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EMC Test Report

Information Technology Equipment
Class B Digital Device

FCC Part 15
Industry Canada ICES-003, Issue 5

Model: 6235ANNGW and 6235ANNGU

COMPANY:	Intel Corporation 100 Center Point Circle, Suite 200 Columbia, SC 29210, USA
TEST SITE(S):	NTS Silicon Valley
REPORT DATE:	January 14, 2013
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ACCREDITED
Testing Cert #0214.26

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	1-14-2013	First release	

TABLE OF CONTENTS

SCOPE

Governments and standards organizations around the world have published requirements regarding the electromagnetic compatibility (EMC) of electronic equipment. Testing has been performed on the Intel Corporation model 6235ANNGW, pursuant to the following standards.

Standard	Title	Standard Date
FCC Part 15, Subpart B	Radio Frequency Devices	October 2011 as Amended
ICES-003, Issue 5	Information Technology Equipment (ITE) – Limits and methods of measurement	August 2012

All measurements and evaluations have been in accordance with these specifications, test procedures, and measurement guidelines as outlined in NTS Silicon Valley test procedures, and in accordance with the standards referenced therein (refer to Appendix E).

OBJECTIVE

The objective of Intel Corporation is to verify compliance with FCC and Canada's requirements for digital devices.

STATEMENT OF COMPLIANCE

The tested sample of Intel Corporation models 6235ANNGW and 6235ANNGU complied with the requirements of:

Standard/Regulation	Equipment Type/Class	Standard Date
Subpart B of Part 15 of the FCC Rules (CFR title 47)	Class B	2011 as amended
ICES-003, Issue 5	Class B	2012

As specified in Section 15.101 of FCC Part 15, unintentional radiators shall be authorized prior to the initiation of marketing. Based on the description of the EUT, the following criteria per Section 15.101 of FCC Part 15 were applied to the EUT:

Type of device	**Equipment authorization required**
Class B personal computers and peripherals	Declaration of Conformity or Certification *[Certification is sought]*

The test results recorded herein are based on a single type test of the Intel Corporation model 6235ANNGW and therefore apply only to the tested sample(s). The sample was selected and prepared by Stephen Hackett of Intel Corporation.

Maintenance of compliance is the responsibility of the company. Any modification of the product that could result in increased emissions or susceptibility should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different enclosure, different line filter or power supply, harnessing and/or interface cable changes, etc.).

DEVIATIONS FROM THE STANDARDS

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

INFORMATION TECHNOLOGY EQUIPMENT EMISSIONS TEST RESULTS

The following emissions tests were performed on the Intel Corporation model 6235ANNGW. The measurements were extracted from the data recorded during testing and represent the highest-amplitude emissions relative to the specification limits. The complete test data is provided in the appendices of this report.

CONDUCTED EMISSIONS (MAINS PORT)

Frequency Range Operating Voltage	Standard/Section	Requirement	Measurement	Margin	Status
0.15-30 MHz, 120 V, 60 Hz	FCC § 15.107(a) (Class B)	0.15-0.5 MHz: 66-56 dBμV QP 56-46 dBμV Av 0.5-5.0 MHz: 56 dBμV QP 46 dBμV Av 5.0-30.0 MHz: 60 dBμV QP 50 dBμV Av	31.3 dBμV @ 4.428 MHz	-24.7 dB	Complied

RADIATED EMISSIONS

Frequency Range	Standard/Section	Requirement	Measurement	Margin	Status
30-1000 MHz	FCC §15.109(g) Class B	30-230 MHz, 30 dBμV/m 230-1000 MHz, 37 dBμV/m (10 m limit)	44.8 dBμV/m @ 332.27 MHz	-1.2 dB	Complied

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 were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Conducted Emissions	dBuV or dBuA	150 kHz – 30 MHz	± 2.2 dB
Radiated Electric Field	dBuV/m	30-1000 MHz	± 3.6 dB
		1000-40,000 MHz	± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

GENERAL

The Intel Corporation Intel® Centrino® Advanced-N 6235 models 6235ANNGW and 6235ANNGU are Bluetooth/IEEE 802.11a/b/g/n wireless network adapter modules. The modules support MIMO (2x2) for 802.11n modes and MISO (1x2) for 802.11a/b/g modes. Bluetooth only operation mode is a 1x1. When Bluetooth is operational then 802.11b/g/n modes operate as SISO (1x1). 802.11a/n modes still operate as MIMO (2x2) with Bluetooth operational.
The card is sold under two different FCC/IC ID numbers and models. The ID's ending in "U" are intended to allow user install conditions and host systems must be provided with a BIOS locking feature that prevents installation of unauthorized devices.
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 external to the PC.

The sample was received on December 1, 2012 and tested on December 18, 2012. The samples tested are as follows:

Company	Model	Description	Serial Number	FCC ID
Intel Corporation	6235ANNGW	Bluetooth / IEEE 802.11a/b/g/n wireless network adapter module	50405 (JBP) 50405 (DSS, DTS and NII)	PD96235ANNG PD96235ANNGU 1000M-6235ANNG
	6235ANNGU			1000M-6235ANNGU

HIGHEST EUT INTERNAL SOUCE

The highest internal source of the EUT was declared as 40 MHz.

Based on the declared highest internal source, the upper frequency range of measurement for the current project were:

FCC Part 15, Subpart B

Highest Internal Source (MHz)	Upper Frequency Range of Measurement (MHz)	Applicability
Below 1.705	30	
1.705 – 108	1000	X
108 – 500	2000	
500 – 1000	5000	
Above 1000	5th harmonic of the highest internal source or 40 GHz, whichever is lower	

ENCLOSURE

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

MODIFICATIONS

No modifications were made to the EUT during testing. The test fixture cable had two ferrite clamps added.

SUPPORT EQUIPMENT

The following equipment was used as local support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Intel Corporation	-	NGFF Test Fixture	3902412-312	N/A
Dell	Latitude D520	Laptop PC	Unmarked	N/A
Agilent	E3610A	DC Supply	MY40011740	N/A

The following equipment was used as remote support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Asante	FH109TN	Ethernet Switch	320I0199	N/A

No support equipment was used during testing.

EUT INTERFACE PORTS

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

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Laptop Ethernet	Remote Switch	CAT5	Unshielded	20.0
Laptop Mini PCI	Fixture PCIe	Ribbon	unshielded	0.7
Laptop DC Power In	AC/DC Adapter	Mulitconductor	shielded	1.5
DC Power Supply	Fixture DC power	2-wire	unshielded	0.7
DC Power Supply - AC port	AC Mains	3-wire	unshielded	1.5
EUT - RF ports (x2)	Antenna Fixture	coaxial (x2)	shielded	0.2

EUT OPERATION

During emissions testing the digital interface to the EUT was active, the laptop was showing a scrolling H pattern and the peripheral interfaces were enabled and active.

EMISSIONS TESTING

RADIATED AND CONDUCTED EMISSIONS

Final test measurements were taken at the NTS Silicon Valley Anechoic Chambers listed below. The test sites contain separate areas for radiated and conducted emissions testing. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are registered with the VCCI and are on file with the FCC and Industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 4	211948	2845B-4	41039 Boyce Road Fremont, CA 94538-2435

RADIATED EMISSIONS CONSIDERATIONS

Radiated emissions measurements were made with the EUT powered from a supply voltage within the expected tolerances of each nominal operating voltage/frequency for each geographical regions covered by the scope of the standards referenced in this report.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions tests are performed in conformance with ANSI C63.4, and Subpart B of Part 15 of FCC Rules for Digital Devices.

Mains port measurements are made with the EUT connected to the public power network through 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.

Telecommunication port measurements are made with the unshielded network cable connected through an impedance stabilization network (ISN) appropriate to the type of cable employed. Where no suitable ISN is available measurements are made using a capacitive voltage probe (CVP) and a current probe. If shielded cables are specified for the port under test the measurement is made of the noise voltage on the shield of the cable via a 100 ohm resistor.

EMISSIONS MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1:2006 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7 GHz. 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.

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 1000 MHz 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.

INSTRUMENT CONTROL COMPUTER

Measurements are converted to the field strength at an antenna or voltage developed at the LISN (or ISN) measurement port, which is then compared directly with the appropriate specification limit under software control of the test receivers and spectrum analyzers. 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 emission measurements utilize a fifty micro-Henry 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.

IMPEDANCE STABILIZATION NETWORK (ISN)

Telecommunication port conducted emission measurements utilize an Impedance Stabilization Network with a 150-ohm termination impedance and specific longitudinal conversion loss as the voltage monitoring point. This network provides for calibrated radio-frequency noise measurements by the design of the internal circuitry on the EUT and measurement ports, respectively. For current measurements, a current probe with a uniform frequency response and less than 1-ohm insertion impedance is used.

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 bilog antenna or combination of biconical and log periodic antennas are used to cover the range from 30 MHz to 1000 MHz. Narrowband tuned dipole antennas may be used over the entire 30 to 1000 MHz frequency range for precision measurements of field strength. Above 1000 MHz, horn antennas are used. The antenna calibration factors are included in site factors that are programmed into the test receivers or data collection 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.

ANSI C63.4 specify 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 up to 12-mm thick if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the company's specifications. An appendix of this report contains the list of test equipment used and calibration information.

EMISSIONS TEST PROCEDURES

EUT AND CABLE PLACEMENT

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

CONDUCTED EMISSIONS (MAINS)

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. Emissions that have peak values close to the specification limit are also measured in the quasi-peak and average detection modes to determine compliance except when the amplitude of the emission when measured with the quasi-peak detector is more than 10 dB below the specification limit for average measurements. In this case only quasi-peak measurements are performed.

CONDUCTED EMISSIONS (TELECOMMUNICATION PORTS)

Conducted emissions voltages are measured at a point 80 cm from the EUT. If conducted emission currents are measured, the current probe is located 70 cm from the EUT. 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. Emissions that have peak values close to the specification limit are also measured in the quasi-peak and average detection modes to determine compliance except when the amplitude of the emission when measured with the quasi-peak detector is more than 10 dB below the specification limit for average measurements. In this case only quasi-peak measurements are performed.

RADIATED EMISSIONS

General

FCC Part 15 references the test methods of ANSI C63.4-2003 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz) for emissions measurements. However FCC Public Notice DA 09-2478 (released on November 25, 2009) clarifies measurements made to determine compliance may be performed using the test methods of either the 2003 or 2009 version of the ANSI C63.4 document.

For the current project, the test methods of ANSI C63.4-2003 were used. As the two versions of ANSI C63.4 specify different usage of floor absorbers during radiated emissions testing, the table below has been included for clarification:

Frequency Range	ANSI C63.4-2003	ANSI C63.4-2009
30-1000 MHz	No floor absorbers used	No floor absorbers used
Above 1000 MHz	No floor absorbers used	“Free space” test environment with floor absorbers placed between antenna and EUT in accordance with CISPR 16-1-4

Radiated emissions measurements are performed in two phases, preliminary scan and final maximization.

Preliminary Scan

A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one or more of these with the antenna polarized vertically and one or more of these are performed with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied as necessary to determine the highest emission relative to the limit.

Note that for the frequency range of 1-6 GHz in the “free space” test environment, CISPR 22 allows the antenna to be set at fixed height equal to the center height of the EUT, except for cases where additional scans are necessary with the antenna height adjusted up and down to ensure the measurement antenna illuminates the entire height of the EUT. However, in cases where a single “free space” test is performed in the 1-6 GHz frequency to simultaneously meet the requirements of FCC Part 15 (ANSI C63.4-2009 test methods) and CISPR 22, the antenna height is by default varied since required by ANSI C63.4.

In the frequency range of 30-1000 MHz, a speaker (with demodulation) is provided in the receiver to aid in discriminating between EUT and ambient emissions if required. Other possible methods for discriminating between EUT and ambient emissions involve scanning with near-field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final Maximization

During final maximization, 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 that results in the highest emission is then maintained while varying the antenna height from one to four meters. 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. Emissions that have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

Final measurements in the frequency range of 30-1000 MHz are made using a quasi-peak detector and compared to the quasi-peak limit. Final measurements above 1 GHz are made using average and peak detectors and compared to the average and peak limits respectively.

When testing above 1 GHz, the receive antenna is restricted to a maximum height of 2.5 m. Maximum emissions are found within this restricted range because emission levels decrease over distance and as the antenna is raised above 2.5 m, the distance from the EUT increases. As a result of the increased measurement distance, at antenna heights above 2.5 m, lower emission levels are measured as compared to emissions levels measured at antenna heights at 2.5 m and below. Final measurements are captured at 3 meters test distance except in cases where a closer test distance is required due to noise-floor considerations of the test-and-measurement equipment.

For measurements above 1 GHz every effort is made to ensure the EUT remains within the cone of radiation of the measurement antenna (i.e. 3 dB beam-width of the antenna). This may include rotating the product and/or angling the measurement antenna.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form). The calculation is 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, 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

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

Appendix A Test Equipment Calibration Data

Radiated and Conducted Emissions, 18-Dec-12

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	LISN, 10 kHz-100 MHz	3825/2	1293	2/16/2013
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	5/15/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	12/12/2013
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	5/25/2013
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/25/2013
Com-Power	9KHz-30MHz, 50uH, 15Aac, 10Adc, max	LI-215A	2672	5/25/2013

Appendix B Test Data

T90448 Pages 17 - 23

Client:	Intel Corporation	Job Number:	J88901
Product	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Emissions Standard(s):	FCC 15.B (JBP)	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Intel Corporation

Product

Intel® Centrino® Advanced-N 6235

Date of Last Test: 12/18/2012

Client:	Intel Corporation	Job Number:	J88901
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.B (JBP)	Class:	B

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: 12/18/2012
Test Engineer: Mark Hill
Test Location: Fremont Chamber #4

Config. Used: 1
Config Change: -
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

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 EUT's interface cables.

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 1000 MHz, Preliminary	Class B	Eval	46.7 dBµV/m @ 199.68 MHz (+3.2 dB)
2	Radiated Emissions 30 - 1000 MHz, Maximized	Class B	Pass	44.8 dBµV/m @ 332.27 MHz (-1.2 dB)

Modifications Made During Testing

Added two ferrites (Wurth 742 724 75) to the blue PCI expansion cable.

Deviations From The Standard

No deviations were made from the requirements of the standard.

NTS
WE ENGINEER SUCCESS

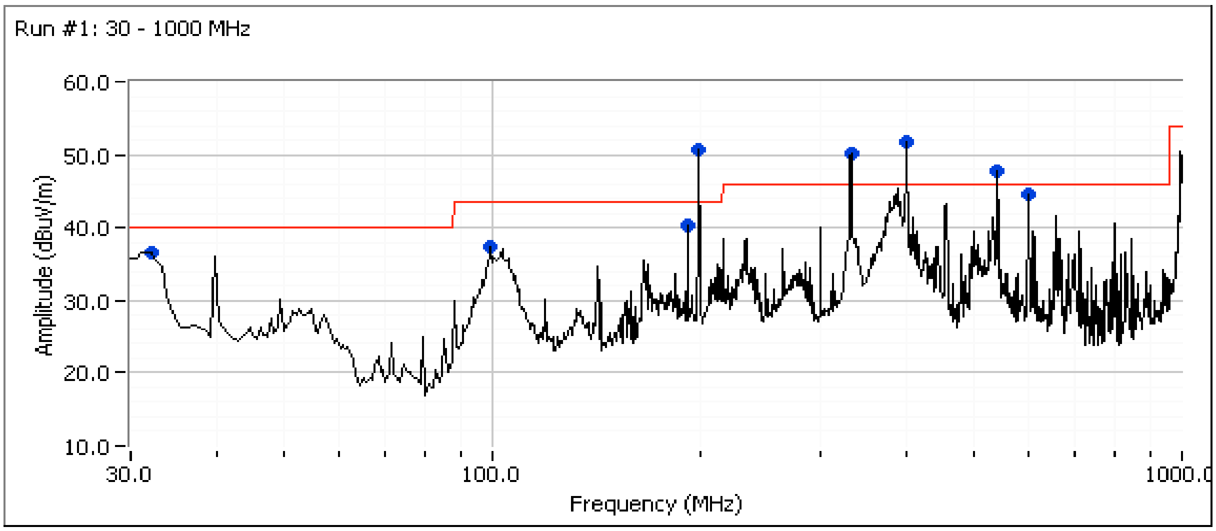
EMC Test Data

Client:	Intel Corporation	Job Number:	J88901
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.B (JBP)	Class:	B

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz
EUT is a PC peripheral, Host PC configured with two external peripheral devices of different I/O protocols, FCC H-Pattern running

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

EUT and Test Configuration Details (Engineering Evaluation Tests Only):
Please include pertinent information for the configuration tested and copy down to each run, modifying as appropriate



Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15B Class B		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
32.046	36.6	V	40.0	-3.4	Peak	42	1.0	
332.273	50.1	H	46.0	4.1	Peak	190	1.0	
600.030	44.6	V	46.0	-1.4	Peak	202	1.0	
192.010	40.4	H	43.5	-3.1	Peak	219	1.0	
199.676	50.6	H	43.5	7.1	Peak	229	1.0	
99.734	37.4	V	43.5	-6.1	Peak	271	1.0	
541.252	47.8	H	46.0	1.8	Peak	303	2.0	
399.142	51.8	H	46.0	5.8	Peak	310	1.0	

EMC Test Data

Client:	Intel Corporation	Job Number:	J88901
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.B (JBP)	Class:	B

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

Frequency	Level	Pol	FCC 15B Class B		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
199.676	46.7	H	43.5	3.2	QP	230	1.0	QP (1.00s)
332.273	45.2	H	46.0	-0.8	QP	198	1.0	QP (1.00s)
399.142	44.8	H	46.0	-1.2	QP	316	1.0	QP (1.00s)
192.010	34.7	H	43.5	-8.8	QP	234	1.1	QP (1.00s)
99.734	34.2	V	43.5	-9.3	QP	275	1.0	QP (1.00s)
542.100	33.8	H	46.0	-12.2	QP	304	1.8	QP (1.00s)
600.030	25.5	V	46.0	-20.5	QP	158	1.0	QP (1.00s)
32.046	16.1	V	40.0	-23.9	QP	81	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)
Note: Added two Wurth 742 724 75 ferrites to the blue PCIE expansion cable. One at the laptop end and one at the test fixture end.

Frequency	Level	Pol	FCC 15B Class B		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
332.273	44.8	H	46.0	-1.2	QP	196	1.0	QP (1.00s)
199.676	40.0	H	43.5	-3.5	QP	225	1.0	QP (1.00s)
399.142	40.5	H	46.0	-5.5	QP	317	1.0	QP (1.00s)
99.734	34.2	V	43.5	-9.3	QP	277	1.0	QP (1.00s)
192.010	31.1	H	43.5	-12.4	QP	232	1.1	QP (1.00s)
541.252	25.5	H	46.0	-20.5	QP	304	1.8	QP (1.00s)

EMC Test Data

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Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
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Conducted Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

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Config Change: -
EUT Voltage: 120V/60Hz

General Test Configuration

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

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	Class B	Pass	31.3 dBμV @ 4.428 MHz (-24.7 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.

EMC Test Data

Client:	Intel Corporation	Job Number:	J88901
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.B (JBP)	Class:	B

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

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

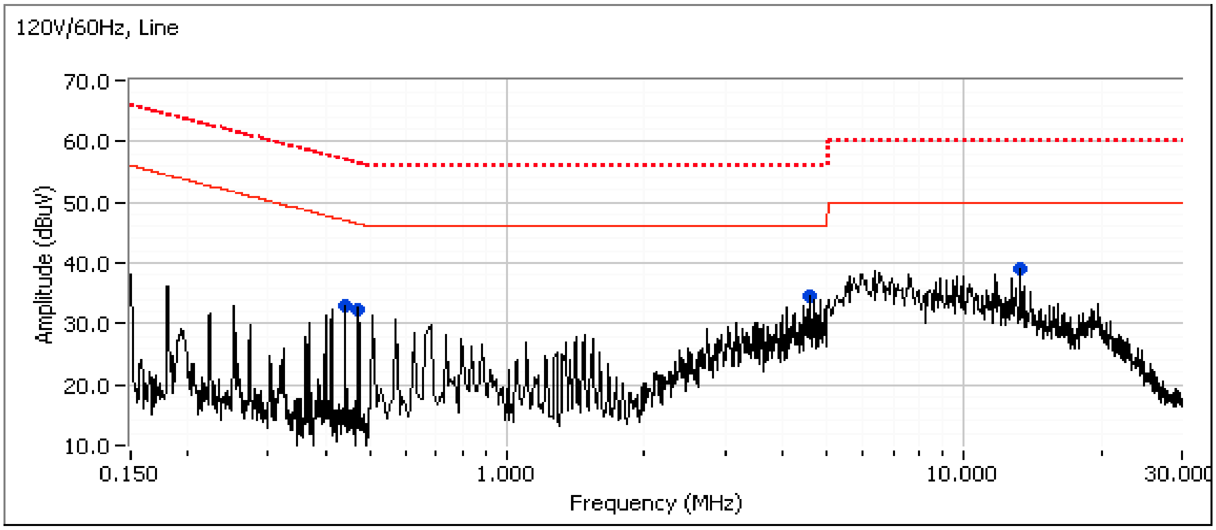
Frequency	Level	AC	Class B		Detector	Comments
MHz	dBμV	Line	Limit	Margin	QP/Ave	
0.455	33.7	Neutral	46.8	-13.1	Peak	
0.471	33.1	Neutral	46.5	-13.4	Peak	
4.428	36.6	Neutral	46.0	-9.4	Peak	
5.983	37.4	Neutral	50.0	-12.6	Peak	
0.443	33.0	Line 1	47.0	-14.0	Peak	
0.473	32.5	Line 1	46.5	-14.0	Peak	
4.621	34.6	Line 1	46.0	-11.4	Peak	
13.329	38.9	Line 1	50.0	-11.1	Peak	

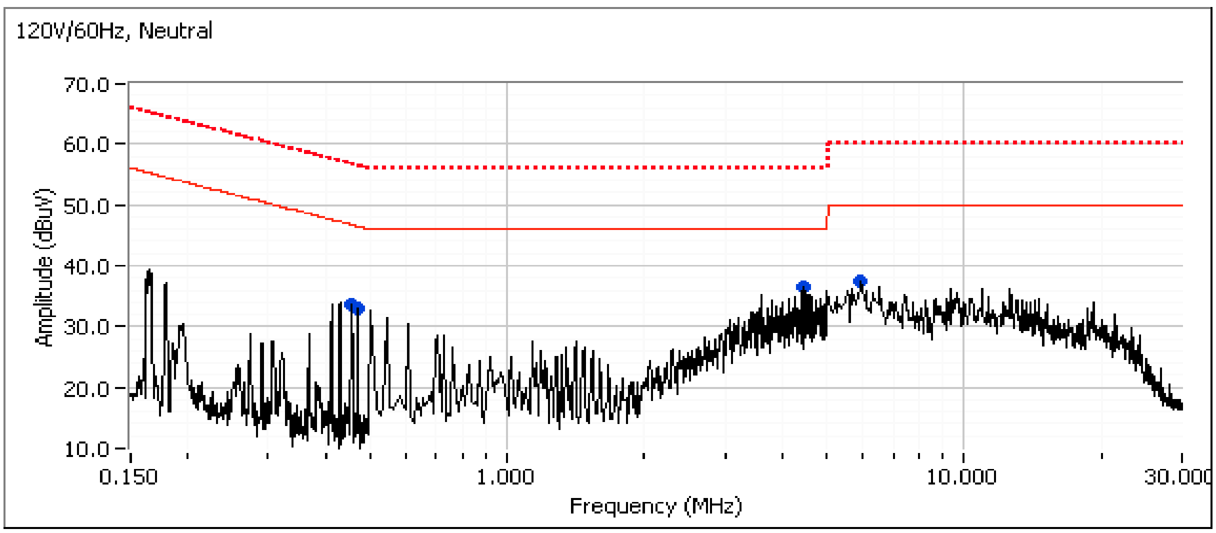
Final quasi-peak and average readings

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBμV	Line	Limit	Margin	QP/Ave	
4.428	31.3	Neutral	56.0	-24.7	QP	QP (1.00s)
4.428	20.4	Neutral	46.0	-25.6	AVG	AVG (0.10s)
4.621	28.5	Line 1	56.0	-27.5	QP	QP (1.00s)
5.983	30.9	Neutral	60.0	-29.1	QP	QP (1.00s)
4.621	16.8	Line 1	46.0	-29.2	AVG	AVG (0.10s)
13.329	20.5	Line 1	50.0	-29.5	AVG	AVG (0.10s)
0.443	26.8	Line 1	57.0	-30.2	QP	QP (1.00s)
0.473	26.3	Line 1	56.5	-30.2	QP	QP (1.00s)
0.471	26.2	Neutral	56.5	-30.3	QP	QP (1.00s)
0.455	26.4	Neutral	56.8	-30.4	QP	QP (1.00s)
5.983	19.5	Neutral	50.0	-30.5	AVG	AVG (0.10s)
13.329	28.3	Line 1	60.0	-31.7	QP	QP (1.00s)
0.443	8.3	Line 1	47.0	-38.7	AVG	AVG (0.10s)
0.473	6.9	Line 1	46.5	-39.6	AVG	AVG (0.10s)
0.455	6.6	Neutral	46.8	-40.2	AVG	AVG (0.10s)
0.471	6.1	Neutral	46.5	-40.4	AVG	AVG (0.10s)

EMC Test Data

Client:	Intel Corporation	Job Number:	J88901
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T90448
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.B (JBP)	Class:	B





Appendix C Product Labeling Requirements

The following information has been provided to clarify notification, equipment labeling requirements and information that must be included in the operator's manual. These requirements may be found in the standards/regulations listed in the scope of this report.

Label Location

The required label(s) must be in a *conspicuous location* on the product, which is defined as any location readily visible to the user of the device without the use of tools.

Label Attachment

The label(s) must be *permanently attached* to the product, which is defined as attached such that it can normally be expected to remain fastened to the equipment during the equipment's expected useful life. A paper gum label will generally <u>not</u> meet this condition.

United States Class B Label

> FCC ID: ABC1234567
> This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The FCC Identifier is comprised of the grantee code (in the example above **ABC**) that was assigned by the FCC plus a unique alpha-numeric specific to the product being certified. The ID must appear on the device.

If the device is too small or for such use that it is not practicable to place the US label statement on it, the statement shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed

Appendix D User Manual Regulatory Statements

Where special accessories, such as shielded cables, are required in order to meet the emission limits, appropriate instructions regarding the need to use such accessories must be contained on the first page of text concerned with the installation of the device in the operator's manual.

A requirement by FCC regulations, and recommended for all regulatory markets, is a cautionary statement to the end user that changes or modifications to the device not expressly approved by you, the manufacturer, could void their right to operate the equipment.

United States Class B Manual Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and the receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

Note: Additional information about corrective measures may also be provided to the user at the company's option.

The FCC has indicated that the radio interference statement be bound in the same manner as the operator's manual. Thus, a loose-leaf insert page in a bound or center-spine and stapled manual would <u>not</u> meet this condition.

Appendix E Basic and Reference Standards

Subpart B of Part 15 of FCC Rules for digital devices.

FCC Part 15 Subpart B references the use of ANSI C63.4–2003: "*Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*" for the purposes of evaluating the radiated and conducted emissions from digital devices.

End of Report

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