FCC CFR47 PART 15 SUBPART E
CLASS II PERMISSIVE CHANGE
TEST REPORT
FOR

WIRELESS LAN MINI-PCI EXPRESS, 802.11a/b/g

MODEL NUMBER: PA3489U-1MPC

FCC ID: CJ6UPA3489WL

REPORT NUMBER: 06U10660-3

ISSUE DATE: OCTOBER 30, 2006

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

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
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LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	10/30/06	Initial Issue	Thu

TABLE OF CONTENTS

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: WIRELESS LAN MINI-PCI EXPRESS, 802.11a/b/g

MODEL: PA3489U-1MPC

SERIAL NUMBER: 76019908J

DATE TESTED: OCTOBER 20 - 24, 2006

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

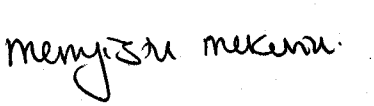
Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:



MENGISTU MEKURIA
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 WLAN transceiver in Toshiba Protégé R400 Tablet

5.2. DESCRIPTION OF CLASS II CHANGE

The major changes filed under this application include:

Change #1: The EUT module is being used in a different host;
Change #2: Collocation with BT module;
Change #3: Collocation with WWAN module.

5.3. MAXIMUM OUTPUT POWER

The transmitter has a same conducted output power on the original grant of FCC ID: CJ6UPA3489WL.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes two PIFA antennas, each with a maximum gain of 0.8dBi @ 5.2GHz bands.

5.5. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was CRTU, rev. 4.0.18.0000

The test utility software used during testing was CRTU, rev. 4.0.18.0000

5.6. WORST-CASE CONFIGURATION AND MODE

The Mobile position and portable X, Y and Z positions have been investigated; the worst-case configuration has been evaluated at mobile position for 5.2GHz band.

The worst-case channel is determined as the channel with the highest output power. The highest measured output powers were at 5300 MHz for 11a.

The worst-case data rate for this channel is determined to be 6 Mb/s for 11a mode based on previous experience with WLAN product design architectures.

5.7. DESCRIPTION OF TEST SETUP

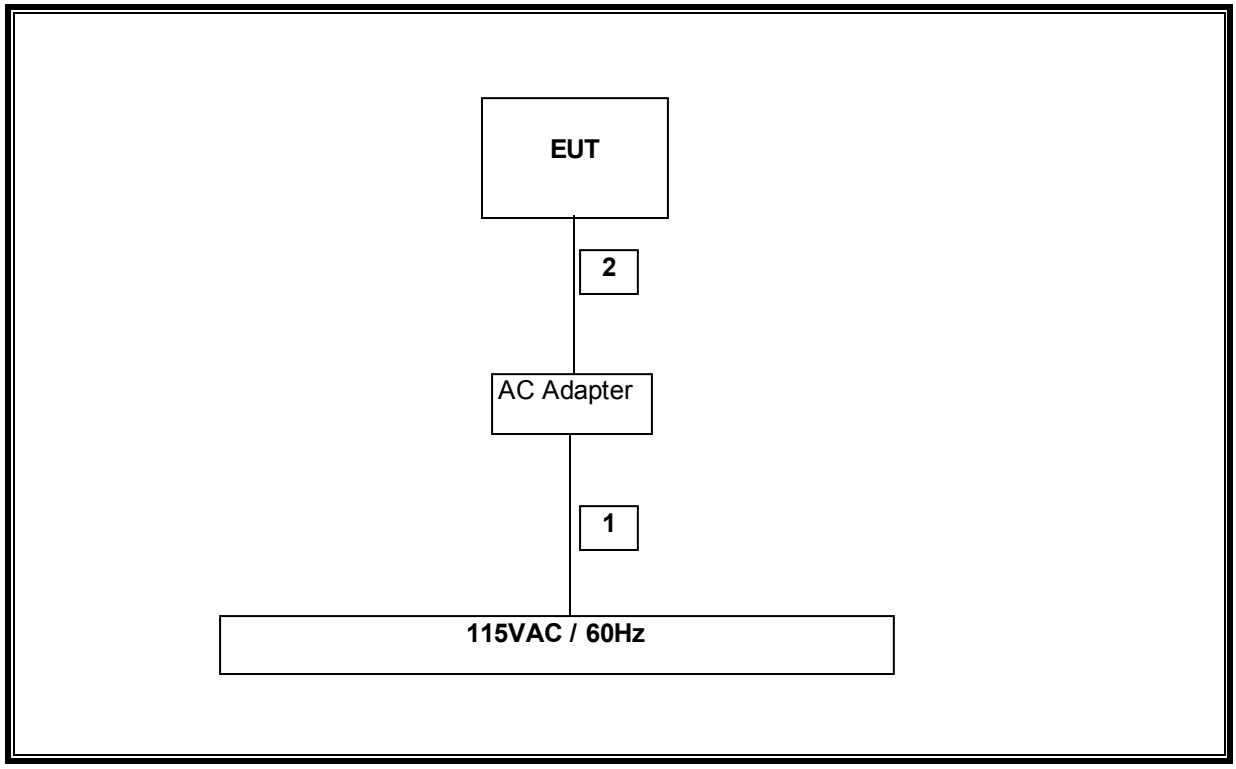
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	2m	N/A
2	DC	1	DC	Un-shielded	2m	N/A

TEST SETUP

The EUT is installed in a host laptop computer. 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
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
Antenna, Bilog 30 MHz ~ 2	Sunol Scienc	JB1	A121003	9/3/2007
EMI Receiver, 9 kHz ~ 2.9	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/2007
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-	2023	8/30/2007
Spectrum Analyzer 3 Hz ~	Agilent / HP	E4446A	MY43360112	5/3/2007
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29310	4/22/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
Spectrum Analyzer 3 Hz ~	Agilent / HP	E4446A	MY43360112	5/3/2007
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/22/2007
7.6 Highpass Filter	Micro-Tronics	HPM13195	1	CNR

7. LIMITS AND RESULTS

7.1. 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 11.5 dB (including 10 dB pad and 1.5dB 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	15.80
Middle	5260	17.30
High	5320	17.40

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.

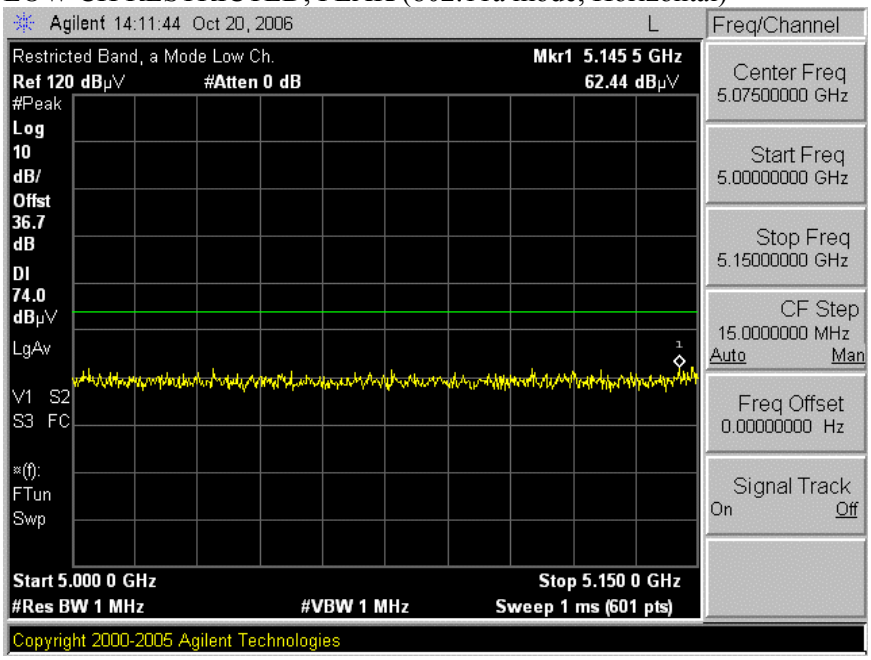
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

7.3. CHANNEL TESTS FOR THE 5150 TO 5350 MHz BAND

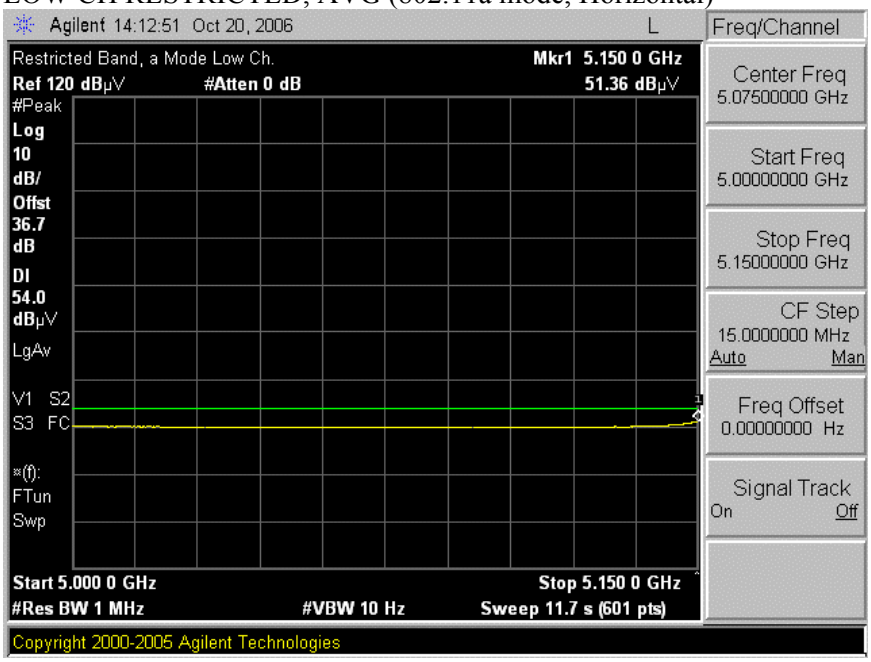
7.3.1. TRANSMITTER ABOVE 1 GHZ FOR 5150 TO 5350 MHz BAND

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

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

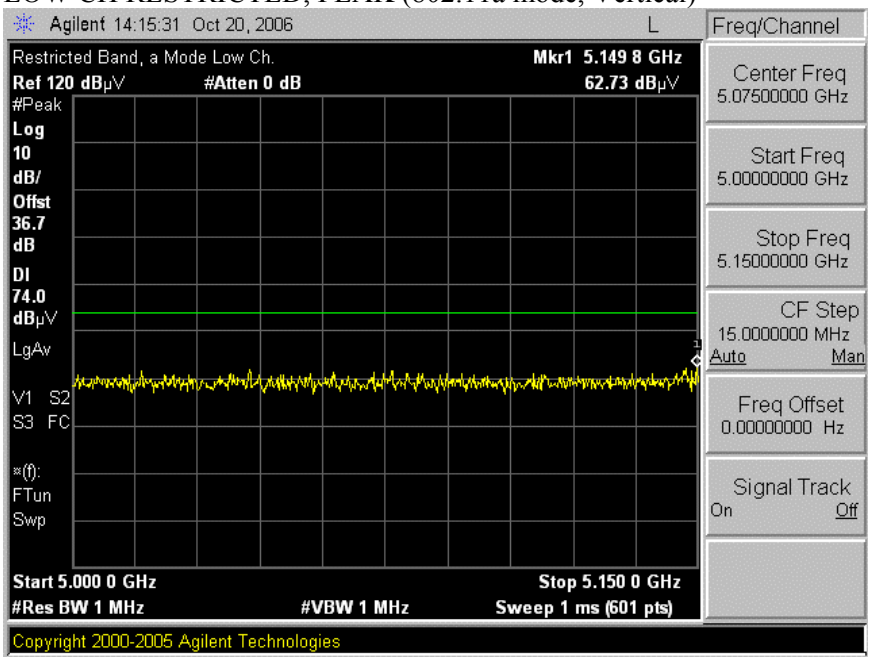


LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)

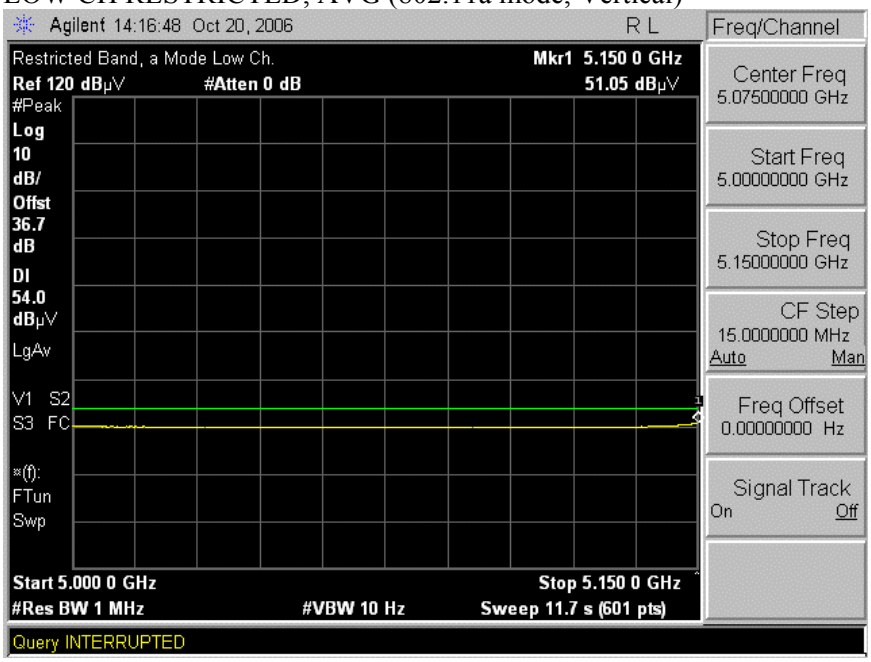


RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)

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

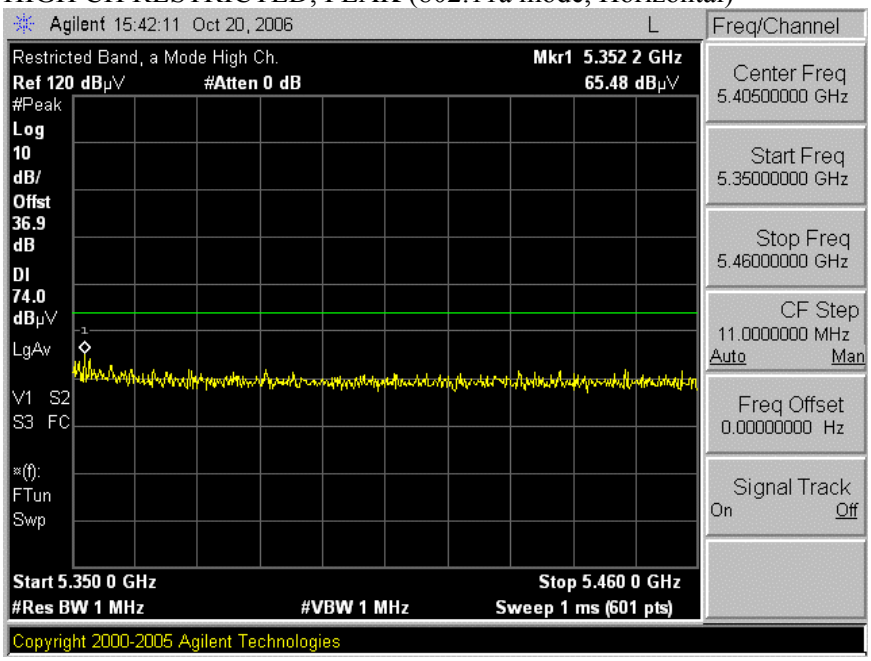


LOW CH RESTRICTED, AVG (802.11a mode, Vertical)

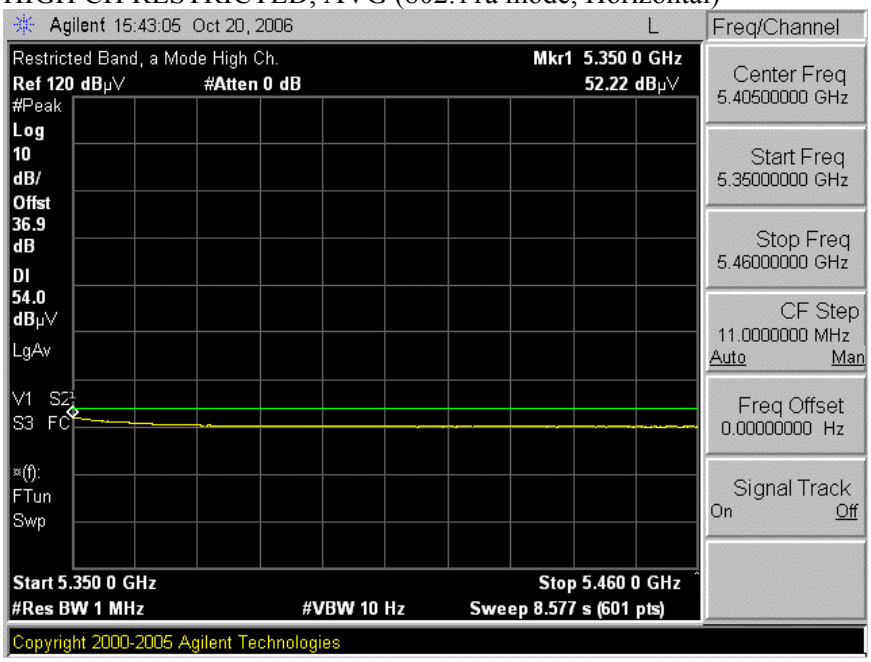


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)

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

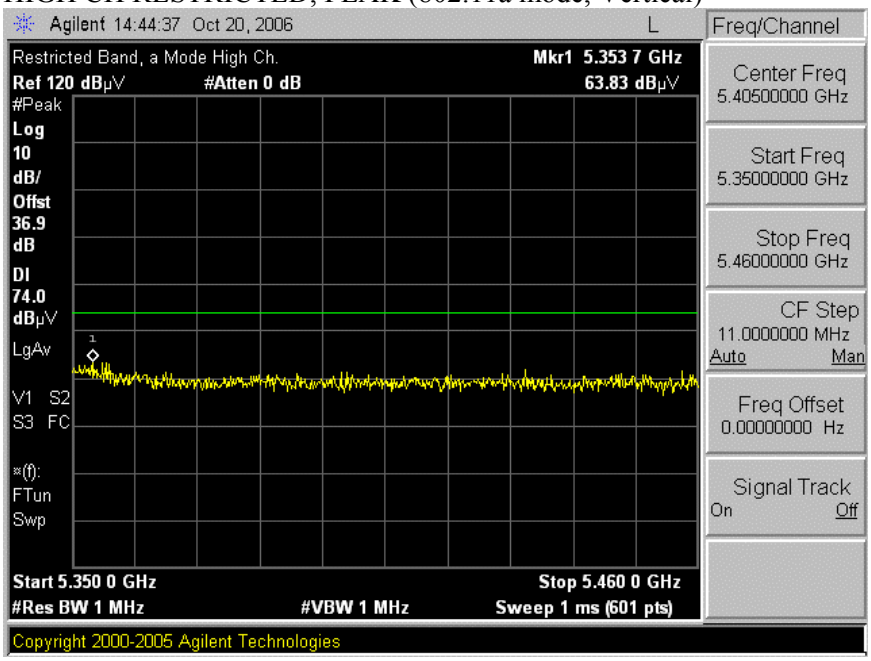


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

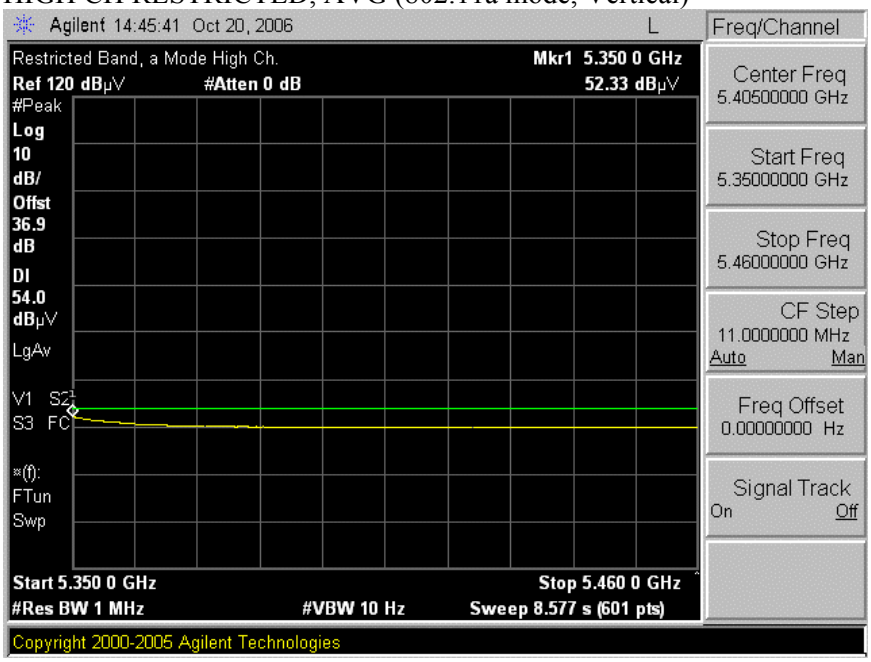


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, VERTICAL)

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



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



HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

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

Company: Toshiba America Information Systems, Inc.
Project #: 06U10660
Date: 10/20/2007
Test Engineer: William Zhuang
Configuration: EUT
Mode: Tx On in a Mode, 5.2GHz

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T87 Miteq 924342	T88 Miteq 26-40GHz	T89; ARA 18-26GHz; S/N:1049	FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
Joseph 187207005		Gordon 203134001	HPF_7.6GHz	

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)
Low Ch. 5180MHz															
15.540	3.0	50.3	38.5	38.7	5.5	-41.3	0.0	0.7	54.0	42.2	74	54	-20.0	-11.8	H
15.540	3.0	51.0	38.4	38.7	5.5	-41.3	0.0	0.7	54.7	42.1	74	54	-19.3	-11.9	V
Mid Ch. 5260MHz															
15.780	3.0	50.7	38.4	38.8	5.6	-41.2	0.0	0.7	54.6	42.3	74	54	-19.4	-11.7	H
15.780	3.0	52.7	40.0	38.8	5.6	-41.2	0.0	0.7	56.6	43.9	74	54	-17.4	-10.1	V
Hi Ch, 5825 MHz															
10.640	3.0	51.7	39.0	36.8	4.2	-39.4	0.0	0.8	54.2	41.4	74	54	-19.8	-12.6	H
15.960	3.0	51.8	40.0	38.8	5.7	-41.1	0.0	0.7	55.8	44.0	74	54	-18.2	-10.0	H
10.640	3.0	50.5	38.3	36.8	4.2	-39.4	0.0	0.8	53.0	40.7	74	54	-21.0	-13.3	V
15.960	3.0	52.7	40.8	38.8	5.7	-41.1	0.0	0.7	56.7	44.8	74	54	-17.3	-9.2	V

Rev. 5.1.6
Note: No other emissions were detected above the system noise floor.

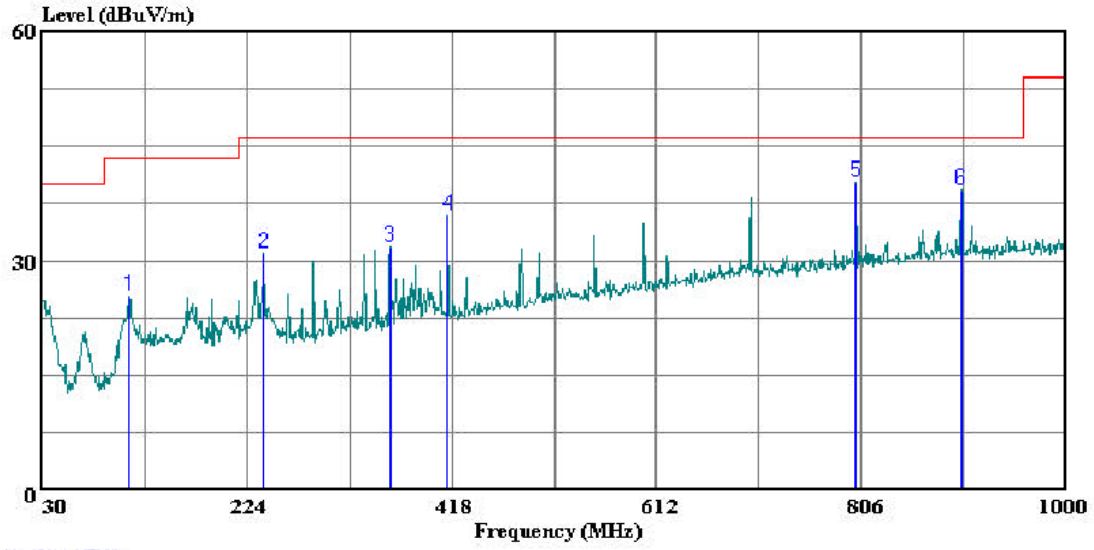
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

7.3.2. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

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

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

Data#: 8 File#: 06U10660 emi.EMI Date: 10-23-2006 Time: 23:19:19



(Audix ATC)

Trace: 7 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Mengistu Mekuria
Company: : Toshiba America Information Sys.,Inc.
Project #: : 06J10660
Configuration:: WLAN Card inside Laptop
Mode of Oper.:: TX 11a Mode
Target: : FCC Class B

Page: 1

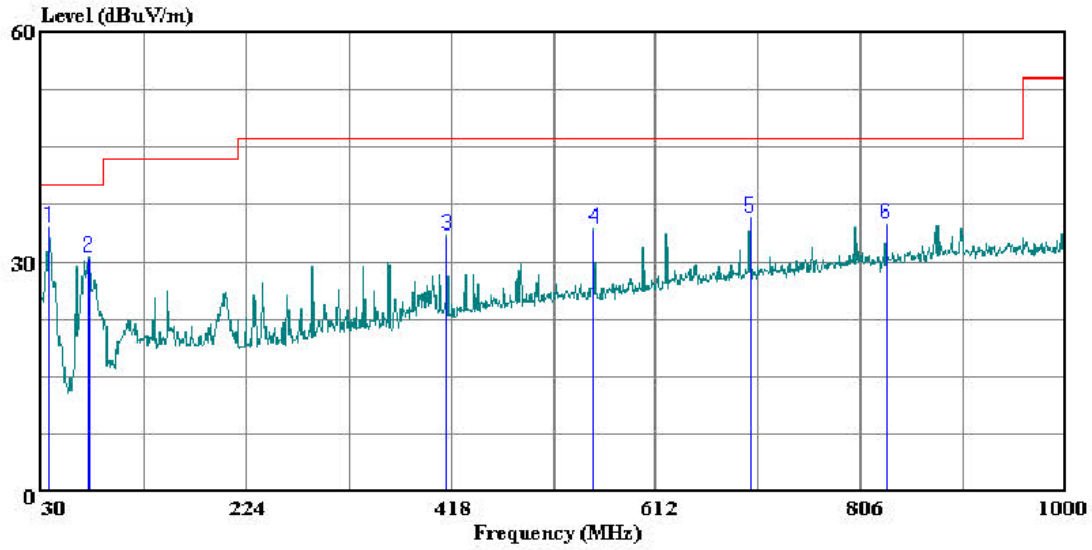
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	112.450	39.60	-14.21	25.39	43.50	-18.11	Peak
2	239.520	45.60	-14.60	31.00	46.00	-15.00	Peak
3	359.800	42.70	-10.91	31.79	46.00	-14.21	Peak
4	414.120	45.60	-9.62	35.98	46.00	-10.02	Peak
5	801.150	42.60	-2.37	40.23	46.00	-5.77	Peak
6	901.060	40.70	-1.35	39.35	46.00	-6.65	Peak

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

VERTICAL PLOT

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

Data#: 6 File#: 06U10660 emi.EMI Date: 10-23-2006 Time: 23:12:12



(Audix ATC)

Trace: 5 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Mengistu Mekuria
Company: : Toshiba America Information Sys.,Inc.
Project #: : 06J10660
Configuration:: WLAN Card inside Laptop
Mode of Oper.:: TX 11a Mode
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	36.790	45.40	-10.98	34.42	40.00	-5.58	Peak
2	74.620	49.70	-19.16	30.54	40.00	-9.46	Peak
3	414.120	43.00	-9.62	33.38	46.00	-12.62	Peak
4	552.830	40.90	-6.68	34.22	46.00	-11.78	Peak
5	701.240	39.60	-3.90	35.70	46.00	-10.30	Peak
6	830.250	37.10	-2.11	34.99	46.00	-11.01	Peak

7.4. 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:

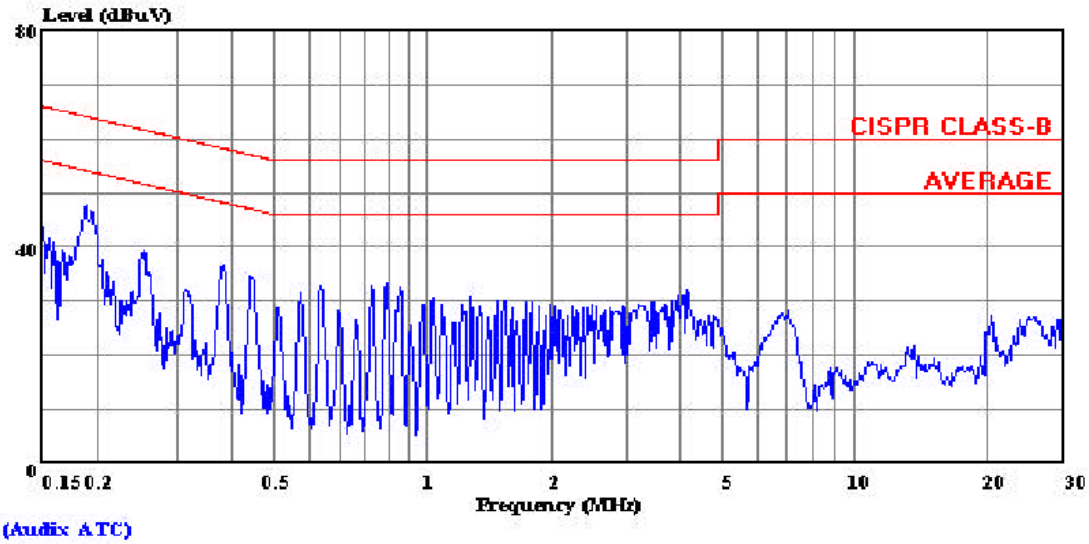
6 WORST EMISSIONS

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	47.96	--	--	0.00	64.12	54.12	-16.16	-6.16	L1
0.39	36.61	--	--	0.00	58.13	48.13	-21.52	-11.52	L1
4.25	32.17	--	--	0.00	56.00	46.00	-23.83	-13.83	L1
0.19	47.47	--	--	0.00	64.04	54.04	-16.57	-6.57	L2
0.45	32.83	--	--	0.00	56.89	46.89	-24.06	-14.06	L2
1.32	32.45	--	--	0.00	56.00	46.00	-23.55	-13.55	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 4 File#: 06U10660LC.EMI Date: 10-18-2006 Time: 11:51:36



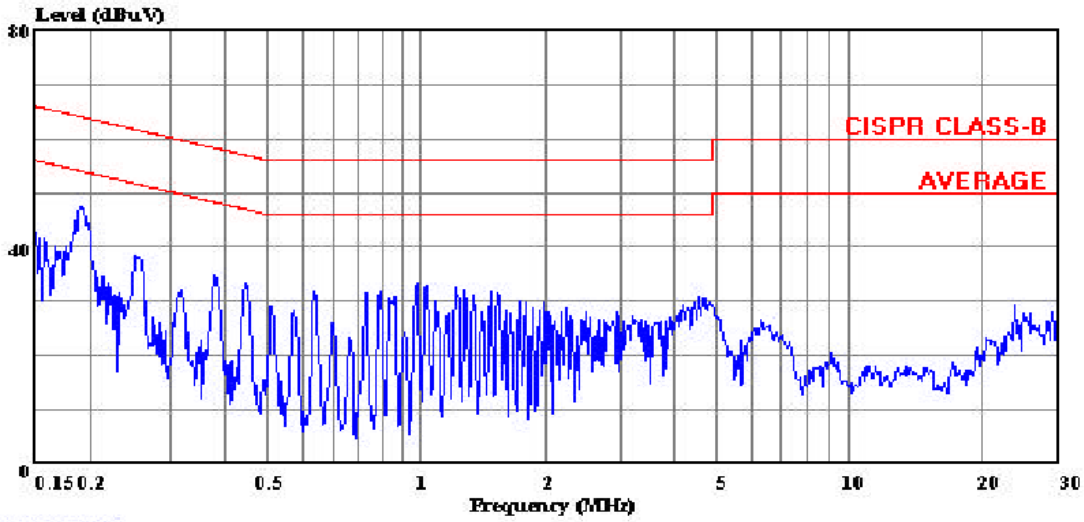
Trace: Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Chin Pang
Project # : 06J10660
Company : Toshiba America Ingormation sys., Inc.
EUT configuration: EUT only
Mode of operation: TX Mode
Power Source : 115VAC / 60Hz
: L1: Peak(Blue)

LINE 2 RESULTS

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

Data#: 7 File#: 06U10660LC.EMI Date: 10-18-2006 Time: 11:54:41



Trace: Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Chin Pang
Project # : 06J10660
Company : Toshiba America Ingormation sys., Inc.
EUT configuration: EUT only
Mode of operation: TX Mode
Power Source : 115VAC / 60Hz
: L2: Peak(Blue)