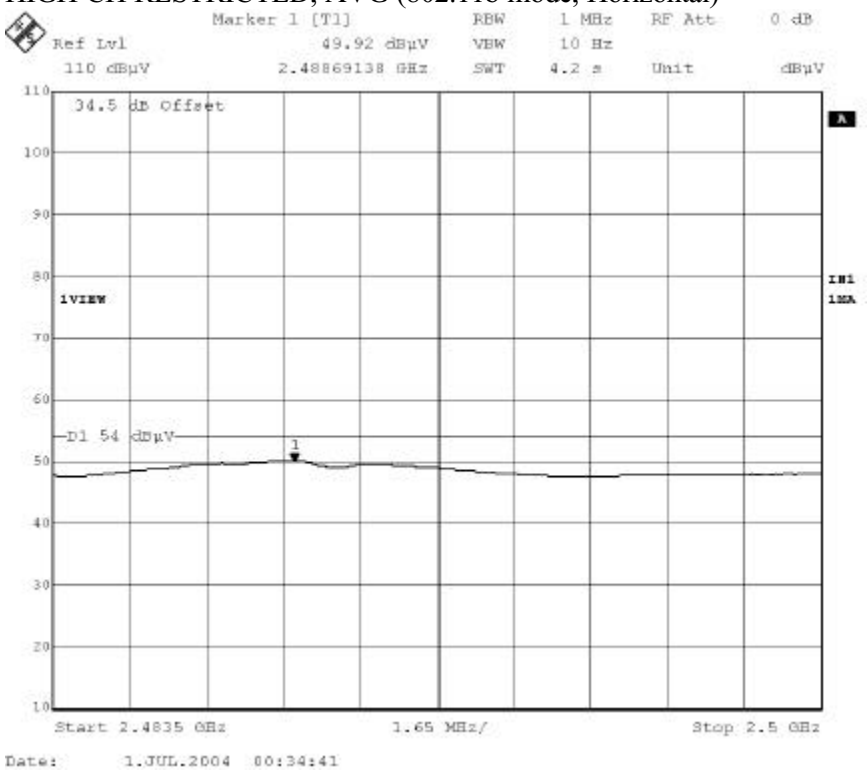
LOW CH RESTRICTED, AVG (802.11b mode, Vertical)



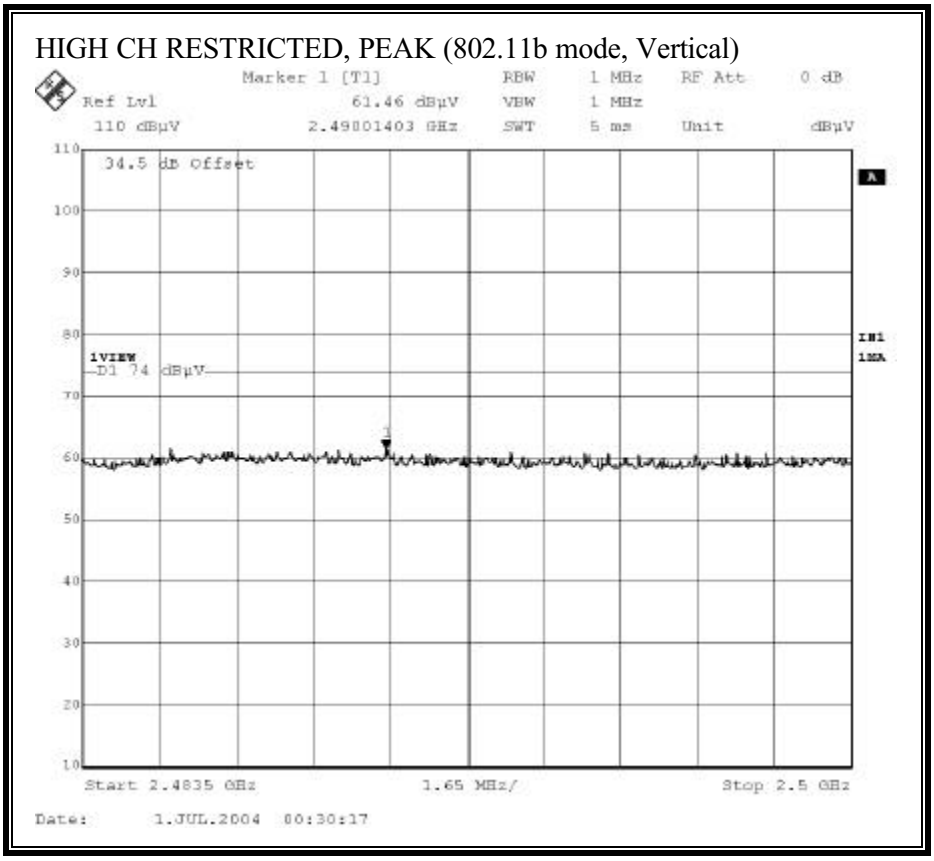
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)



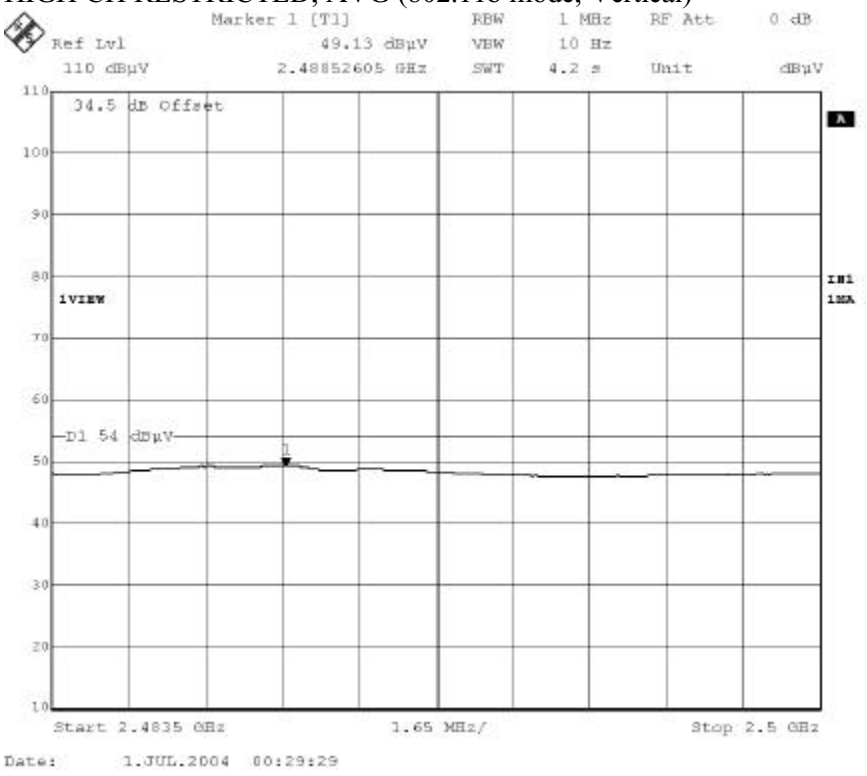
HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)



RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)



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



HARMONICS AND SPURIOUS EMISSIONS (b MODE)

06/30/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U2843
Company: INTEL
EUT Descrip.: 802.11 a/b/g Mini PCI type 3B Card
EUT M/N: PA3375U-1MP
Test Target: FCC 15.247
Mode Oper: TX 11b mode, Laptop Position, TIAN Antenna

Test Equipment:

EMCO Horn 1-18GHz	Spectrum Analyzer	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz
T119; S/N: 29301 @3m	Agilent E4446A Analyzer	T63 Miteq 646456		

Hi Frequency Cable: (2 ft) (2.0 ft) (3 ft) (12 ft)

Peak Measurements: 1 MHz Resolution Bandwidth, 1MHz Video Bandwidth
Average Measurements: 1 MHz Resolution Bandwidth, 10Hz Video Bandwidth

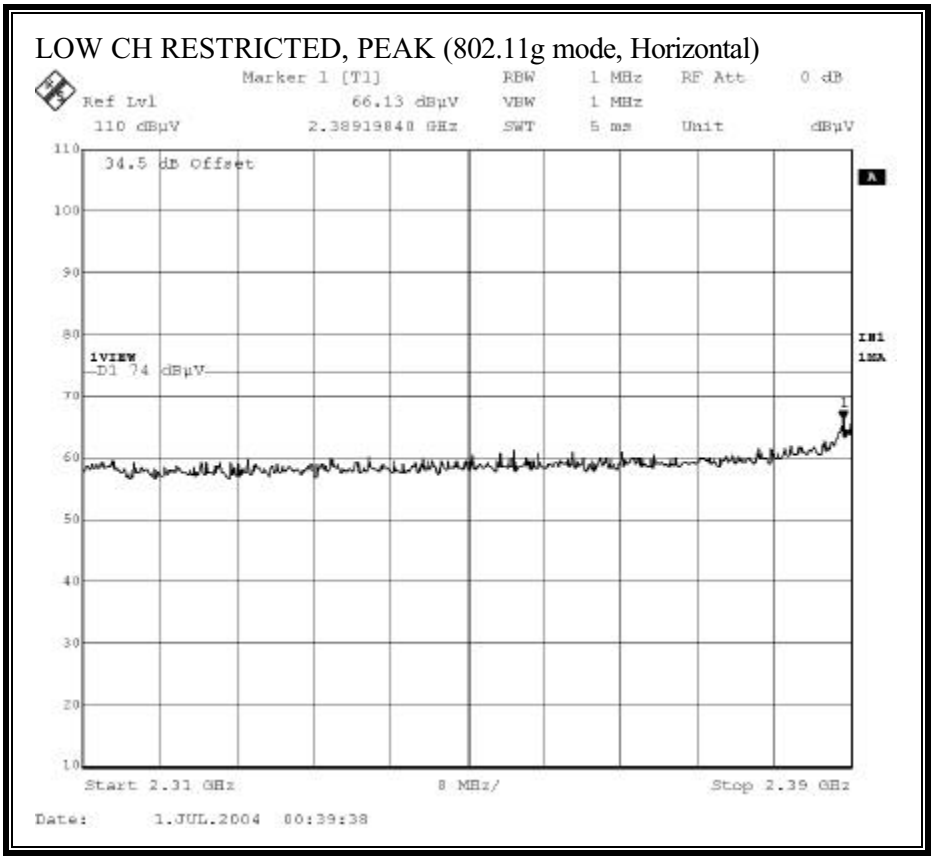
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
2412 Channel															
4.824	9.8	46.9	40.1	35.0	2.9	-35.3	0.0	1.0	50.4	43.6	74.0	54.0	-23.6	-10.4	V
4.824	9.8	47.8	42.5	35.0	2.9	-35.3	0.0	1.0	51.3	46.0	74.0	54.0	-22.7	-8.0	H
2437 Channel															
4.874	9.8	45.0	32.5	35.0	2.9	-35.3	0.0	1.0	48.5	36.0	74.0	54.0	-25.5	-18.0	V
7.311	9.8	45.6	32.4	36.7	3.7	-34.6	0.0	1.0	52.3	39.1	74.0	54.0	-21.7	-14.9	V
4.874	9.8	44.7	31.5	35.0	2.9	-35.3	0.0	1.0	48.2	35.0	74.0	54.0	-25.8	-19.0	H
7.311	9.8	45.0	33.2	36.7	3.7	-34.6	0.0	1.0	51.7	39.9	74.0	54.0	-22.3	-14.1	H
2462 Channel															
4.924	9.8	44.9	33.8	35.0	2.9	-35.3	0.0	1.0	48.5	37.4	74.0	54.0	-25.5	-16.6	V
7.386	9.8	44.7	32.3	36.7	3.7	-34.5	0.0	1.0	51.5	39.1	74.0	54.0	-22.5	-14.9	V
4.924	9.8	44.3	33.7	35.0	2.9	-35.3	0.0	1.0	47.9	37.3	74.0	54.0	-26.1	-16.7	H
7.386	9.8	45.3	32.0	36.7	3.7	-34.5	0.0	1.0	52.1	38.8	74.0	54.0	-21.9	-15.2	H

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		

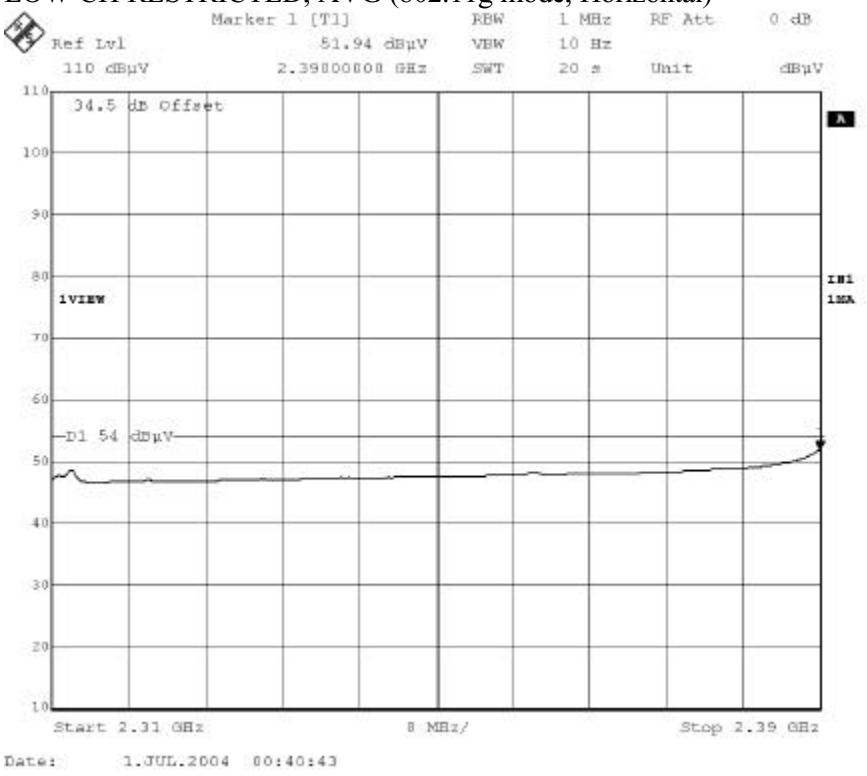
Note: No other spurious emissions were detected above the system noise in the restricted bands.

RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

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

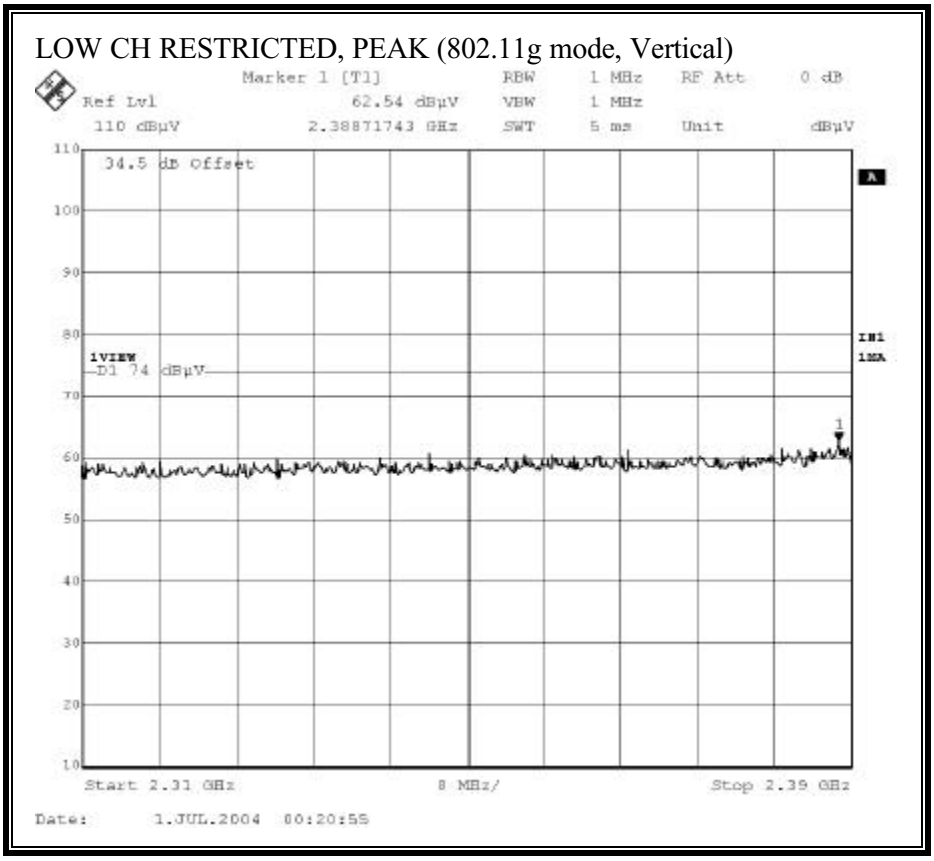


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

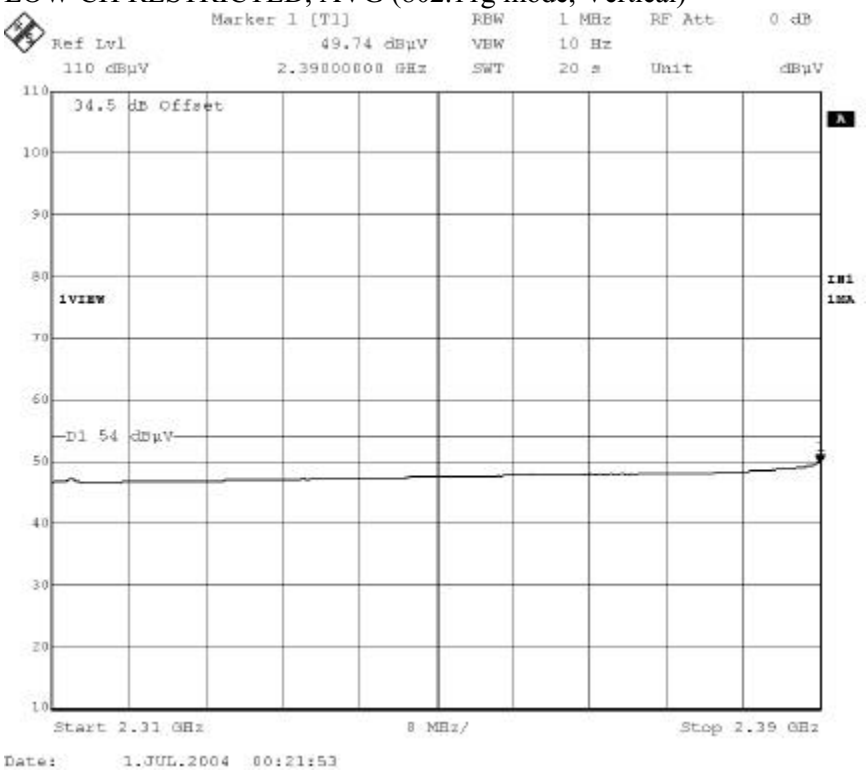


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

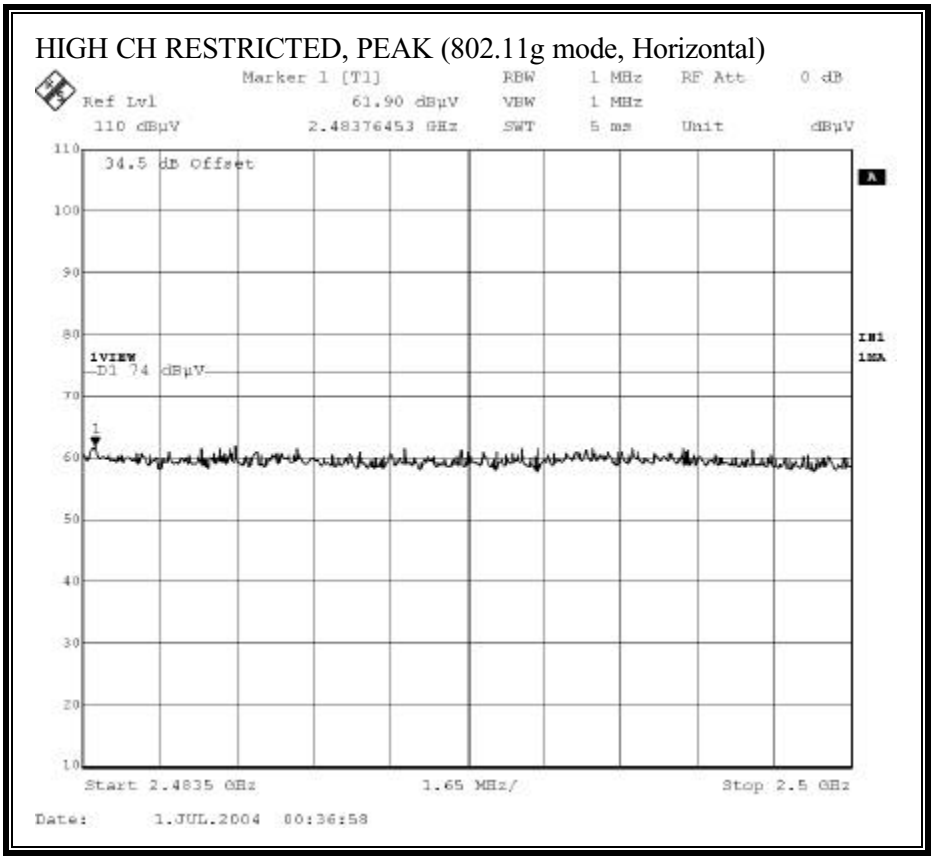
LOW CH RESTRICTED, PEAK (802.11g mode, Vertical)



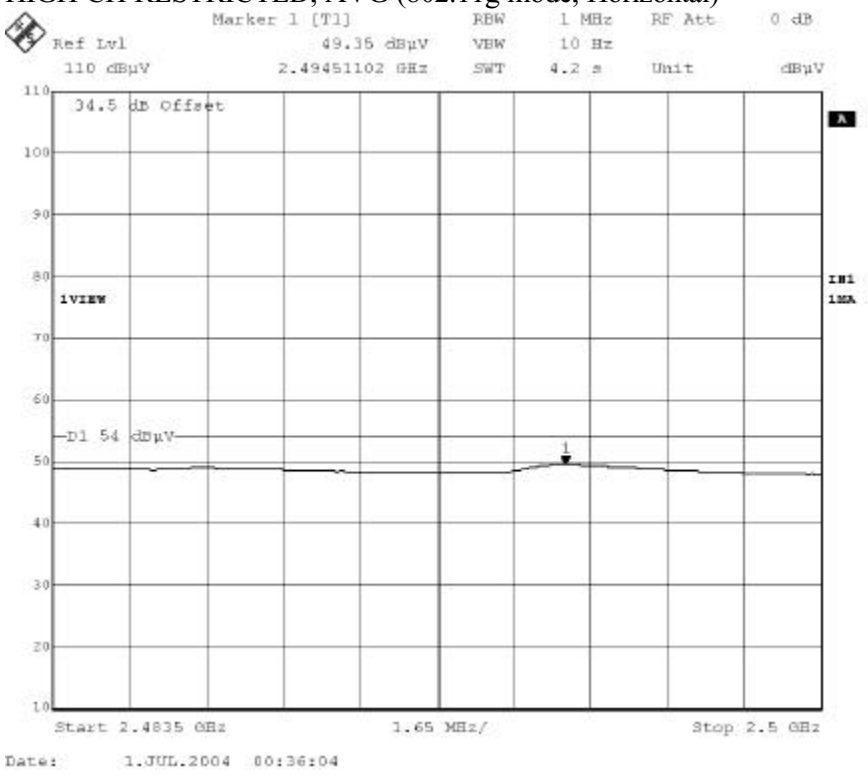
LOW CH RESTRICTED, AVG (802.11g mode, Vertical)



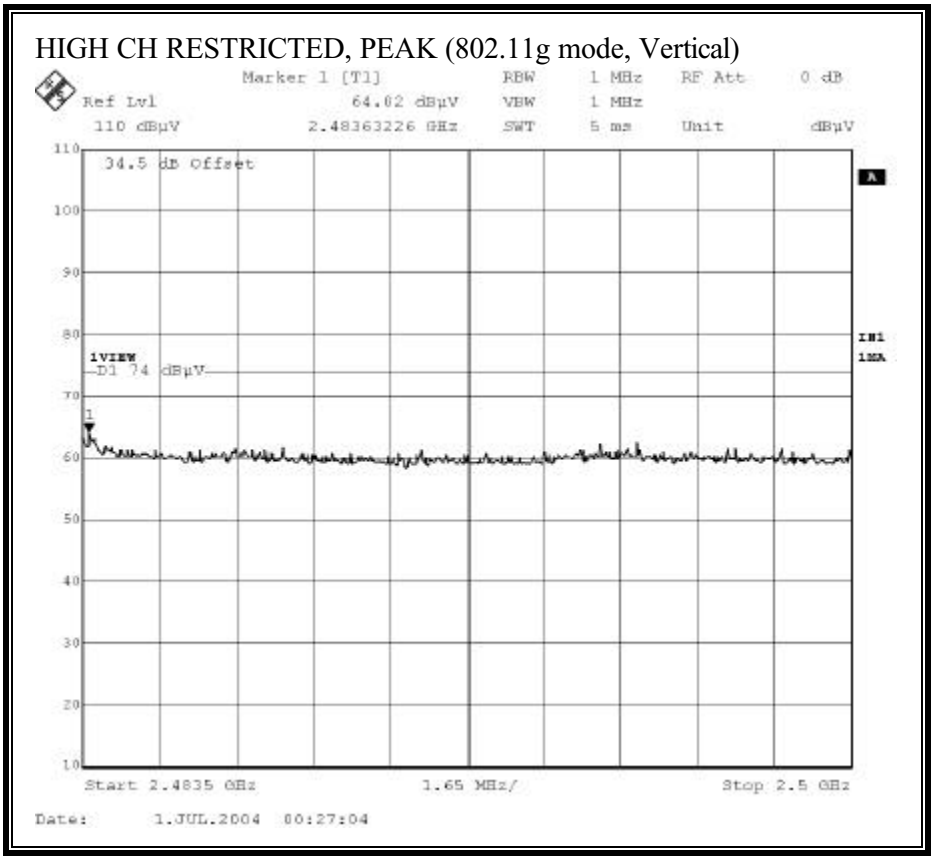
RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)



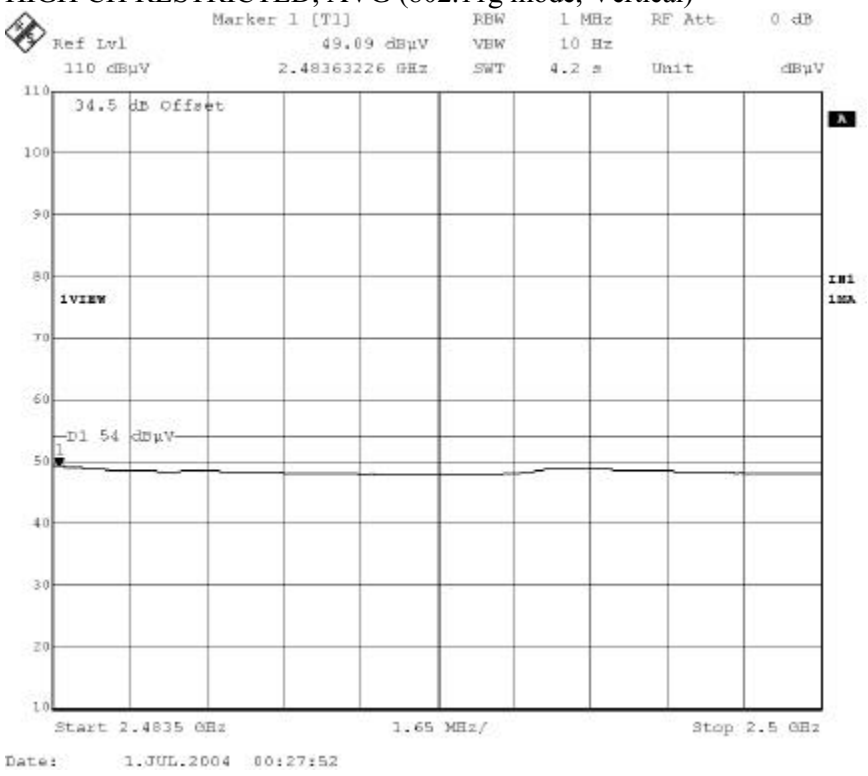
HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)



RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)



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



HARMONICS AND SPURIOUS EMISSIONS (g MODE)

06/30/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: David Garcia
Project #: 04U2843
Company: INTEL
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EUT M/N: PA3375U-1MP
Test Target: FCC 15.247
Mode Oper: TX 11g mode, Laptop Position, TIAN Antenna

Test Equipment:

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T119; S/N: 29301 @3m	Agilent E4446A Analyzer	T63 Miteq 646456		

Hi Frequency Cable: ☑ (2 ft) ☐ (2.0 ft) ☐ (3 ft) ☑ (12 ft)

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
2412 Channel															
4.824	9.8	47.0	33.9	35.0	2.9	-35.3	0.0	1.0	50.5	37.4	74.0	54.0	-23.5	-16.6	V
4.824	9.8	46.0	32.5	35.0	2.9	-35.3	0.0	1.0	49.5	36.0	74.0	54.0	-24.5	-18.0	H
2437 Channel															
4.874	9.8	44.3	32.0	35.0	2.9	-35.3	0.0	1.0	47.8	35.5	74.0	54.0	-26.2	-18.5	V
7.311	9.8	44.1	32.4	36.7	3.7	-34.6	0.0	1.0	50.8	39.1	74.0	54.0	-23.2	-14.9	V
4.874	9.8	43.0	31.5	35.0	2.9	-35.3	0.0	1.0	46.5	35.0	74.0	54.0	-27.5	-19.0	H
7.311	9.8	44.0	31.6	36.7	3.7	-34.6	0.0	1.0	50.7	38.3	74.0	54.0	-23.3	-15.7	H
2462 Channel															
4.924	9.8	44.0	31.9	35.0	2.9	-35.3	0.0	1.0	47.6	35.5	74.0	54.0	-26.4	-18.5	V
7.386	9.8	43.2	32.1	36.7	3.7	-34.5	0.0	1.0	50.0	38.9	74.0	54.0	-24.0	-15.1	V
4.924	9.8	44.2	33.0	35.0	2.9	-35.3	0.0	1.0	47.8	36.6	74.0	54.0	-26.2	-17.4	H
7.386	9.8	44.6	32.1	36.7	3.7	-34.5	0.0	1.0	51.4	38.9	74.0	54.0	-22.6	-15.1	H

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