FCC CFR47 PART 22 CERTIFICATION
TEST REPORT

FOR

869-894MHz MULTI-CHANNEL AMPLIFIER

MODEL: G3S-800-180

FCC ID: E675JS0058

REPORT NUMBER: 02U1219-1

ISSUE DATE: MARCH 26, 2002

Prepared for
POWERWAVE TECHNOLOGIES, INC.
1801 EAST ST. ANDREW PLACE
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Prepared by
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1. FCC CERTIFICATION INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part2, Subpart J, Sections 2.1033 – 2.1055.

2.1033(c)(1)	**Applicant:**	POWERWAVE TECHNOLOGIES, INC. 1801 EAST ST. ANDREW PLACE SANTA ANA, CA 92705
	Contact person:	JEFF DALE
	Telephone number:	(714) 466-1476
2.1033(c)(2)	**FCC ID:**	E675JS0058
2.1033(c)(4)	**Types of Emissions:**	F1D (AMPS WIDEBAND DATA), F8W (AMPS Voice), F9W (CDMA & W-CDMA), DXW (TDMA), GXW (GSM), AND G7W (EDGE)
2.1033(c)(5)	**Frequency Range:**	869 – 894 MHz
2.1033(c)(6)	**Range of Operation Power:**	0-210 Watts, dependant on input signal level
2.1033(c)(7)	**Maximum Power Rating:**	210 Watts
2.1033(c)(8)	**DC Voltage and Current:**	27Vdc @ 62 A; typical

Section 22.913(a); Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.

TYPE OF EQUIPMENT:	CELLULAR AMPLIFIER
MEASUREMENT DISTANCE:	3 METER
TECHNICAL LIMIT:	FCC 22.359, 22.917
FCC RULES:	PART 22
EQUIPMENT AUTHORIZATION PROCEDURE	CERTIFICATION
MODIFICATIONS MADE ON EUT	☐ YES (REFER TO SECTION 8) ☒ NO

The above equipment was tested by Compliance Certification Services for compliance with the requirements set forth in the FCC CFR 47, PART 22 Subpart H. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

TESTED BY:

KERWIN CORPUZ
ASSOCIATE EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

REVIEWED and RELEASED BY:

MIKE HECKROTTE
CHIEF EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The G3S-800-180 is a linear, feed-forward power amplifier that operates in the 25 MHz frequency band from 869 MHz to 894 MHz. It is designed for use in an amplifier system that is modular in design, and is ideally suited for use in AMPS/TDMA/CDMA/EDGE/GSM base stations. The plug-in Model G3S-800-180 amplifier modules can each provide maximum 210 watts of power and function completely independently of each other.

3. 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.

4. 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))

5. MEASUREMENT INSTRUMENTATION

Radiated emissions were measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide liner horn. EMI receivers were used for line conducted readings, spectrum analyzers with pre-selectors and quasi-peak detectors were used to perform radiated measurements. Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specification for “Radio Interference Measuring Apparatus and Measurement Methods,” Publication 16.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

6. 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.

7. UNITS OF MEASUREMENT

Measurements of radiated interference are reported in terms of dB(µV/m) at a specified distance. The indicated readings on the spectrum analyzer were converted to dB(µV/m) by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dB(µV).

The field strength is calculated by adding the Antenna Factor and Cable Factors, then by subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4dB/m and a Cable Factor of 1.1dB is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m. The 32 dBµV/m value was mathematically converted to its corresponding level in uV/m.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/m

Level in uV/m = Common Antilogarithm [(32 dBµV/m)/20] = 39.8 µV/m

8. EQUIPMENT MODIFICATIONS

To achieve compliance for FCC PART 22 requirement, the following change(s) were made during compliance testing:

No changes were required in order to achieve compliance to FCC Part 22.

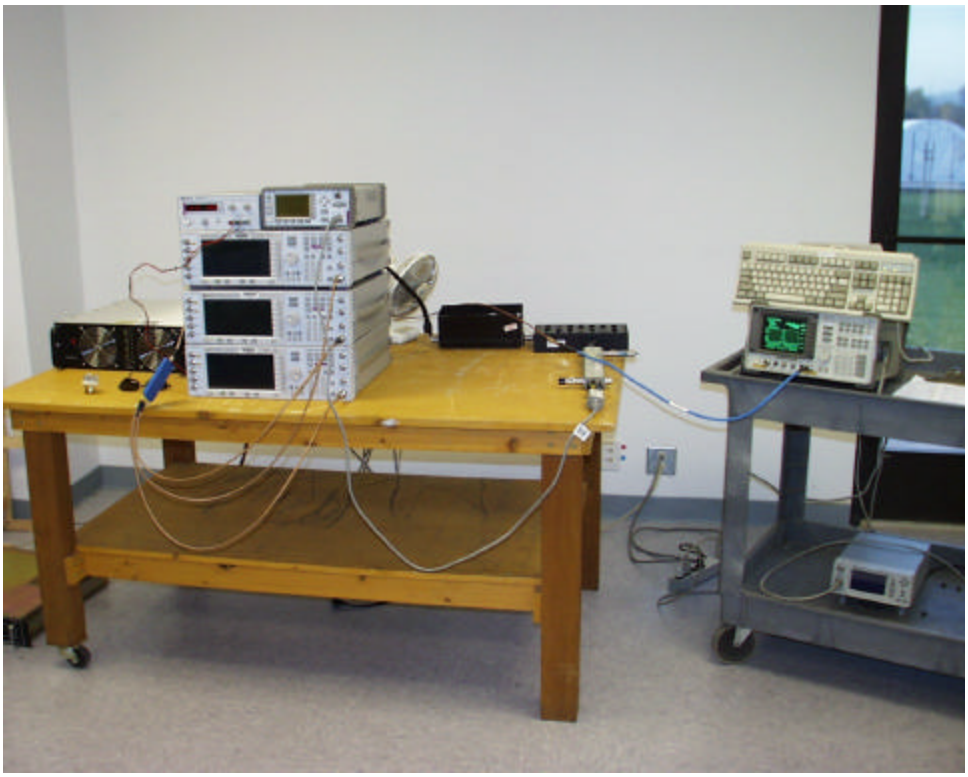
9. TEST EQUIPMENT LIST

Device Type	Manufacturer	Model Number	Serial No.	CAL Due Date
Spectrum Analyzer	HP	8566B	2140A01296	5/4/02
RF Preselector	HP	85685A	2817A00756	5/4/02
Pre-Amp	Miteq	NSP2600-44	646456	4/12/02
Bilog Antenna	Chase EMC Ltd.	CBL6112	2049	8/21/02
Horn Antenna	EMCO	3115	6739	1/31/03
Horn Antenna	EMCO	3115	6717	1/31/03
Signal Generator	HP	83732B	US34490599	3/21/02
Spectrum Analyzer	HP	8593EM	3710A00205	6/20/02

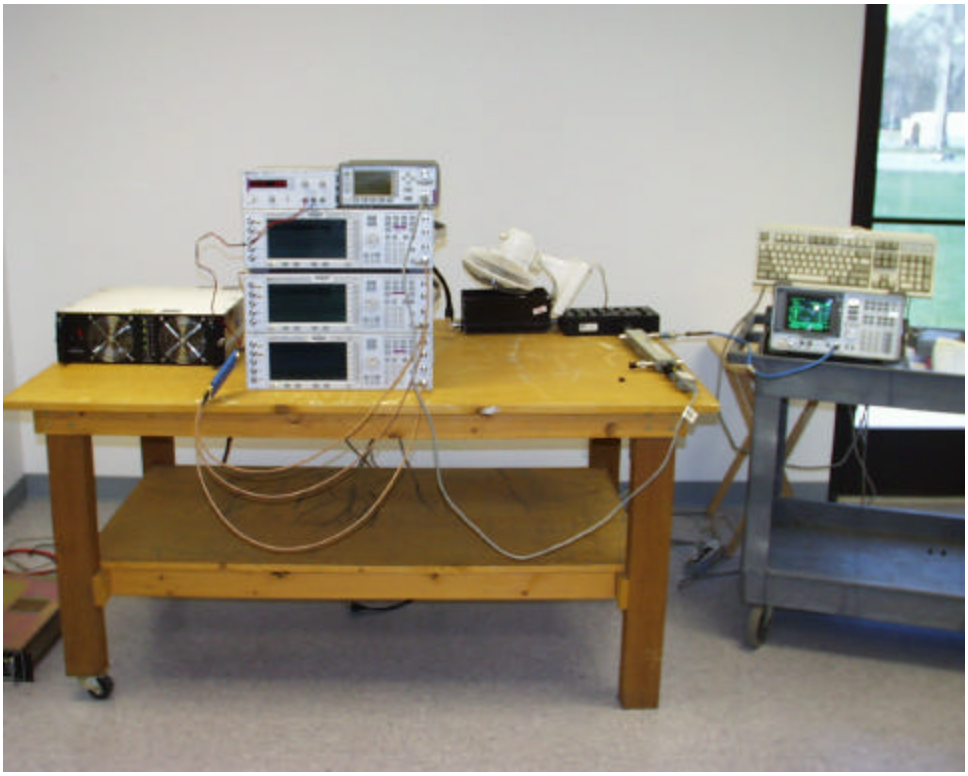
10. SUPPORT EQUIPMENT LIST

Device Type	Manufacturer	Model Number	Serial No.	CAL Due Date
SIGNAL GENERATOR	AGILENT	E4433B	US40052095	10/31/02
SIGNAL GENERATOR	AGILENT	E4433B	US40051593	7/31/02
SIGNAL GENERATOR	AGILENT	E4433B	US40051146	4/4/02
COMBINER	ANAREN	44000	416	N/A
PRE-AMPLIFIER	Mini-Circuit	ZHL-1042J-SMA	D061698-5	N/A
EUT Bandpass Filter	LORCH	WF-11065	AB26	N/A
HIGH POWER ATTENUATOR	Weinchel Corp.	53-20-34	LF243	N/A
POWER SUPPLY	Power Ten Inc.	P62B-30100	1007075	N/A
POWER METER	HP	E4418B	US39251104	5/17/02
POWER SENSOR	HP	8481A	US37295787	6/1/02
DIRECTIONAL COUPLER	HP	778D	14951	N/A
DIRECTIONAL COUPLER	AGILENT	773D	2839A01650	N/A

11. EUT SETUP PHOTOS



Occupied Bandwidth Input Setup

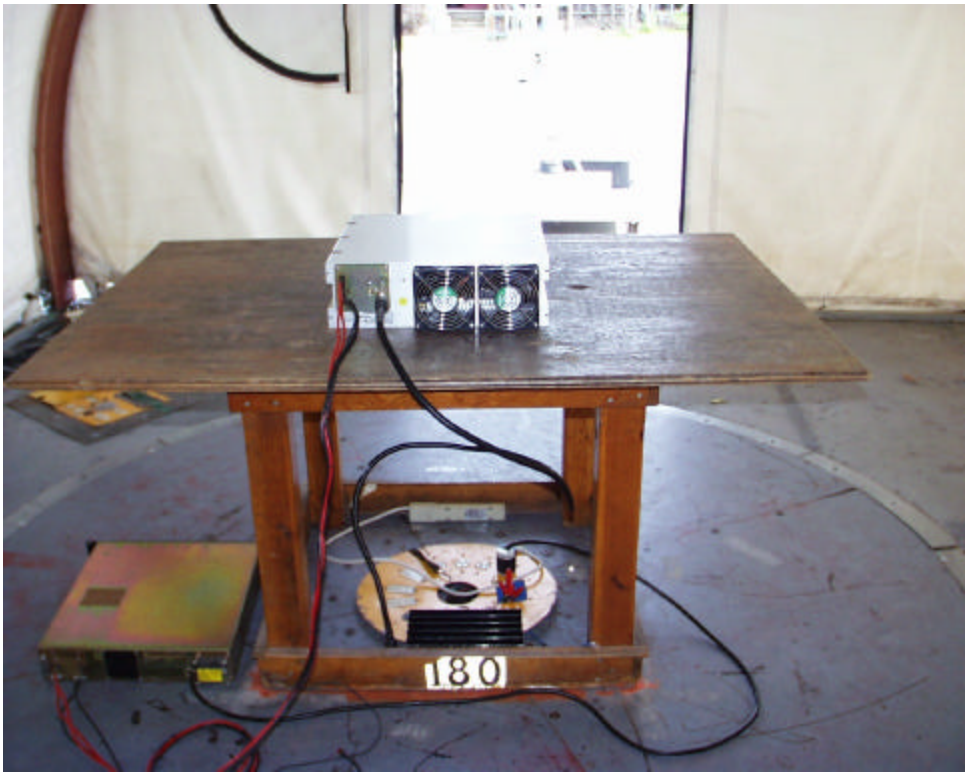


Occupied Bandwidth Output Setup

1 – 9GHz Radiated Emission Setup

Substitution Method Setup

Part15 front view Radiated Emission Setup

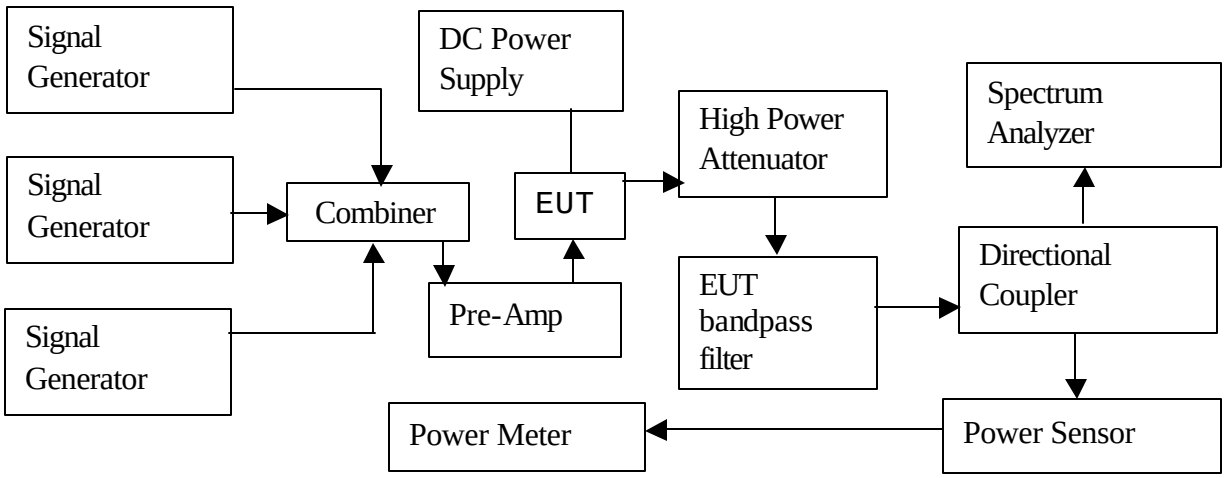


Part15 back view Radiated Emission Setup

12. EXTERNAL I/O CABLE CONSTRUCTION DESCRIPTION

CABLE NO: ALL	
I/O Port: INPUTS/OUTPUTS	**Number of I/O ports of this type:** ALL
Number of Conductors: 2	**Connector Type:** N TYPE and SMA
Capture Type: SCREW-IN	**Type of Cable used:** SHIELDED
Cable Connector Type: METAL HOOD	**Cable Length:** 1 meter
Bundled During Tests: NO	**Data Traffic Generated:** YES
Remark: N/A	

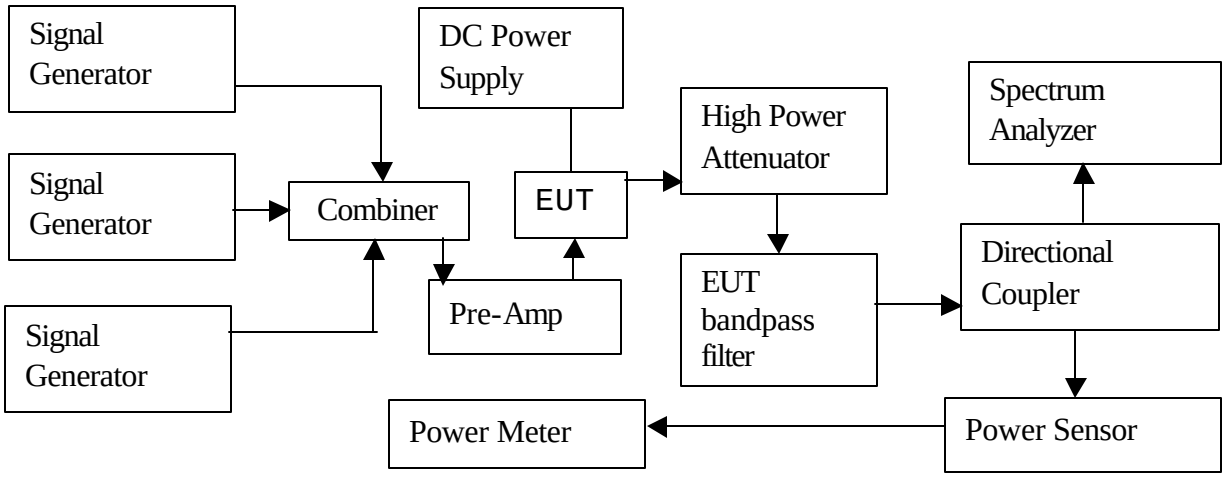
13. CONFIGURATION BLOCK DIAGRAM



14. PART 2: CERTIFICATION TEST REQUIREMENT:

14.1 SECTION 2.1046: RF POWER OUTPUT

TEST SETUP:



Minimum requirement:
Section 22.913(a); Maximum ERP.
The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts. The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

Test procedure:
The EUT was setup as shown above. The EUT was setup according to the manufacturer's tune-up procedure to give maximum output power of 210 Watts.

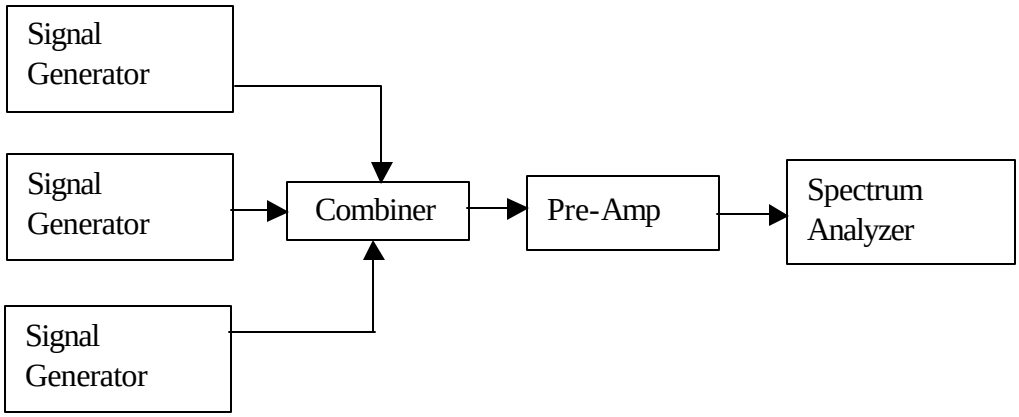
Test Result:
The EUT's measured output power was 210 Watts.

14.2 SECTION 2.1047: MODULATION CHARACTERISTICS

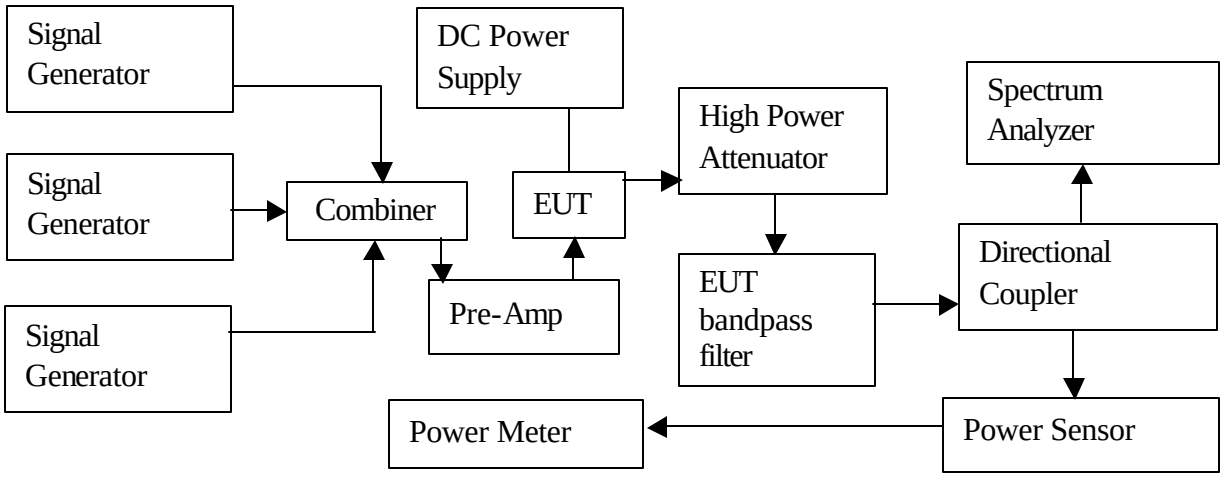
Not applicable. EUT is a power amplifier.

14.3 SECTION 2.1049: OCCUPIED BANDWIDTH

TEST SETUP FOR INPUT:



TEST SETUP FOR OUTPUT:



Minimum Requirement:
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.

Test Procedure:

The Eut's occupied bandwidth is compared to the input source plot (signal generator) and output plot (power amplifier) to check that the output signal bandwidth is representative of the input signal bandwidth.

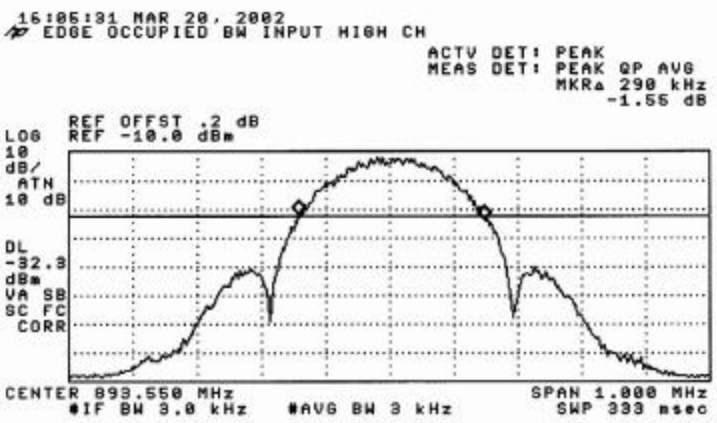
Use the setup for input shown above. Correct for external attenuation and cable loss. Using the marker delta function, measure the 20dB bandwidth of the signal generator's emission. Record the spectrum analyzer plot.

Use the setup for output shown above. Correct for external attenuation and cable loss. Set the power amplifier to the maximum output gain. Using the marker delta function, measure the 20dB bandwidth of the EUT's emission. Record the spectrum analyzer plot.

Test Results:

See plots below:

OCCUPIED BANDWIDTH		
Plot#	**Description**	**Bandwidth (kHz)**
1	EDGE 20dB Input Bandwidth @ Low Channel (869.45 MHz)	290
2	EDGE 20dB Input Bandwidth @ Mid Channel (881.5 MHz)	288
3	EDGE 20dB Input Bandwidth @ High Channel (893.55 MHz)	288
4	EDGE 20dB Output Bandwidth @ Low Channel (869.45 MHz)	283
5	EDGE 20dB Output Bandwidth @ Mid Channel (881.5 MHz)	288
6	EDGE 20dB Output Bandwidth @ High Channel (893.55 MHz)	290
7	GSM 20dB Input Bandwidth @ Low Channel (869.45 MHz)	290
8	GSM 20dB Input Bandwidth @ Mid Channel (881.5 MHz)	290
9	GSM 20dB Input Bandwidth @ High Channel (893.55 MHz)	290
10	GSM 20dB Output Bandwidth @ Low Channel (869.45 MHz)	298
11	GSM 20dB Output Bandwidth @ Mid Channel (881.5 MHz)	290
12	GSM 20dB Output Bandwidth @ High Channel (893.55 MHz)	290
13	TDMA 20dB Input Bandwidth @ Low Channel (869.45 MHz)	32.5
14	TDMA 20dB Input Bandwidth @ Mid Channel (881.5 MHz)	32.5
15	TDMA 20dB Input Bandwidth @ High Channel (893.55 MHz)	32.3
16	TDMA 20dB Output Bandwidth @ Low Channel (869.45 MHz)	32.5
17	TDMA 20dB Output Bandwidth @ Mid Channel (881.5 MHz)	32.5
18	TDMA 20dB Output Bandwidth @ High Channel (893.55 MHz)	32.5
19	CDMA 20dB Input Bandwidth @ Low Channel (870.875 MHz)	1395
20	CDMA 20dB Input Bandwidth @ Mid Channel (881.5 MHz)	1395
21	CDMA 20dB Input Bandwidth @ High Channel (892.125 MHz)	1395
22	CDMA 20dB Output Bandwidth @ Low Channel (870.875 MHz)	1395
23	CDMA 20dB Output Bandwidth @ Mid Channel (881.5 MHz)	1395
24	CDMA 20dB Output Bandwidth @ High Channel (892.125 MHz)	1395
25	AMPS/VOICE 20dB Input Bandwidth @ Low Channel (869.2 MHz)	36.5
26	AMPS/VOICE 20dB Input Bandwidth @ Mid Channel (881.5 MHz)	36.5
27	AMPS/VOICE 20dB Input Bandwidth @ High Channel (893.8 MHz)	36.5
28	AMPS/VOICE 20dB Output Bandwidth @ Low Channel (869.2 MHz)	36.5
29	AMPS/VOICE 20dB Output Bandwidth @ Mid Channel (881.5 MHz)	36.5
30	AMPS/VOICE 20dB Output Bandwidth @ High Channel (893.8 MHz)	36.5
31	AMPS/DATA 20dB Input Bandwidth @ Low Channel (869.2 MHz)	40.1
32	AMPS/DATA 20dB Input Bandwidth @ Mid Channel (881.5 MHz)	40.1
33	AMPS/DATA 20dB Input Bandwidth @ High Channel (893.8 MHz)	40.1
34	AMPS/DATA 20dB Output Bandwidth @ Low Channel (869.2 MHz)	40.1
35	AMPS/DATA 20dB Output Bandwidth @ Mid Channel (881.5 MHz)	40.5
36	AMPS/DATA 20dB Output Bandwidth @ High Channel (893.8 MHz)	40.5



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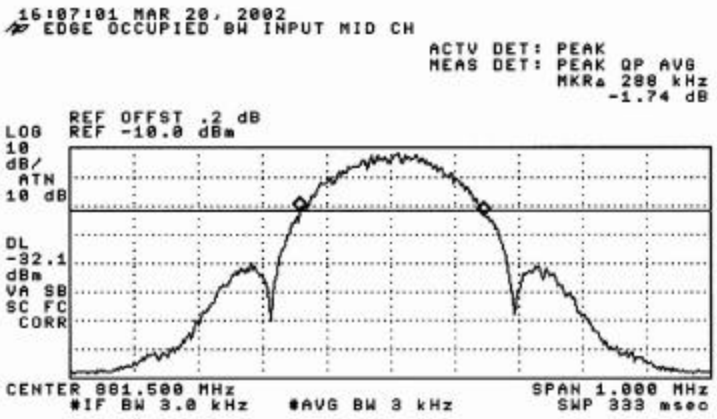

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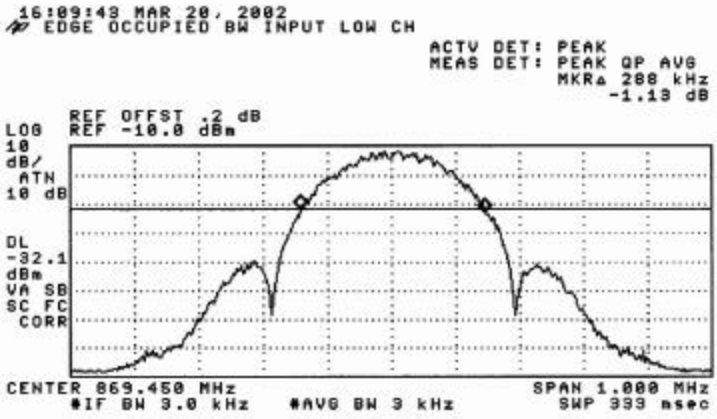

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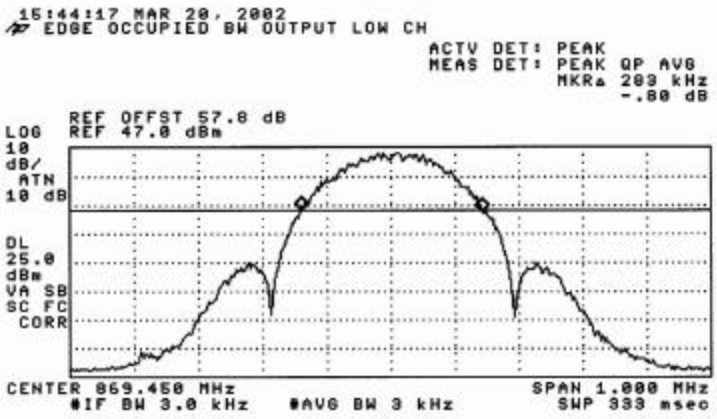

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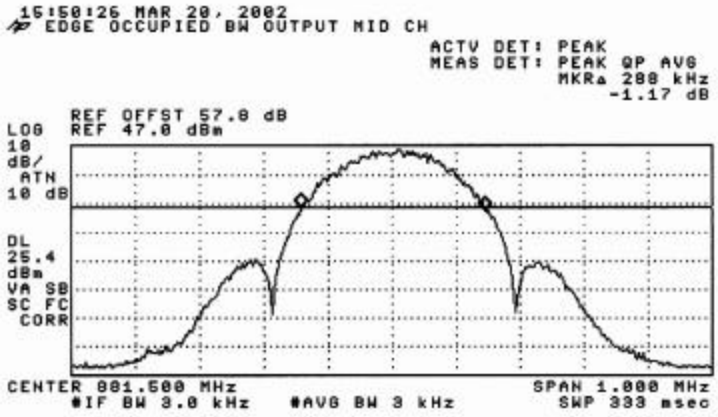

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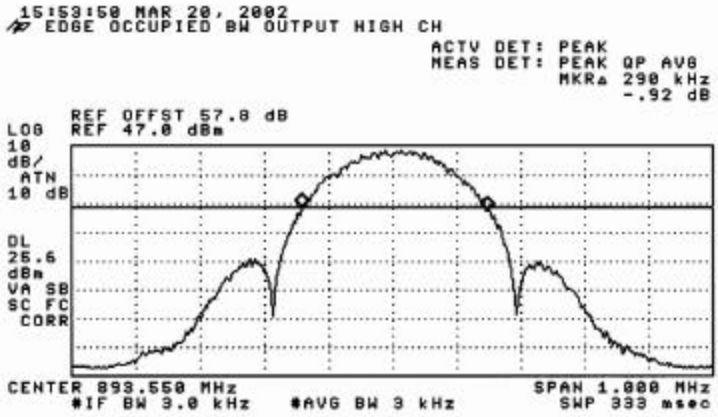

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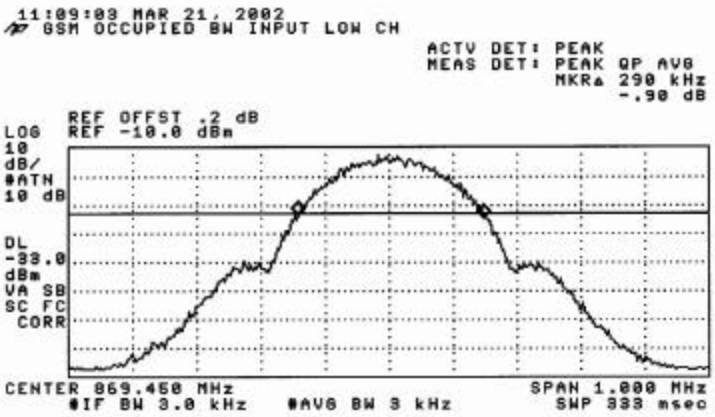

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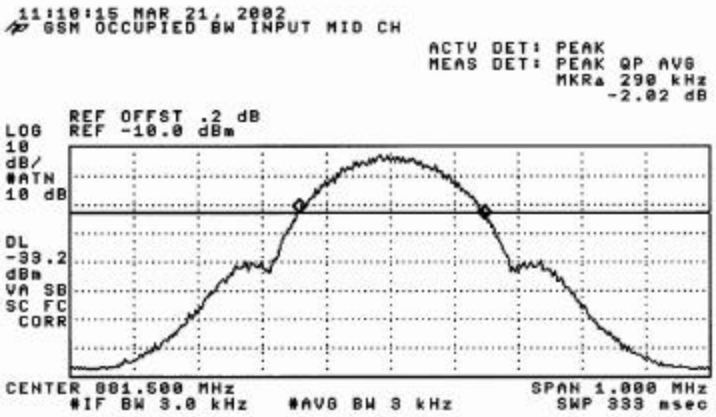

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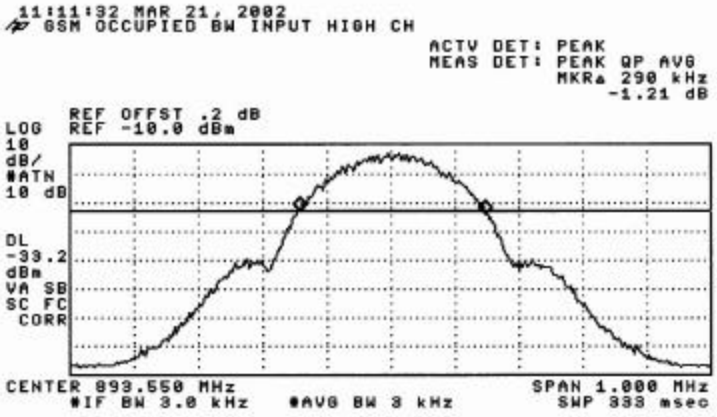

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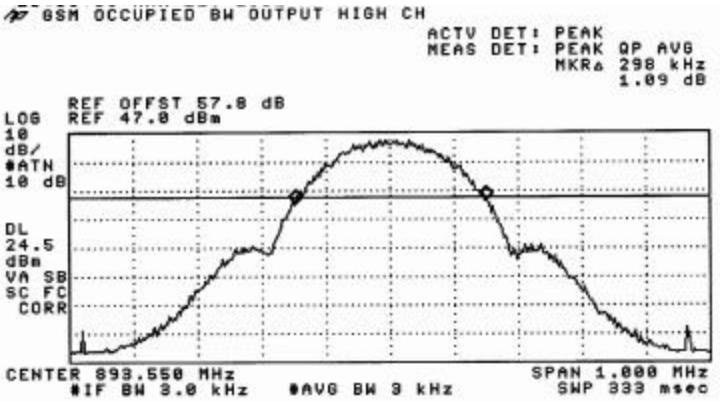

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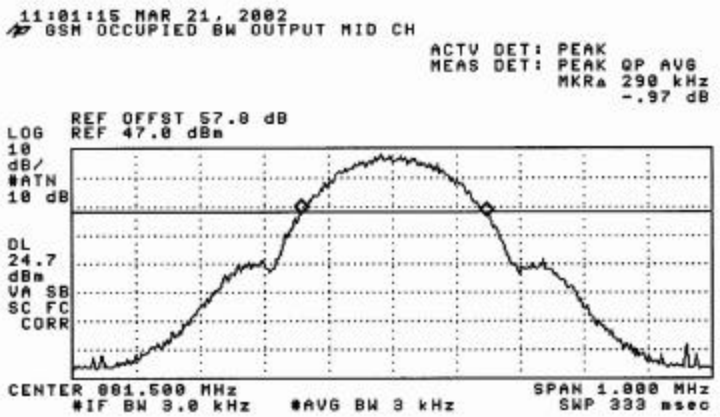

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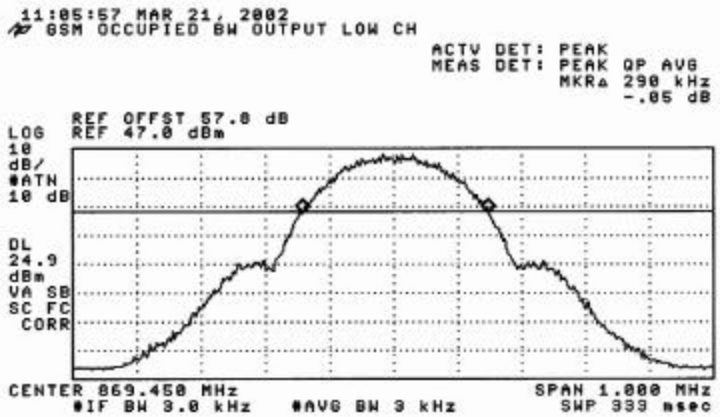

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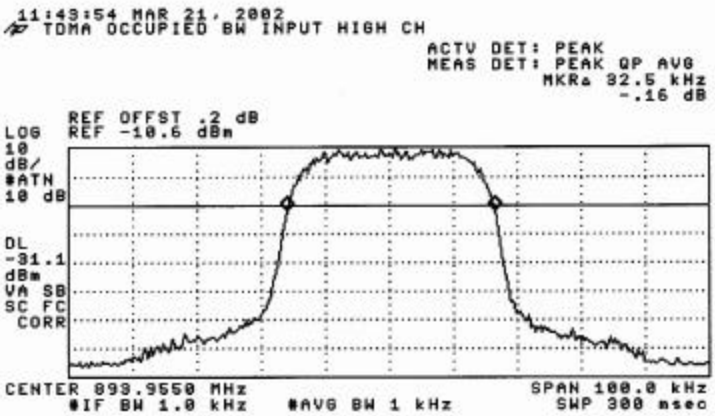

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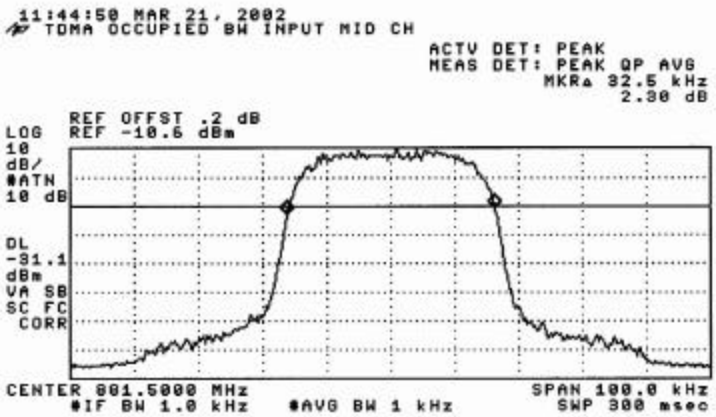

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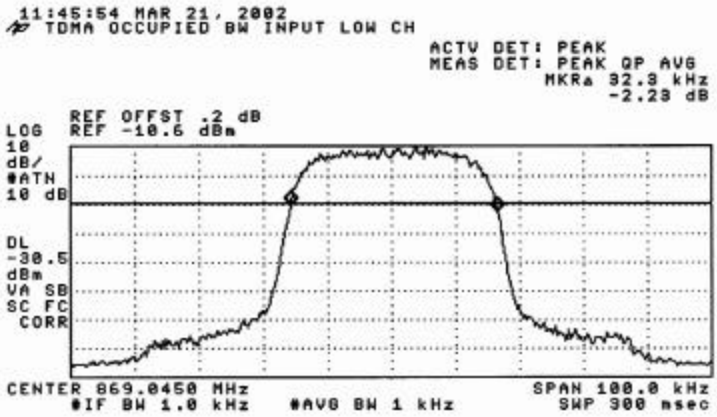

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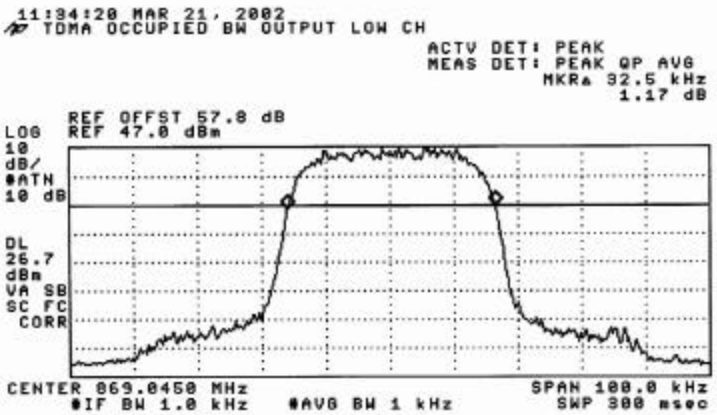

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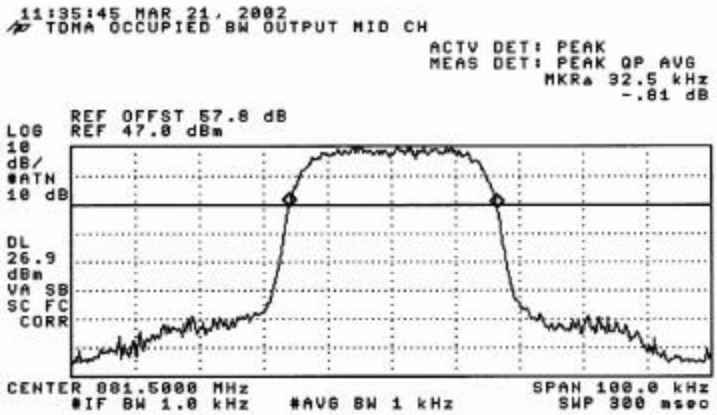

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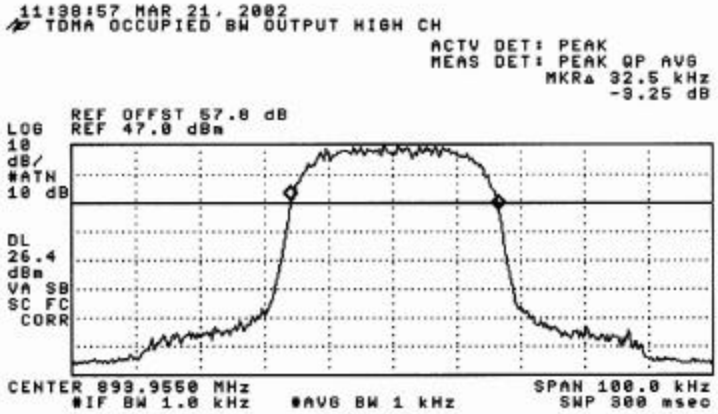

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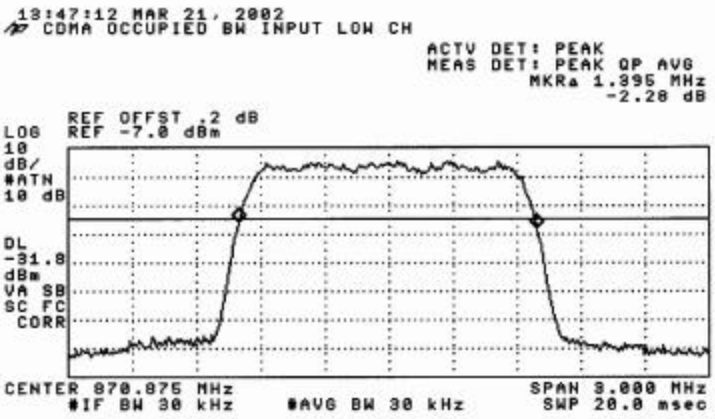

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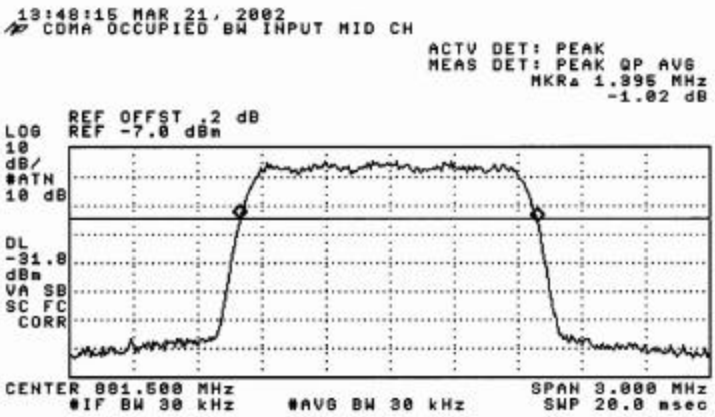

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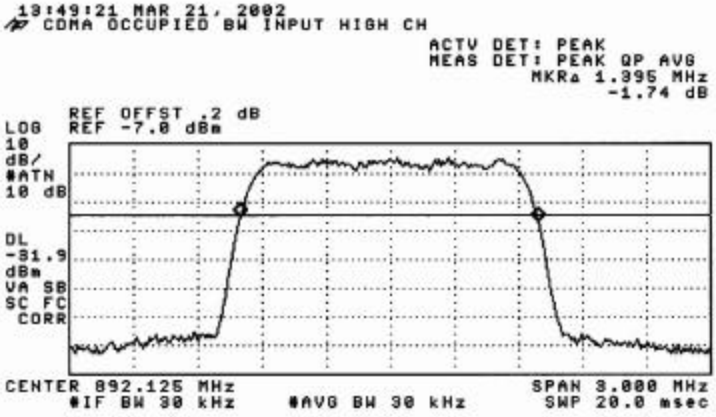

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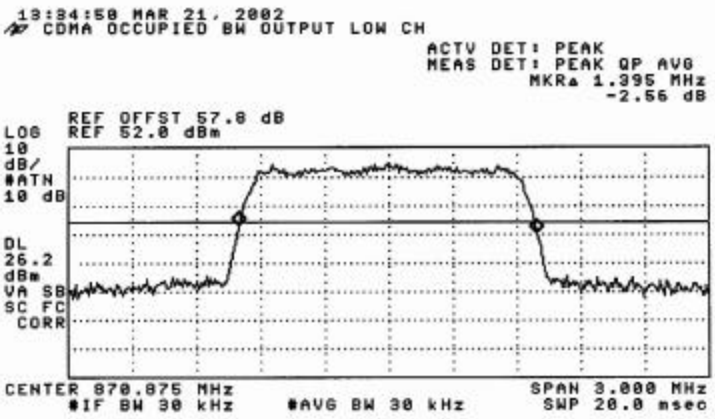

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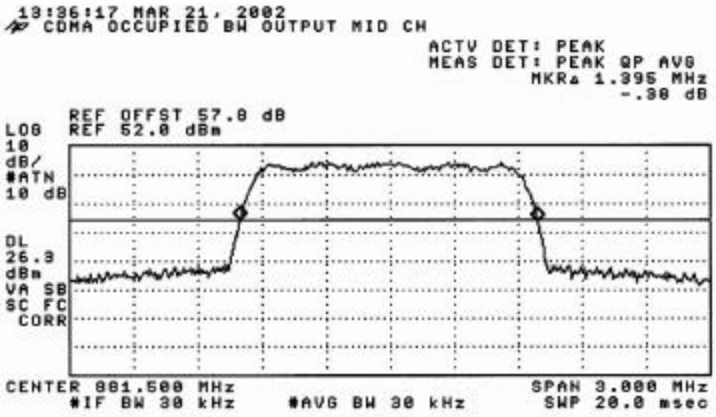

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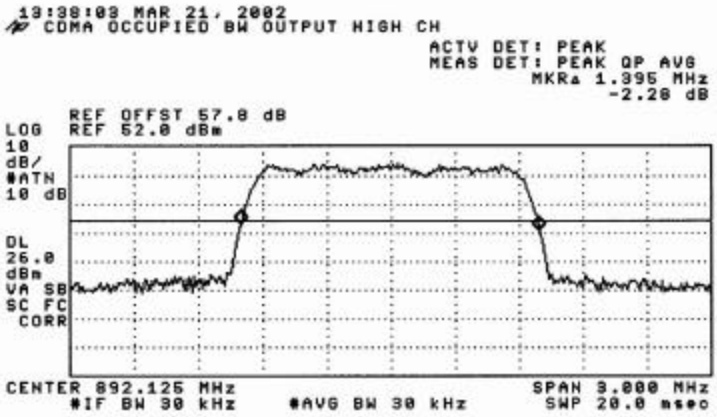

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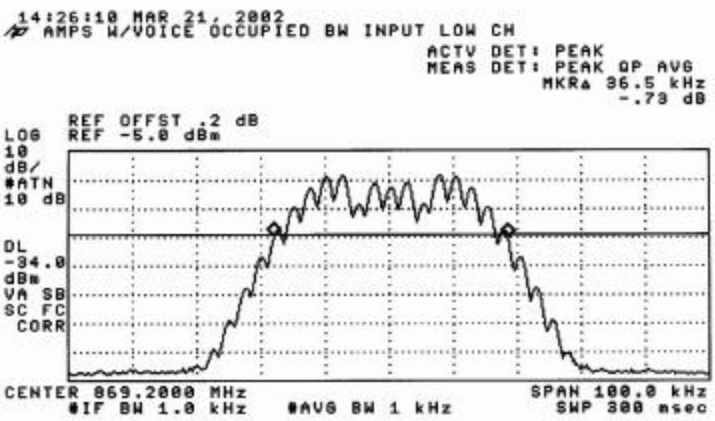

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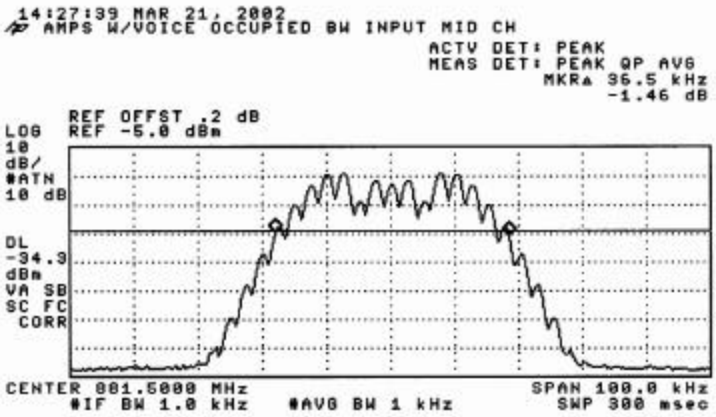

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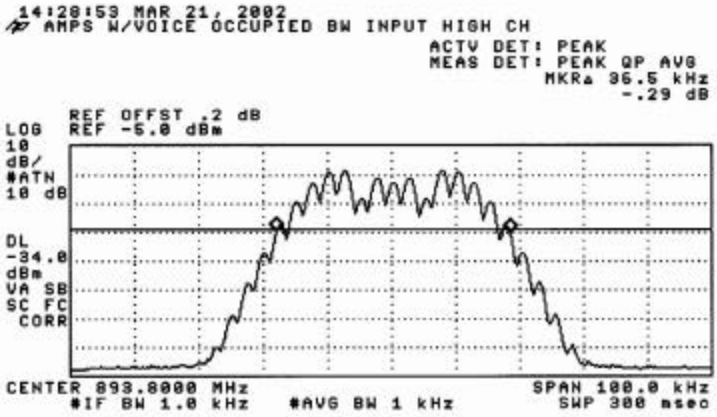

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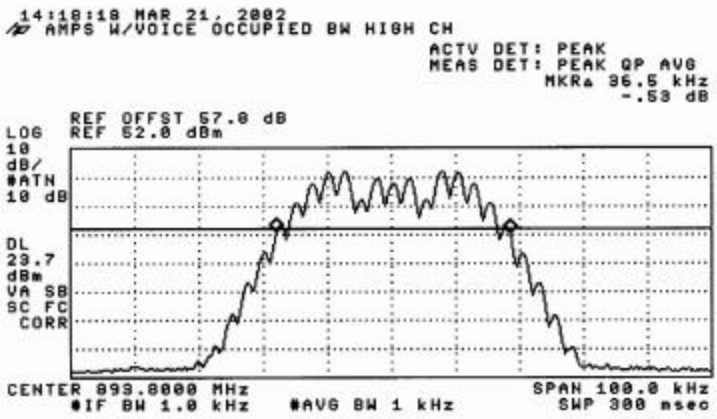

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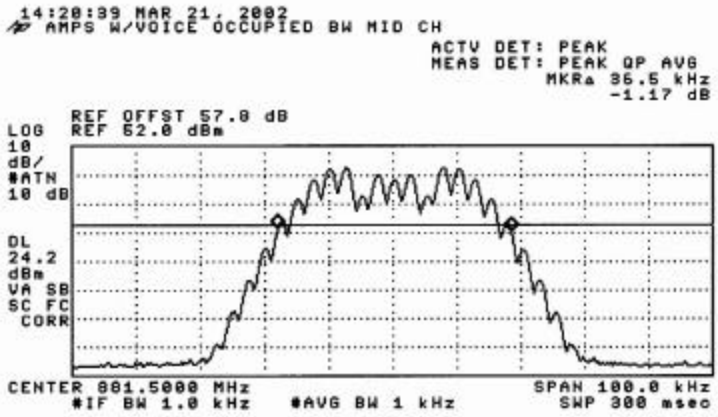

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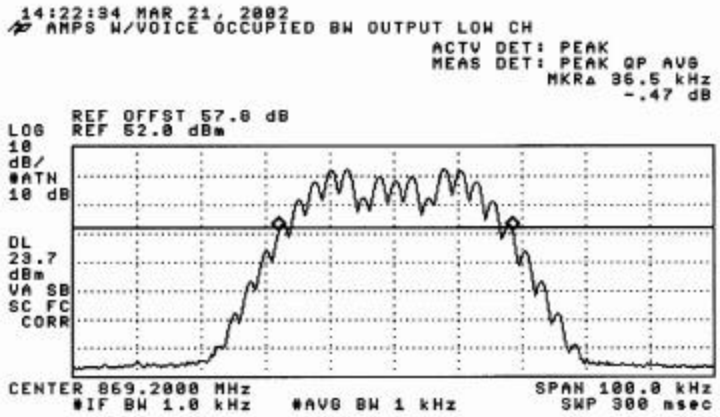

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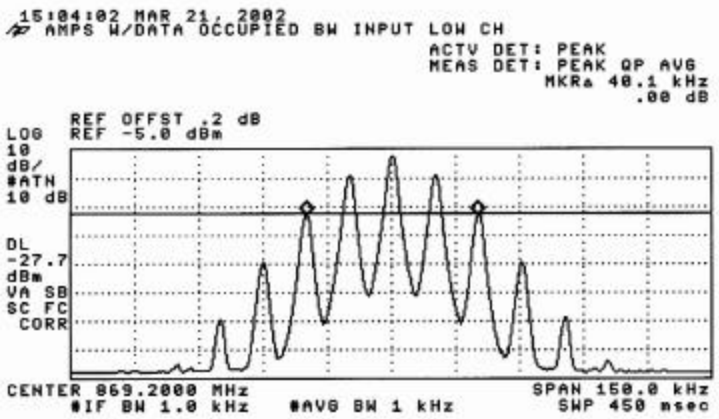

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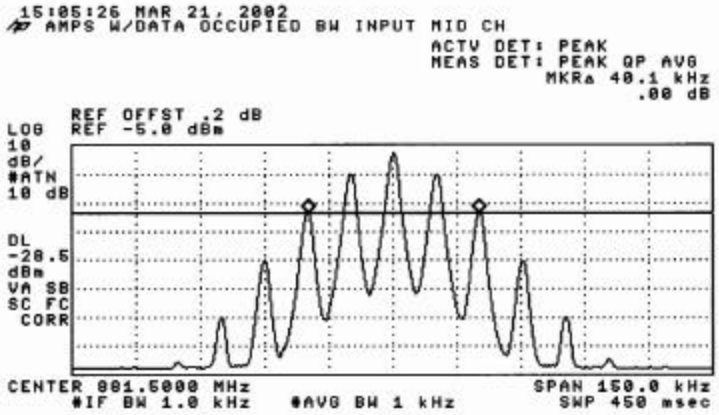

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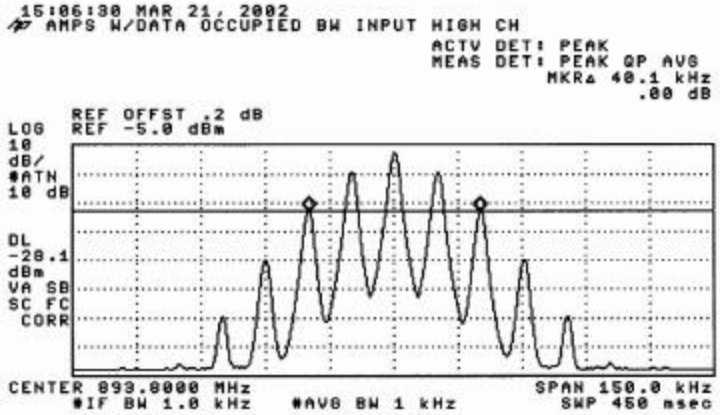

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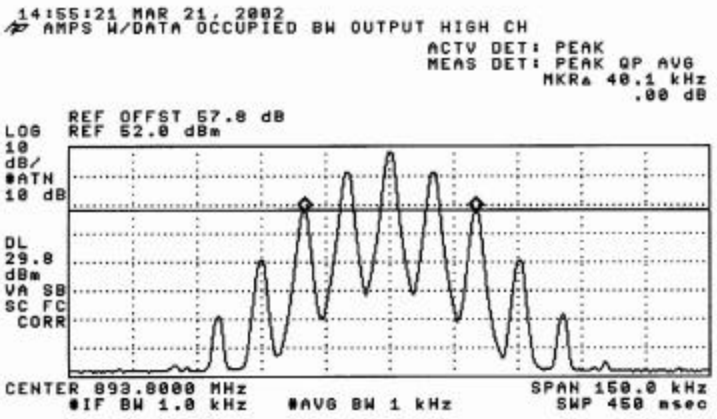

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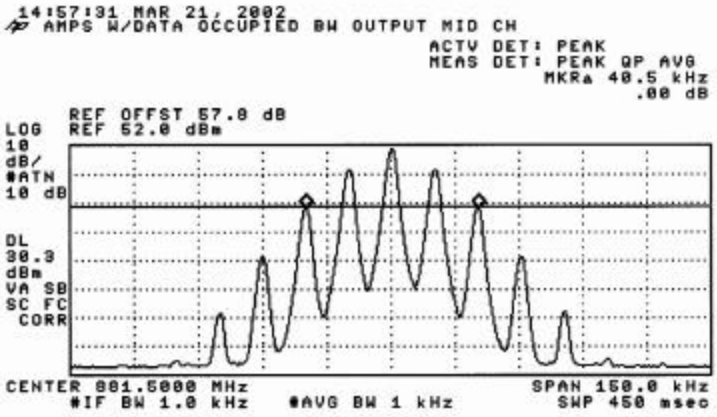

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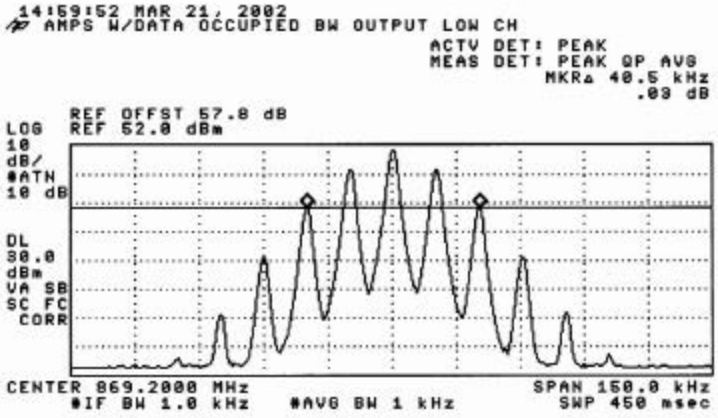

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