



**FCC CFR47 PART 24 E CERIFICATION
CLASS II PERMISSIVE CHANGE**

TEST REPORT

FOR

PCS MULTI CARRIER POWER AMPLIFIER

MODEL: G3S-1900-80

FCC ID: E675JS0045

REPORT NUMBER: 02U1151-1

ISSUE DATE: FEBRUARY 01, 2002

Prepared for
POWERWAVE
1801 EAST ST. ANDREW PLACE
SANTA ANA, CA 92705
USA

Prepared by
COMPLIANCE CERTIFICATION SERVICES, INC.
561F MONTEREY ROAD, ROUTE 2
MORGAN HILL, CA 95037, USA
TEL: (408) 463-0885
FAX: (408) 463-0888

TABLE OF CONTENT

1. TEST RESULT CERTIFICATION	3
2. EUT DESCRIPTION	4
3. PERMISSIVE CHANGE	4
4. TEST METHODOLOGY	4
5. TEST FACILITY	4
6. ACCREDITATION AND LISTING	4
7. MEASURING INSTRUMENT CALIBRATION	4
8. APPLICABLE RULES AND BRIEF TEST RESULT	5
9. TEST SETUP, PROCEDURE AND RESULT	8
9.1. SECTION 2.1046: RF POWER OUTPUT	8
9.2. SECTION 2.1047: MODULATION CHARACTERISTICS	11
9.3. SECTION 2.1049: OCCUPIED BANDWIDTH	11
9.4. SECTION 2.1051: SPURIOUS EMISSION AT ANTENNA TERMINAL	17
9.5. SECTION 2.1053: FIELD STRENGTH OF SPURIOUS RADIATION	42
9.6. SECTION 2.1055: FREQUENCY STABILITY	45
ATTACHMENT	47
9.7. EUT PHOTOS	47
9.8. PROPOSED FCC ID LABEL FORMAT	66
9.9. SCHEMATIC, PART LISTS AND BLOCK DIAGRAM	67
9.10. INSTALLATION AND SERVICE MANUAL	68

1. TEST RESULT CERTIFICATION

COMPANY NAME: POWERWAVE
1801 EAST ST. ANDREW PLACE
SANTA ANA, CA 92705, USA

CONTACT PERSON: JEFF DALE / RELIABILITY ENGINEERING

TELEPHONE NO: (714) 466-1476 EXT. 1476

EUT DESCRIPTION: PCS MULTI CARRIER POWER AMPLIFIER

MODEL NAME: G3S-19000-80

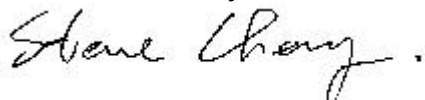
DATE TESTED: FEBRUARY 01, 2002

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	1930-1990 MHz POWER AMPLIFIER
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CERIFICATION (PERMISSIVE CLASS II CHANGE)
FCC RULE	CFR 47 PART 2, 15 and 24 Subpart E

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 24 Subpart E-Broadband PCS. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

Warning : This document reports conditions under which testing was conducted and results of tests performed. 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.

Released For CCS By:



STEVE CHENG
EMC DEPARTMENT MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:



KERWIN CORPUZ
EMC ASSOCIATE ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

This product is a linear, feed-forward power amplifier that operates in the 60 MHz frequency band from 1930 MHz to 1990 MHz. It is designed to operate in a maximum of two continuous frequency blocks in the PCS band or a total instantaneous bandwidth of 20 MHz.

3. PERMISSIVE CHANGE

Add EDGE Waveform to the previous Amplifier System. No hardware or software changes were made to the EUT.

4. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

5. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

6. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2))

7. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

8. APPLICABLE RULES AND BRIEF TEST RESULT

§24.232- POWER LIMIT

24.232(a); Maximum Peak output power for base station transmitters should not exceed 100 Watts EIRP (equivalent isotropically radiated power).

24.232(b); Mobile/Portable stations are limited to 2 Watts EIRP peak power.

Spec limit: As specified above, 100W maximum.

Test result: Measured with power meter and Spectrum Analyzer. All outputs were adjusted to 49.0dBm (80Watts) during testing.

TYPE OF EMISSIONS

300KG7W (EDGE)

§24.235- FREQUENCY STABILITY

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Spec limit: As stated above.

Test result: Not Applicable, EUT is a power amplifier.

§24.238- EMISSION LIMITS

24.238(a); The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instruction manual and/or alignment procedure, shall not be less than $43 + 10 \log$ (mean output power in watts) dBc below the mean power output outside a licensee's frequency block.

Power Amplifier Mean Power = 80 Watts (49dBm)
 $43 + 10 \log (80 \text{ Watts}) = 62 \text{ dB}$

Out-of-Band and Band-Edges emissions must be attenuated by the following amount:
 $49 \text{ dBm} - 62 \text{ dB} = -13 \text{ dBm}$

24.238(b) & (c);

- (1) Compliance with the out-of-band emissions requirement is based on test being performed with 1MHz analyzer RES BW.
- (2) At block edges, RES BW may be adjusted to a level at least as large as 1% of emission bandwidth. The emissions bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. For the EUT this is at least:

EDGE:

$0.01 * 300 \text{ kHz} = 3 \text{ kHz}$. A RES BW of 3 kHz was used for measuring at the block edges.

Spec limit: As specified as above.

Test result: This measurement results shows that the EUT complies with the rule.

§2.1057- SPECTRUM RANGE TO BE INVESTIGATED

Lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:

(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the equipment operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.

(b) Particular attention should be paid to harmonics and sub-harmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency.

Radiation at the frequencies of multiplier stages should also be checked.

(c) The amplitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be reported.

(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

Spec limit: Frequency investigation range from 15M to tenth harmonic (i.e. 20 GHz.).

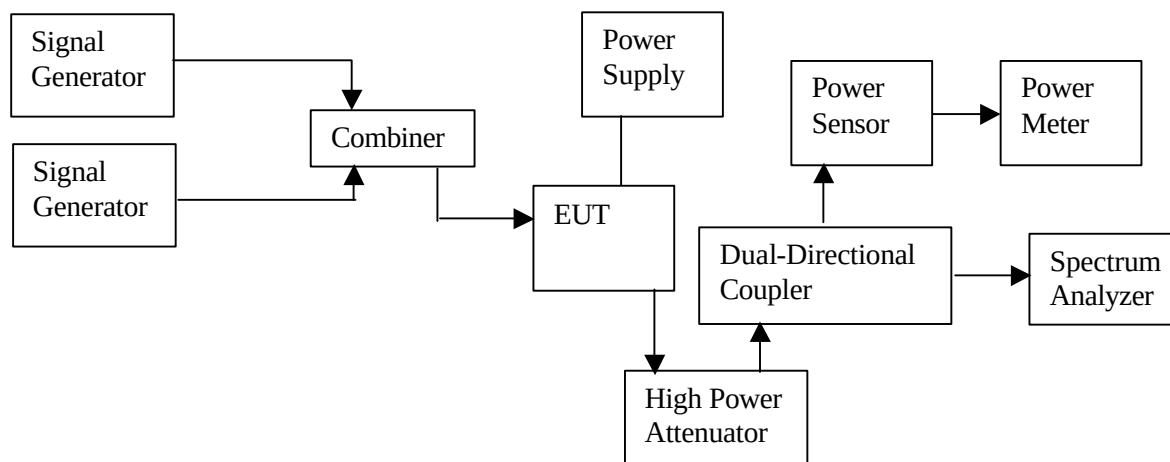
9. TEST SETUP, PROCEDURE AND RESULT

9.1. SECTION 2.1046: RF POWER OUTPUT

INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	AGILENT	E4433B	US40052095	10/31/02
Signal Generator	AGILENT	E4433B	US40051850	6/1/02
Combiner	NARDA	4322-2	02584	N/A
1000W Attenuator	WEINSCHEL	82-40-34	102	N/A
Dual-Direct. Coupler (0.1-2GHz)	HP	778D	18748	N/A
Dual-Direct. Coupler (2-18GHz)	AGILENT	773D	2839A01640	N/A
Power Sensor	HP	8481A	US37299471	12/31/02
Power Meter	HP	E4418B	US39251104	5/17/02
Power Supply	Power Tech., Inc.	P63C-30330	9917C0030	N/A
Spectrum Analyzer	HP	8593EM	3710A00205	6/20/02

TEST SETUP

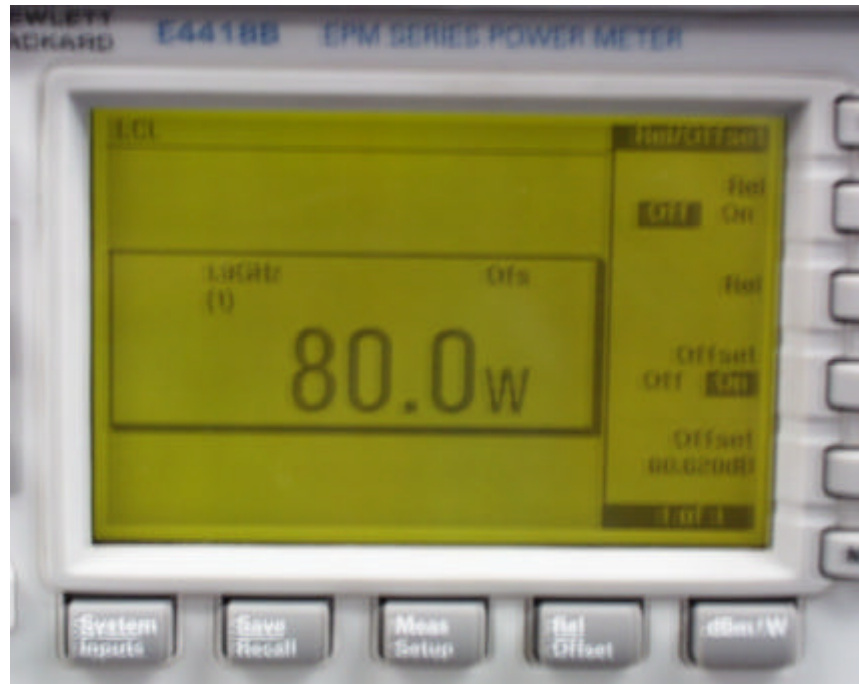


TEST PROCEDURE

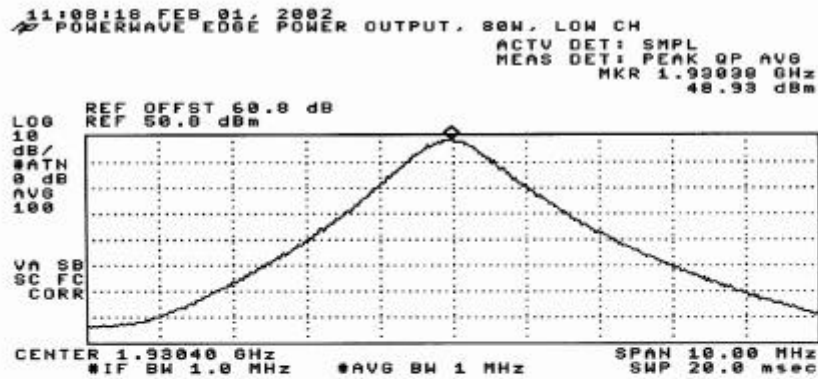
The EUT was set to maximum output power (maximum gain). RF output power was measured with Power Meter and Spectrum Analyzer.

RESULT

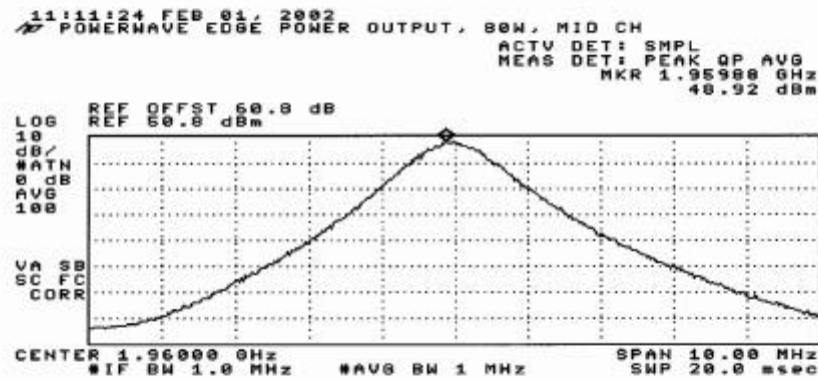
Measured with power meter and Spectrum Analyzer. All outputs were adjusted to 80 watts (49 dBm) during testing.



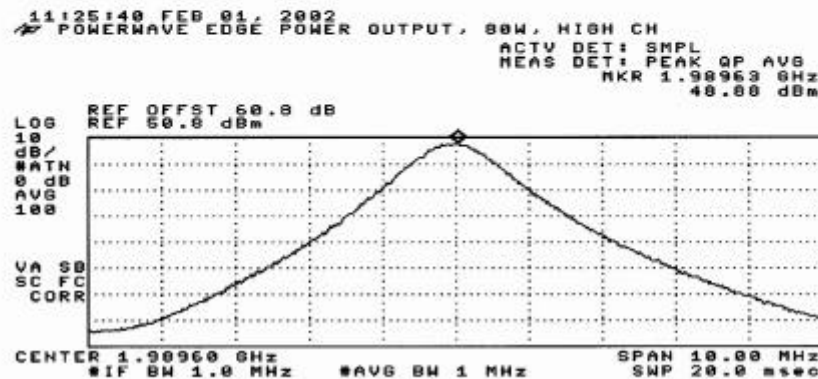
MEASURED with POWER METER



Low channel
@ 1930.4 MHz



Mid channel
@ 1960 MHz



High channel
@ 1989.6 MHz

MEASURED with SPECTRUM ANALYZER

9.2. SECTION 2.1047: MODULATION CHARACTERISTICS

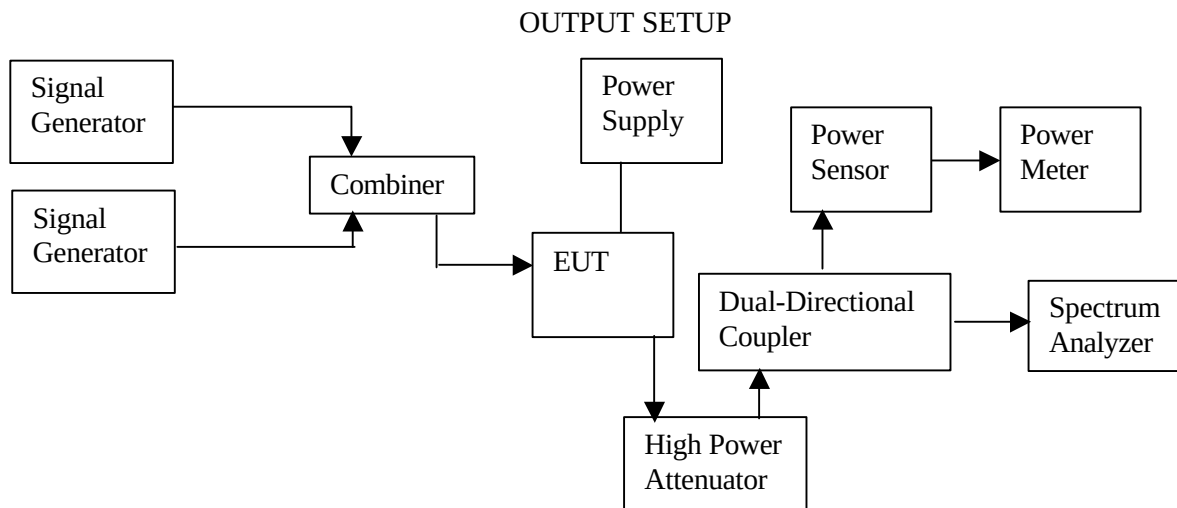
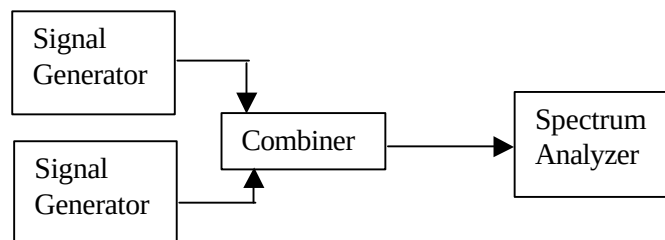
(NOT APPLICABLE, EUT IS A POWER AMPLIFIER)

9.3. SECTION 2.1049: OCCUPIED BANDWIDTH**SECTION 2.1049(i)**

Transmitters designed for other types of modulation – when modulated by an appropriate signal of sufficient amplitude to be representative of the type of service in which used. A description of the input signal should be supplied.

INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	AGILENT	E4433B	US40052095	10/31/02
Signal Generator	AGILENT	E4433B	US40051850	6/1/02
Combiner	NARDA	4322-2	02584	N/A
1000W Attenuator	WEINSCHEL	82-40-34	102	N/A
Dual-Direct. Coupler (0.1-2GHz)	HP	778D	18748	N/A
Dual-Direct. Coupler (2-18GHz)	AGILENT	773D	2839A01640	N/A
Power Sensor	HP	8481A	US37299471	12/31/02
Power Meter	HP	E4418B	US39251104	5/17/02
Power Supply	Power Tech., Inc.	P63C-30330	9917C0030	N/A
Spectrum Analyzer	HP	8593EM	3710A00205	6/20/02

TEST SETUP**INPUT SETUP**



Antenna Terminal Output Measurement Setup



Antenna Terminal Input Measurement Setup

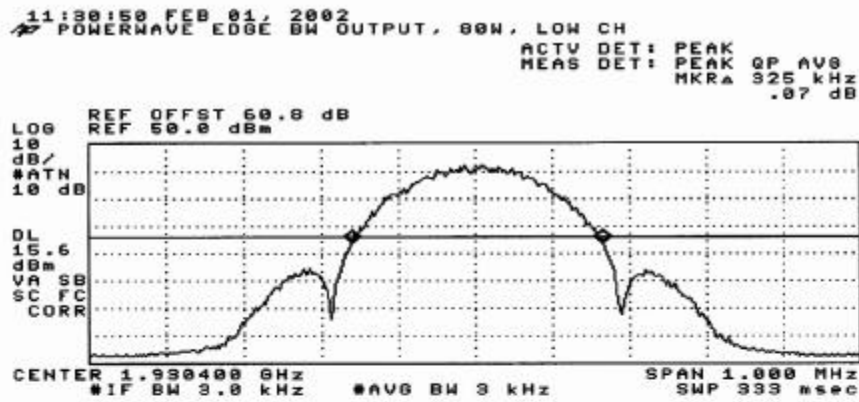
TEST PROCEDURE

The EUT's occupied bandwidth output plot is compared with the input source plot to check that no distortion is created when the input signal is amplified by the EUT. Identical bandwidths, spans and center frequencies are used for both plots. Reference levels and attenuation are adjusted. The emission bandwidth was attenuated by 26 dB below the transmitter power. When measuring the source input, single signal generator was turned on.

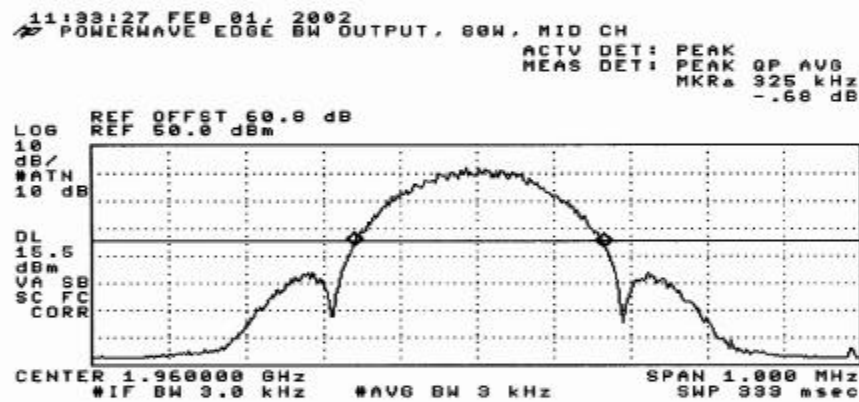
RESULT

The following table indicates the plot number associated with the Input Bandwidth and Output Bandwidth plots. All measurements are in peak detector mode.

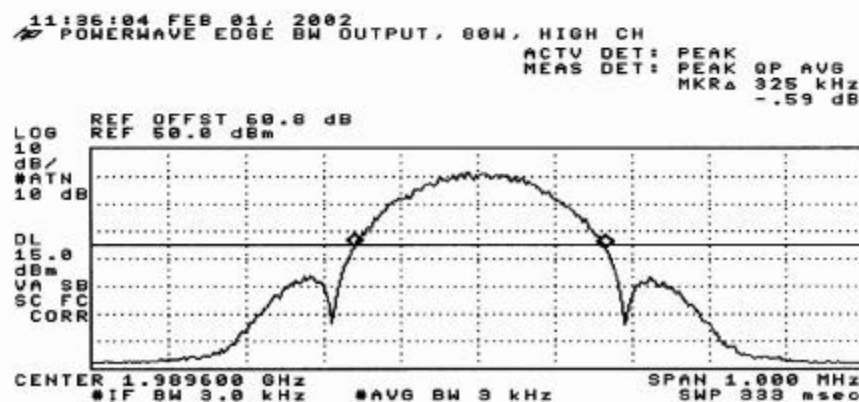
*** EDGE ***		
Plot#	Description	Frequency Range (MHz)
1	Low Channel Output Bandwidth	1930.4
2	Mid Channel Output Bandwidth	1960
3	High Channel Output Bandwidth	1989.6
4	Low Channel Input Bandwidth	1930.4
5	Mid Channel Input Bandwidth	1960
6	High Channel Input Bandwidth	1989.6



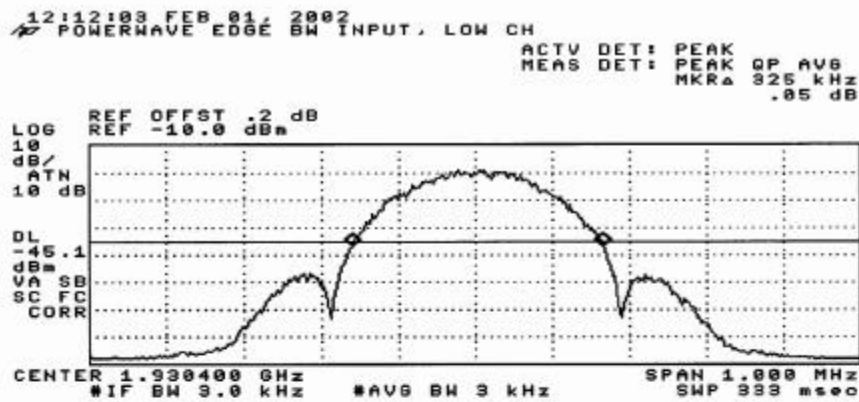
1



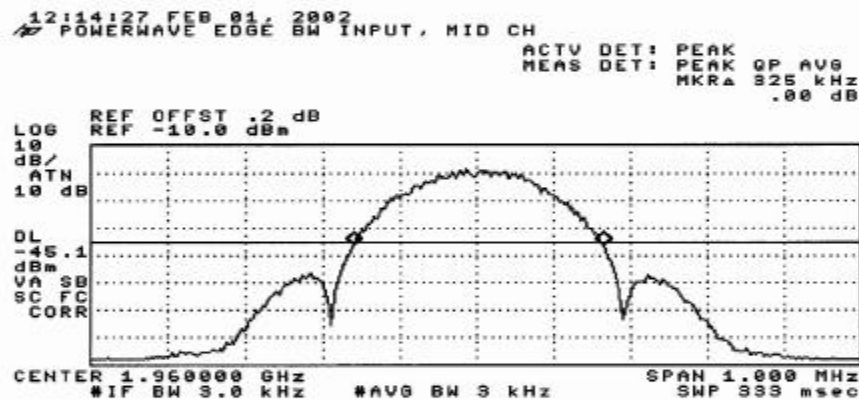
2



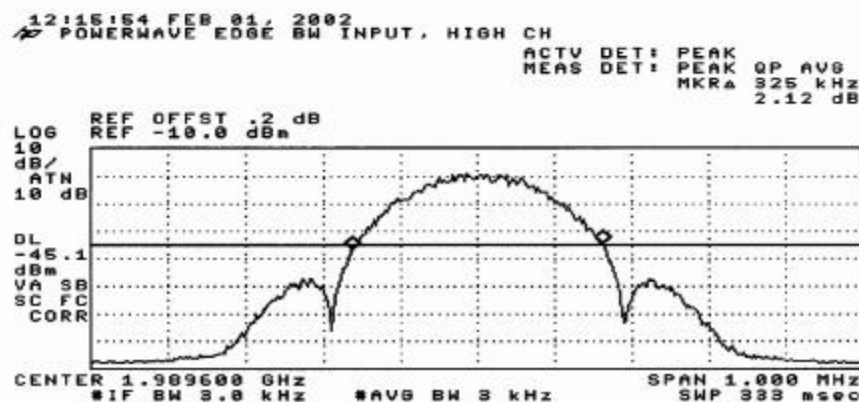
3



4



5



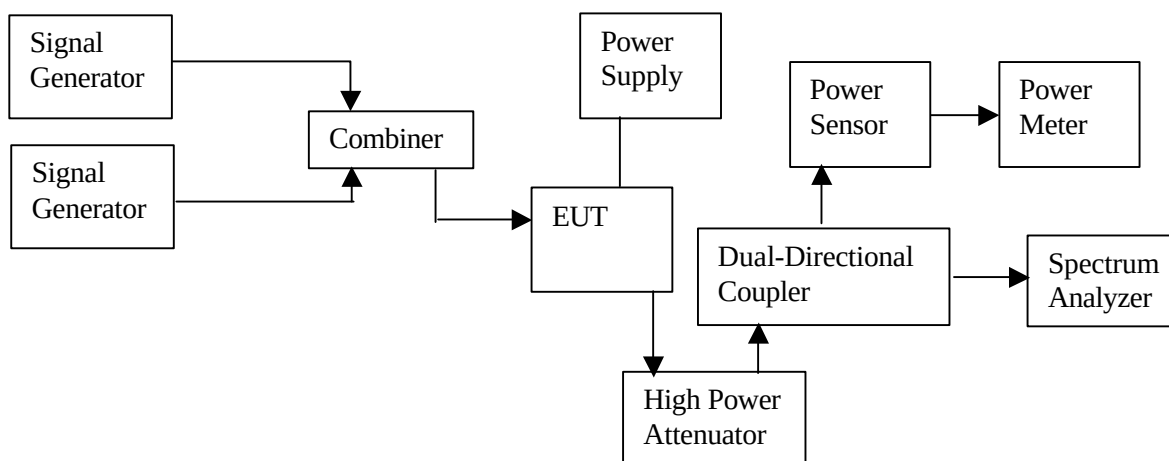
6

9.4. SECTION 2.1051: SPURIOUS EMISSION AT ANTENNA TERMINAL

INSTRUMENTS LIST

EQUIPMENT	MANUFACTURE	MODEL NO.	SERIAL NO.	CAL. DUE DATE
Signal Generator	AGILENT	E4433B	US40052095	10/31/02
Signal Generator	AGILENT	E4433B	US40051850	6/1/02
Combiner	NARDA	4322-2	02584	N/A
1000W Attenuator	WEINSCHEL	82-40-34	102	N/A
Dual-Direct. Coupler (0.1-2GHz)	HP	778D	18748	N/A
Dual-Direct. Coupler (2-18GHz)	AGILENT	773D	2839A01640	N/A
Power Sensor	HP	8481A	US37299471	12/31/02
Power Meter	HP	E4418B	US39251104	5/17/02
Power Supply	Power Tech., Inc.	P63C-30330	9917C0030	N/A
Spectrum Analyzer	HP	8593EM	3710A00205	6/20/02

TEST SETUP





Spurious Emission at Antenna Terminal setup

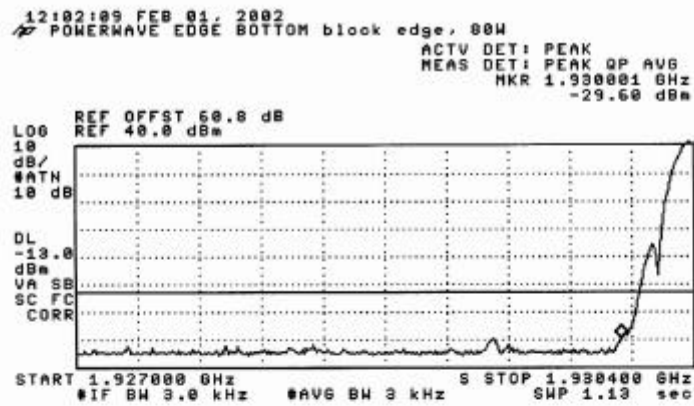
TEST PROCEDURE

- 1) Two balanced signals were applied to the RF input. One set as close as possible to the bottom of the block edge. One set as close as possible to the top of the block edge and one set both ends of the block. Set the RES BW to 1% of the emission bandwidth to show compliance with the -13dBm limit, in the 1 MHz bands immediately outside and adjacent to the top and bottom edges of the frequency block.
- 2) For the Out-of-Band measurements a 1 MHz RES BW was used to scan from 15 MHz to $10f_o$ of the fundamental carrier for all frequency block. A display line was placed at -13dBm to show compliance.

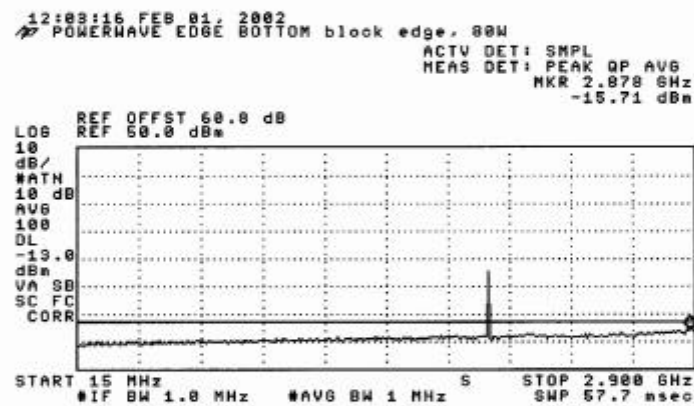
RESULT

The following table indicates the plot number associated with the Block Edges, Intermodulation and Out-of-Band emission plots. Measurements are in peak detector mode for Block Edges and in average detector mode for Intermodulation and Out-of-Band.

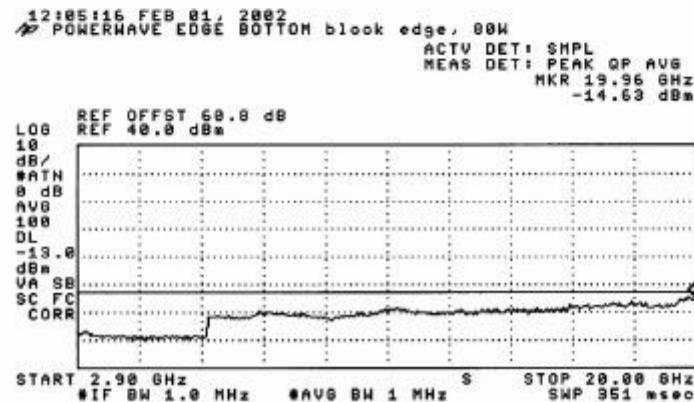
*** EDGE ***		
Plot#	Description	Frequency Range (MHz)
7	Bottom Block Edge	1927 to 1930.4
8	Bottom Block Edge out-of-band	15 to 2900
9	Bottom Block Edge out-of-band	2900 to 20000
10	Top Block Edge	1989.6 to 1993
11	Top Block Edge out-of-band	15 to 2900
12	Top Block Edge out-of-band	2900 to 20000
13	Block A: Intermod, 2 tone @ Bottom of block	1930.45, 1932.45 (20MHz span)
14	Block A: Intermod, 2 tone @ Bottom of block	1930.45, 1932.45 (100MHz span)
15	Block A: Intermod, 2 tone @ Bottom of block, out-of-band	15 to 1000
16	Block A: Intermod, 2 tone @ Bottom of block, out-of-band	1000 to 2900
17	Block A: Intermod, 2 tone @ Bottom of block, out-of-band	2900 to 10000
18	Block A: Intermod, 2 tone @ Bottom of block, out-of-band	10000 to 20000
19	Block A: Intermod, 2 tone @ Top of block	1942.6, 1944.6 (20MHz span)
20	Block A: Intermod, 2 tone @ Top of block	1942.6, 1944.6 (100MHz span)
21	Block A: Intermod, 2 tone @ Top of block, out-of-band	15 to 1000
22	Block A: Intermod, 2 tone @ Top of block, out-of-band	1000 to 2900
23	Block A: Intermod, 2 tone @ Top of block, out-of-band	2900 to 10000
24	Block A: Intermod, 2 tone @ Top of block, out-of-band	10000 to 20000
25	Block A: Intermod, 2 tone @ Both ends of block	1930.4, 1944.6 (20MHz span)
26	Block A: Intermod, 2 tone @ Both ends of block	1930.4, 1944.6 (100MHz span)
27	Block A: Intermod, 2 tone @ Both ends of block, out-of-band	15 to 1000
28	Block A: Intermod, 2 tone @ Both ends of block, out-of-band	1000 to 2900
29	Block A: Intermod, 2 tone @ Both ends of block, out-of-band	2900 to 10000
30	Block A: Intermod, 2 tone @ Both ends of block, out-of-band	10000 to 20000



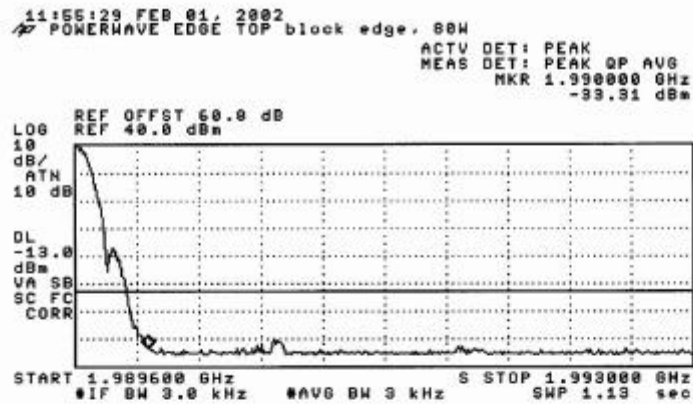
7



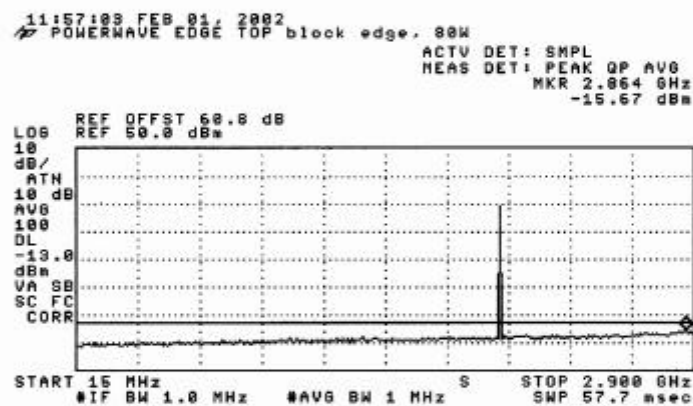
8



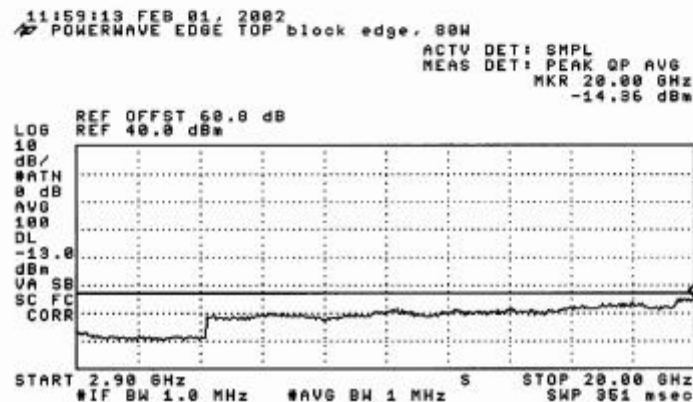
9



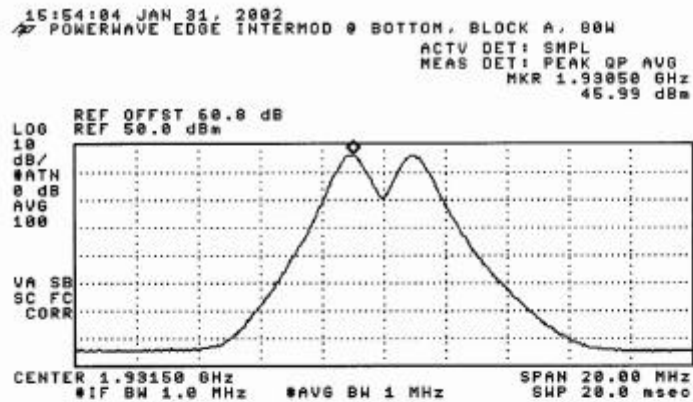
10



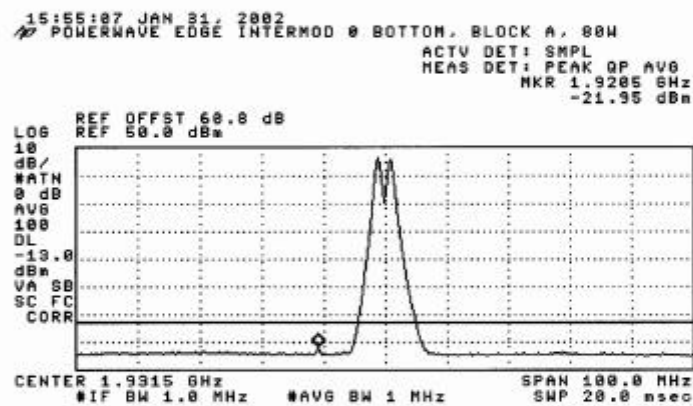
11



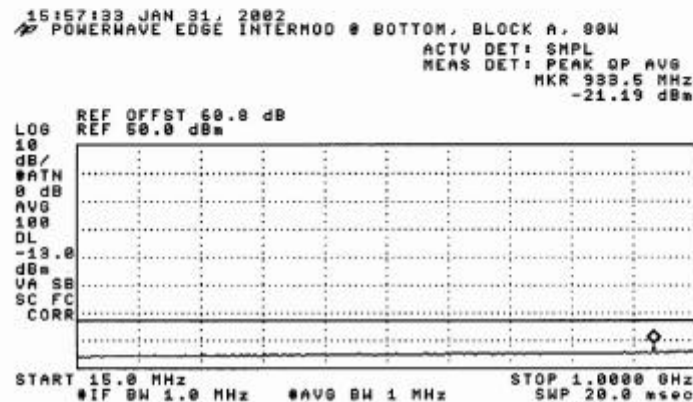
12



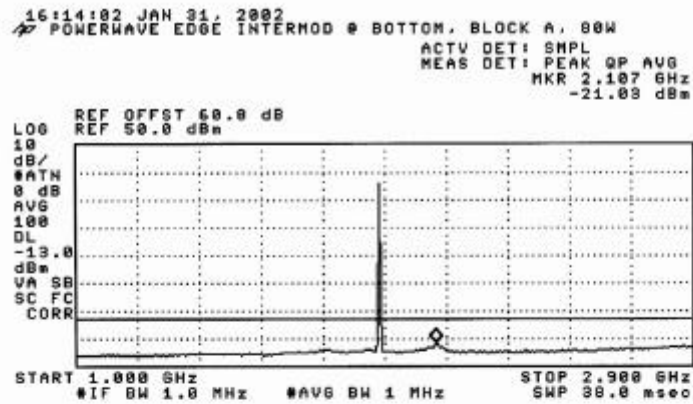
13



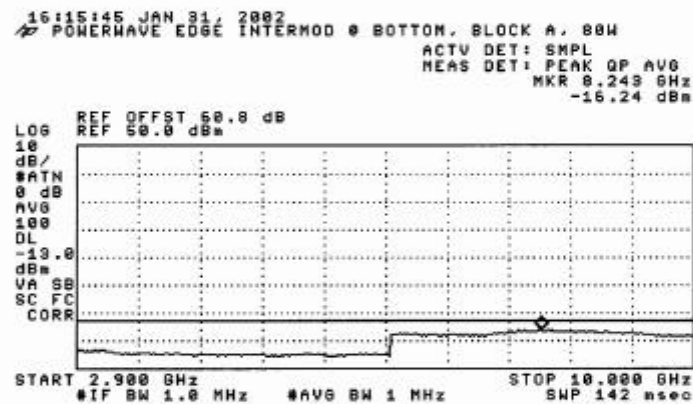
14



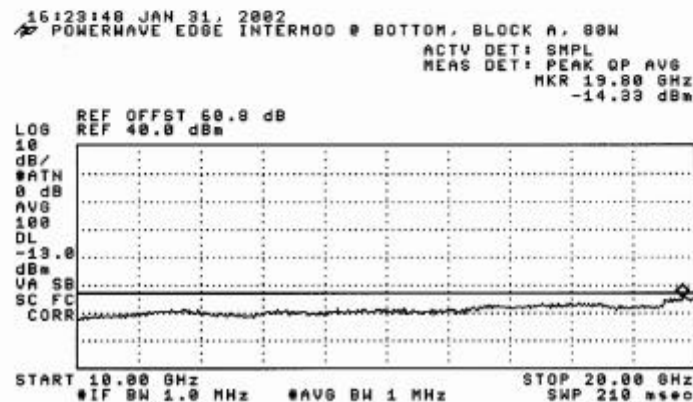
15



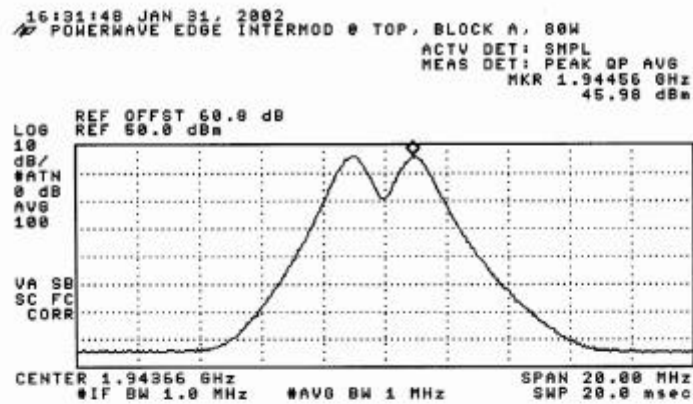
16



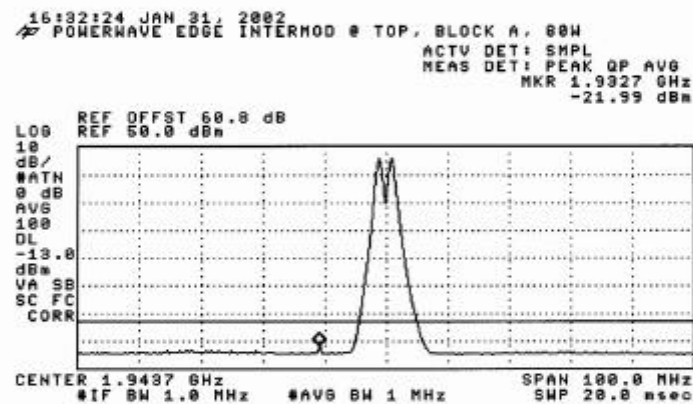
17



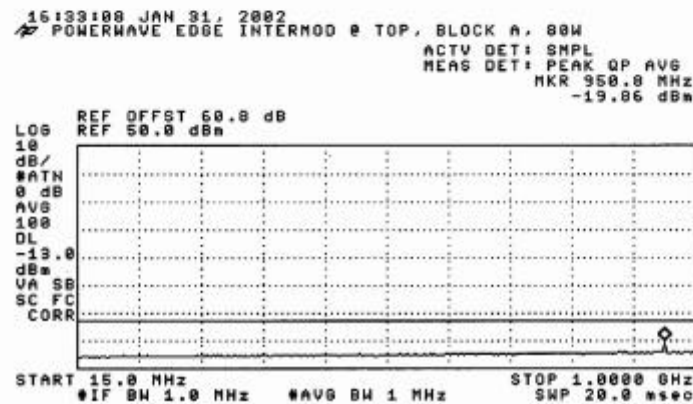
18



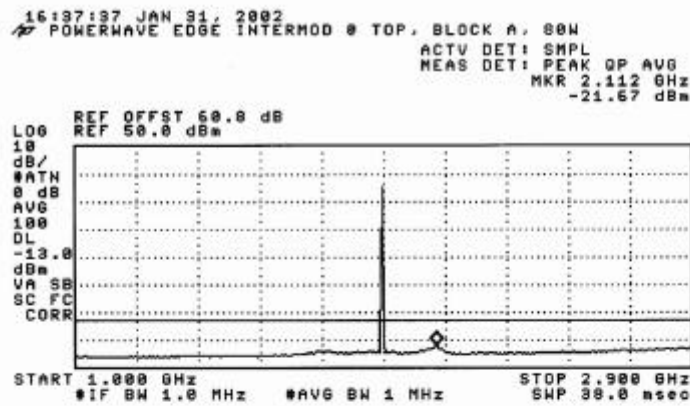
19



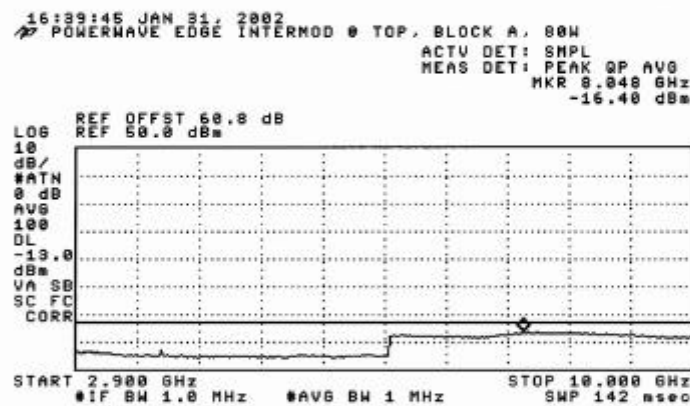
20



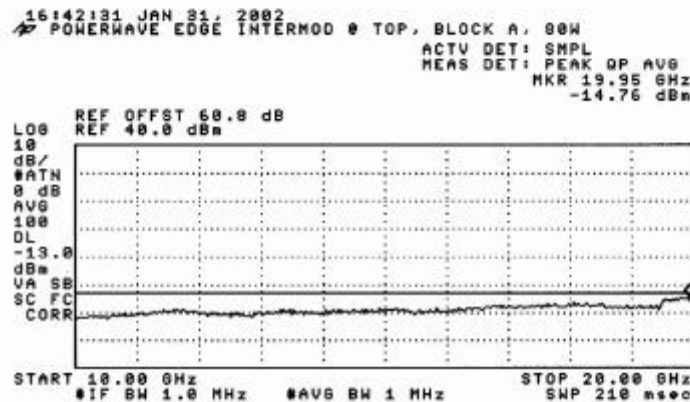
21



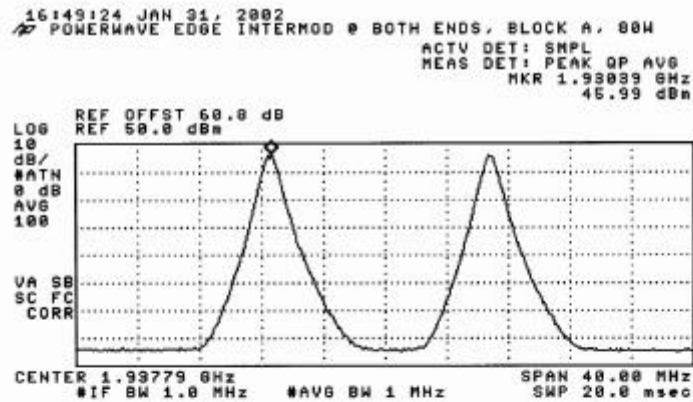
22



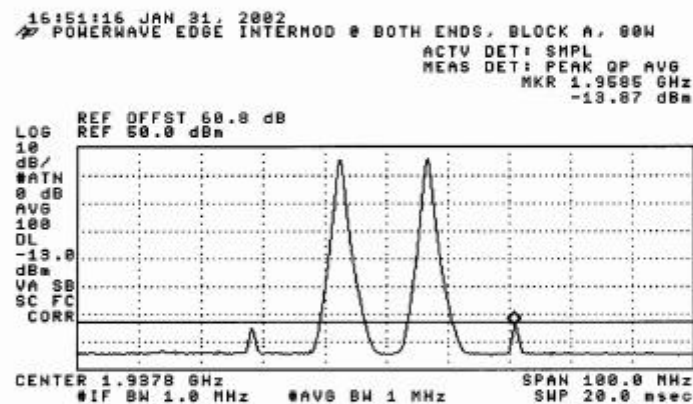
23



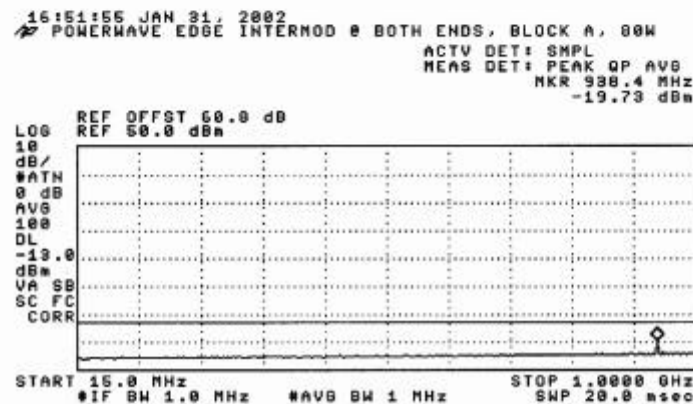
24



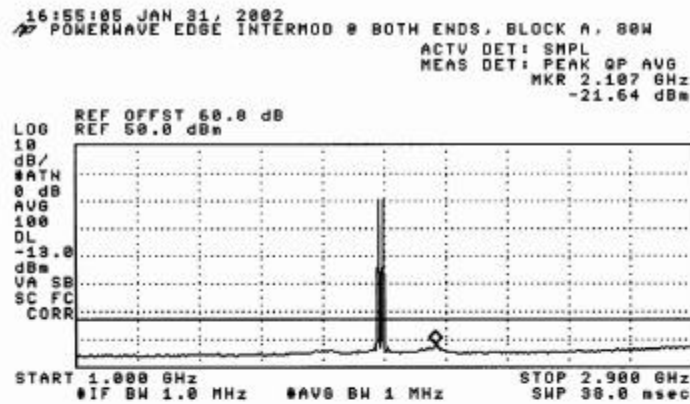
25



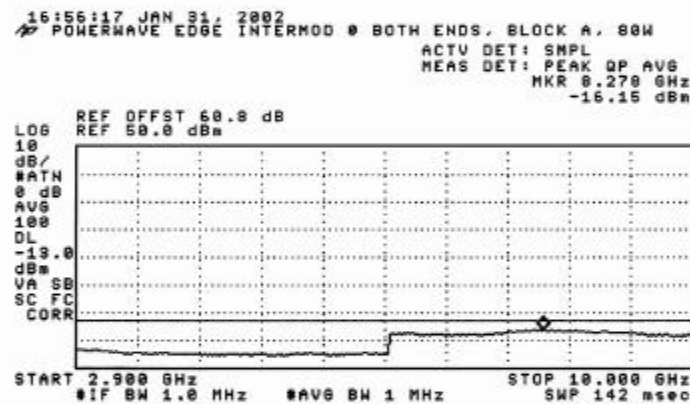
26



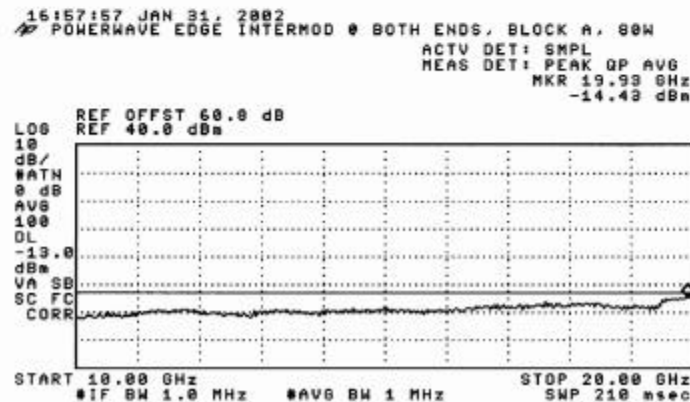
27



28

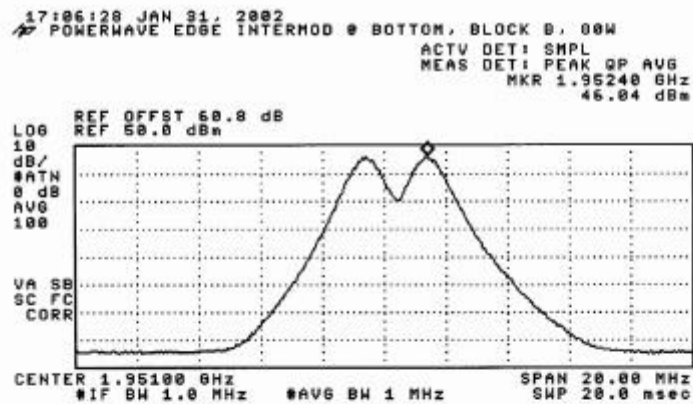


29

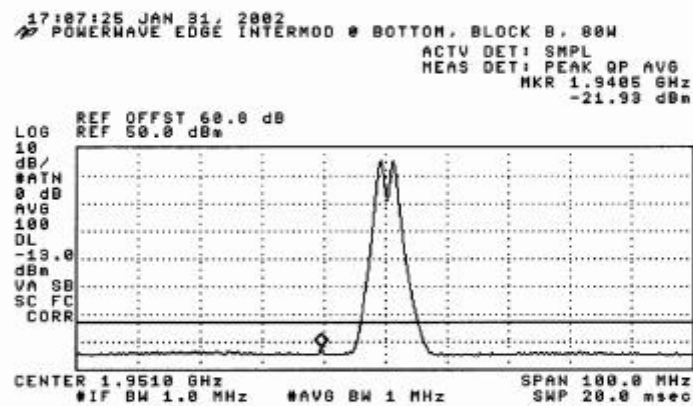


30

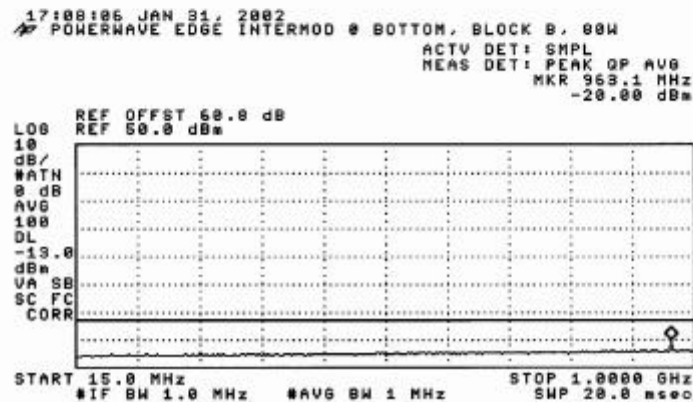
*** EDGE ***		
Plot#	Description	Frequency Range (MHz)
31	Block B : Intermod, 2 tone @ Bottom of block	1950.4, 1952.4 (20MHz span)
32	Block B : Intermod, 2 tone @ Bottom of block	1950.4, 1952.4 (100MHz span)
33	Block B : Intermod, 2 tone @ Bottom of block, out-of-band	15 to 1000
34	Block B : Intermod, 2 tone @ Bottom of block, out-of-band	1000 to 2900
35	Block B : Intermod, 2 tone @ Bottom of block, out-of-band	2900 to 10000
36	Block B : Intermod, 2 tone @ Bottom of block, out-of-band	10000 to 20000
37	Block B : Intermod, 2 tone @ Top of block	1962.6, 1964.6 (20MHz span)
38	Block B : Intermod, 2 tone @ Top of block	1962.6, 1964.6 (100MHz span)
39	Block B : Intermod, 2 tone @ Top of block, out-of-band	15 to 1000
40	Block B : Intermod, 2 tone @ Top of block, out-of-band	1000 to 2900
41	Block B : Intermod, 2 tone @ Top of block, out-of-band	2900 to 10000
42	Block B : Intermod, 2 tone @ Top of block, out-of-band	10000 to 20000
43	Block B : Intermod, 2 tone @ Both ends of block	1950.4, 1964.6 (20MHz span)
44	Block B : Intermod, 2 tone @ Both ends of block	1950.4, 1964.6 (100MHz span)
45	Block B : Intermod, 2 tone @ Both ends of block, out-of-band	15 to 1000
46	Block B : Intermod, 2 tone @ Both ends of block, out-of-band	1000 to 2900
47	Block B : Intermod, 2 tone @ Both ends of block, out-of-band	2900 to 10000
48	Block B : Intermod, 2 tone @ Both ends of block, out-of-band	10000 to 20000



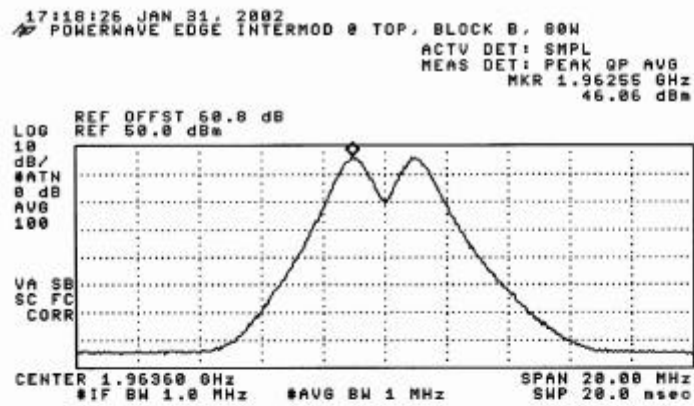
31



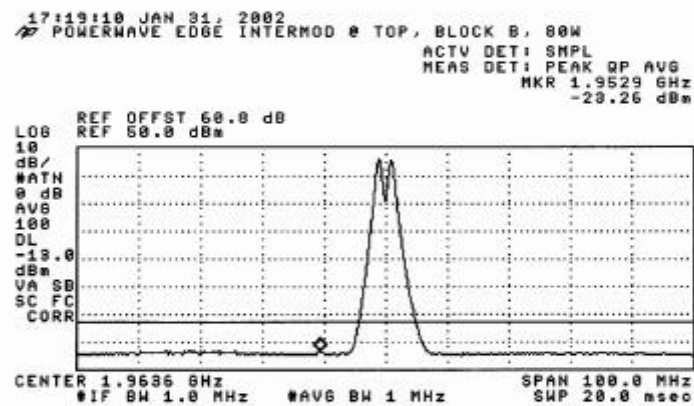
32



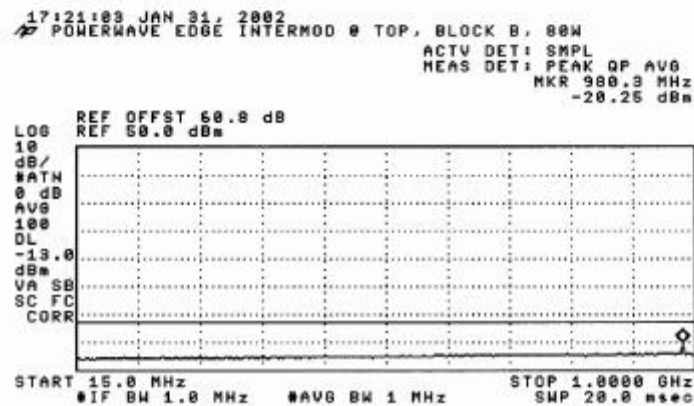
33



37



37



39