*EMC Test Report*

*Application for Grant of Equipment Authorization*
*Class II Permissive Change/Reassessment*
*pursuant to*

*Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7*
*FCC Part 15 Subpart C*

*Model: Intel Centrino Advanced-N 6200*

| | |
|---|---|
| IC CERTIFICATION #: | 1000M-622ANHU and 1000M-622ANH |
| FCC ID: | PD9622ANHU and PD9622ANH |
| APPLICANT: | Intel Corporation<br>2111 NE 25th Avenue<br>Hillsboro, OR 97124 |
| TEST SITE(S): | Elliott Laboratories<br>41039 Boyce Road.<br>Fremont, CA. 94538-2435 |
| IC SITE REGISTRATION #: | 2845B-4, 2845B-5 |
| REPORT DATE: | April 14, 2010 |
| FINAL TEST DATES: | March 12 to April 1, 2010 |
| AUTHORIZED SIGNATORY: | Mark Briggs<br>Staff Engineer<br>Elliott Laboratories. |

Testing Cert #2016-01

## *REVISION HISTORY*

| Revision # | Date | Comments | Modified By |
|---|---|---|---|
| - | | First release | |

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## *SCOPE*

An electromagnetic emissions test has been performed on the Intel Corporation Intel Centrino Advanced-N 6200, pursuant to the following rules:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
RSS 310 Issue 2 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
FCC DTS Measurement Procedure KDB558074, March 2005

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

## *OBJECTIVE*

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

## *STATEMENT OF COMPLIANCE*

The tested sample of Intel Corporation Intel Centrino Advanced-N 6200 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
RSS 310 Issue 2 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Intel Corporation Intel Centrino Advanced-N 6200 and therefore apply only to the tested sample. The sample was selected and prepared by Steve Hackett of Intel Corporation.

## *DEVIATIONS FROM THE STANDARDS*

No deviations were made from the published requirements listed in the scope of this report.

## *TEST RESULTS SUMMARY*

*DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)*

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.247(a) | RSS 210 A8.2 | Digital Modulation | The proposed changes to the digital circuits do not affect the characteristics of the device with respect to output power, bandwidth, power density or other measurements made at the antenna port. | | |
| 15.247 (a) (2) | RSS 210 A8.2 (1) | 6dB Bandwidth | | | |
| 15.247 (b) (3) | RSS 210 A8.2 (4) | Output Power (multipoint systems) | | | |
| 15.247(d) | RSS 210 A8.2 (2) | Power Spectral Density | | | |
| 15.247(c) | RSS 210 A8.5 | Antenna Port Spurious Emissions 30MHz – 25 GHz | | | |
| 15.247(c) / 15.209 | RSS 210 A8.5 | Radiated Spurious Emissions 30MHz – 25 GHz | 52.6dBµV/m @ 2483.5MHz (-1.4dB) | 15.207 in restricted bands, all others <-30dBc Note 1 | Complies |
| Note 1: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst) / RMS averaging over a time interval, as permitted under RSS 210 section A8.4(4). | | | | | |

*DIGITAL TRANSMISSION SYSTEMS (5725 –5850 MHz)*

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.247(a) | RSS 210 A8.2 | Digital Modulation | The proposed changes to the digital circuits do not affect the characteristics of the device with respect to output power, bandwidth, power density or other measurements made at the antenna port. | | |
| 15.247 (a) (2) | RSS 210 A8.2 (1) | 6dB Bandwidth | | | |
| 15.247 (b) | RSS 210 A8.2 (4) | Output Power (multipoint systems) | | | |
| 15.247(d) | RSS 210 A8.2 (2) | Power Spectral Density | | | |
| 15.247(c) | RSS 210 A8.5 | Antenna Port Spurious Emissions – 30MHz – 40 GHz | | | |
| 15.247(c) / 15.209 | RSS 210 A8.5 Table 2, 3 | Radiated Spurious Emissions 30MHz – 40 GHz | 45.5dBµV/m @ 7673.3MHz (-8.5dB) | 15.207 in restricted bands, all others <-30dBc Note 1 | Complies |
| Note 1: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst) / RMS averaging over a time interval, as permitted under RSS 210 section A8.4(4). | | | | | |

*GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS*

| FCC Rule Part | RSS Rule part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.203 | - | RF Connector | No changes to the rf connectors are proposed. | | |
| 15.109 | RSS GEN 7.2.3 Table 1 | Receiver spurious emissions | 47.7dBµV/m @ 6000.7MHz (-6.3dB) | Refer to page **Error! Bookmark not defined.** | Complies |
| 15.207 | RSS GEN Table 2 | AC Conducted Emissions | The proposed changes to the digital circuits do not affect the values originally reported for AC conducted emissions. | | |
| 15.247 (b) (5) 15.407 (f) | RSS 102 | RF Exposure Requirements | No change in power rating or antenna gain are proposed. The maximum eirp and, therefore, the MPE evaluation, remains unchanged from that previously reported. | | |
| - | RSP 100 RSS GEN 7.1.5 | User Manual | No changes to the user manual are proposed. | | |
| - | RSP 100 RSS GEN 4.4.1 | 99% Bandwidth | The proposed changes to the digital circuits do not affect the bandwidth of the signal as previously reported. | | |

*MEASUREMENT UNCERTAINTIES*

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

| Measurement Type | Frequency Range (MHz) | Calculated Uncertainty (dB) |
|---|---|---|
| Conducted Emissions | 0.15 to 30 | ± 2.4 |
| Radiated Emissions | 0.015 to 30 | ± 3.0 |
| Radiated Emissions | 30 to 1000 | ± 3.6 |
| Radiated Emissions | 1000 to 40000 | ± 6.0 |

## *EQUIPMENT UNDER TEST (EUT) DETAILS*

### *GENERAL*

The Intel Corporation Intel Centrino Advanced-N 6200 is a 2x2 802.11abgn mini PCI express module. The device is sold under two different model numbers in Canada, one having a full modular approval (622ANHMW) and the other a limited modular approval (622ANHU). There are no hardware or firmware differences between the two model numbers. It is only the scope of the certification that is different.

The sample was received on March 12, 2010 and tested on March 12 to April 1, 2010. The EUT consisted of the following component(s):

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Intel Corporation | 622ANHU | 2x2 802.11abgn mini PCI express module | MAC Address 0023146851DC | FCC:PD9622ANHU IC:1000M-622ANHU |
| | 622ANHMW | | | FCC:PD9622ANH IC:1000M-622ANH |

### *OTHER EUT DETAILS*

The device was tested with the Universe PIFA antennas evaluated in the original filing. The antenna specifications are provided below for reference.

| Frequency Band | Gain (dBi) | |
|---|---|---|
| | Main | Aux |
| 2400-2500 MHz | 3.24 | |
| 5150-5350 MHz | 3.73 | |
| 5470-5725 MHz | 4.77 | |
| 5725-5850 MHz | 4.97 | |

### *ENCLOSURE*

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

### *MODIFICATIONS*

No modifications were made to the EUT during the time the product was at Elliott.

### *SUPPORT EQUIPMENT*

The following equipment was used as support equipment for testing:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Dell | - | Laptop | Prototype | N/A |
| Intel | Mini PCIE extender card | Extender card | None | N/A |

*EUT INTERFACE PORTS*

The I/O cabling configuration during testing was as follows:

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded/Unshielded | Length(m) |
| Laptop Adapter | AC power | - | Unshielded | 1.0 |
| Extender mini PCI | Laptop mini PCI bus | Ribbon | Unshielded | 1.0 |
| Extender dc power | DC power supply | 2-wires | Unshielded | 1.0 |

*EUT OPERATION*

For measurements on the spurious emissions from the transmitter the EUT was operating on the specified channel at the specified output power using one or both chains, as detailed in the test descriptions, with a > 99% duty cycle. Worst case modes and transmitter chains were selected based on the original test data for spurious emissions.

The output power for all spurious measurements away from the band edges was at, or above, the maximum power rating in each band. For band edge measurements the output power was set at or above either the rated power in each band or, in some cases, to the maximum nominal operating power (as programmed into the EEPROM) plus +1.5dB to account for the worst case tolerance in output power from the programmed power stored in EEPROM. The EEPROM power is always lower than the maximum rated power by at least 1.5dB. All target powers are measured with an average power meter and, therefore, do not exactly correlate with the powers listed in the grant which are measured in accordance with the FCC procedures based on the U-NII power measurement methods. The original report includes information correlating the average power (measured with a power meter) to the reported average power (measured using a spectrum analyzer).

For receiver spurious the device was in receive mode and tested on the center channel in each band.

## *TEST SITE*

### *GENERAL INFORMATION*

Final test measurements were taken on March 12, 13, 14, 15, 16, 31, and April 1, 2010 at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

| Site | Registration Numbers | | Location |
|---|---|---|---|
| | FCC | Canada | |
| Chamber 3 | 769238 | 2845B-3 | 41039 Boyce Road<br>Fremont, CA 94538-2435 |
| Chamber 4 | 211948 | 2845B-4 | |
| Chamber 5 | 211948 | 2845B-5 | |

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement of predictable local TV, radio, and mobile communications traffic. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

### *CONDUCTED EMISSIONS CONSIDERATIONS*

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

### *RADIATED EMISSIONS CONSIDERATIONS*

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

## *MEASUREMENT INSTRUMENTATION*

### *RECEIVER SYSTEM*

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

*INSTRUMENT CONTROL COMPUTER*

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

*LINE IMPEDANCE STABILIZATION NETWORK (LISN)*

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

*FILTERS/ATTENUATORS*

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

*ANTENNAS*

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

*ANTENNA MAST AND EQUIPMENT TURNTABLE*

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

*INSTRUMENT CALIBRATION*

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

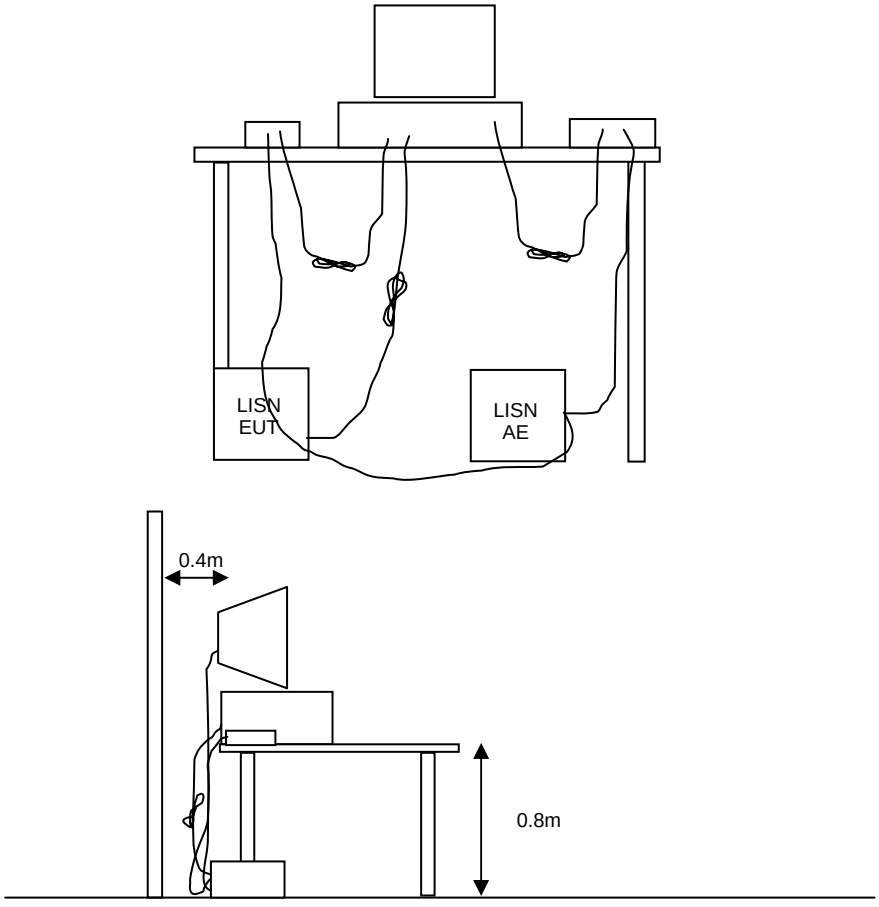
## *TEST PROCEDURES*

### *EUT AND CABLE PLACEMENT*

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

### *CONDUCTED EMISSIONS*

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.



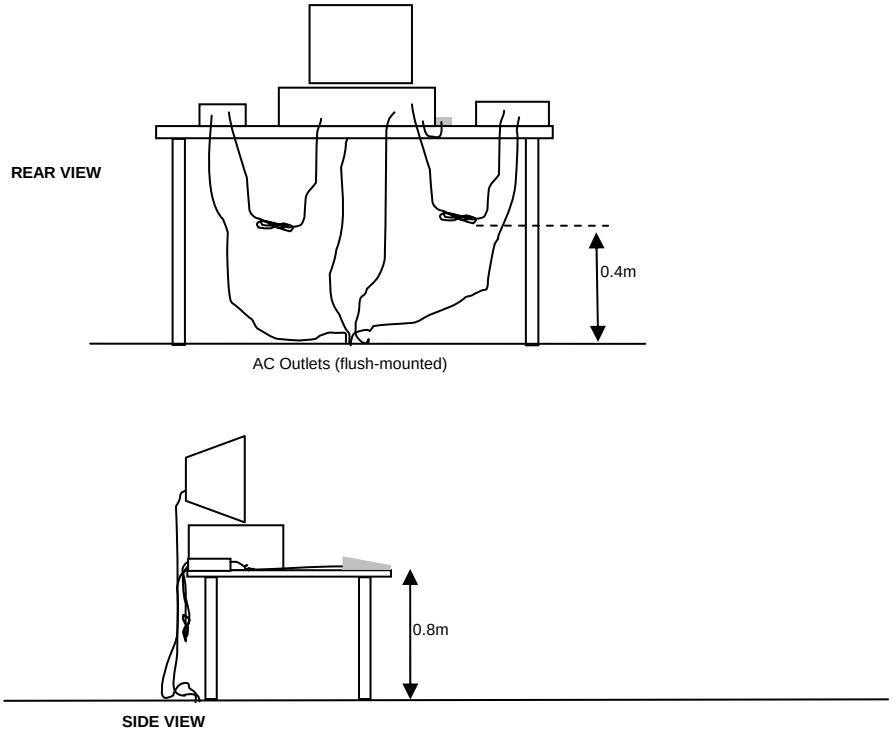
*RADIATED EMISSIONS*

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

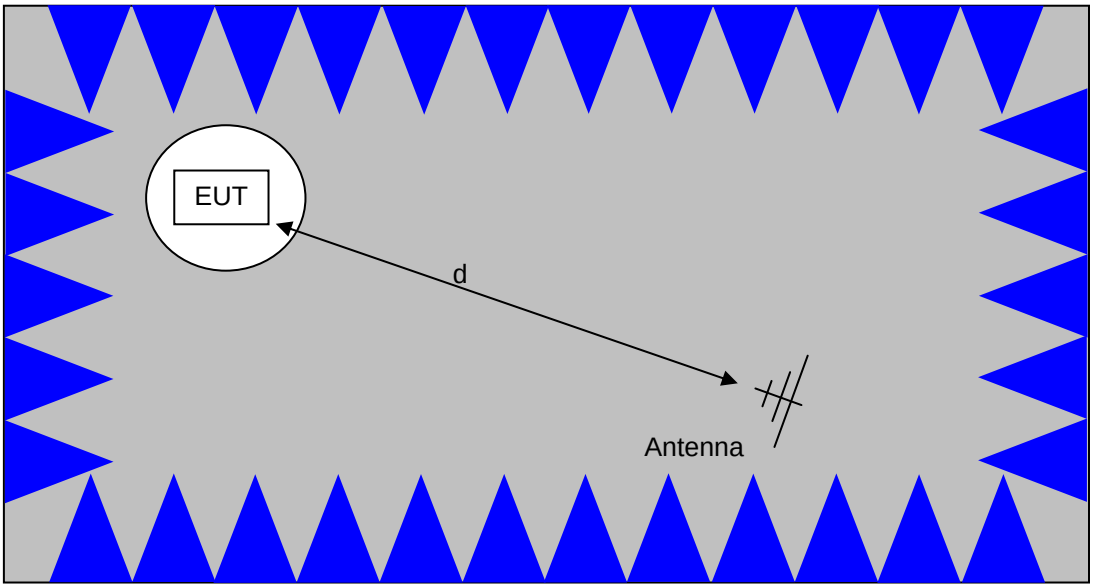
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

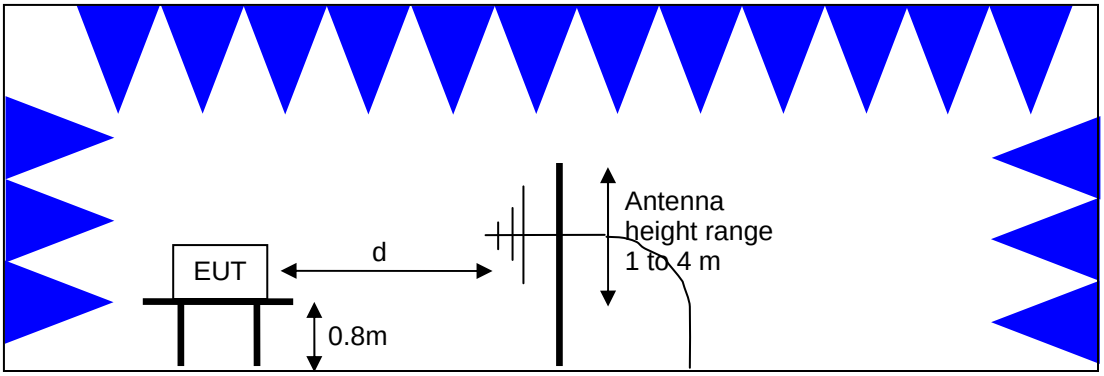



Typical Test Configuration for Radiated Field Strength Measurements




The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.




Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

## *SPECIFICATION LIMITS AND SAMPLE CALCULATIONS*

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

### *GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS*

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

| Frequency Range (MHz) | Limit (uV/m) | Limit (dBuV/m @ 3m) |
|---|---|---|
| 0.009-0.490 | $2400/F_{KHz}$ @ 300m | $67.6-20*\log_{10}(F_{KHz})$ @ 300m |
| 0.490-1.705 | $24000/F_{KHz}$ @ 30m | $87.6-20*\log_{10}(F_{KHz})$ @ 30m |
| 1.705 to 30 | 30 @ 30m | 29.5 @ 30m |
| 30 to 88 | 100 @ 3m | 40 @ 3m |
| 88 to 216 | 150 @ 3m | 43.5 @ 3m |
| 216 to 960 | 200 @ 3m | 46.0 @ 3m |
| Above 960 | 500 @ 3m | 54.0 @ 3m |

### *RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS*

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

| Frequency Range (MHz) | Limit (uV/m @ 3m) | Limit (dBuV/m @ 3m) |
|---|---|---|
| 30 to 88 | 100 | 40 |
| 88 to 216 | 150 | 43.5 |
| 216 to 960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

*OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS*

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

| Operating Frequency (MHz) | Output Power | Power Spectral Density |
|---|---|---|
| 902 – 928 | 1 Watt (30 dBm) | 8 dBm/3kHz |
| 2400 – 2483.5 | 1 Watt (30 dBm) | 8 dBm/3kHz |
| 5725 – 5850 | 1 Watt (30 dBm) | 8 dBm/3kHz |

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

*TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS*

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

*SAMPLE CALCULATIONS - CONDUCTED EMISSIONS*

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

$R_r$ = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

*SAMPLE CALCULATIONS - RADIATED EMISSIONS*

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

$F_d$ = Distance Factor in dB

$D_m$ = Measurement Distance in meters

$D_s$ = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

$R_r$ = Receiver Reading in dBuV/m

$F_d$ = Distance Factor in dB

$R_c$ = Corrected Reading in dBuV/m

$L_s$ = Specification Limit in dBuV/m

$M$ = Margin in dB Relative to Spec

*SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION*

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ microvolts per meter}$$

where P is the eirp (Watts)

# *Appendix A Test Equipment Calibration Data*

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 785 | 6/3/2010 |
| EMCO | Antenna, Horn, 1-18 GHz (SA40-Red) | 3115 | 1142 | 7/15/2010 |
| Rohde & Schwarz | Power Meter, Single Channel | NRVS | 1290 | 10/22/2010 |
| Hewlett Packard | High Pass filter, 8.2 GHz (Blu System) | P/N 84300-80039 (84125C) | 1392 | 6/22/2010 |
| Hewlett Packard | SpecAn 9 kHz - 40 GHz, FT (SA40) Blue | 8564E (84125C) | 1393 | 4/10/2010 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB7 | 1538 | 10/15/2010 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 1549 | 6/4/2010 |
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 1561 | 6/10/2010 |
| Hewlett Packard | Preamplifier, 100 kHz - 1.3 GHz | 8447E | 1606 | 4/30/2010 |
| Micro-Tronics | Band Reject Filter, 2400-2500 MHz | BRM50702-02 | 1683 | 7/29/2010 |
| Micro-Tronics | Band Reject Filter, 5725-5875 MHz | BRC50705-02 | 1728 | 2/1/2011 |
| Micro-Tronics | Band Reject Filter, 5150-5350 MHz | BRC50703-02 | 1729 | 9/25/2010 |
| Micro-Tronics | Band Reject Filter, 5470-5725 MHz | BRC50704-02 | 1730 | 9/25/2010 |
| Hewlett Packard | SpecAn 9 kHz - 40 GHz, (SA40) Purple | 8564E (84125C) | 1771 | 9/30/2010 |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 1780 | 9/17/2010 |
| Rohde & Schwarz | Pwr Sensor 300 uW - 30 Watts (+ 25dB pad) | NRV-Z54 | 1788 | 6/9/2010 |
| Rohde & Schwarz | Attenuator, 25 dB, 30W, DC-18 GHz | 25dB, 30W, Type N | 1794 | 6/9/2010 |

# *Appendix B Test Data*

T78676 21 Pages

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | - |
| Emissions Standard(s): | FCC 15E, FCC 15C, FCC 15B | Class: | B |
| Immunity Standard(s): | - | Environment: | - |

# EMC Test Data

For The

# Intel Corporation

Model

Puma Peak 2x2

Date of Last Test: 4/1/2010

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

# FCC 15.247 (DTS) Radiated Emissions Band Edge Measurements

## Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

## General Test Configuration

The EUT ws installed into a test fixture such that the EUT was exposed (i.e. outside of a host PC).
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

## Summary of Results

MAC Address: 0023146851DC CRTU Tool Version 5.15.36.0 Driver version 13.0.0.91

| Run # | Mode | Channel | Target Power | Measured Power | Test Performed | Limit | Result / Margin |
|---|---|---|---|---|---|---|---|
| Run # 1 | 802.11b Chain A | #1 2412MHz | 16.5 | 16.7 | Restricted Band Edge at 2400 MHz | 15.209 | 38.4dBµV/m @ 2390.0MHz (-15.6dB) |
| | | #11 2462MHz | 16.5 | 16.7 | Restricted Band Edge at 2483.5 MHz | 15.209 | 44.0dBµV/m @ 2483.5MHz (-10.0dB) |
| | 802.11b Chain B | #1 2412MHz | 16.6 | | Restricted Band Edge at 2400 MHz | 15.209 | Original testing showed Chain A worst case and margins > 10dB |
| | | #11 2462MHz | 16.6 | | Restricted Band Edge at 2483.5 MHz | 15.209 | |
| Run # 2 | 802.11g Chain A | #1 2412MHz | 15.4 | 14.8 | Restricted Band Edge at 2400 MHz | 15.209 | 52.5dBµV/m @ 2389.4MHz (-1.5dB) |
| | | #11 2462MHz | 15.5 | 15.7 | Restricted Band Edge at 2483.5 MHz | 15.209 | 51.7dBµV/m @ 2390.0MHz (-2.3dB) |
| | 802.11g Chain B | #1 2412MHz | 15.6 | | Restricted Band Edge at 2400 MHz | 15.209 | Original testing showed Chain A worst case and margins > 6dB |
| | | #11 2462MHz | 15.7 | | Restricted Band Edge at 2483.5 MHz | 15.209 | |
| Run # 3 | n20 Chain A | #1 2412MHz | 14.7 | 14.7 | Restricted Band Edge at 2400 MHz | 15.209 | 52.5dBµV/m @ 2390.0MHz (-1.5dB) |
| | | #11 2462MHz | 14.4 | 14.3 | Restricted Band Edge at 2483.5 MHz | 15.209 | 52.4dBµV/m @ 2483.5MHz (-1.6dB) |
| Run # 4 | n20 Chain B | #1 2412MHz | 14.5 | 14.5 | Restricted Band Edge at 2400 MHz | 15.209 | 52.4dBµV/m @ 2390.0MHz (-1.6dB) |
| | | #11 2462MHz | 14.3 | 14.6 | Restricted Band Edge at 2483.5 MHz | 15.209 | 52.6dBµV/m @ 2483.5MHz (-1.4dB) |
| Run # 5 | n40 Chain A | #3 2422MHz | 10.5 | 10.7 | Restricted Band Edge at 2400 MHz | 15.209 | 51.8dBµV/m @ 2390.0MHz (-2.2dB) |
| | | #9 2452MHz | 11.5 | 11.7 | Restricted Band Edge at 2483.5 MHz | 15.209 | 50.7dBµV/m @ 2483.5MHz (-3.3dB) |

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Run # 6 | n40 Chain B | #3 2422MHz | 10.5 | 10.6 | Restricted Band Edge at 2400 MHz | 15.209 | 49.9dBµV/m @ 2389.8MHz (-4.1dB) |
| | | #9 2452MHz | 11.0 | 11.2 | Restricted Band Edge at 2483.5 MHz | 15.209 | 51.7dBµV/m @ 2483.5MHz (-2.3dB) |

Note - the target and measured power are average powers (measured with average power sensor) and are used for reference purposes only. Power is set using " Set TX Power Manually" mode in the CRTU tool.

## Ambient Conditions:

Rel. Humidity: 19.8 %
Temperature: 40 °C

## Modifications Made During Testing

No modifications were made to the EUT during testing

## Deviations From The Standard

No deviations were made from the requirements of the standard.

## Marker Delta Measurements

Three sets of marker deltas are measured using the following settings: RB=VB=100kHz; RB=1MHz,VB=1MHz; RB=1MHz, VB=10Hz.
Marker deltas are made conducted (analyzer connected to EUT rf port a 20dB pad) for single chain operation.
The fundamental field strength is always measured at a 3m test distance.

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 1, Band Edge Field Strength - 802.11b, Chain A

Date of Test: 3/12/2010 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run # 1a, EUT on Channel #1 2412MHz - 802.11b, Chain A

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| A | 16.5 | 16.7 | 17.0 |

*Fundamental Signal Field Strength*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2413.870 | 99.1 | V | - | - | AVG | 186 | 1.8 | RB 1 MHz; VB: 10 Hz |
| 2413.200 | 102.0 | V | - | - | PK | 186 | 1.8 | RB 1 MHz; VB: 1 MHz |
| 2413.900 | 101.1 | H | - | - | AVG | 314 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2413.170 | 104.0 | H | - | - | PK | 314 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2412.870 | 98.5 | H | - | - | PK | 314 | 1.0 | RB 100 kHz; VB: 100 kHz |

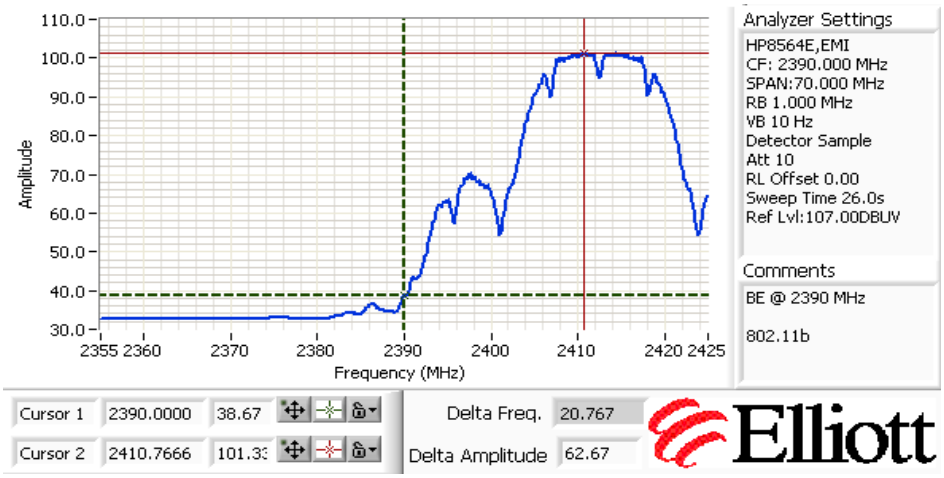
*2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 104.0 | 102.0 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 101.1 | 99.1 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *60.7 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 43.3 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 40.4 dBuV/m | | |

| | Margin | Level | Limit | Detector |
|---|---|---|---|---|
| *Delta Marker - 1MHz/1MHz:* | -15.6 | 38.4 | 54 | Avg |
| *Delta Marker - 1MHz/10Hz:* | -30.7 | 43.3 | 74 | Pk |

| | | |
|---|---|---|
| Calculated Band-Edge Measurement (Peak): | 47.5 dBuV/m | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 38.4 dBuV/m | Using 1MHz delta value |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2390.000 | 38.4 | - | 54.0 | -15.6 | Avg | - | - | Using 1MHz delta value |



# EMC Test Data

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 1b, EUT on Channel #11 2462MHz - 802.11b, Chain A

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| A | 16.5 | 16.7 | 18.0 |

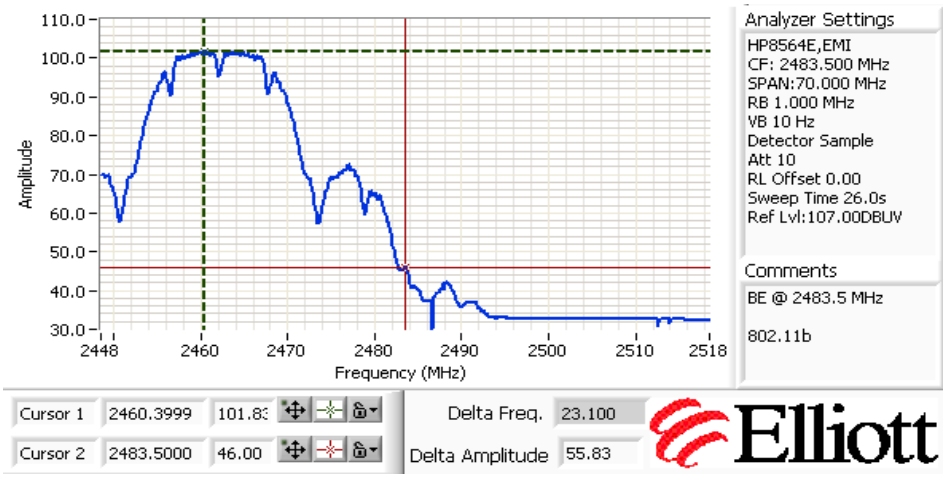
*Fundamental Signal Field Strength*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2460.330 | 99.8 | H | - | - | AVG | 301 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2460.630 | 102.6 | H | - | - | PK | 301 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2461.470 | 96.8 | H | - | - | PK | 301 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2460.330 | 97.8 | V | - | - | AVG | 271 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2463.130 | 100.7 | V | - | - | PK | 271 | 1.0 | RB 1 MHz; VB: 1 MHz |

*2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 102.6 | 100.7 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 99.8 | 97.8 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *53.3 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 49.3 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 46.5 dBuV/m | | Margin / Level / Limit / Detector |
| *Delta Marker - 1MHz/1MHz:* | *51.5 dB* | | -10.0 / 44.0 / 54 / Avg |
| *Delta Marker - 1MHz/10Hz:* | 55.8 dB | | -24.7 / 49.3 / 74 / Pk |
| Calculated Band-Edge Measurement (Peak): | 51.1 dBuV/m | | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 44.0 dBuV/m | | Using 1MHz delta value |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2483.500 | 44.0 | - | 54.0 | -10.0 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 2, Band Edge Field Strength - 802.11g, Chain A

Date of Test: 3/12/2010 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run # 2a, EUT on Channel #1 2412MHz - 802.11g, Chain A

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| A | 15.4 | 14.8 | 16.0 |

*Fundamental Signal Field Strength*

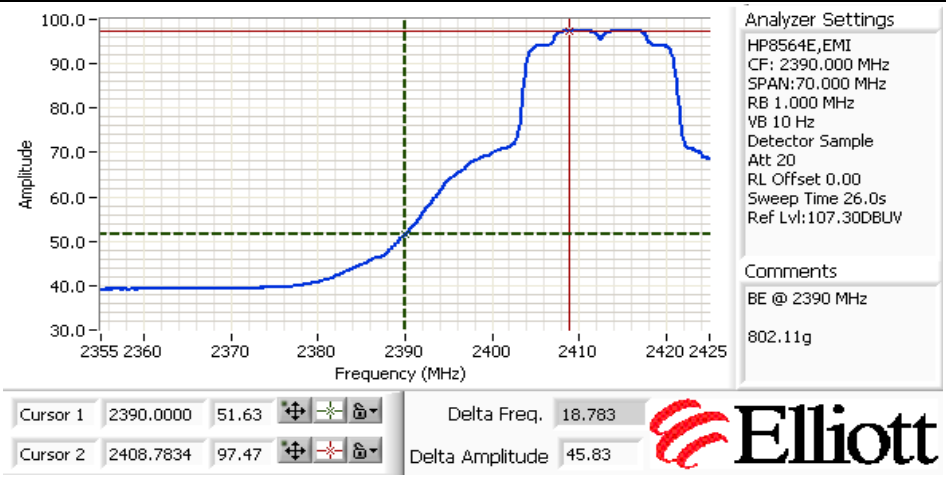
| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2413.410 | 98.3 | H | - | - | AVG | 320 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2412.070 | 106.7 | H | - | - | PK | 320 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2409.630 | 98.1 | H | - | - | PK | 320 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2414.670 | 95.3 | V | - | - | AVG | 184 | 1.8 | RB 1 MHz; VB: 10 Hz |
| 2414.800 | 103.6 | V | - | - | PK | 184 | 1.8 | RB 1 MHz; VB: 1 MHz |

*2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 106.7 | 104.8 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 98.3 | 96.8 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *44.2 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 62.5 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 54.1 dBuV/m | | |
| *Delta Marker - 1MHz/1MHz:* | *39.0 dB* | | |
| *Delta Marker - 1MHz/10Hz:* | 45.8 dB | | |
| Calculated Band-Edge Measurement (Peak): | 67.7 dBuV/m | | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 52.5 dBuV/m | | Using 1MHz delta value |

| Margin | Level | Limit | Detector |
|---|---|---|---|
| -1.5 | 52.5 | 54 | Avg |
| -11.5 | 62.5 | 74 | Pk |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2390.000 | 52.5 | - | 54.0 | -1.5 | Avg | - | - | Using 1MHz delta value |



# EMC Test Data

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 2b, EUT on Channel #11 2462MHz - 802.11g, Chain A

Date of Test: 3/31/2010 Test Location: Chamber #5

Test Engineer: Suhaila Khushzad Config Change: none

| | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| Chain A | 15.5 | 15.7 | 31.0 |

*Fundamental Signal Field Strength*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2466.670 | 97.2 | H | - | - | AVG | 307 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2465.400 | 104.8 | H | - | - | PK | 307 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2467.000 | 99.3 | H | - | - | PK | 307 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2466.600 | 94.0 | V | - | - | AVG | 141 | 1.2 | RB 1 MHz; VB: 10 Hz |
| 2464.870 | 101.8 | V | - | - | PK | 141 | 1.2 | RB 1 MHz; VB: 1 MHz |
| 2466.930 | 92.2 | V | - | - | PK | 141 | 1.2 | RB 100 kHz; VB: 100 kHz |

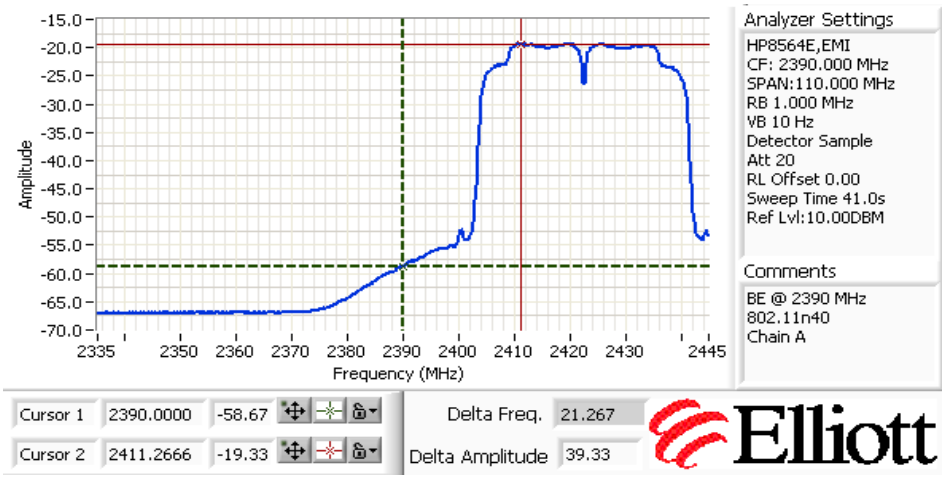
*2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 104.8 | 101.8 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 97.2 | 94.0 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *44.8 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 60.0 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 52.4 dBuV/m | | |

| | Margin | Level | Limit | Detector |
|---|---|---|---|---|
| *Delta Marker - 1MHz/1MHz:* | *38.0 dB* | -2.3 | 51.7 | 54 | Avg |
| *Delta Marker - 1MHz/10Hz:* | 45.5 *dB* | -14.0 | 60.0 | 74 | Pk |

| | | |
|---|---|---|
| Calculated Band-Edge Measurement (Peak): | 66.8 dBuV/m | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 51.7 dBuV/m | Using 1MHz delta value |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2390.000 | 51.7 | - | 54.0 | -2.3 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 3, Band Edge Field Strength - n20, Chain A

Date of Test: 3/12/2010 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run # 3a, EUT on Channel #1 2412MHz - n20, Chain A

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| A | 14.7 | 14.7 | 15.0 |

*Fundamental Signal Field Strength*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2415.130 | 97.3 | H | - | - | AVG | 319 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2415.370 | 105.3 | H | - | - | PK | 319 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2415.970 | 97.6 | H | - | - | PK | 319 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2414.970 | 94.8 | V | - | - | AVG | 185 | 1.8 | RB 1 MHz; VB: 10 Hz |
| 2415.430 | 103.0 | V | - | - | PK | 185 | 1.8 | RB 1 MHz; VB: 1 MHz |

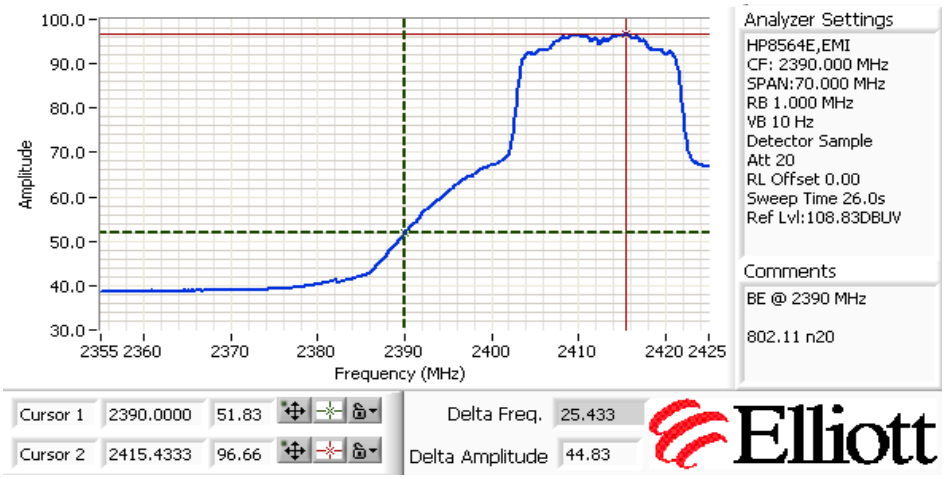
*2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 105.3 | 103.0 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 97.3 | 94.8 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *43.3 dB* | | <- this can only be used if band edge signal is |
| Calculated Band-Edge Measurement (Peak): | 62.0 dBuV/m | | highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Avg): | 54.0 dBuV/m | | |

| | Margin | Level | Limit | Detector |
|---|---|---|---|---|
| *Delta Marker - 1MHz/1MHz:* | *34.3 dB* | -1.5 | 52.5 | 54 | Avg |
| *Delta Marker - 1MHz/10Hz:* | 44.8 dB | -12.0 | 62.0 | 74 | Pk |

| | | |
|---|---|---|
| Calculated Band-Edge Measurement (Peak): | 71.0 dBuV/m | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 52.5 dBuV/m | Using 1MHz delta value |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2390.000 | 52.5 | - | 54.0 | -1.5 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 3b, EUT on Channel #11 2462MHz - n20, Chain A

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| A | 14.4 | 14.3 | 14.5 |

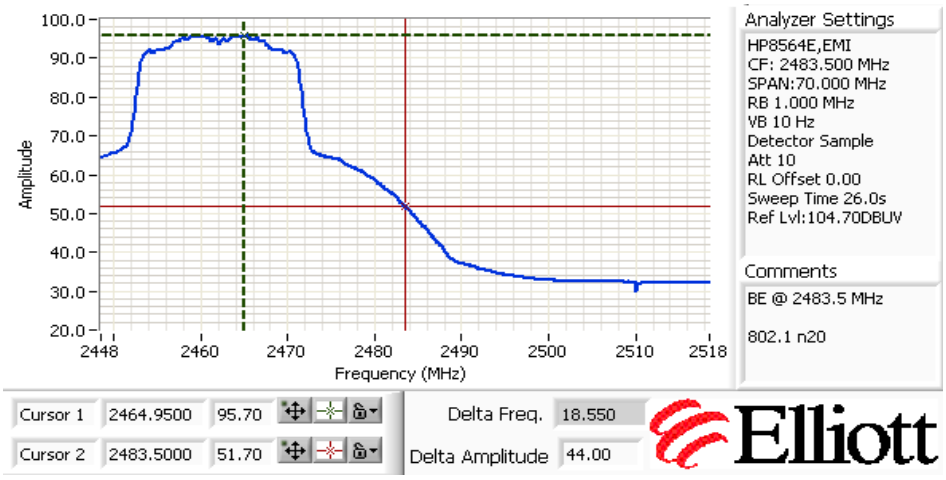
*Fundamental Signal Field Strength*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2464.970 | 96.4 | H | - | - | AVG | 317 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2465.570 | 104.5 | H | - | - | PK | 317 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2462.770 | 95.8 | H | - | - | PK | 317 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2458.730 | 96.0 | V | - | - | AVG | 193 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2465.400 | 103.8 | V | - | - | PK | 193 | 1.0 | RB 1 MHz; VB: 1 MHz |

*2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 104.5 | 103.8 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 96.4 | 96.0 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *42.8 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 61.7 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 53.6 dBuV/m | | Margin / Level / Limit / Detector |
| *Delta Marker - 1MHz/1MHz:* | *34.8 dB* | | -1.6 / 52.4 / 54 / Avg |
| *Delta Marker - 1MHz/10Hz:* | 44.0 dB | | -12.3 / 61.7 / 74 / Pk |
| Calculated Band-Edge Measurement (Peak): | 69.7 dBuV/m | | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 52.4 dBuV/m | | Using 1MHz delta value |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2483.500 | 52.4 | - | 54.0 | -1.6 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 4, Band Edge Field Strength - n20, Chain B

Date of Test: 3/13/2010 Test Location: Chamber #4

Test Engineer: Suhaila Khushzad Config Change: none

Run # 4a, EUT on Channel #1 2412MHz - n20, Chain B

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| B | 14.5 | 14.5 | 15.5 |

*Fundamental Signal Field Strength*

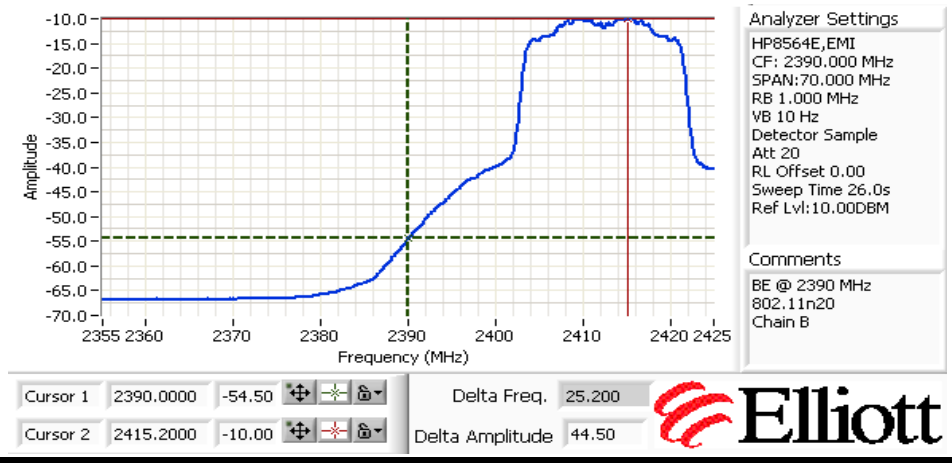
| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2415.370 | 96.9 | H | - | - | AVG | 40 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2414.600 | 104.3 | H | - | - | PK | 40 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2415.330 | 95.0 | V | - | - | AVG | 81 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2409.270 | 102.8 | V | - | - | PK | 81 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2417.270 | 95.8 | V | - | - | PK | 81 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2409.800 | 94.4 | H | - | - | PK | 39 | 1.0 | RB 100 kHz; VB: 100 kHz |

*2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 104.3 | 102.8 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 96.9 | 95.0 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *44.3 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 60.0 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 52.6 dBuV/m | | |

| | | Margin | Level | Limit | Detector |
|---|---|---|---|---|---|
| *Delta Marker - 1MHz/1MHz:* | *35.3 dB* | -1.6 | 52.4 | 54 | Avg |
| *Delta Marker - 1MHz/10Hz:* | 44.5 *dB* | -14.0 | 60.0 | 74 | Pk |
| Calculated Band-Edge Measurement (Peak): | 69.0 dBuV/m | Using 100kHz delta value | | | |
| Calculated Band-Edge Measurement (Avg): | 52.4 dBuV/m | Using 1MHz delta value | | | |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2390.000 | 52.4 | - | 54.0 | -1.6 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 4b, EUT on Channel #11 2462MHz - n20, Chain B

| Chain | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| B | 14.3 | 14.6 | 15.0 |

*Fundamental Signal Field Strength*

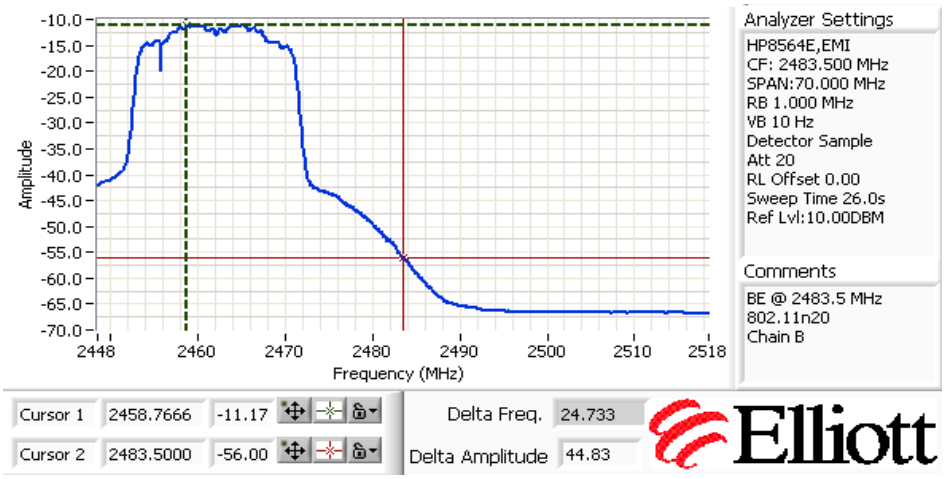
| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2458.070 | 97.4 | H | - | - | AVG | 54 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2460.200 | 105.2 | H | - | - | PK | 54 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2465.130 | 93.7 | V | - | - | AVG | 84 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2465.270 | 101.3 | V | - | - | PK | 84 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2463.530 | 92.4 | V | - | - | PK | 84 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2459.130 | 93.4 | H | - | - | PK | 52 | 1.0 | RB 100 kHz; VB: 100 kHz |

*2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 105.2 | 101.3 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 97.4 | 93.7 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *43.8 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 61.4 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 53.6 dBuV/m | | |
| *Delta Marker - 1MHz/1MHz:* | *34.8 dB* | | |
| *Delta Marker - 1MHz/10Hz:* | 44.8 *dB* | | |
| Calculated Band-Edge Measurement (Peak): | 70.4 dBuV/m | | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 52.6 dBuV/m | | Using 1MHz delta value |

| Margin | Level | Limit | Detector |
|---|---|---|---|
| -1.4 | 52.6 | 54 | Avg |
| -12.6 | 61.4 | 74 | Pk |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2483.500 | 52.6 | - | 54.0 | -1.4 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 5, Band Edge Field Strength - n40, Chain A

Date of Test: 3/31/2010 Test Location: Chamber #5

Test Engineer: Suhaila Khushzad Config Change: none

Run # 5a, EUT on Channel #3 2422MHz - n40, Chain A

| | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| Chain A | 10.5 | 10.7 | 25.0 |

*Fundamental Signal Field Strength*

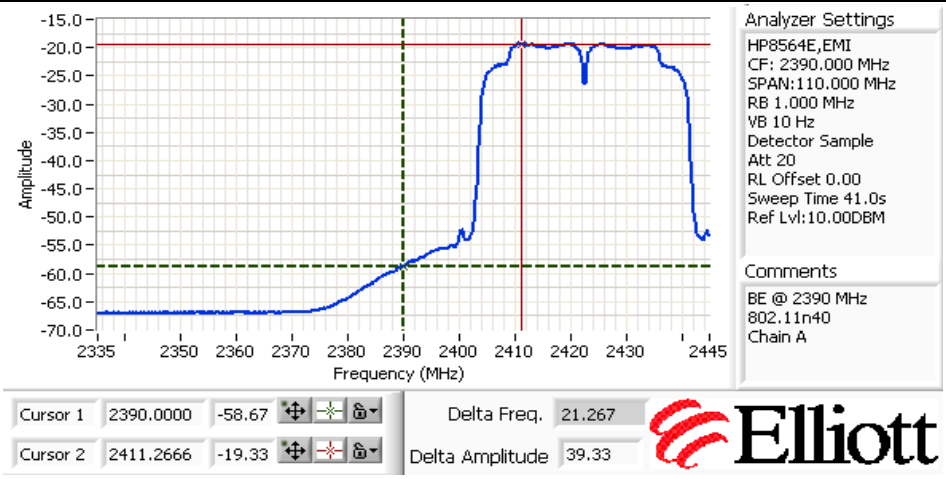
| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2410.930 | 89.5 | H | - | - | AVG | 333 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2411.000 | 91.1 | V | - | - | AVG | 189 | 1.5 | RB 1 MHz; VB: 10 Hz |
| 2411.930 | 98.8 | V | - | - | PK | 189 | 1.5 | RB 1 MHz; VB: 1 MHz |
| 2410.870 | 92.0 | V | - | - | PK | 189 | 1.5 | RB 100 kHz; VB: 100 kHz |

*2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 97.5 | 98.8 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 89.5 | 91.1 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *36.5 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 62.3 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 54.6 dBuV/m | | |
| *Delta Marker - 1MHz/1MHz:* | *33.2 dB* | | |
| *Delta Marker - 1MHz/10Hz:* | 39.3 *dB* | | |
| Calculated Band-Edge Measurement (Peak): | 65.6 dBuV/m | | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 51.8 dBuV/m | | Using 1MHz delta value |

| Margin | Level | Limit | Detector |
|---|---|---|---|
| -2.2 | 51.8 | 54 | Avg |
| -11.7 | 62.3 | 74 | Pk |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2390.000 | 51.8 | - | 54.0 | -2.2 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 5b, EUT on Channel #9 2452MHz - n40, Chain A

| | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| Chain A | 11.5 | 11.7 | 26.0 |

*Fundamental Signal Field Strength*

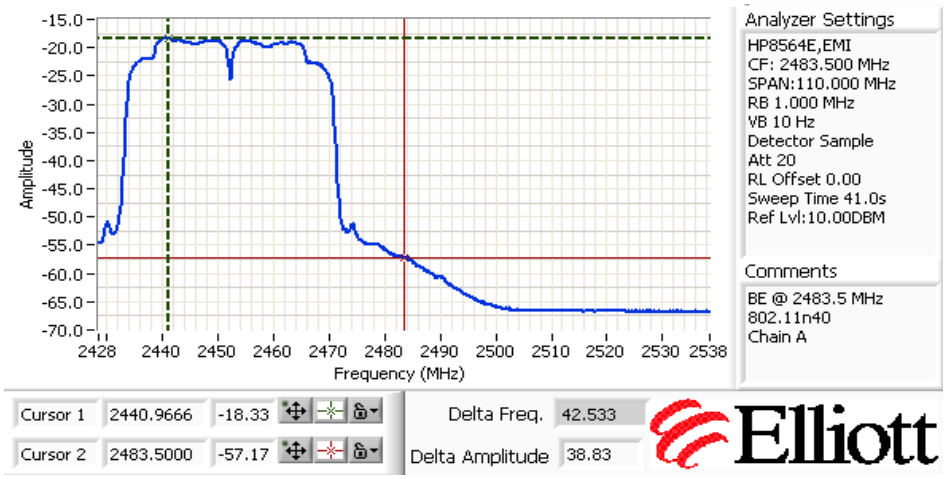
| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2441.000 | 87.3 | V | - | - | AVG | 289 | 1.1 | RB 1 MHz; VB: 10 Hz |
| 2442.000 | 95.6 | V | - | - | PK | 289 | 1.1 | RB 1 MHz; VB: 1 MHz |
| 2442.130 | 86.1 | V | - | - | PK | 289 | 1.1 | RB 100 kHz; VB: 100 kHz |
| 2441.070 | 89.5 | H | - | - | AVG | 332 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2442.000 | 97.5 | H | - | - | PK | 332 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2440.930 | 89.6 | H | - | - | PK | 332 | 1.0 | RB 100 kHz; VB: 100 kHz |

*2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 97.5 | 95.6 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 89.5 | 87.3 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *36.5 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 61.0 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 53.0 dBuV/m | | |

| | | Margin | Level | Limit | Detector |
|---|---|---|---|---|---|
| *Delta Marker - 1MHz/1MHz:* | *32.2 dB* | -3.3 | 50.7 | 54 | Avg |
| *Delta Marker - 1MHz/10Hz:* | 38.8 dB | -13.0 | 61.0 | 74 | Pk |
| Calculated Band-Edge Measurement (Peak): | 65.3 dBuV/m | Using 100kHz delta value | | | |
| Calculated Band-Edge Measurement (Avg): | 50.7 dBuV/m | Using 1MHz delta value | | | |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2483.500 | 50.7 | - | 54.0 | -3.3 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 6, Band Edge Field Strength - n40, Chain B

Date of Test: 3/31/2010 Test Location: Chamber #5

Test Engineer: Suhaila Khushzad Config Change: none

Run # 6a, EUT on Channel #3 2422MHz - n40, Chain B

| | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| Chain B | 10.5 | 10.6 | 24.5 |

*Fundamental Signal Field Strength*

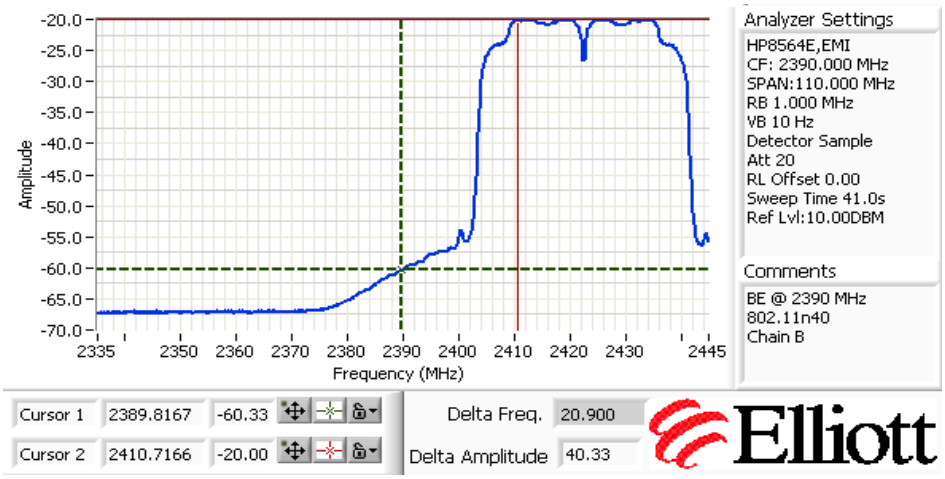
| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2411.000 | 88.7 | V | - | - | AVG | 164 | 1.6 | RB 1 MHz; VB: 10 Hz |
| 2411.530 | 96.4 | V | - | - | PK | 164 | 1.6 | RB 1 MHz; VB: 1 MHz |
| 2411.070 | 90.2 | H | - | - | AVG | 10 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2412.070 | 98.1 | H | - | - | PK | 10 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2409.730 | 91.0 | H | - | - | PK | 10 | 1.0 | RB 100 kHz; VB: 100 kHz |

*2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 98.1 | 96.4 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 90.2 | 88.7 | Average Measurement (RB=1MHz, VB=10Hz) |
| *Delta Marker - 100kHz* | *37.7 dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. |
| Calculated Band-Edge Measurement (Peak): | 60.4 dBuV/m | | |
| Calculated Band-Edge Measurement (Avg): | 52.5 dBuV/m | | |
| *Delta Marker - 1MHz/1MHz:* | *34.8 dB* | | |
| *Delta Marker - 1MHz/10Hz:* | 40.3 *dB* | | |
| Calculated Band-Edge Measurement (Peak): | 63.3 dBuV/m | | Using 100kHz delta value |
| Calculated Band-Edge Measurement (Avg): | 49.9 dBuV/m | | Using 1MHz delta value |

| Margin | Level | Limit | Detector |
|---|---|---|---|
| -4.1 | 49.9 | 54 | Avg |
| -13.6 | 60.4 | 74 | Pk |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2389.820 | 49.9 | - | 54.0 | -4.1 | Avg | - | - | Using 1MHz delta value |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 6b, EUT on Channel #9 2452MHz - n40, Chain B

| | Power Settings | | |
|---|---|---|---|
| | Target (dBm) | Measured (dBm) | Software Setting |
| Chain B | 11.0 | 11.2 | 25.5 |

*Fundamental Signal Field Strength*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2440.930 | 91.2 | H | - | - | AVG | 15 | 1.0 | RB 1 MHz; VB: 10 Hz |
| 2442.000 | 99.1 | H | - | - | PK | 15 | 1.0 | RB 1 MHz; VB: 1 MHz |
| 2441.270 | 91.8 | H | - | - | PK | 15 | 1.0 | RB 100 kHz; VB: 100 kHz |
| 2440.930 | 87.5 | V | - | - | AVG | 160 | 1.8 | RB 1 MHz; VB: 10 Hz |
| 2444.600 | 95.6 | V | - | - | PK | 160 | 1.8 | RB 1 MHz; VB: 1 MHz |
| 2441.270 | 85.9 | V | - | - | PK | 160 | 1.8 | RB 100 kHz; VB: 100 kHz |

*2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta*

| | H | V | |
|---|---|---|---|
| Fundamental emission level @ 3m in 1MHz RBW: | 99.1 | 95.6 | Peak Measurement (RB=VB=1MHz) |
| Fundamental emission level @ 3m in 1MHz RBW: | 91.2 | 87.5 | Average Measurement (RB=1MHz, VB=10Hz) |

| | | | | | |
|---|---|---|---|---|---|
| *Delta Marker - 100kHz* | *dB* | | <- this can only be used if band edge signal is highest within 2MHz of band edge. | | |
| Calculated Band-Edge Measurement (Peak): | 99.1 dBuV/m | | Margin | Level | Limit | Detector |
| Calculated Band-Edge Measurement (Avg): | 91.2 dBuV/m | | | | | |
| *Delta Marker - 1MHz/1MHz:* | *34.8 dB* | | -2.3 | 51.7 | 54 | Avg |
| *Delta Marker - 1MHz/10Hz:* | 39.5 *dB* | | -9.7 | 64.3 | 74 | Pk |
| Calculated Band-Edge Measurement (Peak): | 64.3 dBuV/m | | Using 1MHz delta value | | | |
| Calculated Band-Edge Measurement (Avg): | 51.7 dBuV/m | | Using 1MHz delta value | | | |

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2483.500 | 51.7 | - | 54.0 | -2.3 | Avg | - | - | Using 1MHz delta value |

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

# RSS 210 / FCC 15.247 (DTS) / FCC 15 E (NII)
# Transmitter and Receiver Radiated Spurious Emissions

## Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

## General Test Configuration

The EUT ws installed into a test fixture such that the EUT was exposed (i.e. outside of a host PC).
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

## Ambient Conditions:

Temperature: 19.2 °C
Rel. Humidity: 41 %

## Modifications Made During Testing

No modifications were made to the EUT during testing

## Summary of Results

MAC Address: 0023146851DC CRTU Tool Version 5.15.36.0 Driver version 13.0.0.91

| Run # | Mode | Channel | Target Power | Measured Power | Test Performed | Limit | Result / Margin |
|---|---|---|---|---|---|---|---|
| 2.4 GHz DTS band - verified that the changes had no signifcant effect on the spurious emissions away from the restricted band edges by evaluating the worst case mode (802.11b) and worst case OFDM mode (802.11n20). The margins had improved over those from the original testing (-14dB for 802.11b mode). | | | | | | | |
| Run # 1 | 802.11b Chain B | #6 2437MHz | 16.4 | 16.5 | Radiated Emissions, 1 - 26 GHz | FCC 15.209 / 15.247 | 48.0dBµV/m @ 5995.8MHz (-22.0dB) |
| Run # 2 | n20 Chain A+B | #6 2437MHz | 16.6 | 16.6 | Radiated Emissions, 1 - 26 GHz | FCC 15.209 / 15.247 | 47.9dBµV/m @ 2998.3MHz (-22.1dB) |
| 5.7 GHz DTS band - verified that the changes had no signifcant effect on the spurious emissions away from the restricted band edges by evaluating the worst case mode (802.11n40) on the worst case channel (#151, 5755 MHz). The margin was slightly improved over the margin from the original testing (-7.2dB). | | | | | | | |
| Run #3 | n40 Chain A+B | #151 5755MHz# | 16.7 | 16.8 | Radiated Emissions, 1 - 40 GHz | FCC 15.209 / 15.247 | 45.5dBµV/m @ 7673.3MHz (-8.5dB) |
| Receiver spurious emissions: | | | | | | | |
| Run # 4 | Rx Chain A+B | #6 2437MHz | - | - | Radiated Emissions, 1 - 12 GHz | RSS 210 | 47.3dBµV/m @ 3000.4MHz (-6.7dB) |
| | | #157 5785MHz | - | - | | | 47.7dBµV/m @ 6000.7MHz (-6.3dB) |

| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

## Deviations From The Standard

Radiated spurious emissions were measured only to 18 GHz when the device was operating in the 2.4 GHz band. Although the requirement would be to test to 26GHz, the testing performed on the original version of this device indicated there were no significant emissions above 10GHz. As the measurements showed there were no significant emissions between 10 GHz and 18 GHz measurements above 18 GHz were considered unnecessary.

Radiated spurious emissions were measured only to 40 GHz when the device was operating on the - channel in the #159 5795MHzest 5 GHz band (5725-5850 MHz). The requirement would be to test to 40GHz for all channels. The measurements for the #159 5795MHzest channel showed there were no significant emissions above 18 GHz, therefore measurements above 18 GHz were considered unnecessary for the remaining 5GHz channels.

Run # 1, Radiated Spurious Emissions, 1-26GHz, 802.11b, Chain B

Date of Test: 3/15/2010 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: None

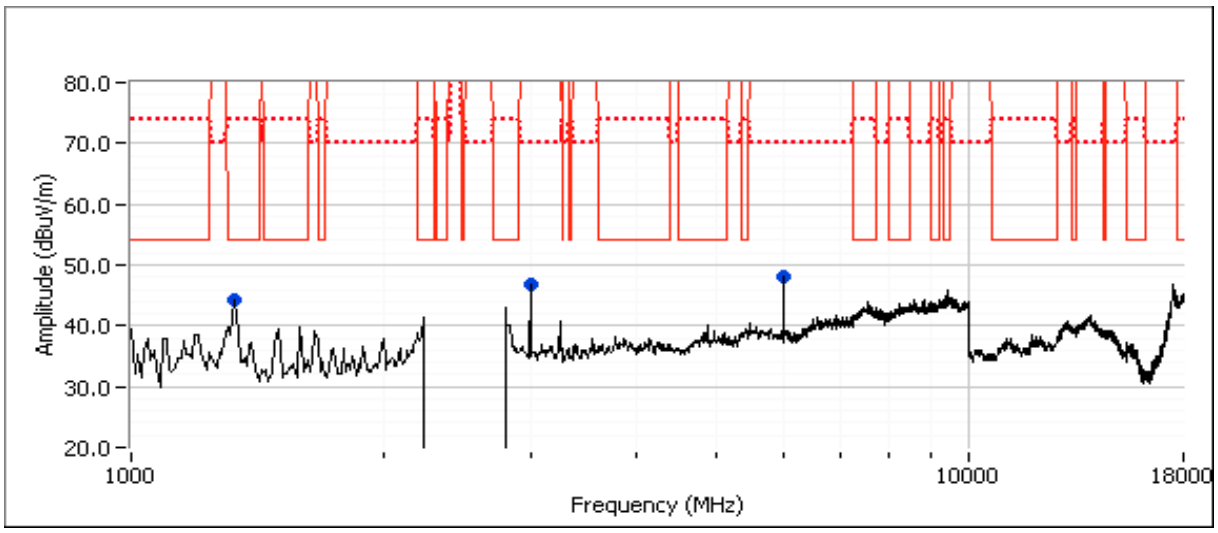
Run # 1a, EUT on - Channel #6 (2437 MHz) - 802.11b, Chain B

| | Power Settings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Target (dBm) | | | | Measured (dBm) | | | | Software Setting |
| Chain | A | B | C | Total | A | B | C | Total | |
| | | 16.4 | | 16.5 | | 16.5 | | 16.6 | 17.0 |

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209/15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| *5995.830* | 48.0 | V | 70.0 | -22.0 | Peak | 97 | 1.0 | |
| 1327.850 | 28.6 | H | 54.0 | -25.4 | AVG | 43 | 1.1 | |
| 1330.190 | 44.8 | H | 74.0 | -29.2 | PK | 43 | 1.1 | |
| *2998.330* | 46.8 | V | 70.0 | -23.2 | Peak | 105 | 1.0 | |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz. |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 2, Radiated Spurious Emissions, 1-26GHz, n20, Chain A+B

Date of Test: 3/15/2010 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: None

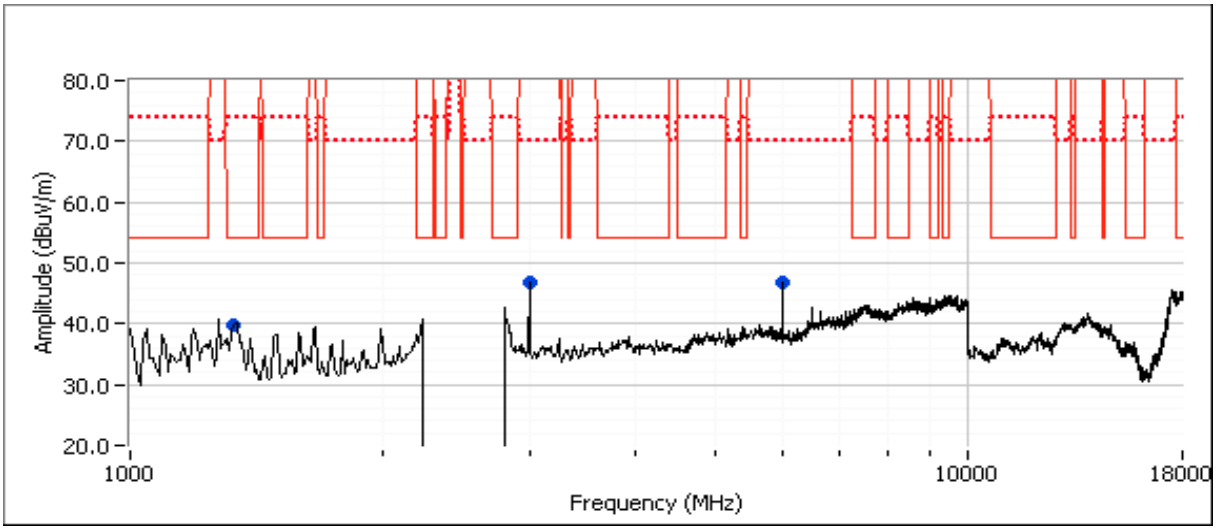
Run # 2a, EUT on - Channel #6 (2437 MHz) - n20, Chain A+B

| | Power Settings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Target (dBm) | | | | Measured (dBm) | | | | Software Setting |
| Chain | A | B | C | Total | A | B | C | Total | |
| | 13.6 | 13.6 | | 16.6 | 13.5 | 13.6 | | 16.6 | 13.5 |

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209/15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| *2998.330* | 47.9 | V | 70.0 | -22.1 | Peak | 100 | 1.0 | |
| 1328.660 | 28.1 | H | 54.0 | -25.9 | AVG | 76 | 1.3 | |
| 1328.910 | 43.8 | H | 74.0 | -30.2 | PK | 76 | 1.3 | |
| *5995.830* | 45.5 | V | 70.0 | -24.5 | Peak | 137 | 1.0 | |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz. |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run #3, Radiated Spurious Emissions, 1-40GHz, n40, Chain A+B

Date of Test: 3/15/2010 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: None

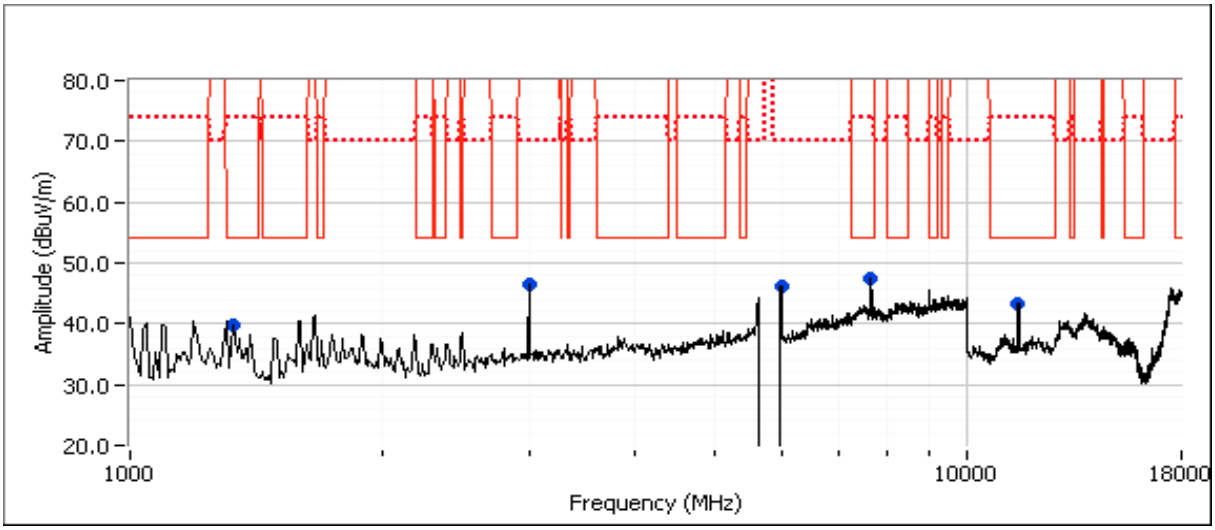
Run #3a, EUT on Channel #151 5755MHz - n40, Chain A+B

| | Power Settings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Target (dBm) | | | | Measured (dBm) | | | | Software Setting |
| Chain | A | B | C | Total | A | B | C | Total | |
| | 13.7 | 13.7 | | 16.7 | 14.5 | 13.0 | | 16.8 | 13.0 |

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209/15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 7673.320 | 45.5 | V | 54.0 | -8.5 | AVG | 176 | 1.3 | |
| 7673.490 | 51.0 | V | 74.0 | -23.0 | PK | 176 | 1.3 | |
| 11509.960 | 37.3 | V | 54.0 | -16.7 | AVG | 199 | 1.0 | |
| 11509.930 | 54.0 | V | 74.0 | -20.0 | PK | 199 | 1.0 | |
| *5995.830* | 46.1 | V | 70.0 | -23.9 | Peak | 109 | 1.0 | |
| *2998.330* | 46.6 | V | 70.0 | -23.4 | Peak | 101 | 1.0 | |
| *1330.000* | 39.7 | V | 54.0 | -14.3 | Peak | 93 | 1.0 | |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz. |



| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run #s 4,5, 6 were evalauting spurious emissions in the U-NII / LELAN bands, refer to U-NII/LELAN test report

Run # 7, Radiated Spurious Emissions, 1-40GHz, Rx, Chain A+B

Date of Test: 3/15/2010 Test Location: FT Chamber #4

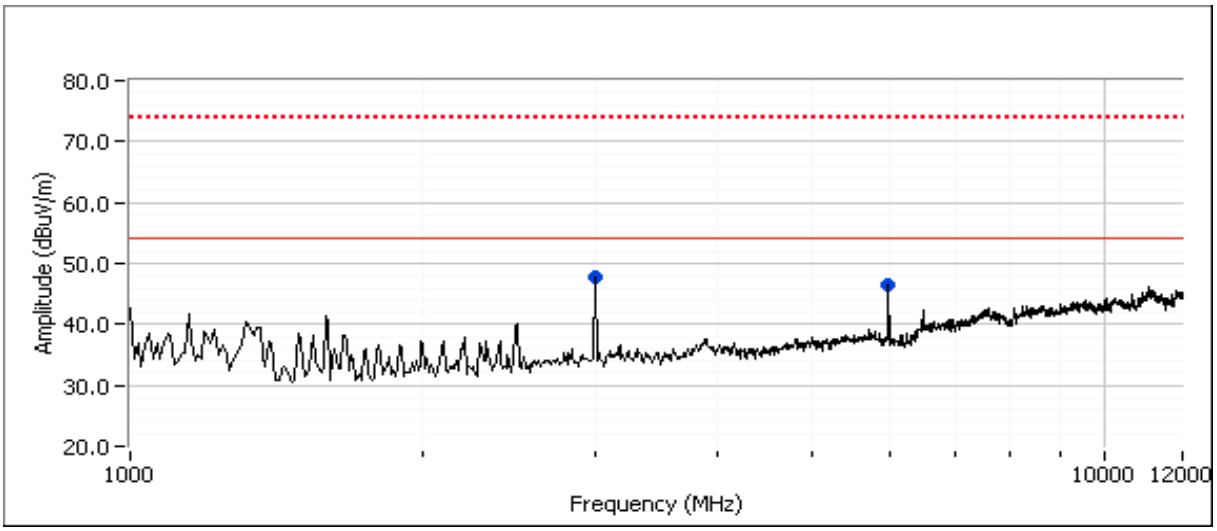
Test Engineer: Rafael Varelas Config Change: None

Run # 7a: EUT on Channel #6 2437MHz - Rx, Chain A+B

| | Power Settings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Target (dBm) | | | | Measured (dBm) | | | | Software Setting |
| Chain | A | B | C | Total | A | B | C | Total | |
| | | | | 0.0 | | | | 0.0 | |

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 3000.370 | 47.3 | V | 54.0 | -6.7 | AVG | 95 | 1.0 | |
| 3000.280 | 52.3 | V | 74.0 | -21.7 | PK | 95 | 1.0 | |
| 6000.750 | 46.4 | V | 54.0 | -7.6 | AVG | 94 | 1.0 | |
| 6000.690 | 49.7 | V | 74.0 | -24.3 | PK | 94 | 1.0 | |




Run # 7b - Run 7d: EUT operating on LELAN channels, refer to LELAN test rpeort/data.

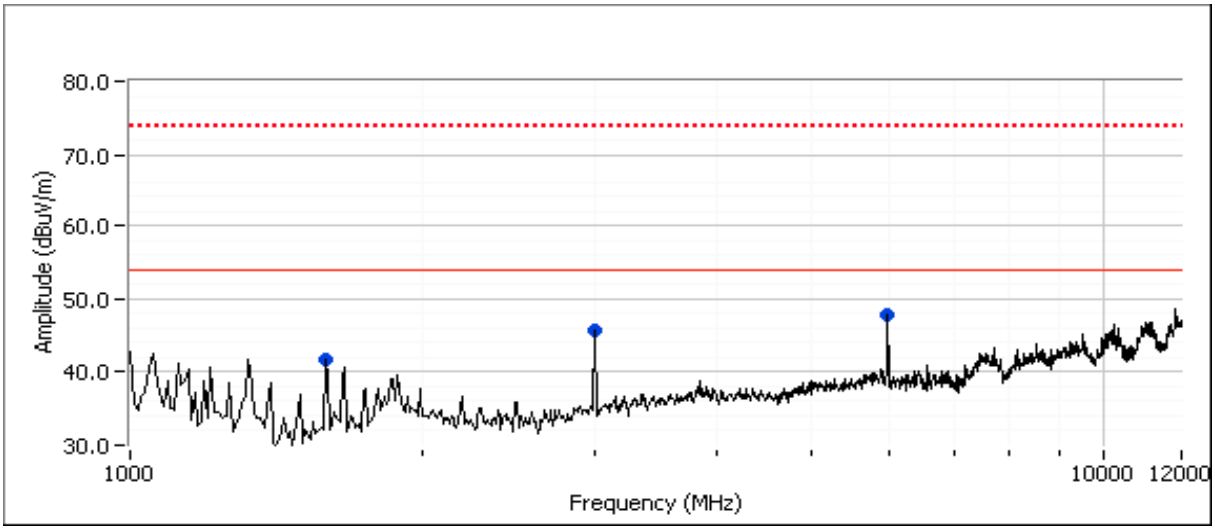
| | | | |
|---|---|---|---|
| Client: | Intel Corporation | Job Number: | J78599 |
| Model: | Puma Peak 2x2 | T-Log Number: | T78676 |
| | | Account Manager: | Christine Krebill |
| Contact: | Steve Hackett | | |
| Standard: | FCC 15E, FCC 15C, FCC 15B | Class: | N/A |

Run # 7e: EUT on Channel #157 5785MHz - Rx, Chain A+B

| | Power Settings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Target (dBm) | | | | Measured (dBm) | | | | Software Setting |
| Chain | A | B | C | Total | A | B | C | Total | |
| | | | | 0.0 | | | | 0.0 | |

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 1592.940 | 26.8 | H | 54.0 | -27.2 | AVG | 281 | 1.5 | |
| 3000.360 | 41.4 | H | 54.0 | -12.6 | AVG | 321 | 1.8 | |
| 6000.710 | 47.7 | V | 54.0 | -6.3 | AVG | 267 | 1.5 | |
| 1592.970 | 43.5 | H | 74.0 | -30.5 | PK | 281 | 1.5 | |
| 3000.280 | 47.6 | H | 74.0 | -26.4 | PK | 321 | 1.8 | |
| 6000.750 | 51.6 | V | 74.0 | -22.4 | PK | 267 | 1.5 | |



## *Appendix C Photographs of Test Configurations*

Uploaded as a separate exhibit

## *Appendix D Theory of Operation*

Uploaded as a separate exhibit (ANHU application only) – contains detailed information about the BiOS Lock mechanisms.

## *Appendix E Schematics*

Uploaded as a separate exhibit – contains detailed information about the proposed changes.

## *Appendix F RF Exposure Information*

Uploaded as a separate exhibit. Note that the rf exposure calculation is taken form the original filing. The antennas evaluated as part of this permissive change are of lower gain, therefore the original evaluation represents the worst case MPE calculation for the device.