FCC CFR47 PART 22 SUBPART C
CERTIFICATION
TEST REPORT

FOR

450 – 470 MHZ RF POWER AMPLIFIER
100 WATTS, FM / CW MODULATION

MODEL NUMBER: PA6-1AE-SRXRF-PS

FCC ID: BBD6-1AE-RXR

REPORT NUMBER: 05U3493-1B

ISSUE DATE: AUGUST 4, 2005

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

Prepared by
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d.b.a.
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Revision History

Rev.	Issue Date	Revisions	Revised By
A	06/22/05	Initial Issue	YZ
B	08/04/05	Added Input data for Occupied Bandwidth	D.Z.

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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: 450 – 470 MHZ RF POWER AMPLIFIER
100 WATTS, FM / CW MODULATION

MODEL: PA6-1AE-SRXRF-PS

SERIAL NUMBER: N/A

DATE TESTED: JUNE 15 ~JUNE 16, 2005

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 22 SUBPART C	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:

YAN ZHENG
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

WILLIAM ZHUANG
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with TIA/EIA 603A (2001), FCC CFR 47 Part 2, FCC CFR 47 Part 22.

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	50	100.0

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT utilizes device has no antenna. RF output provided by female “N” connector

5.4. 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 450 MHz.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Signal Generator, 9KHz -3200MHz	HP	8684C	3623AB3025	7/5/2006
Amplifier	Amplifier Research	150W1000M2	303370	CNR
Power Attenuator	Tenuline	8343-200	970	CNR

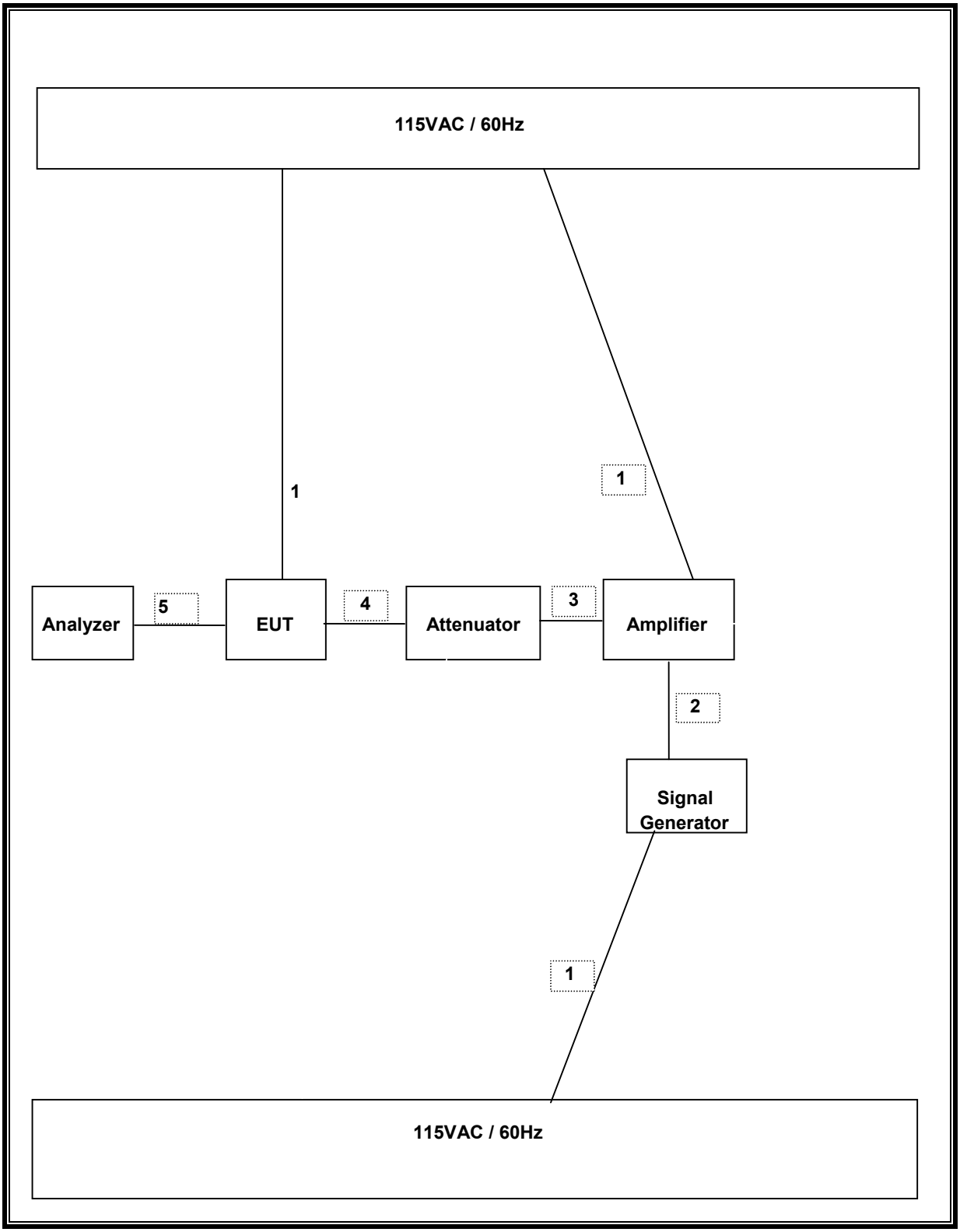
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	5	US115	Unshielded	1.8m	
2 -- 5	N-Connector	4	N-Type	Shileded	1m	
6	DC	1	Din	Unshielded	2m	

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**
Peak / Average Power Sensor	Agilent	E9327A	US40440755	11/7/2005
Power Meter	Agilent	E4416A	GB41291160	11/7/2005
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	11/20/2005
RF Filter Section	HP	85420E	3705A00256	11/20/2005
Spectrum Analyzer 20 Hz ~ 44 GHz	Agilent	E4446A	US42070220	3/28/2006
Signal Generator, 10 MHz~20 GHz	HP	83732B	US34490599	7/7/2005
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/29/2005
Antenna, Bilog 30MHz ~ 2Ghz	Sunol Sciences	JB1	A121003	3/3/2006
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-44	646456	8/17/2005

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

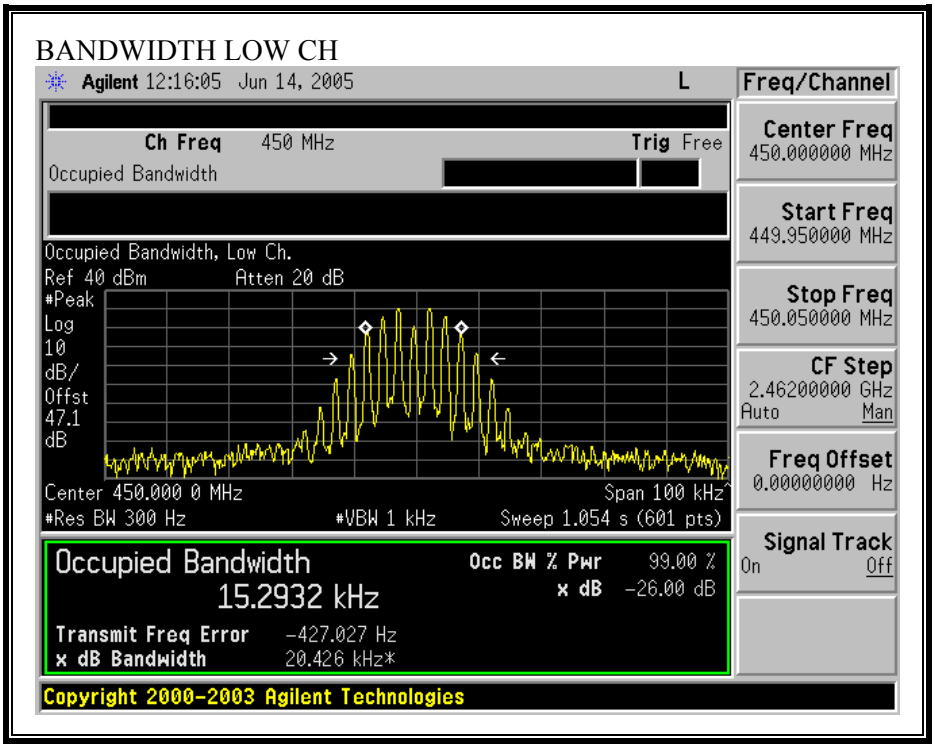
Channel	Frequency (MHz)	Bandwidth (KHz)
Low	450	20.426
Middle	460	20.420
High	470	20.410

FM Modulation - Output

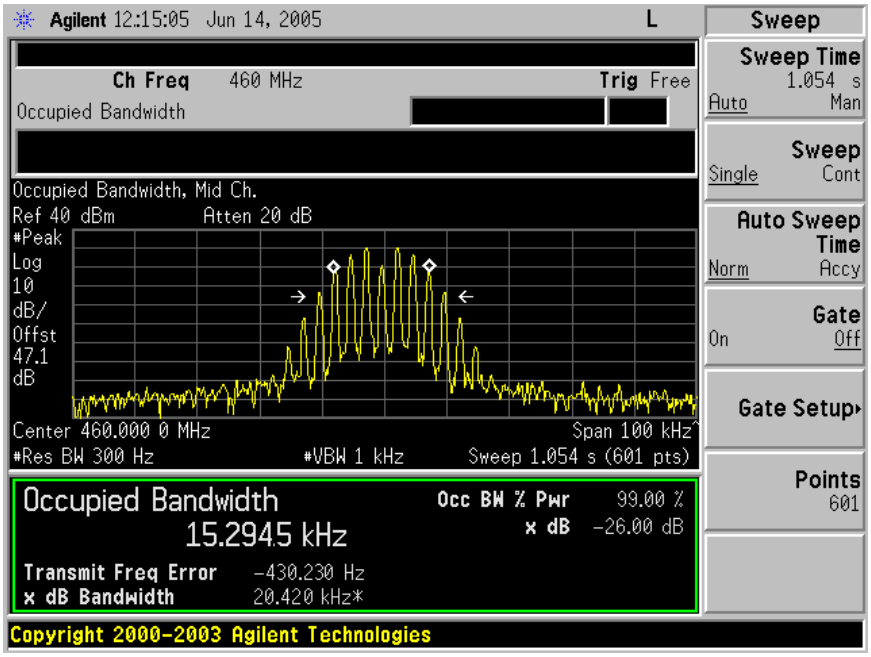
Channel	Frequency (MHz)	Bandwidth (MHz)
Low	450	20.416
Middle	460	20.424
High	470	20.416

FM 26 dB BANDWIDTH - INPUT

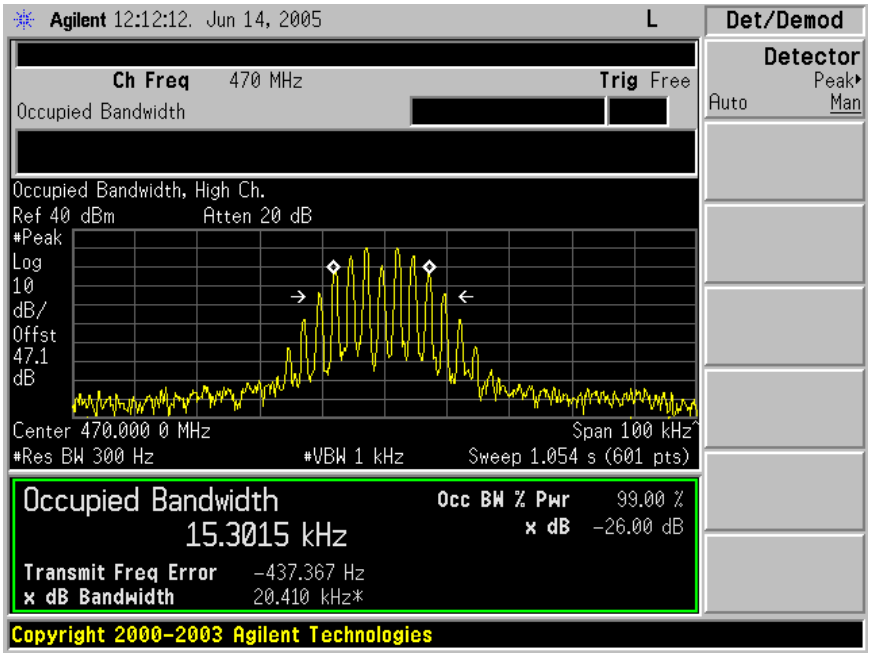
BANDWIDTH LOW CH



BANDWIDTH MID CH

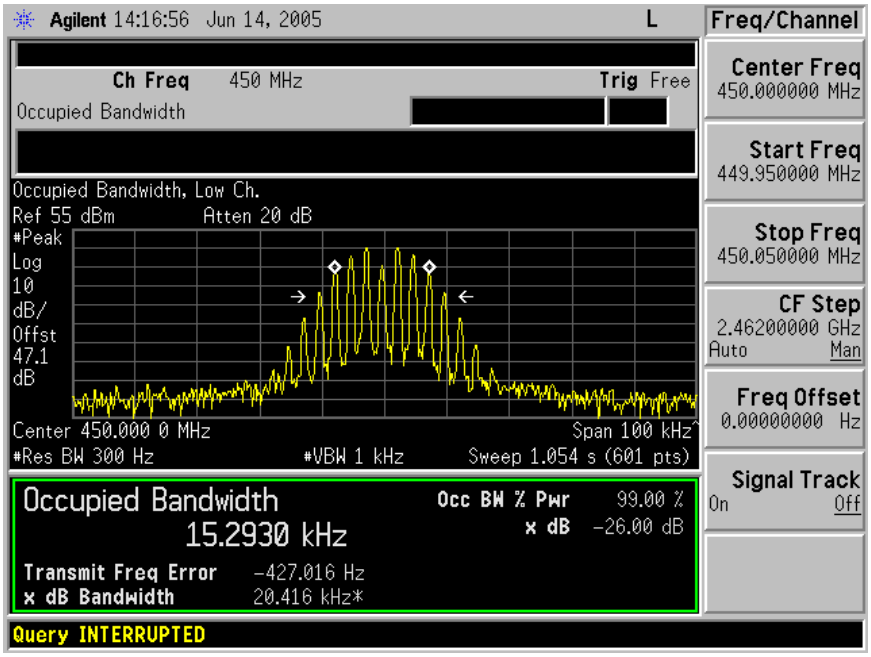


BANDWIDTH HIGH CH

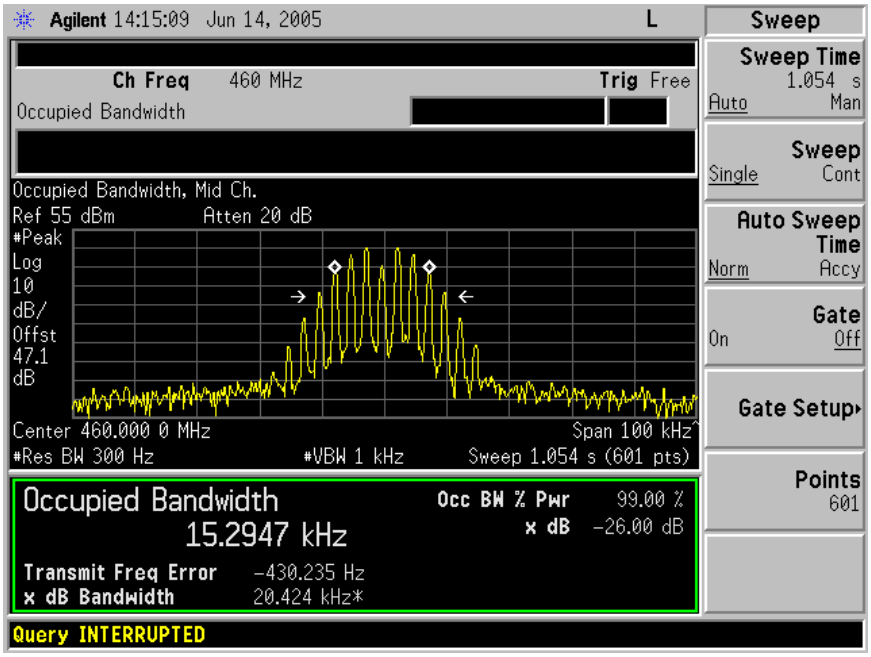


FM 26 dB BANDWIDTH - OUTPUT

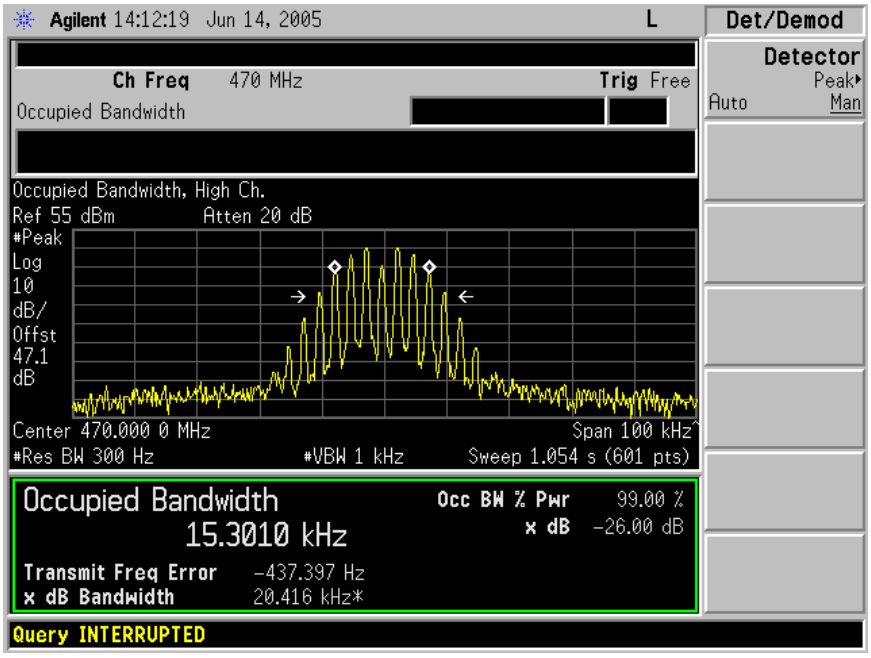
BANDWIDTH LOW CH



BANDWIDTH MID CH



BANDWIDTH HIGH CH



7.2. FM EMISSION LIMITATION

LIMIT

§22.359(2) For transmitters that operate in the frequency ranges 450 to 512 MHz and 929 to 932 MHz,
(i) On any frequency removed from the center frequency of the assigned channel by a displacement frequency fd (in kHz) of more than 5 kHz but not more than 10 kHz: at least 83 log (fd÷5) dB; the center frequency of the assigned channel by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB:
(ii) On any frequency removed from the center frequency of the assigned channel by a displacement frequency fd (in kHz) of more than 10 kHz but not more than 250 percent of the authorized bandwidth: at least 116 log (fd÷6.1) dB, or 50 + 10 log P dB, or 70 dB, whichever is the lesser attenuation;
(iii) On any frequency removed from the center frequency of the assigned channel by more than 250 percent of the authorized bandwidth: at least 43 + 10 log P dB, or 80 dB, whichever is the lesser attenuation.

TEST PROCEDURE

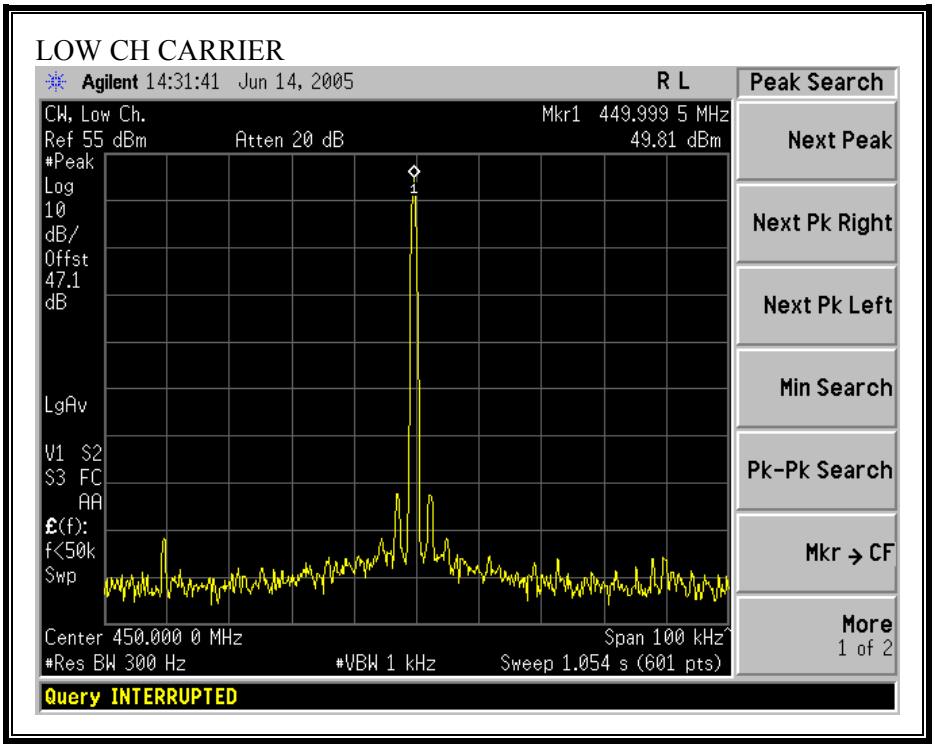
ANSI / TIA / EIA 603 Clause 2.4.10

RESULTS

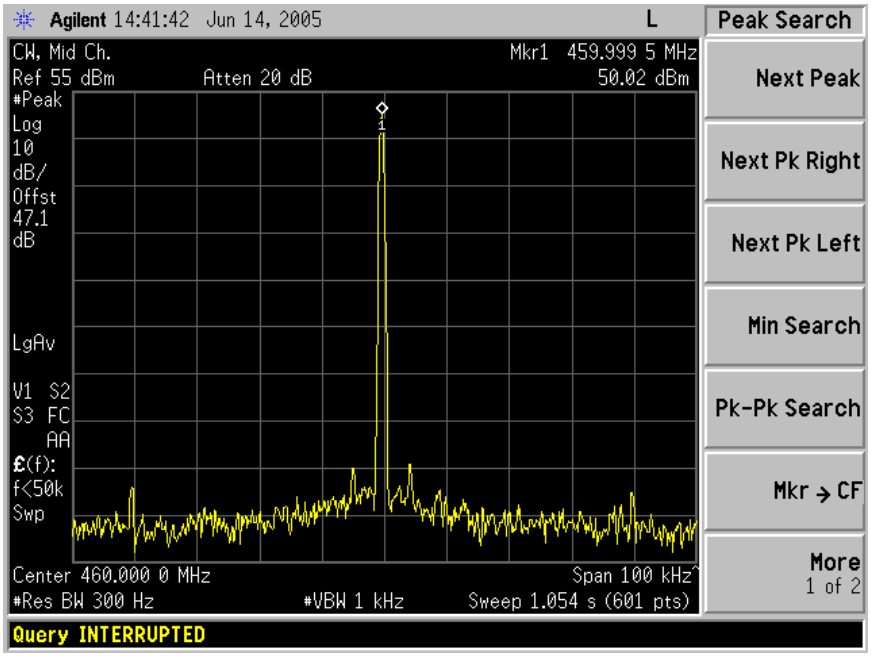
No non-compliance noted:

Un-modulation Signal:

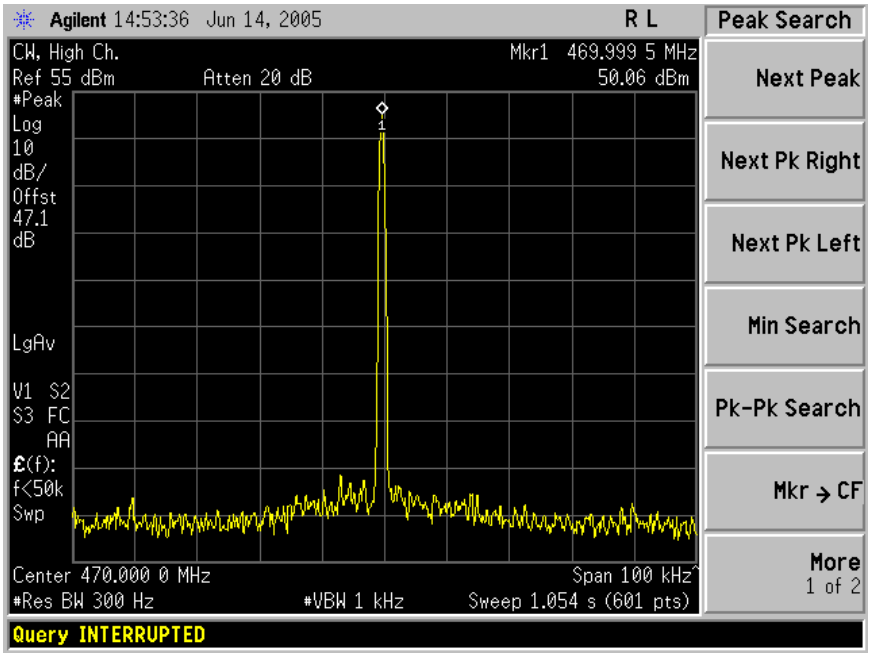
LOW CH CARRIER



MID CH CARRIER

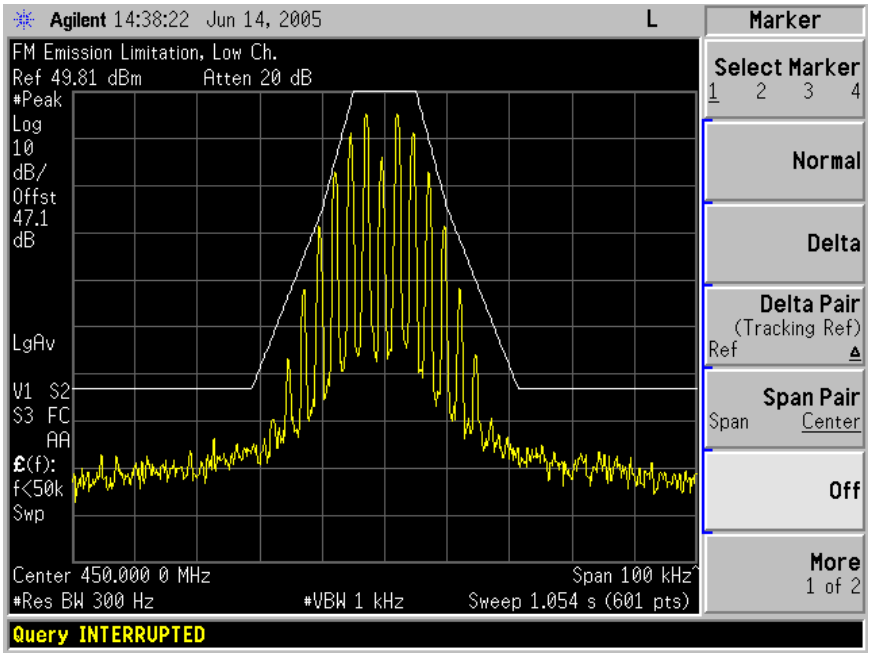


HIGH CH CARRIER

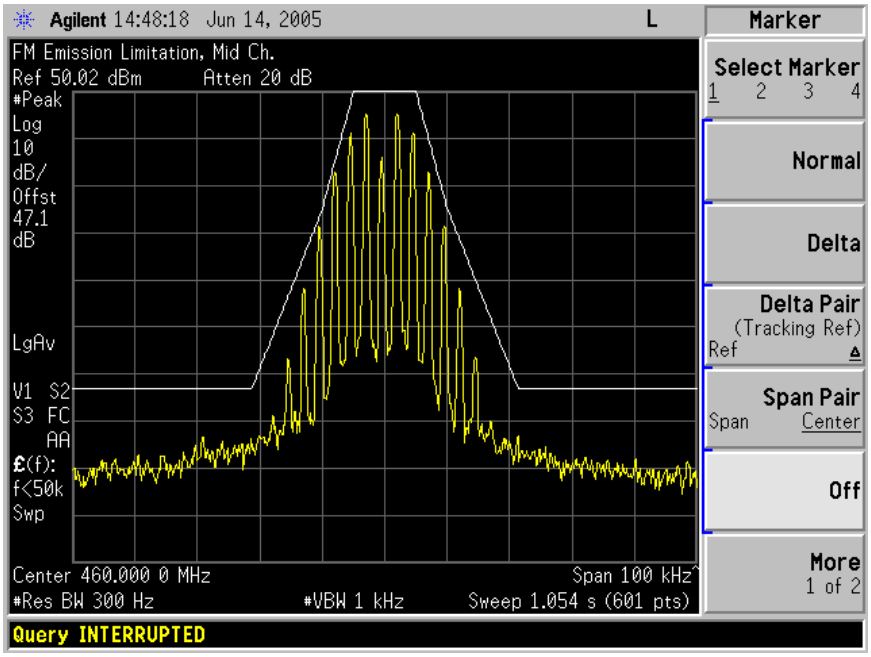


FM EMISSIONS MASK

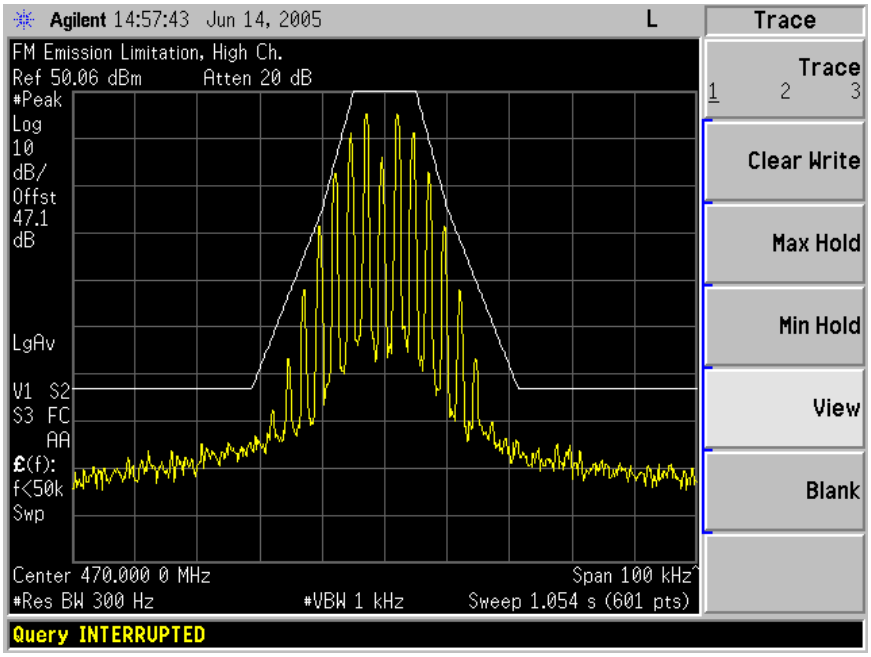
EMISSIONS MASK LOW CH



EMISSIONS MASK MID CH



EMISSIONS MASK HIGH CH



7.3. MODULATION CHARACTERISTICS

Not Applicable. This EUT is an amplifier.

7.4. RF POWER OUTPUT

LIMIT

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

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.2.17

RESULTS

No non-compliance noted.

Conducted Output Power

CW Output Power vs Voltage

Channel Freq.	Output Power at normal voltage 120 VAC	Output Power at 85% of normal voltage 102 VAC	Output Power at 115% of normal voltage 138 VAC
450 MHz	49.8 dBm / 95.5 W	50.0 dBm / 100 W	49.9 dBm / 97.7 W
460 MHz	50.0 dBm / 100 W	50.0 dBm / 100 W	50.1 dBm / 102.3W
470 MHz	49.7 dBm / 93.3 W	49.8 dBm / 95.5 W	50.2 dBm / 104.7 W

7.5. FREQUENCY STABILITY

Not Applicable. This EUT is an amplifier.

7.6. SPURIOUS EMISSION AT ANTENNA TERMINAL

LIMIT

§22.917 (a) 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.

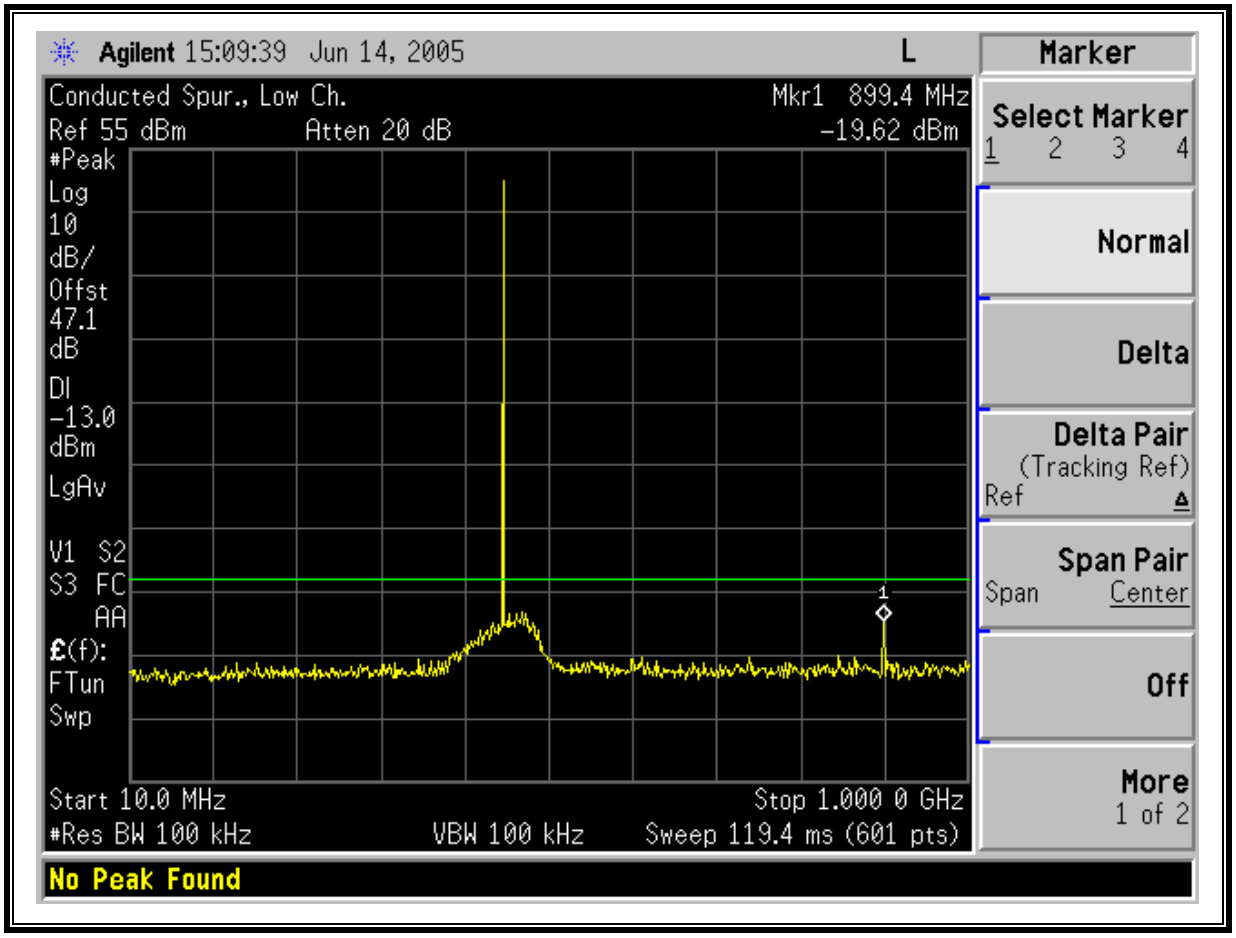
TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 3.2.13 & FCC 22.917 (b)

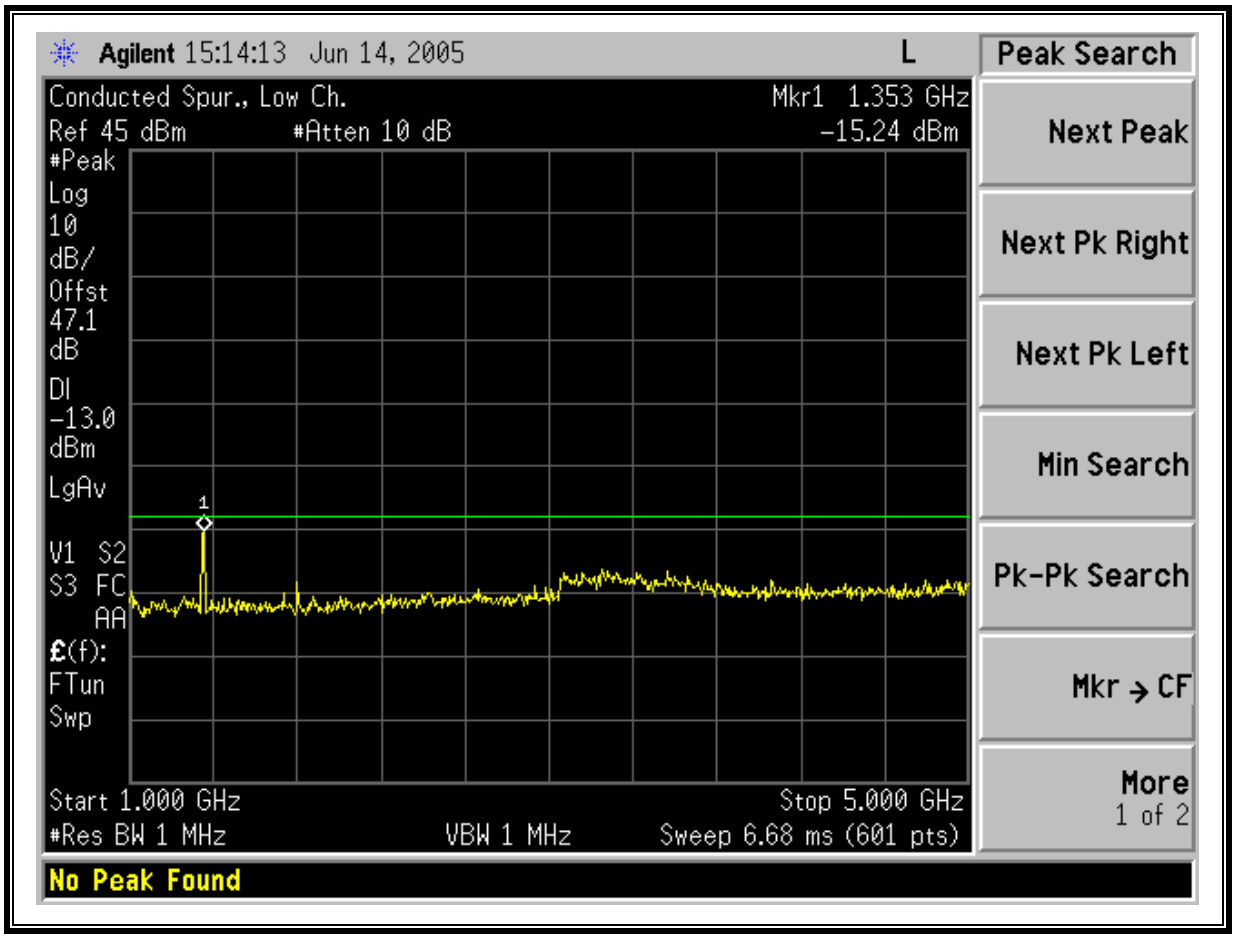
RESULTS

No non-compliance noted.

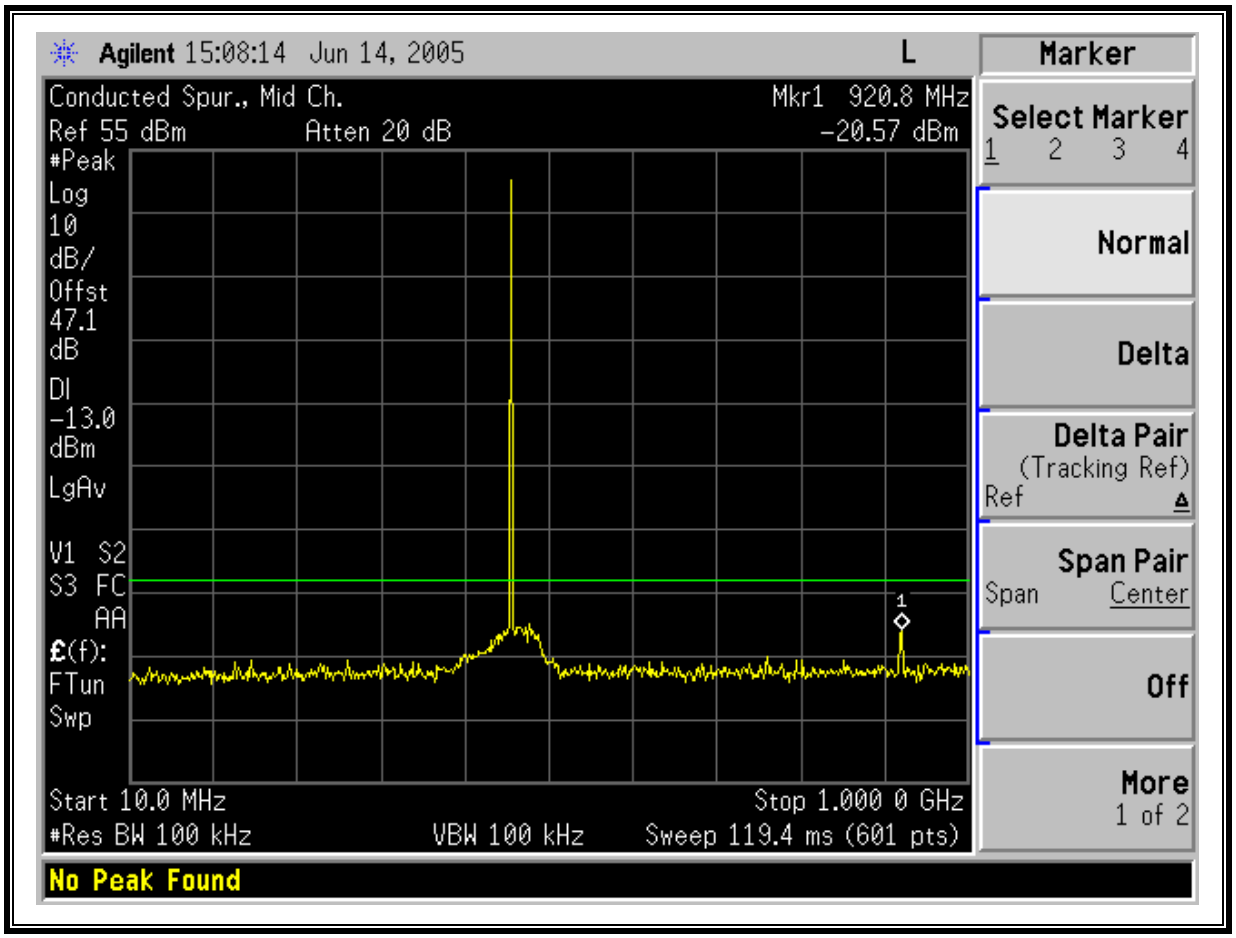
Low Channel, 10MHz to 1000MHz



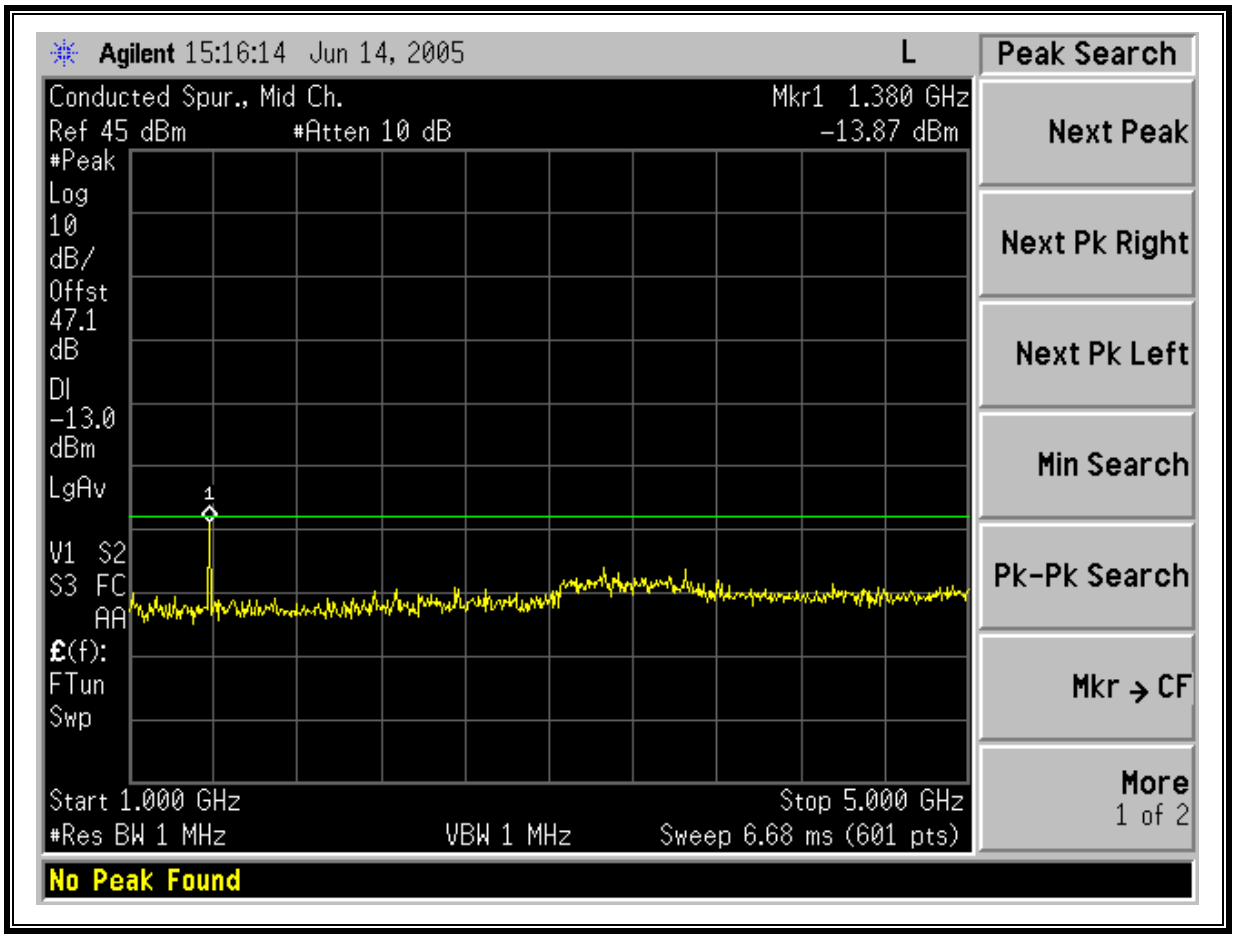
Low Channel, 1000MHz to 5000MHz



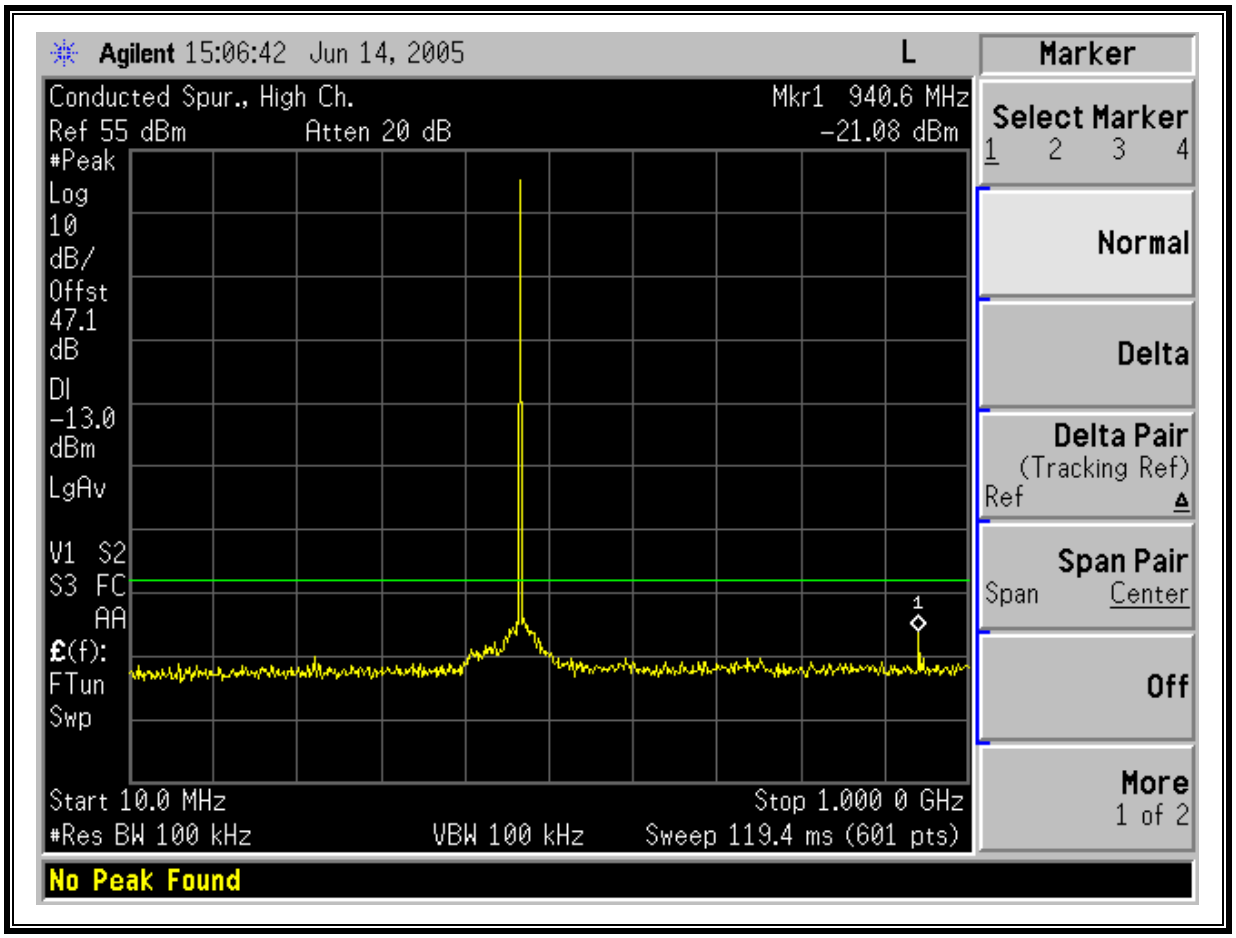
Mid Channel, 10MHz to 1000MHz



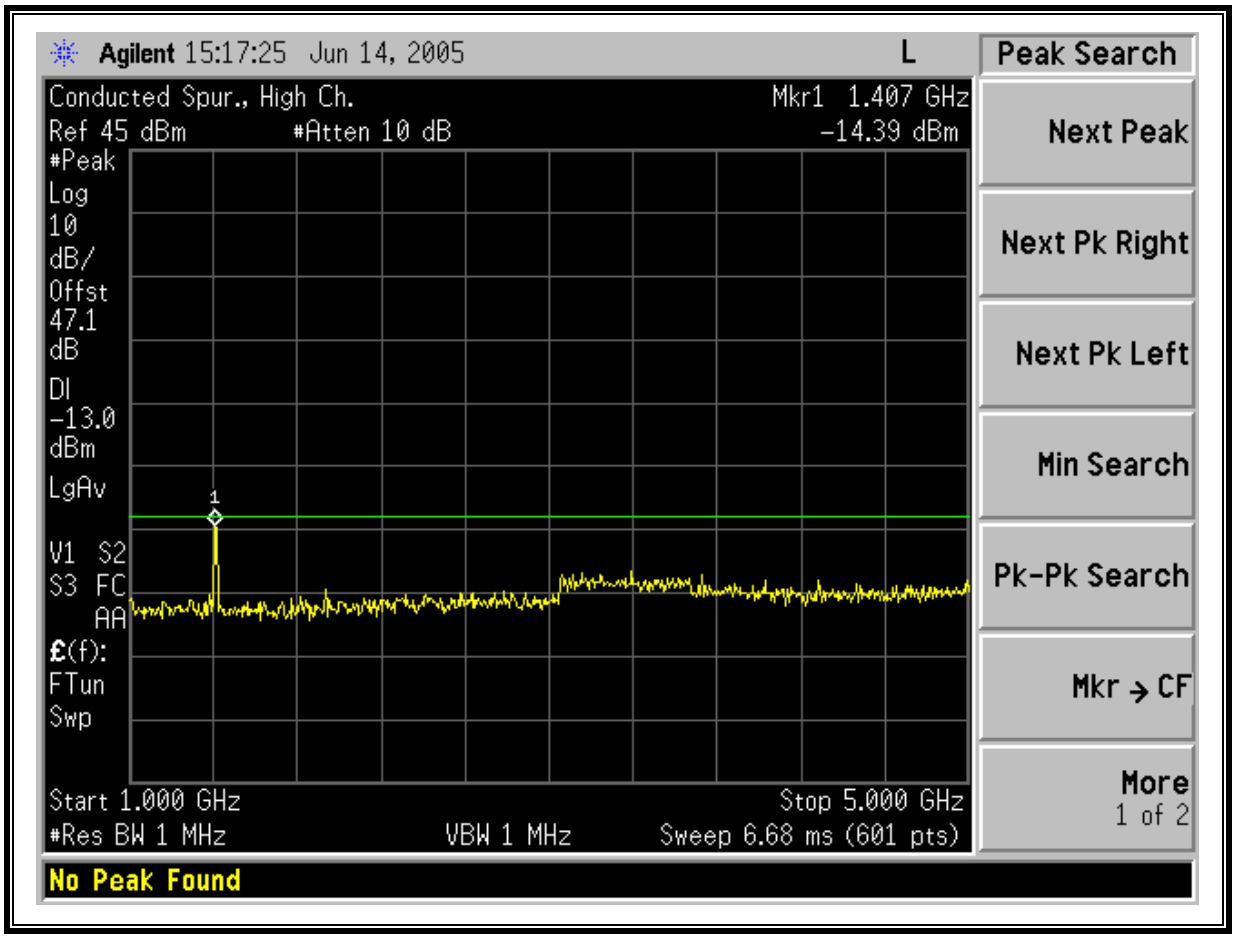
Mid Channel, 1000MHz to 5000MHz



High Channel, 10MHz to 1000MHz



High Channel, 1000MHz to 5000MHz



7.7. FIELD STRENGTH OF SPURIOUS RADIATION

LIMIT

§22.917 (a) 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 3.2.12 & FCC 22.917 (b)

RESULTS

No non-compliance noted.

7.7.1. 10MHz TO 1000MHz SPURIOUS RADIATION

06/14/05 30 - 1000MHz Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr: William Zhuang
Project #: 05U3493
Company: TPL Communications
EUT Descrip.: RF PowerAmplifier, 450-470MHz, Single Channel, 120VAC
EUT M/N: PA6-1AE-SRXRF-PS
Test Target: FCC22
Mode Oper: Turn On, Worst case, Mid Ch.

Test Equipment:

Bilog Antenna	Cable	Pre-amplifer 8447D	Limit
5m Chamber Sunol Bilog	5m Chamber Cable		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
61.50	41.2	H	-46.5	1.1	-2.1	-4.3	-51.9	-13.0	-38.9	
83.40	46.9	H	-39.8	1.2	-0.4	-2.6	-43.6	-13.0	-30.6	
190.10	30.6	H	-51.7	1.7	3.7	1.5	-51.8	-13.0	-38.8	
221.60	31.3	H	-51.6	1.9	5.8	3.7	-49.8	-13.0	-36.8	
311.30	35.7	H	-43.4	2.1	6.0	3.9	-41.7	-13.0	-28.7	
929.70	32.3	H	-37.3	3.7	6.8	4.7	-36.3	-13.0	-23.3	
39.70	35.7	V	-46.0	1.0	-12.1	-14.3	-61.2	-13.0	-48.2	
61.50	45.8	V	-42.2	1.1	-2.1	-4.3	-47.6	-13.0	-34.6	
83.40	46.7	V	-36.9	1.2	-0.4	-2.6	-40.7	-13.0	-27.7	
221.60	31.8	V	-51.0	1.9	5.8	3.7	-49.2	-13.0	-36.2	
338.00	30.6	V	-48.7	2.2	6.0	3.9	-47.0	-13.0	-34.0	
929.70	28.7	V	-40.6	3.7	6.8	4.7	-39.6	-13.0	-26.6	

7.7.2. ABOVE 1000MHz SPURIOUS RADIATION

Spurious & Harmonic (ERP), Low Channel

06/14/05 High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr: William Zhuang
Project #: 05U3493
Company: TPL Communications
EUT Descrip.: RF Power Amplifier, 450-470MHz, Single Channel, 120VAC
EUT M/N: PA6-1AE-SRXRF-PS
Test Target: FCC22
Mode Oper: Turn On

Test Equipment:

EMCO Horn 1-18GHz: T73; 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-amplifer 1-26GHz:
Pre-amplifer 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	55.1	V	-54.7	1.2	7.6	5.5	-50.4	-13.0	-37.4	
1.800	68.7	V	-39.5	1.3	8.7	6.5	-34.3	-13.0	-21.3	
2.250	46.8	V	-59.9	1.5	9.5	7.4	-54.1	-13.0	-41.1	
2.700	43.8	V	-61.4	1.7	9.7	7.5	-55.6	-13.0	-42.6	
3.150	43.1	V	-60.8	1.8	9.7	7.6	-55.0	-13.0	-42.0	
3.600	38.8	V	-64.1	2.0	10.0	7.9	-58.2	-13.0	-45.2	
4.050	40.1	V	-61.8	2.1	10.4	8.2	-55.7	-13.0	-42.7	
4.500	38.3	V	-63.0	2.3	10.8	8.6	-56.6	-13.0	-43.6	
4.950	36.8	V	-63.8	2.4	11.2	9.0	-57.2	-13.0	-44.2	
1.350	49.0	H	-60.1	1.2	7.6	5.5	-55.8	-13.0	-42.8	
1.800	46.0	H	-61.4	1.3	8.7	6.5	-56.2	-13.0	-43.2	
2.250	38.9	H	-67.6	1.5	9.5	7.4	-61.7	-13.0	-48.7	
2.700	41.3	H	-63.8	1.7	9.7	7.5	-57.9	-13.0	-44.9	
3.150	39.4	H	-64.3	1.8	9.7	7.6	-58.5	-13.0	-45.5	
3.600	32.1	H	-70.7	2.0	10.0	7.9	-64.8	-13.0	-51.8	
4.050	30.6	H	-70.9	2.1	10.4	8.2	-64.8	-13.0	-51.8	
4.500	34.6	H	-66.3	2.3	10.8	8.6	-60.0	-13.0	-47.0	
4.950	38.5	H	-61.8	2.4	11.2	9.0	-55.3	-13.0	-42.3	

Spurious & Harmonic (ERP), Mid Channel

06/14/05 High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr: William Zhuang
Project #: 05U3493
Company: TPL Communications
EUT Descrip.: RF Power Amplifier, 450-470MHz, Single Channel, 120VAC
EUT M/N: PA6-1AE-SRXRF-PS
Test Target: FCC22
Mode Oper: Turn On

Test Equipment:

EMCO Horn 1-18GHz: T73; 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-amplifer 1-26GHz:
Pre-amplifer 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
Mid Ch. 460MHz										
1.380	51.5	H	-57.4	1.2	7.7	5.5	-53.1	-13.0	-40.1	
1.840	44.0	H	-63.4	1.4	8.8	6.6	-58.1	-13.0	-45.1	
2.300	45.1	H	-61.3	1.5	9.6	7.4	-55.4	-13.0	-42.4	
2.760	44.8	H	-60.1	1.7	9.7	7.5	-54.2	-13.0	-41.2	
3.220	32.8	H	-70.8	1.8	9.8	7.6	-65.0	-13.0	-52.0	
3.680	38.2	H	-64.4	2.0	10.1	7.9	-58.4	-13.0	-45.4	
4.140	39.3	H	-62.2	2.2	10.4	8.3	-56.0	-13.0	-43.0	
4.600	32.9	H	-67.9	2.3	10.9	8.7	-61.5	-13.0	-48.5	
5.050	39.0	H	-59.2	2.5	11.2	9.0	-52.6	-13.0	-39.6	
1.380	48.3	V	-61.3	1.2	7.7	5.5	-57.0	-13.0	-44.0	
1.840	45.0	V	-63.1	1.4	8.8	6.6	-57.8	-13.0	-44.8	
2.300	42.5	V	-64.1	1.5	9.6	7.4	-58.3	-13.0	-45.3	
2.760	50.2	V	-54.8	1.7	9.7	7.5	-49.0	-13.0	-36.0	
3.220	37.0	V	-66.7	1.8	9.8	7.6	-60.9	-13.0	-47.9	
3.680	32.2	V	-70.5	2.0	10.1	7.9	-64.6	-13.0	-51.6	
4.140	46.8	V	-54.9	2.2	10.4	8.3	-48.8	-13.0	-35.8	
4.600	39.1	V	-62.1	2.3	10.9	8.7	-55.7	-13.0	-42.7	
5.050	46.9	V	-52.3	2.5	11.2	9.0	-45.7	-13.0	-32.7	

Spurious & Harmonic (ERP), High Channel

06/14/05 High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr: William Zhuang
Project #: 05U3493
Company: TPL Communications
EUT Descrip.: RF Power Amplifier, 450-470MHz, Single Channel, 120VAC
EUT M/N: PA6-1AE-SRXRF-PS
Test Target: FCC22
Mode Oper: Turn On

Test Equipment:

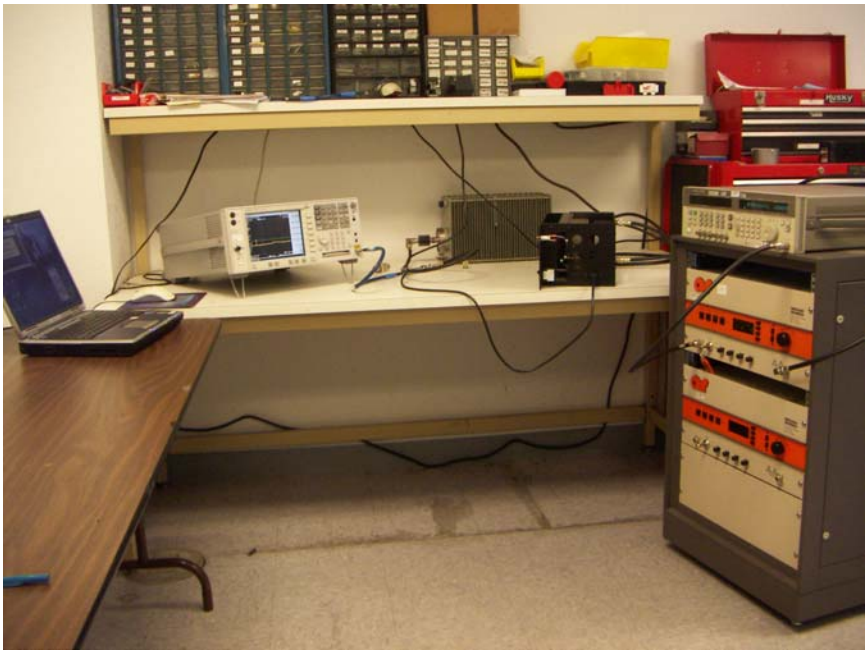
EMCO Horn 1-18GHz: T73; S/N: 6717 @3m
Horn > 18GHz:
Limit: FCC 22
☐ High Pass Filter
Hi Frequency Cables: ☐ (2 ft) ☐ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)
Pre-amplifer 1-26GHz:
Pre-amplifer 26-40GHz:

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
High Ch. 470MHz										
1.410	50.1	V	-59.5	1.2	7.8	5.6	-55.1	-13.0	-42.1	
1.880	48.3	V	-59.7	1.4	8.9	6.7	-54.3	-13.0	-41.3	
2.350	45.5	V	-61.0	1.6	9.6	7.5	-55.1	-13.0	-42.1	
2.820	50.5	V	-54.3	1.7	9.6	7.5	-48.5	-13.0	-35.5	
3.290	36.4	V	-67.2	1.9	9.8	7.7	-61.4	-13.0	-48.4	
3.760	44.9	V	-57.7	2.0	10.2	8.0	-51.7	-13.0	-38.7	
4.230	51.8	V	-49.8	2.2	10.5	8.4	-43.6	-13.0	-30.6	
4.700	49.3	V	-51.7	2.3	10.9	8.8	-45.2	-13.0	-32.2	
5.170	46.4	V	-52.4	2.5	11.1	9.0	-46.0	-13.0	-33.0	
1.410	50.6	H	-58.3	1.2	7.8	5.6	-53.9	-13.0	-40.9	
1.880	45.9	H	-61.3	1.4	8.9	6.7	-55.9	-13.0	-42.9	
2.350	50.6	H	-55.7	1.6	9.6	7.5	-49.7	-13.0	-36.7	
2.820	44.8	H	-59.8	1.7	9.6	7.5	-54.0	-13.0	-41.0	
3.290	35.2	H	-68.2	1.9	9.8	7.7	-62.4	-13.0	-49.4	
3.760	39.4	H	-63.0	2.0	10.2	8.0	-57.0	-13.0	-44.0	
4.230	48.2	H	-53.1	2.2	10.5	8.4	-46.9	-13.0	-33.9	
4.700	43.0	H	-57.7	2.3	10.9	8.8	-51.2	-13.0	-38.2	
5.170	46.8	H	-51.1	2.5	11.1	9.0	-44.6	-13.0	-31.6	

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