



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION**

TEST REPORT

FOR

802.11 B/G WIRELESS LAN CARD

MODEL NUMBER: TMW1059

FCC ID: NUSTMW1059

REPORT NUMBER: 04I2702-1

ISSUE DATE: MAY 05, 2004

Prepared for

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18, OAZA GOMIGAYA, TSURUGASHIMA-SHI,
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Prepared by

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1. TEST RESULT CERTIFICATION

COMPANY NAME: TOKO INCORPORATED
18, OAZA GOMIGAYA, TSURUGASHIMA-SHI,
SAITAMA-KEN 350-2281
JAPAN

EUT DESCRIPTION: 802.11B/G WIRELESS LAN CARD

MODEL: TMW1059

DATE TESTED: MAY 03-04, 2004

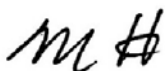
| APPLICABLE STANDARDS | |
|-----------------------|-------------------------|
| STANDARD | TEST RESULTS |
| FCC PART 15 SUBPART C | NO NON-COMPLIANCE NOTED |

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.

Approved & Released For CCS By:

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ENGINEERING MANAGER
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CHIN PANG
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is an 802.11b/g Wireless LAN Card in a PCMCIA form factor, operating in the 2400-2483.5MHz Band.

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

| Frequency Range (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|--------------------------|---------|-----------------------|----------------------|
| 2412 - 2462 | 802.11b | 21.19 | 131.52 |
| 2412 - 2462 | 802.11g | 22.83 | 191.87 |

The radio utilizes an inverted “ F “ type antenna with a maximum peak gain of 2.14 dBi.

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 |
| Quasi-Peak Adaptor | HP | 85650A | 2811A01155 | 5/24/2005 |
| SA Display Section 2 | HP | 85662A | 38496 | 5/24/2005 |
| SA RF Section, 1.5 GHz | HP | 85680B | 38496 | 2/22/2005 |
| Preamplifier, 1300MHz | HP | 8447D | 38405 | 8/18/2004 |
| Site B Antenna, Bilog | Chase | 2944A06589 | 38217 | 3/8/2005 |
| LISN, 10 kHz ~ 30 MHz | FCC | 50/250-25-2 | 38419 | 10/13/2004 |
| LISN, 10 kHz ~ 30 MHz | Solar | 8012-50-R-24-BNC | 38273 | 10/13/2004 |
| EMI Test Receiver | R & S | ESHS 20 | 38273 | 7/17/2004 |
| Line Filter | Lindgren | LMF-3489 | 38185 | CNR |
| Spectrum Analyzer | Agilent | E4446A | US42070220 | 1/13/2005 |
| Preamplifier, 1 ~ 26 GHz | Miteq | NSP10023988 | 38365 | 4/25/2005 |
| Antenna, Horn 1 ~ 18 GHz | EMCO | 3115 | 38467 | 2/4/2005 |
| 2.7GHz HP Filter | MicroTronic | HPM13194 | 38387 | CNR |
| 2.4-2.5GHz Rejector Filter | MicroTronic | BRM50702 | 1 | CNR |
| 4.6GHz HP Filter | Mircrowave | HP4570-9SS | 3 | CNR |

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|-----------------------------------|--------------|---------------|---------------|--------|
| Description | Manufacturer | Model | Serial Number | FCC ID |
| Laptop | IBM | ThinkPad | NA | DoC |
| AC Adapter | IBM | Made in China | NA | DoC |

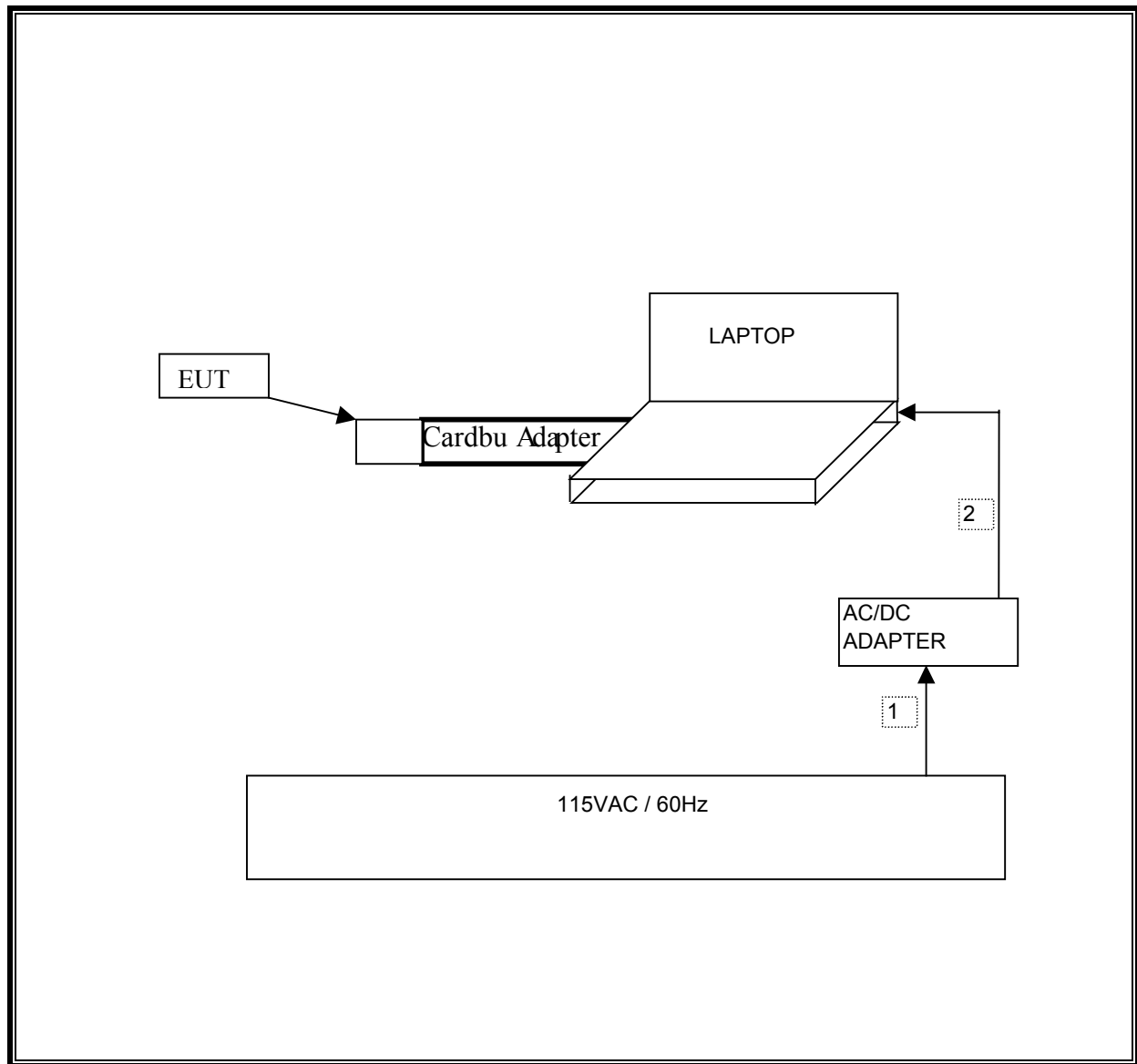
I/O CABLES

| I/O CABLE LIST | | | | | | |
|----------------|------|----------------------|----------------|------------|--------------|--------------------------|
| Cable No. | Port | # of Identical Ports | Connector Type | Cable Type | Cable Length | Remarks |
| 1 | AC | 1 | US115 | UNSHIELDED | 1m | 3 Prong |
| 2 | DC | 1 | DC | UNSHIELDED | 2m | Ferrite on DC output end |

TEST SETUP

The EUT is installed in a host laptop computer via a cardbus-to-PCI adapter / extension board during the tests. Test software is used to exercise 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 300 kHz. The sweep time is coupled.

RESULTS

No non-compliance noted:

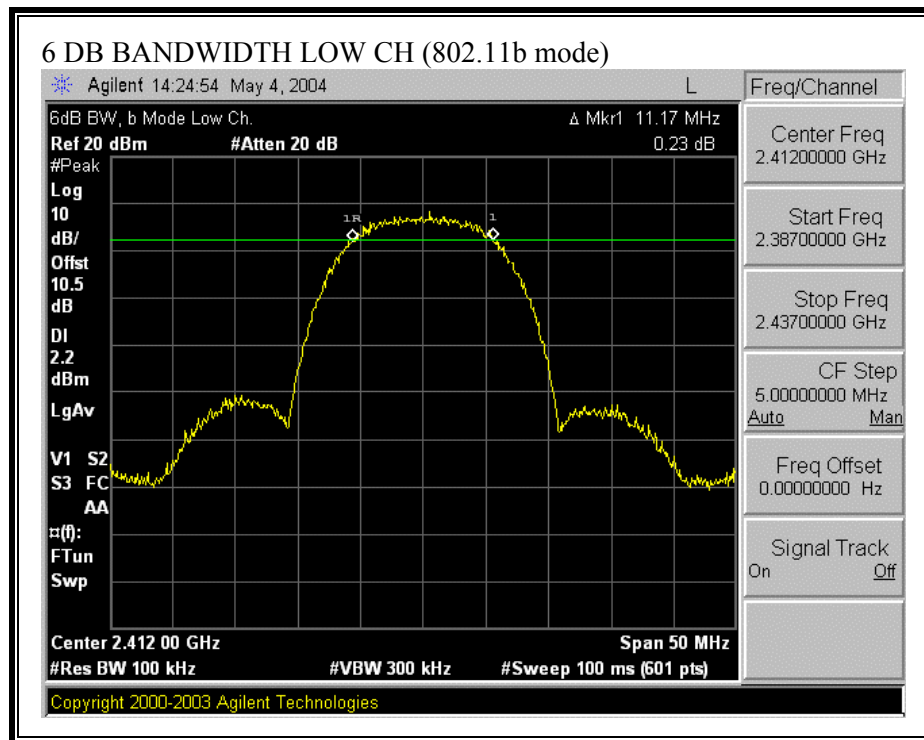
802.11b Mode

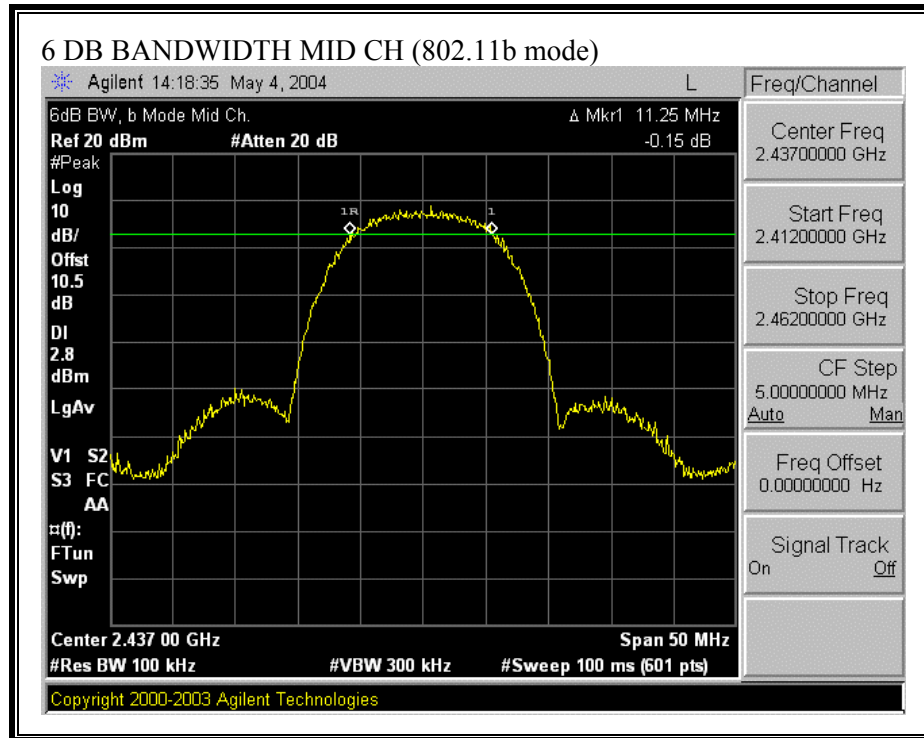
| Channel | Frequency (MHz) | 6 dB Bandwidth (kHz) | Minimum Limit (kHz) | Margin (kHz) |
|---------|--------------------|-------------------------|------------------------|-----------------|
| Low | 2412 | 11170 | 500 | 10670 |
| Middle | 2437 | 11250 | 500 | 10750 |
| High | 2462 | 11330 | 500 | 10830 |

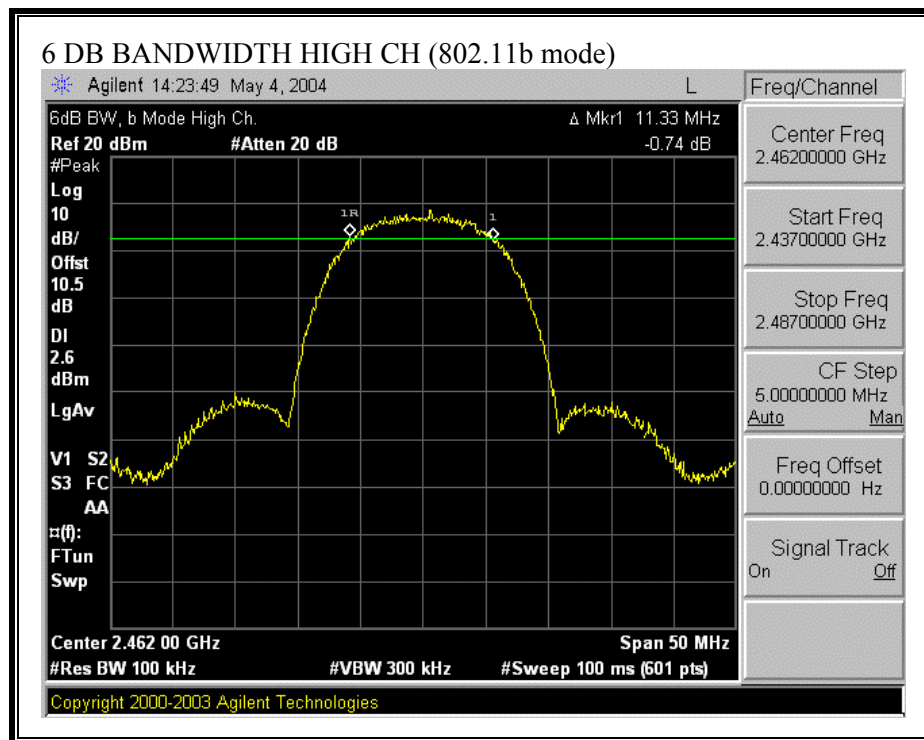
802.11g Mode

| Channel | Frequency (MHz) | 6 dB Bandwidth (kHz) | Minimum Limit (kHz) | Margin (kHz) |
|---------|--------------------|-------------------------|------------------------|-----------------|
| Low | 2412 | 16330 | 500 | 15830 |
| Middle | 2437 | 16250 | 500 | 15750 |
| High | 2462 | 16170 | 500 | 15670 |

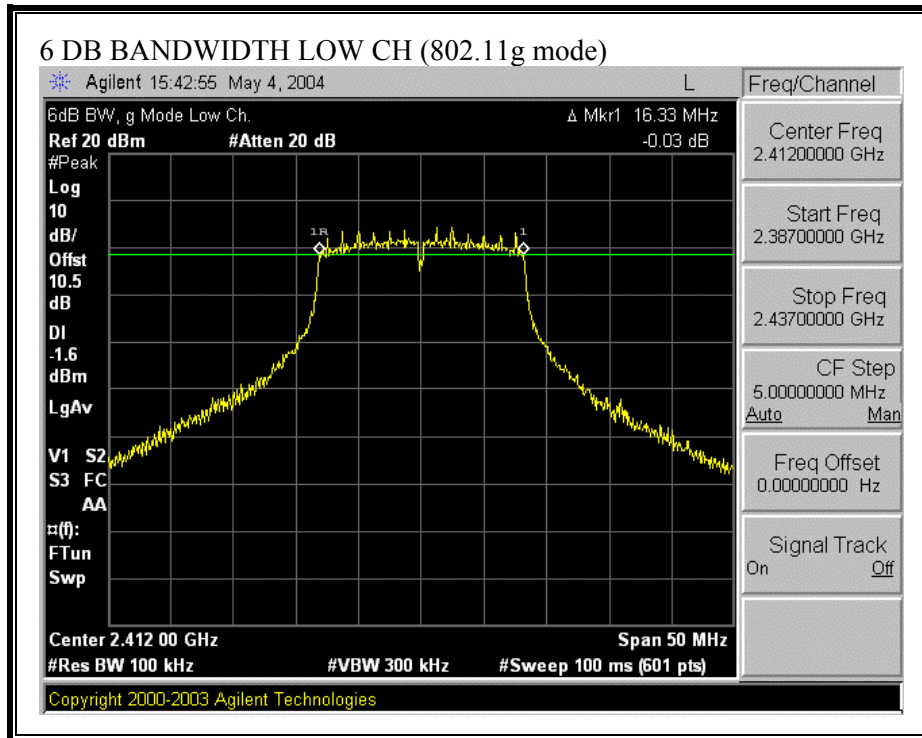
6 DB BANDWIDTH (802.11b MODE)

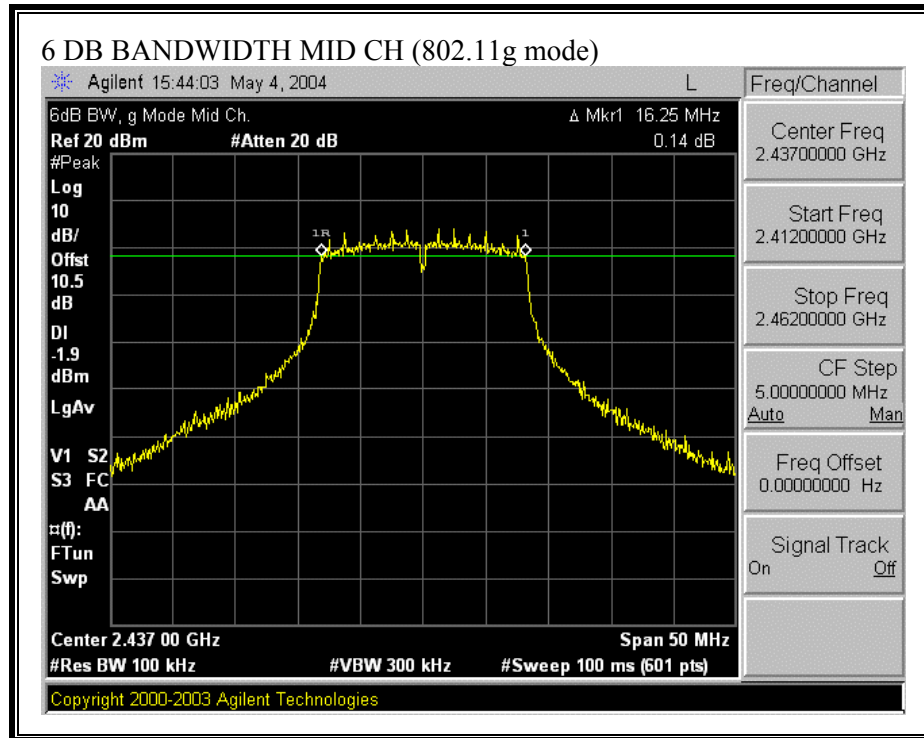


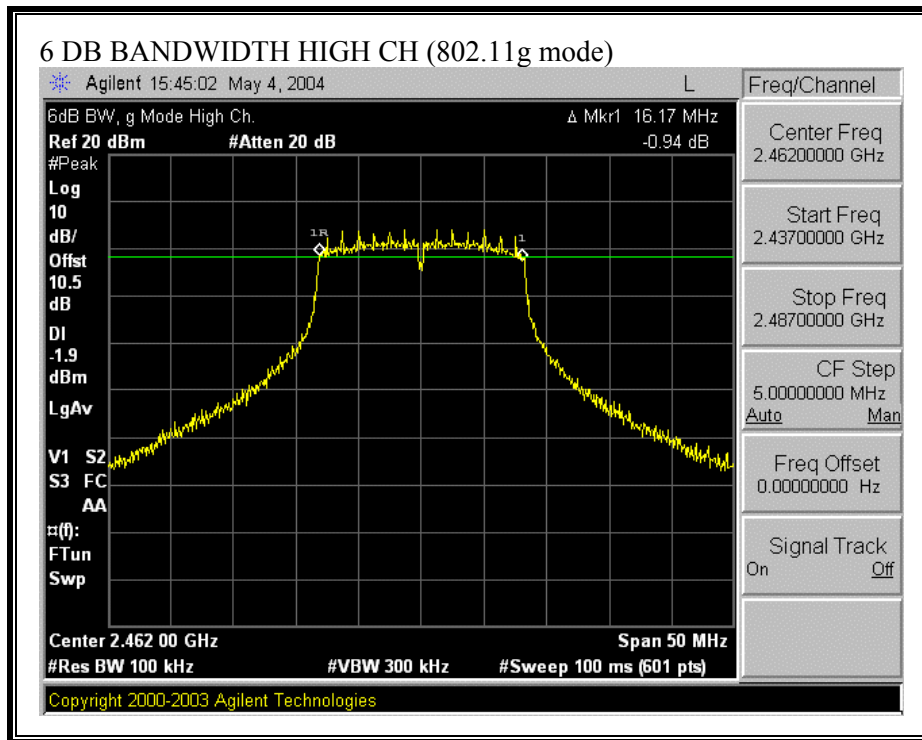




6 DB BANDWIDTH (802.11g MODE)







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.

RESULTS

No non-compliance noted:

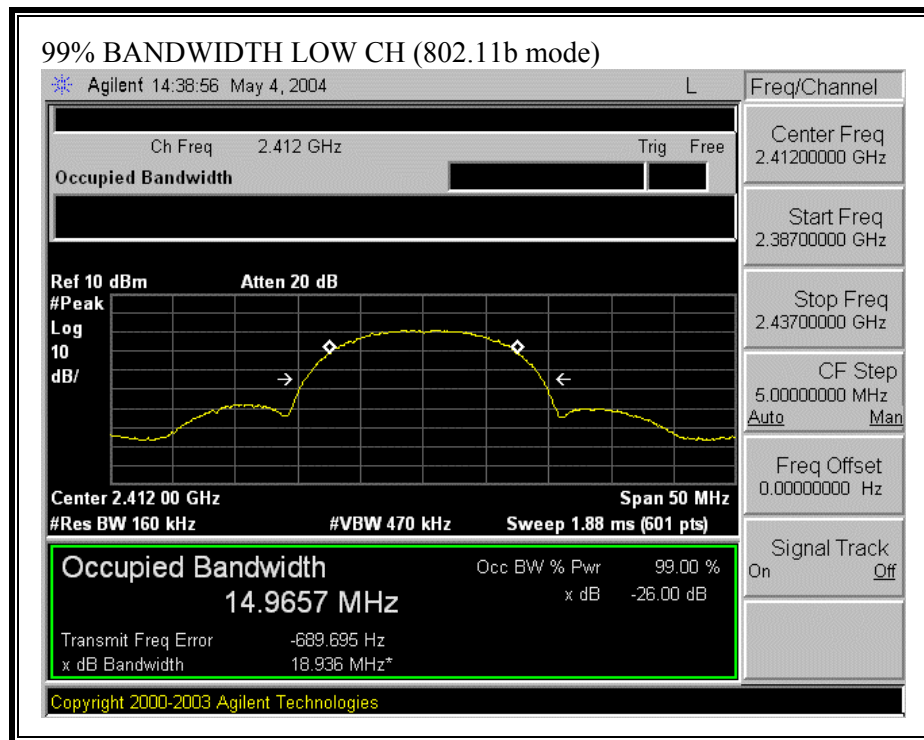
802.11b Mode

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|--------------------|------------------------|
| Low | 2412 | 14.9657 |
| Middle | 2437 | 14.9987 |
| High | 2462 | 14.9938 |

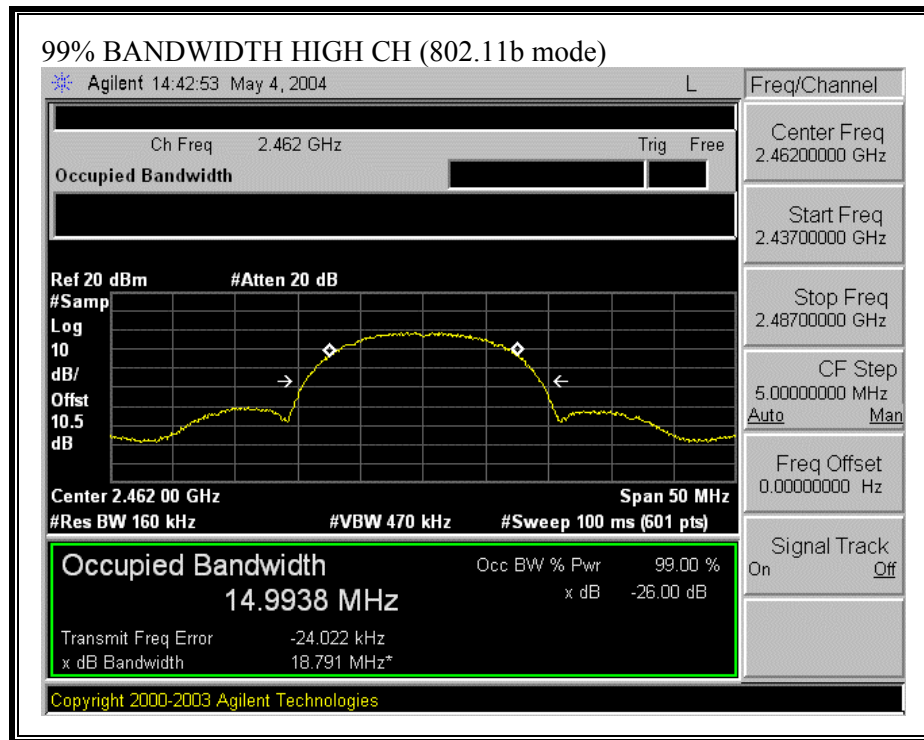
802.11g Mode

| Channel | Frequency (MHz) | 99% Bandwidth (MHz) |
|---------|--------------------|------------------------|
| Low | 2412 | 16.363 |
| Middle | 2437 | 16.3873 |
| High | 2462 | 16.3443 |

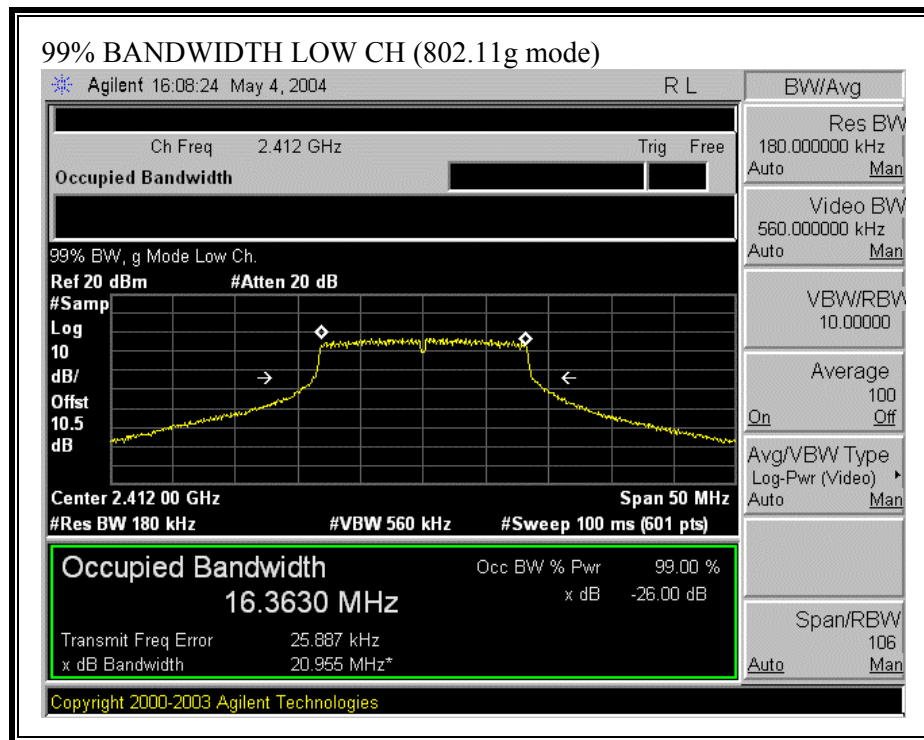
99% BANDWIDTH (802.11b MODE)

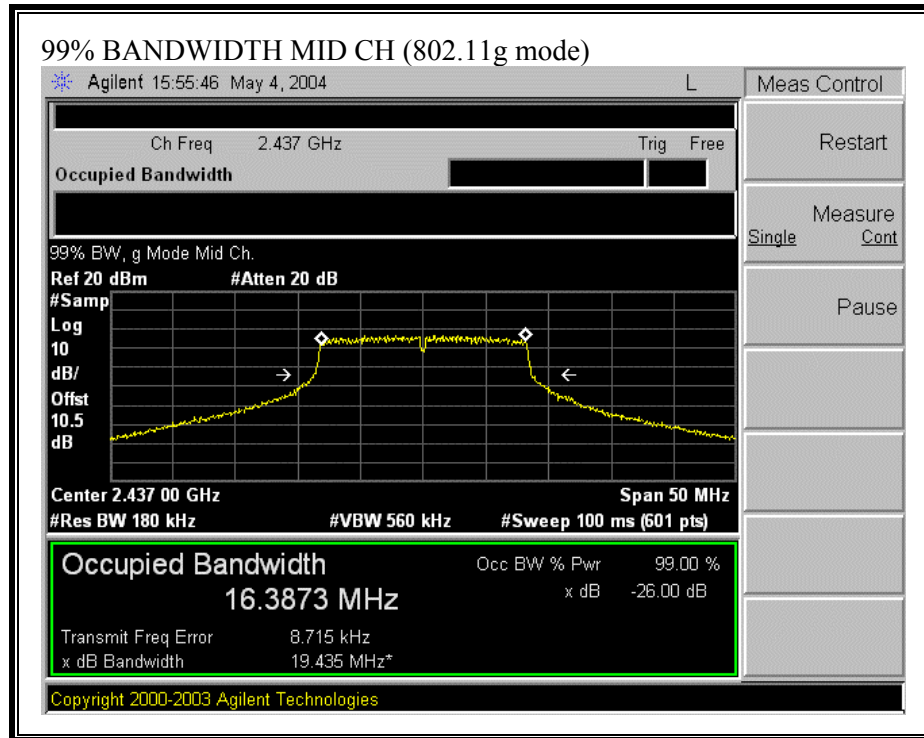


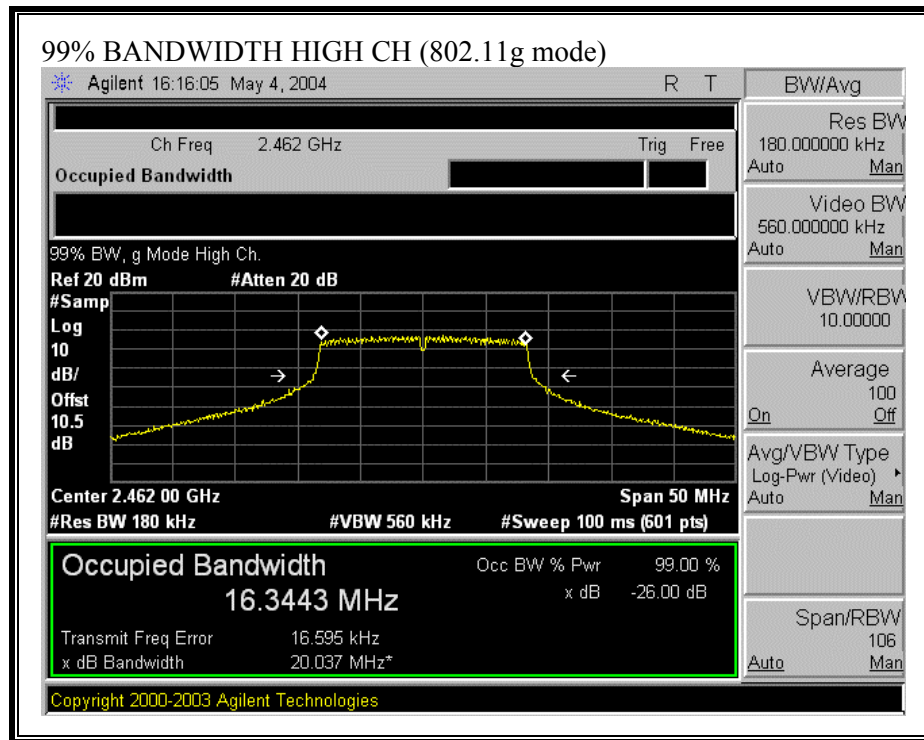




99% BANDWIDTH (802.11g MODE)







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.

The maximum antenna gain is 2.14 dBi, therefore the limit is 30Bm.

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

No non-compliance noted:

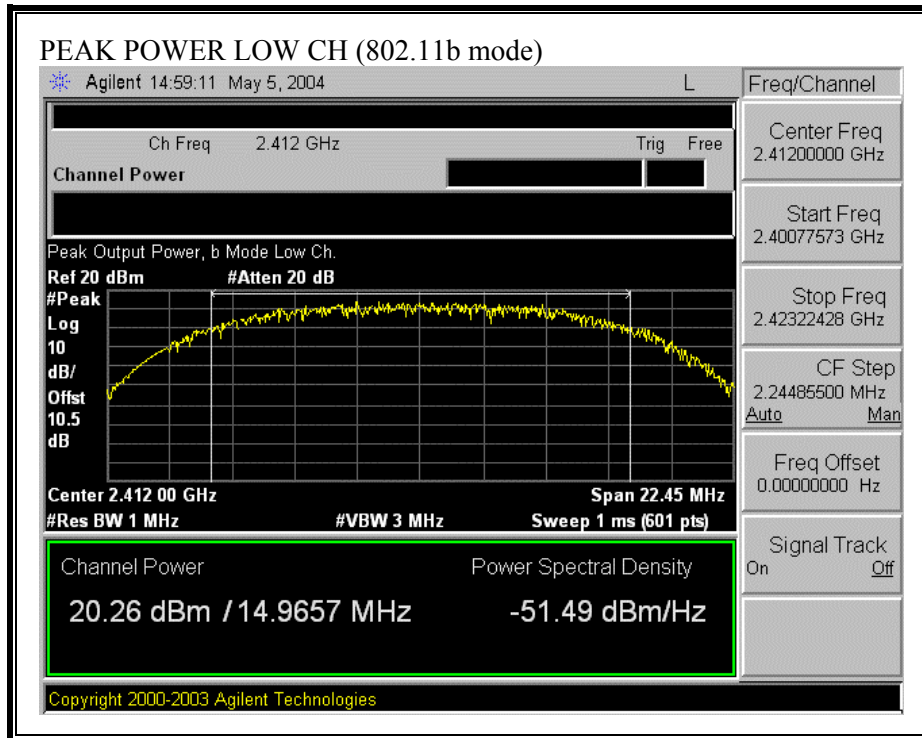
802.11b Mode

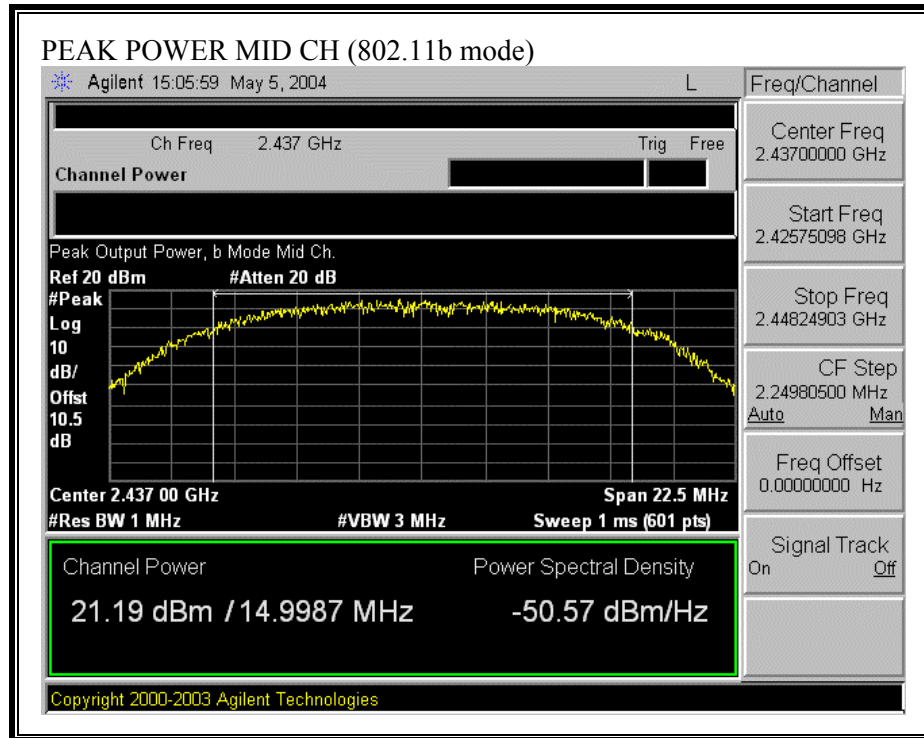
| Channel | Frequency (MHz) | Peak Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------|----------------|----------------|
| Low | 2412 | 20.26 | 30 | -9.74 |
| Middle | 2437 | 21.19 | 30 | -8.81 |
| High | 2462 | 21.01 | 30 | -8.99 |

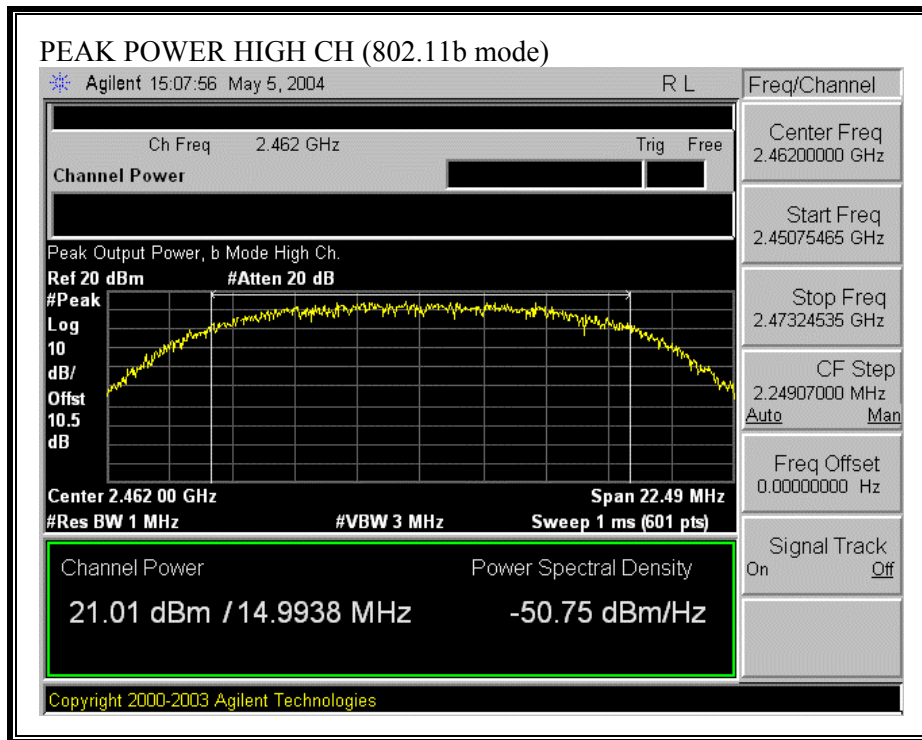
802.11g Mode

| Channel | Frequency (MHz) | Peak Power (dBm) | Limit (dBm) | Margin (dB) |
|---------|--------------------|---------------------|----------------|----------------|
| Low | 2412 | 22.51 | 30 | -7.49 |
| Middle | 2437 | 22.83 | 30 | -7.17 |
| High | 2462 | 22.76 | 30 | -7.24 |

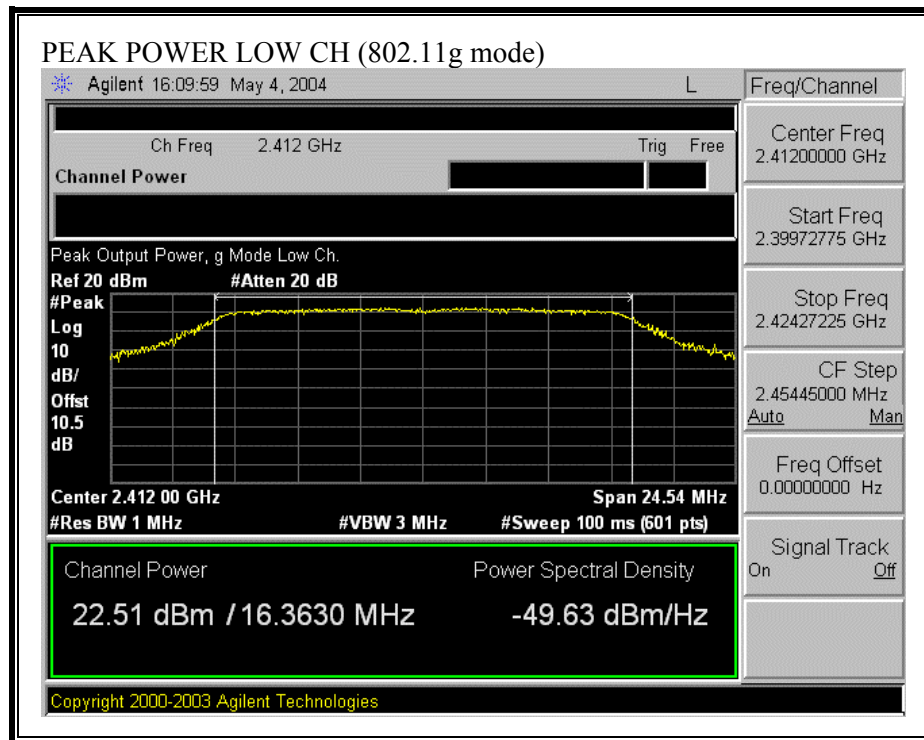
OUTPUT POWER (802.11b MODE)

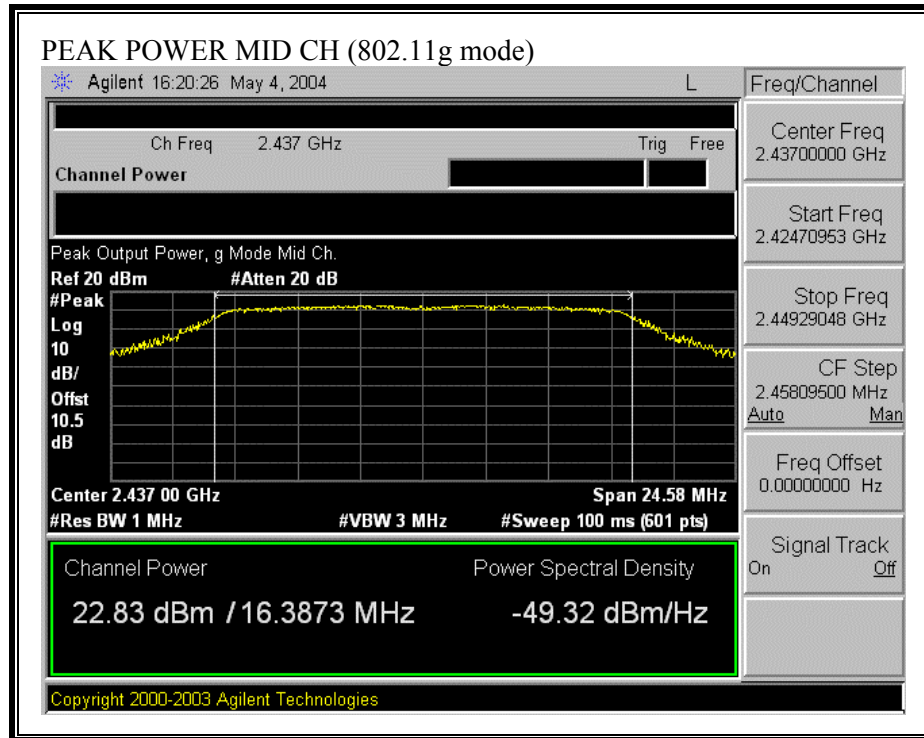


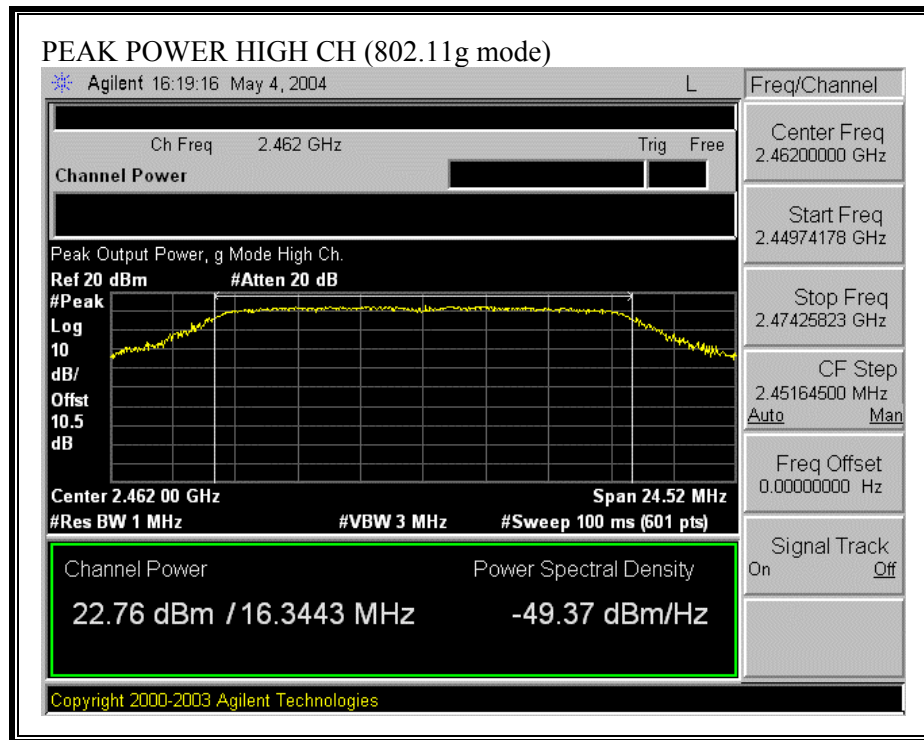




OUTPUT POWER (802.11g MODE)







7.4. 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 0.5 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 | 17.43 |
| Middle | 2437 | 17.94 |
| High | 2462 | 17.74 |

802.11g Mode

| Channel | Frequency (MHz) | Average Power (dBm) |
|---------|-----------------|---------------------|
| Low | 2412 | 15.20 |
| Middle | 2437 | 15.06 |
| High | 2462 | 15.91 |

7.5. 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:

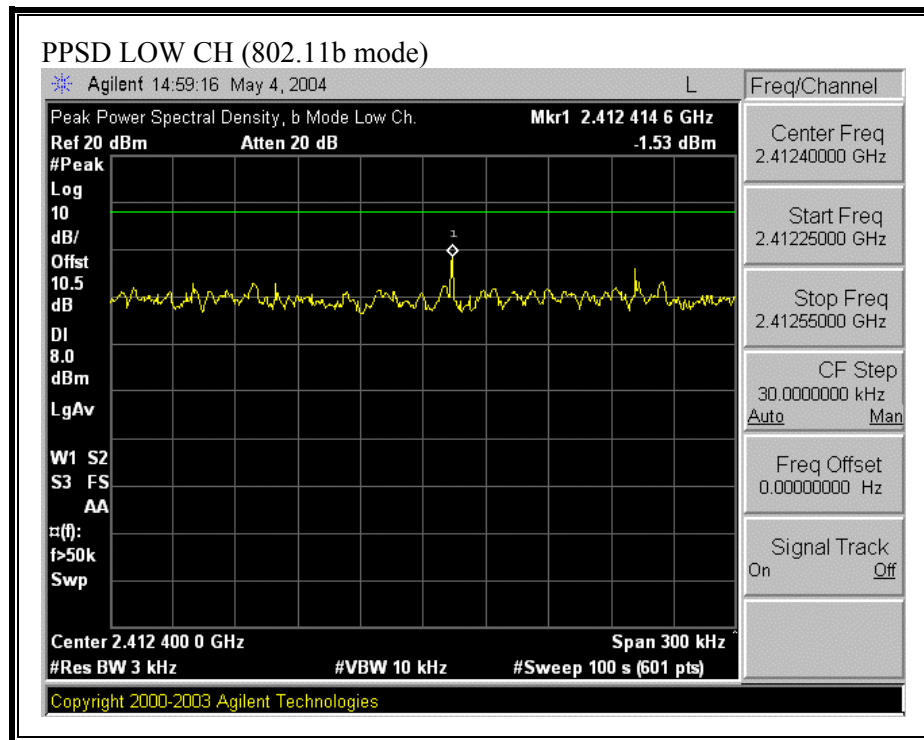
802.11b Mode

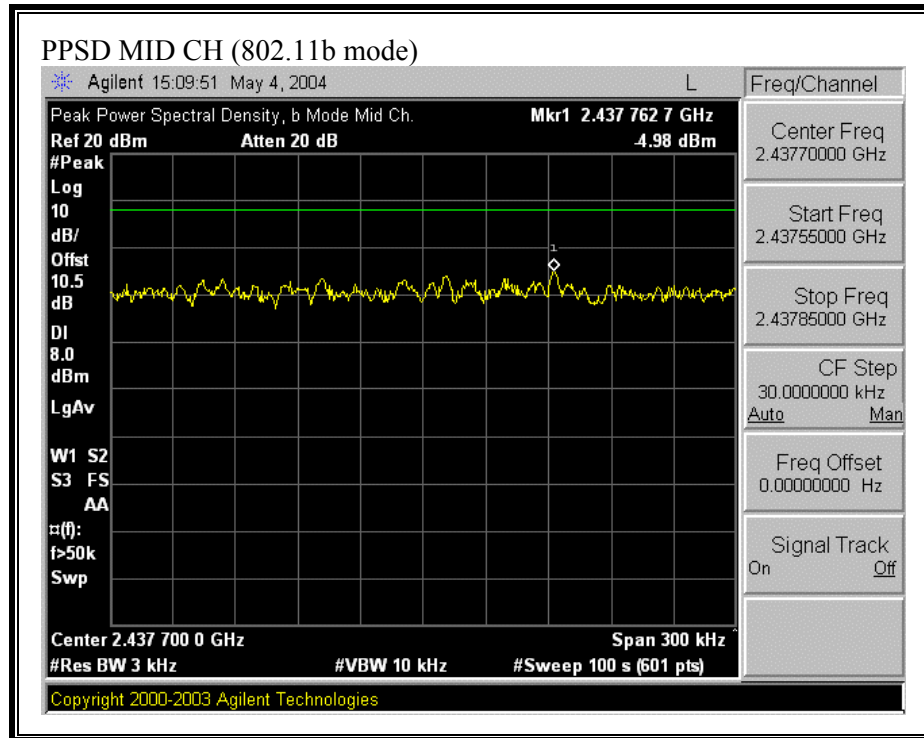
| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------|-------------|-------------|
| Low | 2412 | -1.53 | 8 | -9.53 |
| Middle | 2437 | -4.98 | 8 | -12.98 |
| High | 2462 | -2.31 | 8 | -10.31 |

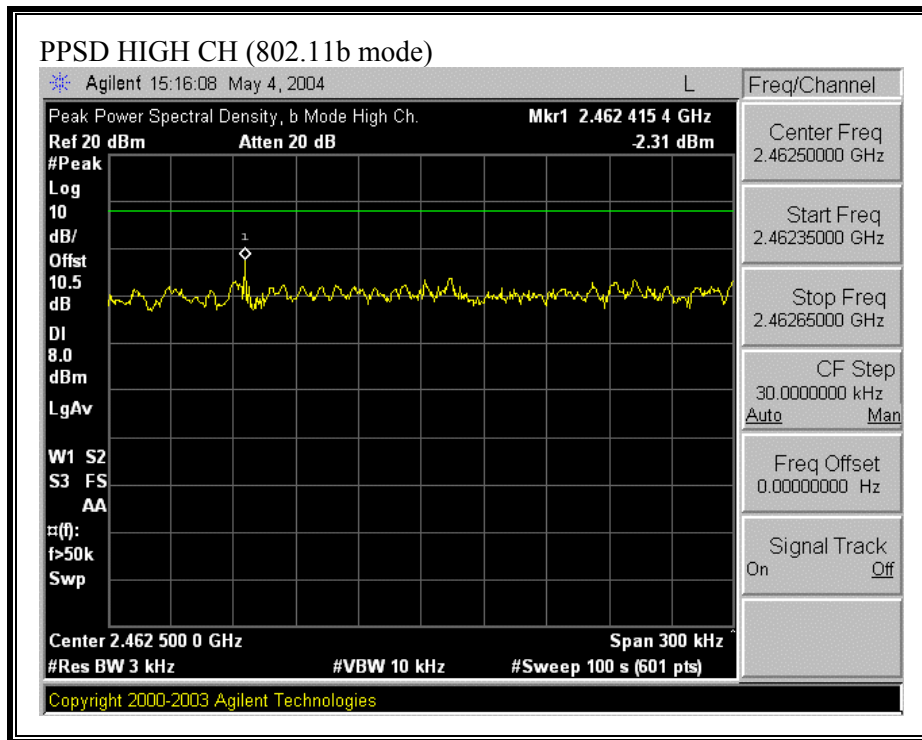
802.11g Mode

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---------|-----------------|------------|-------------|-------------|
| Low | 2412 | -8.97 | 8 | -16.97 |
| Middle | 2437 | -8.88 | 8 | -16.88 |
| High | 2462 | -8.95 | 8 | -16.95 |

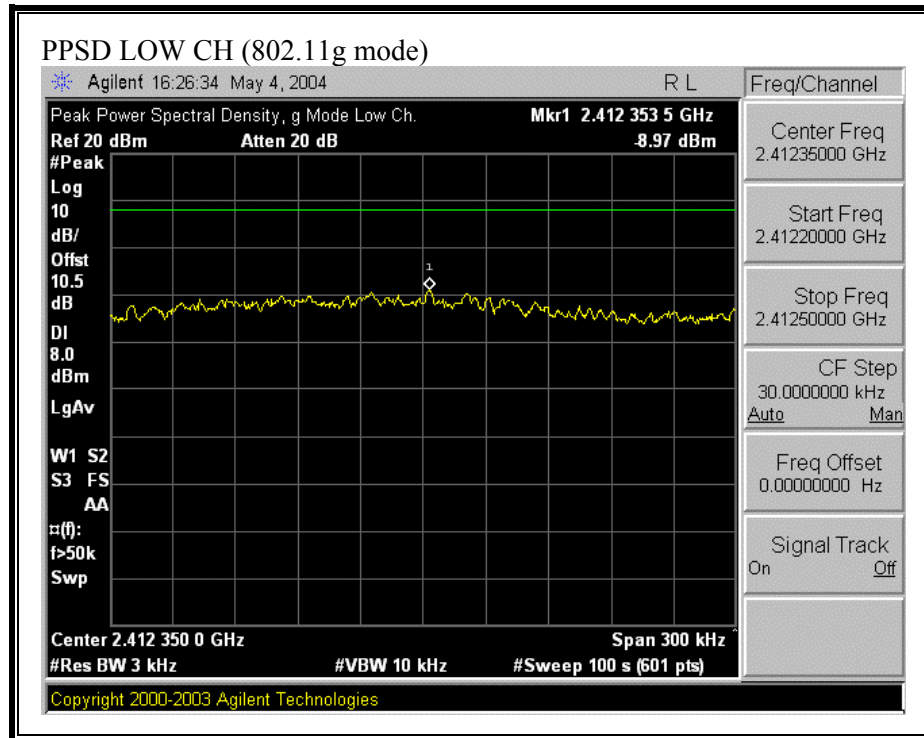
PEAK POWER SPECTRAL DENSITY (802.11b MODE)

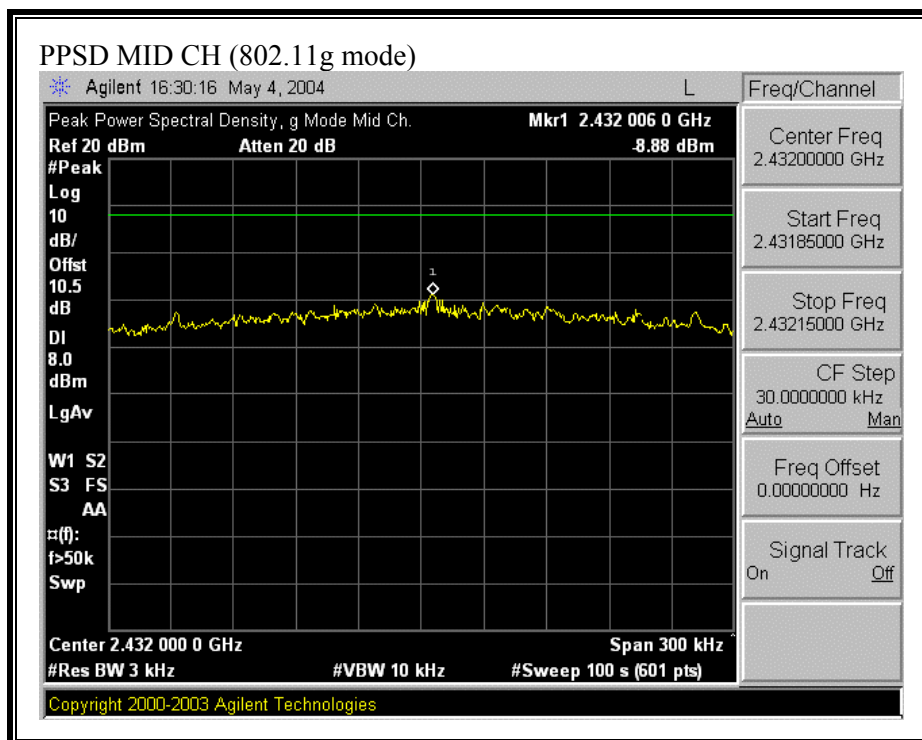


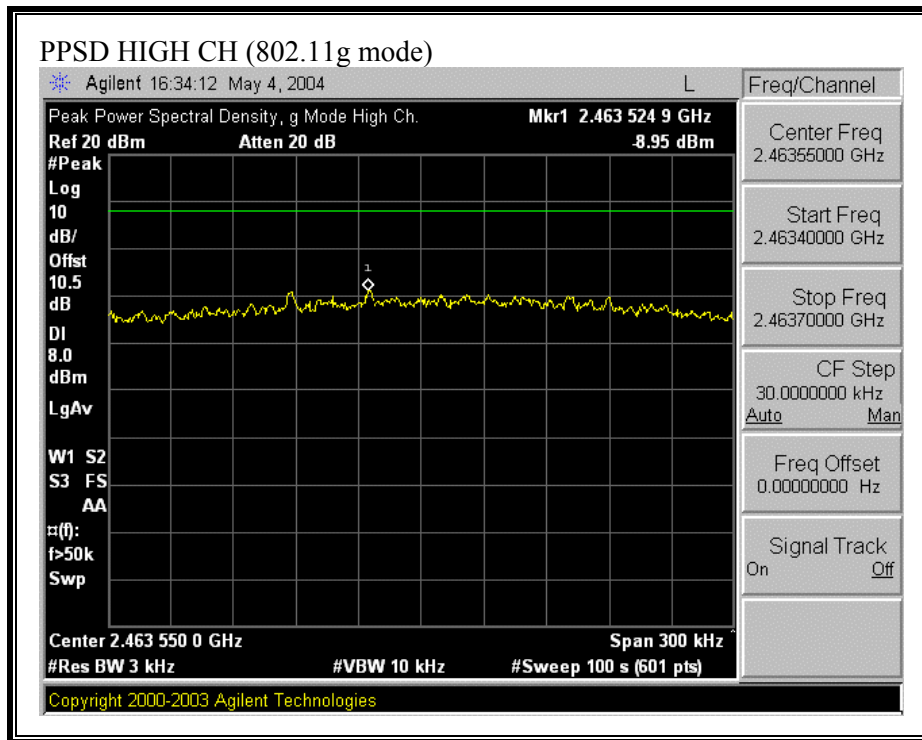




PEAK POWER SPECTRAL DENSITY (802.11g MODE)







7.6. 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

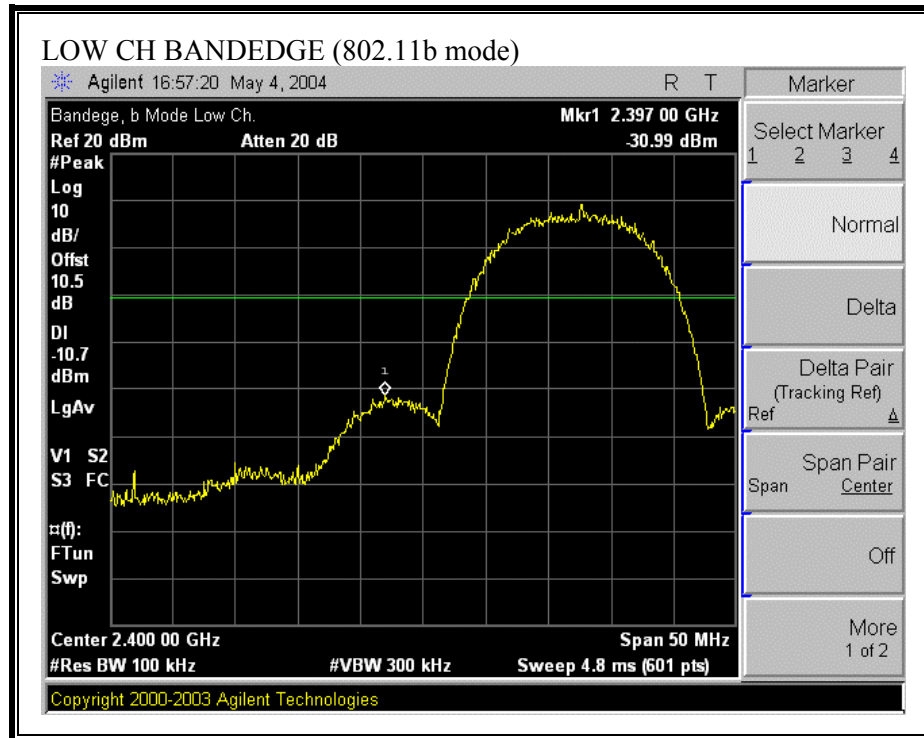
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

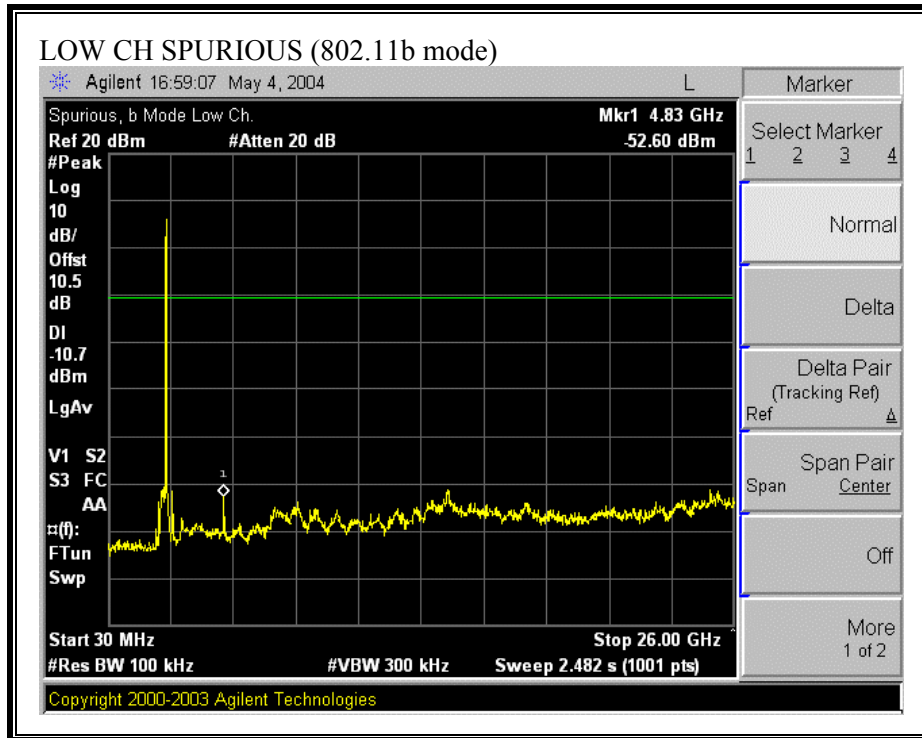
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

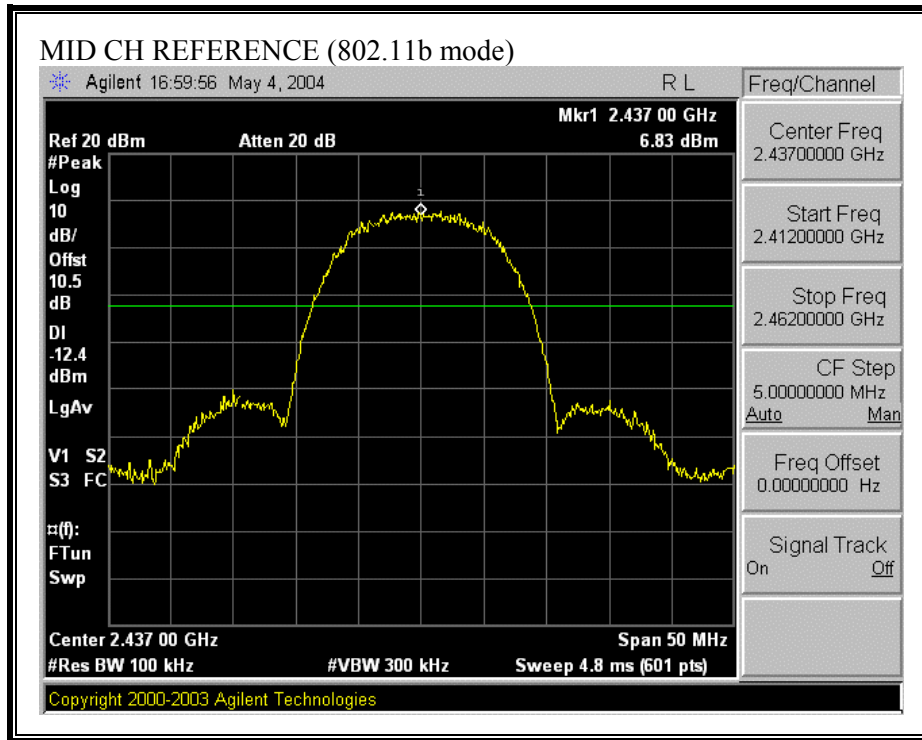
No non-compliance noted:

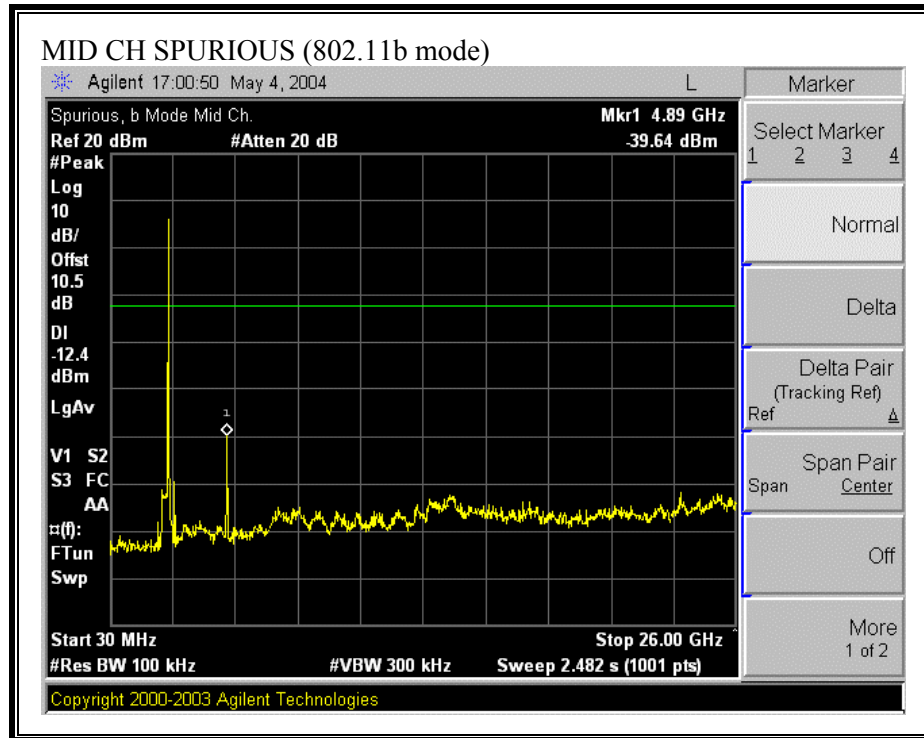
SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)



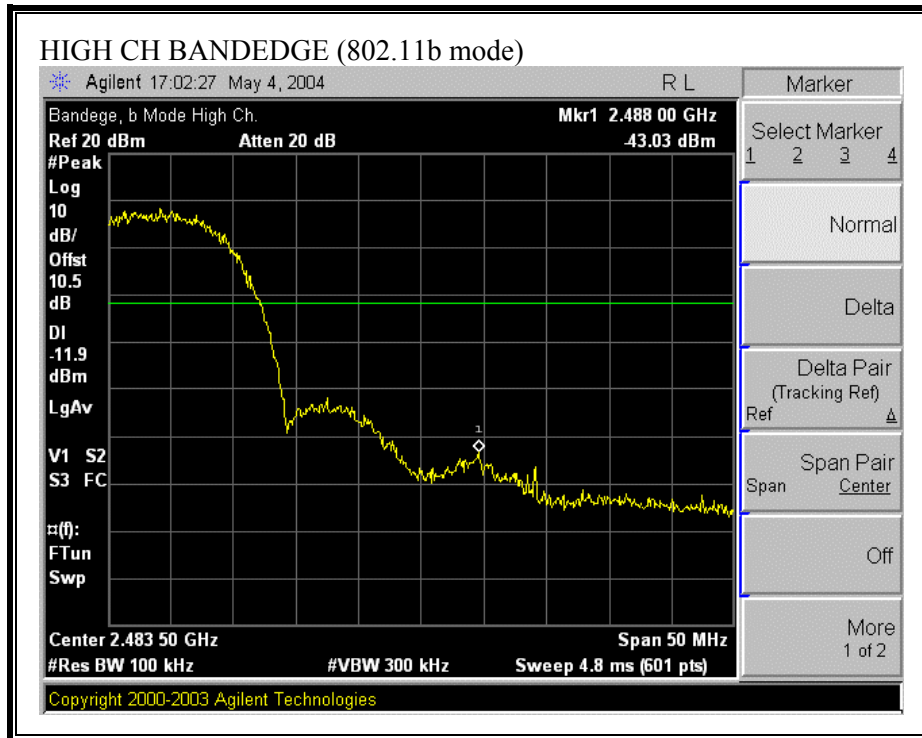


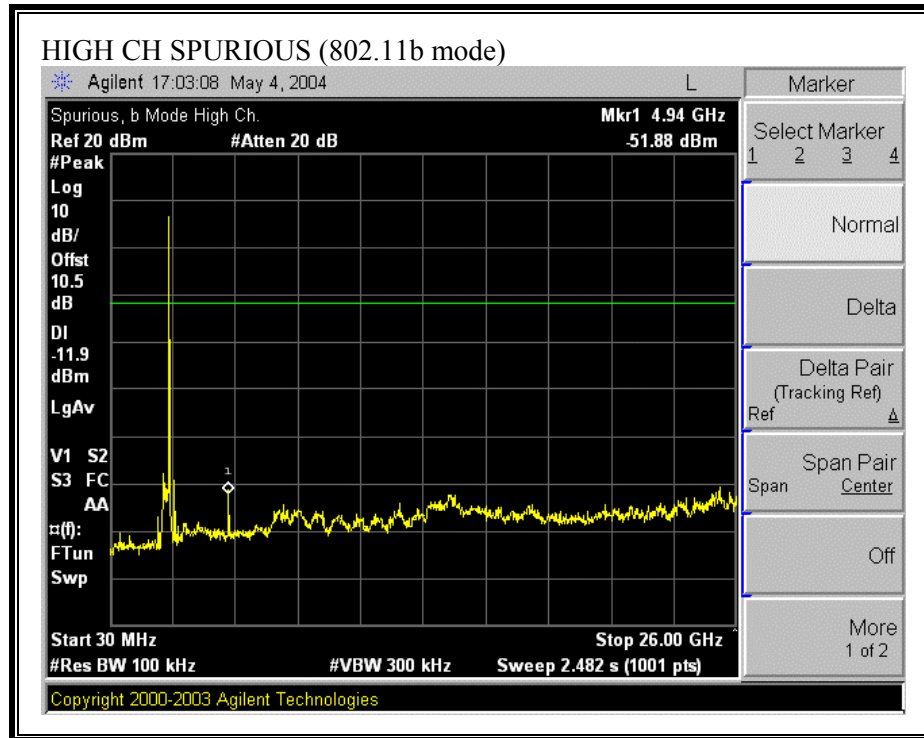
SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)



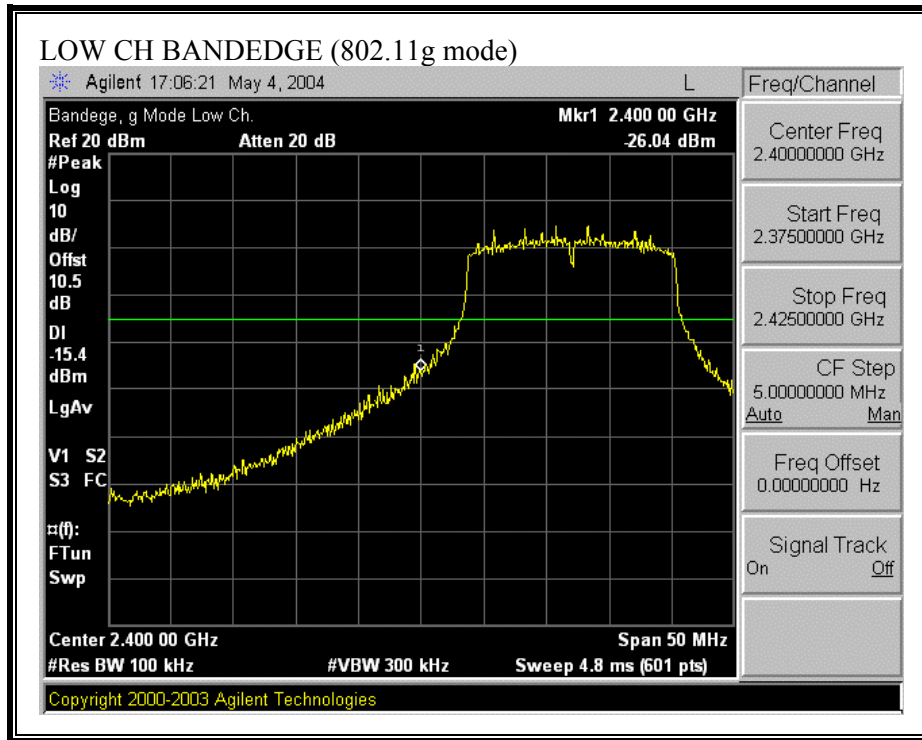


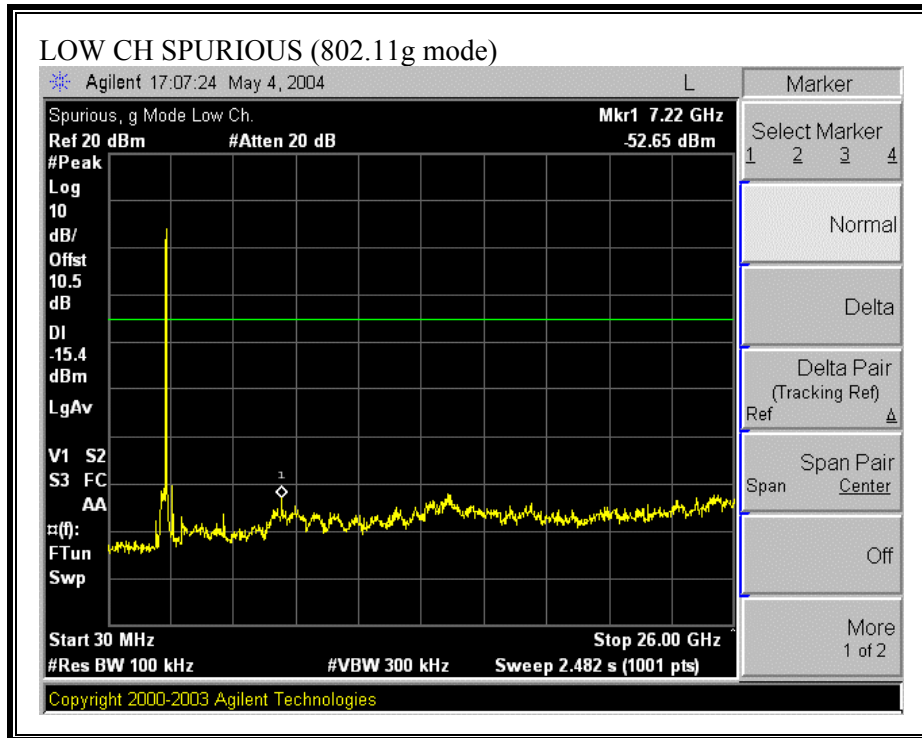
SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)



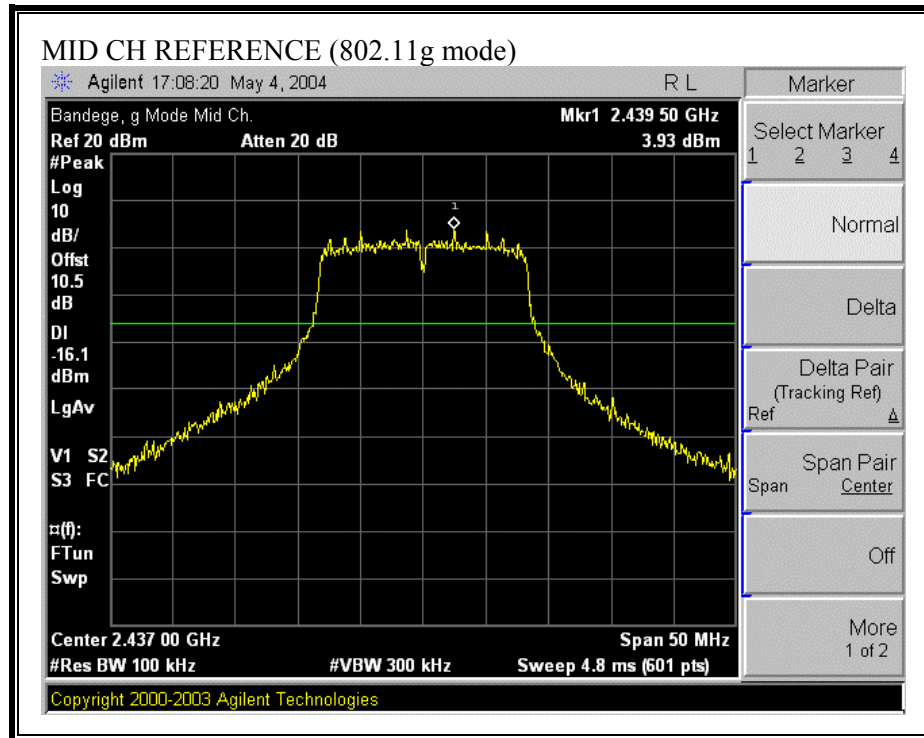


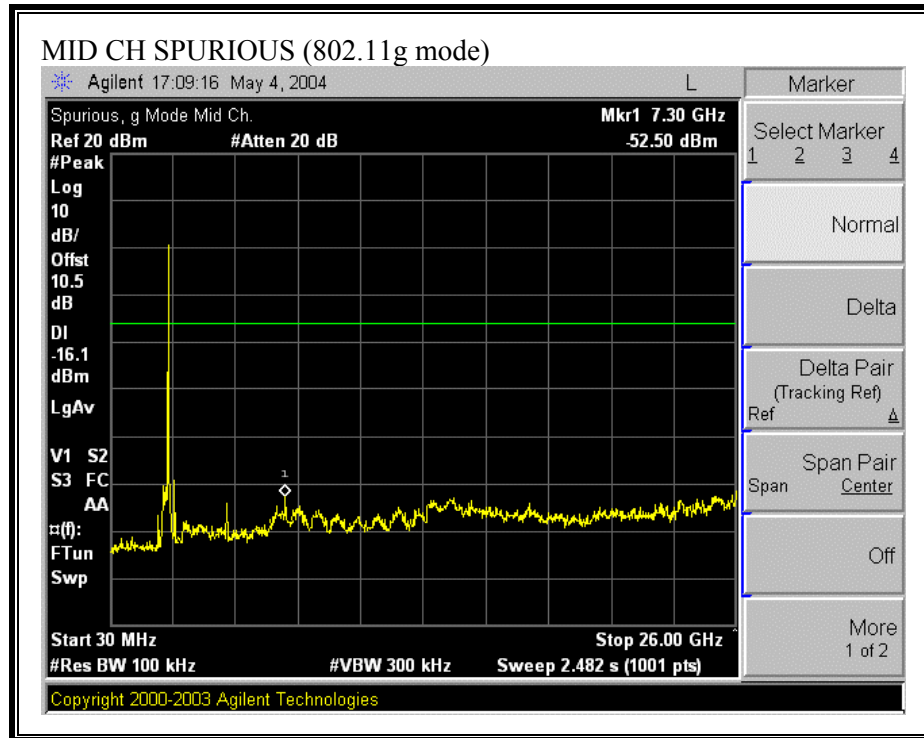
SPURIOUS EMISSIONS, LOW CHANNEL (802.11g MODE)



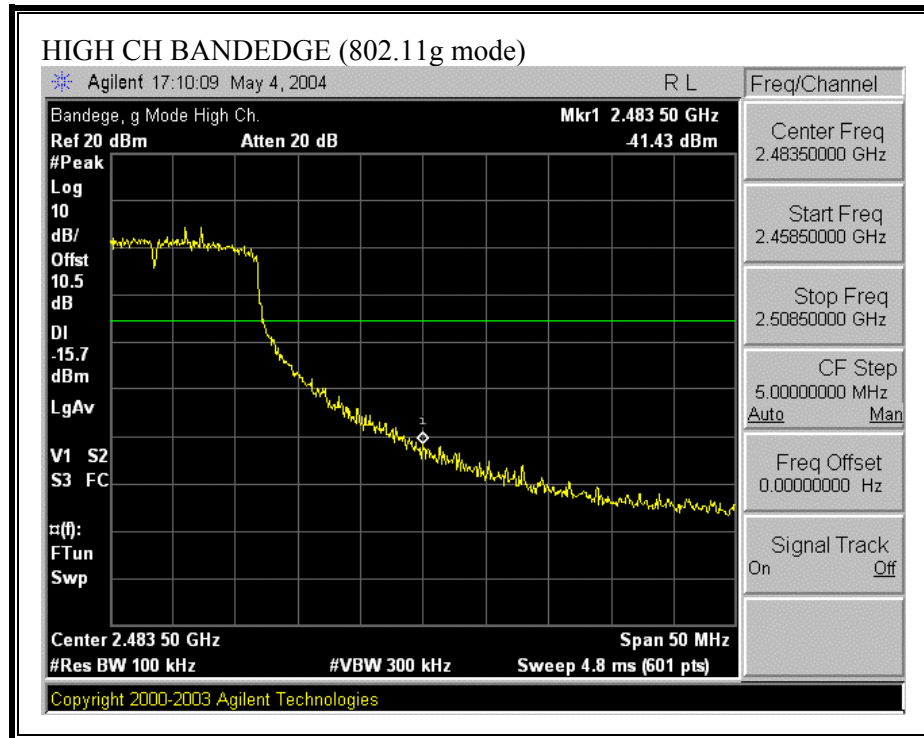


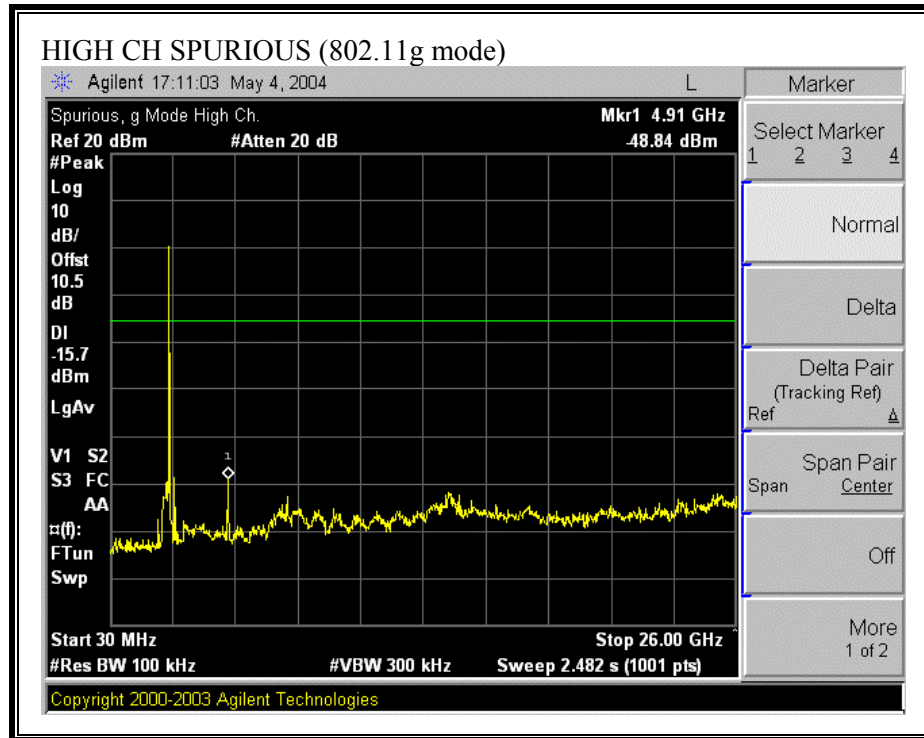
SPURIOUS EMISSIONS, MID CHANNEL (802.11g MODE)





SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g MODE)





7.7. RADIATED EMISSIONS

7.7.1. 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.

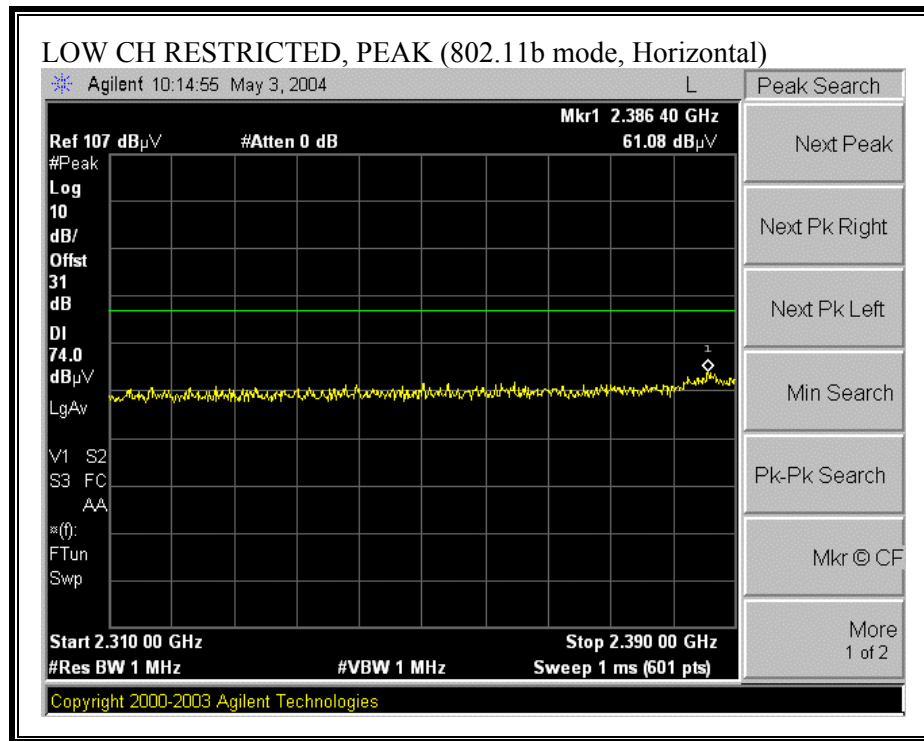
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

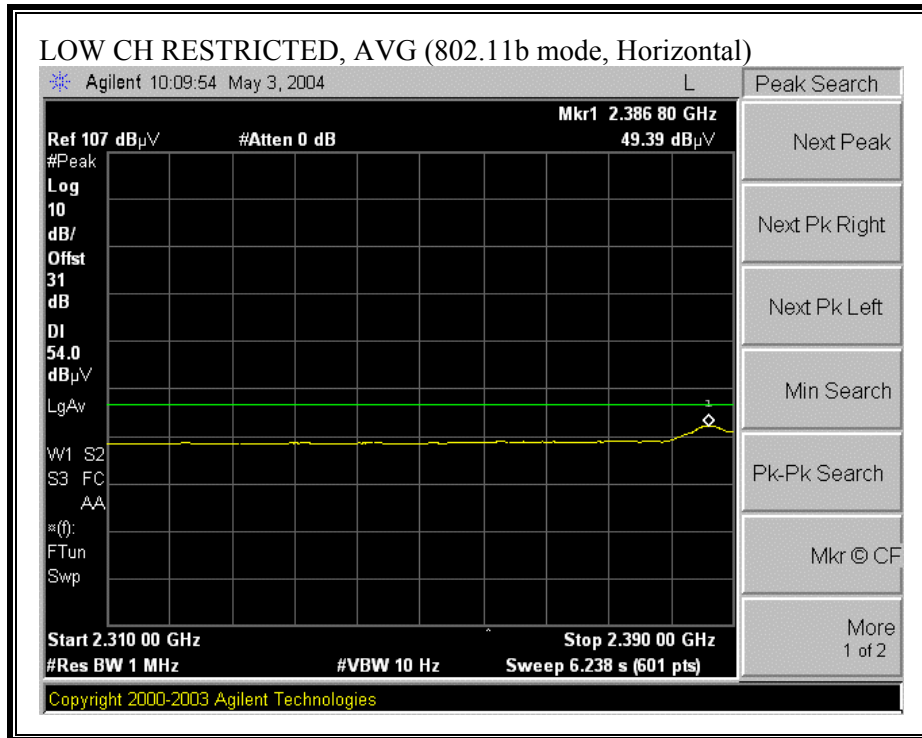
RESULTS

No non-compliance noted:

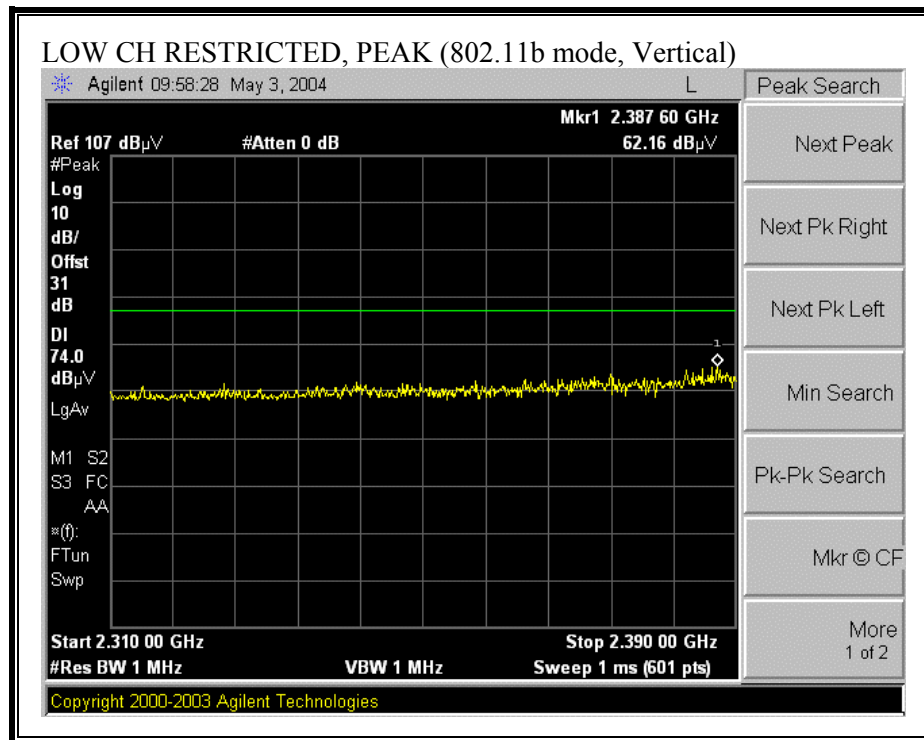
7.7.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHZ

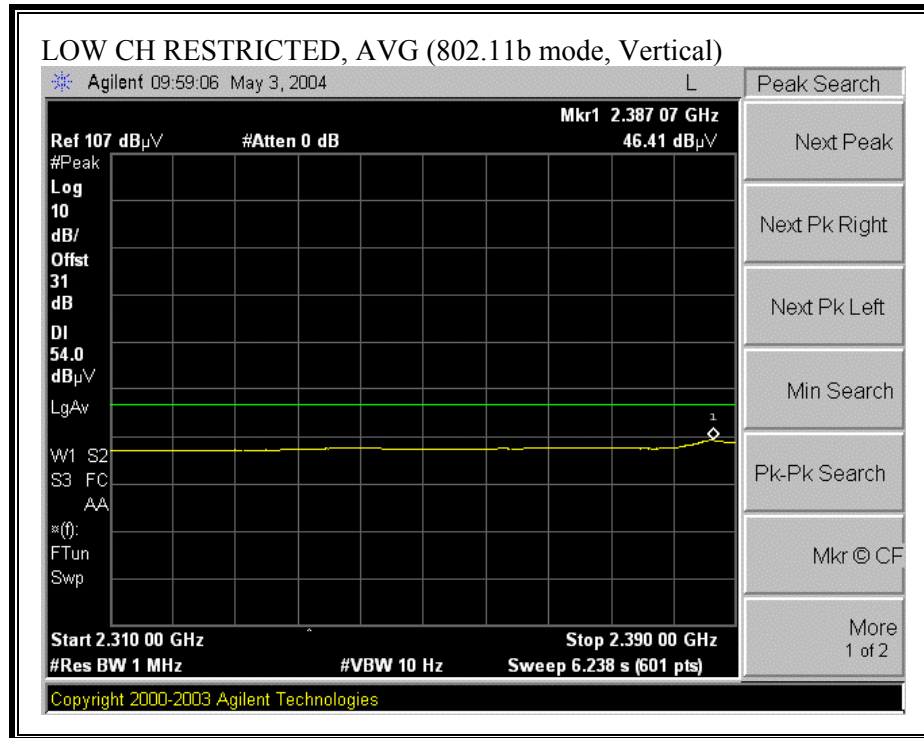
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)



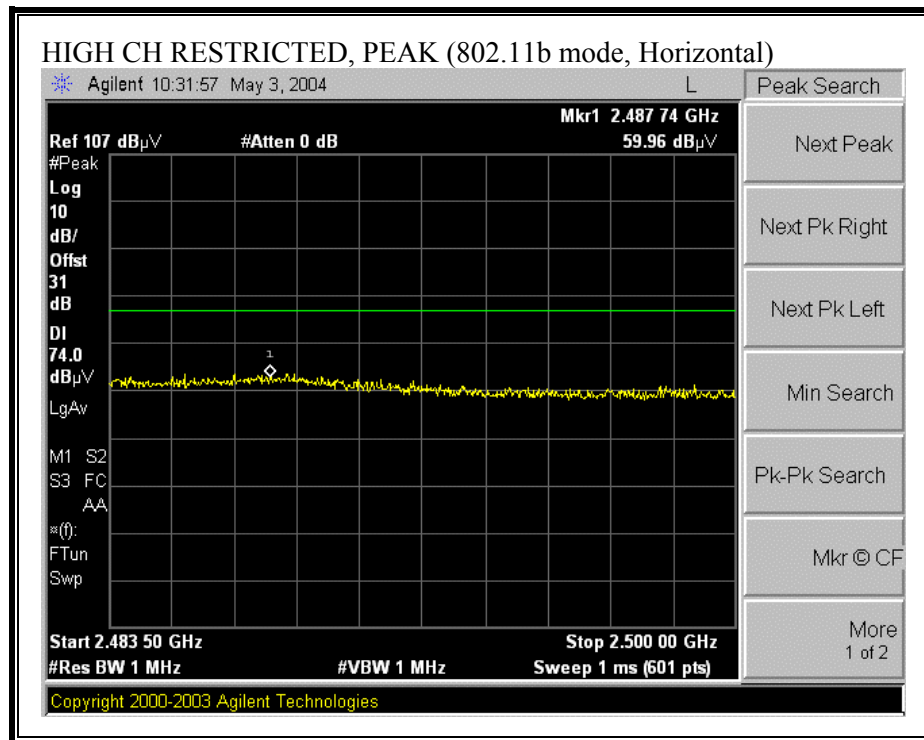


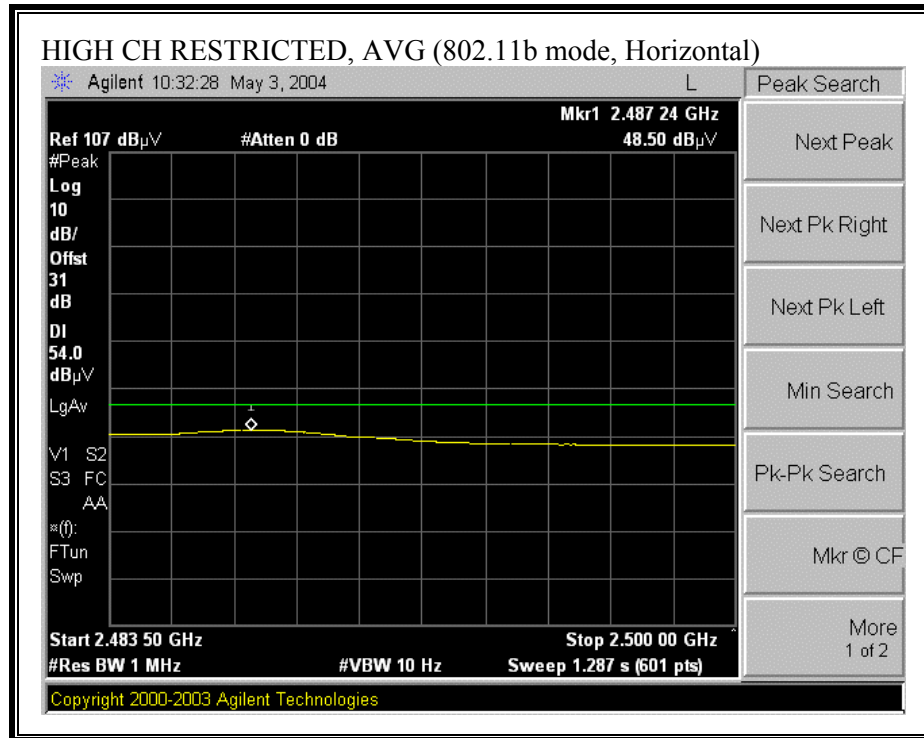
RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



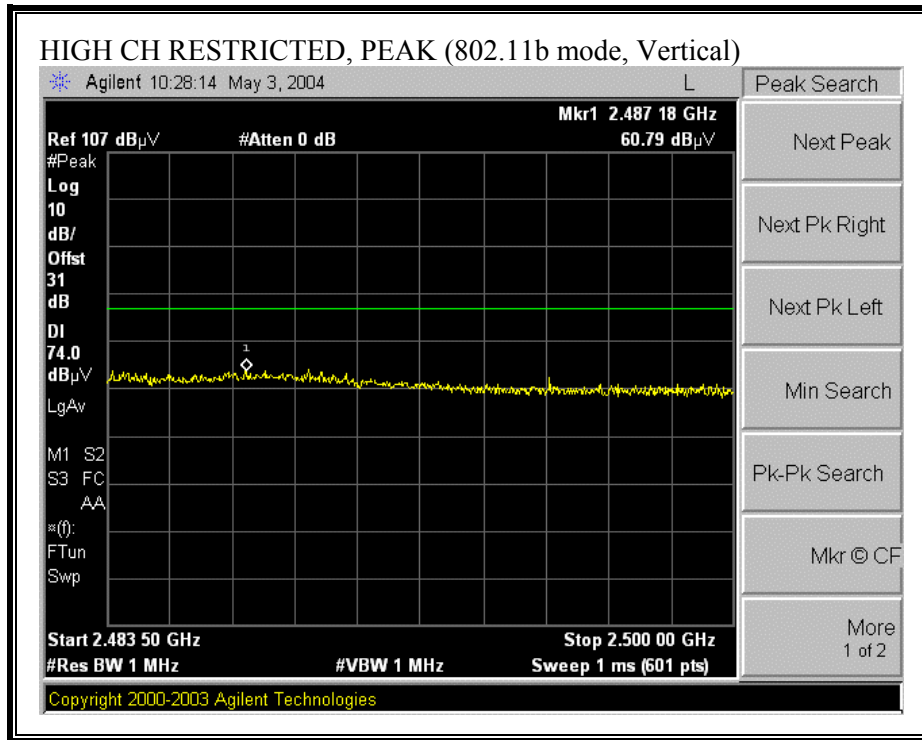


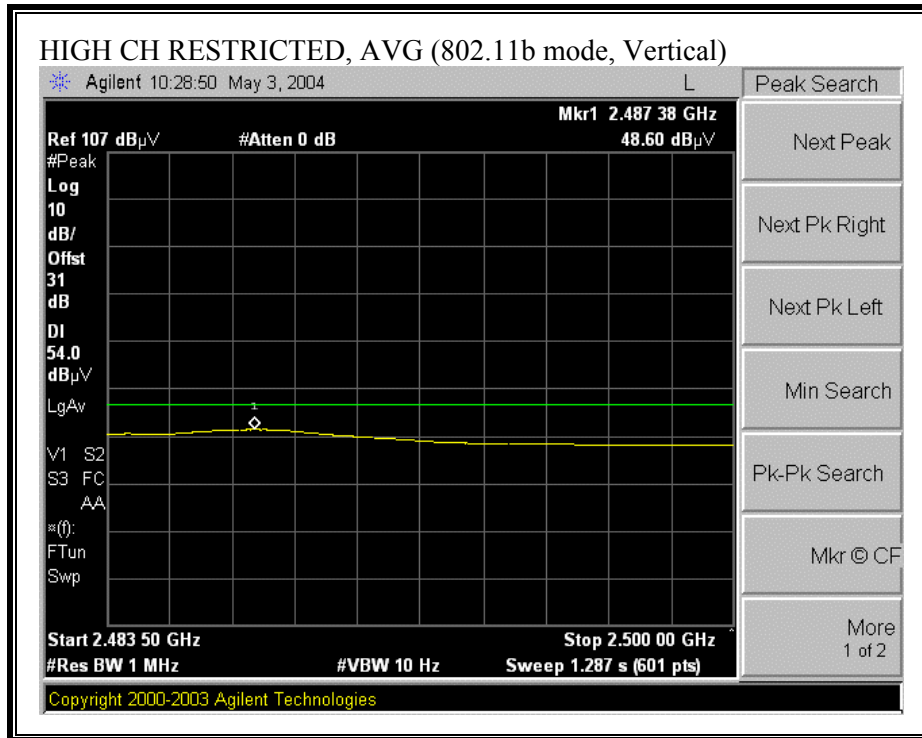
RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)

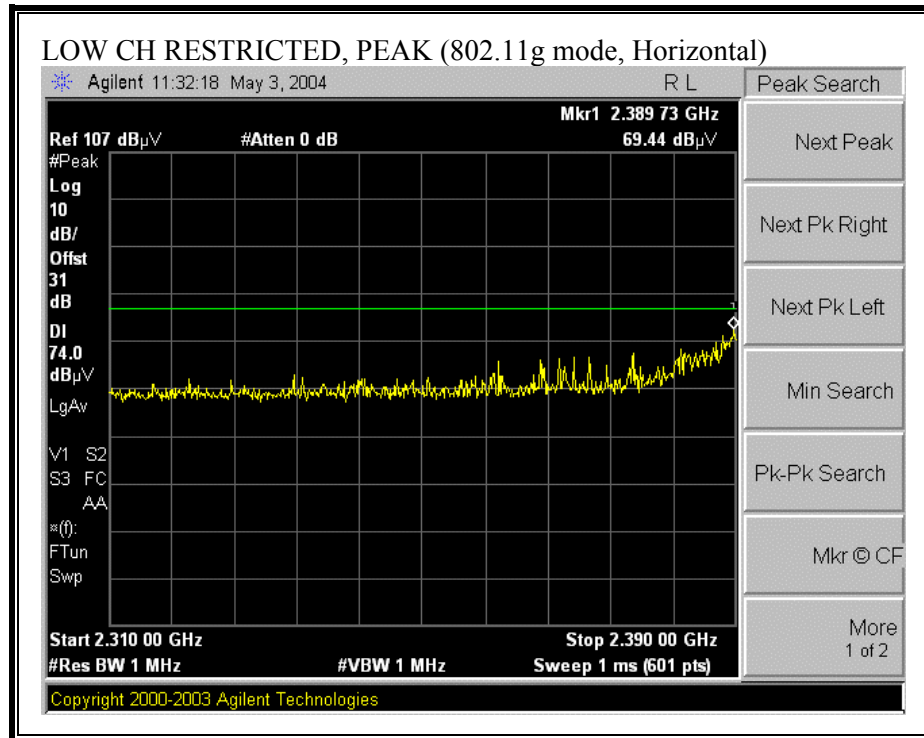


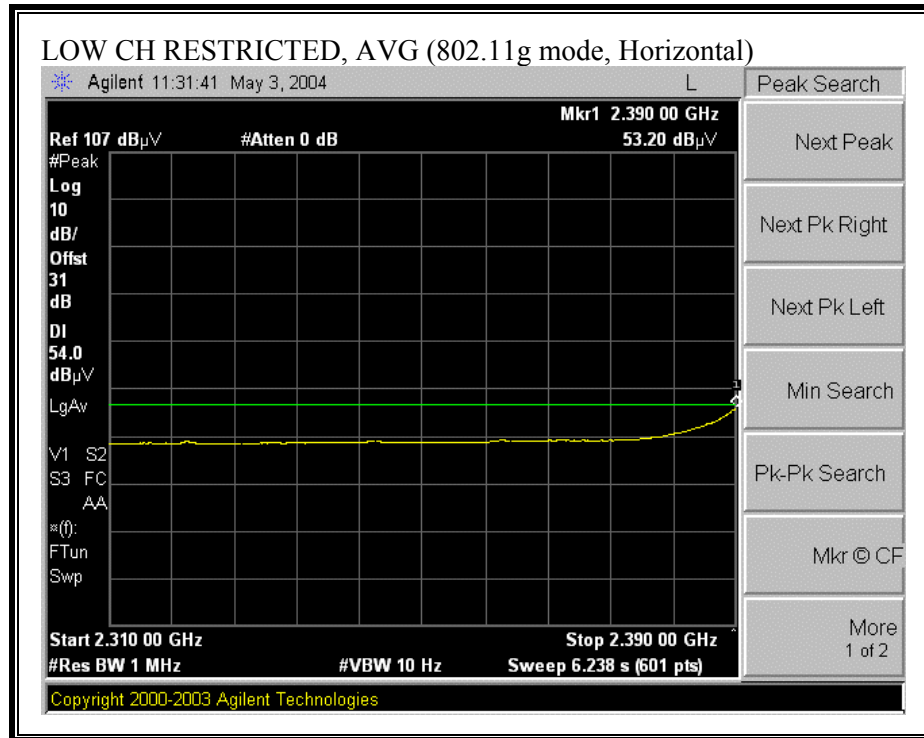


HARMONICS AND SPURIOUS EMISSIONS (b MODE)

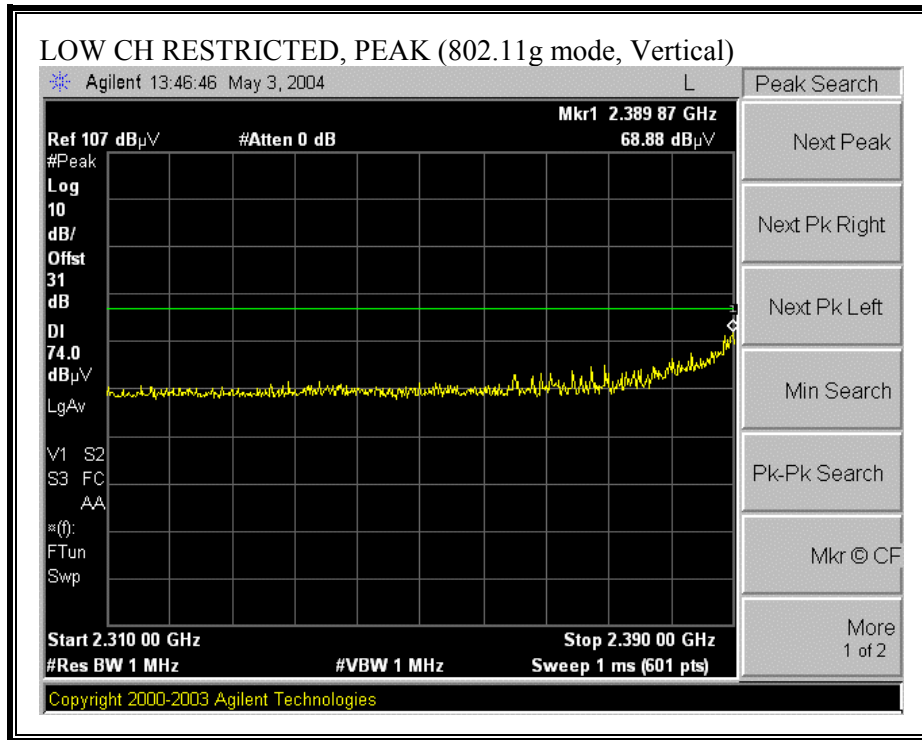
| 05/03/04 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site | | | | | | | | | | | | | | | | |
|---|-----------------------|--|----------------|---|-------|------------------------|--------------------------------|--------------|-------------|------------|---------------|----------------|------------------------------|------------|-------|--|
| Test Engr: Chin Pang Project #: 04I2702-1 Company: TOKO, Inc EUT Descr.: 802.11g/b Wireless LAN Card EUT M/N: TMW 1059 (FCC ID: NUSTMW 1059) Test Target: FCC 15.247 Mode Oper: TX, 11b | | | | | | | | | | | | | | | | |
| Test Equipment: | | | | | | | | | | | | | | | | |
| EMCO Horn 1-18GHz TS9; S/N: 3245 @3m | | Spectrum Analyzer Agilent E4446A Analyzer | | Pre-amplifier 1-26GHz T63 Miteq 646456 | | Pre-amplifier 26-40GHz | | Horn > 18GHz | | | | | | | | |
| Hi Frequency Cables: <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (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 | |
| 11b, Transmitting at Low Ch | | | | | | | | | | | | | | | | |
| 4.824 | 9.8 | 49.5 | 36.4 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 51.1 | 38.0 | 74.0 | 54.0 | -22.9 | -16.0 | V | |
| 7.238 | 9.8 | 50.0 | 39.6 | 35.9 | 3.7 | -34.6 | 0.0 | 1.0 | 55.9 | 45.5 | 74.0 | 54.0 | -18.1 | -8.5 | V | |
| 4.824 | 9.8 | 47.5 | 34.0 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 49.1 | 35.6 | 74.0 | 54.0 | -24.9 | -18.4 | H | |
| 7.238 | 9.8 | 53.8 | 44.1 | 35.9 | 3.7 | -34.6 | 0.0 | 1.0 | 59.7 | 50.0 | 74.0 | 54.0 | -14.3 | -4.0 | H | |
| 9.648 | 9.8 | 42.0 | 33.0 | 37.9 | 4.3 | -33.3 | 0.0 | 1.0 | 51.8 | 42.8 | 74.0 | 54.0 | -22.2 | -11.2 | H | |
| 11b, Transmitting at Mid Ch | | | | | | | | | | | | | | | | |
| 4.847 | 9.8 | 47.0 | 35.6 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 48.7 | 37.3 | 74.0 | 54.0 | -25.3 | -16.7 | V | |
| 7.311 | 9.8 | 52.5 | 43.0 | 36.0 | 3.7 | -34.6 | 0.0 | 1.0 | 58.6 | 49.1 | 74.0 | 54.0 | -15.4 | -4.9 | V | |
| 9.748 | 9.8 | 43.0 | 32.0 | 37.8 | 4.3 | -33.4 | 0.0 | 1.0 | 52.7 | 41.7 | 74.0 | 54.0 | -21.3 | -12.3 | V | |
| 4.847 | 9.8 | 46.0 | 34.2 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 47.7 | 35.9 | 74.0 | 54.0 | -26.3 | -18.1 | H | |
| 7.311 | 9.8 | 51.7 | 42.2 | 36.0 | 3.7 | -34.6 | 0.0 | 1.0 | 57.8 | 48.3 | 74.0 | 54.0 | -16.2 | -5.7 | H | |
| 9.748 | 9.8 | 40.0 | 31.9 | 37.8 | 4.3 | -33.4 | 0.0 | 1.0 | 49.7 | 41.6 | 74.0 | 54.0 | -24.3 | -12.4 | H | |
| 11b, Transmitting at High Ch | | | | | | | | | | | | | | | | |
| 4.923 | 9.8 | 51.0 | 38.0 | 33.1 | 3.0 | -35.3 | 0.0 | 1.0 | 52.8 | 39.8 | 74.0 | 54.0 | -21.2 | -14.2 | V | |
| 7.384 | 9.8 | 52.3 | 41.8 | 36.1 | 3.7 | -34.5 | 0.0 | 1.0 | 58.5 | 48.0 | 74.0 | 54.0 | -15.5 | -6.0 | V | |
| 4.923 | 9.8 | 47.0 | 35.0 | 33.1 | 3.0 | -35.3 | 0.0 | 1.0 | 48.8 | 36.8 | 74.0 | 54.0 | -25.2 | -17.2 | H | |
| 7.384 | 9.8 | 50.0 | 40.0 | 36.1 | 3.7 | -34.5 | 0.0 | 1.0 | 56.2 | 46.2 | 74.0 | 54.0 | -17.8 | -7.8 | H | |
| NO OTHER SPURIOUS EMISSIONS DETECTED ABOVE THE SYSTEM NOISE FLOOR IN THE RESTRICTED BAND -20dB TO THE LIMIT | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | |

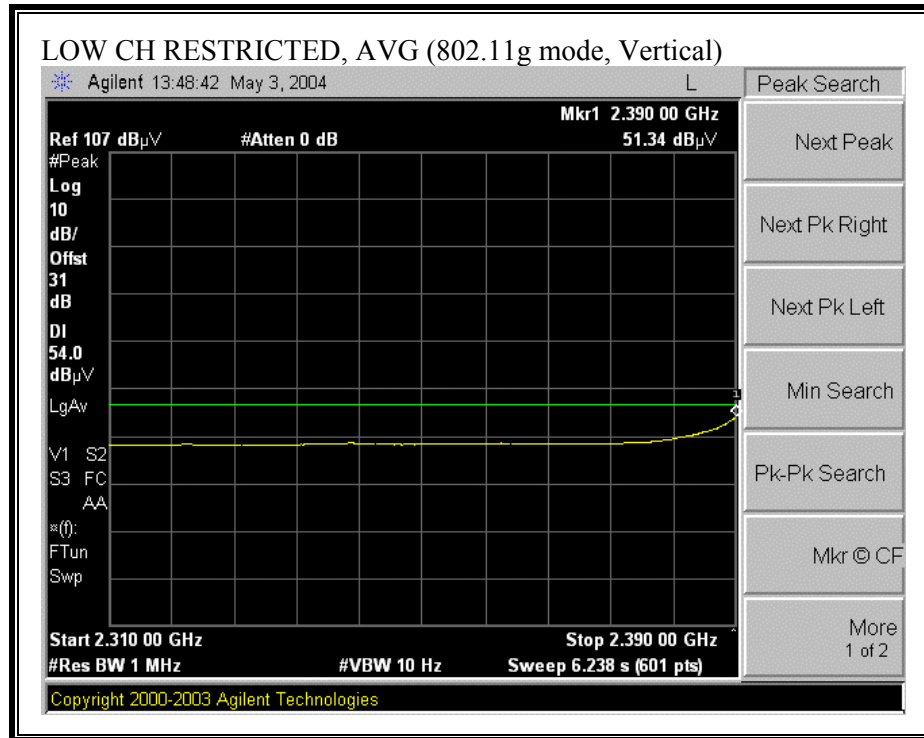
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)



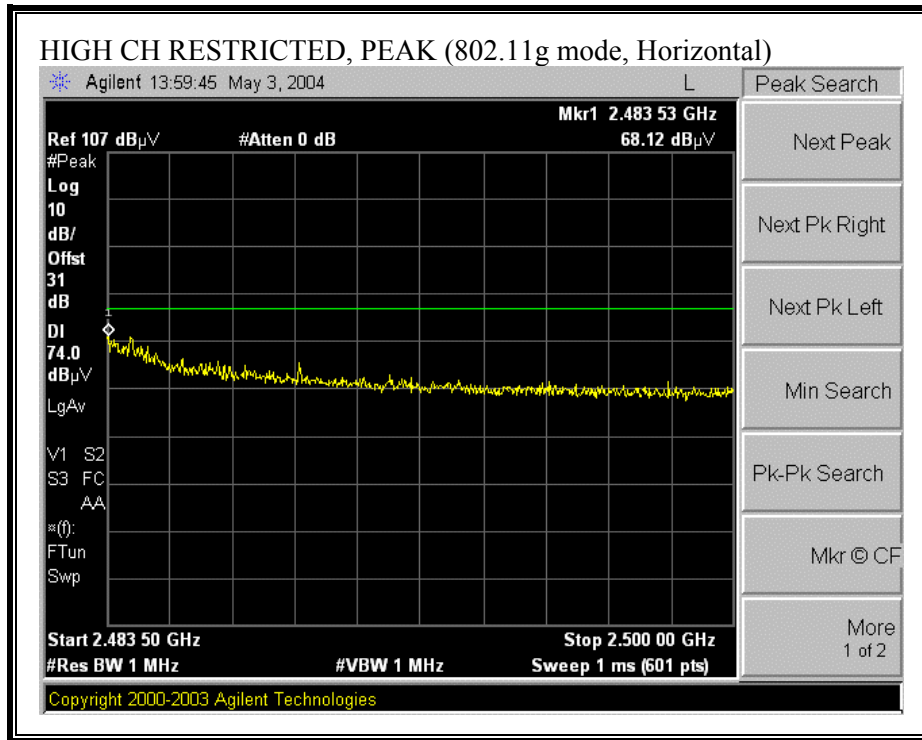


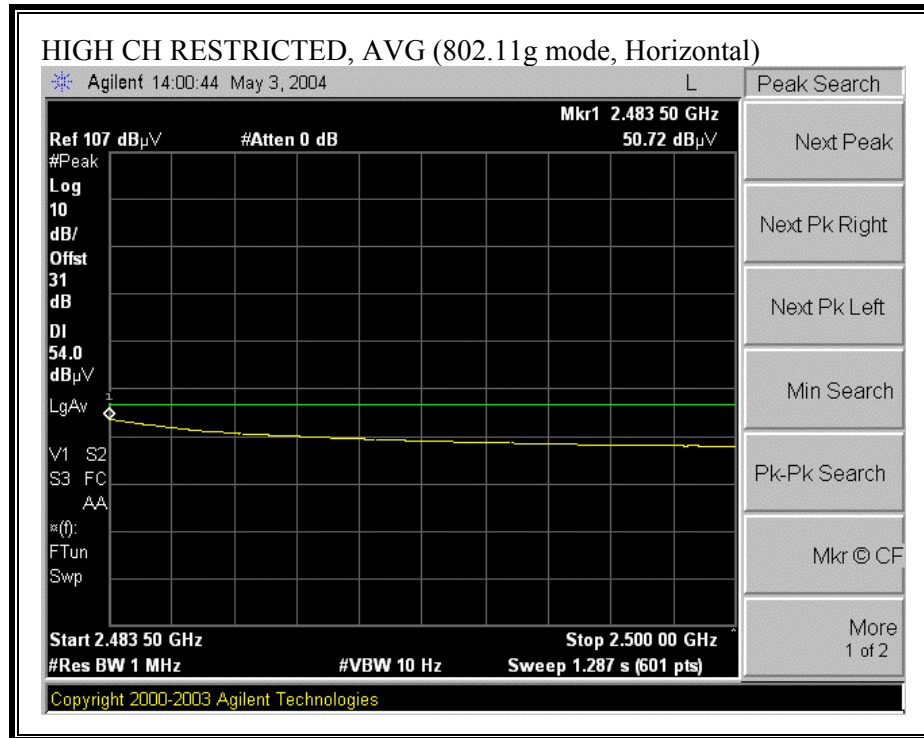
RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)



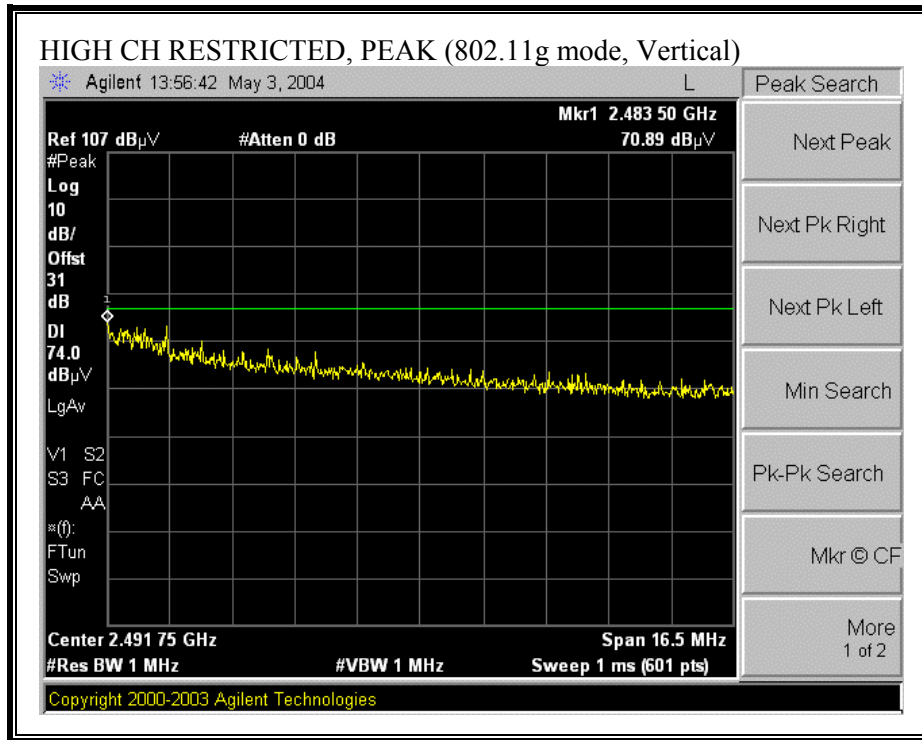


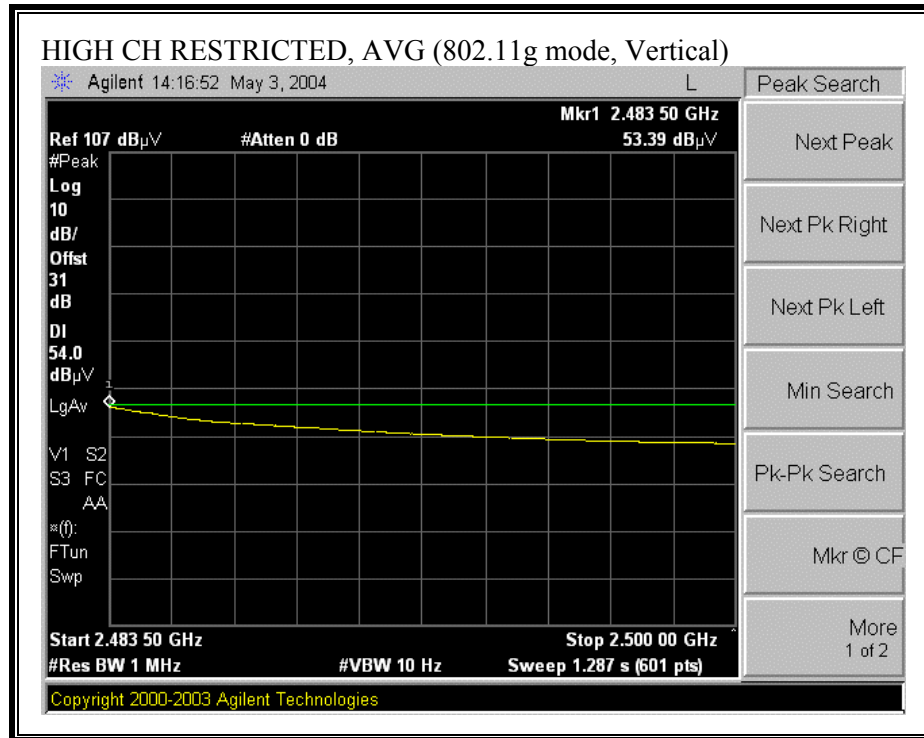
RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)






HARMONICS AND SPURIOUS EMISSIONS (g MODE)

| 05/03/04 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site Test Engr: Chin Pang Project #: 04I2702-1 Company: TOKO, Inc EUT Descr.: 802.11g/b Wireless LAN Card EUT M/N: TMW 1059 (FCC ID: NUSTMW 1059) Test Target: FCC 15.247 Mode Oper: TX, 11g Test Equipment: <table border="1"><tr><td>EMCO Horn 1-18GHz T59; S/N: 3245 @3m</td><td>Spectrum Analyzer Agilent E4446A Analyzer</td><td>Pre-amplifier 1-26GHz T63 Miteq 646456</td><td>Pre-amplifier 26-40GHz</td><td>Horn > 18GHz</td></tr></table> <table border="1"><tr><td colspan="4">Hi Frequency Cables <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (12 ft)</td><td colspan="2">Peak Measurements: 1 MHz Resolution Bandwidth 1MHz Video Bandwidth</td><td colspan="2">Average Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth</td></tr></table> | | | | | | | | | | | | | | | | EMCO Horn 1-18GHz T59; S/N: 3245 @3m | Spectrum Analyzer Agilent E4446A Analyzer | Pre-amplifier 1-26GHz T63 Miteq 646456 | Pre-amplifier 26-40GHz | Horn > 18GHz | Hi Frequency Cables <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (12 ft) | | | | Peak Measurements: 1 MHz Resolution Bandwidth 1MHz Video Bandwidth | | Average Measurements: 1 MHz Resolution Bandwidth 10Hz Video Bandwidth | |
|--|--|---|------------------------|---|----------|--|--------------------------------|-----|----------------|---------------|------------------|-------------------|------------------------------|---------------|-------|---|--|---|------------------------|--------------|---|--|--|--|---|--|--|--|
| EMCO Horn 1-18GHz T59; S/N: 3245 @3m | Spectrum Analyzer Agilent E4446A Analyzer | Pre-amplifier 1-26GHz T63 Miteq 646456 | Pre-amplifier 26-40GHz | Horn > 18GHz | | | | | | | | | | | | | | | | | | | | | | | | |
| Hi Frequency Cables <input type="checkbox"/> (2 ft) <input checked="" type="checkbox"/> (2 ~ 3 ft) <input type="checkbox"/> (4 ~ 6 ft) <input checked="" type="checkbox"/> (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 | | | | | | | | | | | | | |
| 11g, Transmitting at Low Ch Art setting 15.5dBm | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.824 | 9.8 | 46.0 | 34.5 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 47.6 | 36.1 | 74.0 | 54.0 | -26.4 | -17.9 | V | | | | | | | | | | | | | |
| 7.238 | 9.8 | 50.2 | 38.4 | 35.9 | 3.7 | -34.6 | 0.0 | 1.0 | 56.1 | 44.3 | 74.0 | 54.0 | -17.9 | -9.7 | V | | | | | | | | | | | | | |
| 4.824 | 9.8 | 45.0 | 32.4 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 46.6 | 34.0 | 74.0 | 54.0 | -27.4 | -20.0 | H | | | | | | | | | | | | | |
| 7.238 | 9.8 | 54.2 | 42.4 | 35.9 | 3.7 | -34.6 | 0.0 | 1.0 | 60.1 | 48.3 | 74.0 | 54.0 | -13.9 | -5.7 | H | | | | | | | | | | | | | |
| 11g, Transmitting at Mid Ch Art setting 15.5dBm | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.874 | 9.8 | 48.0 | 35.4 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 49.7 | 37.1 | 74.0 | 54.0 | -24.3 | -16.9 | V | | | | | | | | | | | | | |
| 7.311 | 9.8 | 53.8 | 41.0 | 36.0 | 3.7 | -34.6 | 0.0 | 1.0 | 59.9 | 47.1 | 74.0 | 54.0 | -14.1 | -6.9 | V | | | | | | | | | | | | | |
| 9.748 | 9.8 | 45.0 | 33.0 | 37.8 | 4.3 | -33.4 | 0.0 | 1.0 | 54.7 | 42.7 | 74.0 | 54.0 | -19.3 | -11.3 | V | | | | | | | | | | | | | |
| 4.874 | 9.8 | 46.0 | 34.2 | 33.1 | 2.9 | -35.3 | 0.0 | 1.0 | 47.7 | 35.9 | 74.0 | 54.0 | -26.3 | -18.1 | H | | | | | | | | | | | | | |
| 7.311 | 9.8 | 52.8 | 40.0 | 36.0 | 3.7 | -34.6 | 0.0 | 1.0 | 58.9 | 46.1 | 74.0 | 54.0 | -15.1 | -7.9 | H | | | | | | | | | | | | | |
| 11g, Transmitting at High Ch, Art Setting 15.5dBm | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.924 | 9.8 | 48.3 | 35.0 | 33.1 | 3.0 | -35.3 | 0.0 | 1.0 | 50.1 | 36.8 | 74.0 | 54.0 | -23.9 | -17.2 | V | | | | | | | | | | | | | |
| 7.384 | 9.8 | 55.8 | 41.8 | 36.1 | 3.7 | -34.5 | 0.0 | 1.0 | 62.0 | 48.0 | 74.0 | 54.0 | -12.0 | -6.0 | V | | | | | | | | | | | | | |
| 4.924 | 9.8 | 47.0 | 35.0 | 33.1 | 3.0 | -35.3 | 0.0 | 1.0 | 48.8 | 36.8 | 74.0 | 54.0 | -25.2 | -17.2 | H | | | | | | | | | | | | | |
| 7.384 | 9.8 | 56.0 | 42.0 | 36.1 | 3.7 | -34.5 | 0.0 | 1.0 | 62.2 | 48.2 | 74.0 | 54.0 | -11.8 | -5.8 | H | | | | | | | | | | | | | |
| NO OTHER SPURIOUS EMISSIONS DETECTED ABOVE THE SYSTEM NOISE FLOOR IN THE RESTRICTED BAND -20dB TO THE LIMIT | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| No other spurious emissions were detected above system noise floor. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | | | | | | | |

7.7.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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

| | | | | | | | |
|---|--|--|--|--|--|--|--|
|  | | | | | | Project #: 04I2702-1 Report #: 040504B1 Date & Time: 05/04/04 10:07 AM Test Engr: Chin Pang | |
| FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP 561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888 | | | | | | | |
| Company: TOKO, INC. | | | | | | | |
| EUT Description: 802.11b/g Wireless LAN Card | | | | | | | |
| Test Configuration : EUT/Laptop/AC Adapter | | | | | | | |
| Type of Test: FCC Class B | | | | | | | |
| Mode of Operation: TX (WORST CASE) | | | | | | | |
| << Main Sheet | | | | | | | |

| Freq. | Reading | AF | Closs | Pre-amp | Level | Limit | Margin | Pol | Az | Height | Mark |
|--------------|---------|-------|-------|---------|----------|-------|--------|-------|-------|---------|---------|
| (MHz) | (dBuV) | (dB) | (dB) | (dB) | (dBuV/m) | FCC_B | (dB) | (H/V) | (Deg) | (Meter) | (P/Q/A) |
| 180.00 | 53.40 | 9.26 | 3.09 | 28.82 | 36.93 | 43.50 | -6.57 | 3mV | 0.00 | 1.00 | P |
| 72.00 | 53.80 | 6.49 | 1.77 | 29.20 | 32.85 | 40.00 | -7.15 | 3mV | 0.00 | 1.00 | P |
| 171.80 | 52.80 | 9.54 | 2.89 | 28.90 | 36.33 | 43.50 | -7.17 | 3mH | 0.00 | 1.50 | P |
| 364.50 | 48.10 | 14.70 | 4.57 | 28.71 | 38.66 | 46.00 | -7.34 | 3mH | 0.00 | 1.50 | P |
| 430.00 | 45.30 | 16.35 | 5.11 | 28.98 | 37.77 | 46.00 | -8.23 | 3mV | 0.00 | 1.50 | P |
| 80.00 | 51.90 | 7.05 | 1.94 | 29.30 | 31.59 | 40.00 | -8.41 | 3mH | 0.00 | 1.50 | P |
| 6 Worst Data | | | | | | | | | | | |

7.8. 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 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

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

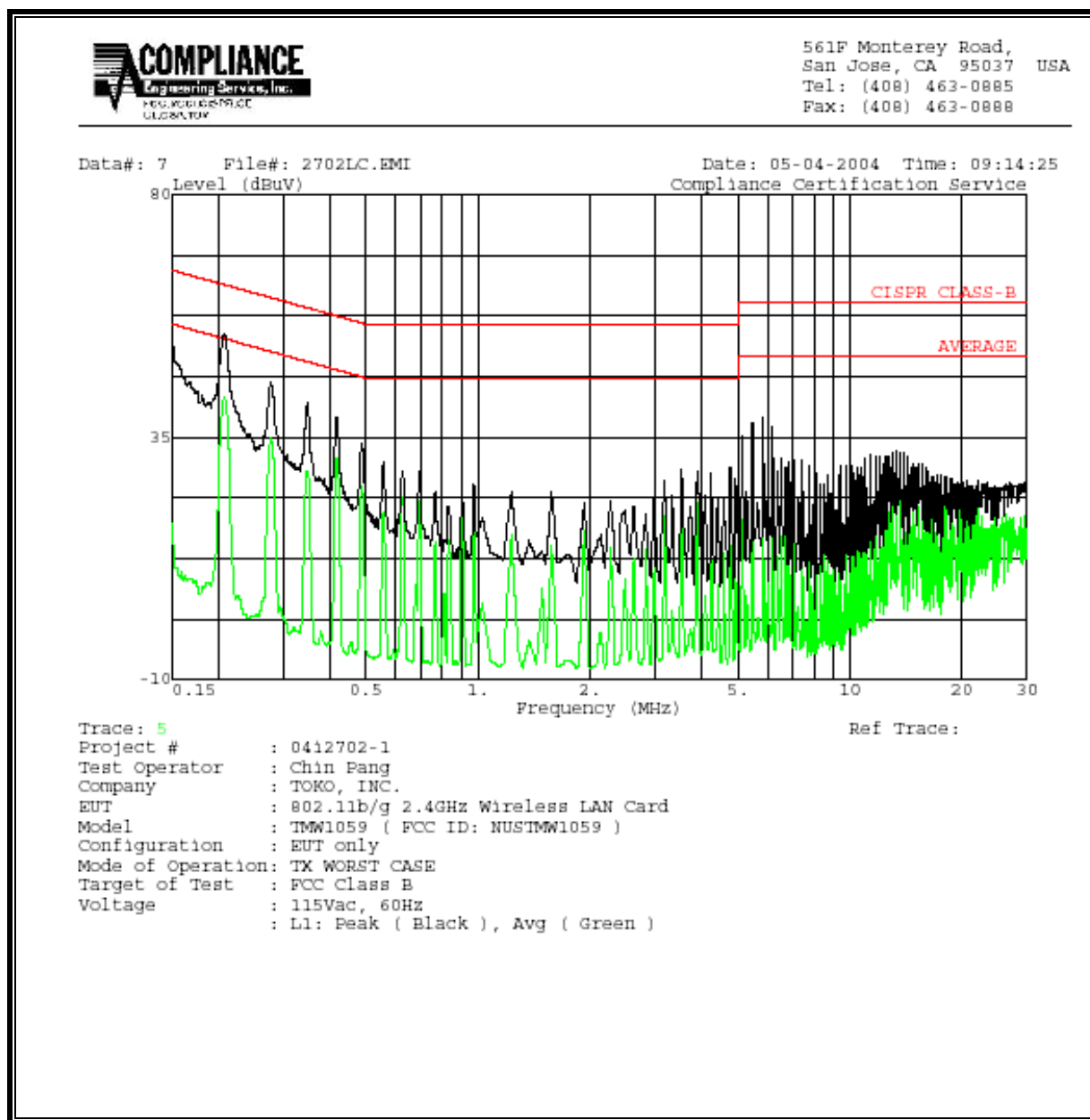
RESULTS

No non-compliance noted:

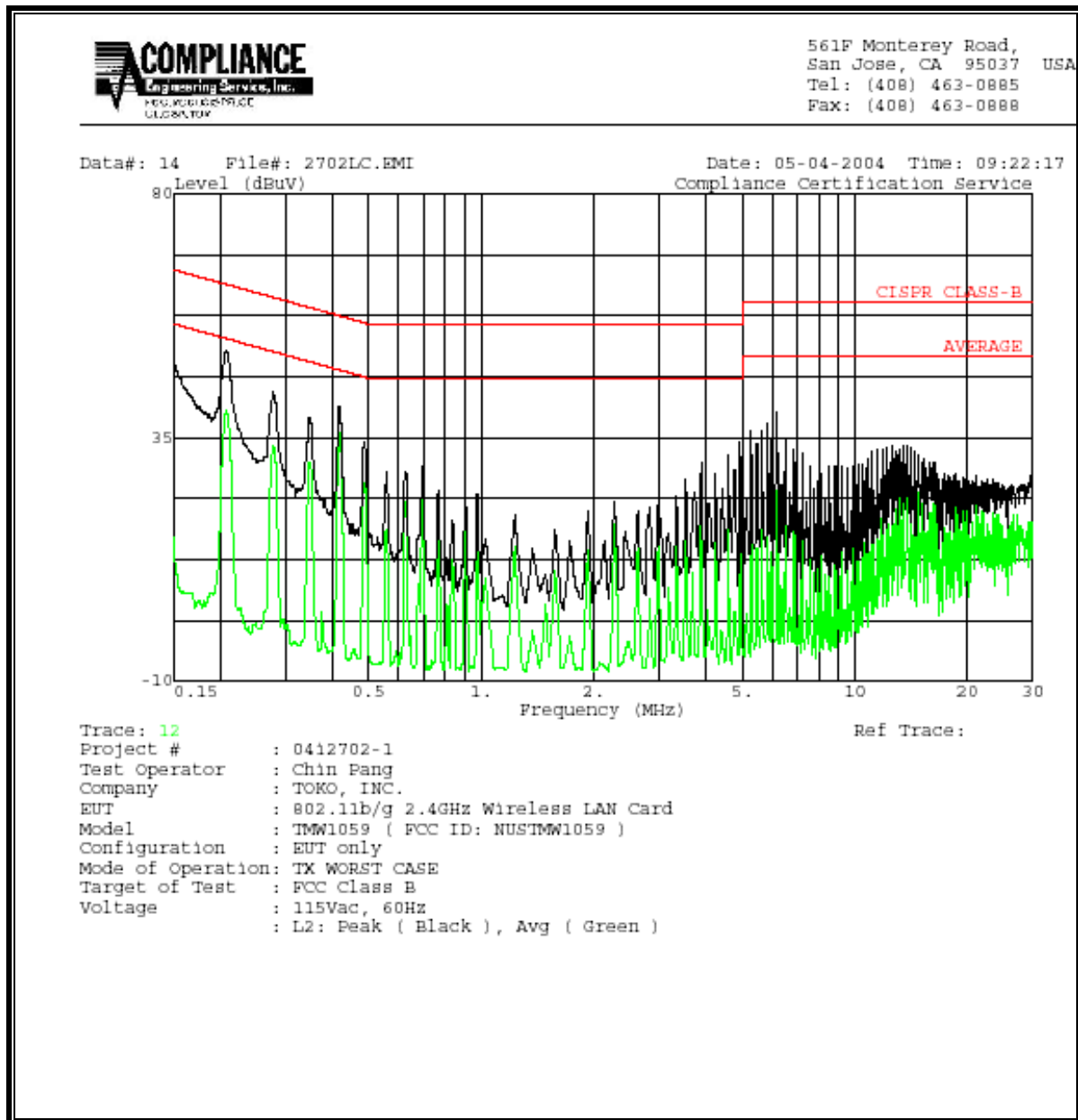
6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq. | Reading | | | Closs | Limit | EN B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.21 | 54.95 | -- | 42.47 | 0.00 | 64.37 | 54.37 | -9.42 | -11.90 | L1 |
| 0.28 | 45.24 | -- | 35.84 | 0.00 | 62.40 | 52.40 | -17.16 | -16.56 | L1 |
| 5.84 | 38.50 | -- | 27.84 | 0.00 | 60.00 | 50.00 | -21.50 | -22.16 | L1 |
| 0.21 | 52.18 | -- | 41.03 | 0.00 | 64.34 | 54.34 | -12.16 | -13.31 | L2 |
| 0.28 | 44.35 | -- | 33.98 | 0.00 | 62.37 | 52.37 | -18.02 | -18.39 | L2 |
| 6.19 | 40.74 | -- | 26.19 | 0.00 | 60.00 | 50.00 | -19.26 | -23.81 | L2 |
| 6 Worst Data | | | | | | | | | |

LINE 1 RESULTS

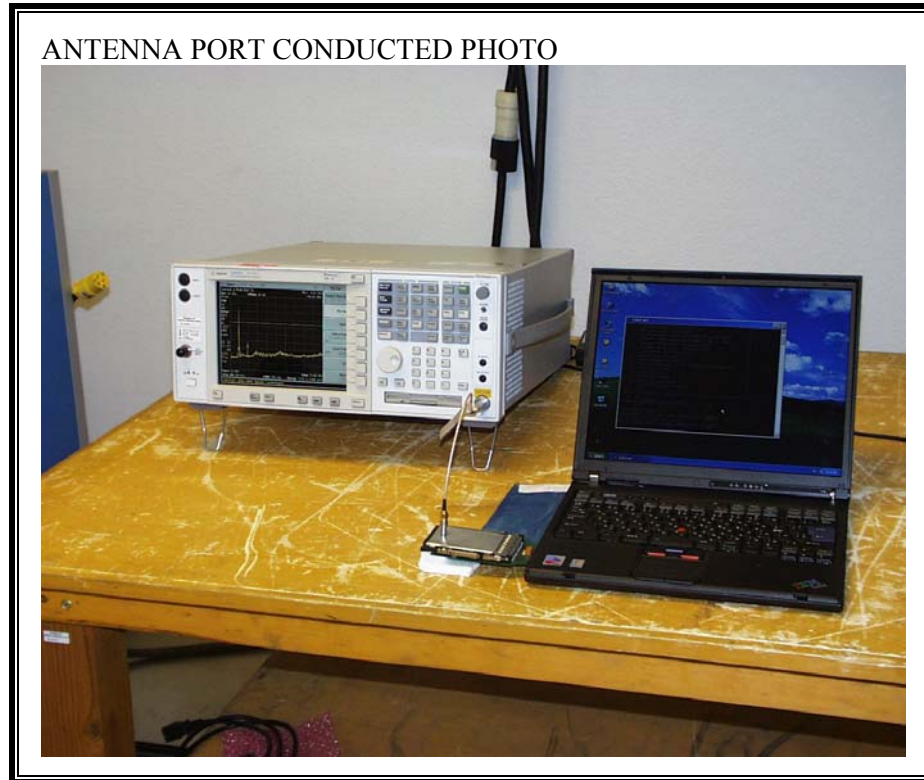


LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



LINE CONDUCTED BACK PHOTO



END OF REPORT