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

RF POWER AMPLIFIER

MODEL NUMBER: PA3-1AC

FCC ID: BBD3-1AC

REPORT NUMBER: 06U10112-1B

ISSUE DATE: JULY 20, 2006

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

Prepared by
COMPLIANCE CERTIFICATION SERVICES
561F MONTEREY ROAD
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
A	3/14/06	Initial Issue	Thu
B	7/20/06	Revised Sections 5.1 & 5.2	Thu

TABLE OF CONTENTS

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: PA3-1AC

SERIAL NUMBER: 01675

DATE TESTED: MARCH 07 - 08, 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:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

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 45 Watts RF Power Amplifier, the operation frequency range is: 150-174MHz (FCC 90) and 150 – 162.0125MHz (FCC 22).

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

FCC Part	Frequency Range (MHz)	Modulation	Conducted Output Power (dBm)	Conducted Output Power (W)
22	150-162.0125	CW	46.54	45.1
90	150-174	CW	46.54	45.1

5.3. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power and with the CW input signal.

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

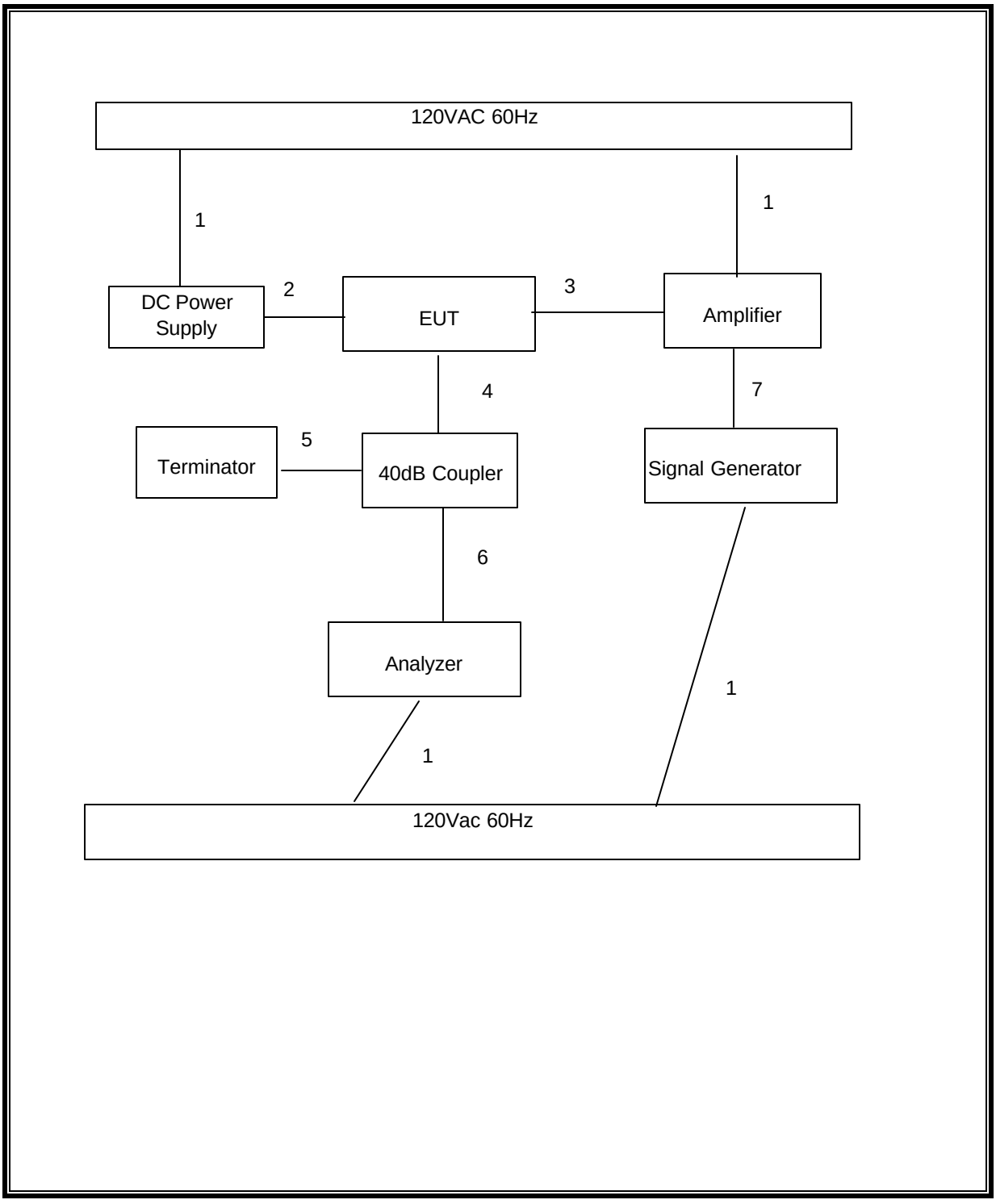
I/O CABLES

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

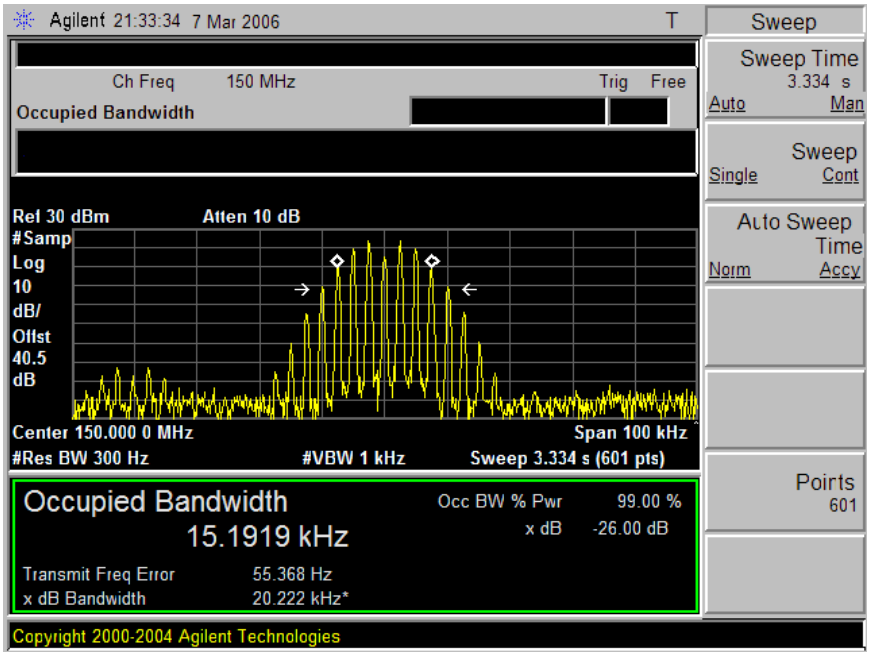
Channel	Frequency (MHz)	Bandwidth (kHz)
Low	150	20.222
Mid	162.0125	20.225
High	174	20.218

FM Modulation - Output

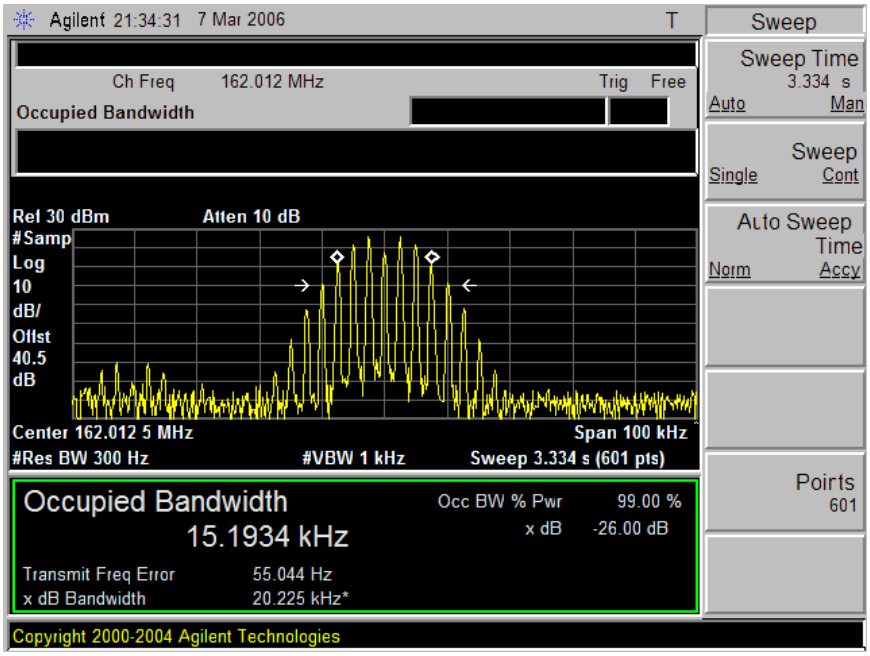
Channel	Frequency (MHz)	Bandwidth (kHz)
Low	150	20.199
Mid	162.0125	20.205
High	174	20.195

FM 26 dB BANDWIDTH - INPUT

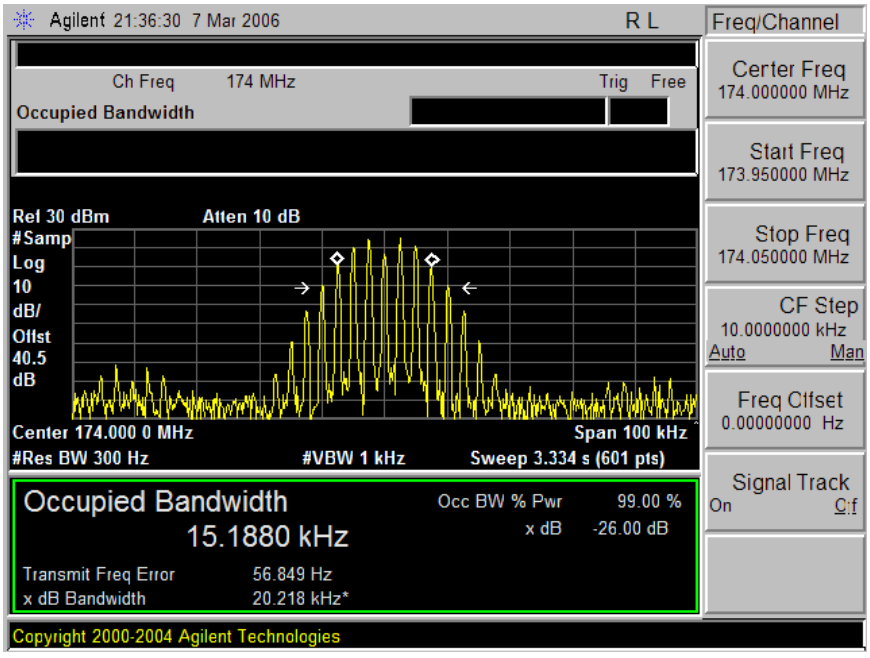
BANDWIDTH LOW CH



BANDWIDTH MID CH

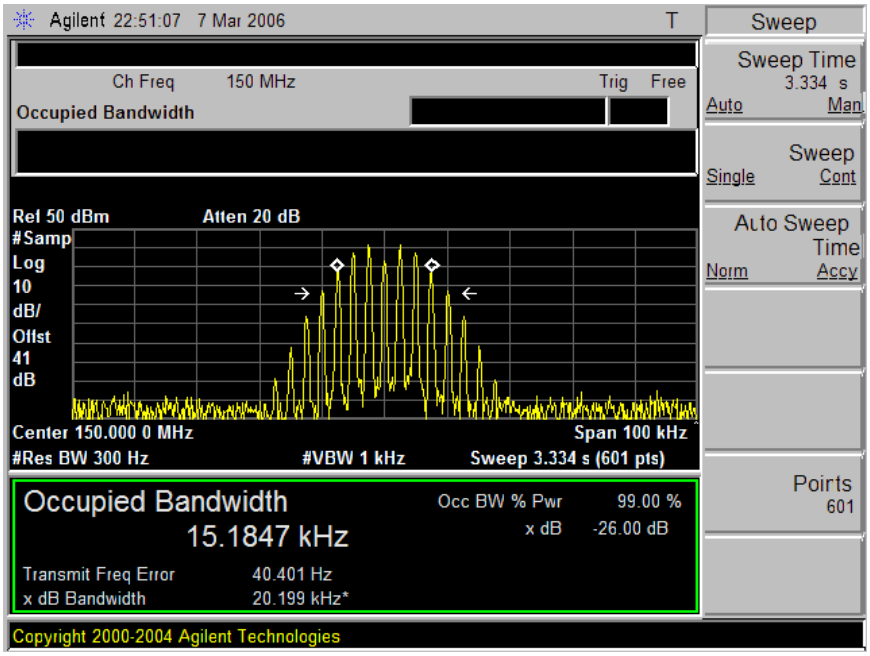


BANDWIDTH HIGH CH

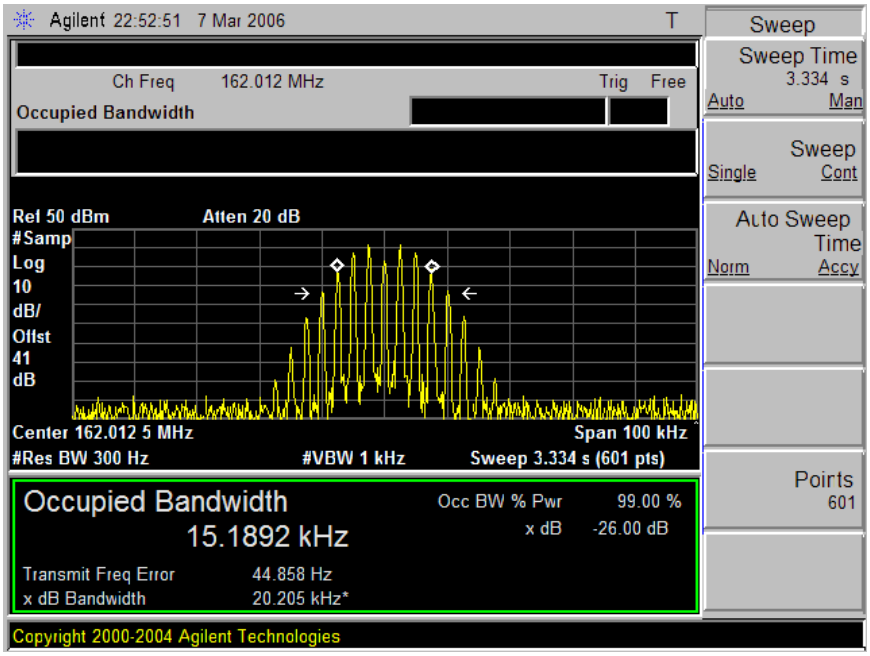


FM 26 dB BANDWIDTH -OUTPUT

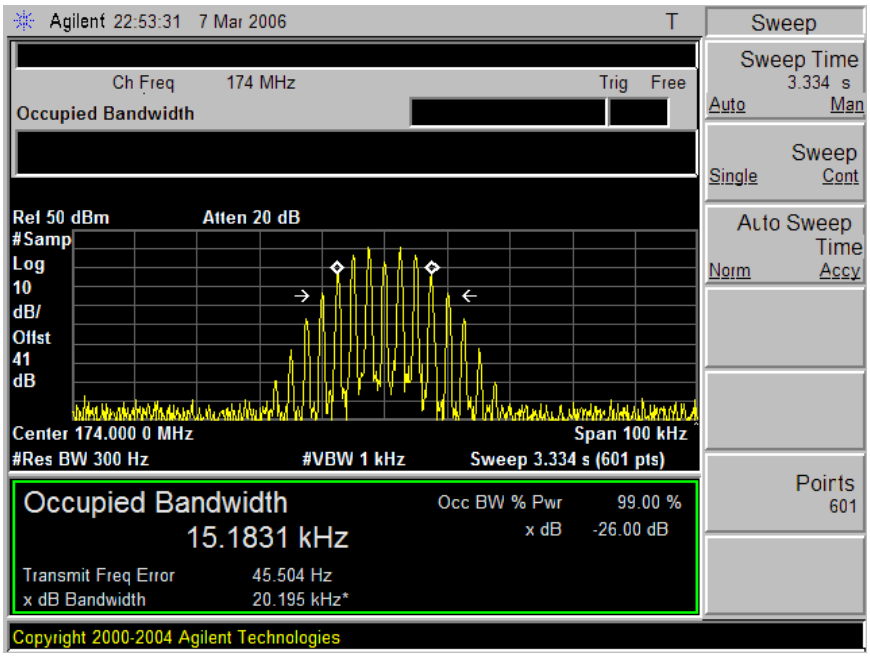
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.2. FM EMISSION LIMITATION

LIMIT

§90.210 (c) & 22.359 (b): For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the un-modulated 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 2/11) 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

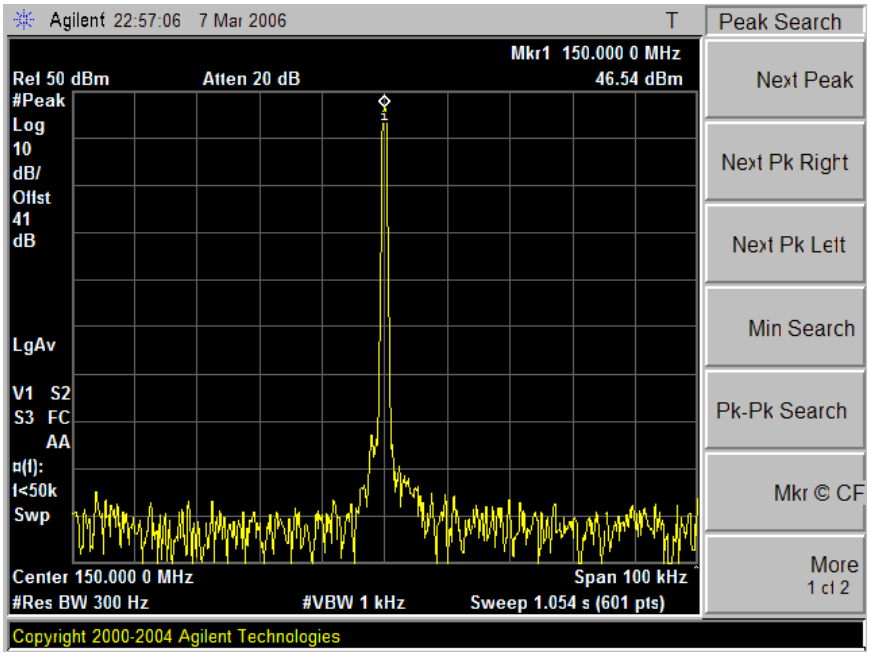
ANSI / TIA / EIA 603 Clause 3.2.11

RESULTS

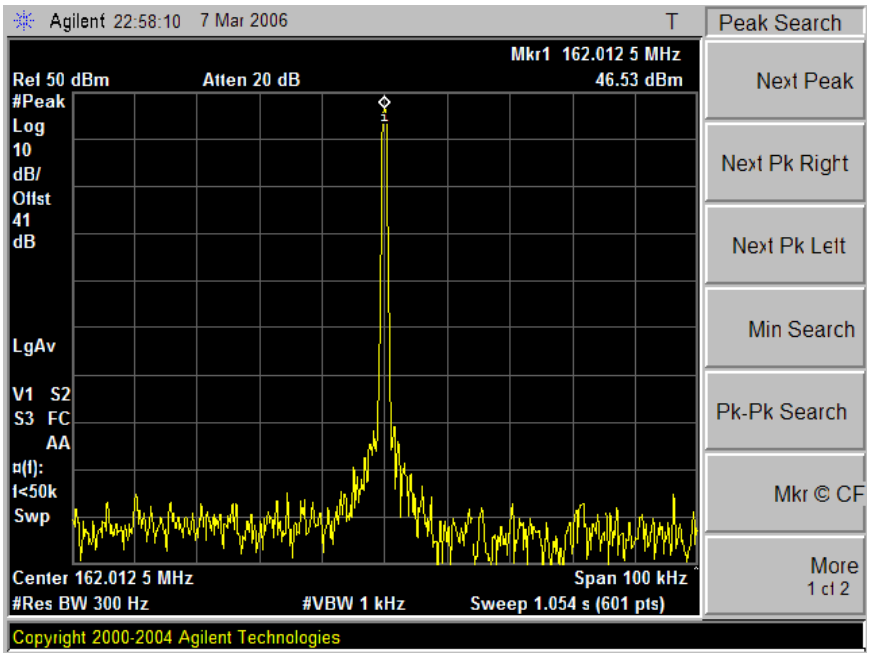
No non-compliance noted:

Un-modulated Signal:

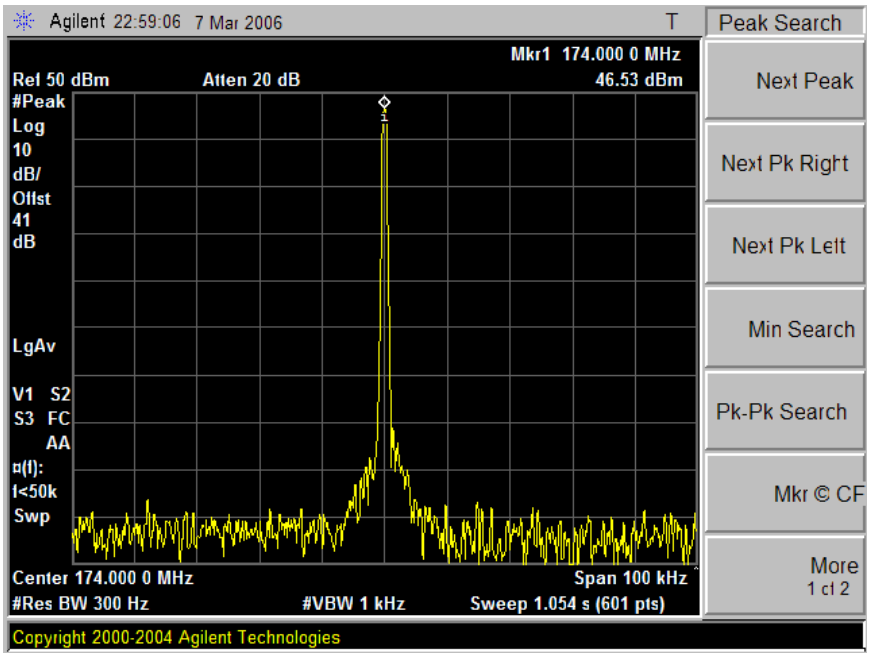
UN-MODULATED LOW CH



UN-MODULATED MID CH

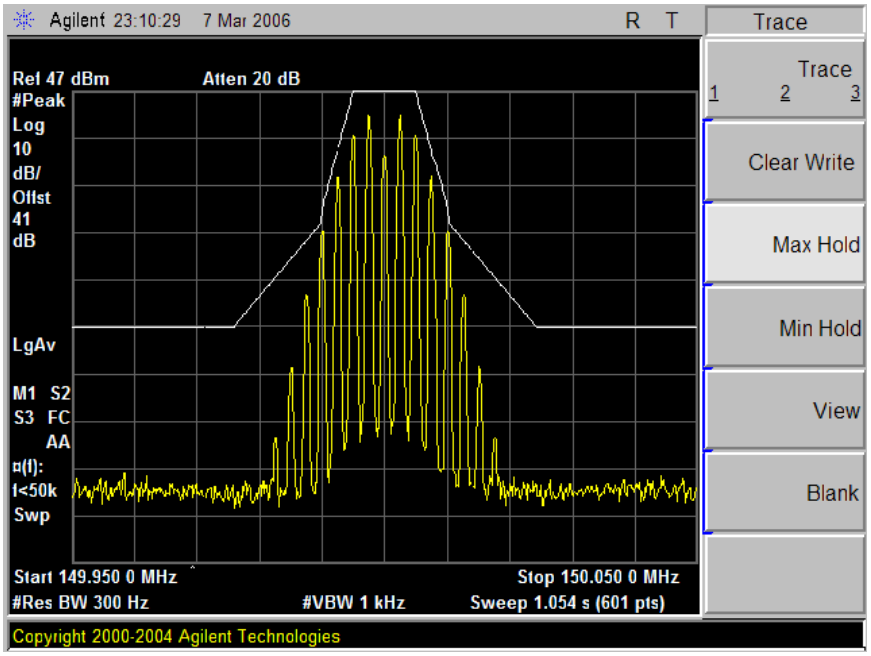


UN-MODULATED HIGH CH

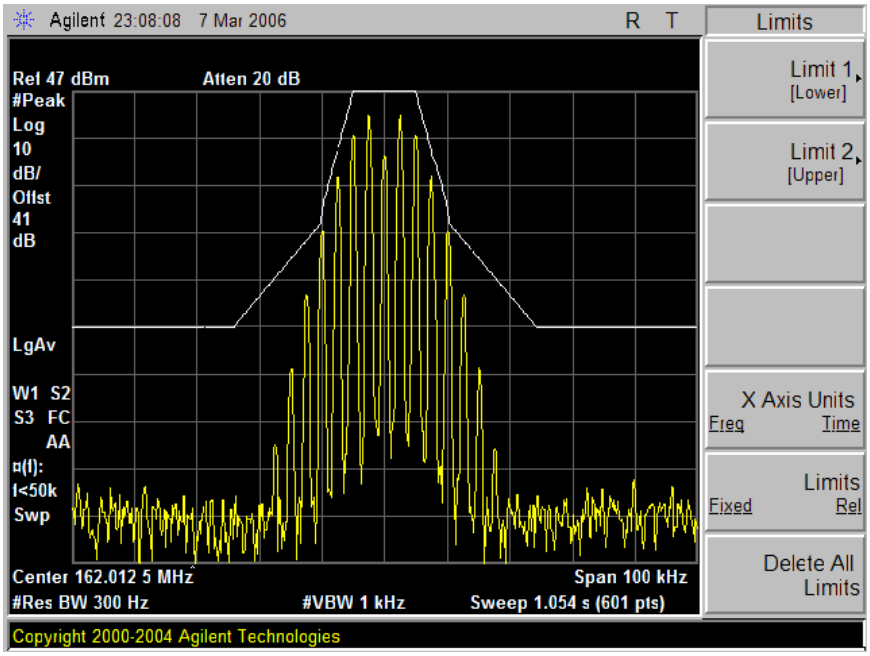


FM EMISSIONS MASK

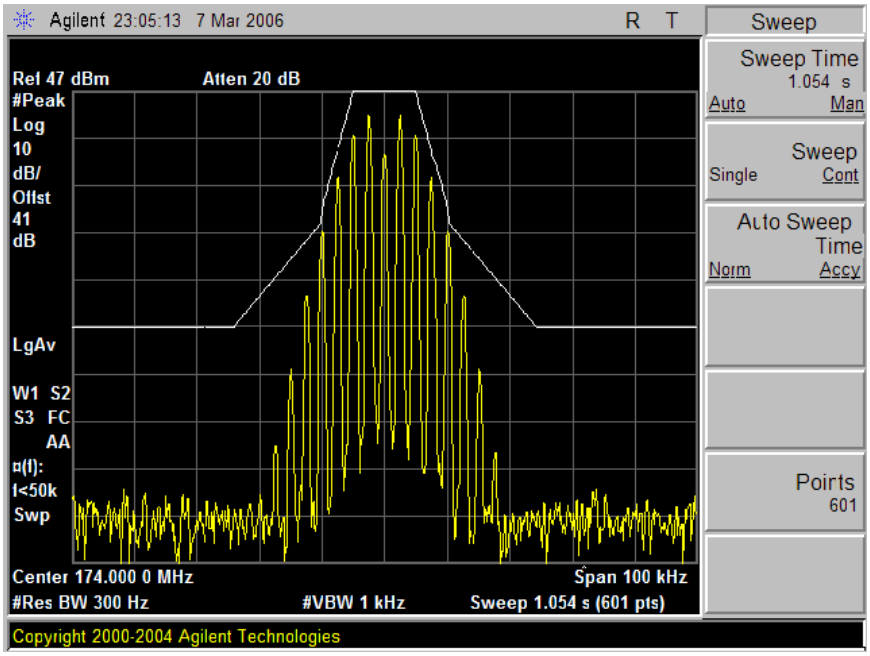
EMISSIONS MASK LOW CH



EMISSIONS MASK MID CH



EMISSIONS MASK HIGH CH



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

The Maximum ERP of base transmitters and cellular repeaters must not exceed 500 Watts.

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

RESULTS

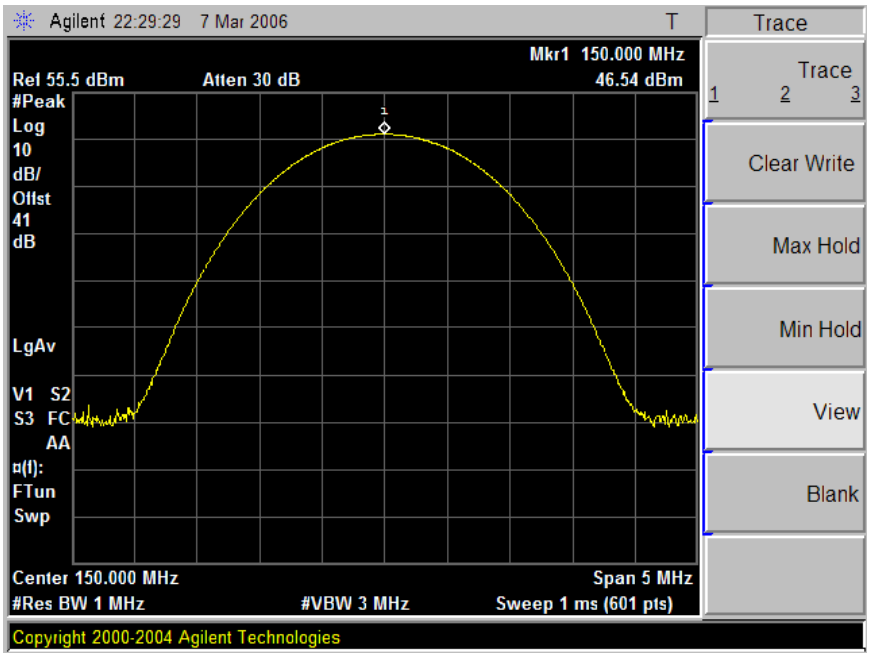
No non-compliance noted.

CW Output Power

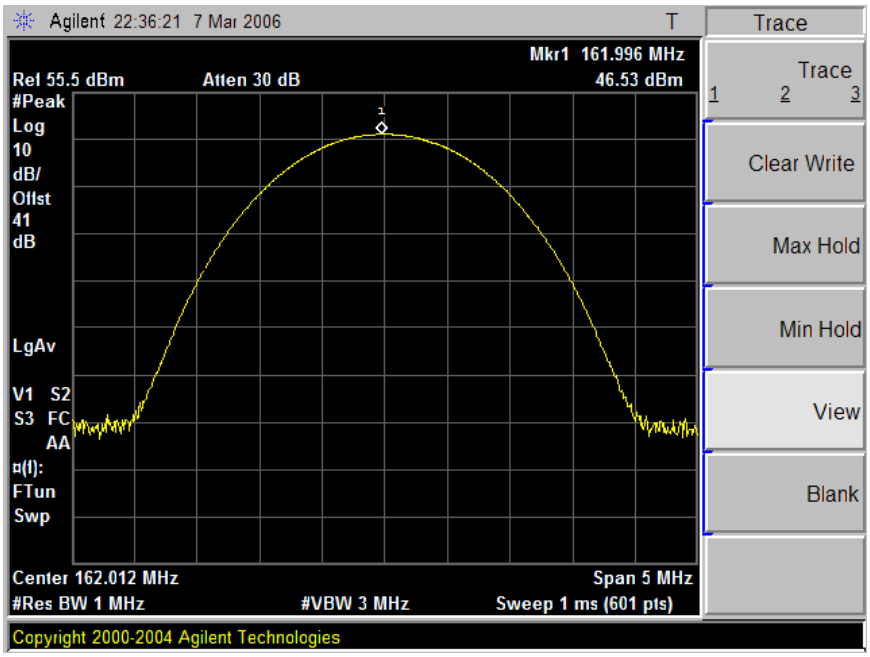
Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	150	46.54	45.08
Mid	162.0125	46.53	44.98
High	174	46.52	44.87

Conducted Output Power

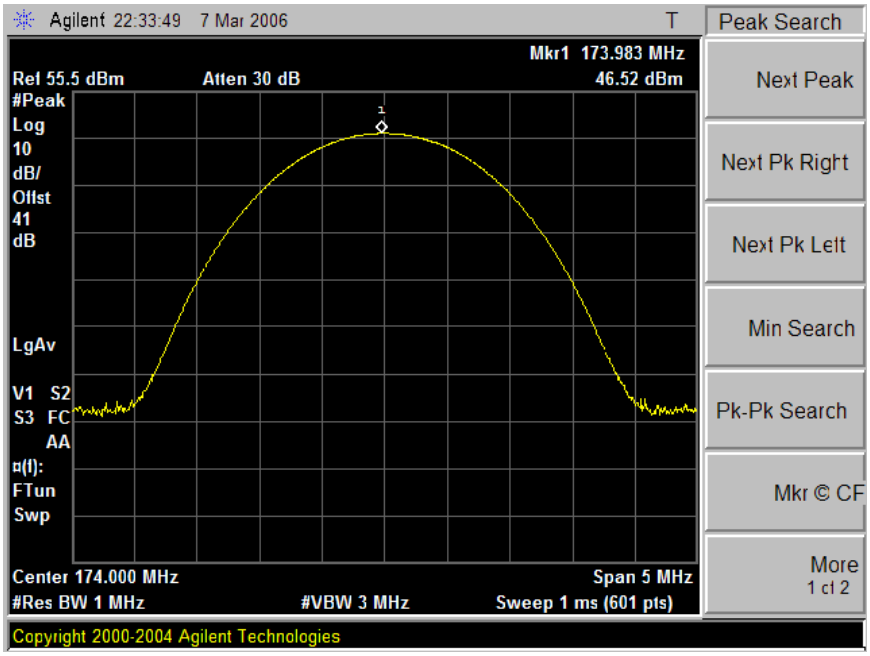
CW LOW CH



CW MID CH



CW HIGH CH



7.5. VOLTAGE STABILITY

LIMIT

The Maximum ERP of base transmitters and cellular repeaters must not exceed 500 Watts.

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 normal voltage 13.8VDC		Output Power at 85% voltage 11.7VDC		Output Power at 115% voltage 15.8VDC	
	dBm	Watt	dBm	Watt	dBm	Watt
150	46.54	45.08	45.00	31.62	46.58	45.50
162.0125	46.53	44.98	45.76	37.67	46.63	46.03
174	46.52	44.87	39.99	47.00	46.70	46.77

7.6. FREQUENCY STABILITY

Not Applicable. Due to this EUT is a power amplifier and has no Local Oscillator circuitry to shift the RF signal.

7.7. 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.

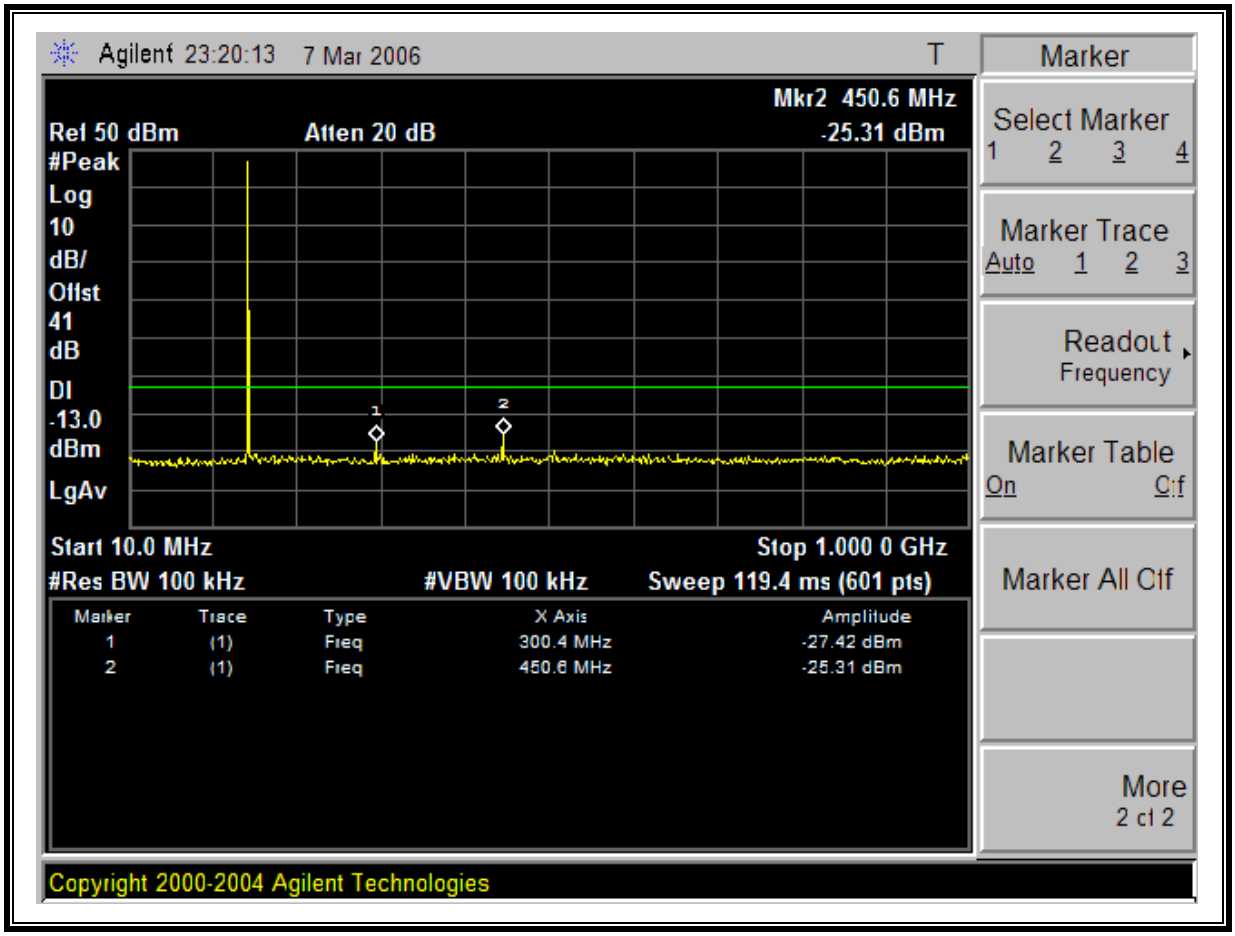
TEST PROCEDURE

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

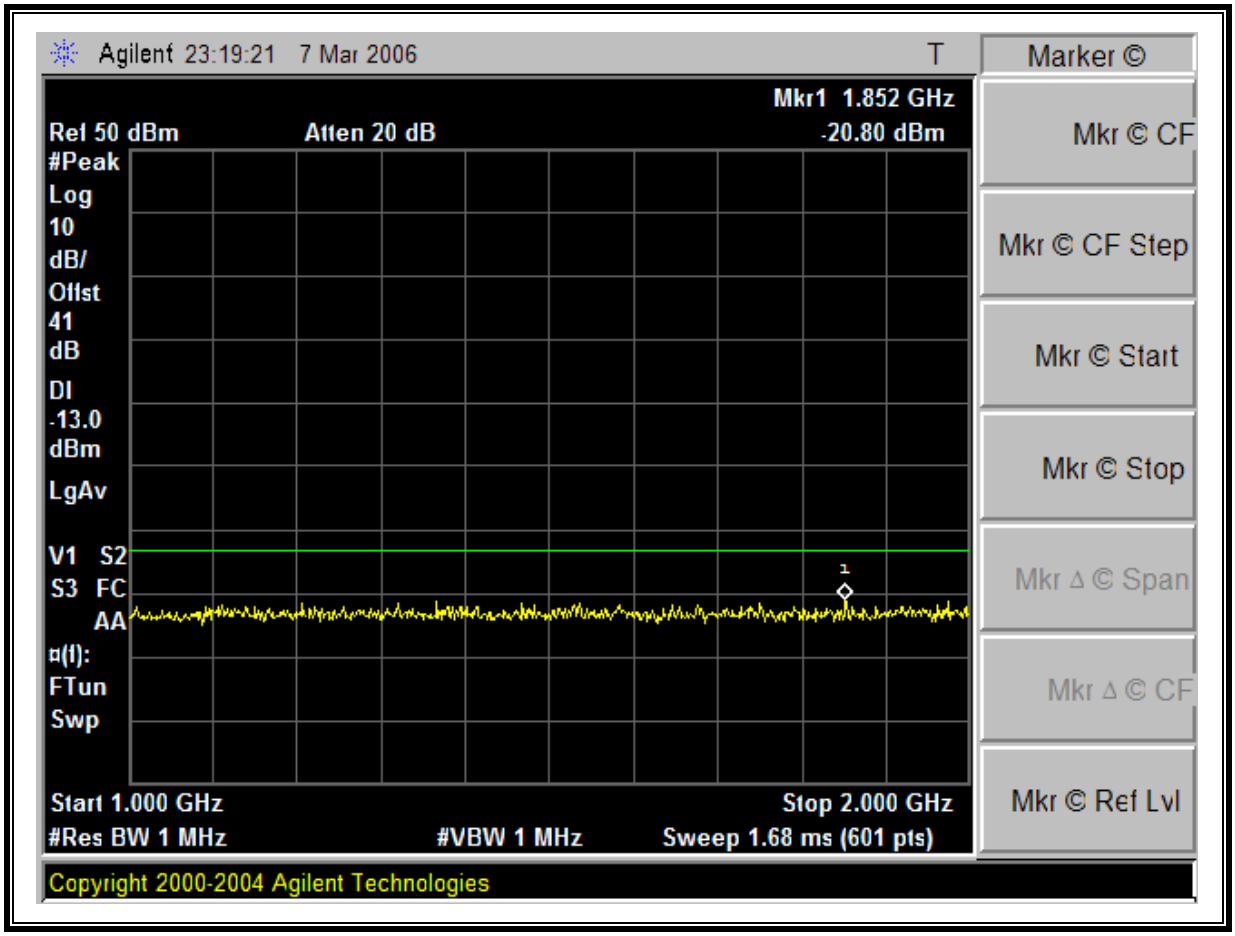
RESULTS

No non-compliance noted.

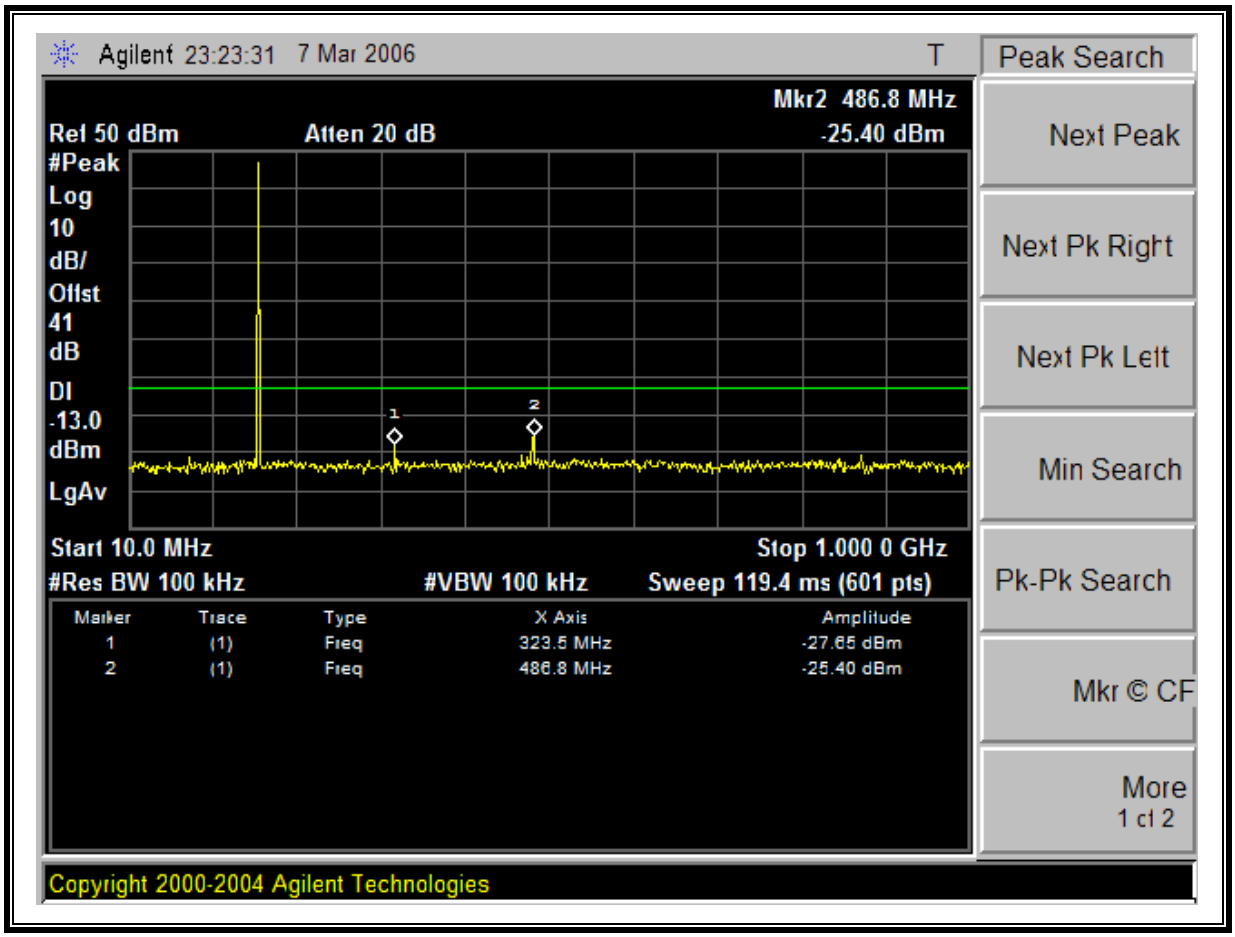
Low Channel, 10MHz to 1000MHz



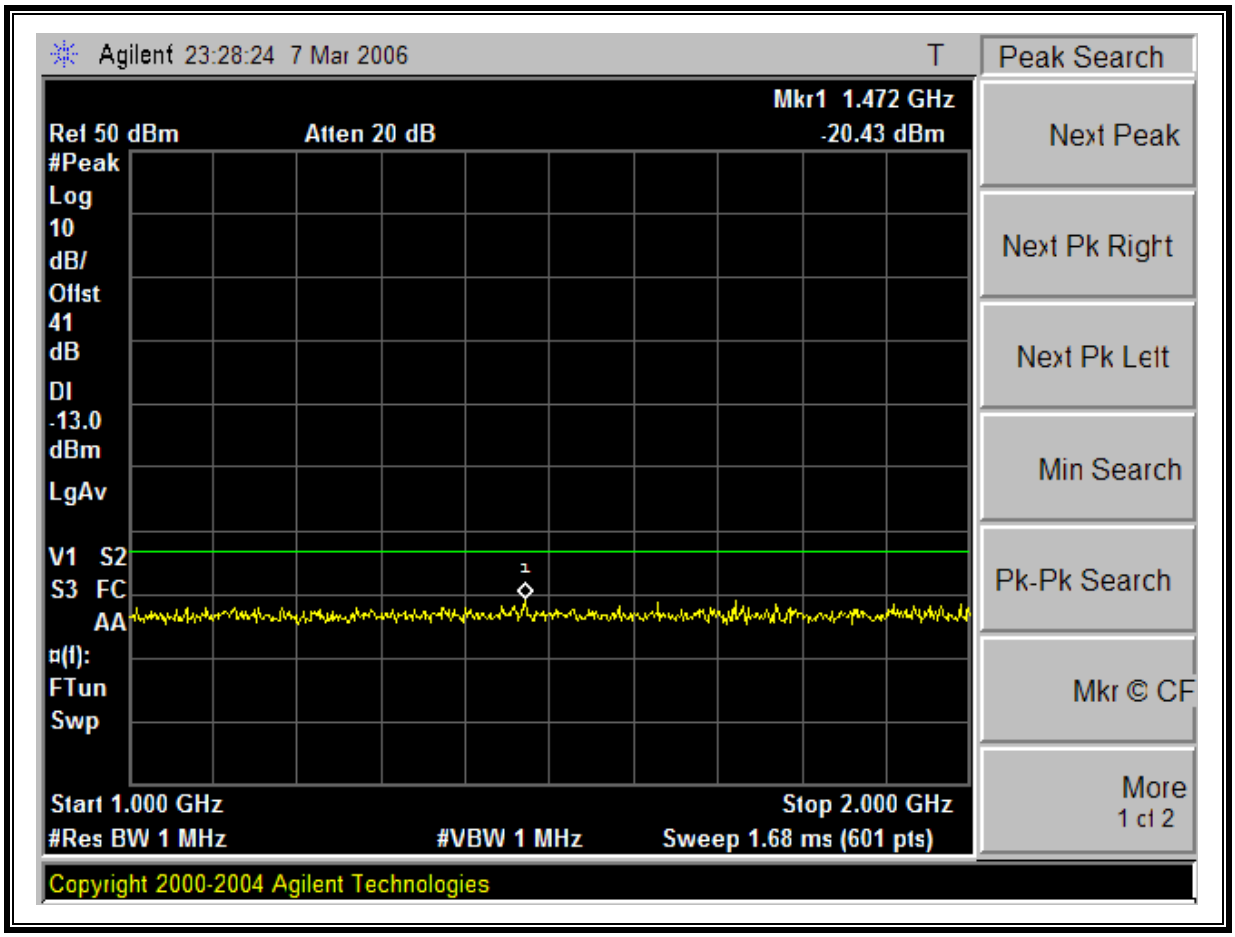
Low Channel, 1000MHz to 2000MHz



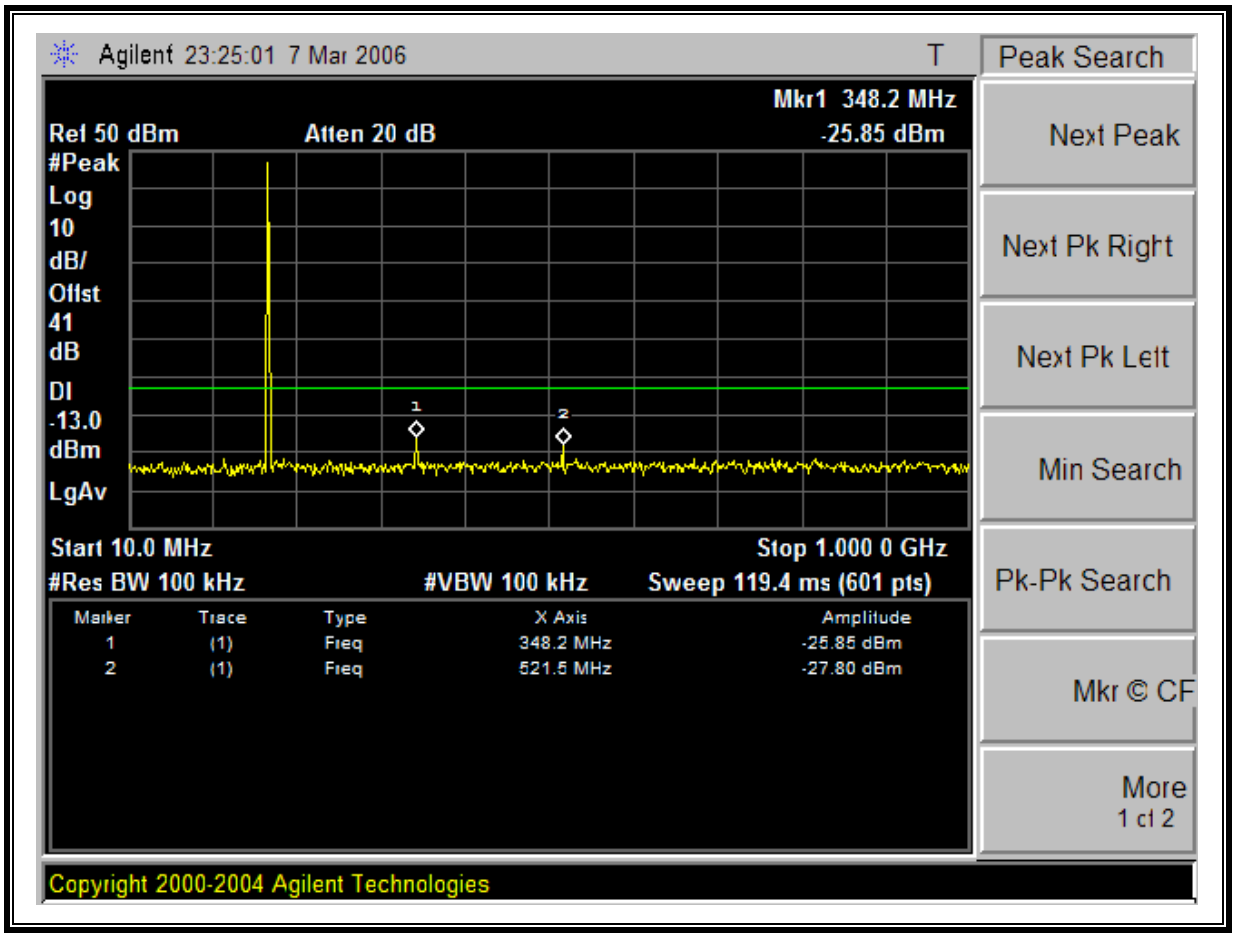
Mid Channel, 10MHz to 1000MHz



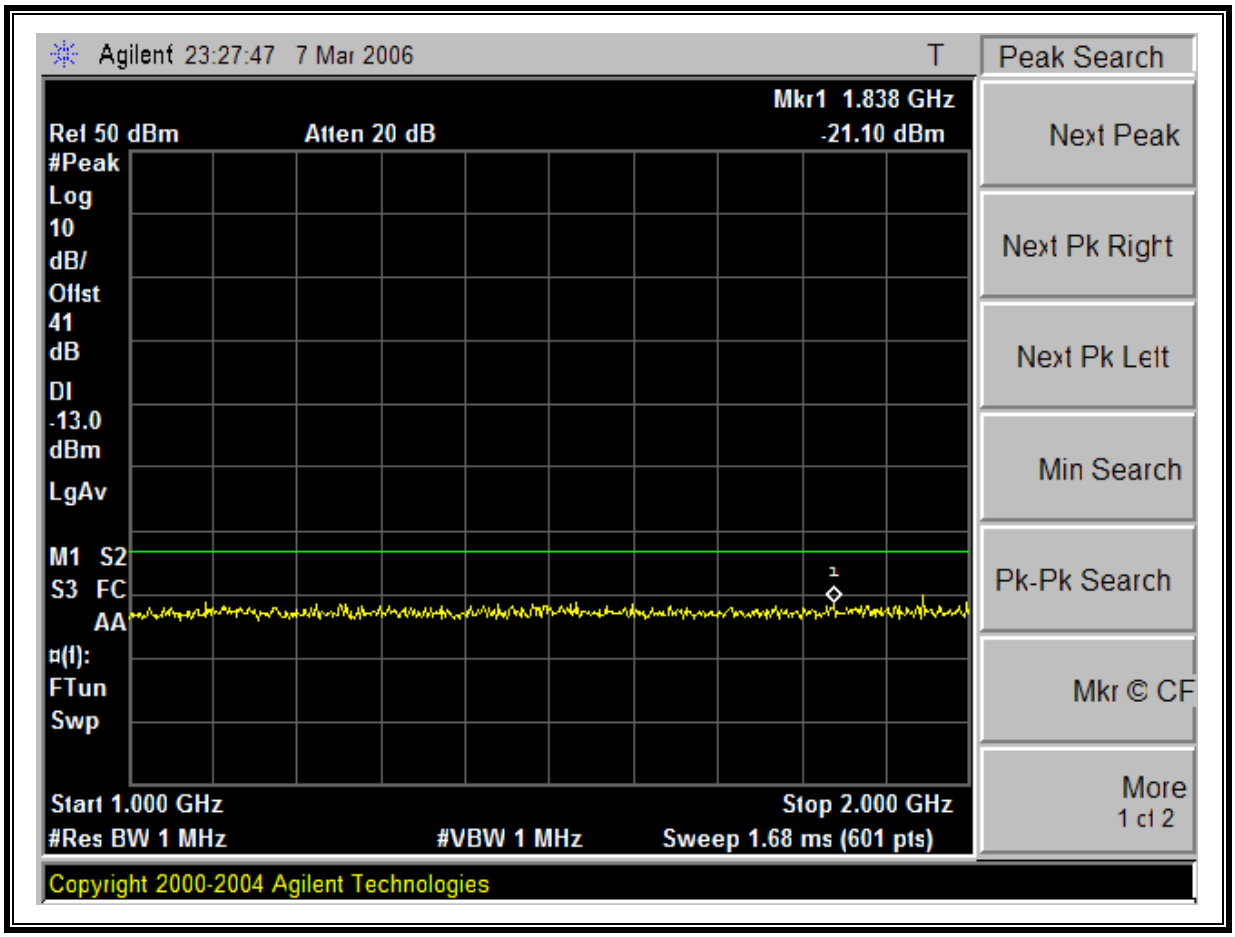
Low Channel, 1000MHz to 2000MHz



High Channel, 10MHz to 1000MHz



High Channel, 1000MHz to 2000MHz



7.7.1. 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.

7.7.2. SPURIOUS RADIATION

Spurious & Harmonic (ERP),

03/08/04 **30 - 1000MHz Substitution Measurement**
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr:Chin Pang
Project #:06U10112-1
Company:TPL Communications
EUT Descrip.:RF Power Amplifier
EUT M/N:PA3-1AC
Test Target:Part 22 and 90
Mode Oper:TX with 50 Ohm Load

Test Equipment:

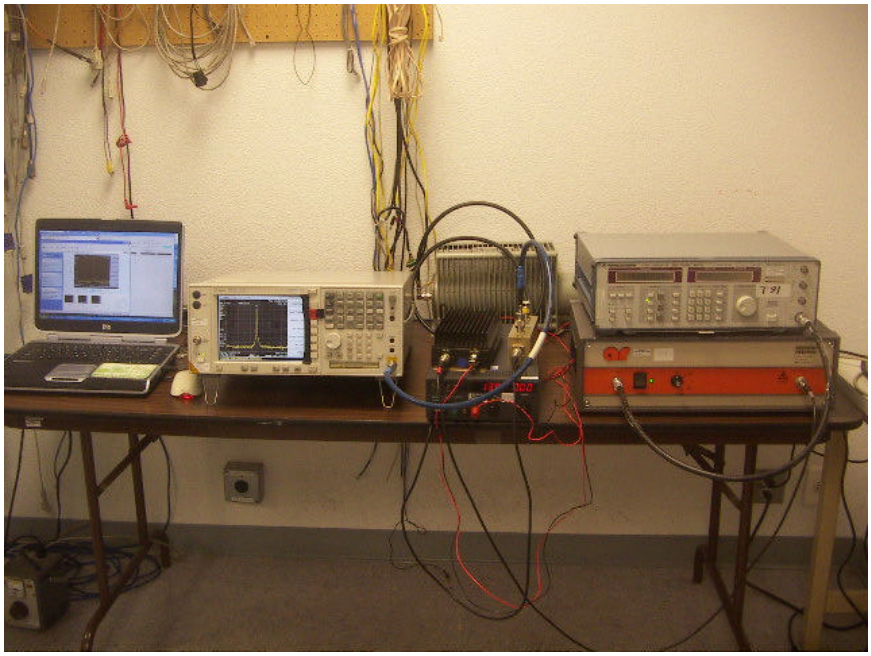
Bilog Antenna	Cable	Pre-amplifer 8447D	Limit
5m Chamber Sunol Bilog	5m Chamber Cable	T5 8447D	ERP

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, 150MHz										
93.10	54.0	V	-57.7	1.3	-0.4	-2.6	-61.5	-13.0	-48.5	
316.20	51.0	V	-55.9	2.1	6.0	3.9	-54.2	-13.0	-41.2	
350.10	53.6	V	-52.6	2.2	6.0	3.9	-50.9	-13.0	-37.9	
90.60	53.4	H	-59.8	1.3	-0.3	-2.4	-63.5	-13.0	-50.5	
190.10	51.0	H	-58.6	1.7	3.7	1.5	-58.7	-13.0	-45.7	
299.10	51.5	H	-55.5	2.1	6.0	3.9	-53.7	-13.0	-40.7	
Mid Ch, 162.0125MHz										
94.00	55.0	V	-56.5	1.3	-0.5	-2.7	-60.5	-13.0	-47.5	
304.00	50.0	V	-57.2	2.1	6.0	3.9	-55.4	-13.0	-42.4	
347.70	52.0	V	-54.2	2.2	6.0	3.9	-52.6	-13.0	-39.6	
93.10	55.0	H	-57.8	1.3	-0.4	-2.6	-61.7	-13.0	-48.7	
187.60	51.0	H	-58.6	1.7	3.5	1.4	-58.9	-13.0	-45.9	
291.90	54.0	H	-53.3	2.1	6.0	3.9	-51.4	-13.0	-38.4	
High, 174MHz Ch										
94.00	54.2	V	-57.3	1.3	-0.5	-2.7	-61.3	-13.0	-48.3	
156.10	52.0	V	-56.2	1.6	0.9	-1.2	-59.0	-13.0	-46.0	
376.80	51.5	V	-54.1	2.3	6.0	3.9	-52.5	-13.0	-39.5	
93.10	52.0	H	-60.8	1.3	-0.4	-2.6	-64.7	-13.0	-51.7	
158.50	54.3	H	-54.6	1.6	1.1	-1.0	-57.2	-13.0	-44.2	
355.00	52.7	H	-52.4	2.2	6.0	3.9	-50.8	-13.0	-37.8	
Note: No other emissions were detected above the system noise floor up to 2GHz.										

8. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

RADIATED BACK PHOTO

END OF REPORT