

***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 Acer Incorporated
Model: Acer Travelmate C110***

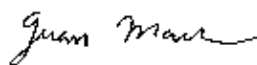
FCC ID: PU5MS2133

GRANTEE: Acer Incorporated
21F 88, Sec. 1 Hsin Tai Wu R., Hsichih
Taipei Hsien 221, Taiwan, R.O.C

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

REPORT DATE: June 5, 2003

FINAL TEST DATE: May 22, May 23, May 24 and May 27, 2003



AUTHORIZED SIGNATORY: _____

Juan Martinez
Sr. EMC Engineer



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DECLARATIONS OF COMPLIANCE

Equipment Name and Model:

Acer Travelmate C110

Manufacturer:

Acer Incorporated
21F 88, Sec. 1 Hsin Tai Wu Rd., Hsichih
Taipei Hsien 221, Taiwan, R.O.C.

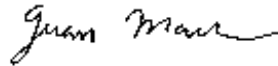
Tested to applicable standards:

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 **SV2** Dated August 12, 2001Departmental Acknowledgement Number: IC2845 **SV4** Dated July 19, 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: June 5, 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.).

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SCOPE

An electromagnetic emissions test has been performed on the Acer Incorporated model Acer Travelmate C110 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 Acer Incorporated model Acer Travelmate C110 and therefore apply only to the tested sample. The sample was selected and prepared by Robert Paxman.

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)		The antenna is integral to the host device	Antenna Gain = 2.61 dBi The antenna is integral to the host system	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	26dB: 34.7 MHz 20dB: 22.8 MHz 99%: 17.1 MHz	N/A
15.407(a) (1)	6.2.2 q1 (i)	Output Power	15.5dBm (0.035 Watts)	COMPLIES
15.407(a) (1))	6.2.2 q1 (i)	Power Spectral Density	3.1dBm/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 = 2.61 dBi The antenna is integral to the host system	COMPLIES
15.407(a) (2)	6.2.2 q1 (ii)	Bandwidth	26dB: 31.5 MHz 20dB: 26.8 MHz 99%: 17.2 MHz	N/A
15.407(a) (2)	6.2.2 q1 (ii)	Output Power	16.4dBm (0.044 Watts)	COMPLIES
15.407(a) (2))	6.2.2 q1 (ii)	Power Spectral Density	3.9dBm/MHz	COMPLIES
General requirements for all bands				
15.407(b) (5) / 15.209	6.2.2 q1 (ii)	Spurious Emissions below 1GHz	Measured during radiated conducted emissions tests for digital device.	COMPLIES
15.407(b) (2)	6.2.2 q1 (ii)	Spurious Emissions above 1GHz	-8.81dB @ 5350 MHz	COMPLIES
	7	Receiver Spurious Emissions above 1GHz	-12.9dB @ 4924.0MHz (Note 1)	COMPLIES
	6.2.2 q(iv)(a)	Digital Modulation	Digital Modulation is used, refer to the "Theory of Operations" (Exhibit 9) for a detailed explanation.	COMPLIES
	6.2.2 q(iv)(b)	Peak Spectral Density	3.9dBm/MHz	COMPLIES
15.407(a)(6)		Peak Excursion Ratio	7.7dB	COMPLIES
	6.2.2 q(iv)(c)	Channel Selection	The device was tested on the highest, lowest and center channels available.	N/A
15.407 (c)	6.2.2 q(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 q(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 q(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 q(iv)(g)	RF Exposure Requirements	Refer to SAR Report in Exhibit 11	COMPLIES
15.407(b) / 15.207		AC Conducted Emissions	43.1 dBuV @ 0.211 MHz (-9.9 dB)	COMPLIES
	6.6	AC Conducted Emissions	43.1 dBuV @ 0.211 MHz (-4.9 dB)	

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 Acer Incorporated model Acer Travelmate C110 is a mini PCI Card dual band (802.11a and 802.11b) transceiver that is made to be installed into Acer Laptop (Model: TravelMate C110). The Mini PCI was installed in such a laptop during testing.

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 May 22, 2003 and tested on May 22, May 23, May 24 and May 27, 2003. The EUT and host system consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
Acer Travelmate C110 Laptop	-	PU5MS2133

ENCLOSURE

The EUT has no enclosure. 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 support equipment was used during emissions testing.

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Deskjet 3820	USB Printer	CN2451B1YS	DoC

EXTERNAL I/O CABLING

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
AC	120Vac outlet	3 prong	Unshielded	1.8

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. The laptop display was position in 90 degrees configuration and tablet configuration during the radiated emission test.

ANTENNA REQUIREMENTS

As the device is intended to operate in the 5.15 – 5.25 GHz band an integral antenna as detailed in 15.407 (d) and RSS-210 6.2.2(q1) (i) is required. The antenna for the device is integral to the laptop. The antenna will be place inside and located on the laptop display. To further insure compliance with 15.407 (d) epoxy will be used to permanently glue the connectors to the MPCIE card connector.

TEST SITE**GENERAL INFORMATION**

Final test measurements were taken on May 22, May 23, May 24 and May 27, 2003 at the Elliott Laboratories Open Area Test Site #2 & 4 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 terms 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:

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

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) 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 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:

$$R_T - B = C$$

and

$$C - S = M$$

where:

R_T = 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, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

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:

$$F_d = 20 * \text{LOG}_{10} (D_m/D_s)$$

where:

$$F_d = \text{Distance Factor in dB}$$

$$D_m = \text{Measurement Distance in meters}$$

$$D_s = \text{Specification Distance in meters}$$

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:

$$R_r = \text{Receiver Reading in dBuV/m}$$

$$F_d = \text{Distance Factor in dB}$$

$$R_c = \text{Corrected Reading in dBuV/m}$$

$$L_s = \text{Specification Limit in dBuV/m}$$

$$M = \text{Margin in dB Relative to Spec}$$

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Conducted and Radiated Emissions, 24-May-03**Engineer: volivas**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	773	12	3/18/03	3/18/04
Filtek	High Pass Filter, 1GHz	HP12/1000-5BA	956	12	3/11/03	3/11/04
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	12	2/28/03	2/28/04
Solar Electronics Co	LISN	8028-50-TS-24-BNC	904	12	6/19/02	6/19/03
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	12	3/31/03	3/31/04
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	12	1/24/03	1/24/04
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1398	12	1/10/03	1/10/04
Hewlett Packard	Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	12	11/19/02	11/19/03
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	1316	12	12/6/02	12/6/03

Radiated Emissions, 30 - 40,000 MHz, 08-Jul-03**Engineer: jmartinez**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), system 2	84125C	1410	12	4/2/03	4/2/04

Power Measurements, 08-Jul-03**Engineer: jmartinez**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Assett #</u>	<u>Cal interval</u>	<u>Last Calibrated</u>	<u>Cal Due</u>
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1290	12	4/3/03	4/3/04
Rohde & Schwarz	Power Sensor 100uW - 10 Watts	NRV-Z53	1236	12	8/15/02	8/15/03

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T51308_UNII 36 Pages
T51308_Digital 8 Pages



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, & E, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Intel Corporation

Model

ACER Laptop w/ WM3B2100A

Date of Last Test: 5/27/2003



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, & E, RSS-210 is	Class:	Radio
Immunity Spec:	-	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 Acer Laptop (Model: TravelMate C110). 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
Acer	TravelMate C110	Laptop		PU5MS2133

Other EUT Details

The EUT is the mini PCI card installed into the host laptop.

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	-	-	None

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



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Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

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)
AC Port	120Vac outlet	Power Cord	Unshielded	1.8

Note: The Laptop ports were not connected as these are not required during the transmitter radiated emission test.

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. The laptop display was position in 90 degree configuration and tablet configuration during the radiated emission test.

For receive-mode tests the device was configured to receive only on the specified channel.

Preliminary tests demonstrated that the emissions below 1GHz were independent of the mode (transmit versus receive) and of the channel selected. Radiated emissions in the 30 - 1000 MHz frequency range for receive and transmit modes were, therefore, covered by the digital device mode tests. These tests were performed with the device configured to transmit on the center channel of the 5.15 - 5.35 GHz band (5.26 GHz).



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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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: 5/27/2003
Test Engineer: Marissa Faustino
Test Location: SVOATS #4

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/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

Ambient Conditions: Temperature: 22 °C
 Rel. Humidity: 47 %

Summary of Results

Run #	Test Performed	Limit	Result	Comments
1	Output Power	15.407(a) (1), (2)	Pass	16.4 dBm
2	Power Spectral Density (PSD)	15.407(a) (1), (2)	Pass	3.9dBm/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



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		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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					Limit
Ch.	MHz	dBm	TCP	Data Rate	Tx Filter	TDA	DSP	dBm
36	5180	15.5	29	6 (6Mb/s)	37	226	98	17
48	5260	16.4	27	6 (6Mb/s)	35	226	98	17
64	5320	15.4	29	6 (6Mb/s)	37	226	98	17

Note 1: Measured using a Rhode & Schwarz Power Meter with a peak power sensor.

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	3.1	4.0	201	Note 1
52	5260	3.2	11.0	202	Note 1
64	5320	3.9	11.0	203	Note 1

Note 1: The above measurements were made using RBW = 1MHz, VBW = 3MHz Peak Detector (Method# 1 PSD).

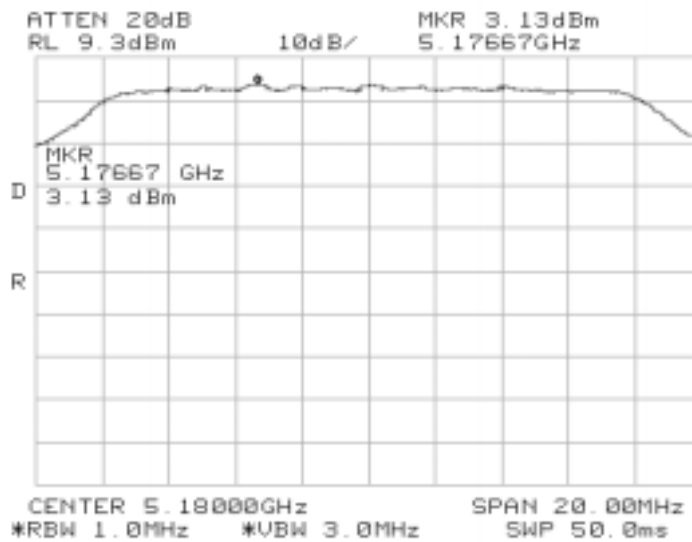


EMC Test Data

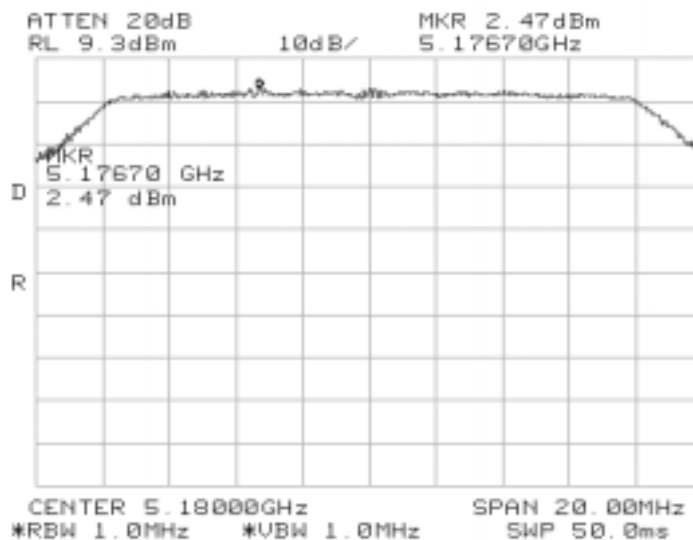
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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

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

FCC 201



Canada PSD 201

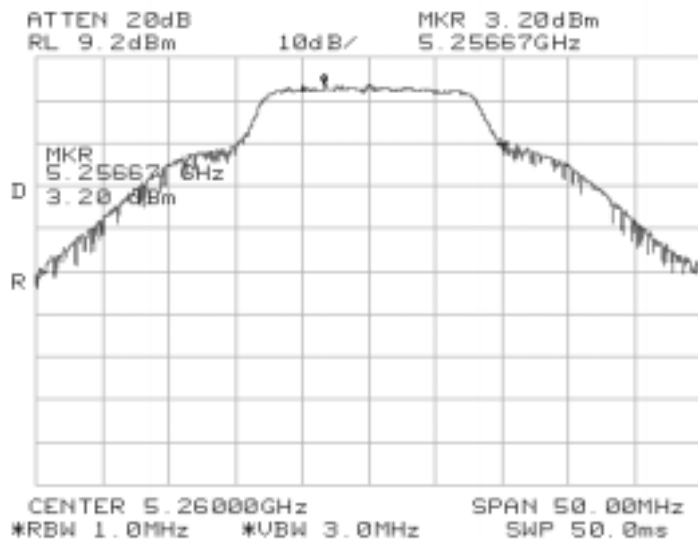




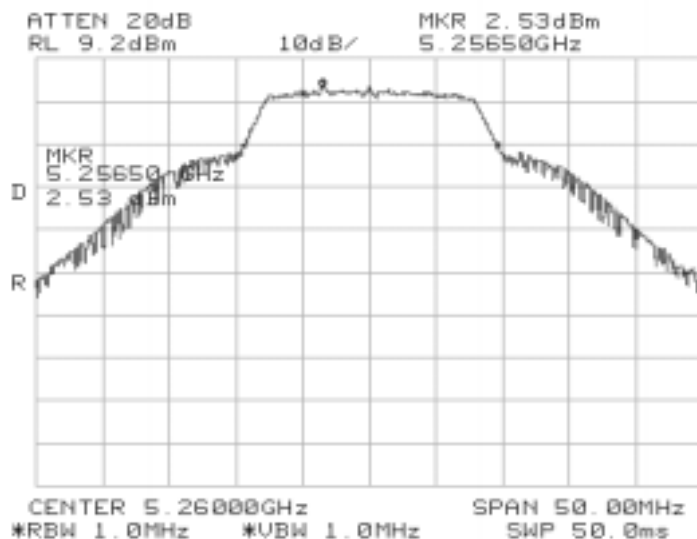
EMC Test Data

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Contact:	Robert Paxman	Account Manager:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

FCC 202



Canada PSD 202

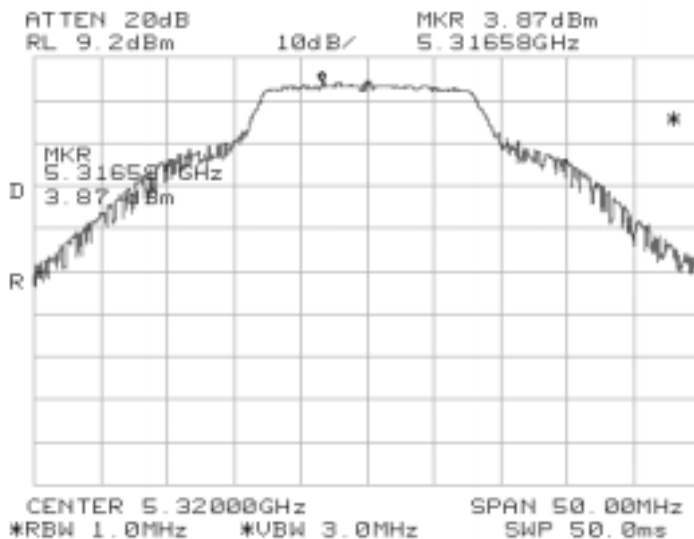




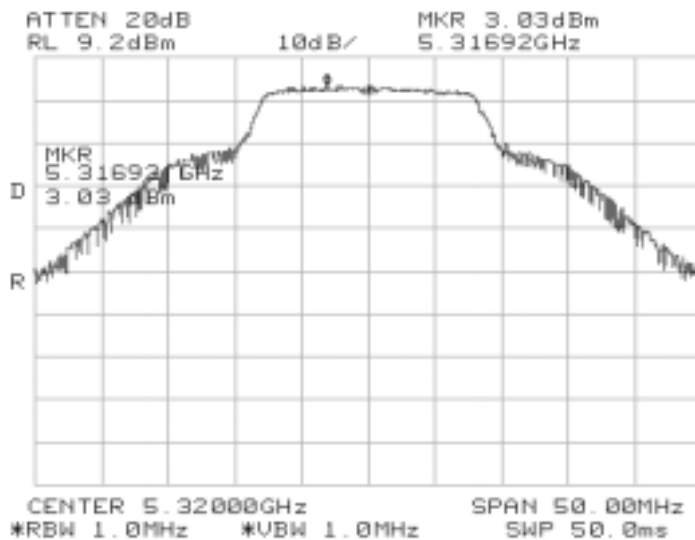
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FCC 203



Canada PSD 203





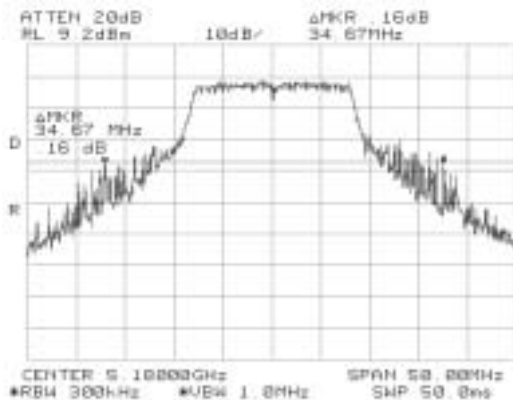
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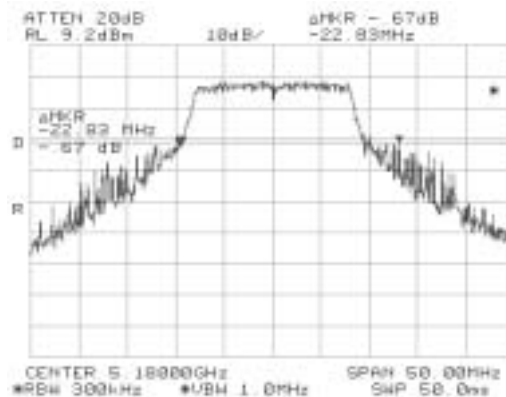
Run #3: Signal Bandwidth

Channel	Frequency (MHz)	Resolution Bandwidth	26 dB Signal Bandwidth (MHz)	20 dB Signal Bandwidth (MHz)	Graph reference #
36	5180	300 kHz	34.7	22.8	301
52	5260	300 kHz	29.4	20.5	302
64	5320	300 kHz	31.5	26.8	303

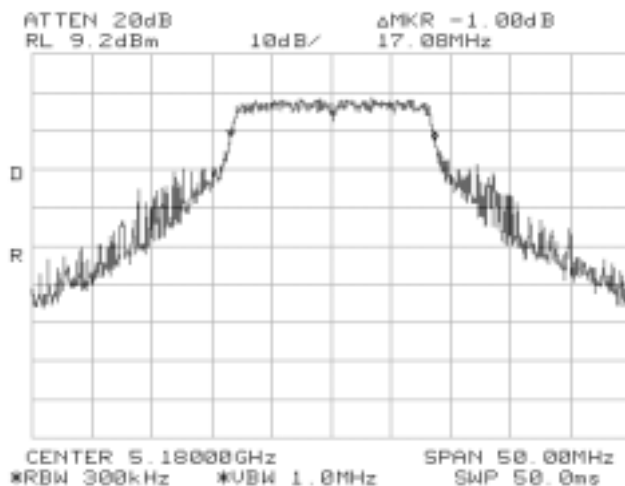
26-dB



20-dB



99%

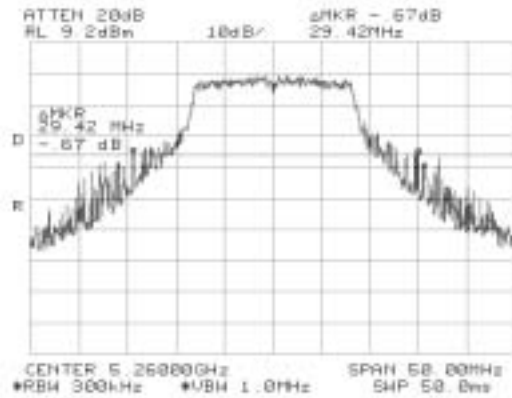




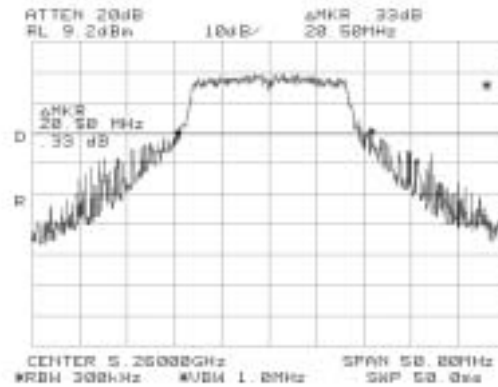
EMC Test Data

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Contact:	Robert Paxman	Account Manager:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

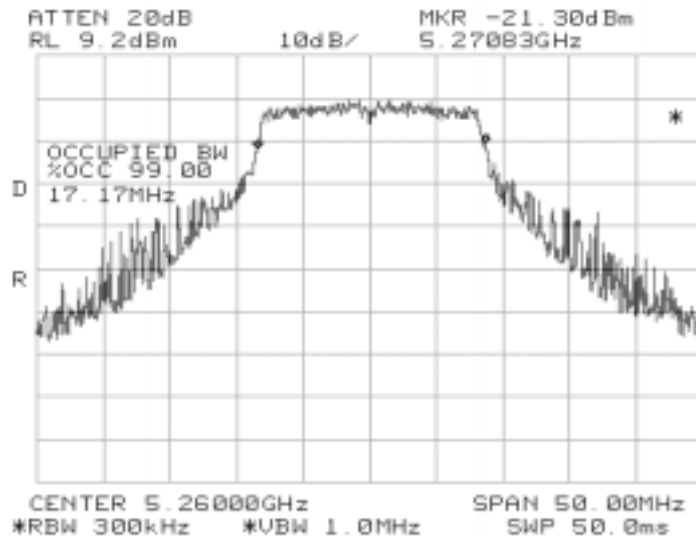
26-dB



20-dB



99%

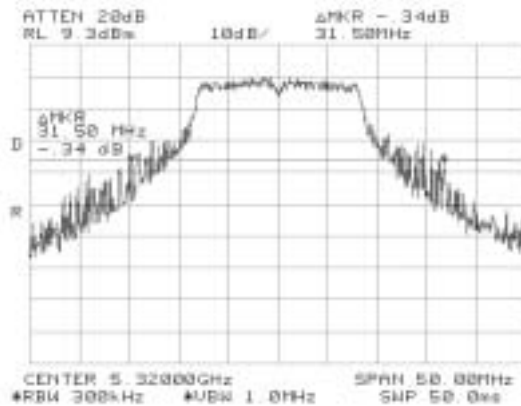




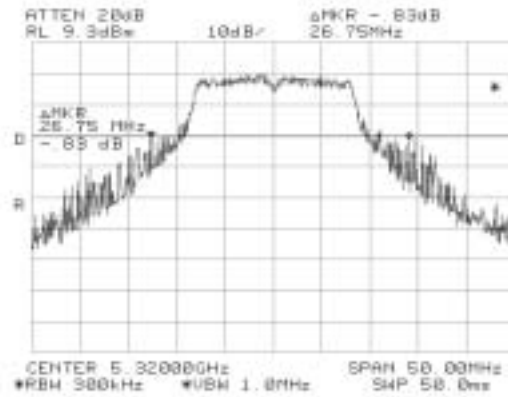
EMC Test Data

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Contact:	Robert Paxman	Account Manager:	Robert Holt
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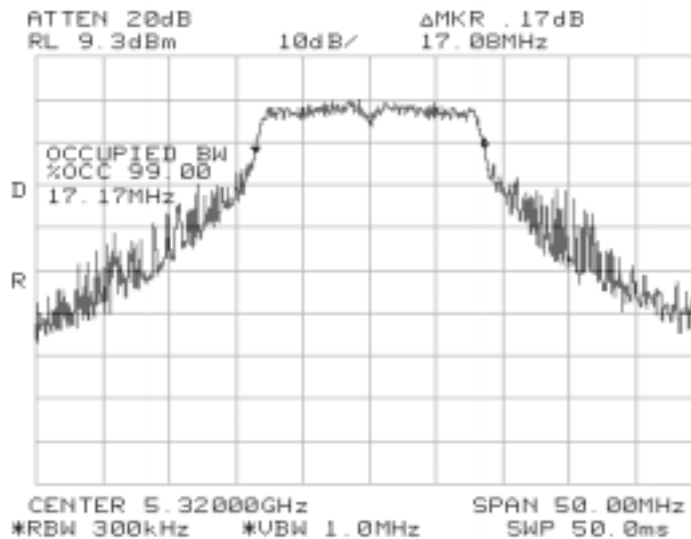
26-dB



20-dB



99%





EMC Test Data

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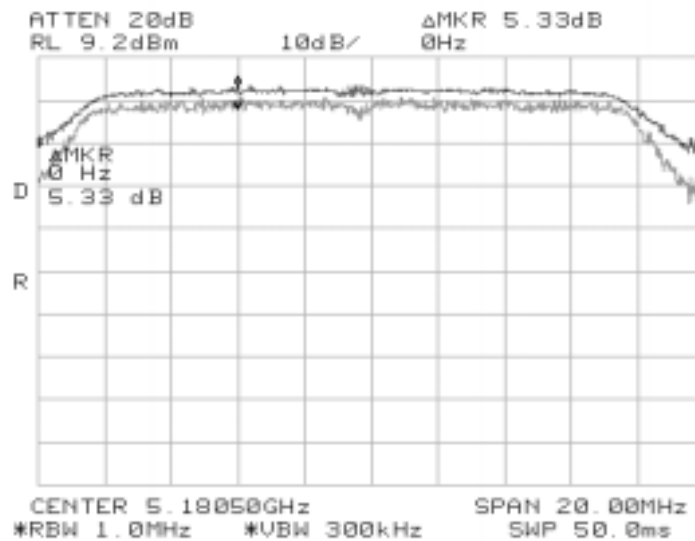
Run #4: Peak Excursion Measurement

Plots Showing Peak Excursion

Trace A: RBW = 1MHz VBW = 3MHz

Trace B: RBW = 1 MHz, VBW = 300kHz (Method# 3)

Peak Excursion = 5.33 dB (5180 MHz)

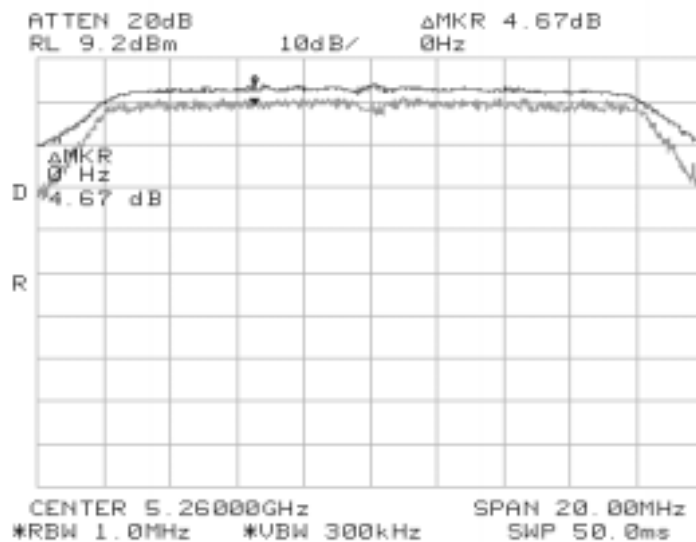




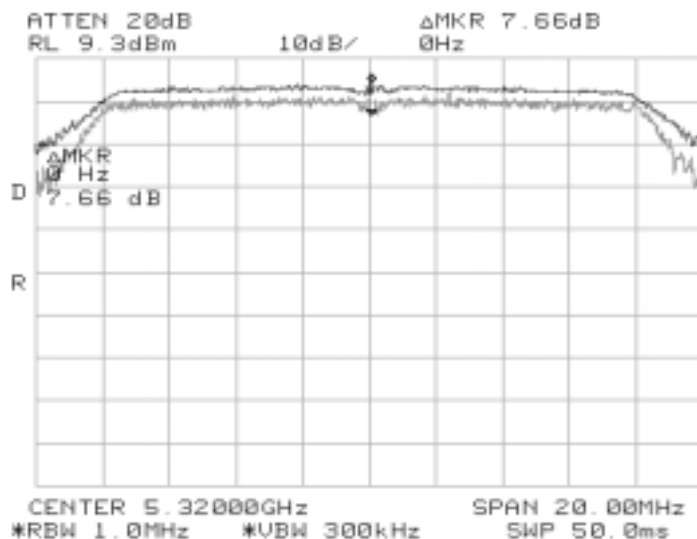
EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
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Contact:	Robert Paxman	Account Manager:	Robert Holt
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Peak Excursion = 4.67 dB (5260 MHz)



Peak Excursion = 7.7 dB (5320 MHz)





EMC Test Data

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Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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	-44.3dBm(5.15 GHz)	502
		5.25 to 10 GHz	-50.0dBm(5.42GHz)	503
		10 GHz to 20 GHz	None	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	-52.6dBm(5.42GHz)	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	-53.5dBm(5.24)	512
		5.35 to 10 GHz	-46.2dBm(5.35)	513
		10 GHz to 20 GHz	None	514
		20 GHz to 40 GHz	None	515

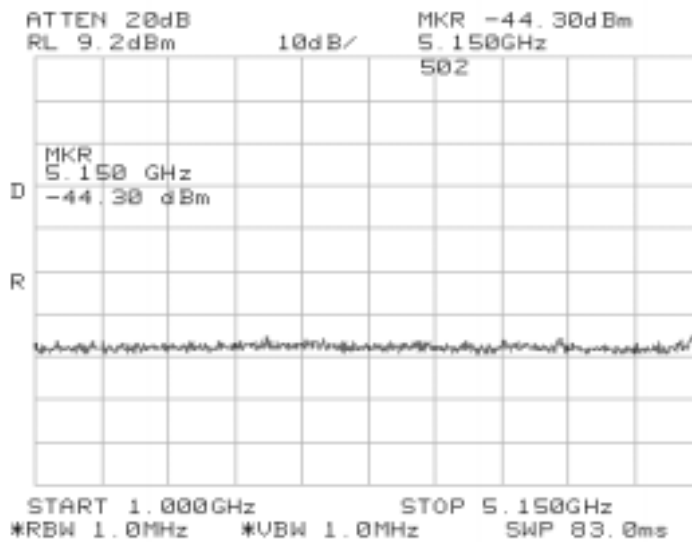
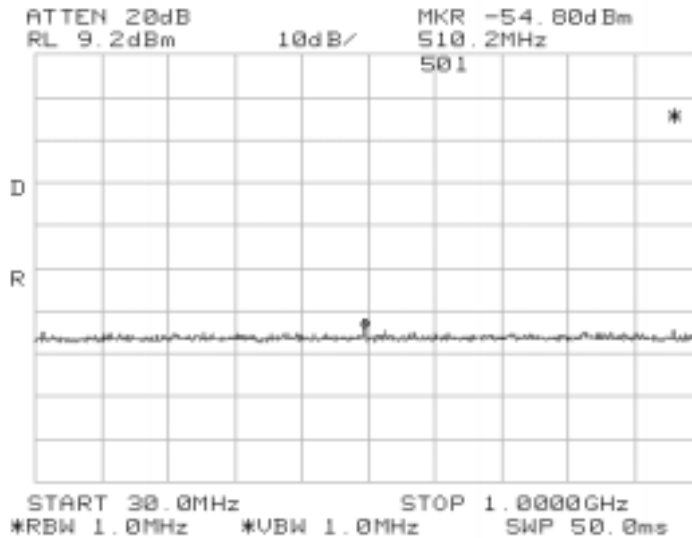
Note 1:	Signal is in a restricted band. Refer to run #6 for field strength measurements.
Note 2:	Signal is not in restricted band. Limit is -27dBm eirp. As the signal strength is significantly lower than -27dBm no field strength measurements required.
Note 3:	Signal is not in restricted band. Limit is -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.



EMC Test Data

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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

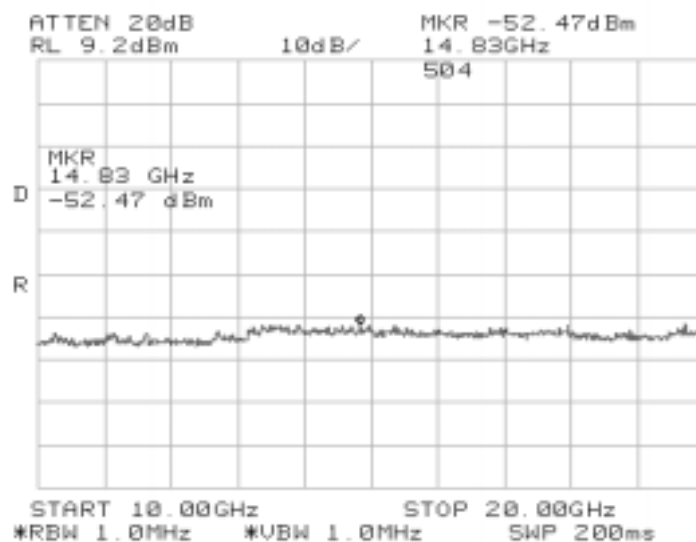
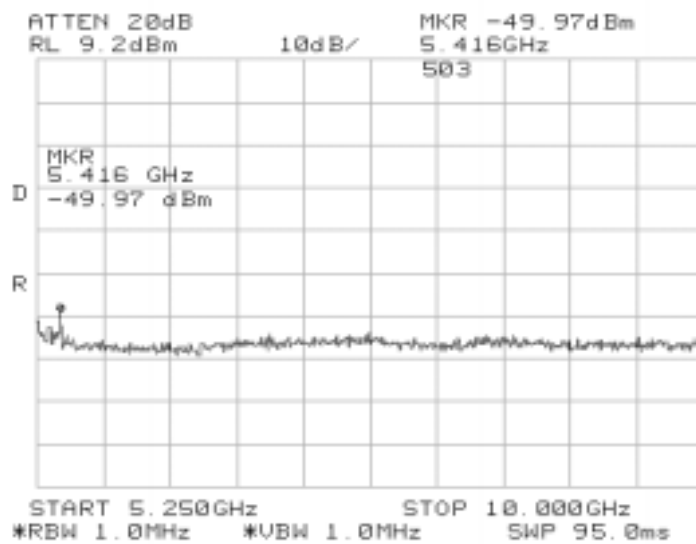
Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz)





EMC Test Data

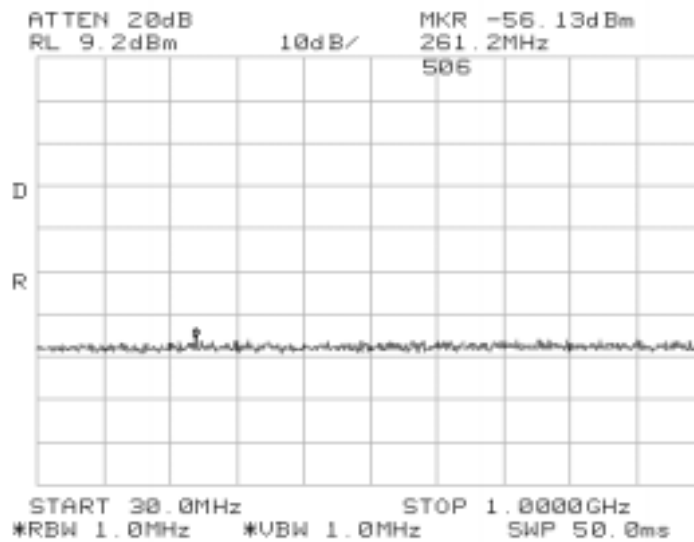
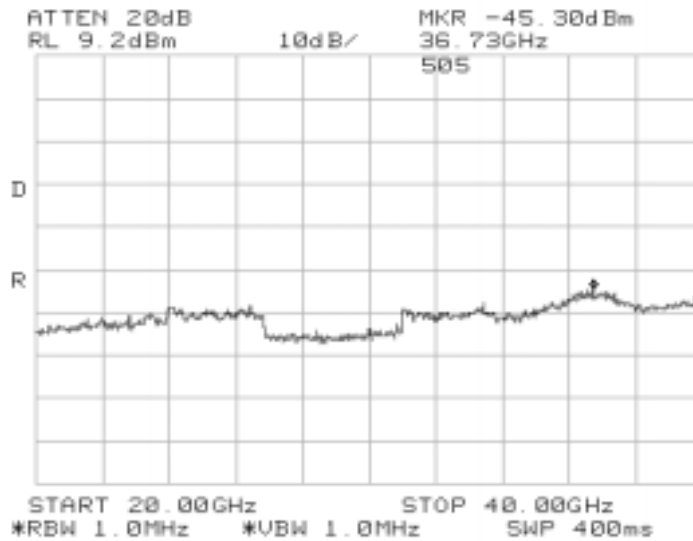
Client:	Intel Corporation	Job Number:	J51307
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Contact:	Robert Paxman	Account Manager:	Robert Holt
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EMC Test Data

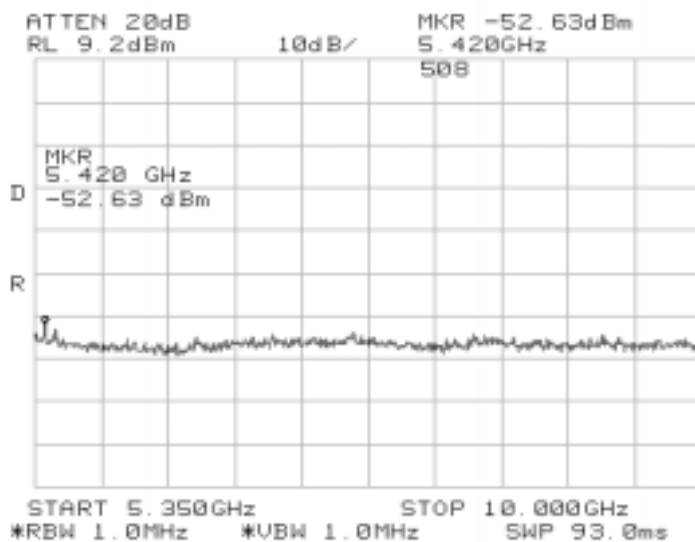
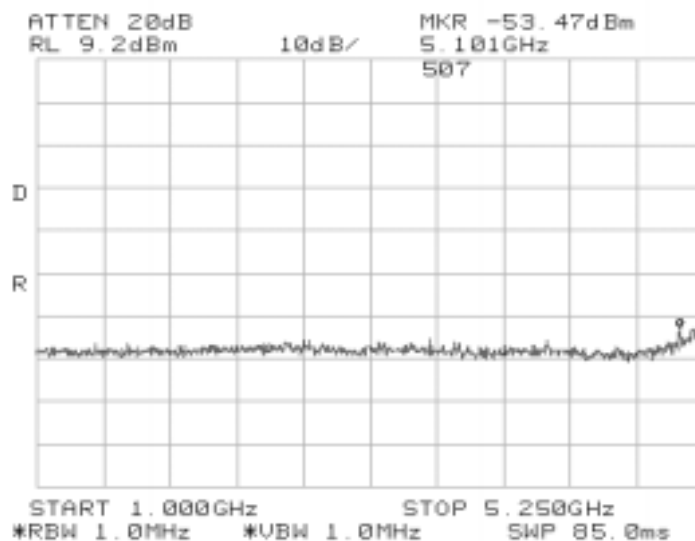
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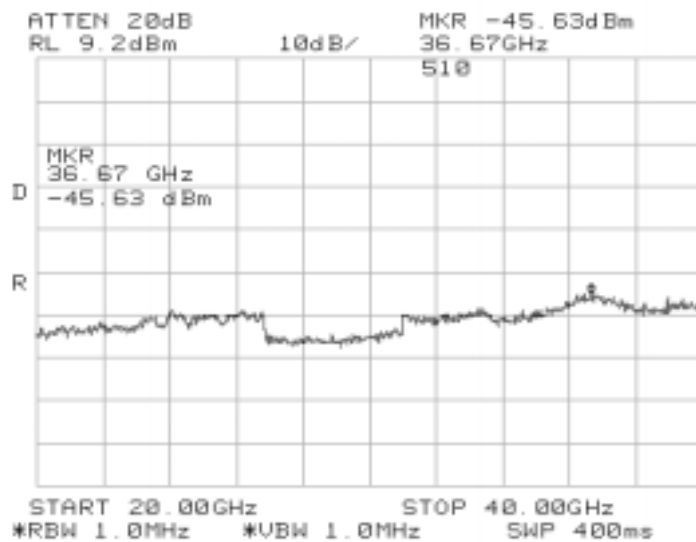
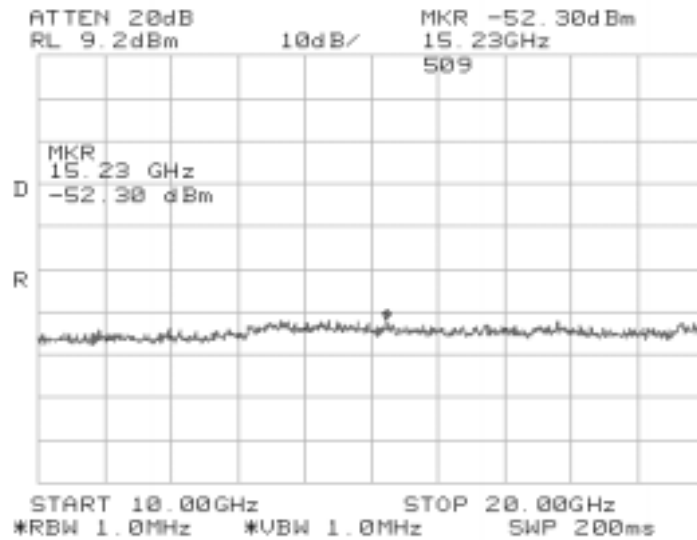
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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio





EMC Test Data

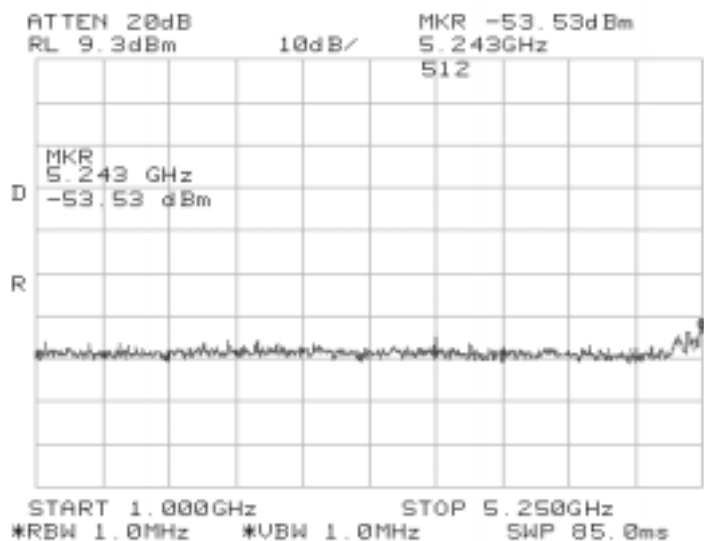
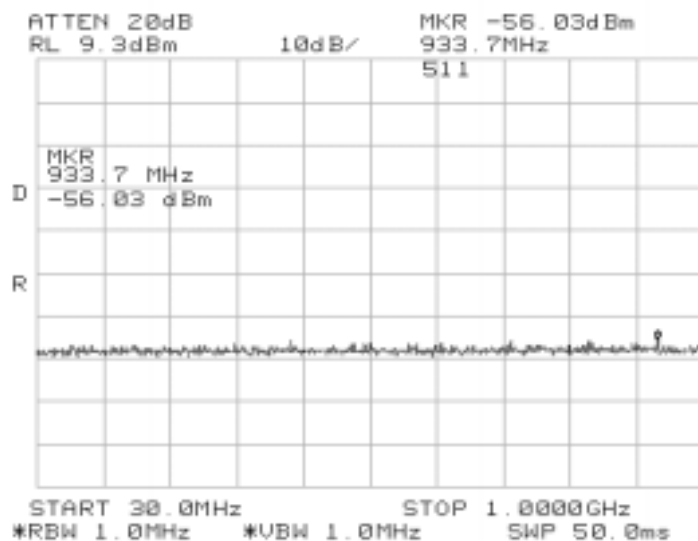
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EMC Test Data

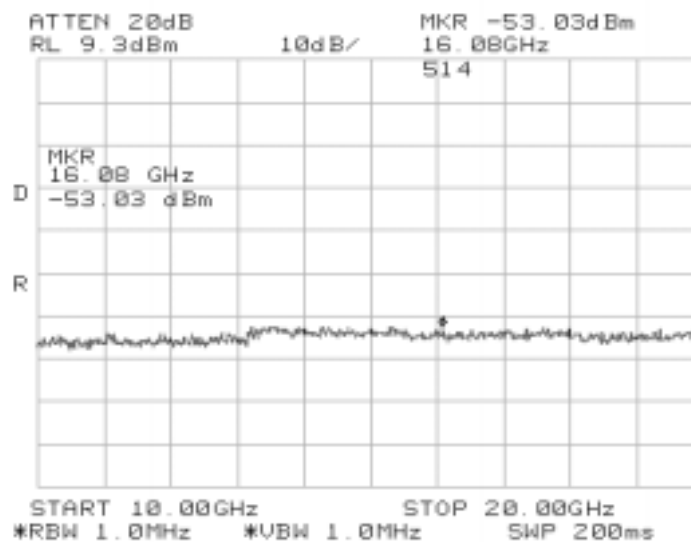
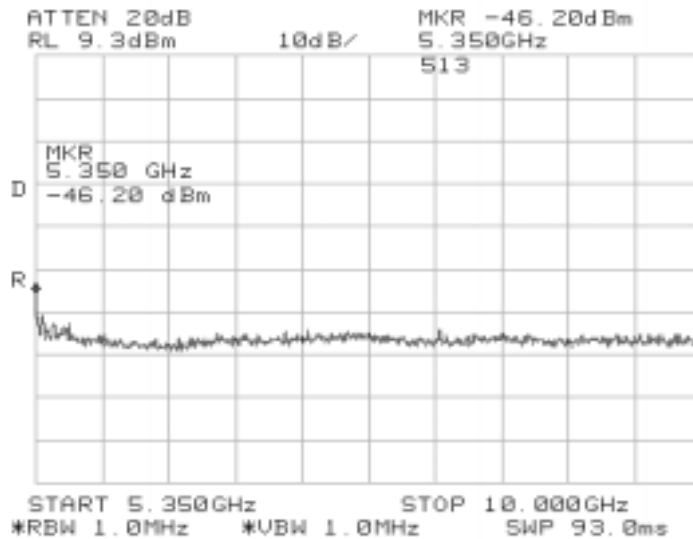
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EMC Test Data

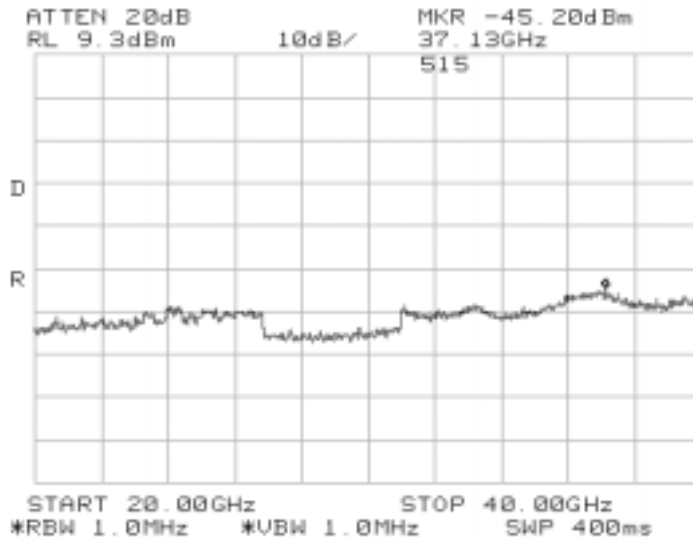
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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Radiated Emissions - UNII / LELAN Tx

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: 5/23/2003
Test Engineer: jmartinez
Test Location: SVOATS #4

Config. Used: 2
Config Change: None
EUT Voltage: 120V/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: 25°C
Rel. Humidity: 43%

Summary of Results

Run #	Test Performed	Limit	Result	Comments
1	RE, 1000 - 40000 MHz - Spurious Emissions	15.407(b)(6)	Pass	-8.81dB @ 5350 MHz
2	RE, 1000 - 40000 MHz - Spurious Emissions	15.407(b)(6)	Pass	-10.3dB @ 7013 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.

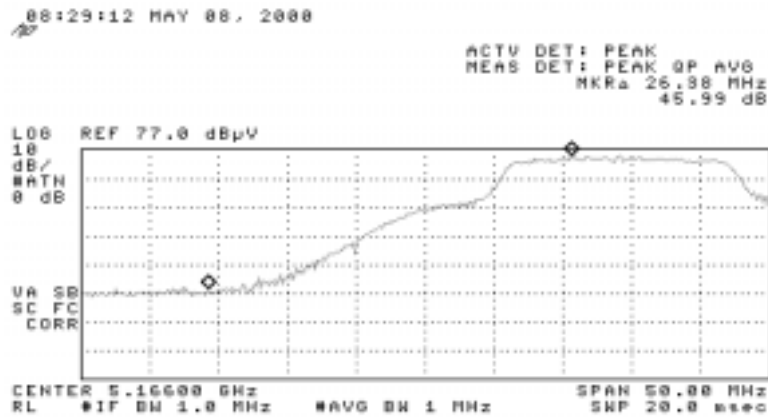


EMC Test Data

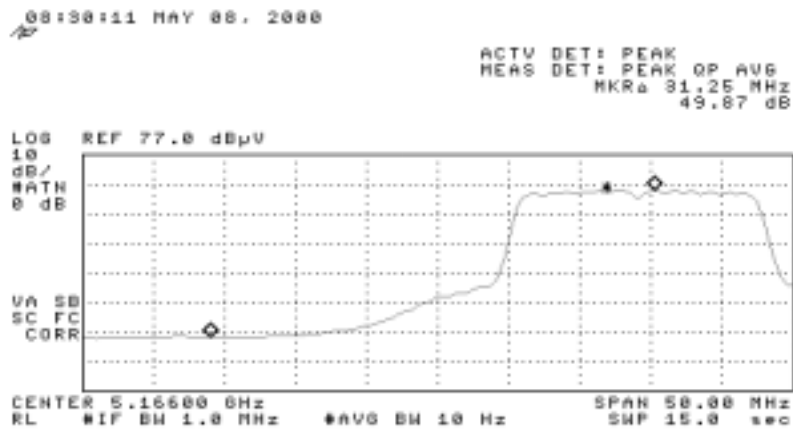
Client:	Intel Corporation	Job Number:	J51307
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Contact:	Robert Paxman	Proj Eng:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #1a: Bandedges (90 Degrees)

5180 MHz Peak Bandedge



5180 MHz Avg Bandedge

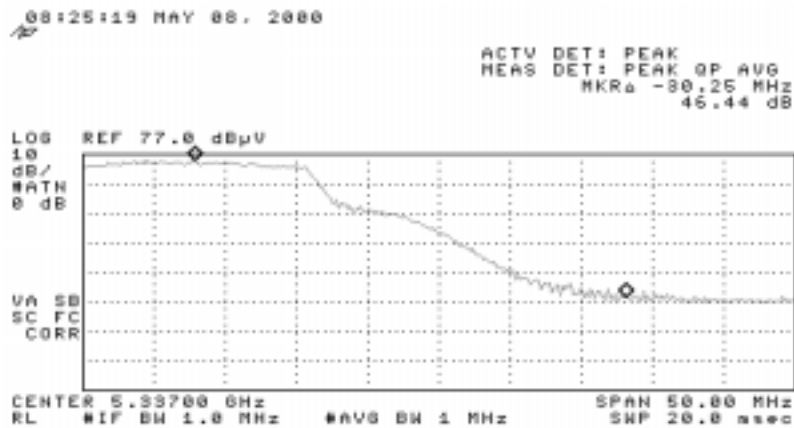




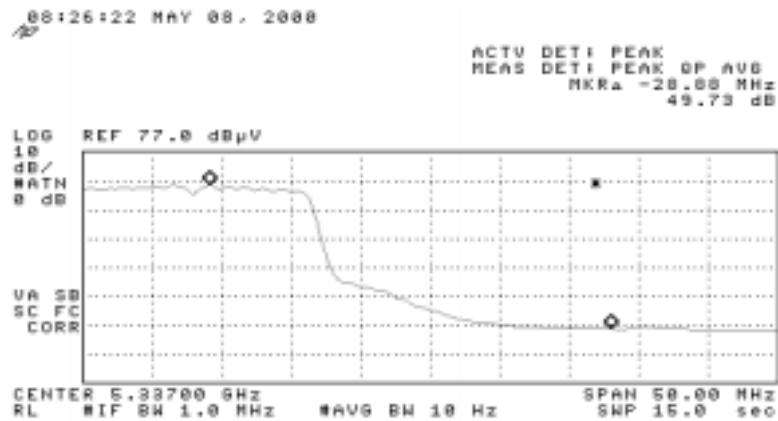
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5320 MHz Peak Bandedge



5320 MHz Avg Bandedge





EMC Test Data

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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #1b: Radiated Spurious Emissions, 1000 - 40000 MHz (90 Degrees)

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	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.0	104.3	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	94.4	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5180.0	101.4	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	92.0	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	105.4	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	94.9	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	104.2	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	94.6	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.0	58.3	v	74.0	-15.7	Pk	-	-	
5150.0	44.5	v	54.0	-9.5	Avg	-	-	Note 1
5150.0	55.4	h	74.0	-18.6	Pk	-	-	Note 1
5150.0	42.2	h	54.0	-11.8	Avg	-	-	Note 1
5350.0	59.0	v	74.0	-15.0	Pk	-	-	Note 2
5350.0	45.2	v	54.0	-8.8	Avg	-	-	Note 2
5350.0	57.8	h	74.0	-16.2	Pk	-	-	Note 2
5350.0	44.9	h	54.0	-9.1	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 #1a (-45.99 dBc for peak and -49.78 dBc for average) applied to the highest peak and average 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 #1a (-46.44 dBc for peak and -49.73 dBc for average) applied to the highest peak and average field strength measurements of the fundamental signal level.



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
Contact:	Robert Paxman	Proj Eng:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #1c: 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	51.3	v	68.3	-17.0	Note 3	163	1.3	Note 4
15540.0	51.7	v	74.0	-22.3	Pk	360	1.3	Note 2
15540.0	38.7	v	54.0	-15.3	Avg	360	1.3	Note 2
10360.0	51.0	h	68.3	-17.3	Note 3	180	1.3	Note 4
15540.0	51.8	h	74.0	-22.2	Pk	0	1.3	Note 2
15540.0	38.6	h	54.0	-15.4	Avg	0	1.3	Note 2
3453.0	50.5	v	68.3	-17.8	Note 3	304	1.1	Note 4
6906.0	57.4	v	68.3	-10.9	Note 3	0	1.1	Note 4
3453.0	52.0	h	68.3	-16.3	Note 3	331	1.0	Note 4
6906.0	58.2	h	68.3	-10.1	Note 3	120	1.0	Note 4

EUT On Center Channel (Channel 48, 5.26 GHz)

10520.0	44.7	v	68.3	-23.6	Note 3	122	1.3	Note 4
15780.0	50.1	v	74.0	-24.0	Pk	130	1.9	Note 2
15780.0	38.2	v	54.0	-15.9	Avg	130	1.9	Note 2
10520.0	40.8	h	68.3	-27.5	Note 3	273	1.2	Note 4
15780.0	50.6	h	74.0	-23.5	Pk	0	1.4	Note 2
15780.0	38.2	h	54.0	-15.8	Avg	0	1.4	Note 2
3506.0	45.3	v	68.3	-23.0	Note 3	360	1.0	Note 4
7013.0	52.9	v	68.3	-15.4	Note 3	0	1.0	Note 4
3506.0	51.2	h	68.3	-17.1	Note 3	0	1.0	Note 4
7013.0	50.0	h	68.3	-18.3	Note 3	360	1.0	Note 4

EUT On Highest Channel Available (Channel 64, 5.32 GHz)

10640.0	52.6	v	74.0	-21.4	Pk	57	1.3	Note 2
10640.0	43.7	v	54.0	-10.3	Avg	57	1.3	Note 2
15960.0	51.6	v	74.0	-22.4	Pk	0	1.3	Note 2
15960.0	38.2	v	54.0	-15.8	Avg	0	1.3	Note 2
10640.0	52.1	h	74.0	-22.0	Pk	335	1.3	Note 2
10640.0	41.4	h	54.0	-12.6	Avg	335	1.3	Note 2
15960.0	51.5	h	74.0	-22.5	Pk	360	1.0	Note 2
15960.0	38.0	h	54.0	-16.0	Avg	360	1.0	Note 2
3546.7	48.9	v	68.3	-19.4	Note 3	0	1.0	Note 4
7093.3	52.9	v	68.3	-15.5	Note 3	360	1.0	Note 4
3546.7	43.4	h	68.3	-24.9	Note 3	360	1.0	Note 4
7093.3	52.8	h	68.3	-15.5	Note 3	362	1.0	Note 4

See following page for test notes...



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Proj Eng:	Robert Holt
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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.



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
Contact:	Robert Paxman	Proj Eng:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #2a: Bandedge Measurements (Tablet mode)

5180 MHz Peak Bandedge

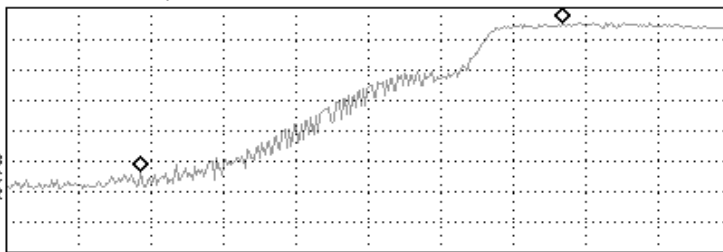
10:42:43 MAY 08, 2000

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRA 27.96 MHz
48.73 dB

LOG REF 87.0 dBμV

10
dB/
#ATN
0 dB

VA SB
SC FC
CORR



START 5.14000 GHz STOP 5.18800 GHz
RL #IF BW 1.0 MHz #AVG BW 1 MHz SWP 20.0 msec

5180 MHz Avg Bandedge

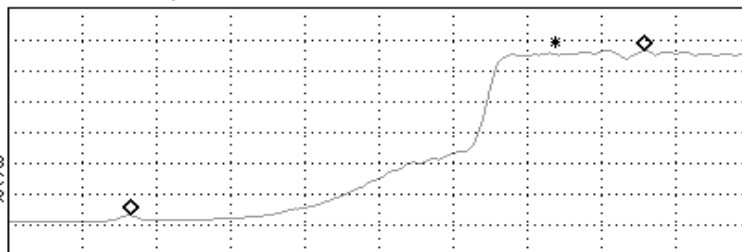
10:44:09 MAY 08, 2000

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRA 33.24 MHz
53.18 dB

LOG REF 87.0 dBμV

10
dB/
#ATN
0 dB

VA SB
SC FC
CORR



START 5.14000 GHz STOP 5.18800 GHz
RL #IF BW 1.0 MHz #AVG BW 10 Hz SWP 14.4 sec



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
Contact:	Robert Paxman	Proj Eng:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

5320 MHz Peak Bandedge

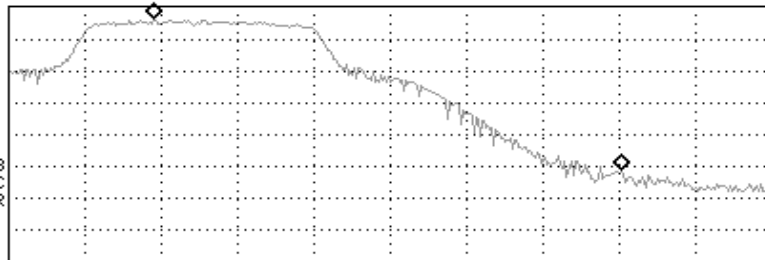
10:48:15 MAY 08, 2000

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -32.88 MHz
47.72 dB

LOG REF 87.0 dBμV

10
dB/
#ATN
0 dB

VA SB
SC FC
CORR



START 5.30632 GHz STOP 5.36000 GHz
RL #IF BW 1.0 MHz #AVG BW 1 MHz SWP 20.0 msec

5320 MHz Avg Bandedge

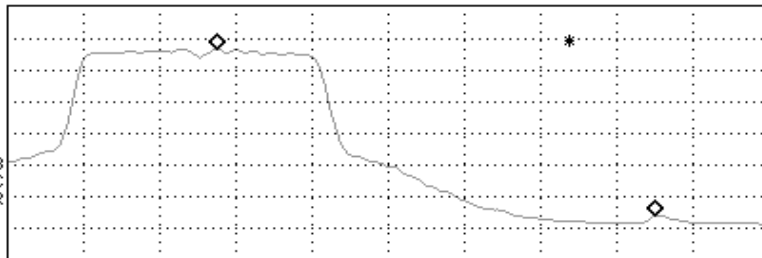
10:50:13 MAY 08, 2000

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ -30.87 MHz
52.45 dB

LOG REF 87.0 dBμV

10
dB/
#ATN
0 dB

VA SB
SC FC
CORR



START 5.30632 GHz STOP 5.36000 GHz
RL #IF BW 1.0 MHz #AVG BW 10 Hz SWP 16.1 sec



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
Contact:	Robert Paxman	Proj Eng:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #2b: Radiated Spurious Emissions, 1000 - 40000 MHz (Tablet mode)

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	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.0	99.8	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	90.5	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5180.0	98.0	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5180.0	88.7	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	99.8	v	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	90.7	v	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
5320.0	96.9	h	-	-	Pk	-	-	RBW = VBW = 1 MHz
5320.0	87.9	h	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBuV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5150.0	51.0	v	74.0	-23.0	Pk	-	-	Note 1
5150.0	37.4	v	54.0	-16.6	Avg	-	-	Note 1
5150.0	49.2	h	74.0	-24.8	Pk	-	-	Note 1
5150.0	35.6	h	54.0	-18.4	Avg	-	-	Note 1
5350.0	52.1	v	74.0	-21.9	Pk	-	-	Note 2
5350.0	38.3	v	54.0	-15.7	Avg	-	-	Note 2
5350.0	49.1	h	74.0	-24.9	Pk	-	-	Note 2
5350.0	35.5	h	54.0	-18.5	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 #2a (-48.73 dBc for peak and -53.1 dBc for average) applied to the highest peak and average 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 #2a (-47.72 dBc for peak and -52.45 dBc for average) applied to the highest peak and average field strength measurements of the fundamental signal level.



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
Contact:	Robert Paxman	Proj Eng:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #2c: 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	43.2	v	68.3	-25.1	Note 3	120	1.5	Note 4
15540.0	50.9	v	74.0	-23.1	Pk	360	1.1	Note 2
15540.0	39.5	v	54.0	-14.5	Avg	360	1.1	Note 2
10360.0	40.2	h	68.3	-28.1	Note 3	158	1.3	Note 4
15540.0	51.7	h	74.0	-22.3	Pk	361	1.2	Note 2
15540.0	38.6	h	54.0	-15.4	Avg	361	1.2	Note 2
3453.0	46.0	v	68.3	-22.3	Note 3	360	1.0	Note 4
6906.0	52.9	v	68.3	-15.4	Note 3	0	1.0	Note 4
3453.0	46.8	h	68.3	-21.5	Note 3	360	1.0	Note 4
6906.0	53.9	h	68.3	-14.4	Note 3	0	1.0	Note 4

EUT On Center Channel (Channel 48, 5.26 GHz)

10520.0	44.2	v	68.3	-24.1	Note 3	140	1.3	Note 4
15780.0	50.2	v	74.0	-23.8	Pk	0	1.3	Note 2
15780.0	38.6	v	54.0	-15.4	Avg	0	1.3	Note 2
10520.0	40.6	h	68.3	-27.7	Note 3	360	1.5	Note 4
15780.0	50.6	h	74.0	-23.4	Pk	0	1.3	Note 2
15780.0	38.0	h	54.0	-16.0	Avg	0	1.3	Note 2
3506.0	45.8	v	68.3	-22.5	Note 3	0	1.0	Note 4
7013.0	56.7	v	68.3	-11.6	Note 3	360	1.0	Note 4
3506.0	47.2	h	68.3	-21.1	Note 3	0	1.2	Note 4
7013.0	58.0	h	68.3	-10.3	Note 3	0	1.2	Note 4

EUT On Highest Channel Available (Channel 64, 5.32 GHz)

10640.0	52.3	v	74.0	-21.7	Pk	194	1.1	Note 2
10640.0	43.0	v	54.0	-11.0	Avg	194	1.1	Note 2
15960.0	48.9	v	74.0	-25.1	Pk	0	1.0	Note 2
15960.0	38.4	v	54.0	-15.6	Avg	0	1.0	Note 2
10640.0	53.3	h	74.0	-20.7	Pk	117	1.1	Note 2
10640.0	41.4	h	54.0	-12.7	Avg	117	1.1	Note 2
15960.0	51.0	h	74.0	-23.0	Pk	0	1.0	Note 2
15960.0	37.4	h	54.0	-16.6	Avg	0	1.0	Note 2
3546.7	45.3	v	68.3	-23.0	Note 3	42	1.0	Note 4
7093.3	57.2	v	68.3	-11.1	Note 3	360	1.0	Note 4
3546.7	53.7	h	68.3	-14.6	Note 3	0	1.0	Note 4
7093.3	50.5	h	68.3	-17.8	Note 3	0	1.0	Note 4

See following page for test notes...



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Proj Eng:	Robert Holt
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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.



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	N/A

Radiated Emissions - UNII/LELAN Rx

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: 5/27/2003

Test Engineer: Rafael

Test Location: SVOATS #2

Config. Used: 1

Config Change: None

EUT Voltage: 120V/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.

Ambient Conditions:

Temperature: 18 °C

Rel. Humidity: 73 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1a-1c	RE, Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-23.3dB @ 3453.0MHz

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.



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
Contact:	Robert Paxman	Account Manager:	Robert Holt
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	N/A

Run #1a: Radiated Spurious Emissions, Low Channel @ 5180 MHz

80211a, Receiver Mode

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
3453.000	50.7	v	74.0	-23.3	Pk	170	1.3	
3453.000	43.9	v	54.0	-10.1	Avg	170	1.3	
1368.000	46.7	v	74.0	-27.3	Pk	300	1.0	
1368.000	37.3	v	54.0	-16.7	Avg	300	1.0	
1070.000	45.4	v	74.0	-28.6	Pk	350	1.0	
1070.000	28.9	v	54.0	-25.1	Avg	350	1.0	
6907.000	53.7	v	74.0	-20.3	Pk	140	1.7	
6907.000	43.5	v	54.0	-10.5	Avg	140	1.7	
3453.000	47.7	h	74.0	-26.3	Pk	285	1.6	
3453.000	38.6	h	54.0	-15.4	Avg	285	1.6	
1368.000	47.3	h	74.0	-26.7	Pk	35	1.8	
1368.000	40.1	h	54.0	-13.9	Avg	35	1.8	
1070.000	41.8	h	74.0	-32.2	Pk	210	1.4	
1070.000	27.6	h	54.0	-26.4	Avg	210	1.4	
6907.000	52.2	h	74.0	-21.8	Pk	145	1.6	
6907.000	40.5	h	54.0	-13.5	Avg	145	1.6	

Run #1b: Radiated Spurious Emissions, Center Channel @ 5260 MHz

80211a, Receiver Mode

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBμV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1368.000	46.9	v	74.0	-27.1	Pk	10	2.2	
1368.000	39.2	v	54.0	-14.8	Avg	10	2.2	
3506.000	49.1	v	74.0	-24.9	Pk	350	2.0	
3506.000	39.8	v	54.0	-14.2	Avg	350	2.0	
7013.000	54.5	v	74.0	-19.5	Pk	145	1.5	
7013.000	44.8	v	54.0	-9.2	Avg	145	1.5	
1368.000	47.2	h	74.0	-26.8	Pk	300	2.3	
1368.000	39.9	h	54.0	-14.1	Avg	300	2.3	
3506.000	47.4	h	74.0	-26.6	Pk	345	1.9	
3506.000	38.1	h	54.0	-15.9	Avg	345	1.9	
7013.000	54.0	h	74.0	-20.0	Pk	50	1.9	
7013.000	42.7	h	54.0	-11.3	Avg	50	1.9	



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	N/A

Run #1c: Radiated Spurious Emissions, High Channel @ 5320 MHz 80211a, Receiver Mode

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1368.000	46.1	v	74.0	-27.9	Pk	15	1.8	
1368.000	38.3	v	54.0	-15.7	Avg	15	1.8	
3547.000	48.9	v	74.0	-25.1	Pk	20	1.5	
3547.000	41.4	v	54.0	-12.6	Avg	20	1.5	
7093.000	53.9	v	74.0	-20.1	Pk	145	1.3	
7093.000	43.9	v	54.0	-10.1	Avg	145	1.3	
1368.000	47.9	h	74.0	-26.1	Pk	310	1.8	
1368.000	40.8	h	54.0	-13.2	Avg	310	1.8	
3547.000	48.3	h	74.0	-25.7	Pk	0	1.8	
3547.000	40.1	h	54.0	-13.9	Avg	0	1.8	
7093.000	53.3	h	74.0	-20.7	Pk	315	1.3	
7093.000	40.8	h	54.0	-13.2	Avg	315	1.3	



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, & E, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Intel Corporation

Model

ACER Laptop w/ WM3B2100A

Date of Last Test: 5/27/2003



EMC Test Data

Client:	Intel Corporation	Job Number:	J51307
Model:	ACER Laptop w/ WM3B2100A	T-Log Number:	T51308
		Account Manager:	Robert Holt
Contact:	Robert Paxman		
Emissions Spec:	FCC Part 15 B, C, & E, RSS-210 is	Class:	Radio
Immunity Spec:	-	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 Acer Laptop (Model: TravelMate C110). 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
Acer	TravelMate C110	Laptop		PU5MS2133

Other EUT Details

The EUT is the mini PCI card installed into the host laptop.

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	-	-	None

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



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Immunity Spec:	-	Environment:	-

Test Configuration #2

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Hewlett Packard	Deskjet 3820	USB Printer	CN2451B1YS	

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)
AC	120Vac outlet	3 prong	Unshielded	1.8

Note: Only a serial device was connected. No parallel ports available. This test was with minimum system setup only.

EUT Operation During Emissions (Digital)

The transmitter was set to operate on the center channel of the 5.15 - 5.35 Ghz band (preliminary testing demonstrated that the radiated emissions below 1Ghz were independent of operating channel). The laptop was configured to display a scrolling "H" pattern on its display. Emissions below 1Ghz were measured with the laptop screen vertical as this configuration produced the highest levels of emissions.



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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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: 5/23/2003

Test Engineer: volivas

Test Location: SVOATS #2

Config. Used: 2

Config Change: none

EUT Voltage: 230V/50Hz

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: 14 °C
Rel. Humidity: 83 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -1000 MHz, Preliminary Scan	EN55022B	Eval	-4.0dB @ 673.917MHz
2	RE, 30 - 1000MHz, Maximized Emissions	EN55022B	Pass	-4.0dB @ 673.917MHz
3	RE, 30 - 1000MHz, Maximized Emissions	FCC B	Pass	-10.8dB @ 234.135MHz
4	RE, 1000 - 2000 MHz, Maximized Emissions	FCC B	Pass	-12.9dB @ 1370.0MHz

Modifications Made During Testing:

No modifications were made to the EUT during testing



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Deviations From The Standard

No deviations were made from the requirements of the standard.

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

Acer (5230)

Frequency	Level	Pol	EN55022 B		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
673.917	33.0	H	37.0	-4.0	QP	250	4.0	
234.135	32.5	V	37.0	-4.5	QP	64	1.0	
228.035	24.4	V	30.0	-5.6	QP	144	1.0	
228.024	22.3	H	30.0	-7.7	QP	224	3.7	
223.806	21.5	H	30.0	-8.5	QP	290	3.4	
223.806	21.2	V	30.0	-8.8	QP	202	1.0	
669.842	28.0	H	37.0	-9.0	QP	91	1.0	Note 1
225.992	20.7	H	30.0	-9.3	QP	292	4.0	
432.060	26.9	V	37.0	-10.1	QP	218	1.0	
912.126	25.6	V	37.0	-11.4	QP	83	1.0	
224.007	18.5	H	30.0	-11.5	QP	274	1.0	
669.842	25.2	V	37.0	-11.8	QP	200	1.0	Note 1
217.845	17.4	H	30.0	-12.6	QP	160	1.0	
32.002	14.0	V	30.0	-16.0	QP	320	1.0	
32.579	13.8	V	30.0	-16.2	QP	0	1.0	
588.393	19.8	H	37.0	-17.2	QP	82	1.0	
331.857	19.4	H	37.0	-17.6	QP	44	2.5	
584.318	19.4	H	37.0	-17.6	QP	350	1.0	
329.820	13.4	H	37.0	-23.6	QP	332	4.0	

Note 1: Antenna brought into 3M and the measurement extrapolated to 10M by subtracting 10.5dB from the reading.

Run #2: Maximized Readings From Run #1

Frequency	Level	Pol	EN55022 B		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
673.917	33.0	H	37.0	-4.0	QP	250	4.0	EUT+AMBIENT
234.135	32.5	V	37.0	-4.5	QP	64	1.0	
228.035	24.4	V	30.0	-5.6	QP	144	1.0	
228.024	22.3	H	30.0	-7.7	QP	224	3.7	
223.806	21.5	H	30.0	-8.5	QP	290	3.4	
223.806	21.2	V	30.0	-8.8	QP	202	1.0	



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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	Class:	Radio

Run #3: Maximized Readings From Run #1 tested to FCC B limit

Measurements made at 3m per FCC requirements.

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
234.135	35.2	V	46.0	-10.8	QP	360	1.0	
228.024	34.8	H	46.0	-11.2	QP	124	1.0	
223.806	33.7	H	46.0	-12.3	QP	305	1.0	
228.035	31.1	V	46.0	-14.9	QP	0	1.0	
673.917	30.4	H	46.0	-15.6	QP	344	1.0	EUT+AMBIENT
223.806	29.7	V	46.0	-16.3	QP	75	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	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1370.000	41.1	H	54.0	-12.9	Avg	150	1.8	
1370.000	40.5	V	54.0	-13.5	Avg	166	1.0	
2000.000	37.2	V	54.0	-16.8	Avg	360	1.0	
2000.000	37.1	H	54.0	-16.9	Avg	360	1.0	
1137.500	33.5	V	54.0	-20.5	Avg	83	1.0	
1137.500	31.6	H	54.0	-22.4	Avg	0	1.0	
2000.000	50.0	V	74.0	-24.0	Pk	360	1.0	
1370.000	49.9	H	74.0	-24.1	Pk	150	1.8	
1370.000	49.9	V	74.0	-24.1	Pk	166	1.0	
2000.000	49.4	H	74.0	-24.6	Pk	360	1.0	
1137.500	49.2	V	74.0	-24.8	Pk	83	1.0	
1137.500	43.9	H	74.0	-30.1	Pk	0	1.0	



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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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: 5/23/2003
Test Engineer: volivas
Test Location: SVOATS #2

Config. Used: 2
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: 14 °C
Rel. Humidity: 83 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	EN55022 B	Pass	-6.9dB @ 0.498MHz
2	CE, AC Power, 120V/60Hz	EN55022 B	Pass	-9.9dB @ 0.211MHz

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.



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Spec:	FCC Part 15 B, C, & E, RSS-210 issue 5	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	
0.498	39.1	Line 1	46.0	-6.9	AV	
0.214	44.5	Neutral	53.0	-8.5	AV	
0.281	41.2	Neutral	50.7	-9.5	AV	
1.064	36.0	Neutral	46.0	-10.0	AV	
0.214	42.6	Line 1	53.0	-10.4	AV	
0.214	50.7	Neutral	63.0	-12.3	QP	
0.281	46.5	Neutral	60.7	-14.2	QP	
0.214	48.2	Line 1	63.0	-14.8	QP	
0.498	41.1	Line 1	56.0	-14.9	QP	
1.064	36.9	Neutral	56.0	-19.1	QP	
1.053	7.3	Line 1	46.0	-38.7	AV	
1.053	15.1	Line 1	56.0	-40.9	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	
0.211	43.1	Neutral	53.0	-9.9	AV	
0.209	41.5	Line 1	53.2	-11.7	AV	
0.211	50.6	Neutral	63.0	-12.4	QP	
0.426	34.7	Line 1	47.3	-12.6	AV	
0.284	36.9	Neutral	50.7	-13.8	AV	
0.284	36.4	Line 1	50.7	-14.3	AV	
0.209	48.5	Line 1	63.2	-14.7	QP	
0.349	32.8	Neutral	49.0	-16.2	AV	
0.284	43.8	Neutral	60.7	-16.9	QP	
0.284	42.0	Line 1	60.7	-18.7	QP	
0.426	38.1	Line 1	57.3	-19.2	QP	
0.349	37.1	Neutral	59.0	-21.9	QP	