FCC CFR47 PART 15 SUBPART C
CERTIFICATION
TEST REPORT

FOR

802.11 a/b/g PCI EXPRESS CARD

MODEL NUMBER: WM3965ABG

FCC ID: PD9WM3965ABG

REPORT NUMBER: 06U10130-1

ISSUE DATE: APRIL 10, 2006

Prepared for
INTEL CORPORATION
2111 N.E.25TH AVE.
HILLSBORO, OR 97124, USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
-	4/10/06	Initial Issue	D.Garcia

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: INTEL CORPORATION
2111 N.E. 25TH AVE.
HILLSBORO, OR 97124, USA

EUT DESCRIPTION: 802.11a/b/g PCI EXPRESS CARD

MODEL: WM3965ABG

SERIAL NUMBER: 000529096

DATE TESTED: MARCH 29 to APRIL 1, 2006

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:

DAVID GARCIA
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN
EMC TECHNICIAN
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 802.11a/b/g wireless LAN transceiver Mini PCI type 3B card.

The radio module is manufactured by Intel Corporation.

5.2. MAXIMUM OUTPUT POWER

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

2400 to 2483.5 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	18.95	78.52
2412 - 2462	802.11g	24.85	305.49

5725 to 5850 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5745 - 5825	802.11a	24.86	306.20

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes external WLAN self standing dual band vertically polarized antenna with a 1.5m cable and a stripline connector, the maximum gain is 0.64 dBi in the 2.4 GHz band and –2.05 in the 5.725 GHz band.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing were CRTU rev. 4.0.22. KIRTLAND for b and g mode, GRTT version 1.1.1 for a mode.

The test utility software used during testing was CRTU.EXE and GRTT.EXE.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2437 MHz. For 2.4GHz band and 5785Hz for 5GHz band.

The worst-case data rate for this channel is determined to be 6 Mb/s for g and a mode, 1Mb/s for b mode.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Desktop Computer	Intel	N/A	N/A	N/A
Mouse	HP	M042KC	30536213	DoC
Keyboard	HP	5183	BF32119779	E5XKB5183
Monitor	NOKIA	920C	973	N/A

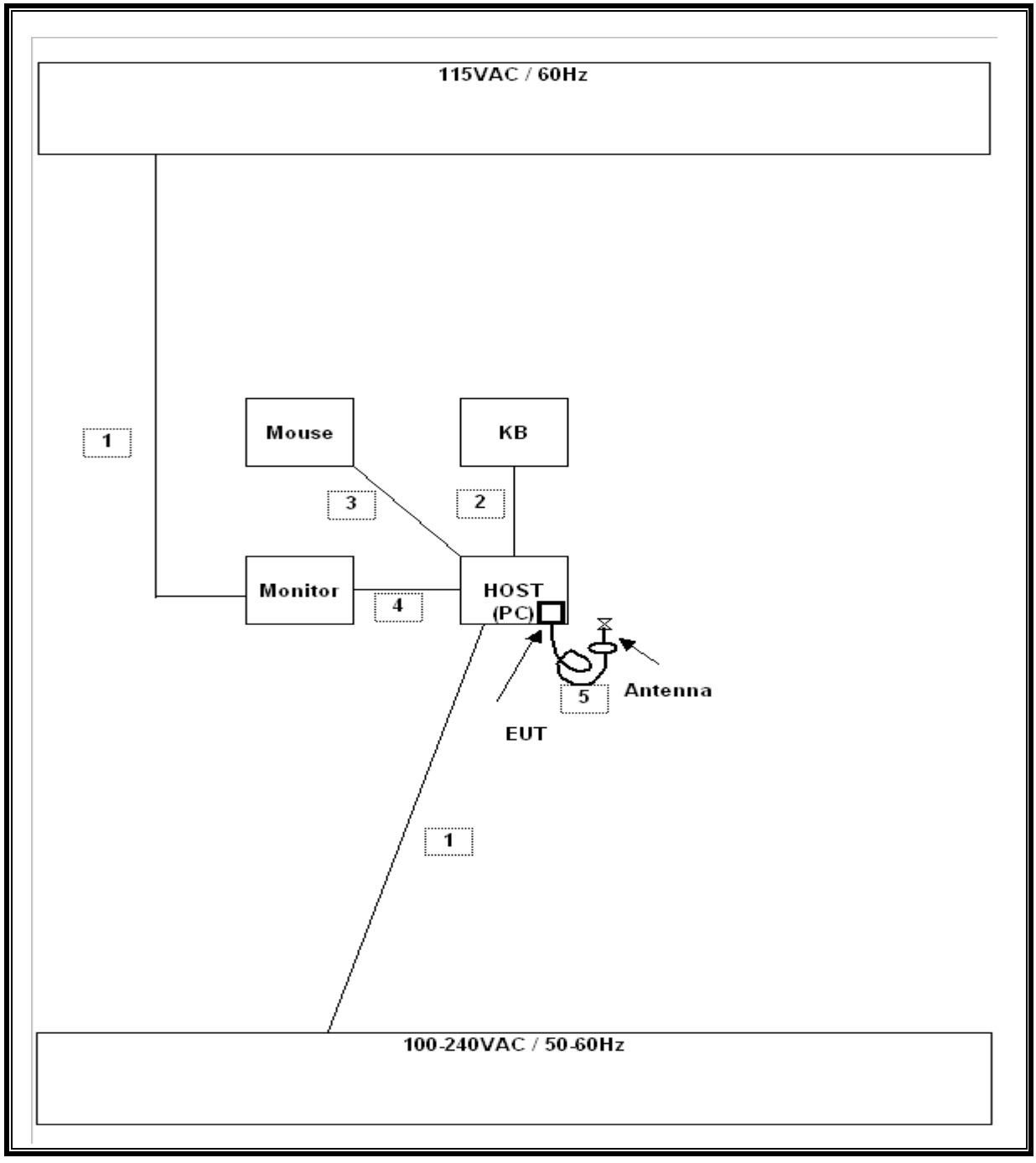
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	2	US 115V	Un-shielded	2m	No
2	KB	1	PS/2	Shielded	2m	Yes
3	Mouse	1	PS/2	Un-shielded	2m	Yes
4	Video	1	DB15	Shielded	2m	Yes
5	Antenna	1	Antenna	Un-shielded	1m	Yes

TEST SETUP

The EUT is installed outside a host desktop computer via a PCI to PCI Express extension 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 Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/29/2007
RF Filter Section	HP	85420E	3705A00256	3/29/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	3/3/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent	8449B	3008A00561	10/3/2007
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29301	4/22/2006
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	9/12/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	8/30/2006
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
AC Power Source, 10 kVA	ACS	AFC-10K-AFC-2	J1568	CNR
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2007
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2007
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	US42510266	10/19/2006

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS FOR THE 2400 TO 2483.5 MHz BAND

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

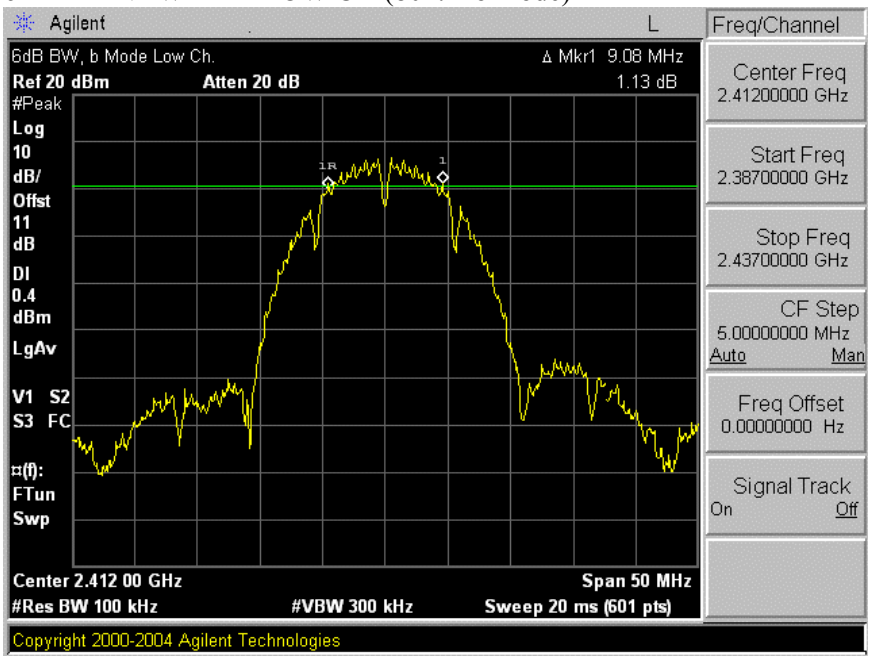
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	9008	500	8508
Middle	2437	9008	500	8508
High	2462	9170	500	8670

802.11g Mode

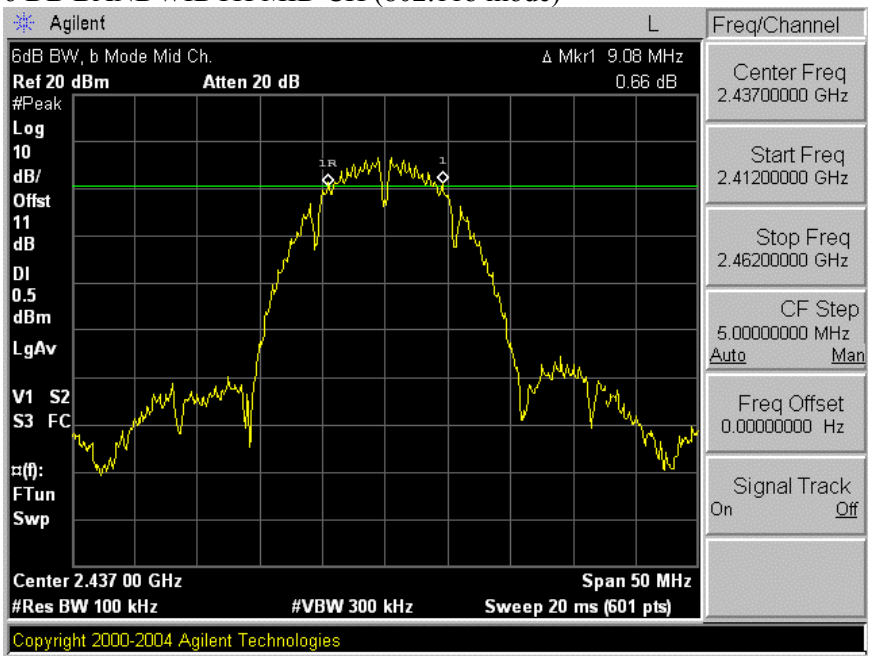
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	2412	16420	500	15920
Middle	2437	16420	500	15920
High	2462	16500	500	16000

6 DB BANDWIDTH (802.11b MODE)

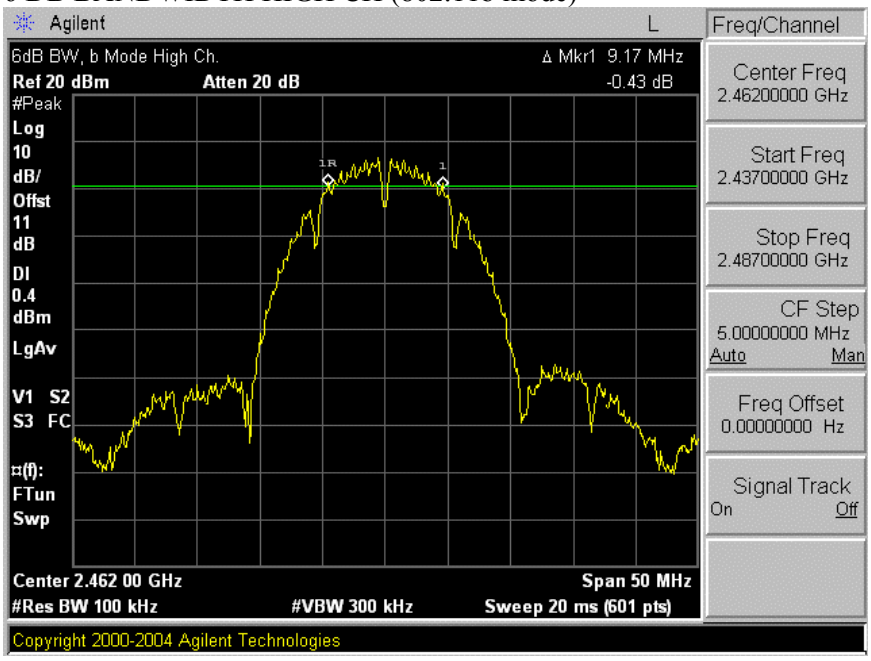
6 DB BANDWIDTH LOW CH (802.11b mode)



6 DB BANDWIDTH MID CH (802.11b mode)

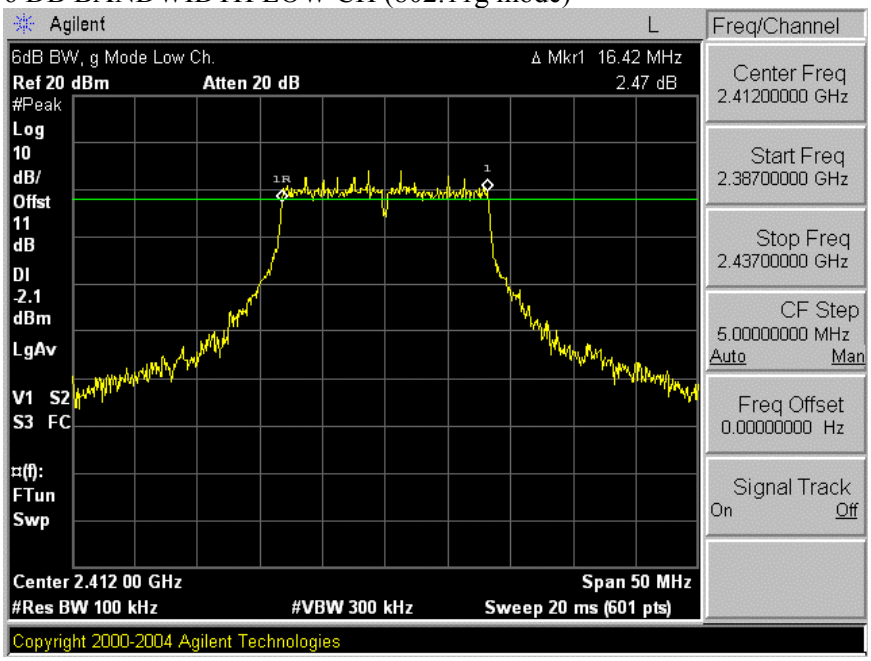


6 DB BANDWIDTH HIGH CH (802.11b mode)

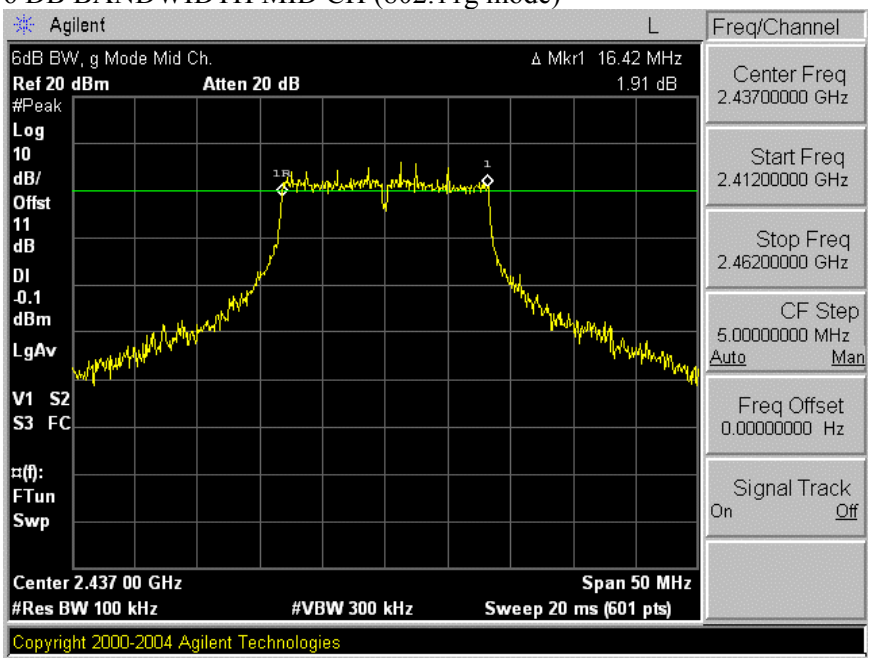


6 DB BANDWIDTH (802.11g MODE)

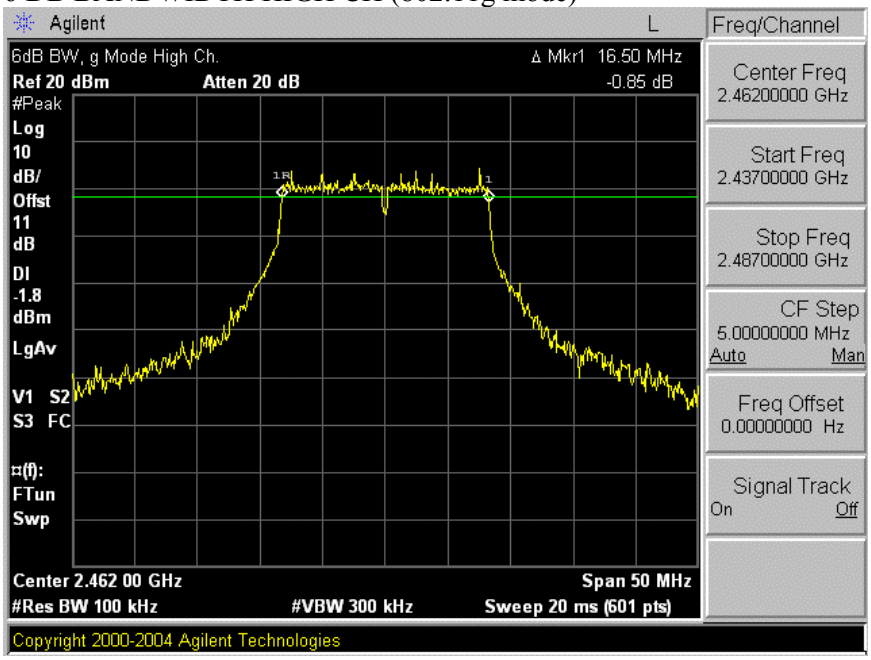
6 DB BANDWIDTH LOW CH (802.11g mode)



6 DB BANDWIDTH MID CH (802.11g mode)



6 DB BANDWIDTH HIGH CH (802.11g mode)



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

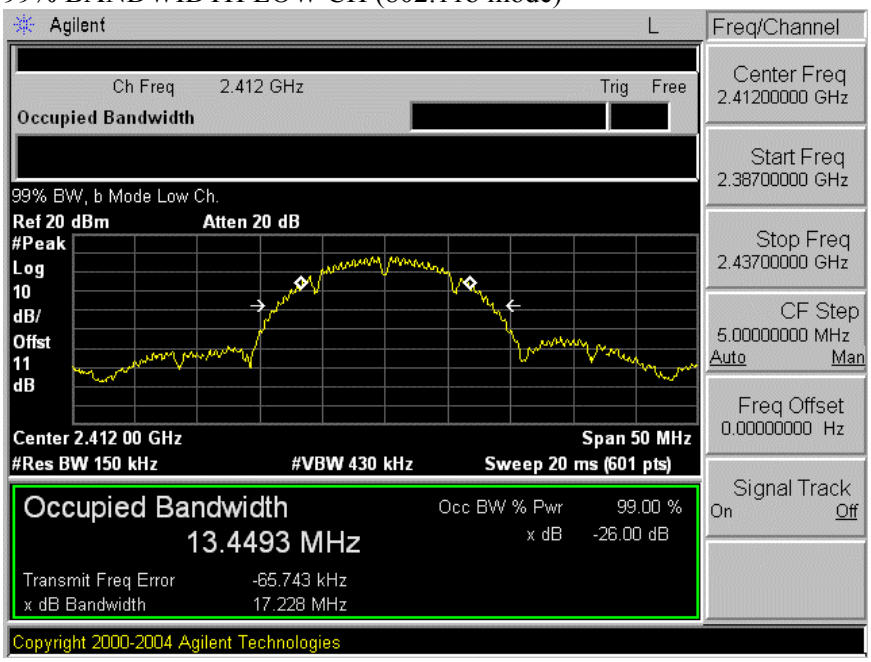
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	13.4493
Middle	2437	13.464
High	2462	13.4763

802.11g Mode

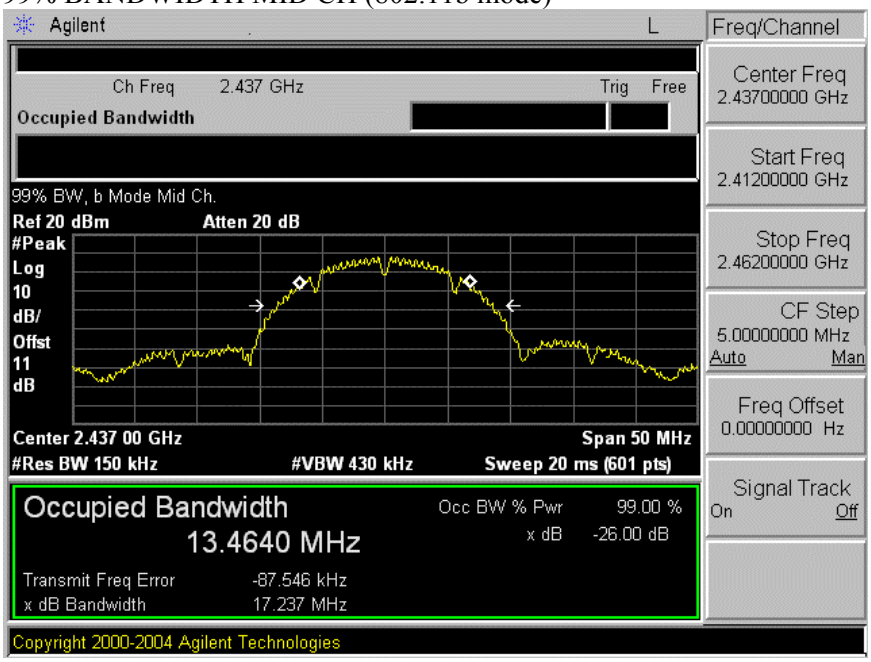
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.8804
Middle	2437	16.9124
High	2462	16.8472

99% BANDWIDTH (802.11b MODE)

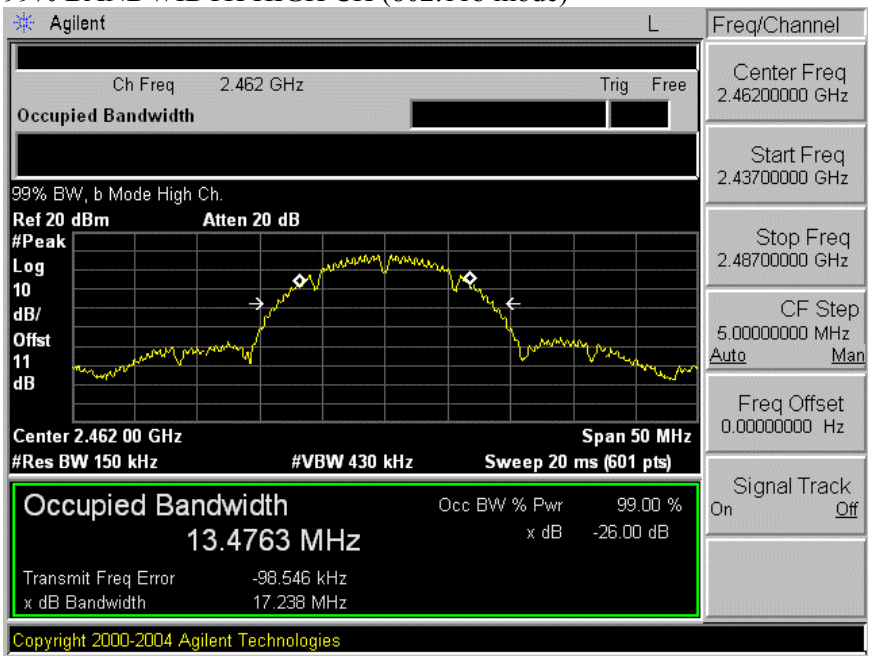
99% BANDWIDTH LOW CH (802.11b mode)



99% BANDWIDTH MID CH (802.11b mode)

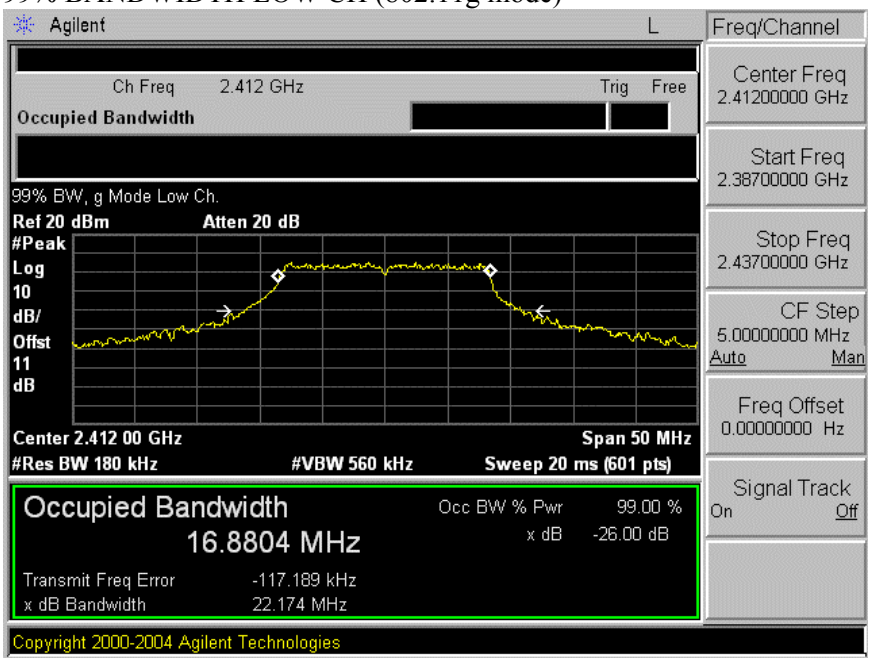


99% BANDWIDTH HIGH CH (802.11b mode)

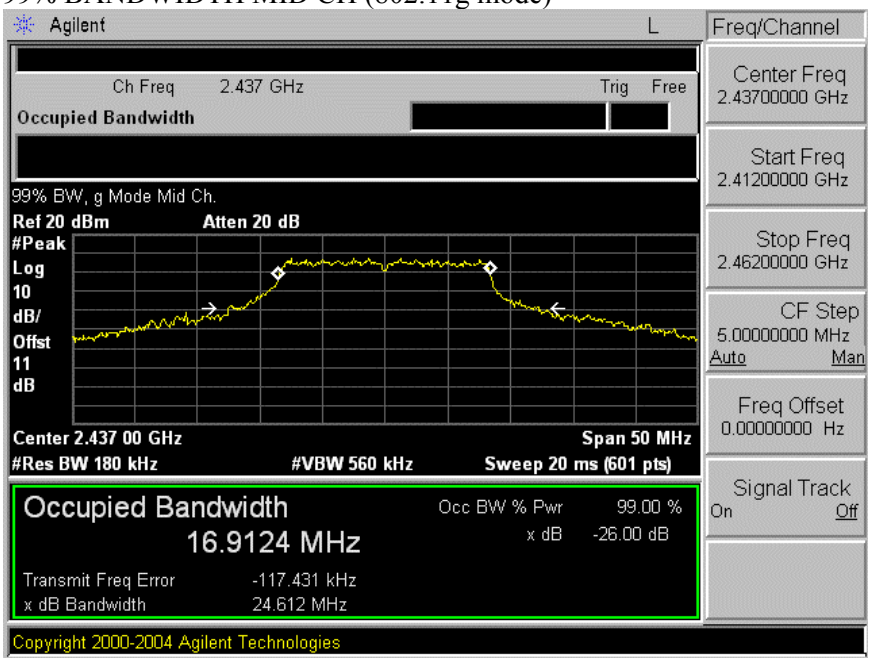


99% BANDWIDTH (802.11g MODE)

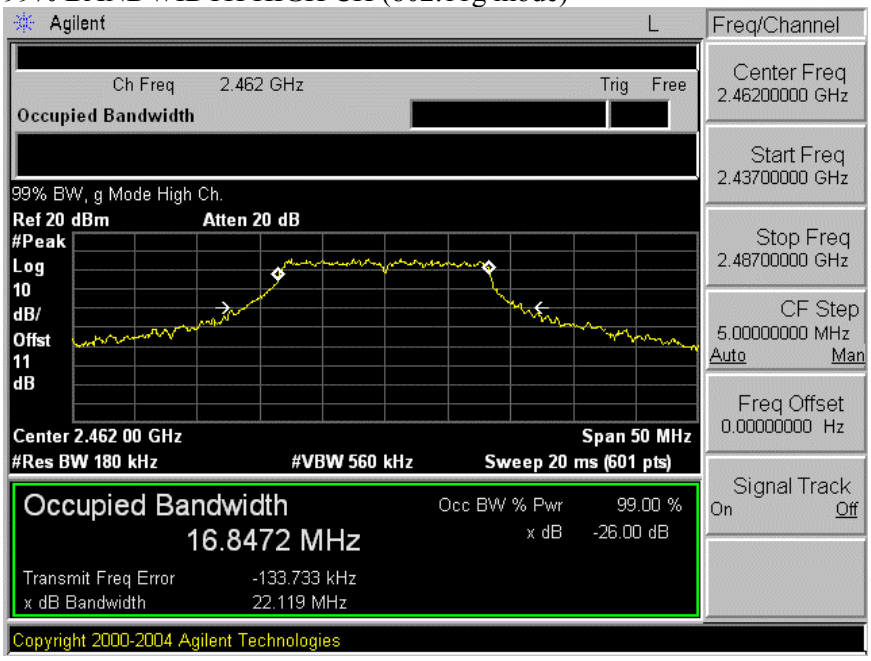
99% BANDWIDTH LOW CH (802.11g mode)



99% BANDWIDTH MID CH (802.11g mode)



99% BANDWIDTH HIGH CH (802.11g mode)



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) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

§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 antenna gain is .64 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

No non-compliance noted:

802.11b Mode

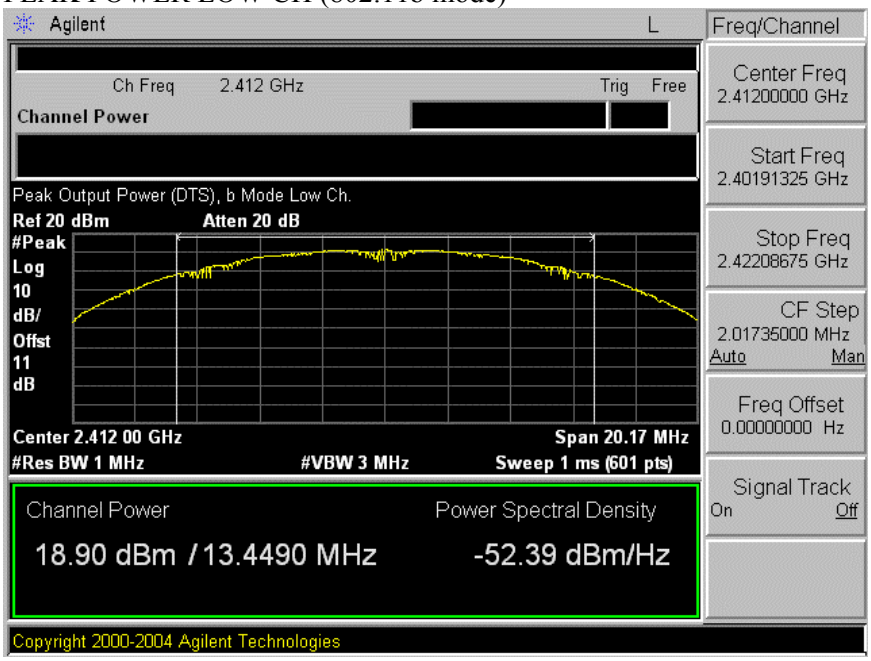
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	18.90	30	-11.10
Middle	2437	18.95	30	-11.05
High	2462	18.92	30	-11.08

802.11g Mode

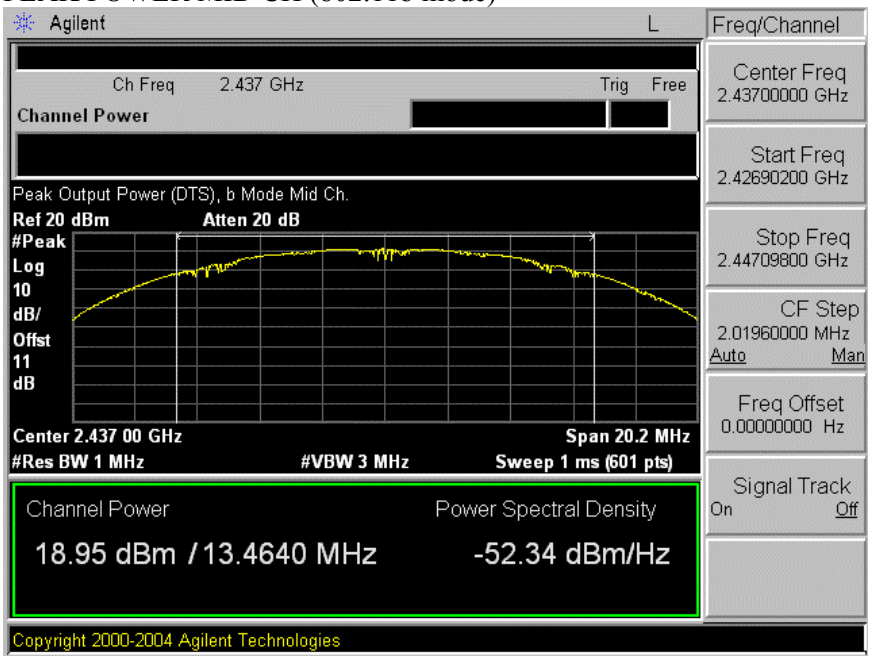
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	23.19	30	-6.81
Middle	2437	24.85	30	-5.15
High	2462	23.60	30	-6.40

OUTPUT POWER (802.11b MODE)

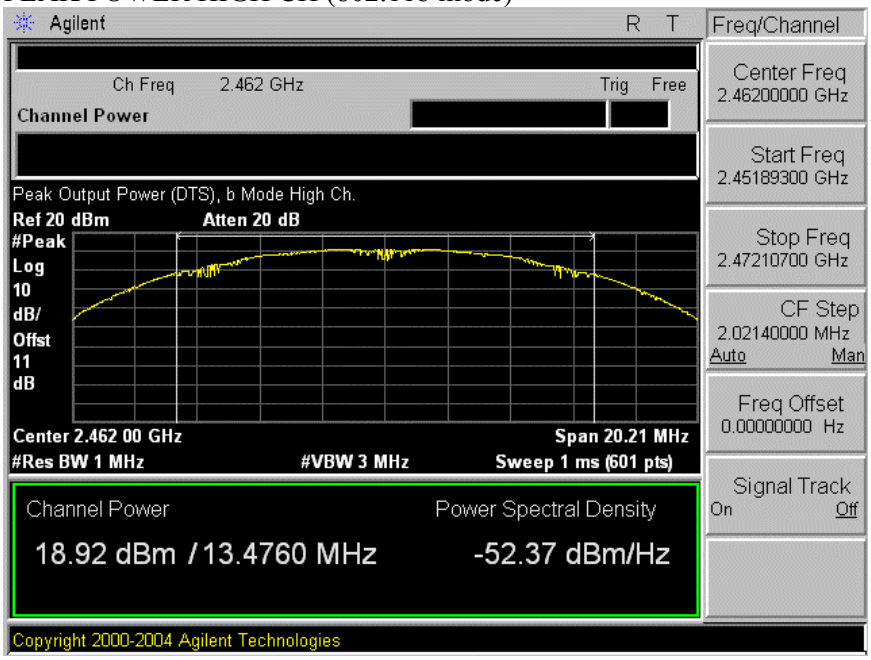
PEAK POWER LOW CH (802.11b mode)



PEAK POWER MID CH (802.11b mode)

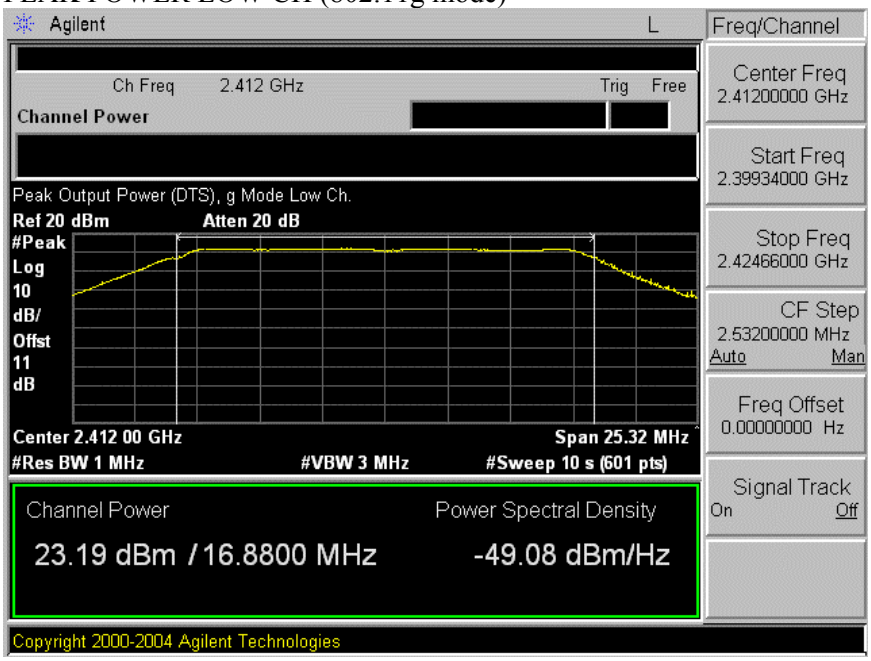


PEAK POWER HIGH CH (802.11b mode)

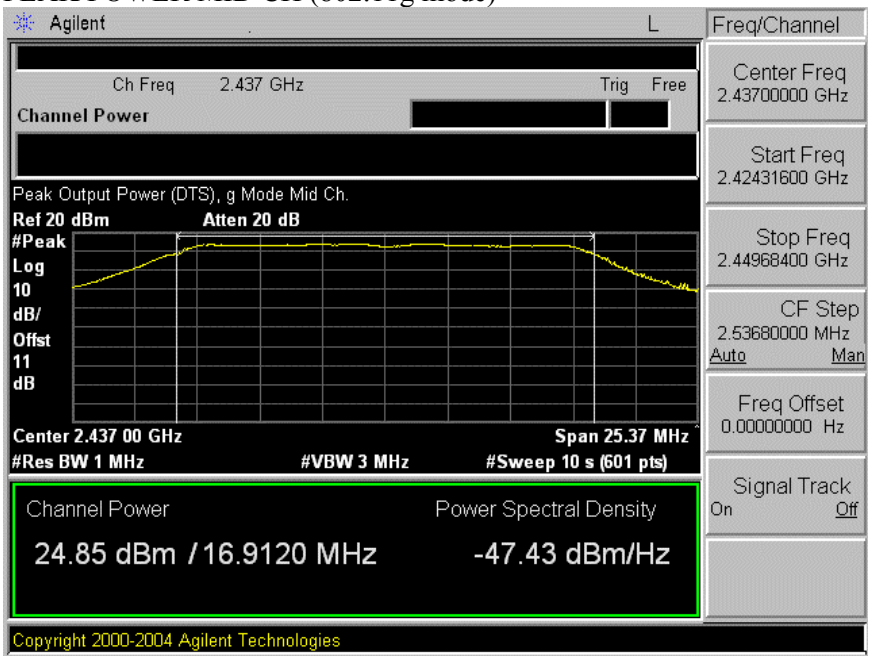


OUTPUT POWER (802.11g MODE)

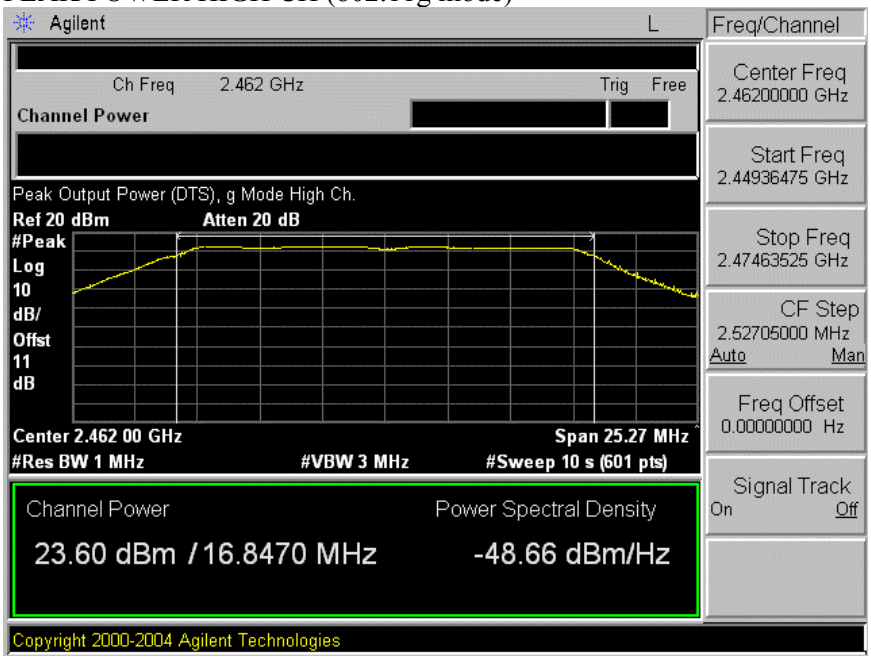
PEAK POWER LOW CH (802.11g mode)



PEAK POWER MID CH (802.11g mode)



PEAK POWER HIGH CH (802.11g mode)



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

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

where

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

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 \wedge ((P + G) / 10) / (d\wedge 2)$

LIMITS

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

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11b	20.0	16.74	0.64	0.01
802.11g	20.0	16.49	0.64	0.01

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 10.5 dB (including 10 dB pad and .49 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11b Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	16.63
Middle	2437	16.74
High	2462	16.52

802.11g Mode

Channel	Frequency (MHz)	Power (dBm)
Low	2412	15.31
Middle	2437	16.49
High	2462	15.26

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

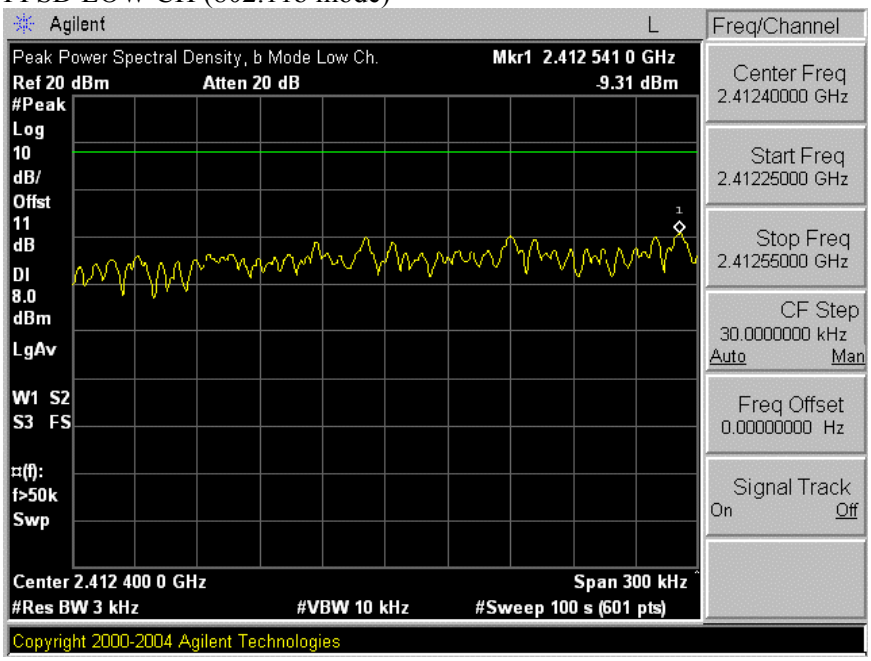
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.31	8	-17.31
Middle	2437	-9.13	8	-17.13
High	2462	-8.94	8	-16.94

802.11g Mode

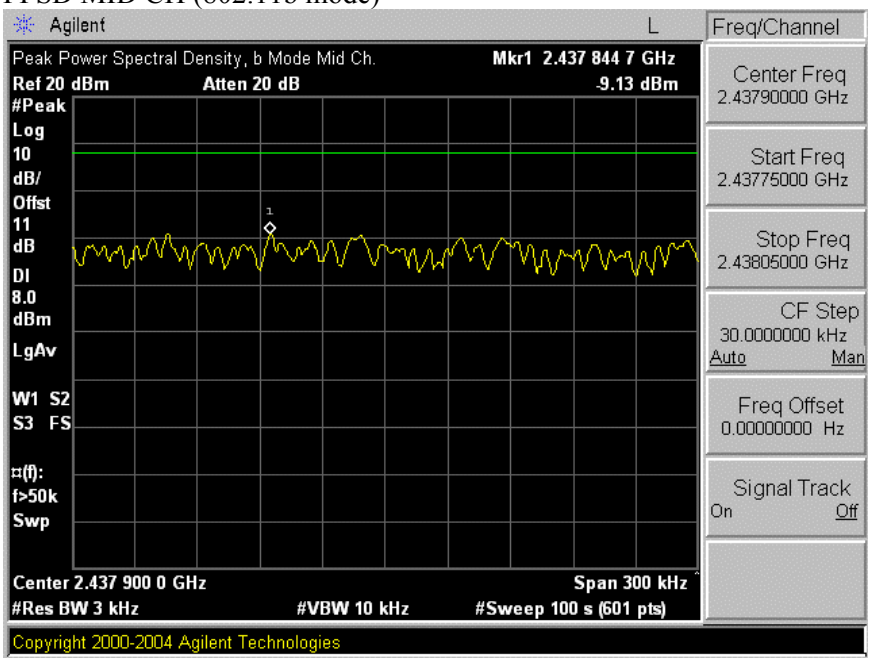
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.83	8	-17.83
Middle	2437	-8.02	8	-16.02
High	2462	-9.76	8	-17.76

PEAK POWER SPECTRAL DENSITY (802.11b MODE)

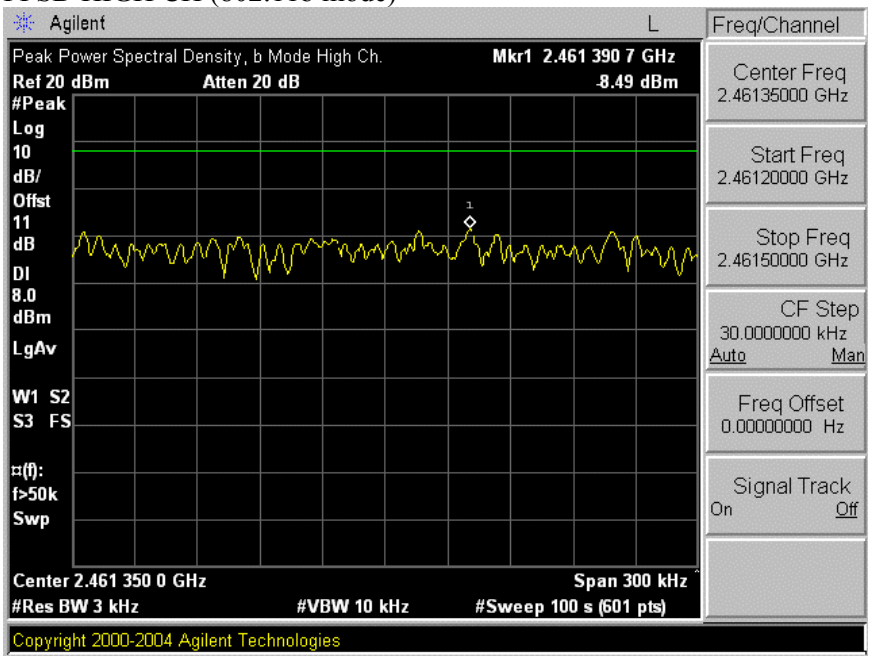
PPSD LOW CH (802.11b mode)



PPSD MID CH (802.11b mode)

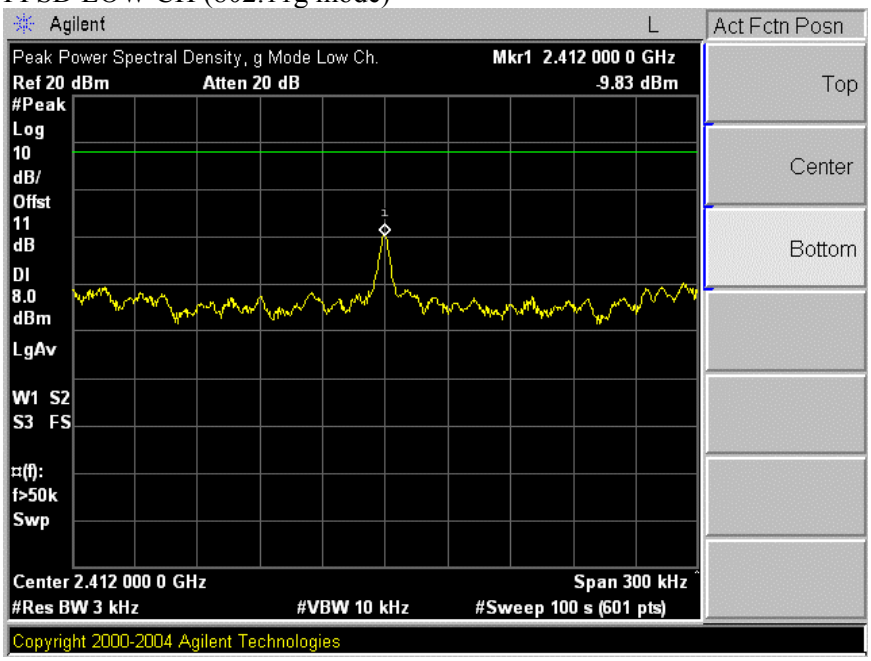


PPSD HIGH CH (802.11b mode)

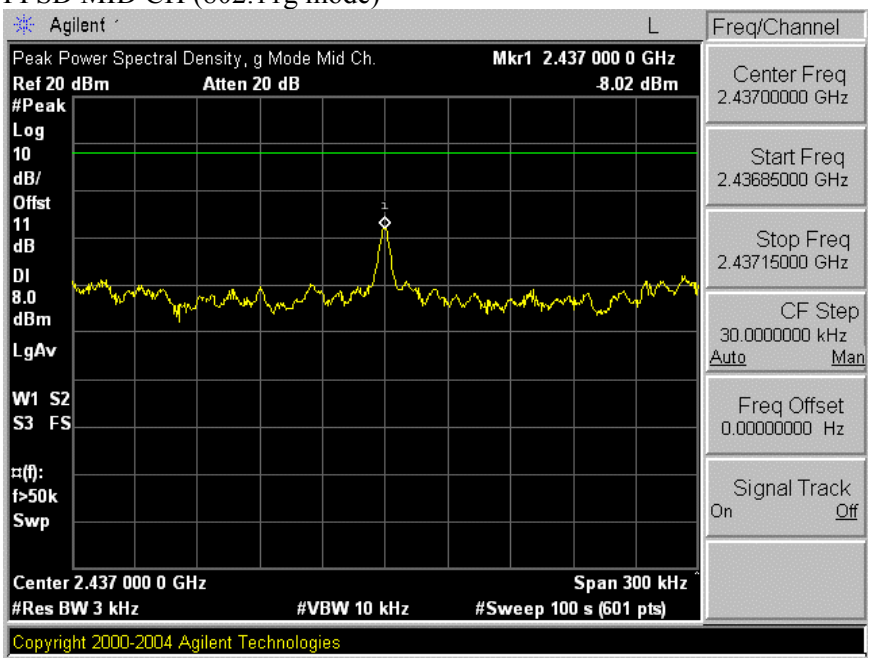


PEAK POWER SPECTRAL DENSITY (802.11g MODE)

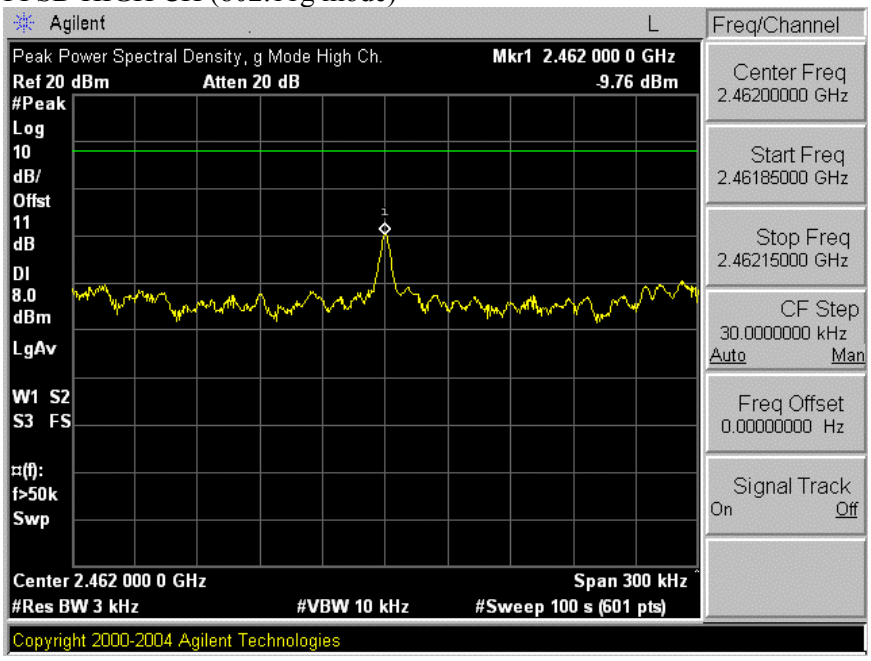
PPSD LOW CH (802.11g mode)



PPSD MID CH (802.11g mode)



PPSD HIGH CH (802.11g mode)



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.

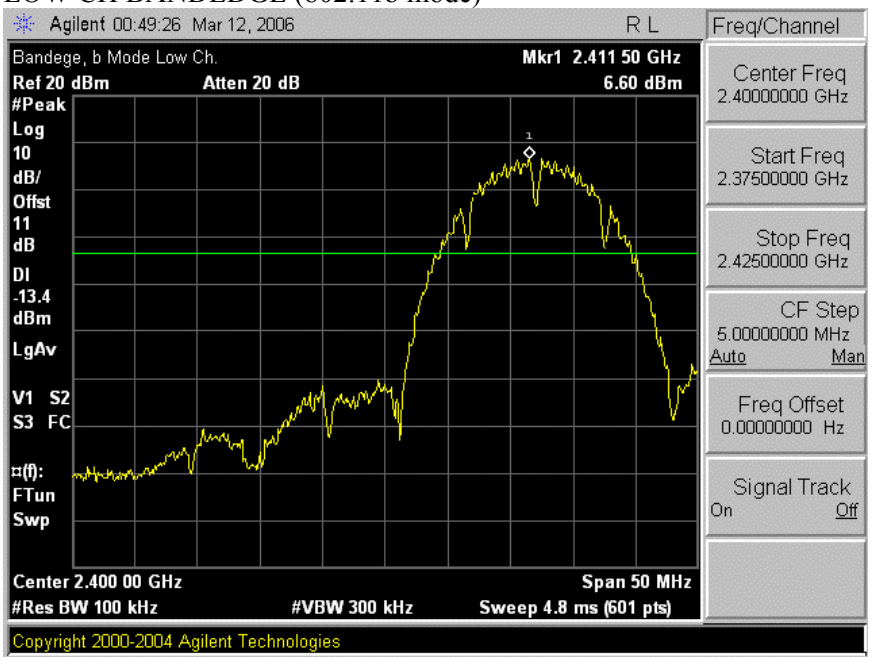
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

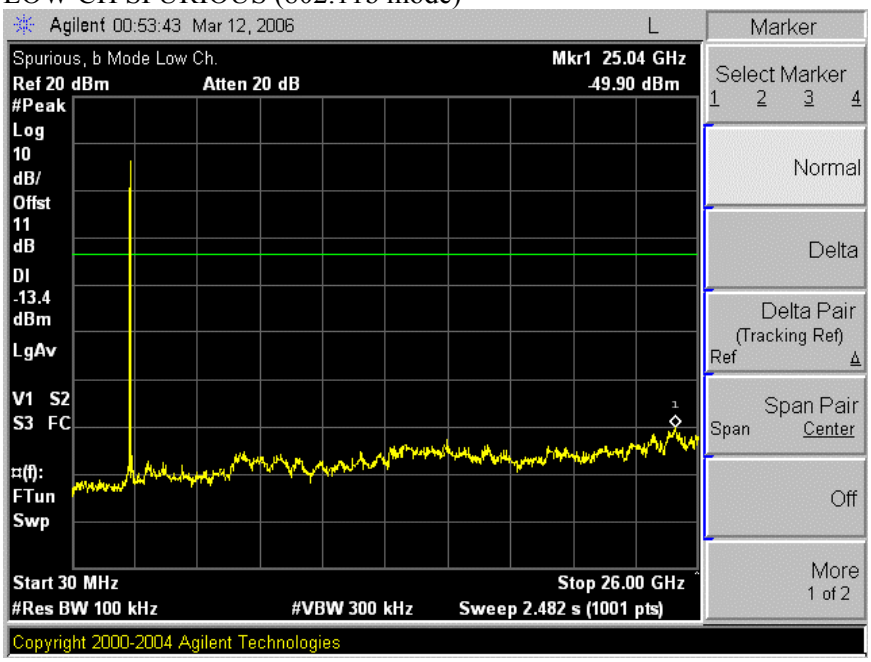
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)

LOW CH BANDEDGE (802.11b mode)

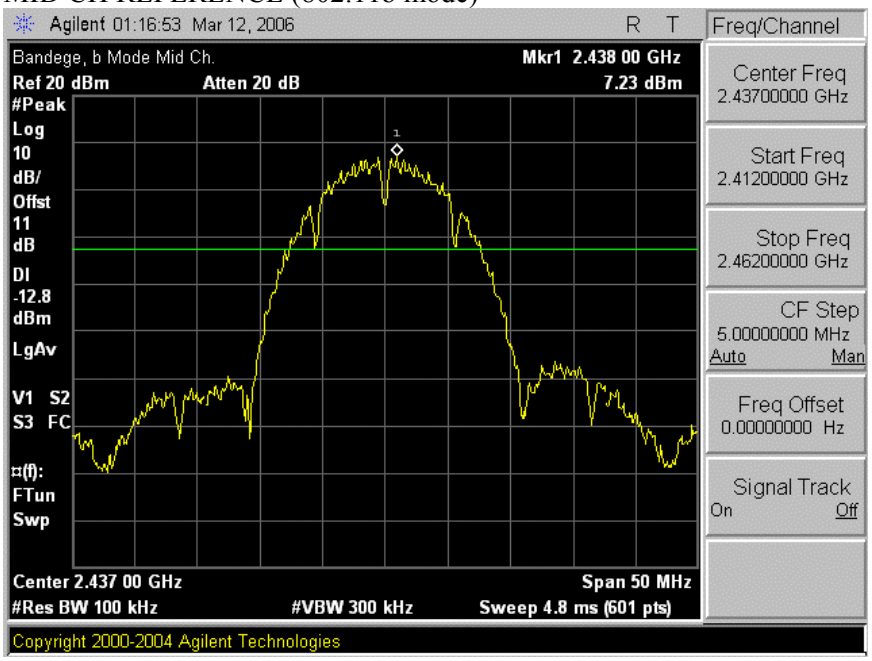


LOW CH SPURIOUS (802.11b mode)

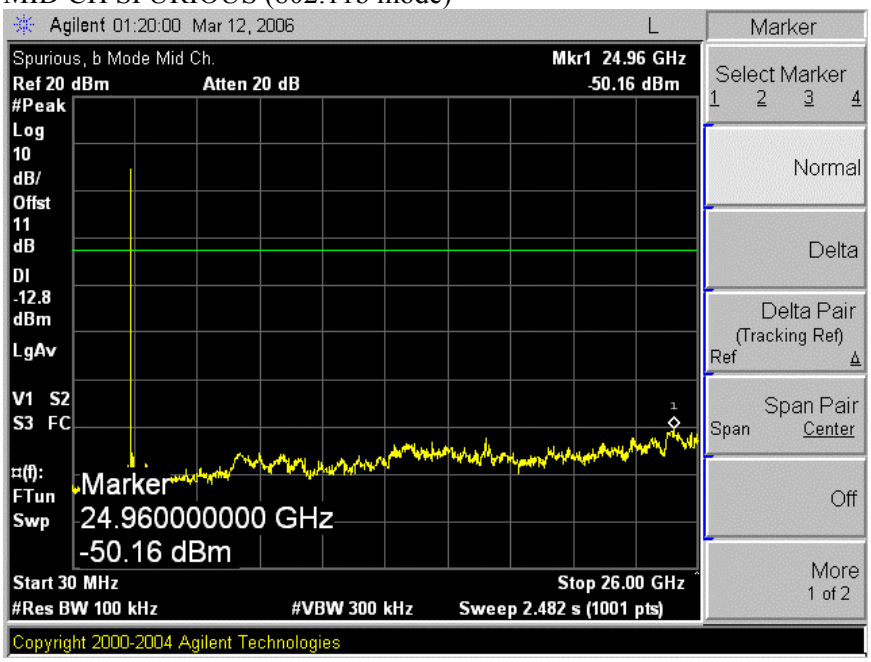


SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)

MID CH REFERENCE (802.11b mode)



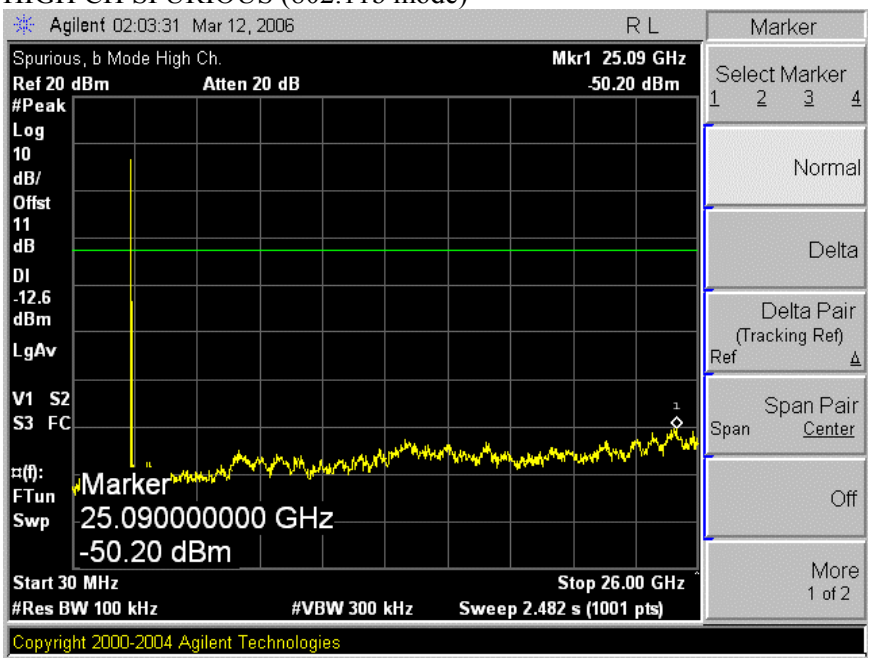
MID CH SPURIOUS (802.11b mode)



SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

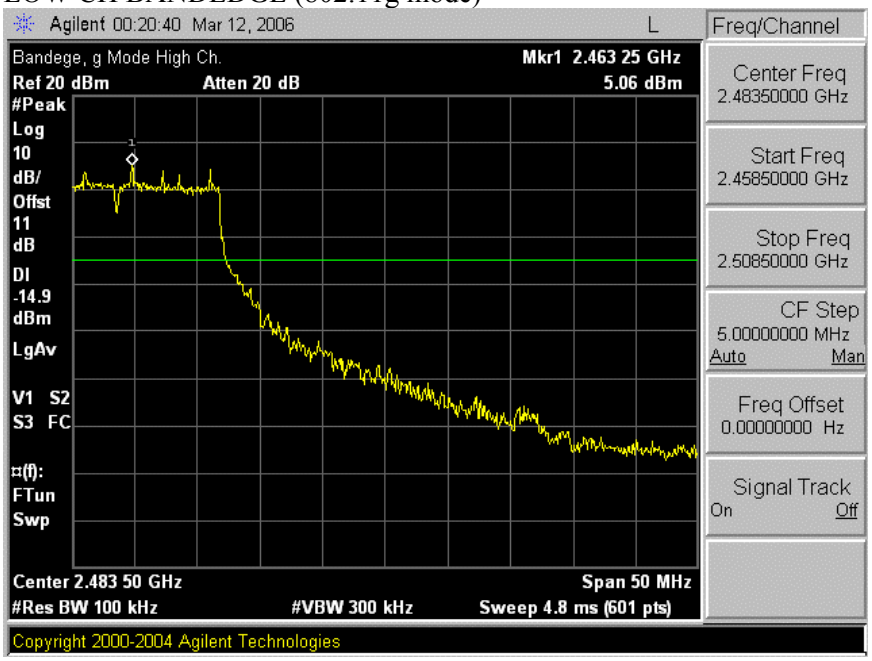
HIGH CH BANDEDGE (802.11b mode)

HIGH CH SPURIOUS (802.11b mode)

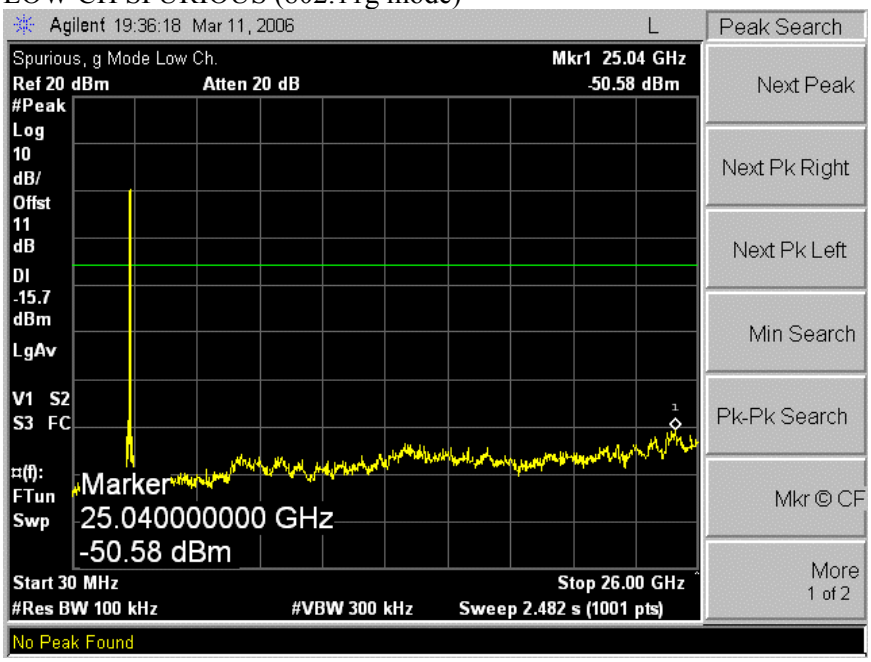


SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)

LOW CH BANDEDGE (802.11g mode)

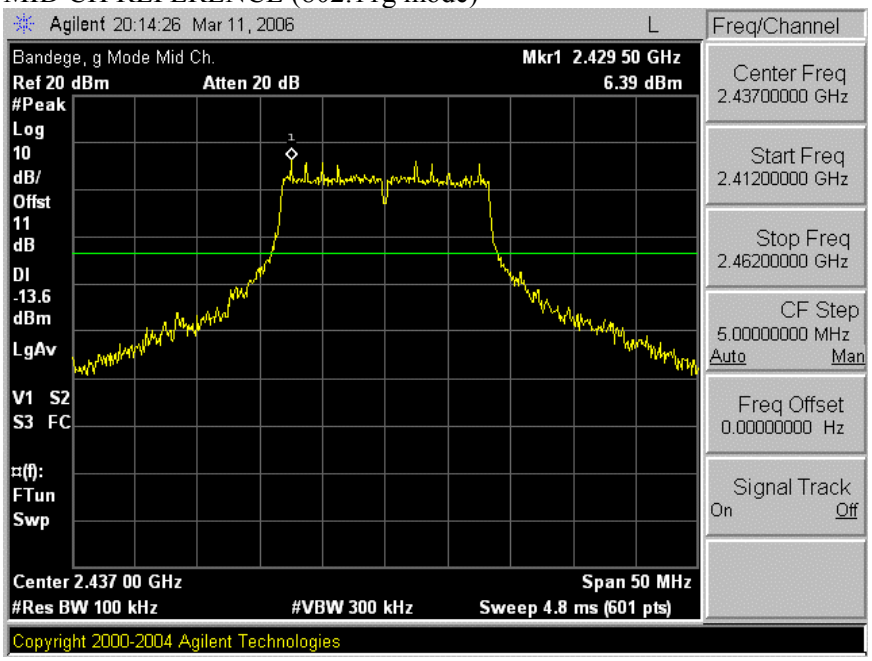


LOW CH SPURIOUS (802.11g mode)

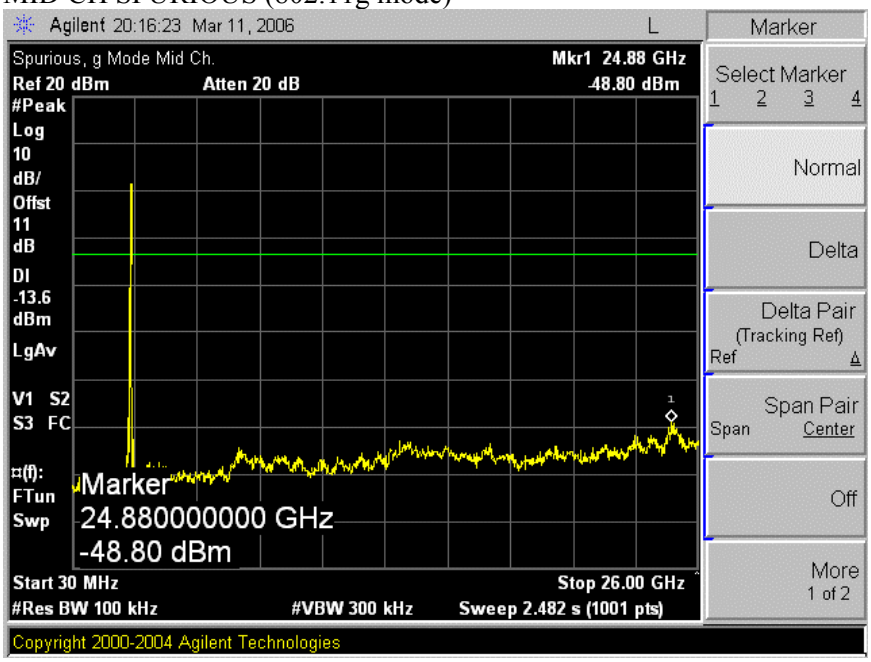


SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)

MID CH REFERENCE (802.11g mode)

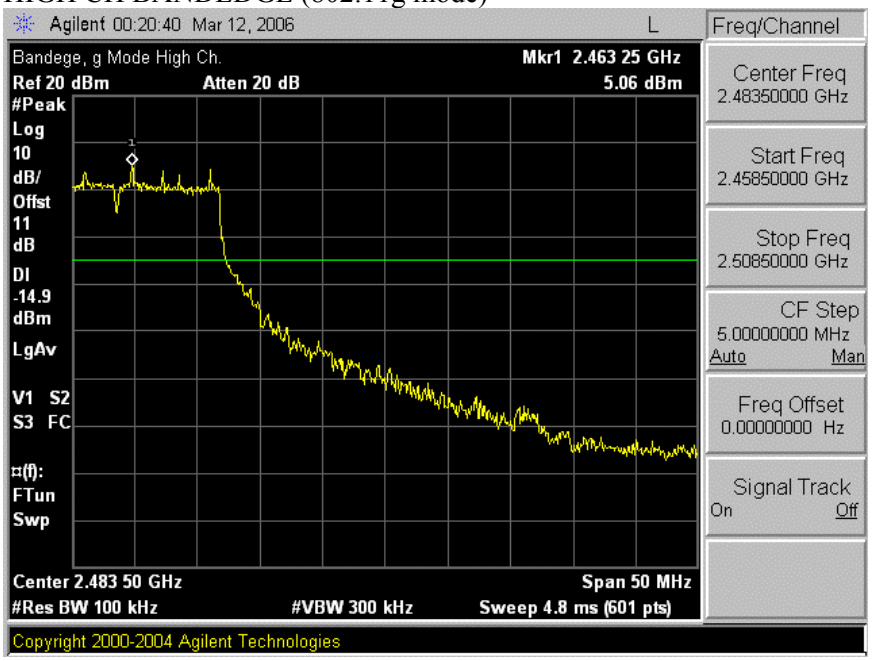


MID CH SPURIOUS (802.11g mode)

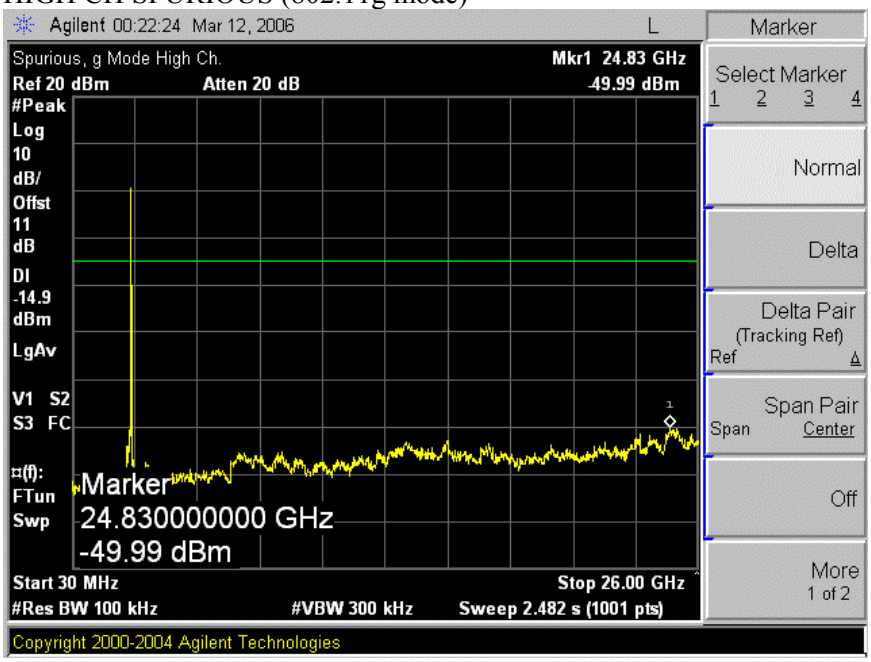


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)

HIGH CH BANDEDGE (802.11g mode)



HIGH CH SPURIOUS (802.11g mode)



7.2. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

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

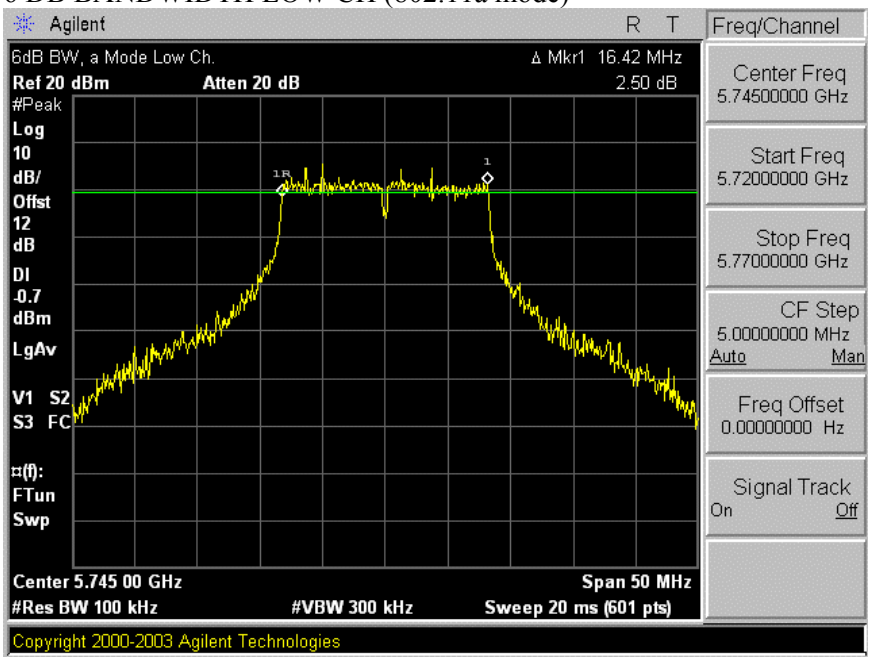
No non-compliance noted:

802.11a Mode

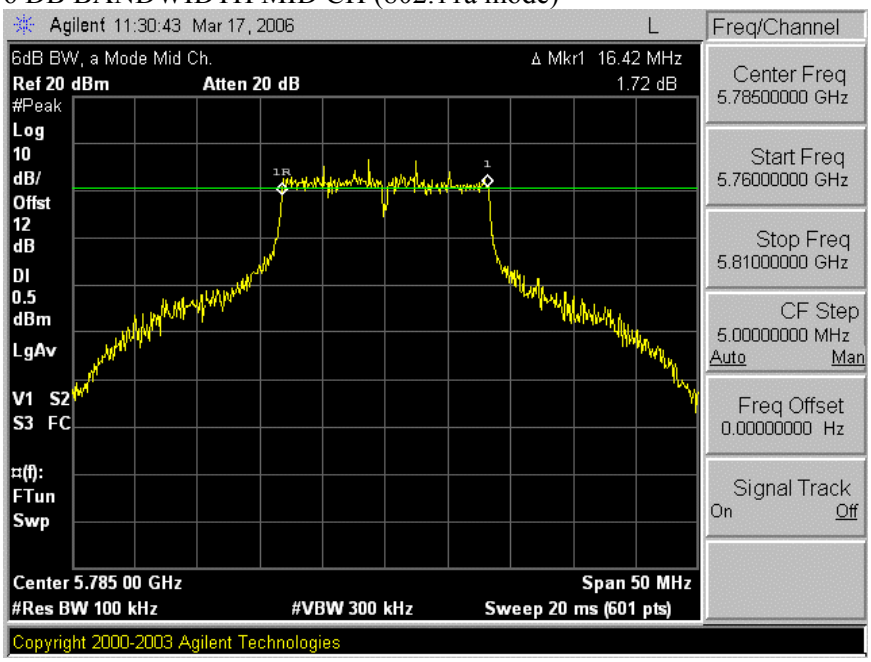
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)	Minimum Limit (kHz)	Margin (kHz)
Low	5745	16420	500	15920
Middle	5785	16420	500	15920
High	5825	16420	500	15920

6 DB BANDWIDTH (802.11a MODE)

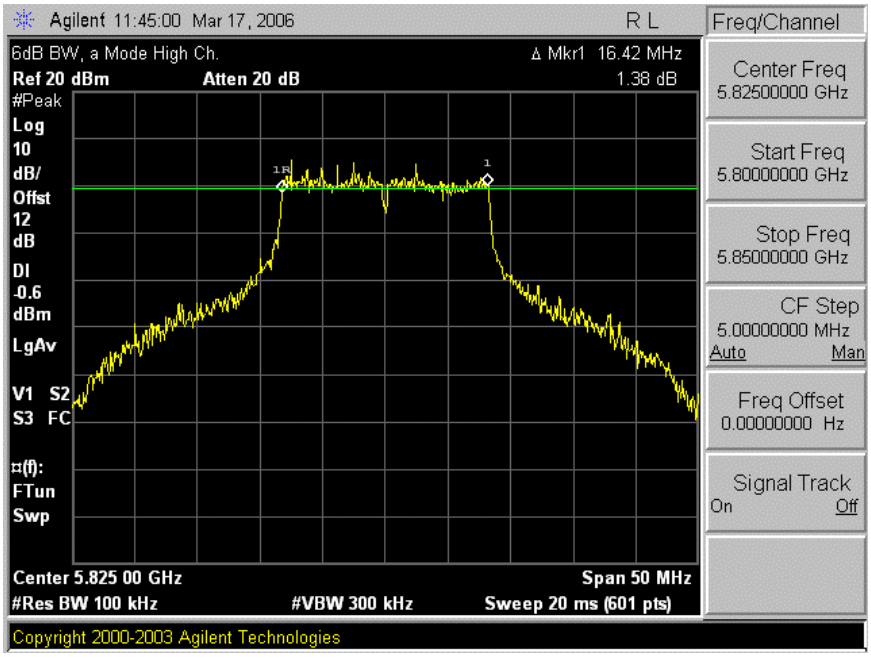
6 DB BANDWIDTH LOW CH (802.11a mode)



6 DB BANDWIDTH MID CH (802.11a mode)



6 DB BANDWIDTH HIGH CH (802.11a mode)



7.2.2. 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

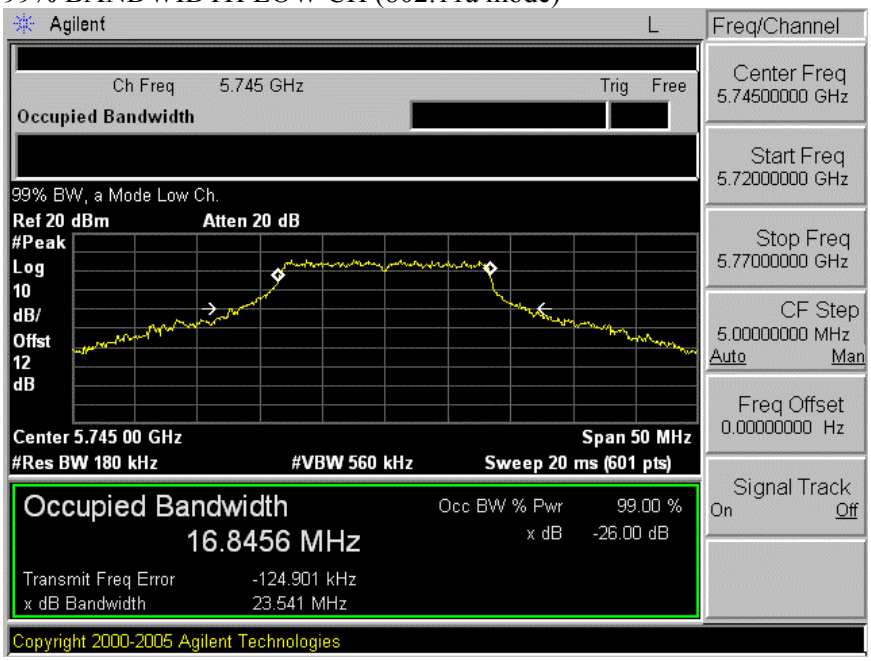
No non-compliance noted:

802.11a Mode

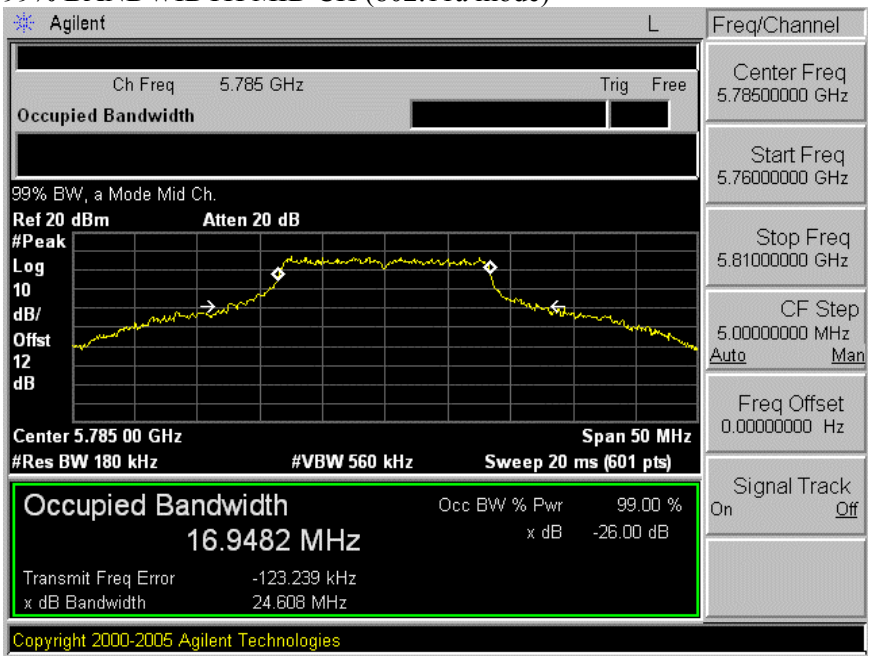
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5745	16.8456
Middle	5785	16.9482
High	5825	17.1079

99% BANDWIDTH (802.11a MODE)

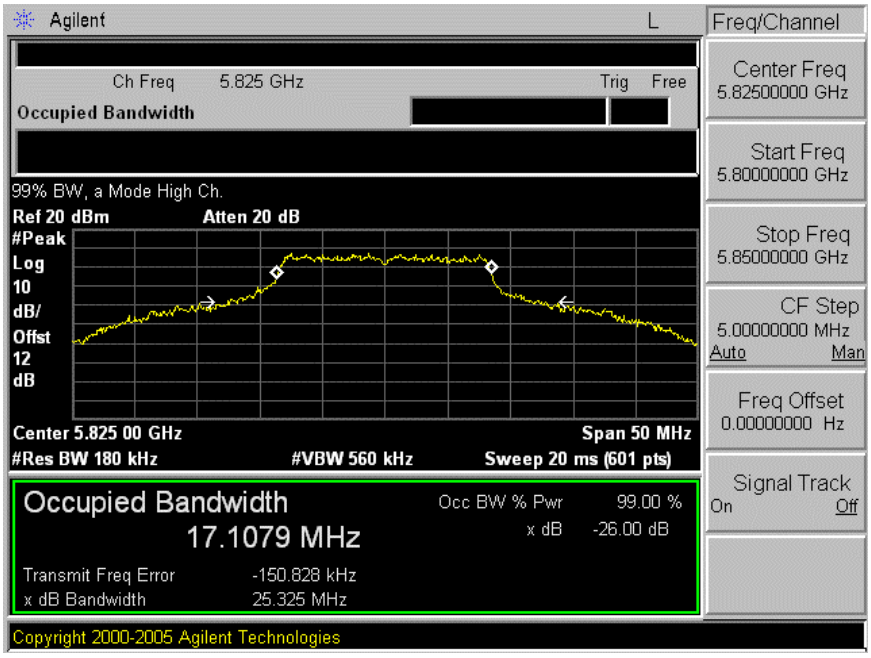
99% BANDWIDTH LOW CH (802.11a mode)



99% BANDWIDTH MID CH (802.11a mode)



99% BANDWIDTH HIGH CH (802.11a mode)



7.2.3. 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)(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.

§15.247 (b) (4) (ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

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 antenna gain is –2.05 dBi for other than fixed, point-to-point operations, therefore the limit is 30 dBm.

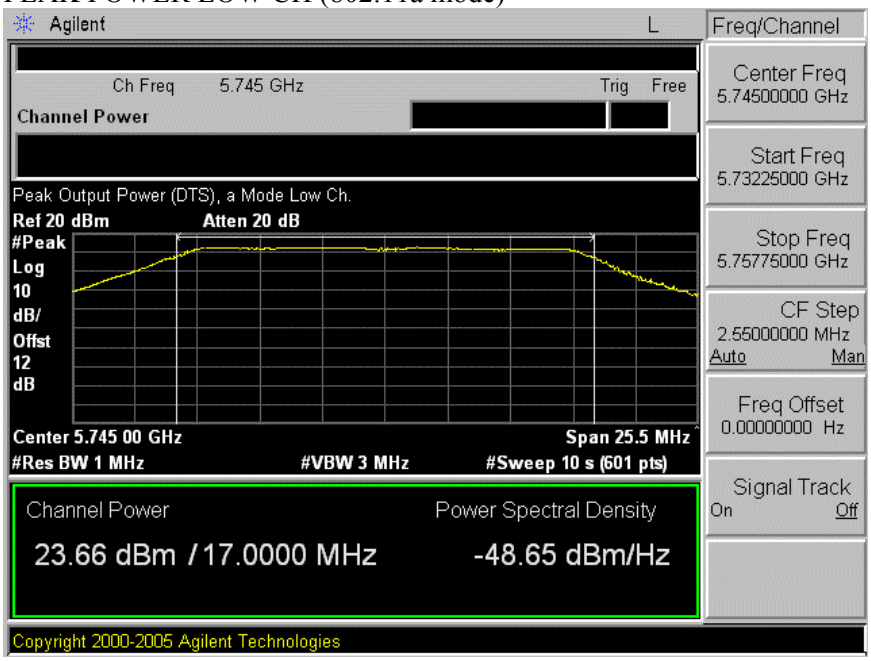
No non-compliance noted:

802.11a Mode

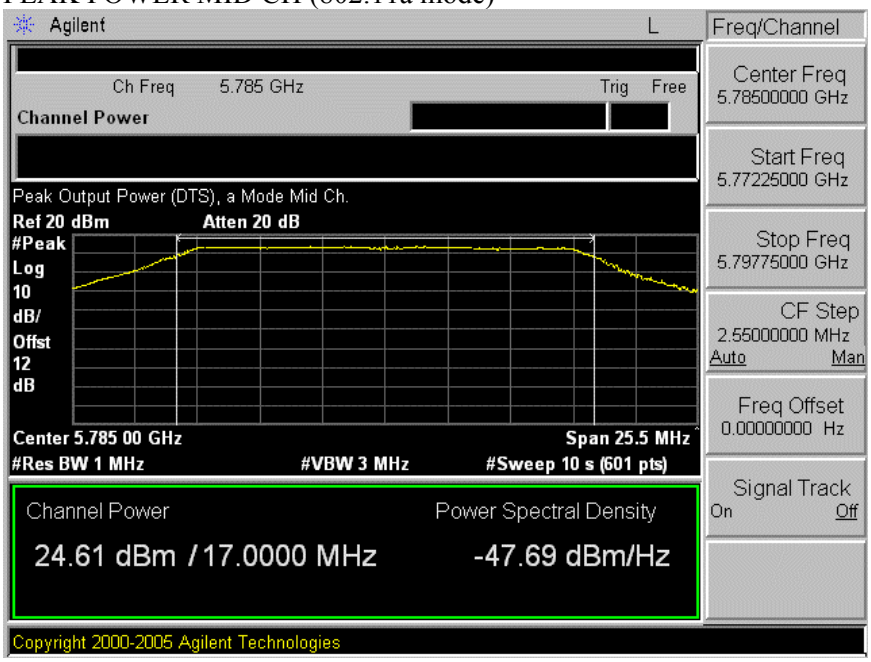
Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
Low	5745	23.66	30	-6.34
Middle	5785	24.61	30	-5.39
High	5825	24.86	30	-5.14

OUTPUT POWER (802.11a MODE)

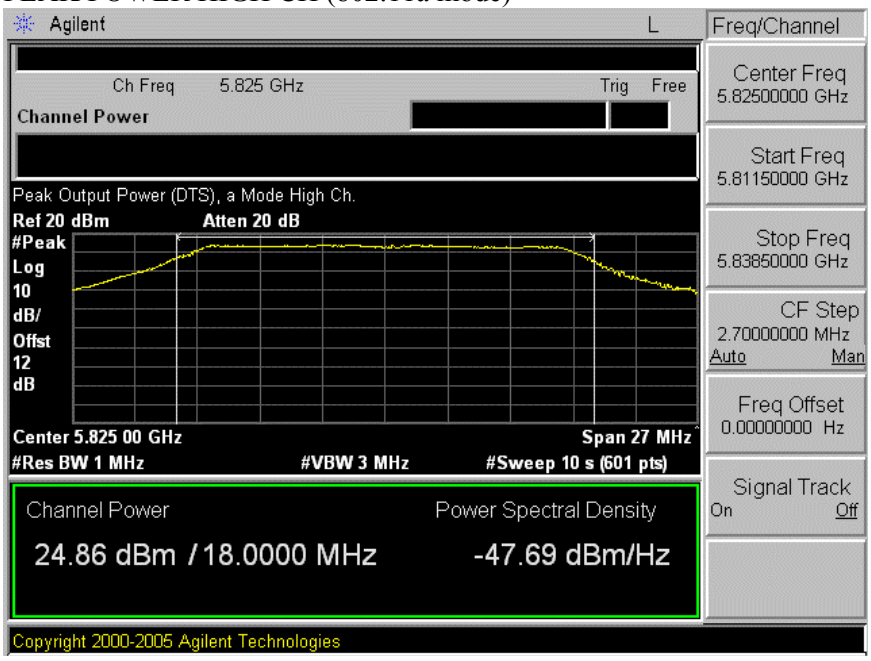
PEAK POWER LOW CH (802.11a mode)



PEAK POWER MID CH (802.11a mode)



PEAK POWER HIGH CH (802.11a mode)



7.2.4. 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

Substituting the logarithmic form of power and gain using:

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

yields

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

where

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

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 \wedge ((P + G) / 10) / (d^2)$

LIMITS

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

RESULTS

No non-compliance noted: (MPE distance equals 20 cm)

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11a	20.0	24.86	-2.05	0.04

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 dB (including 10 dB pad and 1 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	17.56
Middle	5785	17.65
High	5825	17.63

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

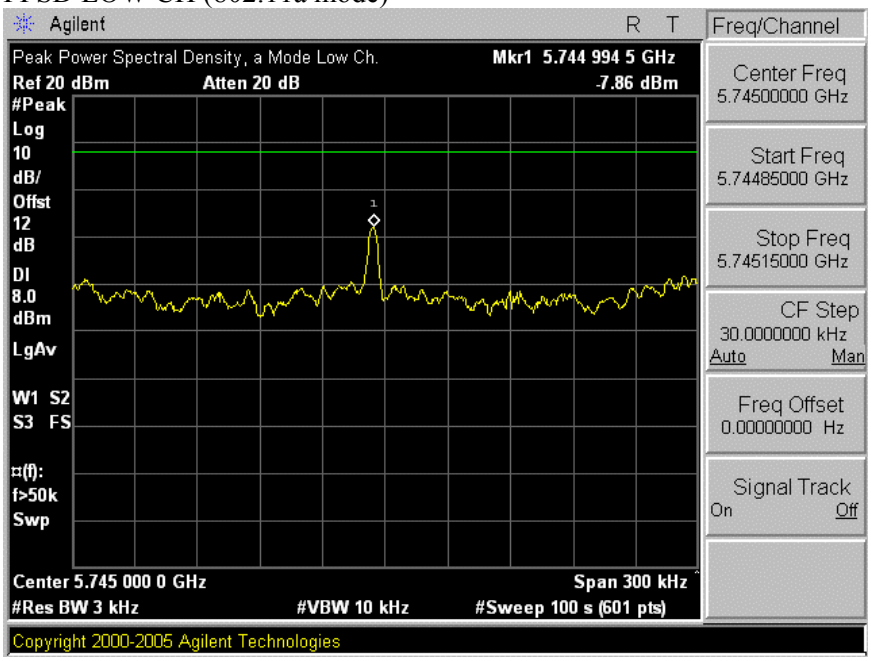
No non-compliance noted:

802.11a Mode

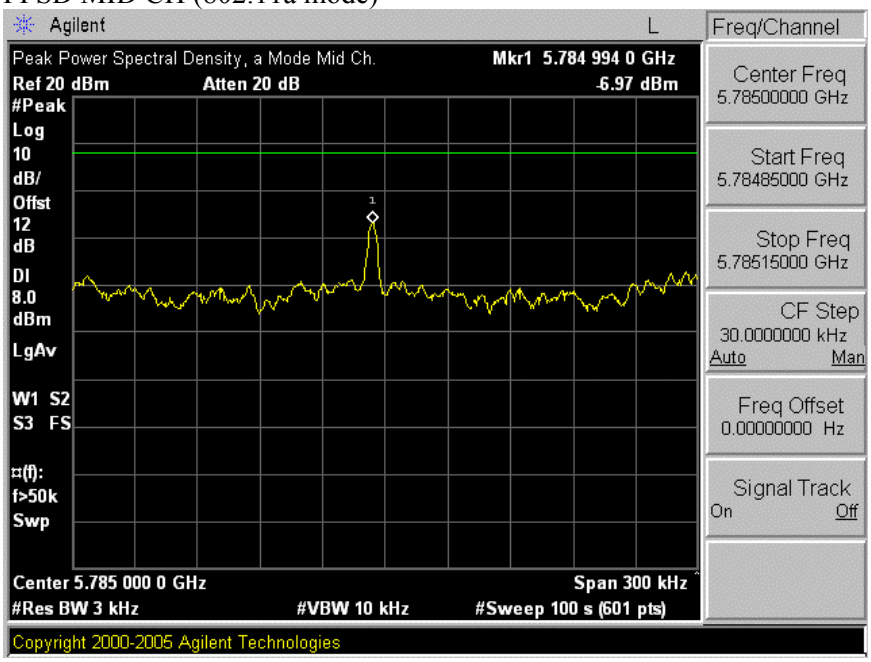
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5745	-7.86	8	-15.86
Middle	5785	-6.97	8	-14.97
High	5825	-8.16	8	-16.16

PEAK POWER SPECTRAL DENSITY (802.11a MODE)

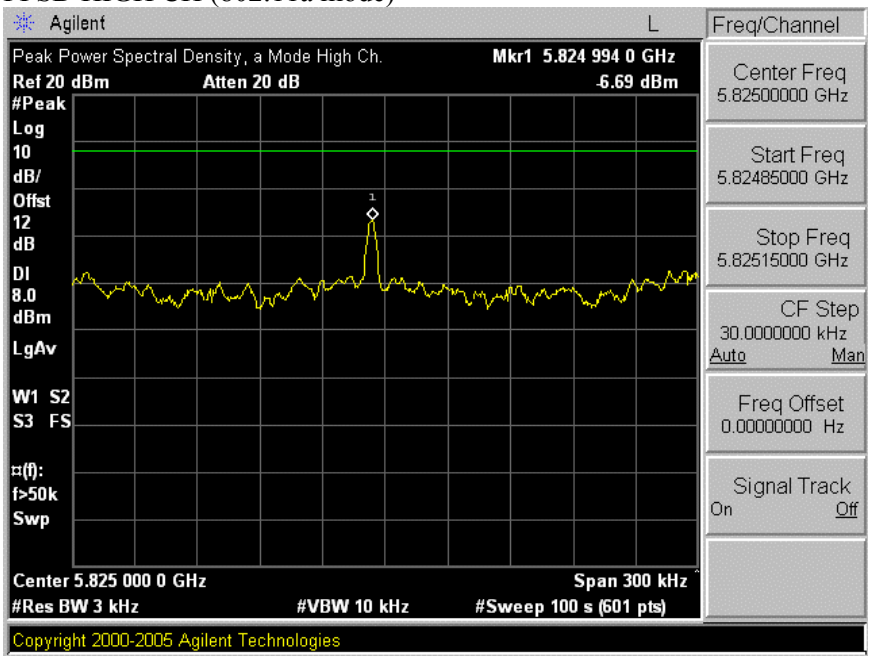
PPSD LOW CH (802.11a mode)



PPSD MID CH (802.11a mode)



PPSD HIGH CH (802.11a mode)



7.2.7. 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.

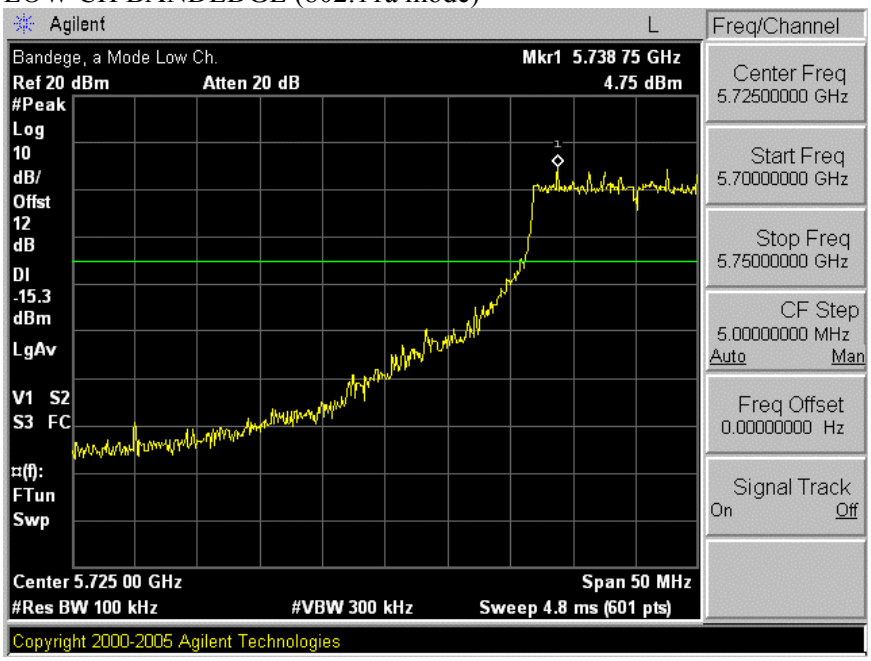
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

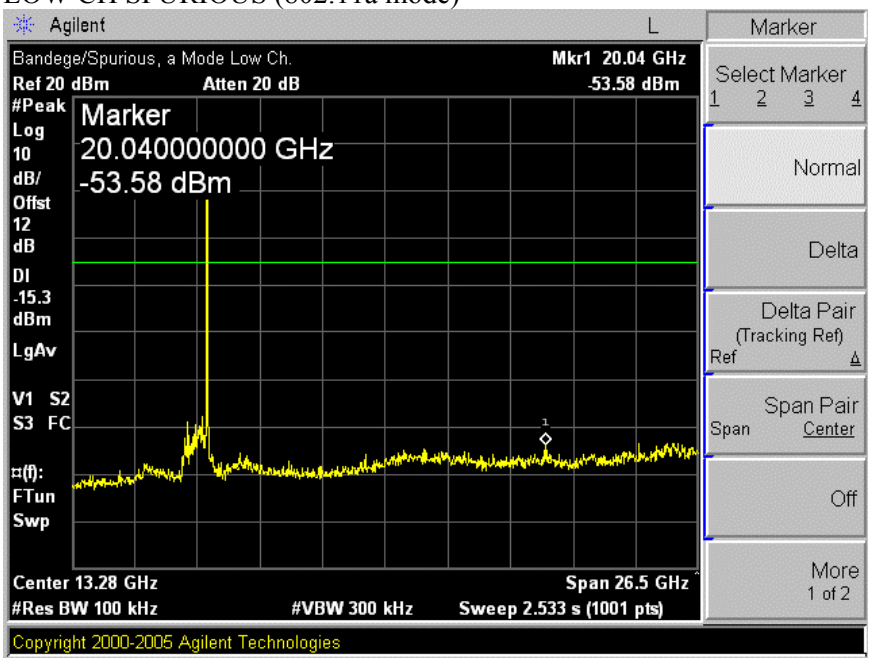
No non-compliance noted:

SPURIOUS EMISSIONS, LOW CHANNEL (802.11a MODE)

LOW CH BANDEDGE (802.11a mode)

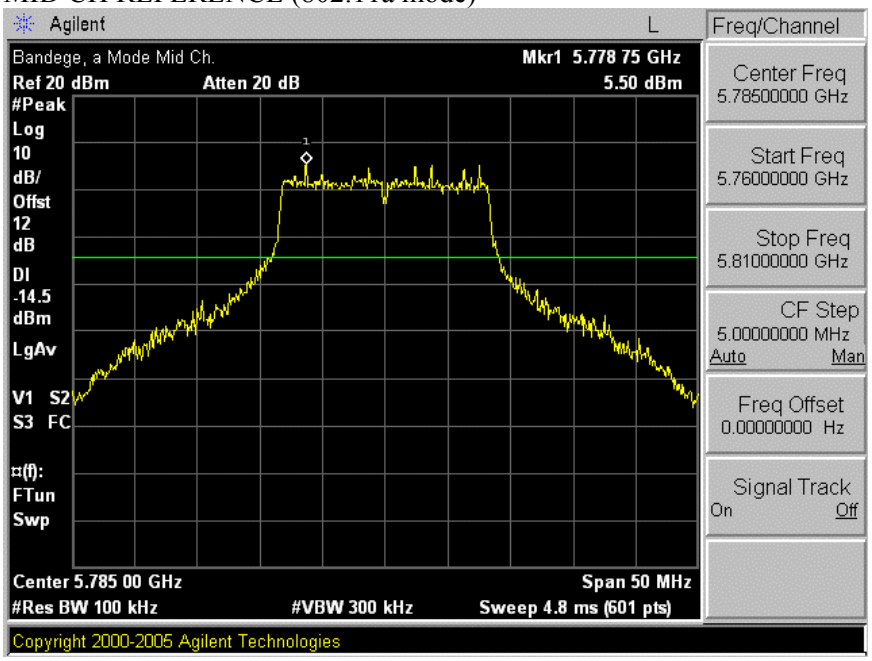


LOW CH SPURIOUS (802.11a mode)

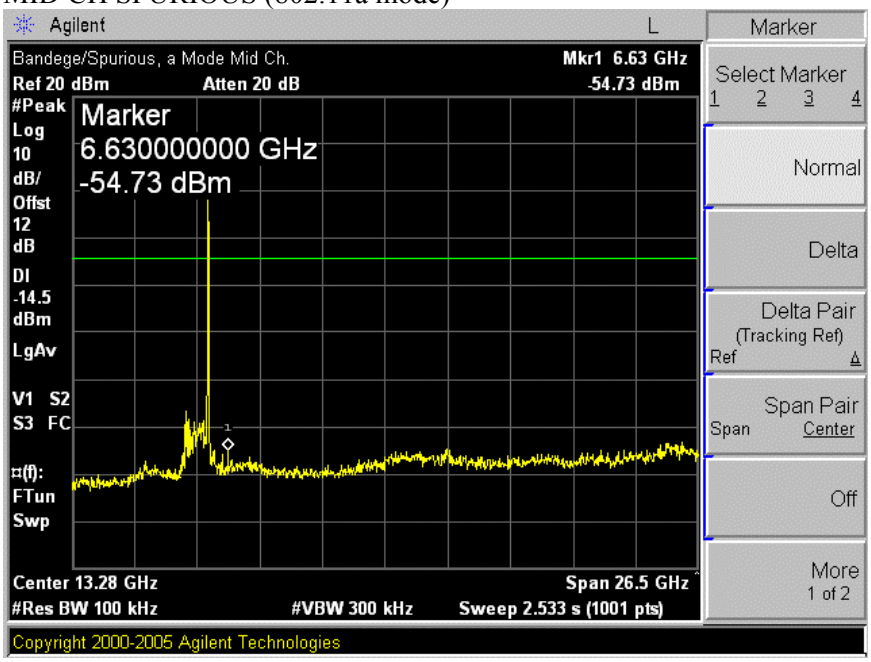


SPURIOUS EMISSIONS, MID CHANNEL (802.11a MODE)

MID CH REFERENCE (802.11a mode)

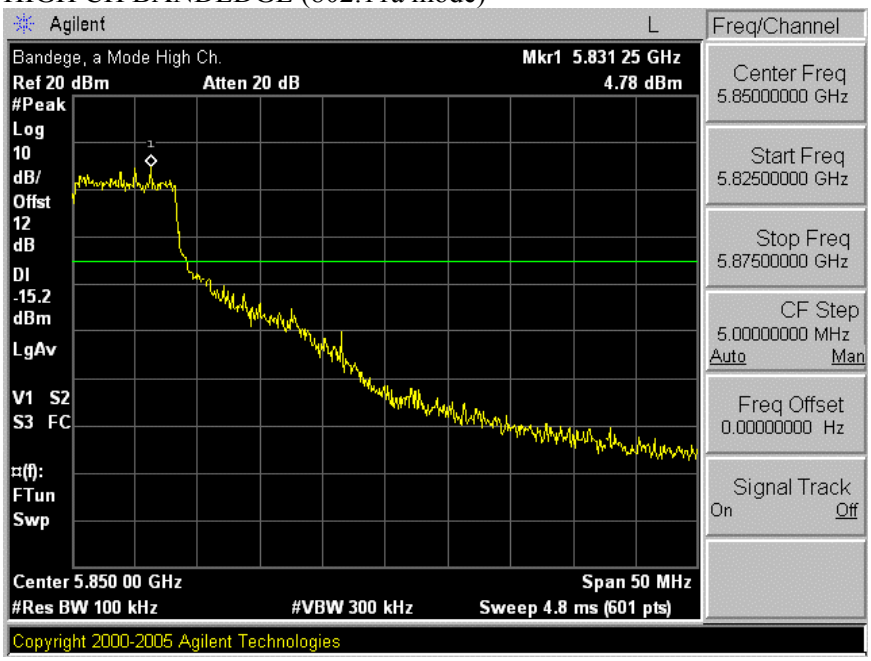


MID CH SPURIOUS (802.11a mode)

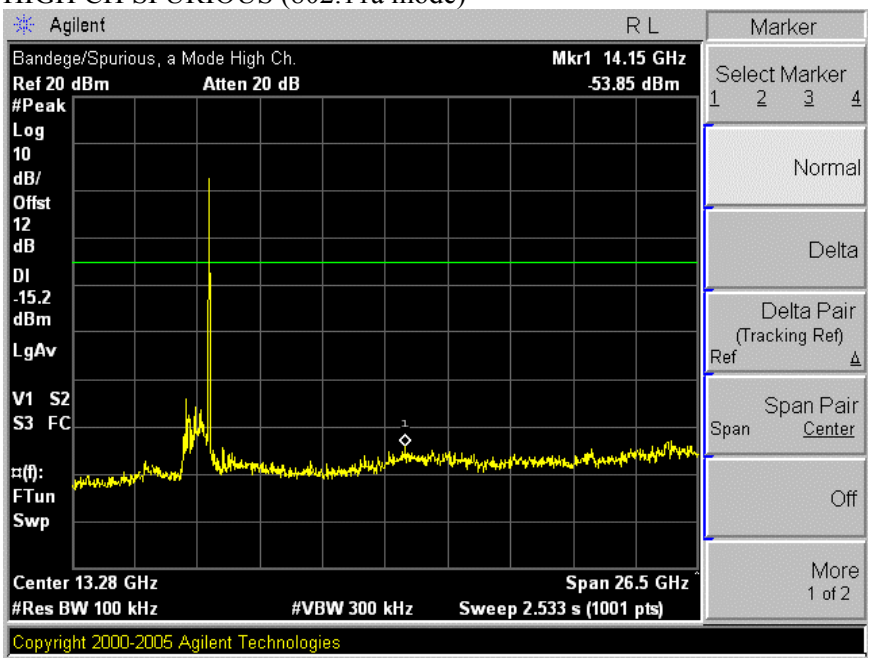


SPURIOUS EMISSIONS, HIGH CHANNEL (802.11a MODE)

HIGH CH BANDEDGE (802.11a mode)



HIGH CH SPURIOUS (802.11a mode)



7.3. 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.

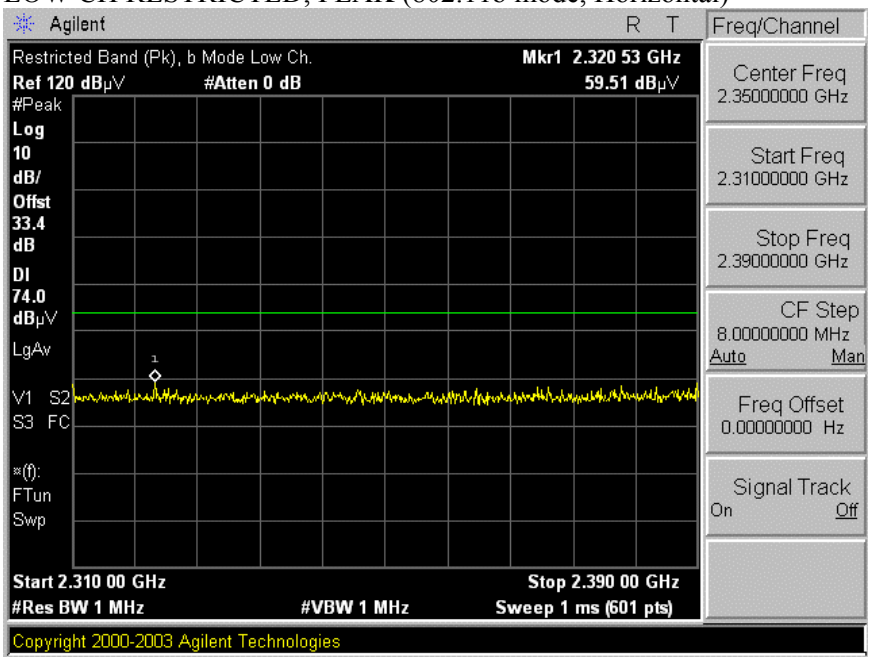
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

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.

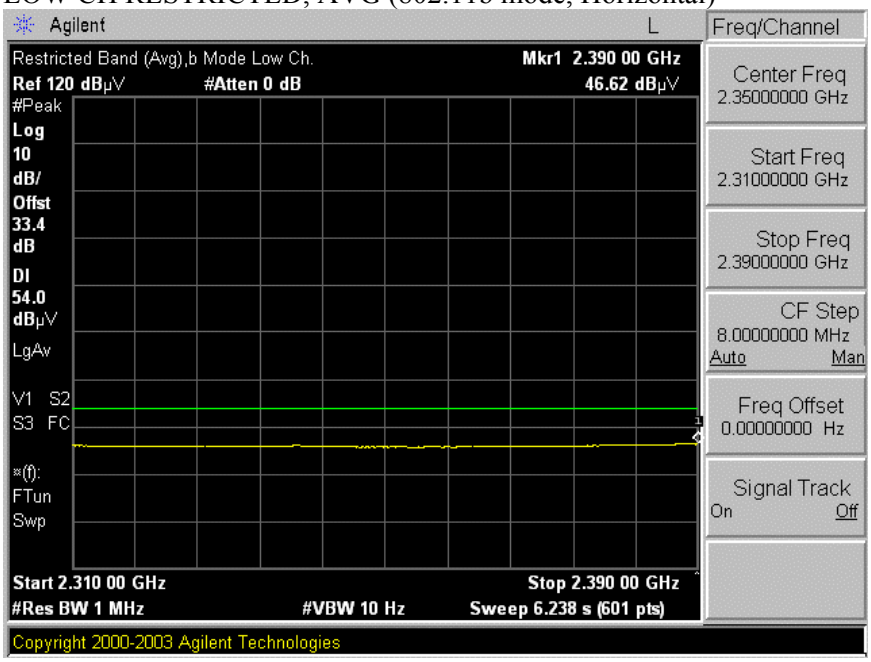
7.3.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)

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

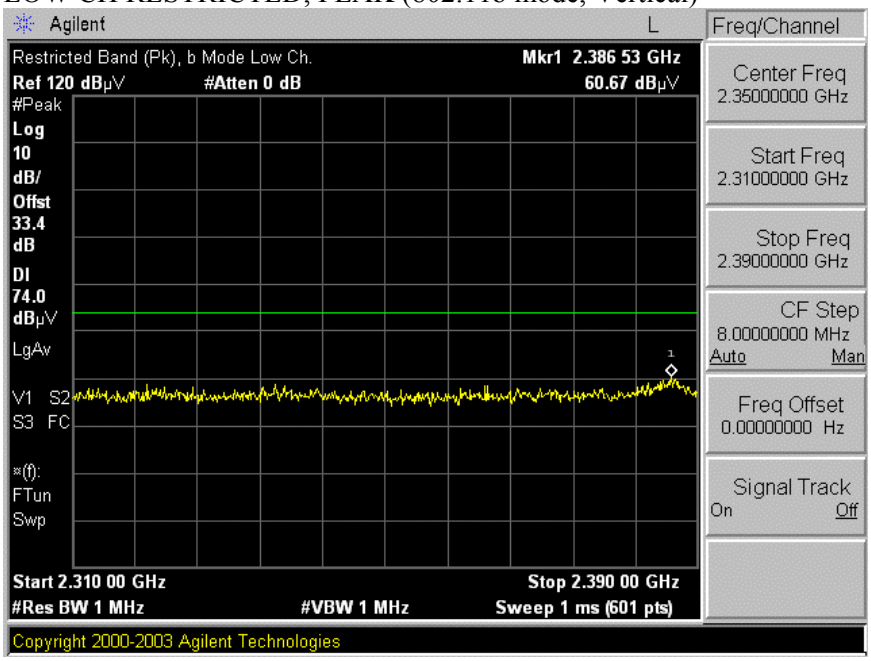


LOW CH RESTRICTED, AVG (802.11b mode, Horizontal)

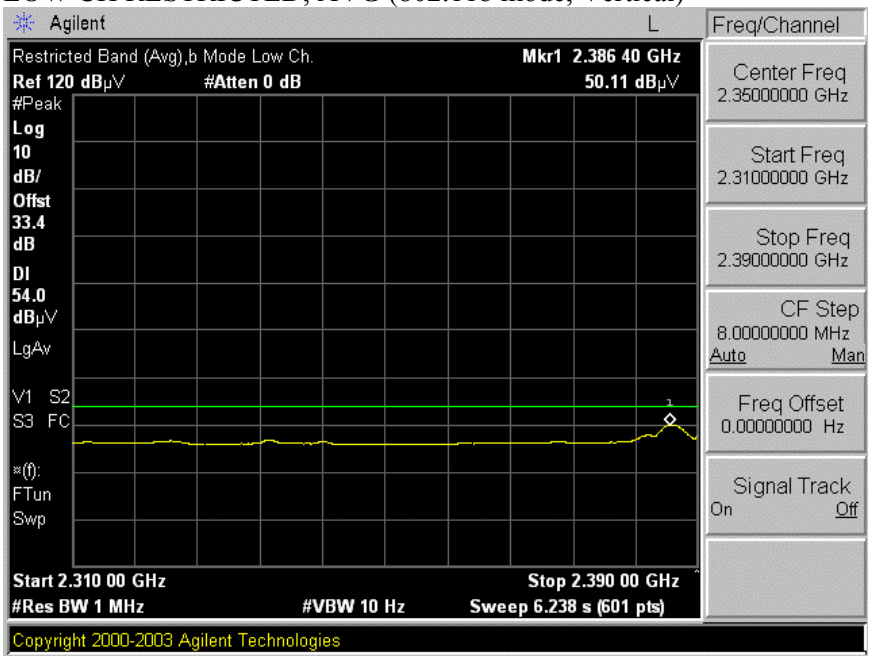


RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)

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

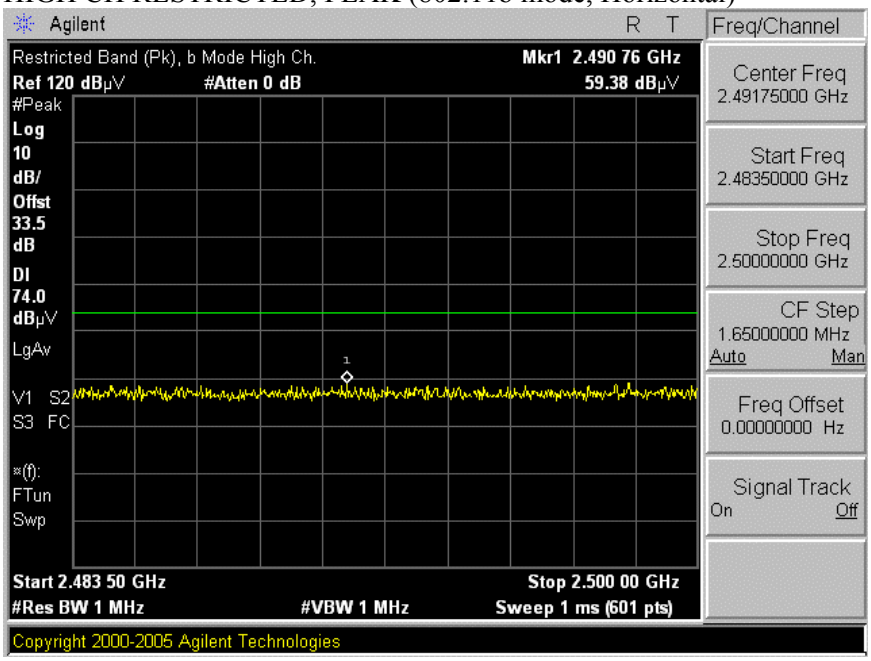


LOW CH RESTRICTED, AVG (802.11b mode, Vertical)

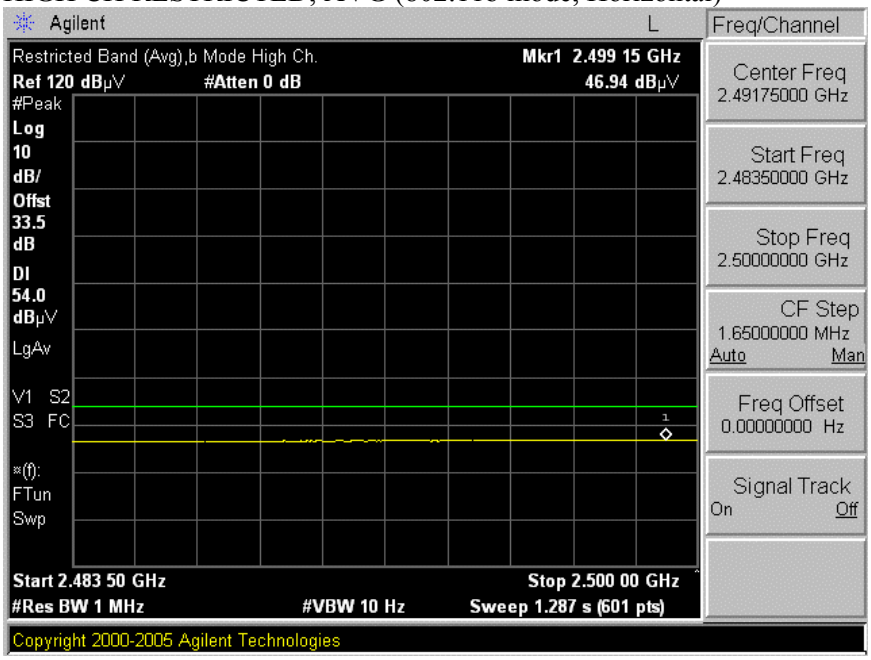


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)

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

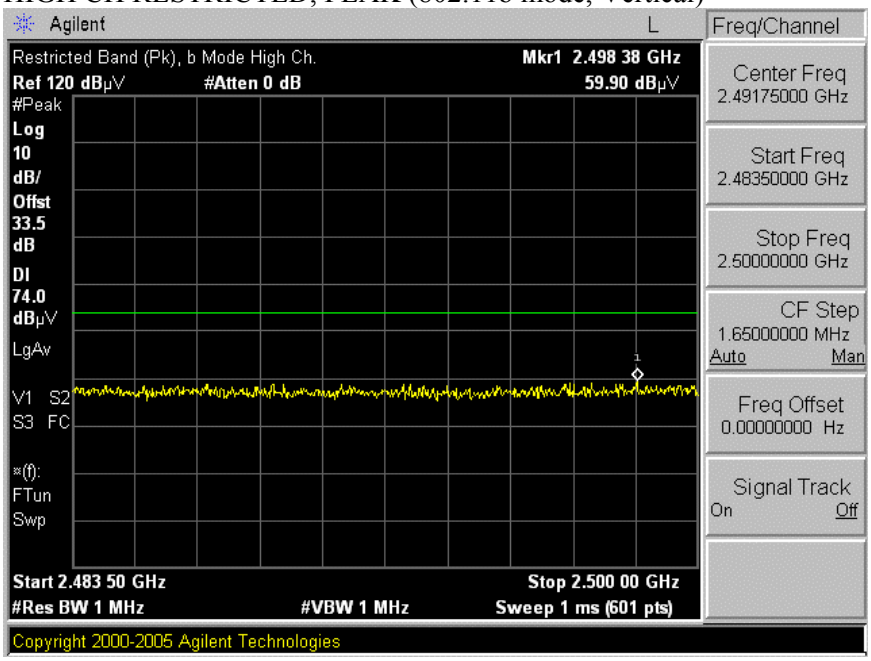


HIGH CH RESTRICTED, AVG (802.11b mode, Horizontal)

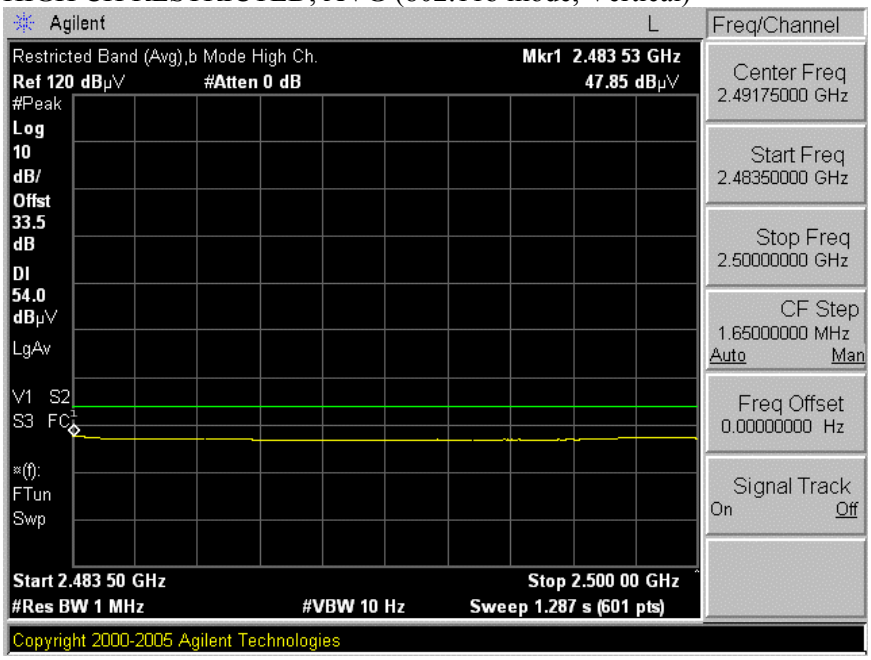


RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

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



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



HARMONICS AND SPURIOUS EMISSIONS (b MODE)

03/20/06 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engineer: Thanh Nguyen
Project #: 06U10130
Company: Intel
EUT Description: 802.11 a/b/g Mini PCI type 3 card
EUT M/N: Kirtland
EUT S/N: 000529096(Card #2)
Test Target: FCC UNII WLAN
Mode Of Operation: Tx b mode
Average Power Meter: Low = 16.5 dBm, Mid = 16.5 dBm, High = 16.5 dBm

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_7.6GHz	

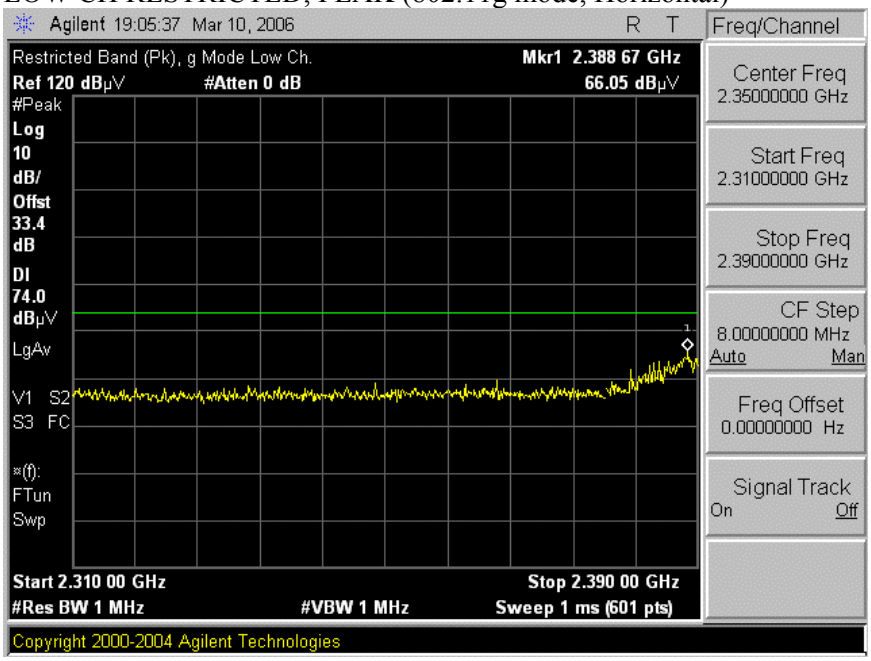
Peak Measurements RBW=VBW=1MHz
Average Measurements RBW=1MHz ; VBW=10Hz

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)
Tx Ch 11, 2462MHz															
4.924	3.0	49.73	44.71	34.1	2.8	-34.9	0.0	0.0	51.8	46.8	74	54	-22.2	-7.2	V
7.386	3.0	45.94	38.36	35.7	3.3	-34.6	0.0	0.6	50.9	43.3	74	54	-23.1	-10.7	V
9.848	3.0	43.54	32.04	33.6	3.7	-35.1	0.0	0.8	46.7	35.2	74	54	-27.3	-18.8	V
12.310	3.0	43.86	33.00	38.5	4.4	-32.4	0.0	0.7	55.0	44.1	74	54	-19.0	-9.9	V
14.772	3.0	42.71	30.85	39.7	4.6	-32.4	0.0	0.8	55.3	43.4	74	54	-18.7	-10.6	Noise floor
4.924	3.0	47.85	40.75	34.1	2.8	-34.9	0.0	0.0	49.9	42.8	74	54	-24.1	-11.2	H
7.386	3.0	47.70	40.66	35.7	3.3	-34.6	0.0	0.6	52.7	45.6	74	54	-21.3	-8.4	H
9.848	3.0	50.44	46.06	33.5	3.7	-35.1	0.0	0.8	53.5	49.1	74	54	-20.5	-4.9	H
12.310	3.0	44.77	34.04	38.5	4.4	-32.4	0.0	0.7	55.9	45.2	74	54	-18.1	-8.8	H
14.772	3.0	42.71	30.85	39.7	4.6	-32.4	0.0	0.8	55.3	43.4	74	54	-18.7	-10.6	Noise floor
Tx Ch 6, 2437MHz															
4.874	3.0	48.74	43.08	34.1	2.8	-34.9	0.0	0.0	50.8	45.1	74	54	-23.2	-8.9	V
7.311	3.0	47.30	39.50	35.6	3.3	-34.7	0.0	0.6	52.3	44.5	74	54	-21.7	-9.5	V
9.748	3.0	46.60	41.09	33.5	3.7	-35.0	0.0	0.8	49.6	44.1	74	54	-24.4	-9.9	V
12.185	3.0	42.61	31.43	38.5	4.3	-32.4	0.0	0.7	53.7	42.5	74	54	-20.3	-11.5	V
14.622	3.0	42.77	30.58	39.6	4.6	-32.4	0.0	0.8	55.2	43.0	74	54	-18.8	-11.0	Noise floor
4.874	3.0	46.92	40.39	34.1	2.8	-34.9	0.0	0.0	48.9	42.4	74	54	-25.1	-11.6	H
7.311	3.0	47.84	42.33	35.6	3.3	-34.7	0.0	0.6	52.8	47.3	74	54	-21.2	-6.7	H
9.748	3.0	49.38	46.52	33.5	3.7	-35.0	0.0	0.8	52.4	49.5	74	54	-21.6	-4.5	H
12.185	3.0	44.99	34.28	38.5	4.3	-32.4	0.0	0.7	56.1	45.3	74	54	-17.9	-8.7	H
14.622	3.0	42.36	31.20	39.6	4.6	-32.4	0.0	0.8	54.8	43.7	74	54	-19.2	-10.3	Noise floor
Tx Ch 1, 2412MHz															
4.824	3.0	46.43	36.31	34.0	2.8	-34.8	0.0	0.0	48.4	38.3	74	54	-25.6	-15.7	V
7.236	3.0	47.10	37.92	35.6	3.3	-34.7	0.0	0.7	52.1	42.9	74	54	-21.9	-11.1	V
9.648	3.0	45.51	41.65	33.5	3.7	-35.0	0.0	0.8	48.6	44.7	74	54	-25.4	-9.3	V
12.060	3.0	42.35	31.24	38.4	4.3	-32.4	0.0	0.7	53.4	42.2	74	54	-20.6	-11.8	V
14.494	3.0	42.76	32.33	39.5	4.5	-32.4	0.0	0.7	55.1	44.7	74	54	-18.9	-9.3	Noise floor
4.824	3.0	47.44	41.94	33.5	2.8	-34.8	0.0	0.0	48.9	43.4	74	54	-25.1	-10.6	H
7.236	3.0	46.58	38.53	33.5	3.3	-34.7	0.0	0.7	49.4	41.4	74	54	-24.6	-12.6	H
9.648	3.0	52.54	46.42	37.1	3.7	-35.0	0.0	0.8	59.2	53.1	74	54	-14.8	-0.9	H
12.060	3.0	45.73	30.27	38.4	4.3	-32.4	0.0	0.7	56.7	41.3	74	54	-17.3	-12.7	H
14.494	3.0	43.76	31.42	39.5	4.5	-32.4	0.0	0.7	56.1	43.8	74	54	-17.9	-10.2	Noise floor
No other Harmonics emissions were detected above 12GHz.															

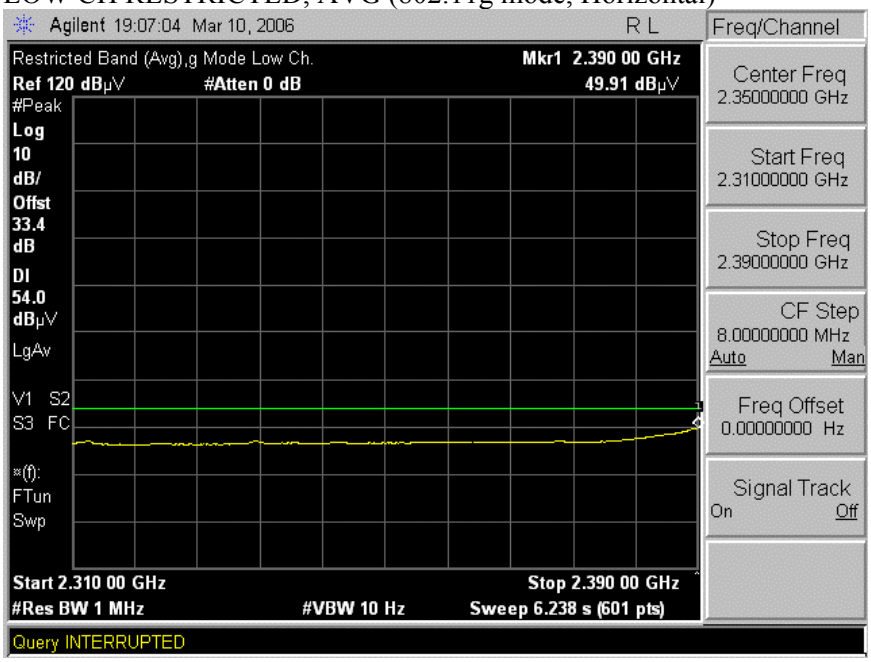
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)

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

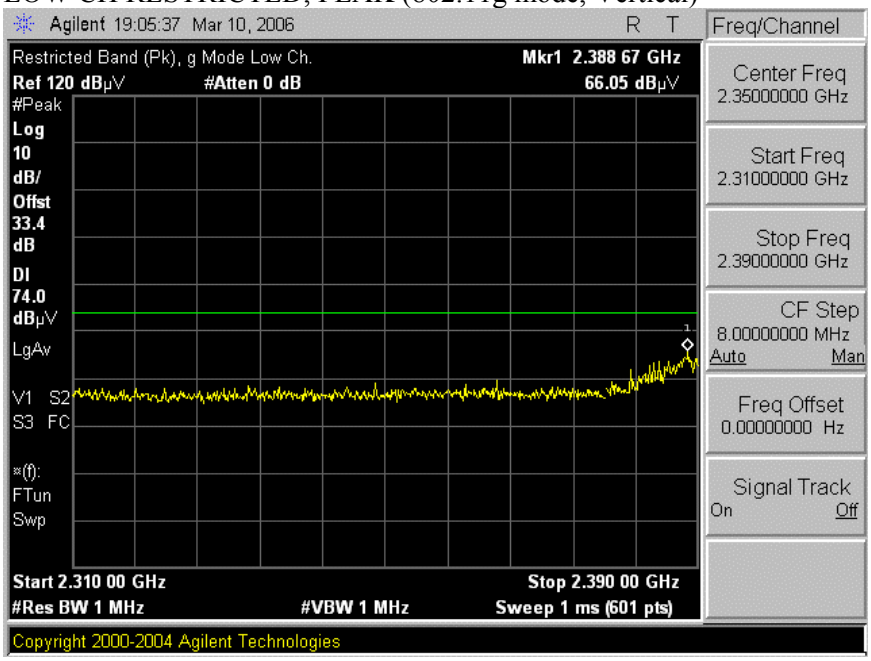


LOW CH RESTRICTED, AVG (802.11g mode, Horizontal)

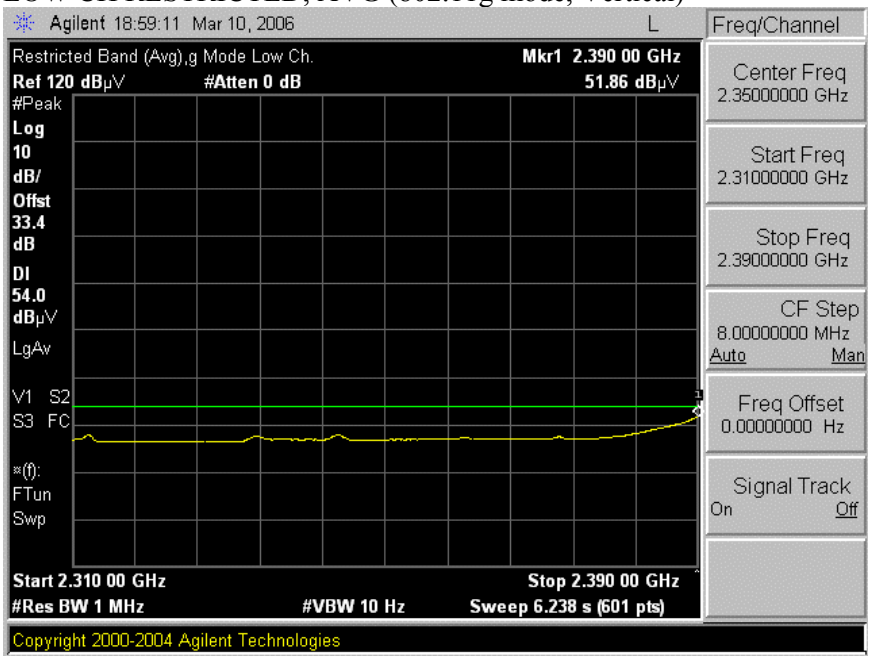


RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)

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

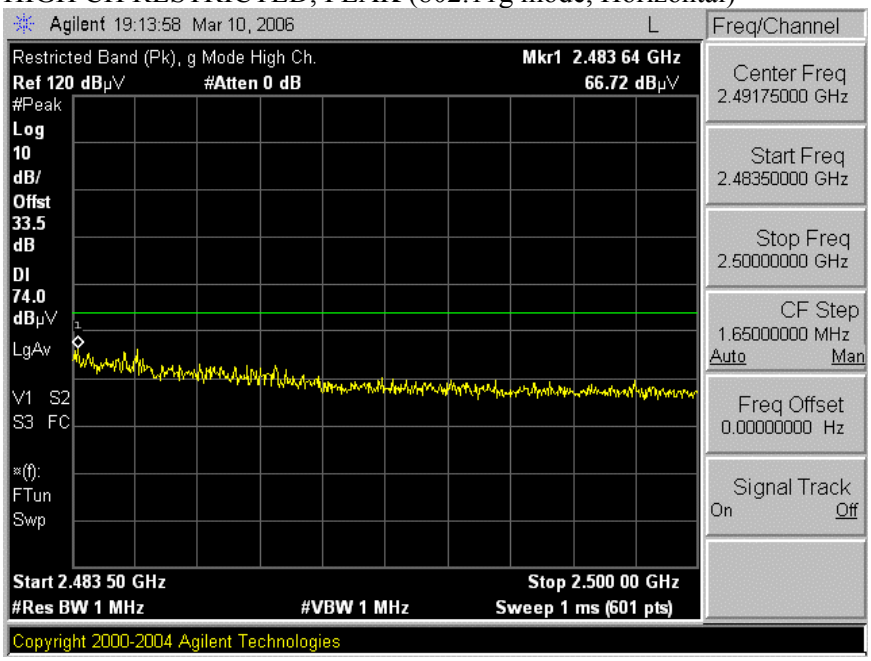


LOW CH RESTRICTED, AVG (802.11g mode, Vertical)

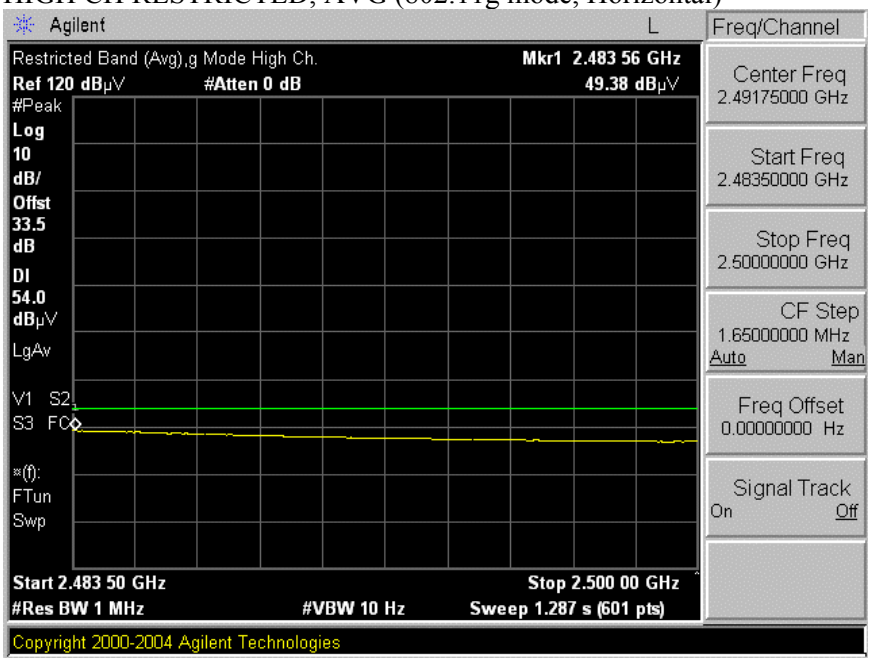


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)

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

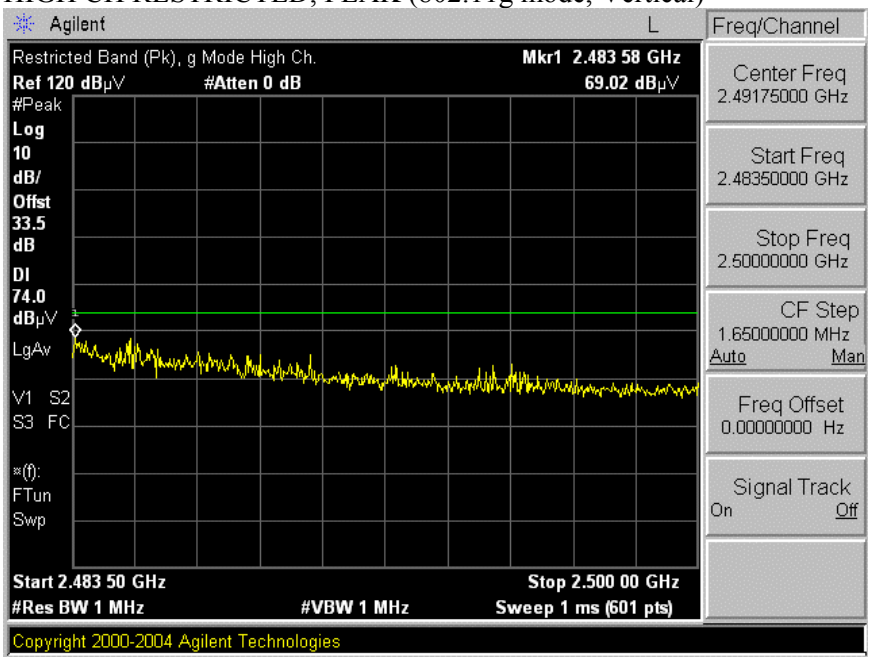


HIGH CH RESTRICTED, AVG (802.11g mode, Horizontal)

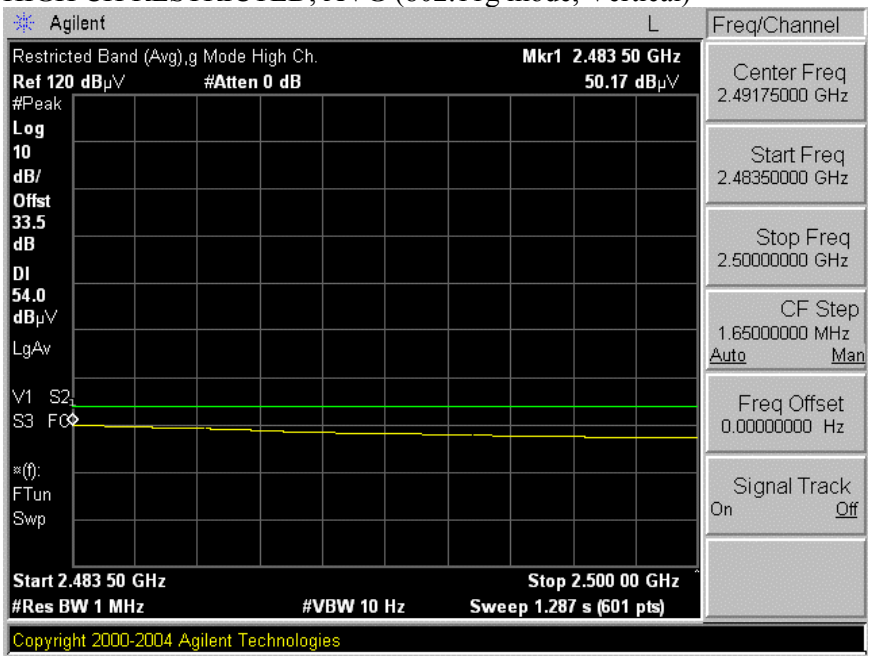


RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)

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



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



HARMONICS AND SPURIOUS EMISSIONS (g MODE)

03/20/06 High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Test Engineer: Thanh Nguyen
Project #: 06U10130
Company: Intel
EUT Description: 802.11 a/b/g Mini PCI type 3 card
EUT M/N: Kirtland
EUT S/N: 000529096(Card #2)
Test Target: FCC UNII WLAN
Mode Of Operation: Tx g mode
Average Power Meter: Low = 15.0 dBm, Mid = 16.5 dBm, High = 15.0 dBm

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_7.6GHz	

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)
Harmonics spurious															
Tx Ch 11, 2462MHz															
4.924	3.0	48.46	42.35	34.1	2.8	-34.9	0.0	0.0	50.5	44.4	74	54	-23.5	-9.6	V
7.386	3.0	44.27	37.46	35.7	3.3	-34.6	0.0	0.6	49.2	42.4	74	54	-24.8	-11.6	V
9.848	3.0	43.54	32.58	33.6	3.7	-35.1	0.0	0.8	46.7	35.7	74	54	-27.3	-18.3	Noise floor
4.924	3.0	46.59	33.74	34.1	2.8	-34.9	0.0	0.0	48.6	35.8	74	54	-25.4	-18.2	H
7.386	3.0	47.70	33.16	35.7	3.3	-34.6	0.0	0.6	52.7	38.1	74	54	-21.3	-15.9	H
9.848	3.0	42.78	36.57	33.5	3.7	-35.1	0.0	0.8	45.8	39.6	74	54	-28.2	-14.4	Noise floor
Tx Ch 6, 2437MHz															
4.874	3.0	49.45	42.57	34.1	2.8	-34.9	0.0	0.0	51.5	44.6	74	54	-22.5	-9.4	V
7.311	3.0	46.35	36.34	35.6	3.3	-34.7	0.0	0.6	51.3	41.3	74	54	-22.7	-12.7	V
9.748	3.0	41.37	32.65	33.5	3.7	-35.0	0.0	0.8	44.4	35.7	74	54	-29.6	-18.3	Noise floor
4.874	3.0	45.68	39.68	34.1	2.8	-34.9	0.0	0.0	47.7	41.7	74	54	-26.3	-12.3	H
7.311	3.0	45.35	32.45	35.6	3.3	-34.7	0.0	0.6	50.3	37.4	74	54	-23.7	-16.6	H
9.748	3.0	42.27	34.28	33.5	3.7	-35.0	0.0	0.8	45.3	37.3	74	54	-28.7	-16.7	Noise floor
Tx Ch 1, 2412MHz															
4.824	3.0	47.25	35.85	34.0	2.8	-34.8	0.0	0.0	49.2	37.8	74	54	-24.8	-16.2	V
7.236	3.0	49.20	37.92	35.6	3.3	-34.7	0.0	0.7	54.2	42.9	74	54	-19.8	-11.1	V
9.648	3.0	43.26	34.20	33.5	3.7	-35.0	0.0	0.8	46.3	37.2	74	54	-27.7	-16.8	Noise floor
4.824	3.0	45.18	32.26	33.5	2.8	-34.8	0.0	0.0	46.6	33.7	74	54	-27.4	-20.3	H
7.236	3.0	48.97	35.16	33.5	3.3	-34.7	0.0	0.7	51.8	38.0	74	54	-22.2	-16.0	H
9.648	3.0	42.34	36.30	37.1	3.7	-35.0	0.0	0.8	49.0	43.0	74	54	-25.0	-11.0	Noise floor
No other Harmonics emissions were detected above 3rd.															

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 5725 TO 5850 MHz BAND

HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

03/20/06 High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Test Engineer: Thanh Nguyen
Project #: 06U10130
Company: Intel
EUT Description: 802.11 a/b/g Mini PCI type 3 card
EUT M/N: Kirtland
EUT S/N: 000529096 (Card #2)
Test Target: FCC UNII WLAN
Mode Of Operation: Tx a mode
Average Power Meter: Low = 17.5 dBm, Mid = 17.5 dBm, High = 17.5dBm

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T145 Agilent 3008A005(			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Thanh 177079008		Thanh 208946003	HPF_7.6GHz	

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)
Tx Ch 165, 5825MHz															
11.650	3.0	59.9	42.8	38.1	4.2	-32.9	0.0	0.7	70.0	52.9	74	54	-4.0	-1.1	V
17.475	3.0	47.8	35.9	42.0	5.3	-32.0	0.0	0.6	63.7	51.8	74	54	-10.3	-2.2	V
23.300	3.0	46.4	33.9	33.6	6.3	-32.4	0.0	0.0	53.9	41.3	74	54	-20.1	-12.7	Noise floor
11.650	3.0	56.8	41.2	38.1	4.2	-32.9	0.0	0.7	66.9	51.3	74	54	-7.1	-2.7	H
17.475	3.0	49.5	35.1	42.0	5.3	-32.0	0.0	0.6	65.4	51.0	74	54	-8.6	-3.0	H
23.300	3.0	47.2	34.0	33.5	6.3	-32.4	0.0	0.0	54.6	41.4	74	54	-19.4	-12.6	Noise floor
Tx Ch 157, 5785MHz															
11.570	3.0	55.2	40.8	38.0	4.2	-33.0	0.0	0.7	65.1	50.7	74	54	-8.9	-3.3	V
17.455	3.0	46.6	33.9	42.0	5.3	-32.0	0.0	0.6	62.5	49.8	74	54	-11.5	-4.2	V
23.140	3.0	46.4	34.0	33.5	6.2	-32.4	0.0	0.0	53.7	41.3	74	54	-20.3	-12.7	Noise floor
11.570	3.0	54.4	38.2	38.0	4.2	-33.0	0.0	0.7	64.3	48.2	74	54	-9.7	-5.8	H
17.455	3.0	44.5	34.0	42.0	5.3	-32.0	0.0	0.6	60.4	49.9	74	54	-13.6	-4.1	H
23.140	3.0	45.2	34.2	33.5	6.2	-32.4	0.0	0.0	52.5	41.5	74	54	-21.5	-12.5	Noise floor
Tx Ch 165, 5745MHz															
11.490	3.0	50.2	35.8	38.0	4.2	-33.1	0.0	0.7	60.0	45.5	74	54	-14.0	-8.5	V
17.235	3.0	45.7	34.0	42.0	5.2	-32.0	0.0	0.6	61.5	49.8	74	54	-12.5	-4.2	V
22.980	3.0	45.5	39.5	33.5	6.2	-32.4	0.0	0.0	52.8	46.8	74	54	-21.2	-7.2	Noise floor
11.490	3.0	55.1	42.5	38.0	4.2	-33.1	0.0	0.7	64.8	52.3	74	54	-9.2	-1.7	H
17.235	3.0	49.6	36.9	42.0	5.2	-32.0	0.0	0.6	65.4	52.8	74	54	-8.6	-1.2	H
22.980	3.0	45.9	34.3	33.5	6.2	-32.4	0.0	0.0	53.3	41.7	74	54	-20.7	-12.3	Noise floor
No other Harmonics emissions were detected above 3rd harmonic															

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		

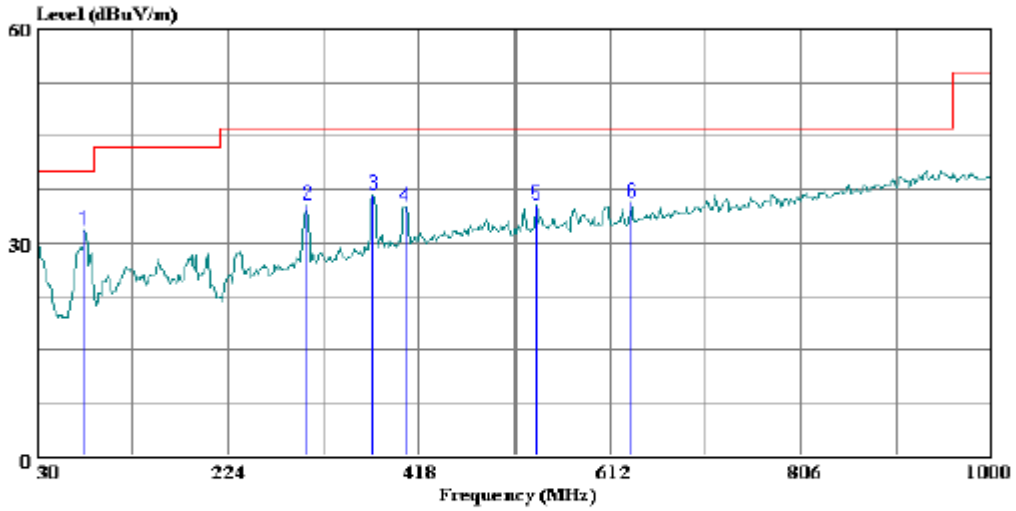
7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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#: 26 File#: EMIbelow1GHz.EMI Date: 03-29-2006 Time: 13:58:34



(Audix ATC)

Trace: 25 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator : Thanh Nguyen
Project # : 06U10130
Company : Intel
EUT : 802.11a/b/g Mini PCI type 3B card for PC
Model No : KIRTLAND
Serial Number : 000529096
Configuration : EUT,PC,Monitor
Mode of operation: Tranmit Worst case
Target of Test : FCC Class B

HORIZONTAL DATA

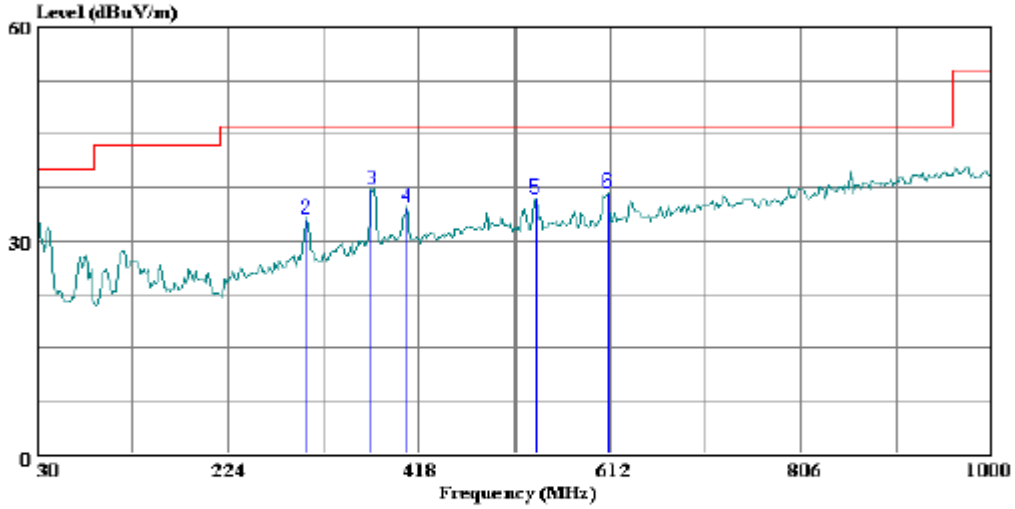
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	77.530	22.76	9.03	31.79	40.00	-8.21	Peak
2	305.480	19.52	15.80	35.32	46.00	-10.68	Peak
3	372.410	19.21	17.45	36.66	46.00	-9.34	Peak
4	404.420	16.91	18.15	35.06	46.00	-10.94	Peak
5	536.340	14.59	20.73	35.32	46.00	-10.68	Peak
6	633.340	13.59	22.05	35.64	46.00	-10.36	Peak

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#: 24 File#: EMIbelow1GHz.EMI Date: 03-29-2006 Time: 13:53:56



(Audix ATC)

Trace: 22 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator : Thanh Nguyen
Project # : 06U10130
Company : Intel
EUT : 802.11a/b/g Mini PCI type 3B card for PC
Model No : KIRTLAND
Serial Number : 000529096
Configuration : EUT,PC,Monitor
Mode of operation: Transmit Worst case
Target of Test : FCC Class B

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	12.21	20.45	32.66	40.00	-7.34	Peak
2	304.510	17.33	15.78	33.11	46.00	-12.89	Peak
3	370.470	19.76	17.40	37.16	46.00	-8.84	Peak
4	406.360	16.55	18.20	34.74	46.00	-11.26	Peak
5	535.370	15.19	20.71	35.90	46.00	-10.10	Peak
6	609.090	15.17	21.66	36.83	46.00	-9.17	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:

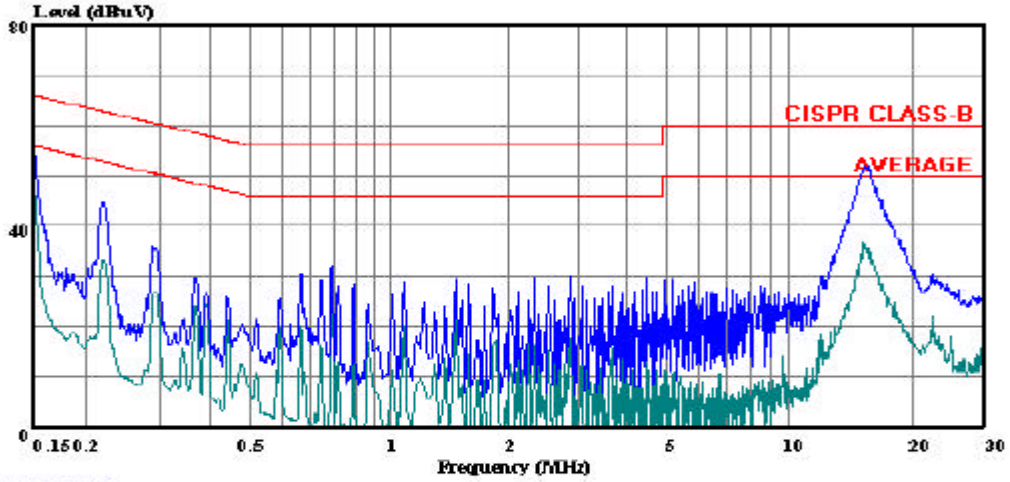
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz) TX_5GHz									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	59.44	--	51.36	0.00	66.00	56.00	-6.56	-4.64	L1
0.22	44.64	--	33.41	0.00	62.86	52.86	-18.22	-19.45	L1
15.47	51.86	--	36.37	0.00	60.00	50.00	-8.14	-13.63	L1
0.15	59.06	--	51.33	0.00	66.00	56.00	-6.94	-4.67	L2
0.22	46.96	--	37.35	0.00	62.78	52.78	-15.82	-15.43	L2
15.63	50.58	--	35.10	0.00	60.00	50.00	-9.42	-14.90	L2
6 Worst Data									

LINE 1 RESULTS

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

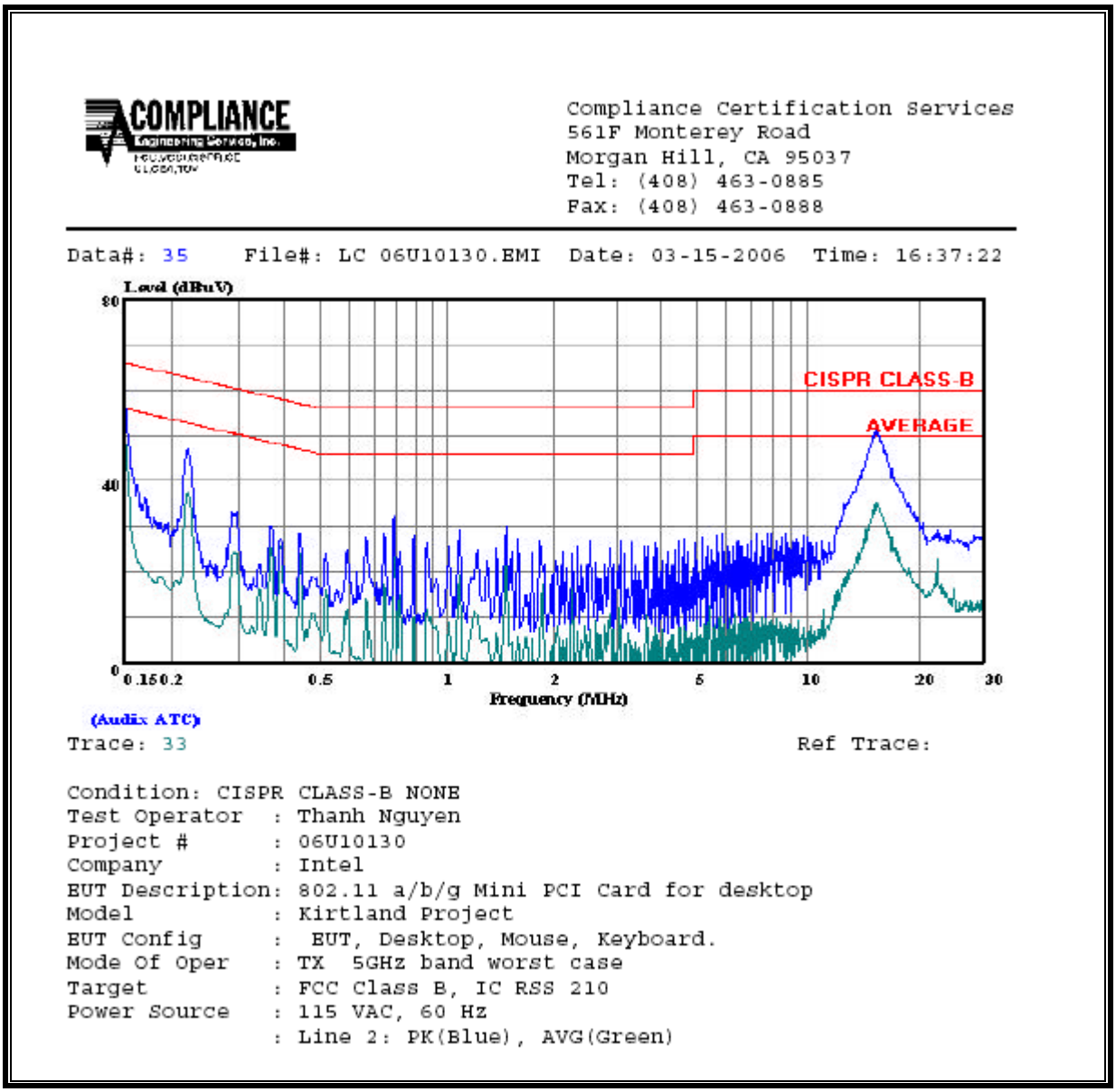
Data#: 42 File#: LC 06U10130.EMI Date: 03-15-2006 Time: 17:00:33



Trace: 40 Ref Trace:

Condition: CISPR CLASS-B NONE
Test Operator : Thanh Nguyen
Project # : 06U10130
Company : Intel
EUT Description: 802.11 a/b/g Mini PCI Card for desktop
Model : Kirtland Project
EUT Config : EUT, Desktop, Mouse, Keyboard.
Mode Of Oper : TX 5GHz band worst case
Target : FCC Class B, IC RSS 210
Power Source : 115 VAC, 60 Hz
: Line 1: PK(Blue), AVG(Green)

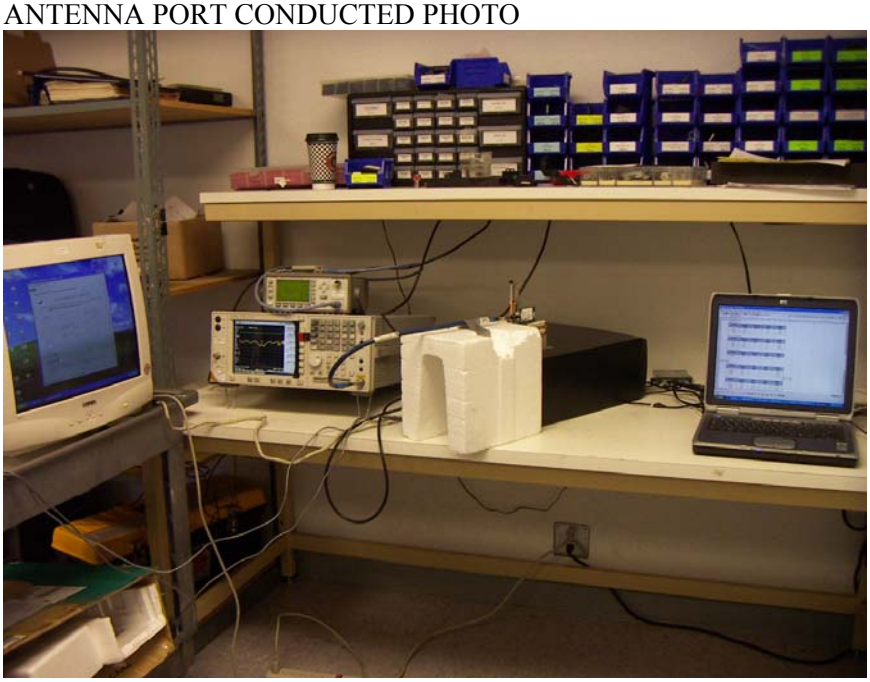
LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

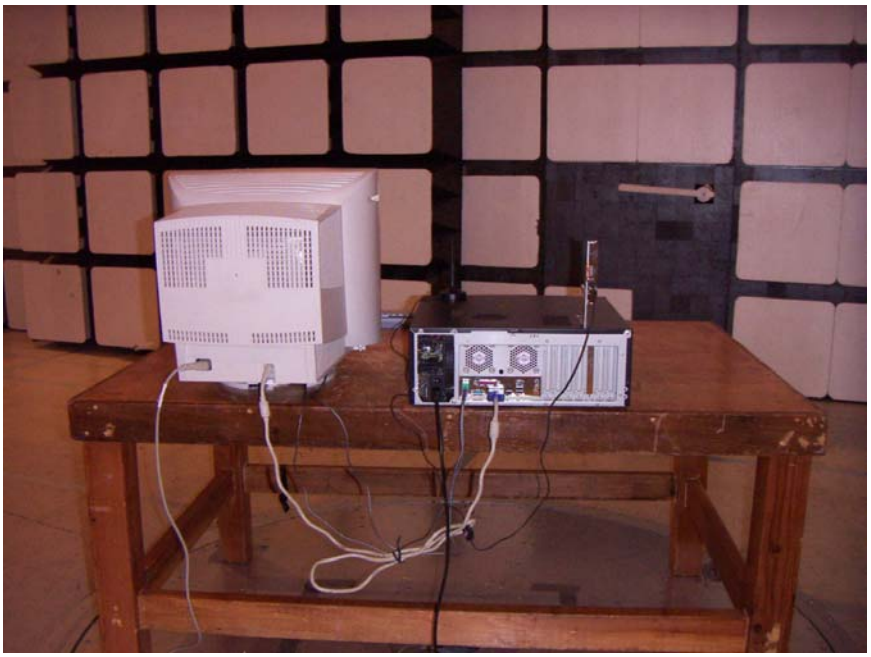
ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP

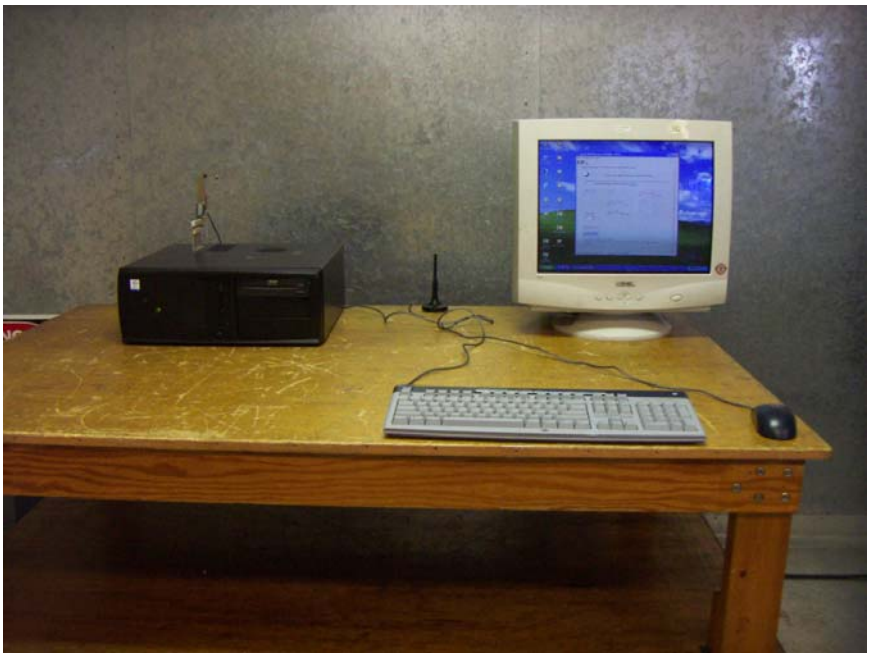
RADIATED FRONT PHOTO

RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO

END OF REPORT