



**FCC CFR47 PART 15 SUBPART E
CERTIFICATION
TEST REPORT**

FOR

802.11 A/G HALF SIZE MINI-PCI WLAN MODULE

MODEL NUMBER: PA3459U-1MPC, PA3461U/E-1MPC (FOR OPTION)

FCC ID: CJ6UPA3459WL

REPORT NUMBER: 05U3391-2

ISSUE DATE: MAY 27, 2005

Prepared for

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

Prepared by

COMPLIANCE ENGINEERING SERVICES, INC.

d.b.a.

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LAB CODE:200065-0

Revision History

<u>Rev.</u>	<u>Revisions</u>	<u>Revised By</u>
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1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: 802.11A/G HALF SIZE MINI-PCI WLAN MODULE

MODEL: PA3459U-1MPC; PA3461U/E-1MPC (FOR OPTION)

SERIAL NUMBER: 1152T000018

DATE TESTED: MAY 09-19, 2005

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.

Note: The 5.2 GHz band is applicable to this report; other bands of operation 2.4 and 5.8 GHz are documented in a separate report.

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

CHIN PANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

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. 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>.

4. CALIBRATION AND UNCERTAINTY

4.1. 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.

4.2. 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. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/b/g transceiver Module

The radio module is manufactured by Atheros Communications.

The EUT module is installed and tested inside the Las Vegas Laptop, so additional tests conducted on radiated emissions and AC power line conducted emissions, while conducted emissions data remains the same as what was performed under CCS project no.: 05U3390-1.

5.2. MAXIMUM OUTPUT POWER

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	14.71	29.58

5250 to 5350 MHz Authorized Band

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5250 - 5320	802.11a	14.92	31.05

5.3. MANUFACTURER'S DESCRIPTION OF MODEL DIFFERENCES

The two modules are identical and only different in model number.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes four PIFA Film type antennas; each has a maximum gain as follows:

PIFA type antennas:

1. HTL017 - 4.24 dBi at 2.4GHz without cable loss;
2. HTL017 - 4.12 dBi at 5.8GHz without cable loss;
3. HTL004 - 4.18 dBi at 2.4GHz without cable loss;
4. TIAN01 - 4.66 dBi at 5.2GHz without cable loss.

The HTL017 antenna, which has the highest gain of 2.4GHz and 5.8GHz bands; also the TIAN01 antenna, which has the highest gain of 5.2GHz bands, so both antennas represent the worst-case scenario.

5.5. SOFTWARE AND FIRMWARE

The test firmware was installed in the EUT during testing.

The test utility software used during testing was art program "ART_V52build58_all".

5.6. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest average output power. The highest measured average output powers were at 2412 MHz for b/g mode, 5320 MHz for a mode (UNII), and 5745 MHz for a mode (DTS).

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC Adapter	Toshiba	PA3241U-1ACA	0409A5177935G	DoC
Laptop	Toshiba Las Vegas	PLU10N-AAA14	04B-0619	DoC

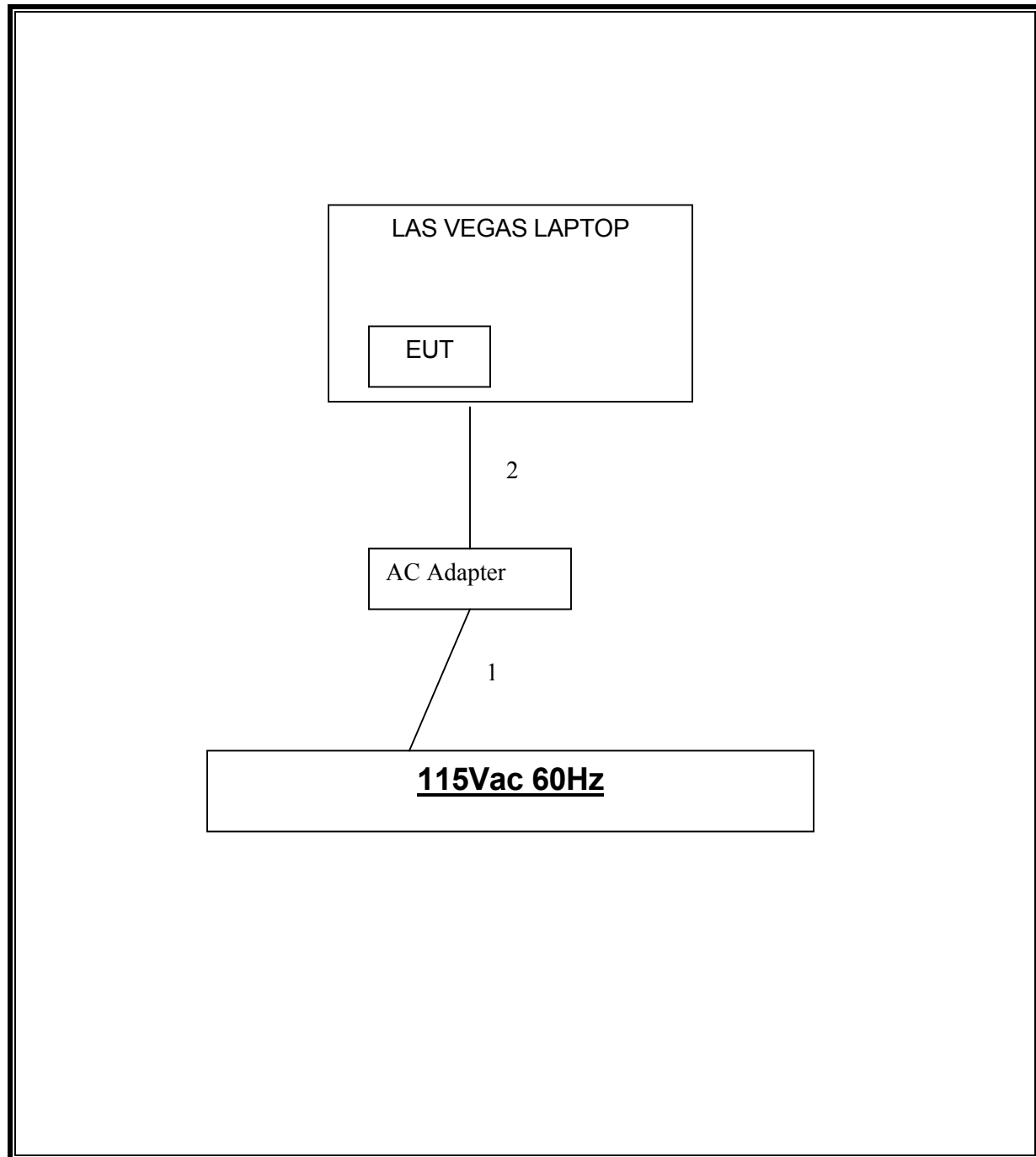
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	115VAC	Unshielded	2m	No
2	DC	1	DC	Unshielded	1.5m	No

TEST SETUP

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

SETUP DIAGRAM FOR TESTS



6. 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
EMI Test Receiver	R & S	ESHS 20	827129/006	10/22/2005
Site A Line Stabilizer / Conditioner	Tripplite	LC-1800a	A0051681	CNR
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2005
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2005
Spectrum Analyzer	HP	E4446A	US42510266	8/25/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3117	29310	9/12/2005
4.0 High Pass Filter	Micro Tronics	HPM13351	1	CNR
Amplifier 1-26GHz	MITEQ	NSP2600-SP	924342	8/17/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	9/12/2005
30MHz---- 2Ghz	Sunol Sciences	JB1 Antenna	A121003	9/12/2005
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/6/2006
RF Filter Section	HP	85420E	3705A00256	3/6/2006
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/06
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/06
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/05
Antenna, Horn 18 ~ 26 GHz	ARA	SWH-28	1007	9/12/05
7.6 High Pass Filter	Micro Tronics	HPM13195	2	CNR

7. LIMITS AND RESULTS

7.1. CHANNEL TESTS

7.1.1. AVERAGE POWER

AVERAGE POWER LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

No non-compliance noted:

The cable assembly insertion loss of 11.7 dB (including 10dB pad and 1.7dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode

Channel	Frequency (MHz)	Average Power (dBm)
Low	5180	15.01
Middle	5260	15.20
High	5320	15.36

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.

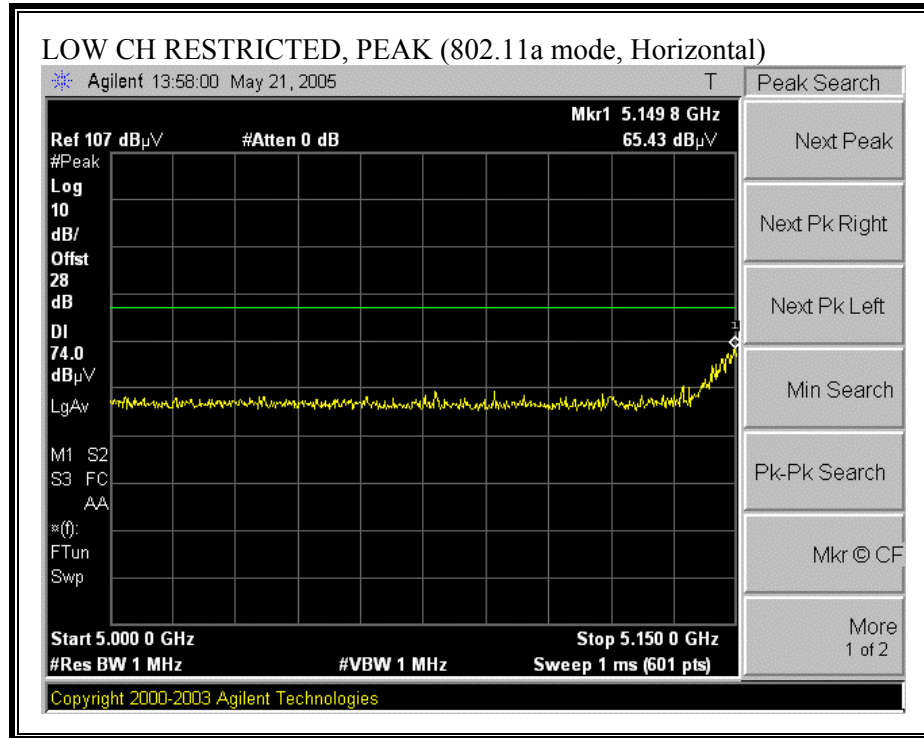
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

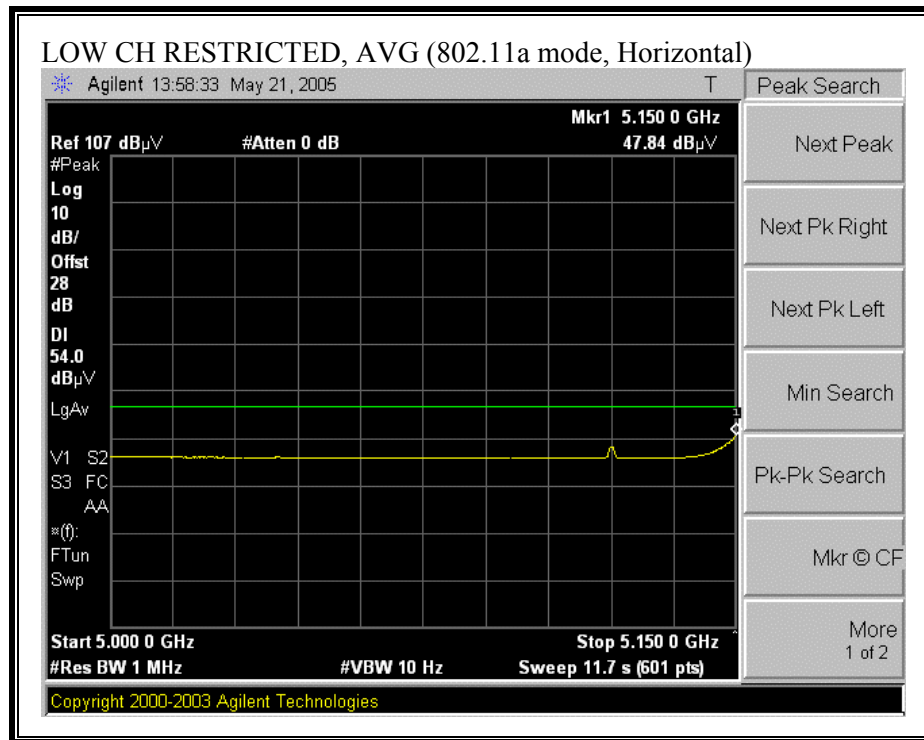
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each band.

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.

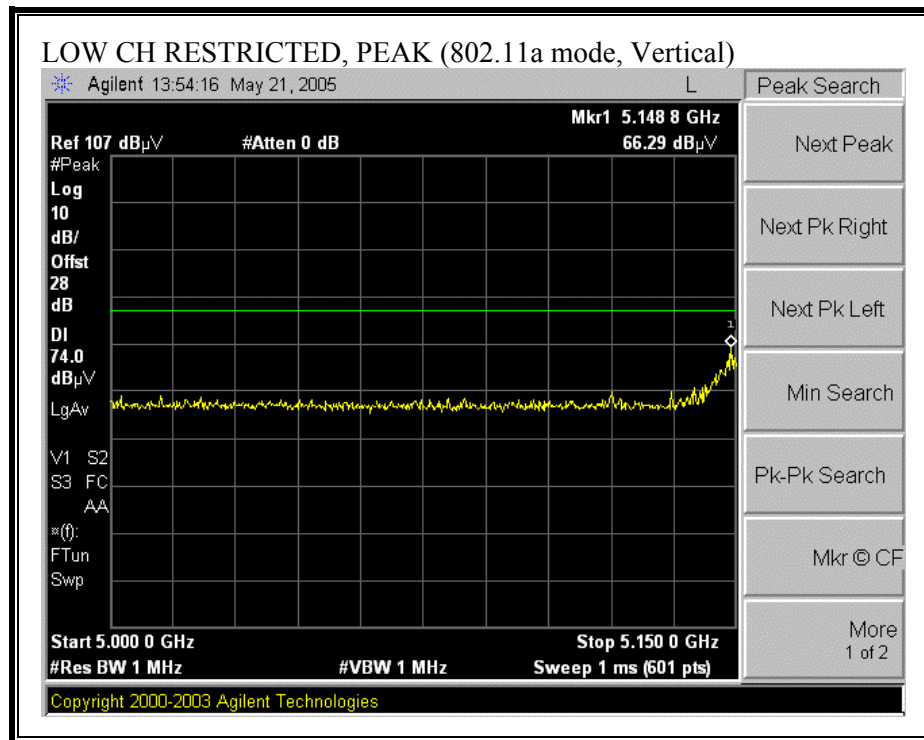
7.2.2. TRANSMITTER ABOVE 1 GHZ

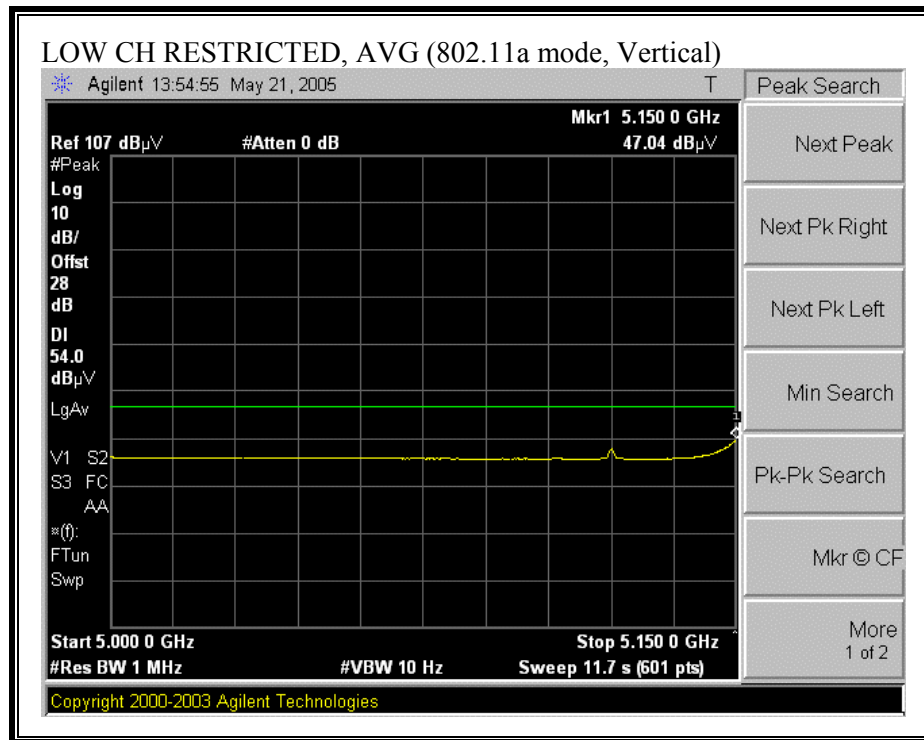
RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)



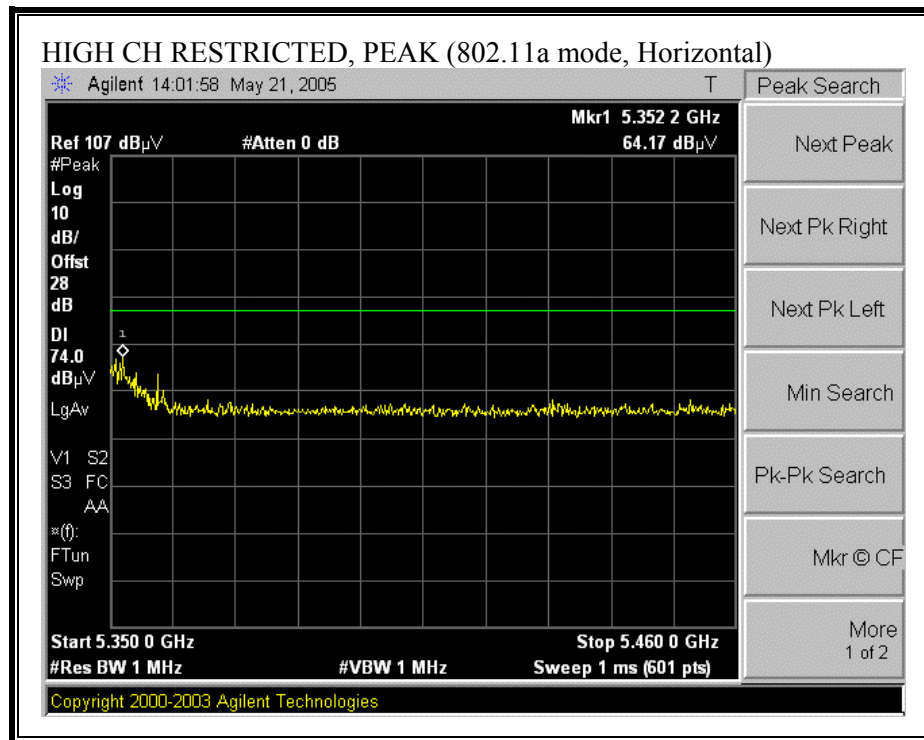


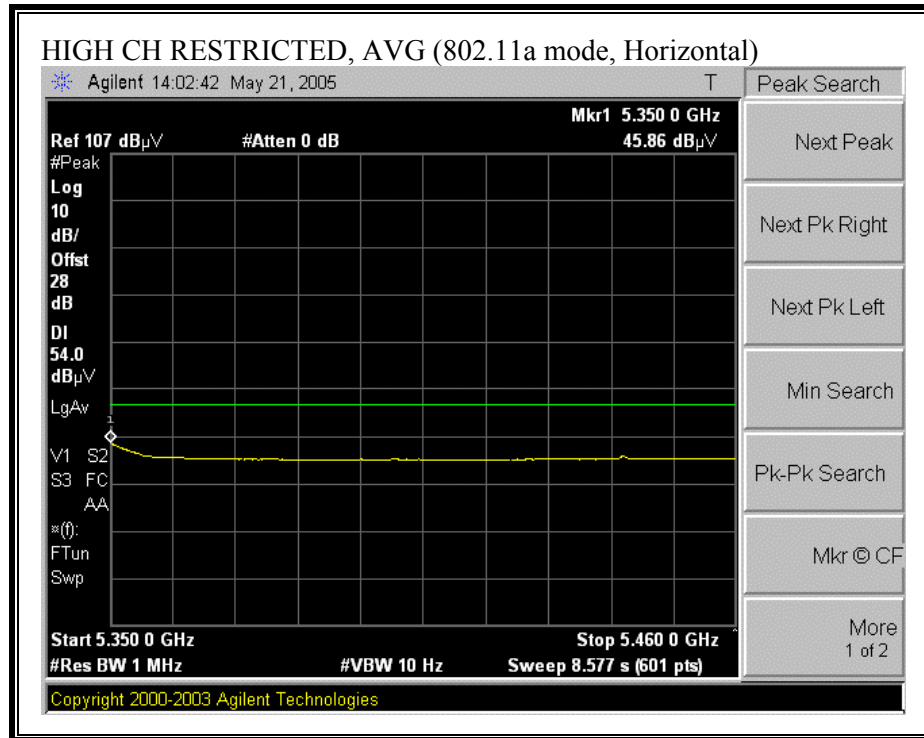
RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)



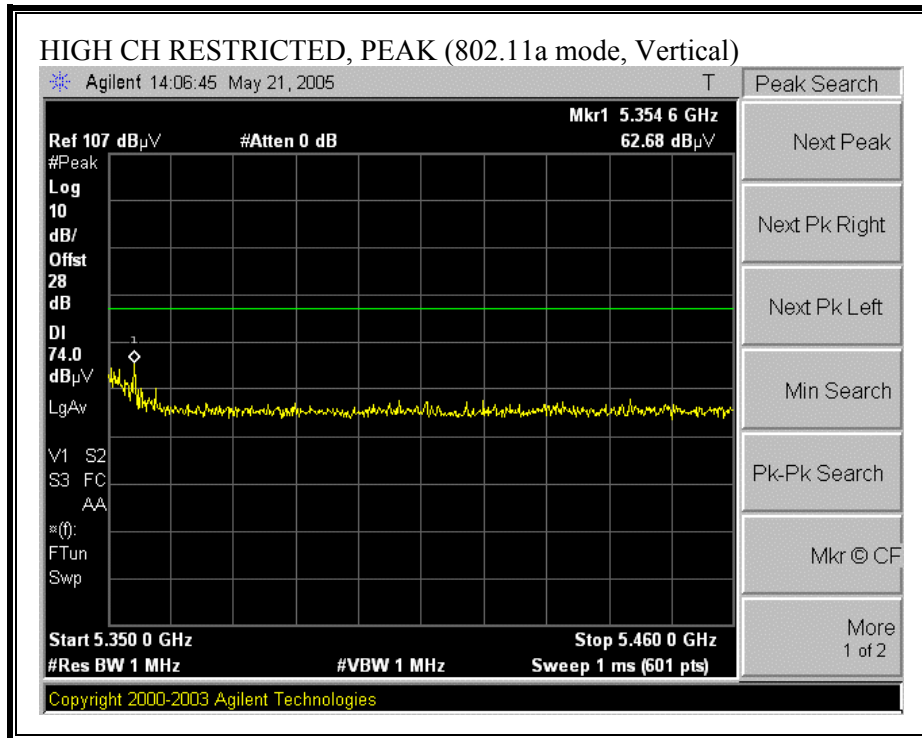


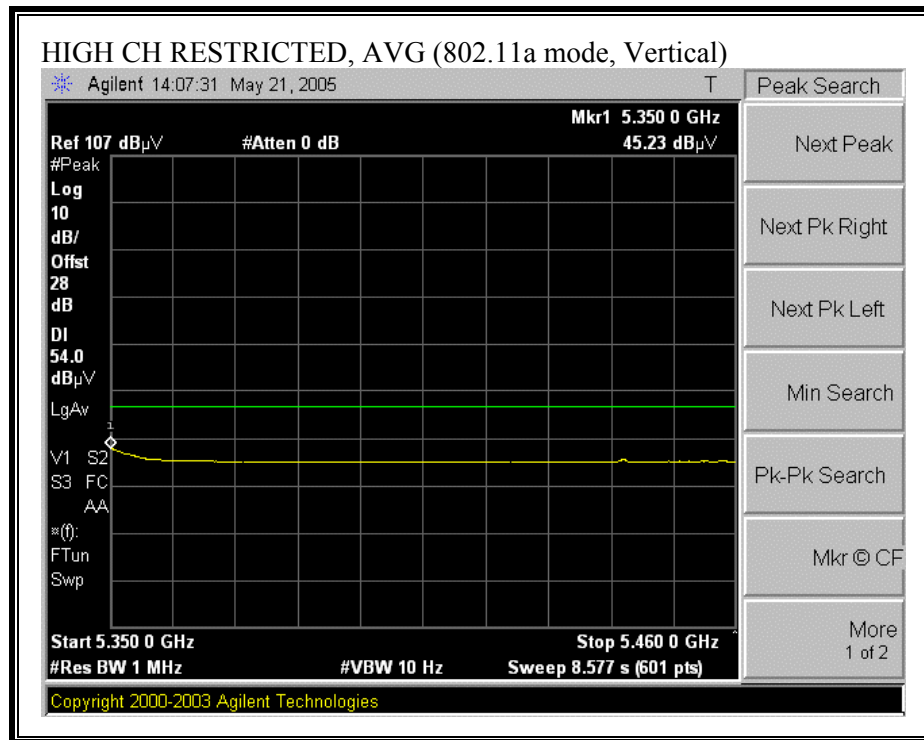
RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)





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





HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

05/21/05 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr:Chin Pang Project #:05U3391-1 Company:Toshiba EUT Descrip.:802.11 a/b/g MB62HL Half-Size Mini-PCI WLAN Module with Antenna TIAN01 EUT M/N:PA-3459-1MPC Test Target:FCC 15.407 Mode Oper:Tx, 5.2GHz Band																
Test Equipment:																
EMCO Horn 1-18GHz T73; S/N: 6717 @3m		Pre-amplifier 1-26GHz T87 Miteq 924342		Pre-amplifier 26-40GHz		Horn > 18GHz		Limit FCC 15.205								
Hi Frequency Cables				HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz								
2 foot cable		3 foot cable		4 foot cable		12 foot cable		HPF_7.6GHz		Reject Filter						
4_Thanh		12_Neelesh														
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)	
Low Ch																
15.540	3.0	64.4	49.1	39.6	7.9	-44.9	0.0	0.7	67.7	52.4	74	54	-6.3	-1.6	V	
15.540	3.0	57.0	45.0	39.6	7.9	-44.9	0.0	0.7	60.3	48.3	74	54	-13.7	-5.7	H	
mid ch																
15.780	3.0	59.0	46.8	39.2	7.9	-44.9	0.0	0.7	61.9	49.7	74	54	-12.1	-4.3	V	
15.780	3.0	55.6	43.0	39.2	7.9	-44.9	0.0	0.7	58.5	45.9	74	54	-15.5	-8.1	H	
High ch																
10.640	3.0	54.0	40.0	38.0	6.9	-41.1	0.0	0.8	58.5	44.5	74	54	-15.5	-9.5	V	
15.860	3.0	60.0	46.4	39.0	8.0	-44.9	0.0	0.7	62.8	49.2	74	54	-11.2	-4.8	V	
10.640	3.0	48.5	37.3	38.0	6.9	-41.1	0.0	0.8	53.0	41.8	74	54	-21.0	-12.2	H	
15.960	3.0	55.0	42.0	38.9	8.0	-44.9	0.0	0.7	57.7	44.7	74	54	-16.3	-9.3	H	
Note: No other emissions were detected above the system noise floor.																
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. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

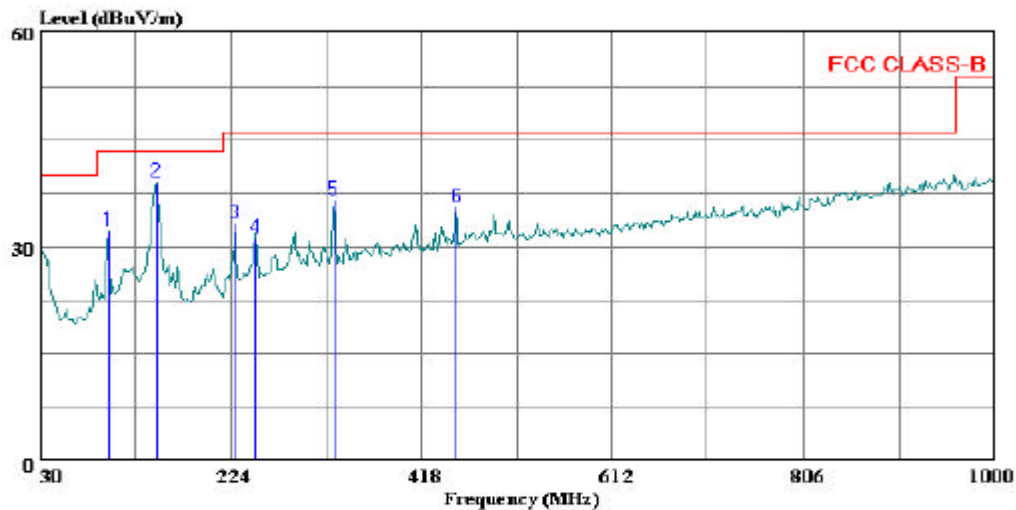
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

Data#: 10 File#: 3391 test.EMI Date: 05-20-2005 Time: 19:08:16



(Auxiliary ATC)

Trace: 9

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator: : Chin Pang
Project #: : 05U3391-1
Company: : Toshiba
EUT: : 802.11 a/b/g MB62HL Half SizeMini-PCI
: WLAN with LAS Vegas Laptop
Model No. : TBD
Configuration : EUT and Las Vegas Laptop
Target of Test : FCC Class B
Mode of Operation: Tx (Mid Ch), 5.2GHz Band

HORIZONTAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	99.840	20.76	11.38	32.14	43.50	-11.36	Peak
2	148.340	24.68	14.33	39.00	43.50	-4.50	Peak
3	227.880	20.33	12.95	33.28	46.00	-12.72	Peak
4	249.220	17.28	13.87	31.14	46.00	-14.86	Peak
5	329.730	20.18	16.44	36.62	46.00	-9.38	Peak
6	453.890	16.22	19.28	35.50	46.00	-10.50	Peak

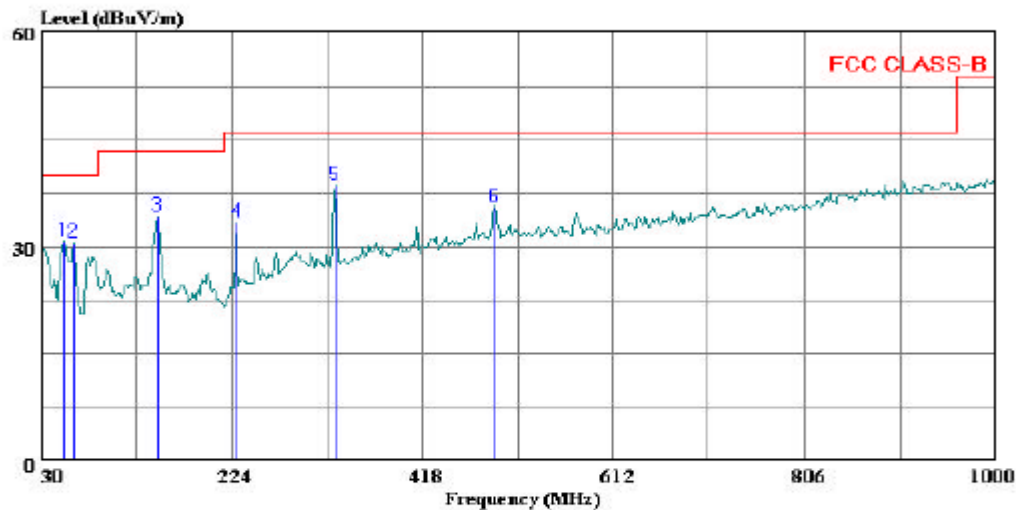
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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

Data#: 12 File#: 3391 test.EMI Date: 05-20-2005 Time: 19:11:51



(Auxiliary ATC)

Trace: 11

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator: : Chin Pang
Project #: : 05U3391-1
Company: : Toshiba
EUT: : 802.11 a/b/g MB62HL Half SizeMini-PCI
Model No. : TBD
Configuration : EUT and Las Vegas Laptop
Target of Test : FCC Class B
Mode of Operation: Tx (Mid Ch), 5.2GHz Band

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	53.280	21.79	8.94	30.73	40.00	-9.27	Peak
2	62.980	21.55	8.90	30.45	40.00	-9.55	Peak
3	148.340	19.90	14.33	34.22	43.50	-9.28	Peak
4	227.880	20.49	12.95	33.44	46.00	-12.56	Peak
5	329.730	22.12	16.44	38.56	46.00	-7.44	Peak
6	491.720	15.44	20.10	35.54	46.00	-10.46	Peak

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 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.

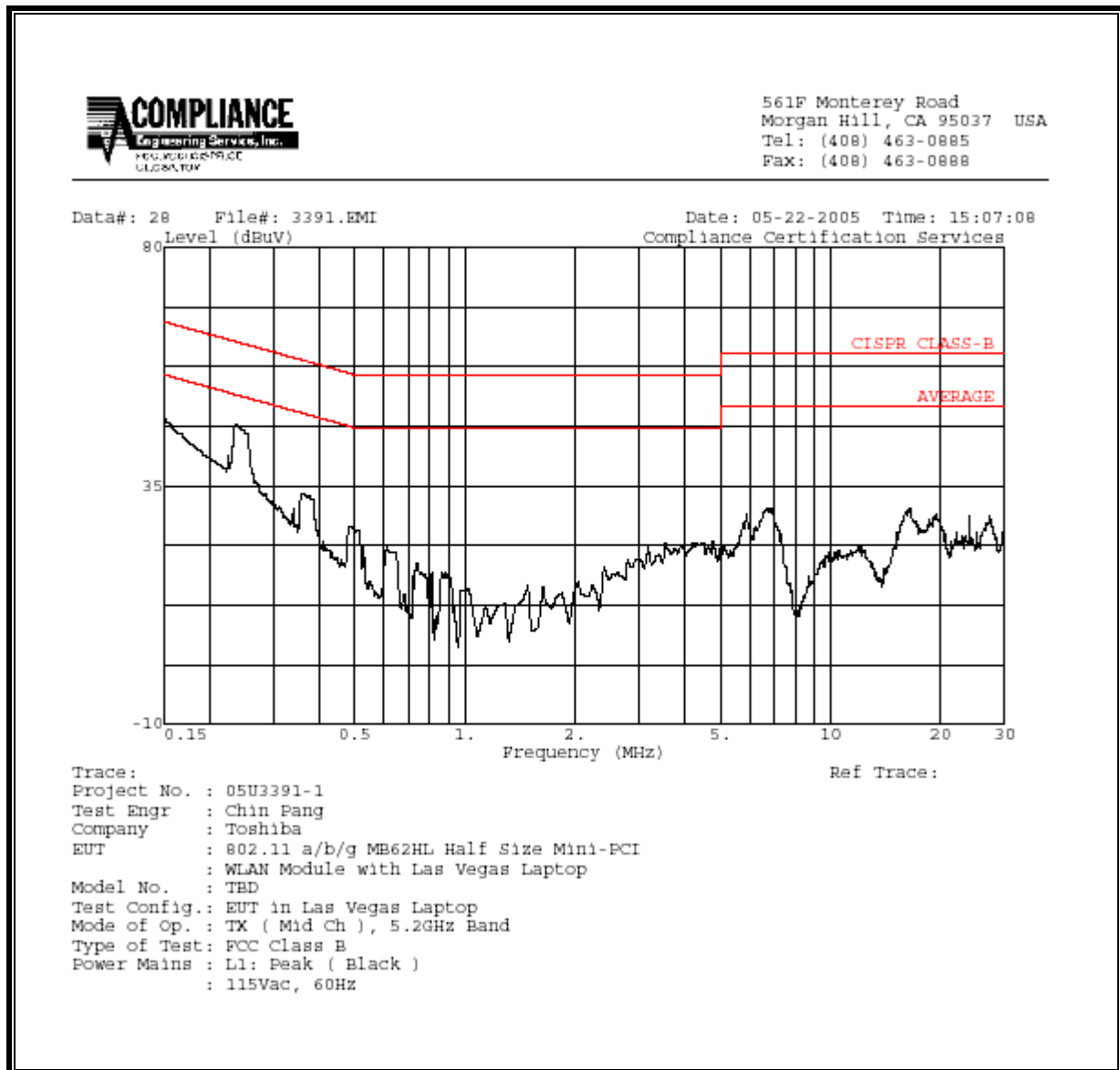
RESULTS

No non-compliance noted:

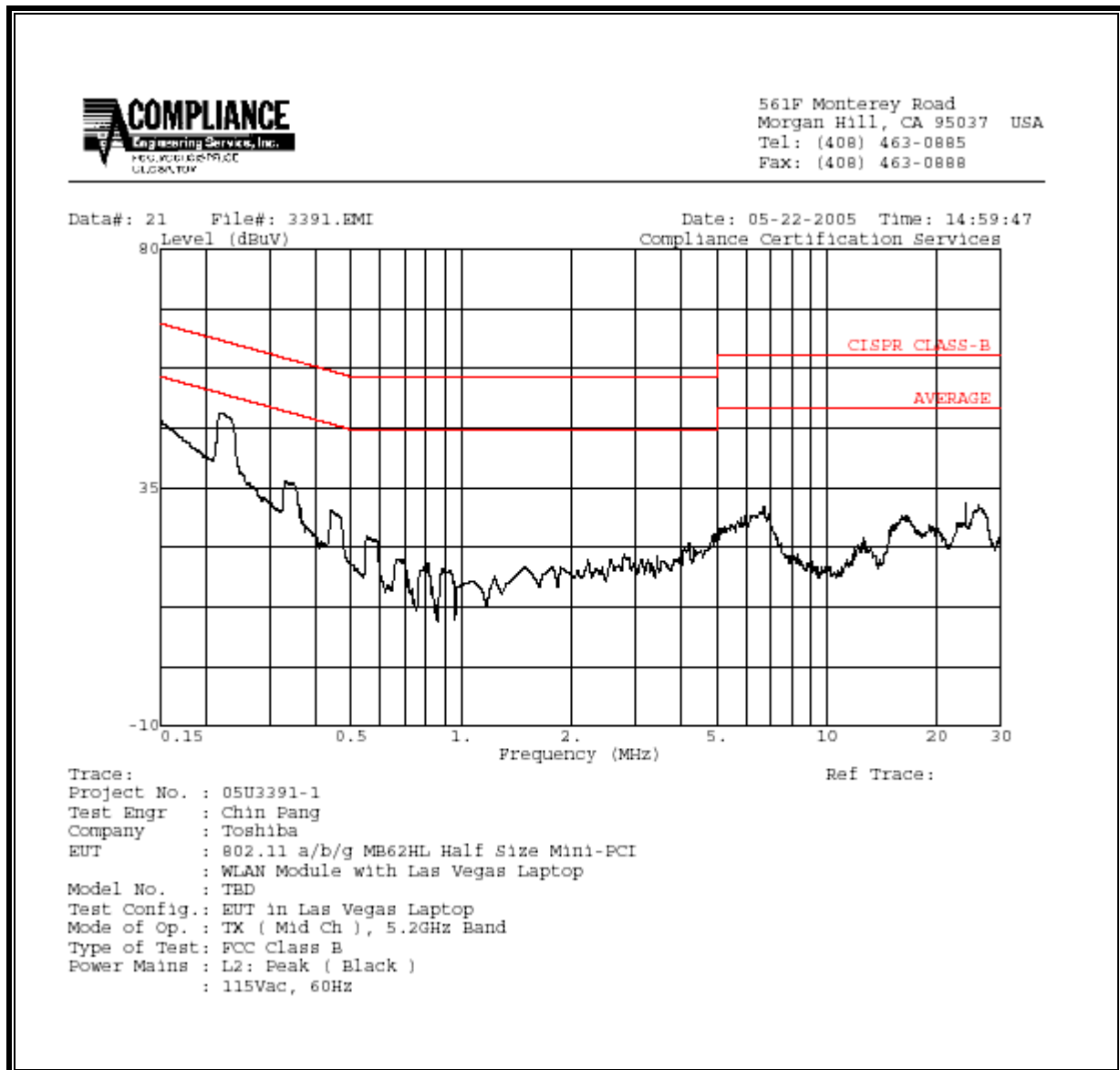
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.24	46.60	--	--	0.00	62.20	52.20	-15.60	-5.60	L1
0.36	33.50	--	--	0.00	58.73	48.73	-25.23	-15.23	L1
6.84	30.74	--	--	0.00	60.00	50.00	-29.26	-19.26	L1
0.22	49.20	--	--	0.00	62.82	52.82	-13.62	-3.62	L2
0.34	35.92	--	--	0.00	59.30	49.30	-23.38	-13.38	L2
6.72	31.60	--	--	0.00	60.00	50.00	-28.40	-18.40	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS



(Please be noted that pages 31 through 34 have been extracted as Setup Photos, this is the end of the body of this report).