



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

FOR

802.11 a/b/g MINI PCI MODULE

MODEL NUMBER: PH1117-E & PH12127-E

BRAND NAME: PHILIPS

FCC ID: PUBWCM1010

REPORT NUMBER: 03U2040-6

ISSUE DATE: 7/16/2003

Prepared for
**ACCTON AND PHILIPS WIRELESS NETWORKING
1962 ZANKER ROAD
SAN JOSE, CA 95122, U.S.A**

Prepared by
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1. TEST RESULT CERTIFICATION

COMPANY NAME: ACCTON AND PHILIPS WIRELESS NETWORKING
1962 ZANKER ROAD
SAN JOSE, CALIFORNIA 95122 U.S.A

EUT DESCRIPTION: 802.11 a/b/g MINI PCI MODULE

MODEL: PH1117-E & PH12127-E

MODEL DIFFERENCE: The two models are identical. Two model names are for marketing Purposes only.

DATE TESTED: JULY 7 – JULY 11 , 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; other bands of operation (2.4 and 5.8 GHz) are documented in a 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 CLASS II PERMISSIVE CHANGE

The Philips PH1117-E is a high performance 802.11 a/b/g WLAN client product intended for a laptop application. The difference between PH1117-E and PH12127 is model designation, which is for marketing purposes only.

The Class II Permissive change consists of adding a new antenna type.

The new antenna type consists of a pair of identical multiplayer ceramic chip antennas. This antenna has a maximum gain of 0 dBi.

The peak output power is 18.61 dBm (73 mW) in the 5150 to 5350 MHz band.

For test purposes, the EUT is installed on a cardbus to Mini-PCI extender / adapter, which is subsequently installed in a laptop computer equipped with a cardbus slot and the appropriate radio testing software. The antennas are mounted on a separate printed circuit board.

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.

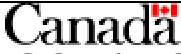
4. FACILITIES AND ACCREDITATION

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 EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	2/4/2004
Amplifier 1-26 GHz	MITEQ	NSP2600-SP	924341	4/25/2004
Amplifier 1-26 GHz	MITEQ	NSP2600-SP	924342	4/25/2004
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	837990	9/6/2003
Line Filter	Lindgren	LMF-3489	497	CNR
LISN, 10 kHz ~ 30 MHz	FCC	50/250-25-2	114	9/6/2003
EMI Test Receiver	R & S	ESHS 20	827129/006	7/17/2004
PSA	AGILENT	E4446A	US42070220	1/13/2004
Peak Power Meter	AGILENT	E4416A	6B41291160	8/9/2003
Power Sensor	AGILENT	E9327A	US40440755	8/9/2003
EMI Test Receiver	HP	8542E	3942A00286	11/20/2003
RF Filter Section	HP	85420E	3705A00256	11/20/2003
Bilog Antenna	ARA	LPB-25201A	1185	3/6/2004
10dB Pad	WEINSCHEL	56-10	K16148	N/A
2.4-2.5 GHz Reject Filter	MICROTRONICS	BRM50702	1	N/A
5.725-5.875 GHz Reject Filter	MICROTRONICS	BRC13192	1	N/A

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
LAPTOP	IBM	THINKPAD A-30	N/A	DoC
AC ADAPTER	IBM	02K6744	11302K67442S1	N/A
ANTENNA	N/A	N/A	N/A	N/A

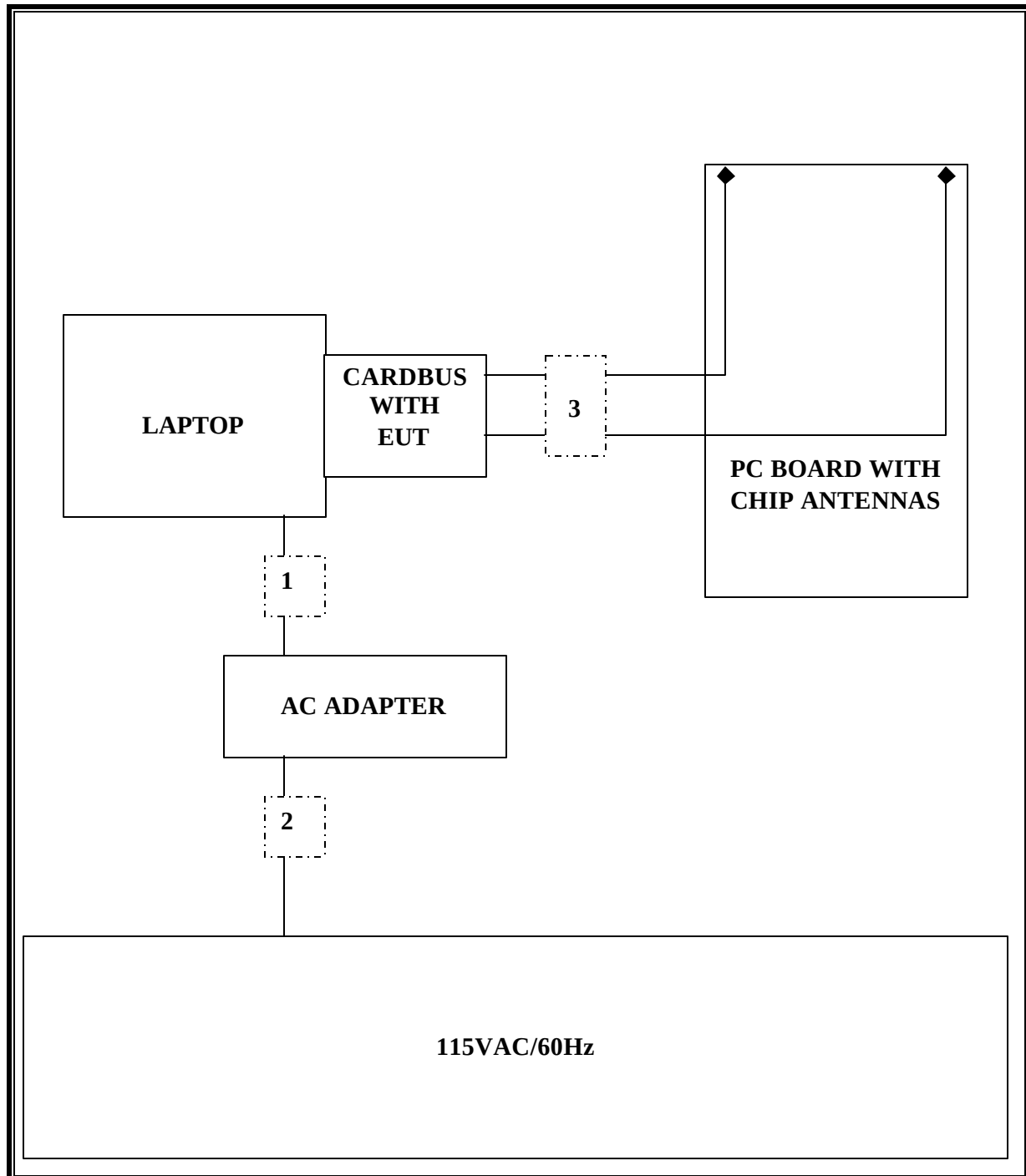
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	PWR	1	DC PWR	UNSHIELDED	1.86M	N/A
2	PWR	1	AC PWR	UNSHIELDED	1.86M	N/A
3	ANTENNA	2	UFL	COAXIAL	0.1M	N/A

TEST SETUP

The EUT is connected to the laptop via a Cardbus-to-MiniPCI adapter / extender and the antennas are mounted within an external PC board.

SETUP DIAGRAM



7. APPLICABLE LIMITS AND TEST RESULTS

7.1. MAXIMUM PERMISSIBLE EXPOSURE WITH MLR100 ANTENNA

LIMITS

§15.247 (b) (5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

CALCULATIONS

Given

$$E = \sqrt{(30 * P * G) / d}$$

and

$$S = E^2 / 3770$$

where

E = Field Strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = distance in meters

S = Power Density in milliwatts / square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = 100 * d \text{ (m)}$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d = distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power Density in mW / cm²

Substituting the logarithmic form of power and gain using:

$$P \text{ (mW)} = 10^{(P \text{ (dBm)} / 10)} \text{ and}$$

$$G \text{ (numeric)} = 10^{(G \text{ (dBi)} / 10)}$$

yields

$$d = 0.282 * 10^{((P + G) / 20) / \sqrt{S}} \quad \text{Equation (1)}$$

where

d = MPE distance in cm

P = Power in dBm

G = Antenna Gain in dBi

S = Power Density Limit in mW / cm²

Equation (1) and the measured peak power is used to calculate the MPE distance.

LIMITS

S = 1.0 mW / cm² from 1.1310 Table 1

RESULTS

No non-compliance noted:

Mode	Power Density Limit (mW/cm ²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
Normal	1.0	18.61	0.00	2.40

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.2. 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
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.

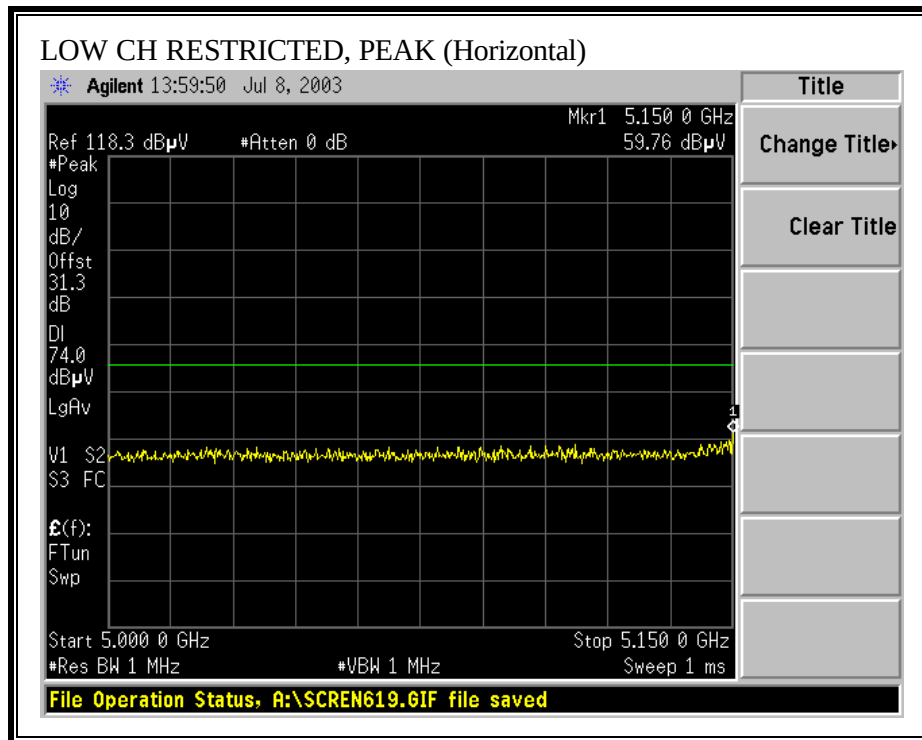
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

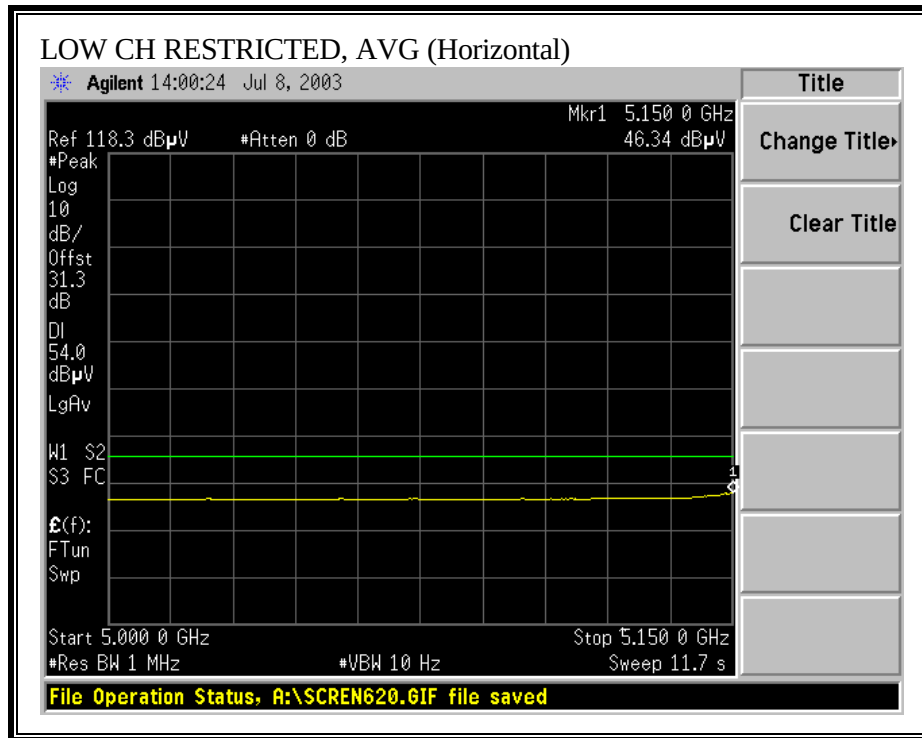
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

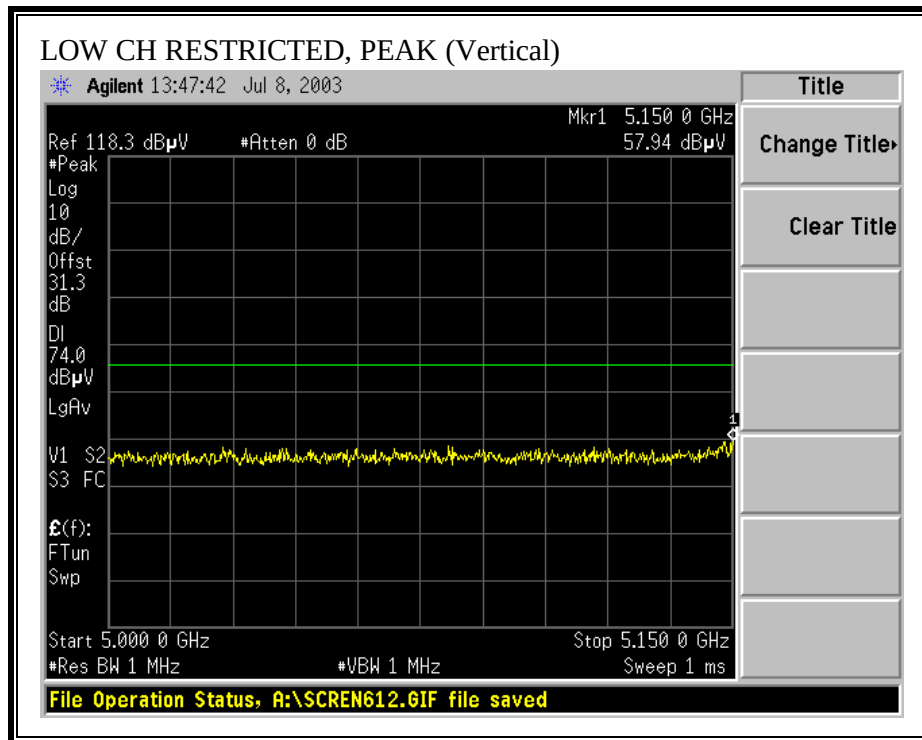
No non-compliance noted:

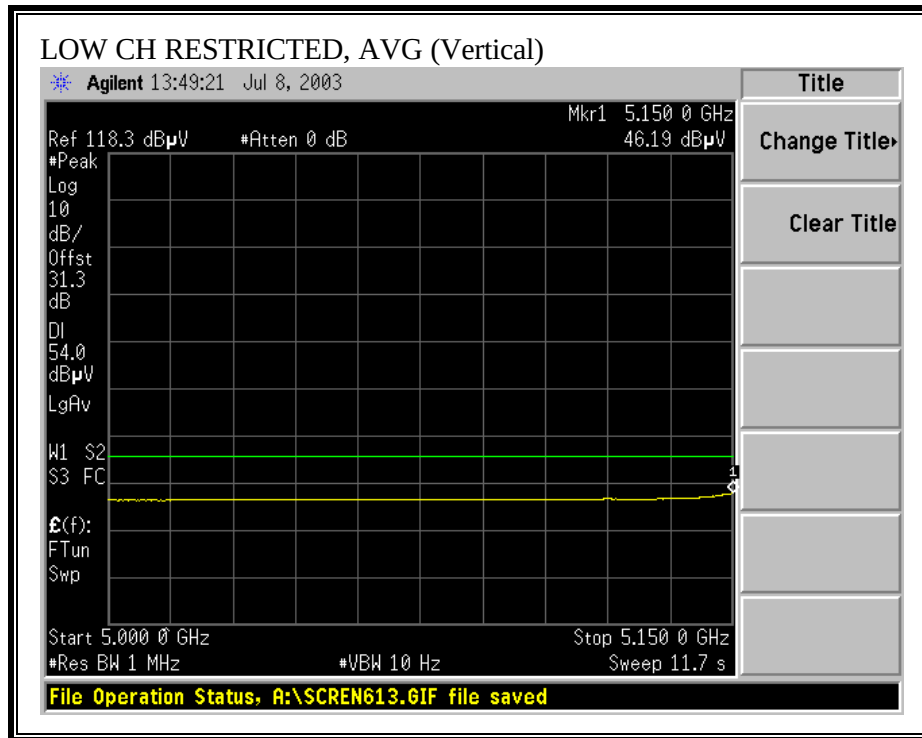
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



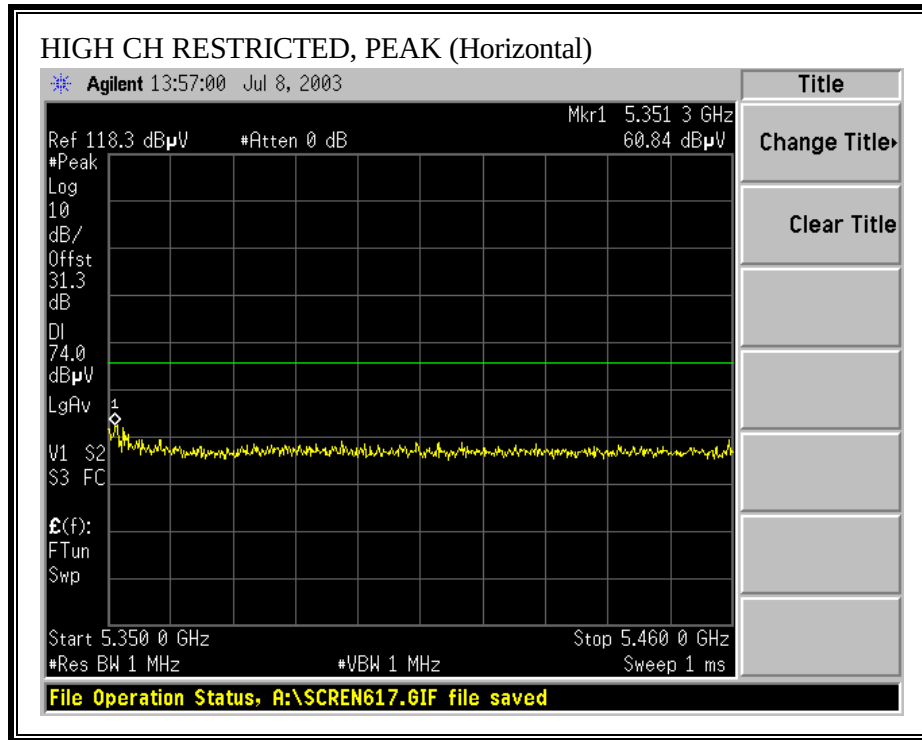


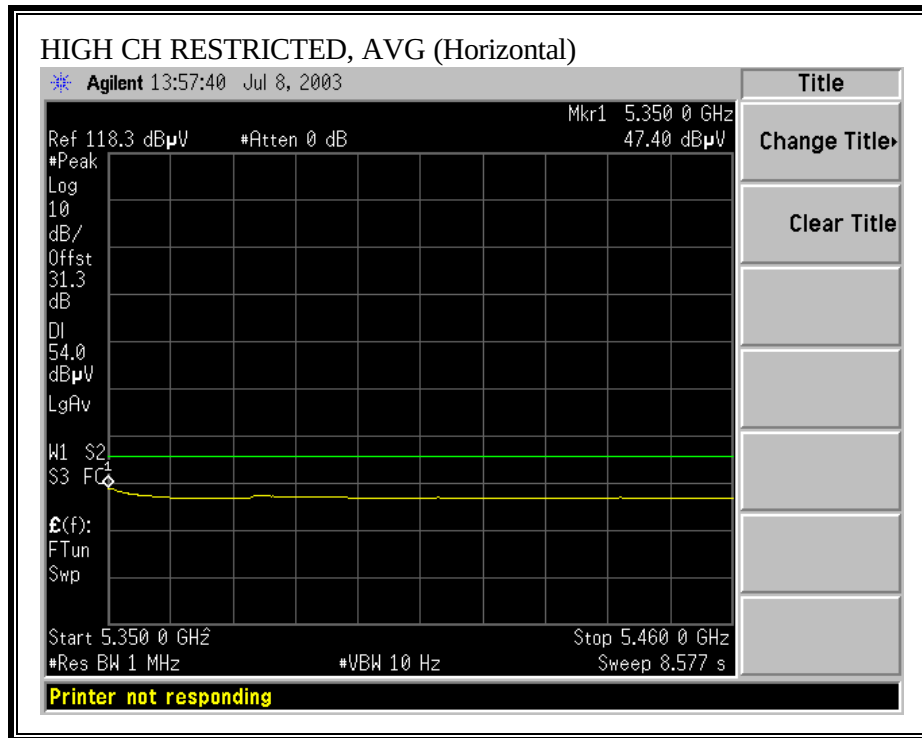
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



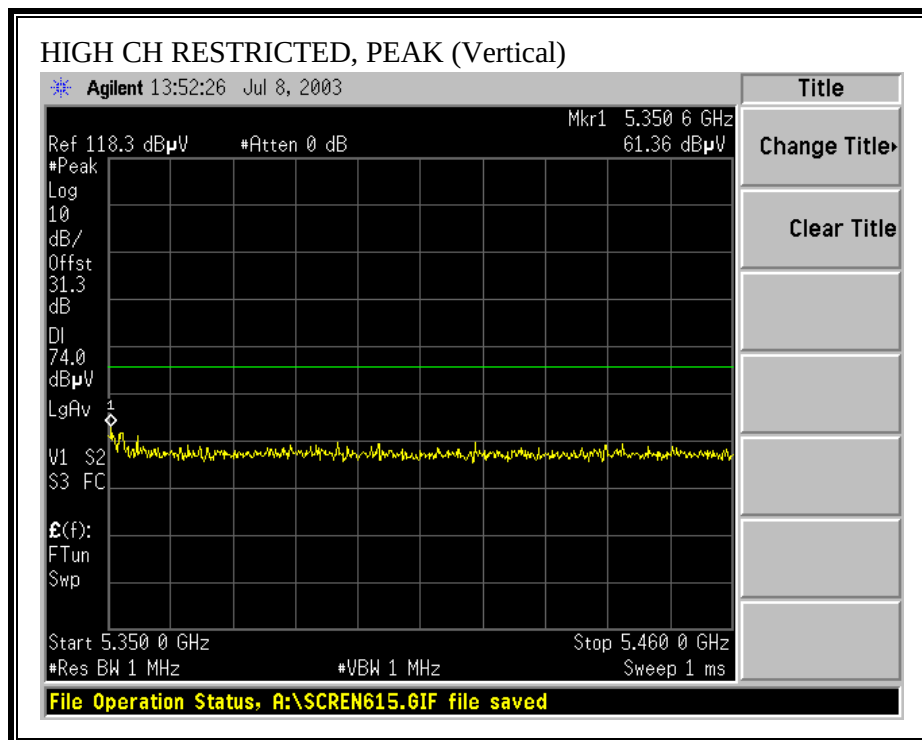


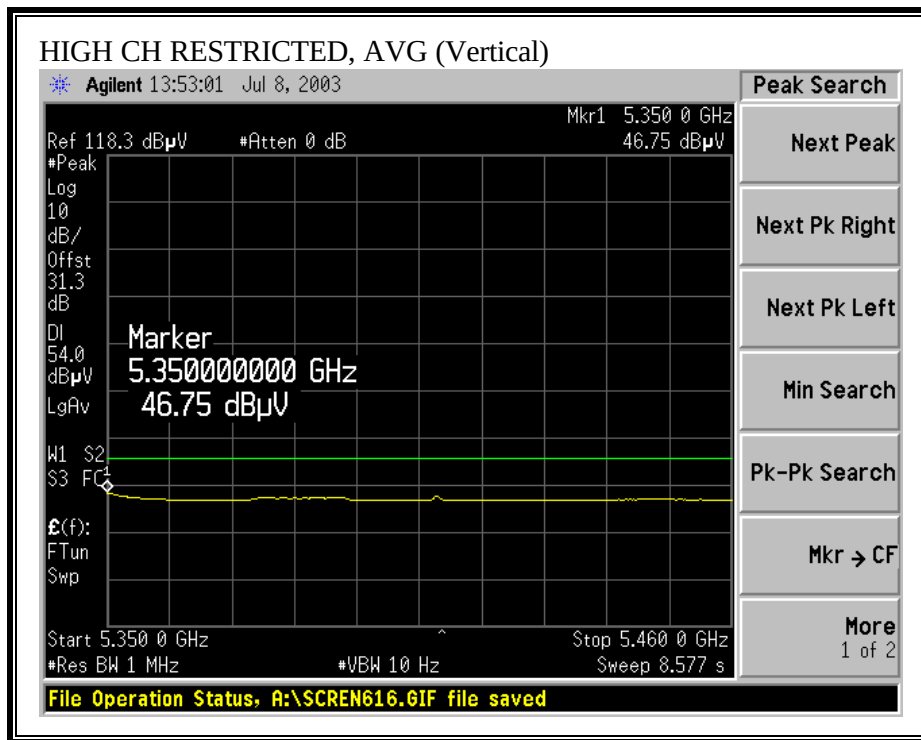
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

07/07/03 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																
Test Engr: VIEN TRAN Project #: PHILIPS Company: ACCTON/PHILIPS EUT Descr.: 802.11a/b/g MINI PCI MODULE EUT M/N: PH11107-E & PH12127-E Test Target: FCC 14.247/15.407 Mode Oper: Harmonic and Spur Tx at L/M/H ch (5.2GHz)_a Mode_with MLR100 antenna																
Test Equipment																
EMCO Horn 1-18GHz T60; S/N: 2238 @3m		Pre-amplifier 1-26GHz T87 Miteq 924342		Spectrum Analyzer Agilent E4446A Analyzer		Horn > 18GHz										
Hi Frequency Cables ☐ (2 ft) ☐ (2 ~ 3 ft) ☒ (4 ~ 6 ft) ☐ (12 ft)																
Peak Measurements: 1 MHz Resolution Bandwidth 1MHz Video Bandwidth																
Average Measurements: 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	
LOW CH=5.18GHz ART=14																
15.540	9.8	53.0	40.2	39.4	7.1	-45.5	0.0	1.0	54.9	42.1	74.0	54.0	-19.1	-11.9	V	
15.540	9.8	51.8	39.5	39.4	7.1	-45.5	0.0	1.0	53.7	41.4	74.0	54.0	-20.3	-12.6	H	
NO OTHER EMISSION FOUND AFTER 2nd HARMONIC																
MID CH=5.26GHz ART=17																
15.780	9.8	51.1	39.0	38.7	7.2	-45.6	0.0	1.0	52.3	40.3	74.0	54.0	-21.7	-13.7	V	
15.780	9.8	50.6	38.8	38.7	7.2	-45.6	0.0	2.0	52.9	41.1	74.0	54.0	-21.1	-12.9	H	
NO OTHER EMISSION FOUND AFTER 2nd HARMONIC																
HI CH=5.32GHz ART=14																
10.640	9.8	48.2	38.3	38.2	5.5	-41.3	0.0	1.0	51.6	41.7	74.0	54.0	-22.4	-12.3	V	
15.960	9.8	47.5	37.6	38.3	7.2	-45.7	0.0	1.0	48.3	38.4	74.0	54.0	-25.7	-15.6	V	
10.640	9.8	47.7	36.8	38.2	5.5	-41.3	0.0	1.0	51.1	40.2	74.0	54.0	-22.9	-13.8	H	
15.960	9.8	46.0	36.1	38.3	7.2	-45.7	0.0	1.0	46.8	36.9	74.0	54.0	-27.2	-17.1	H	
NO OTHER EMISSION FOUND AFTER 3rd 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									

HARMONICS AND SPURIOUS EMISSIONS BELOW 1 GHZ

						Project #: 03u2040-3 Report #: 71103 Date & Time: 07/11/03 4:07 PM Test Engr: NEELESH RAJ					
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP 561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888											
Company: ACCTON AND PHILIPS WIRELESS NETWORKING EUT Description: 802.11ABG MINI PCI MODULE (RADON) Test Configuration: LAPTOP/EUT/ANTENNA Type of Test: FCC-B Mode of Operation: TX (WORST CASE)											
☐ A-Site		☐ B-Site		☒ C-Site		☐ F-Site		6 Worst Data		Descending	

Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
166.45	47.33	16.39	2.20	26.78	39.14	43.50	-4.36	3mV	180.00	1.00	P
233.50	55.29	11.29	2.61	26.49	42.70	46.00	-3.30	3mV	45.00	1.00	P
266.60	52.11	12.57	2.81	26.42	41.07	46.00	-4.93	3mV	0.00	1.50	P
333.21	52.40	14.80	3.19	26.63	43.76	46.00	-2.24	3mH	45.00	1.00	P
366.60	51.45	15.08	3.37	26.88	43.03	46.00	-2.97	3mH	215.00	2.00	P
466.50	49.32	16.90	3.88	27.41	42.69	46.00	-3.31	3mH	180.00	2.50	P
Total data #: 6 V.2c											

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.

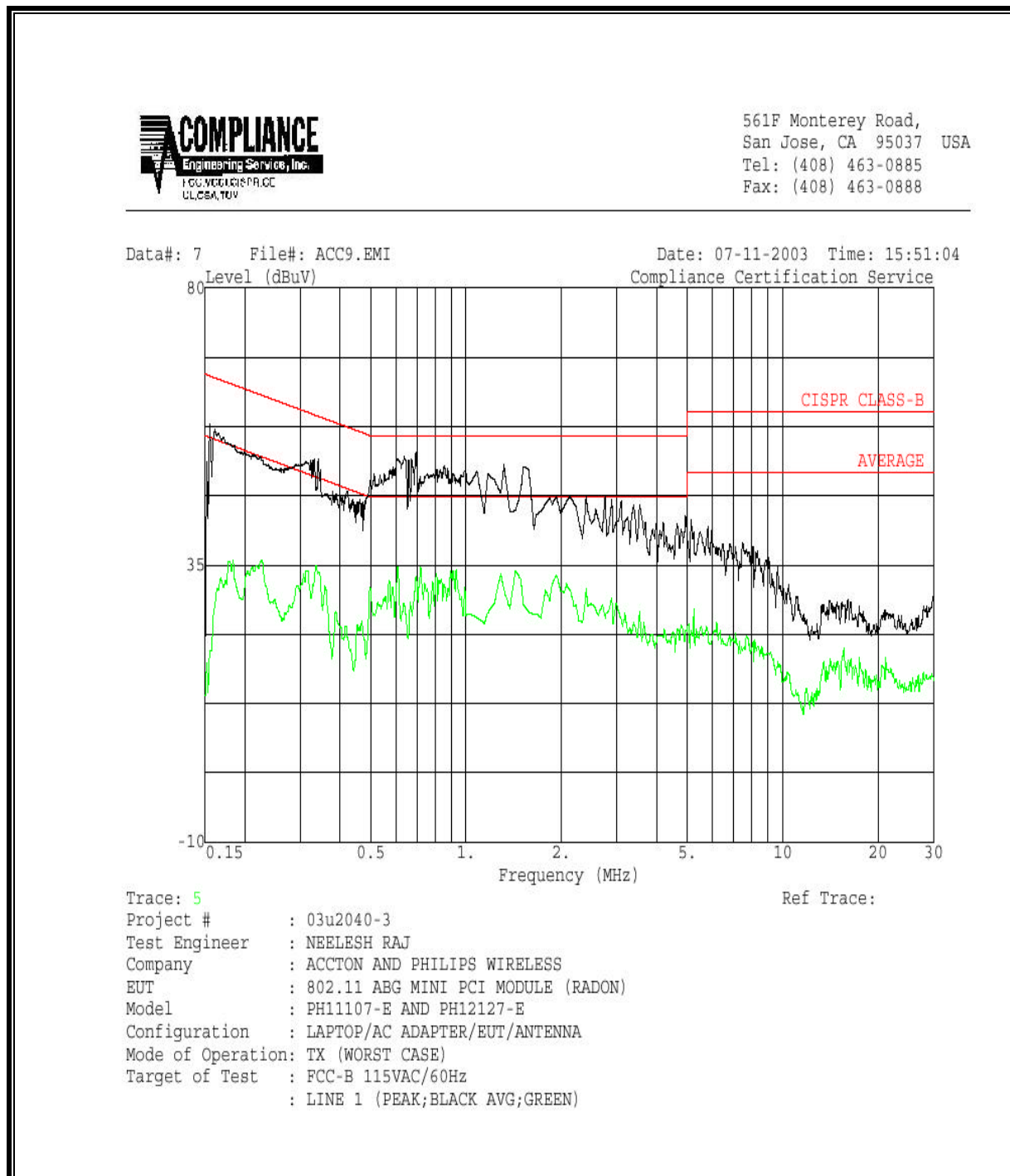
RESULTS

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
0.69	53.24	--	33.10	0.00	56.00	46.00	-2.76	-12.90	L1
0.64	52.68	--	28.58	0.00	56.00	46.00	-3.32	-17.42	L1
1.32	51.32	--	30.89	0.00	56.00	46.00	-4.68	-15.11	L1
0.65	46.82	--	24.25	0.00	56.00	46.00	-9.18	-21.75	L2
0.61	46.92	--	25.20	0.00	56.00	46.00	-9.08	-20.80	L2
0.15	55.16	--	23.42	0.00	66.00	56.00	-10.84	-32.58	L2
6 Worst Data									

LINE 1 (LINE) RESULTS

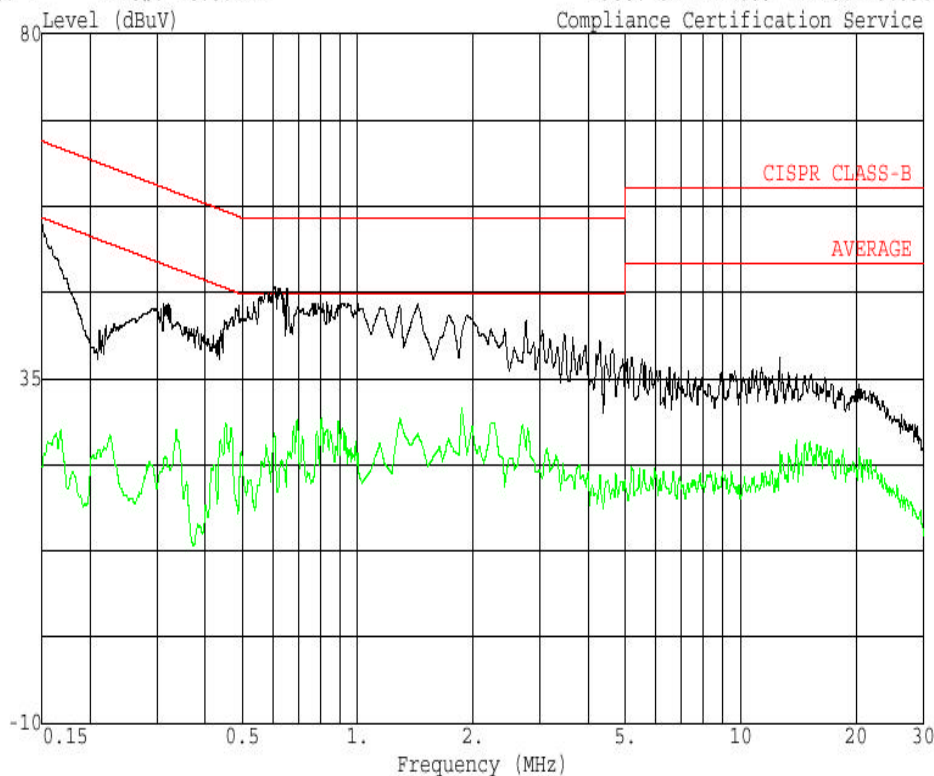


LINE 2 (NEUTRAL) RESULTS



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

Data#: 7 File#: ACC8.EMI Date: 07-11-2003 Time: 15:39:05
Compliance Certification Service

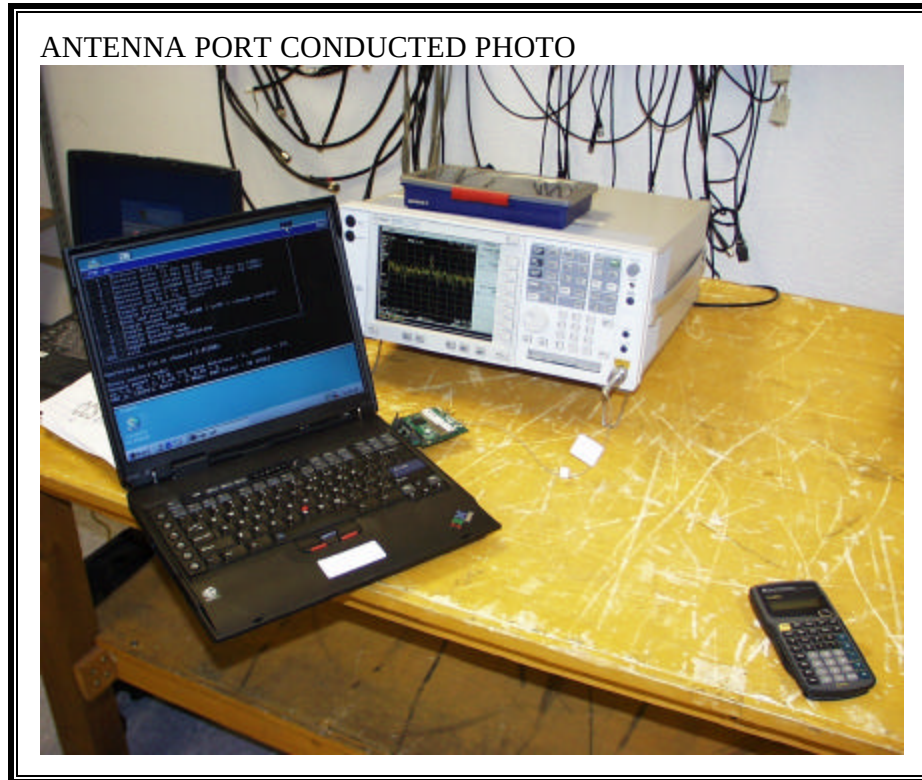


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Project # : 03u2040-3
Test Engineer : NEELESH RAJ
Company : ACCTON AND PHILIPS WIRELESS
EUT : 802.11 ABG MINI PCI MODULE (RADON)
Model : PH11107-E AND PH12127-E
Configuration : LAPTOP/AC ADAPTER/EUT/ANTENNA
Mode of Operation: TX (WORST CASE)
Target of Test : FCC-B 115VAC/60Hz
: LINE 2 (PEAK;BLACK AVG;GREEN)

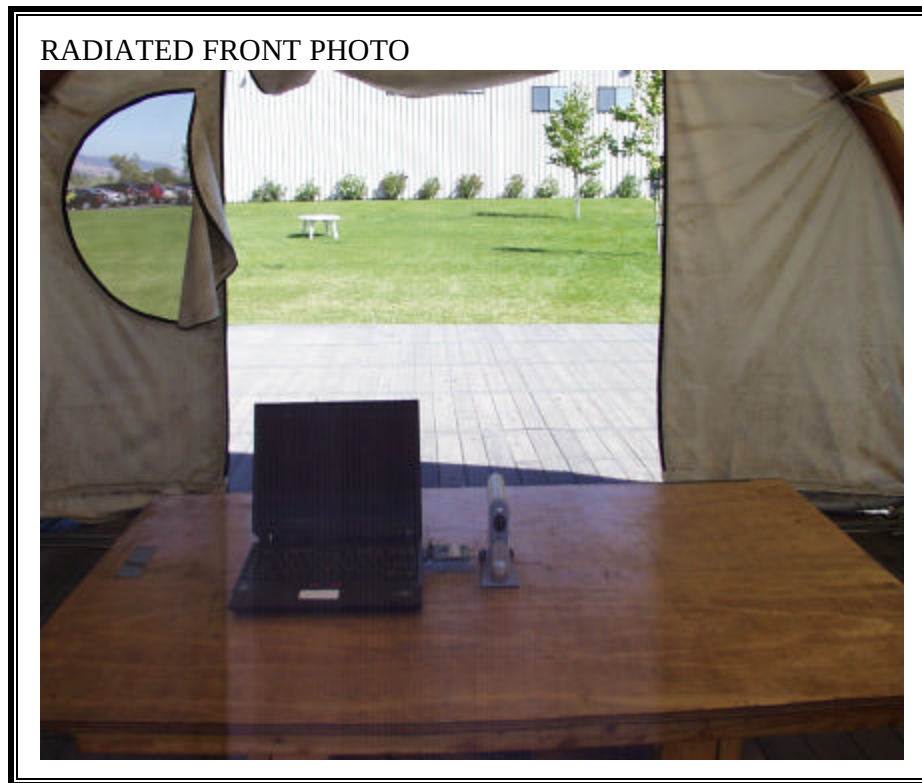
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8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP



RADIATED BACK SIDE PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO



END OF REPORT