

FCC Laboratory
7435 Oakland Mills Road
Columbia, MD 21046

11 PAGES

Attention: Frank Coperich

Re: Pre-amplifier option for a 60 watt cellular RF amplifier

Applicant: Powerwave Inc.

FCC ID: E675JS0026 (type acceptance for 60 watt amplifier)

Dear Frank,

In response to a customer requirement, Powerwave has developed a pre-amplifier for use with their 60 watt cellular power amplifier. This pre-amp is not sold stand-alone and is for use as an option only for the 60 watt amplifier whose FCC ID is listed above. The amplifier is used in its most linear operating region:

Gain: 20 dB
Output (max): 0 - 0.7 dBm
Frequency Range: 869 - 894 MHz

Ten pages of data and spectrum analyzer plots are presented to document the pre-amplifier's performance with respect to type acceptance requirements. Tests were performed for input signals with the following modulations:

TDMA	CDMA	AMPS (Narrowband)	AMPS (Wideband)
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Occupied bandwidth compliance (2.989) is demonstrated by plotting input signal and output signal for each type of modulation, and comparing -20 dBc spectrum widths. IM response of the pre-amplifier (2.991) was demonstrated by combining two independent signals at the input of the pre-amplifier and measuring spurious emissions in the output spectrum. The two frequencies were chosen so as to produce both in-band and out-of-band modulation products. Finally, case radiated emissions (2.993) were measured with a single tone input to the pre-amplifier, with the output terminated in 50 ohms.

Test results indicate the following:

- Occupied bandwidth is not measurably distorted (input /output BW for -20 dB almost identical)
- All spurious emissions well below - 13 dBm at output
- No radiated emissions detected within -20 dB of limits

ADDENDUM TO FCC ID# E676JS0026

FCC CONFIRMATION #EA89771

This addendum is to add a low power pre-amplifier to the above submittal.

EUT was set to maximum gain throughout testing.

2.985 RF POWER OUTPUT:

+0.7 dBm

2.989 OCCUPIED BANDWIDTH:

Shown in plots:

TDMA- plot 14 shows bandwidth @ 880MHz +0.7dBm

plot 15 shows input bandwidth to above @ -20.2dBm

CDMA- plot 3 shows bandwidth @ 880MHz +0.1dBm

plot 4 shows input bandwidth to above @ -20dBm

AMPS NARROW BAND-

plot 19 shows bandwidth @ 880MHz +0.3dBm

plot 20 shows input bandwidth to above @ -20.3dBm

AMPS WIDE BAND-

plot 24 shows bandwidth @ 880MHz +0.5dBm

plot 25 shows input bandwidth to above @ -20.2dBm

2.991 SPURIOUS EMISSIONS AT ANTENNA TERMINAL:

Shown in plots with 2 input signals @ 880MHz & 870MHz of -23.3dBm each.

Output power was measured at 0.0dBm +/- .01dBm.

Intermodulation products @ 860MHz & 890MHz(1 in band, 1 out of band).

TDMA- plots 11,12,13

CDMA- plots 8,9,10

AMPS NARROW BAND- plots 16,17,18

AMPS WIDE BAND- plots 21,22,23

2.993 FIELD STRENGTH OF SPURIOUS EMISSIONS:

22.917 Limits applied.

Spectrum analyzer B/Ws set to 30KHz.

Measured with 1 input signal of -19.9dBm.

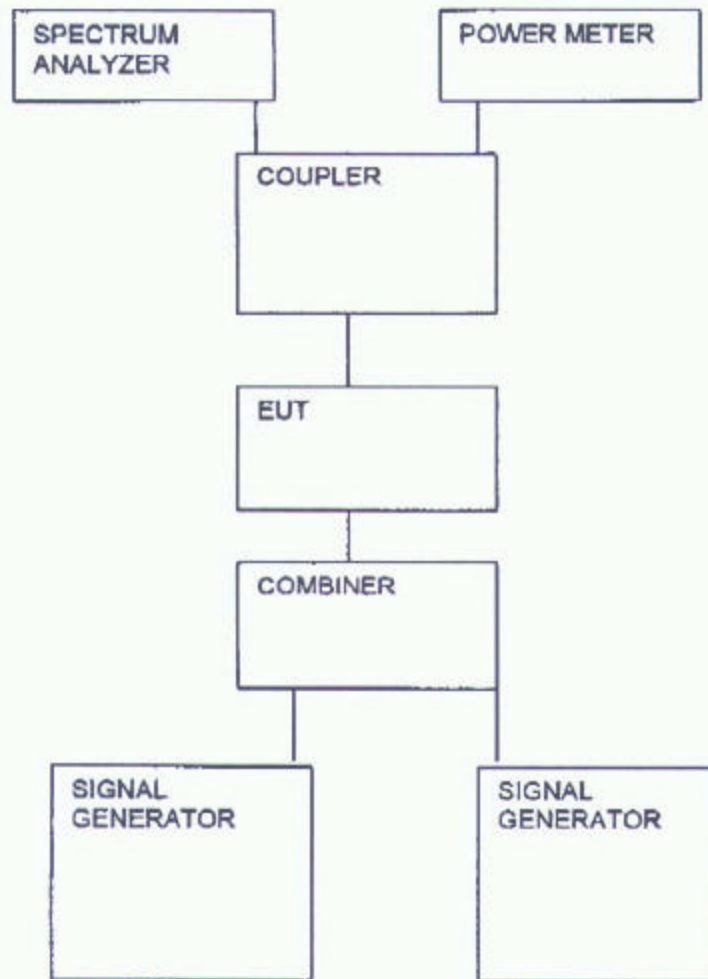
Output power was measured at 0.0dBm.

Fundamental frequencies of 870MHz, 880MHz & 890MHz.

Result: no emissions within 20dB of limits.

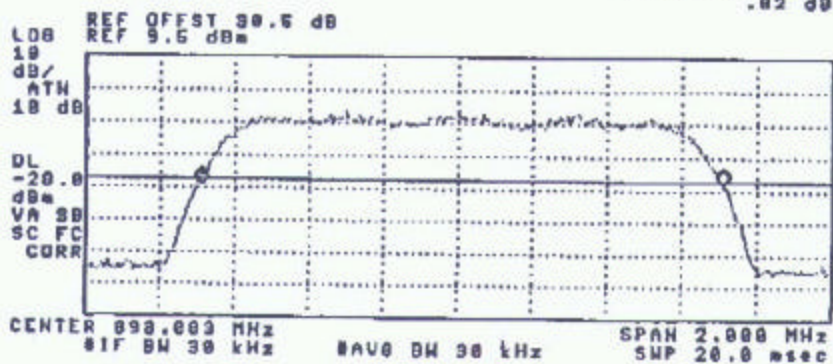
BLOCK DIAGRAM:

Measurements were offset for insertion loss of cables, attenuators, coupler and combiner.



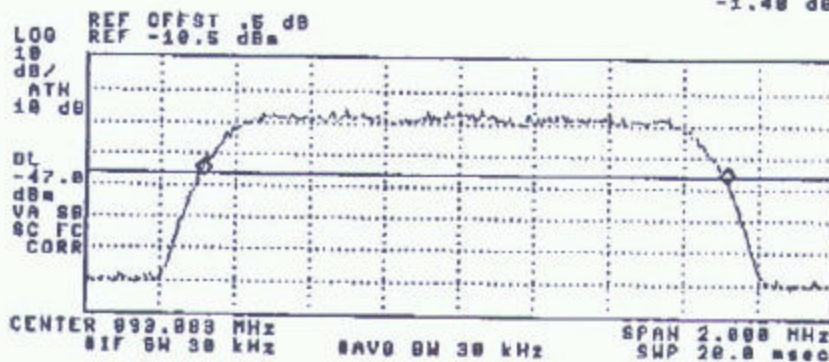
13112111 AUG 27, 1998
 POWERWAVE RF PRE-AMP

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKRA 1.400 MHz
 .82 dB



13118119 AUG 27, 1998
 POWERWAVE RF PRE-AMP

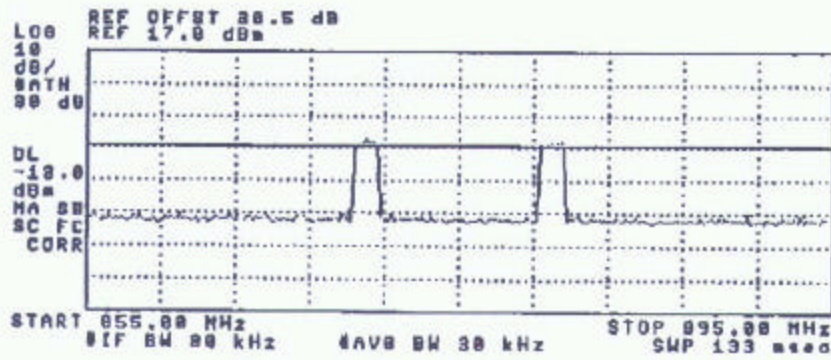
ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKRA 1.400 MHz
 -1.48 dB



15:05:42 AUG 27, 1998
 POWERWAVE RF PRE-AMP

ACTV DET: PEAK
 MEAS DET: PEAK OP AVG

8



15:12:00 AUG 27, 1998
 POWERWAVE RF PRE-AMP

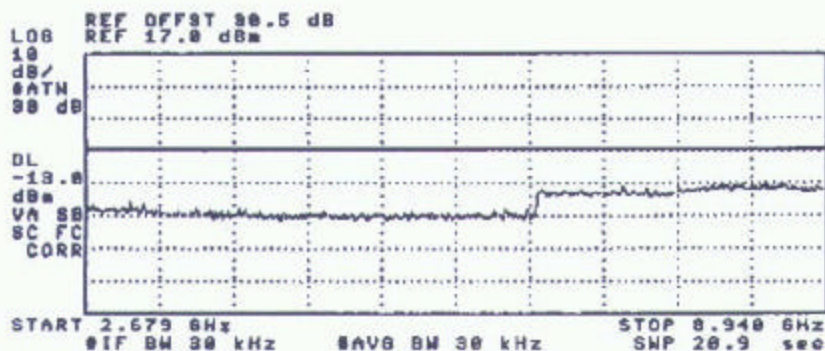
ACTV DET: PEAK
 MEAS DET: PEAK OP AVG
 MKR 878 MHz
 -13.34 dBm

9



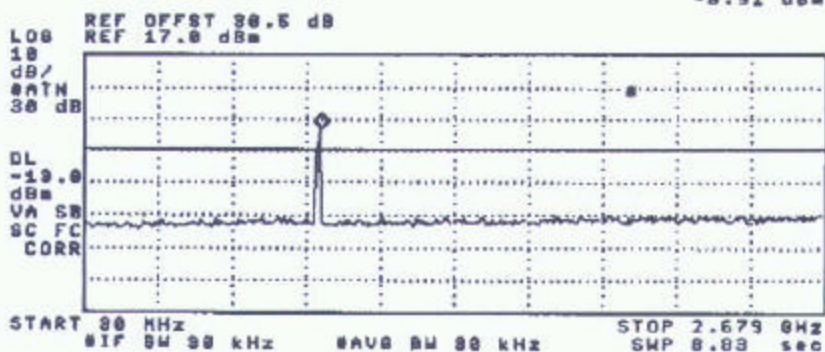
15:14:37 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



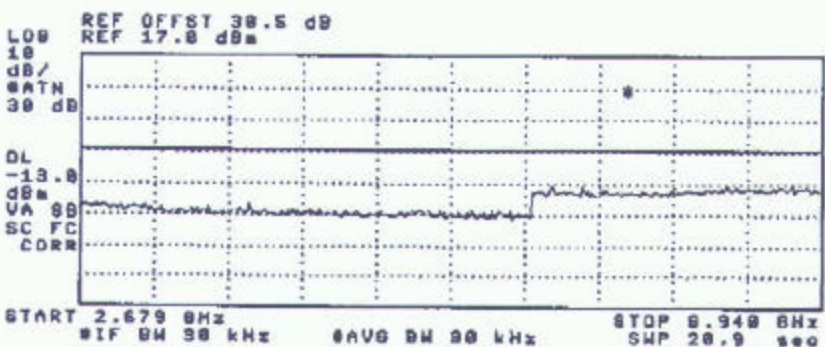
15:20:45 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 070 MHz
-5.91 dBm



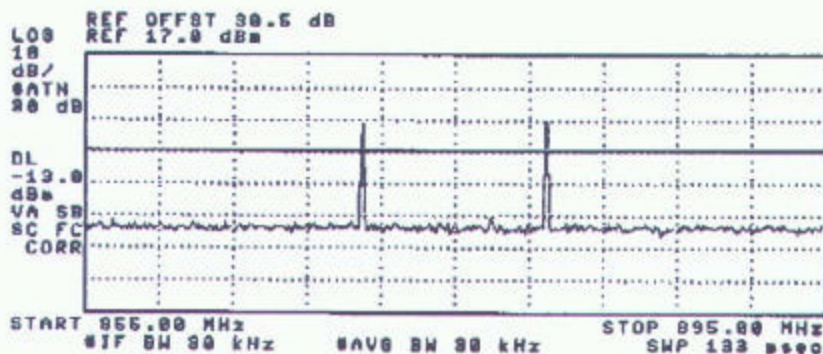
15:30:06 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



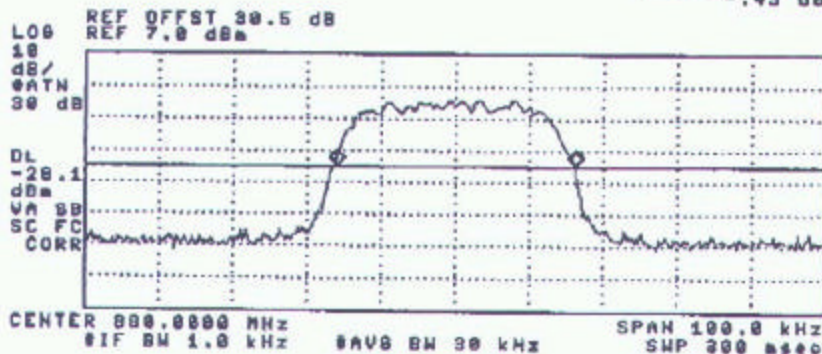
15136102 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



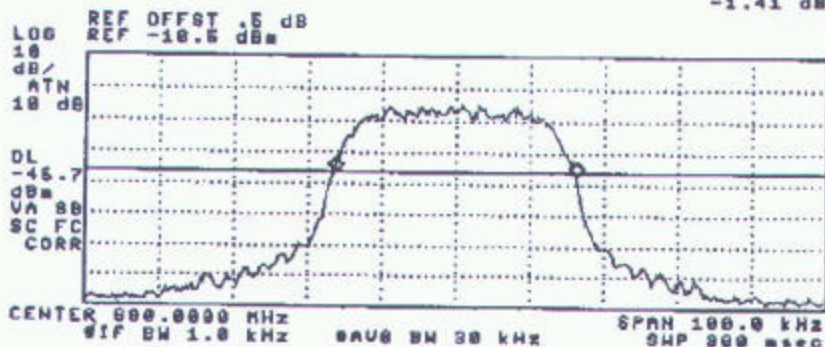
15143116 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRA 32.8 kHz
-1.43 dB



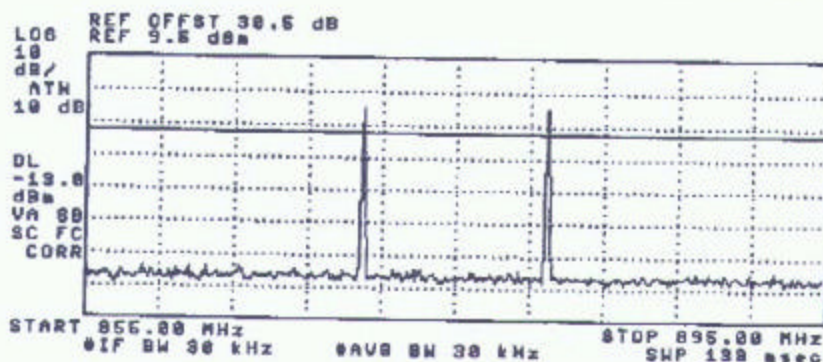
15146151 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRA 32.5 kHz
-1.41 dB



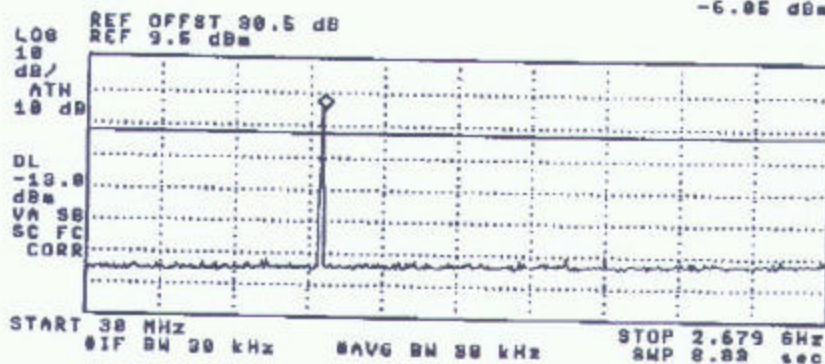
16:27:16 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



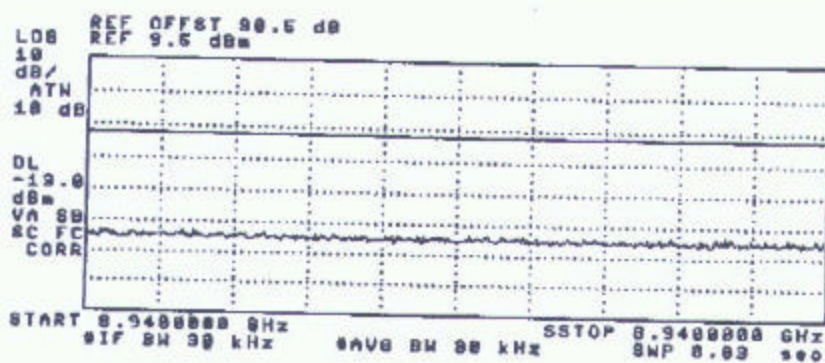
16:29:39 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 878 MHz
-6.05 dBm



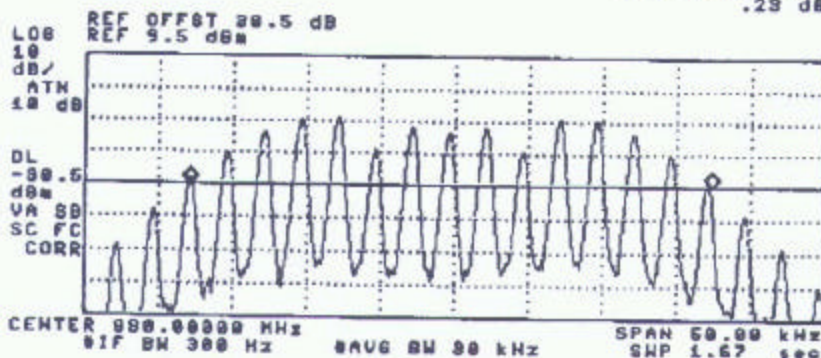
16:38:54 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



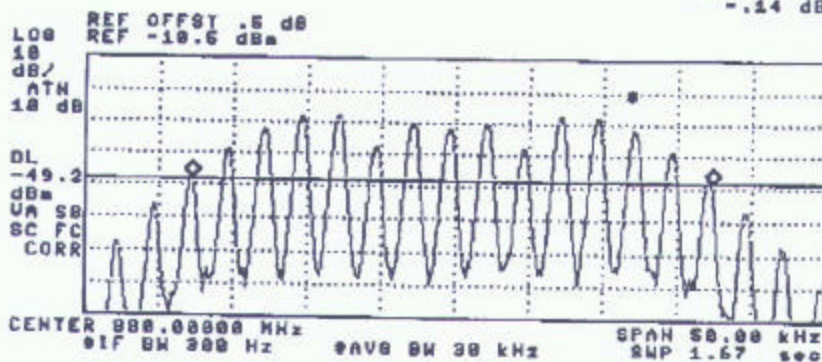
16196153 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRA 35.25 kHz
.29 dB



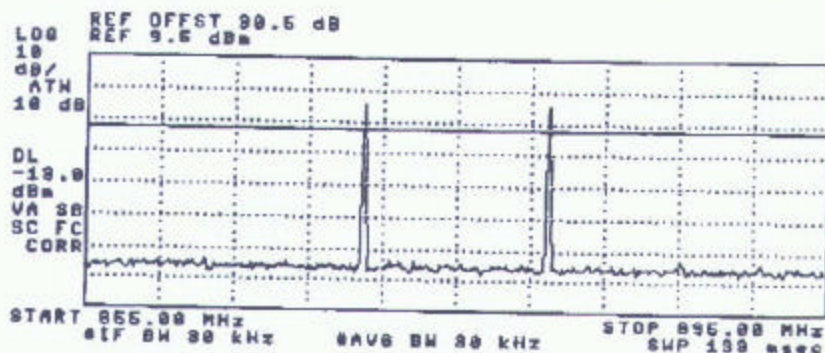
16142181 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRA 35.13 kHz
-.14 dB



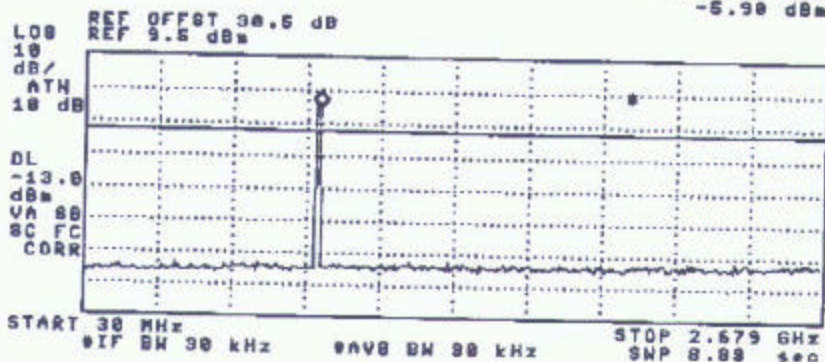
16146135 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



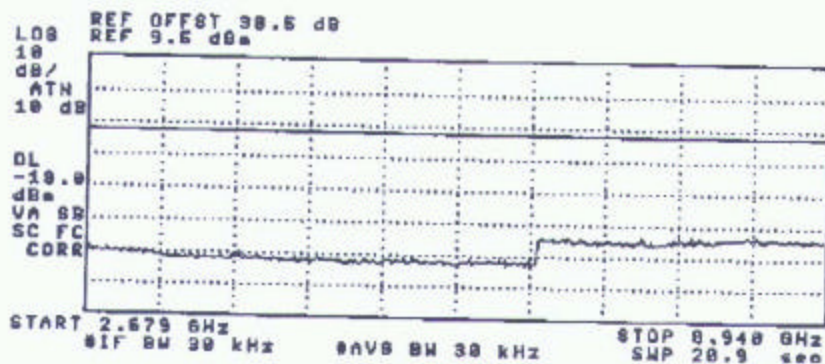
16:47:51 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 871 MHz
-5.98 dBm



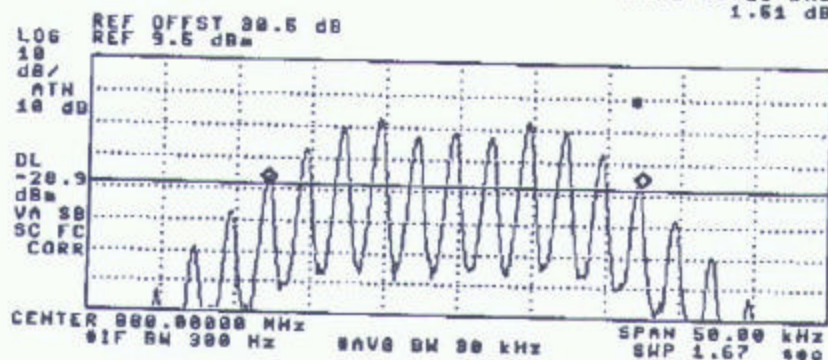
16:49:46 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG



16:52:56 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 25.25 kHz
1.61 dB



15:55:09 AUG 27, 1998
POWERWAVE RF PRE-AMP

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRa 25.25 kHz
.60 dB

