



FCC 47 CFR PART 15 SUBPART C AND ANSI C63.4 : 2003

TEST REPORT

For

IEEE 802.11g Wireless Router

Model : DI-524UP

Data Applies To : WRG-G08

Trade Name : D-Link

Issued for

D-Link Corporation

No.8, Li-shing Road VII, Science-based Industrial Park,

Hsinchu, Taiwan R.O.C.

Issued by

Compliance Certification Services Inc.

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1. TEST REPORT CERTIFICATION

Applicant : D-Link Corporation
Address : No.8, Li-shing Road VII, Science-based Industrial Park,
Hsinchu, Taiwan, R.O.C.
Equipment Under Test : IEEE 802.11g Wireless Router
Model : DI-524UP
Data Applies To : WRG-G08
Trade Name : D-Link
Tested Date : July 29 ~ August 25, 2005

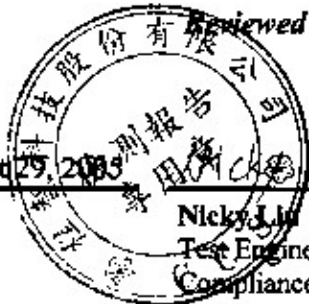
| APPLICABLE STANDARD | |
|---|-------------------------|
| STANDARD | TEST RESULT |
| FCC Part 15 Subpart C : 2004 AND ANSI C63.4 : 2003 | No non-compliance noted |

Approved by:

C. F. Wu

C. F. Wu
Manager of Hsinchu Laboratory
Compliance Certification Services Inc.

Reviewed by:



Nicky Liu
Nicky Liu
Test Engineer of Hsinchu Laboratory
Compliance Certification Services Inc.

August 29, 2005

August 29, 2005

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.



2. EUT DESCRIPTION

2.1 DESCRIPTION OF EUT & POWER

| | |
|----------------------------|---|
| Product Name | IEEE 802.11g Wireless Router |
| Model Number | DI-524UP |
| Data Applies To | WRG-G08 |
| Frequency Range | IEEE 802.11b/g : 2412MHz to 2462MHz |
| Transmit Power | IEEE 802.11b : 21.31dBm IEEE 802.11g : 16.70dBm |
| Channel Spacing | 5MHz |
| Channel Number | IEEE 802.11b/g : 11 Channels |
| Transmit Data Rate | IEEE 802.11b : 11, 5.5, 2, 1 Mbps IEEE 802.11g : 54, 48, 36, 24, 18, 12, 9, 6 Mbps |
| Type of Modulation | IEEE 802.11b : DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g : OFDM (64QAM, 16AQM, QPSK, BPSK) |
| Frequency Selection | by software / firmware |
| Antenna Type | Main : 1/4λ Dipole Antenna, Antenna Gain : 2.14dBi AUX : PCB Antenna (Only RX) |
| Power Source | 5VDC (From Powered Adapter) |

Power Adapter :

| No. | Manufacturer | Model No. | Power Input | Power Output |
|-----|--------------|-----------|---------------------------|--------------|
| 1 | D-Link | JTA0302A | 100~120VAC, 50/60Hz, 0.5A | 5VDC, 2A |

The difference of the series model

| Product | Mode Number | Trade Name |
|------------------------------|-------------|------------|
| IEEE 802.11g Wireless Router | DI-524UP | D-Link |
| | WRG-G08 | Non-brand |

Remark : for more details, please refer to the User's manual of the EUT.



3. DESCRIPTION OF TEST MODES

The EUT (DI-524UP) had been tested under operating condition.

There are three channels have been tested as following :

| Channel | Frequency (MHz) |
|---------|-----------------|
| Low | 2412 |
| Middle | 2437 |
| High | 2462 |

IEEE 802.11b : 11Mbps data rate (worst case) were chosen for full testing.

IEEE 802.11g : 54Mbps data rate (worst case) were chosen for full testing.

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CRF 47 2.1046, 2046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.



5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at Rm.258, Bldg.17, NO.195 , Sec. 4, Chung Hsing Rd., Chu-Tung Chen. Hsin-Chu, Taiwan 310 R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.







Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200118-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: 90585 and 90584).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---------|-----------------|---|---|
| USA | NVLAP | EN 55014-1, AS/NZS 1044, CNS 13783-1, IEC/CISPR 14-1, IEC/CISPR 22, EN 55022, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, AS/NZS CISPR 22, AS/NZS 3548, IEC 61000-4-2/3/4/5/6/8/11 |  200118-0 |
| USA | FCC | 3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements |  90585, 90584 |
| Japan | VCCI | 3/10 meter Open Area Test Sites to perform conducted/radiated measurements |  R-1229/1189 C-1250/1294 |
| Taiwan | CNLA | FCC Method-47 CFR Part 15 Subpart C,D,E CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, CNS 13803, CISPR 13, CNS 13439, FCC Method-47 CFR Part 15 Subpart B, CISPR 14-1, EN 55014-1, CNS 13783-1, EN 55015, CNS 14115, CISPR 22, EN 55022, VCCI CNS 13438, EN 61000-4-2/3/4/5/6/8/11 |  0240 ILAC MRA |
| Taiwan | BSMI | CNS 13803, CNS 13438, CNS 13439, CNS 13783-1, CNS 14115 |  SL2-IS-E-0002 SL2-IN-E-0002 SL2-A1-E-0002 SL2-R1-E-0002 SL2-R2-E-0002 SL2-L1-E-0002 |
| Canada | Industry Canada | RSS212, Issue 1 |  IC 4417-1 |

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



6. CALIBRATION AND UNCERTAINTY

6.1 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.

6.2 MEASUREMENT UNCERTAINTY

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

| PARAMETER | UNCERTAINTY |
|-----------------------------------|-------------|
| Radiated Emission, 30 to 1000 MHz | +/- 3.2 dB |
| Radiated Emission, 1 to 26.5 GHz | +/- 3.2 dB |
| Power Line Conducted Emission | +/- 2.9 dB |

Uncertainty figures are valid to a confidence level of 95%

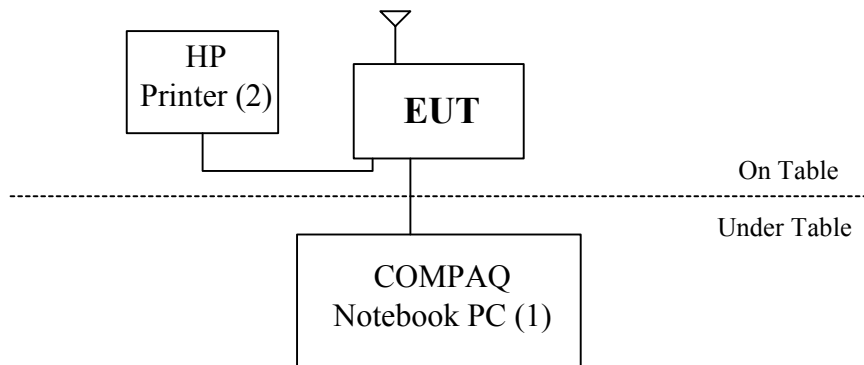


7. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

| No. | Product | Manufacturer | Model No. | Serial No. | FCC ID |
|-----|-------------|--------------|------------------|------------------|--------|
| 1 | Notebook PC | COMPAQ | N 800V | 5Y33KSQZMOXV 1YR | DoC |
| 2 | Printer | HP | hp desk jet 948c | CN19S6S1XS | DoC |

SETUP DIAGRAM FOR TESTS



EUT OPERATING CONDITION

TX mode

1. iwpriv wlan0 mp_start
2. iwpriv wlan0 mp_channel 1、6、11
3. iwpriv wlan0 mp_rate 22(802.11B)、108(802.11G)
4. iwpriv wlan0 mp_txpower cck=16,ofdm=22
5. iwpriv wlan0 mp_ctx da=001122334455,time=-1

RX mode

1. iwpriv wlan0 mp_start
2. iwpriv wlan0 mp_channel 1、6、11
3. iwpriv wlan0 mp_arx start (start)
4. iwpriv wlan0 mp_arx stop (stop)



8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6dB BANDWIDTH

LIMIT

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

TEST EQUIPMENTS

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|-----------------------------------|-----------|------------|---------------------|
| ROHDE & SCHWARZ SPECTRUM ANALYZER | FSEK30 | 835253/002 | September 06, 2004 |

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 1MHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

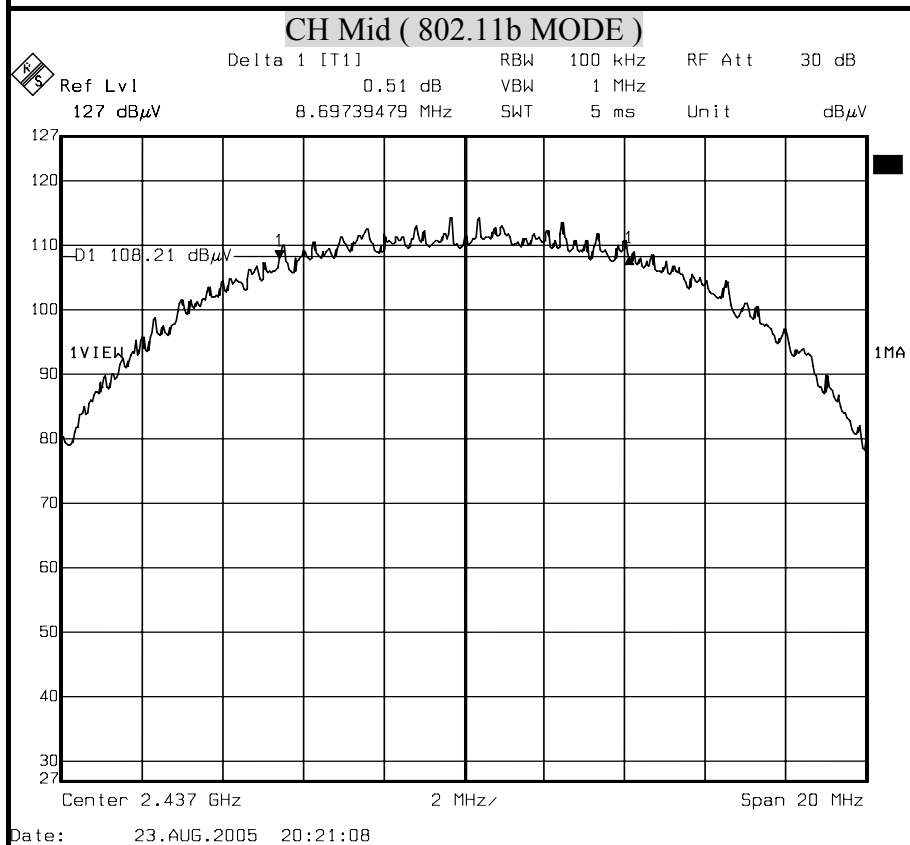
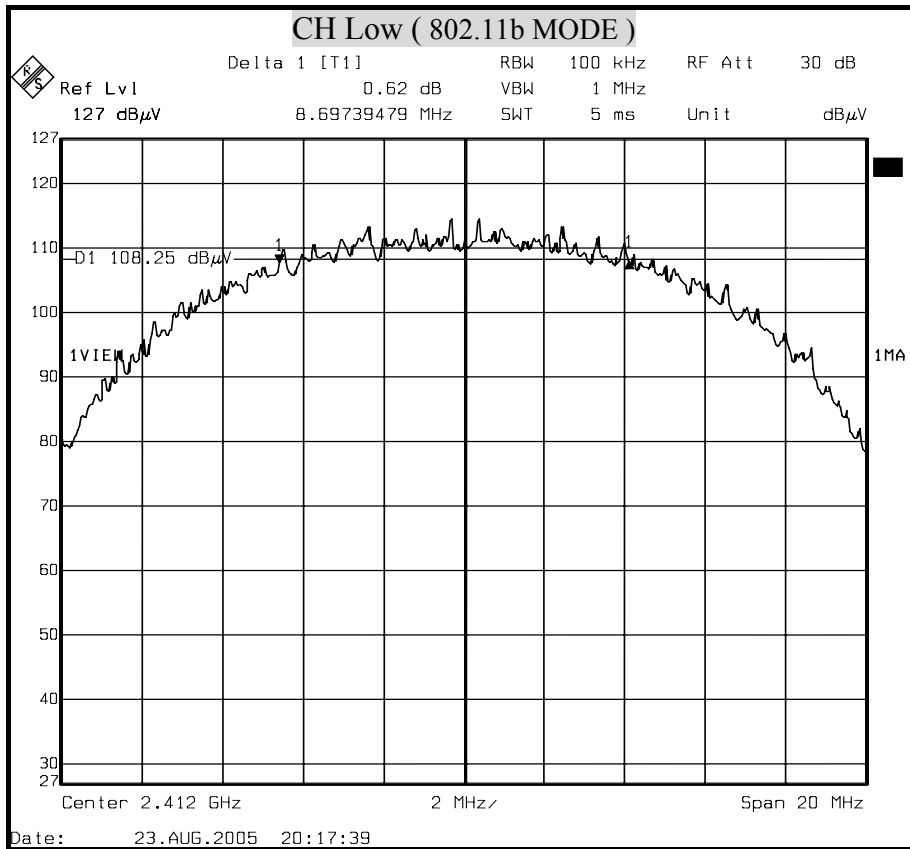
| Channel | Channel Frequency (MHz) | 6dB Bandwidth (kHz) | Minimum Limit (kHz) | Pass / Fail |
|----------------|------------------------------------|--------------------------------|--------------------------------|--------------------|
| Low | 2412 | 8697 | 500 | PASS |
| Middle | 2437 | 8697 | 500 | PASS |
| High | 2462 | 9218 | 500 | PASS |

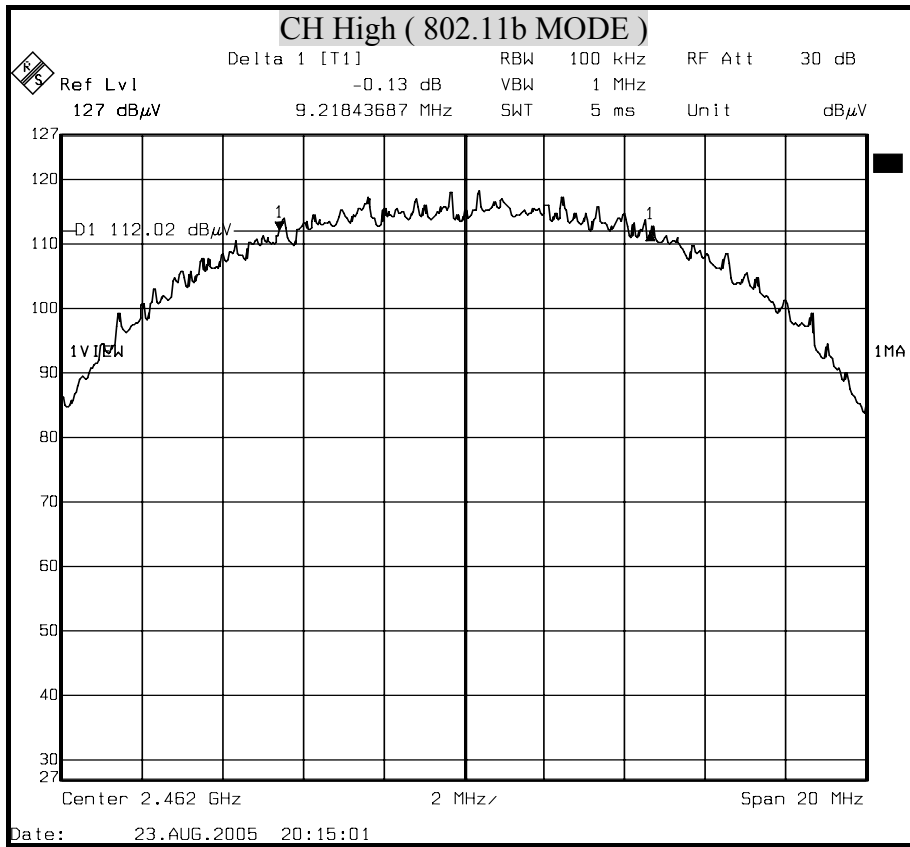
IEEE 802.11g MODE

| Channel | Channel Frequency (MHz) | 6dB Bandwidth (kHz) | Minimum Limit (kHz) | Pass / Fail |
|----------------|------------------------------------|--------------------------------|--------------------------------|--------------------|
| Low | 2412 | 16392 | 500 | PASS |
| Middle | 2437 | 16432 | 500 | PASS |
| High | 2462 | 16352 | 500 | PASS |



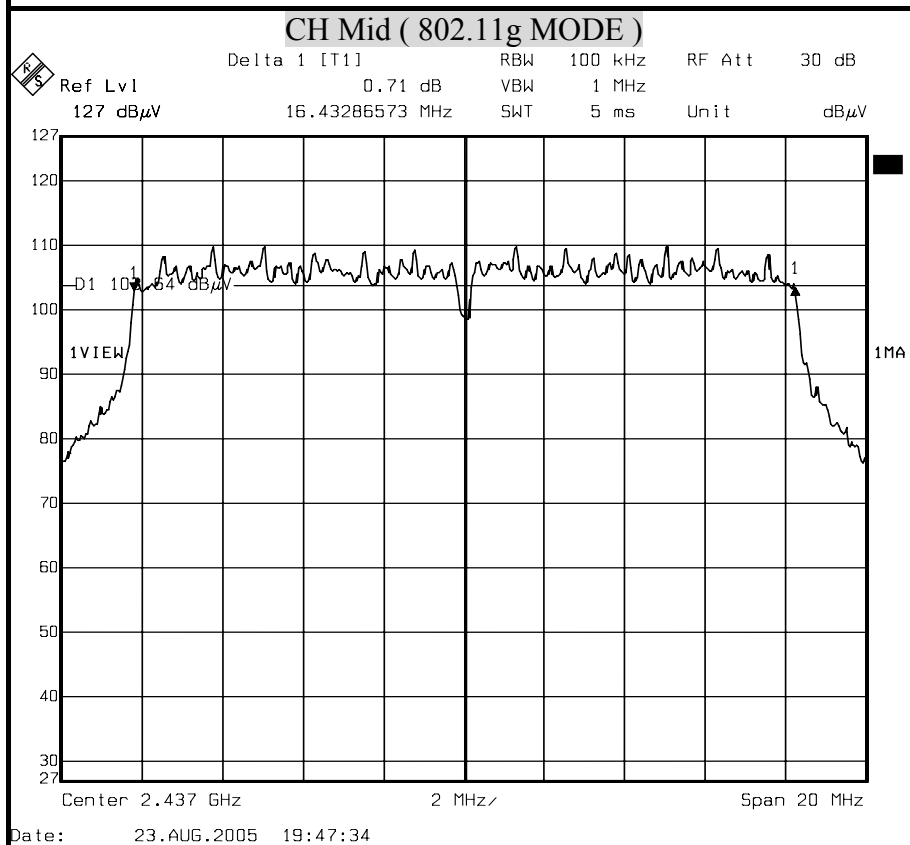
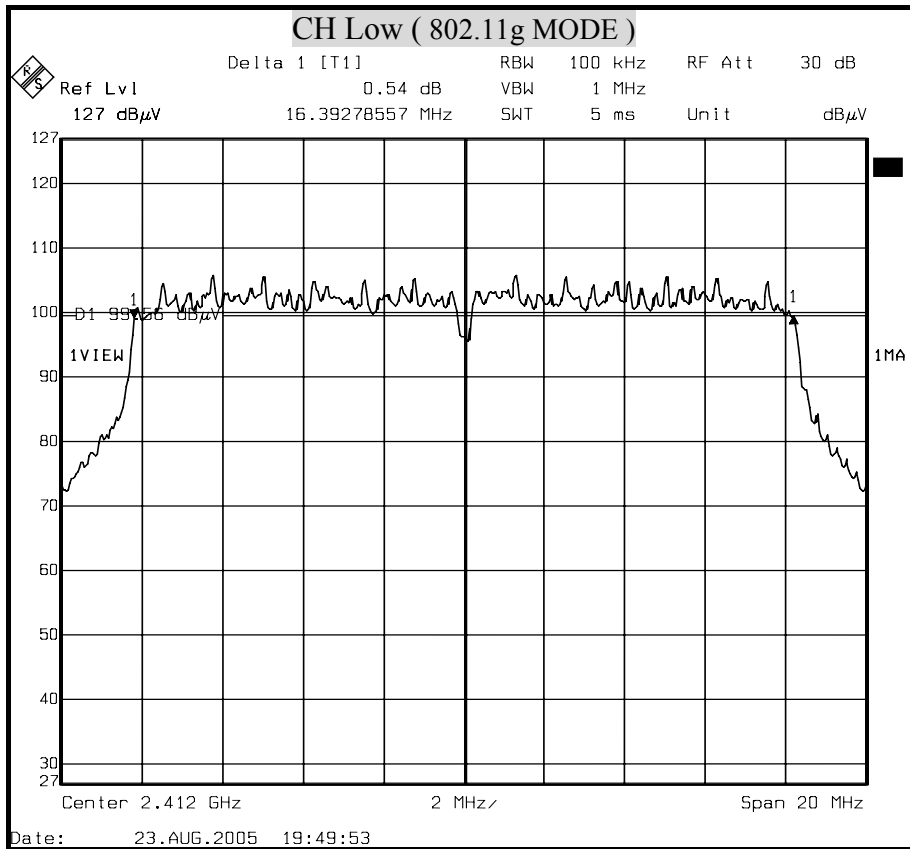
6dB BANDWIDTH (802.11b MODE)

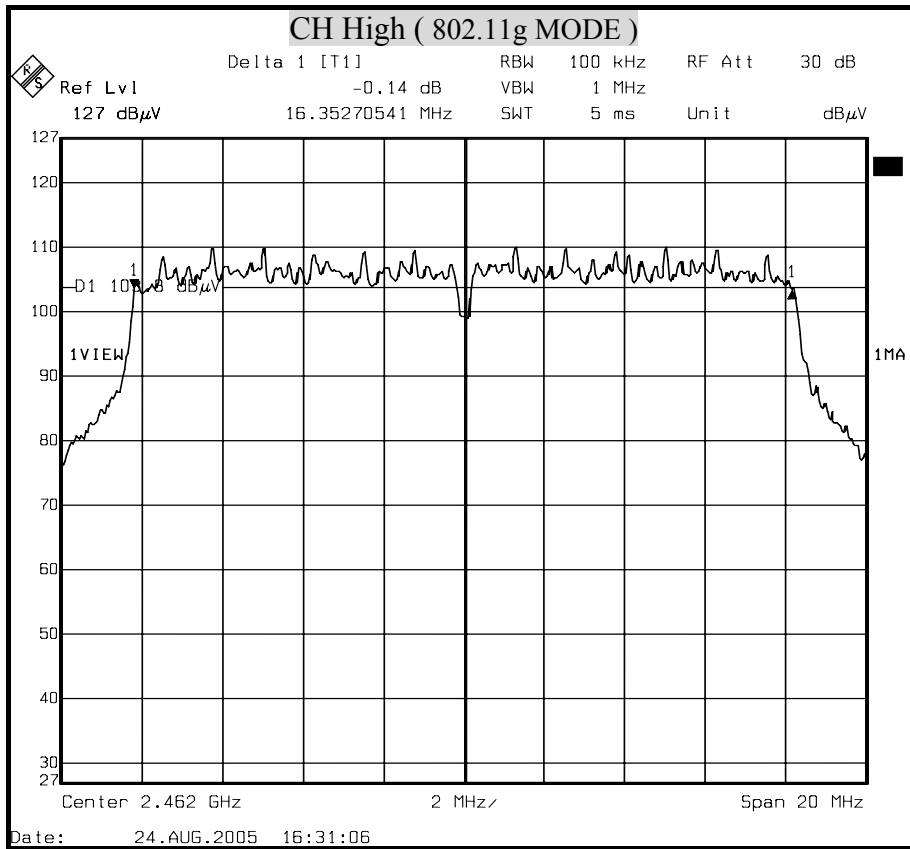






6dB BANDWIDTH (802.11g MODE)







8.2 99% BANDWIDTH

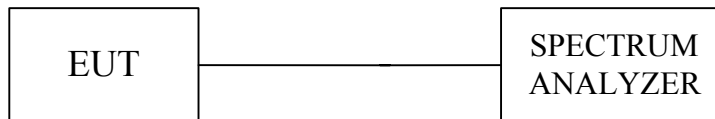
LIMIT

None; for reporting purposes only.

TEST EQUIPMENTS

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|-----------------------------------|-----------|------------|---------------------|
| ROHDE & SCHWARZ SPECTRUM ANALYZER | FSEK30 | 835253/002 | September 06, 2004 |

TEST SETUP



TEST PROCEDURE

1. The spectrum shall be set as follows :

Span : The minimum span to fully display the emission and approximately 20dB below peak level.

RBW : The set to 1% to 3% of the approximate emission width.

2. Compute the combined power of all signal responses contained in the trace by covering all the data points.

3. For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker.

4. The 99% BW is the bandwidth between the right and left markers.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

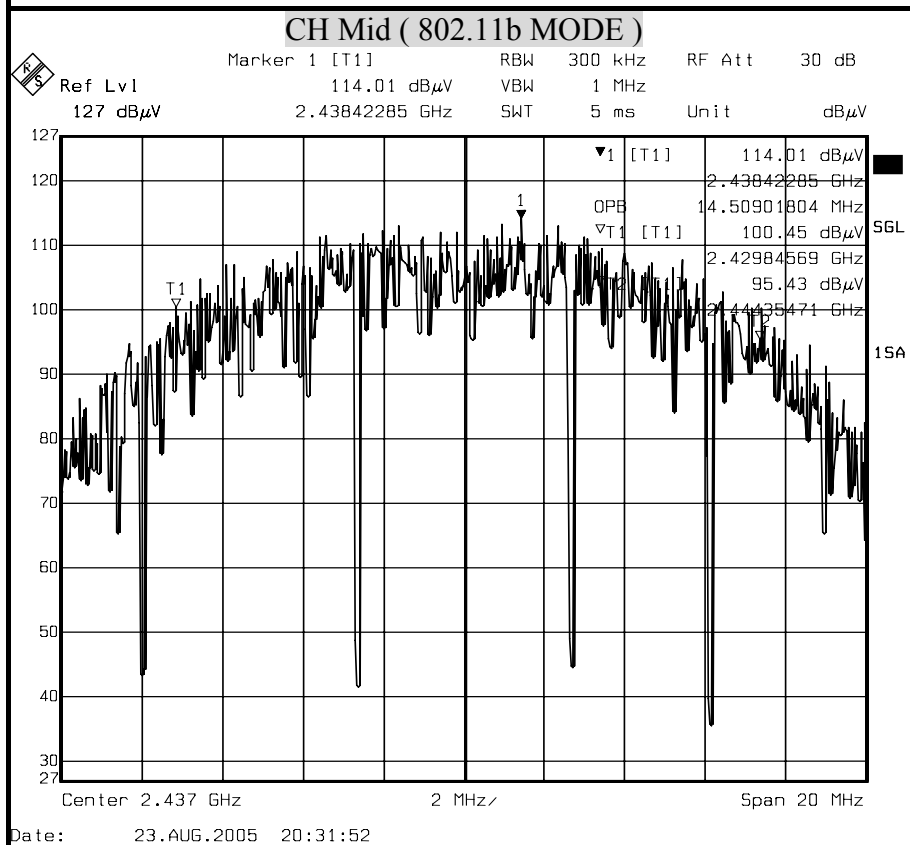
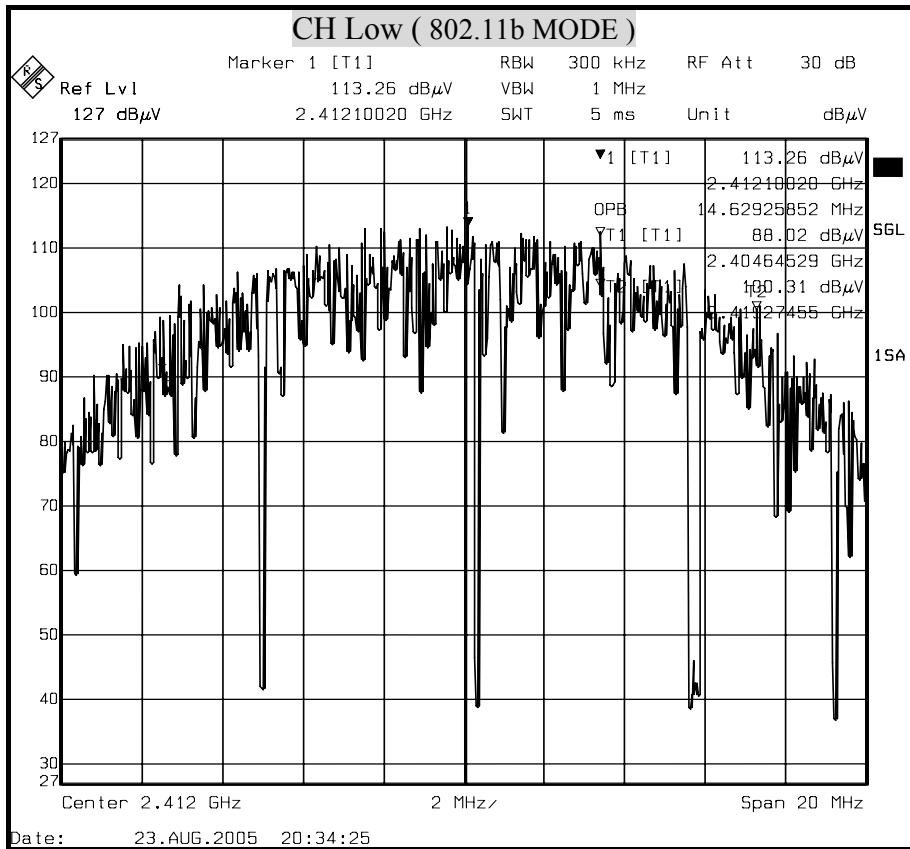
| Channel | Channel Frequency (MHz) | 99% Occupied power bandwidth (MHz) |
|----------------|--------------------------------|---|
| Low | 2412.00 | 14.629 |
| Middle | 2437.00 | 14.509 |
| High | 2462.00 | 14.709 |

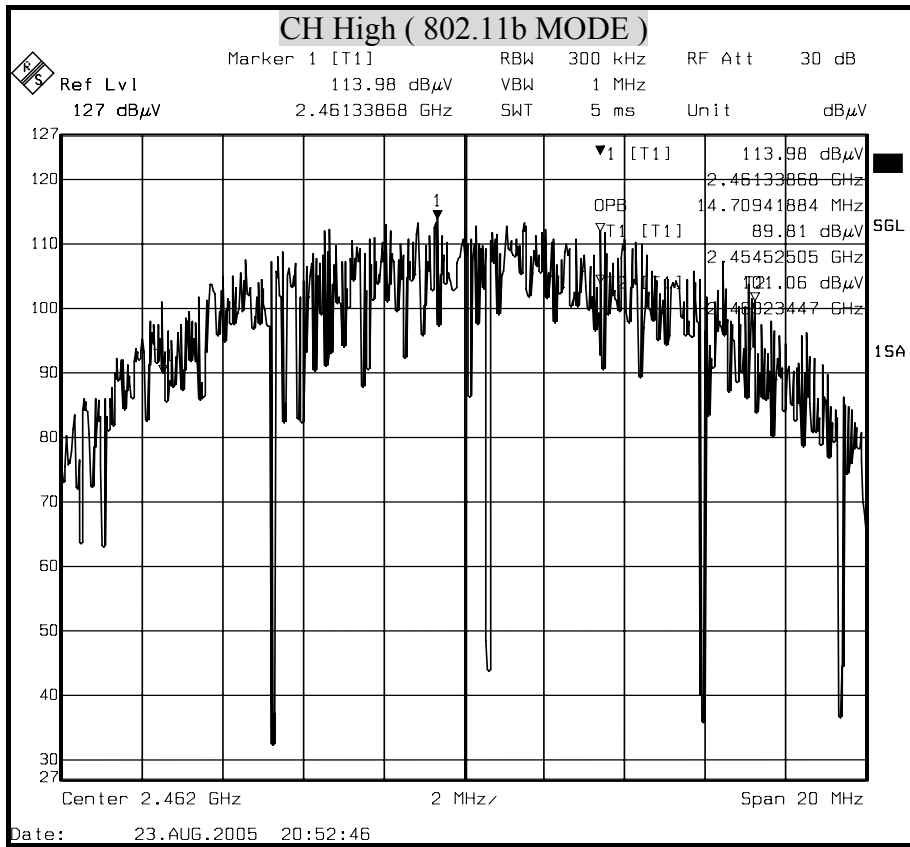
IEEE 802.11g MODE

| Channel | Channel Frequency (MHz) | 99% Occupied power bandwidth (MHz) |
|----------------|--------------------------------|---|
| Low | 2412.00 | 16.513 |
| Middle | 2437.00 | 16.432 |
| High | 2462.00 | 16.432 |



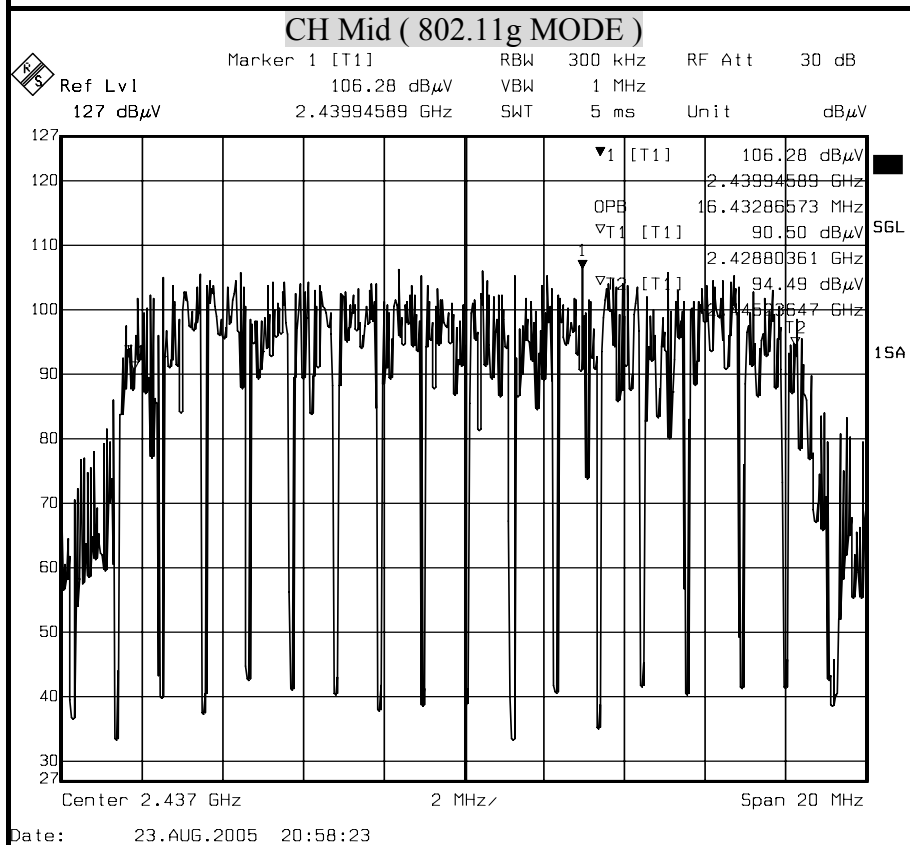
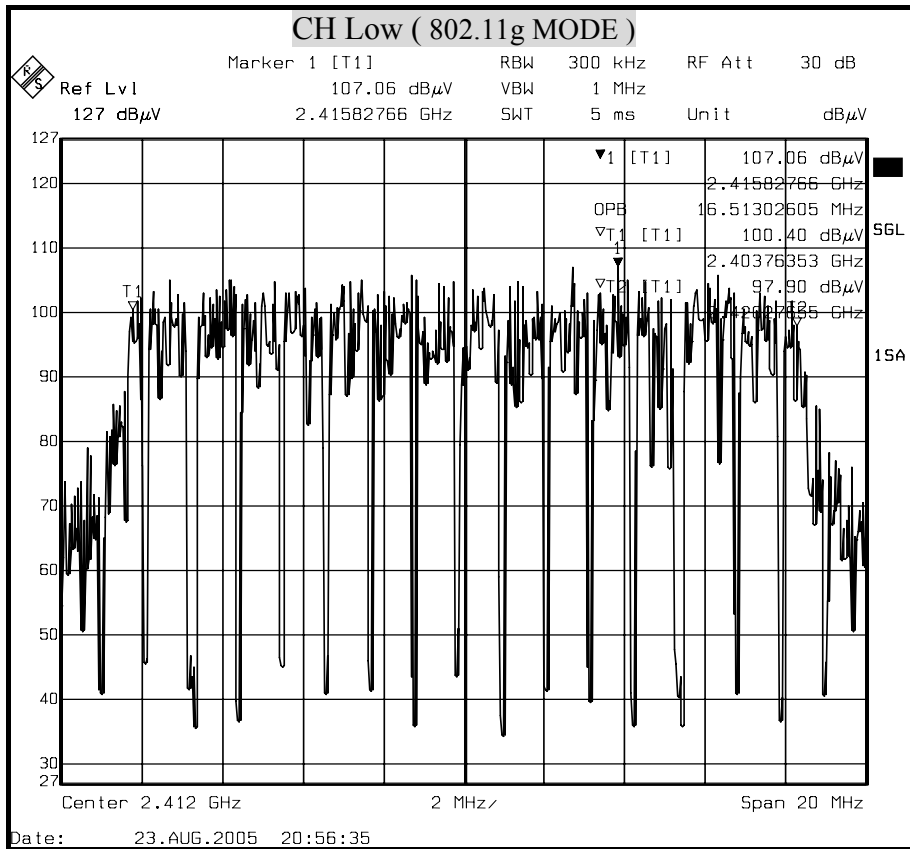
99% BANDWIDTH (802.11b MODE)

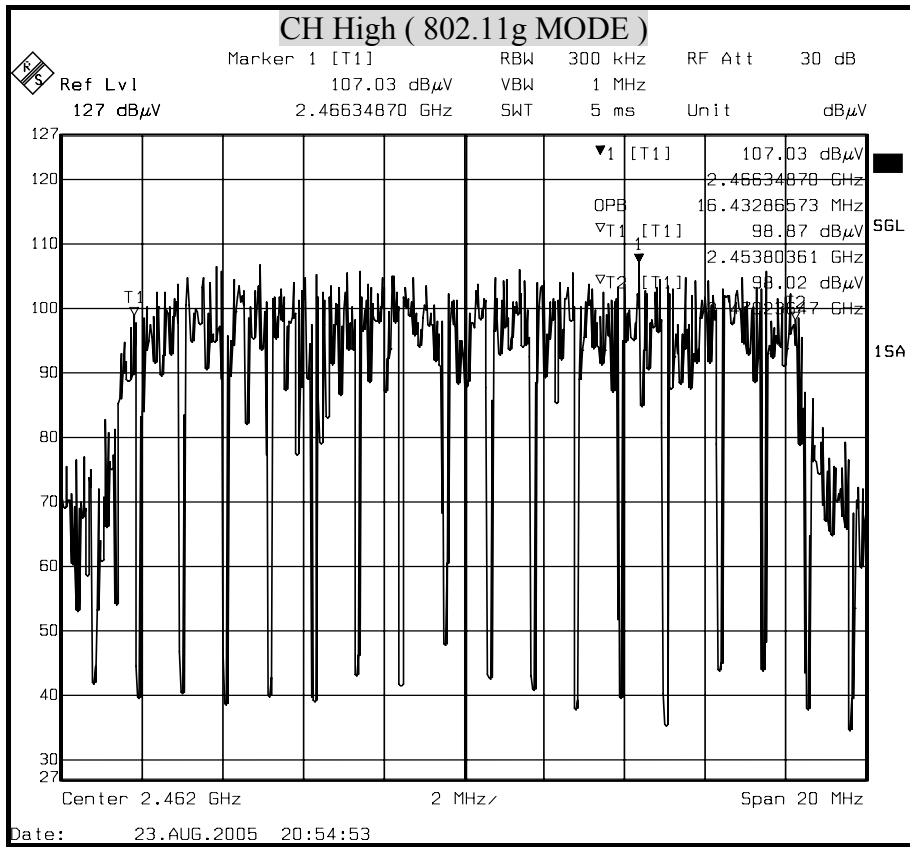






99% BANDWIDTH (802.11g MODE)







8.3 MAXIMUM PEAK OUTPUT POWER

LIMIT

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

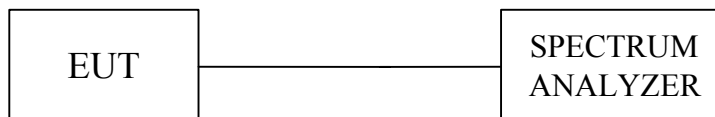
§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

§ 15.247(b) (4) Except as shown in paragraphs (c) 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), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST EQUIPMENTS

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|-----------------------------------|-----------|------------|---------------------|
| ROHDE & SCHWARZ SPECTRUM ANALYZER | FSEK30 | 835253/002 | September 06, 2004 |

TEST SETUP



TEST PROCEDURE

- The spectrum shall be set as follows :
 - Span : 1.5 times channel integration bandwidth.
 - RBW : 1MHz
 - VBW : 3MHz
 - Detector : Peak
 - Sweep : Single trace
- Compute the combined power of all signal responses contained in the trace by covering all the data points.
- For 99% occupied BW, place the markers at the frequency at which 0.5% of the power lies to the right of the right marker and 0.5% of the power lies to the left of the left marker.
- The peak output power is the channel power integrated over 99% bandwidth.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

| Channel | Channel Frequency (MHz) | Peak Power Output Reading (dBm) | Cable loss (dBm) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass / Fail |
|---------|-------------------------|---------------------------------|------------------|-------------------------|------------------------|-------------|
| Low | 2412 | 19.70 | 1.0 | 20.70 | 30 | PASS |
| Middle | 2437 | 19.81 | 1.0 | 20.81 | 30 | PASS |
| High | 2462 | 20.31 | 1.0 | 21.31 | 30 | PASS |

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The result basic equation calculation as follow : $Peak\ Power\ Output = Peak\ Power\ Reading + Cable\ loss$

IEEE 802.11g MODE

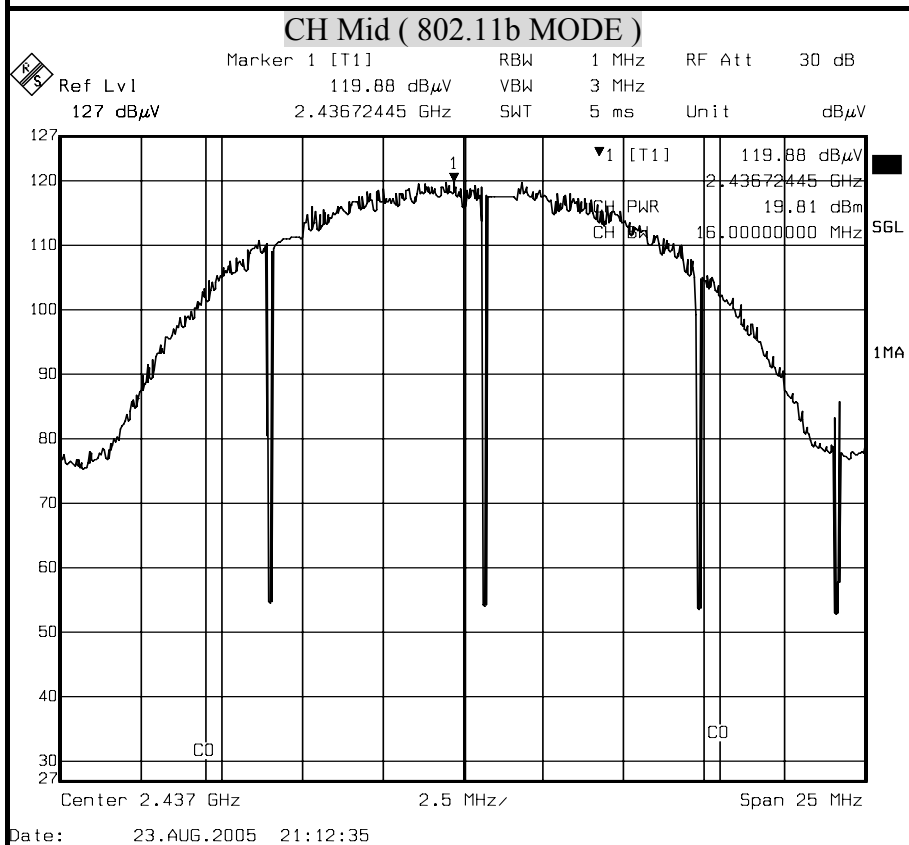
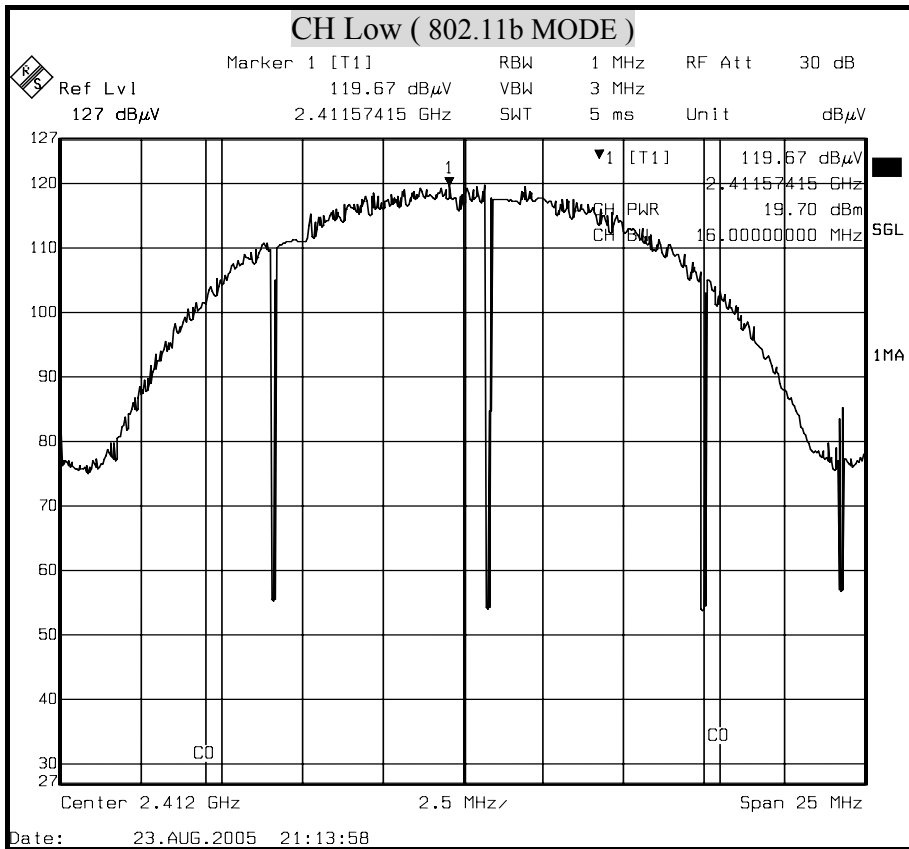
| Channel | Channel Frequency (MHz) | Peak Power Output Reading (dBm) | Cable loss (dBm) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass / Fail |
|---------|-------------------------|---------------------------------|------------------|-------------------------|------------------------|-------------|
| Low | 2412 | 15.20 | 1.0 | 16.20 | 30 | PASS |
| Middle | 2437 | 15.31 | 1.0 | 16.31 | 30 | PASS |
| High | 2462 | 15.70 | 1.0 | 16.70 | 30 | PASS |

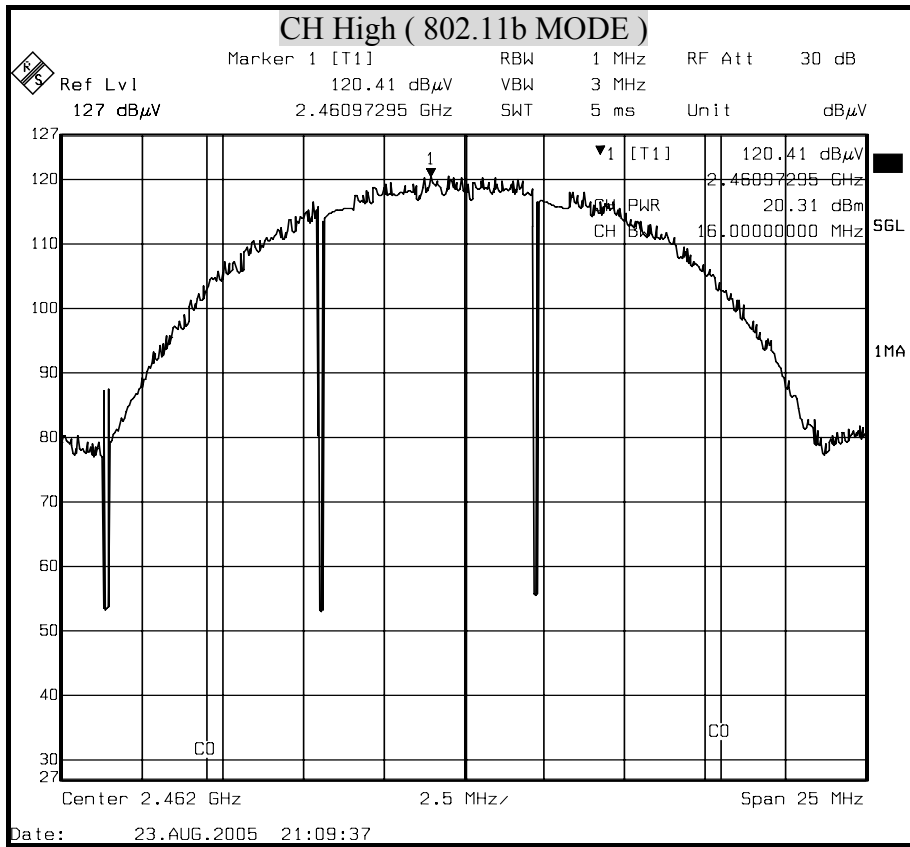
Remark:

1. At final test to get the worst-case emission at 54Mbps.
2. The result basic equation calculation as follow : $Peak\ Power\ Output = Peak\ Power\ Reading + Cable\ loss$



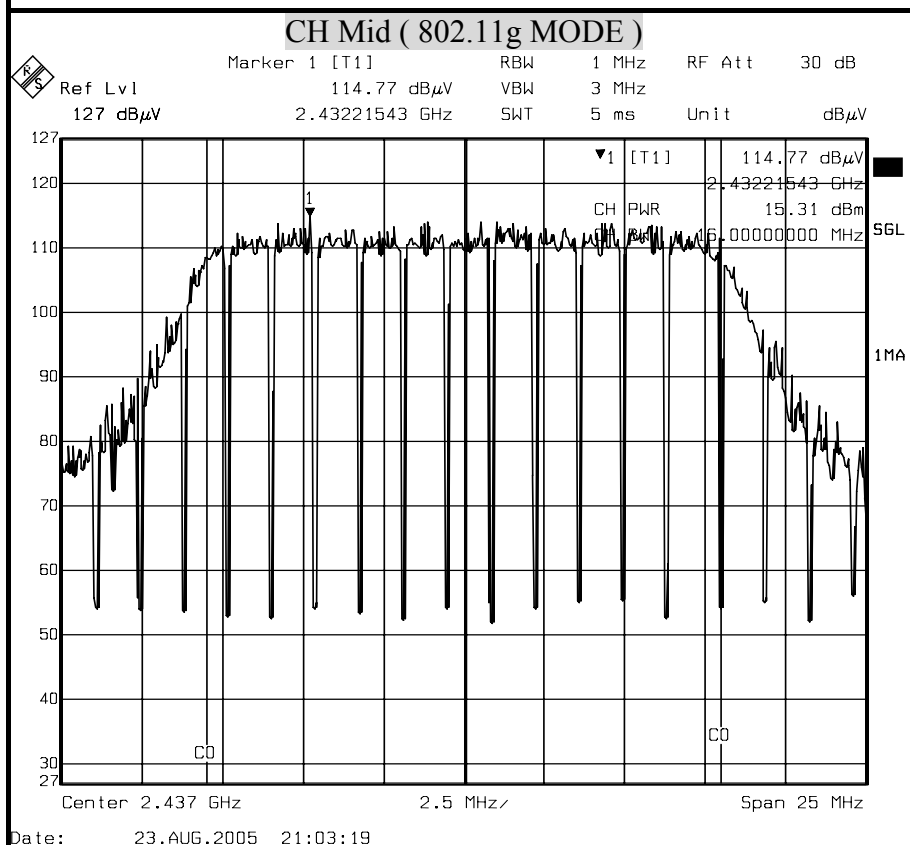
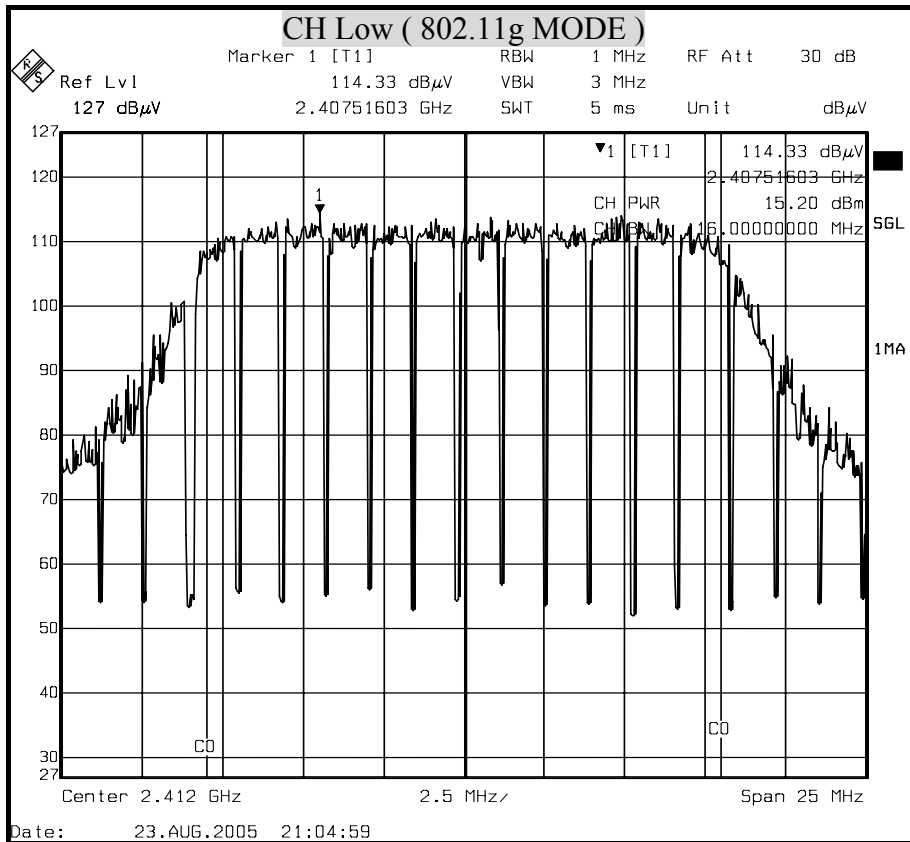
MAXIMUM PEAK OUTPUT POWER (802.11b MODE)

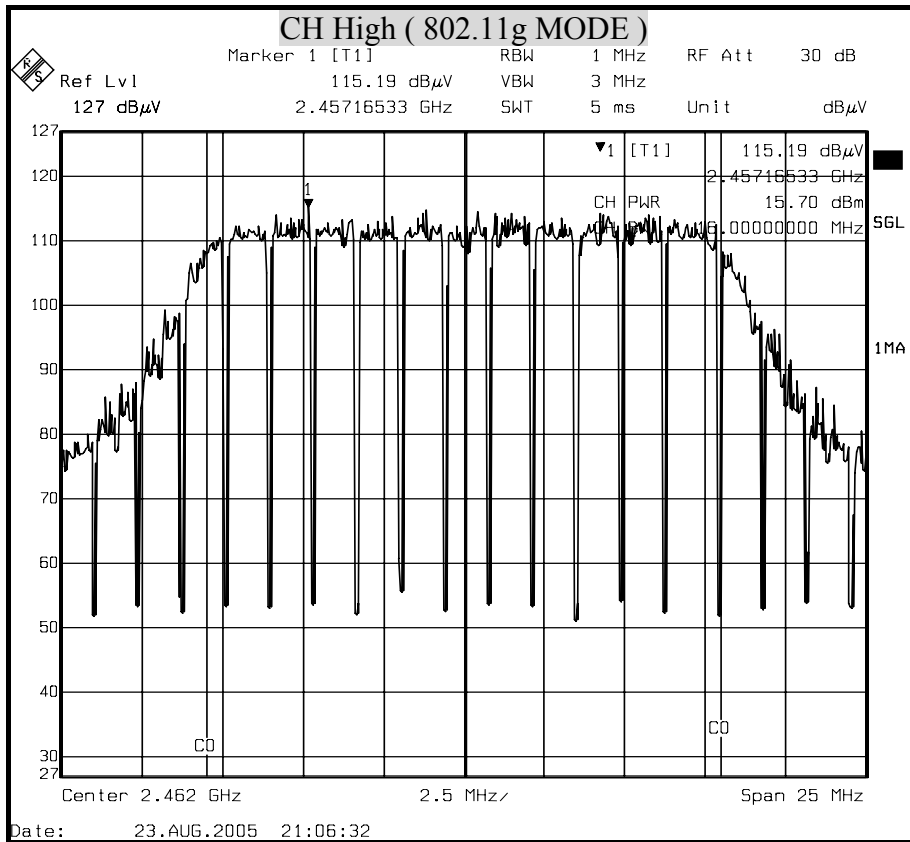






MAXIMUM PEAK OUTPUT POWER (802.11g MODE)







8.4 MAXIMUM PERMISSIBLE EXPOSURE

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b) LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm ²) | Average Time |
|---|-------------------------------|-------------------------------|-------------------------------------|--------------|
| (A) Limits for Occupational / Control Exposures | | | | |
| 300-1,500 | -- | -- | F/300 | 6 |
| 1,500-100,000 | -- | -- | 5 | 6 |
| (B) Limits for General Population / Uncontrol Exposures | | | | |
| 300-1,500 | -- | -- | F/1500 | 6 |
| 1,500-100,000 | -- | -- | 1 | 30 |

CALCULATIONS

$$\text{Given } E = \frac{\sqrt{30 \times P \times G}}{d} \quad \& \quad S = \frac{E^2}{3770}$$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm²

**LIMIT**

Power Density Limit, $S=1.0\text{mW/cm}^2$

TEST RESULTS

No non-compliance noted

| Mode | Minimum separation distance (cm) | Output Power (dBm) | Antenna Gain (dBi) | Power Density Limit (mW/cm^2) | Power Density at 20cm (mW/cm^2) |
|--------------|----------------------------------|--------------------|--------------------|--|--|
| IEEE 802.11b | 20.0 | 21.31 | 2.14 | 1.00 | 0.044027 |
| IEEE 802.11g | 20.0 | 16.70 | 2.14 | 1.00 | 0.015231 |

Remark: For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.



8.5 AVERAGE POWER

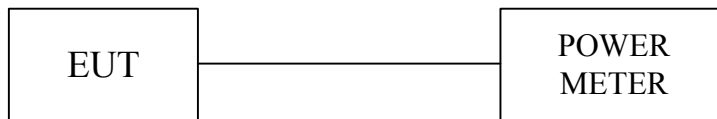
LIMIT

None; for reporting purposes only.

TEST EQUIPMENTS

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|----------------------------|---------------------|----------------------|---------------------|
| ANRITSU POWER METER | ML2487A MAL2491A | 6K00001783 030982 | March 02, 2005 |

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a power meter.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

| Channel | Channel Frequency (MHz) | Average Power (dBm) | Cable loss (dBm) | Average Power Output (dBm) |
|---------|-------------------------|---------------------|------------------|----------------------------|
| Low | 2412 | 14.61 | 1 | 15.61 |
| Middle | 2437 | 14.80 | 1 | 15.80 |
| High | 2462 | 15.28 | 1 | 16.28 |

Remark:

1. At final test to get the worst-case emission at 11Mbps.
2. The result basic equation calculation as follow : $Average\ Power\ Output = Average\ Power\ Reading + Cable\ loss$

IEEE 802.11g MODE

| Channel | Channel Frequency (MHz) | Average Power (dBm) | Cable loss (dBm) | Average Power Output (dBm) |
|---------|-------------------------|---------------------|------------------|----------------------------|
| Low | 2412 | 12.82 | 1 | 13.82 |
| Middle | 2437 | 9.21 | 1 | 10.21 |
| High | 2462 | 9.68 | 1 | 10.68 |

Remark:

1. At final test to get the worst-case emission at 54Mbps.
2. The result basic equation calculation as follow : $Average\ Power\ Output = Average\ Power\ Reading + Cable\ loss$



8.6 POWER SPECTRAL DENSITY

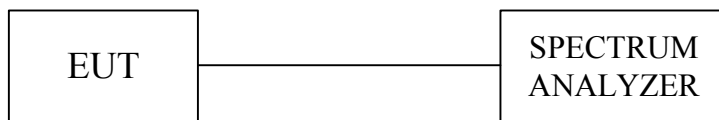
LIMIT

§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENTS

| Description & Manufacturer | Model No. | Serial No. | Date of Calibration |
|-----------------------------------|-----------|------------|---------------------|
| ROHDE & SCHWARZ SPECTRUM ANALYZER | FSEK30 | 835253/002 | September 06, 2004 |

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3KHz RBW and 30KHz VBW, set sweep time=span / 3KHz.

The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span / 3KHz for a full response of the mixer in the spectrum analyzer.

**TEST RESULTS**

No non-compliance noted

IEEE 802.11b MODE

| Channel | Channel Frequency (MHz) | Reading (dBm) | Cable loss (dBm) | Final RF Power Level in 3KHz BW (dBm) | Maxmum Limit (dBm) | Pass / Fail |
|---------|-------------------------|---------------|------------------|---------------------------------------|--------------------|-------------|
| Low | 2412 | -9.66 | 1.0 | -8.66 | 8 | PASS |
| Middle | 2437 | -9.96 | 1.0 | -8.96 | 8 | PASS |
| High | 2462 | -9.23 | 1.0 | -8.23 | 8 | PASS |

Remark:

1. At finial test to get the worst-case emission at 11Mbps.
2. The result basic equation calculation as follow : Final RF Power Level in 3KHz BW (dBm) = Reading+ Cable loss

IEEE 802.11g MODE

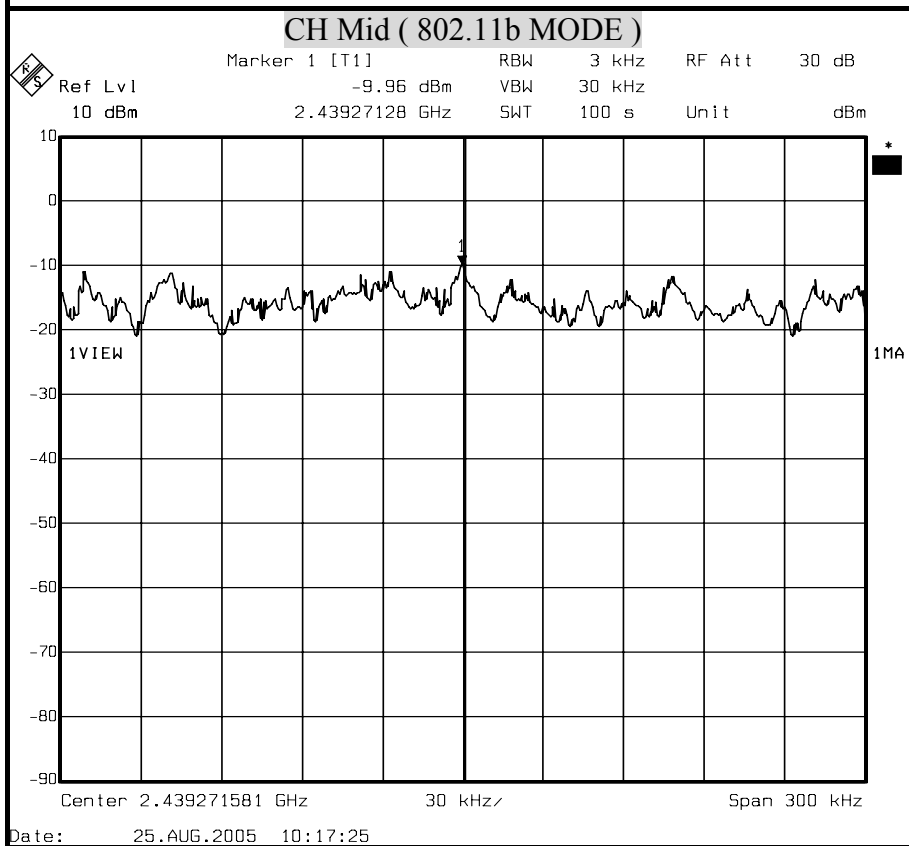
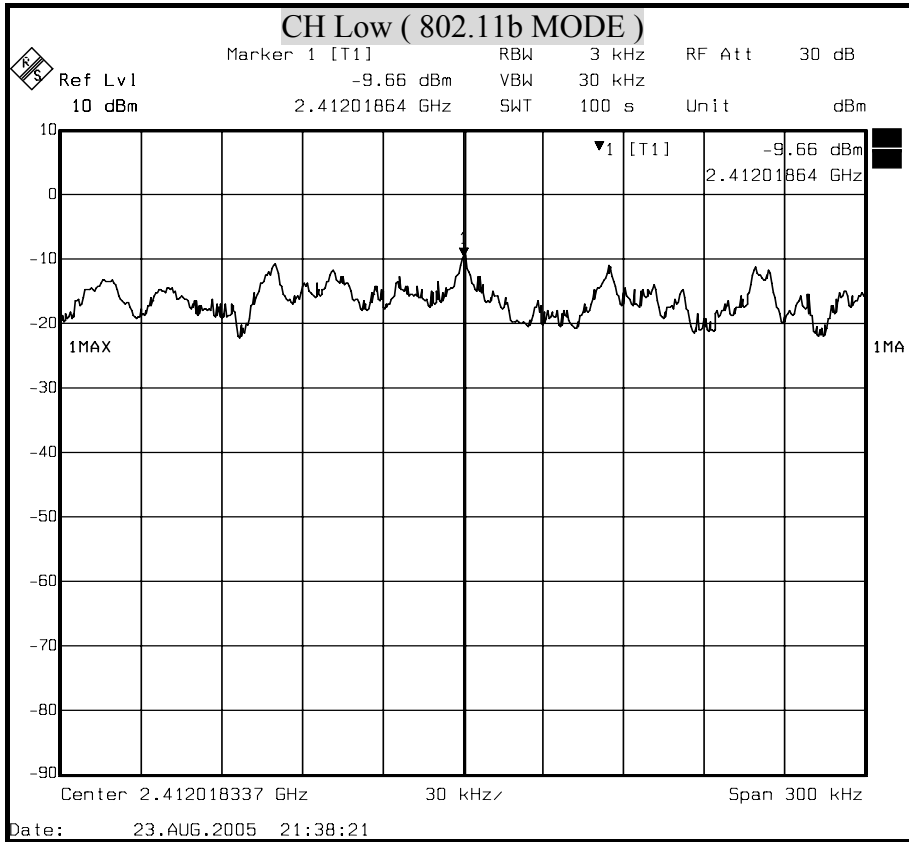
| Channel | Channel Frequency (MHz) | Reading (dBm) | Cable loss (dBm) | Final RF Power Level in 3KHz BW (dBm) | Maxmum Limit (dBm) | Pass / Fail |
|---------|-------------------------|---------------|------------------|---------------------------------------|--------------------|-------------|
| Low | 2412 | -16.77 | 1.0 | -15.77 | 8 | PASS |
| Middle | 2437 | -16.67 | 1.0 | -15.67 | 8 | PASS |
| High | 2462 | -16.37 | 1.0 | -15.37 | 8 | PASS |

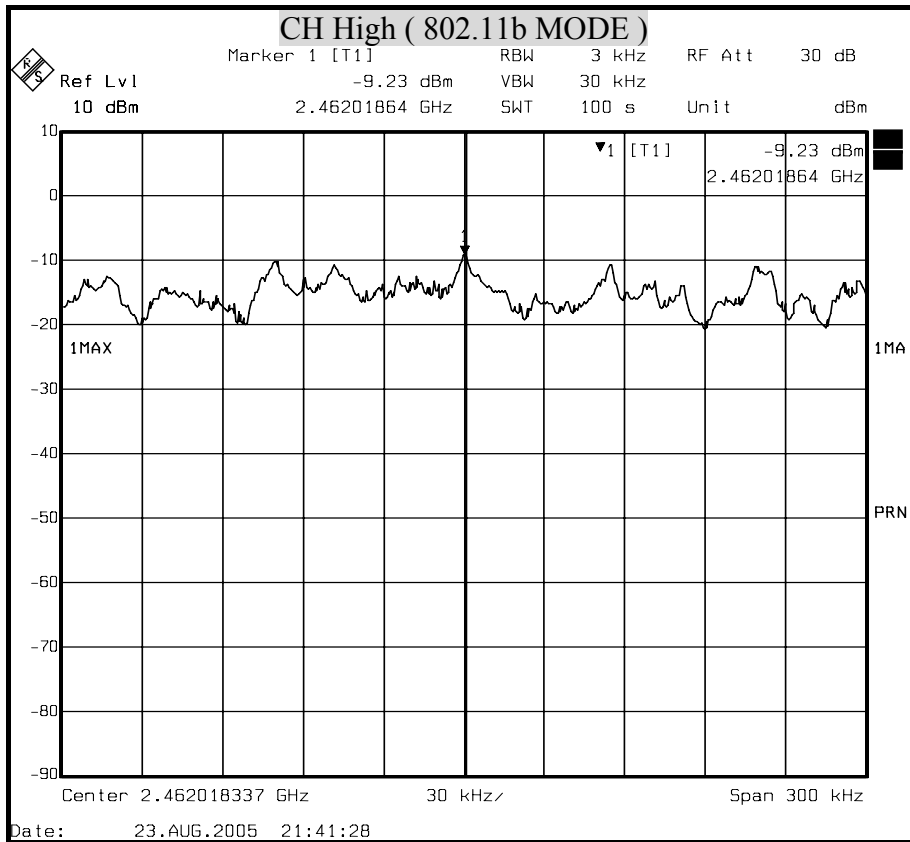
Remark:

1. At finial test to get the worst-case emission at 54Mbps.
2. The result basic equation calculation as follow : Final RF Power Level in 3KHz BW (dBm) = Reading+ Cable loss



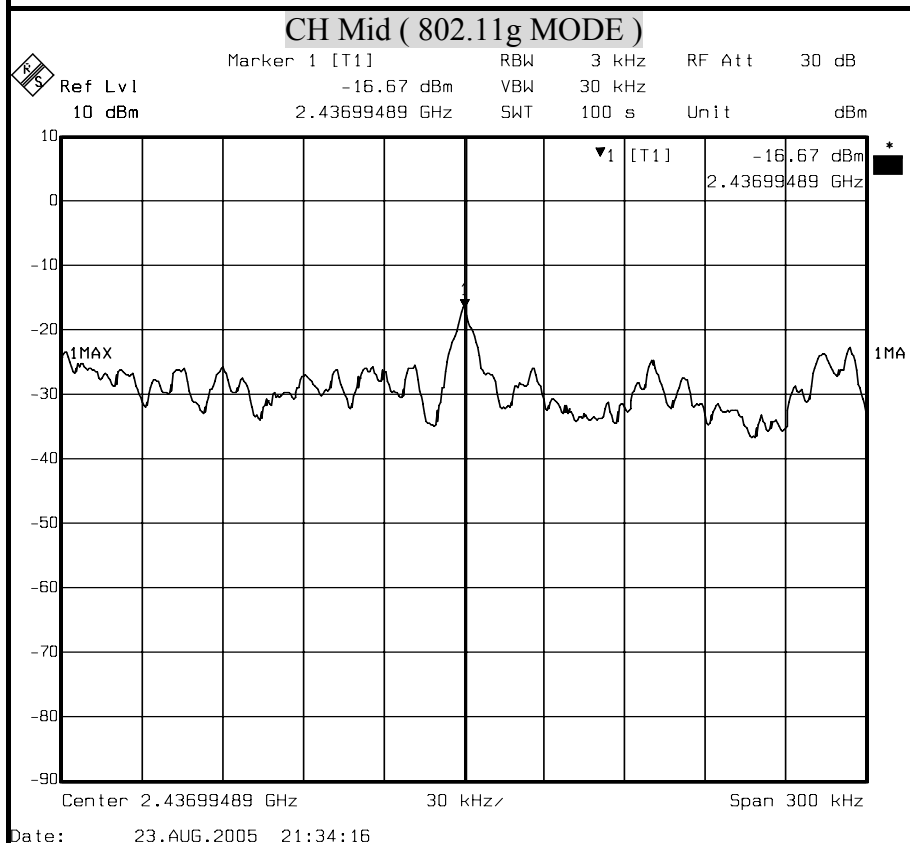
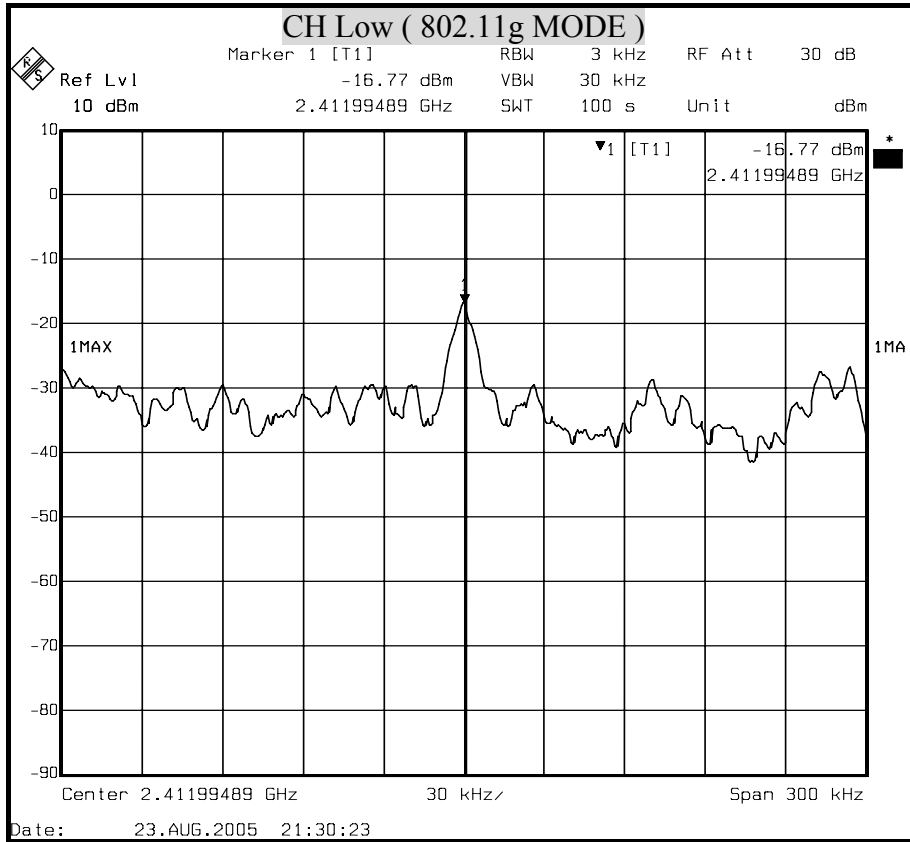
POWER SPECTRAL DENSITY (IEEE 802.11b MODE)

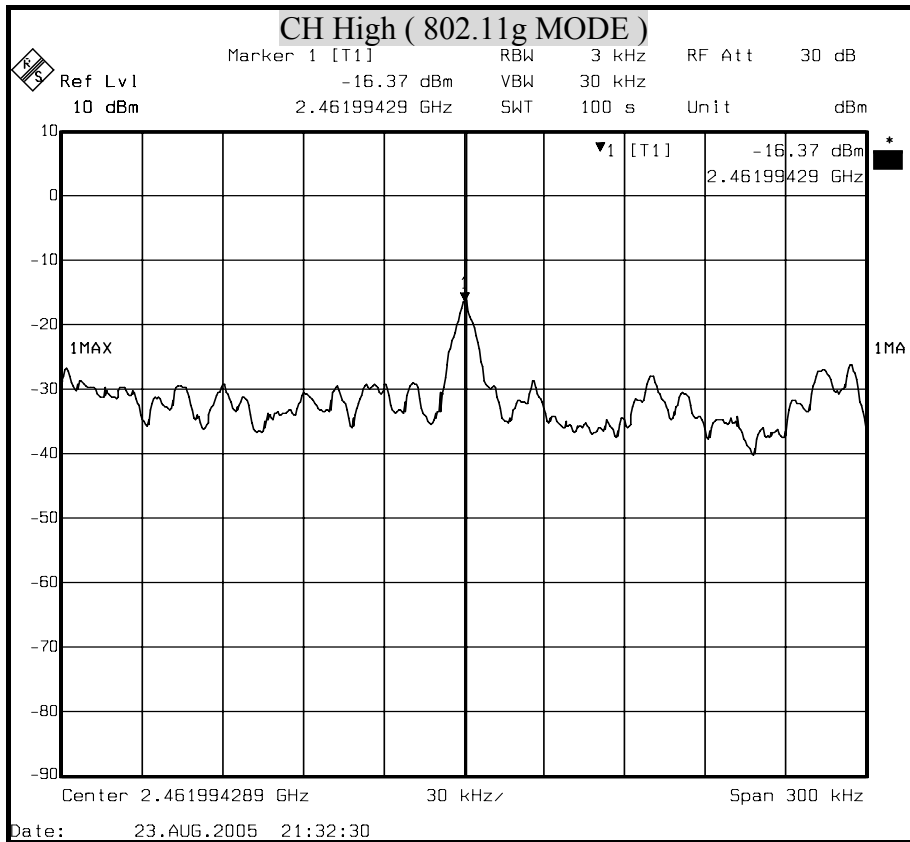






POWER SPECTRAL DENSITY (IEEE 802.11g MODE)







8.7 CONDUCTED SPURIOUS EMISSION

LIMITS

§ 15.247(d) 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)).

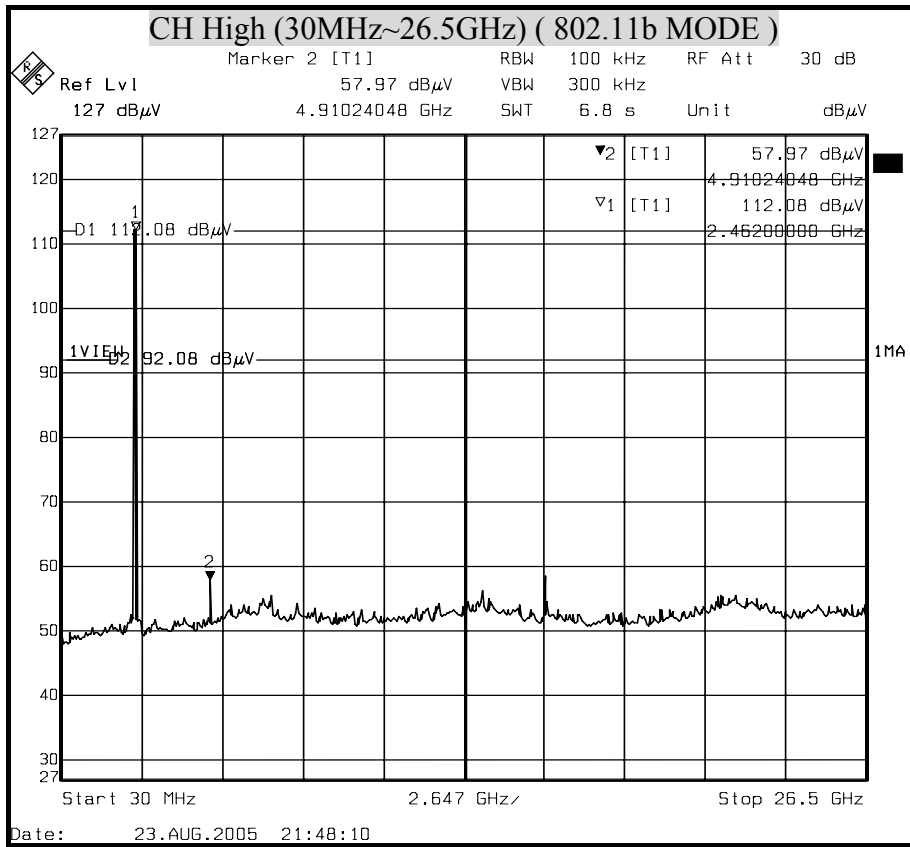
TEST PROCEDURE

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 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

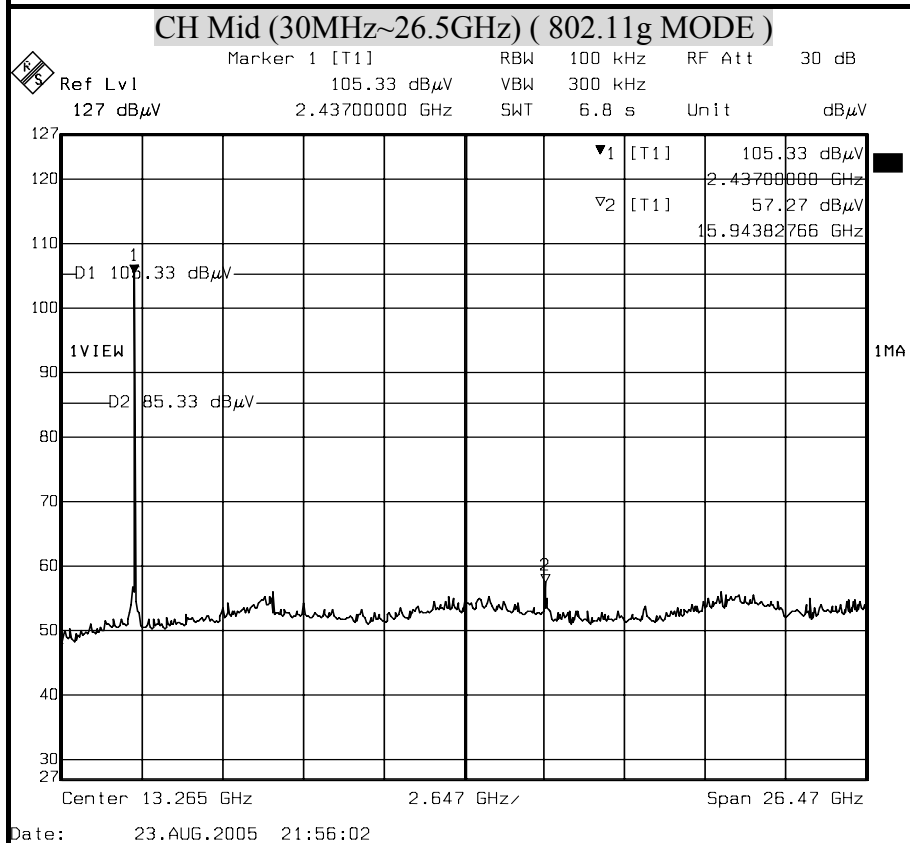
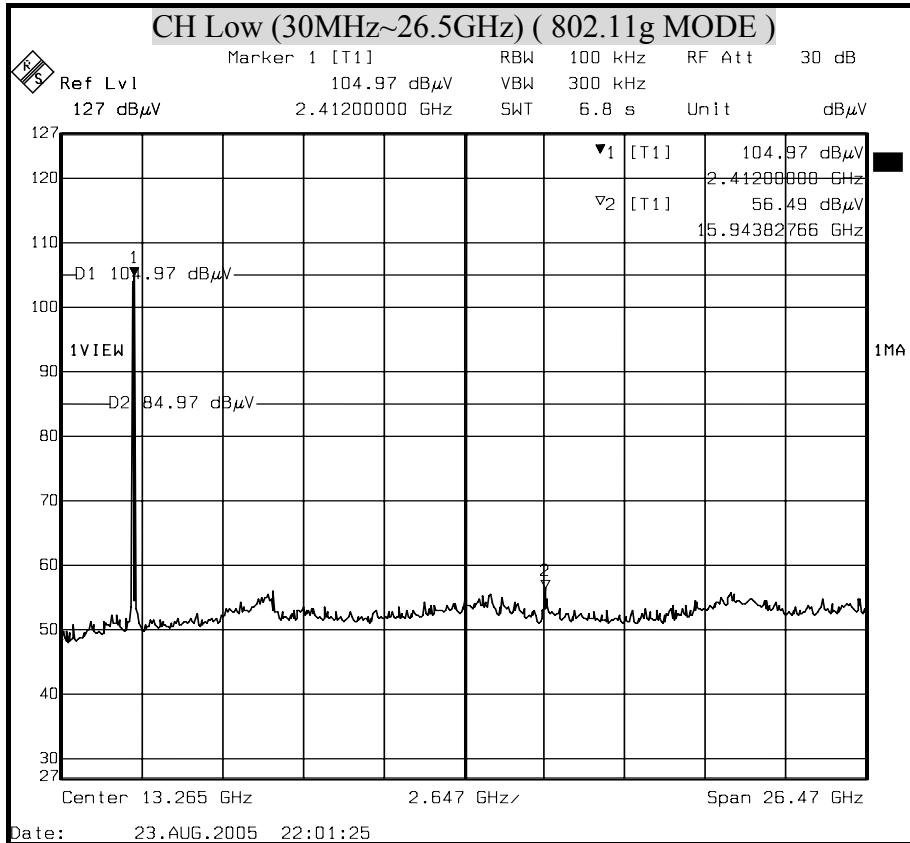
TEST RESULTS

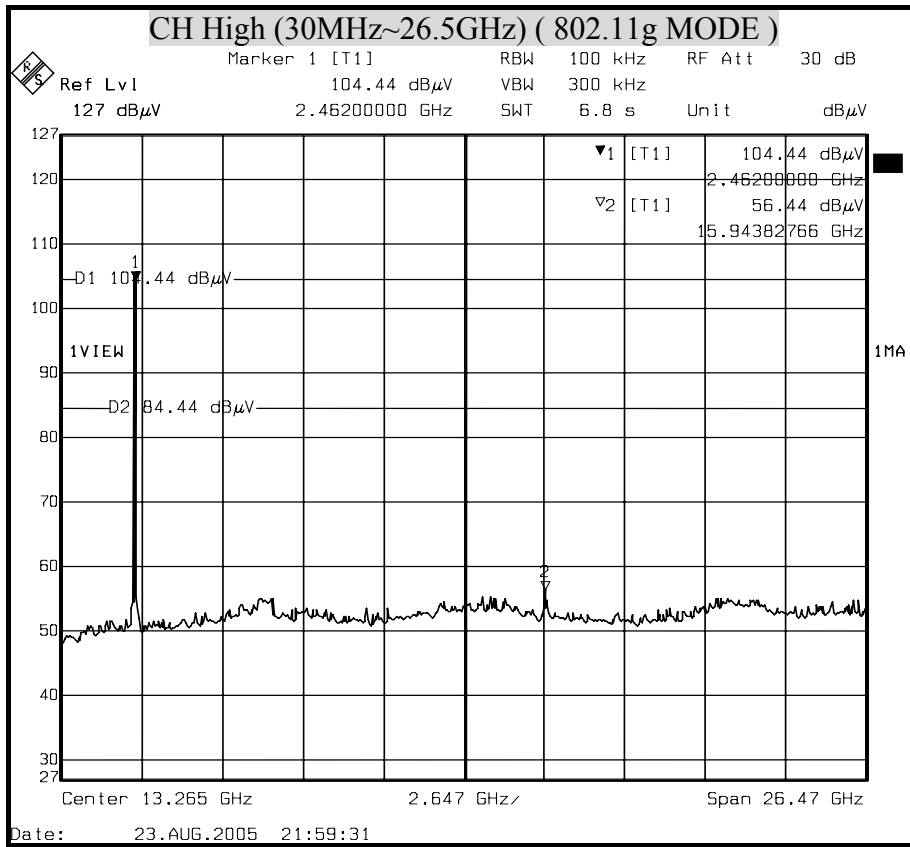
No non-compliance noted





OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT (IEEE 802.11g MODE)







8.8 RADIATED EMISSIONS

8.8.1 TRANSMITTER RADIATED SUPURIOUS 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 - 3338 | 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.

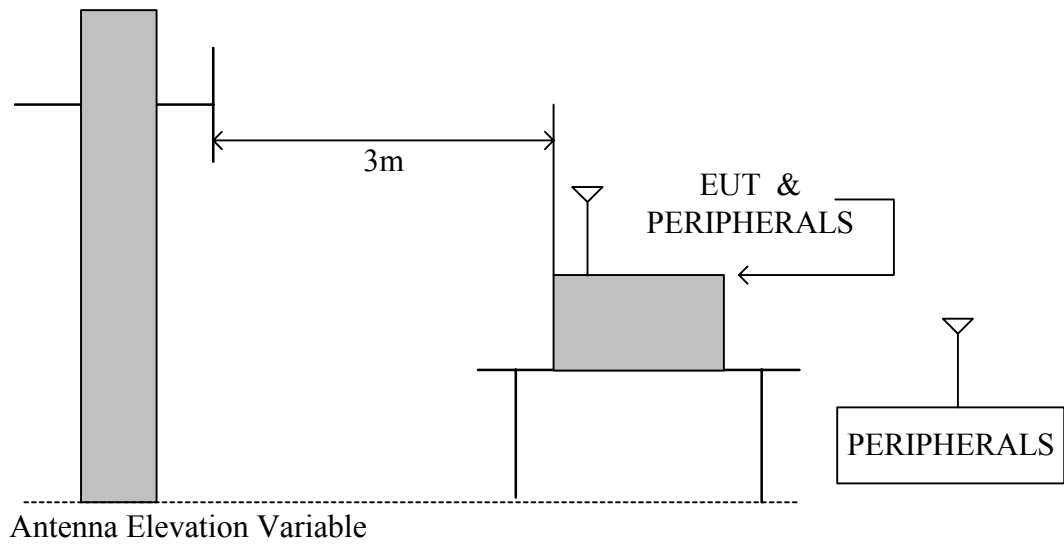
TEST EQUIPMENTS

The following test equipments are utilized in making the measurements contained in this report.

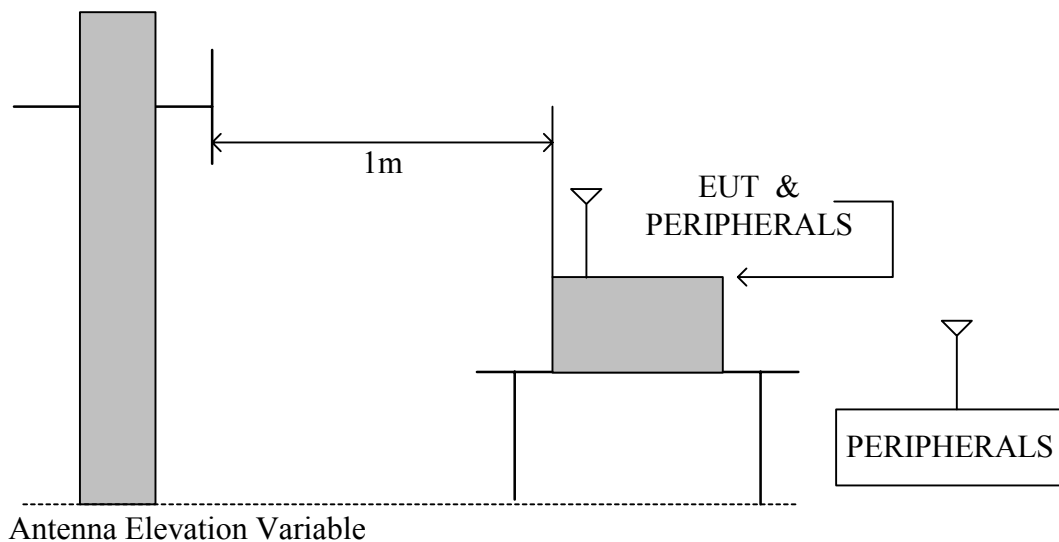
| Manufacturer or Type | Model No. | Serial No. | Date of Calibration | Calibration Period | Remark |
|-----------------------|-------------|------------|---------------------|--------------------|--------|
| CHASE BI-LOG ANTENNA | CBL6112B | 2817 | March 22, 2005 | 1 Year | FINAL |
| R/S SPECTRUM ANALYZER | FSEK30 | 835253/002 | September 06, 2004 | 1 Year | FINAL |
| R/S EMI TEST RECEIVER | ESCS30 | 83548/008 | September 05, 2004 | 1 Year | FINAL |
| OPEN SITE | ----- | No.2 | May 07, 2005 | 1 Year | FINAL |
| N TYPE COAXIAL CABLE | CHA9525 | 4 | June 03, 2005 | 1 Year | FINAL |
| Horn Antenna | 96001 | 2698 | April 09, 2005 | 1 Year | FINAL |
| HP Pre-amplifier | 8449B | 3008A01471 | November 24, 2004 | 1 Year | FINAL |
| HP High pass filter | 84300/80038 | 002 | CAL. ON USE | 1 Year | FINAL |

TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.





TEST PROCEDURE

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 1 meters away from the interference-receiving antenna
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note :

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

TEST RESULTS

No non-compliance noted

**8.8.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz**

| | | | |
|---------------------|-------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/08/18 |
| Model | DI-524UP | Test By | Niky Liu |
| Test Mode | Normal operating (worst case) | TEMP&Humidity | 26.3°C, 52% |

| Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading at 3m(dBμV) | | Limits (dBμV/m) | Emission Level at 3m(dBμV/m) | |
|-----------------|-----------------------|-----------------|---------------------------|----------|-----------------|------------------------------|----------|
| | | | Horizontal | Vertical | | Horizontal | Vertical |
| 109.77 | 13.09 | 2.06 | 6.40 | 10.50 | 43.50 | 21.55 | 25.65 |
| 130.00 | 13.10 | 2.29 | 11.20 | 15.30 | 43.50 | 26.59 | 30.69 |
| 199.98 | 11.20 | 3.14 | 9.30 | 14.30 | 43.50 | 23.64 | 28.64 |
| 250.05 | 13.10 | 4.01 | 5.90 | 16.30 | 46.00 | 23.01 | 33.41 |
| 375.07 | 16.30 | 4.71 | 8.40 | 9.80 | 46.00 | 29.41 | 30.81 |
| 400.00 | 17.00 | 4.85 | 10.20 | 11.30 | 46.00 | 32.05 | 33.15 |
| 500.00 | 18.80 | 5.19 | 6.40 | 7.90 | 46.00 | 30.39 | 31.89 |
| 625.12 | 19.80 | 5.81 | 6.50 | 7.60 | 46.00 | 32.11 | 33.21 |

Remark: Emission level (dBμV/m) =Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).

**8.8.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz**

| | | | |
|---------------------|------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/07/29 |
| Model | DI-524UP | Test By | Niky Liu |
| Test Mode | IEEE 802.11b TX (CH Low) | TEMP&Humidity | 26.9°C, 65% |

| Measurement Distance at 1m Horizontal polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4823.86 | 47.07 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 43.47 | 74.00 | -30.53 | P | 1.00 |
| 4823.86 | 34.49 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 30.89 | 54.00 | -23.11 | A | 1.00 |
| 7236.00 | 45.69 | 39.58 | 6.74 | 35.65 | 9.50 | 2.00 | 48.86 | 74.00 | -25.14 | P | 1.00 |
| 7236.00 | 35.69 | 39.58 | 6.74 | 35.65 | 9.50 | 2.00 | 38.86 | 54.00 | -15.14 | A | 1.00 |
| 9648.00 | 45.15 | 38.97 | 8.29 | 36.44 | 9.50 | 0.61 | 47.08 | 74.00 | -26.92 | P | 1.00 |
| 9648.00 | 33.65 | 38.97 | 8.29 | 36.44 | 9.50 | 0.61 | 35.58 | 54.00 | -18.42 | A | 1.00 |
| 12060.00 | 45.27 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 52.01 | 74.00 | -21.99 | P | 1.00 |
| 12060.00 | 35.74 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 42.48 | 54.00 | -11.52 | A | 1.00 |
| Measurement Distance at 1m Vertical polarity | | | | | | | | | | | |
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4823.88 | 53.55 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 49.94 | 74.00 | -24.06 | P | 1.00 |
| 4823.88 | 41.80 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 38.19 | 54.00 | -15.81 | A | 1.00 |
| 7236.00 | 46.54 | 39.58 | 6.74 | 35.65 | 9.50 | 2.00 | 49.71 | 74.00 | -24.29 | P | 1.00 |
| 7236.00 | 36.15 | 39.58 | 6.74 | 35.65 | 9.50 | 2.00 | 39.32 | 54.00 | -14.68 | A | 1.00 |
| 9648.00 | 47.26 | 38.97 | 8.29 | 36.44 | 9.50 | 0.61 | 49.19 | 74.00 | -24.81 | P | 1.00 |
| 9648.00 | 38.56 | 38.97 | 8.29 | 36.44 | 9.50 | 0.61 | 40.49 | 54.00 | -13.51 | A | 1.00 |
| 12060.00 | 46.98 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 53.72 | 74.00 | -20.28 | P | 1.00 |
| 12060.00 | 36.58 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 43.32 | 54.00 | -10.68 | A | 1.00 |

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.



| | | | |
|---------------------|------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/07/29 |
| Model | DI-524UP | Test By | Nikey Liu |
| Test Mode | IEEE 802.11b TX (CH Middle) | TEMP&Humidity | 26.9°C, 65% |

| Measurement Distance at 1m Horizontal polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4874.08 | 45.26 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 41.61 | 74.00 | -32.39 | P | 1.00 |
| 4874.08 | 33.35 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 29.70 | 54.00 | -24.30 | A | 1.00 |
| 7311.77 | 45.03 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 48.38 | 74.00 | -25.62 | P | 1.00 |
| 7311.77 | 33.72 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 37.07 | 54.00 | -16.93 | A | 1.00 |
| 9747.61 | 44.68 | 39.15 | 8.33 | 36.60 | 9.50 | 0.55 | 46.61 | 74.00 | -27.39 | P | 1.00 |
| 9747.61 | 33.22 | 39.15 | 8.33 | 36.60 | 9.50 | 0.55 | 35.15 | 54.00 | -18.85 | A | 1.00 |
| 12185.00 | 45.38 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 52.17 | 74.00 | -21.83 | P | 1.00 |
| 12185.00 | 33.29 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 40.08 | 54.00 | -13.92 | A | 1.00 |

| Measurement Distance at 1m Vertical polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4874.08 | 53.16 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 49.51 | 74.00 | -24.49 | P | 1.00 |
| 4874.08 | 40.15 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 36.50 | 54.00 | -17.50 | A | 1.00 |
| 7311.77 | 49.36 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 52.71 | 74.00 | -21.29 | P | 1.00 |
| 7311.77 | 38.39 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 41.74 | 54.00 | -12.26 | A | 1.00 |
| 9747.61 | 47.52 | 39.15 | 8.33 | 36.60 | 9.50 | 0.55 | 49.45 | 74.00 | -24.55 | P | 1.00 |
| 9747.61 | 37.75 | 39.15 | 8.33 | 36.60 | 9.50 | 0.55 | 39.68 | 54.00 | -14.32 | A | 1.00 |
| 12185.00 | 45.48 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 52.27 | 74.00 | -21.73 | P | 1.00 |
| 12185.00 | 34.95 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 41.74 | 54.00 | -12.26 | A | 1.00 |

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.



| | | | |
|---------------------|------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/07/29 |
| Model | DI-524UP | Test By | Nikey Liu |
| Test Mode | IEEE 802.11b TX (CH High) | TEMP&Humidity | 26.9°C, 65% |

| Measurement Distance at 1m Horizontal polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4924.00 | 46.37 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 42.68 | 74.00 | -31.32 | P | 1.00 |
| 4924.00 | 33.65 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 29.96 | 54.00 | -24.04 | A | 1.00 |
| 7386.00 | 44.69 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 48.23 | 74.00 | -25.77 | P | 1.00 |
| 7386.00 | 35.36 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 38.90 | 54.00 | -15.10 | A | 1.00 |
| 9848.00 | 46.70 | 39.33 | 8.37 | 36.76 | 9.50 | 0.49 | 48.63 | 74.00 | -25.37 | P | 1.00 |
| 9848.00 | 36.35 | 39.33 | 8.37 | 36.76 | 9.50 | 0.49 | 38.28 | 54.00 | -15.72 | A | 1.00 |
| 12310.00 | 47.07 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 53.91 | 74.00 | -20.09 | P | 1.00 |
| 12310.00 | 35.88 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 42.72 | 54.00 | -11.28 | A | 1.00 |

| Measurement Distance at 1m Vertical polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4923.77 | 53.15 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 49.46 | 74.00 | -24.54 | P | 1.00 |
| 4923.77 | 39.75 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 36.06 | 54.00 | -17.94 | A | 1.00 |
| 7386.00 | 46.77 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 50.31 | 74.00 | -23.69 | P | 1.00 |
| 7386.00 | 36.60 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 40.14 | 54.00 | -13.86 | A | 1.00 |
| 9848.00 | 49.00 | 39.33 | 8.37 | 36.76 | 9.50 | 0.49 | 50.93 | 74.00 | -23.07 | P | 1.00 |
| 9848.00 | 40.72 | 39.33 | 8.37 | 36.76 | 9.50 | 0.49 | 42.65 | 54.00 | -11.35 | A | 1.00 |
| 12310.00 | 51.48 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 58.32 | 74.00 | -15.68 | P | 1.00 |
| 12310.00 | 41.01 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 47.85 | 54.00 | -6.15 | A | 1.00 |

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable - Preamp + Filter - Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.



| | | | |
|---------------------|------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/08/18 |
| Model | DI-524UP | Test By | Nikey Liu |
| Test Mode | IEEE 802.11g TX (CH Low) | TEMP&Humidity | 23.9°C, 65% |

| Measurement Distance at 1m Horizontal polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4823.86 | 43.36 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 39.76 | 74.00 | -34.24 | P | 1.00 |
| 4823.86 | 32.14 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 28.54 | 54.00 | -25.46 | A | 1.00 |
| 12060.00 | 42.15 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 48.89 | 74.00 | -25.11 | P | 1.00 |
| 12060.00 | 31.11 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 37.85 | 54.00 | -16.15 | A | 1.00 |
| Measurement Distance at 1m Vertical polarity | | | | | | | | | | | |
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4823.86 | 46.39 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 42.79 | 74.00 | -31.21 | P | 1.00 |
| 4823.86 | 33.98 | 33.97 | 5.08 | 35.16 | 9.50 | 2.00 | 30.38 | 54.00 | -23.62 | A | 1.00 |
| 12060.00 | 43.99 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 50.73 | 74.00 | -23.27 | P | 1.00 |
| 12060.00 | 32.19 | 41.95 | 9.23 | 35.74 | 9.50 | 0.80 | 38.93 | 54.00 | -15.07 | A | 1.00 |

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:

$$\text{Level} = \text{Reading} + \text{AF} + \text{Cable} - \text{Preamp} + \text{Filter} - \text{Dist}, \text{Margin} = \text{Level} - \text{Limit}$$
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.



| | | | |
|---------------------|------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/08/18 |
| Model | DI-524UP | Test By | Nikey Liu |
| Test Mode | IEEE 802.11g TX (CH Middle) | TEMP&Humidity | 23.9°C, 65% |

| Measurement Distance at 1m Horizontal polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4874.08 | 41.36 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 37.71 | 74.00 | -36.29 | P | 1.00 |
| 4874.08 | 32.70 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 29.05 | 54.00 | -24.95 | A | 1.00 |
| 7311.77 | 42.58 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 45.93 | 74.00 | -28.07 | P | 1.00 |
| 7311.77 | 31.68 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 35.03 | 54.00 | -18.97 | A | 1.00 |
| 12185.00 | 43.57 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 50.36 | 74.00 | -23.64 | P | 1.00 |
| 12185.00 | 33.14 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 39.93 | 54.00 | -14.07 | A | 1.00 |
| Measurement Distance at 1m Vertical polarity | | | | | | | | | | | |
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4874.08 | 43.25 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 39.60 | 74.00 | -34.40 | P | 1.00 |
| 4874.08 | 32.14 | 34.15 | 5.10 | 35.20 | 9.50 | 1.80 | 28.49 | 54.00 | -25.51 | A | 1.00 |
| 7311.77 | 42.50 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 45.85 | 74.00 | -28.15 | P | 1.00 |
| 7311.77 | 31.47 | 39.70 | 6.79 | 35.64 | 9.50 | 2.00 | 34.82 | 54.00 | -19.18 | A | 1.00 |
| 12185.00 | 43.68 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 50.47 | 74.00 | -23.53 | P | 1.00 |
| 12185.00 | 30.25 | 41.85 | 9.25 | 35.62 | 9.50 | 0.80 | 37.04 | 54.00 | -16.96 | A | 1.00 |

Remark:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.



| | | | |
|---------------------|------------------------------|--------------------------|-------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/08/18 |
| Model | DI-524UP | Test By | Nikey Liu |
| Test Mode | IEEE 802.11g TX (CH High) | TEMP&Humidity | 23.9°C, 65% |

| Measurement Distance at 1m Horizontal polarity | | | | | | | | | | | |
|--|----------------|-----------|------------|--------------|-----------|-------------|----------------|----------------|-------------|--------------|----------------|
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4924.00 | 41.80 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 38.11 | 74.00 | -35.89 | P | 1.00 |
| 4924.00 | 32.25 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 28.56 | 54.00 | -25.44 | A | 1.00 |
| 7386.00 | 40.63 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 44.17 | 74.00 | -29.83 | P | 1.00 |
| 7386.00 | 31.47 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 35.01 | 54.00 | -18.99 | A | 1.00 |
| 12310.00 | 41.22 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 48.06 | 74.00 | -25.94 | P | 1.00 |
| 12310.00 | 32.88 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 39.72 | 54.00 | -14.28 | A | 1.00 |
| Measurement Distance at 1m Vertical polarity | | | | | | | | | | | |
| Freq. (MHz) | Reading (dBμV) | AF (dBμV) | Cable (dB) | Pre-amp (dB) | Dist (dB) | Filter (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Mark (P/Q/A) | Height (Meter) |
| 4924.00 | 42.70 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 39.01 | 74.00 | -34.99 | P | 1.00 |
| 4924.00 | 31.06 | 34.33 | 5.12 | 35.24 | 9.50 | 1.60 | 27.37 | 54.00 | -26.63 | A | 1.00 |
| 7386.00 | 41.36 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 44.90 | 74.00 | -29.10 | P | 1.00 |
| 7386.00 | 30.26 | 39.82 | 6.84 | 35.62 | 9.50 | 2.00 | 33.80 | 54.00 | -20.20 | A | 1.00 |
| 12310.00 | 42.57 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 49.41 | 74.00 | -24.59 | P | 1.00 |
| 12310.00 | 32.10 | 41.75 | 9.28 | 35.49 | 9.50 | 0.80 | 38.94 | 54.00 | -15.06 | A | 1.00 |

Remark:

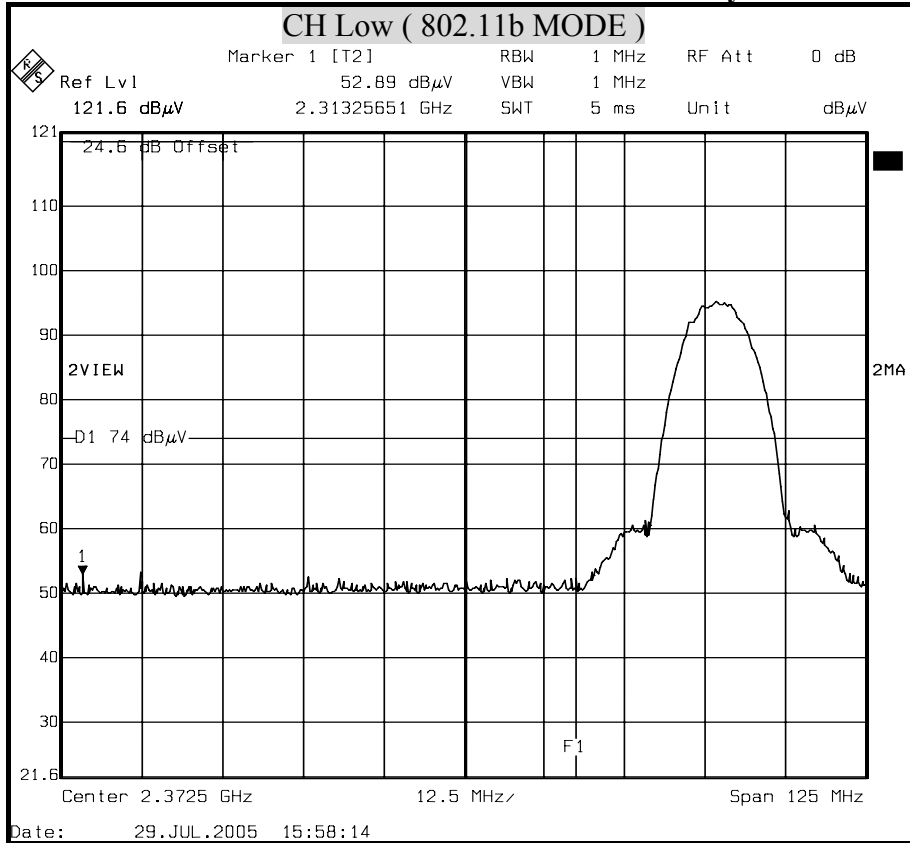
1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
4. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
5. The other emission levels were 20dB below the limit
6. The test limit distance is 3M limit.



8.8.4 RESTRICTED BAND EDGES

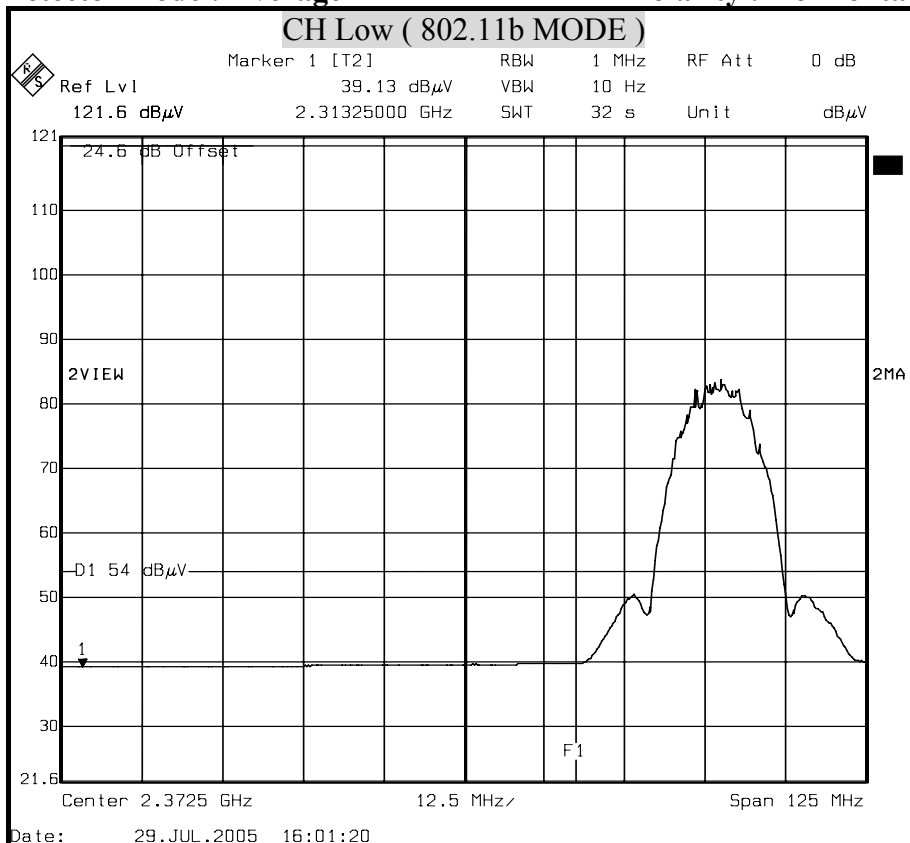
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

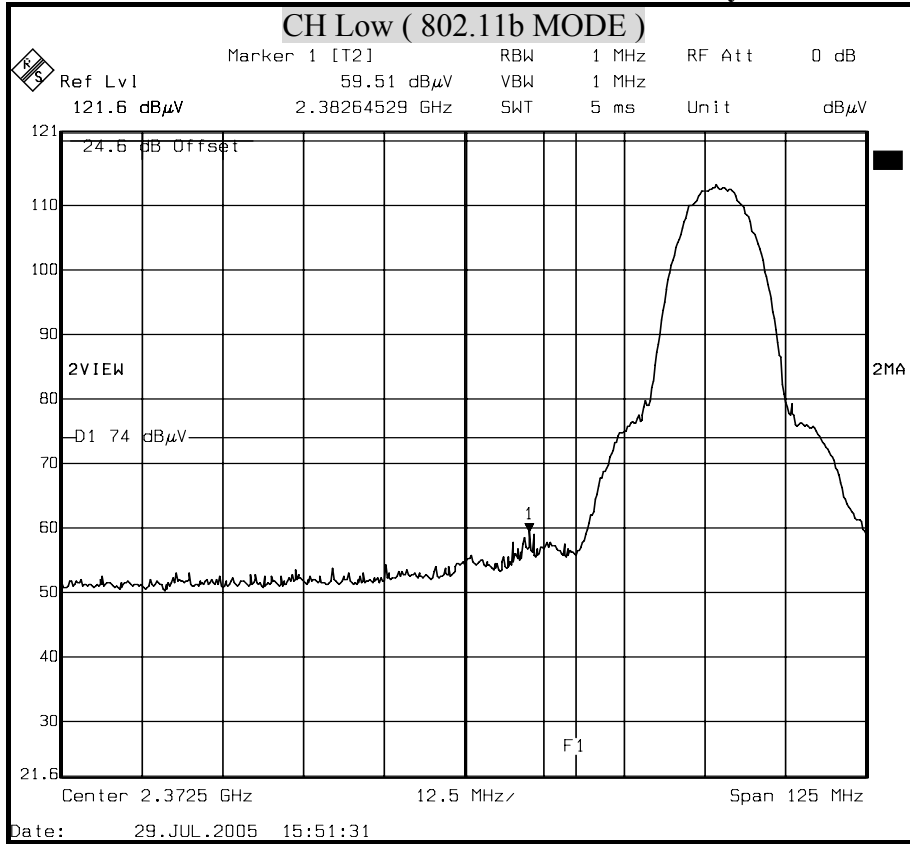
Polarity : Horizontal





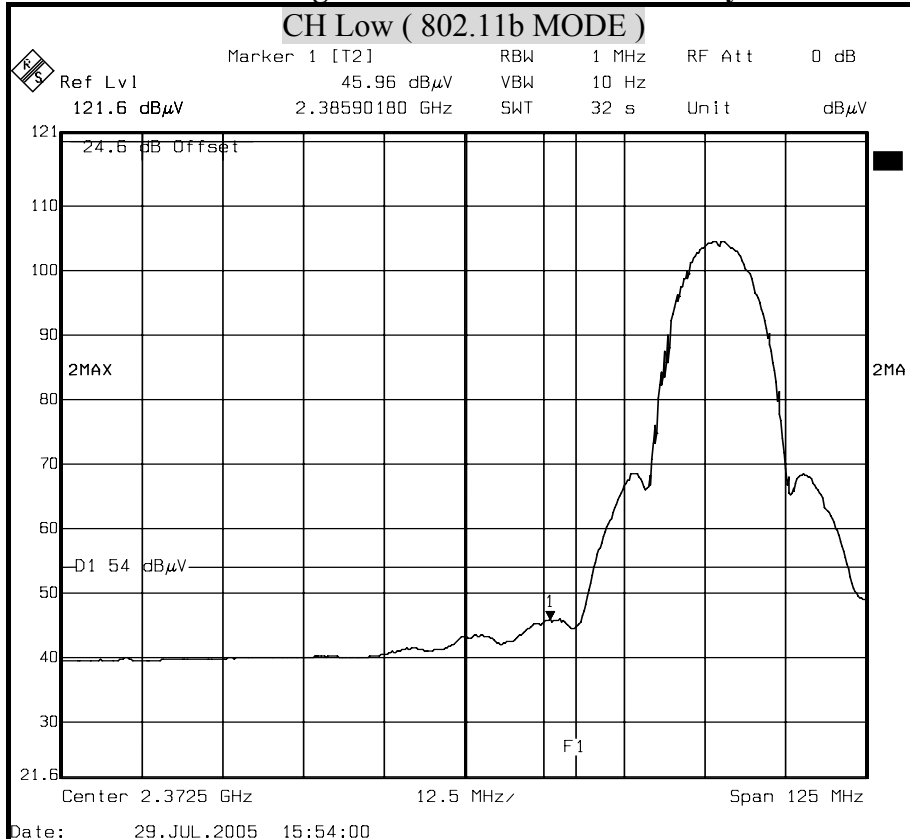
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

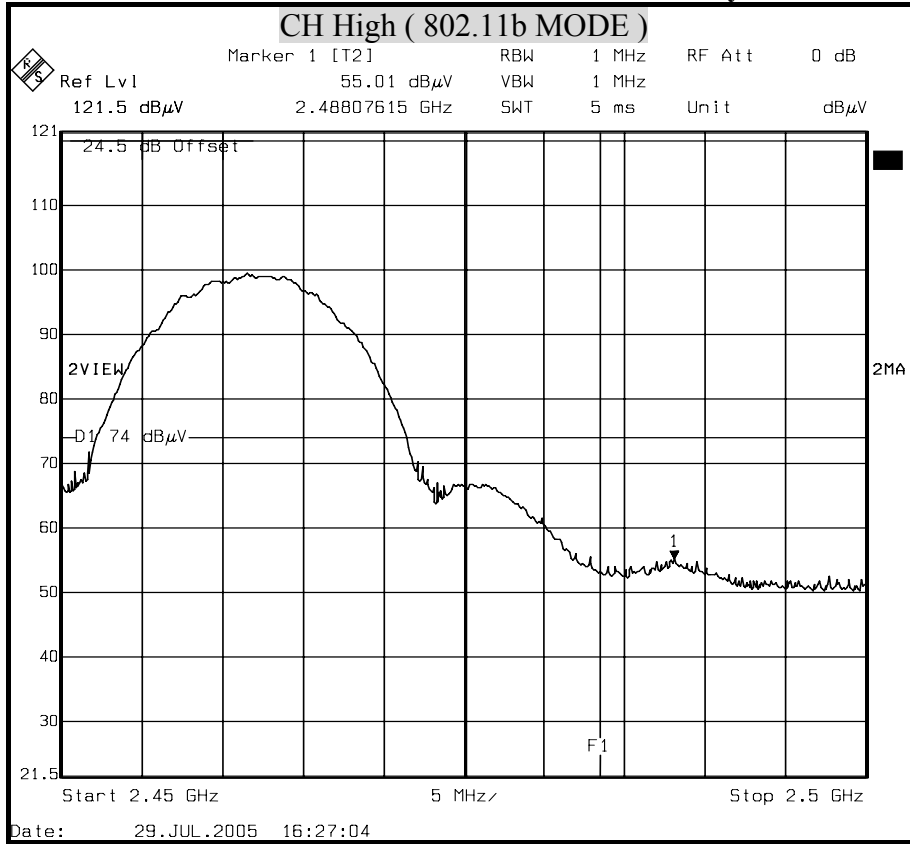
Polarity : Vertical





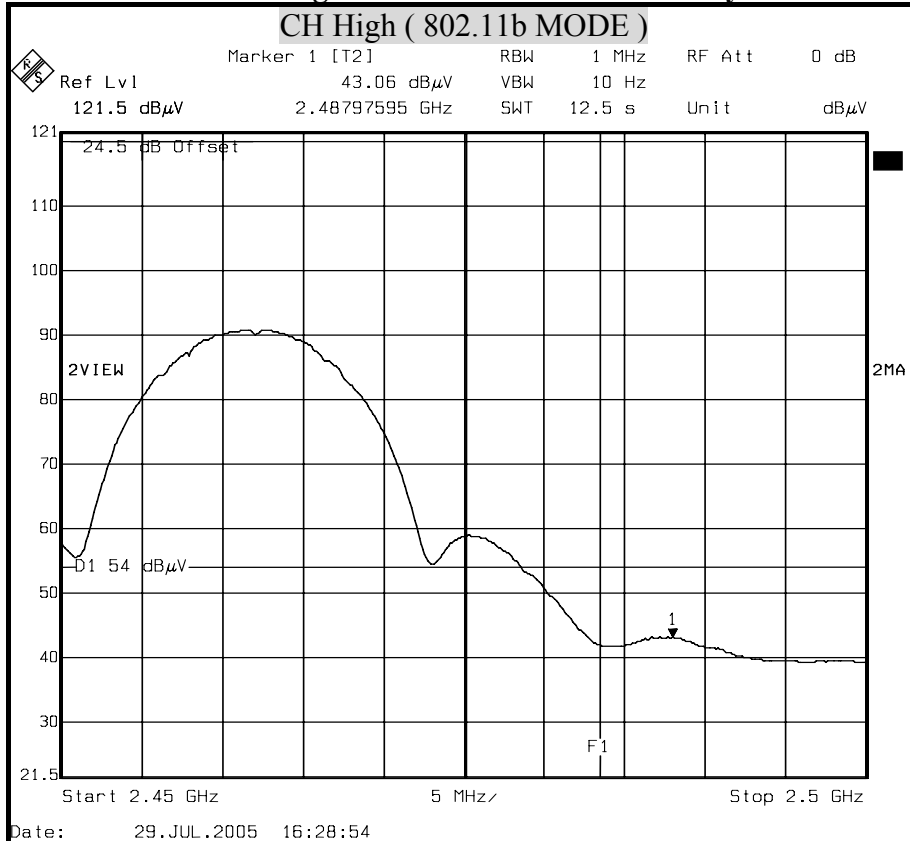
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

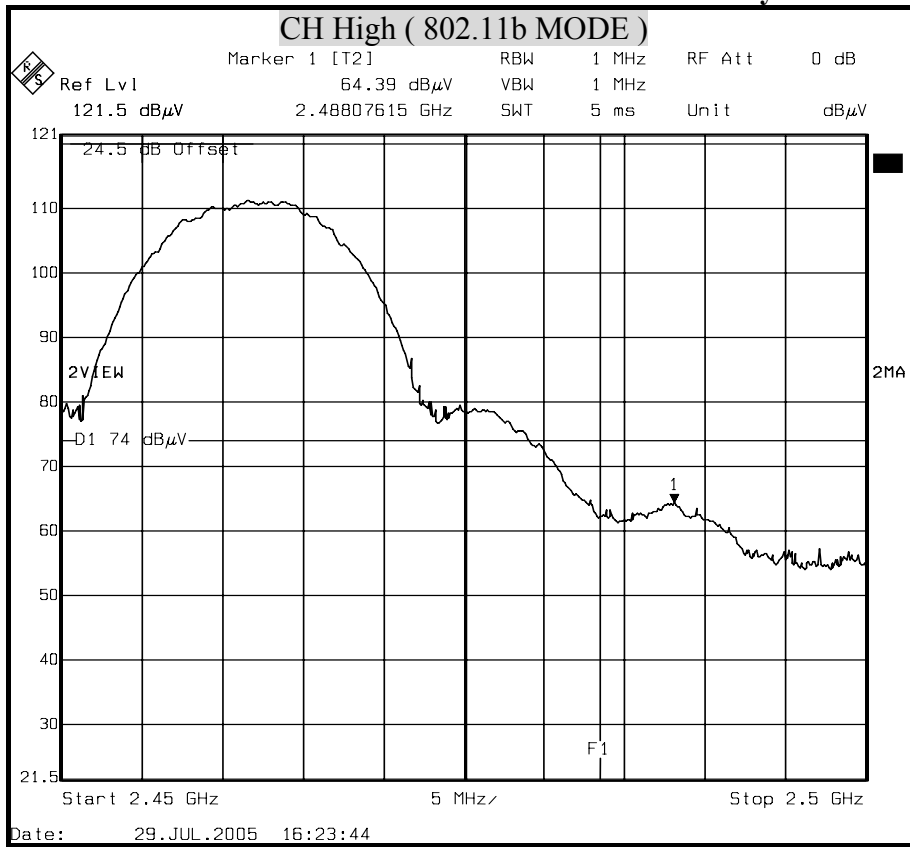
Polarity : Horizontal





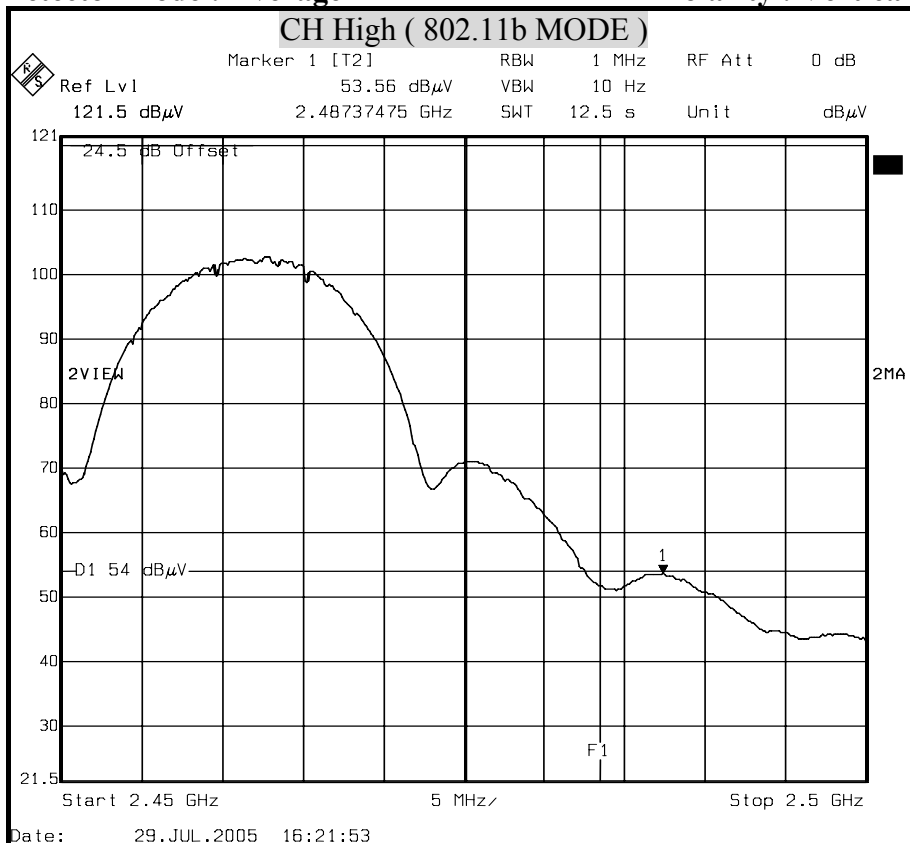
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

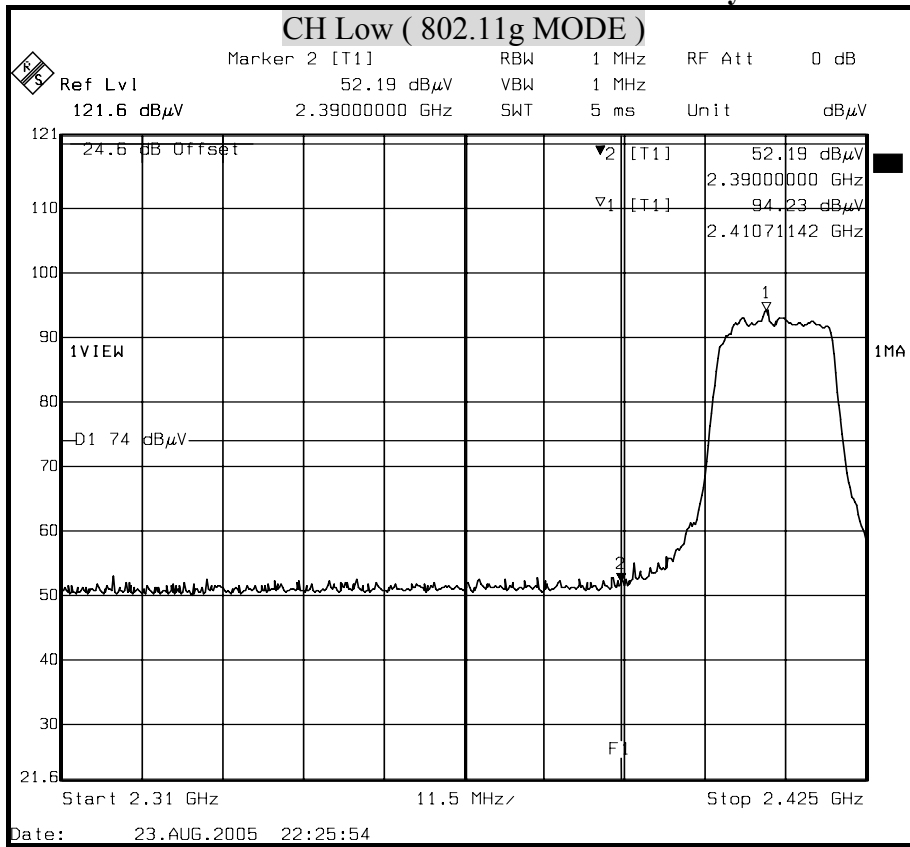
Polarity : Vertical





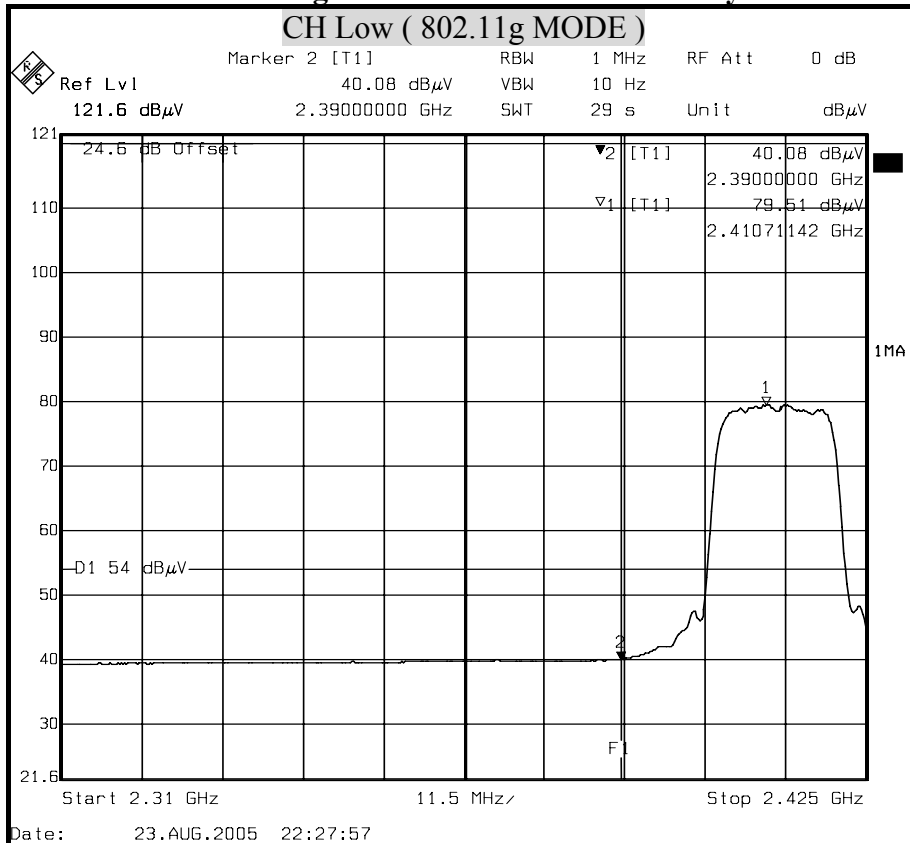
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

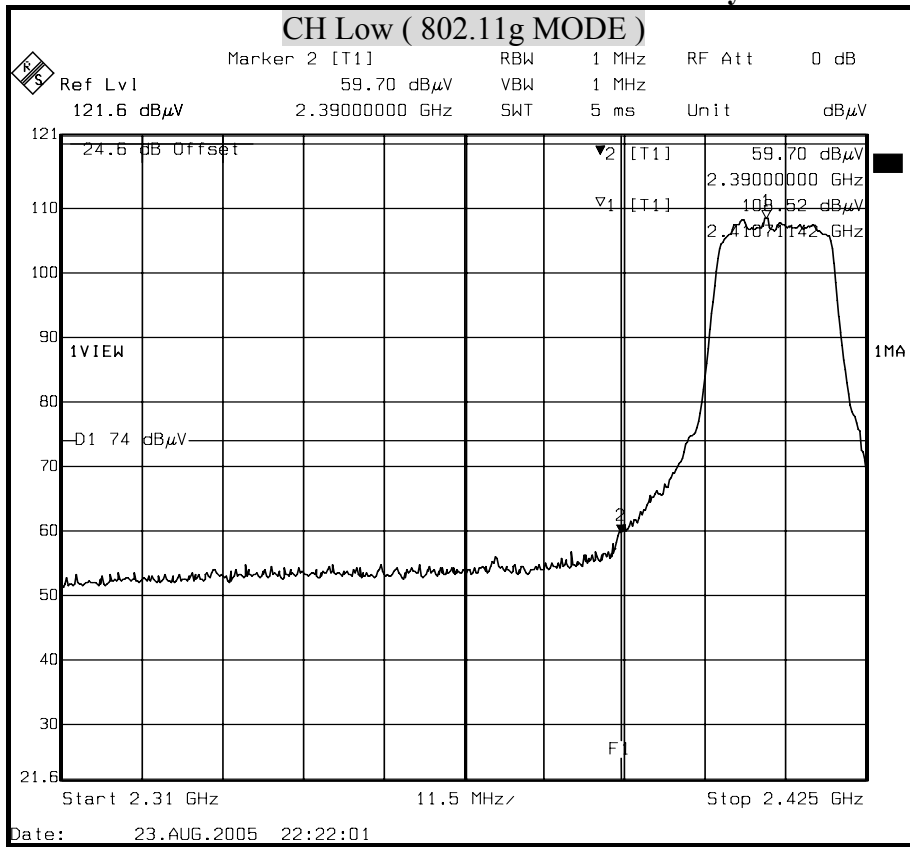
Polarity : Horizontal





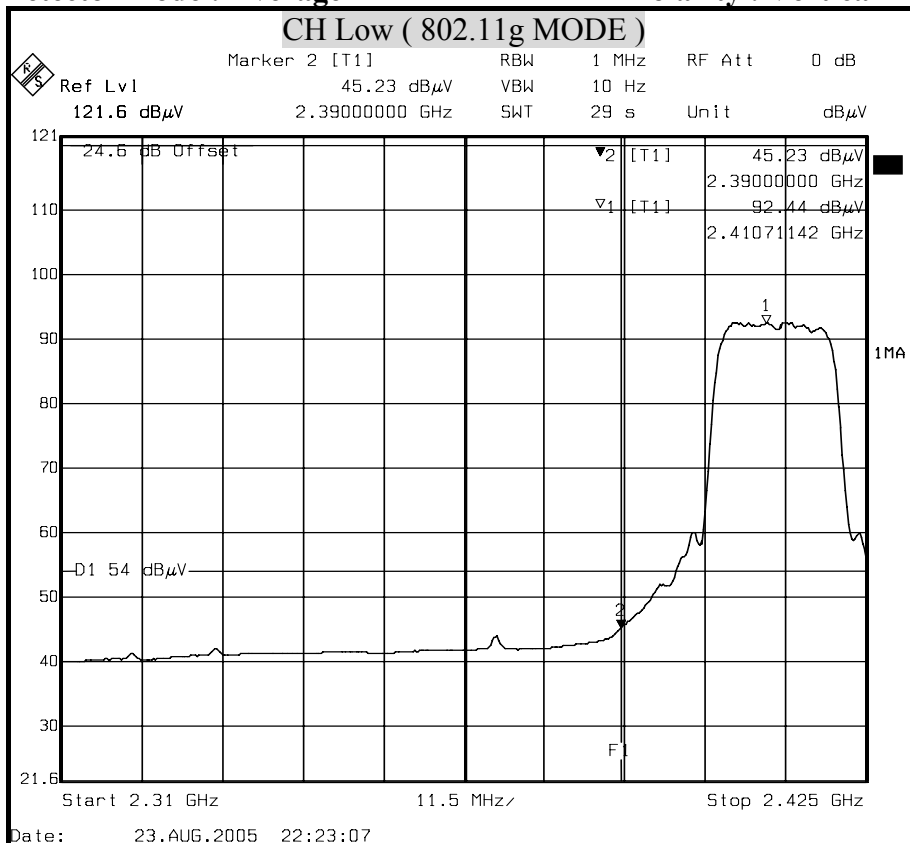
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

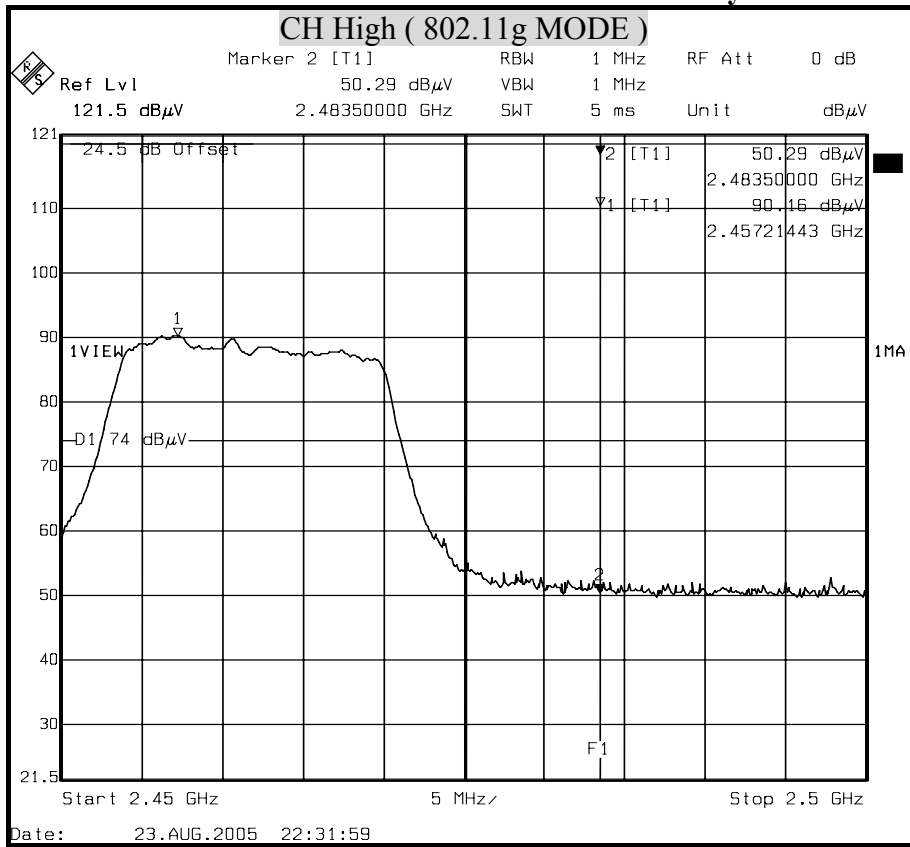
Polarity : Vertical





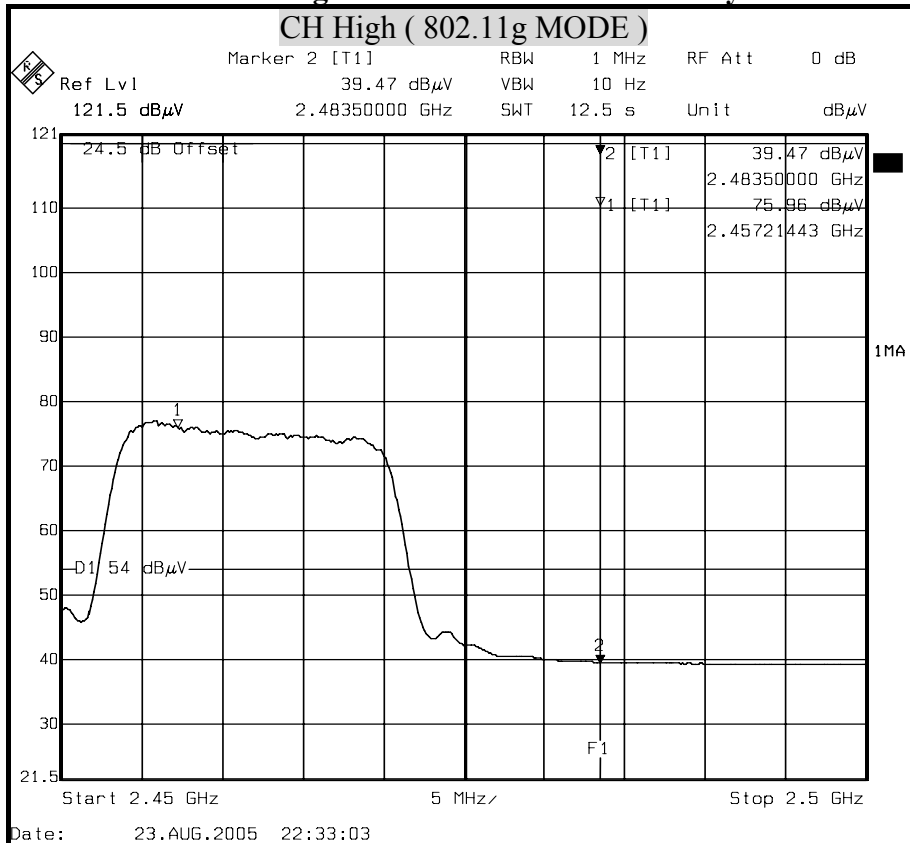
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

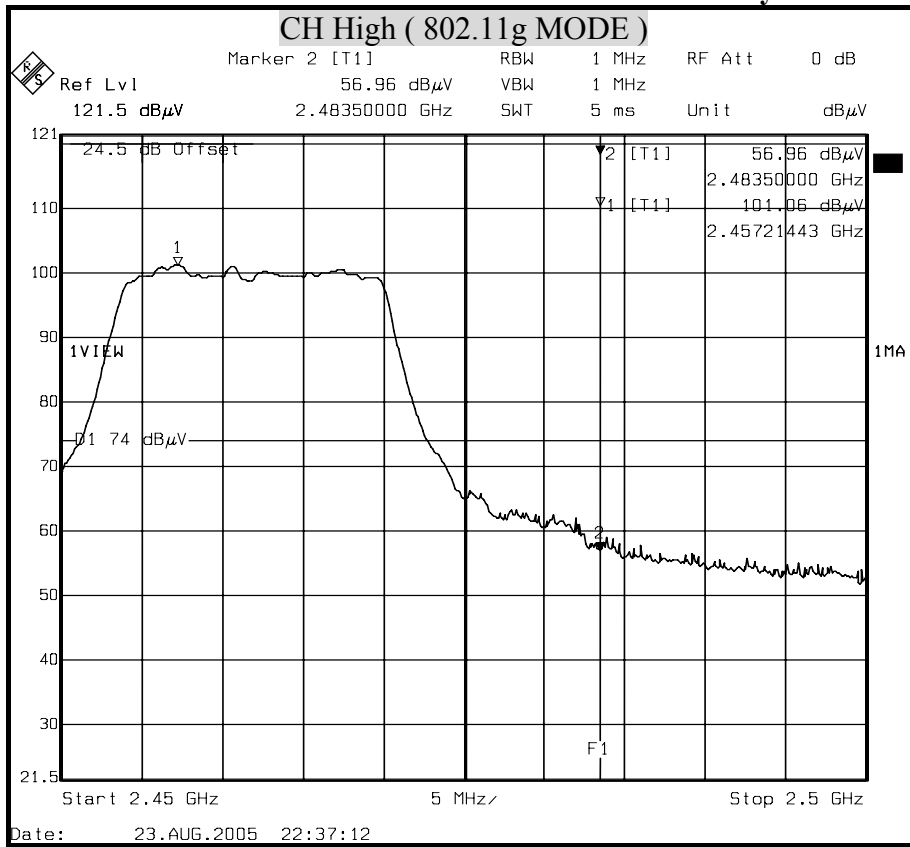
Polarity : Horizontal





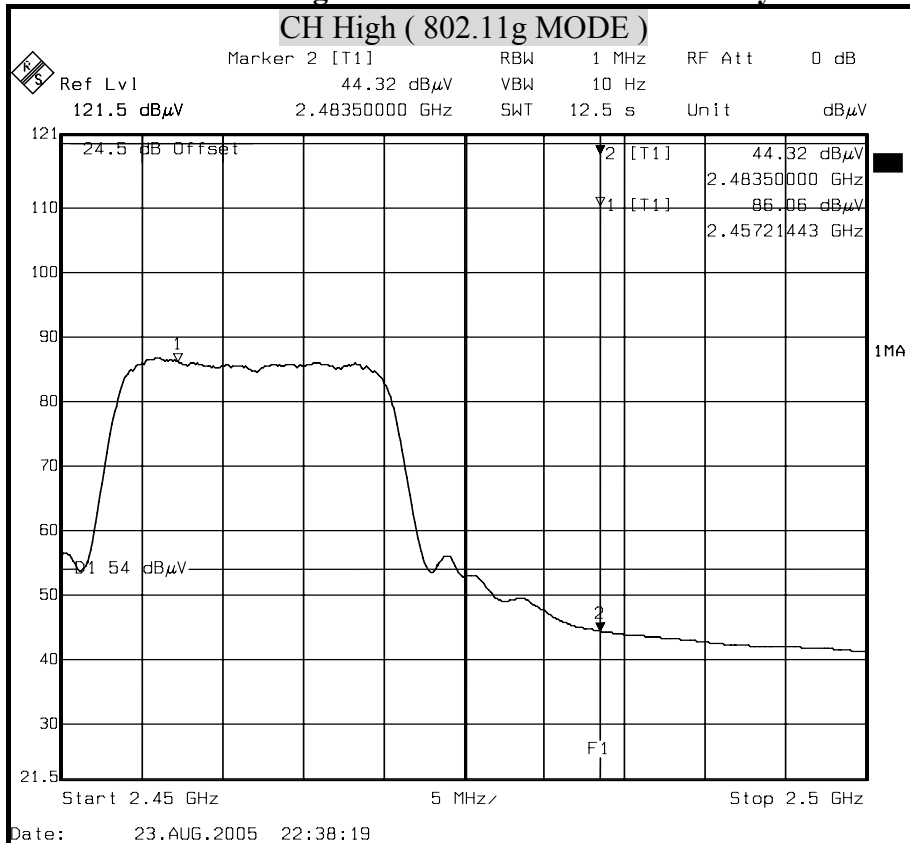
Detector mode : Peak

Polarity : Vertical



Detector mode : Average

Polarity : Vertical





8.9 POWERLINE CONDUCTED EMISSIONS

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) 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 (dB μ v) | |
|-----------------------------|------------------------------|----------|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56 | 56 to 46 |
| 0.5 - 5 | 56 | 46 |
| 5 - 30 | 60 | 50 |

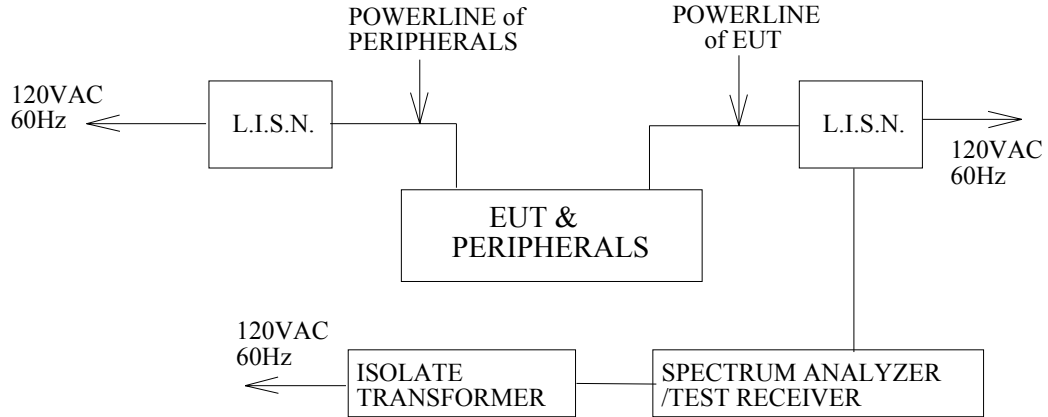
TEST EQUIPMENTS

The following test equipments are used during the conducted powerline tests :

| Manufacturer or Type | Model No. | Serial No. | Date of Calibration | Calibration Period | Remark |
|-----------------------------|-----------|------------------------|--|--------------------|---------|
| HP SPECTRUM ANALYZER | 8594E | 3801A05627 | April 28, 2005 | 1 Year | PRETEST |
| SOLAR ISOLATION TRANSFORMER | 7032-1 | N/A | N/A | N/A | FINAL |
| EMCO L.I.S.N. | 3850/2 | 9311-1025 9401-1028 | January 10, 2005 For Characteristic impedance January 10, 2005 For Insertion loss | 1 Year | FINAL |
| R & S TEST RECEIVER | ESHS30 | 838550/003 | February 21, 2005 | 1 Year | FINAL |
| KEENE SHIELDED ROOM | 5983 | No.1 | N/A | N/A | FINAL |
| R & S PULSE LIMIT | EHS3Z2 | 357.8810.52 | July 10, 2005 | 1 Year | FINAL |
| N TYPE COAXIAL CABLE | ----- | ----- | July 10, 2005 | 1 Year | FINAL |
| 50 Ω TERMINATOR | ----- | ----- | July 10, 2005 | 1 Year | FINAL |



TEST SETUP



TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm 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 quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

TEST RESULTS

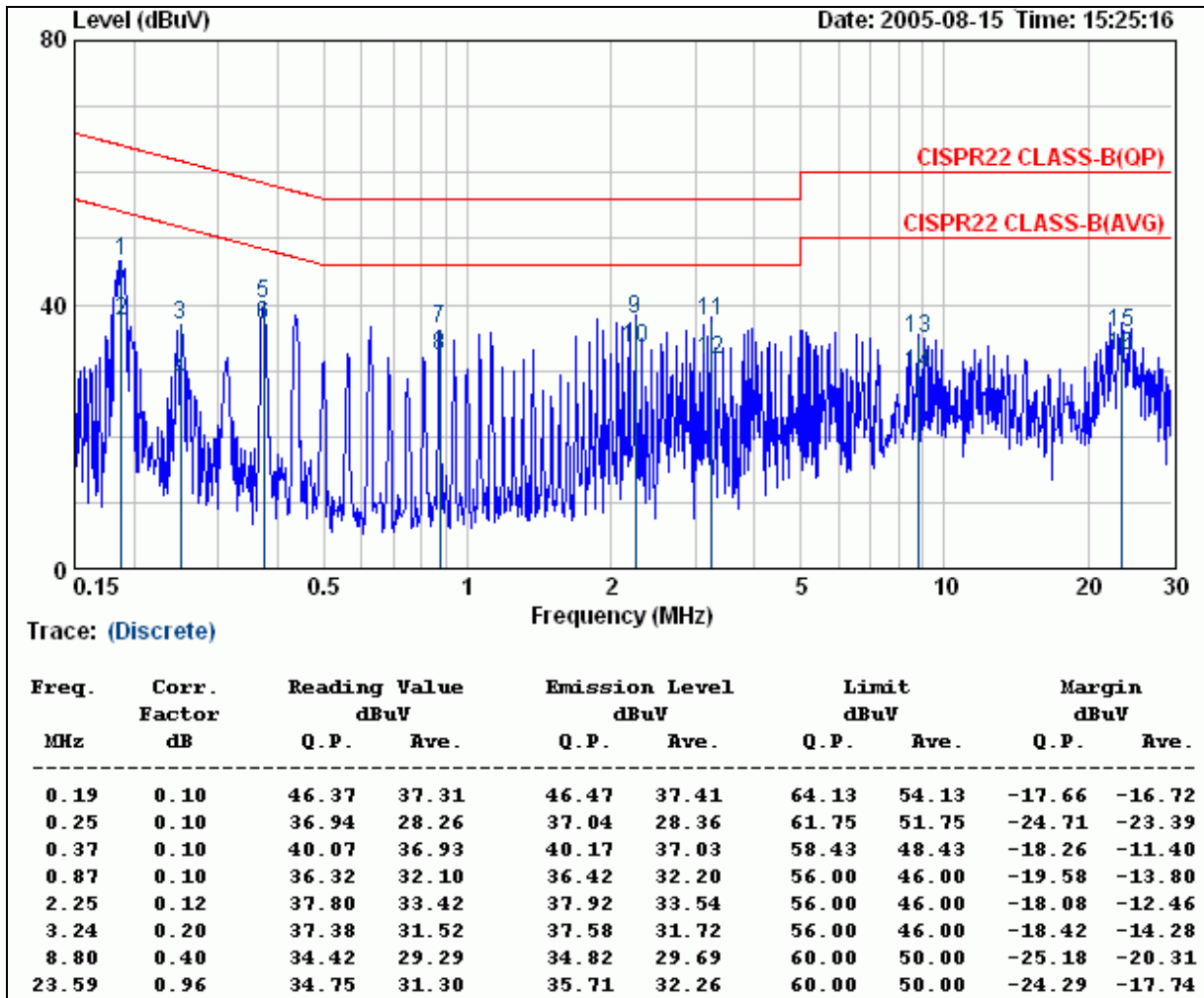
No non-compliance noted



CONDUCTED RF VOLTAGE MEASUREMENT

| | | | |
|---------------------|-------------------------------|--------------------------|------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/08/15 |
| Model | DI-524UP | Test By | Niky Li |
| Test Mode | Normal operating (worst case) | TEMP&Humidity | 29°C, 55% |

LINE



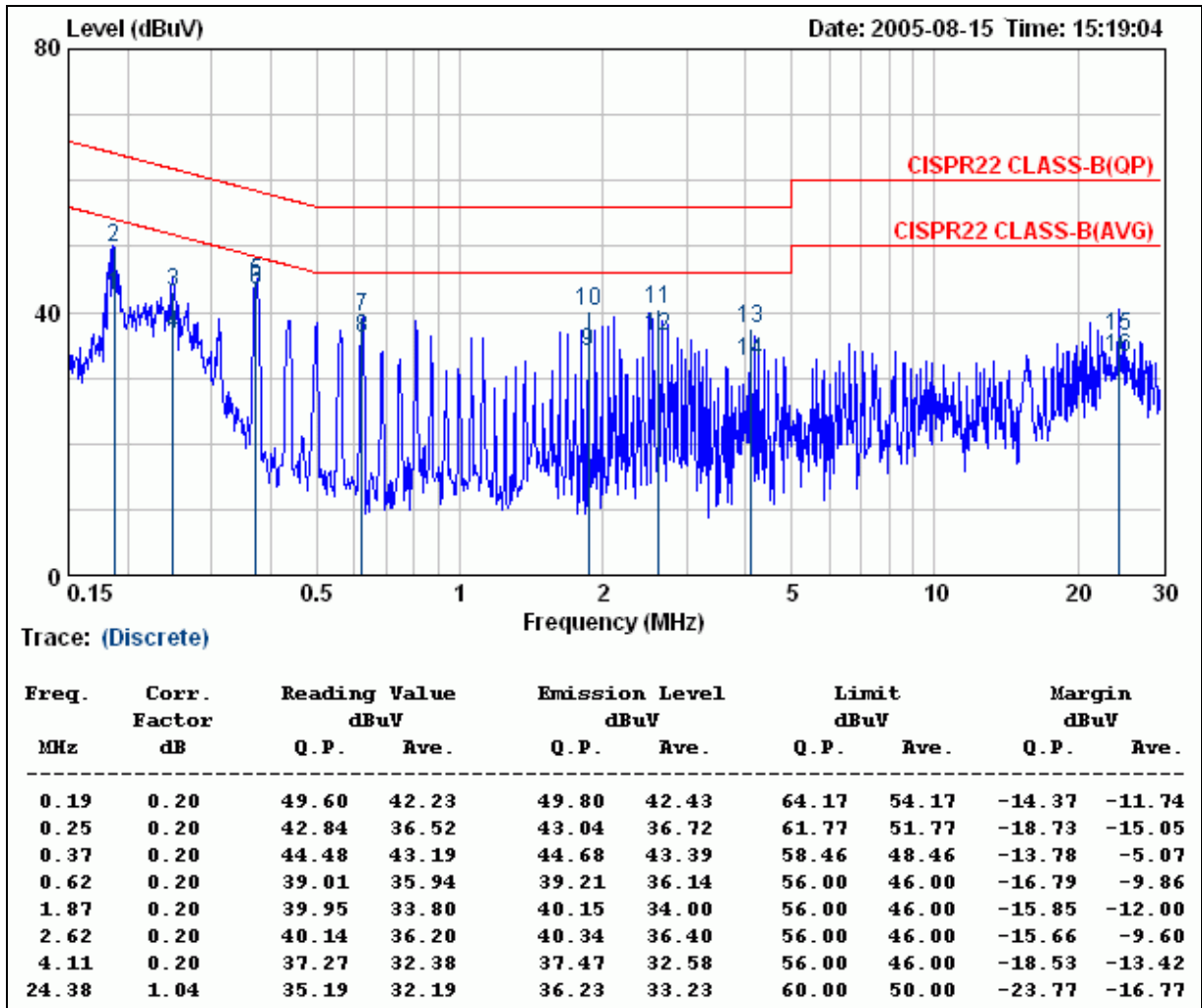
Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level - Limit value



| | | | |
|---------------------|-------------------------------|--------------------------|------------|
| Product Name | IEEE 802.11g Wireless Router | Test Date | 2005/08/15 |
| Model | DI-524UP | Test By | Niky Liu |
| Test Mode | Normal operating (worst case) | TEMP&Humidity | 29°C, 55% |

NEUTRAL



Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level - Limit value



9. ANTENNA REQUIREMENT

9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used for this product is $1/4\lambda$ Dipole antenna . The maximum peak Gain of this antenna is only 2.14 dBi.