



**FCC CFR47 PART 15 SUBPART E  
CLASS II PERMISSIVE CHANGE  
CERTIFICATION TEST REPORT**

**FOR**

**802.11 A/B/G INTEL WIRELESS WIFI LINK 4965AG**

**MODEL NUMBER: 4965AG**

**FCC ID: PD9LEN4965AG**

**REPORT NUMBER: 07U10925-5, REVISION C**

**ISSUE DATE: APRIL 17, 2007**

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**NVLAP LAB CODE 200065-0**

Revision History

| <u>Rev.</u> | <u>Issue<br/>Date</u> | <u>Revisions</u>               | <u>Revised By</u> |
|-------------|-----------------------|--------------------------------|-------------------|
| --          | 04/03/07              | Initial Issue                  | T. Chan           |
| B           | 04/13/07              | Corrected Sections 5.1 & 7.1.1 | T. Hong           |
| C           | 04/17/07              | Updated Section 7.1.1          | T. Hong           |

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# 1. ATTESTATION OF TEST RESULTS

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

**EUT DESCRIPTION:** 802.11A/B/G INTEL WIRELESS WIFI LINK 4965AG

**MODEL:** 4965AG

**SERIAL NUMBER:** LV-00470

**DATE TESTED:** MARCH 17-23, 2007

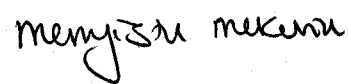
| APPLICABLE STANDARDS  |                         |
|-----------------------|-------------------------|
| STANDARD              | TEST RESULTS            |
| FCC PART 15 SUBPART E | NO NON-COMPLIANCE NOTED |

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:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

MENGISTU MEKURIA  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

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

### 4.2. MEASUREMENT UNCERTAINTY

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

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

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

## **5. EQUIPMENT UNDER TEST**

### **5.1. DESCRIPTION OF EUT**

The EUT is an 802.11a/b/g Wireless WiFi Link.

The radio module is manufactured by Intel.

### **5.2. DESCRIPTION OF CLASS II CHANGE**

1. Add WLAN Main Antenna-1: 25.90354.001, Main Antenna-2: 25.90424.001 and Aux Antenna: 25.90355.001
2. Add Lenovo ThinkPad X61 Tablet Notebook.

### **5.3. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes two PIFA antennas for diversity, at 5.2GHz band with maximum peak gain of 2.54dBi.

### **5.4. SOFTWARE AND FIRMWARE**

The EUT driver software installed in the host support equipment during testing was CRTU, version 9.7.34.0

The test utility software used during testing was CRTU version 4.1.26.0000

### **5.5. WORST-CASE CONFIGURATION AND MODE**

The worst-case channel is determined as the channel with the highest output power. The highest measured output powers were at 5320 MHz for 11a,

The worst-case data rate for this channel is determined to be 6 Mb/s, based on previous experience with 2.4GHz WLAN product design architectures.

The Mobile position and portable X, Y and Z positions have been investigated, Mobile position was determined as the worst-case position for 2.4GHz band and Y position for the 5GHz band.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST |              |                     |                        |        |
|-----------------------------------|--------------|---------------------|------------------------|--------|
| Description                       | Manufacturer | Model               | Serial Number          | FCC ID |
| Laptop                            | Lenovo       | ThinkPad X61 Tablet | LV-00161               | DoC    |
| AC Adaptop                        | Lenovo       | Lenovo              | 11S92P1160Z1ZBGH6C6KK0 | DoC    |

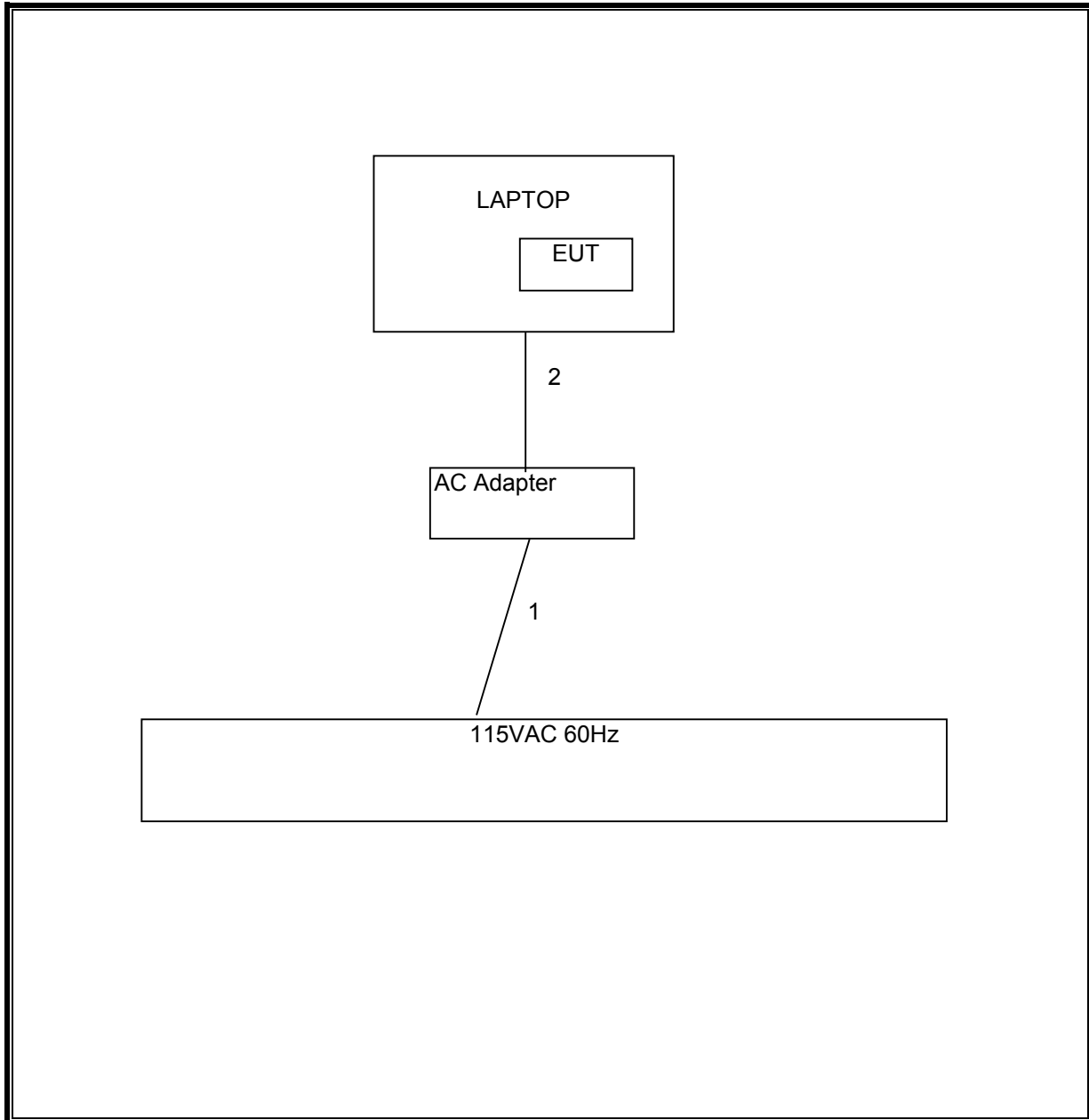
### I/O CABLES

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

### TEST SETUP

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

**SETUP DIAGRAM FOR TESTS**





## 6. TEST AND MEASUREMENT EQUIPMENT

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

| TEST EQUIPMENT LIST             |                |             |               |           |
|---------------------------------|----------------|-------------|---------------|-----------|
| Description                     | Manufacturer   | Model       | Serial Number | Cal Due   |
| Antenna, Horn 1 ~ 18 GHz        | ETS            | 3117        | 29301         | 4/22/2007 |
| Preamplifier, 1 ~ 26.5 GHz      | Agilent / HP   | 8449B       | 3008A00561    | 10/3/2007 |
| Antenna, Horn 18 ~ 26 GHz       | ARA            | MWH-1826/B  | 1049          | 9/12/2007 |
| Preamplifier, 1300 MHz          | Agilent / HP   | 8447D       | 1937A02062    | 1/23/2008 |
| Antenna, Bilog 30 MHz ~ 2 Ghz   | Sunol Sciences | JB1         | A0022704      | 9/3/2007  |
| SA RF Section, 1.5 GHz          | Agilent / HP   | 85680B      | 2814A04227    | 1/7/2008  |
| SA Display Section 2            | Agilent / HP   | 85662A      | 2816A16696    | 4/7/2008  |
| Quasi-Peak Adaptor              | Agilent / HP   | 85650A      | 3145A01654    | 1/21/2008 |
| LISN, 10 kHz ~ 30 MHz           | FCC            | 50/250-25-2 | 114           | 8/30/2007 |
| EMI Test Receiver               | R & S          | ESHS 20     | 827129/006    | 6/3/2007  |
| Peak / Average Power Sensor     | Agilent        | E9327A      | US40440755    | 12/2/2007 |
| Peak Power Meter                | Agilent / HP   | E4416A      | GB41291160    | 12/2/2007 |
| Spectrum Analyzer 3 Hz ~ 44 GHz | Agilent / HP   | E4446A      | MY43360112    | 5/3/2007  |
| 2.4 - 2.5 Reject Filter         | Micro Tronics  | BRM50702    | 3             | N/A       |
| 7.6 GHz High Pass Filter        | Micro Tronics  | HPM13350    | 1             | N/A       |

## 7. LIMITS AND RESULTS

### 7.1. CHANNEL TESTS FOR THE 5150 TO 5350 MHz BAND

#### 7.1.1. 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.

| <b>Mode Channel</b> | <b>Frequency (MHz)</b> | <b>Average Power Chain A (dBm)</b> | <b>Average Power Chain B (dBm)</b> |
|---------------------|------------------------|------------------------------------|------------------------------------|
|---------------------|------------------------|------------------------------------|------------------------------------|

802.11a Mode

|        |      |      |      |
|--------|------|------|------|
| Low    | 5180 | 16.5 | 16.4 |
| Middle | 5260 | 17.5 | 17.6 |
| High   | 5320 | 16.5 | 16.5 |

## 7.2. RADIATED EMISSIONS

### 7.2.1. 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       |
| <sup>1</sup> 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     | ( <sup>2</sup> ) |
| 13.36 - 13.41              |                       |                 |                  |

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

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

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

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

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

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

## **TEST PROCEDURE**

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

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

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

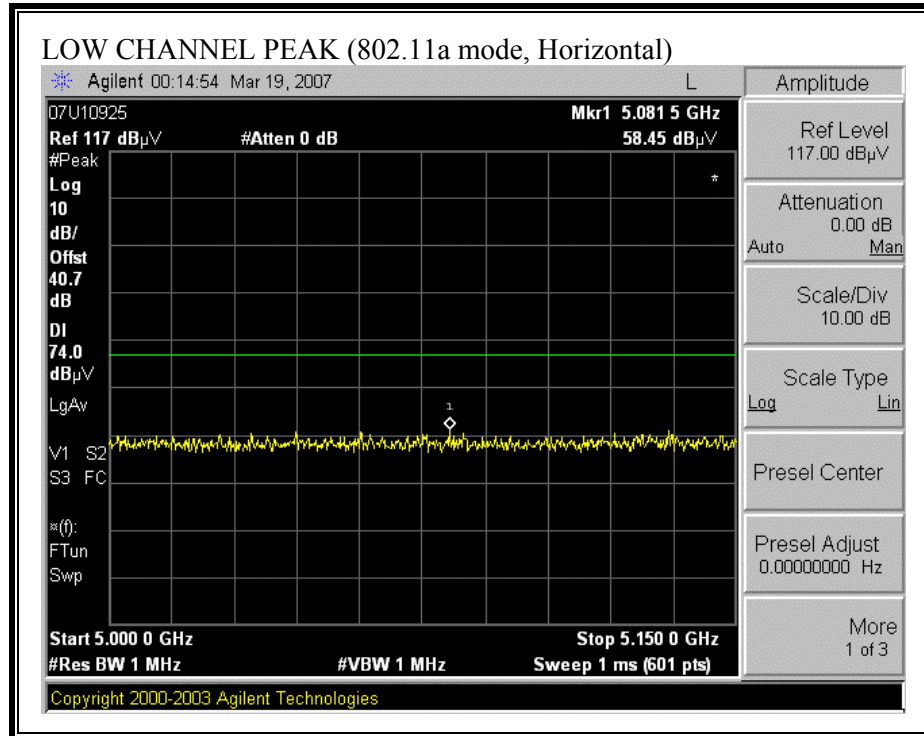
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

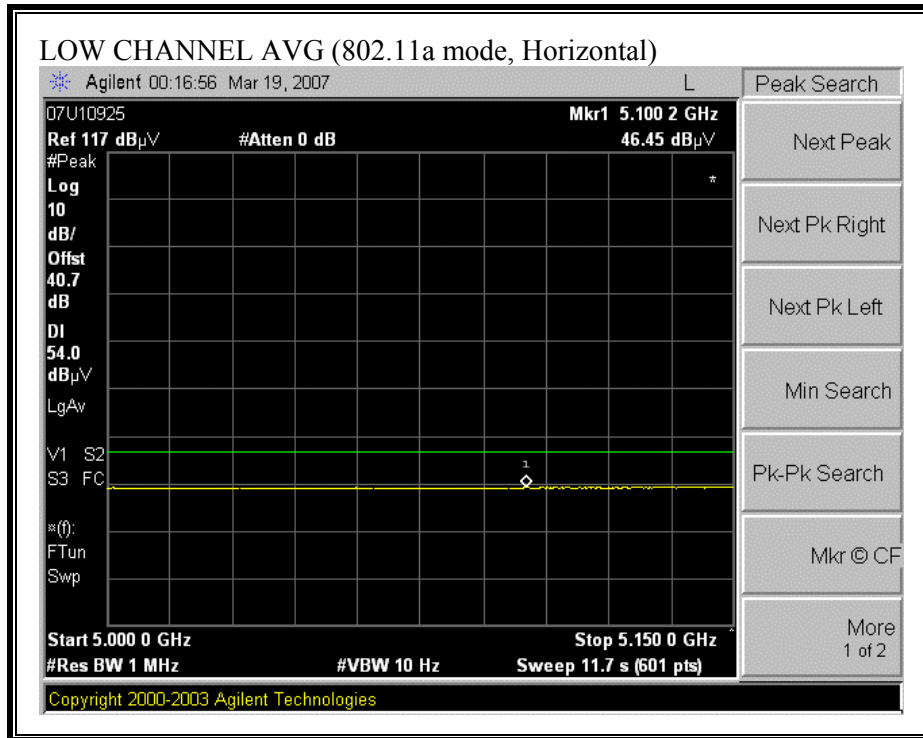
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

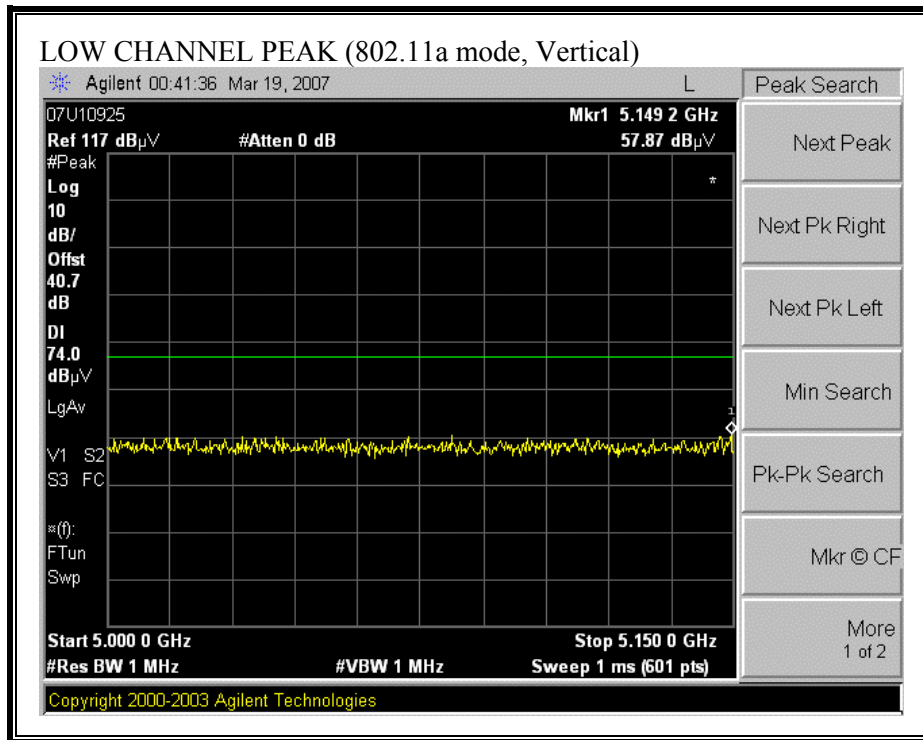
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

### 7.2.2. TRANSMITTER ABOVE 1 GHz FOR 5150 TO 5350 MHz BAND

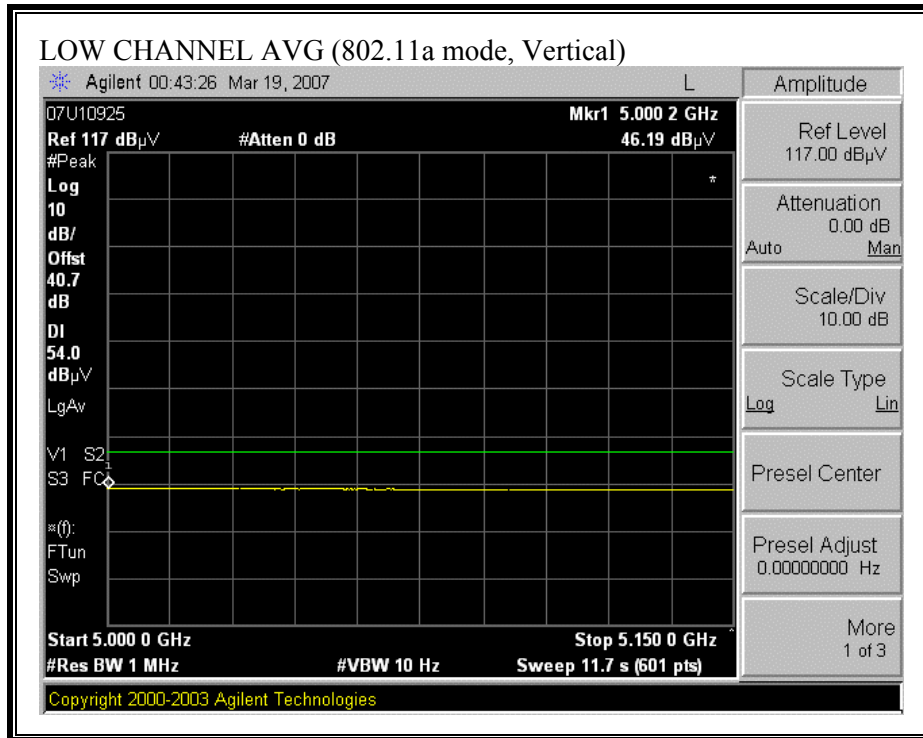
#### RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL)



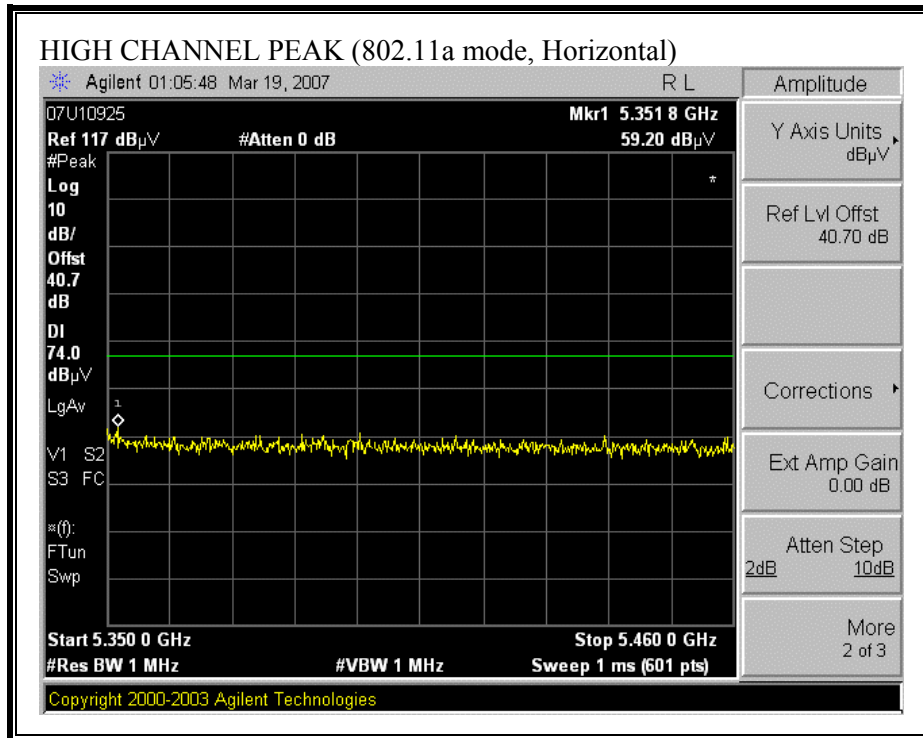


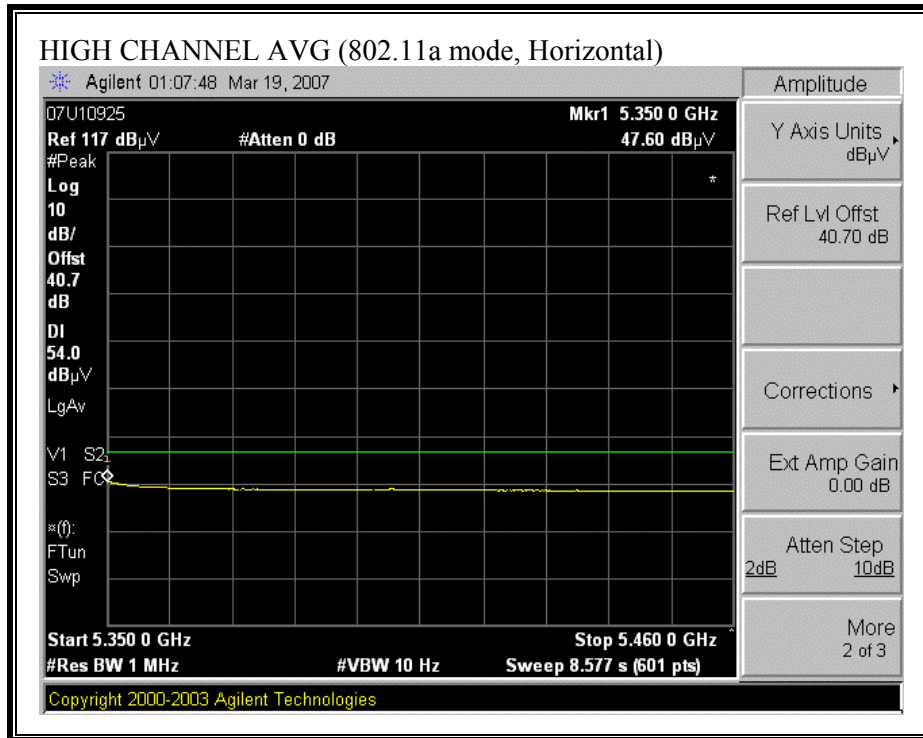


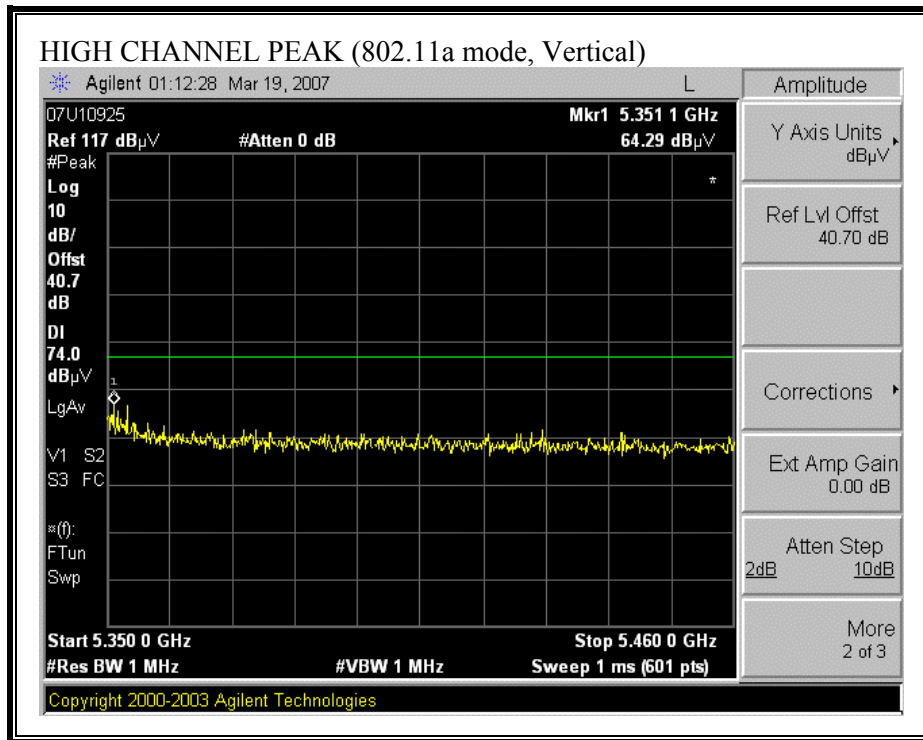


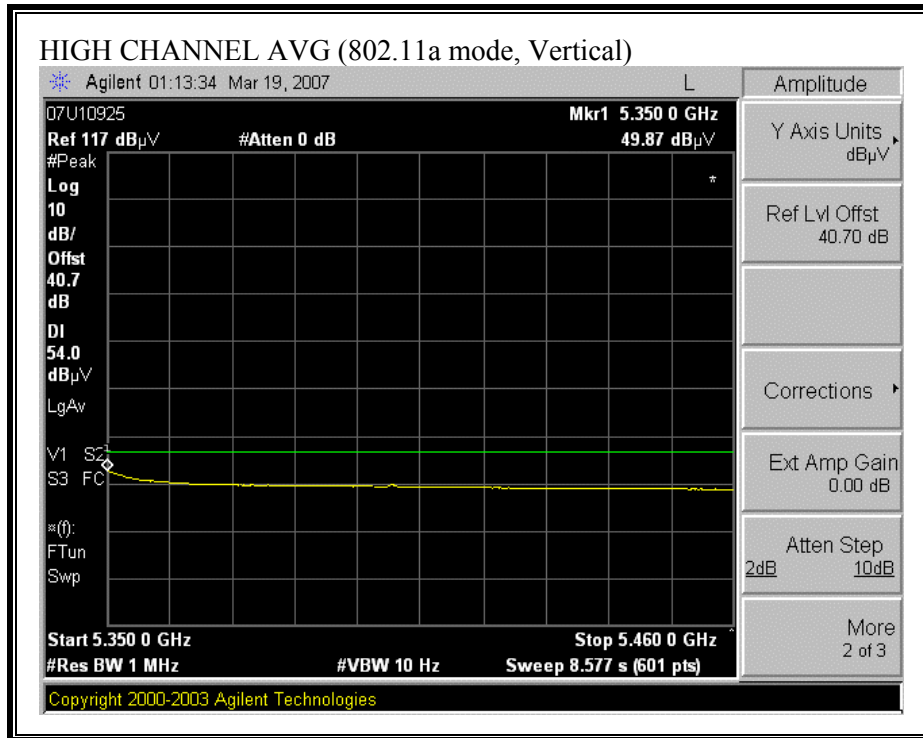


**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL)**









**HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)**

**High Frequency Measurement**  
 Compliance Certification Services, Fremont Chamber B

Company: Intel  
 Project #: 07U10925  
 Date: 3/20/2007  
 Test Engineer: Mengistu Mekuria  
 Configuration: EUT Only  
 Mode: Transmit, 11a mode 5.2GHz

**Test Equipment:**

|                      |                              |                               |                             |              |
|----------------------|------------------------------|-------------------------------|-----------------------------|--------------|
| <b>Horn 1-18GHz</b>  | <b>Pre-amplifier 1-26GHz</b> | <b>Pre-amplifier 26-40GHz</b> | <b>Horn &gt; 18GHz</b>      | <b>Limit</b> |
| T120; S/N: 29310 @3m | T145 Agilent 3008A005        | T88 Miteq 26-40GHz            | T89; ARA 18-26GHz; S/N:1049 | FCC 15.205   |

Hi Frequency Cables

|                     |                     |                      |            |                      |  |
|---------------------|---------------------|----------------------|------------|----------------------|--|
| <b>2 foot cable</b> | <b>3 foot cable</b> | <b>12 foot cable</b> | <b>HPF</b> | <b>Reject Filter</b> | <b>Peak Measurements</b><br>RBW=VBW=1MHz           |
|                     |                     | Gordon 203134001     | HPF_7.6GHz |                      | <b>Average Measurements</b><br>RBW=1MHz ; VBW=10Hz |

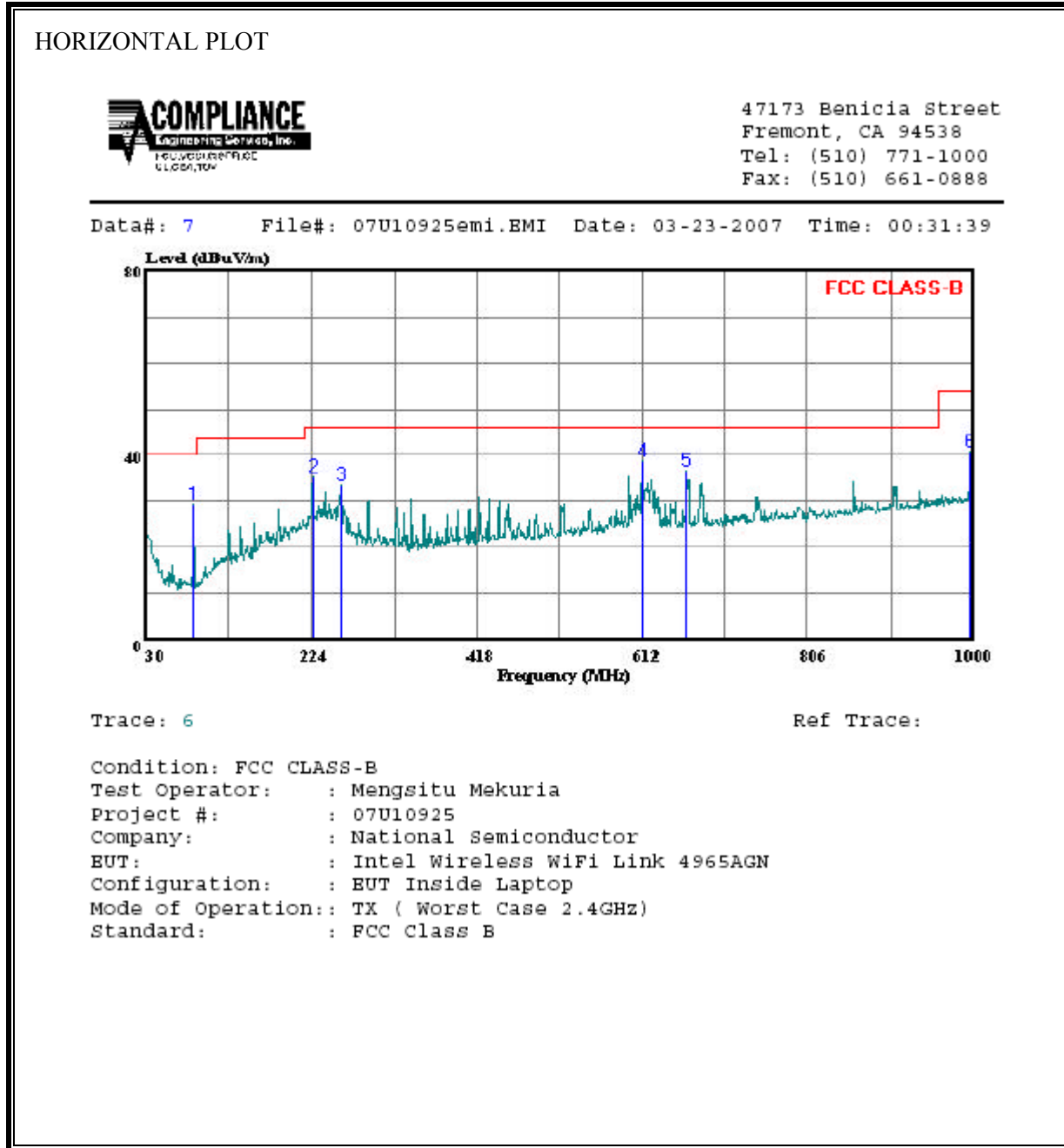
| f GHz                   | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|-------------------------|----------|--------------|----------------|---------|-------|--------|-----------|---------|-------------|------------|---------------|----------------|-----------|------------|-------------|
| <b>Low Ch. 5180MHz</b>  |          |              |                |         |       |        |           |         |             |            |               |                |           |            |             |
| 15.540                  | 3.0      | 44.6         | 31.9           | 39.0    | 12.7  | -32.3  | 0.0       | 0.7     | 64.7        | 52.0       | 74            | 54             | -9.3      | -2.0       | V           |
| 15.540                  | 3.0      | 46.2         | 33.1           | 39.0    | 12.7  | -32.3  | 0.0       | 0.7     | 66.3        | 53.2       | 74            | 54             | -7.7      | -0.8       | H           |
| <b>Mid Ch. 5260MHz</b>  |          |              |                |         |       |        |           |         |             |            |               |                |           |            |             |
| 15.780                  | 3.0      | 45.5         | 32.3           | 39.1    | 12.8  | -32.2  | 0.0       | 0.7     | 65.9        | 52.6       | 74            | 54             | -8.1      | -1.4       | V           |
| 15.780                  | 3.0      | 43.9         | 31.3           | 39.1    | 12.8  | -32.2  | 0.0       | 0.7     | 64.3        | 51.7       | 74            | 54             | -9.7      | -2.3       | H           |
| <b>High Ch. 5320MHz</b> |          |              |                |         |       |        |           |         |             |            |               |                |           |            |             |
| 10.640                  | 3.0      | 47.2         | 32.4           | 37.5    | 10.7  | -34.2  | 0.0       | 0.8     | 61.9        | 47.1       | 74            | 54             | -12.1     | -6.9       | V           |
| 15.960                  | 3.0      | 45.3         | 31.4           | 39.3    | 12.8  | -32.2  | 0.0       | 0.7     | 65.9        | 52.0       | 74            | 54             | -8.1      | -2.0       | H           |
| 10.640                  | 3.0      | 47.2         | 32.4           | 37.5    | 10.7  | -34.2  | 0.0       | 0.8     | 61.9        | 47.1       | 74            | 54             | -12.1     | -6.9       | V           |
| 15.960                  | 3.0      | 46.1         | 32.0           | 39.3    | 12.8  | -32.2  | 0.0       | 0.7     | 66.7        | 52.6       | 74            | 54             | -7.3      | -1.4       | H           |

Rev. 5.1.6  
 Note: No other emissions were detected above the system noise floor.

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

### 7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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



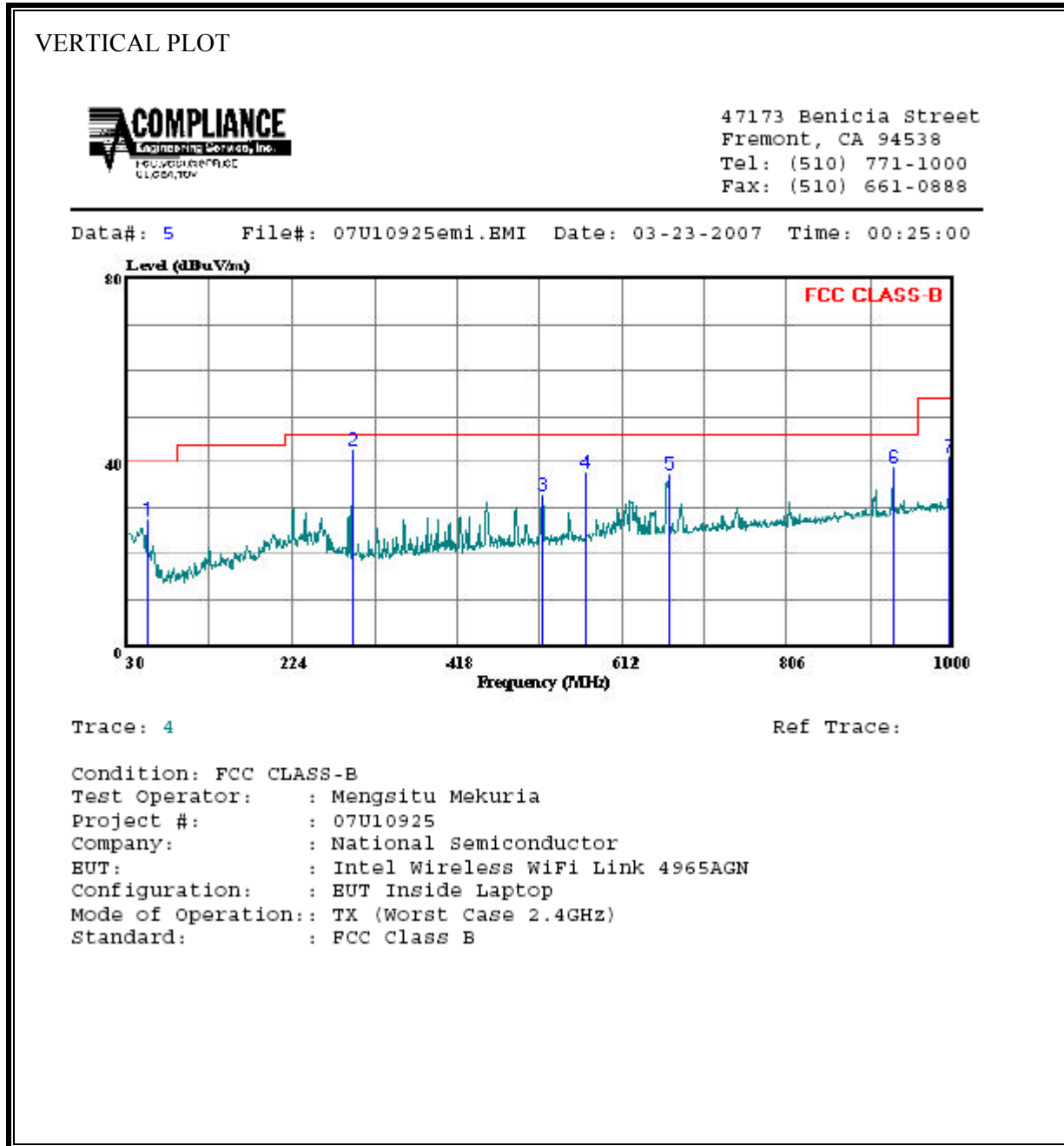
HORIZONTAL DATA

Page: 1

|   | Freq    | Read Level | Probe Factor | Cable Loss | Preamp Factor | Level  | Limit Line | Over Limit | Remark |
|---|---------|------------|--------------|------------|---------------|--------|------------|------------|--------|
|   | MHz     | dBuV       | dB           | dB         | dB            | dBuV/m | dBuV/m     | dB         |        |
| 1 | 85.290  | 52.30      | 7.90         | 0.97       | 31.69         | 29.48  | 40.00      | -10.52     | Peak   |
| 2 | 225.940 | 53.90      | 11.50        | 1.60       | 31.58         | 35.42  | 46.00      | -10.58     | Peak   |
| 3 | 258.920 | 51.00      | 12.53        | 1.72       | 31.64         | 33.61  | 46.00      | -12.39     | Peak   |
| 4 | 612.000 | 48.40      | 19.44        | 2.76       | 31.92         | 38.68  | 46.00      | -7.32      | Peak   |
| 5 | 663.410 | 45.60      | 20.11        | 2.83       | 31.96         | 36.59  | 46.00      | -9.41      | Peak   |
| 6 | 996.120 | 43.80      | 23.64        | 3.60       | 30.14         | 40.89  | 54.00      | -13.11     | Peak   |



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



VERTICAL DATA

Page: 1

|   | Freq    | Read Level | Probe Factor | Cable Loss | Preamp Factor | Level  | Limit Line | Over Limit | Remark |
|---|---------|------------|--------------|------------|---------------|--------|------------|------------|--------|
|   | MHz     | dBuV       | dB           | dB         | dB            | dBuV/m | dBuV/m     | dB         |        |
| 1 | 54.250  | 50.20      | 8.27         | 0.75       | 31.75         | 27.47  | 40.00      | -12.53     | Peak   |
| 2 | 295.780 | 58.70      | 13.79        | 1.84       | 31.59         | 42.74  | 46.00      | -3.26      | Peak   |
| 3 | 518.880 | 43.90      | 18.25        | 2.52       | 31.78         | 32.89  | 46.00      | -13.11     | Peak   |
| 4 | 568.350 | 48.20      | 18.89        | 2.62       | 31.81         | 37.90  | 46.00      | -8.10      | Peak   |
| 5 | 666.320 | 46.50      | 20.15        | 2.85       | 31.94         | 37.56  | 46.00      | -8.44      | Peak   |
| 6 | 930.160 | 43.30      | 23.03        | 3.55       | 30.95         | 38.93  | 46.00      | -7.07      | Peak   |
| 7 | 996.120 | 44.10      | 23.64        | 3.60       | 30.14         | 41.19  | 54.00      | -12.81     | Peak   |

## 7.2.4. MAXIMUM PERMISSIBLE EXPOSURE

### LIMITS

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

**Table 5**  
**Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)**

| 1<br>Frequency<br>(MHz) | 2<br>Electric Field<br>Strength; rms<br>(V/m) | 3<br>Magnetic Field<br>Strength; rms<br>(A/m)   | 4<br>Power<br>Density<br>(W/m <sup>2</sup> ) | 5<br>Averaging<br>Time<br>(min)   |
|-------------------------|---|---|--|-----------------------------------|
| 0.003–1                 | 280   | 2.19  |  | 6                                 |
| 1–10                    | 280/ <i>f</i>                                 | 2.19/ <i>f</i>                                  |  | 6                                 |
| 10–30                   | 28  | 2.19/ <i>f</i>                                  |  | 6                                 |
| 30–300                  | 28  | 0.073   | 2*   | 6                                 |
| 300–1 500               | 1.585 <i>f</i> <sup>0.5</sup>                 | 0.0042 <i>f</i> <sup>0.5</sup>                  | <i>f</i> /150                                | 6                                 |
| 1 500–15 000            | 61.4  | 0.163   | 10   | 6                                 |
| 15 000–150 000          | 61.4  | 0.163   | 10   | 616 000 / <i>f</i> <sup>1.2</sup> |
| 150 000–300 000         | 0.158 <i>f</i> <sup>0.5</sup>                 | 4.21 x 10 <sup>-4</sup> <i>f</i> <sup>0.5</sup> | 6.67 x 10 <sup>-5</sup> <i>f</i>             | 616 000 / <i>f</i> <sup>1.2</sup> |

\* Power density limit is applicable at frequencies greater than 100 MHz.

- Notes:**
1. Frequency, *f*, is in MHz.
  2. A power density of 10 W/m<sup>2</sup> is equivalent to 1 mW/cm<sup>2</sup>.
  3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

## **CALCULATIONS**

Given

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

and

$$S = E^2 / 377$$

where

E = Field Strength in Volts/meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power Density in watts/square meter

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

$$d = \sqrt{((30 * P * G) / (377 * S))}$$

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

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

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

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (377 * S))}$$

$$d = 0.892 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in W/m<sup>2</sup>

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.892 * 10^{((P + G) / 20)} / \sqrt{S}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in W/m<sup>2</sup>

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

$$S = 0.795 * 10^{((P + G) / 10)} / (d^2)$$

**LIMITS**

From IC Safety Code 6, Section 2.2 Table 5 Column 4,  $S = 10 \text{ W/m}^2$

**RESULTS**

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

| <b>Mode</b> | <b>MPE Distance (cm)</b> | <b>Output Power (dBm)</b> | <b>Antenna Gain (dBi)</b> | <b>Power Density (<math>\text{W/m}^2</math>)</b> |
|-------------|--------------------------|---------------------------|---------------------------|--|
| 5.2GHz Band | 20.0                     | 20.60                     | 2.54                      | 0.41   |

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

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

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

\*Decreases with the logarithm of the frequency.

#### TEST PROCEDURE

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

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

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

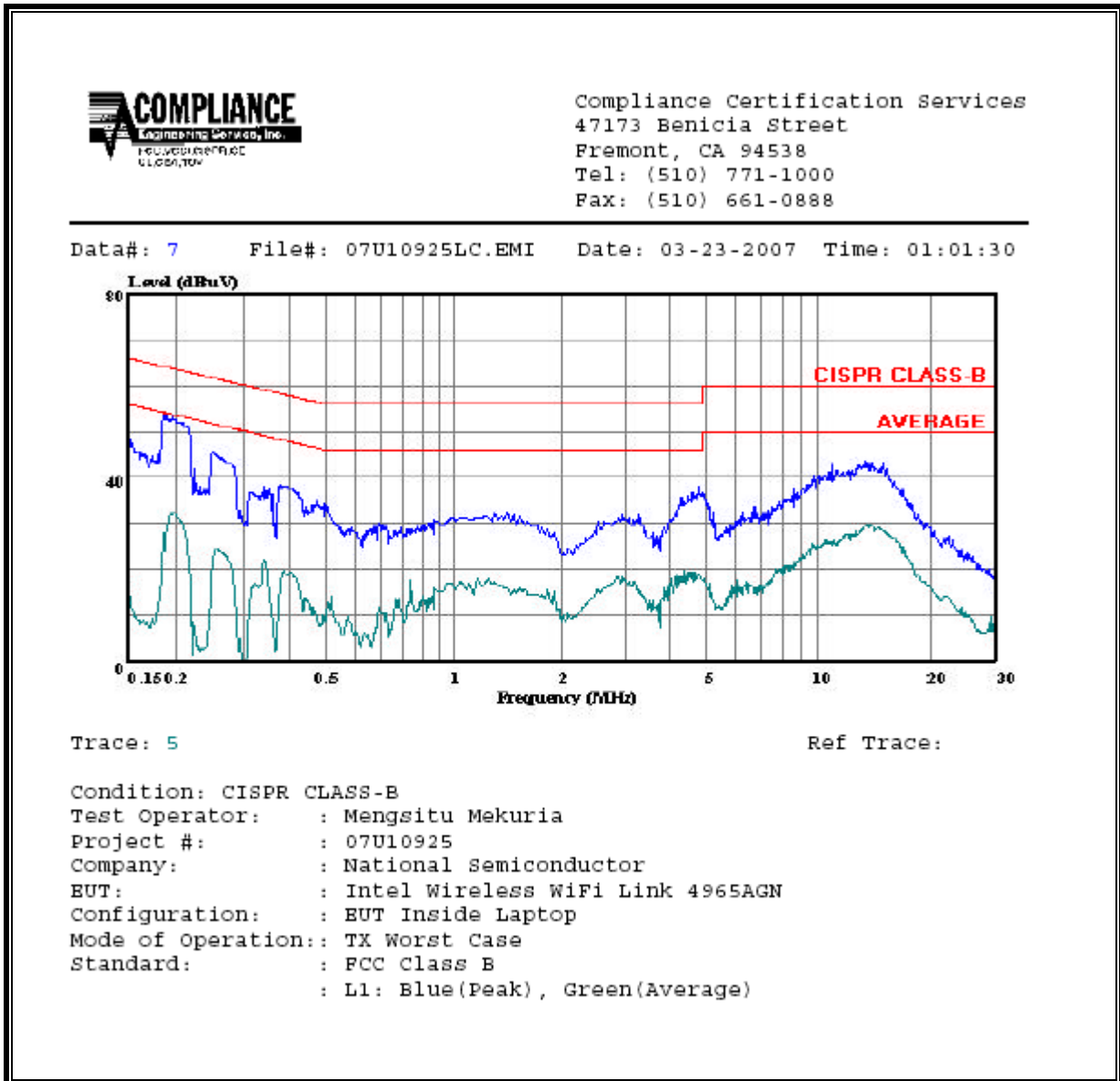
#### RESULTS

No non-compliance noted:

**6 WORST EMISSIONS**

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) |           |           |           |       |       |       |         |         |         |
|--|-----------|-----------|-----------|-------|-------|-------|---------|---------|---------|
| Freq.                                  | Reading   |           |           | Closs | Limit | EN B  | Margin  |         | Remark  |
| (MHz)                                  | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB)  | QP    | AV    | QP (dB) | AV (dB) | L1 / L2 |
| 0.19                                   | 53.62     | --        | 32.38     | 0.00  | 64.12 | 54.12 | -10.50  | -21.74  | L1      |
| 4.85                                   | 38.10     | --        | --        | 0.00  | 56.00 | 46.00 | -17.90  | -7.90   | L1      |
| 13.62                                  | 43.12     | --        | --        | 0.00  | 60.00 | 50.00 | -16.88  | -6.88   | L1      |
| 0.20                                   | 49.41     | --        | 36.98     | 0.00  | 63.61 | 53.61 | -14.20  | -16.63  | L2      |
| 4.53                                   | 35.88     | --        | --        | 0.00  | 56.00 | 46.00 | -20.12  | -10.12  | L2      |
| 13.70                                  | 43.06     | --        | --        | 0.00  | 60.00 | 50.00 | -16.94  | -6.94   | L2      |
| 6 Worst Data                           |           |           |           |       |       |       |         |         |         |

**LINE 1 RESULTS**





**LINE 2 RESULTS**

