Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94086-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart E (UNII Devices) and Industry Canada RSS 210 Issue 5 (LELEAN Devices) on the Intel Corporation Model: WM3B2100A

FCC ID: PD9WM3B2100A

GRANTEE: Intel Corporation
23000 Corporate Center Drive
Thousand Oaks, CA 91320

TEST SITE: Elliott Laboratories, Inc.
684 W. Maude Avenue
Sunnyvale, CA 94086

REPORT DATE: April 29, 2003

FINAL TEST DATE: April 23 and April 25, 2003

AUTHORIZED SIGNATORY: _____
Juan Martinez
Sr. EMC Engineer

ACCREDITED

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
WM3B2100A

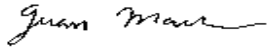
Manufacturer:
Intel Corporation
23000 Corporate Center Drive
Thousand Oaks, CA 91320

Tested to applicable standards:
RSS-210, Issue 5, November 2001 (Low Power License-Exempt Radiocommunication Devices)
FCC Part 15 Subpart E (UNII Devices)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 **SV3** Dated July 30, 2001

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4 as detailed in section 5.3 of RSS-210, Issue 5); and that the equipment performed in accordance with the data submitted in this report.



Signature	_____
Name	Juan Martinez
Title	Sr. EMC Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	April 29, 2003

Maintenance of compliance with the above standards 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.).

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the Intel Corporation model WM3B2100A pursuant to Subpart E of Part 15 of FCC Rules for Unlicensed National Information Infrastructure (UNII) devices and RSS-210 Issue 5 for licence-exempt local area network (LELAN) devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC 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.

The test results recorded herein are based on a single type test of the Intel Corporation model WM3B2100A and therefore apply only to the tested sample. The sample was selected and prepared by Robert Paxman of Intel Corporation

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart E of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their 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.

SUMMARY OF RESULTS

FCC Part 15 Section	RSS 210 Section	Description	Comments	Result
Operation in the 5.15 – 5.25 GHz Band				
15.407 (d)		As the device operates in the 5.15 – 5.25 GHz band the antenna must be integral to the device.	Antenna Gain = 5 dBi (Ethetronics) Antenna Gain = 0 dBi (Hitachi) The antenna is integral to the laptop computer	COMPLIES
15.407(e)		Indoor operation only	Refer to user's manual in Exhibit 6	COMPLIES
15.407(a) (1)	6.2.2(q1)(i)	Bandwidth	28.92 MHz (26dB), 19.67 MHz (20dB)	N/A
15.407(a) (1)	6.2.2(q1)(i)	Output Power	16.5 dBm @ 5180 MHz	COMPLIES
15.407(a) (1))	6.2.2(q1)(i)	Power Spectral Density	--6.5 dBm/MHz @ 5180 MHz	COMPLIES
15.407(b) (5) / 15.209	6.2.2(q1)(ii)	Spurious Emissions below 1GHz	-1.7dB @ 99.990MHz	COMPLIES
15.407(b) (2)	6.2.2(q1)(ii)	Spurious Emissions above 1GHz	-7.6 dB @ 15540 MHz	COMPLIES
Operation in the 5.25 – 5.35 GHz Band Note: The device is restricted to indoor use only, therefore the spectral density of spurious emissions in the 5.15 – 5.25 GHz band were limited to the power spectral limits for intentional signals detailed in FCC 15.407(a)(1) and RSS 210 6.2.2(q1) (i)				
		Maximum Antenna Gain /Integral Antenna	Antenna Gain = 5 dBi (Ethetronics) Antenna Gain = 0 dBi (Hitachi) The antenna is integral to the laptop computer	COMPLIES
15.407(a) (2)	6.2.2(q1)(ii)	Bandwidth	29.83 MHz (26dB), 19.75 MHz (20dB)	N/A
15.407(a) (2)	6.2.2(q1)(ii)	Output Power	17.3 dBm @ 5320 MHz	COMPLIES
15.407(a) (2))	6.2.2(q1)(ii)	Power Spectral Density	-6.5 dBm/MHz @ 5260 MHz	COMPLIES
15.407(b) (5) / 15.209	6.2.2(q1)(ii)	Spurious Emissions below 1GHz	-1.7dB @ 99.990MHz	COMPLIES
15.407(b) (2)	6.2.2(q1)(ii)	Spurious Emissions above 1GHz	-3.4 dB @ 10640 MHz	COMPLIES

General requirements for all bands				
FCC Part 15 Section	RSS 210 Section	Description	Comments	Result
	6.2.2(q1)(iv)(a)	Digital Modulation	Digital Modulation is used, refer to the "Theory of Operations" (Exhibit 9) for a detailed explanation.	COMPLIES
	6.2.2(q1)(iv)(b)	Peak Spectral Density	4.93 dBm/MHz	COMPLIES
15.407(a)(6)		Peak Excursion Ratio	< 13 dB	COMPLIES
	6.2.2(q1)(iv)(c)	Channel Selection	The device was tested on the following channels: 36, 52 and 64. These channels represent the highest, lowest and center channels available.	N/A
15.407 (c)	6.2.2(q1)(iv)(d)	Automatic Discontinuation of Operation in the absence of information to transmit	Operation is discontinued in the absence of information to transmit, refer to the "Theory of Operations" in Exhibit 9 for a detailed explanation.	COMPLIES
15.407 (g)	6.2.2(q1)(iv)(e)	Frequency Stability	Frequency stability is 20 ppm, refer to the "Theory of Operations" in Exhibit 9 for a detailed analysis.	COMPLIES
	6.2.2(q1)(iv)(g)	User Manual information	All relevant statements have been included in the user's manuals. Refer to Exhibit 6 for details	COMPLIES
15.407 (f)	6.2.2(q1)(iv)(g)	RF Exposure Requirements	Refer to MPE Calculations	COMPLIES
15.407(b) / 15.207	6.6	AC Conducted Emissions	-14.2dB @ 0.174MHz	COMPLIES

MEASUREMENT UNCERTAINTIES

ISO Guide 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 NAMAS document NIS 81.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Intel Corporation model WM3B2100A is a mini PCI Card dual band (802.11a and 802.11b) transceiver which is designed to be installed into a laptop PC and connect to antennas mounted in the screen of the laptop. The Mini PCI was tested outside the host system. The host laptop was treated as tabletop equipment during testing to simulate the end user environment. The electrical rating of the laptop is 120/240 V, 50/60 Hz, 5 Amps.

The sample was received on April 23, 2003 and tested on April 23 and April 25, 2003. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
Intel Corporation WM3B2100A Mini PCI card	DEB	PD9WM3B2100A

OTHER EUT DETAILS

Ethertronics Antenna at 2.4 Ghz has a gain of 2 dBi and at 5 Ghz a gain of 5 dBi.
Hitachi Antenna at 2.4 Ghz and at 5 Ghz a gain of 0 dBi.
Antennas will be installed inside at the topside of the display screen of the Laptop. The Laptop vendors will professionally install the antennas.

ENCLOSURE

The EUT contains it's own shield made out of aluminum. It measures approximately 6 cm wide by 2 cm deep by 4.5 cm high.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Pavilion 500	PC	MX21111561	DoC
Dell	828FI	Monitor	22794E28CJ29	DoC
Compaq	SK-2800	Keyboard	B1C800BCPHVV9Q	GYUR66SK
Hewlett Packard	P813I	Mouse	K020215557	DoC

No remote support equipment was used during testing.

EUT INTERFACE PORTS

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

EUT Tx	Antenna #1	Antenna Cable	Shielded	0.5
EUT Rx	Antenna #2	Antenna Cable	Shielded	0.5
Host PC, Keyboard	Keyboard	Keyboard Cable	Shielded	1.0
Host PC, AC Input	AC Power Source	IEC Power Cord	Unshielded	2.0
Host PC, Mouse	Mouse	Mouse Cable	Shielded	1.0
Monitor, AC Input	AC Power Source	IEC Power Cord	Unshielded	2.0

EUT OPERATION DURING TESTING

The EUT was transmitting on the channel stated in each test description at the maximum power. The transmission was continuous at 6Mb/s for 802.11a mode and at 1Mb/s in 802.11b mode. These data rates produce the highest power spectral density in their respective modes.
For measurements of radiated emissions above 1GHz host laptop's screen was in the down position to reduce any effects it might have on the antenna-related emissions. The EUT was tested with two different antennas (Ethertronics and Hitachi). The antennas were mounted to the top edge of a sheet of glass with a metal backing. The glass and metal simulated the actual implementation of the antennas in a laptop system.

ANTENNA REQUIREMENTS

Ethertronics Antenna at 2.4 Ghz has a gain of 2 dBi and at 5 Ghz a gain of 5 dBi.
Hitachi Antenna at 2.4 Ghz and at 5 Ghz a gain of 0 dBi.
Antennas will be installed inside at the topside of the display screen of the Laptop. The Laptop vendors will professionally install the antennas.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on April 23 and April 25, 2003 at the Elliott Laboratories Open Area Test Site #3 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 5 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

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

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. 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. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 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.

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.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and 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.

POWER METER

A power meter and **peak** power sensor are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

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 biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

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

INSTRUMENT CALIBRATION

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

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires 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

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

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. 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 regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is 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. 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. 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 which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed 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.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in temrs of Watts, milliwatts or dBm. 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.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter at a distance of 3m from the equipment under test:

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

where P is the eirp (Watts)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

FCC 15.407 (a) OUTPUT POWER LIMITS

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

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 - 5250	50mW (17 dBm)	4 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi.
Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

RS-210 6.2.2(q1) OUTPUT POWER LIMITS

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

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 - 5250	200mW (23 dBm)	10 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi.
Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

SPURIOUS RADIATED EMISSIONS LIMITS

The table below shows the limits for unwanted (spurious) emissions falling in the restricted bands detailed in Part 15.205 and Industry Canada RSS-210 Table 2.

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

The table below shows the limits for unwanted (spurious) emissions outside of the restricted bands above 1GHz.

Operating Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength At 3m (dBuV/m)
5150 - 5250	-27 dBm	68.3 dBuV/m
5250 - 5350	-27 dBm (note 1)	68.3 dBuV/m
5725 – 5825	-27 dBm (note 2)	68.3 dBuV/m
	-17 dBm (note 3)	78.3 dBuV/m

Note 1: If operation is restricted to indoor use only then emissions in the band 5.15 – 5.25 GHz must meet the power spectral density limits for the intentional signals detailed in RSS 210 and FCC Subpart E for devices operating in the 5.15 – 5.25 Ghz band.
Note 2: Applies to spurious signals separated by more than 10 MHz from the allocated band.
Note 3: Applies to spurious signals within 10 MHz of the allocated band.

AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.205 and Industry Canada RSS-210 section 6.6.

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

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, if the amplitude measured in the quasi-peak mode is at least 6 dB higher than the amplitude measured in the average mode, the level measured in the quasi-peak mode may be reduced by 13 dB before comparing it to the limit.

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

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Conducted and Radiated Emissions, 25-Apr-03
Engineer: volivas

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-4, OATS	362	12	4/19/02	4/30/03
EMCO	Biconical Antenna, 30-300 MHz	3110B	1320	12	6/3/02	6/3/03
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	12	10/9/02	10/9/03
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	12	10/30/02	10/30/03
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	12	7/18/02	7/18/03
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	1/24/03	1/24/04
Rohde & Schwarz	Test Receiver, 20-1300MHz	ESVP	213	12	7/22/02	7/22/03

Radiated Emissions, 1 - 40,000 GHz, 28-Apr-03
Engineer: jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	High Pass filter, 3.5GHz	84300-80038	1157	18	3/1/02	9/1/03
Hewlett Packard	High Pass filter, 8.2GHz	P/N-84300-80039	1156	12	4/17/03	4/17/04
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	12	2/28/03	2/28/04
Hewlett Packard	Microwave EMI test system (SA40, 9kHz - 40GHz)	84125C	1149	12	3/12/03	3/12/04
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	1/24/03	1/24/04
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12	4/8/03	4/8/04
Rohde & Schwarz	Power Sensor 100uW - 10 Watts	NRV-Z53	1236	12	8/15/02	8/15/03
Hewlett Packard	Spectrum Analyzer, 9KHz - 26.5GHz	8563E	F1202LB	12	9/27/02	9/27/03

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T50976_UNII 37 Pages
T50976_Digital 8 Pages

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, and E, RSS-	Class:	Radio
Immunity Spec:	N/A	Environment:	-

EMC Test Data

For The

Intel Corporation

Model

WM3B2100A

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, and E, RSS-21(	Class:	Radio
Immunity Spec:	N/A	Environment:	-

EUT INFORMATION

General Description

The EUT is a mini PCI Card dual band (802.11a and 802.11b) transceiver which is designed to be installed into a laptop PC and connect to antennas mounted in the screen of the laptop. The Mini PCI was tested outside the host system. The host laptop was treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the laptop is 120/240 V, 50/60 Hz, 5 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Intel Corporation	WM3B2100A	Mini PCI card	DEB	PD9WM3B2100A

Antenna

Ethertronics Antenna at 2.4 Ghz has a gain of 2 dBi and at 5 Ghz a gain of 5 dBi.
Hitachi Antenna at 2.4 Ghz and at 5 Ghz a gain of 0 dBi.
Antennas will be installed inside at the topside of the display screen of the Laptop. The Laptop vendors will professionally install the antennas.

EUT Enclosure

The EUT contains it's own shield made out of aluminum. It measures approximately 6 cm wide by 2 cm deep by 4.5 cm high.

Modification History

Mod. #	Test	Date	Modification
1			

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, and E, RSS-21(	Class:	Radio
Immunity Spec:	N/A	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Pavilion 500	PC	MX21111561	DoC
Dell	828FI	Monitor	22794E28CJ29	DoC
Compaq	SK-2800	Keyboard	B1C800BCPHVV9Q	GYUR66SK
Hewlett Packard	P813I	Mouse	K020215557	DoC

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Interface Cabling and Ports

EUT Tx	Antenna #1	Antenna Cable	Shielded	0.5
EUT Rx	Antenna #2	Antenna Cable	Shielded	0.5
Host PC, Keyboard	Keyboard	Keyboard Cable	Shielded	1.0
Host PC, AC Input	AC Power Source	IEC Power Cord	Unshielded	2.0
Host PC, Mouse	Mouse	Mouse Cable	Shielded	1.0
Monitor, AC Input	AC Power Source	IEC Power Cord	Unshielded	2.0

EUT Operation During Emissions Testing (Radio)

The EUT was transmitting on the channel stated in each test description at the maximum power. The transmission was continuous at 6Mb/s for 802.11a mode and at 1Mb/s in 802.11b mode. These data rates produce the highest power spectral density in their respective modes.

For measurements of radiated emissions above 1GHz host laptop's screen was in the down position to reduce any effects it might have on the antenna-related emissions. The EUT was tested with two different antennas (Ethertronics and Hitachi). The antennas were mounted to the top edge of a sheet of glass with a metal backing. The glass and metal simulated the actual implementation of the antennas in a laptop system.

Elliott

EMC Test Data

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Receiver Emission RSS-210 issue 5

Test Specifics

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

Date of Test:	4/23/03	Config. Used:	1
Test Engineer:	jgonzalez	Config Change:	None
Test Location:	SVOATS #3	EUT Voltage:	120V / 60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.
On the OATS, the measurement antenna was located 3m from the EUT for the frequency range 1 - 18 GHz.

Ambient Conditions:

Temperature:	11 °C
Rel. Humidity:	98 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1-6	RE, 1000 - 18000 MHz, Maximized Emissions	RSS210 RX Mode (Hitachi)	Pass	Refer to individual Runs
1-6	RE, 1000 - 18000 MHz, Maximized Emissions	RSS210 RX Mode (Ethertronics)	Pass	Refer to individual Runs

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:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #1: Maximized readings, 1000 - 18000 MHz
Hitachi
Mode A (5.180GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3453.000	49.9	H	60.0	-10.1	Avg	176	1.0	
13813.000	44.6	H	60.0	-15.4	Avg	200	1.0	
6906.000	43.3	V	60.0	-16.7	Avg	134	1.0	
17266.000	41.9	V	60.0	-18.1	Avg	321	1.0	
10354.000	41.3	V	60.0	-18.7	Avg	0	1.0	
6906.000	40.5	H	60.0	-19.5	Avg	200	1.0	
3453.000	38.5	V	60.0	-21.5	Avg	10	1.0	
10360.000	36.3	H	60.0	-23.7	Avg	132	1.0	

Run #2: Maximized readings, 1000 - 18000 MHz
Hitachi
Mode A (5.260GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7013.000	44.0	H	60.0	-16.0	Avg	187	1.0	
3506.000	42.8	H	60.0	-17.2	Avg	321	1.0	
7013.000	42.5	V	60.0	-17.5	Avg	234	1.0	
3506.000	41.8	V	60.0	-18.2	Avg	0	1.0	
10519.000	41.1	V	60.0	-18.9	Avg	360	1.0	

Run #3: Maximized readings, 1000 - 18000 MHz
Hitachi
Mode A (5.320GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7092.000	43.4	V	60.0	-16.6	Avg	111	1.0	
3546.000	41.9	V	60.0	-18.1	Avg	200	1.0	
3546.000	41.3	H	60.0	-18.7	Avg	89	1.0	
7092.000	42.3	H	60.0	-17.7	Avg	203	1.0	
10630.000	41.9	H	60.0	-18.1	Avg	0	1.0	
10630.000	39.1	V	60.0	-20.9	Avg	349	1.0	

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #4: Maximized readings, 1000 - 18000 MHz
Hitachi
Mode B (2.412GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.000	27.2	H	60.0	-32.8	Avg	312	1.0	
4823.000	40.8	H	60.0	-19.2	Avg	154	1.0	
4823.000	41.2	V	60.0	-18.8	Avg	18	1.0	

Run #5: Maximized readings, 1000 - 18000 MHz
Hitachi
Mode B (2.437GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.000	39.0	V	60.0	-21.0	Avg	300	1.0	

Run #6: Maximized readings, 1000 - 18000 MHz
Hitachi
Mode B (2.462GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2462.000	33.7	V	60.0	-26.3	Avg	0	1.0	

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #1: Maximized readings, 1000 - 18000 MHz
Ethertronics
Mode A (5.180GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3453.000	46.7	V	60.0	-13.3	Avg	22	1.0	
6906.000	39.8	V	60.0	-20.2	Avg	134	1.0	
13813.000	40.1	V	60.0	-19.9	Avg	100	1.0	
3453.000	38.4	H	60.0	-21.6	Avg	321	1.0	
10359.000	39.7	H	60.0	-20.3	Avg	300	1.0	

Run #2: Maximized readings, 1000 - 18000 MHz
Ethertronics
Mode A (5.260GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3506.000	40.3	V	60.0	-19.7	Avg	321	1.0	
7012.000	39.7	V	60.0	-20.3	Avg	179	1.0	
17530.000	43.1	V	60.0	-16.9	Avg	37	1.0	
3506.000	42.0	H	60.0	-18.0	Avg	98	1.0	
7012.000	39.1	H	60.0	-20.9	Avg	0	1.0	
10518.000	38.7	H	60.0	-21.3	Avg	360	1.0	

Run #3: Maximized readings, 1000 - 18000 MHz
Ethertronics
Mode A (5.320GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3546.000	39.7	V	60.0	-20.3	Avg	134	1.0	
7092.000	39.7	V	60.0	-20.3	Avg	231	1.0	
10638.000	40.7	V	60.0	-19.3	Avg	347	1.0	
3546.000	38.7	H	60.0	-21.3	Avg	300	1.0	
10638.000	41.2	H	60.0	-18.8	Avg	1	1.0	

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #4: Maximized readings, 1000 - 18000 MHz
Ethertronics
Mode B (2.412GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.000	29.7	V	60.0	-30.3	Avg	346	1.0	

Run #5: Maximized readings, 1000 - 18000 MHz
Ethertronics
Mode B (2.437GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.000	37.8	H	60.0	-22.2	Avg	321	1.0	

Run #6: Maximized readings, 1000 - 18000 MHz
Ethertronics
Mode B (2.462GHz)

Frequency	Level	Pol	RSS210 Rx Mode		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2462.000	36.7	V	60.0	-23.3	Avg	134	1.0	

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

FCC Part 15 Subpart E Tests

Test Specifics

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:	4/25/03	Config. Used:	1
Test Engineer:	Jmartinez	Config Change:	None
Test Location:	SVOATS# 3	Host Unit Voltage	120Vac, 60Hz

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT unless stated otherwise.
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 and cables used.

Ambient Conditions:

Temperature: 24°C
Rel. Humidity: 80%

Summary of Results

Run #	Test Performed	Limit	Result	Comments
1	Output Power	15.407(a) (1), (2)	Pass	17.3 dBm
2	Power Spectral Density (PSD)	15.407(a) (1), (2)	Pass	-5.1dBm/MHz
3	26dB Bandwidth	15.407	Pass	> 20 MHz
3	20 dB Bandwidth	RSS 210	Pass	> 20 MHz
4	Peak Excursion Envelope	15.407(a) (6)	Pass	Peak to average excursion < 13dB
5	Antenna Conducted - Out of Band Spurious	15.407(b)	Pass	All emissions below the -27dBm/MHz limit
6	Bandedges	15.407(b)	N/A	Refer to plots

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Run #1: Output Power (Peak Power Measurements)

Antenna Gain: 5 dBi

	Freq	Power	Settings				
Ch.	MHz	dBm	TCP	Data Rate	Tx Filter	TDA	DSP
36	5180	16.5	31	6 (6Mb/s)	38	226	98
48	5260	16.9	31	6 (6Mb/s)	38	226	98
64	5320	17.3	31	6 (6Mb/s)	38	226	110

Note 1:	Measured using a Rhode & Schwards Power Meter with a peak power sensor.
Note 2:	RSS 210 limit is 23dBm in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit. This limit is based on the emission bandwidth and operating frequency.

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #2: Power Spectral Density

Antenna Gain: 5 dBi

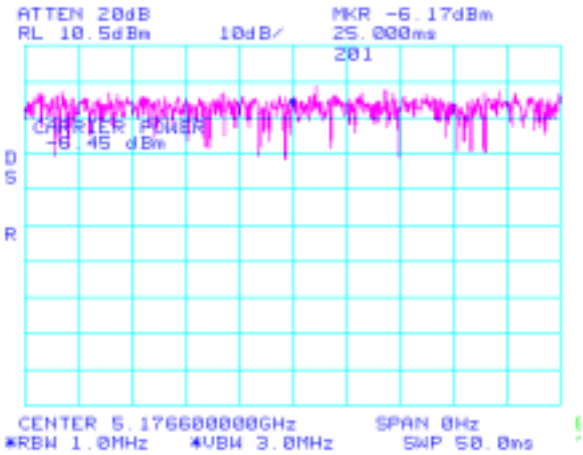
Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)	FCC Limit (dBm) note 2	Graph Reference	
36	5180	-6.5	4.0	201	Note 1
52	5260	-6.5	11.0	202	Note 1
64	5320	-5.1	11.0	203	Note 1

Note 1:	The above measurements were made using RBW = 1MHz, VBW = 3MHz, video averaging on. To demonstrate compliance with RSS 210, the peak PSD was also measured using RBW= VBW=1MHz, video averaging off during the peak excursion measurements (run #4). The peak PSD of 4.93 **dBm** did not exceed the maximum permitted average PSD of 10dBm (5.15 to 5.25 GHz band) or 11dBm (5.25-5.35GHz band) so no restriction is placed on the output power or average PSD with respect to RSS 210.
Note 2:	RSS 210 limit is 10dBm/MHz in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit.

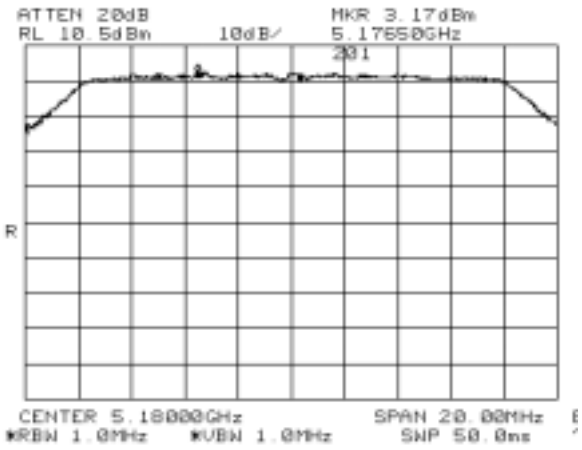
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Plots Showing Power Spectral Density (RBW = 1MHz, VBW = 3 MHz, Power Averaging ON)

FCC

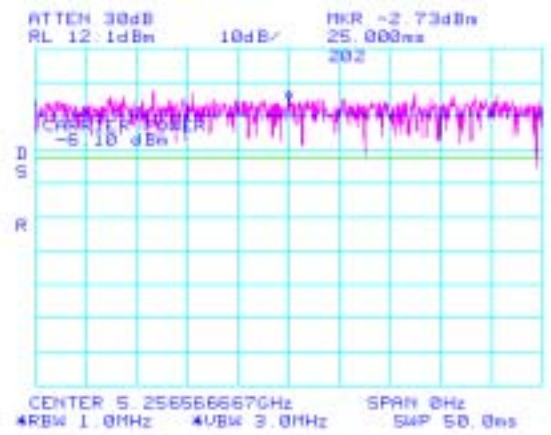


Canada PSD

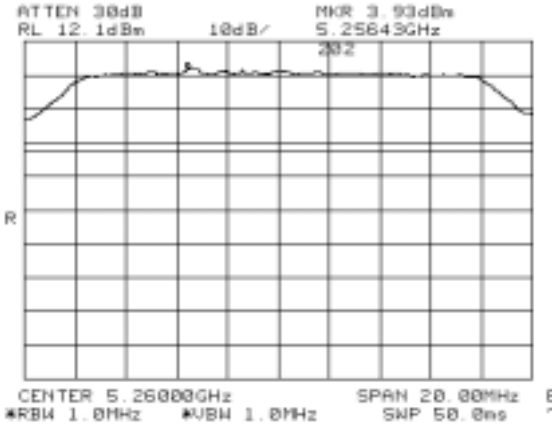


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

FCC

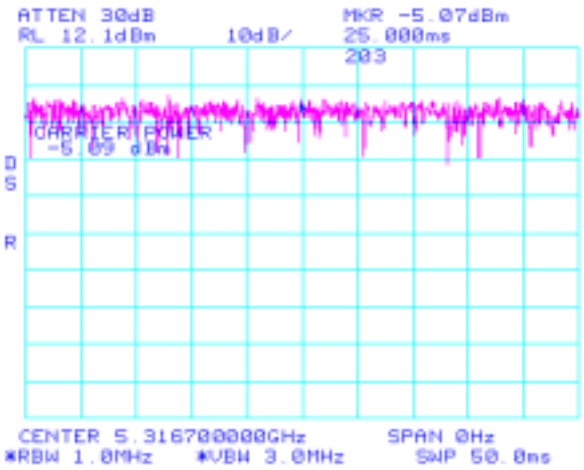


Canada PSD

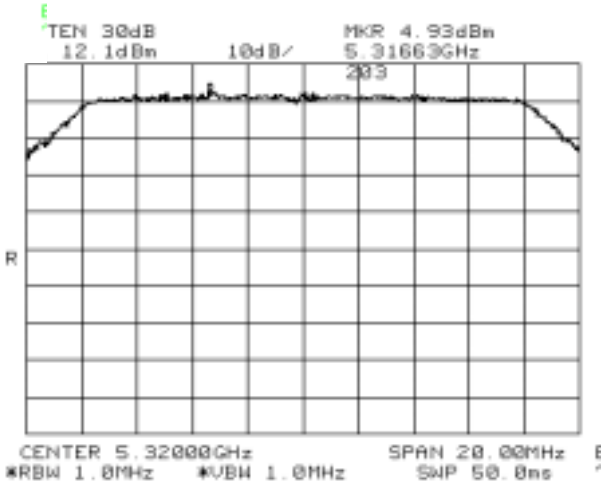


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

FCC



Canada PSD

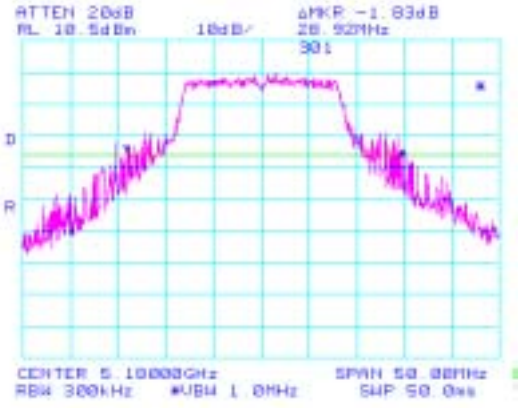


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

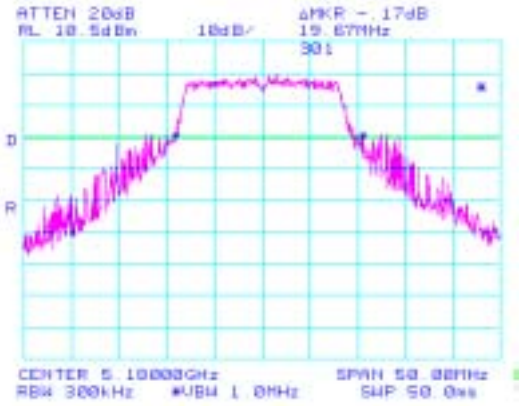
Run #3: Signal Bandwidth

Channel	Frequency (MHz)	Resolution Bandwidth	26 dB Signal Bandwidth (MHz)	20 dB Signal Bandwidth (MHz)	Graph reference #
36	5180	300 kHz	28.92	19.67	301
52	5260	300 kHz	29.75	20.25	302
64	5320	300 kHz	29.83	19.75	303

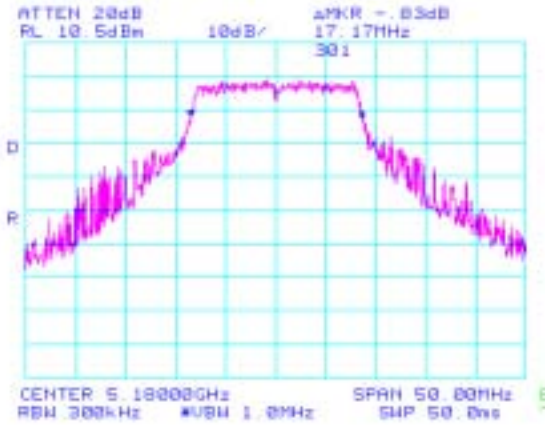
26-dB



20-dB

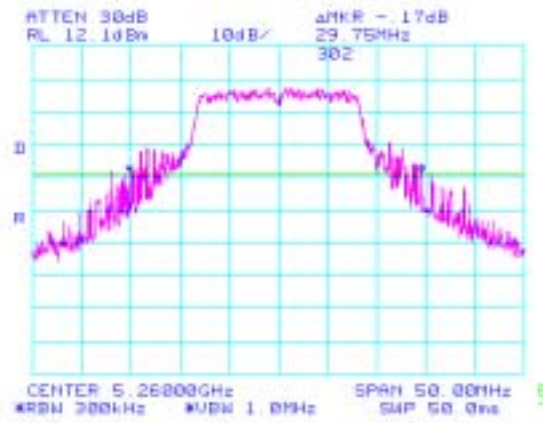


99%

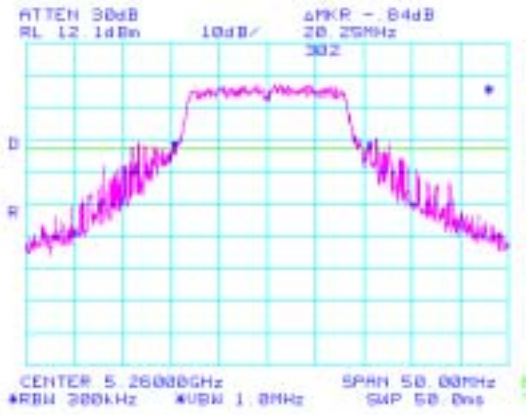


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

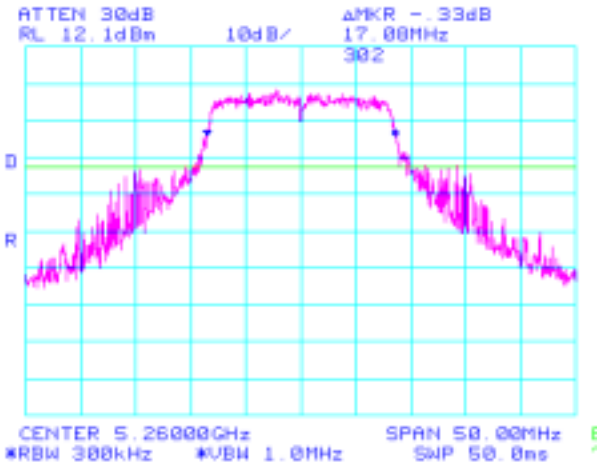
26-dB



20-dB

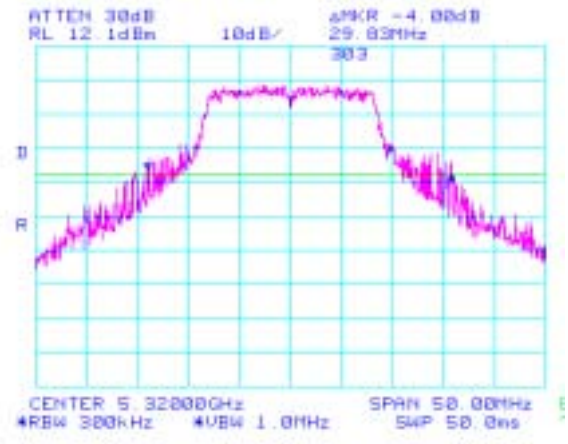


99%

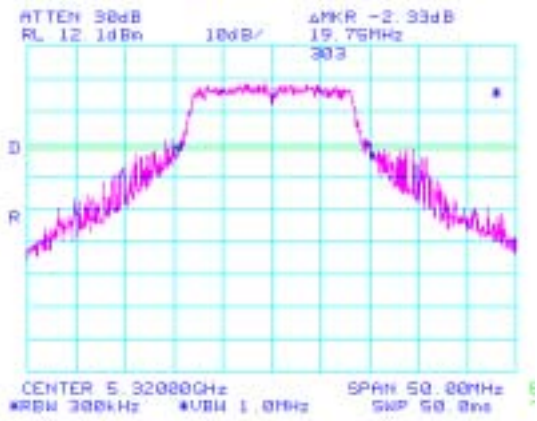


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

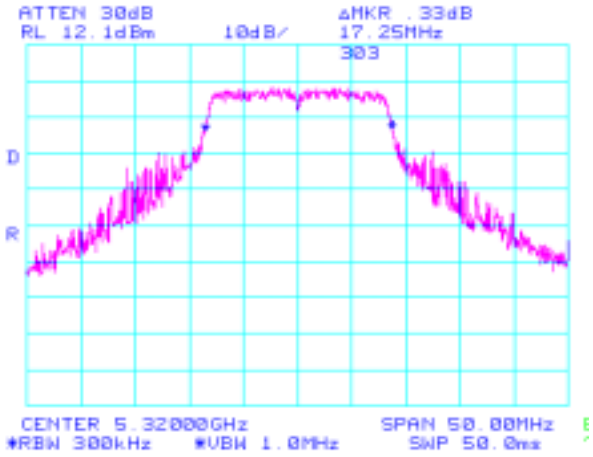
26-dB



20-dB



99%



Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

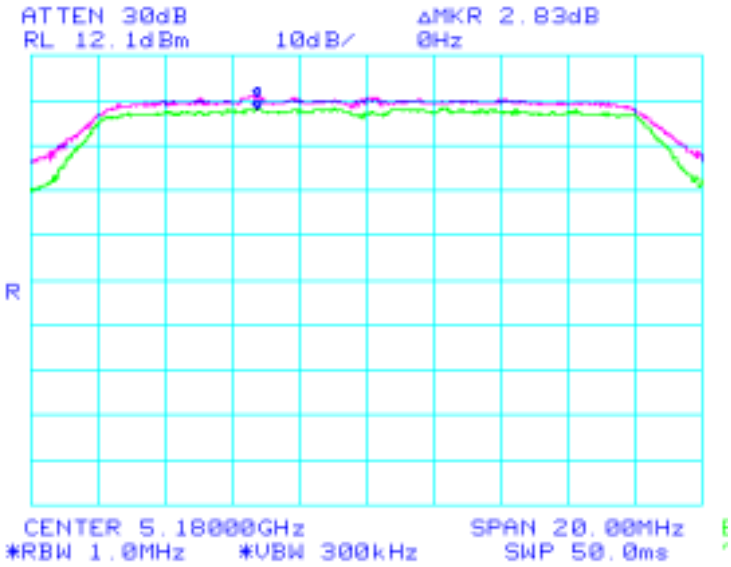
Run #4: Peak Excursion Measurement

Plots Showing Peak Excursion

Trace A: RBW =1MHz VBW = 3MHz

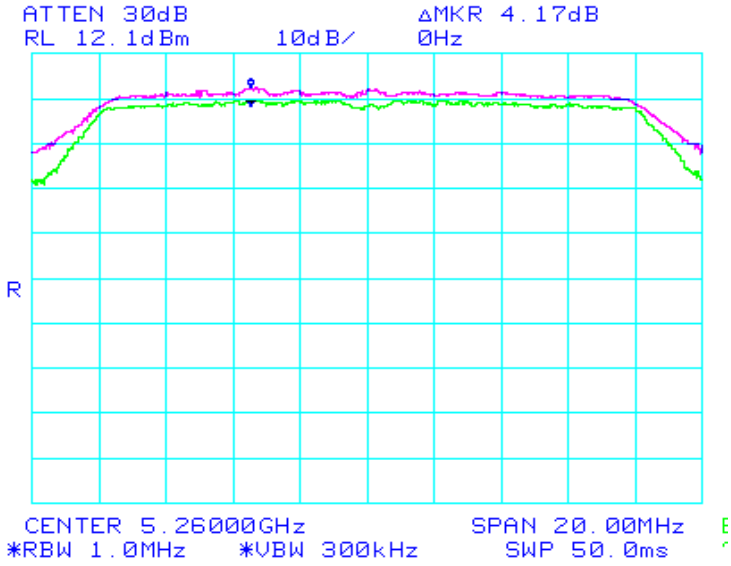
Trace B: RBW = 1 MHz, VBW = 300kHz

Peak Excursion = 2.83 dB (5180 MHz)

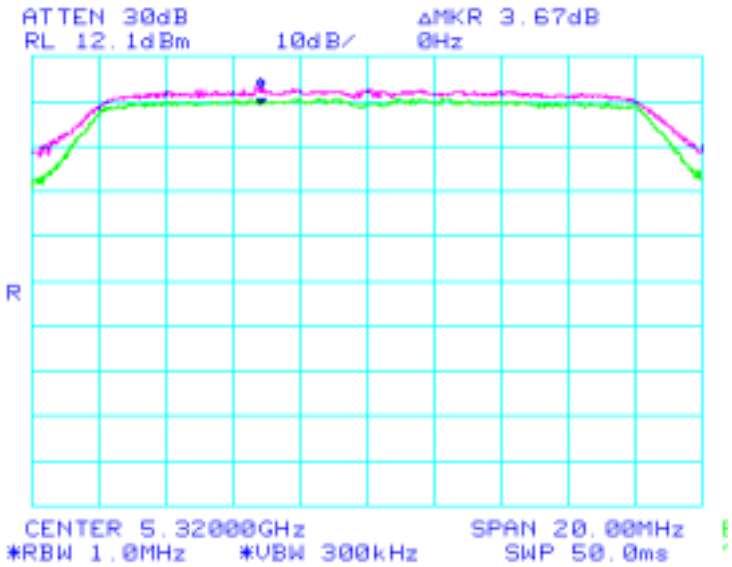


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Peak Excursion = 4.17 dB (5260 MHz)



Peak Excursion = 4.0 dB (5320 MHz)



Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #5: Out Of Band Spurious Emissions - Antenna Conducted

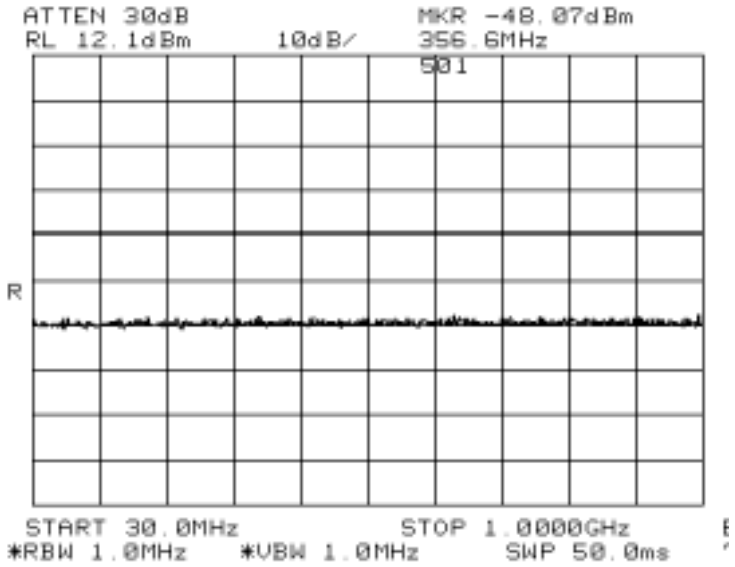
The antenna gain of the radios integral antenna is 5dBi. The EIRP limit is -27dBm/MHz for all out of band signals that do not fall in restricted bands. A limit of -21 dBm was, therefore, used for signals not in restricted bands and close to the intentional band with the assumption that the antenna gain was equal to 5 within 100 MHz of the upper and lower band edges. For signals removed from the band edge by more than 100MHz, radiated measurements were made (refer to run #6) if the signal amplitude exceeded -37dBm.

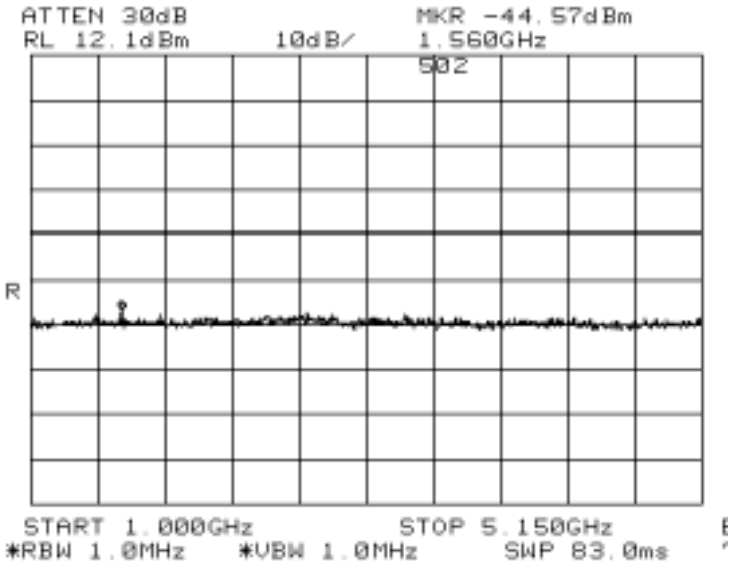
Channel	Frequency (MHz)	Frequency Range	Highest Spurious Signal	Graph reference #
36	5180	30 - 1000 MHz	Note 4	501
		1 to 5.15 GHz	None	502
		5.25 to 10 GHz	None	503
		10 GHz to 20 GHz	-39.7dBm(13.5GHz)	504
		20 GHz to 40 GHz	None	505
52	5260	30 - 1000 MHz	Note 4	506
		1 to 5.25 GHz	None	507
		5.35 to 10 GHz	None	508
		10 GHz to 20 GHz	None	509
		20 GHz to 40 GHz	None	510
64	5320	30 - 1000 MHz	Note 4	511
		1 to 5.25 GHz	None	512
		5.35 to 10 GHz	None	513
		10 GHz to 20 GHz	None	514
		20 GHz to 40 GHz	None	515

Note 1:	Signal is in a restricted band. Refer to run #6 for field strength measurements.
Note 2:	Signal is not in restricted band. Limit is -27dBm eirp. As the signal strength is significantly lower than -27dBm no field strength measurements required.
Note 3:	Signal is not in restricted band. Limit is -27dBm eirp. Although the signal strength is significantly lower than -27dBm field strength measurements were made (refer to run #6)
Note 4:	All spurious signals in this frequency band measured during digital device radiated emissions test.

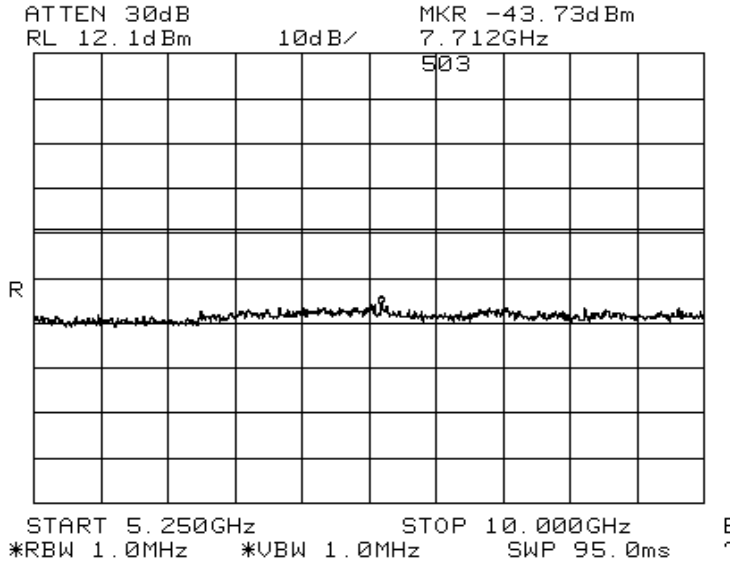
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

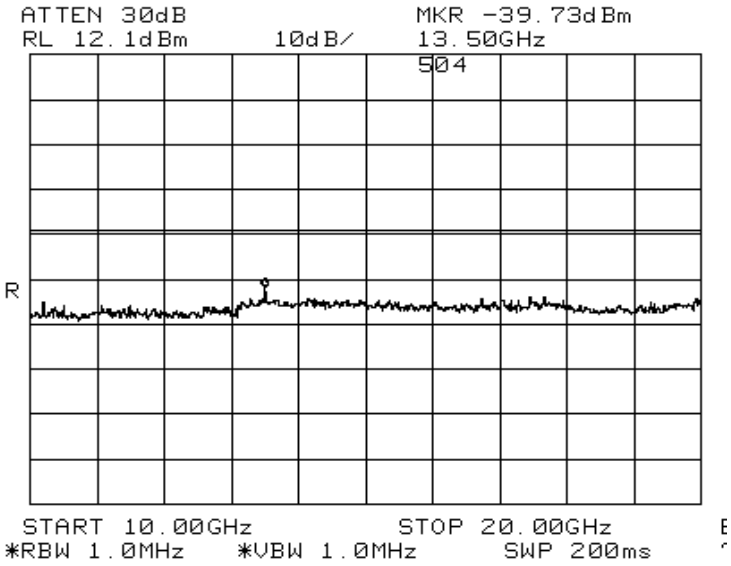
Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz)



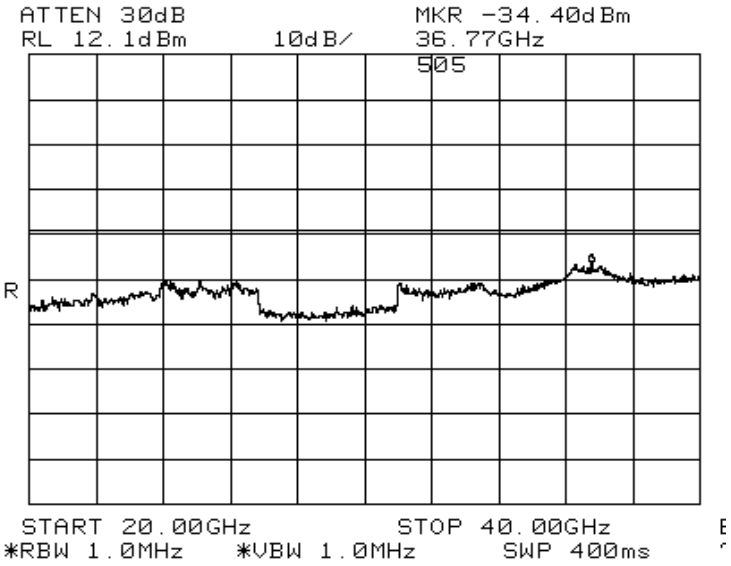


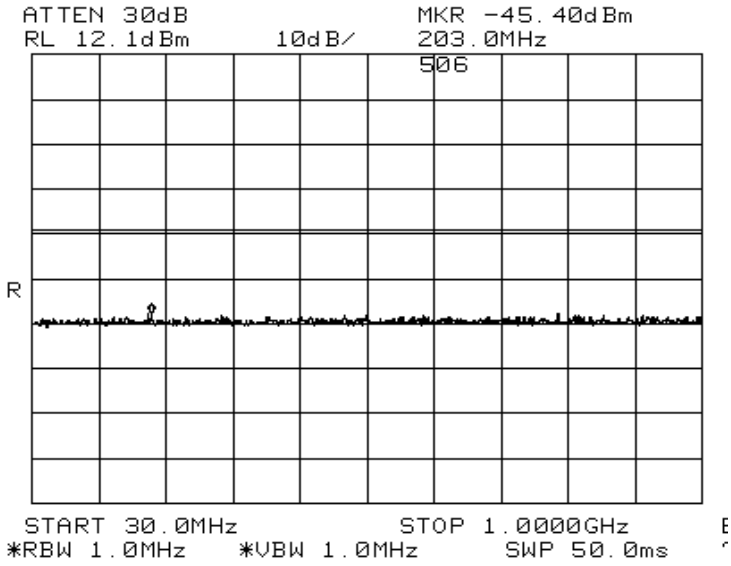
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio



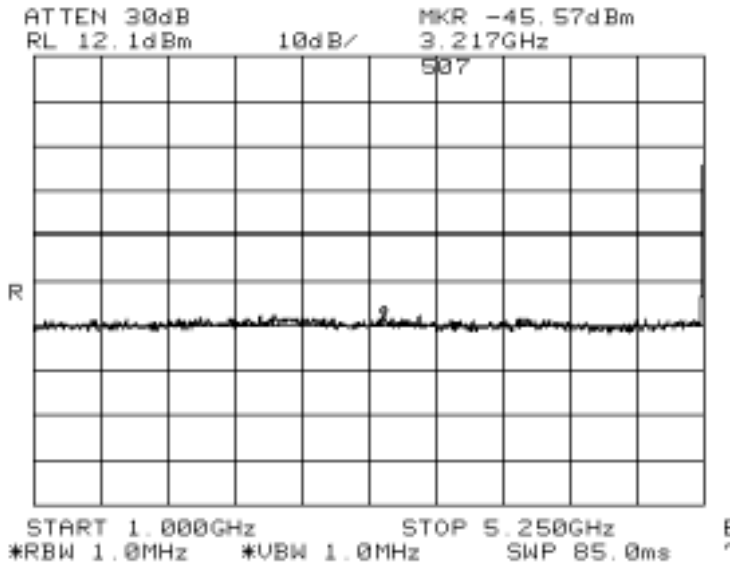


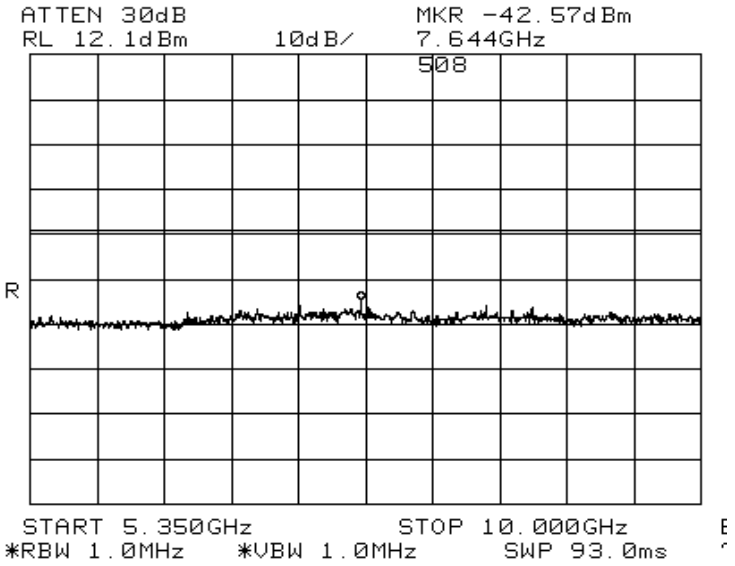
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio



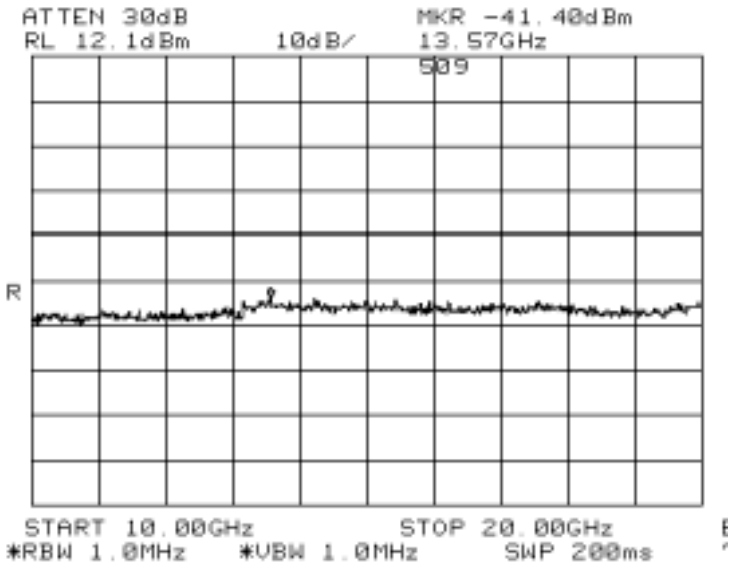


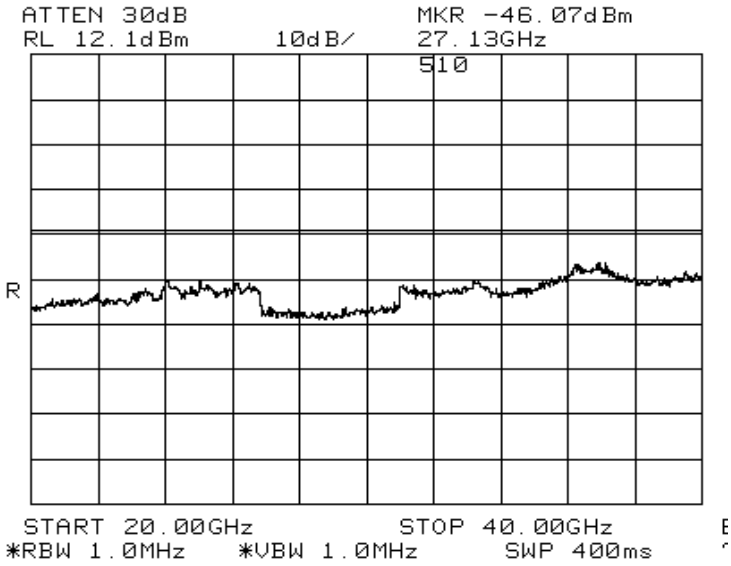
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio



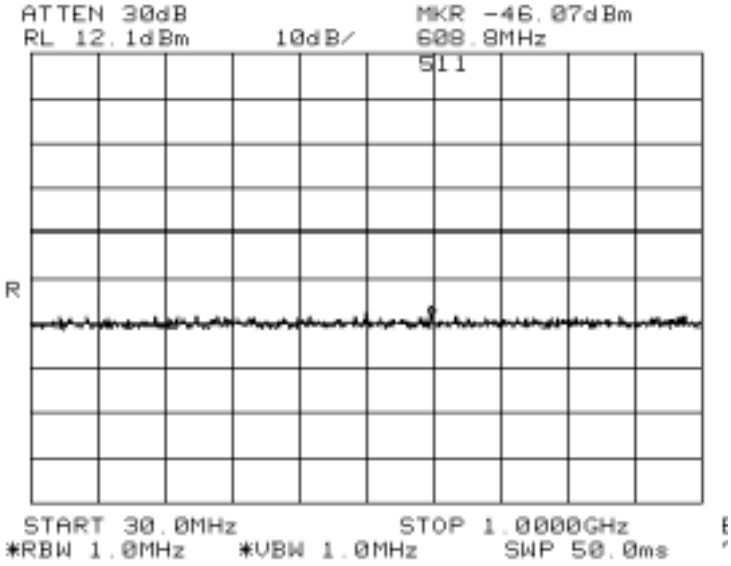


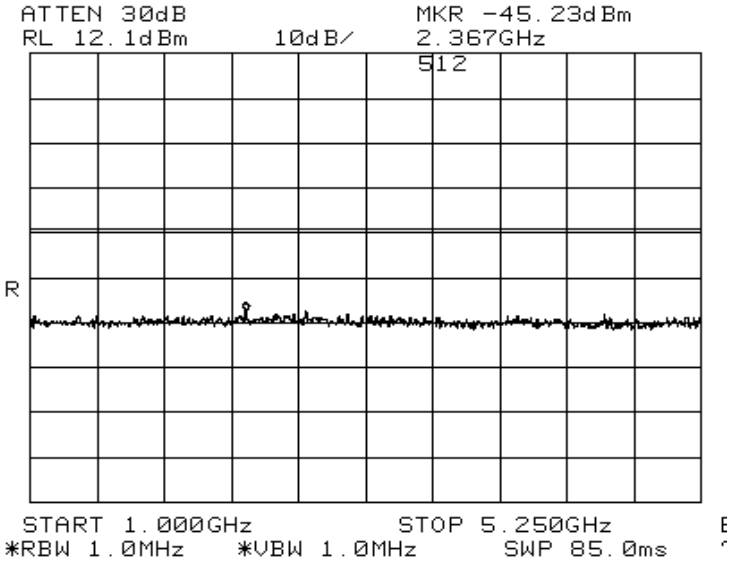
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio



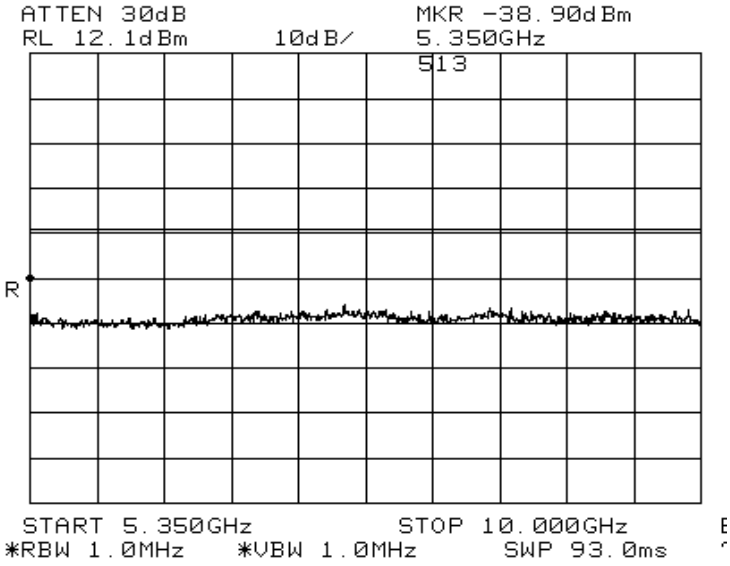


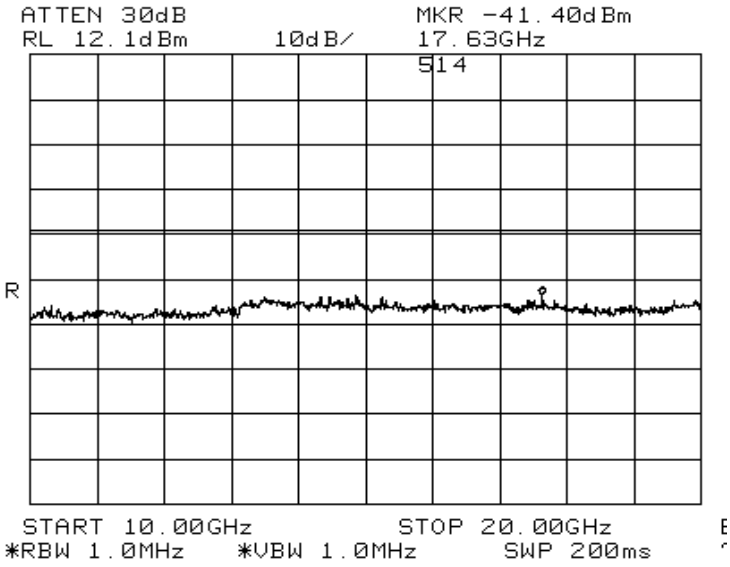
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio



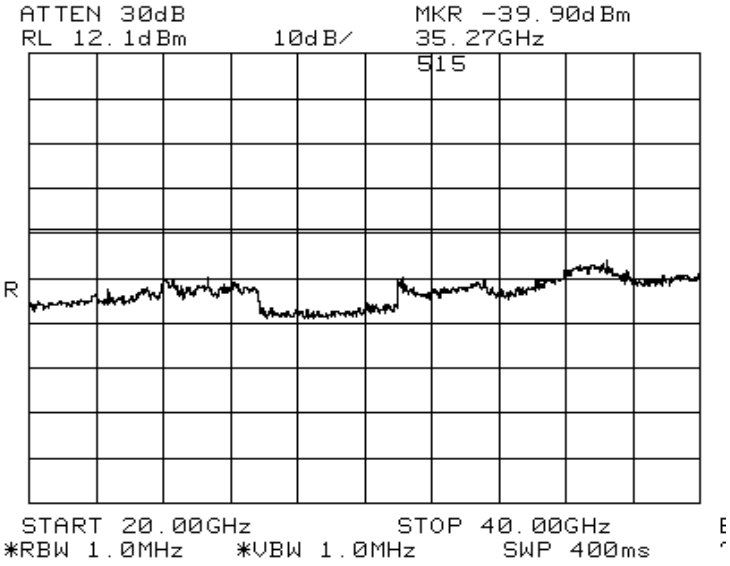


Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio





Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio



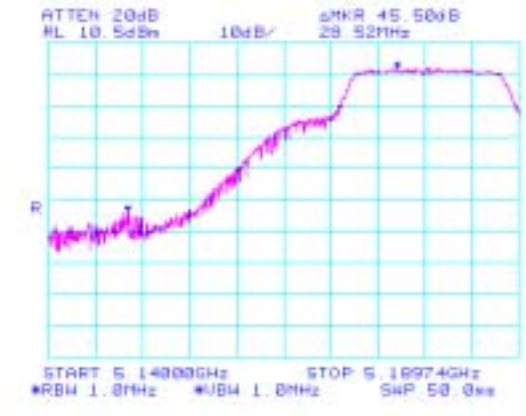
Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

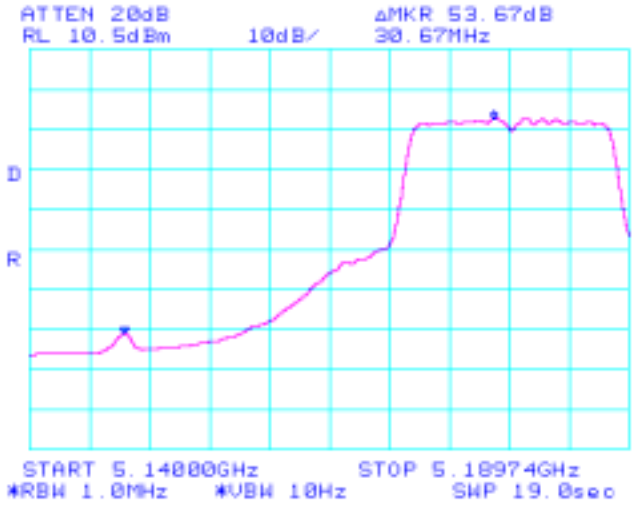
Run# 6: Band Edge Measurements:

For signals in the restricted bands immediately above and below the 5.15 to 5.35 GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was then applied to the average and peak field strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

Plots Showing Out-Of-Band Emissions (Peak RBW=VBW=1MHz; Average RBW = 1MHz, VBW = 10Hz)

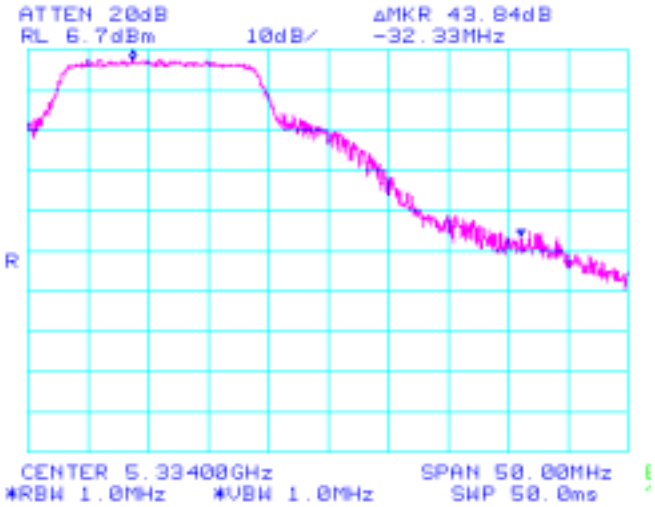
5.15 GHz band edge, EUT operating on the lowest channel

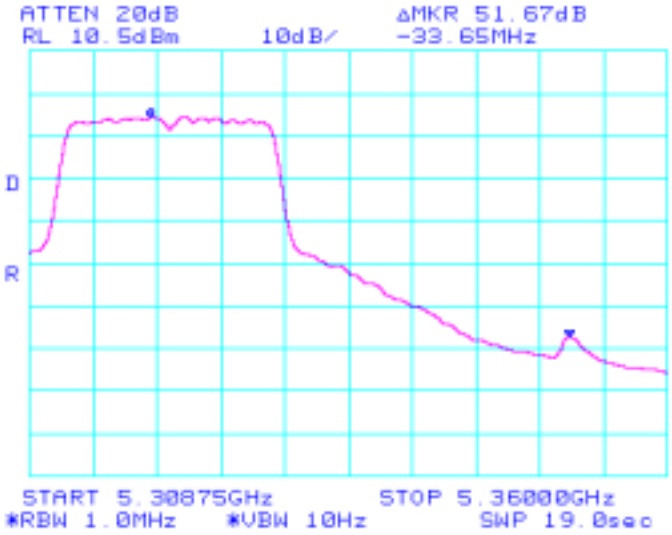




Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

5.35 GHz band edge EUT operating on channel 64 (highest channel):





Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

FCC Part 15 Subpart E Tests

Test Specifics

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:	4/23/03	Config. Used:	1
Test Engineer:	Jmartinez	Config Change:	None
Test Location:	SVOATS# 3	Host Unit Voltage	120Vac, 60Hz

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT unless stated otherwise.

Ambient Conditions:

Temperature: 13°C
Rel. Humidity: 91%

Summary of Results

Run #	Test Performed	Limit	Result	Comments
1	RE, 1000 - 40000 MHz - Spurious Emissions	15.407(b)(6)	Pass	-3.4dB @ 10640.01 MHz
2	RE, 1000 - 40000 MHz - Spurious Emissions	15.407(b)(6)	Pass	-3.5dB @ 10640.01 MHz

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:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #1: Radiated Spurious Emissions, 1000 - 40000 MHz (Ethotronics Antenna)

Spurious emissions from 30 - 1000 MHz were measured while performing emissions measurements of the digital device. Refer to run# 1 performed on 04-25-2003

Limit for emissions in restricted bands:	54dBuV/m (Average)	74dBuV/m (Peak)
Limit for emissions outside of restricted bands:	EIRP < -27dBm/MHz	(68dBuV/m)

Fundamental signal measurements (to calculate the band edge field strengths):

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.0	104.2	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	95.5	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5180.0	103.4	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	94.2	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	105.6	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	96.8	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	101.6	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	92.5	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.0	58.7	v	74.0	-15.3	Pk	-	-	Note 1
5150.0	41.8	v	54.0	-12.2	Avg	-	-	Note 1
5150.0	57.9	h	74.0	-16.1	Pk	-	-	Note 1
5150.0	40.6	h	54.0	-13.4	Avg	-	-	Note 1
5350.0	61.7	v	74.0	-12.3	Pk	-	-	Note 2
5350.0	45.1	v	54.0	-8.9	Avg	-	-	Note 2
5350.0	57.7	h	74.0	-16.3	Pk	-	-	Note 2
5350.0	40.8	h	54.0	-13.2	Avg	-	-	Note 2

Note 1:	EUT operating on the lowest channel available in the 5.15 - 5.25 MHz band. Signal level calculated using the relative measurements in run #6 (-45.5 dBc for peak and -53.67 dBc for average) applied to the highest peak and verage field strength measurements of the fundamental signal level.
Note 2:	EUT operating on highest channel available in the 5.25 - 5.35 MHz band. Signal level calculated using the relative measurements in run #6 (-43.84 dBc for peak and -51.67 dBc for average) applied to the highest peak and average field strength measurements of the fundamental signal level.

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #2b: Radiated Spurious Emissions, 1000 - 40000 MHz

EUT On Lowest Channel Available (Channel 36, 5.18 GHz)

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10360.0	54.2	v	68.3	-14.1	Note 3	260	1.1	Note 4
15540.0	51.8	v	74.0	-22.2	Pk	260	1.1	Note 2
15540.0	39.0	v	54.0	-15.0	Avg	260	1.1	Note 2
10360.0	44.8	h	68.3	-23.5	Note 3	280	1.0	Note 4
15540.0	52.1	h	74.0	-21.9	Pk	280	1.0	Note 2
15540.0	48.0	h	54.0	-6.0	Avg	280	1.0	Note 2
3453.0	49.6	v	68.3	-18.7	Note 3	201	1.0	Note 4
6906.0	47.3	v	68.3	-21.0	Note 3	162	1.1	Note 4
3453.0	62.8	h	68.3	-5.5	Note 3	141	1.1	Note 4
6906.0	38.8	h	68.3	-29.5	Note 3	220	1.1	Note 4
EUT On Center Channel (Channel 48, 5.26 GHz)								
10520.0	52.8	v	68.3	-15.5	Note 3	220	1.2	Note 4
15780.0	50.6	v	74.0	-23.4	Pk	220	1.2	Note 2
15780.0	37.7	v	54.0	-16.3	Avg	220	1.2	Note 2
10520.0	46.1	h	68.3	-22.2	Note 3	250	1.1	Note 4
15780.0	50.4	h	74.0	-23.6	Pk	250	1.1	Note 2
15780.0	37.7	h	54.0	-16.3	Avg	250	1.1	Note 2
3506.0	52.8	v	68.3	-15.5	Note 3	125	1.0	Note 4
7013.0	49.1	v	68.3	-19.2	Note 3	180	1.0	Note 4
3506.0	49.5	h	68.3	-18.8	Note 3	145	1.0	Note 4
7013.0	45.5	h	68.3	-22.8	Note 3	165	1.0	Note 4
EUT On Highest Channel Available (Channel 64, 5.32 GHz)								
10640.0	57.5	v	74.0	-16.5	Pk	150	1.1	Note 2
10640.0	50.6	v	54.0	-3.4	Avg	150	1.1	Note 2
15960.0	56.5	v	74.0	-17.5	Pk	150	1.1	Note 2
15960.0	50.3	v	54.0	-3.7	Avg	150	1.1	Note 2
10640.0	55.9	h	74.0	-18.2	Pk	225	1.0	Note 2
10640.0	48.7	h	54.0	-5.3	Avg	225	1.0	Note 2
15960.0	52.5	h	74.0	-21.5	Pk	255	1.0	Note 2
15960.0	42.3	h	54.0	-11.7	Avg	255	1.0	Note 2
3546.7	52.0	v	68.3	-16.3	Note 3	240	1.2	Note 4
7093.3	48.0	v	68.3	-20.3	Note 3	220	1.0	Note 4
3546.7	44.5	h	68.3	-23.8	Note 3	210	1.0	Note 4
7093.3	36.4	h	68.3	-31.9	Note 3	200	1.2	Note 4

See following page for test notes...

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

...test notes for run 6b

Note 1:	For emissions falling in the restricted bands detailed in 15.205 the general limits of 15.209 apply. For all other emissions the limit is EIRP < -27dBm (equivalent to a field strength at 3m of 68dBuV/m)
Note 2:	Signal is in a restricted band
Note 3:	Restricted Band Peak Measurements: Resolution and Video BW: 1 MHz, Restricted Band Average Measurements: Resolution Bw: 1MHz and Video Bw: 10 Hz. All other measurements, RBW = 1MHz and VBW = 3MHz, video averaging on (100 samples).
Note 4:	Signal does not fall in a restricted band.

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #2: Radiated Spurious Emissions, 1000 - 40000 MHz (Hitachi Antenna)

Spurious emissions from 30 - 1000 MHz were measured while performing emissions measurements of the digital device. Refer to run# 1 performed on 04-25-2003

Limit for emissions in restricted bands:	54dBuV/m (Average)	74dBuV/m (Peak)
Limit for emissions outside of restricted bands:	EIRP < -27dBm/MHz	(68dBuV/m)

Fundamental signal measurements (to calculate the band edge field strengths):

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.0	99.5	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	89.9	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5180.0	102.6	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	99.1	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	102.4	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	94.4	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	100.2	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	90.4	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.0	54.0	v	74.0	-20.0	Pk	-	-	Note 1
5150.0	36.2	v	54.0	-17.8	Avg	-	-	Note 1
5150.0	57.1	h	74.0	-16.9	Pk	-	-	Note 1
5150.0	45.4	h	54.0	-8.6	Avg	-	-	Note 1
5350.0	58.6	v	74.0	-15.4	Pk	-	-	Note 2
5350.0	42.7	v	54.0	-11.3	Avg	-	-	Note 2
5350.0	56.4	h	74.0	-17.6	Pk	-	-	Note 2
5350.0	38.7	h	54.0	-15.3	Avg	-	-	Note 2

Note 1:	EUT operating on the lowest channel available in the 5.15 - 5.25 MHz band. Signal level calculated using the relative measurements in run #6 (-45.5 dBc for peak and -53.67 dBc for average) applied to the highest peak and verage field strength measurements of the fundamental signal level.
Note 2:	EUT operating on highest channel available in the 5.25 - 5.35 MHz band. Signal level calculated using the relative measurements in run #6 (-43.84 dBc for peak and -51.67 dBc for average) applied to the highest peak and average field strength measurements of the fundamental signal level.

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #6b: Radiated Spurious Emissions, 1000 - 40000 MHz

EUT On Lowest Channel Available (Channel 36, 5.18 GHz)

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg			
10360.0	54.1	v	68.3	-14.2	Note 3	200	1.2	Note 4
15540.0	59.6	v	74.0	-14.4	Pk	200	1.2	Note 2
15540.0	46.4	v	54.0	-7.6	Avg	200	1.2	Note 2
10360.0	54.8	h	68.3	-13.5	Note 3	280	11.2	Note 4
15540.0	59.8	h	74.0	-14.2	Pk	280	1.2	Note 2
15540.0	46.4	h	54.0	-7.7	Avg	280	1.2	Note 2
3453.0	52.1	v	68.3	-16.2	Note 3	160	1.0	Note 4
6906.0	55.3	v	68.3	-13.0	Note 3	230	1.2	Note 4
3453.0	53.3	h	68.3	-15.0	Note 3	240	1.3	Note 4
6906.0	53.1	h	68.3	-15.2	Note 3	180	1.3	Note 4
EUT On Center Channel (Channel 48, 5.26 GHz)								
10520.0	50.6	v	68.3	-17.7	Note 3	201	1.3	Note 4
15780.0	57.7	v	74.0	-16.3	Pk	180	1.3	Note 2
15780.0	45.7	v	54.0	-8.4	Avg	180	1.3	Note 2
10520.0	40.0	h	68.3	-28.3	Note 3	140	1.1	Note 4
15780.0	56.9	h	74.0	-17.1	Pk	190	1.1	Note 2
15780.0	45.6	h	54.0	-8.5	Avg	190	1.1	Note 2
3506.0	53.7	v	68.3	-14.6	Note 3	210	1.2	Note 4
7013.0	51.0	v	68.3	-17.3	Note 3	180	1.2	Note 4
3506.0	54.5	h	68.3	-13.8	Note 3	200	1.2	Note 4
7013.0	53.0	h	68.3	-15.3	Note 3	250	1.2	Note 4
EUT On Highest Channel Available (Channel 64, 5.32 GHz)								
10640.0	56.6	v	74.0	-17.4	Pk	246	1.0	Note 2
10640.0	50.5	v	54.0	-3.5	Avg	246	1.0	Note 2
15960.0	52.1	v	74.0	-21.9	Pk	246	1.0	Note 2
15960.0	39.0	v	54.0	-15.0	Avg	246	1.0	Note 2
10640.0	54.7	h	74.0	-19.3	Pk	136	1.0	Note 2
10640.0	47.3	h	54.0	-6.7	Avg	136	1.0	Note 2
15960.0	452.0	h	74.0	378.0	Pk	136	1.0	Note 2
15960.0	39.4	h	54.0	-14.6	Avg	136	1.0	Note 2
3546.7	52.2	v	68.3	-16.1	Note 3	249	1.5	Note 4
7093.3	46.5	v	68.3	-21.8	Note 3	272	1.5	Note 4
3546.7	49.6	h	68.3	-18.7	Note 3	250	1.2	Note 4
7093.3	42.3	h	68.3	-26.0	Note 3	253	1.4	Note 4

See following page for test notes...

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

...test notes for run 6b

Note 1:	For emissions falling in the restricted bands detailed in 15.205 the general limits of 15.209 apply. For all other emissions the limit is EIRP < -27dBm (equivalent to a field strength at 3m of 68dBuV/m)
Note 2:	Signal is in a restricted band
Note 3:	Restricted Band Peak Measurements: Resolution and Video BW: 1 MHz, Restricted Band Average Measurements: Resolution Bw: 1MHz and Video Bw: 10 Hz. All other measurements, RBW = 1MHz and VBW = 3MHz, video averaging on (100 samples).
Note 4:	Signal does not fall in a restricted band.

Elliott

EMC Test Data

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, and E, RSS-	Class:	Radio
Immunity Spec:	N/A	Environment:	-

EMC Test Data

For The

Intel Corporation

Model

WM3B2100A

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, and E, RSS-21(	Class:	Radio
Immunity Spec:	N/A	Environment:	-

EUT INFORMATION

General Description

The EUT is a mini PCI Card dual band (802.11a and 802.11b) transceiver which is designed to be installed into a laptop PC and connect to antennas mounted in the screen of the laptop. The Mini PCI was tested outside the host system. The host laptop was treated as table-top equipment during testing to simulate the end user environment. The electrical rating of the laptop is 120/240 V, 50/60 Hz, 5 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Intel Corporation	WM3B2100A	Mini PCI card	DEB	PD9WM3B2100A

Antenna

Ethertronics Antenna at 2.4 Ghz has a gain of 2 dBi and at 5 Ghz a gain of 5 dBi.
Hitachi Antenna at 2.4 Ghz and at 5 Ghz a gain of 0 dBi.
Antennas will be installed inside at the topside of the display screen of the Laptop. The Laptop vendors will professionally install the antennas.

EUT Enclosure

The EUT contains it's own shield made out of aluminum. It measures approximately 6 cm wide by 2 cm deep by 4.5 cm high.

Modification History

Mod. #	Test	Date	Modification
1			

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Proj Eng:	Mark Briggs
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, and E, RSS-21(	Class:	Radio
Immunity Spec:	N/A	Environment:	-

Test Configuration #2

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Pavilion 500	PC	MX21111561	DoC
Dell	828FI	Monitor	22794E28CJ29	DoC
Compaq	SK-2800	Keyboard	B1C800BCPHVV9Q	GYUR66SK
Hewlett Packard	P813I	Mouse	K020215557	DoC
3Com	Pilot1000	PDA	604719G68390	MQ90001
Hewlett Packard	2225C	Printer	2714540166	DSI6XU2225

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Interface Cabling and Ports

EUT Tx	Antenna #1	Antenna Cable	Shielded	0.5
EUT Rx	Antenna #2	Antenna Cable	Shielded	0.5
Host PC, Keyboard	Keyboard	Keyboard Cable	Shielded	1.0
Host PC, AC Input	AC Power Source	IEC Power Cord	Unshielded	2.0
Host PC, Mouse	Mouse	Mouse Cable	Shielded	1.0
Host PC, COM Port	PDA	HotSync Cable	Shielded	1.0
Host PC, Parallel Port	Printer	Parallel Cable	Shielded	1.0
Monitor, AC Input	AC Power Source	IEC Power Cord	Unshielded	2.0

EUT Operation During Emissions Testing (Radio)

The EUT was transmitting on the middle channel stated at the maximum power. The worst case mode from 802.11b or 802.11a was picked from the pre-scan in chamber# 2.

For measurements of radiated emissions below 1GHz and AC conducted emissions, the host laptop was connected to two peripherals (PDA and Printer) and had a scrolling 'H' pattern displayed on the screen. The laptop screen was open and the antenna located behind the laptop screen.

Elliott

EMC Test Data

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Radiated Emissions

Test Specifics

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: 4/25/03
Test Engineer: volivas
Test Location: SVOATS #3

Config. Used: 2
Config Change: none
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated emissions testing.
On the OATS, the measurement antenna was located 10 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 2 GHz.
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.
Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 80 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -1000 MHz, Preliminary Scan	EN55022 B	Eval	-2.4dB @ 99.990MHz
2	RE, 30 - 1000MHz, Maximized Emissions	EN55022 B	Pass	-1.7dB @ 99.990MHz
3	RE, 1000 - 2000 MHz, Maximized Emissions	FCC B	Pass	-6.6dB @ 1796.0MHz

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.

Elliott

EMC Test Data

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

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

Frequency	Level	Pol	EN55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
99.990	27.6	V	30.0	-2.4	QP	288	1.0	
99.990	26.7	H	30.0	-3.3	QP	15	4.0	
33.340	25.3	V	30.0	-4.7	QP	300	1.0	
66.800	20.8	V	30.0	-9.2	QP	134	1.0	
800.935	26.7	H	37.0	-10.3	QP	205	2.1	
719.880	26.3	V	37.0	-10.7	QP	0	1.0	
997.600	25.4	H	37.0	-11.6	QP	84	1.0	
997.600	25.4	V	37.0	-11.6	QP	360	1.0	
299.970	25.1	V	37.0	-11.9	QP	360	1.0	
33.410	17.2	H	30.0	-12.8	QP	149	1.3	
336.020	23.2	V	37.0	-13.8	QP	326	1.0	
81.140	15.3	H	30.0	-14.7	QP	337	1.0	
719.880	22.2	H	37.0	-14.8	QP	316	1.0	
800.935	22.1	V	37.0	-14.9	QP	36	1.0	
85.220	14.2	V	30.0	-15.8	QP	92	1.0	
80.910	14.1	V	30.0	-15.9	QP	331	1.0	
299.970	20.6	H	37.0	-16.4	QP	360	2.0	
738.805	20.4	H	37.0	-16.6	QP	360	1.0	
738.805	20.4	V	37.0	-16.6	QP	324	1.0	
166.730	12.7	H	30.0	-17.3	QP	126	1.1	
287.970	19.7	H	37.0	-17.3	QP	289	1.0	
233.500	15.8	V	37.0	-21.2	QP	0	1.0	
234.460	14.0	H	37.0	-23.0	QP	300	1.0	
336.020	13.2	H	37.0	-23.8	QP	360	4.0	

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Run #2: Maximized Readings From Run #1

Frequency	Level	Pol	EN55022 B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
99.990	28.3	V	30.0	-1.7	QP	288	1.0	
99.990	27.3	H	30.0	-2.7	QP	15	4.0	
33.340	25.5	V	30.0	-4.5	QP	300	1.0	
66.800	20.8	V	30.0	-9.2	QP	134	1.0	
800.935	26.7	H	37.0	-10.3	QP	205	2.1	
719.880	26.3	V	37.0	-10.7	QP	0	1.0	

Run #3: Maximized readings, 1000 - 2000 MHz

Measurements made at 3m per FCC requirements.

Frequency	Level	Pol	FCC Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1796.000	47.4	V	54.0	-6.6	Avg	360	1.0	
1949.810	47.3	V	54.0	-6.7	Avg	0	1.0	
1303.000	37.1	H	54.0	-16.9	Avg	100	1.0	
1948.810	56.2	V	74.0	-17.8	Pk	0	1.0	
1064.190	34.0	H	54.0	-20.0	Avg	300	1.0	
1481.940	33.3	V	54.0	-20.7	Avg	360	1.0	
2012.130	32.6	H	54.0	-21.4	Avg	295	1.0	
1303.000	52.6	H	74.0	-21.4	Pk	100	1.0	
1796.000	51.5	V	74.0	-22.5	Pk	360	1.0	
1064.190	46.4	H	74.0	-27.6	Pk	300	1.0	
1481.940	45.7	V	74.0	-28.3	Pk	360	1.0	
2012.130	45.3	H	74.0	-28.7	Pk	295	1.0	

Client:	Intel Corporation	Job Number:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

Conducted Emissions - Power Ports

Test Specifics

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: 4/25/03
Test Engineer: volivas
Test Location: SVOATS #3

Config. Used: 1
Config Change: none
EUT Voltage: Refer to individual run

General Test Configuration

For tabletop equipment, the EUT host system was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment.

Ambient Conditions:

Temperature: 11 °C
Rel. Humidity: 80 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	EN55022 B	Pass	-11.7dB @ 0.190MHz
2	CE, AC Power,120V/60Hz	EN55022 B	Pass	-14.2dB @ 0.174MHz

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:	J50404
Model:	WM3B2100A	T-Log Number:	T50976
		Account Manager:	Mark Briggs
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, and E, RSS-210	Class:	Radio

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

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.190	42.3	Neutral	54.0	-11.7	AV	
0.190	48.7	Neutral	64.0	-15.3	QP	
0.199	45.1	Line 1	63.6	-18.5	QP	
0.199	33.2	Line 1	53.6	-20.4	AV	
0.409	25.8	Line 1	47.6	-21.8	AV	
0.284	27.4	Neutral	50.7	-23.3	AV	
0.284	32.4	Neutral	60.7	-28.3	QP	
0.409	26.8	Line 1	57.6	-30.8	QP	
9.663	15.0	Line 1	50.0	-35.0	AV	
10.664	22.7	Neutral	60.0	-37.3	QP	
10.664	10.6	Neutral	50.0	-39.4	AV	
9.663	16.4	Line 1	60.0	-43.6	QP	

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

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.174	50.5	Neutral	64.7	-14.2	QP	
0.190	39.7	Line 1	54.0	-14.3	AV	
0.190	48.7	Line 1	64.0	-15.3	QP	
0.301	29.5	Neutral	50.1	-20.6	AV	
0.304	28.3	Line 1	50.1	-21.8	AV	
0.174	30.9	Neutral	54.7	-23.8	AV	
0.304	32.9	Line 1	60.1	-27.2	QP	
0.301	32.2	Neutral	60.1	-27.9	QP	
15.814	22.9	Neutral	60.0	-37.1	QP	
15.814	11.9	Neutral	50.0	-38.1	AV	
16.128	10.7	Line 1	50.0	-39.3	AV	
16.128	19.9	Line 1	60.0	-40.1	QP	