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Electromagnetic Emissions Test Report and Application for Class II Permissive Change pursuant to FCC Part 15, Subpart C (15.247) DTS Specifications, Industry Canada RSS 210 Issue 5 on the Intel Corporation Model: WM3B2200BG

FCC ID:	PD9WM3B2200BG
UPN:	1000M-3B2200BG
GRANTEE:	Intel Corporation 13280 Evening Creek Drive San Diego, CA 92128
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	August 8, 2005
FINAL TEST DATE:	July 29, 2005
AUTHORIZED SIGNATORY:	Juan Martinez Senior EMC Engineer

ACCREDITED
2016-01

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:
WM3B2200BG

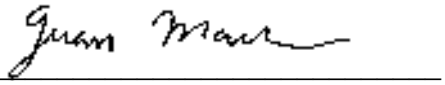
Manufacturer:
Intel Corporation
13280 Evening Creek Drive
San Diego, CA 92128

Tested to applicable standards:
RSS-210, Issue 5, November 2001 (Low Power License-Exempt Radiocommunication Devices)
FCC Part 15.247 (DTS)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC 4549-4 Dated July 19, 2003

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 C63.4:2003 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	Senior EMC Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	August 8, 2005

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.).

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SCOPE

An electromagnetic emissions test has been performed on the Intel Corporation model WM3B2200BG pursuant to Subparts C Part 15 of FCC Rules 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: 2003 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 WM3B2200BG 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 Subparts C 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	Measured Value	Comments	Result
15.247(a)	6.2.2(o)(b)	Digital Modulation	Systems uses OFDM / DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	6.2.2(o)(b)	6dB Bandwidth	N/A	Minimum allowed is 500kHz	Complies
	RSP 100	99% Bandwidth	N/A	For information only	Complies
15.247 (b) (3)	6.2.2(o)(b)	Output Power, 2400 - 2483.5 MHz	17 dBm (0.501 Watts) EIRP = 0.0813 W	Multi-point applications: Maximum permitted is 1Watt, with EIRP limited to 4 Watts.	Complies
15.247(d)	6.2.2(o)(b)	Power Spectral Density	N/A	Maximum permitted is 8dBm/3kHz	Complies
15.247(c)	6.2.2(o)(e1)	Antenna Port Spurious Emissions – 30MHz – 26.5 GHz	All spurious emissions < -20dBc	All spurious emissions < -20dBc.	Complies
15.247(c) / 15.209		Radiated Spurious Emissions – 30MHz – 26.5 GHz	48.9dBuV/m @ 4823.99MHz (-5.1dB)	Emissions in restricted bands must meet the radiated emissions limits detailed in 15.207. All others must be < -20dBc	Complies
15.207		AC Conducted Emissions	N/A		N/A
	6.6	AC Conducted Emissions	N/A		N/A
15.247 (b) (5)		RF Exposure Requirements	MPE Calculation		
15.203		RF Connector	Hirose connector (Antennas will be installed inside laptops)	Unique antenna connection required for user-installed applications.	Complies

EIRP calculated using antenna gain of dBi (2.1) for the highest EIRP point-to-multipoint system.

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 UKAS document LAB 34.

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 WM3B2200BG is a 802.11/ab/g wireless that is designed to connect to PC. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end-user environment. The EUT is powered via the PC.

The sample was received on July 29, 2005 and tested on July 29, 2005. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Intel	WMB32200BG	802.11b/g card	B2C80C494BC883 05001	PD9WM3B2 200BG

ENCLOSURE

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

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	Pavilian a300n	Computer	MXK3391864	-
Hewlett Packard	M042KG	Mouse	030870136	-
Hewlett Packard	5183	Keyboard	BF3339165	E5XKB5183
Samsung	151S R	Monitor	GG15H4JTB04858E	-

No equipment was used as remote support equipment for emissions testing:

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Main Ant	Antenna	Coax	Shielded	0.25

EUT OPERATION DURING TESTING

The EUT was transmitting continuously on either the low, 2412MHz, the middle, 2437MHz, or the high, 2462MHz.

PROPOSED MODIFICATION DETAILS

GENERAL

For details of the modifications being proposed to the Intel Corporation model WM3B2200BG, please refer to Intel Class II Permissive Change Letter.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on July 29, 2005 at the Elliott Laboratories Anechoic Chamber # 4 located at 41039 Boyce Road, Fremont, CA 94538-2435. 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 C63.4:2003. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 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 C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

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

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The 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 C63.4:2003 , and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

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

RADIATED EMISSIONS

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:

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

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)and RSS 210 (o) 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
902 – 928	1 Watts (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watts (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watts (30 dBm)	8 dBm/3kHz

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

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.

RSS 210 (o) AND FCC 15.247 TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands detailed in Part 15.205 and for all spurious emissions from the receiver are:

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

All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

RS 210 (q1) and FCC 15E TRANSMIT MODE 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.

RS 210 Table 3 RECEIVE MODE SPURIOUS RADIATED EMISSIONS LIMITS

The table below shows the limits for unwanted (spurious) emissions from the receiver as detailed in table 3of RSS 210:

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
960 to 1610	500	54.0
Above 1610	1000	60.0

FCC 15.205 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.

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

RSS-210 SECTION 6.6 AC POWER PORT CONDUCTED EMISSIONS LIMITS

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

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

C = Corrected 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

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 1000 - 12,600 MHz, 29-Jul-05
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer, 9KHz-26.5GHz	8593EM	1141	10-Jun-06
Micro-Tronics	Band Reject Filter, 2400-2500MHz	BRM50702-02	1731	09-Jun-06

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T60665 13 Pages

Elliott

EMC Test Data

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Emissions Spec:	FCC 15.247	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Intel

Model

WM3B2200BG Permissive Change w/ Sony Antenna

Date of Last Test: 7/29/2005

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Emissions Spec:	FCC 15.247	Class:	Radio
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The WMB32200BG is a 802.11/ab/g wireless that is designed to connect to PC. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end-user environment. The EUT is powered via the PC.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Intel	WMB32200BG	802.11b/g card	B2C80C494BC88305001	PD9WM3B2200BG

Other EUT Details

IC ID: 1000M-3B2200BG

EUT Antenna

The EUT antenna is an
The antenna is integral to the device

EUT Enclosure

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

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Emissions Spec:	FCC 15.247	Class:	Radio
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Pavilian a300n	Computer	MXK3391864	-
Hewlett Packard	M042KG	Mouse	030870136	-
Hewlett Packard	5183	Keyboard	BF3339165	E5XKB5183
Samsung	151S R	Monitor	GG15H4JTB04858E	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Main Ant	Antenna	Coax	Shielded	0.25

EUT Operation During Emissions Tests

The EUT was transmitting continuously on either the low, 2412MHz, the middle, 2437MHz, or the high, 2462MHz.

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

FCC 15.247 DTS - Spurious Emissions (802.11b)

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: 7/29/2005 Config. Used: 1
Test Engineer: Jmartinez Config Change: None
Test Location: Fremont Chamber #4 Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 43 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 1000 - 25000 MHz - Spurious Emissions In Restricted Bands	FCC Part 15.209 / 15.247(c)	Pass	48.9dBuV/m (278.6uV/m) @ 4823.99MHz (-5.1dB)
2	Output Power	15.247(b)	Pass	17dBm @ 2412MHz
3	Recever Emissions	RSS-210	Pass	52.2dBuVm (408.3uV/m) @ 3312MHz (-7.8dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

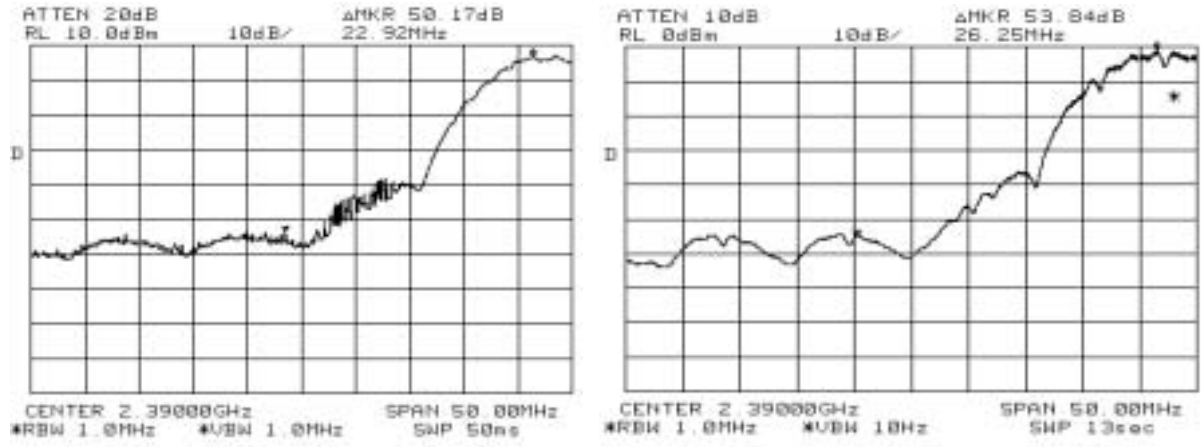
No deviations were made from the requirements of the standard.

EMC Test Data

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

Run #1a: Radiated Spurious Emissions, 1000 - 25000 MHz. Low Channel @ 2412MHz
Gain Setting - 30

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	102.65	103.89	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	99.5	100.26	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - Peak	50.2 dB		
Delta Marker - Average	53.8 dB		
Calculated Band-Edge Measurement:	53.69 dBuV/m		Peak
Calculated Band-Edge Measurement:	46.46 dBuV/m		Average



Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4824.015	40.4	V	54.0	-13.6	AVG	121	1.0	Restricted
4824.015	44.8	V	74.0	-29.2	PK	121	1.0	Restricted
9647.954	57.2	V	93.8	-36.6	PK	225	1.0	Non-Restricted
4823.925	48.9	H	54.0	-5.1	AVG	174	1.1	Restricted
4823.925	51.3	H	74.0	-22.7	PK	174	1.1	Restricted
9647.887	61.5	H	93.8	-32.4	PK	200	1.0	Non-Restricted

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

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

Run #1b: Radiated Spurious Emissions, 1000 - 25000 MHz. Center Channel @ 2437 MHz
Gain Setting - 30

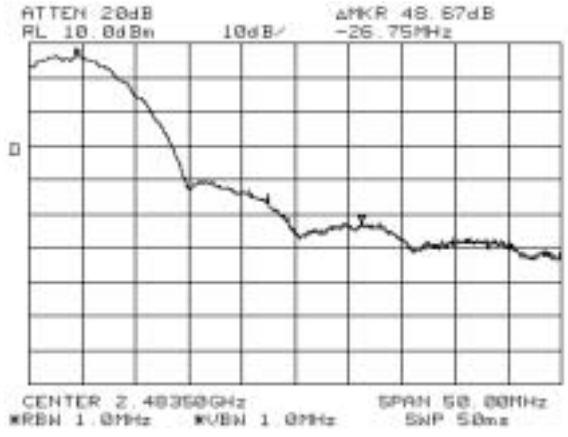
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.007	42.7	V	54.0	-11.3	AVG	123	1.3	Restricted
4874.007	46.7	V	74.0	-27.3	PK	123	1.3	Restricted
9747.875	56.8	V	93.8	-37.1	PK	229	1.1	Non-Restricted
4873.970	45.9	H	54.0	-8.1	AVG	171	1.0	Restricted
4873.970	49.3	H	74.0	-24.7	PK	171	1.0	Restricted
9747.957	61.4	H	93.8	-32.4	PK	194	1.5	Non-Restricted

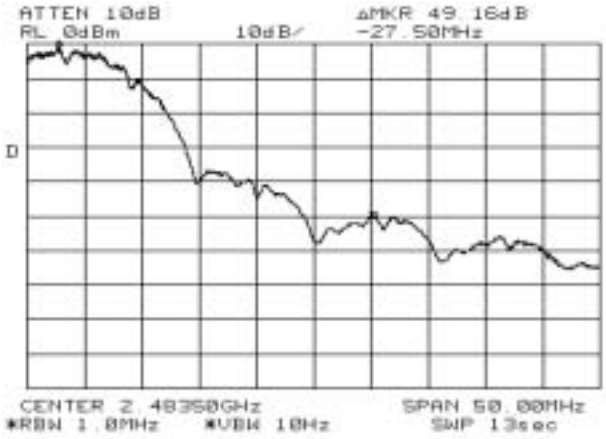
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20 dB below the level of the fundamental.

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

Run #1c: Radiated Spurious Emissions, 1000 - 25000 MHz. High Channel @ 2462 MHz
Gain Setting - 30

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	102.64	104.89	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	99.1	101.21	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - Peak	48.7 dB		
Delta Marker - Average	49.2 dB		
Calculated Band-Edge Measurement:	56.19 dBuV/m		Peak
Calculated Band-Edge Measurement:	52.01 dBuV/m		Average





Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4924.059	43.8	V	54.0	-10.3	AVG	123	1.3	Restricted
4924.059	47.4	V	74.0	-26.6	PK	123	1.3	Restricted
9847.966	55.9	V	94.0	-38.1	PK	173	1.1	Non-Restricted
4923.916	45.3	H	54.0	-8.7	AVG	195	1.0	Restricted
4923.916	48.6	H	74.0	-25.4	PK	195	1.0	Restricted
9847.884	59.4	H	94.0	-34.7	PK	197	1.0	Non-Restricted

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

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

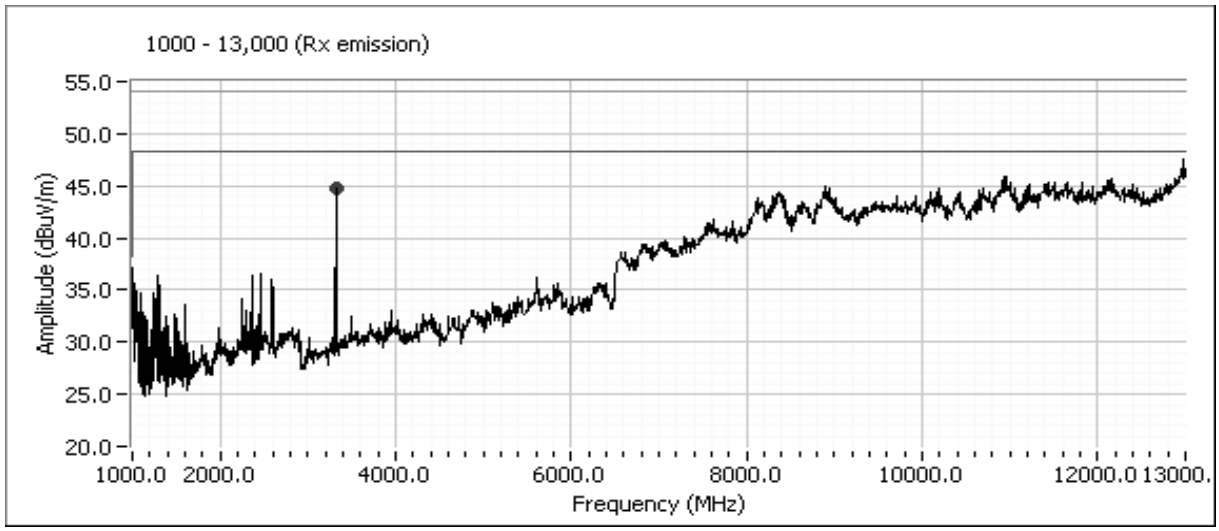
Run #2: Output Power

Maximum antenna gain: 2.1 dBi

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2412	17.0	0.0501	0.0813
Mid	2437	17.0	0.0501	0.0813
High	2462	17.0	0.0501	0.0813

Note 1:	Output power measured using a peak power meter

Run #3: Radiated Emissions, 1000 - 10000 MHz. Rx Mode, Center Channel @ 2437 MHz



Frequency	Level	Pol	RSS-210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3312.909	47.5	V	60.0	-12.5	AVG	175	1.0	
3312.909	49.5	V	80.0	-30.5	PK	175	1.0	
3312.842	52.2	H	60.0	-7.8	AVG	330	1.0	
3312.842	53.3	H	80.0	-26.7	PK	330	1.0	

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

FCC 15.247 DTS - Spurious Emissions (802.11g)

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: 7/29/2005 Config. Used: 1
Test Engineer: Mehran Birgani Config Change: None
Test Location: Fremont Chamber #4 Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 48 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	RE, 1000 - 25000 MHz Spurious Emissions in Restricted Bands	FCC Part 15.209 / 15.247(c)	Pass	47.1dBuV/m (226.5uV/m) @ 7381.37 MHz (-6.9dB)
2	Output Power	15.247(b)	Pass	16dBm @ 2412MHz
3	Receiver Emissions	RSS-210	Pass	24.4dBµV/m (16.6µV/m) @ 3005.7MHz (-29.6dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

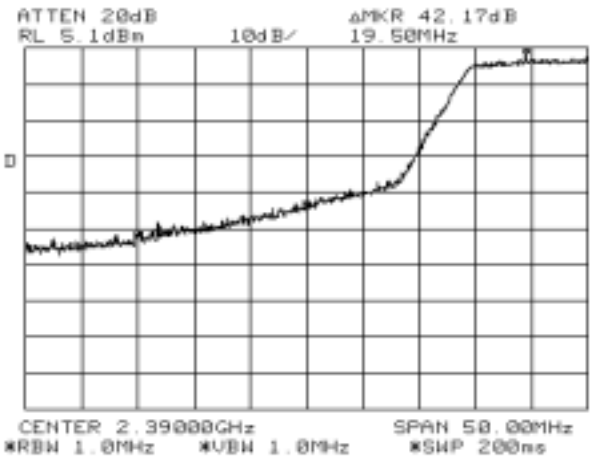
Deviations From The Standard

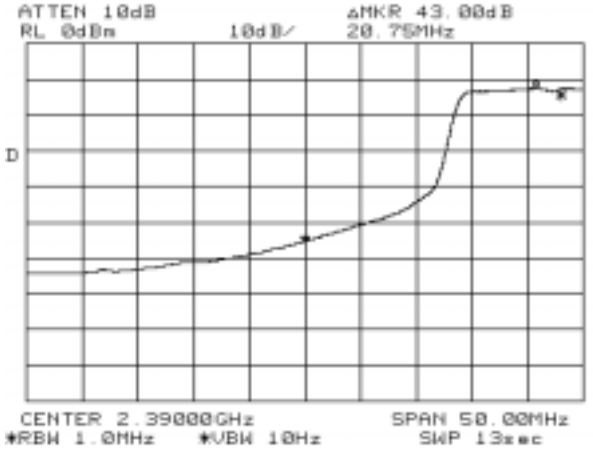
No deviations were made from the requirements of the standard.

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

Run #1a: Radiated Spurious Emissions, 1000 - 25000 MHz. Low Channel @ 2412 MHz
Gain Setting - 23

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	98.65	98.54	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	89.59	89.18	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - Peak	42.2 dB		
Delta Marker - Average	43.0 dB		
Calculated Band-Edge Measurement:	56.45 dBuV/m		Peak
Calculated Band-Edge Measurement:	46.59 dBuV/m		Average





Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4826.510	28.7	H	54.0	-25.3	AVG	185	1.0	2nd Harmonics
4823.213	27.7	V	54.0	-26.3	AVG	128	1.0	2nd Harmonics
4826.510	40.5	H	74.0	-33.5	PK	185	1.0	2nd Harmonics
4823.213	39.2	V	74.0	-34.8	PK	128	1.0	2nd Harmonics
12062.03	37.3	V	54.0	-16.7	AVG	193	1.0	5th Harmonics (Noise Floor)
12062.03	48.8	V	74.0	-25.2	PK	193	1.0	5th Harmonics (Noise Floor)

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

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

Run #1b: Radiated Spurious Emissions, 1000 - 25000 MHz. Center Channel @ 2437 MHz
Gain Setting - 23

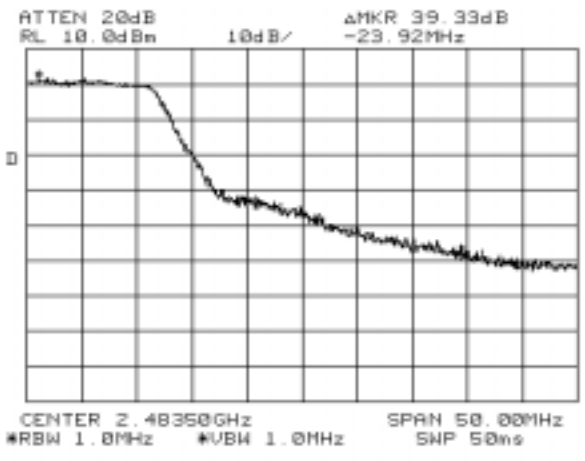
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7305.490	31.8	H	54.0	-22.2	AVG	265	1.0	3rd Harmonics
7310.918	31.3	V	54.0	-22.7	AVG	39	1.0	3rd Harmonics
4873.880	29.2	H	54.0	-24.8	AVG	172	1.0	2nd Harmonics
4879.920	28.4	V	54.0	-25.6	AVG	128	1.0	2nd Harmonics
7305.490	43.3	H	74.0	-30.7	PK	265	1.0	3rd Harmonics
7310.918	42.6	V	74.0	-31.4	PK	39	1.0	3rd Harmonics
4873.880	40.5	H	74.0	-33.5	PK	172	1.0	2nd Harmonics
4879.920	39.3	V	74.0	-34.7	PK	128	1.0	2nd Harmonics

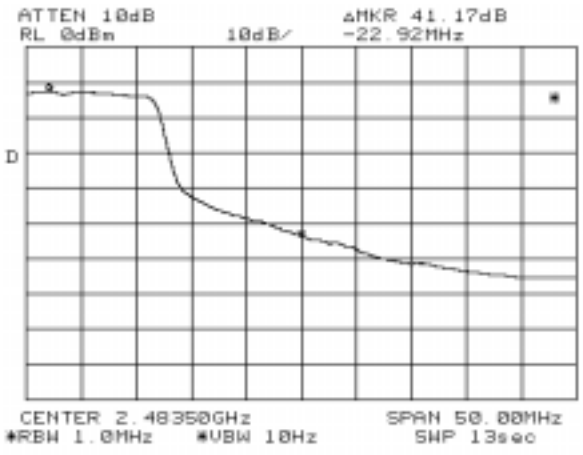
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

Run #1c: Radiated Spurious Emissions, 1000 - 25000 MHz. High Channel @ 2462 MHz
Gain Setting - 23

	H	V	
Fundamental emission level @ 3m in 1MHz RBW:	97.58	96.52	Peak Measurement (RB=VB=1MHz)
Fundamental emission level @ 3m in 1MHz RBW:	88.26	88.23	Average Measurement (RB=1MHz, VB=10Hz)
Delta Marker - Peak	39.3 dB		
Delta Marker - Average	41.2 dB		
Calculated Band-Edge Measurement:	58.28 dBuV/m		Peak
Calculated Band-Edge Measurement:	47.06 dBuV/m		Average





Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4931.240	29.1	H	54.0	-24.9	AVG	177	1.0	2nd Harmonics
4931.240	40.4	H	74.0	-33.6	PK	177	1.0	2nd Harmonics
4930.340	28.9	V	54.0	-25.1	AVG	127	1.0	2nd Harmonics
4930.340	40.8	V	74.0	-33.2	PK	127	1.0	2nd Harmonics
7379.440	32.4	V	54.0	-21.6	AVG	355	1.0	3rd Harmonic
7379.440	43.7	V	74.0	-30.3	PK	355	1.0	3rd Harmonic
7381.310	32.1	H	54.0	-21.9	AVG	231	1.0	3rd Harmonic
7381.310	42.9	H	74.0	-31.1	PK	231	1.0	3rd Harmonic

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

Client:	Intel	Job Number:	J60624
Model:	WM3B2200BG Permissive Change w/ Sony Antenna	T-Log Number:	T60665
		Account Manager:	Nesha Lambert
Contact:	Robert Paxman		
Spec:	FCC 15.247	Class:	N/A

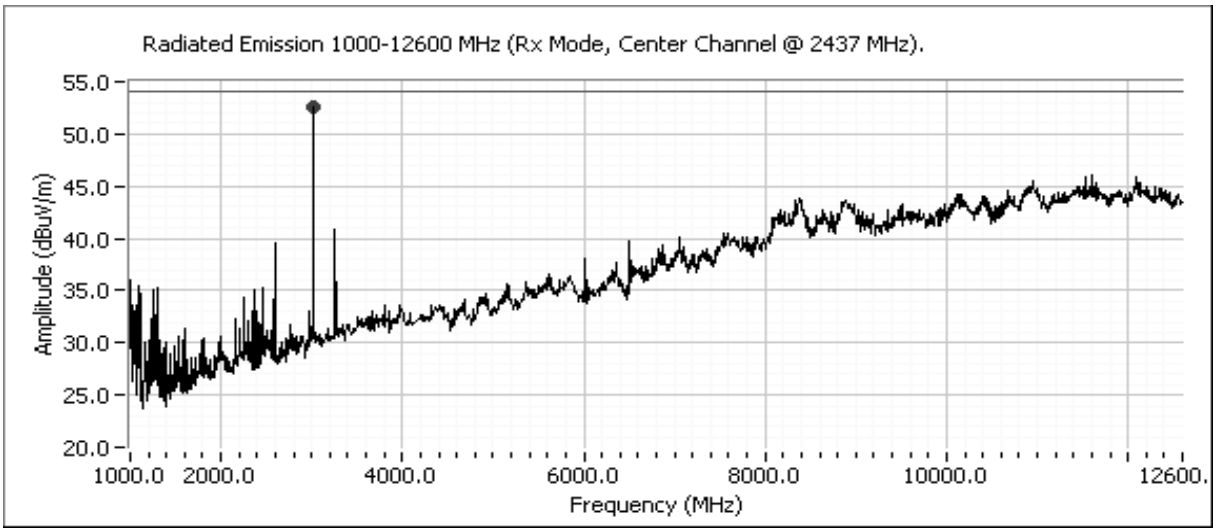
Run #2: Output Power

Maximum antenna gain: 2.1 dBi

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2412	16.0	0.0398	0.0646
Mid	2437	16.0	0.0398	0.0646
High	2462	15.9	0.0389	0.0631

Note 1: Output power measured using a peak power meter

Run #3: Radiated Emissions, 1000 - 10000 MHz. Rx Mode, Center Channel @ 2437 MHz



Frequency	Level	Pol	RSS-210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
3005.660	24.4	H	54.0	-29.6	AVG	272	2.0	Ambient
3005.660	35.3	H	74.0	-38.7	PK	272	2.0	Ambient

EXHIBIT 3: Test Configuration Photographs

2 Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

Unchanged from original application

EXHIBIT 5: Detailed Photographs of Intel Corporation Model WM3B2200BGConstruction

Unchanged from original application

EXHIBIT 6: Operator's Manual for Intel Corporation Model WM3B2200BG

Unchanged from original application

EXHIBIT 7: Block Diagram of Intel Corporation Model WM3B2200BG

Unchanged from original application

EXHIBIT 8: Schematic Diagrams for Intel Corporation Model WM3B2200BG

Unchanged from original application

EXHIBIT 9: Theory of Operation for Intel Corporation Model WM3B2200BG

Unchanged from original application

EXHIBIT 10: Advertising Literature

Unchanged from original application

EXHIBIT 11: RF Exposure Information

2 Pages