

## 7.7. CONDUCTED SPURIOUS EMISSIONS

### LIMITS

§15.407 (b) (1 & 2) For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz.

### TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

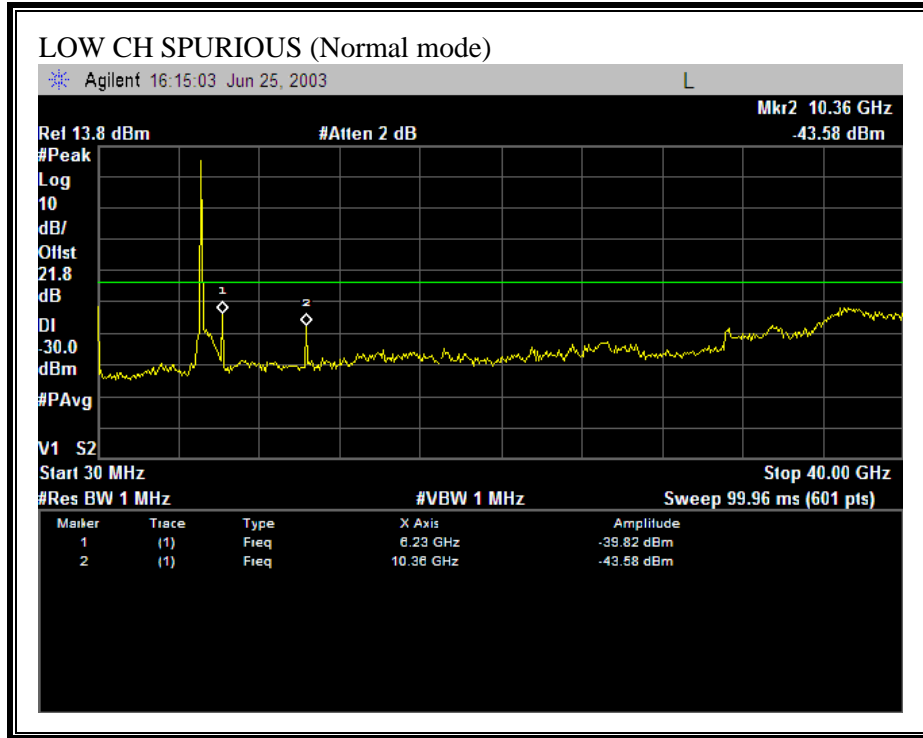
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

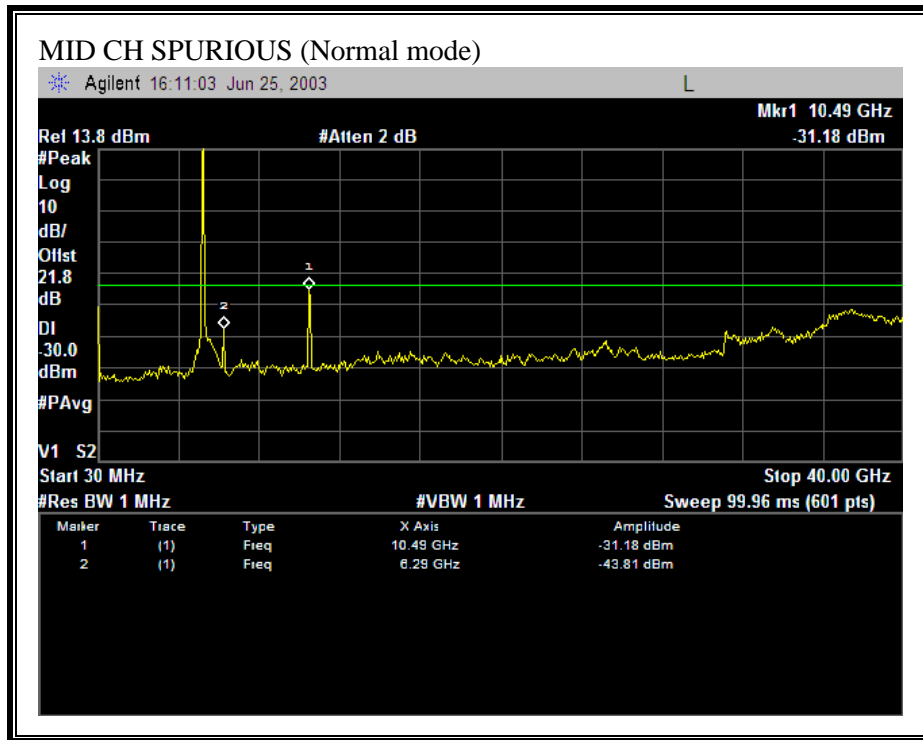
### RESULTS

No non-compliance noted:

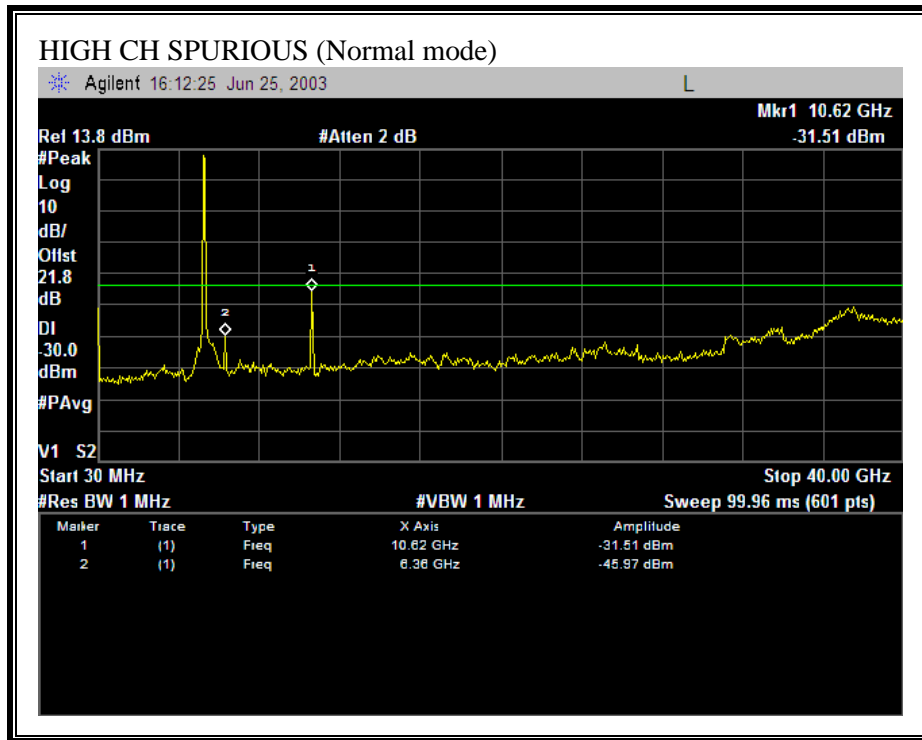
**SPURIOUS EMISSIONS, LOW CHANNEL (NORMAL MODE)**



SPURIOUS EMISSIONS, MID CHANNEL (NORMAL MODE)



SPURIOUS EMISSIONS, HIGH CHANNEL (NORMAL MODE)



## 7.8. 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
<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.

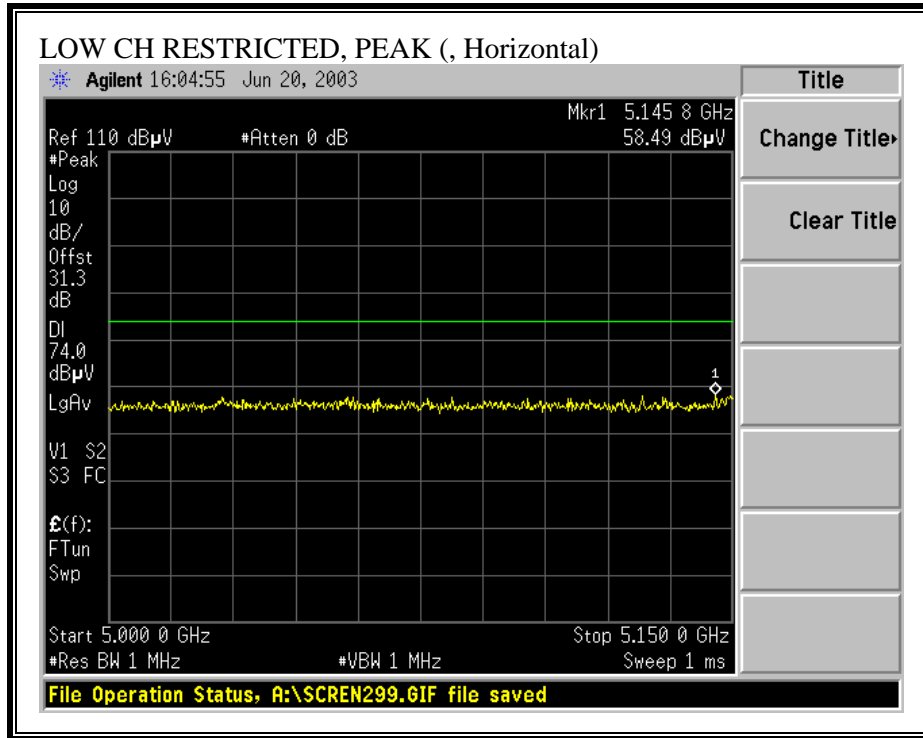
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

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.

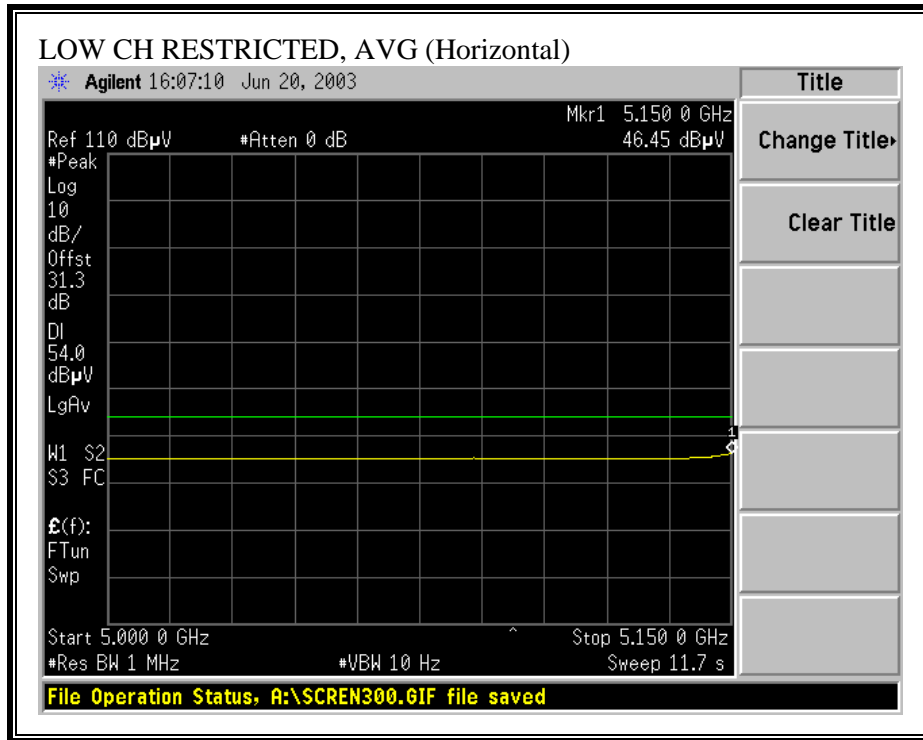
### **RESULTS**

No non-compliance noted:

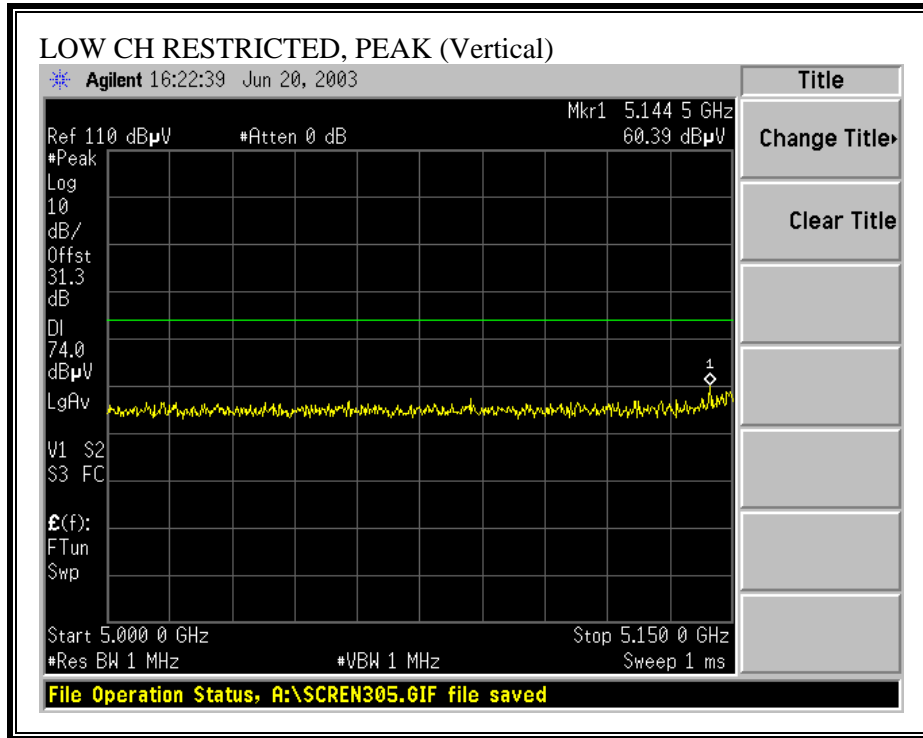
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**

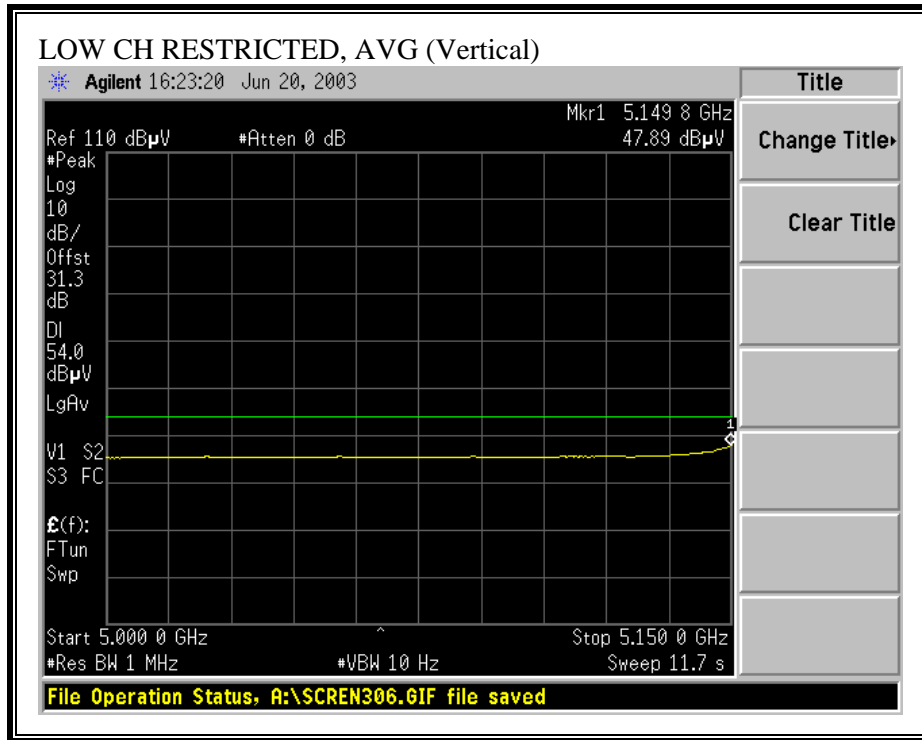




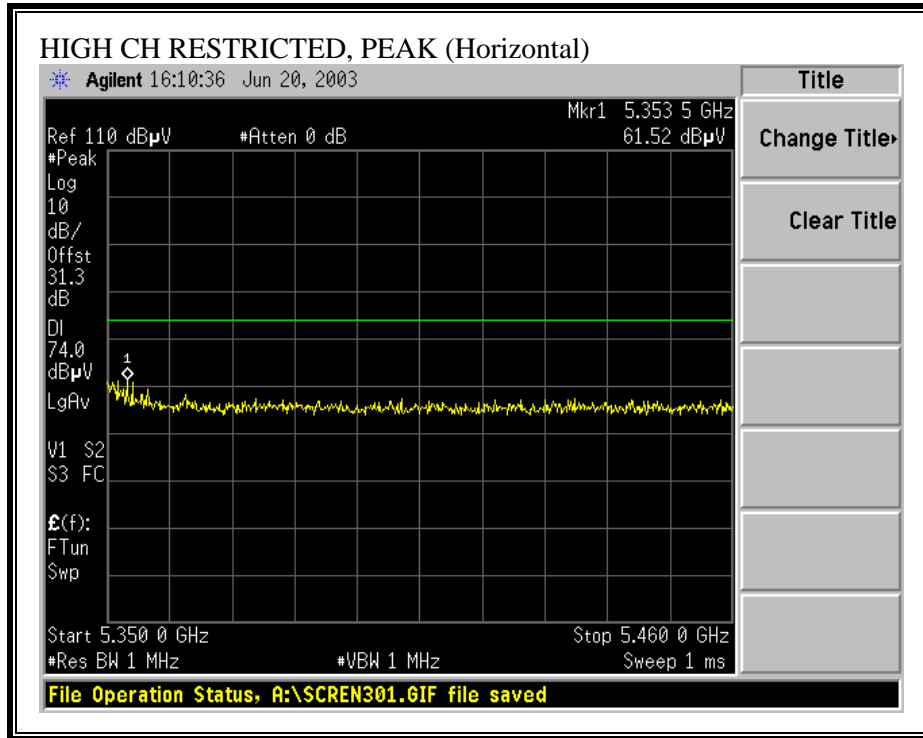


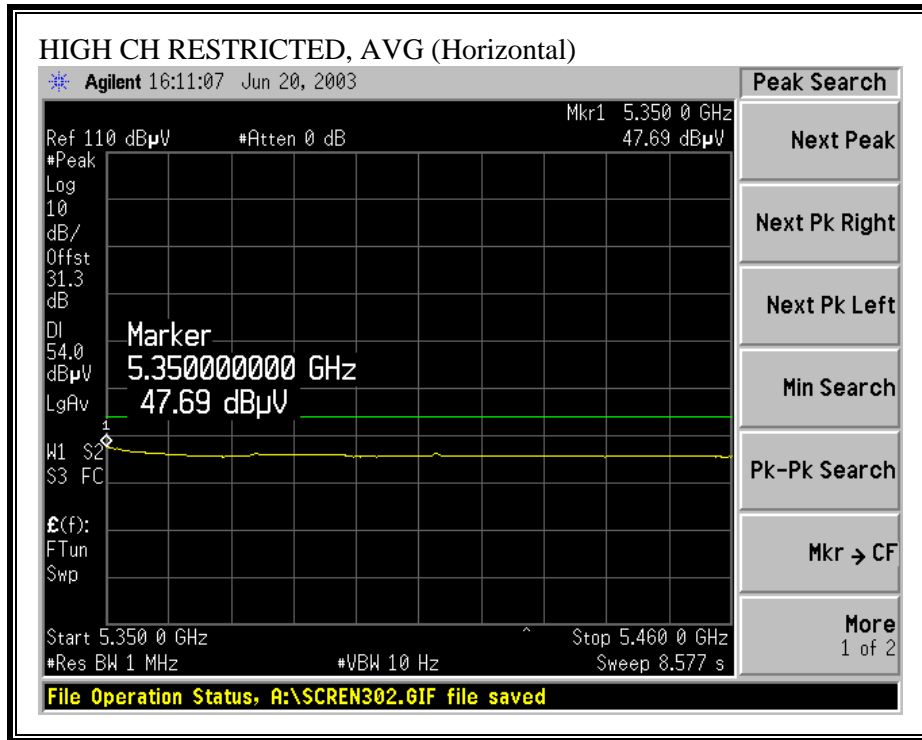
**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**



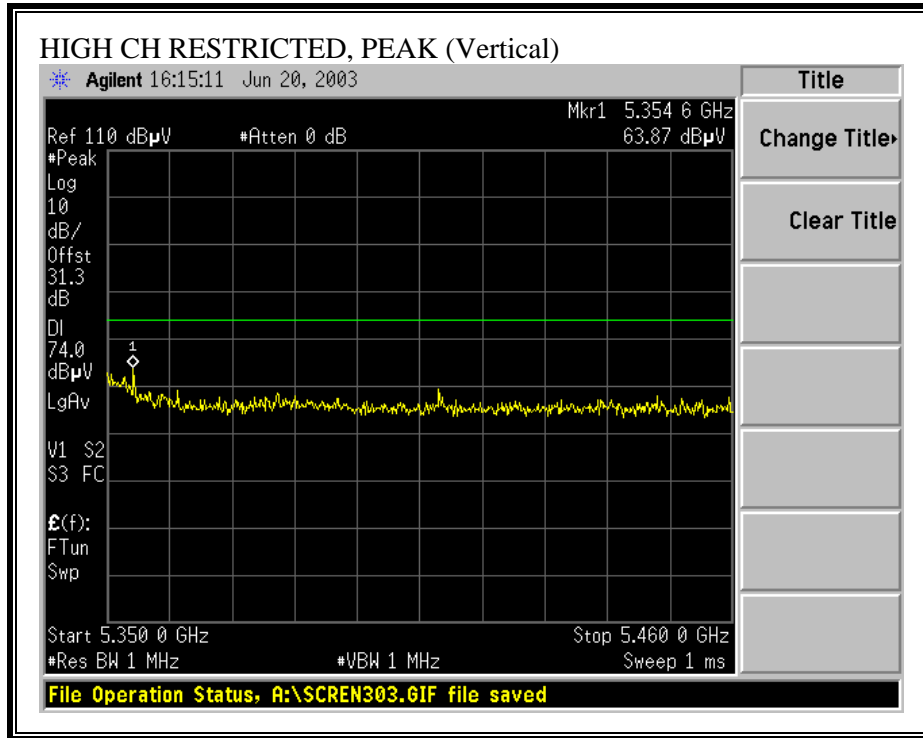


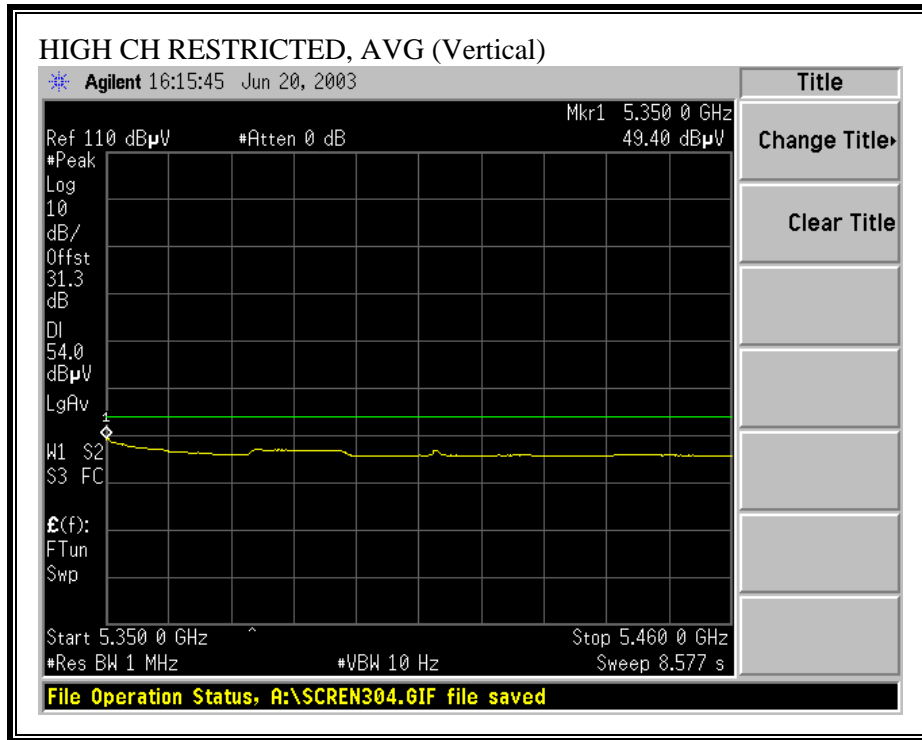
**RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**





**RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)**



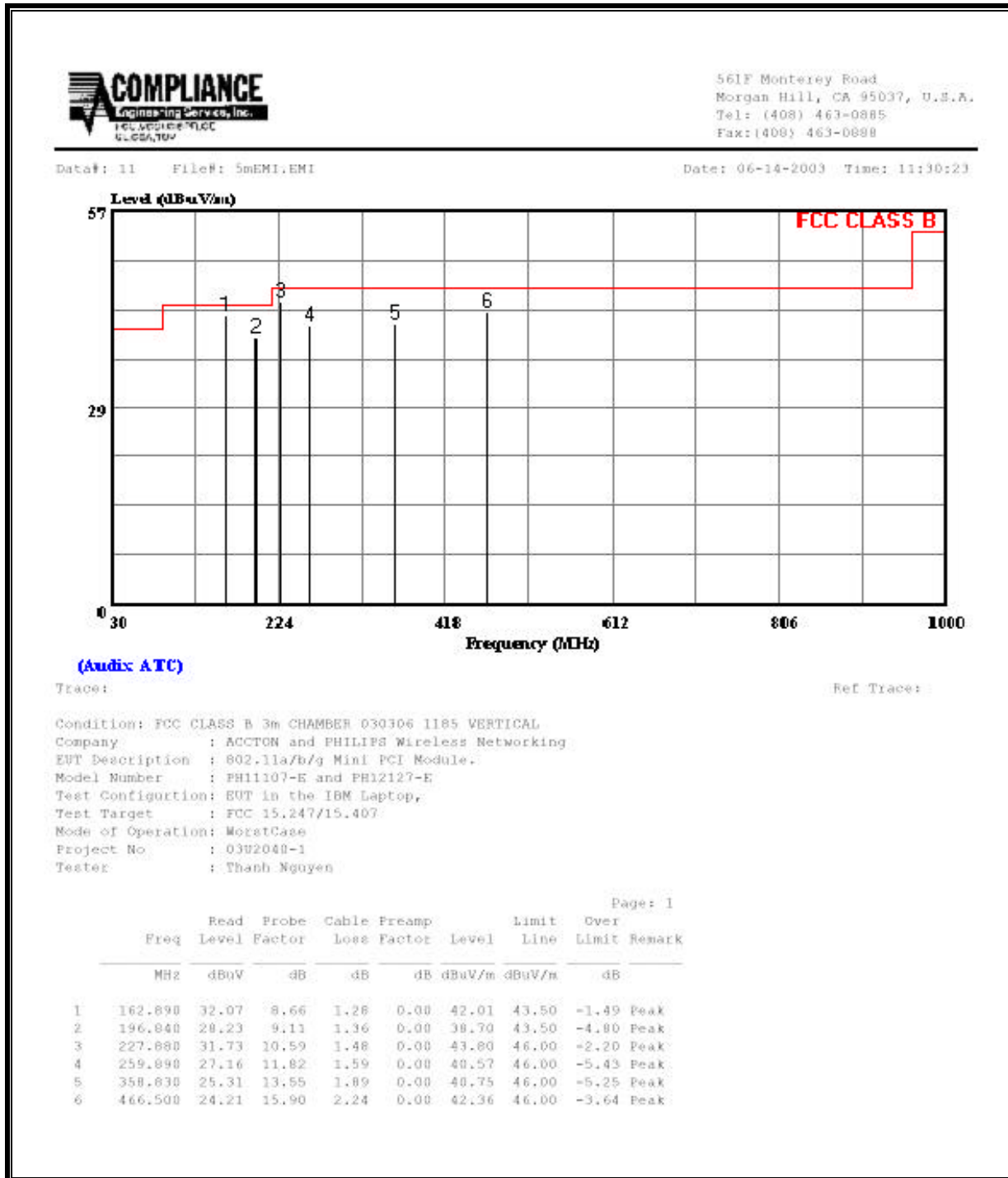


**HARMONICS AND SPURIOUS EMISSIONS**

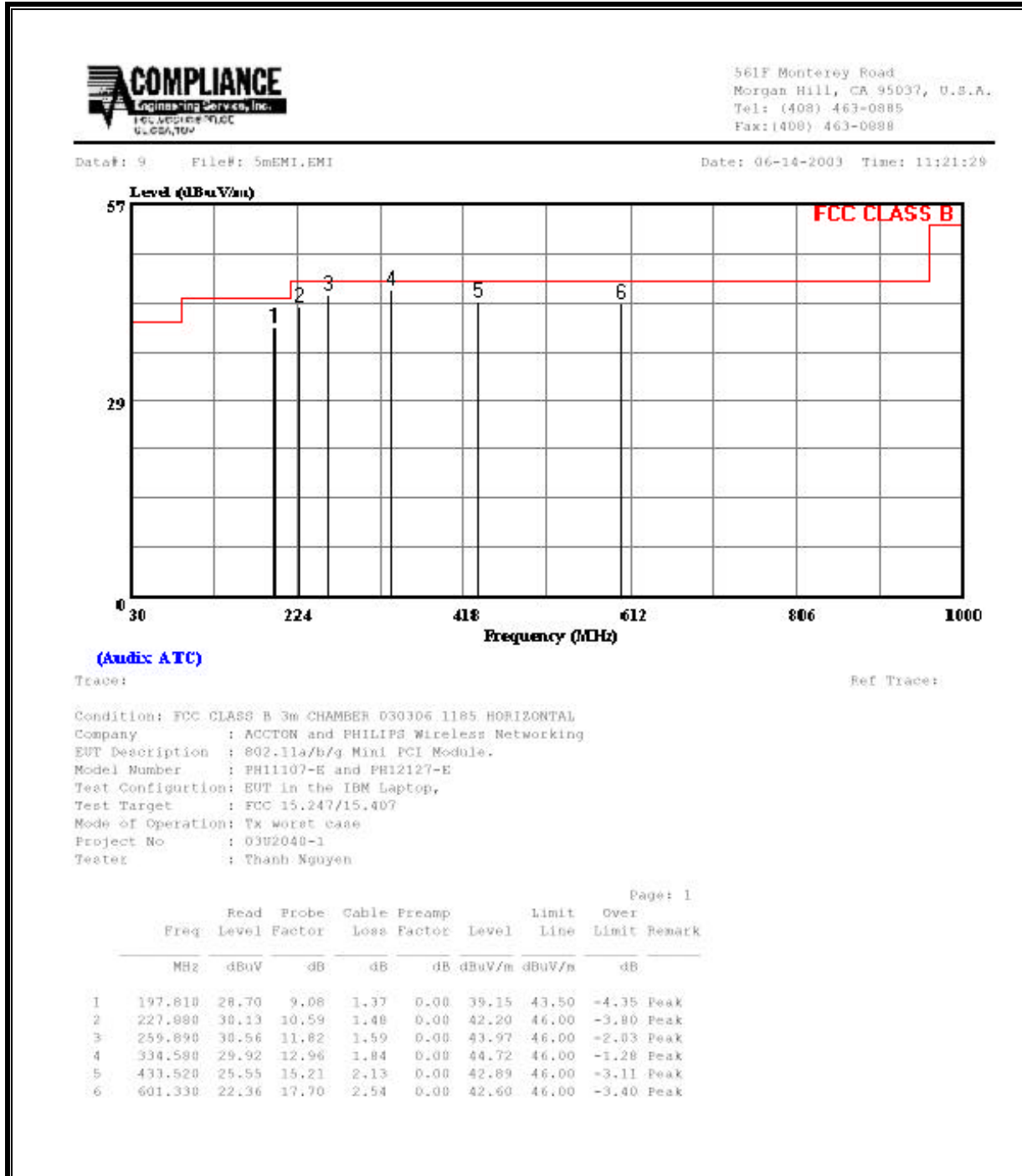
06/20/03 <b>High Frequency Measurement</b> Compliance Certification Services, Morgan Hill Open Field Site  Test Engr: VIEN TRAN Project #: PHILIPS Company: ACCTON/PHILIPS EUT Descrip.: 802.11a/b/g MINI PCI MODULE EUT M/N: PH11107-E & PH12127-E Test Target: FCC 14.247/15.407 Mode Oper: Harmonic and Spur Tx at L/M/H Channels (5.2GHz)_Normal Mode  Test Equipment: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; width: 20%;">EMCO Horn 1-18GHz T59; S/N: 3245 @3m</div> <div style="border: 1px solid black; padding: 2px; width: 20%;">Pre-amplifier 1-26GHz T34 HP 8449B</div> <div style="border: 1px solid black; padding: 2px; width: 20%;">Spectrum Analyzer Agilent E4446A Analyzer</div> <div style="border: 1px solid black; padding: 2px; width: 20%;">Horn &gt; 18GHz</div> </div> <div style="margin-top: 10px;">                 Hi Frequency Cables  <input type="checkbox"/> (2 ft)    <input type="checkbox"/> (2 ~ 3 ft)    <input checked="" type="checkbox"/> (4 ~ 6 ft)    <input checked="" type="checkbox"/> (12 ft)             </div> <div style="margin-top: 10px; display: flex; justify-content: space-between;"> <div> <b>Peak Measurements:</b>                      1 MHz Resolution Bandwidth                      1MHz Video Bandwidth                 </div> <div> <b>Average Measurements:</b>                      1 MHz Resolution Bandwidth                      10Hz Video Bandwidth                 </div> </div>																																													
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																														
<b>LOW CH=5180MHz</b>																																													
15.540	9.8	41.3	28.6	39.5	7.1	-33.9	0.0	1.0	55.0	42.3	74.0	54.0	-19.0	-11.7	V																														
15.540	9.8	40.4	28.0	39.5	7.1	-33.9	0.0	1.0	54.1	41.7	74.0	54.0	-19.9	-12.3	H																														
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																																													
<b>MID CH=5260MHz</b>																																													
15.780	9.8	42.4	29.0	39.0	7.2	-33.9	0.0	1.0	55.6	42.3	74.0	54.0	-18.4	-11.7	V																														
15.780	9.8	41.9	28.9	39.0	7.2	-33.9	0.0	1.0	55.2	42.2	74.0	54.0	-18.8	-11.8	H																														
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																																													
<b>HI CH=5320MHz</b>																																													
10.640	9.8	42.3	31.6	38.0	5.5	-34.3	0.0	1.0	52.5	41.8	74.0	54.0	-21.5	-12.2	V																														
15.960	9.8	41.2	29.3	38.6	7.2	-33.8	0.0	1.0	54.1	42.2	74.0	54.0	-19.9	-11.8	V																														
10.640	9.8	45.2	31.6	38.0	5.5	-34.3	0.0	1.0	55.4	41.8	74.0	54.0	-18.6	-12.2	H																														
15.960	9.8	41.9	29.3	38.6	7.2	-33.8	0.0	1.0	54.8	42.2	74.0	54.0	-19.2	-11.8	H																														
NO OTHER EMISSION FOUND AFTER 3rd HARMONIC																																													
<table style="width: 100%; border: none;"> <tr> <td style="width: 15%;">f</td> <td style="width: 35%;">Measurement Frequency</td> <td style="width: 15%;">Amp</td> <td style="width: 15%;">Preamp Gain</td> <td style="width: 15%;">Avg Lim</td> <td style="width: 20%;">Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table>																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		
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																																								
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AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit																																								
CL	Cable Loss	HPF	High Pass Filter																																										



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

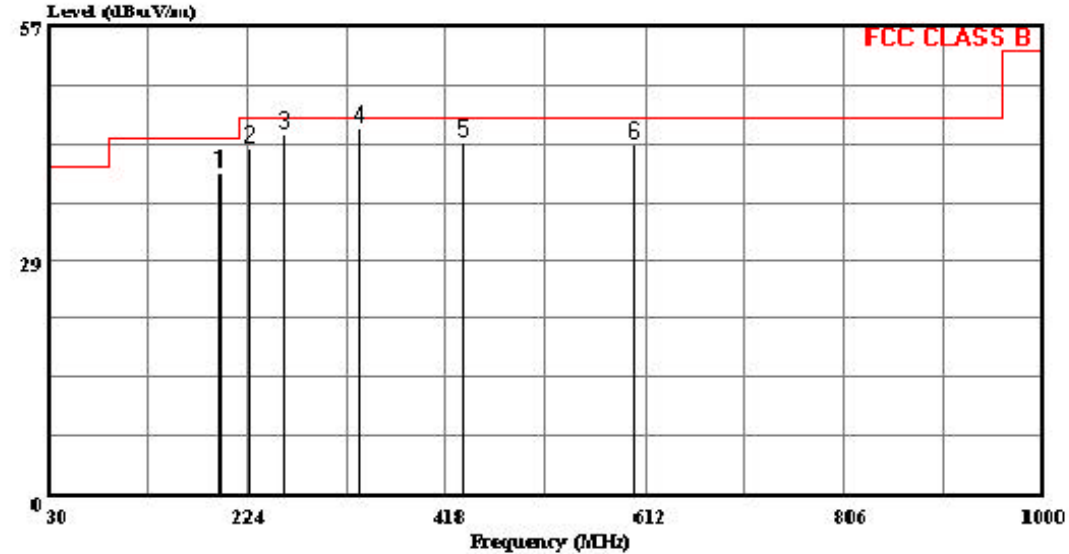


**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)-HORIZONTAL**



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

Data#: 9 File#: 5mEMI.EMI Date: 06-14-2003 Time: 11:21:29



(Audix A TC)

Trace: Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 HORIZONTAL  
 Company : ACCTON and PHILIPS Wireless Networking  
 EUT Description : 802.11a/b/g Mini PCI Module.  
 Model Number : PH11107-E and PH12127-E  
 Test Configuration: EUT in the IBM Laptop,  
 Test Target : FCC 15.247/15.407  
 Mode of Operation: TX worst case  
 Project No : 03U2040-1  
 Tester : Thanh Nguyen

Page: 1

	Read Freq	Probe Level	Probe Factor	Cable Loss	Preamp Factor	Limit Level	Over Line	Limit Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB
1	197.810	28.70	9.08	1.37	0.00	39.15	43.50	-4.35 Peak
2	227.980	30.13	10.59	1.48	0.00	42.20	46.00	-3.80 Peak
3	259.890	30.56	11.82	1.59	0.00	43.97	46.00	-2.03 Peak
4	334.580	29.92	12.96	1.84	0.00	44.72	46.00	-1.28 Peak
5	433.520	25.55	15.21	2.13	0.00	42.89	46.00	-3.11 Peak
6	601.330	22.36	17.70	2.54	0.00	42.60	46.00	-3.40 Peak

## 7.9. 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.

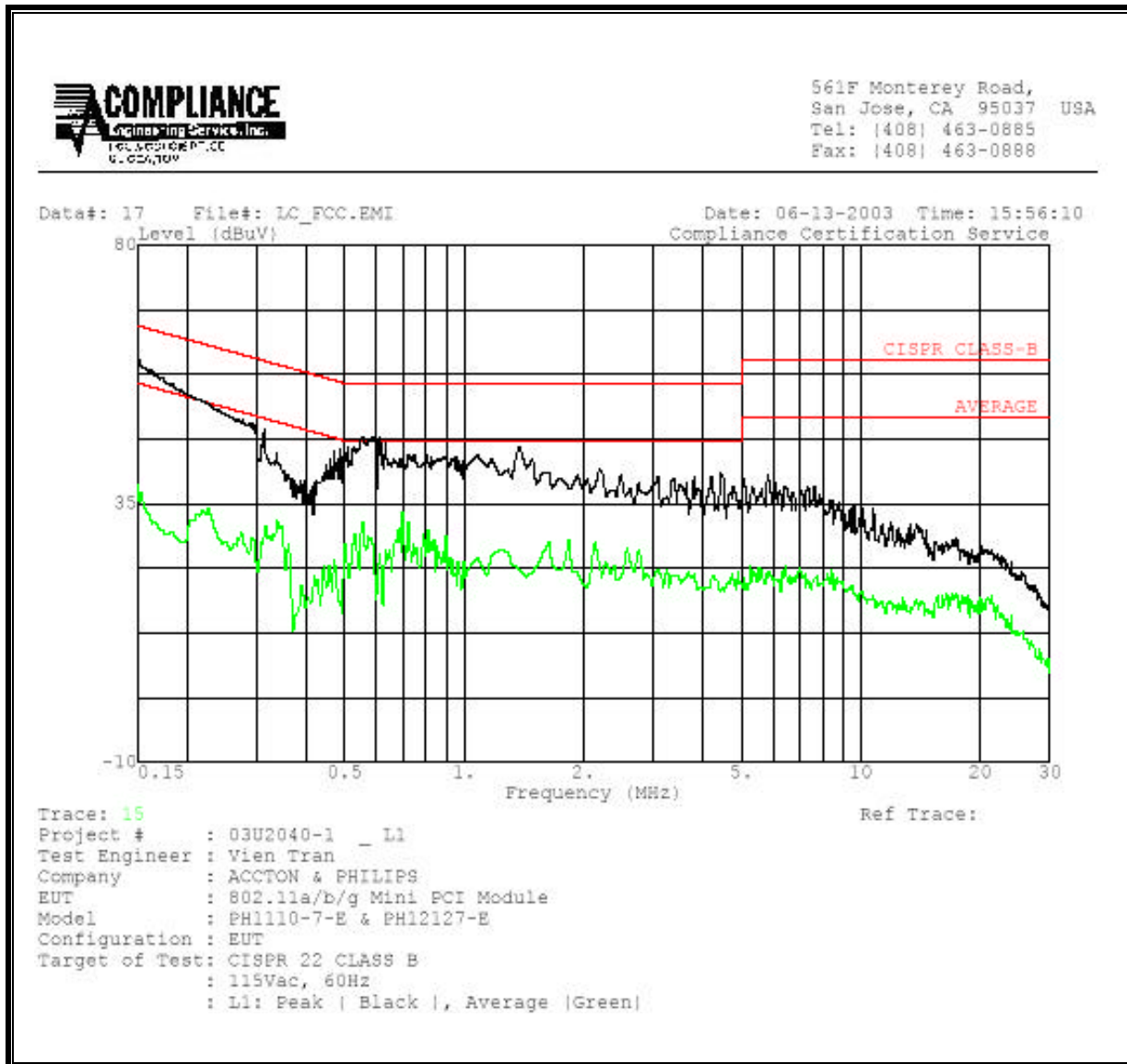
### RESULTS

No non-compliance noted:

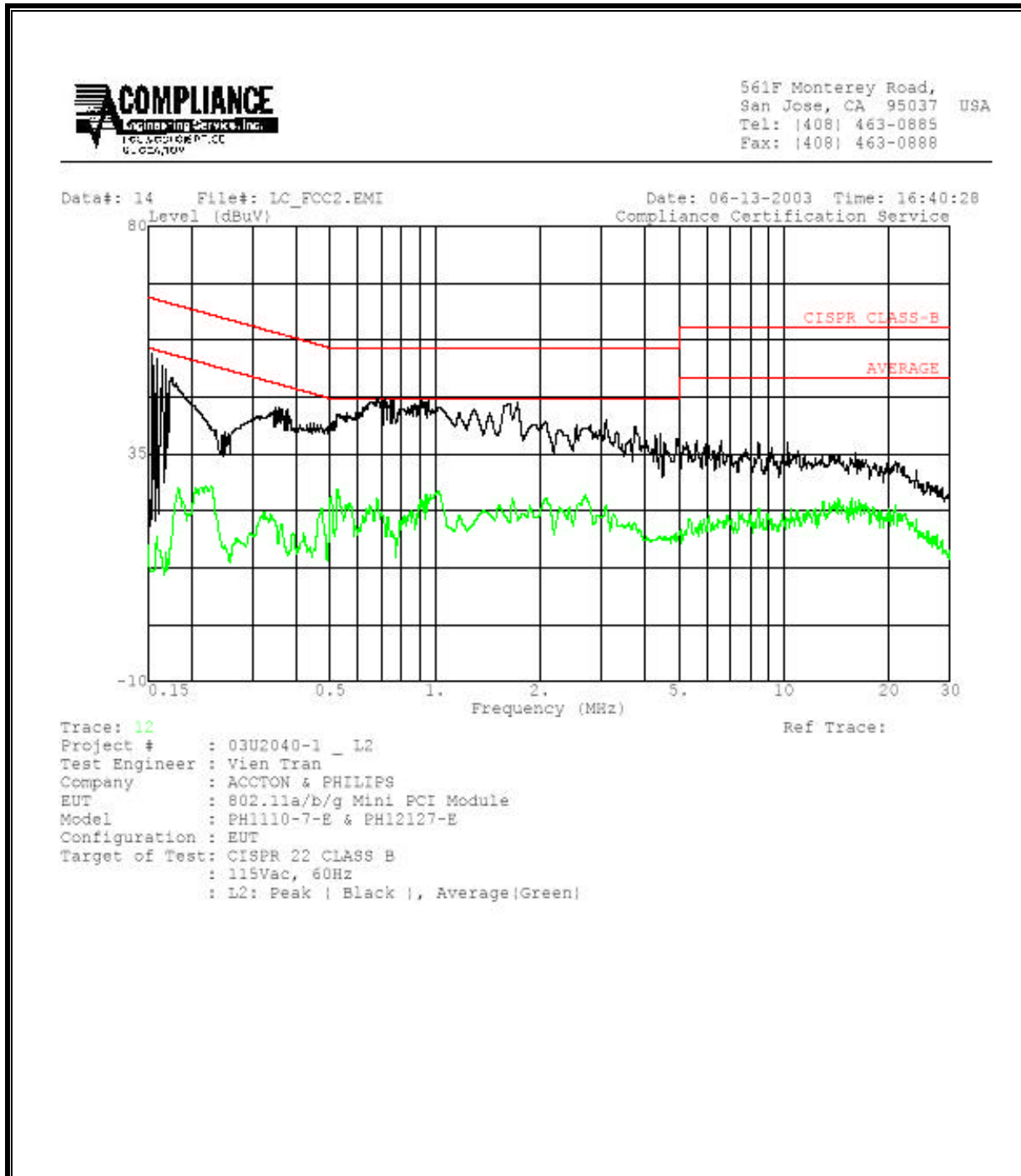
**6 WORST EMISSIONS**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN_B		Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)			AV	QP (dB)	AV (dB)		
0.15	59.54	--	38.29	0.00	66.00	56.00	-6.46	-17.71	L1	
0.29	48.80	--	24.11	0.00	62.00	52.00	-13.20	-27.89	L1	
0.56	46.50	--	33.55	0.00	56.00	46.00	-9.50	-12.45	L1	
0.15	55.88	--	17.15	0.00	66.00	56.00	-10.12	-38.85	L2	
0.68	43.37	--	26.11	0.00	56.00	46.00	-12.63	-19.89	L2	
1.63	45.79	--	24.62	0.00	56.00	46.00	-10.21	-21.38	L2	
6 Worst Data										

**LINE 1 (LINE) RESULTS**

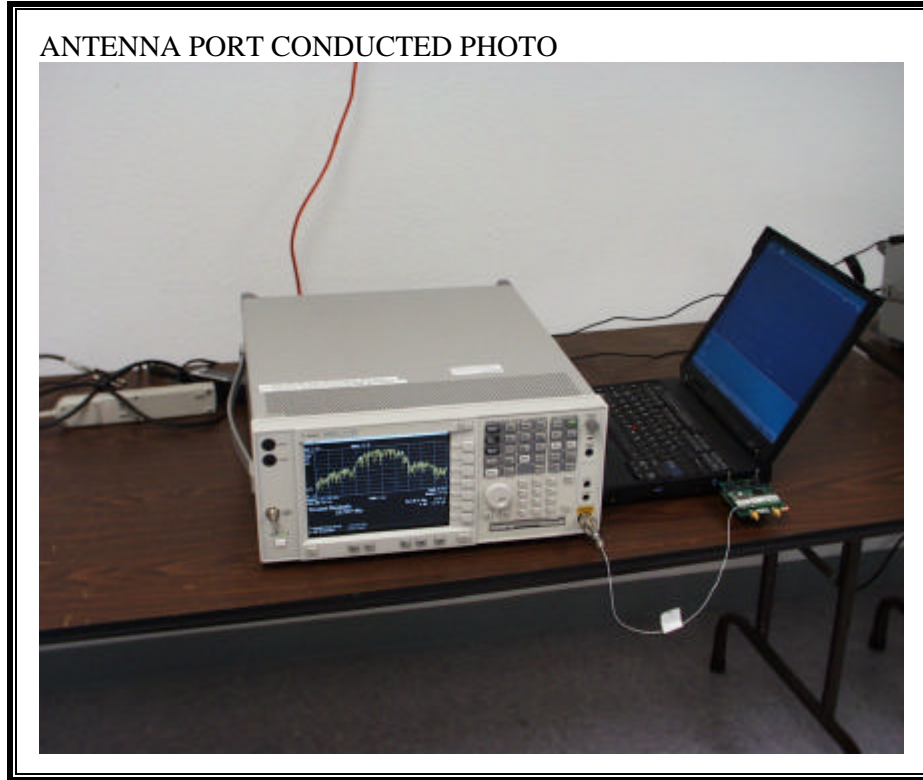


**LINE 2 (NEUTRAL) RESULTS**

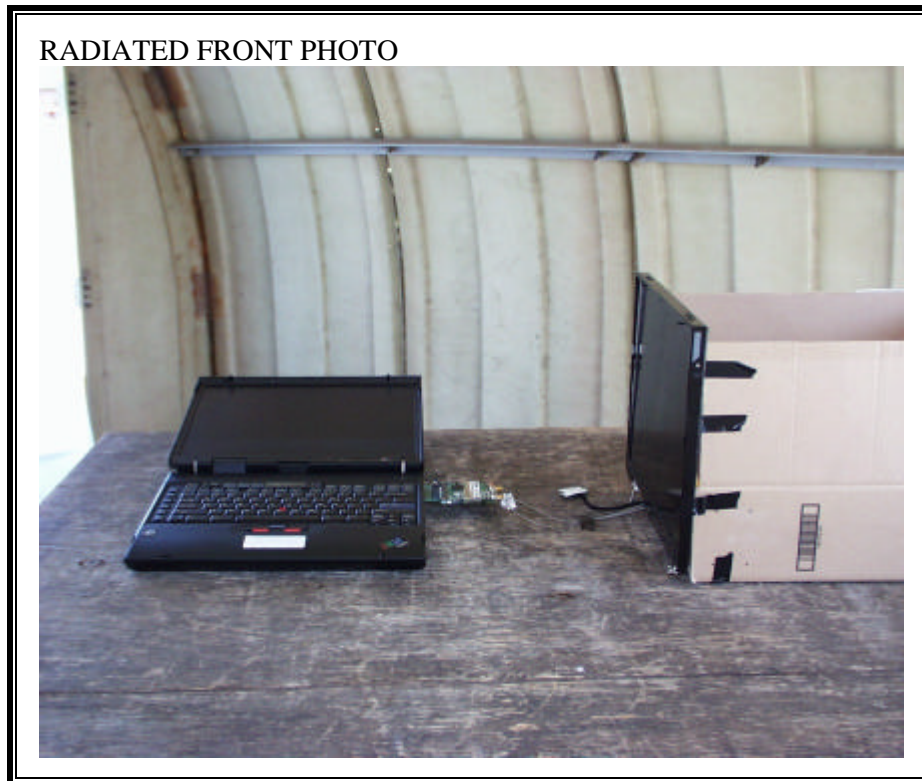


## 8. SETUP PHOTOS

### ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



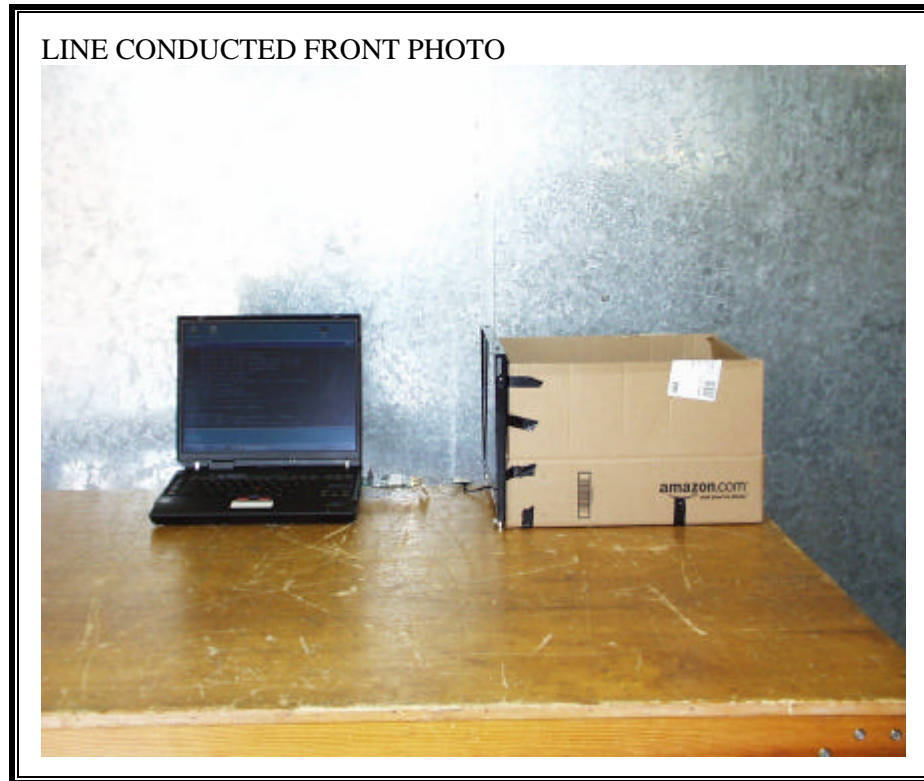
**RADIATED RF MEASUREMENT SETUP**

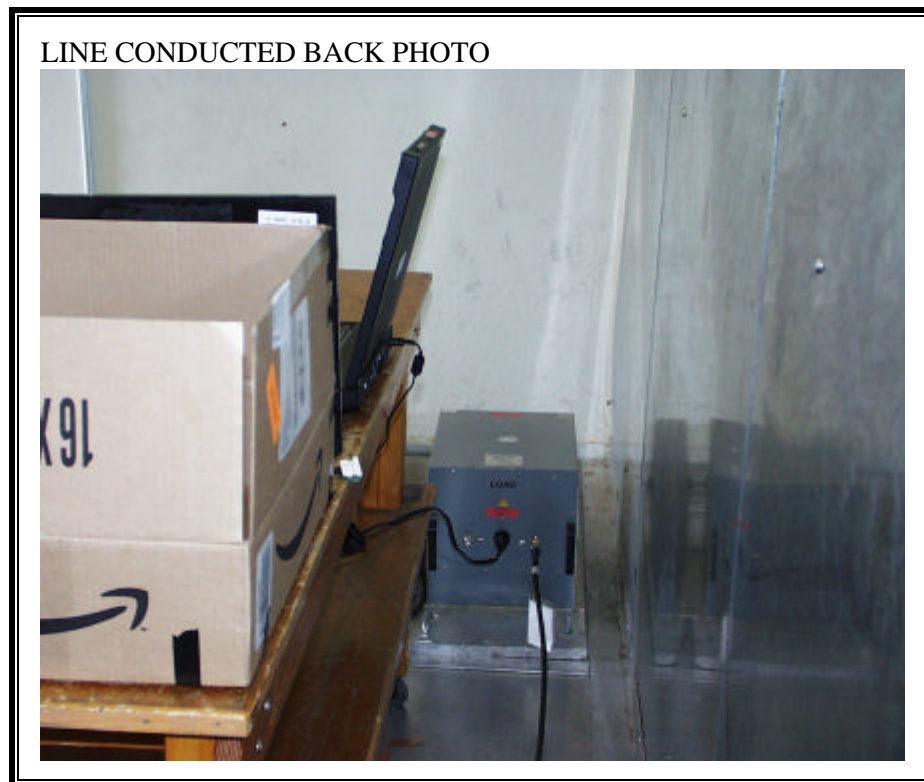






**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**





**END OF REPORT**