



**FCC CFR47 PART 15 SUBPART E**

**TEST REPORT**

***FOR***

**802.11a/b MINIPCI TYPE 3B CARD**

**MODEL NUMBER: PA3234U-1MPC, PA3267U-1MPC**

**FCC ID: CJ6UPA3234WL**

**REPORT NUMBER: 03U2054-3**

**ISSUE DATE: 6/30/2003**

*Prepared for*

**TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY  
2-9 SUEHIRO-CHO, OME  
TOKYO, 198-8710  
JAPAN**

*Prepared by*

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## 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY  
2-9 SUEHIRO-CHO, OME  
TOKYO, 198-8710, JAPAN

**EUT DESCRIPTION:** 802.11a/b MINIPCI TYPE 3B CARD

**MODEL:** PA3234U-1MPC, PA3267-1MPC

**MODEL DIFFERENCE:** THE ONLY DIFFERENCE IS THE END-USE APPLICATION OF THE MODULE.

**DATE TESTED:** 6/12 – 6/15/2003

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.

**Note:** The 5.2 GHz band is applicable to this report; the 2.4 GHz band of operation is documented in a separate report. Conducted measurement is documented in separate report.

Approved & Released For CCS By:

Tested By:



MIKE HECKROTTE  
CHIEF ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

NEELESH RAJ  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. DESCRIPTION OF EUT

The EUT is an 802.11a/b Mini PCI Type 3B Card operating in the 5.15 – 5.35GHz band with a peak output power of 17.32dBm (54mW) has a peak antenna gain of 2.7dBi. The changes are as follows:

Add a new host Toshiba computer model PP4012-624F and add three new film antennas.

1. Hitachi Cable, Dual Band Film antenna, model: HTL008, antenna gain 2.7dBi.
2. Hitachi Cable, Wide band film antenna, model: HTL012, antenna gain 0.5dBi.
3. Tyco Electronics AMP, Dual band film antenna, TIAN01, antenna gain -0.2dBi.

Testing was performed on the worst-case, highest gain antenna since all three antennas are the same type.

### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.







### 4. FACILITIES AND ACCREDITATION

#### 4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	 R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	 ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	 ELA-171
Taiwan	BSMI	CNS 13438	 SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	 IC2324 A,B,C, and F

## 5. CALIBRATION AND UNCERTAINTY

### 5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

### 5.2. MEASUREMENT UNCERTAINTY

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

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 AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
<b>Bilog Antenna</b>	<b>AR</b>	<b>LPB-25201A</b>	<b>1185</b>	<b>3/28/2004</b>
<b>EMI Receiver</b>	<b>HP</b>	<b>8542A</b>	<b>3942A00280</b>	<b>11/20/2003</b>
<b>RF Filter Section</b>	<b>HP</b>	<b>85420E</b>	<b>3705A00256</b>	<b>11/20/2003</b>
<b>EMI Test Receiver</b>	<b>R &amp; S</b>	<b>ESHS 20</b>	<b>827129/006</b>	<b>7/17/2004</b>
<b>LISN, 10 kHz ~ 30 MHz</b>	<b>FCC</b>	<b>50/250-25-2</b>	<b>114</b>	<b>9/6/2003</b>
<b>Line Filter</b>	<b>Lindgren</b>	<b>LMF-3489</b>	<b>497</b>	<b>CNR</b>
<b>5GHz reject filter</b>	<b>Micro Tronic</b>	<b>BRM50702</b>	<b>2</b>	<b>N.C.R</b>
<b>Preamplifier, 1 ~ 26 GHz</b>	<b>Miteq</b>	<b>NSP10023988</b>	<b>646456</b>	<b>4/25/2004</b>
<b>Antenna, Horn 1 ~ 18 GHz</b>	<b>EMCO</b>	<b>3115</b>	<b>2238</b>	<b>2/4/2004</b>
<b>Psa Series Spectrum Analyzer</b>	<b>HP</b>	<b>E4440A</b>	<b>US41421507</b>	<b>5/8/2004</b>
<b>Antenna, Horn, 18 ~ 26 GHz</b>	<b>ARA</b>	<b>MWH-1826/B</b>	<b>1013</b>	<b>02/02/04</b>



## 6. SETUP OF EQUIPMENT UNDER TEST

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
LAPTOP	TOSHIBA	PP4012-624FM	92033677	DoC
AC ADAPTER	TOSHIBA	ADP-45XH	215141	DoC

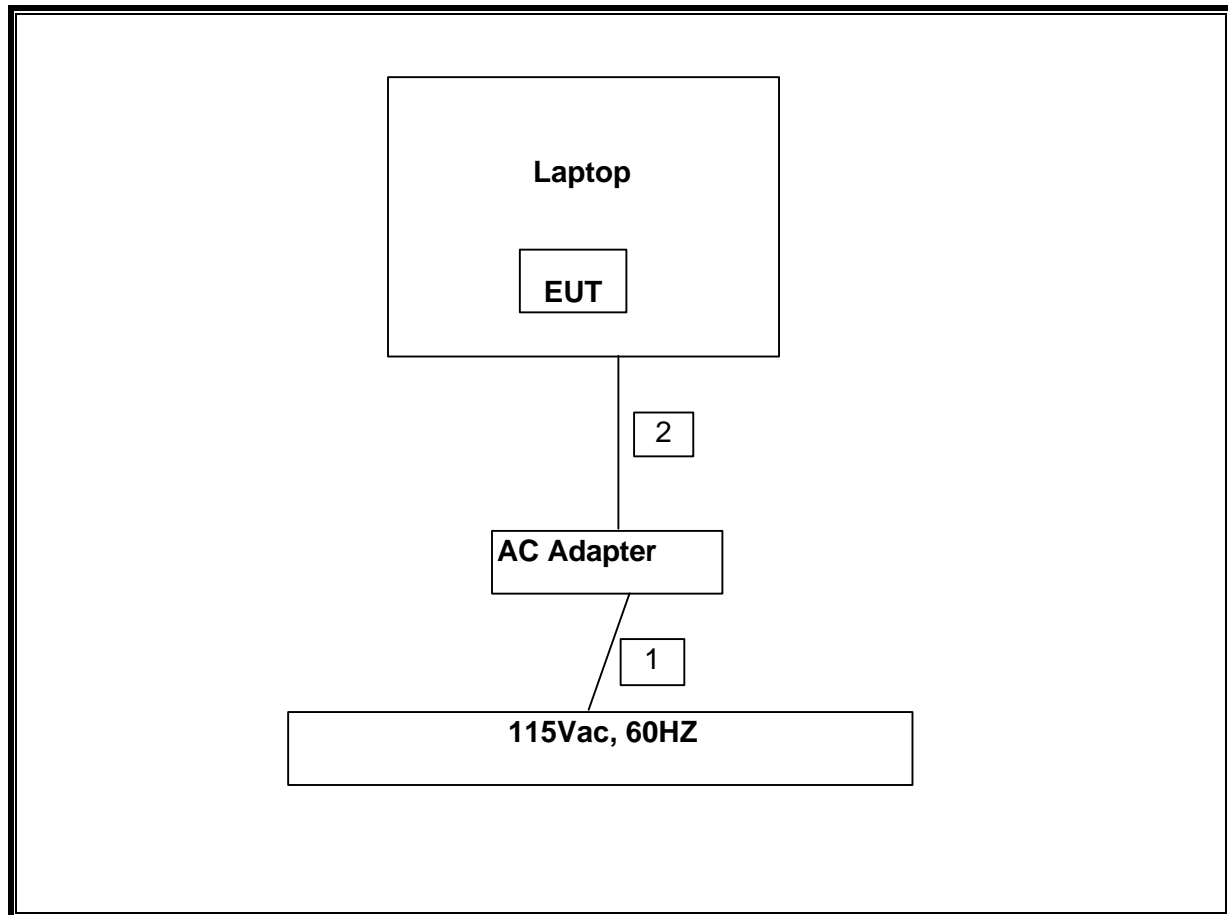
### I/O CABLES

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	AC	1	US 115V	Un-shielded	2m	No	No	Yes on LC Test
2	DC	1	DC	Un-shielded	2m	No	No	N/A
3	USB	2	USB	Un-shielded	2m	Yes	No	Ferrite on EUT's end

### TEST SETUP

The EUT was installed in a host computer.

**SETUP DIAGRAM**



## **SETUP FOR DIGITAL DEVICE TESTS**

## **SUPPORT EQUIPMENT**

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
USB MOUSE	MICROSOFT	4902	4947675	DoC
USB MOUSE	MICROSOFT	4902	4947676	DoC
LAPTOP	TOSHIBA	PP4012-624FM	92033677	DoC
AC ADAPTER	TOSHIBA	ADP-45XH	215141	DoC

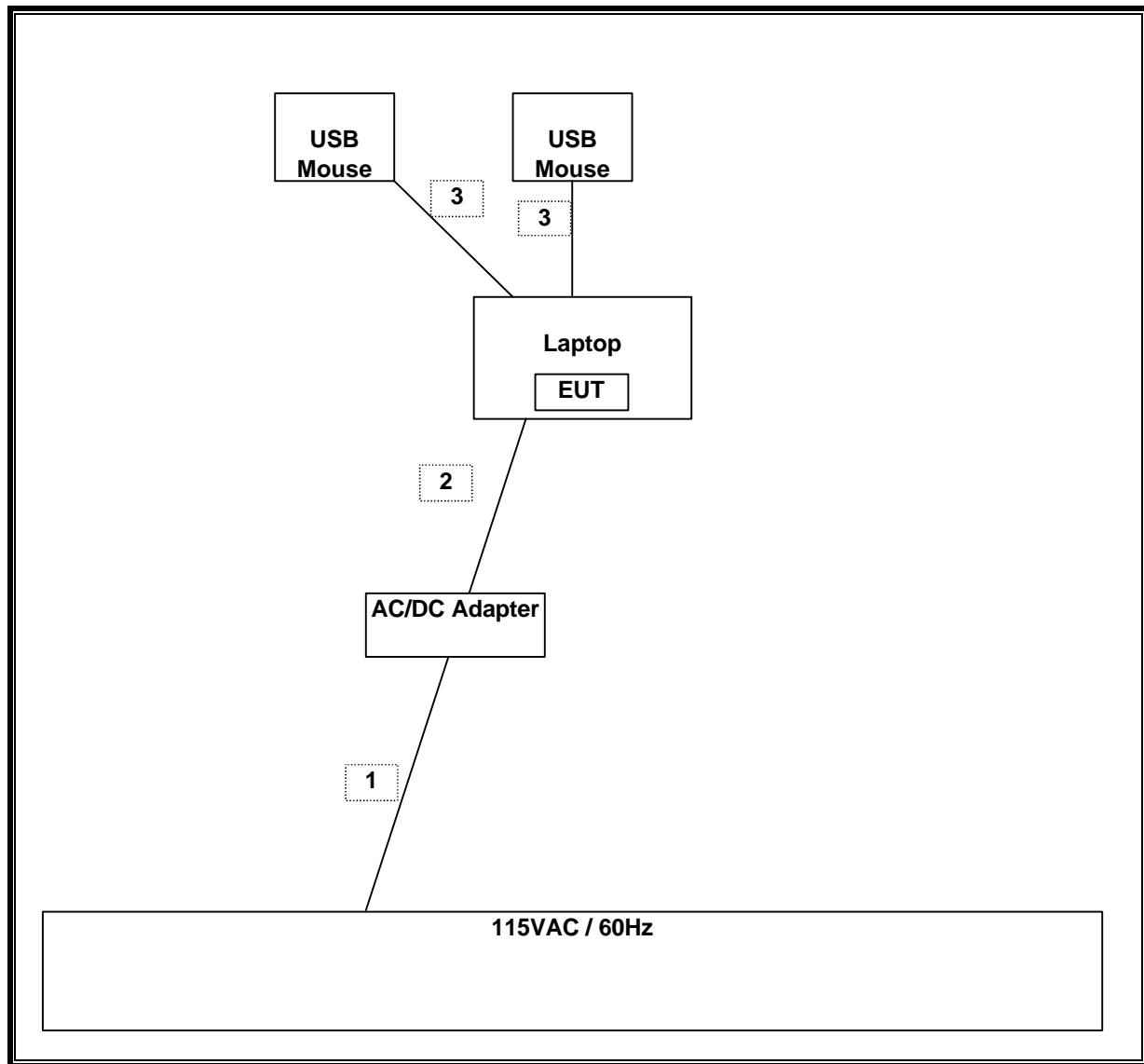
## **I/O CABLES**

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	No
2	DC	1	DC	Un-shielded	2m	No
3	USB	2	USB	Un-shielded	2m	Yes

## **TEST SETUP**

The EUT was installed in a host computer.

**SETUP DIAGRAM FOR DIGITAL DEVICE TESTS**



## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1. RADIATED 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
<sup>1</sup> 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	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> 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.

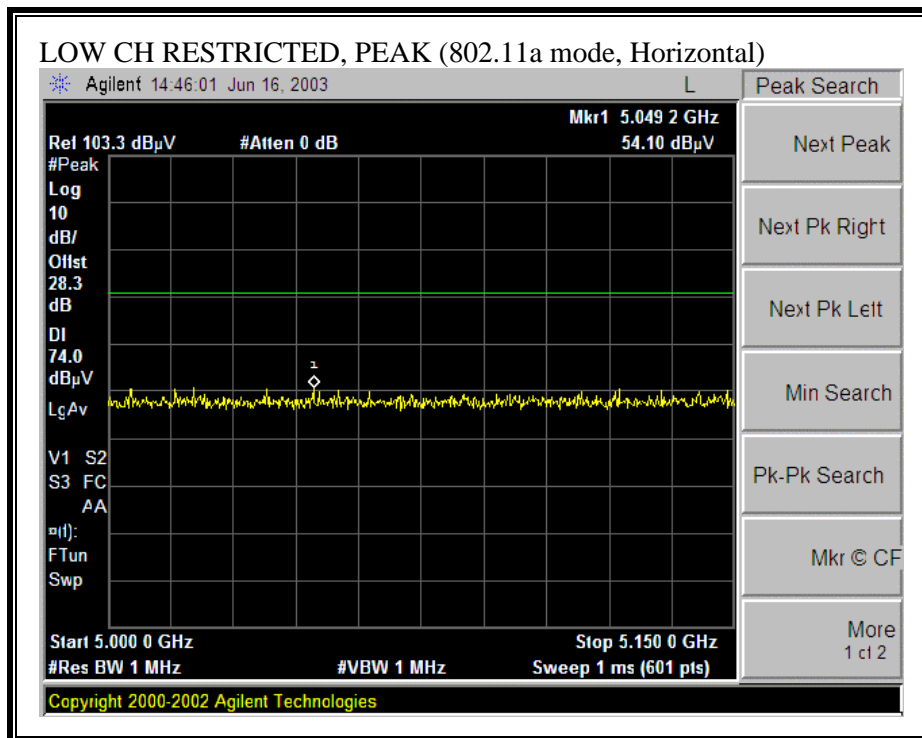
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

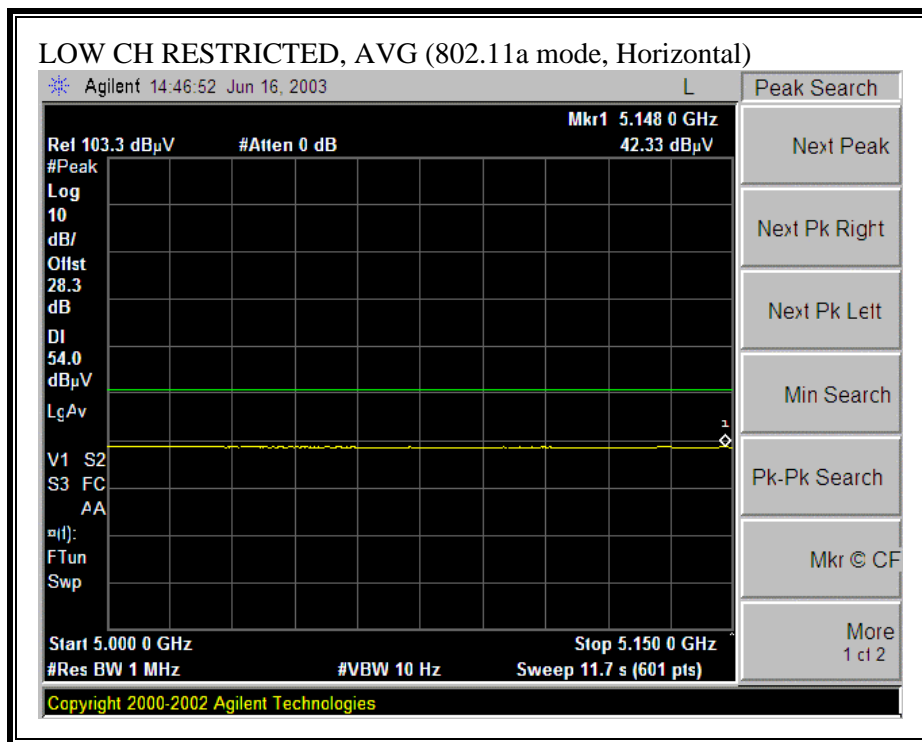
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## **RESULTS**

No non-compliance noted:

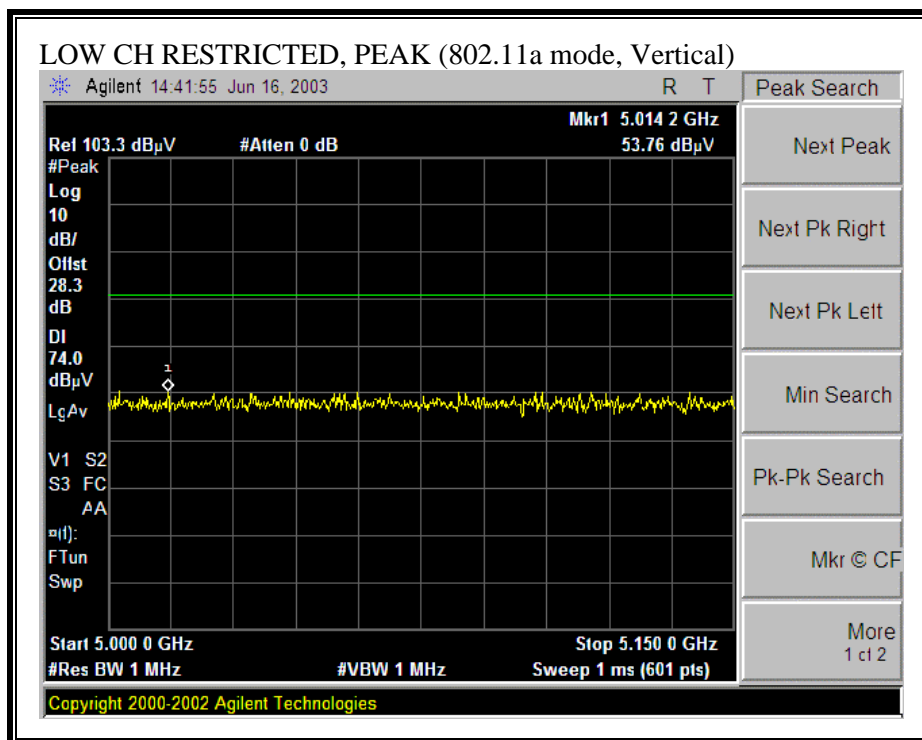
**RESTRICTED BANDEDGE (a MODE, LOW CHANNEL, HORIZONTAL)**

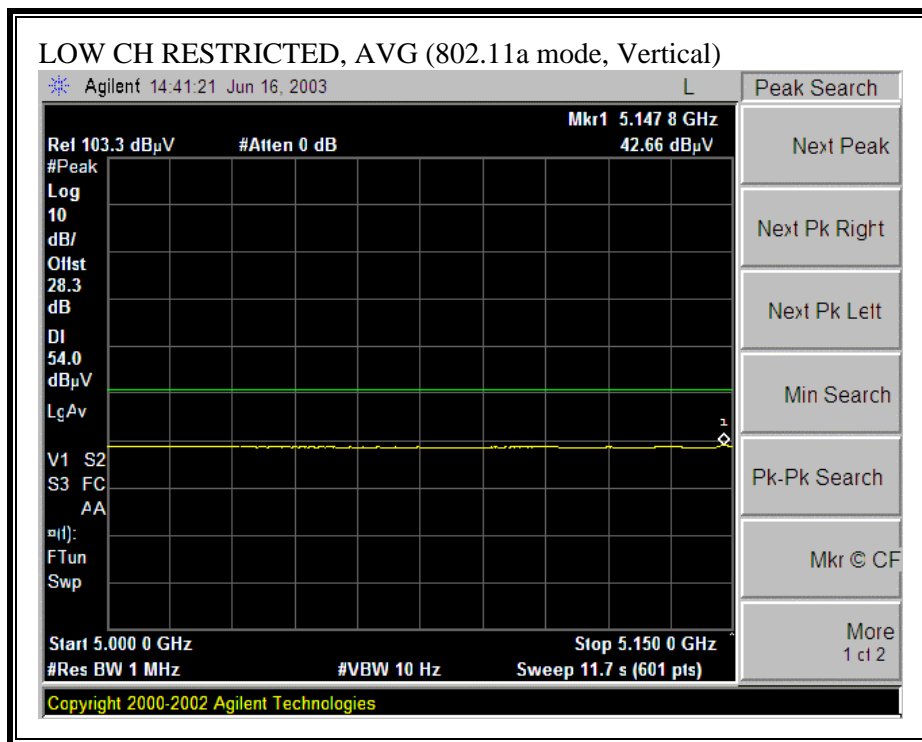




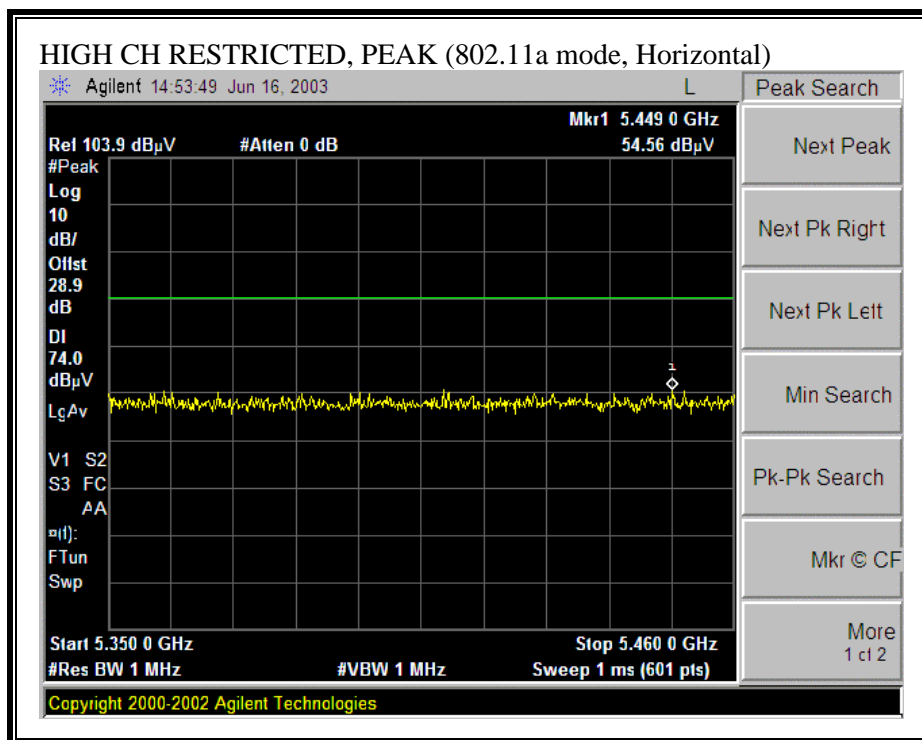


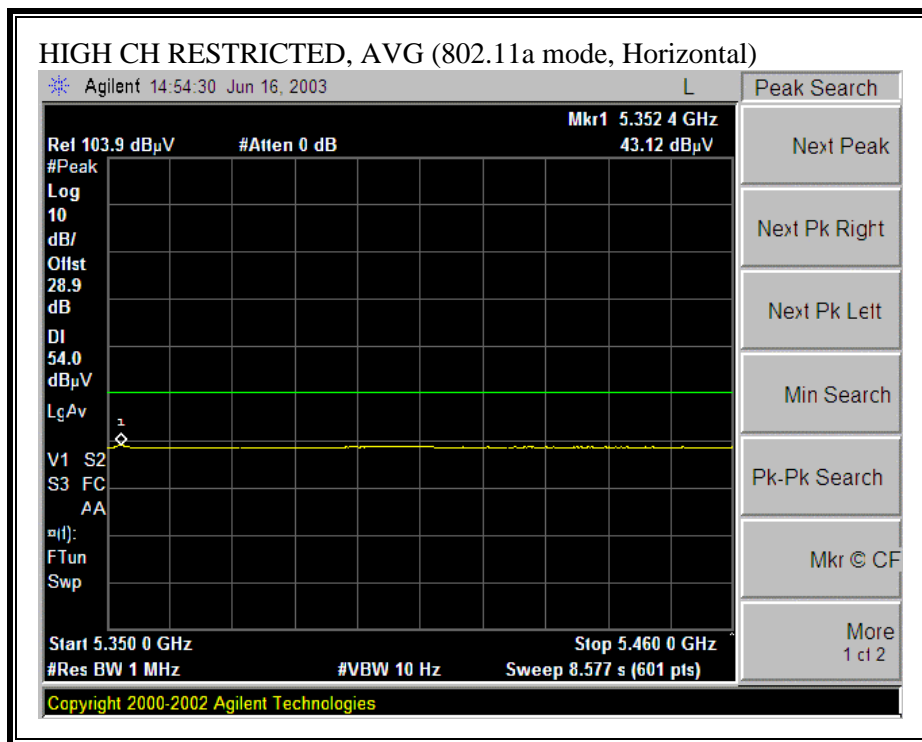
**RESTRICTED BANDEDGE (a MODE, LOW CHANNEL, VERTICAL)**



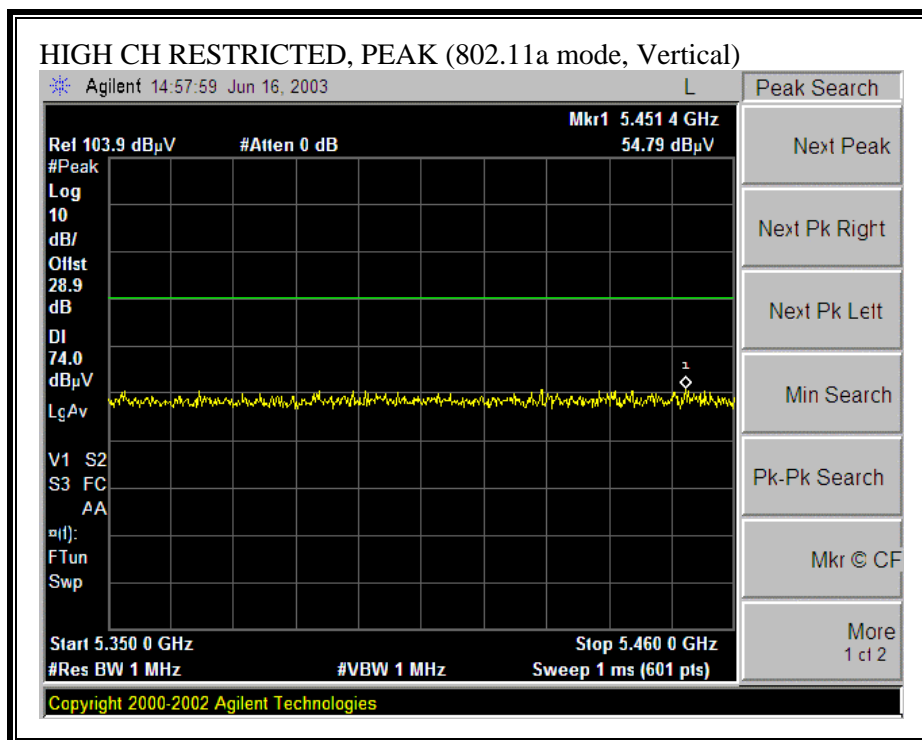


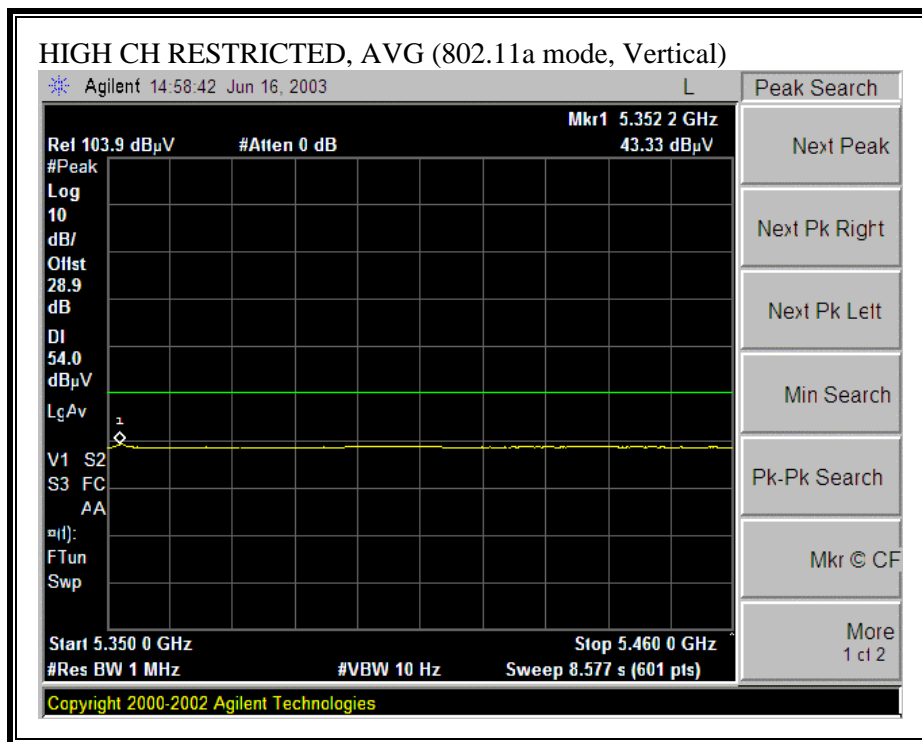
**RESTRICTED BANDEDGE (a MODE, HIGH CHANNEL, HORIZONTAL)**





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

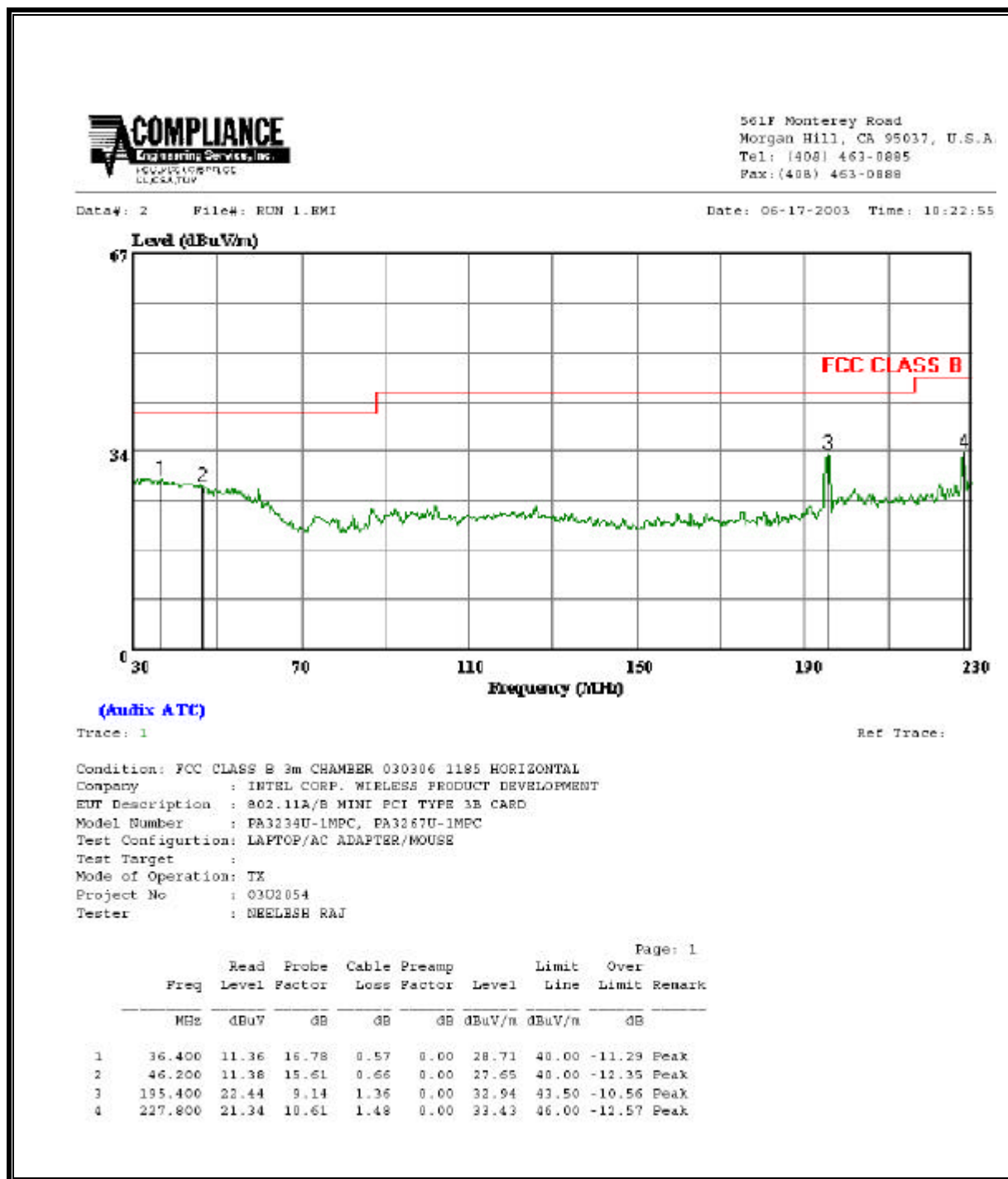




## HARMONICS AND SPURIOUS EMISSIONS a-MODE

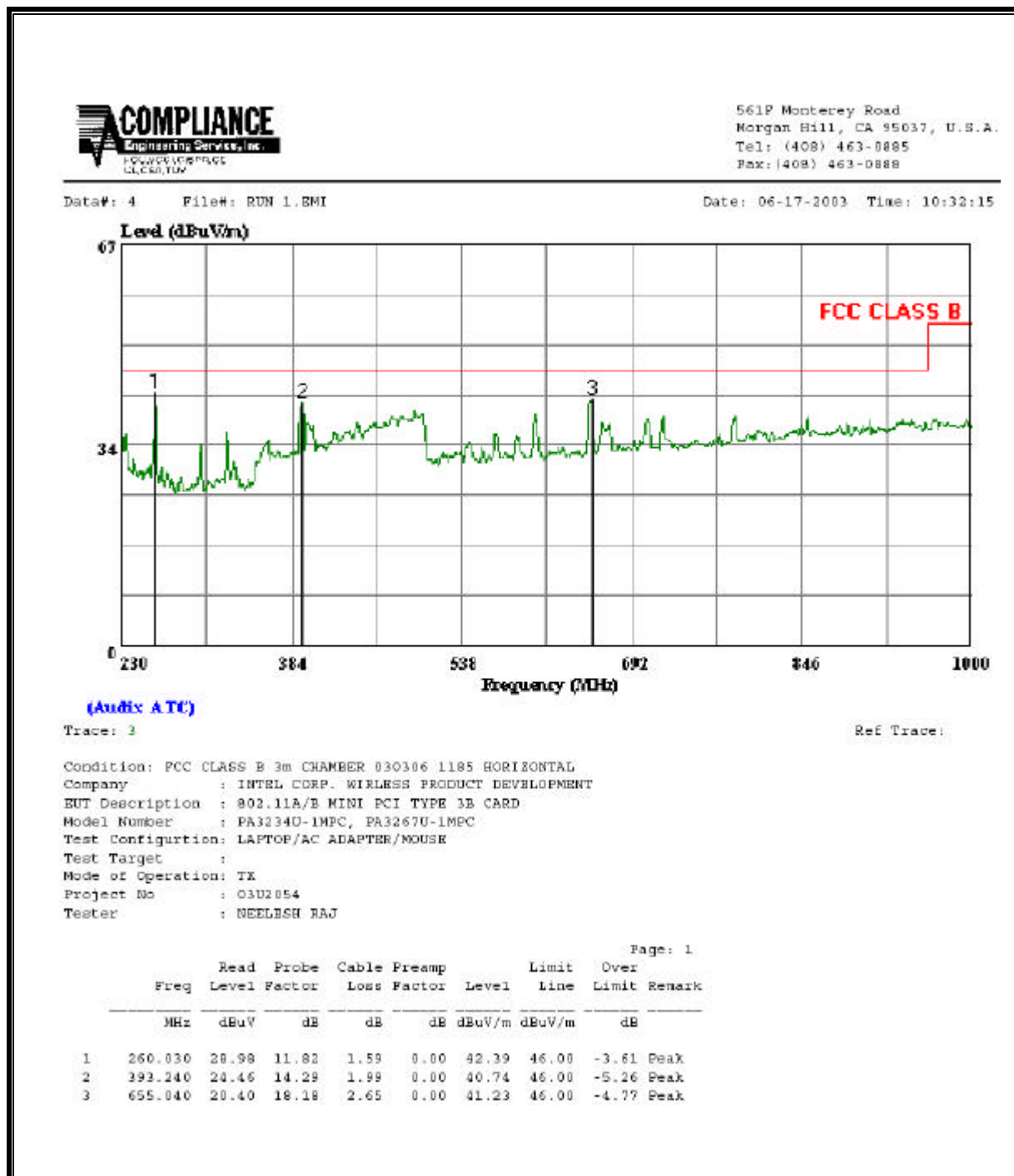
06/16/03 <b>High Frequency Measurement</b> <b>Compliance Certification Services, Morgan Hill Open Field Site</b>																
<b>Test Engr:</b>		NEELESH RAJ														
<b>Project #:</b>		03U2054														
<b>Company:</b>		INTEL CORP. WIRELESS PRODUCT														
<b>EUT Descrip.:</b>		802.11a/b MiniPCI Type 3B Card														
<b>EUT M/N:</b>		PA3234U-1MPC, PA3267U-1MPC														
<b>Test Target:</b>		FCC 15.407														
<b>Mode Oper:</b>		TX														
<b>Test Equipment:</b>																
EMCO Horn 1-18GHz		Pre-amplifier 1-26GHz		Spectrum Analyzer				Horn > 18GHz								
T73; S/N: 6717 @3m		T86 Miteq 924341		PSA				T87; ARA 18-26GHz; S/N:1049								
<b>Hi Frequency Cables</b>																
<input type="checkbox"/> (2 ft)		<input checked="" type="checkbox"/> (2 ~ 3 ft)		<input type="checkbox"/> (4 ~ 6 ft)		<input checked="" type="checkbox"/> (12 ft)										
<b>Peak Measurements:</b> 1 MHz Resolution Bandwidth 1MHz Video Bandwidth																
<b>Average Measurements:</b> 1 MHz Resolution Bandwidth 10Hz Video Bandwidth																
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes	
HIGH CHANNEL =5320																
10.640	9.8	48.7	37.0	38.3	4.8	-44.2	0.0	1.0	48.5	36.8	74.0	54.0	-25.5	-17.2	V (FLOOR NOISE)	
10.640	9.8	48.6	37.0	38.3	4.8	-44.2	0.0	1.0	48.4	36.8	74.0	54.0	-25.6	-17.2	H (FLOOR NOISE)	
NO OTHER SPURIOUS EMISSIONS SEEN IN THE RESTRICTED BANDS FROM MIDDLE AND HIGH CHANNELS UPTO 10TH HARMONIC																
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									

SPURIOUS EMISSIONS 30 TO 230MHz HORIZONTAL (WORST-CASE CONFIGURATION)

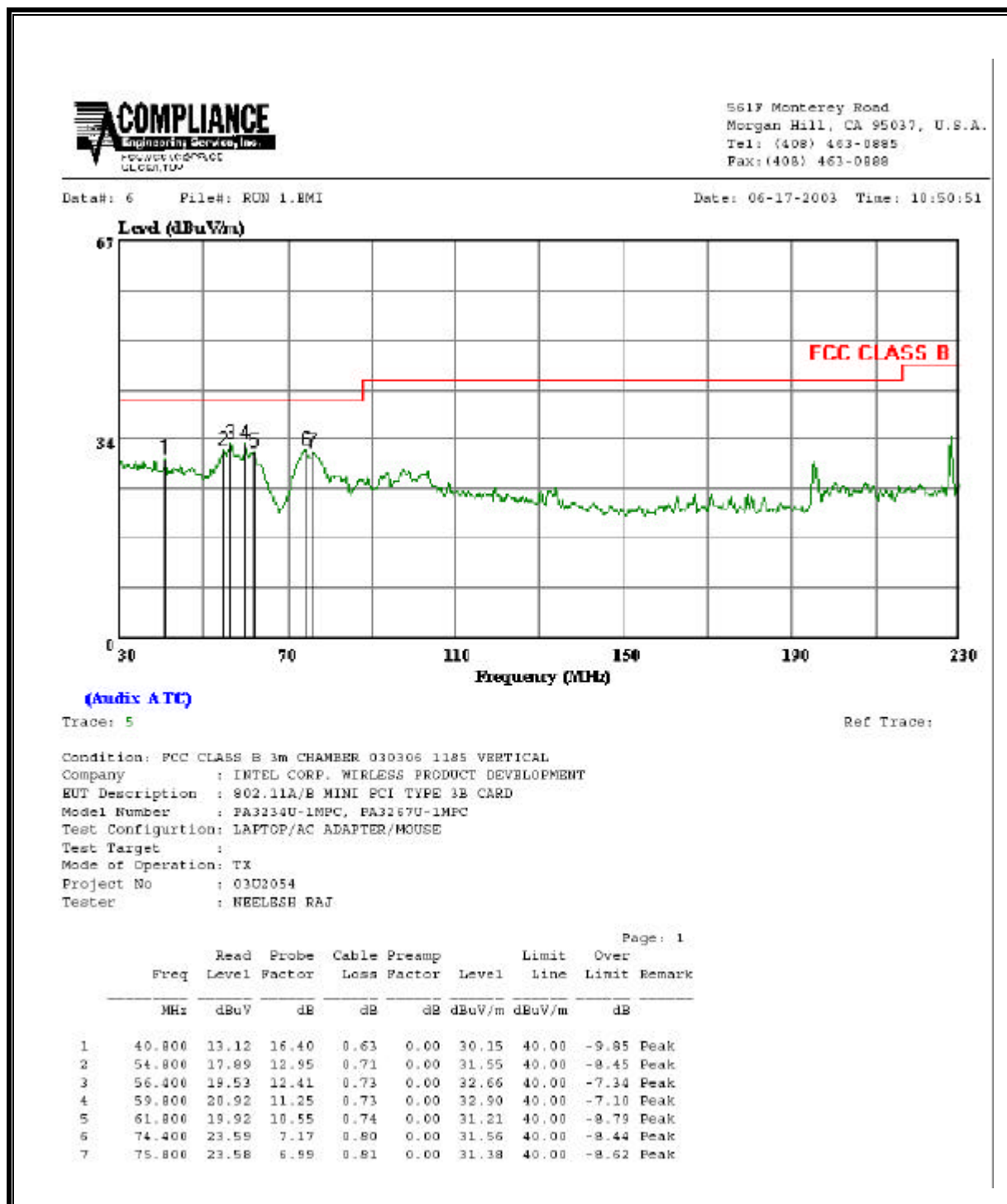




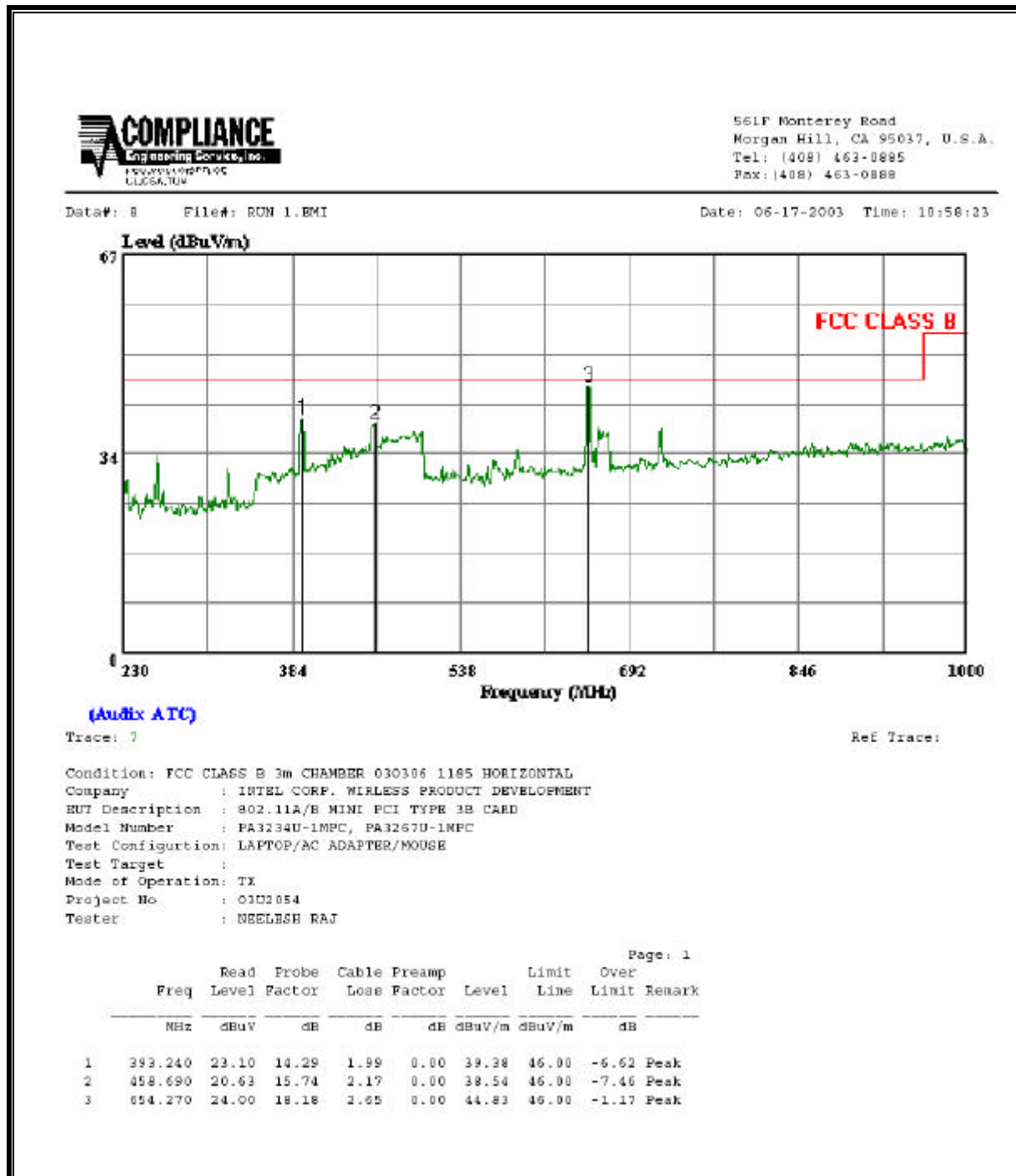
**SPURIOUS EMISSIONS 230 TO 1000 MHz HORIZONTAL (WORST-CASE CONFIGURATION)**



SPURIOUS EMISSIONS 30 TO 230MHz VERTICAL (WORST-CASE CONFIGURATION)



**SPURIOUS EMISSIONS 230 TO 1000 MHz VERTICAL (WORST-CASE CONFIGURATION)**



## 7.2. CO-LOCATED RADIATED EMISSIONS

### **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.

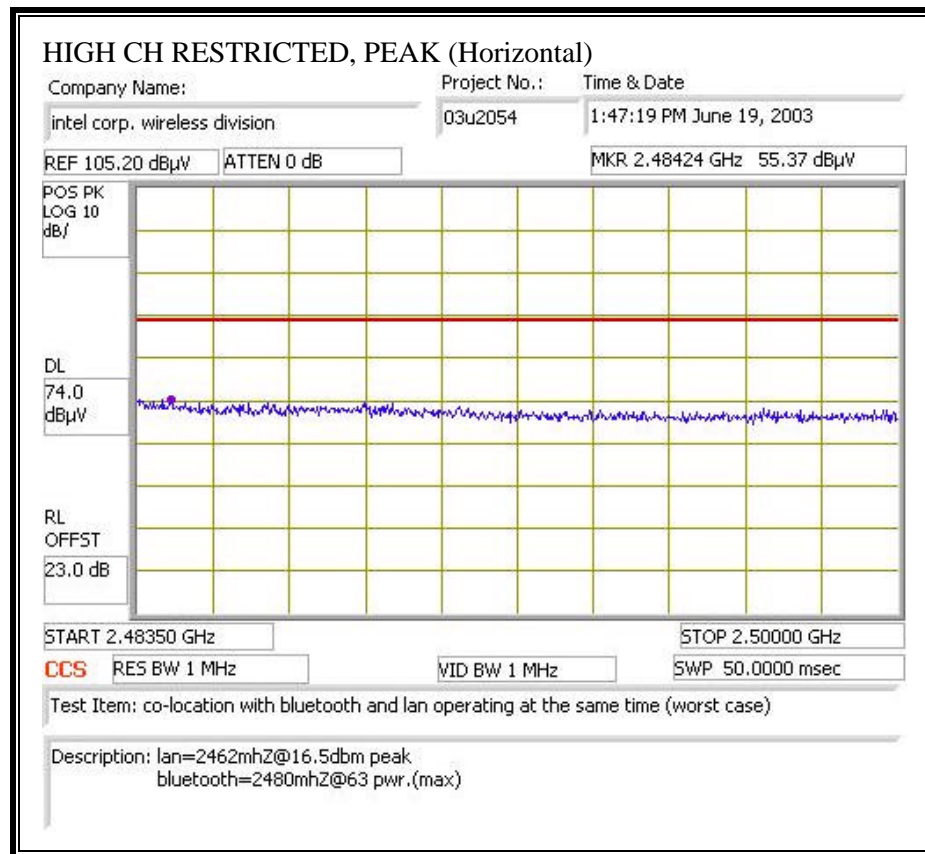
The dominant transmitter WLAN is set to the worst case channel. The spurious emissions performance of the dominant transmitter is investigated as the settings of the non-dominant transmitter Bluetooth are varied. Worst case results are reported.

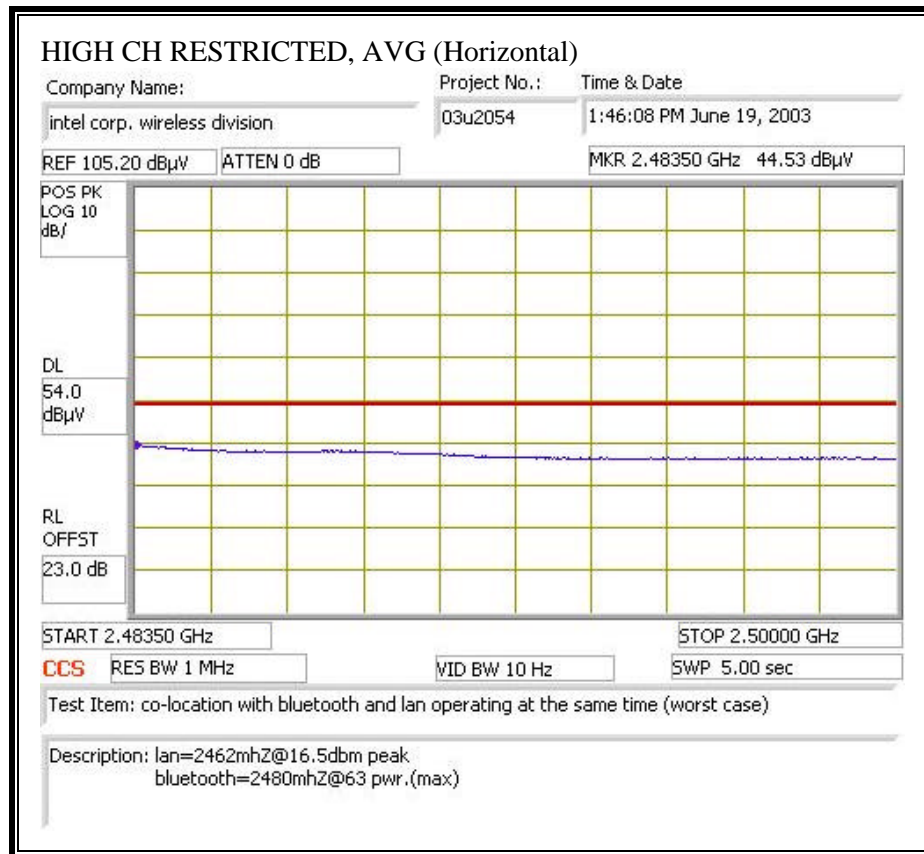
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

### **RESULTS**

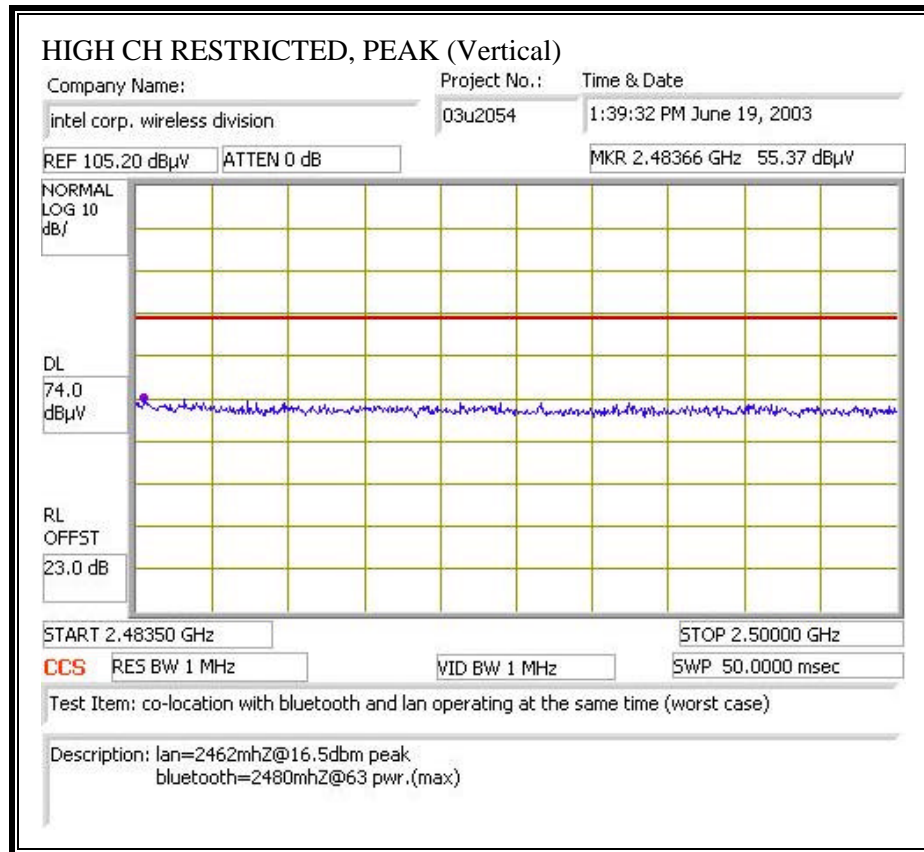
No non-compliance noted:

**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

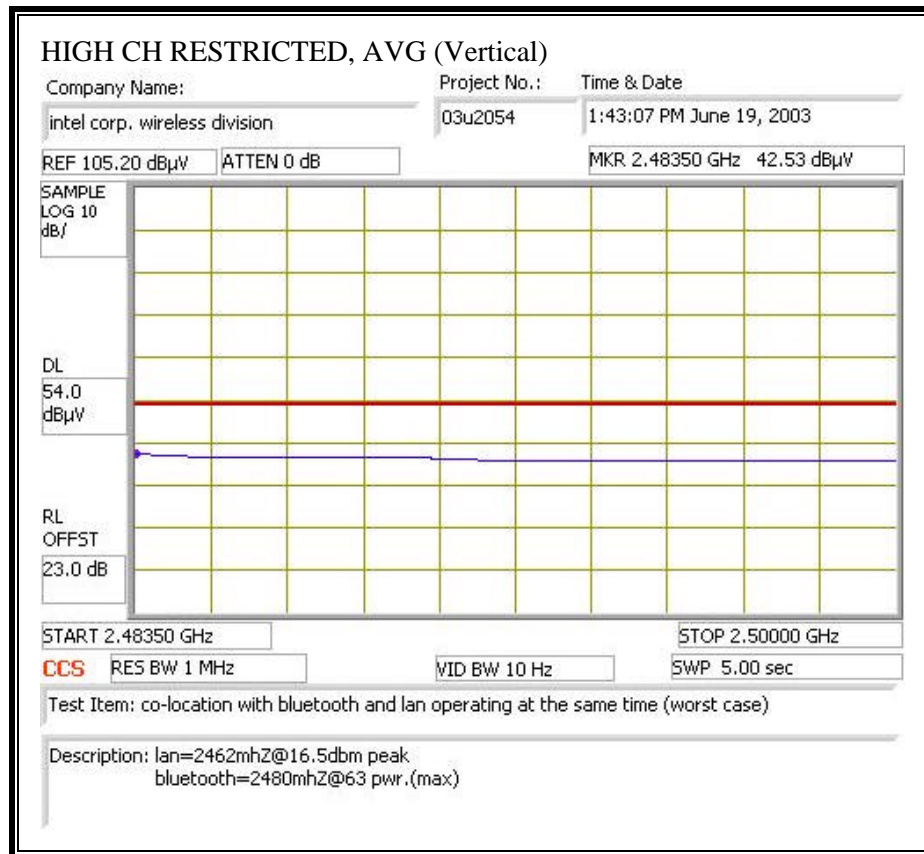




**WORST-CASE RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**









[illegible]

### 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  $\mu$ H/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.

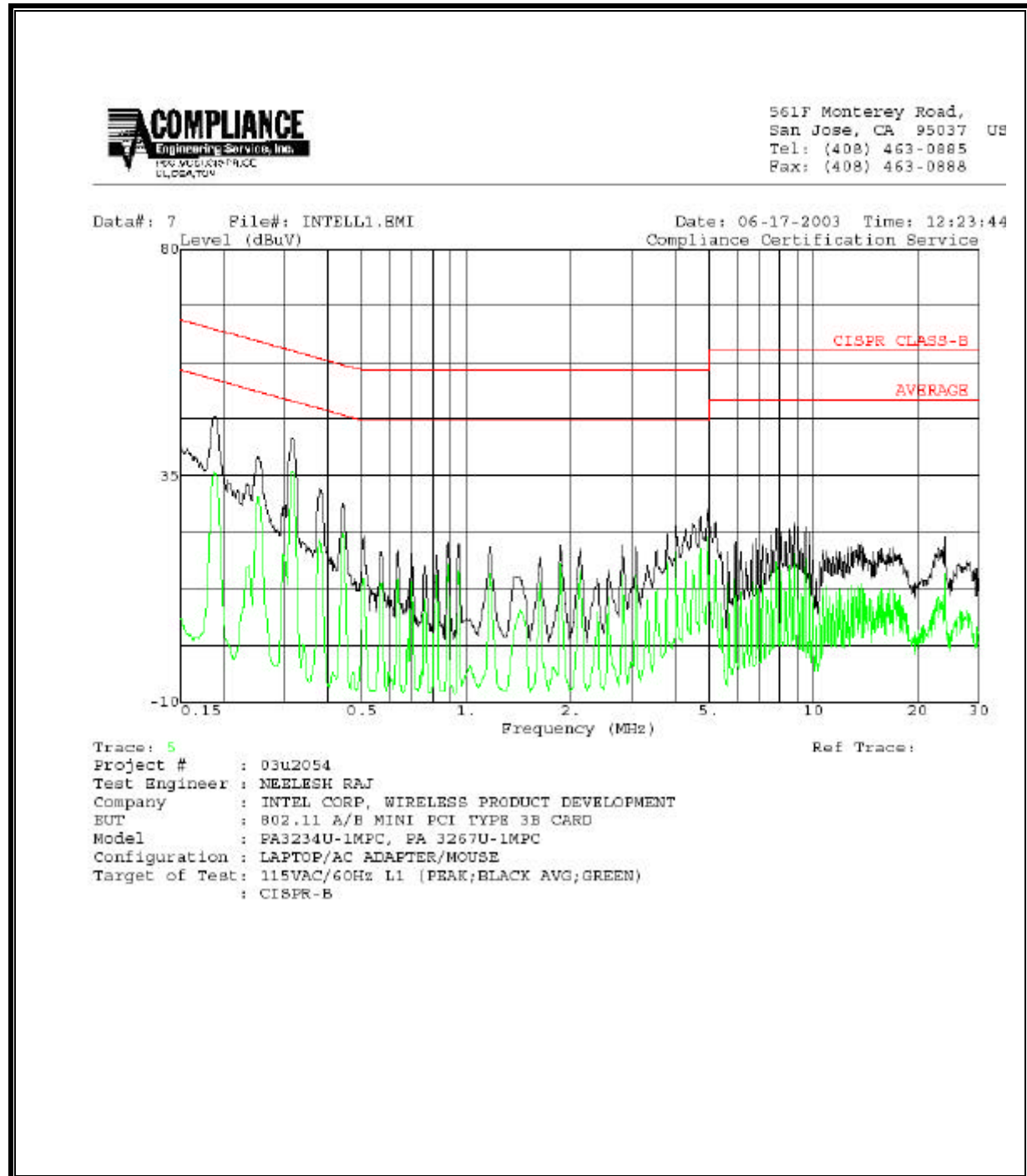
#### RESULTS

No non-compliance noted:

# **6 WORST EMISSIONS**

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
0.19	46.86	--	35.58	0.00	64.94	54.94	-18.08	-19.36	L1
0.25	38.63	--	30.80	0.00	63.09	53.09	-24.46	-22.29	L1
0.31	42.52	--	35.83	0.00	61.34	51.34	-18.82	-15.51	L1
0.19	48.20	--	37.50	0.00	64.94	54.94	-16.74	-17.44	L2
0.25	46.46	--	35.25	0.00	63.11	53.11	-16.65	-17.86	L2
0.32	37.48	--	32.59	0.00	61.20	51.20	-23.72	-18.61	L2
6 Worst Data									

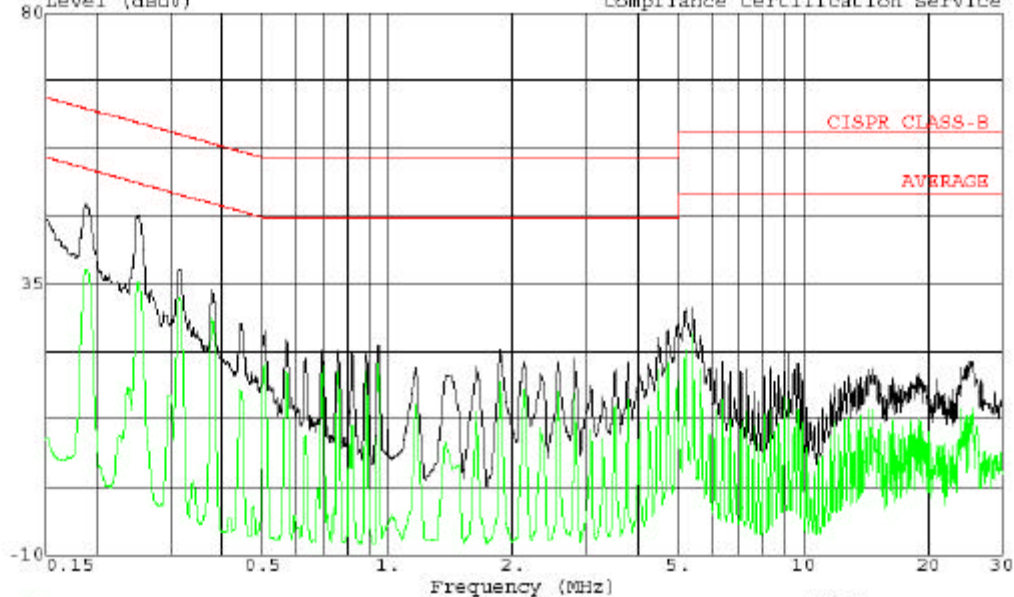
**LINE 1 AND LINE 2 RESULTS**





561F Monterey Road,  
San Jose, CA 95037 USA  
Tel: (408) 463-0885  
Fax: (408) 463-0888

Data#: 7 File#: INTELL2.EMI Date: 06-17-2003 Time: 11:45:44  
Level (dBuV) Compliance Certification Service

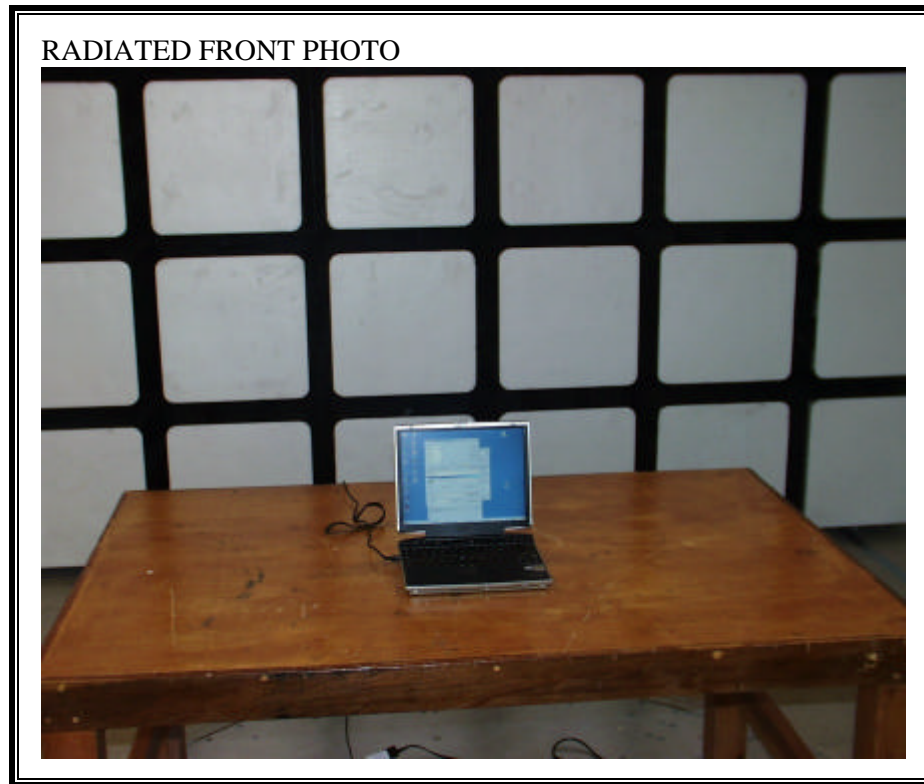


Trace: 5  
Project # : 03u2054  
Test Engineer : NEELESH RAJ  
Company : INTEL CORP, WIRELESS PRODUCT DEVELOPMENT  
EUT : 802.11 A/B MINI PCI TYPE 3B CARD  
Model : PA3234U-1MPC, PA 3267U-1MPC  
Configuration : LAPTOP/AC ADAPTER/MOUSE  
Target of Test: 115VAC/60Hz L2 [PEAK;BLACK AVG;GREEN]  
: CISPR-B

Ref Trace:

## 8. SETUP PHOTOS

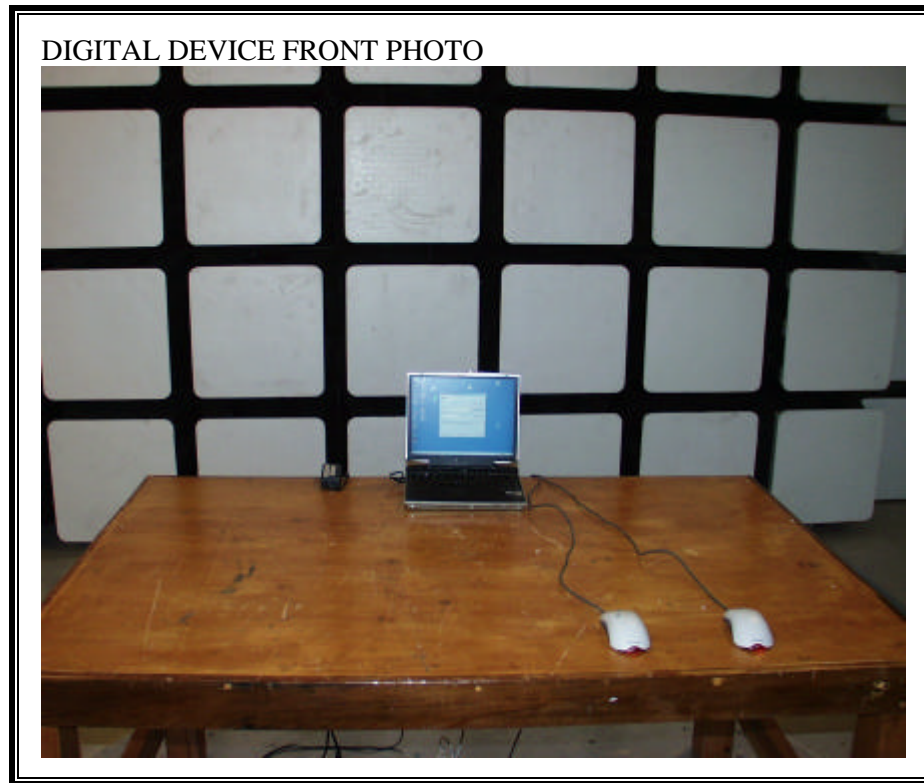
### RADIATED RF MEASUREMENT SETUP





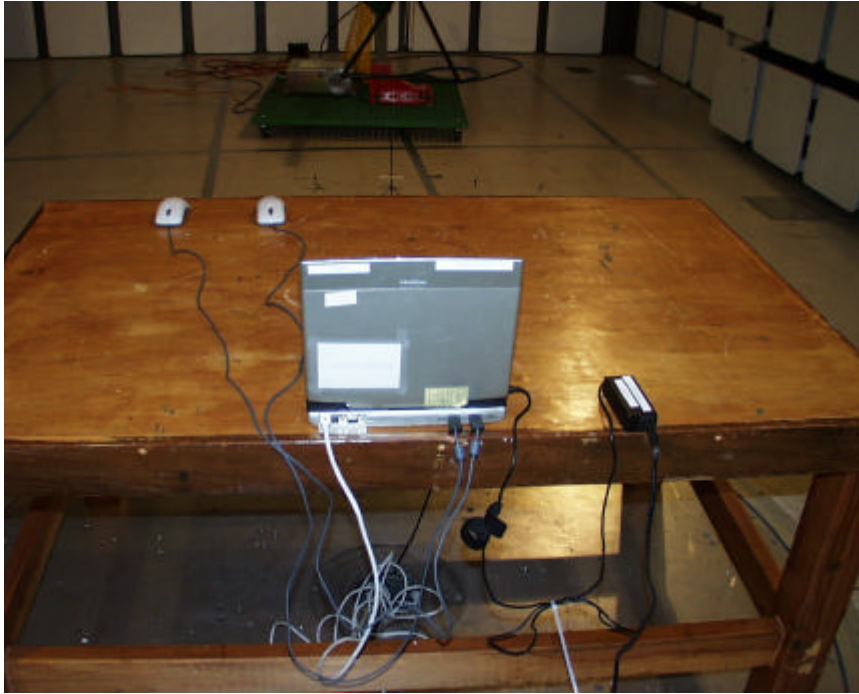


**DIGITAL DEVICE RADIATED EMISSIONS SETUP**





DIGITAL DEVICE BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



**END OF REPORT**