FCC CFR47 PART 15 SUBPART E
CERTIFICATION
CLASS II PERMISSIVE CHANGE

TEST REPORT

FOR

802.11a/b/g MINI PCI TYPE 3A CARD

MODEL NUMBER: WM3A2915ABG

FCC ID: E2K5HCKT

REPORT NUMBER: 04U3016-2

ISSUE DATE: OCTOBER 14, 2004

Prepared for
DELL COMPUTER CORPORATION
ONE DELL WAY
ROUND ROCK, TX 78682 USA

Prepared by
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Revision History

Rev.	Revisions	Revised By

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1. TEST RESULT DECLARATION

COMPANY NAME: DELL COMPUTER CORPORATION
ONE DELL WAY
ROUND ROCK, TX 78682, USA

EUT DESCRIPTION: 802.11a/b/g MINI PCI TYPE 3A CARD

MODEL: WM3A2915ABG

DATE TESTED: OCTOBER 5 – 11, 2004

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

YAN ZHENG
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN & HITACHI H. SOLANKI
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The EUT is an 802.11a/b/g Mini PCI type 3A card installed in DELL Gilbert platform with Wistron Triple-Band antenna and DELL Gilbert platform with Hitachi Monoploeantenna.

The transmitter has a maximum peak conducted output power as follows:

5150 to 5250 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5250	802.11a	11.5	14.13

5250 to 5350 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5250 - 5320	802.11a	16.3	42.66

DELL GILBERT LAPTOP WITH WISTRON ANTENNA
The radio utilizes two identical internal PIFA antennas for diversity. The Wistron antenna (model DC330014500) has a maximum gain of 2.61 dBi in the 2.4 GHz band and 2.37 dBi in the 5 GHz band.

DELL GILBERT LAPTOP WITH HITACHI ANTENNA
The radio utilizes two identical internal Monopole antennas for diversity. The Hitachi antenna (model HFT17-DL03) has a maximum gain of 1.5 dBi in the 2.4 GHz band and 5.1 dBi in the 5 GHz band.

3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/2001, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

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LAB CODE:200065-0

No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

5.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Preamplifier, 1 ~ 26 GHz	**Miteq**	**NSP2600-44**	**646456**	**8/17/2005**
Antenna, Horn 1 ~ 18 GHz	**EMCO**	**3115**	**2238**	**9/12/2005**
Antenna, Horn, 18 ~ 26 GHz	**ARA**	**MWH-1826/B**	**1013**	**9/12/2005**
Spectrum Analyzer 20 Hz ~ 44 GHz	**Agilent**	**E4446A**	**US42070220**	**4/1/2005**
Peak Power Meter	**Agilent**	**E4416A**	**GB41291160**	**11/7/2004**
EMI Test Receiver	**R & S**	**ESHS 20**	**827129/006**	**10/22/2005**
LISN, 10 kHz ~ 30 MHz	**FCC**	**LISN-50/250-25-2**	**2023**	**8/30/2005**
Site A Line Stabilizer / Conditioner	**Tripplite**	**LC-1800a**	**A0051681**	**CNR**
LISN, 10 kHz ~ 30 MHz	**Solar**	**8012-50-R-24-BNC**	**8379443**	**10/13/2004**
AC Power Source, 10KVA	**ACS**	**AFC-10K-AFC-2**	**J1568**	**CNR**
EMI Receiver, 9 kHz ~ 2.9 GHz	**HP**	**8542E**	**3942A00286**	**11/21/2004**

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST					
Description	Manufacturer	Model	Serial Number	FCC	NOTES
LAPTOP	DELL	INSPIRON 9200	GIL056P2		with WNC-X02; #56
LAPTOP	DELL	INSPIRON 9200	GIL057P2		with HITACHIX02; #57
AC ADAPTER	DELL	PA-1900-02D	1B35	N/A	FOR LAPTOP#56
AC ADAPTER	DELL	PA-1900-02D	1AC8	N/A	FOR LAPTOP#57

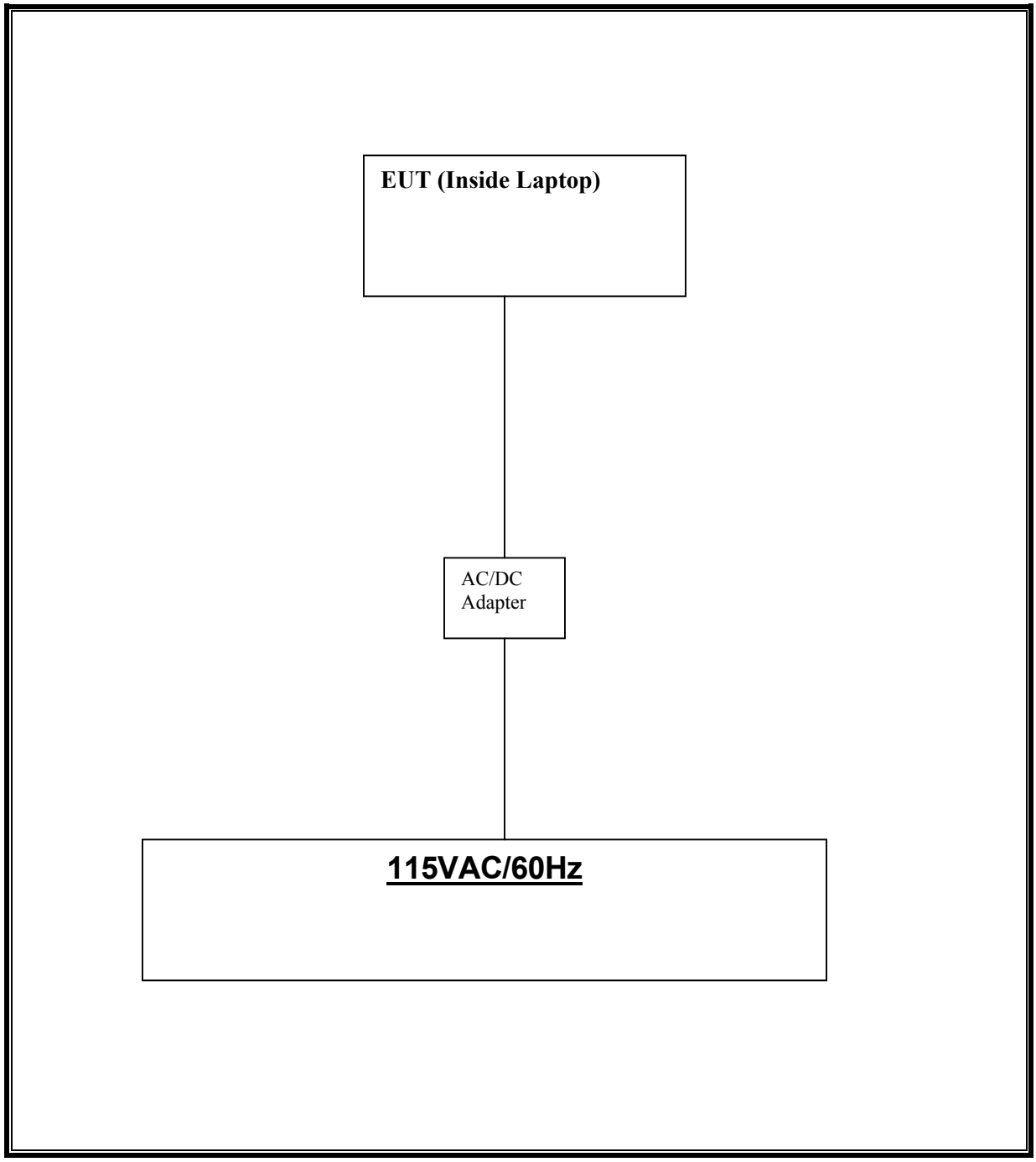
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	USA115V	Unsheilded	1m	
2	DC	1	DC	Unsheilded	1.5m	Ferrite at EUT

TEST SETUP

The EUT is installed in a host laptop computer. And the test software exercised the radio card

SETUP DIAGRAM FOR TESTS



7. APPLICABLE LIMITS AND TEST RESULTS

7.1.1. PEAK POWER

LIMIT

§15.407 (a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

§15.407 (a) (1) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

LIMITS AND RESULTS FOR WISTRON ANTENNA

No non-compliance noted:

Limit in 5150 to 5250 MHz Band

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	20.32	17.08	2.37	17.00

Limit in 5250 to 5350 MHz Band

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Mid	5260	24	20.32	24.08	2.37	24.00
High	5320	24	20.99	24.22	2.37	24.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	11.5	17.00	-5.50
Mid	5260	16.3	24.00	-7.70
High	5320	16.2	24.00	-7.80

LIMITS AND RESULTS FOR HITACHI ANTENNA

Limit in 5150 to 5250 MHz Band

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	20.32	17.08	5.10	17.00

Limit in 5250 to 5350 MHz Band

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Mid	5260	24	20.32	24.08	5.10	24.00
High	5320	24	20.99	24.22	5.10	24.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	11.5	17.00	-5.50
Mid	5260	16.3	24.00	-7.70
High	5320	16.2	24.00	-7.80

7.1.2. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2

RESULTS

No non-compliance noted:

HITACHI ANTENNA

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11a	1.0	16.30	5.10	3.31

WISTRON ANTENNA

Mode	Power Density Limit (mW/cm^2)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
802.11a	1.0	16.30	2.37	2.42

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.2. RADIATED EMISSIONS

7.2.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

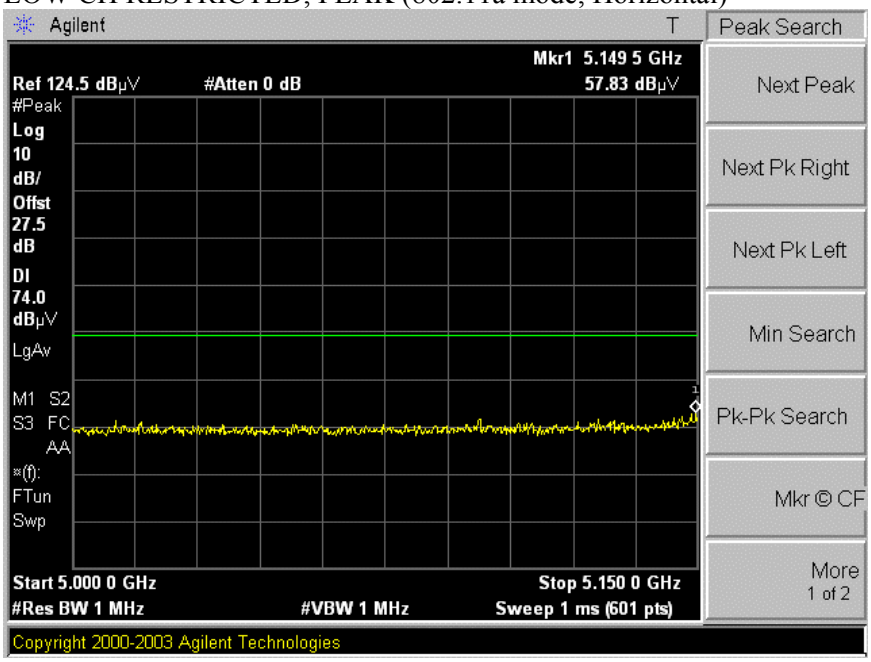
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

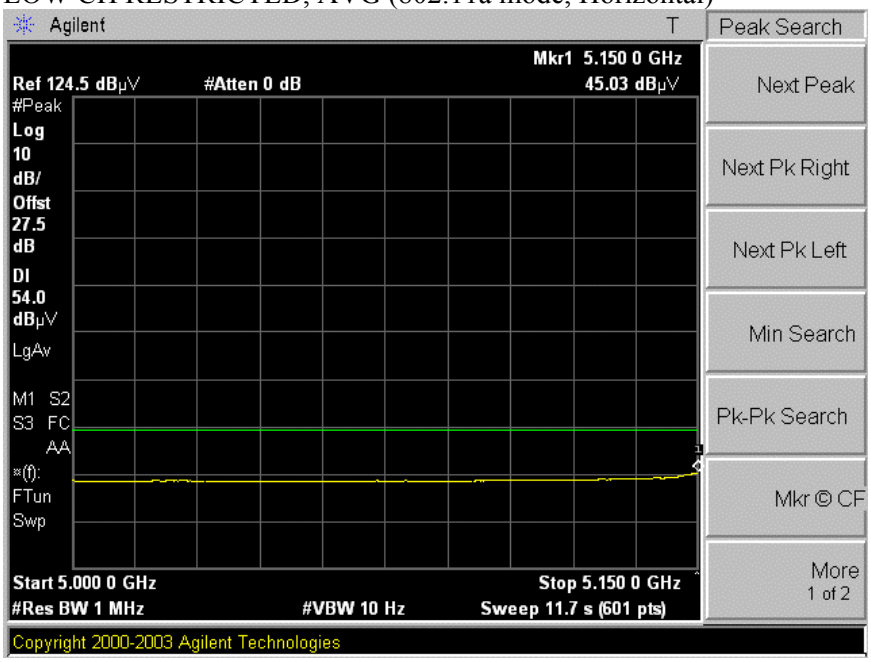
7.2.2. TRANSMITTER ABOVE 1 GHZ FOR 5150 TO 5350 MHz BAND WITH HITACHI ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

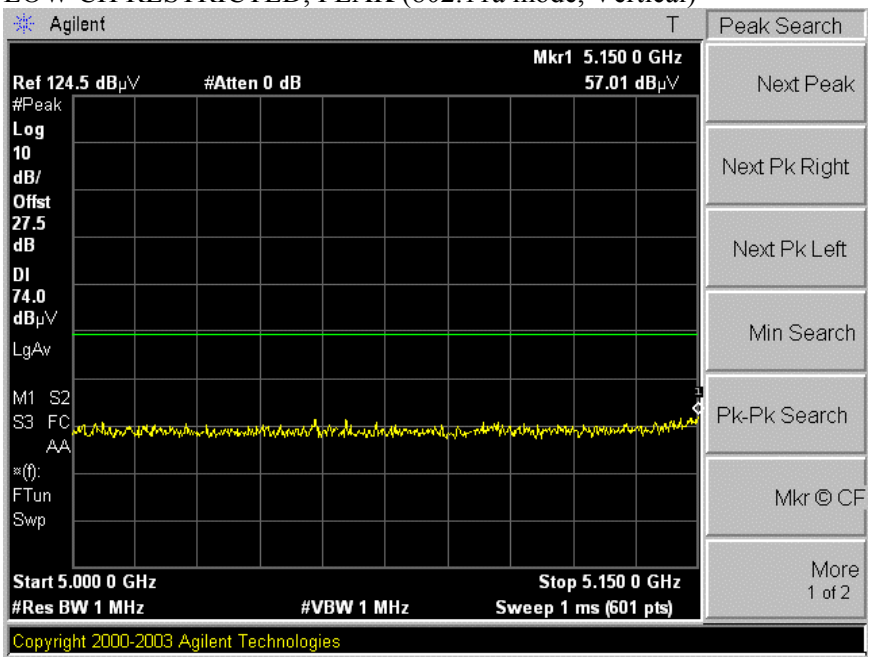


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

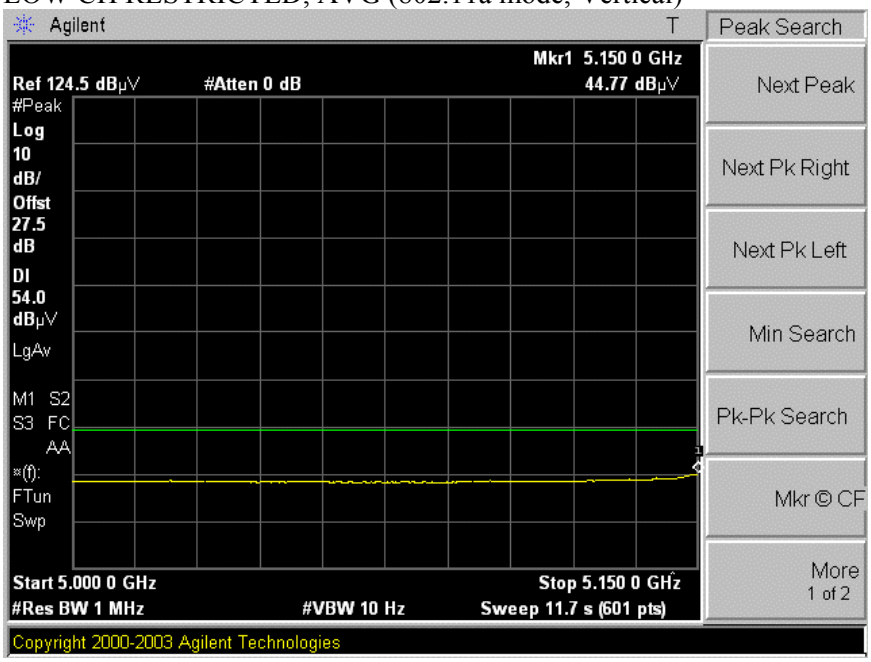


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

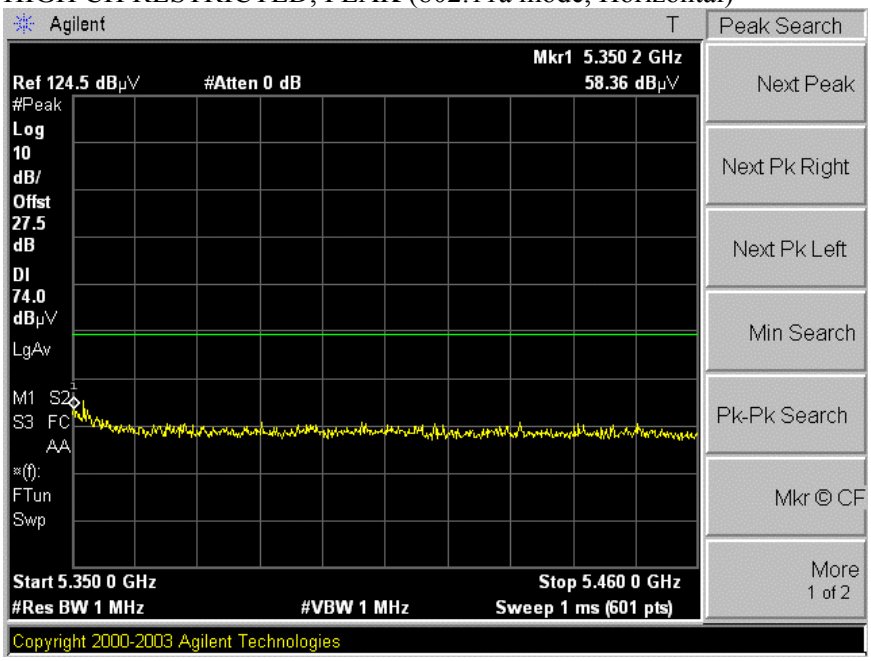


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

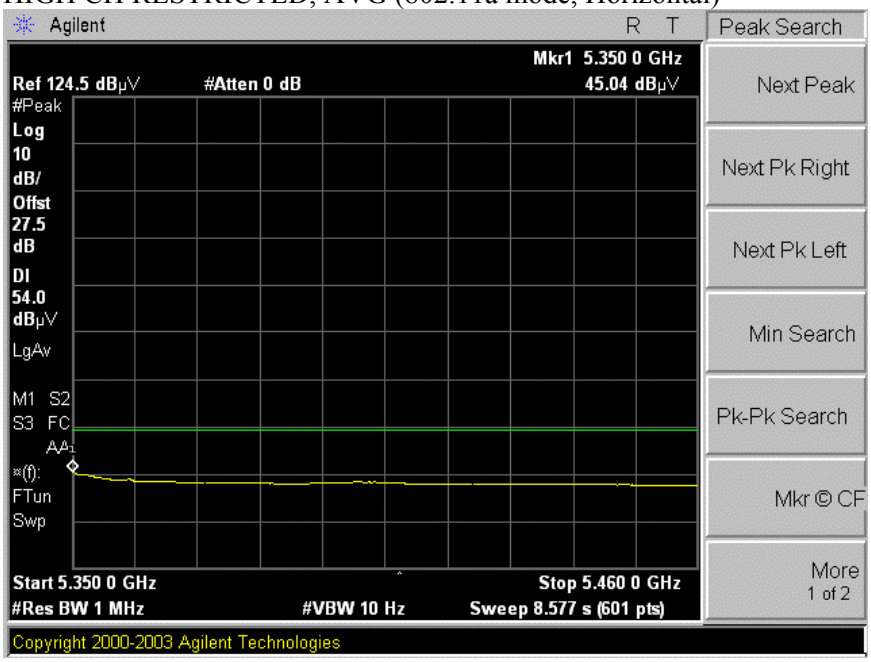


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

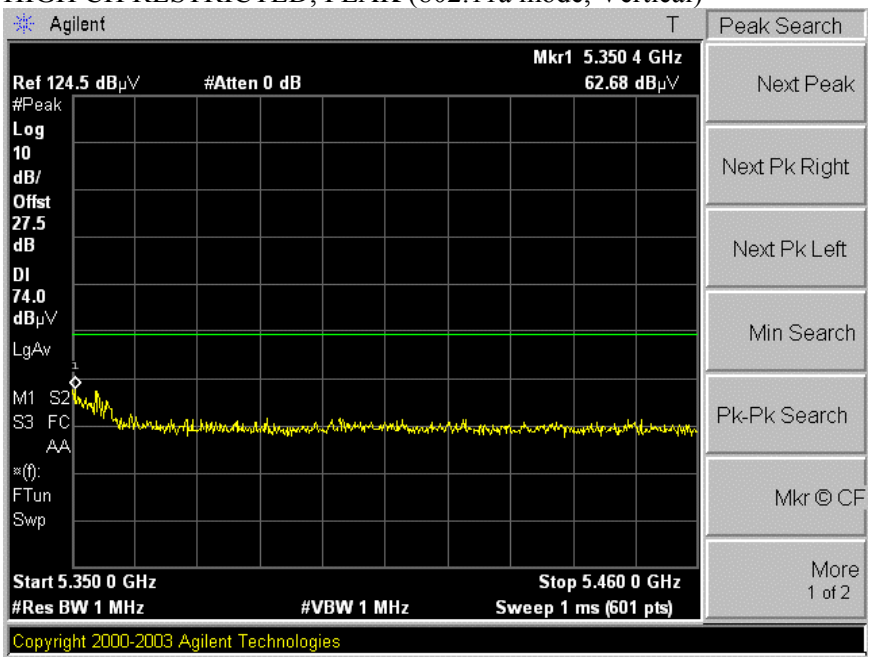


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

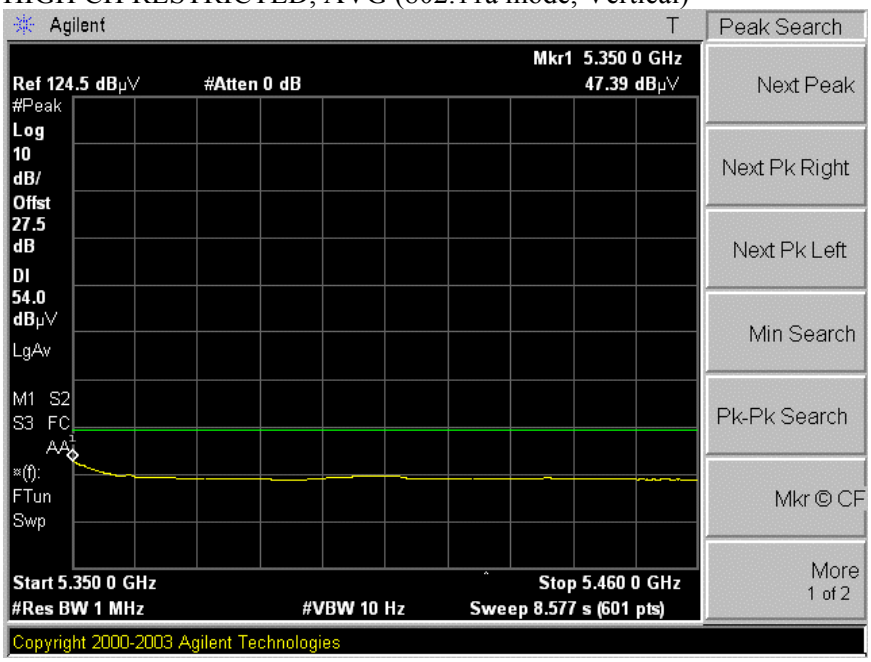


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

10/05/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Thanh Nguyen
Project #: 04U3016-1
Company: INTEL Corporation
EUT Descrip.: 802.11a/b/g Mini PCI type 3B Card, FCC ID#E2K5HCKT.
EUT M/N:
Test Target: FCC Part 15/247
Mode Oper: Tx a UNII Mode

Test Equipment:

EMCO Horn 1-18GHz: T60; S/N: 2238 @3m
Pre-amplifer 1-26GHz: T63 Miteq 646456
Pre-amplifer 26-40GHz:
Horn >18GHz:

Hi Frequency Cables: 2 foot cable; 3 foot cable; 4 foot cable: 4_Thanh; 12 foot cable: 12_Thanh

HPF:
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

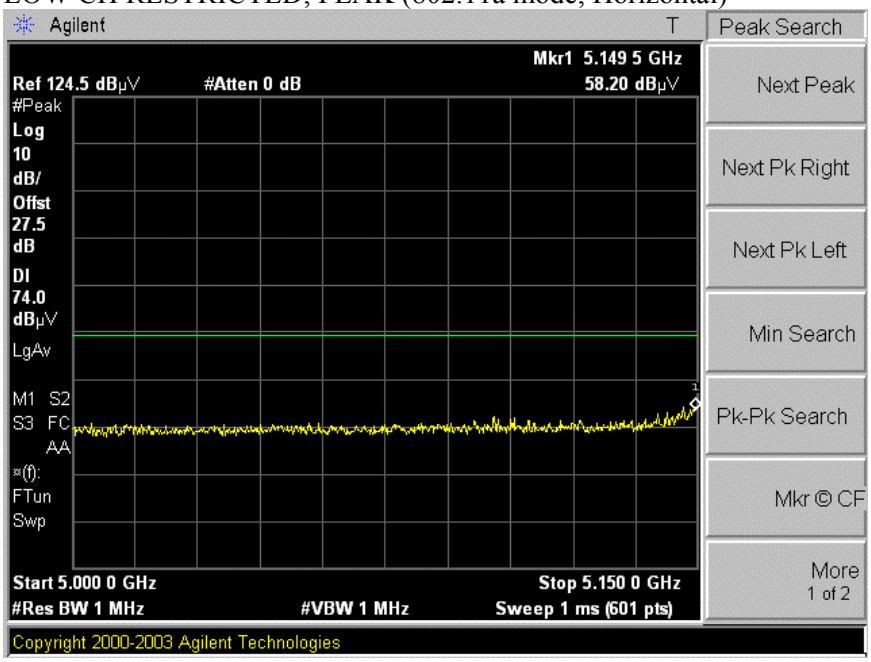
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
HIGH Channel															
Harmonics															
10.640	1.0	46.2	34.1	38.1	6.3	-33.6	-9.5	0.0	47.4	35.4	74	54	-26.6	-18.6	V
10.640	1.0	47.3	34.1	38.1	6.3	-33.6	-9.5	0.0	48.6	35.4	74	54	-25.4	-18.6	H
No harmonic emission above 2nd harmonic															
Spurious emissions															
1.554	3.0	61.5	40.1	25.9	1.9	-36.7	0.0	0.0	52.6	31.3	74	54	-21.4	-22.7	V
1.577	3.0	54.2	38.0	26.0	1.9	-36.7	0.0	0.0	45.4	29.2	74	54	-28.6	-24.8	H
MID Channel															
Harmonics															
10.520	1.0	45.4	34.1	38.1	6.2	-33.5	-9.5	0.0	46.8	35.5	74	54	-27.2	-18.5	V
10.520	1.0	45.9	33.5	38.1	6.2	-33.5	-9.5	0.0	47.3	34.9	74	54	-26.7	-19.1	H
No harmonic emission above 2nd harmonic															
Spurious emissions															
1.579	3.0	53.9	37.0	26.0	1.9	-36.7	0.0	0.0	45.1	28.3	74	54	-28.9	-25.7	H
1.558	3.0	61.3	40.0	26.0	1.9	-36.7	0.0	0.0	52.4	31.2	74	54	-21.6	-22.8	V
LOW Channel															
Harmonics															
10.360	3.0	46.5	34.0	38.2	6.2	-33.3	0.0	0.0	57.6	45.1	74	54	-16.4	-8.9	V
10.360	3.0	44.8	33.2	38.2	6.2	-33.3	0.0	0.0	55.9	44.3	74	54	-18.1	-9.7	H
No harmonic emission above 2nd harmonic															
Spurious emissions															
1.156	3.0	60.9	40.4	24.3	1.6	-36.8	0.0	0.0	50.0	29.5	74	54	-24.0	-24.5	V
1.577	3.0	54.2	37.0	26.0	1.9	-36.7	0.0	0.0	45.5	28.3	74	54	-28.5	-25.7	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

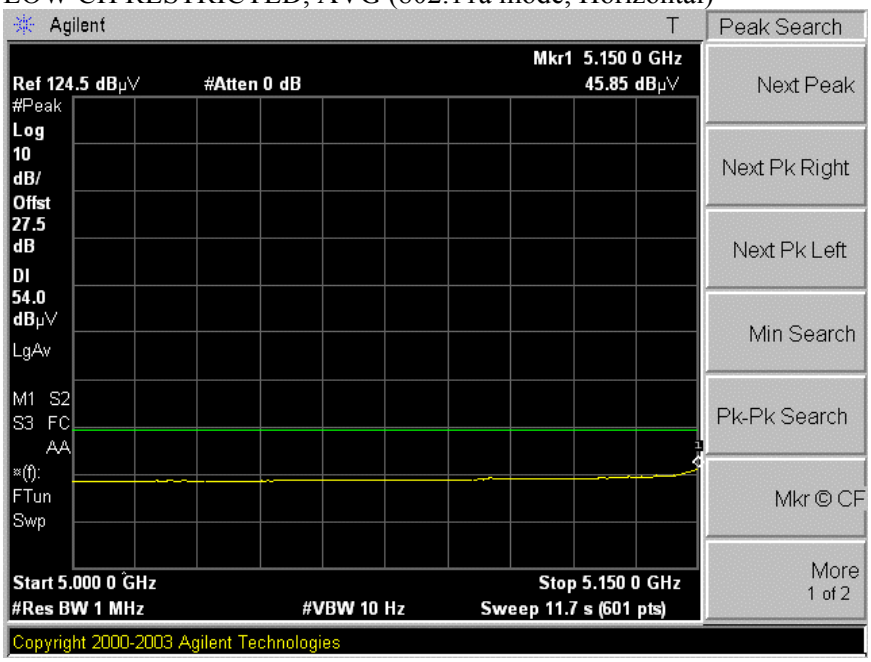
7.2.3. TRANSMITTER ABOVE 1 GHZ FOR 5150 TO 5350 MHz BAND WITH WISTRON ANTENNA

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)

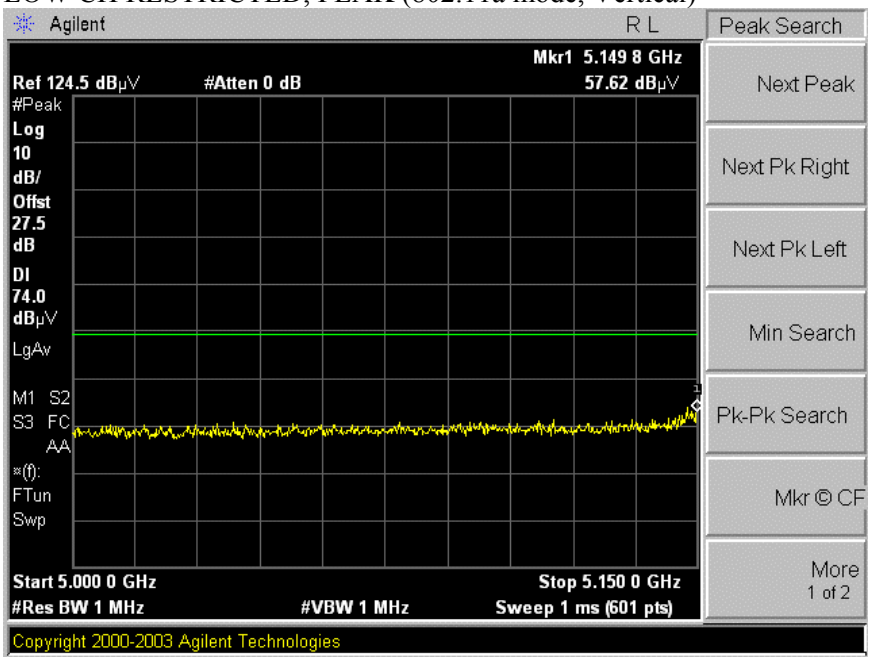


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

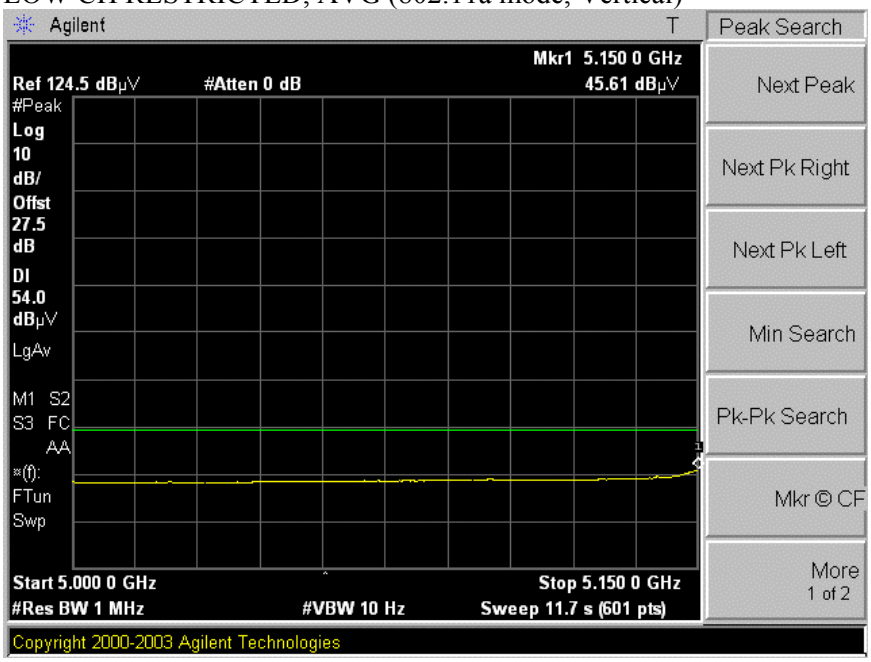


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (802.11a mode, Vertical)

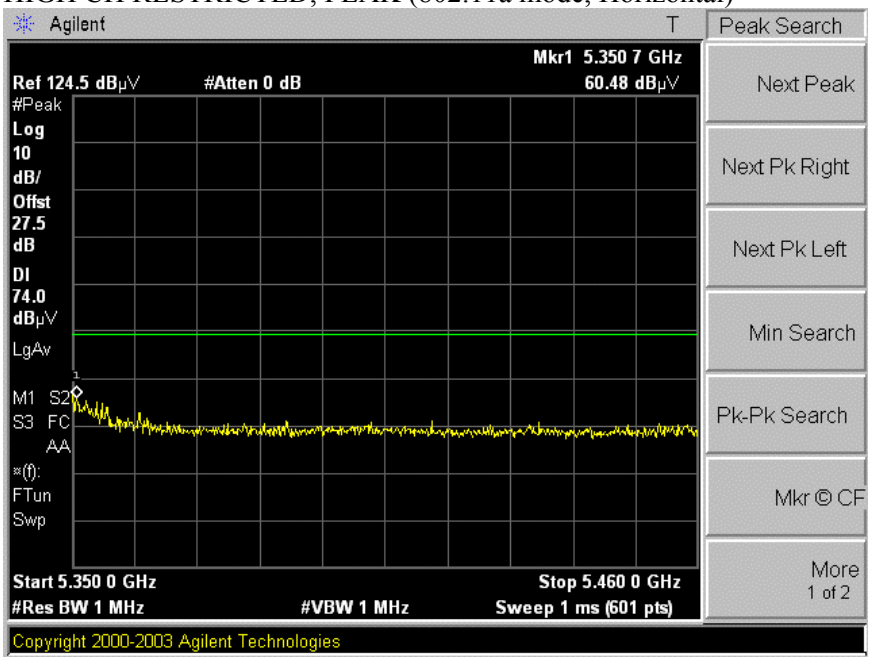


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

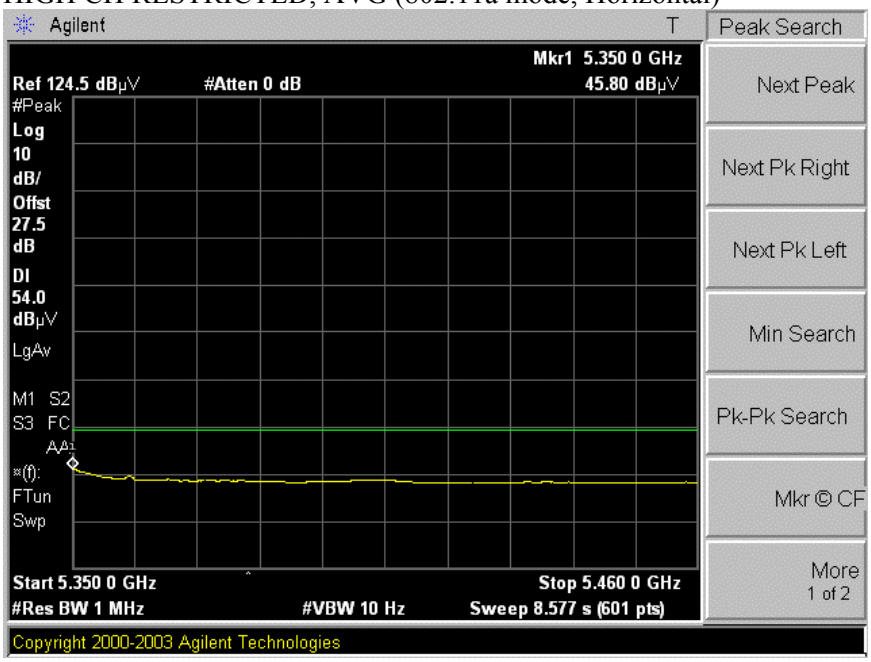


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

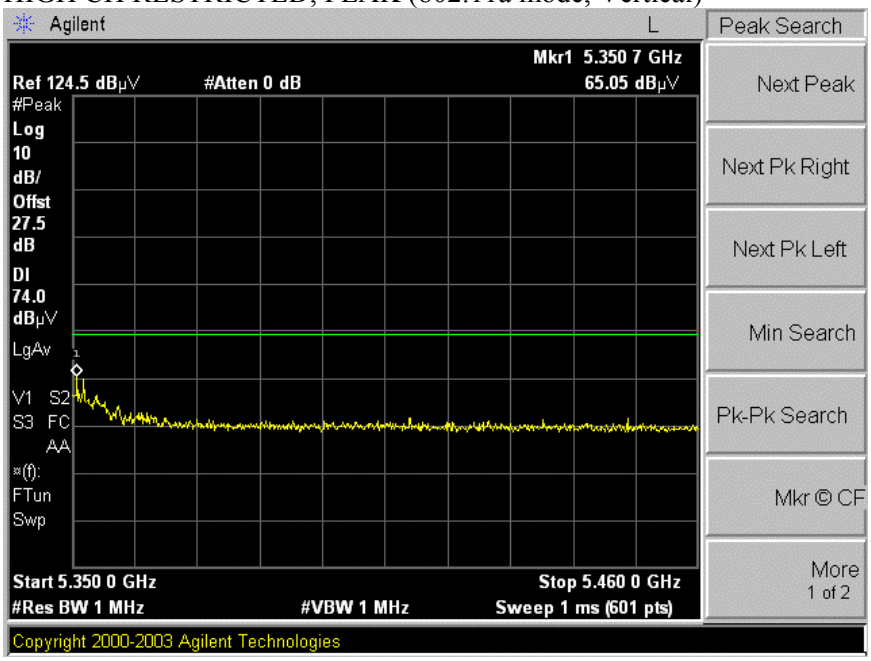


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

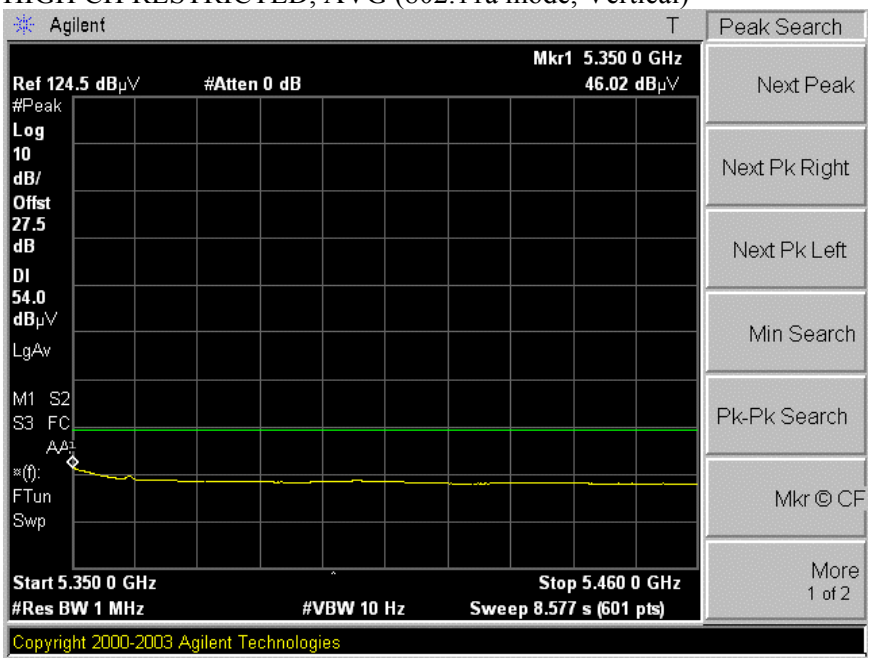


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

10/05/04 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Thanh Nguyen
Project #: 04U3016-1
Company: INTEL Corporation
EUT Descrip.: 802.11a/b/g Mini PCI type 3B Card, FCC ID#E2K5HCKT.
EUT M/N:
Test Target: FCC Part 15/247
Mode Oper: Tx a UNII Mode

Test Equipment:

EMCO Horn 1-18GHz: T60; S/N: 2238 @3m
Pre-amplifer 1-26GHz: T63 Miteq 646456
Pre-amplifer 26-40GHz:
Horn >18GHz:

Hi Frequency Cables
2 foot cable:
3 foot cable:
4 foot cable: 4_Thanh
12 foot cable: 12_Thanh

HPF:
Reject Filter:

Peak Measurements
RBW=VBW=1MHz

Average Measurements
RBW=1MHz ; VBW=10Hz

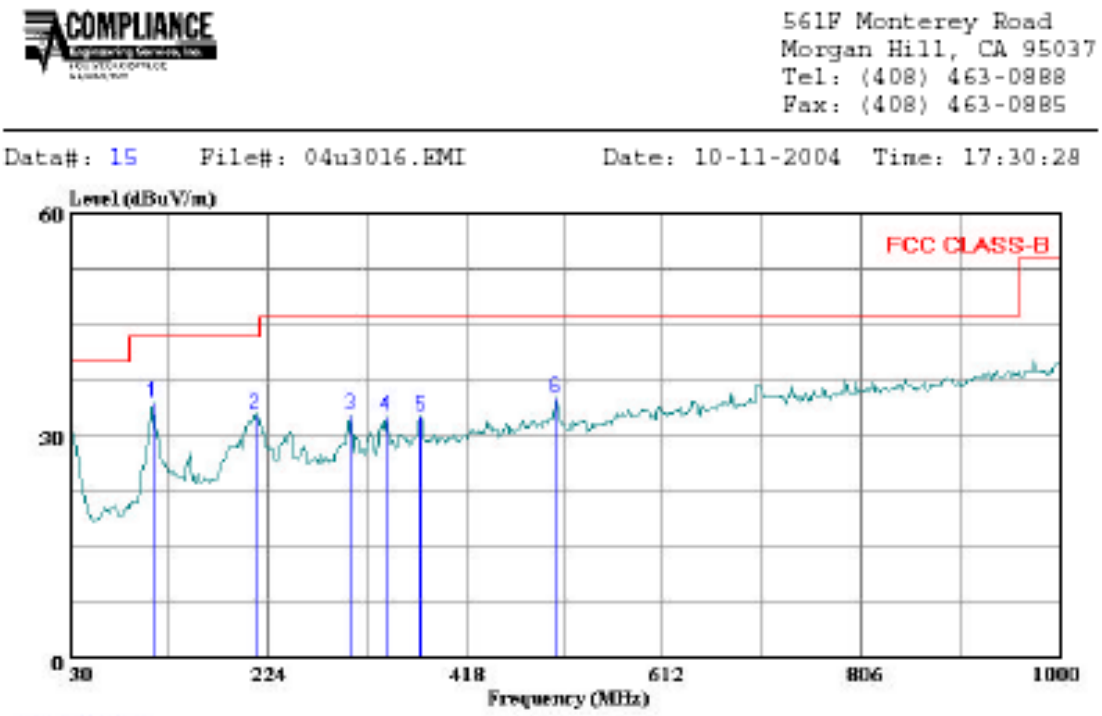
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
HIGH Channel															
Harmonics															
10.640	1.0	46.2	34.1	38.1	6.3	-33.6	-9.5	0.0	47.4	35.4	74	54	-26.6	-18.6	V
10.640	1.0	47.3	34.1	38.1	6.3	-33.6	-9.5	0.0	48.6	35.4	74	54	-25.4	-18.6	H
No harmonic emission above 2nd harmonic															
Spurious emissions															
1.554	3.0	61.5	40.1	25.9	1.9	-36.7	0.0	0.0	52.6	31.3	74	54	-21.4	-22.7	V
1.577	3.0	54.2	38.0	26.0	1.9	-36.7	0.0	0.0	45.4	29.2	74	54	-28.6	-24.8	H
MID Channel															
Harmonics															
10.520	1.0	45.4	34.1	38.1	6.2	-33.5	-9.5	0.0	46.8	35.5	74	54	-27.2	-18.5	V
10.520	1.0	45.9	33.5	38.1	6.2	-33.5	-9.5	0.0	47.3	34.9	74	54	-26.7	-19.1	H
No harmonic emission above 2nd harmonic															
Spurious emissions															
1.579	3.0	53.9	37.0	26.0	1.9	-36.7	0.0	0.0	45.1	28.3	74	54	-28.9	-25.7	H
1.558	3.0	61.3	40.0	26.0	1.9	-36.7	0.0	0.0	52.4	31.2	74	54	-21.6	-22.8	V
LOW Channel															
Harmonics															
10.360	3.0	46.5	34.0	38.2	6.2	-33.3	0.0	0.0	57.6	45.1	74	54	-16.4	-8.9	V
10.360	3.0	44.8	33.2	38.2	6.2	-33.3	0.0	0.0	55.9	44.3	74	54	-18.1	-9.7	H
No harmonic emission above 2nd harmonic															
Spurious emissions															
1.156	3.0	60.9	40.4	24.3	1.6	-36.8	0.0	0.0	50.0	29.5	74	54	-24.0	-24.5	V
1.577	3.0	54.2	37.0	26.0	1.9	-36.7	0.0	0.0	45.5	28.3	74	54	-28.5	-25.7	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

7.2.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH HITACHI ANTENNA

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



HORIZONTAL DATA

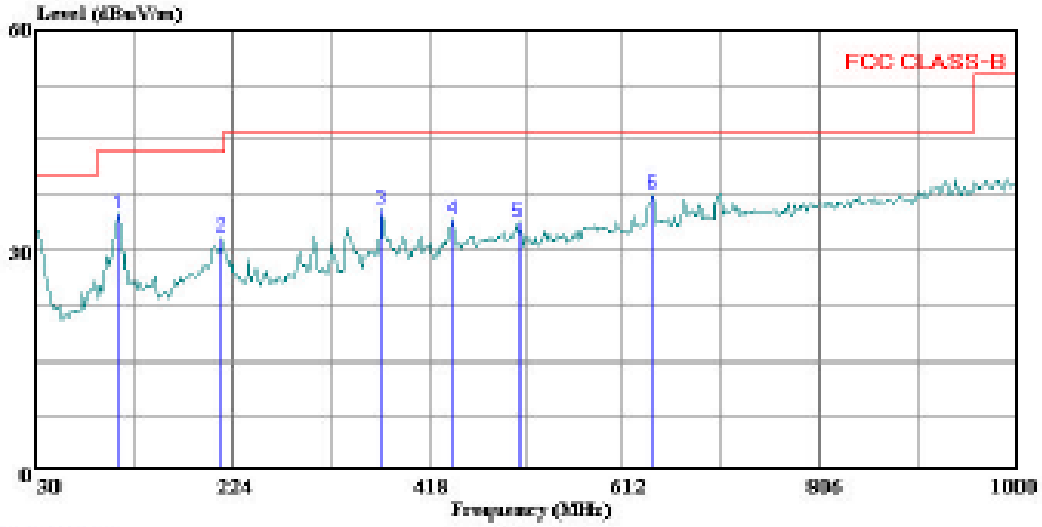
	Freq	Remark	Read Level	Factor	Level	Limit Line	Over Limit
	MHz		dBuV	dB	dBuV/m	dBuV/m	dB
1	111.480	Peak	20.31	14.10	34.41	43.50	-9.09
2	212.360	Peak	19.66	13.22	32.88	43.50	-10.62
3	305.480	Peak	16.35	16.40	32.75	46.00	-13.25
4	339.430	Peak	15.67	17.03	32.70	46.00	-13.30
5	373.380	Peak	14.76	17.92	32.68	46.00	-13.32
6	507.240	Peak	14.02	21.07	35.09	46.00	-10.91

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 13 File#: 04u3016.EMI Date: 10-11-2004 Time: 17:25:26



(Audix ATC)
Trace: 12 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Hitesh H. Solanki
Project #: : 04U3016-1
Company: : INTEL
EUT: : 802.11 a/b/g Mini PCI Type 3B card
Model No: : WNC X02
Configuration: : EUT within a Dell Laptop#57
Target of Test: : FCC Class B
Mode of Operation: Tx, Worst Case configuration

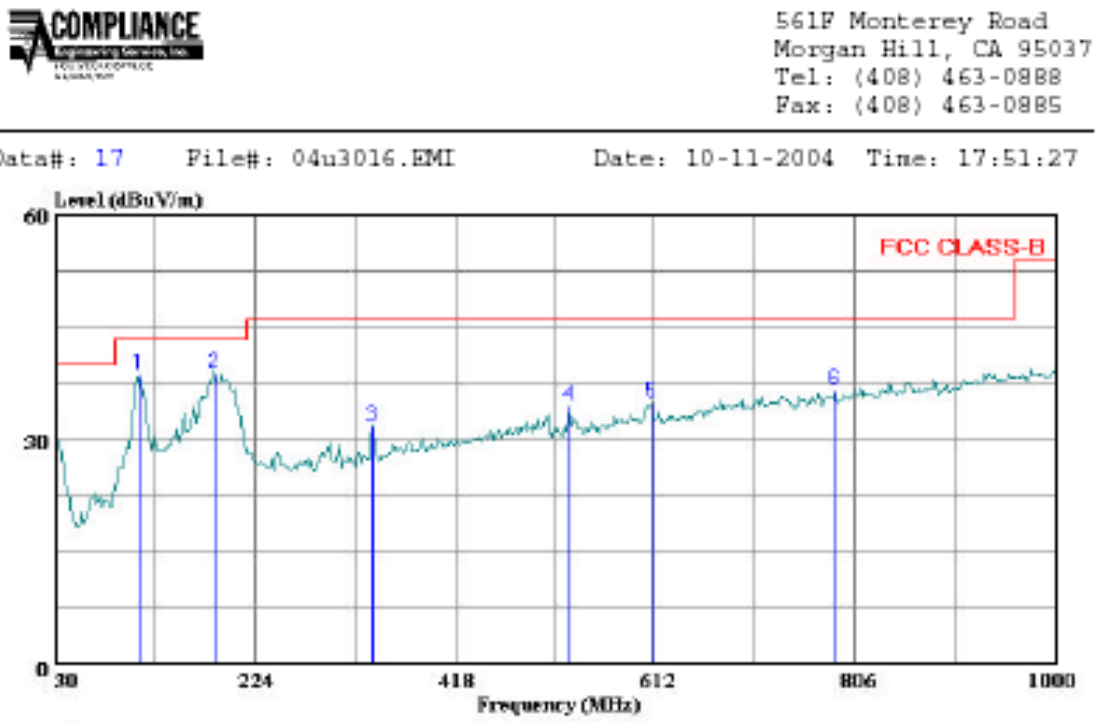
VERTICAL DATA

	Freq	Remark	Read Level	Factor	Level	Limit Line	Over Limit
	MHz		dBuV	dB	dBuV/m	dBuV/m	dB
1	111.480	Peak	20.73	14.10	34.83	43.50	-8.67
2	213.330	Peak	18.36	13.22	31.58	43.50	-11.92
3	371.440	Peak	17.62	17.87	35.49	46.00	-10.51
4	441.280	Peak	14.46	19.61	34.07	46.00	-11.93
5	507.240	Peak	12.64	21.07	33.71	46.00	-12.29
6	640.130	Peak	14.45	23.08	37.53	46.00	-8.47

7.2.5. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz WITH WISTRON ANTENNA

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



HORIZONTAL DATA

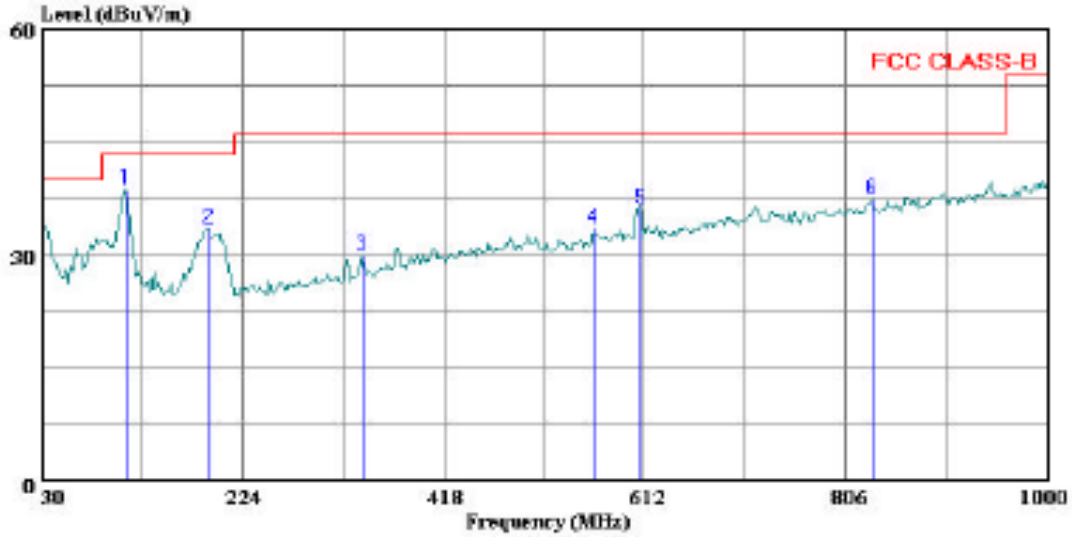
	Freq	Remark	Read Level	Factor	Level	Limit Line	Over Limit
	MHz		dBuV	dB	dBuV/m	dBuV/m	dB
1	111.480	Peak	24.50	14.10	38.60	43.50	-4.90
2	185.200	Peak	25.60	13.32	38.92	43.50	-4.58
3	337.490	Peak	14.72	16.98	31.70	46.00	-14.30
4	528.580	Peak	13.17	21.35	34.52	46.00	-11.48
5	609.090	Peak	12.49	22.41	34.90	46.00	-11.10
6	785.630	Peak	11.35	25.10	36.45	46.00	-9.55

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 19 File#: 04u3016.EMI Date: 10-11-2004 Time: 17:54:44



(Audix ATC)
Trace: 18 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Hitesh H. Solanki
Project #: : 04U3016-1
Company: : INTEL
EUT: : 802.11 a/b/g Mini PCI Type 3B card
Model No: : WNC X02
Configuration: : EUT within a Dell Laptop#56
Target of Test: : FCC Class B
Mode of Operation: Tx, Worst Case configuration

VERTICAL DATA

	Freq	Remark	Read Level	Factor	Level	Limit Line	Over Limit
	MHz		dBuV	dB	dBuV/m	dBuV/m	dB
1	111.480	Peak	24.59	14.10	38.69	43.50	-4.81
2	191.990	Peak	19.93	13.47	33.40	43.50	-10.10
3	339.430	Peak	12.87	17.03	29.90	46.00	-16.10
4	562.530	Peak	11.64	21.75	33.39	46.00	-12.61
5	608.120	Peak	13.75	22.39	36.14	46.00	-9.86
6	832.190	Peak	11.64	25.72	37.36	46.00	-8.64

7.3. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

No non-compliance noted:

6 WORST EMISSIONS

WNC ANTENNA

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.22	51.60	--	39.50	0.00	63.89	53.89	-12.29	-14.39	L1
0.45	46.50	--	27.30	0.00	57.51	47.51	-11.01	-20.21	L1
0.62	44.10	--	28.30	0.00	56.00	46.00	-11.90	-17.70	L1
0.22	51.70	--	39.50	0.00	63.91	53.91	-12.21	-14.41	L2
0.45	46.40	--	27.30	0.00	57.51	47.51	-11.11	-20.21	L2
0.62	44.10	--	28.30	0.00	56.00	46.00	-11.90	-17.70	L2
6 Worst Data									

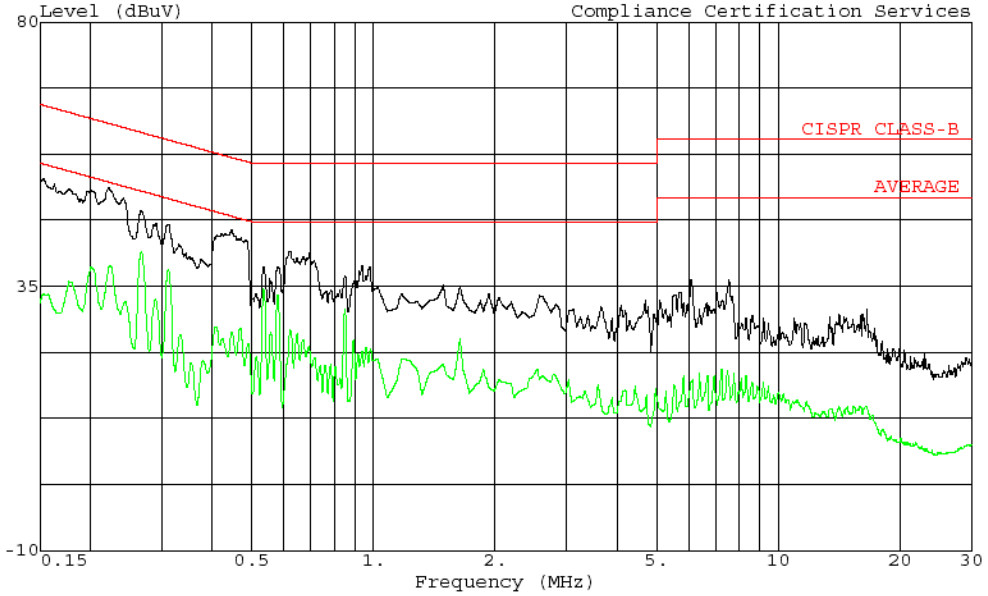
HITACHI ANTENNA

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	55.40	--	41.50	0.00	65.91	55.91	-10.51	-14.41	L1
0.35	46.60	--	38.10	0.00	60.34	50.34	-13.74	-12.24	L1
0.57	44.10	--	32.50	0.00	56.00	46.00	-11.90	-13.50	L1
0.23	50.80	--	39.60	0.00	63.80	53.80	-13.00	-14.20	L2
0.46	45.30	--	27.30	0.00	57.17	47.17	-11.87	-19.87	L2
0.56	46.00	--	34.00	0.00	56.00	46.00	-10.00	-12.00	L2
6 Worst Data									

LINE 1 RESULTS (WNC ANTENNA)

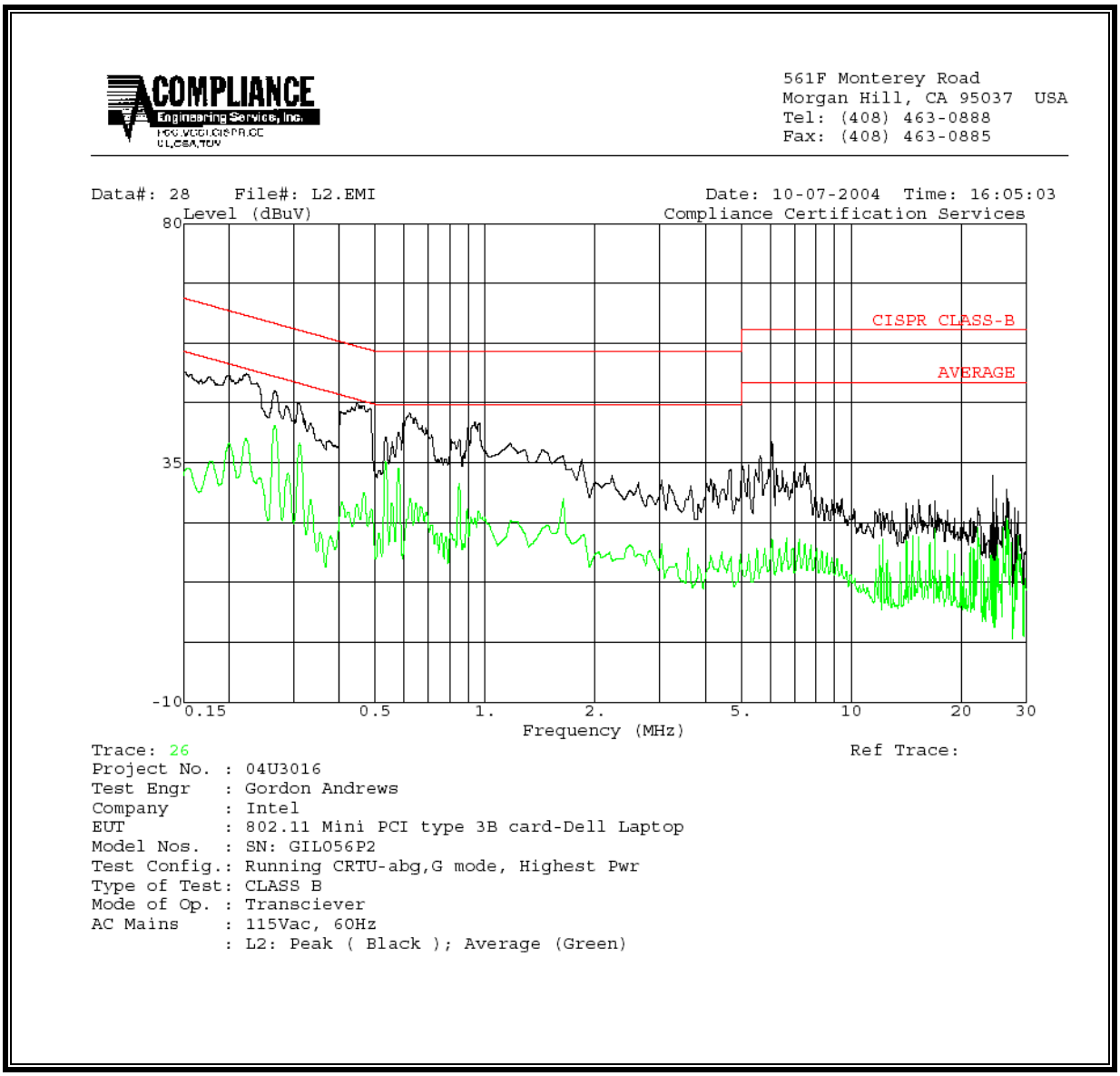
COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037 USA
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 21 File#: L1.EMI Date: 10-07-2004 Time: 15:39:06



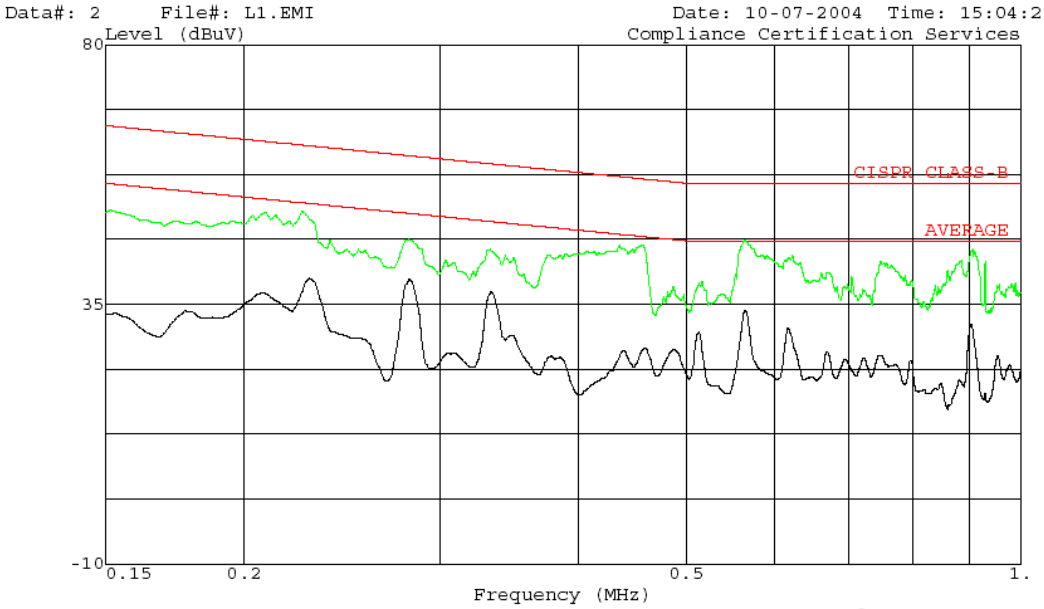
Trace: 19 Ref Trace:
Project No. : 04U3016
Test Engr : Gordon Andrews
Company : Intel
EUT : 802.11 Mini PCI type 3B card-Dell Laptop
Model Nos. : SN: GIL056P2
Test Config.: Running CRTU-abg,G mode, Highest Pwr
Type of Test: CLASS B
Mode of Op. : Transciever
AC Mains : 115Vac, 60Hz
: L1: Peak (Black); Average (Green)

LINE 2 RESULTS (WNC ANTENNA)



LINE 1 RESULTS (HITACHI ANTENNA)

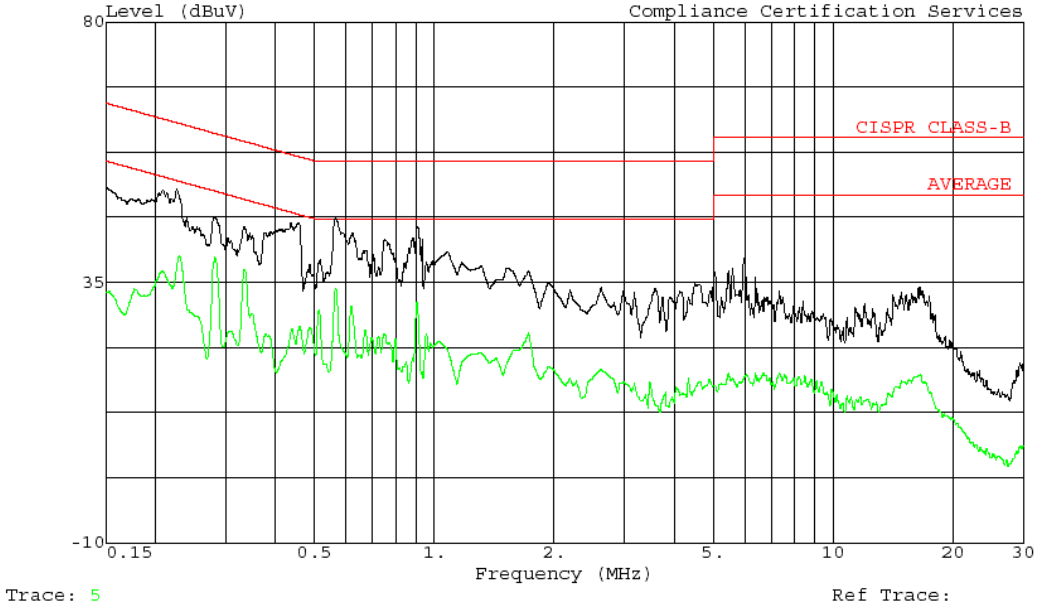
COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037 USA
Tel: (408) 463-0888
Fax: (408) 463-0885



Trace: 1 Ref Trace:
Project No. : 04U3016
Test Engr : Gordon Andrews
Company : Intel
EUT : 802.11 Mini PCI type 3B card-Dell Laptop
Model Nos. : SN: GIL057P2
Test Config.: Running CRTU-abg,G mode, Highest Pwr
Type of Test: CLASS B
Mode of Op. : Transciever
AC Mains : 115Vac, 60Hz
: L1: Peak (Black); Average (Green)

LINE 2 RESULTS (HITACHI ANTENNA)

COMPLIANCE Engineering Services, Inc.
561F Monterey Road
Morgan Hill, CA 95037 USA
Tel: (408) 463-0888
Fax: (408) 463-0885

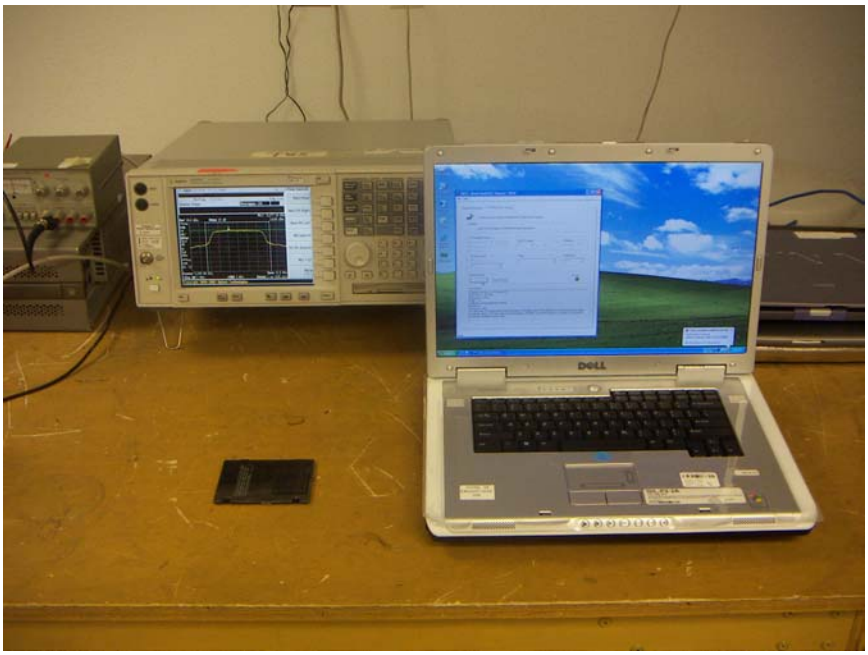


Trace: 5 Ref Trace:
Project No. : 04U3016
Test Engr : Gordon Andrews
Company : Intel
EUT : 802.11 Mini PCI type 3B card-Dell Laptop
Model Nos. : SN: GIL057P2
Test Config.: Running CRTU-abg,G mode, Highest Pwr
Type of Test: CLASS B
Mode of Op. : Transciever
AC Mains : 115Vac, 60Hz
: L2: Peak (Black); Average (Green)

8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT