# FCC CFR47 PART 15 SUBPART E CERTIFICATION

# TEST REPORT

**FOR**

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

**MODEL NUMBER: WM3A2915ABG**

**FCC ID: E2K5HCKT**

**REPORT NUMBER: 04U2790-2**

**ISSUE DATE: JULY 15, 2004**

*Prepared for*
**DELL COMPUTER CORPORATION**
**ONE DELL WAY**
**ROUND ROCK, TX 78682, USA**

*Prepared by*
**COMPLIANCE CERTIFICATION SERVICES**
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# 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** DELL COMPUTER CORPORATION
ONE DELL WAY
ROUND ROCK, TX 78682, USA

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

**MODEL:** WM3A2915ABG

**DATE TESTED:** JUNE 09 TO JUNE 29, 2004

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

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

**Note**: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

**Note:** The 5.2 GHz band is applicable to this report.

Approved & Released For CCS By:

MIKE HECKROTTE
ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

VIEN TRAN
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

# 2. EUT DESCRIPTION

The EUT is an 802.11a/b/g transceiver 802.11a/b/g Mini PCI type 3B card.

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

5150 to 5250 MHz Authorized Band

| Frequency Band (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 5180 - 5250 | 802.11a | 11.06 | 12.76 |

5250 to 5350 MHz Authorized Band

| Frequency Band (MHz) | Mode | Output Power (dBm) | Output Power (mW) |
|---|---|---|---|
| 5250 - 5320 | 802.11a | 15.81 | 38.11 |

**PRECISION M60 LAPTOP WITH WISTRON ANTENNA SET IN BASE**
The radio utilizes two identical internal PIFA antennas for diversity. The Wistron model CA9-C has a maximum gain of 3.47 dBi.

**PRECISION M60 LAPTOP WITH HITACHI ANTENNA SET IN BASE**
The radio utilizes two identical internal Monopole antennas for diversity. The Hitachi model HFT04-DL01 has a maximum gain of 4.9 dBi.

**INSPIRON 510M LAPTOP WITH PHYCOMP ANTENNA SET IN LCD**
The radio utilizes two identical internal Patch antennas for diversity. The Phycomp model CAN4313 351 has a maximum gain of 2.8 dBi.

**INSPIRON 300M LAPTOP WITH WISTRON ANTENNA SET IN LCD**
The radio utilizes two identical internal PIFA antennas for diversity. The Wistron model CAO-S has a maximum gain of 2.43 dBi.

**INSPIRON 300M LAPTOP WITH HITACHI ANTENNA SET IN LCD**
The radio utilizes two identical internal Monopole antennas for diversity. The Hitachi model HFT06 has a maximum gain of 3.7 dBi.

The model number was changed after testing commenced. All data in this report is applicable to the model number documented in Section 1 above.

# 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.

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**LAB CODE:200065-0**

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

# 5. CALIBRATION AND UNCERTAINTY

## 5.1. MEASURING INSTRUMENT CALIBRATION

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

## 5.2. MEASUREMENT UNCERTAINTY

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

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

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

## 5.3. TEST AND MEASUREMENT EQUIPMENT

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

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

# 6. SETUP OF EQUIPMENT UNDER TEST

## SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | |
|---|---|---|---|---|
| **Description** | **Manufacturer** | **Model** | **Serial Number** | **FCC ID** |
| LAPTOP | DELL | Precision M60 (PP02X) | N/A | N/A |
| LAPTOP | DELL | Inspiron 510M (PP10L) | N/A | N/A |
| LAPTOP | DELL | Precision M60 (PP02X) | N/A | N/A |
| LAPTOP | DELL | Inspiron 300M | PR04S | N/A |
| LAPTOP | DELL | Inspiron 300M | PR04S | N/A |
| AC ADAPTER | DELL | HP-OQ065B83 | N/A | N/A |
| AC ADAPTER | DELL | PA-1650-05D | N/A | N/A |
| AC ADAPTER | DELL | PA-1900-02D | N/A | N/A |
| AC ADAPTER | DELL | HP-OQ065B83 | N/A | N/A |
| AC ADAPTER | DELL | PA-1650-05 | N/A | N/A |

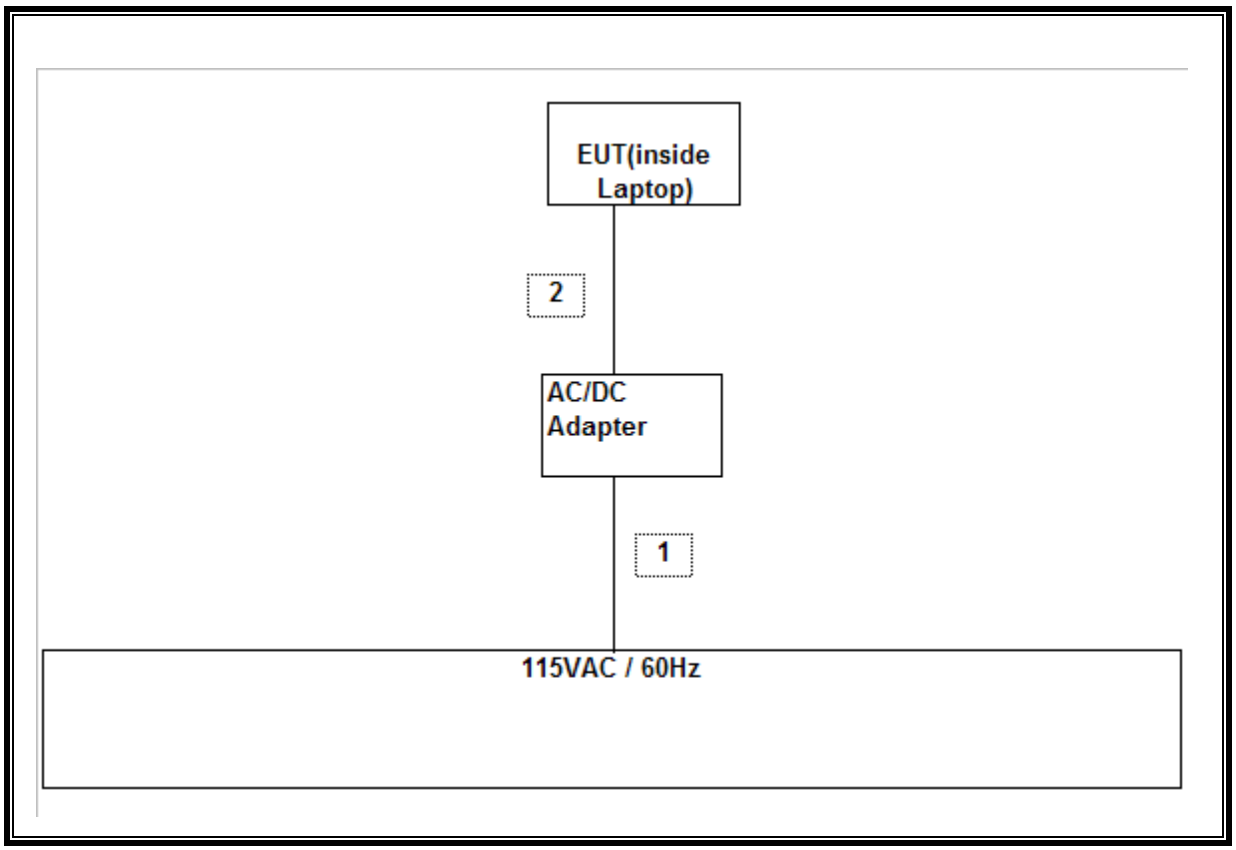
## I/O CABLES

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

## TEST SETUP

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

**SETUP DIAGRAM FOR TESTS**



# 7. APPLICABLE LIMITS AND TEST RESULTS

## 7.1. EMISSION BANDWIDTH

**LIMIT**

§15.403 (c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

**RESULTS**

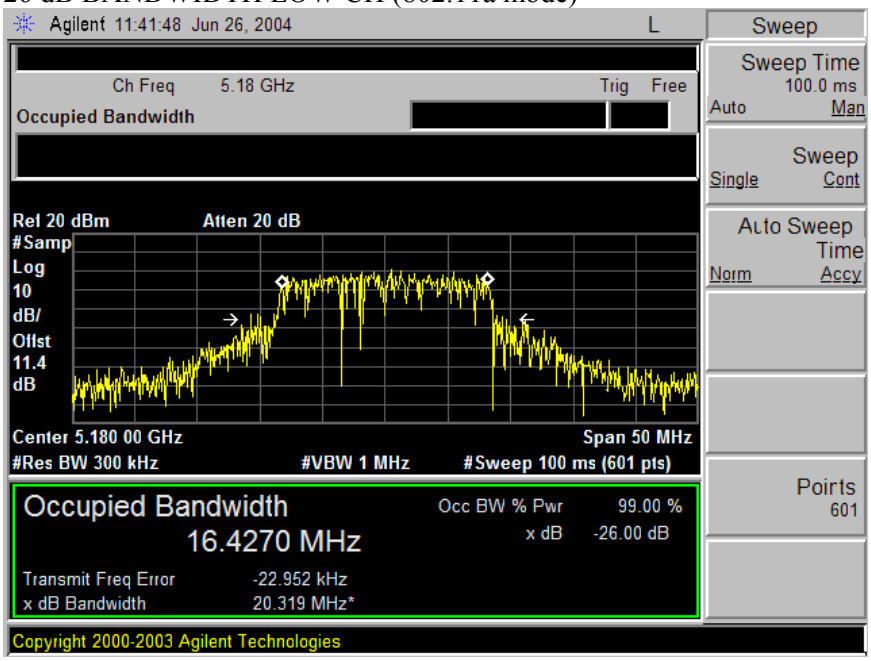
No non-compliance noted:

802.11a Mode

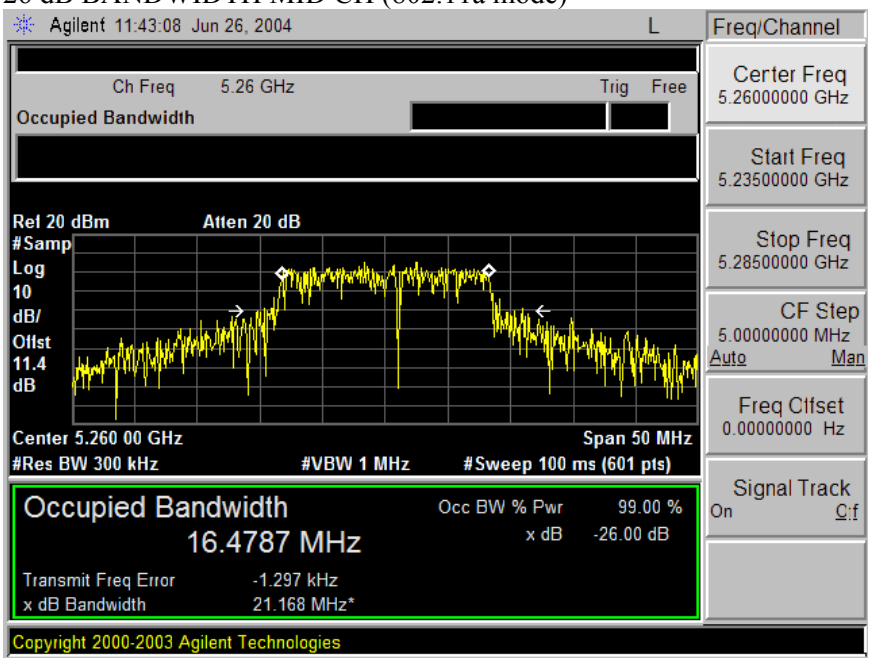
| Channel | Frequency (MHz) | B (MHz) | 10 Log B (dB) |
|---|---|---|---|
| Low | 5180 | 20.32 | 13.08 |
| Middle | 5260 | 21.17 | 13.26 |
| High | 5320 | 20.99 | 13.22 |

## 26 dB EMISSION BANDWIDTH (802.11a MODE)

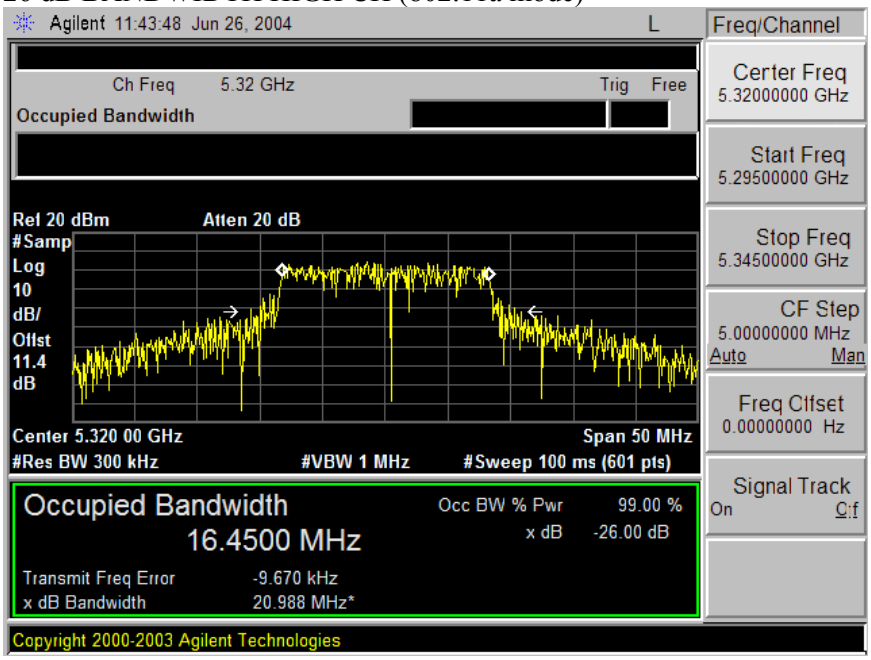
26 dB BANDWIDTH LOW CH (802.11a mode)



26 dB BANDWIDTH MID CH (802.11a mode)



26 dB BANDWIDTH HIGH CH (802.11a mode)



## 7.2. PEAK POWER

**LIMIT**

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

**TEST PROCEDURE**

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

## LIMITS AND RESULTS

No non-compliance noted:

Limit in 5150 to 5250 MHz Band

| Mode | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Antenna Gain (dBi) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 802.11a | 5180 | 17 | 20.319 | 17.08 | 2.18 | 17.00 |

Limit in 5250 to 5350 MHz Band

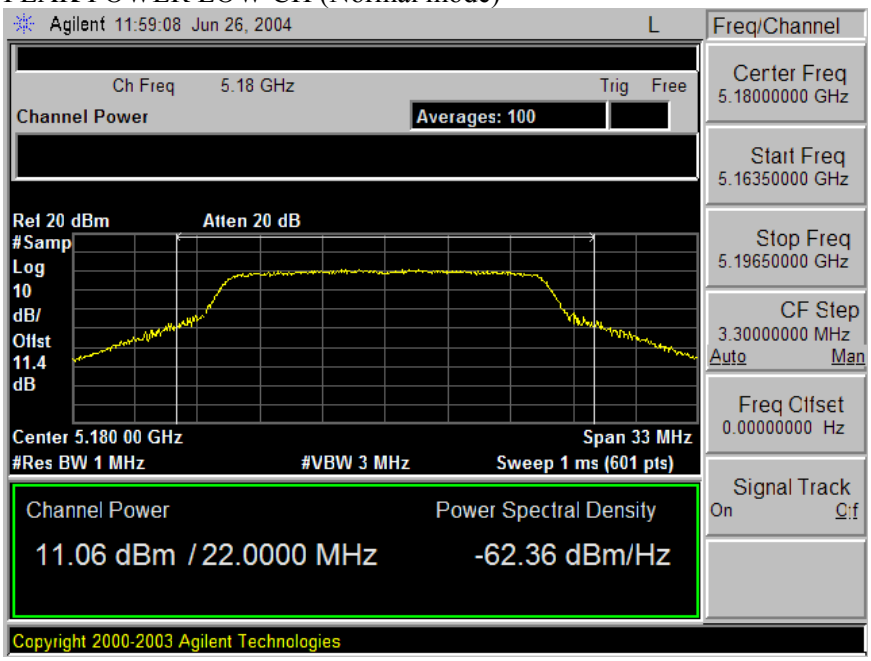
| Mode | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 11 + 10 Log B Limit (dBm) | Antenna Gain (dBi) | Limit (dBm) |
|---|---|---|---|---|---|---|
| 802.11a | 5260 | 24 | 21.168 | 24.26 | 3.39 | 24.00 |
| 802.11a | 5320 | 24 | 20.988 | 24.22 | 3.47 | 24.00 |

802.11a mode Results

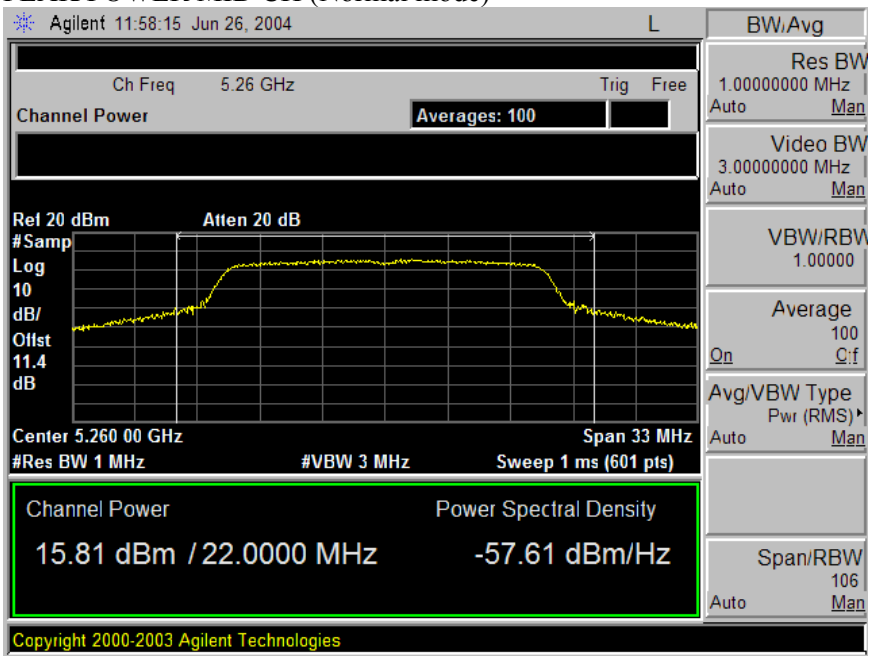
| Channel | Frequency (MHz) | Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 11.06 | 17.00 | -5.94 |
| Middle | 5260 | 15.81 | 24.00 | -8.19 |
| High | 5320 | 15.74 | 24.00 | -8.26 |

**PEAK POWER (802.11a MODE)**

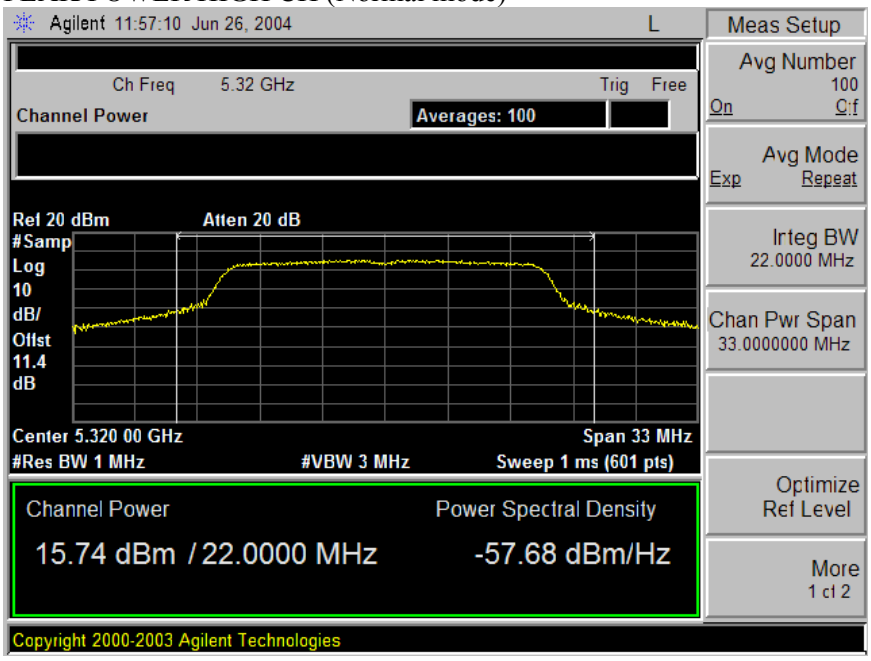
PEAK POWER LOW CH (Normal mode)



PEAK POWER MID CH (Normal mode)



PEAK POWER HIGH CH (Normal mode)



## 7.3. MAXIMUM PERMISSIBLE EXPOSURE

**LIMITS**

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

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

## CALCULATIONS

Given

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

and

$S = E \wedge 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

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

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

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

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

yields

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

where

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

Substituting the logarithmic form of power and gain using:

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

yields

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

where

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

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

## LIMITS

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

### 7.3.1. MPE, INSPIRON 510M LAPTOP WITH PHYCOMP ANTENNA SET

**RESULTS**

No non-compliance noted:

| Mode | Power Density Limit (mW/cm^2) | Output Power (dBm) | Antenna Gain (dBi) | MPE Distance (cm) |
|---|---|---|---|---|
| 802.11a | 1.0 | 15.81 | 2.80 | 2.40 |

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

### 7.3.2. MPE, INSPIRON 300M LAPTOP WITH WISTRON ANTENNA SET

**RESULTS**

No non-compliance noted:

| Mode | Power Density Limit (mW/cm^2) | Output Power (dBm) | Antenna Gain (dBi) | MPE Distance (cm) |
|---|---|---|---|---|
| 802.11a | 1.0 | 15.81 | 2.43 | 2.30 |

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

## 7.3.3. MPE, INSPIRON 300M LAPTOP WITH HITACHI ANTENNA SET

**BAND RESULTS**

No non-compliance noted:

| Mode | Power Density Limit (mW/cm^2) | Output Power (dBm) | Antenna Gain (dBi) | MPE Distance (cm) |
|---|---|---|---|---|
| 802.11a | 1.0 | 15.81 | 3.70 | 2.67 |

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

## 7.4. 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 11.4 dB (including 10 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode

| Channel | Frequency (MHz) | Average Power (dBm) |
|---|---|---|
| Low | 5180 | 11.20 |
| Middle | 5260 | 16.30 |
| High | 5320 | 16.20 |

## 7.5. PEAK POWER SPECTRAL DENSITY

**LIMIT**

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17 dBm) or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24 dBm) or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain = 4.9 dBi, therefore there is no reduction due to antenna gain.

**TEST PROCEDURE**

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

**RESULTS**

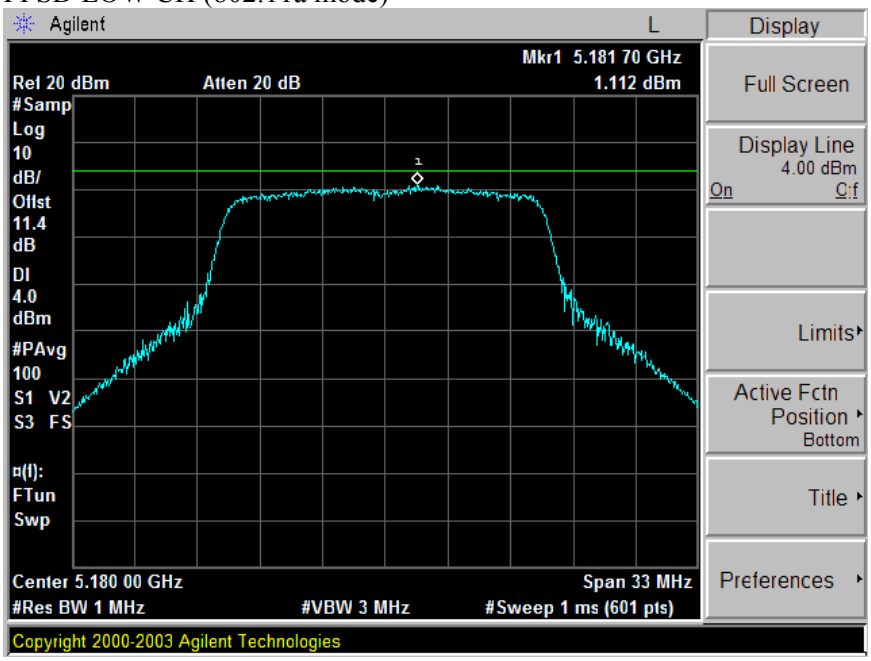
No non-compliance noted:

802.11a Mode

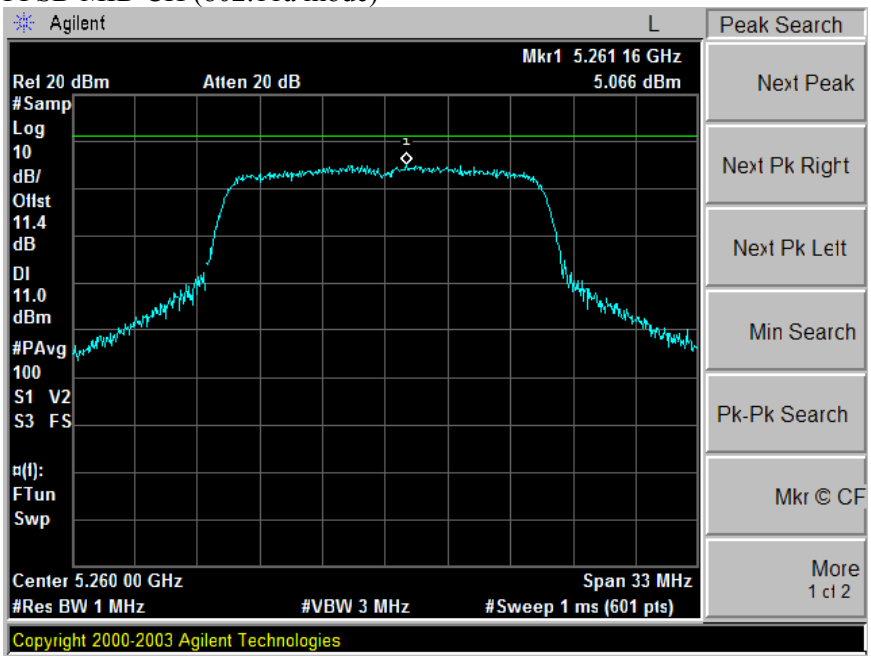
| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 1.11 | 4.00 | -2.89 |
| Middle | 5260 | 5.07 | 11.00 | -5.93 |
| High | 5320 | 4.99 | 11.00 | -6.01 |

## PEAK POWER SPECTRAL DENSITY (802.11a MODE)

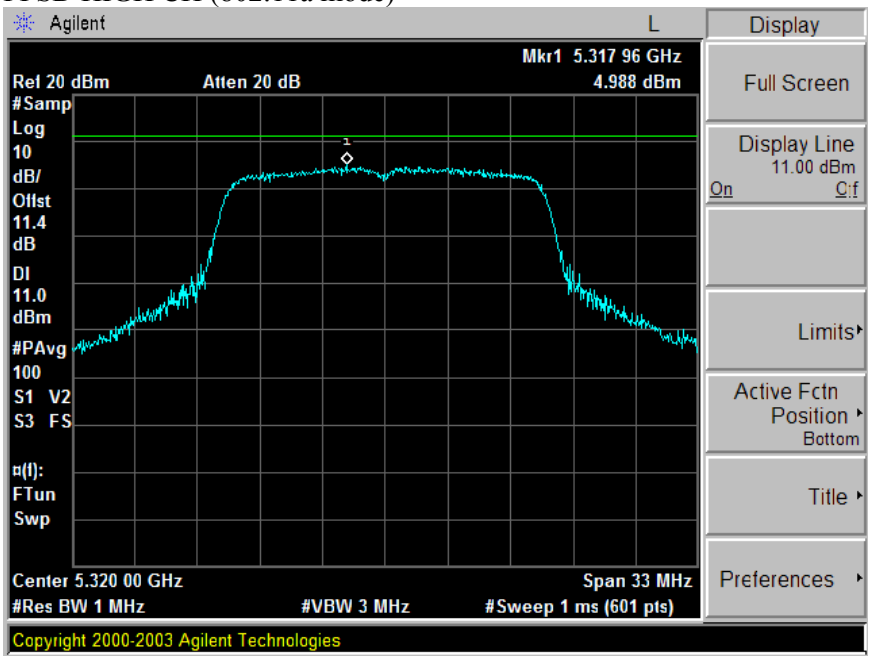
PPSD LOW CH (802.11a mode)



PPSD MID CH (802.11a mode)



PPSD HIGH CH (802.11a mode)



## 7.6. PEAK EXCURSION

**LIMIT**

§15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

**TEST PROCEDURE**

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

**RESULTS**

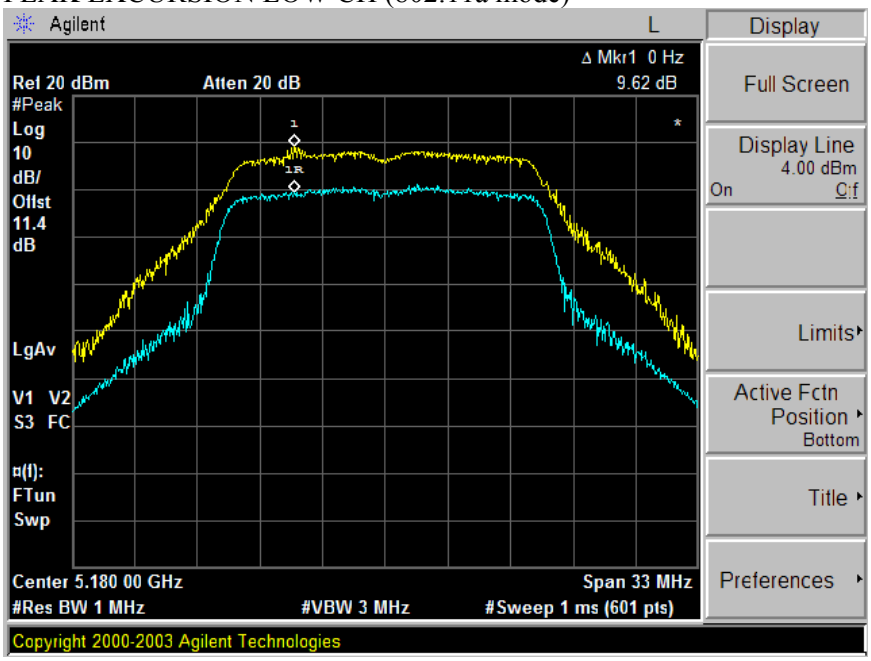
No non-compliance noted:

802.11a Mode

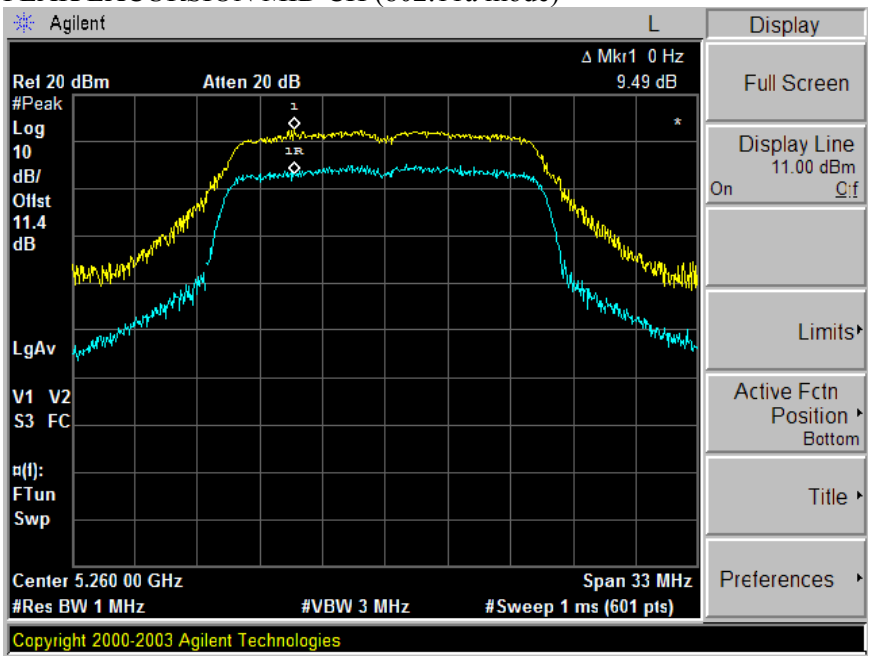
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 9.26 | 13 | -3.74 |
| Middle | 5260 | 9.49 | 13 | -3.51 |
| High | 5320 | 9.18 | 13 | -3.82 |

**PEAK EXCURSION (802.11a MODE)**

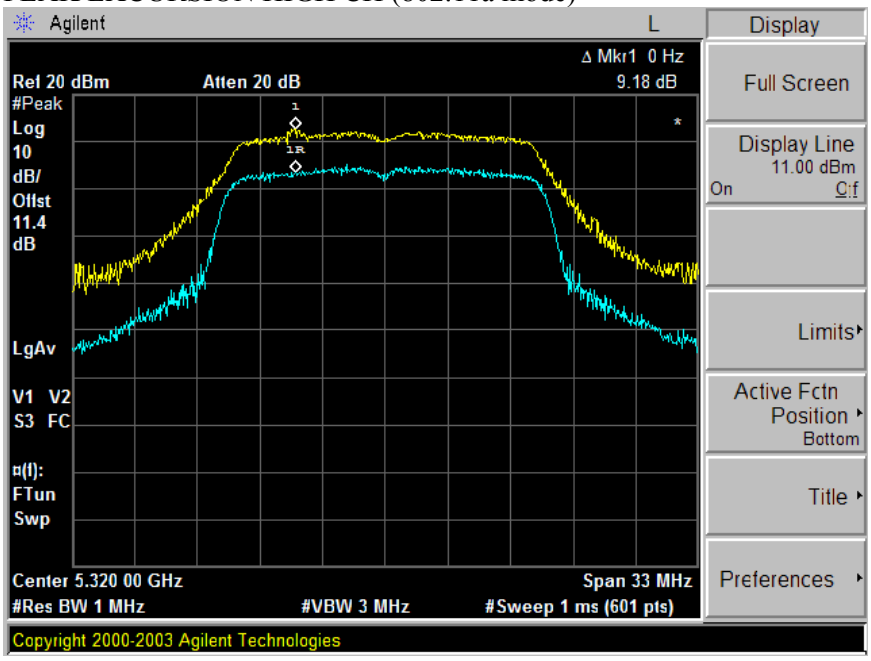
PEAK EXCURSION LOW CH (802.11a mode)



PEAK EXCURSION MID CH (802.11a mode)



PEAK EXCURSION HIGH CH (802.11a mode)



# 7.7. CONDUCTED SPURIOUS EMISSIONS

## LIMITS

§15.407 (b) (1 & 2) For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz.

## TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

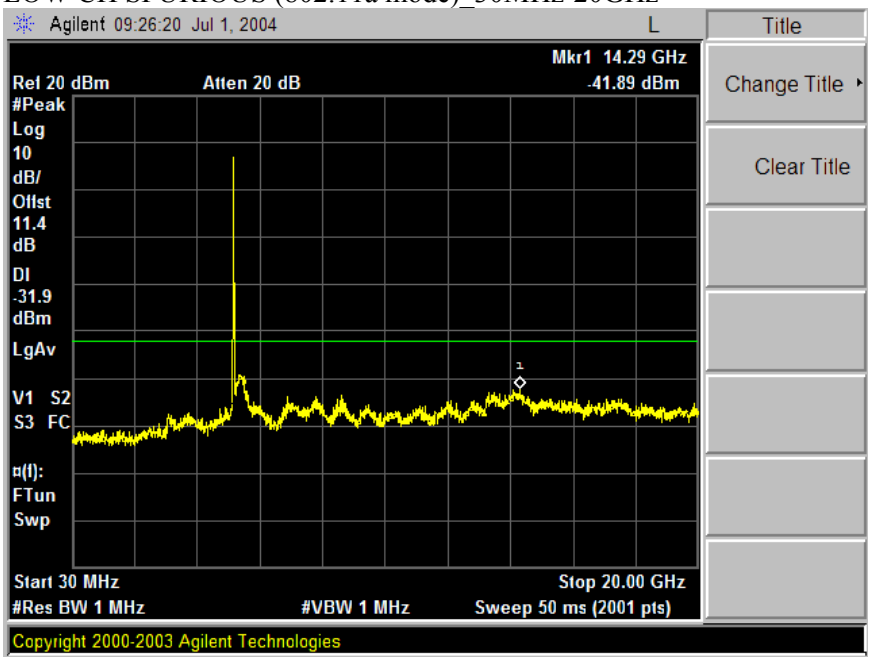
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

## RESULTS

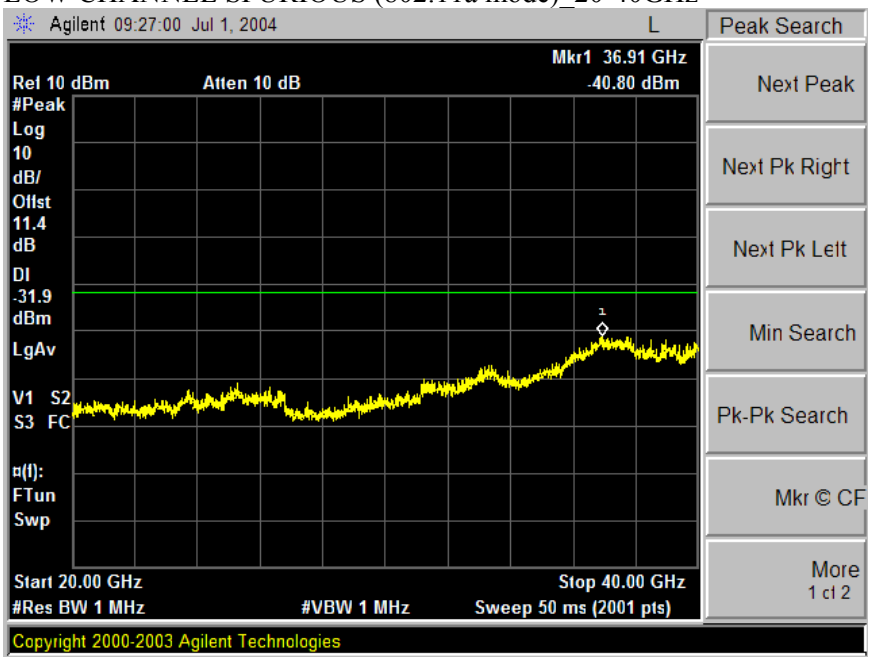
No non-compliance noted:

**SPURIOUS EMISSIONS (802.11a MODE)**

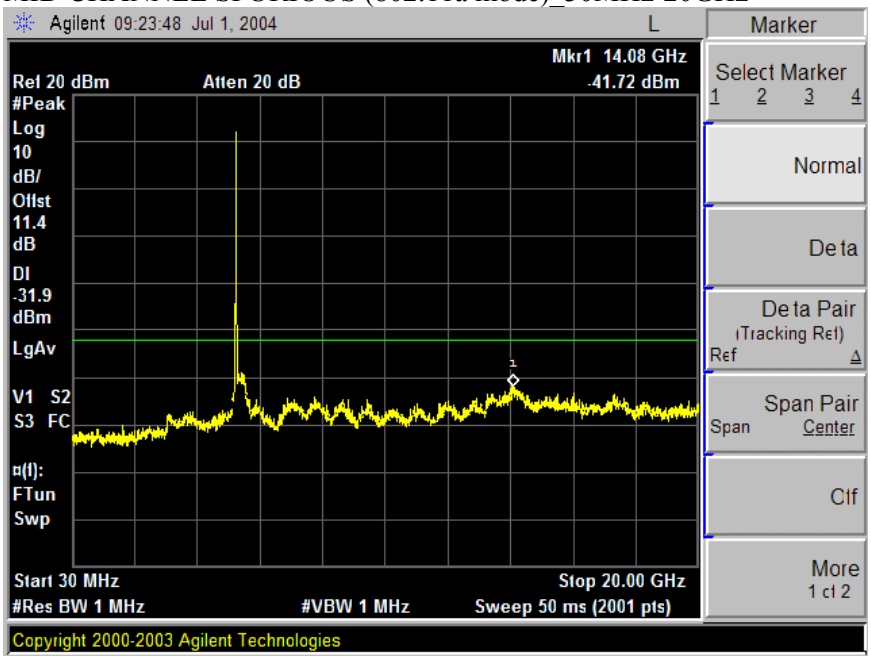
LOW CH SPURIOUS (802.11a mode)_30MHz-20GHz



LOW CHANNEL SPURIOUS (802.11a mode)_20-40GHz

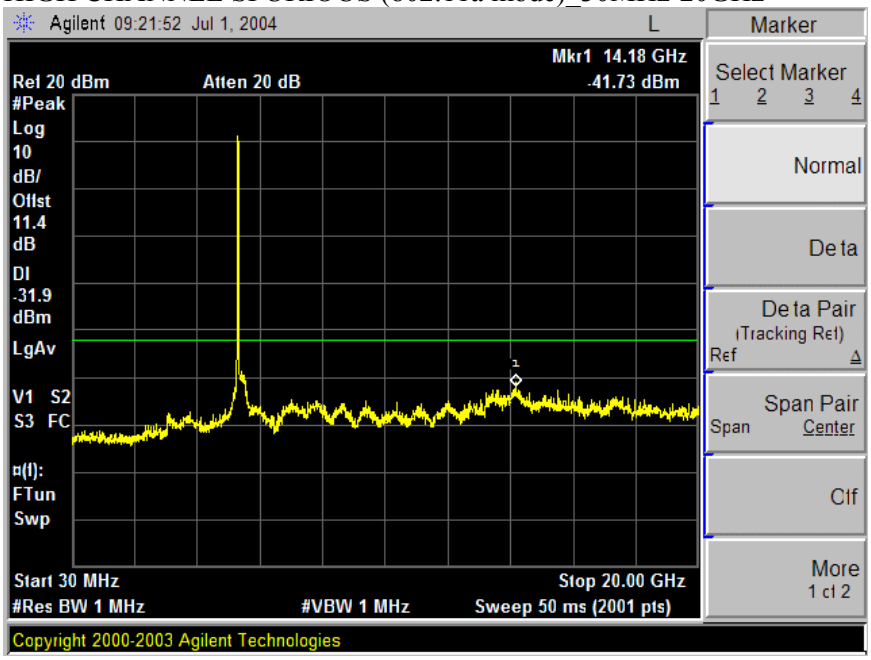


MID CHANNEL SPURIOUS (802.11a mode)_30MHz-20GHz



MID CHANNEL SPURIOUS (802.11a mode)_20-40GHz

HIGH CHANNEL SPURIOUS (802.11a mode)_30MHz-20GHz



HI CHANNEL SPURIOUS (802.11a mode)_20-40GHz

# 7.8. RADIATED EMISSIONS

## 7.8.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

**LIMITS**

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

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

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

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

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 30 - 88 | 100 ** | 3 |
| 88 - 216 | 150 ** | 3 |
| 216 - 960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

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

## TEST PROCEDURE

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

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

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

The spectrum from 30 MHz to 40 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.

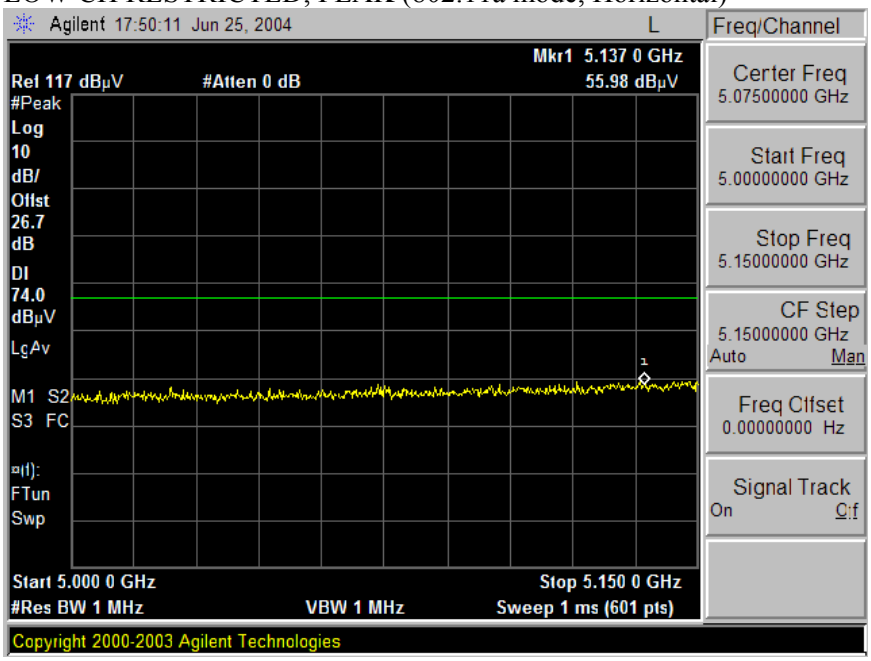
## RESULTS

No non-compliance noted:

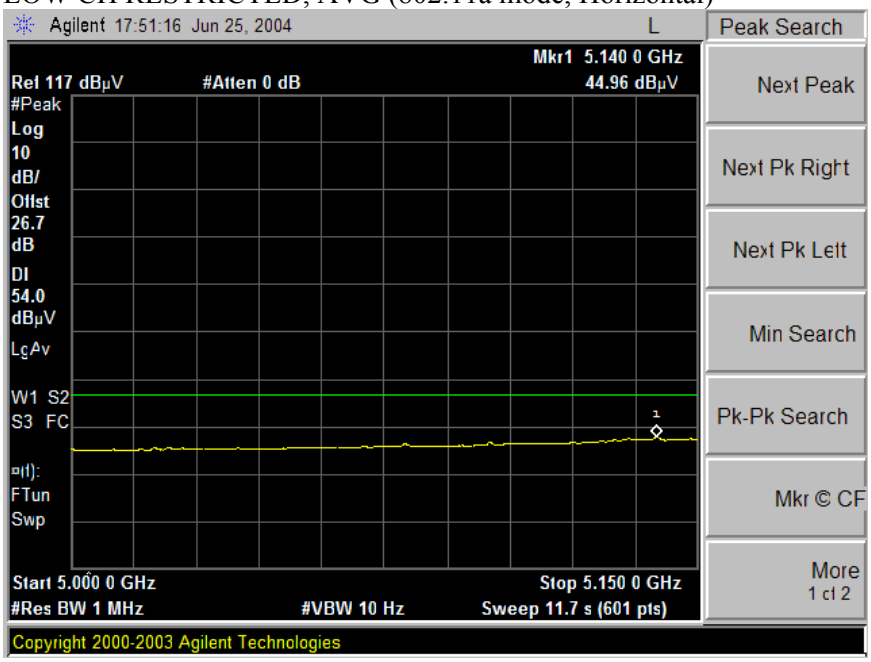
## 7.8.2. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz, PRECISION M60 LAPTOP WITH WISTRON ANTENNA SET

**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)**

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

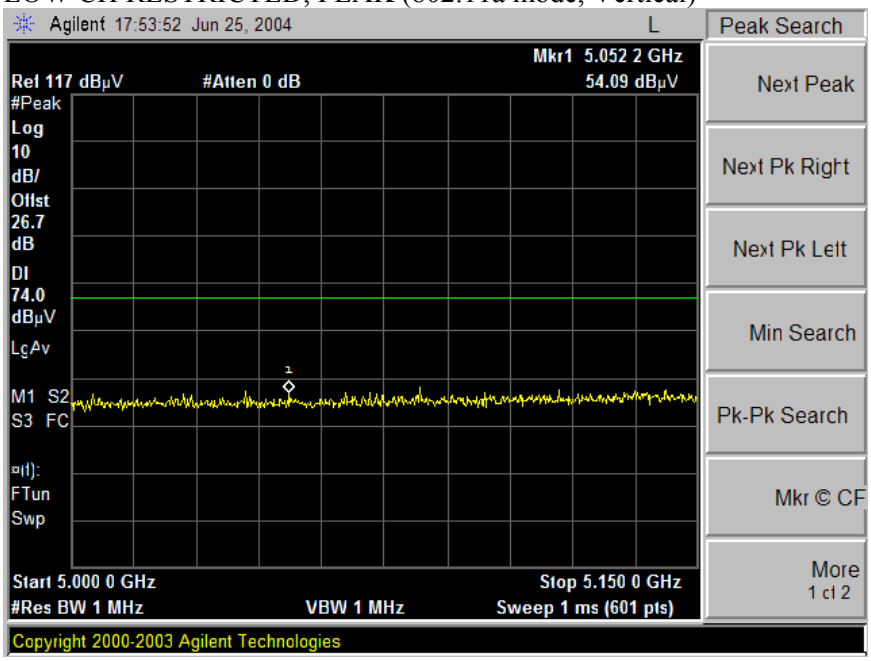


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

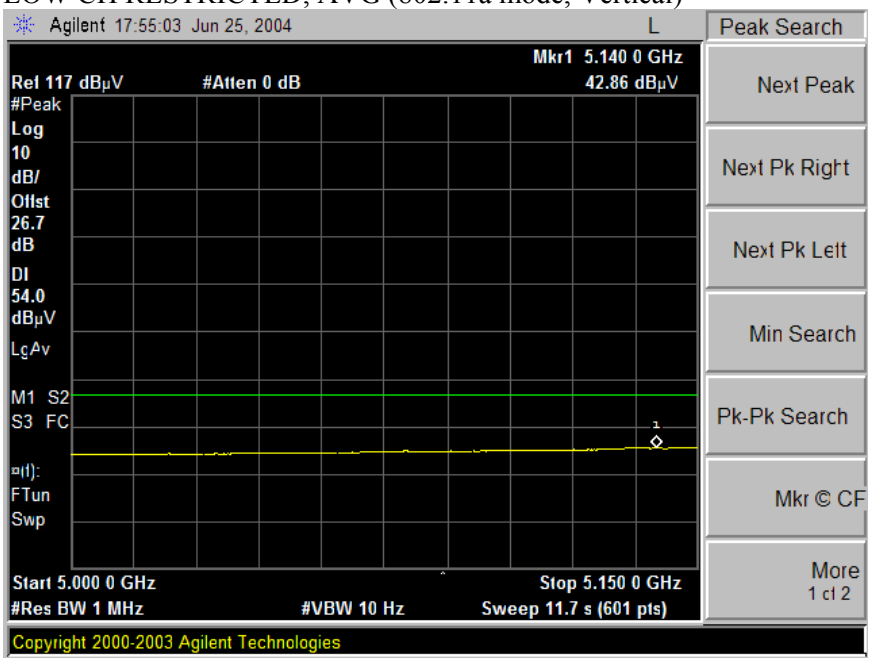


**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)**

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

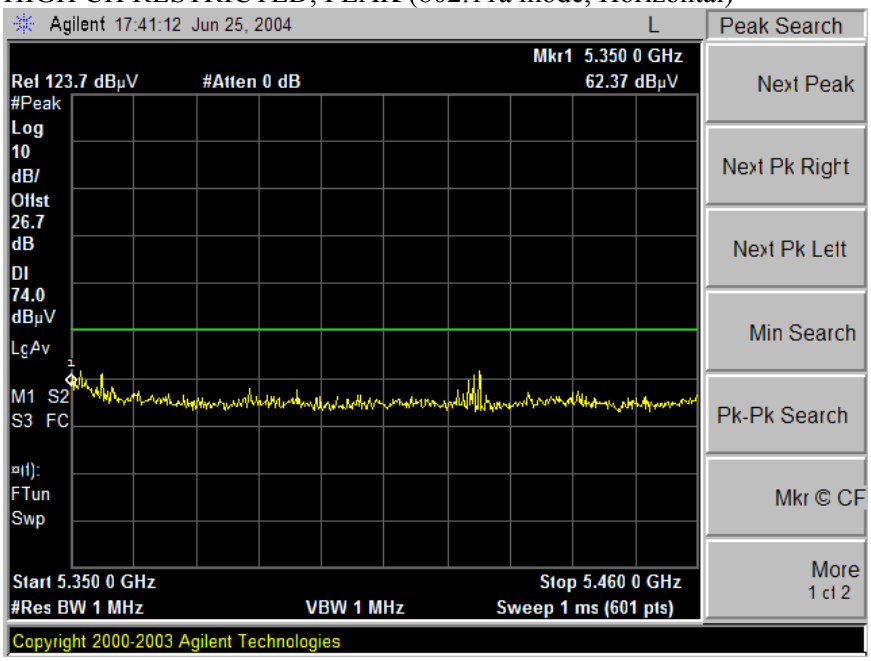


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

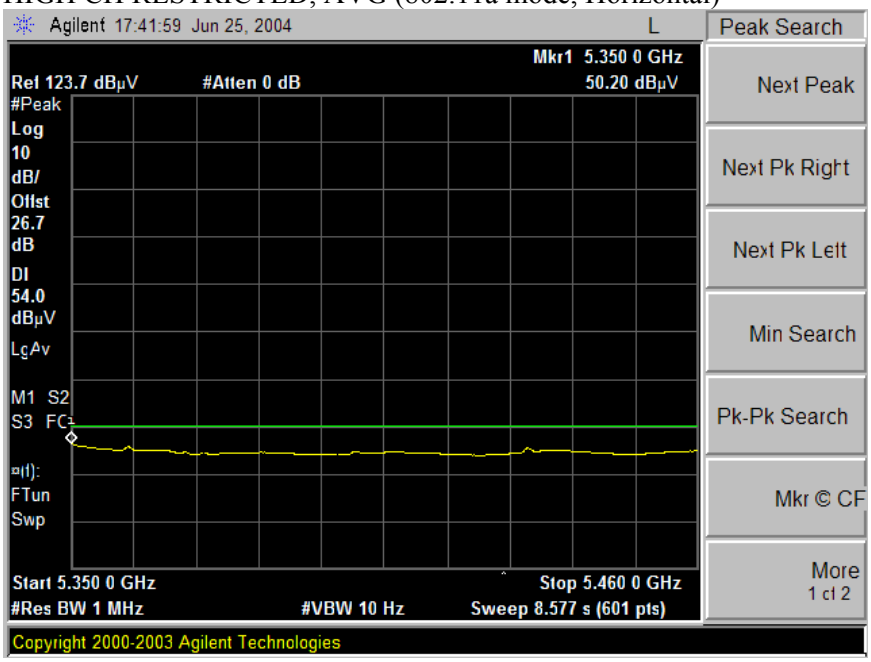


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)**

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

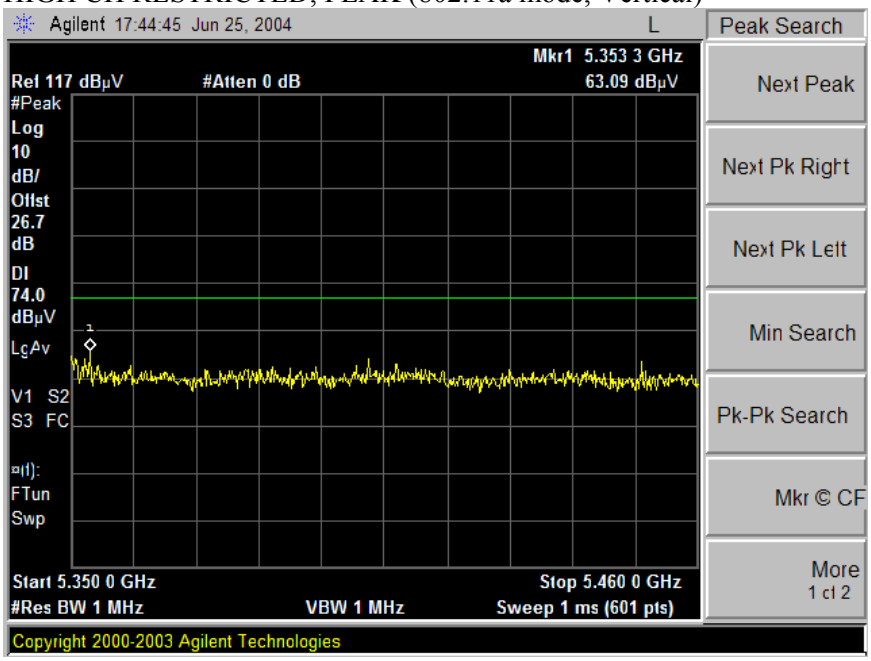


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

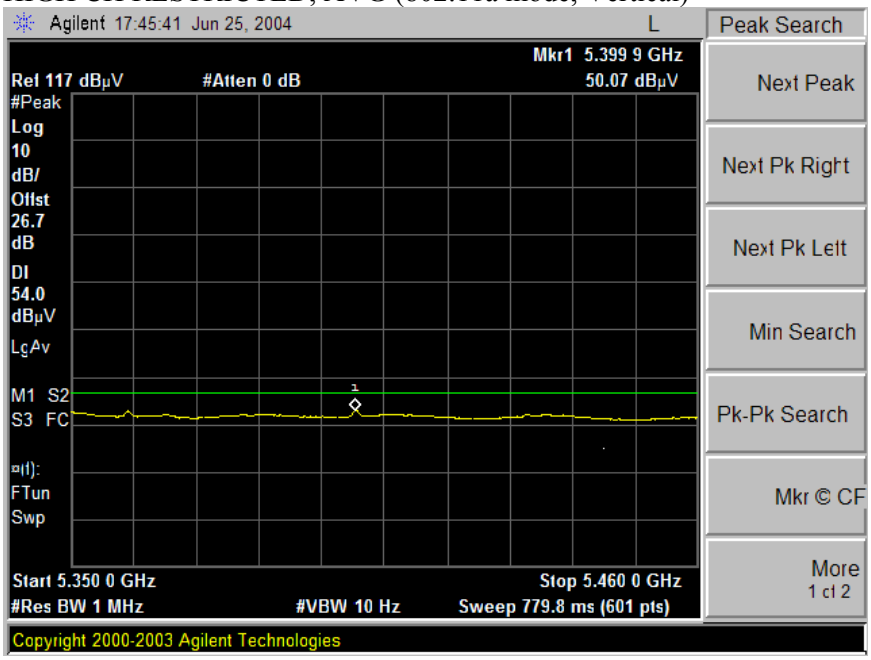


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)**

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



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



## HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

06/25/04 **High Frequency Measurement**
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:** VIEN TRAN
**Project #:** 04U2790
**Company:** INTEL
**EUT Descrip.:** 802.11abg DELL LAPTOP_PRECISION M60_WNC ONBASE
**EUT M/N:** WM3A2195ABG INTEL CARD
**Test Target:** FCC15.407
**Mode Oper:** TX _ 11a 5.18-5.32GHz _ LOW / MID / HI CHANNELS_HARMONIC SPUR

**Test Equipment:**

| EMCO Horn 1-18GHz | Spectrum Analyzer | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz |
|---|---|---|---|---|
| T73; S/N: 6717 @3m | Agilent E4446A Analyzer | T87 Miteq 924342 | | |

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOW CH 5.18GHz | | | | | | | | | | | | | | | |
| 15.540 | 9.8 | 43.0 | 31.0 | 39.2 | 6.4 | -45.5 | 0.0 | 1.0 | 44.0 | 32.0 | 74.0 | 54.0 | -30.0 | -22.0 | V |
| 15.540 | 9.8 | 45.3 | 31.9 | 39.2 | 6.4 | -45.5 | 0.0 | 1.0 | 46.3 | 32.9 | 74.0 | 54.0 | -27.7 | -21.1 | H |
| MID CH 5.26GHz | | | | | | | | | | | | | | | |
| 15.780 | 9.8 | 42.0 | 30.0 | 38.6 | 6.5 | -45.6 | 0.0 | 1.0 | 42.5 | 30.5 | 74.0 | 54.0 | -31.5 | -23.5 | V |
| 15.780 | 9.8 | 43.8 | 31.7 | 38.6 | 6.5 | -45.6 | 0.0 | 1.0 | 44.3 | 32.2 | 74.0 | 54.0 | -29.7 | -21.8 | H |
| HI CH 5.32GHz | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 42.0 | 30.7 | 38.3 | 5.8 | -41.3 | 0.0 | 1.0 | 45.8 | 34.5 | 74.0 | 54.0 | -28.2 | -19.5 | V |
| 15.964 | 9.8 | 44.0 | 32.8 | 38.2 | 6.6 | -45.7 | 0.0 | 1.0 | 44.1 | 32.9 | 74.0 | 54.0 | -29.9 | -21.1 | V |
| 10.642 | 9.8 | 41.6 | 30.3 | 38.3 | 5.8 | -41.3 | 0.0 | 1.0 | 45.4 | 34.1 | 74.0 | 54.0 | -28.6 | -19.9 | H |
| 15.964 | 9.8 | 42.5 | 31.1 | 38.2 | 6.6 | -45.7 | 0.0 | 1.0 | 42.6 | 31.2 | 74.0 | 54.0 | -31.4 | -22.8 | H |

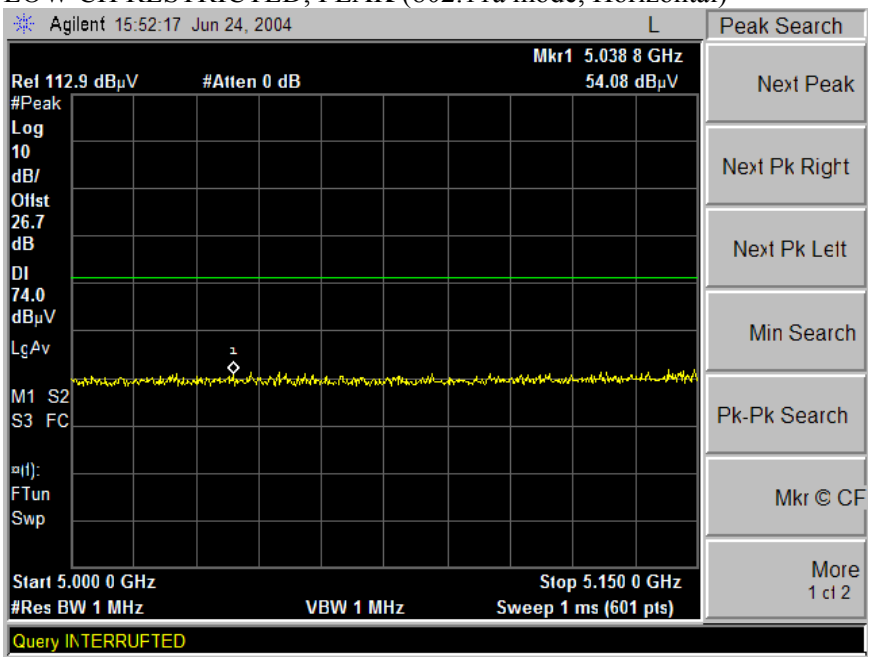
NO OTHER RADIATED EMISSION WERE DETECTED UP TO 10TH HARMONIC

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

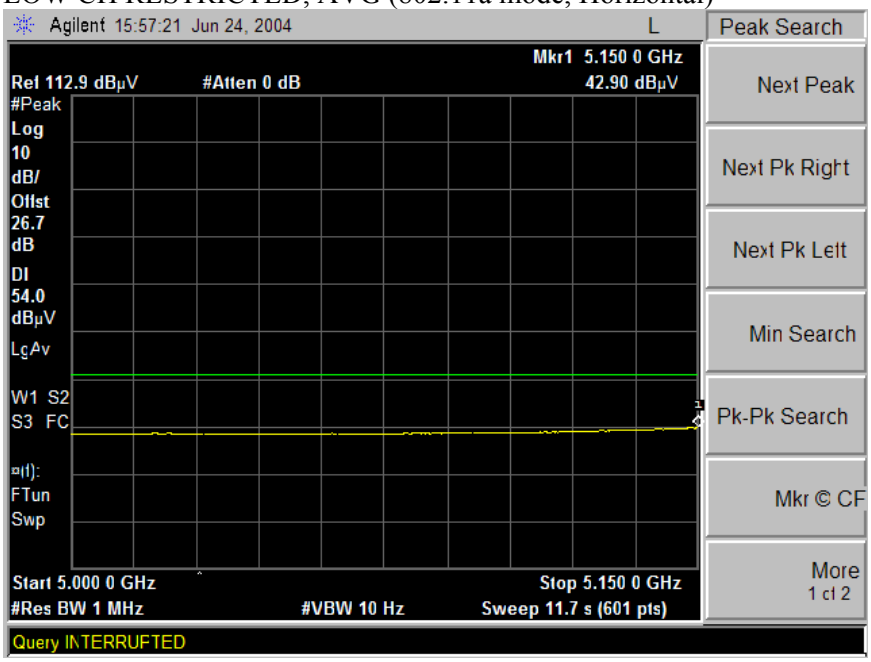
## 7.8.3. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz, PRECISION M60 LAPTOP WITH HITACHI ANTENNA SET

**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)**

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

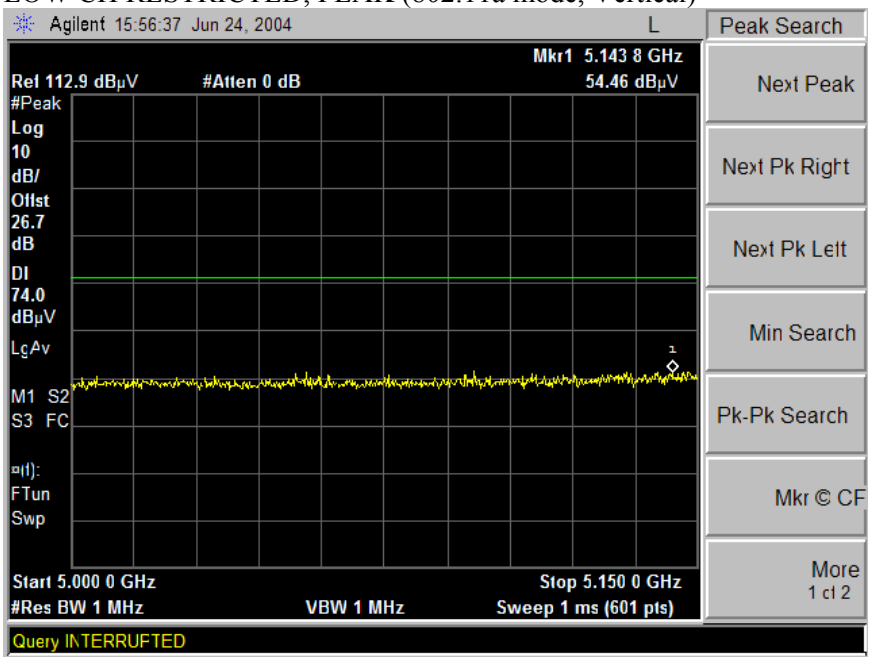


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

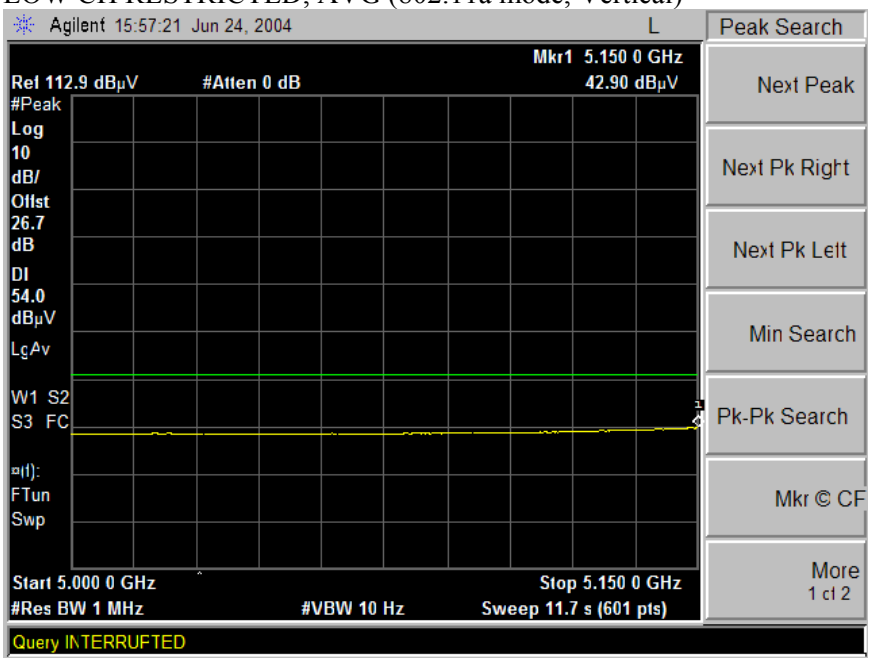


**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)**

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

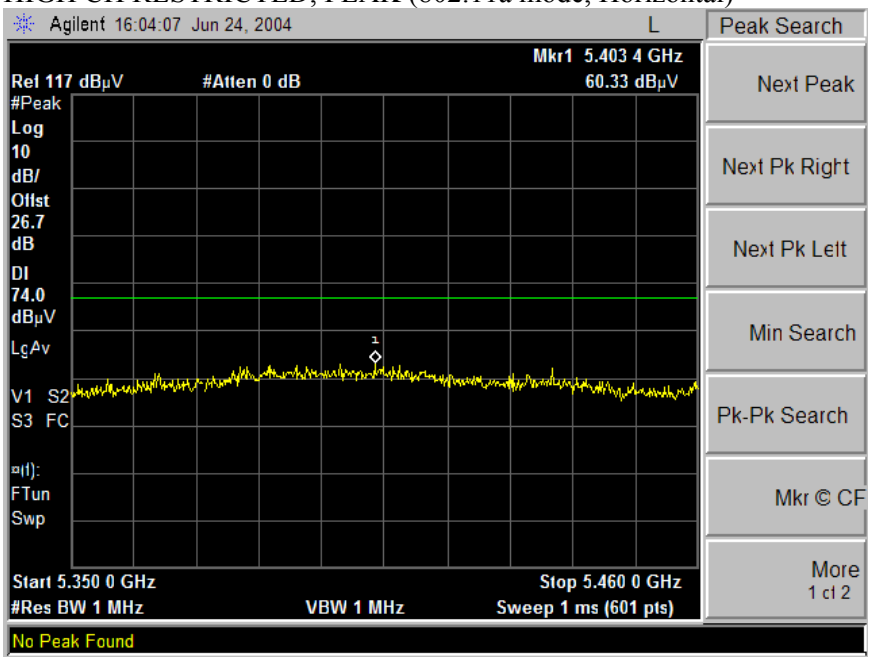


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

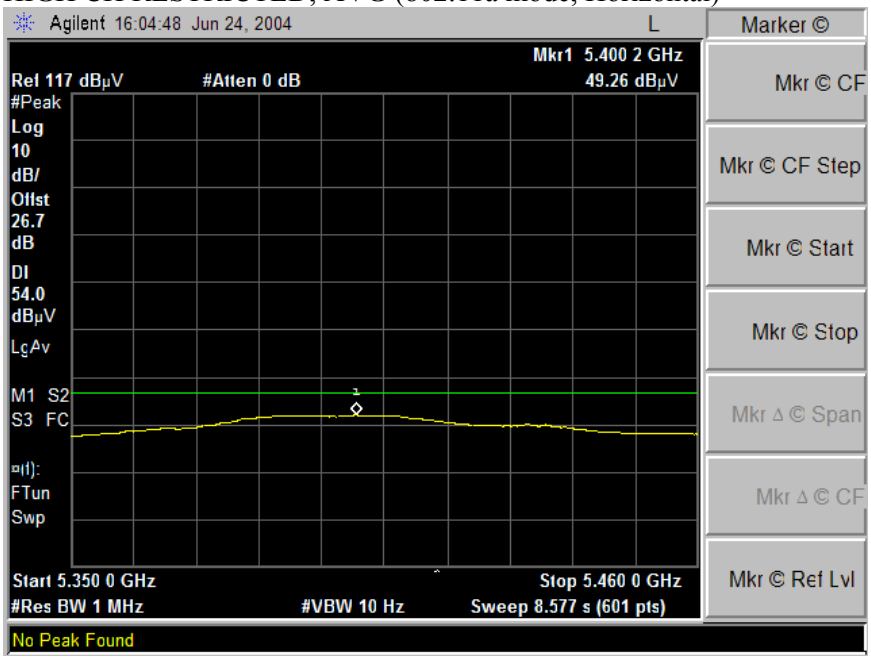


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)**

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

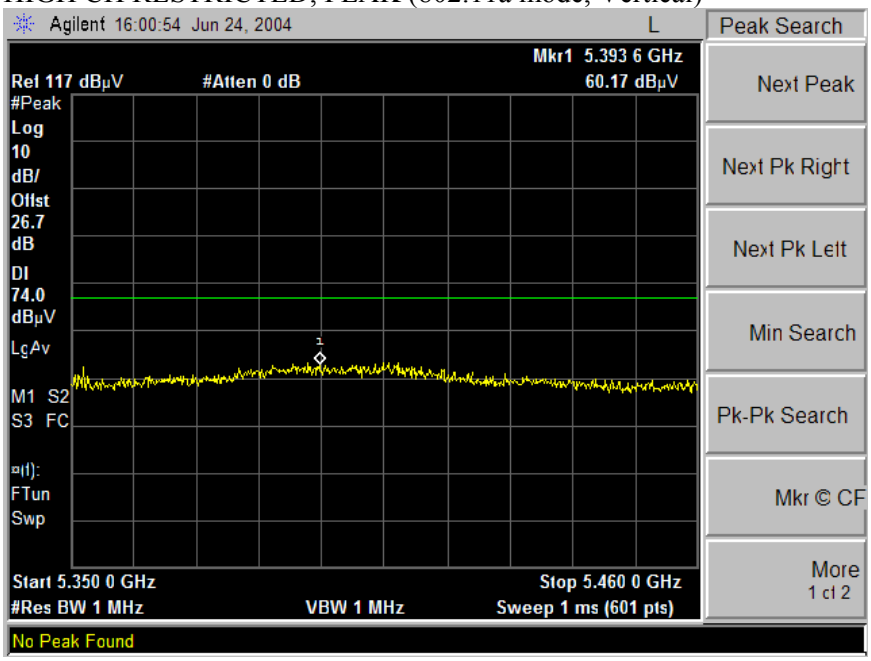


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

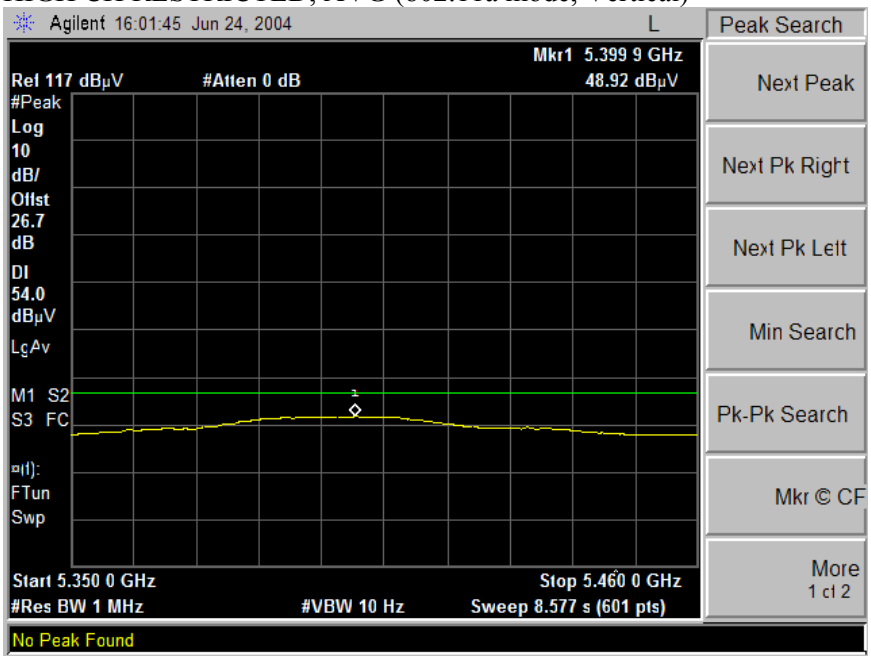


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)**

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



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



## HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

06/24/04 High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: VIEN TRAN
Project #: 04U2790
Company: INTEL
EUT Descrip.: 802.11abg DELL LAPTOP_M60 (HITACHI ON BASE)
EUT M/N: WM3A2195ABG INTEL CARD
Test Target: FCC15.407
Mode Oper: TX _ 11a 5.18-5.32GHz _ LOW / MID / HI CHANNELS_HARMONIC SPUR

Test Equipment:

| EMCO Horn 1-18GHz | Spectrum Analyzer | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz |
|---|---|---|---|---|
| T73; S/N: 6717 @3m | Agilent E4446A Analyzer | T87 Miteq 924342 | | |

Hi Frequency Cables: [x] (2 ft) [ ] (2 ~ 3 ft) [ ] (4 ~ 6 ft) [x] (12 ft)

Limit: FCC 15.205

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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOW CH 5.18GHz | | | | | | | | | | | | | | | |
| 15.540 | 9.8 | 46.6 | 34.5 | 39.2 | 6.4 | -45.5 | 0.0 | 1.0 | 47.6 | 35.5 | 74.0 | 54.0 | -26.4 | -18.5 | V |
| 15.540 | 9.8 | 45.0 | 33.1 | 39.2 | 6.4 | -45.5 | 0.0 | 1.0 | 46.0 | 34.1 | 74.0 | 54.0 | -28.0 | -19.9 | H |
| | | | | | | | | | | | | | | | |
| MID CH 5.26GHz | | | | | | | | | | | | | | | |
| 15.780 | 9.8 | 46.2 | 34.3 | 38.6 | 6.5 | -45.6 | 0.0 | 1.0 | 46.7 | 34.8 | 74.0 | 54.0 | -27.3 | -19.2 | V |
| 15.780 | 9.8 | 45.0 | 33.3 | 38.6 | 6.5 | -45.6 | 0.0 | 1.0 | 45.5 | 33.8 | 74.0 | 54.0 | -28.5 | -20.2 | H |
| | | | | | | | | | | | | | | | |
| HI CH 5.32GHz | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 46.0 | 34.2 | 38.3 | 5.8 | -41.3 | 0.0 | 1.0 | 49.8 | 38.0 | 74.0 | 54.0 | -24.2 | -16.0 | V |
| 15.964 | 9.8 | 44.6 | 32.5 | 38.2 | 6.6 | -45.7 | 0.0 | 1.0 | 44.7 | 32.6 | 74.0 | 54.0 | -29.3 | -21.4 | V |
| | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 44.3 | 32.0 | 38.3 | 5.8 | -41.3 | 0.0 | 1.0 | 48.1 | 35.8 | 74.0 | 54.0 | -25.9 | -18.2 | H |
| 15.964 | 9.8 | 45.3 | 34.5 | 38.2 | 6.6 | -45.7 | 0.0 | 1.0 | 45.4 | 34.6 | 74.0 | 54.0 | -28.6 | -19.4 | H |

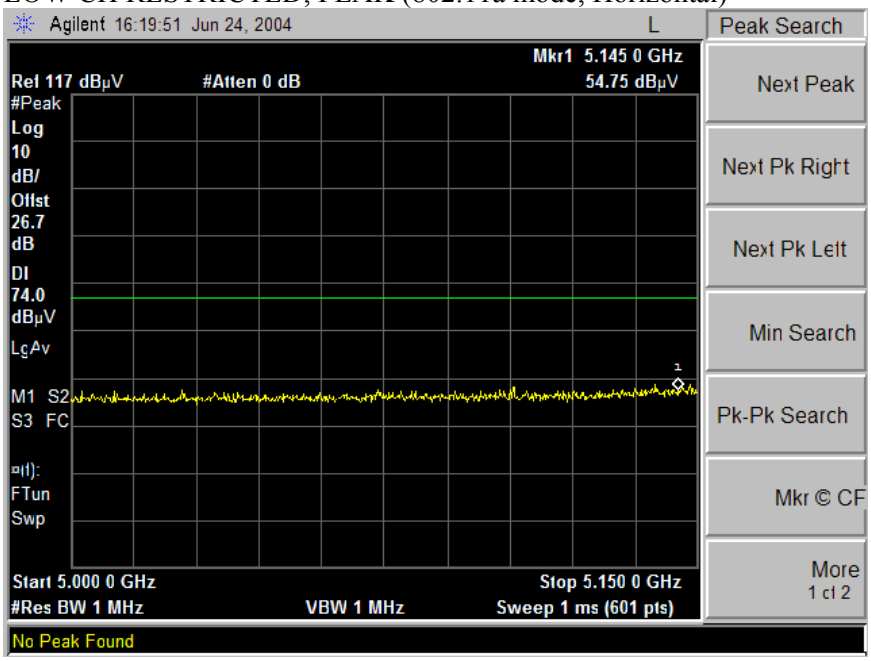
NO OTHER RADIATED EMISSION WERE DETECTED UP TO 10TH HARMONIC

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

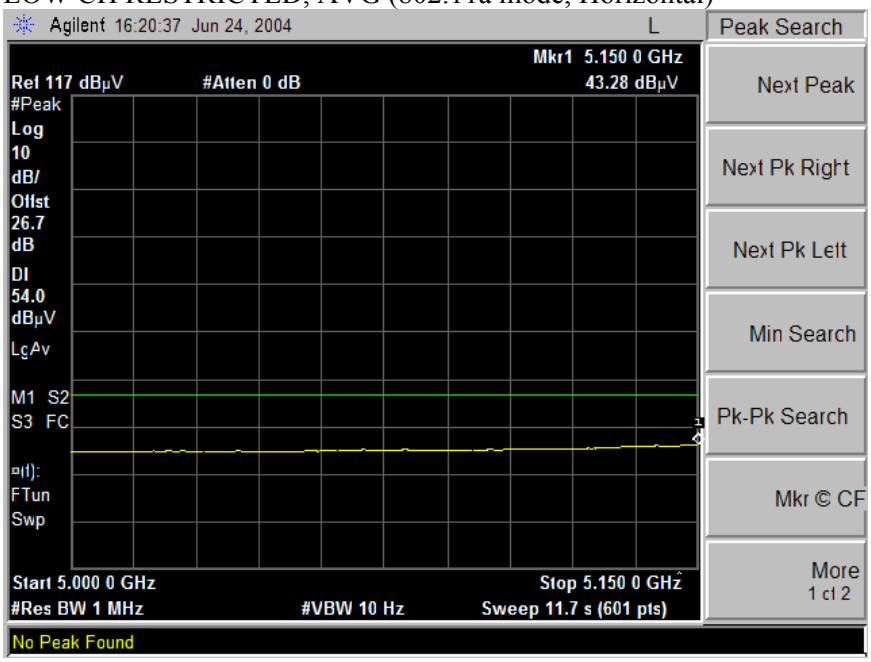
## 7.8.4. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz, INSPIRON 510M LAPTOP WITH PHYCOMP ANTENNA SET

**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)**

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

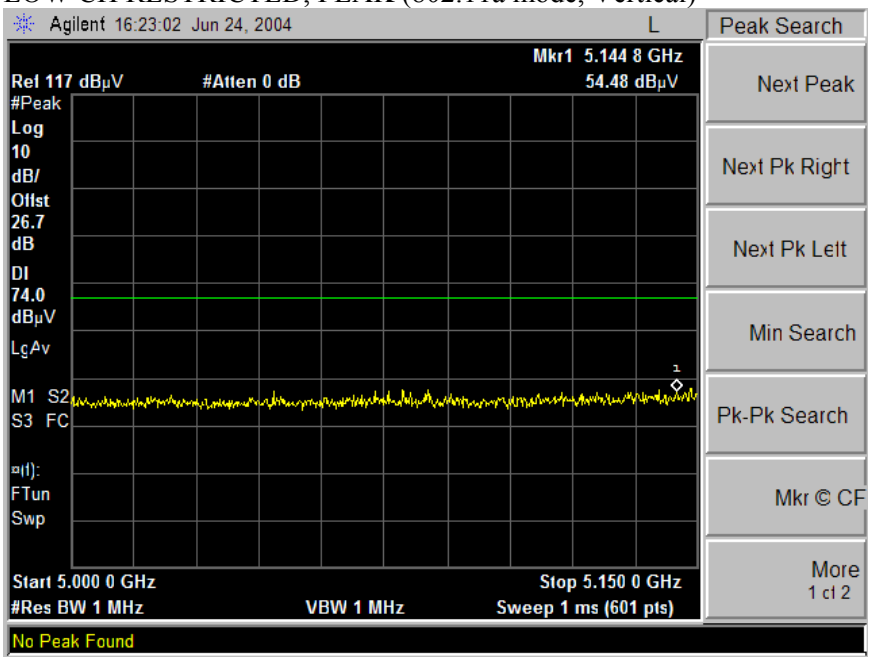


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

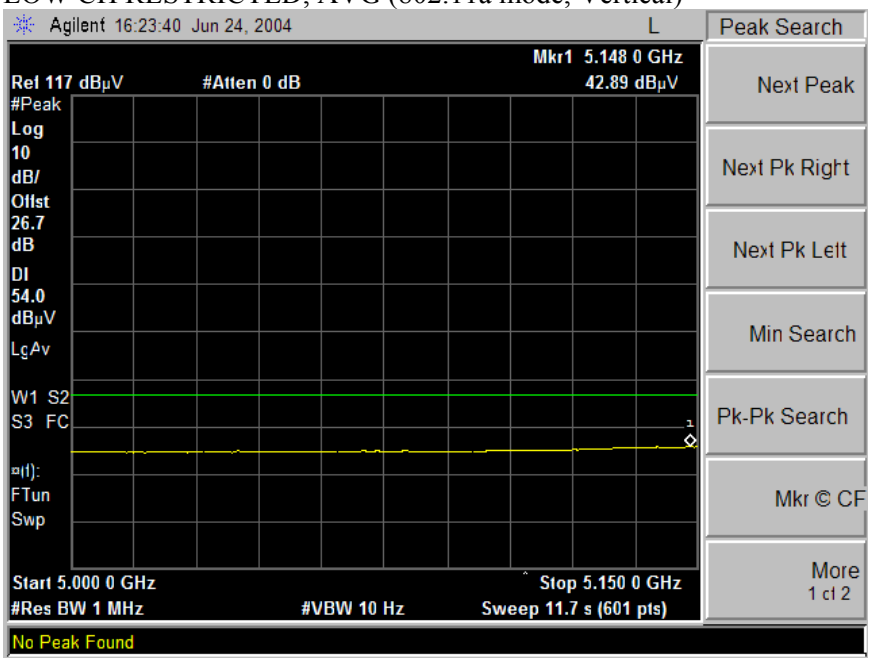


**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)**

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

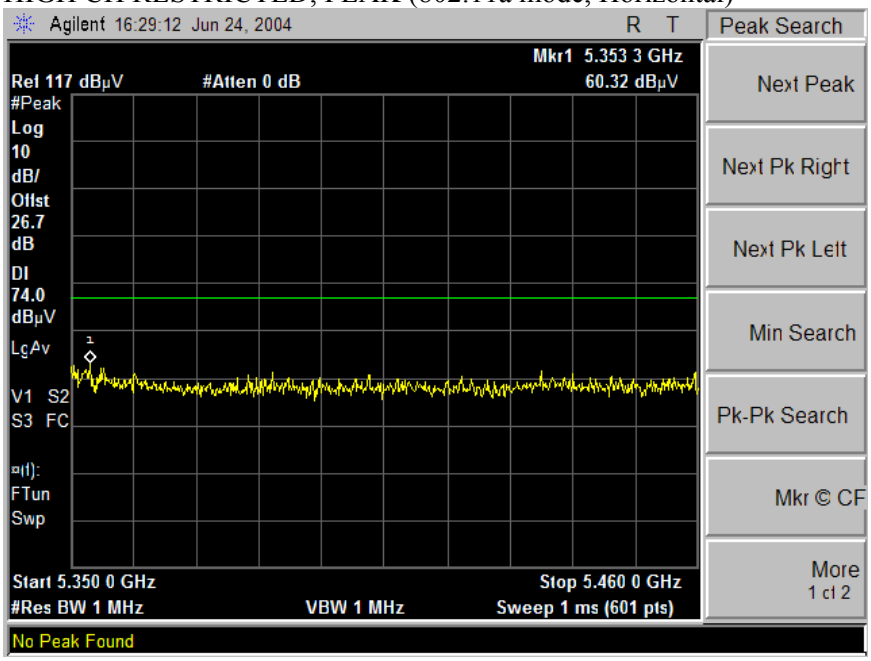


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

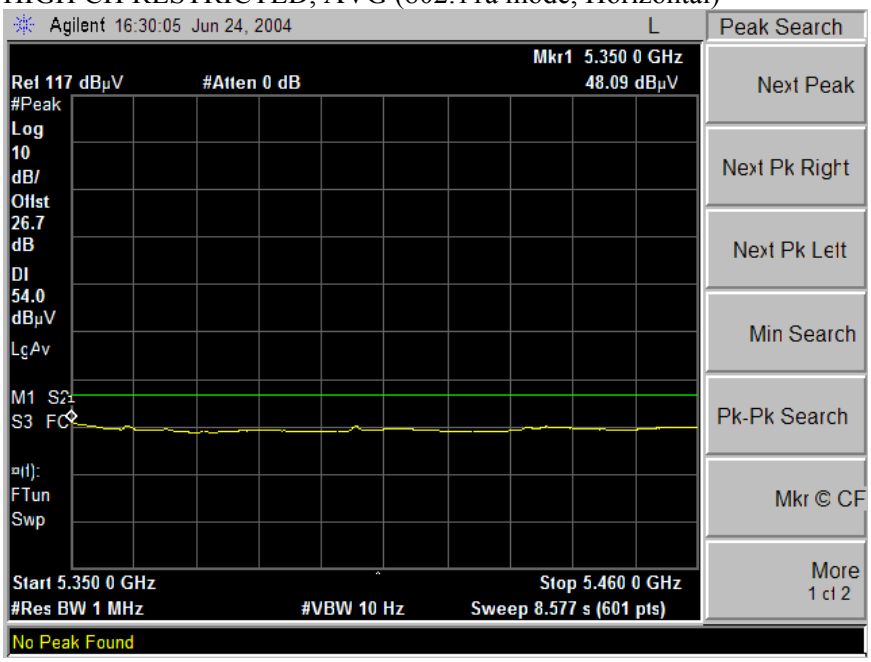


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)**

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

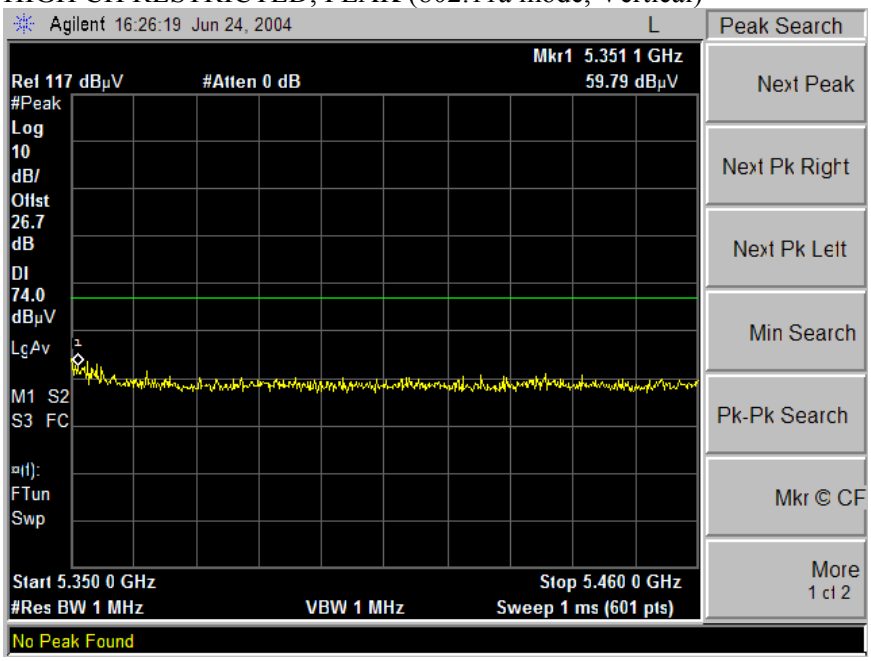


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

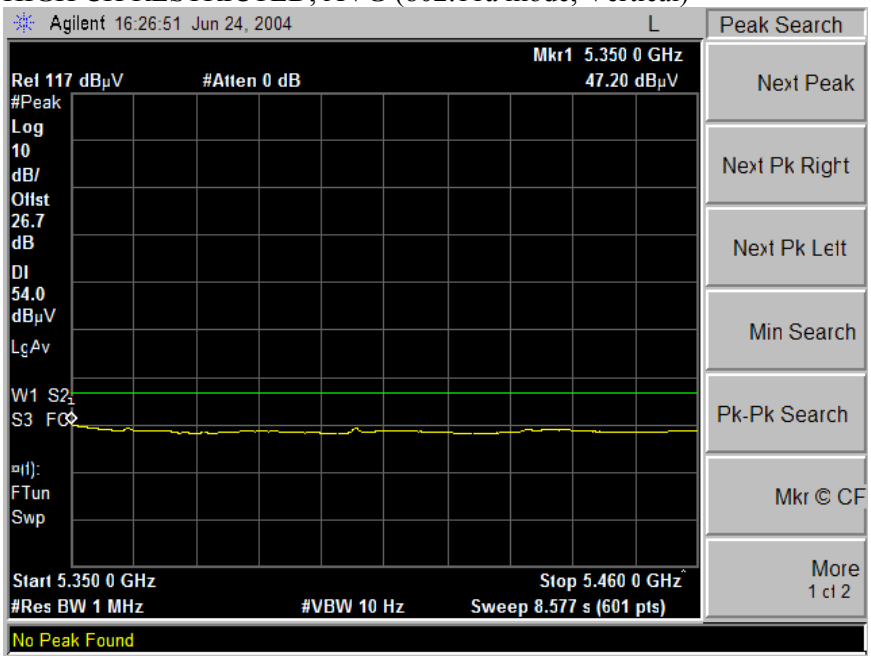


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)**

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



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



## HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

06/24/04 **High Frequency Measurement**
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr:** VIEN TRAN
**Project #:** 04U2790
**Company:** INTEL
**EUT Descrip.:** 802.11abg DELL LAPTOP_INSPIRON 510M (PHY ON LCD)
**EUT M/N:** WM3A2195ABG INTEL CARD
**Test Target:** FCC15.407
**Mode Oper:** TX _ 11a 5.18-5.32GHz _ LOW / MID / HI CHANNELS_HARMONIC SPUR

**Test Equipment:**

| EMCO Horn 1-18GHz | Spectrum Analyzer | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz |
|---|---|---|---|---|
| T73; S/N: 6717 @3m | Agilent E4446A Analyzer | T87 Miteq 924342 | | |

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOW CH 5.18GHz | | | | | | | | | | | | | | | |
| 15.540 | 9.8 | 43.2 | 32.0 | 39.2 | 6.4 | -45.5 | 0.0 | 1.0 | 44.2 | 33.0 | 74.0 | 54.0 | -29.8 | -21.0 | V |
| 15.540 | 9.8 | 44.7 | 33.5 | 39.2 | 6.4 | -45.5 | 0.0 | 1.0 | 45.7 | 34.5 | 74.0 | 54.0 | -28.3 | -19.5 | H |
| | | | | | | | | | | | | | | | |
| MID CH 5.26GHz | | | | | | | | | | | | | | | |
| 15.780 | 9.8 | 46.4 | 34.8 | 38.6 | 6.5 | -45.6 | 0.0 | 1.0 | 46.9 | 35.3 | 74.0 | 54.0 | -27.1 | -18.7 | V |
| 15.780 | 9.8 | 47.8 | 36.1 | 38.6 | 6.5 | -45.6 | 0.0 | 1.0 | 48.3 | 36.6 | 74.0 | 54.0 | -25.7 | -17.4 | H |
| | | | | | | | | | | | | | | | |
| HI CH 5.32GHz | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 45.6 | 34.0 | 38.3 | 5.8 | -41.3 | 0.0 | 1.0 | 49.4 | 37.8 | 74.0 | 54.0 | -24.6 | -16.2 | V |
| 15.964 | 9.8 | 44.2 | 33.1 | 38.2 | 6.6 | -45.7 | 0.0 | 1.0 | 44.3 | 33.2 | 74.0 | 54.0 | -29.7 | -20.8 | V |
| | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 46.8 | 35.2 | 38.3 | 5.8 | -41.3 | 0.0 | 1.0 | 50.6 | 39.0 | 74.0 | 54.0 | -23.4 | -15.0 | H |
| 15.964 | 9.8 | 45.4 | 34.3 | 38.2 | 6.6 | -45.7 | 0.0 | 1.0 | 45.5 | 34.4 | 74.0 | 54.0 | -28.5 | -19.6 | H |

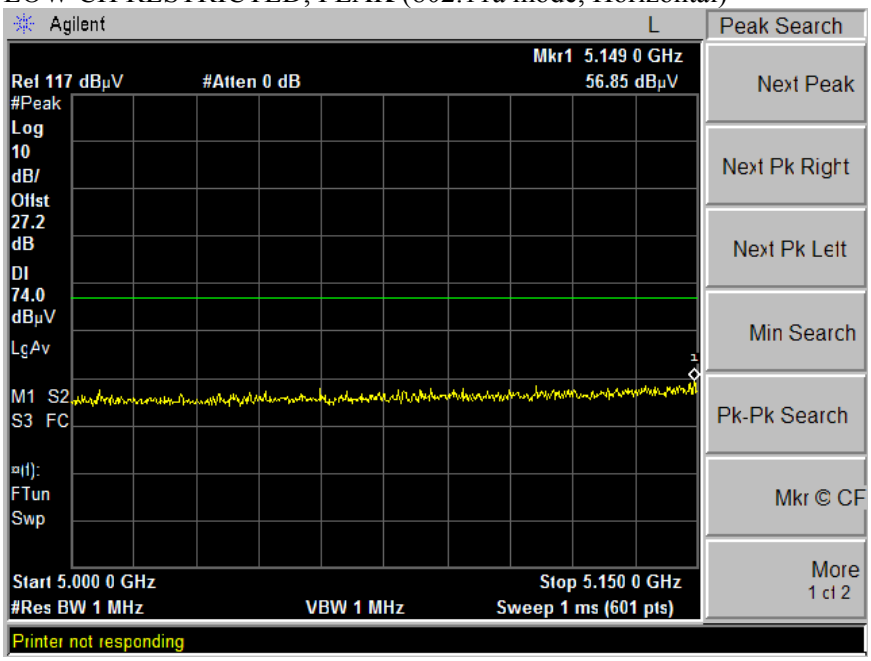
NO OTHER RADIATED EMISSION WERE DETECTED UP TO 10TH HARMONIC

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

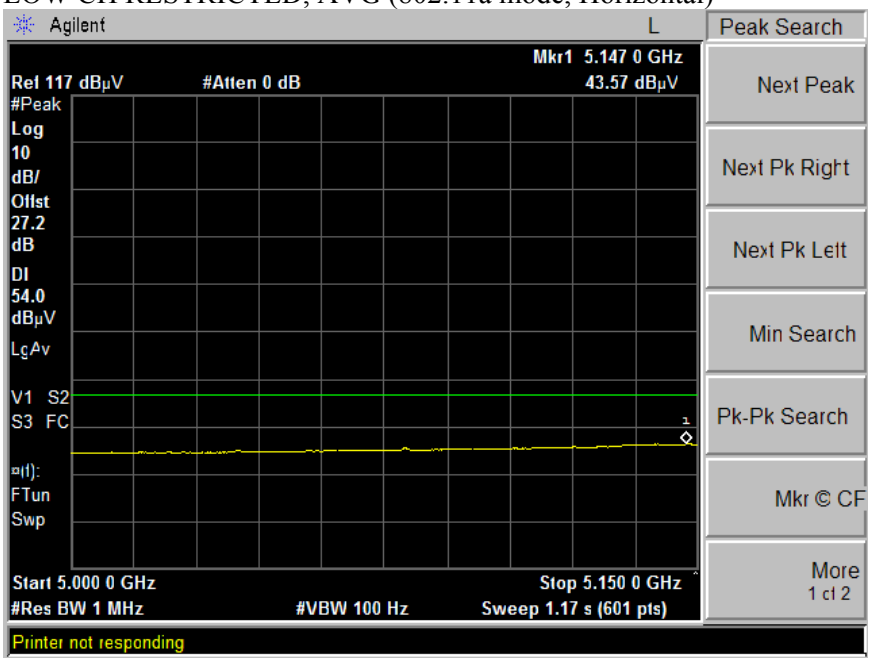
## 7.8.5. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz, INSPIRON 300M LAPTOP WITH WISTRON ANTENNA SET

**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)**

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

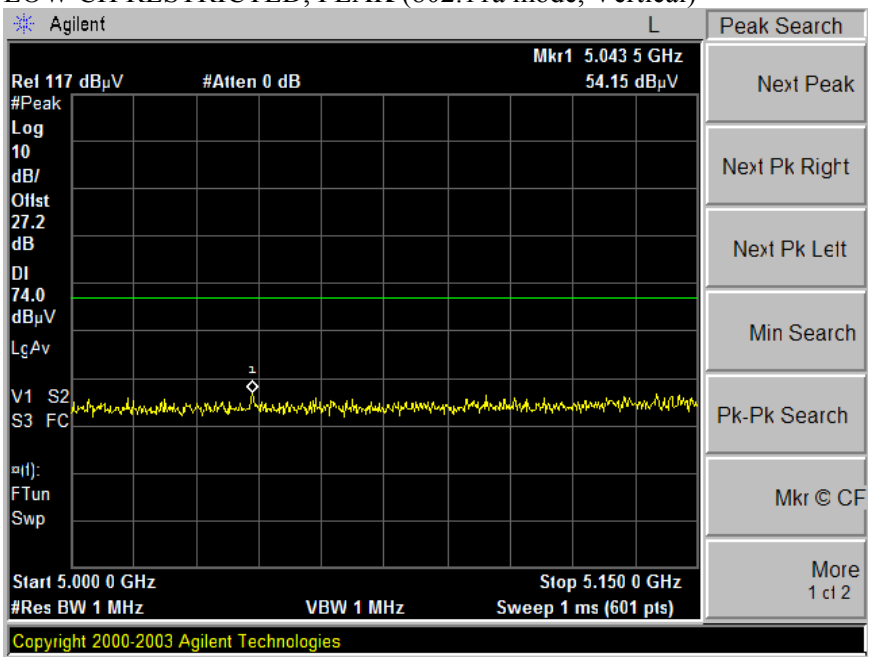


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

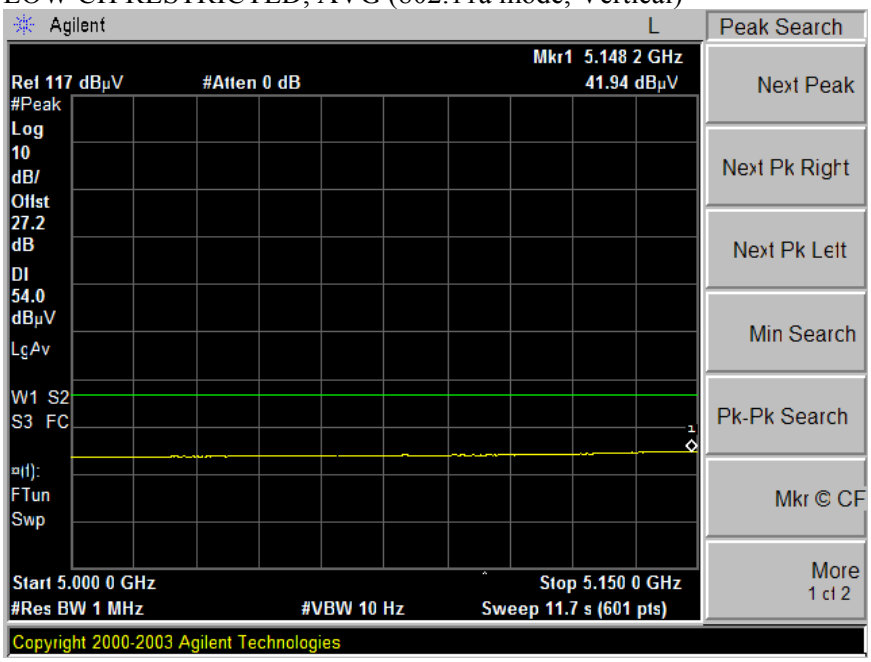


**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)**

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

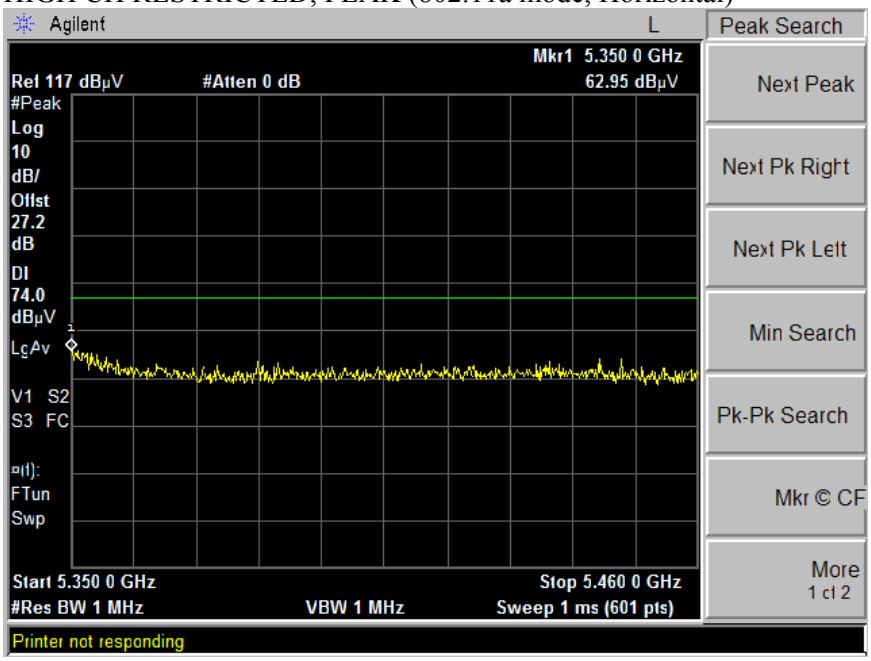


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

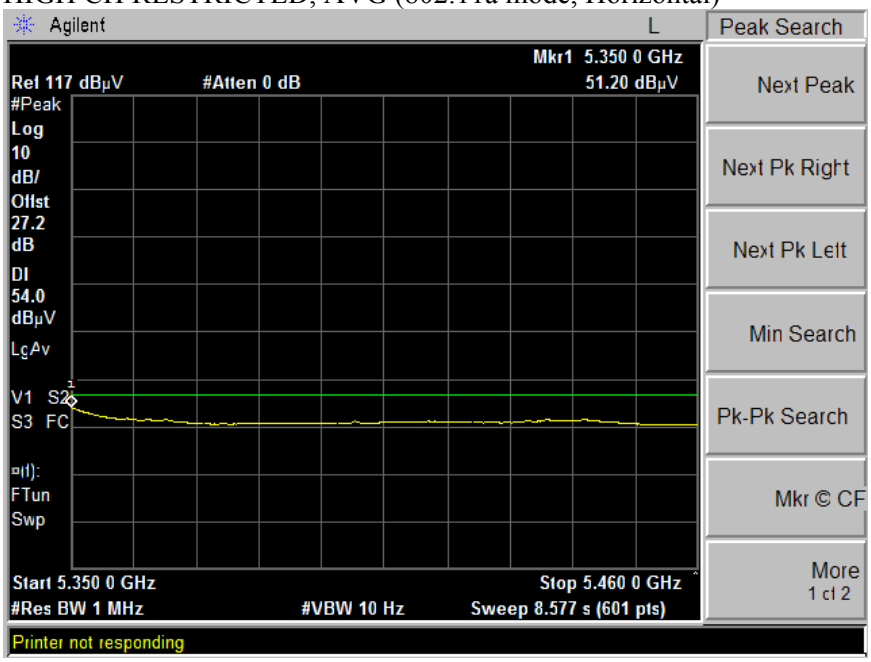


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)**

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

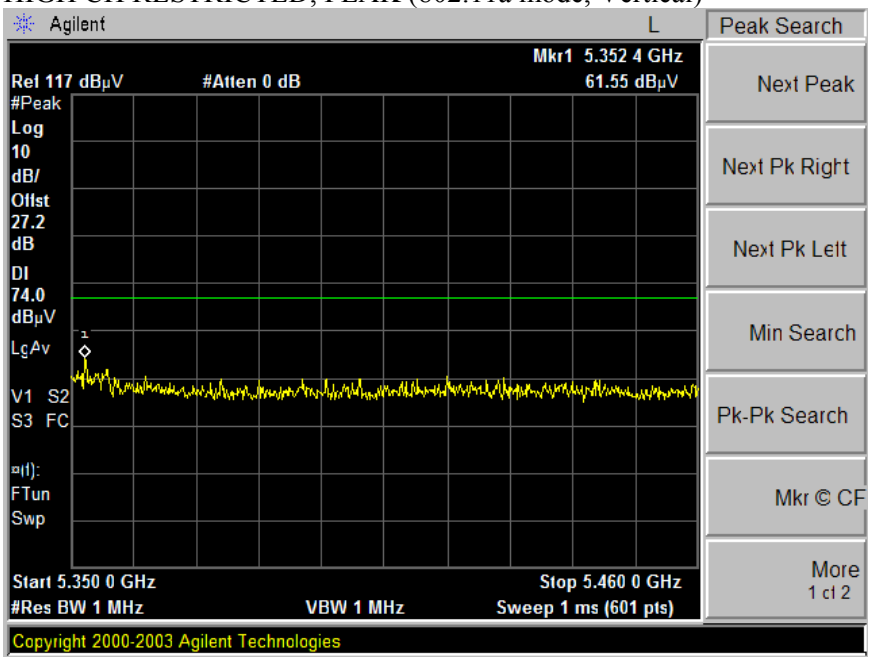


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

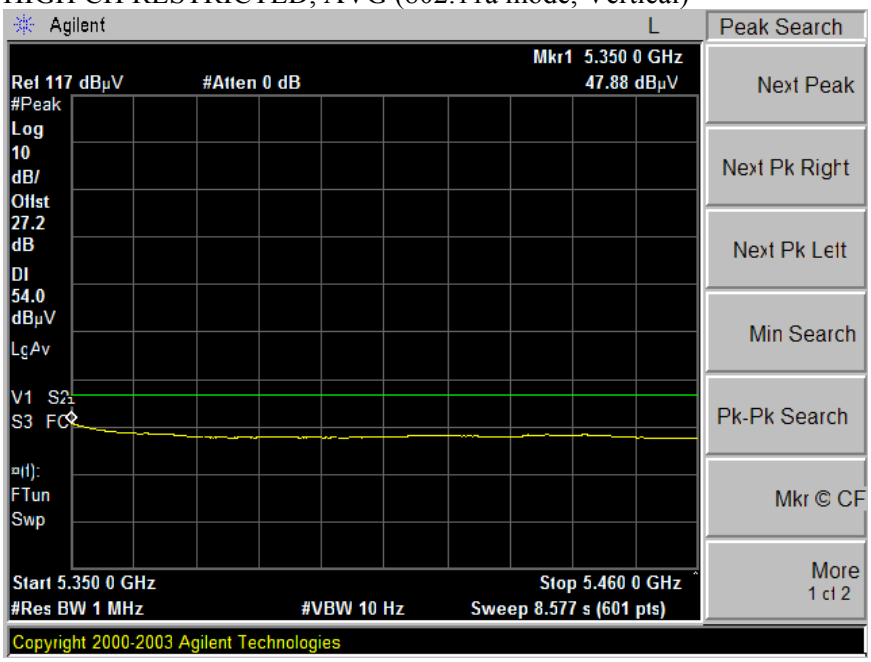


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)**

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



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



## HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

07/06/04 **High Frequency Measurement**
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr: VIEN TRAN**
**Project #: 04U2790**
**Company: INTEL**
**EUT Descrip.: 802.11abg DELL LAPTOP_INSPIRON 300M_WNC ANTENNA AT BASE_LAPTOP UNDOCK (worstcase)**
**EUT M/N: WM3A2195ABG INTEL CARD**
**Test Target: FCC15.407**
**Mode Oper: TX _ 11a 5.2GHZ _ LOW / MID / HI CHANNELS_HARMONIC SPUR**

**Test Equipment:**

| EMCO Horn 1-18GHz | Spectrum Analyzer | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | Agilent E4446A Analyzer | T87 Miteq 924342 | | |

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOW CH 5.18GHz | | | | | | | | | | | | | | | |
| 15.540 | 9.8 | 45.0 | 32.7 | 39.4 | 6.4 | -45.5 | 0.0 | 1.0 | 46.2 | 33.9 | 74.0 | 54.0 | -27.8 | -20.1 | V |
| 15.540 | 9.8 | 44.0 | 32.0 | 39.4 | 6.4 | -45.5 | 0.0 | 1.0 | 45.2 | 33.2 | 74.0 | 54.0 | -28.8 | -20.8 | H |
| MID CH 5.26GHz | | | | | | | | | | | | | | | |
| 15.780 | 9.8 | 45.8 | 33.8 | 38.7 | 6.5 | -45.6 | 0.0 | 1.0 | 46.4 | 34.4 | 74.0 | 54.0 | -27.6 | -19.6 | V |
| 15.780 | 9.8 | 44.0 | 32.2 | 38.7 | 6.5 | -45.6 | 0.0 | 1.0 | 44.6 | 32.8 | 74.0 | 54.0 | -29.4 | -21.2 | H |
| HI CH 5.32GHz | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 42.0 | 30.0 | 38.2 | 5.8 | -41.3 | 0.0 | 1.0 | 45.7 | 33.7 | 74.0 | 54.0 | -28.3 | -20.3 | V |
| 15.964 | 9.8 | 43.5 | 32.5 | 38.3 | 6.6 | -45.7 | 0.0 | 1.0 | 43.6 | 32.6 | 74.0 | 54.0 | -30.4 | -21.4 | V |
| 10.642 | 9.8 | 41.5 | 29.6 | 38.2 | 5.8 | -41.3 | 0.0 | 1.0 | 45.2 | 33.3 | 74.0 | 54.0 | -28.8 | -20.7 | H |
| 15.964 | 9.8 | 43.8 | 32.5 | 38.3 | 6.6 | -45.7 | 0.0 | 1.0 | 43.9 | 32.6 | 74.0 | 54.0 | -30.1 | -21.4 | H |

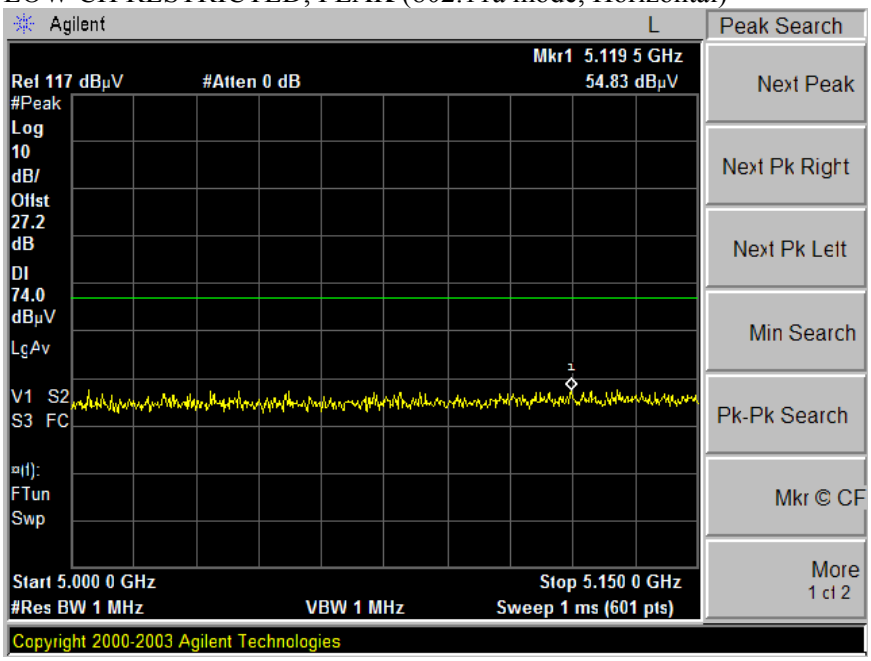
**NO OTHER RADIATED EMISSION WERE DETECTED UP TO 10TH HARMONIC**

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

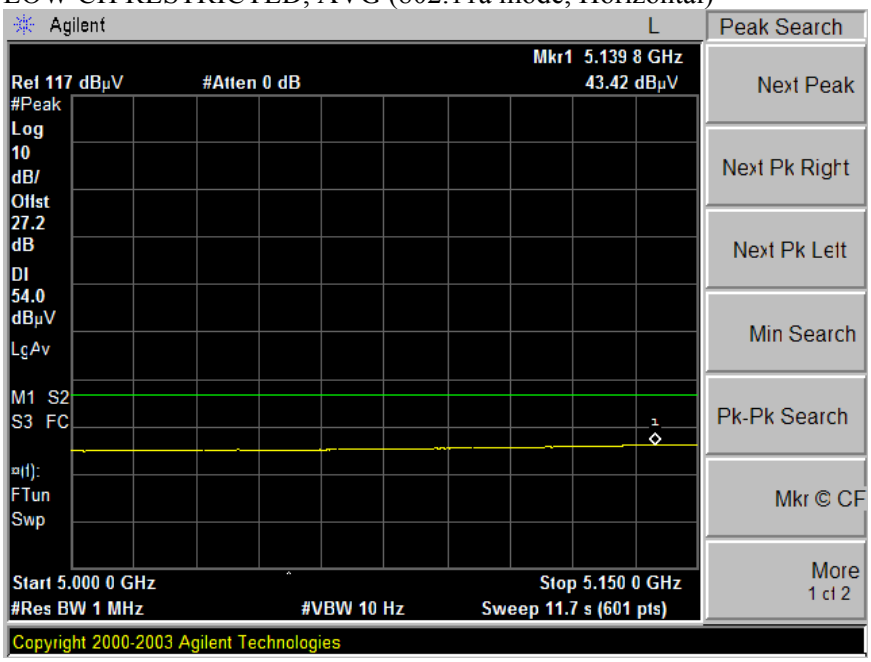
## 7.8.6. TRANSMITTER RADIATED EMISSIONS ABOVE 1 GHz, INSPIRON 300M LAPTOP WITH HITACHI ANTENNA SET

**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)**

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

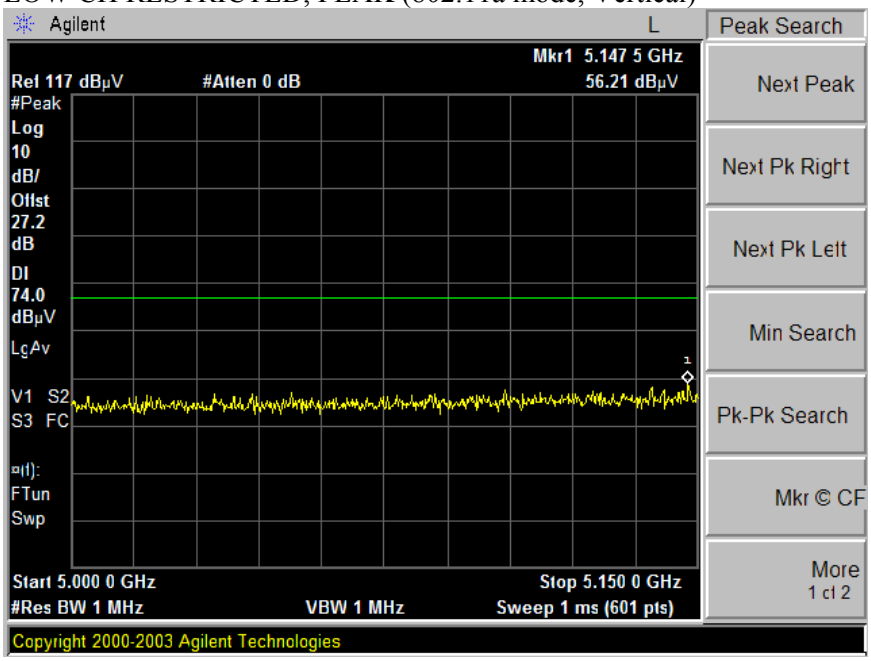


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

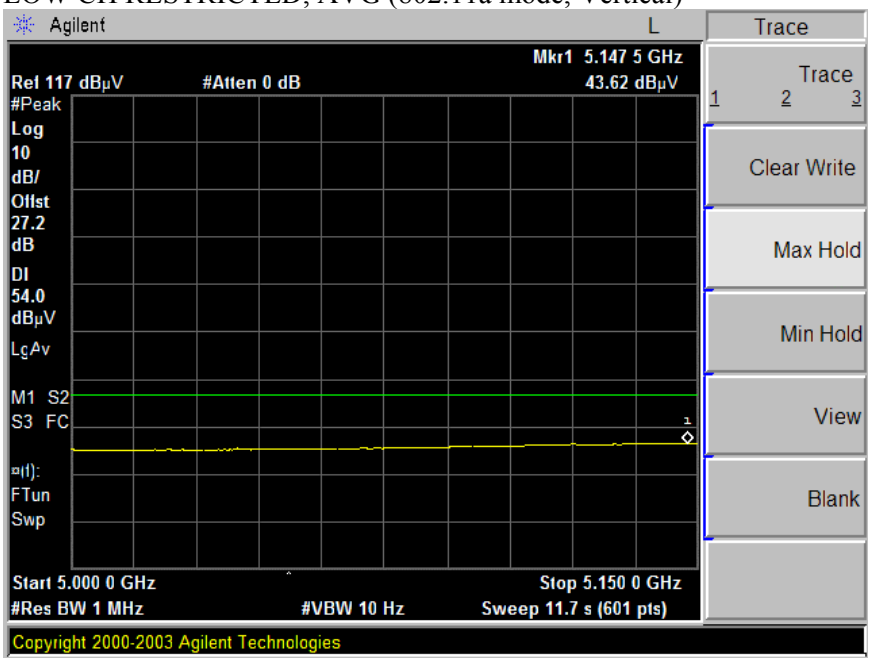


**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)**

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

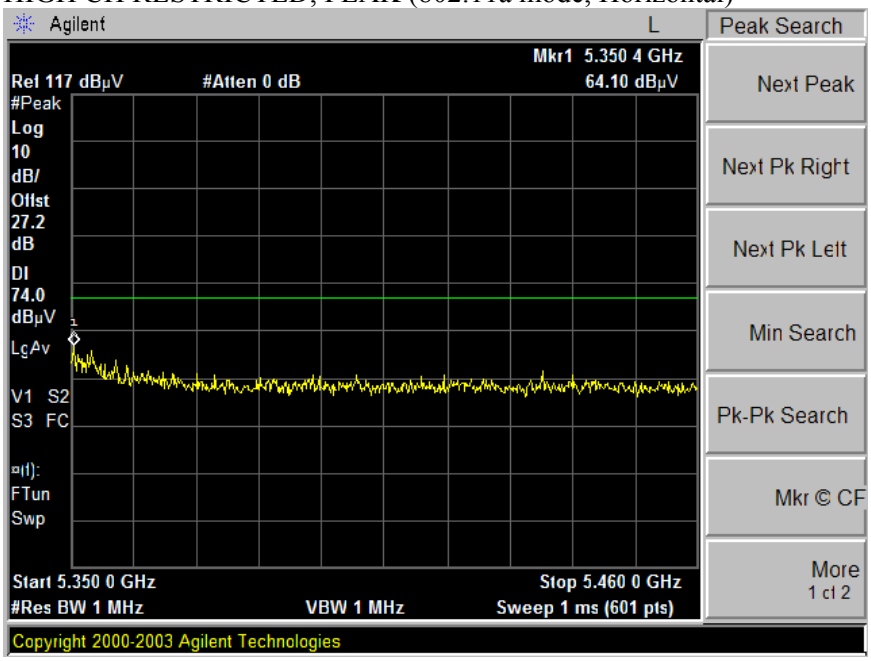


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

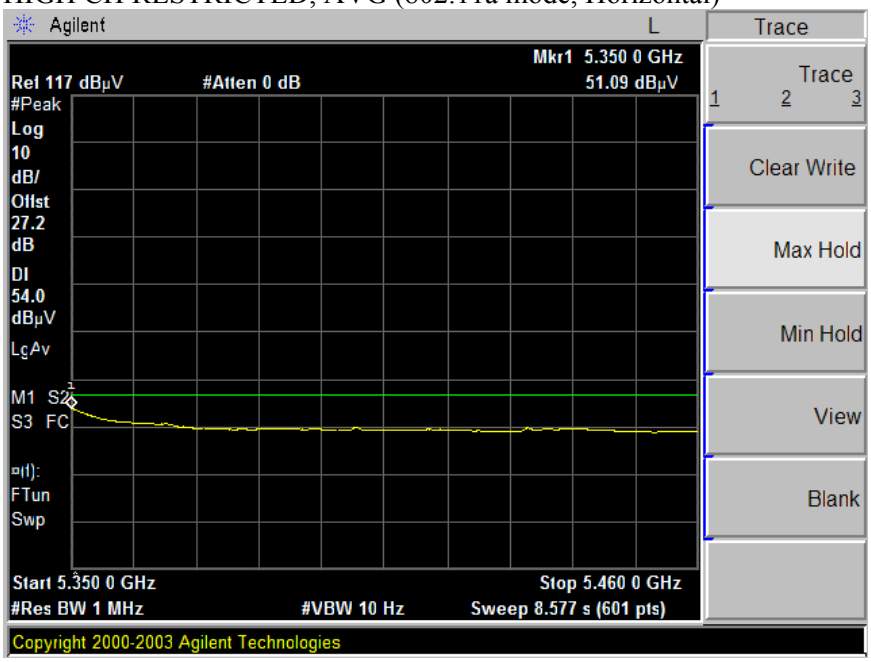


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)**

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

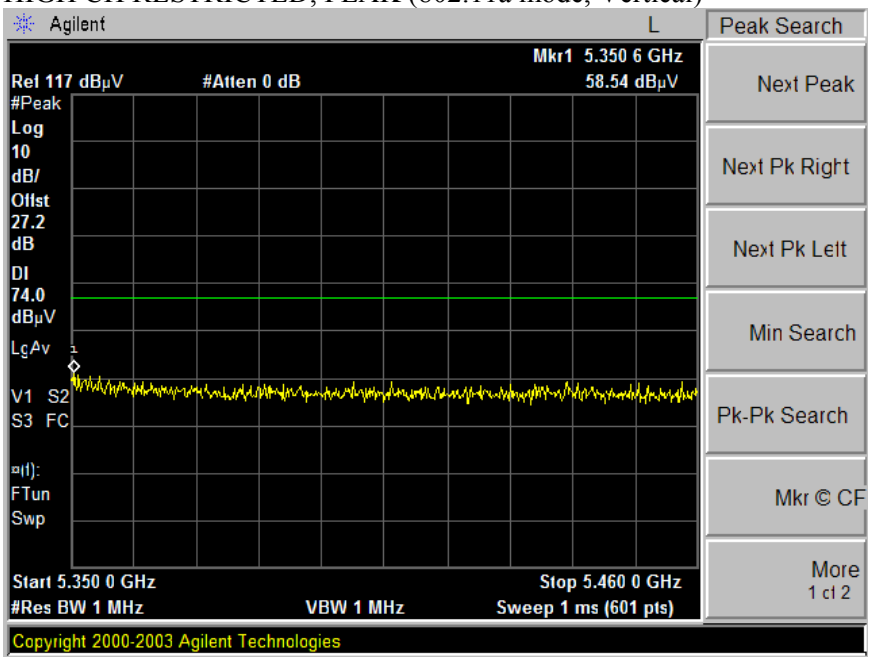


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

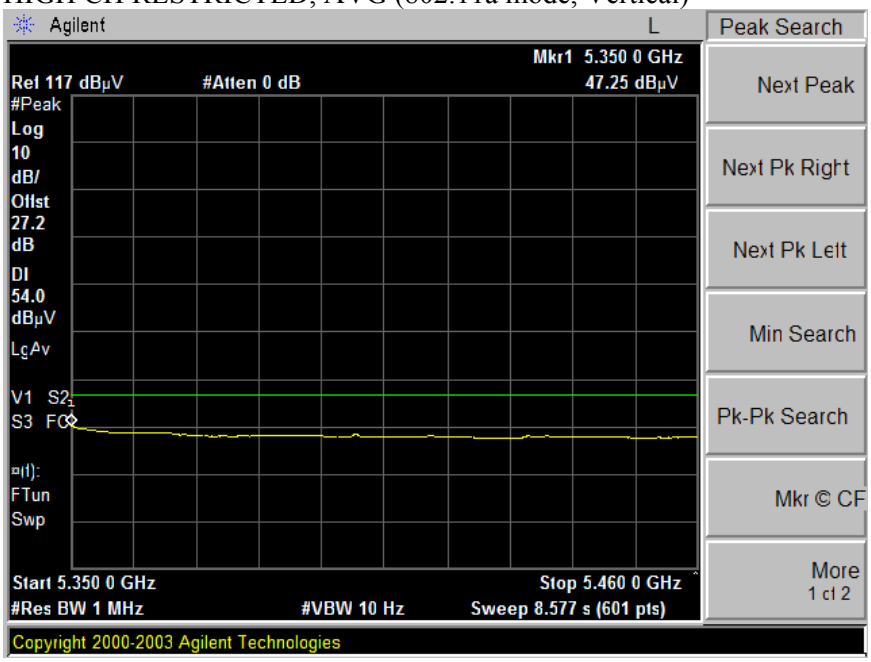


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)**

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



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



## HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

07/02/04 **High Frequency Measurement**
**Compliance Certification Services, Morgan Hill Open Field Site**

**Test Engr: VIEN TRAN**
**Project #: 04U2790**
**Company: INTEL**
**EUT Descrip.: 802.11abg DELL LAPTOP_INSPIRON 330M_HITACHI ANTENNA AT BASE_LAPTOP UNDOCK (worstcase)**
**EUT M/N: WM3A2195ABG INTEL CARD**
**Test Target: FCC15.407**
**Mode Oper: TX _ 11a _ LOW / MID / HI CHANNELS_HARMONIC SPUR**

**Test Equipment:**

| EMCO Horn 1-18GHz | Spectrum Analyzer | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | Agilent E4446A Analyzer | T87 Miteq 924342 | | |

Hi Frequency Cables: ☑ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Limit: FCC 15.205

**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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOW CH 5.18GHz | | | | | | | | | | | | | | | |
| 15.540 | 9.8 | 46.0 | 34.1 | 39.4 | 6.4 | -45.5 | 0.0 | 1.0 | 47.2 | 35.3 | 74.0 | 54.0 | -26.8 | -18.7 | V |
| 15.540 | 9.8 | 44.6 | 32.4 | 39.4 | 6.4 | -45.5 | 0.0 | 1.0 | 45.8 | 33.6 | 74.0 | 54.0 | -28.2 | -20.4 | H |
| MID CH 5.26GHz | | | | | | | | | | | | | | | |
| 15.780 | 9.8 | 45.8 | 33.8 | 38.7 | 6.5 | -45.6 | 0.0 | 1.0 | 46.4 | 34.4 | 74.0 | 54.0 | -27.6 | -19.6 | V |
| 15.780 | 9.8 | 44.0 | 32.2 | 38.7 | 6.5 | -45.6 | 0.0 | 1.0 | 44.6 | 32.8 | 74.0 | 54.0 | -29.4 | -21.2 | H |
| HI CH 5.32GHz | | | | | | | | | | | | | | | |
| 10.642 | 9.8 | 44.0 | 32.5 | 38.2 | 5.8 | -41.3 | 0.0 | 1.0 | 47.7 | 36.2 | 74.0 | 54.0 | -26.3 | -17.8 | V |
| 15.964 | 9.8 | 47.0 | 34.3 | 38.3 | 6.6 | -45.7 | 0.0 | 1.0 | 47.1 | 34.4 | 74.0 | 54.0 | -26.9 | -19.6 | V |
| 10.642 | 9.8 | 43.0 | 31.3 | 38.2 | 5.8 | -41.3 | 0.0 | 1.0 | 46.7 | 35.0 | 74.0 | 54.0 | -27.3 | -19.0 | H |
| 15.964 | 9.8 | 45.8 | 34.5 | 38.3 | 6.6 | -45.7 | 0.0 | 1.0 | 45.9 | 34.6 | 74.0 | 54.0 | -28.1 | -19.4 | H |

NO OTHER RADIATED EMISSION WERE DETECTED UP TO 10TH HARMONIC

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

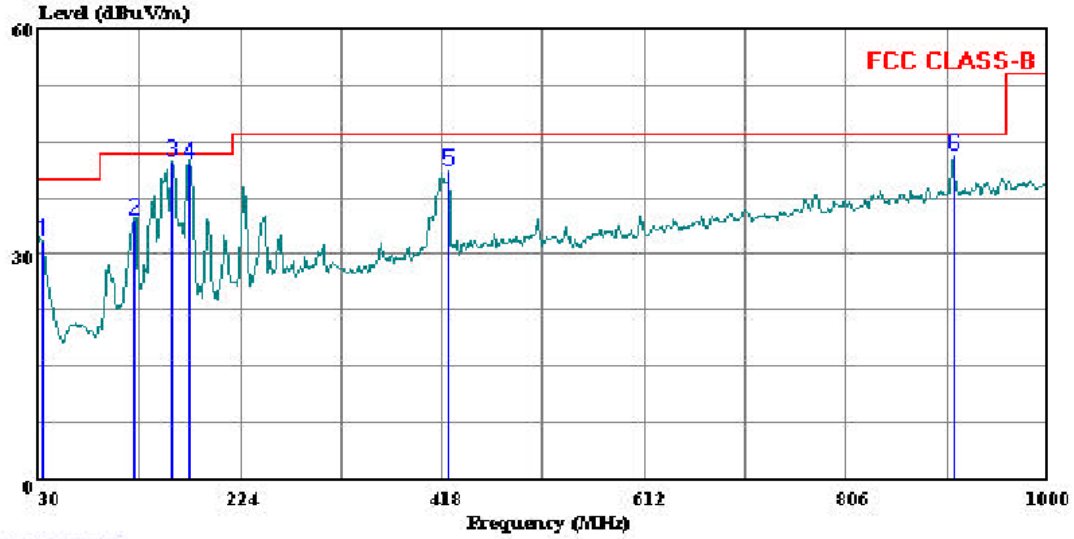
## 7.8.7. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz, PRECISION M60 LAPTOP WITH WISTRON ANTENNA SET

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

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 6 File#: FCC.EMI Date: 06-18-2004 Time: 19:41:36




(Audix ATC)
Trace: 5 Ref Trace:

Condition: 3m HORIZONTAL
Test Operator: : Thanh Nguyen
Project #: : 04U2790-4
Company: : INTEL
EUT: : 802.11 a/b/g Mini PCI type 3B card,
: M60 portable computer, Wistron Antenna
Model No: : WM3B2195ABG = Intel card
Configuration: : EUT in Dell Laptop
Target of Test: : FCC Class B
Mode of Operation: Tx worst case

HORIZONTAL DATA

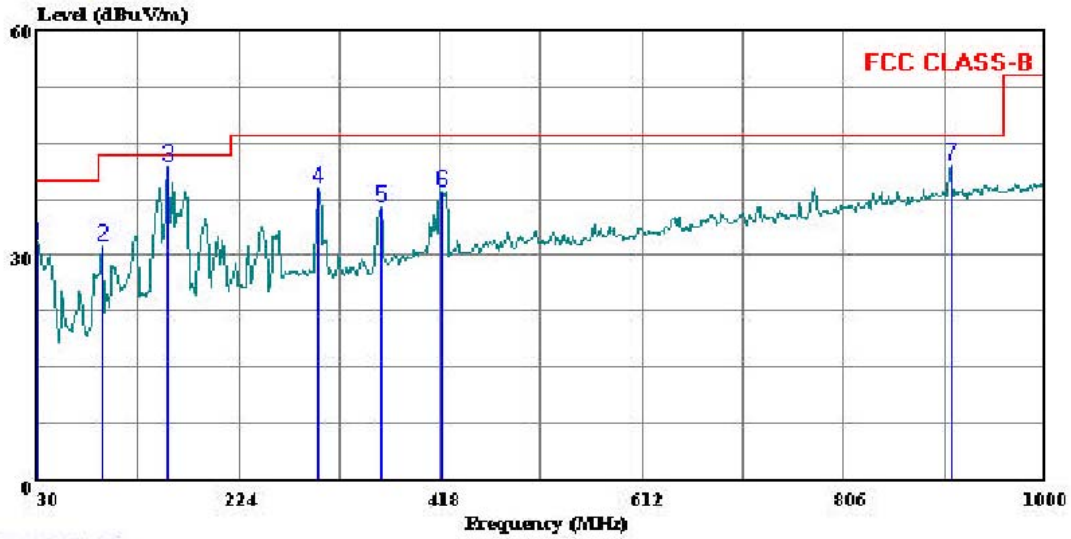
| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 33.880 | Peak | 11.10 | 20.70 | 31.80 | 40.00 | -8.20 |
| 2 | 122.150 | Peak | 19.52 | 15.14 | 34.66 | 43.50 | -8.84 |
| 3 | 158.040 | Peak | 28.32 | 13.90 | 42.22 | 43.50 | -1.28 |
| 4 | 175.500 | Peak | 29.03 | 13.10 | 42.13 | 43.50 | -1.37 |
| 5 | 424.790 | Peak | 22.12 | 18.82 | 40.94 | 46.00 | -5.06 |
| 6 | 909.790 | Peak | 16.74 | 26.42 | 43.16 | 46.00 | -2.84 |

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

VERTICAL PLOT

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: FCC.EMI Date: 06-18-2004 Time: 19:30:39




(Audix ATC)

Trace: 3 Ref Trace:

Condition: 3m VERTICAL
Test Operator: : Thanh Nguyen
Project #: : 04U2790-4
Company: : INTEL
EUT: : 802.11 a/b/g Mini PCI type 3B card,
: M60 portable computer, Wistron Antenna
Model No: : WM3B2195ABG = Intel card
Configuration: : EUT in Dell Laptop
Target of Test: : FCC Class B
Mode of Operation: TX Worst Case

VERTICAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.000 | Peak | 8.40 | 22.95 | 31.35 | 40.00 | -8.65 |
| 2 | 92.080 | Peak | 22.20 | 9.08 | 31.28 | 43.50 | -12.22 |
| 3 | 155.130 | Peak | 27.72 | 14.03 | 41.75 | 43.50 | -1.75 |
| 4 | 300.630 | Peak | 23.16 | 15.93 | 39.09 | 46.00 | -6.91 |
| 5 | 361.740 | Peak | 19.13 | 17.22 | 36.35 | 46.00 | -9.65 |
| 6 | 419.940 | Peak | 19.66 | 18.69 | 38.35 | 46.00 | -7.65 |
| 7 | 909.790 | Peak | 15.69 | 26.42 | 42.11 | 46.00 | -3.89 |

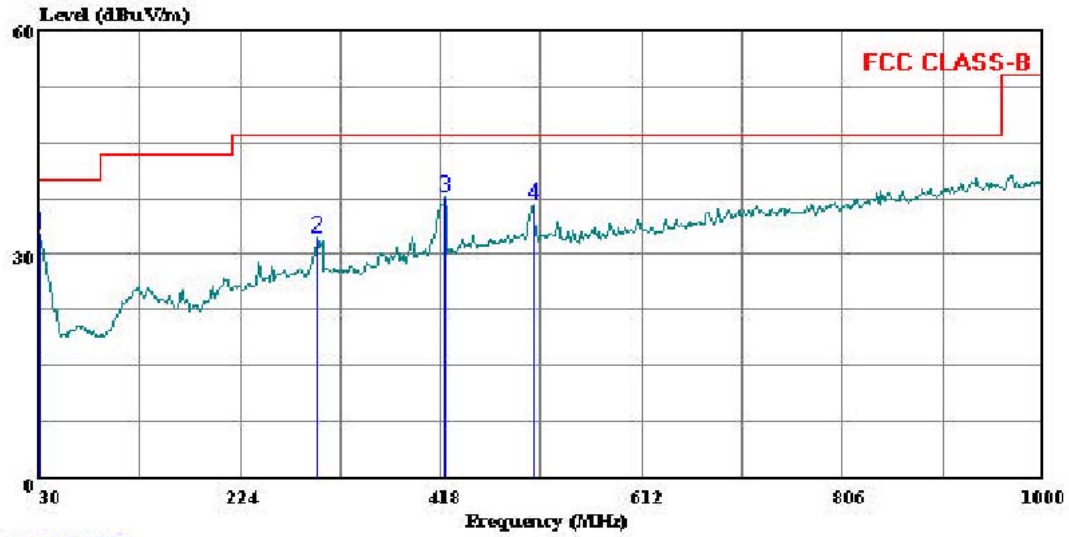
## 7.8.8. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz, PRECISION M60 LAPTOP WITH HITACHI ANTENNA SET

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

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 6 File#: 04U2790.EMI Date: 06-25-2004 Time: 20:03:38




Trace: 5 Ref Trace:

Condition: 3m HORIZONTAL
Test Operator: : David Garcia
Project #: : 04U2790
Company: : Intel
EUT: : 802.11a/b/g Mini PCI Card
: Hitachi antenna; m60 Platform
Model No: : WM3B2195ABG
Configuration: : EUT/Laptop
Target of Test: : FCC Class B
Mode of Operation: TX Worst Case

HORIZONTAL DATA

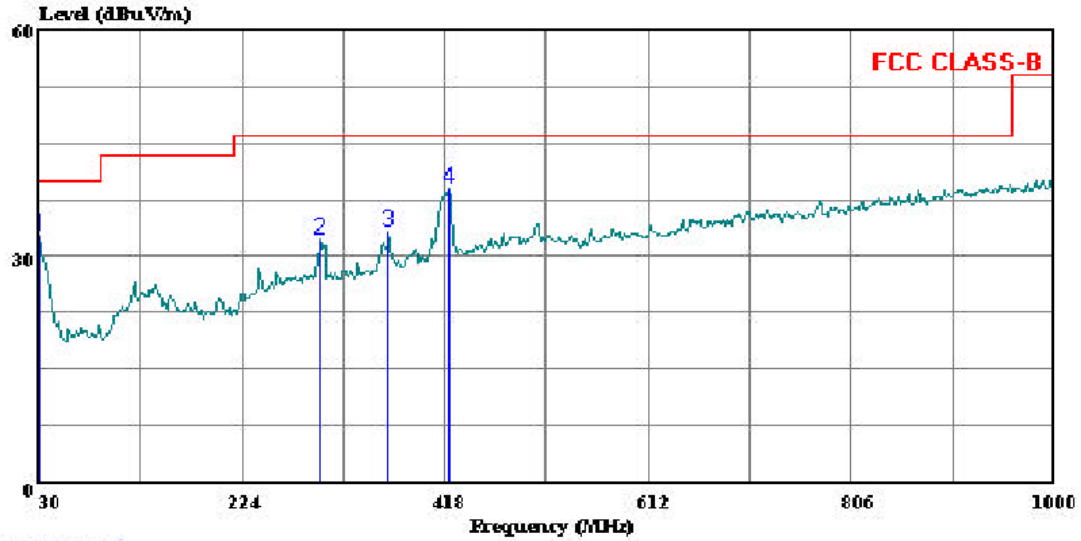
| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.000 | Peak | 9.89 | 22.95 | 32.84 | 40.00 | -7.16 |
| 2 | 298.690 | Peak | 16.27 | 15.91 | 32.18 | 46.00 | -13.83 |
| 3 | 421.880 | Peak | 19.02 | 18.75 | 37.77 | 46.00 | -8.23 |
| 4 | 507.240 | Peak | 16.02 | 20.70 | 36.72 | 46.00 | -9.28 |

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

VERTICAL PLOT

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: 04U2790.EMI Date: 06-25-2004 Time: 19:56:51




(Audix ATC)

Trace: 3 Ref Trace:

Condition: 3m VERTICAL
Test Operator: : David Garcia
Project #: : 04U2790
Company: : Intel
EUT: : 802.11a/b/g Mini PCI Card
: Hitachi antenna; m60 Platform
Model No: : WM3B2195ABG
Configuration: : EUT/Laptop
Target of Test: : FCC Class B
Mode of Operation: TX Worst Case

VERTICAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.000 | Peak | 9.89 | 22.95 | 32.84 | 40.00 | -7.16 |
| 2 | 298.690 | Peak | 16.30 | 15.91 | 32.20 | 46.00 | -13.80 |
| 3 | 363.680 | Peak | 15.94 | 17.25 | 33.19 | 46.00 | -12.81 |
| 4 | 421.880 | Peak | 20.32 | 18.75 | 39.07 | 46.00 | -6.93 |

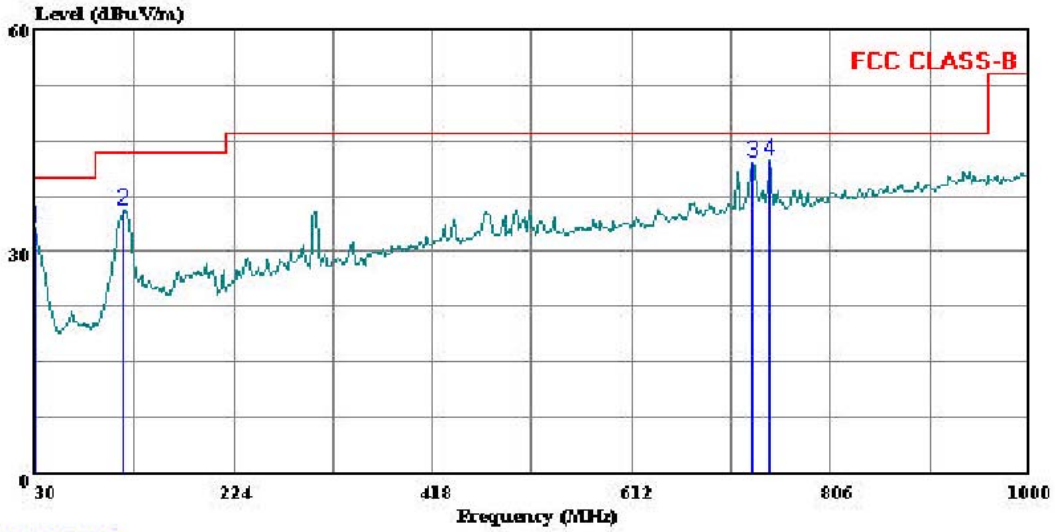
## 7.8.9. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz, INSPIRON 510M LAPTOP WITH PHYCOMP ANTENNA SET

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

HORIZONTAL PLOT

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 8 File#: 04U2790.EMI Date: 06-21-2004 Time: 23:11:37




(Audix ATC)

Trace: 7 Ref Trace:

Condition: 3m HORIZONTAL
Test Operator: : David Garcia
Project #: : 04U2790
Company: : Intel
EUT: : 802.11 a/b/g Mini PCI type card,
Model No: : WM3B2195ABG
Configuration: : EUT in Dell Laptop, M510, PHY antenna
Target of Test: : FCC Class B
Mode of Operation: Transmit at worst case

HORIZONTAL DATA

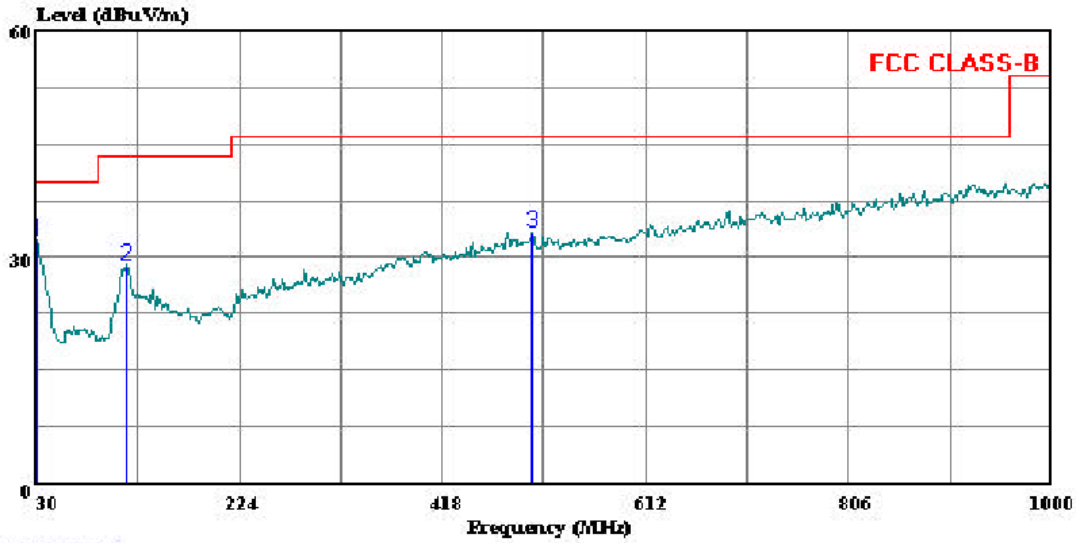
| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.000 | Peak | 10.36 | 22.95 | 33.31 | 40.00 | -6.69 |
| 2 | 116.330 | Peak | 21.06 | 14.51 | 35.57 | 43.50 | -7.93 |
| 3 | 730.340 | Peak | 17.93 | 24.26 | 42.19 | 46.00 | -3.81 |
| 4 | 746.830 | Peak | 18.04 | 24.30 | 42.34 | 46.00 | -3.66 |

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

VERTICAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 10 File#: 04u2790.emi Date: 06-21-2004 Time: 23:16:33




(Audix A.TC)

Trace: 9 Ref Trace:

Condition: 3m VERTICAL
Test Operator: : David Garcia
Project #: : 04U2790
Company: : Intel
EUT: : 802.11 a/b/g Mini PCI type card,
Model No: : WM3B2195ABG
Configuration: : EUT in Dell Laptop, M510, PHY antenna
Target of Test: : FCC Class B
Mode of Operation: Transmit at worst case

VERTICAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.970 | Peak | 9.29 | 22.95 | 32.24 | 40.00 | -7.76 |
| 2 | 115.360 | Peak | 14.46 | 14.39 | 28.85 | 43.50 | -14.65 |
| 3 | 504.330 | Peak | 12.54 | 20.67 | 33.21 | 46.00 | -12.79 |

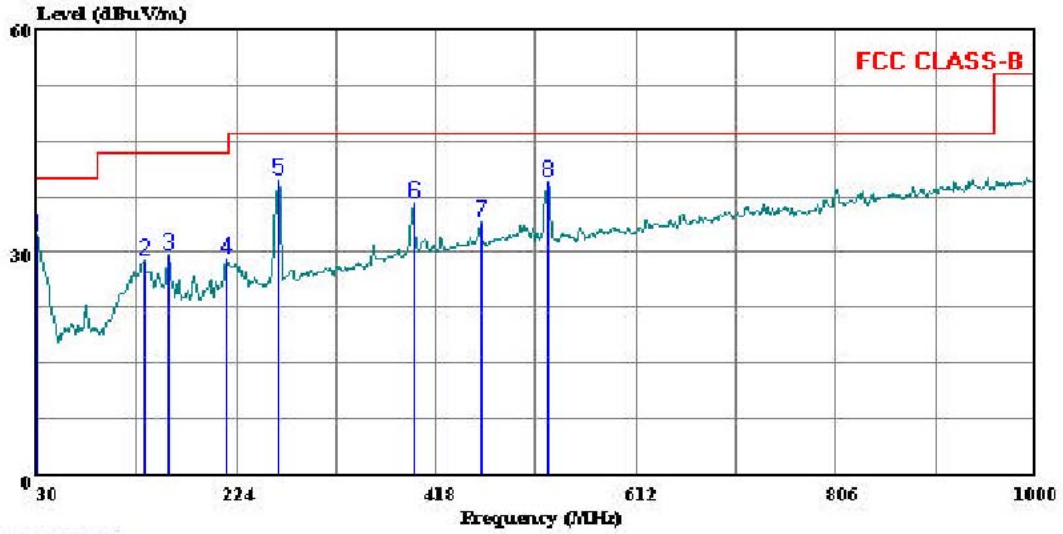
## 7.8.10. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz, INSPIRON 300M LAPTOP WITH WISTRON ANTENNA SET

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

HORIZONTAL PLOT

COMPLIANCE Engineering Service, Inc.
561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 4 File#: Intel-EMC.EMI Date: 07-02-2004 Time: 21:01:56




(Audix ATC)

Trace: 3 Ref Trace:

Condition: FCC CLASS-B SUNOL BILOG 12/22/04 HORIZONTAL
Test Operator: : William Zhuang
Project #: : 04U2790
Company: : INTEL (RP)
EUT: : 802.11 a/b/g Mini PCI type 3B Card,
: 300M WNC Ant. Undocked
Model No: : WM3B2195ABG=Intel Card
Configuration: : EUT stand alone
Target of Test: : FCC Class B
Mode of Operation: TXat worst case

HORIZONTAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.970 | Peak | 9.23 | 22.95 | 32.18 | 40.00 | -7.82 |
| 2 | 133.790 | Peak | 13.33 | 15.48 | 28.81 | 43.50 | -14.69 |
| 3 | 158.040 | Peak | 15.81 | 13.90 | 29.71 | 43.50 | -13.79 |
| 4 | 213.330 | Peak | 16.14 | 12.85 | 28.99 | 43.50 | -14.51 |
| 5 | 264.740 | Peak | 24.93 | 14.78 | 39.71 | 46.00 | -6.29 |
| 6 | 395.690 | Peak | 18.47 | 18.12 | 36.59 | 46.00 | -9.41 |
| 7 | 460.680 | Peak | 14.34 | 19.71 | 34.05 | 46.00 | -11.95 |

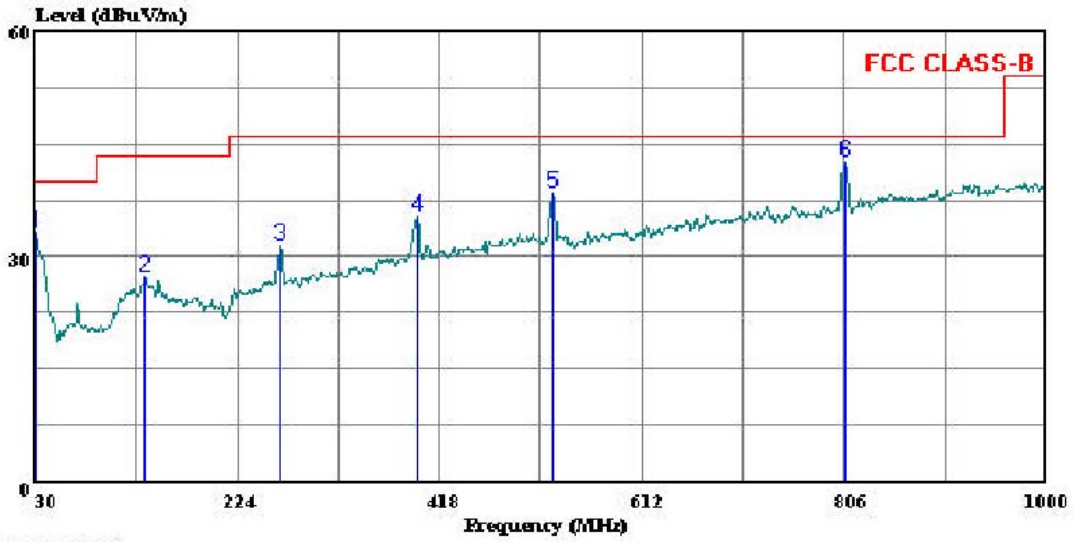
| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 8 | 526.640 | Peak | 18.45 | 20.99 | 39.44 | 46.00 | -6.56 |

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

VERTICAL PLOT

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 2 File#: Intel-EMC.EMI Date: 07-02-2004 Time: 20:50:30




(Audix ATC)

Trace: 1 Ref Trace:

Condition: FCC CLASS-B SUNOL BILOG 12/22/04 VERTICAL
Test Operator: : William Zhuang
Project #: : 04U2790
Company: : INTEL (RP)
EUT: : 802.11 a/b/g Mini PCI type 3B Card,
: 300M WNC Ant. Undocked
Model No: : WM3B2195ABG=Intel Card
Configuration: : EUT stand alone
Target of Test: : FCC Class B
Mode of Operation: TX at worst case

VERTICAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.000 | Peak | 10.41 | 22.95 | 33.36 | 40.00 | -6.64 |
| 2 | 135.730 | Peak | 11.97 | 15.39 | 27.36 | 43.50 | -16.14 |
| 3 | 264.740 | Peak | 16.68 | 14.78 | 31.46 | 46.00 | -14.54 |
| 4 | 396.660 | Peak | 17.22 | 18.14 | 35.35 | 46.00 | -10.65 |
| 5 | 526.640 | Peak | 17.47 | 20.99 | 38.46 | 46.00 | -7.54 |
| 6 | 807.940 | Peak | 17.59 | 25.08 | 42.67 | 46.00 | -3.33 |

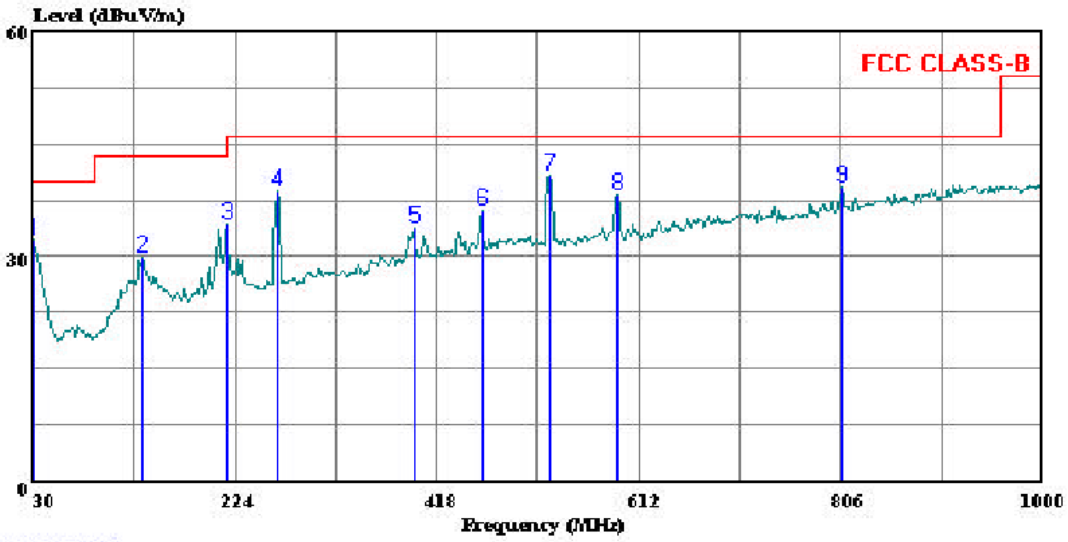
## 7.8.11. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz, INSPIRON 300M LAPTOP WITH HITACHI ANTENNA SET

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

HORIZONTAL PLOT

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 6 File#: Intel-EMC.EMI Date: 07-02-2004 Time: 21:16:08




(Audix ATC)

Trace: 5 Ref Trace:

Condition: FCC CLASS-B SUNOL BILOG 12/22/04 HORIZONTAL
Test Operator: : William Zhuang
Project #: : 04U2790
Company: : INTEL (RP)
EUT: : 802.11 a/b/g Mini PCI type 3B Card,
: 300M Hitachi Ant. Undocked
Model No: : WM3B2195ABG=Intel Card
Configuration: : EUT stand alone
Target of Test: : FCC Class B
Mode of Operation: TX at worst case

HORIZONTAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.000 | Peak | 9.25 | 22.95 | 32.20 | 40.00 | -7.80 |
| 2 | 135.730 | Peak | 14.57 | 15.39 | 29.96 | 43.50 | -13.54 |
| 3 | 216.240 | Peak | 21.43 | 12.91 | 34.34 | 46.00 | -11.66 |
| 4 | 264.740 | Peak | 24.02 | 14.78 | 38.80 | 46.00 | -7.20 |
| 5 | 395.690 | Peak | 15.63 | 18.12 | 33.75 | 46.00 | -12.25 |
| 6 | 460.680 | Peak | 16.32 | 19.71 | 36.03 | 46.00 | -9.97 |
| 7 | 525.670 | Peak | 19.68 | 20.97 | 40.66 | 46.00 | -5.34 |

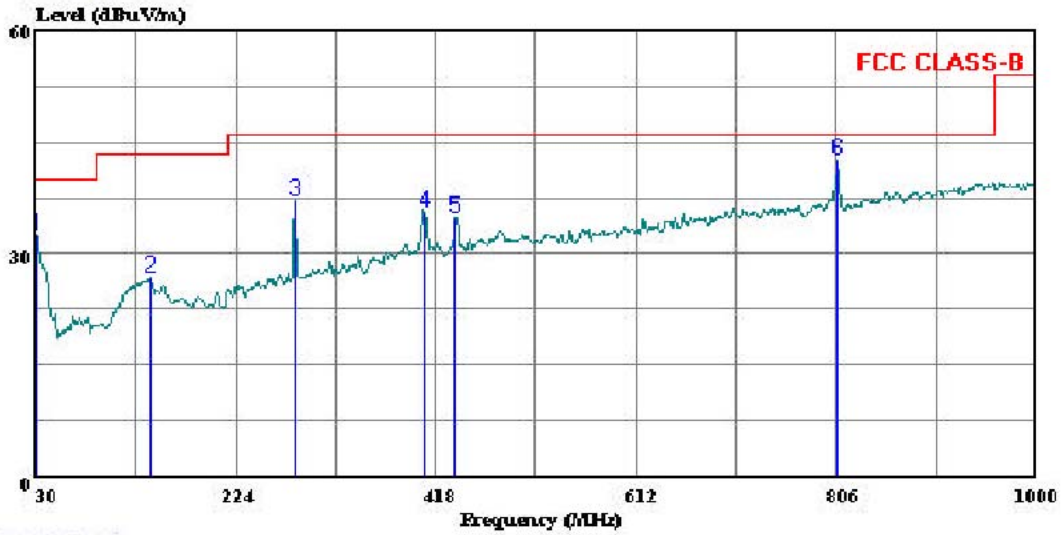
| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 8 | 590.660 | Peak | 16.21 | 21.86 | 38.07 | 46.00 | -7.93 |
| 9 | 807.940 | Peak | 14.22 | 25.08 | 39.30 | 46.00 | -6.70 |

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

VERTICAL PLOT

561F Monterey Road
San Jose, CA 95131
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 8 File#: Intel-EMC.EMI Date: 07-02-2004 Time: 21:25:29




(Audix ATC)

Trace: 7 Ref Trace:

Condition: FCC CLASS-B SUNOL BILOG 12/22/04 VERTICAL
Test Operator: : William Zhuang
Project #: : 04U2790
Company: : INTEL (RP)
EUT: : 802.11 a/b/g Mini PCI type 3B Card,
: 300M Hitachi Ant. Undocked
Model No: : WM3B2195ABG=Intel Card
Configuration: : EUT stand alone
Target of Test: : FCC Class B
Mode of Operation: TX t worst case

VERTICAL DATA

| | Freq | Remark | Read Level | Factor | Level | Limit Line | Over Limit |
|---|---|---|---|---|---|---|---|
| | MHz | | dBuV | dB | dBuV/m | dBuV/m | dB |
| 1 | 30.970 | Peak | 9.55 | 22.95 | 32.50 | 40.00 | -7.50 |
| 2 | 140.580 | Peak | 11.42 | 15.23 | 26.65 | 43.50 | -16.85 |
| 3 | 281.230 | Peak | 21.68 | 15.47 | 37.15 | 46.00 | -8.86 |
| 4 | 406.360 | Peak | 17.24 | 18.36 | 35.60 | 46.00 | -10.40 |
| 5 | 437.400 | Peak | 15.70 | 19.14 | 34.84 | 46.00 | -11.16 |
| 6 | 807.940 | Peak | 17.48 | 25.08 | 42.56 | 46.00 | -3.44 |

## 7.9. POWERLINE CONDUCTED EMISSIONS

**LIMIT**

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

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

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

* Decreases with the logarithm of the frequency.

**TEST PROCEDURE**

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

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

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

**RESULTS**

No non-compliance noted:

## 7.9.1. POWERLINE CONDUCTED EMISSIONS, PRECISION M60 LAPTOP WITH WISTRON ANTENNA SET

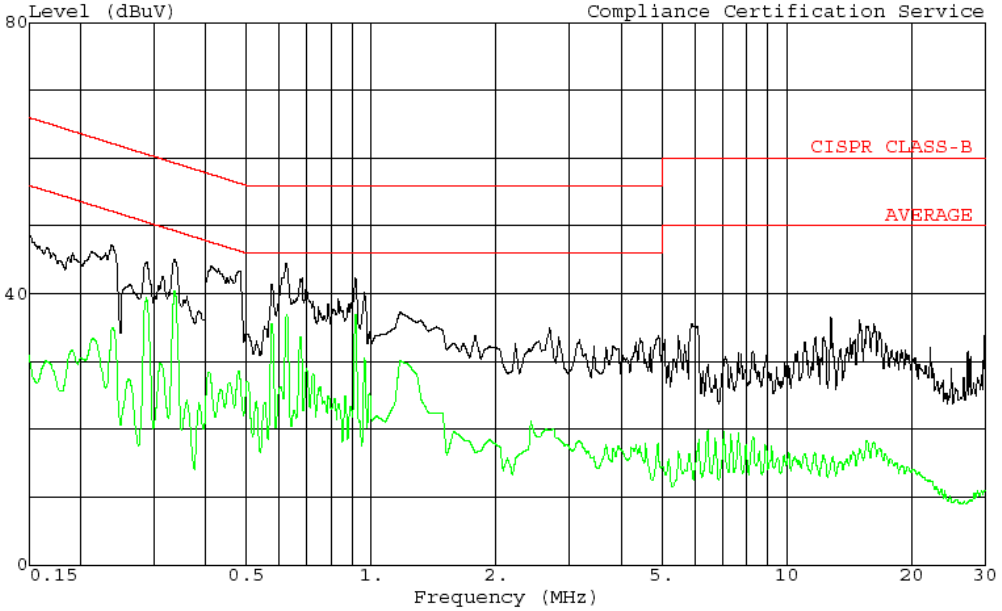
**6 WORST EMISSIONS**

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Freq. | Reading | | | Closs | Limit | FCC_B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.24 | 47.30 | -- | -- | 0.00 | 63.49 | 53.49 | -16.19 | -6.19 | L1 |
| 0.62 | 44.44 | -- | -- | 0.00 | 56.00 | 46.00 | -11.56 | -1.56 | L1 |
| 12.78 | 36.62 | -- | -- | 0.00 | 60.00 | 50.00 | -23.38 | -13.38 | L1 |
| 0.17 | 58.38 | -- | 32.51 | 0.00 | 65.57 | 55.57 | -7.19 | -23.06 | L2 |
| 0.29 | 52.91 | -- | 39.61 | 0.00 | 61.94 | 51.94 | -9.03 | -12.33 | L2 |
| 0.58 | 47.52 | -- | 33.94 | 0.00 | 56.00 | 46.00 | -8.48 | -12.06 | L2 |
| 6 Worst Data | | | | | | | | | |

## LINE 1 RESULTS

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

Data#: 7 File#: LC.EMI Date: 06-18-2004 Time: 20:39:28

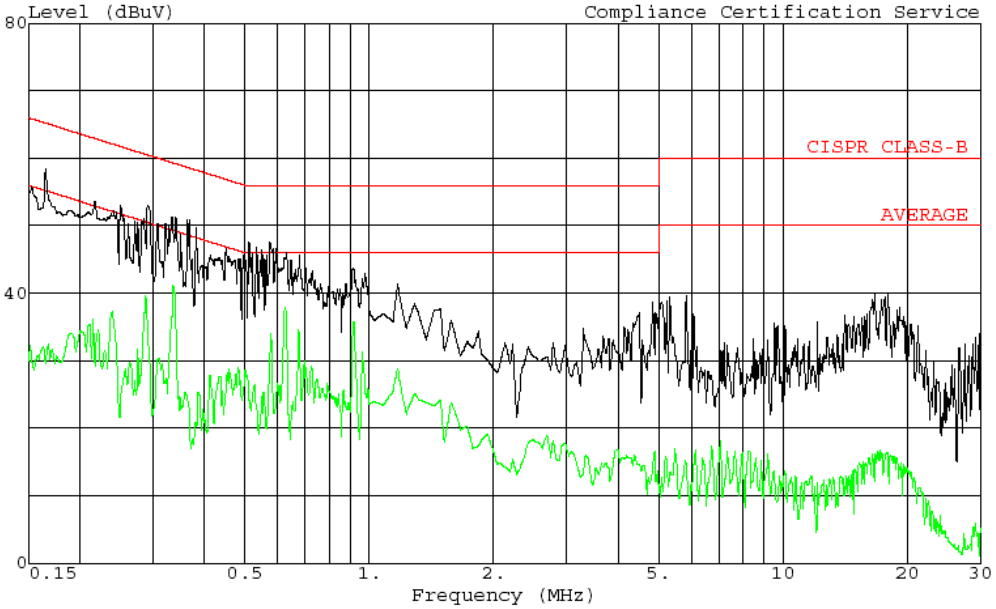



Trace: 5 Ref Trace:
Project # : 04U2790-2
Test Operator : Thanh Nguyen
Company : Intel
EUT : 802.11a/b/g Mini PCI type 3 Card
Model : WM3B2195ABG; M60 portable computer, Wistron Antenna
Configuration : EUT/Dell LapTop, AC/DC Adapter
Mode of Operation: Tx Worst case
Target of Test : CISPR22 Class B
Voltage : 115VAC/60Hz
: L1: Peak ( Black ), Avg ( Green )

**LINE 2 RESULTS**

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

Data#: 14 File#: LC.EMI Date: 06-18-2004 Time: 20:50:09




Trace: 12 Ref Trace:
Project # : 04U2790-2
Test Operator : Thanh Nguyen
Company : Intel
EUT : 802.11a/b/g Mini PCI type 3 Card
Model : WM3B2195ABG; M60 portable computer, Wistron Antenna
Configuration : EUT/Dell LapTop, AC/DC Adapter
Mode of Operation: Tx Worst case
Target of Test : CISPR22 Class B
Voltage : 115VAC/60Hz
: L2: Peak ( Black ), Avg ( Green )

## 7.9.2. POWERLINE CONDUCTED EMISSIONS, PRECISION M60 LAPTOP WITH HITACHI ANTENNA SET

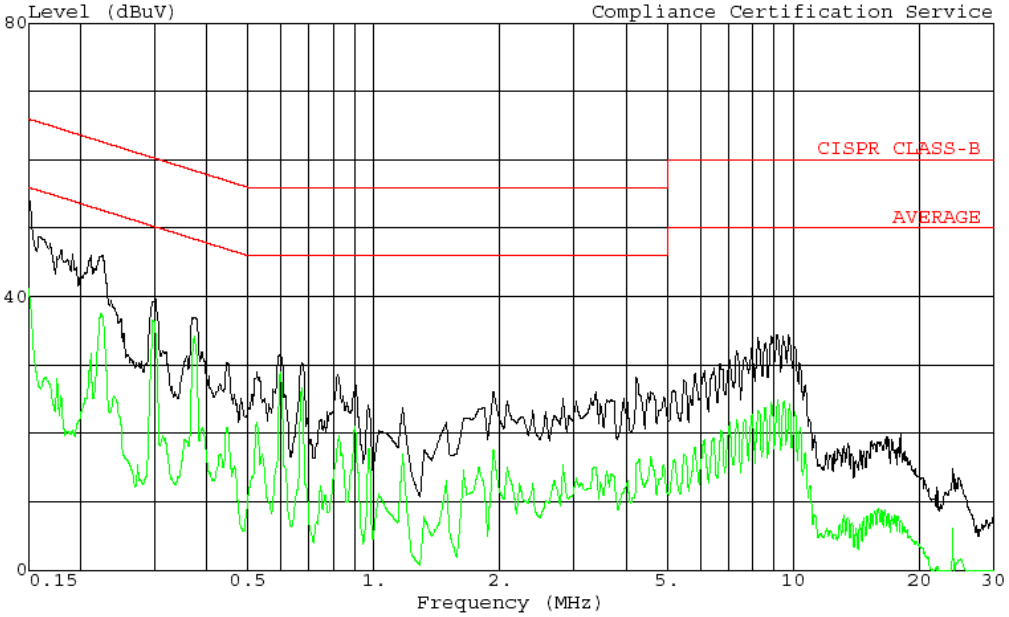
**6 WORST EMISSIONS**

| 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 |
| 0.16 | 57.58 | -- | 30.75 | 0.00 | 65.74 | 55.74 | -8.16 | -24.99 | L1 |
| 0.60 | 40.48 | -- | -- | 0.00 | 56.00 | 46.00 | -15.52 | -5.52 | L1 |
| 0.91 | 36.96 | -- | -- | 0.00 | 56.00 | 46.00 | -19.04 | -9.04 | L1 |
| 0.32 | 42.40 | -- | -- | 0.00 | 61.20 | 51.20 | -18.80 | -8.80 | L2 |
| 0.60 | 40.40 | -- | -- | 0.00 | 56.00 | 46.00 | -15.60 | -5.60 | L2 |
| 0.91 | 38.04 | -- | -- | 0.00 | 56.00 | 46.00 | -17.96 | -7.96 | L2 |
| 6 Worst Data | | | | | | | | | |

**LINE 1 RESULTS**

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

Data#: 7 File#: 04U2790.EMI Date: 06-25-2004 Time: 17:57:43



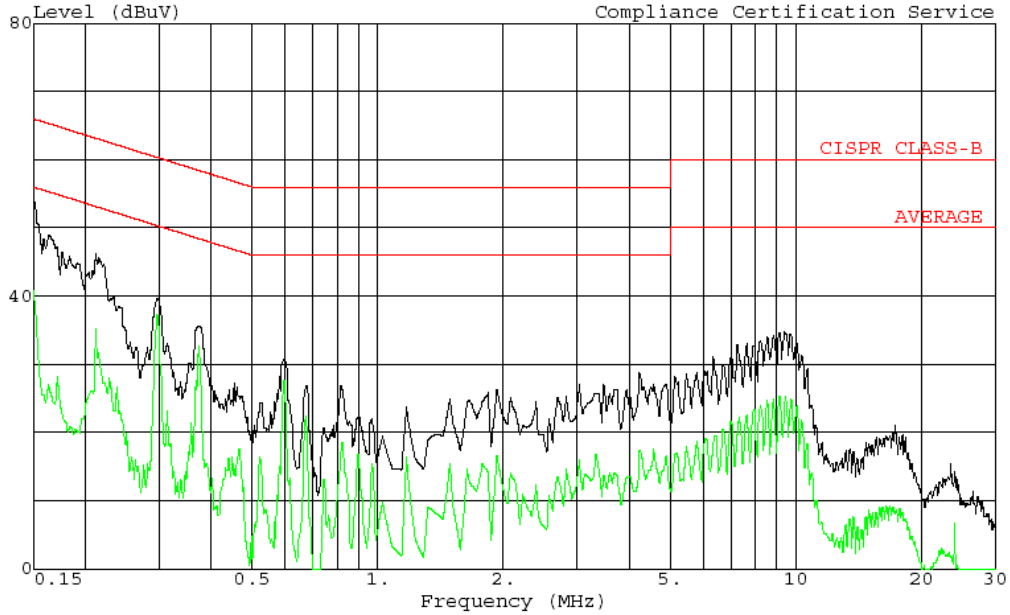

Trace: 5 Ref Trace:

Project # : 04U2790
Test Operator : David Garcia
Company : Intel
EUT : 802.11 a/b/g Mini PCI Card; Hitachi antenna; m60 Platform
Model : WM3B2195ABG
Configuration : EUT/Dell m60 platform, AC PA-1650-05D
Mode of Operation: Tx worst case
Target of Test : FCC Class B
Voltage : 115VAC/60Hz
: L1: Peak ( Black ), Avg ( Green )

**LINE 2 RESULTS**

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

Data#: 14 File#: 04U2790.EMI Date: 06-25-2004 Time: 18:13:06




Trace: 12 Ref Trace:

| | |
|---|---|
| Project # | : 04U2790 |
| Test Operator | : David Garcia |
| Company | : Intel |
| EUT | : 802.11 a/b/g Mini PCI Card |
| | : Hitachi antenna; m60 Platform |
| Model | : WM3B2195ABG |
| Configuration | : EUT/Dell m60 platform, AC PA-1650-05D |
| Mode of Operation | : Tx worst case |
| Target of Test | : FCC Class B |
| Voltage | : 115VAC/60Hz |
| | : L2: Peak ( Black ), Avg ( Green ) |

## 7.9.3. POWERLINE CONDUCTED EMISSIONS, INSPIRON 510M LAPTOP WITH PHYCOMP ANTENNA SET

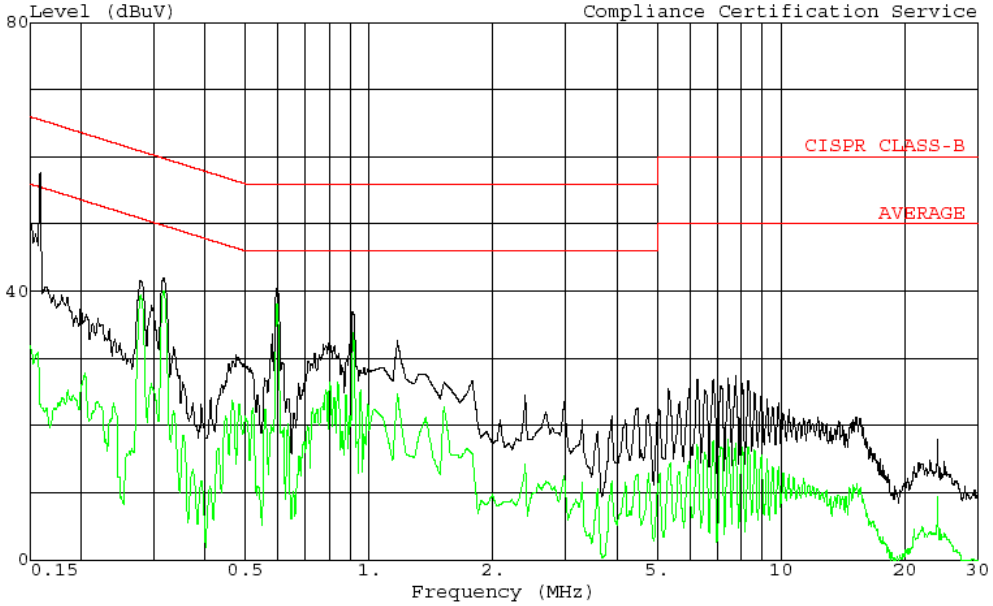
**6 WORST EMISSIONS**

| 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 |
| 0.16 | 57.58 | -- | 30.75 | 0.00 | 65.74 | 55.74 | -8.16 | -24.99 | L1 |
| 0.60 | 40.48 | -- | -- | 0.00 | 56.00 | 46.00 | -15.52 | -5.52 | L1 |
| 0.91 | 36.96 | -- | -- | 0.00 | 56.00 | 46.00 | -19.04 | -9.04 | L1 |
| 0.32 | 42.40 | -- | -- | 0.00 | 61.20 | 51.20 | -18.80 | -8.80 | L2 |
| 0.60 | 40.40 | -- | -- | 0.00 | 56.00 | 46.00 | -15.60 | -5.60 | L2 |
| 0.91 | 38.04 | -- | -- | 0.00 | 56.00 | 46.00 | -17.96 | -7.96 | L2 |
| 6 Worst Data | | | | | | | | | |

**LINE 1 RESULTS**

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

Data#: 14 File#: 04U2790.EMI Date: 06-25-2004 Time: 18:51:07



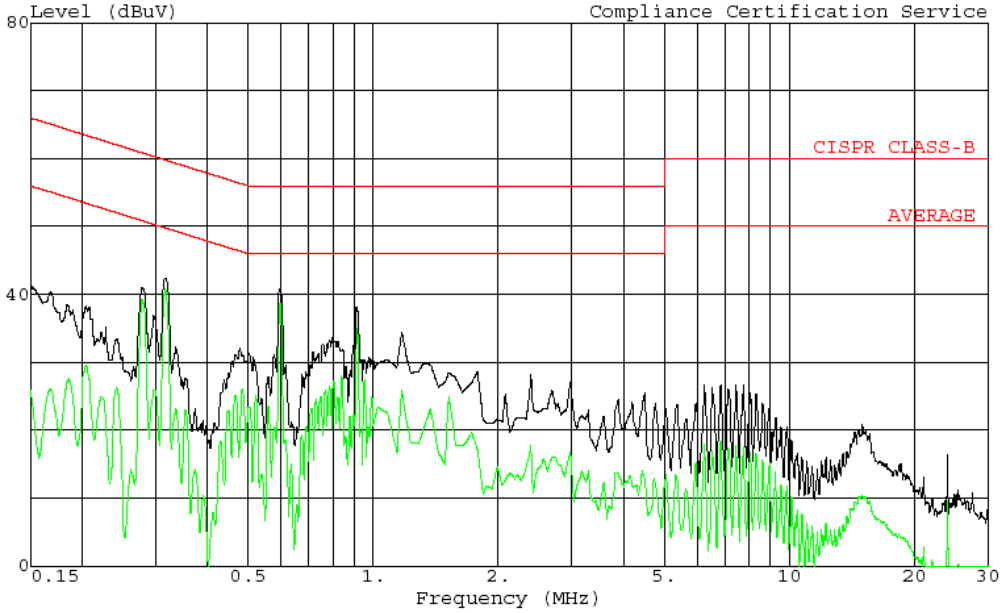

Trace: 12 Ref Trace:

Project # : 04U2790
Test Operator : David Garcia
Company : Intel
EUT : 802.11 a/b/g Mini PCI Card
: EUT in Dell Laptop, M510, PHY antenna
Model : WM3B2195ABG
Configuration : EUT/Laptop AC adapter PA-1650-05D
Mode of Operation: Tx worst case
Target of Test : FCC Class B
Voltage : 115VAC/60Hz
: L1: Peak ( Black ), Avg ( Green )

**LINE 2 RESULTS**

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

Data#: 21 File#: 04U2790.EMI Date: 06-25-2004 Time: 19:04:03




Trace: 19 Ref Trace:
Project # : 04U2790
Test Operator : David Garcia
Company : Intel
EUT : 802.11 a/b/g Mini PCI Card
: EUT in Dell Laptop, M510, PHY antenna
Model : WM3B2195ABG
Configuration : EUT/Laptop AC adapter PA-1650-05D
Mode of Operation: Tx worst case
Target of Test : FCC Class B
Voltage : 115VAC/60Hz
: L2: Peak ( Black ), Avg ( Green )

## 7.9.4. POWERLINE CONDUCTED EMISSIONS, INSPIRON 3000M LAPTOP WITH WISTRON ANTENNA SET

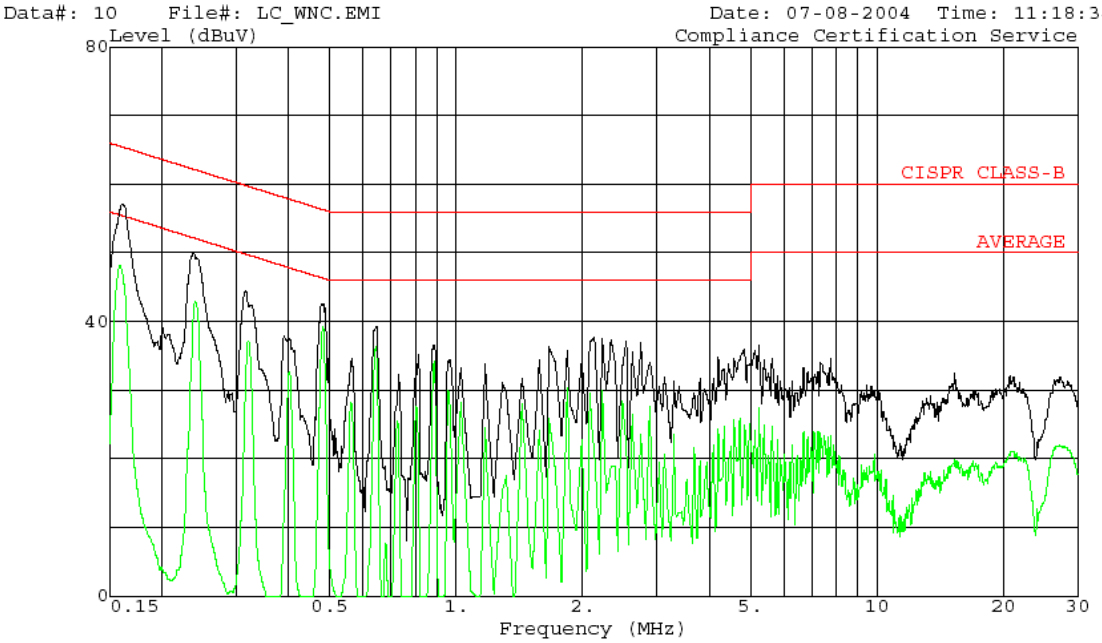
Note: The worst-case configuration is with the EUT docked.

**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 |
| 0.16 | 57.14 | -- | 48.24 | 0.00 | 65.71 | 55.71 | -8.57 | -7.47 | L1 |
| 0.64 | 33.22 | -- | 36.37 | 0.00 | 56.00 | 46.00 | -22.78 | -9.63 | L1 |
| 5.22 | 36.76 | -- | 27.35 | 0.00 | 60.00 | 50.00 | -23.24 | -22.65 | L1 |
| 0.16 | 57.18 | -- | 48.03 | 0.00 | 65.71 | 55.71 | -8.53 | -7.68 | L2 |
| 2.26 | 36.18 | -- | 31.03 | 0.00 | 56.00 | 46.00 | -19.82 | -14.97 | L2 |
| 7.49 | 33.42 | -- | 24.40 | 0.00 | 60.00 | 50.00 | -26.58 | -25.60 | L2 |
| 6 Worst Data | | | | | | | | | |

**LINE 1 RESULTS**

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

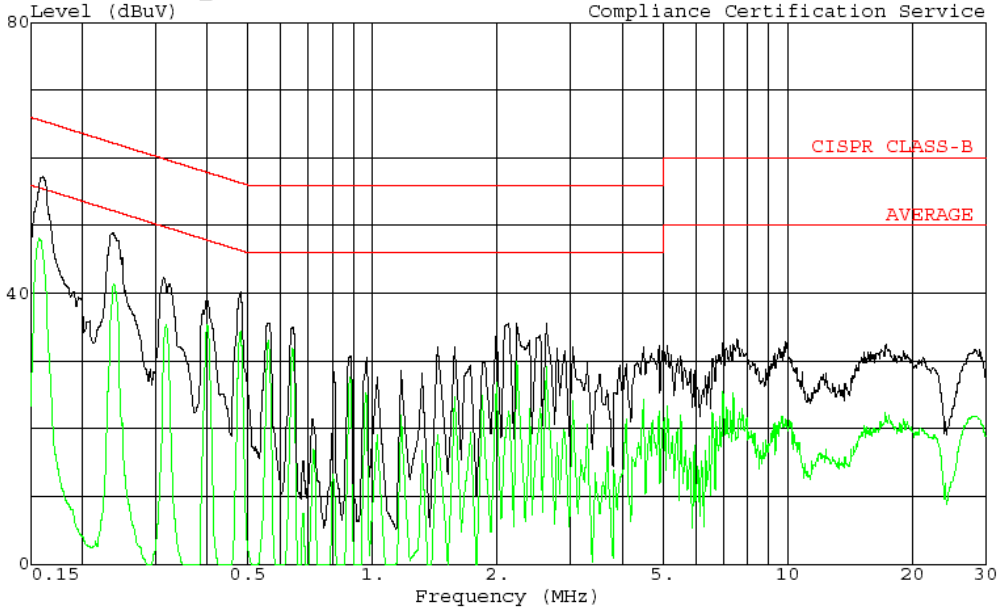



Trace: 8 Ref Trace:
Project # : 04U2790_FCC_L1_WNC_DOCK
Test Operator : VIEN TRAN
Company : Intel
EUT : 11 a/b/g Mini PCI type 3B card
: 300M WNC Ant.
Model : WM3B2195ABG
Configuration : EUT in Dell laptop Inspiron 300m
Mode of Operation: Tx Worstcase
Target of Test : FCC Class B
Voltage : 115V, 60Hz
: L1: Peak ( black ), Average (Green)

**LINE 2 RESULTS**

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

Data#: 17 File#: LC_WNC.EMI Date: 07-08-2004 Time: 12:07:02




Trace: 15 Ref Trace:
Project # : 04U2790_FCC_L2_WNC_DOCK
Test Operator : VIEN TRAN
Company : Intel
EUT : 11 a/b/g Mini PCI type 3B card
: 300M WNC Ant.
Model : WM3B2195ABG
Configuration : EUT in Dell laptop Inspiron 300m
Mode of Operation: Tx Worstcase
Target of Test : FCC Class B
Voltage : 115V, 60Hz
: L2: Peak ( black ), Average (Green)

## 7.9.5. POWERLINE CONDUCTED EMISSIONS, INSPIRON 3000M LAPTOP WITH HITACHI ANTENNA SET

Note: The worst-case configuration is with the EUT undocked.

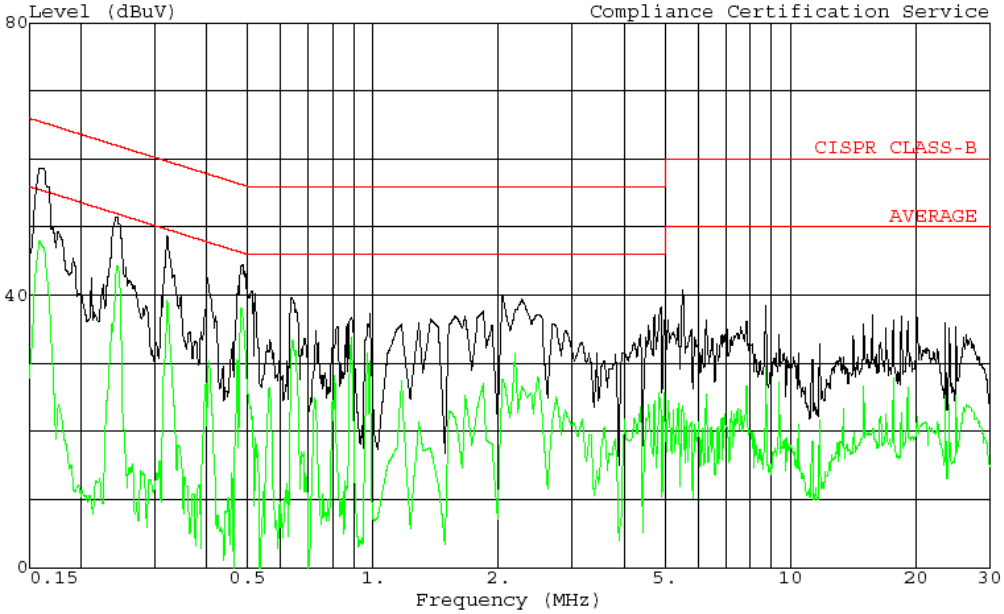
**6 WORST EMISSIONS**

| 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 |
| 0.16 | 58.64 | -- | 47.92 | 0.00 | 65.71 | 55.71 | -7.07 | -7.79 | L1 |
| 0.63 | 40.00 | -- | 33.47 | 0.00 | 56.00 | 46.00 | -16.00 | -12.53 | L1 |
| 8.78 | 40.76 | -- | 29.24 | 0.00 | 60.00 | 50.00 | -19.24 | -20.76 | L1 |
| 0.16 | 58.46 | -- | 48.94 | 0.00 | 65.71 | 55.71 | -7.25 | -6.77 | L2 |
| 2.31 | 38.96 | -- | 33.80 | 0.00 | 56.00 | 46.00 | -17.04 | -12.20 | L2 |
| 8.78 | 35.66 | -- | 26.80 | 0.00 | 60.00 | 50.00 | -24.34 | -23.20 | L2 |
| 6 Worst Data | | | | | | | | | |

**LINE 1 RESULTS**

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

Data#: 7 File#: FCC.EMI Date: 07-08-2004 Time: 15:04:20

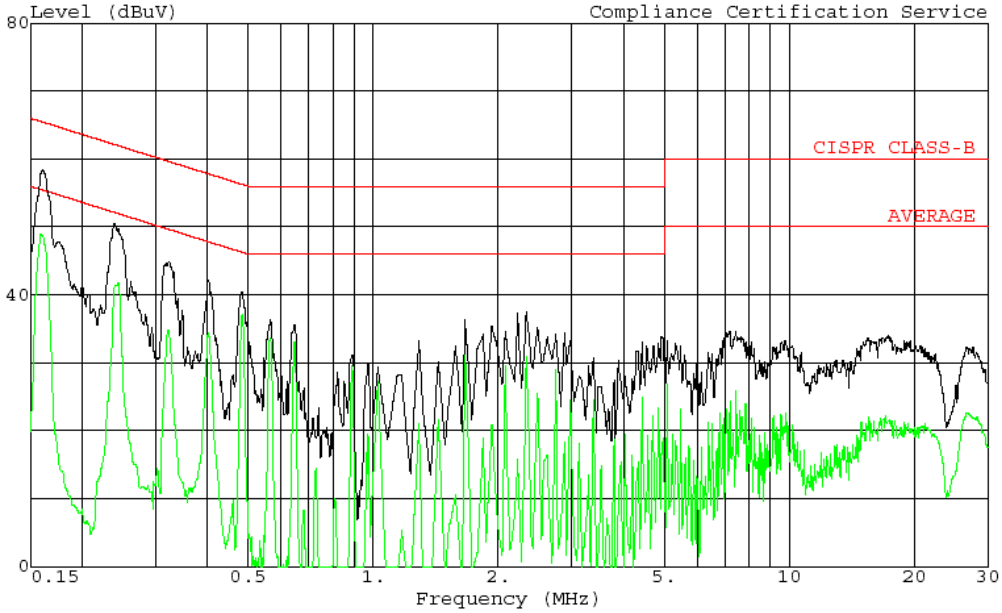



Trace: 5 Ref Trace:
Project # : 04U2790_FCC_HITACHI_DOCK
Test Operator : VIEN TRAN
Company : Intel
EUT : 11 a/b/g Mini PCI type 3B card
: 300M Hitachi Ant.
Model : WM3B2195ABG
Configuration : EUT in Dell laptop Inspiron 300m
Mode of Operation: Tx Worstcase
Target of Test : FCC Class B
Voltage : 115V, 60Hz
: L1: Peak ( black ), Average (Green)

**LINE 2 RESULTS**

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

Data#: 14 File#: FCC.EMI Date: 07-08-2004 Time: 15:26:42



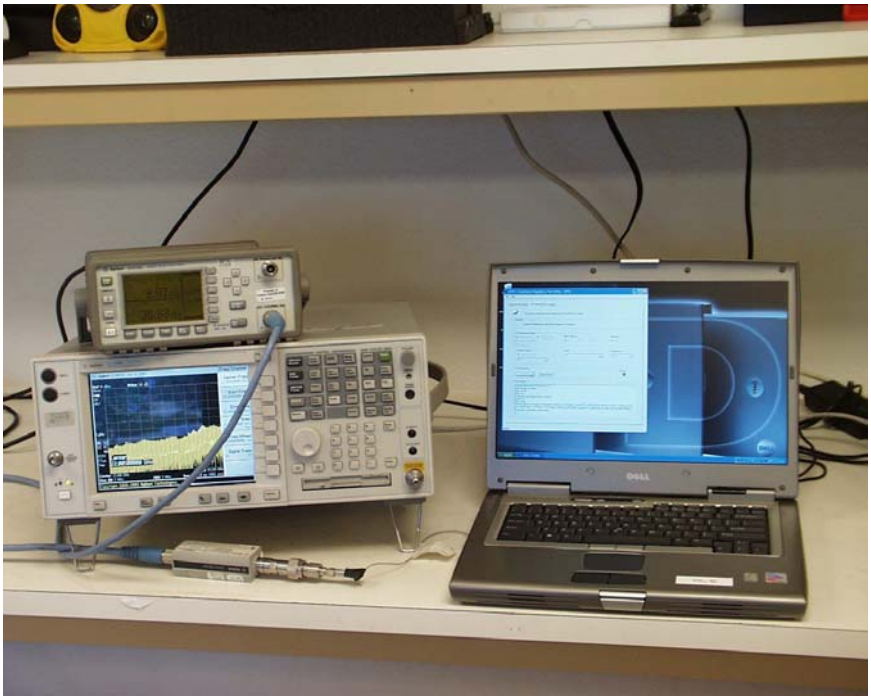

Trace: 12 Ref Trace:

| | |
|---|---|
| Project # | : 04U2790_FCC_L2_HITACHI_DOCK |
| Test Operator | : VIEN TRAN |
| Company | : Intel |
| EUT | : 11 a/b/g Mini PCI type 3B card |
| | : 300M Hitachi Ant. |
| Model | : WM3A2195ABG |
| Configuration | : EUT in Dell laptop Inspiron 300m |
| Mode of Operation | : Tx Worstcase |
| Target of Test | : FCC Class B |
| Voltage | : 115V, 60Hz |
| | : L2: Peak ( black ), Average (Green) |

# 8. SETUP PHOTOS

## 8.1. ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



## 8.2. PRECISION M60 LAPTOP WITH WISTRON ANTENNA SET

**RADIATED RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

## POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

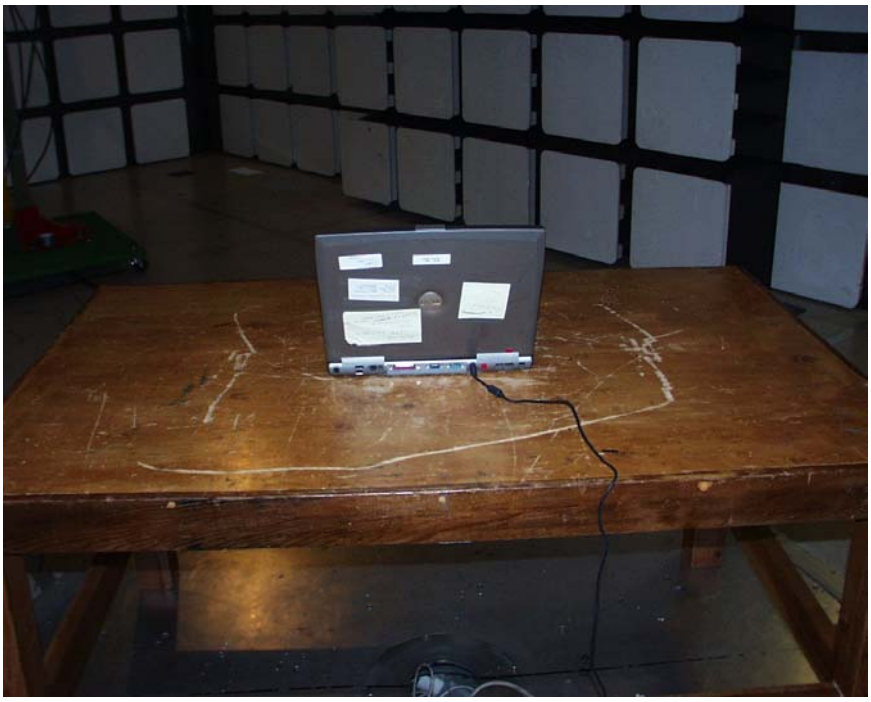
LINE CONDUCTED BACK PHOTO

## 8.3. PRECISION M60 LAPTOP WITH HITACHI ANTENNA SET

**RADIATED RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO

RADIATED BACK PHOTO



## POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

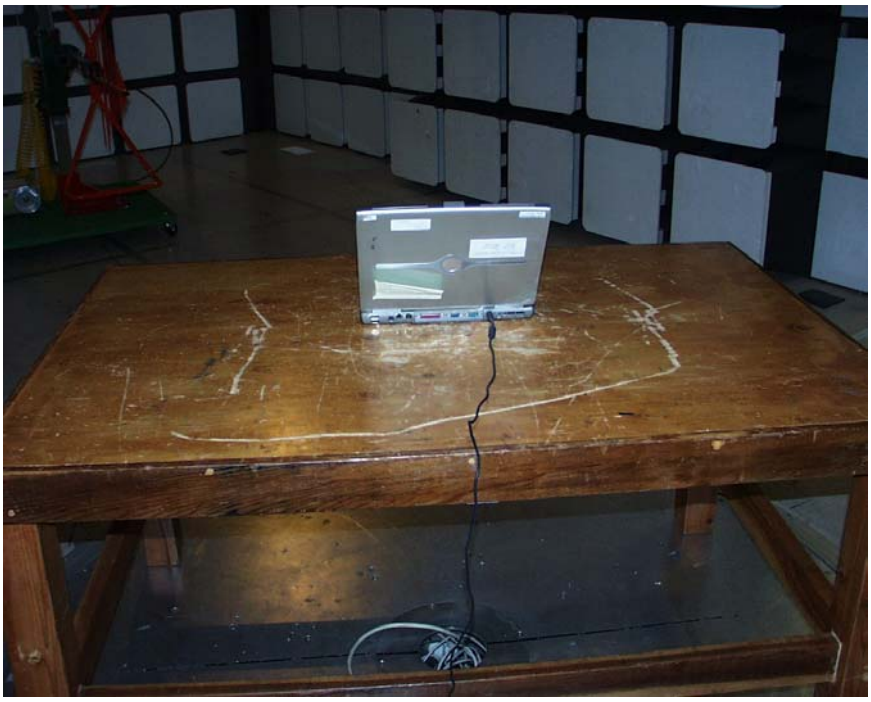
LINE CONDUCTED BACK PHOTO

## 8.4. INSPIRON 510M LAPTOP WITH PHYCOMP ANTENNA SET

**RADIATED RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO

RADIATED BACK PHOTO



## POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

## 8.5. INSPIRON 300M LAPTOP WITH WISTRON ANTENNA SET

**RADIATED RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

## POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

## 8.6. INSPIRON 300M LAPTOP WITH HITACHI ANTENNA SET

**RADIATED RF MEASUREMENT SETUP**

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

## POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO


# END OF REPORT