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EMC Test Report

Application for Grant of Equipment Authorization

Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
FCC Part 15 Subpart C

Model: PBA5001

FCC ID:	PD9PBA5001
IC CERTIFICATION #	1000M-PBA5001
APPLICANT:	Intel Mobile Communications 100 Center Point Circle Suite 200 Columbia, SC 29210
TEST SITE(S):	National Technical Systems - Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4, 2845B-5, 2845B-7
REPORT DATE:	October 25, 2013
FINAL TEST DATES:	September 19, 20, 23, 24, 25, 26 and 30 and October 1, 2, 4, 7, 8, 9, 10 and 11, 2013
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	October 25, 2013	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Intel Mobile Communications model PBA5001, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "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 National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2009
FHSS test procedure DA 00-0705A1

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

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

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

OBJECTIVE

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

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

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

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

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

STATEMENT OF COMPLIANCE

The tested sample of Intel Mobile Communications model PBA5001 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "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 Mobile Communications model PBA5001 and therefore apply only to the tested sample. The sample was selected and prepared by Steve Hackett of Intel Mobile Communications.

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, less than 75 channels)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	Basic Rate: 0. MHz EDR: 1. MHz	Channel spacing > 2/3rds 20dB BW	Complies
		Channel Separation	1 MHz		Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Number of Channels	Min: 20 Max: 79	15 or more	Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Channel Dwell Time (*average time of occupancy)*	<0.4 second within a period of 0.4 x number of channels	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	The system uses the Bluetooth algorithm and, therefore, meets all requirements for channel utilization.	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power	Basic rate: 5.6 dBm EDR: 0.7 dBm EIRP = 0.0 W[Note 1]	*0.125 Watts (EIRP < 0.5 Watts)*	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	47.2 dBµV/m @ 2362.0 MHz (-6.8 dB)	15.207 in restricted bands, all others < -20dBc	Complies
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies
Note 1: EIRP calculated using antenna gain of 3.2 dBi					

ADDITIONAL MEASUREMENTS

As both Bluetooth and 802.11 transmissions can occur simultaneously, radiated spurious measurements were made with both Bluetooth and 802.11 transmitting simultaneously.

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.209	RSS 210 A8.5	Radiated Spurious Emissions	53.4 dBµV/m @ 2390.0 MHz (-0.6 dB)[Note 1]	15.209 in restricted bands, all others < -20dBc or <-30dBc [Note 2]	Complies
Note 1: Emission was second harmonic of the 802.11 signal and not an intermodulation product, but was the highest amplitude emissions observed with both Bluetooth and Wi-Fi operating simultaneously. Note 2: A limit of -30dBc was used when the maximum conducted output power was measured and a limit of -20dBc was used when maximum peak conducted output power was measured.					

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Not applicable as antennas are integral in host systems	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	15.0 dBµV @ 7.009 MHz (-35.0 dB)	Refer to page 17	Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Refer to User Manual for details	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	No detachable antenna	Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	20dB Bandwidth	Basic Rate: 933 kHz EDR: 1.517 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	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Intel Mobile Communications model PBA5001 is an IEEE 802.11a/b/g/n/ac + BT 4.0 wireless network adapter module that supports 2x2 (MIMO) and 1x1 (SISO) operation and Bluetooth operation in Basic Rate, Enhanced Data Rate and Low Energy modes.
For radio testing purposes the card was installed in a test fixture that exposed all sides of the card. For digital device testing for certification under equipment code JBP the card was installed in a test fixture that exposed all sides of the card.

The sample was received on September 18, 2013 and tested on September 19, 20, 23, 24, 25, 26 and 30 and October 1, 2, 4, 7, 8, 9, 10 and 11, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Intel Mobile Communications	PBA5001	PCIe Half Mini Card form factor Bluetooth / IEEE 802.11a/b/g/n/ac wireless network adapter	001500DC7B25	PD9PBA5001

ANTENNA SYSTEM

The EUT antenna is a two-antenna PIFA antenna system – SkyCross, Inc. One or both antennas are used for WiFi operation and one for Bluetooth operation. For Bluetooth: Tx is chain B, Rx is chain B. For WiFi, only Chain A is used for transmit in the 2.4GHz band when Bluetooth is active, both chains can be used in 5GHz bands.
The antenna connects to the EUT via a non-standard antenna connector, thereby meeting the requirements of FCC 15.203.

Band (MHz)	Antenna Gain
2400-2483.5	3.2 dBi
5150-5250	3.6 dBi
5250-5350	3.7 dBi
5470-5725	4.8 dBi
5725-5850	5.0 dBi

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Dell	Latitude E5400	Laptop Computer	GFZW54J	-
Agilent	E3610A	DC Power Supply	MY40001912	-
Intel	HMC-NGFF Extension REV.01	Extender board	-	-

PORTS

The cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Antenna (x2)	Antenna	Coax	Shielded	0.3
Laptop Mini PCIe slot	Extender Board PCIe	Ribbon	Unshielded	0.8
Laptop USB	Extender Board USB	Multiwire	Shielded	1.5

EUT OPERATION

The EUT was installed into a test fixture that exposed all sides of the card. The test fixture interfaced to a laptop computer for power and control. The laptop computer was used to configure the EUT to continuously transmit at a specified output power on the channel specified in the test data. For transmit mode measurements the system was configured to operate in each of the available operating modes – 802.11b, 802.11g, 802.11n (20, 40 and 80 MHz channel bandwidths), 802.11ac (20, 40 and 80 MHz channel bandwidths), Bluetooth 1Mb/s, Bluetooth 3Mb/s and Bluetooth Low Energy. In addition radiated spurious tests were repeated with the device operating in both Bluetooth and 802.11 modes to determine if any spurious emissions due to intermodulation products were created.

The data rates used for all tests were the lowest data rates for each 802.11 mode – 1Mb/s for 802.11b, 6Mb/s for 802.11a and 802.11g, 6.5MB/s for 802.11n20, 13.5 Mb/s for 802.11n40, and 29.3 Mb/s for 802.11ac80. The device operates at its maximum output power at the lowest data rate (this was confirmed through separate measurements – refer to test data for actual measurements). Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through preliminary testing, to produce emissions similar to those for 3Mb/s.

The PC was using the Intel test utility DRTU Version 1.7.1-752 for WiFi tests and 1.7.1-777 for Bluetooth mode tests and the device driver was version 16.6.0.1 for all tests.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken 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	
Chamber 7	A2LA accreditation	2845B-7	

ANSI C63.4 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.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. 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 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

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 C63.10 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 as specified in ANSI C63.4. 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 C63.10, 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.

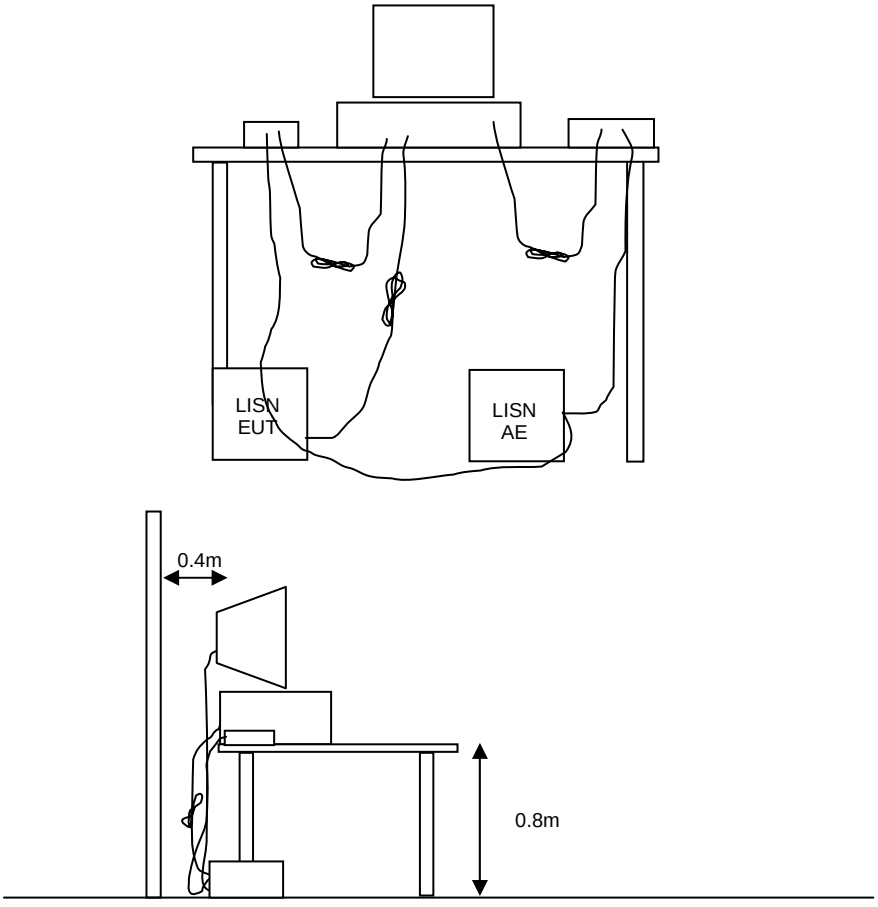


Figure 1 Typical Conducted Emissions Test Configuration

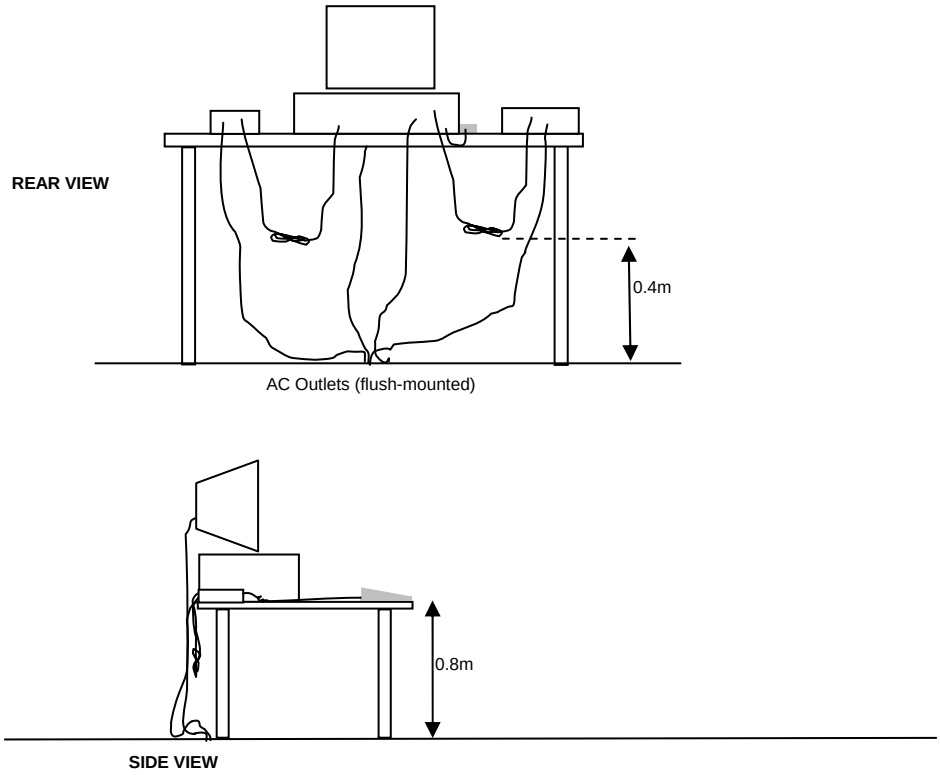
RADIATED EMISSIONS

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.

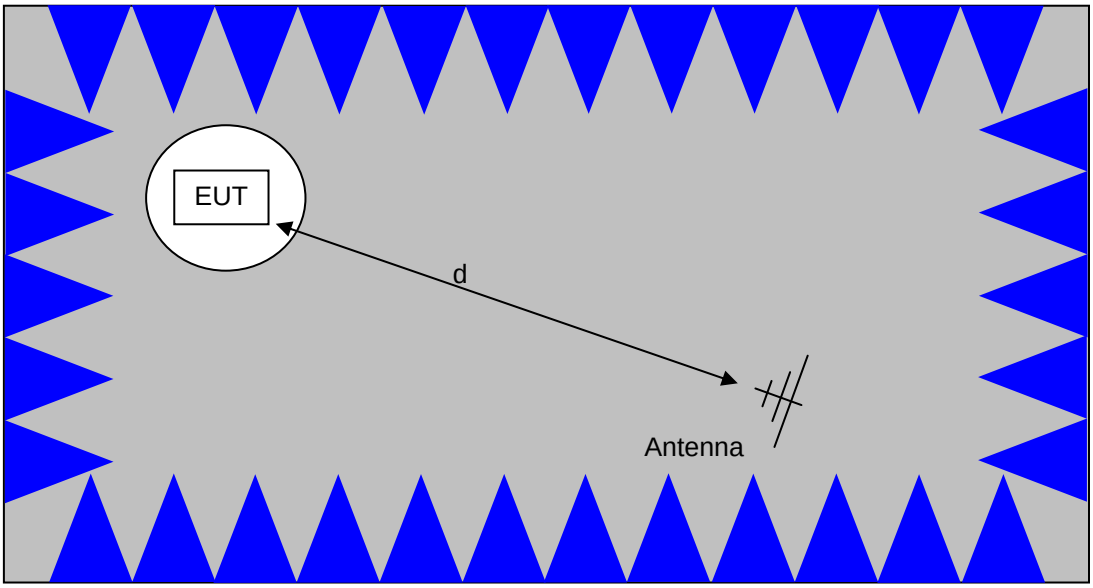
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

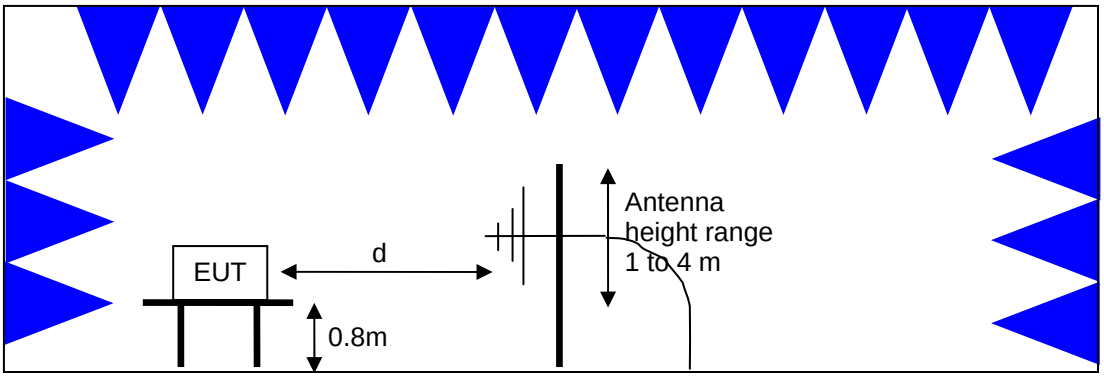


Typical Test Configuration for Radiated Field Strength Measurements



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.

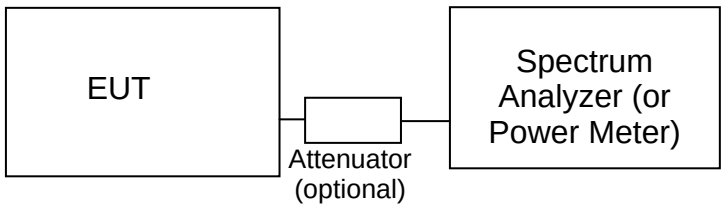
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and NTS Silicon Valley's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and 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:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

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

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

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

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

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

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

OUTPUT POWER LIMITS – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

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 d (meters) from the equipment under test:

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

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Cal Due
Radio Antenna Port (Power), 18-Sep-13				
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	6/3/2014
Rohde & Schwarz	Power Meter, Single Channel, +1795+1796	NRVS	1534	7/29/2014
Radio Antenna Port (Power and Spurious Emissions), 19-Sep-13				
Rohde & Schwarz	Signal Analyzer 20 Hz - 26.5 GHz	FSQ26	2327	4/25/2014
Radiated Emissions, 1,000 - 6,500 MHz, 19-Sep-13				
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	6/3/2014
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Rohde & Schwarz	Power Meter, Single Channel, +1795+1796	NRVS	1534	7/29/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Radiated Emissions, Band edge, 20-Sep-13				
Rohde & Schwarz	Power Sensor, 1 uW-100 mW, DC-18 GHz, 50ohms	NRV-Z51	1070	6/3/2014
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Rohde & Schwarz	Power Meter, Single Channel, +1795+1796	NRVS	1534	7/29/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Radiated Emissions, 30 - 6,500 MHz, 20-Sep-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	6/22/2014
Radiated Emissions, 1 - 26 GHz, 23-Sep-13				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	11/9/2013
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	6/26/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/24/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/11/2013
Radiated Emissions, 1,000 - 40,000 MHz, 24-Sep-13				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	11/9/2013
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	6/26/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	High Pass filter, 8.2 GHz (Purple System)	P/N 84300-80039	1767	12/5/2013
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/24/2014
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	2241	10/4/2013
Radio Antenna Port (Power and Spurious Emissions), 25-Sep-13				
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	1/28/2014
Radio Antenna Port (Power and Spurious Emissions), 27-Sep-13				
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	1/28/2014
Radio Antenna Port (Power and Spurious Emissions), 30-Sep-13				
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts use with 20dB attenuator sn:1031.6959.00 only	NRV-Z32	1423	9/17/2014
Rohde & Schwarz	Power Meter, Single Channel, +1795+1796	NRVS	1534	7/29/2014
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	1/28/2014
Radio Antenna Port (Power and Spurious Emissions), 01-Oct-13				
Agilent Technologies	USB Average Power Sensor	U2001A	2442	12/17/2013
Fischer Custom Comm	LISN, 4x 50A, 50 uH , decoupling network, 150kHz-30MHz	FCC-LISN-50-50-4-02-550v	2776	1/10/2014
Radio Antenna Port (Power and Spurious Emissions), 02-Oct-13				
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	1/28/2014
Radiated Emissions, 30 - 1,000 MHz, 03-Oct-13				
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	8/9/2014
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/8/2014
Radiated Emissions, 1000 - 26,500 MHz, 05-Oct-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/8/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/19/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/3/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/24/2014
Radiated Emissions, 1 - 26 GHz, 07-Oct-13				
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Hewlett Packard	High Pass filter, 8.2 GHz (Blu System)	P/N 84300-80039 (84125C)	1392	5/14/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013

Manufacturer	Description	Model	Asset #	Cal Due
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	10/3/2014
Hewlett Packard	Head (Inc W1-W4, 1946 , 1947) Purple	84125C	1772	6/18/2014
A. H. Systems	Red System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	6/10/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/24/2014
Radiated Emissions, 1000 - 10,000 MHz, 08-Oct-13				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	11/9/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Radiated Spurious Emissions, 1000 - 15,000 MHz, 09-Oct-13				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	11/9/2013
Narda West	High Pass Filter, 8 GHz	HPF 180	821	3/13/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2014
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	1682	3/13/2014
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1729	8/2/2014
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	1730	8/2/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Radio Antenna Port (Power and Spurious Emissions), 11-Oct-13				
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts use with 20dB attenuator sn:1031.6959.00 only	NRV-Z32	1423	9/17/2014
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1539	8/30/2014
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	3/7/2014
Radio Antenna Port (Power and Spurious Emissions), 11-Oct-13				
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	3/7/2014
Radiated Emissions, 30 - 1,000 MHz, 14-Oct-13				
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	8/9/2014
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/8/2014
Conducted Emissions - AC Power Ports, 14-Oct-13				
EMCO	LISN, 10 kHz-100 MHz	3825/2	1293	2/14/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/8/2014
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2671	5/24/2014

Manufacturer	Description	Model	Asset #	Cal Due
Radiated Emissions, 30 - 1,000 MHz, 15-Oct-13				
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	8/9/2014
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/8/2014
Radiated Emissions, 1000 - 26,500 MHz, 17-Oct-13				
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Hewlett Packard	Head (Inc W1-W4, 1946 , 1947) Purple	84125C	1772	6/18/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/24/2014
Radio Antenna Port (Power and Spurious Emissions), 17-Oct-13				
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	3/7/2014
Radiated Emissions, 1,000-3,000 MHz & Radiated Power, 22-Oct-13				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	6/8/2014
Radiated Emissions, 1000 - 26,500 MHz, 23-Oct-13				
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2014
Hewlett Packard	Head (Inc W1-W4, 1946 , 1947) Purple	84125C	1772	6/18/2014
A. H. Systems	Spare System Horn, 18-40GHz	SAS-574, p/n: 2581	2162	7/24/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	2/19/2014

Appendix B Test Data

T93372 Pages 27 – 111

Client:	Intel Corporation	Job Number:	J93358
Product	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Emissions Standard(s):	FCC Part 15.247, 15.407	Class:	B
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

Intel Corporation

Product

PBA5001

Date of Last Test: 10/24/2013

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Power vs. Data Rate

In normal operating modes the card uses power settings stored on EEPROM to set the output power. For a given nominal output power the actual transmit power normally is reduced as the data rate increases, therefore testing was performed at the data rate in the mode wiht highest power to determine compliance with the requirements.
The following power measurements were made using a GATED average power meter and with the device configured in a continuous transmit mode on Chain 1 at the various data rates in each mode to verify the highest power mode:

Sample Notes

MAC Address: 001500DC7B25 DRTU Tool Version 1.7.1-752, Driver version 16.6.0.1 (WiFi only)
MAC Address: 001500DC7B25 DRTU Tool Version 1.7.1-777, for ac80 mode (10/1/13)
MAC Address: 001500DC7B29 DRTU Tool Version 1.7.1-777, Driver version ??? (BT basic & enhanced)

Date of Test: 9/18/2013
Test Engineer: Jack Liu
Test Location: FT chamber # 4

2.4GHz -20MHz

Mode	Data Rate	Power (dBm)	Power setting
802.11b	1	**15.4**	20.0
	2	15.4	
	5.5	15.3	
	11	15.3	
802.11g	6	**14.6**	20.0
	9	14.5	
	12	14.5	
	18	14.5	
	24	14.4	
	36	14.3	
	48	14.3	
	54	14.2	

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Date of Test: 9/18/2013
Test Engineer: Joseph Cadigal
Test Location: FT chamber # 4

2.4GHz -20/40MHz

Mode	Data Rate	Power (dBm)	Power setting	
802.11n/ac 20MHz	6.5	**14.9**	20.0	
	13	14.7		
	19.5	14.6		
	26	14.4		
	39	14.4		
	52	14.2		
	58.5	14.3		
	65	14.2		
	78			<<-11ac mode only
802.11n/ac 40MHz	13.5	**15.0**	20.0	
	27	14.6		
	40.5	14.3		
	54	14.2		
	81	14.0		
	108	13.9		
	121.5	13.9		
	135	13.8		
	162			<<-11ac mode only
	180			<<-11ac mode only

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

5GHz -20/40/80MHz

Mode	Data Rate	Power (dBm)	Power setting	
802.11n/ac 20MHz	6.5	**7.1**	20.0	
	13	7.0		
	19.5	7.0		
	26	6.7		
	39	6.5		
	52	6.4		
	58.5	6.4		
	65	6.5		
	78	6.0		<<-11ac mode only
802.11n/ac 40MHz	13.5	**6.4**	20.0	
	27	6.4		
	40.5	6.3		
	54	6.3		
	81	6.2		
	108	6.1		
	121.5	6.1		
	135	6.1		
	162	6.0		<<-11ac mode only
	180	6.0		<<-11ac mode only

Date of Test: 10/1/2013
Test Engineer: John Caizzi
Test Location: Lab 4A

802.11ac 80MHz	29.3	**4.4**	20.0
	58.5	4.3	
	87.8	4.2	
	117	4.1	
	175.5	4.0	
	234	3.9	
	266.3	3.8	
	292.5	3.8	
	351	3.8	
	390	3.7	

Note : Power setting - the software power setting used during testing, included for reference only.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Duty Cycle

Date of Test: 9/18/2013
Test Engineer: Joseph Cadigal
Test Location: FT chamber # 4

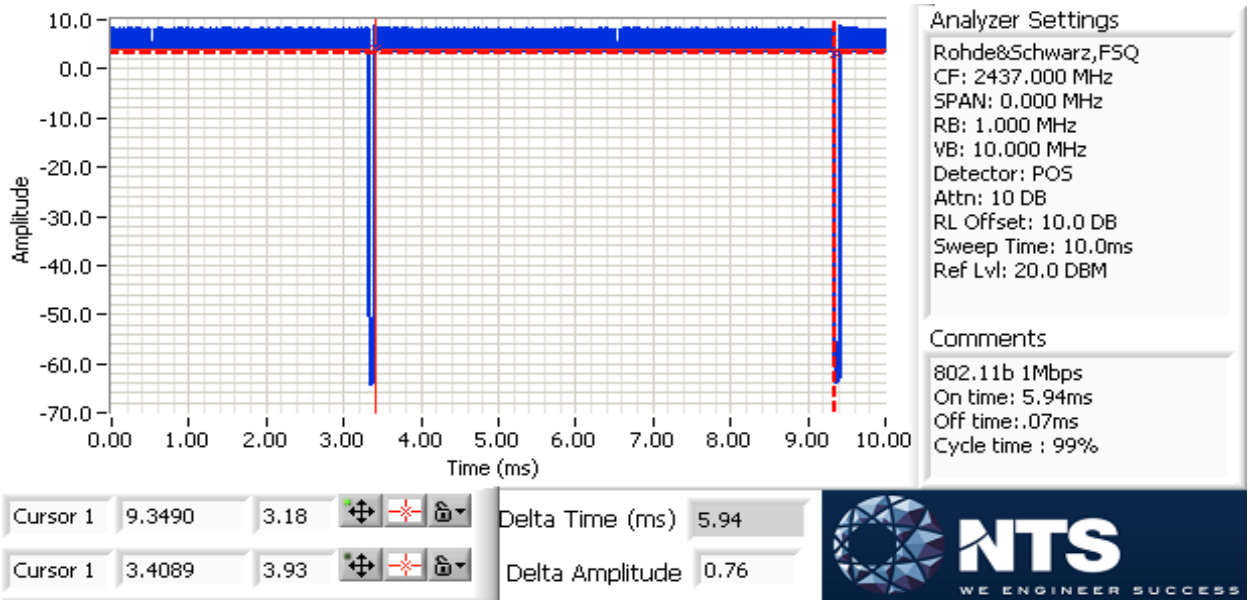
2.4GHz - 20/40MHz

Duty cycle measurements performed on the worse case data rate for power.

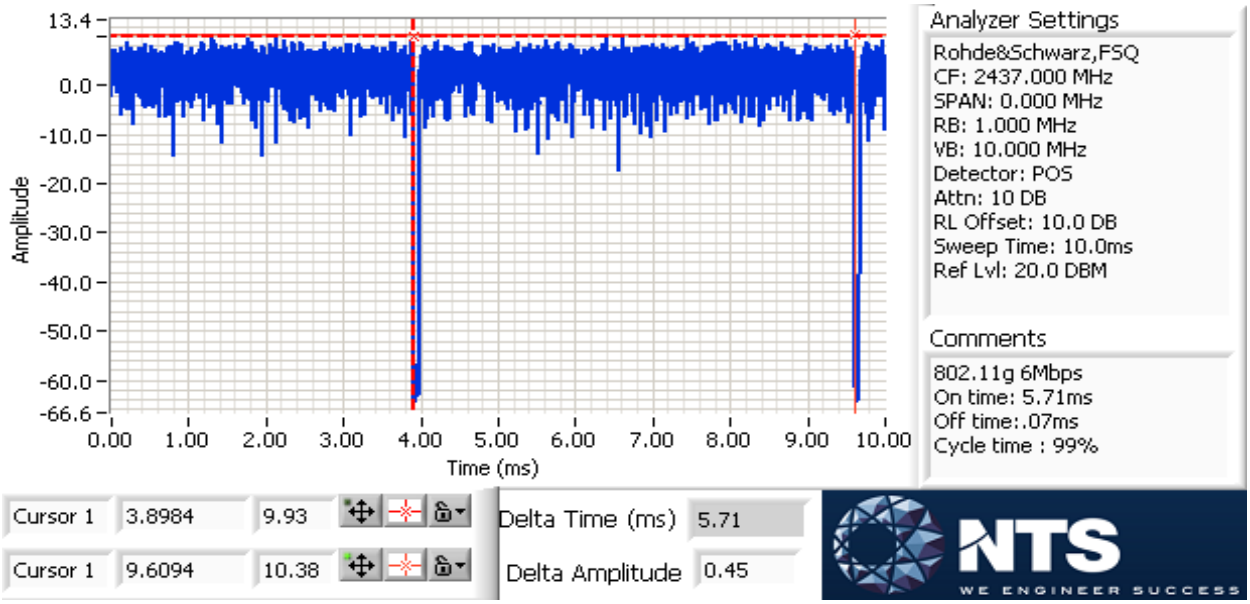
Notes: Measurements taken with maximum RBW/VBW settings allowed.

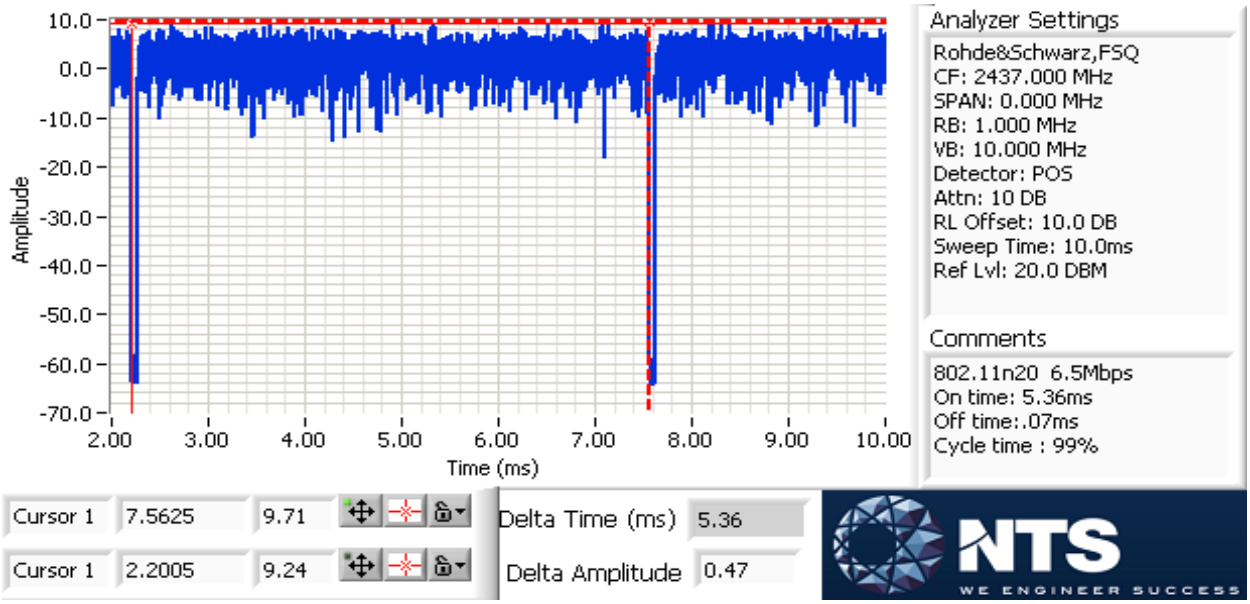
Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1Mbps	0.99	Yes	5.94	0.0	0.0	168
11g	6Mbps	0.99	Yes	5.71	0.0	0.0	175
n20	6.5Mbps	0.99	Yes	5.36	0.0	0.0	187
n40	13.5Mbps	0.97	Yes	2.88	0.1	0.2	347

* Correction factor when using RMS/Power averaging - 10*log(1/x)
** Correction factor when using linear voltage average - 20*log(1/x)
T = Minimum transmission duration

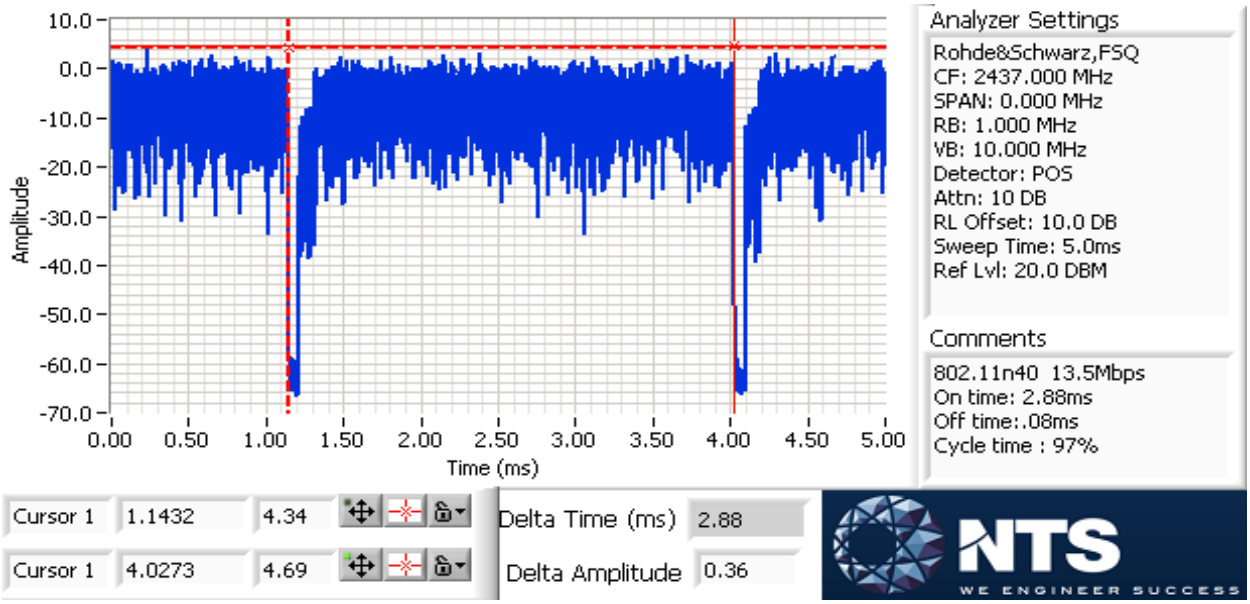


Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

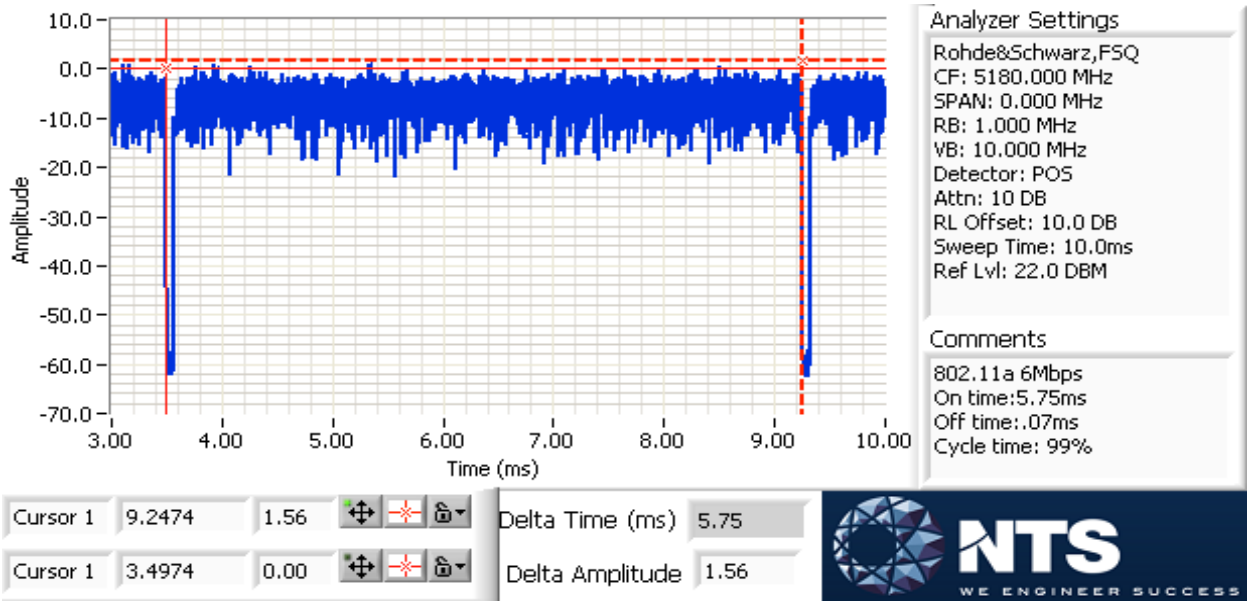
Date of Test: 9/18/2013
Test Engineer: Joseph Cadigal
Test Location: FT chamber # 4

5GHz-20/40/80MHz
Duty cycle measurements performed on the worse case data rate for power.

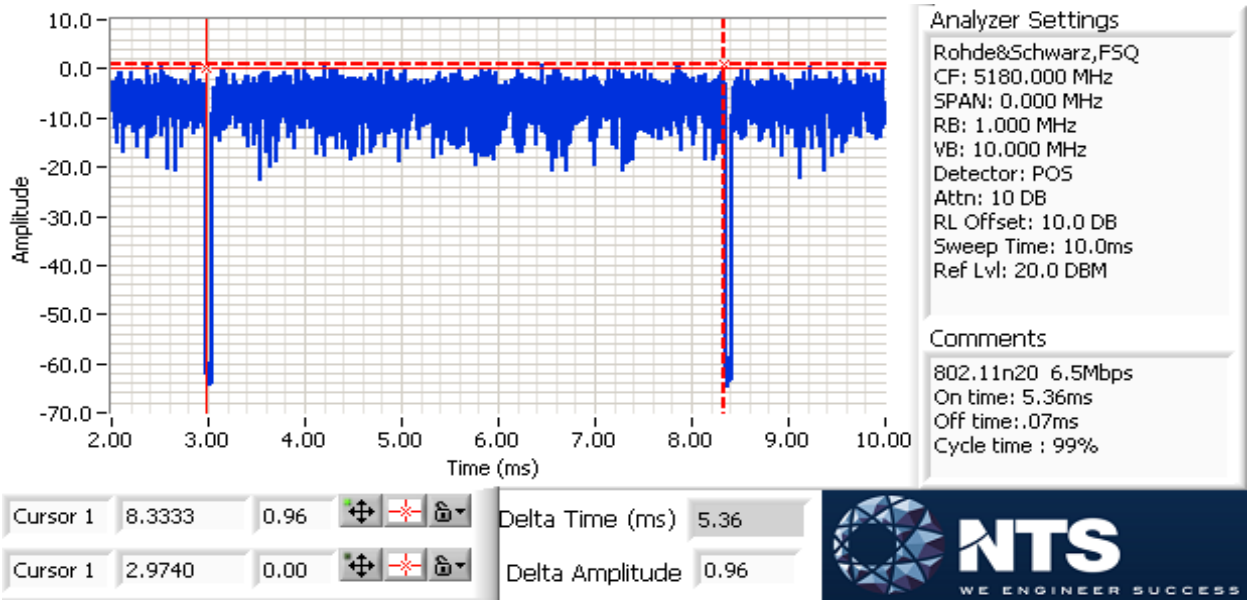
Notes: Measurements taken with maximum RBW/VBW settings allowed.

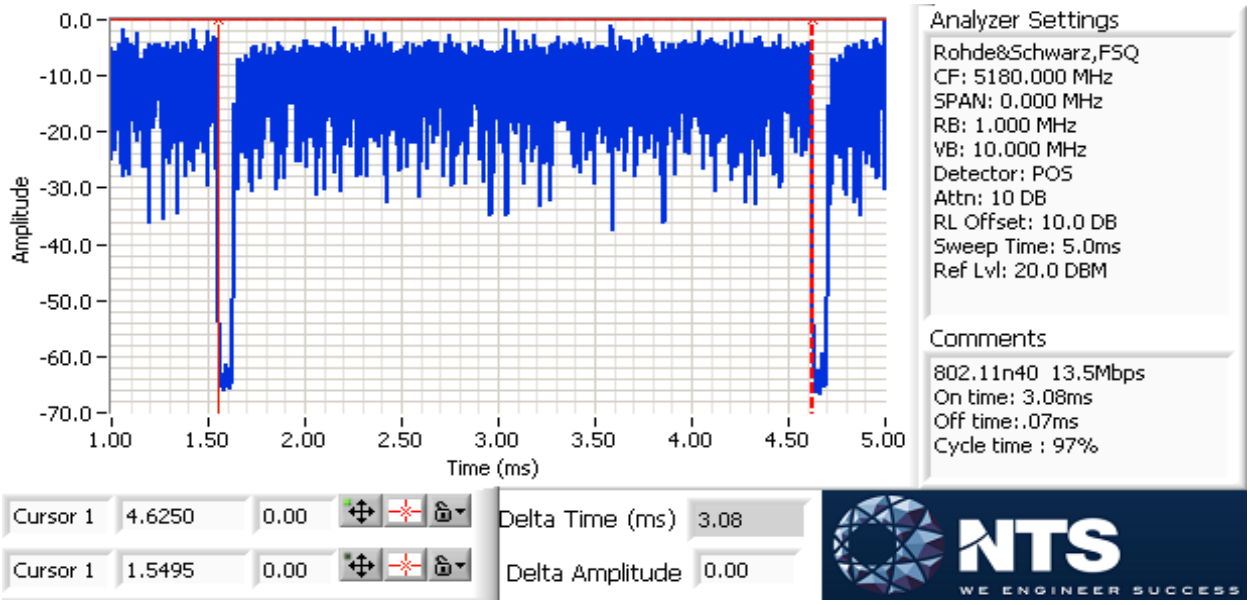
Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
a	6Mbps	0.99	Yes	5.75	0.0	0.0	174
n20	6.5Mbps	0.99	Yes	5.36	0.0	0.0	187
n40	13.5Mbps	0.97	Yes	3.08	0.1	0.2	325
ac80	VHT0	0.93	Yes	0.43	0.3	0.6	2326

* Correction factor when using RMS/Power averaging - 10*log(1/x)
** Correction factor when using linear voltage average - 20*log(1/x)
T = Minimum transmission duration



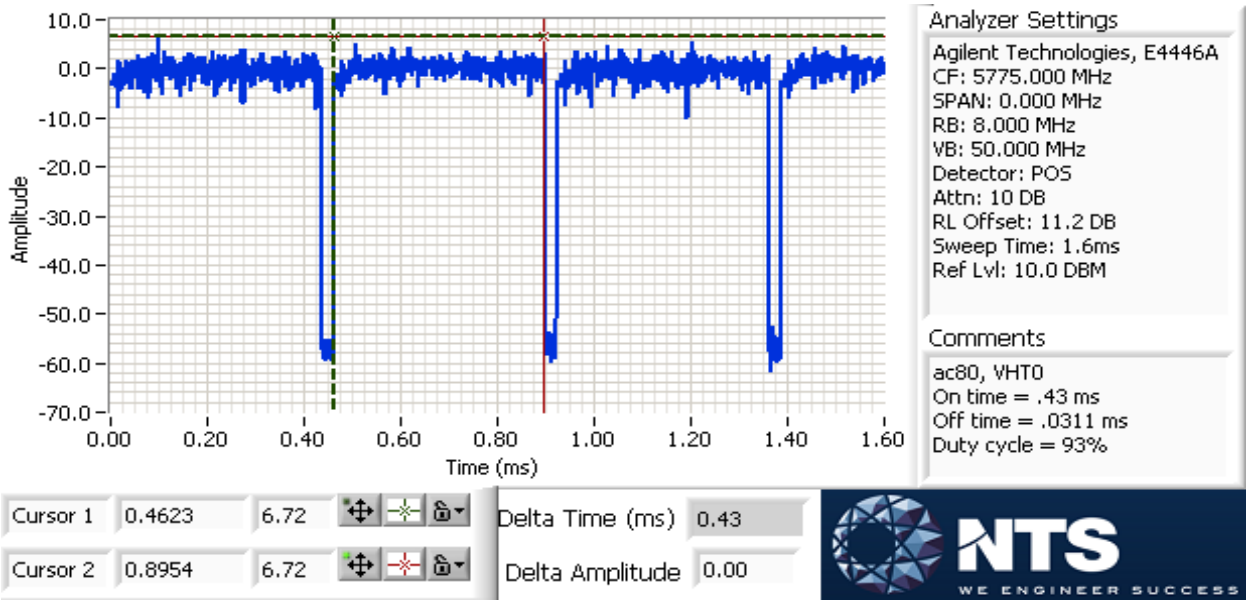
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Date of Test: 10/1/2013
Test Engineer: John Caizzi
Test Location: Lab 4A



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

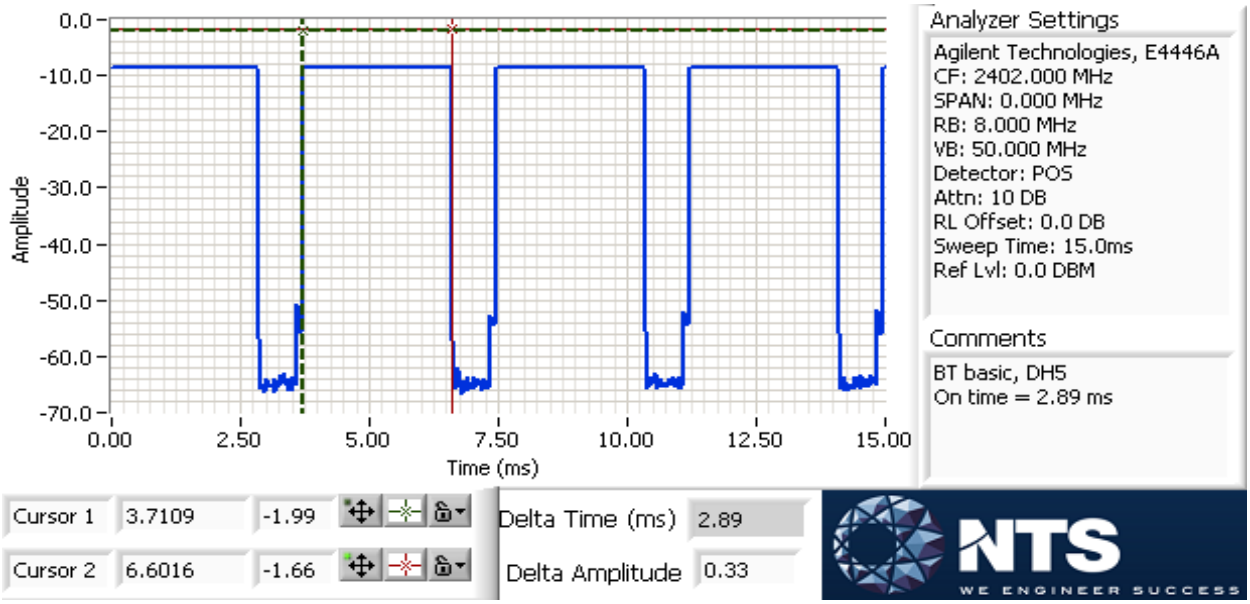
Date of Test: 10/3/2013 & 10/16/2013
Test Engineer: John Caizzi & Joseph Cadigal
Test Location: Lab 4A

Bluetooth

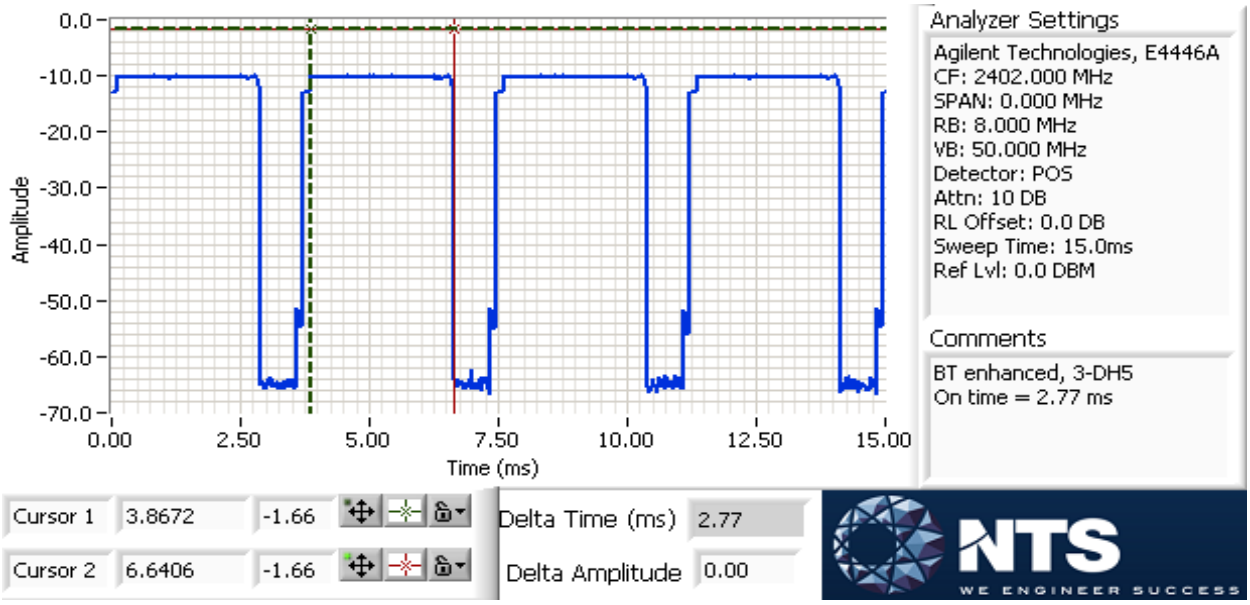
Notes: Measurements taken with maximum RBW/VBW settings allowed.

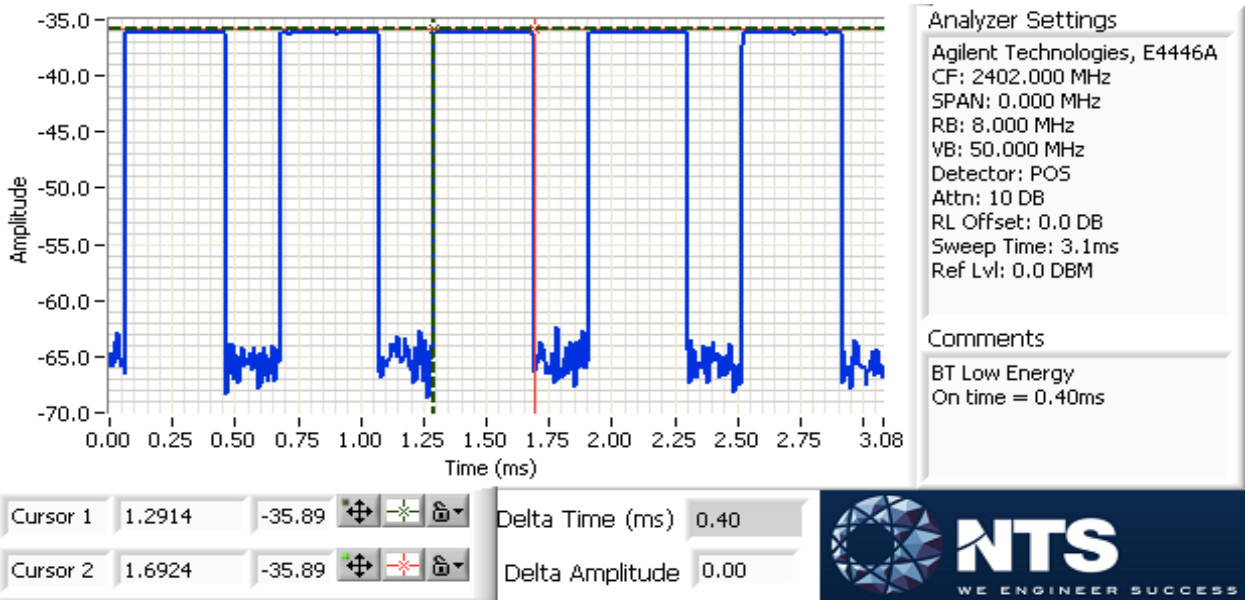
Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
Basic	DH5	0.77	Yes	2.89	1.1	2.3	346
Enhanced	3-DH5	0.73	Yes	2.77	1.3	2.7	361
LE	BLE	0.66	Yes	0.40	1.8	3.6	2500

* Correction factor when using RMS/Power averaging - 10*log(1/x)
** Correction factor when using linear voltage average - 20*log(1/x)
T = Minimum transmission duration



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

FCC 15.247 FHSS - Power, 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.

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 25 °C
Rel. Humidity: 30 %

Summary of Results

MAC Address: 001500DC7B25, DRTU Tool Version 1.7.1-777, Driver version 16.6.0.1

1	30 - 25,000 MHz - Transmitter Conducted Spurious Emissions	FCC Part 15.247(c)	Pass	All emissions below -20dBc limit
2	Output Power	15.247(b)	Pass	Basic Rate: 5.6 dBm (0.0036 W) EDR: 0.7 dBm (0.0011 W)
3	20dB Bandwidth	15.247(a)	Pass	Basic Rate: 933 kHz EDR: 1517 kHz
3	99% bandwidth	15.247(a)	Pass	Basic Rate: 874 kHz EDR: 1373 kHz
3	Channel Occupancy	15.247(a)	Pass	Complies with Bluetooth protocol
3	Number of Channels	15.247(a)	Pass	79 channels

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 Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #1: Antenna Conducted Spurious Emissions, 30 - 25,000 MHz.

Date of Test: 10/9/2013 Config. Used: 1

Test Engineer: Joseph Cadigal Config Change: none

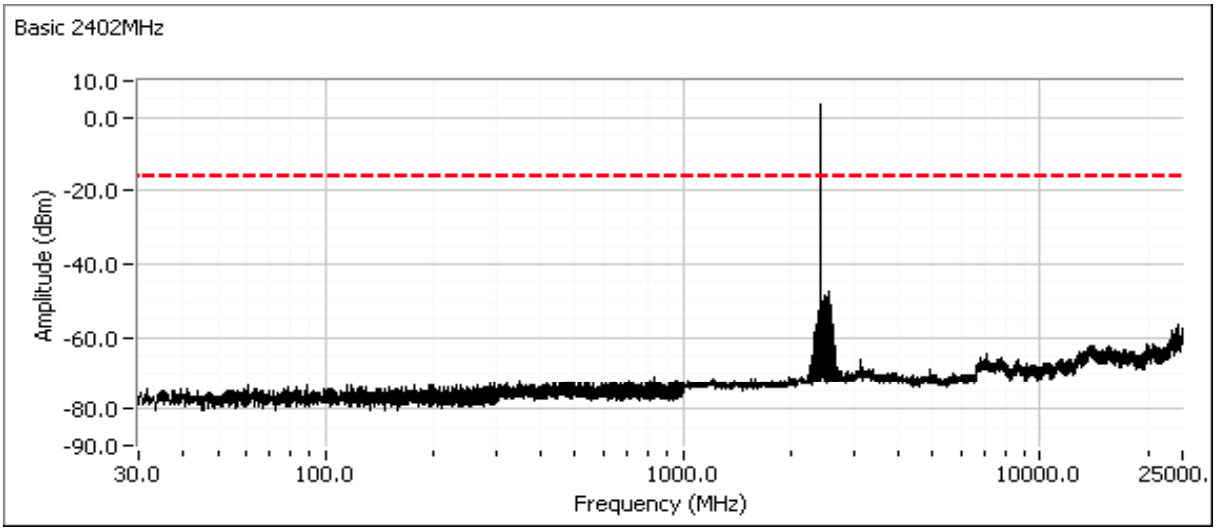
Test Location: FT Lab#4A Host Unit Voltage 3.3Vdc

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level with the hopping feature disabled. The spectrum analyzer is left in max hold mode until the trace stabilizes.

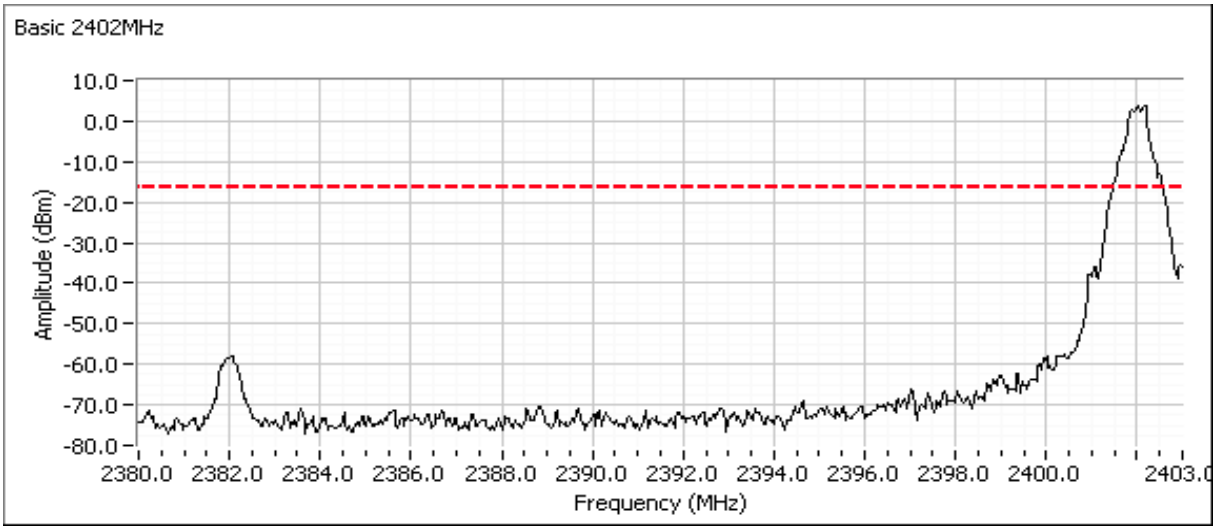
Basic rate (1Mb/s)

Low channel

Broadband plot



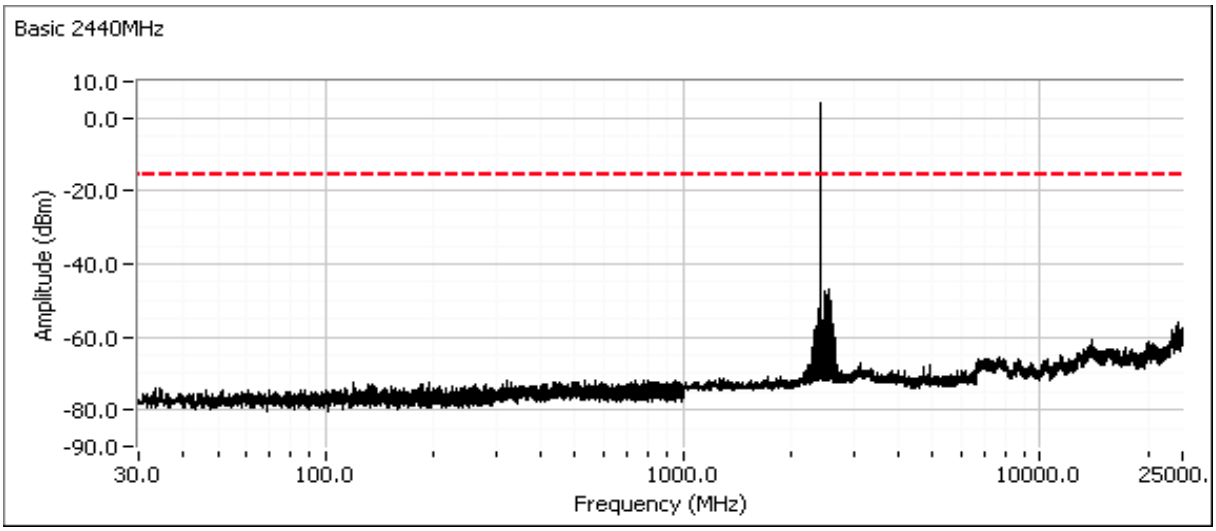
Plot showing -20dBc at the lower band edge



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

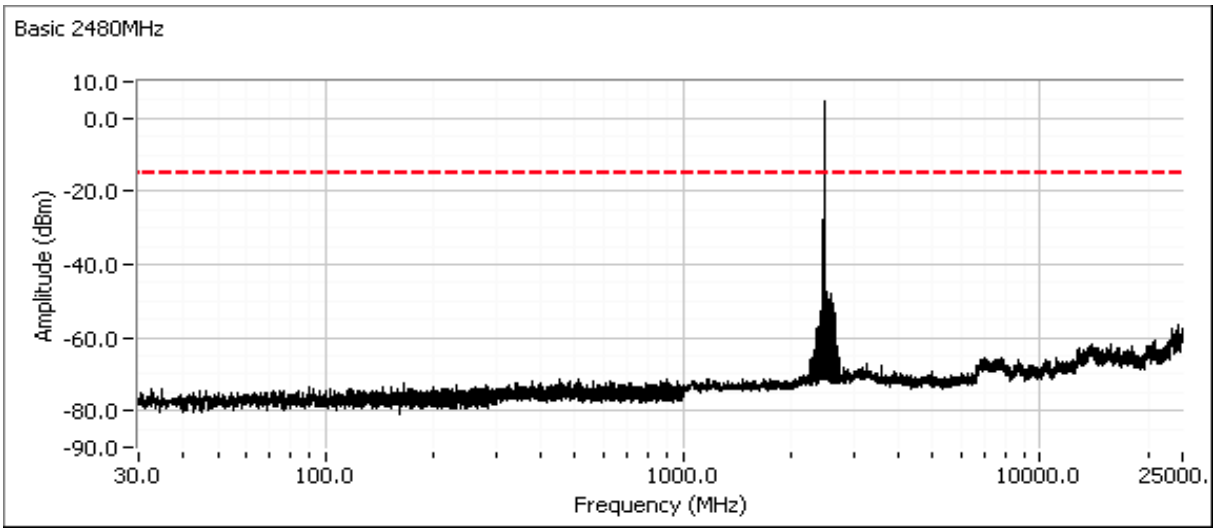
Center channel

Broadband plot



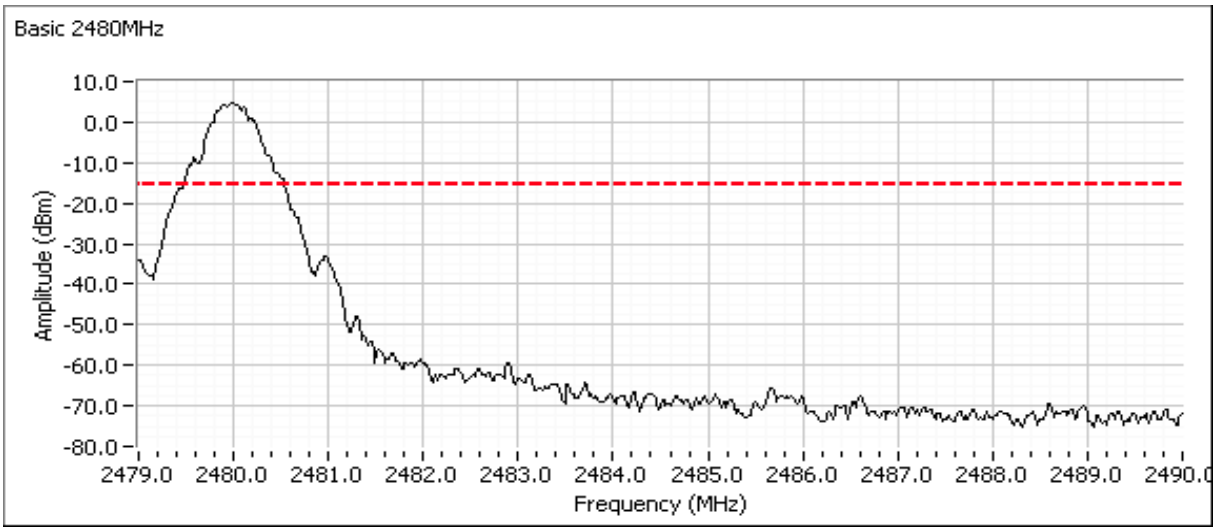
High channel

Broadband plot



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

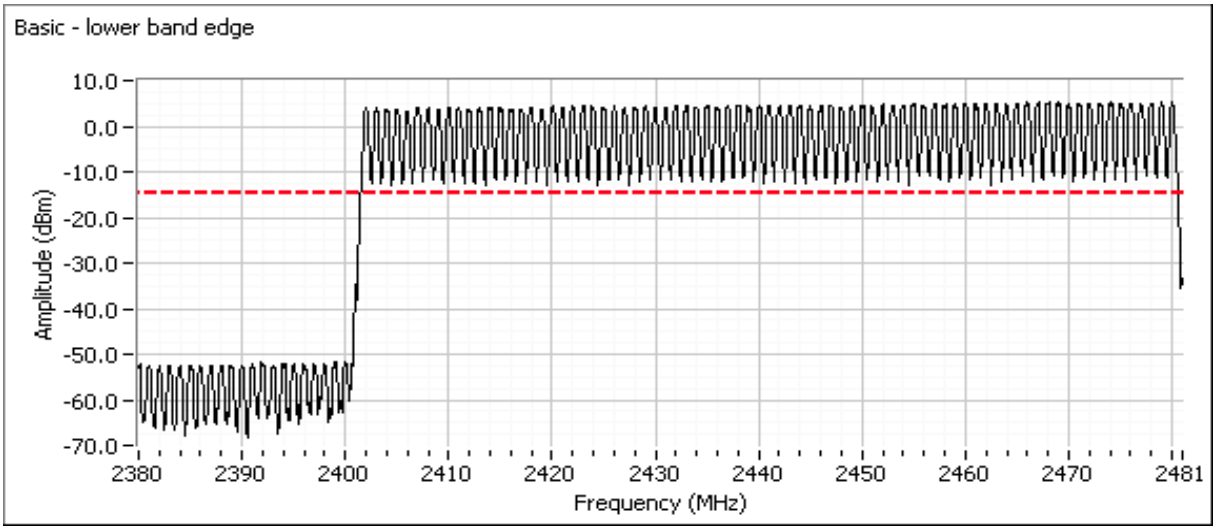
Plot showing -20dBc at the upper band edge



Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level with the hopping feature enabled to show compliance with the -20dBc requirement at the allocated band edge. The spectrum analyzer is left in max hold mode until the trace stabilizes.

Low channel, hopping enabled

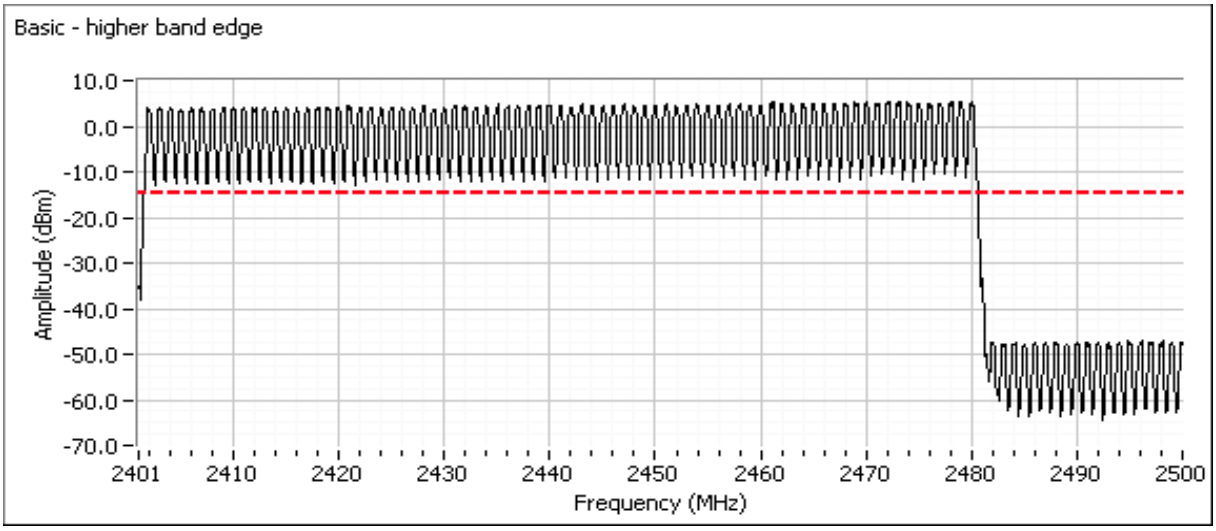
Plot showing -20dBc at the lower band edge



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

High channel, hopping enabled

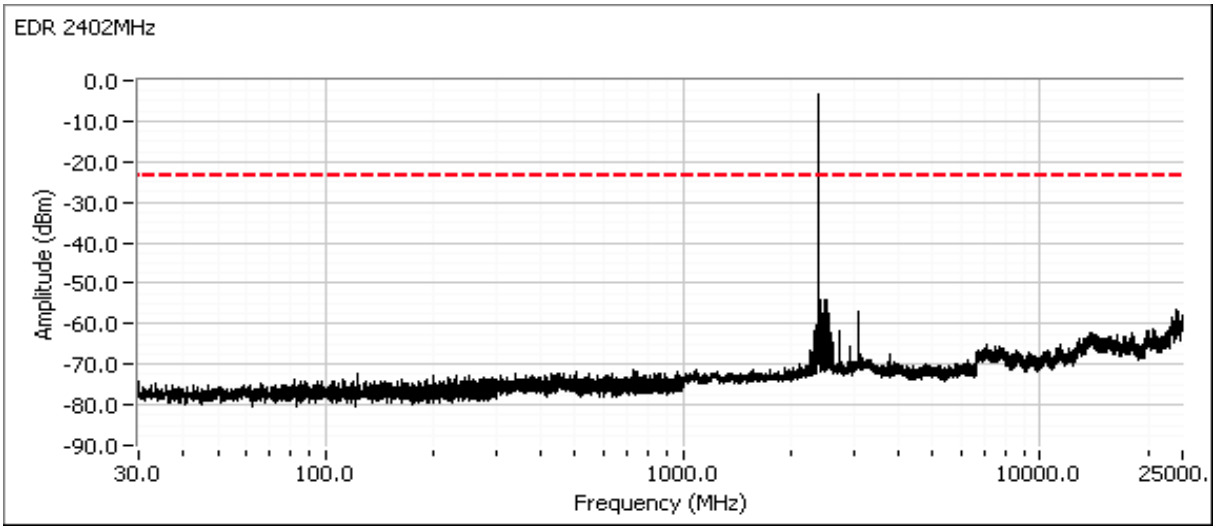
Plot showing -20dBc at the upper band edge



EDR (3Mb/s)

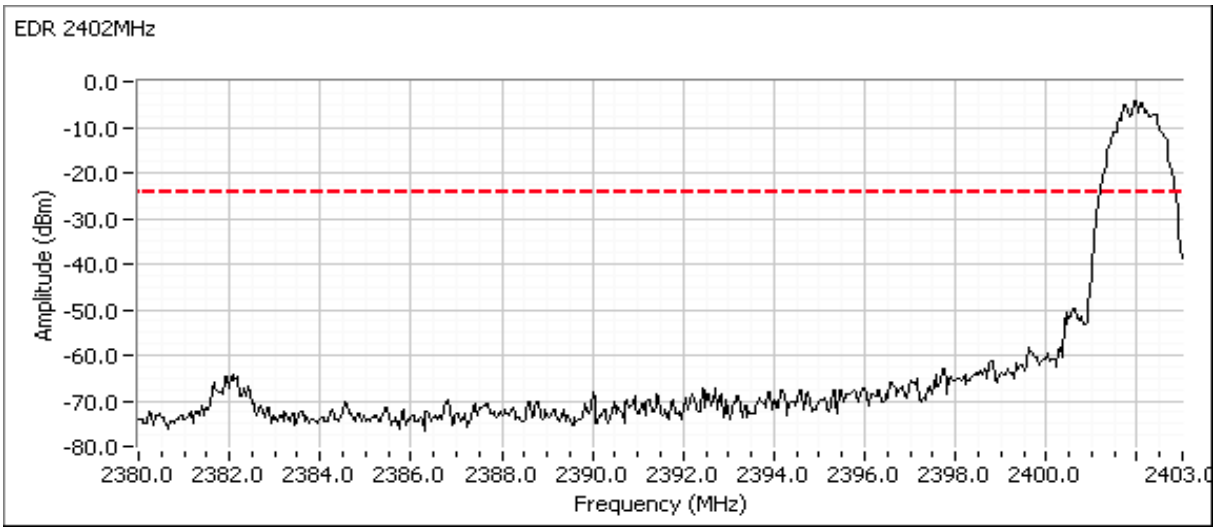
Low channel

Broadband plot



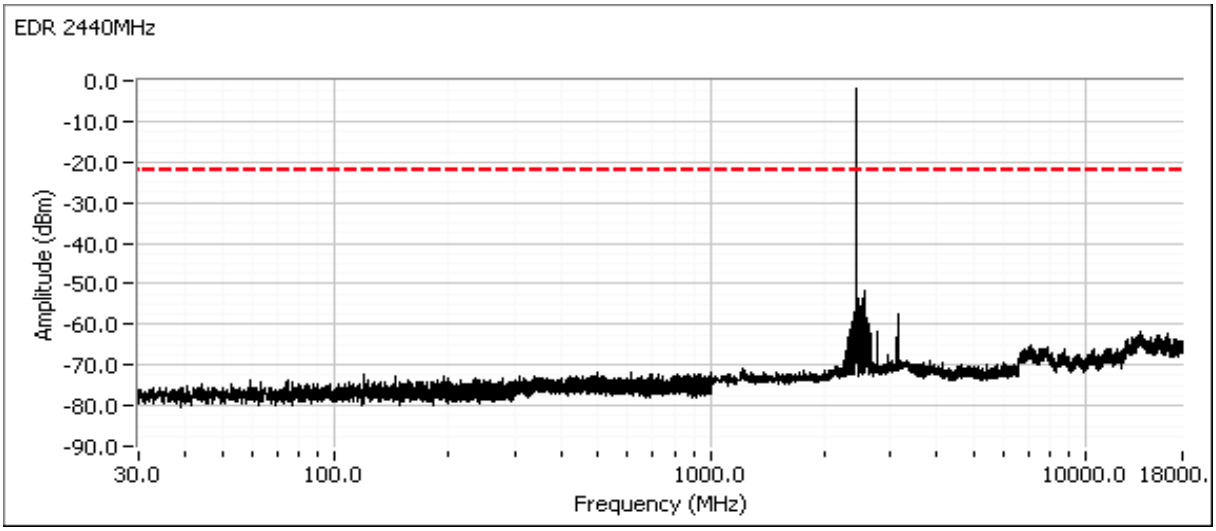
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Plot showing -20dBc at the lower band edge



Center channel

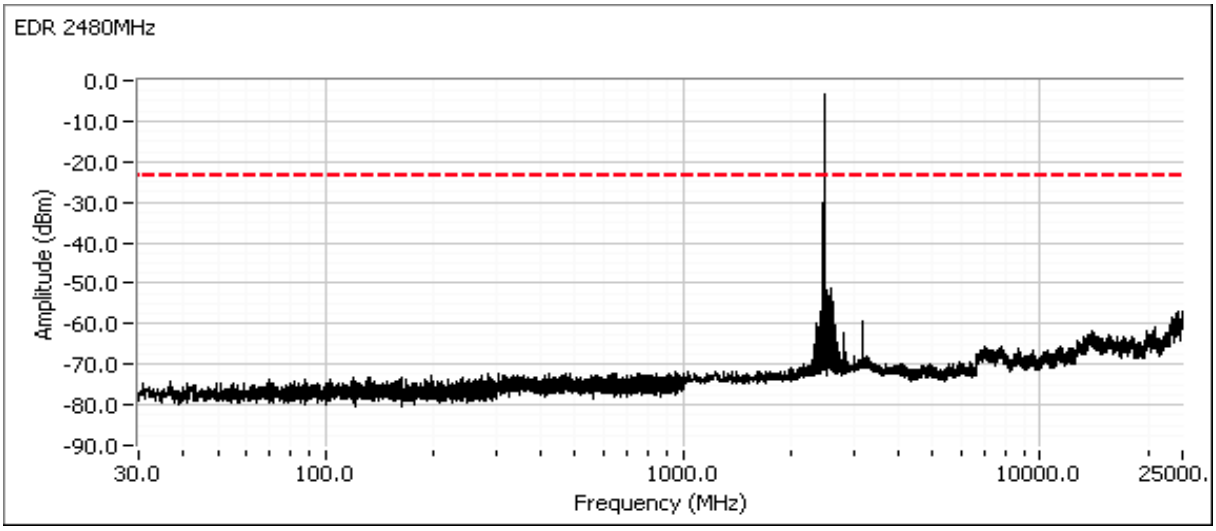
Broadband plot



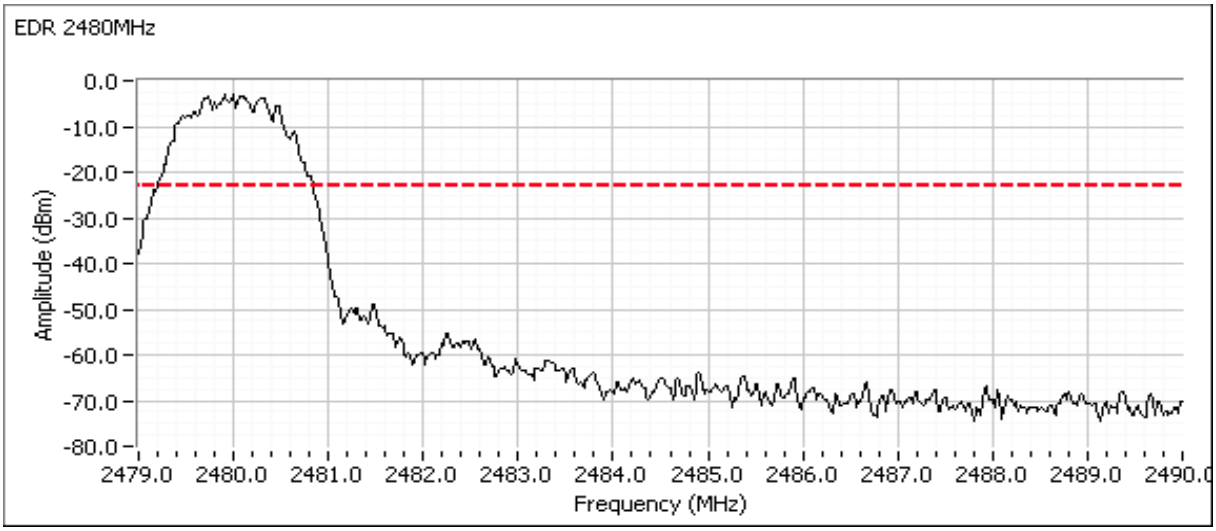
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

High channel

Broadband plot



Plot showing -20dBc at the upper band edge

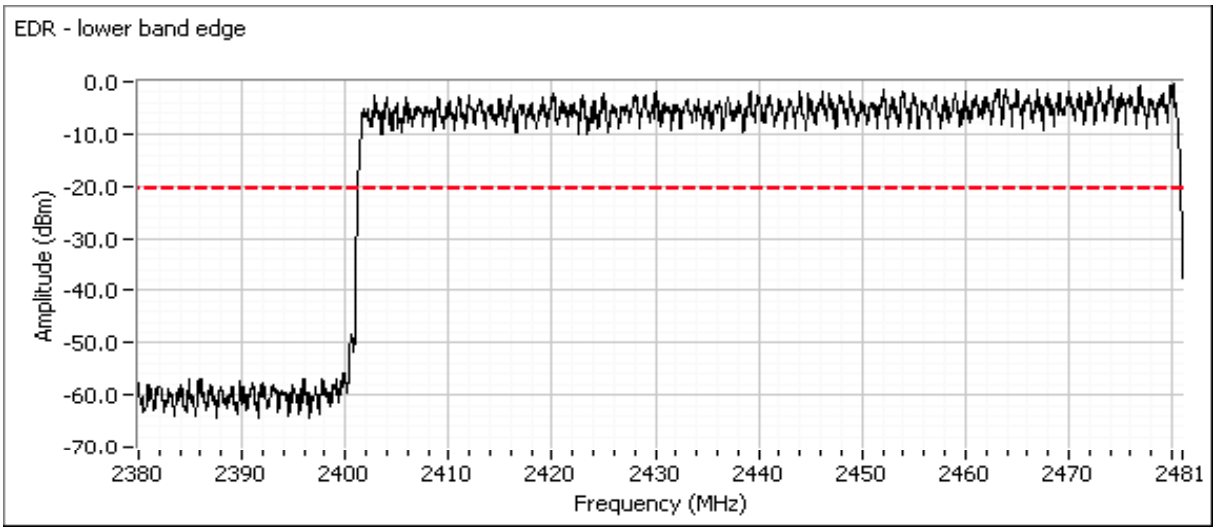


Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level with the hopping feature enabled to show compliance with the -20dBc requirement at the allocated band edge. The spectrum analyzer is left in max hold mode until the trace stabilizes.

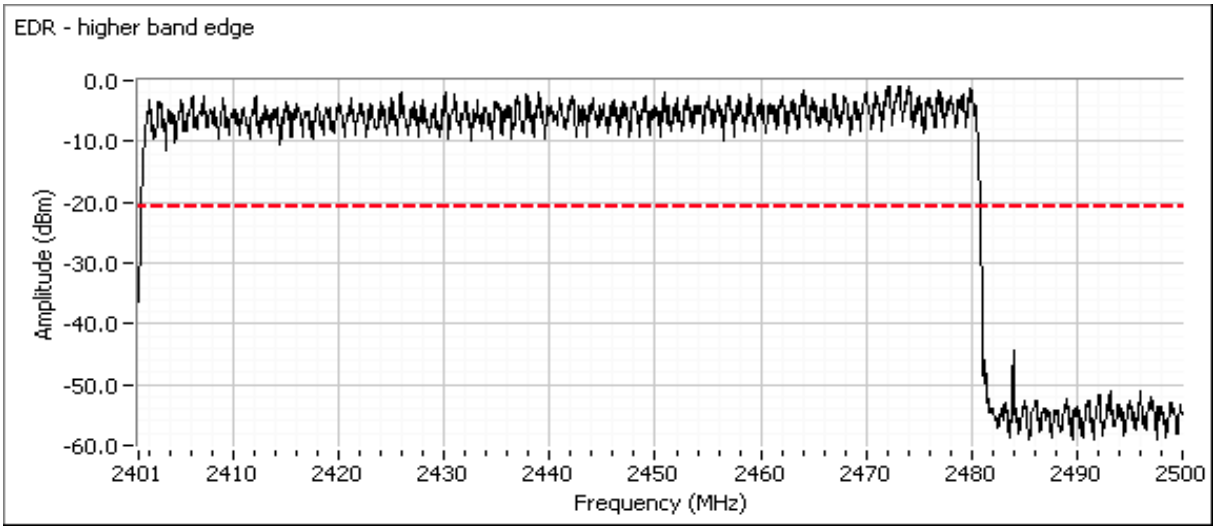
Low channel, hopping enabled

Plot showing -20dBc at the lower band edge



High channel, hopping enabled

Plot showing -20dBc at the upper band edge



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #2: Output Power

Date of Test: 10/10/2013 Config. Used: 1
Test Engineer: Joseph Cadigal Config Change: none
Test Location: FT Lab#4A Host Unit Voltage 3.3Vdc

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt.
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

Maximum antenna gain: 3.2 dBi

Mode	Channel	Frequency (MHz)	Res BW	Pavg	Output Power (dBm)	Output Power (W)	EIRP (W)
Basic	Low	2402			4.2	0.0026	0.0055
	Mid	2440			5.0	0.0032	0.0066
	High	2480			5.6	0.0036	0.0076
EDR	Low	2402			-1.1	0.0008	0.0016
	Mid	2440			-0.1	0.0010	0.0020
	High	2480			0.7	0.0012	0.0025

Note 1:	Output power is measured as a peak power using either a peak power meter or with a spectrum analyzer and VB > 3 x RB and RB > 20dB bandwidth. The actual method used was a peak power meter.
Note 2:	Setting is the test utility software setting and used for reference only. Pavg is the average output power measured with an average power meter and is provided for reference only.

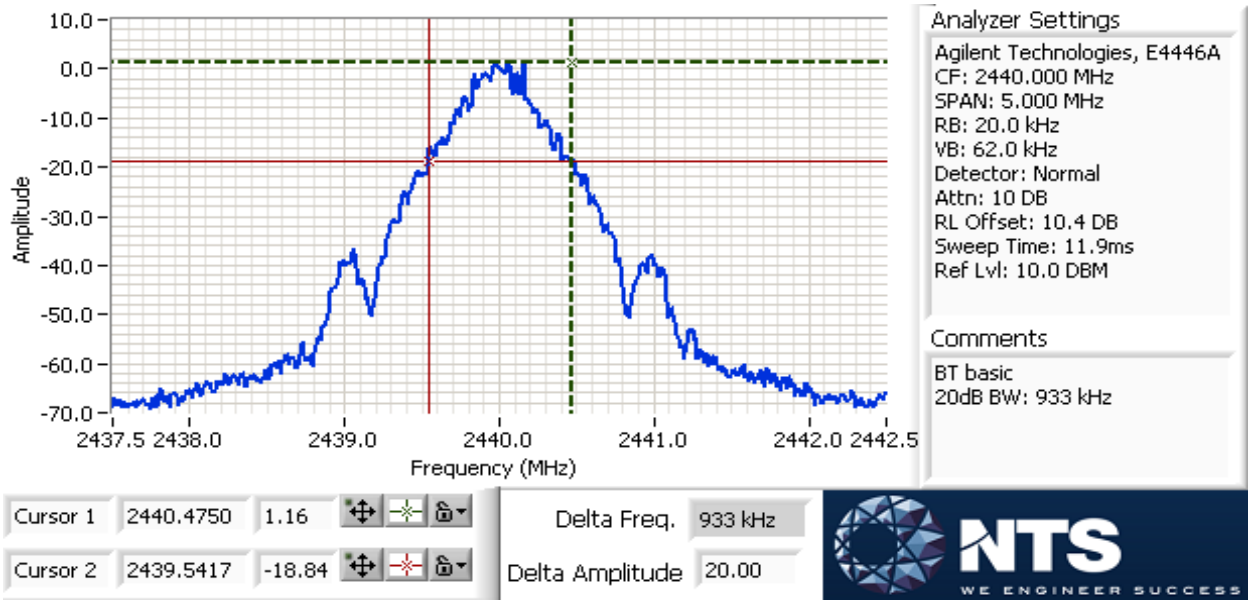
Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels

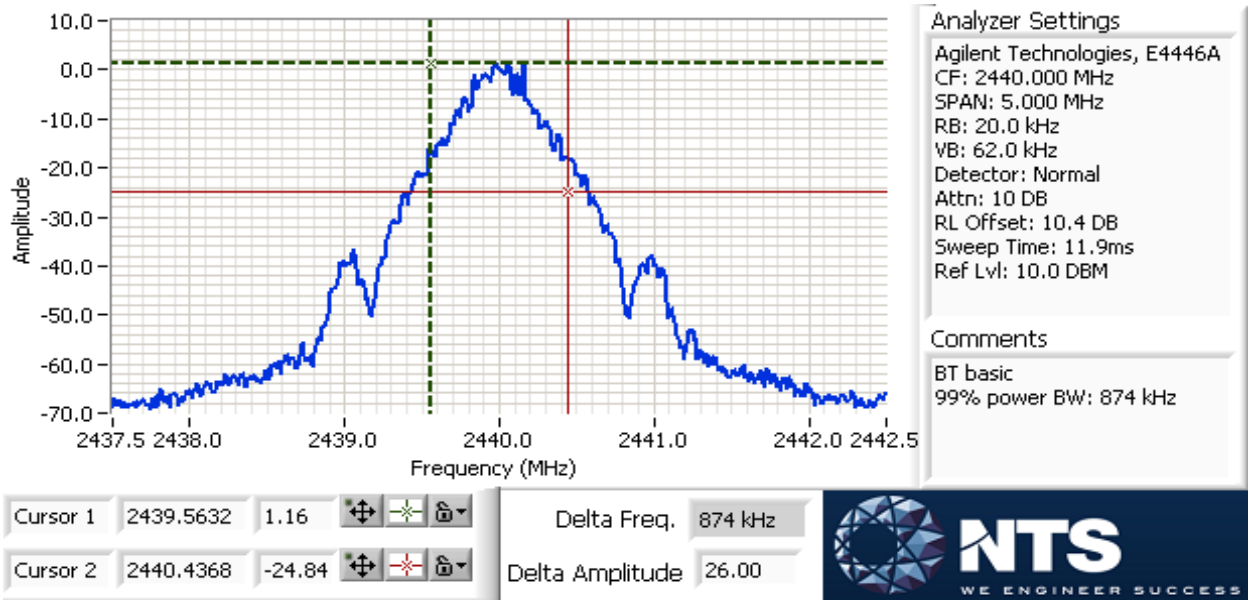
Date of Test: 10/11/2013 Config. Used: 1
Test Engineer: John Caizzi Config Change: none
Test Location: Lab #4B Host Unit Voltage 3.3Vdc

Mode	Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Basic	Low	2402	20 kHz	925	20 kHz	865
	Mid	2440		933		874
	High	2480		933		865
EDR	Low	2402		1517		1373
	Mid	2440		1517		1364
	High	2480		1500		1373

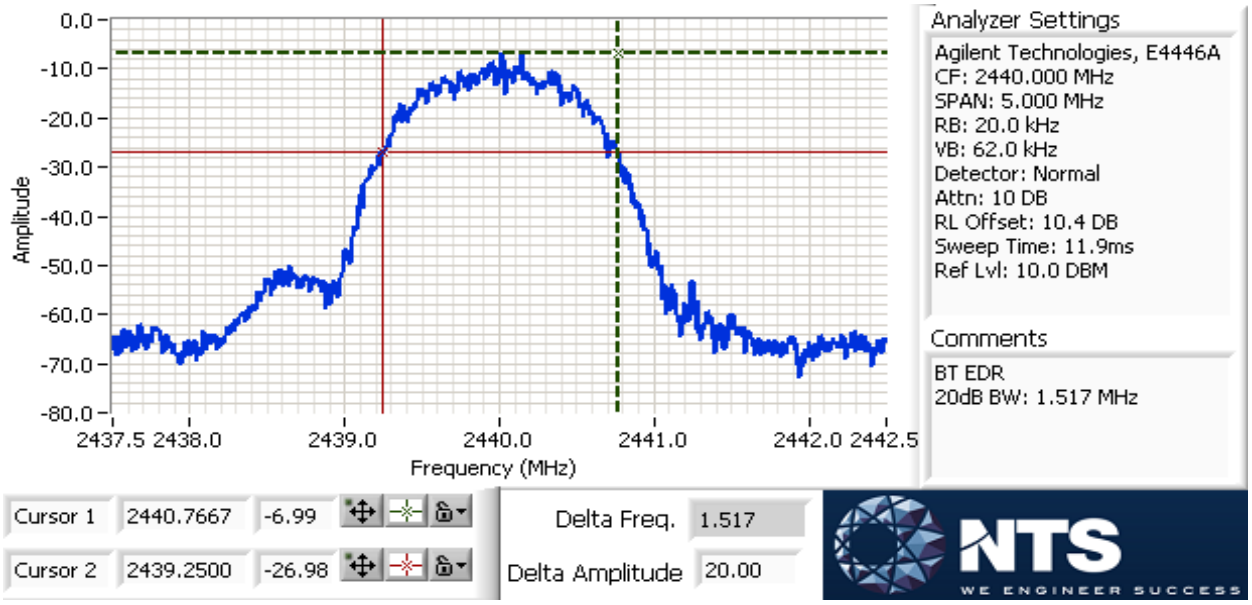
Note 1:	20dB bandwidth measured using RB = 20 kHz, VB = 62 kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 20 kHz, VB = 62 kHz (VB >=3RB)

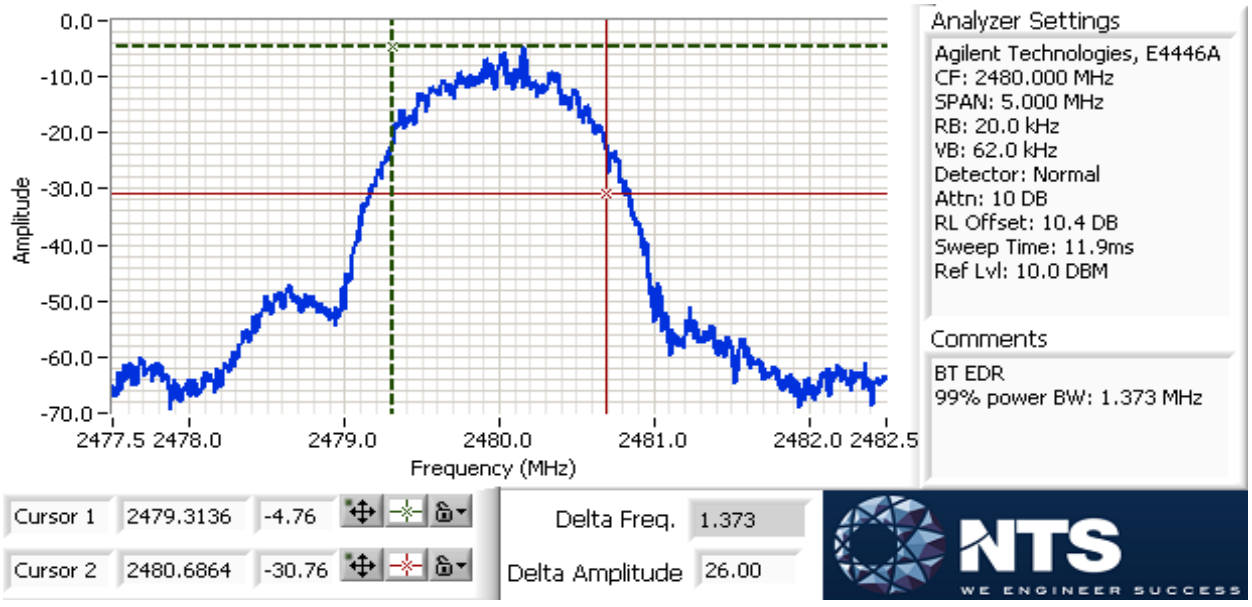
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





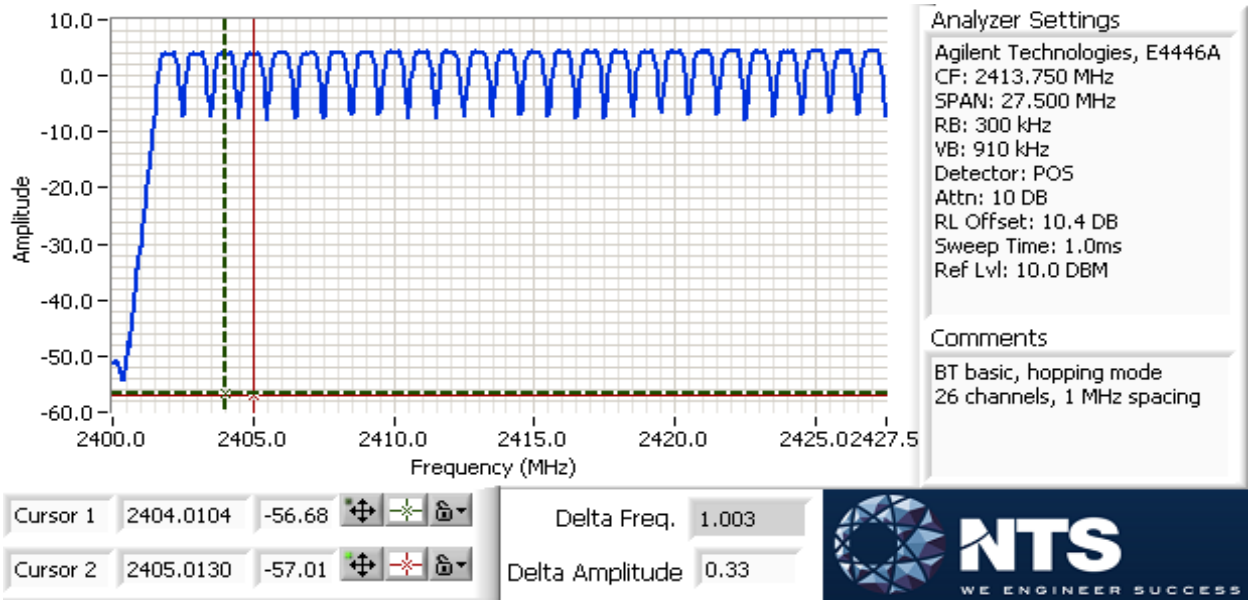
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

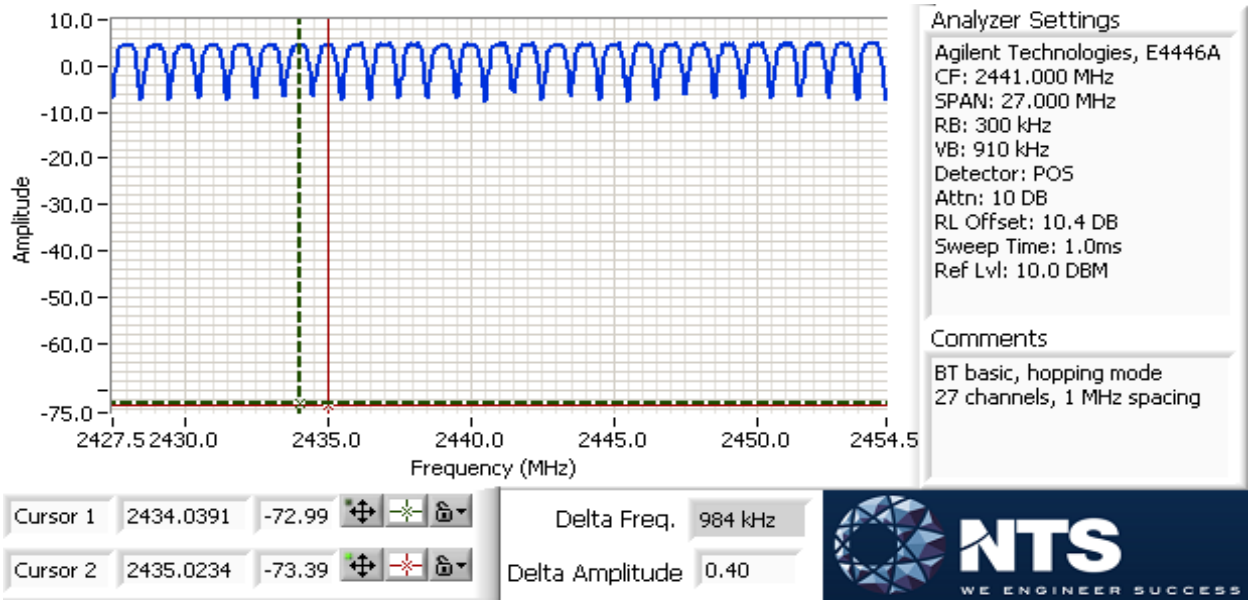




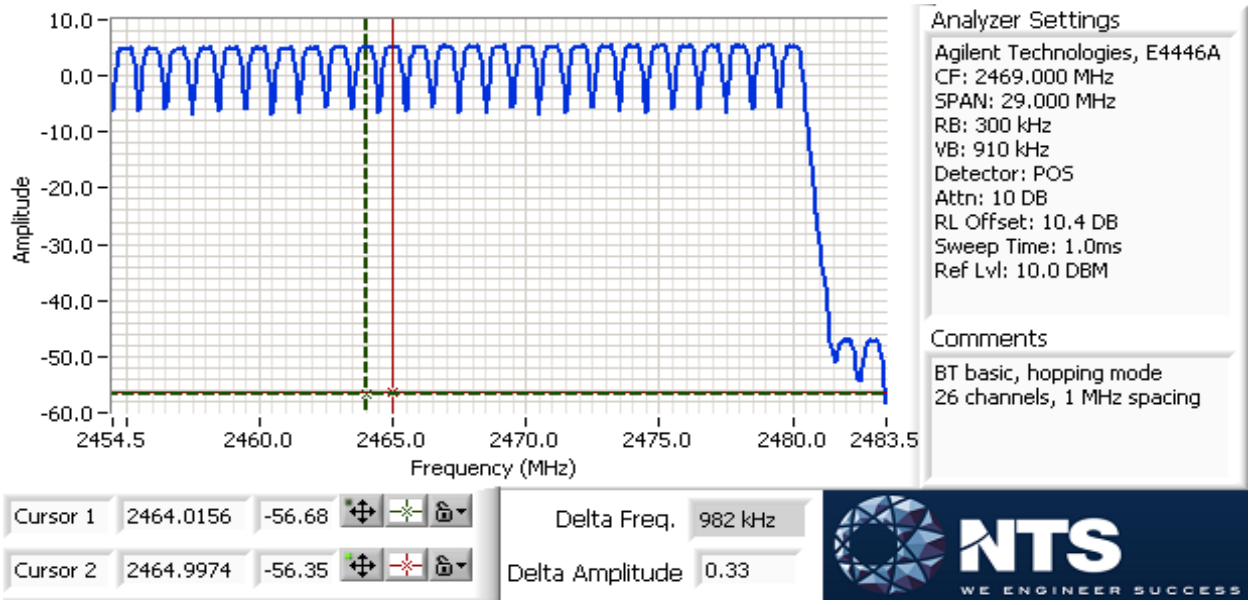
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

The channel spacing is 1MHz with a minimum of 20 channels and a maximum of 79 channels used. See plots below showing all 79 channels, with first channel at 2402 MHz and last channel at 2480 MHz



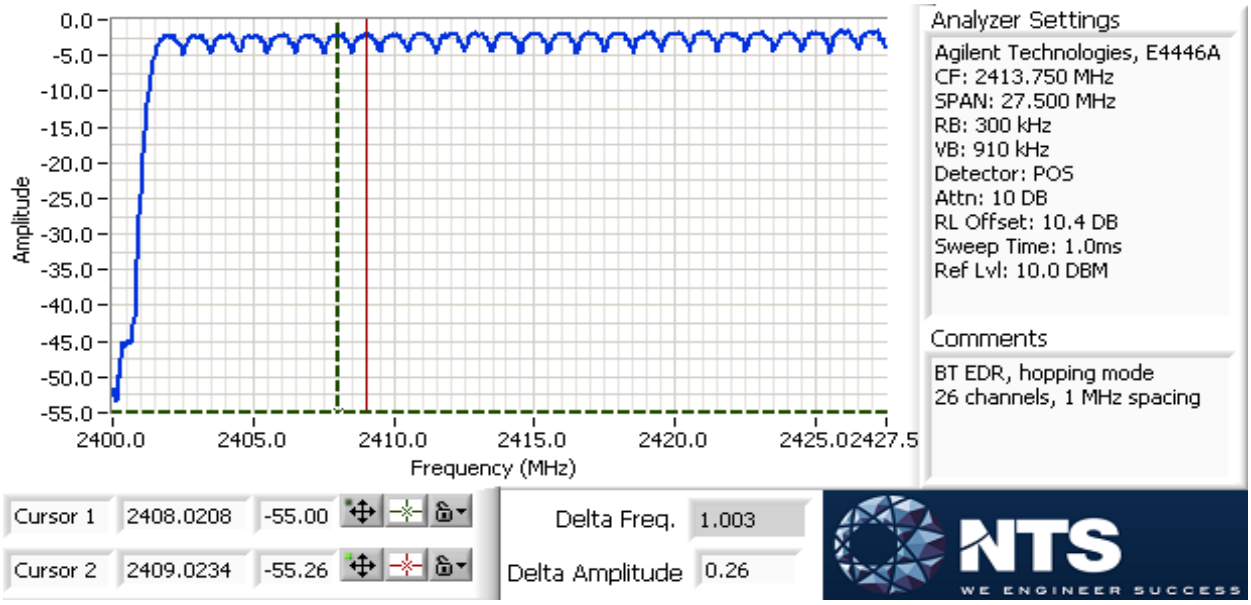


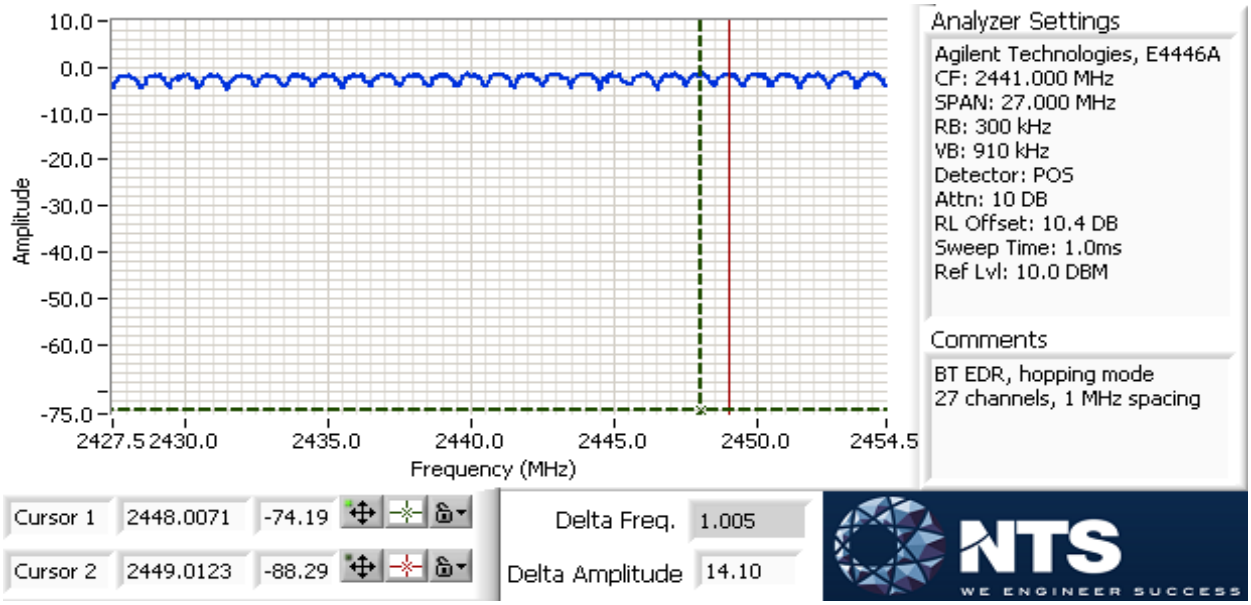
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



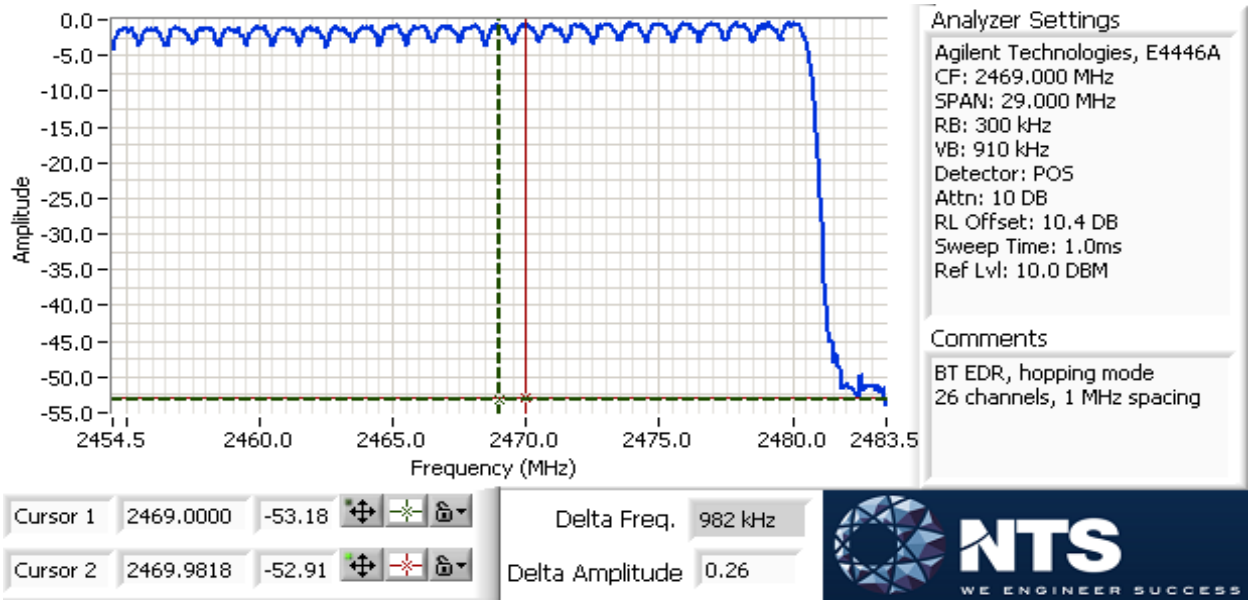
Total channels = 26+27+26 = 79

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Total channels = 26+27+26 = 79

Requirement: Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)
The device complies with the Bluetooth protocol and employs a minimum of 20 of the available 79 hopping channels when employing adaptive frequency hopping and all 79 channels when not. Channels are selected in a pseudo random manner to ensure, on average, all channels are used equally.
The hopping rate is 1600 hops per second although any ne channel may be used for a single hop slot, 3 hop slots or 5 hop slots. The dwell time per channel is, therefore either 0.625ms (single slot), 1.875ms (three slot) or 3.125ms (five slot). The average time of occupancy will not exceed 0.4s in any time interval of 0.4s mutliplied by the number of channels being used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

RSS 210 and FCC 15.247 (DSS) 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.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 24 °C
Rel. Humidity: 40 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

MAC Address: 001500DC7B25 DRTU Tool Version 1.7.1-777, Driver version 16.6.0.1

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	Bluetooth basic rate (1Mb/s)	low	Max	3.3	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	47.2 dBµV/m @ 2362.0 MHz (-6.8 dB)
					Radiated Emissions, 1 - 26 GHz		42.7 dBµV/m @ 7467.3 MHz (-11.3 dB)
1b		center	Max	4.0	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	42.6 dBµV/m @ 7454.1 MHz (-11.4 dB)
1c		high	Max	4.6	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	41.3 dBµV/m @ 2500.0 MHz (-12.7 dB)
					Radiated Emissions, 1 - 26 GHz		56.2 dBµV/m @ 1199.3 MHz (-17.8 dB)
2a	Bluetooth EDR (3 Mb/s)	low	Max	-3.1	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	38.6 dBµV/m @ 2362.0 MHz (-15.4 dB)
					Radiated Emissions, 1 - 26 GHz		43.0 dBµV/m @ 7496.9 MHz (-11.0 dB)
2b		center	Max	-2.3	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	42.9 dBµV/m @ 7461.6 MHz (-11.1 dB)
2c		high	Max	-1.5	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	37.7 dBµV/m @ 2483.5 MHz (-16.3 dB)
					Radiated Emissions, 1 - 26 GHz		43.2 dBµV/m @ 7496.0 MHz (-10.8 dB)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	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.

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

Antenna: antenna connected.

Basic data rate		Extended data rate	
Duty Cycle:	0.770	Duty Cycle:	0.730
Correction Factor (dB)	2.3	Correction Factor (dB)	2.7

Notes:

Bluetooth uses a frequency hopping algorithm that means that the device, during normal operation, is only on a specific channel for a short period of time. The average correction factor is calculated as follows:

A maximum length packet has a duration of 5 time slots.
The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.
With a minimum of 20 hopping channels a channel will not be used more than 4 times in any 100ms period.
The maximum dwell time in a 100ms period is 4 x 3.125ms = 12.5ms.
The average correction factor is, therefore, 20log(12.5/100) =-18dB

As this is a hopping radio this correction factor can be applied to the average value of the signal provided the average value was measured with the device continuously transmitting. DA 00-0705 permits the use of the average correction on the measured average value for frequency hopping radios but this correction was not applied.

Run #1: Radiated Spurious Emissions, 1000-26000 MHz. Operating Mode: Basic data rate (1Mb/s)

Date of Test:	10/4/2013	Test Location:	FT Chamber#4
Test Engineer:	Joseph Cadigal	Config Change:	none

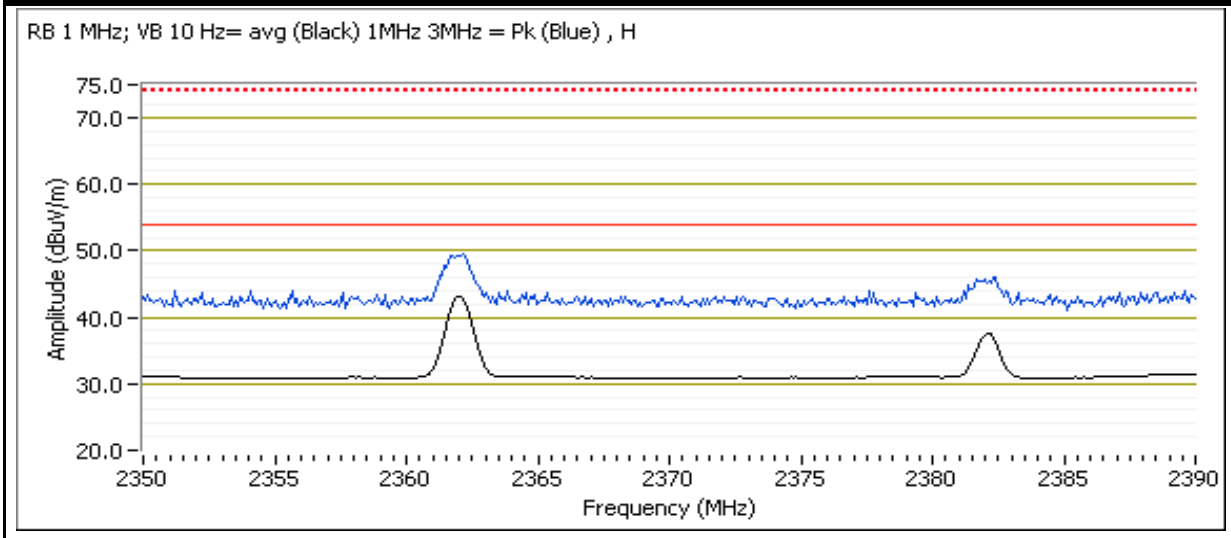
Run #1a, EUT on Channel #1 2402MHz

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain B	-	3.3	Max

Band Edge Signal Field Strength - Direct measurement of 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	
2362.020	47.2	H	54.0	-6.8	AVG	126	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
2380.300	53.8	H	74.0	-20.2	PK	126	1.0	POS; RB 1 MHz; VB: 3 MHz
2382.060	45.6	V	54.0	-8.4	AVG	72	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
2376.530	54.1	V	74.0	-19.9	PK	72	1.0	POS; RB 1 MHz; VB: 3 MHz

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



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	
2402.010	97.4	V	-	-	Pk	72	1.0	POS; RB 100 kHz; VB: 100 kHz
2402.000	99.7	H	-	-	PK	126	1.0	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	97.4	dBµV/m
Limit for emissions outside of restricted bands:	77.4	dBµV/m

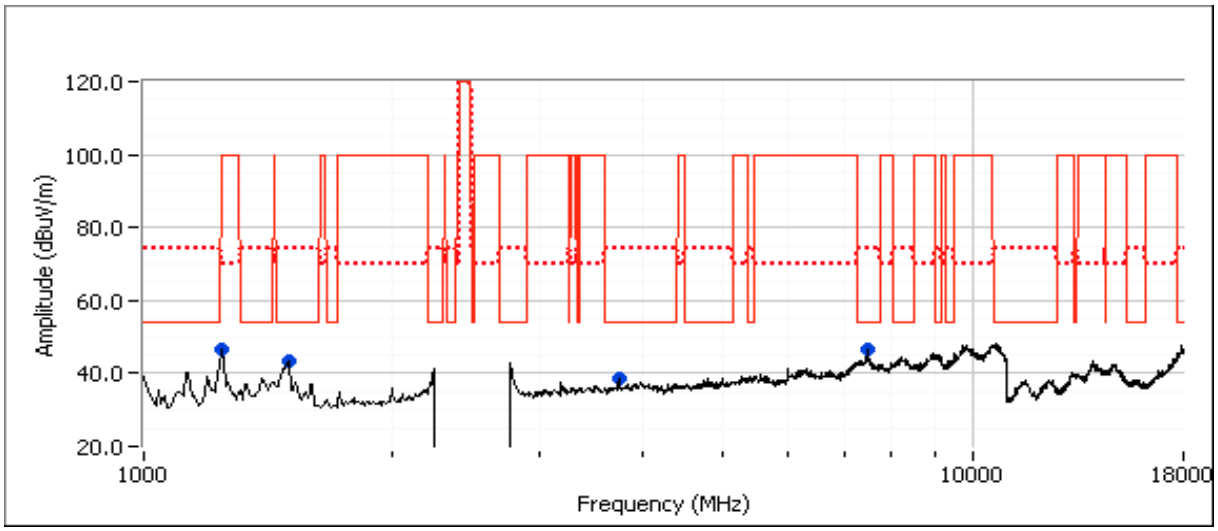
Limit is -20dBc (Peak power measurement)

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	
7467.270	42.7	V	54.0	-11.3	AVG	151	1.6	RB 1 MHz;VB 10 Hz;Peak, Note 2
1498.990	34.7	V	54.0	-19.3	AVG	319	1.0	RB 1 MHz;VB 10 Hz;Peak
7467.490	53.4	V	74.0	-20.6	PK	151	1.6	RB 1 MHz;VB 3 MHz;Peak
3747.830	31.9	V	54.0	-22.1	AVG	271	1.0	RB 1 MHz;VB 10 Hz;Peak
1499.340	50.4	V	74.0	-23.6	PK	319	1.0	RB 1 MHz;VB 3 MHz;Peak
1233.850	30.0	V	54.0	-24.0	AVG	212	1.2	RB 1 MHz;VB 10 Hz;Peak
3748.010	49.6	V	74.0	-24.4	PK	271	1.0	RB 1 MHz;VB 3 MHz;Peak
1233.900	46.9	V	74.0	-27.1	PK	212	1.2	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -20dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Run #1b: , EUT on Channel #39 2441MHz

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain B	-	4.0	Max

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	
2439.990	99.7	H	-	-	PK	64	1.0	POS; RB 100 kHz; VB: 100 kHz
2440.060	98.1	V	-	-	PK	72	1.0	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	98.1	dBµV/m	
Limit for emissions outside of restricted bands:	78.1	dBµV/m	Limit is -20dBc (Peak power measurement)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

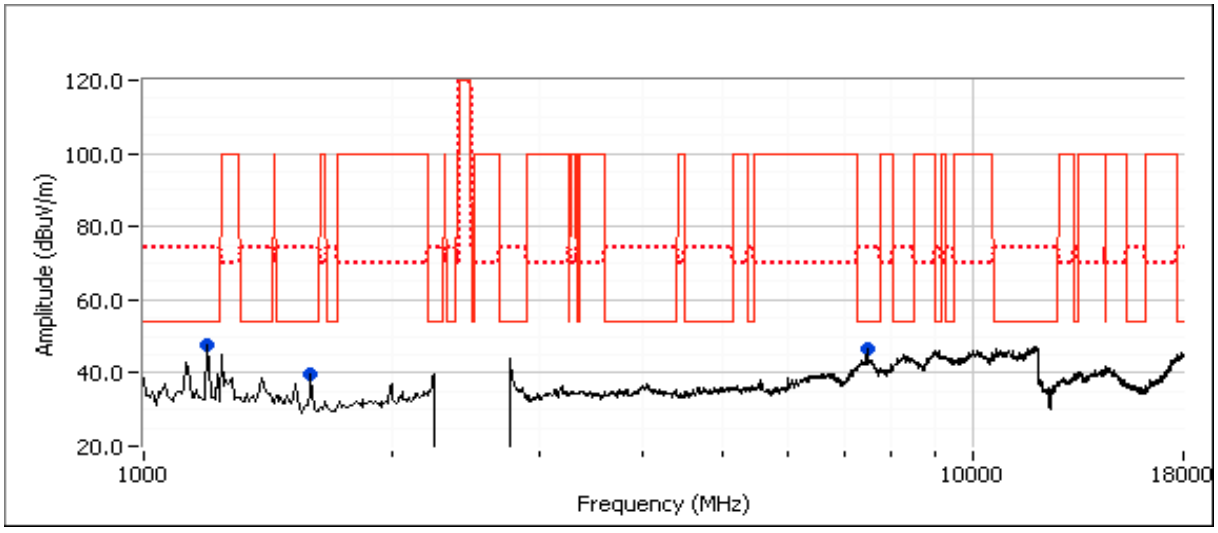
Date of Test: 10/7/2013 Test Location: FT Chamber#4

Test Engineer: Deniz Demrici Config Change: none

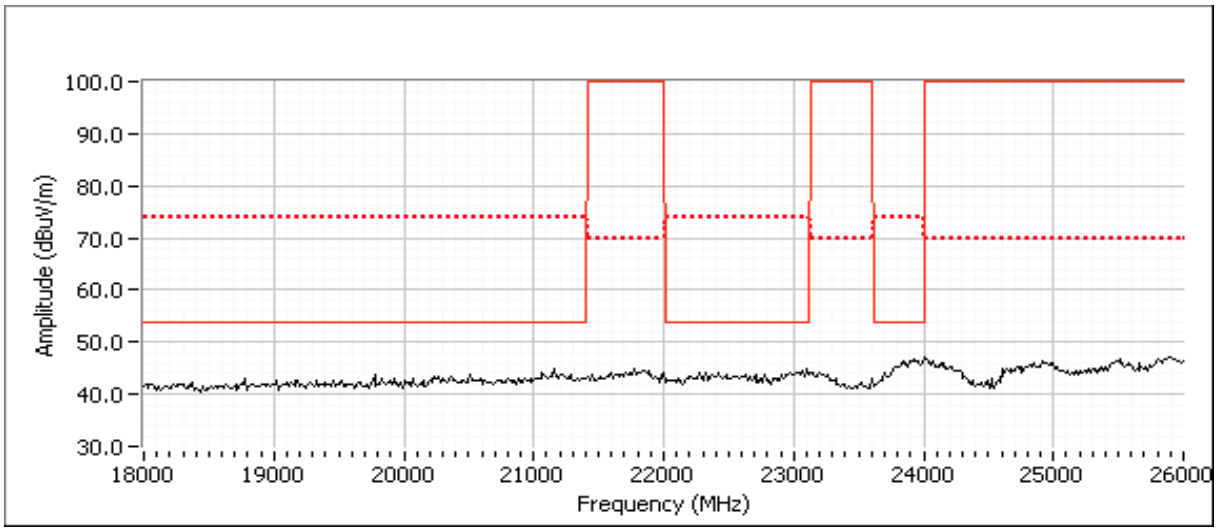
Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7454.130	42.6	V	54.0	-11.4	AVG	193	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
1197.760	57.4	V	74.0	-16.6	PK	157	1.0	RB 1 MHz;VB 3 MHz;Peak
1195.360	33.0	V	54.0	-21.0	AVG	157	1.0	RB 1 MHz;VB 10 Hz;Peak
7455.000	52.2	V	74.0	-21.8	PK	193	1.0	RB 1 MHz;VB 3 MHz;Peak
1593.340	27.2	H	54.0	-26.8	AVG	162	1.0	RB 1 MHz;VB 10 Hz;Peak
1598.920	45.4	H	74.0	-28.6	PK	162	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -20dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.
Note 3:	Scans made between 18 - 26GHz with the measurement antenna moved around the card and its antennas 100 cm from the device indicated there were no signifcant emissions in this frequency range



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #1c: , EUT on Channel #79 2480MHz

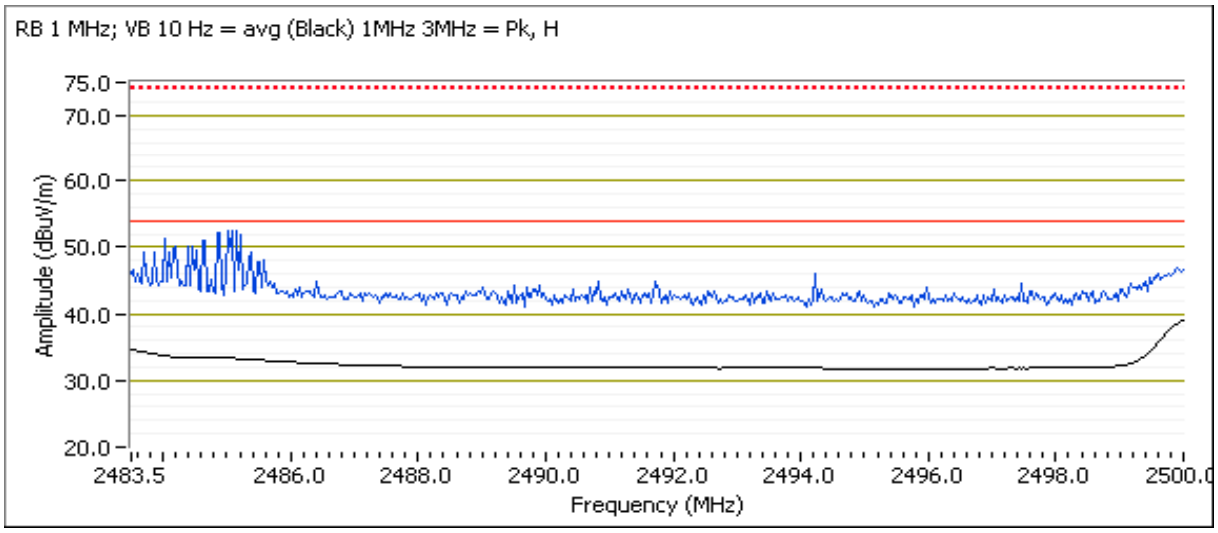
	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain B	-	4.6	Max

Date of Test: 10/4/2013 Test Location: FT Chamber#4

Test Engineer: Joseph Cadigal Config Change: none

Band Edge Signal Field Strength - Direct measurement of 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	
2500.000	41.3	H	54.0	-12.7	AVG	132	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
2499.970	49.7	H	74.0	-24.3	PK	132	1.0	POS; RB 1 MHz; VB: 3 MHz
2500.000	38.8	V	54.0	-15.2	AVG	74	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
2484.360	45.0	V	74.0	-29.0	PK	74	1.0	POS; RB 1 MHz; VB: 3 MHz



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	
2479.910	99.1	V	-	-	PK	76	1.0	POS; RB 100 kHz; VB: 100 kHz
2479.880	100.5	H	-	-	PK	132	2.2	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	99.1	dBµV/m	
Limit for emissions outside of restricted bands:	79.1	dBµV/m	Limit is -20dBc (Peak power measurement)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

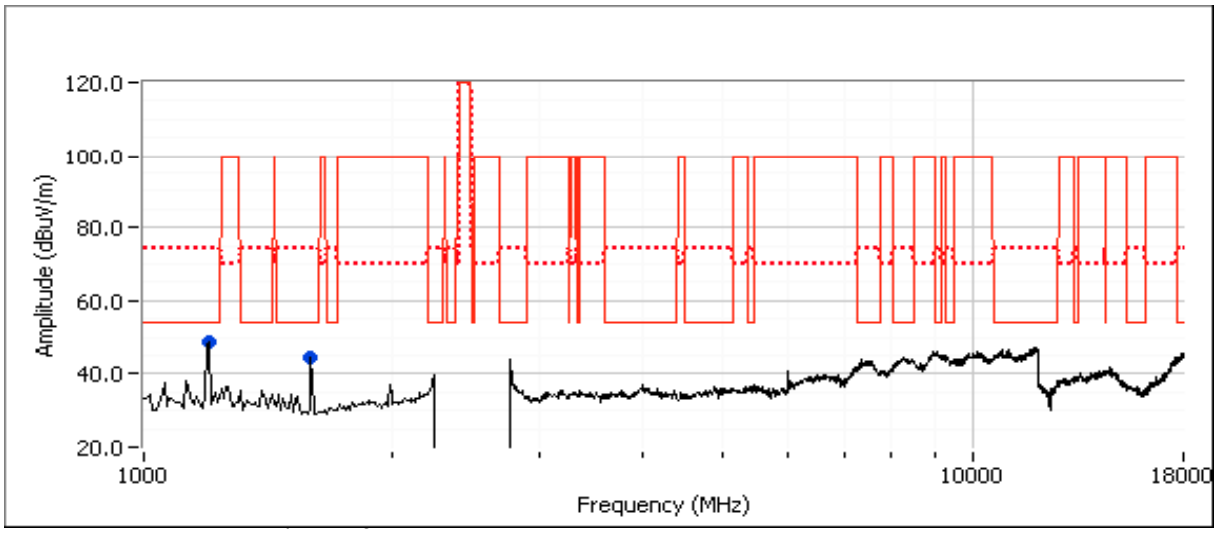
Date of Test: 10/7/2013 Test Location: FT Chamber#4

Test Engineer: Deniz Demrici Config Change: none

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	
1199.270	56.2	V	74.0	-17.8	PK	171	1.0	RB 1 MHz;VB 3 MHz;Peak
1198.950	30.0	V	54.0	-24.0	AVG	171	1.0	RB 1 MHz;VB 10 Hz;Peak
1594.030	49.6	V	74.0	-24.4	PK	144	1.7	RB 1 MHz;VB 3 MHz;Peak
1598.490	27.6	V	54.0	-26.4	AVG	144	1.7	RB 1 MHz;VB 10 Hz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -20dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #2: Radiated Spurious Emissions, 1000-26000 MHz. Operating Mode: EDR data rate (3Mb/s)

Date of Test: 10/4/2013 Test Location: FT Chamber#4

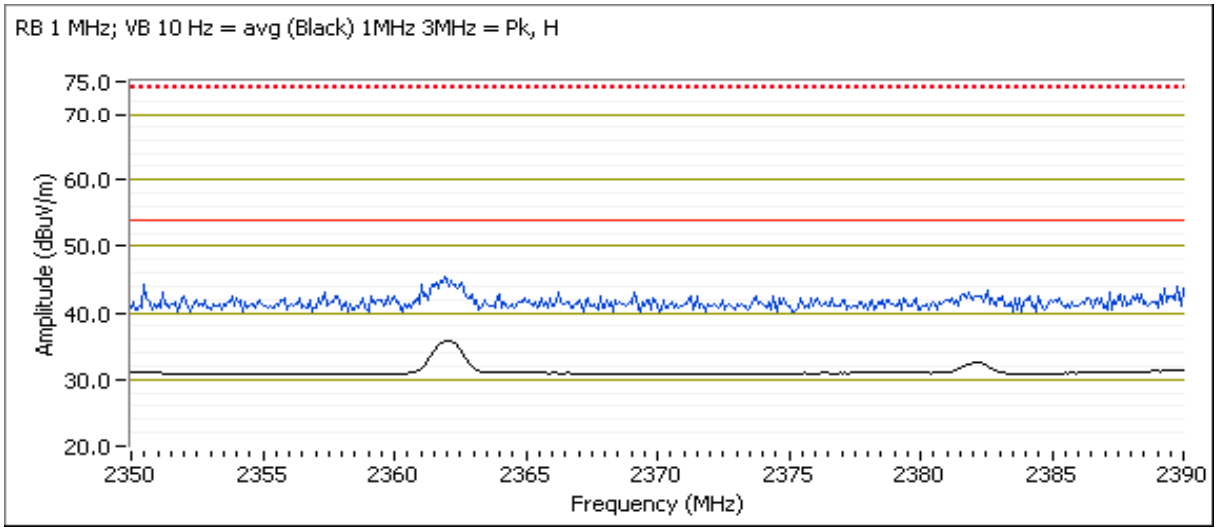
Test Engineer: Joseph Cadigal Config Change: none

Run #2a, EUT on Channel #1 2402MHz

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain B	-	-3.1	Max

Band Edge Signal Field Strength - Direct measurement of 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	
2362.020	38.6	H	54.0	-15.4	AVG	61	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
2361.940	43.0	H	74.0	-31.0	PK	61	1.0	POS; RB 1 MHz; VB: 3 MHz
2362.020	36.4	V	54.0	-17.6	AVG	67	1.0	POS; RB 1 MHz; VB: 10 Hz
2382.460	42.8	V	74.0	-31.2	PK	67	1.0	POS; RB 1 MHz; VB: 3 MHz



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

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	
2401.830	90.6	H	-	-	PK	61	1.0	POS; RB 100 kHz; VB: 100 kHz
2401.820	87.9	V	-	-	PK	67	1.0	POS; RB 100 kHz; VB: 100 kHz

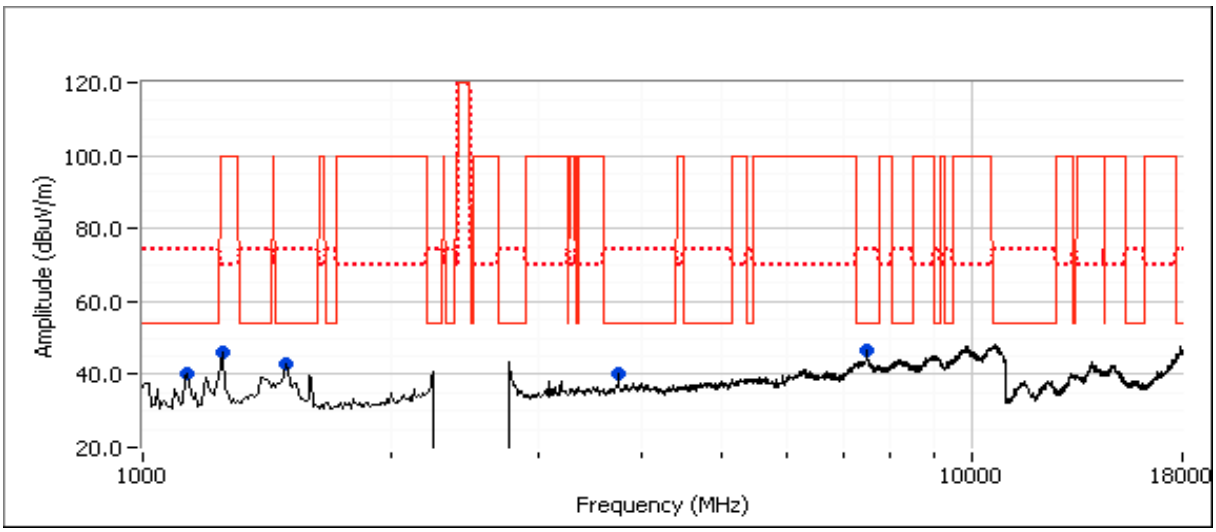
Fundamental emission level @ 3m in 100kHz RBW:	87.9	dBµV/m	
Limit for emissions outside of restricted bands:	67.9	dBµV/m	Limit is -20dBc (Peak power measurement)

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	
7496.910	43.0	V	54.0	-11.0	AVG	164	1.6	RB 1 MHz;VB 10 Hz;Peak, Note 2
1244.590	55.6	V	74.0	-18.4	PK	194	1.0	RB 1 MHz;VB 3 MHz;Peak
7496.190	54.8	V	74.0	-19.2	PK	164	1.6	RB 1 MHz;VB 3 MHz;Peak
1499.020	34.0	V	54.0	-20.0	AVG	197	1.3	RB 1 MHz;VB 10 Hz;Peak
1129.010	31.7	V	54.0	-22.3	AVG	41	1.3	RB 1 MHz;VB 10 Hz;Peak
3741.980	31.2	V	54.0	-22.8	AVG	194	1.0	RB 1 MHz;VB 10 Hz;Peak
1498.430	49.6	V	74.0	-24.4	PK	197	1.3	RB 1 MHz;VB 3 MHz;Peak
1128.620	45.9	V	74.0	-28.1	PK	41	1.3	RB 1 MHz;VB 3 MHz;Peak
3743.820	44.4	V	74.0	-29.6	PK	194	1.0	RB 1 MHz;VB 3 MHz;Peak
1245.720	33.1	V	54.0	-20.9	AVG	194	1.0	RB 1 MHz;VB 10 Hz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -20dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Run #2b: , EUT on Channel #39 2440MHz

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain B	-	-2.3	Max

Fundamental Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2440.100	91.0	H	-	-	PK	64	1.0	POS; RB 100 kHz; VB: 100 kHz
2440.170	90.7	V	-	-	PK	75	1.0	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	90.7	dBµV/m
Limit for emissions outside of restricted bands:	70.7	dBµV/m

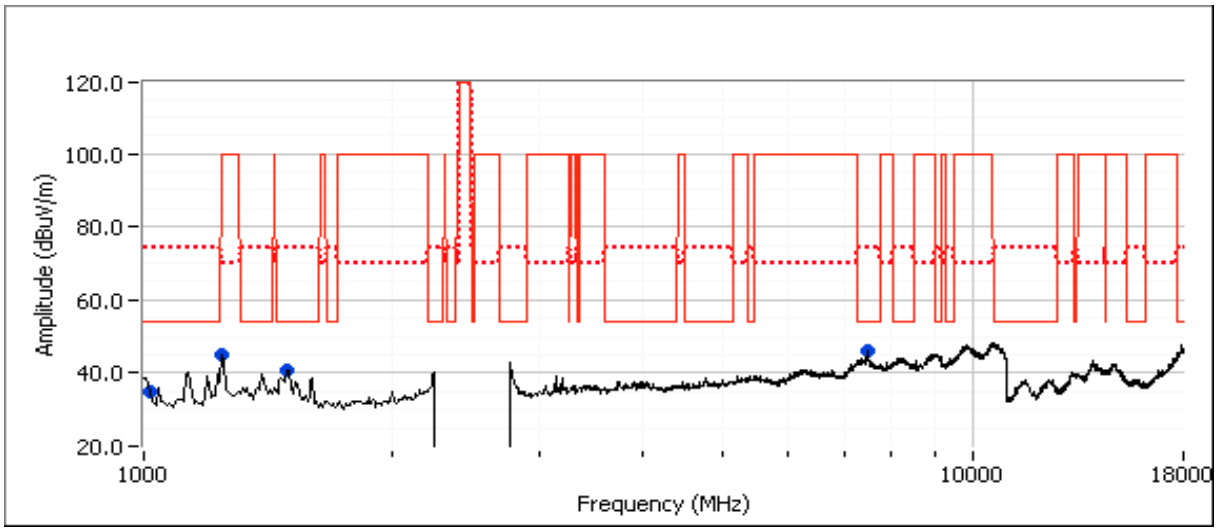
Limit is -20dBc (Peak power measurement)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

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	
7461.620	42.9	V	54.0	-11.1	AVG	164	1.6	RB 1 MHz;VB 10 Hz;Peak, Note 2
7462.460	51.5	V	74.0	-22.5	PK	164	1.6	RB 1 MHz;VB 3 MHz;Peak
1233.430	27.9	V	54.0	-26.1	AVG	235	1.3	RB 1 MHz;VB 10 Hz;Peak
1232.410	43.5	V	74.0	-30.5	PK	235	1.3	RB 1 MHz;VB 3 MHz;Peak
1495.610	34.1	V	54.0	-19.9	AVG	295	1.0	RB 1 MHz;VB 10 Hz;Peak
1495.220	50.1	V	74.0	-23.9	PK	295	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -20dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.
Note 3:	Scans made between 18 - 26GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no signifcant emissions in this frequency range



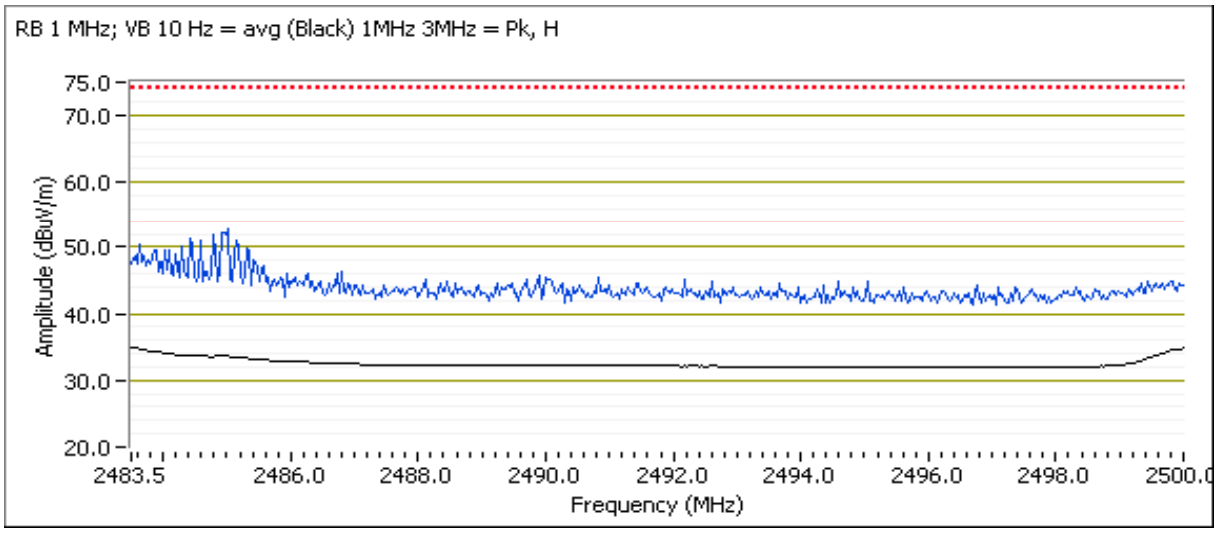
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #2c: , EUT on Channel #79 2480MHz

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain B	-	-1.5	Max

Band Edge Signal Field Strength - Direct measurement of 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	
2483.500	37.7	H	54.0	-16.3	AVG	116	1.4	RB 1 MHz;VB 10 Hz;Peak, Note 2
2484.160	51.4	H	74.0	-22.6	PK	116	1.4	POS; RB 1 MHz; VB: 3 MHz
2483.530	37.2	V	54.0	-16.8	AVG	74	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 2
2483.600	46.1	V	74.0	-27.9	PK	74	1.0	POS; RB 1 MHz; VB: 3 MHz



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	
2479.970	93.5	H	-	-	PK	116	1.4	POS; RB 100 kHz; VB: 100 kHz
2480.110	91.3	V	-	-	PK	74	1.0	POS; RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	91.3	dBµV/m
Limit for emissions outside of restricted bands:	71.3	dBµV/m

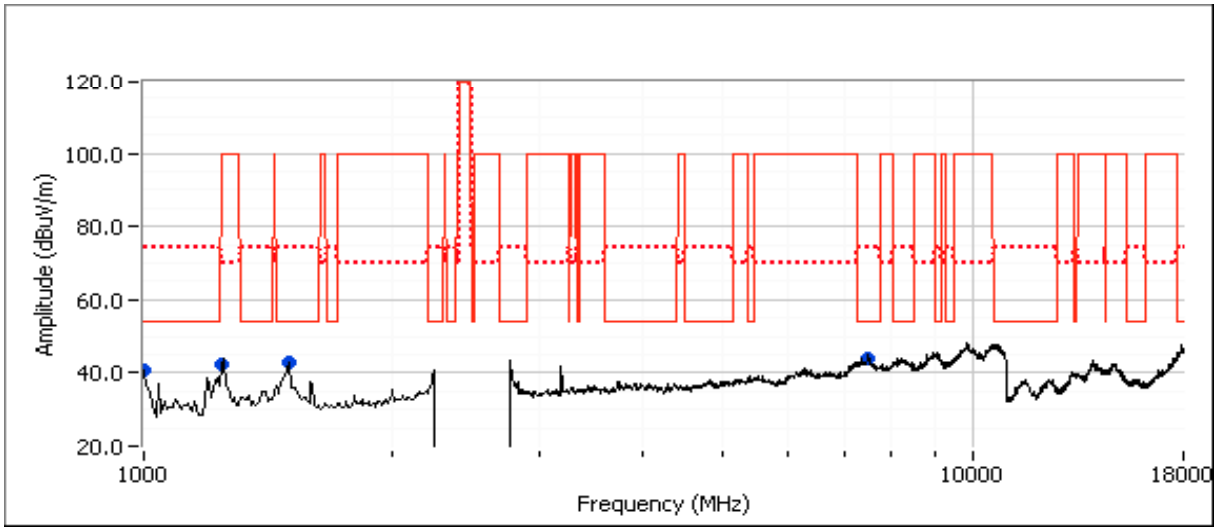
Limit is -20dBc (Peak power measurement)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

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	
7496.020	43.2	V	54.0	-10.8	AVG	299	1.9	RB 1 MHz;VB 10 Hz;Peak, Note 2
7494.260	54.0	V	74.0	-20.0	PK	299	1.9	RB 1 MHz;VB 3 MHz;Peak
1000.000	21.2	H	54.0	-32.8	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Peak
1000.000	33.3	H	74.0	-40.7	PK	0	1.0	RB 1 MHz;VB 3 MHz;Peak
1238.290	26.8	V	54.0	-27.2	AVG	229	1.3	RB 1 MHz;VB 10 Hz;Peak
1236.200	38.3	V	74.0	-35.7	PK	229	1.3	RB 1 MHz;VB 3 MHz;Peak
1494.940	33.9	V	54.0	-20.1	AVG	308	1.0	RB 1 MHz;VB 10 Hz;Peak
1494.880	51.6	V	74.0	-22.4	PK	308	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -20dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	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.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

For Bluetooth: Tx is chain B, Rx is chain B. For WiFi, only Chain A is used for transmit in the 2.4GHz band when Bluetooth is active, both chains can be used in 5GHz bands.

Ambient Conditions:

Temperature: 24 °C
Rel. Humidity: 39 %

Summary of Results

MAC Address: 001500DC7B25 DRTU Tool Version 1.7.1-777, Driver version 16.6.0.1

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1	BT 1Mb/s 802.11b	2402MHz 2412MHz	Max 21	16.7	Radiated Emissions 1- 10 GHz	FCC 15.247	51.2 dBµV/m @ 2389.8 MHz (-2.8 dB)
2	BT 1Mb/s 802.11b	2480MHz 2462MHz	Max 22	16.7		FCC 15.247	51.6 dBµV/m @ 2488.0 MHz (-2.4 dB)
3	BT 1Mb/s 802.11g	2402MHz 2412MHz	Max 20	15.5		FCC 15.247	53.0 dBµV/m @ 2390.0 MHz (-1.0 dB)
4	BT 1Mb/s 802.11g	2480MHz 2462MHz	Max 22.5	16.6		FCC 15.247	51.3 dBµV/m @ 2483.6 MHz (-2.7 dB)
WiFi mode for the following runs based on worst case mode from runs 1 through 4							
5	BT 1Mb/s 802.11g	2402MHz 2437MHz	Max 23.5	16.7	Radiated Emissions 1- 10 GHz	FCC 15.247	51.2 dBµV/m @ 2483.6 MHz (-2.8 dB)
6	BT 1Mb/s 802.11g	2440MHz 2412MHz	Max 23	16.5		FCC 15.247	53.4 dBµV/m @ 2390.0 MHz (-0.6 dB)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
7	BT 1Mb/s 802.11g	2440MHz 2462MHz	Max 23	16.6	Radiated Emissions 1- 10 GHz	FCC 15.247	53.4 dBµV/m @ 2483.6 MHz (-0.6 dB)
8	BT 1Mb/s 802.11g	2480MHz 2437MHz	Max 23.5	16.6		FCC 15.247	51.8 dBµV/m @ 2483.5 MHz (-2.2 dB)
WiFi mode and channel and Bluetooth channel based on the worst case mode from runs 1 through 8							
9	BT 3Mb/s 802.11g	2440 MHz 2412 MHz	Max 18.5	13.5	Radiated Emissions 1- 10 GHz	FCC 15.247	50.3 dBµV/m @ 2389.8 MHz (-3.7 dB)
10	BTLE 802.11b	2440 MHz 2412 MHz	Max 19.5	15.4		FCC 15.247	45.0 dBµV/m @ 2332.4 MHz (-9.0 dB)
WiFi mode - 802.11n 20MHz with both chains active at 16.5dBm per chain, center channel in each 5GHz band. Bluetooth on center channel, 1Mb/s mode							
11	BT 1Mb/s 802.11n20	2440MHz 5200MHz	28 28.5 Max	12.1 12.2	Radiated Emissions 1- 15 GHz	FCC 15.247	42.9 dBµV/m @ 4880.0 MHz (-11.1 dB)
12	BT 1Mb/s 802.11n20	2440MHz 5300MHz	30.5 30.5 Max	13 13		FCC 15.247	42.5 dBµV/m @ 4880.0 MHz (-11.5 dB)
13	BT 1Mb/s 802.11n20	2440MHz 5580MHz	30.5 30.5 Max	13.7 13.6		FCC 15.247	43.3 dBµV/m @ 4880.0 MHz (-10.7 dB)
14	BT 1Mb/s 802.11n20	2440MHz 5785MHz	30.5 30.5 Max	13.5 13.5		FCC 15.247	42.4 dBµV/m @ 4880.0 MHz (-11.6 dB)

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.

Basic data rate		Extended data rate	
Duty Cycle:	0.770	Duty Cycle:	0.730
Correction Factor (dB)	2.3	Correction Factor (dB)	2.7

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Notes:

Bluetooth Basic Rate and EDR modes use a frequency hopping algorithm that means that the device, during normal operation, is only on a specific channel for a short period of time. The average correction factor is calculated as follows:

A maximum length packet has a duration of 5 time slots.

The hopping rate is 1600 hops/second so the maximum dwell time is 5/1600 seconds, or 3.125ms.

With a minimum of 20 hopping channels a channel will not be used more than 4 times in any 100ms period.

The maximum dwell time in a 100ms period is 4 x 3.125ms = 12.5ms.

The average correction factor is, therefore, 20log(12.5/100) =-18dB

As this is a hopping radio this correction factor can be applied to the average value of the signal provided the average value was measured with the device continuously transmitting. DA 00-0705 permits the use of the average correction on the measured average value for frequency hopping radios.

All measurements in this data sheet do not include this average correction factor.

Run #1: 1-10GHz, 802.11b @ 2412 MHz Chain 1, BT Basic Rate @ 2402 MHz Chain 2

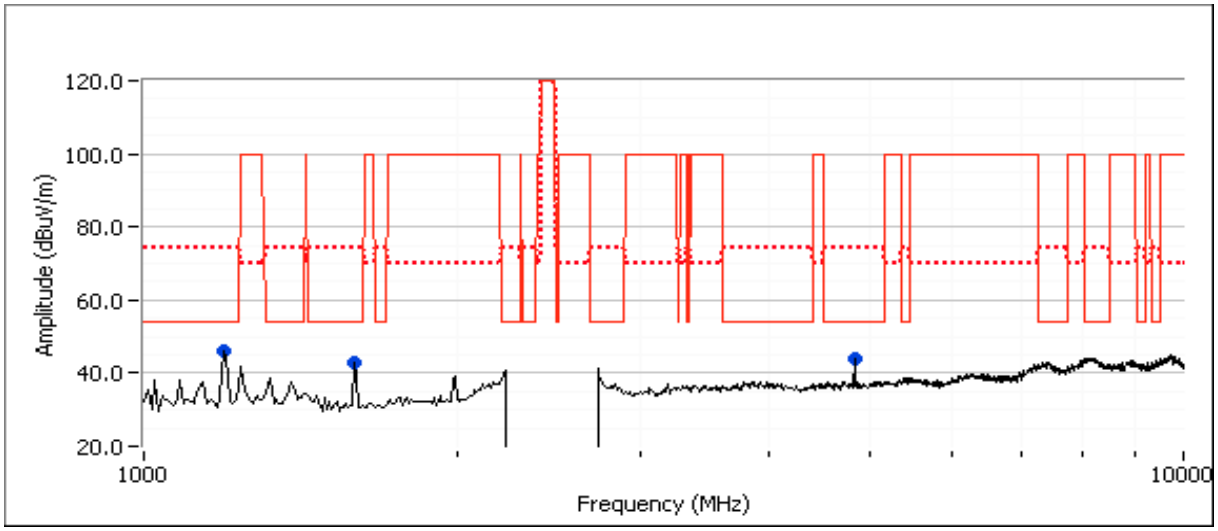
Date of Test: 10/7/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.7	21.0
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

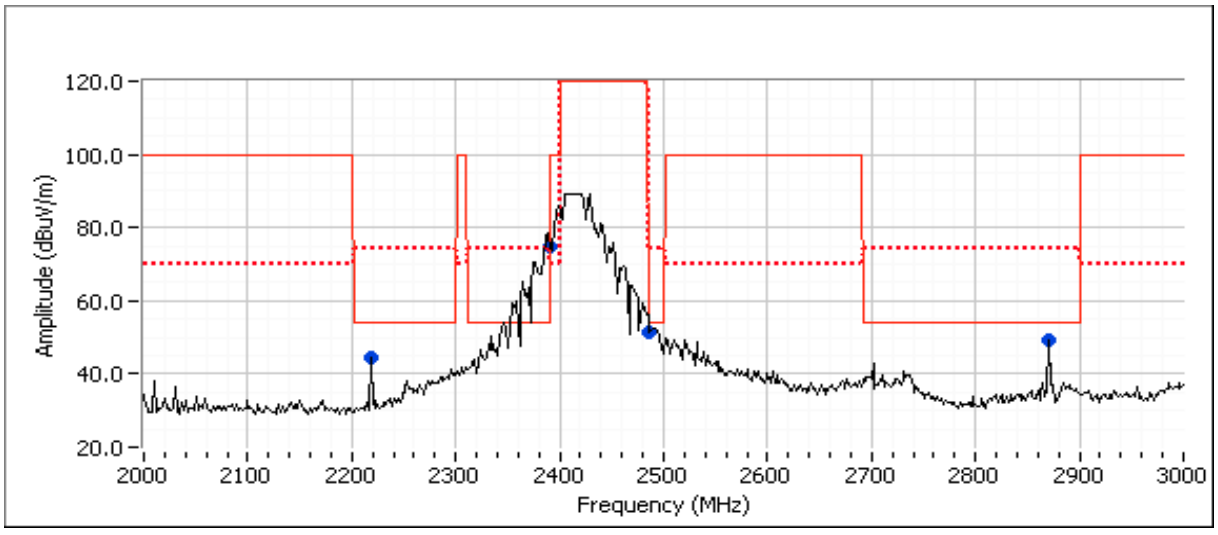
Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4824.030	44.0	V	54.0	-10.0	Peak	143	1.6	
1199.430	46.2	V	54.0	-7.8	Peak	200	1.0	
1594.190	42.7	V	54.0	-11.3	Peak	228	1.9	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4823.990	42.9	V	54.0	-11.1	AVG	143	1.6	RB 1 MHz;VB 10 Hz;Peak
4824.100	48.8	V	74.0	-25.2	PK	143	1.6	RB 1 MHz;VB 3 MHz;Peak
1198.200	31.0	V	54.0	-23.0	AVG	200	1.0	RB 1 MHz;VB 10 Hz;Peak
1198.360	56.5	V	74.0	-17.5	PK	200	1.0	RB 1 MHz;VB 3 MHz;Peak
1593.910	30.2	V	54.0	-23.8	AVG	228	1.9	RB 1 MHz;VB 10 Hz;Peak
1595.290	51.1	V	74.0	-22.9	PK	228	1.9	RB 1 MHz;VB 3 MHz;Peak

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2226.620	44.6	V	54.0	-9.4	Peak	360	1.0	
2863.210	49.0	V	54.0	-5.0	Peak	360	1.0	

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2222.350	28.5	V	54.0	-25.5	AVG	336	1.0	RB 1 MHz;VB 10 Hz;Peak
2225.490	39.6	V	74.0	-34.4	PK	336	1.0	RB 1 MHz;VB 3 MHz;Peak
2862.720	30.9	V	54.0	-23.1	AVG	192	1.0	RB 1 MHz;VB 10 Hz;Peak
2863.740	42.4	V	74.0	-31.6	PK	192	1.0	RB 1 MHz;VB 3 MHz;Peak
2225.290	27.9	H	54.0	-26.1	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Peak
2226.850	39.2	H	74.0	-34.8	PK	0	1.0	RB 1 MHz;VB 3 MHz;Peak
2863.100	30.9	H	54.0	-23.1	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Peak
2861.990	42.4	H	74.0	-31.6	PK	0	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #2: 1-10GHz, 802.11b @ 2462 MHz Chain 1, BT Basic Rate @ 2480 MHz Chain 2

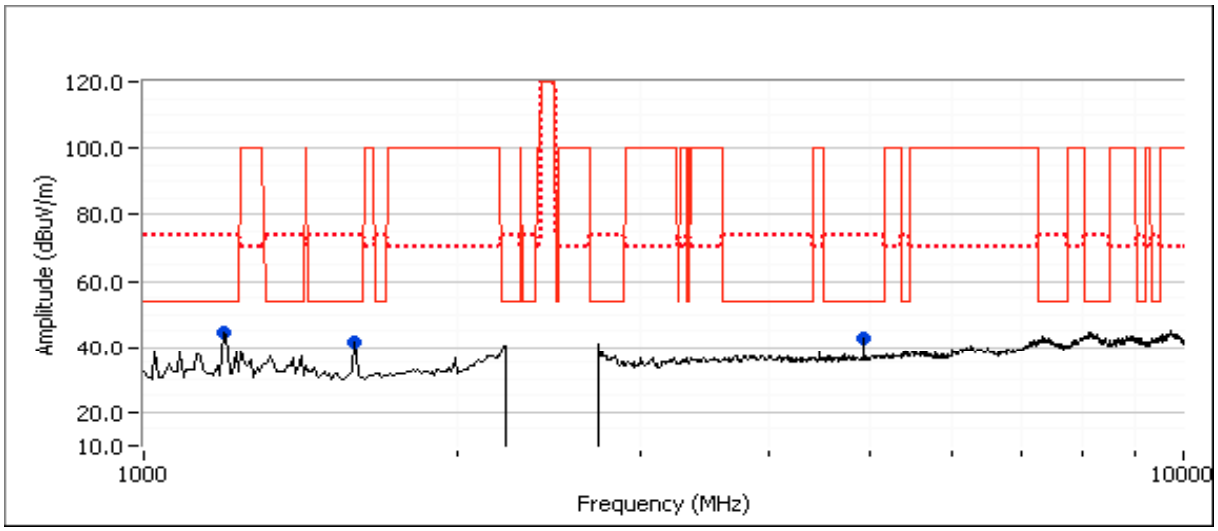
Date of Test: 10/7/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.6	22.0
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Preliminary Measurements (Peak versus average limit)

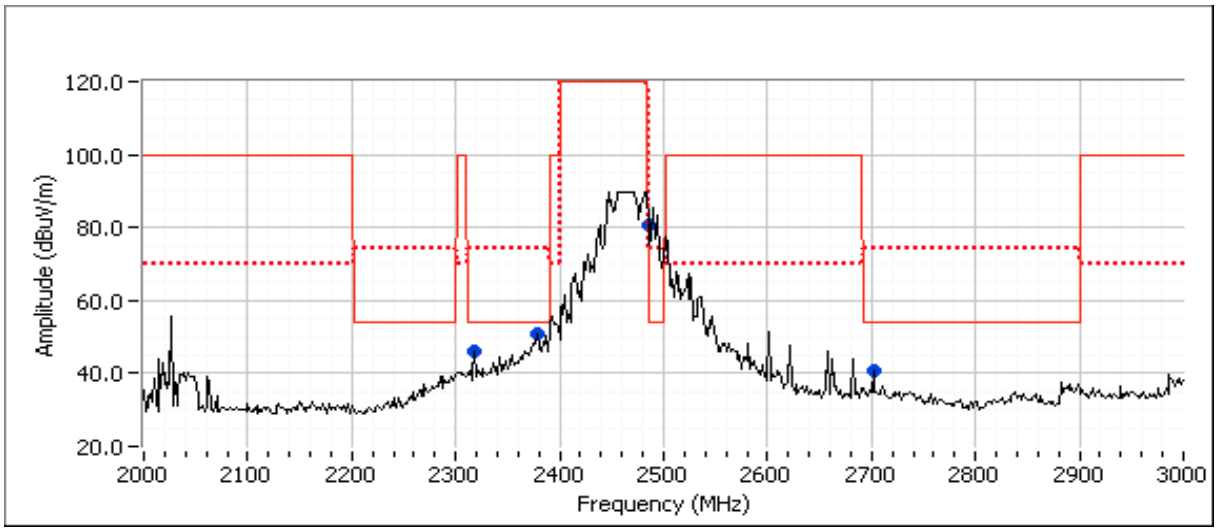
Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1584.680	41.8	V	54.0	-12.2	Peak	79	1.3	
4924.030	42.8	V	54.0	-11.2	Peak	117	1.3	
1199.430	44.7	V	54.0	-9.3	Peak	330	1.6	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1585.860	27.4	V	54.0	-26.6	AVG	79	1.3	RB 1 MHz;VB 10 Hz;Peak
1583.720	38.4	V	74.0	-35.6	PK	79	1.3	RB 1 MHz;VB 3 MHz;Peak
4924.000	41.4	V	54.0	-12.6	AVG	117	1.3	RB 1 MHz;VB 10 Hz;Peak
4924.310	48.0	V	74.0	-26.0	PK	117	1.3	RB 1 MHz;VB 3 MHz;Peak
1199.230	30.2	V	54.0	-23.8	AVG	330	1.6	RB 1 MHz;VB 10 Hz;Peak
1198.990	49.2	V	74.0	-24.8	PK	330	1.6	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2310.620	46.0	V	54.0	-8.0	Peak	308	1.0	
2700.120	40.7	V	54.0	-13.3	Peak	360	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2379.270	39.2	V	54.0	-14.8	AVG	264	1.0	RB 1 MHz;VB 10 Hz;Peak
2379.540	50.1	V	74.0	-23.9	PK	264	1.0	RB 1 MHz;VB 3 MHz;Peak
2700.060	34.5	V	54.0	-19.5	AVG	196	1.7	RB 1 MHz;VB 10 Hz;Peak
2700.400	43.6	V	74.0	-30.4	PK	196	1.7	RB 1 MHz;VB 3 MHz;Peak
2700.080	35.9	H	54.0	-18.1	AVG	360	1.2	RB 1 MHz;VB 10 Hz;Peak
2700.000	45.4	H	74.0	-28.6	PK	360	1.2	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #3: 1-10GHz, 802.11g @ 2412 MHz Chain 1, BT Basic Rate @ 2402 MHz Chain 2

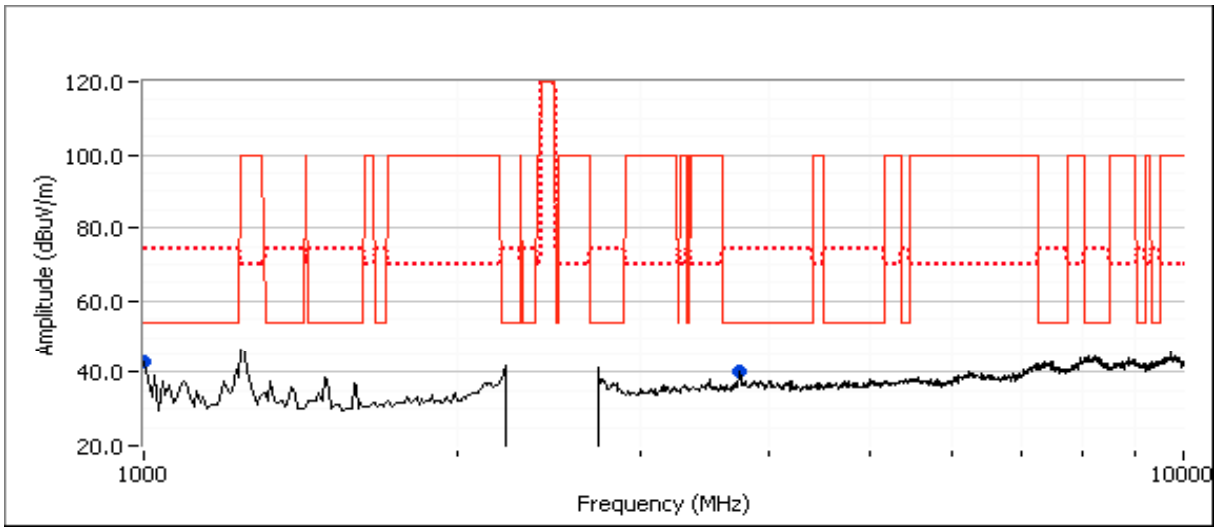
Date of Test: 10/7/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	15.5	20.0
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Preliminary Measurements (Peak versus average limit)

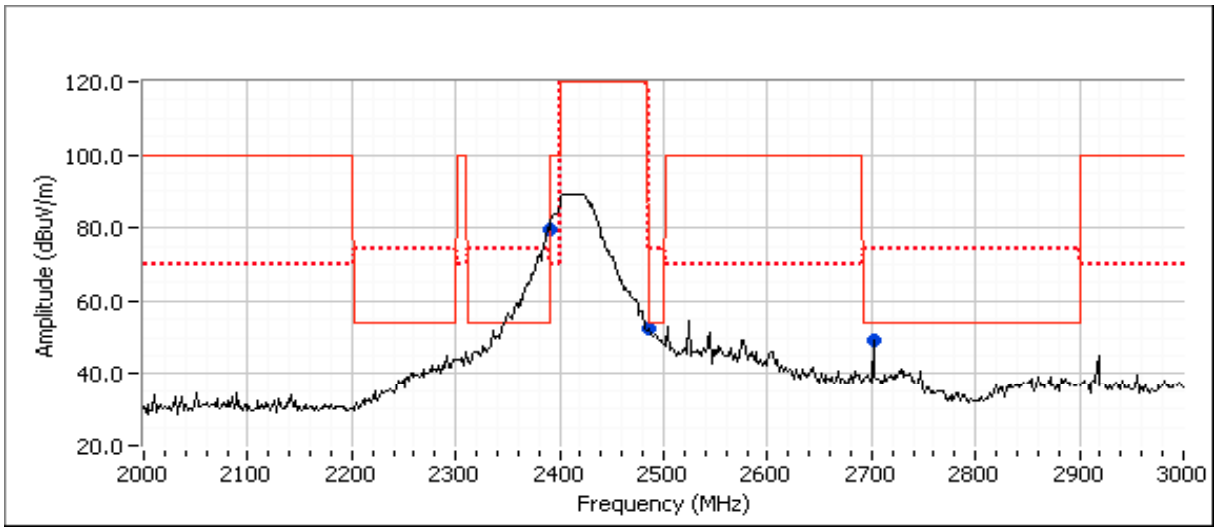
Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3746.860	40.2	H	54.0	-13.8	Peak	62	1.3	
1000.140	43.1	H	54.0	-10.9	Peak	224	1.6	

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3746.910	33.1	H	54.0	-20.9	AVG	62	1.3	RB 1 MHz;VB 10 Hz;Peak
3745.660	51.1	H	74.0	-22.9	PK	62	1.3	RB 1 MHz;VB 3 MHz;Peak
1000.795	25.3	H	54.0	-28.7	AVG	224	1.6	RB 100 kHz;VB 10 Hz;Peak
1000.270	39.2	H	74.0	-34.8	PK	224	1.6	RB 100 kHz;VB 300 kHz;Peak

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2694.820	49.3	V	54.0	-4.7	Peak	153	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2695.670	30.8	V	54.0	-23.2	AVG	290	1.0	RB 1 MHz;VB 10 Hz;Peak
2693.530	41.6	V	74.0	-32.4	PK	290	1.0	RB 1 MHz;VB 3 MHz;Peak
2696.040	32.2	H	54.0	-21.8	AVG	353	1.0	RB 1 MHz;VB 10 Hz;Peak
2695.390	43.7	H	74.0	-30.3	PK	353	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #4: 1-10GHz, 802.11g @ 2462 MHz Chain 1, BT Basic Rate @ 2480 MHz Chain 2

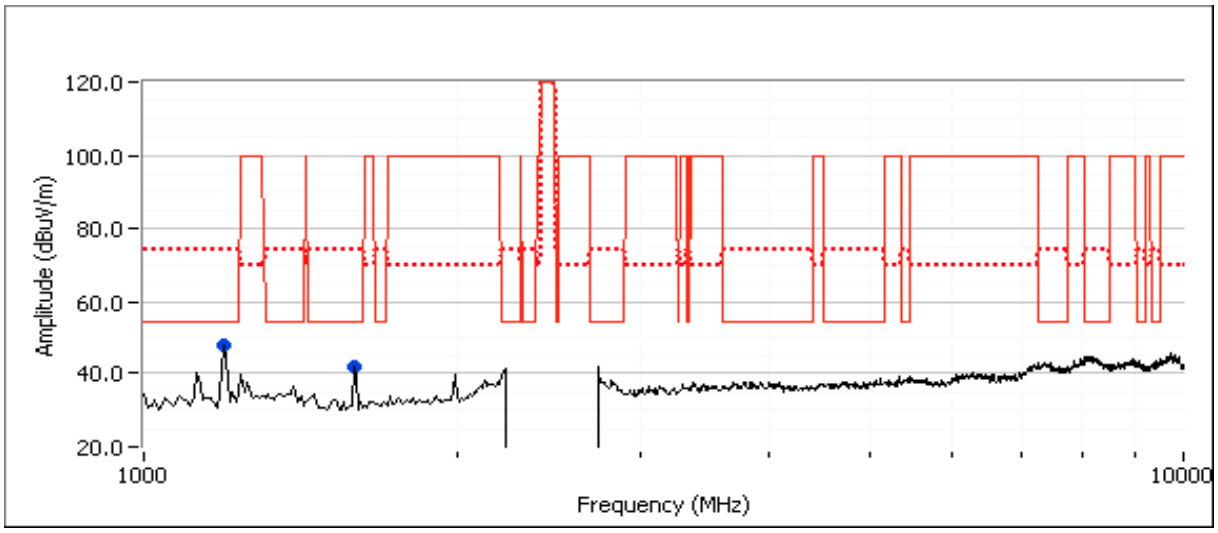
Date of Test: 10/7/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.6	22.5
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Preliminary Measurements (Peak versus average limit)

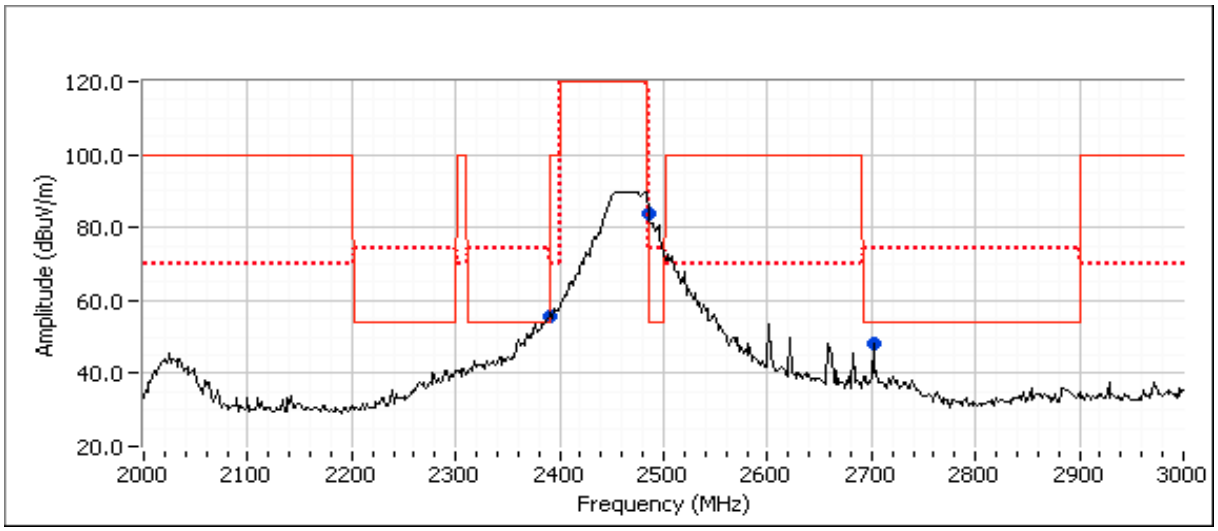
Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1194.610	47.7	V	54.0	-6.3	Peak	319	1.6	
1597.080	42.0	V	54.0	-12.0	Peak	329	1.0	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1195.820	33.2	V	54.0	-20.8	AVG	317	1.6	RB 1 MHz;VB 10 Hz;Peak
1195.220	56.9	V	74.0	-17.1	PK	317	1.6	RB 1 MHz;VB 3 MHz;Peak
1597.870	30.5	V	54.0	-23.5	AVG	331	1.0	RB 1 MHz;VB 10 Hz;Peak
1596.460	50.1	V	74.0	-23.9	PK	331	1.0	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1194.610	47.7	V	54.0	-6.3	Peak	319	1.6	
1597.080	42.0	V	54.0	-12.0	Peak	329	1.0	
2701.670	48.2	V	54.0	-5.8	Peak	211	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.180	34.1	V	54.0	-19.9	AVG	203	1.6	RB 1 MHz;VB 10 Hz;Peak
2700.190	43.0	V	74.0	-31.0	PK	203	1.6	RB 1 MHz;VB 3 MHz;Peak
2700.170	36.6	H	54.0	-17.4	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Peak
2700.290	46.4	H	74.0	-27.6	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #5: 1-10GHz, 802.11g @ 2437 MHz Chain 1, BT Basic Rate @ 2402 MHz Chain 2

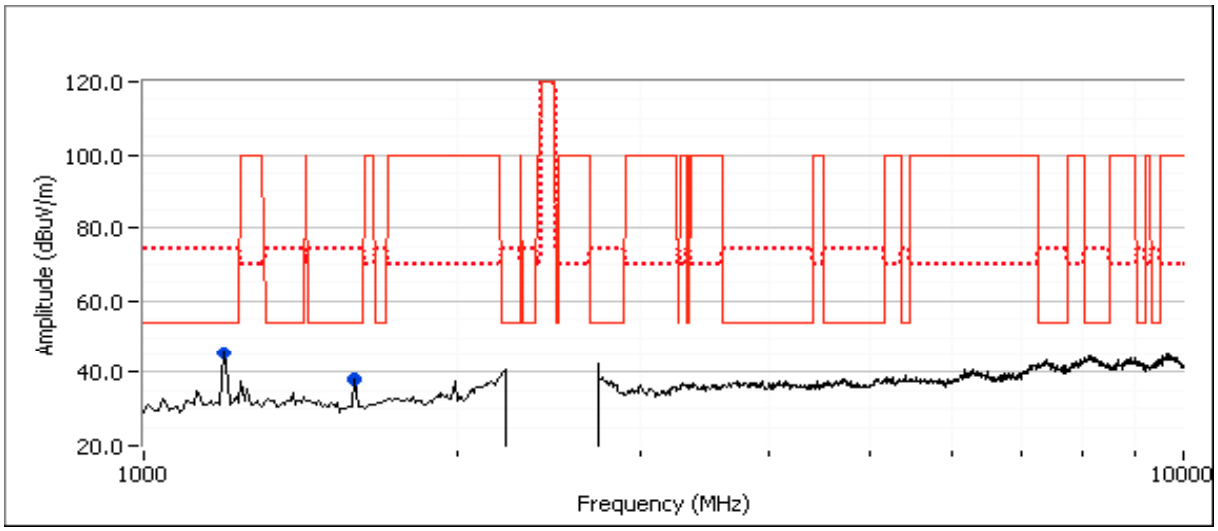
Date of Test: 10/8/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.7	23.5
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Preliminary Measurements (Peak versus average limit)

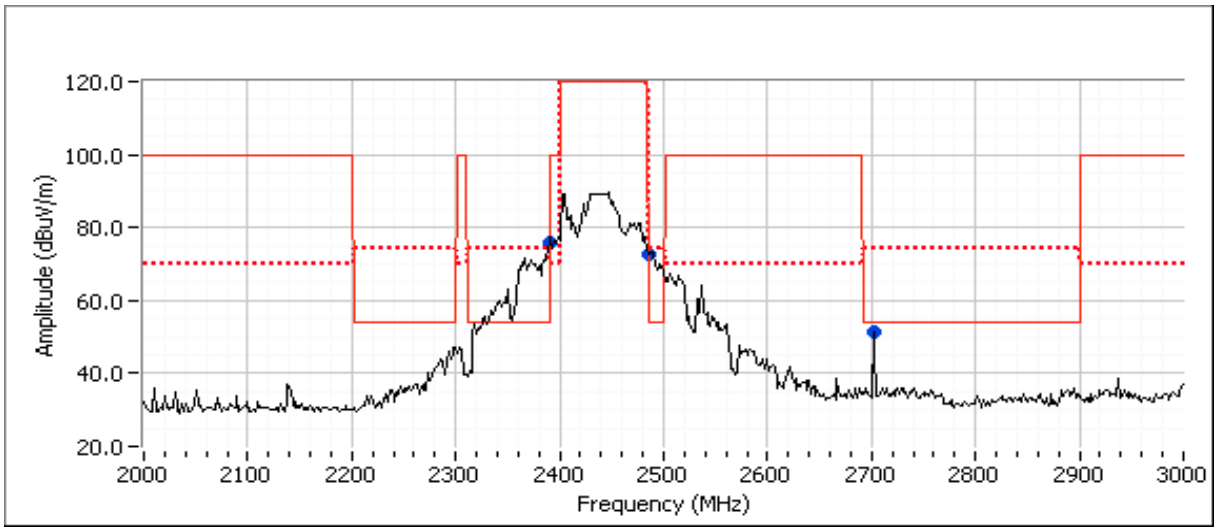
Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1593.250	38.2	H	54.0	-15.8	Peak	155	2.2	
1195.690	45.5	V	54.0	-8.5	Peak	339	2.5	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1593.400	28.2	H	54.0	-25.8	AVG	156	2.2	RB 1 MHz;VB 10 Hz;Peak
1592.420	45.7	H	74.0	-28.3	PK	156	2.2	RB 1 MHz;VB 3 MHz;Peak
1195.300	31.0	V	54.0	-23.0	AVG	340	2.5	RB 1 MHz;VB 10 Hz;Peak
1196.420	50.4	V	74.0	-23.6	PK	340	2.5	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.120	51.2	V	54.0	-2.8	Peak	0	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.100	34.9	V	54.0	-19.1	AVG	311	1.9	RB 1 MHz;VB 10 Hz;Peak
2700.100	43.6	V	74.0	-30.4	PK	311	1.9	RB 1 MHz;VB 3 MHz;Peak
2700.040	35.8	H	54.0	-18.2	AVG	22	1.7	RB 1 MHz;VB 10 Hz;Peak
2700.290	45.1	H	74.0	-28.9	PK	22	1.7	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #6: 1-10GHz, 802.11g @ 2412 MHz Chain 1, BT Basic Rate @ 2440 MHz Chain 2

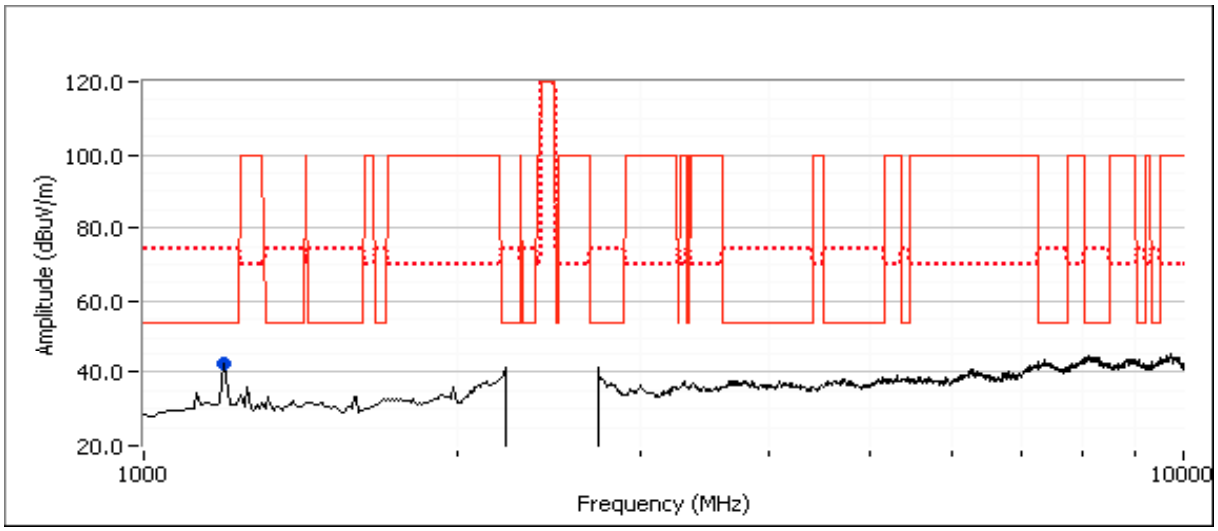
Date of Test: 10/8/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.5	23.0
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Preliminary Measurements (Peak versus average limit)

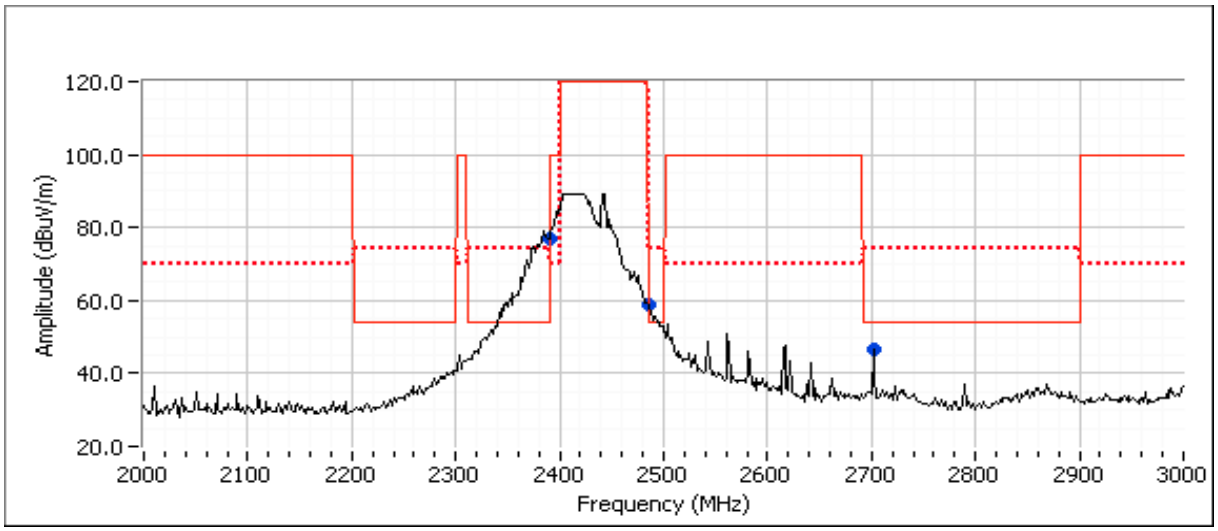
Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1198.380	42.3	V	54.0	-11.7	Peak	184	1.3	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1196.970	30.3	V	54.0	-23.7	AVG	182	1.3	RB 1 MHz;VB 10 Hz;Peak
1199.600	53.5	V	74.0	-20.5	PK	182	1.3	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.140	46.7	V	54.0	-7.3	Peak	0	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.110	33.4	V	54.0	-20.6	AVG	294	2.1	RB 1 MHz;VB 10 Hz;Peak
2700.150	42.9	V	74.0	-31.1	PK	294	2.1	RB 1 MHz;VB 3 MHz;Peak
2700.090	34.6	H	54.0	-19.4	AVG	0	1.2	RB 1 MHz;VB 10 Hz;Peak
2699.710	44.4	H	74.0	-29.6	PK	0	1.2	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #7: 1-10GHz, 802.11g @ 2462 MHz Chain 1, BT Basic Rate @ 2440 MHz Chain 2

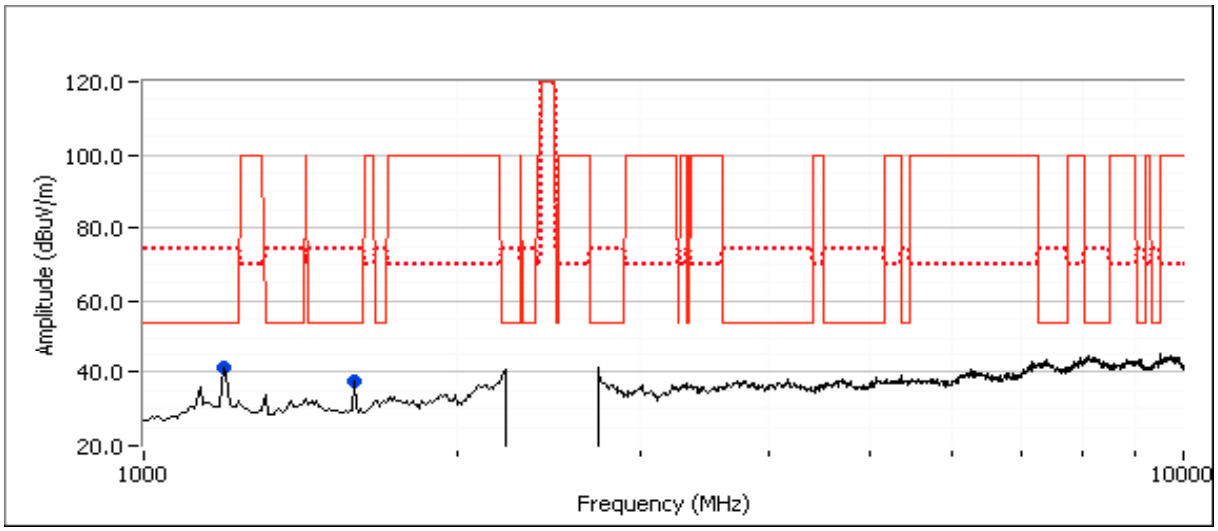
Date of Test: 10/8/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.6	23.0
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



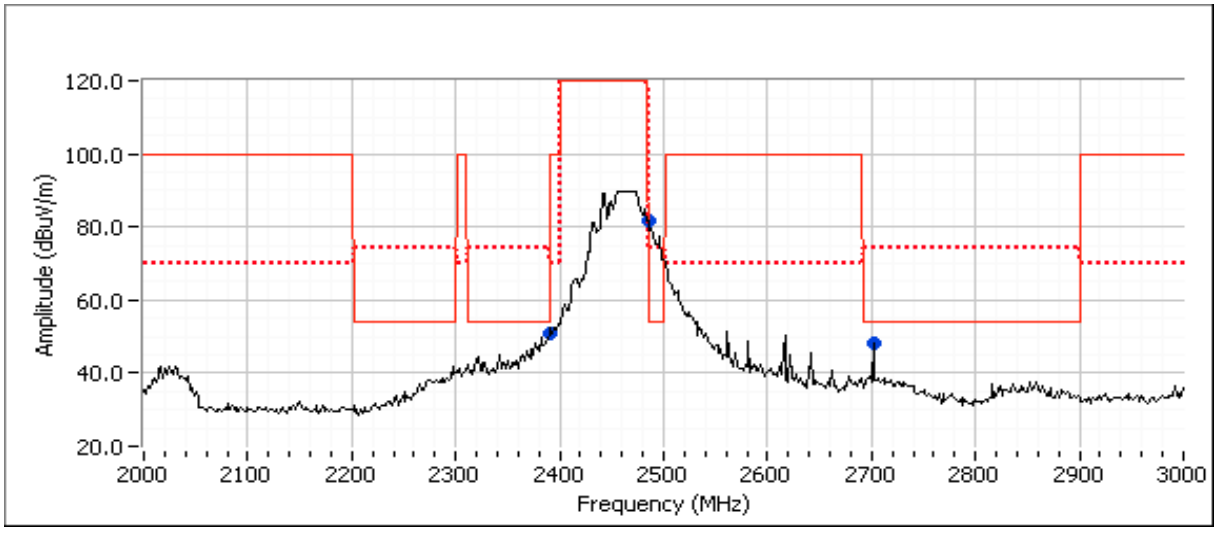
Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1588.060	37.3	V	54.0	-16.7	Peak	210	1.0	
1199.570	41.2	V	54.0	-12.8	Peak	354	1.3	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1588.490	25.6	V	54.0	-28.4	AVG	211	1.0	RB 1 MHz;VB 10 Hz;Peak
1588.710	36.6	V	74.0	-37.4	PK	211	1.0	RB 1 MHz;VB 3 MHz;Peak
1199.860	28.3	V	54.0	-25.7	AVG	355	1.3	RB 1 MHz;VB 10 Hz;Peak
1198.620	49.0	V	74.0	-25.0	PK	355	1.3	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.140	48.2	V	54.0	-5.8	Peak	0	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.100	31.7	V	54.0	-22.3	AVG	130	1.0	RB 1 MHz;VB 10 Hz;Peak
2700.320	41.8	V	74.0	-32.2	PK	130	1.0	RB 1 MHz;VB 3 MHz;Peak
2699.980	32.9	H	54.0	-21.1	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Peak
2699.910	45.0	H	74.0	-29.0	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #8: 1-10GHz, 802.11g @ 2437 MHz Chain 1, BT Basic Rate @ 2480 MHz Chain 2

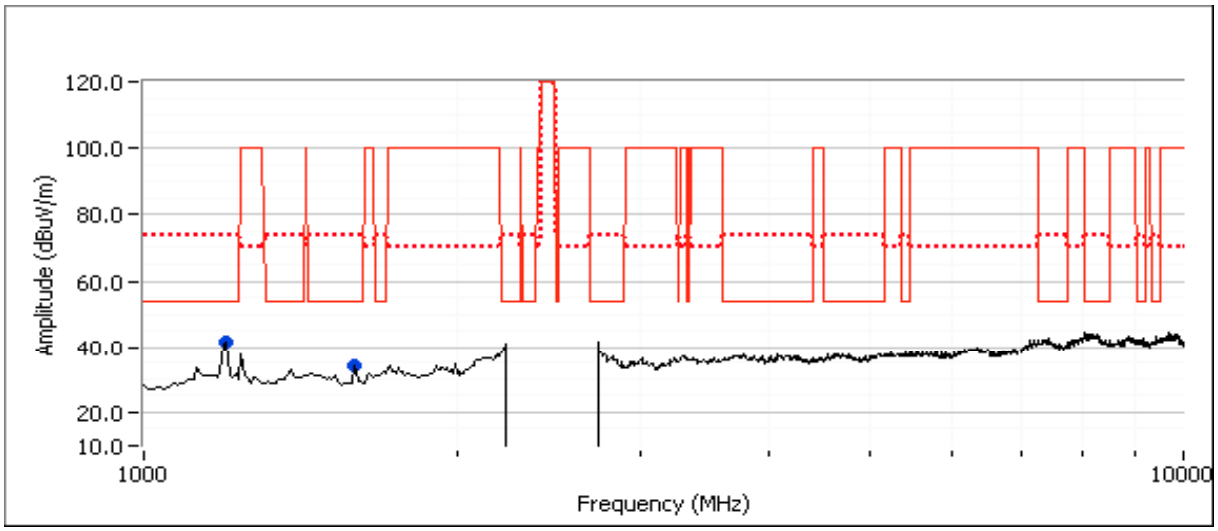
Date of Test: 10/8/2013 Test Location: FT Chamber#7

Test Engineer: Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	16.5	16.6	23.5
Chain 2	-		Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Preliminary Measurements (Peak versus average limit)

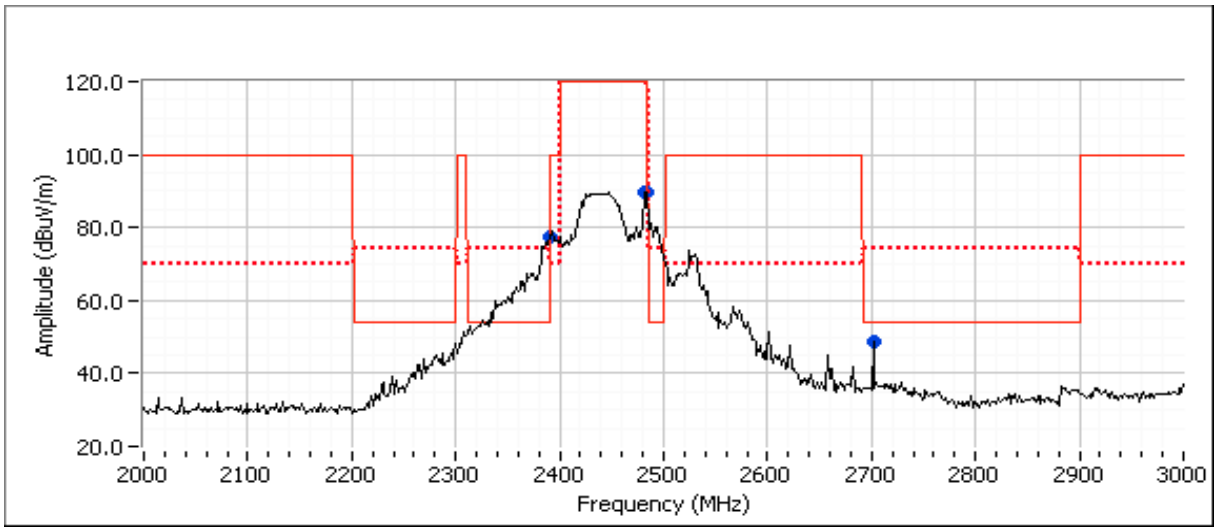
Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1196.420	41.7	V	54.0	-12.3	Peak	0	1.9	
1586.650	33.7	V	54.0	-20.3	Peak	209	1.9	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1195.790	28.9	V	54.0	-25.1	AVG	0	1.9	RB 1 MHz;VB 10 Hz;Peak
1195.270	48.2	V	74.0	-25.8	PK	0	1.9	RB 1 MHz;VB 3 MHz;Peak
1587.690	25.4	V	54.0	-28.6	AVG	210	1.9	RB 1 MHz;VB 10 Hz;Peak
1586.420	37.3	V	74.0	-36.7	PK	210	1.9	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT



Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.120	48.7	V	54.0	-5.3	Peak	0	1.0	

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2700.030	33.6	V	54.0	-20.4	AVG	112	1.0	RB 1 MHz;VB 10 Hz;Peak
2700.230	42.4	V	74.0	-31.6	PK	112	1.0	RB 1 MHz;VB 3 MHz;Peak
2700.090	35.0	H	54.0	-19.0	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Peak
2699.920	45.3	H	74.0	-28.7	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

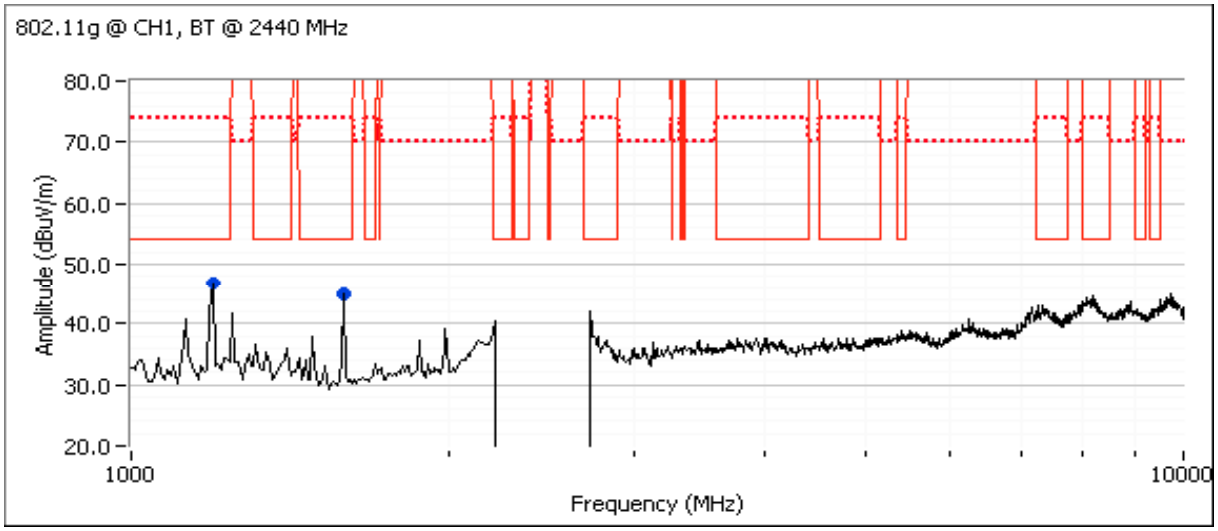
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #9: 1-10GHz, 802.11g @ 2412 MHz Chain 1, BT EDR Rate @ 2440 MHz Chain 2

Date of Test: 10/9/2013 Test Location: Chamber 4
Test Engineer: John Caizzi & Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	13.5	13.6	18.5
Chain 2			Max

Note - measured power in table above is average power, for reference only.
Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



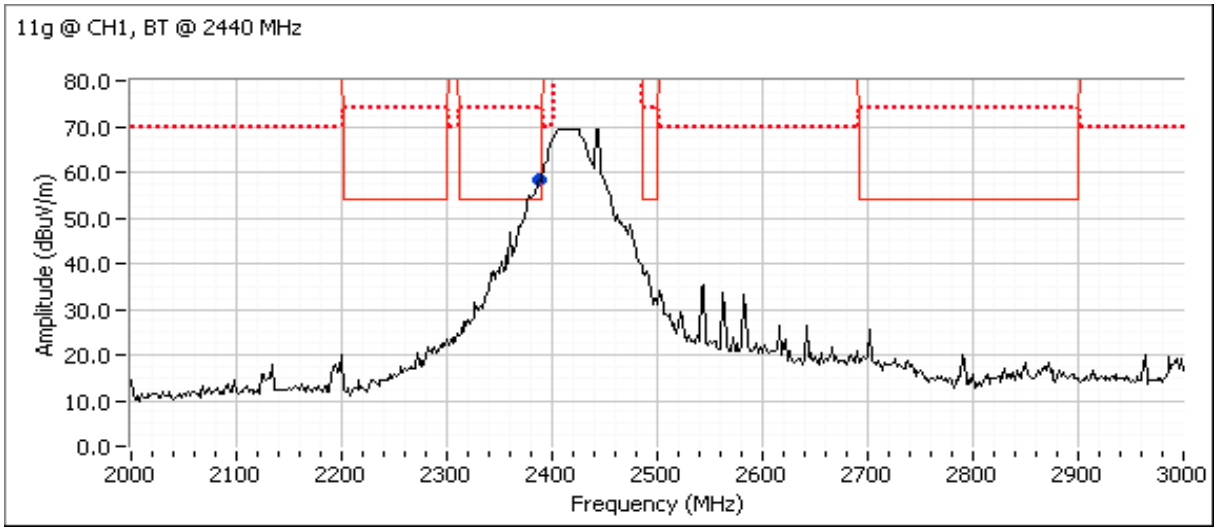
Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1195.000	*46.7*	*H*	*54.0*	*-7.3*	*Peak*	*256*	*1.0*	*Note 3*
1592.500	*45.0*	*V*	*54.0*	*-9.0*	*Peak*	*194*	*1.0*	*Note 3*

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1195.620	31.2	H	54.0	-22.8	AVG	257	1.0	RB 1 MHz;VB 10 Hz;Peak
1194.230	51.9	H	74.0	-22.1	PK	257	1.0	RB 1 MHz;VB 3 MHz;Peak
1593.570	32.5	V	54.0	-21.5	AVG	192	1.0	RB 1 MHz;VB 10 Hz;Peak
1593.570	55.1	V	74.0	-18.9	PK	192	1.0	RB 1 MHz;VB 3 MHz;Peak

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Note 1:	There were no signifcant out of band emissions in this frequency range.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #10: 1-10GHz, 802.11b @ 2412 MHz Chain 1, BTLE @ 2440 MHz Chain 2

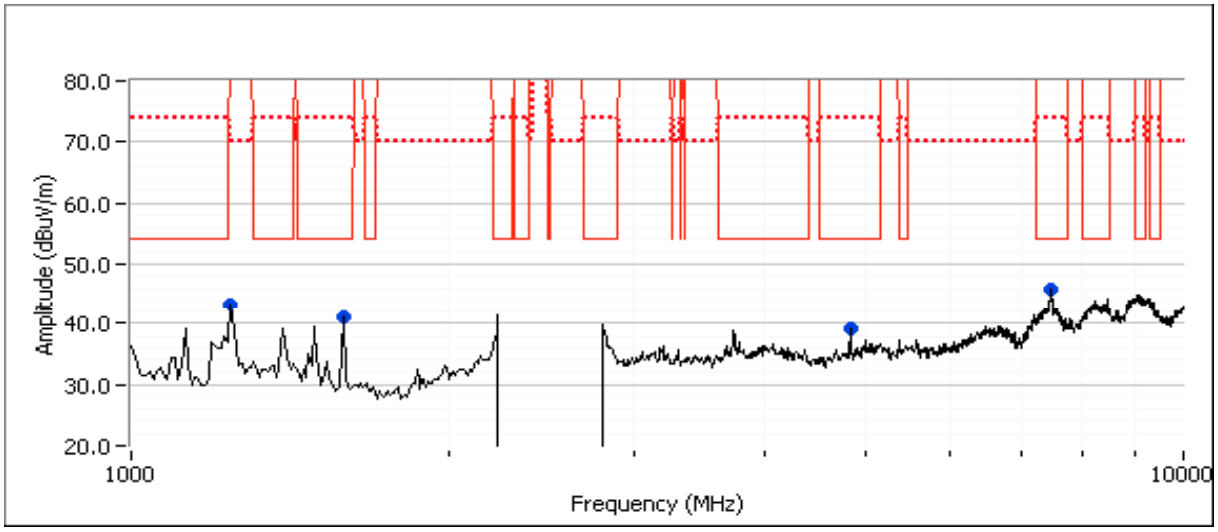
Date of Test: 10/23/2013 Test Location: Chamber 4

Test Engineer: Rafael Varelas Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
Chain 1	15.5	15.4	19.5
Chain 2			Max

Note - measured power in table above is average power, for reference only.

Perform normal 1-10 GHz scan with filter for fundamental and then 2-3 GHz scan 20-30 cm from the product wihtout filter.



Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

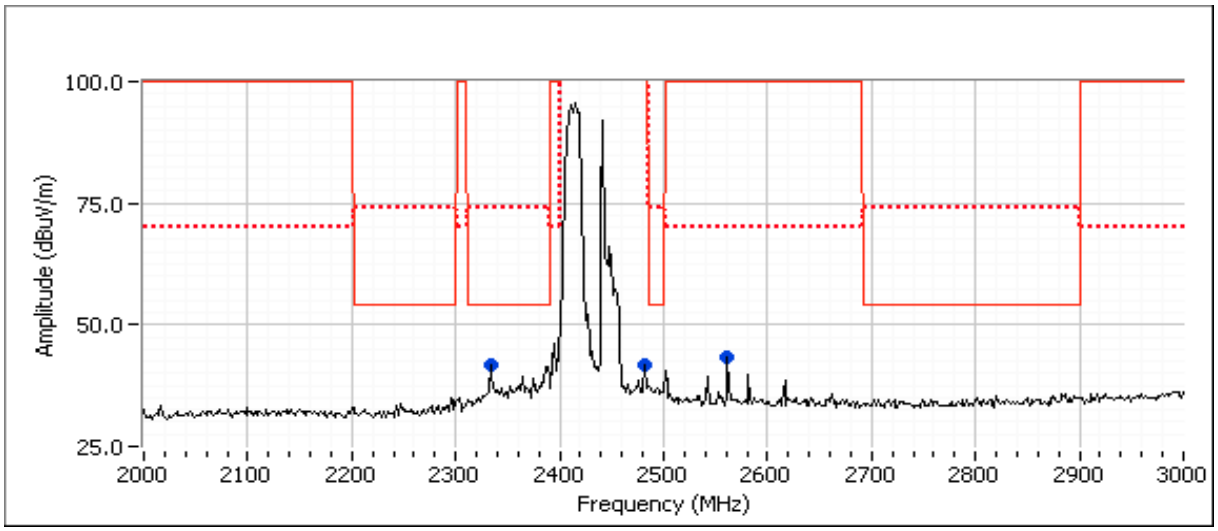
Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1244.580	43.2	H	74.0	-30.8	Peak	302	1.3	Note 2
1593.960	41.0	V	54.0	-13.0	Peak	203	1.0	
4824.030	39.2	V	54.0	-14.8	Peak	106	1.3	
7466.840	45.9	V	54.0	-8.1	Peak	116	1.6	

Spurious Emissions excluding allocated band (final measurements at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7468.640	40.3	V	54.0	-13.7	AVG	102	0.9	RB 1 MHz;VB 10 Hz;Peak
7468.960	54.0	V	74.0	-20.0	PK	102	0.9	RB 1 MHz;VB 3 MHz;Peak
4824.040	35.4	V	54.0	-18.6	AVG	103	1.0	RB 1 MHz;VB 10 Hz;Peak
4823.900	43.0	V	74.0	-31.0	PK	103	1.0	RB 1 MHz;VB 3 MHz;Peak
1594.890	32.2	V	54.0	-21.8	AVG	206	0.9	RB 1 MHz;VB 10 Hz;Peak
1593.410	49.8	V	74.0	-24.2	PK	206	0.9	RB 1 MHz;VB 3 MHz;Peak
1246.060	30.3	H	54.0	-23.7	AVG	296	1.2	RB 1 MHz;VB 10 Hz;Peak, Note 2
1246.050	50.7	H	74.0	-23.3	PK	296	1.2	RB 1 MHz;VB 3 MHz;Peak, Note 2

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A



Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2333.330	41.7	H	74.0	-32.3	Peak	180	1.0	
2481.670	41.6	H	120.0	-78.4	Peak	180	1.0	
2561.670	43.3	H	74.0	-30.7	Peak	180	1.0	Note 2

Spurious Emissions near allocated band (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2332.400	45.0	H	54.0	-9.0	AVG	245	1.0	RB 1 MHz;VB 10 Hz;Peak
2330.210	56.2	H	74.0	-17.8	PK	245	1.0	RB 1 MHz;VB 3 MHz;Peak
2332.440	44.5	V	54.0	-9.5	AVG	308	1.0	RB 1 MHz;VB 10 Hz;Peak
2332.010	56.0	V	74.0	-18.0	PK	308	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	Signal is only present when Bluetooth is enabled, average correction for hopping occupancy could be applied.

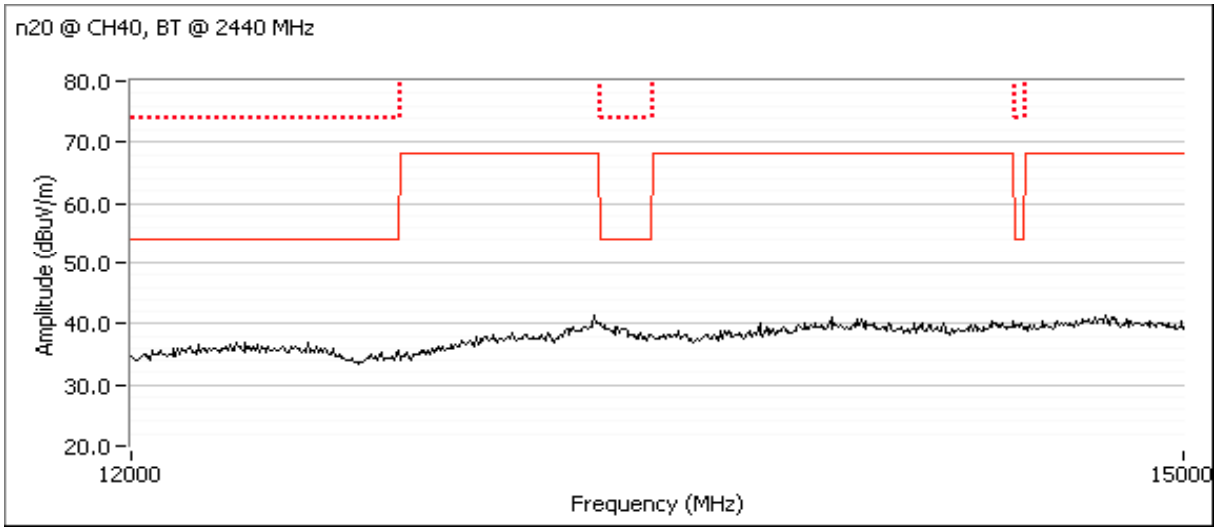
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #11: 1-15GHz, 802.11n20 @ 5200 MHz Chain 1+2, BT Basic Rate @ 2440 MHz Chain 2

Date of Test: 10/9/2013 Test Location: Chamber 4
Test Engineer: John Caizzi & Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
WiFi 1	12.0	12.1	28.0
WiFi 2	12.0	12.2	28.5
Bluetooth			Max

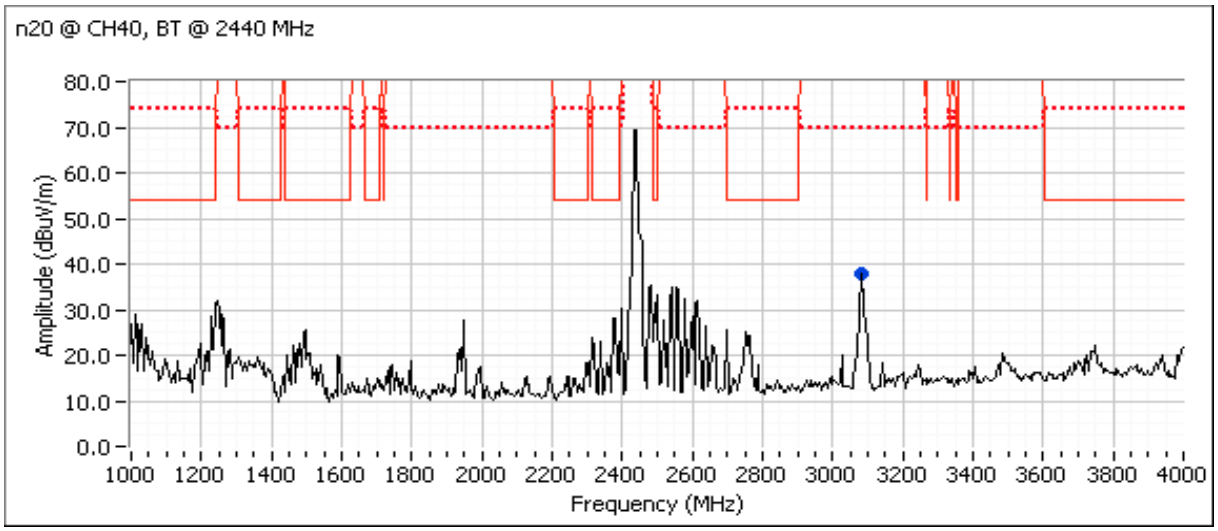
Note - measured power in table above is average power, for reference only.
Perform normal 7-15 GHz scan with filter for fundamental and then 1-4 and 4-7 GHz scans 20-30 cm from the product wihtout filter.

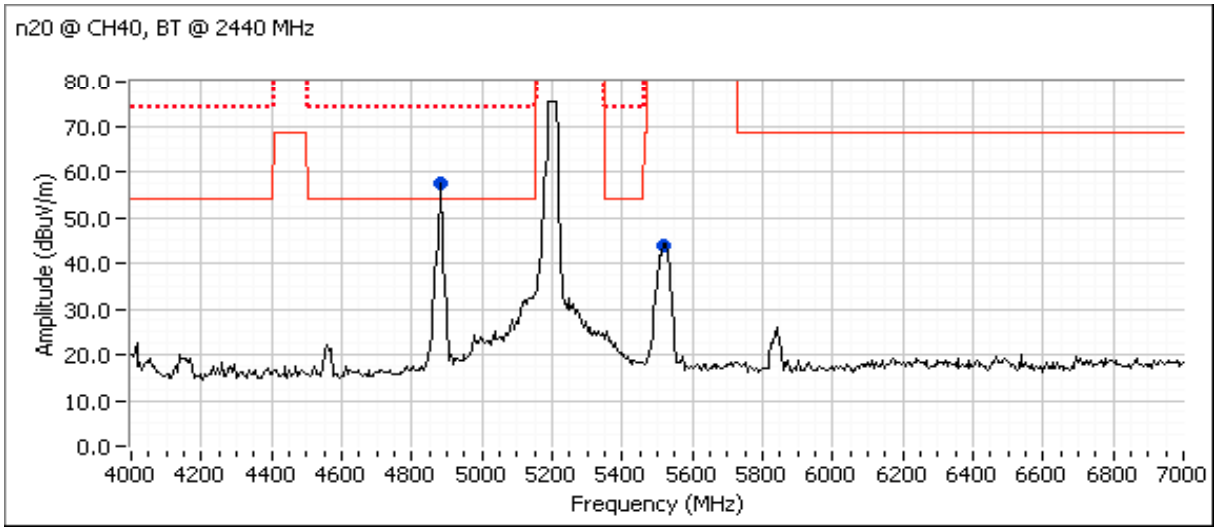


Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
								No emissions found 7-12 GHz.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3080.000	*37.9*	*V*	*70.0*	*-32.1*	*Peak*	*0*	*1.0*	
4880.000	*57.3*	*V*	*54.0*	*3.3*	*Peak*	*0*	*1.0*	
5520.000	*43.8*	*V*	*112.3*	*-68.5*	*Peak*	*0*	*1.0*	

Spurious Emissions (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.020	42.9	V	54.0	-11.1	AVG	137	1.3	RB 1 MHz;VB 10 Hz;Peak, Note 3
4880.270	47.3	V	74.0	-26.7	PK	137	1.3	RB 1 MHz;VB 3 MHz;Peak
5520.500	46.0	V	68.3	-22.3	PK	189	1.0	RB 1 MHz;VB 3 MHz;Peak
4880.000	37.4	H	54.0	-16.6	AVG	109	1.6	RB 1 MHz;VB 10 Hz;Peak, Note 3
4880.050	46.1	H	74.0	-27.9	PK	109	1.6	RB 1 MHz;VB 3 MHz;Peak
5520.230	45.7	H	68.3	-22.6	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

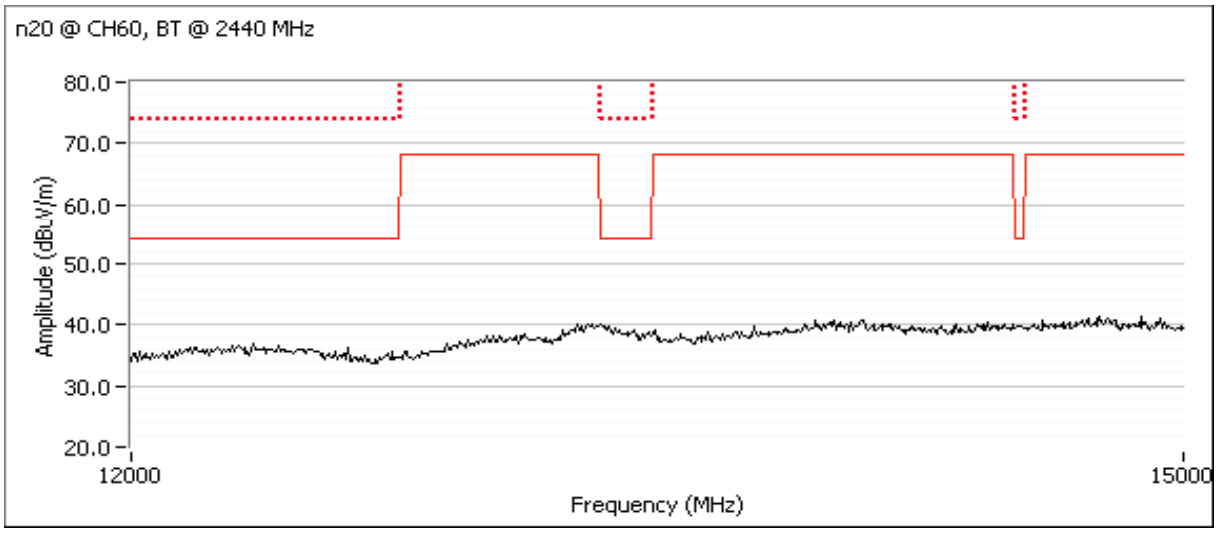
Run #12: 1-15GHz, 802.11n20 @ 5300 MHz Chain 1+2, BT Basic Rate @ 2440 MHz Chain 2

Date of Test: 10/9/2013 Test Location: Chamber 4
Test Engineer: John Caizzi & Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
WiFi 1	13.0	13.0	30.5
WiFi 2	13.0	13.0	30.5
Bluetooth			Max

Note - measured power in table above is average power, for reference only.

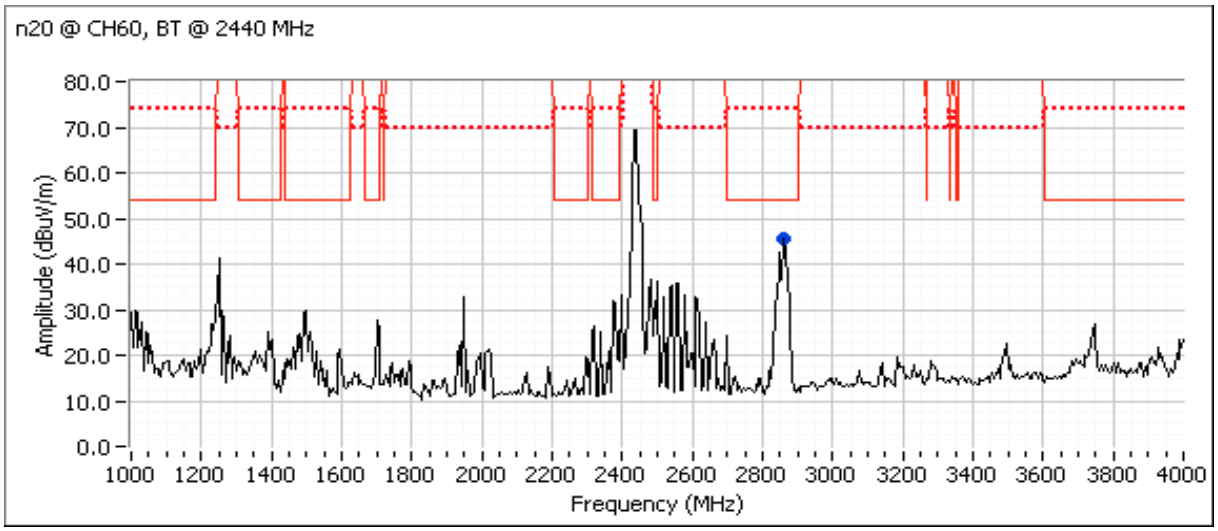
Perform normal 7-15 GHz scan with filter for fundamental and then 1-4 and 4-7 GHz scans 20-30 cm from the product wihtout filter.

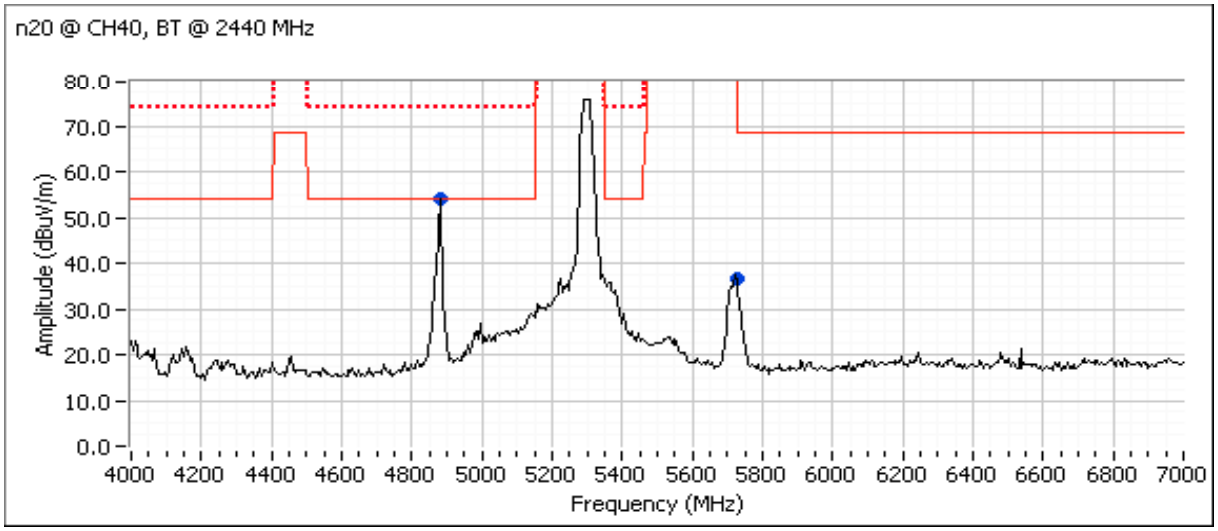


Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
								No emissions found 7-12 GHz.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.000	*54.0*	*V*	*54.0*	*0.0*	*Peak*	*0*	*1.0*	*CH60*
5725.000	*36.6*	*V*	*68.3*	*-31.7*	*Peak*	*0*	*1.0*	*CH60*
2860.000	*45.6*	*V*	*54.0*	*-8.4*	*Peak*	*0*	*1.0*	*CH60*

Spurious Emissions (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.020	42.5	V	54.0	-11.5	AVG	225	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 3
4879.840	47.3	V	74.0	-26.7	PK	225	1.0	RB 1 MHz;VB 3 MHz;Peak
5724.080	45.2	V	68.3	-23.1	PK	171	1.0	RB 1 MHz;VB 3 MHz;Peak
2859.470	30.5	V	54.0	-23.5	AVG	123	1.0	RB 1 MHz;VB 10 Hz;Peak
2859.900	42.0	V	74.0	-32.0	PK	123	1.0	RB 1 MHz;VB 3 MHz;Peak
4879.880	39.0	H	54.0	-15.0	AVG	135	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 3
4880.690	46.8	H	74.0	-27.2	PK	135	1.0	RB 1 MHz;VB 3 MHz;Peak
5724.870	45.4	H	68.3	-22.9	PK	65	1.0	RB 1 MHz;VB 3 MHz;Peak
2860.790	30.4	H	54.0	-23.6	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Peak
2860.000	41.3	H	74.0	-32.7	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

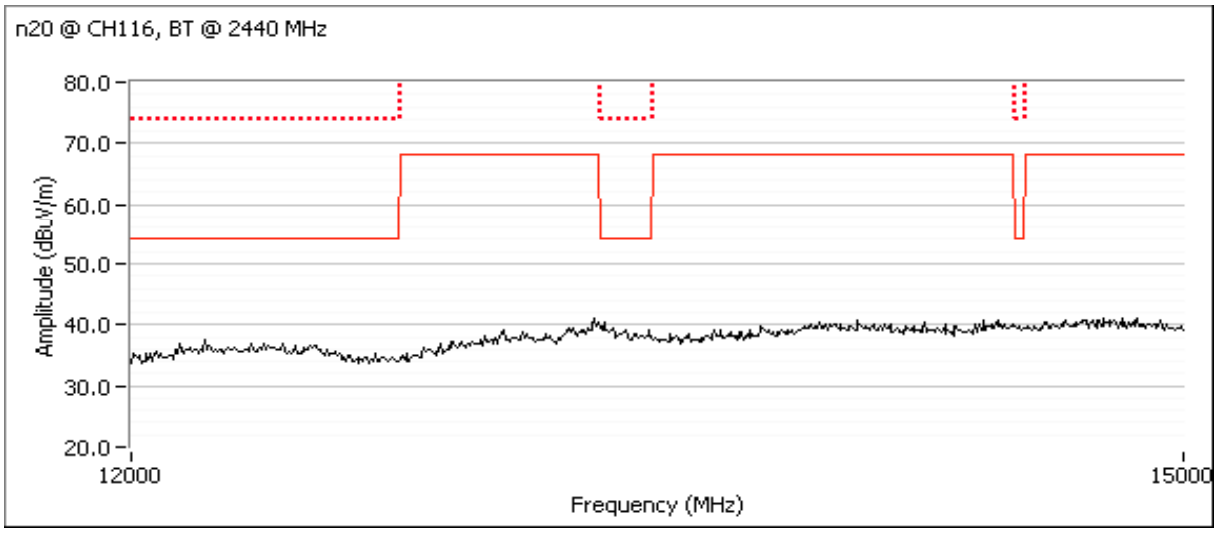
Run #13: 1-15GHz, 802.11n20 @ 5580 MHz Chain 1+2, BT Basic Rate @ 2440 MHz Chain 2

Date of Test: 10/9/2013 Test Location: Chamber 4
Test Engineer: John Caizzi & Joseph Cadigal Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
WiFi 1	13.5	13.7	32.5
WiFi 2	13.5	13.6	32.0
Bluetooth			Max

Note - measured power in table above is average power, for reference only.

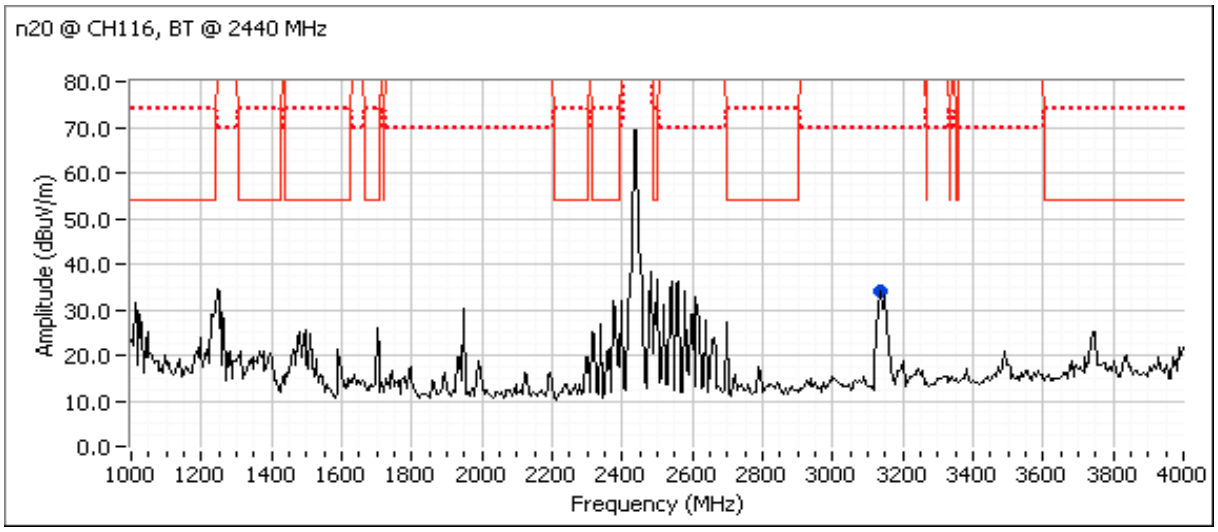
Perform normal 7-15 GHz scan with filter for fundamental and then 1-4 and 4-7 GHz scans 20-30 cm from the product wihtout filter.

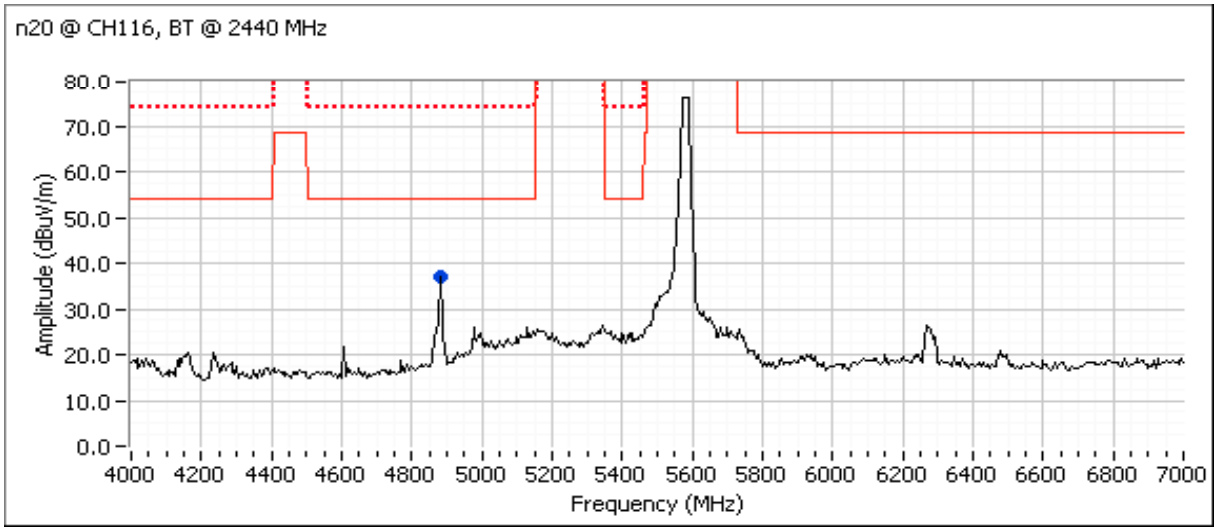


Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
								No emissions found 7-12 GHz.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3135.000	*34.0*	*V*	*70.0*	*-36.0*	*Peak*	*0*	*1.0*	*CH116*
4880.000	*37.2*	*V*	*54.0*	*-16.8*	*Peak*	*0*	*1.0*	*CH116*

Spurious Emissions (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.010	43.3	H	54.0	-10.7	AVG	129	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 3
4879.960	48.1	H	74.0	-25.9	PK	129	1.0	RB 1 MHz;VB 3 MHz;Peak
3133.620	43.1	V	68.3	-25.2	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak
4880.100	40.6	V	54.0	-13.4	AVG	224	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 3
4880.350	48.2	V	74.0	-25.8	PK	224	1.0	RB 1 MHz;VB 3 MHz;Peak
3133.620	43.1	V	68.3	-25.2	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak
3134.070	42.0	H	68.3	-26.3	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

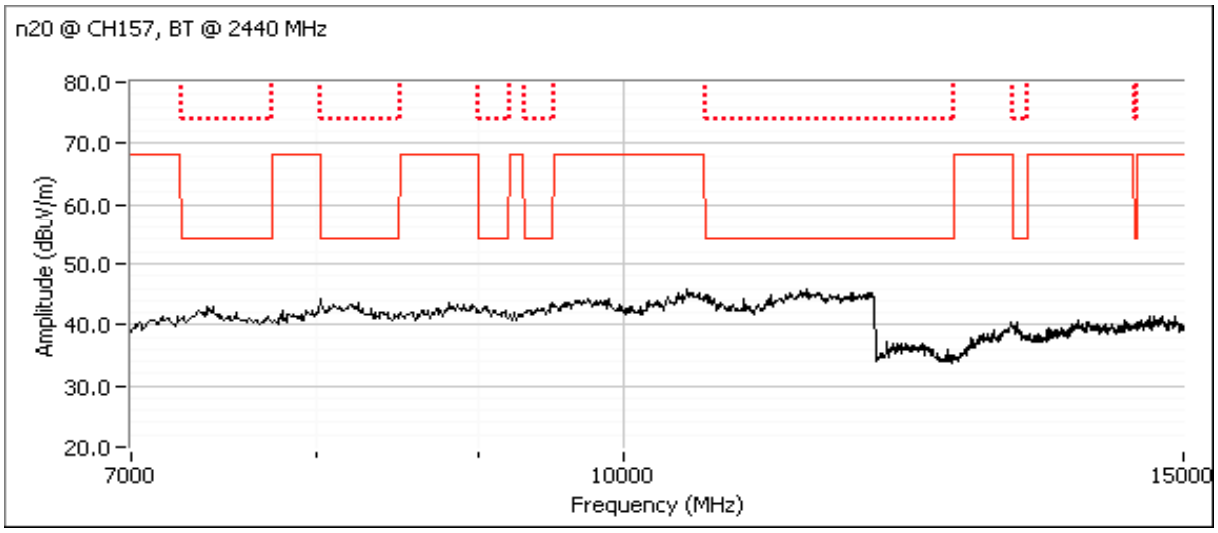
Run #14: 1-15GHz, 802.11n20 @ 5785 MHz Chain 1+2, BT Basic Rate @ 2440 MHz Chain 2

Date of Test: 10/9/2013 Test Location: Chamber 4
Test Engineer: John Caizzi Config Change: none

	Power Settings		
	Target (dBm)	Measured (dBm)	Software Setting
WiFi 1	13.5	13.5	34.5
WiFi 2	13.5	13.5	34.0
Bluetooth			Max

Note - measured power in table above is average power, for reference only.

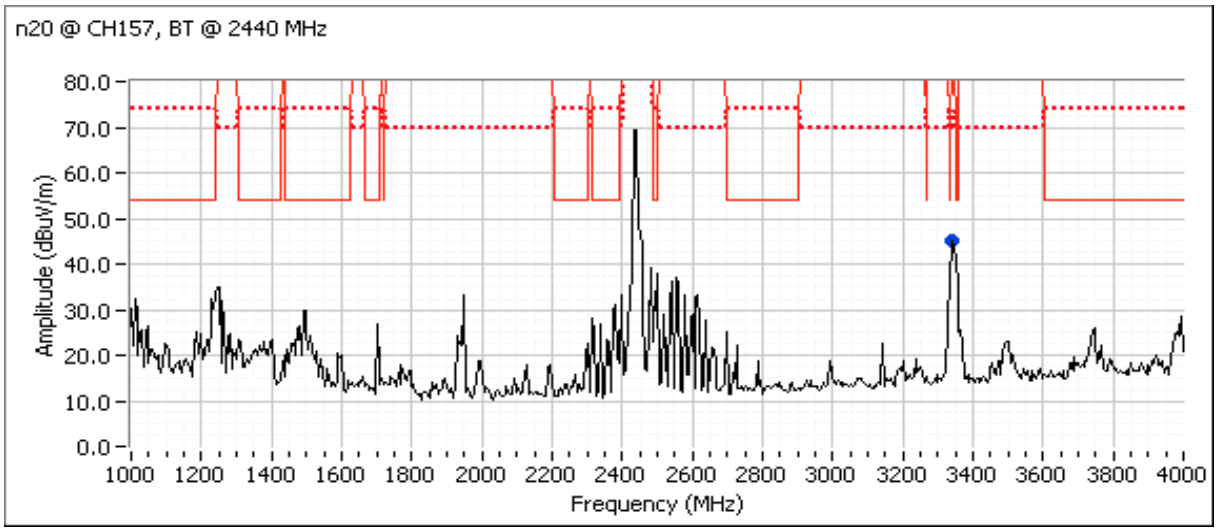
Perform normal 7-15 GHz scan with filter for fundamental and then 1-4 and 4-7 GHz scans 20-30 cm from the product wihtout filter.

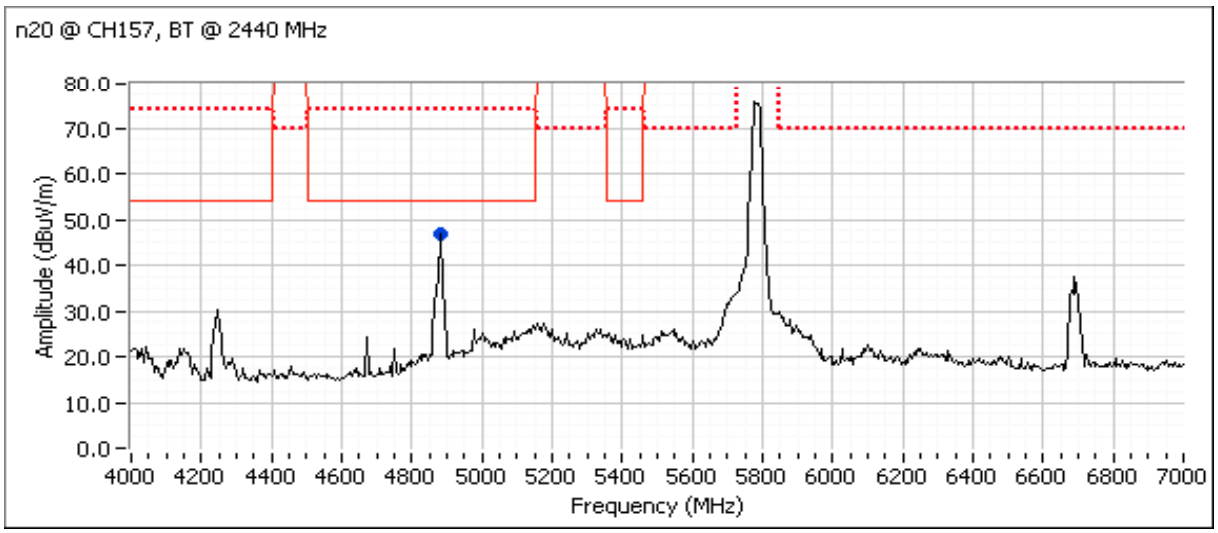


Preliminary Measurements (Peak versus average limit)

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
								No emissions found 7-12 GHz.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary Measurements (Peak versus average limit) at 20-30cm from EUT

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.000	*46.8*	*V*	*54.0*	*-7.2*	*Peak*	*0*	*1.0*	*CH157*
3340.000	*45.1*	*V*	*70.0*	*-24.9*	*Peak*	*0*	*1.0*	*CH157*

Spurious Emissions (final measurments at 3m)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4880.000	42.4	H	54.0	-11.6	AVG	128	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 3
4879.890	47.9	H	74.0	-26.1	PK	128	1.0	RB 1 MHz;VB 3 MHz;Peak
4879.940	38.3	V	54.0	-15.7	AVG	241	1.0	RB 1 MHz;VB 10 Hz;Peak, Note 3
4880.190	46.6	V	74.0	-27.4	PK	241	1.0	RB 1 MHz;VB 3 MHz;Peak
3339.910	42.8	V	68.3	-25.5	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak
3340.560	43.2	H	68.3	-25.1	PK	334	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	Emission has duty cycle < 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Radiated Emissions

(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: 10/2/2013 0:00
Test Engineer: Joseph Cadigal
Test Location: FT chamber#4
Config. Used: 1
Config Change: None
EUT Voltage: POE

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.
The test distance and extrapolation factor (if applicable) are detailed under each run description.
Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna and manipulation of the cables.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 40 %

Summary of Results

MAC Address: 001500DC7B25 DRTU Tool Version 1.7.1-752, Driver version 16.6.0.1

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 1000 MHz, Preliminary	FCC 15.209 / RSS 210	Eval	Refer to individual runs
2	Radiated Emissions 30 - 1000 MHz, Maximized	FCC 15.209 / RSS 210	Pass	37.7 dBµV/m @ 906.14 MHz (-8.3 dB)
3	Radiated Emissions 30 - 1000 MHz, Preliminary	FCC 15.209 / RSS 210	Eval	Refer to individual runs
4	Radiated Emissions 30 - 1000 MHz, Maximized	FCC 15.209 / RSS 210	Pass	26.3 dBµV/m @ 48.00 MHz (-13.7 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

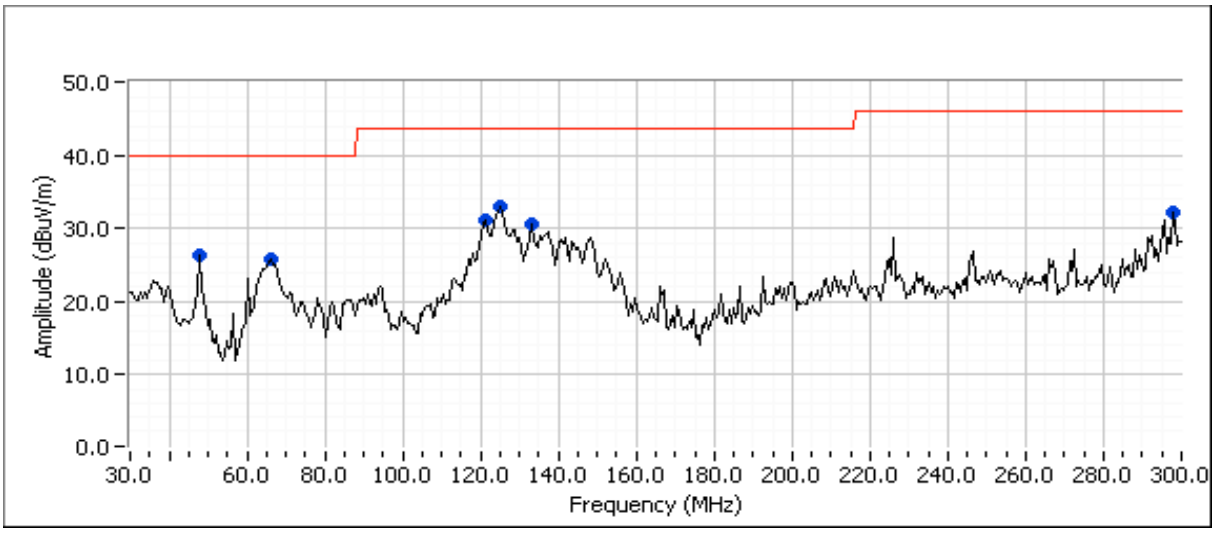
Deviations From The Standard

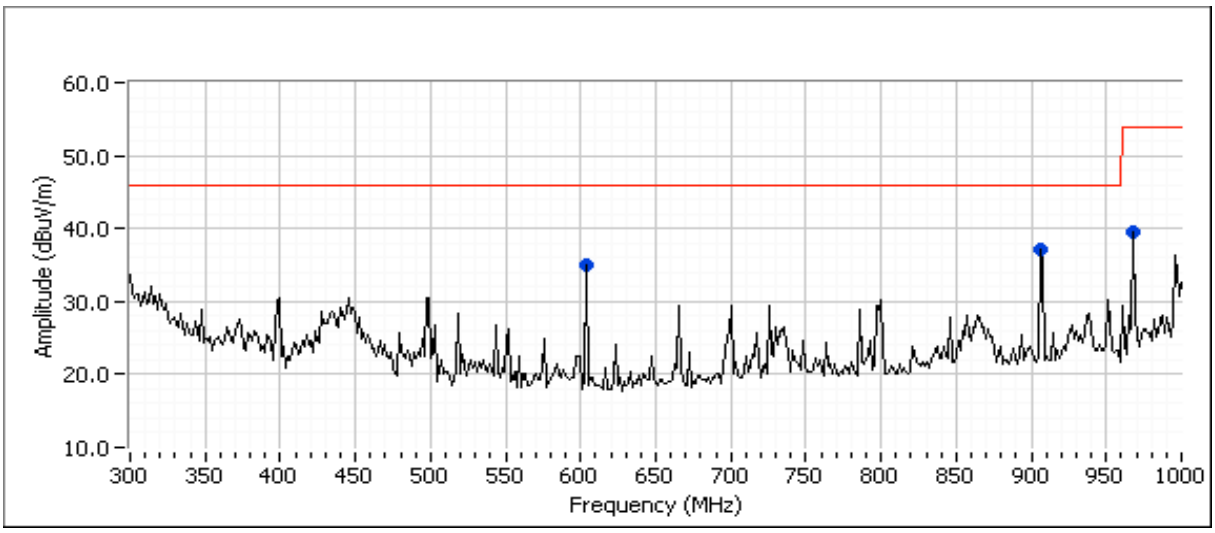
No deviations were made from the requirements of the standard.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz
Configured to TX , 802.11b 16.5dBm on chain A (setting 23) on channel 6, BT chain B (setting Max) on channel 2440MHz

Test Parameters for Preliminary Scan(s)			
Frequency Range	Prescan Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
966.543	39.5	V	54.0	-14.5	Peak	16	1.0	
66.345	25.9	V	40.0	-14.1	Peak	109	1.0	
604.092	35.1	H	46.0	-10.9	Peak	154	1.0	
297.341	32.2	H	46.0	-13.8	Peak	195	1.0	
906.138	37.1	V	46.0	-8.9	Peak	195	1.0	
133.097	30.7	H	43.5	-12.8	Peak	234	2.0	
121.422	31.2	H	43.5	-12.3	Peak	269	2.5	
125.606	32.9	H	43.5	-10.6	Peak	273	2.5	
48.000	26.2	V	40.0	-13.8	Peak	322	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
966.543	39.7	V	54.0	-14.3	QP	16	1.0	QP (1.00s)
66.345	21.8	V	40.0	-18.2	QP	109	1.0	QP (1.00s)
604.092	35.1	H	46.0	-10.9	QP	154	1.0	QP (1.00s)
297.341	25.3	H	46.0	-20.7	QP	195	1.0	QP (1.00s)
906.138	37.7	V	46.0	-8.3	QP	195	1.0	QP (1.00s)
133.097	23.6	H	43.5	-19.9	QP	234	2.0	QP (1.00s)
121.422	25.7	H	43.5	-17.8	QP	269	2.5	QP (1.00s)
125.606	26.9	H	43.5	-16.6	QP	273	2.5	QP (1.00s)
48.000	25.1	V	40.0	-14.9	QP	322	1.0	QP (1.00s)

Run #2: Maximized Readings From Run #1

Test Parameters for Maximized Reading(s)			
Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

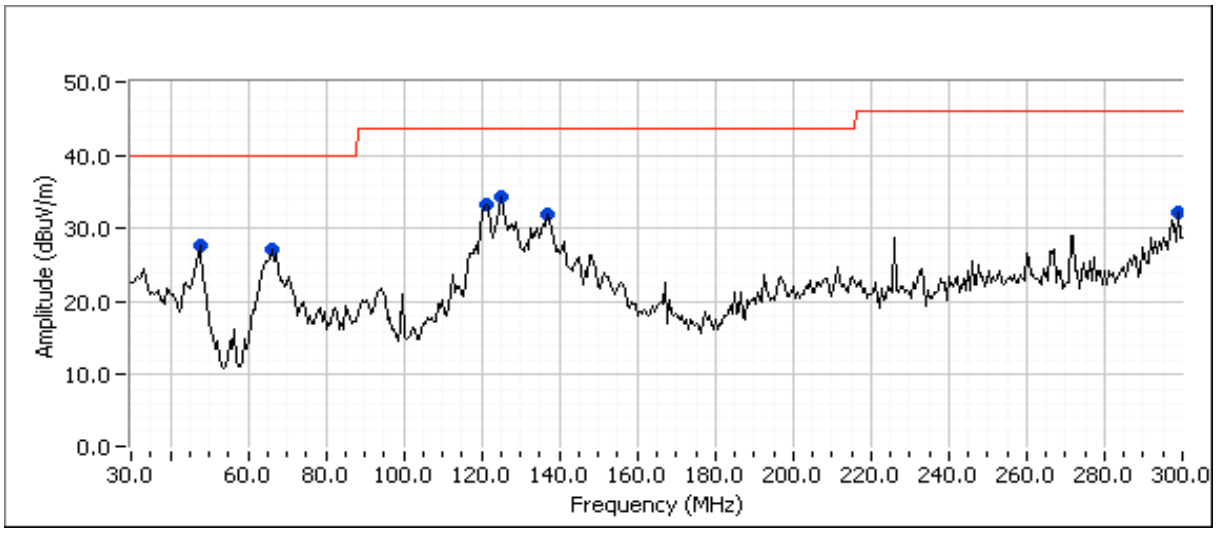
Frequency	Level	Pol	FCC 15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
906.138	37.7	V	46.0	-8.3	QP	195	1.0	QP (1.00s)
604.092	35.1	H	46.0	-10.9	QP	154	1.0	QP (1.00s)
966.543	39.7	V	54.0	-14.3	QP	16	1.0	QP (1.00s)
48.000	25.1	V	40.0	-14.9	QP	322	1.0	QP (1.00s)
125.606	26.9	H	43.5	-16.6	QP	273	2.5	QP (1.00s)
121.422	25.7	H	43.5	-17.8	QP	269	2.5	QP (1.00s)

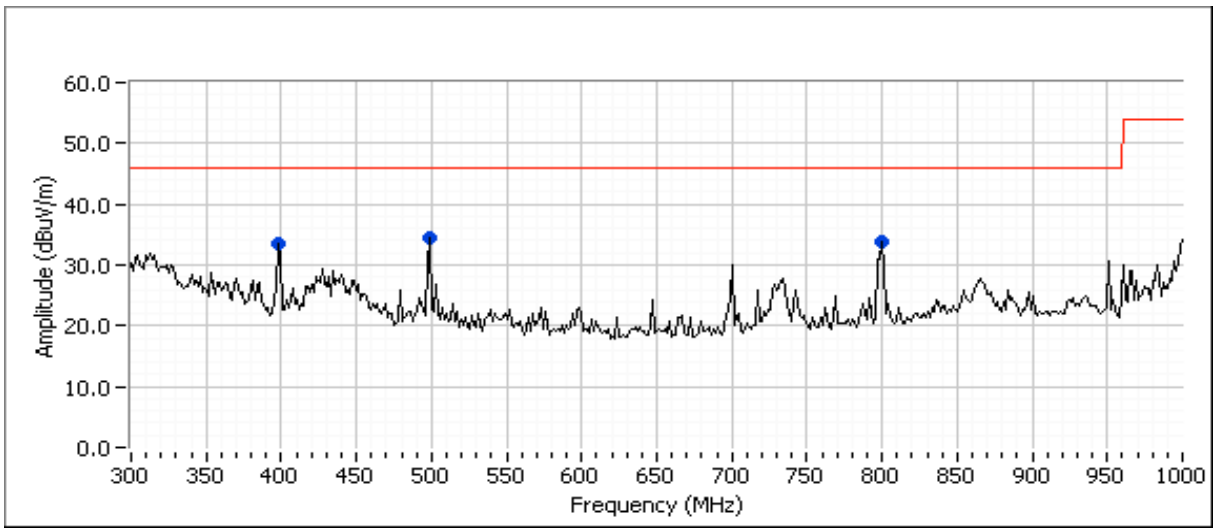
Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #3: Preliminary Radiated Emissions, 30 - 1000 MHz

Configured to TX , 802.11a 16.5dBm on each chain (settings 37, 39) on channel 100, BT chain B (setting Max) on channel 2440MHz

Test Parameters for Preliminary Scan(s)			
Frequency Range	Prescan Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
299.038	32.3	H	46.0	-13.7	Peak	11	2.0	
48.000	27.6	V	40.0	-12.4	Peak	12	1.0	
66.646	27.0	V	40.0	-13.0	Peak	147	1.0	
800.047	33.7	V	46.0	-12.3	Peak	187	1.0	
136.947	31.8	H	43.5	-11.7	Peak	234	2.0	
498.376	34.5	H	46.0	-11.5	Peak	249	1.0	
124.989	34.2	H	43.5	-9.3	Peak	273	2.5	
121.635	33.2	H	43.5	-10.3	Peak	300	2.5	
398.603	33.6	H	46.0	-12.4	Peak	326	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
299.038	19.9	H	46.0	-26.1	QP	11	2.0	QP (1.00s)
48.000	26.3	V	40.0	-13.7	QP	11	1.0	QP (1.00s)
66.646	22.5	V	40.0	-17.5	QP	147	1.0	QP (1.00s)
800.047	24.2	V	46.0	-21.8	QP	187	1.0	QP (1.00s)
136.947	21.7	H	43.5	-21.8	QP	234	2.0	QP (1.00s)
498.376	15.1	H	46.0	-30.9	QP	249	1.0	QP (1.00s)
124.989	23.7	H	43.5	-19.8	QP	273	2.5	QP (1.00s)
121.635	23.9	H	43.5	-19.6	QP	300	2.5	QP (1.00s)
398.603	22.1	H	46.0	-23.9	QP	326	1.0	QP (1.00s)

Run #4: Maximized Readings From Run #3

Test Parameters for Maximized Reading(s)			
Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	FCC 15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
48.000	26.3	V	40.0	-13.7	QP	11	1.0	QP (1.00s)
66.646	22.5	V	40.0	-17.5	QP	147	1.0	QP (1.00s)
121.635	23.9	H	43.5	-19.6	QP	300	2.5	QP (1.00s)
124.989	23.7	H	43.5	-19.8	QP	273	2.5	QP (1.00s)
800.047	24.2	V	46.0	-21.8	QP	187	1.0	QP (1.00s)
136.947	21.7	H	43.5	-21.8	QP	234	2.0	QP (1.00s)

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Conducted Emissions

(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: 10/2/2013 0:00
Test Engineer: Joseph Cadigal
Test Location: FT chamber#4

Config. Used: 1
Config Change: None
EUT Voltage: 3.3Vdc

General Test Configuration

The EUT on the test fixture and other support equipment 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 located outside the chamber.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 40 %

Summary of Results

MAC Address: 00:15:00:DC:7B:25, EUT installed in Laptop

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	RSS 210 / 15.207	Pass	15.0 dBµV @ 7.009 MHz (-35.0 dB)

Modifications Made During Testing

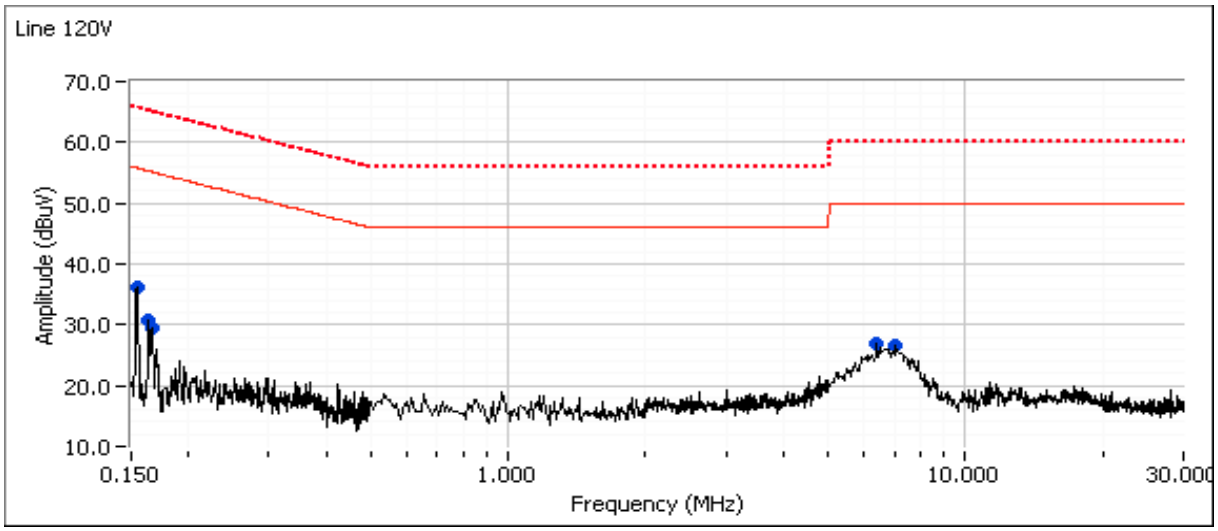
No modifications were made to the EUT during testing

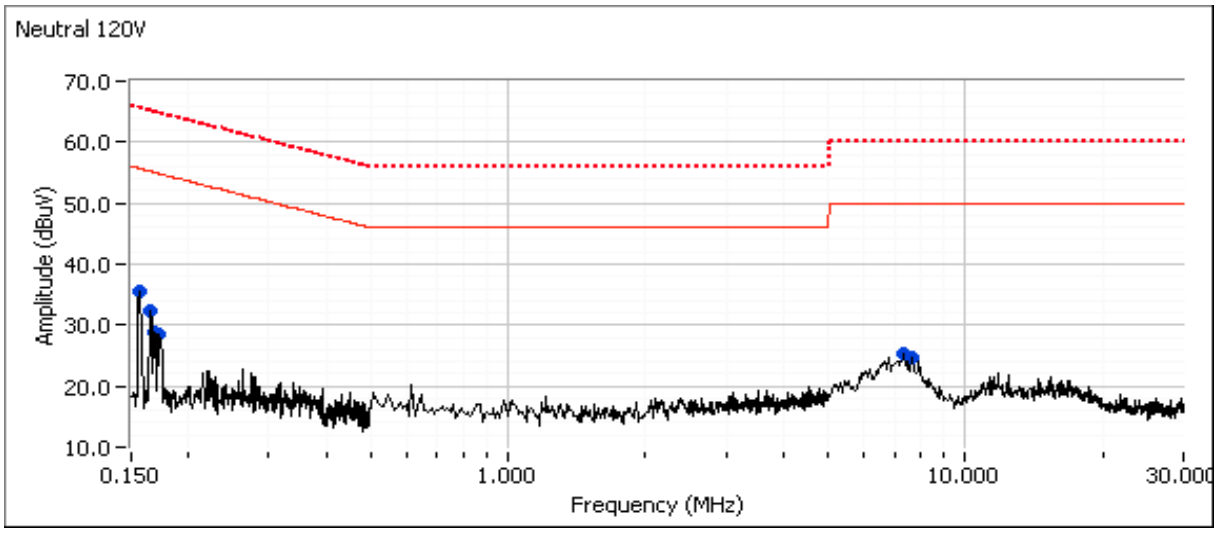
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz





Client:	Intel Corporation	Job Number:	J93358
Model:	PBA5001	T-Log Number:	T93372
		Project Manager:	Christine Krebill
Contact:	Steve Hackett	Project Coordinator:	-
Standard:	FCC Part 15.247, 15.407	Class:	N/A

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

Frequency	Level	AC	RSS 210 / 15.207		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.154	36.3	Line	55.8	-19.5	Peak	
0.163	30.9	Line	55.3	-24.4	Peak	
0.166	29.5	Line	55.1	-25.6	Peak	
7.009	26.7	Line	50.0	-23.3	Peak	
6.392	27.0	Line	50.0	-23.0	Peak	
0.157	35.4	Neutral	55.7	-20.3	Peak	
0.165	32.3	Neutral	55.2	-22.9	Peak	
0.170	28.8	Neutral	55.0	-26.2	Peak	
0.172	28.6	Neutral	54.8	-26.2	Peak	
7.623	24.6	Neutral	50.0	-25.4	Peak	
7.314	25.3	Neutral	50.0	-24.7	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	RSS 210 / 15.207		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
7.009	15.0	Line	50.0	-35.0	AVG	AVG (0.10s)
0.156	30.2	Neutral	65.7	-35.5	QP	QP (1.00s)
6.392	14.3	Line	50.0	-35.7	AVG	AVG (0.10s)
0.154	29.6	Line	65.8	-36.2	QP	QP (1.00s)
0.172	28.1	Neutral	64.9	-36.8	QP	QP (1.00s)
7.314	11.2	Neutral	50.0	-38.8	AVG	AVG (0.10s)
7.623	11.1	Neutral	50.0	-38.9	AVG	AVG (0.10s)
0.169	25.9	Neutral	65.0	-39.1	QP	QP (1.00s)
7.009	20.5	Line	60.0	-39.5	QP	QP (1.00s)
6.392	20.2	Line	60.0	-39.8	QP	QP (1.00s)
0.165	25.2	Neutral	65.2	-40.0	QP	QP (1.00s)
0.163	24.2	Line	65.3	-41.1	QP	QP (1.00s)
7.314	18.9	Neutral	60.0	-41.1	QP	QP (1.00s)
0.166	23.0	Line	65.2	-42.2	QP	QP (1.00s)
7.623	16.5	Neutral	60.0	-43.5	QP	QP (1.00s)
0.172	11.1	Neutral	54.9	-43.8	AVG	AVG (0.10s)
0.154	11.6	Line	55.8	-44.2	AVG	AVG (0.10s)
0.156	11.5	Neutral	55.7	-44.2	AVG	AVG (0.10s)
0.163	10.7	Line	55.3	-44.6	AVG	AVG (0.10s)
0.166	10.6	Line	55.2	-44.6	AVG	AVG (0.10s)
0.169	10.4	Neutral	55.0	-44.6	AVG	AVG (0.10s)
0.165	10.5	Neutral	55.2	-44.7	AVG	AVG (0.10s)

End of Report

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