



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

POWER AMPLIFIER

MODEL NUMBER: M4-BBDA-U

FCC ID: TCJ-M4BBDAU

REPORT NUMBER: 05U3796-1

ISSUE DATE: DECEMBER 20, 2005

Prepared for
**CANAM TECHNOLOGY
5318 E. SECOND STREET, # 700
LONG BEACH, CA 90803, USA**

Prepared by
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Revision History

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A	12/0205	Initial Issue	Thu
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: CANAM TECHNOLOGY
5318 E. SECOND STREET, # 700
LONG BEACH, CA 90803 USA

EUT DESCRIPTION: POWER AMPLIFIER

MODEL: M4-BBDA-U

SERIAL NUMBER: 1009

DATE TESTED: OCTOBER 26 ~NOVEMBER 4, 2005

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

WILLIAM ZHUANG
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 Mark-IV Broadband Amplifiers are highly-linear devices suitable for applications in the two-way radio UHF band.

The model number was changed after testing commenced. All data in this report is applicable to the model number documented in Section 1 above.

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)
421 ~ 512	CW	37	5.0

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 mid channel.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
Power Attenuator	Tenuline	8343-200	970	CNR
DC power supply, 40 V @ 30 A	HP	6268A	6M1458	CNR
Signal Generator, 10 MHz ~ 20 GHz	HP	83732B	US34490599	10/5/06
Power Sensor, 18 GHz, 300 mW	R&S	NVR-Z51	DE 13013	2/3/07
Peak Power Meter	Agilent	E4416A	GB41291160	2/9/06
Signal Generator, 40 GHz	R & S	SMP04	DE 34210	6/8/06

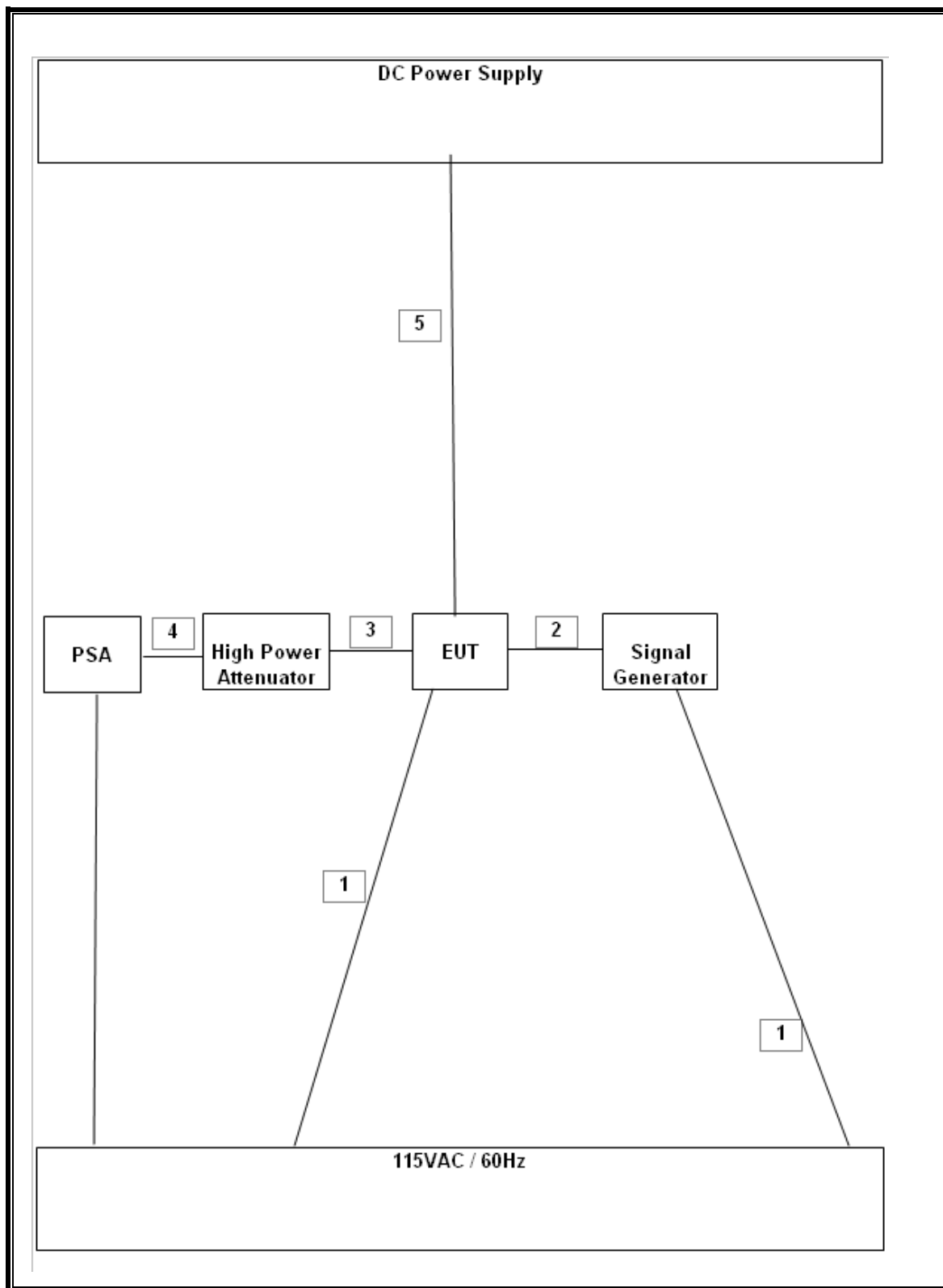
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	3	US115	Unshielded	1.8m	
2 -- 4	Input / Output	4	N-Type	Shielded	1m	
5	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
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	MY43360112	3/28/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/29/2006
RF Filter Section	HP	85420E	3705A00256	3/29/2006
Antenna, Bilog 30MHz ~ 2Ghz	Sunol Sciences	JB1	A121003	3/3/2006
Preamplifier, 1 ~ 26 GHz	Miteq	NSP2600-SP	924342	8/17/2006
Antenna, Horn 1 ~ 18 GHz	ETS	3117	29301	4/22/2006

7. LIMITS AND RESULTS

7.1. OCCUPIED BANDWIDTH

LIMIT

None: for reporting purposes only.

TEST PROCEDURE

Measurements were made with a 2.5 kHz modulating signal adjusted to produce 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:

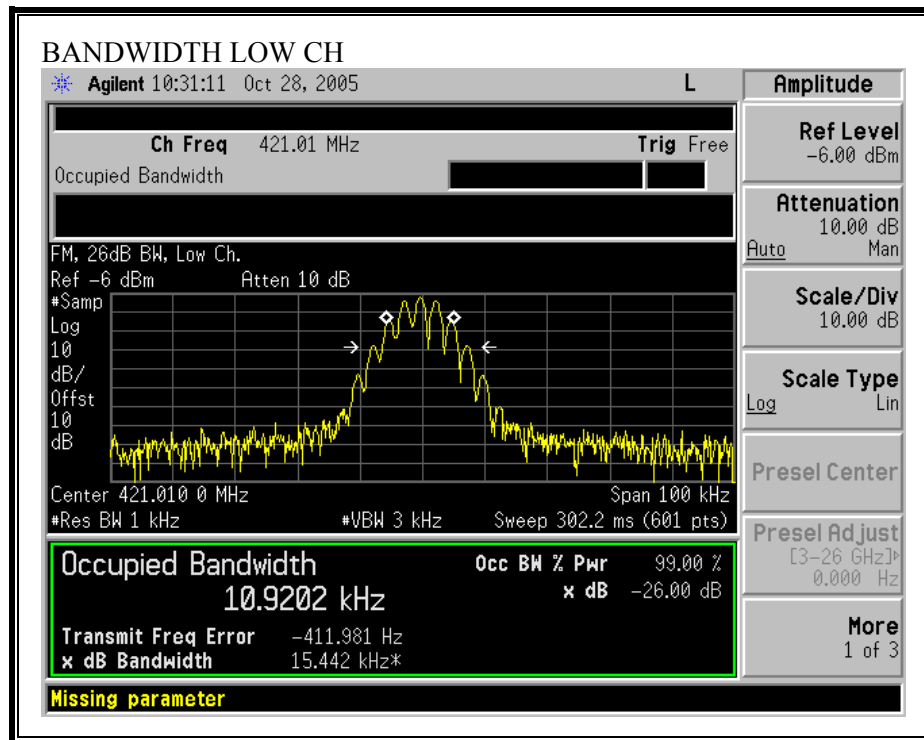
FM Modulation - Input

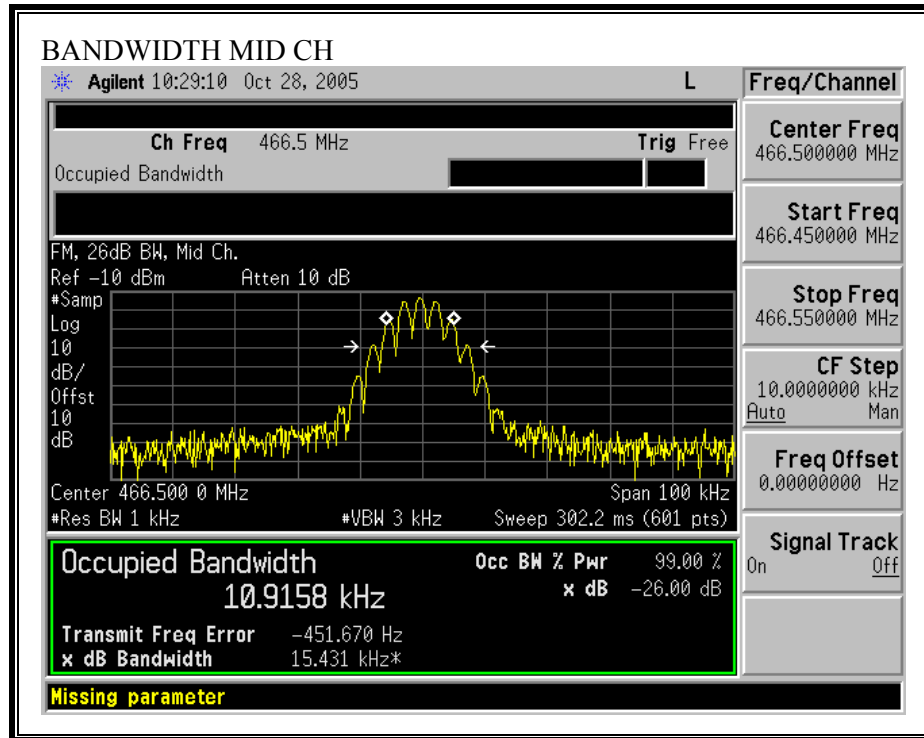
Channel	Frequency (MHz)	Bandwidth (kHz)
Low	421.01	15.442
Middle	466.5	15.431
High	511.99	15.484

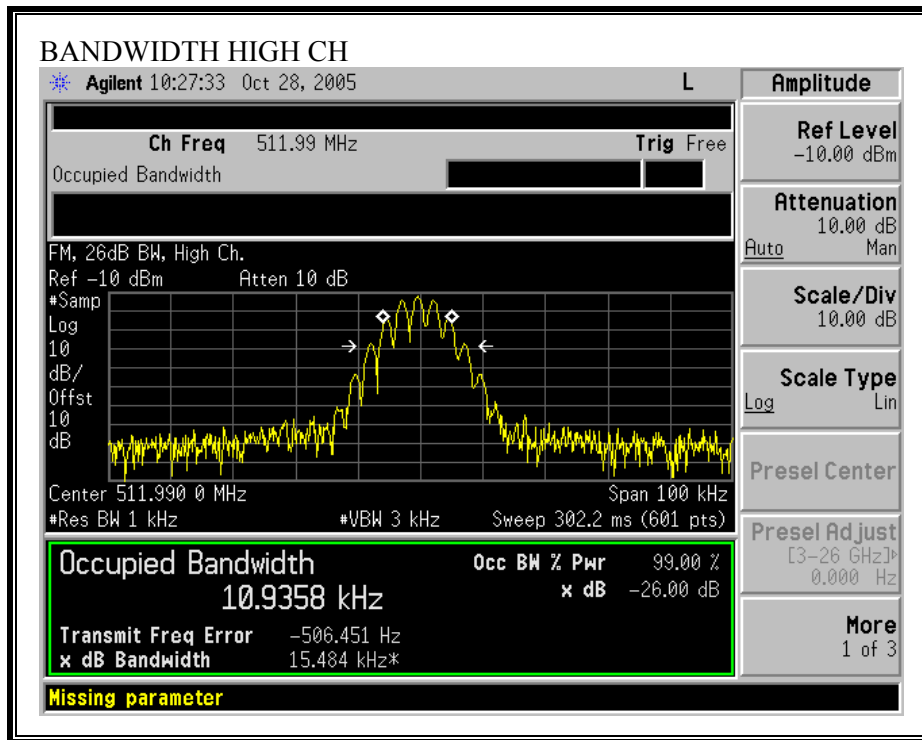
FM Modulation - Output

Channel	Frequency (MHz)	Bandwidth (kHz)
Low	421.01	15.438
Middle	466.5	15.427
High	511.99	15.457

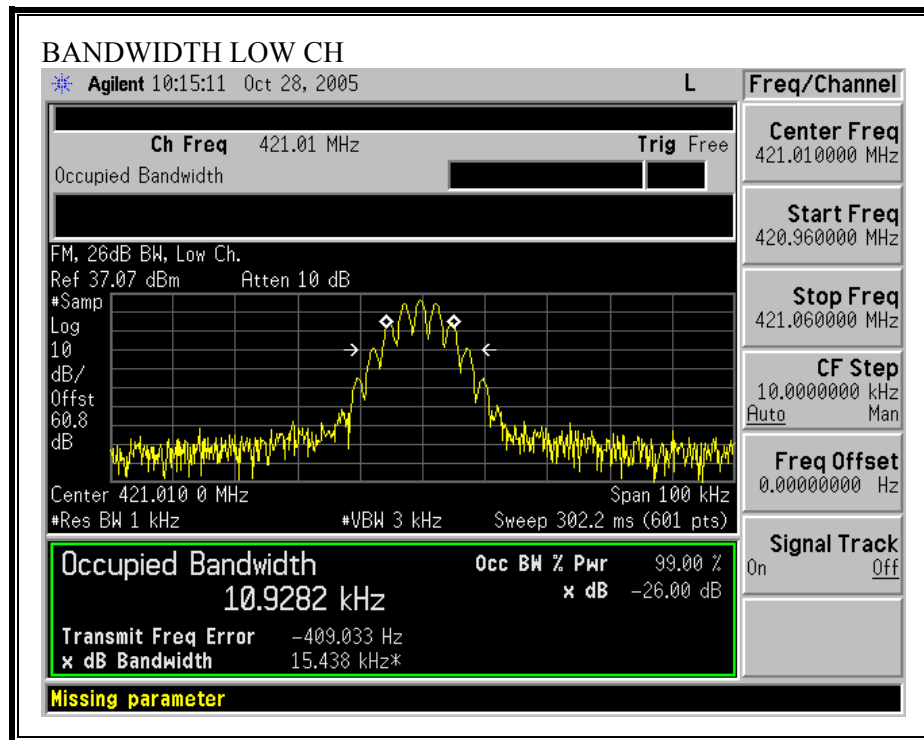
FM 26 dB BANDWIDTH - INPUT

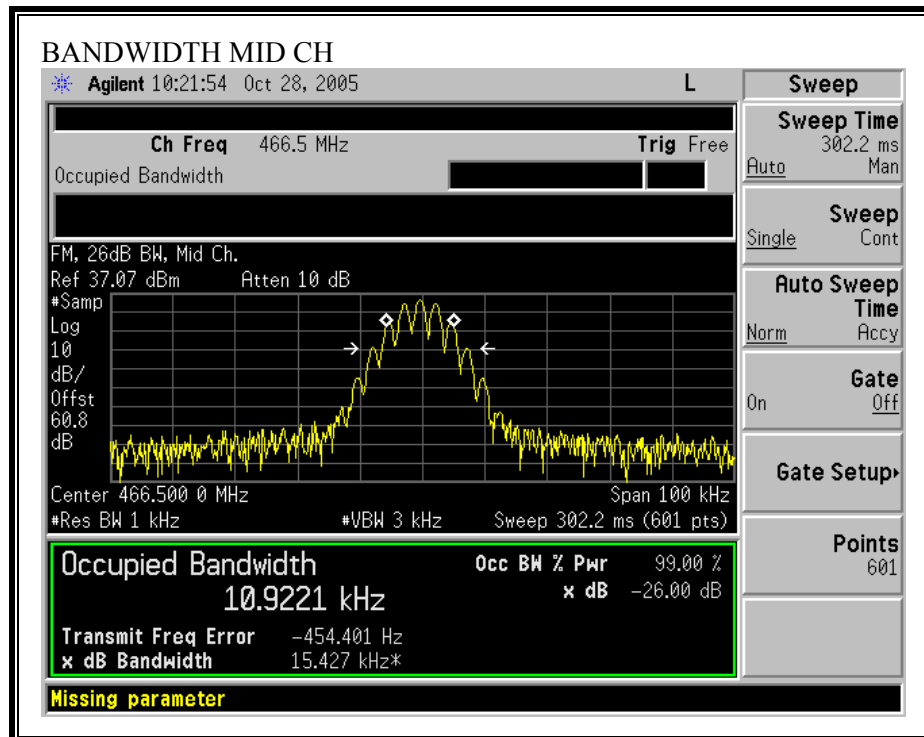


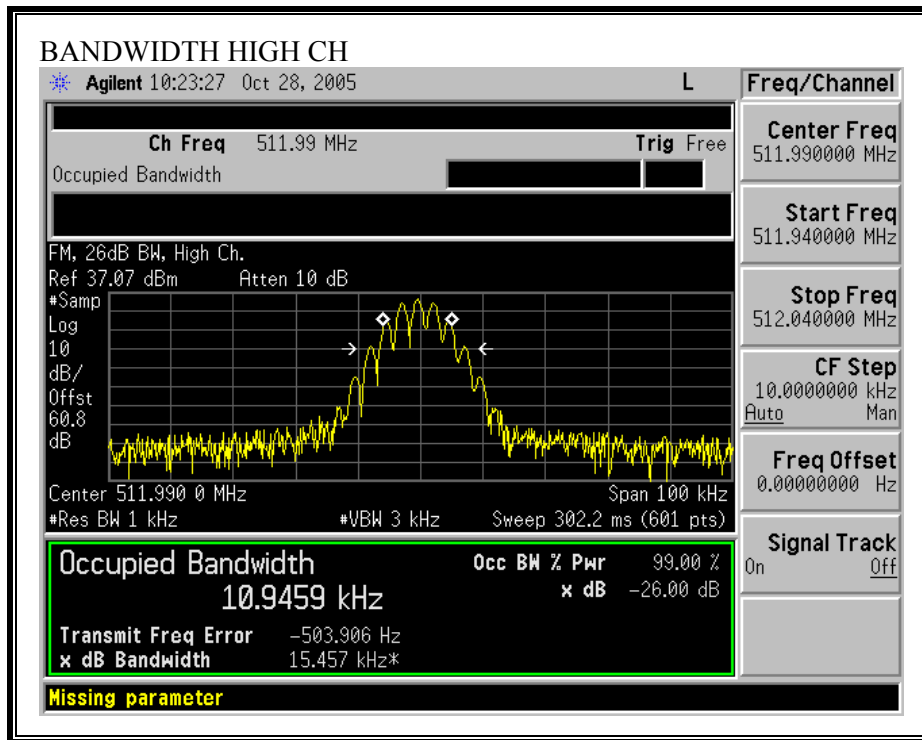




FM 26 dB BANDWIDTH -OUTPUT







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.

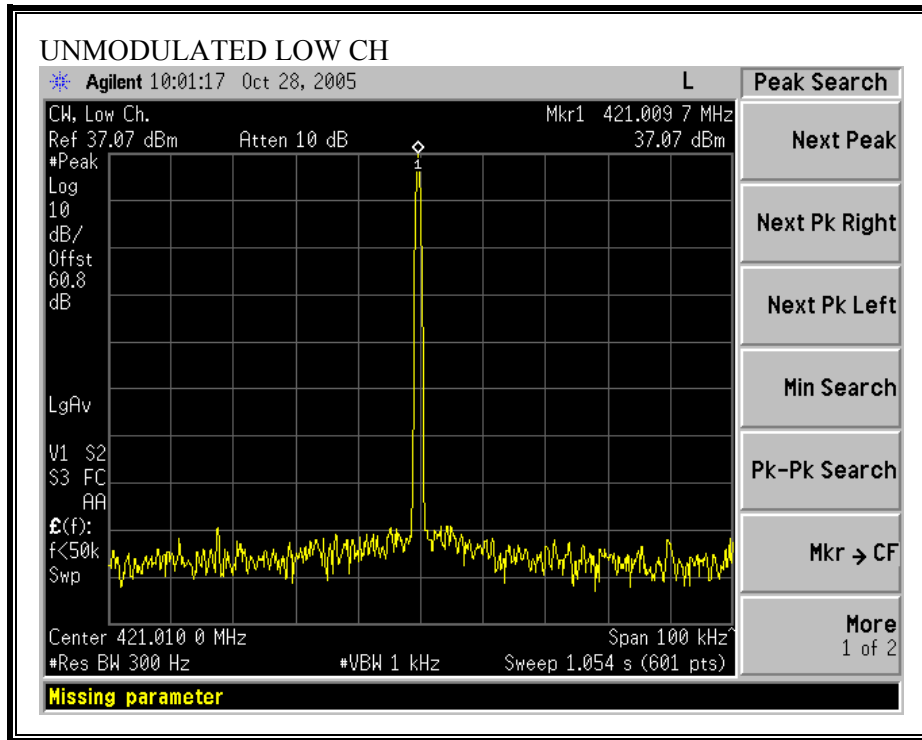
TEST PROCEDURE

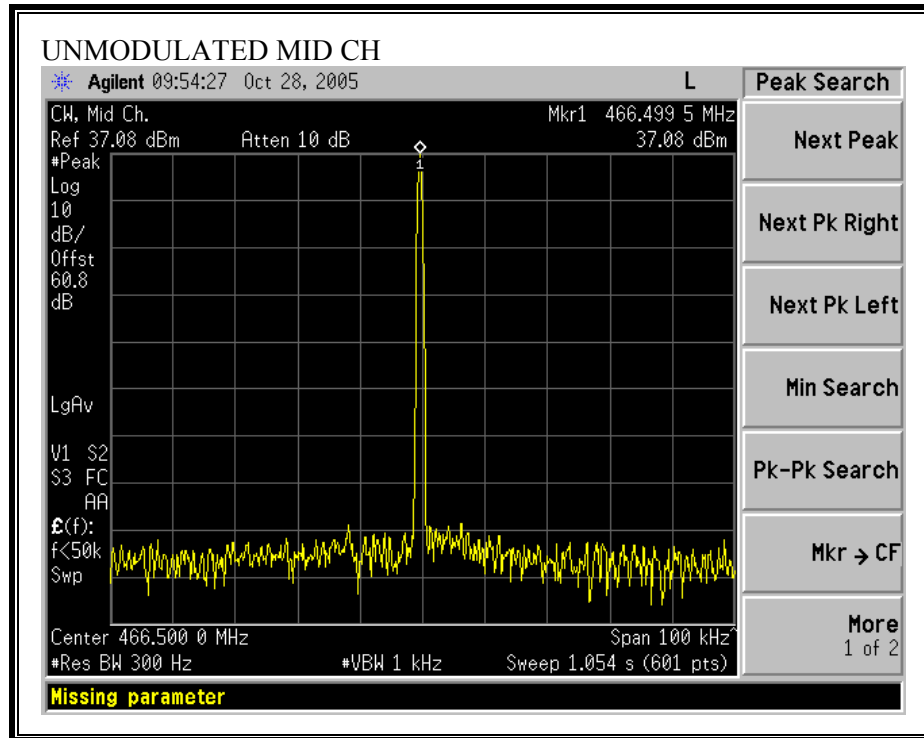
ANSI / TIA / EIA 603 Clause 3.2.11

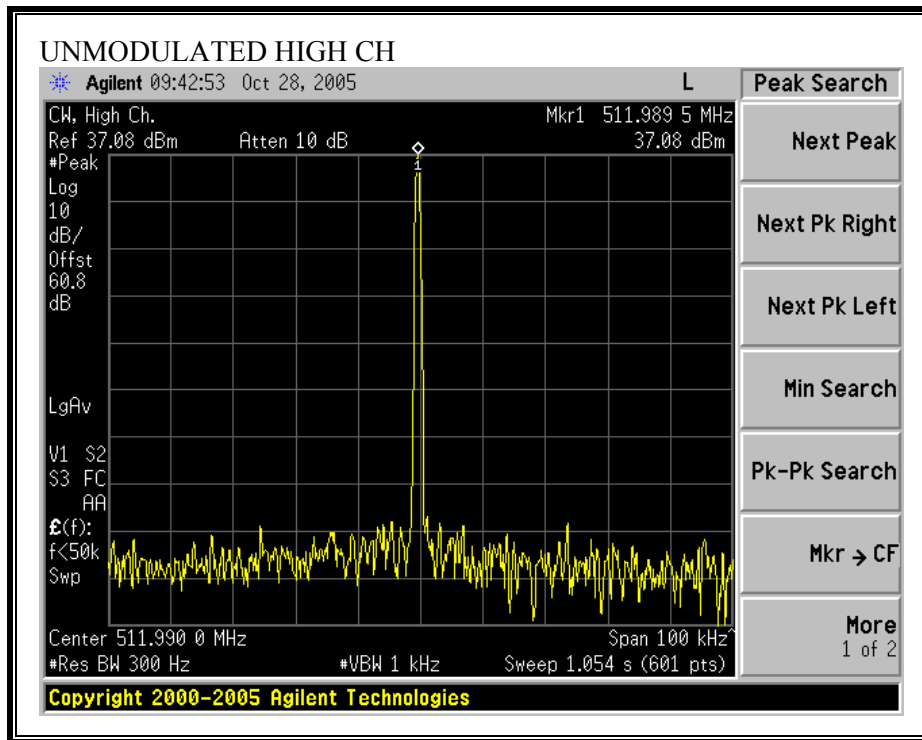
RESULTS

No non-compliance noted:

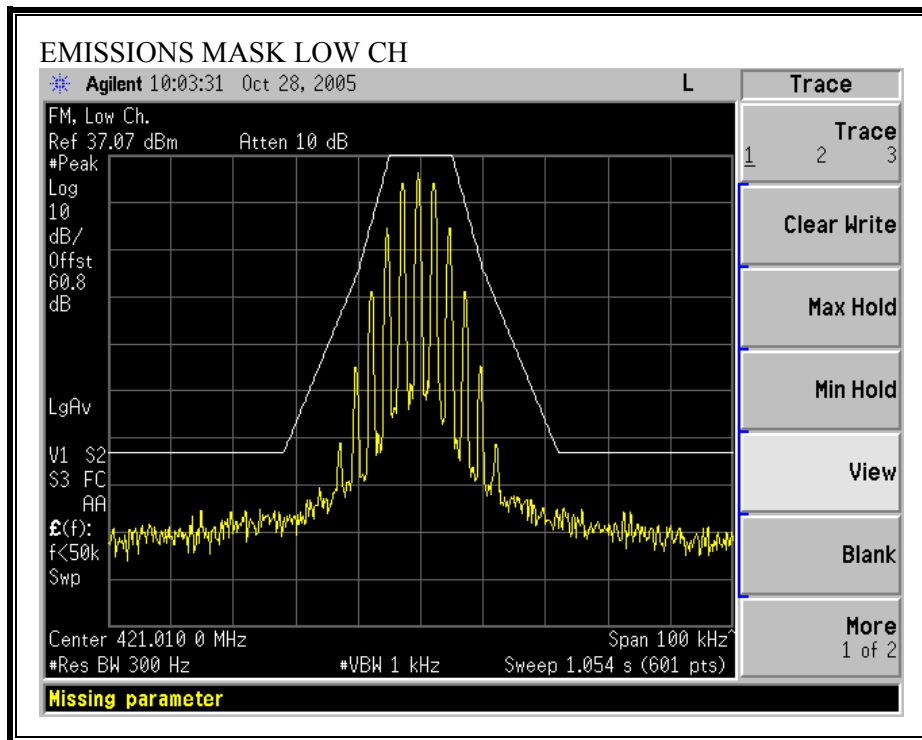
Unmodulated Signal:

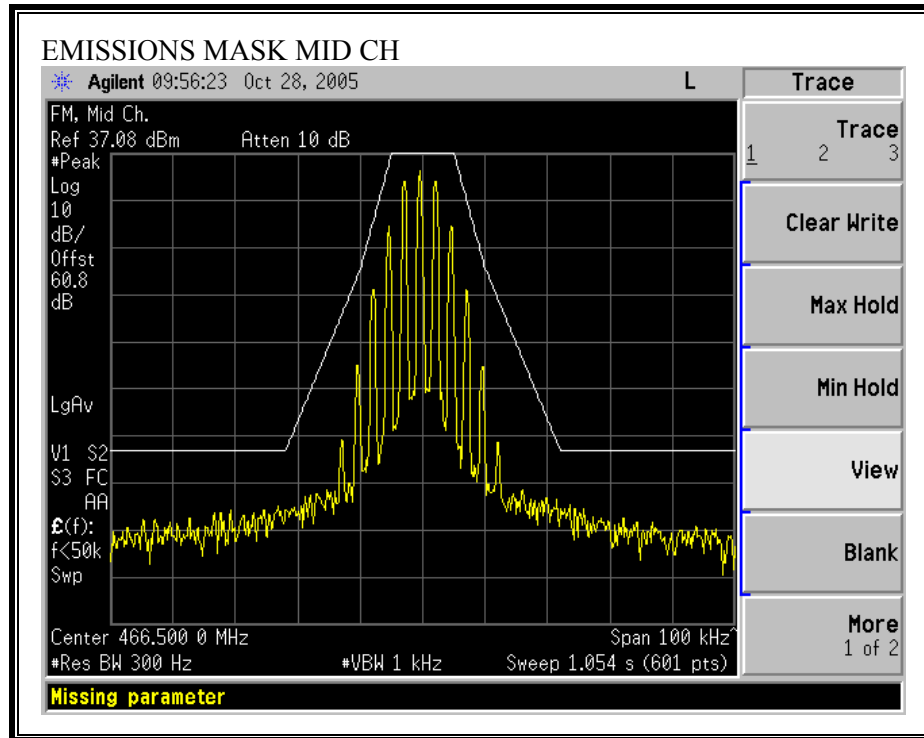


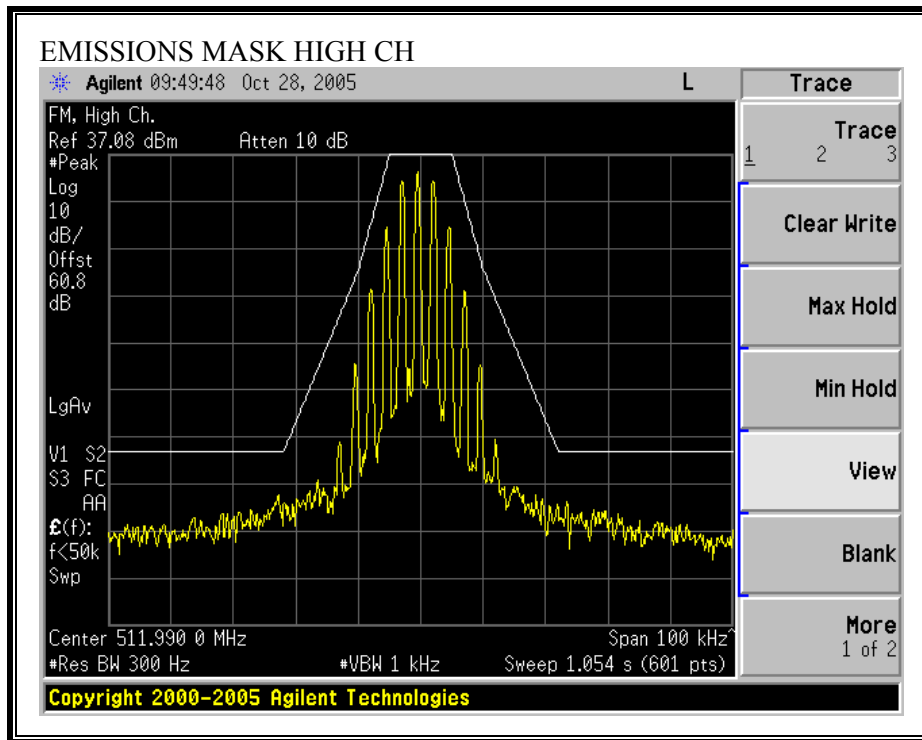




FM EMISSIONS MASK







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).

§22.627(a): Frequency range 470-512MHz is 1000 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

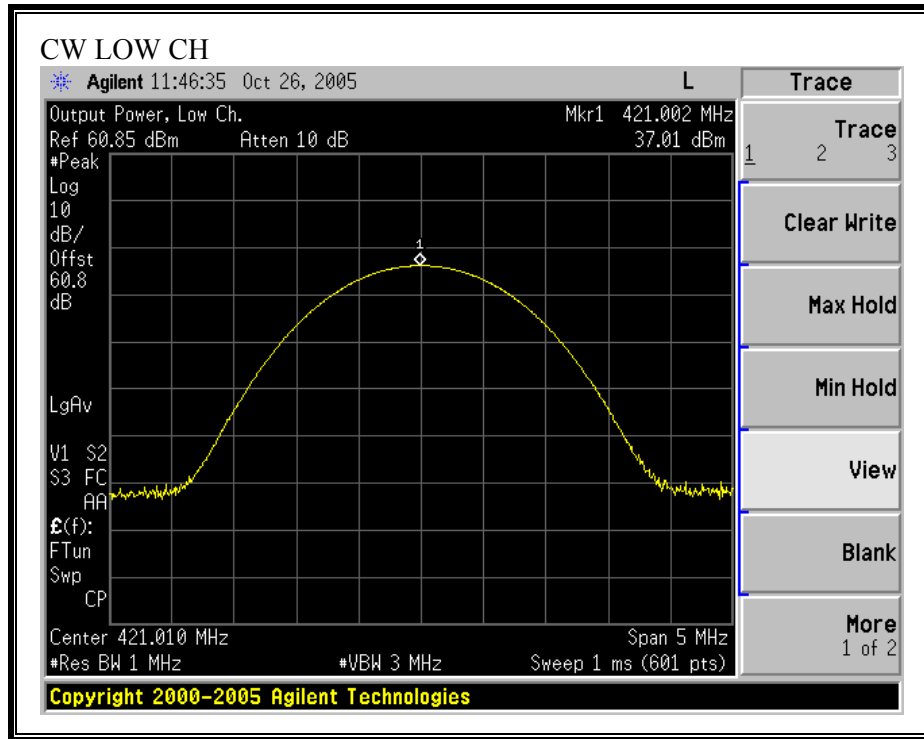
RESULTS

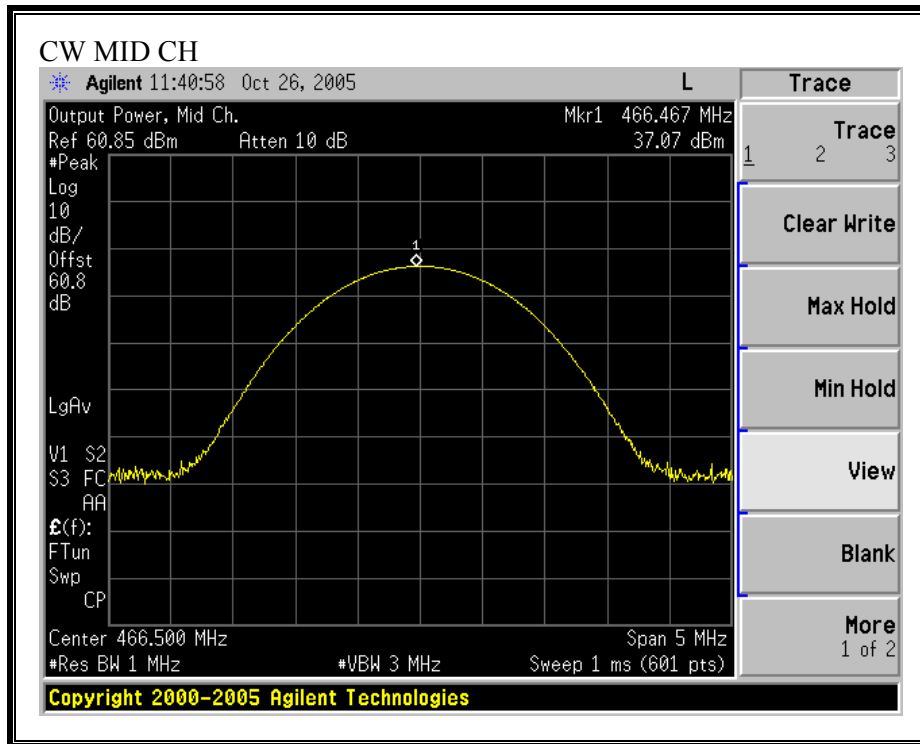
No non-compliance noted.

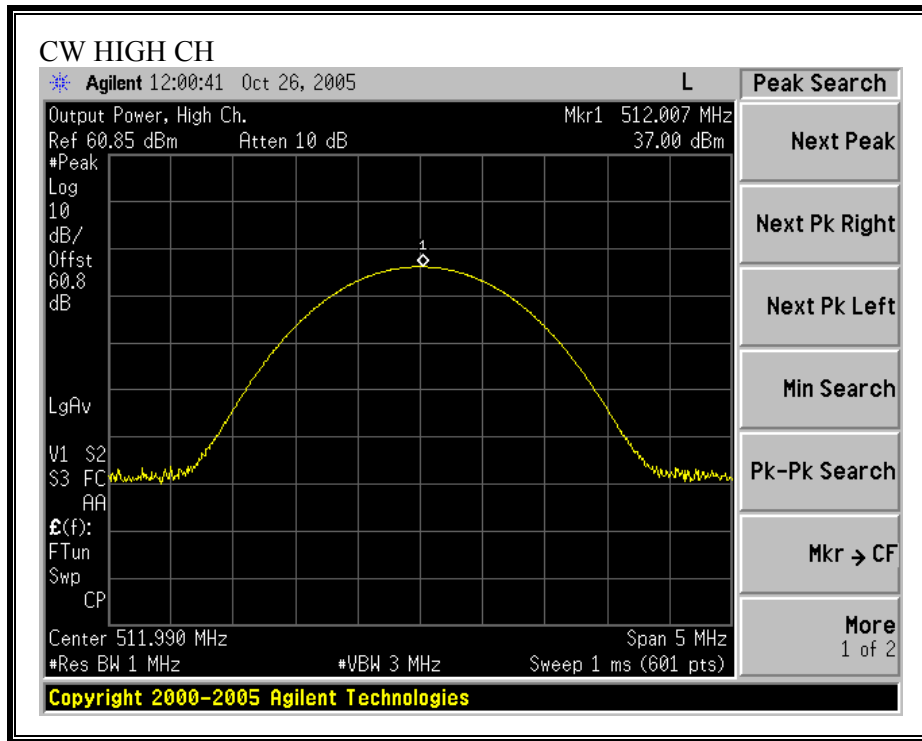
CW Output Power

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)
Low	421.01	37.01	5.02
Middle	466.5	37.07	5.09
High	511.99	37.00	5.01

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).

§22.627(a): Frequency range 470-512MHz is 1000 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

RESULTS

No non-compliance noted.

Conducted Output Power vs Voltage

Channel Frequency (MHz)	Output Power at normal voltage 28 VDC	Output Power at 85% voltage 23.8 VDC	Output Power at 115% voltage 32.2 VDC
421.01	37.01 dBm / 5.02 W	37.01 dBm / 5.02 W	37.01 dBm / 5.02 W
466.5	37.07 dBm / 5.09 W	37.07 dBm / 5.09 W	37.07 dBm / 5.09 W
511.99	37 dBm / 5.01 W	37 dBm / 5.01 W	37 dBm / 5.01 W

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.

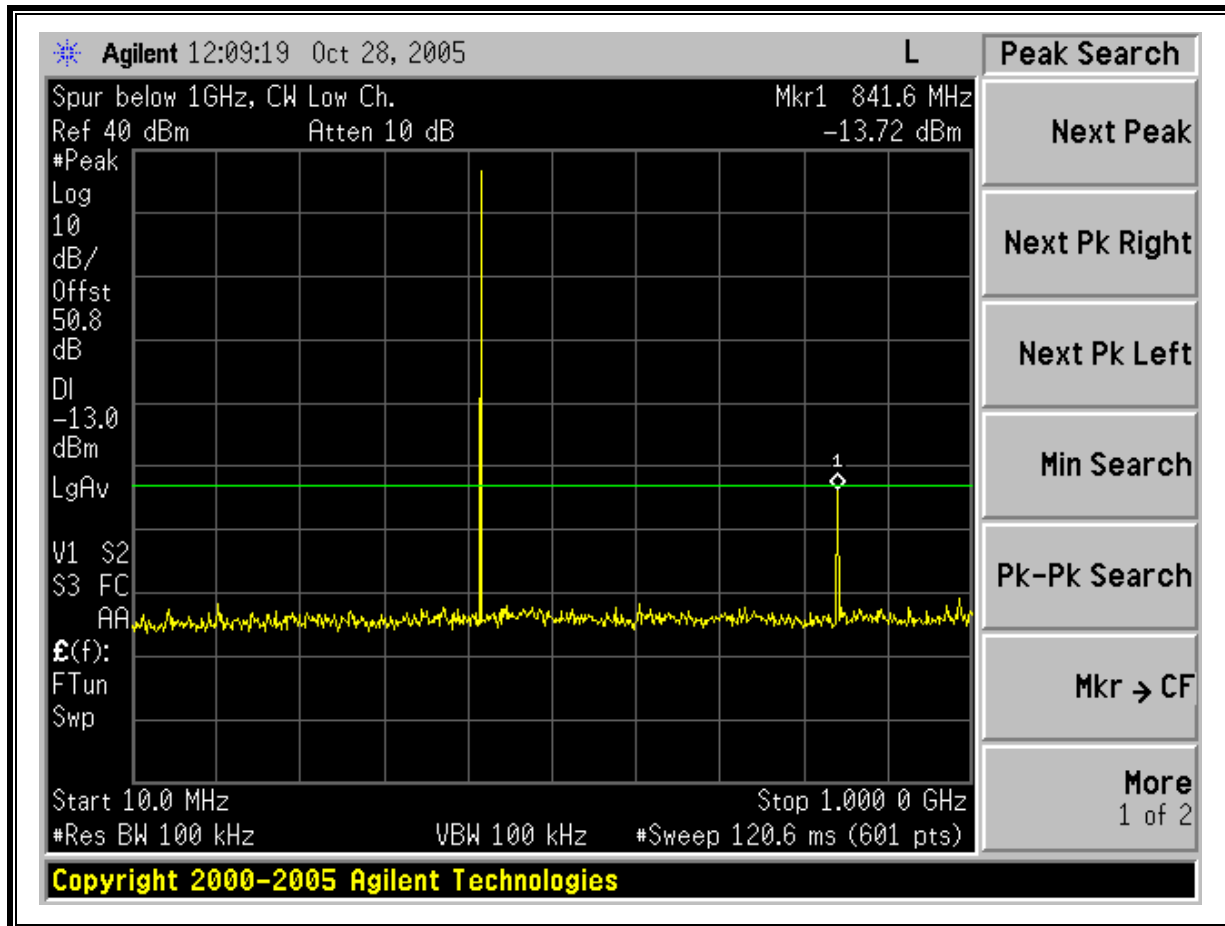
TEST PROCEDURE

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

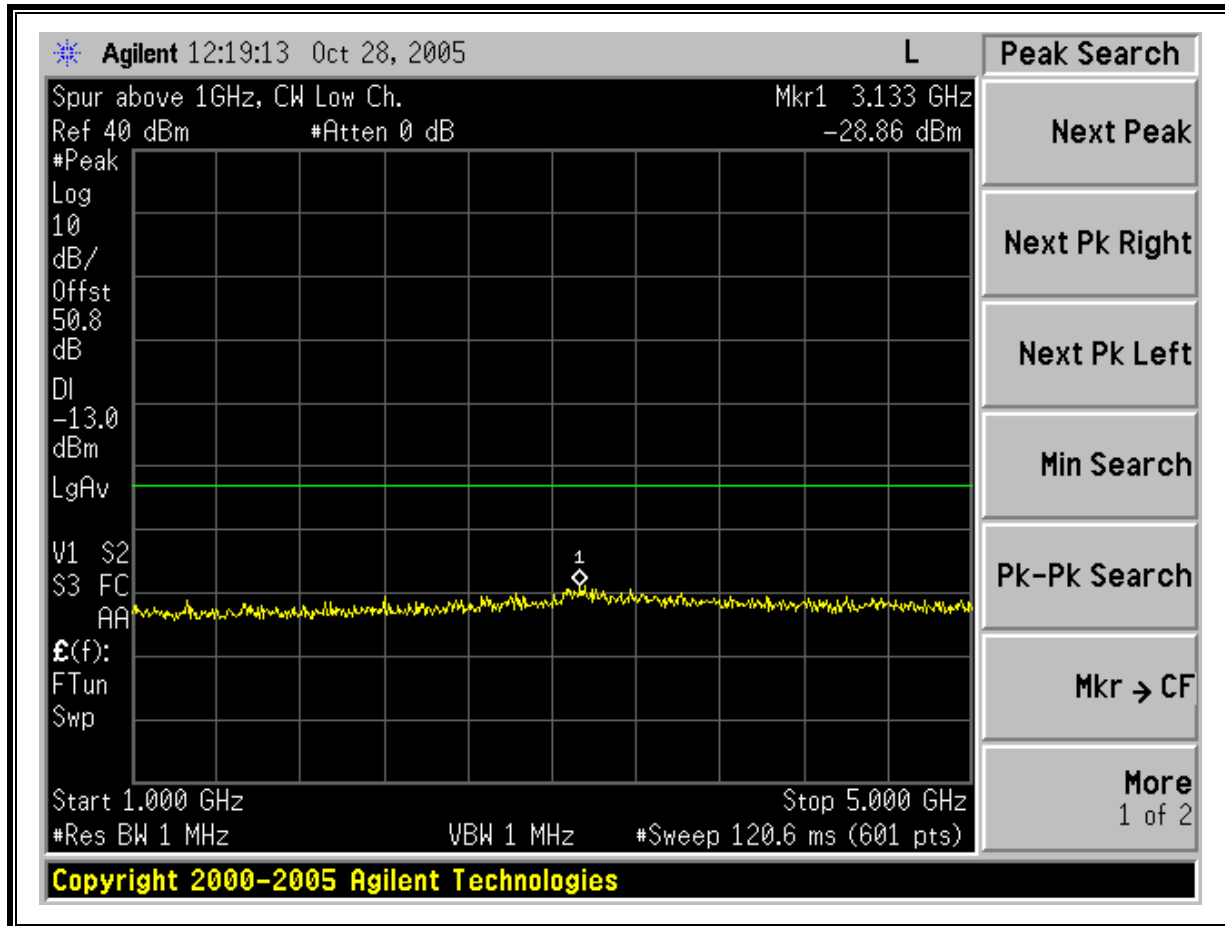
RESULTS

No non-compliance noted.

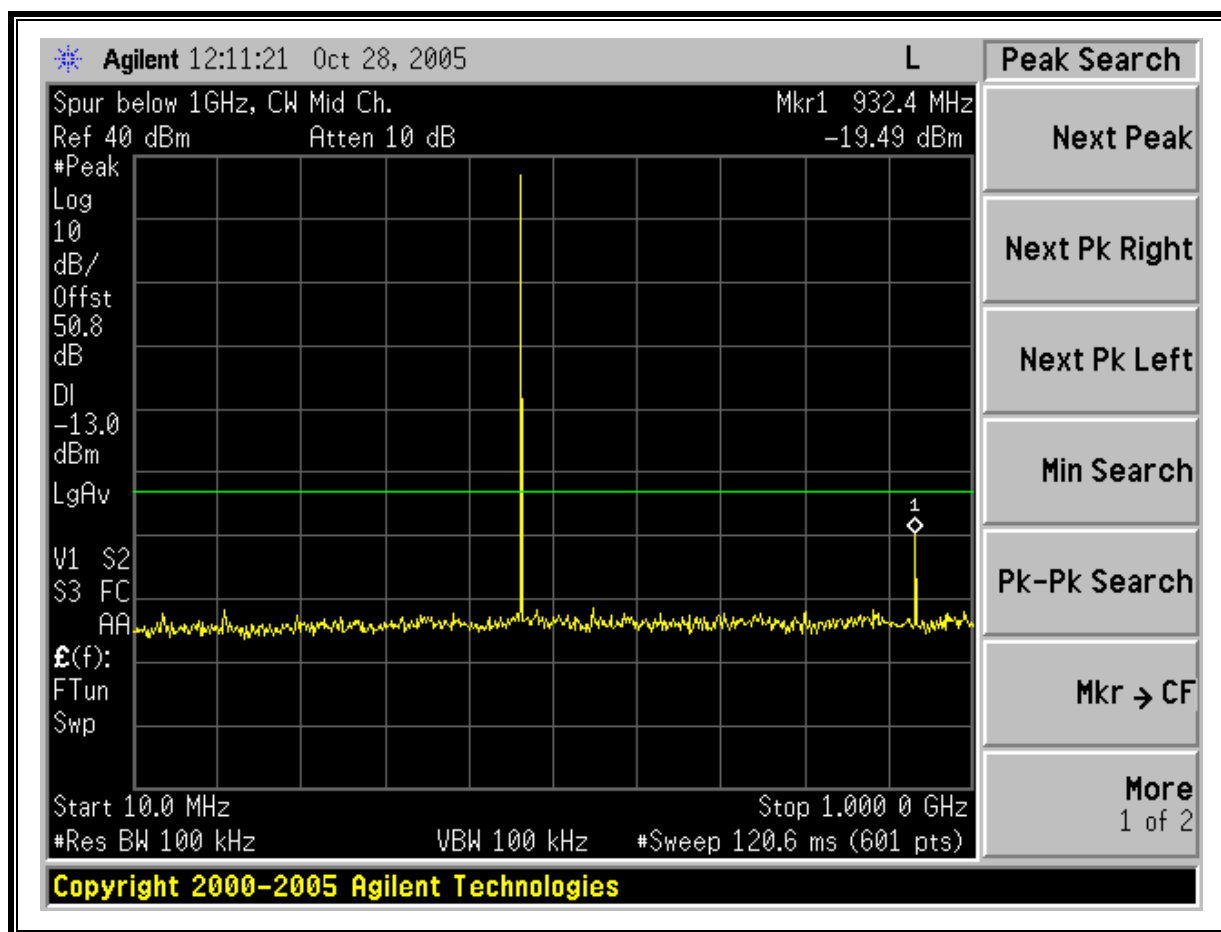
Low Channel, CW, 10Mz to 1000MHz



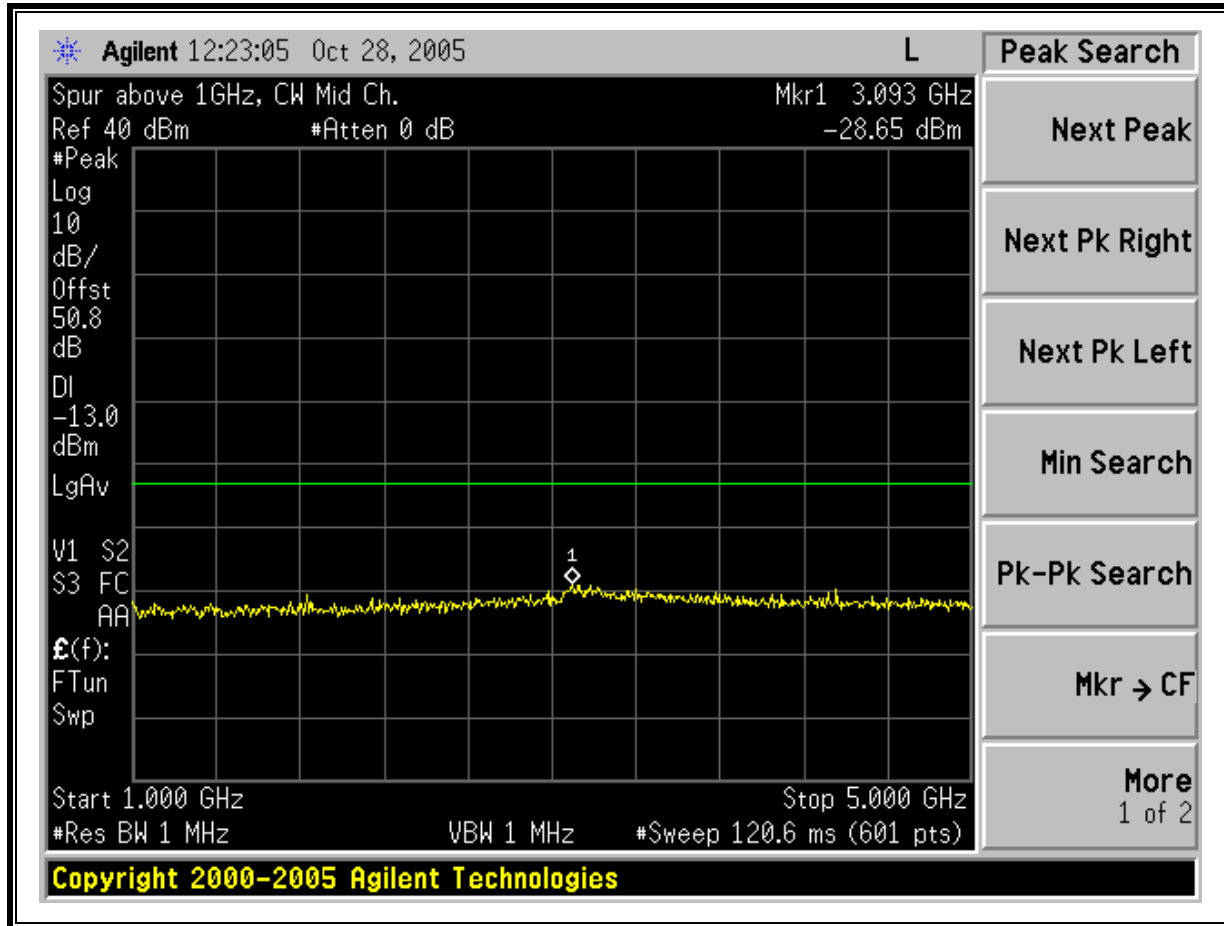
Low Channel, CW, 1000MHz to 5000MHz



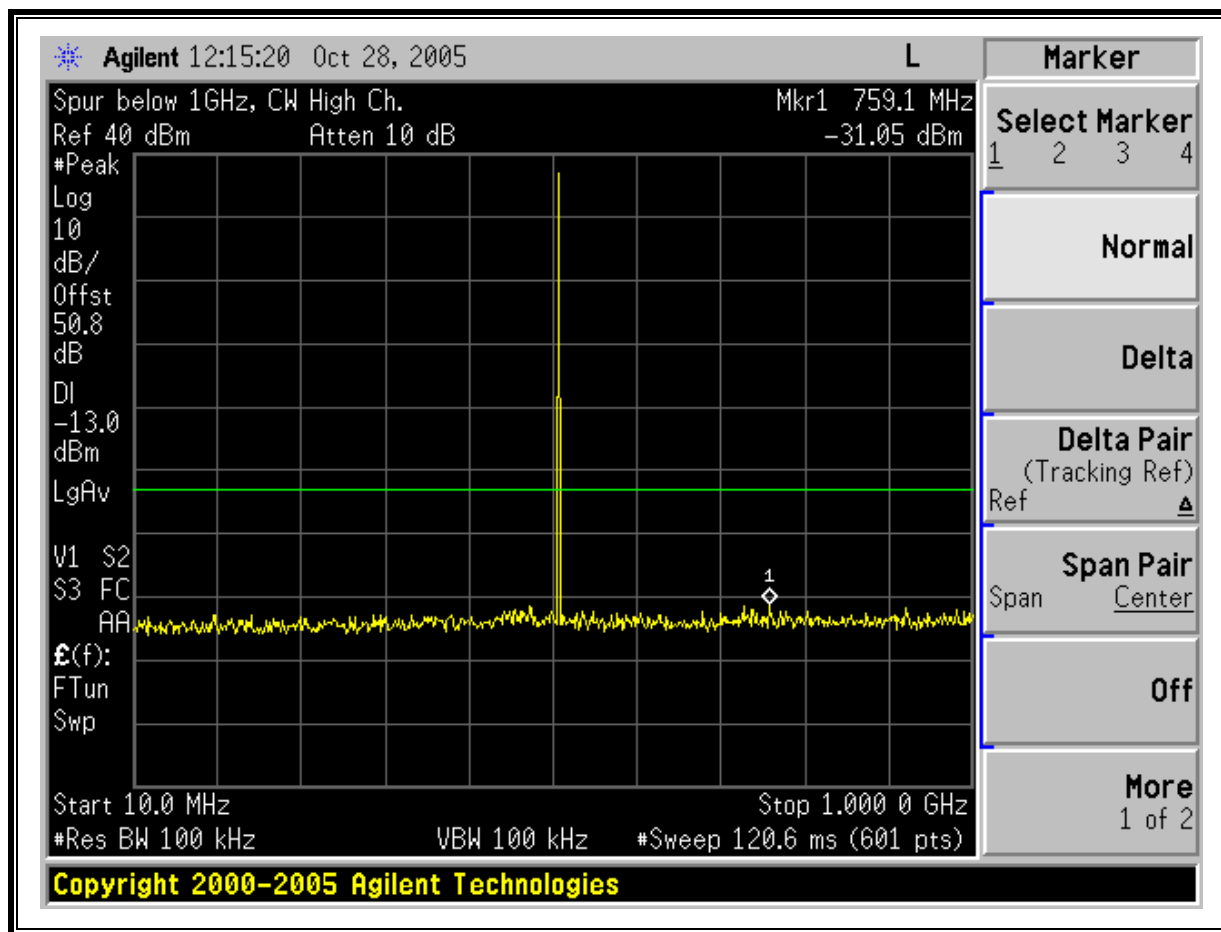
Mid Channel, CW, 10MHz to 1000MHz



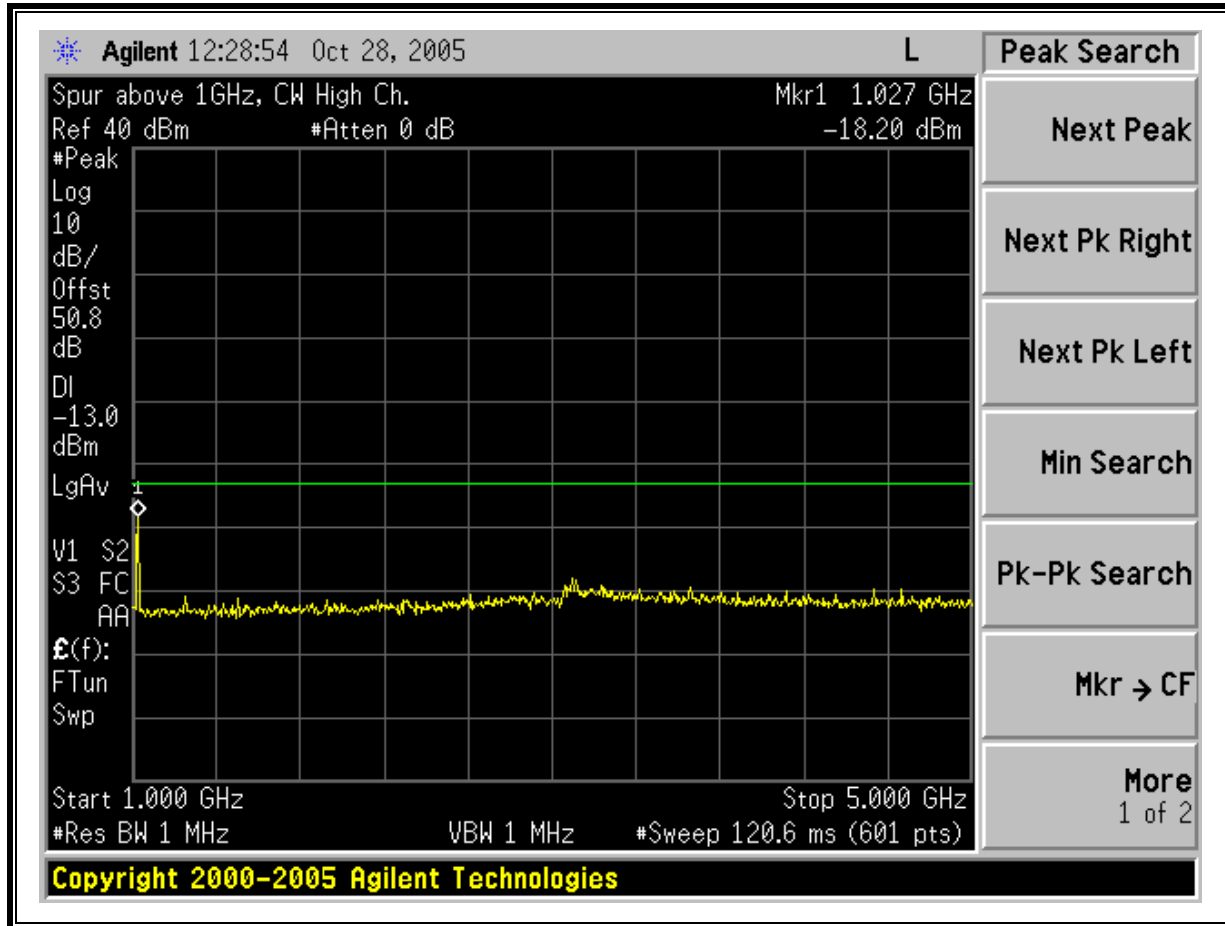
Mid Channel, CW, 1000MHz to 5000MHz



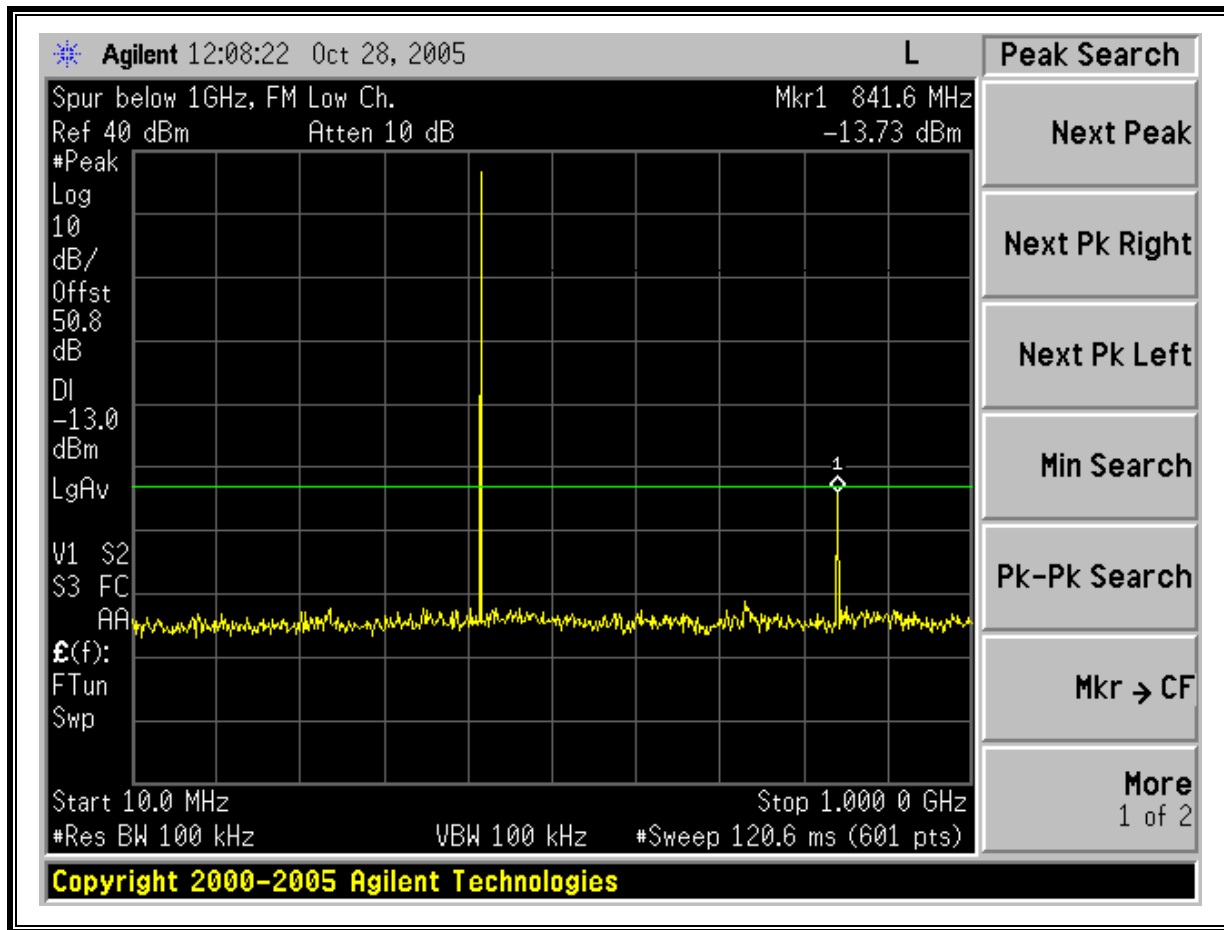
High Channel, CW, 10MHz to 1000MHz



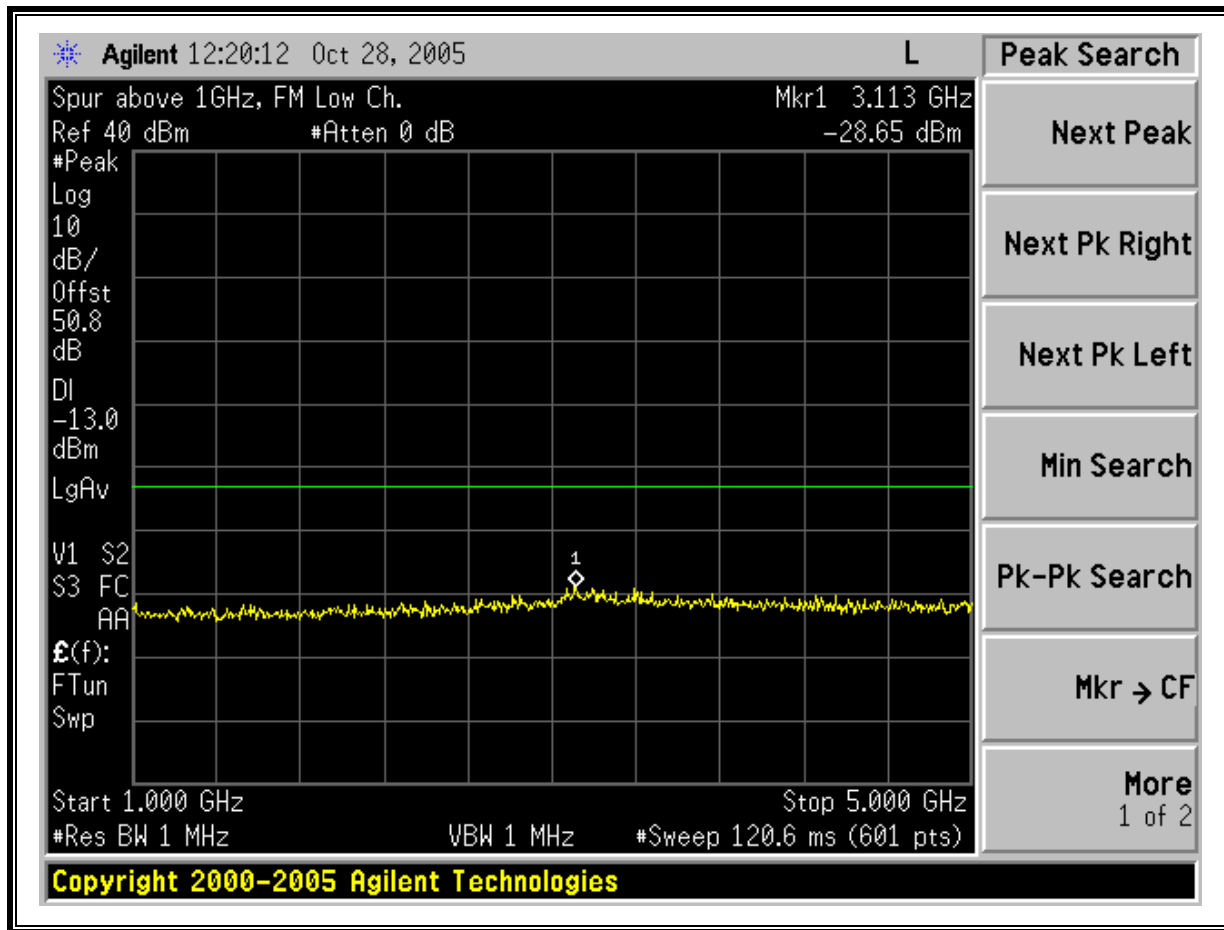
High Channel, CW, 1000MHz to 5000MHz



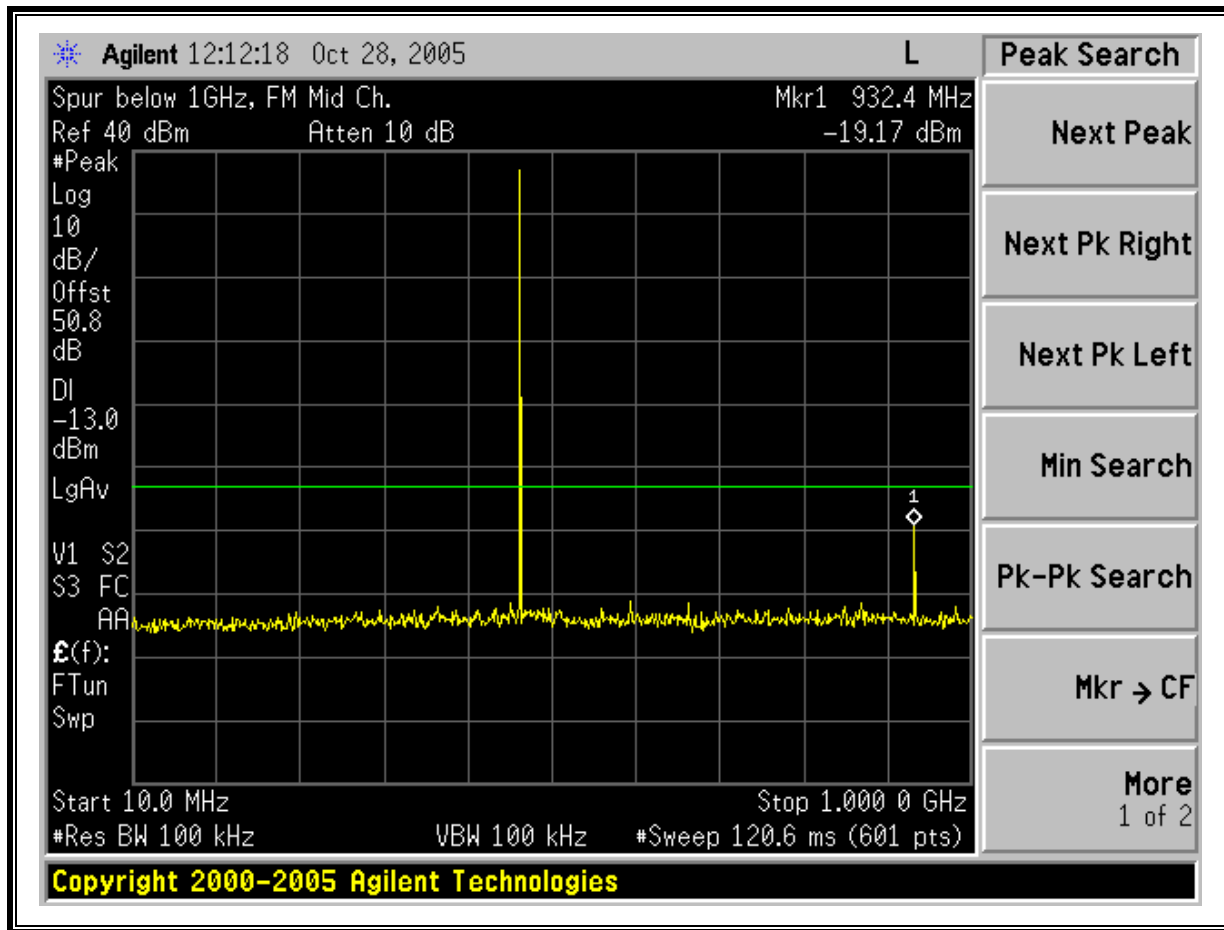
Low Channel, FM, 10Mz to 1000MHz



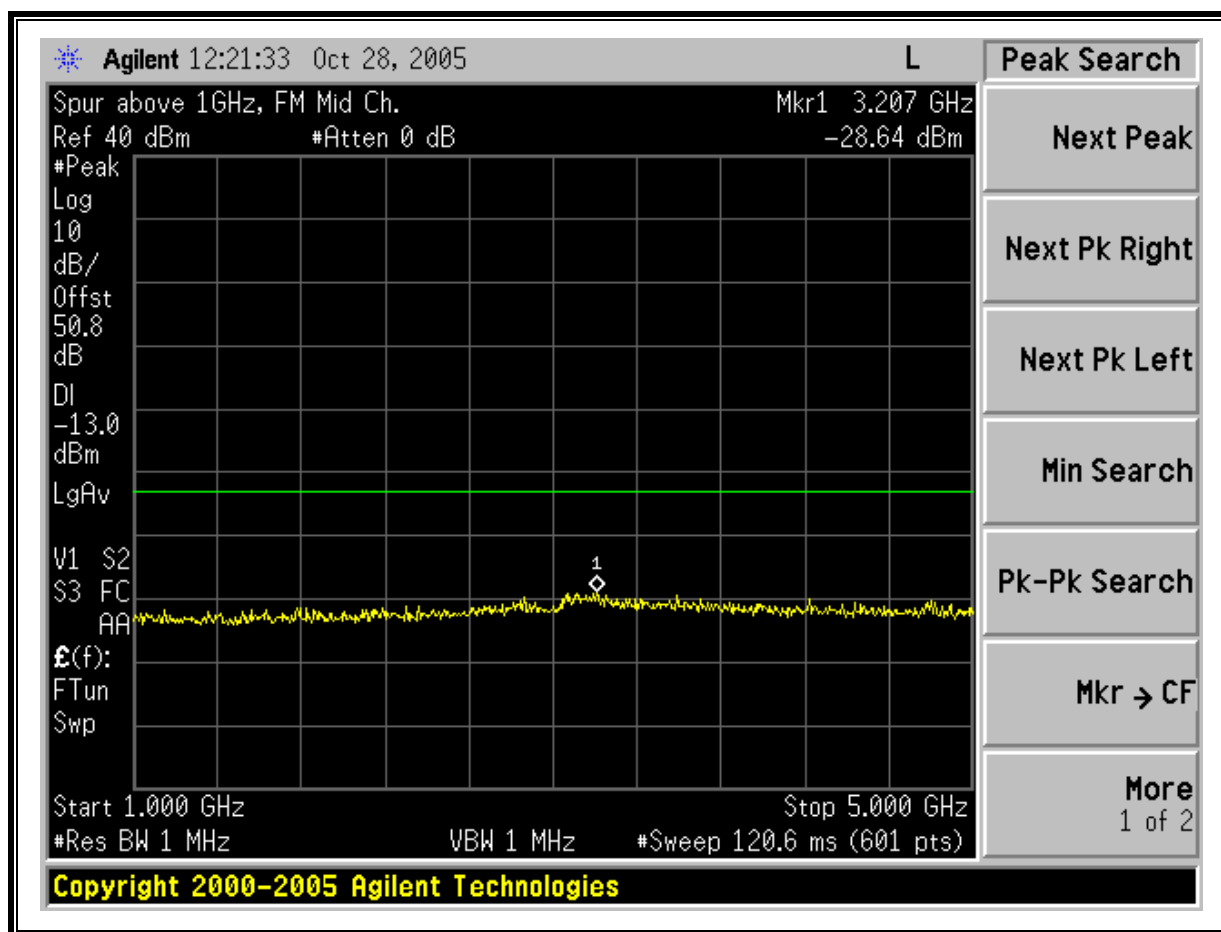
Low Channel, FM, 1000MHz to 5000MHz



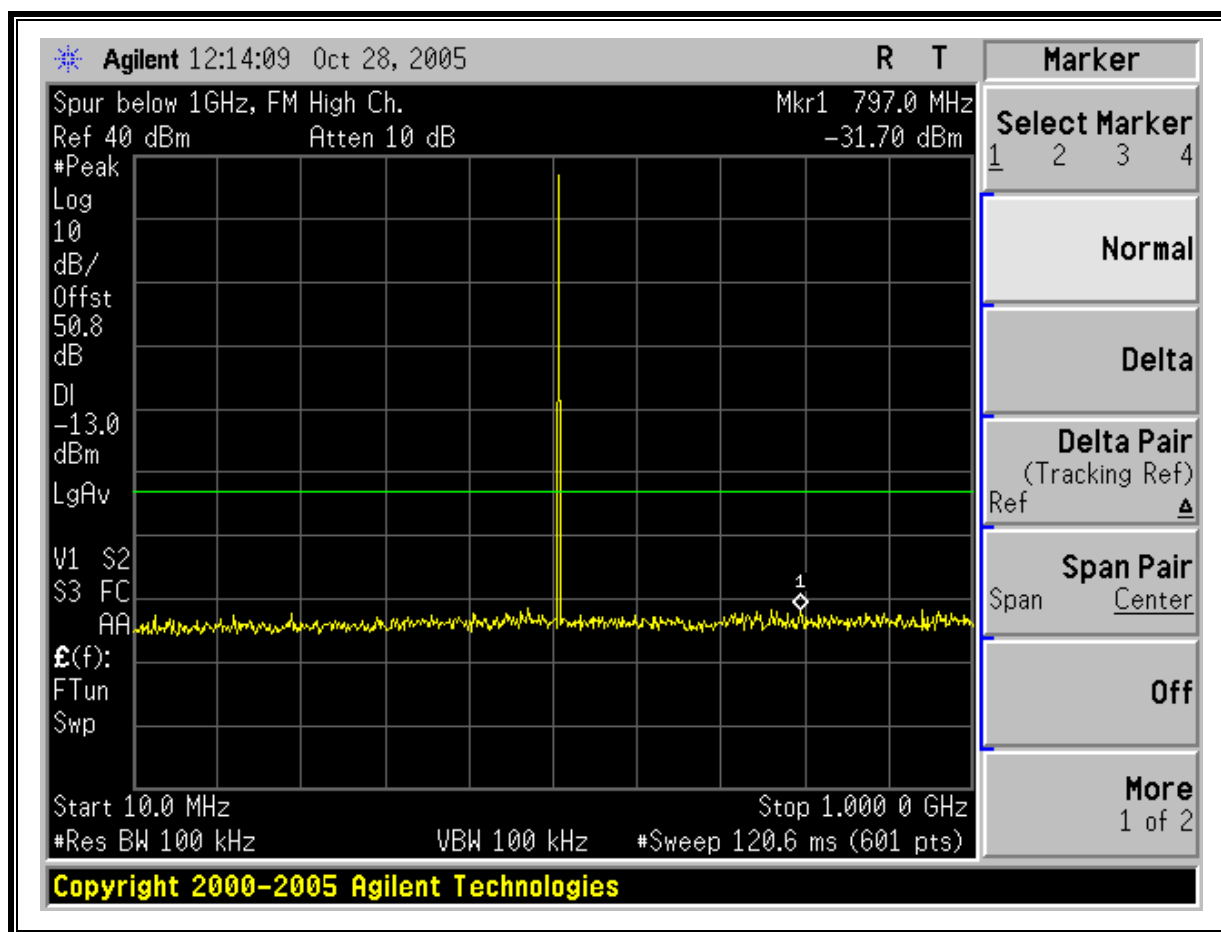
Mid Channel, FM, 10Mz to 1000MHz



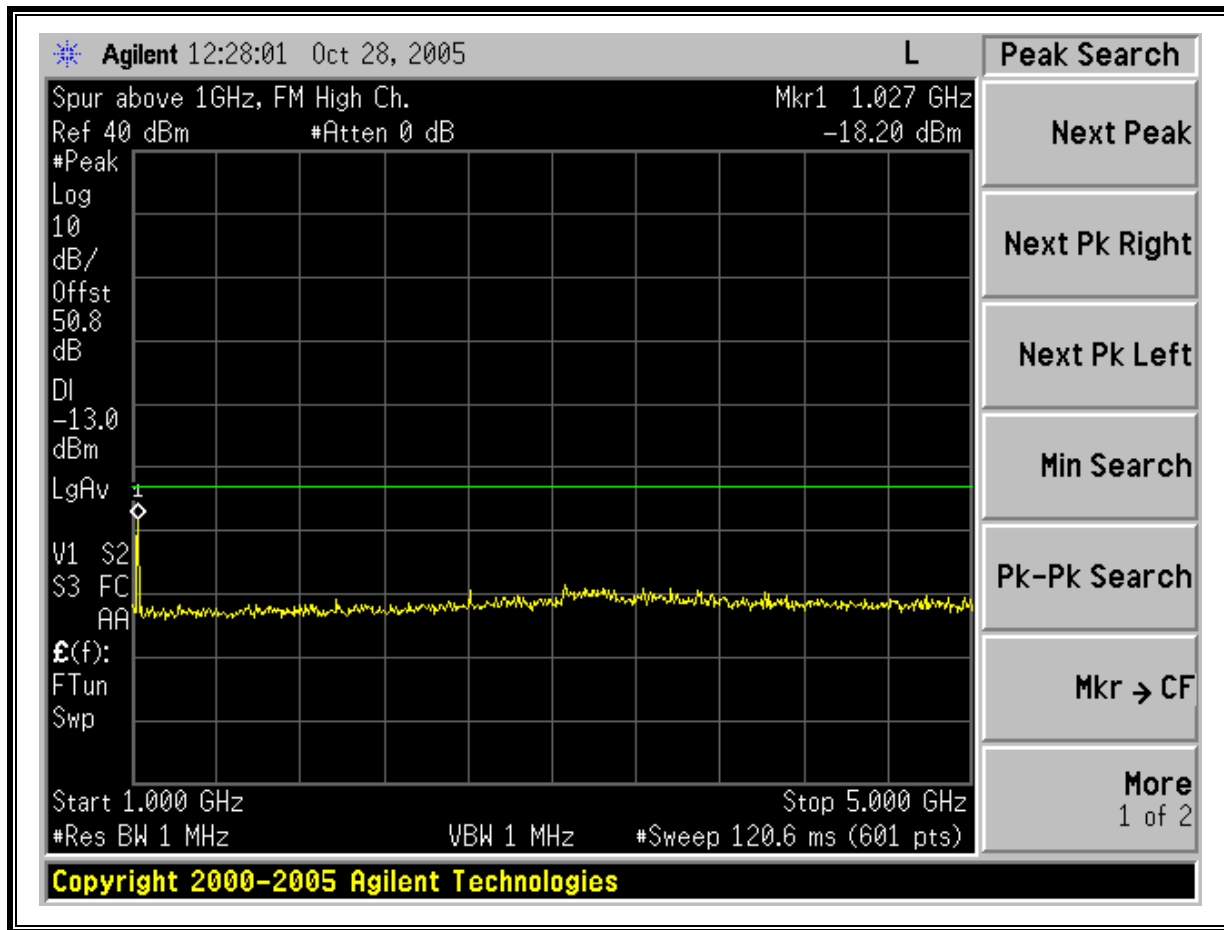
Mid Channel, FM, 1000MHz to 5000MHz



High Channel, FM, 10Mz to 1000MHz



High Channel, FM, 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 3.2.12, FCC 22.861, & FCC 90.210

RESULTS

No non-compliance noted.

7.7.1. 30MHz TO 1000MHz SPURIOUS RADIATION

10/27/05 30 - 1000MHz Substitution Measurement										
Compliance Certification Services, Morgan Hill 5m Chamber Site										
Test Engr: Chin Pang Project #: 05U3796-1 Company: Canam Technology EUT Descrip.: RF Power Amplifier, UHF 400-512MHz, DC Powered EUT M/N: CT-M4-PA-U Test Target: FCC Part22 Mode Oper: Tx										
Test Equipment:										
Bilog Antenna		Cable		Pre-amplifier 8447D		Limit				
5m Chamber Sumol 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, 412.01MHz										
140.50	48.0	H	-59.8	1.5	-0.9	-3.0	-64.3	-13.0	-51.3	
147.00	52.0	H	-56.2	1.5	0.0	-2.2	-59.9	-13.0	-46.9	
330.10	49.8	H	-55.9	2.2	6.0	3.9	-54.2	-13.0	-41.2	
401.30	46.4	H	-58.3	2.4	6.0	3.9	-56.8	-13.0	-43.8	
844.10	65.1	H	-33.3	3.5	6.7	4.6	-32.2	-13.0	-19.2	
140.50	49.2	V	-59.2	1.5	-0.9	-3.0	-63.7	-13.0	-50.7	
200.50	47.0	V	-61.4	1.8	4.4	2.2	-60.9	-13.0	-47.9	
329.20	52.0	V	-54.6	2.2	6.0	3.9	-52.9	-13.0	-39.9	
844.00	64.0	V	-33.9	3.5	6.7	4.6	-32.8	-13.0	-19.8	
Mid Ch, 466.5MHz										
140.50	48.5	H	-59.3	1.5	-0.9	-3.0	-63.8	-13.0	-50.8	
200.50	49.1	H	-57.7	1.8	4.4	2.2	-57.2	-13.0	-44.2	
329.20	50.3	H	-55.4	2.2	6.0	3.9	-53.7	-13.0	-40.7	
403.30	48.2	H	-56.5	2.4	6.0	3.9	-55.0	-13.0	-42.0	
935.70	62.0	H	-35.2	3.7	6.8	4.7	-34.2	-13.0	-21.2	
140.50	50.6	V	-57.8	1.5	-0.9	-3.0	-62.3	-13.0	-49.3	
329.20	50.5	V	-56.1	2.2	6.0	3.9	-54.4	-13.0	-41.4	
403.30	45.8	V	-58.8	2.4	6.0	3.9	-57.2	-13.0	-44.2	
935.70	65.0	V	-31.9	3.7	6.8	4.7	-31.0	-13.0	-18.0	
High Ch, 512MHz										
140.50	53.8	H	-54.0	1.5	-0.9	-3.0	-58.5	-13.0	-45.5	
228.00	47.6	H	-62.3	1.9	5.9	3.7	-60.5	-13.0	-47.5	
329.20	59.0	H	-46.7	2.2	6.0	3.9	-45.0	-13.0	-32.0	
140.50	52.0	V	-56.4	1.5	-0.9	-3.0	-60.9	-13.0	-47.9	
144.40	50.0	V	-58.7	1.5	-0.3	-2.5	-62.7	-13.0	-49.7	
329.20	49.3	V	-57.3	2.2	6.0	3.9	-55.6	-13.0	-42.6	
403.30	45.3	V	-59.3	2.4	6.0	3.9	-57.7	-13.0	-44.7	

7.7.2. ABOVE 1000MHz SPURIOUS RADIATION

Spurious & Harmonic (ERP)

10/27/2006
High Frequency Substitution Measurement
Compliance Certification Services, Morgan Hill 5m Chamber Site

Test Engr:Chin Pang
Project #:06U3796-1
Company:Canam Technology
EUT Descr.:RF Power Amplifier UHF 400-512MHz, DC Powered
EUT M/N:CT-M4-PA-U
Test Target:FCC Part 22
Mode Oper:TX

Test Equipment:

EMCO Horn 1-18GHz

Horn > 18GHz

Limit

☒ High Pass Filter

T119; S/N: 29301 @3m

FCC 22

Hi Frequency Cables

☐ (2 ft)

☒ (2 ~ 3 ft)

☐ (4 ~ 6 ft)

☒ (12 ft)

Pre-amplifier 1-26 GHz

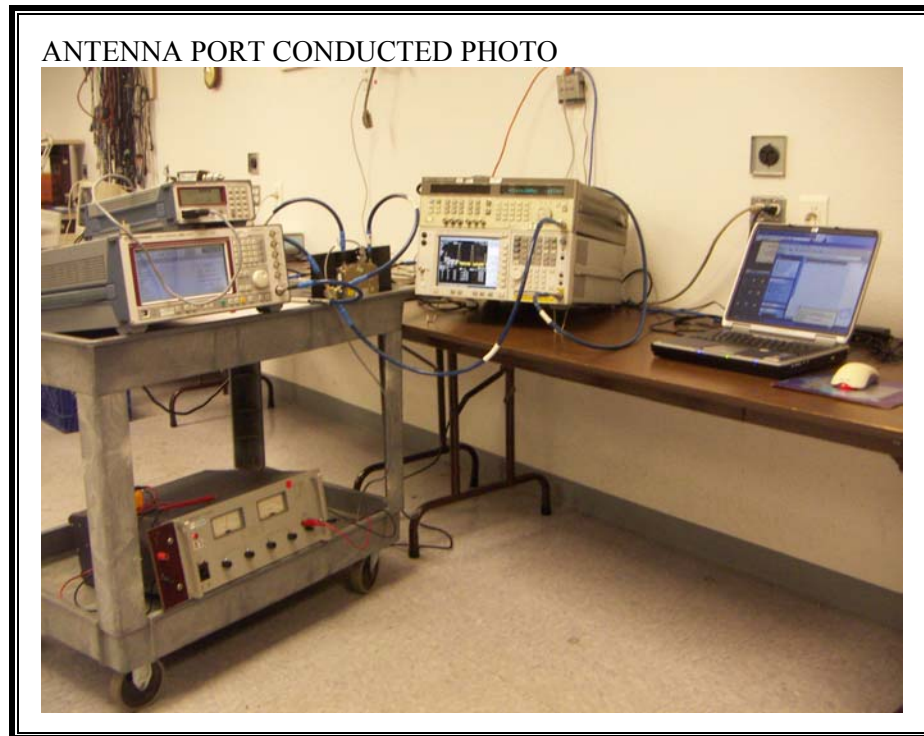
Pre-amplifier 26-40GHz

T87 Miteq 924342

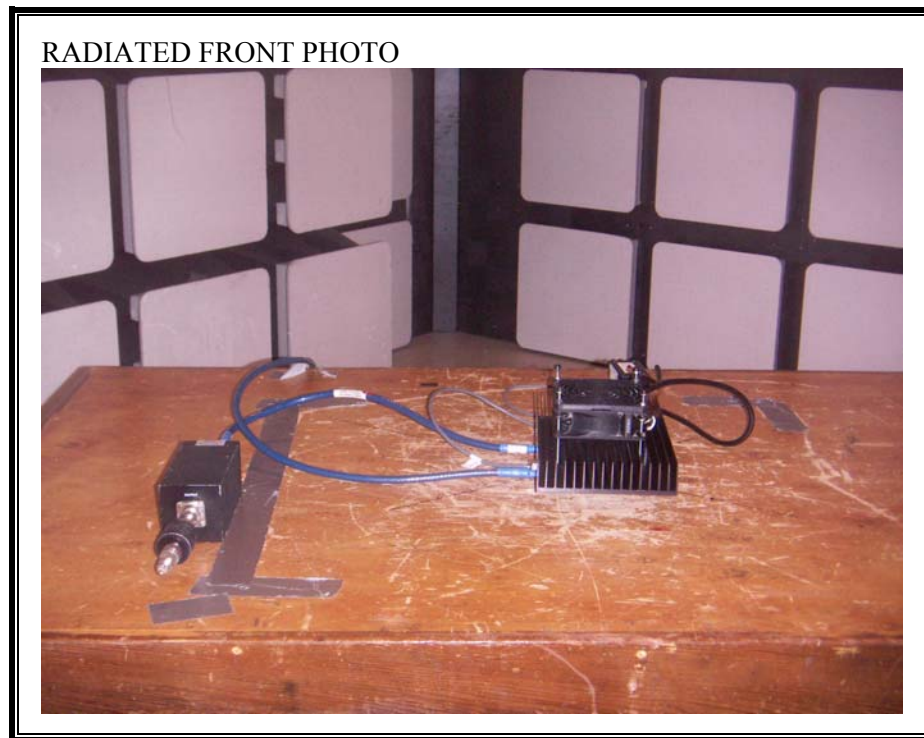
f GHz	SA reading (dBuV/m)	Ant. Pol. (H/V)	SG reading (dBm)	CL (dB)	Gain (dBi)	Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Notes
Low Ch. 421.01MHz										
1.263	69.0	H	-36.8	1.4	3.4	1.3	-36.9	-13.0	-23.9	
1.503	66.5	H	-37.8	1.5	3.8	1.6	-37.8	-13.0	-24.8	
1.685	67.6	H	-35.7	1.6	4.0	1.8	-35.4	-13.0	-22.4	
2.103	60.0	H	-41.8	1.8	5.0	2.8	-40.7	-13.0	-27.7	
2.798	56.0	H	-44.3	2.1	6.9	4.7	-41.6	-13.0	-28.6	
1.263	68.4	V	-38.1	1.4	3.4	1.3	-38.2	-13.0	-25.2	
1.685	64.0	V	-40.0	1.6	4.0	1.8	-39.7	-13.0	-26.7	
2.103	60.5	V	-41.5	1.8	5.0	2.8	-40.4	-13.0	-27.4	
3.373	56.4	V	-42.9	2.3	7.9	5.7	-39.5	-13.0	-26.5	
Mid Ch. 466.5MHz										
1.404	84.1	H	-20.8	1.5	3.6	1.5	-20.9	-13.0	-7.9	
1.871	64.4	H	-37.7	1.7	4.2	2.1	-37.3	-13.0	-24.3	
2.790	55.8	H	-44.5	2.1	6.9	4.7	-41.9	-13.0	-28.9	
3.735	57.4	H	-41.4	2.5	8.7	6.5	-37.4	-13.0	-24.4	
1.404	82.0	V	-23.6	1.5	3.6	1.5	-23.7	-13.0	-10.7	
1.871	63.8	V	-39.1	1.7	4.2	2.1	-38.6	-13.0	-25.6	
2.798	55.6	V	-44.9	2.1	6.9	4.7	-42.2	-13.0	-29.2	
High Ch. 512MHz										
1.026	70.0	H	-37.2	1.4	3.1	1.0	-37.6	-13.0	-24.6	
1.540	82.1	H	-22.0	1.6	3.8	1.7	-21.9	-13.0	-8.9	
2.054	61.0	H	-40.8	1.8	4.7	2.6	-40.0	-13.0	-27.0	
2.798	56.0	H	-44.3	2.1	6.9	4.7	-41.6	-13.0	-28.6	
1.026	70.5	V	-37.4	1.4	3.1	1.0	-37.8	-13.0	-24.8	
1.540	81.0	V	-23.8	1.6	3.8	1.7	-23.7	-13.0	-10.7	
2.054	63.0	V	-39.0	1.8	4.7	2.6	-38.2	-13.0	-25.2	
2.804	54.9	V	-45.6	2.1	6.9	4.7	-42.9	-13.0	-29.9	
Note: No other emissions were detected above the system noise floor up to 10th harmonic.										

8. SETUP PHOTOS

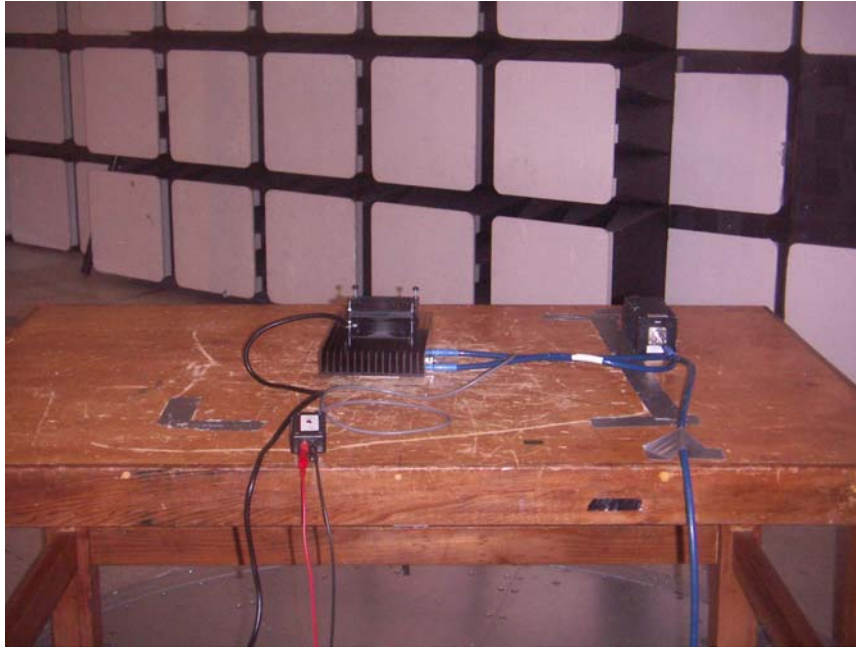
ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP



RADIATED RF MEASUREMENT SETUP



RADIATED BACK PHOTO



END OF REPORT