



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

**FOR**

**PCI Express 802.11a/b/g transceiver**

**MODEL NUMBER: PA3503U-1MPC**

**FCC ID: CJ6UPA3503WL**

**REPORT NUMBER: 05U3822-2**

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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:** PCI Express 802.11a/b/g transceiver

**MODEL:** PA3503U-1MPC

**SERIAL NUMBER:** 6159Y031916

**DATE TESTED:** DECEMBER 14-20, 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.

Approved & Released For CCS By:

Tested By:



DAVID GARCIA  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES



FRANK IBRAHIM  
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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. 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

The radio module is manufactured by Atheros Communications Inc.

### **5.2. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes two Integrated Omni-directional antennas for diversity; model HTL017 antenna has a maximum gain of 3.2 dBi. Additional antennas of same type and lower gain are used with this radio and listed in the FCC submission.

### **5.3. DESCRIPTION OF CLASS II PERMISSIVE CHANGE**

1. The radio module has a limited module approval and is installed in a portable condition.
2. Add new antenna models:  
Hitachi: HTL017 & HFT40  
Tyco: TIAN01 & TBN001  
WNC: WNC001

Full antenna details are included in separate exhibit.

### **5.4. 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\_build 13.

### **5.5. WORST-CASE CONFIGURATION AND MODE**

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

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2437 MHz in 11g 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.

Thus worst-case radiated emissions below 1 GHz and power line conducted emissions tests were made at 2437 MHz in the 802.11g mode, at 6 Mb/s.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop	Toshiba	Portege M400	05B-012	DoC
AC/DC Adapter	Toshiba	PA3283U-1ACA	03X19218	DoC

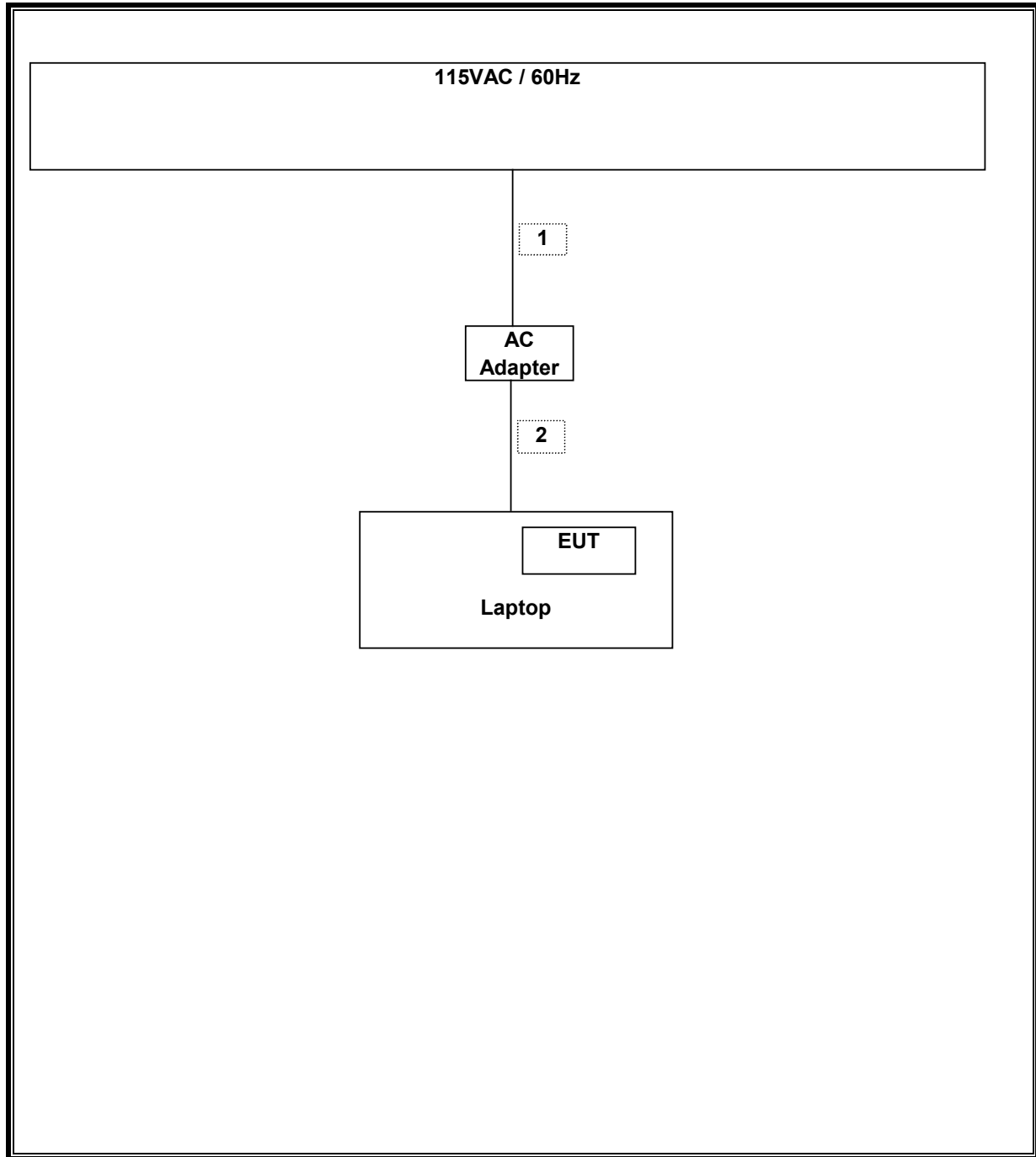
### I/O CABLES

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**





## 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
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	MY43360112	3/28/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/2006
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2006
Antenna, Horn 18 ~ 26 GHz	ARA	MWH-1826/B	1049	9/12/2006
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	12/29/2006
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-SP	924342	9/2/2006
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/18/2006
Peak / Average Power Sensor	Agilent	E9327A	US40440755	2/10/2006
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/2006
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-30/250- 26-2	2023	8/30/2006
LISN, 10 kHz ~ 30 MHz	Solar	3012-30-K-24- DNC	8379443	8/30/2006
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	1/6/2006
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	3/3/2006
Preamplifier, 1300 MHz	HP	8447D	1937A02062	1/7/2006
7.6 GHz High Pass Filter	Micro-Tronics	HPM13195	001	C.N.R.

## 7. CHANNEL TESTS FOR 5150 – 5350 MHz BAND

### 7.1. LIMITS AND RESULTS

#### 7.1.1. AVERAGE POWER

##### AVERAGE POWER LIMIT

None: for reporting purposes only. The average power for each channel was set to the average power specified in the original filing.

##### TEST PROCEDURE

The transmitter output is connected to a power meter.

##### RESULTS

No non-compliance noted:

The cable assembly insertion loss of 12.2 dB (including 10 dB pad and 2.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

802.11a Mode, UNII

Channel	Frequency (MHz)	Average Power (dBm)
Low	5180	18.20
Middle 1	5240	18.30
Middle 2	5260	18.50
High	5320	18.40

## 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
<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.

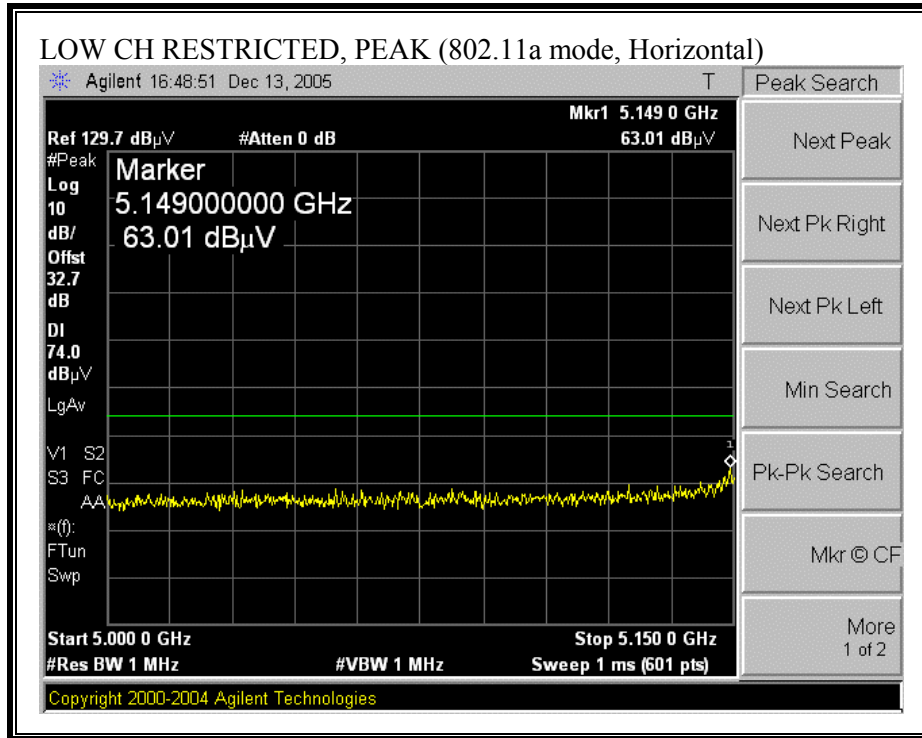
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

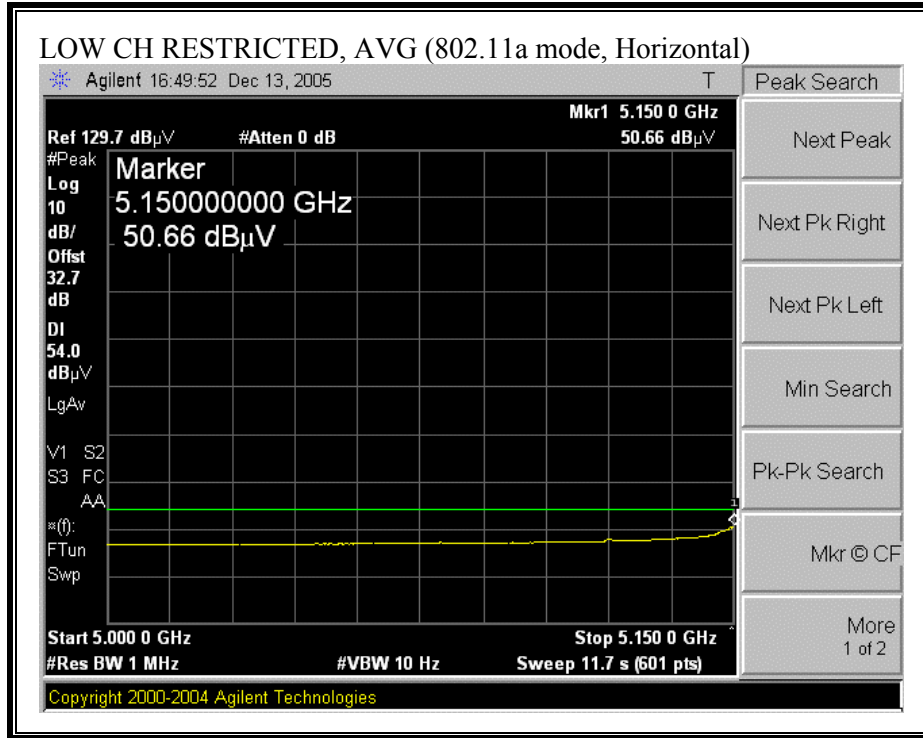
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each band.

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.

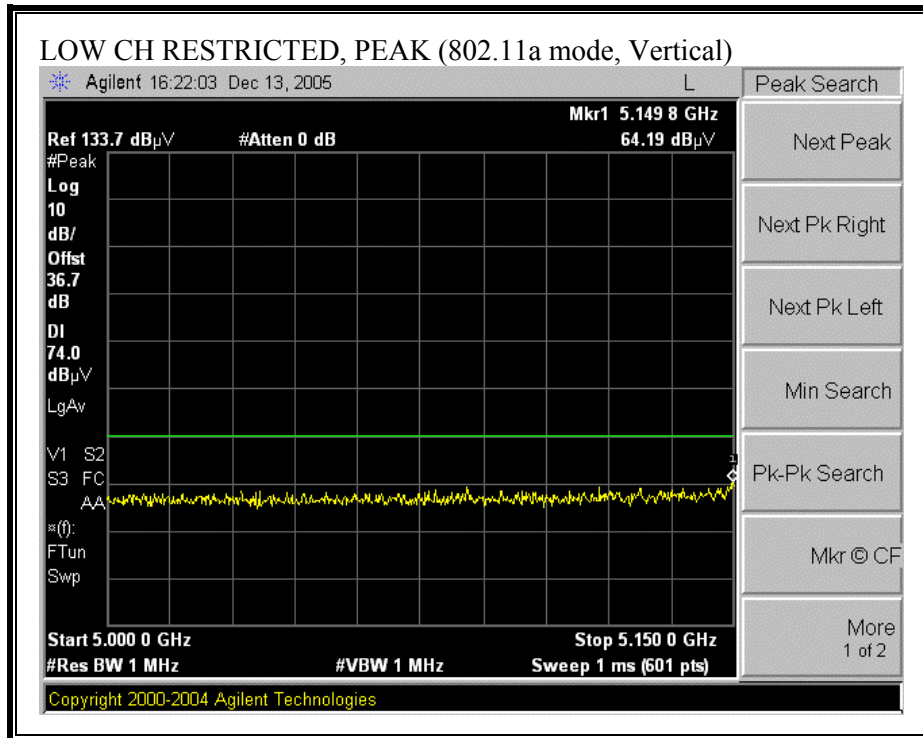
### 7.2.2. TRANSMITTER ABOVE 1 GHZ FOR 5150 TO 5350 MHz BAND

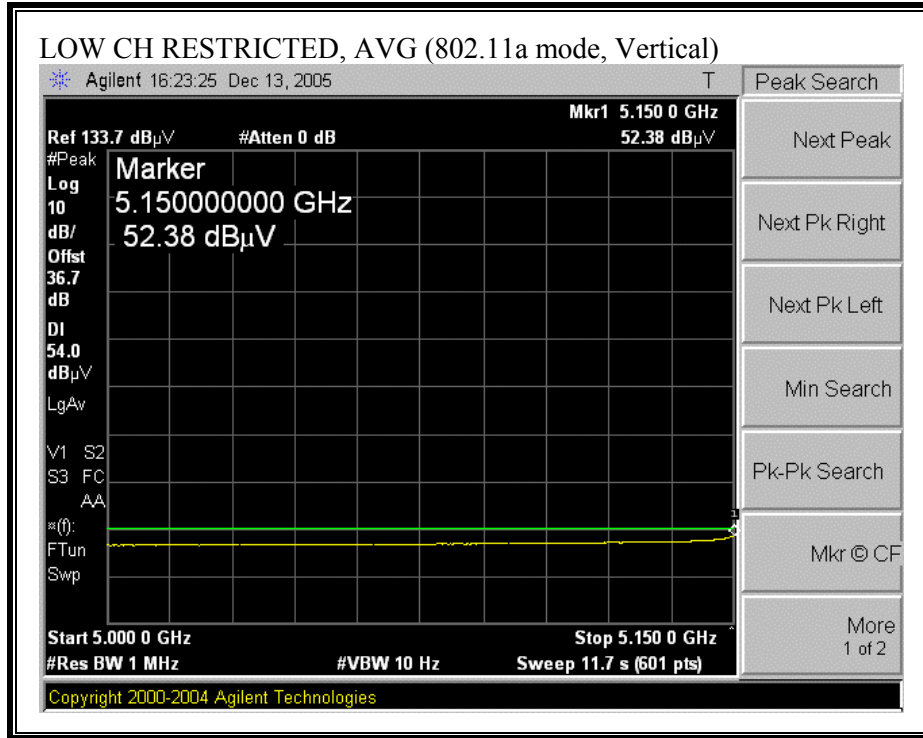
#### RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, HORIZONTAL)





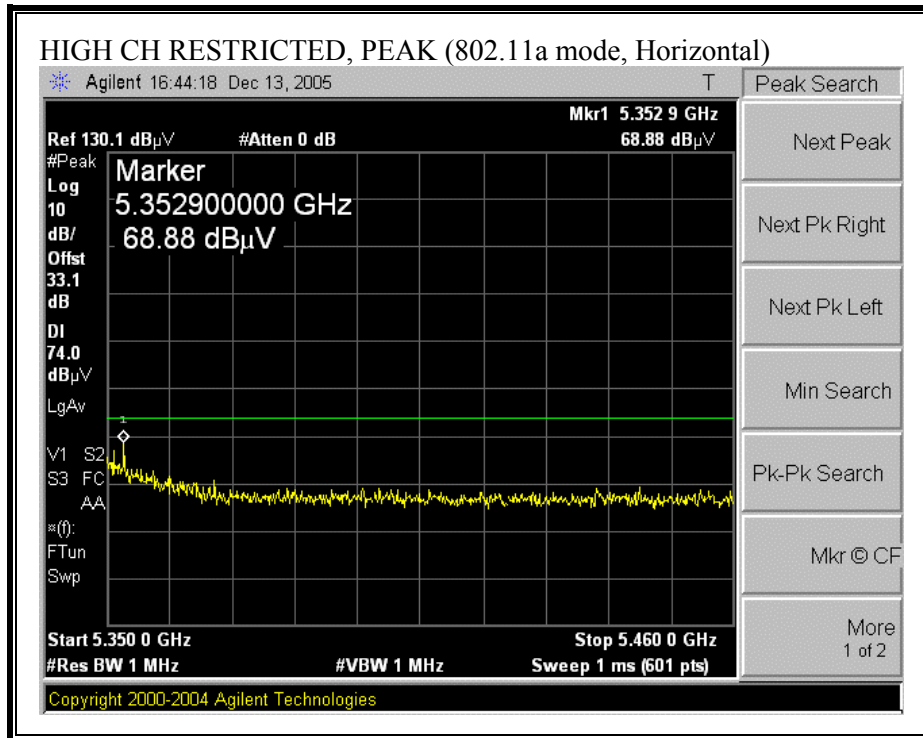
**RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, VERTICAL)**

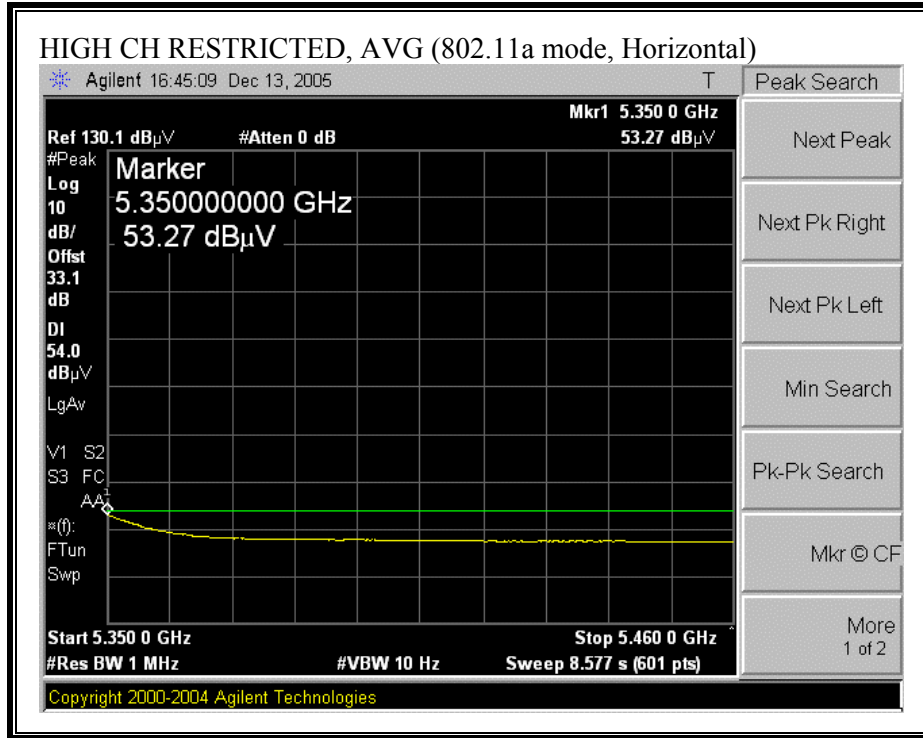




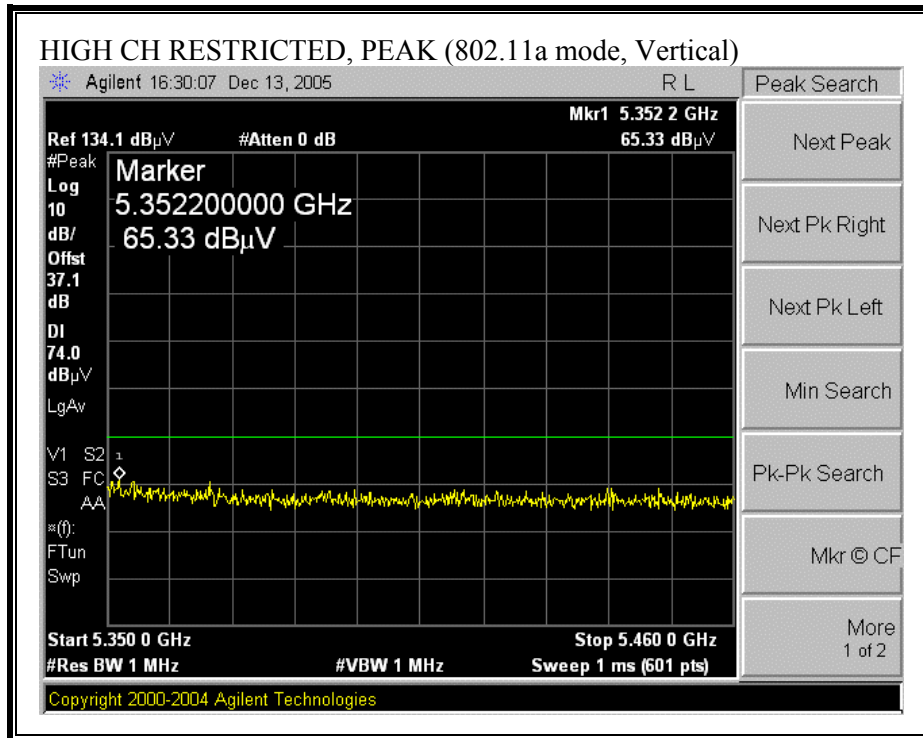


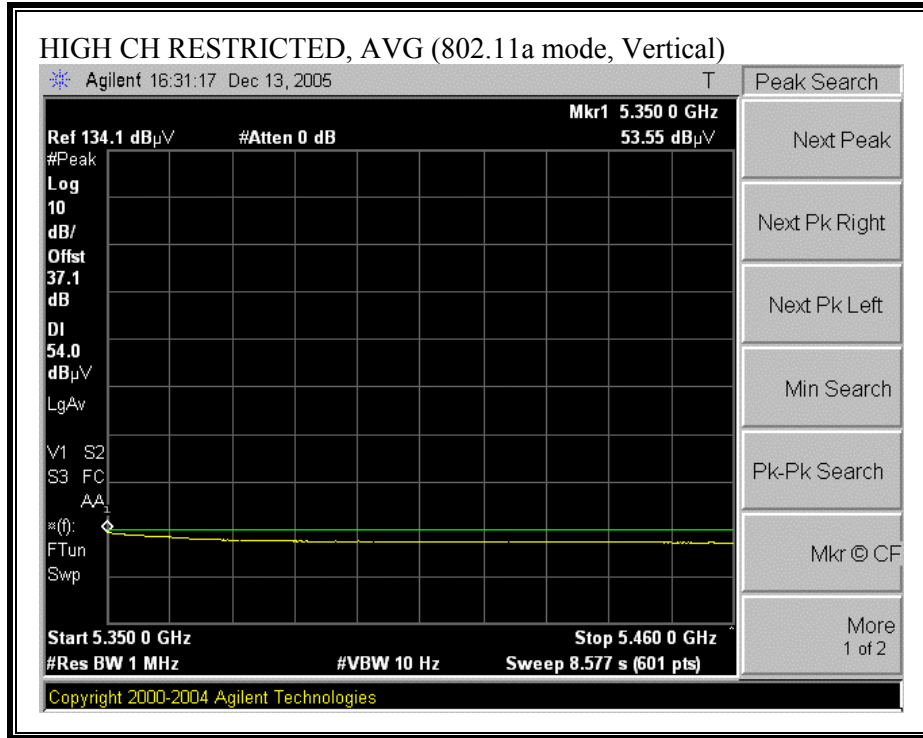
**RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, HORIZONTAL)**





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





**HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)**

12/14/05 **High Frequency Measurement**  
 Compliance Certification Services, Morgan Hill Open Field Site

**Test Engr:** Frank Ibrahim  
**Project #:** 05U3822  
**Company:** Toshiba  
**EUT Descrip.:** Mini PCExpress 802.11 a/b/g transceiver  
**EUT M/N:** AR5BXB6  
**Test Target:** FCC 15.407  
**Configuration:** Stand Alone EUT  
**Mode Oper:** TX ON in 11a mode  
**Power Settings:** Conducted Average Power: Low(18.25 dBm), Mid 1(18.35 dBm), Mid 2(18.50 dBm), High(18.36 dBm)

**Test Equipment:**

<b>Horn 1-18GHz</b> T73; S/N: 6717 @3m	<b>Pre-amplifier 1-26GHz</b> T34 HP 8449B	<b>Pre-amplifier 26-40GHz</b> T88 Miteq 26-40GHz	<b>Horn &gt; 18GHz</b> T125; ARA 18-26GHz; S/N:1007
<b>Hi Frequency Cables</b>			
<b>2 foot cable</b>	<b>3 foot cable</b> Frank 177080001	<b>12 foot cable</b> Frank 187209001	<b>HPF</b> HPF_7.6GHz
			<b>Reject Filter</b>

**Peak Measurements**  
 RBW=VBW=1MHz  
**Average Measurements**  
 RBW=1MHz ; VBW=10Hz

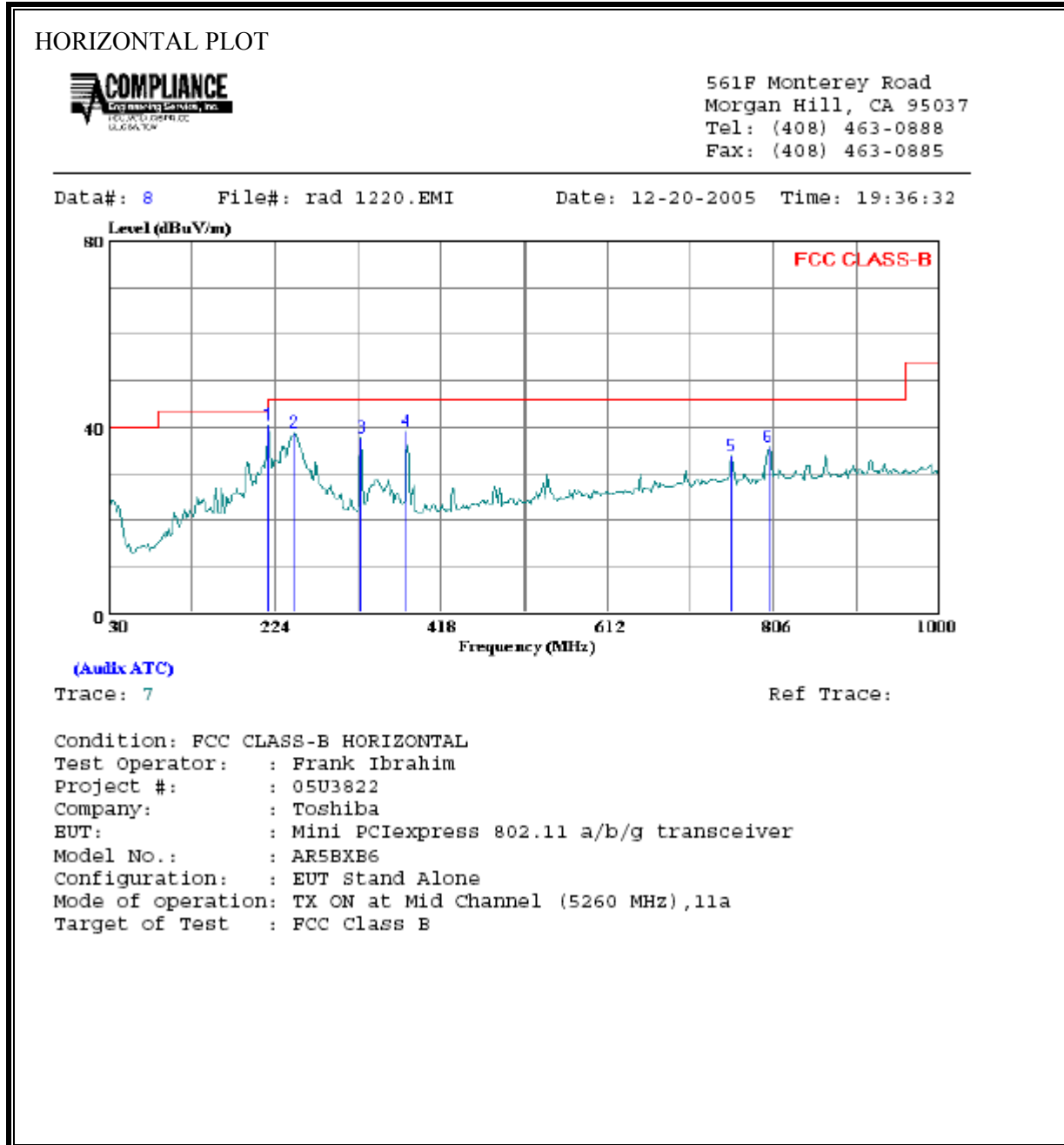
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fitr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
<b>11a Low Channel</b>															
15.540	3.0	46.2	32.7	39.6	6.2	-32.2	0.0	0.7	60.5	47.0	74	54	-13.5	-7.0	V
15.540	3.0	45.7	32.3	39.6	6.2	-32.2	0.0	0.7	60.0	46.6	74	54	-14.0	-7.4	H
<b>11a Mid Channel (5240MHz)</b>															
15.720	3.0	47.1	33.2	39.3	6.3	-32.2	0.0	0.7	61.2	47.3	74	54	-12.8	-6.7	V
15.720	3.0	46.8	33.7	39.3	6.3	-32.2	0.0	0.7	60.9	47.8	74	54	-13.1	-6.2	H
<b>11a Mid Channel (5260 MHz)</b>															
15.780	3.0	46.3	32.5	39.2	6.3	-32.2	0.0	0.7	60.3	46.5	74	54	-13.7	-7.5	V
15.780	3.0	46.0	33.6	39.2	6.3	-32.2	0.0	0.7	60.0	47.6	74	54	-14.0	-6.4	H
<b>11a High Channel</b>															
10.640	3.0	61.8	42.5	38.0	5.1	-32.6	0.0	0.8	73.0	53.7	74	54	-1.0	-0.3	V
10.640	3.0	50.6	32.7	38.0	5.1	-32.6	0.0	0.8	61.8	43.9	74	54	-12.2	-10.1	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		

EUT scanned from 1 GHz to 40 GHz, no other signals were found above noise floor in this frequency range.

### 7.2.3. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

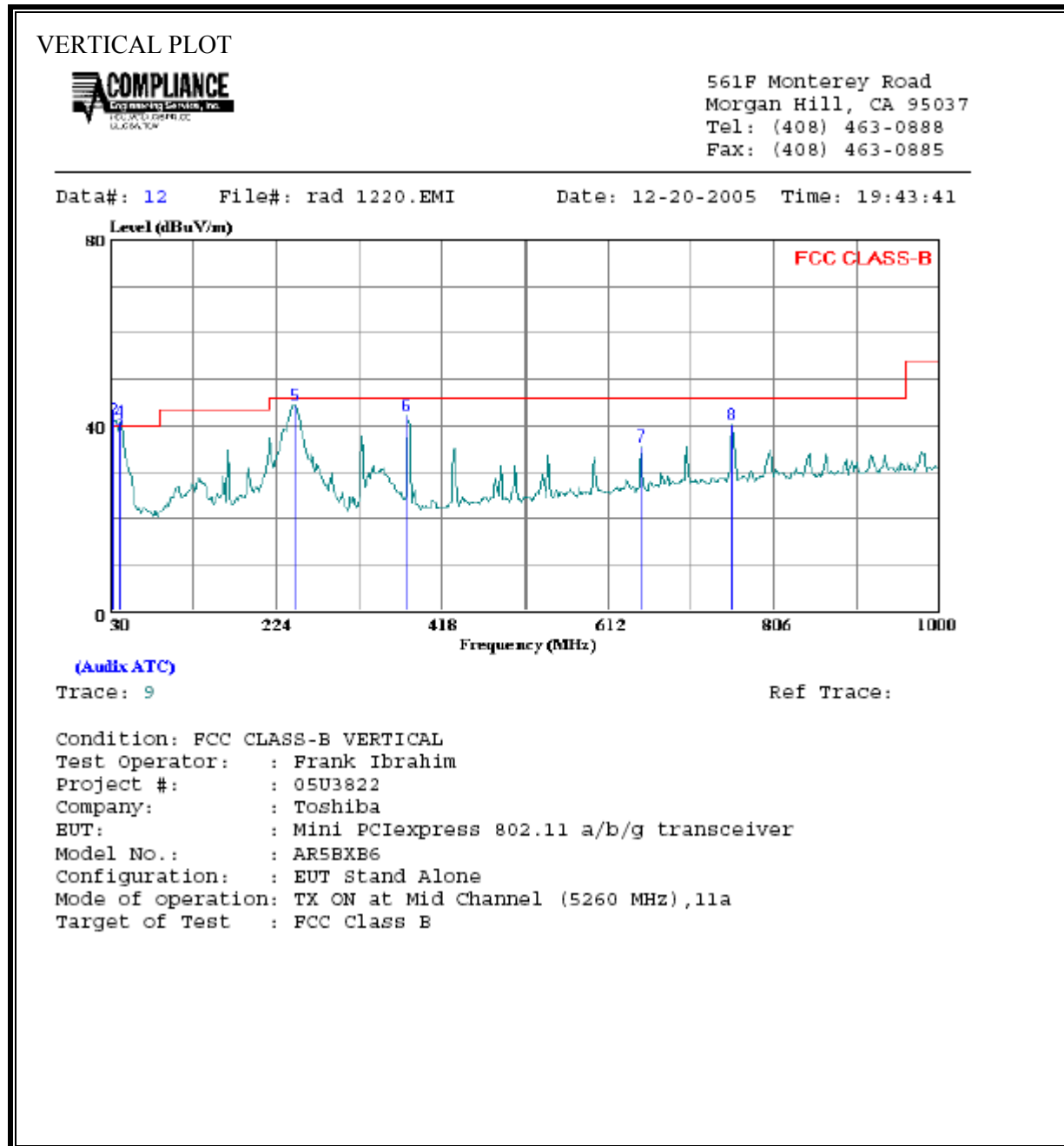
#### SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)



HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	216.240	55.65	-15.26	40.39	46.00	-5.61	Peak
2	247.280	52.56	-13.84	38.71	46.00	-7.29	Peak
3	324.880	48.72	-11.18	37.54	46.00	-8.46	Peak
4	378.230	48.95	-10.00	38.95	46.00	-7.05	Peak
5	756.530	36.33	-2.47	33.86	46.00	-12.14	Peak
6	800.180	37.41	-1.79	35.62	46.00	-10.38	Peak

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





VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	33.880	48.50	-8.87	39.63	40.00	-0.37	QP
2 *	33.880	50.02	-8.87	41.15	40.00	1.15	Peak
3	41.640	52.60	-13.67	38.93	40.00	-1.07	QP
4 *	41.640	53.61	-13.02	40.59	40.00	0.59	Peak
5	246.310	58.24	-13.84	44.40	46.00	-1.60	Peak
6	378.230	52.06	-10.00	42.06	46.00	-3.94	Peak
7	649.830	39.85	-4.33	35.52	46.00	-10.48	Peak
8	756.530	42.57	-2.47	40.10	46.00	-5.90	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  $\mu$ 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.

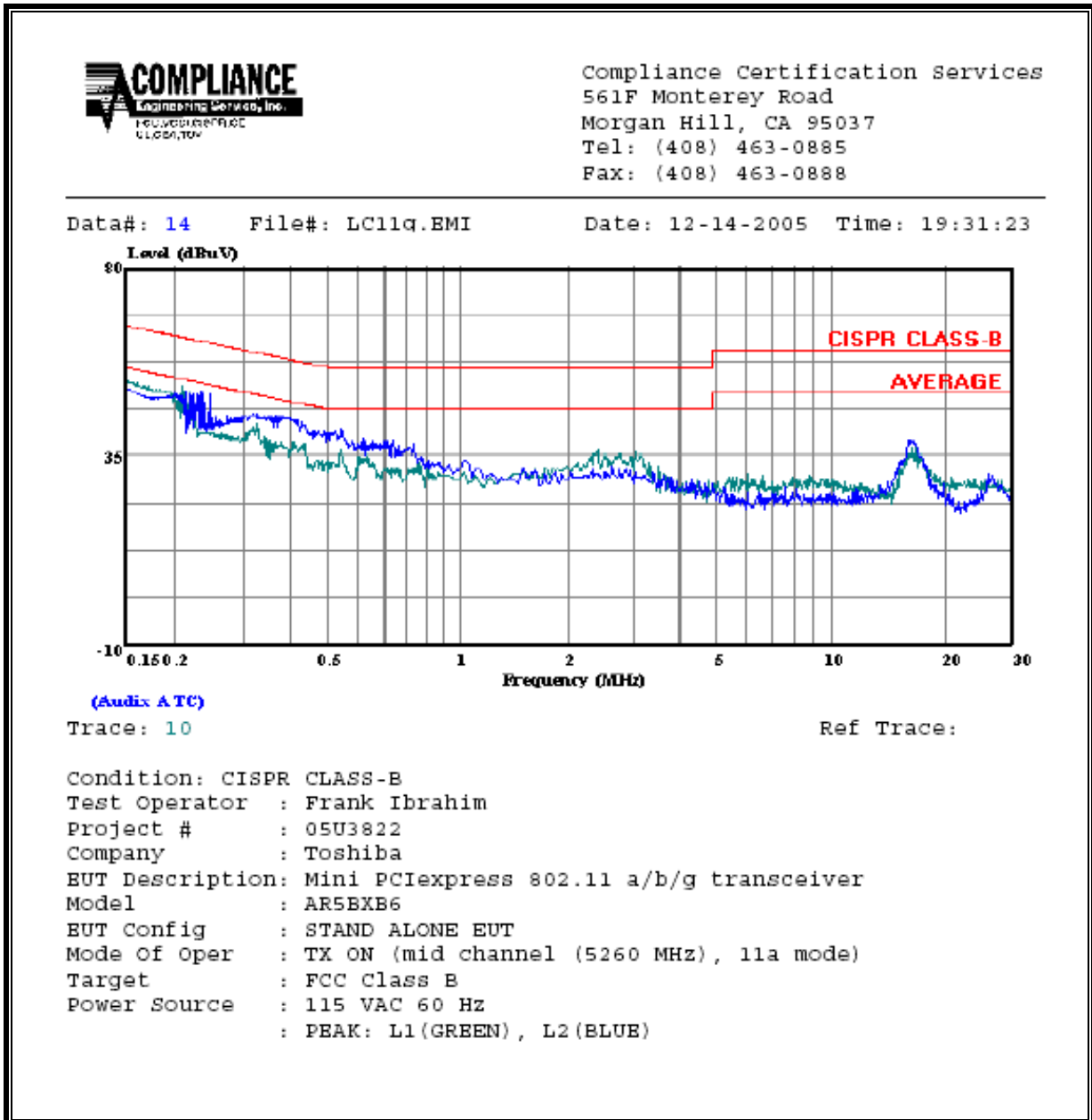
#### RESULTS

No non-compliance noted:

**6 WORST EMISSIONS**

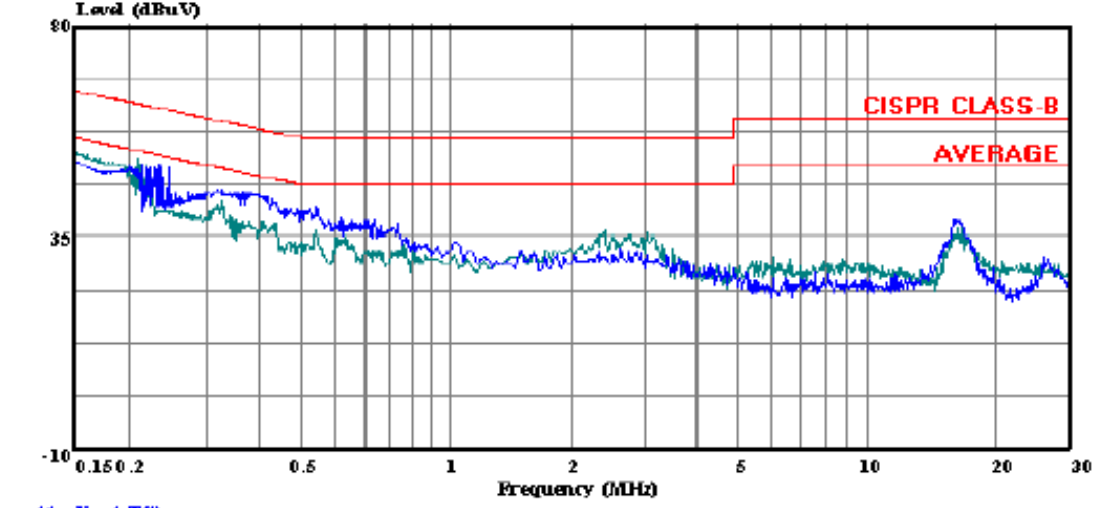
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	53.06	--	--	0.00	66.00	56.00	-12.94	-2.94	L1
0.21	51.70	--	--	0.00	63.24	53.24	-11.54	-1.54	L1
16.40	36.78	--	--	0.00	60.00	50.00	-23.22	-13.22	L1
0.15	51.18	--	--	0.00	66.00	56.00	-14.82	-4.82	L2
0.24	50.30	--	--	0.00	62.27	52.27	-11.97	-1.97	L2
16.23	38.70	--	--	0.00	60.00	50.00	-21.30	-11.30	L2
6 Worst Data									

**LINE 1 AND LINE 2 RESULTS**



**COMPLIANCE** Engineering Services, Inc.  
561F Monterey Road  
Morgan Hill, CA 95037  
Tel: (408) 463-0885  
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Data#: 14 File#: LC11q.EMI Date: 12-14-2005 Time: 19:31:23



(Aux: A TC)  
Trace: 10 Ref Trace:  
Condition: CISPR CLASS-B  
Test Operator : Frank Ibrahim  
Project # : 05U3822  
Company : Toshiba  
EUT Description: Mini PCIexpress 802.11 a/b/g transceiver  
Model : AR5BXB6  
EUT Config : STAND ALONE EUT  
Mode Of Oper : TX ON (mid channel (5260 MHz), 11a mode)  
Target : FCC Class B  
Power Source : 115 VAC 60 HZ  
: PEAK: L1 (GREEN), L2 (BLUE)