



**FCC CFR47 CERTIFICATION
CLASS II PERMISSIVE CHANGE
TEST REPORT**

FOR

MiniPCI Express 802.11a/b/g Transceiver

MODEL NUMBER: PA3503U-1MPC

FCC ID: CJ6UPA3503WL

REPORT NUMBER: 07U10782-1

ISSUE DATE: JANUARY 11, 2007

Prepared for

**TOSHIBA CORPORATION DIGITAL MEDIA NETWORK COMPANY
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Prepared by

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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	1/11/07	Initial Issue	Thu

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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: MiniPCI Express 802.11a/b/g Transceiver

MODEL: PA3503U-1MPC

SERIAL NUMBER: XB62-070-A0072

DATE TESTED: JANUARY 3, 2007

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: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. 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. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

THANH NGUYEN
EMC ENGINEER
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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

3. CROSS REFERENCE TO OTHER REPORTS ON THIS PRODUCT

For Dynamic Frequency Selection measurement and RF Conducted Antenna Port please refer to CCS Report 06U10337 attachment.

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>.

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%.

6. EQUIPMENT UNDER TEST

6.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g transceiver

The radio module is manufactured by Atheros Communications Inc.

6.2. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes PIFA antenna model number HFT40 manufactured by Hitachi Cable, Ltd with a peak gain of 2.27 dBi in the 5470-5725 MHz band.

6.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The major change filed under this application is:

Change 1: DFS function is added.

Change 2: Frequency band is added.

6.4. MAXIMUM OUTPUT POWER

Same output power as previous CCS Report 06U10337 attachment.

6.5. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Atheros Radio Test, Revision 5.3 Build #11.

The test utility software used during testing was ART, v53_b28.

6.6. WORST-CASE CONFIGURATION AND MODE

Radiated emissions tests above 1 GHz were performed on each applicable L/M/H channel.

In our opinion the worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 5600 MHz in 11a mode. The worst-case data rate for this channel is determined to be 6 Mb/s, based on previous experience with Atheros WLAN product design architectures.

EUT was investigated under both mobile and portable configurations with X /Y/ Z polarizations, and mobile configuration was found to be the worst case.

Thus worst-case radiated emissions below 1 GHz and power line conducted emissions tests were made at 5600 MHz in the 802.11a mode, at 6 Mb/s.

6.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Toshiba	PSR20U-AAAA4	46026672J	DoC
AC/DC Adapter	Toshiba	PA3283U-1ACA	03X19214	DoC

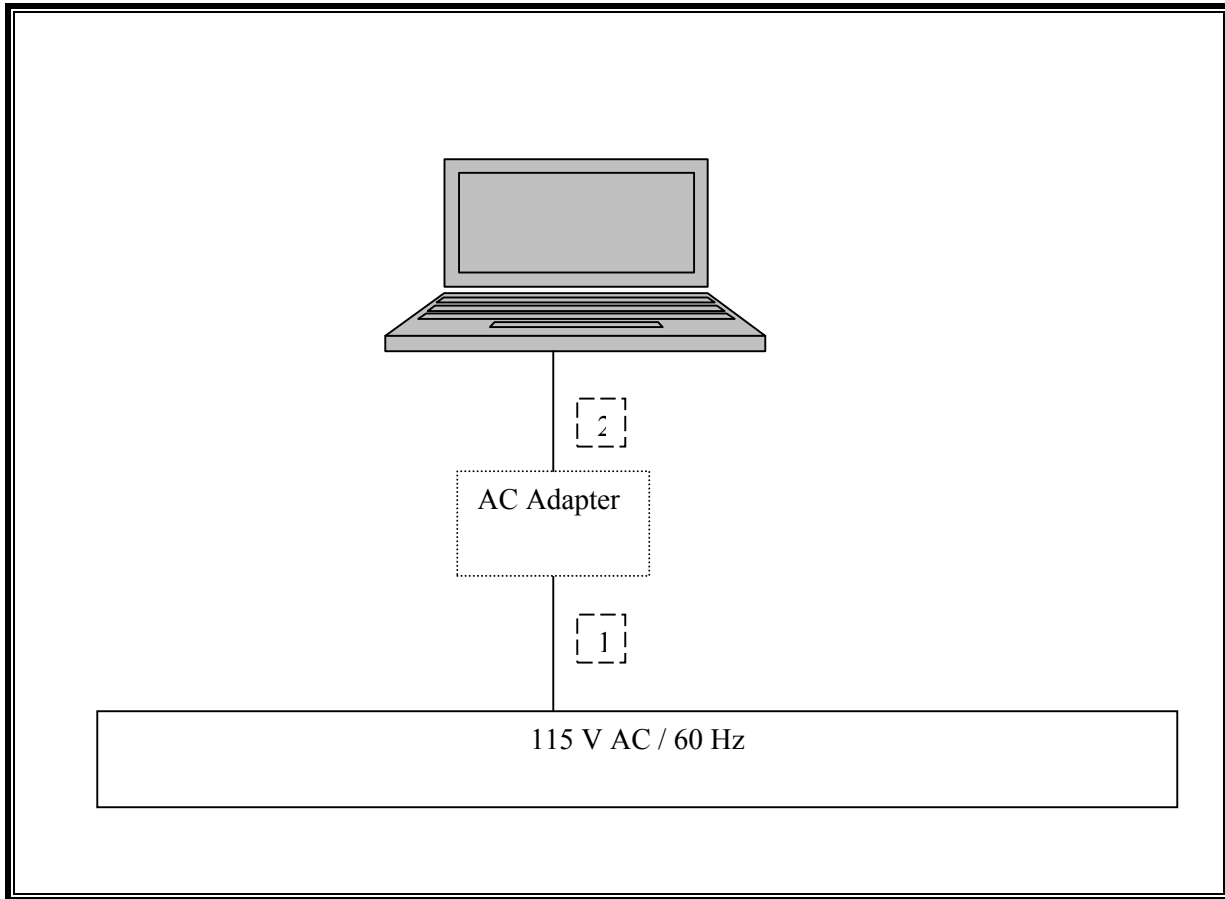
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	2m	N/A
2	DC	1	DC	Unshielded	2m	N/A

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



7. 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
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	9001-3245	4/22/2007
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29301	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/18/2007
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	9/12/2007
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	4/13/2007
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2007
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
Peak / Average Power Sensor	Agilent	E9327A	US40440755	12/2/2007
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	MY43360112	5/3/07
7.6GHz HPF	MicroTronic	HPM13195	1	CNR

8. LIMITS AND RESULTS

8.1. RADIATED EMISSIONS

8.1.1. 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.

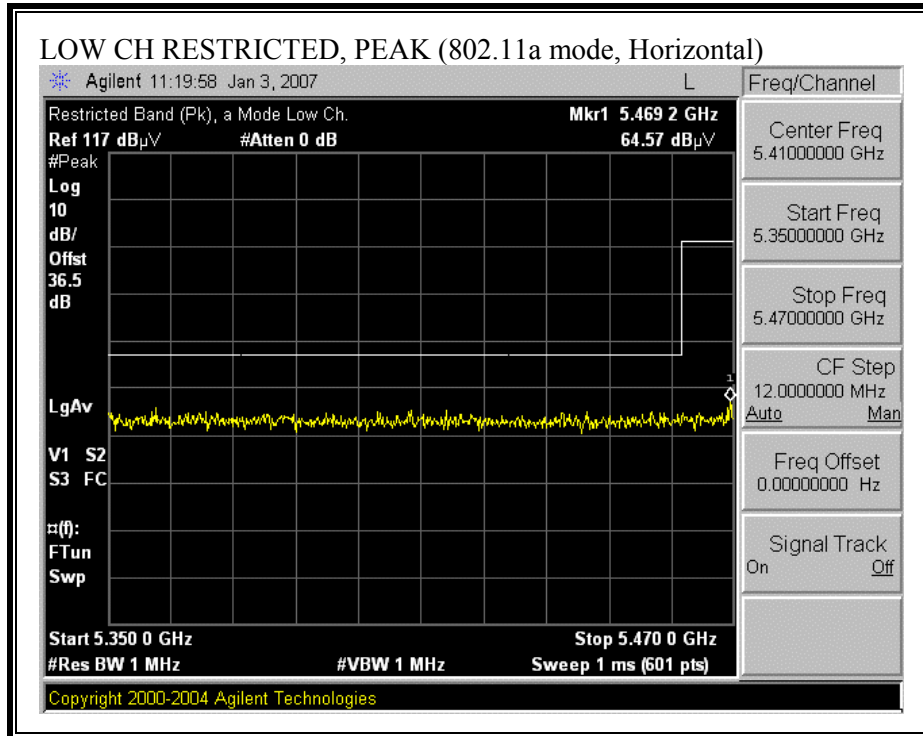
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

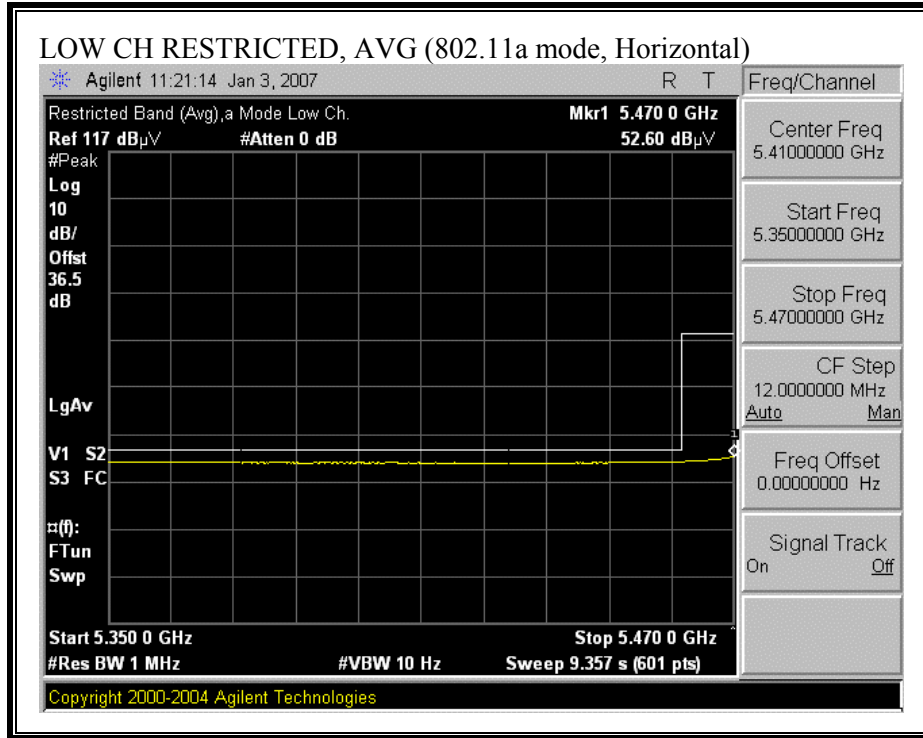
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each band.

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.

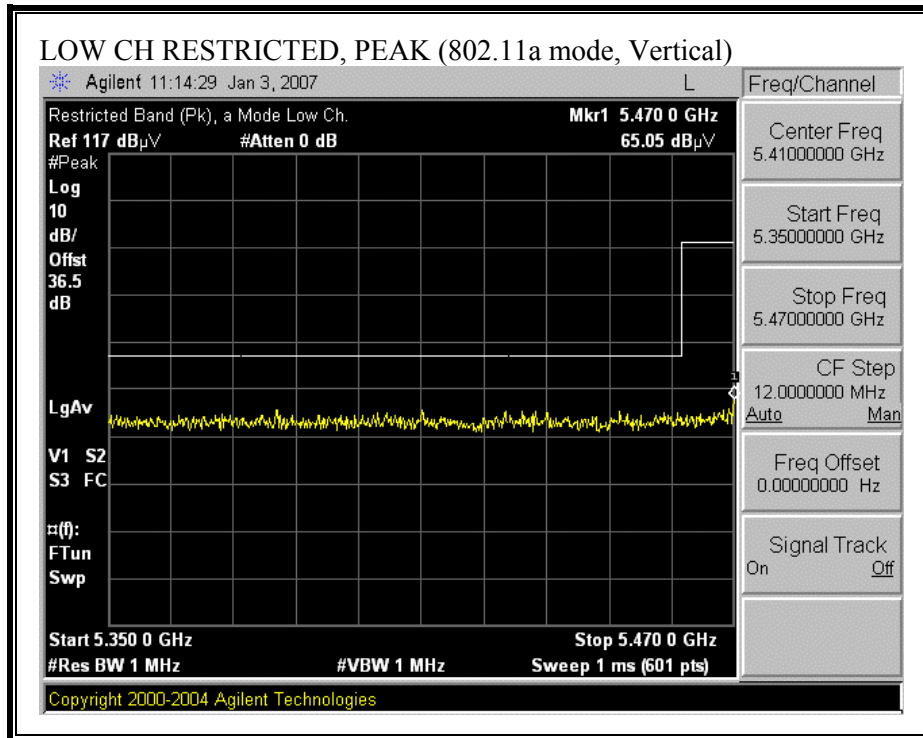
8.1.2. TRANSMITTER ABOVE 1 GHZ FOR 5470 TO 5725 MHz BAND

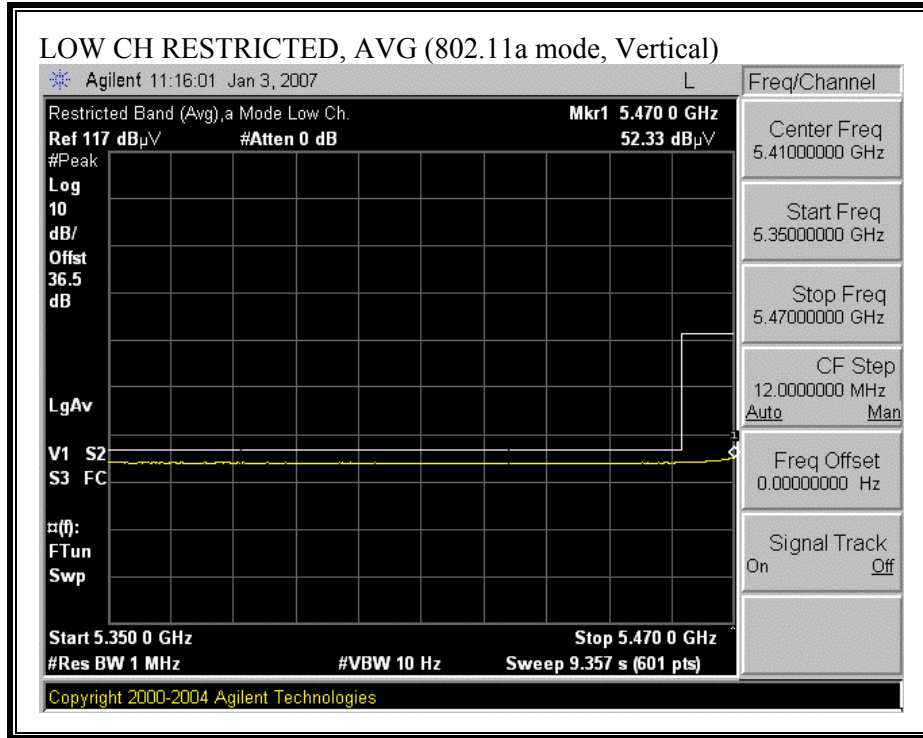
RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)



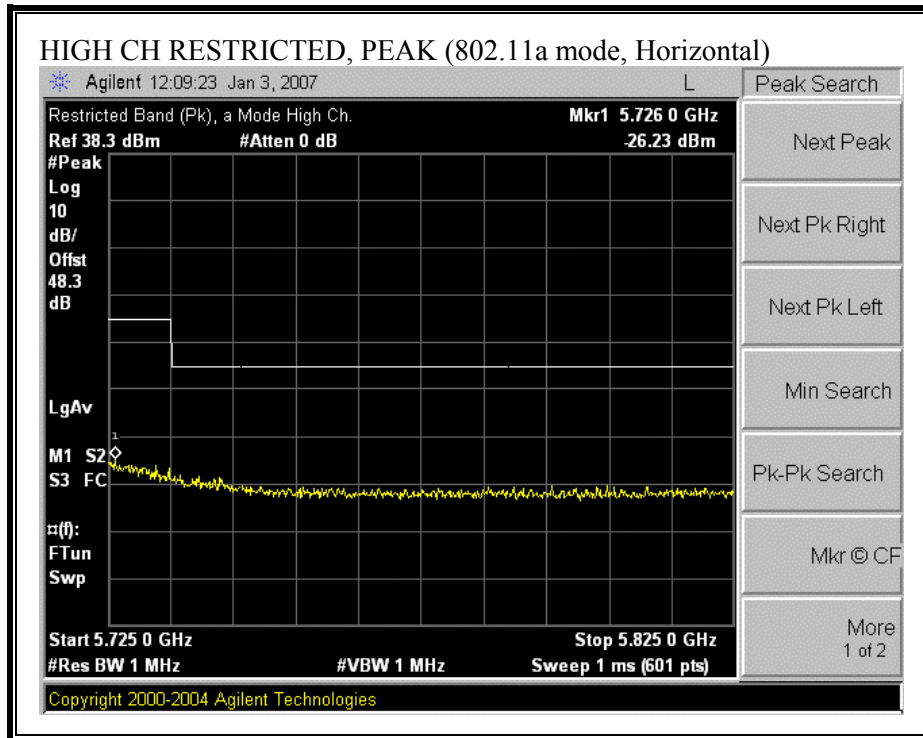


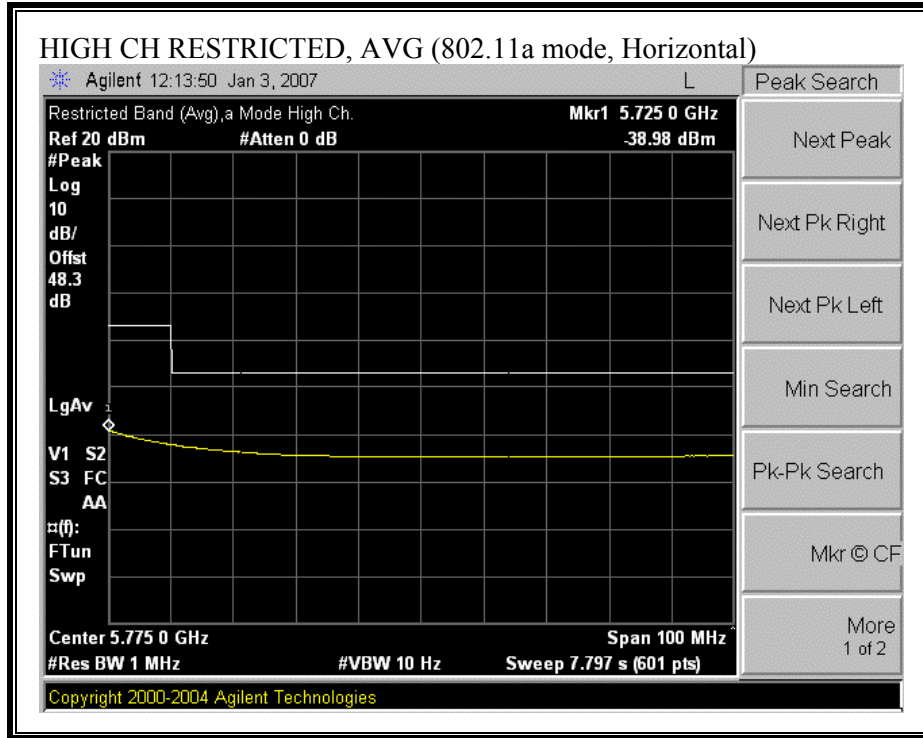
RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)



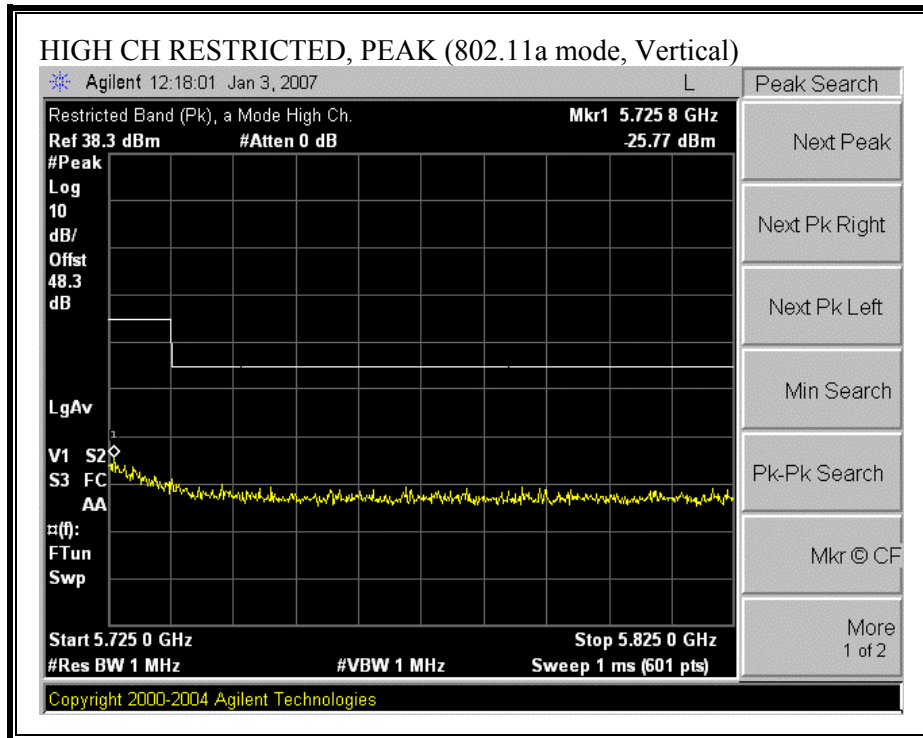


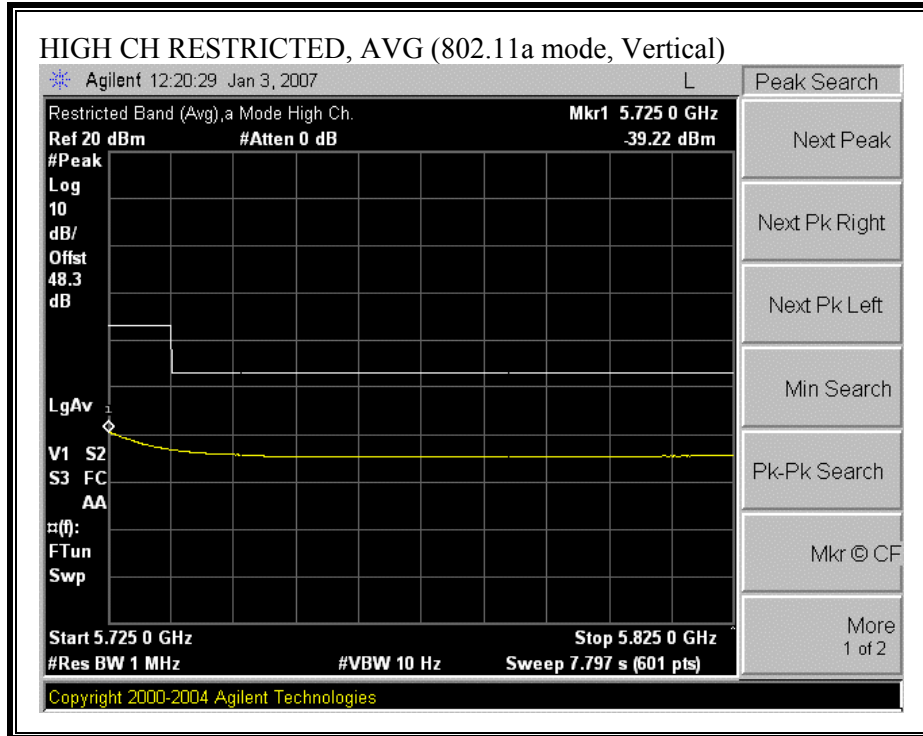
RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)





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





HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

High Frequency Measurement
 Compliance Certification Services, Morgan Hill Open Field Site

Company: TOSHIBA Corporation Digital Media Network Company
 Project #: 07U10782
 Date: Jan 03, 2007
 Test Engineer: Thanh Nguyen
 Configuration: EUT only
 Mode: Transmit

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz
Thanh 177079008		Thanh 208946003	HPF_7.6GHz	R_002	Average Measurements RBW=1MHz ; VBW=10Hz

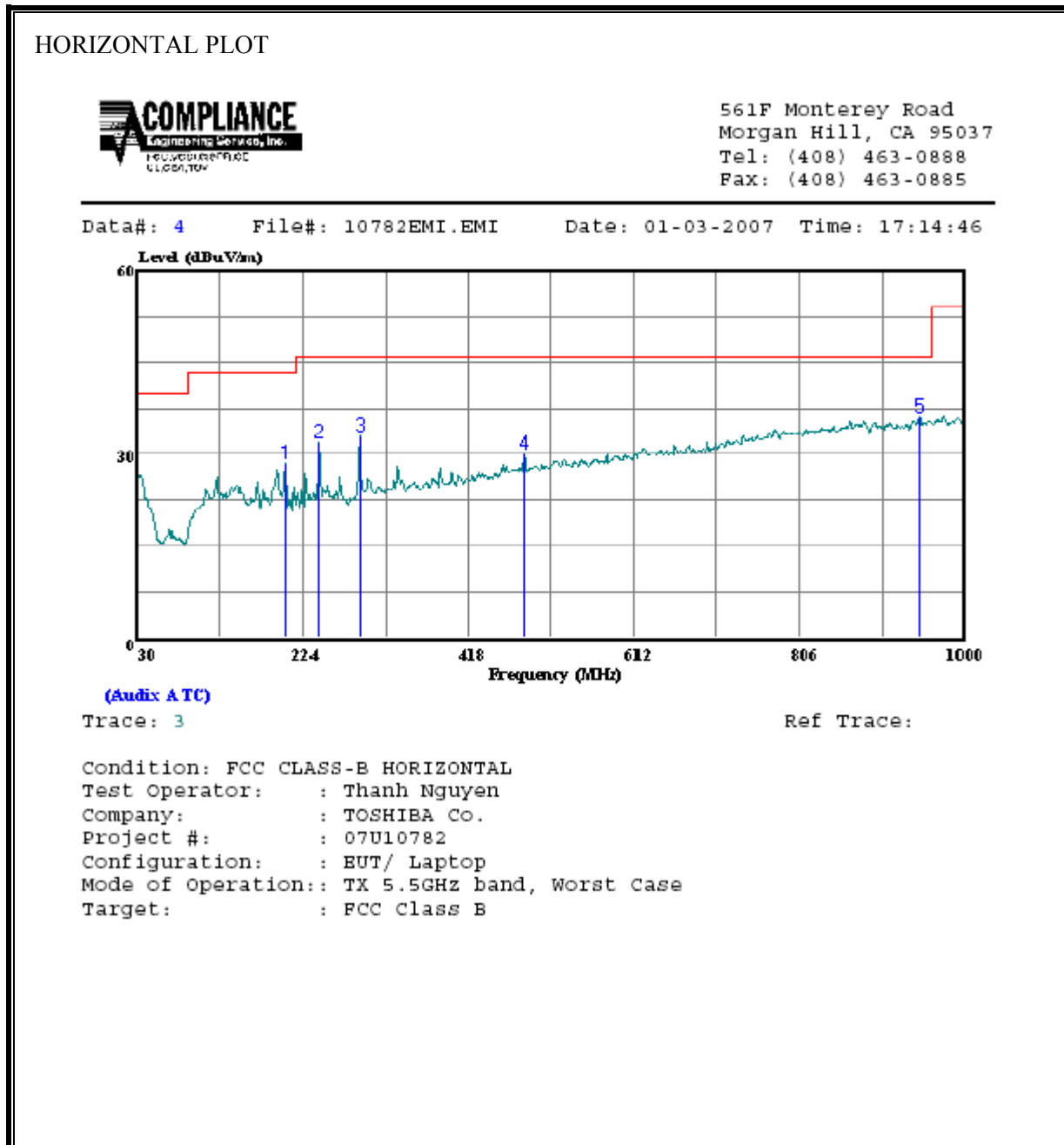
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Harmonics Emissions															
High Channel															
11.400	3.0	47.0	35.4	37.4	4.2	-35.9	0.0	0.7	53.3	41.7	74	54	-20.7	-12.3	V
17.100	3.0	44.7	31.5	41.2	5.2	-33.7	0.0	0.7	58.1	44.8	74	54	-15.9	-9.2	V
11.400	3.0	44.3	33.8	41.2	4.2	-35.9	0.0	0.7	54.4	44.0	74	54	-19.6	-10.0	H
17.100	3.0	44.0	31.5	41.2	5.2	-33.7	0.0	0.7	57.3	44.8	74	54	-16.7	-9.2	H
Mid channel															
11.200	3.0	47.9	35.1	37.3	4.1	-36.1	0.0	0.7	54.0	41.2	74	54	-20.0	-12.8	H
16.800	3.0	44.7	31.3	40.2	5.1	-33.8	0.0	0.7	56.9	43.5	74	54	-17.1	-10.5	H
11.200	3.0	47.3	34.9	37.3	4.1	-36.1	0.0	0.7	53.4	40.9	74	54	-20.6	-13.1	V
16.800	3.0	43.7	31.3	40.2	5.1	-33.8	0.0	0.7	55.8	43.5	74	54	-18.2	-10.5	V
Low Channel															
11.000	3.0	49.1	33.4	37.3	4.1	-36.3	0.0	0.7	54.9	39.2	74	54	-19.1	-14.8	V
16.500	3.0	44.3	31.5	39.3	5.0	-34.1	0.0	0.7	55.3	42.5	74	54	-18.7	-11.5	V
11.000	3.0	48.2	34.7	37.3	4.1	-36.3	0.0	0.7	54.0	40.6	74	54	-20.0	-13.4	H
16.500	3.0	44.7	31.5	39.3	5.0	-34.1	0.0	0.7	55.6	42.5	74	54	-18.4	-11.5	H
Spurious emissions															
1.140	3.0	52.9	39.3	25.8	1.3	-39.3	0.0	0.0	40.7	27.1	74	54	-33.3	-26.9	H
1.020	3.0	55.1	49.9	25.5	1.3	-39.5	0.0	0.0	42.3	37.2	74	54	-31.7	-16.8	H
1.497	3.0	52.3	52.3	26.7	1.5	-38.8	0.0	0.0	41.7	41.7	74	54	-32.3	-12.3	H
2.496	3.0	50.5	38.2	28.9	2.1	-37.5	0.0	0.0	44.0	31.7	74	54	-30.0	-22.3	H
1.330	3.0	61.1	39.6	26.3	1.4	-39.0	0.0	0.0	49.8	28.2	74	54	-24.2	-25.8	V
1.500	3.0	55.0	41.2	26.7	1.5	-38.8	0.0	0.0	44.5	30.6	74	54	-29.5	-23.4	V
1.658	3.0	52.7	38.6	27.1	1.6	-38.6	0.0	0.0	42.8	28.7	74	54	-31.2	-25.3	V
2.493	3.0	52.3	35.9	28.9	2.1	-37.5	0.0	0.0	45.8	29.3	74	54	-28.2	-24.7	V

Rev. 5.1.6

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		

8.1.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

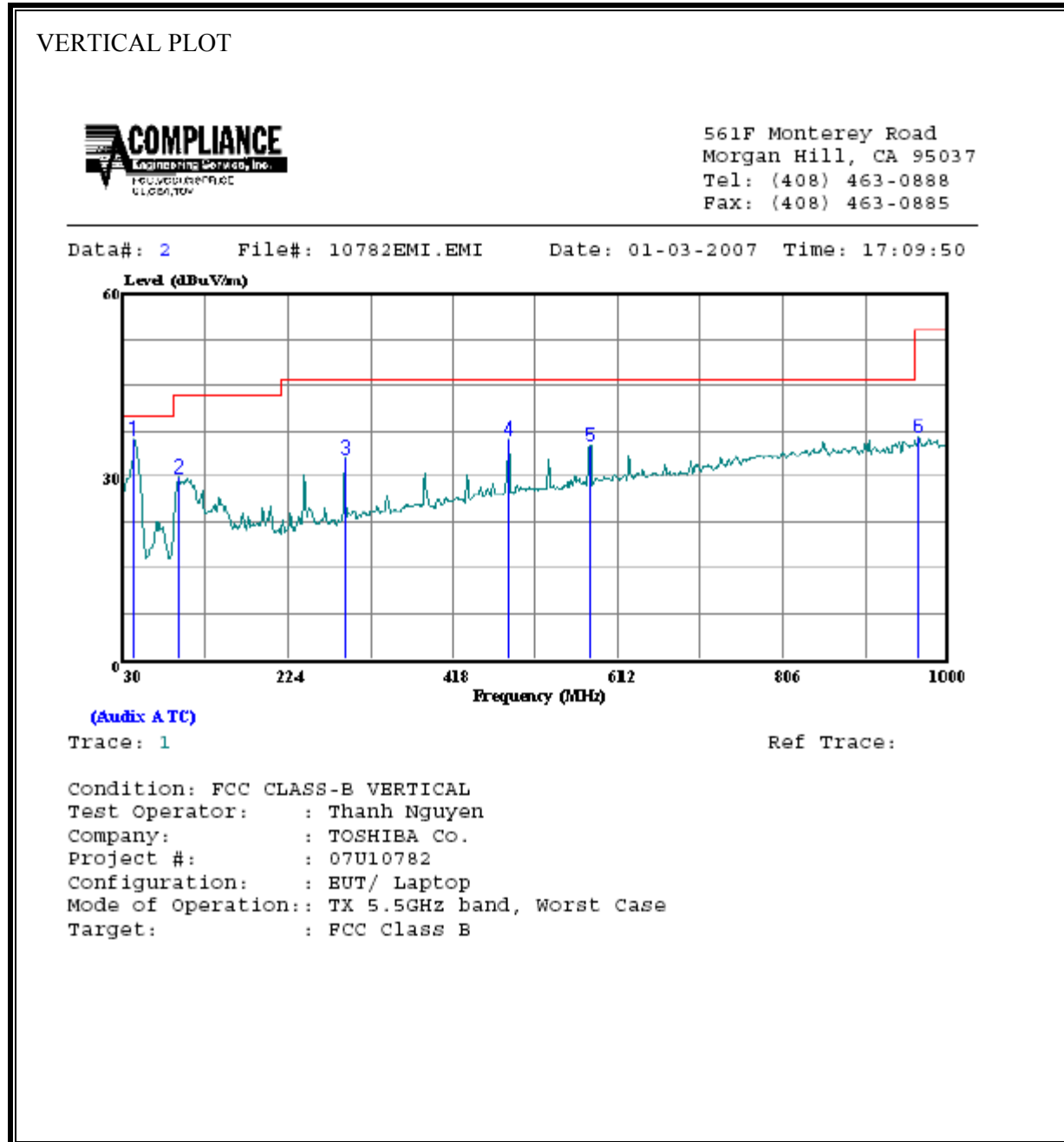
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	203.630	14.44	14.01	28.45	43.50	-15.05	Peak
2	242.430	18.30	13.63	31.93	46.00	-14.07	Peak
3	290.930	17.77	15.33	33.10	46.00	-12.90	Peak
4	482.990	10.33	19.89	30.22	46.00	-15.78	Peak
5	947.620	9.54	26.45	35.99	46.00	-10.01	Peak

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



VERTICAL DATA

	Read		Limit	Over		
Freq	Level	Factor	Level	Line	Limit	Remark
-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	43.580	22.96	13.02	35.98	40.00	-4.02 Peak
2	94.990	19.67	10.12	29.79	43.50	-13.71 Peak
3	290.930	17.65	15.33	32.98	46.00	-13.02 Peak
4	482.990	16.13	19.89	36.02	46.00	-9.98 Peak
5	579.020	13.77	21.27	35.04	46.00	-10.96 Peak
6	965.080	9.97	26.63	36.60	54.00	-17.40 Peak

8.2. FREQUENCY STABILITY

LIMIT

§15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

RSS-210 A9.5 (e) +/- 10 ppm

TEST PROCEDURE

Reference measurements of the carrier frequency are made at nominal conditions of +20°C and the rated supply voltage.

Additional measurements are made at temperatures of – 30°C and +50°C at the manufacturer’s rated power supply voltage. Additional measurements are made at +/- 15 percent of the manufacturer’s rated supply voltage temperature of +20°C.

The additional measurements are compared with the reference measurements to calculate the frequency stability.

RESULTS

No non-compliance noted:

Reference Frequency at 20 deg C and 115 VAC

Supply Voltage (VAC)	Temperature (deg C)	Frequency (MHz)	Delta (ppm)
115.00	20	5600.01880	Reference
115.00	-30	5600.038137	-3.452
115.00	50	5600.03809	-3.443
97.75	20	5600.01924	-0.077
132.25	20	5600.01820	0.108

8.3. 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 μ 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.

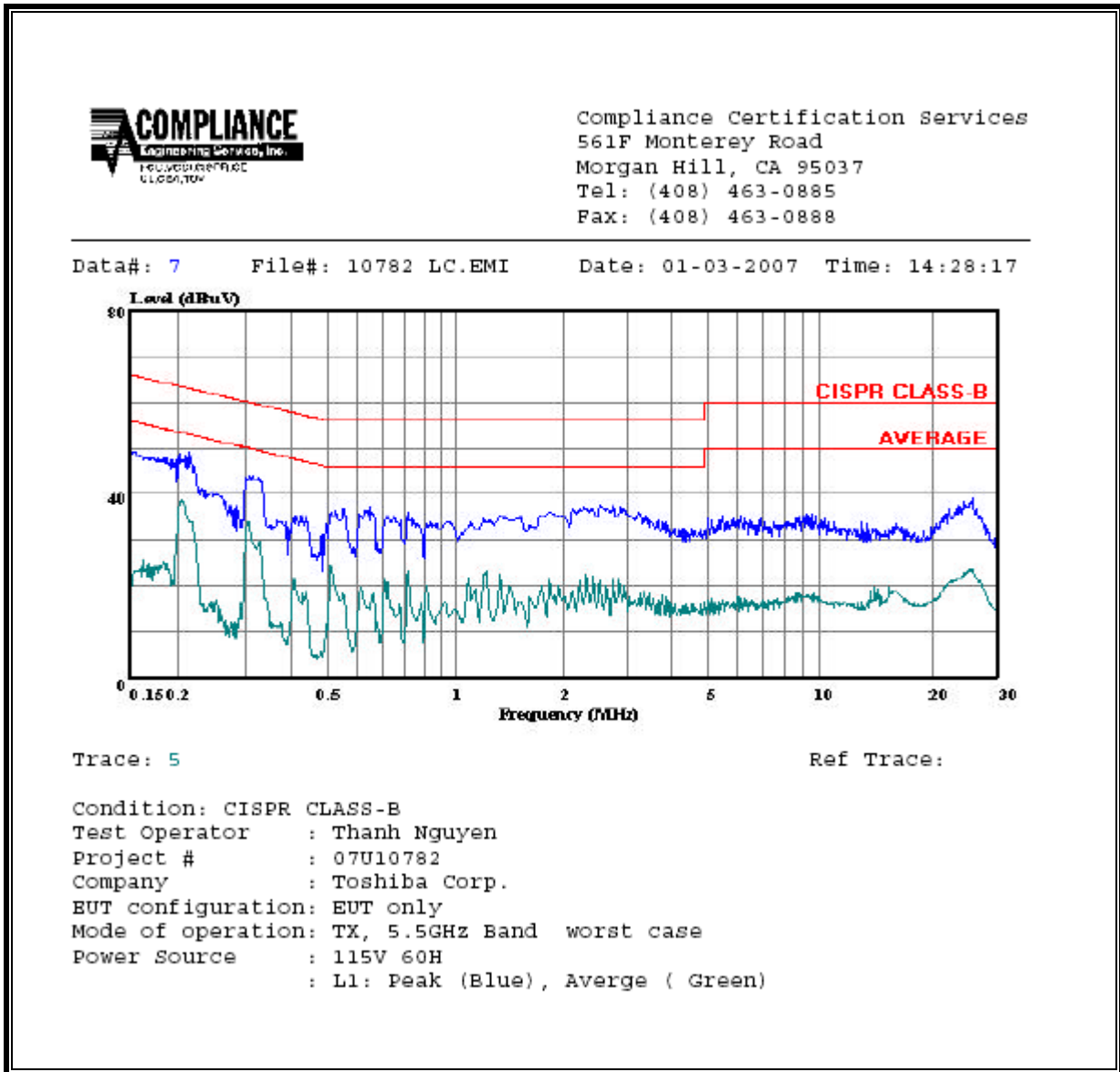
RESULTS

No non-compliance noted:

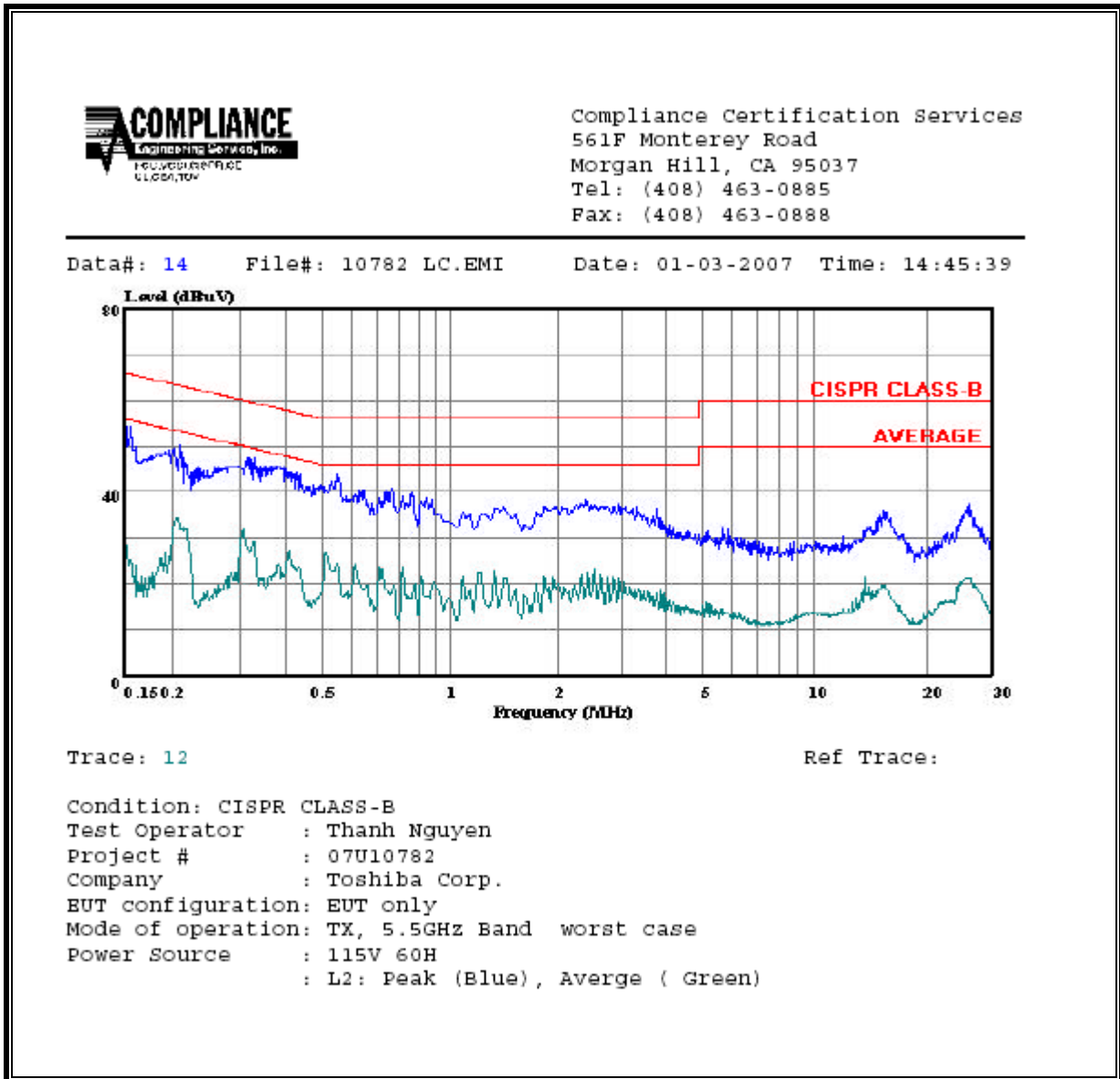
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq.	Reading			Class	Limit	EN_B		Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2	
0.22	48.72	--	--	0.00	63.01	53.01	-14.29	-4.29	L1	
0.32	43.82	--	--	0.00	59.84	49.84	-16.02	-6.02	L1	
25.73	39.10	--	--	0.00	60.00	50.00	-20.90	-10.90	L1	
0.15	54.42	--	34.30	0.00	65.89	55.89	-11.47	-21.59	L2	
0.55	43.98	--	24.19	0.00	56.00	46.00	-12.02	-21.81	L2	
26.14	37.36	--	--	0.00	60.00	50.00	-22.64	-12.64	L2	
6 Worst Data										

LINE 1 RESULTS



LINE 2 RESULTS

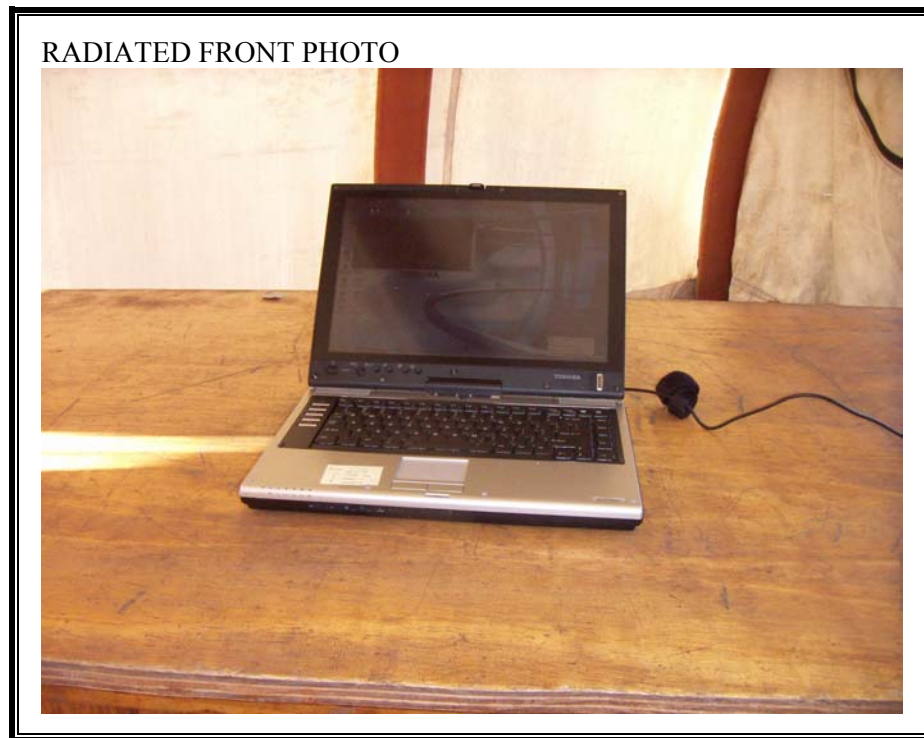


9. SETUP PHOTOS

TEMPERATURE RF MEASUREMENT SETUP



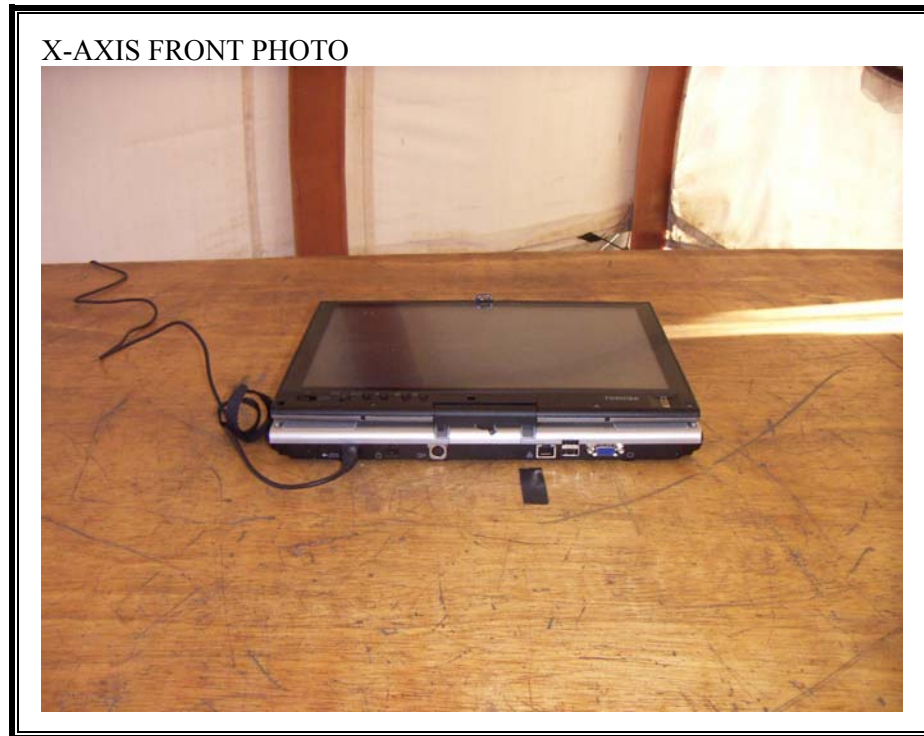
RADIATED RF MEASUREMENT SETUP FOR MOBILE CONFIGURATION



RADIATED BACK PHOTO



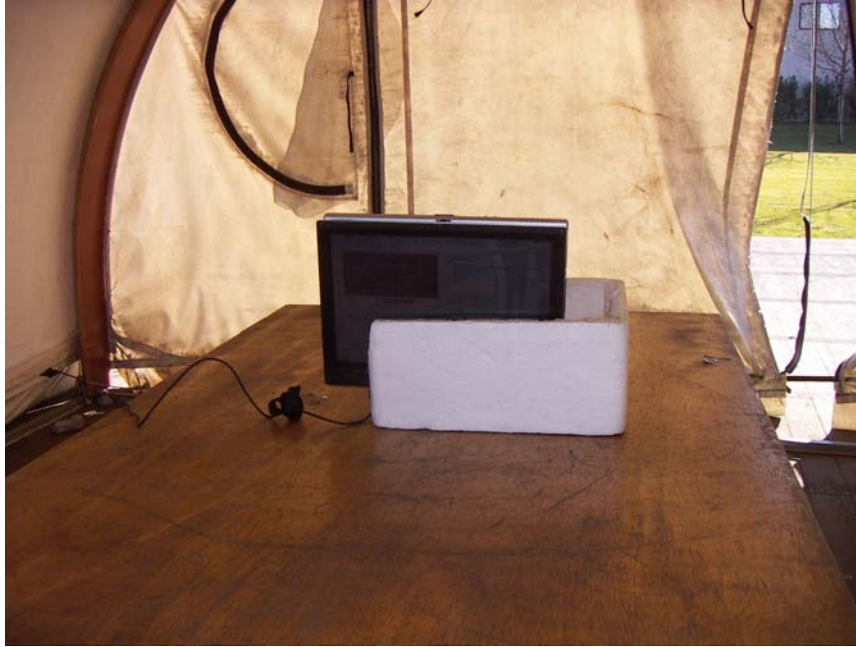
RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION

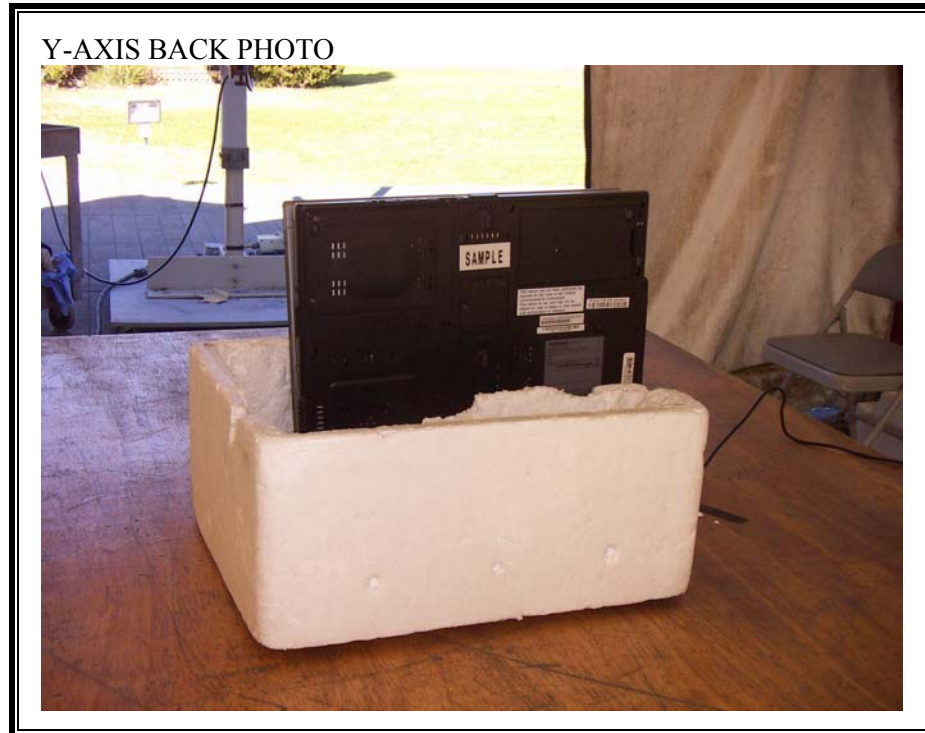


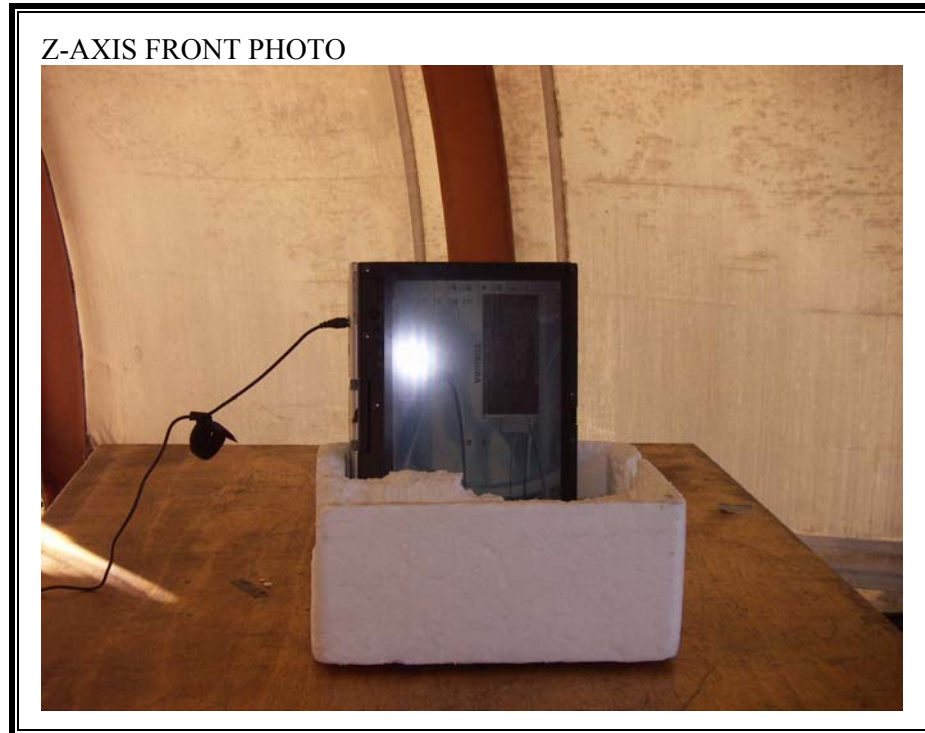
X-AXIS BACK PHOTO



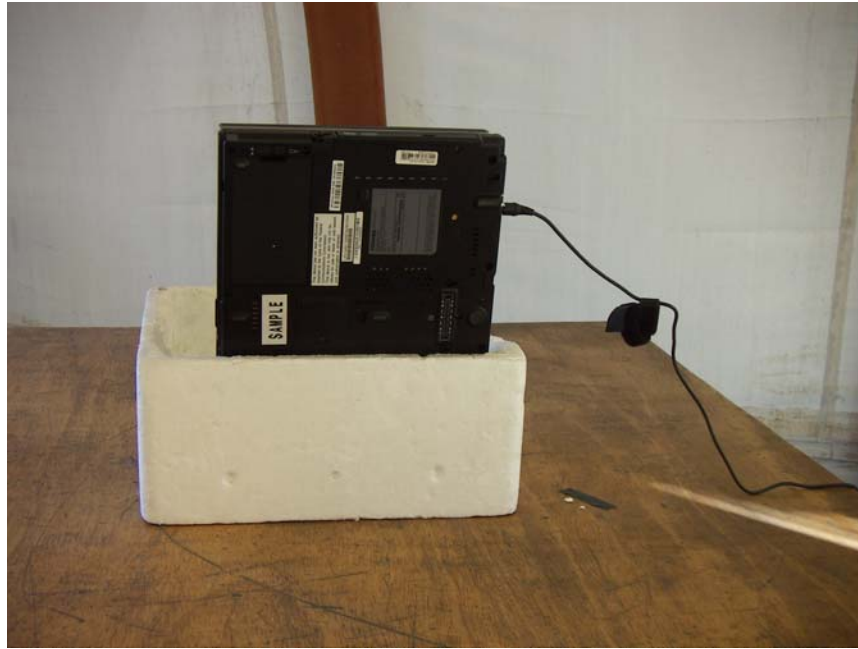
Y-AXIS FRONT PHOTO



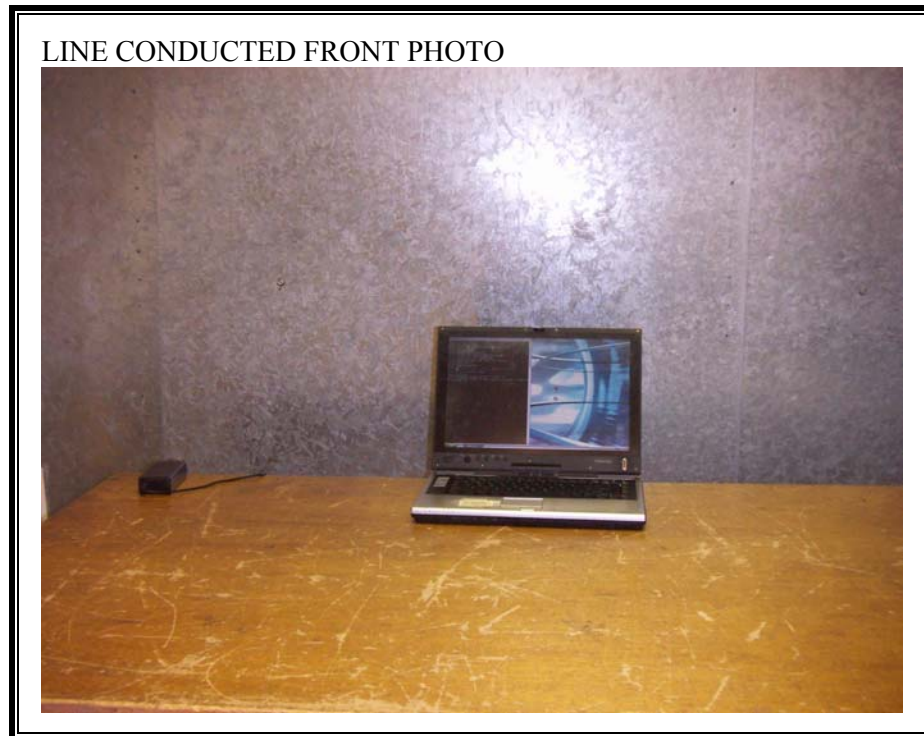




Z-AXIS BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP





END OF REPORT