

# FCC CFR47 PART 15 SUBPART E INDUSTRY CANADA RSS-210 ISSUE 7 CLASS II PERMISSIVE CHANGE CERTIFICATION TEST REPORT

FOR
WIRELESS ACCESS POINT
MODEL NUMBER: AP4000-MR

FCC ID: HZB-L49U24U50 IC: 1856A-49240

REPORT NUMBER: 07U11459-1 ISSUE DATE: JANUARY 17, 2008

Prepared for

PROXIM WIRELESS 2115 O NEL DRIVE SANTA CLARA, CA 95131, U.S.A.

Prepared by

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# **Revision History**

Rev.	Issue Date	Revisions	Revised By
	1/17/08	Initial Issue	T. Chan

# DATE: JANUARY 17, 2008 IC: 1856A-49240

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# 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** PROXIM WIRELESS

2115 O NEL DRIVE

SANTA CLARA, CA 94538, U.S.A.

**EUT DESCRIPTION:** WIRELESS ACCESS POINT

MODEL: AP4000-MR SERIAL NUMBER: TN6A500157

**DATE TESTED:** NOVEMBER10-17 AND DECEMBER 3-10, 2007 AND

JANUARY 8-10, 2008

#### **APPLICABLE STANDARDS**

**STANDARD** 

**TEST RESULTS** 

CFR 47 Part 15 Subpart E

No Non-Compliance Noted

RSS-210 Issue 7 Annex 8 and RSS-GEN Issue 2

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:

Tested By:

THU CHAN

EMC SUPERVISOR

COMPLIANCE CERTIFICATION SERVICES

CHIN PANG EMC ENGINEER

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COMPLIANCE CERTIFICATION SERVICES

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# 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, RSS-GEN Issue 2, and RSS-210 Issue 7.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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
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 802.11 abg Access Point with four external antennas.

# 5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The Class II changes to the EUT are as follows:

- 1. A new digital daughterboard has been added onto the original single board product.
- 2. The radio board and the new digital board are now housed in a ruggedized case.
- 3. Minor layout changes were made to the digital portion of the original board to accommodate the daughter board form and fit.

There have been no changes to the layout or the circuit of the radio portion of the product.

#### 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

Please refer to the original FCC ID: HZB-L49U24U50 grant on 05/23/2007.

#### 5.4. SOFTWARE AND FIRMWARE

The EUT driver and Utility software installed during testing was Solarwinds.Net TFTP Server and Art\_ap4000MR.sei

#### 5.5. WORST-CASE CONFIGURATION AND MODE

The four worst case of external antenna types with the access point. They are Omni, Sector, Panel and Parabolic antennas with a maximum gain of 13 dB, 17dbi, 28.2dBi and 33.4dBi.

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at low channel for 5.2GHz and 5.5GHz band. For 5.8GHz band EUT was investigated on the worst case with highest power and highest antenna gain.

The worst-case data rate for this channel is determined to be 6 Mb/s.

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# 5.6. DESCRIPTION OF TEST SETUP

# **SUPPORT EQUIPMENT**

PERIPHERAL SUPPORT EQUIPMENT LIST					
Description	Manufacturer	Model	Serial Number	FCC ID	
Notebook	Sony	PCG-881R	R2429159	DoC	
AC Adapter	Sony	PCGA-AC16V	0202B0335718R	DoC	
POE	PowerDsine	3001G	R0717608001109800	DoC	

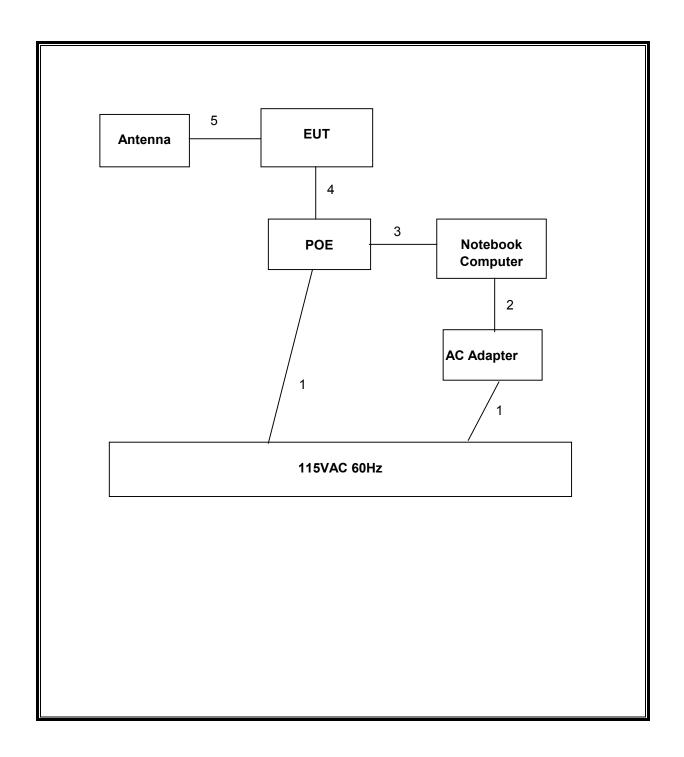
# **I/O CABLES**

	I/O CABLE LIST						
Cable No.	Port	# of Identica Ports	Connector Type	Cable Type	Cable Length	Remarks	
1	AC	1	US 115V	Un-shielded	2m	N/A	
2	DC	1	DC	Un-shielded	2m	N/A	
3	Data In	1	RJ45	Un-shielded	2m	N/A	
4	Data & Power Out	1	RJ45	Un-shielded	0.2m	N/A	
5	SMA	1	Antenna	Shielded	1m	N/A	

#### **TEST SETUP**

The EUT is installed in a host laptop computer during the tests. 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	Asset	Cal Date	Cal Due
Peak Power Meter	Agilent / HP	E4416A	C00963	2/14/2007	12/7/2008
Peak / Average Power Sensor	Agilent	E9327A	C00964	2/14/2007	12/7/2008
Horn	EMCO	3115	C00945	4/15/2007	4/15/2008
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	10/3/2007	9/28/2008
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	8/6/2007	9/28/2008
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	9/30/207	10/11/2008
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	4/11/2007	4/11/2008
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	10/15/2007	9/28/2008
Preamp, 1000MHz	Sonoma	310N	NA	1/20/2007	1/20/2008
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01012	5/2/2007	8/7/2008
EMI Test Receiver, 30 MHz	R&S	ESHS 20	N02396	10/16/2006	1/27/2008
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	9/15/2007	10/25/2008

# 7. RADIATED TEST RESULTS

# 7.1. LIMITS AND PROCEDURE

#### **LIMITS**

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range	Field Strength Limit	Field Strength Limit	
(MHz)	(uV/m) at 3 m	(dBuV/m) at 3 m	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	

#### **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.

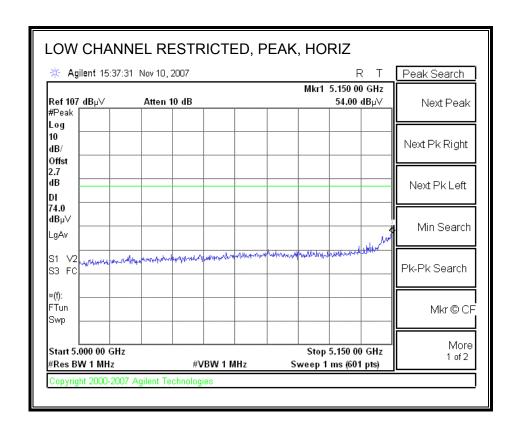
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

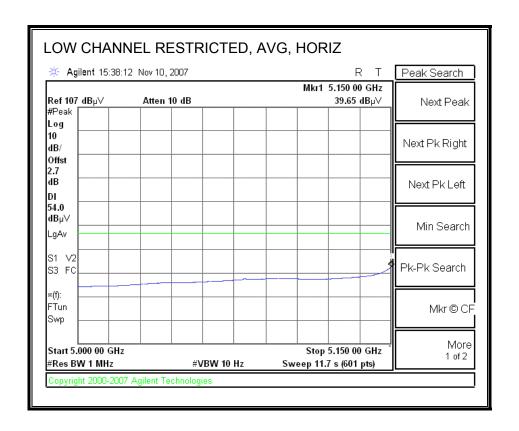
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

# 7.1.1. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.2 GHz BAND

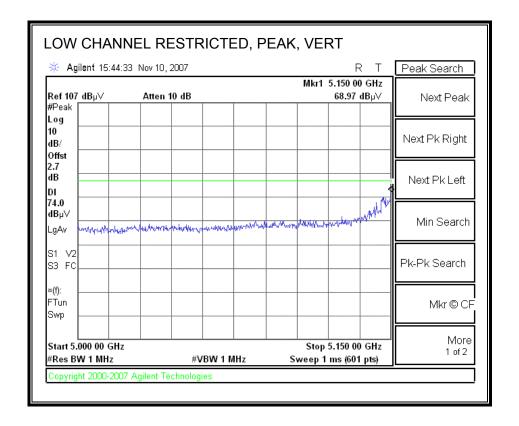
#### **SECTOR ANTENNA**

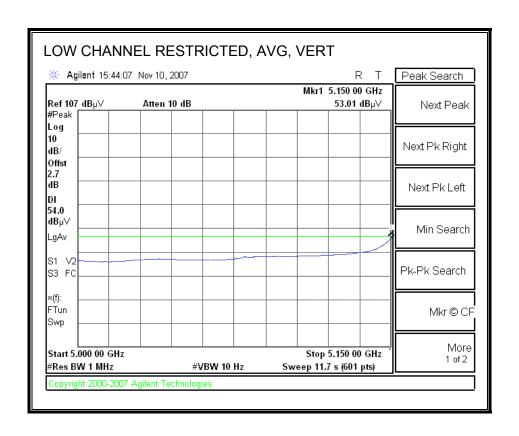
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



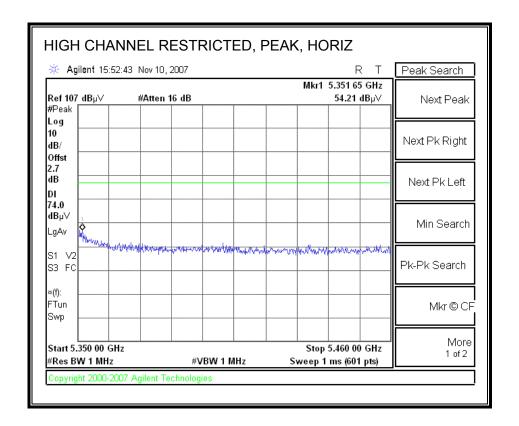


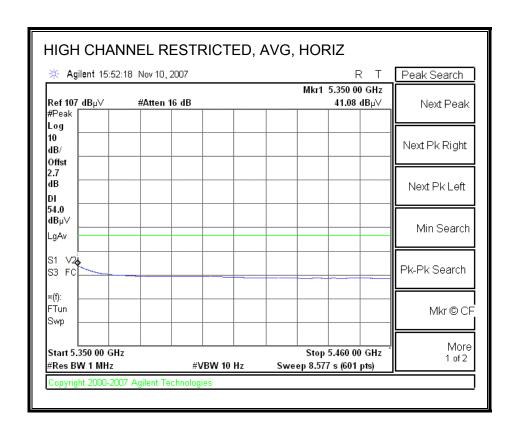
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



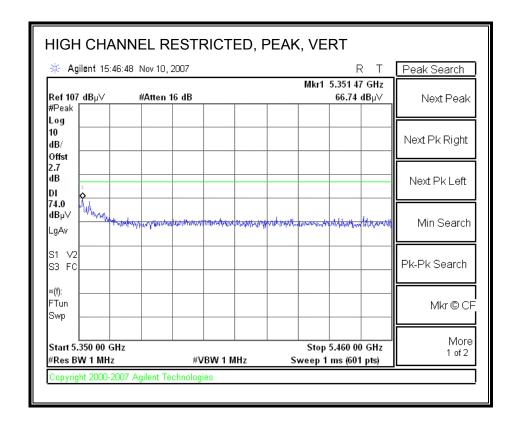


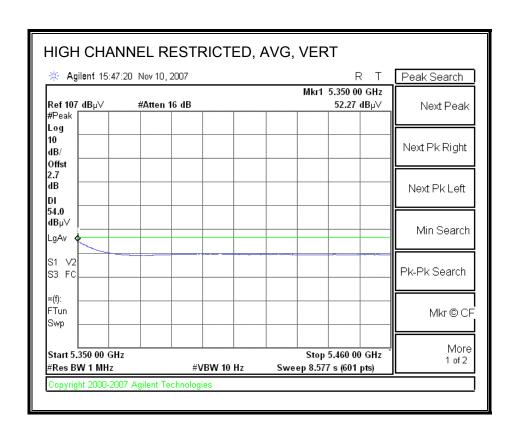
#### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



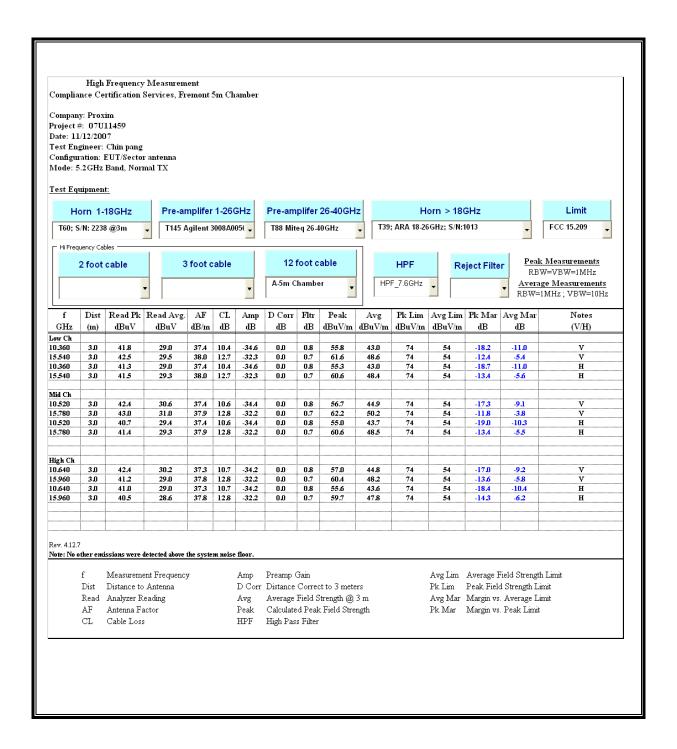


#### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



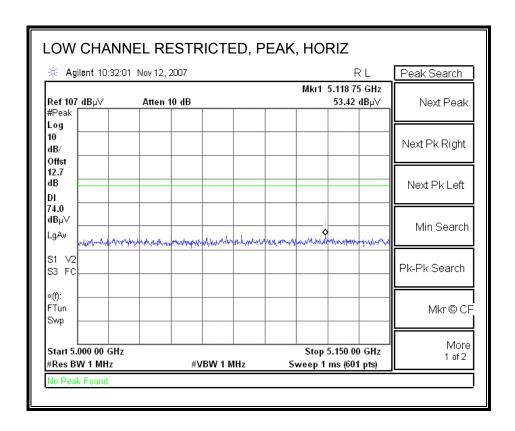


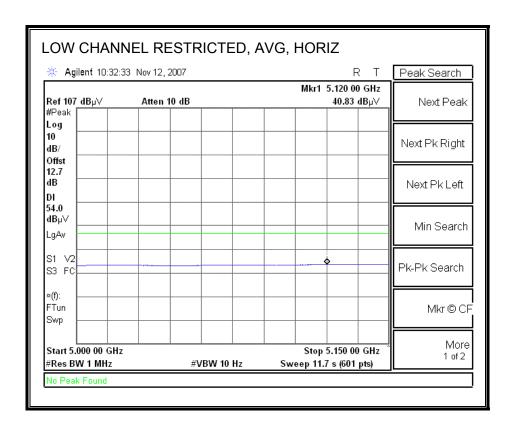
#### HARMONICS AND SPURIOUS EMISSIONS



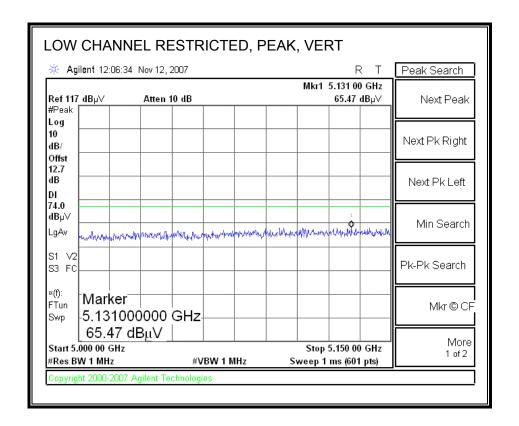
# **PANEL ANTENNA**

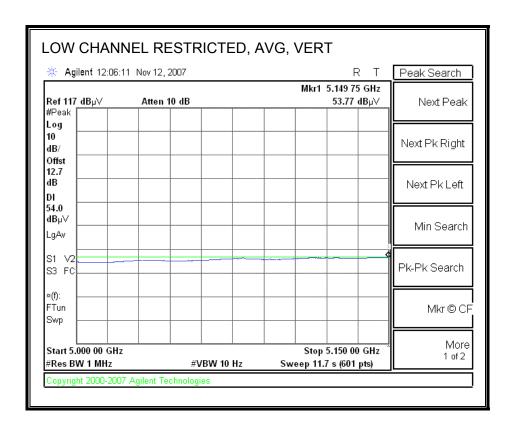
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



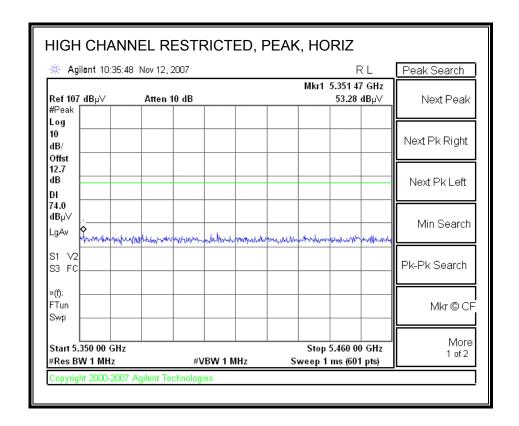


#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



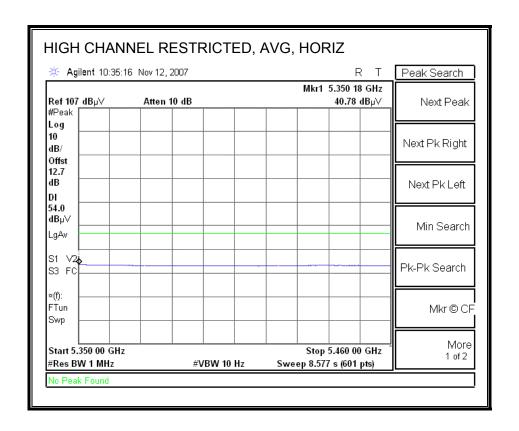


#### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

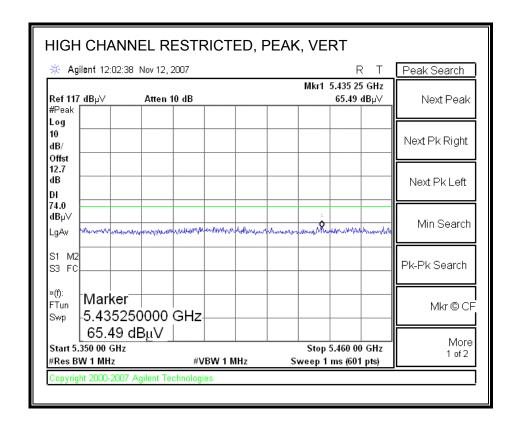


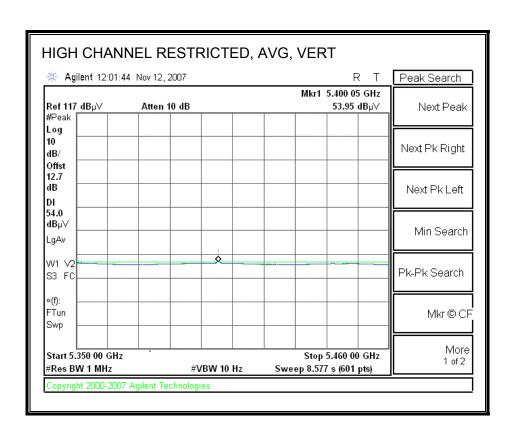
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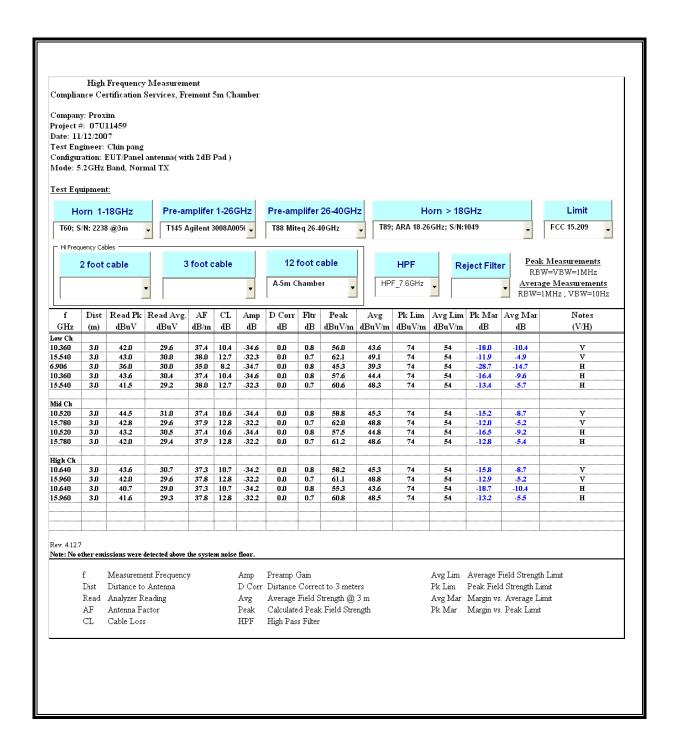


#### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



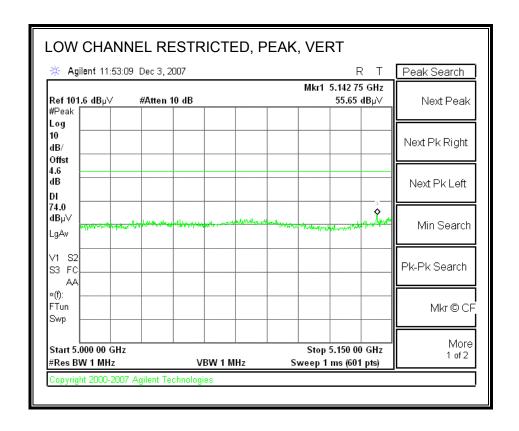


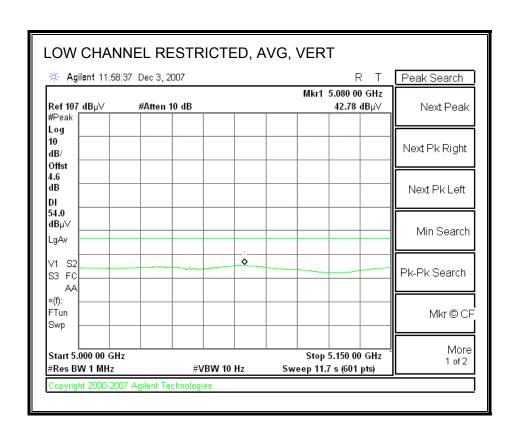
#### HARMONICS AND SPURIOUS EMISSIONS



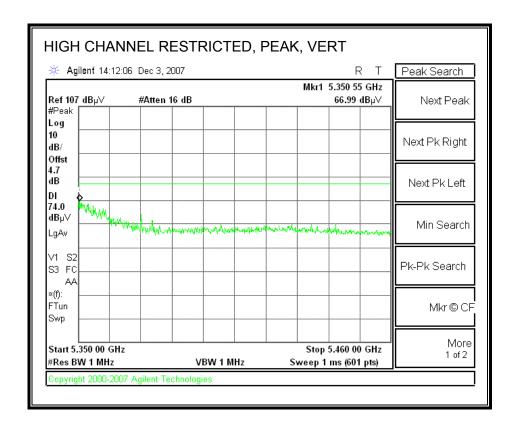
#### **OMNI ANTENNA**

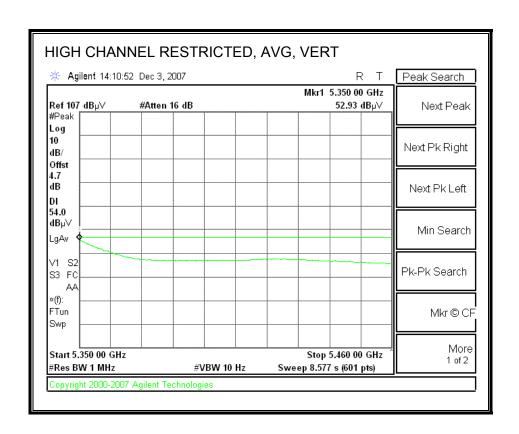
# RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL) (WORST CASE)



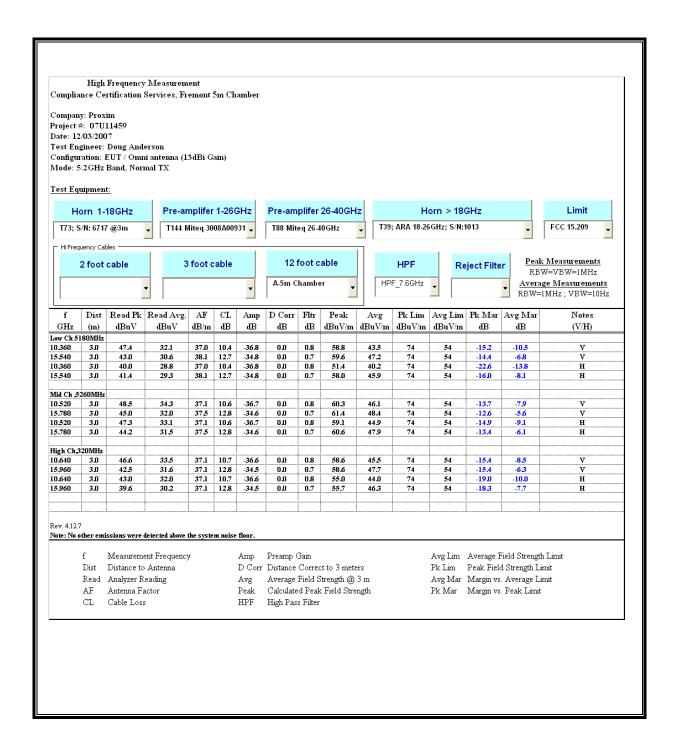


#### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)( WORST CASE)



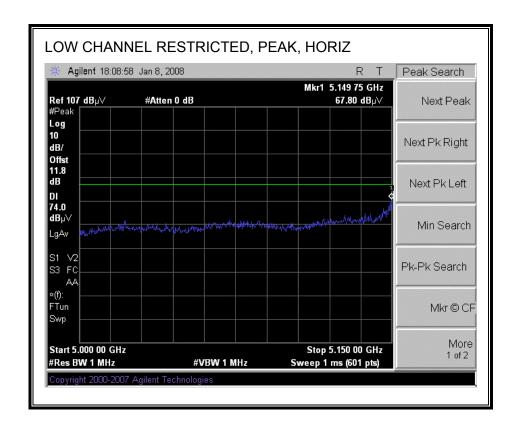


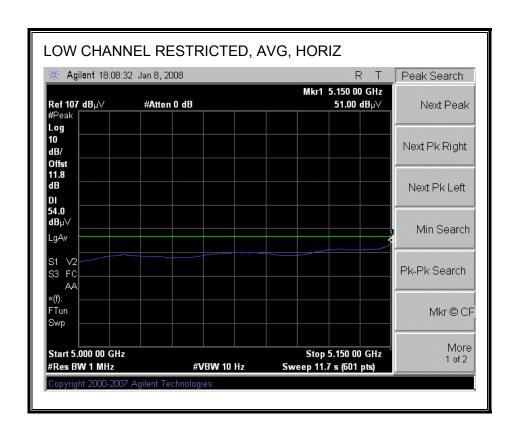
#### HARMONICS AND SPURIOUS EMISSIONS



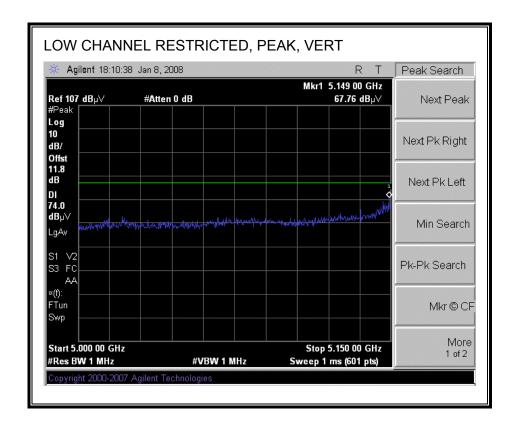
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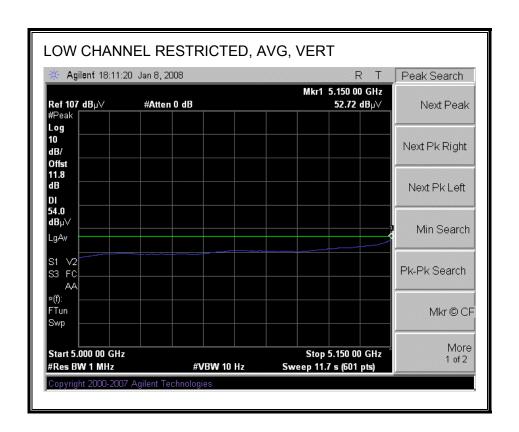
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



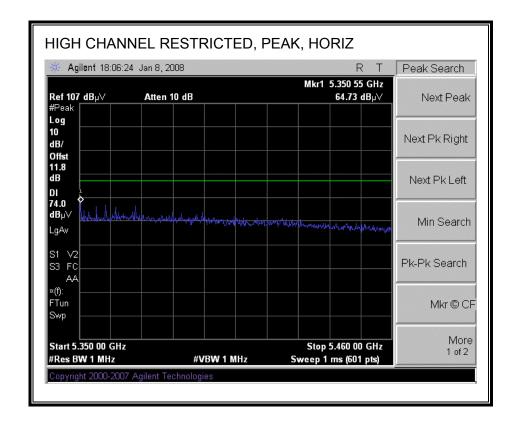


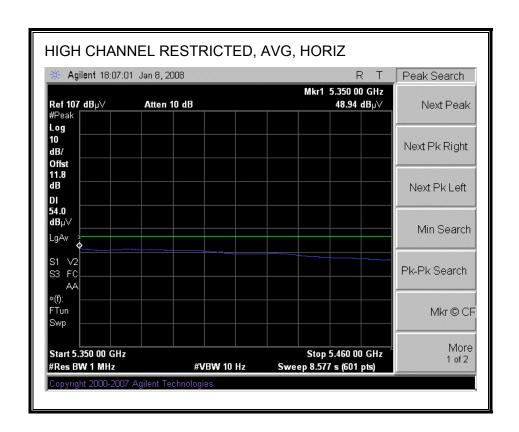
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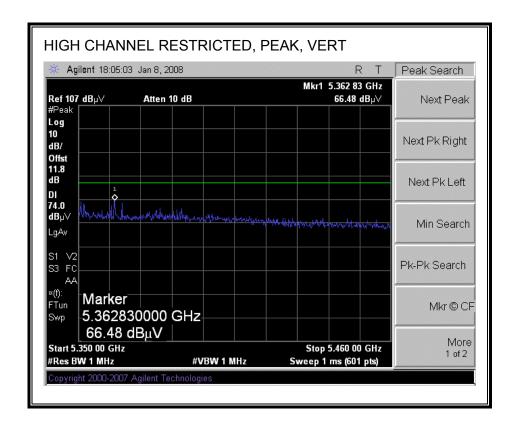


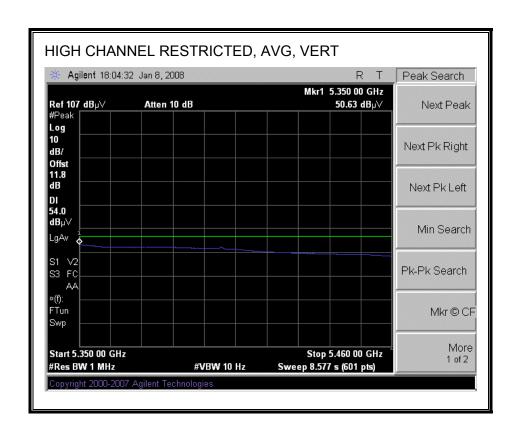
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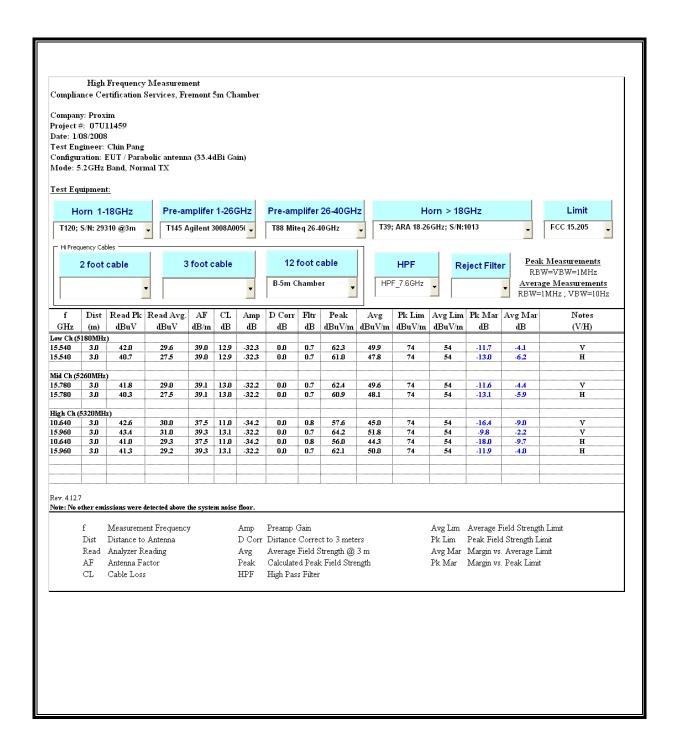


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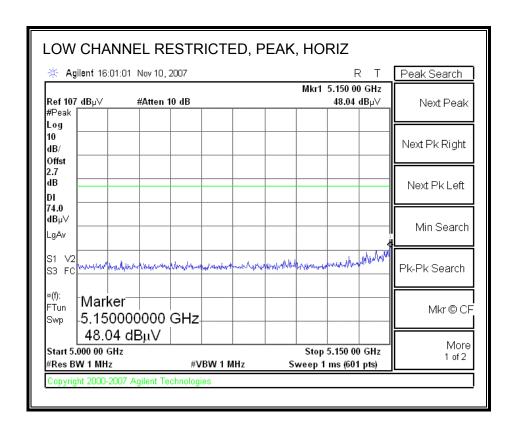
#### **HARMONICS AND SPURIOUS EMISSIONS**

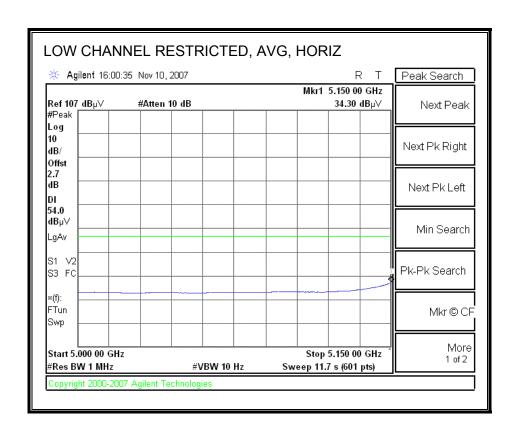


# 7.1.2. TRANSMITTER ABOVE 1 GHz FOR 802.11a TURBO MODE IN THE 5.2 GHz BAND

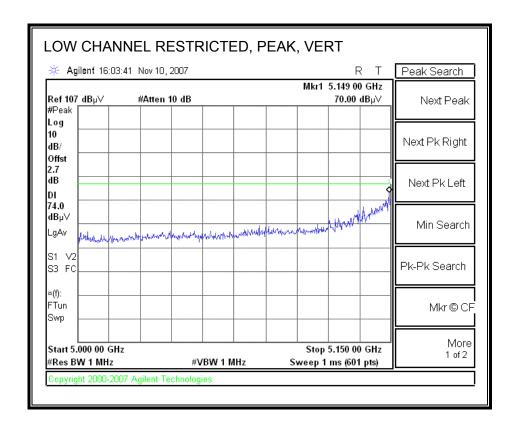
### **WITH SECTOR ANTENNA**

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



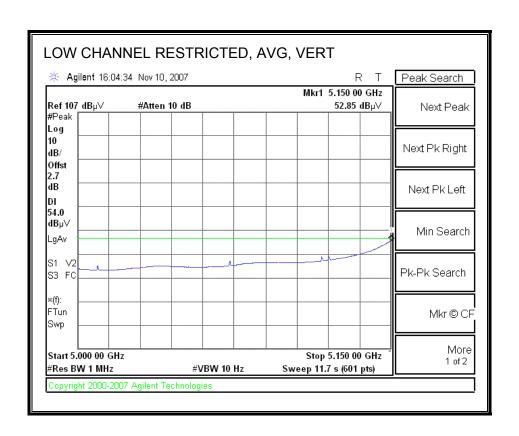


### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

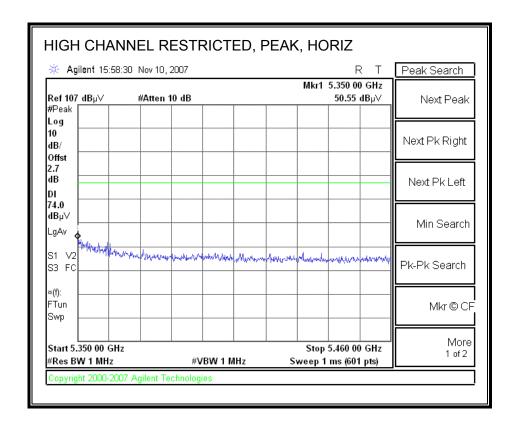


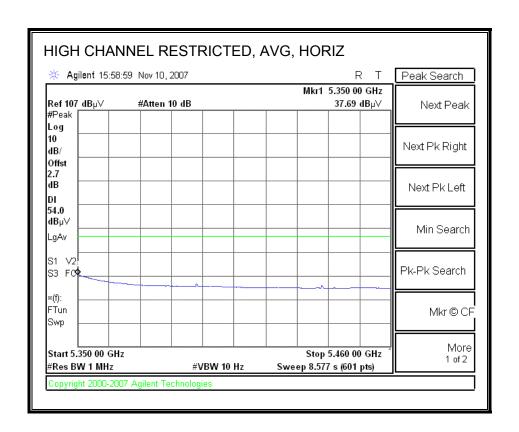
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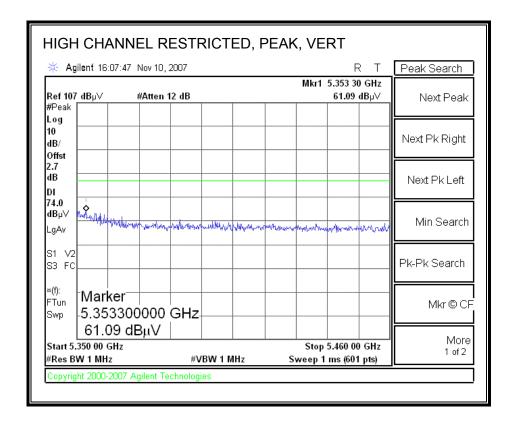


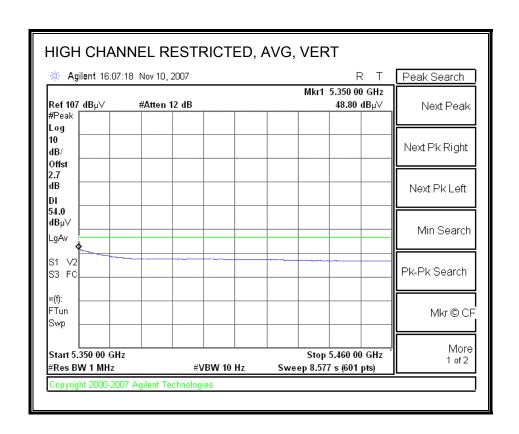
### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



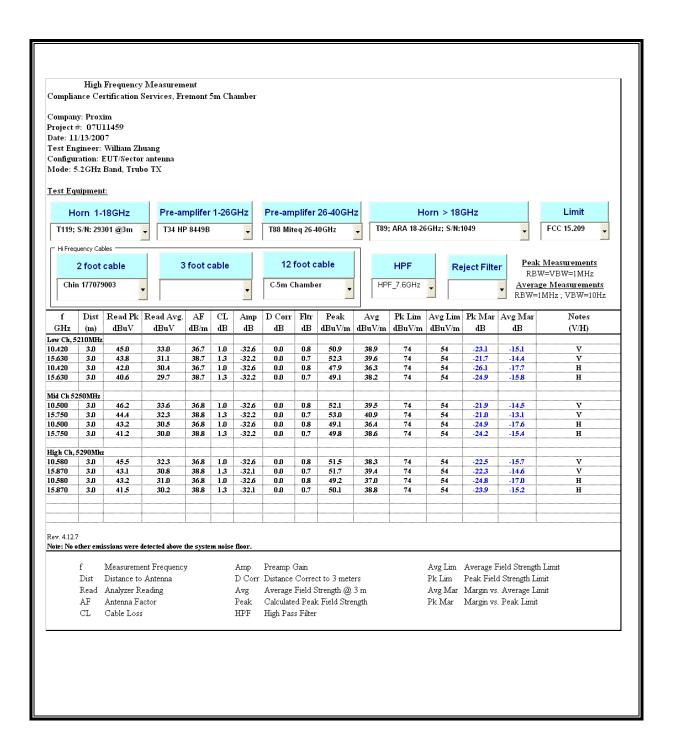


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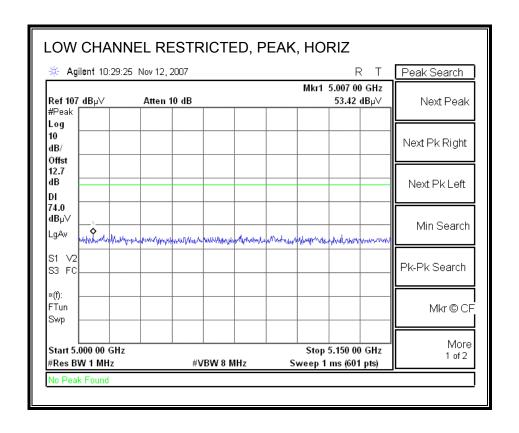


#### **HARMONICS AND SPURIOUS EMISSIONS**



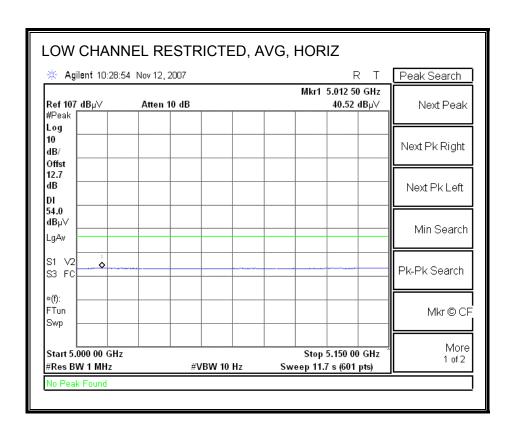
# **WITH PANEL ANTENNA**

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

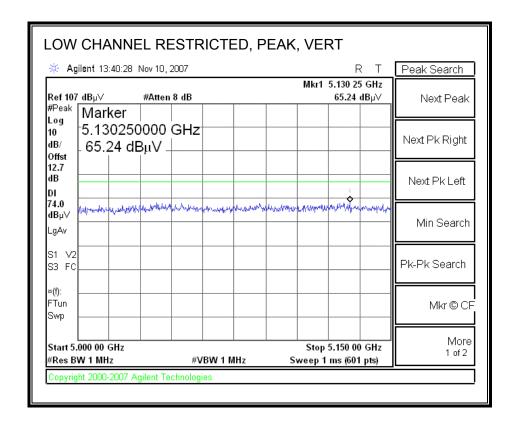


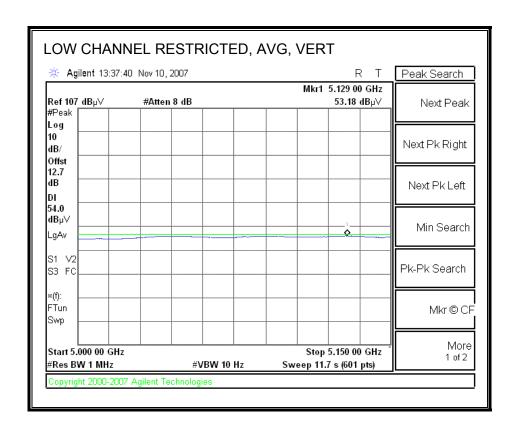
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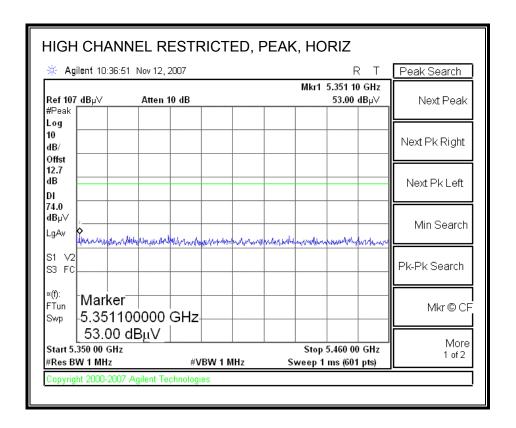


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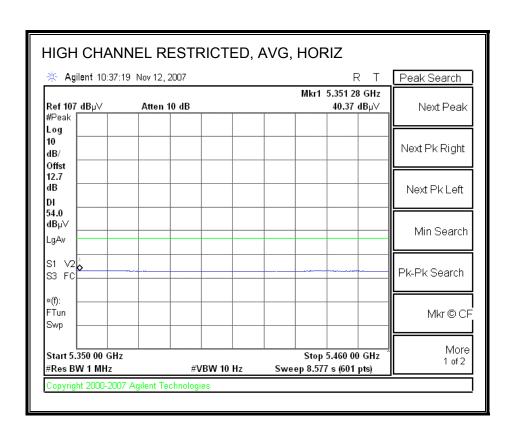


### RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)

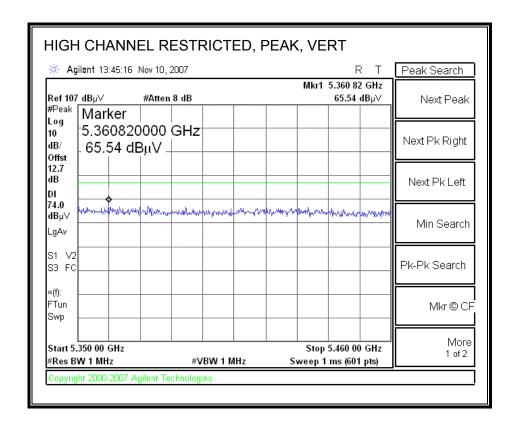


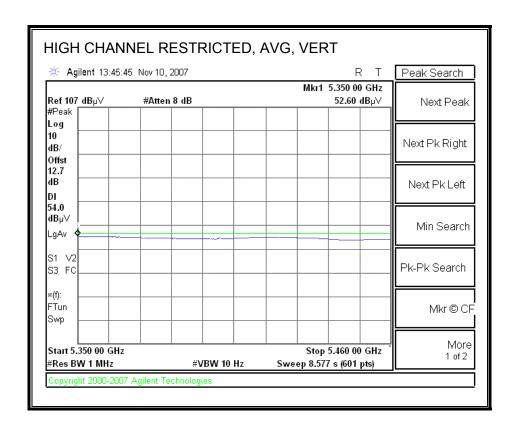
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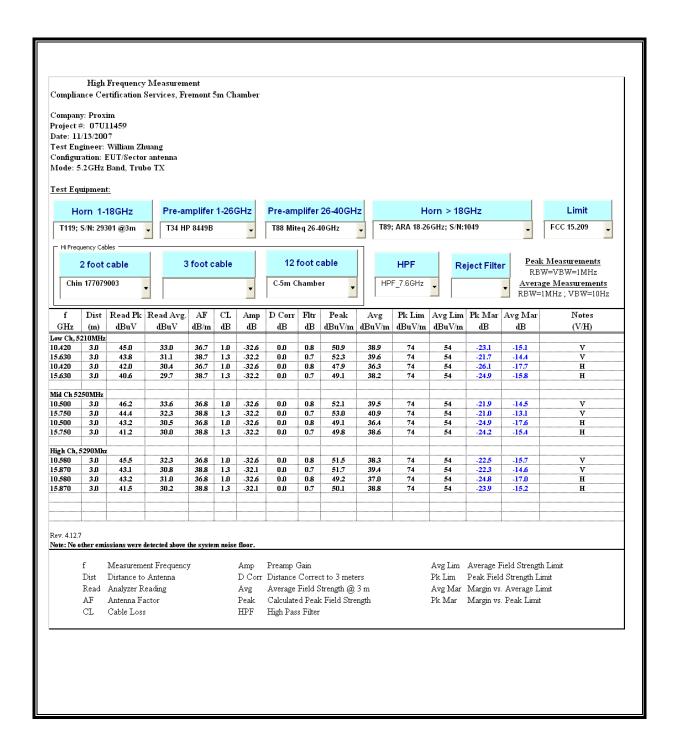


### RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)





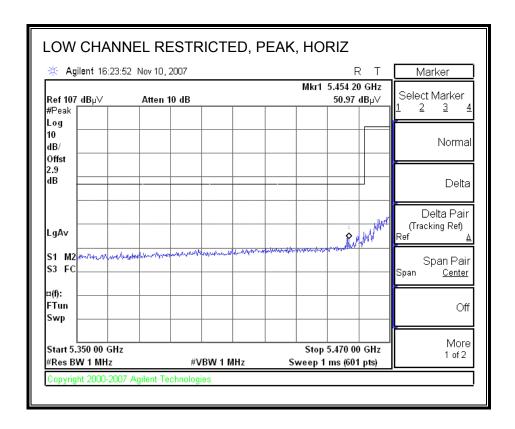
# HARMONICS AND SPURIOUS EMISSIONS

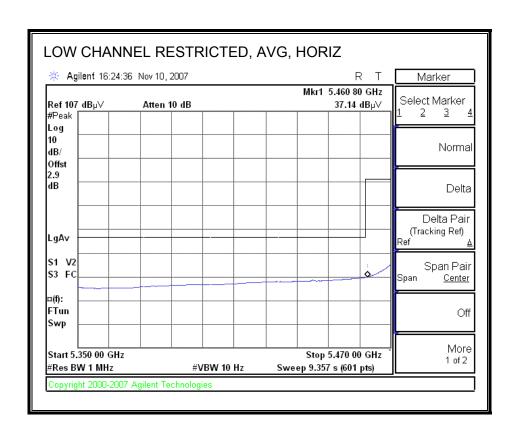


# 7.1.3. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.6 GHz BAND

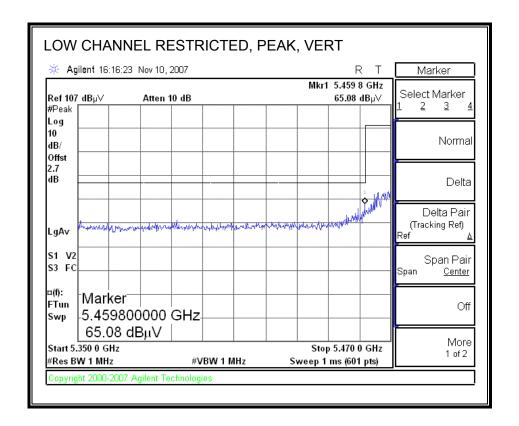
### **SECTOR ANTENNA**

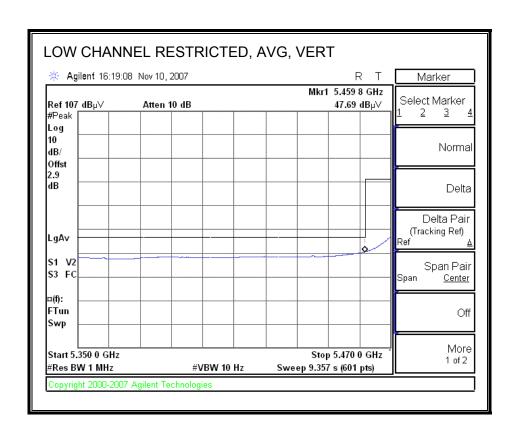
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



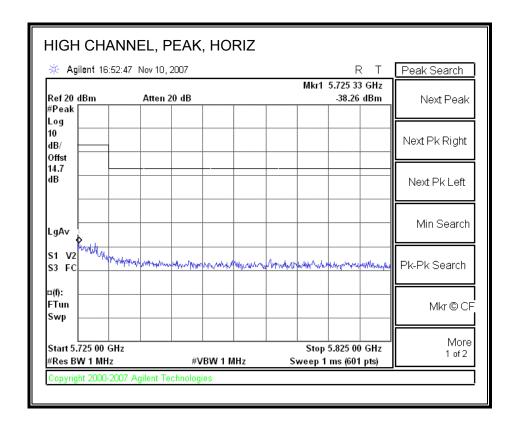


### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



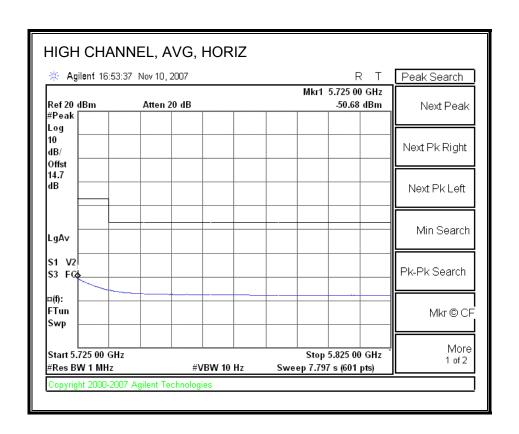


### <u>AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)</u>

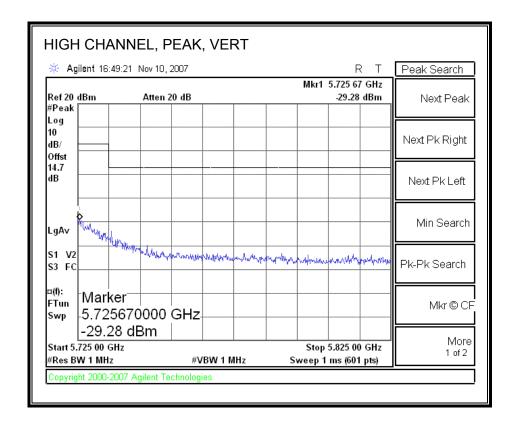


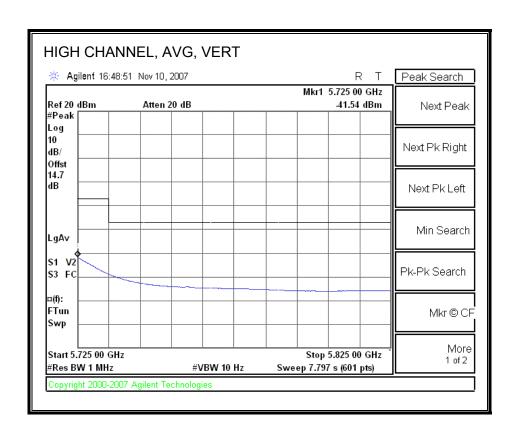
REPORT NO: 07U11459-1 DATE: JANUARY 17, 2008 FCC ID: HZB-L49U24U50

IC: 1856A-49240

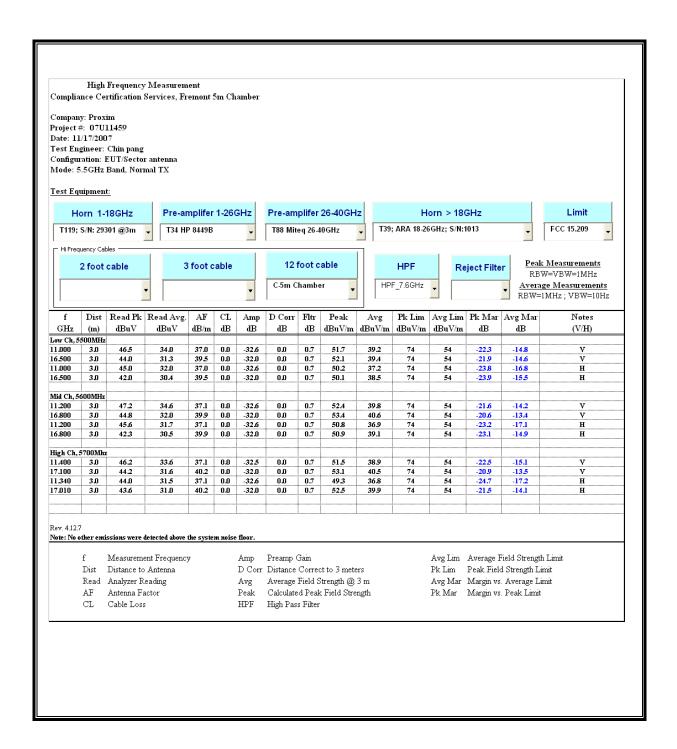


### **AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**



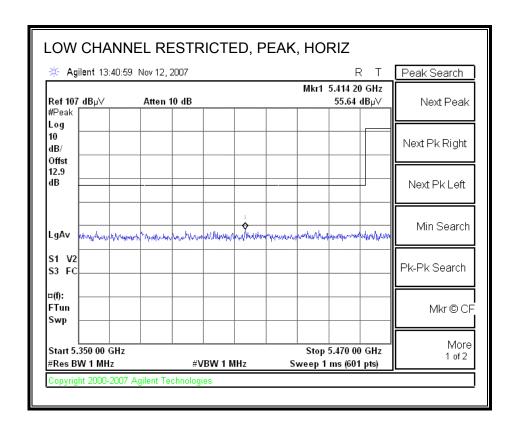


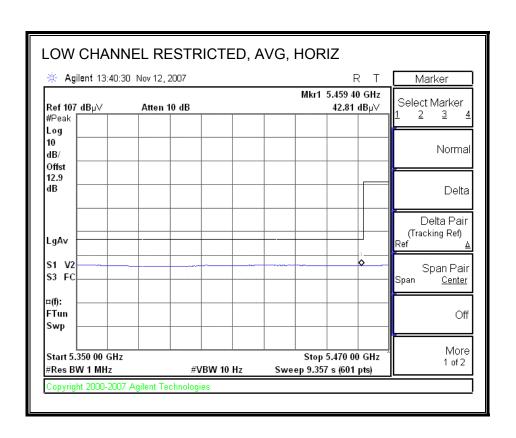
#### **HARMONICS AND SPURIOUS EMISSIONS**



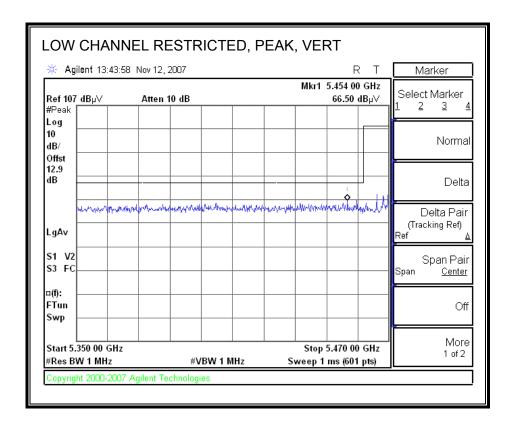
### **PANEL ANTENNA**

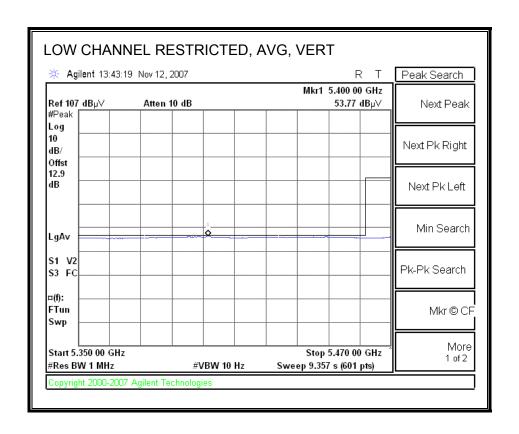
### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



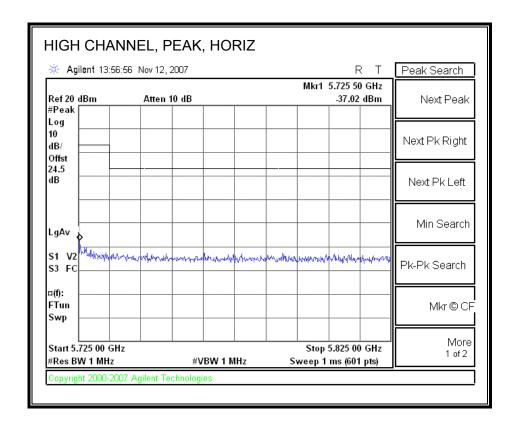


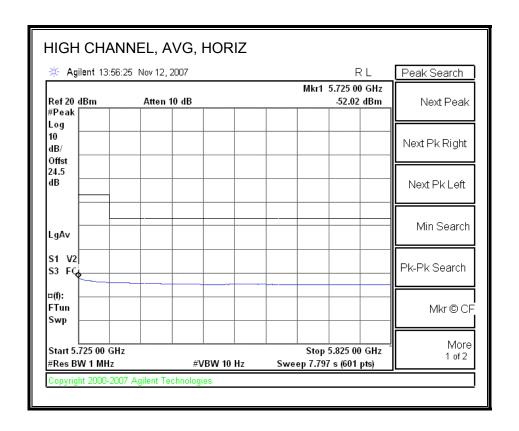
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



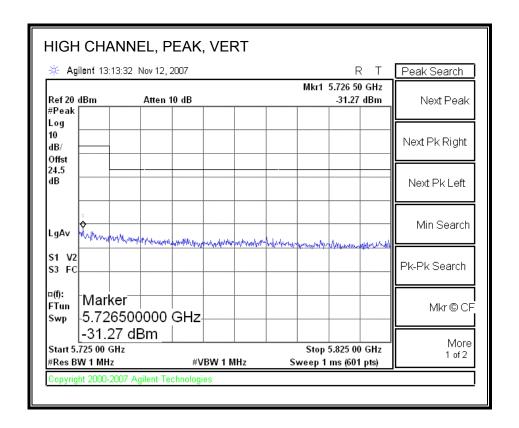


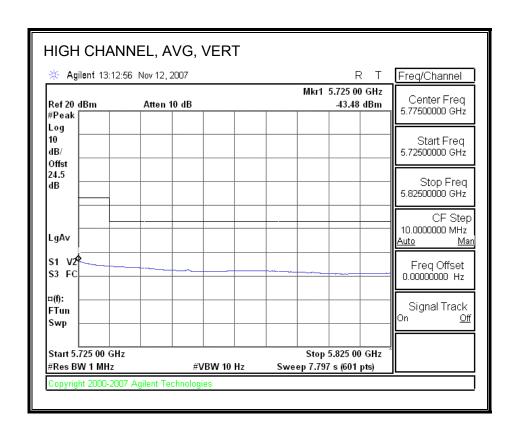
#### **AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

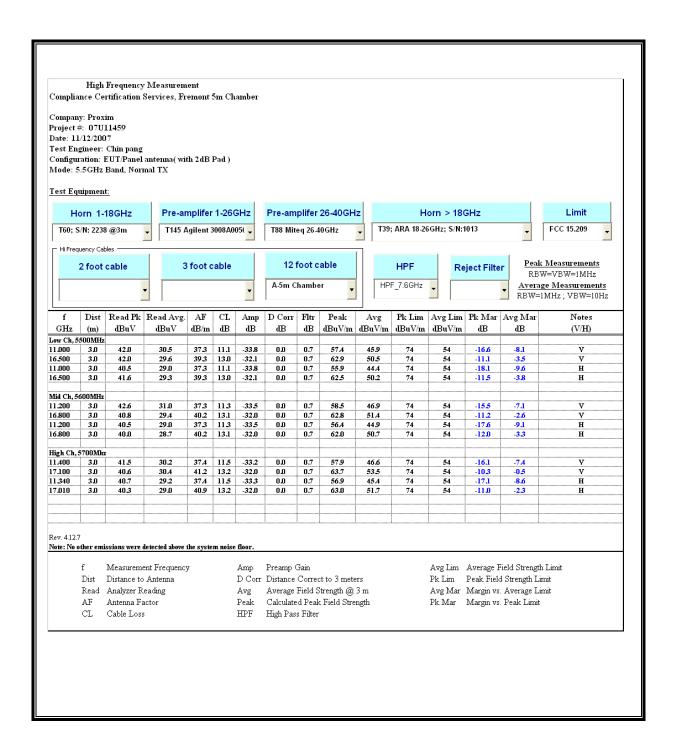




#### **AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**

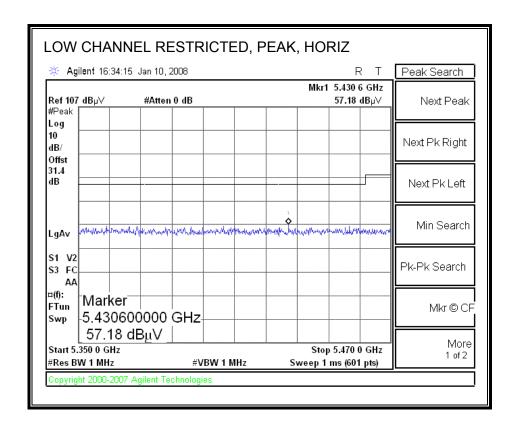


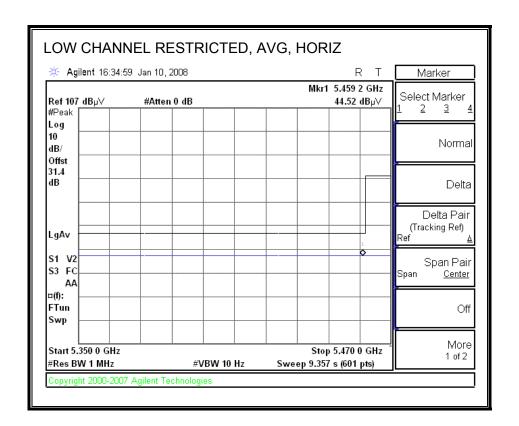




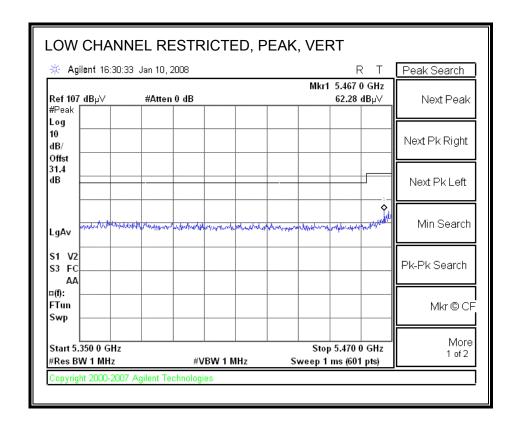
#### O)MNI ANTENNA

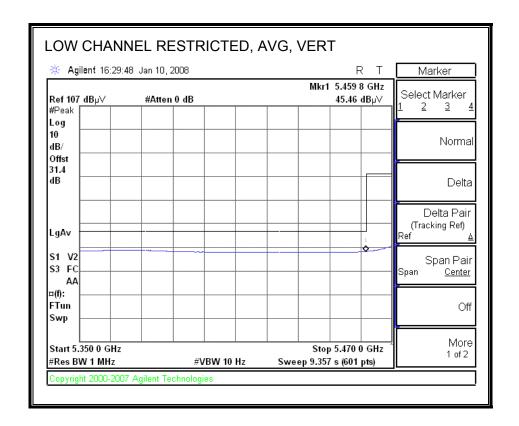
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



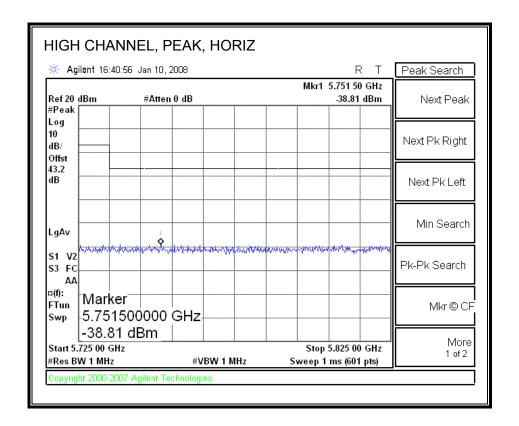


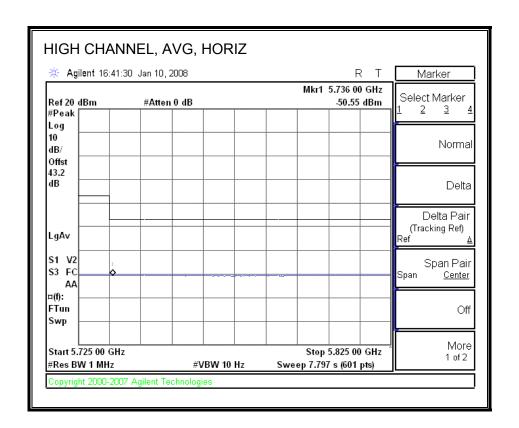
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



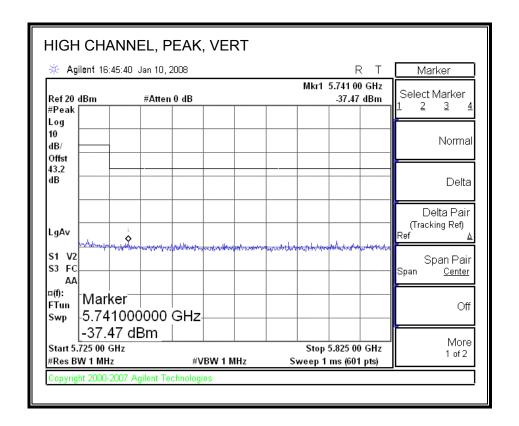


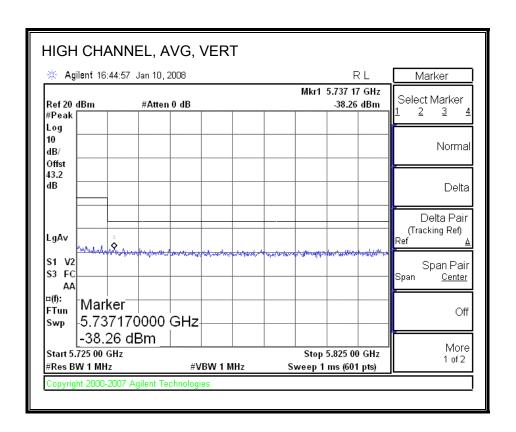
#### **AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)**

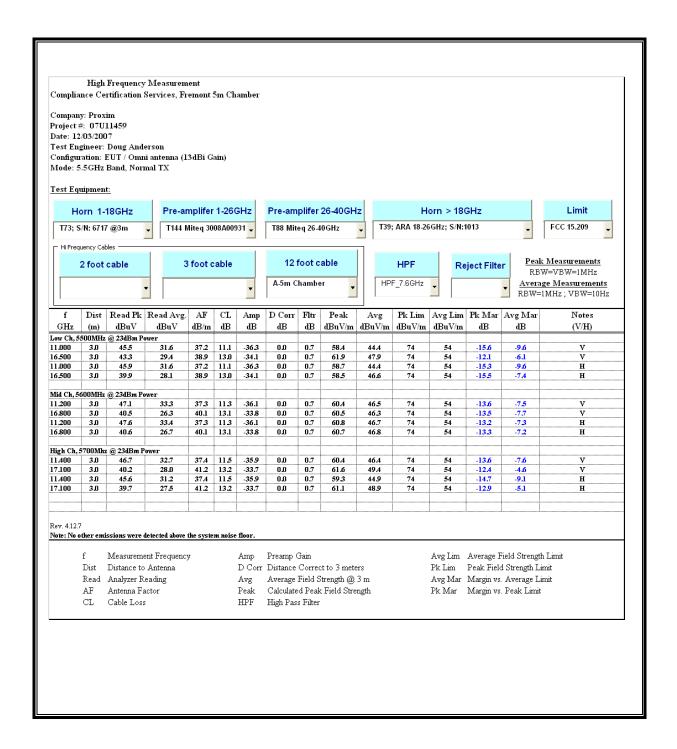




#### **AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**

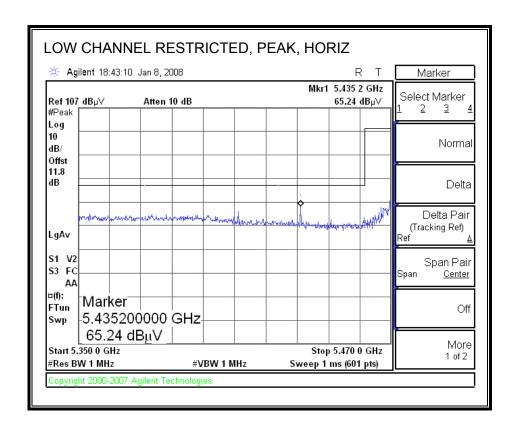


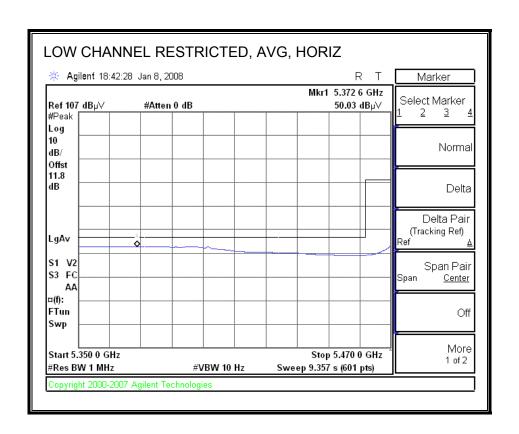




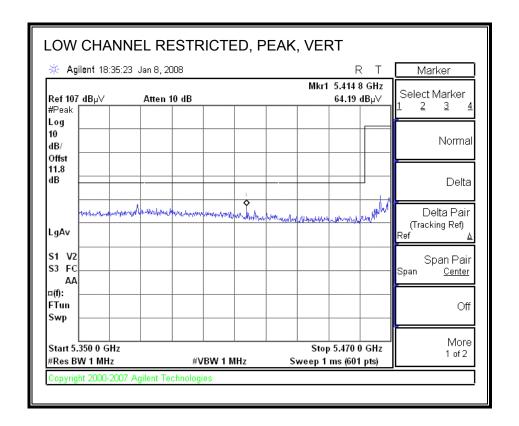
#### **PARABOLIC ANTENNA**

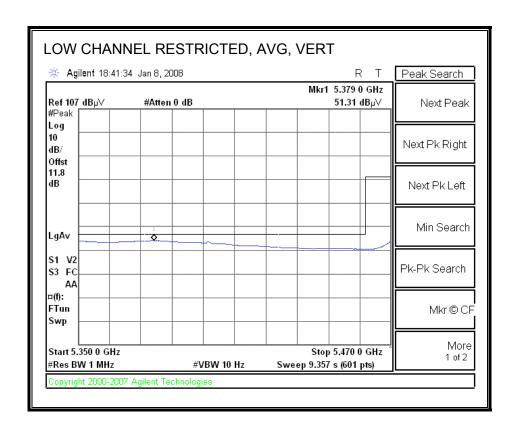
#### RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



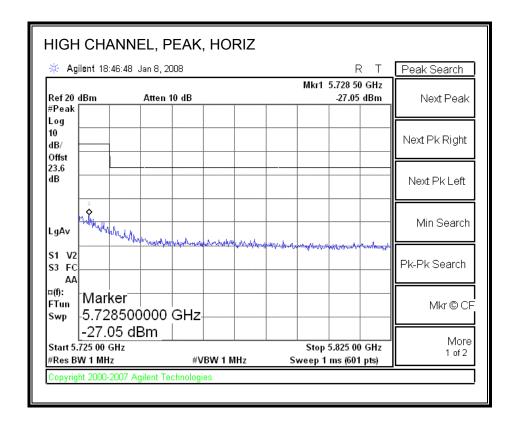


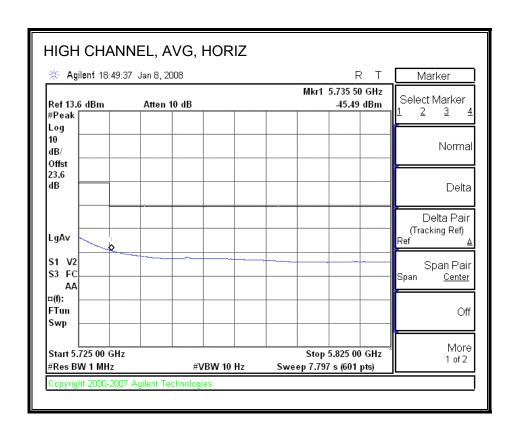
#### RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



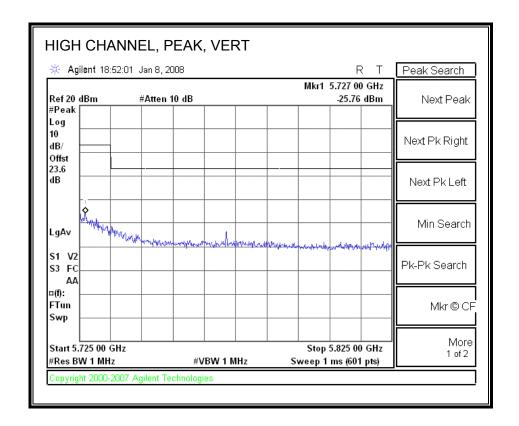


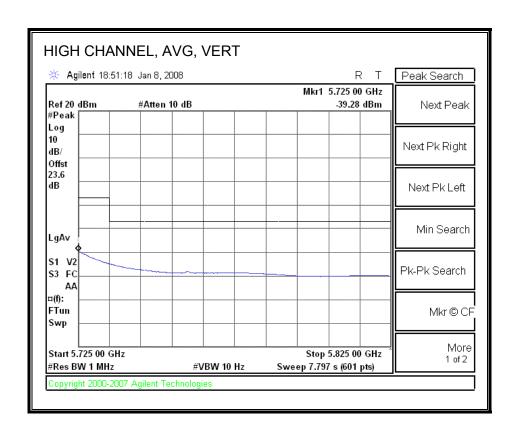
#### <u>AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)</u>

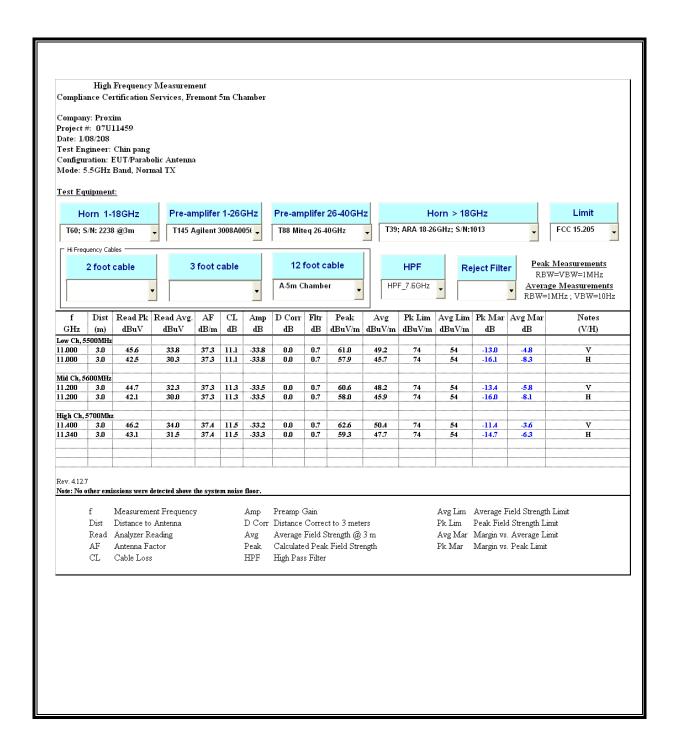




#### **AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)**

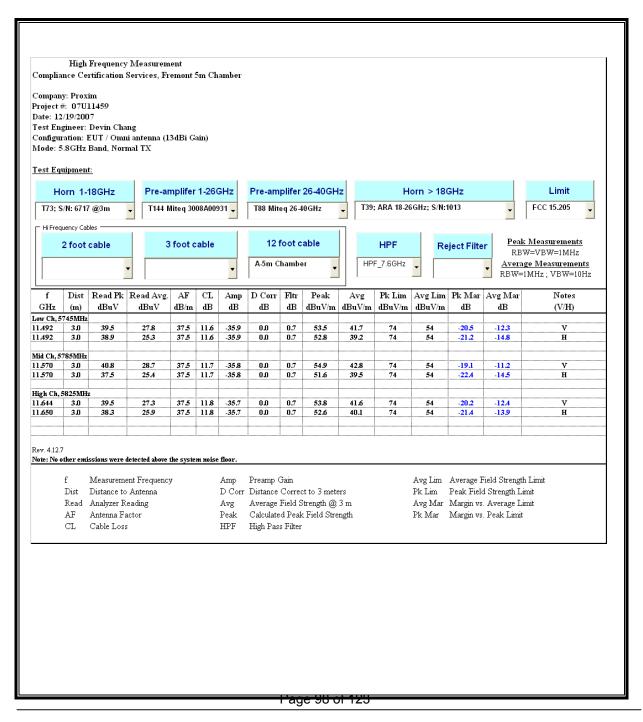




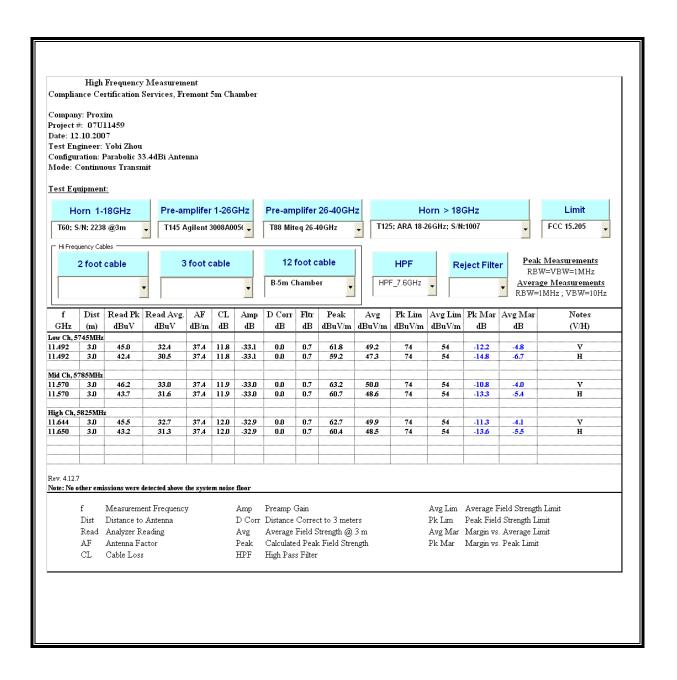


# 7.1.4. TRANSMITTER ABOVE 1 GHz FOR 802.11a MODE IN THE 5.8 GHz BAND (WORST CASE, HIGHEST POWER AND HIGHEST ANTENNA GAIN)

#### **OMNI ANTENNA**

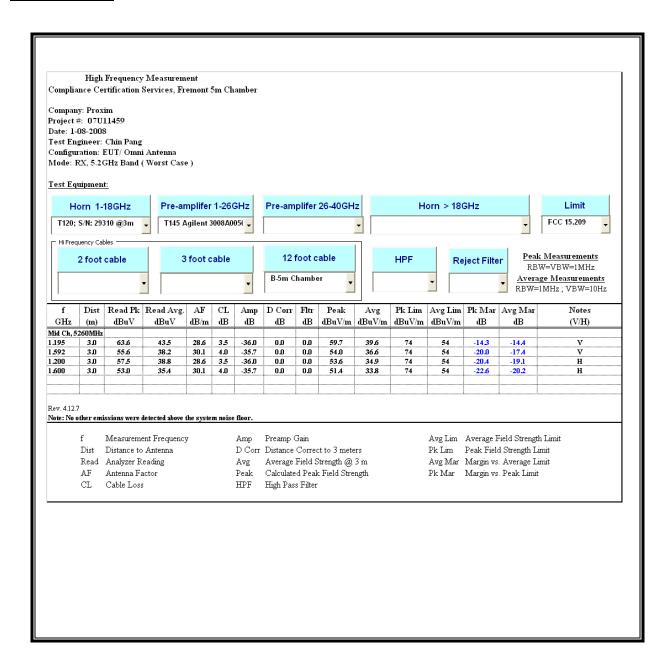


#### **PARABOLIC ANTENNA**

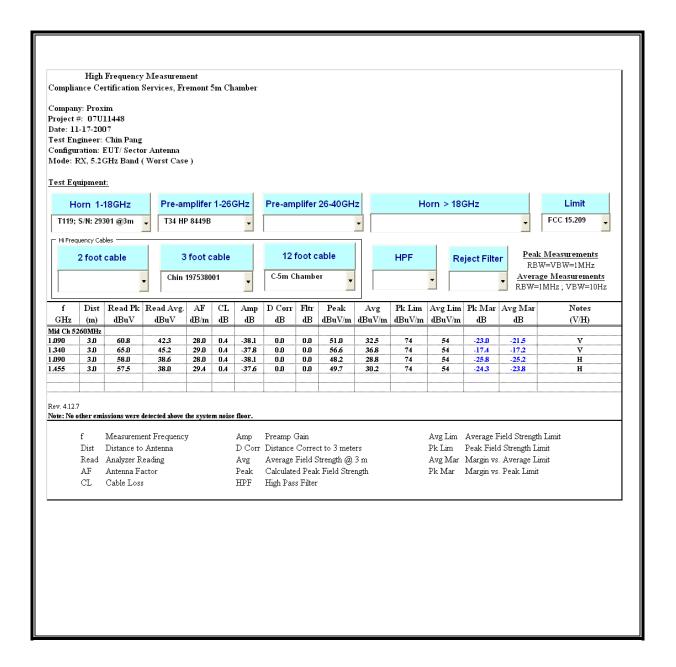


# 7.1.5. RECEIVER ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 5GHz BAND

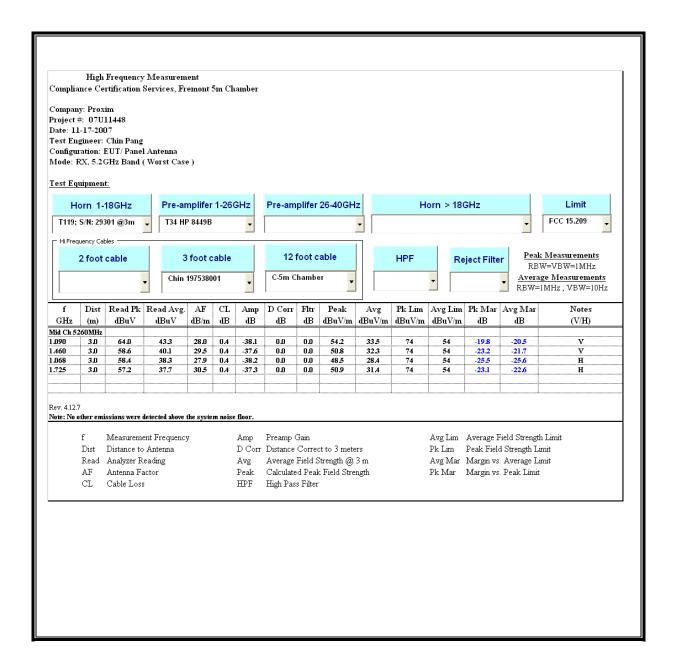
#### **OMNI ANTENNA**



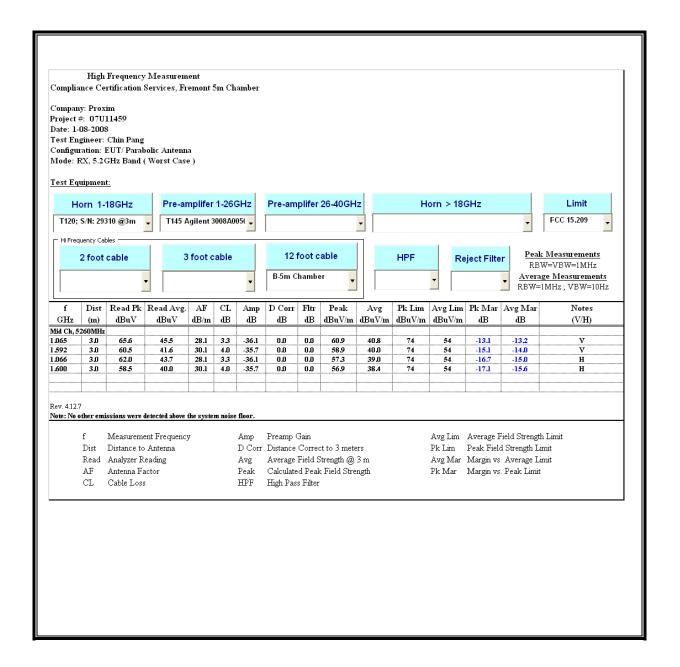
#### **SECTOR ANTENNA**



# **PANEL ANTENNA**



# **PARBOLIC ANTENNA**



# 7.2. WORST-CASE BELOW 1 GHz

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

HORIZO	HORIZONTAL DATA										
-	Freq		Factor		Line	Over Limit	Remark	Page: 1			
1 2 3 4 5 6	42.610 62.010 106.630 245.340 318.090 337.490	48.98 56.29 56.46 51.94 48.81	-17.56 -23.04 -19.33 -18.03 -15.36	31.42 33.25 37.13 33.91 33.45	40.00 40.00 43.50 46.00 46.00	-8.58 -6.75 -6.37 -12.09 -12.55	Peak Peak Peak Peak				

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

VERT	VERTICAL DATA										
	Freq	Read Level	Factor	Level		Over Limit	Remark	Page:	1		
	MHz	dBuV	dB	dBuV/m	$\overline{\text{dBuV/m}}$	dB					
1 2 3 4 5 6	153.190 243.400 337.490 442.250 557.680 675.050	48.06 50.37 44.29 41.24	-19.66 -16.77 -14.64 -13.07	28.40 33.60 29.65 28.17	46.00 46.00 46.00 46.00	-17.60 -12.40 -16.35 -17.83	Peak Peak Peak Peak				

# 8. AC POWER LINE CONDUCTED EMISSIONS

#### **LIMITS**

FCC §15.207 (a)

RSS-Gen 7.2.2

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 receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

#### **RESULTS**

# **6 WORST EMISSIONS**

# **POE POWER**

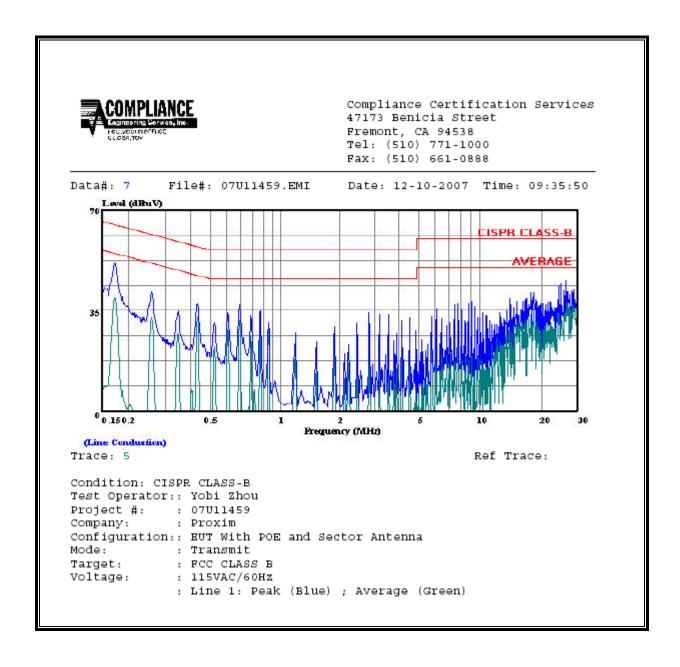
	CONDUCTED EMISSIONS DATA (115VAC 60Hz)										
Freq.		Closs	Limit	FCC_B	Margin		Remark				
(MHz)	PK (dBuV) QP (dBuV) AV (dBuV)		(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2			
0.47	35.01		27.16	0.00	56.53	46.53	-21.52	-19.37	L1		
2.75	34.17		29.20	0.00	56.00	46.00	-21.83	-16.80	L1		
26.56	41.89		39.79	0.00	60.00	50.00	-18.11	-10.21	L1		
0.47	35.25		30.21	0.00	56.53	46.53	-21.28	-16.32	L2		
2.75	34.61		30.59	0.00	56.00	46.00	-21.39	-15.41	L2		
26.56	43.73		42.10	0.00	60.00	50.00	-16.27	-7.90	L2		
6 Worst Data											

# **DIRECT POWER**

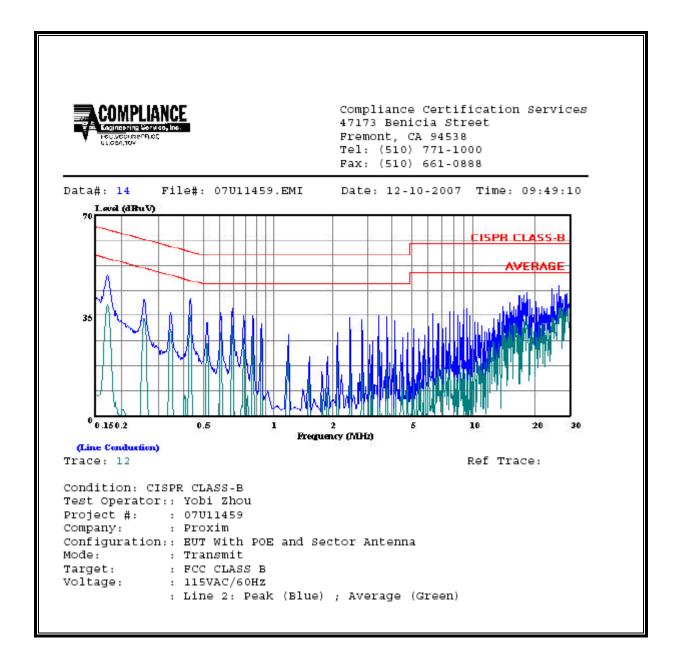
CONDUCTED EMISSIONS DATA (115VAC 60Hz)											
Freq.		Closs	Limit	EN_B	Margin		Remark				
(MHz)	PK (dBuV)	(dBuV) QP (dBuV) AV (dBuV)		(dB)	QP	AV	QP (dB) AV (dB)		L1 / L2		
0.22	54.46		44.27	0.00	63.01	53.01	-8.55	-8.74	L1		
0.98	39.94		34.93	0.00	56.00	46.00	-16.06	-11.07	L1		
18.33	50.78		47.48	0.00	60.00	50.00	-9.22	-2.52	L1		
0.22	53.30		41.38	0.00	63.01	53.01	-9.71	-11.63	L2		
0.98	40.30		38.37	0.00	56.00	46.00	-15.70	-7.63	L2		
18.33	51.80		47.23	0.00	60.00	50.00	-8.20	-2.77	L2		
6 Worst Data											
Direct Power											

#### **POE POWER**

#### **LINE 1 RESULTS**

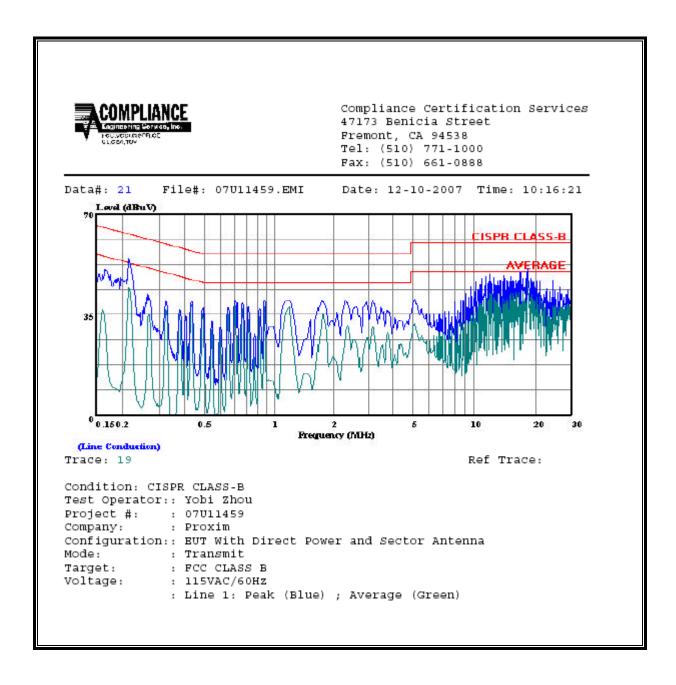


# **LINE 2 RESULTS**

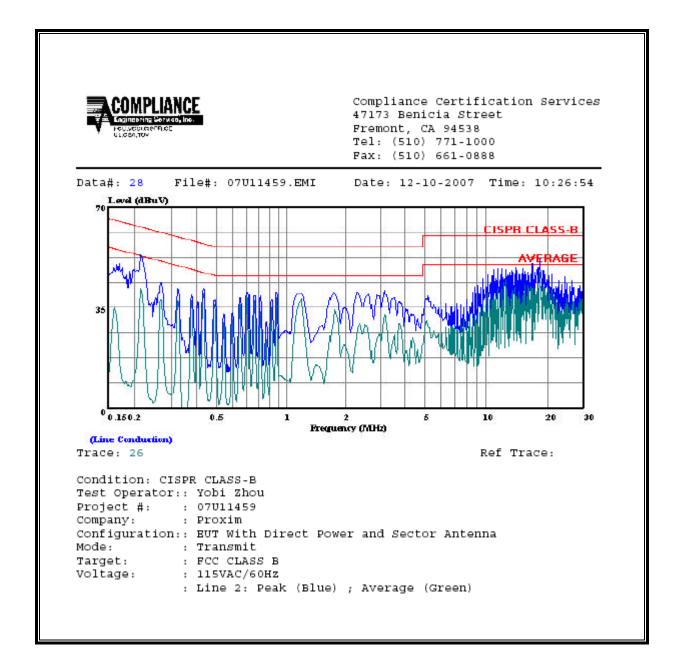


### **DIRECT POWER**

#### **LINE 1 RESULTS**



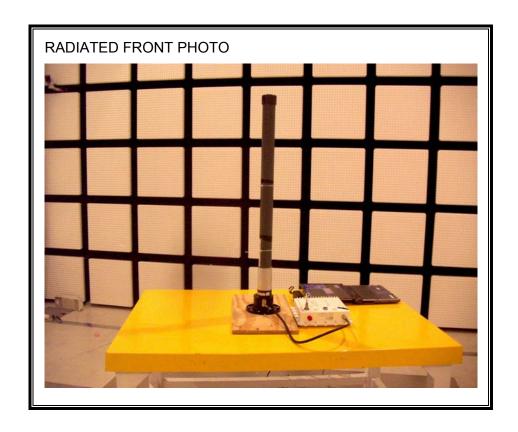
### **LINE 2 RESULTS**



# 9. SETUP PHOTOS

### RADIATED RF MEASUREMENT SETUP

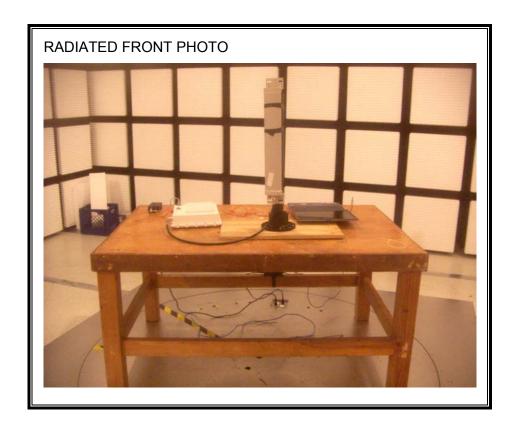
### **OMNI ANTENNA**

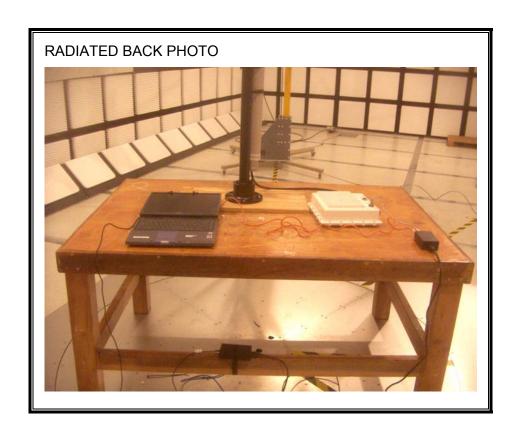




# RADIATED RF MEASUREMENT SETUP

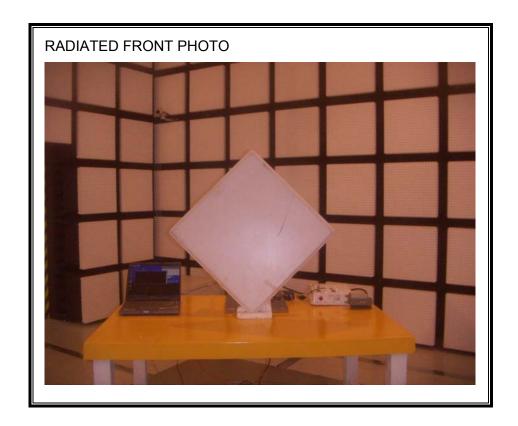
### **SECTOR ANTENNA**

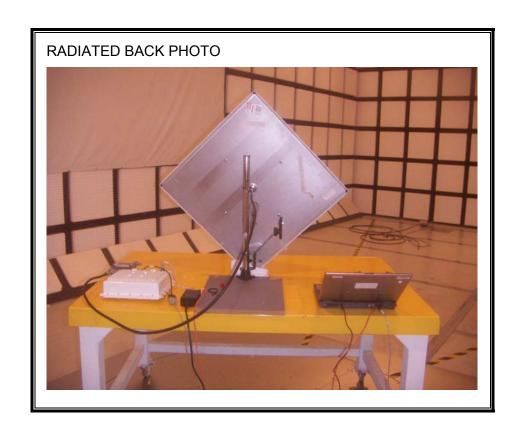




# RADIATED RF MEASUREMENT SETUP

### **PANELANTENNA**

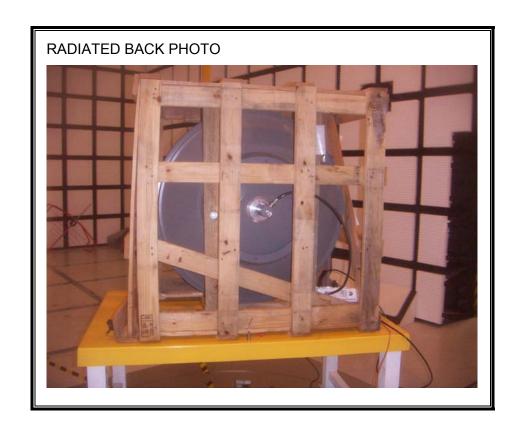




### RADIATED RF MEASUREMENT SETUP

### **PARABOLIC ANTENNA**

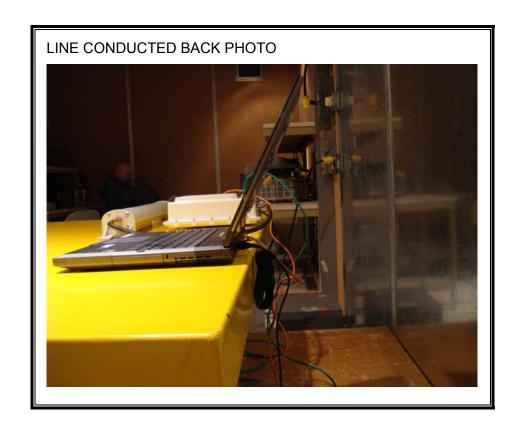




# POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

### **EUT WITH POE**

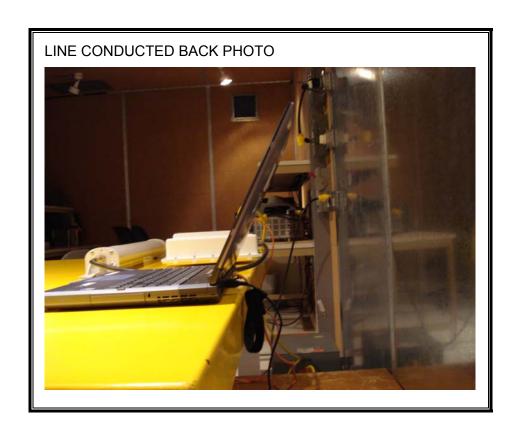




# POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

### **DIRECT POWER**





**END OF REPORT**