EMC Test Report

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

Intel® Centrino® Advanced-N + WiMAX 6250, model 622ANXHMW

FCC ID(s):	PD9622ANXH PD9622ANXHU E2K625ANXH
APPLICANT:	Intel Corporation 2111 NE 25th Avenue JF3-302 Hillsboro, OR 97124
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4, 2845B-5
REPORT DATE:	September 17, 2009
FINAL TEST DATES:	Aug 5, Aug 7, Aug 11, Aug 19-21, Aug 24-27, Sept 2, Sept 3 and Sept 9, 2009

AUTHORIZED SIGNATORY:

Mark Briggs
Staff Engineer
Elliott Laboratories.

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	September 23, 2009	First release	

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SCOPE

An electromagnetic emissions test has been performed on the Intel Corporation Intel® Centrino® Advanced-N + WiMAX 6250, model 622ANXHMW, 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"
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.

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 + WiMAX 6250, model 622ANXHMW 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"
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 + WiMAX 6250, model 622ANXHMW 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	Systems uses OFDM and DSSS techniques	-	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	> 10.3 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems) (Note 3)	802.11b: 16.6 dBm 802.11g: 15.7 dBm HT20: 15.7 dBm (0.0457 Watts) HT40: 15.8 dBm (0.038 Watts)	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density (Note 3)	b:-7.5dBm/3kHz g:-9.2dBm/3kHz HT20:-8.5dBm/3kHz HT40:-9.8dBm/3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All emissions more than 30dB below highest in-band level.	< -30dBc Note 1	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	52.9dBµV/m @ 2389.0MHz Margin: 1.1dB (Note 2)	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).
Note 2: Spurious emissions below 1GHz were independent of the operating channel and operating mode. The highest emission below 1GHz complied with 15.209 limits.
Note 3: For 802.11b, 802.11g and HT20 modes the highest output power and PSD were measured in single-chain (MISO) mode. The highest power and psd in HT40 were measured in dual chain (2x2) mode.

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	Systems uses OFDM and DSSS techniques	-	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	> 16.3 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	802.11a: 15.3 dBm HT20: 15.2 dBm (0.034 Watts) HT40: 15.4 dBm (0.035 Watts)	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	a:-8.7dBm/3kHz HT20:-9.5dBm/3kHz HT40:-12.8dBm/3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All emissions more than 30dB below highest in-band level.	< -30dBc Note 1	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	43.4dBµV/m @ 11650MHz Margin: 10.6dB	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). Note 2: Spurious emissions below 1GHz were independent of the operating channel and operating mode. The highest emission below 1GHz complied with 15.209 limits.					

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	UFL connector	Unique connector required	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	38.6dBµV/m @ 114.111MHz	Refer to standard	Complies (- 4.9 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	43.3dBµV @ 1.906MHz	Refer to standard	Complies (-12.7dB)
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11 and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Only applicable to Canada, not evaluated.	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Only applicable to Canada, not evaluated.	Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	802.11b: 13.7 MHz 802.11g: 17.2 MHz 802.11a: 16.3 MHz HT20: 18.5 MHz HT40: 36.9 MHz	Information only	N/A

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 + WiMAX 6250, model 622ANXHMW is a PCI express form factor (half-mini) card that is designed to provide a 2x2 802.11abgn and 1x2 802.16e interfaces for host systems such as laptop PCs. The electrical rating of the EUT is 3.3Vdc (via mini PCI bus).

For module-level tests of the transceiver the card was installed into a test fixture that was controlled from a laptop PC. The test fixture exposed the card outside of a host system to meet the modular test requirements of FCC and Industry Canada.

The AC conducted emissions tests were performed with the card installed into the mini-PCI bus of a laptop, as would be the case in normal use.

The samples were received on August 3, 2009 and tested on Aug 5, Aug 7, Aug 11, Aug 19-21, Aug 24-27, Sept 2, Sept 3 and Sept 9, 2009. The EUT consisted of the following component(s):

Company	Model	Description	MAC Address	FCC ID
Intel Corporation	622ANXHMW	2x2 802.11abgn PCIe card	001E6400E972	PD9622ANXH
			00150059F1BC	PD9622ANXHU
			00150059F23C	E2K625ANXH
MAC address 001E6400E972 used for AC conducted emissions testing. MAC address 00150059F1BC or 00150059F23C used for all transmitter and radiated spurious measurements. MAC address 00150059F23C used for all rf port measurements.				

ANTENNA SYSTEM

The antenna system used with the Intel Corporation Intel® Centrino® Advanced-N + WiMAX 6250, model 622ANXHMW was a PIFA antenna.

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 support equipment was used for spurious radiated emissions and all rf port measurements:

Company	Model	Description	Serial Number	FCC ID
Intel	None	PCIe test fixture		N/A
Dell	-	Laptop PC	Prototype	None
Topward	-	DC Supply		N/A

The following equipment was used when measuring the conducted emissions from the AC power port:

Company	Model	Description	Serial Number	FCC ID
Hewlett Packard	IP26000	Printer	QC2-6844-DB02-01	DoC
Toshiba	PSAG8U-04001W	Host Laptop	49290792Q	DoC
Company	Model	Description	Serial Number	FCC ID
Netgear	FS108	Hub	F518H2BCB092554	-
The ethernet hub was located outside the test chamber.				

EUT INTERFACE PORTS

The I/O cabling configuration for spurious radiated emissions and all rf port measurements was:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Test fixture PCI	Laptop PCI	Ribbon Cable	Unshielded	0.8
Test fixture 3.3Vdc	Bench supply	2-wire	Unshielded	0.8

The I/O cabling configuration for AC power port conducted emissions measurements was:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Laptop Ethernet	Hub	Cat-5	Unshielded	10.0
Laptop USB	Printer	USB	Shielded	1.5
Laptop AC Power	AC Mains	3Wire	Unshielded	1.0

EUT OPERATION

During AC conducted emissions testing the EUT was being controlled by the CRTU tool to operate in a continuous transmit mode on the center channel. In addition the laptop was displaying a scrolling 'H' pattern on the screen and had link enabled to both the ethernet and USB peripherals.

For measurements on the radiated spurious emissions generated by the receiver the EUT was being controlled by the Intel CRTU tool to operate in a continuous receive mode on the center channel.

During transmitter tests the EUT was being controlled by the Intel CRTU tool to operate in a continuous transmit mode on the top, bottom or center channel as required and in each of the different modulation modes. The data rates of 1Mb/s for 802.11b, 6Mb/s for 802.11g, 6.5Mb/s for HT20 and 13.0Mb/s for HT40 modes were selected based on preliminary testing that identified those data rates having the highest output power in each mode when the device is operated under EEPROM control, which reduces power as the data rate is increased to ensure signal integrity.

Spurious emissions at the band edges were made with the device operating on the top and bottom channels in each band for each operating mode (802.11a in the 5GHz bands, 802.11b and 802.11g in the 2.4GHz band and both HT20 and HT40 in all bands) for each operating chain (chain A and Chain B). Additionally measurements were made in HT20 and HT40 modes with both chains active simultaneously.

Spurious radiated emissions above 1GHz away from the band edges of the allocated bands were made in single chain mode for the legacy modes (both Chain A and Chain B separately) and with both chains active in HT20 and HT40 modes. In the MIMO modes the output power per chain was set to the highest single chain power setting to ensure both single- and dual-chain power levels were covered by the one set of measurements (the output power per chain is higher in single-chain mode to obtain the same total output power as MIMO mode).

Spurious emissions at the rf port were made in single chain mode (Chain A and Chain B separately) for the legacy and HT20 and HT40 modes. For HT20 and HT40 modes the limit of -27dBm eirp was adjusted to account for antenna gain and then by an extra -3dB to account for the fact that two chains may be active simultaneously.

Preliminary measurements for the spurious emissions below 1GHz indicated that emissions below 1Ghz were independent of the operating frequency and operating mode (transmit versus receive), therefore the final measurements were made with the device in transmit mode, both chains A and B active and tuned to 2437 MHz in HT20 mode.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on Aug 5, Aug 7, Aug 11, Aug 19-21, Aug 24-27, Sept 2, Sept 3 and Sept 9, 2009 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 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. 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.

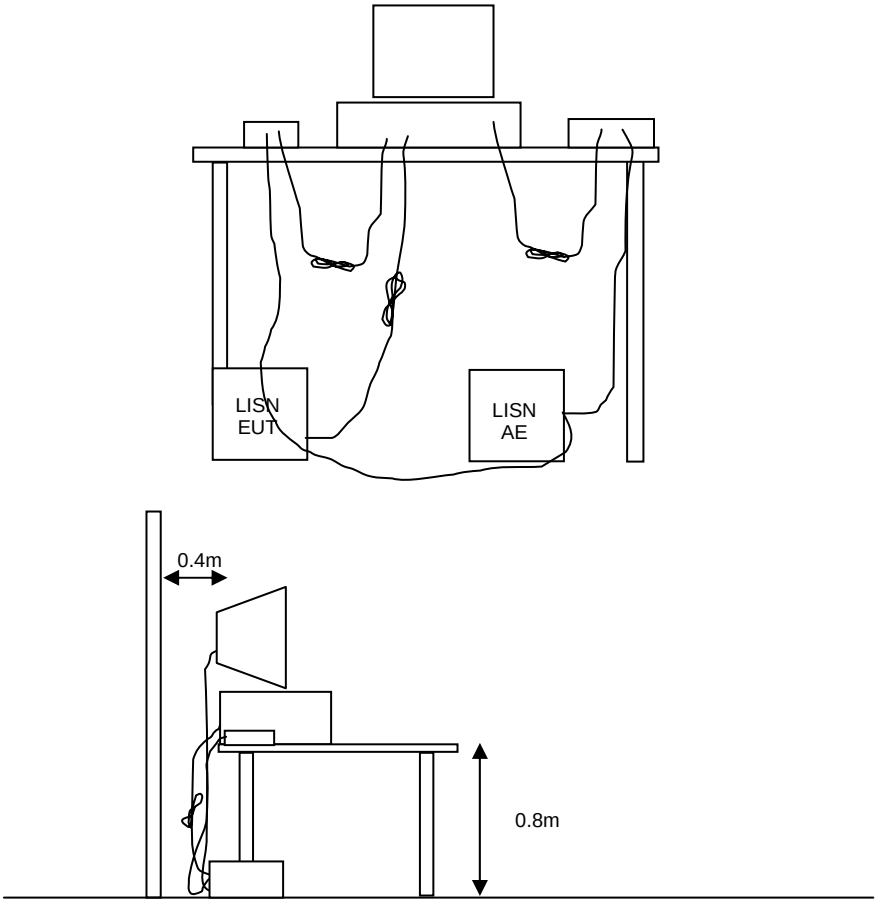
TEST PROCEDURES

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.



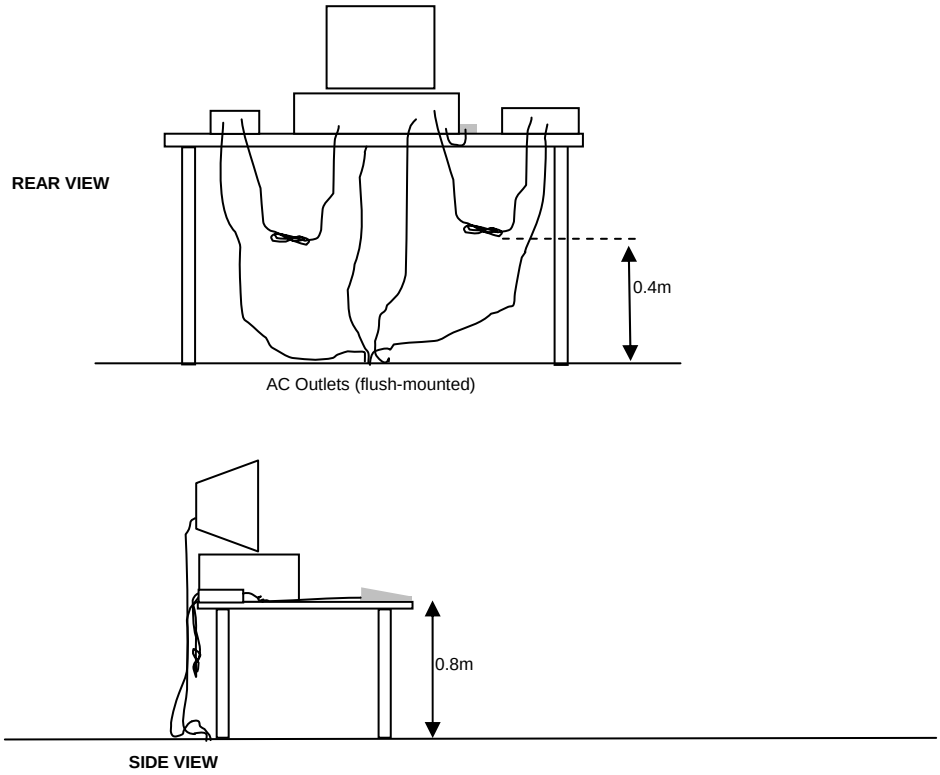
RADIATED EMISSIONS

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.

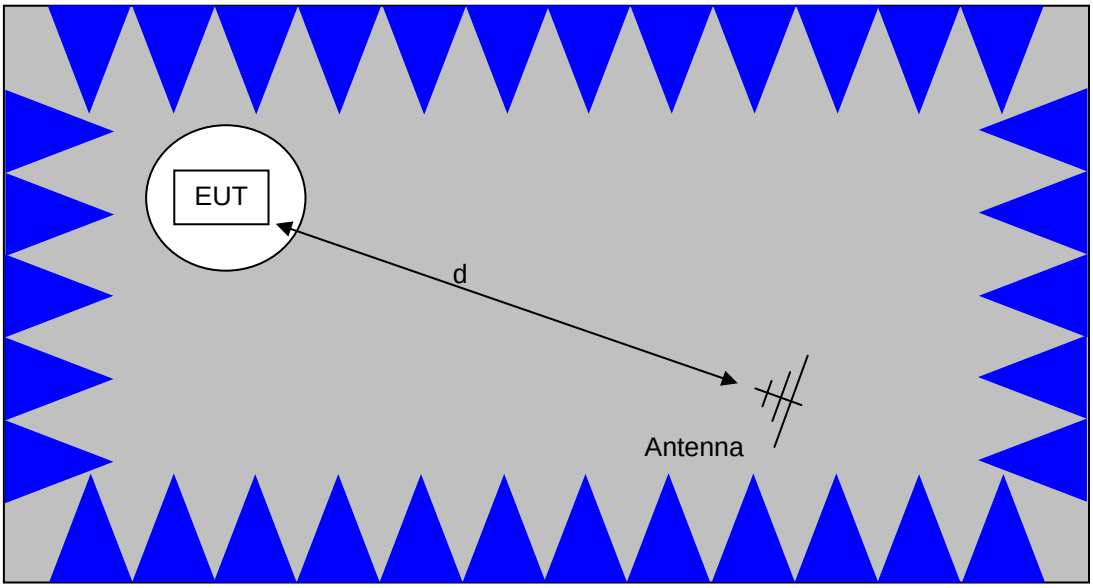
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

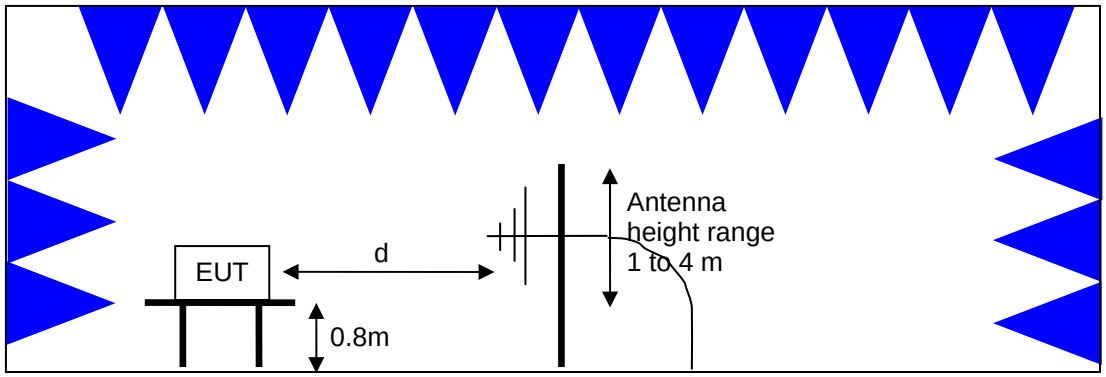


Typical Test Configuration for Radiated Field Strength Measurements



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

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

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

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

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

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
AC Conducted Emissions				
EMCO	LISN, 10 kHz-100 MHz	3825/2	1293	18-Mar-10
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1593	09-Jun-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	26-Feb-10
Fischer Custom Comm	LISN, 25A, 150kHz to 30MHz, 25 Amp,	FCC-LISN-50-25-2-09	2001	15-Oct-09
Transmitter/Receiver Spurious Emissions 30 – 1000 MHz				
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	13-Jun-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	26-Feb-10
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1632	13-Apr-10
Receiver Spurious Emissions 1,000 – 18,000 MHz				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	09-Oct-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	02-Sep-10
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	20-Oct-09
Transmitter Spurious Emissions 1,000 – 40,000 MHz and rf Port measurements				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	09-Oct-09
Hewlett Packard	SpecAn 9 KHz-26.5 GHz, Non-Program	8563E	284	29-Dec-09
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	03-Jun-10
EMCO	Antenna, Horn, 1-18 GHz	3115	786	06-Dec-09
EMCO	Antenna, Horn, 1-18GHz	3115	868	10-Jun-10
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	06-Apr-10
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	02-Sep-10
Hewlett Packard	High Pass filter, 8.2 GHz (Blu System)	P/N 84300-80039 (84125C)	1392	22-Jun-10
Hewlett Packard	SpectAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	10-Apr-10
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	06-Nov-09
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1539	12-Sep-09
Rohde & Schwarz	Power Sensor 100 uW - 10 Watts	NRV-Z53	1555	28-Jan-10
Rohde & Schwarz	Attenuator, 20 dB , 50 ohm, 10W, DC-18 GHz	20dB, 10W, Type N	1556	28-Jan-10
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	1728	07-Oct-09
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1729	07-Oct-09
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1731	02-Dec-09
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	20-Oct-09
Hewlett Packard	Head (Inc W1-W4, 1946, 1947) Purple	84125C	1772	6-May-10
A.H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	17-Mar-10

Appendix B Test Data

T76369 (AC conducted emissions, transmitter spurious emissions 30 – 1000 MHz, receiver spurious emissions)	19 Pages
T76370 (Transmitter rf port measurements, transmitter radiated emissions 1 – 40GHz)	101 Pages

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		-
Emissions Standard(s):	RSS 210 / FCC 15.247	Class:	DTS
Immunity Standard(s):	N/A	Environment:	-

EMC Test Data

For The

Intel

Model

2x2 WiFi with WiMax MiniPCI

Date of Last Test: 8/25/2009

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	DTS

Conducted Emissions - Module Installed in Laptop

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

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

Date of Test: 8/7/2009
Test Engineer: Peter Sales
Test Location: Chamber #3

Config. Used: 1
Config Change: None
Host Unit Voltage 230V/50Hz and 120V/Hz

General Test Configuration

For tabletop equipment, the host system was located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located outside of the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 40 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	EN55022 Class B	Pass	49.6dBµV @ 1.916MHz (-6.4dB)
2	CE, AC Power,120V/60Hz	FCC 15.207 FCC Class B	Pass	43.3dBµV @ 1.906MHz (-12.7dB)

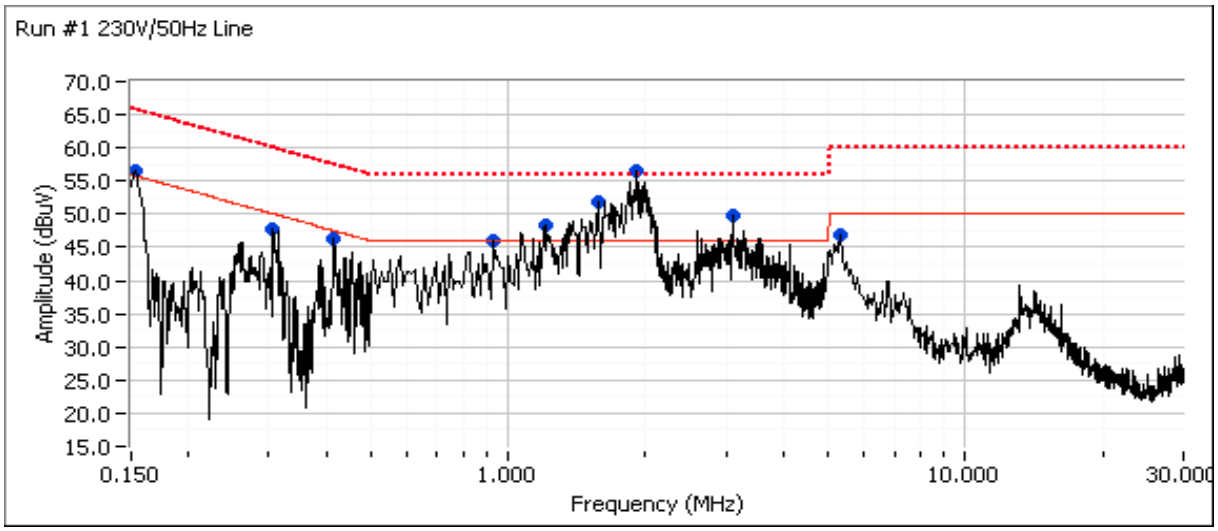
Modifications Made During Testing

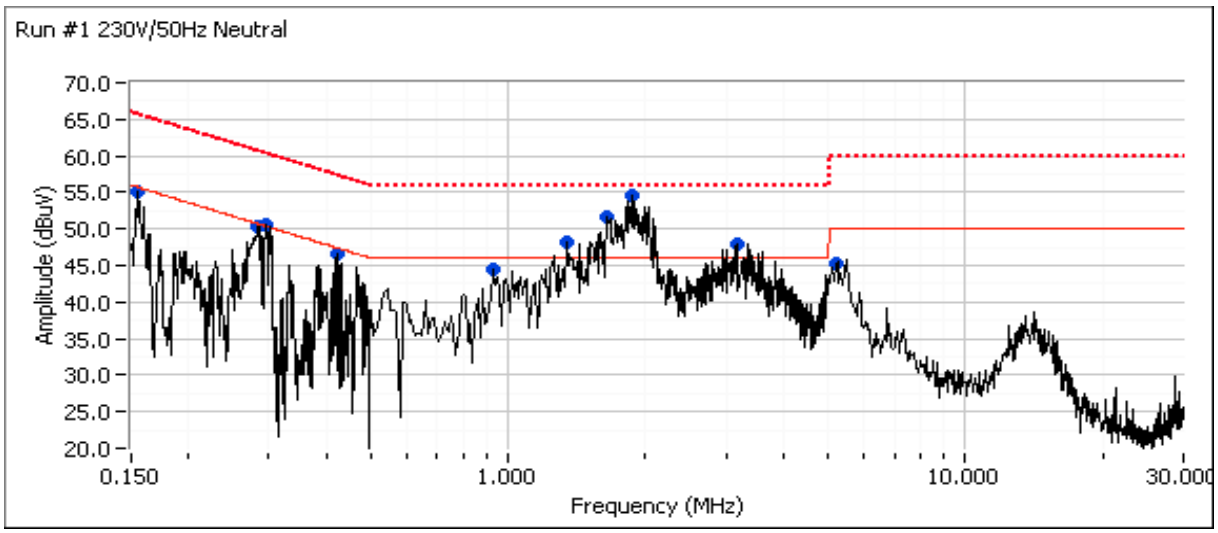
No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	DTS





Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz Continued next page...

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	DTS

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
1.916	56.6	Line	46.0	10.6	Peak	
1.584	52.0	Line	46.0	6.0	Peak	
3.111	49.8	Line	46.0	3.8	Peak	
1.186	48.4	Line	46.0	2.4	Peak	
0.153	56.4	Line	55.8	0.6	Peak	
0.296	50.5	Neutral	50.4	0.1	Peak	
0.940	45.9	Line	46.0	-0.1	Peak	
0.284	50.4	Neutral	50.7	-0.3	Peak	
0.151	55.1	Neutral	55.7	-0.6	Peak	
0.423	46.6	Neutral	47.4	-0.8	Peak	
0.415	46.2	Line	47.5	-1.3	Peak	
0.306	47.8	Line	50.1	-2.3	Peak	
5.373	47.0	Line	50.0	-3.0	Peak	
5.241	45.3	Neutral	50.0	-4.7	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
1.916	49.6	Line	56.0	-6.4	QP	QP (1.00s)
1.916	35.8	Line	46.0	-10.2	AVG	AVG (0.10s)
0.151	55.6	Neutral	65.9	-10.3	QP	QP (1.00s)
1.584	45.3	Line	56.0	-10.7	QP	QP (1.00s)
0.153	52.6	Line	65.8	-13.2	QP	QP (1.00s)
1.186	41.8	Line	56.0	-14.2	QP	QP (1.00s)
0.296	45.9	Neutral	60.4	-14.5	QP	QP (1.00s)
0.284	46.1	Neutral	60.7	-14.6	QP	QP (1.00s)
3.111	41.3	Line	56.0	-14.7	QP	QP (1.00s)
1.584	30.5	Line	46.0	-15.5	AVG	AVG (0.10s)
0.940	40.5	Line	56.0	-15.5	QP	QP (1.00s)
3.111	30.1	Line	46.0	-15.9	AVG	AVG (0.10s)
0.423	41.4	Neutral	57.4	-16.0	QP	QP (1.00s)
0.415	41.3	Line	57.5	-16.2	QP	QP (1.00s)
0.306	43.6	Line	60.1	-16.5	QP	QP (1.00s)
0.151	39.0	Neutral	55.9	-16.9	AVG	AVG (0.10s)
0.153	36.2	Line	55.8	-19.6	AVG	AVG (0.10s)
1.186	25.2	Line	46.0	-20.8	AVG	AVG (0.10s)
0.940	24.3	Line	46.0	-21.7	AVG	AVG (0.10s)
5.373	37.9	Line	60.0	-22.1	QP	QP (1.00s)
0.284	28.6	Neutral	50.7	-22.1	AVG	AVG (0.10s)
0.296	28.2	Neutral	50.4	-22.2	AVG	AVG (0.10s)

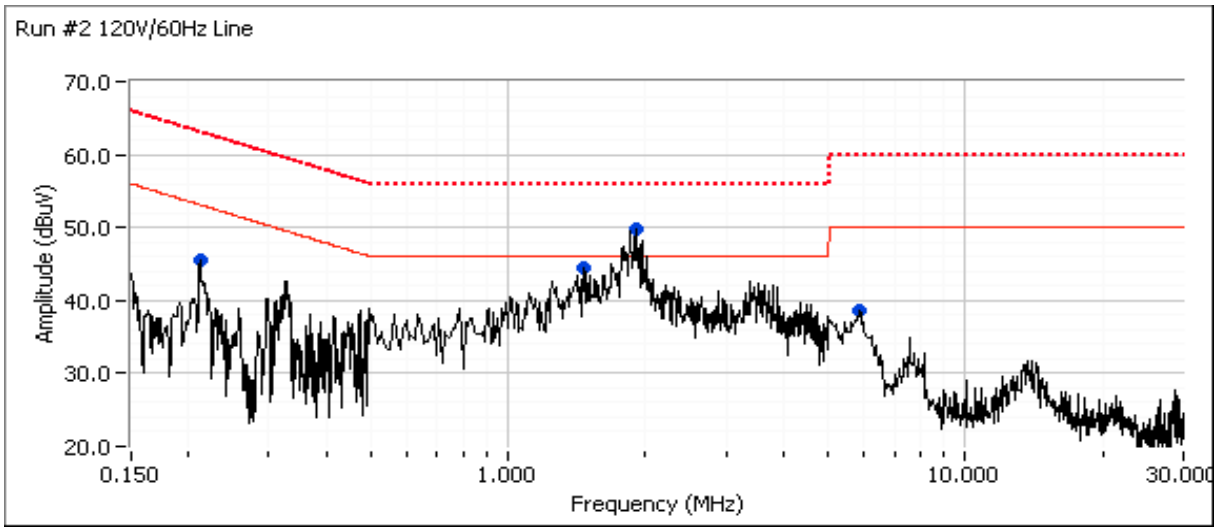
Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz Continued next page...

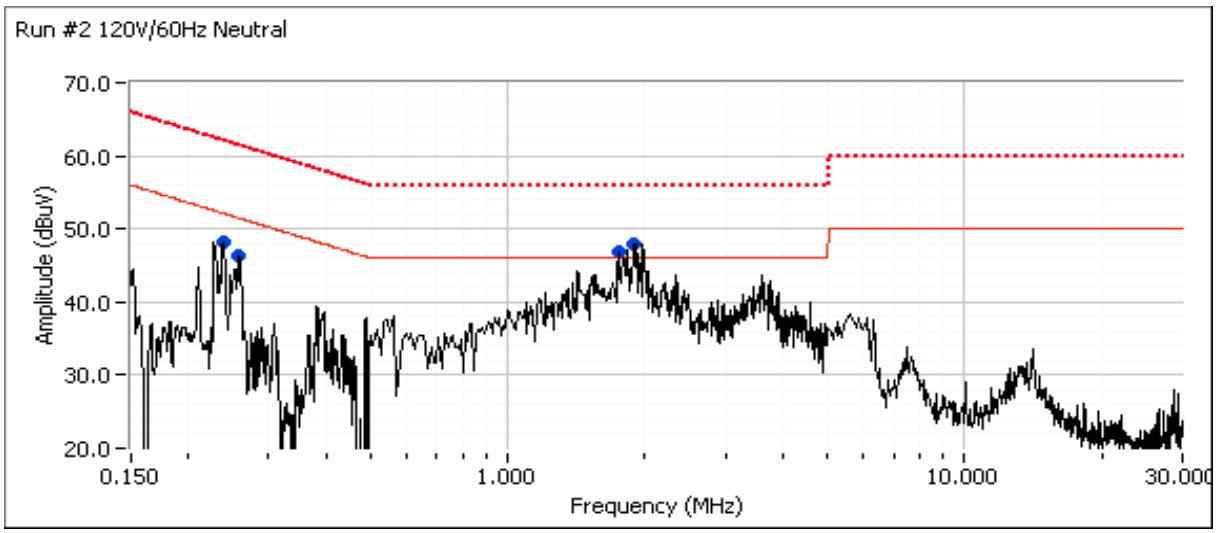
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	DTS

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
5.241	37.8	Neutral	60.0	-22.2	QP	QP (1.00s)
0.415	24.4	Line	47.5	-23.1	AVG	AVG (0.10s)
5.373	25.5	Line	50.0	-24.5	AVG	AVG (0.10s)
5.241	25.5	Neutral	50.0	-24.5	AVG	AVG (0.10s)
0.423	22.8	Neutral	47.4	-24.6	AVG	AVG (0.10s)
0.306	24.2	Line	50.1	-25.9	AVG	AVG (0.10s)

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	DTS

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz





Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz Continued next page...

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	DTS

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
1.906	49.9	Line	46.0	3.9	Peak	
1.898	47.8	Neutral	46.0	1.8	Peak	
1.744	46.9	Neutral	46.0	0.9	Peak	
1.465	44.5	Line	46.0	-1.5	Peak	
0.238	48.1	Neutral	52.2	-4.1	Peak	
0.259	46.3	Neutral	51.5	-5.2	Peak	
0.212	45.4	Line	53.1	-7.7	Peak	
5.852	38.5	Line	50.0	-11.5	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
1.906	43.3	Line	56.0	-12.7	QP	QP (1.00s)
1.898	43.1	Neutral	56.0	-12.9	QP	QP (1.00s)
1.906	30.0	Line	46.0	-16.0	AVG	AVG (0.10s)
1.744	39.9	Neutral	56.0	-16.1	QP	QP (1.00s)
1.898	29.5	Neutral	46.0	-16.5	AVG	AVG (0.10s)
1.744	28.1	Neutral	46.0	-17.9	AVG	AVG (0.10s)
1.465	37.9	Line	56.0	-18.1	QP	QP (1.00s)
0.238	44.1	Neutral	62.2	-18.1	QP	QP (1.00s)
0.259	42.4	Neutral	61.5	-19.1	QP	QP (1.00s)
1.465	26.2	Line	46.0	-19.8	AVG	AVG (0.10s)
0.212	40.4	Line	63.1	-22.7	QP	QP (1.00s)
0.259	26.7	Neutral	51.5	-24.8	AVG	AVG (0.10s)
0.238	25.9	Neutral	52.2	-26.3	AVG	AVG (0.10s)
5.852	22.5	Line	50.0	-27.5	AVG	AVG (0.10s)
0.212	25.5	Line	53.1	-27.6	AVG	AVG (0.10s)
5.852	32.0	Line	60.0	-28.0	QP	QP (1.00s)

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.407 (UNII) Radiated Spurious Emissions

Test Specific Details

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

Date of Test: See runs Config. Used: Module - installed in fixture

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: 22.4 °C
Rel. Humidity: 43 %

Summary of Results

Sample #2 MAC Address: 00150059F23C; CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
1	Tx and RX	Note 1	-	-	Radiated Emissions 30 - 1000 MHz	RSS 210 / FCC 15.209	38.6dBµV/m @ 114.111MHz (-4.9dB)
2	Receive - Chain A	#6 2437 MHz	-	-	Radiated Emissions, 1 -7.5 GHz	RSS 210	47.7dBµV/m @ 3000.4MHz (-6.3dB)
	Receive Chain A+B	#6 2437 MHz	-	-			47.8dBµV/m @ 3000.4MHz (-6.2dB)
3	Receive - Chain A	#40 5200MHz	-	-	Radiated Emissions, 1 - 18 GHz	FCC 15.209 / 15 E	45.9dBµV/m @ 6000.7MHz (-8.1dB)
	Receive - Chain A	#60 5300 MHz	-	-			47.2dBµV/m @ 3000.4MHz (-6.8dB)
	Receive - Chain A	#120 5600MHz	-	-			47.1dBµV/m @ 3000.4MHz (-6.9dB)
	Receive - Chain A	#157 5785 MHz	-	-			47.0dBµV/m @ 3000.4MHz (-7.0dB)
	Receive Chain A+B	#40 5200MHz	-	-	Radiated Emissions, 1 - 18 GHz	FCC 15.209 / 15 E	46.8dBµV/m @ 3000.4MHz (-7.2dB)
		#60 5300 MHz	-	-			45.4dBµV/m @ 6000.8MHz (-8.6dB)
		#120 5600MHz	-	-			Not tested, single chain was worst case for all other channels
		#157 5785 MHz	-	-			

1: Scans indicated that emissions below 1Ghz were independent of operating channel and operating mode (transmit versus receive).

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

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.

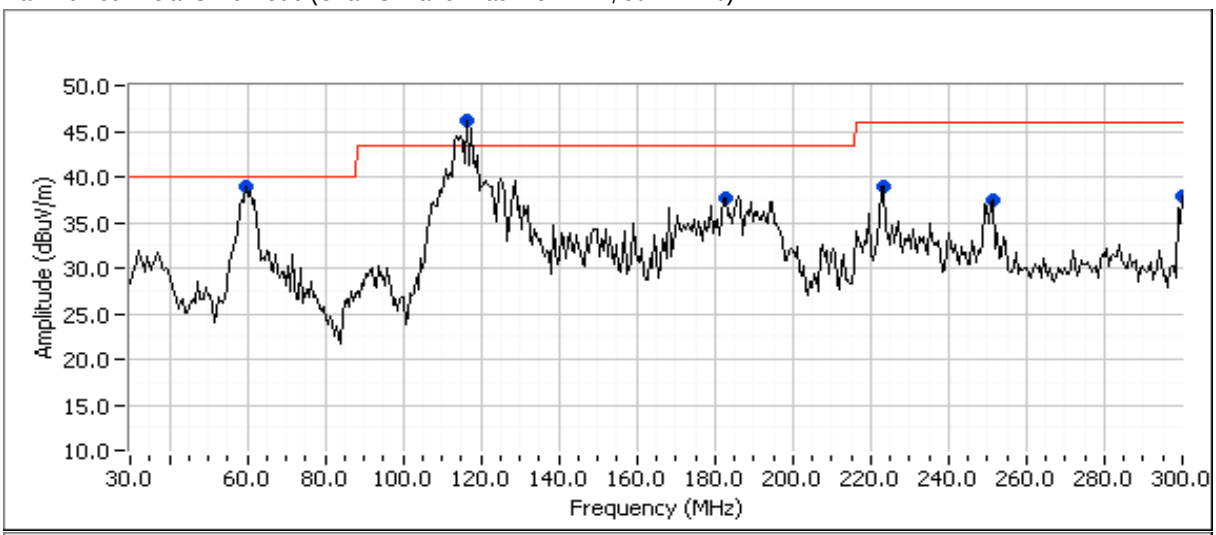
Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz

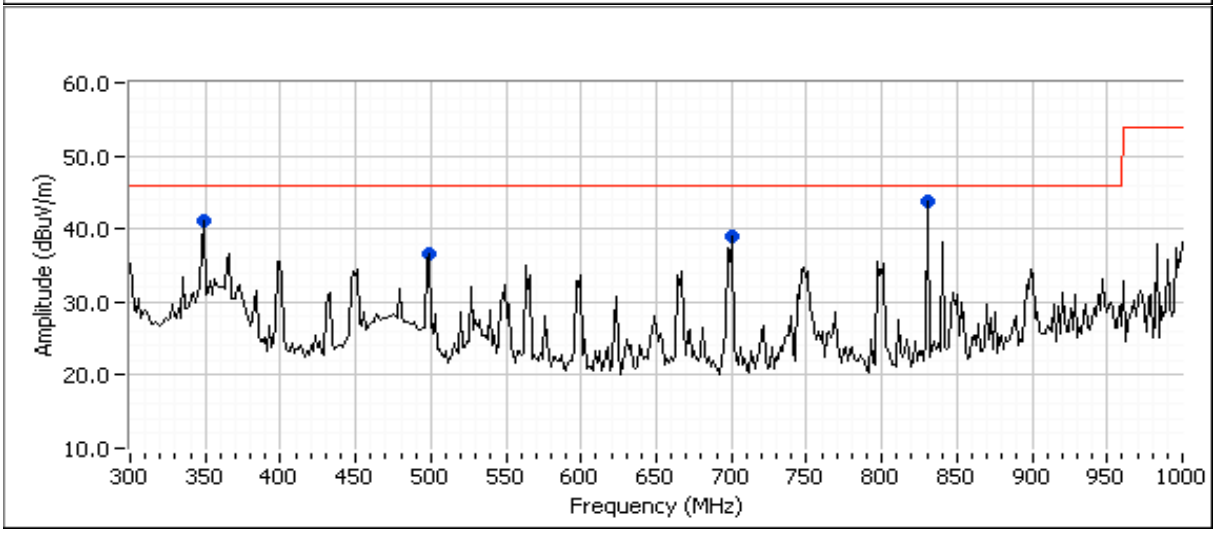
Date of Test: 8/17/2009 Test Location: FT Chamber #4

Test Engineer: Suhaila Config Change: none

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Run #1a: Device in transmit mode (Chains A and B at 2437 MHz, 802.11n20)





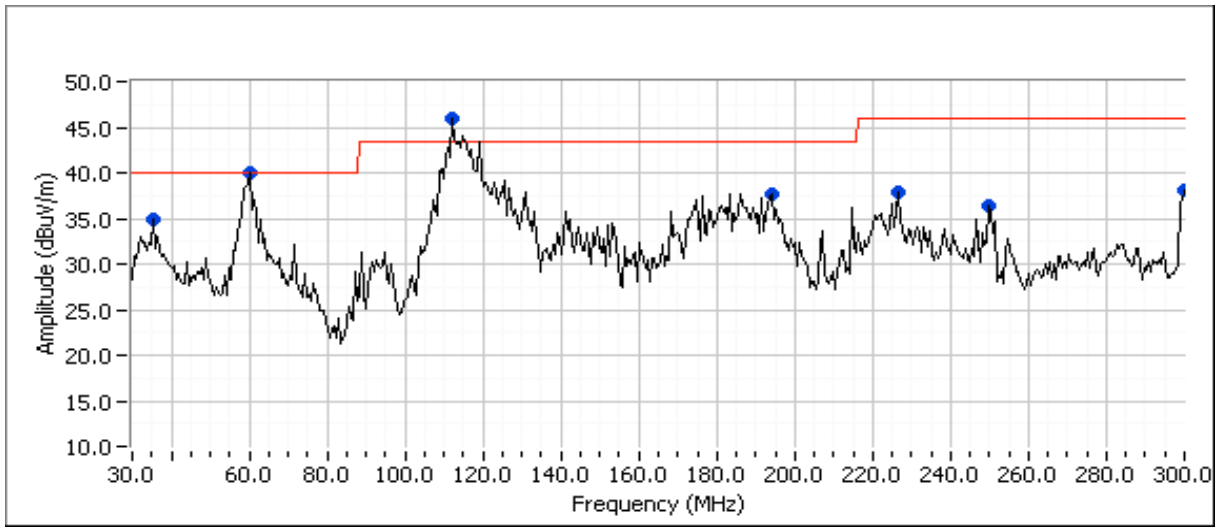
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

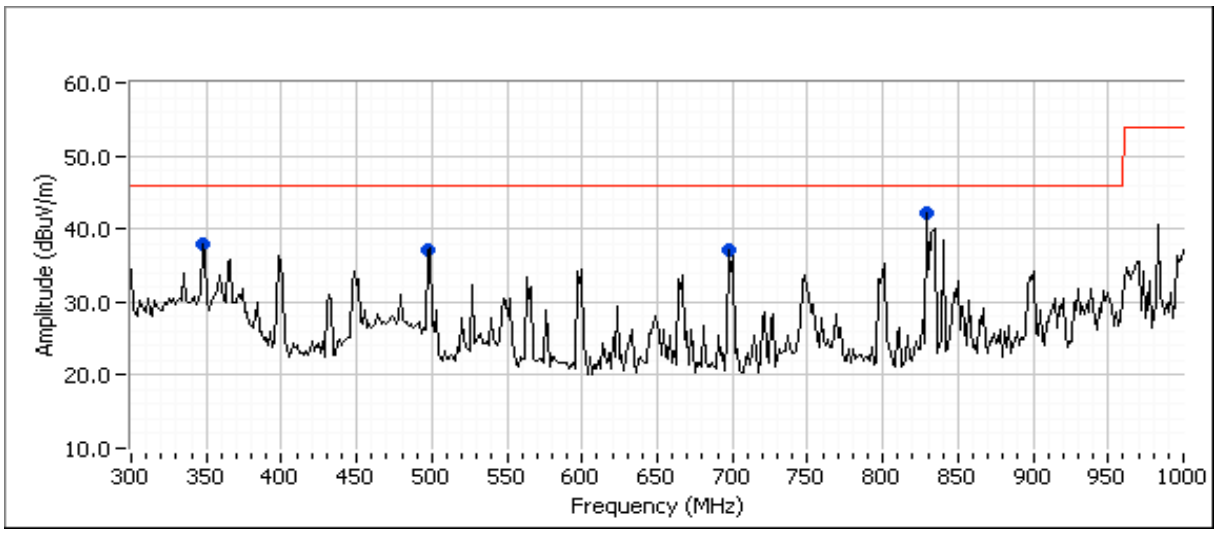
Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
117.044	46.1	H	43.5	2.6	Peak	116	1.5	
59.084	38.9	V	40.0	-1.1	Peak	112	3.0	
823.821	43.8	V	46.0	-2.2	Peak	18	1.0	
348.972	41.2	H	46.0	-4.8	Peak	139	1.0	
185.004	37.7	H	43.5	-5.8	Peak	343	1.0	
221.440	38.9	H	46.0	-7.1	Peak	232	2.0	
699.113	38.9	H	46.0	-7.1	Peak	119	1.0	
299.318	37.8	H	46.0	-8.2	Peak	89	1.0	
250.778	37.4	H	46.0	-8.6	Peak	55	1.0	
497.978	36.7	V	46.0	-9.3	Peak	5	1.0	

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1b: Device in transmit mode (Chains A and B at 5600 MHz, 802.11n20)





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
114.111	45.9	H	43.5	2.4	Peak	108	1.5	
59.733	39.9	V	40.0	-0.1	Peak	101	2.5	
827.133	42.1	V	46.0	-3.9	Peak	22	4.0	
37.191	35.0	V	40.0	-5.0	Peak	155	1.0	
195.133	37.6	H	43.5	-5.9	Peak	10	1.5	
299.102	38.0	H	46.0	-8.0	Peak	104	1.0	
226.148	37.9	H	46.0	-8.1	Peak	235	1.5	
349.533	37.8	H	46.0	-8.2	Peak	148	1.0	
499.662	37.2	V	46.0	-8.8	Peak	0	1.0	
699.000	37.0	H	46.0	-9.0	Peak	121	1.0	
249.555	36.4	H	46.0	-9.6	Peak	230	1.0	

Run #1c: Maximized quasi-peak readings - worst case from 1a and 1b

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
114.111	38.6	H	43.5	-4.9	QP	126	1.5	QP (1.00s)
59.733	30.0	V	40.0	-10.0	QP	65	2.0	QP (1.00s)
349.533	35.4	H	46.0	-10.6	QP	127	1.0	QP (1.00s)
37.191	29.1	V	40.0	-10.9	QP	113	1.0	QP (1.00s)
299.102	35.0	H	46.0	-11.0	QP	83	1.0	QP (1.00s)
499.662	34.6	V	46.0	-11.4	QP	10	1.1	QP (1.00s)
699.000	34.3	H	46.0	-11.7	QP	112	1.2	QP (1.00s)
226.148	32.7	H	46.0	-13.3	QP	233	1.4	QP (1.00s)
195.133	29.9	H	43.5	-13.6	QP	27	1.0	QP (1.00s)
249.555	32.3	H	46.0	-13.7	QP	219	1.0	QP (1.00s)
827.133	16.5	V	46.0	-29.5	QP	0	3.5	QP (1.00s)

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

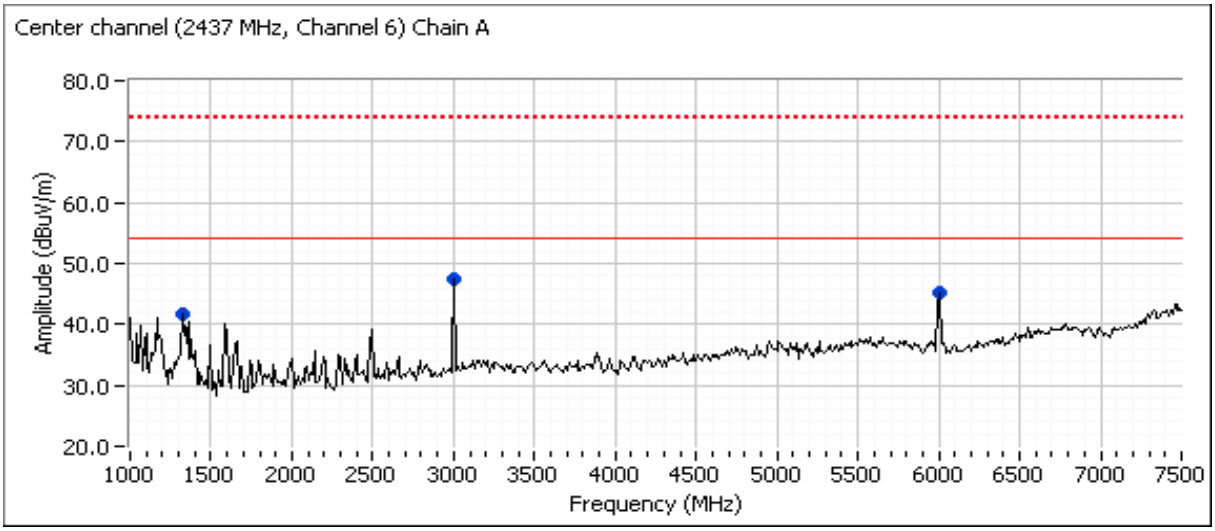
Run #2, Receiver Radiated Spurious Emissions, 1,000 - 7,500 MHz. Operation in the 2.4 GHz Band

Date of Test: 8/25/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run #2a: Center channel (2437MHz, channel 6), Chain A

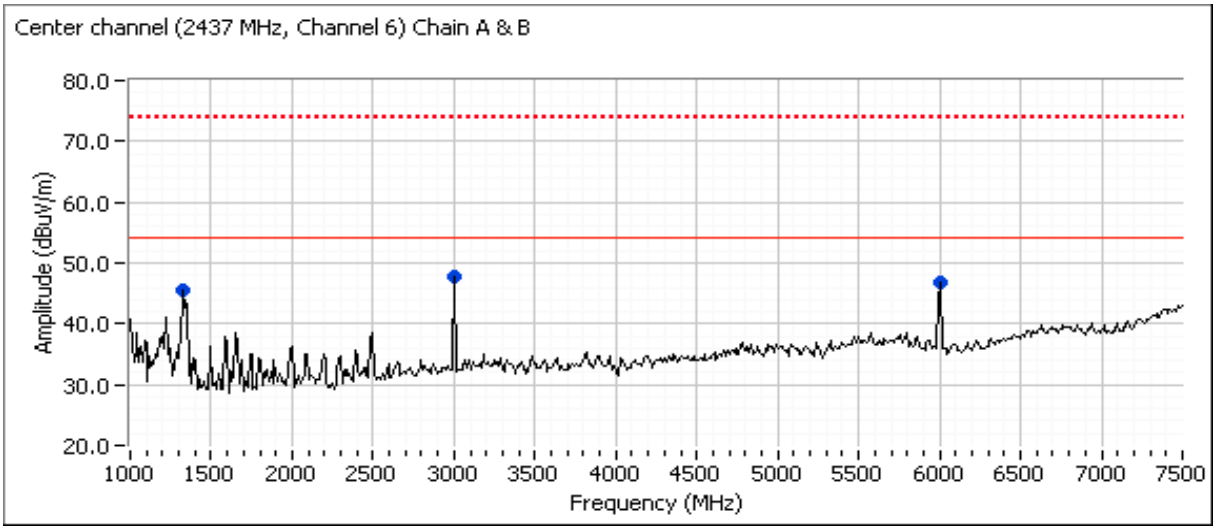
Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.380	47.7	V	54.0	-6.3	AVG	267	1.0	MHz; VB: 10 Hz
3000.300	51.2	V	74.0	-22.8	PK	267	1.0	MHz; VB: 1 MHz
6000.730	45.2	V	54.0	-8.8	AVG	147	1.0	MHz; VB: 10 Hz
6000.560	49.6	V	74.0	-24.4	PK	147	1.0	MHz; VB: 1 MHz
1327.640	26.9	V	54.0	-27.1	AVG	141	1.0	MHz; VB: 10 Hz
1327.240	48.9	V	74.0	-25.1	PK	141	1.0	MHz; VB: 1 MHz



Run #2b: Center channel (2437MHz, channel 6), Chain A and B

Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.440	47.8	V	54.0	-6.2	AVG	265	1.0	MHz; VB: 10 Hz
3000.400	50.8	V	74.0	-23.2	PK	265	1.0	MHz; VB: 1 MHz
1329.540	32.1	V	54.0	-21.9	AVG	110	1.0	MHz; VB: 10 Hz
1327.800	55.1	V	74.0	-18.9	PK	110	1.0	MHz; VB: 1 MHz
6000.870	46.7	V	54.0	-7.3	AVG	102	1.0	MHz; VB: 10 Hz
6000.770	50.3	V	74.0	-23.7	PK	102	1.0	MHz; VB: 1 MHz

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A



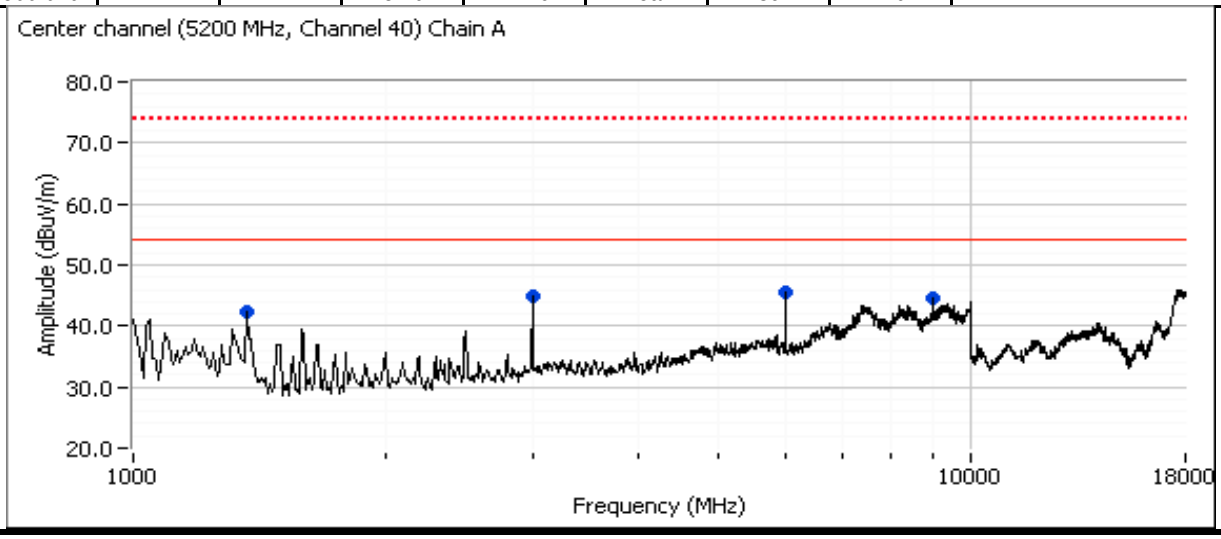
Run #3, Receiver Radiated Spurious Emissions, 1,000 - 18,000 MHz. Operation in the 5GHz Bands

Date of Test: 8/25/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run #3a: Center channel 5150 - 5250 MHz (5200MHz, channel 40), Chain A

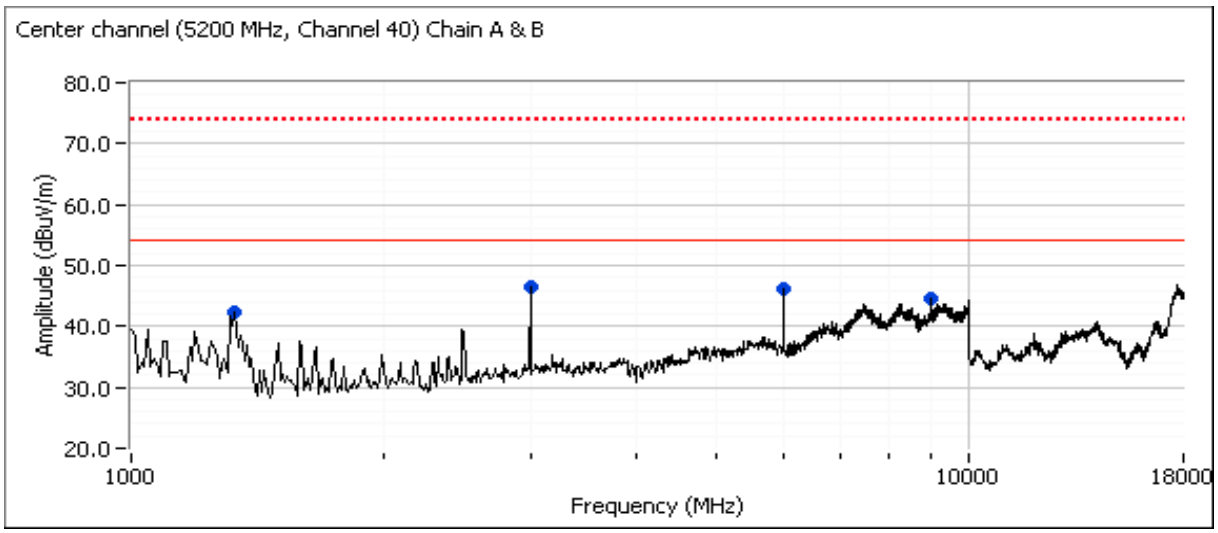
Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
6000.720	45.9	V	54.0	-8.1	AVG	102	1.0	MHz; VB: 10 Hz
6000.730	49.5	V	74.0	-24.5	PK	102	1.0	MHz; VB: 1 MHz
3000.360	44.8	V	54.0	-9.2	AVG	99	1.6	MHz; VB: 10 Hz
3000.420	48.8	V	74.0	-25.2	PK	99	1.6	MHz; VB: 1 MHz
9001.080	43.1	V	54.0	-10.9	AVG	132	1.0	MHz; VB: 10 Hz
9000.930	50.2	V	74.0	-23.8	PK	132	1.0	MHz; VB: 1 MHz
1366.670	42.4	V	54.0	-11.6	Peak	89	1.0	



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #3b: Center channel 5150 - 5250 MHz (5200MHz, channel 40), Chain A and B

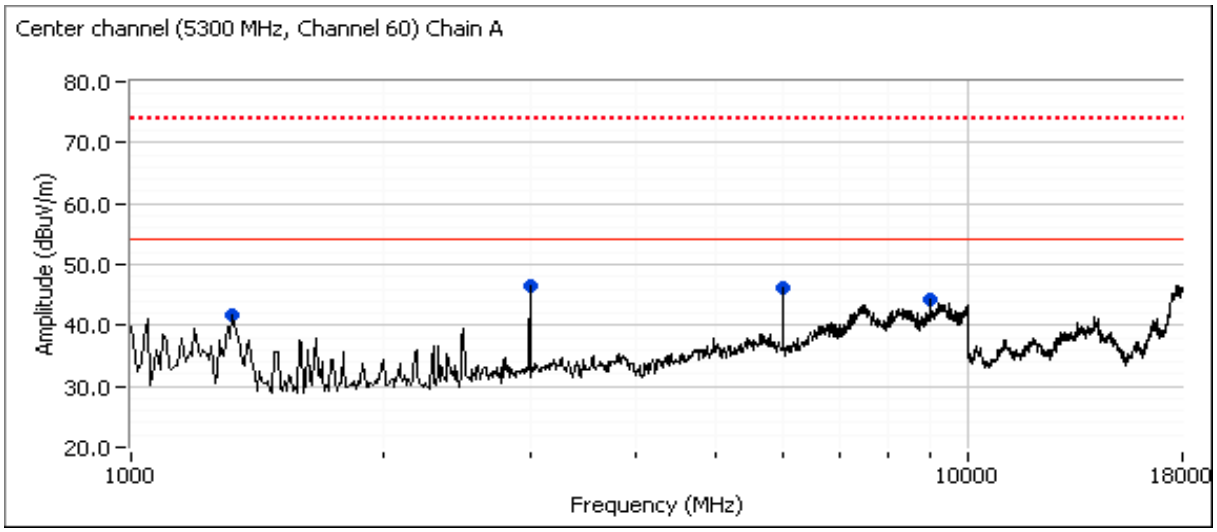
Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.360	46.8	V	54.0	-7.2	AVG	263	1.0	MHz; VB: 10 Hz
3000.360	50.8	V	74.0	-23.2	PK	263	1.0	MHz; VB: 1 MHz
6000.740	46.1	V	54.0	-7.9	AVG	98	1.0	MHz; VB: 10 Hz
6000.580	49.4	V	74.0	-24.6	PK	98	1.0	MHz; VB: 1 MHz
9001.030	42.1	V	54.0	-11.9	AVG	135	1.0	MHz; VB: 10 Hz
9000.940	49.5	V	74.0	-24.5	PK	135	1.0	MHz; VB: 1 MHz
1330.000	42.4	V	54.0	-11.6	Peak	97	1.9	



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #3c: Center channel 5250 - 5350 MHz (5300MHz, channel 60), Chain A

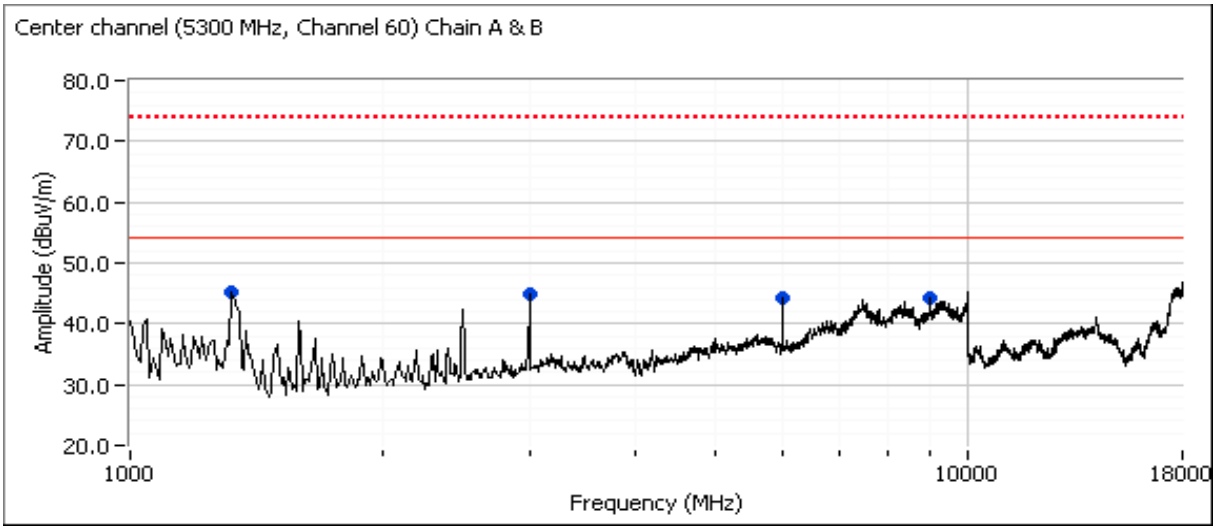
Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.360	47.2	V	54.0	-6.8	AVG	261	1.0	MHz; VB: 10 Hz
3000.290	51.1	V	74.0	-22.9	PK	261	1.0	MHz; VB: 1 MHz
9001.080	43.8	V	54.0	-10.2	AVG	132	1.0	MHz; VB: 10 Hz
9001.050	51.0	V	74.0	-23.0	PK	132	1.0	MHz; VB: 1 MHz
6000.750	45.8	V	54.0	-8.2	AVG	270	1.7	MHz; VB: 10 Hz
6000.590	50.9	V	74.0	-23.1	PK	270	1.7	MHz; VB: 1 MHz
1320.830	41.8	V	54.0	-12.2	Peak	108	1.6	



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #3d: Center channel 5250 - 5350 MHz (5300MHz, channel 60), Chain A and B

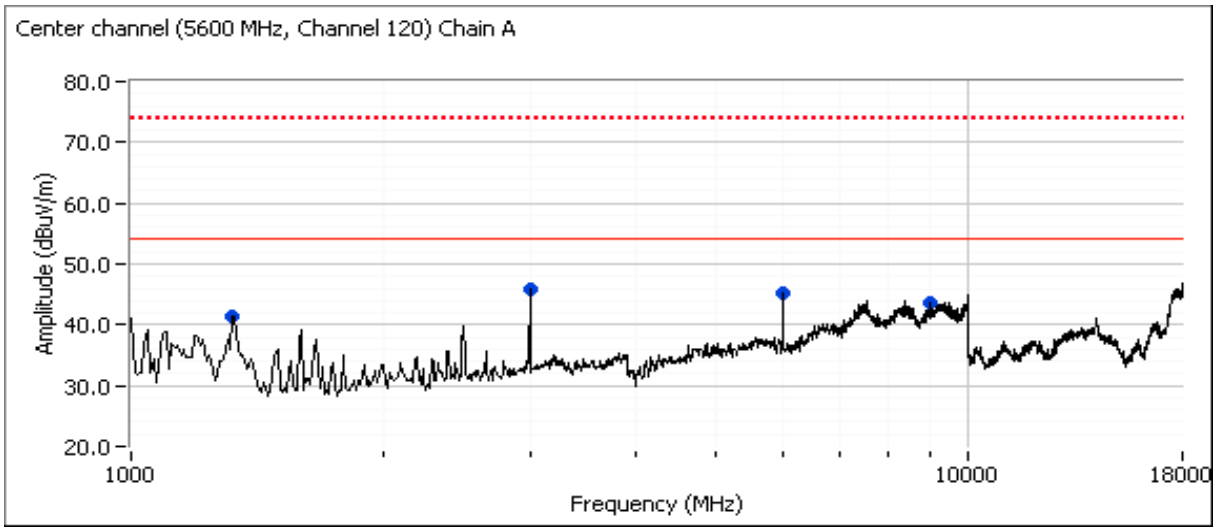
Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
6000.750	45.4	V	54.0	-8.6	AVG	270	1.8	MHz; VB: 10 Hz
6000.850	49.6	V	74.0	-24.4	PK	270	1.8	MHz; VB: 1 MHz
1328.170	32.1	V	54.0	-21.9	AVG	109	1.0	MHz; VB: 10 Hz
1328.510	57.3	V	74.0	-16.7	PK	109	1.0	MHz; VB: 1 MHz
9001.080	43.2	V	54.0	-10.8	AVG	133	1.0	MHz; VB: 10 Hz
9001.030	50.6	V	74.0	-23.4	PK	133	1.0	MHz; VB: 1 MHz
3000.390	44.5	H	54.0	-9.5	AVG	215	1.3	MHz; VB: 10 Hz
3000.230	49.0	H	74.0	-25.0	PK	215	1.3	MHz; VB: 1 MHz



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #3e: Center channel 5470 - 5725 MHz (5600MHz, channel 120), Chain A

Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.360	47.1	V	54.0	-6.9	AVG	267	1.0	MHz; VB: 10 Hz
6000.720	45.7	V	54.0	-8.3	AVG	268	1.8	MHz; VB: 10 Hz
9001.050	41.8	V	54.0	-12.2	AVG	190	1.0	MHz; VB: 10 Hz
1320.830	41.3	V	54.0	-12.7	Peak	120	1.9	
3000.400	50.7	V	74.0	-23.3	PK	267	1.0	MHz; VB: 1 MHz
6000.690	50.8	V	74.0	-23.2	PK	268	1.8	MHz; VB: 1 MHz
9000.880	49.6	V	74.0	-24.4	PK	190	1.0	MHz; VB: 1 MHz



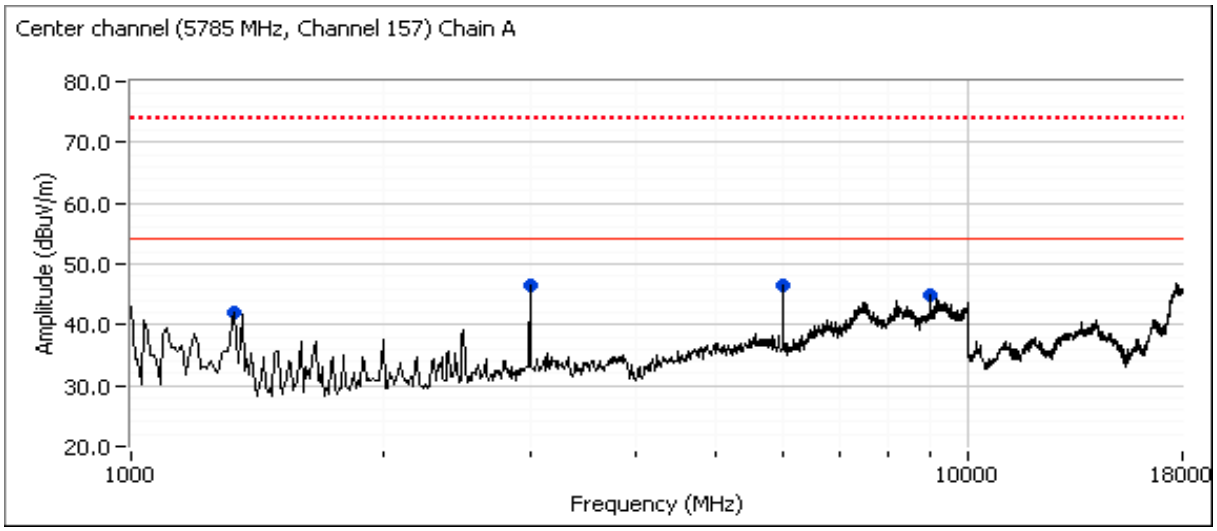
Run #3f: Center channel 5470 - 5725 MHz (5600MHz, channel 120), Chain A and B

Not performed - previous measurements in 5150 - 5350 MHz frequency range demonstrated that emissions with the single chain active were representative of the emissions with both chains active.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76369
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #3g: Center channel 5725 - 5850 MHz (5785MHz, channel 157), Chain A

Frequency	Level	Pol	RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.390	47.0	V	54.0	-7.0	AVG	264	1.0	MHz; VB: 10 Hz
3000.370	50.7	V	74.0	-23.3	PK	264	1.0	MHz; VB: 1 MHz
6000.740	45.8	V	54.0	-8.2	AVG	269	1.8	MHz; VB: 10 Hz
6000.440	50.0	V	74.0	-24.0	PK	269	1.8	MHz; VB: 1 MHz
9001.040	41.3	V	54.0	-12.7	AVG	176	1.1	MHz; VB: 10 Hz
9001.110	49.3	V	74.0	-24.7	PK	176	1.1	MHz; VB: 1 MHz
1330.000	42.1	V	54.0	-11.9	Peak	98	1.0	



Run #3h: Center channel 5725 - 5850 MHz (5785MHz, channel 157), Chain A and B

Not performed - previous measurements in 5150 - 5350 MHz frequency range demonstrated that emissions with the single chain active were representative of the emissions with both chains active.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		-
Emissions Standard(s):	RSS 210 / FCC 15.247	Class:	DTS
Immunity Standard(s):	N/A	Environment:	-

EMC Test Data

For The

Intel

Model

2x2 WiFi with WiMax MiniPCI

Date of Last Test: 9/9/2009

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, Bandwidth and Spurious Emissions - 2.4GHz

Test Specific Details

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

Date of Test: 8/26/2009
Test Engineer: Suhaila Khushzad/R. Varelas
Test Location: Chamber # 3

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.
All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 45 %

Summary of Results

Sample #2 MAC Address: 00150059F23C (except where noted); CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	20 24 24 24	16.8 16.8 16.5 16.5	Output Power	15.247(b)	Pass	802.11b: 16.6 dBm 802.11g: 15.7 dBm HT20: 15.7 dBm HT40: 15.5 dBm
2	19.5 24.0 24.0 21.0	16.4 15.3 15.7 15.5	Power spectral Density (PSD)	15.247(d)	Pass	802.11b:-7.5dBm/3kHz 802.11g:-9.2dBm/3kHz HT20:-8.5dBm/3kHz HT40:-11.8dBm/3kHz
3	20.0 24.0 24.0 24.0	16.6 15.6 15.7 15.5	Minimum 6dB Bandwidth	15.247(a)	Pass	802.11b: 10.3 MHz 802.11g: 16.5 MHz HT20: 17.8 MHz HT40: 36.7 MHz
3	20.0 23.5 24.0 24.0	16.6 14.2 15.6 15.5	99% Bandwidth	RSS GEN	-	802.11b: 13.7 MHz 802.11g: 17.2 MHz HT20: 18.5 MHz HT40: 36.9 MHz
4			Spurious emissions	15.247(b)	Pass	All Emissions less than 30dBc

Modifications Made During Testing

No modifications were made to the EUT during testing

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Deviations From The Standard

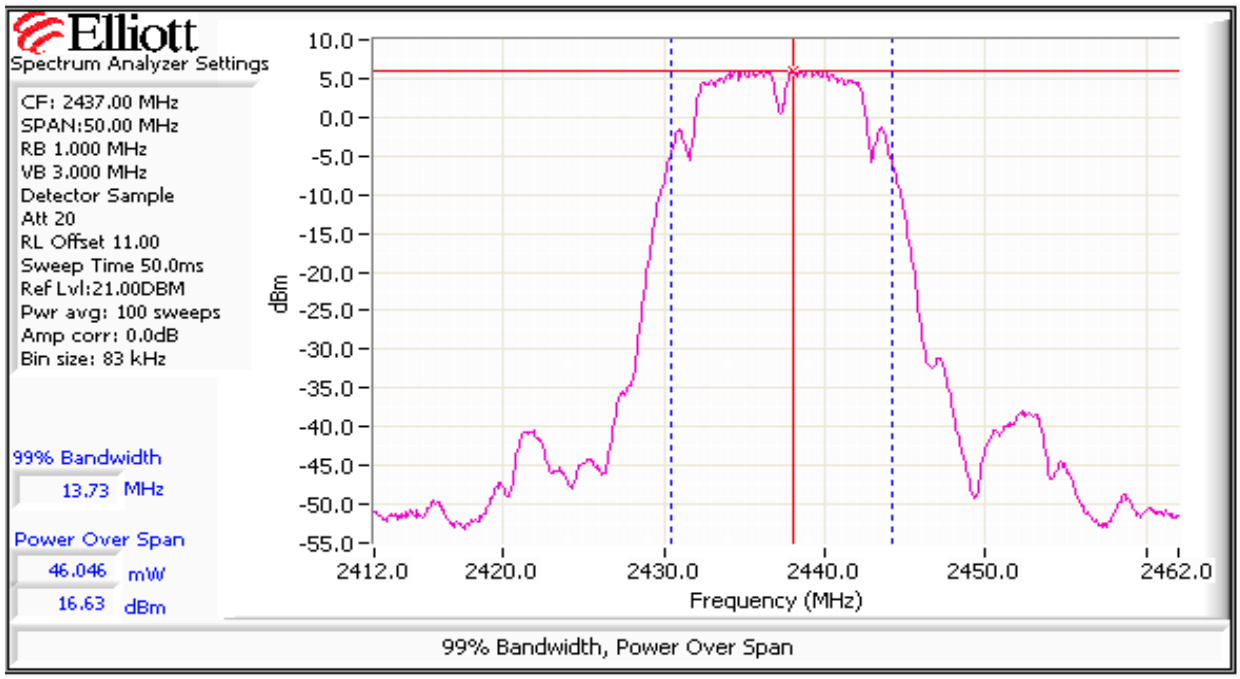
No deviations were made from the requirements of the standard.

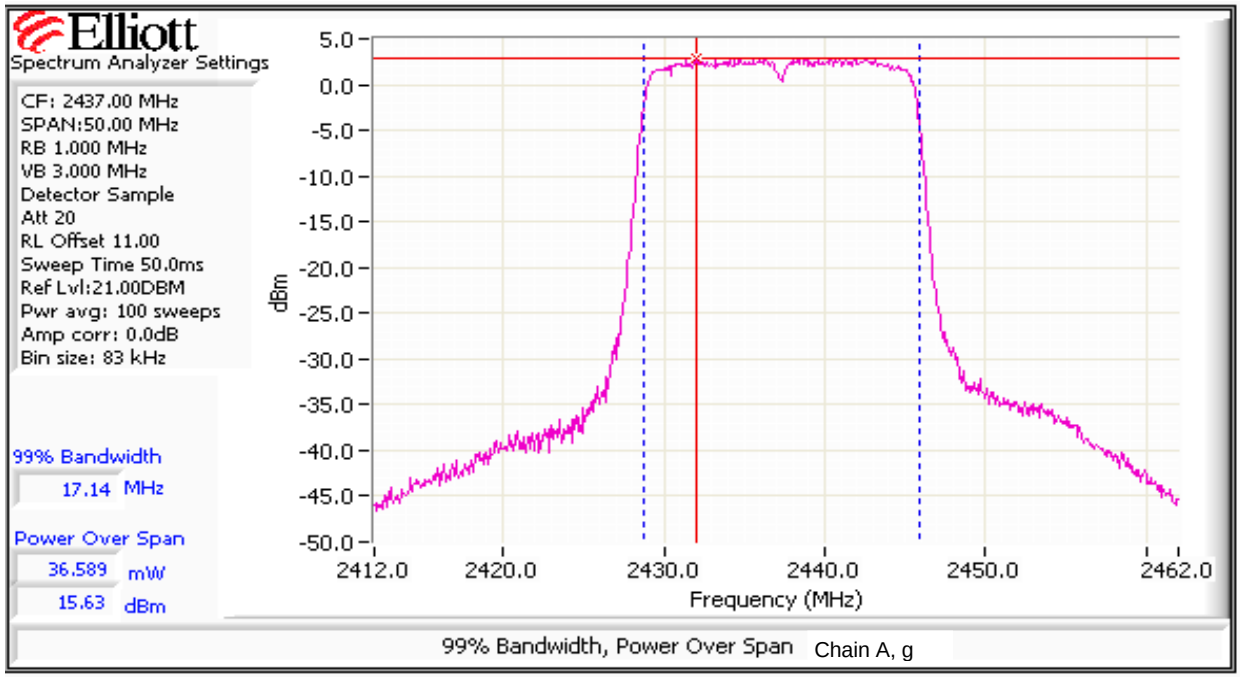
Run #1: Output Power

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
20	Chain A: 802.11b - #1	16.6	45.6	3.2	Pass	19.8	0.095	16.7	46.8
20	Chain A: 802.11b - #6	16.6	45.7	3.2	Pass	19.8	0.095	16.8	47.9
20	Chain A: 802.11b - #11	16.2	41.4	3.2	Pass	19.4	0.086	16.6	45.7
19.5	Chain B: 802.11b - #1	16.4	43.4	3.2	Pass	19.6	0.091	16.7	46.8
19.5	Chain B: 802.11b - #6	16.4	43.5	3.2	Pass	19.6	0.091	16.7	46.8
20.5	Chain B: 802.11b - #11	16.2	41.7	3.2	Pass	19.4	0.087	16.6	45.7
24	Chain A: 802.11g - #1	15.7	37.2	3.2	Pass	18.9	0.078	16.8	47.9
24	Chain A: 802.11g - #6	15.6	36.6	3.2	Pass	18.8	0.076	16.8	47.9
23	Chain A: 802.11g - #11	14.3	26.7	3.2	Pass	17.5	0.056	15.7	37.2
21.5	Chain B: 802.11g - #1	13.2	20.7	3.2	Pass	16.4	0.043	14.9	30.9
23.5	Chain B: 802.11g - #6	15.3	34.0	3.2	Pass	18.5	0.071	16.5	44.7
24.5	Chain B: 802.11g - #11	15.1	32.7	3.2	Pass	18.3	0.068	16.3	42.7
23.5	Chain B: 802.11g - #11	14.2	26.1	3.2	Pass	17.4	0.055	15.4	34.7
24	Chain A: HT20 - #1	15.7	37.2	3.2	Pass	18.9	0.078	16.5	44.7
24	Chain A: HT20 - #6	15.7	36.7	3.2	Pass	18.9	0.077	16.7	46.8
23.5	Chain A: HT20 - #11	15.2	33.1	3.2	Pass	18.4	0.069	15.9	38.9
20.5	Chain B: HT20 - #1	12.9	19.7	3.2	Pass	16.1	0.041	13.7	23.4
24	Chain B: HT20 - #6	15.6	36.6	3.2	Pass	18.8	0.076	16.5	44.7
23.5	Chain B: HT20 - #11	14.7	29.2	3.2	Pass	17.9	0.061	15.1	32.4
22	Chain A: HT40 - #3	13.6	22.8	3.2	Pass	16.8	0.048	14.8	30.2
24	Chain A: HT40 - #6	15.5	35.4	3.2	Pass	18.7	0.074	16.7	46.8
20.5	Chain A: HT40 - #9	12.4	17.4	3.2	Pass	15.6	0.036	13.6	22.9
17	Chain B: HT40 - #3	8.9	7.7	3.2	Pass	12.1	0.016	10.8	12.0
24	Chain B: HT40 - #6	15.5	35.8	3.2	Pass	18.7	0.075	16.5	44.7
22	Chain B: HT40 - #9	13.3	21.5	3.2	Pass	16.5	0.045	14.6	28.8

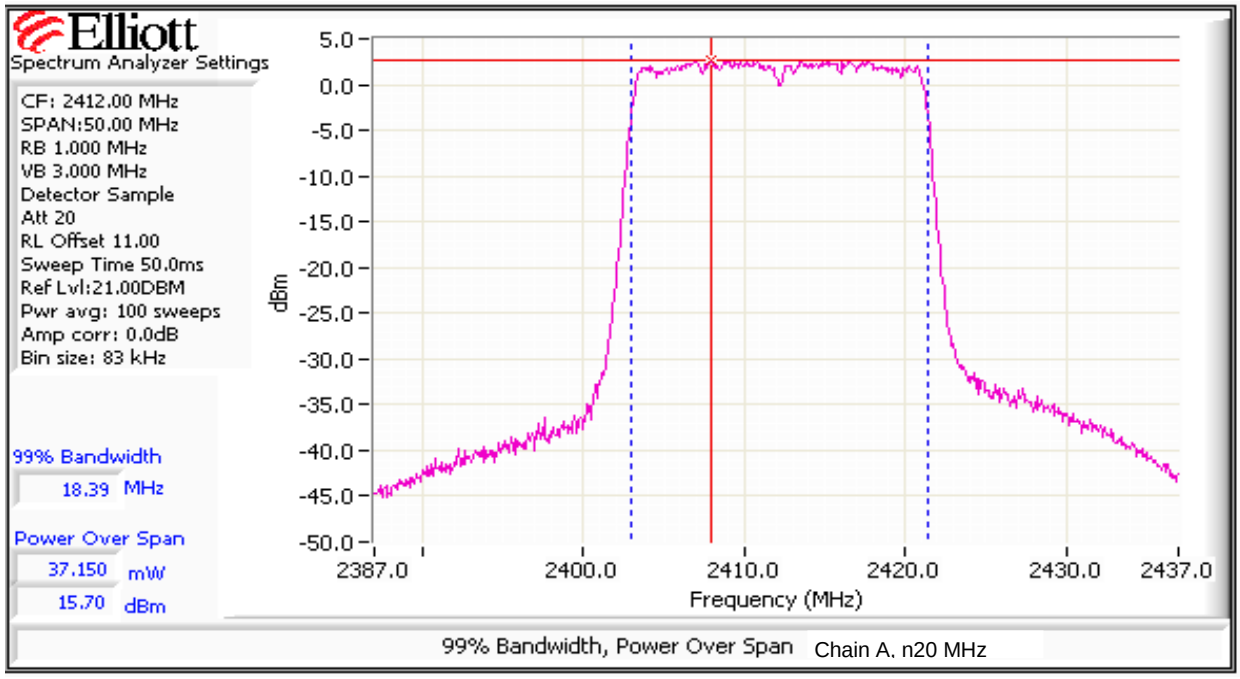
Note 1:	Output power measured using a spectrum analyzer (see plots below): RBW=1MHz, VB=3 MHz, sample detector, power averaging on (transmitted signal was continuous) and power integration over >=80 MHz for n40 mode and >=40MHz for b, g and n20 modes. Spurious limit is -30dBc because this method was used.
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Power measured using average power meter and is included for reference only.

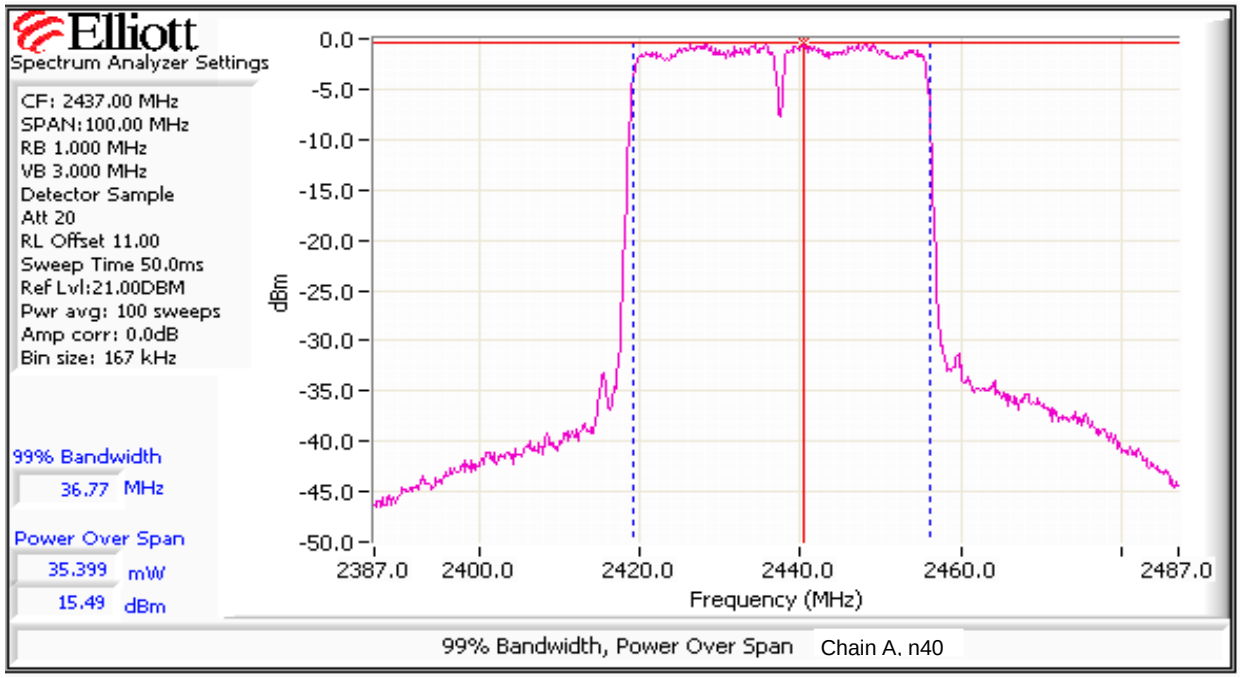
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





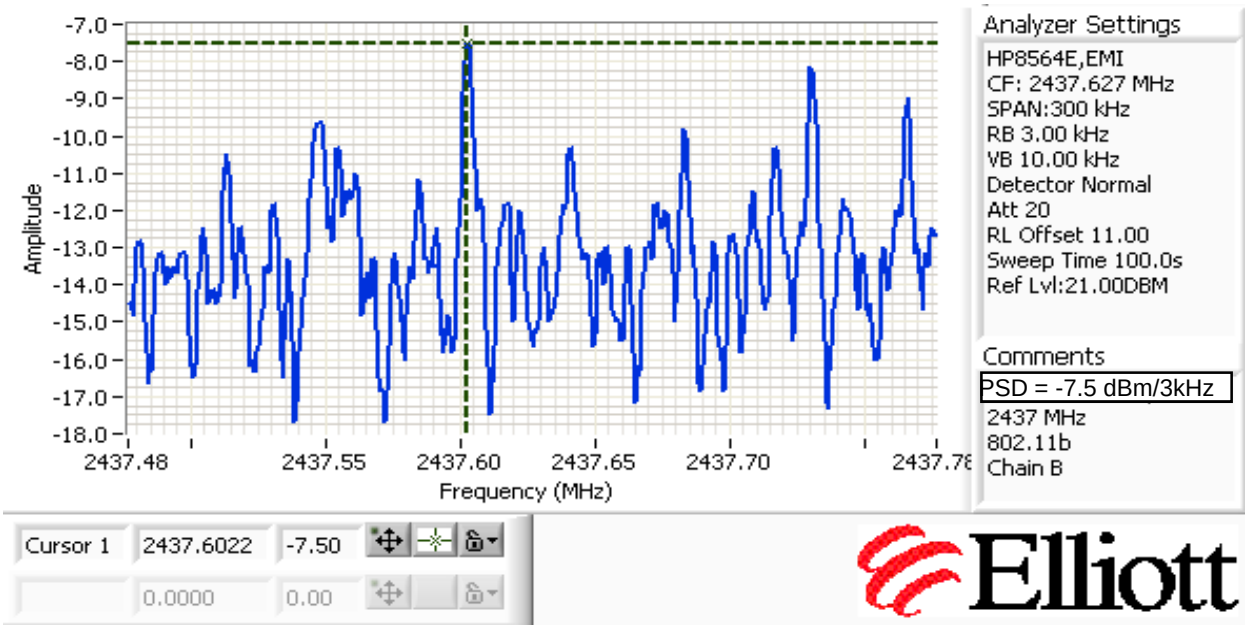
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

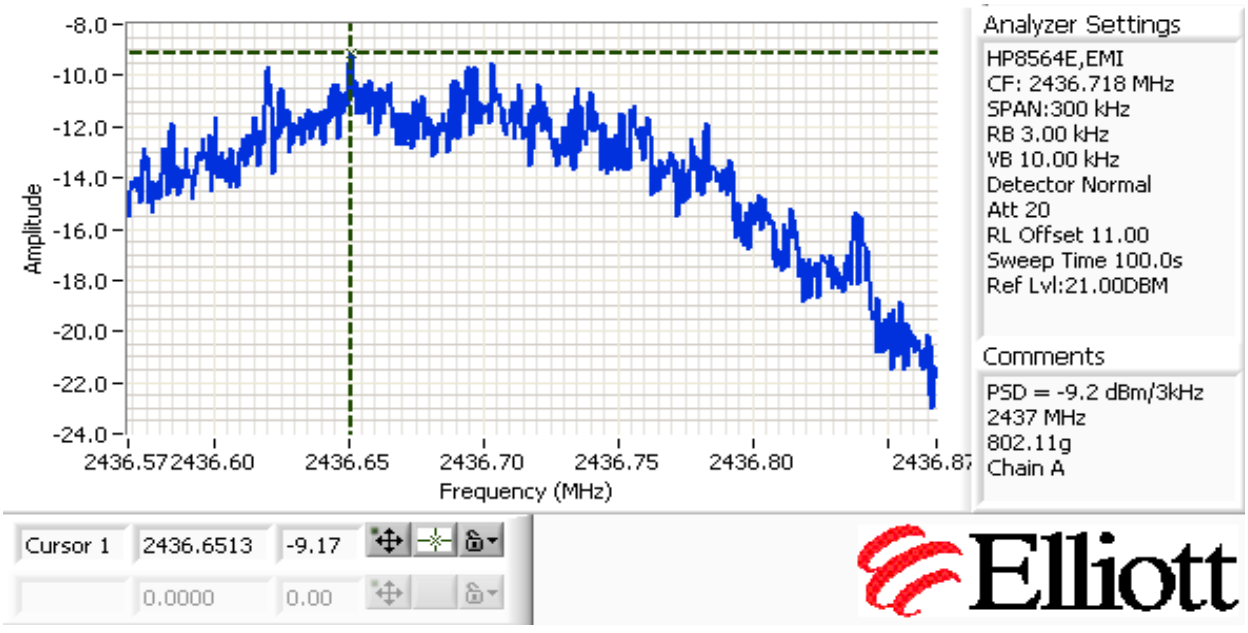
Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
20	Chain A: 802.11b - #1	-8.0	8.0	Pass
20	Chain A: 802.11b - #6	-7.7	8.0	Pass
20	Chain A: 802.11b - #11	-8.3	8.0	Pass
24	Chain A: 802.11g - #1	-9.7	8.0	Pass
24	Chain A: 802.11g - #6	-9.2	8.0	Pass
23	Chain A: 802.11g - #11	-10.2	8.0	Pass
24	Chain A: HT20 - #1	-9.5	8.0	Pass
24	Chain A: HT20 - #6	-8.5	8.0	Pass
23	Chain A: HT20 - #11	-8.5	8.0	Pass
22	Chain A: HT40 - #3	-12.5	8.0	Pass
24	Chain A: HT40 - #6	-11.8	8.0	Pass
21	Chain A: HT40 - #9	-15.8	8.0	Pass
19.5	Chain B: 802.11b - #1	-8.5	8.0	Pass
19.5	Chain B: 802.11b - #6	-7.5	8.0	Pass
20.5	Chain B: 802.11b - #11	-8.7	8.0	Pass
22.5	Chain B: 802.11g - #1	-10.5	8.0	Pass
22.5	Chain B: 802.11g - #6	-10.5	8.0	Pass
23.5	Chain B: 802.11g - #11	-10.7	8.0	Pass
19.5	Chain B: HT20 - #1	-12.7	8.0	Pass
24	Chain B: HT20 - #6	-9.0	8.0	Pass
21.5	Chain B: HT20 - #11	-12.3	8.0	Pass
18.5	Chain B: HT40 - #3	-17.8	8.0	Pass
24	Chain B: HT40 - #6	-12.5	8.0	Pass
22	Chain B: HT40 - #9	-15.3	8.0	Pass

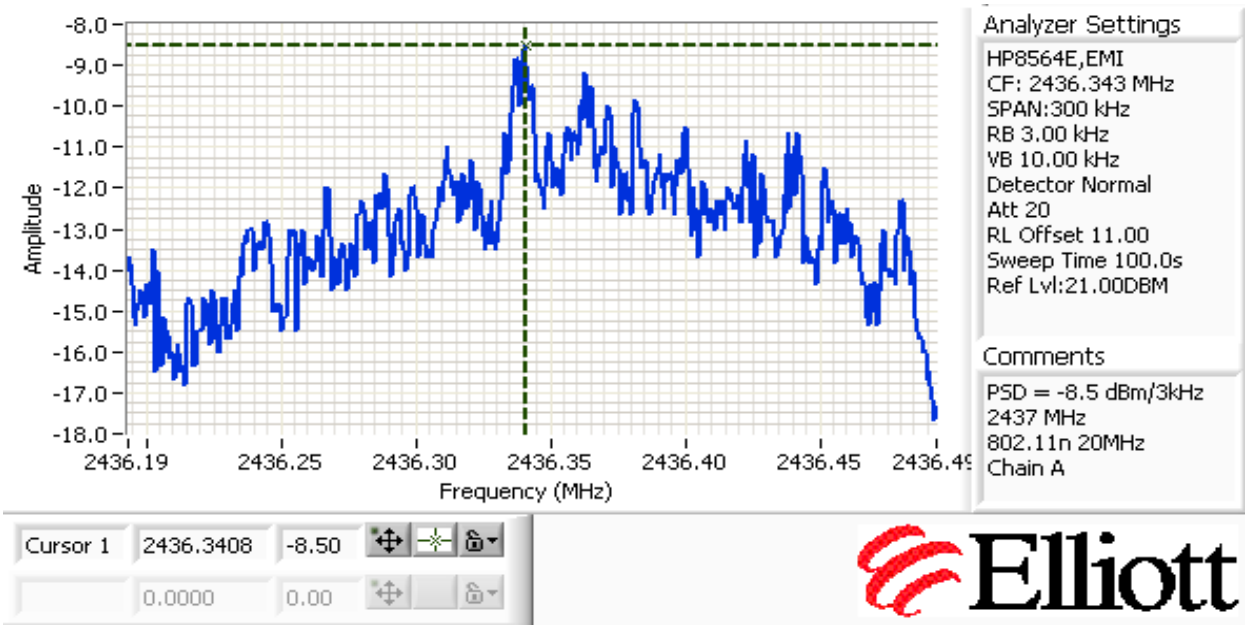
Note 1:	Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.

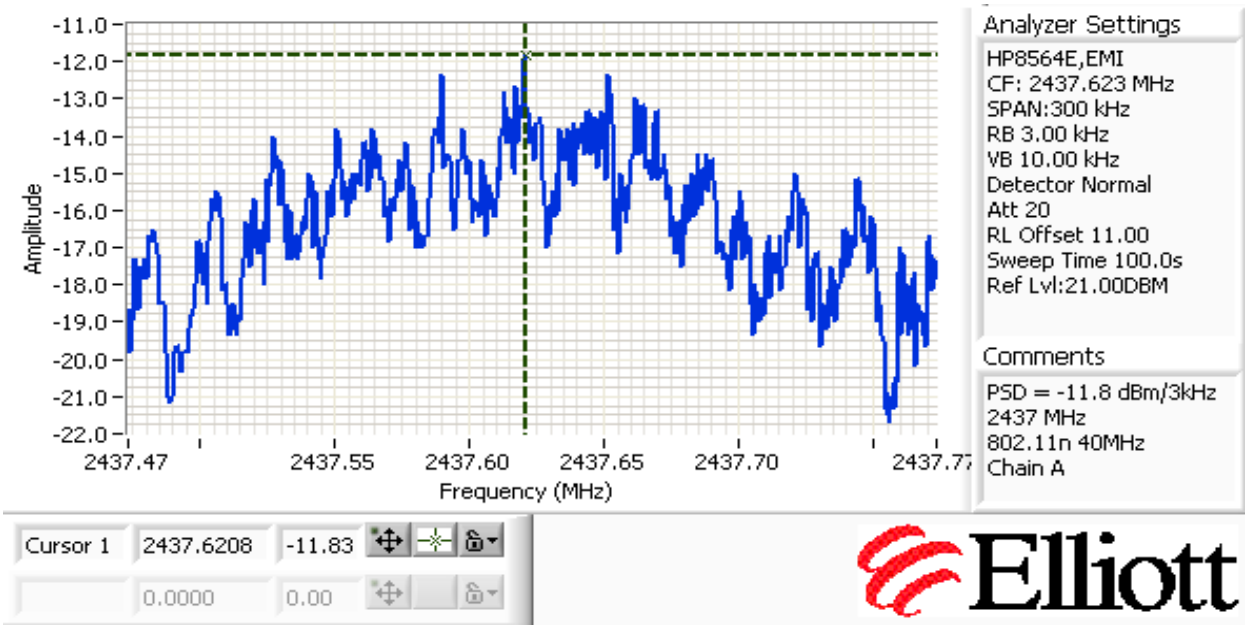
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

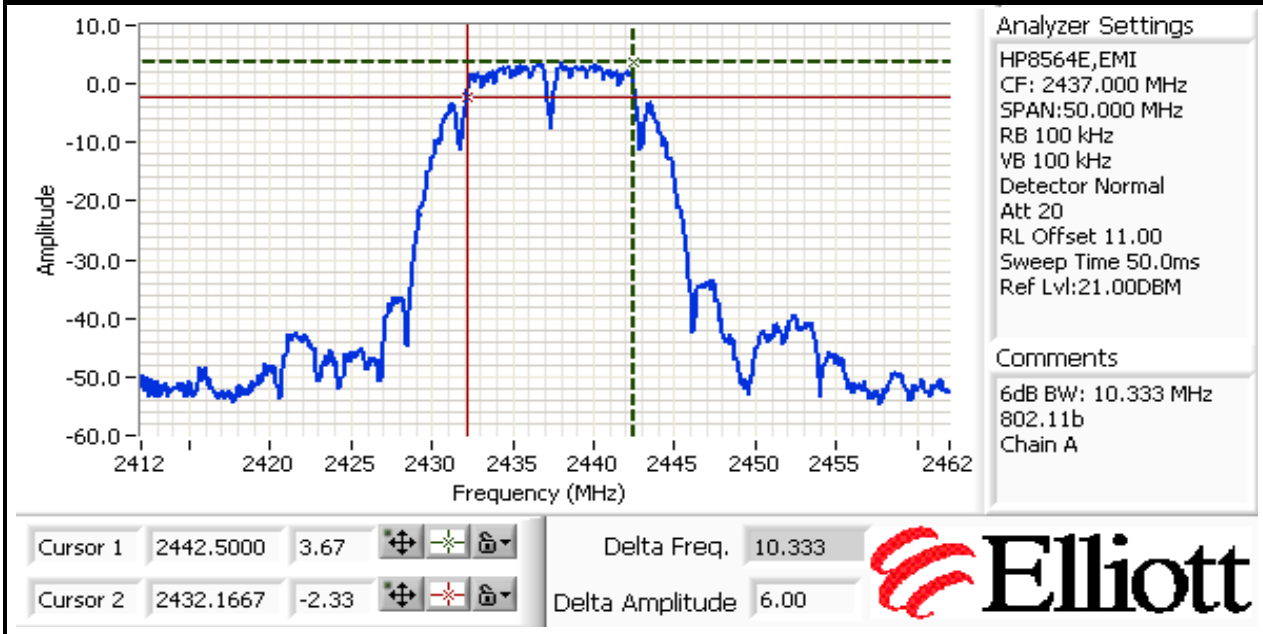
Run #3: Signal Bandwidth

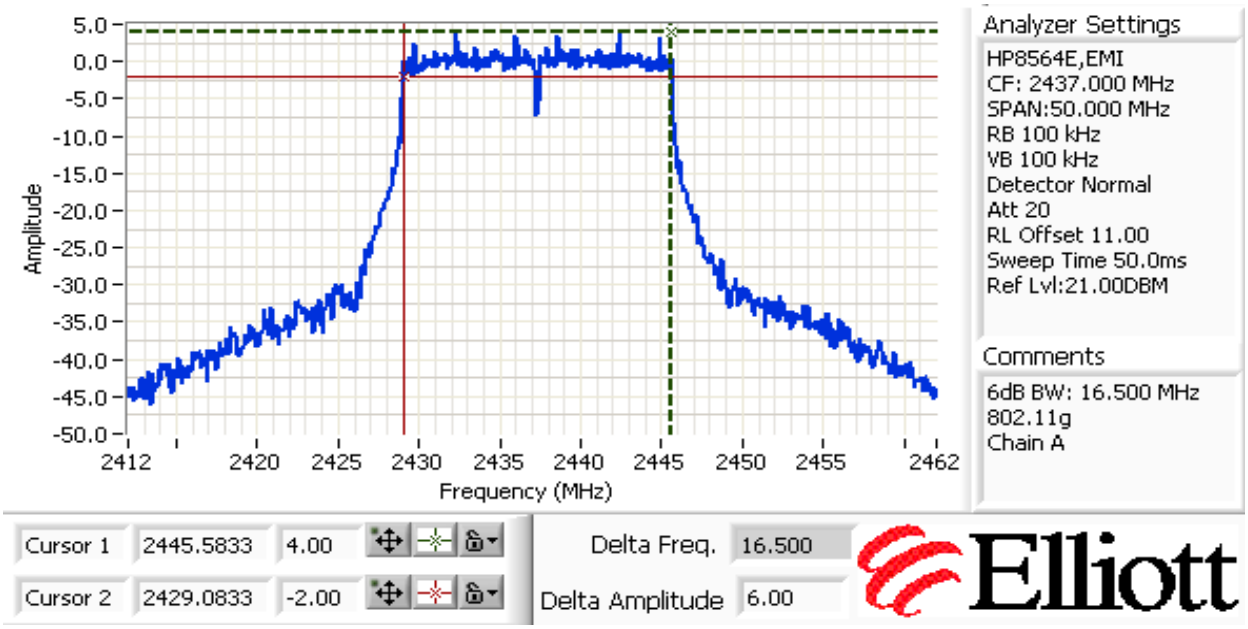
Note - only measure Chain A for 6dB bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz) 6dB	99%
20	Chain A: 802.11b - #1	100kHz	10.3	13.64
20	Chain A: 802.11b - #6	100kHz	10.3	13.73
20	Chain A: 802.11b - #11	100kHz	10.3	13.64
24	Chain A: 802.11g - #1	100kHz	16.5	17.14
24	Chain A: 802.11g - #6	100kHz	16.5	17.14
23	Chain A: 802.11g - #11	100kHz	16.6	17.14
24	Chain A: HT20 - #1	100kHz	17.8	18.4
24	Chain A: HT20 - #6	100kHz	17.8	18.4
23	Chain A: HT20 - #11	100kHz	17.9	18.4
22	Chain A: HT40 - #3	100kHz	36.7	36.8
24	Chain A: HT40 - #6	100kHz	36.7	36.8
21	Chain A: HT40 - #9	100kHz	36.7	36.8
19.5	Chain B: 802.11b - #1			13.64
19.5	Chain B: 802.11b - #6			13.64
20.5	Chain B: 802.11b - #11			13.64
22.5	Chain B: 802.11g - #1			17.14
22.5	Chain B: 802.11g - #6			17.14
23.5	Chain B: 802.11g - #11			17.2
19.5	Chain B: HT20 - #1			18.4
24	Chain B: HT20 - #6			18.5
21.5	Chain B: HT20 - #11			18.4
18.5	Chain B: HT40 - #3			36.8
24	Chain B: HT40 - #6			36.9
22	Chain B: HT40 - #9			36.8

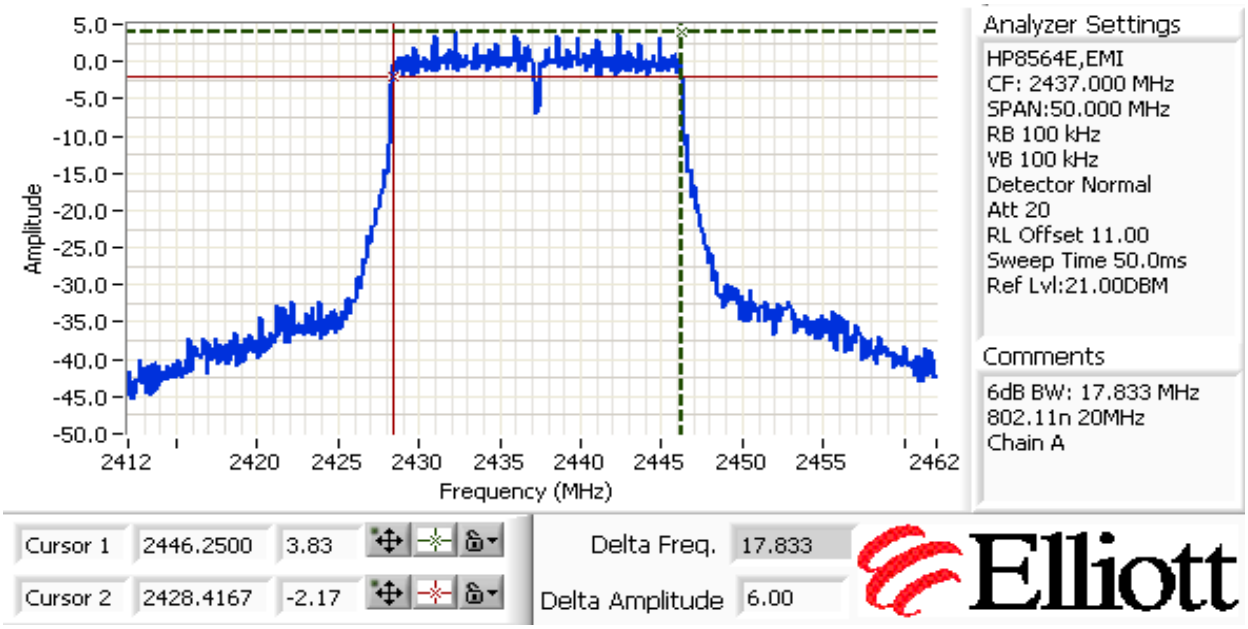
Note 1:	99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB
Note 2:	Requirement is that the 6dB bandwidth be greater than 500kHz. Only chain A bandwidth was measured as representative of both chains given that the signal bandwidth far exceeds the minimum required and the similarity of the signal on each chain.

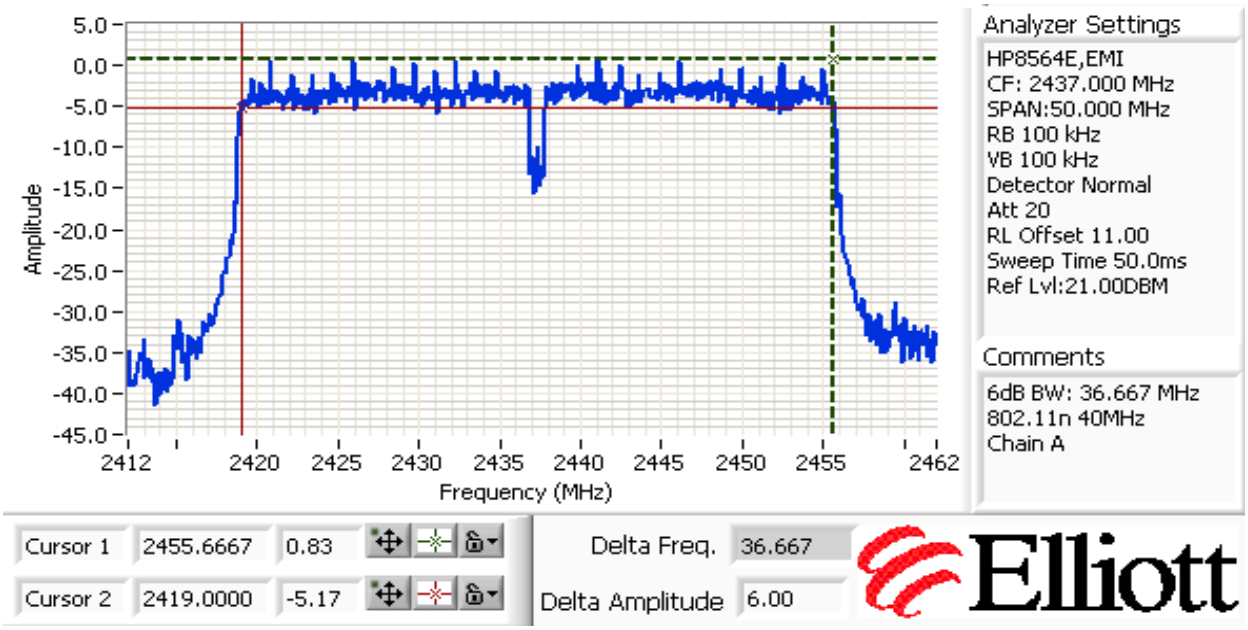
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





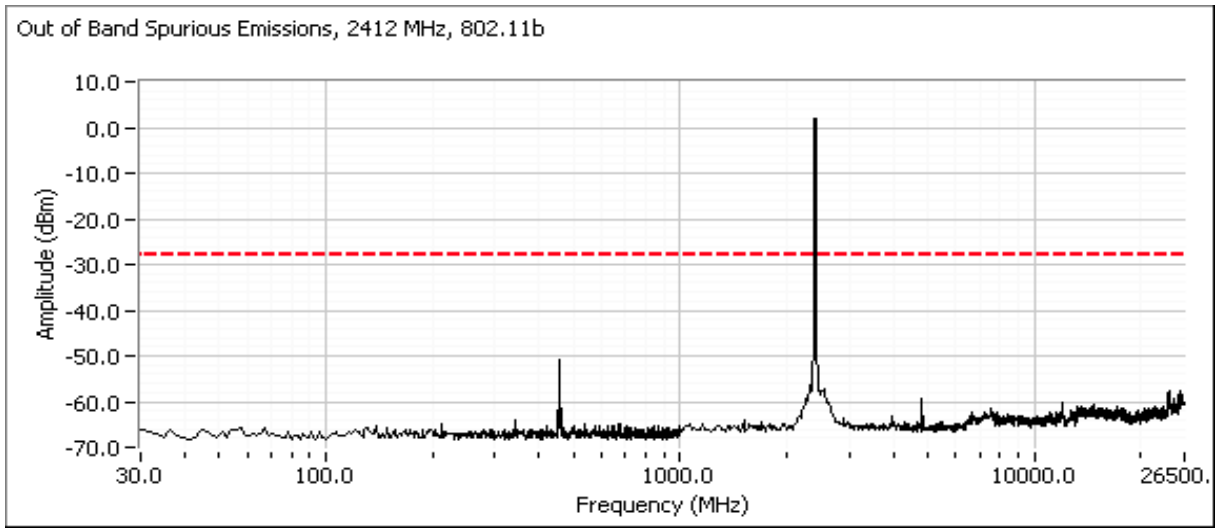
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #4: Out of Band Spurious Emissions

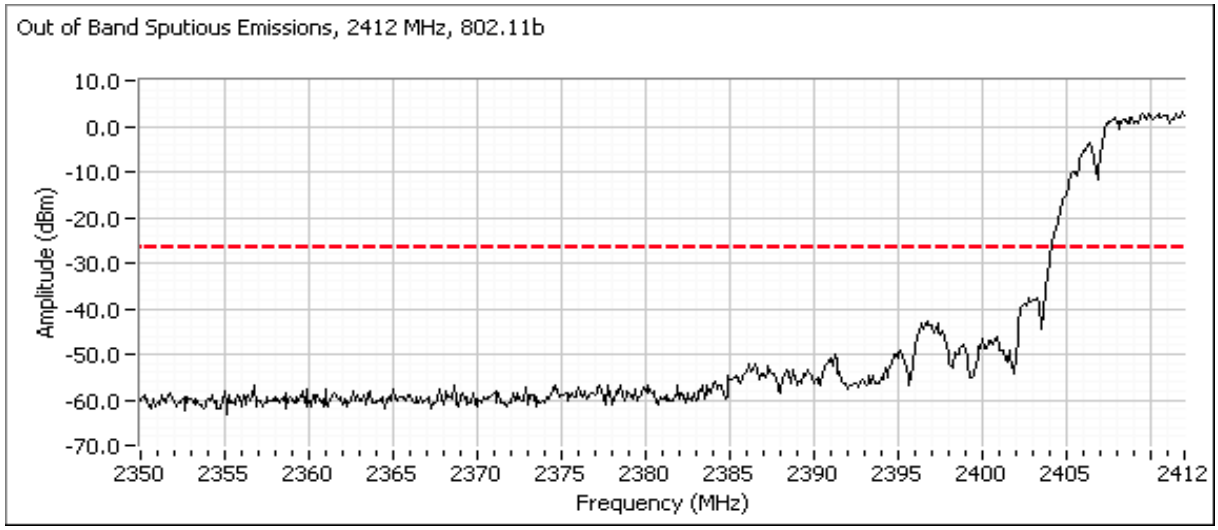
Frequency (MHz)	Limit	Result
2412, 2422	-30dBc	Pass
2437	-30dBc	Pass
2452, 2462	-30dBc	Pass

802.11b Mode Chain A

Plots for low channel, power setting(s) = 20.0

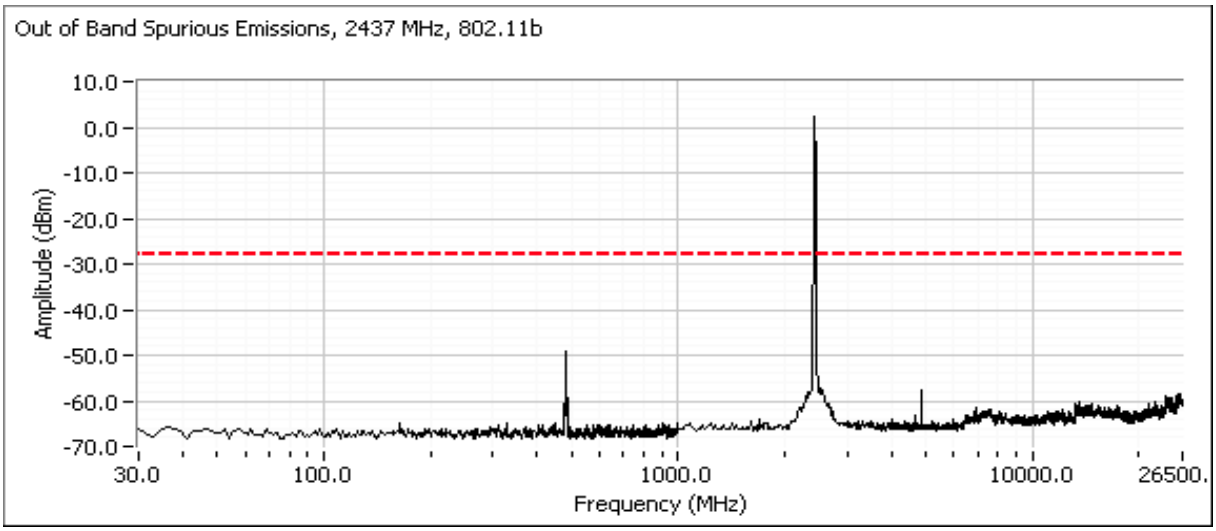


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

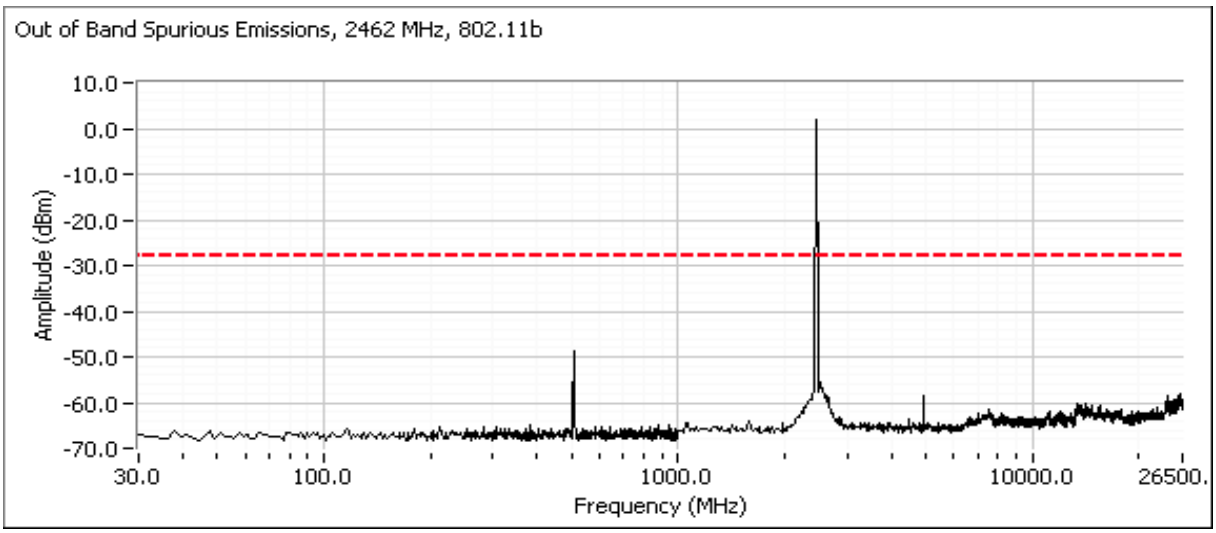


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 20.0



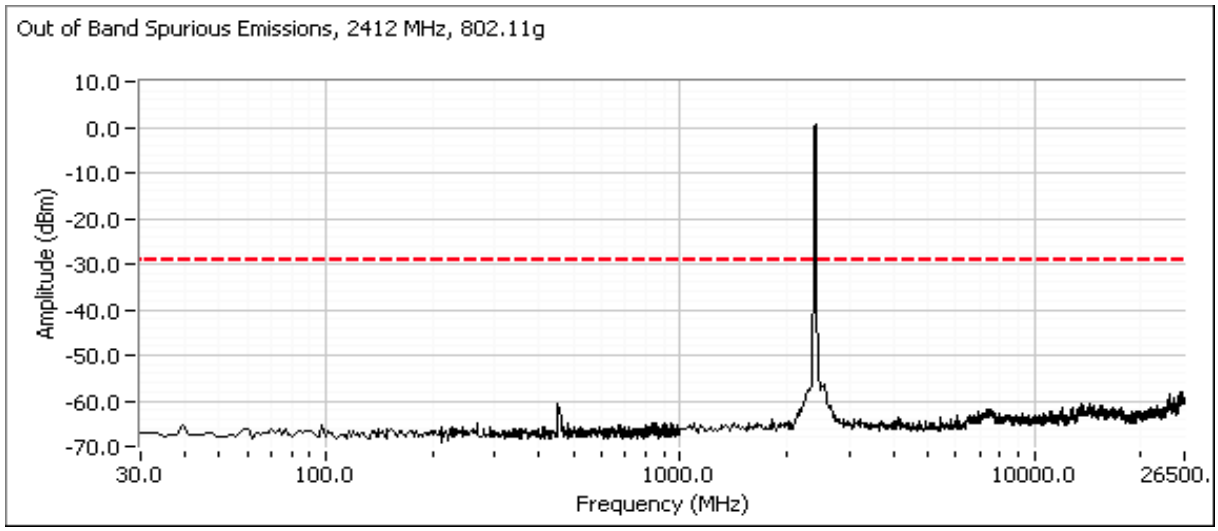
Plots for high channel, power setting(s) = 20.0



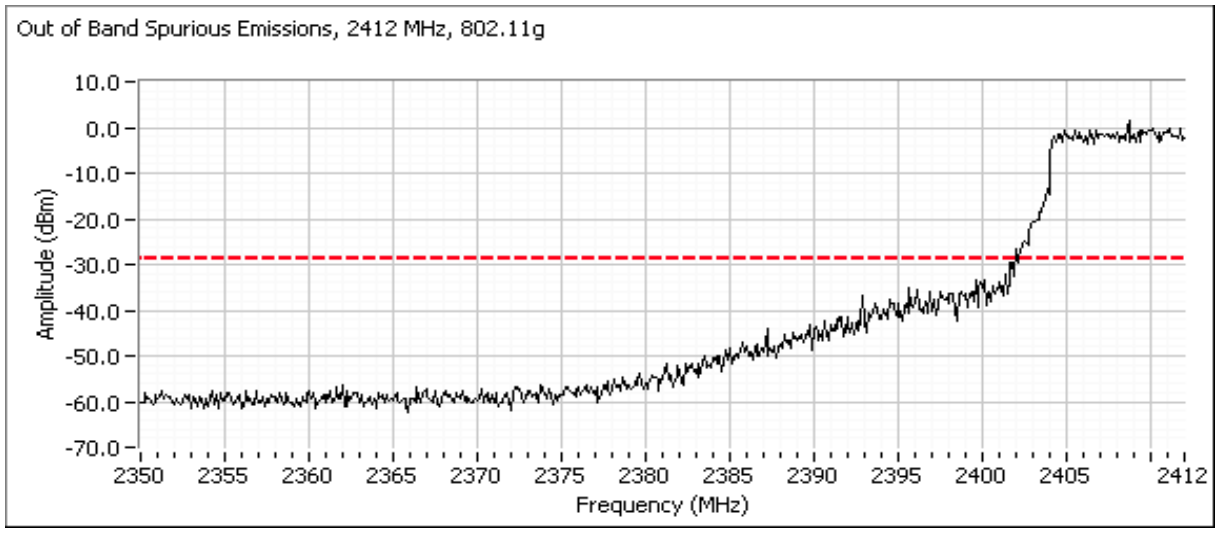
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

802.11g Mode Chain A

Plots for low channel, power setting(s) = 24.0

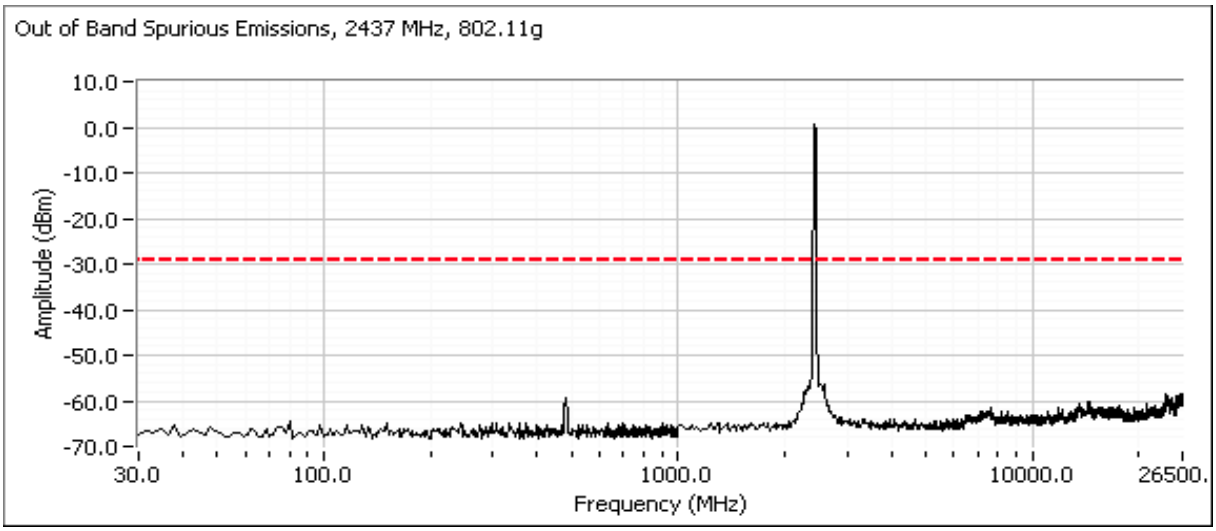


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

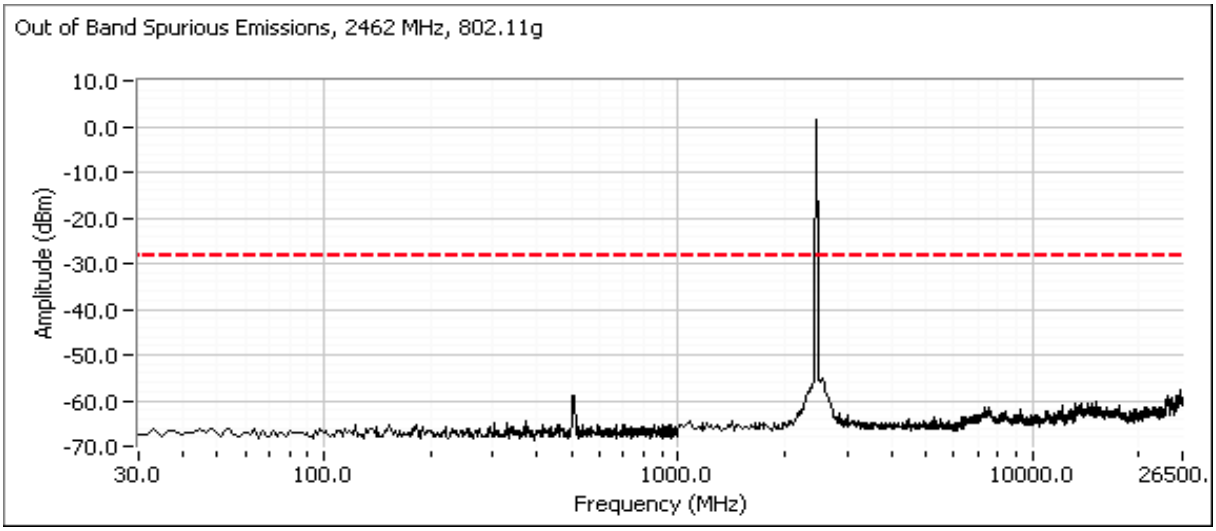


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 24.0



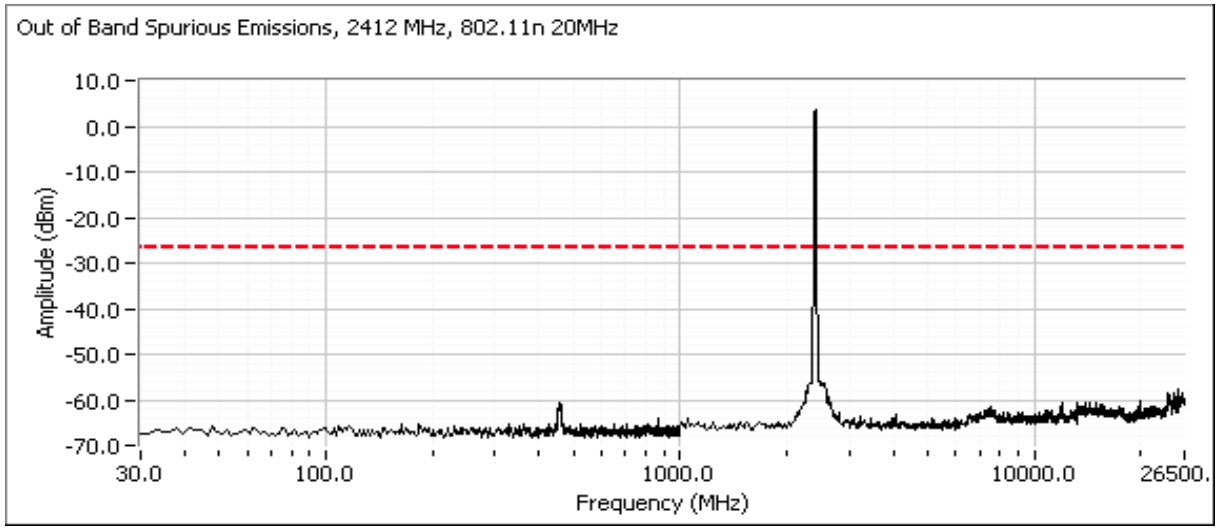
Plots for high channel, power setting(s) = 23.0



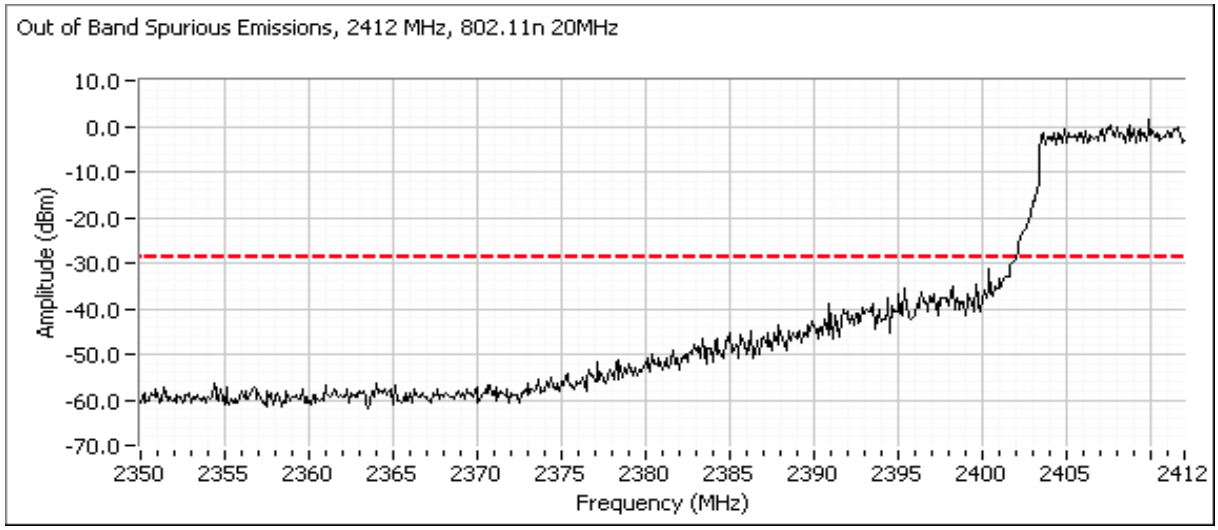
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

HT20 Mode Chain A

Plots for low channel, power setting(s) = 24.0

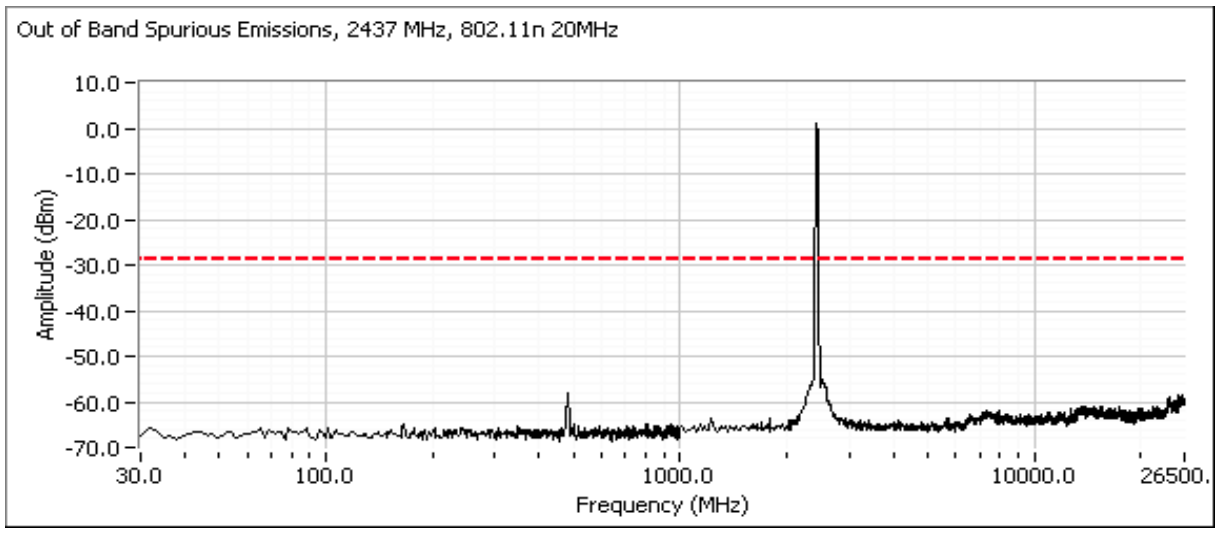


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

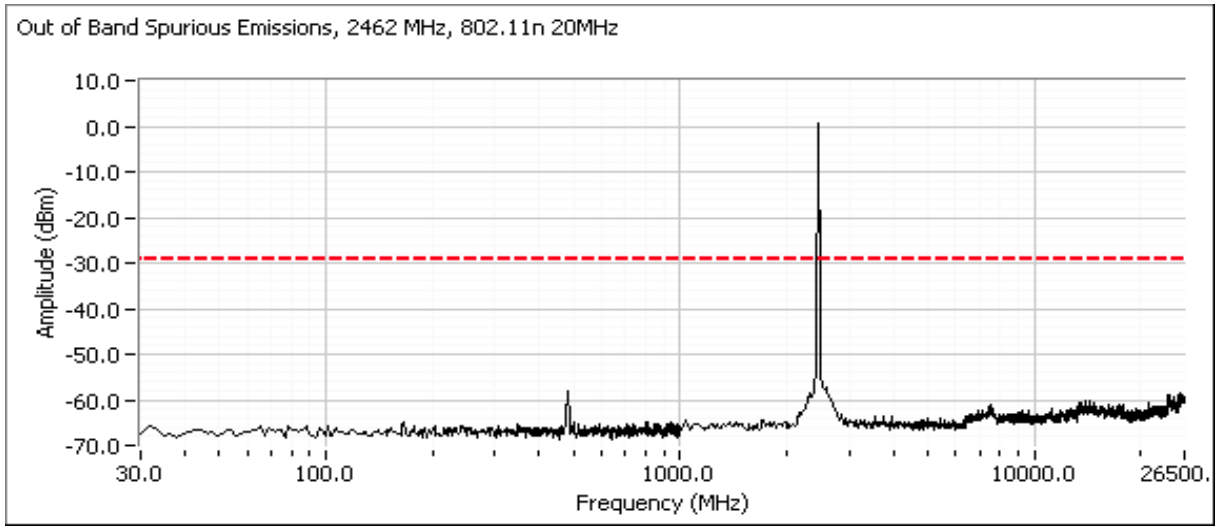


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 24.0



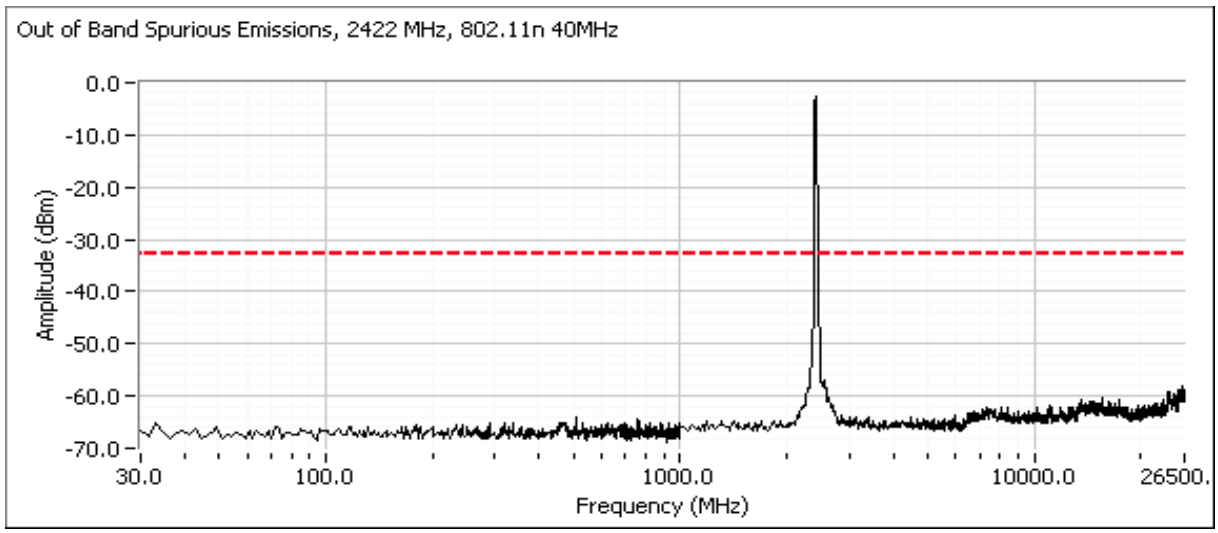
Plots for high channel, power setting(s) = 23.0



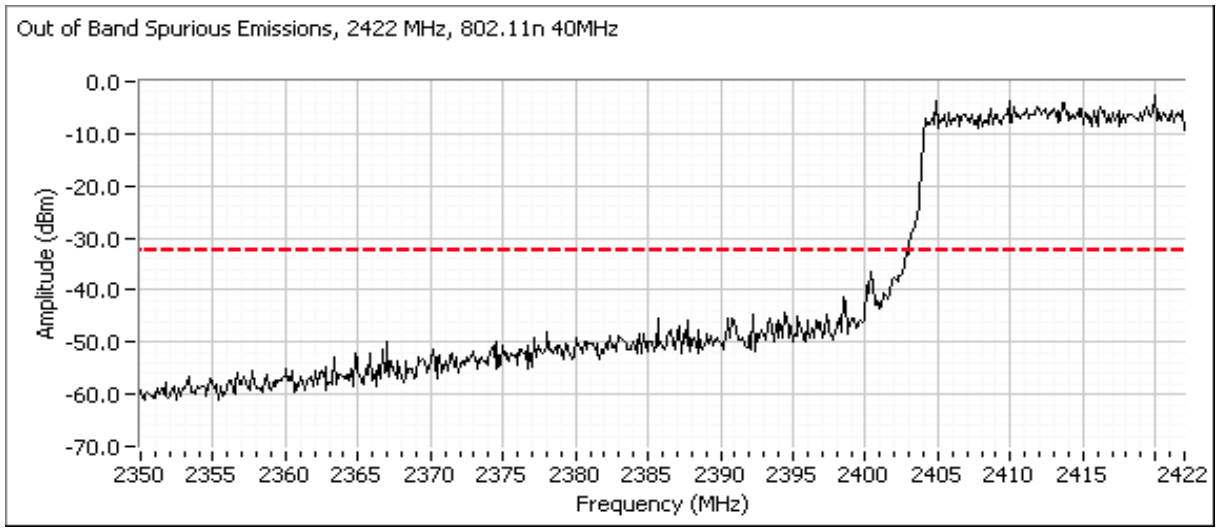
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

HT40 Mode Chain A

Plots for low channel, power setting(s) = 22.0

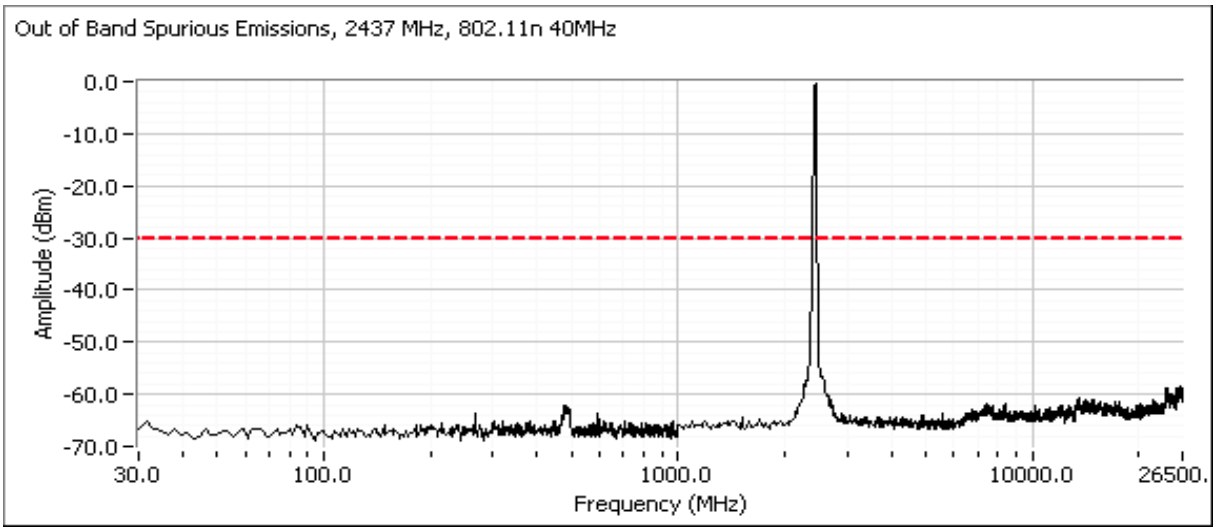


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

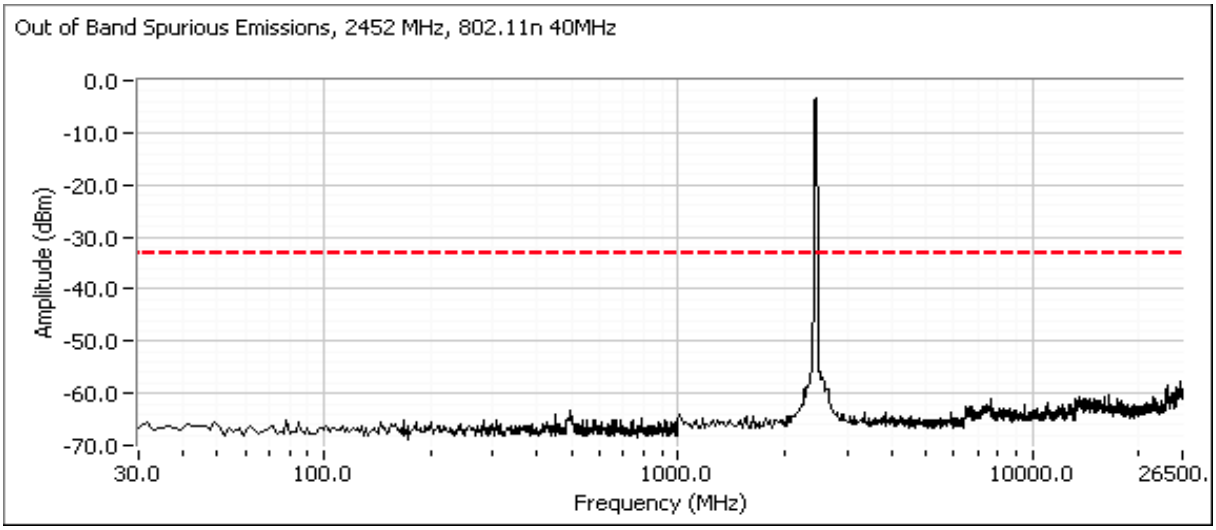


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 24.0



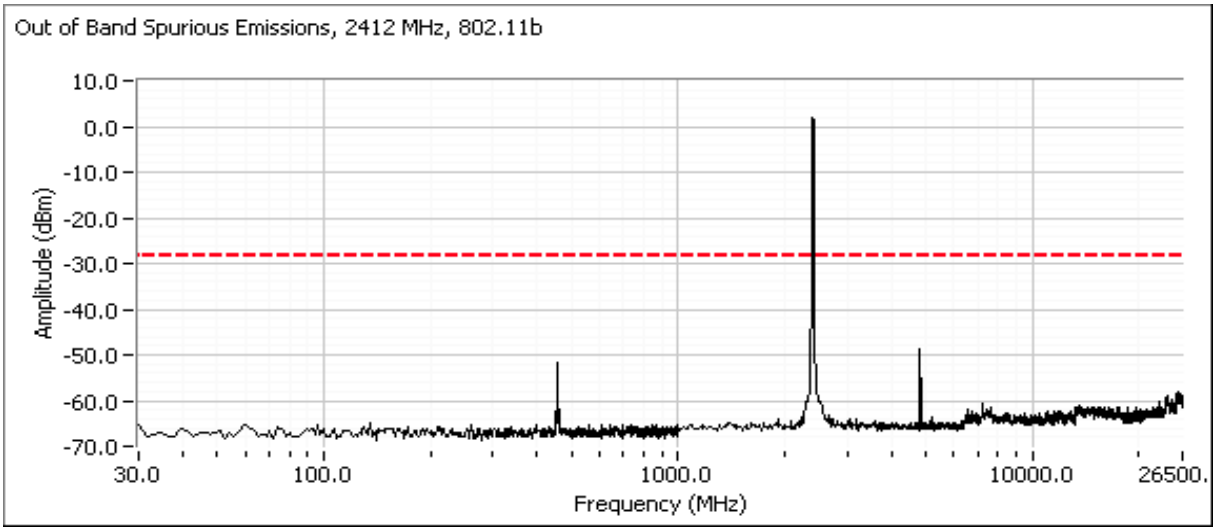
Plots for high channel, power setting(s) = 21.0



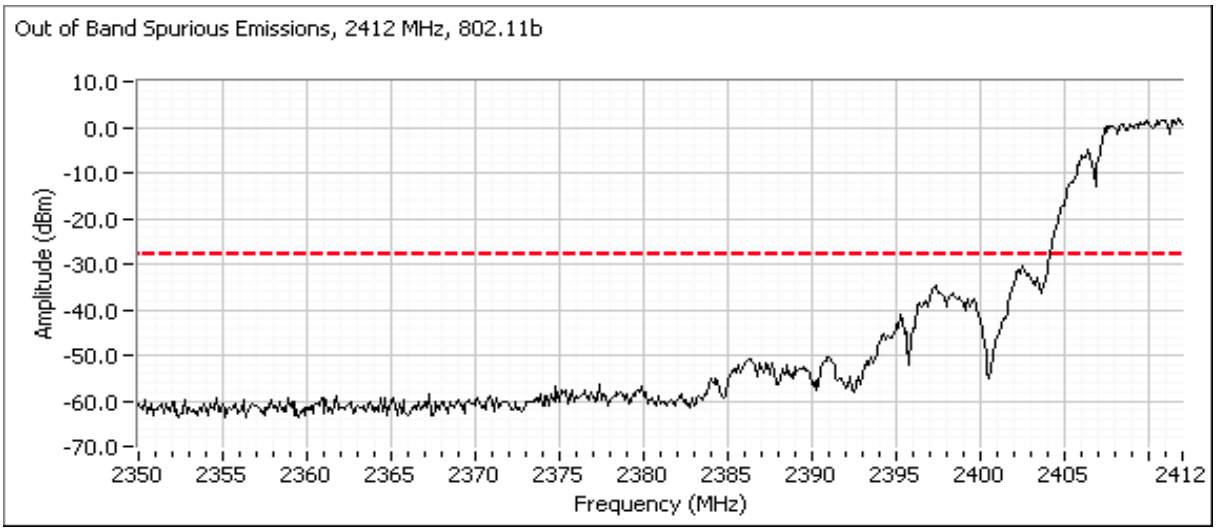
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

802.11b Mode Chain B

Plots for low channel, power setting(s) = 19.5

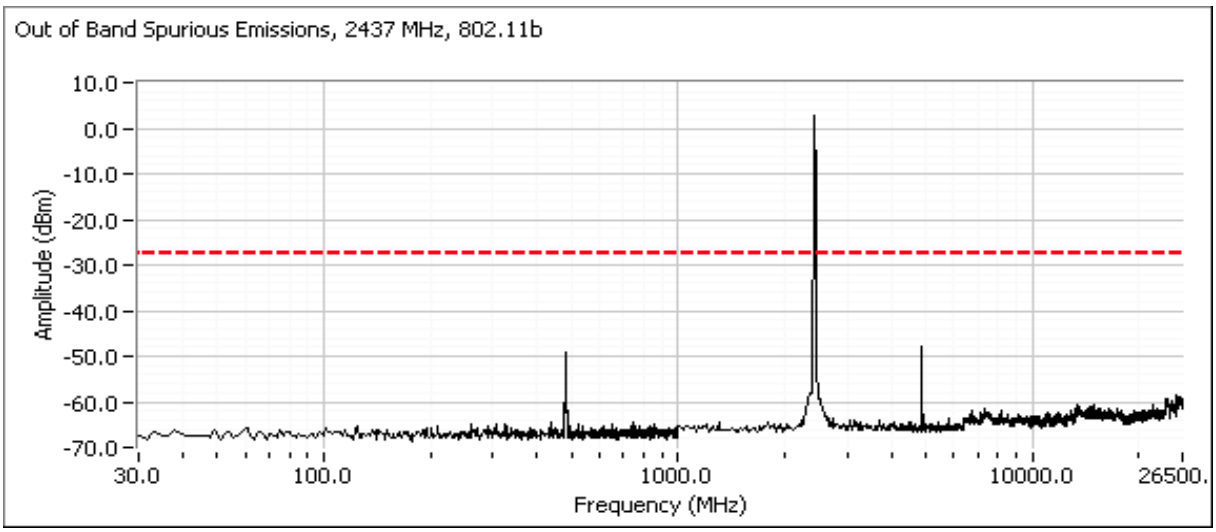


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

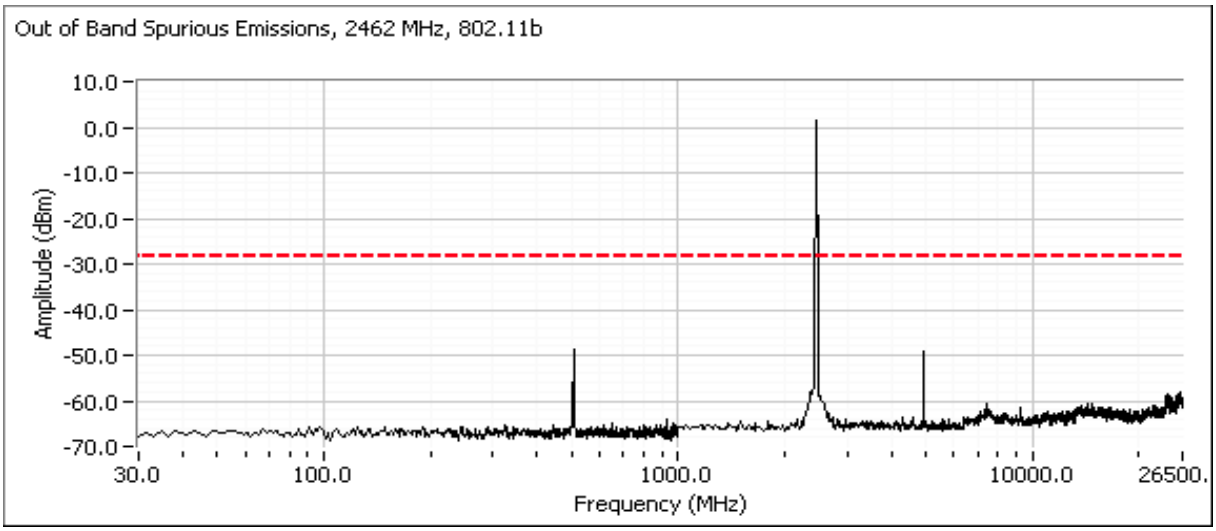


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 19.5



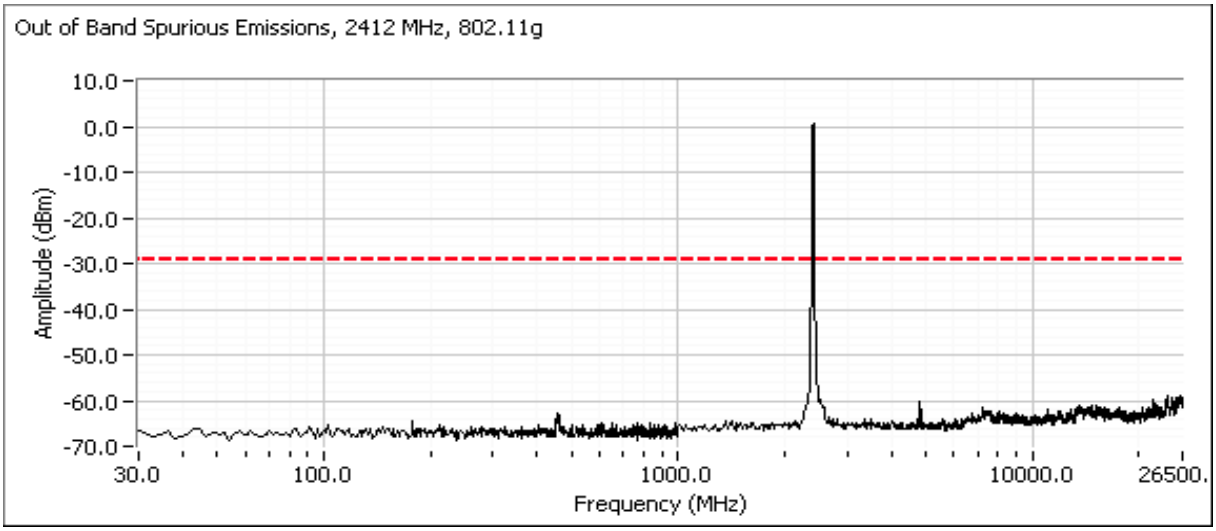
Plots for high channel, power setting(s) = 20.5



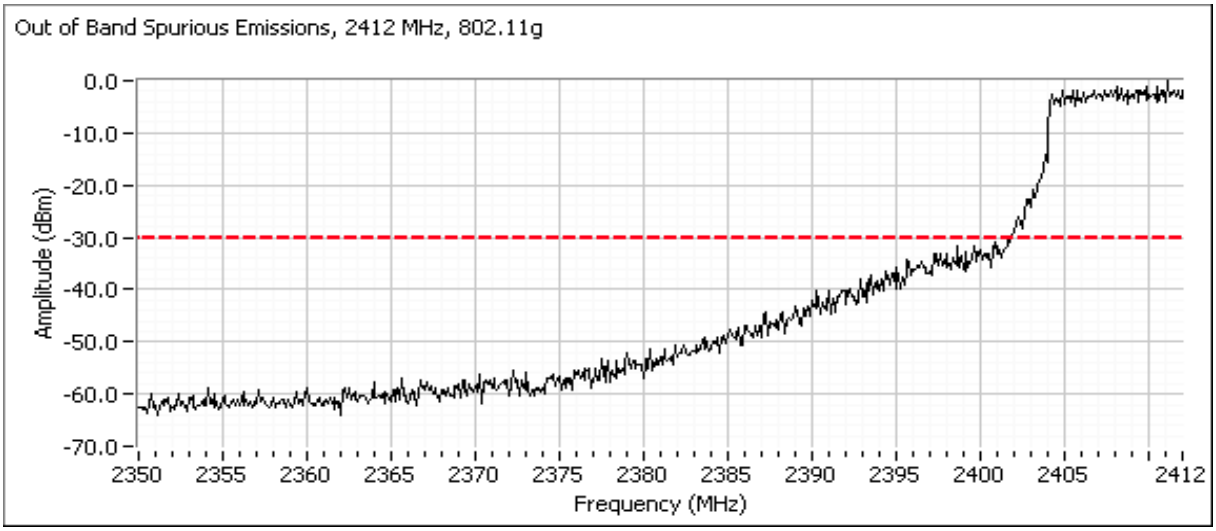
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

802.11g Mode Chain B

Plots for low channel, power setting(s) = 22.5

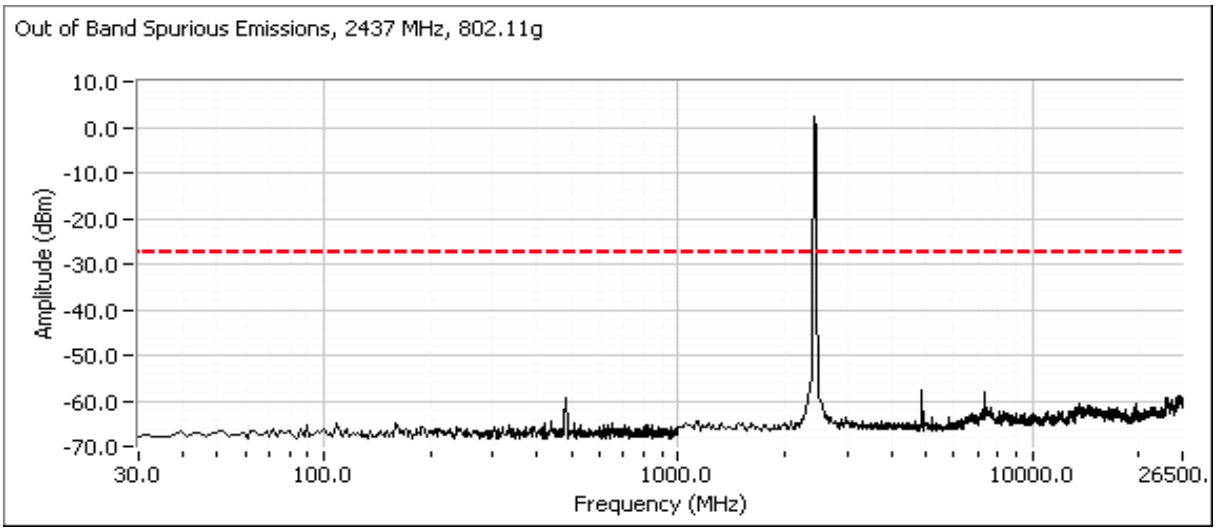


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

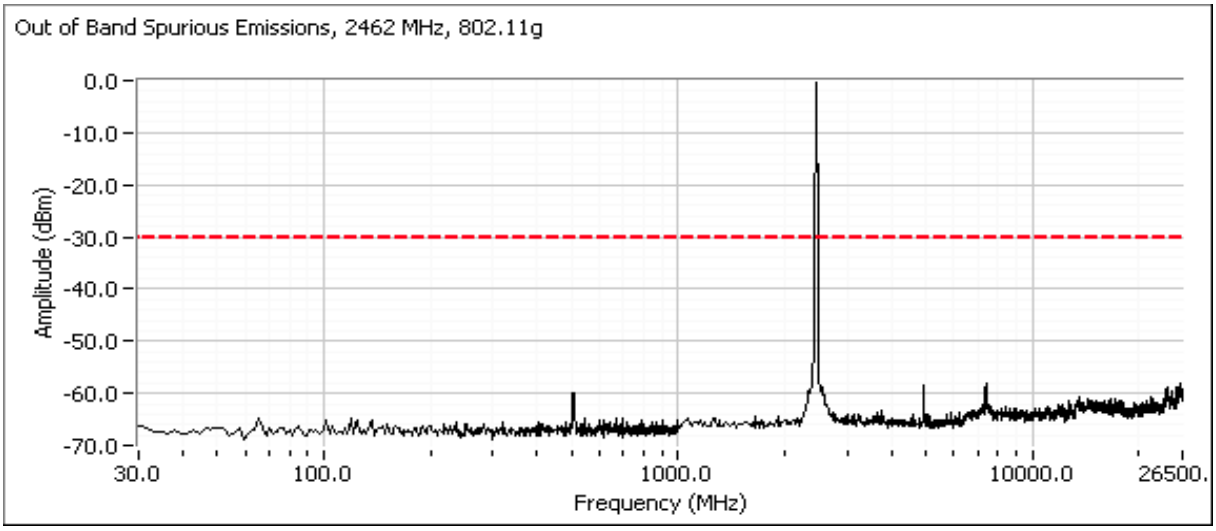


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 23.5



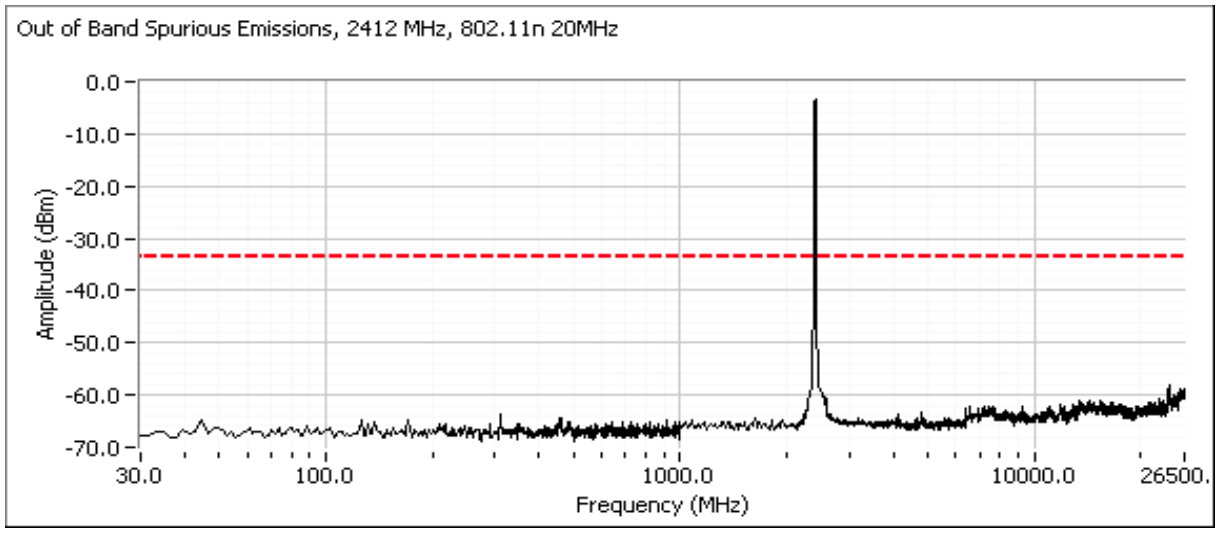
Plots for high channel, power setting(s) = 23.5



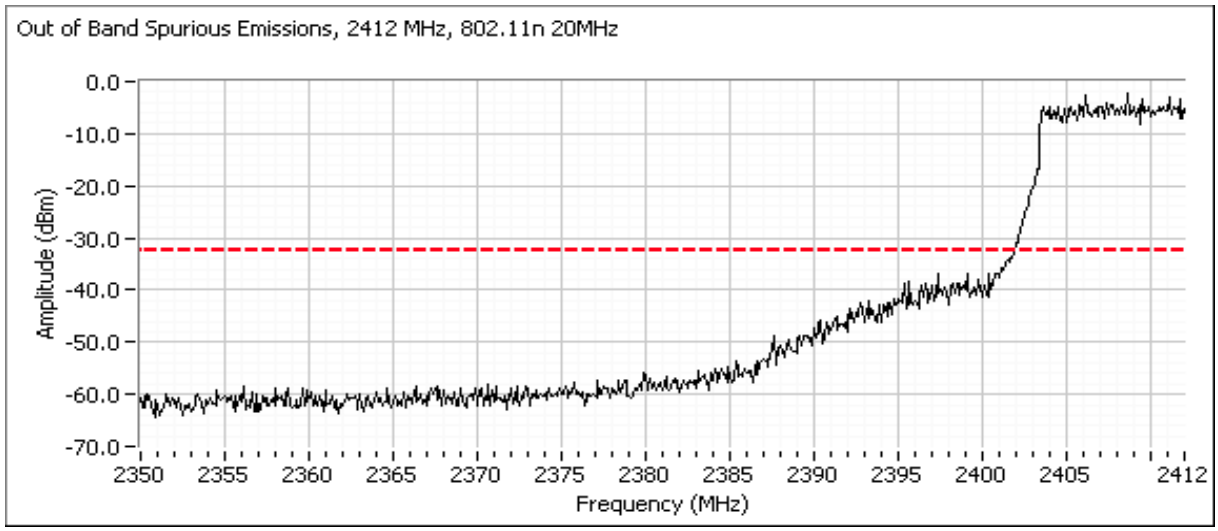
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

HT20 Mode Chain B

Plots for low channel, power setting(s) = 19.5

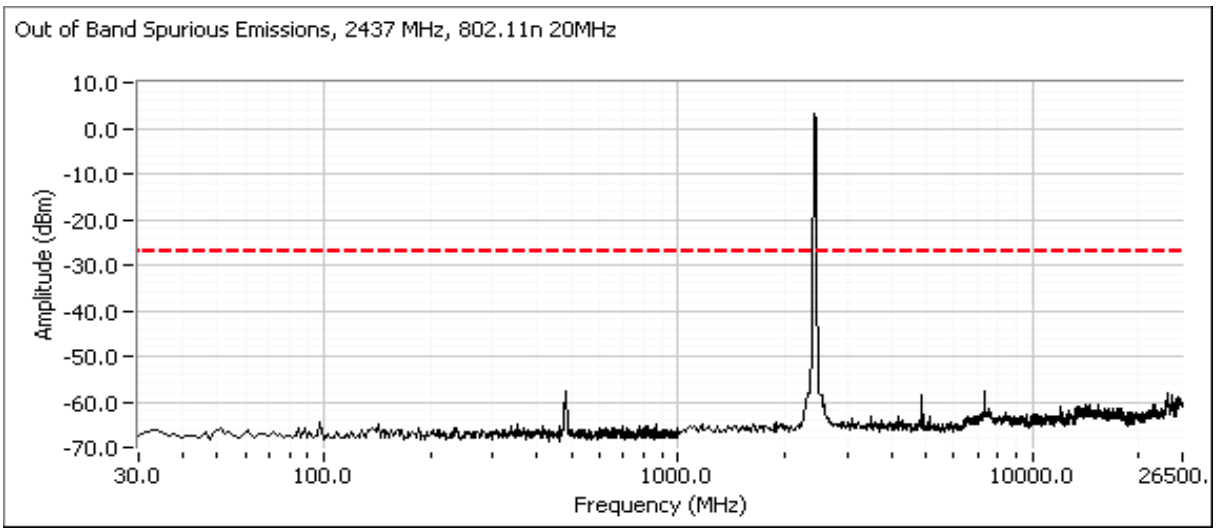


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

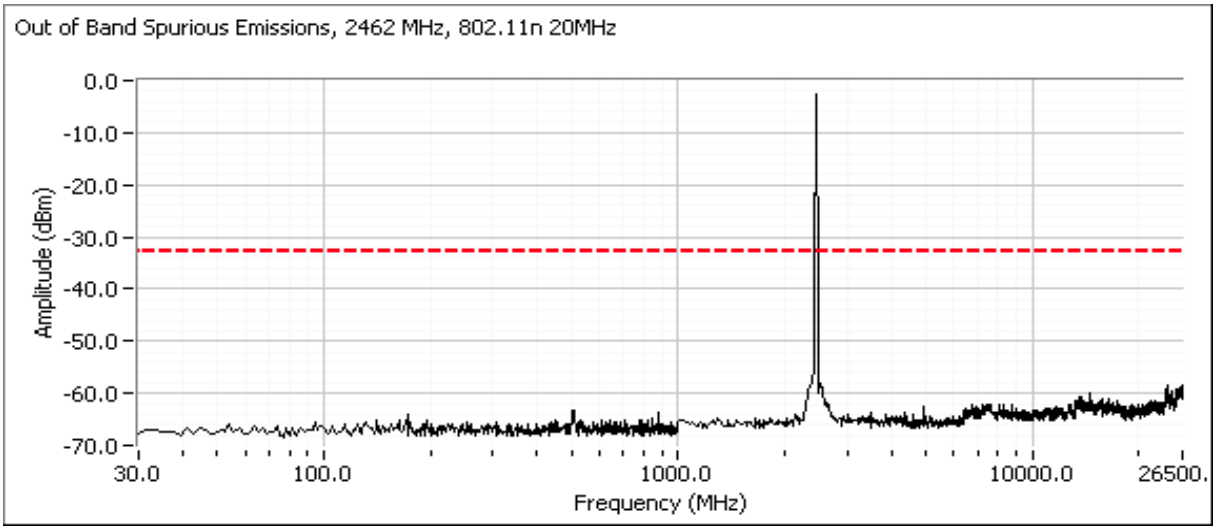


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 24.0



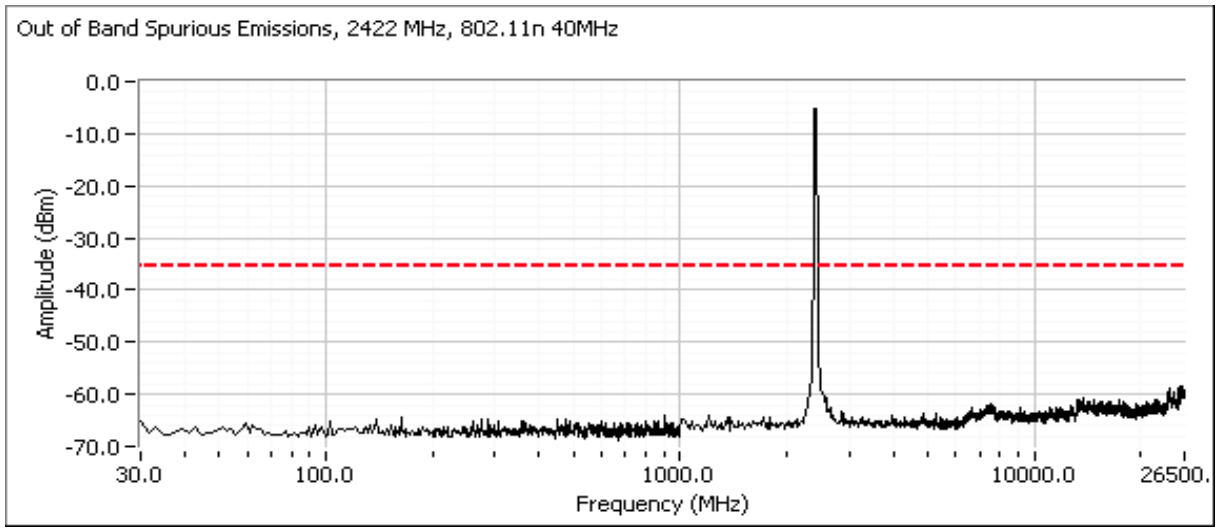
Plots for high channel, power setting(s) = 21.5



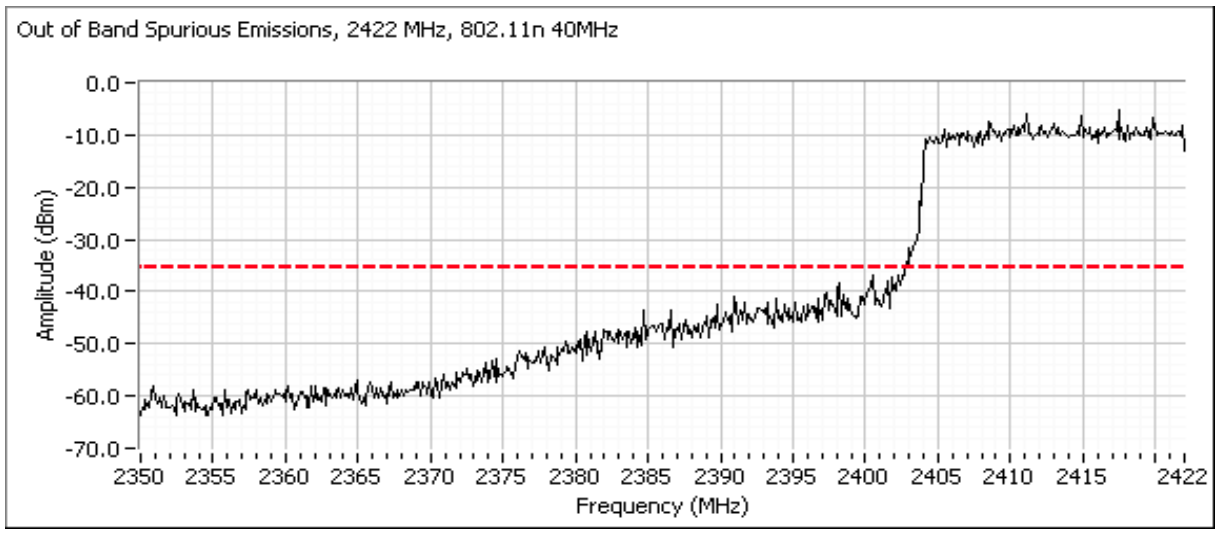
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

HT40 Mode Chain B

Plots for low channel, power setting(s) = 18.5

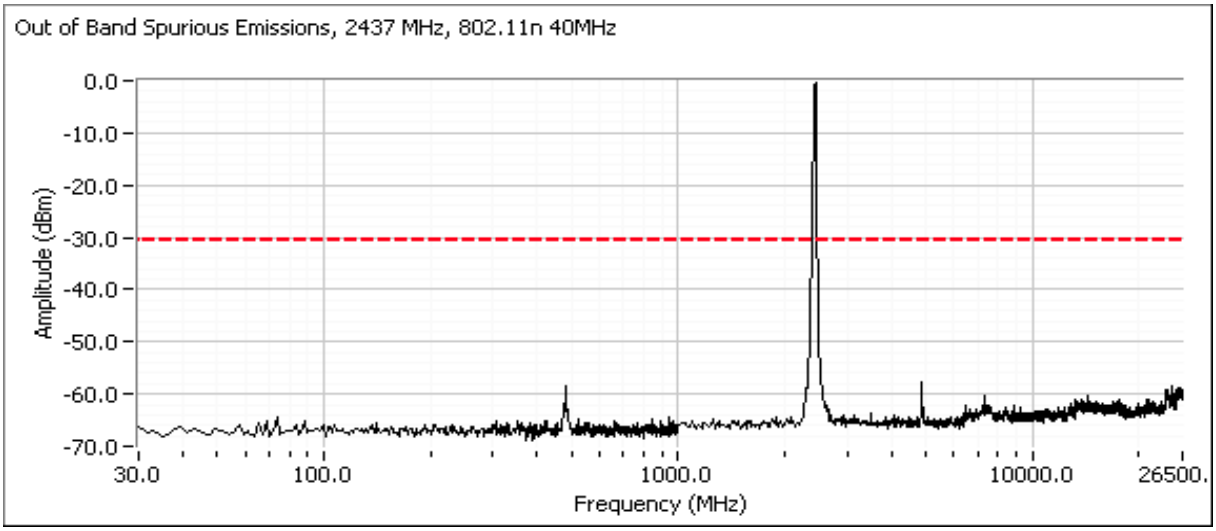


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

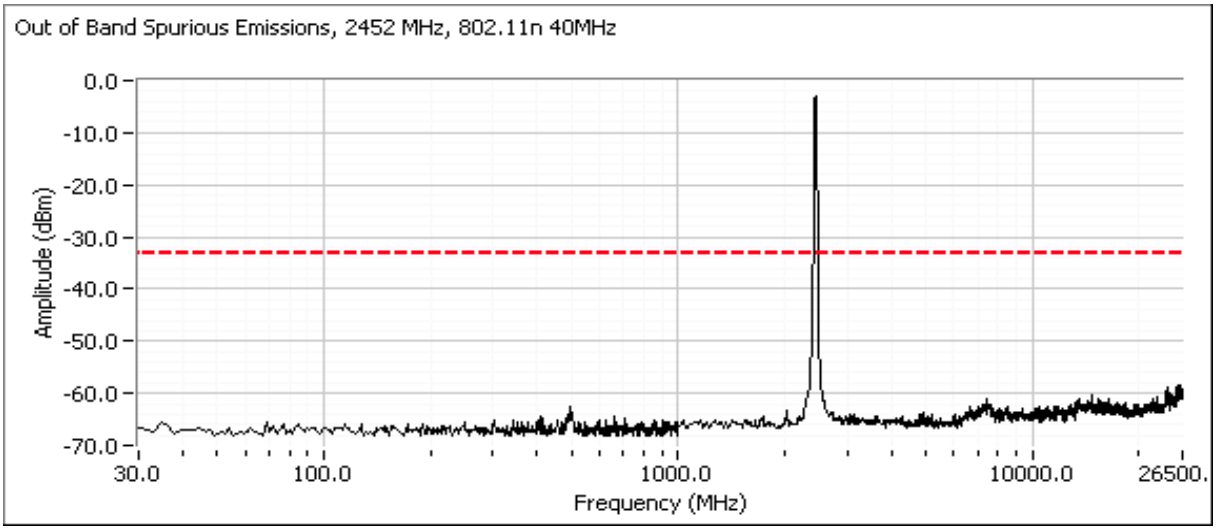


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Plots for center channel, power setting(s) = 24.0



Plots for high channel, power setting(s) = 22.0



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements
MIMO and Smart Antenna Systems - Power and PSD

Test Specific Details

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

Date of Test: 9/3/2009
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 21.7 °C
Rel. Humidity: 42 %

Summary of Results

Sample #2 MAC Address: 00150059F23C (except where noted); CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power Chain A + B	15.247(b)	Pass	HT20: 15.6 dBm HT40: 15.8 dBm
2	Power spectral Density (PSD) Chain A + B	15.247(d)	Pass	HT20: -9.4 dBm/3kHz HT40:-9.8 dBm/3kHz
-	6dB Bandwidth	15.247(a)		Covered by single-chain measurements at higher power per chain
-	99% Bandwidth	RSS GEN	-	
-	Spurious emissions	15.247(b)		

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.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1: Output Power - Chain A + B

Operating Mode:

Transmitted signal on chain is coherent ? no

2412 MHz HT20	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.6	13.5						
Output Power (dBm) Note 1	12.25	11.8			15.0 dBm	0.032 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	3.2	3.2				3.2 dBi	Pass	
eirp (dBm) Note 2	15.45	15			18.2 dBm	0.067 W		

2437 MHz HT20	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.7	13.8						
Output Power (dBm) Note 1	12.6	12.5			15.6 dBm	0.036 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	3.2	3.2				3.2 dBi	Pass	
eirp (dBm) Note 2	15.8	15.7			18.8 dBm	0.075 W		

2462 MHz HT20	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.6	13.6						
Output Power (dBm) Note 1	12.5	12.0			15.3 dBm	0.034 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	3.2	3.2				3.2 dBi	Pass	
eirp (dBm) Note 2	15.7	15.2			18.5 dBm	0.070 W		

2422 MHz HT40	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.2	13.1						
Output Power (dBm) Note 1	11.7	12.2			15.0 dBm	0.031 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	3.2	3.2				3.2 dBi	Pass	
eirp (dBm) Note 2	14.9	15.4			18.2 dBm	0.066 W		

2437 MHz HT40	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.8	13.9						
Output Power (dBm) Note 1	12.9	12.6			15.8 dBm	0.038 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	3.2	3.2				3.2 dBi	Pass	
eirp (dBm) Note 2	16.1	15.8			19.0 dBm	0.079 W		

2452 MHz HT40	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.8	13.6						
Output Power (dBm) Note 1	13.0	12.2			15.6 dBm	0.036 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	3.2	3.2				3.2 dBi	Pass	
eirp (dBm) Note 2	16.17	15.4			18.8 dBm	0.076 W		

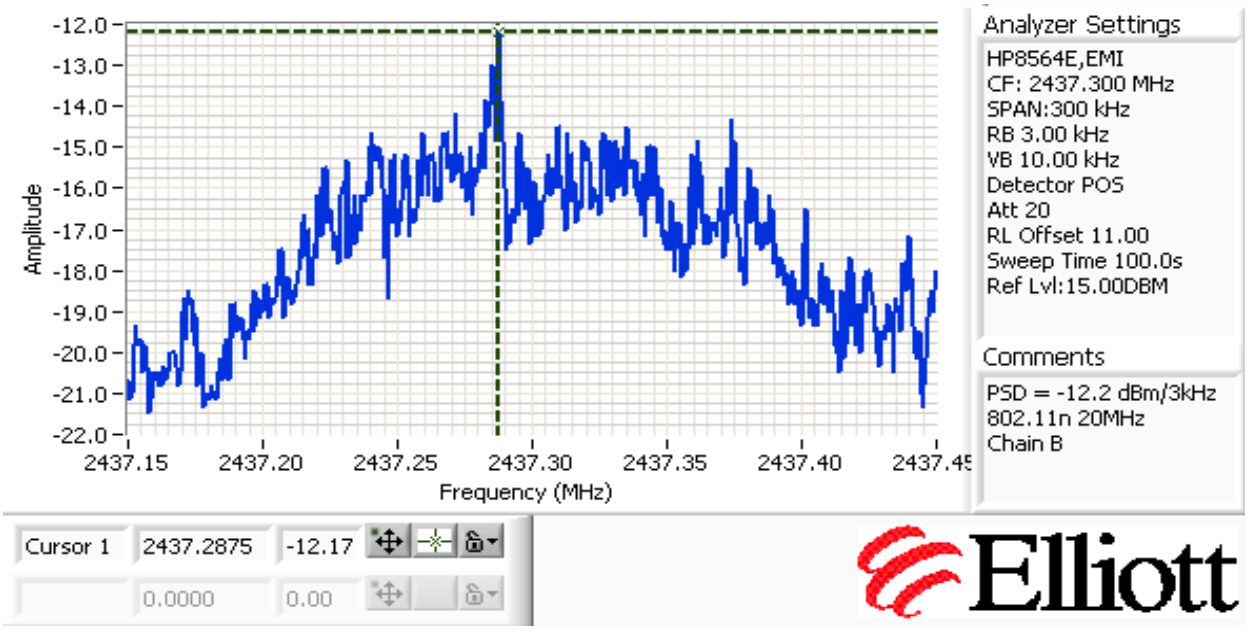
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Note 1:	Output power measured using a spectrum analyzer (see plots below): RBW=1MHz, VB=3 MHz, sample detector, power averaging on (transmitted signal was continuous) and power integration over >=80 MHz for n40 mode and >=40MHz for b, g and n20 modes. Spurious limit is -30dBc because this method was used.
Note 2:	Antenna gain in dBi
Note 3:	Power measured using average power meter and is included for reference only.

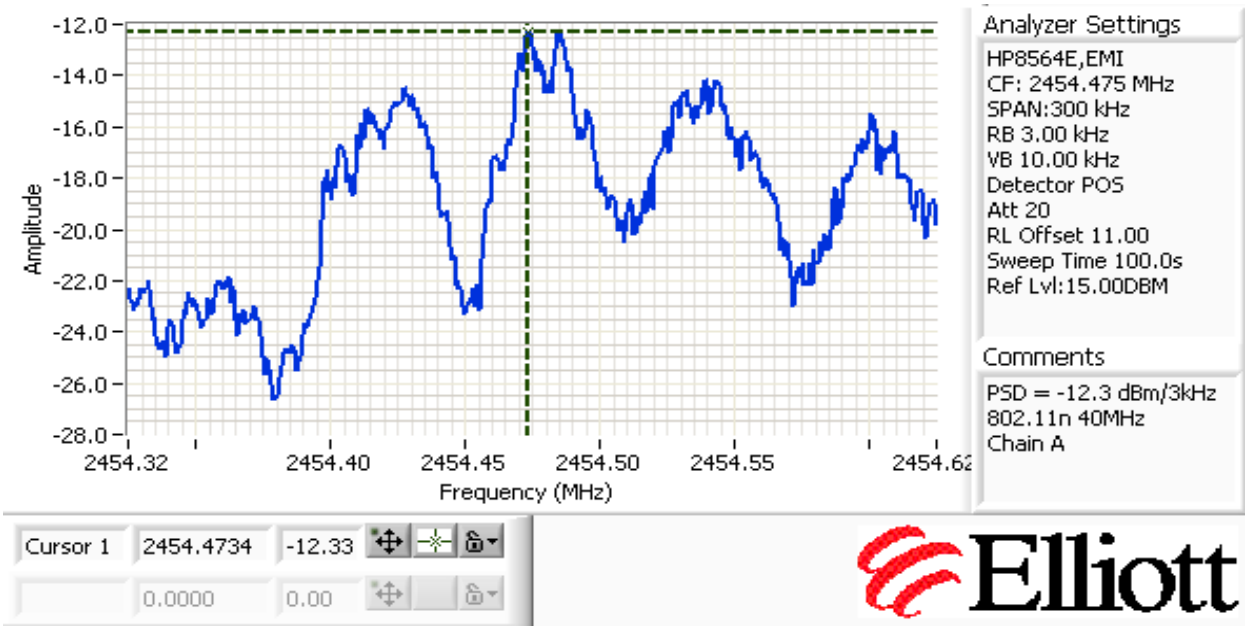
Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1 Chain 1	Chain 2	Chain 3	Chain 4	Total	Limit dBm/3kHz	Result
22.0/22.0	2412 HT20	-13.8	-13.3			-10.5	8.0	Pass
22.0/22.5	2437 HT20	-12.7	-12.2			-9.4	8.0	Pass
22.0/23.0	2467 HT20	-13.2	-12.5			-9.8	8.0	Pass
23.5/24.0	2422 HT40	-14.3	-12.7			-10.4	8.0	Pass
23.5/24.0	2437 HT40	-13.8	-13.0			-10.4	8.0	Pass
23.0/24.0	2452 HT40	-12.3	-13.3			-9.8	8.0	Pass

Note 1:	Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210, FCC 15.247 (DTS) Band Edge Field Strength

Summary of Results

Sample #2 MAC Address: 00150059F23C (except where noted); CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91
Sample #1's Chain B connector was damaged during testing which is why some measurements are made with sample 2. Comparison testing at a couple of spot frequencies showed no significant difference in results between samples.
Band edge levels measured for adjacent channels if the output power at the lowest/highest channels has to be dropped by more than 3dB from the nominal target power of 16.5dBm. Chain B, channel 5 complied with the band edge at a power level of 13.6dBm in n40 mode with 0.7dB margin, data below shows the power level to obtain a margin of 1dB or more.

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
Run #1	802.11n 40MHz A	#3 2422MHz	14.5	14.7	Restricted Band Edge at 2390 MHz	15.209	49.8dBµV/m @ 2390.0MHz (-4.2dB)
		#9 2452MHz	13.5	13.6	Restricted Band Edge at 2483.5 MHz	15.209	52.8dBµV/m @ 2483.5MHz (-1.2dB)
Run # 2	802.11n 40MHz B	#3 2422MHz	12.5	10.8	Restricted Band Edge at 2390 MHz	15.209	52.3dBµV/m @ 2389.8MHz (-1.7dB)
		#9 2452MHz	14.0	14.6	Restricted Band Edge at 2483.5 MHz	15.209	51.0dBµV/m @ 2483.5MHz (-3.0dB)
Run # 3	n40 A	#4, #8	16.5	NA	Restricted Band Edges	15.209	N/A #3 & #9 >13.5dBm
Run # 4	802.11n 40MHz B	#4 2427MHz	16.5	12.7	Restricted Band Edge at 2390 MHz	15.209	52.9dBµV/m @ 2389.0MHz (-1.1dB)
		#8	16.5	NA	Restricted Band Edge	15.209	N/A - # 9 > 13.5dBm
Run # 5	n40 A	#5, #7	16.5	NA	Restricted Band Edge	15.209	N/A - #8& 9 > 13.5dBm
Run # 6	802.11n 40MHz B	#5 2432MHz	16.5	13.1	Restricted Band Edge at 2390 MHz	15.209	52.0dBµV/m @ 2390.0MHz (-2.0dB)
		#7	16.5	NA	Restricted Band Edge	15.209	N/A - # 9 > 13.5dBm
Run # 7	n40 A	#6	16.5	NA	Restricted Band Edges	15.209	N/A - #8& 9 > 13.5dBm
Run # 8	n40 B	#6	16.5	NA	Restricted Band Edges	15.209	N/A - # 5& 7 >13.5dBm
Run # 9	802.11n 40MHz A + B	#3 2422MHz	16.5 13.5/13.5	13.2/13.1	Restricted Band Edge at 2390 MHz	15.209	52.9dBµV/m @ 2390.0MHz (-1.1dB)
		#9 2452MHz	16.5 13.5/13.5	13.7/13.6	Restricted Band Edge at 2483.5 MHz	15.209	52.6dBµV/m @ 2483.5MHz (-1.4dB)
Run # 10	802.11n 20MHz A	#1 2412MHz	16.5	16.6	Restricted Band Edge at 2390 MHz	15.209	51.2dBµV/m @ 2390.0MHz (-2.8dB)
		#11 2462MHz	16.5	15.9	Restricted Band Edge at 2483.5 MHz	15.209	52.9dBµV/m @ 2483.5MHz (-1.1dB)
Run # 11	802.11n 20MHz B	#1 2412MHz	14.5	14.6	Restricted Band Edge at 2400 MHz	15.209	52.3dBµV/m @ 2390.0MHz (-1.7dB)
		#11 2462MHz	16.5	15.1	Restricted Band Edge at 2483.5 MHz	15.209	50.4dBµV/m @ 2483.5MHz (-3.6dB)

continued on the following page ...

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
Run # 12	802.11n 20MHz A+B	#1 2412MHz	16.5 13.5/13.5	18.2 15.1/15.3	Restricted Band Edge at 2390 MHz	15.209	50.1dBµV/m @ 2389.4MHz (-3.9dB)
		#11 2462MHz	16.5 13.5/13.5	17.7 14.7/14.8	Restricted Band Edge at 2483.5 MHz	15.209	50.3dBµV/m @ 2483.7MHz (-3.7dB)

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:

Rel. Humidity:	15-65 %
Temperature:	15-25 °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. For MIMO operation the delta measurement is made in a radiated manner with the measurement antenna located approximately 50cm from the EUT's antennas. The fundamental field strength is always measured at a 3m test distance.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1, Band Edge Field Strength - 802.11n 40MHz, A

Date of Test: 8/21/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run #1a, EUT on Channel #3 2422MHz - 802.11n 40MHz, A

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	14.5	14.7	22.0

Fundamental Signal Field Strength

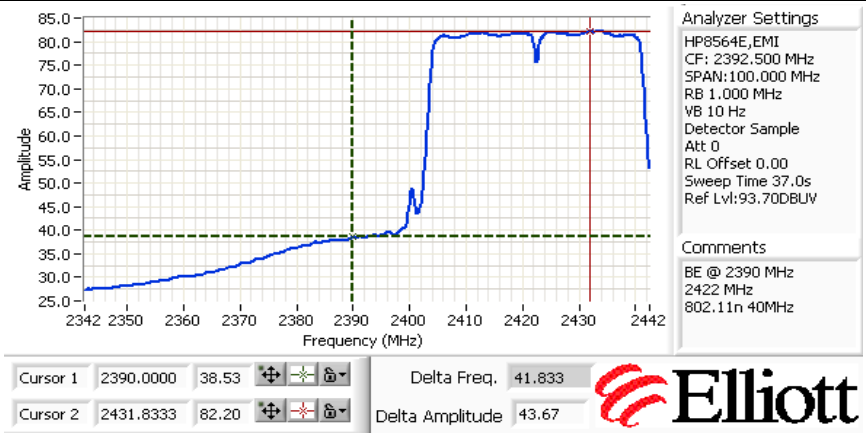
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.470	91.2	V	-	-	AVG	226	1.0	RB 1 MHz; VB: 10 Hz
2414.400	99.7	V	-	-	PK	226	1.0	RB 1 MHz; VB: 1 MHz
2424.870	91.4	V	-	-	PK	226	1.0	RB 100 kHz; VB: 100 kHz
2412.470	93.5	H	-	-	AVG	63	1.0	RB 1 MHz; VB: 10 Hz
2414.400	102.1	H	-	-	PK	63	1.0	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:	102.1	99.7	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	93.5	91.2	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):	59.3 dBuV/m		
Calculated Band-Edge Measurement (Avg):	50.7 dBuV/m		

		Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	*38.3 dB*	-4.2	49.8	54	Avg
Delta Marker - 1MHz/10Hz:	43.7 dB	-14.7	59.3	74	Pk
Calculated Band-Edge Measurement (Peak):	63.8 dBuV/m	Using 100kHz delta value			
Calculated Band-Edge Measurement (Avg):	49.8 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	49.8	-	54.0	-4.2	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1b, EUT on Channel #9 2452MHz - 802.11n 40MHz, A

Date of Test: 9/9/2009 Test Location: FT Chamber #3

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	13.5	13.6	20.5

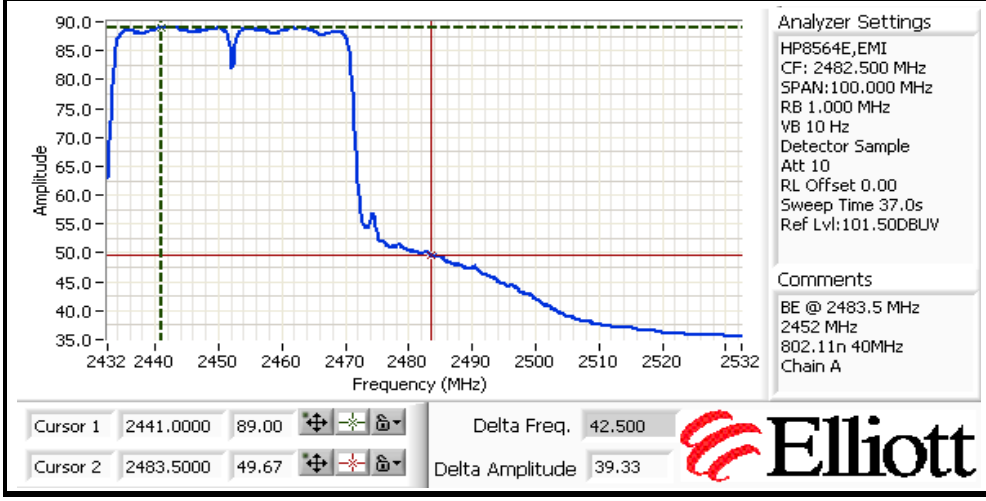
Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2463.000	89.2	V	-	-	AVG	302	1.0	RB 1 MHz; VB: 10 Hz
2462.530	97.3	V	-	-	PK	302	1.0	RB 1 MHz; VB: 1 MHz
2463.000	92.1	H	-	-	AVG	298	1.0	RB 1 MHz; VB: 10 Hz
2462.530	100.5	H	-	-	PK	298	1.0	RB 1 MHz; VB: 1 MHz
2457.330	92.6	H	-	-	PK	298	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:	100.5	97.3	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	92.1	89.2	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*37.8 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	62.7 dBuV/m		
Calculated Band-Edge Measurement (Avg):	54.3 dBuV/m		Margin / Level / Limit / Detector
Delta Marker - 1MHz/1MHz:	*35.5 dB*		-1.2 / 52.8 / 54 / Avg
Delta Marker - 1MHz/10Hz:	39.3 dB		-11.3 / 62.7 / 74 / Pk
Calculated Band-Edge Measurement (Peak):	65.0 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.8 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	52.8	-	54.0	-1.2	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 2, Band Edge Field Strength - 802.11n 40MHz, B

Run # 2a, EUT on Channel #3 2422MHz - 802.11n 40MHz, B

Date of Test: 9/9/2009 Test Location: FT Chamber #3

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	12.5	10.8	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	
2431.400	90.8	H	-	-	AVG	57	1.0	RB 1 MHz; VB: 10 Hz
2432.330	99.4	H	-	-	PK	57	1.0	RB 1 MHz; VB: 1 MHz
2434.870	91.4	H	-	-	PK	57	1.0	RB 100 kHz; VB: 100 kHz
2405.530	87.0	V	-	-	AVG	62	1.0	RB 1 MHz; VB: 10 Hz
2432.600	95.1	V	-	-	PK	62	1.0	RB 1 MHz; VB: 1 MHz
2427.330	88.5	V	-	-	PK	62	1.0	RB 100 kHz; VB: 100 kHz

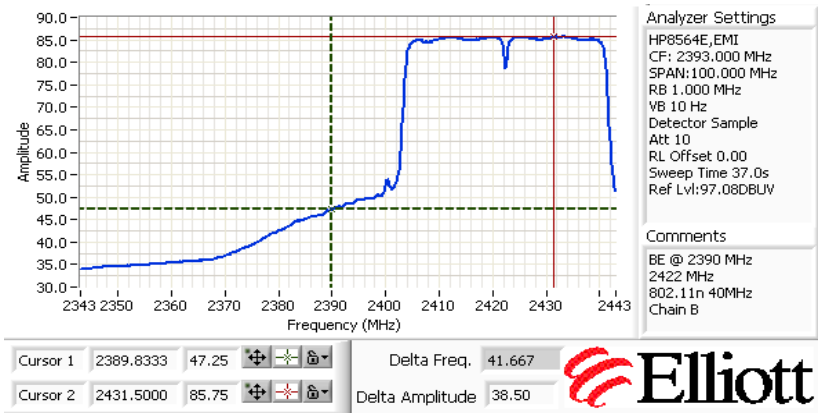
2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	99.4	95.1	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	90.8	87.0	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*36.8 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	62.6 dBuV/m		
Calculated Band-Edge Measurement (Avg):	54.0 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz: *34.0 dB*	-1.7	52.3	54	Avg
Delta Marker - 1MHz/10Hz: 38.5 *dB*	-11.4	62.6	74	Pk

Calculated Band-Edge Measurement (Peak):	65.4 dBuV/m	Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.3 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	
2389.833	52.3	-	54.0	-1.7	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 2b, EUT on Channel #9 2452MHz - 802.11n 40MHz, B - Sample #1 MAC Address: 00150059F1BC

Date of Test: 8/5/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	14.0	14.6	15.0

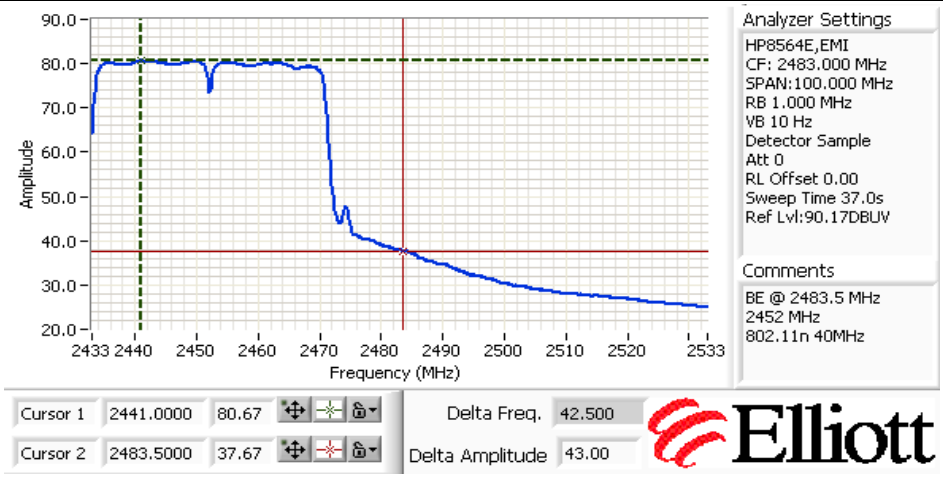
Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.070	94.0	H	-	-	AVG	57	1.0	RB 1 MHz; VB: 10 Hz
2441.730	102.3	H	-	-	PK	57	1.0	RB 1 MHz; VB: 1 MHz
2442.200	93.5	H	-	-	PK	57	1.0	RB 100 kHz; VB: 100 kHz
2441.130	91.2	V	-	-	AVG	26	1.4	RB 1 MHz; VB: 10 Hz
2441.400	99.7	V	-	-	PK	26	1.4	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:	102.3	99.7	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	94.0	91.2	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*42.2 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	60.1 dBuV/m		
Calculated Band-Edge Measurement (Avg):	51.8 dBuV/m		
Delta Marker - 1MHz/1MHz:	*35.5 dB*		-3.0 51.0 54 Avg
Delta Marker - 1MHz/10Hz:	43.0 dB		-13.9 60.1 74 Pk
Calculated Band-Edge Measurement (Peak):	66.8 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	51.0 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	51.0	-	54.0	-3.0	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 4, Band Edge Field Strength - 802.11n 40MHz, B

Date of Test: 8/21/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Run # 4a, EUT on Channel #4 2427MHz - 802.11n 40MHz, B

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	12.7	19.5

Fundamental Signal Field Strength

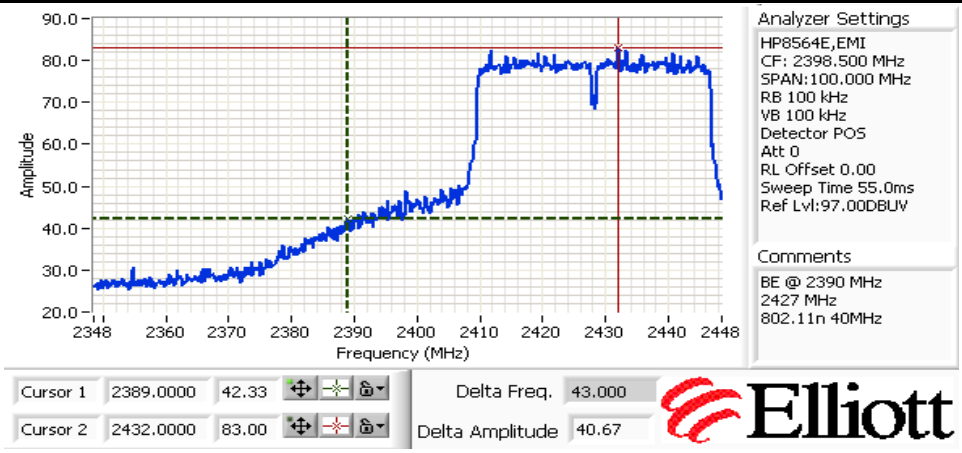
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2417.330	93.6	H	-	-	AVG	57	1.0	RB 1 MHz; VB: 10 Hz
2437.600	101.5	H	-	-	PK	57	1.0	RB 1 MHz; VB: 1 MHz
2438.670	94.1	H	-	-	PK	57	1.0	RB 100 kHz; VB: 100 kHz
2416.130	87.0	V	-	-	AVG	101	1.0	RB 1 MHz; VB: 10 Hz
2416.670	95.1	V	-	-	PK	101	1.0	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:	101.5	95.1	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	93.6	87.0	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	40.7 *dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	60.8 dBuV/m		
Calculated Band-Edge Measurement (Avg):	52.9 dBuV/m		
Delta Marker - 1MHz/1MHz:	*36.8 dB*		
Delta Marker - 1MHz/10Hz:	*39.5 dB*		
Calculated Band-Edge Measurement (Peak):	64.7 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	54.1 dBuV/m		Using 100kHz delta value

Margin	Level	Limit	Detector
-1.1	52.9	54	Avg
-13.2	60.8	74	Pk

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.000	52.9	-	54.0	-1.1	Avg	-	-	Using 100kHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 6, Band Edge Field Strength - 802.11n 40MHz, B

Run # 6a, EUT on Channel #5 2432MHz - 802.11n 40MHz, B

Date of Test: 9/9/2009 Test Location: FT Chamber #3

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	13.1	19.5

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	
2430.270	93.5	H	-	-	AVG	53	1.0	RB 1 MHz; VB: 10 Hz
2428.530	101.5	H	-	-	PK	53	1.0	RB 1 MHz; VB: 1 MHz
2415.800	94.1	H	-	-	PK	53	1.0	RB 100 kHz; VB: 100 kHz
2422.400	89.3	V	-	-	AVG	63	1.0	RB 1 MHz; VB: 10 Hz
2422.000	97.3	V	-	-	PK	63	1.0	RB 1 MHz; VB: 1 MHz

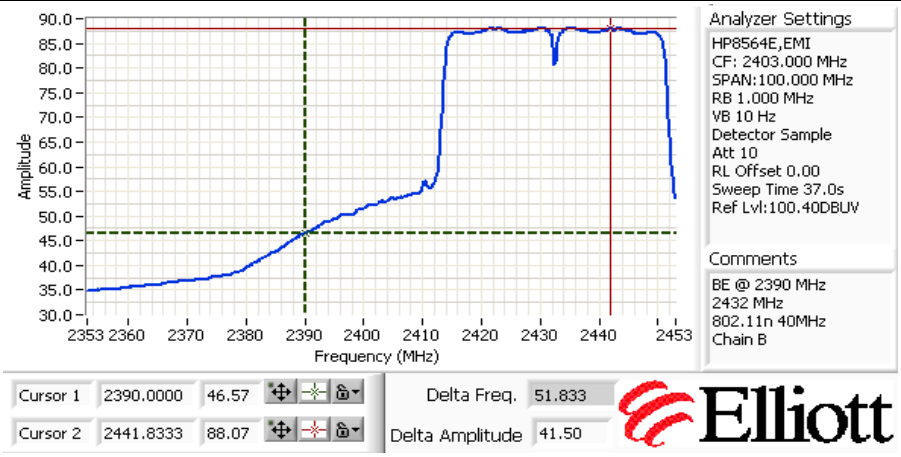
2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	101.5	97.3	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	93.5	89.3	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*41.5 dB*		<- this can only be used if band edge signal is
Calculated Band-Edge Measurement (Peak):	60.0 dBuV/m		highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Avg):	52.0 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	-2.0	52.0	54	Avg
Delta Marker - 1MHz/10Hz:	-14.0	60.0	74	Pk

Calculated Band-Edge Measurement (Peak):	62.8 dBuV/m	Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.0 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	
2390.000	52.0	-	54.0	-2.0	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 9, Band Edge Field Strength - 802.11n 40MHz, A + B
Run # 9a, EUT on Channel #3 2422MHz - 802.11n 40MHz, A + B

Date of Test: 9/9/2009 Test Location: FT Chamber #3
Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A + B	16.5 (13.5 per chain)	13.2/13.1	21.0/21.0

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	
2431.200	92.7	H	-	-	AVG	53	1.0	RB 1 MHz; VB: 10 Hz
2405.270	102.6	H	-	-	PK	53	1.0	RB 1 MHz; VB: 1 MHz
2411.470	95.1	H	-	-	PK	53	1.0	RB 100 kHz; VB: 100 kHz
2431.470	88.4	V	-	-	AVG	59	1.0	RB 1 MHz; VB: 10 Hz
2431.800	98.2	V	-	-	PK	59	1.0	RB 1 MHz; VB: 1 MHz

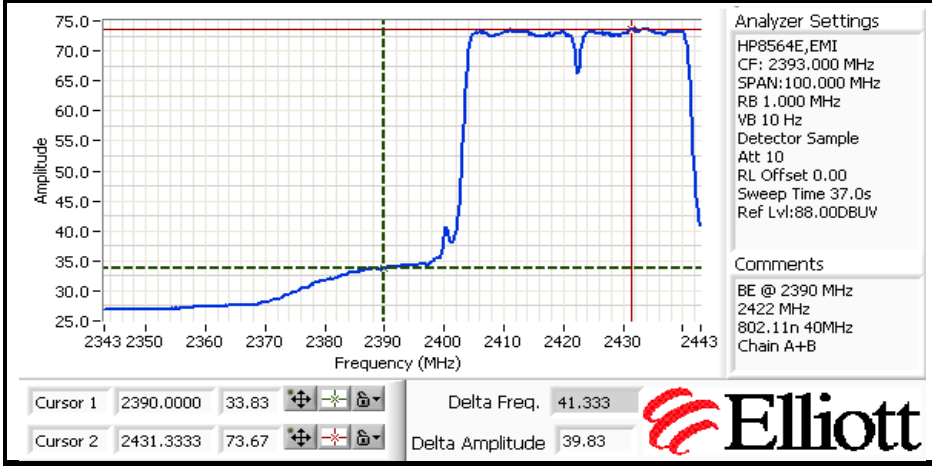
2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	102.6	98.2	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	92.7	88.4	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*35.8 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	66.8 dBuV/m		
Calculated Band-Edge Measurement (Avg):	56.9 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	-1.1	52.9	54	Avg
Delta Marker - 1MHz/10Hz:	-9.7	64.3	74	Pk

Calculated Band-Edge Measurement (Peak):	64.3 dBuV/m	Using 1MHz delta value
Calculated Band-Edge Measurement (Avg):	52.9 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	52.9	-	54.0	-1.1	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 9b, EUT on Channel #9 2452MHz - 802.11n 40MHz, A + B

Date of Test: 8/21/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A + B	16.5 (13.5 per chain)	13.7/13.6	22.0/22.5

Fundamental Signal Field Strength

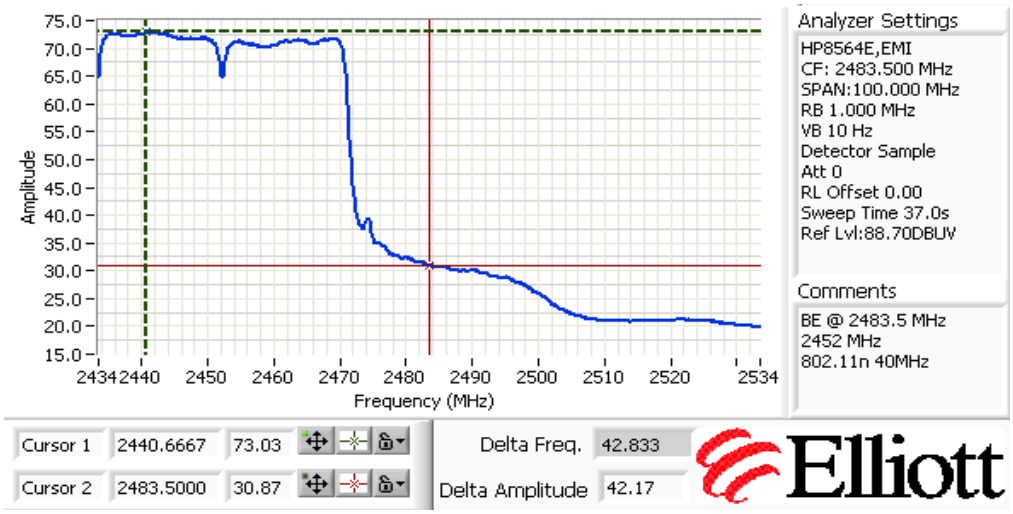
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2454.400	94.8	H	-	-	AVG	349	1.0	RB 1 MHz; VB: 10 Hz
2453.670	104.5	H	-	-	PK	349	1.0	RB 1 MHz; VB: 1 MHz
2449.530	89.9	V	-	-	AVG	272	1.0	RB 1 MHz; VB: 10 Hz
2461.730	99.9	V	-	-	PK	272	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	99.9	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	94.8	89.9	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*39.0 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	65.5 dBuV/m		
Calculated Band-Edge Measurement (Avg):	55.8 dBuV/m		

		Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	*38.2 dB*	-1.4	52.6	54	Avg
Delta Marker - 1MHz/10Hz:	42.2 dB	-8.5	65.5	74	Pk
Calculated Band-Edge Measurement (Peak):	66.3 dBuV/m	Using 100kHz delta value			
Calculated Band-Edge Measurement (Avg):	52.6 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	52.6	-	54.0	-1.4	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 10, Band Edge Field Strength - 802.11n 20MHz, A

Run # 10a, EUT on Channel #1 2412MHz - 802.11n 20MHz, A -

Date of Test: 8/24/2009 Test Location: Chamber # 4

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.6	23.5

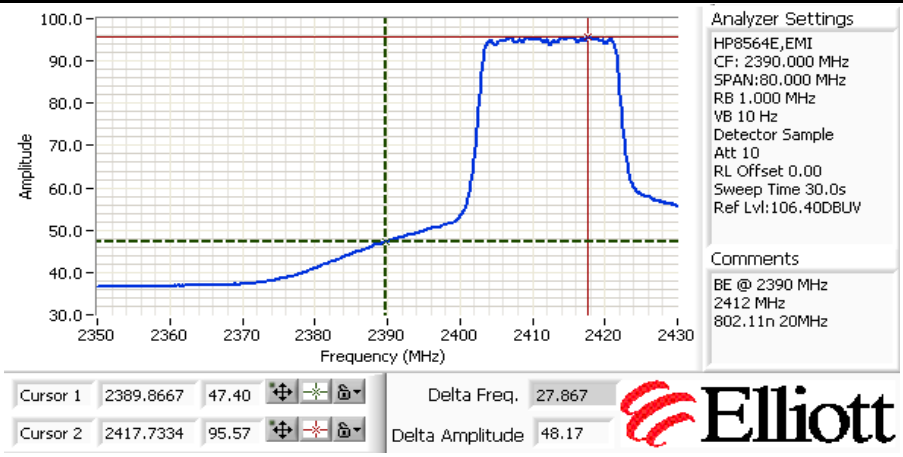
Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2417.300	99.4	H	-	-	AVG	337	1.0	RB 1 MHz; VB: 10 Hz
2417.570	107.2	H	-	-	PK	337	1.0	RB 1 MHz; VB: 1 MHz
2410.870	97.2	H	-	-	PK	337	1.0	RB 100 kHz; VB: 100 kHz
2415.100	95.0	V	-	-	AVG	192	1.3	RB 1 MHz; VB: 10 Hz
2415.300	103.0	V	-	-	PK	192	1.3	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:	107.2	103.1	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	99.4	95.0	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*44.7 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):	54.7 dBuV/m		
Delta Marker - 1MHz/1MHz:	*37.0 dB*		-2.8 51.2 54 Avg
Delta Marker - 1MHz/10Hz:	48.2 *dB*		-11.5 62.5 74 Pk
Calculated Band-Edge Measurement (Peak):	70.2 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	51.2 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	
2389.867	51.2	-	54.0	-2.8	Avg	-	-	Using 1MHz Delta Value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 10b, EUT on Channel #11 2462MHz - 802.11n 20MHz, A

Date of Test: 9/9/2009 Test Location: FT Chamber #3

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	15.9	23.5

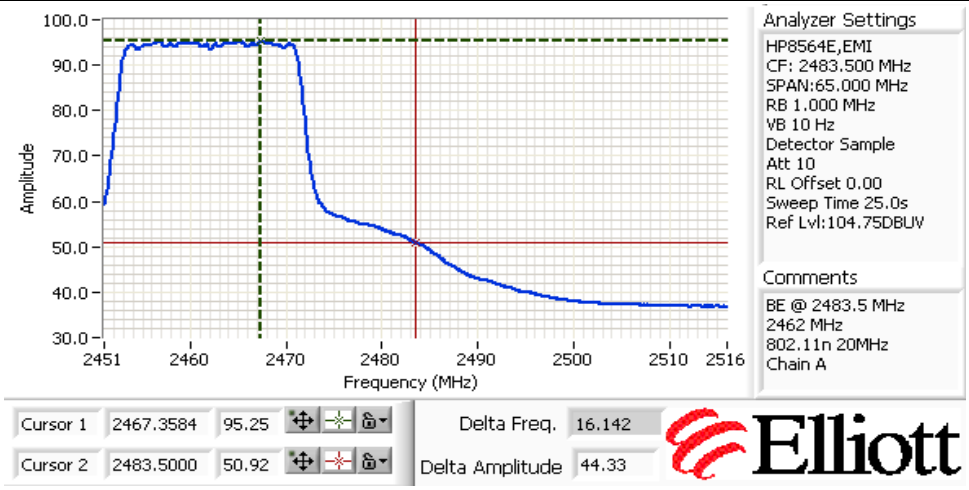
Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2467.270	97.2	H	-	-	AVG	295	1.0	RB 1 MHz; VB: 10 Hz
2457.170	104.8	H	-	-	PK	295	1.0	RB 1 MHz; VB: 1 MHz
2457.070	97.5	H	-	-	PK	295	1.0	RB 100 kHz; VB: 100 kHz
2467.430	94.9	V	-	-	AVG	323	1.7	RB 1 MHz; VB: 10 Hz
2467.570	102.7	V	-	-	PK	323	1.7	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:	104.8	102.7	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	97.2	94.9	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*43.3 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	61.5 dBuV/m		
Calculated Band-Edge Measurement (Avg):	53.9 dBuV/m		Margin / Level / Limit / Detector
Delta Marker - 1MHz/1MHz:	*36.3 dB*		-1.1 / 52.9 / 54 / Avg
Delta Marker - 1MHz/10Hz:	44.3 dB		-12.5 / 61.5 / 74 / Pk
Calculated Band-Edge Measurement (Peak):	68.5 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.9 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	52.9	-	54.0	-1.1	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 11, Band Edge Field Strength - 802.11n 20MHz, B

Run # 11a, EUT on Channel #1 2412MHz - 802.11n 20MHz, B - Sample #2

Date of Test: 9/3/2009 Test Location: FT Chamber #4 Engineer: Rafael Varelas

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	14.5	14.6	21.0

Fundamental Signal Field Strength

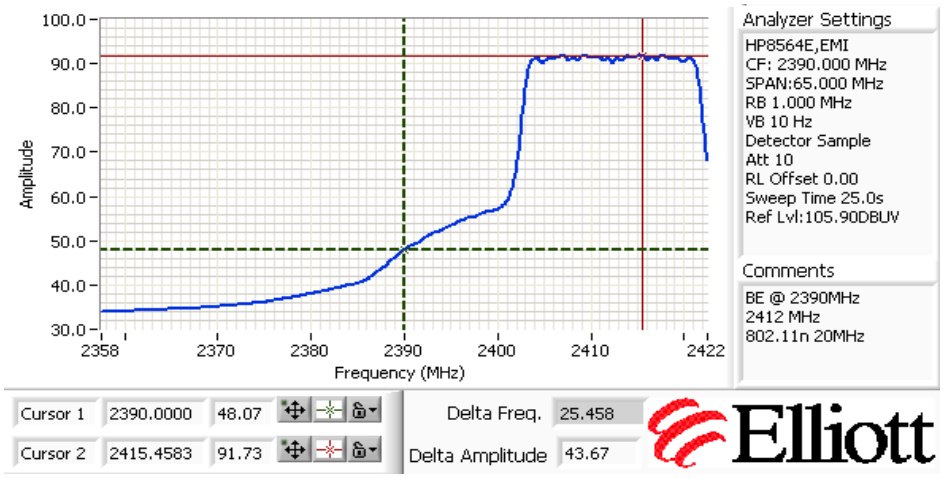
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2413.470	93.4	V	-	-	AVG	106	1.0	RB 1 MHz; VB: 10 Hz
2407.300	101.3	V	-	-	PK	106	1.0	RB 1 MHz; VB: 1 MHz
2408.800	96.0	H	-	-	AVG	55	1.0	RB 1 MHz; VB: 10 Hz
2407.300	104.0	H	-	-	PK	55	1.0	RB 1 MHz; VB: 1 MHz
2409.630	95.9	H	-	-	PK	55	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	101.3	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	96.0	93.4	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*43.3 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	60.7 dBuV/m		
Calculated Band-Edge Measurement (Avg):	52.7 dBuV/m		
Delta Marker - 1MHz/1MHz:	*37.3 dB*		-1.7
Delta Marker - 1MHz/10Hz:	43.7 dB		-13.3
Calculated Band-Edge Measurement (Peak):	66.7 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.3 dBuV/m		Using 1MHz delta value

Margin	Level	Limit	Detector
-1.7	52.3	54	Avg
-13.3	60.7	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	52.3	-	54.0	-1.7	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 11b, EUT on Channel #11 2462MHz - 802.11n 20MHz, B - Sample #1 MAC Address: 00150059F1BC

Date of Test: 8/7/2009 Test Location: FT Chamber #4 Engineer: Rafael Varelas

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	15.1	16.0

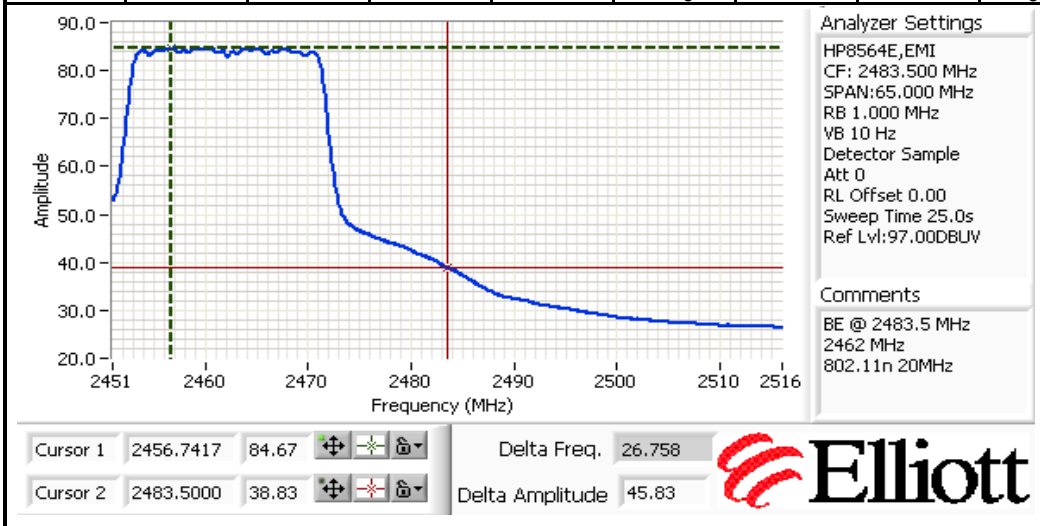
Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2467.370	96.2	H	-	-	AVG	98	1.0	RB 1 MHz; VB: 10 Hz
2467.470	104.3	H	-	-	PK	98	1.0	RB 1 MHz; VB: 1 MHz
2468.530	95.9	H	-	-	PK	98	1.0	RB 100 kHz; VB: 100 kHz
2467.330	91.9	V	-	-	AVG	105	1.0	RB 1 MHz; VB: 10 Hz
2468.630	99.6	V	-	-	PK	105	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:	104.3	99.6	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	96.2	91.9	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*43.7 dB*		<- this can only be used if band edge signal is
Calculated Band-Edge Measurement (Peak):	60.6 dBuV/m		highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Avg):	52.5 dBuV/m		Margin / Level / Limit / Detector
Delta Marker - 1MHz/1MHz:	*36.2 dB*		-3.6 / 50.4 / 54 / Avg
Delta Marker - 1MHz/10Hz:	45.8 dB		-13.4 / 60.6 / 74 / Pk
Calculated Band-Edge Measurement (Peak):	68.1 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	50.4 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	50.4	-	54.0	-3.6	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 12, Band Edge Field Strength - 802.11n 20MHz, A+B, Sample #1 MAC Address: 00150059F1BC

Date of Test: 8/7/2009 Test Location: FT Chamber #3

Test Engineer: Rafael Varelas Config Change: none

Run # 12a, EUT on Channel #1 2412MHz - 802.11n 20MHz, A+B

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A+B	16.5 (13.5 per chain)	16.6/16.8	25.5/26.5

Fundamental Signal Field Strength

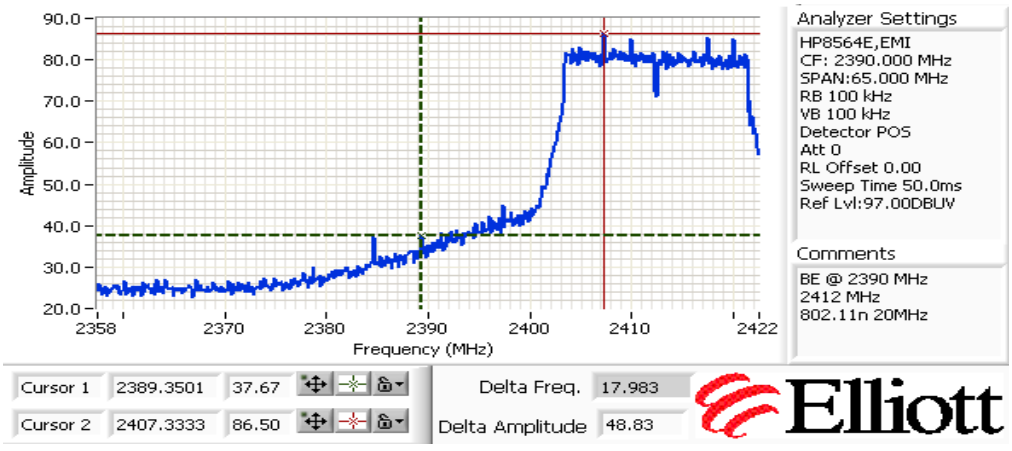
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2413.170	98.9	H	-	-	AVG	350	1.0	RB 1 MHz; VB: 10 Hz
2410.700	108.5	H	-	-	PK	350	1.0	RB 1 MHz; VB: 1 MHz
2413.400	99.2	H	-	-	PK	350	1.0	RB 100 kHz; VB: 100 kHz
2413.670	97.3	V	-	-	AVG	21	1.5	RB 1 MHz; VB: 10 Hz
2407.730	108.0	V	-	-	PK	21	1.5	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:	108.5	108.0	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	98.9	97.3	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	48.8 *dB*		<- this can only be used if band edge signal is
Calculated Band-Edge Measurement (Peak):	59.7 dBuV/m		highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Avg):	50.1 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	*45.5 dB*	-3.9	50.1	54	Avg
Delta Marker - 1MHz/10Hz:	*46.8 dB*	-14.3	59.7	74	Pk
Calculated Band-Edge Measurement (Peak):	63.0 dBuV/m	Using 100kHz delta value			
Calculated Band-Edge Measurement (Avg):	52.1 dBuV/m	Using 100kHz delta value			

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.350	50.1	-	54.0	-3.9	Avg	-	-	Using 100kHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 12b, EUT on Channel #11 2462MHz - 802.11n 20MHz, A+B

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A+B	16.5 (13.5 per chain)	14.7/14.8	24.0/25.5

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	
2470.270	99.1	H	-	-	AVG	160	1.0	RB 1 MHz; VB: 10 Hz
2467.300	108.2	H	-	-	PK	160	1.0	RB 1 MHz; VB: 1 MHz
2471.070	98.2	H	-	-	PK	160	1.0	RB 100 kHz; VB: 100 kHz
2466.930	97.3	V	-	-	AVG	338	1.7	RB 1 MHz; VB: 10 Hz
2464.770	106.6	V	-	-	PK	338	1.7	RB 1 MHz; VB: 1 MHz

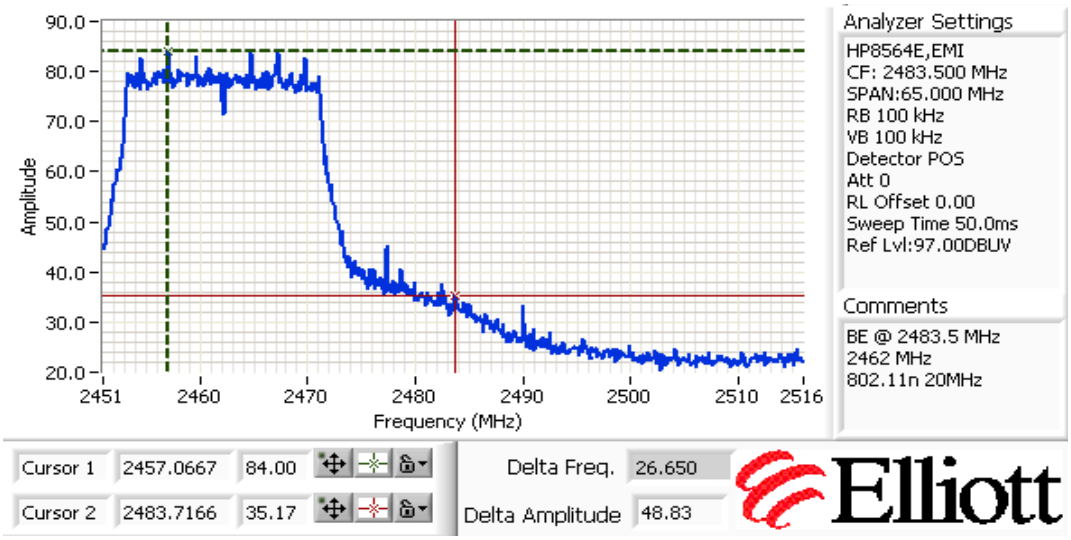
2483.5 MHz Band Edge Signal Radiated Field Strength - Marker Delta

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	108.2	106.6	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	99.1	97.3	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	48.8 *dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	59.4 dBuV/m		
Calculated Band-Edge Measurement (Avg):	50.3 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	-3.7	50.3	54	Avg
Delta Marker - 1MHz/10Hz:	-14.6	59.4	74	Pk

Calculated Band-Edge Measurement (Peak):	65.5 dBuV/m	Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.4 dBuV/m	Using 100kHz delta value

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.716	50.3	-	54.0	-3.7	Avg	-	-	Using 100kHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210, FCC 15.247 (DTS) Band Edge Field Strength

Summary of Results

Sample #1 MAC Address: 00150059F1BC (except where noted); CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91
Band edge levels measured for adjacent channels if the output power at the lowest/highest channels has to be dropped by more than 3dB from the nominal target power of 16.5dBm.

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
Run #1	802.11g A	#1 2412MHz	16.5	16.8	Restricted Band Edge at 2390 MHz	15.209	49.7dBµV/m @ 2390.0MHz (-4.3dB)
		#11 2462MHz	16.5	15.3	Restricted Band Edge at 2483.5 MHz	15.209	50.5dBµV/m @ 2483.5MHz (-3.5dB)
Run # 2	802.11g B	#1 2412MHz	15.5	14.9	Restricted Band Edge at 2390 MHz	15.209	52.2dBµV/m @ 2389.9MHz (-1.8dB)
		#11 2462MHz	16.0	16.0	Restricted Band Edge at 2483.5 MHz	15.209	51.2dBµV/m @ 2483.5MHz (-2.8dB)
Run # 3	802.11b A	#1 2412MHz	16.5	16.5	Restricted Band Edge at 2390 MHz	15.209	45.3dBµV/m @ 2386.1MHz (-8.7dB)
		#11 2462MHz	16.5	16.6	Restricted Band Edge at 2483.5 MHz	15.209	49.5dBµV/m @ 2483.5MHz (-4.5dB)
Run # 4	802.11b B	#1 2412MHz	16.5	16.6	Restricted Band Edge at 2390 MHz	15.209	47.2dBµV/m @ 2386.3MHz (-6.8dB)
		#11 2462MHz	16.5	16.7	Restricted Band Edge at 2483.5 MHz	15.209	42.7dBµV/m @ 2483.5MHz (-11.3dB)

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:

Rel. Humidity:	15-65 %
Temperature:	15-25 °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.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

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. For MIMO operation the delta measurement is made in a radiated manner with the measurement antenna located approximately 50cm from the EUT's antennas. The fundamental field strength is always measured at a 3m test distance.

Run #1, Band Edge Field Strength - 802.11g, A

Run #1a EUT on Channel #1 2412MHz - 802.11g, A - Sample #2 MAC: 00150059F23C *(sample #1 rf connector damaged)*

Date of Test: 9/9/2009 Test Location: FT Chamber #4

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.8	24.0

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	
2406.470	97.2	H	-	-	AVG	297	1.0	RB 1 MHz; VB: 10 Hz
2407.600	104.9	H	-	-	PK	297	1.0	RB 1 MHz; VB: 1 MHz
2405.870	97.3	H	-	-	PK	297	1.0	RB 100 kHz; VB: 100 kHz
2406.870	95.2	V	-	-	AVG	267	1.0	RB 1 MHz; VB: 10 Hz
2408.200	103.1	V	-	-	PK	267	1.0	RB 1 MHz; VB: 1 MHz
2408.300	94.7	V	-	-	PK	267	1.0	RB 100 kHz; VB: 100 kHz

2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta

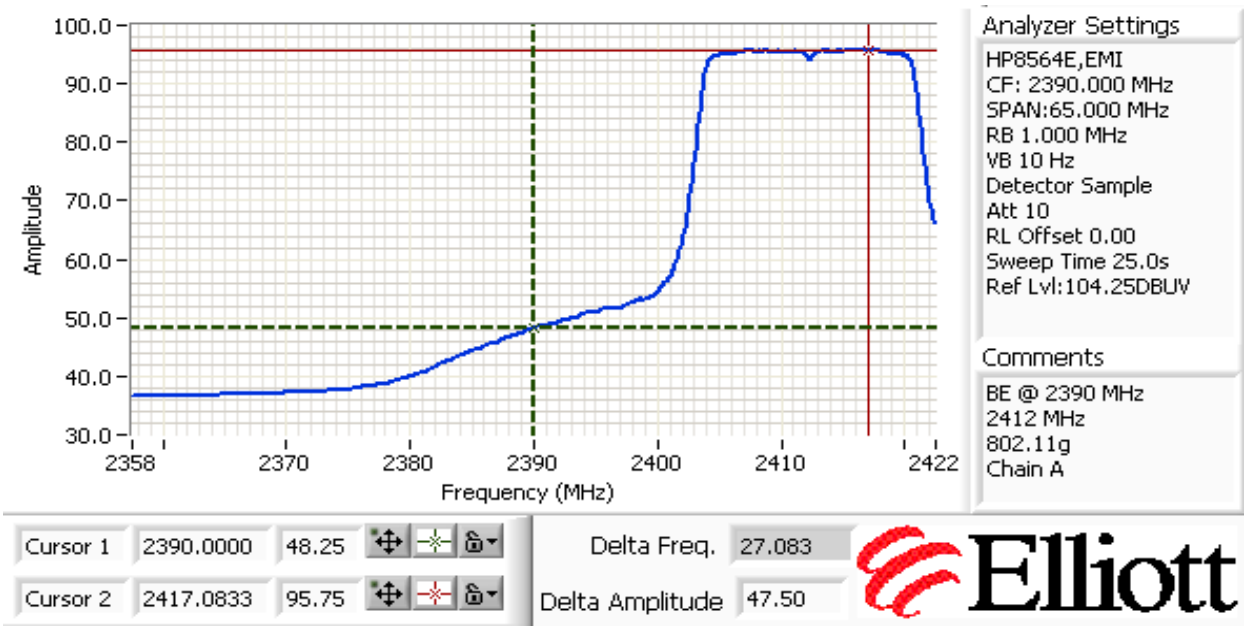
	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	104.9	103.1	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	97.2	95.2	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*45.0 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	59.9 dBuV/m		
Calculated Band-Edge Measurement (Avg):	52.2 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	-4.3	49.7	54	Avg
Delta Marker - 1MHz/10Hz:	-14.1	59.9	74	Pk

Calculated Band-Edge Measurement (Peak):	66.4 dBuV/m	Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	49.7 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	49.7	-	54.0	-4.3	Avg	-	-	Using 1MHz delta value

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

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

Date of Test: 8/11/2009 Test Location: FT Chamber #5

Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	15.3	16.0

Fundamental Signal Field Strength

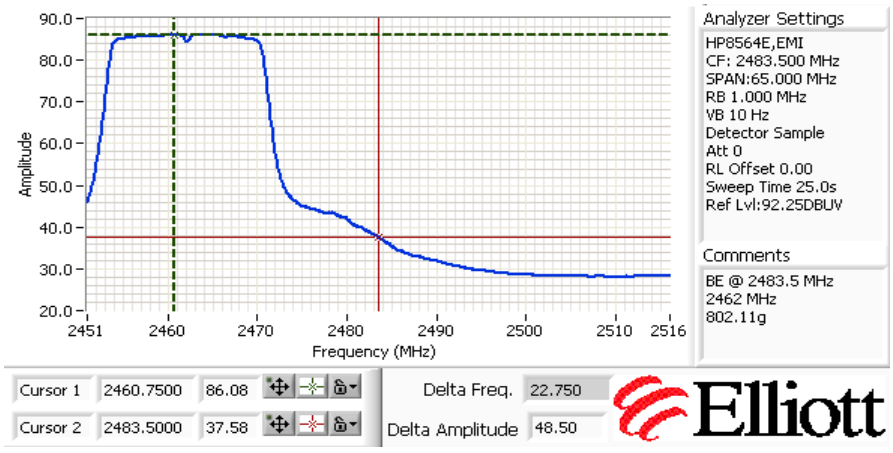
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2467.070	98.7	H	-	-	AVG	322	1.0	RB 1 MHz; VB: 10 Hz
2466.330	106.5	H	-	-	PK	322	1.0	RB 1 MHz; VB: 1 MHz
2467.070	99.0	V	-	-	AVG	337	1.5	RB 1 MHz; VB: 10 Hz
2465.570	106.5	V	-	-	PK	337	1.5	RB 1 MHz; VB: 1 MHz
2467.230	99.4	V	-	-	PK	337	1.5	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:	106.5	106.5	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	98.7	99.0	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*46.2 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	60.3 dBuV/m		
Calculated Band-Edge Measurement (Avg):	52.8 dBuV/m		

		Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	*38.5 dB*	-3.5	50.5	54	Avg
Delta Marker - 1MHz/10Hz:	48.5 *dB*	-13.7	60.3	74	Pk
Calculated Band-Edge Measurement (Peak):	68.0 dBuV/m	Using 100kHz delta value			
Calculated Band-Edge Measurement (Avg):	50.5 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	
2483.500	50.5	-	54.0	-3.5	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 2, Band Edge Field Strength - 802.11g, B - Sample #2 MAC: 00150059F23C *(sample #1 rf connector damaged)*
Run # 2a, EUT on Channel #1 2412MHz - 802.11g, B

Date of Test: 9/9/2009 Test Location: FT Chamber #3
Test Engineer: Rafael Varelas Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	15.5	14.9	21.5

Fundamental Signal Field Strength

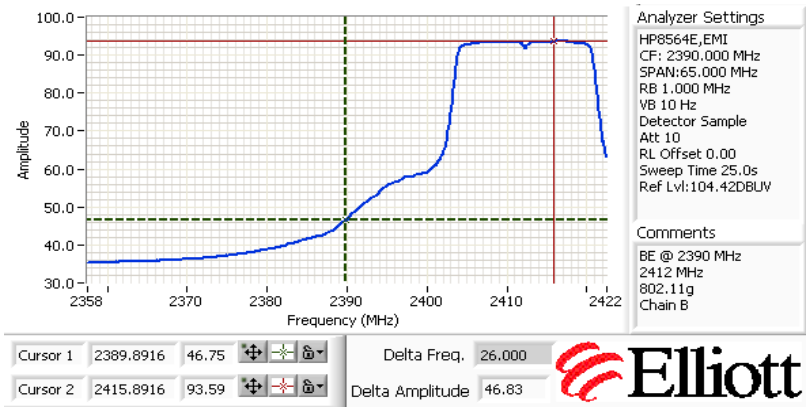
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2406.870	99.0	H	-	-	AVG	52	1.0	RB 1 MHz; VB: 10 Hz
2408.200	107.5	H	-	-	PK	52	1.0	RB 1 MHz; VB: 1 MHz
2407.100	100.0	H	-	-	PK	52	1.0	RB 100 kHz; VB: 100 kHz
2406.070	103.7	V	-	-	PK	64	1.0	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:	107.5	103.7	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	99.0	95.7	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*43.3 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	64.2 dBuV/m		
Calculated Band-Edge Measurement (Avg):	55.7 dBuV/m		
Delta Marker - 1MHz/1MHz:	*36.3 dB*		-1.8
Delta Marker - 1MHz/10Hz:	46.8 *dB*		-9.8
Calculated Band-Edge Measurement (Peak):	71.2 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	52.2 dBuV/m		Using 1MHz delta value

Margin	Level	Limit	Detector
-1.8	52.2	54	Avg
-9.8	64.2	74	Pk

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.891	52.2	-	54.0	-1.8	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

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

Date of Test: 8/25/2009 Test Location: Chamber # 4

Test Engineer: Suhaila Khushzad Config Change: none

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.0	16.0	24.0

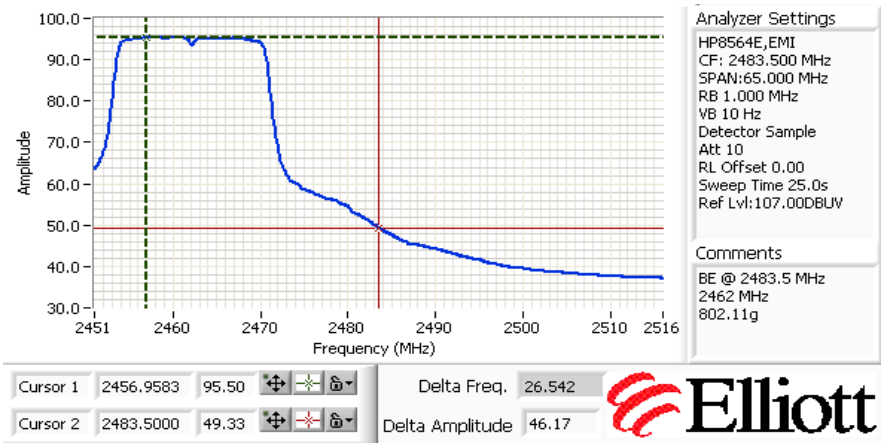
Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2456.930	97.4	H	-	-	AVG	340	1.0	RB 1 MHz; VB: 10 Hz
2458.270	105.1	H	-	-	PK	340	1.0	RB 1 MHz; VB: 1 MHz
2457.470	96.5	H	-	-	PK	340	1.0	RB 100 kHz; VB: 100 kHz
2457.130	94.2	V	-	-	AVG	81	2.1	RB 1 MHz; VB: 10 Hz
2455.800	102.0	V	-	-	PK	81	2.1	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:	105.1	102.0	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	97.4	94.2	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*42.0 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	63.1 dBuV/m		
Calculated Band-Edge Measurement (Avg):	55.4 dBuV/m		
Delta Marker - 1MHz/1MHz:	*35.5 dB*		-2.8 51.2 54 Avg
Delta Marker - 1MHz/10Hz:	46.2 *dB*		-10.9 63.1 74 Pk
Calculated Band-Edge Measurement (Peak):	69.6 dBuV/m		Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	51.2 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	51.2	-	54.0	-2.8	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 3, Band Edge Field Strength - 802.11b, A

Date of Test: 8/11/2009 Test Location: Chamber #5

Test Engineer: Suhaila Khushzad Config Change: none

Run # 3a, EUT on Channel #1 2412MHz - 802.11b, A

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.5	16.5

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	
2414.070	102.0	H	-	-	AVG	325	1.0	RB 1 MHz; VB: 10 Hz
2413.270	104.9	H	-	-	PK	325	1.0	RB 1 MHz; VB: 1 MHz
2414.000	101.0	V	-	-	AVG	190	1.5	RB 1 MHz; VB: 10 Hz
2413.270	104.0	V	-	-	PK	190	1.5	RB 1 MHz; VB: 1 MHz
2409.800	100.2	V	-	-	PK	190	1.5	RB 100 kHz; VB: 100 kHz

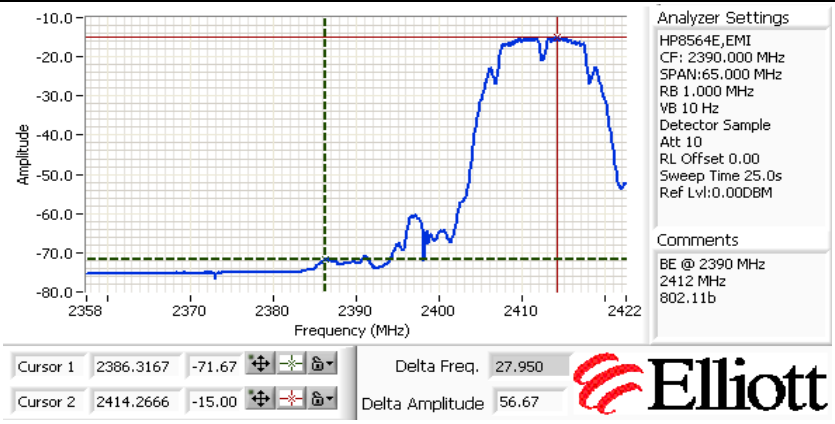
2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	104.9	104.0	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	102.0	101.0	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*53.0 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	51.9 dBuV/m		
Calculated Band-Edge Measurement (Avg):	49.0 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	-8.7	45.3	54	Avg
Delta Marker - 1MHz/10Hz:	-22.1	51.9	74	Pk

Calculated Band-Edge Measurement (Peak):	56.6 dBuV/m	Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	45.3 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	
2386.130	45.3	-	54.0	-8.7	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 3b, EUT on Channel #11 2462MHz - 802.11b, A

Chain	Power Settings Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.6	17.5

Fundamental Signal Field Strength

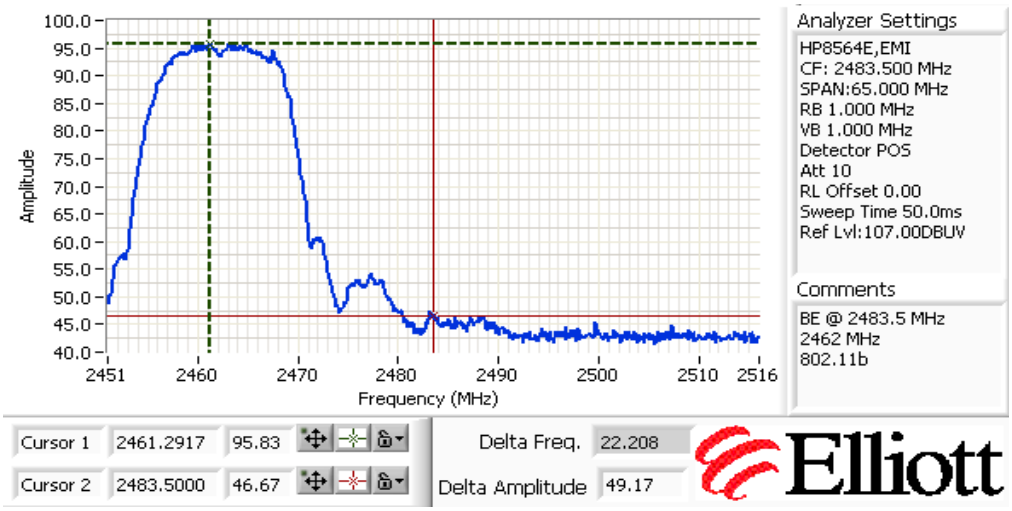
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
2460.470	104.0	H	-	-	AVG	317	1.0	RB 1 MHz; VB: 10 Hz	17.5
2461.330	107.0	H	-	-	PK	317	1.0	RB 1 MHz; VB: 1 MHz	17.5
2461.600	101.3	H	-	-	PK	317	1.0	RB 100 kHz; VB: 100 kH	17.5
2460.470	103.0	V	-	-	AVG	341	1.5	RB 1 MHz; VB: 10 Hz	
2461.400	106.0	V	-	-	PK	341	1.5	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:	107.0	106.0	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	104.0	103.0	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*52.5 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	54.5 dBuV/m		
Calculated Band-Edge Measurement (Avg):	51.5 dBuV/m		

		Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	*49.2 dB*	-4.5	49.5	54	Avg
Delta Marker - 1MHz/10Hz:	54.5 *dB*	-19.5	54.5	74	Pk
Calculated Band-Edge Measurement (Peak):	57.8 dBuV/m	Using 100kHz delta value			
Calculated Band-Edge Measurement (Avg):	49.5 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	
2483.500	49.5	-	54.0	-4.5	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 8, Band Edge Field Strength - 802.11b, B

Date of Test: 8/11/2009 Test Location: Chamber # 5

Test Engineer: Suhaila Khushzad Config Change: none

Run # 8a, EUT on Channel #1 2412MHz - 802.11b, B

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.6	17.5

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	
2414.000	101.4	H	-	-	AVG	102	1.2	RB 1 MHz; VB: 10 Hz
2413.270	104.4	H	-	-	PK	102	1.2	RB 1 MHz; VB: 1 MHz
2414.800	98.4	H	-	-	PK	102	1.2	RB 100 kHz; VB: 100 kHz
2414.000	99.9	V	-	-	AVG	78	1.0	RB 1 MHz; VB: 10 Hz
2413.270	102.6	V	-	-	PK	78	1.0	RB 1 MHz; VB: 1 MHz

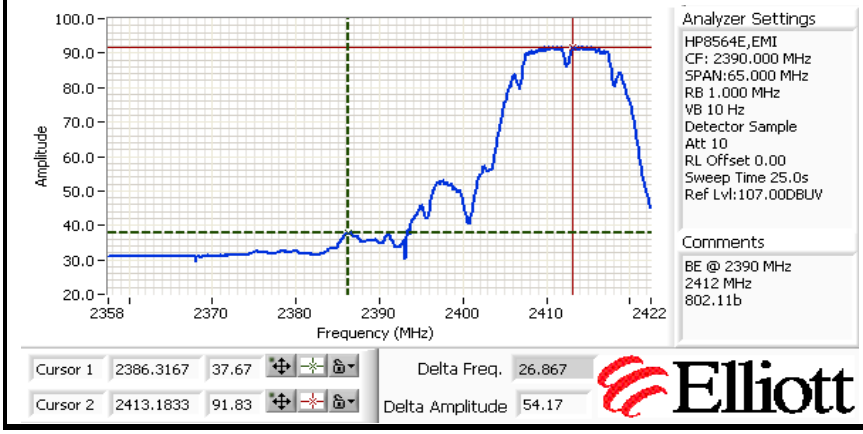
2390 MHz Band Edge Signal Radiated Field Strength - Marker Delta

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	104.4	102.6	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	101.4	99.9	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*52.2 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	52.2 dBuV/m		
Calculated Band-Edge Measurement (Avg):	49.2 dBuV/m		

	Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	-6.8	47.2	54	Avg
Delta Marker - 1MHz/10Hz:	-21.8	52.2	74	Pk

Calculated Band-Edge Measurement (Peak):	56.7 dBuV/m	Using 100kHz delta value
Calculated Band-Edge Measurement (Avg):	47.2 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	
2386.310	47.2	-	54.0	-6.8	Avg	-	-	Using 1MHz delta value



EMC Test Data

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run # 8b, EUT on Channel #11 2462MHz - 802.11b, B

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.7	19.0

Fundamental Signal Field Strength

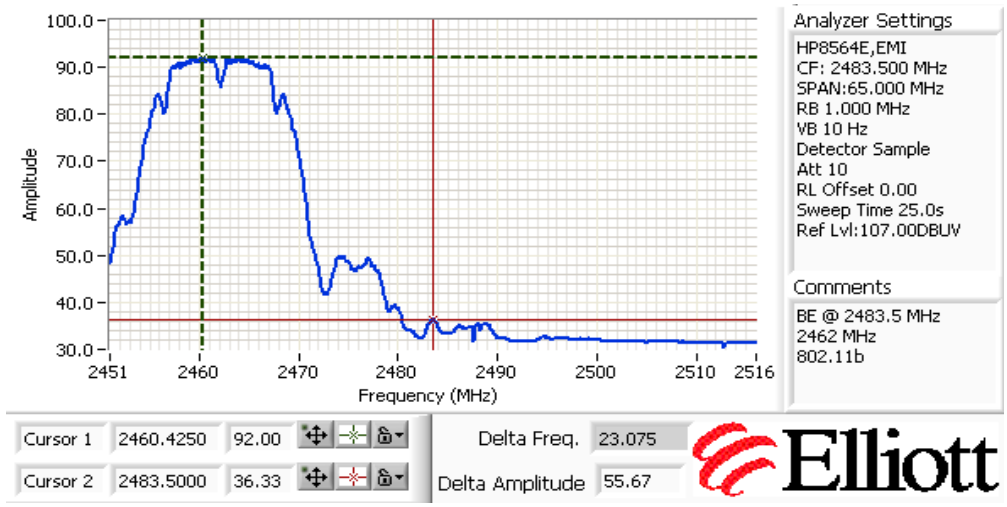
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2460.470	98.4	H	-	-	AVG	57	2.2	RB 1 MHz; VB: 10 Hz
2461.330	101.2	H	-	-	PK	57	2.2	RB 1 MHz; VB: 1 MHz
2459.730	96.8	H	-	-	PK	57	2.2	RB 100 kHz; VB: 100 kHz
2460.470	93.7	V	-	-	AVG	223	1.0	RB 1 MHz; VB: 1 MHz
2463.330	96.6	V	-	-	PK	223	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:	101.2	96.6	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	98.4	93.7	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - 100kHz	*51.7 dB*		<- this can only be used if band edge signal is highest within 2MHz of band edge.
Calculated Band-Edge Measurement (Peak):	49.5 dBuV/m		
Calculated Band-Edge Measurement (Avg):	46.7 dBuV/m		

		Margin	Level	Limit	Detector
Delta Marker - 1MHz/1MHz:	*49.3 dB*	-11.3	42.7	54	Avg
Delta Marker - 1MHz/10Hz:	55.7 dB	-24.5	49.5	74	Pk
Calculated Band-Edge Measurement (Peak):	51.9 dBuV/m	Using 100kHz delta value			
Calculated Band-Edge Measurement (Avg):	42.7 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	42.7	-	54.0	-11.3	Avg	-	-	Using 1MHz delta value



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Ambient Conditions:

Temperature: 22.1 °C

Rel. Humidity: 41 %

Summary

Sample #2 MAC Address: 00150059F23C; CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11b Chain A	#6 2437MHz	16.5 dBm	16.8	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	28.4dBµV/m @ 1145.8MHz (-25.6dB)
1b	802.11b Chain B	#6 2437MHz	16.5 dBm	16.6	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	51.7dBµV/m @ 7310.4MHz (-2.3dB)
1b	802.11b Chain B	#6 2437MHz	16.5 dBm	15.3	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	50.7dBµV/m @ 7310.5MHz (-3.3dB)
1c	802.11g Chain A	#6 2437MHz	16.5 dBm	16.7	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	56.6dBµV/m @ 1330.8MHz (-17.4dB)
1d	802.11g Chain B	#6 2437MHz	16.5 dBm	16.7	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	51.1dBµV/m @ 7310.3MHz (-2.9dB)
1d	802.11g Chain B	#6 2437MHz	16.5 dBm	16.1	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	50.0dBµV/m @ 7310.6MHz (-4.0dB)
Worst case legacy mode and chain tested on top and bottom channel:							
1e	Worst case chain and mode from 1a - 1d	#1 2412MHz	16.5 dBm	16.7	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	38.0dBµV/m @ 4824.0MHz (-16.0dB)
1f		#11 2462MHz	16.5 dBm	16.5	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	49.7dBµV/m @ 7388.8MHz (-4.3dB)
MIMO Modes - tested at the highest power setting per chain (16.5dBm) but with all chains active to cover 1x and 2x modes. As measurements on the center channel demonstrated that 802.11b mode represented the worst case mode the high and low frequencies of operation are considered covered by runs 1e and 1f..							
2a	802.11n20 A+B	#6 2437MHz	16.5 dBm per chain	>16.5 dBm per chain	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	46.7dBµV/m @ 7309.9MHz (-7.3dB)
2b	802.11n40 A+B	#6 2437MHz	16.5 dBm per chain	>16.5 dBm per chain	Radiated Emissions, 1000 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	46.2dBµV/m @ 7309.8MHz (-7.8dB)

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.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, 1000 - 26000 MHz, Legacy modes

Date of Test: 8/19/2009 Config. Used: 1

Test Engineer: Rafael Varelas Config Change: None

Test Location: FT Chamber #4 Host Unit Voltage 120V/60Hz

Run #1a: Chain A, 802.11b Mode, Center channel (2437 MHz)

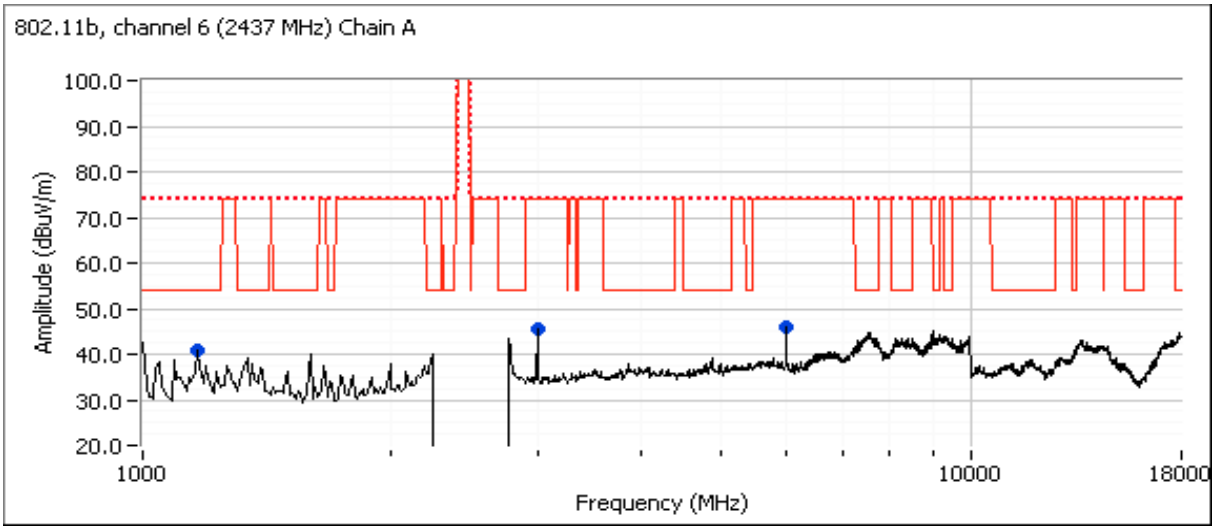
Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.8	19.5

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2435.170	96.5	V	-	-	PK	224	1.8	RB 100 kHz; VB: 100 kHz
2438.900	100.6	H	-	-	AVG	360	1.0	RB 1 MHz; VB: 10 Hz
2438.130	103.7	H	-	-	PK	360	1.0	RB 1 MHz; VB: 1 MHz
2437.870	97.4	H	-	-	PK	359	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	97.4	dBµV/m
Limit for emissions outside of restricted bands:	67.4	dBµV/m

Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1145.820	28.4	V	54.0	-25.6	AVG	118	1.2	. MHz; VB: 10 Hz
1147.490	45.8	V	74.0	-28.2	PK	118	1.2	MHz; VB: 1 MHz
2998.330	45.7	H	74.0	-28.3	Peak	248	1.0	
5995.830	45.8	V	74.0	-28.2	Peak	143	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1b: Chain B, 802.11b Mode, Center channel (2437 MHz)

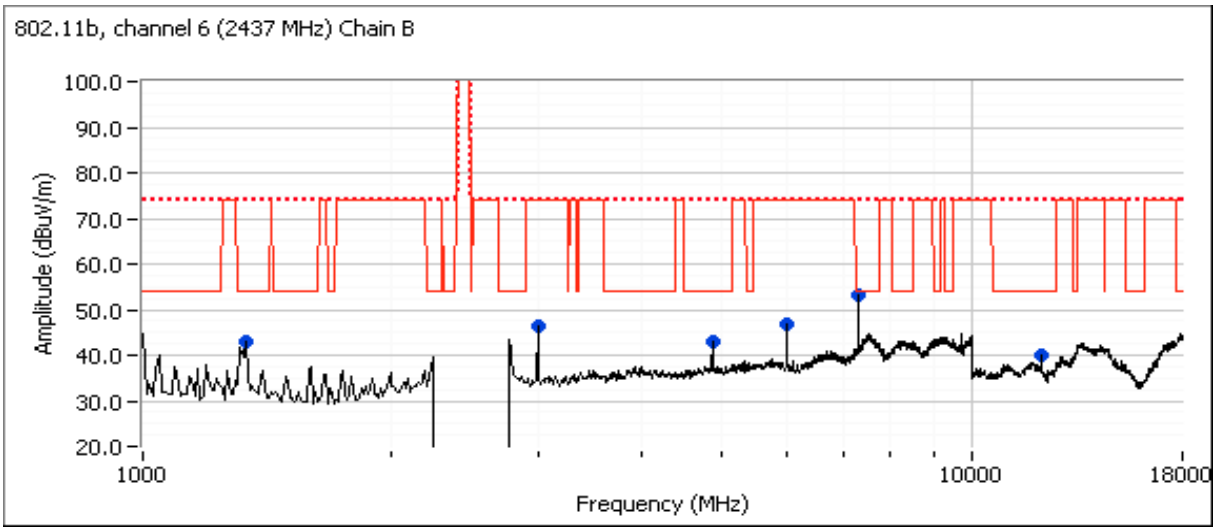
Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.6	19.5

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2437.930	103.3	H	-	-	AVG	58	1.0	RB 1 MHz; VB: 10 Hz
2438.130	106.4	H	-	-	PK	58	1.0	RB 1 MHz; VB: 1 MHz
2438.070	100.8	H	-	-	PK	58	1.0	RB 100 kHz; VB: 100 kHz
2437.830	92.5	V	-	-	PK	249	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	100.8	dBµV/m
Limit for emissions outside of restricted bands:	70.8	dBµV/m

Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7310.360	51.7	V	54.0	-2.3	AVG	212	1.3	RB 1 MHz; VB: 10 Hz
4874.020	43.5	V	54.0	-10.5	AVG	219	1.0	RB 1 MHz; VB: 10 Hz
12173.330	40.2	V	54.0	-13.8	Peak	181	1.3	Peak reading, average limit
7312.160	56.6	V	74.0	-17.4	PK	212	1.3	RB 1 MHz; VB: 1 MHz
1330.060	50.9	V	74.0	-23.1	PK	247	1.3	RB 1 MHz; VB: 1 MHz
1328.820	29.6	V	54.0	-24.4	AVG	247	1.3	RB 1 MHz; VB: 10 Hz
4874.000	48.0	V	74.0	-26.0	PK	219	1.0	RB 1 MHz; VB: 1 MHz

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	15.3	18.0

Date of Test: 8/27/2009 Test Location: Chamber #5

Test Engineer: Suhaila Khushzad

Spurious Emissions - remeasured 3rd harmonic to detrmine output power level that has more than 3dB margin

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7310.530	50.7	V	54.0	-3.3	AVG	158	1.5	RB 1 MHz; VB: 10 Hz
7312.200	56.0	V	74.0	-18.0	PK	158	1.5	RB 1 MHz; VB: 1 MHz
7308.270	38.8	H	54.0	-15.2	AVG	180	1.0	RB 1 MHz; VB: 10 Hz
7306.730	49.8	H	74.0	-24.2	PK	180	1.0	RB 1 MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

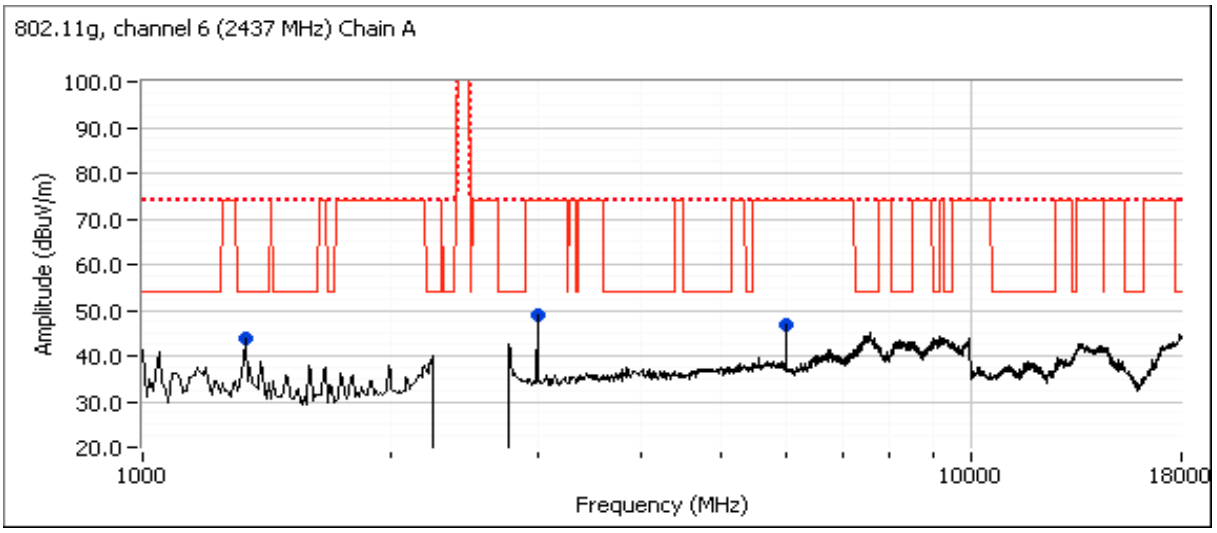
Run #1c: Chain A, 802.11g Mode, Center channel (2437 MHz)

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.7	23.5

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.030	98.0	H	-	-	AVG	2	1.0	RB 1 MHz; VB: 10 Hz
2441.230	106.0	H	-	-	PK	2	1.0	RB 1 MHz; VB: 1 MHz
2442.200	98.3	H	-	-	PK	2	1.0	RB 100 kHz; VB: 100 kHz
2443.500	93.8	V	-	-	PK	225	1.8	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	98.3	dBµV/m	
Limit for emissions outside of restricted bands:	68.3	dBµV/m	Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1330.800	56.6	V	74.0	-17.4	PK	95	1.0	MHz; VB: 1 MHz
1329.960	34.3	V	54.0	-19.7	AVG	95	1.0	. MHz; VB: 10 Hz
2998.330	48.9	V	68.3	-19.4	Peak	250	1.0	
5995.830	46.6	V	68.3	-21.7	Peak	102	1.3	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

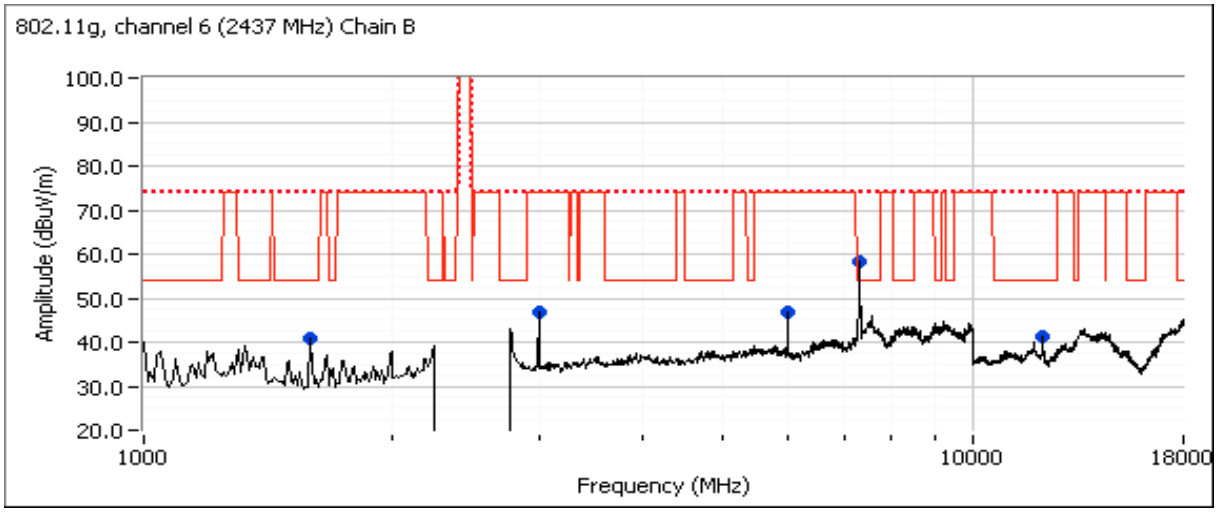
Run #1d: Chain B, 802.11g Mode, Center channel (2437 MHz)

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.7	24.0

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2439.670	95.2	V	-	-	PK	251	1.8	RB 100 kHz; VB: 100 kHz
2435.870	100.5	H	-	-	AVG	56	1.0	RB 1 MHz; VB: 10 Hz
2441.330	108.8	H	-	-	PK	56	1.0	RB 1 MHz; VB: 1 MHz
2435.870	101.2	H	-	-	PK	56	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	101.2	dBµV/m
Limit for emissions outside of restricted bands:	71.2 dBµV/m	Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7310.340	51.1	V	54.0	-2.9	AVG	211	1.2	RB 1 MHz; VB: 10 Hz
7314.670	66.4	V	74.0	-7.6	PK	211	1.2	RB 1 MHz; VB: 1 MHz
1586.670	40.7	V	54.0	-13.3	Peak	80	1.3	Peak reading, average limit
12180.510	34.4	V	54.0	-19.6	AVG	173	1.3	RB 1 MHz; VB: 10 Hz
12176.240	50.5	V	74.0	-23.5	PK	173	1.3	RB 1 MHz; VB: 1 MHz
5995.830	46.8	V	71.2	-24.4	Peak	145	1.0	
2998.330	46.7	V	71.2	-24.5	Peak	302	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.1	23.0

Date of Test: 8/27/2009 Test Location: Chamber #5

Test Engineer: Suhaila Khushzad

Spurious Emissions - remeasured 3rd harmonic to detrmine output power level that has more than 3dB margin

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7310.600	50.0	V	54.0	-4.0	AVG	156	1.6	RB 1 MHz; VB: 10 Hz
7318.270	66.9	V	74.0	-7.1	PK	156	1.6	RB 1 MHz; VB: 1 MHz
7308.800	42.4	H	54.0	-11.6	AVG	13	1.0	RB 1 MHz; VB: 10 Hz
7306.530	61.7	H	74.0	-12.3	PK	13	1.0	RB 1 MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1e: Chain B, Worst-case from runs 1a - 1d, b Mode, low channel (2412 MHz)

Date of Test: 8/20/2009 Config. Used: 1

Test Engineer: Suhaila Khushzad Config Change: None

Test Location: Chamber #5 Host Unit Voltage 120V/60Hz

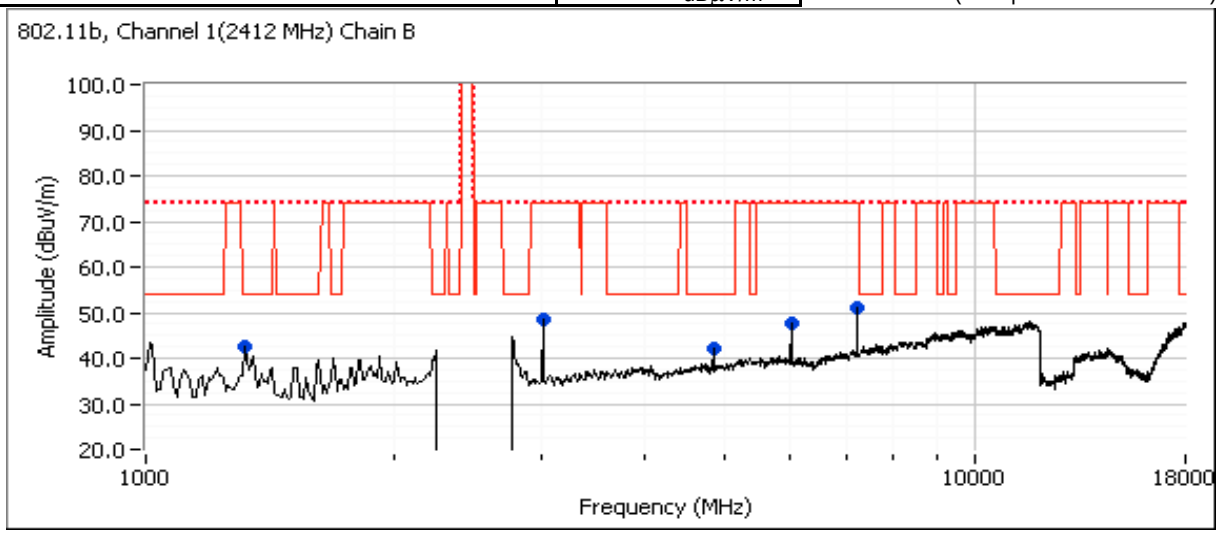
Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.7	19.0

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2414.800	104.1	H	-	-	AVG	53	1.0	RB 1 MHz; VB: 10 Hz
2412.670	95.6	V	-	-	PK	54	1.0	RB 100 kHz; VB: 100 kHz
2411.670	101.6	H	-	-	PK	53	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	101.6	dBµV/m
Limit for emissions outside of restricted bands:	71.6	dBµV/m

Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4823.960	38.0	V	54.0	-16.0	AVG	123	1.0	RB 1 MHz; VB: 10 Hz
4824.100	46.0	V	74.0	-28.0	PK	123	1.0	RB 1 MHz; VB: 1 MHz
1332.700	34.7	V	54.0	-19.3	AVG	94	1.0	RB 1 MHz; VB: 10 Hz
1329.780	51.6	V	74.0	-22.4	PK	94	1.0	RB 1 MHz; VB: 1 MHz
3000.230	48.3	V	71.6	-23.3	Peak	255	1.0	
6001.020	47.8	V	71.6	-23.8	Peak	100	1.0	
7235.320	51.2	V	71.6	-20.4	Peak	193	1.9	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1f: Chain B, Worst-case from runs 1a - 1d, b Mode, high channel (2462 MHz)

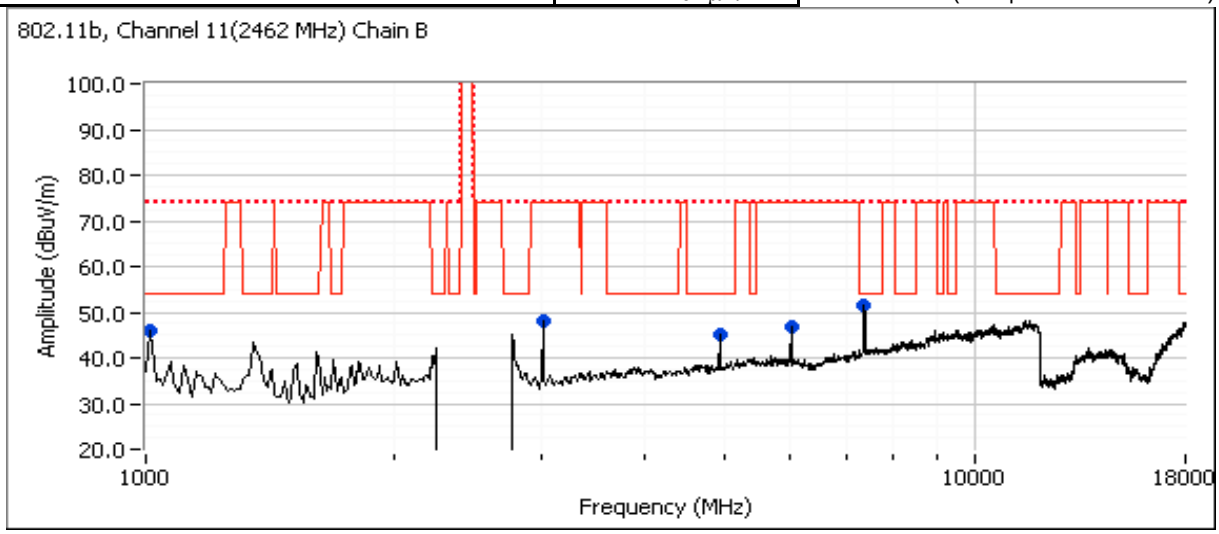
Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
B	16.5	16.5	20.0

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2459.330	103.5	H	-	-	AVG	49	1.0	RB 1 MHz; VB: 10 Hz
2461.070	106.3	H	-	-	PK	49	1.0	RB 1 MHz; VB: 1 MHz
2463.670	101.3	H	-	-	PK	49	1.0	RB 100 kHz; VB: 100 kHz
2459.670	94.6	V	-	-	PK	48	1.7	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	101.3	dBµV/m
Limit for emissions outside of restricted bands:	71.3	dBµV/m

Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7388.780	49.7	V	54.0	-4.3	AVG	183	1.3	RB 1 MHz; VB: 10 Hz
7387.910	55.1	V	74.0	-18.9	PK	183	1.3	RB 1 MHz; VB: 1 MHz
4923.490	43.5	V	54.0	-10.5	AVG	223	1.0	RB 1 MHz; VB: 10 Hz
4924.340	48.4	V	74.0	-25.6	PK	223	1.0	RB 1 MHz; VB: 1 MHz
1000.000	30.7	V	54.0	-23.3	AVG	117	1.3	RB 1 MHz; VB: 10 Hz
1000.470	51.6	V	74.0	-22.4	PK	117	1.3	RB 1 MHz; VB: 1 MHz
3000.230	48.1	V	74.0	-25.9	Peak	249	1.0	
6001.020	46.8	V	74.0	-27.2	Peak	269	1.3	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #2: Radiated Spurious Emissions, 1000 - 26000 MHz, MIMO modes

Run #2a: Chain A+B, 802.11n 20MHz Mode, Center channel (2437 MHz)

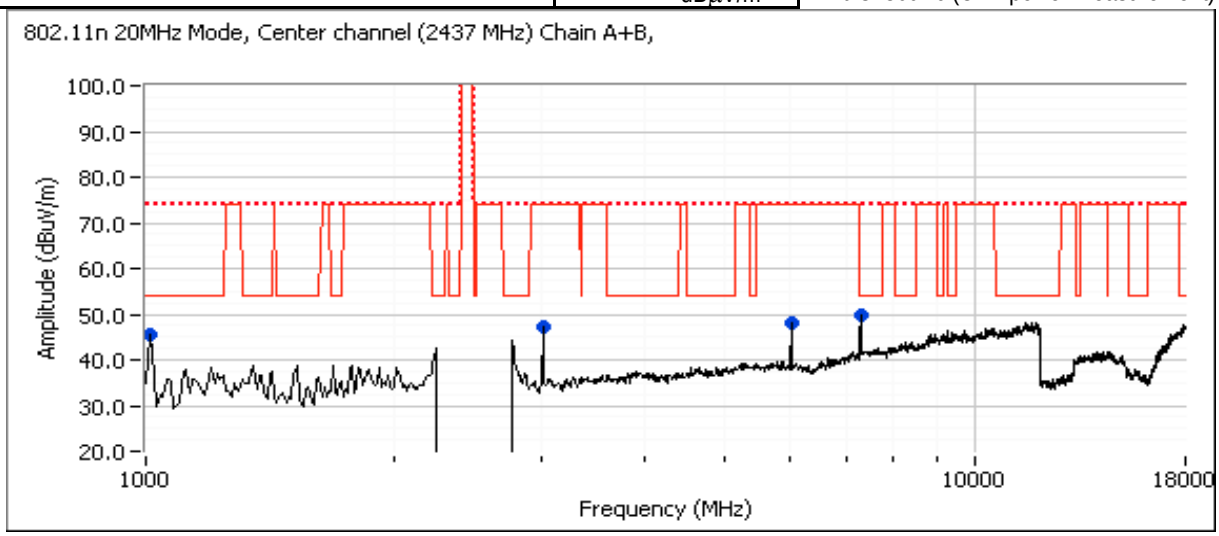
Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A+B	16.5, 16.5	16.5, 16.6	24, 25

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2440.270	101.2	H	-	-	AVG	49	1.0	RB 1 MHz; VB: 10 Hz
2435.400	110.9	H	-	-	PK	49	1.0	RB 1 MHz; VB: 1 MHz
2440.330	95.6	V	-	-	PK	281	1.3	RB 100 kHz; VB: 100 kHz
2440.930	104.0	H	-	-	PK	49	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	104	dBµV/m
Limit for emissions outside of restricted bands:	74	dBµV/m

Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7309.900	46.7	V	54.0	-7.3	AVG	224	1.9	MHz; VB: 10 Hz
7309.900	60.8	V	74.0	-13.2	PK	224	1.9	MHz; VB: 1 MHz
1000.000	30.6	V	54.0	-23.4	AVG	102	1.0	MHz; VB: 10 Hz
1000.730	45.1	V	74.0	-28.9	PK	102	1.0	MHz; VB: 1 MHz
3027.590	47.4	V	74.0	-26.6	Peak	186	1.0	
6000.770	48.0	V	74.0	-26.0	Peak	98	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #2b: Chain A+B, 802.11n 40MHz Mode, Center channel (2437 MHz)

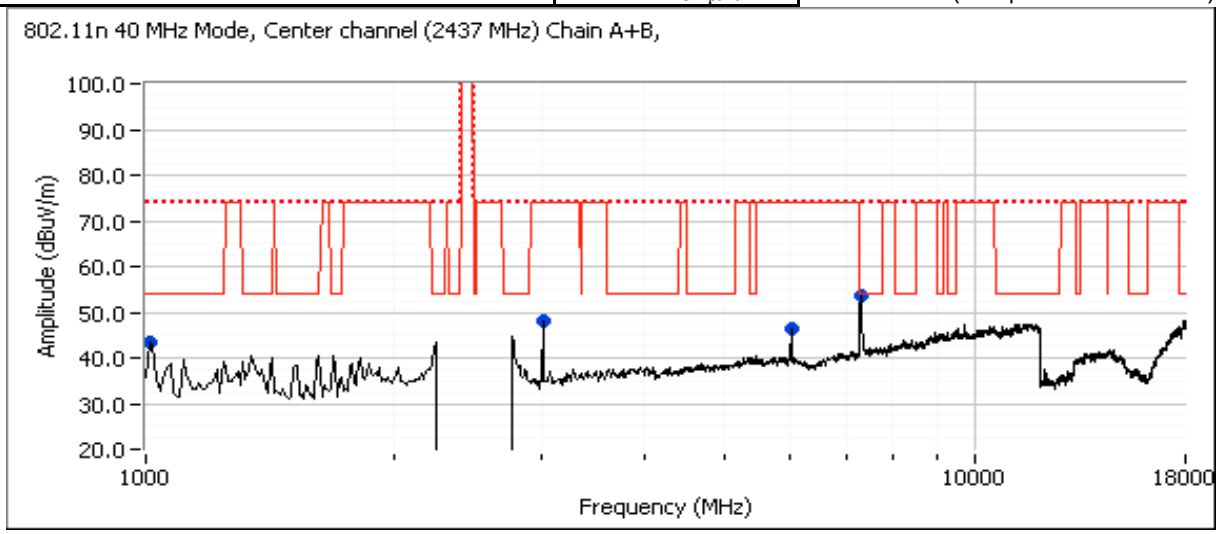
Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A+B	16.5, 16.5	16.7, 16.8	25, 26

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2439.400	97.0	H	-	-	AVG	51	1.0	RB 1 MHz; VB: 10 Hz
2433.400	106.3	H	-	-	PK	51	1.0	RB 1 MHz; VB: 1 MHz
2444.730	98.2	V	-	-	PK	252	1.4	RB 100 kHz; VB: 100 kHz
2434.670	99.8	H	-	-	PK	51	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	99.8	dBµV/m
Limit for emissions outside of restricted bands:	69.8	dBµV/m

Limit is -30dBc (UNII power measurement)



Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7309.800	46.2	V	54.0	-7.8	AVG	154	1.6	. MHz; VB: 10 Hz
7330.470	59.3	V	74.0	-14.7	PK	154	1.6	MHz; VB: 1 MHz
1000.100	32.1	V	54.0	-21.9	AVG	110	1.3	. MHz; VB: 10 Hz
1000.110	48.2	V	74.0	-25.8	PK	110	1.3	MHz; VB: 1 MHz
3000.030	47.9	V	74.0	-26.1	Peak	258	1.0	
6000.680	46.3	V	74.0	-27.7	Peak	269	1.3	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	No emissions above 18GHz observed when scanning the EUT with antenna 10cm from the device/antenna.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Date of Test: 9/2/2009
Test Engineer: Rafael Varelas
Test Location: FT Radio Lab

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 22.1 °C
Rel. Humidity: 42 %

Summary of Results

Sample #2 MAC Address: 00150059F23C; CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	26.5 25.5 26.5	-	Output Power	15.247(b)	Pass	802.11a: 15.3 dBm HT20: 15.2 dBm HT40: 15.4 dBm
2	25.0 25.5 25.5	-	Power spectral Density (PSD)	15.247(d)	Pass	802.11a:-8.7dBm/3kHz HT20:-9.5dBm/3kHz HT40:-12.8dBm/3kHz
3	24.5 25.0 25.0	-	Minimum 6dB Bandwidth	15.247(a)	Pass	802.11a: 16.3 MHz HT20: 17.6 MHz HT40: 36.5 MHz
3	25.5 25.0 26.5	-	99% Bandwidth	RSS GEN	-	802.11a: 17.1 MHz HT20: 18.4 MHz HT40: 36.0 MHz
4		-	Spurious emissions	15.247(b)	Pass	All Emissions less than 30dBc

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.

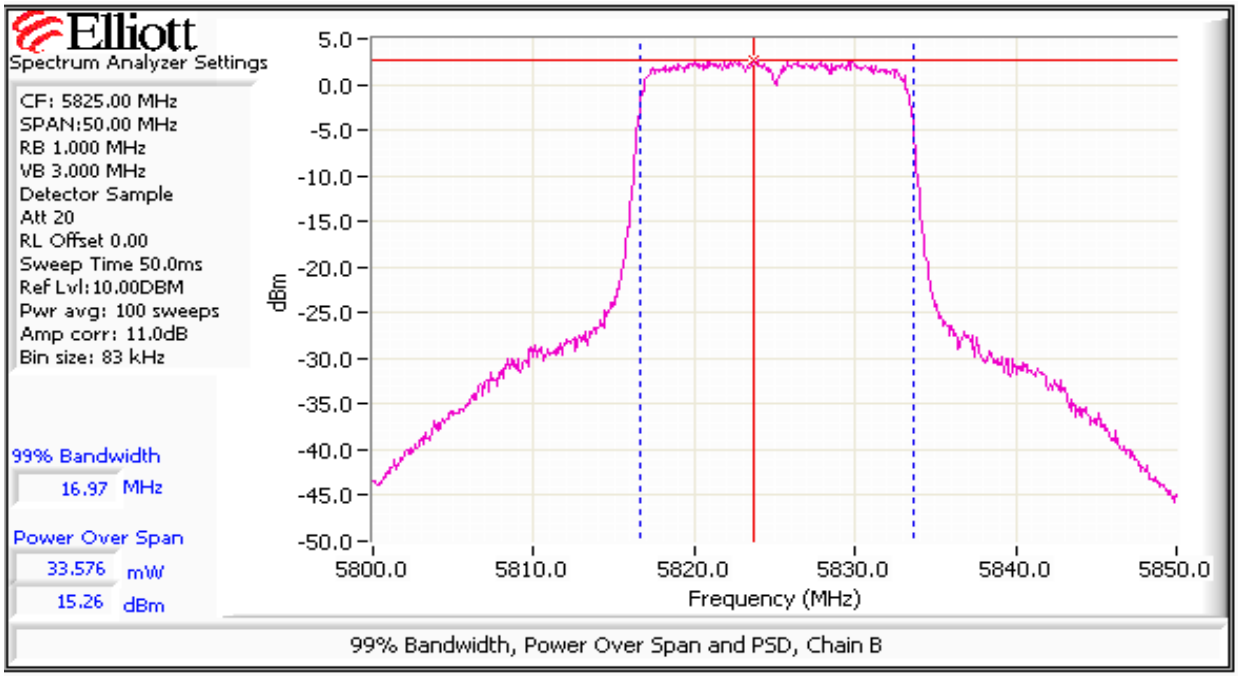
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

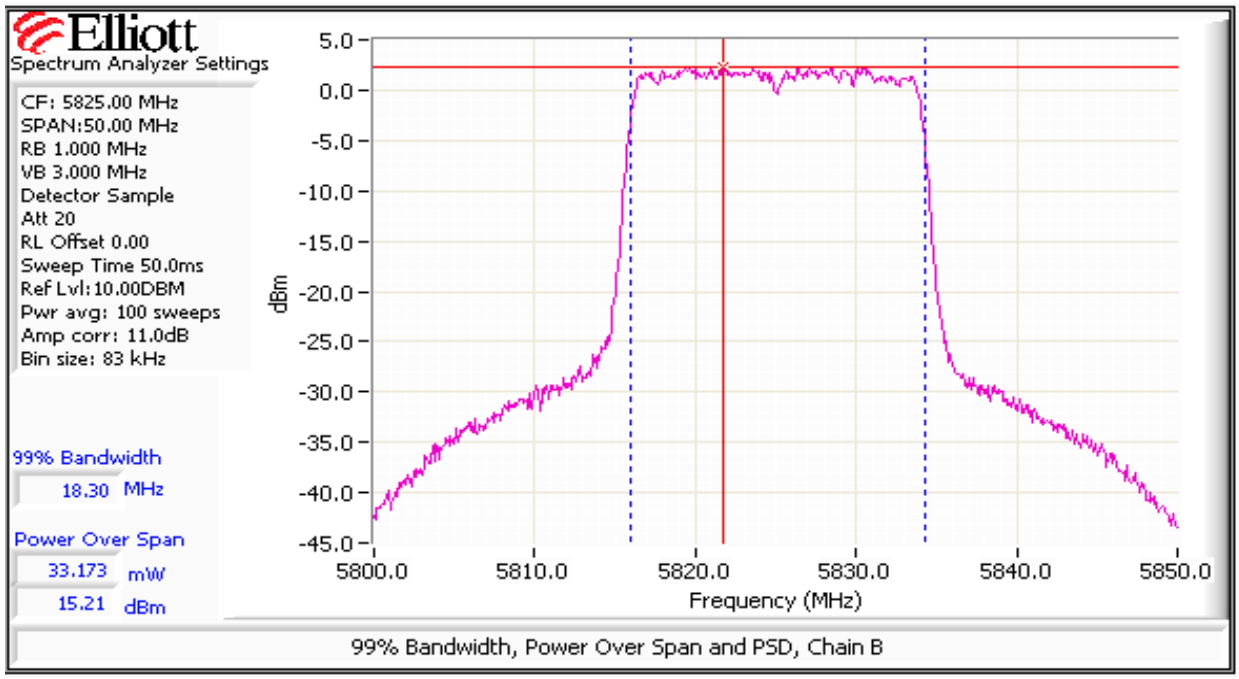
Run #1: Output Power

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP [Note 2] W	Output Power (dBm) [3]	Output Power mW
24.5	Chain A 802.11a, #149	14.9	30.8	5.0	Pass	19.9	0.097	16.7	46.8
25.0	Chain A 802.11a, #157	15.1	32.4	5.0	Pass	20.1	0.102	16.8	47.9
25.5	Chain A 802.11a - #165	14.7	29.5	5.0	Pass	19.7	0.093	16.7	46.8
25.0	Chain B 802.11a, #149	15.1	32.4	5.0	Pass	20.1	0.102	16.7	46.8
25.5	Chain B 802.11a, #157	15.2	33.1	5.0	Pass	20.2	0.105	16.6	45.7
26.5	Chain B 802.11a - #165	15.3	33.9	5.0	Pass	20.3	0.107	16.8	47.9
25.0	Chain A HT20, #149	15.0	31.6	5.0	Pass	20.0	0.100	16.8	47.9
25.0	Chain A HT20 - #157	14.8	30.2	5.0	Pass	19.8	0.095	16.8	47.9
25.5	Chain A HT20, #165	14.6	28.6	5.0	Pass	19.6	0.090	16.6	45.7
25.5	Chain B HT20, #149	15.2	33.1	5.0	Pass	20.2	0.105	16.8	47.9
26.0	Chain B HT20 - #157	15.2	33.1	5.0	Pass	20.2	0.105	16.8	47.9
26.5	Chain B HT20, #165	15.2	33.1	5.0	Pass	20.2	0.105	16.8	47.9
25.0	Chain A: HT40 - #151	15.2	33.1	5.0	Pass	20.2	0.105	16.8	47.9
25.5	Chain A: HT40 - #159	14.9	31.0	5.0	Pass	19.9	0.098	16.6	45.7
25.5	Chain B: HT40 - #151	15.1	32.4	5.0	Pass	20.1	0.102	16.7	46.8
26.5	Chain B: HT40 - #159	15.4	34.7	5.0	Pass	20.4	0.110	16.6	45.7

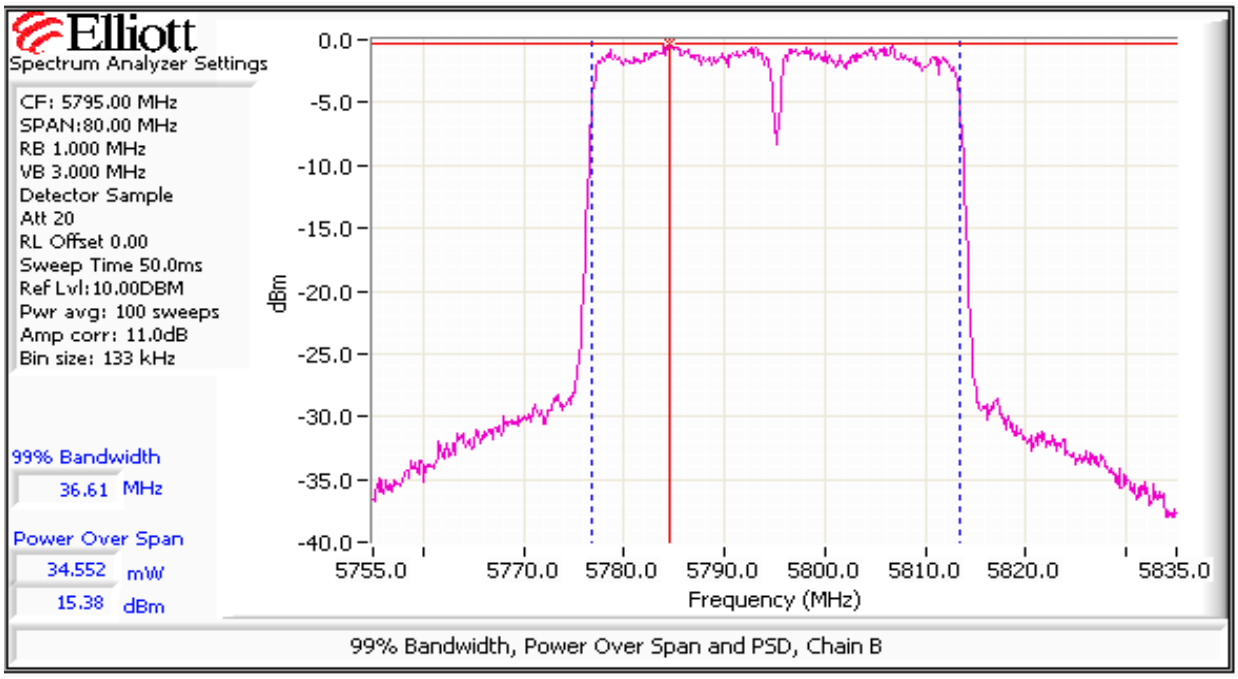
Note 1:	Output power measured using a spectrum analyzer (see plots below): RBW=1MHz, VB=3 MHz, sample detector, power averaging on (transmitted signal was continuous) and power integration over 80 MHz for n40 mode and 40MHz for a and n20 modes. Spurious limit is -30dBc because this method was used.
Note 2:	Power setting - the software power setting used during testing, included for reference only.
Note 3:	Power measured using average power meter and is included for reference only.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

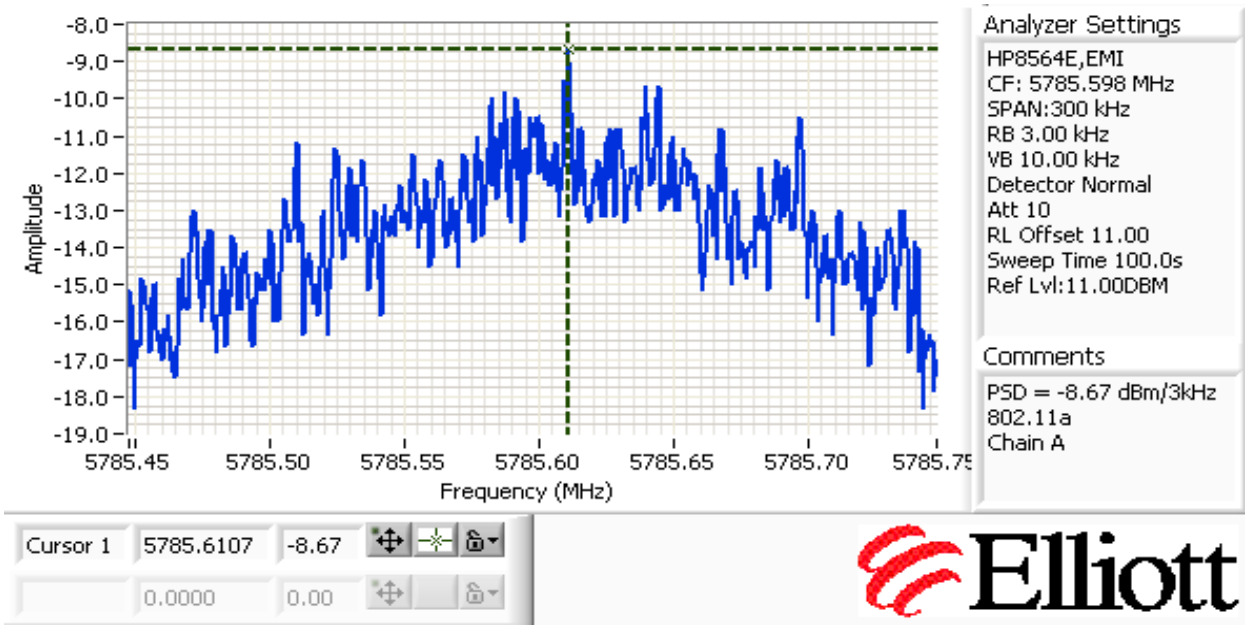


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

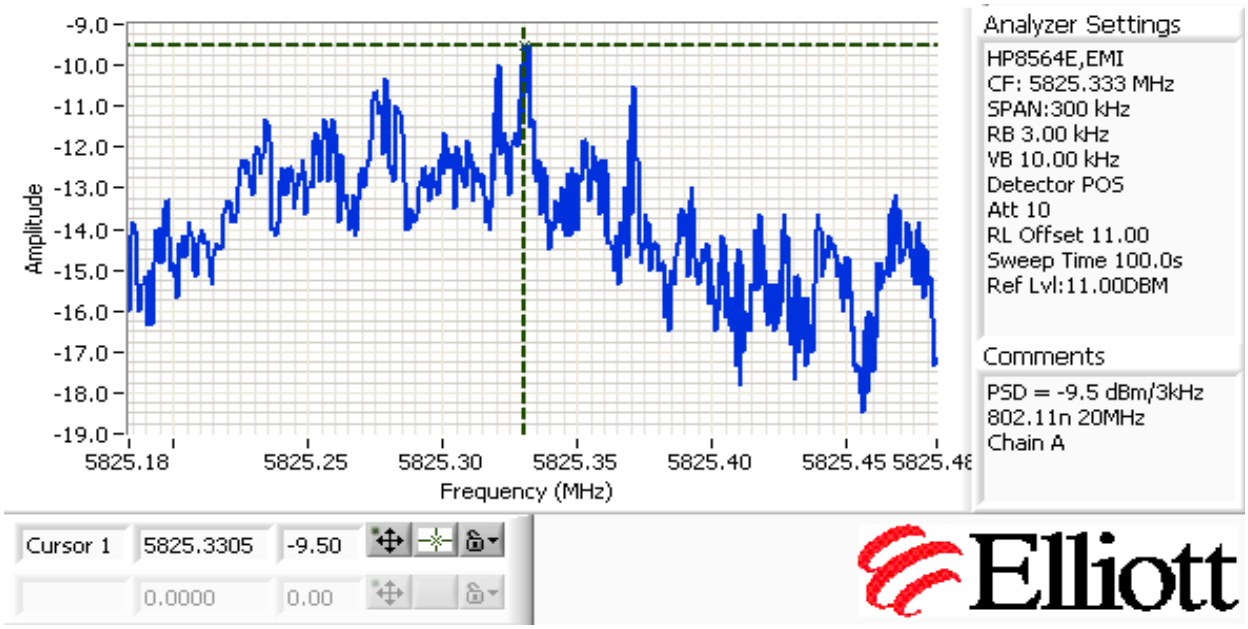
Run #2: Power spectral Density

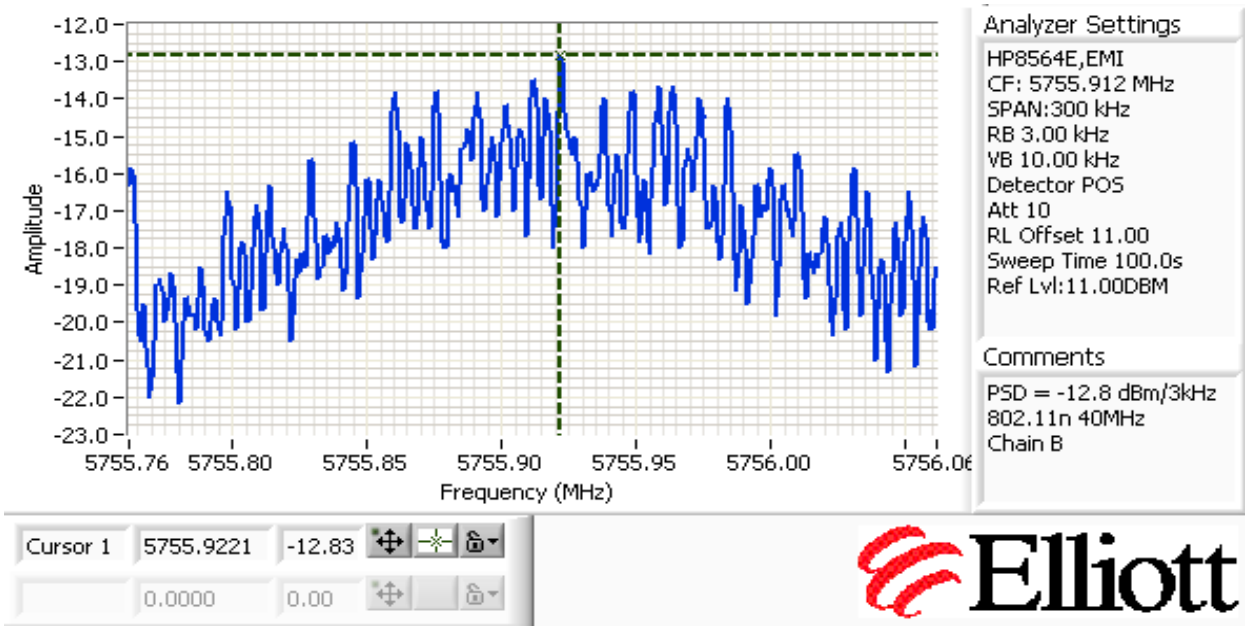
Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
24.5	Chain A 802.11a, #149	-9.3	8.0	Pass
25.0	Chain A 802.11a, #157	-8.7	8.0	Pass
25.5	Chain A 802.11a - #165	-9.5	8.0	Pass
25.0	Chain A HT20, #149	-9.8	8.0	Pass
25.0	Chain A HT20 - #157	-9.7	8.0	Pass
25.5	Chain A HT20, #165	-9.5	8.0	Pass
25.0	Chain A: HT40 - #151	-13.5	8.0	Pass
25.5	Chain A: HT40 - #159	-13.8	8.0	Pass
25.0	Chain B 802.11a, #149	-9.3	8.0	Pass
25.5	Chain B 802.11a, #157	-9.8	8.0	Pass
26.5	Chain B 802.11a - #165	-9.5	8.0	Pass
25.5	Chain B HT20, #149	-9.7	8.0	Pass
26.0	Chain B HT20 - #157	-9.7	8.0	Pass
26.5	Chain B HT20, #165	-9.7	8.0	Pass
25.5	Chain B: HT40 - #151	-12.8	8.0	Pass
26.5	Chain B: HT40 - #159	-13.0	8.0	Pass

Note 1:	Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A



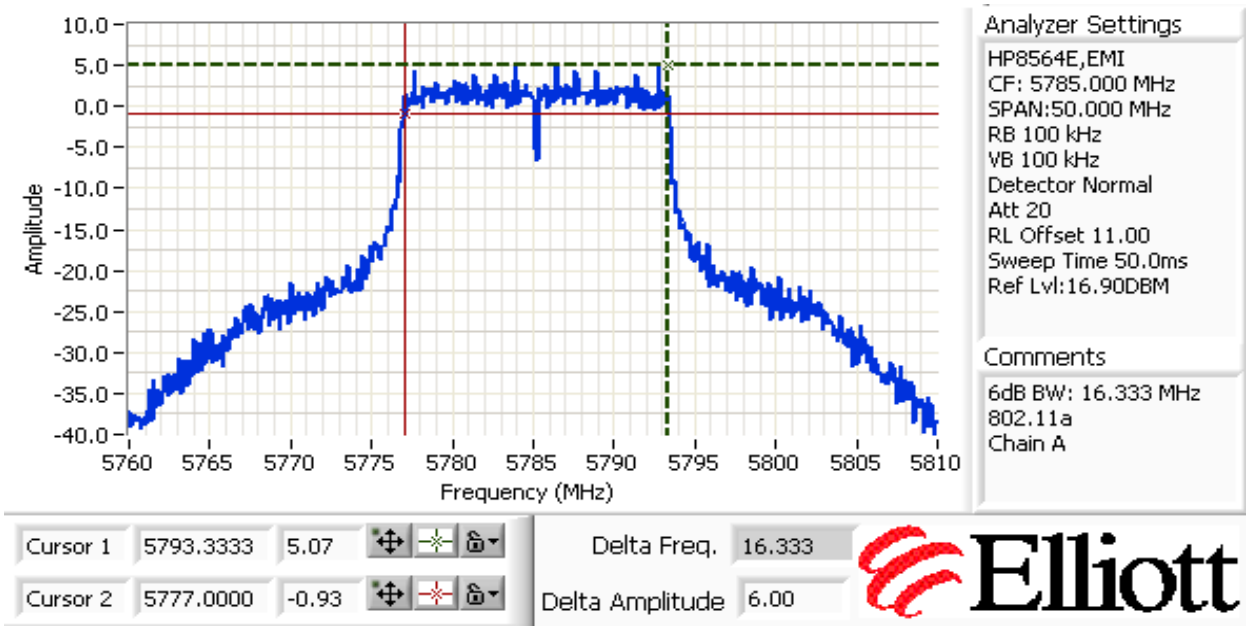


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

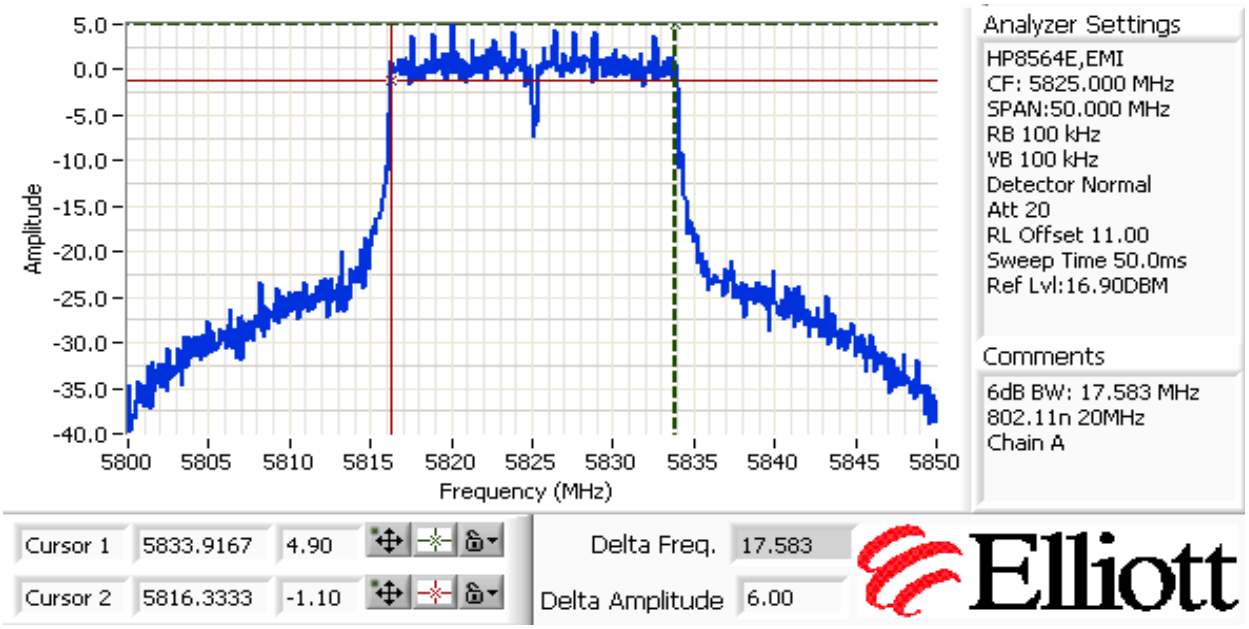
Run #3: Signal Bandwidth

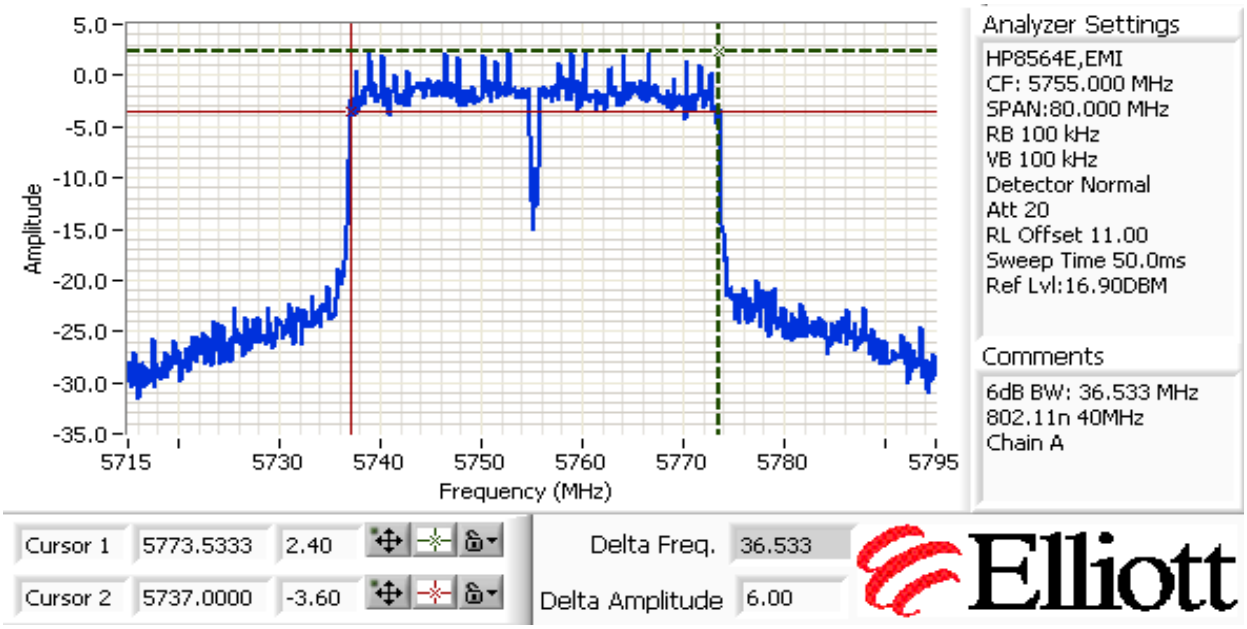
Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz) 6dB	99%
24.5	Chain A 802.11a, #149	100k	16.3	17.1
25.0	Chain A 802.11a, #157	100k	16.3	17.1
25.5	Chain A 802.11a - #165	100k	16.4	17.0
25.0	Chain A HT20, #149	100k	17.66	18.4
25.0	Chain A HT20 - #157	100k	17.66	18.4
25.5	Chain A HT20, #165	100k	17.58	18.3
25.0	Chain A: HT40 - #151	100k	36.5	36.6
25.5	Chain A: HT40 - #159	100k	36.5	36.6
25.0	Chain B 802.11a, #149			17.1
25.5	Chain B 802.11a, #157			17.1
26.5	Chain B 802.11a - #165			17.0
25.5	Chain B HT20, #149			18.4
26.0	Chain B HT20 - #157			18.4
26.5	Chain B HT20, #165			18.3
25.5	Chain B: HT40 - #151			36.6
26.5	Chain B: HT40 - #159			36.6

Note 1:	99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB
Note 2:	Requirement is that the 6dB bandwidth be greater than 500kHz. Only chain A bandwidth was measured as representative of both chains given that the signal bandwidth far exceeds the minimum required and the similarity of the signal on each chain.



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A





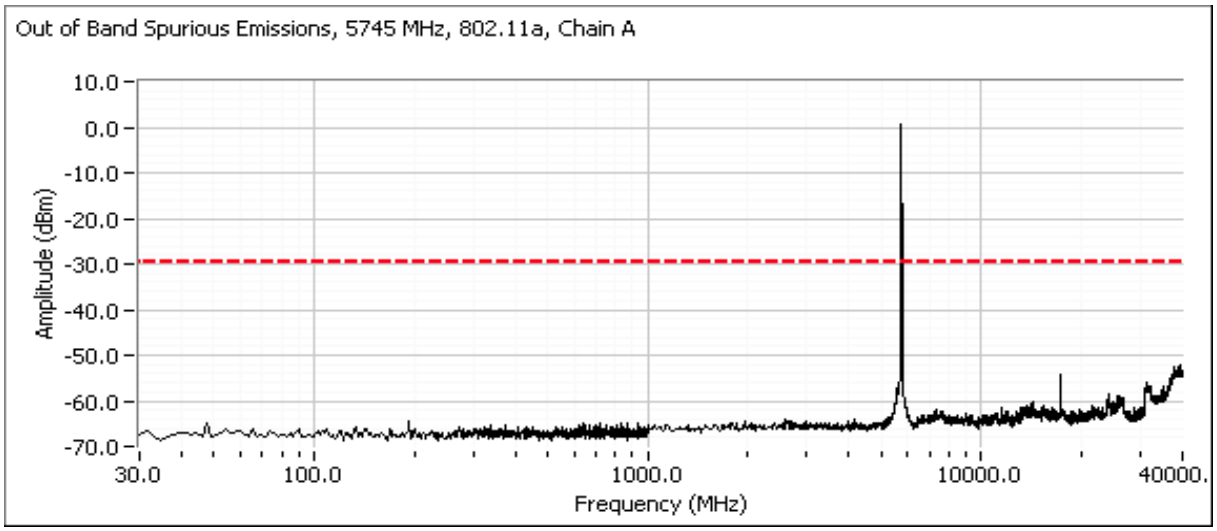
Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

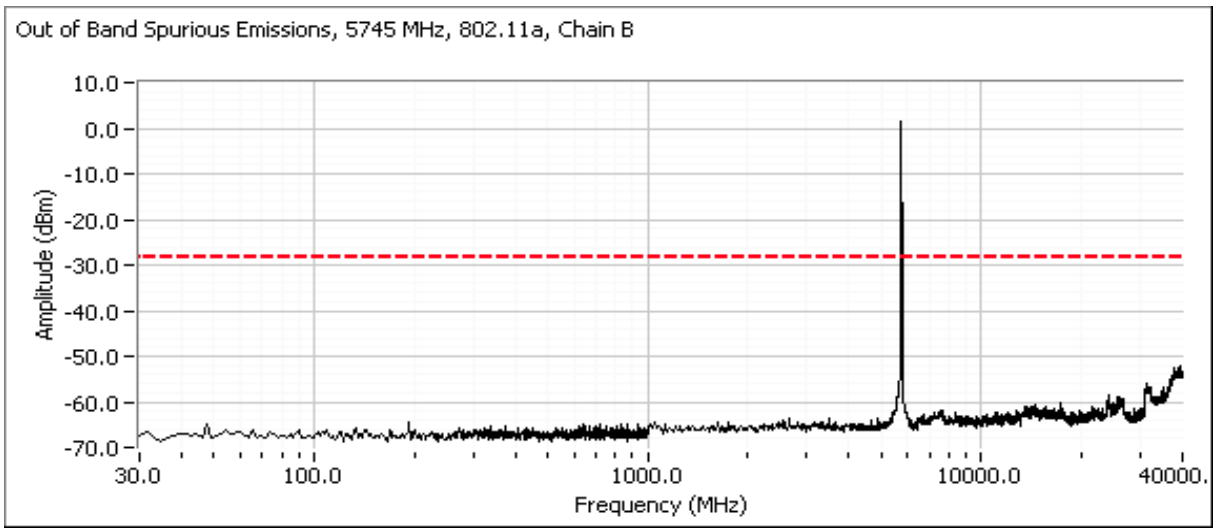
Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
5745, 5755	-30dBc	Pass
5785	-30dBc	Pass
5795, 5825	-30dBc	Pass

802.11a Mode, Chains A and B

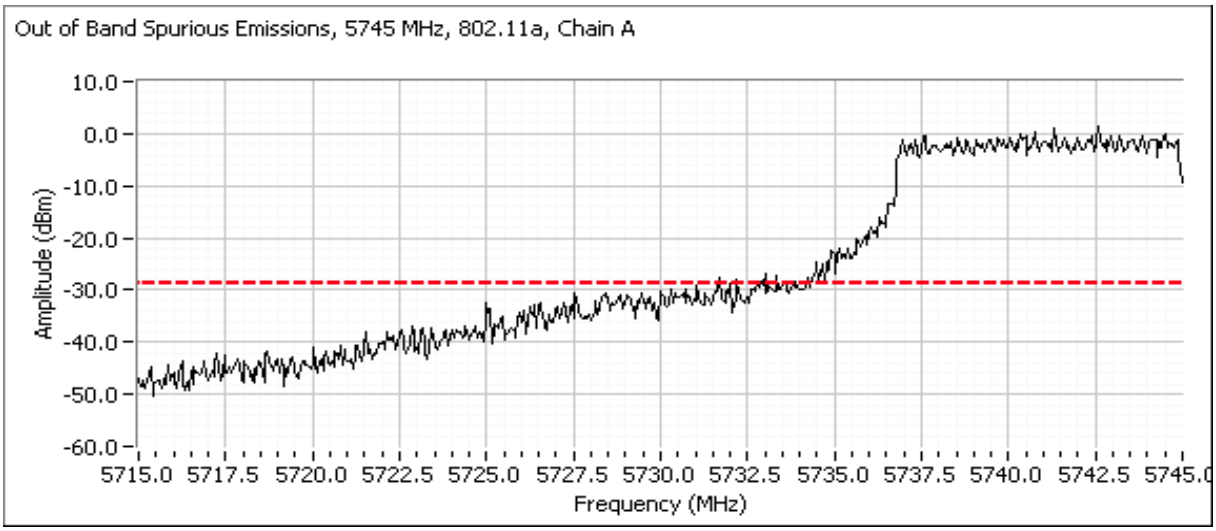
Plots for low channel, power setting(s) , A=24.5, B=25.0

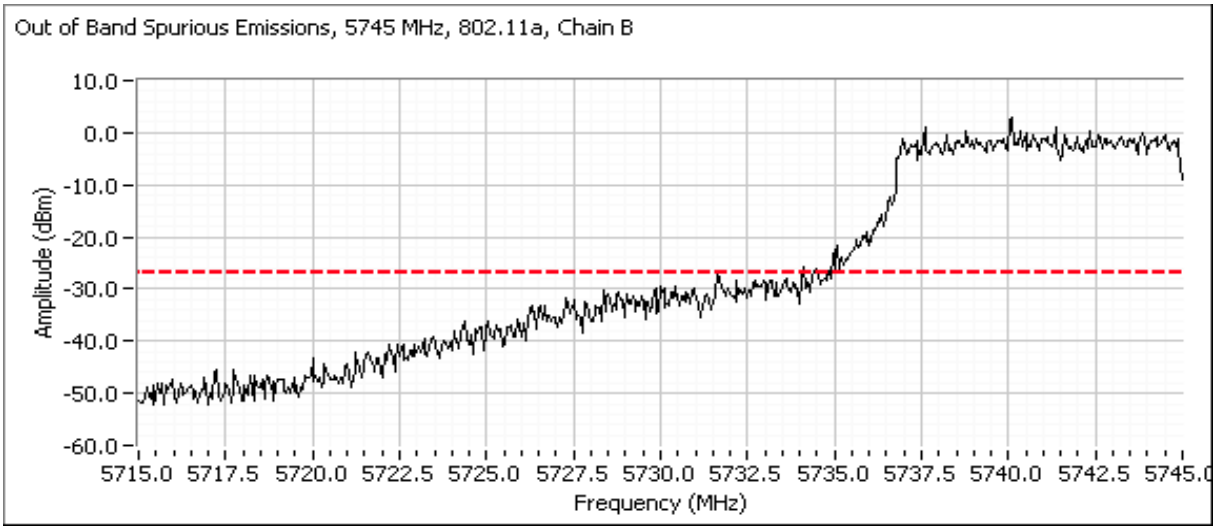




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

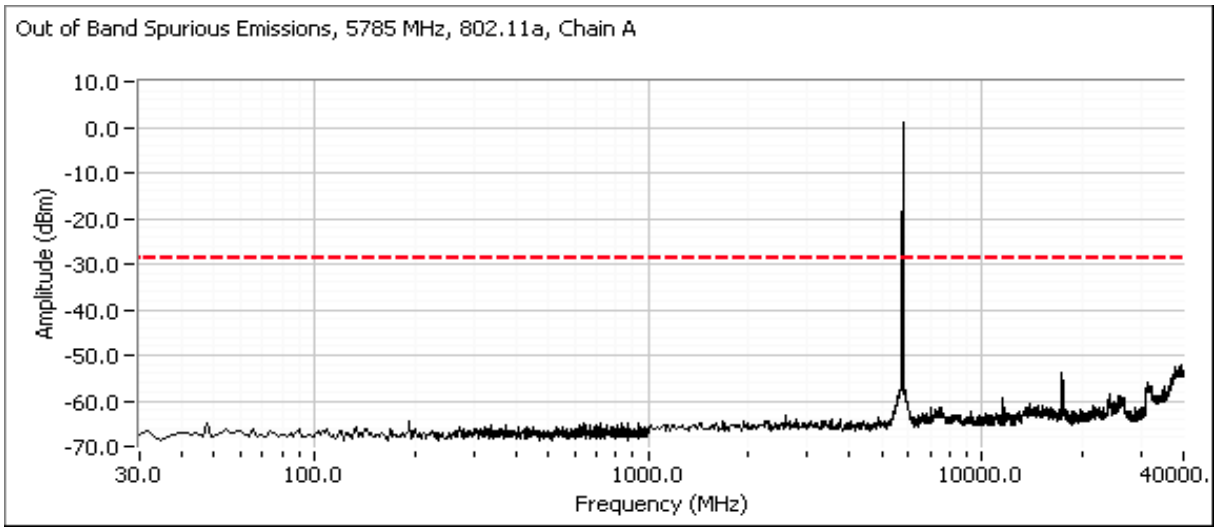
Additional plot from 5715 - 5745 MHz showing compliance with -30dBc at the band edge.

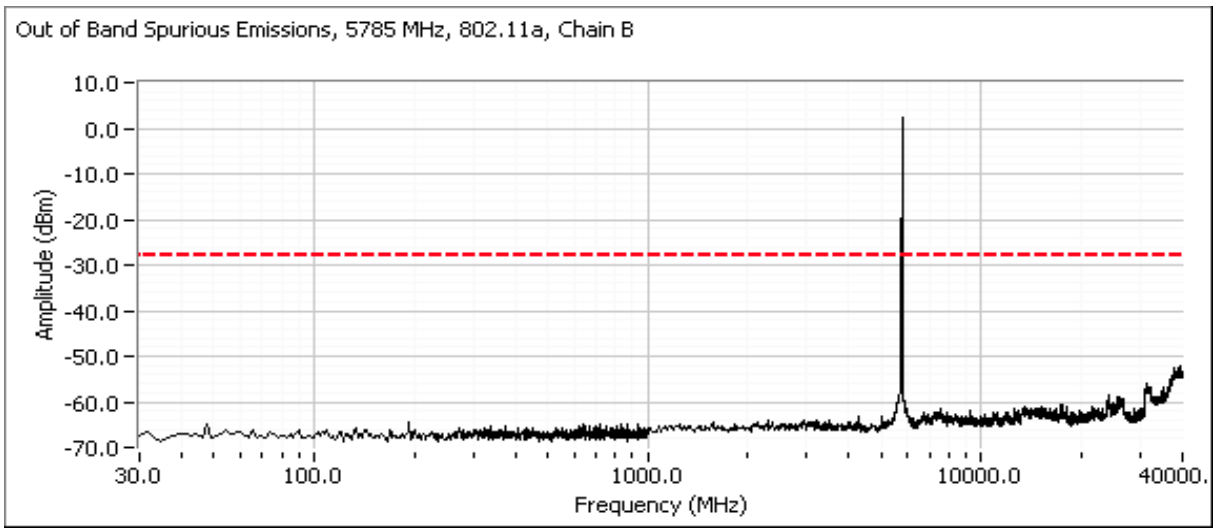




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

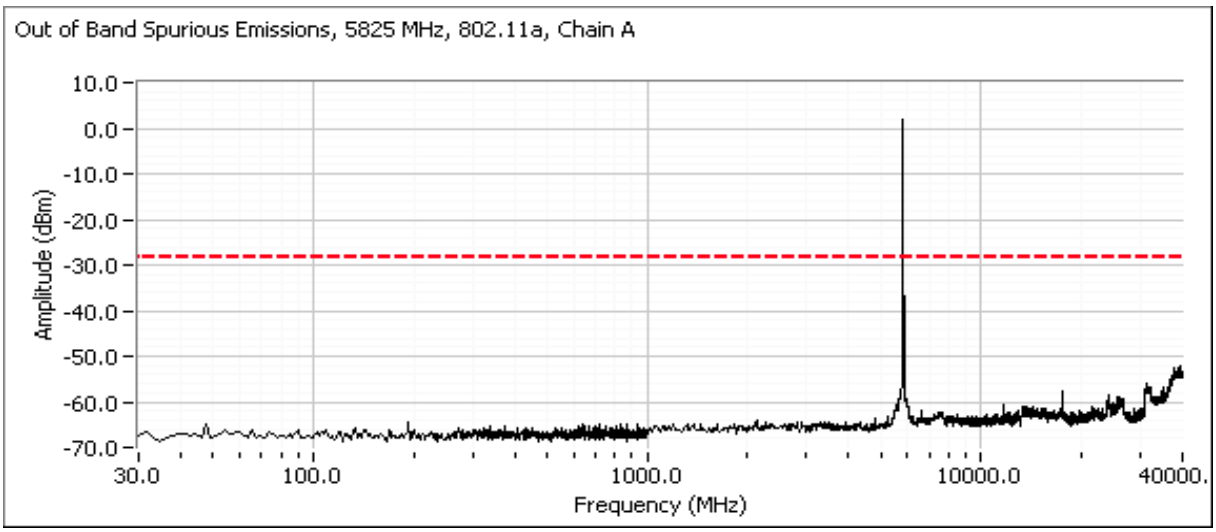
Plots for center channel, power setting(s), A=25.0, B = 25.5

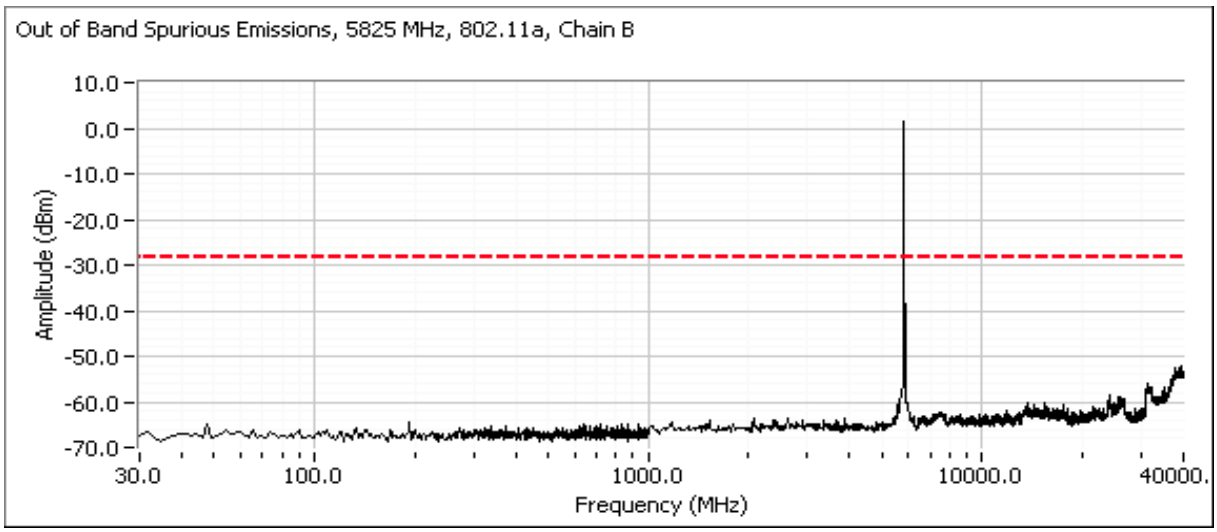




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

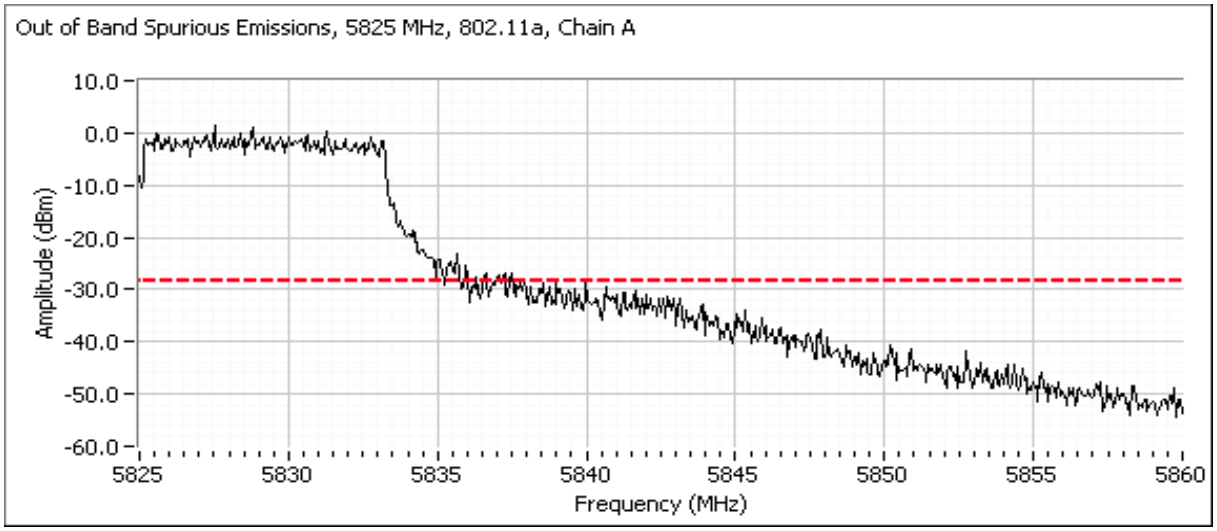
Plots for high channel, power setting(s), A=25.5, B=26.5

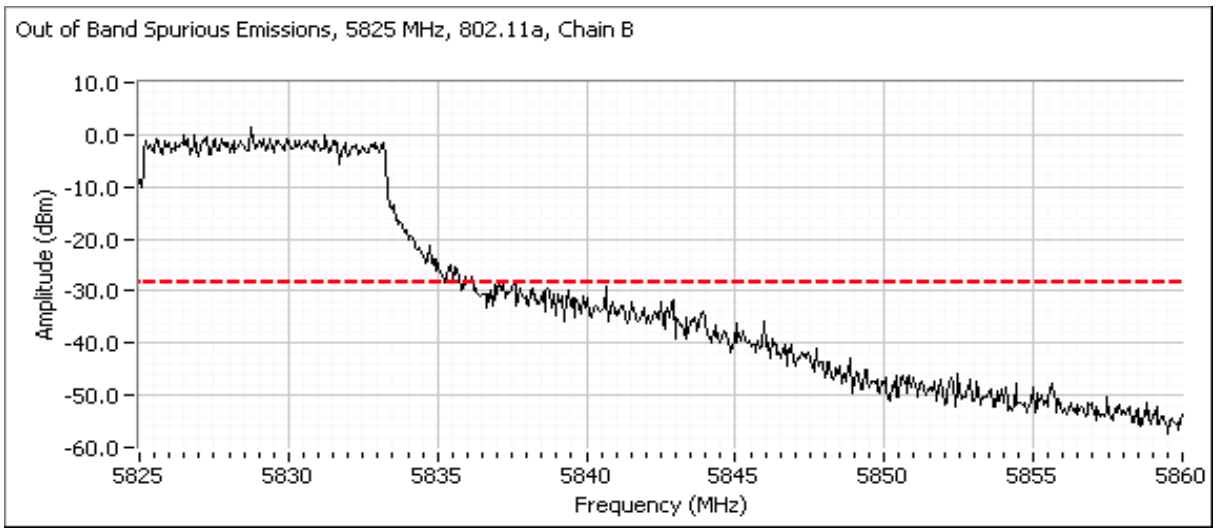




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Additional plot from 5825 - 5860 MHz showing compliance with -30dBc at the band edge.

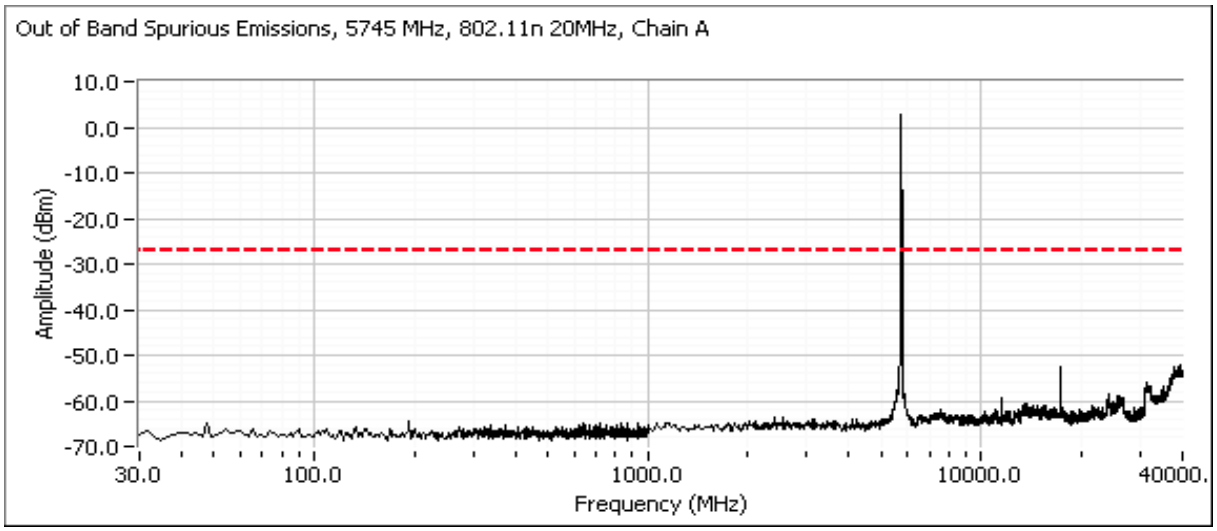


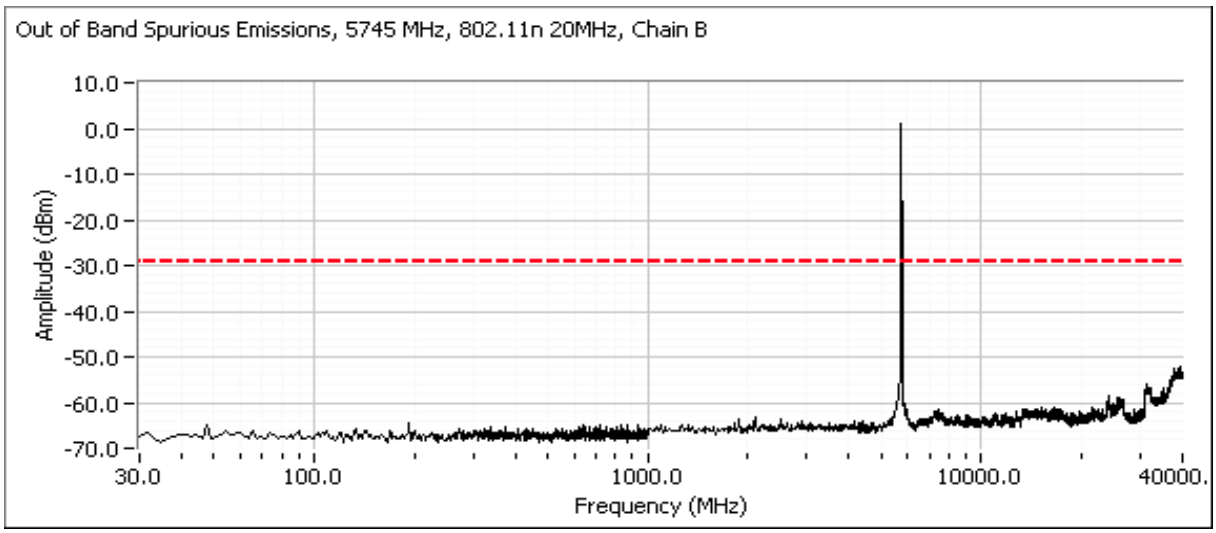


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

HT20 Mode, Chains A and B

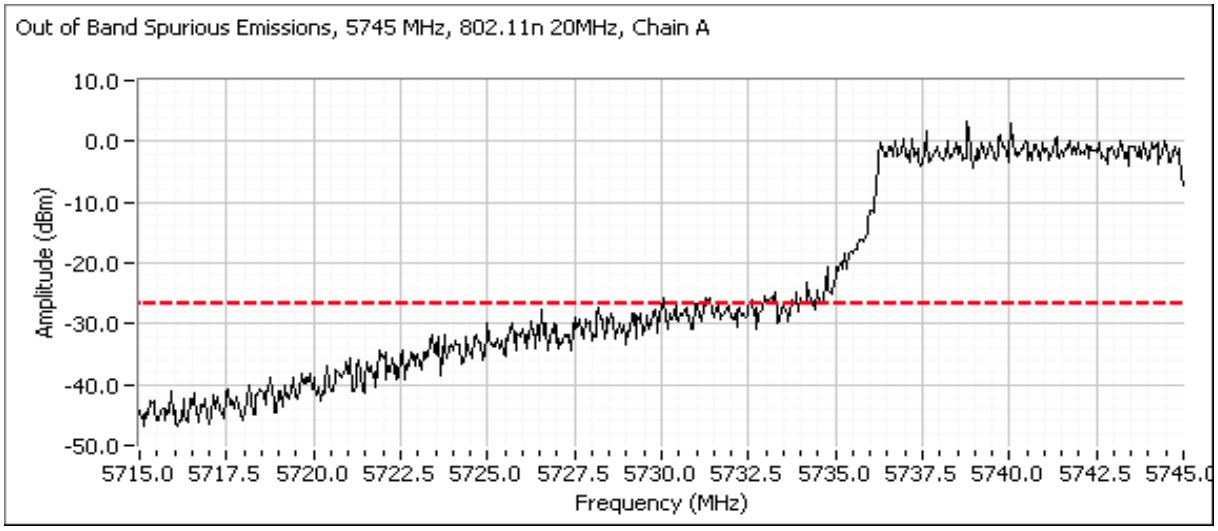
Plots for low channel, power setting(s), A =25.0, B=25.5

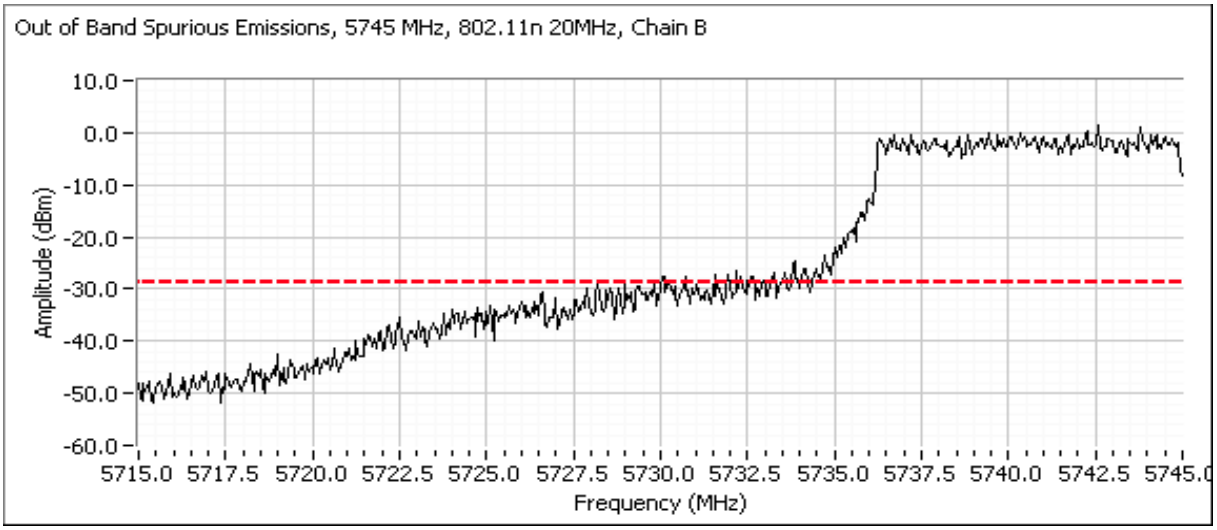




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

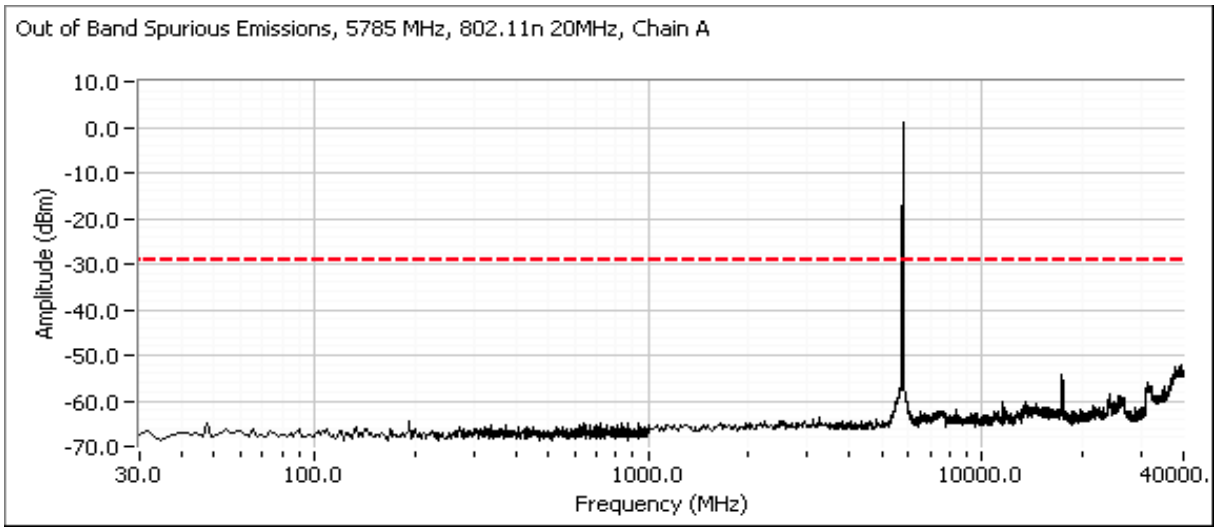
Additional plot from 5715 - 5755 MHz showing compliance with -30dBc at the band edge.

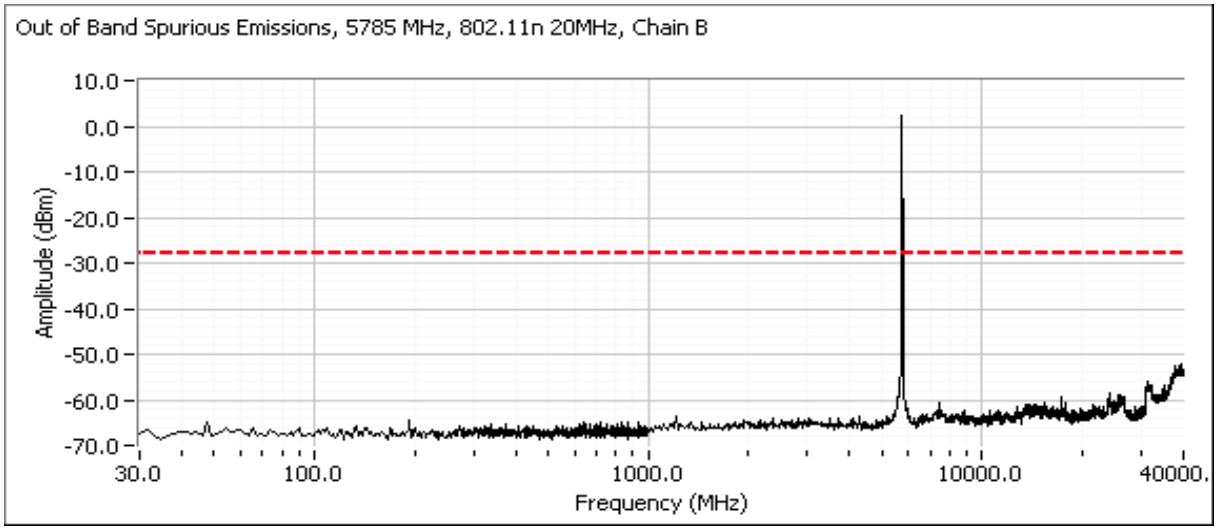




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

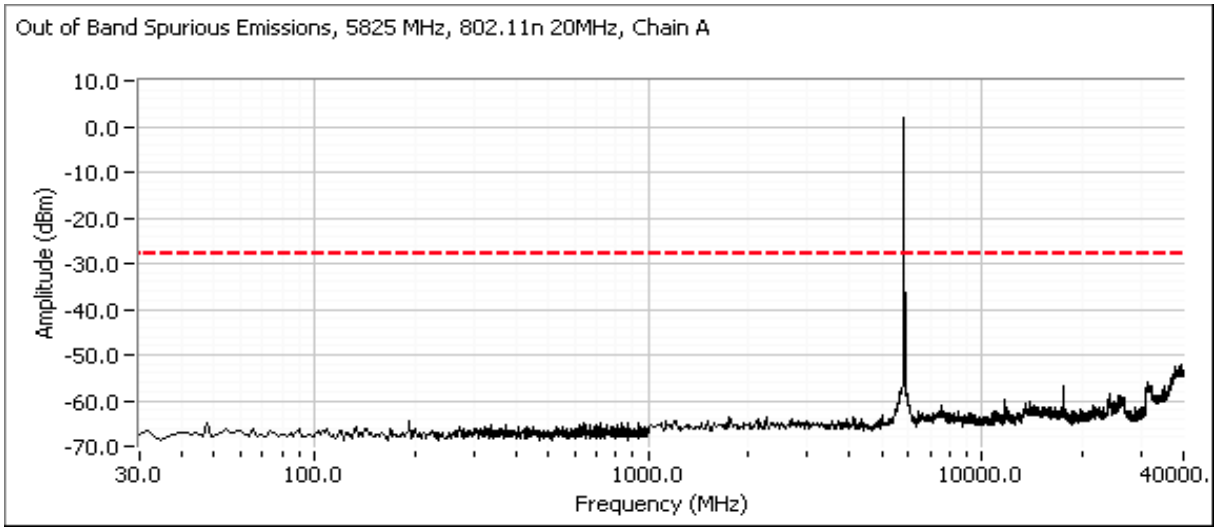
Plots for center channel, power setting(s), A=25.0, B=26.0

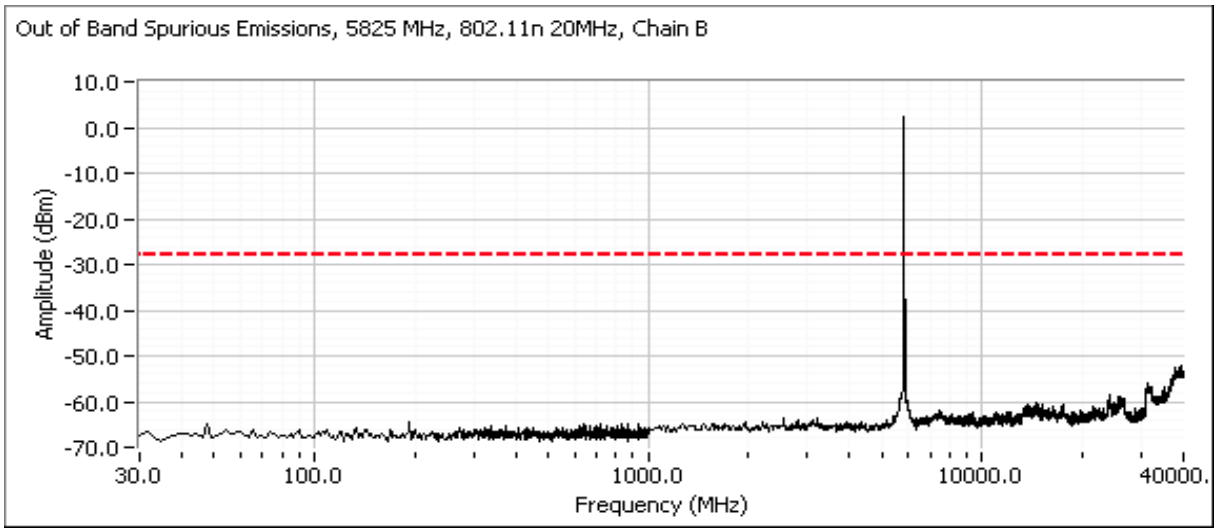




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

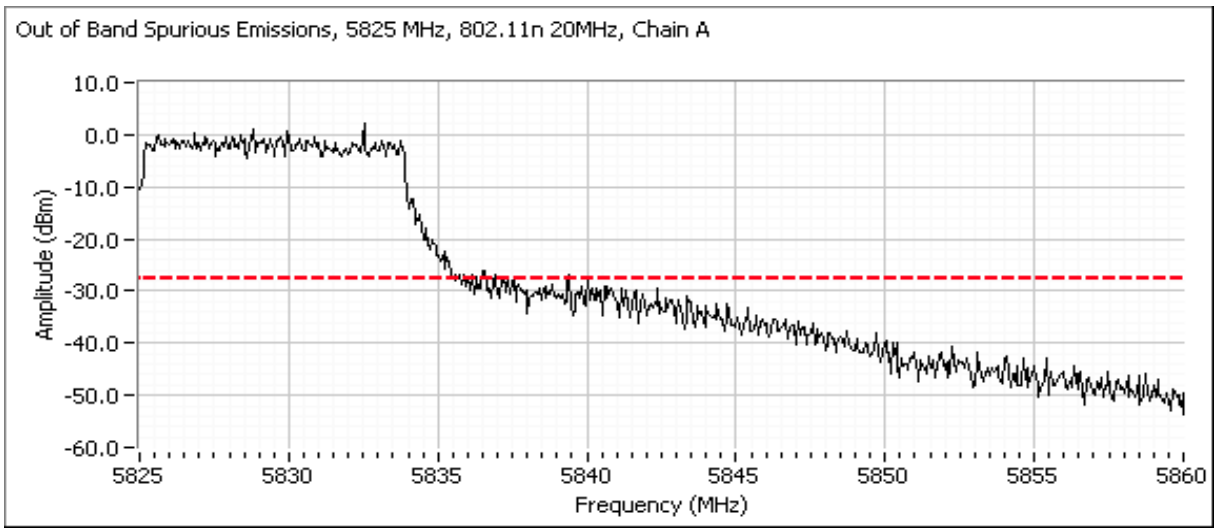
Plots for high channel, power setting(s), A 25.5, B=26.5

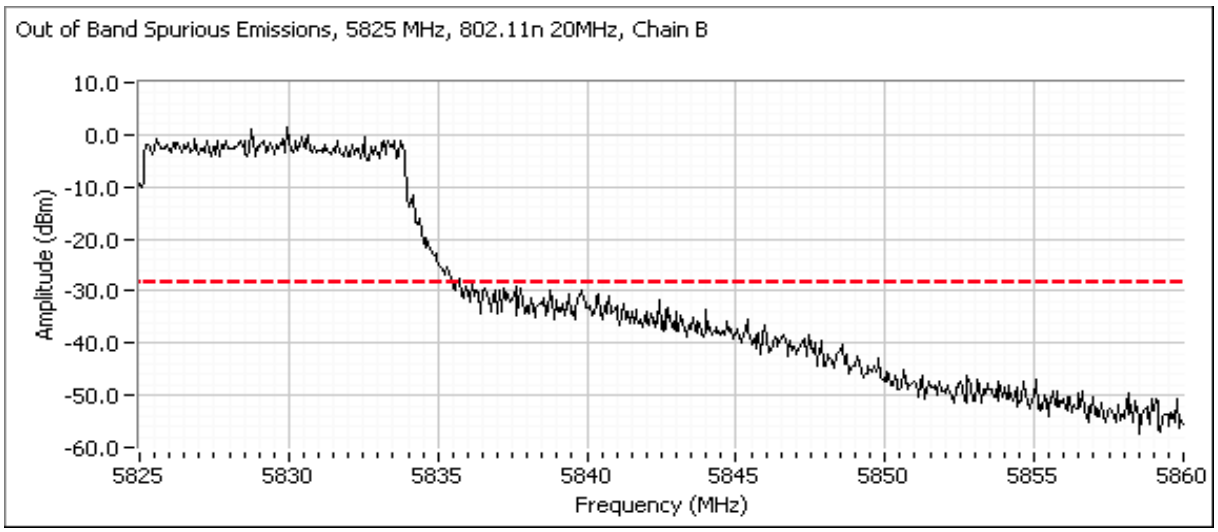




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Additional plot from 5820 - 5860 MHz showing compliance with -30dBc at the band edge.

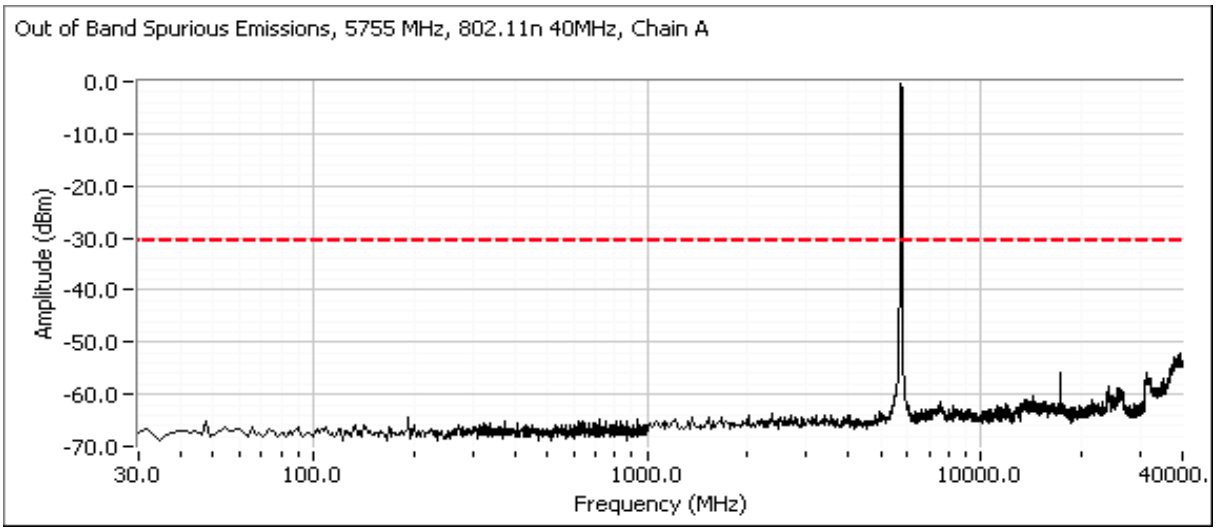


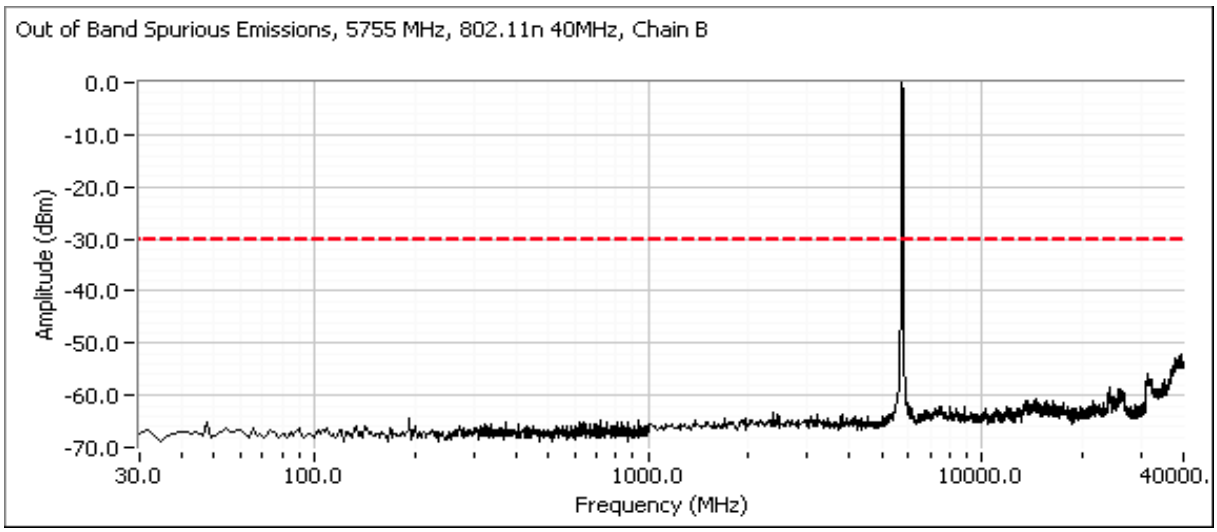


Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

HT40 Mode, Chains A and B

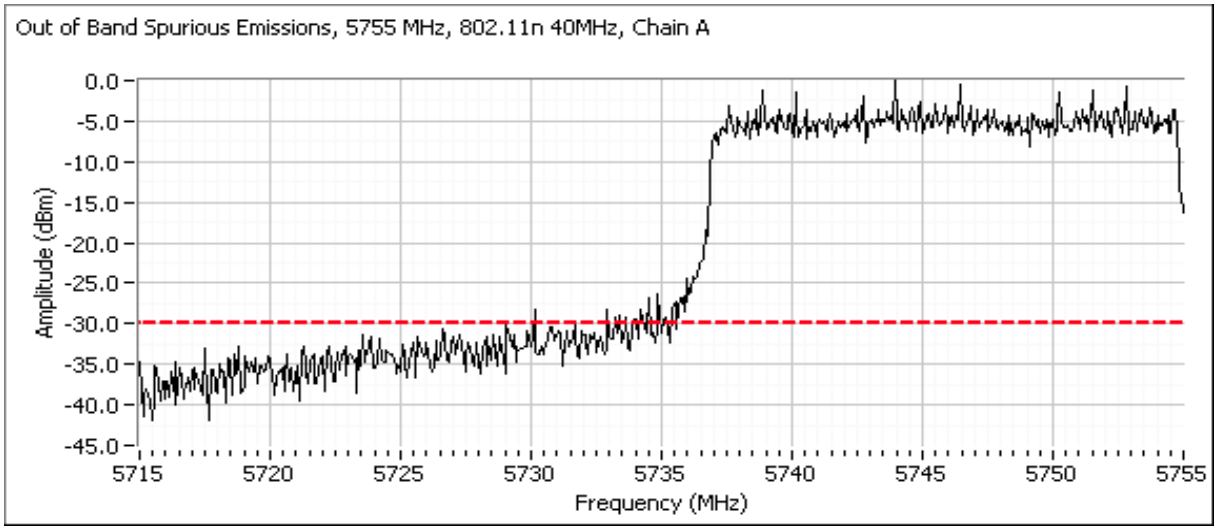
Plots for low channel, power setting(s) ,A =25.0, B = 25.5

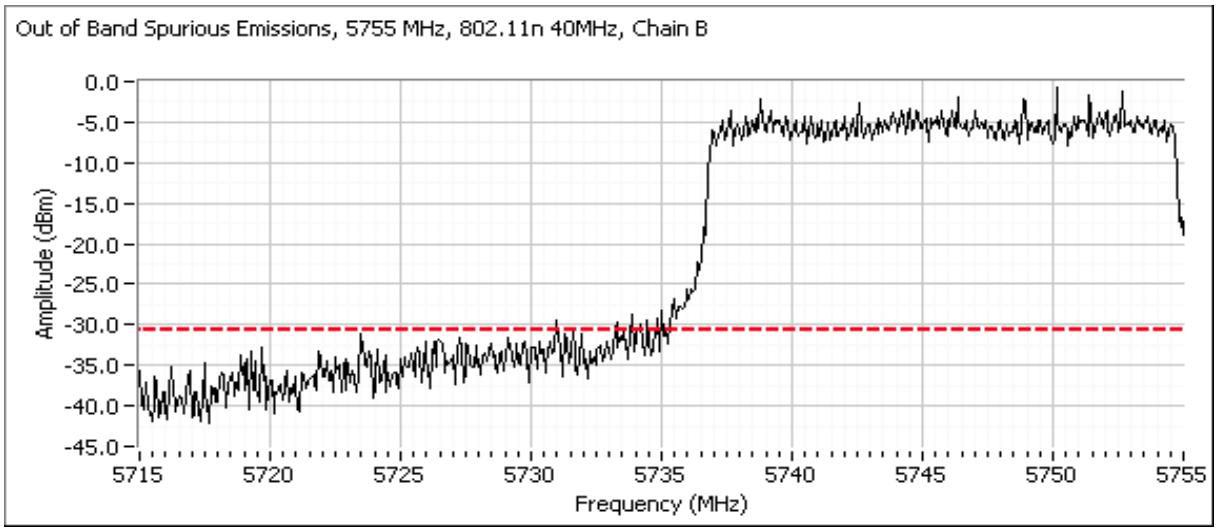




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

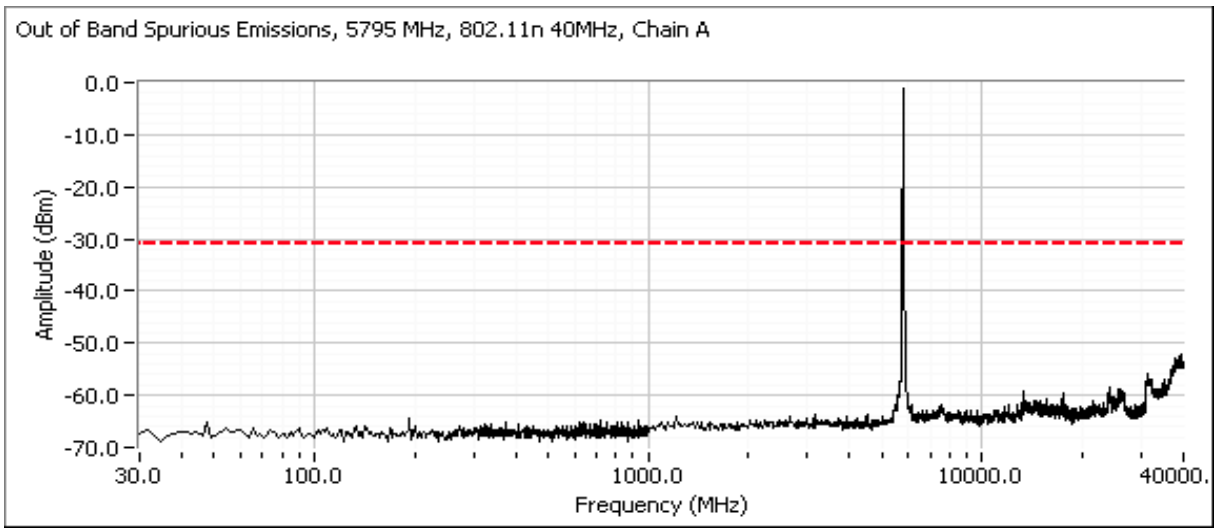
Additional plot from 5715 - 5755 MHz showing compliance with -30dBc at the band edge.

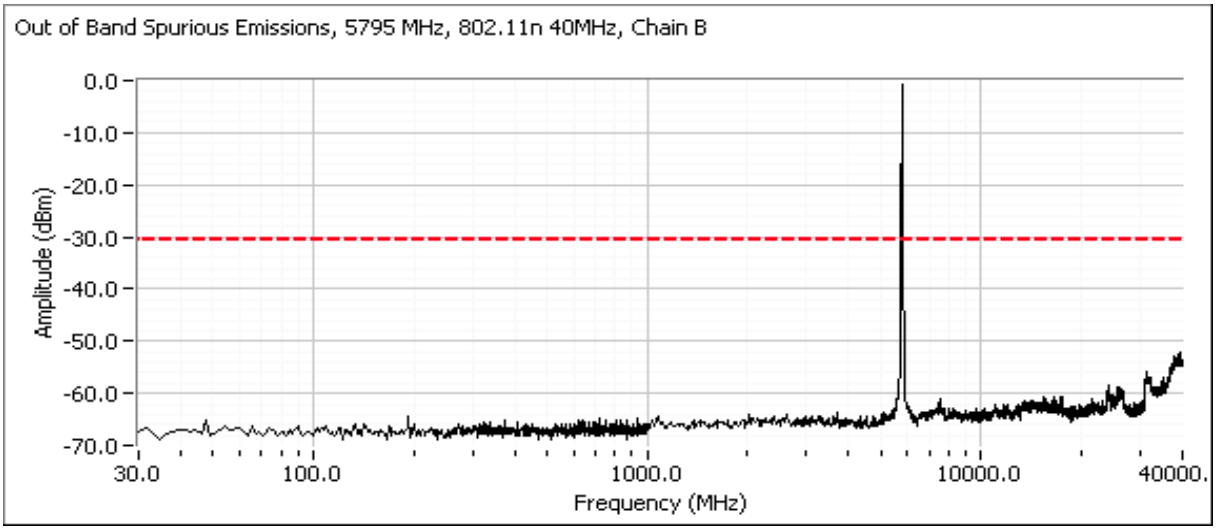




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

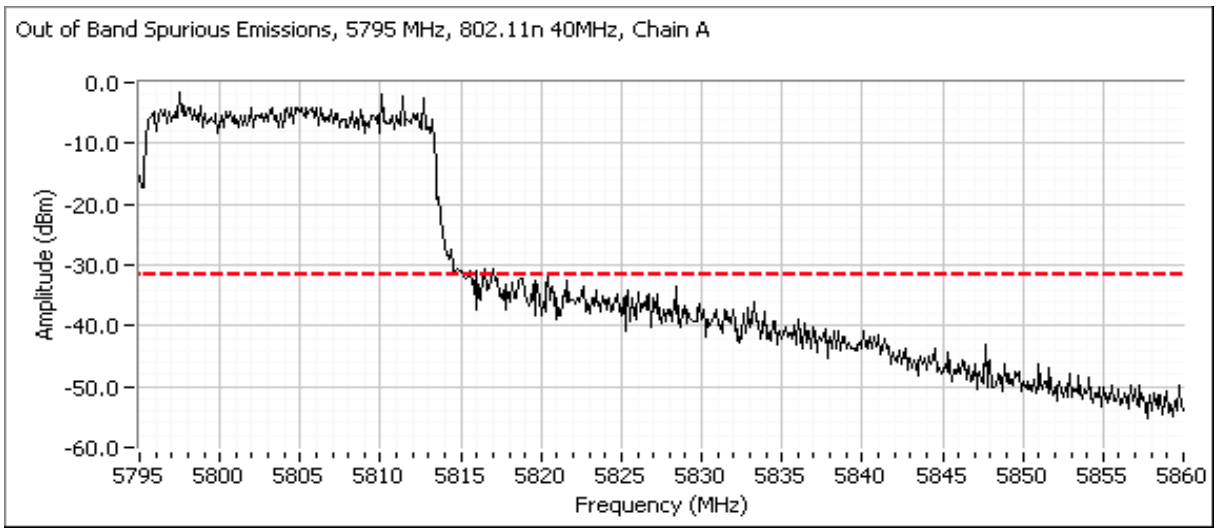
Plots for high channel, power setting(s), A = 25.5, B = 26.5

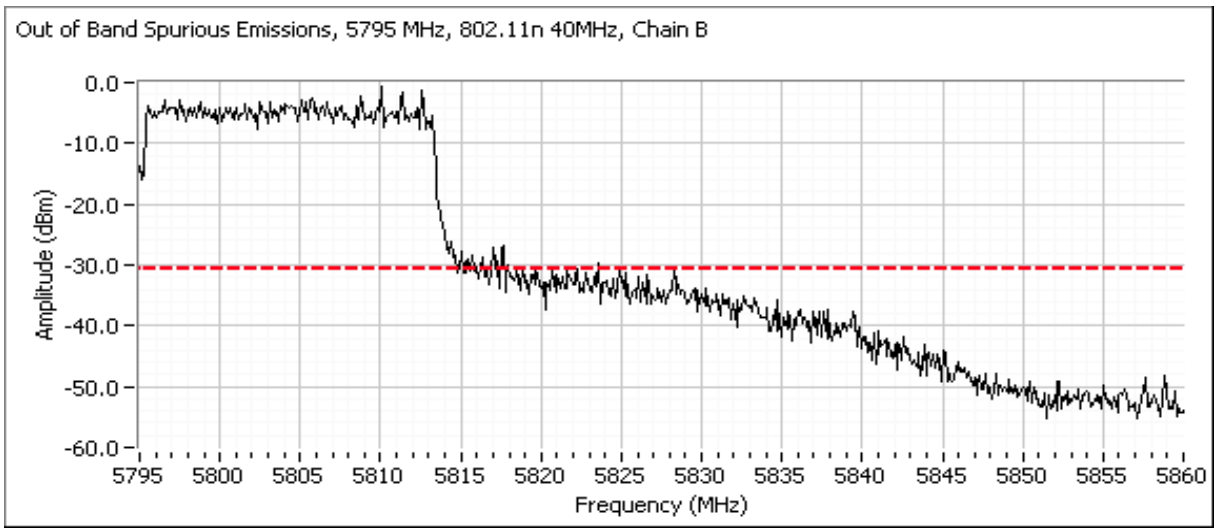




Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Additional plot from 5820 - 5860 MHz showing compliance with -30dBc at the band edge.





Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements
MIMO and Smart Antenna Systems - Power and PSD

Test Specific Details

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

Date of Test: 9/3/2009
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 21.2 °C
Rel. Humidity: 43 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power Chain A + B	15.247(b)	Pass	HT20: 14.6 dBm HT40: 14.4 dBm
2	Power spectral Density (PSD) Chain A + B	15.247(d)	Pass	HT20: -11.4 dBm/3kHz HT40:-13.4 dBm/3kHz
-	6dB Bandwidth	15.247(a)		Covered by single-chain measurements at higher power per chain
-	99% Bandwidth	RSS GEN	-	
-	Spurious emissions	15.247(b)		

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.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1: Output Power - Chain A + B

Transmitted signal on chain is coherent ? no

5745 MHz HT20	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.8	13.8						
Output Power (dBm) Note 1	11.6	11.5			14.6 dBm	0.029 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	5.0	5.0				5.0 dBi	Pass	
eirp (dBm) Note 2	16.6	16.5			19.6 dBm	0.090 W		

5785 MHz HT20	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.7	13.8						
Output Power (dBm) Note 1	10.7	11.2			14.0 dBm	0.025 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	5.0	5.0				5.0 dBi	Pass	
eirp (dBm) Note 2	15.7	16.2			19.0 dBm	0.079 W		

5825 MHz HT20	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.6	13.7						
Output Power (dBm) Note 1	11.2	11.3			14.3 dBm	0.027 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	5.0	5.0				5.0 dBi	Pass	
eirp (dBm) Note 2	16.2	16.3			19.3 dBm	0.084 W		

5755 MHz HT40	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.8	13.8						
Output Power (dBm) Note 1	11.5	11.3			14.4 dBm	0.028 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	5.0	5.0				5.0 dBi	Pass	
eirp (dBm) Note 2	16.5	16.3			19.4 dBm	0.087 W		

5795 MHz HT40	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting/Average power Note 3	13.6	13.6						
Output Power (dBm) Note 1	11.6	11.1			14.4 dBm	0.027 W	30.0 dBm	1.000 W
Antenna Gain (dBi) Note 2	5.0	5.0				5.0 dBi	Pass	
eirp (dBm) Note 2	16.6	16.1			19.4 dBm	0.086 W		

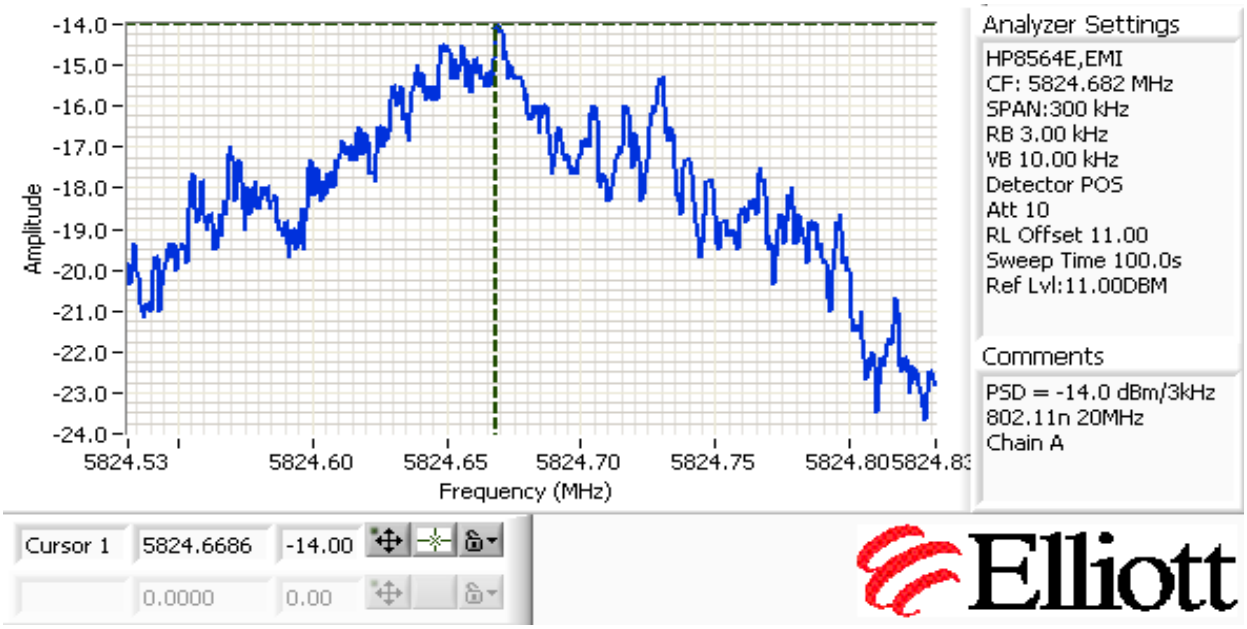
Note 1:	Output power measured using a spectrum analyzer (see plots below): RBW=1MHz, VB=3 MHz, sample detector, power averaging on (transmitted signal was continuous) and power integration over >=80 MHz for n40 mode and >=40MHz for b, g and n20 modes. Spurious limit is -30dBc because this method was used.
Note 2:	Antenna gain in dBi
Note 3:	Power measured using average power meter and is included for reference only.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

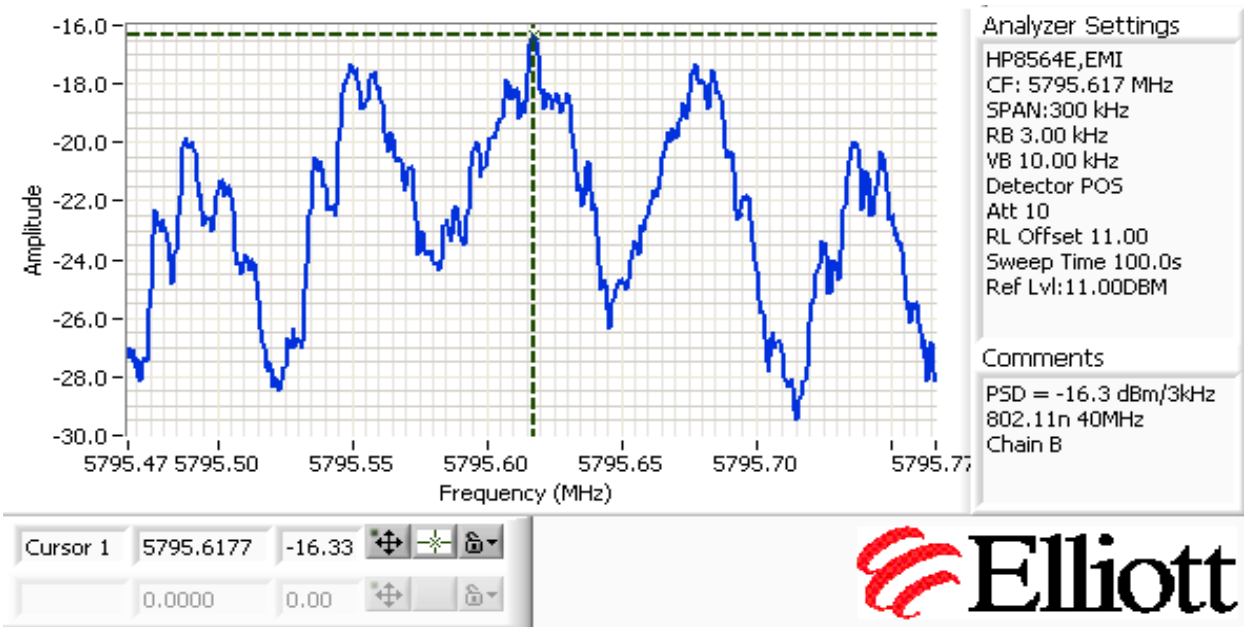
Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1 Chain 1	Chain 2	Chain 3	Chain 4	Total	Limit dBm/3kHz	Result
23.5/24.0	5745 HT20	-14.7	-14.8			-11.7	8.0	Pass
23.5/24.5	5785 HT20	-15.2	-14.5			-11.8	8.0	Pass
24.0/25.0	5825 HT20	-14.0	-14.8			-11.4	8.0	Pass
23.5/24.0	5755 HT40	-16.5	-16.5			-13.5	8.0	Pass
24.0/24.5	5795 HT40	-16.5	-16.3			-13.4	8.0	Pass

Note 1:	Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A



Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

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

Date of Test: 8/25, 26/2009
Test Engineer: Rafael / Suhaila
Test Location: FT Chamber #4

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

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: 22.4 °C
Rel. Humidity: 41 %

Summary of Results

Sample #2 MAC Address: 00150059F23C; CRTU Tool Version 5.199.36.999, Driver Version 13.0.0.91

Run #	Mode	Channel	Target Power	Measured Power	Test Performed	Limit	Result / Margin
1 (Determine worst case mode)	802.11n20 A+B	#157 5785 MHz	16.5dBm per chain	A: 16.7 dBm B: 16.7 dBm	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15.247	39.6dBµV/m @ 11569.9MHz (-14.4dB)
	802.11a Chain A	#157 5785 MHz	16.5 dBm	16.7 dBm			41.3dBµV/m @ 11570.0MHz (-12.7dB)
	802.11a Chain B	#157 5785 MHz	16.5 dBm	16.6 dBm			52.4dBµV/m @ 3000.1MHz (-21.6dB)
	802.11n40 A+B	#159 5795 MHz	16.5dBm per chain	A: 16.6 dBm B: 16.7 dBm			40.0dBµV/m @ 11593.2MHz (-14.0dB)
2	802.11n20 A+B or 802.11a A or B	#149 5745 MHz	16.5 dBm	16.7	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15.247	38.3dBµV/m @ 11490.0MHz (-15.7dB)
		#165 5825 MHz	16.5 dBm	16.8	Radiated Emissions, 1 - 40 GHz	FCC 15.209 / 15.247	43.4dBµV/m @ 11650MHz (-10.6dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

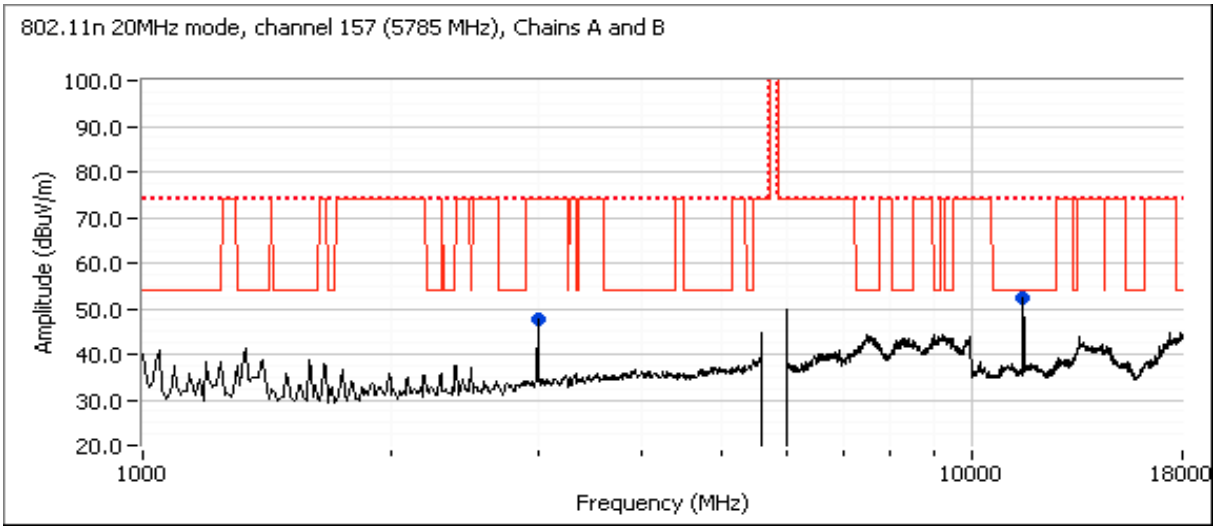
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5725-5850 MHz Band
Preliminary tests on center channel in the 5725-5850 MHz band to determine the worst case mode.
Run #1a: 802.11n 20MHz mode, channel 157 (5785 MHz), Chains A and B active at 16.5dBm each chain

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.7	27.0
B	16.5	16.7	28.0



Spurious Radiated Emissions:

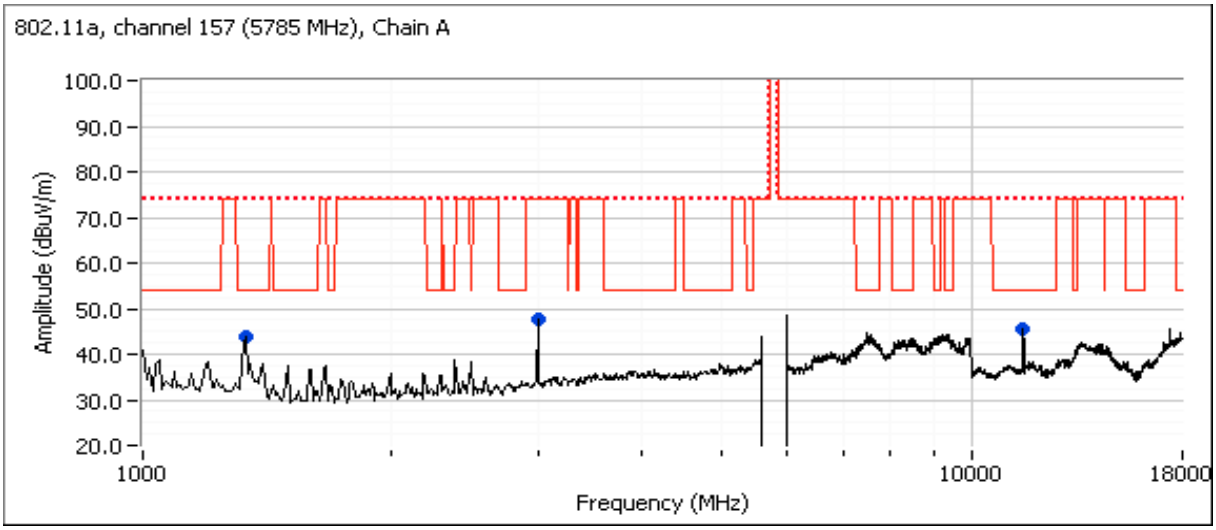
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11569.850	39.6	V	54.0	-14.4	AVG	301	1.4	. MHz; VB: 10 Hz
11570.050	53.6	V	74.0	-20.4	PK	301	1.4	MHz; VB: 1 MHz
3000.380	47.5	V	74.0	-26.5	AVG	191	1.0	. MHz; VB: 10 Hz
3000.200	51.3	V	74.0	-22.7	PK	191	1.0	MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc … refer to conducted plots.
Note 2:	A scan using the measurement antenna within 0.5m of the device indicated no emissions from 18 - 40GHz.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1b: 802.11a, channel 157 (5785 MHz), Chain A at 16.5dBm

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.7	26.0



Spurious Radiated Emissions:

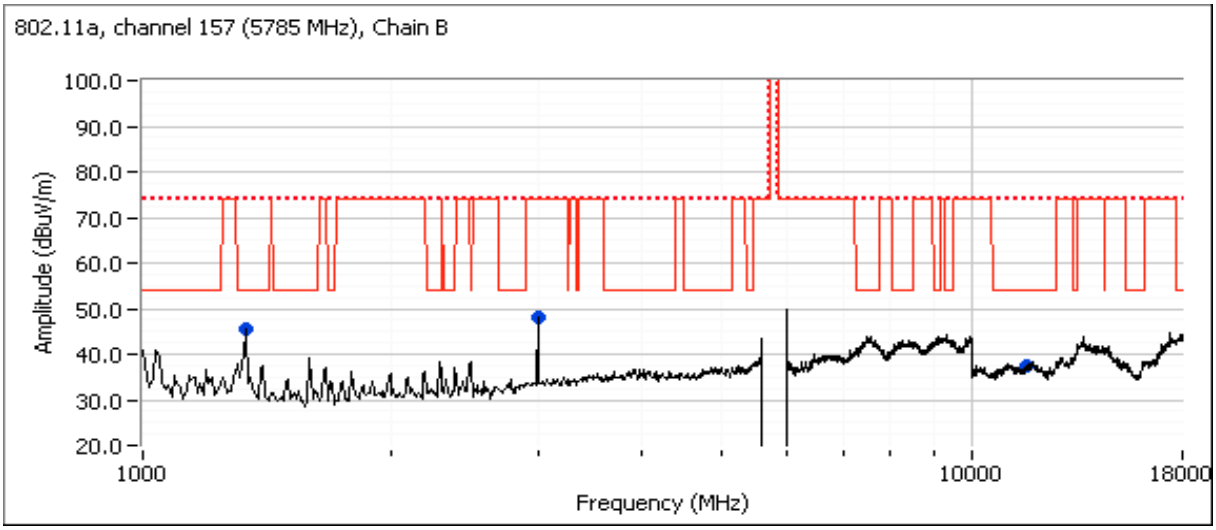
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11570.030	41.3	V	54.0	-12.7	AVG	140	1.1	. MHz; VB: 10 Hz
11569.090	53.1	V	74.0	-20.9	PK	140	1.1	MHz; VB: 1 MHz
1328.150	29.2	V	54.0	-24.8	AVG	256	1.3	. MHz; VB: 10 Hz
1328.020	50.2	V	74.0	-23.8	PK	256	1.3	MHz; VB: 1 MHz
3000.330	44.9	V	74.0	-29.1	AVG	291	1.0	. MHz; VB: 10 Hz
3000.190	49.5	V	74.0	-24.5	PK	291	1.0	MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc … refer to conducted plots.
Note 2:	A scan using the measurement antenna within 0.5m of the device indicated no emissions from 18 - 40GHz.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1c: 802.11a, channel 157 (5785 MHz), Chain B at 16.5dBm

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.6	26.0



Spurious Radiated Emissions:

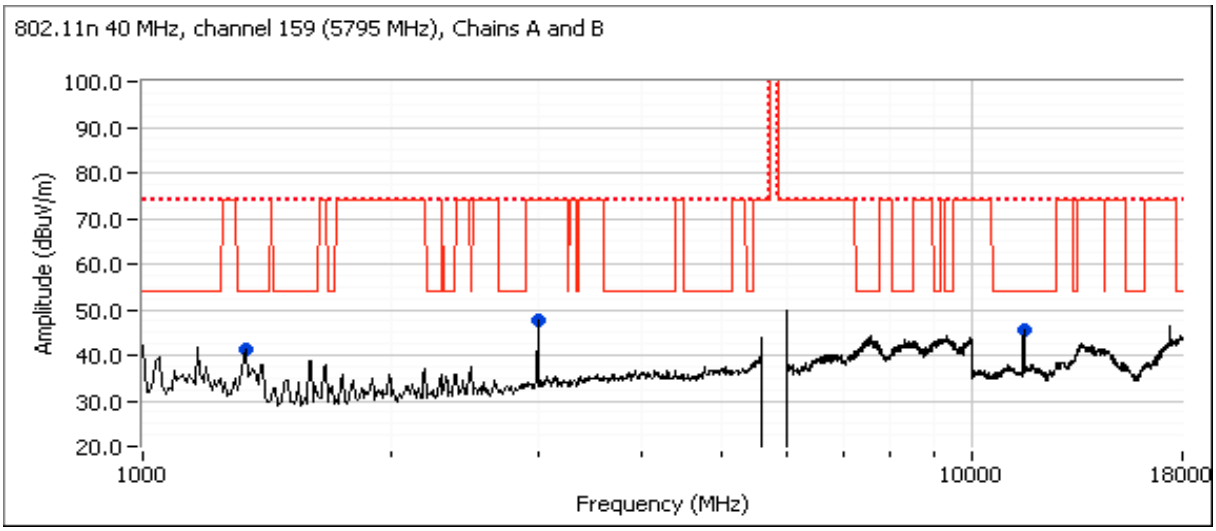
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3000.130	52.4	V	74.0	-21.6	PK	189	1.0	MHz; VB: 1 MHz
3000.260	48.8	V	74.0	-25.2	AVG	189	1.0	MHz; VB: 10 Hz
11570.000	30.4	V	54.0	-23.6	AVG	166	1.0	MHz; VB: 10 Hz
11570.830	42.9	V	74.0	-31.1	PK	166	1.0	MHz; VB: 1 MHz
1329.910	30.3	V	54.0	-23.7	AVG	97	1.0	MHz; VB: 10 Hz
1349.910	47.9	V	74.0	-26.1	PK	97	1.0	MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc … refer to conducted plots.
Note 2:	A scan using the measurement antenna within 0.5m of the device indicated no emissions from 18 - 40GHz.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #1d: 802.11n 40 MHz, channel 159 (5795 MHz), Chains A and B at 16.5dBm each chain

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.6	27.0
B	16.5	16.7	27.5



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	
11593.220	40.0	V	54.0	-14.0	AVG	131	1.1	. MHz; VB: 10 Hz
11590.150	52.9	V	74.0	-21.1	PK	131	1.1	MHz; VB: 1 MHz
3000.260	47.2	V	74.0	-26.8	AVG	188	1.0	. MHz; VB: 10 Hz
3000.190	50.8	V	74.0	-23.2	PK	188	1.0	MHz; VB: 1 MHz
1327.350	26.6	V	54.0	-27.4	AVG	311	1.0	. MHz; VB: 10 Hz
1330.220	45.5	V	74.0	-28.5	PK	311	1.0	MHz; VB: 1 MHz

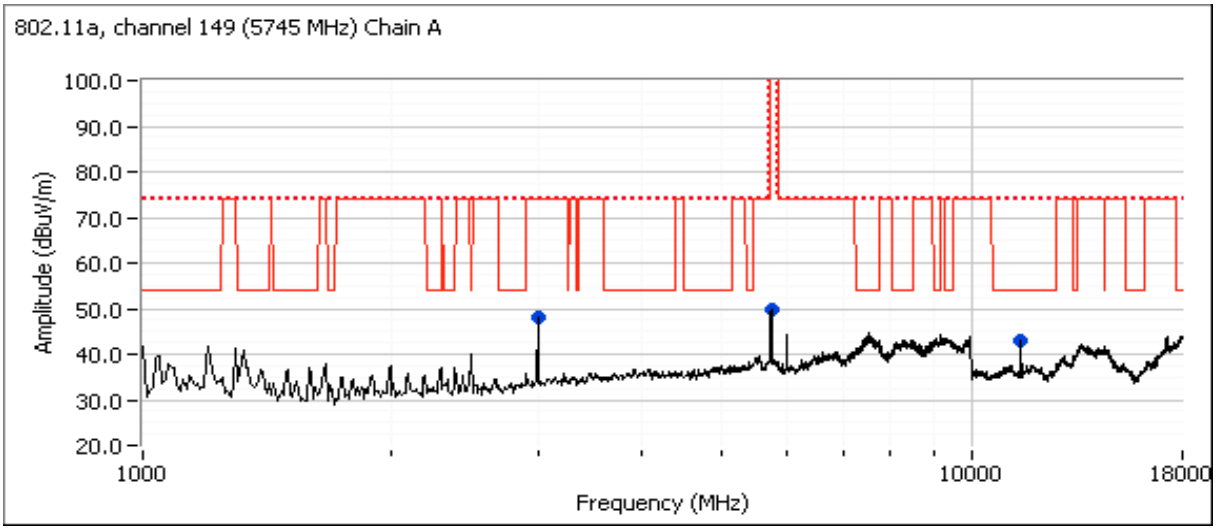
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc … refer to conducted plots.
Note 2:	A scan using the measurement antenna within 0.5m of the device indicated no emissions from 18 - 40GHz.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #2, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5725 - 5850 MHz Band
Measurements on the bottom and top channels on the worst case mode.

Run #2a: 802.11a mode, channel 149 (5745 MHz), Chain A active at 16.5dBm

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.7	25.0



Spurious Radiated Emissions:

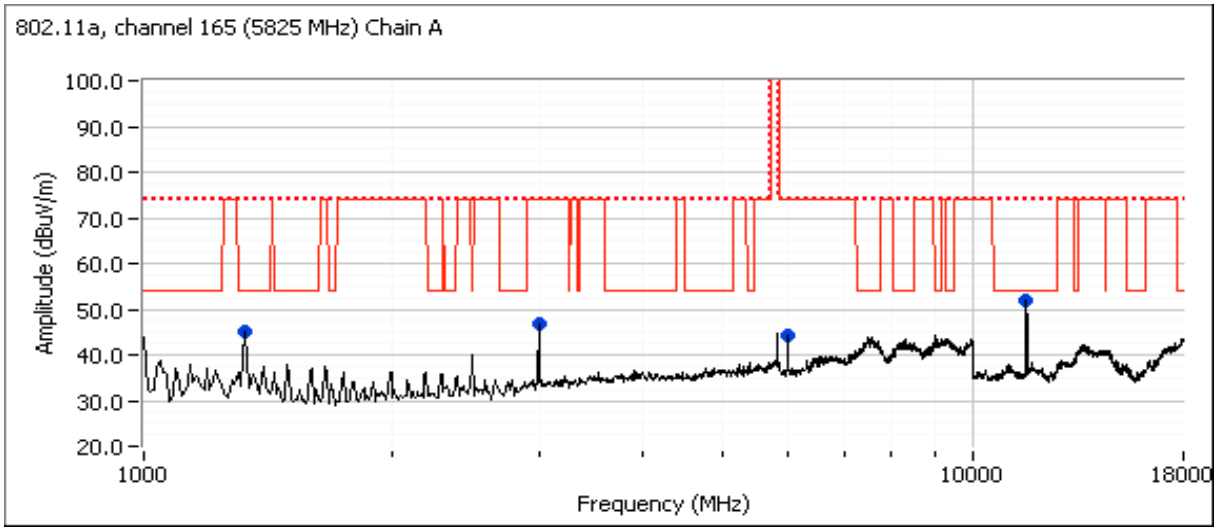
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11489.960	38.3	V	54.0	-15.7	AVG	178	1.3	RB 1 MHz; VB: 10 Hz
11486.220	51.3	V	74.0	-22.7	PK	178	1.3	RB 1 MHz; VB: 1 MHz
2999.330	48.2	V	74.0	-25.8	Peak	255	1.0	
5745.000	50.0	V	-	-	Peak	206	1.3	Fundamental

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc … refer to conducted plots.
Note 2:	A scan using the measurement antenna within 0.5m of the device indicated no emissions from 18 - 40GHz.

Client:	Intel	Job Number:	J75722
Model:	2x2 WiFi with WiMax MiniPCI	T-Log Number:	T76370
		Account Manager:	-
Contact:	S. Hackett		
Standard:	RSS 210 / FCC 15.247	Class:	N/A

Run #2b: 802.11a mode, channel 165 (5825 MHz), Chain A active at 16.5dBm

Chain	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
A	16.5	16.8	25.5



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	
11650.130	43.4	V	54.0	-10.6	AVG	139	1.0	. MHz; VB: 10 Hz
11650.870	55.1	V	74.0	-18.9	PK	139	1.0	MHz; VB: 1 MHz
1329.960	34.9	V	54.0	-19.1	AVG	95	1.0	. MHz; VB: 10 Hz
1329.520	58.5	V	74.0	-15.5	PK	95	1.0	MHz; VB: 1 MHz
2998.330	46.6	V	74.0	-27.4	Peak	253	1.9	
5995.830	44.1	V	74.0	-29.9	Peak	147	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc … refer to conducted plots.
Note 2:	A scan using the measurement antenna within 0.5m of the device indicated no emissions from 18 - 40GHz.

Appendix C Photographs of Test Configurations

Uploaded as a separate exhibit

Appendix D Proposed FCC ID Label & Label Location

Uploaded as a separate exhibit

Appendix E Detailed Photographs

Uploaded as a separate exhibit

Appendix F Operator's Manual

Uploaded as a separate exhibit

Appendix G Block Diagram

Uploaded as a separate exhibit

Appendix H Schematic Diagrams

Uploaded as a separate exhibit

Appendix I Theory of Operation

Uploaded as a separate exhibit

Appendix J RF Exposure Information

Uploaded as a separate exhibit