



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

**FOR**

**802.11ag /DRAFT 802.11n WIRELESS LAN PCI-E MINI CARD**

**MODEL NUMBER: BCM94321MC**

**FCC ID: QDS-BRCM1022**

**REPORT NUMBER: 07U11122-2, REVISION B**

**ISSUE DATE: JULY 19, 2007**

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Revision History

Rev.	Issue Date	Revisions	Revised By
--	07/07/07	Initial Issue	T. Chan
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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** BROADCOM CORPORATION  
190 MATHILDA PLACE  
SUNNYVALE, CA 94086, USA

**EUT DESCRIPTION:** 802.11ag /DRAFT 802.11n WIRELESS LAN PCI-E MINI CARD

**MODEL:** BCM94321MC

**SERIAL NUMBER:** 107 & 316

**DATE TESTED:** JUNE 19 – JULY 02, 2007

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:



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THU CHAN  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



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KEITH NG  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, 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
Radiated Emission, Above 2000 MHz	+/- 43 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 802.11n MIMO transceiver chipset. The chipset is installed on a Mini PCI-E card, model number BCM94321MC.

The radio module is manufactured by Broadcom Corp.

### 5.2. CLASS II PERMISSIVE CHANGE DESCRIPTION

The Class II change is to add a portable platform, Dell XPS Series (PP06XA) laptop.

### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT has 2 Tx/Rx antennas that are automatically selected for use as per the MCS index and STF mode selections. Preliminary testing was performed on all antennas to determine the worst caseFinal testing was performed on the worst case (Amphenol).

- ACON, AMP8P-700022, Stamped Metal Sheet Antenna: 0.3dBi @ 2.4GHz, 2.6dBi @ 5GHz.
- Hitachi, HMG02-DL12, Stamped Metal Sheet Antenna: 2.1dBi @ 2.4GHz, 2.0dBi @ 5GHz.
- Foxconn, WDAN-DWDS1-001-DF, PCB Antenna: 4.04dBi @ 2.4GHz, 2.606dBi @ 5GHz.
- Amphenol, WT0581-11-001-R, WT0581-11-002-R, WT0581-11-003-R: 1.9dBi @ 2.4GHz, 5.26dBi@ 5GHz.

### 5.4. SOFTWARE AND FIRMWARE

The EUT was tested in the following manner:

- “epi\_ttcp.exe” was used to transmit UDP packets to a broadcast IP address (192.168.66.255) – i.e. no ACK required. This test mode sends a continuous packetized data stream with duty cycles that vary dependant upon data rate/MCS Index selected.
- “wl ampdu” and “frameburst” were enabled to ensure worst case data packet transfer and duty cycle.
  - Worst case packet length have also been used to ensure max duty cycle.

## 5.5. WORST-CASE CONFIGURATION AND MODE

Operating modes were changed directly in software with no other changes to the set up. Power levels were verified across all the MCS Index at the start of test and as required throughout testing.

Prior to each test a power meter was used to tune the gated average power within a Tx packet. The channel gates on the meter were set to ensure that, at the time of recording, only packet power was captured without including duty cycle off time.

Power was tuned for different modes, channels and antennas based on the power tuning table contained in the Operational Description submitted under the same filing.

## 5.6. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
Laptop PC	Dell	Inspiron 0000	CN-901014-70166-57K-01JT	DOC
AC Adapter	Dell	PA-1600-06D1	F9710	DOC

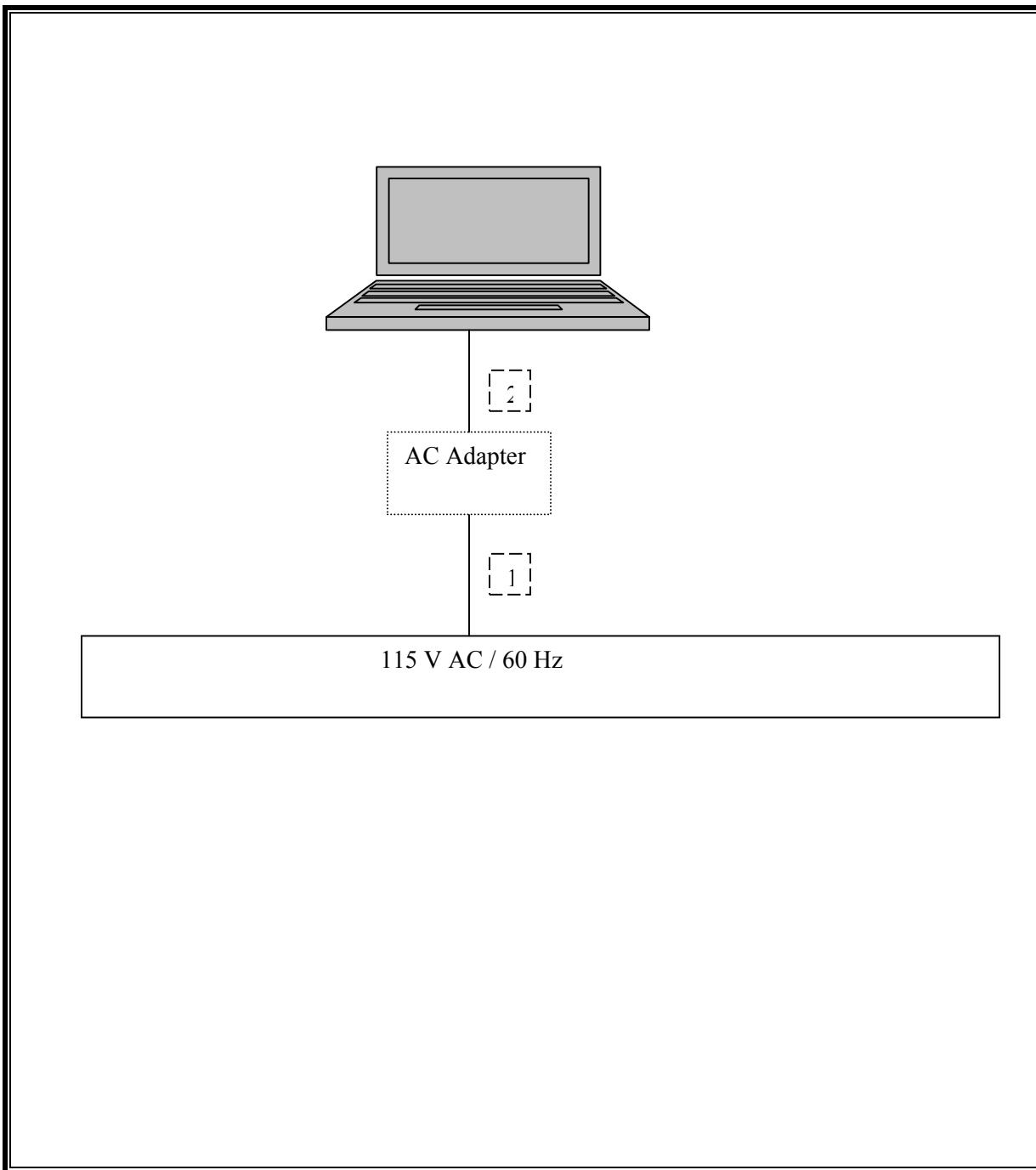
### I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	AC	Unshielded	1.2 m	N/A
2	DC	1	DC	Unshielded	1.2 m	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 / HP	E4446A	US42510266	11/26/2007
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	8/6/2007
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	9/15/2007
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	9/15/2007
EMI Test Receiver	R & S	ESHS 20	827129/006	9/26/2007
AC Power Source, 10 kVA	ACS	AFC-10K-AFC-2	J1568	CNR
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	1/27/2008
RF Filter Section	Agilent / HP	85420E	3705A00256	6/12/2008
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	8/13/2007
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
5.15 - 5.35 Reject Filter	Micro Tronics	BRC13190	1	CNR

## 7. LIMITS AND RESULTS

### 7.1. RADIATED EMISSIONS

#### 7.1.1. 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 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

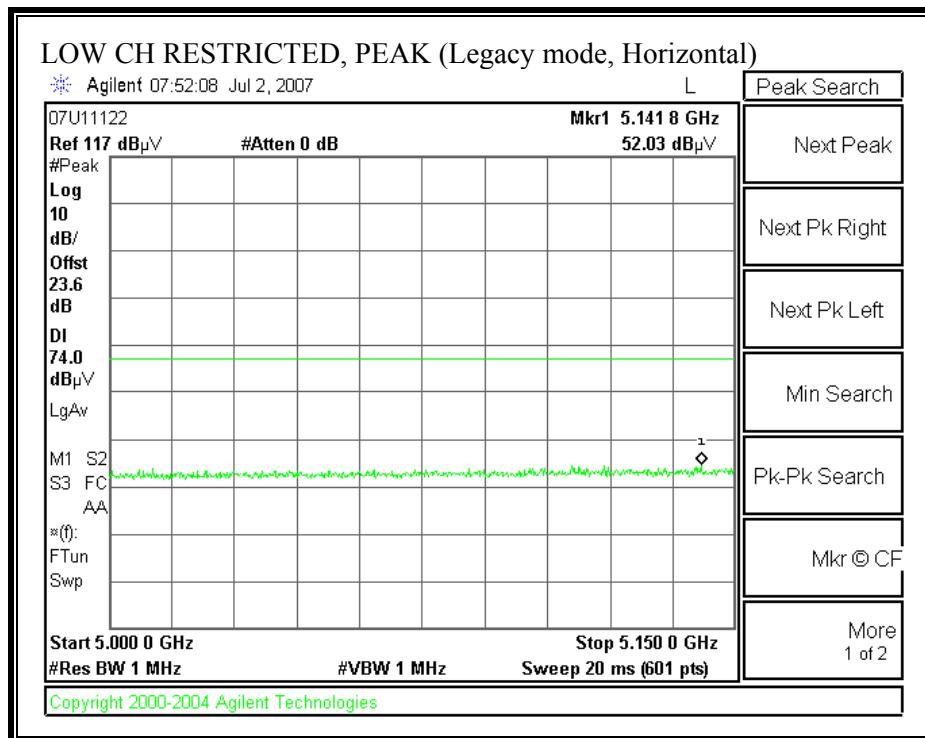
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

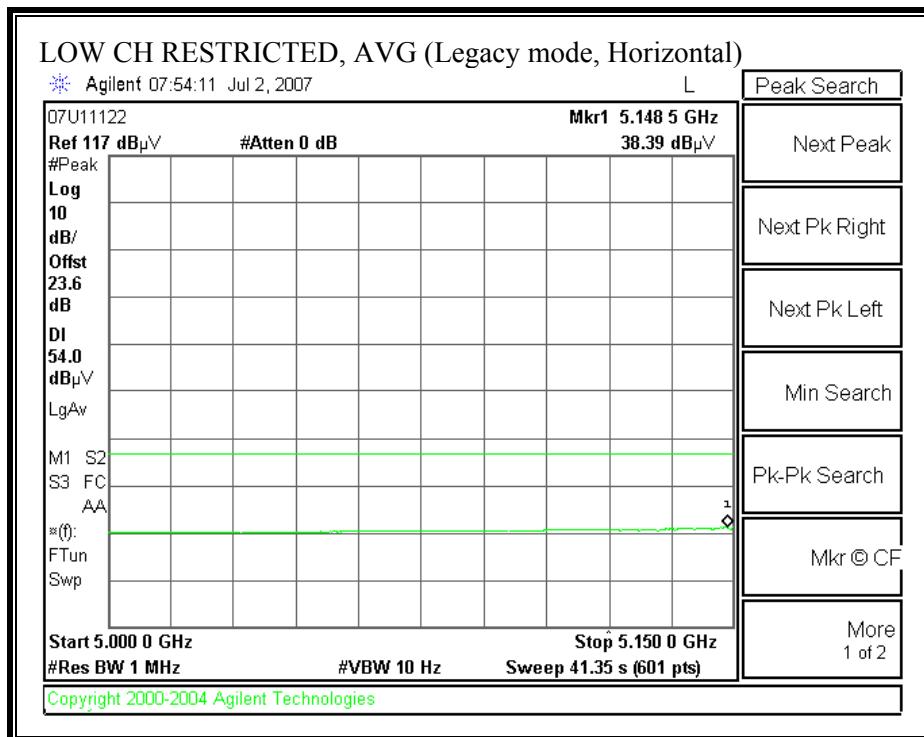
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

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

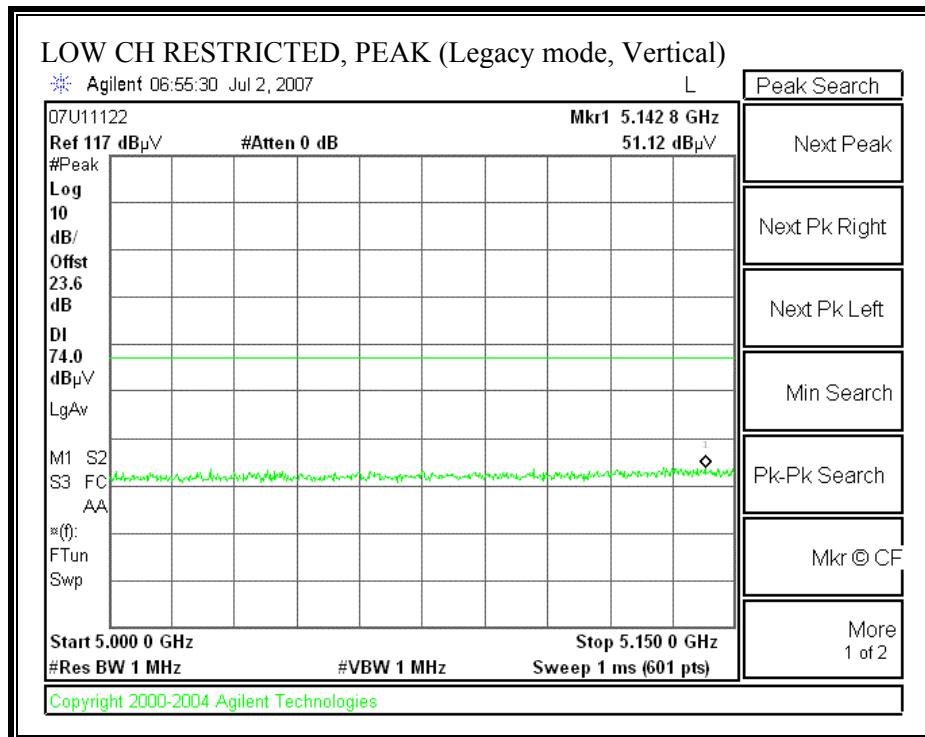
### RESTRICTED BANDEDGE (Legacy MODE, LOW CHANNEL, 5180MHz, HORIZONTAL)

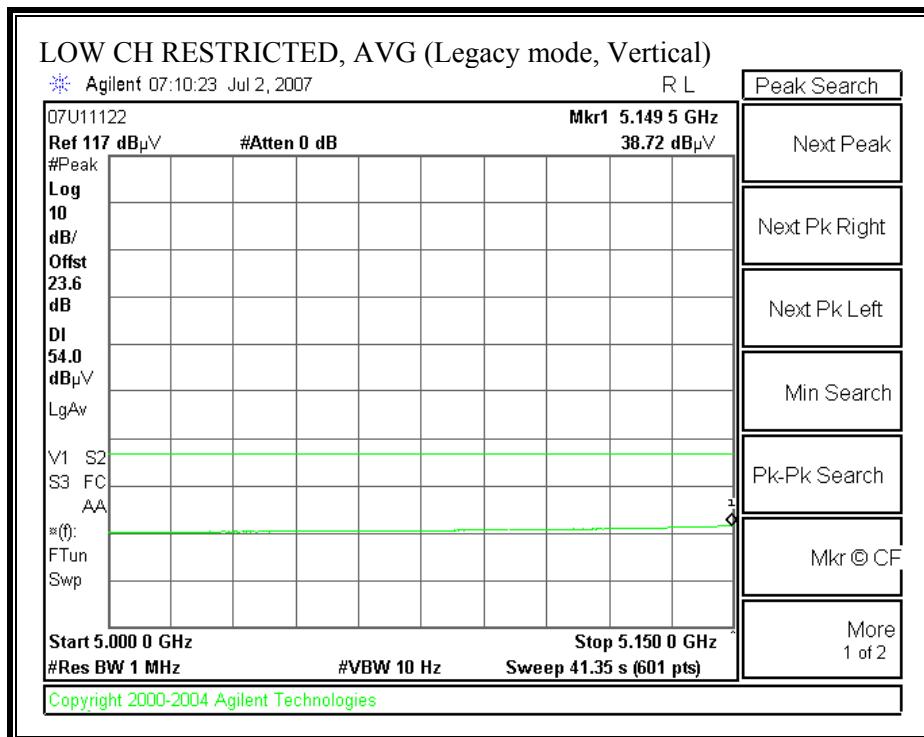
#### Aux Antenna



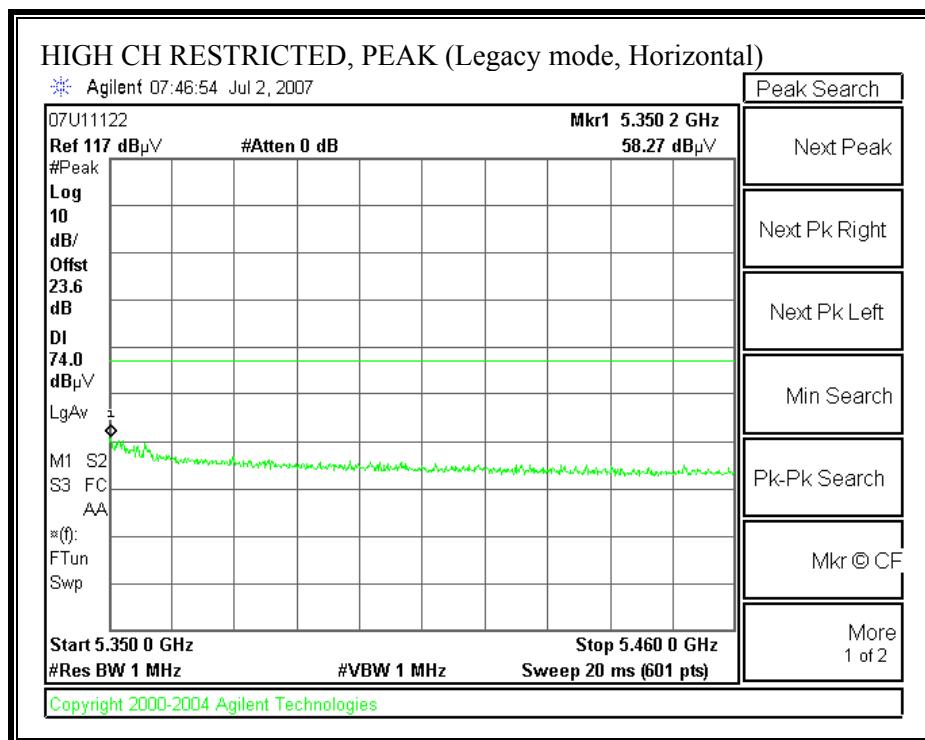


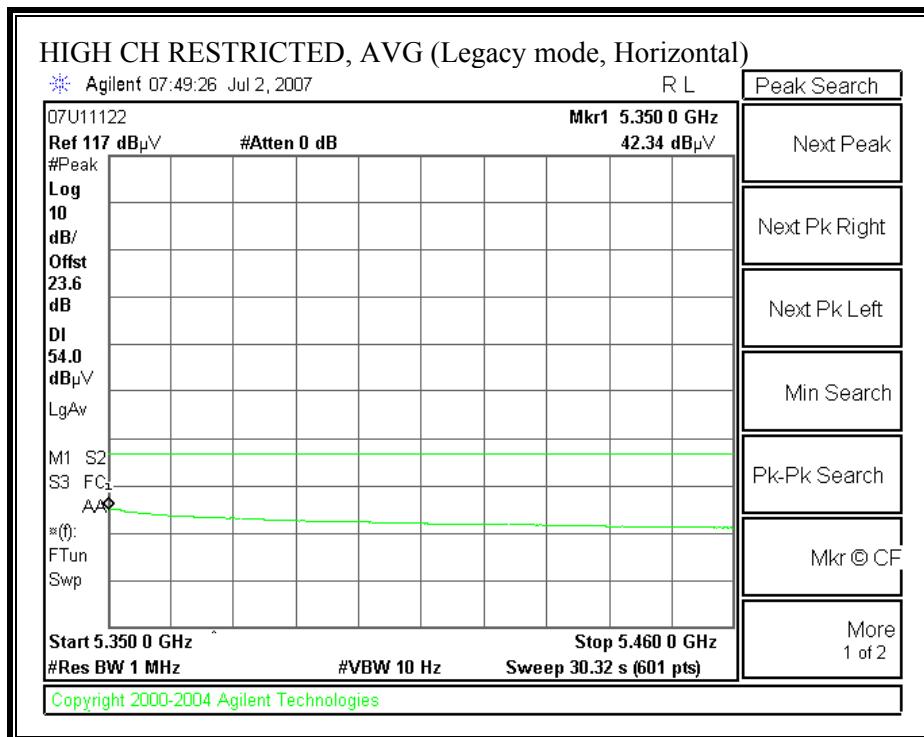
**RESTRICTED BANDEDGE (Legacy MODE, LOW CHANNEL, 5180MHz, VERTICAL)**



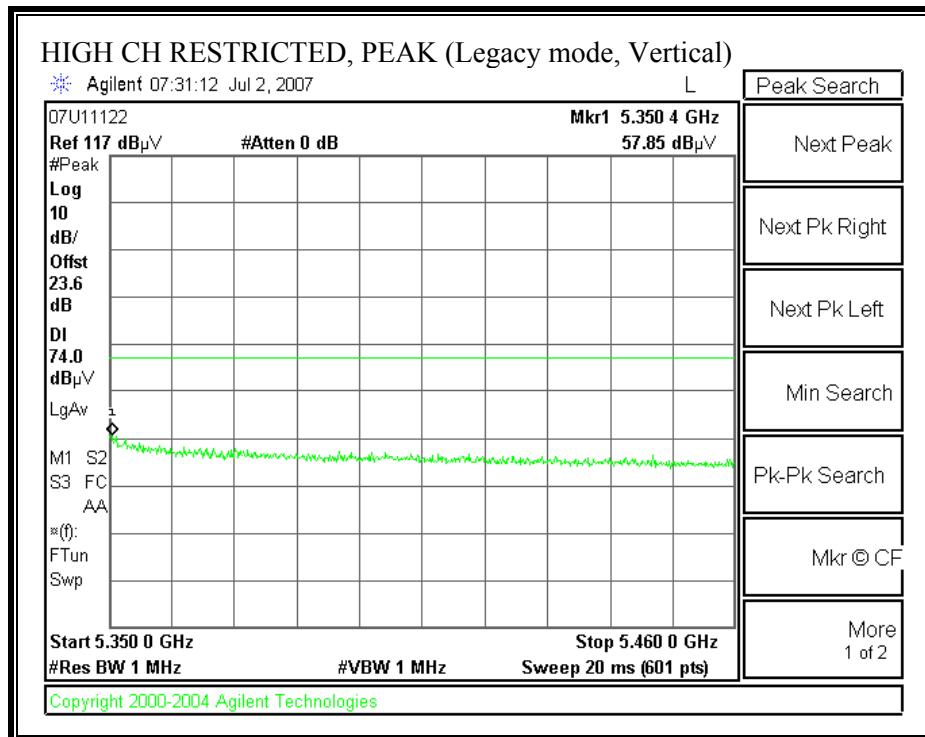


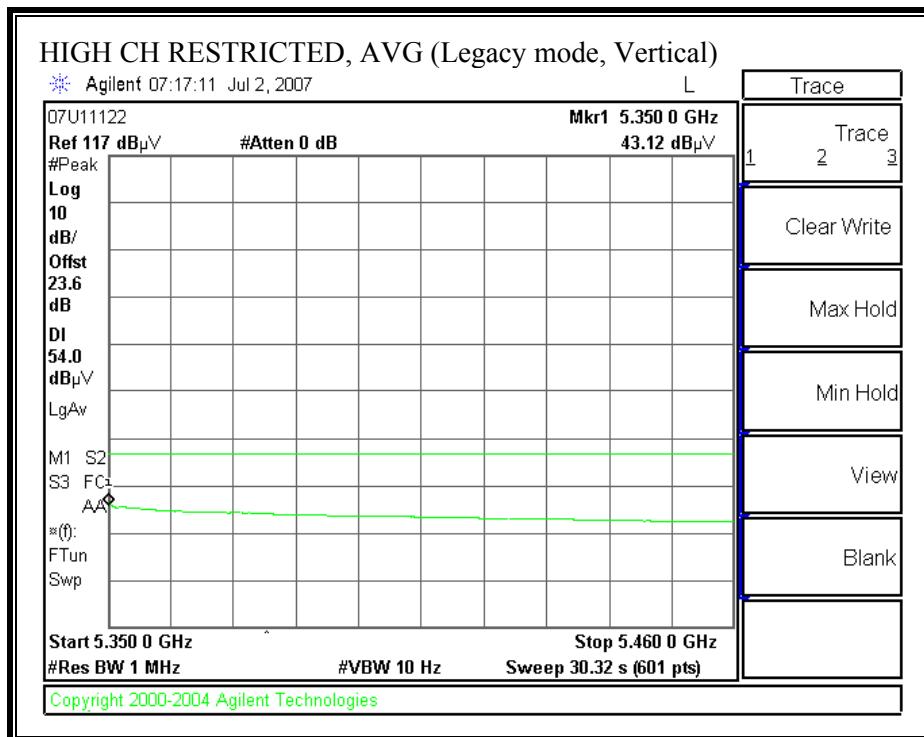
**RESTRICTED BANDEDGE (Legacy MODE, HIGH CHANNEL, 5300MHz, HORIZONTAL)**



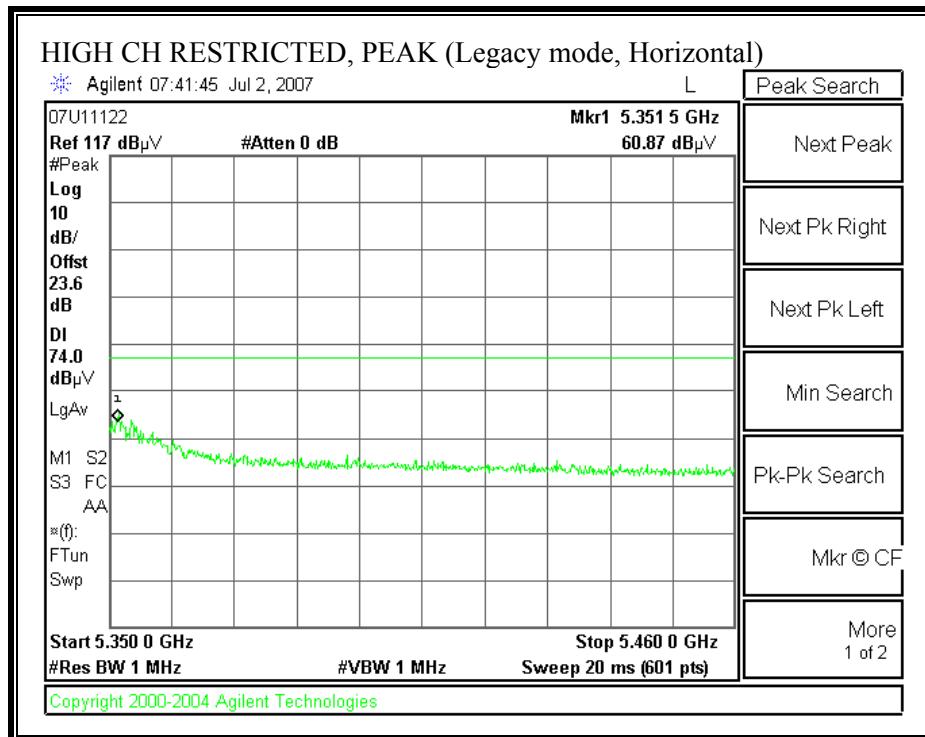


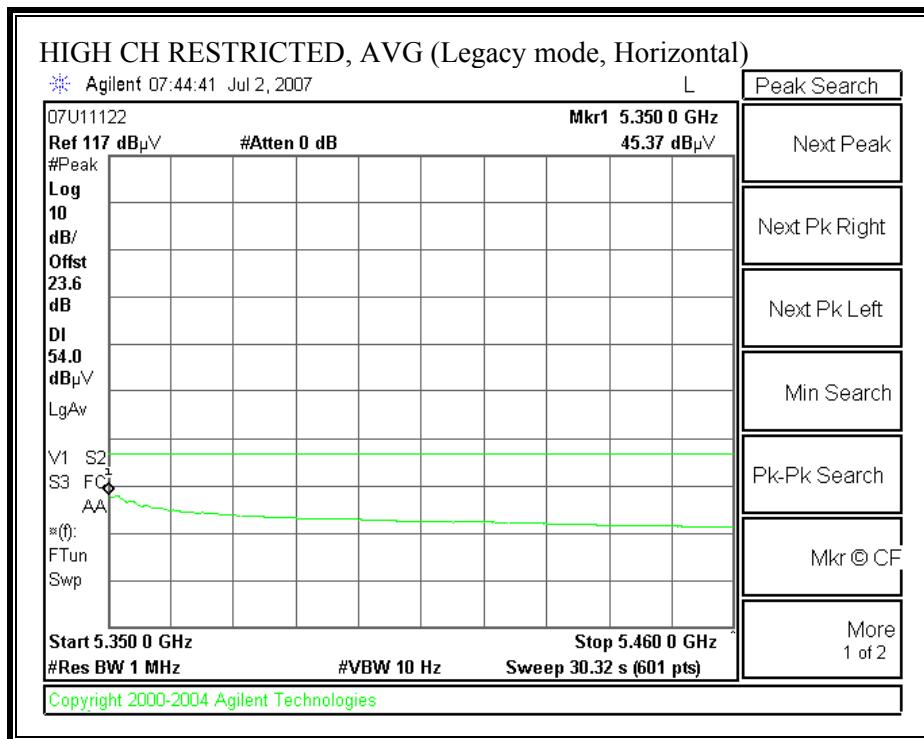
**RESTRICTED BANDEDGE (Legacy MODE, HIGH CHANNEL, 5300MHz, VERTICAL)**



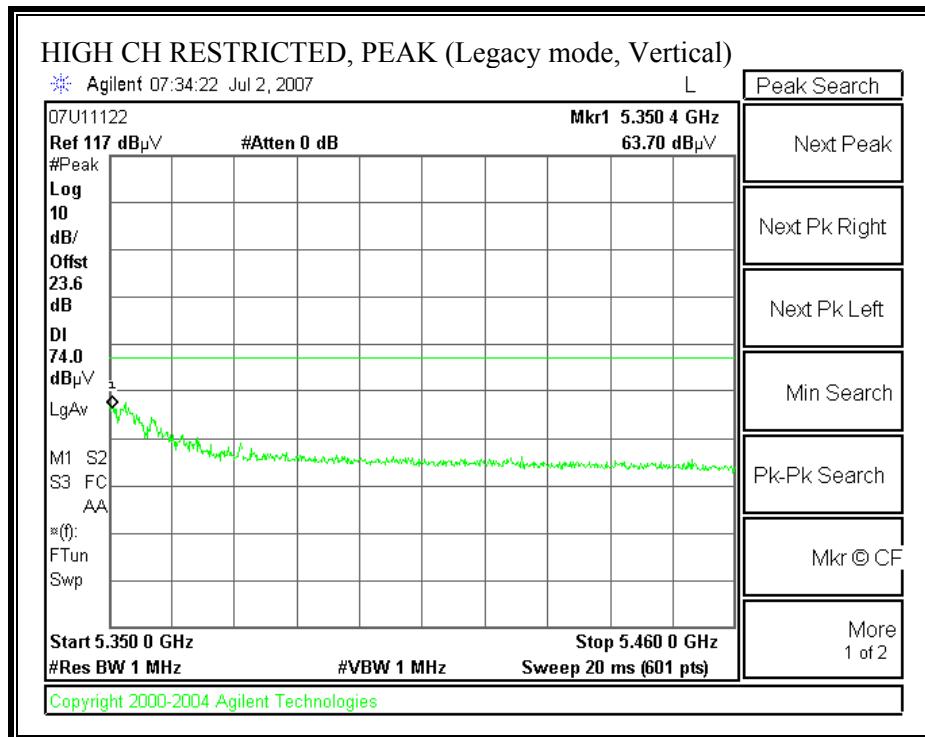


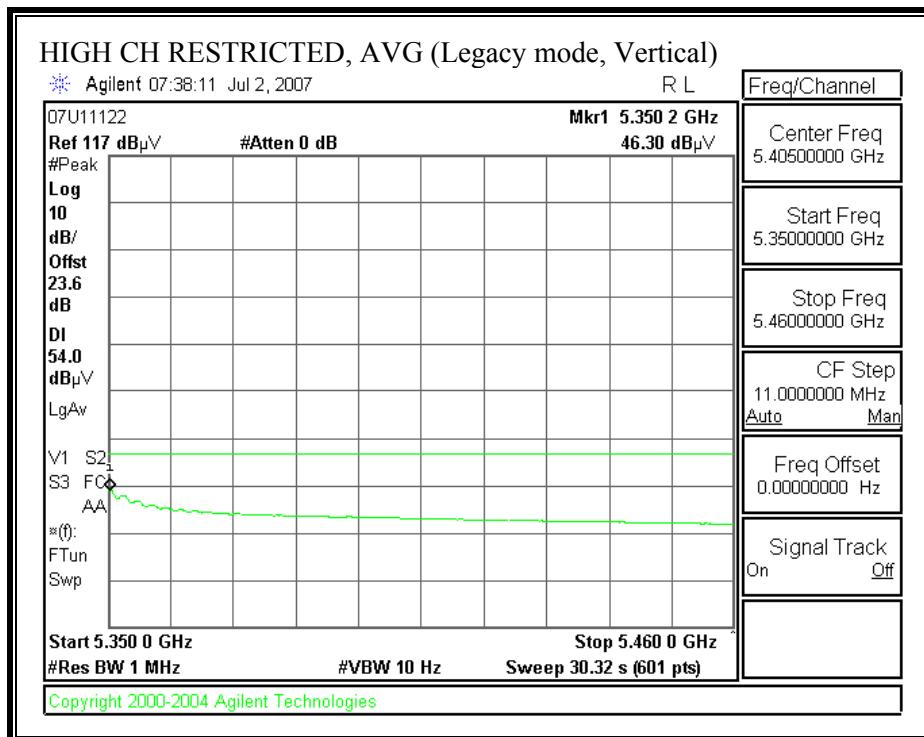
**RESTRICTED BANDEDGE (Legacy MODE, HIGH CHANNEL, 5320MHz, HORIZONTAL)**





**RESTRICTED BANDEDGE (Legacy MODE, HIGH CHANNEL, 5320MHz, VERTICAL)**

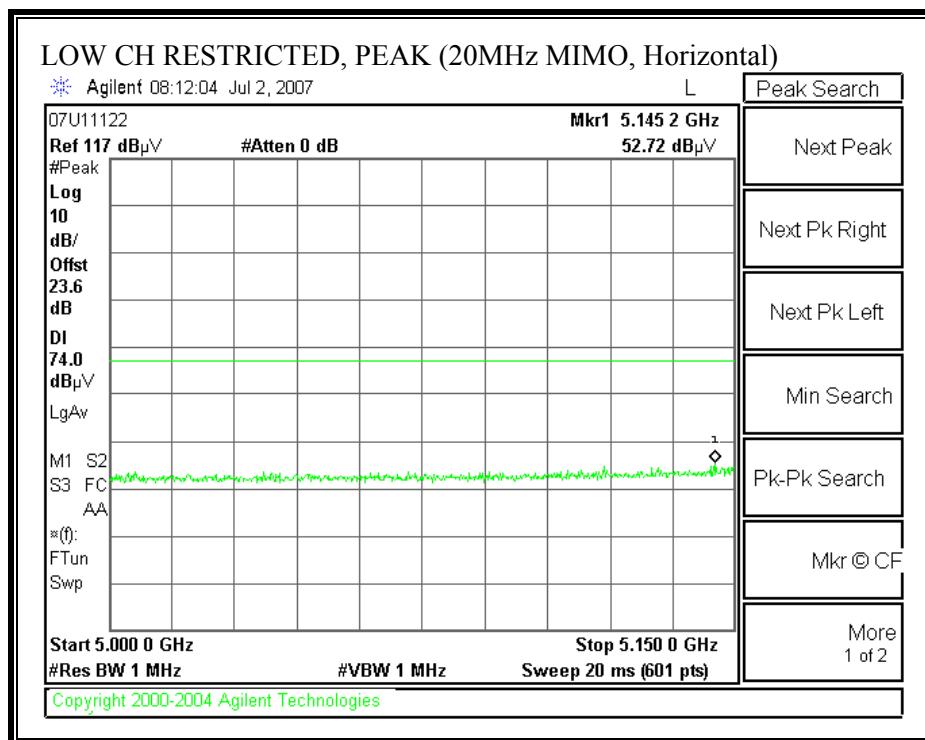


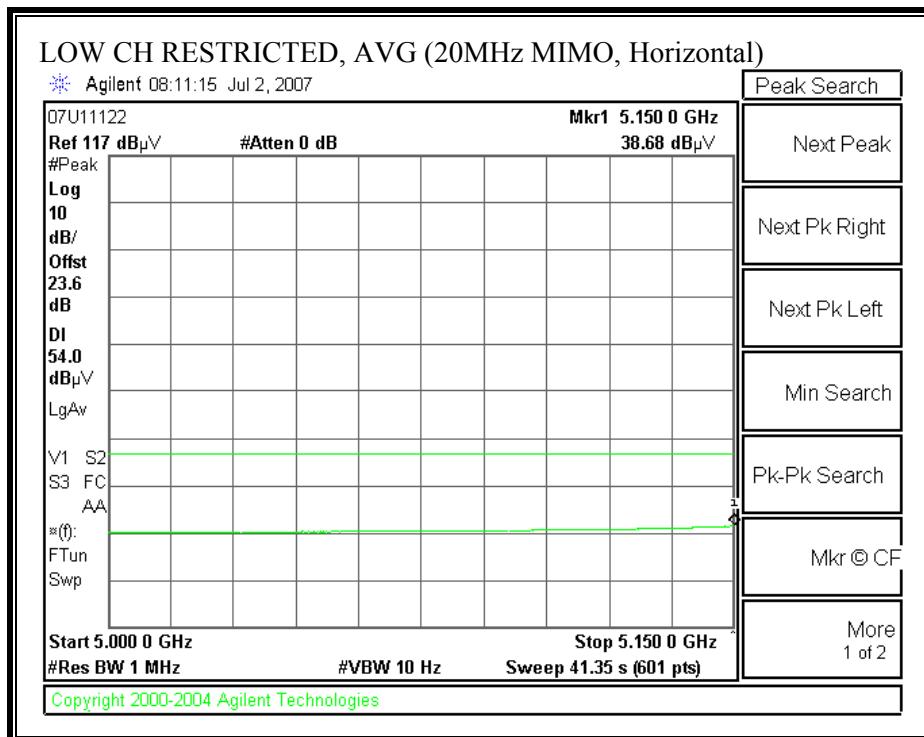


## HARMONICS AND SPURIOUS EMISSIONS (Legacy MODE, Aux Antenna)

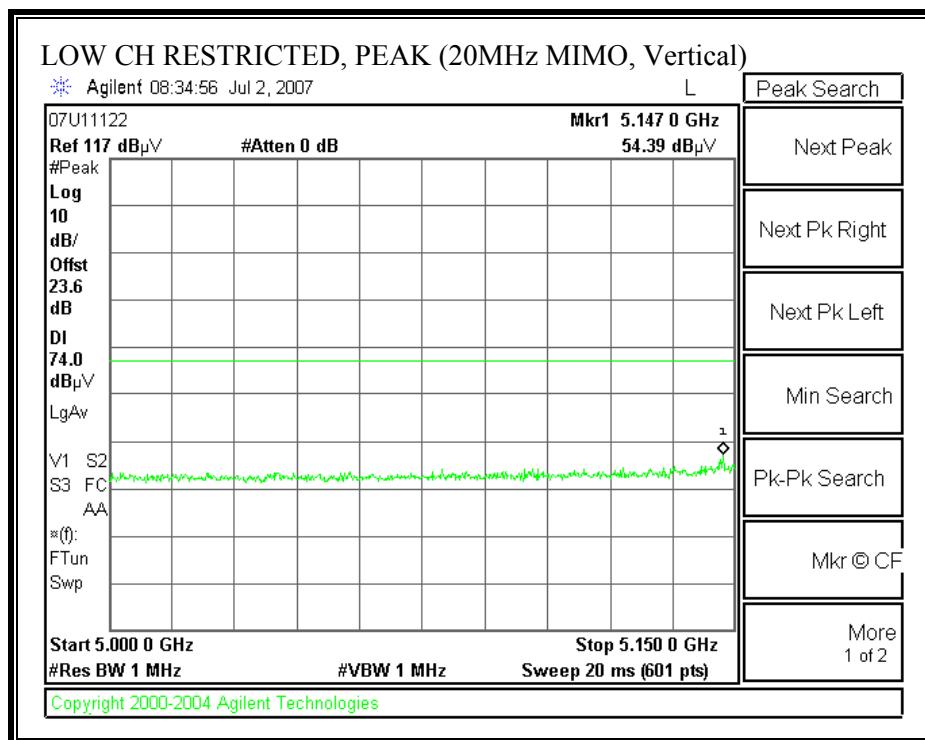
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																					
Company: Broadcom		Project #: 07U11122		Date: 7/2/2007		Test Engineer: Keith Ng		Configuration: EUT Only		Mode: Tx Legacy Mode											
Test Equipment:																					
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz					Limit							
T120; S/N: 29310 @3m			T34 HP 8449B											FCC 15.209							
Hi Frequency Cables																					
2 foot cable			3 foot cable			12 foot cable			HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz								
											R_002		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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)						
Low Ch (5180MHz)																					
1.097	3.0	57.3	44.4	28.2	3.1	-38.1	0.0	0.0	50.5	37.6	74	54	-23.5	-16.4	V						
1.333	3.0	49.6	35.5	29.1	3.4	-37.8	0.0	0.0	44.4	30.3	74	54	-29.6	-23.7	V						
10.360	3.0	46.1	32.7	37.5	10.4	-32.6	0.0	0.0	61.4	48.0	74	54	-12.6	-6.0	V						
15.540	3.0	45.3	32.3	39.0	12.7	-32.2	0.0	0.0	64.7	51.7	74	54	-9.3	-2.3	V						
1.097	3.0	54.1	43.9	28.2	3.1	-38.1	0.0	0.0	47.3	37.1	74	54	-26.7	-16.9	H						
1.333	3.0	52.1	36.1	29.1	3.4	-37.8	0.0	0.0	46.8	30.8	74	54	-27.2	-23.2	H						
10.360	3.0	45.6	31.5	37.5	10.4	-32.6	0.0	0.0	60.9	46.8	74	54	-13.1	-7.2	H						
15.540	3.0	44.7	32.1	39.0	12.7	-32.2	0.0	0.0	64.1	51.6	74	54	-9.9	-2.4	H						
Mid Ch (5260MHz)																					
1.098	3.0	56.7	43.9	28.2	3.1	-38.1	0.0	0.0	49.9	37.1	74	54	-24.1	-16.9	V						
1.335	3.0	50.0	35.5	29.1	3.4	-37.8	0.0	0.0	44.7	30.2	74	54	-29.3	-23.8	V						
10.520	3.0	46.7	31.4	37.5	10.6	-32.6	0.0	0.0	62.2	46.9	74	54	-11.8	-7.1	V						
15.780	3.0	44.1	32.0	39.1	12.8	-32.2	0.0	0.0	63.9	51.8	74	54	-10.1	-2.2	V						
1.097	3.0	55.0	42.4	28.2	3.1	-38.1	0.0	0.0	48.2	35.6	74	54	-25.8	-18.4	H						
1.333	3.0	51.0	35.6	29.1	3.4	-37.8	0.0	0.0	45.7	30.3	74	54	-28.3	-23.7	H						
10.520	3.0	44.2	30.4	37.5	10.6	-32.6	0.0	0.0	59.7	45.8	74	54	-14.3	-8.2	H						
15.780	3.0	42.9	31.6	39.1	12.8	-32.2	0.0	0.0	62.7	51.3	74	54	-11.3	-2.7	H						
Hi Ch (5320MHz)																					
1.100	3.0	58.2	44.9	28.2	3.1	-38.1	0.0	0.0	51.4	38.1	74	54	-22.6	-15.9	V						
1.334	3.0	49.8	35.1	29.1	3.4	-37.8	0.0	0.0	44.5	29.8	74	54	-29.5	-24.2	V						
10.640	3.0	47.4	32.9	37.5	10.7	-32.6	0.0	0.0	63.0	48.5	74	54	-11.0	-5.5	V						
15.960	3.0	45.2	31.7	39.3	12.8	-32.1	0.0	0.0	65.2	51.7	74	54	-8.8	-2.3	V						
1.098	3.0	55.2	42.7	28.2	3.1	-38.1	0.0	0.0	48.4	35.9	74	54	-25.6	-18.1	H						
1.334	3.0	51.6	35.8	29.1	3.4	-37.8	0.0	0.0	46.3	30.5	74	54	-27.7	-23.5	H						
10.640	3.0	45.1	30.1	37.5	10.7	-32.6	0.0	0.0	60.7	45.7	74	54	-13.3	-8.3	H						
15.960	3.0	43.9	31.1	39.3	12.8	-32.1	0.0	0.0	63.9	51.0	74	54	-10.1	-3.0	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													

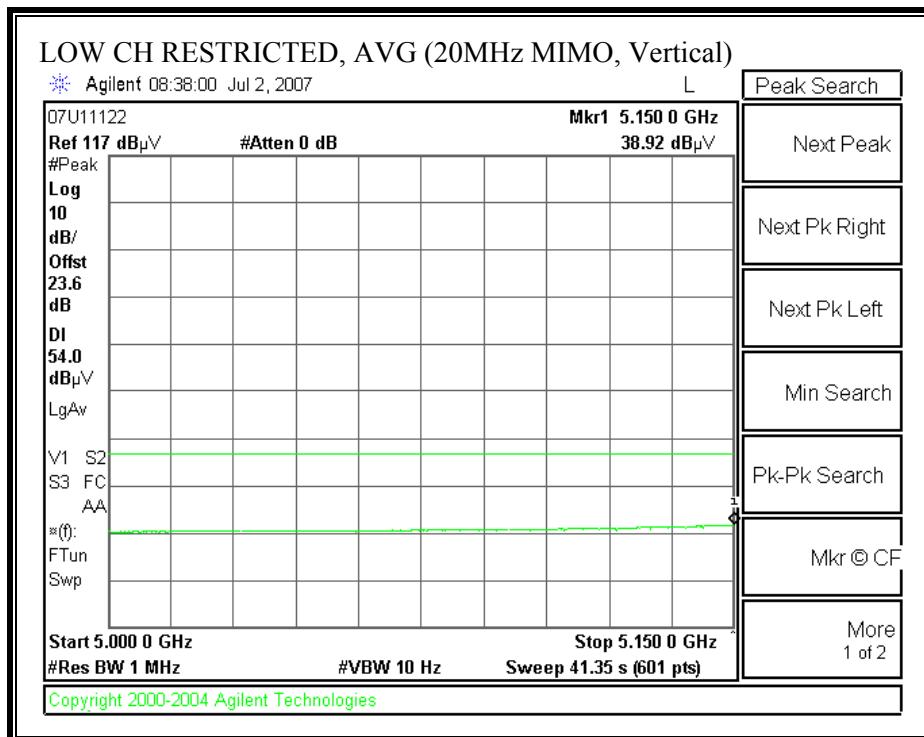
**RESTRICTED BANDEDGE (20MHz MIMO MODE, LOW CHANNEL, 5180MHz, HORIZONTAL)**



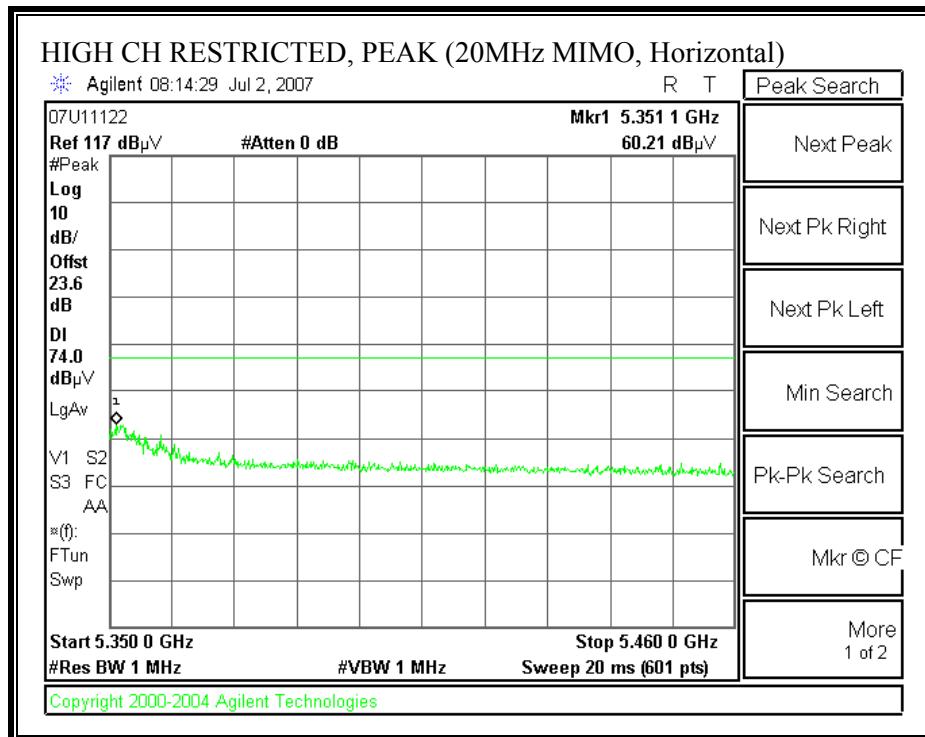


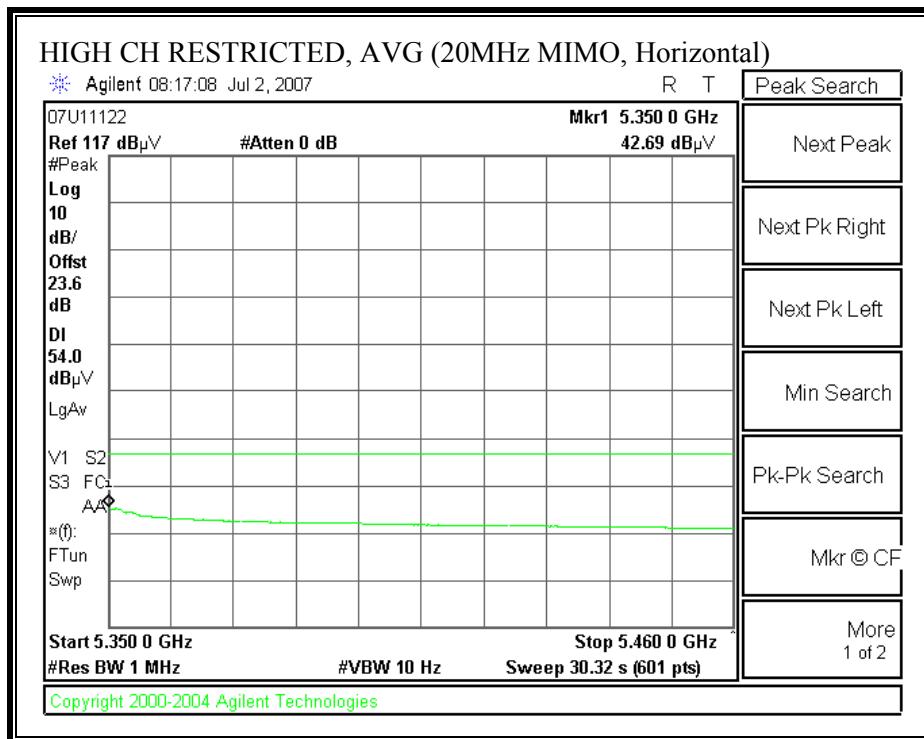
**RESTRICTED BANDEDGE (20MHz MIMO MODE, LOW CHANNEL, 5180MHz, VERTICAL)**



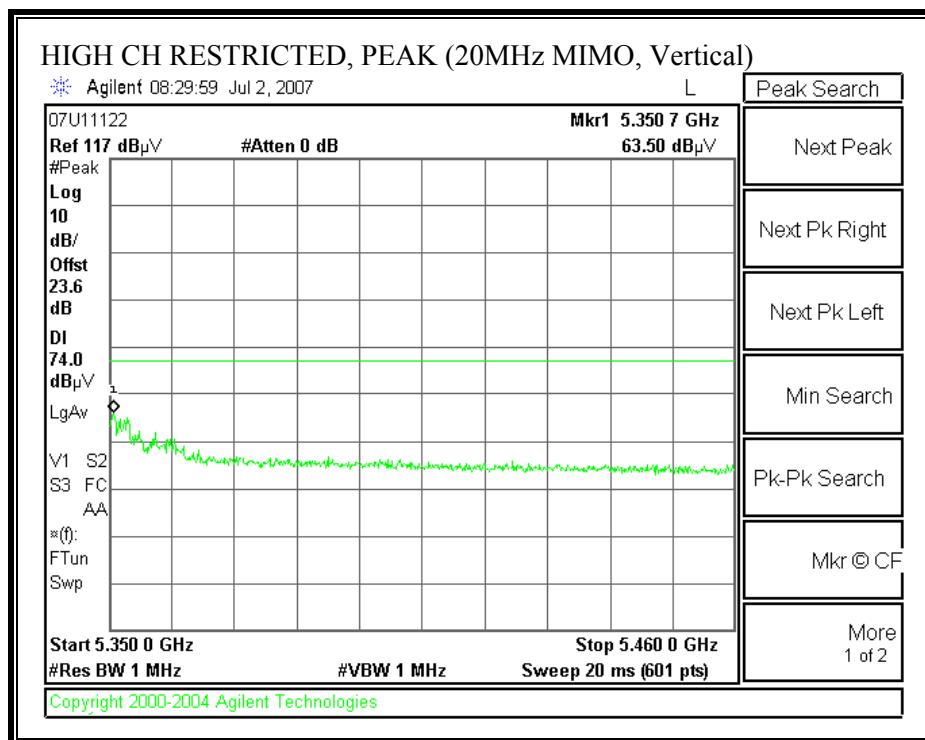


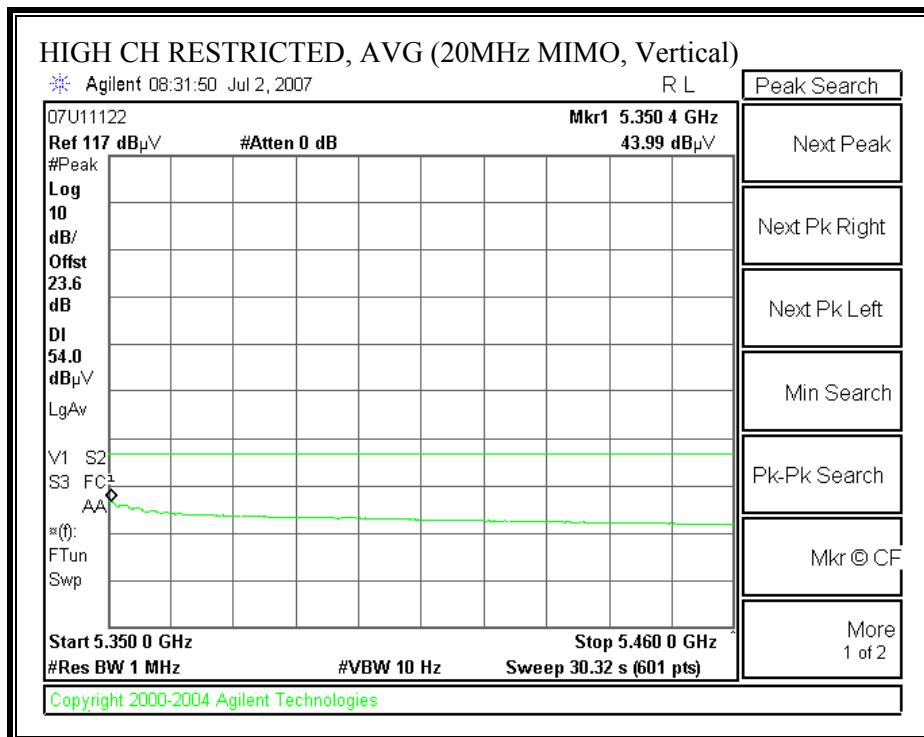
**RESTRICTED BANDEDGE (20MHz MIMO MODE, HIGH CHANNEL, 5320MHz, HORIZONTAL)**





**RESTRICTED BANDEDGE (20MHz MIMO MODE, HI CHANNEL, 5320MHz, VERTICAL)**

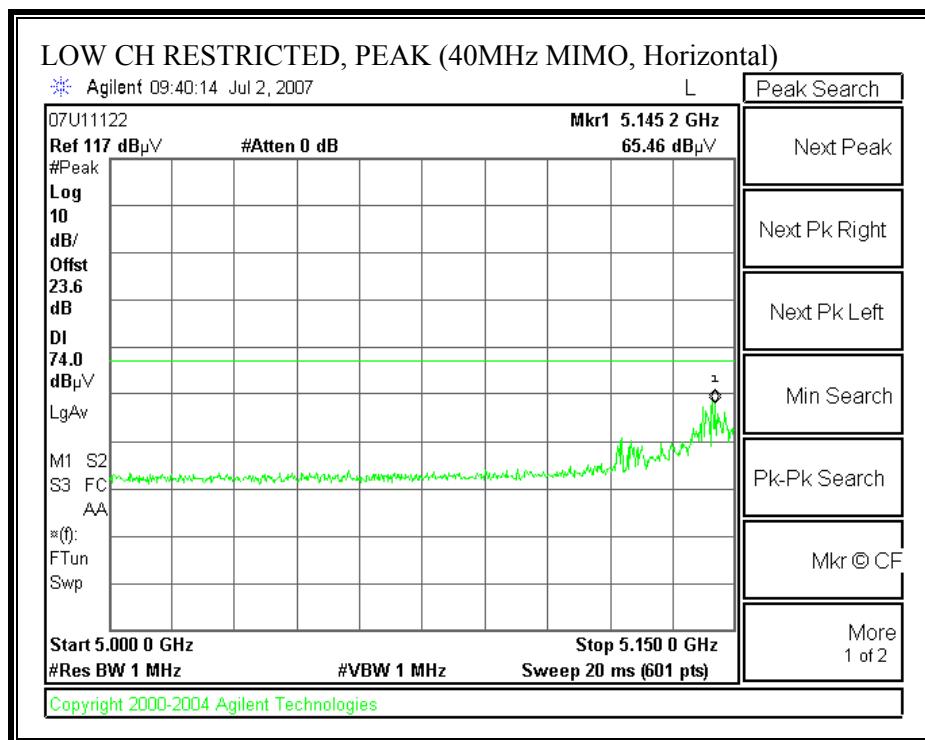


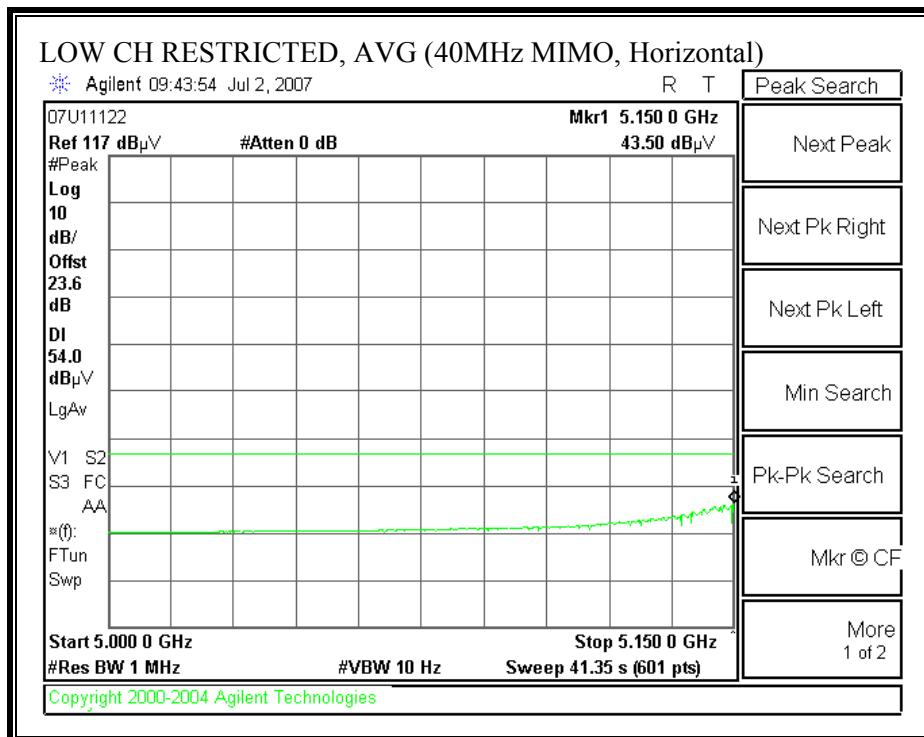


## HARMONICS AND SPURIOUS EMISSIONS (20MHz MIMO MODE)

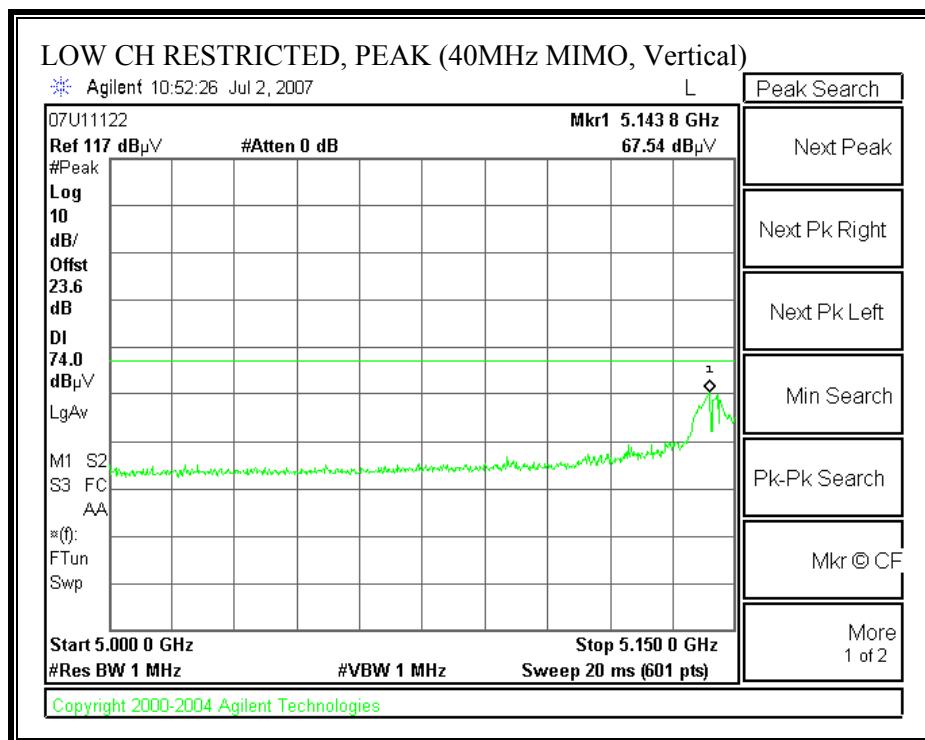
High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																																	
Company: Broadcom		Project #: 07U1122		Date: 7/2/2007		Test Engineer: Keith Ng		Configuration: EUT Only		Mode: Tx 20Mhz MIMO mode																							
<u>Test Equipment:</u>																																	
Horn 1-18GHz				Pre-amplifier 1-26GHz				Pre-amplifier 26-40GHz				Horn > 18GHz																					
T120; S/N: 29310 @3m				T34 HP 8449B																													
Hi Frequency Cables																																	
2 foot cable				3 foot cable				12 foot cable				HPF		Reject Filter																			
								A-5m Chamber																									
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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)																		
Low Ch(5180MHz)																																	
1.096	3.0	55.9	43.5	28.2	3.1	-38.1	0.0	0.0	49.1	36.7	74	54	-24.9	-17.3	V																		
1.329	3.0	51.1	35.5	29.1	3.4	-37.8	0.0	0.0	45.8	30.2	74	54	-28.2	-23.8	V																		
10.360	3.0	45.0	32.1	37.5	10.4	-32.6	0.0	0.0	60.3	47.4	74	54	-13.7	-6.6	V																		
15.540	3.0	45.3	32.3	39.0	12.7	-32.2	0.0	0.0	64.7	51.8	74	54	-9.3	-2.2	V																		
1.096	3.0	58.4	45.5	28.2	3.1	-38.1	0.0	0.0	51.6	38.7	74	54	-22.4	-15.3	H																		
1.314	3.0	55.8	35.8	29.0	3.4	-37.8	0.0	0.0	50.4	30.4	74	54	-23.6	-23.6	H																		
10.360	3.0	44.2	31.9	37.5	10.4	-32.6	0.0	0.0	59.5	47.2	74	54	-14.5	-6.8	H																		
15.540	3.0	44.9	32.2	39.0	12.7	-32.2	0.0	0.0	64.4	51.7	74	54	-9.6	-2.3	H																		
Mid Ch(5260MHz)																																	
1.095	3.0	56.1	42.5	28.2	3.1	-38.1	0.0	0.0	49.3	35.7	74	54	-24.7	-18.3	V																		
1.326	3.0	52.1	34.7	29.1	3.4	-37.8	0.0	0.0	46.8	29.4	74	54	-27.2	-24.6	V																		
10.520	3.0	51.1	33.8	37.5	10.6	-32.6	0.0	0.0	66.6	49.3	74	54	-7.4	-4.7	V																		
15.780	3.0	45.7	31.8	39.1	12.8	-32.2	0.0	0.0	65.5	51.6	74	54	-8.5	-2.4	V																		
1.095	3.0	58.0	42.8	28.2	3.1	-38.1	0.0	0.0	51.2	36.0	74	54	-22.8	-18.0	H																		
1.315	3.0	52.8	36.2	29.0	3.4	-37.8	0.0	0.0	47.4	30.8	74	54	-26.6	-23.2	H																		
10.520	3.0	50.9	34.9	37.5	10.6	-32.6	0.0	0.0	66.4	50.4	74	54	-7.6	-3.6	H																		
15.780	3.0	44.8	31.6	39.1	12.8	-32.2	0.0	0.0	64.5	51.3	74	54	-9.5	-2.7	H																		
Hi Ch(5320MHz)																																	
1.096	3.0	55.8	42.8	28.2	3.1	-38.1	0.0	0.0	49.0	36.0	74	54	-25.0	-18.0	V																		
1.327	3.0	51.6	35.6	29.1	3.4	-37.8	0.0	0.0	46.3	30.3	74	54	-27.7	-23.7	V																		
10.640	3.0	49.0	33.2	37.5	10.7	-32.6	0.0	0.0	64.6	48.8	74	54	-9.4	-5.2	V																		
15.960	3.0	45.2	32.0	39.3	12.8	-32.1	0.0	0.0	65.2	52.0	74	54	-8.8	-2.0	V																		
1.097	3.0	57.9	45.9	28.2	3.1	-38.1	0.0	0.0	51.1	39.1	74	54	-22.9	-14.9	H																		
1.318	3.0	53.5	36.1	29.0	3.4	-37.8	0.0	0.0	48.2	30.8	74	54	-25.8	-23.2	H																		
10.640	3.0	48.9	32.1	37.5	10.7	-32.6	0.0	0.0	64.5	47.7	74	54	-9.5	-6.3	H																		
15.960	3.0	43.9	31.1	39.3	12.8	-32.1	0.0	0.0	63.8	51.0	74	54	-10.2	-3.0	H																		
Rev. 4.12.7																																	
f	Measurement Frequency	Amp	Preamp Gain																														
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters																														
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m																														
AF	Antenna Factor	Peak	Calculated Peak Field Strength																														
CL	Cable Loss	HPF	High Pass Filter																														
				Avg Lim	Average Field Strength Limit																												
				Pk Lim	Peak Field Strength Limit																												
				Avg Mar	Margin vs. Average Limit																												
				Pk Mar	Margin vs. Peak Limit																												

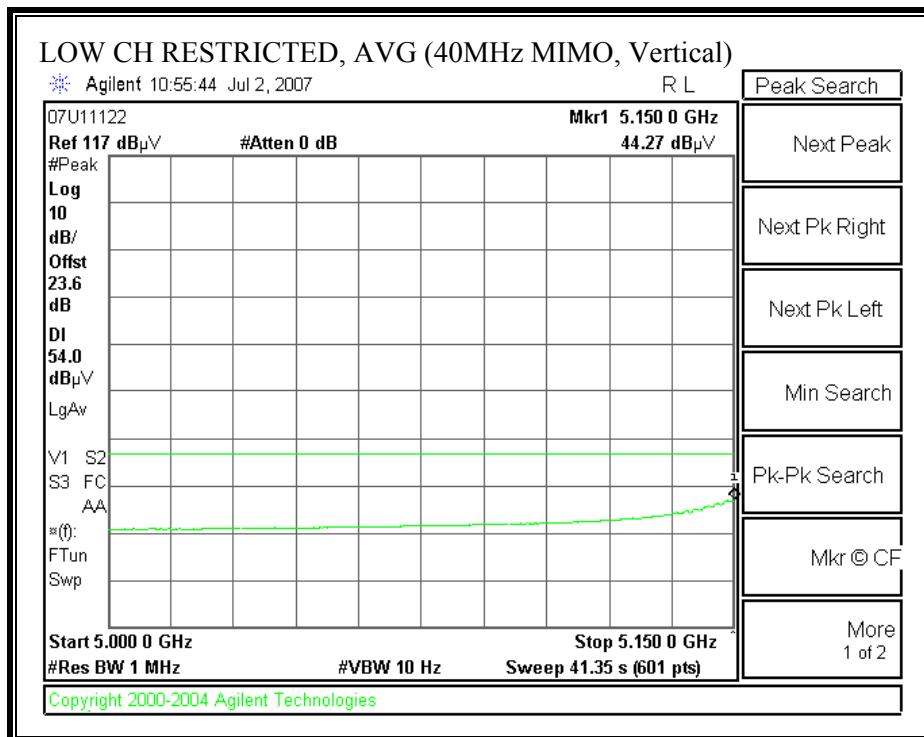
**RESTRICTED BANDEDGE (40MHz MIMO MODE, LOW CHANNEL, 5190MHz, HORIZONTAL)**



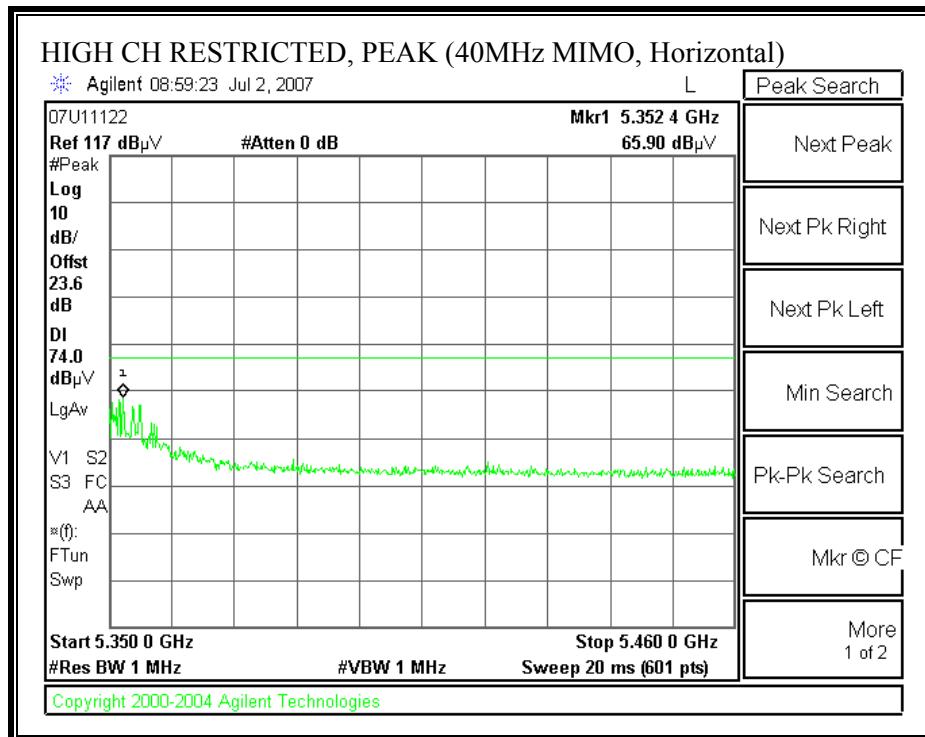


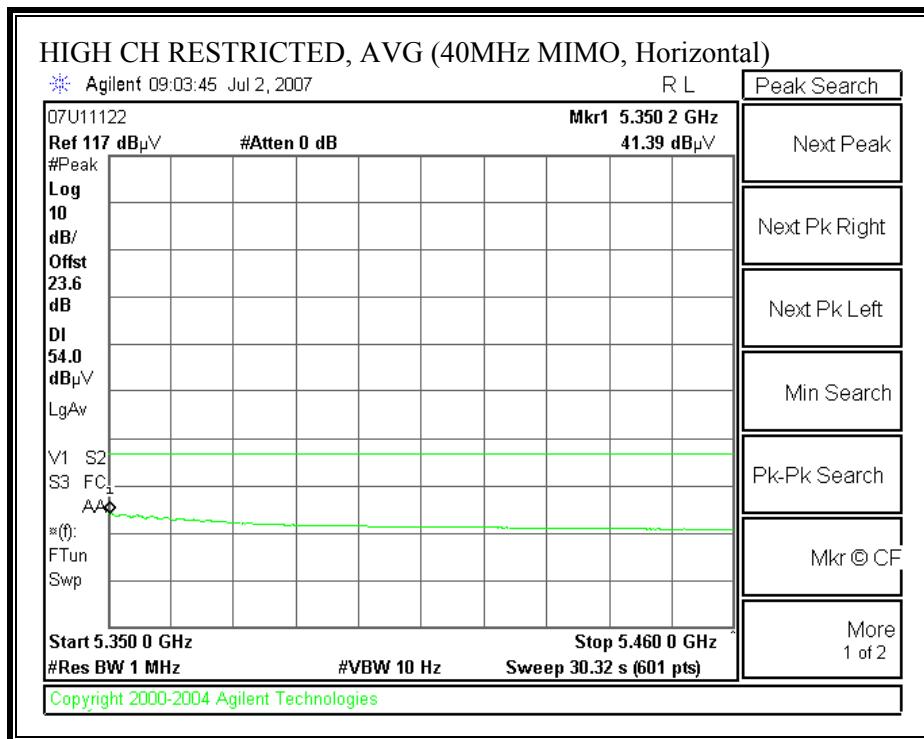
**RESTRICTED BANDEDGE (40MHz MIMO MODE, LOW CHANNEL, 5190MHz, VERTICAL)**



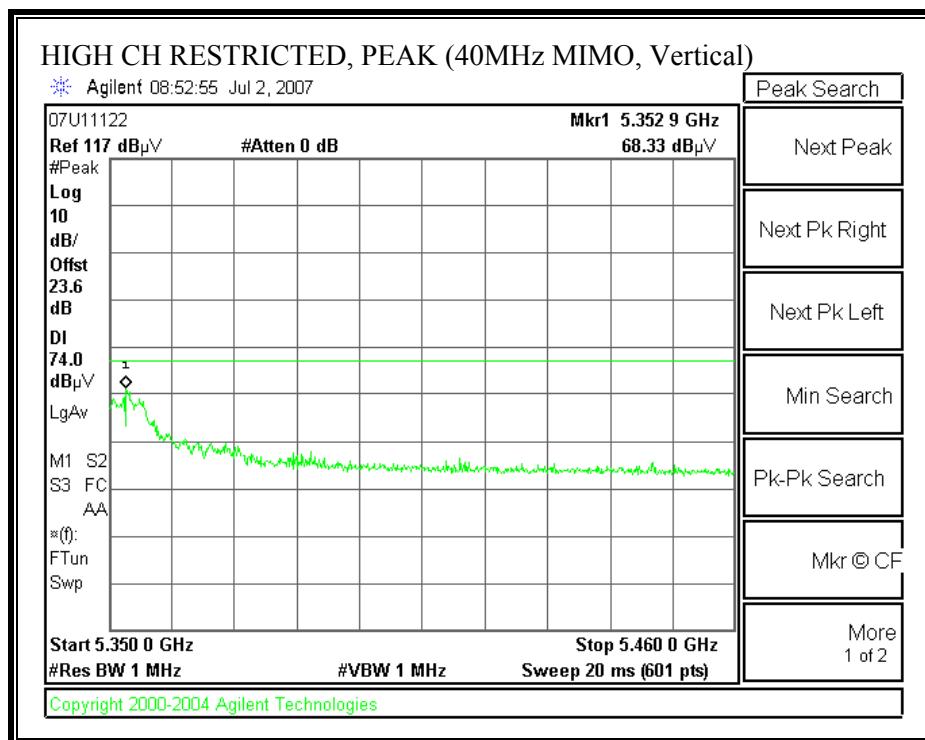


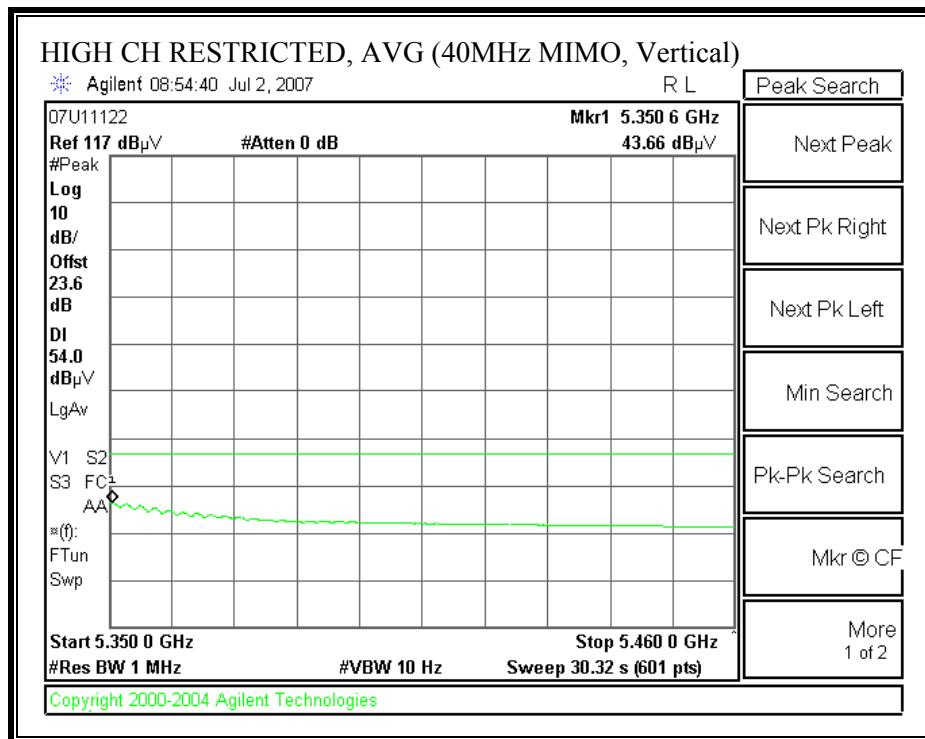
**RESTRICTED BANDEDGE (40MHz MIMO MODE, HI CHANNEL, 5310MHz, HORIZONTAL)**





**RESTRICTED BANDEDGE (40MHz MIMO MODE, HI CHANNEL, 5310MHz, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS (40MHz MIMO MODE)

High Frequency Measurement Compliance Certification Services, Fremont 5m Chamber																																			
Company: Broadcom		Project #: 07U1122		Date: 7/2/2007		Test Engineer: Keith Ng		Configuration: EUT Only		Mode: Tx 40Mhz MIMO mode																									
<u>Test Equipment:</u>																																			
<table border="1"> <tr> <td>Horn 1-18GHz</td> <td>Pre-amplifier 1-26GHz</td> <td>Pre-amplifier 26-40GHz</td> <td colspan="4">Horn &gt; 18GHz</td> <td>Limit</td> </tr> <tr> <td>T120; S/N: 29310 @3m</td> <td>T34 HP 8449B</td> <td></td> <td colspan="4" rowspan="2"></td> <td>FCC 15.209</td> </tr> </table>																Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz				Limit	T120; S/N: 29310 @3m	T34 HP 8449B						FCC 15.209				
Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz				Limit																												
T120; S/N: 29310 @3m	T34 HP 8449B						FCC 15.209																												
<table border="1"> <tr> <td>Hi Frequency Cables</td> <td>2 foot cable</td> <td>3 foot cable</td> <td>12 foot cable</td> <td colspan="2">A-5m Chamber</td> <td>HPF</td> <td>Reject Filter</td> <td>Peak Measurements RBW=VBW=1MHz</td> <td>Average Measurements RBW=1MHz; VBW=10Hz</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td colspan="2"></td> <td></td> <td></td> <td>R_002</td> <td></td> </tr> </table>																Hi Frequency Cables	2 foot cable	3 foot cable	12 foot cable	A-5m Chamber		HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz	Average Measurements RBW=1MHz; VBW=10Hz									R_002	
Hi Frequency Cables	2 foot cable	3 foot cable	12 foot cable	A-5m Chamber		HPF	Reject Filter	Peak Measurements RBW=VBW=1MHz	Average Measurements RBW=1MHz; VBW=10Hz																										
								R_002																											
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr 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>Low Ch (5190MHz)</b>																																			
1.093	3.0	59.0	4.9	28.2	3.1	-38.1	0.0	0.0	52.2	-1.9	74	54	-21.8	-55.9	V																				
1.333	3.0	52.4	37.2	29.1	3.4	-37.8	0.0	0.0	47.1	31.9	74	54	-26.9	-22.1	V																				
10.380	3.0	45.3	34.4	37.5	10.5	-32.6	0.0	0.0	60.7	49.7	74	54	-13.3	-4.3	V																				
15.570	3.0	44.8	32.1	39.0	12.7	-32.2	0.0	0.0	64.3	51.6	74	54	-9.7	-2.4	V																				
1.098	3.0	57.2	44.9	28.2	3.1	-38.1	0.0	0.0	50.4	38.1	74	54	-23.6	-15.9	H																				
1.317	3.0	56.2	37.9	29.0	3.4	-37.8	0.0	0.0	50.8	32.5	74	54	-23.2	-21.5	H																				
10.380	3.0	43.0	30.9	37.5	10.5	-32.6	0.0	0.0	58.3	46.2	74	54	-15.7	-7.8	H																				
15.570	3.0	45.4	32.2	39.0	12.7	-32.2	0.0	0.0	64.8	51.7	74	54	-9.2	-2.3	H																				
<b>Mid Ch (5270MHz)</b>																																			
1.093	3.0	56.6	44.2	28.2	3.1	-38.1	0.0	0.0	49.8	37.4	74	54	-24.2	-16.6	V																				
1.332	3.0	51.0	36.2	29.1	3.4	-37.8	0.0	0.0	45.7	30.9	74	54	-28.3	-23.1	V																				
10.540	3.0	51.2	36.8	37.5	10.6	-32.6	0.0	0.0	66.7	52.3	74	54	-7.3	-1.7	V																				
15.810	3.0	45.3	32.1	39.2	12.8	-32.2	0.0	0.0	65.1	51.8	74	54	-8.9	-2.2	V																				
1.100	3.0	58.5	45.6	28.2	3.1	-38.1	0.0	0.0	51.7	38.8	74	54	-22.3	-15.2	H																				
1.316	3.0	56.6	38.2	29.0	3.4	-37.8	0.0	0.0	51.3	32.8	74	54	-22.7	-21.2	H																				
10.540	3.0	51.3	33.0	37.5	10.6	-32.6	0.0	0.0	66.8	48.5	74	54	-7.2	-5.5	H																				
15.810	3.0	45.0	32.4	39.2	12.8	-32.2	0.0	0.0	64.7	52.2	74	54	-9.3	-1.8	H																				
<b>Hi Ch (5310MHz)</b>																																			
1.094	3.0	55.5	43.1	28.2	3.1	-38.1	0.0	0.0	48.7	36.3	74	54	-25.3	-17.7	V																				
1.331	3.0	50.8	36.1	29.1	3.4	-37.8	0.0	0.0	45.5	30.8	74	54	-28.5	-23.2	V																				
10.620	3.0	44.5	31.2	37.5	10.7	-32.6	0.0	0.0	60.1	46.8	74	54	-13.9	-7.2	V																				
15.930	3.0	42.3	32.0	39.2	12.8	-32.1	0.0	0.0	62.2	51.9	74	54	-11.8	-2.1	V																				
1.098	3.0	56.8	40.6	28.2	3.1	-38.1	0.0	0.0	50.0	33.8	74	54	-24.0	-20.2	H																				
1.316	3.0	55.8	36.0	29.0	3.4	-37.8	0.0	0.0	50.5	30.6	74	54	-23.5	-23.4	H																				
10.620	3.0	44.3	31.2	37.5	10.7	-32.6	0.0	0.0	59.9	46.8	74	54	-14.1	-7.2	H																				
15.930	3.0	43.0	32.0	39.2	12.8	-32.1	0.0	0.0	63.0	52.0	74	54	-11.0	-2.0	H																				
Rev. 4.12.7																																			
f	Measurement Frequency	Amp	Preamp Gain																																
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters																																
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m																																
AF	Antenna Factor	Peak	Calculated Peak Field Strength																																
CL	Cable Loss	HPF	High Pass Filter																																

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

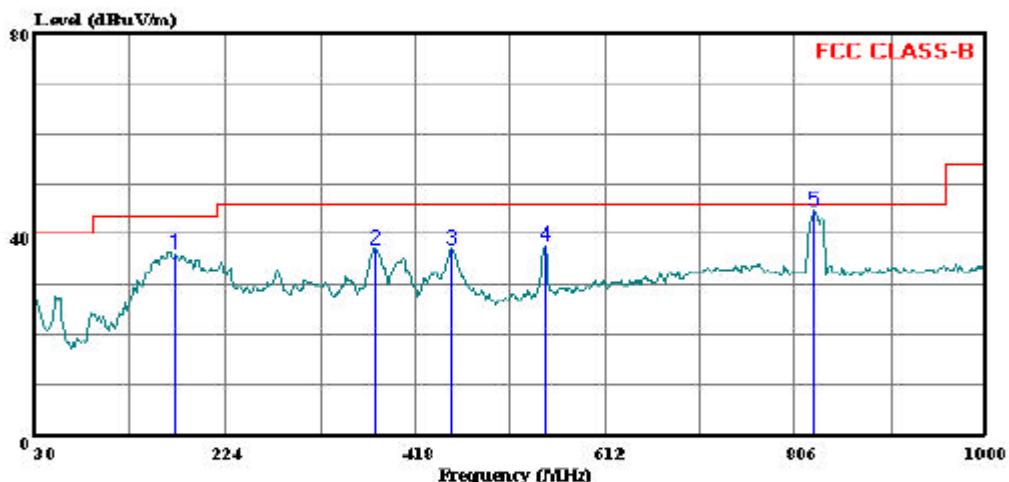
#### SPURIOUS EMISSIONS 30 TO 1000 MHz (5GHz Band, WORST-CASE CONFIGURATION, HORIZONTAL)

##### HORIZONTAL PLOT



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 6 File#: 07U11122A.EMI Date: 06-19-2007 Time: 11:27:44



Trace: 5

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL  
Test Operator:: Keith Ng  
Project #: : 07U11122  
Company: : Broadcom  
Configuration:: EUT only  
Mode : : Tx, 5.2GHz Band  
Target: : FCC class B

## HORIZONTAL DATA

Condition: FCC CLASS-B HORIZONTAL  
Test Operator:: Keith Ng  
Project #: : 07U11122  
Company: : Broadcom  
Configuration:: EUT only  
Mode : : Tx  
Target: : FCC class B

Freq	Read Level	Factor	Level	Limit Line	Over Limit	Probe Factor	Page: 1		
							Cable Loss	Preamp Factor	dB
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	dB	dB	dB	dB
1	172.590	50.66	-14.72	35.94	43.50	-7.56	12.05	1.39	28.16
2	378.230	47.38	-10.36	37.02	46.00	-8.98	15.58	2.12	28.06
3	455.830	45.50	-8.40	37.10	46.00	-8.90	17.15	2.35	27.91
4	550.890	44.15	-6.36	37.79	46.00	-8.21	18.67	2.56	27.58
5	824.430	46.53	-1.86	44.67	46.00	-1.33	21.97	3.20	27.03

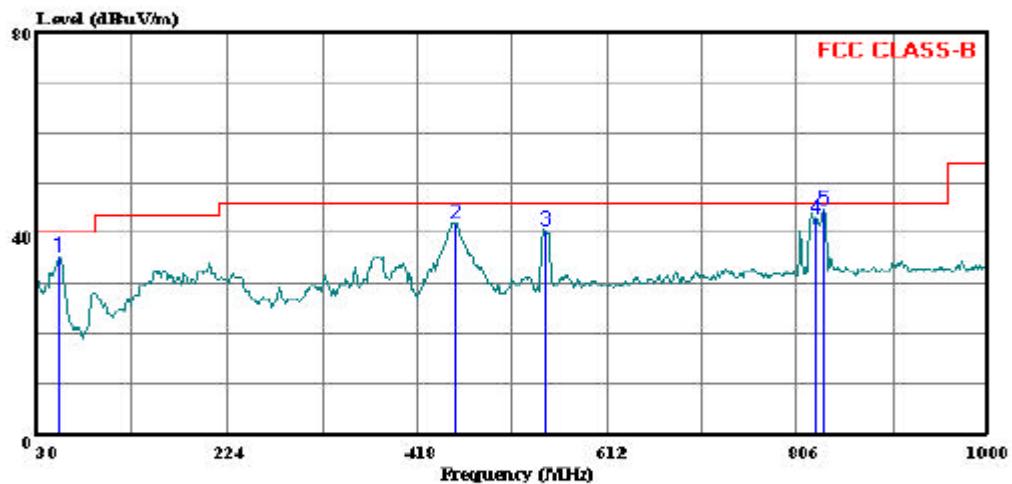
**SPURIOUS EMISSIONS 30 TO 1000 MHz (5GHz Band, WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL PLOT



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 8 File#: 07U11122A.EMI Date: 06-19-2007 Time: 11:36:48



Trace: 7

Ref Trace:

Condition: FCC CLASS-B VERTICAL  
Test Operator:: Keith Ng  
Project #: : 07U11122  
Company: : Broadcom  
Configuration:: EUT only  
Mode : : TX, 5.2GHz Band  
Target: : FCC class B

### VERTICAL DATA

Condition: FCC CLASS-B VERTICAL  
Test Operator:: Keith Ng  
Project #: 07U11122  
Company: Broadcom  
Configuration:: EUT only  
Mode : Tx  
Target: FCC class B

Freq	Read		Limit	Over	Probe	Page: 1			
	Level	Factor				Cable	Preamp		
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	dB	dB	dB
1	53.280	54.43	-19.19	35.24	40.00	-4.76	8.43	0.74	28.36
2	456.800	50.39	-8.38	42.02	46.00	-3.98	17.19	2.34	27.90
3	548.950	46.89	-6.37	40.51	46.00	-5.49	18.64	2.57	27.59
4	824.430	44.66	-1.86	42.80	46.00	-3.20	21.97	3.20	27.03
5	832.190	46.25	-1.74	44.51	46.00	-1.49	22.05	3.26	27.05

## 7.2. 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 <sup>*</sup>	56 to 46 <sup>*</sup>
0.5-5	56	46
5-30	60	50

<sup>\*</sup> 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.

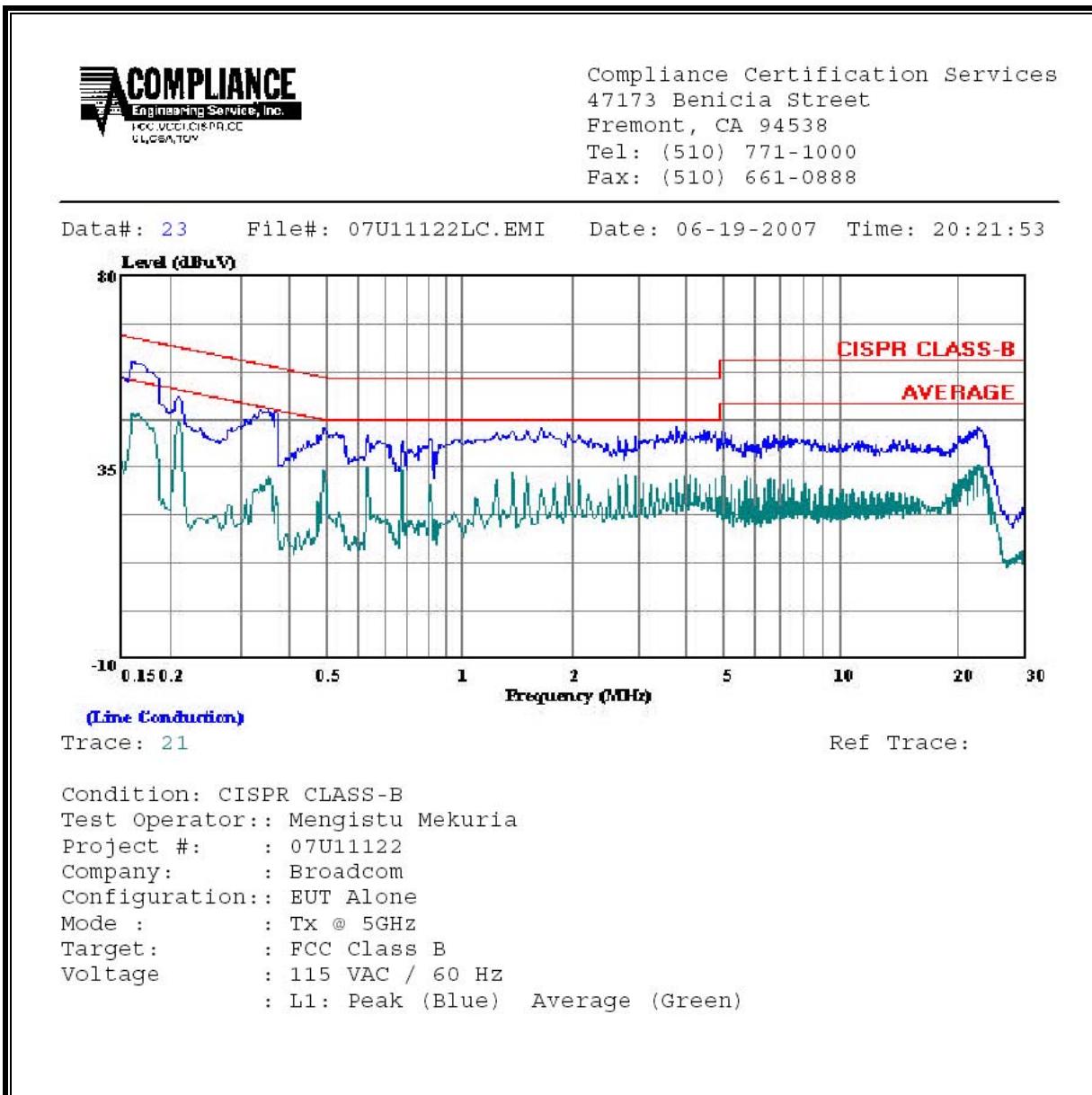
### RESULTS

No non-compliance noted:

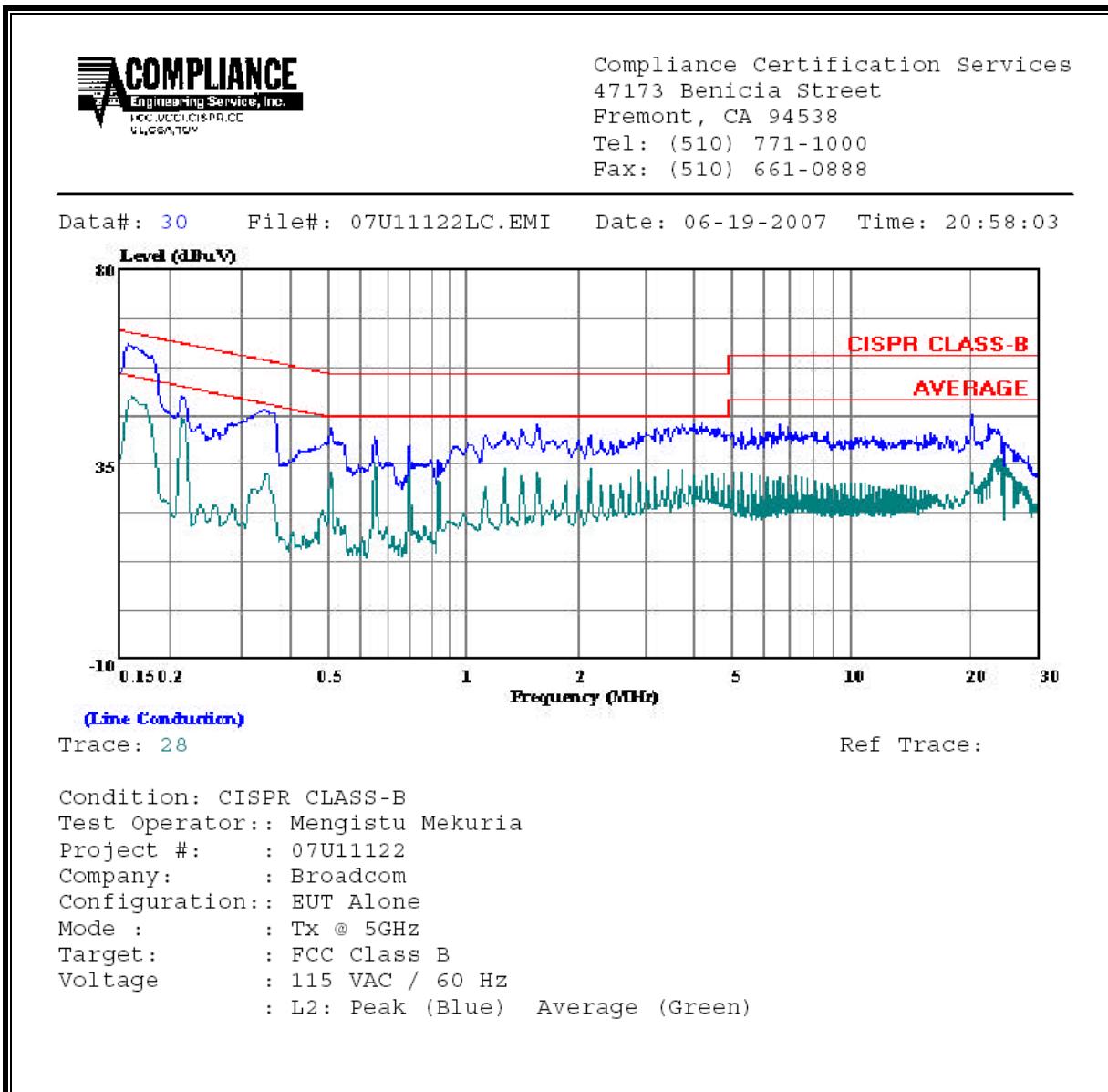
**6 WORST EMISSIONS (5GHz Band)**

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class	Limit	EN_B	Margin		Remark
	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.16	59.76	--	47.53	0.00	65.41	55.41	-5.65	-7.88	L1
0.37	48.06	--	32.93	0.00	58.52	48.52	-10.46	-15.59	L1
3.88	44.40	--	32.14	0.00	56.00	46.00	-11.60	-13.86	L1
0.16	62.74	--	50.59	0.00	65.62	55.62	-2.88	-5.03	L2
0.35	47.62	--	32.91	0.00	59.08	49.08	-11.46	-16.17	L2
4.26	44.46	--	31.30	0.00	56.00	46.00	-11.54	-14.70	L2
6 Worst Data									

**LINE 1 RESULTS**



**LINE 2 RESULTS**

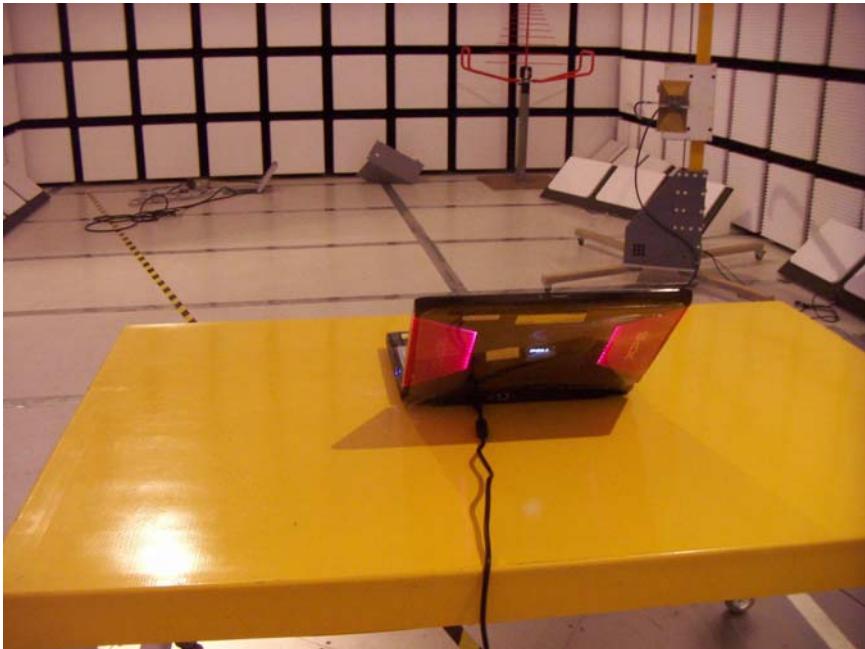


## 8. SETUP PHOTOS

### RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



**POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP**



LINE CONDUCTED BACK PHOTO



**END OF REPORT**