EMC Test Report

Information Technology Equipment
Class B Digital Device

FCC Part 15
Industry Canada ICES-003 Issue 4

Intel® Centrino® Advanced-N 6235, Models 6235ANHMRW and 6235ANHRU
FCC ID: PD96235ANHR and PD96235ANHRU
IC:1000M-6235ANHR and 1000M-6235ANHRU

COMPANY:	Intel Corporation 100 Center Point Circle Suite 200 Columbia, SC 29210
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road Fremont, CA. 94538-2435
REPORT DATE:	May 24, 2012
FINAL TEST DATES:	May 21, 2012
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	05-24-2012	First release	

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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 Intel® Centrino® Advanced-N 6235, Models 6235ANHMRW and 6235ANHRU, pursuant to the following standards.

Standard	Title	Standard Date
FCC Part 15, Subpart B	Radio Frequency Devices	October 2011 as Amended
ICES-003, Issue 4	Digital apparatus	2004

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

OBJECTIVE

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

STATEMENT OF COMPLIANCE

The tested sample of Intel Corporation Intel® Centrino® Advanced-N 6235, Models 6235ANHMRW and 6235ANHRU 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 4	Class B	2004

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 was used]*

The test results recorded herein are based on a single type test of the Intel Corporation Intel® Centrino® Advanced-N 6235, Models 6235ANHMRW and 6235ANHRU and therefore apply only to the tested sample(s). The sample was selected and prepared by Steve 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 Intel® Centrino® Advanced-N 6235, Models 6235ANHMRW and 6235ANHRU. 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	32.0 dBµV @ 0.473 MHz	-14.5 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)	34.7 dBµV/m @79.29 MHz	-5.3 dB	Complied
1000-40000 MHz Note 1	FCC §15.109(a) Class B	54.0 dBµV/m Av 74.0 dBµV/m Pk (3 m limit)	N/A – Note 1		
Note 1 Testing above 1 GHz against FCC 15.109(a) requirements was not required because the highest frequency generated in the EUT was declared to be less than 108 MHz					

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

The Intel Corporation Intel® Centrino® Advanced-N 6235, Models 6235ANHMRW and 6235ANHRU are PCIe Half Mini Card form factor Bluetooth/IEEE 802.11a/b/g/n wireless network adapters. The card supports MIMO (2x2) for 802.11n modes and MISO (1x2) for 802.11a/b/g modes.
Bluetooth operates on a single chain and supports Basic rate, Enhanced data rate and Low Energy modes. The Basic and Enhanced data rates fully support frequency hopping while the Low Energy (LE) mode can operate in both hoping and non-hopping modes. The LE mode was evaluated under the rules for digital modulation systems while the other modes were evaluated as FHSS.
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 (see table below). 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 inside a laptop PC.

The sample was received on April 16, 2012 and tested on May 21, 2012. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Intel Corporation	6235ANHMRW	PCIe Half Mini Card form factor Bluetooth / IEEE 802.11a/b/g/n wireless network adapter	44850006303D	PD96235ANHR PD96235ANHRU 1000M-6235ANHR
	6235ANHRU			1000M-6235ANHRU

OTHER EUT DETAILS

The EUT antenna is a a two-antenna PIFA antenna system – Shanghai Universe Communication Electron Co., Ltd. The antenna connects to the EUT via a non-standard antenna connector, thereby meeting the requirements of FCC 15.203.

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 Elliott.

SUPPORT EQUIPMENT

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

Company	Model	Description	Serial Number	FCC ID
Dell	Latitude E5420	PC Laptop	N/A	N/A
Hewlett Packard	deskjet 5650	Printer	MY3883K42P	N/A
Dell	DA90PM111	DC Supply	N/A	N/A

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

Company	Model	Description	Serial Number	FCC ID
Netgear	DS516	16 port Hub	N/A	N/A

EUT INTERFACE PORTS

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

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Laptop RJ45	Hub	Cat.5	Unshielded	10
Laptop USB	Printer	USB Cable	Shielded	0.9
Laptop AC Power	AC Mains	AC/DC Adaptor	Unshielded	2
AC Power	Printer	3 wires	Unshielded	1.7

EUT OPERATION

During emissions testing the EUT was in a continuous receive mode with Scrolling H pattern displayed on the PC Laptop.

EMISSIONS TESTING

RADIATED AND CONDUCTED EMISSIONS

Final test measurements were taken at the Elliott Laboratories 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
	VCCI	FCC	Canada	
Chamber 4	R-1684 C-1796	211948	IC 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.

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.

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 and CISPR 22 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 CISPR 22 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.

RADIATED EMISSIONS (SEMI-ANECHOIC TEST ENVIRONMENT)

Radiated emissions measurements in a semi-anechoic environment 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 from 30 MHz up to the frequency required by the regulations specified on page 1. One or more of these are performed 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 to determine the highest emission relative to the limit. A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions if required. 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

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.

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.

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

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 Emissions, 30 - 1,000 MHz, 11-May-12

Manufacturer	Description	Model	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	5/28/2012
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/14/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	12/9/2012

Conducted Emissions - AC Power Ports, 11-May-12

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/17/2012
Fischer Custom Comm	LISN, 25A, 150kHz to 30MHz, 25 Amp,	FCC-LISN-50-25-2-09	2000	10/18/2012
Fischer Custom Comm	LISN, 25A, 150kHz to 30MHz, 25 Amp,	FCC-LISN-50-25-2-09	2001	2/15/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	12/9/2012

Appendix B Test Data

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Client:	Intel Corporation	Job Number:	J87129
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		-
Emissions Standard(s):	FCC 15.247, 15.407	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Intel Corporation

Model

Intel® Centrino® Advanced-N 6235

Date of Last Test: 5/22/2012

Client:	Intel Corporation	Job Number:	J87129
Product:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	Class:	B

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: 5/21/2012
Test Engineer: Hong Stenerson
Test Location: Fremont Chamber #4

Config. Used: 2
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

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

Ambient Conditions:

Temperature: 21 °C
Rel. Humidity: 32 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	Class B	Pass	32.0 dBµV @ 0.473 MHz (-14.5 dB)

Modifications Made During Testing

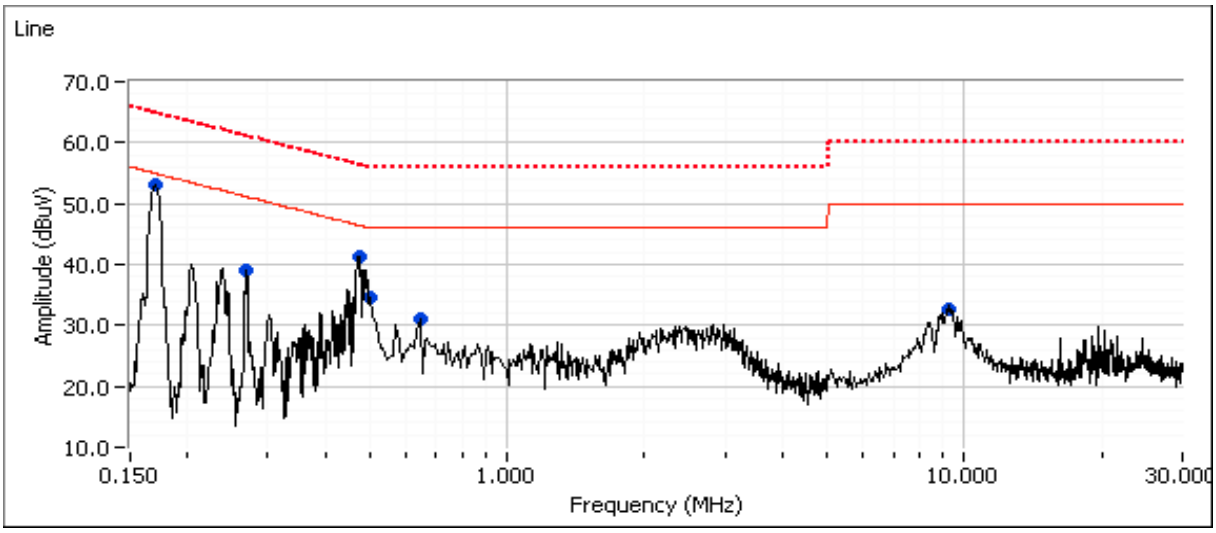
No modifications were made to the EUT during testing

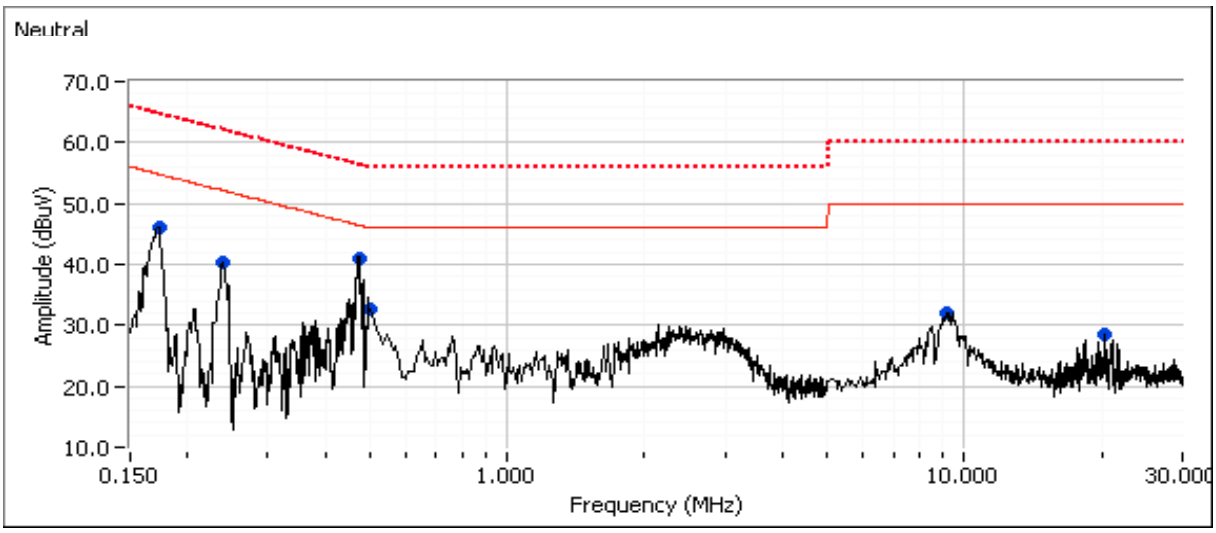
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Intel Corporation	Job Number:	J87129
Product:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	Class:	B

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





Client:	Intel Corporation	Job Number:	J87129
Product:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	Class:	B

Run 1 (Continued)

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	
0.169	53.0	Line 1	55.0	-2.0	Peak	
0.270	39.1	Line 1	51.1	-12.0	Peak	
0.473	41.4	Line 1	46.4	-5.0	Peak	
0.500	34.6	Line 1	46.0	-11.4	Peak	
0.636	31.0	Line 1	46.0	-15.0	Peak	
9.248	32.7	Line 1	50.0	-17.3	Peak	
0.174	46.1	Neutral	54.8	-8.7	Peak	
0.238	40.3	Neutral	52.2	-11.9	Peak	
0.474	41.1	Neutral	46.4	-5.3	Peak	
0.500	32.7	Neutral	46.0	-13.3	Peak	
9.151	32.0	Neutral	50.0	-18.0	Peak	
20.259	28.6	Neutral	50.0	-21.4	Peak	

Client:	Intel Corporation	Job Number:	J87129
Product:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	Class:	B

Run 1 (Continued)
Final quasi-peak and average readings

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.473	32.0	Line 1	46.5	-14.5	AVG	AVG (0.10s)
0.169	50.1	Line 1	65.0	-14.9	QP	QP (1.00s)
0.473	40.4	Line 1	56.5	-16.1	QP	QP (1.00s)
0.169	38.0	Line 1	55.0	-17.0	AVG	AVG (0.10s)
0.474	38.1	Neutral	56.4	-18.3	QP	QP (1.00s)
0.474	28.0	Neutral	46.4	-18.4	AVG	AVG (0.10s)
0.500	27.3	Line 1	46.0	-18.7	AVG	AVG (0.10s)
0.500	35.7	Line 1	56.0	-20.3	QP	QP (1.00s)
0.500	35.7	Neutral	56.0	-20.3	QP	QP (1.00s)
0.500	24.8	Neutral	46.0	-21.2	AVG	AVG (0.10s)
0.174	39.7	Neutral	64.8	-25.1	QP	QP (1.00s)
20.259	24.1	Neutral	50.0	-25.9	AVG	AVG (0.10s)
0.636	29.4	Line 1	56.0	-26.6	QP	QP (1.00s)
0.636	19.1	Line 1	46.0	-26.9	AVG	AVG (0.10s)
9.248	22.2	Line 1	50.0	-27.8	AVG	AVG (0.10s)
9.151	21.1	Neutral	50.0	-28.9	AVG	AVG (0.10s)
9.248	29.8	Line 1	60.0	-30.2	QP	QP (1.00s)
0.174	24.3	Neutral	54.8	-30.5	AVG	AVG (0.10s)
9.151	28.7	Neutral	60.0	-31.3	QP	QP (1.00s)
0.270	19.2	Line 1	51.1	-31.9	AVG	AVG (0.10s)
20.259	27.1	Neutral	60.0	-32.9	QP	QP (1.00s)
0.270	28.1	Line 1	61.1	-33.0	QP	QP (1.00s)
0.238	17.3	Neutral	52.2	-34.9	AVG	AVG (0.10s)
0.238	27.3	Neutral	62.2	-34.9	QP	QP (1.00s)

Client:	Intel Corporation	Job Number:	J87129
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	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: 5/21/2012
Test Engineer: Hong Stenerson
Test Location: Fremont Chamber #4

Config. Used: 2
Config Change: None
Host Unit 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: 21 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 1000 MHz, Preliminary	Class B	Pass	34.5 dBµV/m @ 79.29 MHz (-5.5 dB)
2	Radiated Emissions 30 - 1000 MHz, Maximized	Class B	Pass	34.7 dBµV/m @ 79.29 MHz (-5.3 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

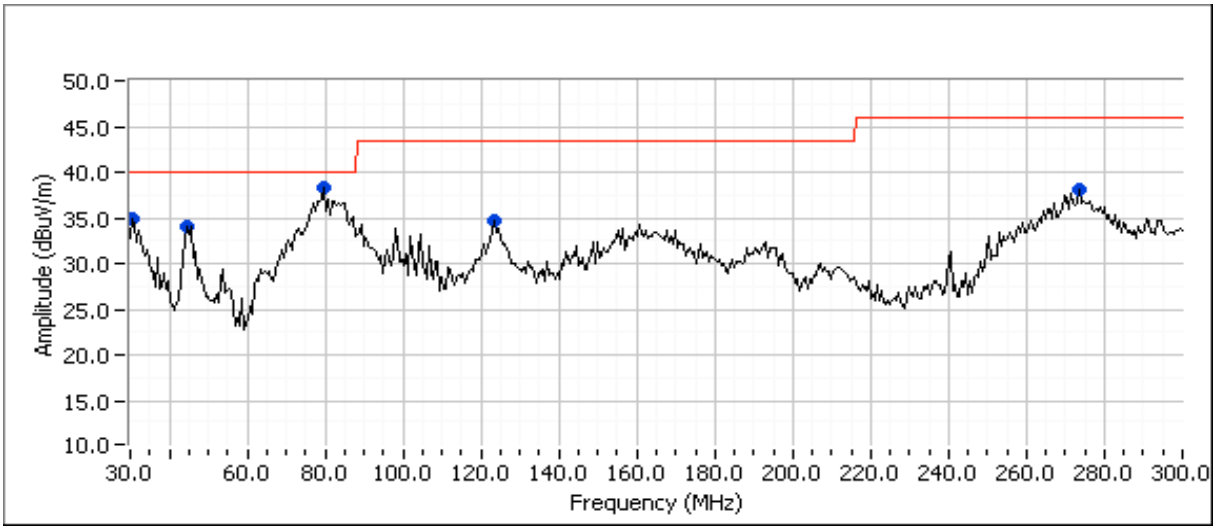
No deviations were made from the requirements of the standard.

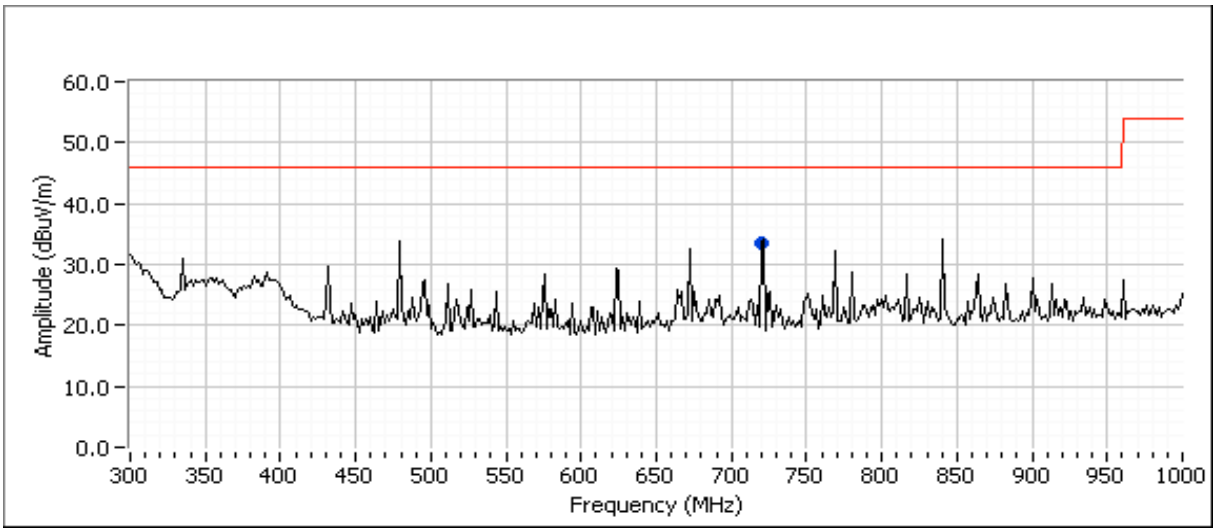
Client:	Intel Corporation	Job Number:	J87129
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	Class:	B

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

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

EUT and Test Configuration Details:





Client:	Intel Corporation	Job Number:	J87129
Model:	Intel® Centrino® Advanced-N 6235	T-Log Number:	T87211
		Account Manager:	Christine Krebill
Contact:	Steve Hackett		
Standard:	FCC 15.247, 15.407	Class:	B

Run 1 (Continued)
Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
79.288	38.4	V	40.0	-1.6	Peak	210	1.0	
44.264	34.0	V	40.0	-6.0	Peak	283	1.0	
30.172	35.0	V	40.0	-5.0	Peak	43	1.0	
123.755	34.6	V	43.5	-8.9	Peak	258	1.0	
273.514	38.0	H	46.0	-8.0	Peak	243	1.0	
719.992	33.5	V	46.0	-12.5	Peak	274	1.0	

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

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
79.288	34.5	V	40.0	-5.5	QP	232	1.0	QP (1.00s)
719.992	33.1	V	46.0	-12.9	QP	272	1.1	QP (1.00s)
30.172	26.9	V	40.0	-13.1	QP	0	1.0	QP (1.00s)
44.264	19.0	V	40.0	-21.0	QP	279	1.0	QP (1.00s)
273.514	24.4	H	46.0	-21.6	QP	234	1.0	QP (1.00s)
123.755	13.3	V	43.5	-30.2	QP	298	1.7	QP (1.00s)

Run #2: Maximized Readings From Run #1
Maximized quasi-peak readings (includes manipulation of EUT interface cables)

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

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
79.288	34.7	V	40.0	-5.3	QP	222	0.9	QP (1.00s)
719.992	33.2	V	46.0	-12.8	QP	274	1.2	QP (1.00s)
30.172	26.9	V	40.0	-13.1	QP	0	1.0	QP (1.00s)
44.264	21.4	V	40.0	-18.6	QP	279	1.0	QP (1.00s)
273.514	24.4	H	46.0	-21.6	QP	234	1.0	QP (1.00s)
123.755	21.4	V	43.5	-22.1	QP	272	1.0	QP (1.00s)

Appendix C 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 or 2009: "*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.

Industry Canada Interference Causing Equipment Standard ICES-003 Issue 4, February 2004

ICES 003 refers to Canadian Standards Association Standard CAN/CSA-CEI/IEC CISPR 22: 02, "*Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment.*" This standard is based on IEC CISPR 22:1997, third edition, with Canadian Deviations.

End of Report

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