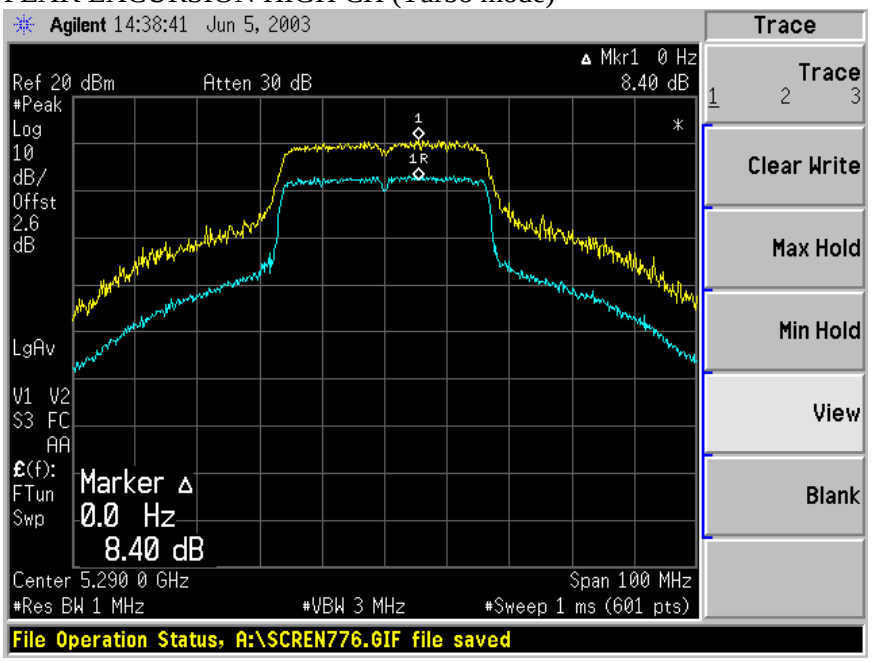
PEAK EXCURSION HIGH CH (Turbo mode)



7.6. 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.

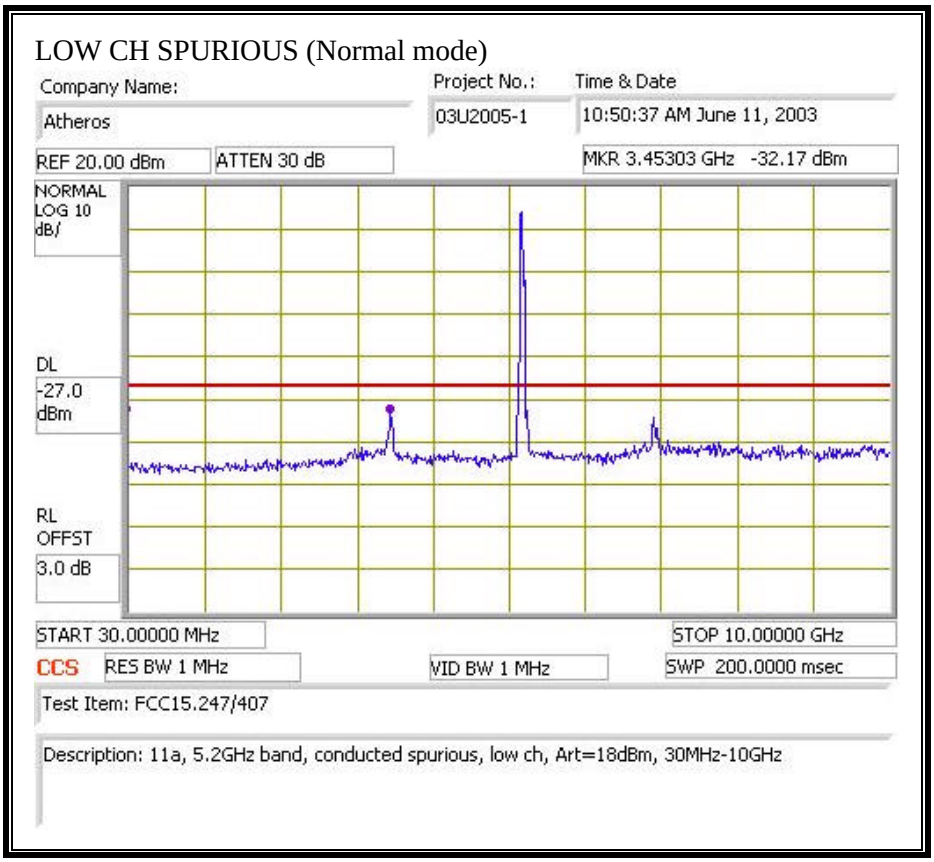
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements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

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

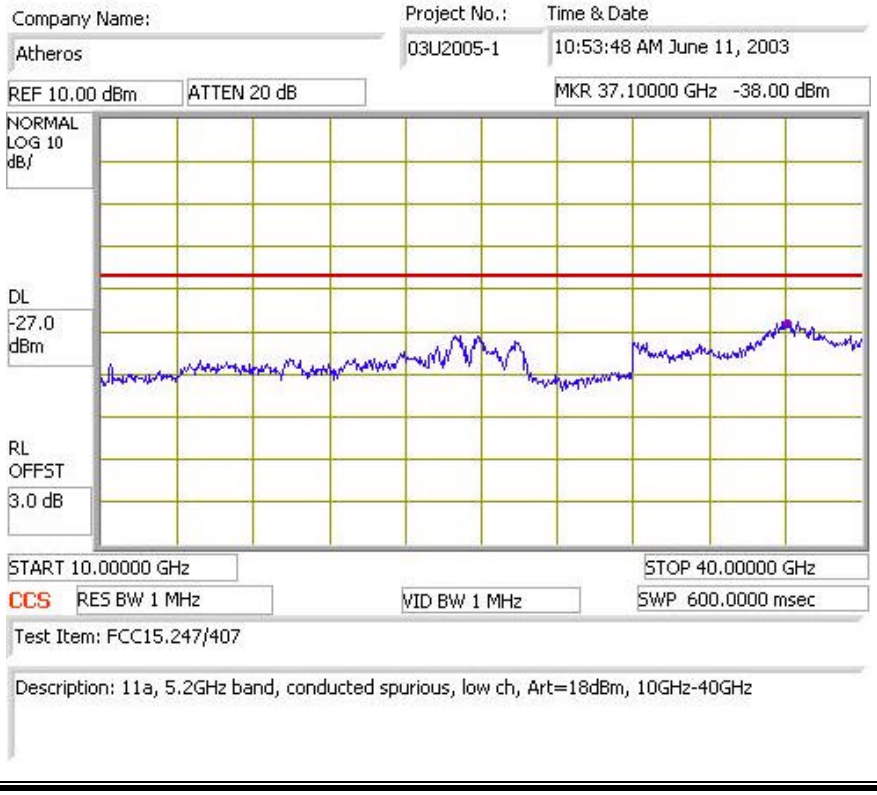
RESULTS

No non-compliance noted:

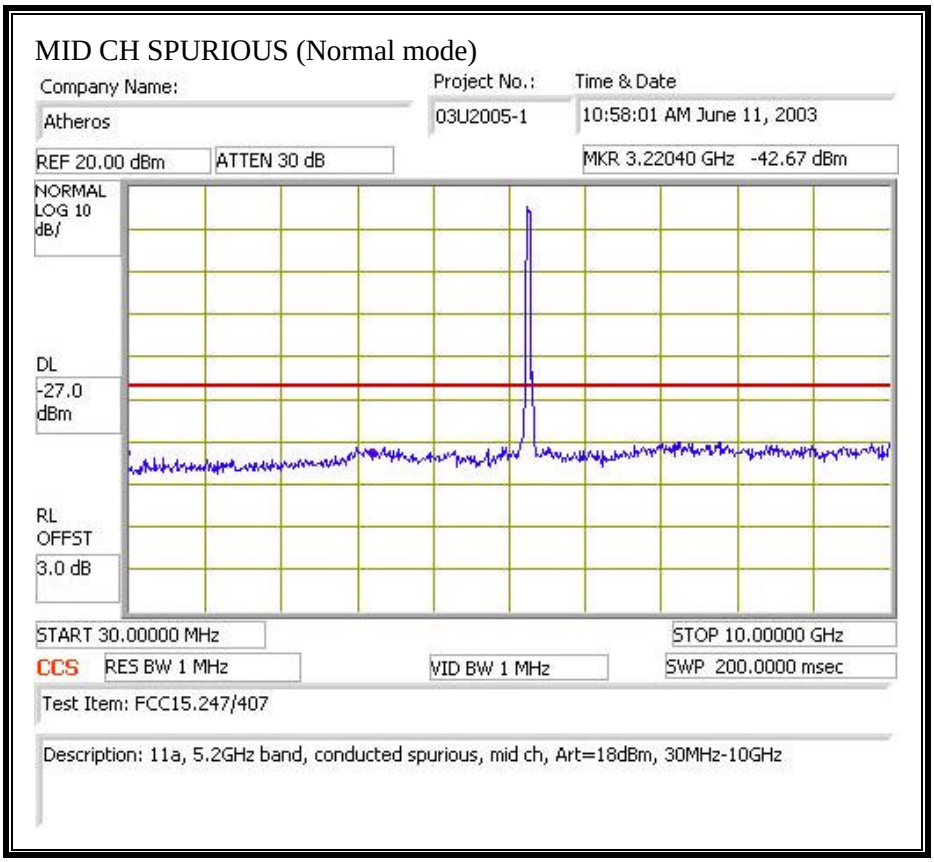
SPURIOUS EMISSIONS, LOW CHANNEL (NORMAL MODE)



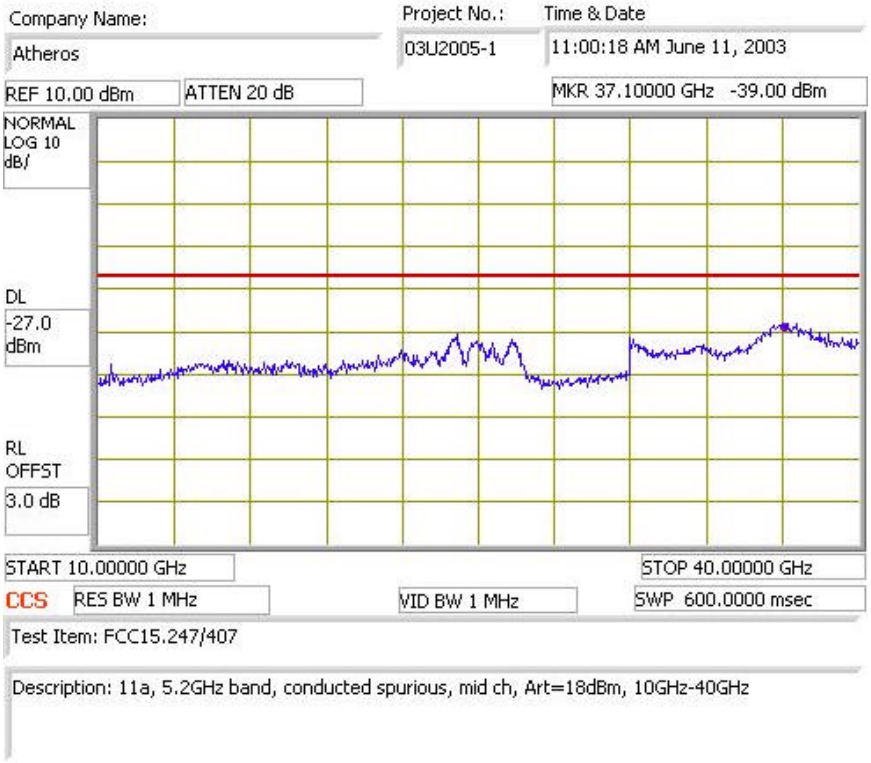
LOW CHANNEL SPURIOUS (Normal mode)



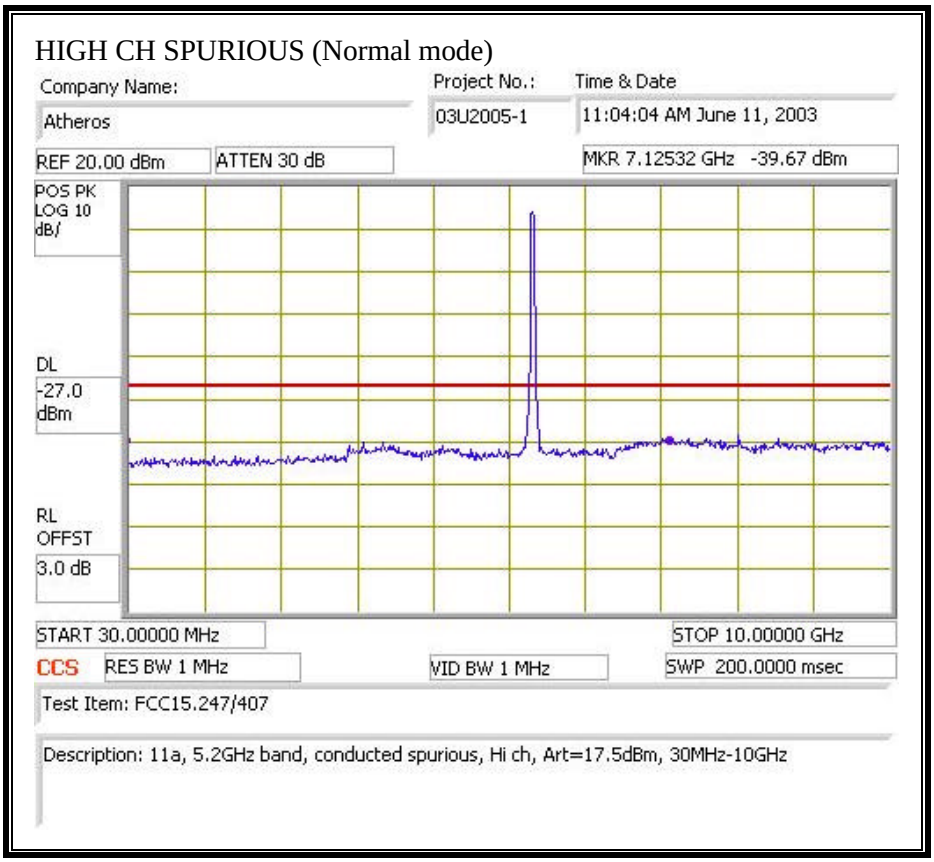
SPURIOUS EMISSIONS, MID CHANNEL (NORMAL MODE)



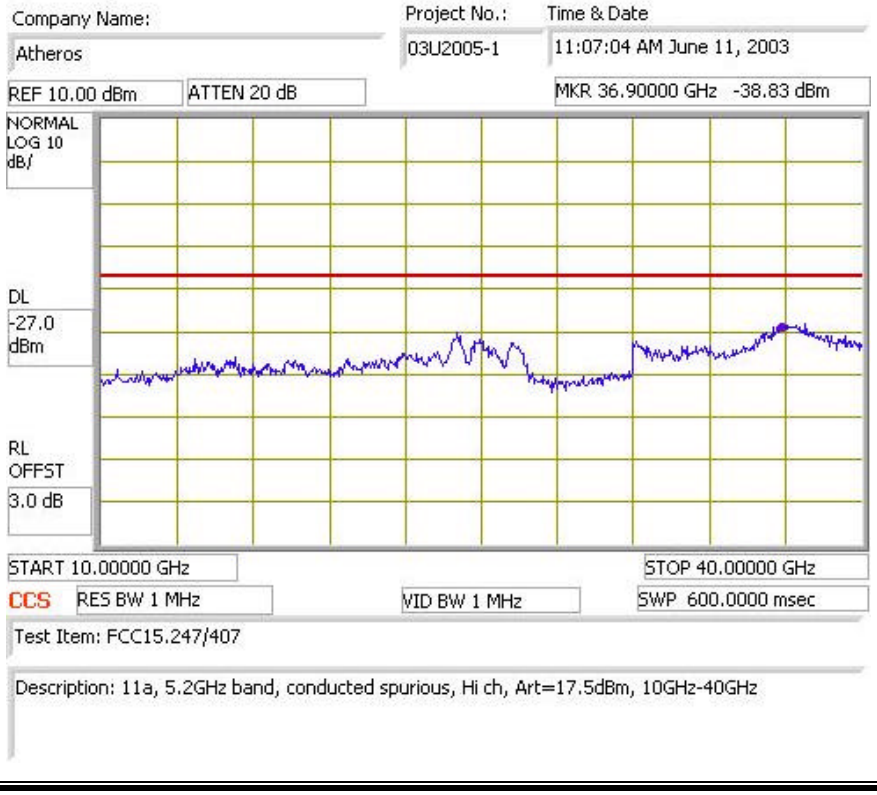
MID CHANNEL SPURIOUS (Normal mode)



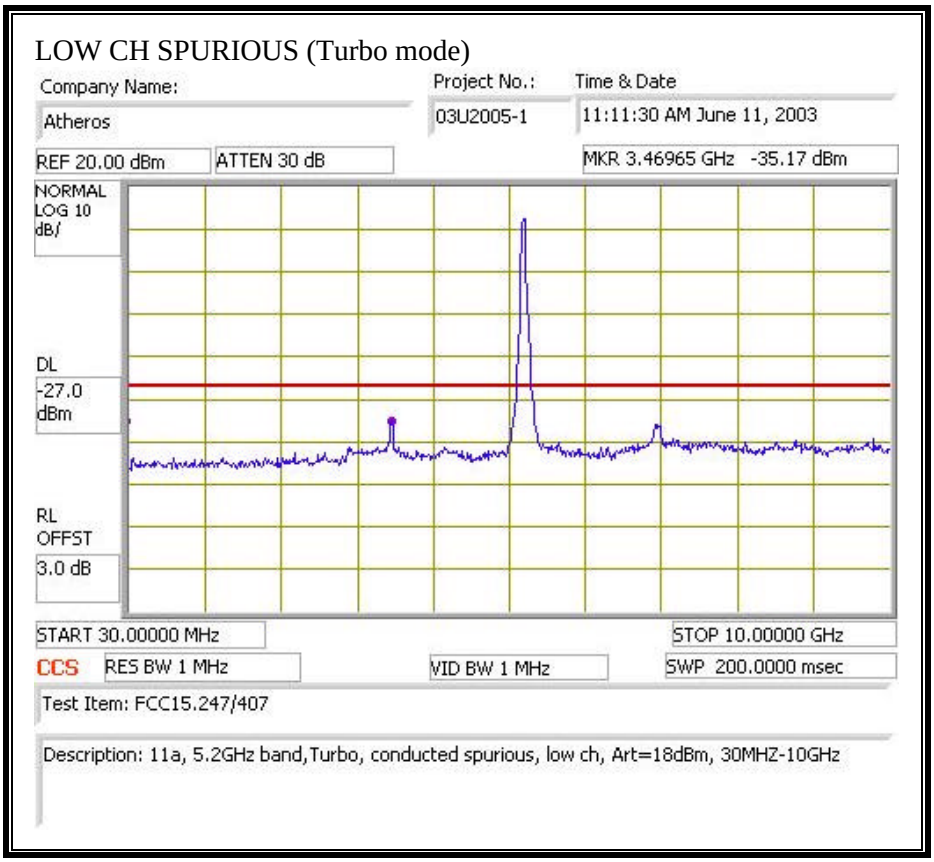
SPURIOUS EMISSIONS, HIGH CHANNEL (NORMAL MODE)



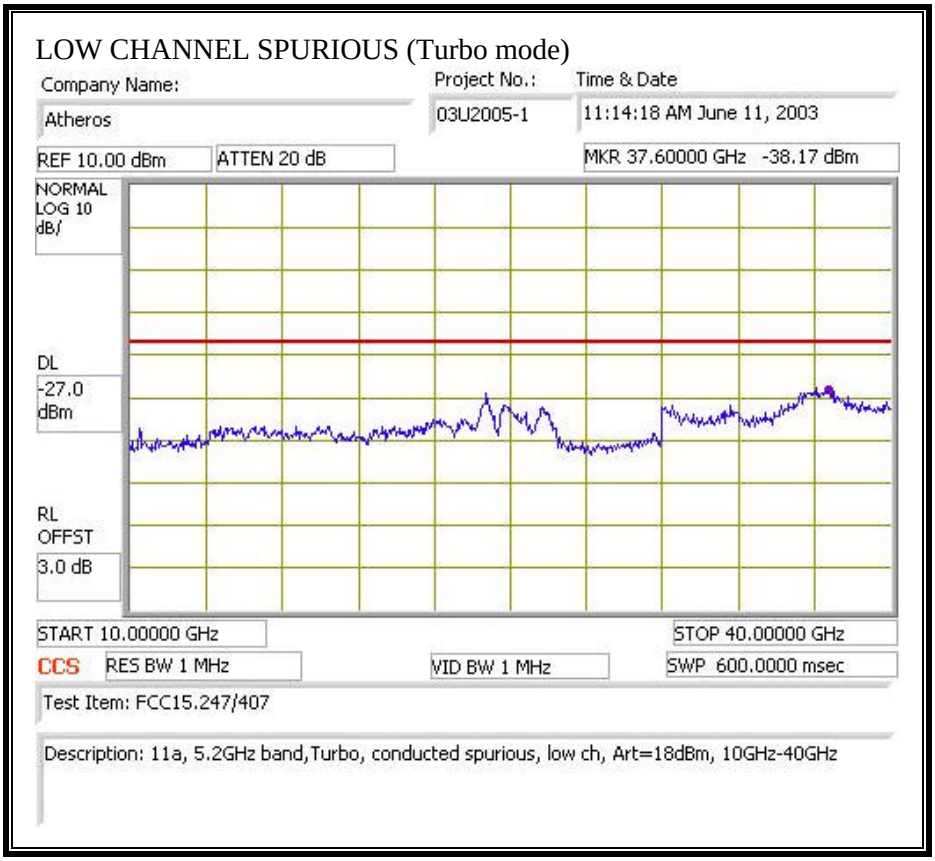
HIGH CHANNEL SPURIOUS (Normal mode)



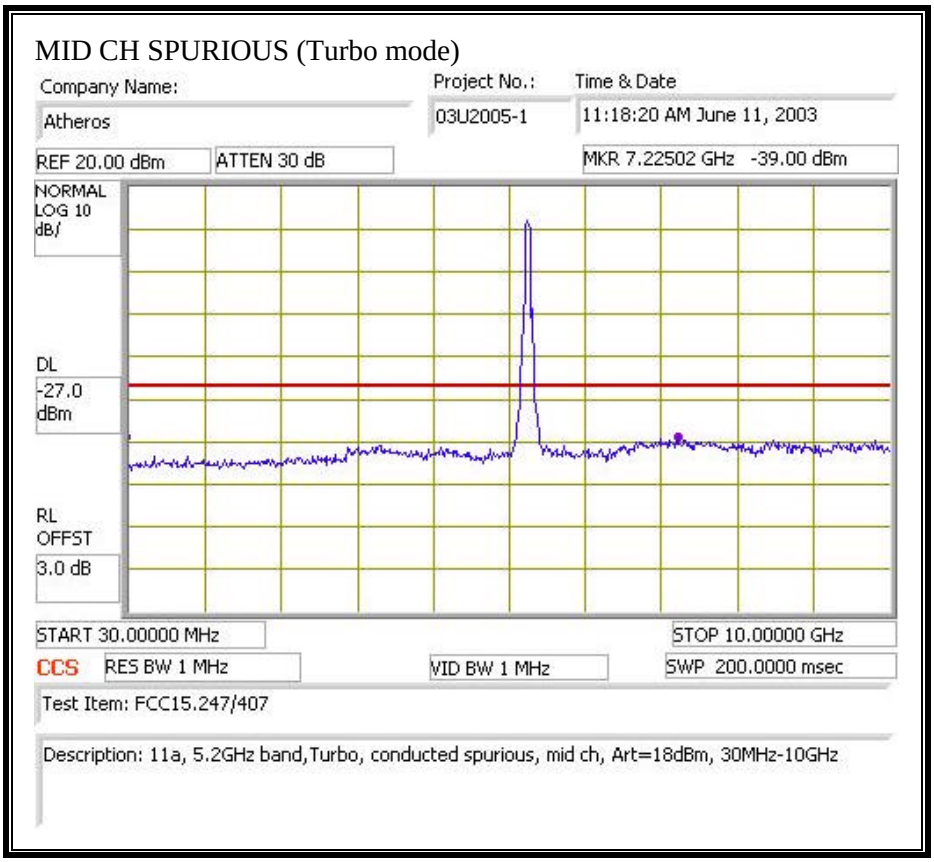
SPURIOUS EMISSIONS, LOW CHANNEL (TURBO MODE)



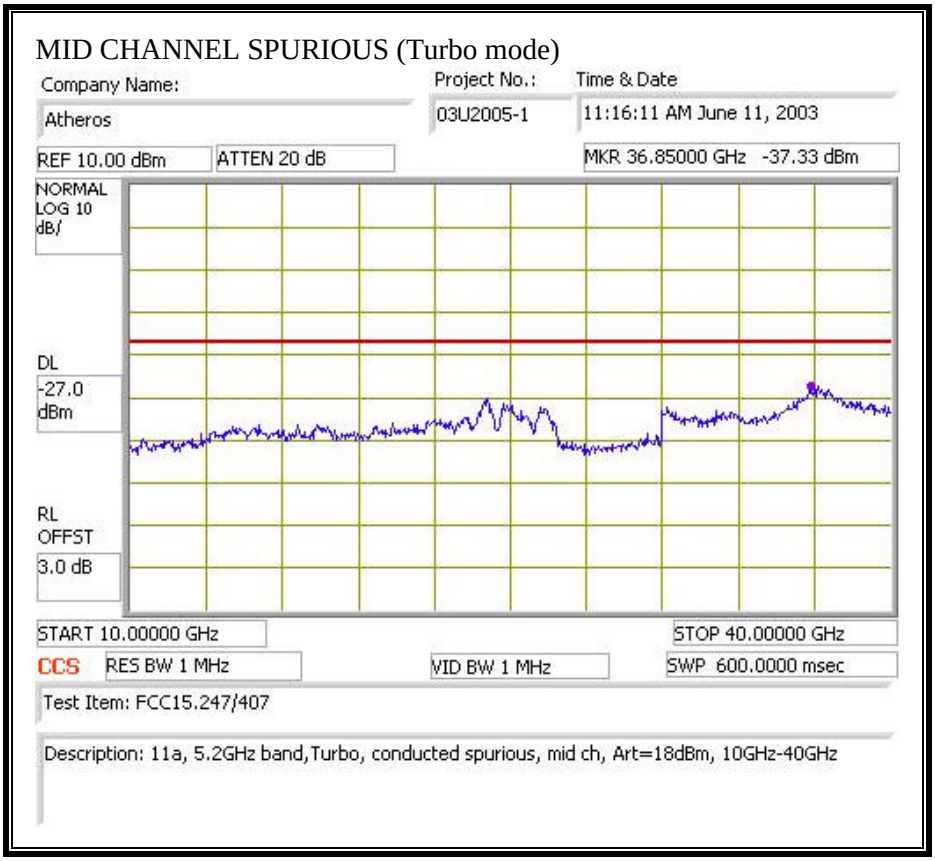
LOW CHANNEL SPURIOUS (Turbo mode)



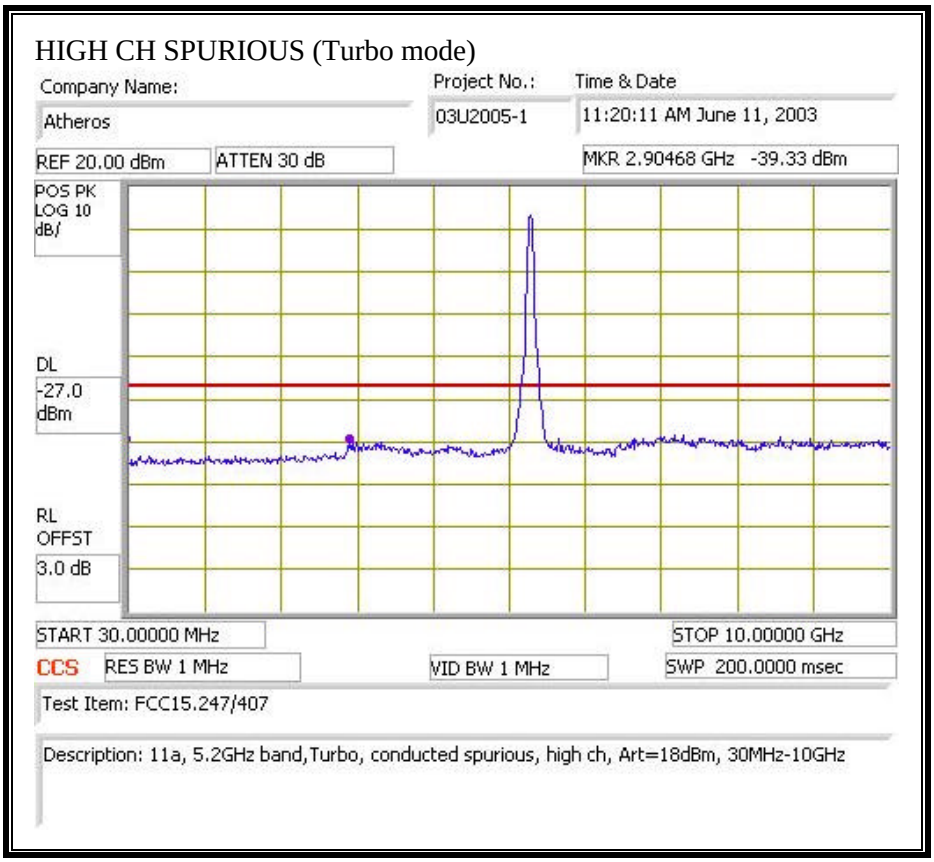
SPURIOUS EMISSIONS, MID CHANNEL (TURBO MODE)



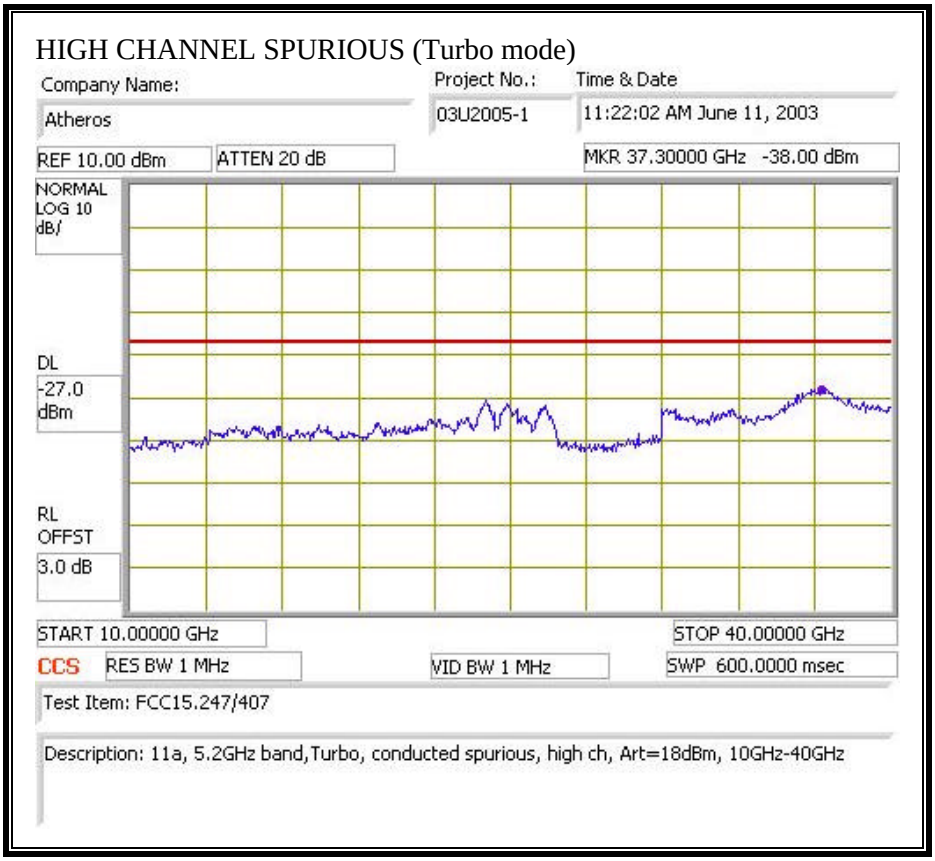
MID CHANNEL SPURIOUS (Turbo mode)



SPURIOUS EMISSIONS, HIGH CHANNEL (TURBO MODE)



HIGH CHANNEL SPURIOUS (Turbo mode)



7.7. 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.

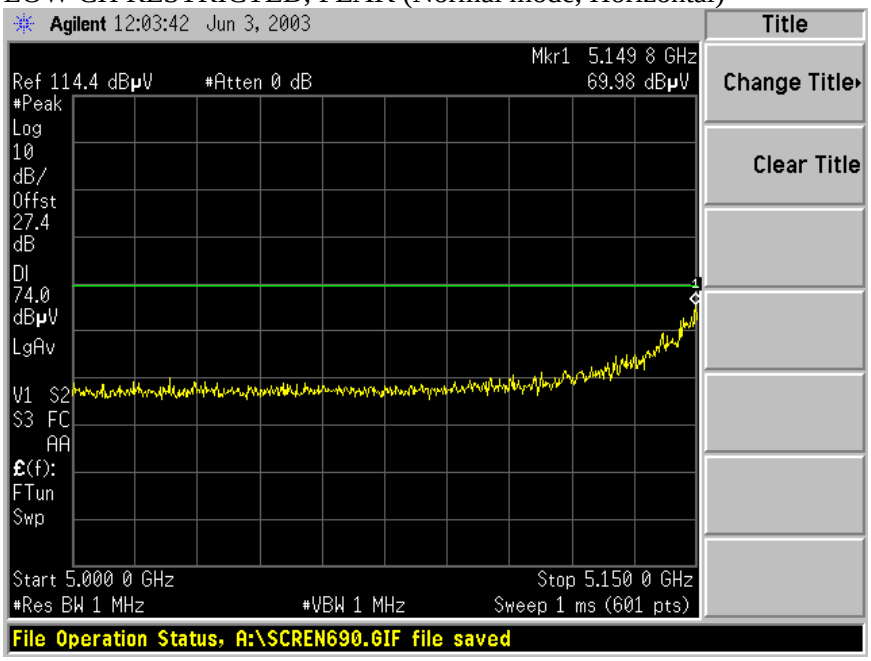
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

RESULTS

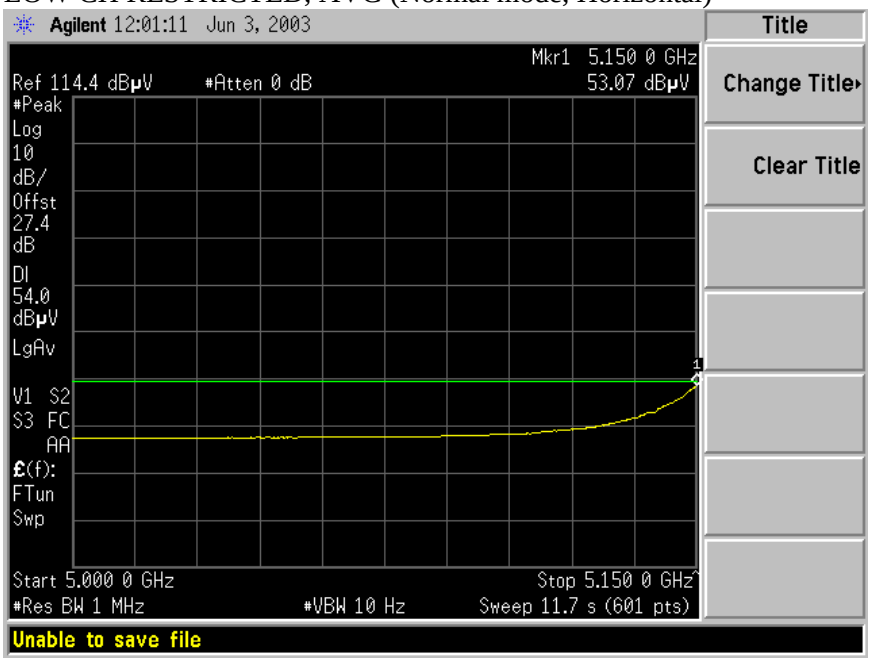
No non-compliance noted:

RESTRICTED BANDEDGE (NORMAL MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (Normal mode, Horizontal)

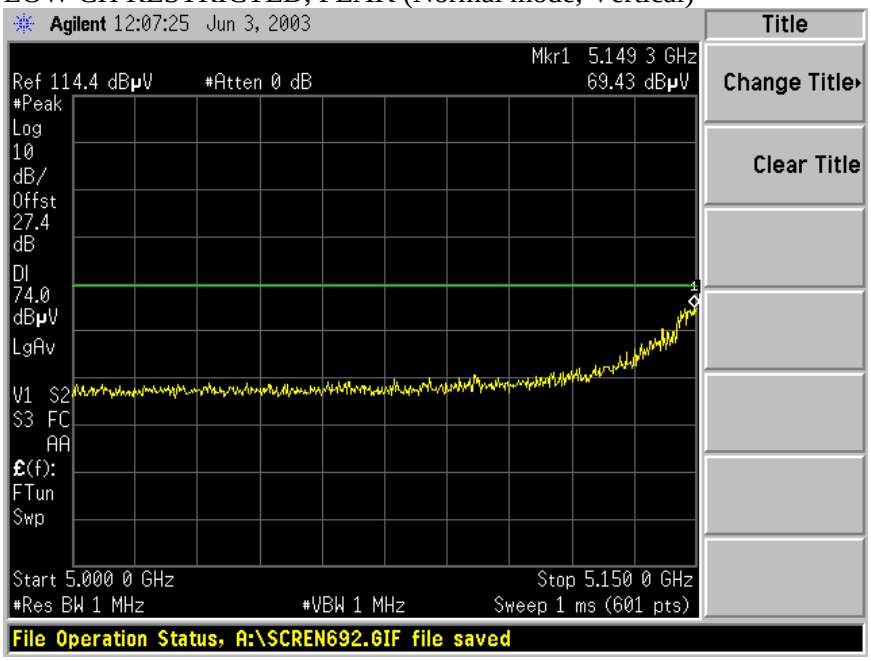


LOW CH RESTRICTED, AVG (Normal mode, Horizontal)

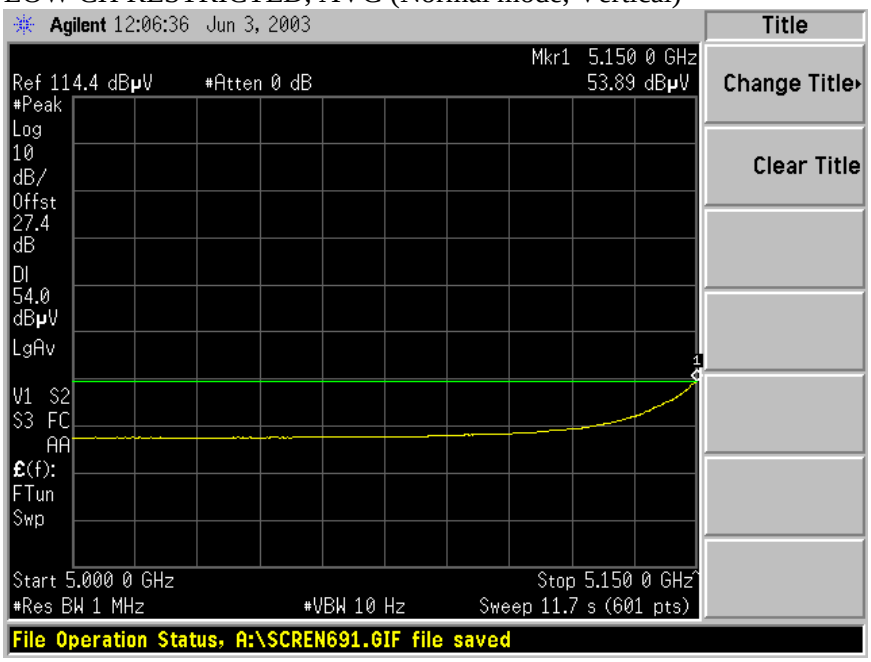


RESTRICTED BANDEDGE (NORMAL MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (Normal mode, Vertical)

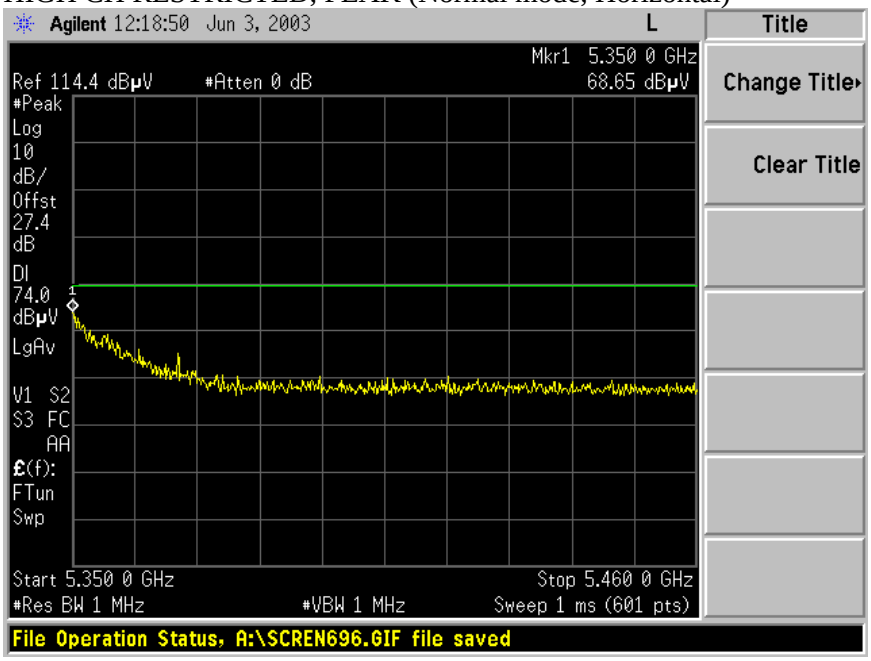


LOW CH RESTRICTED, AVG (Normal mode, Vertical)

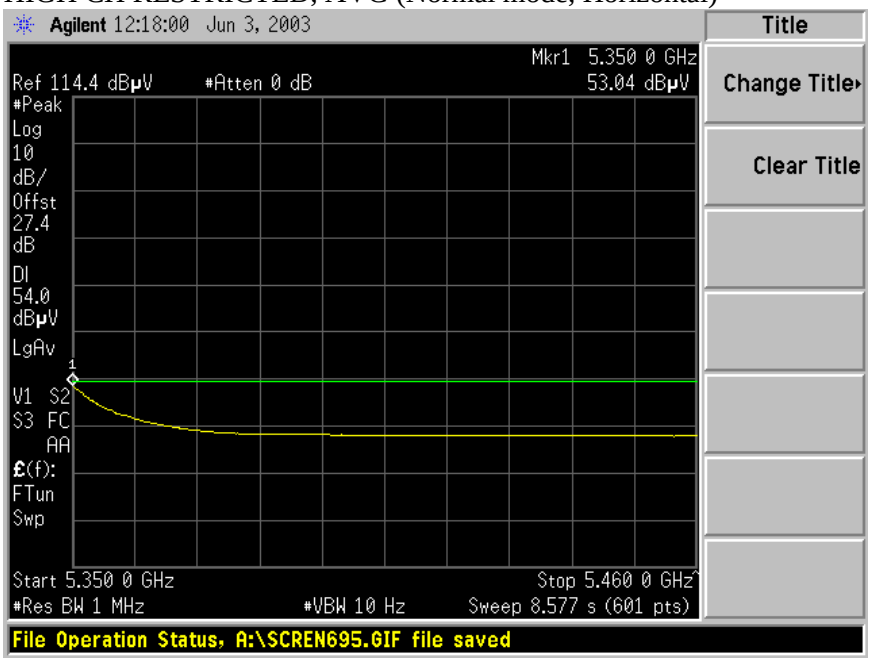


RESTRICTED BANDEDGE (NORMAL MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (Normal mode, Horizontal)

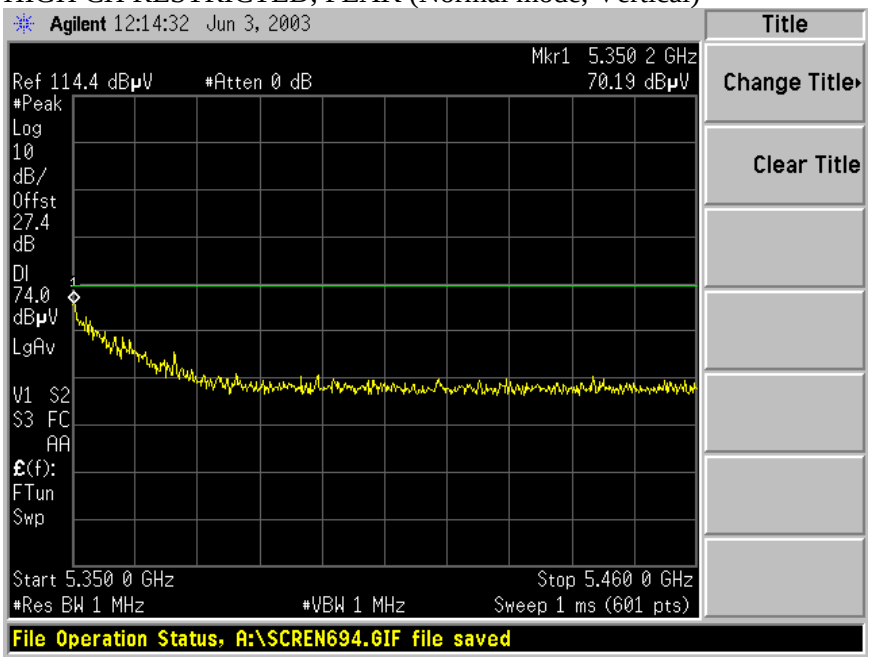


HIGH CH RESTRICTED, AVG (Normal mode, Horizontal)

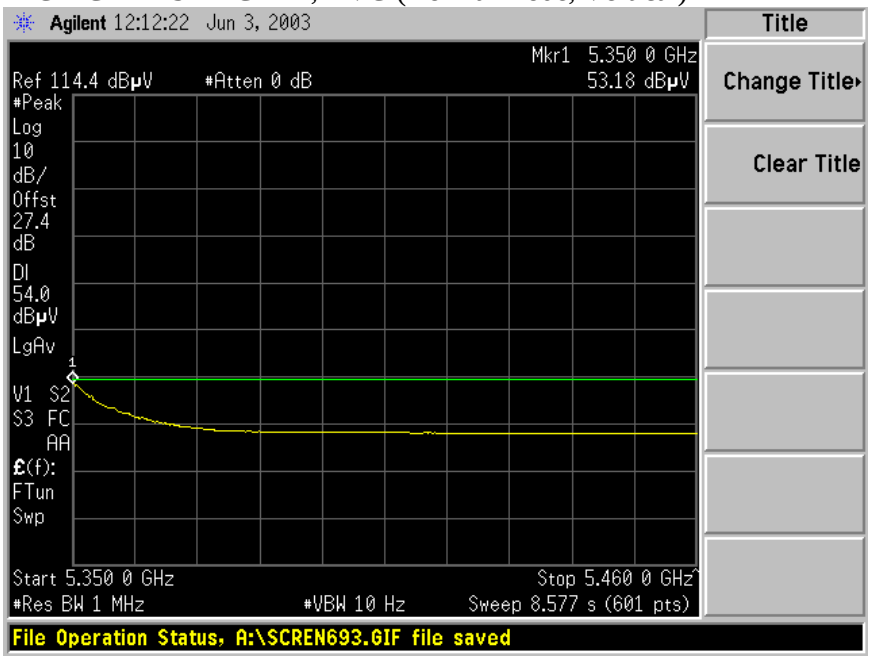


RESTRICTED BANDEDGE (NORMAL MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (Normal mode, Vertical)



HIGH CH RESTRICTED, AVG (Normal mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (NORMAL MODE)

06/06/03 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Thanh Nguyen
Project #: 03U2005
Company: Atheros Harmonics
EUT Descrip.: 802.11a, 20dBm
EUT M/N: TB74-105
Test Target: FCC 15.247, IC
Mode Oper: Transmitting Turbo mode, ATR= 18

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifer 1-26GHz	Spectrum Analyzer	Horn > 18GHz
T59; S/N: 3245 @3m	T63 Miteq 646456	Agilent E4446A Analyzer	T87-T88 ARA 18-40GHz & Mixer > 40GHz

Hi Frequency Cables
☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

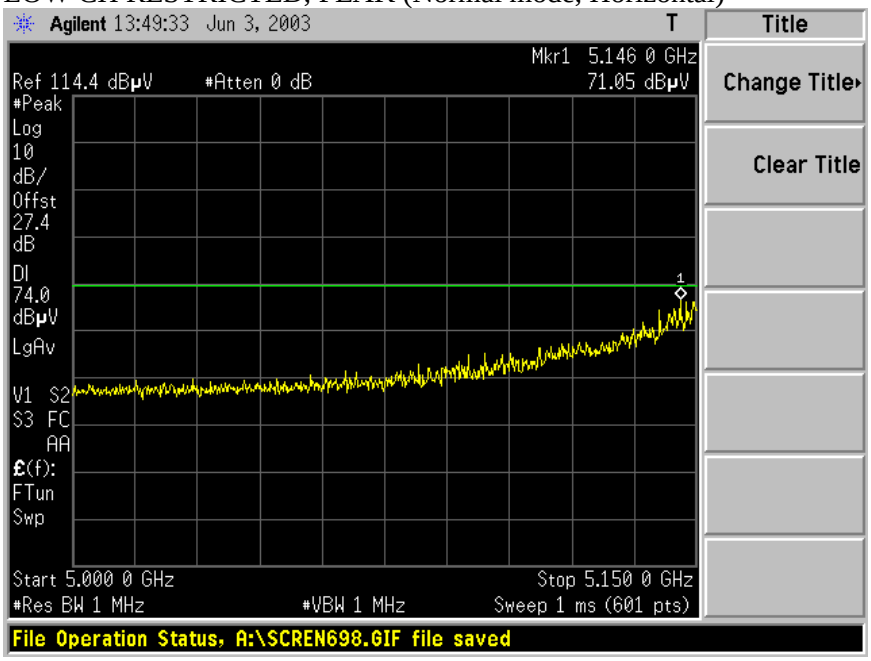
Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

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 Normal 5.180GHz															
Harmonics															
10.360	9.8	44.1	33.6	37.8	5.1	-33.4	0.0	1.0	54.6	44.0	88.2	68.2	-33.6	-24.2	V
15.540	9.8	47.8	38.6	39.5	6.5	-40.0	0.0	1.0	54.7	45.5	74.0	54.0	-19.3	-8.5	V
10.360	9.8	46.1	35.8	37.8	5.1	-33.4	0.0	1.0	56.6	46.2	88.2	68.2	-31.6	-22.0	H
15.540	9.8	46.6	39.4	39.5	6.5	-40.0	0.0	1.0	53.6	46.4	74.0	54.0	-20.4	-7.6	H
MID Normal 5.260GHz															
Harmonics															
10.520	9.8	43.3	34.5	37.9	5.2	-33.5	0.0	1.0	53.9	45.1	88.2	68.2	-34.3	-23.1	V
15.780	9.8	47.6	37.0	39.0	6.6	-40.0	0.0	1.0	54.1	43.5	74.0	54.0	-19.9	-10.5	V
10.520	9.8	47.0	38.2	37.9	5.2	-33.5	0.0	1.0	57.6	48.8	88.2	68.2	-30.6	-19.4	H
15.780	9.8	45.4	36.7	39.0	6.6	-40.0	0.0	1.0	51.9	43.2	74.0	54.0	-22.1	-10.8	H
HIGH Normal 5.320GHz															
Harmonics															
10.640	9.8	44.0	34.7	38.0	5.2	-33.5	0.0	1.0	54.6	45.4	74.0	54.0	-19.4	-8.6	V
15.960	9.8	46.5	36.2	38.6	6.6	-40.0	0.0	1.0	52.6	42.4	74.0	54.0	-21.4	-11.6	V
10.640	9.8	46.9	37.9	38.0	5.2	-33.5	0.0	1.0	57.5	48.6	74.0	54.0	-16.5	-5.4	H

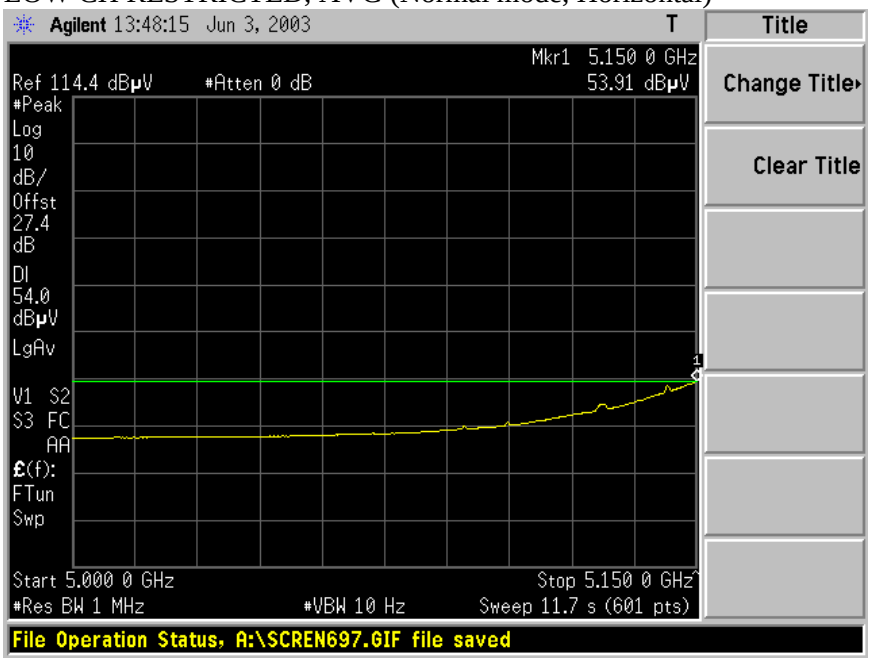
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

RESTRICTED BANDEDGE (TURBO MODE, LOW CHANNEL, HORIZONTAL)

LOW CH RESTRICTED, PEAK (Normal mode, Horizontal)

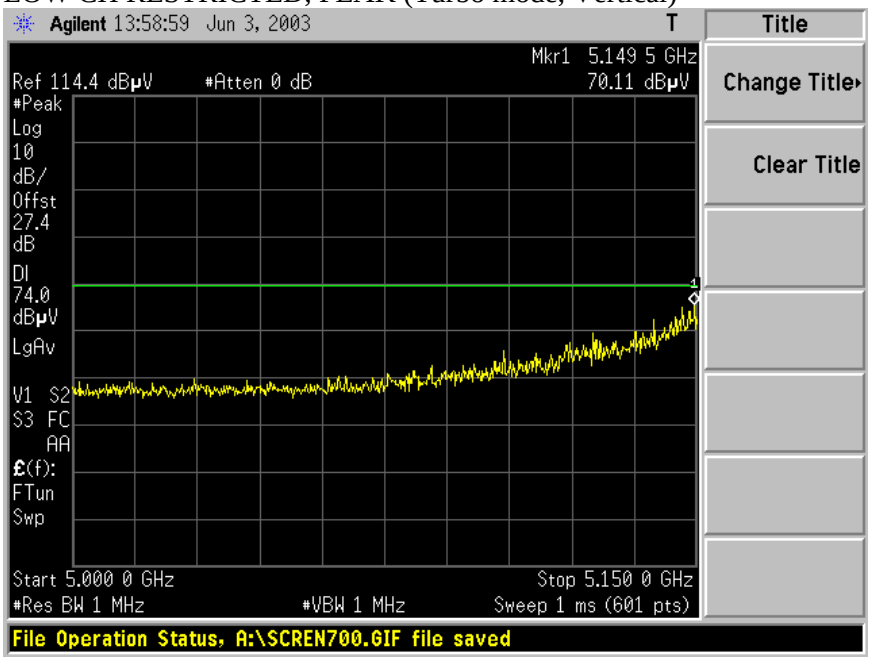


LOW CH RESTRICTED, AVG (Normal mode, Horizontal)

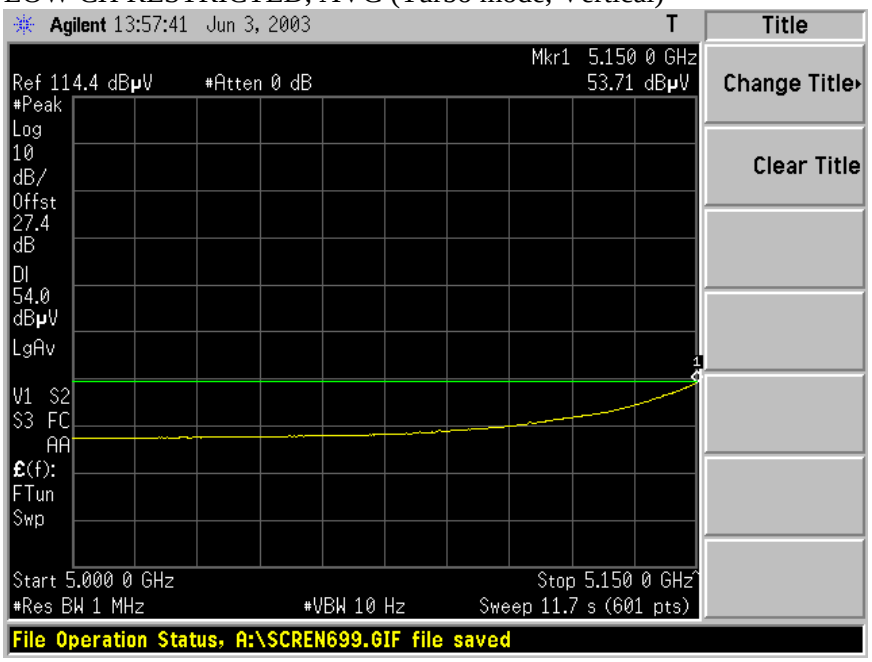


RESTRICTED BANDEDGE (TURBO MODE, LOW CHANNEL, VERTICAL)

LOW CH RESTRICTED, PEAK (Turbo mode, Vertical)

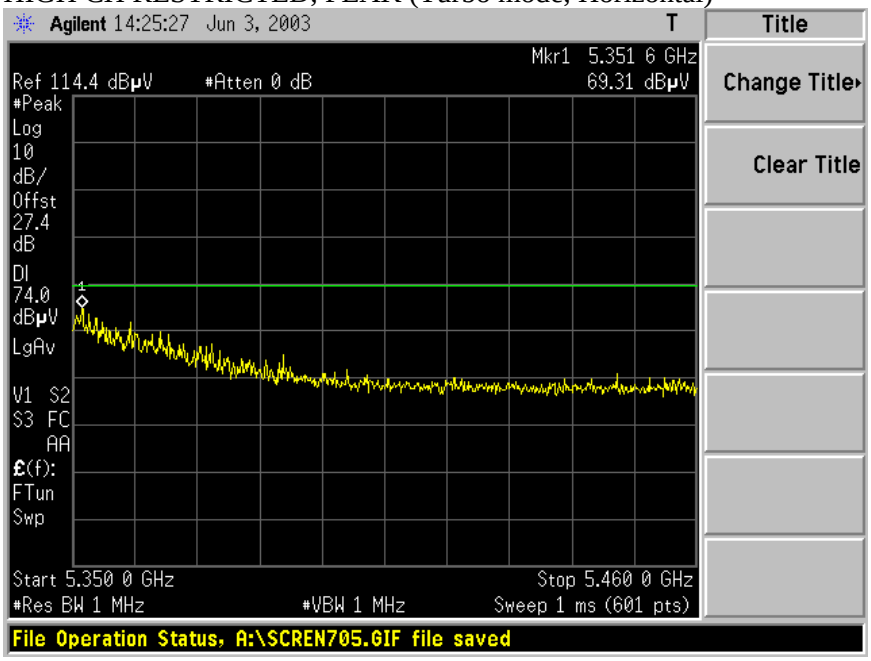


LOW CH RESTRICTED, AVG (Turbo mode, Vertical)

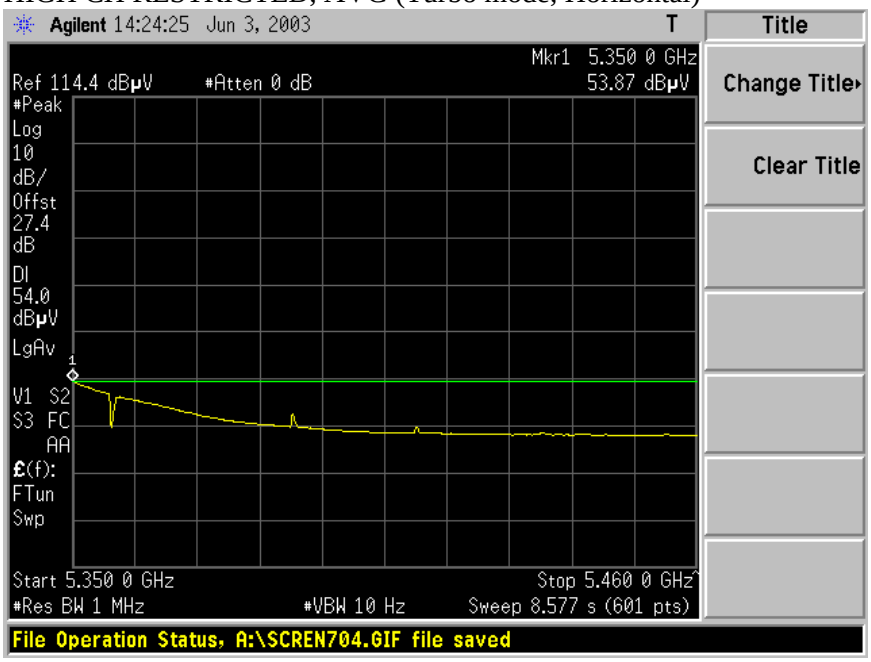


RESTRICTED BANDEDGE (TURBO MODE, HIGH CHANNEL, HORIZONTAL)

HIGH CH RESTRICTED, PEAK (Turbo mode, Horizontal)

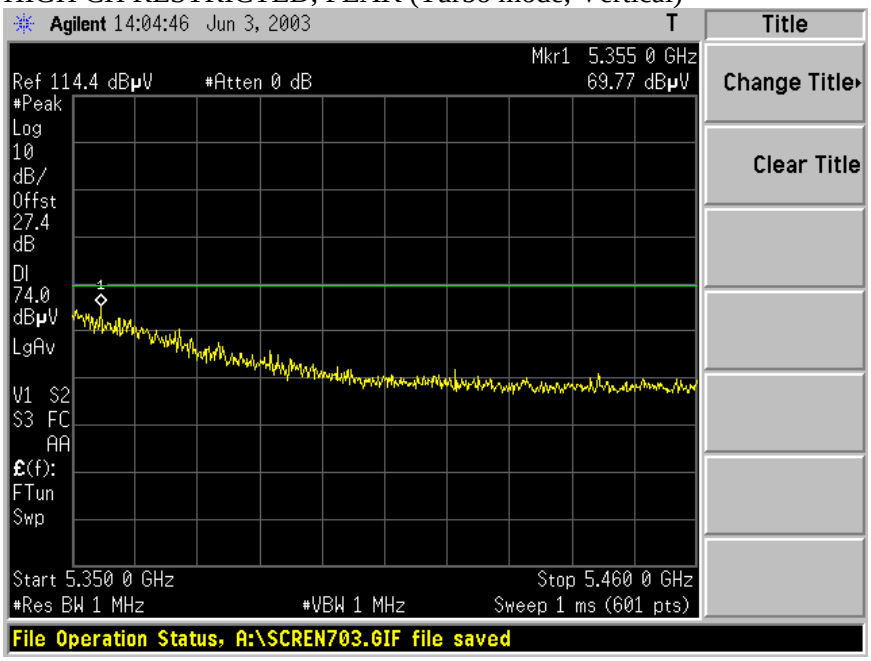


HIGH CH RESTRICTED, AVG (Turbo mode, Horizontal)

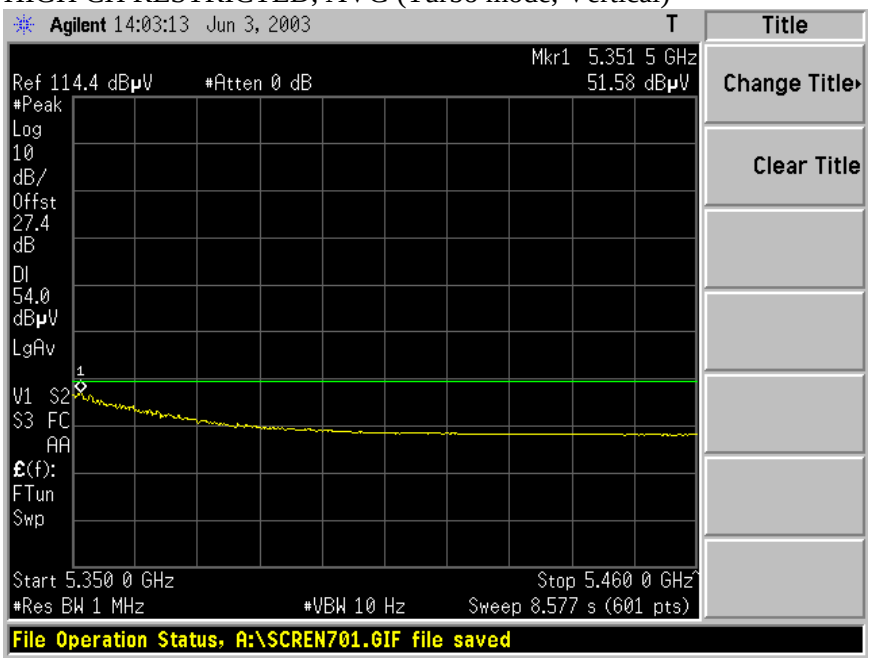


RESTRICTED BANDEDGE (TURBO MODE, HIGH CHANNEL, VERTICAL)

HIGH CH RESTRICTED, PEAK (Turbo mode, Vertical)



HIGH CH RESTRICTED, AVG (Turbo mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (TURBO MODE)

06/06/03 **High Frequency Measurement**
Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Thanh Nguyen
Project #: 03U2005
Company: Atheros Harmonics
EUT Descrip.: 802.11a, 20dBm
EUT M/N: TB74-105
Test Target: FCC 15.247, IC
Mode Oper: Transmitting Turbo mode, ATR= 18

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifer 1-26GHz	Spectrum Analyzer	Horn > 18GHz
T59; S/N: 3245 @3m	T63 Miteq 646456	Agilent E4446A Analyzer	T87-T88 ARA 18-40GHz & Mixer > 40GHz

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

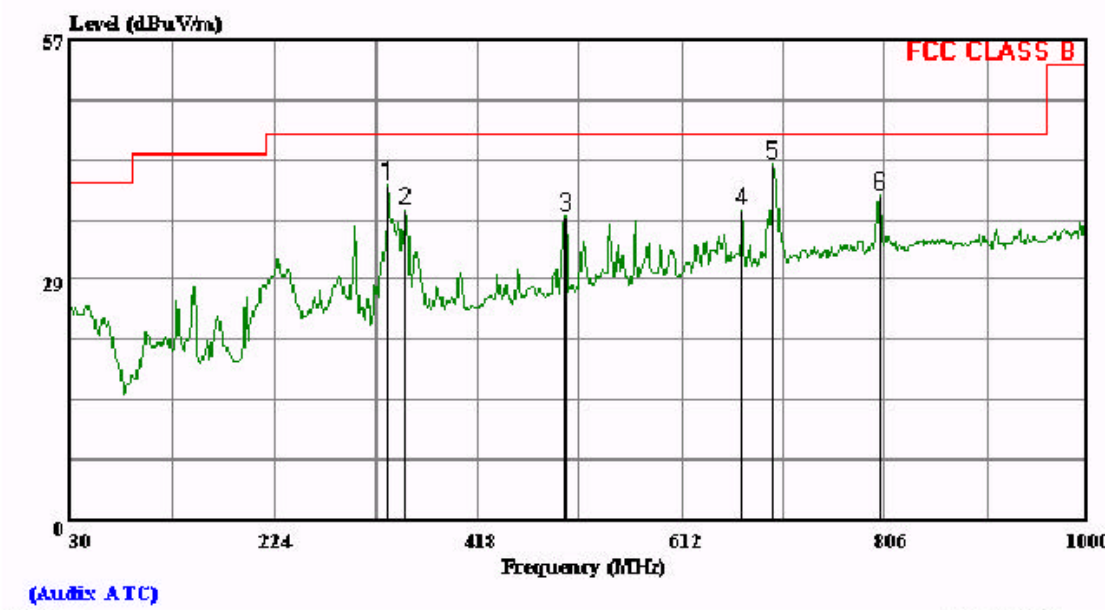
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
LOW Turbo 5.2GHz															
Harmonics															
10.400	9.8	50.9	39.4	37.9	5.1	-33.4	0.0	1.0	61.4	49.9	88.2	68.2	-26.8	-18.3	V
15.600	9.8	54.9	41.3	39.4	6.5	-40.0	0.0	1.0	61.8	48.2	74.0	54.0	-12.2	-5.8	V
10.400	9.8	50.3	37.9	37.9	5.1	-33.4	0.0	1.0	60.8	48.4	88.2	68.2	-27.4	-19.8	H
15.600	9.8	54.5	41.1	39.4	6.5	-40.0	0.0	1.0	61.4	47.9	74.0	54.0	-12.6	-6.1	H
MID Turbo 5250GHz															
Harmonics															
10.500	9.8	43.3	33.1	37.9	5.1	-33.5	0.0	1.0	53.9	43.7	88.2	68.2	-34.3	-24.5	V
15.750	9.8	37.2	41.3	39.1	6.6	-40.0	0.0	1.0	43.7	47.9	74.0	54.0	-30.3	-6.1	V
10.500	9.8	42.9	34.1	37.9	5.1	-33.5	0.0	1.0	53.5	44.7	88.2	68.2	-34.7	-23.5	H
15.750	9.8	45.1	36.9	39.1	6.6	-40.0	0.0	1.0	51.6	43.5	74.0	54.0	-22.4	-10.5	H
HIGH Turbo 5.290GHz															
Harmonics															
10.580	9.8	42.5	34.0	38.0	5.2	-33.5	0.0	1.0	53.2	44.6	88.2	68.2	-35.0	-23.6	V
15.870	9.8	44.8	36.3	38.8	6.6	-40.0	0.0	1.0	51.1	42.6	74.0	54.0	-22.9	-11.4	V
10.580	9.8	44.1	34.9	38.0	5.2	-33.5	0.0	1.0	54.7	45.5	88.2	68.2	-33.5	-22.7	H
15.870	9.8	44.8	36.4	38.8	6.6	-40.0	0.0	1.0	51.1	42.7	74.0	54.0	-22.9	-11.3	H
No more spurious Emissions was detected up to 40GHz.															

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		

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

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

Data#: 4 File#: SpurLow.EMI Date: 06-03-2003 Time: 22:44:0



Trace: 3 Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 VERTICAL
Company : ATHEROS COMMUNICATIONS, INC.
EUT Description : 802.11a/b/g Cardbus
Model Number : CB32
Test Configurtion: EUT plugin the Laptop
Test Target : FCC CLASS-B
Mode of Operation: Tx Worst case
Project No : 03U2005-1
: 30MHz-1GHz Vertical Antenna

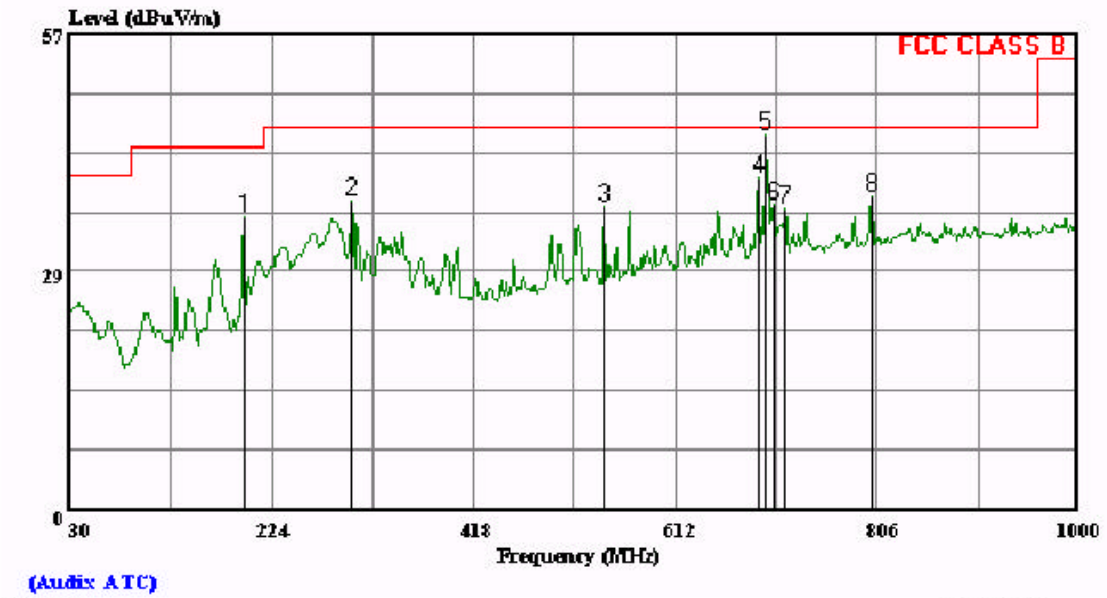
Page: 1

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	332.640	24.94	12.91	1.87	0.00	39.72	46.00	-6.28	Peak
2	349.130	21.67	13.31	1.87	0.00	36.85	46.00	-9.15	Peak
3	502.390	17.14	16.57	2.31	0.00	36.02	46.00	-9.98	Peak
4	669.230	15.65	18.30	2.71	0.00	36.66	46.00	-9.34	Peak
5	698.330	20.89	18.54	2.78	0.00	42.21	46.00	-3.79	Peak
6	800.180	15.78	19.80	3.01	0.00	38.59	46.00	-7.41	Peak

COMPLIANCE Engineering Service, Inc.
FCC,VCCI,CISPR,CE
UL,CSA,TUV

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

Data#: 2 File#: SpurLow.EMI Date: 06-03-2003 Time: 22:36:38



Trace: 1 Ref Trace:

Condition: FCC CLASS B 3m CHAMBER 030306 1185 HORIZONTAL
Company : ATHEROS COMMUNICATIONS, INC.
EUT Description : 802.11a/b/g Cardbus
Model Number : CB32
Test Configurtion: EUT plugin the Laptop
Test Target : FCC CLASS-B
Mode of Operation: Tx Worst case
Project No : 03U2005-1
: 30MHz-1GHz Horizontal Antenna

Page: 1

	Freq	Read Level	Probe Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dB	dBuV/m	dBuV/m	dB	
1	196.840	24.48	9.11	1.36	0.00	34.95	43.50	-8.55	Peak
2	300.630	23.31	12.06	1.71	0.00	37.08	46.00	-8.92	Peak
3	543.130	16.74	17.06	2.39	0.00	36.19	46.00	-9.81	Peak
4	691.540	18.42	18.48	2.80	0.00	39.70	46.00	-6.30	Peak
5	698.330	23.47	18.54	2.78	0.00	44.79	46.00	-1.21	Peak
6	706.090	15.12	18.64	2.75	0.00	36.51	46.00	-9.49	Peak
7	717.730	14.45	18.79	2.80	0.00	36.04	46.00	-9.96	Peak
8	800.180	14.67	19.80	3.01	0.00	37.48	46.00	-8.52	Peak

7.8. 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.

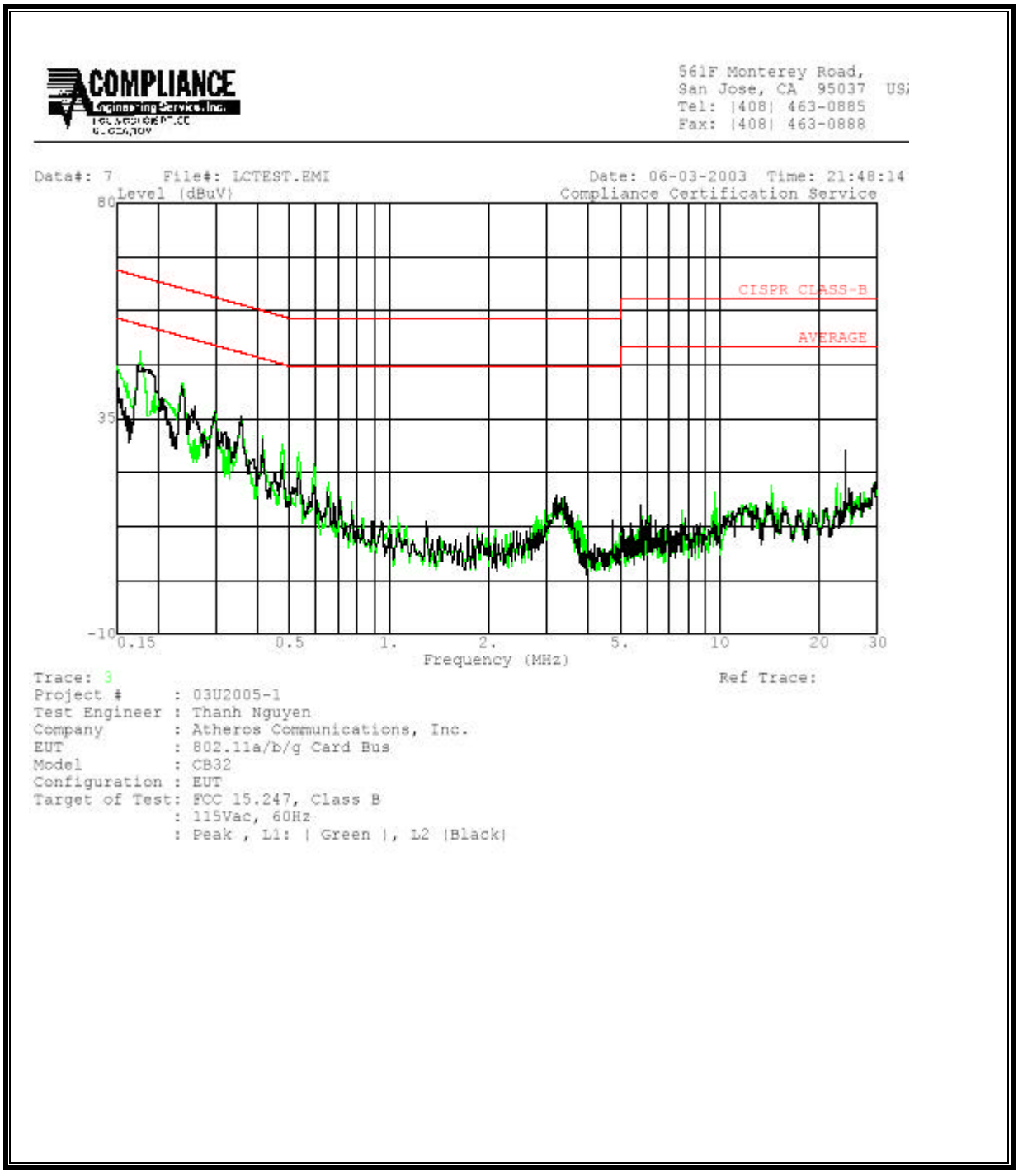
RESULTS

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
0.18	48.86	--	--	0.00	65.23	55.23	-16.37	-6.37	L1
24.01	27.68	--	--	0.00	60.00	50.00	-32.32	-22.32	L1
3.35	18.22	--	--	0.00	56.00	46.00	-37.78	-27.78	L1
0.17	46.12	--	--	0.00	65.31	55.31	-19.19	-9.19	L2
24.01	28.42	--	--	0.00	60.00	50.00	-31.58	-21.58	L2
3.19	19.14	--	--	0.00	56.00	46.00	-36.86	-26.86	L2
6 Worst Data									

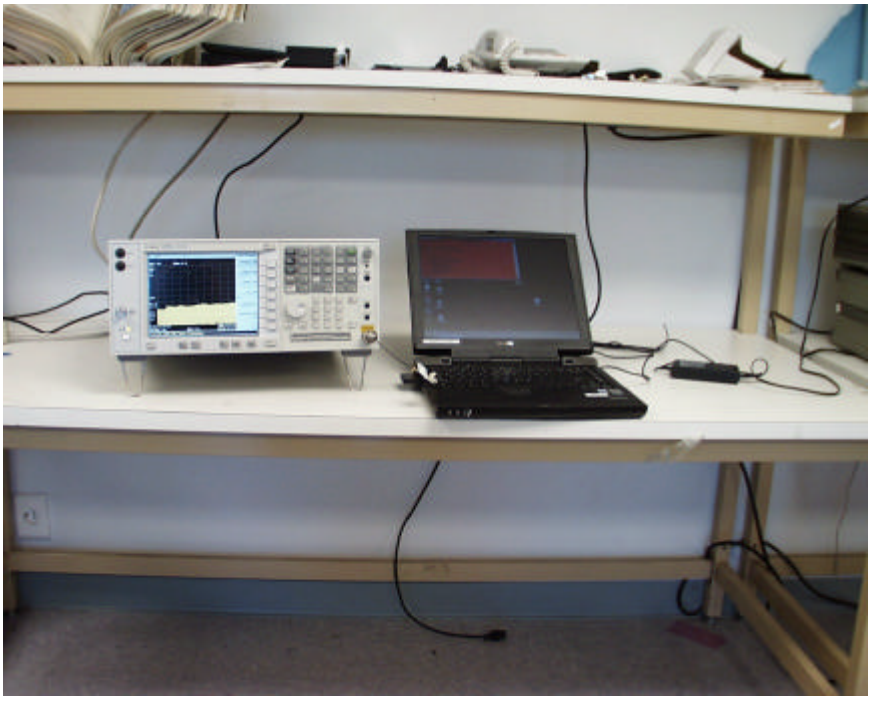
LINE 1 AND LINE 2 RESULTS



8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



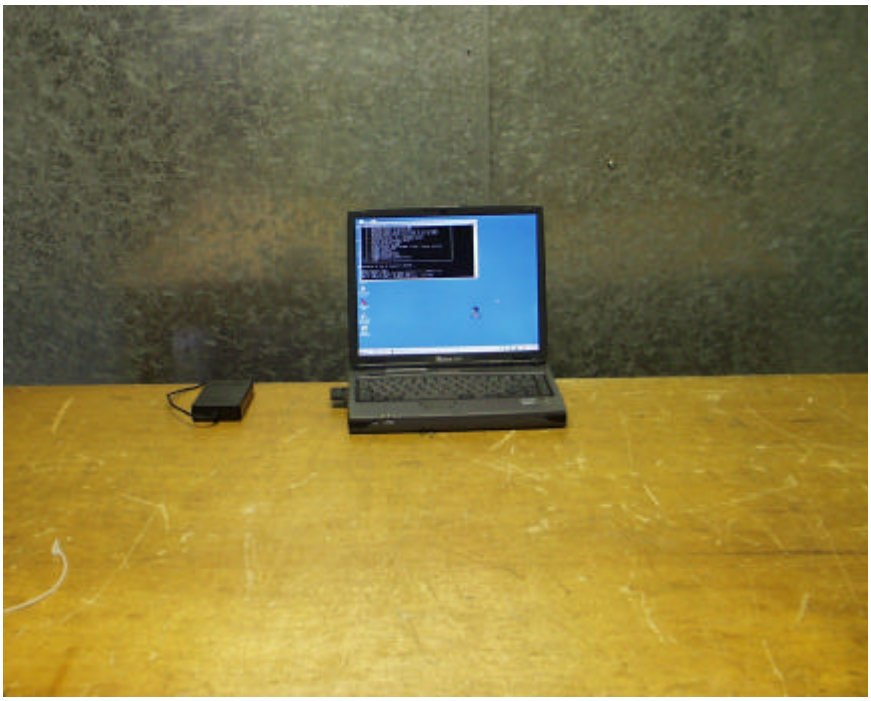
RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO



LINE CONDUCTED BACK PHOTO

END OF REPORT