# 7.7. CONDUCTED SPURIOUS EMISSIONS

# **LIMITS**

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in§15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

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# **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

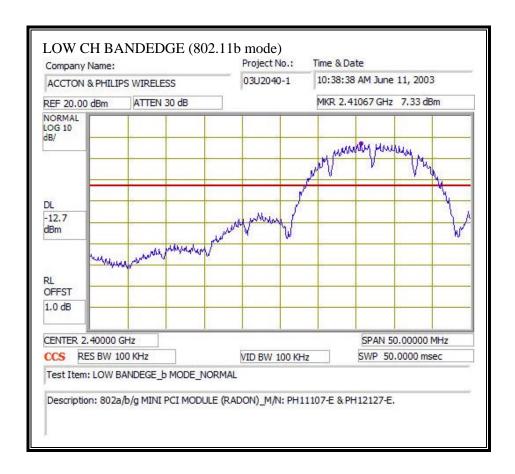
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 5.8 GHz band.

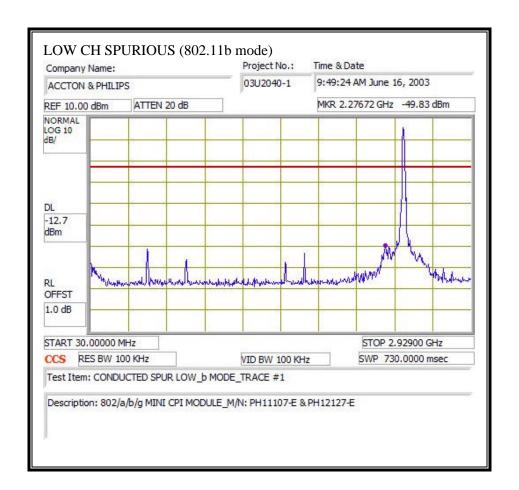
# **RESULTS**

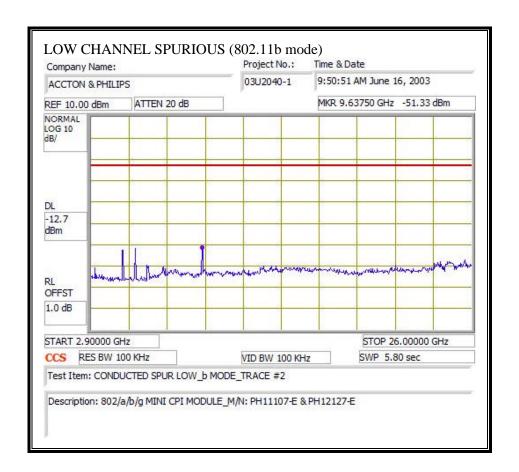
No non-compliance noted:

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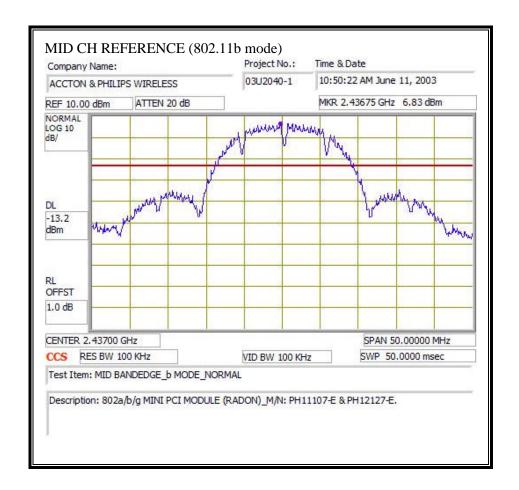
## **SPURIOUS EMISSIONS, LOW CHANNEL (802.11b MODE)**

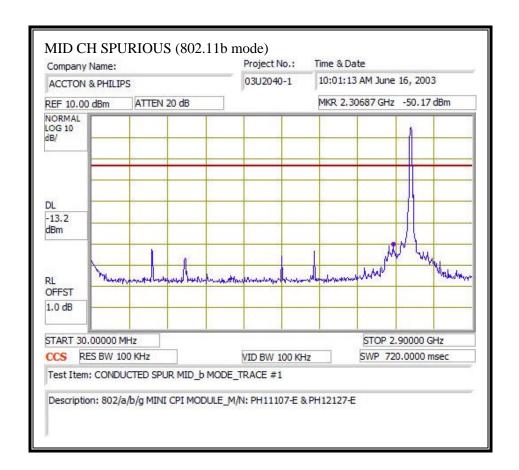


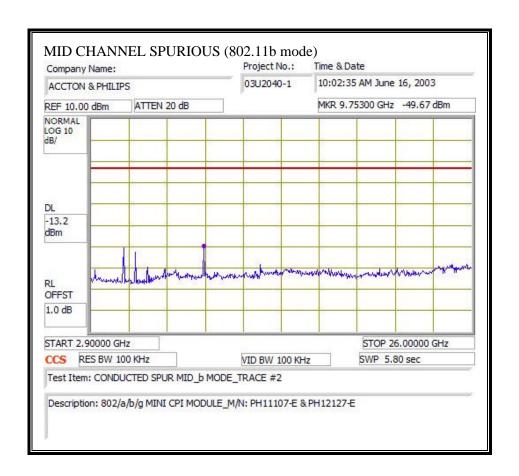




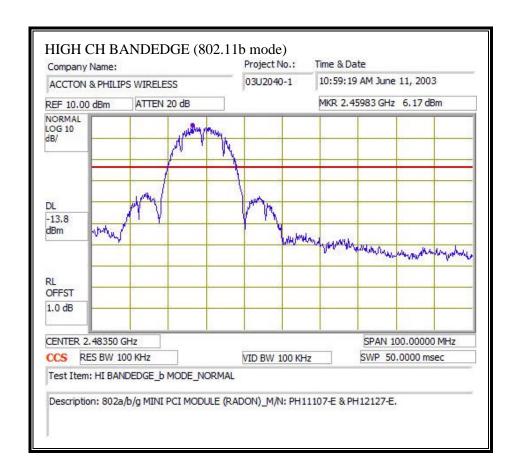
## **SPURIOUS EMISSIONS, MID CHANNEL (802.11b MODE)**

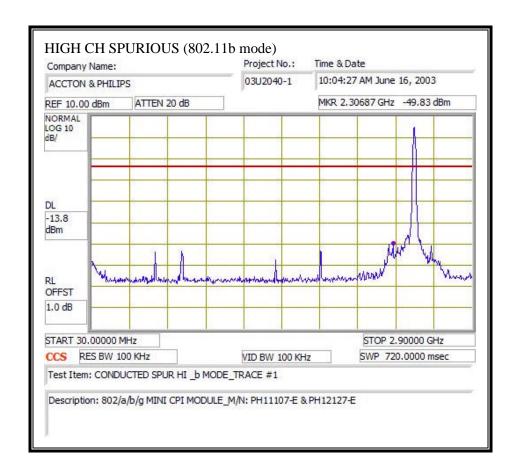


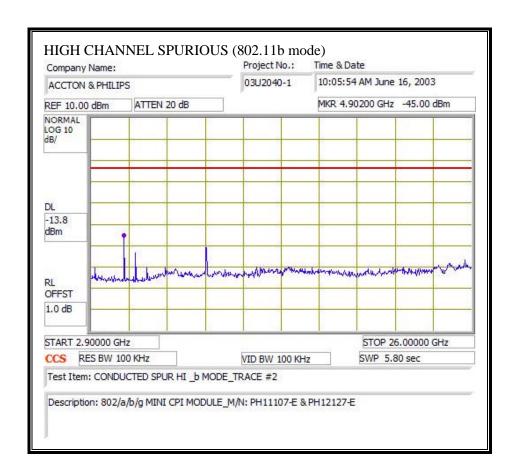




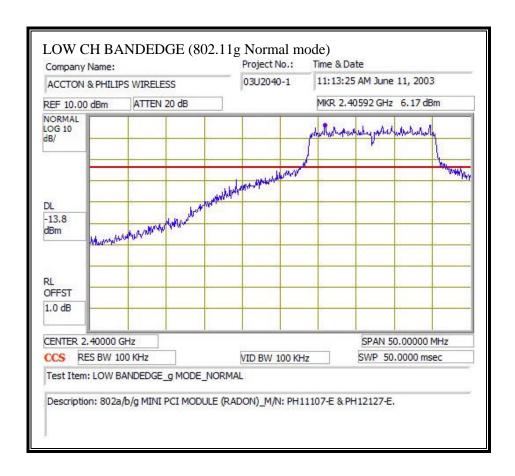
## SPURIOUS EMISSIONS, HIGH CHANNEL (802.11b MODE)

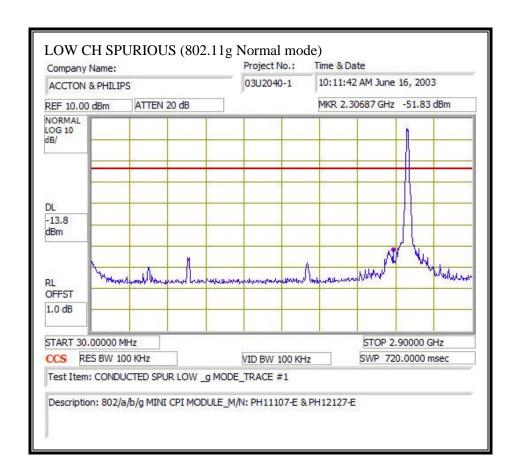


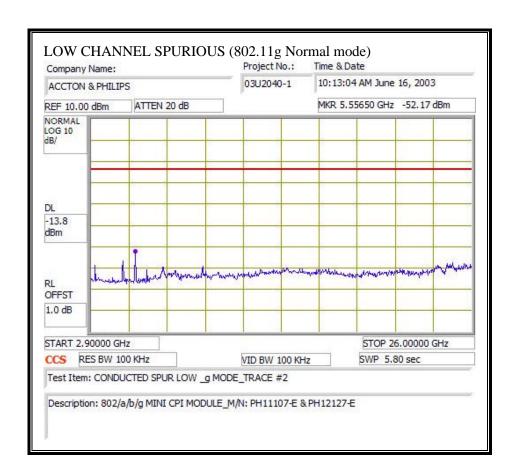




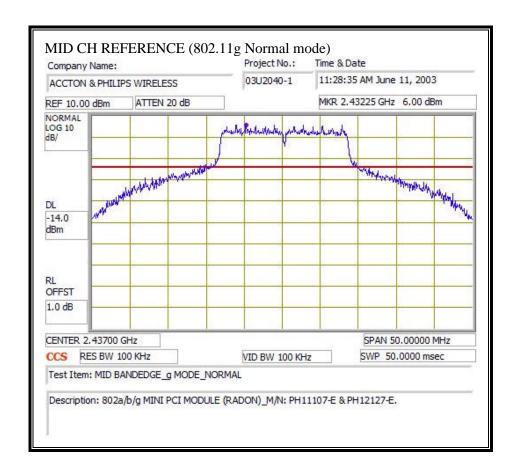
## SPURIOUS EMISSIONS, LOW CHANNEL (802.11g NORMAL MODE)

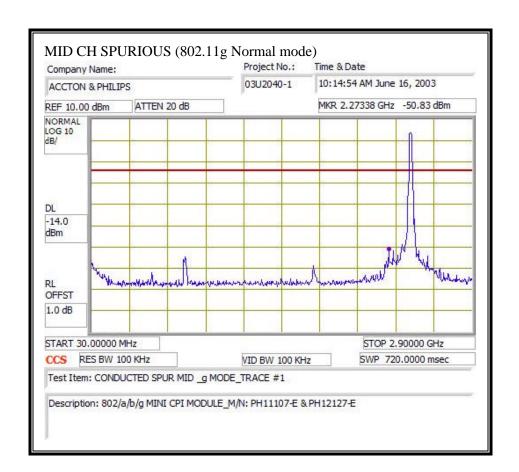


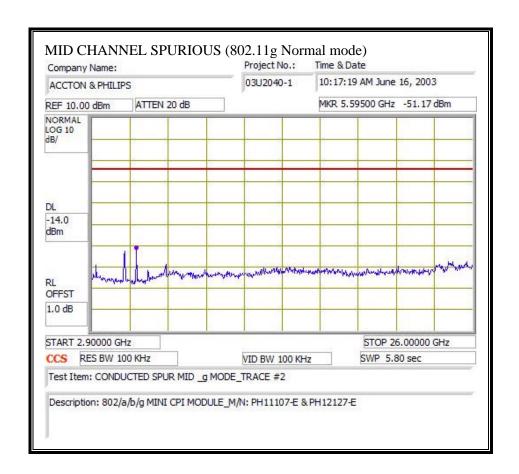




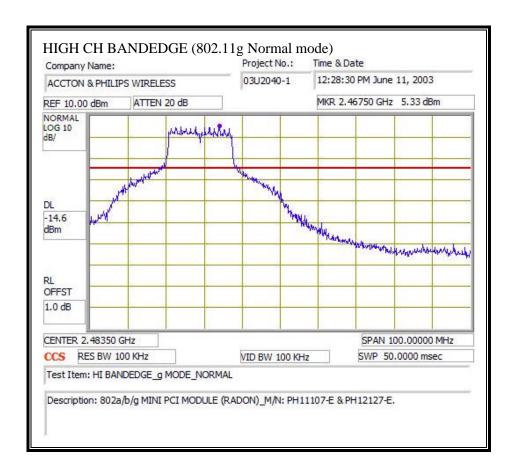
## SPURIOUS EMISSIONS, MID CHANNEL (802.11g NORMAL MODE)

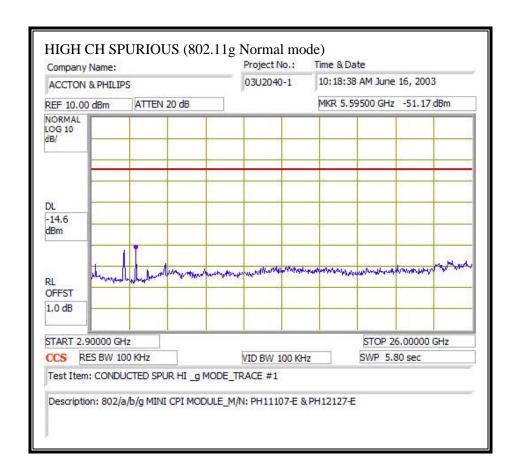


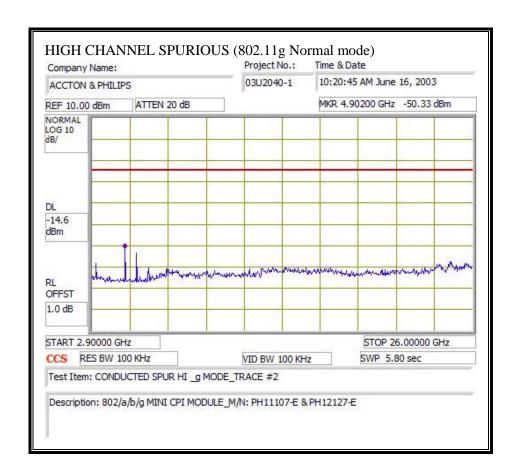




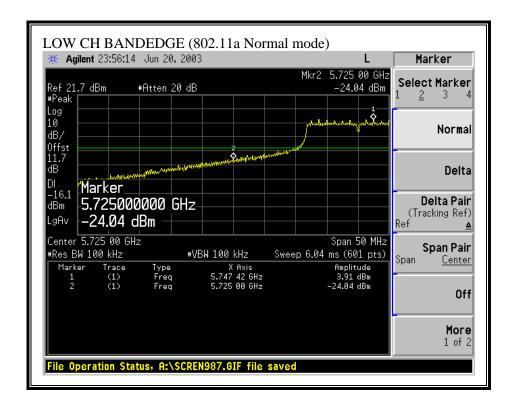
## SPURIOUS EMISSIONS, HIGH CHANNEL (802.11g NORMAL MODE)

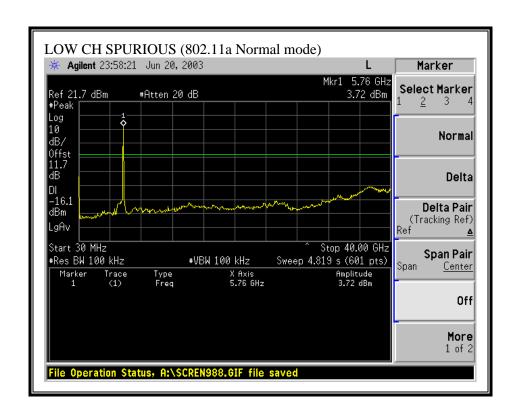




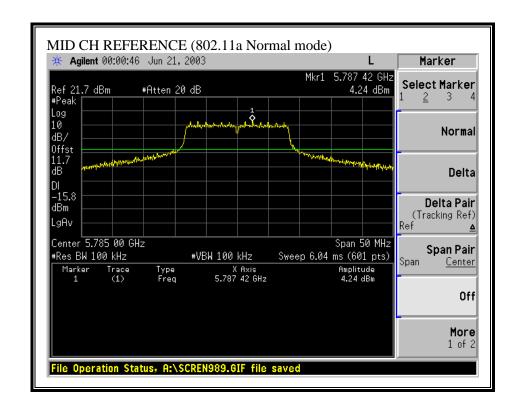


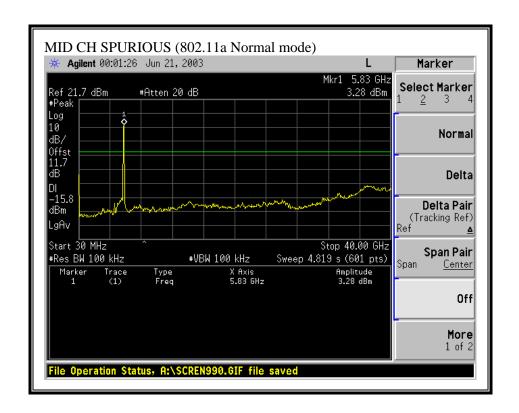
# SPURIOUS EMISSIONS, LOW CHANNEL (802.11a NORMAL MODE)



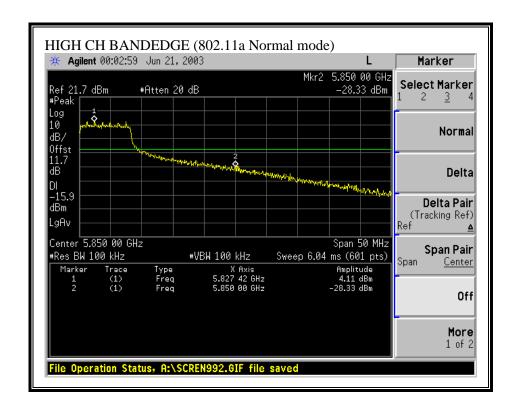


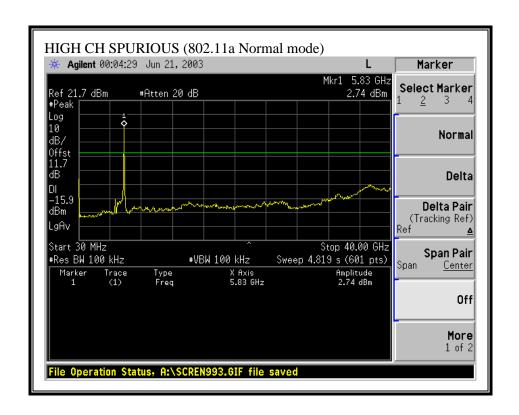
## SPURIOUS EMISSIONS, MID CHANNEL (802.11a NORMAL MODE)





# SPURIOUS EMISSIONS, HIGH CHANNEL (802.11a 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:

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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	$\binom{2}{}$
13.36 - 13.41			

<sup>&</sup>lt;sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

§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.

<sup>&</sup>lt;sup>2</sup> Above 38.6

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§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	

<sup>\*\*</sup> 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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

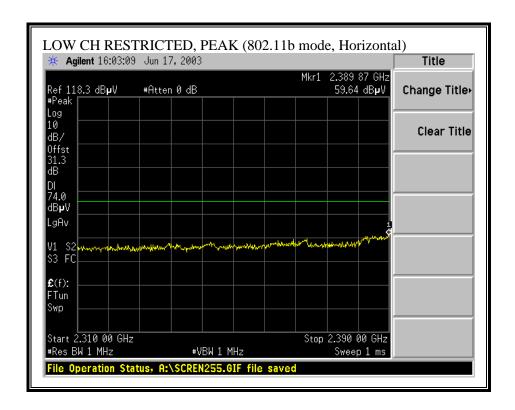
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

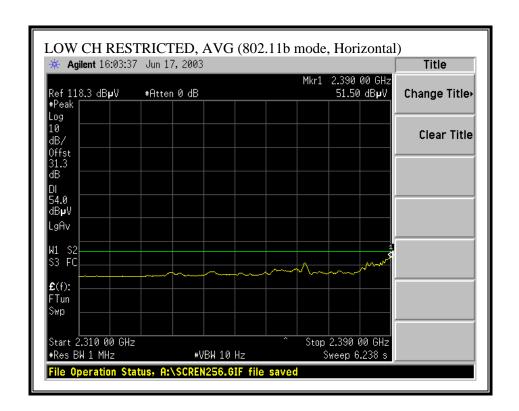
## **RESULTS**

No non-compliance noted:

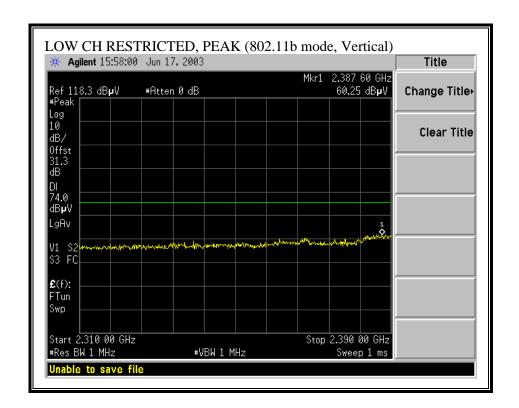
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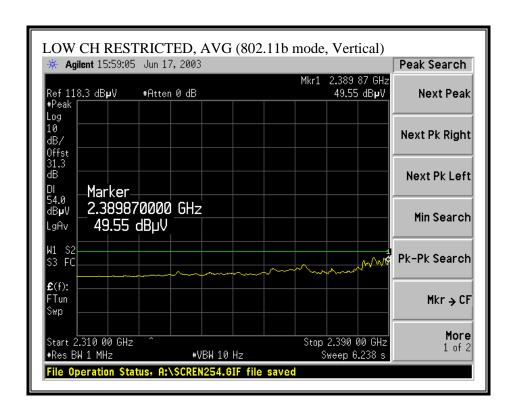
# RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, HORIZONTAL)



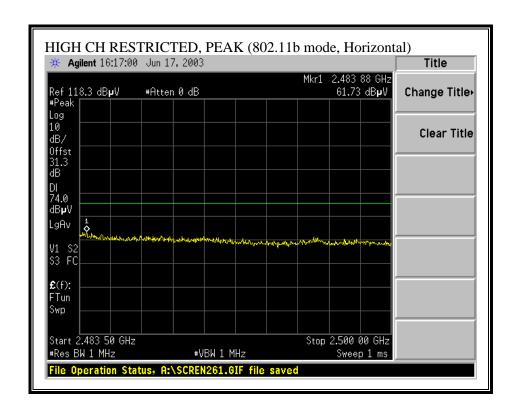


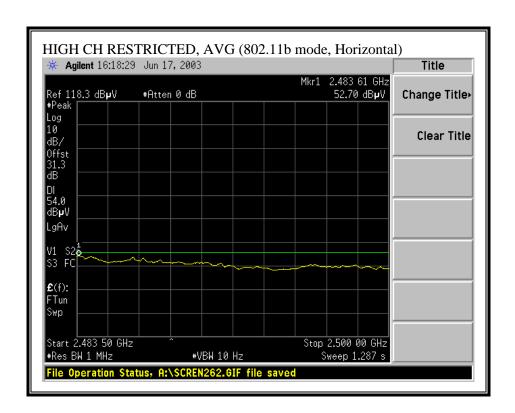
# RESTRICTED BANDEDGE (b MODE, LOW CHANNEL, VERTICAL)



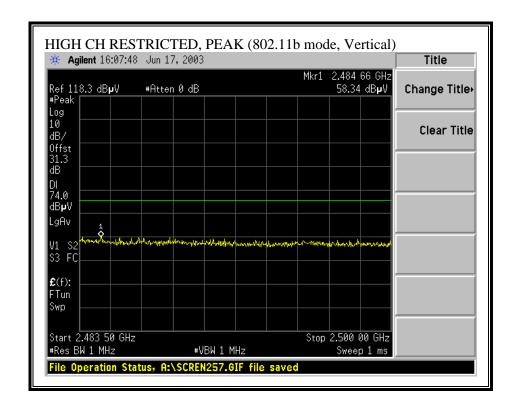


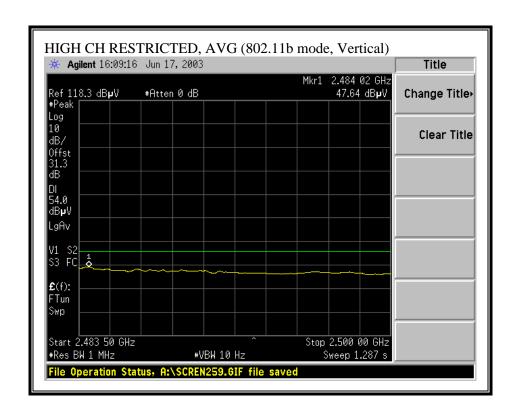
# RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, HORIZONTAL)



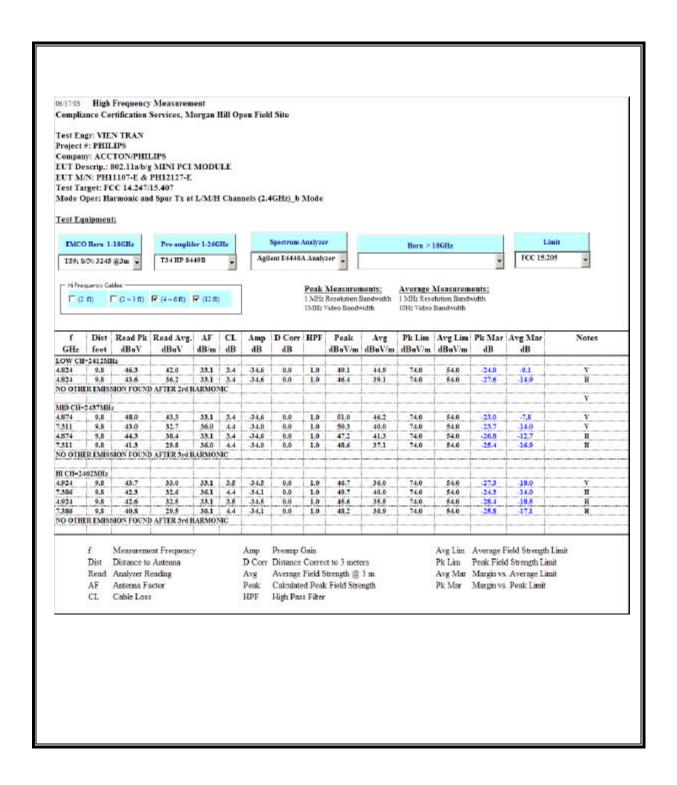


# RESTRICTED BANDEDGE (b MODE, HIGH CHANNEL, VERTICAL)



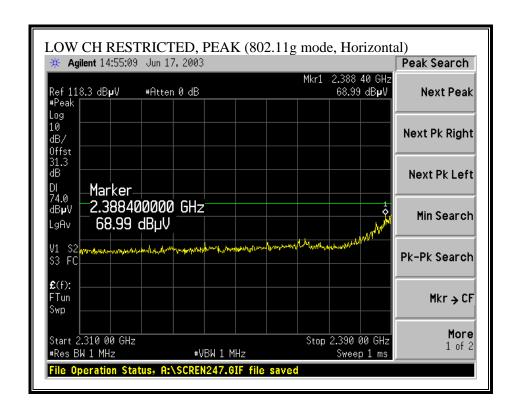


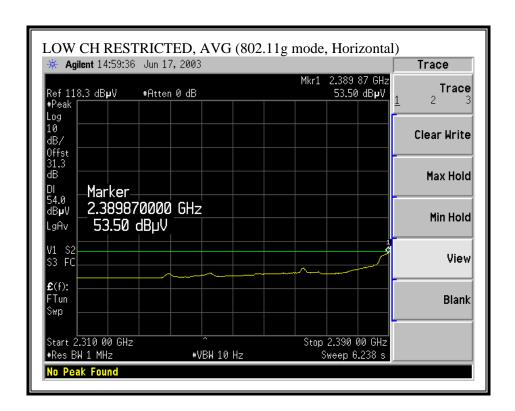
## HARMONICS AND SPURIOUS EMISSIONS (b MODE, LOW MID HIGH CHANNELS)



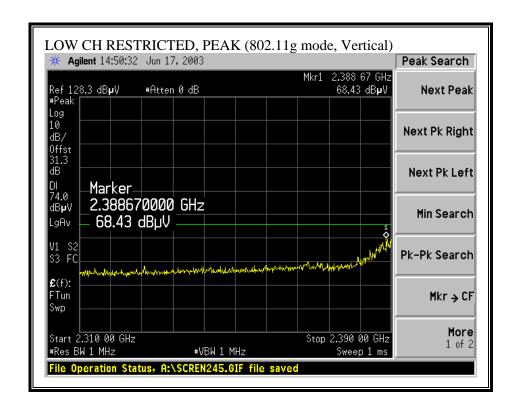
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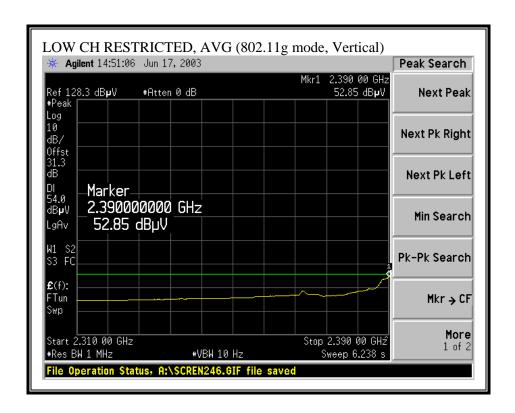
# RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, HORIZONTAL)



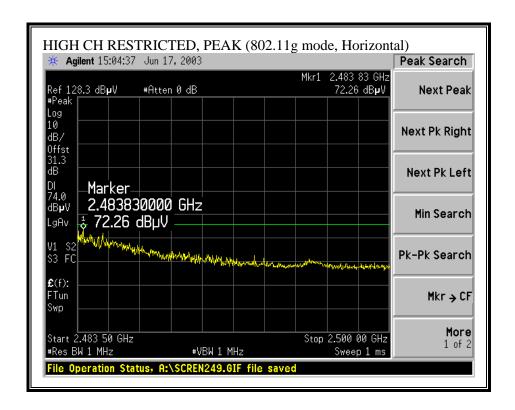


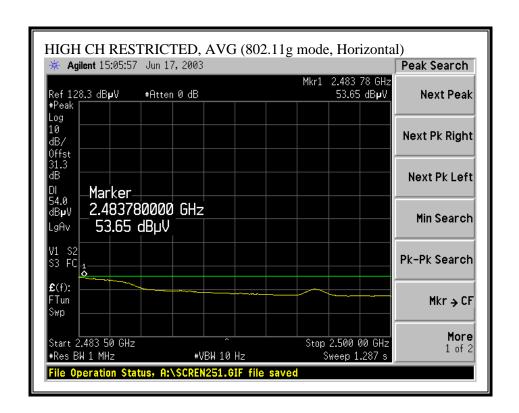
## RESTRICTED BANDEDGE (g MODE, LOW CHANNEL, VERTICAL)



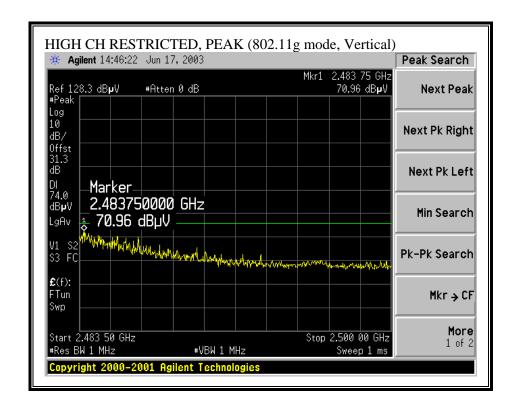


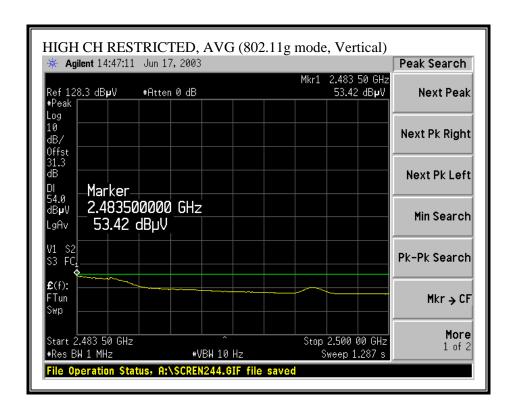
## RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, HORIZONTAL)



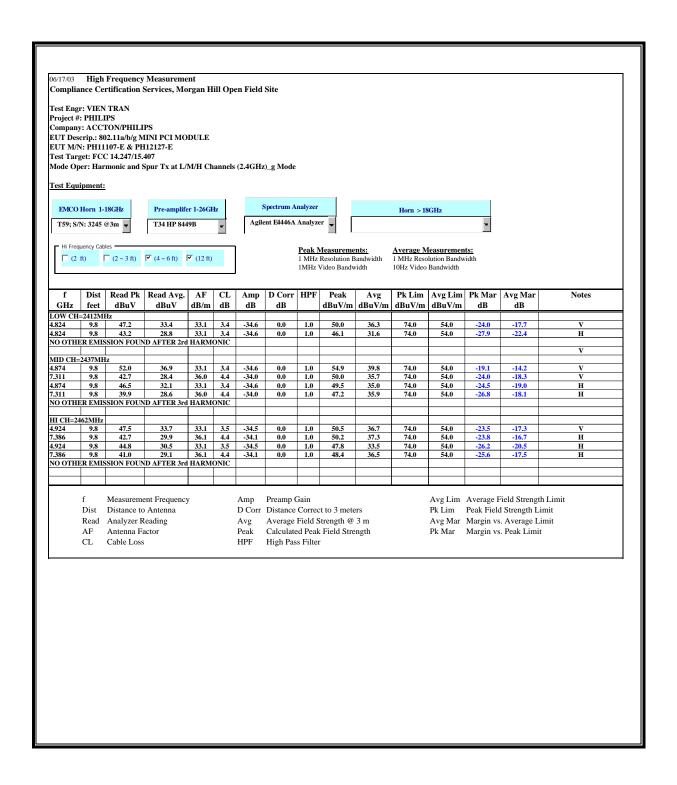


# RESTRICTED BANDEDGE (g MODE, HIGH CHANNEL, VERTICAL)



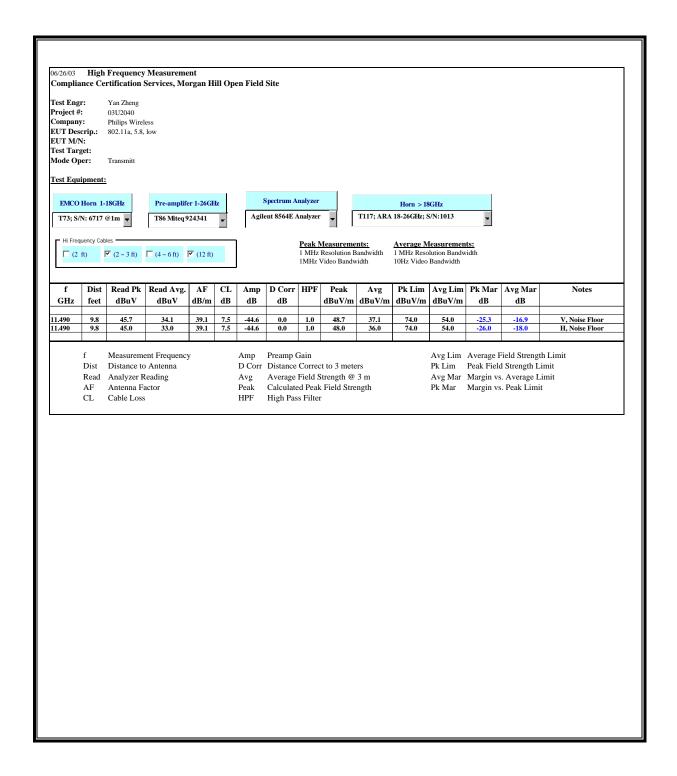


## HARMONICS AND SPURIOUS EMISSIONS (g MODE)



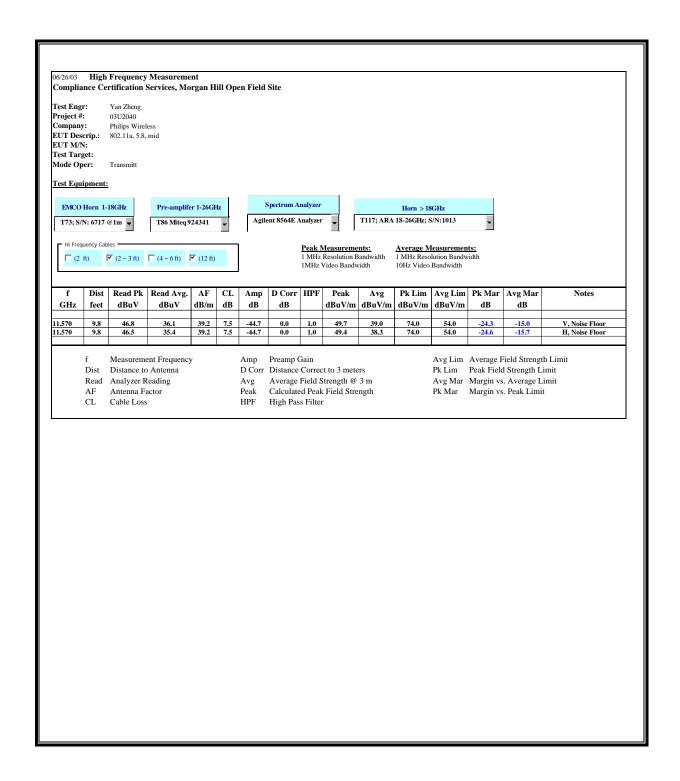
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## HARMONICS AND SPURIOUS EMISSIONS (a MODE, LOW CHANNEL)



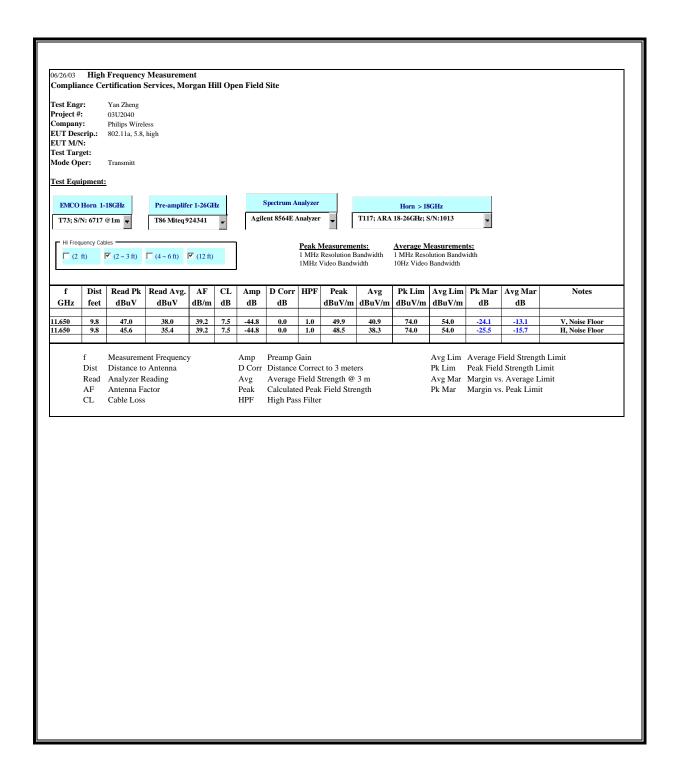
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## HARMONICS AND SPURIOUS EMISSIONS (a MODE, MID CHANNEL)



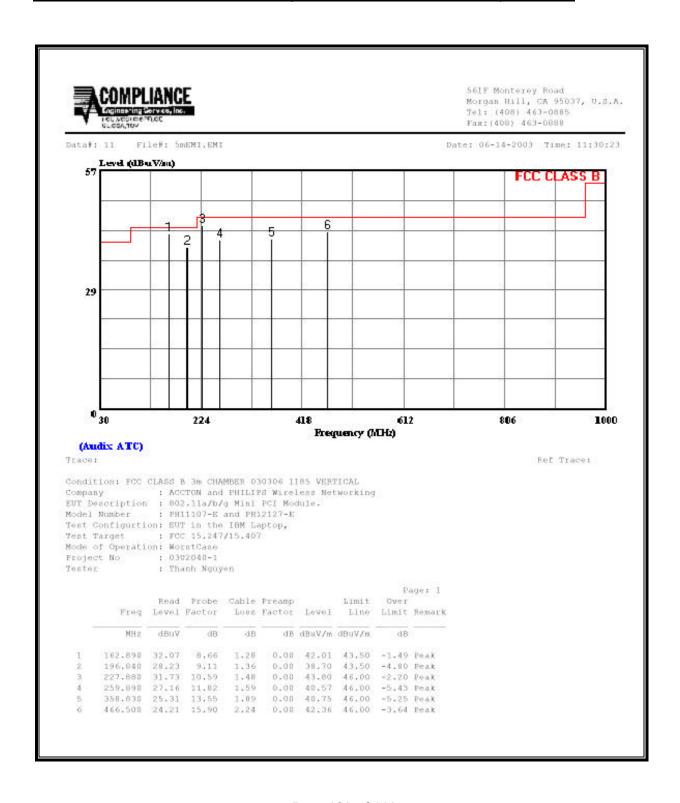
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## HARMONICS AND SPURIOUS EMISSIONS (a MODE, HIGH CHANNEL)



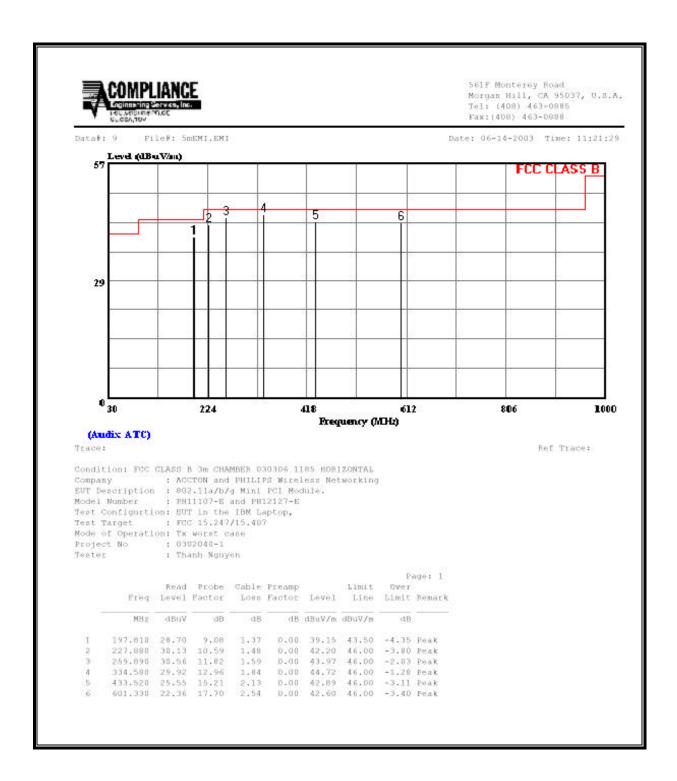
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## SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)-VERTICAL



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



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## 7.9. POWERLINE CONDUCTED EMISSIONS

## **LIMIT**

 $\S15.207$  (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.

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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.

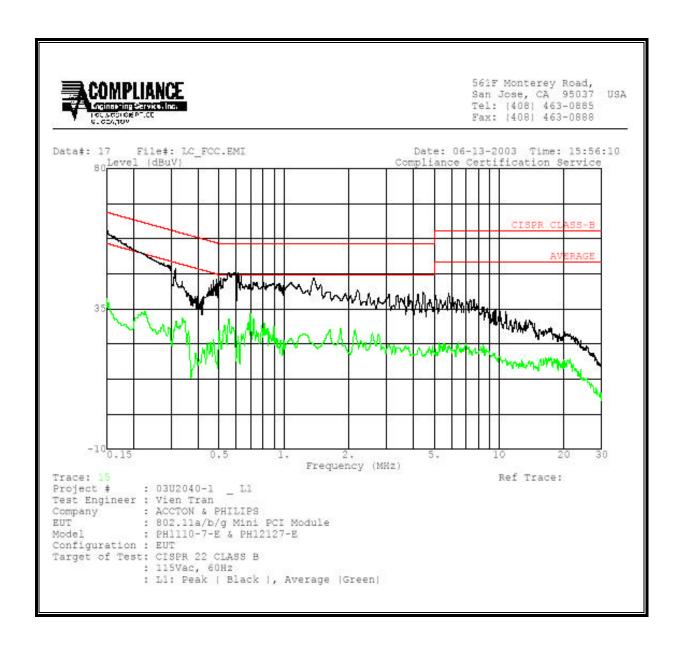
## **RESULTS**

No non-compliance noted:

## **6 WORST EMISSIONS**

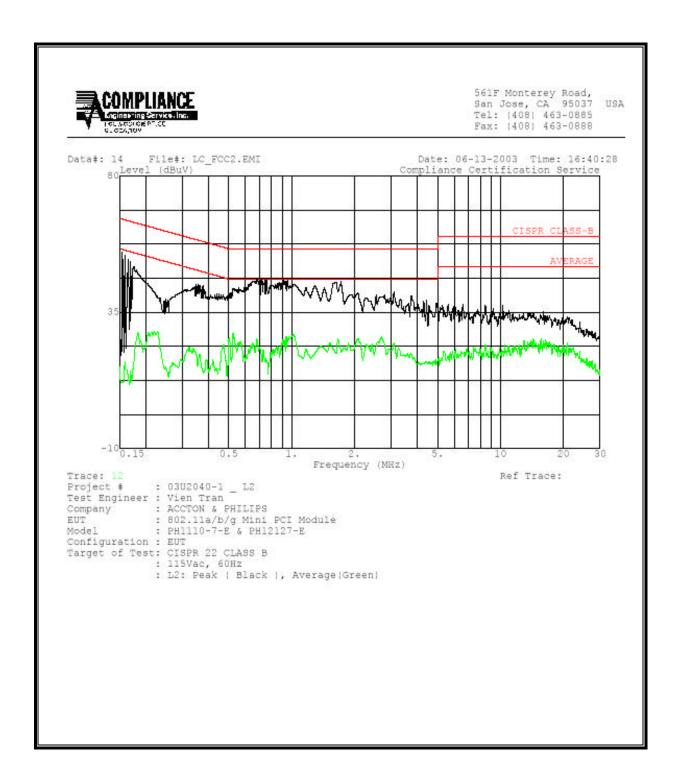
Freq. (MHz)	Reading			Closs	Limit	EN_B	Margin		Remark
	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	$\mathbf{QP}\left(\mathbf{dB}\right)$	AV (dB)	L1/L2
0.15	59.54		38.29	0.00	66.00	56.00	-6.46	-17.71	L1
0.29	48.80		24.11	0.00	62.00	52.00	-13.20	-27.89	L1
0.56	46.50		33.55	0.00	56.00	46.00	-9.50	-12.45	L1
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

## **LINE 1 (LINE) RESULTS**



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## **LINE 2 (NEUTRAL) RESULTS**



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# 8. SETUP PHOTOS

## ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



## **RADIATED RF MEASUREMENT SETUP**

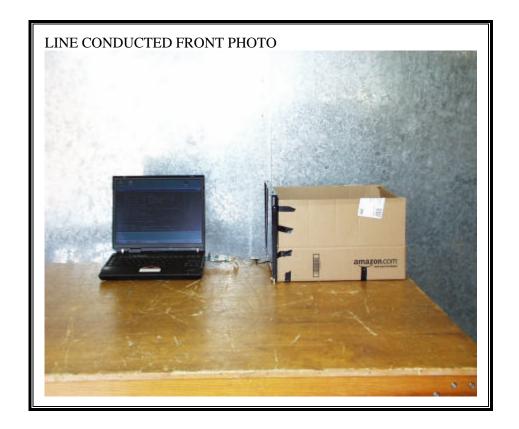


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## POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP



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**END OF REPORT**