



**FCC CFR47 PART 22, SUBPART E
AND
FCC CFR47 PART 90, SUBPART I
CERTIFICATION TEST REPORT
FOR**

RF POWER AMPLIFIER

MODEL NUMBER: PA6-1AC

FCC ID: BBD6-1AC

REPORT NUMBER: 06U10113-1

ISSUE DATE: MARCH 06, 2006

Prepared for
**TPL COMMUNICATION
3370 SAN FERNANDO ROAD, SUITE 206
LOS ANGELES, CA 90065, USA**

Prepared by
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Revision History

Rev.	Issue Date	Revisions	Revised By
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: TPL COMMUNICATION
3370 SAN FERNANDO ROAD, SUITE 206
LOS ANGELES, CA 90065 USA

EUT DESCRIPTION: RF POWER AMPLIFIER

MODEL: PA6-1AC

SERIAL NUMBER: 01676

DATE TESTED: FEBRUARY 23 - MARCH 01, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 22 SUBPART E	NO NON-COMPLIANCE NOTED
FCC PART 90 SUBPART I	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
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603C (2004), FCC CFR 47 Part 2, FCC CFR 47 Part 22, and FCC CFR 47 Part 90.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, 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
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 a RF Power Amplifier, the operation frequency range is: 450 -470MHz
The radio module is manufactured by TPL Communications.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Range (MHz)	Modulation	Conducted Output Power (dBm)	Conducted Output Power (W)
450 ~ 470	CW	47	50.1

5.3. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 460MHz mid channel.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
DC Power Supply	MTM Inc.	XHR 60-18	27519	NA
500 Watt 50 Ohm Terminator	Bird Electronic Corp	8201	13288	NA
Signal Generator, 1024 MHz	R & S	SMY01	842065/030	11/27/07
80-1000MHz Amplifier	Amplifier Research	150W1000M2	303370	CNR
Directional Coupler, 500W, 40 dB, 10 ~ 1000 MHz	Werlatone	C6021	8576	CNR

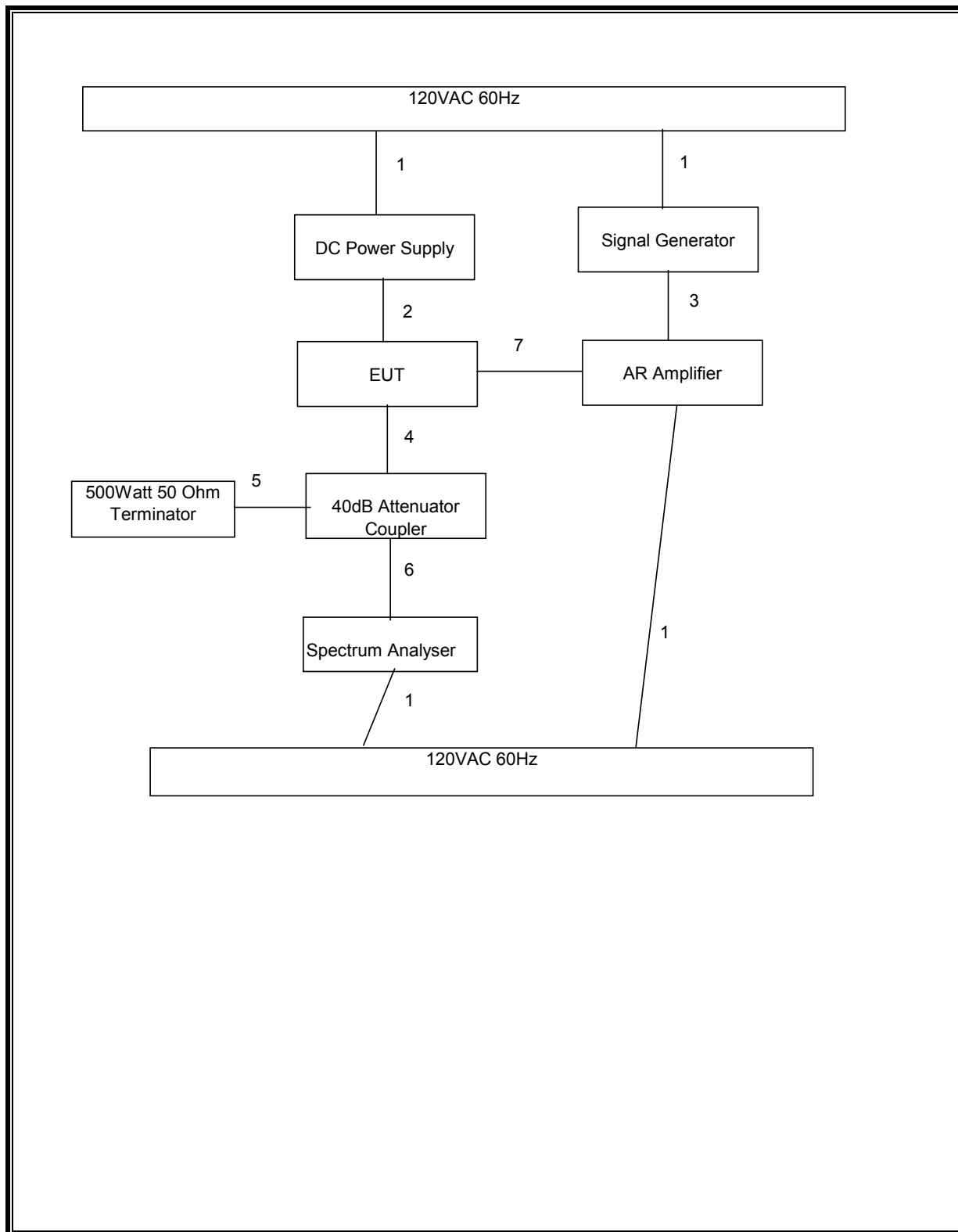
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	4	US 115V	Un-shielded	2m	N/A
2	DC	1	DC	Un-shielded	2m	N/A
3 -- 7	Input / Output	5	N-Connector	Shielded	1m	N/A

TEST SETUP

The EUT is a stand-alone device. The input was given by signal generator as the source modulations of CW and FM during the tests.

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
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	2/4/2007
RF Filter Section	HP	85420E	3705A00256	2/4/2007
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	9/3/2006
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	US42510266	10/19/2006
Signal Generator, 1024 MHz	R & S	SMY01	839957/011	12/12/2007
Directional Coupler, 500W, 40 dB, 10 ~ 1000 MHz	Werlatone	C6021	8576	CNR
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-44	646456	1/23/2007

7. LIMITS AND RESULTS

7.1. OCCUPIED BANDWIDTH

LIMIT

None: for reporting purposes only.

TEST PROCEDURE

Measurements were made with the modulating signal at 2.5 KHz with 5 KHz of FM deviation. The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

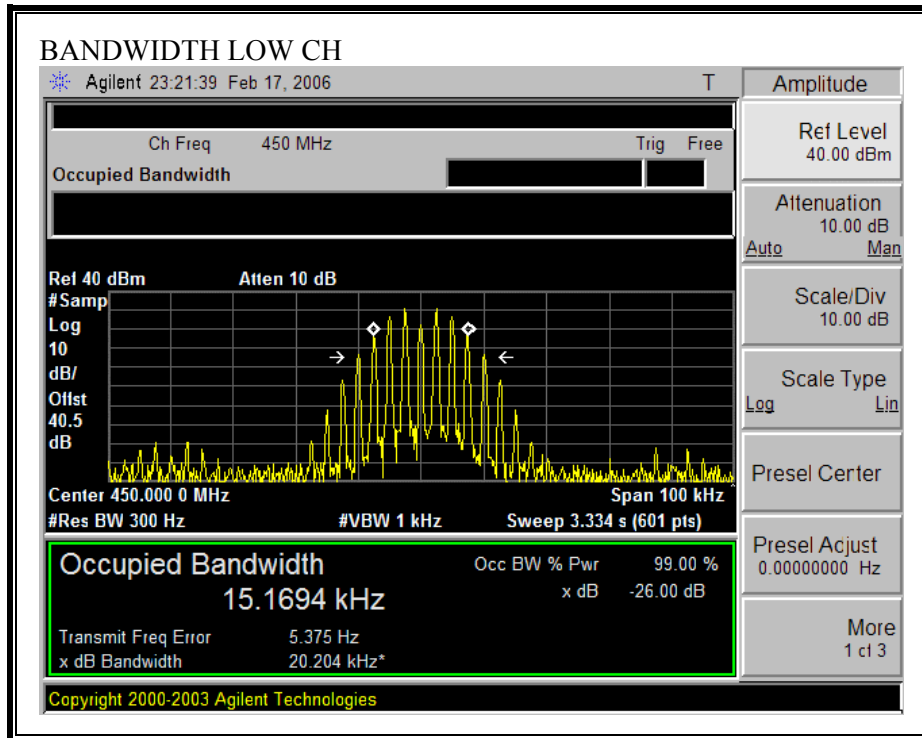
FM Modulation - Input

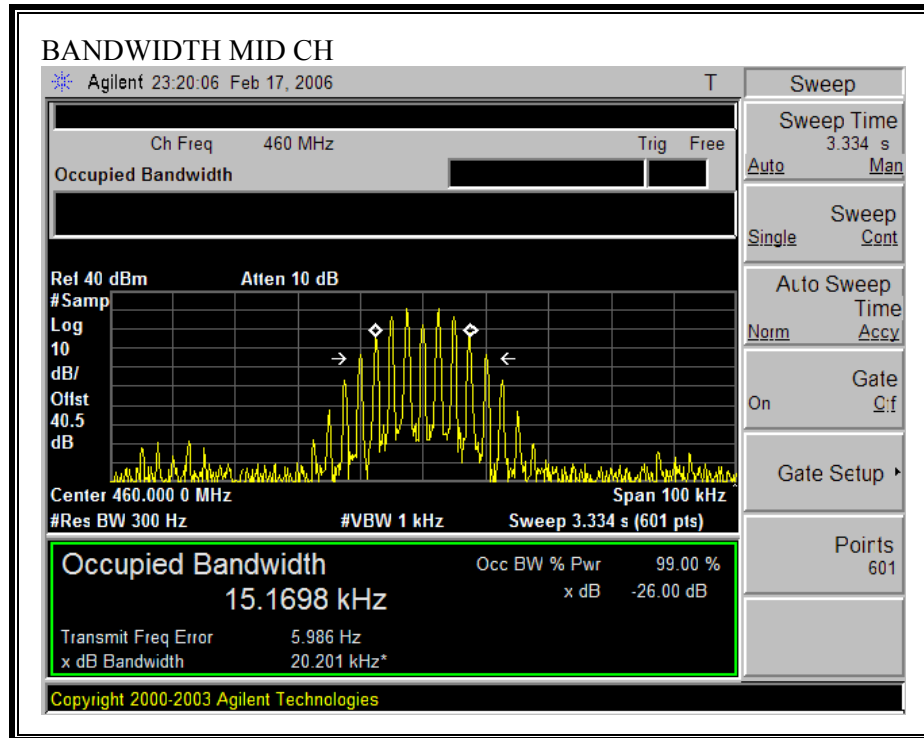
Channel	Frequency (MHz)	Bandwidth (KHz)
Low	450	20.204
Middle	460	20.201
High	470	20.199

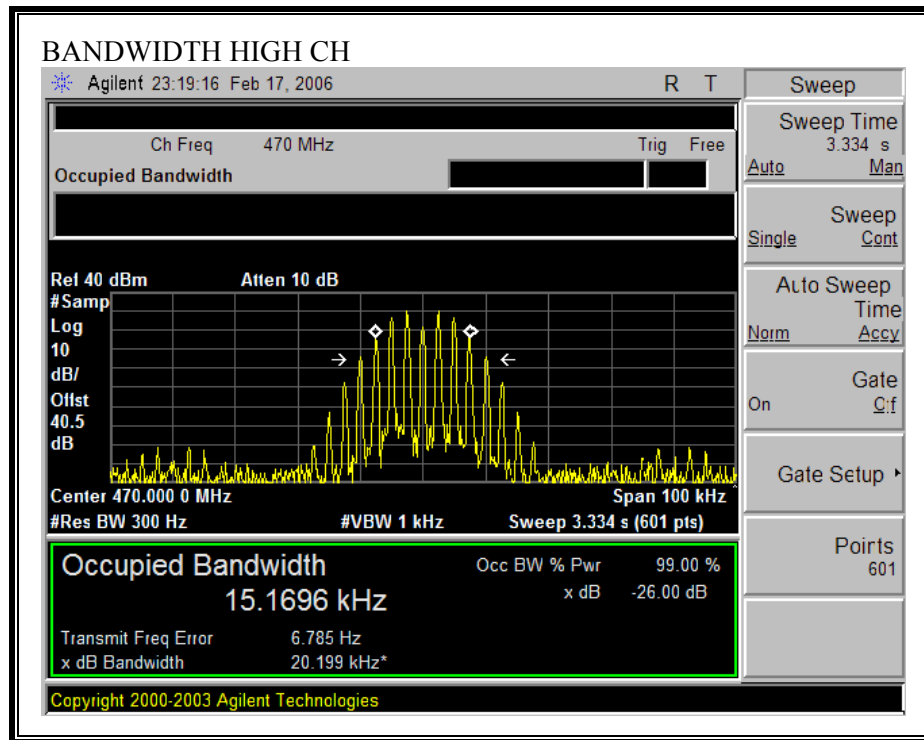
FM Modulation - Output

Channel	Frequency (MHz)	Bandwidth (MHz)
Low	450	20.204
Middle	460	20.202
High	470	20.198

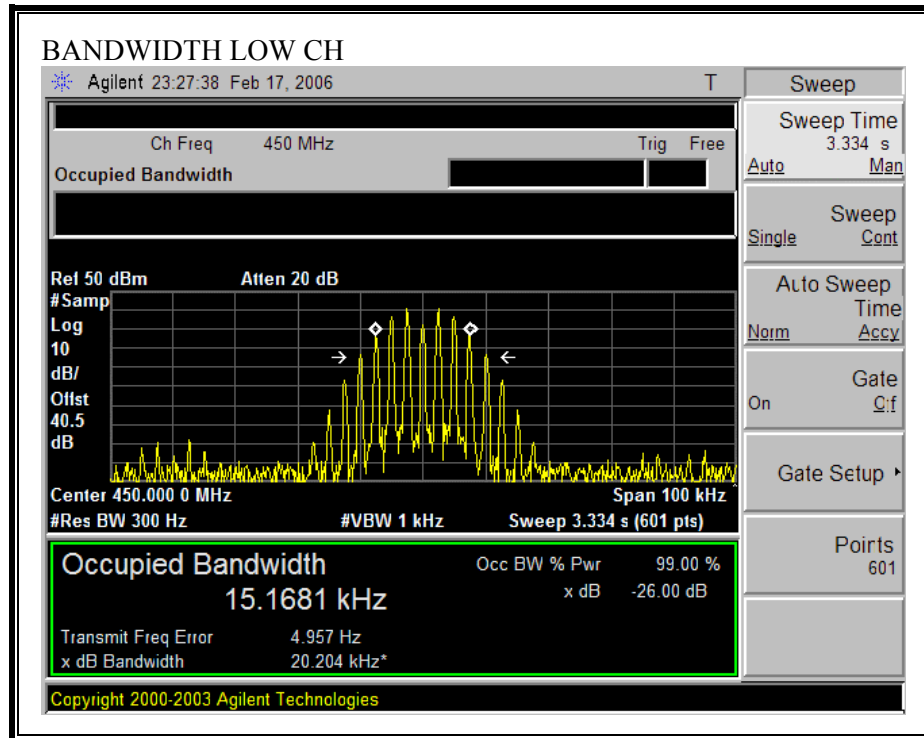
FM 26 dB BANDWIDTH - INPUT

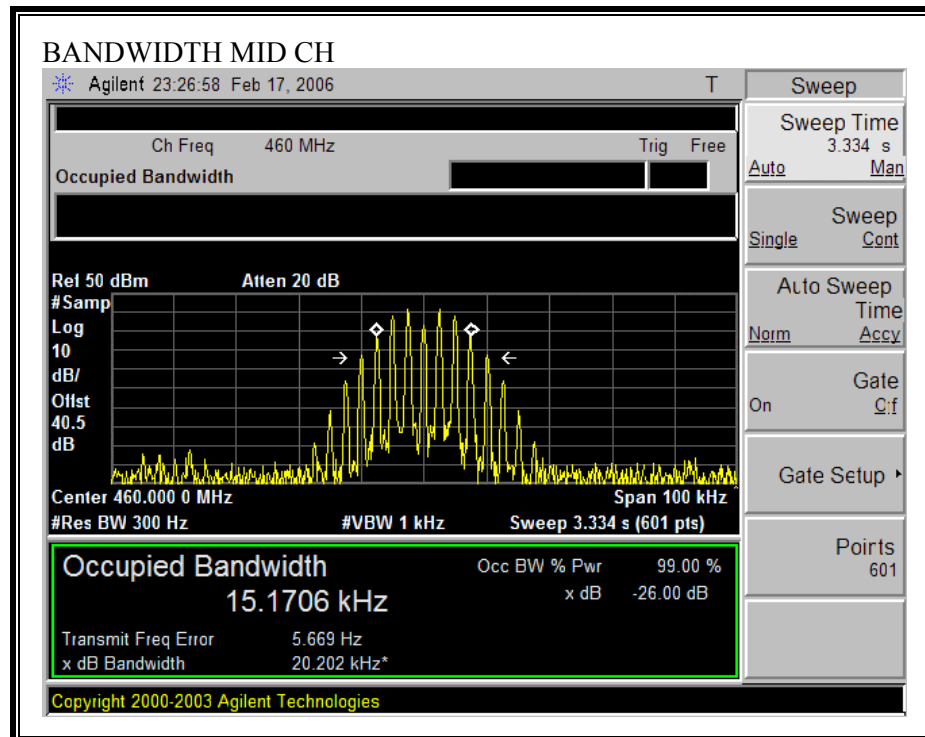


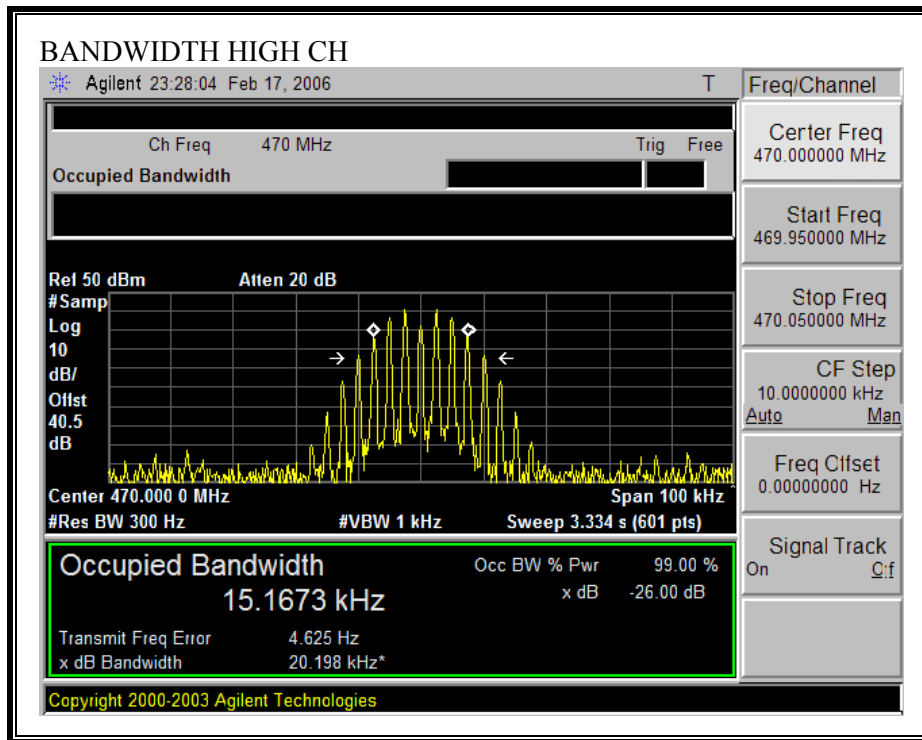




FM 26 dB BANDWIDTH -OUTPUT







7.2. FM EMISSION LIMITATION

LIMIT

§22.359 & §90.210(c):

For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, but no more than 10 kHz: At least $83 \log (fd/5)$ dB;
- (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least $29 \log (fd/11)$ dB or 50 dB, whichever is the lesser attenuation;
- (3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.

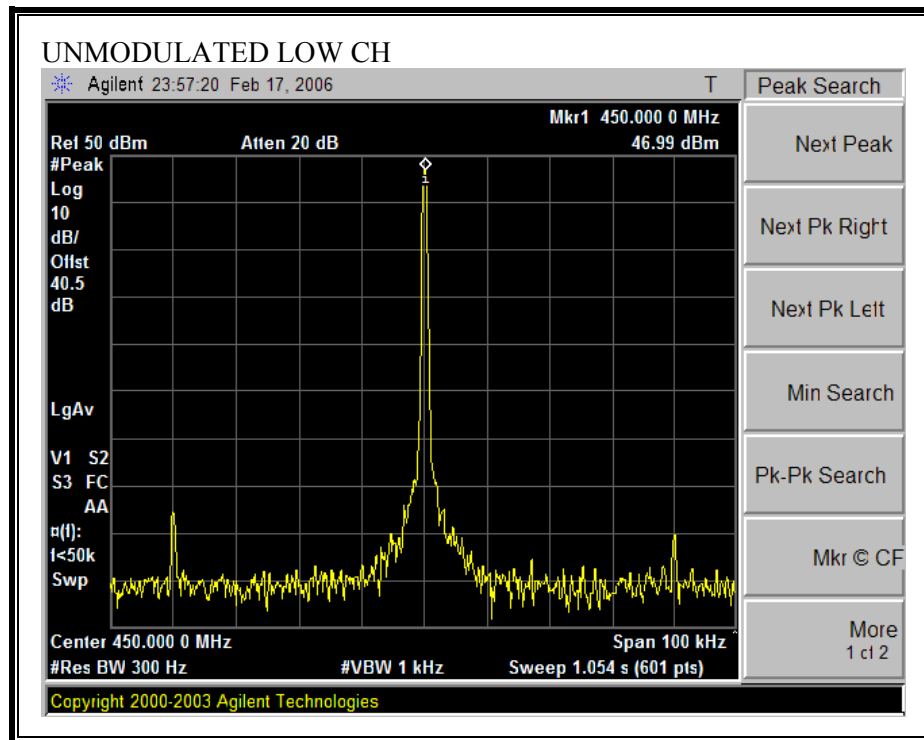
TEST PROCEDURE

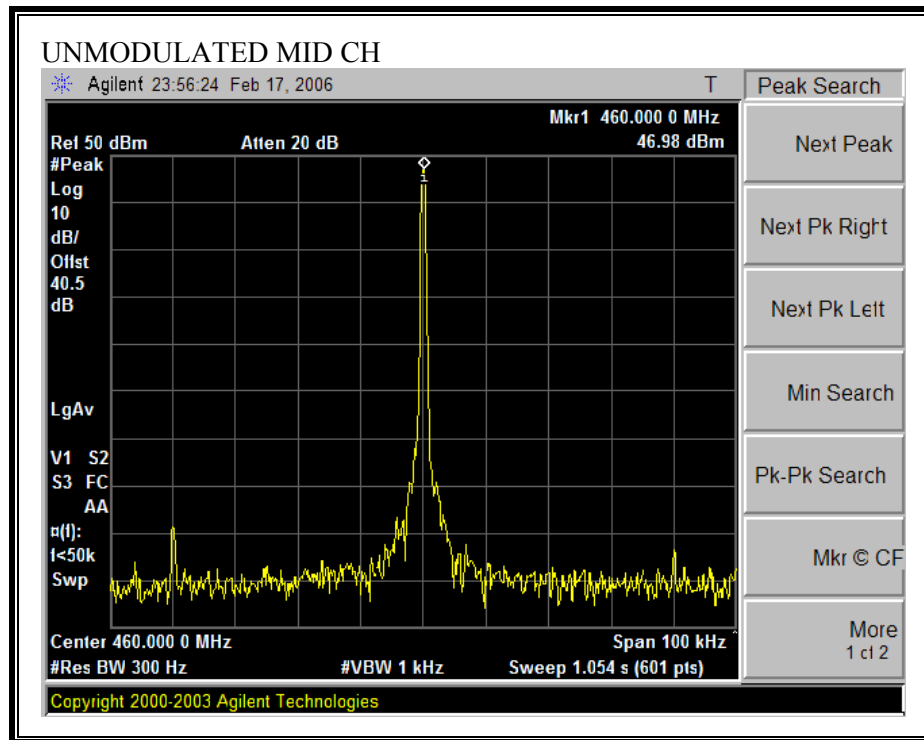
ANSI / TIA / EIA 603 Clause 3.2.11

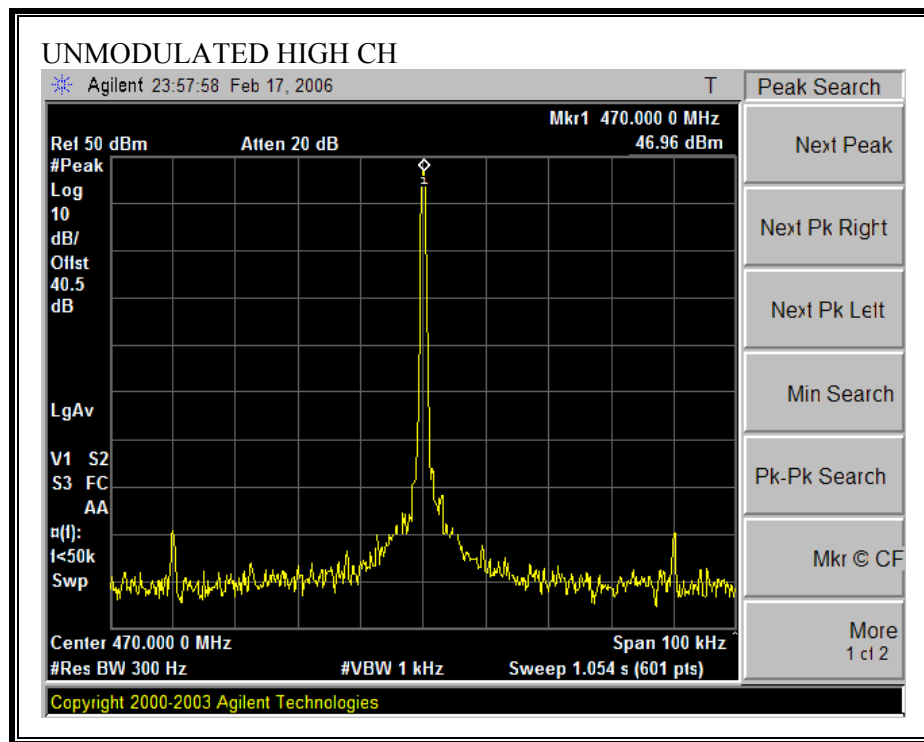
RESULTS

No non-compliance noted:

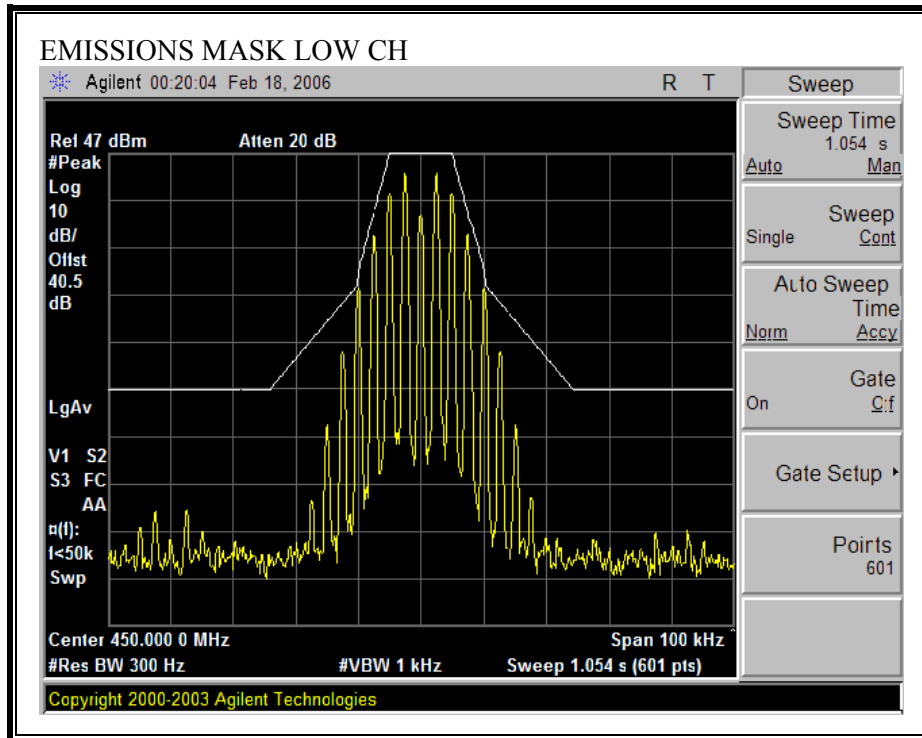
Un-modulated Signal:

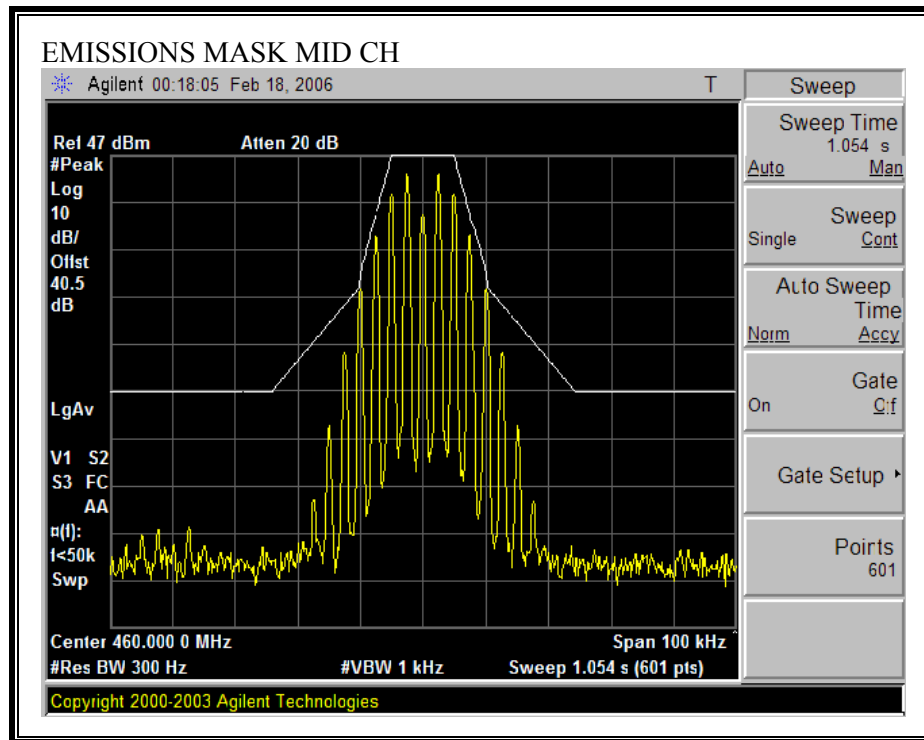


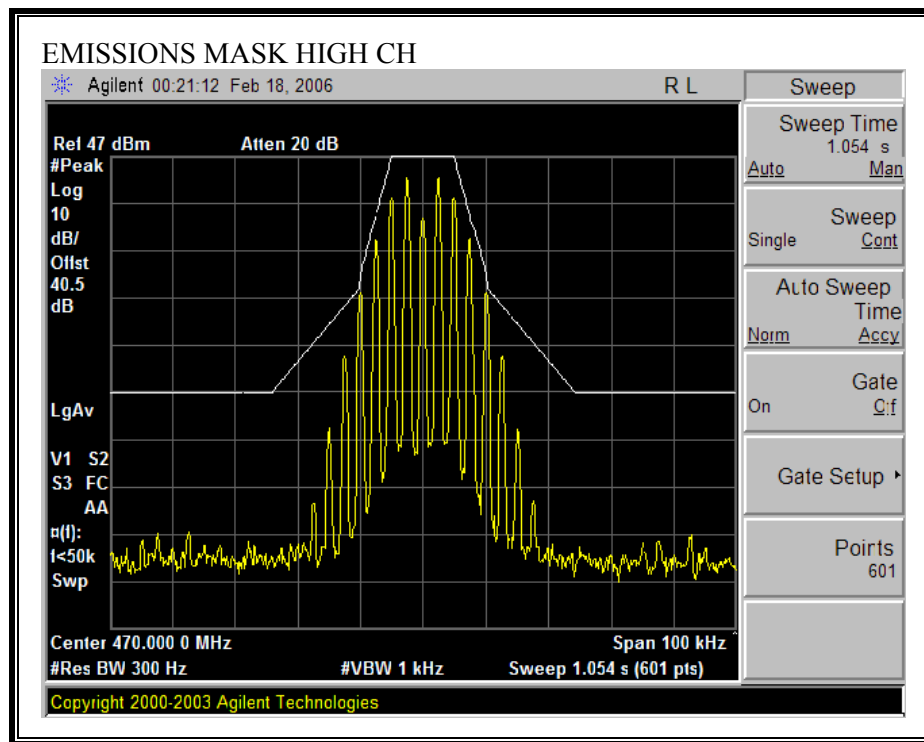




FM EMISSIONS MASK







7.3. MODULATION CHARACTERISTICS

Not Applicable. Due to this EUT is a power amplifier and has no Mix circuitry to modulate the RF signal.

7.4. RF POWER OUTPUT

LIMIT

§22.565(a): Frequency range 454-455MHz is 3500 Watts maximum (ERP), Frequency range 459-460MHz is 150 Watts maximum (ERP).

FCC part 90: The Maximum ERP transmitter power will be considered and authorized on a case-by-case basis. Please refer to the limitations on power and antenna heights are specified in §90.205, §90.279, and §90.309.

ST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.1

RESULTS

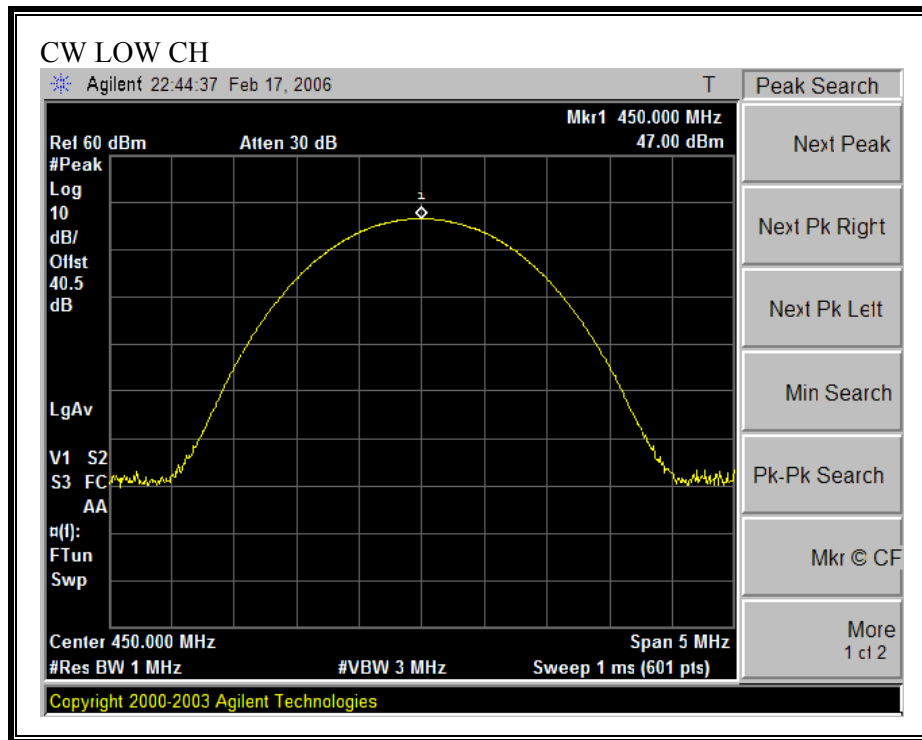
No non-compliance noted.

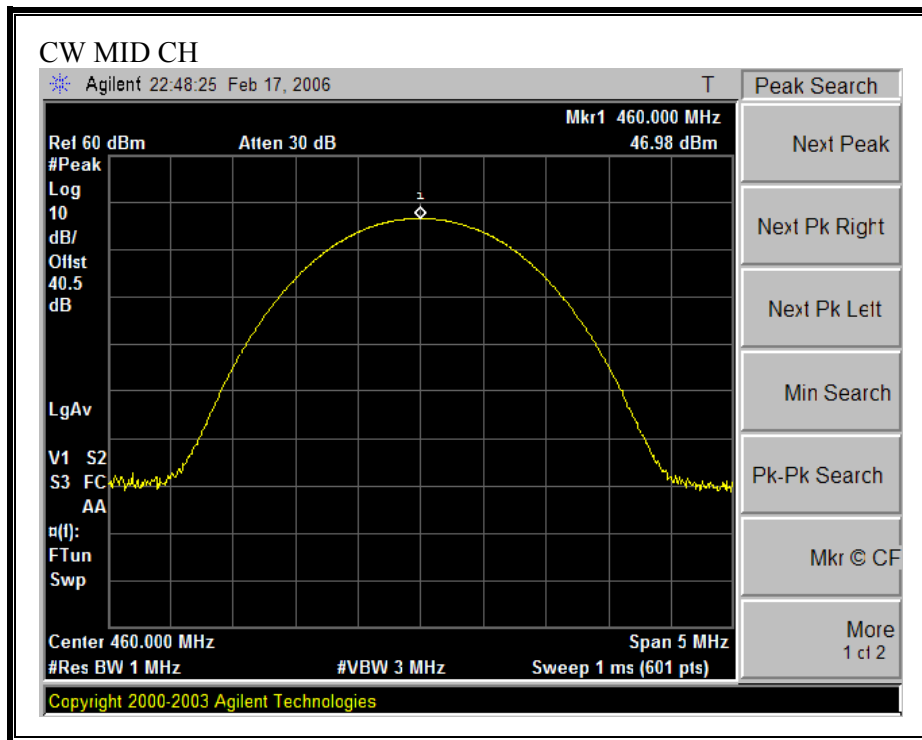
Conducted Output Power

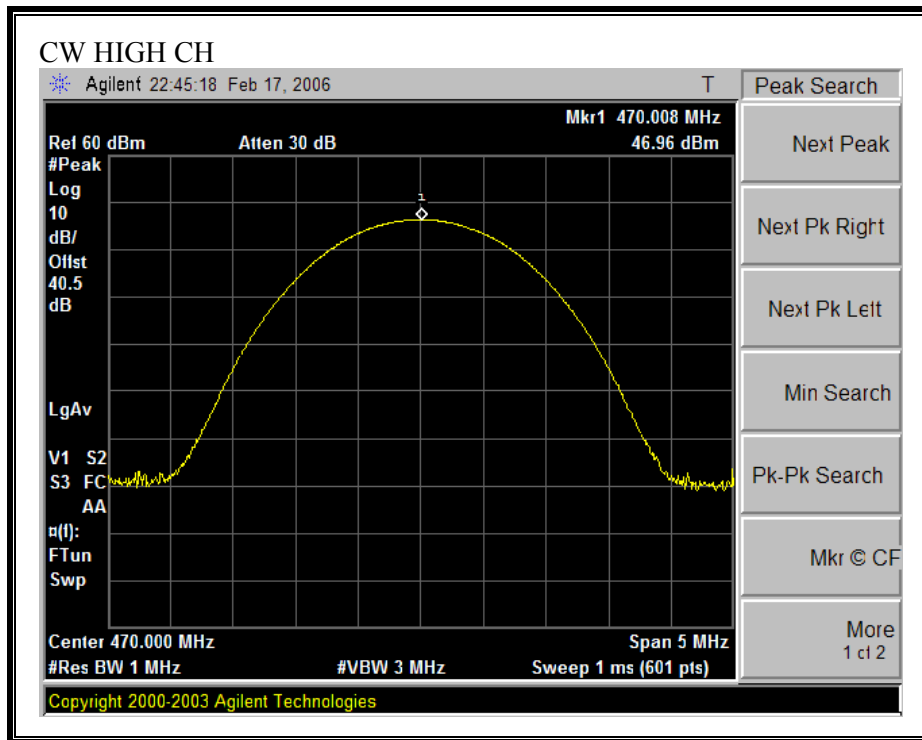
CW Output Power

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	450	47.00	50.12
Mid	460	46.98	49.89
High	470	46.96	49.66

Conducted Output Power







7.5. VOLTAGE STABILITY

LIMIT

§22.565(a): Frequency range 454-455MHz is 3500 Watts maximum (ERP), Frequency range 459-460MHz is 150 Watts maximum (ERP).

FCC part 90: The Maximum ERP transmitter power will be considered and authorized on a case-by-case basis. Please refer to the limitations on power and antenna heights are specified in §90.205, §90.279, and §90.309.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.1

Conducted Output Power vs Voltage

CW Output Power vs Voltage

Channel Frequency (MHz)	Output Power at DC Normal Voltage 13.8		Output Power at 85% Voltage 11.73		Output Power at 115% Voltage 15.87	
	dBm	Watt	dBm	Watt	dBm	Watt
450	47.00	50.12	46.25	42.17	46.92	49.20
460	46.98	49.89	46.67	46.45	46.95	49.55
470	46.98	49.89	46.15	41.21	46.92	49.20

7.6. SPURIOUS EMISSION AT ANTENNA TERMINAL

LIMIT

§22.861 and §90.210 Out of band emissions, The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB

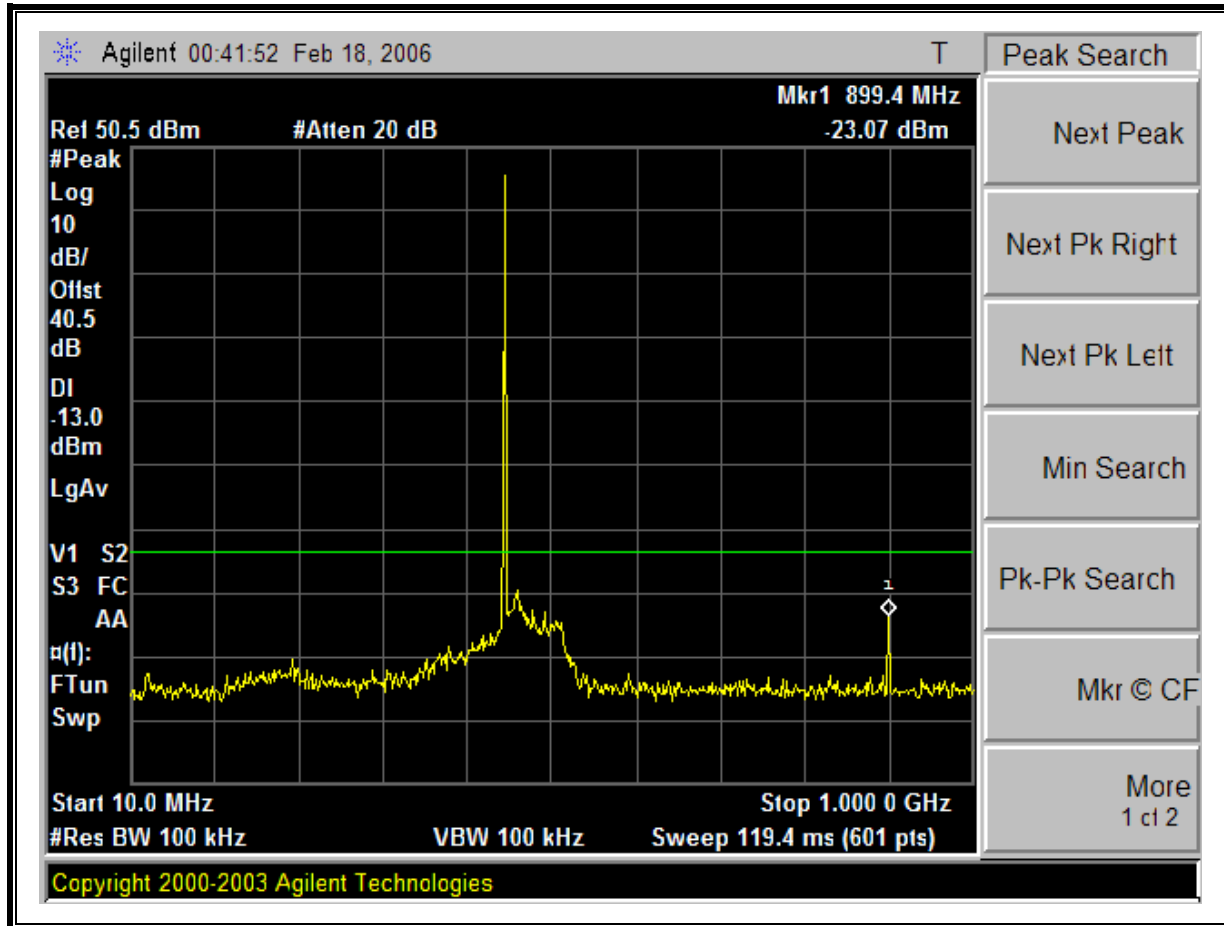
TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.13, FCC 22.861, & FCC 90.210

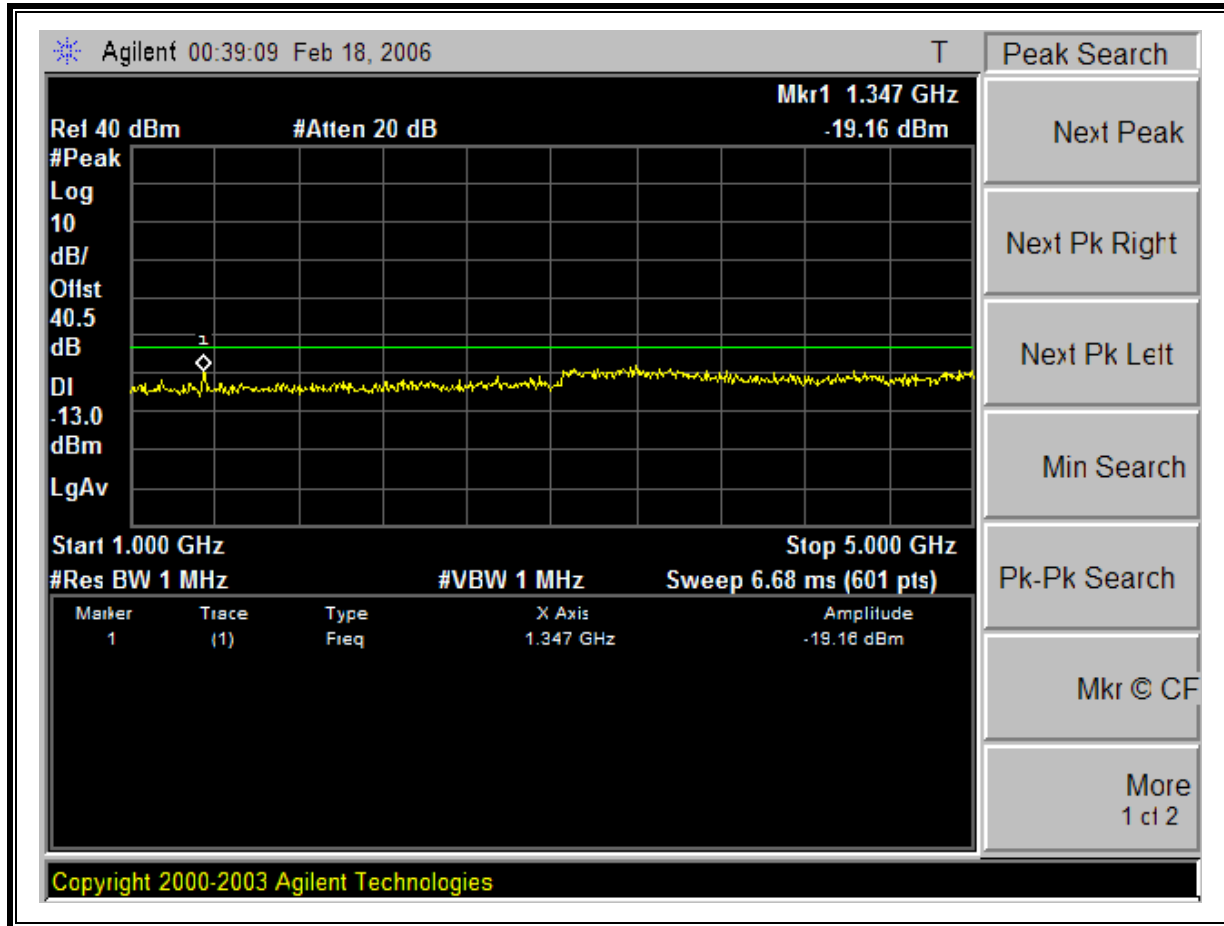
RESULTS

No non-compliance noted.

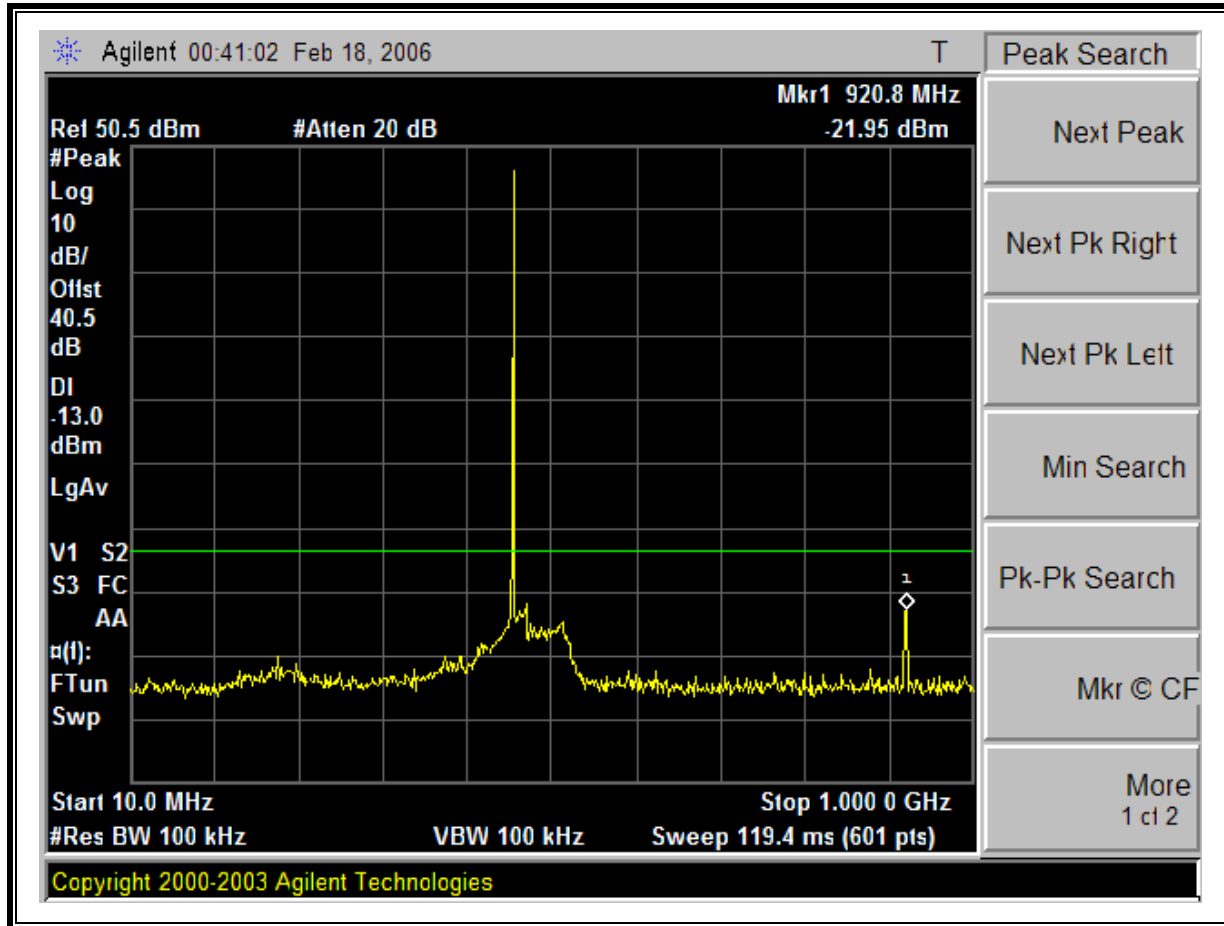
Low Channel, 10MHz to 1000MHz



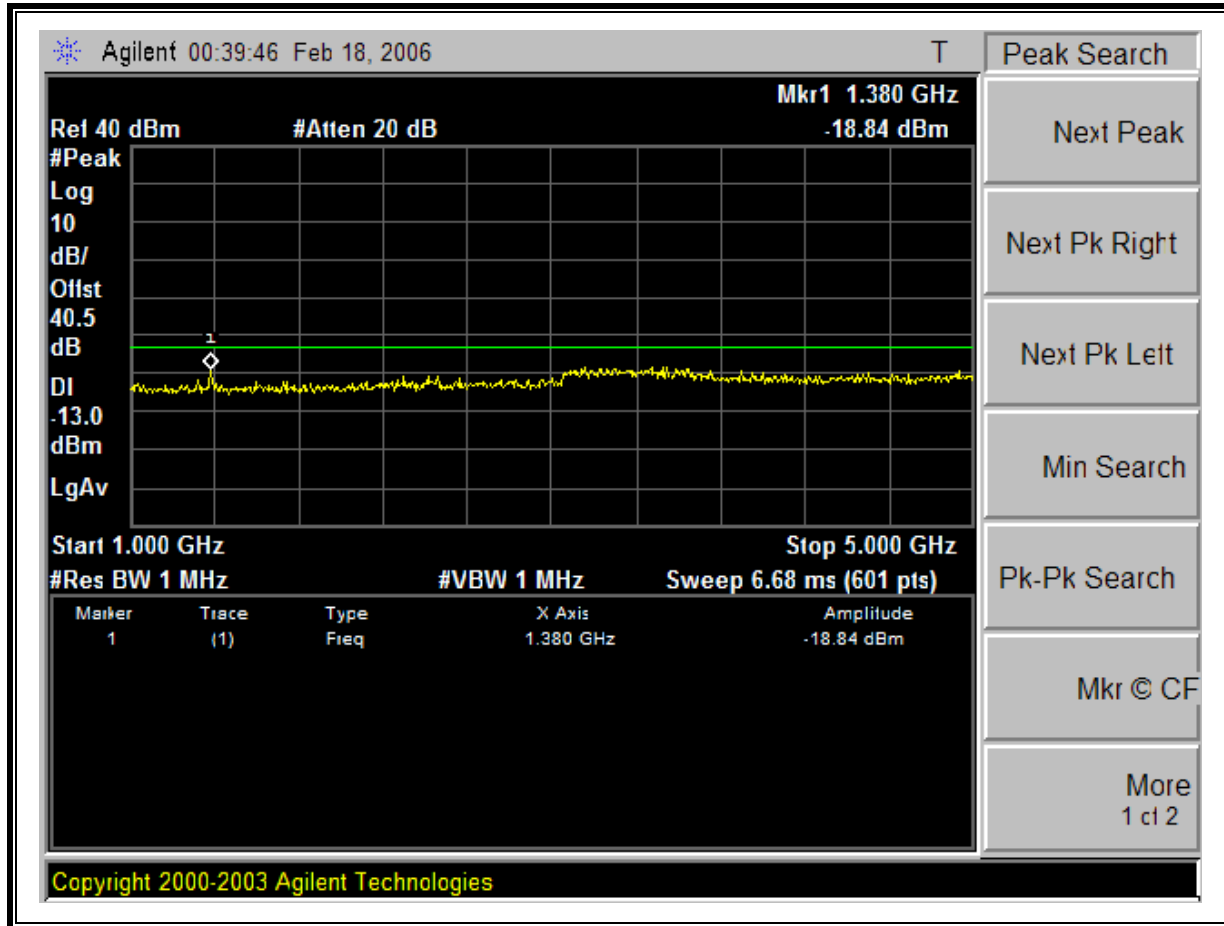
Low Channel, 1000MHz to 5000MHz



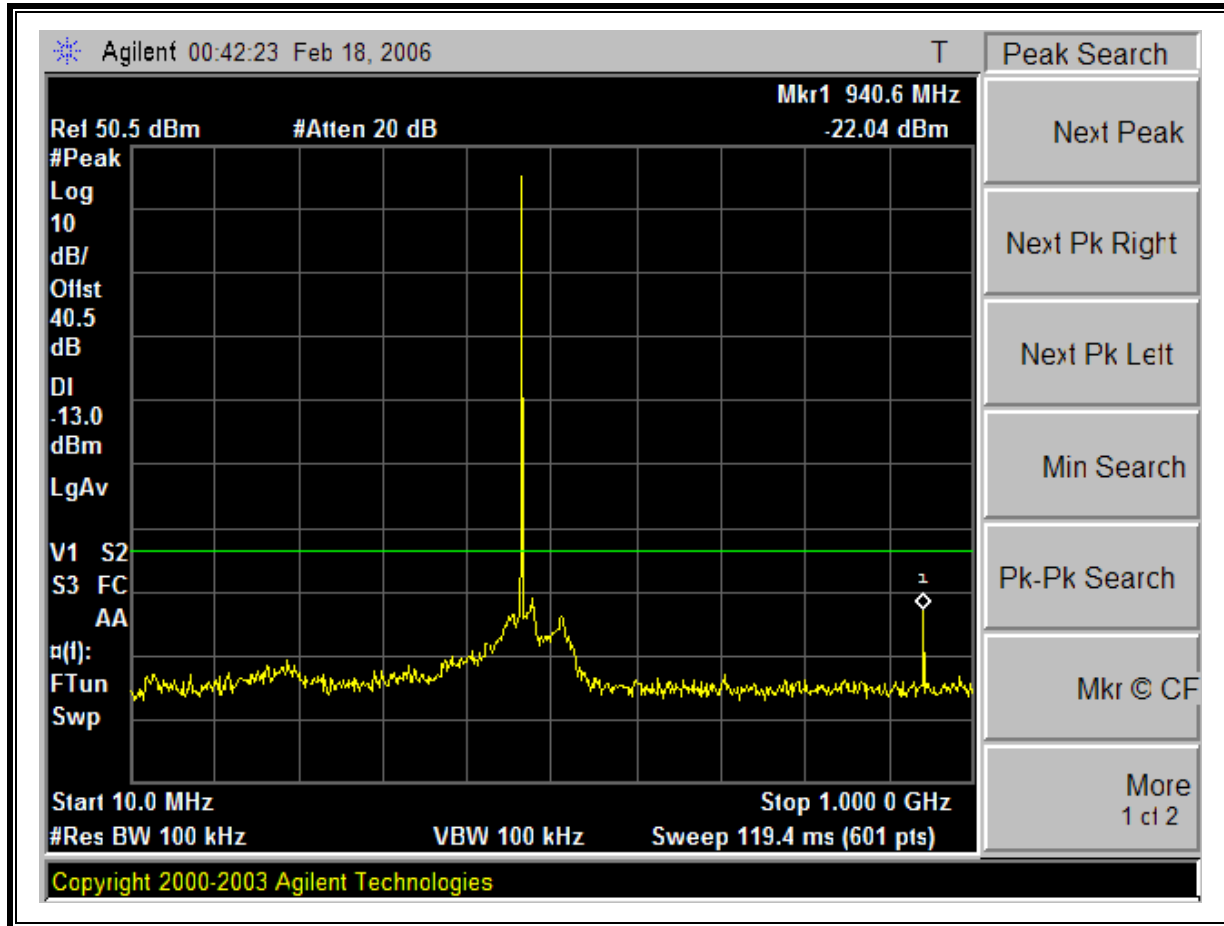
Mid Channel, 10MHz to 1000MHz



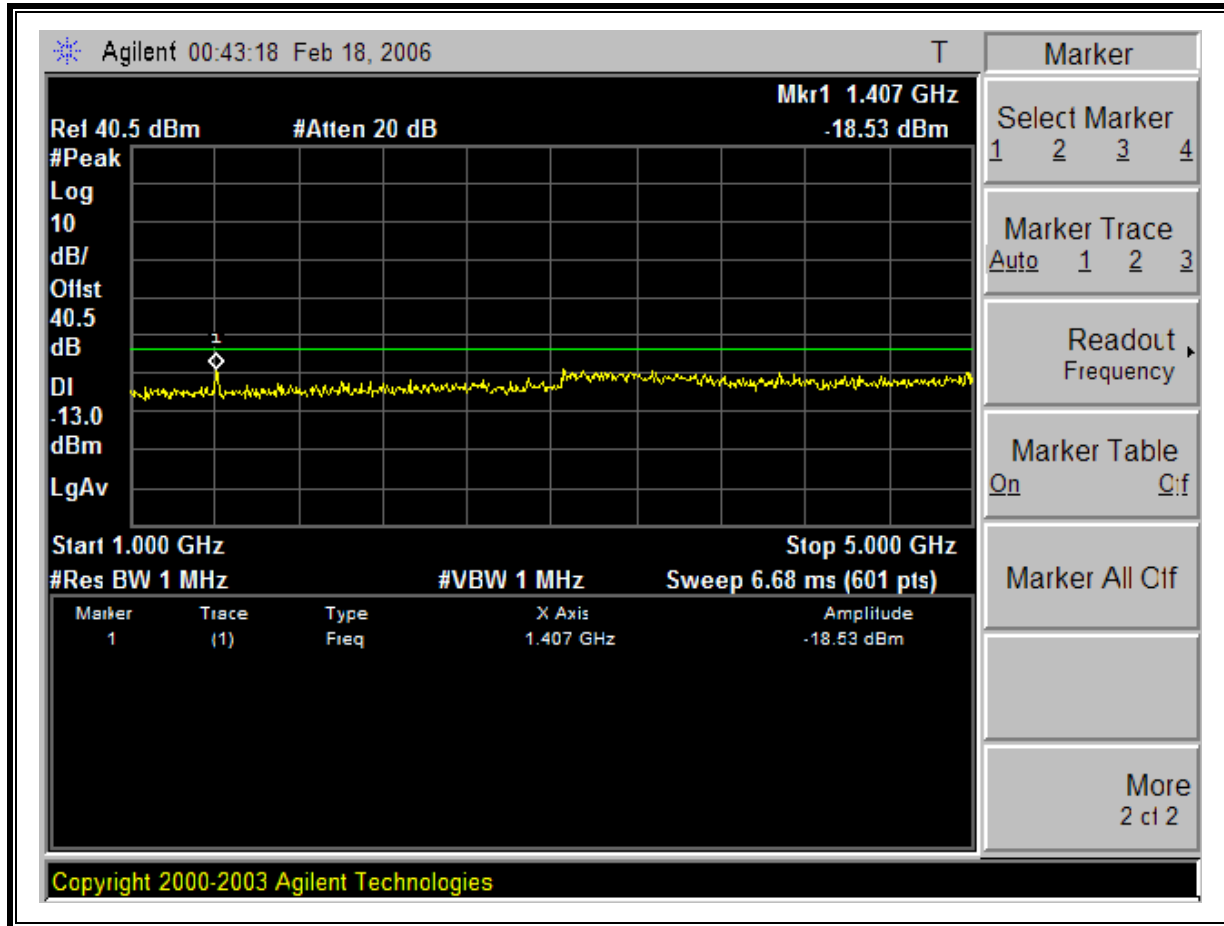
Mid Channel, 1000MHz to 5000MHz



High Channel, 10MHz to 1000MHz



High Channel, 1000MHz to 5000MHz



7.7. FIELD STRENGTH OF SPURIOUS RADIATION

LIMIT

22.861 and §90.210 Out of band emissions, The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.13, FCC 22.861, & FCC 90.210

RESULTS

No non-compliance noted.

7.7.1. 30MHz TO 1000MHz SPURIOUS RADIATION

03/01/06 30 - 1000MHz Substitution Measurement Compliance Certification Services, Morgan Hill 5m Chamber Site Test Engr:Chin Pang Project #:06U10113 Company:TPL Communications EUT Descrip.:RF Power Amplifier EUT M/N:PA6-1AC Test Target:FCC Part 22 Mode Oper:TX Test Equipment:										
Bilog Antenna 5m Chamber Sunol Bilog		Cable 5m Chamber Cable		Pre-amplifer 8447D T5 8447D		Limit ERP				
f MHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch, 450MHz										
75.20	61.8	V	-50.5	1.2	-1.1	-3.3	-55.0	-13.0	-42.0	
211.40	56.0	V	-54.4	1.9	5.8	3.6	-52.7	-13.0	-39.7	
361.60	57.5	V	-48.4	2.3	6.0	3.9	-46.8	-13.0	-33.8	
207.00	58.7	H	-48.7	1.8	5.3	3.2	-47.4	-13.0	-34.4	
361.70	60.0	H	-45.0	2.3	6.0	3.9	-43.4	-13.0	-30.4	
518.80	54.8	H	-48.5	2.7	6.3	4.2	-47.1	-13.0	-34.1	
Mid Ch, 460MHz										
76.10	60.2	V	-52.2	1.2	-1.0	-3.2	-56.5	-13.0	-43.5	
214.30	57.2	V	-53.1	1.9	5.8	3.6	-51.4	-13.0	-38.4	
362.20	57.5	V	-48.4	2.3	6.0	3.9	-46.8	-13.0	-33.8	
76.10	59.0	H	-56.1	1.2	-1.0	-3.2	-60.5	-13.0	-47.5	
214.30	55.3	H	-55.1	1.9	5.8	3.6	-53.3	-13.0	-40.3	
362.20	56.8	H	-48.2	2.3	6.0	3.9	-46.6	-13.0	-33.6	
High Ch, 470MHz										
76.50	60.8	V	-51.6	1.2	-1.0	-3.1	-55.9	-13.0	-42.9	
214.70	57.6	V	-52.7	1.9	5.8	3.6	-50.9	-13.0	-37.9	
362.50	58.1	V	-47.8	2.3	6.0	3.9	-46.2	-13.0	-33.2	
207.50	58.5	H	-49.0	1.8	5.4	3.2	-47.6	-13.0	-34.6	
362.00	54.8	H	-50.2	2.3	6.0	3.9	-48.6	-13.0	-35.6	
659.50	56.7	H	-45.1	3.0	6.8	4.7	-43.5	-13.0	-30.5	

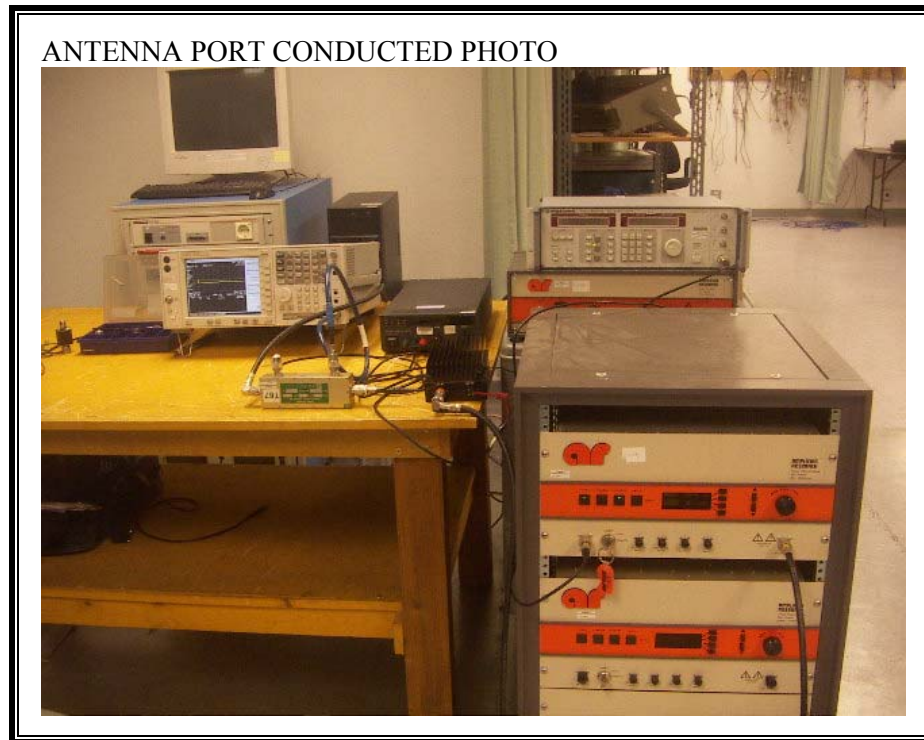
7.7.2. ABOVE 1000MHz SPURIOUS RADIATION

Spurious & Harmonic (ERP)

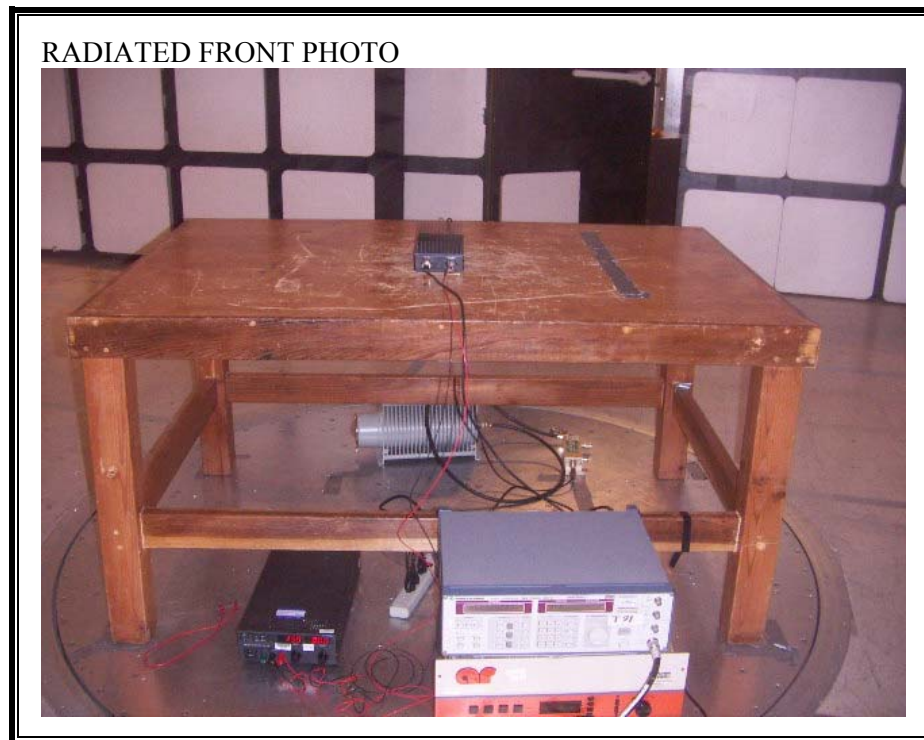
03/01/06 High Frequency Substitution Measurement Compliance Certification Services, Morgan Hill 5m Chamber Site										
Test Engr:Chin Pang Project #:06U10113 Company:TPL Communications EUT Descip.:RF Power Amplifier EUT M/N:PA6-1AC Test Target:FCC Part 22 Mode Oper:TX										
Test Equipment:										
EMCO Horn 1-18GHz T 73; S/N: 6717 @3m		Horn > 18GHz		Limit FCC 22		☐ High Pass Filter				
Hi Frequency Cables ☐ (2 ft) ☒ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☒ (12 ft)				Pre-amplifier 1-26GHz T145 Agilent 3008A		Pre-amplifier 26-40GHz				
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch, 450MHz										
1.350	67.5	V	-44.9	1.5	7.3	5.1	-41.2	-13.0	-28.2	
1.800	54.0	V	-57.3	1.7	8.4	6.3	-52.6	-13.0	-39.6	
2.250	46.0	V	-64.0	1.8	9.3	7.2	-58.7	-13.0	-45.7	
1.350	68.8	H	-42.8	1.5	7.3	5.1	-39.2	-13.0	-26.2	
1.800	55.2	H	-55.4	1.7	8.4	6.3	-50.7	-13.0	-37.7	
2.250	45.7	H	-64.1	1.8	9.3	7.2	-58.8	-13.0	-45.8	
Mid Ch, 460MHz										
1.380	69.3	V	-43.0	1.5	7.4	5.2	-39.3	-13.0	-26.3	
1.840	54.6	V	-56.6	1.7	8.5	6.4	-51.9	-13.0	-38.9	
2.300	46.8	V	-63.1	1.9	9.4	7.3	-57.7	-13.0	-44.7	
1.380	71.0	H	-40.6	1.5	7.4	5.2	-36.9	-13.0	-23.9	
1.840	56.8	H	-53.7	1.7	8.5	6.4	-49.0	-13.0	-36.0	
2.300	44.6	H	-65.1	1.9	9.4	7.3	-59.7	-13.0	-46.7	
High Ch, 470MHz										
1.410	63.5	V	-48.7	1.5	7.4	5.3	-44.9	-13.0	-31.9	
1.880	59.3	V	-51.8	1.7	8.6	6.5	-47.0	-13.0	-34.0	
2.350	46.7	V	-63.1	1.9	9.5	7.3	-57.6	-13.0	-44.6	
1.410	69.9	H	-41.6	1.5	7.4	5.3	-37.8	-13.0	-24.8	
1.880	61.6	H	-48.8	1.7	8.6	6.5	-44.0	-13.0	-31.0	
2.350	46.0	H	-63.6	1.9	9.5	7.3	-58.1	-13.0	-45.1	
Note: No other emissions were detected above the system noise floor.										

8. SETUP PHOTOS

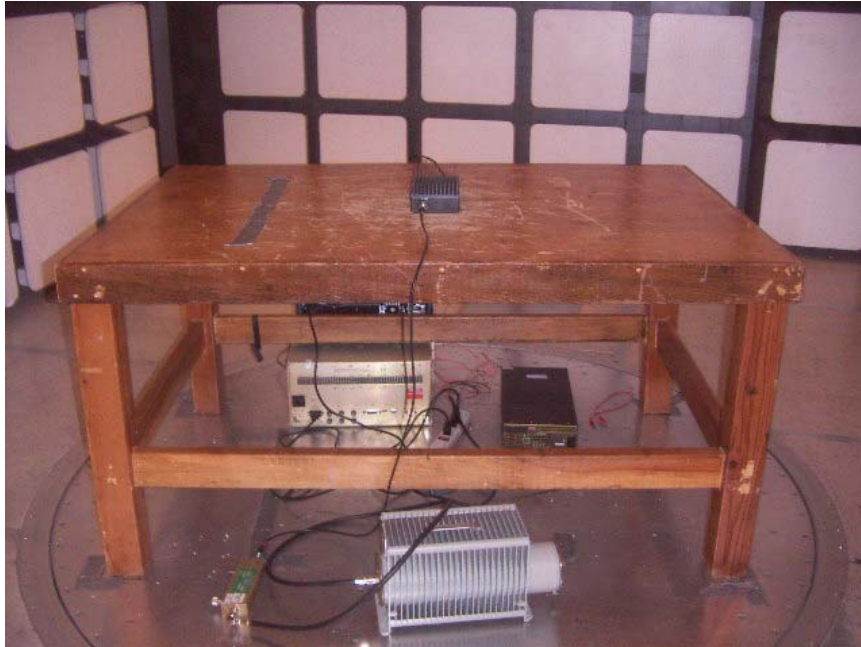
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



END OF REPORT