AEGIS LABS INC.

# Test Report
# And Application for Grant of Equipment Authorization

Pertaining To:

| EUT | FCC ID: |
|---|---|
| **Hewlett Packard Notebook Computer Series PP2170** | **CNTPP2170** |

| Configuration |
|---|
| **Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module, MN: WM3B2100** |

*MEASUREMENTS PERFORMED IN ACCORDANCE WITH*

| Regulatory Standard(s) |
|---|
| 47 CFR Part 15, Subpart C Section 15.247<br><br>Test Method:<br>ANSI C63.4: 1992 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz |

ACCREDITED

Certificate Number: 1111.01

**APPLICANT:**

Hewlett Packard Company
20555 SH 249
Houston, TX 77070

Contact(s): Mr. David Wissel

**PREPARED BY:**

Aegis Labs, Inc.
22431 Antonio Parkway B160-417
Rancho S. Margarita, CA 92688

Agent(s): Mr. Steve Kuiper
Mr. Rick Candelas

Test Report #: INTEL-030811F
Test Report Revision: B, 09-22-03

| | REPORT BODY | APPENDICES | TOTAL PAGES |
|---|---|---|---|
| | | *A* | |
| PAGES | 15 | 31 | 46 |





23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AEGIS LABS INC.

# TABLE OF CONTENTS






23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 1.0 CERTIFICATION OF TEST DATA

Aegis Labs, Inc. operates as both a Nevada and California Corporation with no organizational or financial relationship with any company, institution, or private individual.

Testing and engineering functions provided by Aegis Labs are furnished through the use of part-time, full-time or consulting engineers with the appropriate qualifications to carry out their duties. The intended purpose of this test report is to describe the measurement procedure and to determine whether the equipment under test "EUT" complies with both the conducted and radiated limits. Limits for emissions testing are described under Subpart C of Part 15 of the FCC rules.

The data, data evaluation and equipment configuration represented herein are a true and accurate representation of the Equipment Under Test (EUT) under the requirements specified in the emissions standard as described below. The test results contained in this report are only representative of the test sample tested as described in Section 3.0 of this report. Certification of the EUT is required as a prerequisite to marketing as defined in Part 2 of the FCC Rules.

**Prepared By:**

**08/12/03**

**Rick Candelas** **Date:**
**Staff Engineer**
**Aegis Labs, Inc.**

**Report Approved By:**

**08/12/03**

**Steve J. Kuiper** **Date:**
**Quality Assurance Manager**
**Aegis Labs, Inc.**



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 2.0 SUMMARY OF TEST RESULTS

The test results provided within this report, indicate that the EUT has been found to be in **COMPLIANCE** with the test specifications based upon the following RF compliance standards:

Pass/Fail determination is based upon the nominal values of the test data.

| EMISSIONS STANDARD | | | |
|---|---|---|---|
| **FCC Part 15 Section** | **Description** | **Results** | **Comments** |
| 15.247(a)(2) | The minimum 6dB bandwidth shall be at least 500 kHz. | PASSED | 2.412 GHz = 12.42 MHz<br>2.437 GHz = 12.50 MHz<br>2.462 GHz = 12.67 MHz |
| 15.247(b)(1) | The maximum peak output power of the intentional radiator shall not exceed 1 watt. | PASSED | 2.412 GHz = 16.75 dBm (0.0473 W)<br>2.437 GHz = 16.45 dBm (0.0479 W)<br>2.462 GHz = 16.82 dBm (0.0481 W) |
| 15.247(b)(4) | The intentional radiator shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the FCC guidelines per Section 1.1307(b)(1). | PASSED | Refer to MPE Calculations |
| 15.247(c) | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. | PASSED | Conducted spurious emissions < -20dBc<br>(Refer to Data Sheets) |
| 15.247(c) | Radiated emissions, which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a). All others must be < -20dBc. | PASSED | -8.20 dB @ 2483.5 MHz<br>(Vertical Polarization) |
| 15.247(d) | The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. | PASSED | 2.412 GHz = -7.33 dBm<br>2.437 GHz = -7.17 dBm<br>2.462 GHz = -7.50 dBm |
| 15.207 | AC Conducted Emissions | PASSED | -4.64dB @ 0.1521 MHz |
| CISPR22 | Radiated Emissions (30-1000 MHz) | PASSED | -6.56dB @ 299.73 MHz<br>(Vertical Polarization) |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 3.0 ADMINISTRATIVE DATA AND TEST DESCRIPTION

| | |
|---|---|
| **DEVICE TESTED:** | ITE Type: Hewlett Packard Notebook Computer Series PP2170<br>Model Number(s): Series PP2170<br>Serial Number: J3715PV017<br>FCC ID: CNTPP2170 |
| | |
| **TEST DATE(S):** | August 11-12, 2003 |
| **DATE EUT RECEIVED:** | August 11, 2003 |
| | |
| **ORIGIN OF TEST SAMPLE(S):** | Production Unit |
| | |
| **RESPONSIBLE PARTY:** | Hewlett Packard Company<br>20555 SH 249<br>Houston, TX 77070 |
| | |
| **CLIENT CONTACT:** | Mr. David Wissel |
| **MANUFACTURER:** | Hewlett Packard Company |
| | |
| **TEST LOCATION:** | Aegis Labs, Inc.<br>32231 Trabuco Creek Road<br>Trabuco Canyon, CA 92678<br>Conducted Site #2<br>Radiated Site #2 |
| | |
| **A2LA CERTIFICATE:** | 1111.01, Valid through February 28, 2004 |
| | |
| **PURPOSE OF TEST:** | To demonstrate compliance with the relevant standards described in Section 2.0 of this report. |
| | |
| **TEST(S) PERFORMED:** | Refer to Table in Section 2.0 of this report. |

All calibration vendors were responsible for certifying Aegis Labs, Inc. test equipment as per the manufacturer's specifications and that the equipment is calibrated using instruments and standards where the accuracy is traceable to the National Institute of Standards and Technology (NIST). Calibration of all test equipment conforms to ANSI/NCSL Z540-1 and ISO 10012-1 and/or ISO/IEC Guide 17025 compliance (Additionally, other pertinent test equipment will carry MIL-STD-45662A). All calibration documents are on file with Aegis Labs, Inc., with copies provided upon request.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 4.0 DESCRIPTION OF EUT

4.1 EUT Description

| Equipment Under Test (EUT) | |
|---|---|
| **Trade Name:** | Hewlett Packard Notebook Computer Series PP2170 |
| **Model Number:** | Series PP2170 tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module, MN: WM3B2100 |
| **Frequency Range:** | 2.412 – 2.462 GHz |
| **Type of Transmission:** | Direct Sequence Spread Spectrum |
| **Transfer Rate:** | 1/2/5.5/11 Mbps |
| **Number of Channels:** | 11 |
| **Modulation Type:** | DBPSK, DQPSK, CCK |
| **Antenna Type:** | PIFA Triple Band Antenna |
| **Antenna Gain (See Note 2):** | Main = -0.65dBi<br>Aux = 0.35dBi |
| **Transmit Output Power:** | 16 dBm (Typical) Please see Appendix I (Data Sheets) for actual output power. |
| **Power Supply:** | 3.3VDC from computer MPCI slot. |
| **Number of External Test Ports Exercised:** | 2 Antenna Ports (1 Main & 1 Auxiliary) |

The Hewlett Packard Notebook Computer Series PP2170 was tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module is an embedded 2.4 GHz Wireless Local Area Network Mini-PCI adapter. The Mini-PCI Type 3B form factor is designed for notebook computer systems where overall thickness must be kept to an absolute minimum and connect to antennas internal to the notebook computer. It is capable of a data rate of up to 11 Mbps.

**NOTE 1:** For a more detailed description, please refer to the manufacture's specifications or User's Manual.

**NOTE 2:** Refer to the antenna specifications for a further description of the antennas. Antennas will be professionally installed inside the laptop computer by the laptop vendor.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

### 4.1.1 Channel Number and Frequencies

Eleven channels are provided for the EUT.

| Channel | Frequency (MHz) |
|---|---|
| 1 | 2412 |
| 2 | 2417 |
| 3 | 2422 |
| 4 | 2427 |
| 5 | 2432 |
| 6 | 2437 |
| 7 | 2442 |
| 8 | 2447 |
| 9 | 2452 |
| 10 | 2457 |
| 11 | 2462 |

## 4.2 EUT Configuration

The EUT was set-up according to the ANSI C63.4: 1992 guidelines for emissions testing. All the appropriate test ports were exercised during both the pre-qualification and final evaluation scans.

The EUT was tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot and was connected to a set of Wistron NeWeb corp. triple band antennas via its main and auxiliary Ipex/Hirose antenna ports. Data can be found in Appendix A.

The Hewlett Packard Company notebook computer series PP2170 was connected to a Hewlett Packard printer, Logitech mouse, Dell LCD monitor, and Hayes modem via its parallel, USB, video, and serial ports respectively.

The EUT was transmitting on the channel stated in each test description at the maximum power.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

4.3 List of EUT, Sub-Assemblies, and Host Equipment

| LIST OF EUT AND SUB-ASSEMBLIES | | | |
|---|---|---|---|
| **Equipment Name** | **Manufacturer** | **Model Number** | **Serial Number** |
| Notebook Computer | Hewlett-Packard | Series PP2170 | N/A |
| **EUT Sub-Assemblies** | | | |
| 802.11b MiniPCI Type IIIB Wireless Module | Intel Corporation | WM3B2100 | 00042351595D |
| Auxiliary Triple Band Antenna | Winstron NeWeb Corp. | PN: 6036A0004701 | N/A |
| Main Triple Band Antenna | Winstron NeWeb Corp. | PN: 6036A0004601 | N/A |

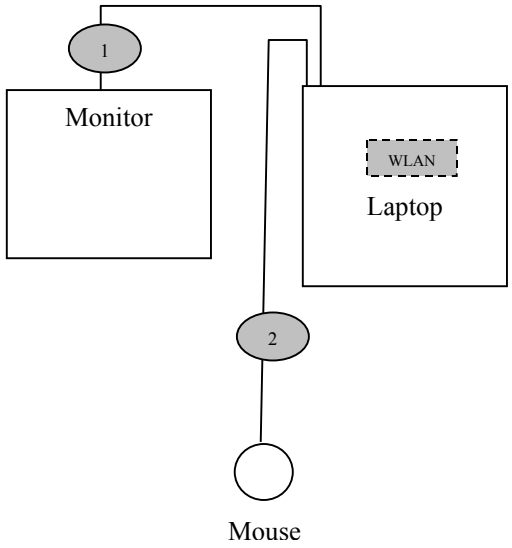
| HOST EQUIPMENT LIST | | | |
|---|---|---|---|
| **Equipment Name** | **Manufacturer** | **Model Number** | **Serial Number** |
| LCD Monitor | Dell | E151FPp | CN-06R644-47804-34R-LATL |
| Mouse | Logitech | M-BJ58 | LNA22802012 |

NOTE: All the power cords of the above support equipment are standard non-shielded, 1.8 meters long.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 4.4 I/O Cabling Diagram and Description




Cable 1: This is a 6-foot braid and foil shielded round cable connecting the Hewlett Packard Company notebook computer with the Dell LCD monitor. It has metallic DB-15 type connector at the computer end and is hardwired to the monitor. The cable is bundled to a length of one meter and the shield of the cable is grounded to the chassis of both devices via the connector shells.

Cable 2: This is a 6-foot braid and foil shielded round cable connecting the Hewlett Packard Company notebook computer to the Logitech mouse. It has a metallic USB-B type connector at the computer end and is hardwired to the mouse. The shield of the cable is grounded to the chassis of the computer via the connector shell.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 5.0 TEST EQUIPMENT AND TEST SETUPS

The test equipment settings and functions are selected using the guidance of ANSI C63.4-1992. All test equipment setups and operations during conducted and radiated emissions testing are in accordance with this reference document.

### 5.1 AC Power Line Conducted Emissions

During conducted emissions measurements, a spectrum analyzer was used as the measuring instrument along with a preselector and quasi-peak detector. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage. The conducted emissions from the EUT in the frequency range from 150 kHz to 30 MHz were captured for graphical display through the use of automated LABVIEW EMI measurement software. All graphical readings were measured in the "Peak" mode only to reduce testing time. Upon completion of the graphical scan, the test lab personnel performed the conducted measurement scan manually using the spectrum analyzer front panel keys. All peak measurements coming within 3 dB of the limit line were "Averaged" and/or "Quasi-Peaked" and denoted appropriately in the EXCEL spreadsheet.

The Equipment Under Test (EUT) was configured as a system with peripherals connected, so that at least one interface port of each type is connected to one external peripheral when tested for conducted emissions according to ANSI C63.4: 1992. Excess power cord length was wrapped in a bundle 30 to 40 centimeters in length near the center of the cord. The EUT was tested in a tabletop configuration.

The emission readings for Line 1 and Line 2 are highlighted on the data sheets in Appendix A. The graphical scans only reflects peak readings while the tabulated data sheets reflect peak, average, and/or quasi-peak readings which ever applies.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 5.2 Spurious Radiated Emissions

A spectrum analyzer was used as the measuring instrumentation along with a preselector and quasi-peak-detector. The pre-amplifiers were used to increase the sensitivity of the instrument. The spectrum analyzer was used in the peak detector mode with the "max-hold" feature activated and in Positive Peak mode. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps. The quasi-peak detector was used only for those readings, which are marked accordingly in the data sheet. The effective measurement bandwidth used for the radiated emissions test was 120 kHz for (30 MHz- 1000 MHz). The spectrum analyzer operated such that the modulation of the signal was filtered out to set the analyzer in linear mode. For testing beyond 1000 MHz a spectrum analyzer capable of taking reading above 1000 MHz was connected to the high frequency amplifier, where these measurement readings were taken with the transducer placed at a 3-meter test distance from the EUT.

The Open Area Test Sites (OATS) was used for radiated emission testing. These test sites are designed according to ANSI C63.4: 1992 and ANSI C63.7: 1992 guidelines. The Measurements were conducted in accordance with ANSI C63.4: 1992 and ANSI C63.7: 1992 requirements.

Broadband biconical, log periodic, and horn antennas were used as transducers during the measurement reading phase. The frequency spans were wide (30 MHz-88 MHz, 88 MHz- 216 MHz, 216 MHz- 300 MHz, and 300 MHz- 1000 MHz). After 1000 MHz the horn antenna was used to measure emissions. The emission readings in both horizontal and vertical polarities are highlighted on the data sheets in Appendix A.

## 5.3 Conducted Emissions at the Antenna Port

A spectrum analyzer or power meter was used as the measuring instrumentation along with an attenuator and/or filter connected to the EUT antenna port. The attenuator and filters are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission. . The instruments recorded the measured readings with the bandwidths (video and resolution) set in accordance with the FCC Rules and regulations.

The measured readings are on the data sheets in Appendix A.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 5.4 Test and Measurement Equipment Used

| TEST EQUIPMENT USED | | | | | |
|---|---|---|---|---|---|
| **Equipment Name** | **Manufacturer** | **Model Number** | **Serial Number** | **Calibration Due Date** | **Calibration Cycle** |
| EMI Receiver - RF Section | Hewlett Packard | 85462A | 3325A00137 | 12/16/03 | 1 Year |
| EMI Receiver - RF Filter Section | Hewlett Packard | 85460A | 3330A00138 | 12/16/03 | 1 Year |
| Attenuator - 5W-10dB | Pasternack | PE7014-10 | N/A | 11/03/03 | 1 Year |
| LISN (EUT) | FCC | FCC-LISN-50-25-2 | 9931 | 02/20/04 | 1 Year |
| LISN (Access) | Com-Power | LI-200 | 12019 | 01/25/04 | 1 Year |
| LISN (Access) | Com-Power | LI-200 | 12018 | 01/25/04 | 1 Year |
| Spectrum Analyzer | Agilent | 8564EC | 4046A00387 | 02/28/04 | 2 Years |
| Preamplifier | Agilent | 8449B | 3008A01573 | 04/29/04 | 2 Years |
| High Pass Filter | Microwave Circuits, Inc. | H3G020G2 | 0301DC0132 | 04/29/04 | 2 Years |
| Antenna - Biconical | EMCO | 3110 | 9108-1421 | 02/11/04 | 1 Year |
| Antenna - Log Periodic | EMCO | 3148 | 4947 | 02/11/04 | 1 Year |
| 1-18 GHz Antenna - Horn | EMCO | 3115 | 2230 | 09/14/03 | 1 Year |
| 18-26.5 GHz Antenna – Horn | Custom Microwave | H042 | 001 | 05/09/04 | 1 Year |
| Power Meter | Rohde & Schwarz | NRVS | DE30863 | 07/21/05 | 2 Years |
| Power Sensor | Leistungsmesskoph | NRV-Z5 | 844855/012 | 07/21/05 | 2 Years |
| Temperature/Humidity Monitor | Dickson | TH550 | 7255185 | 01/18/04 | 1 Year |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 6.0 SAMPLE CALCULATIONS

If a preamplifier is used during the Radiated Emissions Testing, it is required that the amplifier gain be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna, cable and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the Automatic Mode of A.R.M.S. measurements, these considerations are automatically presented as a part of the printout. In the case of manual measurements and for greater efficiency and convenience, usage of the calibration correction factors in the Appendices is necessary to calculate the Corrected Meter Reading. These correlation factors for each meter reading, shall be modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" (CML).

The equation shall be derived in the following manner:

Corrected Meter Reading = Meter Reading + F +C –G - D

Where, F = Antenna Factor
C = Cable Factor
G = Amplifier Gain
D = Distance Factor

Therefore, the equation for determining the Corrected Meter Reading Limit (CML) is:

CML = Specification Limit - F - C + G + D

For the manual mode of measurement, a table of corrected meter reading limits shall be used to permit immediate comparison of the meter reading to determine if the measured emission amplitude exceeded the specification limit at that specific frequency. There shall be two calculation sheets done, one for three meter and one for ten-meter measurement distances, where applicable. The correction factors for the antenna and the amplifier gain are attached in the Appendices.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 7.0 MODIFICATIONS AND RECOMMENDATIONS

No modifications were made to the EUT.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AEGIS LABS INC.

# APPENDIX A

# *TEST DATA*



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AEGIS LABS INC.

## AC POWER LINE CONDUCTED EMISSIONS TEST RESULTS

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/12/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-06 |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 22 C |
| | | **HUMIDITY:** | 76% RH |
| | | **TIME:** | 8:00 AM |

| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.207 |
| **Description:** | AC Power Line Conducted Emissions |
| **Results:** | Passes the conducted limits by –4.64@ 0.1521 MHz |

| **Conducted Limits** | | |
|---|---|---|
| **Frequency (MHz)** | **Quasi-Peak Limit (dBuV)** | **Average Limit (dBuV)** |
| 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.

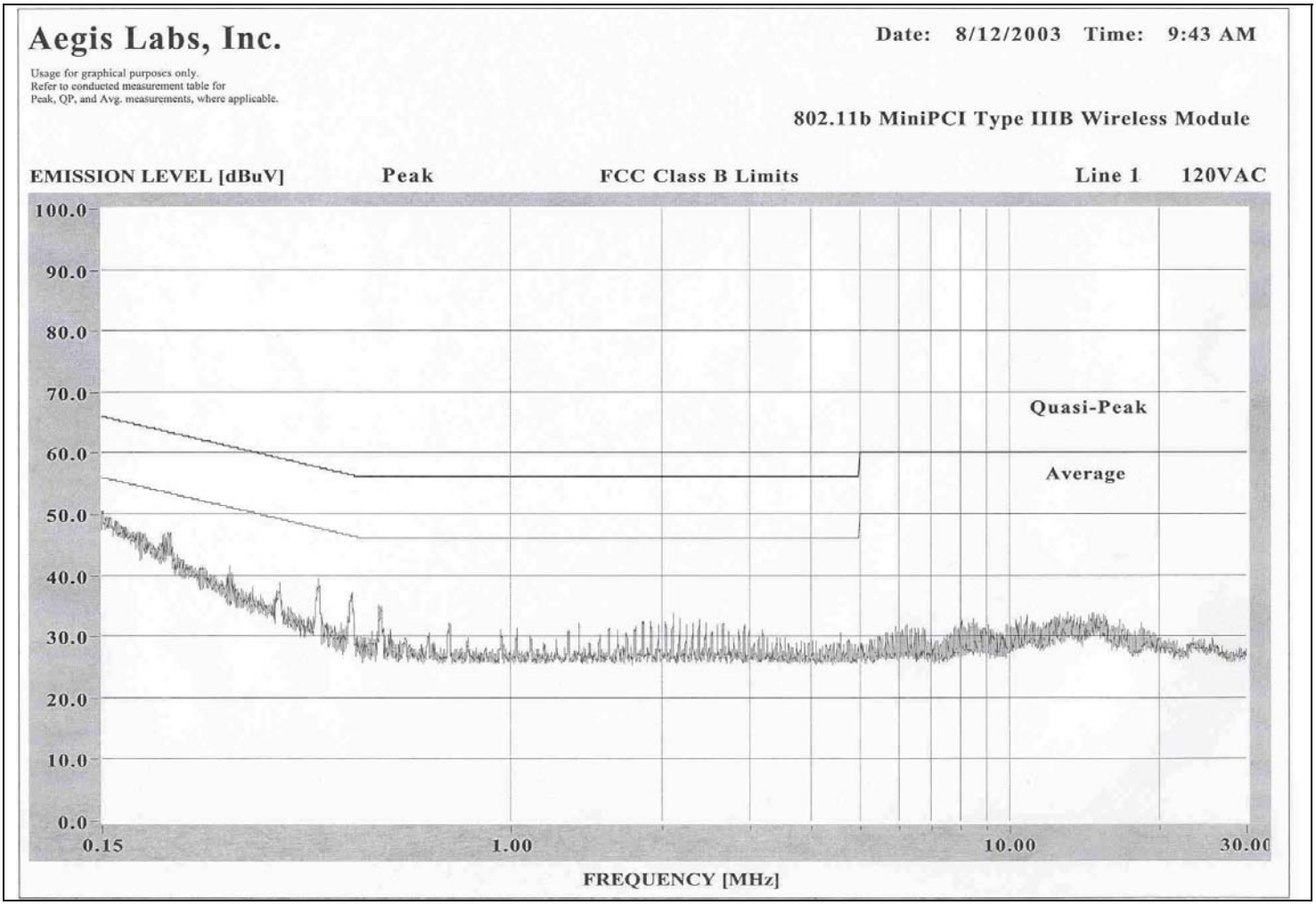
NOTE: During preliminary scans, there wasn't any difference which channel or data rate was used with the EUT; therefore only Channel 1 at a data rate of 1 Mbps was used for final testing.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AC Power Line Conducted Emissions Test Results (Continued)

| CONDUCTED EMISSIONS – LINE 1 | | | | | | |
|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Detector (PK/QP/AV)* | *Average Limit (dBuV)* | *Average Delta(dB)* | *Quasi-Peak Limit (dBuV)* | *Quasi-Peak Delta(dB)* |
| 0.1521 | 51.30 | PK | **55.94** | **-4.64** | **65.94** | **-14.64** |
| 0.2037 | 48.40 | PK | **54.47** | **-6.07** | **64.47** | **-16.07** |
| 0.2688 | 41.50 | PK | **52.60** | **-11.10** | **62.60** | **-21.10** |
| 0.3432 | 41.20 | PK | **50.48** | **-9.28** | **60.48** | **-19.28** |
| 0.4113 | 42.40 | PK | **48.53** | **-6.13** | **58.53** | **-16.13** |
| 2.3150 | 37.40 | PK | **46.00** | **-8.60** | **56.00** | **-18.60** |

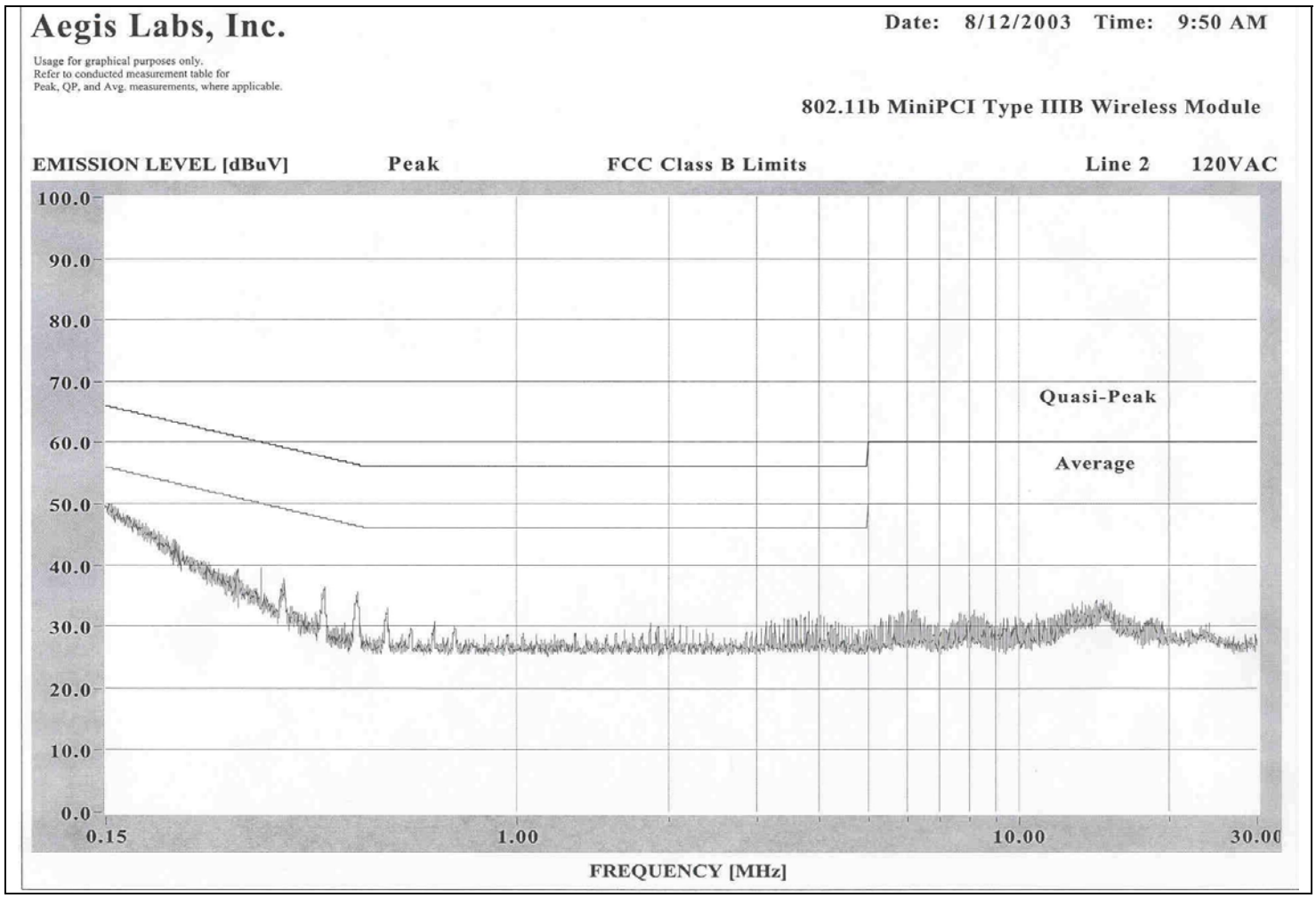





23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AC Power Line Conducted Emissions Test Results (Continued)

| CONDUCTED EMISSIONS - LINE 2 | | | | | | |
|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Detector (PK/QP/AV)* | *Average Limit (dBuV)* | *Average Delta(dB)* | *Quasi-Peak Limit (dBuV)* | *Quasi-Peak Delta(dB)* |
| 0.1521 | 51.00 | PK | **55.94** | **-4.94** | **65.94** | **-14.94** |
| 0.2037 | 44.70 | PK | **54.47** | **-9.77** | **64.47** | **-19.77** |
| 0.2805 | 40.50 | PK | **52.27** | **-11.77** | **62.27** | **-21.77** |
| 0.3441 | 38.90 | PK | **50.45** | **-11.55** | **60.45** | **-21.55** |
| 0.4140 | 40.10 | PK | **48.45** | **-8.35** | **58.45** | **-18.35** |
| 3.4100 | 37.30 | PK | **46.00** | **-8.70** | **56.00** | **-18.70** |






23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AEGIS LABS INC.

## SPURIOUS RADIATED EMISSIONS TEST RESULTS

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/12/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-05 |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 30 C |
| | | **HUMIDITY:** | 45% RH |
| | | **TIME:** | 1:00 PM |

| | |
|---|---|
| **Standard:** | CISPR22 |
| **Description:** | Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Sec. 15.209. (Using CISPR22 Class B Limits) |
| **Results:** | Passes the radiated limits by –6.56@ 299.73 MHz (Vertical antenna polarization) |

| **Radiated Limits** | |
|---|---|
| **Frequency (MHz)** | **Quasi-Peak Limit (dBuV) @ 10m** |
| 30-230 | 30 |
| 230-1000 | 37 |

NOTE: During preliminary scans, there wasn't any difference which channel or data rate was used with the EUT; therefore only Channel 1 at a data rate of 1 Mbps was used for final testing.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

| RADIATED EMISSIONS - Horizontal Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| 132.75 | 36.40 | 400 | 225 | | | 34.34 | 1.95 | 14.41 | 18.42 | 30.00 | -11.58 |
| 144.02 | 39.90 | 400 | 270 | | | 34.33 | 2.00 | 14.90 | 22.48 | 30.00 | -7.52 |
| 232.70 | 40.10 | 400 | 90 | | | 34.24 | 2.63 | 17.49 | 25.98 | 37.00 | -11.02 |
| 264.06 | 36.50 | 400 | 225 | | | 34.21 | 2.81 | 18.43 | 23.53 | 37.00 | -13.47 |
| 288.04 | 37.80 | 400 | 90 | | | 34.17 | 2.95 | 19.37 | 25.95 | 37.00 | -11.05 |
| 299.70 | 39.10 | 350 | 225 | | | 34.14 | 3.00 | 19.69 | 27.65 | 37.00 | -9.35 |
| 308.06 | 35.70 | 300 | 225 | | | 34.13 | 3.05 | 13.90 | 18.51 | 37.00 | -18.49 |
| 336.09 | 37.70 | 250 | 225 | | | 34.10 | 3.22 | 15.06 | 21.88 | 37.00 | -15.12 |
| 352.05 | 39.20 | 250 | 270 | | | 34.09 | 3.31 | 15.19 | 23.61 | 37.00 | -13.39 |
| 396.03 | 35.60 | 200 | 225 | | | 34.03 | 3.48 | 15.18 | 20.23 | 37.00 | -16.77 |
| 440.05 | 35.40 | 150 | 180 | | | 33.94 | 3.66 | 16.46 | 21.58 | 37.00 | -15.42 |
| 456.50 | 41.80 | 200 | 315 | | | 33.91 | 3.74 | 16.96 | 28.59 | 37.00 | -8.41 |
| **RADIATED EMISSIONS – Vertical Antenna Polarization** | | | | | | | | | | | |
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| 59.13 | 43.90 | 100 | 180 | | | 34.40 | 1.19 | 8.90 | 19.59 | 30.00 | -10.41 |
| 72.15 | 41.00 | 100 | 225 | | | 34.39 | 1.42 | 6.76 | 14.79 | 30.00 | -15.21 |
| 132.75 | 39.20 | 100 | 135 | | | 34.34 | 1.95 | 12.99 | 19.79 | 30.00 | -10.21 |
| 143.95 | 40.60 | 100 | 90 | | | 34.33 | 2.00 | 14.40 | 22.67 | 30.00 | -7.33 |
| 232.67 | 35.10 | 100 | 90 | | | 34.24 | 2.63 | 18.20 | 21.69 | 37.00 | -15.31 |
| 264.02 | 35.90 | 100 | 180 | | | 34.21 | 2.81 | 19.21 | 23.72 | 37.00 | -13.28 |
| 288.03 | 37.10 | 100 | 0 | | | 34.17 | 2.95 | 19.98 | 25.86 | 37.00 | -11.14 |
| 299.73 | 41.00 | 100 | 0 | | | 34.14 | 3.00 | 20.59 | 30.44 | 37.00 | -6.56 |
| 308.04 | 37.40 | 100 | 180 | | | 34.13 | 3.05 | 14.39 | 20.71 | 37.00 | -16.29 |
| 320.04 | 37.70 | 100 | 135 | | | 34.12 | 3.12 | 15.28 | 21.99 | 37.00 | -15.01 |
| 352.04 | 37.40 | 100 | 135 | | | 34.09 | 3.31 | 15.39 | 22.01 | 37.00 | -14.99 |
| 396.05 | 36.20 | 100 | 270 | | | 34.03 | 3.48 | 16.14 | 21.80 | 37.00 | -15.20 |
| 457.57 | 36.40 | 100 | 315 | | | 33.91 | 3.75 | 17.25 | 23.49 | 37.00 | -13.51 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/12/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811 |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 30 C |
| | | **HUMIDITY:** | 45% RH |
| | | **TIME:** | 5:00 PM |

| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.247(c) |
| **Description:** | Radiated emissions, which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a). All others must be < -20dBc. |
| **Results:** | Passes the radiated limits by - 8.20 @ 2483.5 MHz (Vertical antenna polarization) |

| **Unwanted Spurious Emissions Limits** | | | |
|---|---|---|---|
| **Frequency (MHz)** | **Field Strength (uV/m)** | **Field Strength (dBuV/m) (Emissions in the restricted bands)** | **Field Strength (dBm/MHz) (Emissions outside the restricted bands)** |
| Above 960 | 500 | 54.00 (Average)<br>74.00 (Peak) | < -20 dBc |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

*Fundamental Measurements at Channels 1, 6, & 11*
*Aegis Labs, Inc. File #: INTEL-030811-03*

| RADIATED EMISSIONS - Horizontal Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| 2412.00 | 70.67 | 100 | 135 | | | | 2.99 | 29.22 | 102.88 | | |
| 2412.00 | | | | 67.00 | A | | 2.99 | 29.22 | 99.21 | | |
| | | | | | | | | | | | |
| 2437.00 | 70.83 | 100 | 135 | | | | 3.05 | 29.27 | 103.15 | | |
| | | | | | | | | | | | |
| 2462.00 | 69.67 | 100 | 135 | | | | 3.11 | 29.32 | 102.10 | | |
| 2462.00 | | | | 66.33 | A | | 3.11 | 29.32 | 98.76 | | |

| RADIATED EMISSIONS – Vertical Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| 2412.00 | 69.17 | 100 | 45 | | | 0.00 | 2.99 | 29.42 | 101.58 | | |
| 2412.00 | | | | 65.67 | A | 0.00 | 2.99 | 29.42 | 98.08 | | |
| | | | | | | | | | | | |
| 2437.00 | 70.67 | 100 | 180 | | | 0.00 | 3.05 | 29.47 | 103.19 | | |
| | | | | | | | | | | | |
| 2462.00 | 71.33 | 100 | 270 | | | 0.00 | 3.11 | 29.52 | 103.96 | | |
| 2462.00 | | | | 67.83 | A | 0.00 | 3.11 | 29.52 | 100.46 | | |

NOTE: Fundamental signals measured to calculate the band edge field strengths using the “Marker Delta Method”.



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

*Band Edge Field Strength Calculations at Channels 1 & 11*
*Aegis Labs, Inc. File #: INTEL-030811-03*

| RADIATED EMISSIONS - Horizontal Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| 2390.00 | | | | | | | | | 49.05 | 74.00 | -24.95 |
| 2390.00 | | | | | A | | | | 40.88 | 54.00 | -13.12 |
| | | | | | | | | | | | |
| 2483.50 | | | | | | | | | 50.43 | 74.00 | -23.57 |
| 2483.50 | | | | | A | | | | 44.10 | 54.00 | -9.90 |

| RADIATED EMISSIONS – Vertical Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| 2390.00 | | | | | | | | | 47.75 | 74.00 | -26.25 |
| 2390.00 | | | | | A | | | | 39.75 | 54.00 | -14.25 |
| | | | | | | | | | | | |
| 2483.50 | | | | | | | | | 52.29 | 74.00 | -21.71 |
| 2483.50 | | | | | A | | | | 45.80 | 54.00 | -8.20 |

NOTE: The "Band Edge Field Strength" was calculated using the "Fundamental" and "Conducted Band Edge" measurements per the "Marker-Delta Method" with the following formula:

$BE = Fm - \Delta m$

Where
BE = Band Edge Field Strength
Fm = Measured Fundamental (Peak or Average)
$\Delta m$ = Measured Conducted Band Edge Delta (Peak or Average)



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

*Spurious Emissions Measurements*
*"Continuous Transmit Mode"*
*Aegis Labs, Inc. File #: INTEL-030811-04*

| RADIATED EMISSIONS - Horizontal Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| **EUT in Continuous Transmit Mode on Channel 1 (2.412 GHz)** | | | | | | | | | | | |
| 4823.86 | 41.33 | 100 | 180 | | | 36.16 | 4.06 | 34.10 | 43.33 | 74.00 | -30.67 |
| 4823.86 | | | | 28.33 | A | 36.16 | 4.06 | 34.10 | 30.33 | 54.00 | -23.67 |
| 1125.25 | 56.33 | 100 | 180 | | | 36.82 | 1.70 | 25.35 | 46.56 | 74.00 | -27.44 |
| 1125.25 | | | | 42.00 | A | 36.82 | 1.70 | 25.35 | 32.23 | 54.00 | -21.77 |
| 1347.55 | 50.67 | 100 | 135 | | | 37.10 | 2.00 | 26.15 | 41.73 | 74.00 | -32.27 |
| 1347.55 | | | | 37.50 | A | 37.10 | 2.00 | 26.15 | 28.56 | 54.00 | -25.44 |
| **EUT in Continuous Transmit Mode on Channel 6 (2.437 GHz)** | | | | | | | | | | | |
| 4873.90 | 41.67 | 100 | 270 | | | 36.20 | 4.10 | 34.27 | 43.84 | 74.00 | -30.16 |
| 4873.90 | | | | 29.00 | A | 36.20 | 4.10 | 34.27 | 31.17 | 54.00 | -22.83 |
| 1123.47 | 61.67 | 100 | 180 | | | 36.82 | 1.70 | 25.34 | 51.89 | 74.00 | -22.11 |
| 1123.47 | | | | 42.17 | A | 36.82 | 1.70 | 25.34 | 32.39 | 54.00 | -21.61 |
| 1346.90 | 53.83 | 100 | 180 | | | 37.09 | 2.00 | 26.15 | 44.89 | 74.00 | -29.11 |
| 1346.90 | | | | 38.17 | A | 37.09 | 2.00 | 26.15 | 29.23 | 54.00 | -24.77 |
| **EUT in Continuous Transmit Mode on Channel 11 (2.462 GHz)** | | | | | | | | | | | |
| 4924.04 | 40.33 | 100 | 225 | | | 36.24 | 4.14 | 34.44 | 42.67 | 74.00 | -31.33 |
| 4924.04 | | | | 27.17 | A | 36.24 | 4.14 | 34.44 | 29.51 | 54.00 | -24.49 |
| 1122.72 | 55.00 | 100 | 180 | | | 36.83 | 1.70 | 25.34 | 45.21 | 74.00 | -28.79 |
| 1122.72 | | | | 42.33 | A | 36.83 | 1.70 | 25.34 | 32.54 | 54.00 | -21.46 |
| 1346.72 | 51.33 | 100 | 180 | | | 37.09 | 2.00 | 26.15 | 42.38 | 74.00 | -31.62 |
| 1346.72 | | | | 37.50 | A | 37.09 | 2.00 | 26.15 | 28.55 | 54.00 | -25.45 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

*Spurious Emissions Measurements*
*"Continuous Transmit Mode"*
*Aegis Labs, Inc. File #: INTEL-030811-04*

| RADIATED EMISSIONS - Vertical Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| **EUT in Continuous Transmit Mode on Channel 1 (2.412 GHz)** | | | | | | | | | | | |
| 4823.94 | 42.83 | 100 | 270 | | | 36.16 | 4.06 | 34.07 | 44.80 | 74.00 | -29.20 |
| 4823.94 | | | | 30.17 | A | 36.16 | 4.06 | 34.07 | 32.14 | 54.00 | -21.86 |
| 1122.10 | 54.33 | 100 | 135 | | | 36.83 | 1.70 | 25.42 | 44.62 | 74.00 | -29.38 |
| 1122.10 | | | | 41.83 | A | 36.83 | 1.70 | 25.42 | 32.12 | 54.00 | -21.88 |
| 1347.08 | 47.67 | 100 | 135 | | | 37.09 | 2.00 | 26.18 | 38.76 | 74.00 | -35.24 |
| 1347.08 | | | | 35.67 | A | 37.09 | 2.00 | 26.18 | 26.76 | 54.00 | -27.24 |
| **EUT in Continuous Transmit Mode on Channel 6 (2.437 GHz)** | | | | | | | | | | | |
| 4874.14 | 40.83 | 100 | 135 | | | 36.20 | 4.10 | 34.22 | 42.95 | 74.00 | -31.05 |
| 4874.17 | | | | 27.83 | A | 36.20 | 4.10 | 34.22 | 29.95 | 54.00 | -24.05 |
| 1123.78 | 56.00 | 100 | 225 | | | 36.82 | 1.70 | 25.42 | 46.30 | 74.00 | -27.70 |
| 1123.78 | | | | 41.33 | A | 36.82 | 1.70 | 25.42 | 31.63 | 54.00 | -22.37 |
| 1327.40 | 55.50 | 100 | 135 | | | 37.05 | 2.00 | 26.11 | 46.56 | 74.00 | -27.44 |
| 1327.40 | | | | 37.17 | A | 37.05 | 2.00 | 26.11 | 28.23 | 54.00 | -25.77 |
| **EUT in Continuous Transmit Mode on Channel 11 (2.462 GHz)** | | | | | | | | | | | |
| 4923.98 | 42.17 | 100 | 270 | | | 36.24 | 4.14 | 34.37 | 44.44 | 74.00 | -29.56 |
| 4923.98 | | | | 29.50 | A | 36.24 | 4.14 | 34.37 | 31.77 | 54.00 | -22.23 |
| 1123.02 | 54.00 | 100 | 225 | | | 36.83 | 1.70 | 25.42 | 44.29 | 74.00 | -29.71 |
| 1123.02 | | | | 41.00 | A | 36.83 | 1.70 | 25.42 | 31.29 | 54.00 | -22.71 |
| 1329.17 | 54.50 | 100 | 45 | | | 37.06 | 2.00 | 26.12 | 45.56 | 74.00 | -28.44 |
| 1329.17 | | | | 37.00 | A | 37.06 | 2.00 | 26.12 | 28.06 | 54.00 | -25.94 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

*Spurious Emissions Measurements*
*"Continuous Receive Mode"*
*Aegis Labs, Inc. File #: INTEL-030811-04*

| RADIATED EMISSIONS - Horizontal Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| **EUT in Continuous Receive Mode on Channel 1 (2.412 GHz)** | | | | | | | | | | | |
| 1122.35 | 52.50 | 100 | 225 | | | 36.83 | 1.70 | 25.34 | 42.71 | 74.00 | -31.29 |
| 1122.35 | | | | 39.17 | A | 36.83 | 1.70 | 25.34 | 29.38 | 54.00 | -24.62 |
| 1327.57 | 51.00 | 100 | 180 | | | 37.06 | 2.00 | 26.08 | 42.02 | 74.00 | -31.98 |
| 1327.57 | | | | 35.50 | A | 37.06 | 2.00 | 26.08 | 26.52 | 54.00 | -27.48 |
| **EUT in Continuous Receive Mode on Channel 6 (2.437 GHz)** | | | | | | | | | | | |
| 1122.35 | 54.00 | 100 | 225 | | | 36.83 | 1.70 | 25.34 | 44.21 | 74.00 | -29.79 |
| 1122.35 | | | | 37.17 | A | 36.83 | 1.70 | 25.34 | 27.38 | 54.00 | -26.62 |
| 1327.57 | 53.50 | 100 | 180 | | | 37.06 | 2.00 | 26.08 | 44.52 | 74.00 | -29.48 |
| 1327.57 | | | | 36.33 | A | 37.06 | 2.00 | 26.08 | 27.35 | 54.00 | -26.65 |
| **EUT in Continuous Receive Mode on Channel 11 (2.462 GHz)** | | | | | | | | | | | |
| 1122.35 | 54.33 | 100 | 225 | | | 36.83 | 1.70 | 25.34 | 44.54 | 74.00 | -29.46 |
| 1122.35 | | | | 38.50 | A | 36.83 | 1.70 | 25.34 | 28.71 | 54.00 | -25.29 |
| 1327.57 | 51.33 | 100 | 180 | | | 37.06 | 2.00 | 26.08 | 42.35 | 74.00 | -31.65 |
| 1327.57 | | | | 37.37 | A | 37.06 | 2.00 | 26.08 | 28.39 | 54.00 | -25.61 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Spurious Radiated Emissions Test Results (Continued)

*Spurious Emissions Measurements*
*"Continuous Receive Mode"*
*Aegis Labs, Inc. File #: INTEL-030811-04*

| RADIATED EMISSIONS - Vertical Antenna Polarization | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Freq. (MHz)* | *Meter Reading (dBuV)* | *Antenna Height (cm)* | *Azimuth (degrees)* | *Quasi pk or AVG (dBuV)* | | *Preamp Factor (dB)* | *Cable Factor (dB)* | *Ant. Factor (dB)* | *Corrected Reading (dBuV)* | *Limits (dBuV)* | *Diff (dB) +=FAIL* |
| **EUT in Continuous Receive Mode on Channel 1 (2.412 GHz)** | | | | | | | | | | | |
| 1121.88 | 54.17 | 100 | 225 | | | 36.83 | 1.70 | 25.41 | 44.45 | 74.00 | -29.55 |
| 1121.88 | | | | 41.00 | A | 36.83 | 1.70 | 25.41 | 31.28 | 54.00 | -22.72 |
| 1327.78 | 53.50 | 100 | 90 | | | 37.06 | 2.00 | 26.11 | 44.56 | 74.00 | -29.44 |
| 1327.78 | | | | 36.00 | A | 37.06 | 2.00 | 26.11 | 27.06 | 54.00 | -26.94 |
| **EUT in Continuous Receive Mode on Channel 6 (2.437 GHz)** | | | | | | | | | | | |
| 1122.03 | 55.33 | 100 | 225 | | | 36.83 | 1.70 | 25.41 | 45.62 | 74.00 | -28.38 |
| 1122.03 | | | | 41.33 | A | 36.83 | 1.70 | 25.41 | 31.62 | 54.00 | -22.38 |
| 1328.00 | 49.00 | 100 | 90 | | | 37.06 | 2.00 | 26.12 | 40.06 | 74.00 | -33.94 |
| 1328.00 | | | | 36.17 | A | 37.06 | 2.00 | 26.12 | 27.23 | 54.00 | -26.77 |
| **EUT in Continuous Receive Mode on Channel 11 (2.462 GHz)** | | | | | | | | | | | |
| 1123.98 | 55.50 | 100 | 225 | | | 36.82 | 1.70 | 25.42 | 45.80 | 74.00 | -28.20 |
| 1123.98 | | | | 41.83 | A | 36.82 | 1.70 | 25.42 | 32.13 | 54.00 | -21.87 |
| 1327.14 | 52.50 | 100 | 90 | | | 37.05 | 2.00 | 26.11 | 43.56 | 74.00 | -30.44 |
| 1324.14 | | | | 35.67 | A | 37.05 | 2.00 | 26.10 | 26.72 | 54.00 | -27.28 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com


## CONDUCTED BAND EDGE MEASUREMENTS

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/11/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-02a |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 25 C |
| | | **HUMIDITY:** | 50% RH |
| | | **TIME:** | 6:00 PM |

| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.247C |
| **Description:** | Conducted band edge plots for use in calculating the emissions within a restricted band near the operating band using the "Marker Delta Method". |
| **Results:** | For signals in the restricted bands immediately above and below the 2.412 to 2.462 GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was then applied to the average and peak field strength of the intentional signal to calculate the field strength of the unintentional signals. |

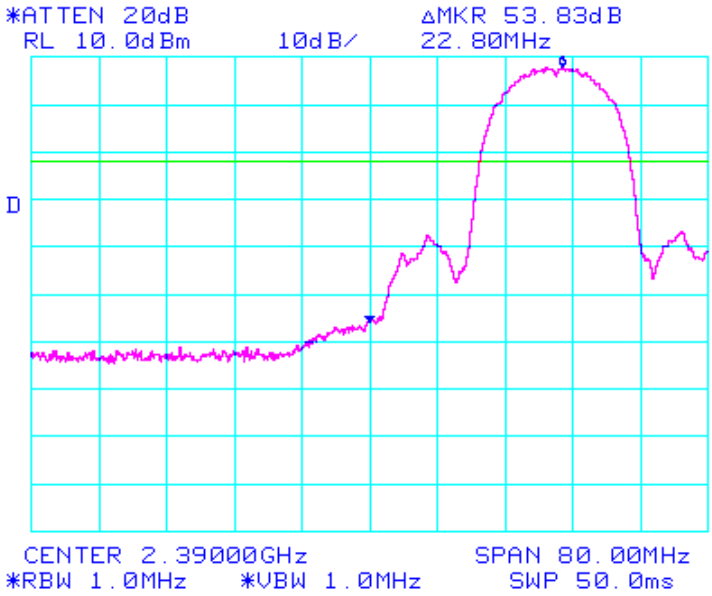


23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

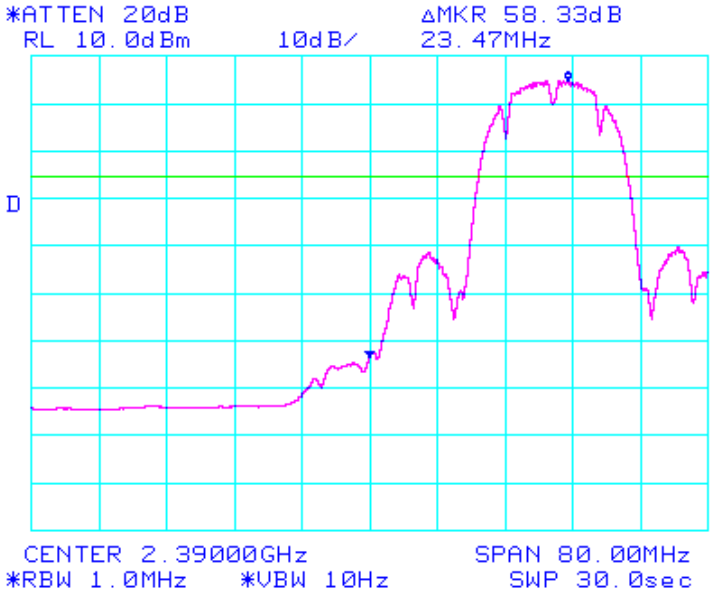
## Conducted Band Edge Measurements (Continued)

Plots Showing Out-Of-Band Emissions (Peak RBW=VBW=1MHz; Average RBW = 1MHz, VBW = 10Hz)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz band edge **PEAK** delta (INTEL-030811-02a1) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz band edge **AVERAGE** delta (INTEL-030811-02a2) | Rick Candelas |



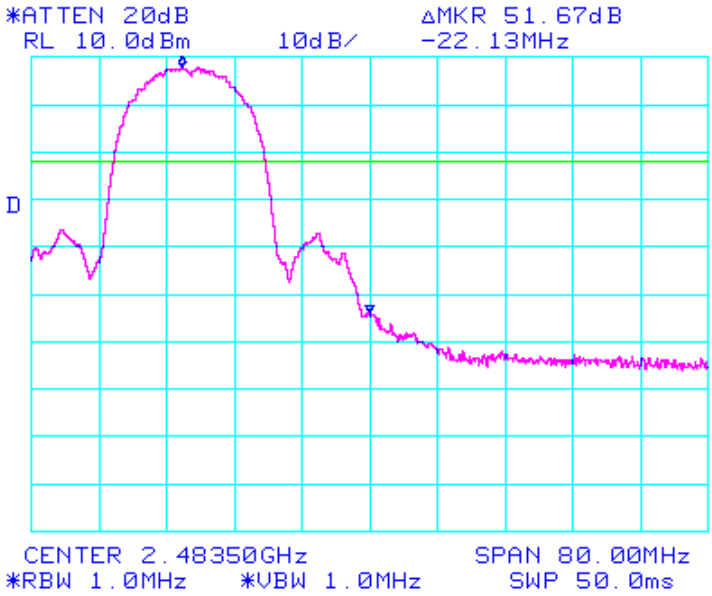



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

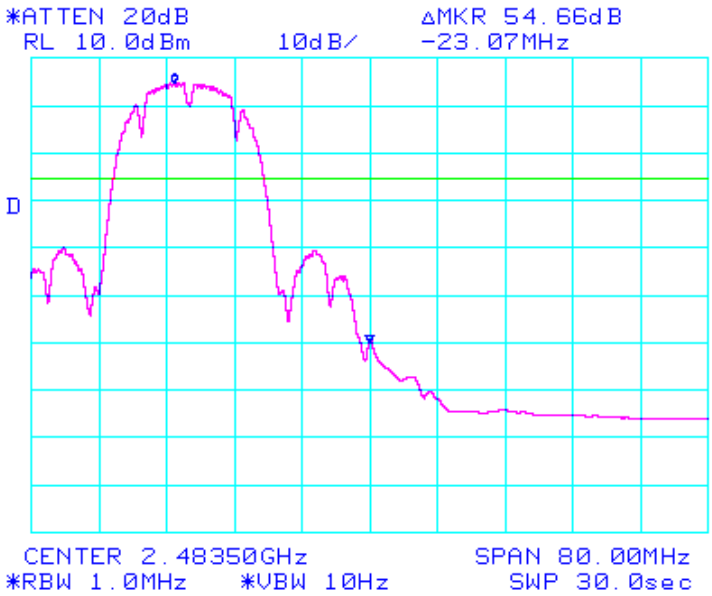
## Conducted Band Edge Measurements (Continued)

Plots Showing Out-Of-Band Emissions (Peak RBW=VBW=1MHz; Average RBW = 1MHz, VBW = 10Hz)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz band edge **PEAK** delta (INTEL-030811-02a3) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz band edge **AVERAGE** delta (INTEL-030811-02a4) | Rick Candelas |






23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## PEAK TRANSMIT POWER

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/11/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-01 |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 28 C |
| | | **HUMIDITY:** | 50% RH |
| | | **TIME:** | 5:00 PM |

| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.247(b)(1) |
| **Description:** | The maximum peak output power of the intentional radiator shall not exceed 1 watt. |
| **Results:** | 0.0473 W @ 2.412 GHz<br>0.0477 W @ 2.437 GHz<br>0.0481 W @ 2.462 GHz |

| **Peak Transmit Power Limits** | |
|---|---|
| **Frequency (MHz)** | **Output Power (W)** |
| 2412-2462 | 1 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Peak Transmit Power (Continued)

| Frequency (MHz) | Rate (Mbps) | Power (dBm) | Cable Factor (dB) | Power Corrected (dBm) | Power (mW) |
|---|---|---|---|---|---|
| 2412.00 | 1 | 16.60 | 0.15 | 16.75 | 47.32 |
| 2412.00 | 5.5 | 16.30 | 0.15 | 16.45 | 44.16 |
| 2412.00 | 11 | 16.20 | 0.15 | 16.35 | 43.15 |
| | | | | | |
| 2437.00 | 1 | 16.65 | 0.15 | 16.80 | 47.86 |
| 2437.00 | 5.5 | 16.32 | 0.15 | 16.47 | 44.36 |
| 2437.00 | 11 | 16.24 | 0.15 | 16.39 | 43.55 |
| | | | | | |
| 2462.00 | 1 | 16.67 | 0.15 | 16.82 | 48.08 |
| 2462.00 | 5.5 | 16.34 | 0.15 | 16.49 | 44.57 |
| 2462.00 | 11 | 16.27 | 0.15 | 16.42 | 43.85 |



23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## 6 dB EMISSIONS BANDWIDTH

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/11/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-02b |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 25 C |
| | | **HUMIDITY:** | 68% RH |
| | | **TIME:** | 7:00 PM |

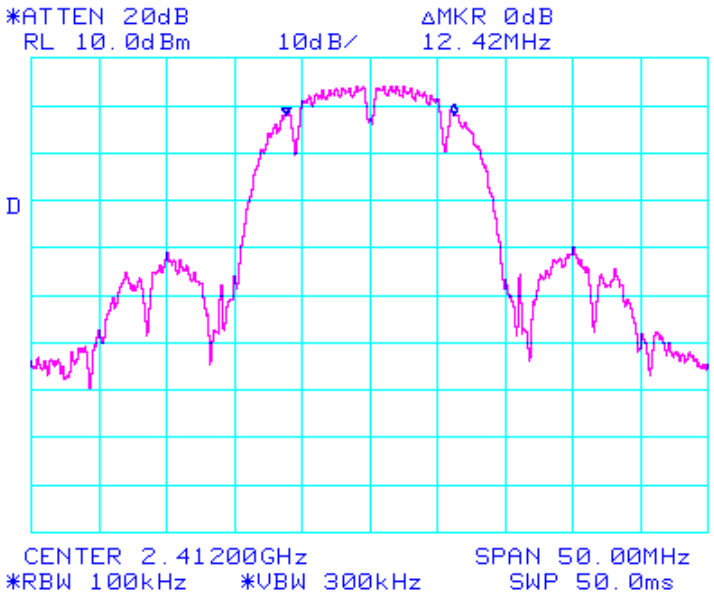
| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.247(a)(2) |
| **Description:** | The minimum 6 dB bandwidth shall be at least 500 kHz. |
| **Results:** | 12.42 MHz @ 2.412 GHz<br>12.50 MHz @ 2.437 GHz<br>12.67 MHz @ 2.462 GHz |



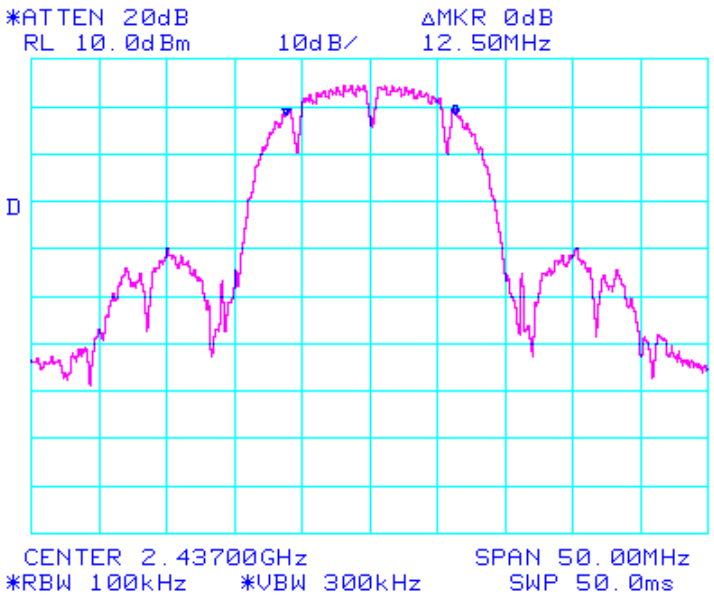
23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

6 dB Emissions Bandwidth (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz<br>(INTEL-030811-02b1) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.437 GHz<br>(INTEL-030811-02b2) | Rick Candelas |

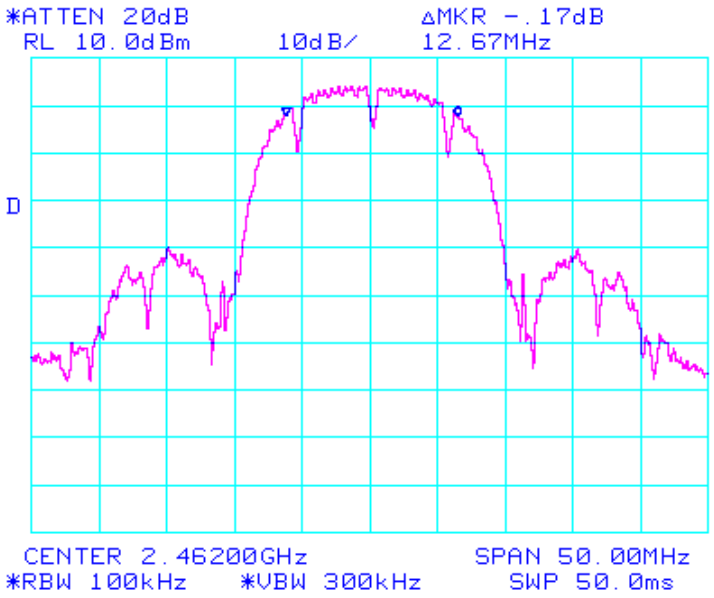





23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

6 dB Emissions Bandwidth (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz<br>(INTEL-030811-02b3) | Rick Candelas |






23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

## PEAK POWER SPECTRAL DENSITY

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/11/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-02c |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 21 C |
| | | **HUMIDITY:** | 68% RH |
| | | **TIME:** | 8:00 PM |

| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.247(d) |
| **Description:** | The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. |
| **Results:** | -7.33 dBm @ 2.412 GHz<br>-7.17 dBm @ 2.437 GHz<br>-7.50 dBm @ 2.462 GHz |

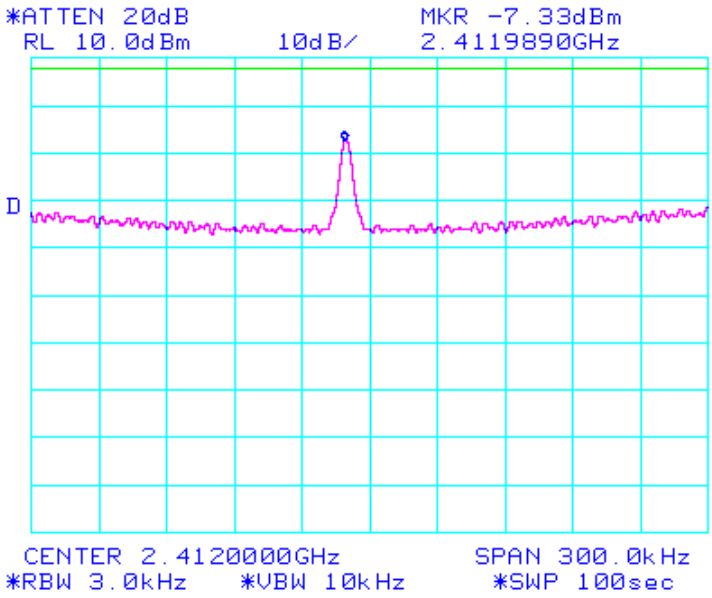
| **Peak Power Spectral Density Limits** | |
|---|---|
| Frequency (MHz) | Limit (dBm) |
| 2412-2462 | 8 |



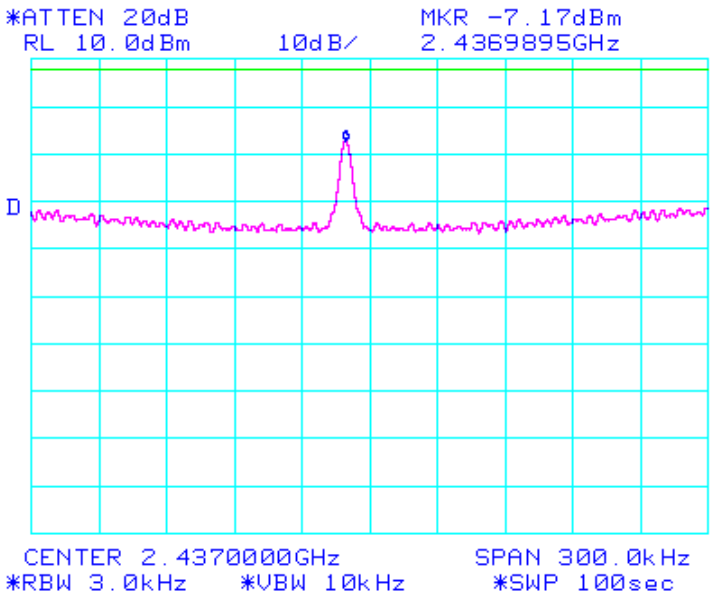
23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Peak Power Spectral Density (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz<br>(INTEL-030811-02c1) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.437 GHz<br>(INTEL-030811-02c2) | Rick Candelas |

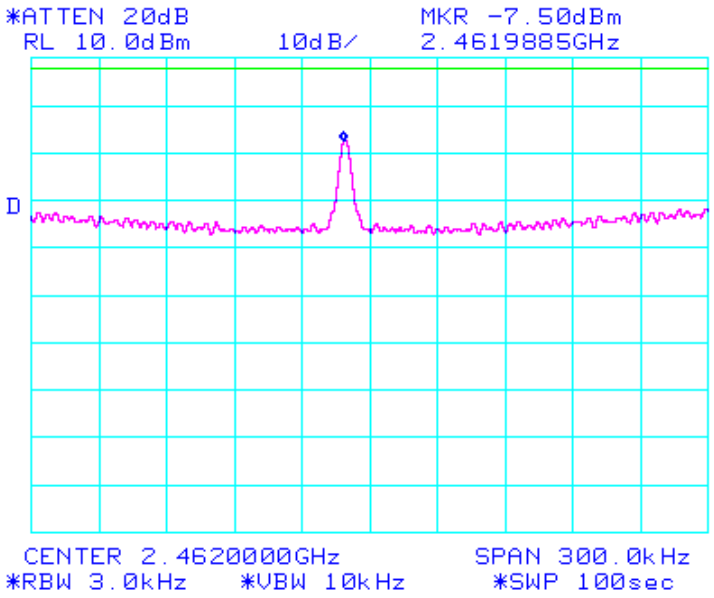





23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Peak Power Spectral Density (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz<br>(INTEL-030811-02c3) | Rick Candelas |






23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

AEGIS LABS INC.

## CONDUCTED OUT OF BAND EMISSIONS

| | | | |
|---|---|---|---|
| **CLIENT:** | Hewlett Packard Company | **DATE:** | 08/11/03 |
| **EUT:** | Notebook Computer | **PROJECT NUMBER:** | INTEL-030811-02d |
| **MODEL NUMBER:** | Series PP2170 | **TEST ENGINEER:** | Rick Candelas |
| **SERIAL NUMBER:** | J3715PV017 | **SITE #:** | 2 |
| **CONFIGURATION:** | Tested with an Intel 802.11b MiniPCI Type IIIB Wireless Module installed in its mini PCI slot. | **TEMPERATURE:** | 20 C |
| | | **HUMIDITY:** | 60% RH |
| | | **TIME:** | 9:00 PM |

| | |
|---|---|
| **Standard:** | FCC CFR 47, Part 15.407(b)(1) and 15.407(b)(2) |
| **Description:** | In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. |

**Test Results Summary**

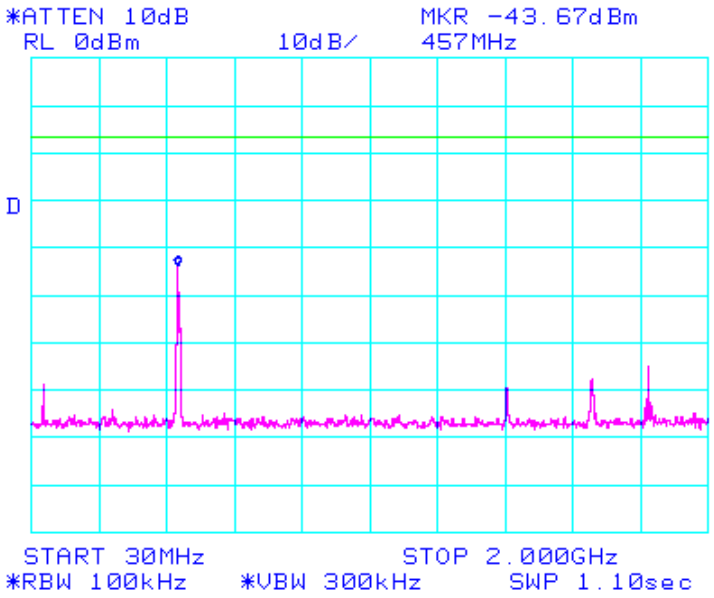
| Plot | Channel Frequency (MHz) | Data | Results |
|---|---|---|---|
| INTEL-030811-07d01 | 2412 | 30MHz – 2GHz | -43.67 dBm @ 457.00 MHz |
| INTEL-030811-07d02 | | 2GHz – 10GHz | -58.50 dBm @ 7.24 GHz |
| INTEL-030811-07d03 | | 10GHz – 20GHz | -70.00 dBm @ 13.42 GHz |
| INTEL-030811-07d04 | | 20GHz – 26.5GHz | -66.50 dBm @ 25.42 GHz |
| INTEL-030811-07d05 | 2437 | 30MHz – 2GHz | -41.33 dBm @ 483.00 MHz |
| INTEL-030811-07d06 | | 2GHz – 10GHz | -59.33 dBm @ 7.31 GHz |
| INTEL-030811-07d07 | | 10GHz – 20GHz | -69.83 dBm @ 13.25 GHz |
| INTEL-030811-07d08 | | 20GHz – 26.5GHz | -67.00 dBm @ 24.62 GHz |
| INTEL-030811-07d09 | 2462 | 30MHz – 2GHz | -42.67 dBm @ 506.00 MHz |
| INTEL-030811-07d10 | | 2GHz – 10GHz | -58.33 dBm @ 7.40 GHz |
| INTEL-030811-07d11 | | 10GHz – 20GHz | -69.33 dBm @ 13.48 GHz |
| INTEL-030811-07d12 | | 20GHz – 26.5GHz | -66.00 dBm @ 24.53 GHz |



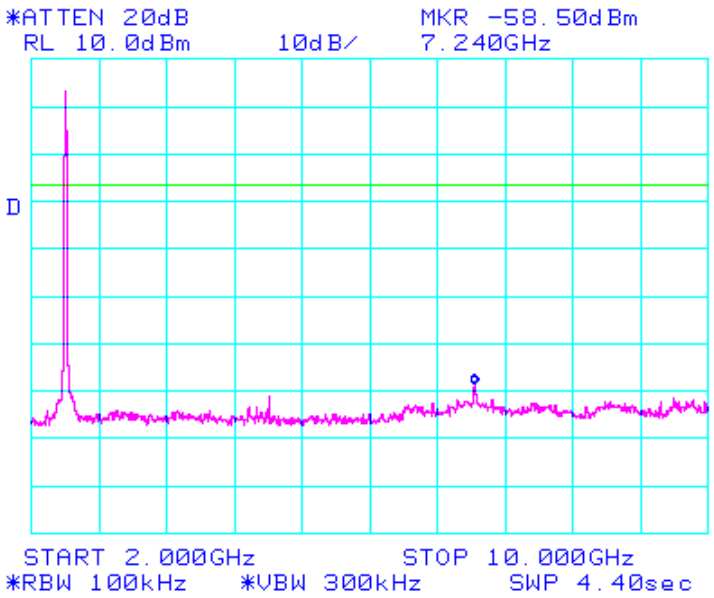
23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Conducted Out Of Band Emissions (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz<br>(INTEL-030811-02d01) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz<br>(INTEL-030811-02d02) | Rick Candelas |

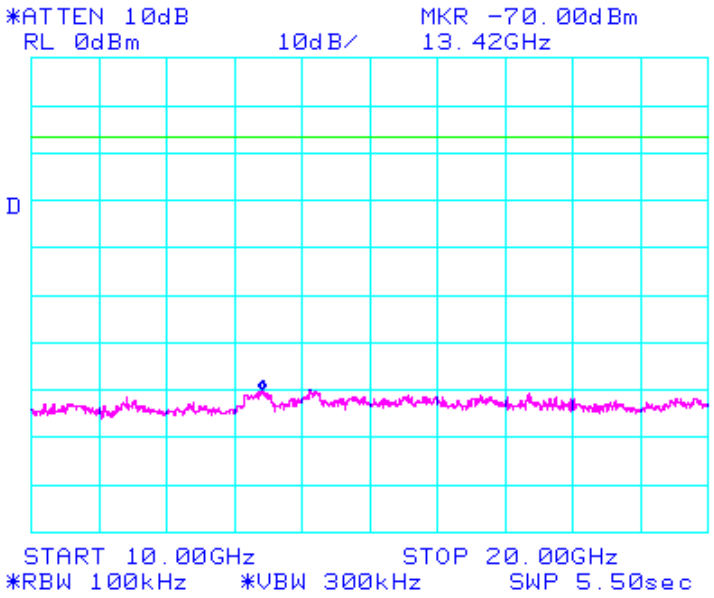




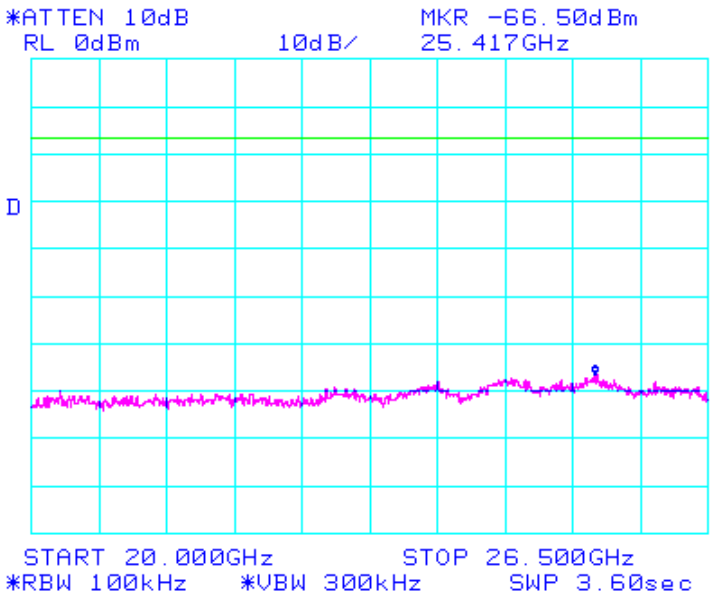

23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Conducted Out Of Band Emissions (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz<br>(INTEL-030811-02d03) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.412 GHz<br>(INTEL-030811-02d04) | Rick Candelas |

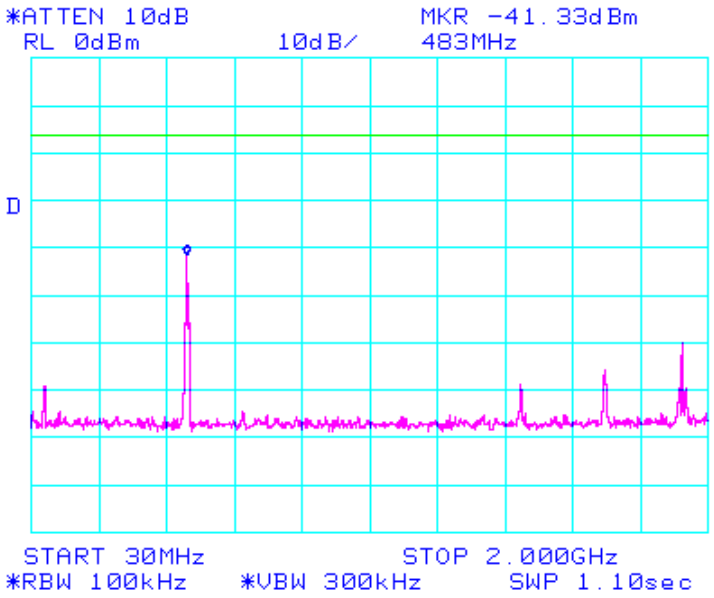




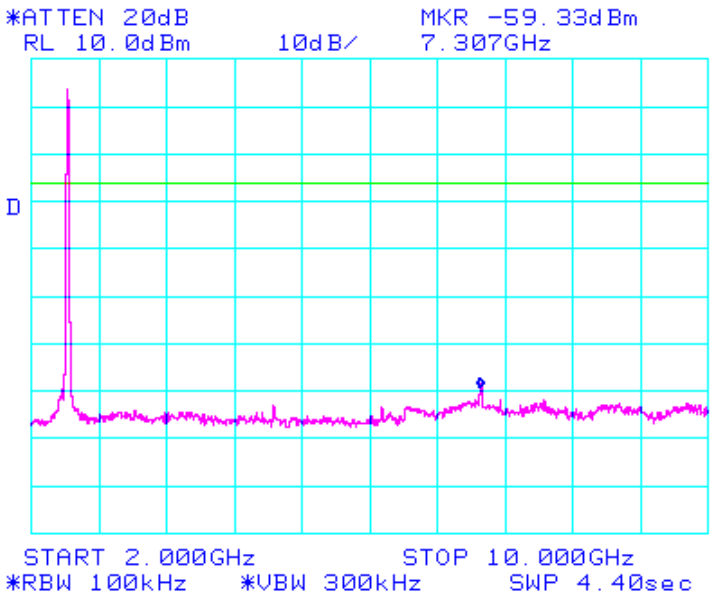

23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Conducted Out Of Band Emissions (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.437 GHz<br>(INTEL-030811-02d05) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.437 GHz<br>(INTEL-030811-02d06) | Rick Candelas |

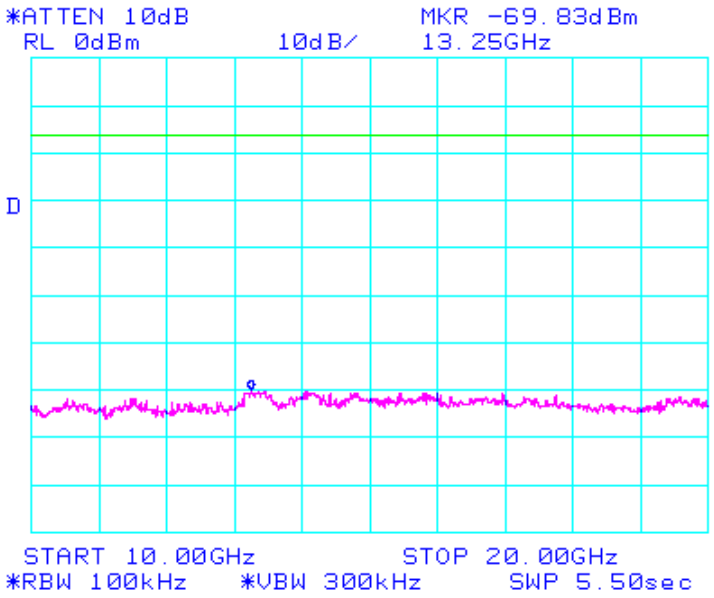




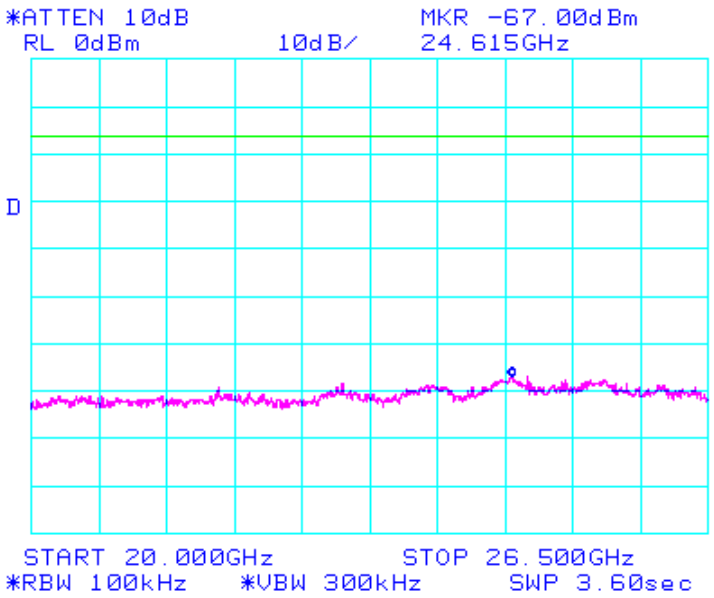

23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Conducted Out Of Band Emissions (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.437 GHz<br>(INTEL-030811-02d07) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.437 GHz<br>(INTEL-030811-02d08) | Rick Candelas |

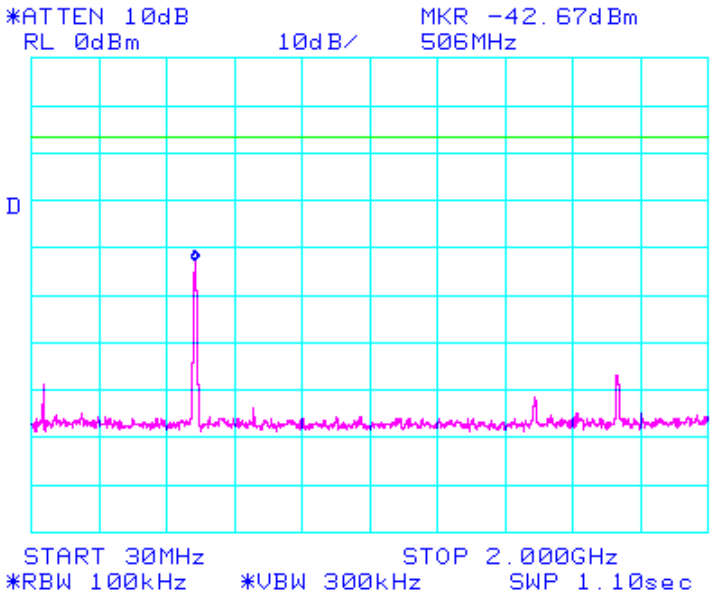




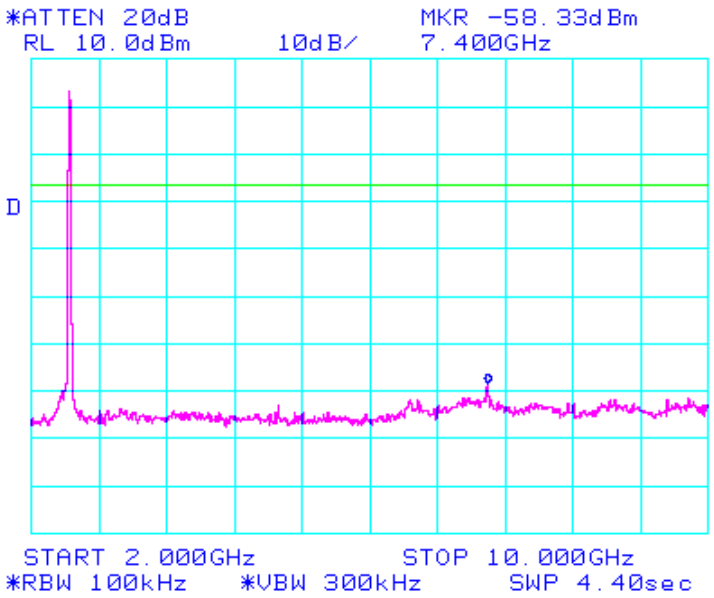

23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Conducted Out Of Band Emissions (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz<br>(INTEL-030811-02d09) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz<br>(INTEL-030811-02d10) | Rick Candelas |

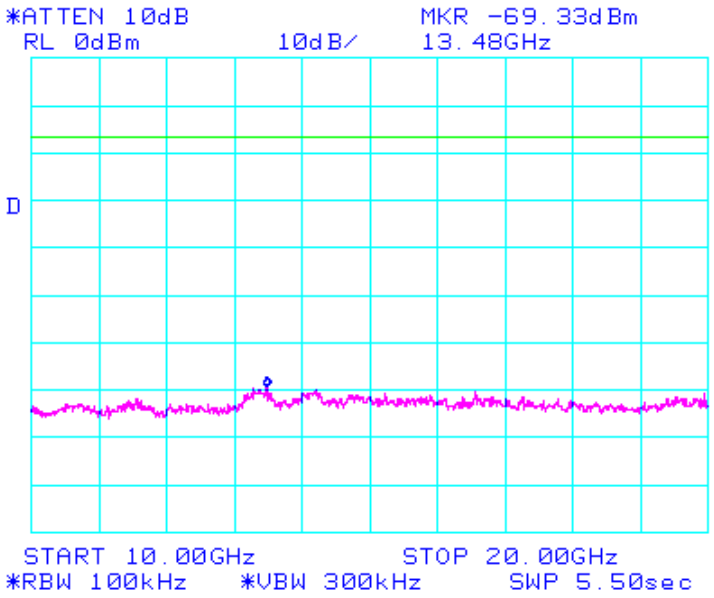




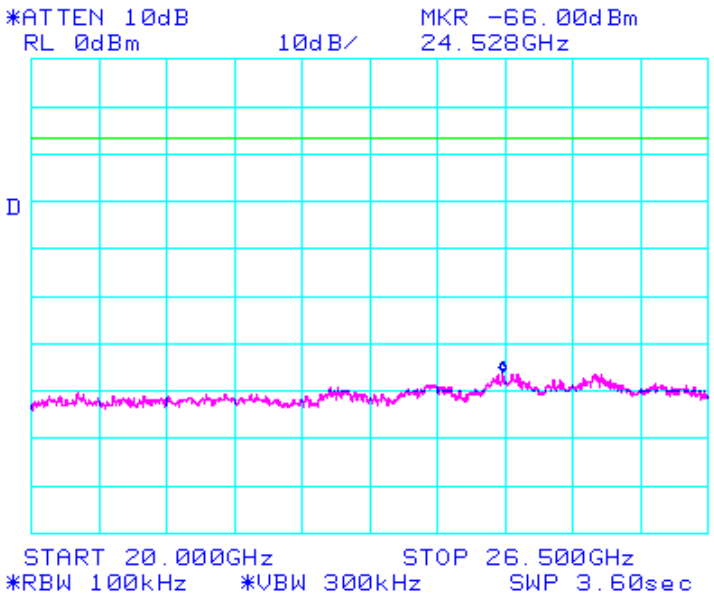

23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com

Conducted Out Of Band Emissions (Continued)

| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz<br>(INTEL-030811-02d11) | Rick Candelas |




| *Test Date* | *Data* | *Test Eng.* |
|---|---|---|
| 08/11/03 | 2.462 GHz<br>(INTEL-030811-02d12) | Rick Candelas |






23091 Antonio Parkway Suite 310 • Rancho Santa Margarita, CA 92688 • Tel 949.459.2754 • Fax 949.459.2759 • www.AegisLabsInc.com