HUGHES
NETWORK SYSTEMS

Subsidiary of
Hughes Aircraft Company

IEEE 802.4L Submission on Microwave Oven Interference Measurement

prepared by
Jonathon Cheah
Hughes Network Systems
San Diego
16 February 1990

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Synopsis:

Measurements were made on the radiation characteristics of microwave ovens. The interpretation of the results obtained in these measurements led to the belief that the radiation had basically a random and piece-meal contiguous frequency content over approximately 100 Mhz bandwidth with specific amplitude envelope distributions.

The results obtained in time domain power measurements showed abrupt amplitude variations over time. It was hypothesized that the abruptness of the amplitude behaviour contributed significantly to the frequency spectra observed.

The results and the observations during the measurement process led to the assertion that there was no evidence that the interference potential from the microwave ovens resembles an unique frequency line interferer, within the observation time and frequency constraints.

The absence of a clearly observable fundamental frequency from the magnetron output indicates that this may have been an intentional design feature for an oven. The measurement results suggested that the magnetron was operating in a spurious moding condition with abrupt amplitude variations. This operating mode may present a severe channel interference problem.

Measurement Set Up:

The measurement was conducted using a HP 8566 spectrum analyzer calibrated using its internal automatic calibration procedure. A test antenna was designed to provide an overall return loss performance of about 10 dB over the measurement frequency range. The test antenna was calibrated by a HP8753A network analyzer coupled with a HP 85046A S parameter test set.

Figure 1 shows the calibration result and a picture of the test antenna. The test antenna will not exert significant frequency response of its own onto the intended test results. The reason for the use of a special test antenna rather than a 900 Mhz flexible normal mode helical antenna which was used in previous tests, was that these antennas have unacceptable frequency response characteristics within the measurement band of interest centered at 2.45 Ghz.

The measurements were conducted within the near field region at the bore-sight of the front of the oven door. The following near field assumptions were made:-

1) The radiation near field region of the radiation is determined by the smallest dimension D of the oven using the following relationship:-

$$d \leq \frac{2D^2}{\lambda}$$

where d is the distance perpendicular to the oven door at bore-sight from the test antenna.

D is the smallest dimension of the oven cooking chamber.

λ is the operating wavelength. In this case, the operating frequency was taken to be 2.45 Ghz.

2) The radiating antenna area effect can be estimated by the dimension D of the oven cooking chamber.

3) The radiation propagation is directed towards the antenna from the oven door.

The reason for conducting the measurement within the near field region of the oven under test is to eliminate any possible radiation antenna effect that may be present from the oven. Antenna effect in the far field may have a significant specific frequency response that may bias the test measurements.

Precautions was also taken to select an appropriate load for the microwave oven. It was determined that a measured 12 oz water load at an initial measured temperature of 25 degree C allowed an optimum result in regards to a 10 minutes test and the maximum radiation power extracted. The same load condition was used for every measurement to ensure the uniformity of the test environment.

All frequency domain measurements were made over a 10 ~~seconds~~ minutes cooking time with the spectrum analyzer in

max-hold mode. The measurement time for the time domain is one single sweep.

The detail measurement results appended in the Appendices are indexed in the following table:-

Microwave Oven Measurements		
Oven name	**Figure references Measurement plots**	**Mode Mixer Speed**
Kenmore 1400 W	Figure A.0 Figures A.1-A.33	1~2 rps
Magic Chef 1400 W	Figure B.0 Figures B.1-B.52	-
Kenmore 1400 W	Figure C.0 Figures C.1-C.19	1~2 rps

Observations

1. The interference power measured was log-linear proportional to the measurement resolution bandwidth. This relationship held true from 30 Hz to 3 Mhz bandwidth.

2. There were very rapid amplitude bursting characteristics which may have had a rise time much shorter than 300 nsecs.

3. There was no evidence of a detectable single frequency spectrum line during the measurements. The rapid and abrupt amplitude variation behaviour precluded this possibility.

Analysis

A few of the interesting measurement results are highlighted here to illustrate the perception of the interference characteristics.

a. Wide frequency span measurement results:

In the wide frequency span measurement, it can be seen that the detected signal levels in the measurement results are not exactly reduced by the same amount of the resolution bandwidth reduction. This phenomenon implies that the spectra measured was not really white noise. The small amount of additional reduction in the measured signal power indicates an impulsive signal origin where the effective impulsive resolution bandwidth is actually related to the nature of the amplitude response V(t) of the impulse:-

$$Bw_{impulse}=V_{pk}\left(\int_{-\infty}^{\infty} V(t)dt\right)^{-1}$$

Actual measurement of the impulse bandwidth of the Spectrum Analyzer to validate this hypothesis was not carried out.

b. Narrow frequency span measurement results:

A typical plot for the narrow frequency span measurements such as Figure 2 shows signs of carrier frequency drifts. It is relevant to point out that this plot is the result of a "max-hold" function, and thus that the frequency lines do not appear in a single scan. So it should not be assumed that the frequency offset between the frequency lines is the repetitive frequency of the pulse train. A more plausible scenario is that of the interference source carrier frequency drifting during the measurement.

The need to limit the resolution bandwidth to 1 Khz in this case is governed by the resolution bandwidth filter shape factor. This is represented by a constant k in the following relationship:-

$$T_{sweep\ time} \geq \frac{kF_{span}}{B_{res\ bw}^{2}}$$

As it can be seen from the plots, the Spectrum Analyzer resolution filter has an extremely good performance.

c. Wide resolution bandwidth time domain measurement

Figure 3 shows the fine grain structure of the impulse characteristics. The power level point, during each period Δ t can be viewed as:-

$$\int_{t}^{t+\Delta t} |S(t)|^2 dt$$

where S(t) is the Fourier Series of the impulse train
after the resolution filter.

Then, from Figure 3, it can be argued that interference power can in fact exist for, within a given frequency interval, up to 8 milliseconds at any given frequency.

The fine oscillatory power variations is most likely caused by a power impulse that approaches a Delta Function with respect to the filter bandwidth. In this case, S(t) can be simply written as:

$$S(t)=\frac{2A}{\pi(t-t_0)}Sin(\pi(f_2-f_1)(t-t_0))cos(\pi(f_2+f_1)(t-t_0))$$

where f_1 and f_2 are the lower and Upper frequencies
of the resolution filter.

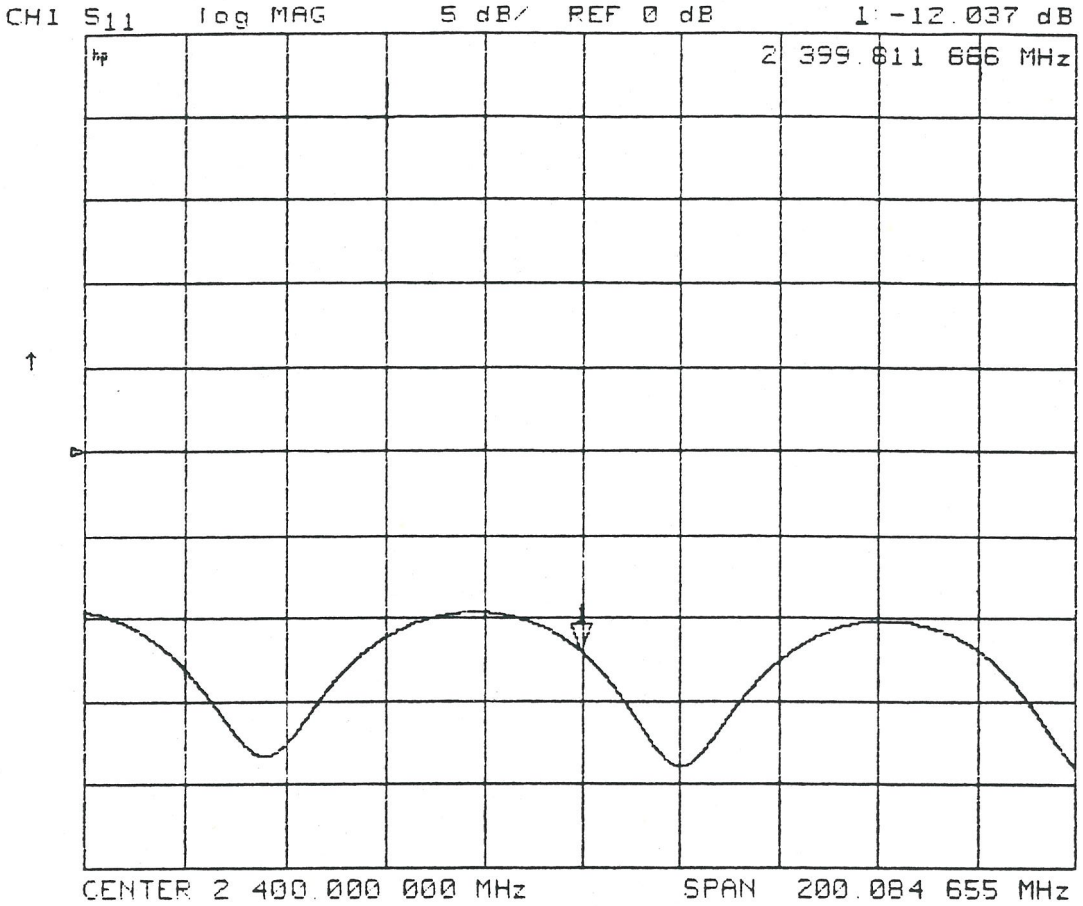
The derived impulse response suggests an almost sinusoidal oscillation similar to the power wave shape depicted in Figure 3 when $|S(t)|^2$ is computed with incremental time. This observation is consistent with the isolated discrete sub-micro second frequency bursts observed previously with a 22 Mhz bandwith filter.

d. Narrow resolution bandwidth time domain measurement

Figure 4 shows a typical result obtained using a 10 Hz resolution bandwidth filter where the average impulses from the interfering source would have produced a near perfect impulse response of the filter.

Conclusion

It is the author's opinion that the interference characteristics of the microwave ovens to the proposed Radio Lan system cannot be taken as a possible line interferer as previously assumed, although it is impulsive in nature. Because of the perceived carrier frequency drifts from the interference source, it is also claimed that the interference energy existed over a broad frequency spectrum with rapidly varying amplitudes, and the resultant effect is a seemingly random and piece-meal contiguous frequency spectrum in time.


CH1 S11 log MAG 5 dB/ REF 0 dB 1: -12.037 dB
2 399.811 666 MHz
CENTER 2 400.000 000 MHz
SPAN 200.084 655 MHz

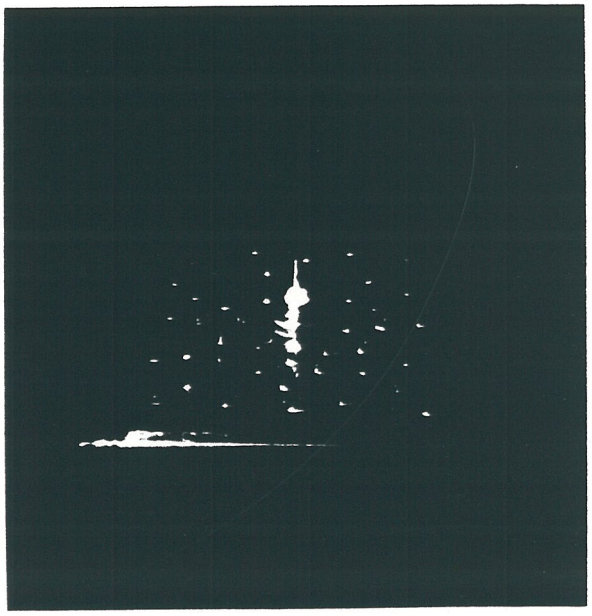


Figure 1

Figure 2

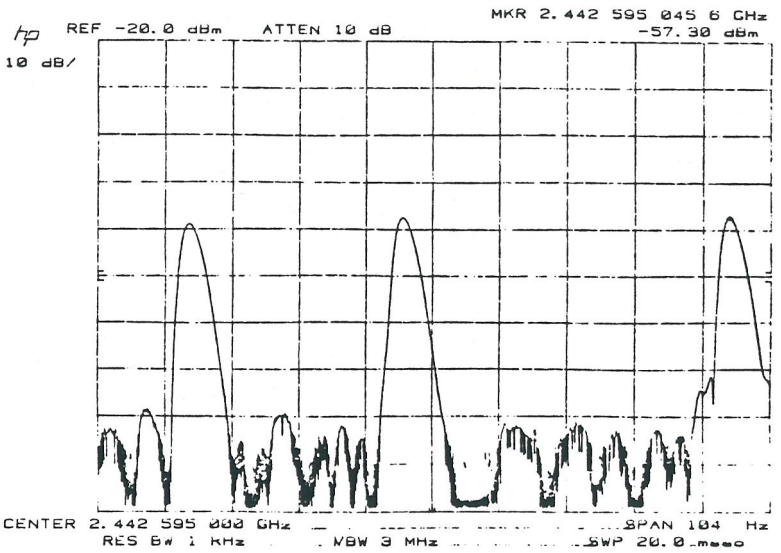


Figure 3

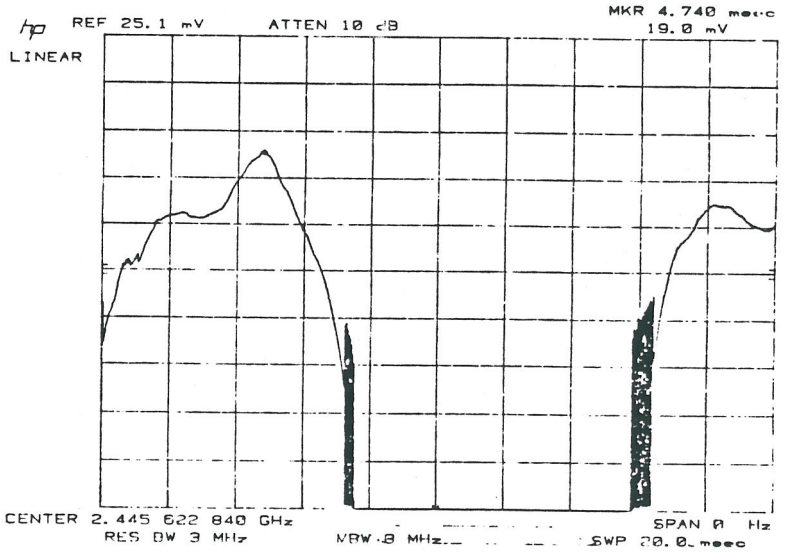
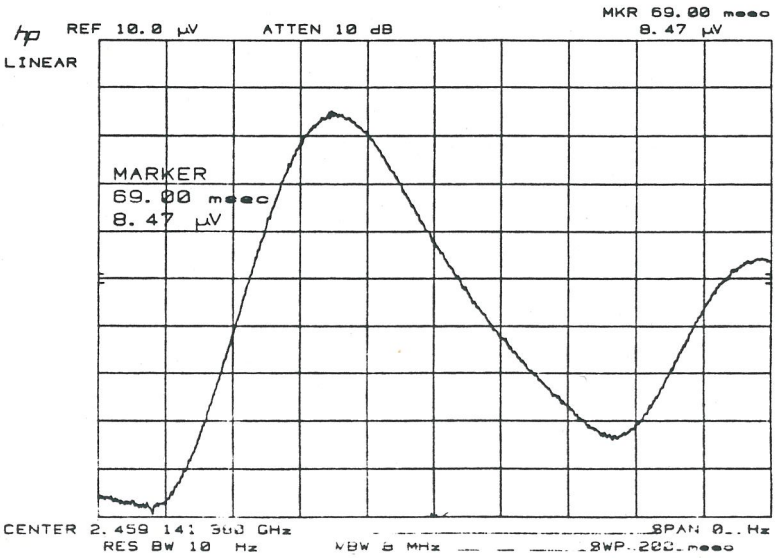
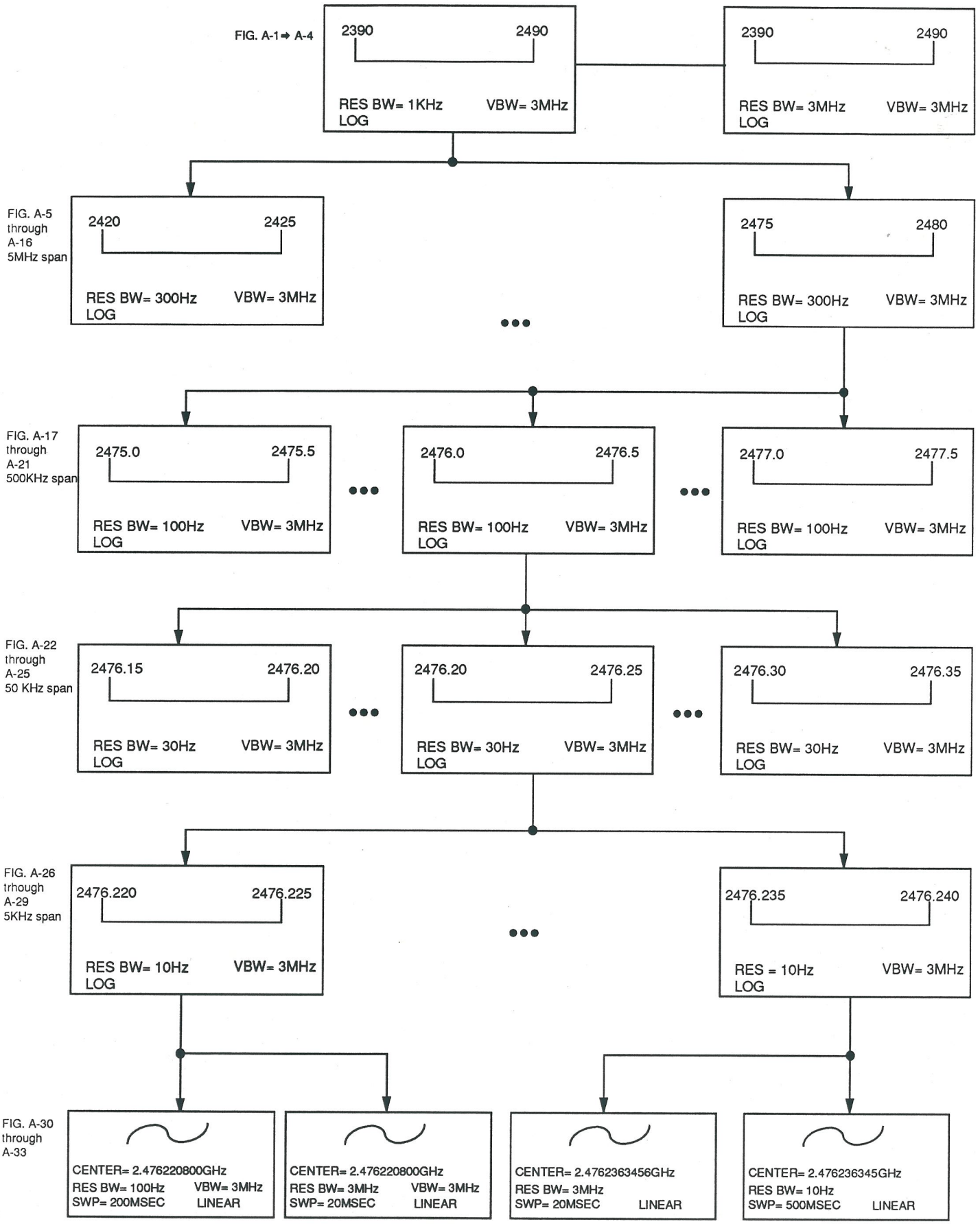


Figure 4



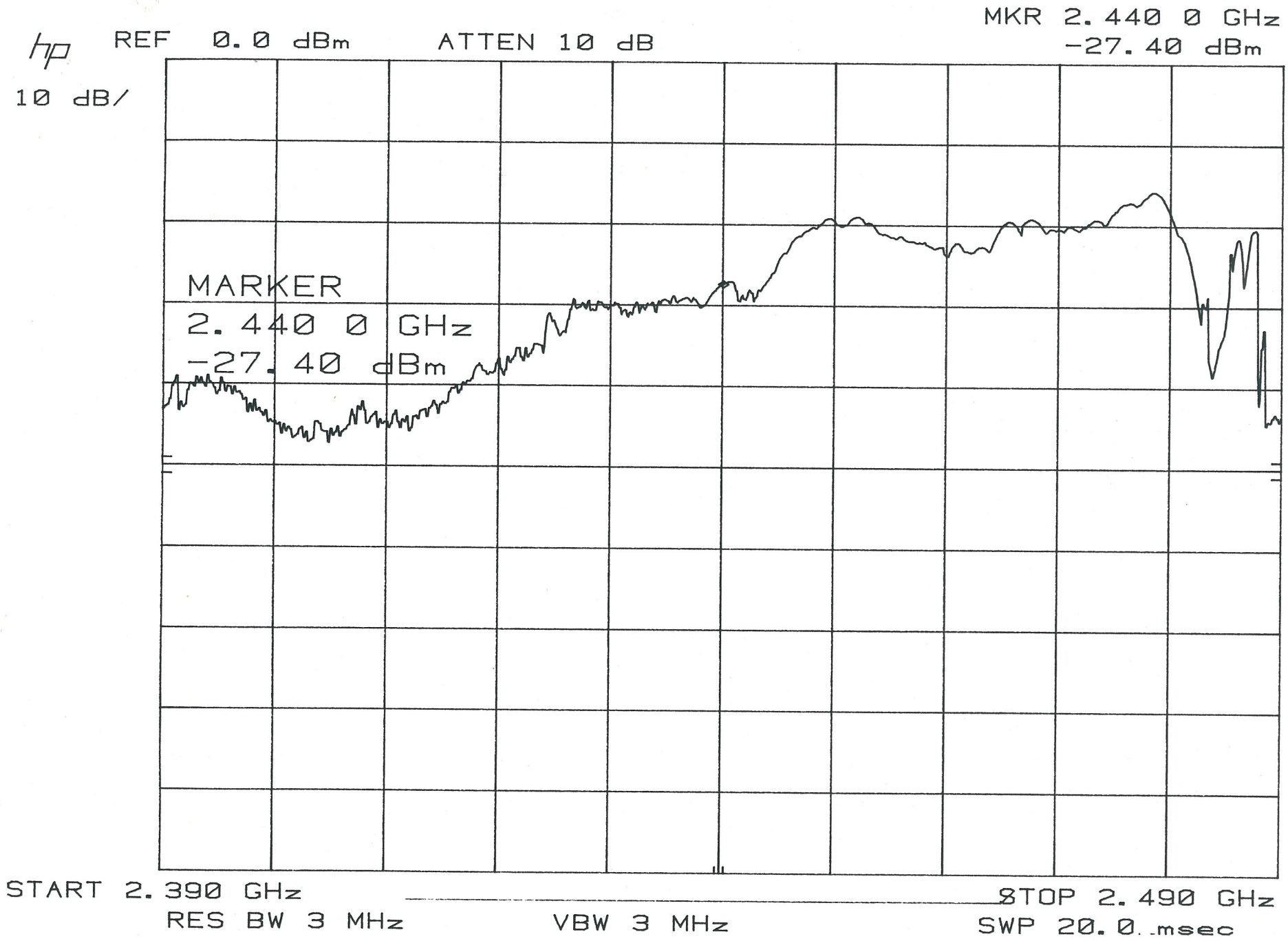
APPENDIX A

Kenmore
1400W
14 3/4"x 10 1/4"



Kenmore
14 3/4"Wx 10 1/4"H

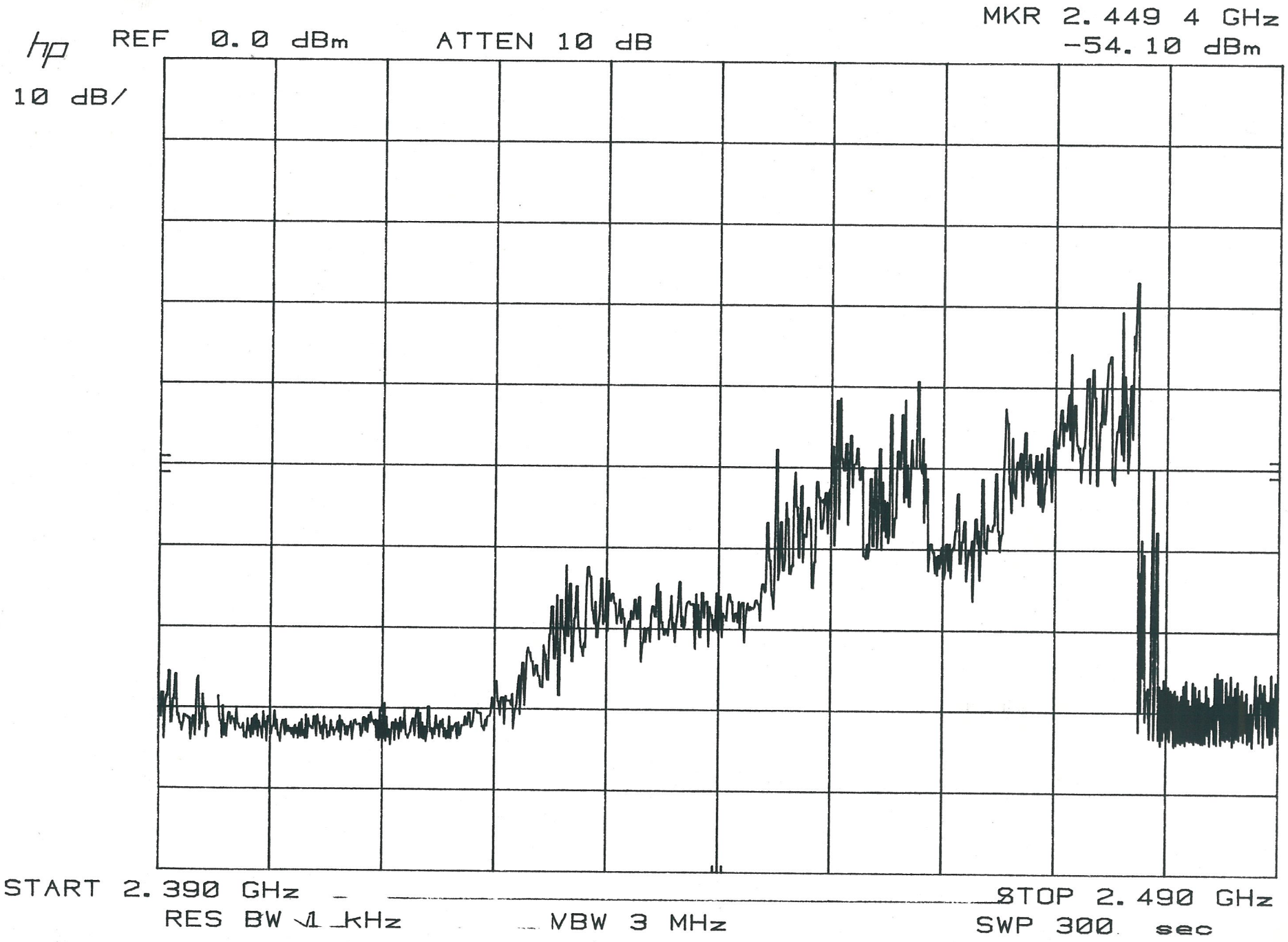
FIGURE A.0


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.440 0 GHz
-27.40 dBm
10 dB/
MARKER
2.440 0 GHz
-27.40 dBm
START 2.390 GHz
STOP 2.490 GHz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Lost ½ cup water of the 1½ cups used

10 minutes Kenmore 1400W. 2450MHZ

Figure 3-1

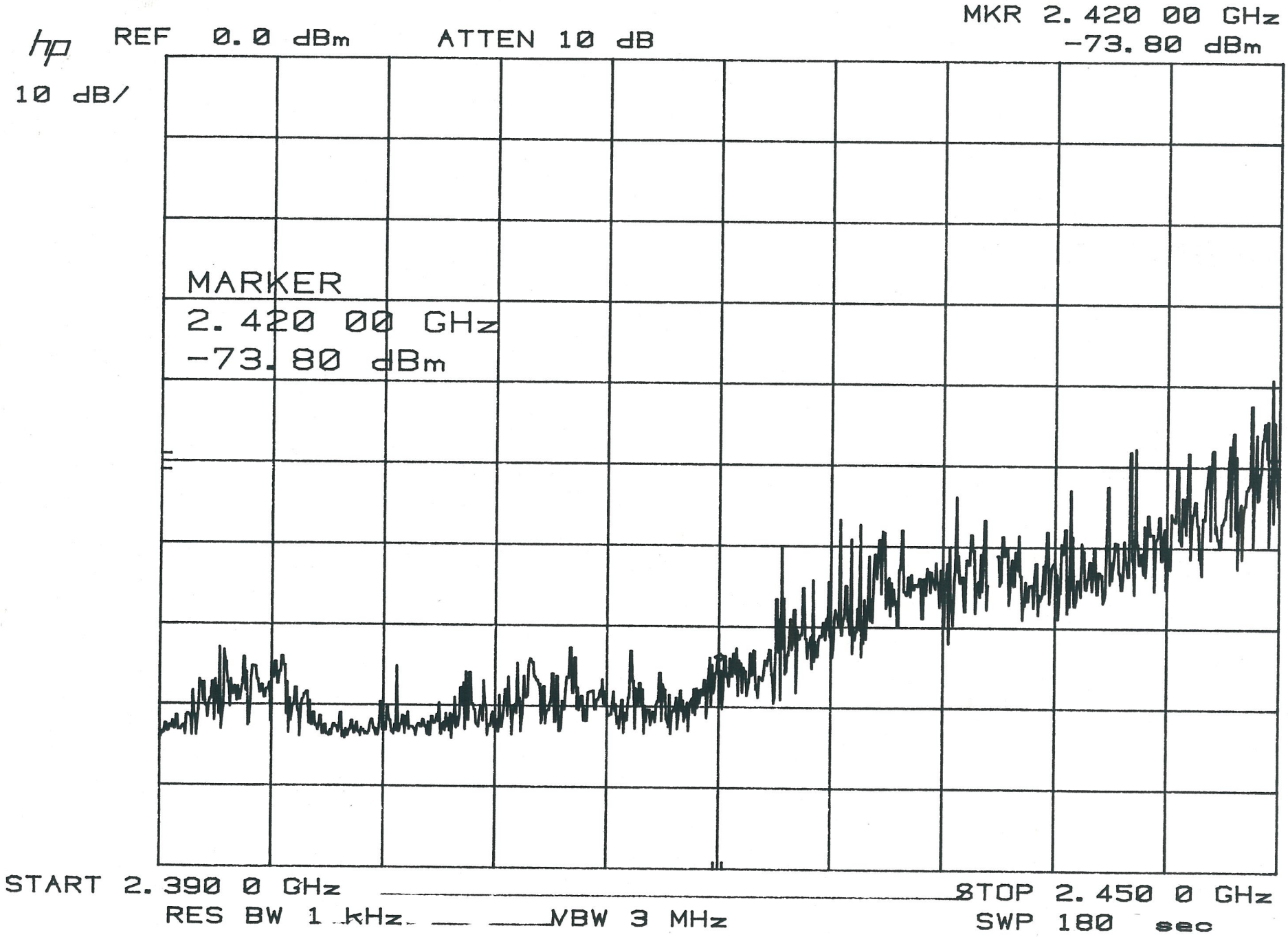

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.449 4 GHz
-54.10 dBm
10 dB/
START 2.390 GHz
STOP 2.490 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 300 sec

Lost ½ cup of the 1½ cups at start

10 minutes Kenmore 1400 W. 2450 MHz

Fan ≅ 1-2 r.p.s.

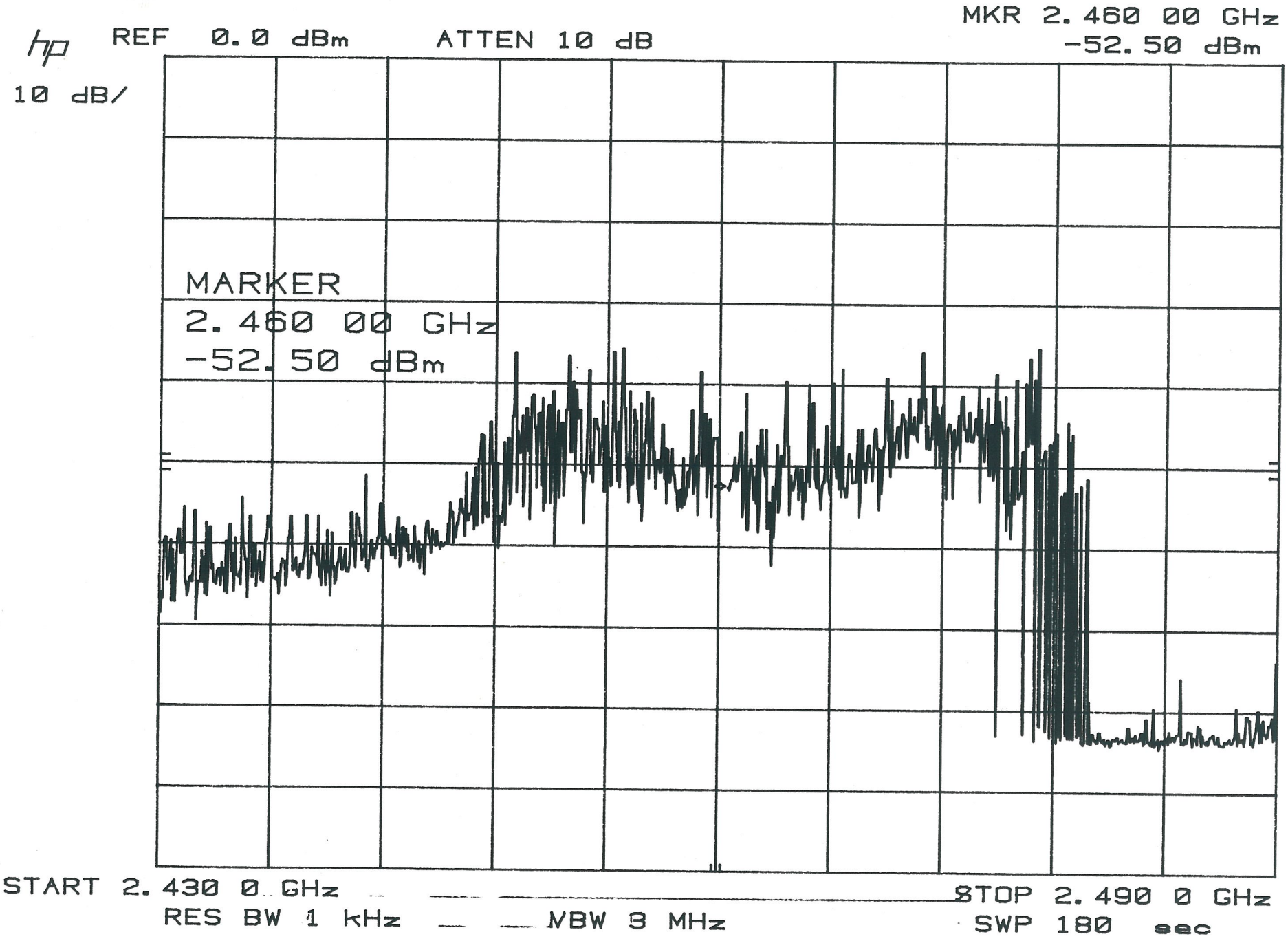
Figure 3-2


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.420 00 GHz
-73.80 dBm
10 dB/
MARKER
2.420 00 GHz
-73.80 dBm
START 2.390 0 GHz
STOP 2.450 0 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 180 sec

Lost 3 oz of the original 12 oz of water
10 minutes

Kenmore
1400 W
~~2540 MHz~~
2450 MHz

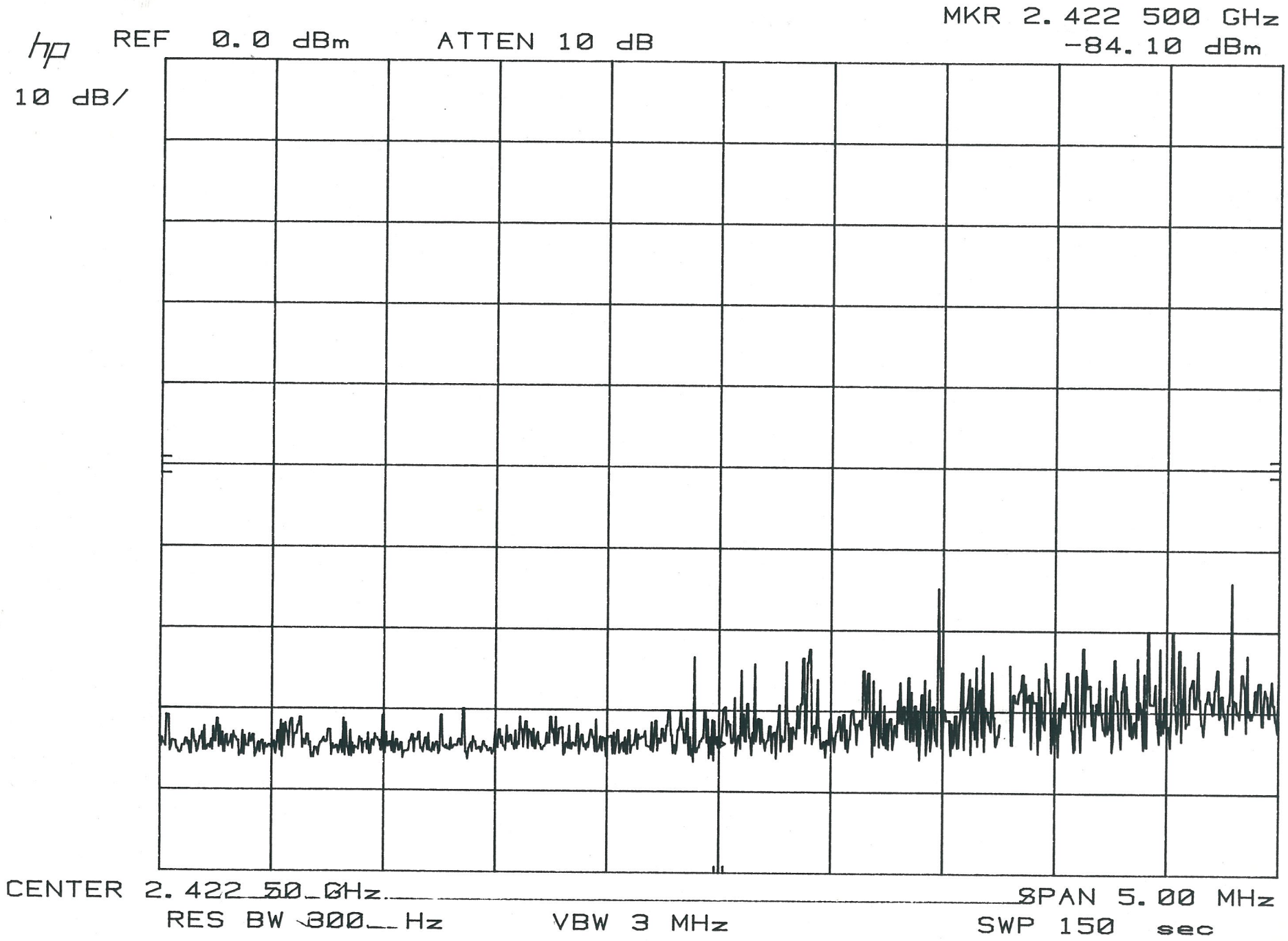
Figure 3-3


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.460 00 GHz
-52.50 dBm
10 dB/
MARKER
2.460 00 GHz
-52.50 dBm
START 2.430 0 GHz
STOP 2.490 0 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 180 sec

Lost 5oz of the original 12 oz of water
10 minutes

Kenmore
1400W
2450MHz

Figure 3-4

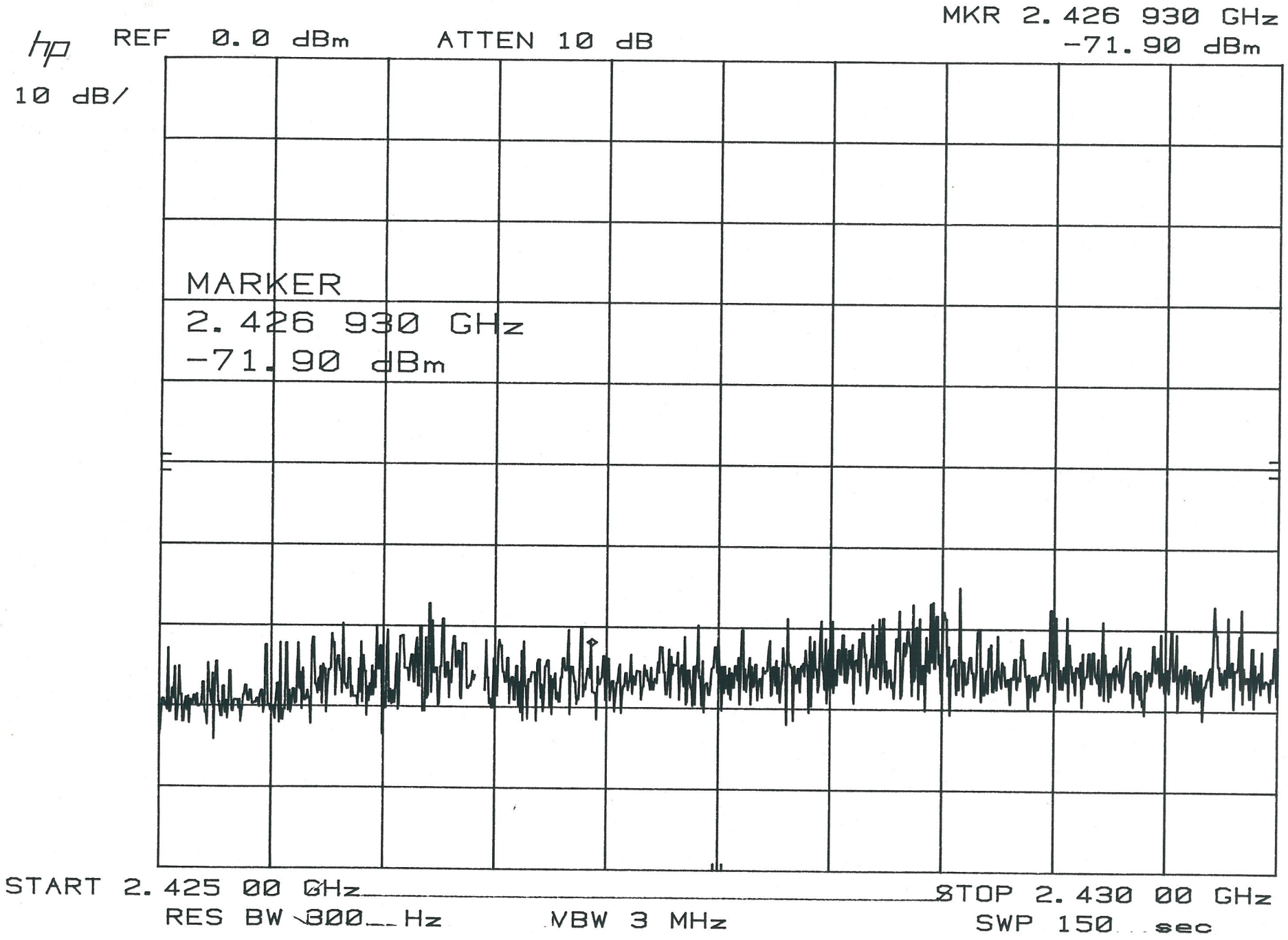

MKR 2.422 500 GHz
-84.10 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
CENTER 2.422 50 GHz
SPAN 5.00 MHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

10 minutes

Lost 1/2 cup of the 1 1/2 cups at start

Kenmore
1400W
2450MHz

Figure 3-5

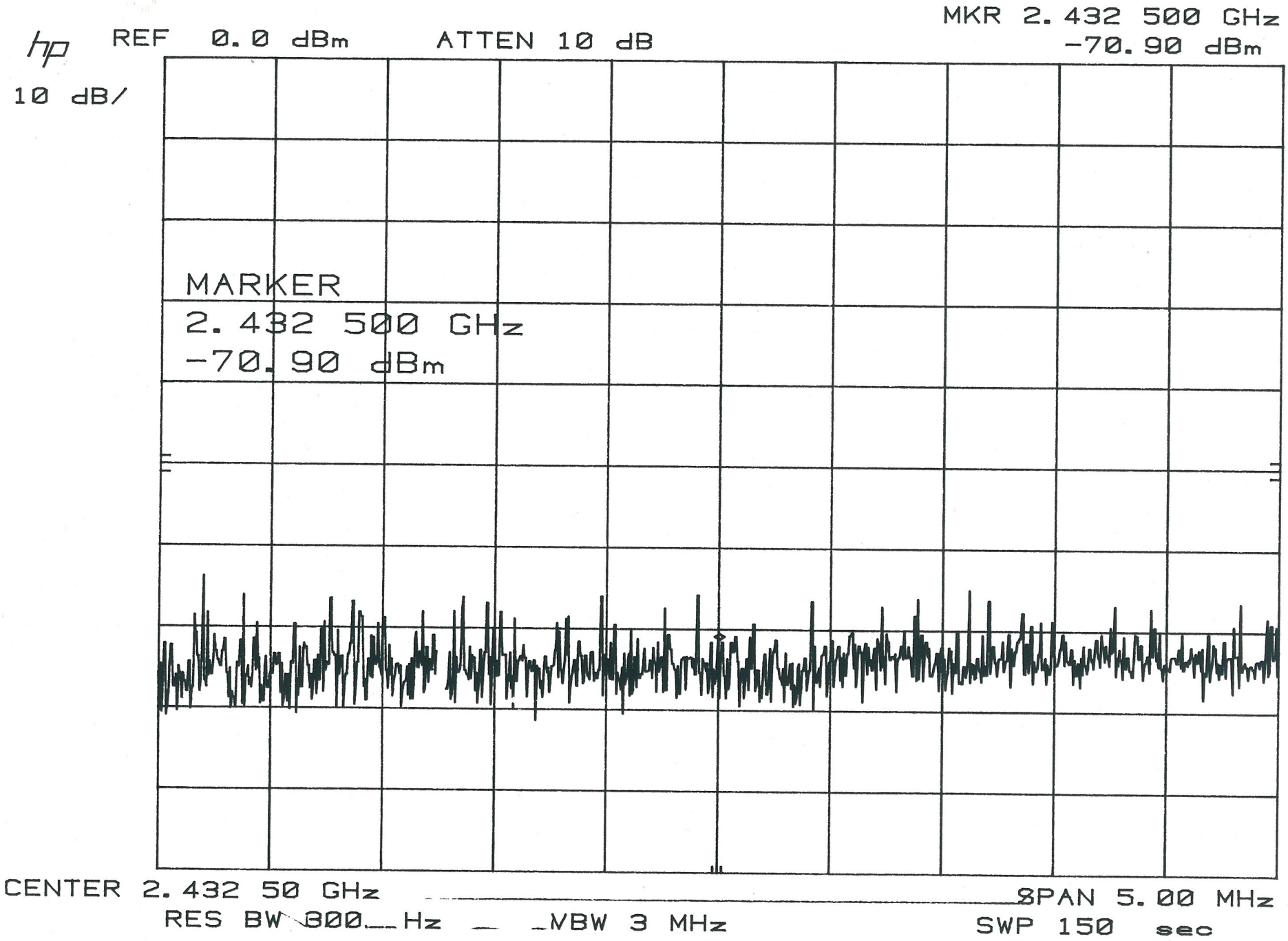

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.426 930 GHz
-71.90 dBm
10 dB/
MARKER
2.426 930 GHz
-71.90 dBm
START 2.425 00 GHz
STOP 2.430 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 4½ oz. of the 13 oz water we started with
10 minutes

Kenmore
1400 w

2450 MHz

Figure 3-6

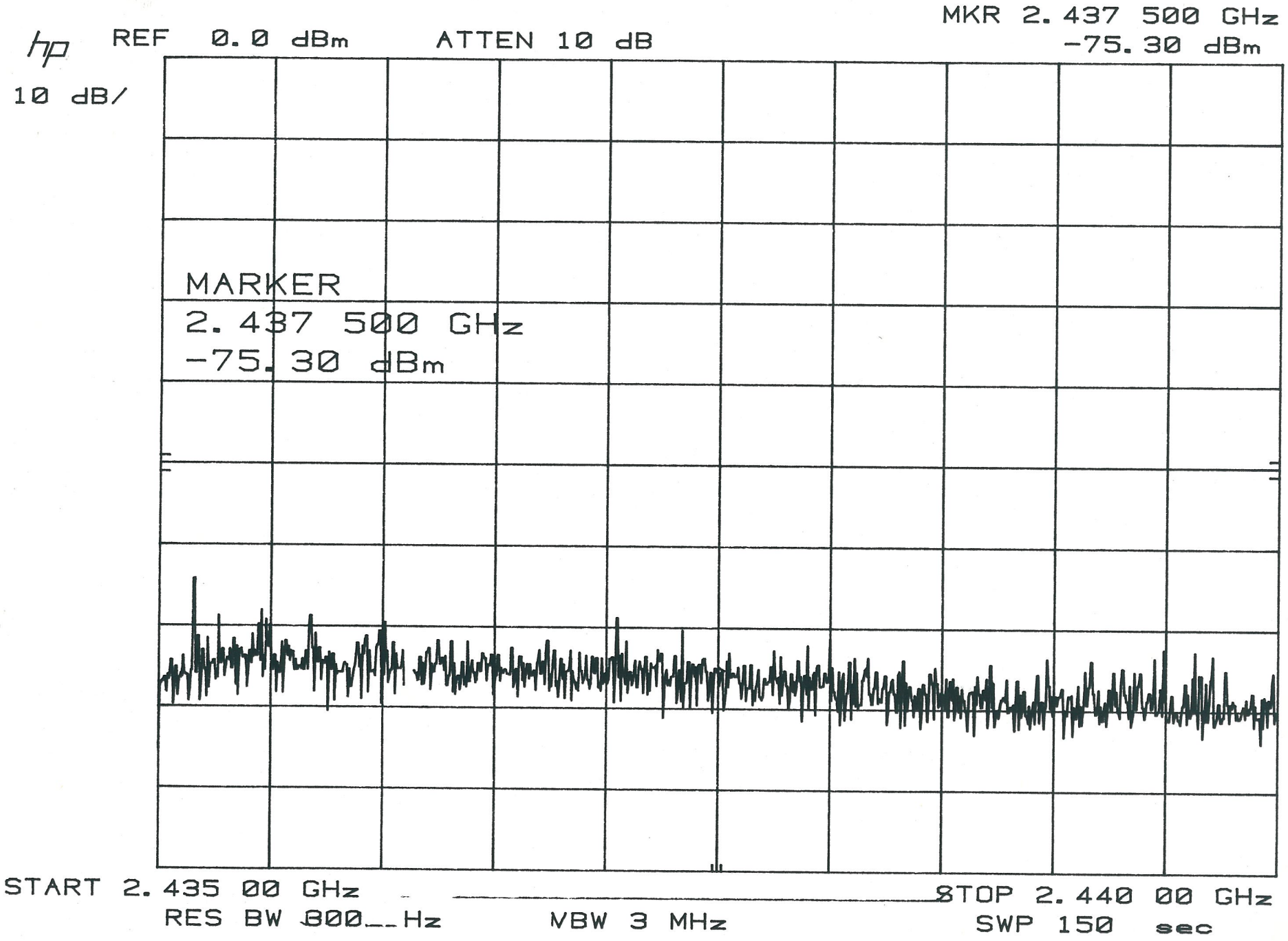

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.432 500 GHz
-70.90 dBm
10 dB/
MARKER
2.432 500 GHz
-70.90 dBm
CENTER 2.432 50 GHz
SPAN 5.00 MHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 3oz of the 12oz of water we started with

10 minutes

Kenmore
1400 W
2450 MHz

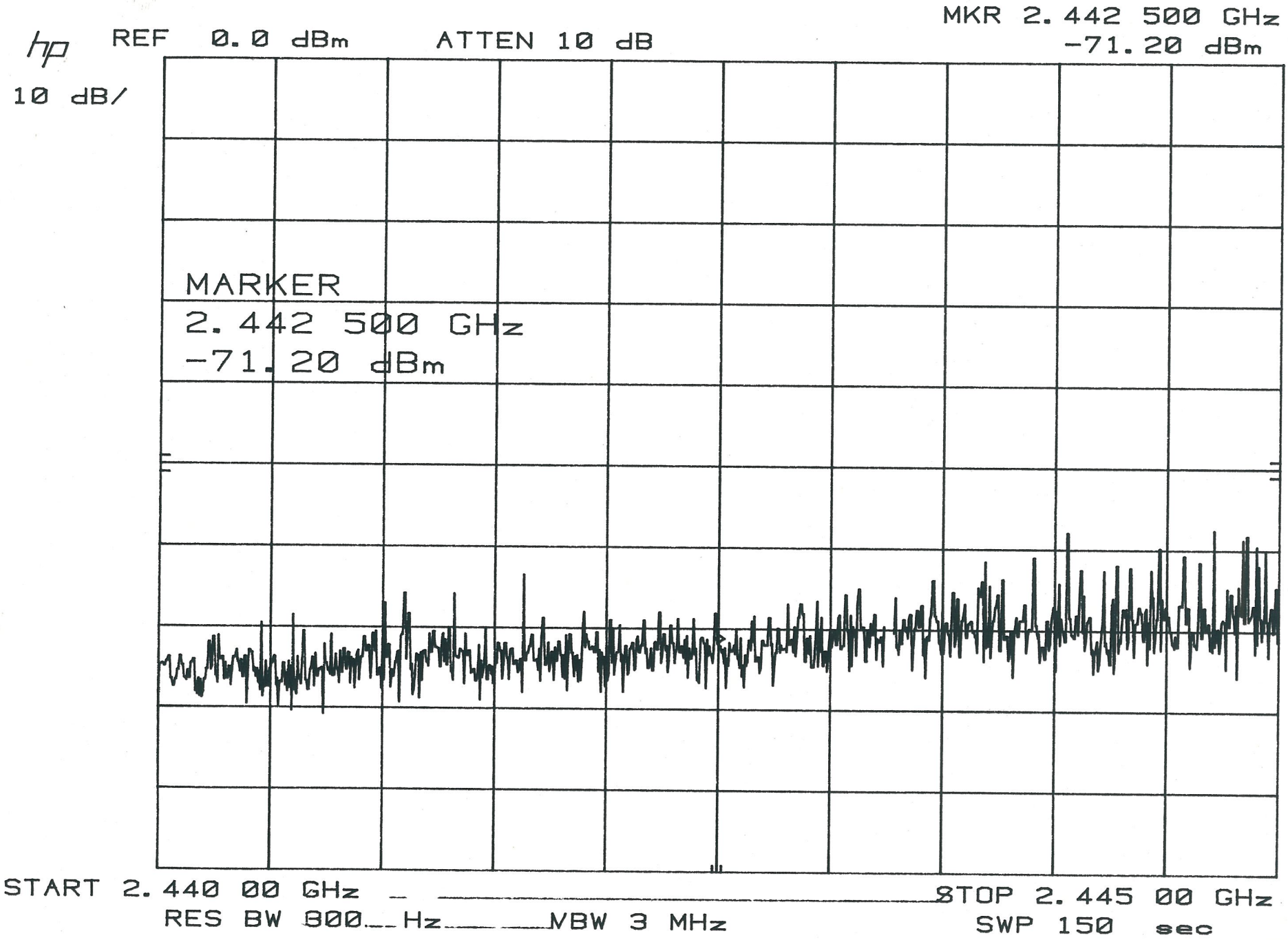
Figure 3-7


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.437 500 GHz
-75.30 dBm
10 dB/
MARKER
2.437 500 GHz
-75.30 dBm
START 2.435 00 GHz
STOP 2.440 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost a little over ½ cup of the original 1½ cups water
10 minutes

Kenmore
1400w
2450 MHz

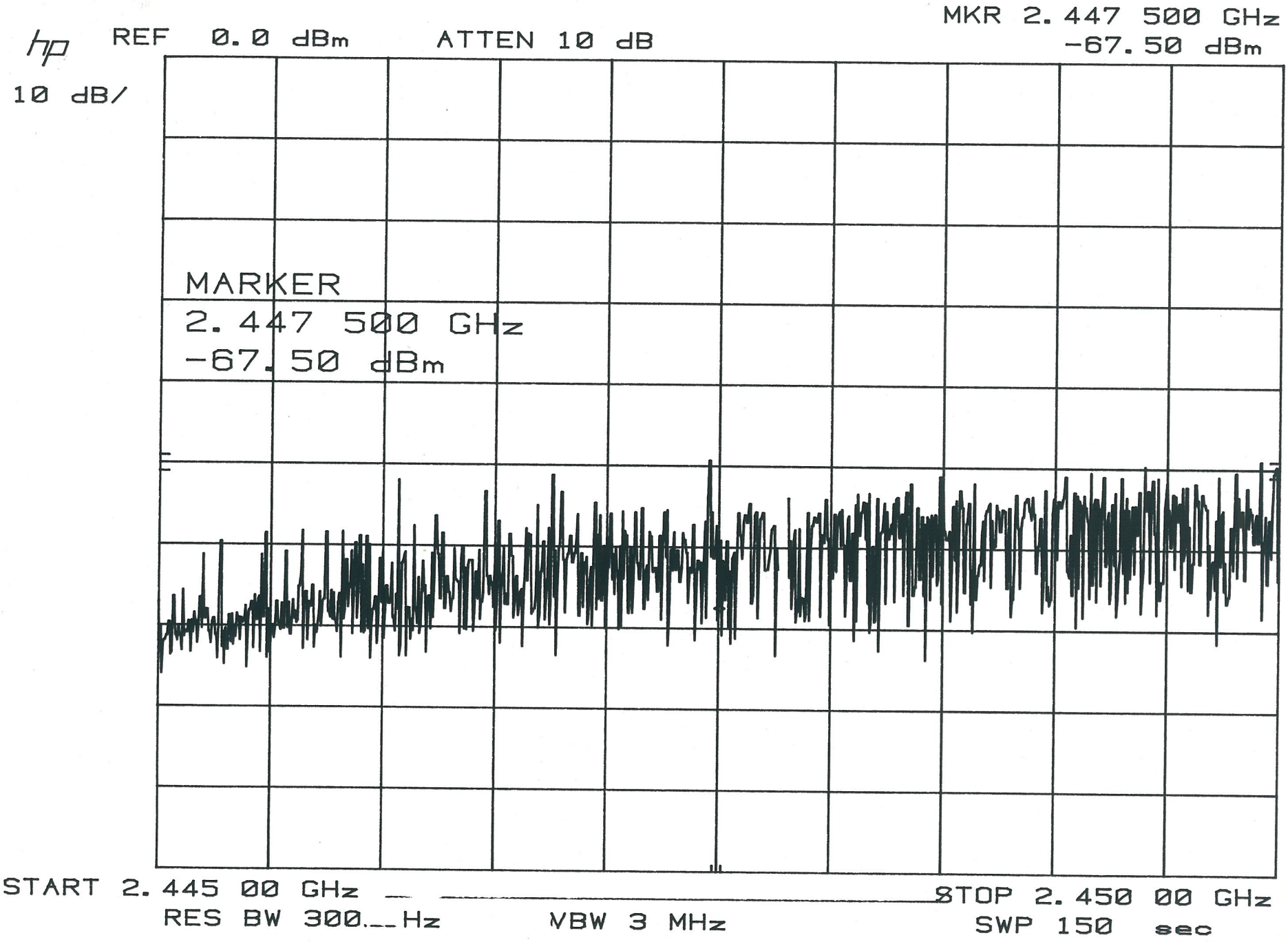
Figure 3-8


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.442 500 GHz
-71.20 dBm
10 dB/
MARKER
2.442 500 GHz
-71.20 dBm
START 2.440 00 GHz
STOP 2.445 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 3 oz. of the original 12 oz water
10 minutes

Kenmore
1400 W
2450 MHz

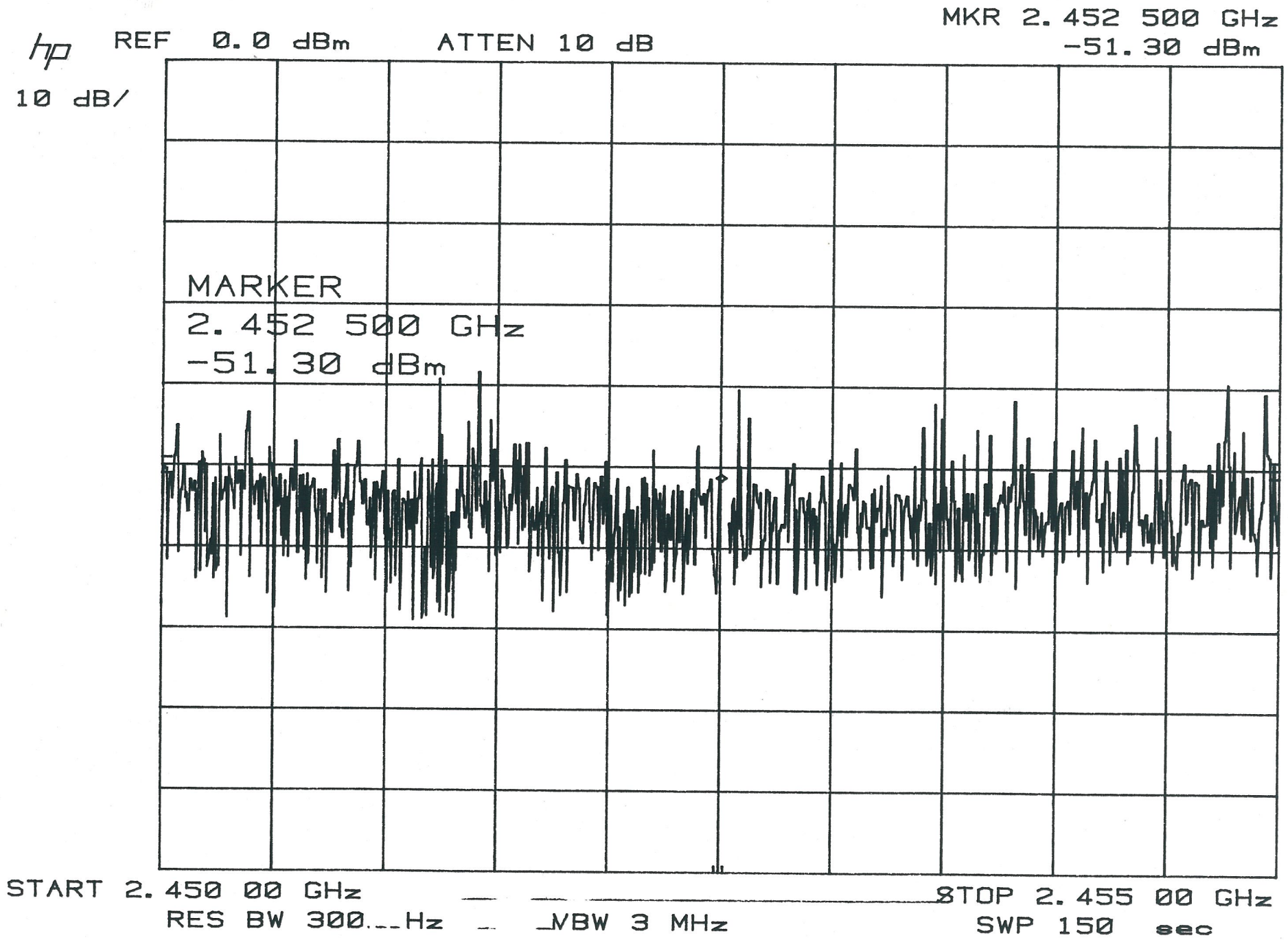
Figure 3-9


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.447 500 GHz
-67.50 dBm
10 dB/
MARKER
2.447 500 GHz
-67.50 dBm
START 2.445 00 GHz
STOP 2.450 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 3 1/2 oz. of the original 12 oz of water
10 minutes

Kenmore
1400W
2450 MHz

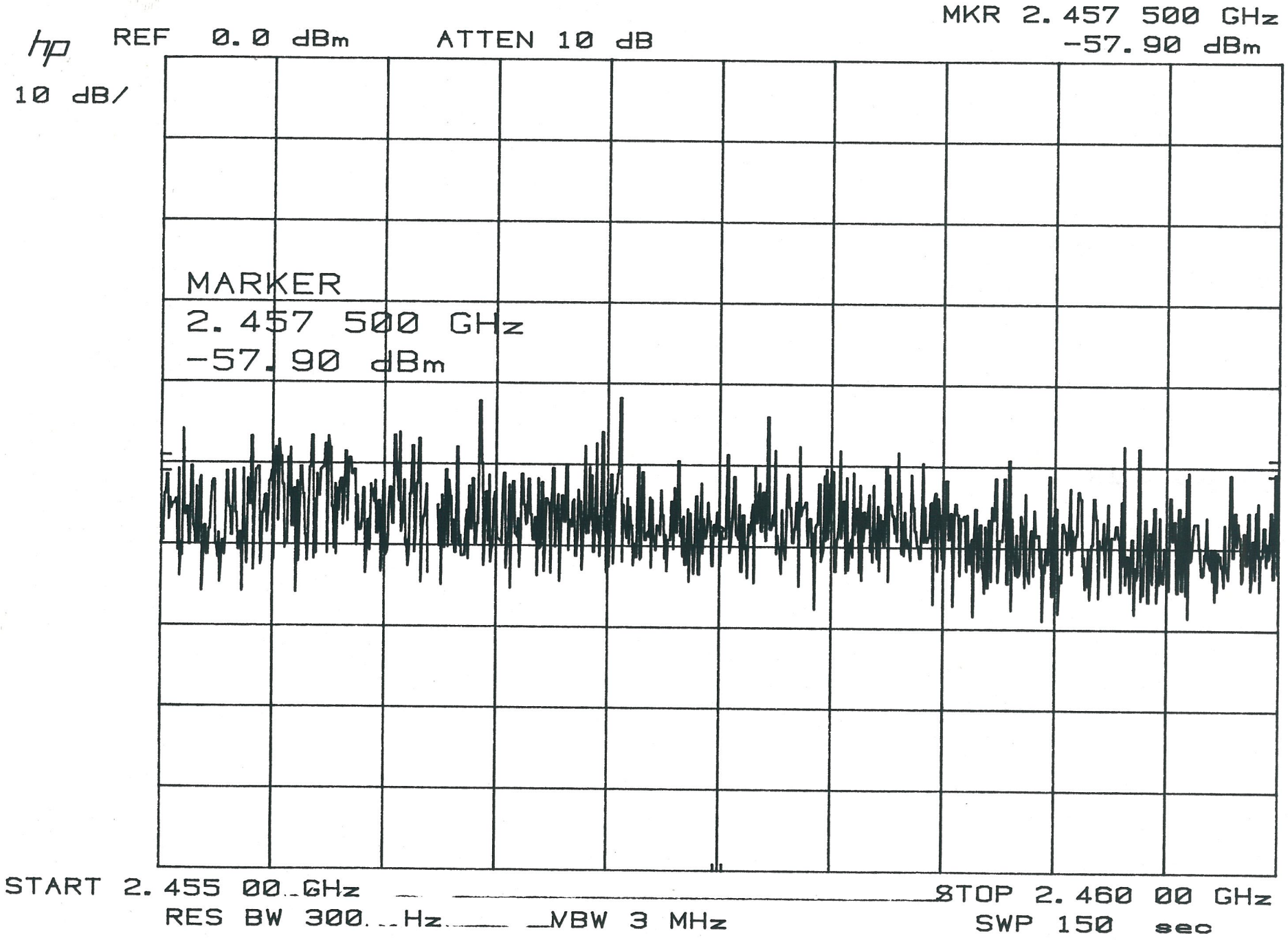
Figure 3-10


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.452 500 GHz
-51.30 dBm
10 dB/
MARKER
2.452 500 GHz
-51.30 dBm
START 2.450 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.455 00 GHz
SWP 150 sec

Lost 3½ oz of the original 12 oz of water
10 minutes

Kenmore
1400 W
2450 MHZ

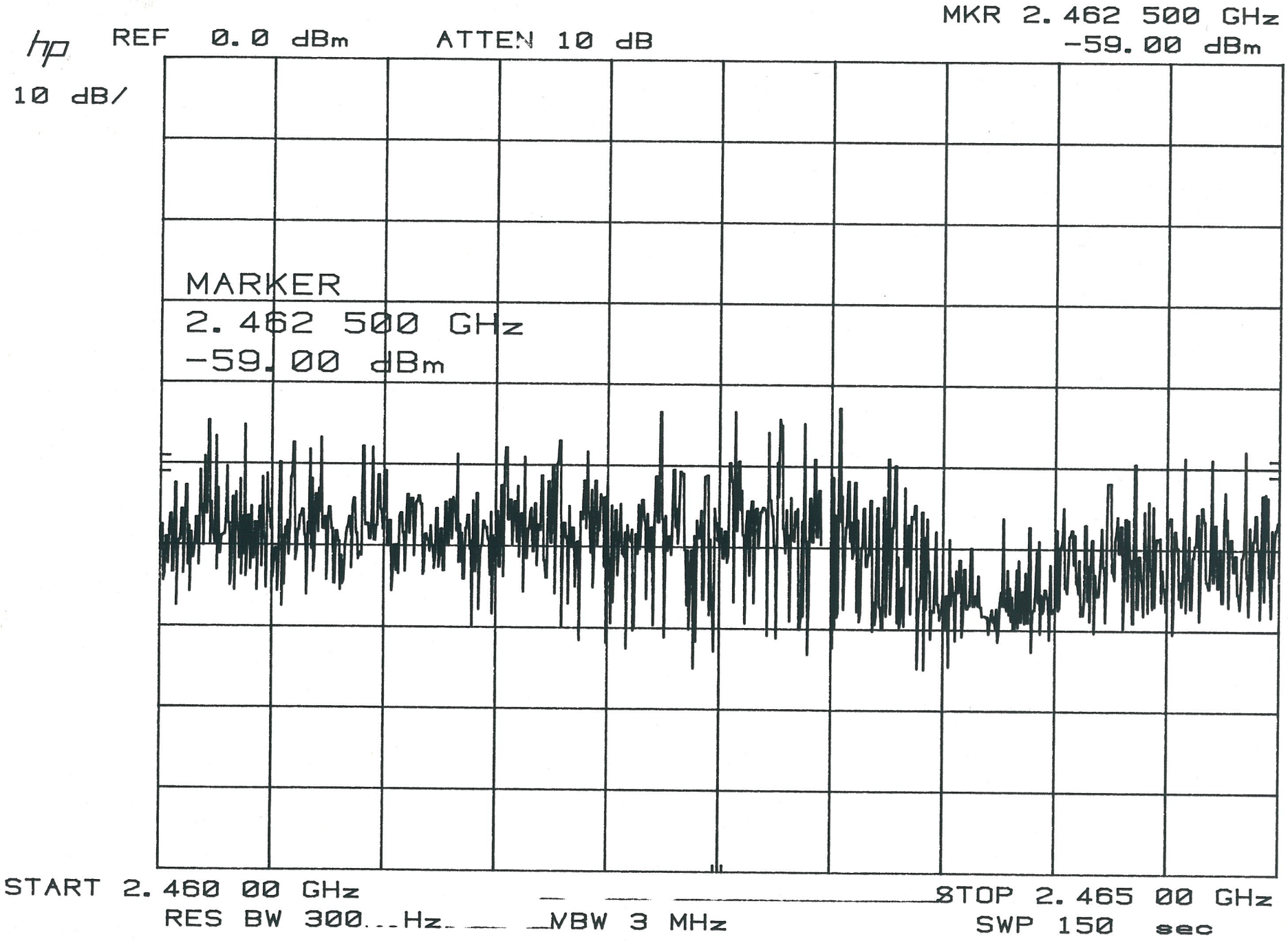
Figure 3-11


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.457 500 GHz
-57.90 dBm
10 dB/
MARKER
2.457 500 GHz
-57.90 dBm
START 2.455 00 GHz
STOP 2.460 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Kenmore
1400W
2450 MHz

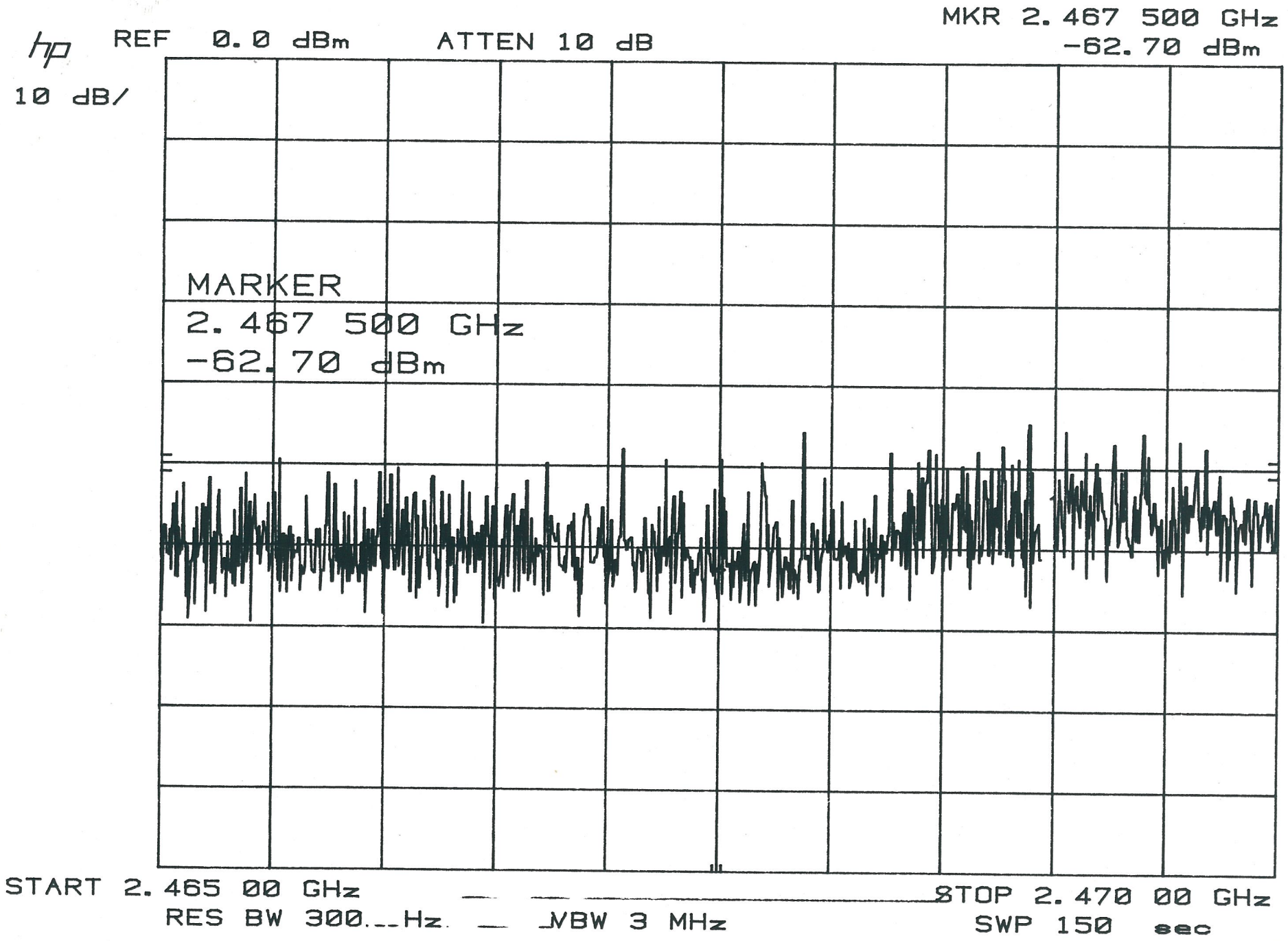
Figure 3-12


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.462 500 GHz
-59.00 dBm
10 dB/
MARKER
2.462 500 GHz
-59.00 dBm
START 2.460 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.465 00 GHz
SWP 150 sec

Lost 3 oz of the original 12 oz of water
10 minutes

Kenmore
1400 W
2450 MHz

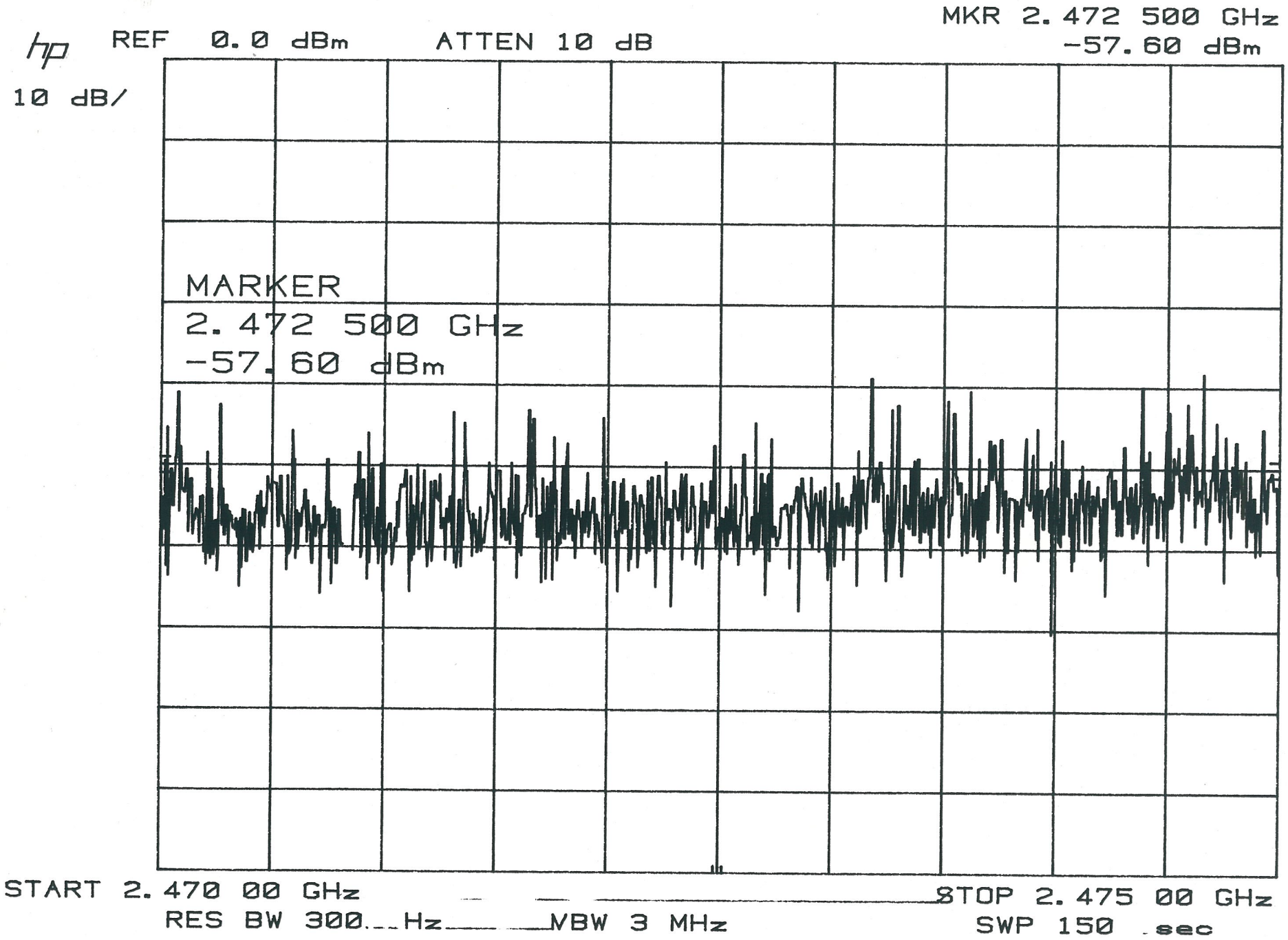
Figure 3-13


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.467 500 GHz
-62.70 dBm
10 dB/
MARKER
2.467 500 GHz
-62.70 dBm
START 2.465 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.470 00 GHz
SWP 150 sec

Lost 3 1/2 oz. of the original 12 oz of water
10 minutes

Kenmore
1400 W
2450 MHz

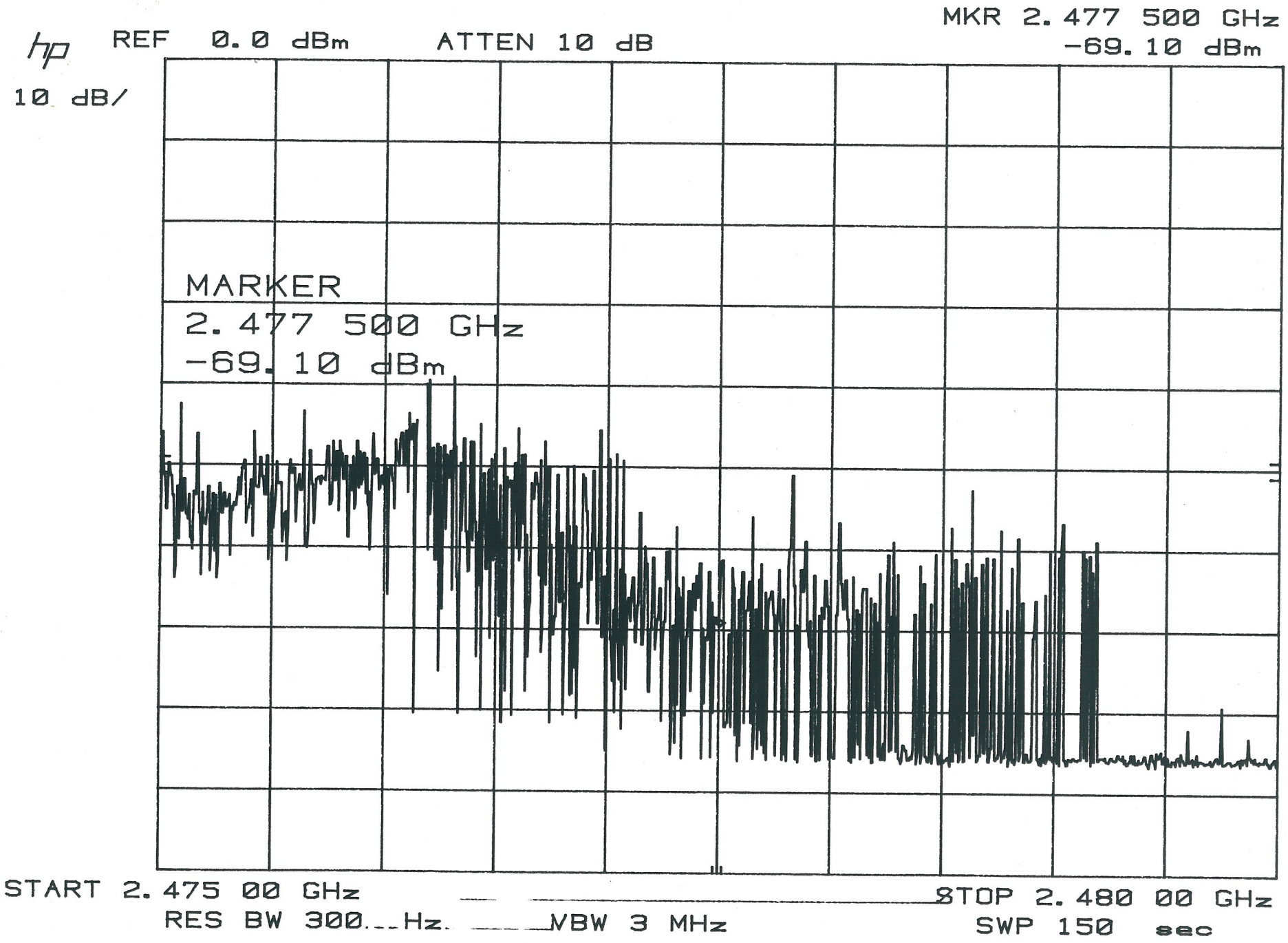
Figure 3-14


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.472 500 GHz
-57.60 dBm
10 dB/
MARKER
2.472 500 GHz
-57.60 dBm
START 2.470 00 GHz
STOP 2.475 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 4½ oz of the original 12 oz of water
10 minutes

Kenmore
1400W
~~2450 MHz~~
2450 MHz

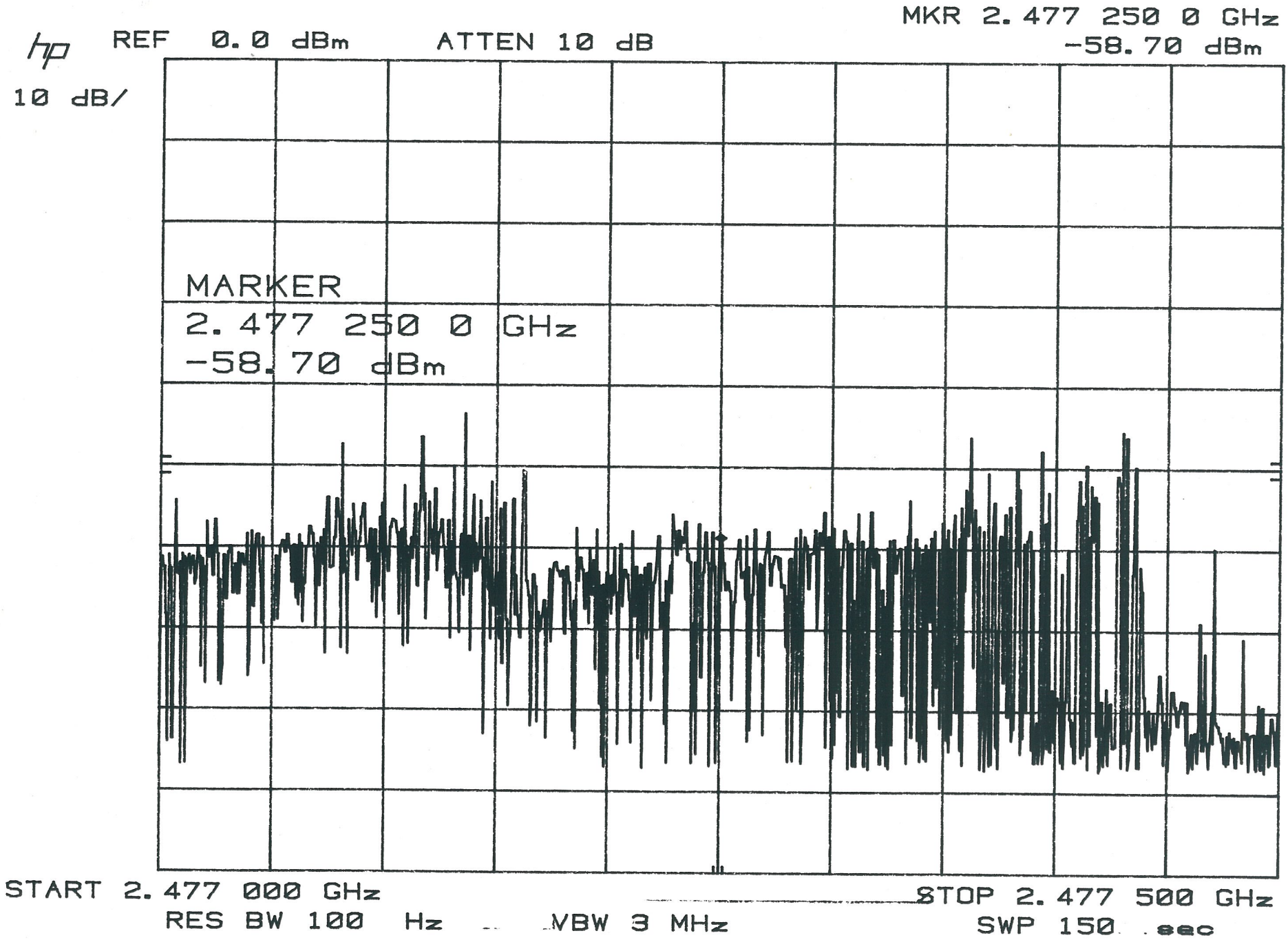
Figure 3-15


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.477 500 GHz
-69.10 dBm
10 dB/
MARKER
2.477 500 GHz
-69.10 dBm
START 2.475 00 GHz
STOP 2.480 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 3oz of the original 12oz of water
10 minutes

Kenmore
1400W
~~2540MHz~~
2450 MHz

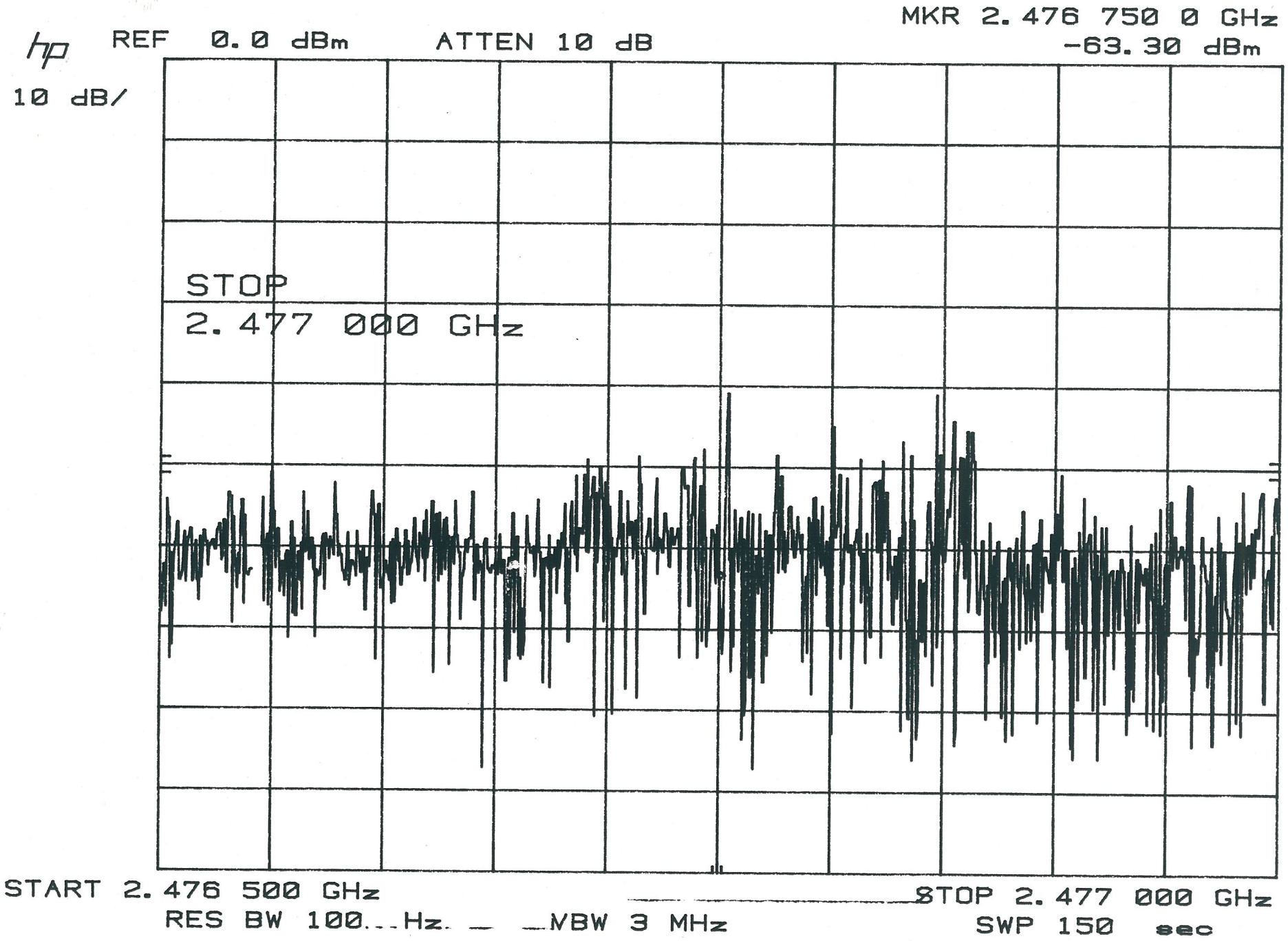
Figure 3-16


MKR 2.477 250 0 GHz
-58.70 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.477 250 0 GHz
-58.70 dBm
START 2.477 000 GHz
STOP 2.477 500 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 3oz of the original 12oz of water
10 minutes

Kenmore
1400 W
2450 MHz

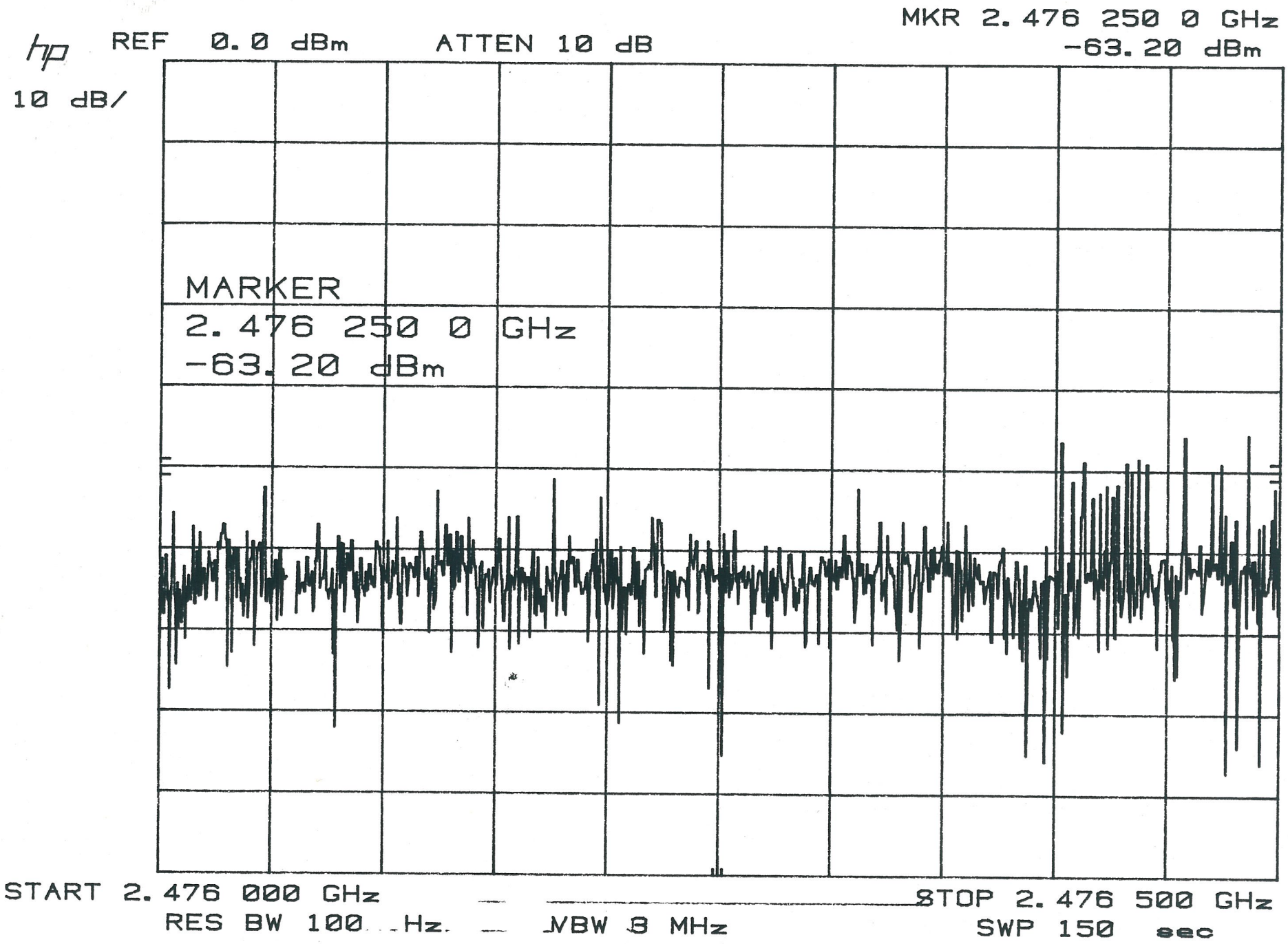
Figure 3-21


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 750 0 GHz
-63.30 dBm
10 dB/
STOP
2.477 000 GHz
START 2.476 500 GHz
RES BW 100...Hz
VBW 3 MHz
STOP 2.477 000 GHz
SWP 150 sec

Lost 3 1/2 ~~of~~ of the original 12oz of water
10 minutes

Kenmore
1400W
2450MHz

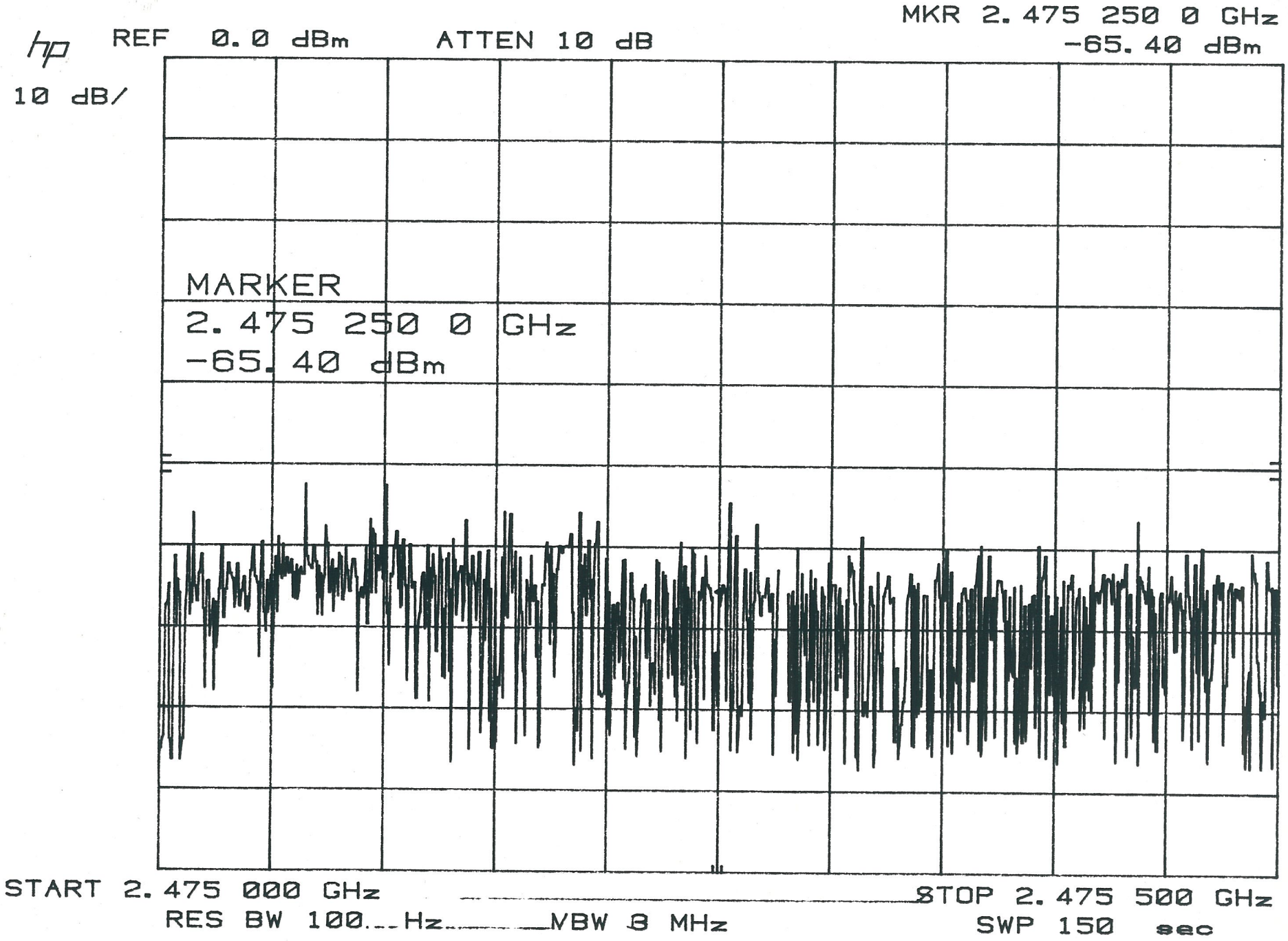
Figure 3-20


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 250 0 GHz
-63.20 dBm
10 dB/
MARKER
2.476 250 0 GHz
-63.20 dBm
START 2.476 000 GHz
STOP 2.476 500 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water
10 minutes

Kenmore
1400 W
2450 MHZ

Figure 3-19

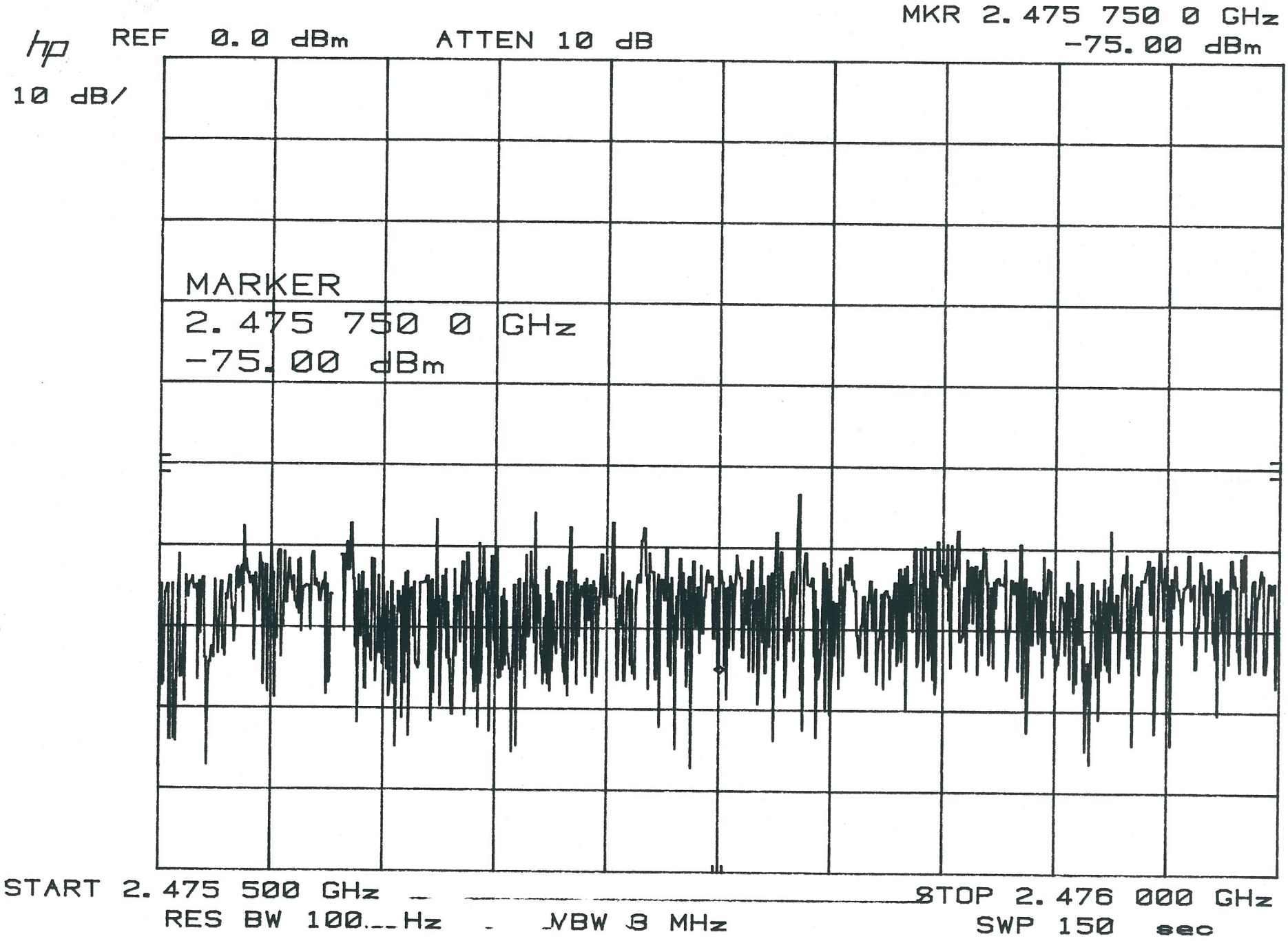

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.475 250 0 GHz
-65.40 dBm
10 dB/
MARKER
2.475 250 0 GHz
-65.40 dBm
START 2.475 000 GHz
STOP 2.475 500 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 3oz of the original 12oz of water

10 minutes

Kenmore
1400W
2450 MHz

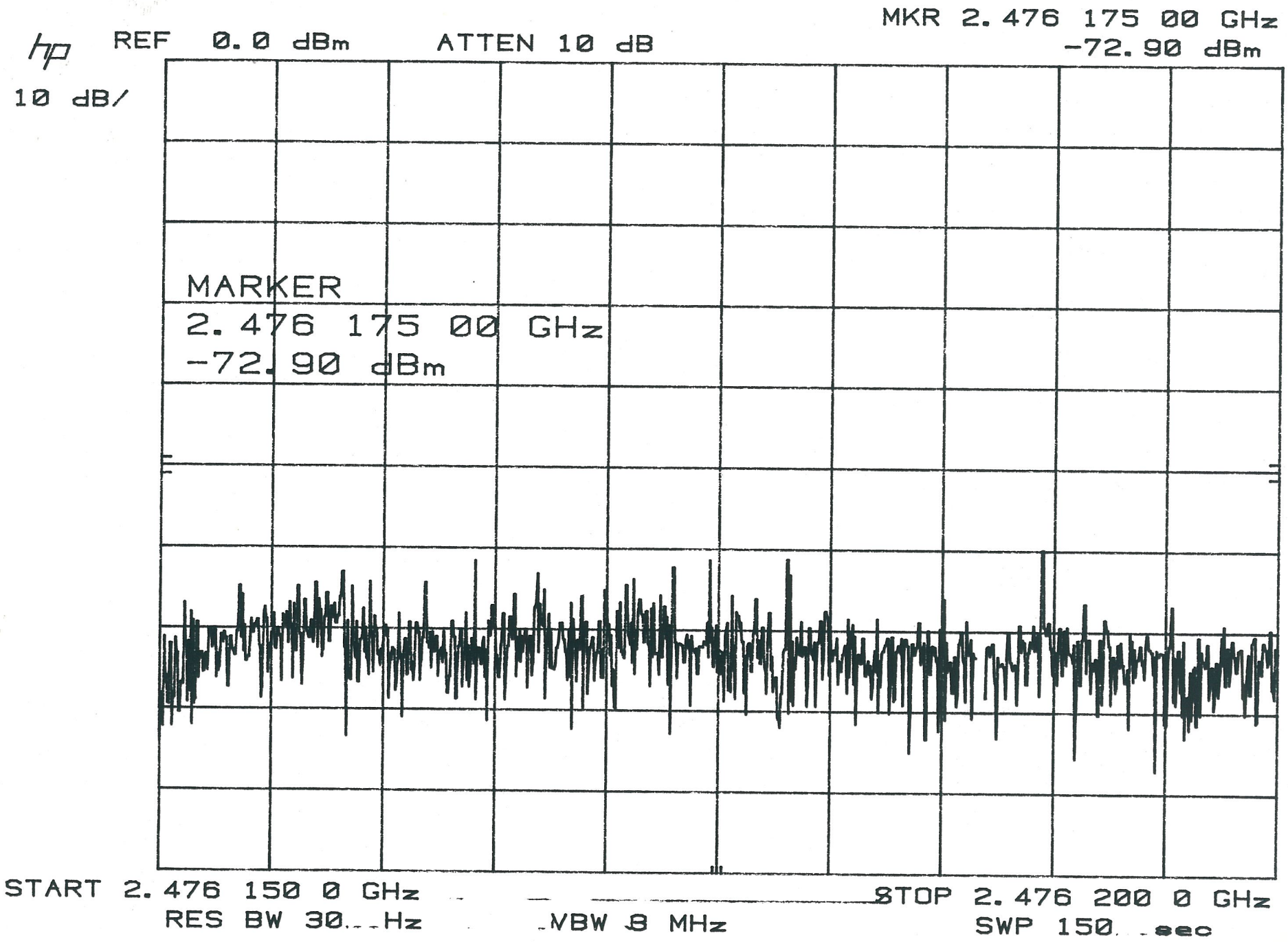
Figure 3-17


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.475 750 0 GHz
-75.00 dBm
10 dB/
MARKER
2.475 750 0 GHz
-75.00 dBm
START 2.475 500 GHz
STOP 2.476 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 3 oz of the original 12 oz of water
10 minutes

Kenmore
1400 W
2450 MHz

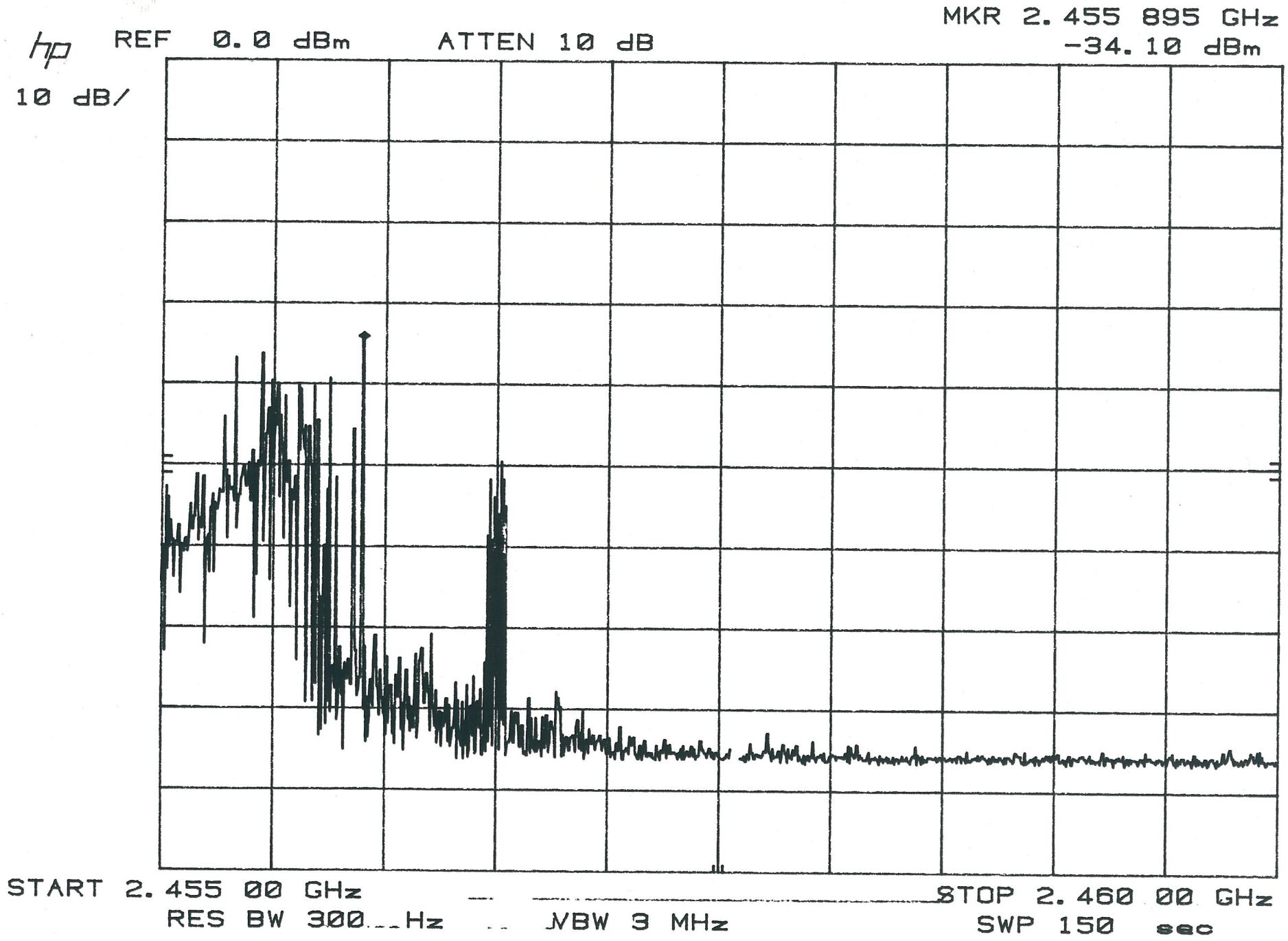
Figure 3-18


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 175 00 GHz
-72.90 dBm
10 dB/
MARKER
2.476 175 00 GHz
-72.90 dBm
START 2.476 150 0 GHz
RES BW 30 Hz
VBW 8 MHz
STOP 2.476 200 0 GHz
SWP 150 sec

Lost 3oz of the original 12oz of water
10 minutes

Kenmore
1400W
2450MHZ

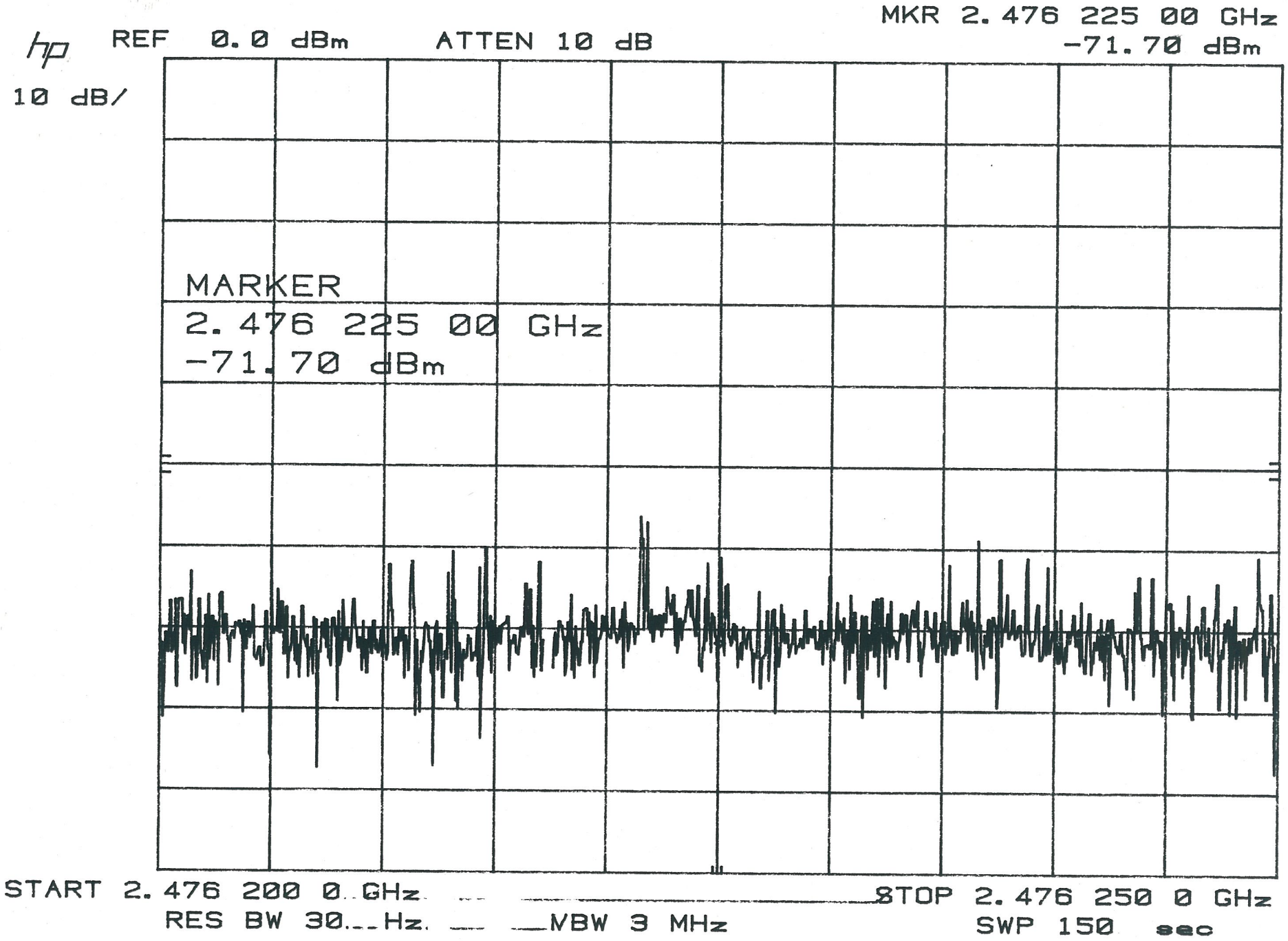
Figure 3-22


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.455 895 GHz
-34.10 dBm
10 dB/
START 2.455 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.460 00 GHz
SWP 150 sec

Lost 3oz of the original 12 oz of water
10 minutes

Magic Chef
2450 MHz

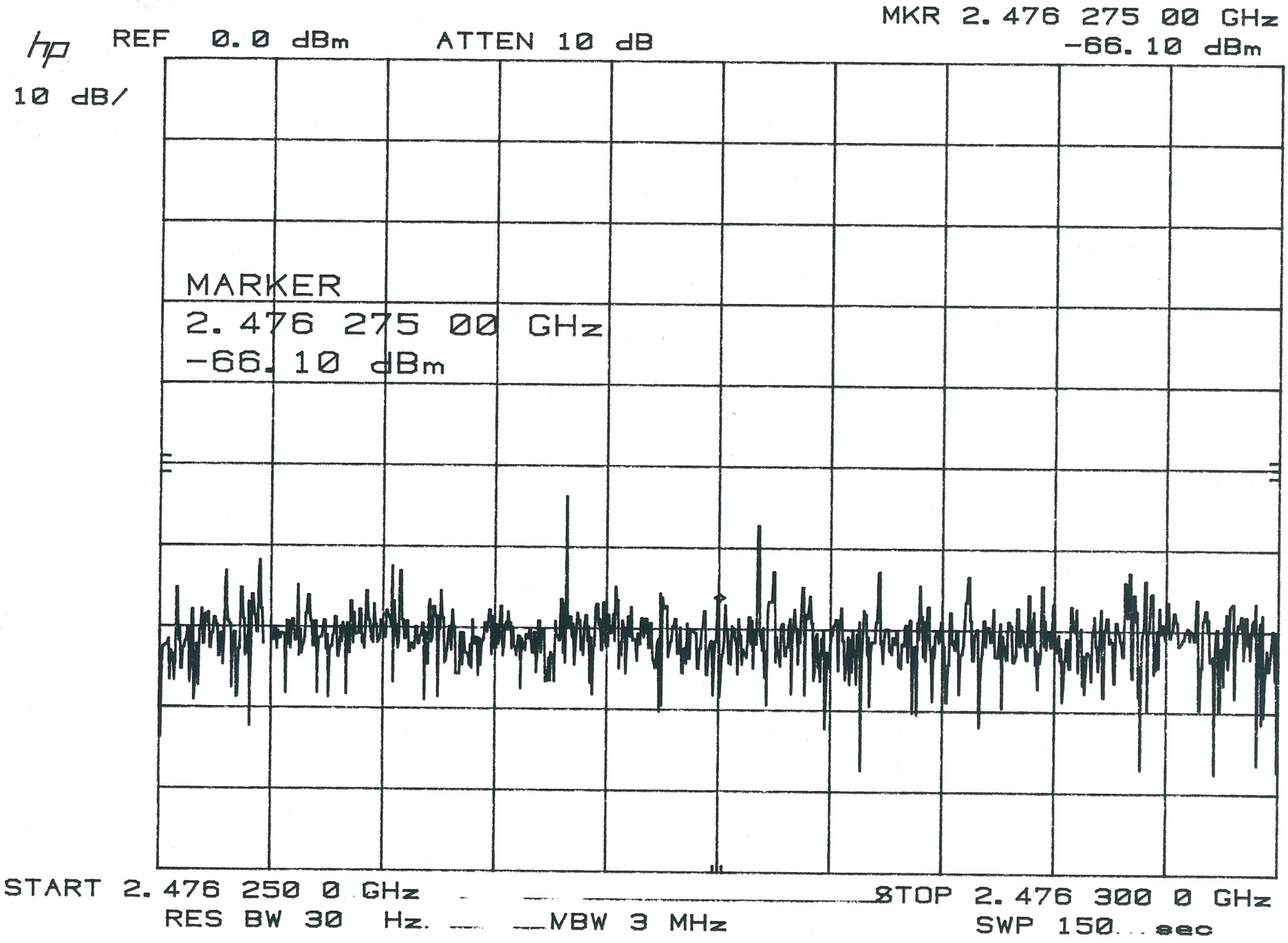
Figure 4-16


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 225 00 GHz
-71.70 dBm
10 dB/
MARKER
2.476 225 00 GHz
-71.70 dBm
START 2.476 200 0 GHz
STOP 2.476 250 0 GHz
RES BW 30 Hz
VBW 3 MHz
SWP 150 sec

Lost 3oz of the original 12oz of water
10 minutes

Kenmore
1400W
2450MHz

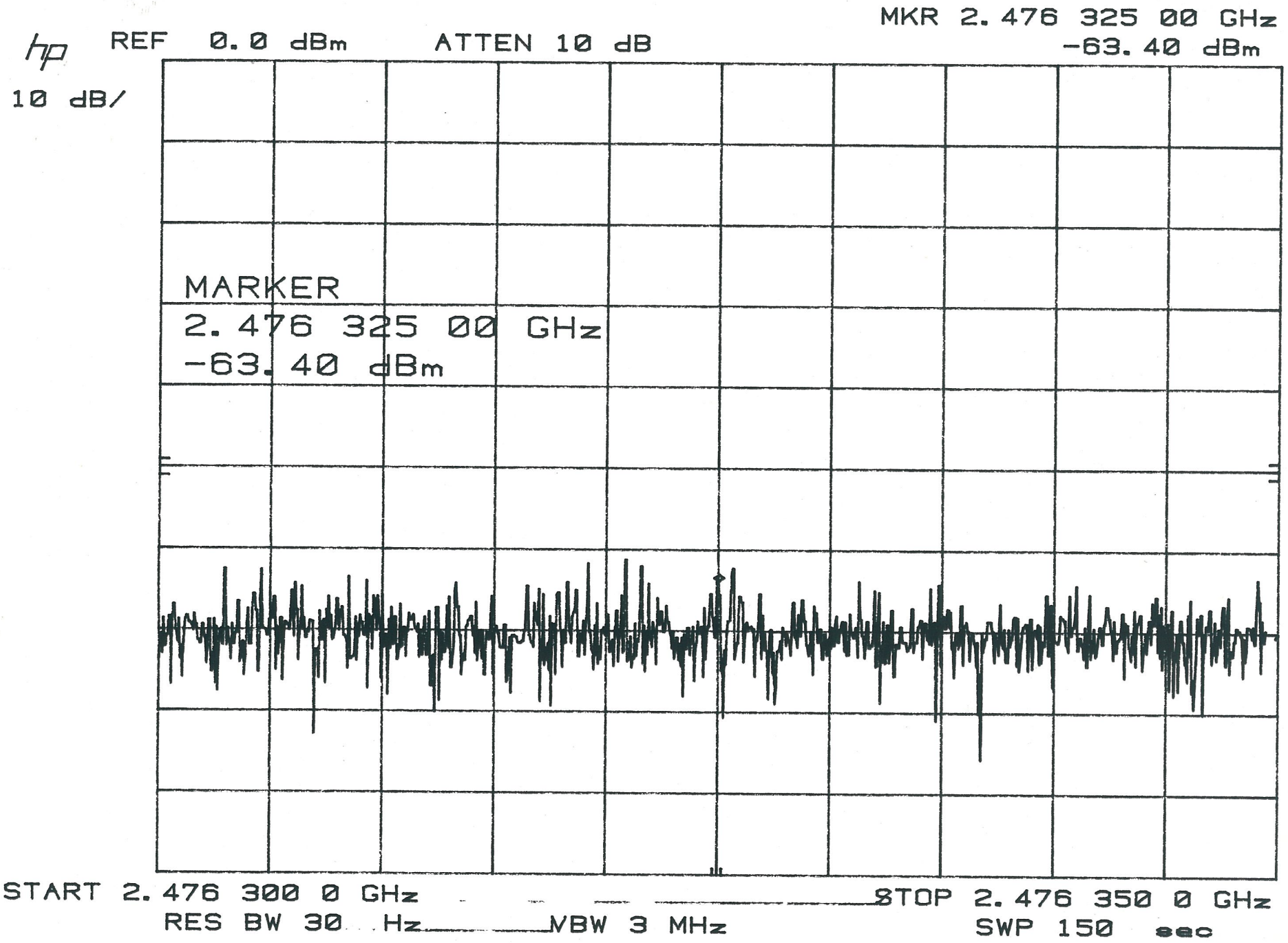
Figure 3-23


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 275 00 GHz
-66.10 dBm
10 dB/
MARKER
2.476 275 00 GHz
-66.10 dBm
START 2.476 250 0 GHz
STOP 2.476 300 0 GHz
RES BW 30 Hz
VBW 3 MHz
SWP 150 sec

Lost 4½ oz of the original 12oz of water
10 minutes

Kenmore
1400 W
2450 MHz

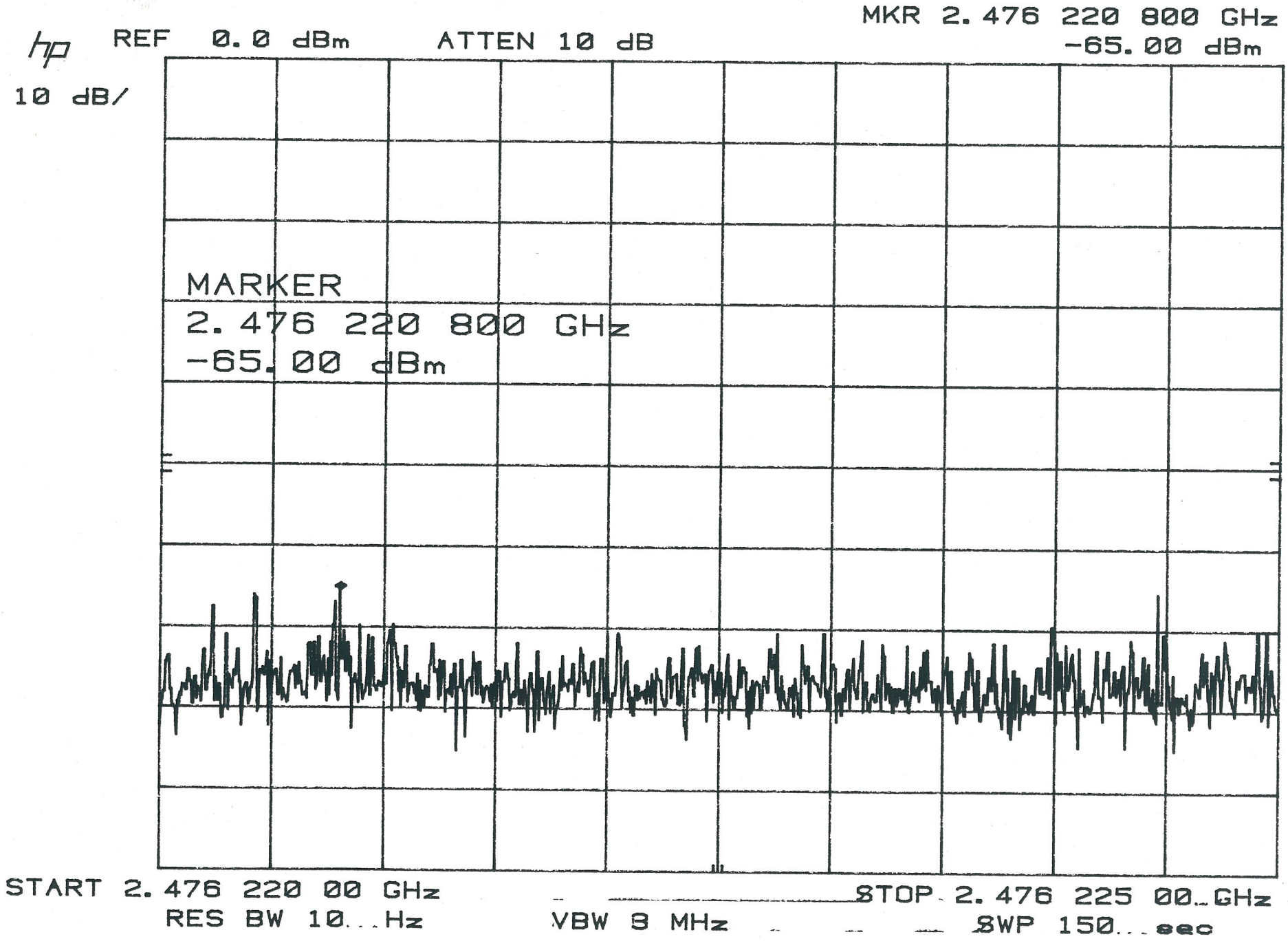
Figure 3-24


MKR 2.476 325 00 GHz
-63.40 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.476 325 00 GHz
-63.40 dBm
START 2.476 300 0 GHz
STOP 2.476 350 0 GHz
RES BW 30 Hz
VBW 3 MHz
SWP 150 sec

Lost 3 oz of the original 12 oz of water
10 minutes

Kenmore
1400 W
2450 MHz

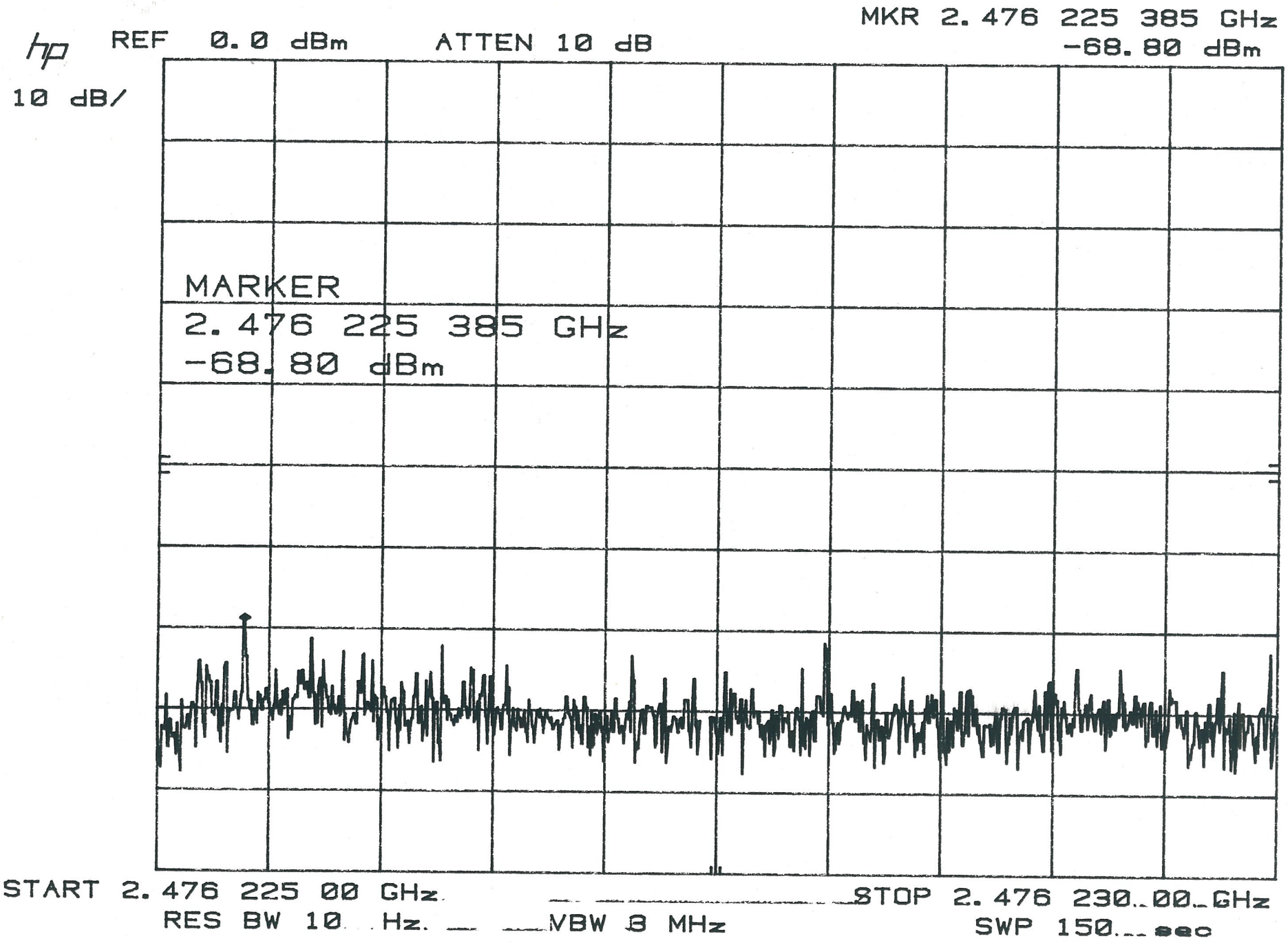
Figure 3-25


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 220 800 GHz
-65.00 dBm
10 dB/
MARKER
2.476 220 800 GHz
-65.00 dBm
START 2.476 220 00 GHz
RES BW 10...Hz
VBW 3 MHz
STOP 2.476 225 00 GHz
SWP 150...sec

Lost 3oz of the original 12 oz of water
10 minutes

Kenmore
1400 W
2450 MHz

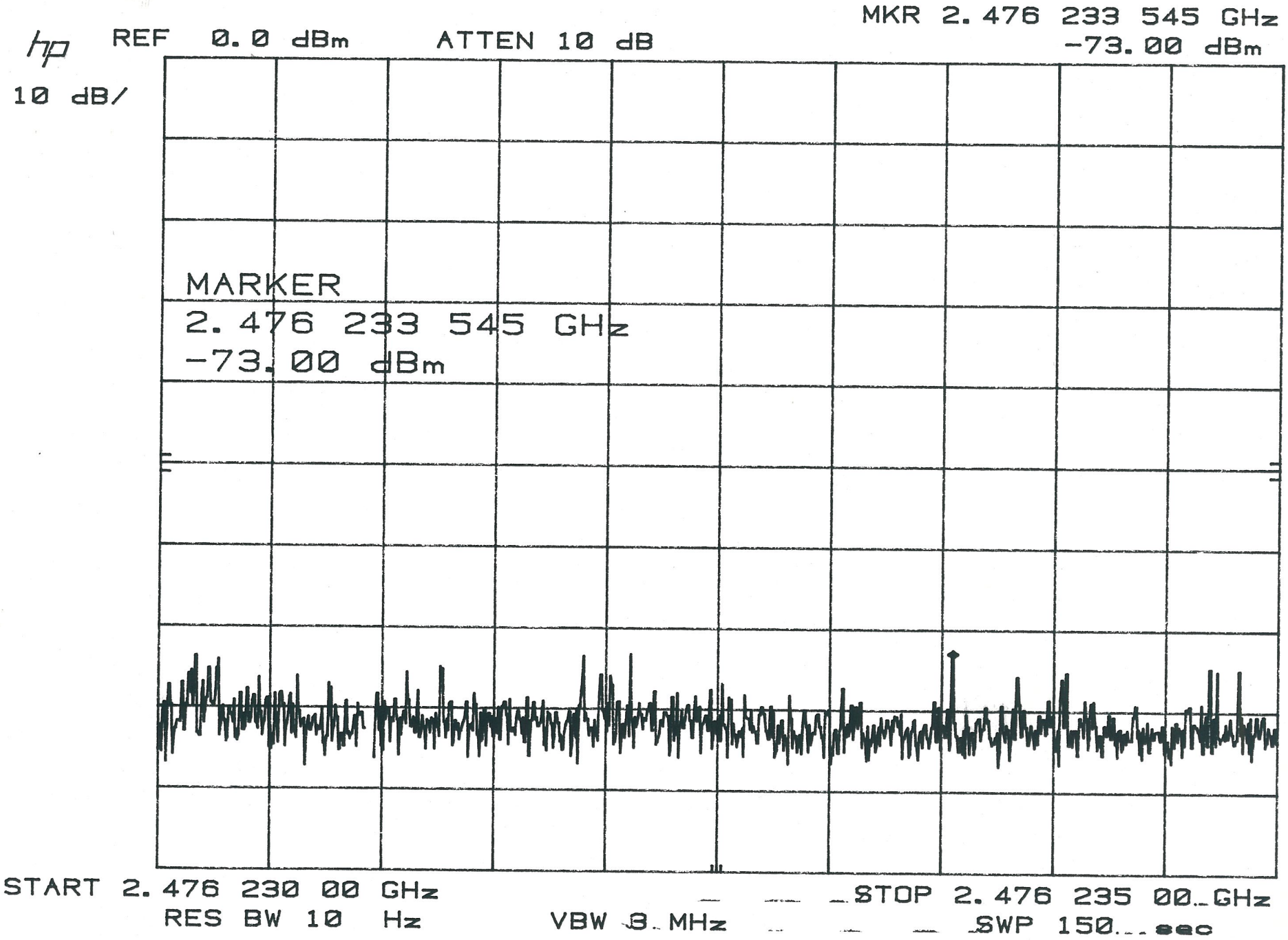
Figure 3-26


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.476 225 385 GHz
-68.80 dBm
10 dB/
MARKER
2.476 225 385 GHz
-68.80 dBm
START 2.476 225 00 GHz
STOP 2.476 230.00 GHz
RES BW 10 Hz
VBW 3 MHz
SWP 150 sec

Lost 3 oz of the original 12 oz of water
10 minutes

Kenmore
1400W
2450MHZ

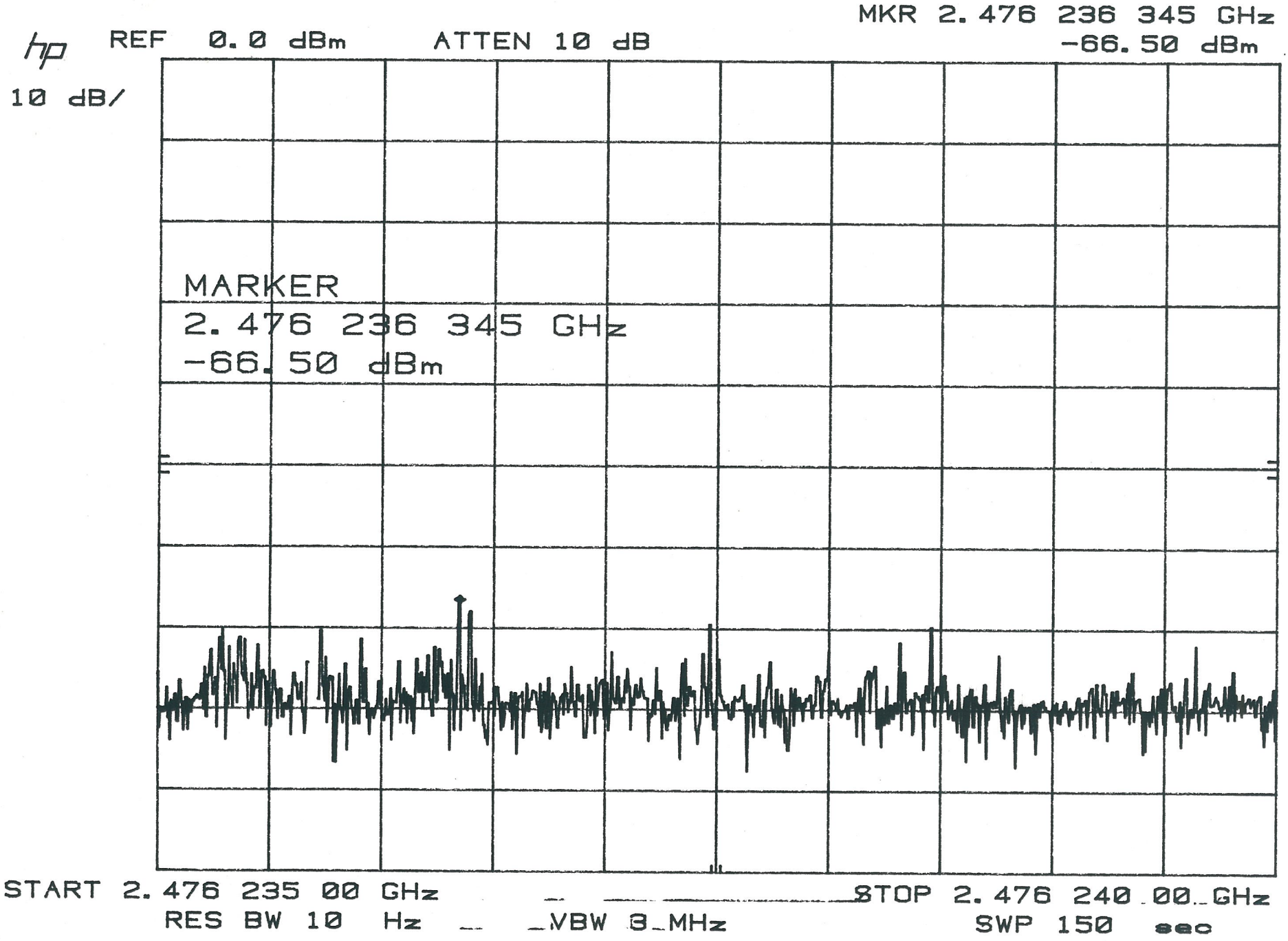
Figure 3-27


MKR 2.476 233 545 GHz
-73.00 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.476 233 545 GHz
-73.00 dBm
START 2.476 230 00 GHz
STOP 2.476 235 00 GHz
RES BW 10 Hz
VBW 3 MHz
SWP 150 sec

Lost 4 1/2 oz of the original 9oz of water
10 minutes

Kenmore
1400W
2450 MHZ

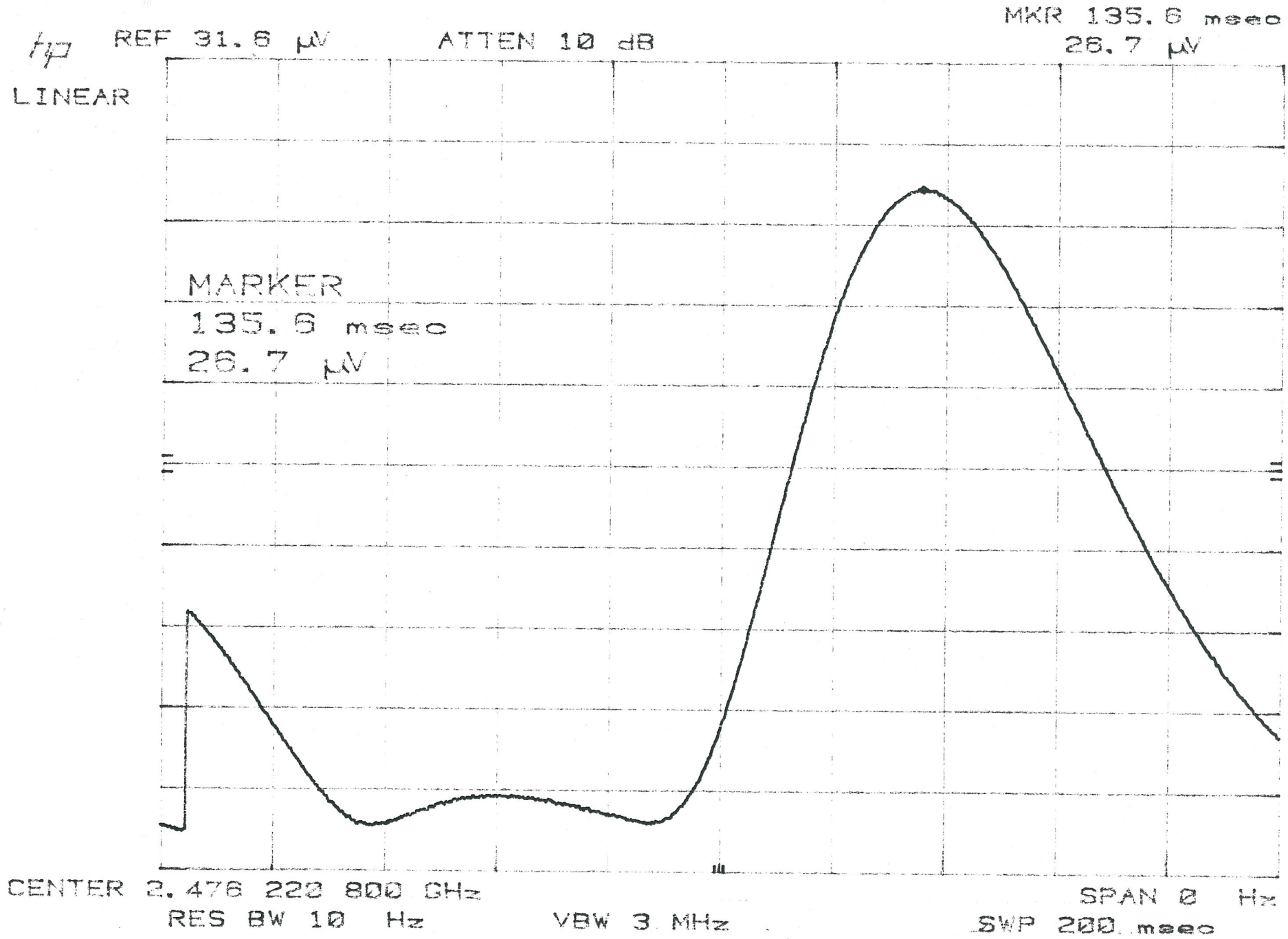
Figure 3-28


MKR 2.476 236 345 GHz
-66.50 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.476 236 345 GHz
-66.50 dBm
START 2.476 235 00 GHz
STOP 2.476 240 00 GHz
RES BW 10 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water
10 minutes

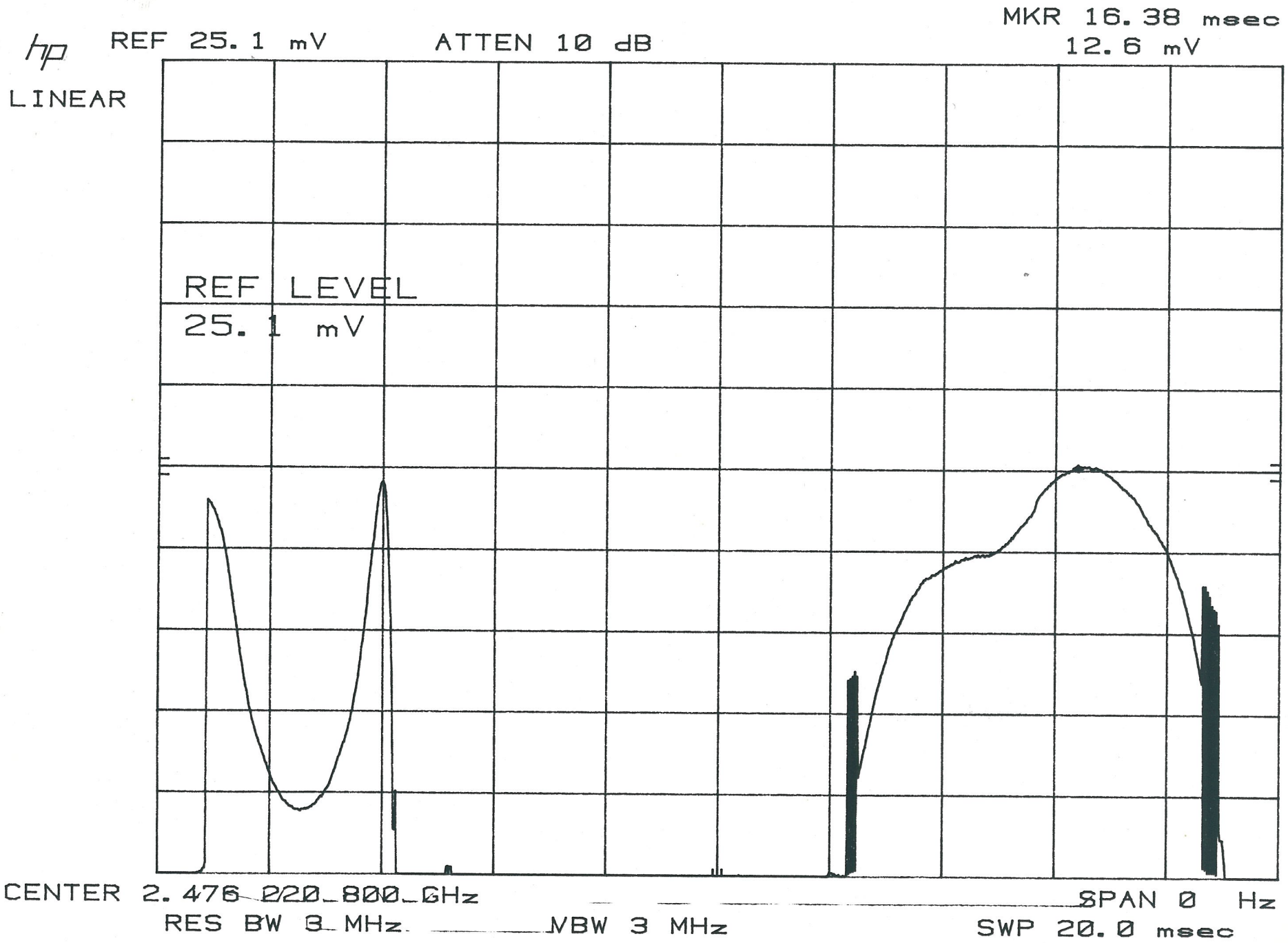
Kenmore
1400W
2450 mHz

Figure 3-29


hp
REF 31.6 µV
ATTEN 10 dB
MKR 135.6 msec
26.7 µV
LINEAR
MARKER
135.6 msec
26.7 µV
CENTER 2.476 222 800 GHz
SPAN 0 Hz
RES BW 10 Hz
VBW 3 MHz
SWP 200 msec

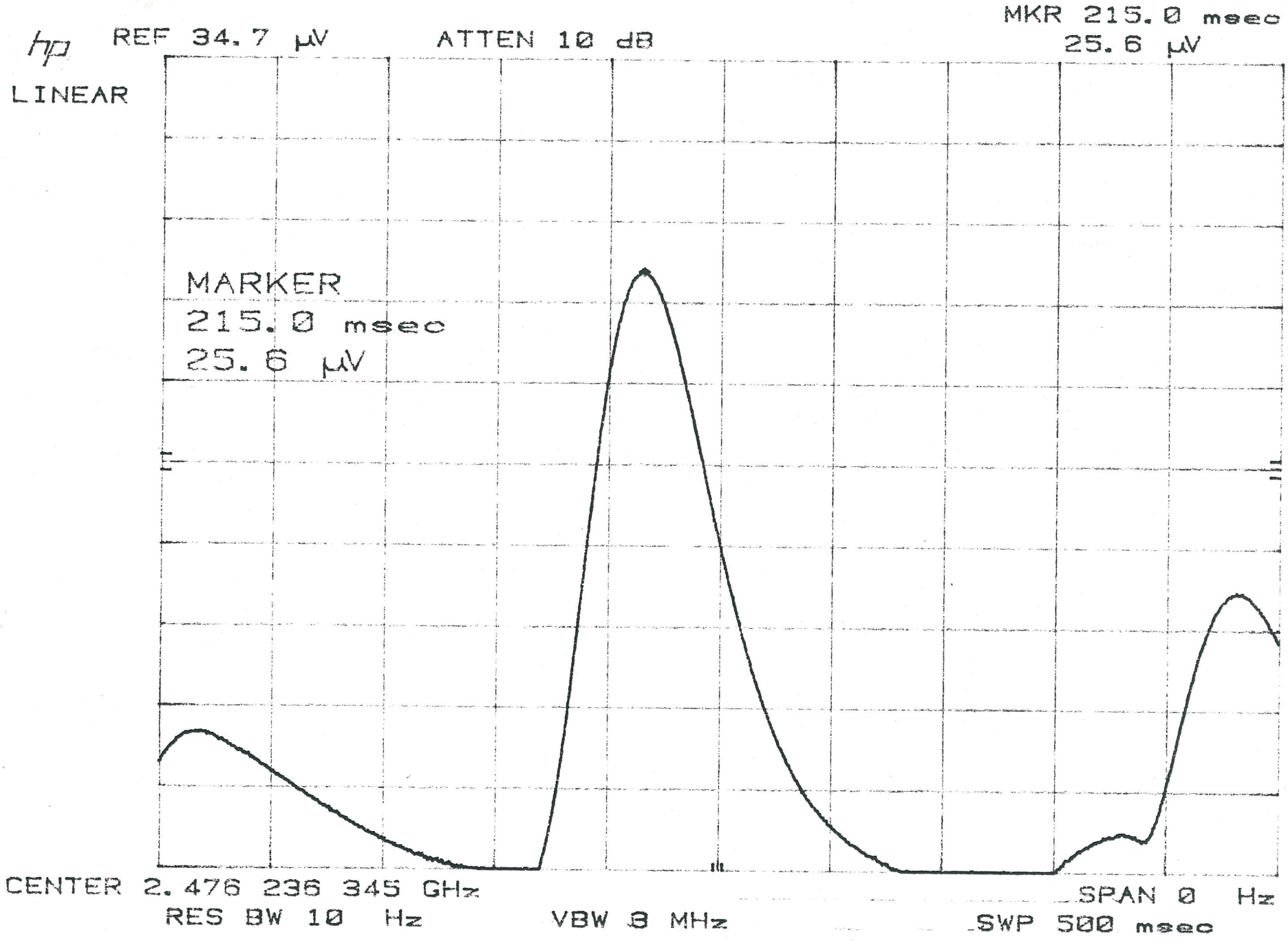
Kenmore
1400 W
2450 MHz

Figure 3-30


MKR 16.38 msec
12.6 mV
REF 25.1 mV
ATTEN 10 dB
LINEAR
REF LEVEL
25.1 mV
CENTER 2.476 220 800 GHz
SPAN 0 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

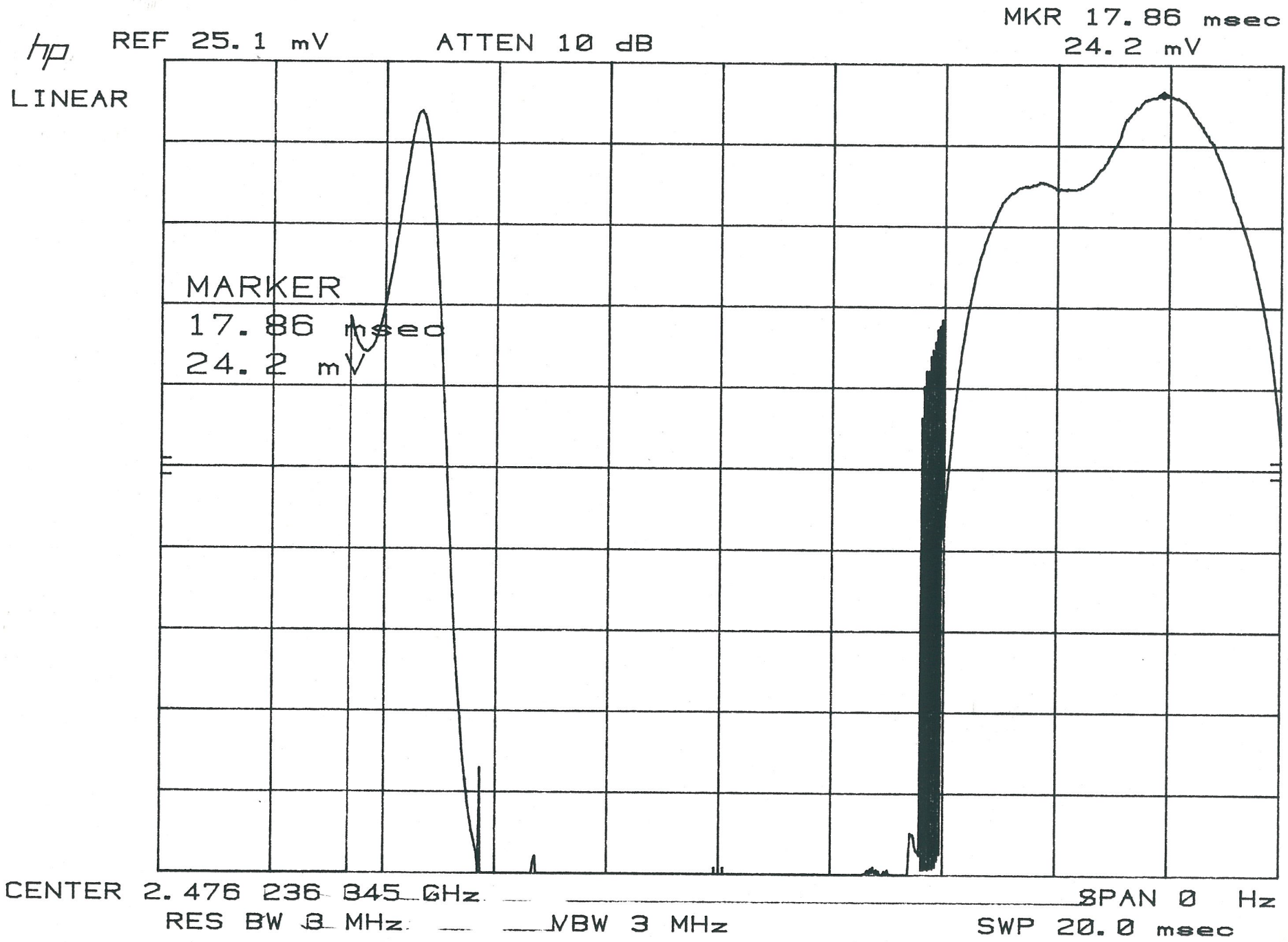
Kenmore
1400 W
2450 mHz

Figure 3-31


hp
REF 34.7 µV
ATTEN 10 dB
MKR 215.0 msec
25.6 µV
LINEAR
MARKER
215.0 msec
25.6 µV
CENTER 2.476 236 345 GHz
RES BW 10 Hz
VBW 3 MHz
SPAN 0 Hz
SWP 500 msec

Kenmore
1400W
2450MHZ

Figure 3-32

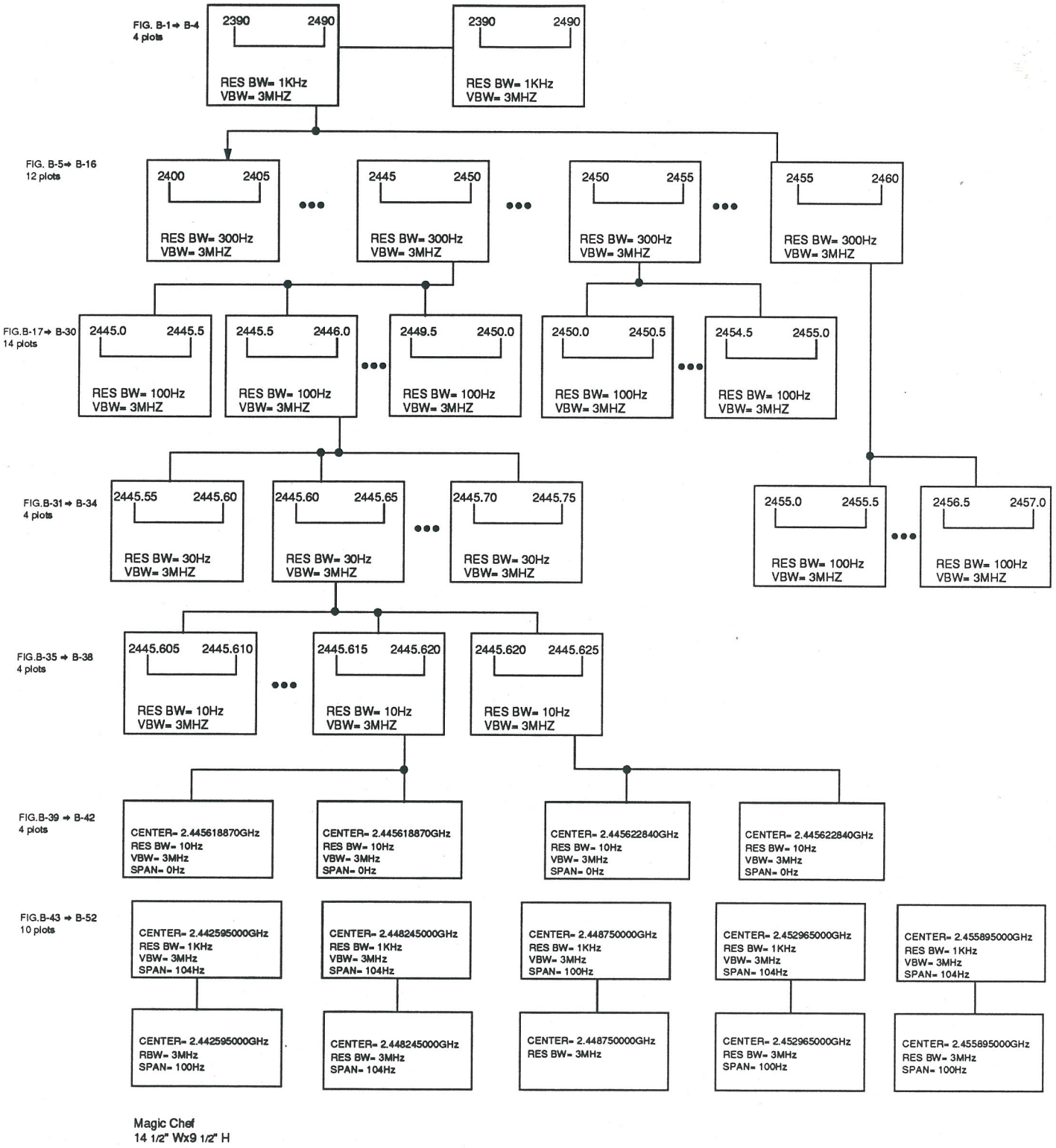

hp
REF 25.1 mV
ATTEN 10 dB
MKR 17.86 msec
24.2 mV
LINEAR
MARKER
17.86 msec
24.2 mV
CENTER 2.476 236 845 GHz
SPAN 0 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Kenmore
1400 W
2450 MHZ

Figure 3-33

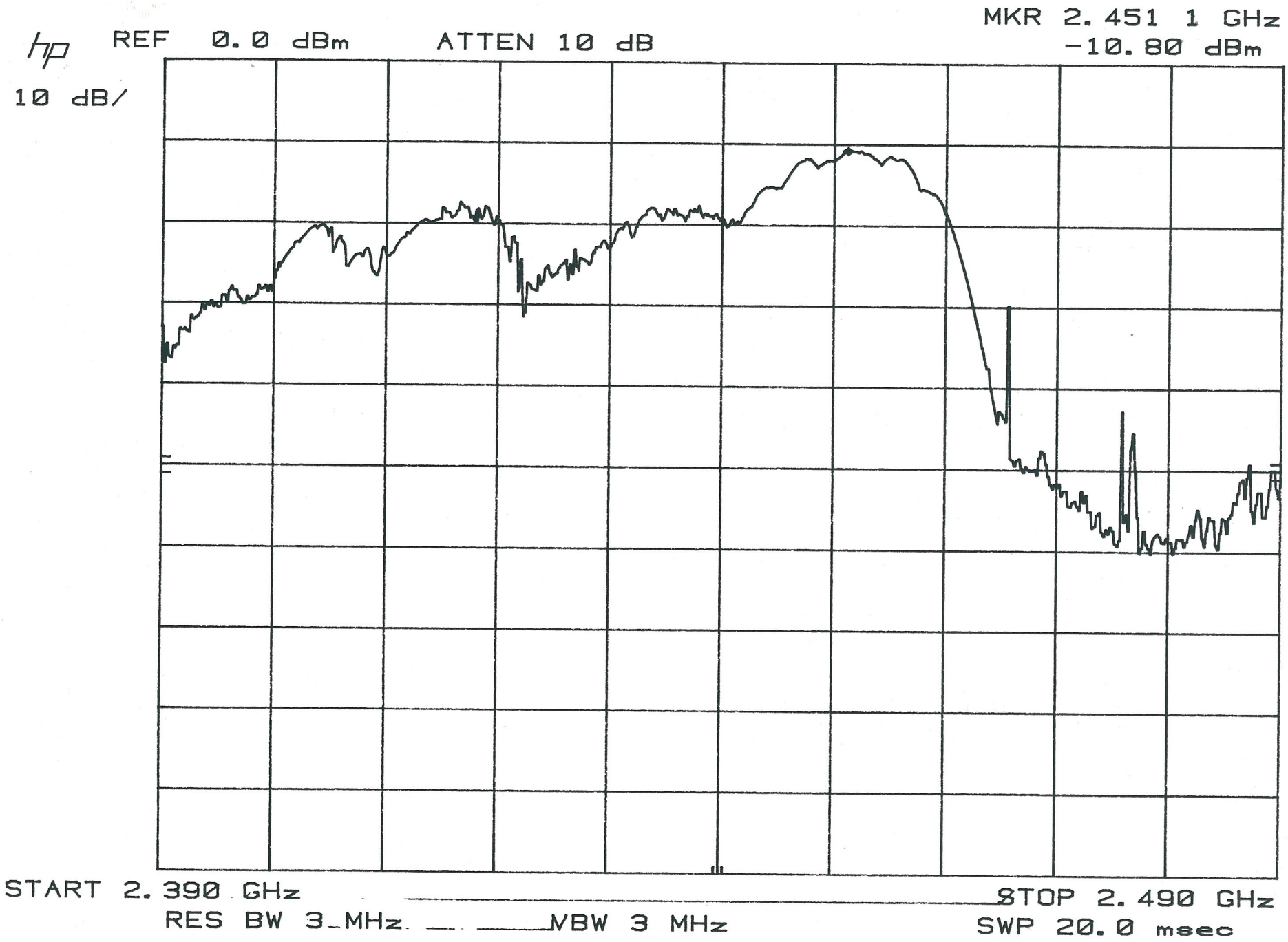
APPENDIX B

Magic Chef
14 1/2" x9 1/2"



Magic Chef
14 1/2" Wx9 1/2" H

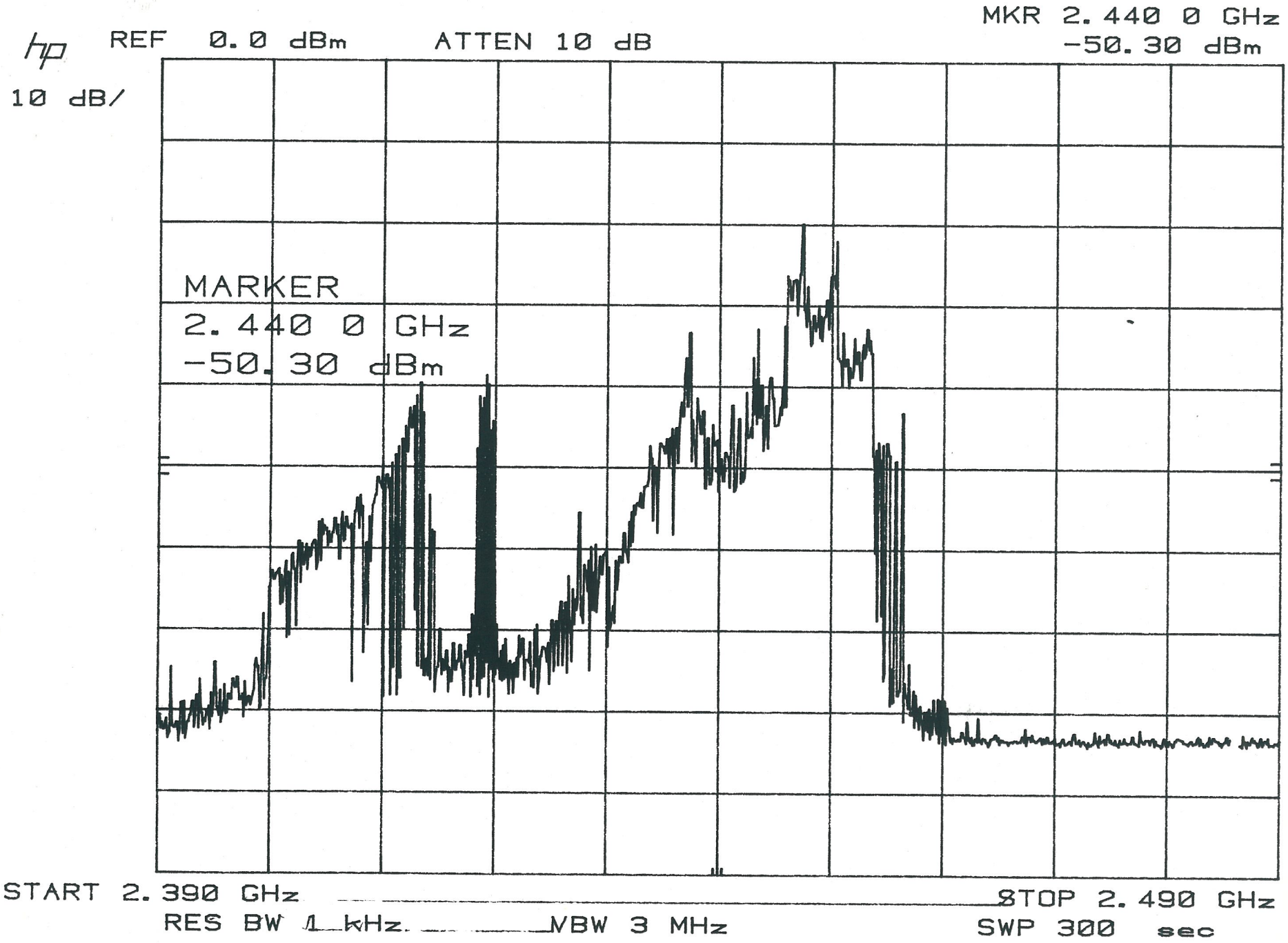
FIGURE B.0


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.451 1 GHz
-10.80 dBm
10 dB/
START 2.390 GHz
STOP 2.490 GHz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Lost ½ cup of the original 1½ cups water
10 minutes

Magic Chef
2450 MHz
Model # MW317Z-4

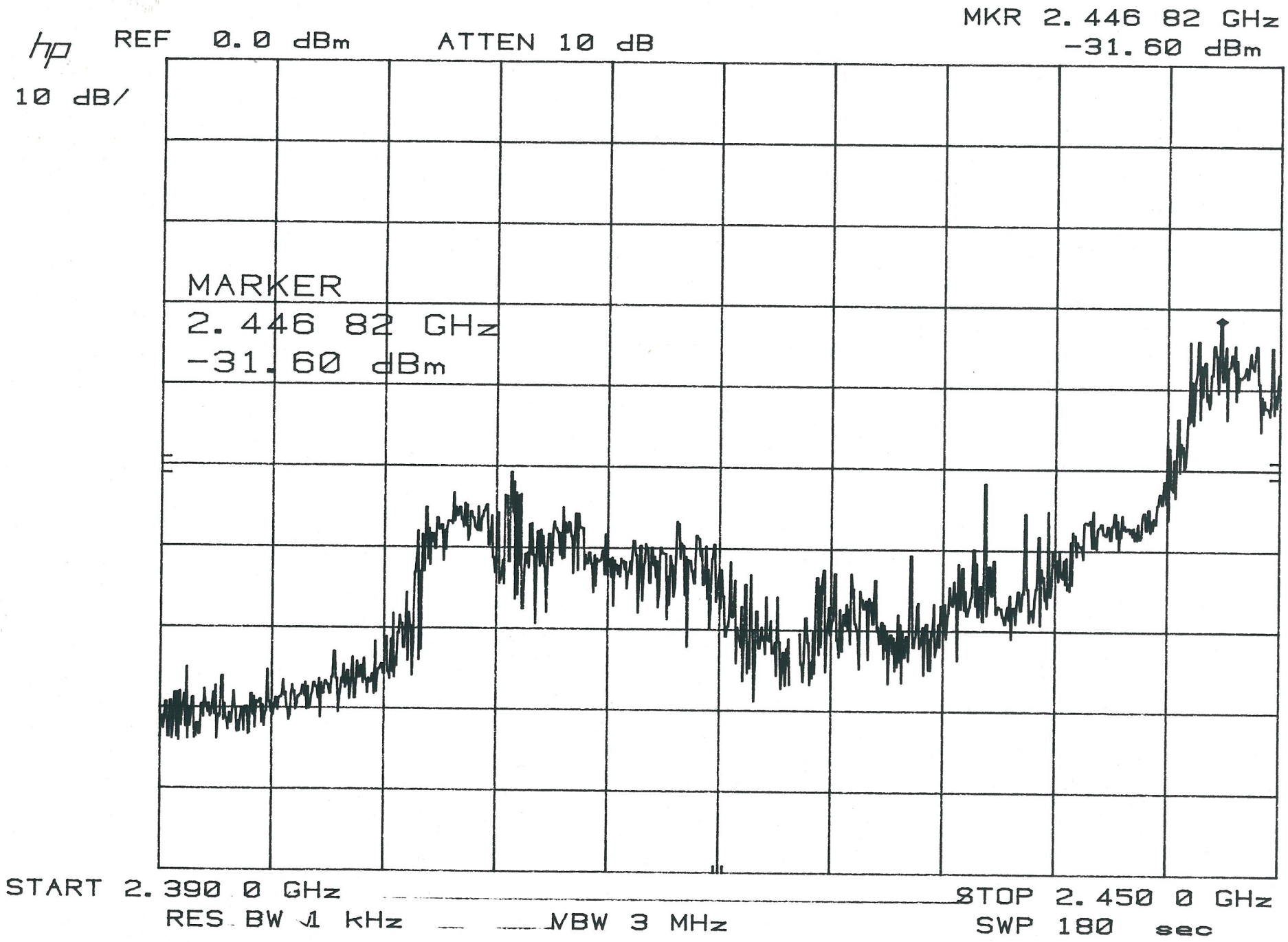
Figure 4-1


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.440 0 GHz
-50.30 dBm
10 dB/
MARKER
2.440 0 GHz
-50.30 dBm
START 2.390 GHz
STOP 2.490 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 300 sec

Lost 9 oz of the original 12 oz of water
15 minutes

Magic Chef
2450 MHz

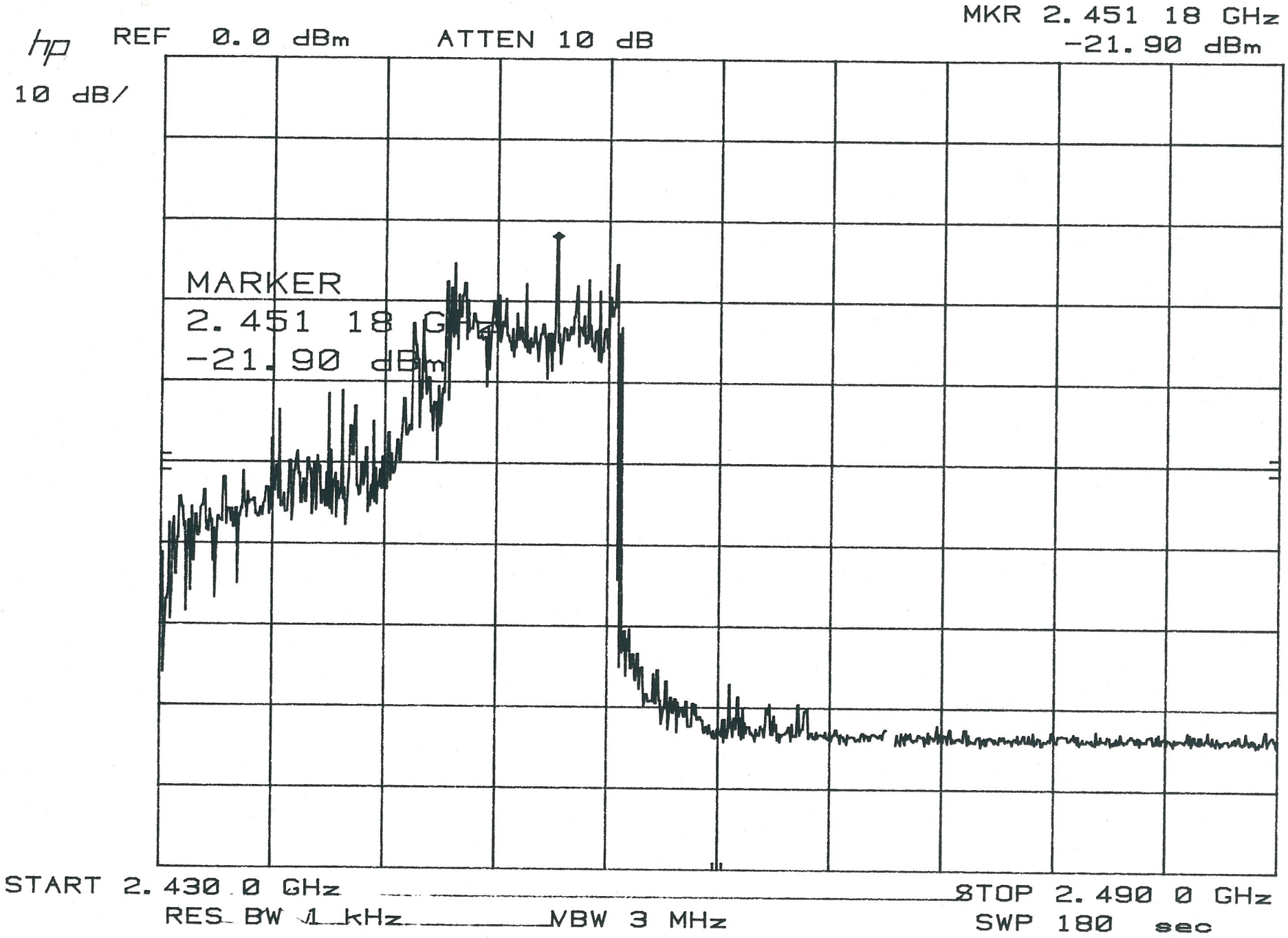
Figure 4-2


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.446 82 GHz
-31.60 dBm
10 dB/
MARKER
2.446 82 GHz
-31.60 dBm
START 2.390 0 GHz
STOP 2.450 0 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 180 sec

Lost 2½ oz of the original 12 oz of water
10 minutes

Magic Chef
2450 MHZ

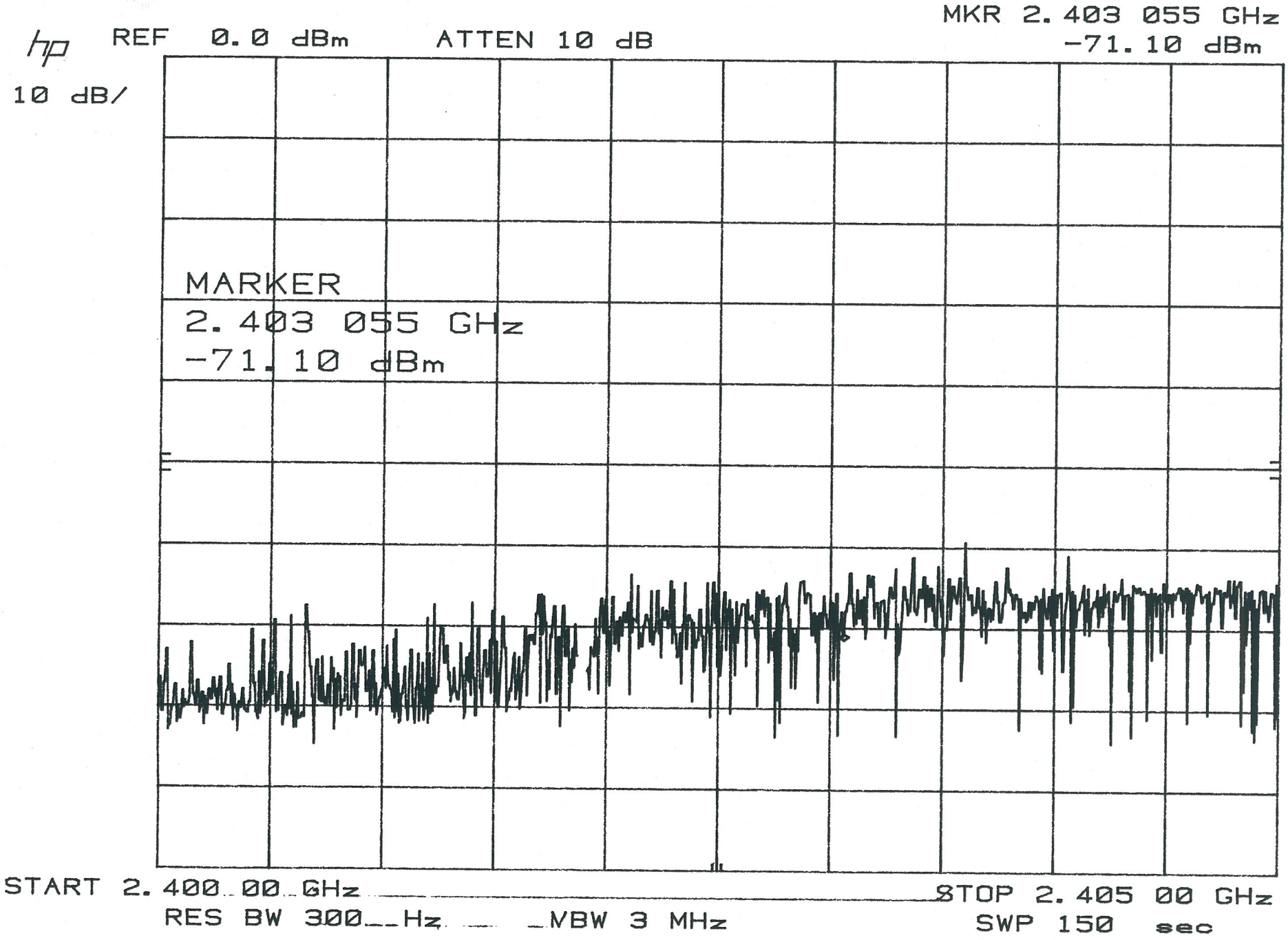
Figure 4-3


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.451 18 GHz
-21.90 dBm
10 dB/
MARKER
2.451 18 GHz
-21.90 dBm
START 2.430 0 GHz
STOP 2.490 0 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 180 sec

Lost ½ cup of the original 1½ cups of water
10 minutes

Magic Chef
2450 MHz

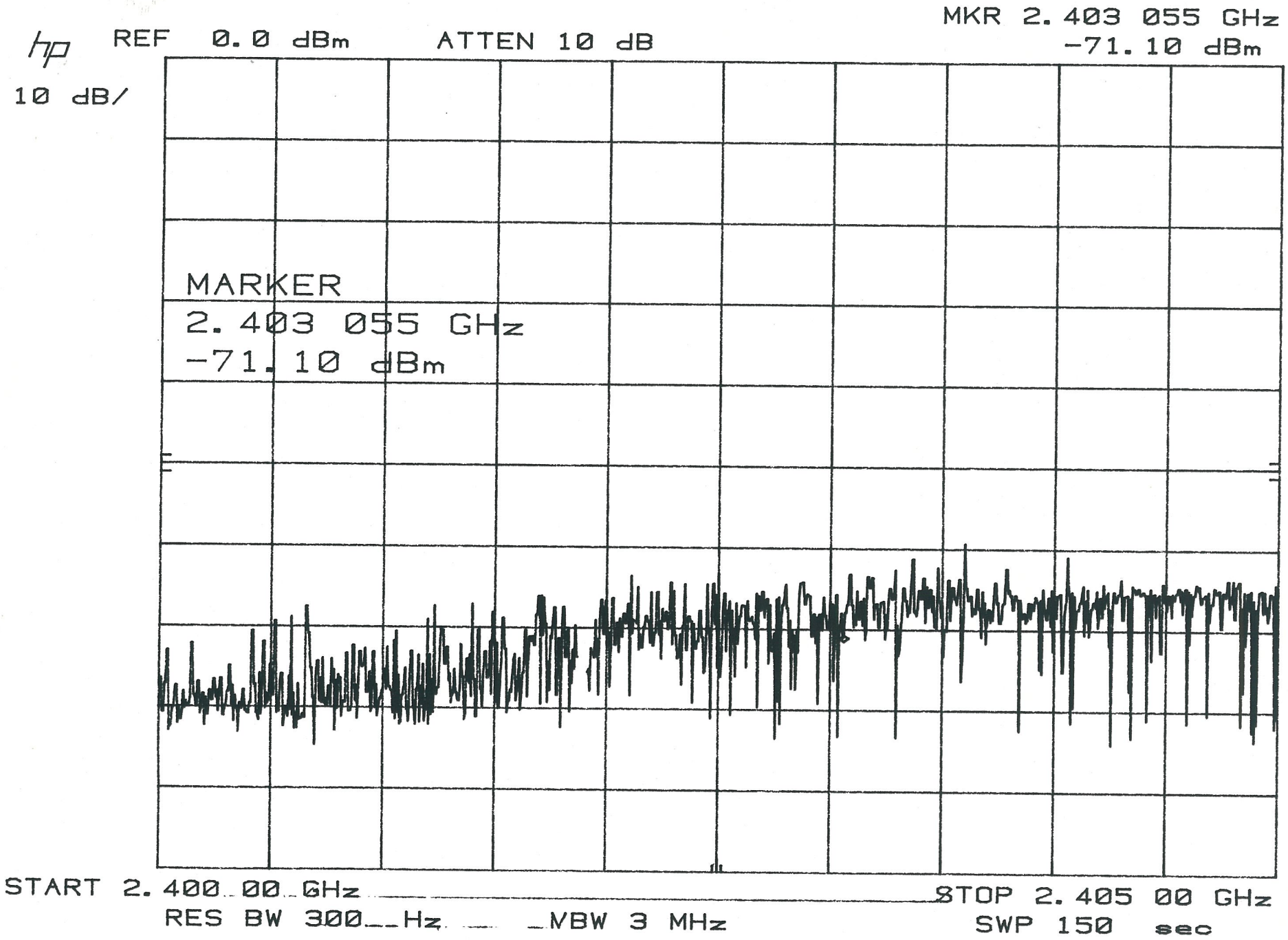
Figure 4-4


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.403 055 GHz
-71.10 dBm
10 dB/
MARKER
2.403 055 GHz
-71.10 dBm
START 2.400 00 GHz
STOP 2.405 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

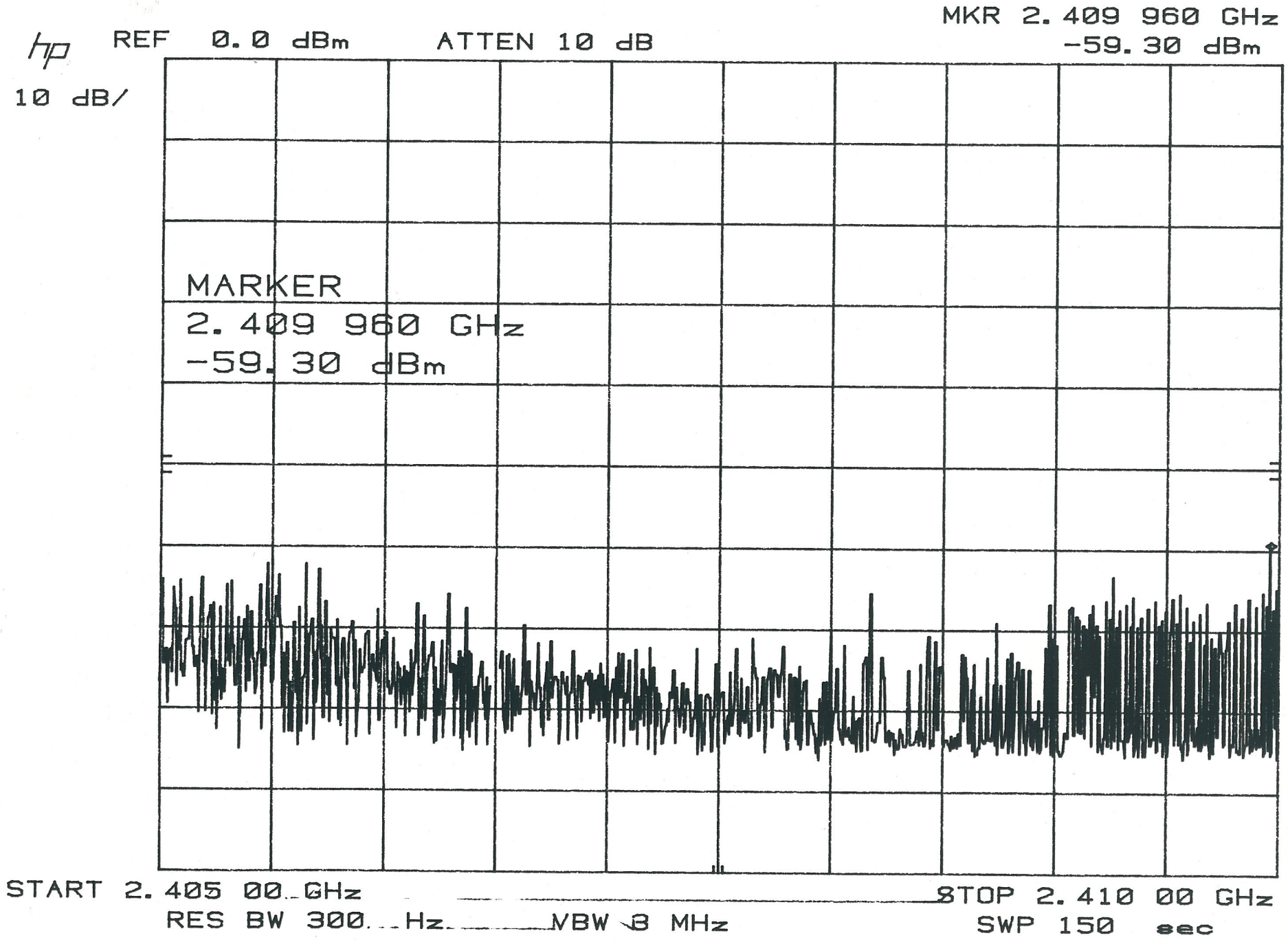
Figure 4-5


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.403 055 GHz
-71.10 dBm
10 dB/
MARKER
2.403 055 GHz
-71.10 dBm
START 2.400 00 GHz
STOP 2.405 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

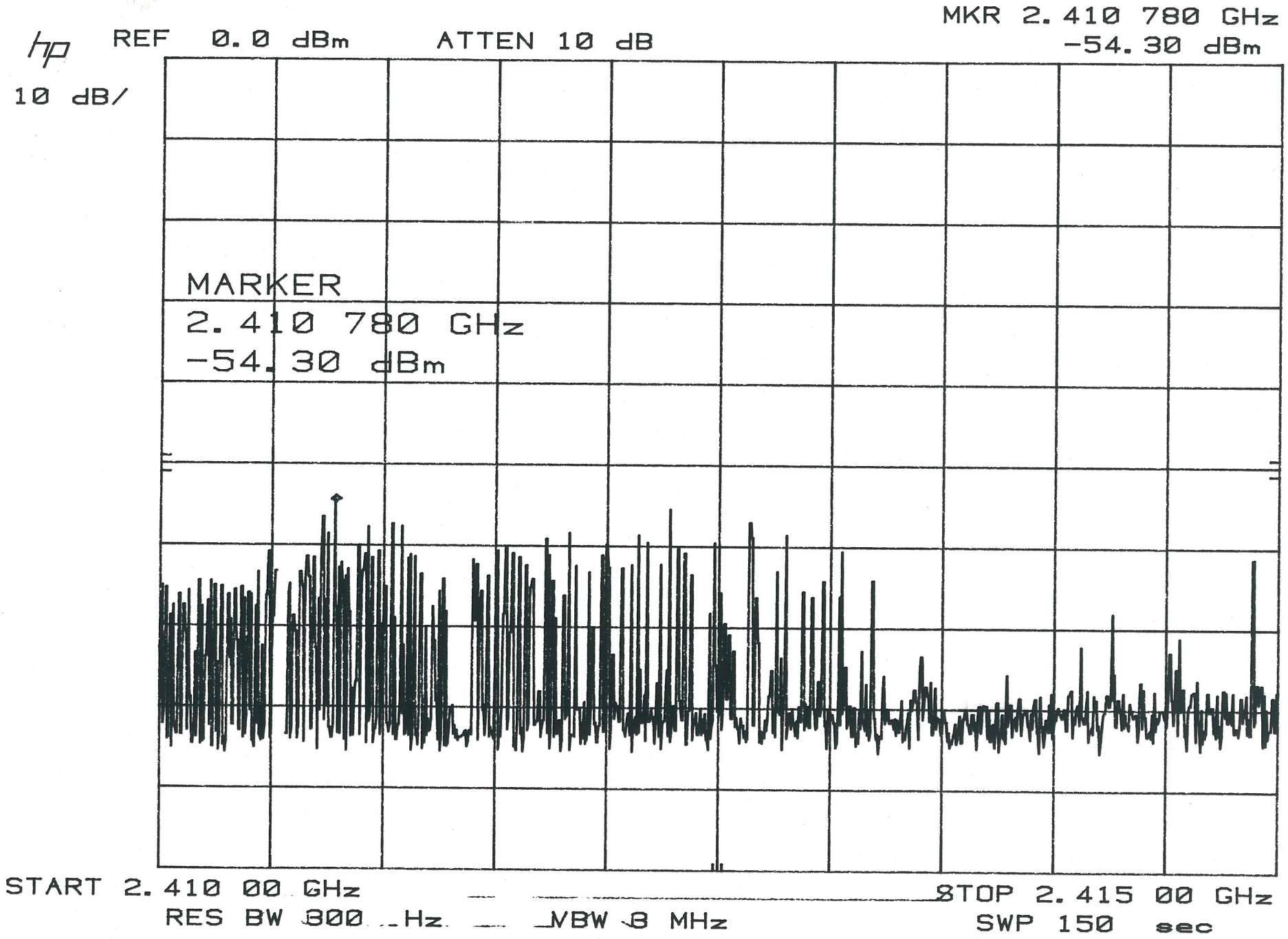
Figure 4-5


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.409 960 GHz
-59.30 dBm
10 dB/
MARKER
2.409 960 GHz
-59.30 dBm
START 2.405 00 GHz
STOP 2.410 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

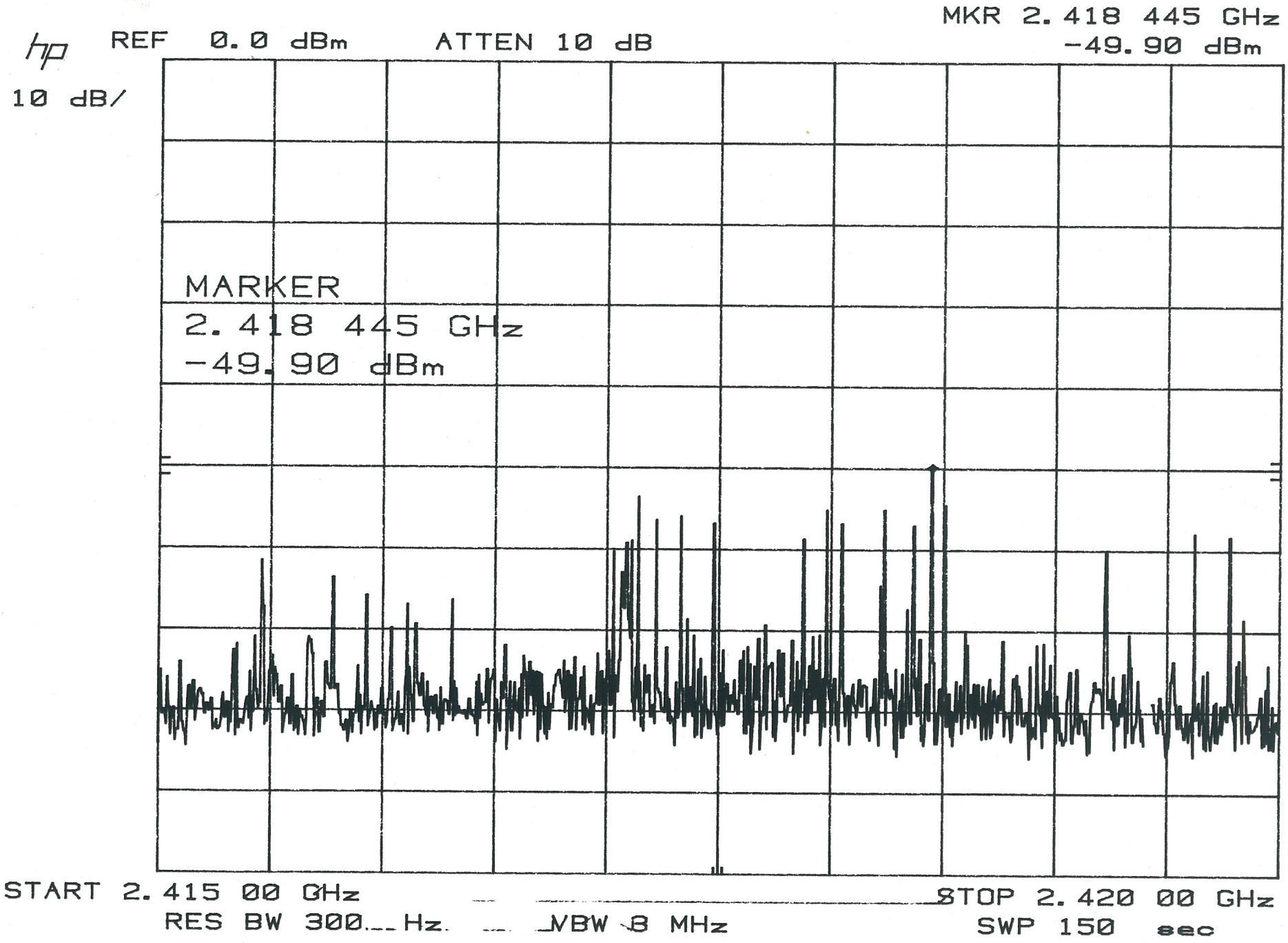
Figure 4-6


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.410 780 GHz
-54.30 dBm
10 dB/
MARKER
2.410 780 GHz
-54.30 dBm
START 2.410 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.415 00 GHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

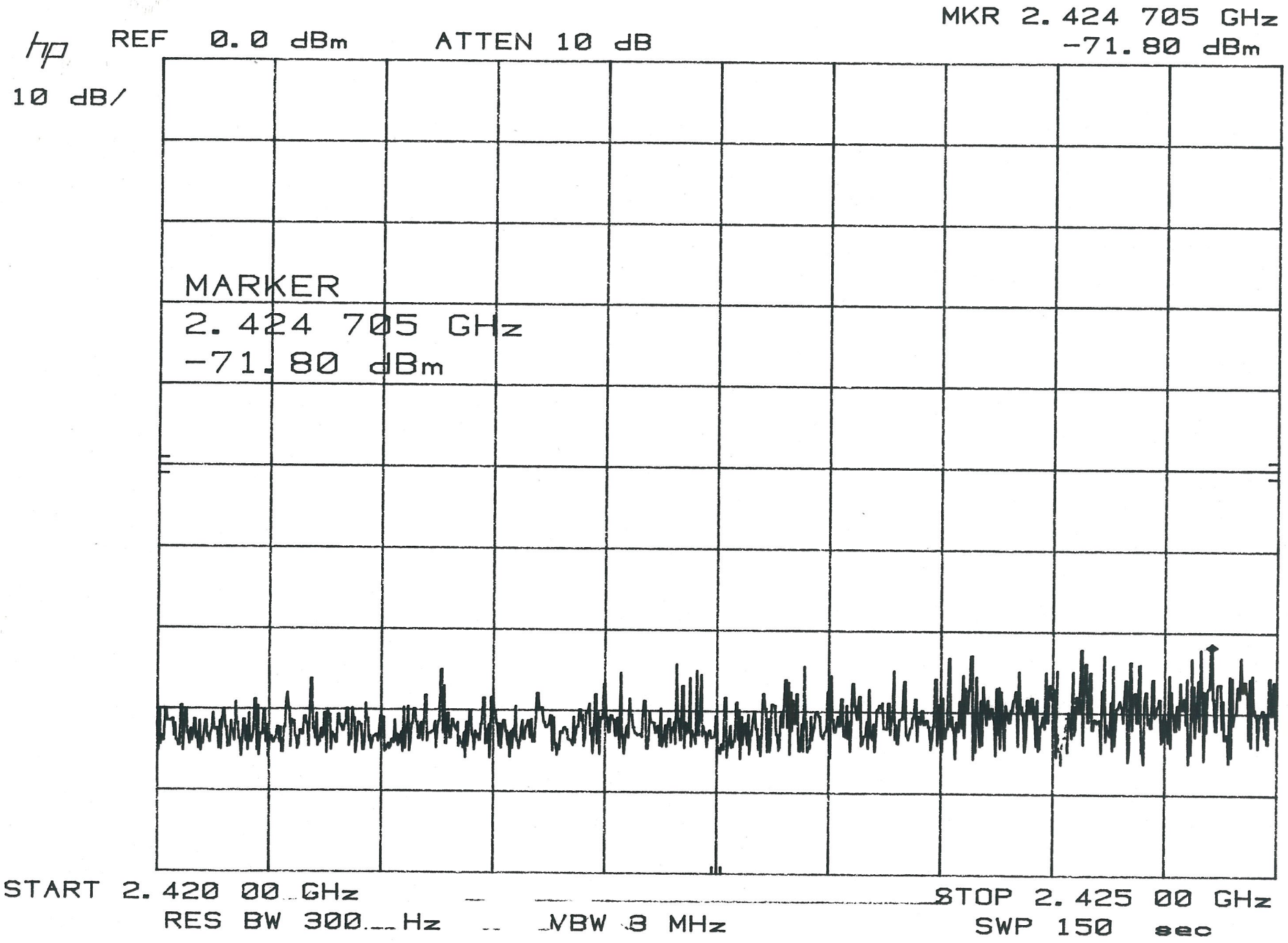
Figure 4-7


MKR 2.418 445 GHz
-49.90 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.418 445 GHz
-49.90 dBm
START 2.415 00 GHz
STOP 2.420 00 GHz
RES BW 300 Hz
VBW 8 MHz
SWP 150 sec

Lost 3oz of the original 9oz of water
10 minutes

Magic Chef
2450MHz

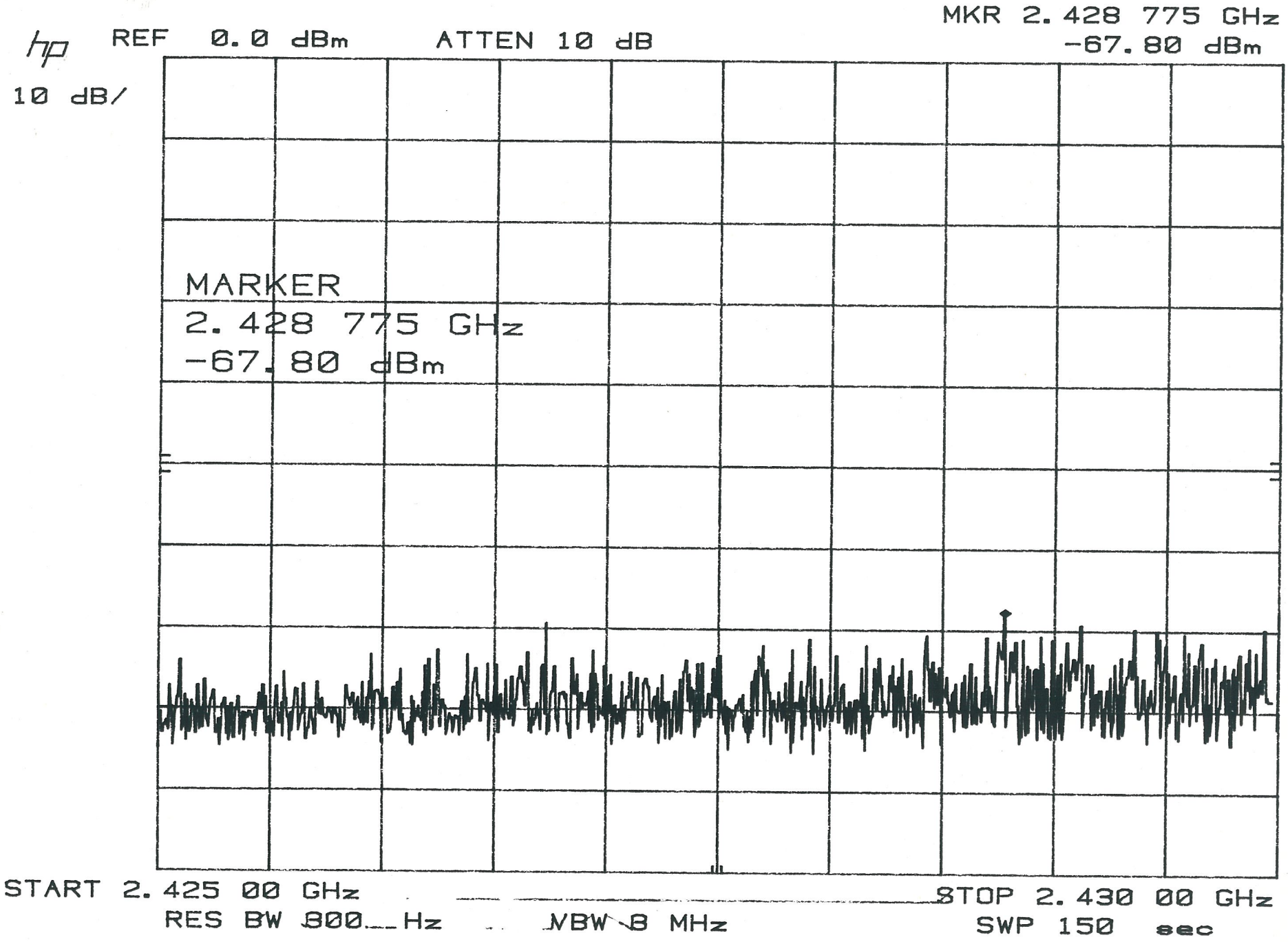
Figure 4-8


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.424 705 GHz
-71.80 dBm
10 dB/
MARKER
2.424 705 GHz
-71.80 dBm
START 2.420 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.425 00 GHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

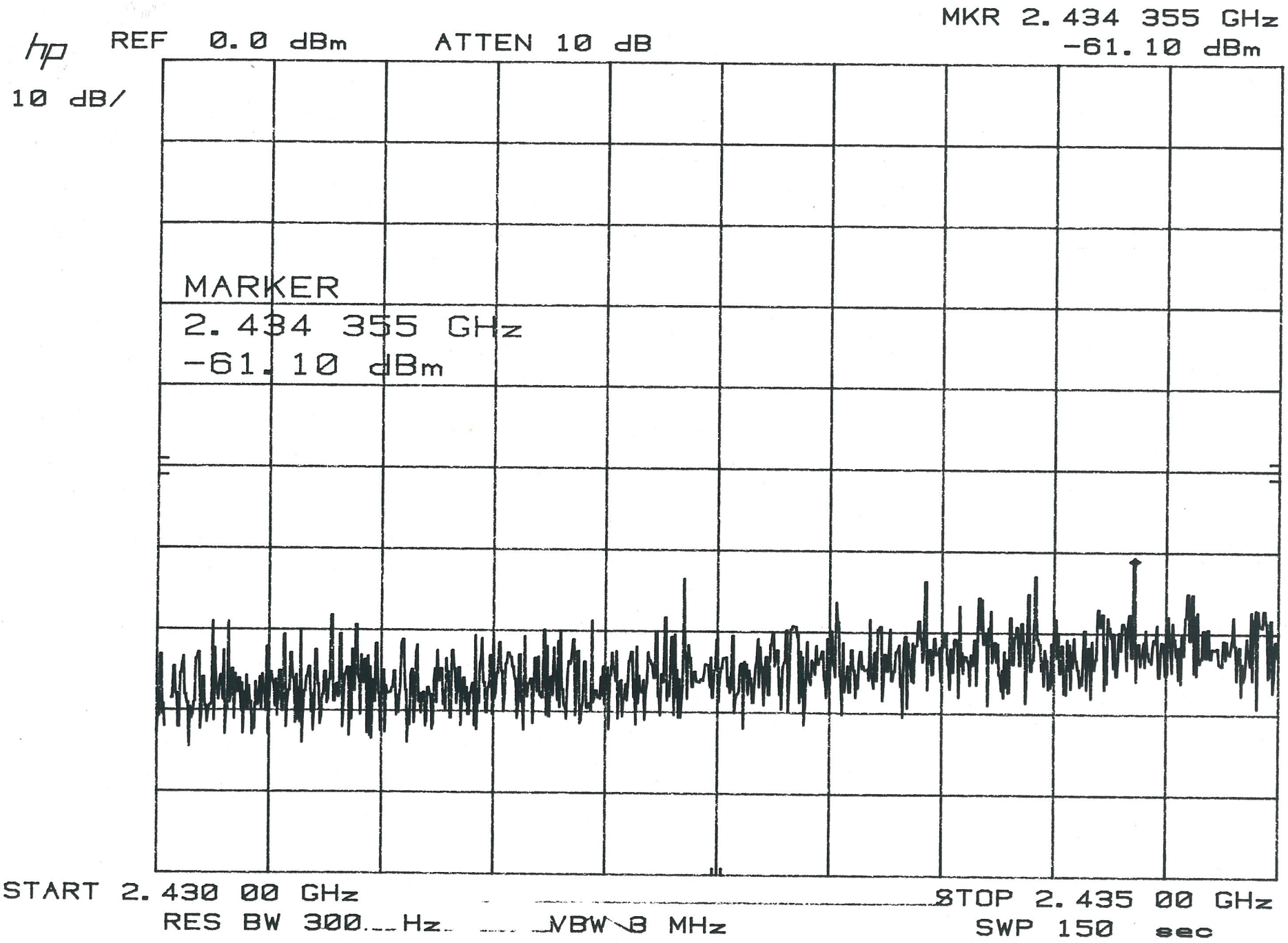
Figure 4-9


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.428 775 GHz
-67.80 dBm
10 dB/
MARKER
2.428 775 GHz
-67.80 dBm
START 2.425 00 GHz
STOP 2.430 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

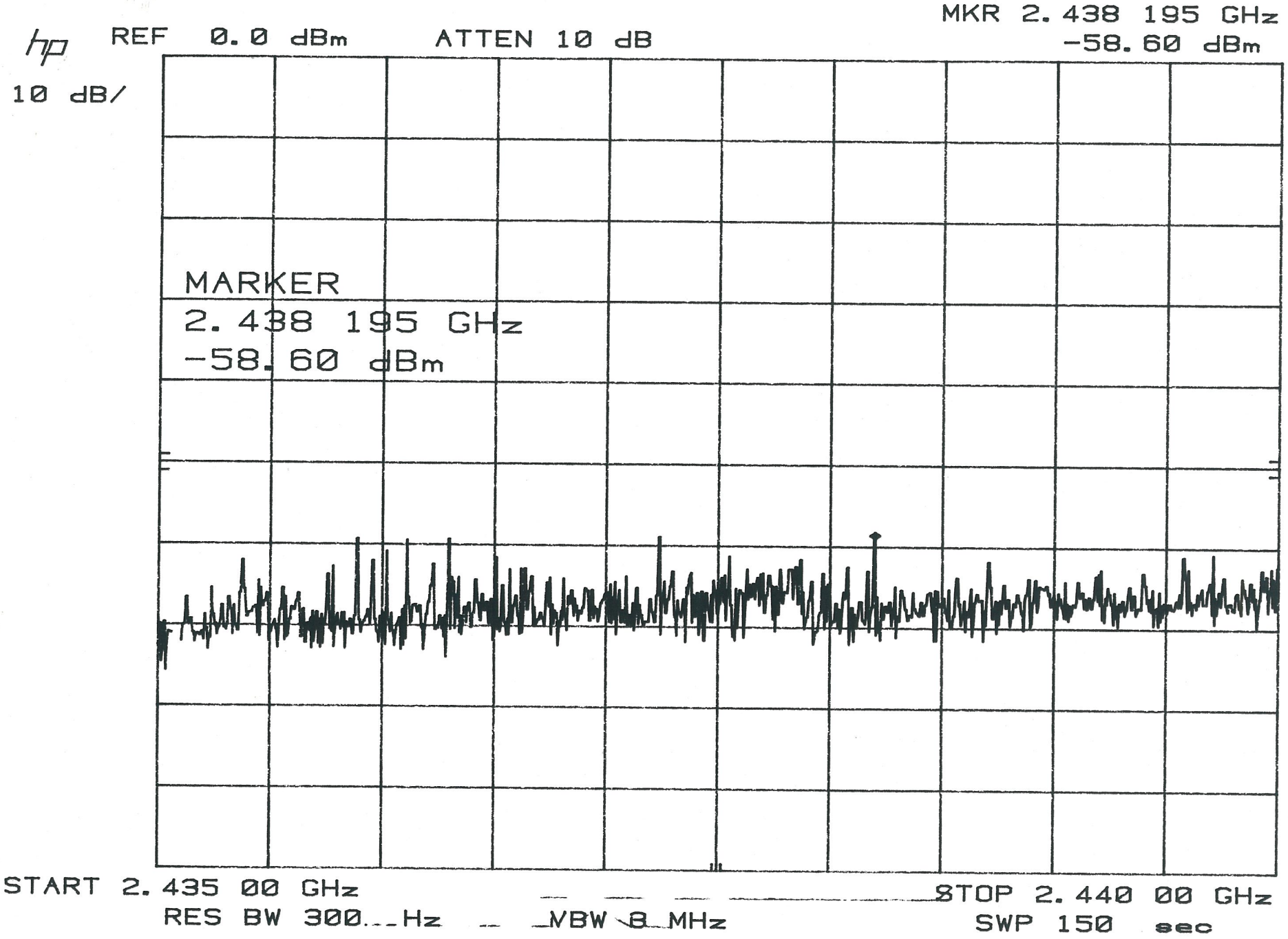
Figure 4-10


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.434 355 GHz
-61.10 dBm
10 dB/
MARKER
2.434 355 GHz
-61.10 dBm
START 2.430 00 GHz
RES BW 300 Hz
VBW 3 MHz
STOP 2.435 00 GHz
SWP 150 sec

Lost 3½ oz of the original 12 oz of water
10 minutes

Magic Chef
2450 MHz

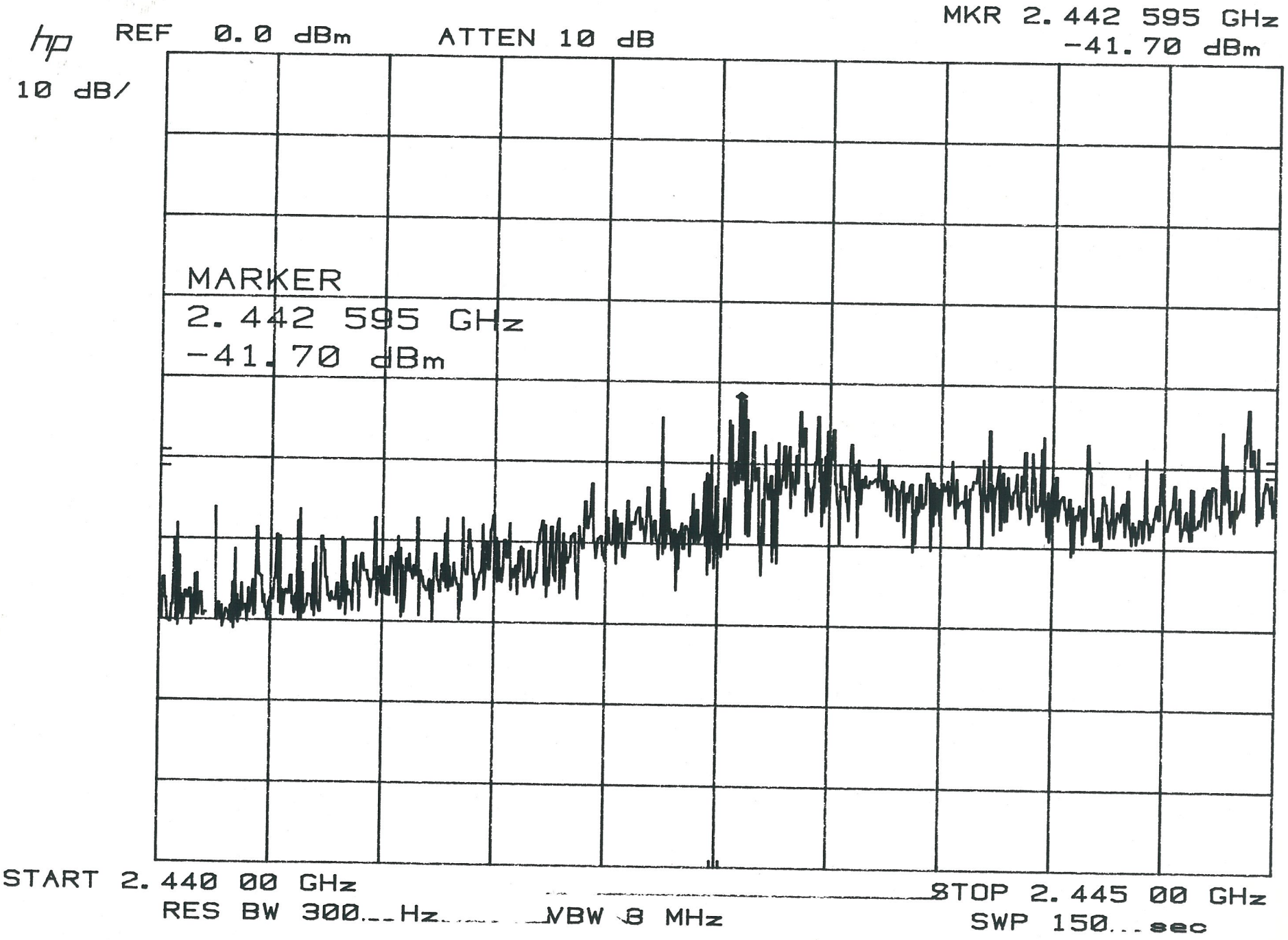
Figure 4-11


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.438 195 GHz
-58.60 dBm
10 dB/
MARKER
2.438 195 GHz
-58.60 dBm
START 2.435 00 GHz
RES BW 300 Hz
VBW 8 MHz
STOP 2.440 00 GHz
SWP 150 sec

Lost 3 oz of the original 12 oz of water
10 minutes

Magic Chef
2450 MHz

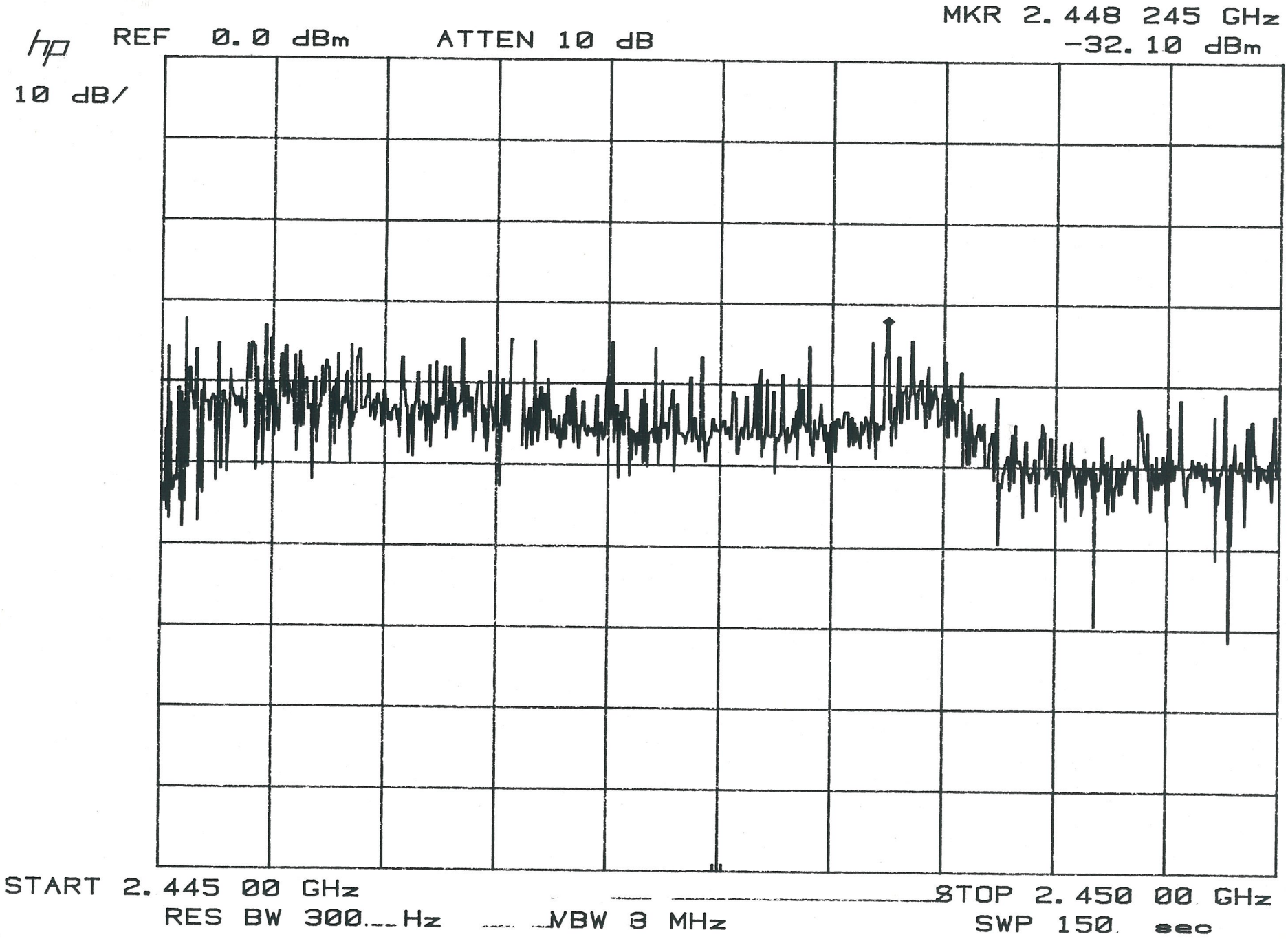
Figure 4-12


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.442 595 GHz
-41.70 dBm
10 dB/
MARKER
2.442 595 GHz
-41.70 dBm
START 2.440 00 GHz
RES BW 300 Hz
VBW 8 MHz
STOP 2.445 00 GHz
SWP 150 sec

Lost 3½ oz of the original 12 oz of water
10 minutes

Magic Chef
2450 MHZ

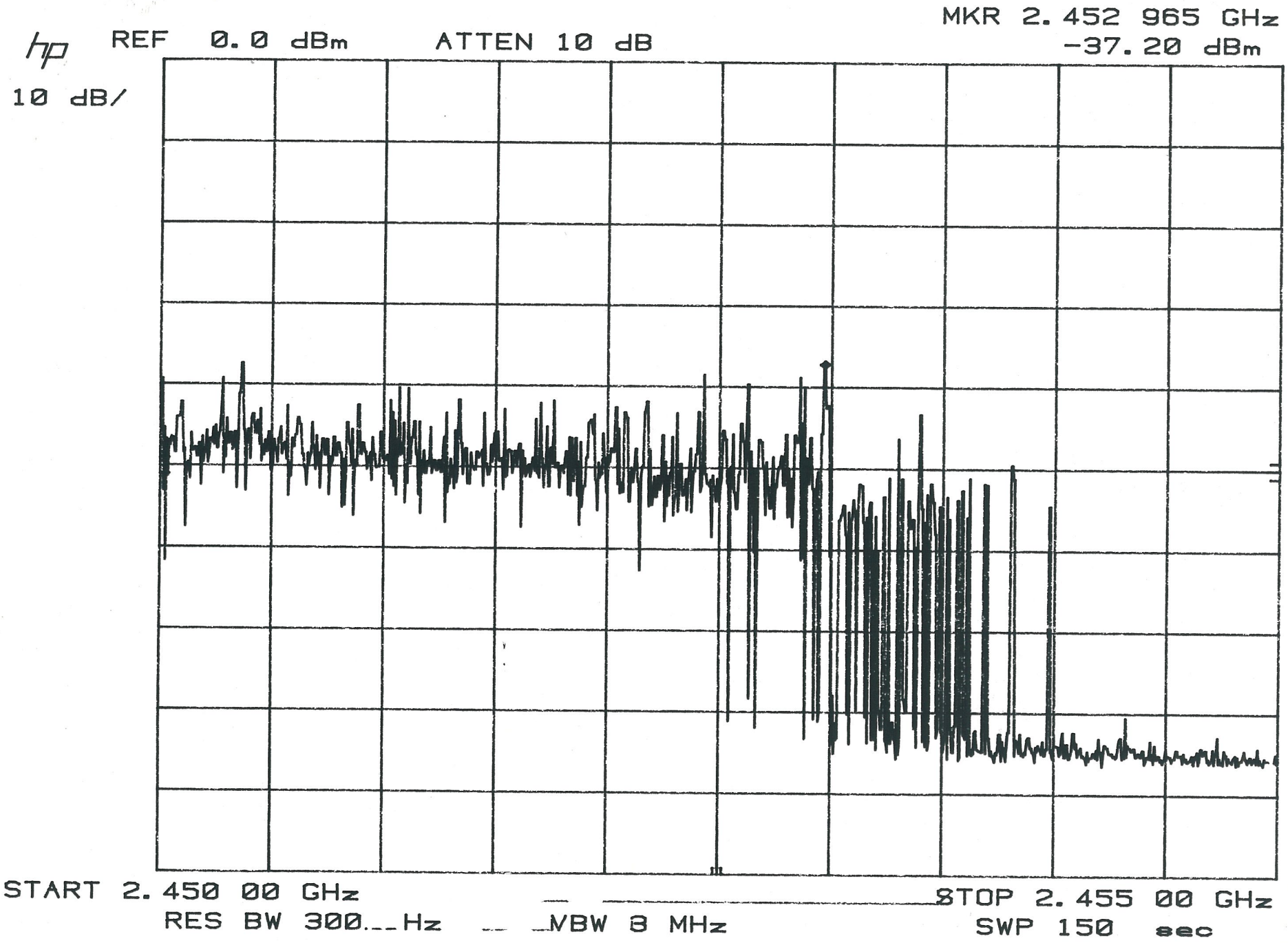
Figure 4-13


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.448 245 GHz
-32.10 dBm
10 dB/
START 2.445 00 GHz
RES BW 300 Hz
VBW 8 MHz
STOP 2.450 00 GHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water
10 minutes

Magic Chef
2450 MHz

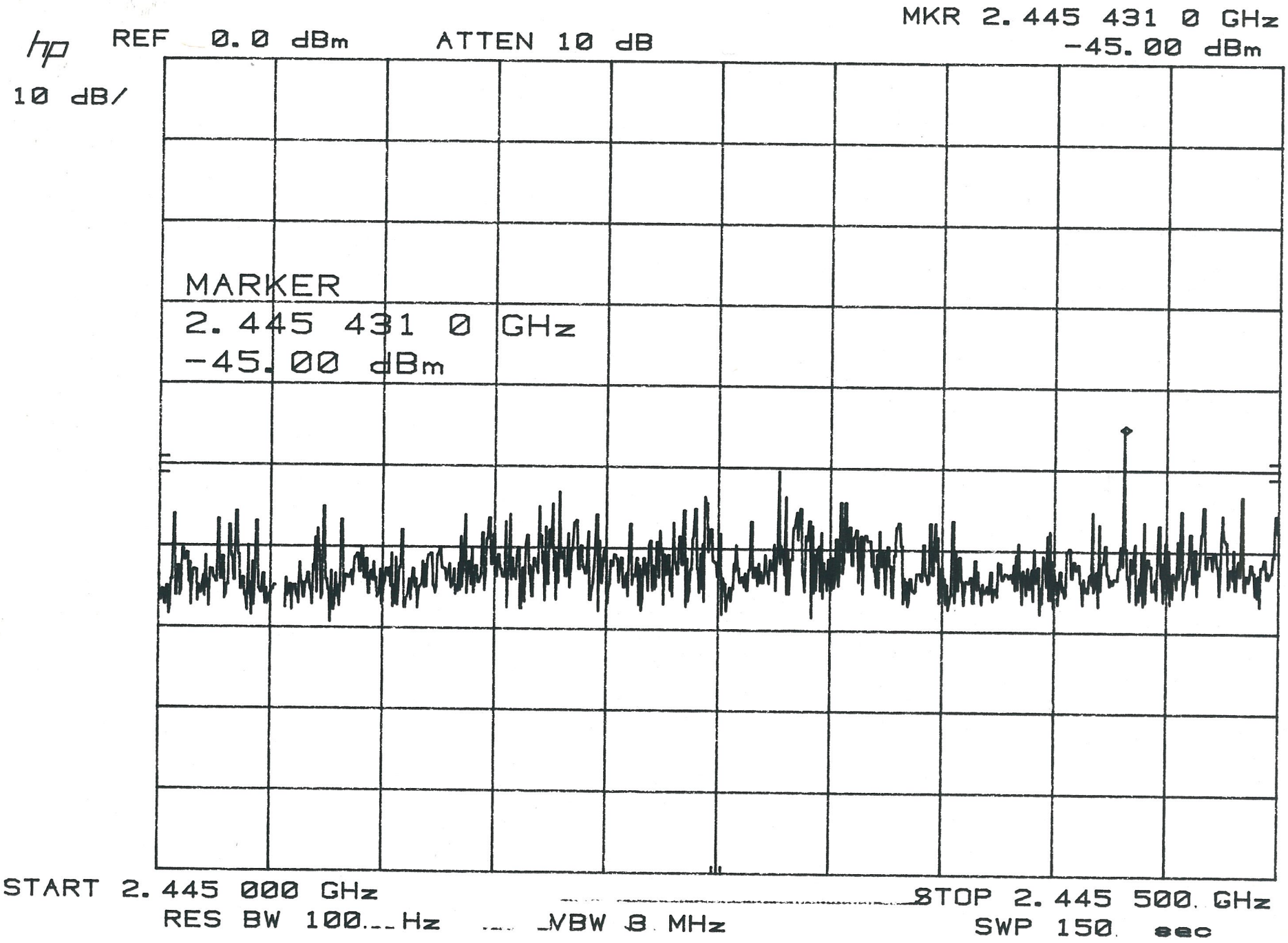
Figure 4-14


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.452 965 GHz
-37.20 dBm
10 dB/
START 2.450 00 GHz
RES BW 300 Hz
VBW 8 MHz
STOP 2.455 00 GHz
SWP 150 sec

Lost 4oz of the original 12oz of water
10 minutes

Magic Chef
2450 MHZ

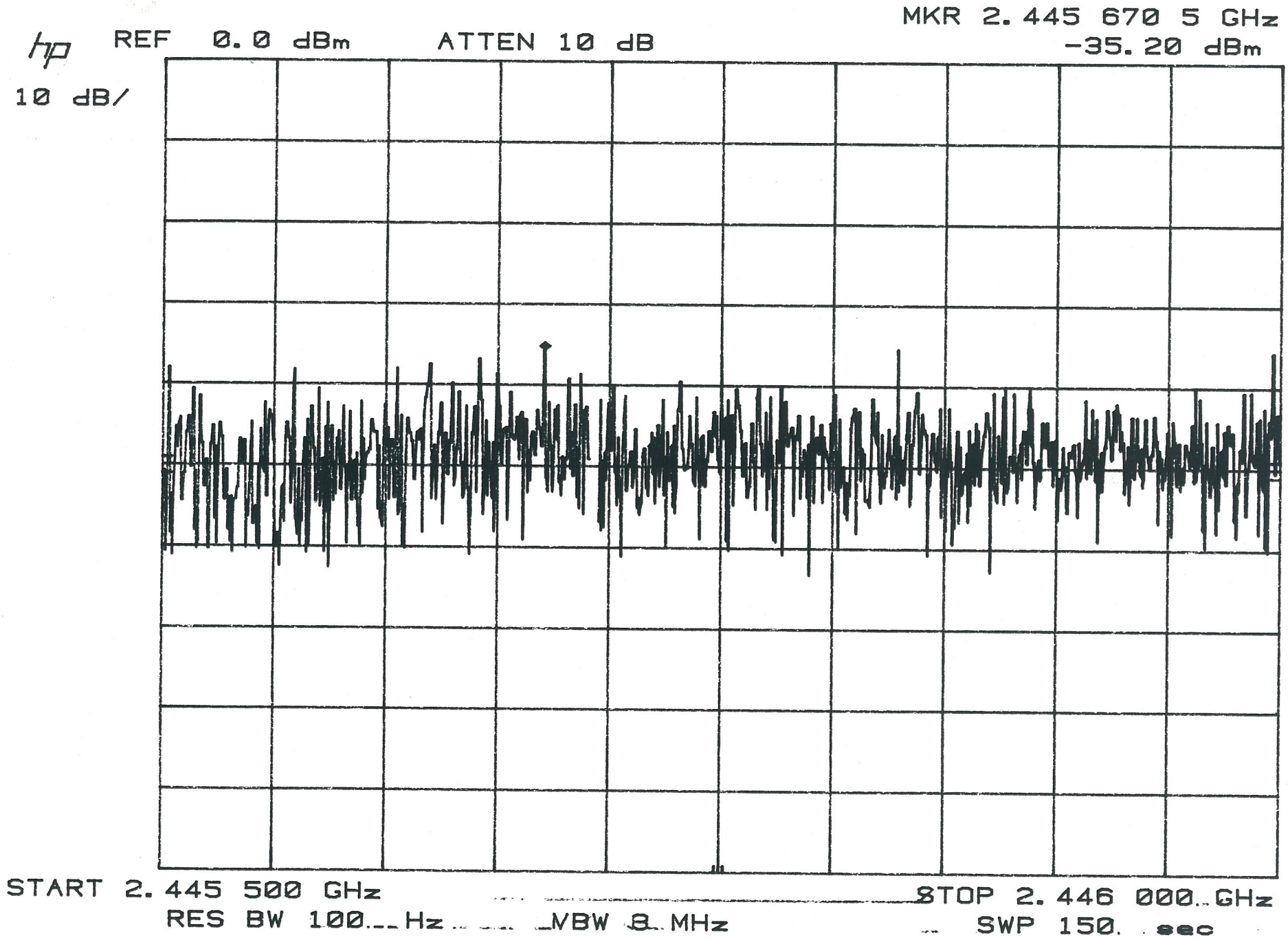
Figure 4-15


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.445 431 0 GHz
-45.00 dBm
10 dB/
MARKER
2.445 431 0 GHz
-45.00 dBm
START 2.445 000 GHz
RES BW 100 Hz
VBW 3 MHz
STOP 2.445 500 GHz
SWP 150 sec

Lost 3½ oz of the original 12 oz of water
10 minutes

Magic Chef
2450MHZ

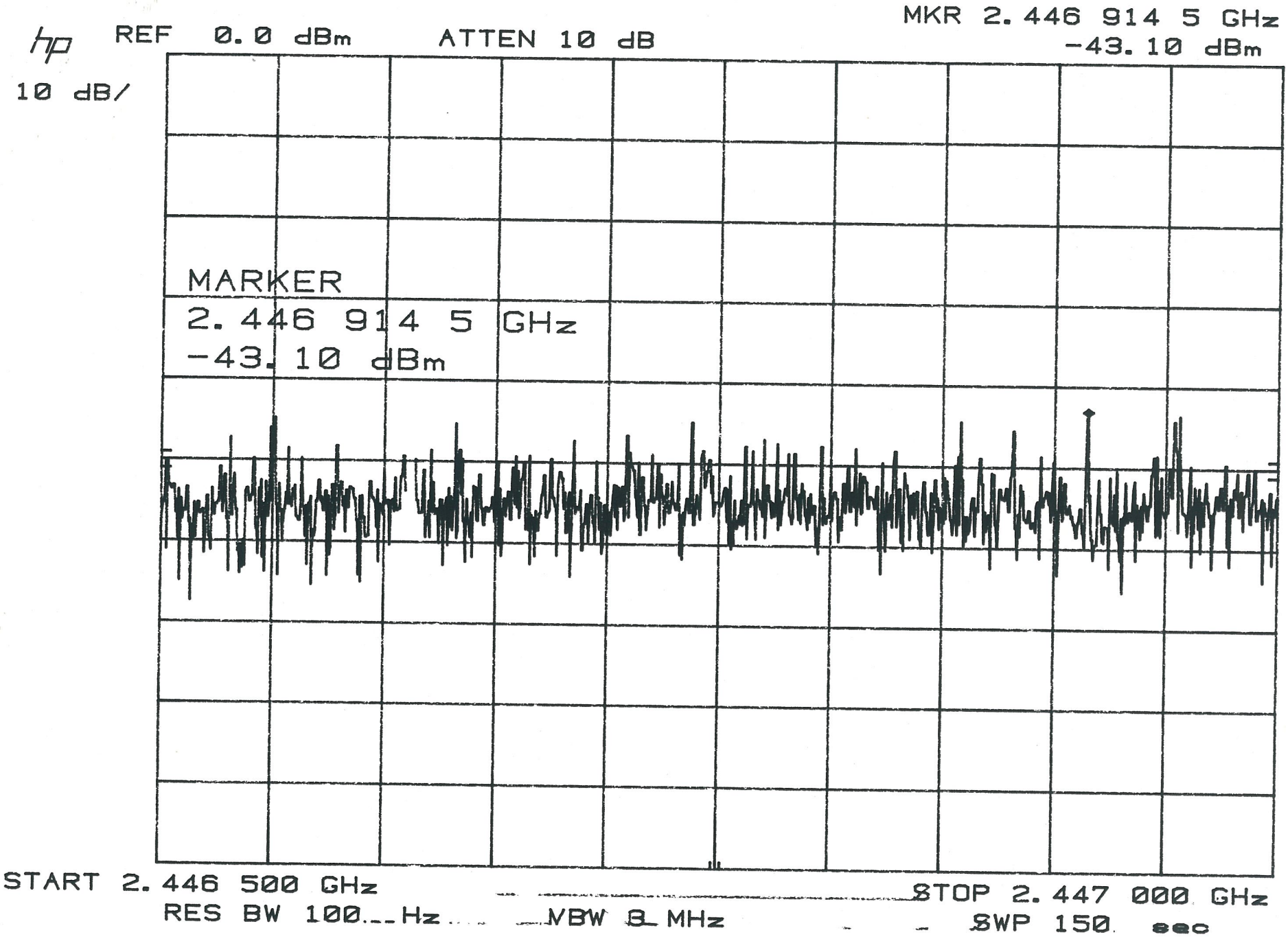
Figure 4-17


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.445 670 5 GHz
-35.20 dBm
10 dB/
START 2.445 500 GHz
STOP 2.446 000 GHz
RES BW 100 Hz
VBW 8 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHZ

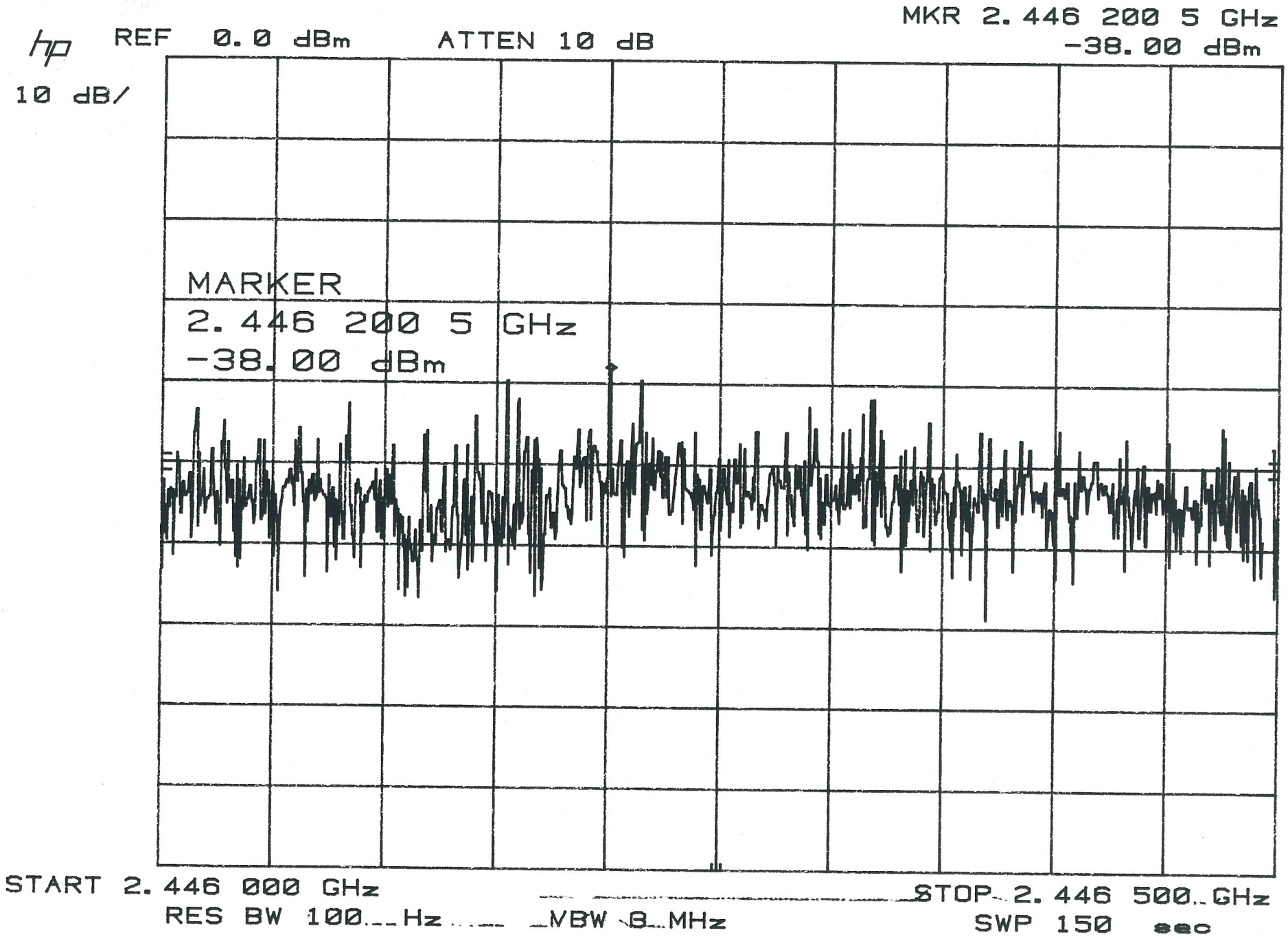
Figure 4-18


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.446 914 5 GHz
-43.10 dBm
10 dB/
MARKER
2.446 914 5 GHz
-43.10 dBm
START 2.446 500 GHz
STOP 2.447 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 1½ oz of the original 12 oz of water
10 minutes

Magic Chef
2450 MHZ

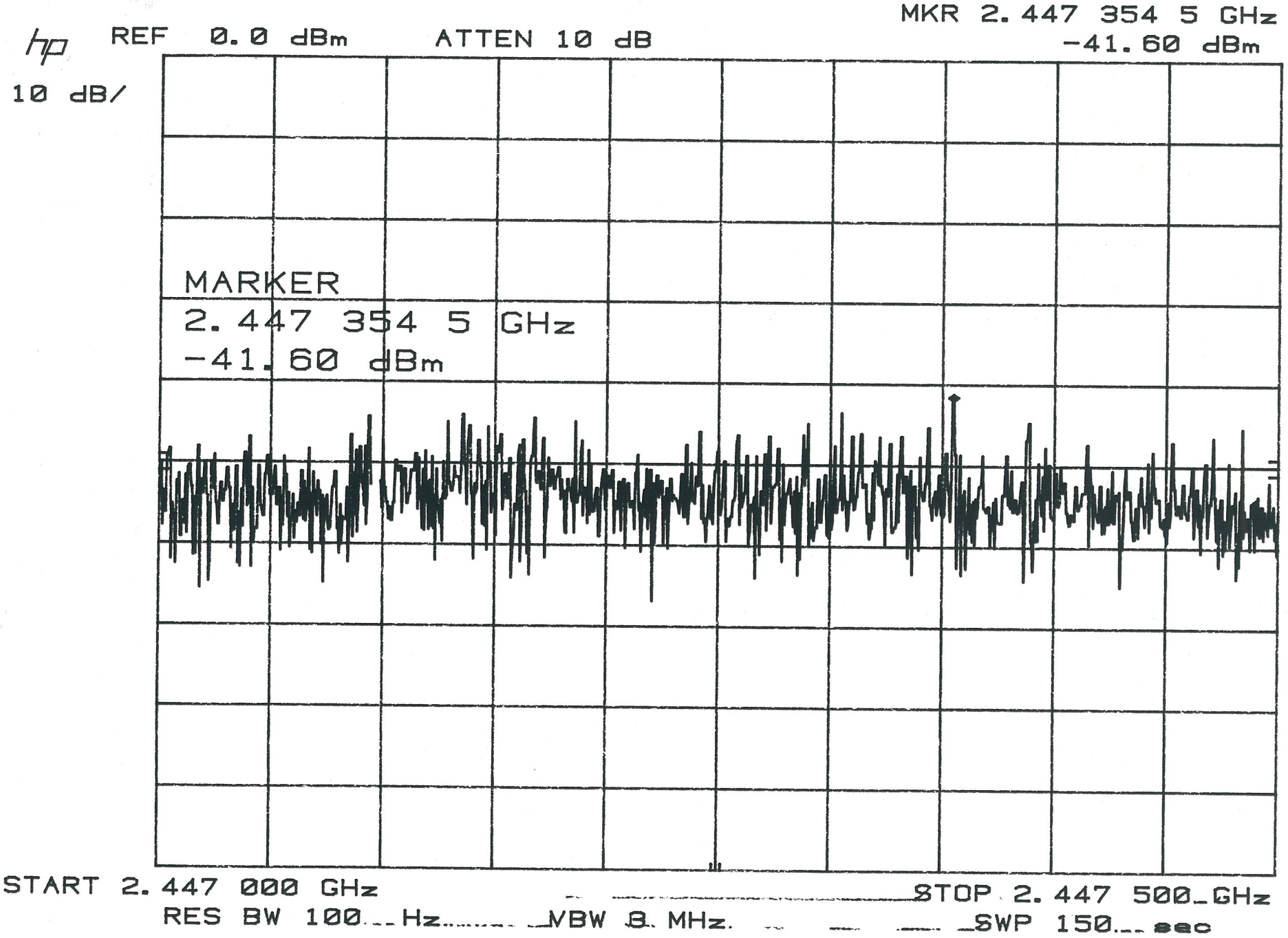
Figure 4-20


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.446 200 5 GHz
-38.00 dBm
10 dB/
MARKER
2.446 200 5 GHz
-38.00 dBm
START 2.446 000 GHz
RES BW 100 Hz
VBW 8 MHz
STOP 2.446 500 GHz
SWP 150 sec

Lost 5oz of the original 8oz of water
10 minutes

Magic Chef
2450 MHz

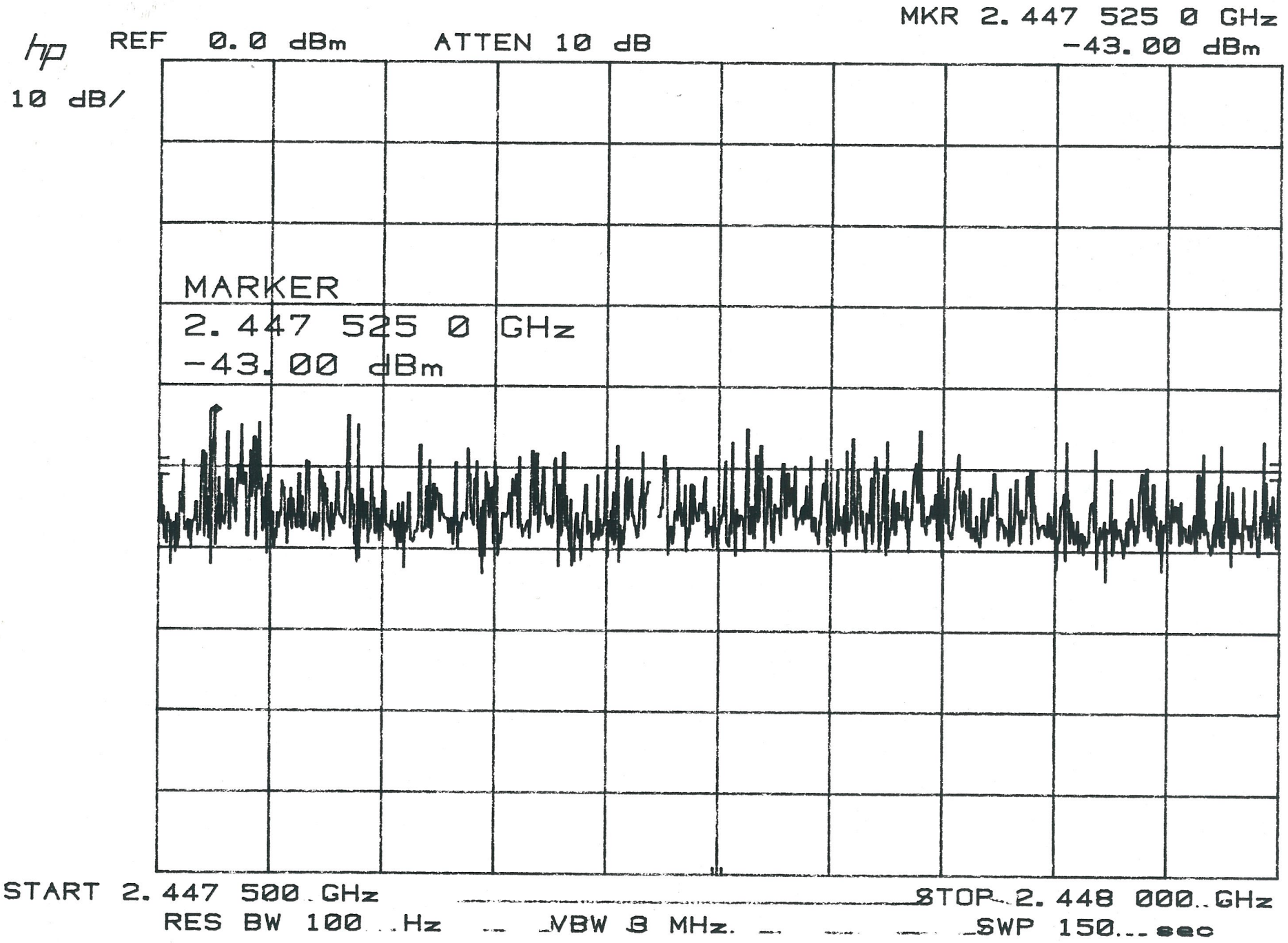
Figure 4-19


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.447 354 5 GHz
-41.60 dBm
10 dB/
MARKER
2.447 354 5 GHz
-41.60 dBm
START 2.447 000 GHz
STOP 2.447 500 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHZ

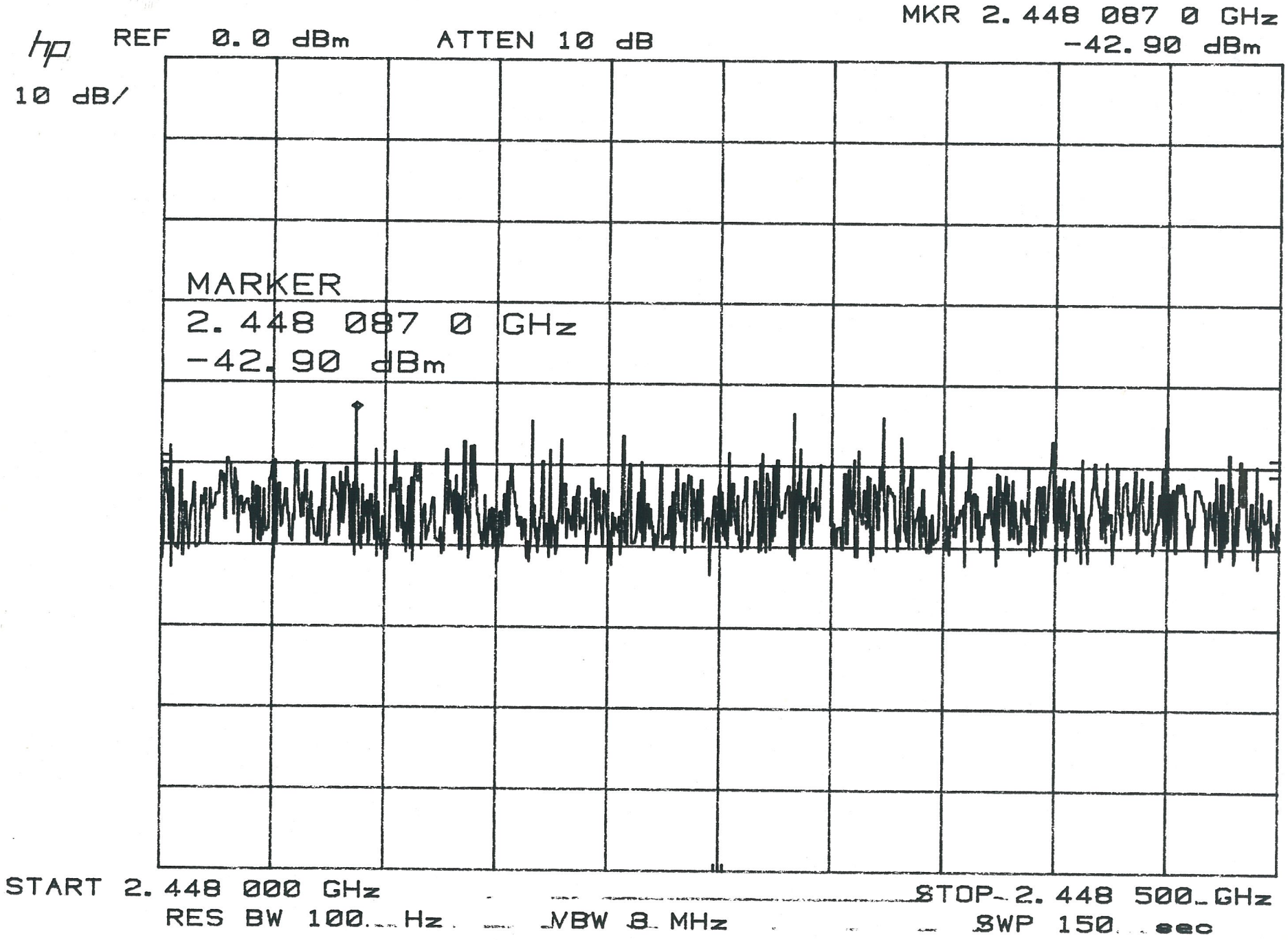
Figure 4-21


MKR 2.447 525 0 GHz
-43.00 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.447 525 0 GHz
-43.00 dBm
START 2.447 500 GHz
STOP 2.448 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water
10 minutes

Magic Chef
2450 MHz

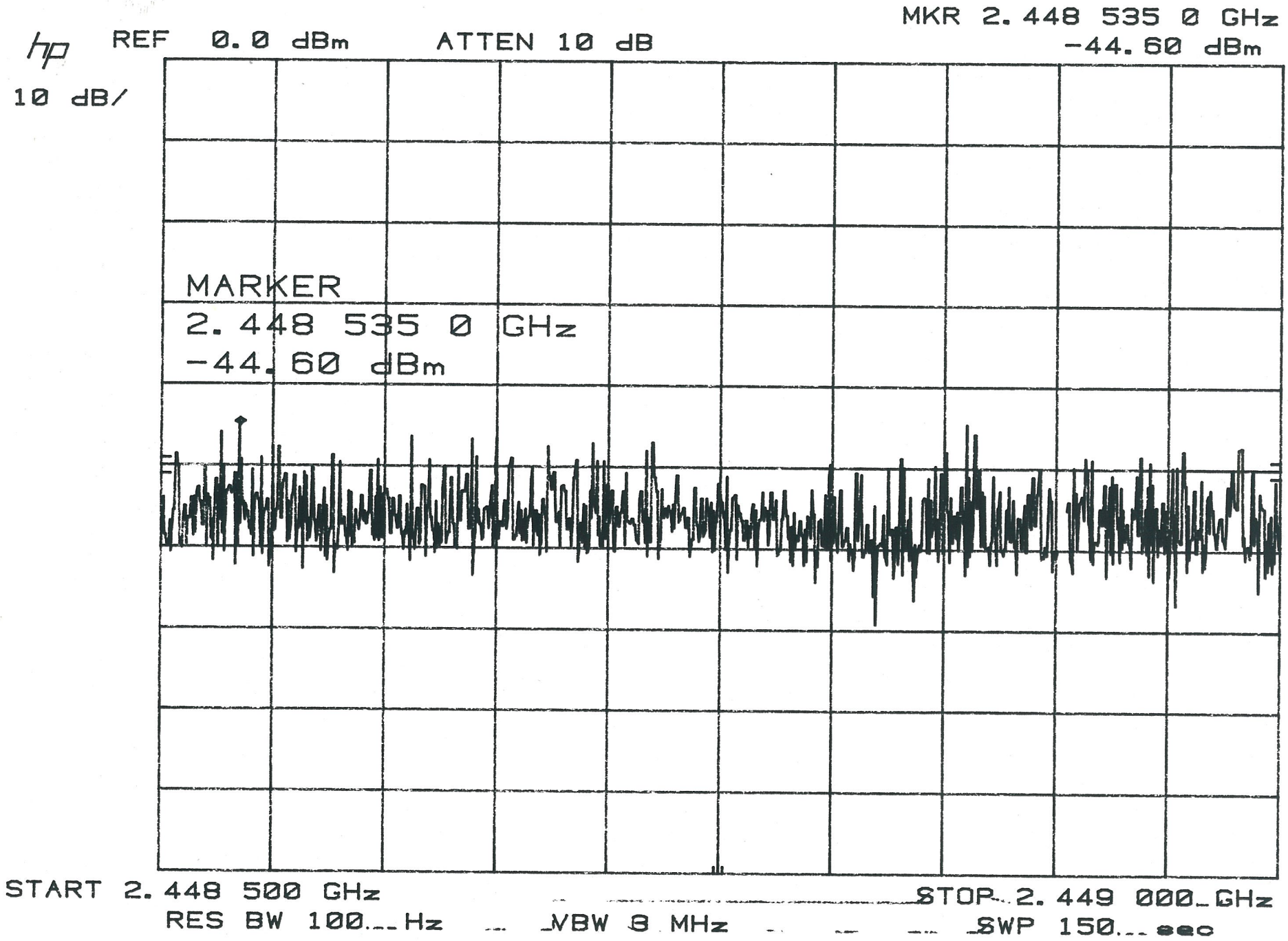
Figure 4-22


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.448 087 0 GHz
-42.90 dBm
10 dB/
MARKER
2.448 087 0 GHz
-42.90 dBm
START 2.448 000 GHz
STOP 2.448 500 GHz
RES BW 100 Hz
VBW 8 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

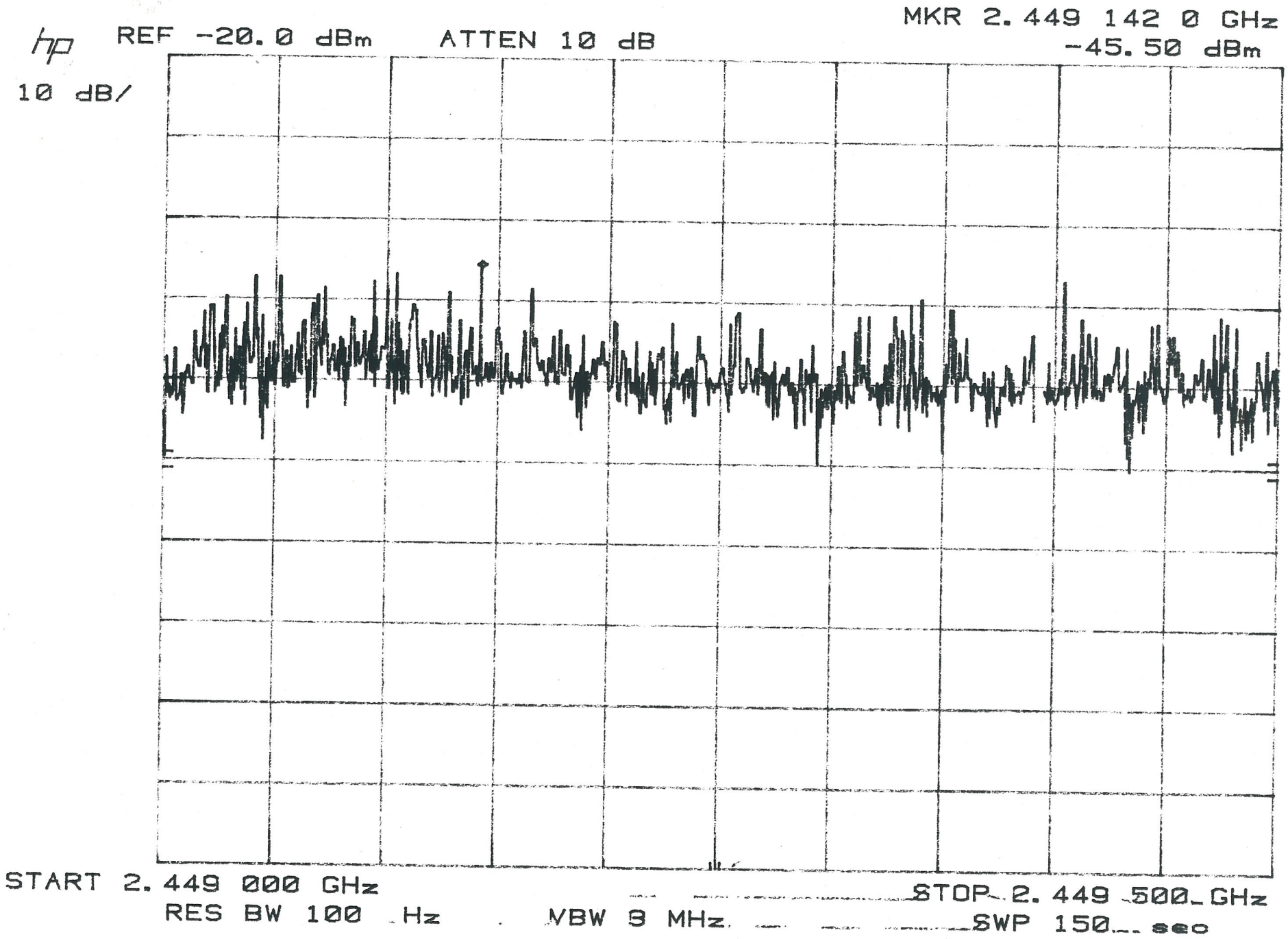
Figure 4-23


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.448 535 0 GHz
-44.60 dBm
10 dB/
MARKER
2.448 535 0 GHz
-44.60 dBm
START 2.448 500 GHz
STOP 2.449 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

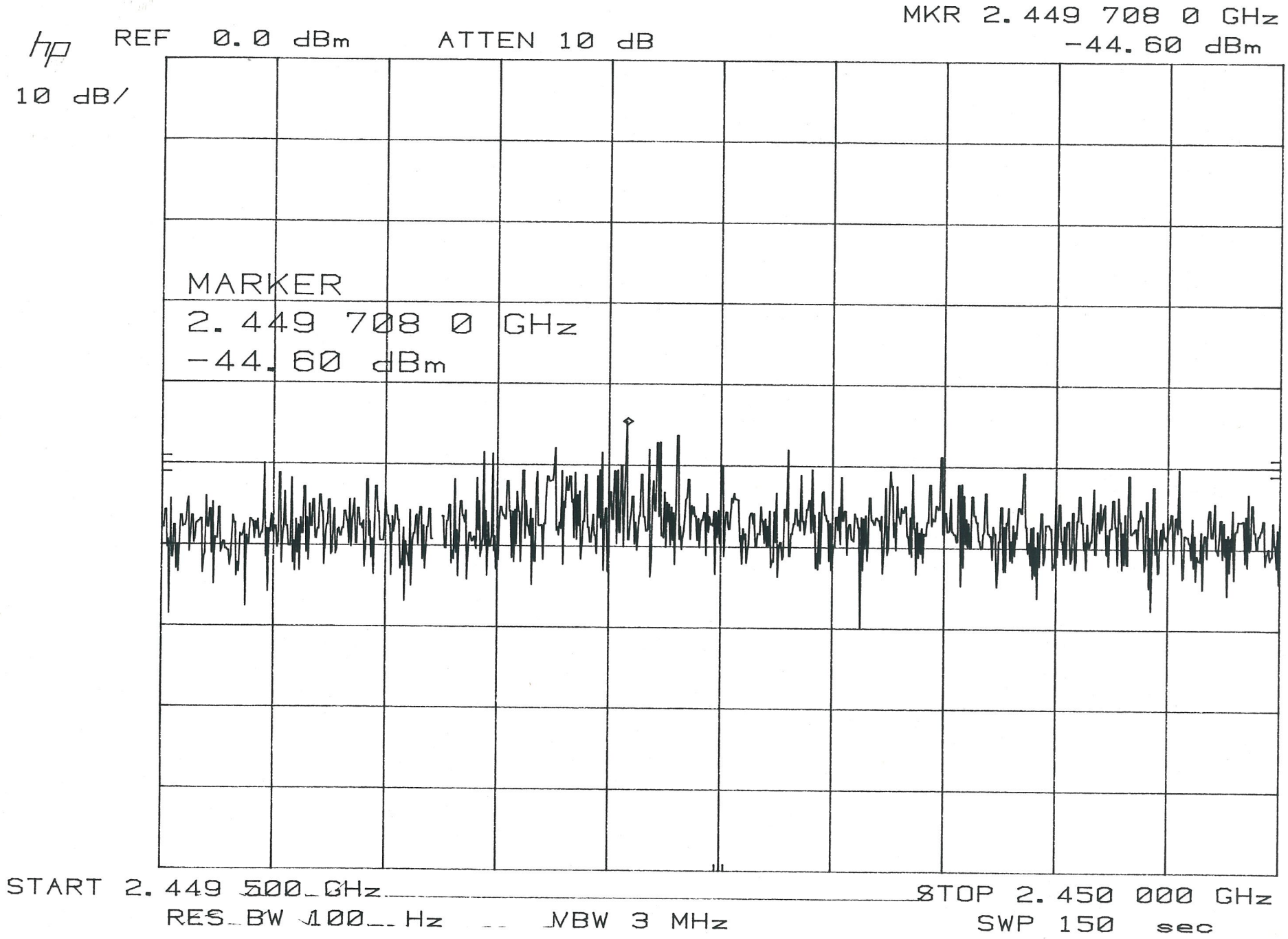
Figure 4-24


hp
REF -20.0 dBm
ATTEN 10 dB
MKR 2.449 142 0 GHz
-45.50 dBm
10 dB/
START 2.449 000 GHz
RES BW 100 Hz
VBW 3 MHz
STOP 2.449 500 GHz
SWP 150 sec

Lost 3oz of the original 12oz of water
10 minutes

Magic Chef
2450 MHZ

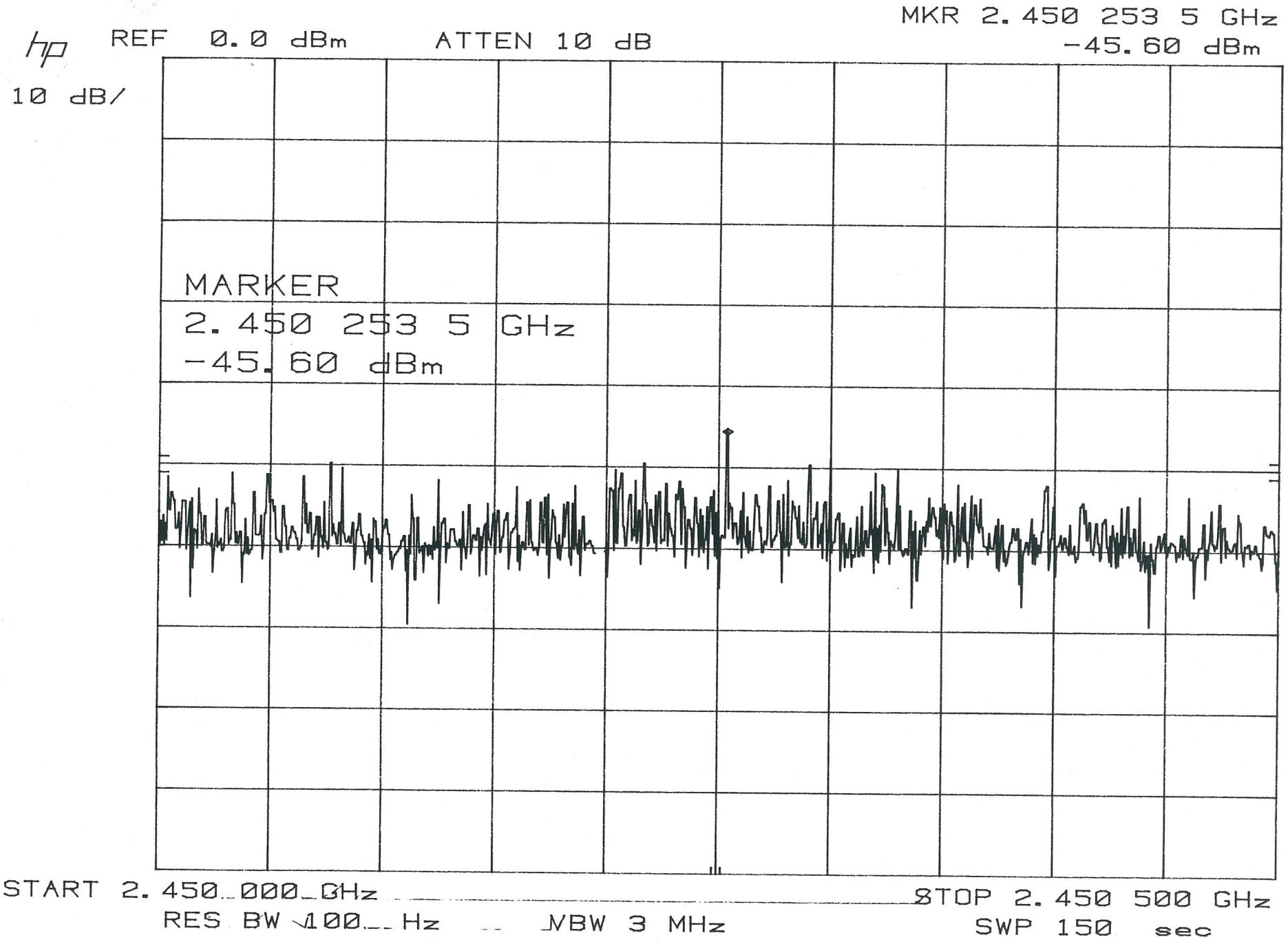
Figure 4-25


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.449 708 0 GHz
-44.60 dBm
10 dB/
MARKER
2.449 708 0 GHz
-44.60 dBm
START 2.449 500 GHz
STOP 2.450 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

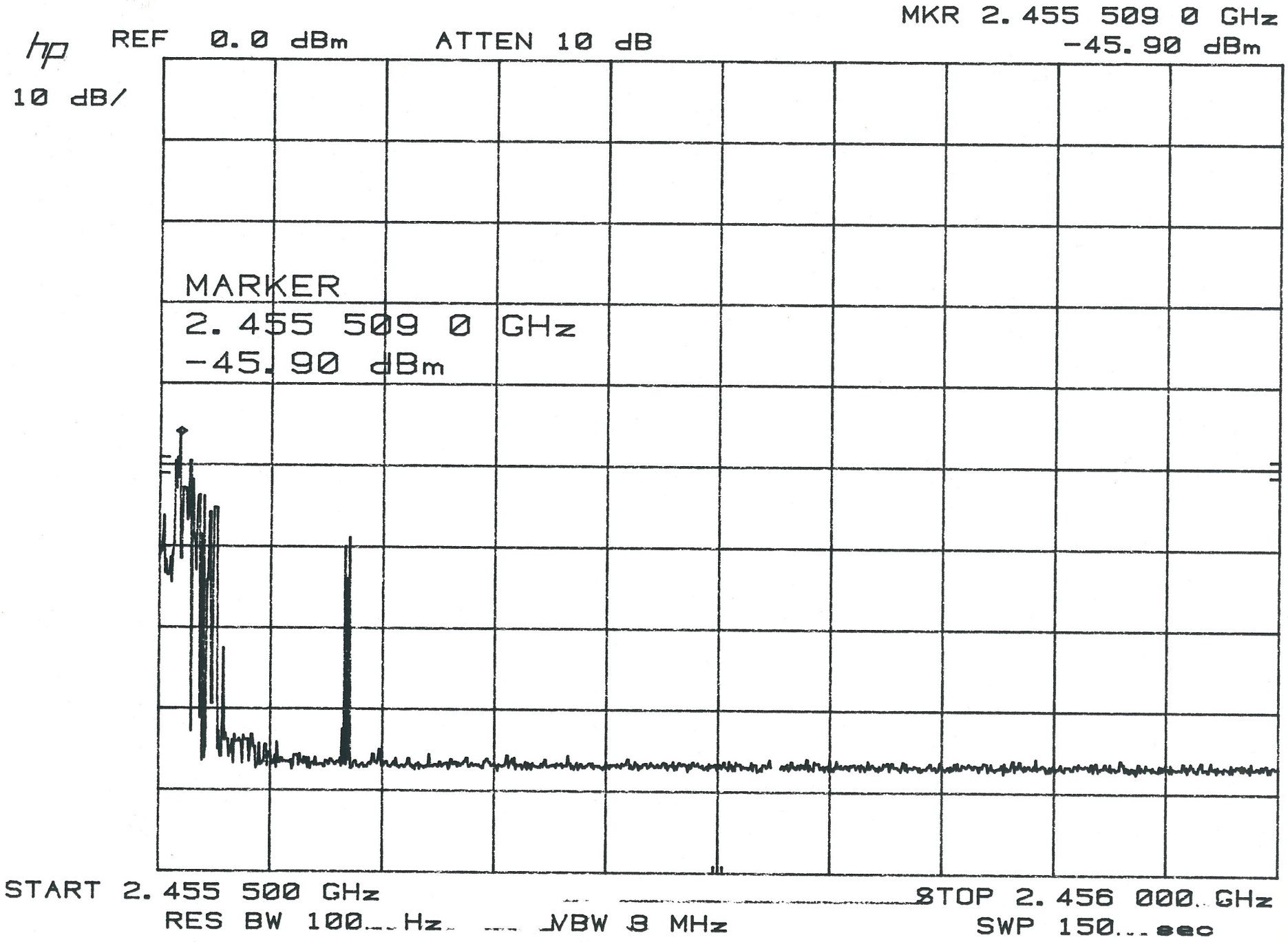
Figure 4-26


MKR 2.450 253 5 GHz
-45.60 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.450 253 5 GHz
-45.60 dBm
START 2.450 000 GHz
STOP 2.450 500 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450MHz

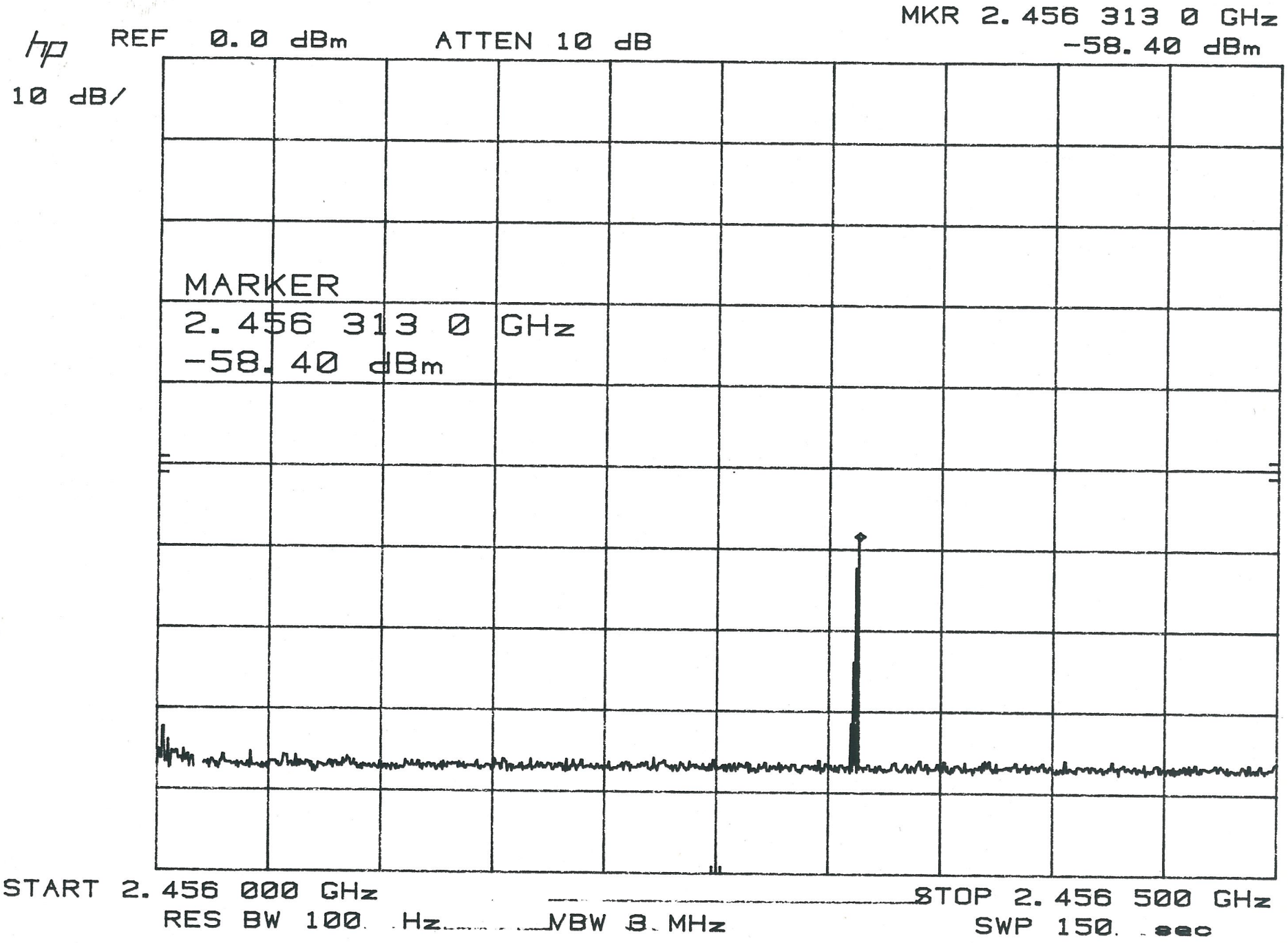
Figure 4-27


MKR 2.455 509 0 GHz
-45.90 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.455 509 0 GHz
-45.90 dBm
START 2.455 500 GHz
STOP 2.456 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water
10 minutes

Magic Chef
2450 MHz

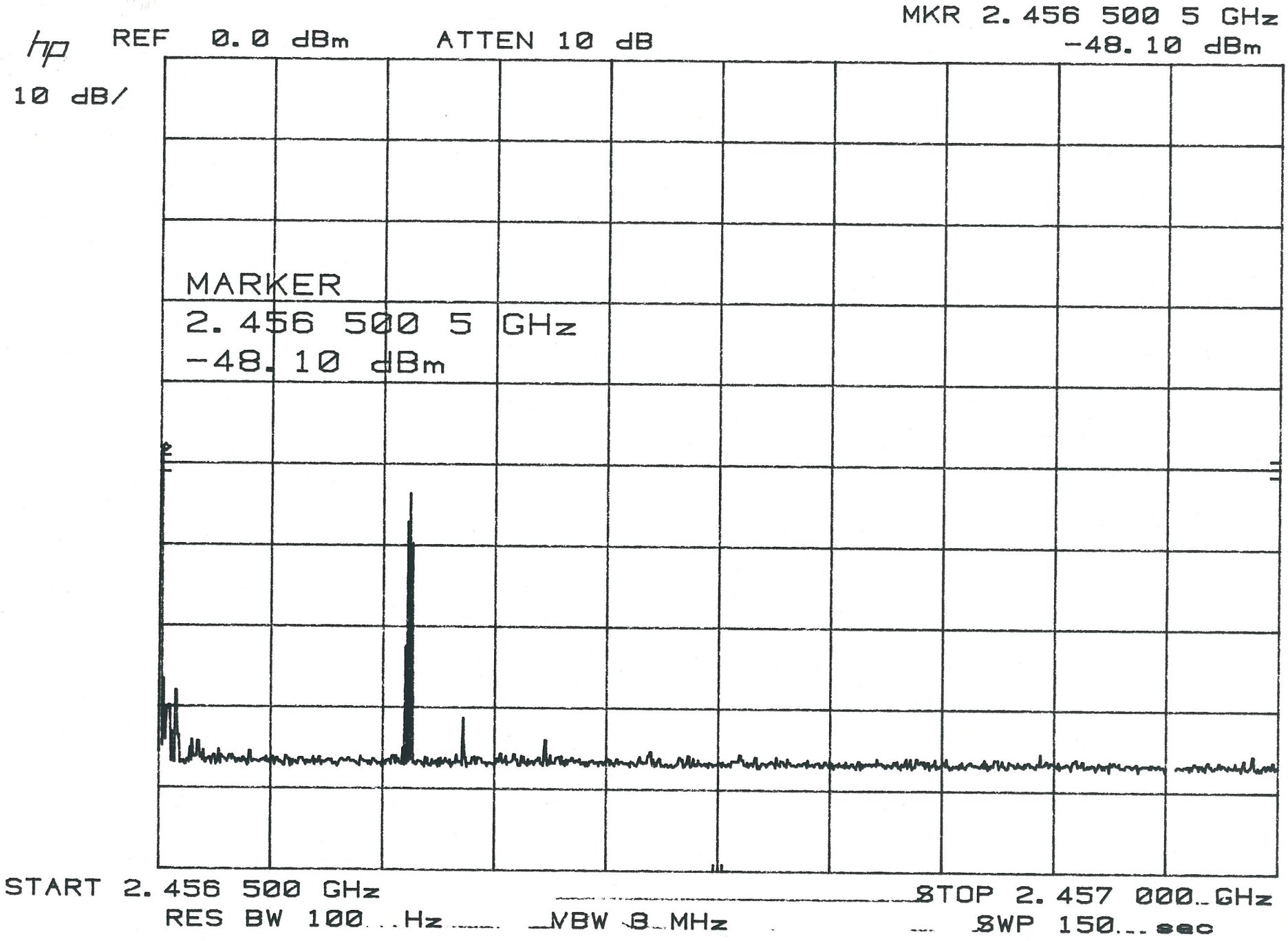
Figure 4-28


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.456 313 0 GHz
-58.40 dBm
10 dB/
MARKER
2.456 313 0 GHz
-58.40 dBm
START 2.456 000 GHz
STOP 2.456 500 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost 3½ oz of the original 12oz of water
10 minutes

Magic Chef
2450 mHz

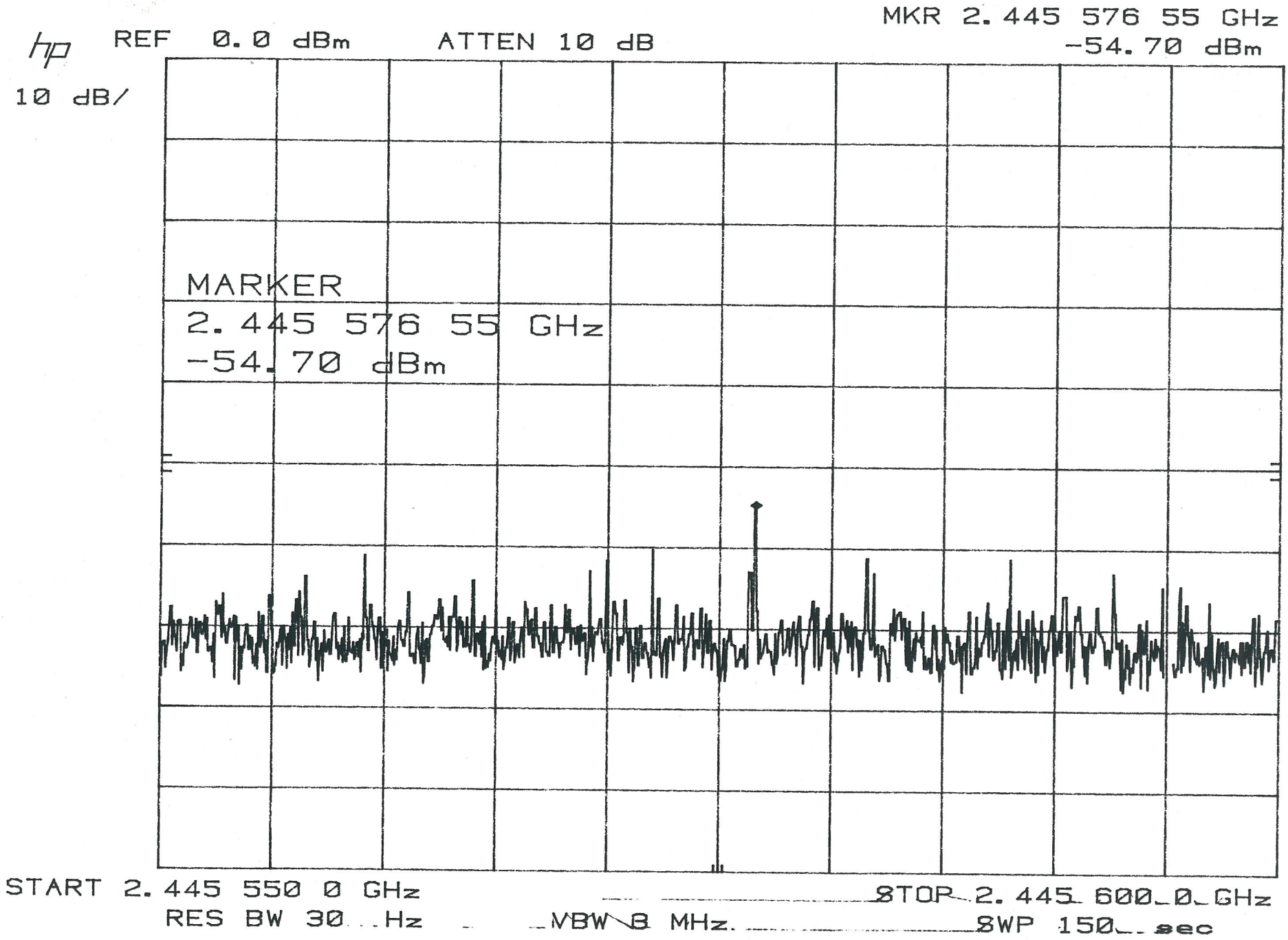
Figure 4-29


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.456 500 5 GHz
-48.10 dBm
10 dB/
MARKER
2.456 500 5 GHz
-48.10 dBm
START 2.456 500 GHz
STOP 2.457 000 GHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water
10 minutes

Magic Chef
2450 mHz

Figure 4-30


MKR 2.445 576 55 GHz
-54.70 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.445 576 55 GHz
-54.70 dBm
START 2.445 550 0 GHz
RES BW 30 Hz
VBW 3 MHz
STOP 2.445 600 0 GHz
SWP 150 sec

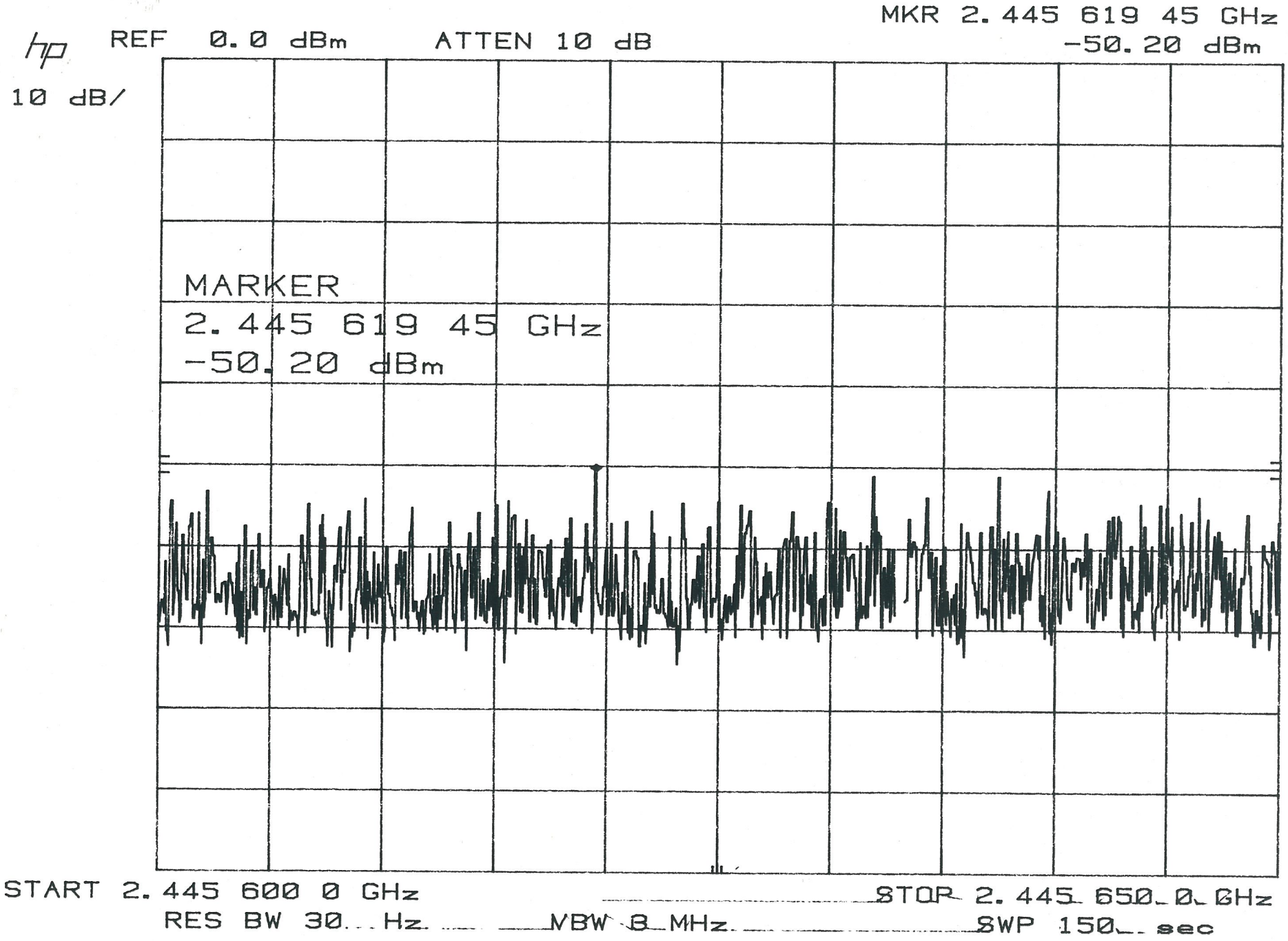
Lost 3oz of the original 12oz of water

10 minutes

Magic Chef

2450MHz

Figure 4-31


MKR 2.445 619 45 GHz
-50.20 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.445 619 45 GHz
-50.20 dBm
START 2.445 600 0 GHz
STOP 2.445 650 0 GHz
RES BW 30 Hz
VBW 3 MHz
SWP 150 sec

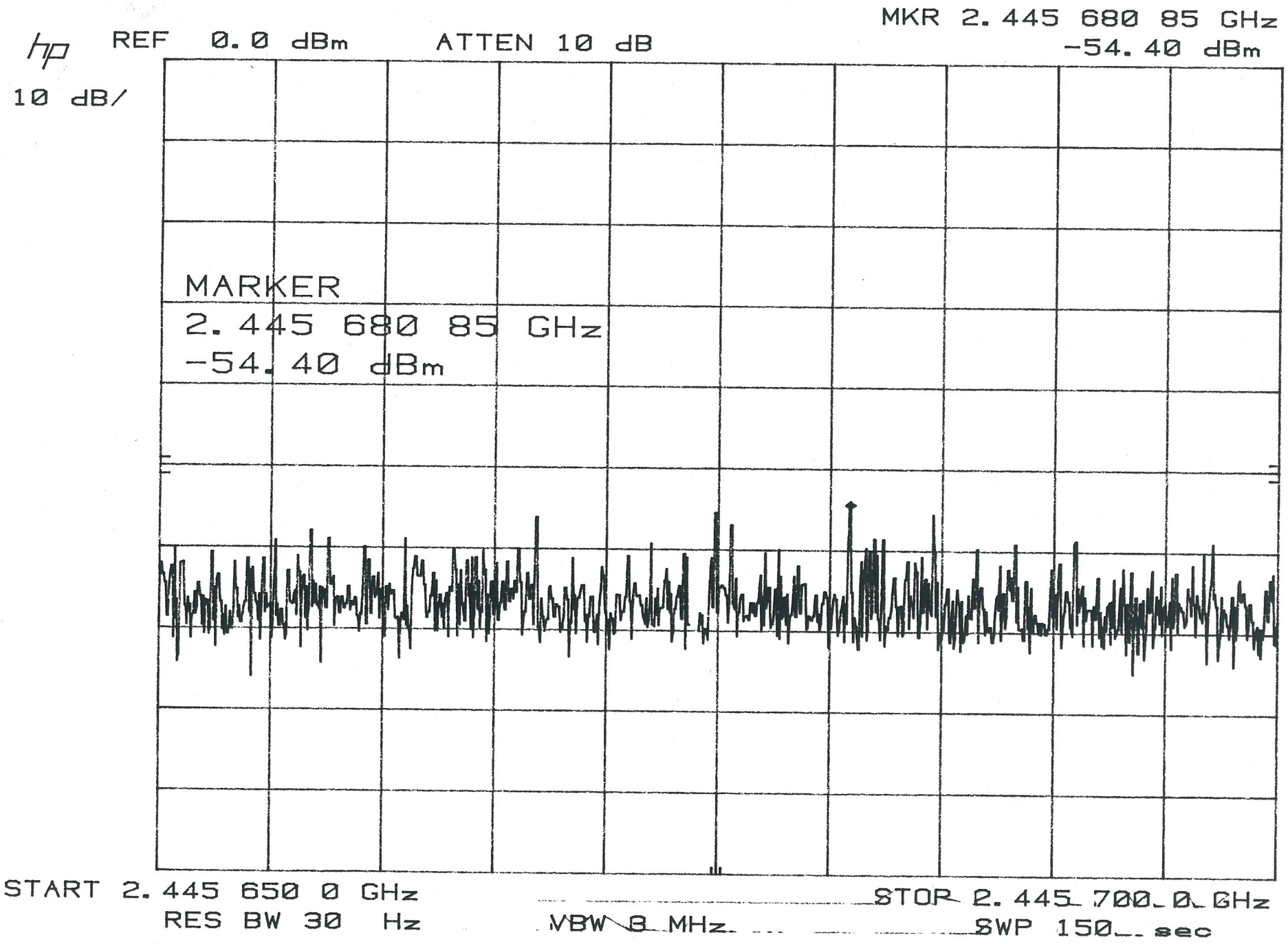
Lost 1/2 cup of ~~the~~ the original 1 1/2 cups water

10 minutes

Magic Chef

2450MHZ

Figure 4-32


MKR 2.445 680 85 GHz
-54.40 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.445 680 85 GHz
-54.40 dBm
START 2.445 650 0 GHz
RES BW 30 Hz
VBW 3 MHz
STOP 2.445 700 0 GHz
SWP 150 sec

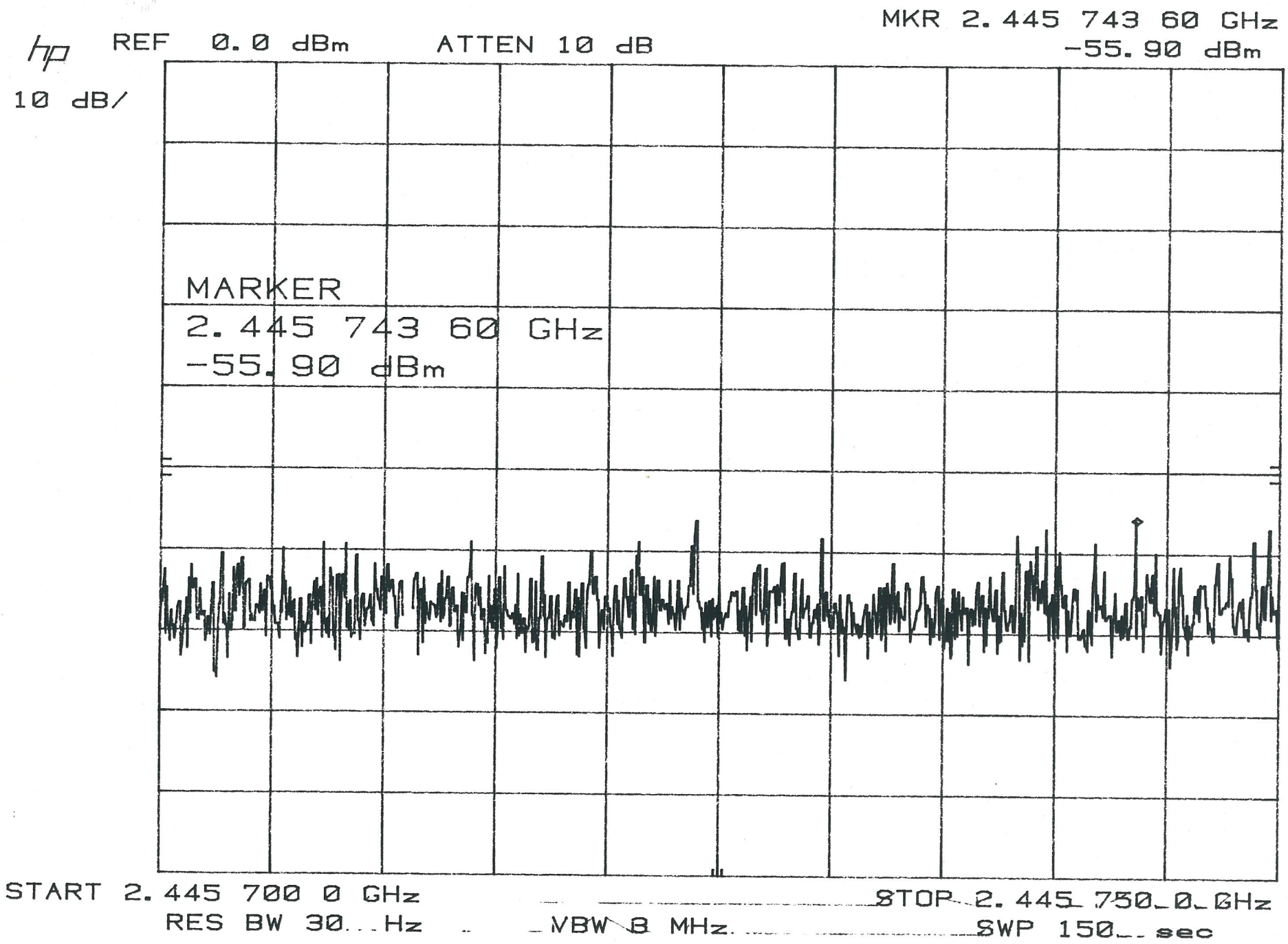
Lost 3oz of the 12oz water started with

10 minutes

Magic Chef

2450 MHz

Figure 4-33


MKR 2.445 743 60 GHz
-55.90 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.445 743 60 GHz
-55.90 dBm
START 2.445 700 0 GHz
STOP 2.445 750 0 GHz
RES BW 30 Hz
VBW 3 MHz
SWP 150 sec

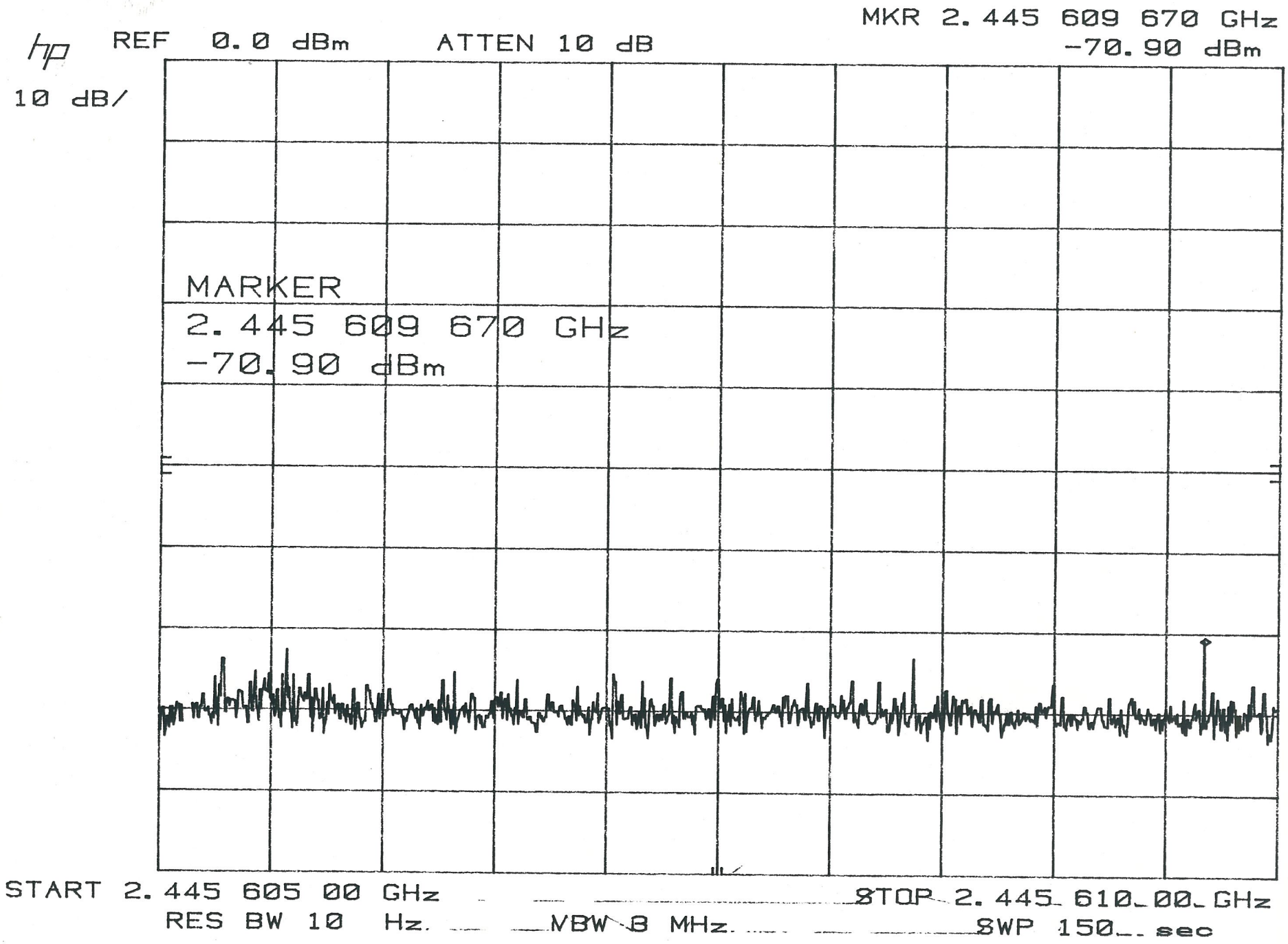
Lost ½ cup of the original 1½ cups water

10 minutes

Magic Chef

2450 MHz

Figure 4-34


MKR 2.445 609 670 GHz
-70.90 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.445 609 670 GHz
-70.90 dBm
START 2.445 605 00 GHz
STOP 2.445 610 00 GHz
RES BW 10 Hz
VBW 8 MHz
SWP 150 sec

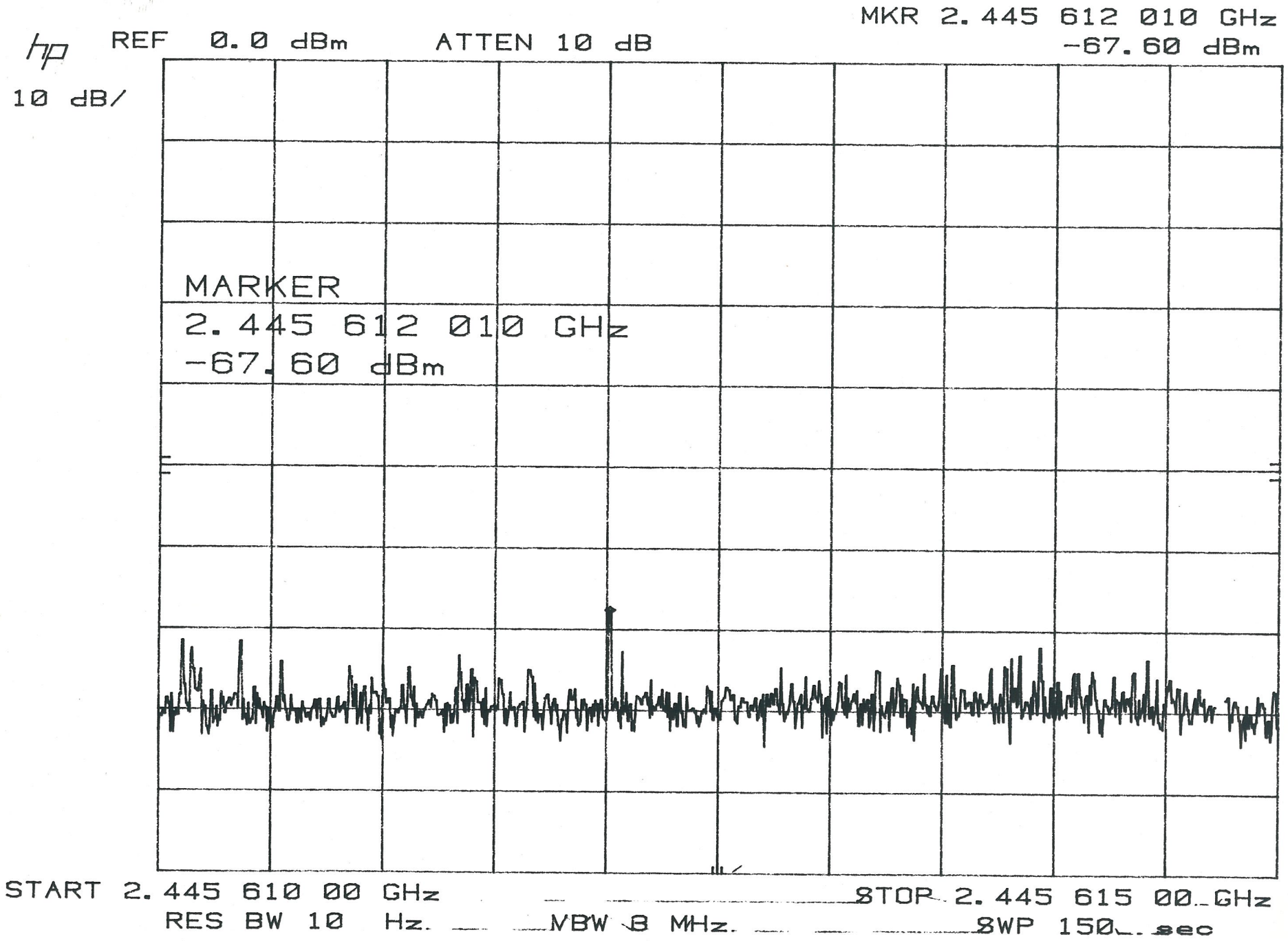
Lost 2½ oz of the original 12 oz of water

10 minutes

Magic Chef

2450 mHz

Figure 4-35


MKR 2.445 612 010 GHz
-67.60 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.445 612 010 GHz
-67.60 dBm
START 2.445 610 00 GHz
STOP 2.445 615 00 GHz
RES BW 10 Hz
VBW 3 MHz
SWP 150 sec

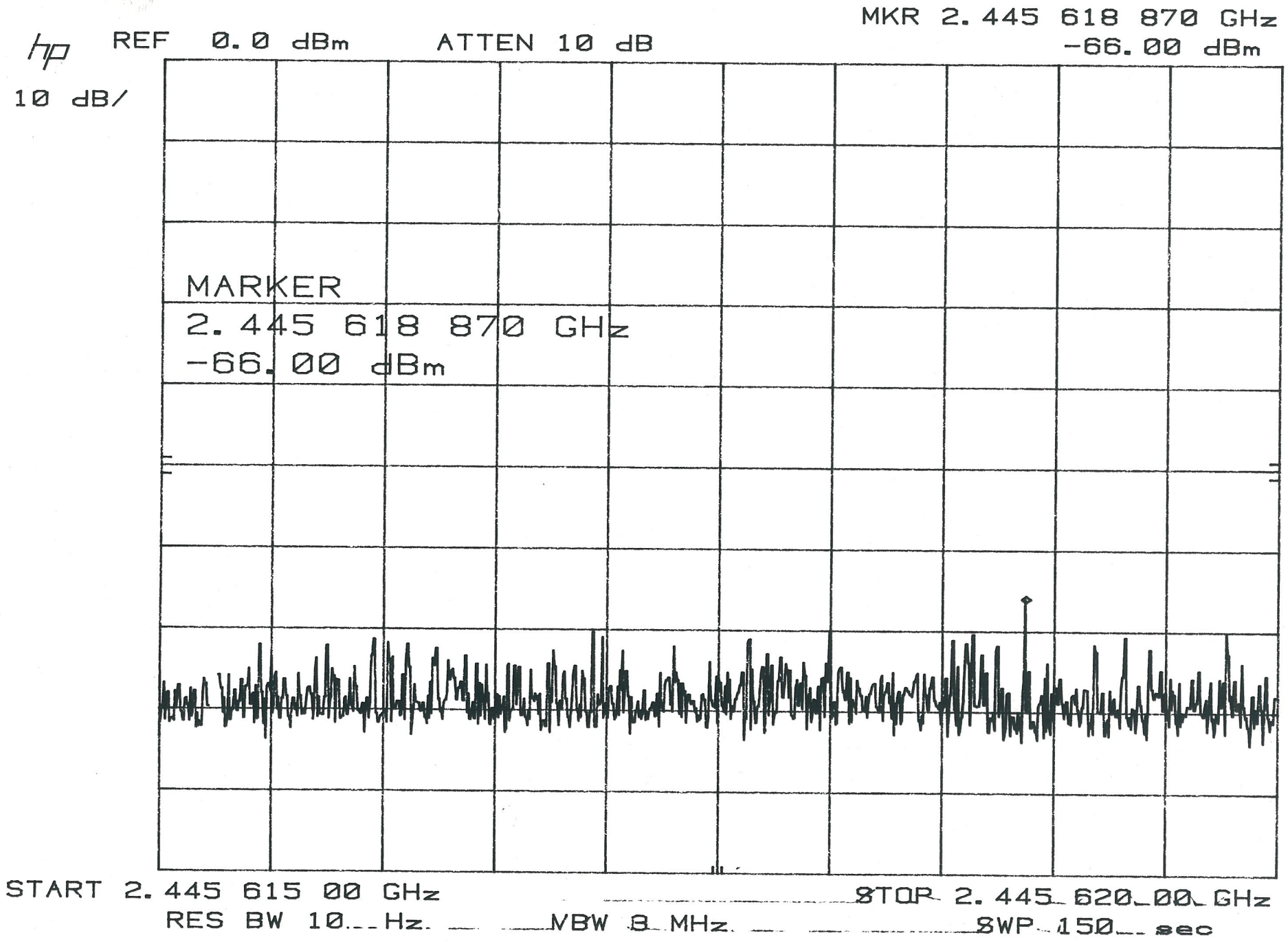
Lost 4½ oz of the original 9½ oz of water

10 minutes

Magic Chef

2450 MHz

Figure 4-36


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.445 618 870 GHz
-66.00 dBm
10 dB/
MARKER
2.445 618 870 GHz
-66.00 dBm
START 2.445 615 00 GHz
STOP 2.445 620 00 GHz
RES BW 10 Hz
VBW 3 MHz
SWP 150 sec

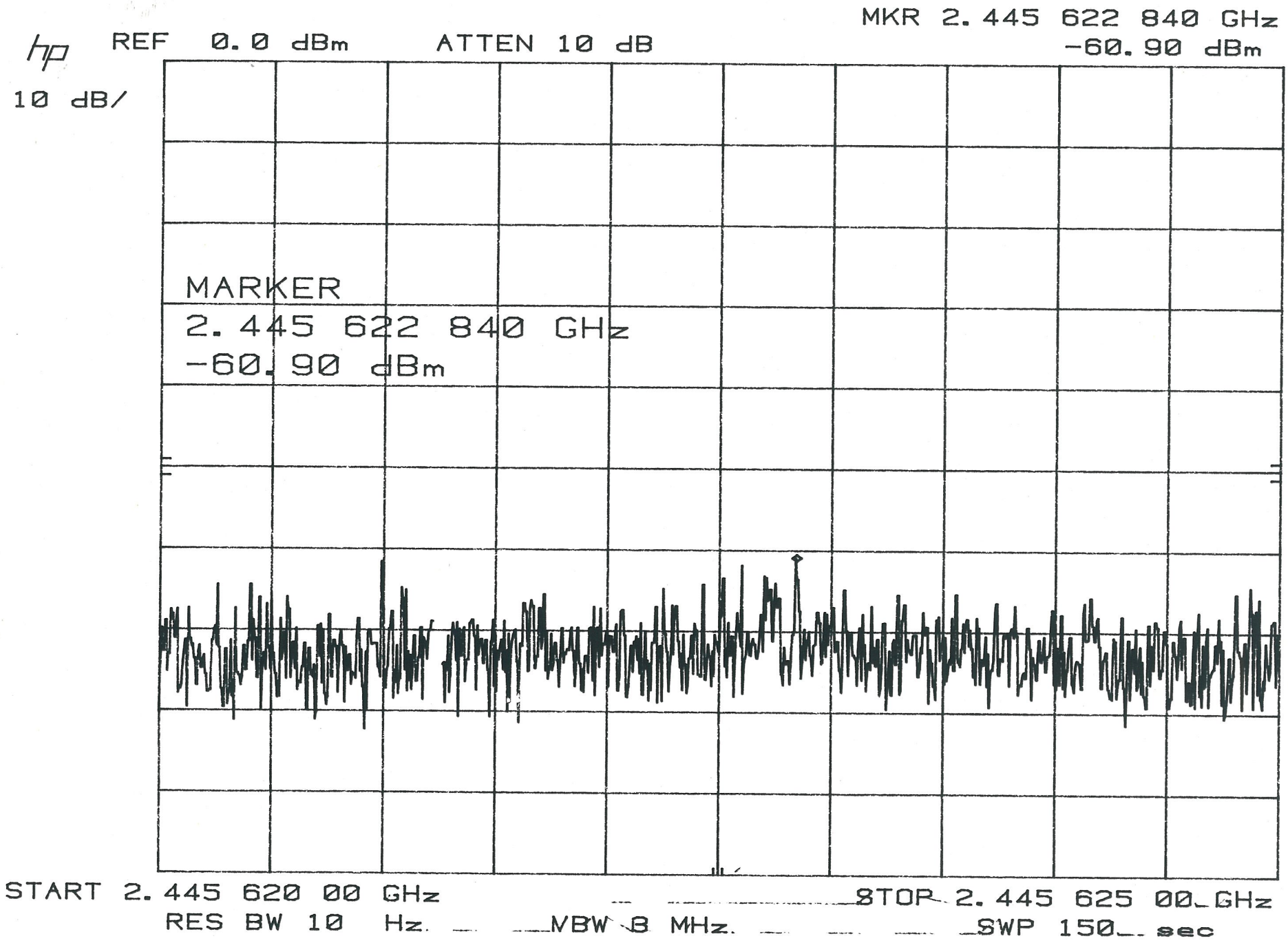
Lost 1/4 cup of the original 1 1/3 cups water

10 minutes

Magic Chef

2450 MHz

Figure 4-37


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.445 622 840 GHz
-60.90 dBm
10 dB/
MARKER
2.445 622 840 GHz
-60.90 dBm
START 2.445 620 00 GHz
STOP 2.445 625 00 GHz
RES BW 10 Hz
VBW 3 MHz
SWP 150 sec

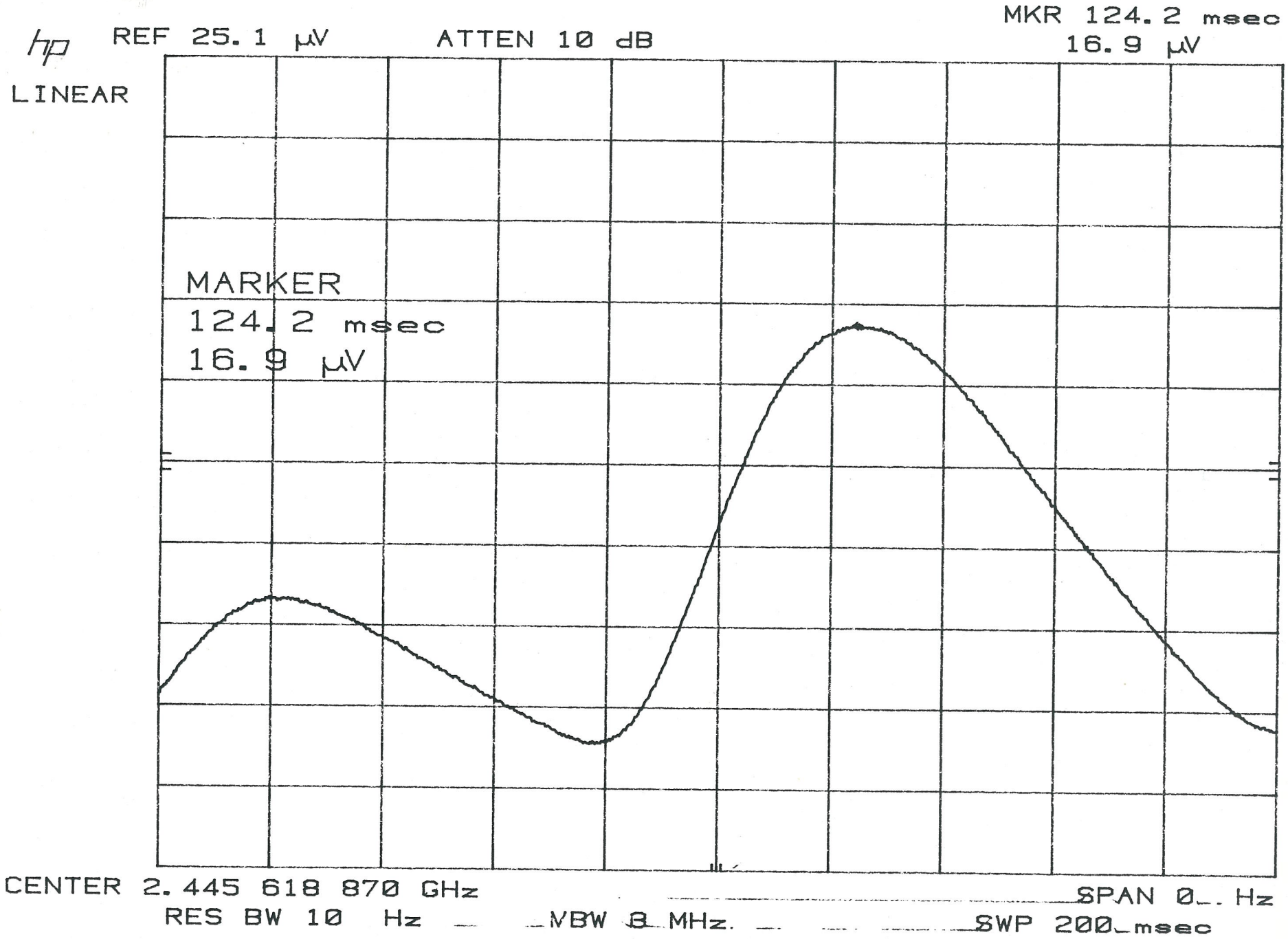
Lost ½ cup of the original 1½ cups of water

10 minutes

Magic Chef

2450 MHz

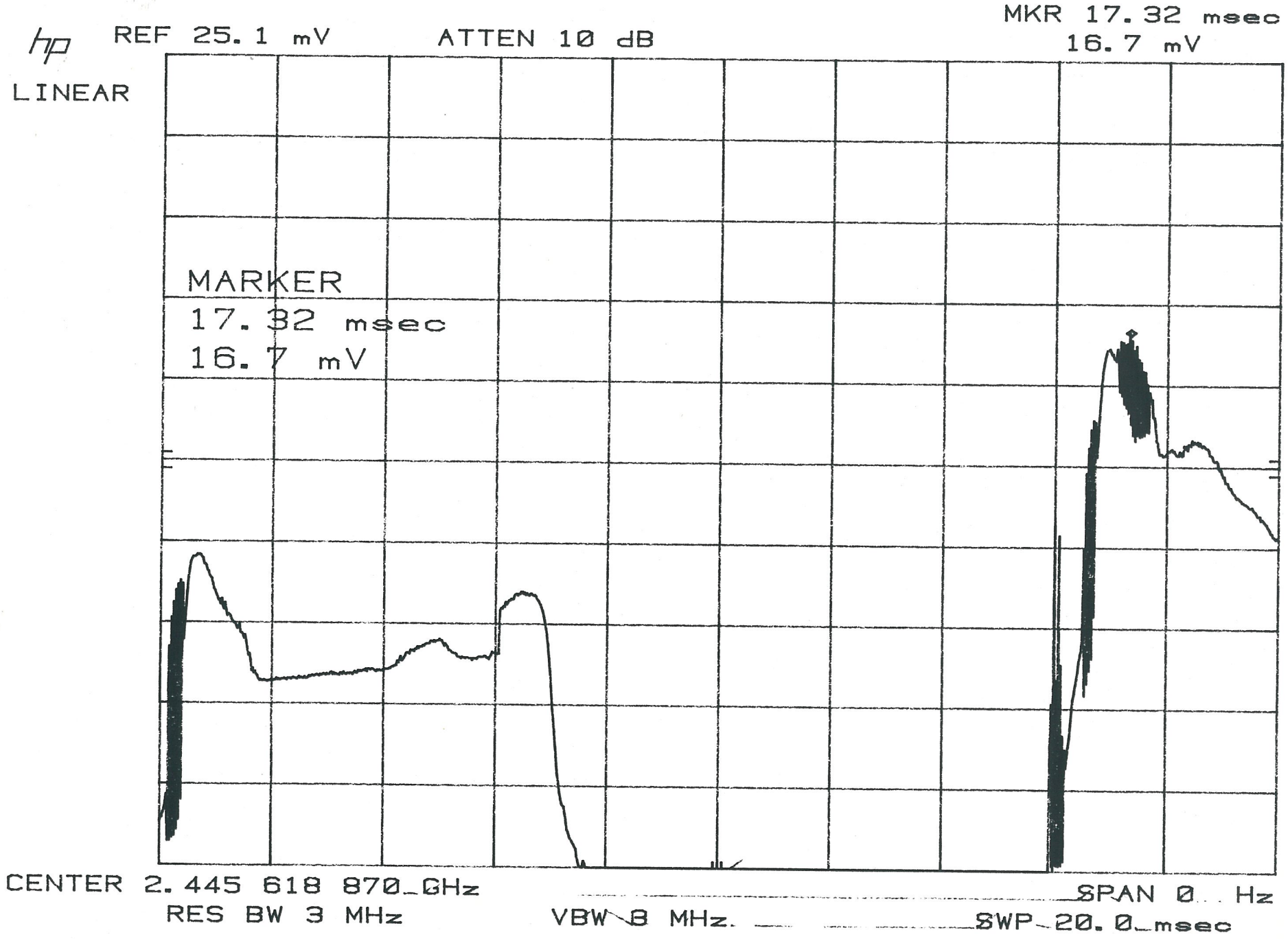
Figure 4-38


hp
REF 25.1 µV
ATTEN 10 dB
MKR 124.2 msec
16.9 µV
LINEAR
MARKER
124.2 msec
16.9 µV
CENTER 2.445 618 870 GHz
SPAN 0 Hz
RES BW 10 Hz
VBW 3 MHz
SWP 200 msec

Magic Chef

2450 MHz

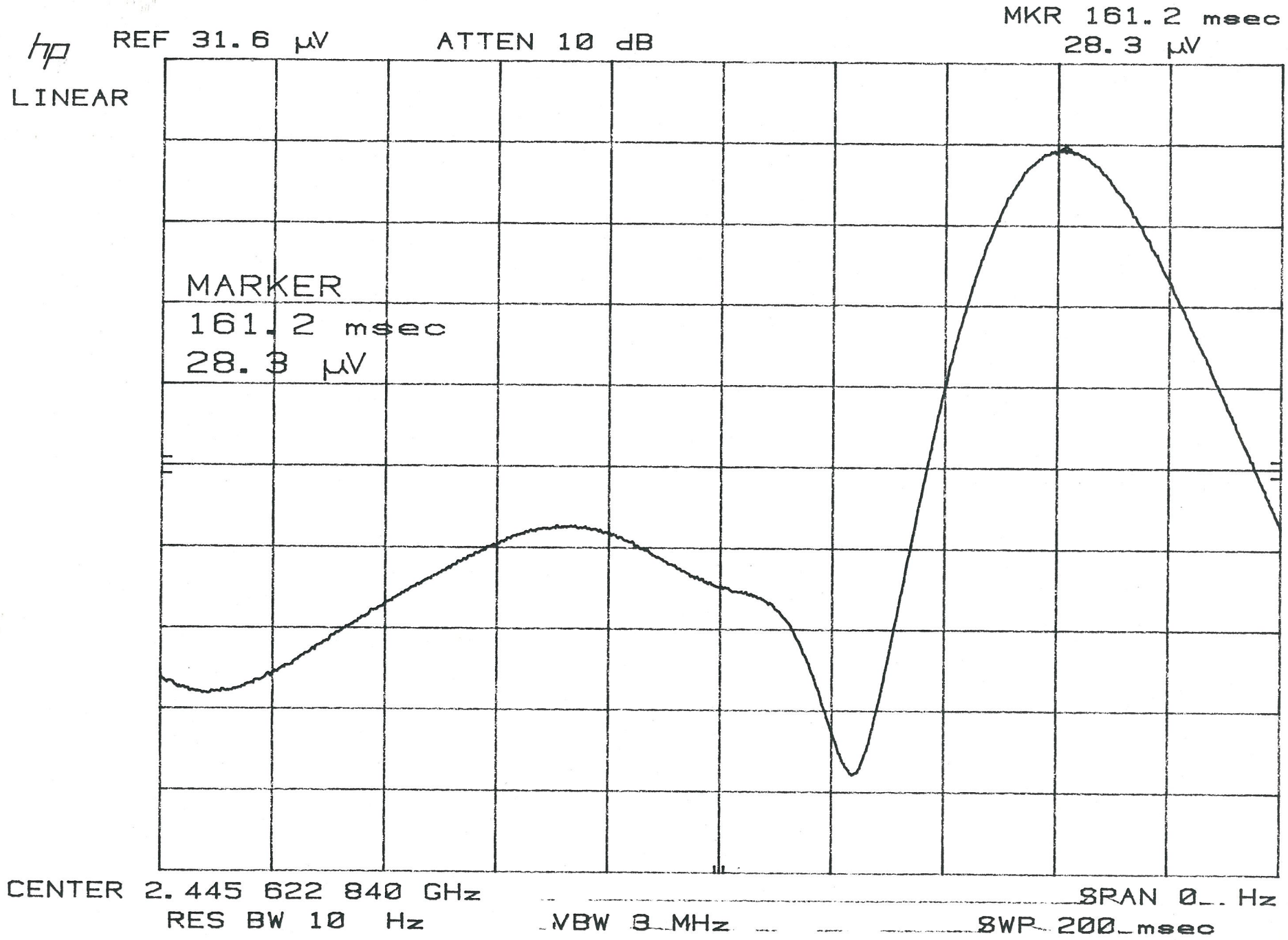
Figure 4-39


hp
REF 25.1 mV
ATTEN 10 dB
MKR 17.32 msec
16.7 mV
LINEAR
MARKER
17.32 msec
16.7 mV
CENTER 2.445 618 870 GHz
RES BW 3 MHz
VBW 3 MHz
SPAN 0 Hz
SWP 20.0 msec

Magic Chef

2450 MHz

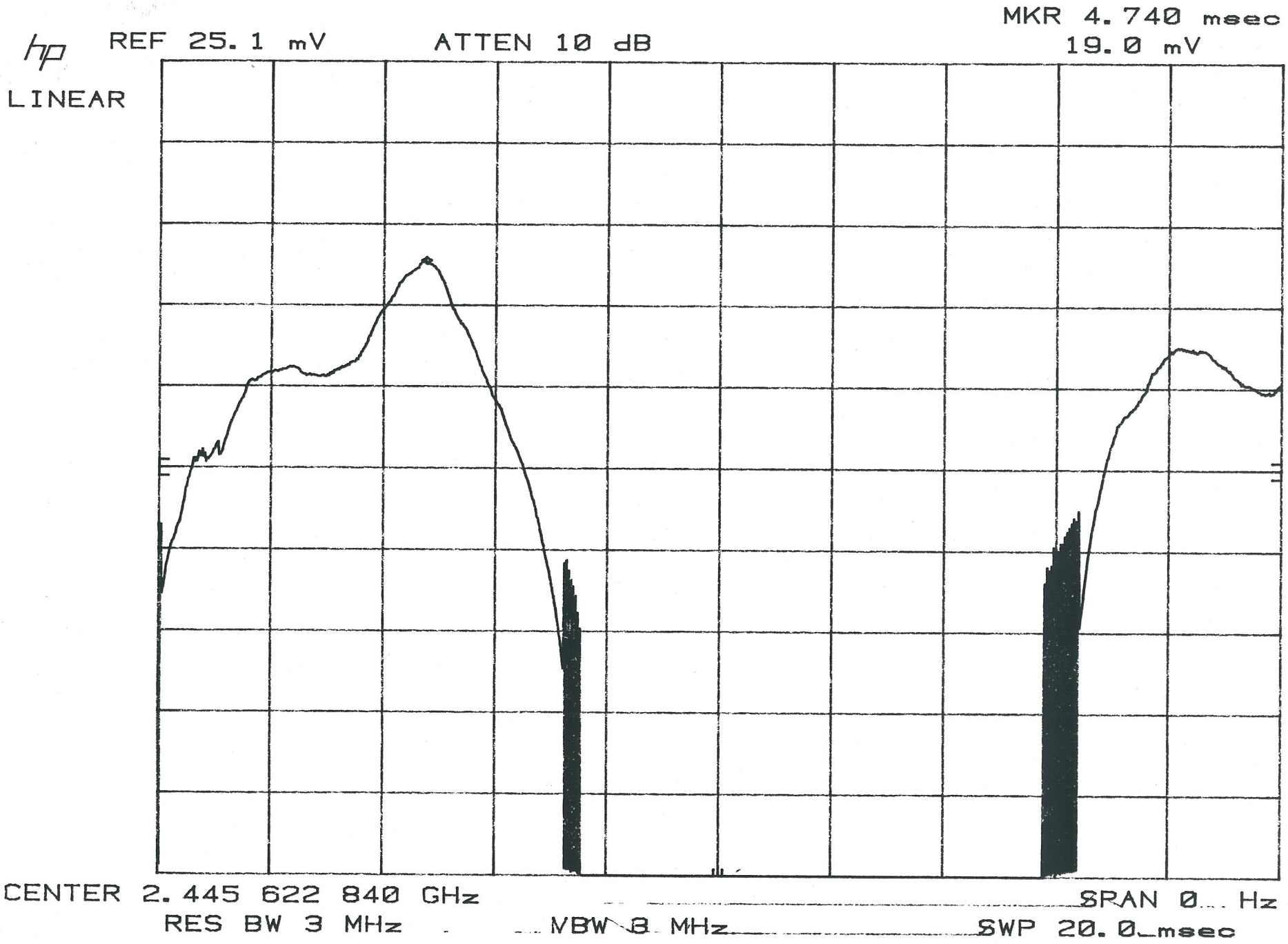
Figure 4-40


hp
REF 31.6 µV
ATTEN 10 dB
MKR 161.2 msec
28.3 µV
LINEAR
MARKER
161.2 msec
28.3 µV
CENTER 2.445 622 840 GHz
SPAN 0 Hz
RES BW 10 Hz
VBW 3 MHz
SWP 200 msec

Magic Chef

2450 MHz

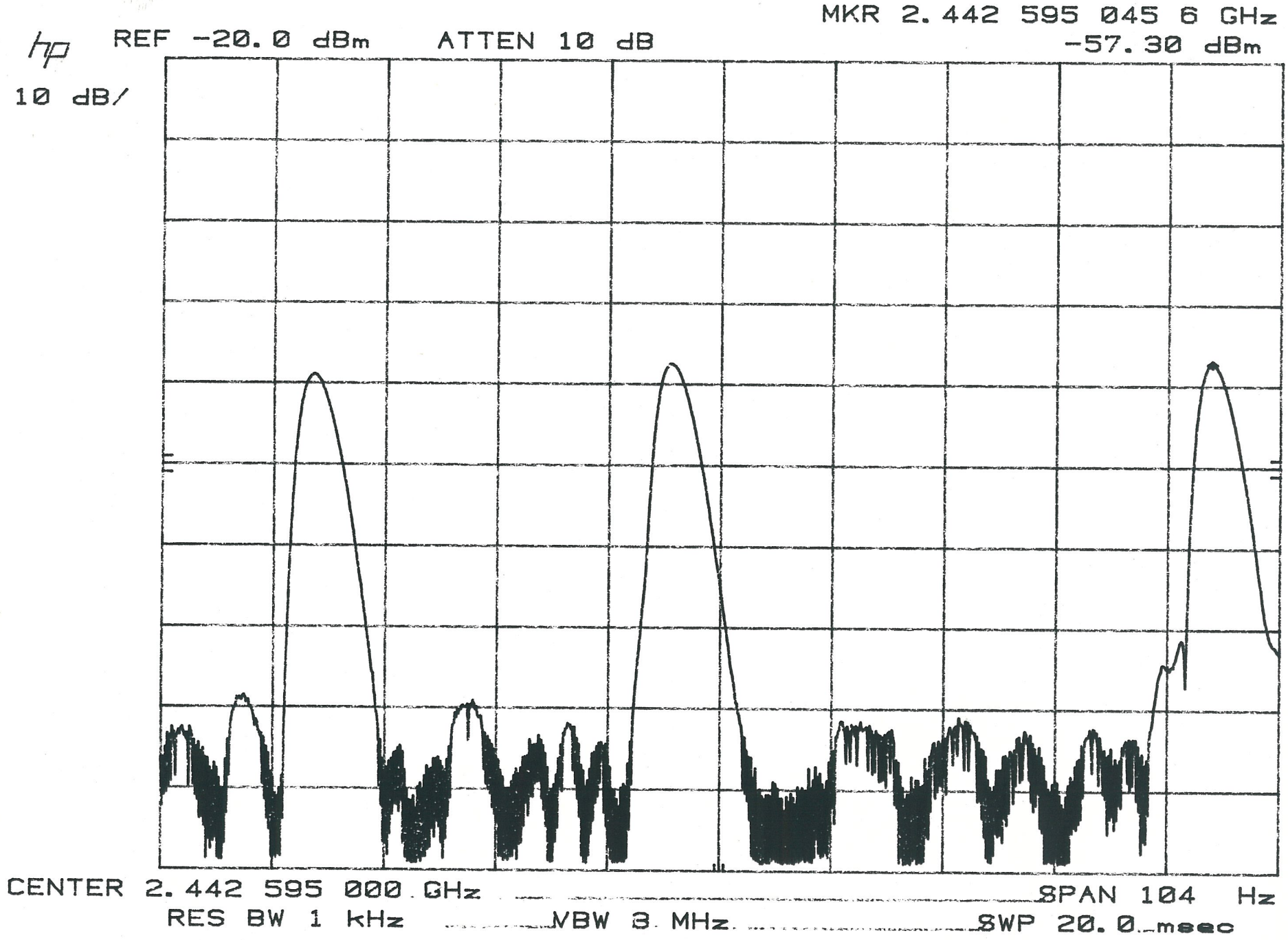
Figure 4-41


hp
REF 25.1 mV
ATTEN 10 dB
MKR 4.740 msec
19.0 mV
LINEAR
CENTER 2.445 622 840 GHz
SPAN 0 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 MHz

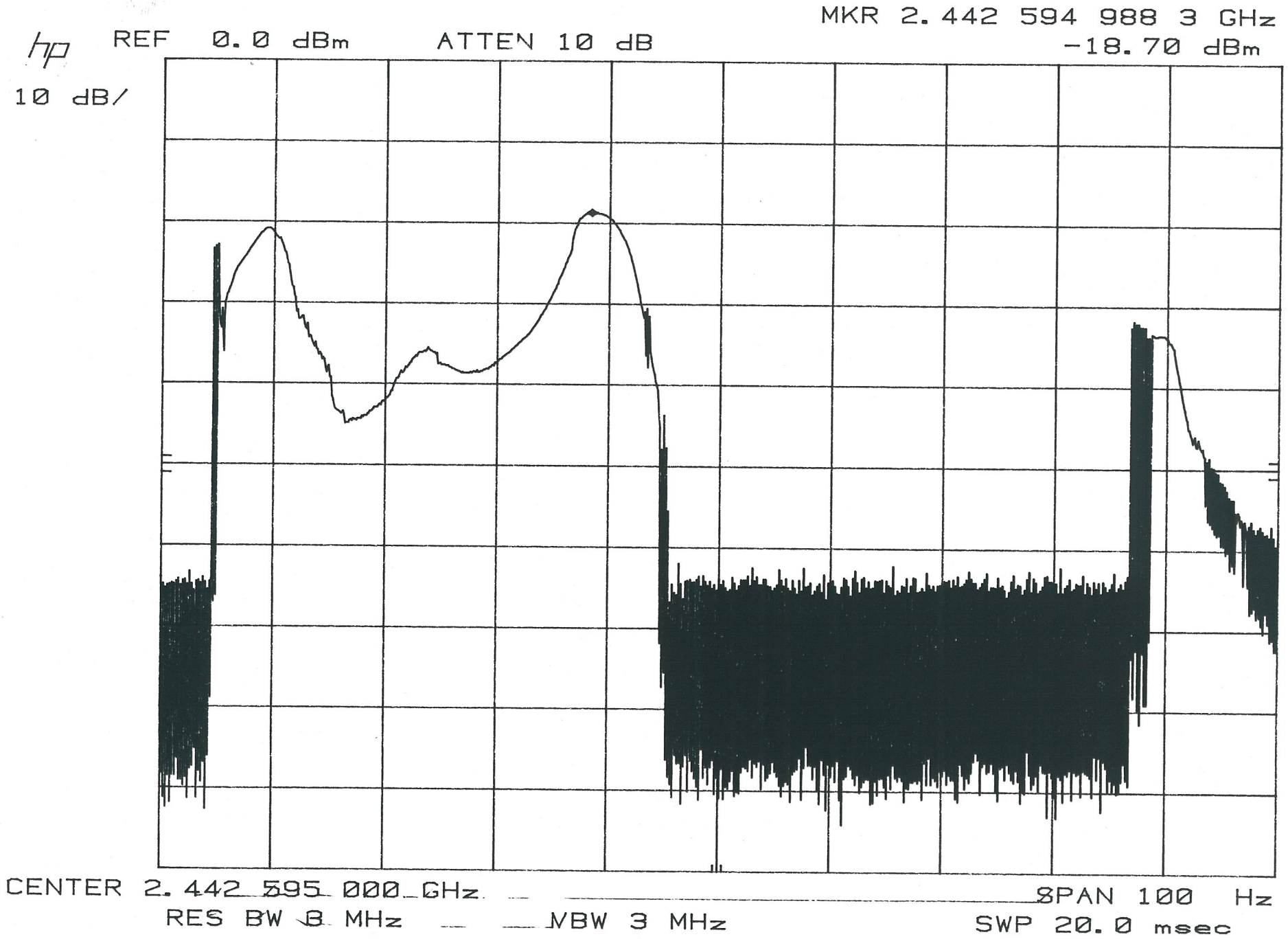
Figure 4-42


hp
REF -20.0 dBm
ATTEN 10 dB
MKR 2.442 595 045 6 GHz
-57.30 dBm
10 dB/
CENTER 2.442 595 000 GHz
SPAN 104 Hz
RES BW 1 kHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

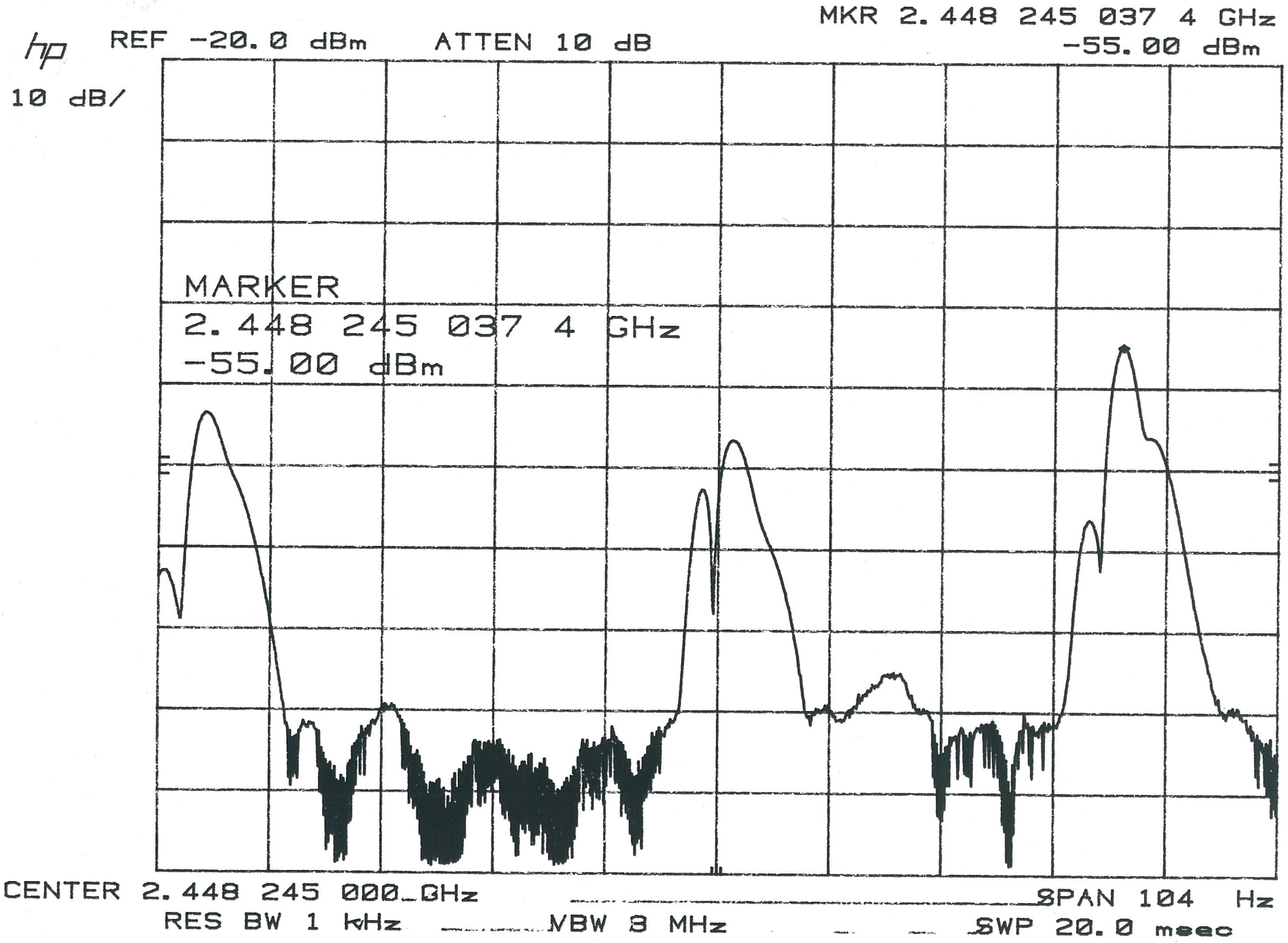
2450 MHz

Figure 4-43


MKR 2.442 594 988 3 GHz
-18.70 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
CENTER 2.442 595 000 GHz
SPAN 100 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef
2450 MHz

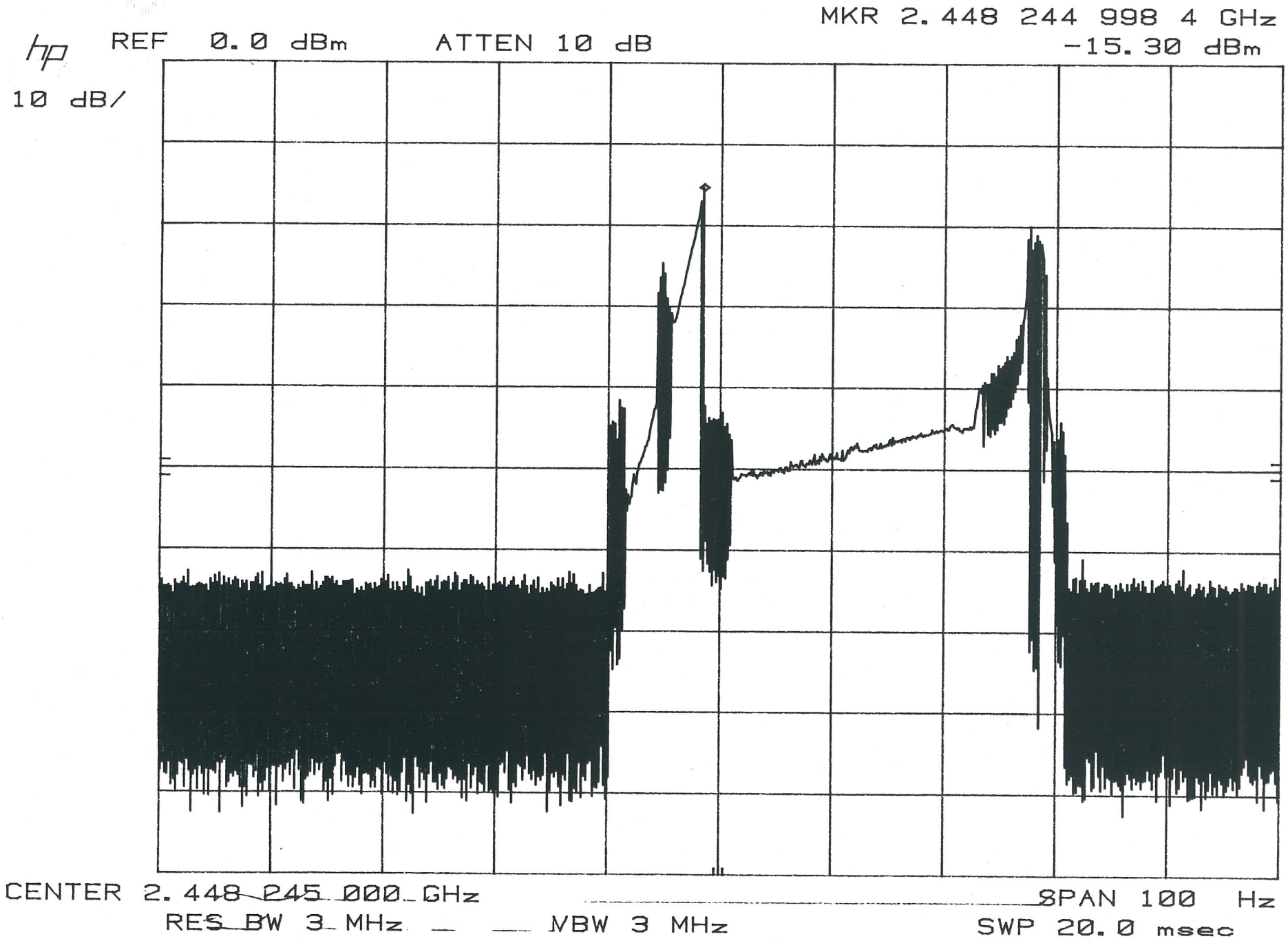
Figure 4-44


MKR 2.448 245 037 4 GHz
-55.00 dBm
REF -20.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.448 245 037 4 GHz
-55.00 dBm
CENTER 2.448 245 000 GHz
SPAN 104 Hz
RES BW 1 kHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 mHz

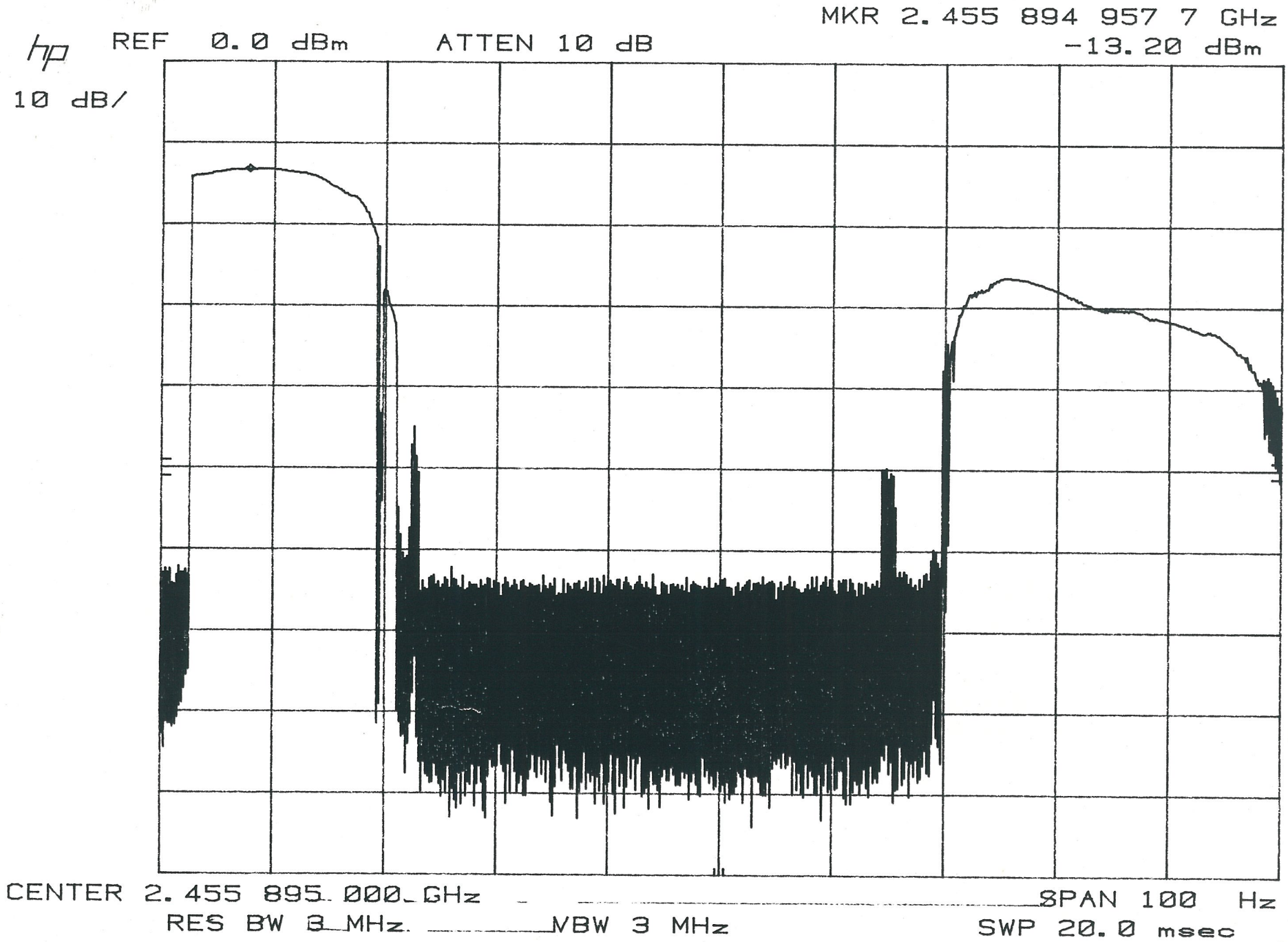
Figure 4-45


MKR 2.448 244 998 4 GHz
-15.30 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
CENTER 2.448 245 000 GHz
SPAN 100 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 MHz

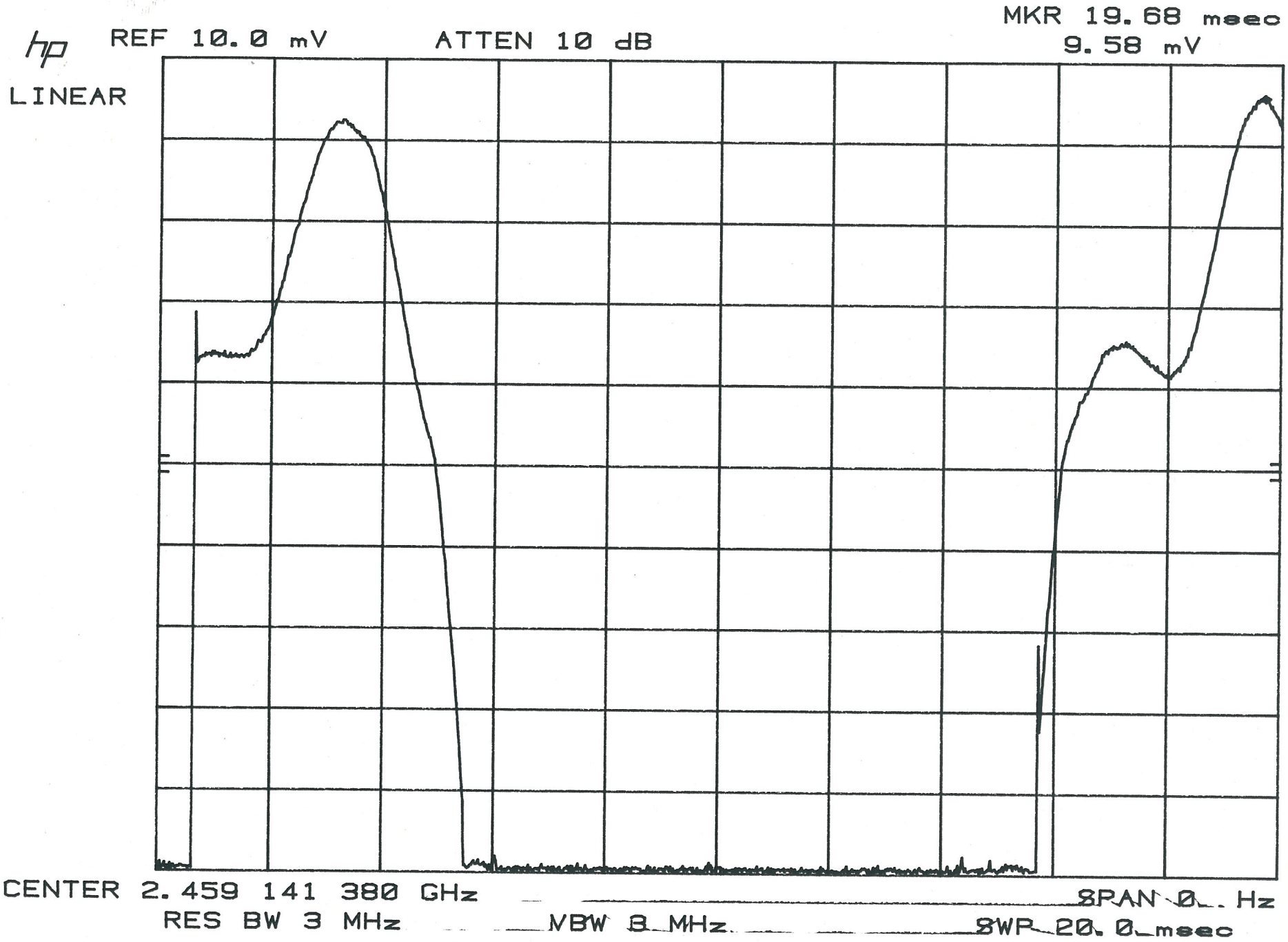
Figure 4-46


MKR 2.455 894 957 7 GHz
REF 0.0 dBm
ATTEN 10 dB
-13.20 dBm
10 dB/
CENTER 2.455 895.000 GHz
SPAN 100 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

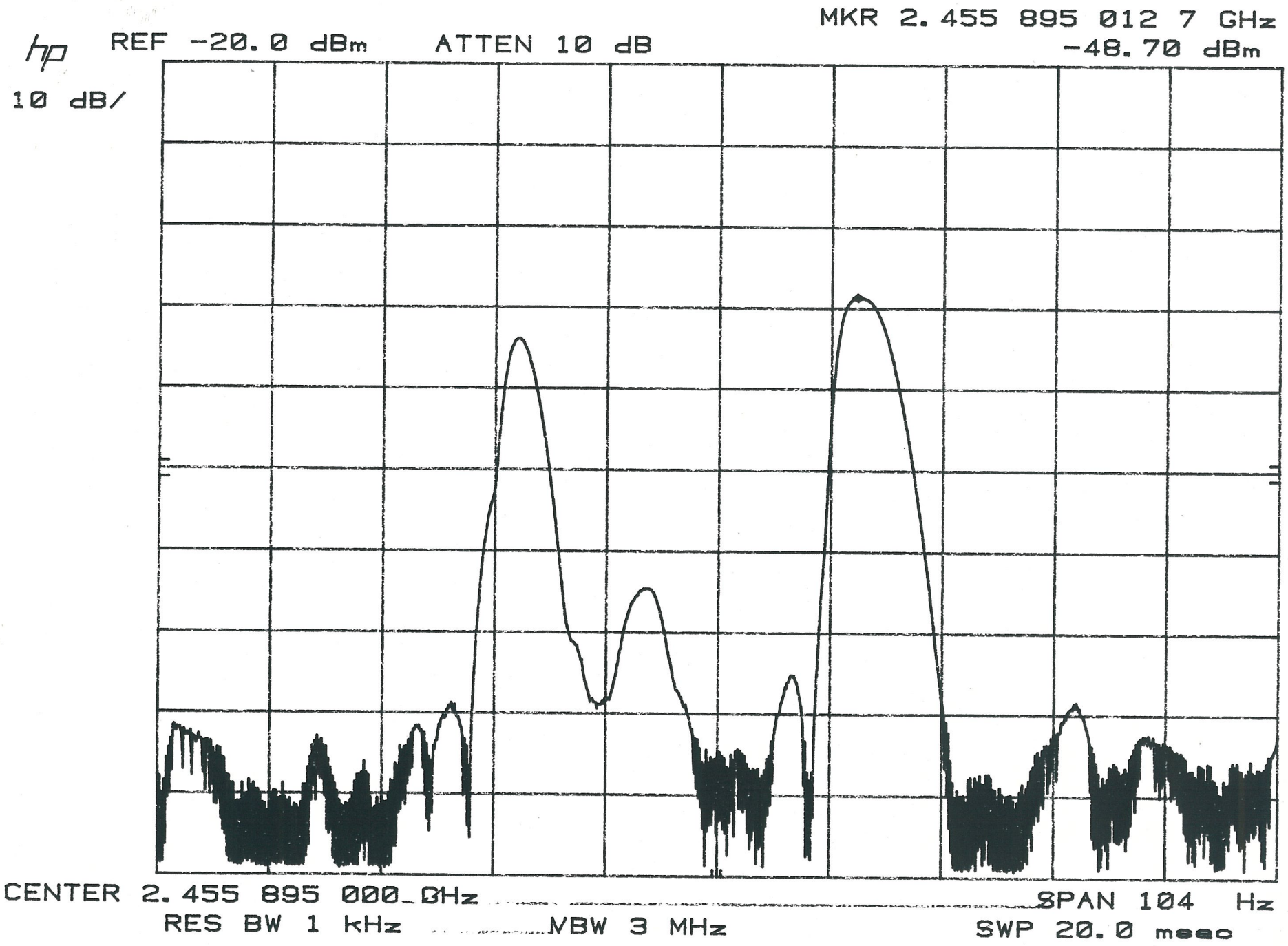
2450 MHz

Figure 4-52


hp
REF 10.0 mV
ATTEN 10 dB
MKR 19.68 msec
9.58 mV
LINEAR
CENTER 2.459 141 380 GHz
SPAN 0. Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Kenmore #2
1400 W
2450 MHz

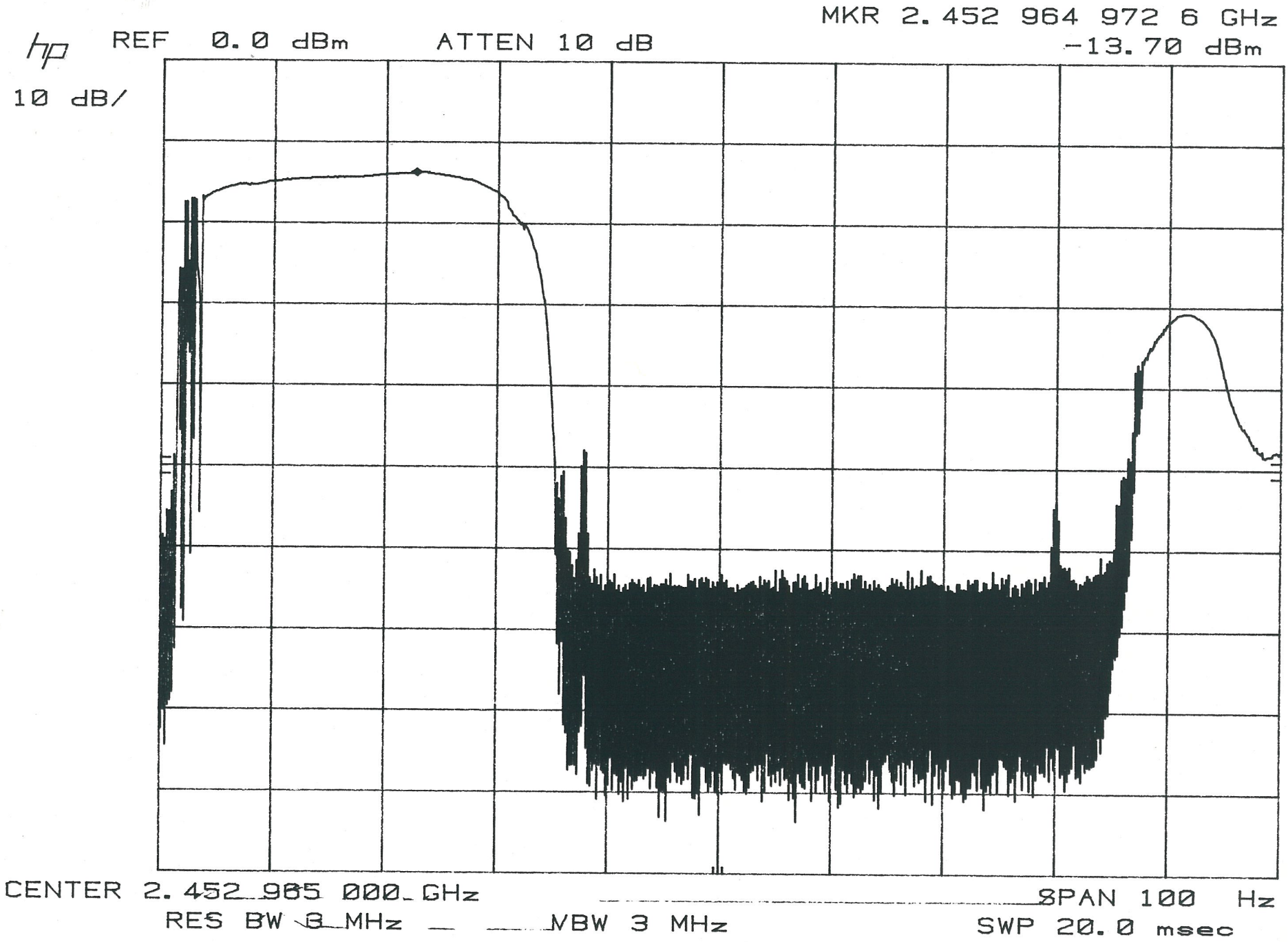
Figure 5-19


MKR 2.455 895 012 7 GHz
-48.70 dBm
hp
REF -20.0 dBm
ATTEN 10 dB
10 dB/
CENTER 2.455 895 000 GHz
SPAN 104 Hz
RES BW 1 kHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 MHz

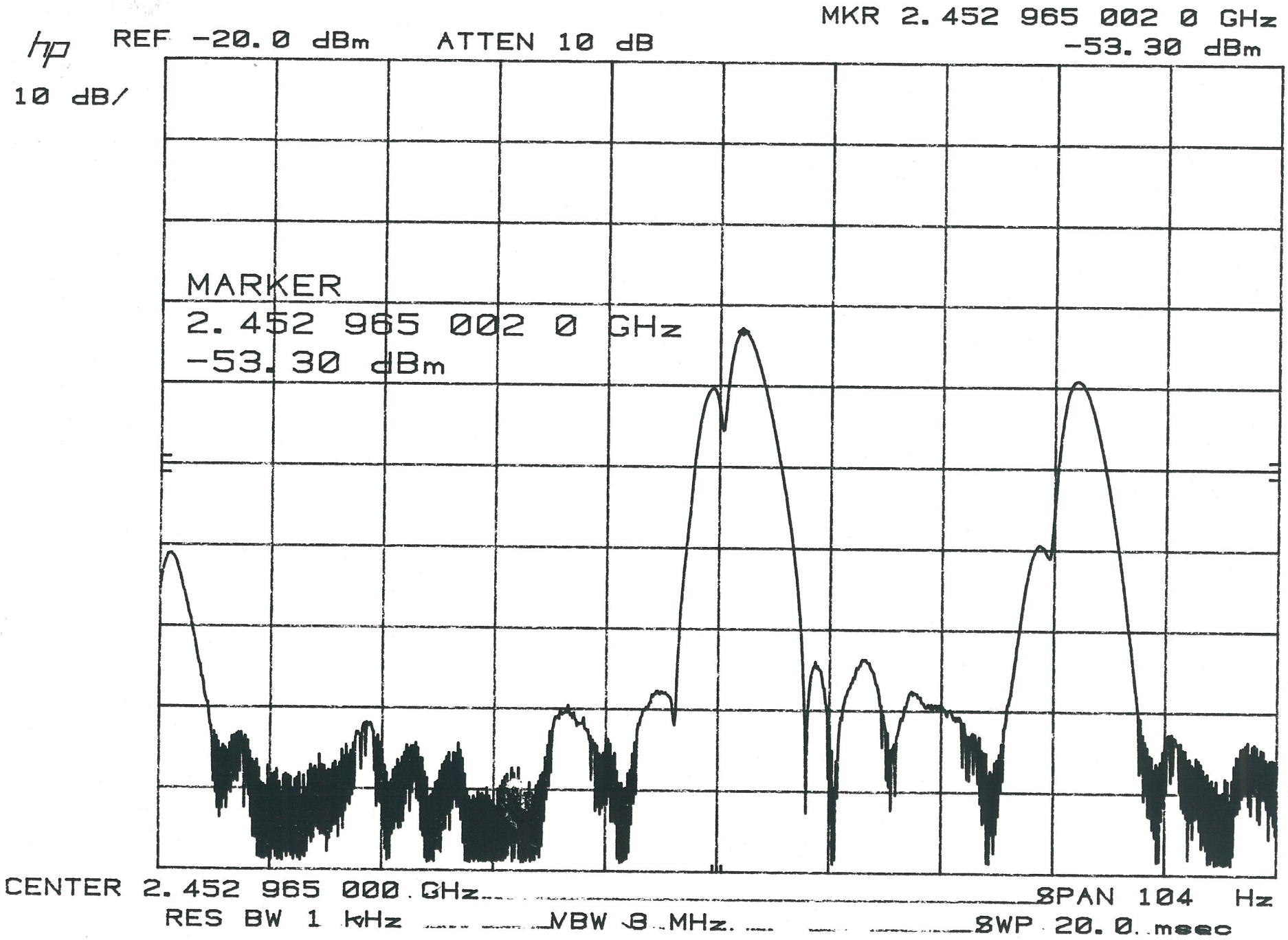
Figure 4-51


MKR 2.452 964 972 6 GHz
-13.70 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
CENTER 2.452 985 000 GHz
SPAN 100 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 MHz

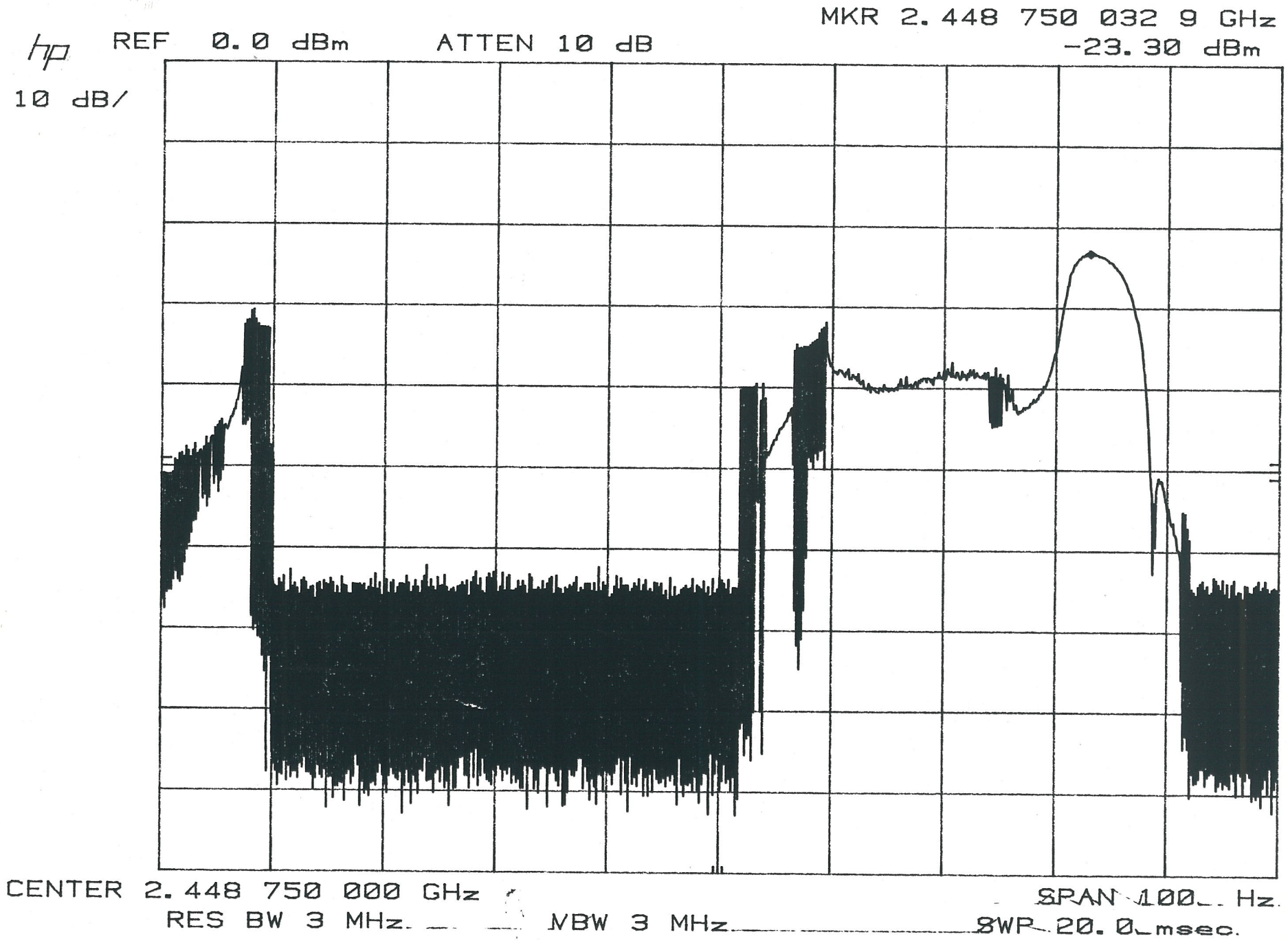
Figure 4-50


hp
REF -20.0 dBm
ATTEN 10 dB
MKR 2.452 965 002 0 GHz
-53.30 dBm
10 dB/
MARKER
2.452 965 002 0 GHz
-53.30 dBm
CENTER 2.452 965 000 GHz
SPAN 104 Hz
RES BW 1 kHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 mHz

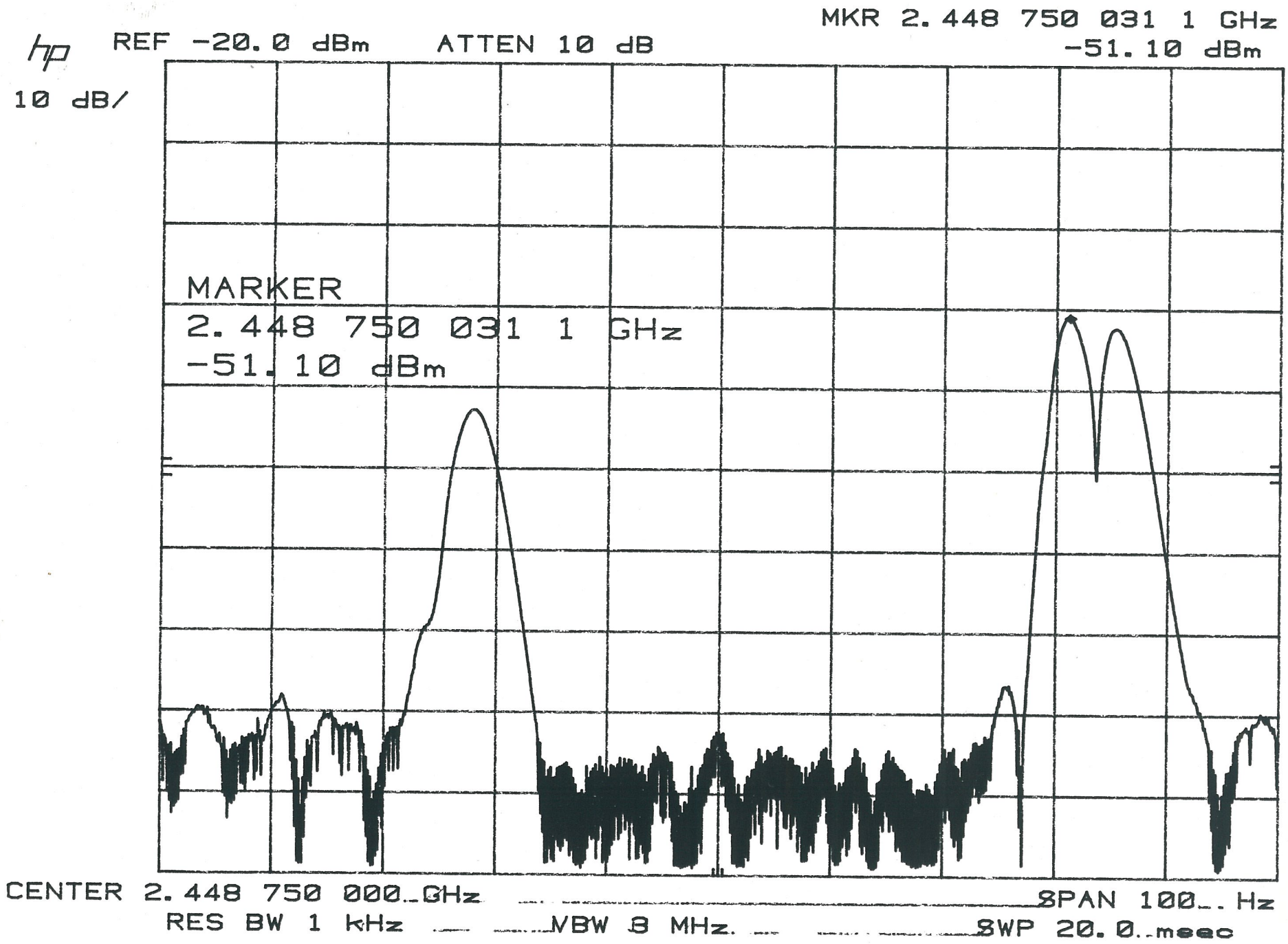
Figure 4-49


MKR 2.448 750 032 9 GHz
-23.30 dBm
REF 0.0 dBm
ATTEN 10 dB
10 dB/
CENTER 2.448 750 000 GHz
SPAN 100 Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Magic Chef

2450 MHz

Figure 4-48


hp
REF -20.0 dBm
ATTEN 10 dB
MKR 2.448 750 031 1 GHz
-51.10 dBm
10 dB/
MARKER
2.448 750 031 1 GHz
-51.10 dBm
CENTER 2.448 750 000 GHz
SPAN 100 Hz
RES BW 1 kHz
VBW 3 MHz
SWP 20.0 msec

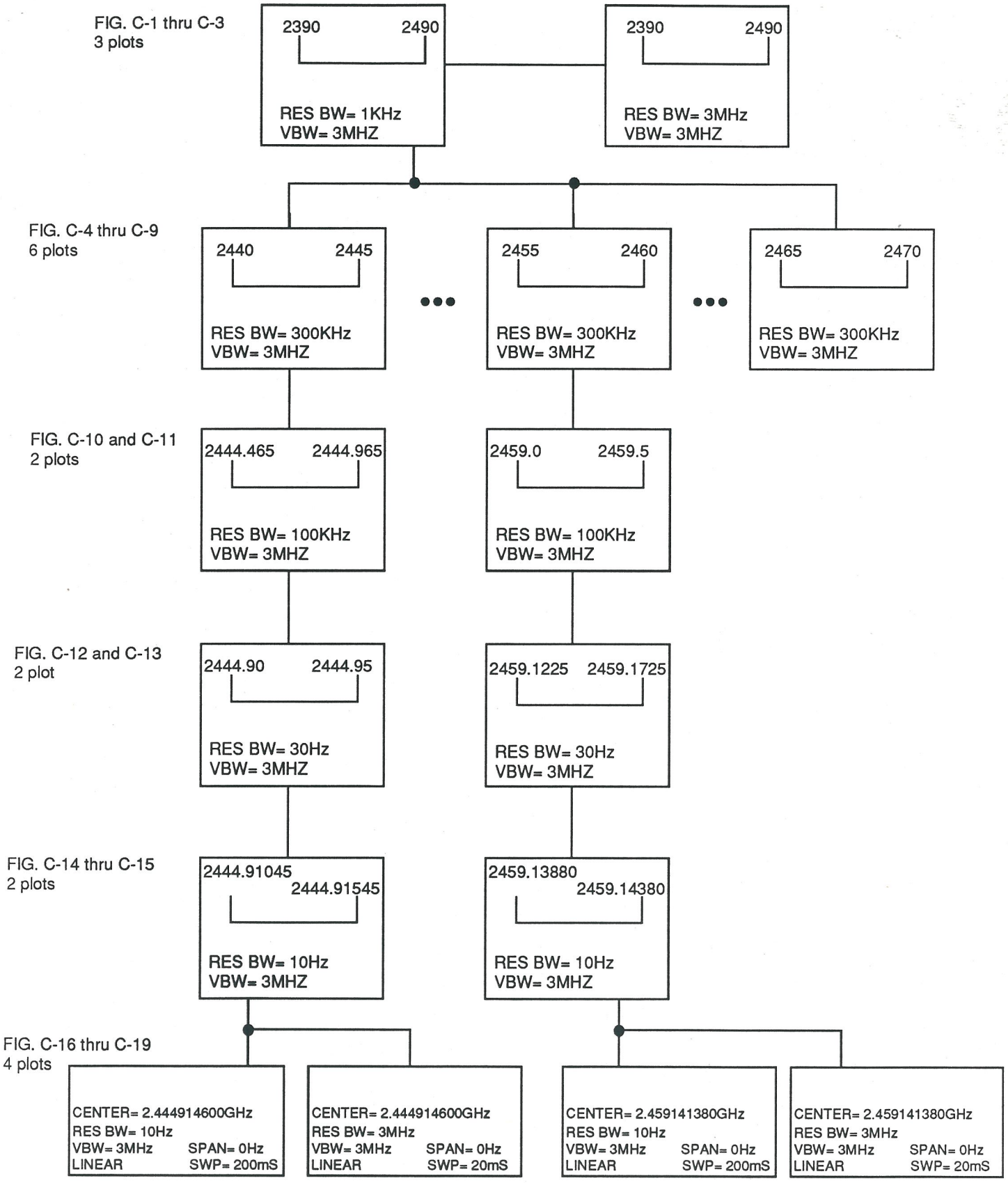
Magic Chef

2450 MHZ

Figure 4-47

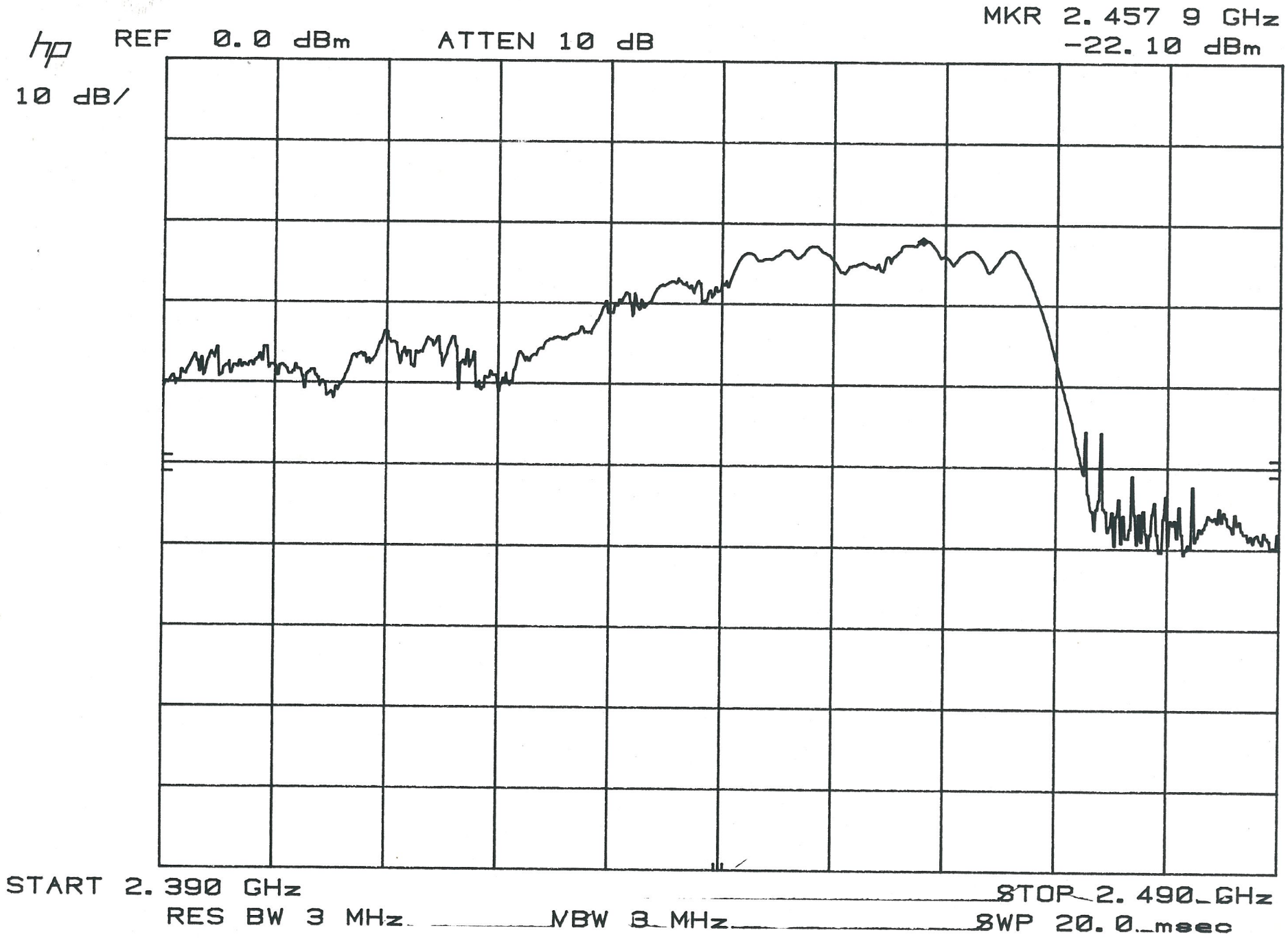
APPENDIX C

Kenmore #2
14 3/4"x 10 1/4"



14 3/4"Wx 10 1/4" H
Kenmore #2

FIGURE C.0

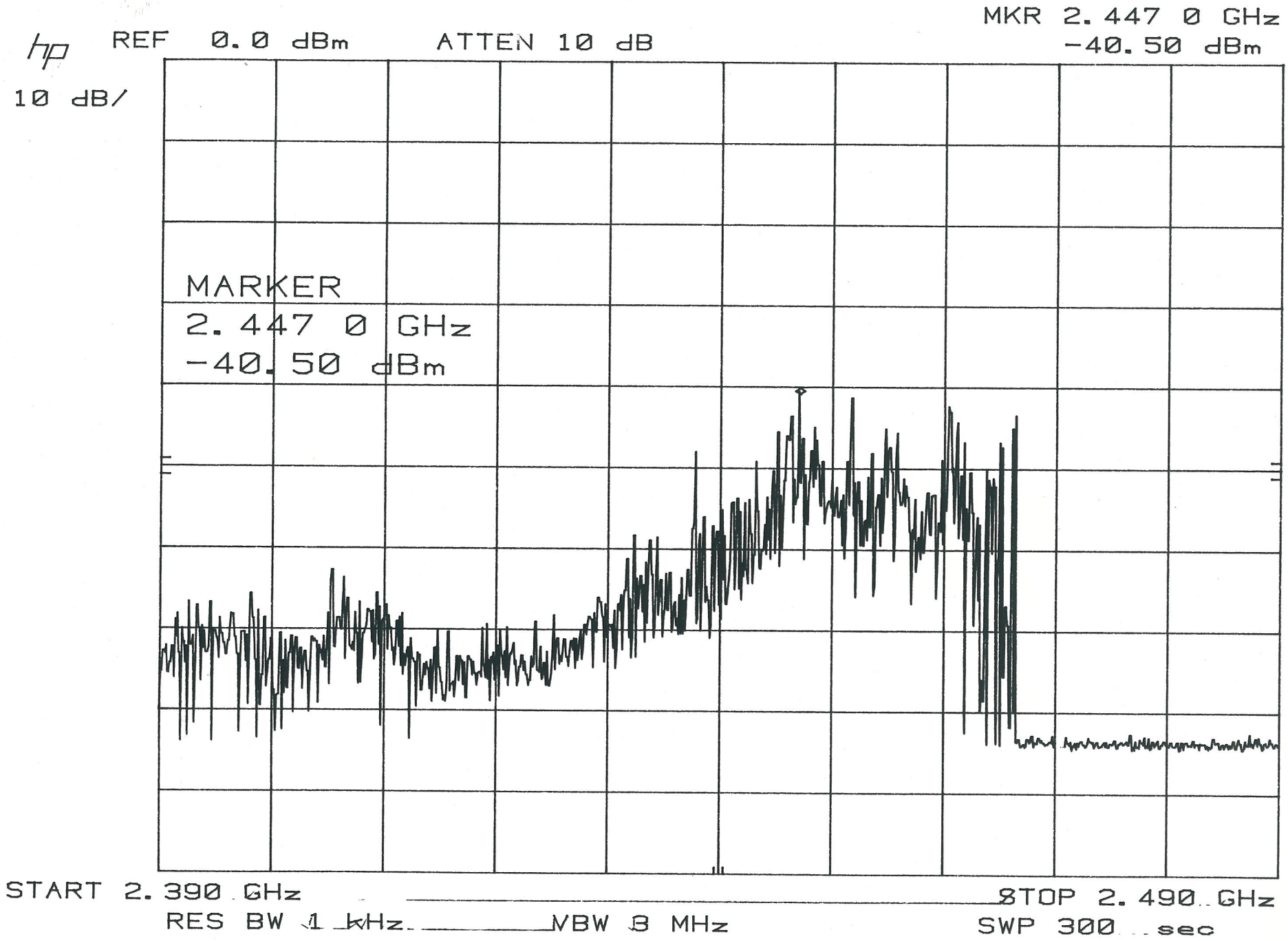

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.457 9 GHz
-22.10 dBm
10 dB/
START 2.390 GHz
STOP 2.490 GHz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec

Lost 1 1/6 cups of the original 1 1/2 cups water

10 minutes

Kenmore #2
1400 W
2450 MHz

Figure 5-1


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.447 0 GHz
-40.50 dBm
10 dB/
MARKER
2.447 0 GHz
-40.50 dBm
START 2.390 GHz
STOP 2.490 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 300 sec

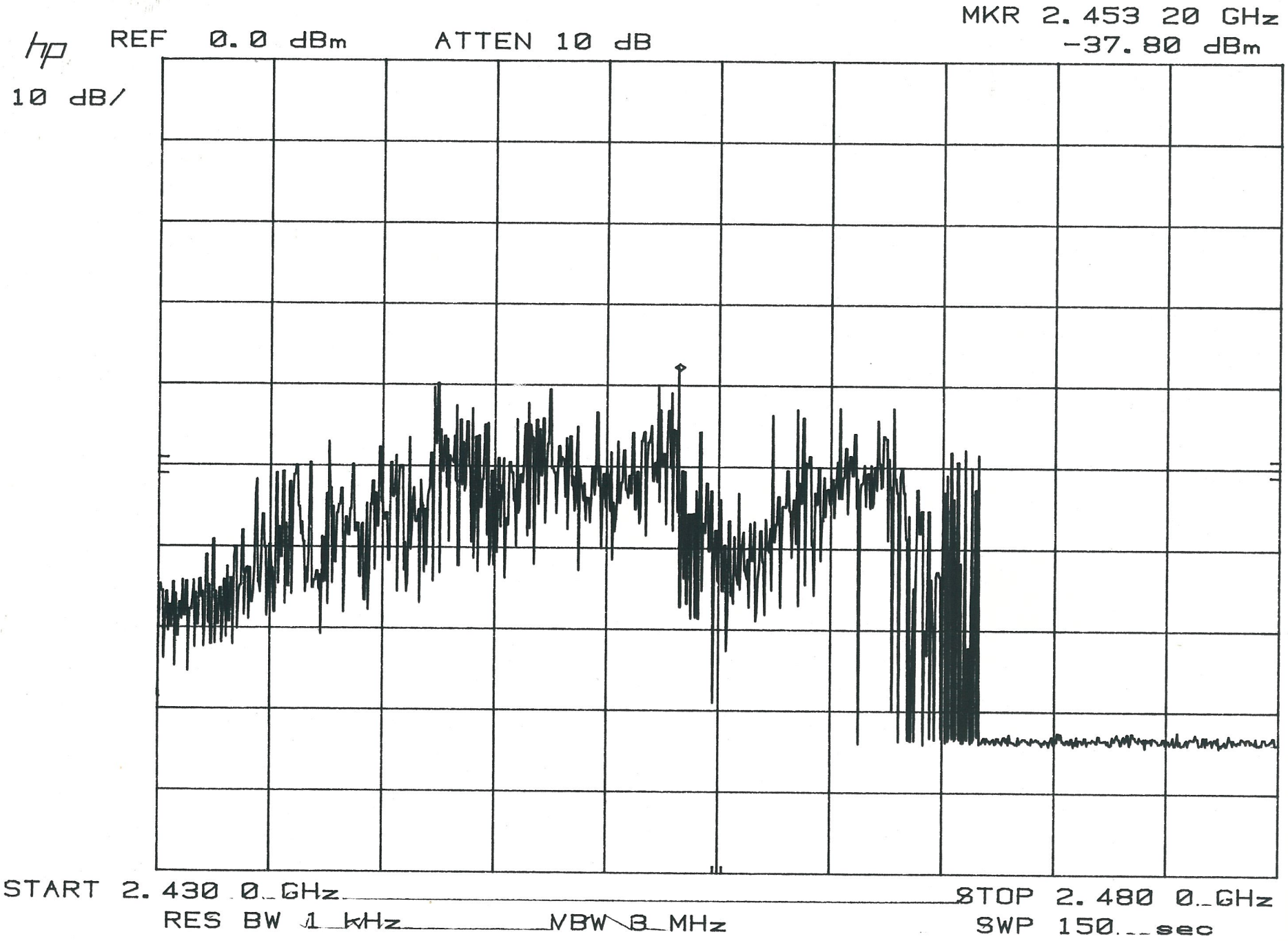
Lost 1/2 cup of the original 1 1/2 cups water

12 minutes

Kenmore
2450 MHz
1400 W

Model # 566.8868510

Figure 5-2


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.453 20 GHz
-37.80 dBm
10 dB/
START 2.430 0 GHz
STOP 2.480 0 GHz
RES BW 1 kHz
VBW 3 MHz
SWP 150 sec

Lost 5 oz of the original 12 oz of water

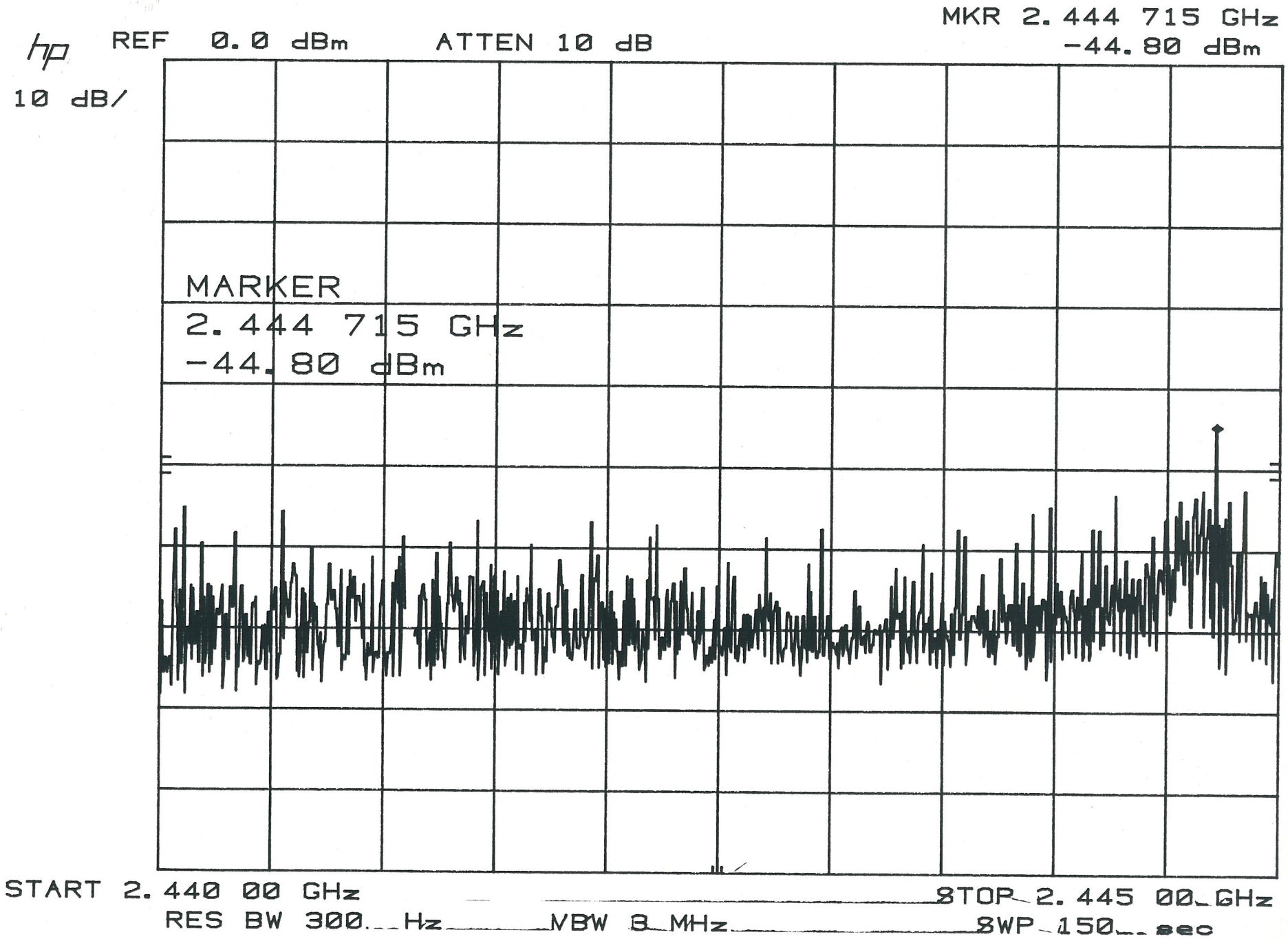
10 minutes

Kenmore #2

1400 W

2450 MHz

Figure 5-3

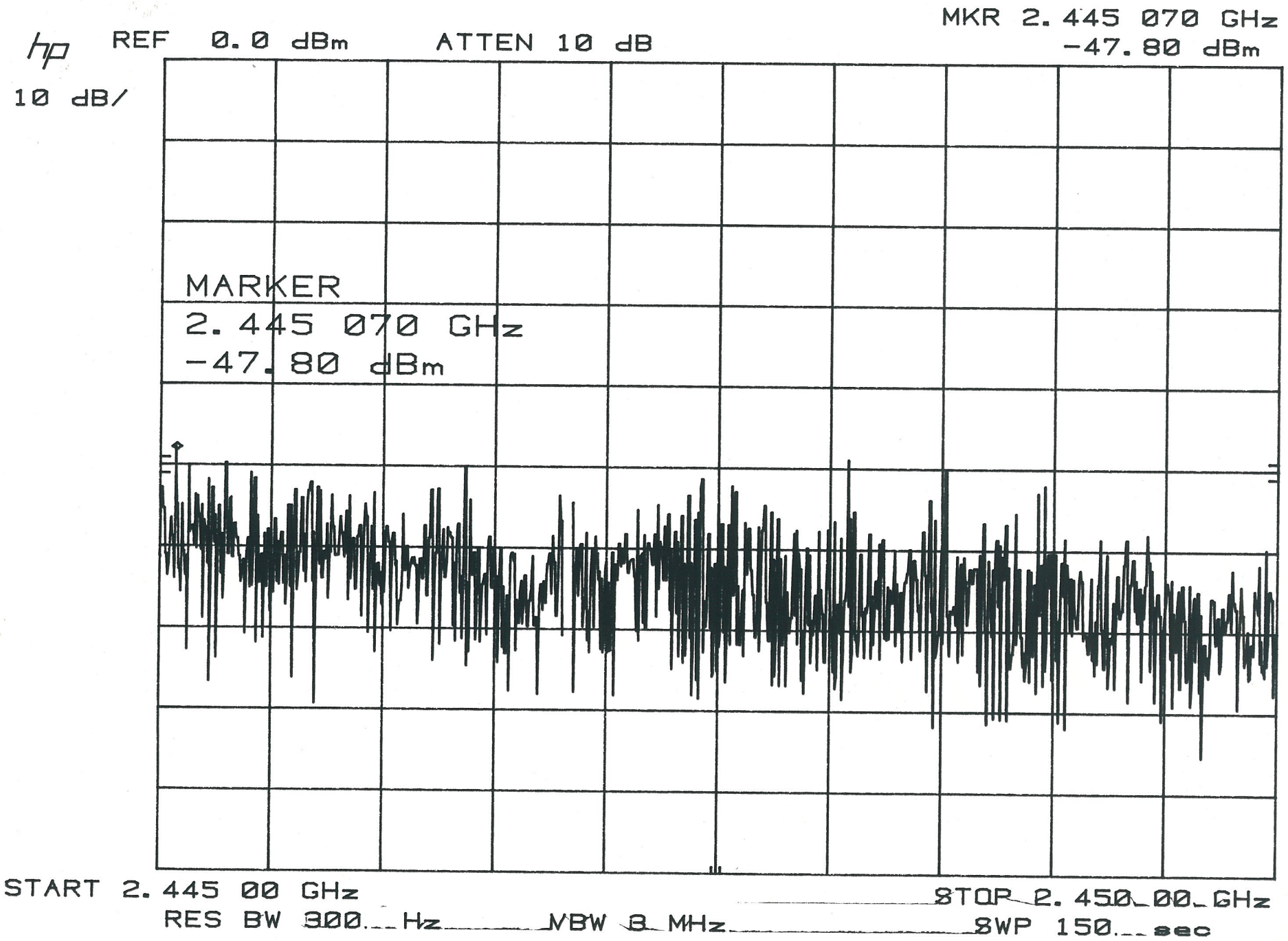

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.444 715 GHz
-44.80 dBm
10 dB/
MARKER
2.444 715 GHz
-44.80 dBm
START 2.440 00 GHz
STOP 2.445 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water

10 min

Kenmore #2
1400 W
2450 MHz

Figure 5-4

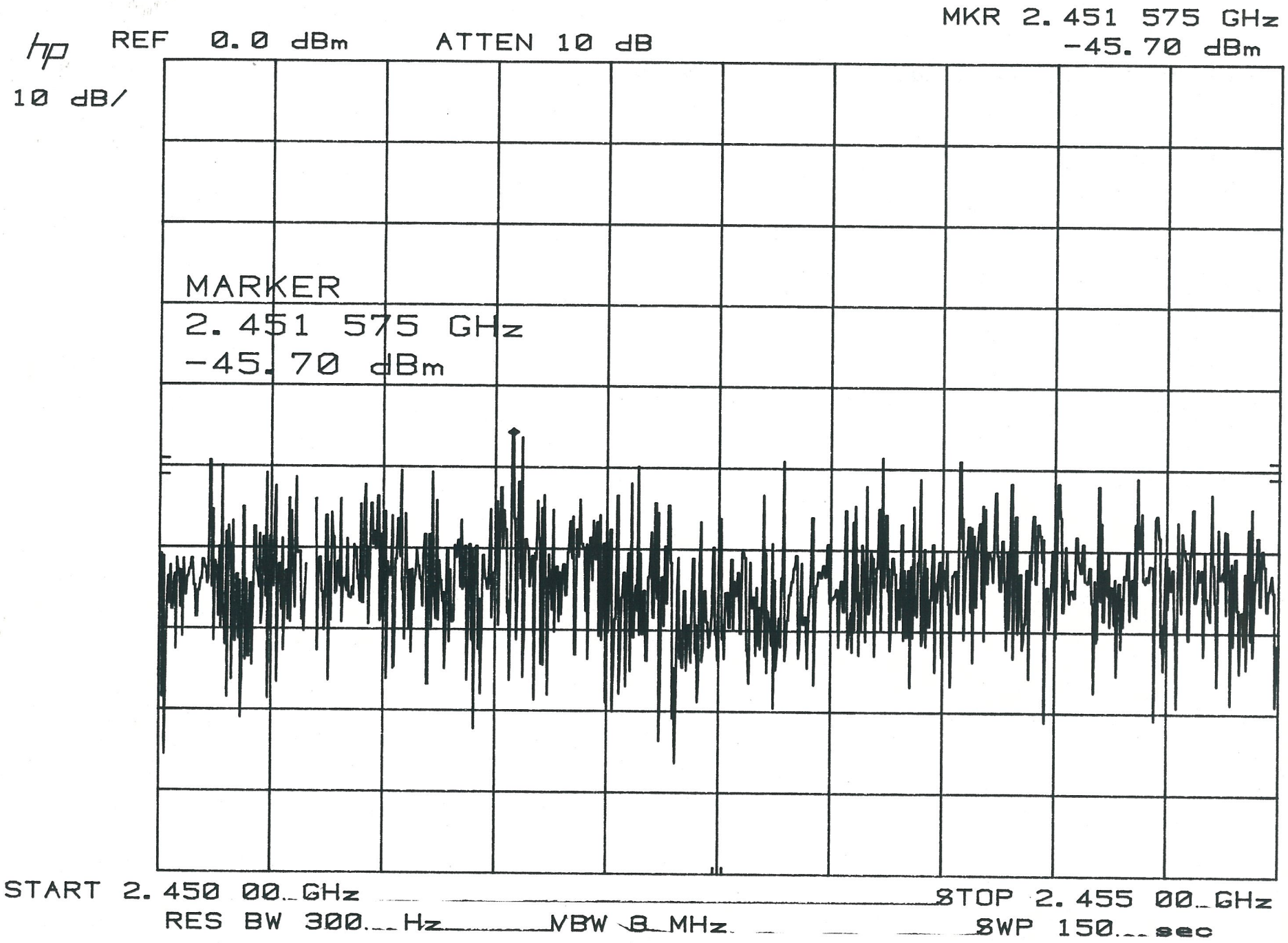

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.445 070 GHz
-47.80 dBm
10 dB/
MARKER
2.445 070 GHz
-47.80 dBm
START 2.445 00 GHz
STOP 2.450 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/3 cups water

10 minutes

Kenmore #2
1400W
2450MHz

Figure 5-5

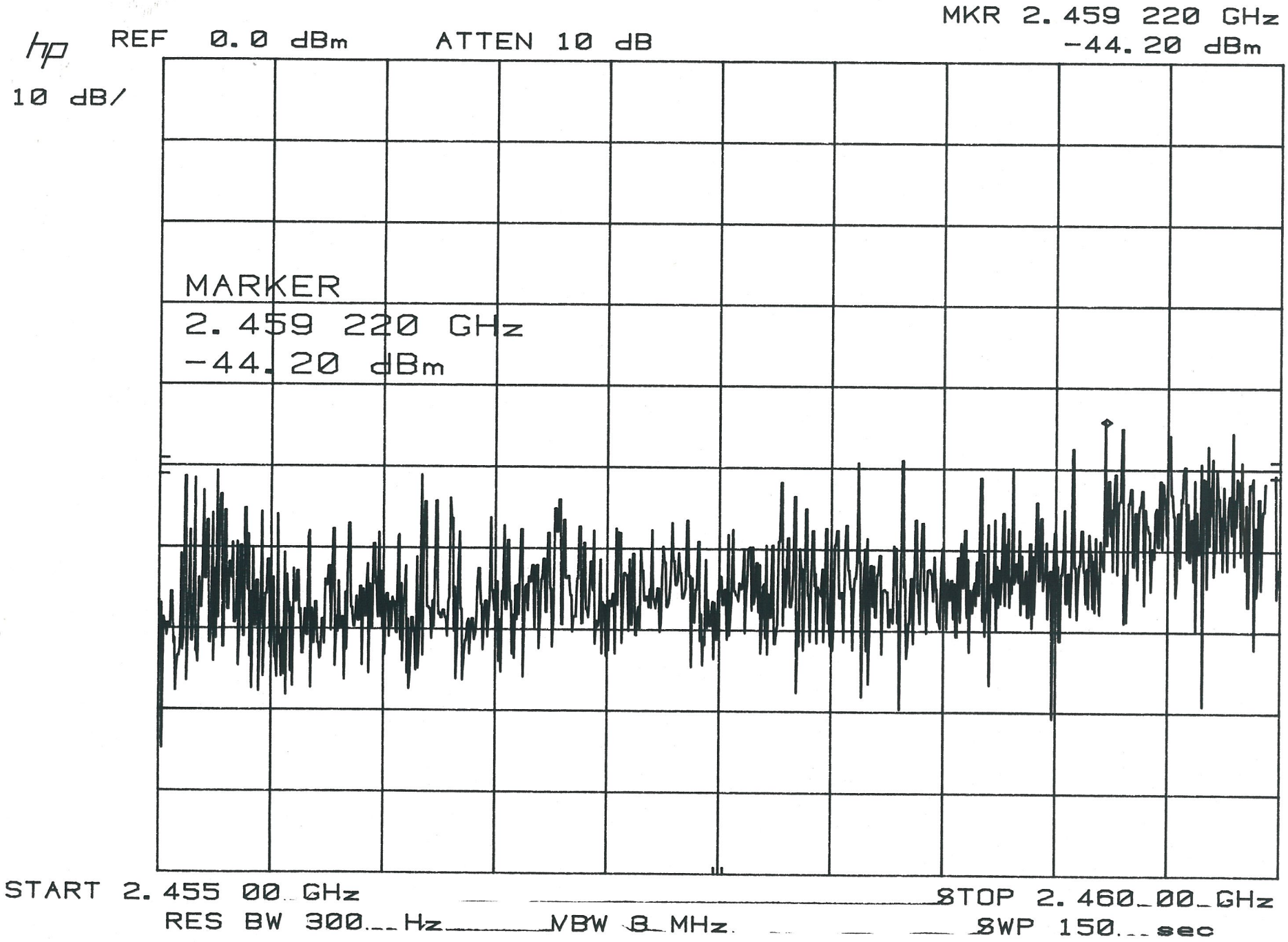

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.451 575 GHz
-45.70 dBm
10 dB/
MARKER
2.451 575 GHz
-45.70 dBm
START 2.450 00 GHz
STOP 2.455 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water

10 minutes

Kenmore #2
1400W
2450 MHz

Figure 5-6

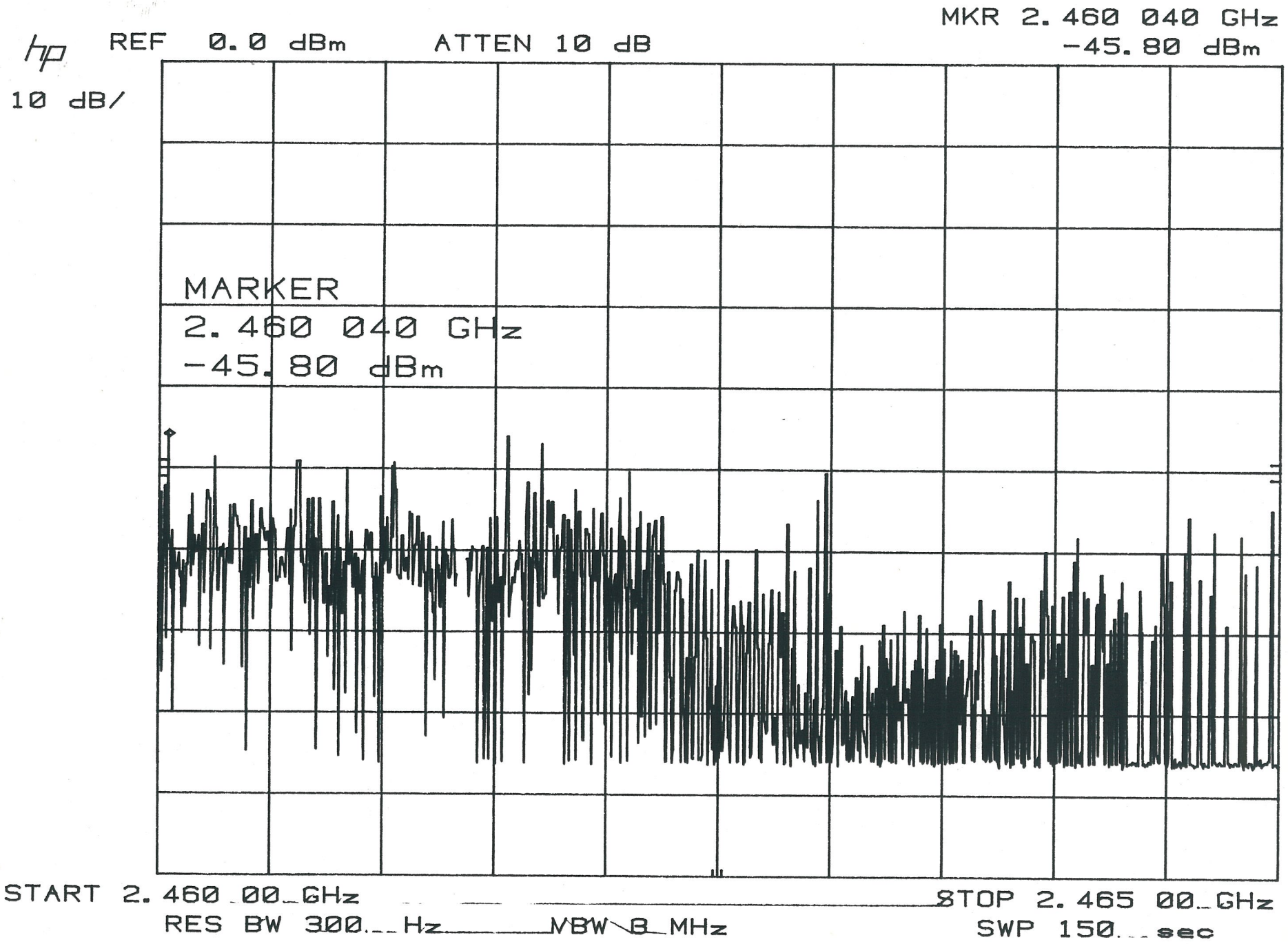

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.459 220 GHz
-44.20 dBm
10 dB/
MARKER
2.459 220 GHz
-44.20 dBm
START 2.455 00 GHz
STOP 2.460 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/2 cup of the original 1 1/2 cups water

10 minutes

Kenmore #2
1400 W
2450 MHz

Figure 5-7

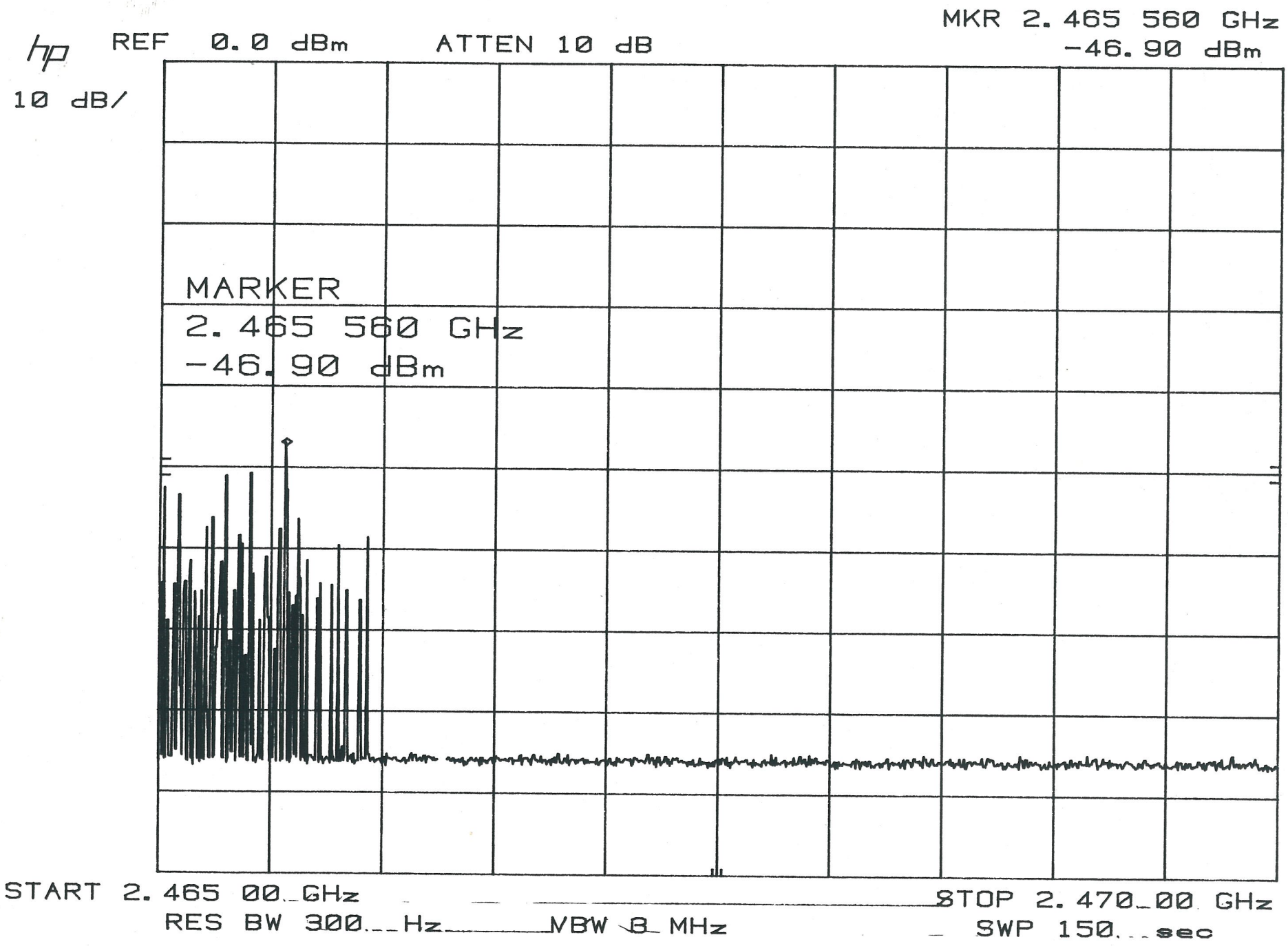

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.460 040 GHz
-45.80 dBm
10 dB/
MARKER
2.460 040 GHz
-45.80 dBm
START 2.460 00 GHz
STOP 2.465 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost ½ cup of the original 1½ cups water

10 minutes

Kenmore #2
1400W
2450 MHz

Figure 5-8

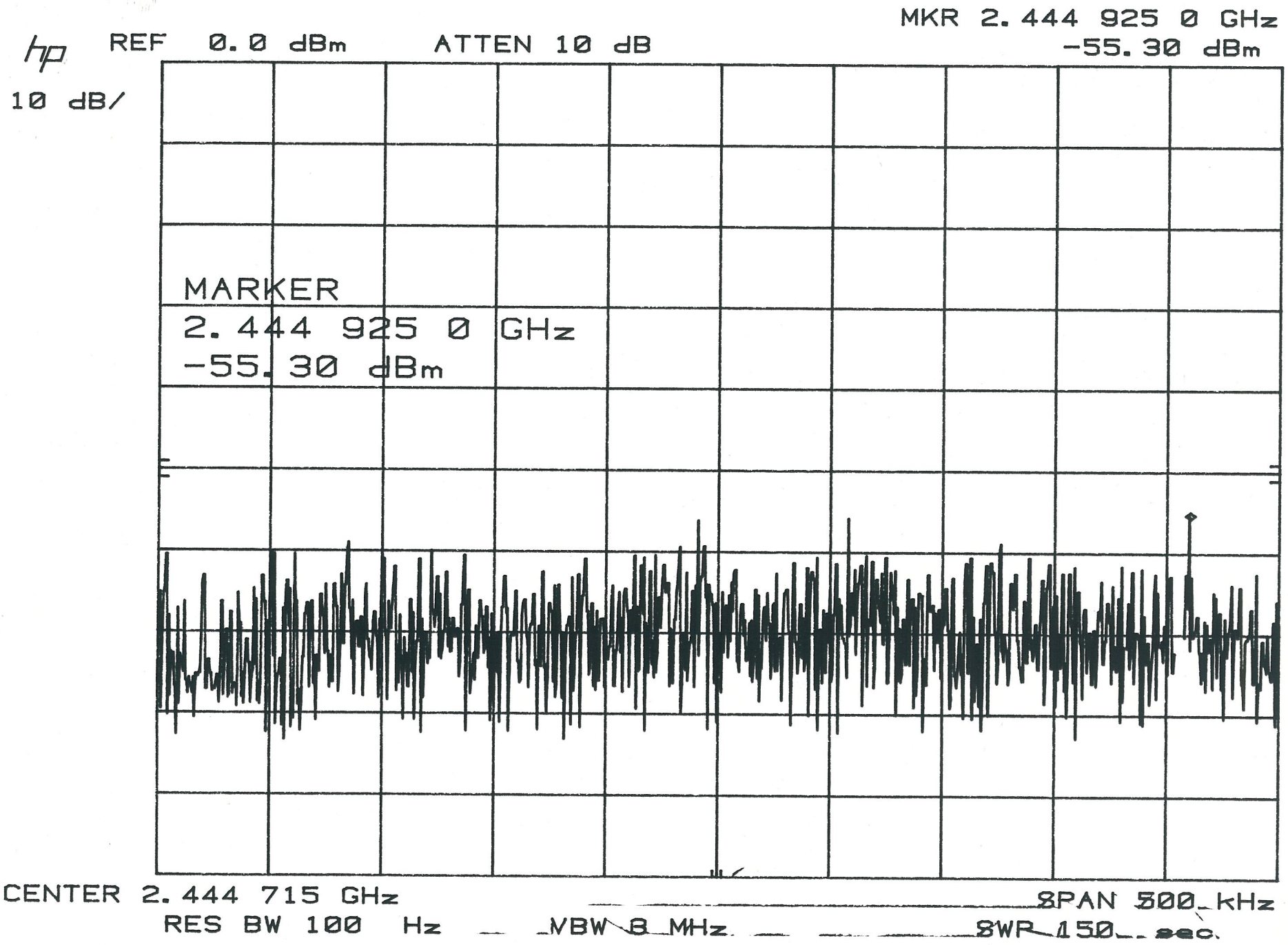

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.465 560 GHz
-46.90 dBm
10 dB/
MARKER
2.465 560 GHz
-46.90 dBm
START 2.465 00 GHz
STOP 2.470 00 GHz
RES BW 300 Hz
VBW 3 MHz
SWP 150 sec

Lost 1/4 cup of the original 1 1/2 cups water

10 minutes

Kenmore #2
1400W
2450MHz

Figure 5-9

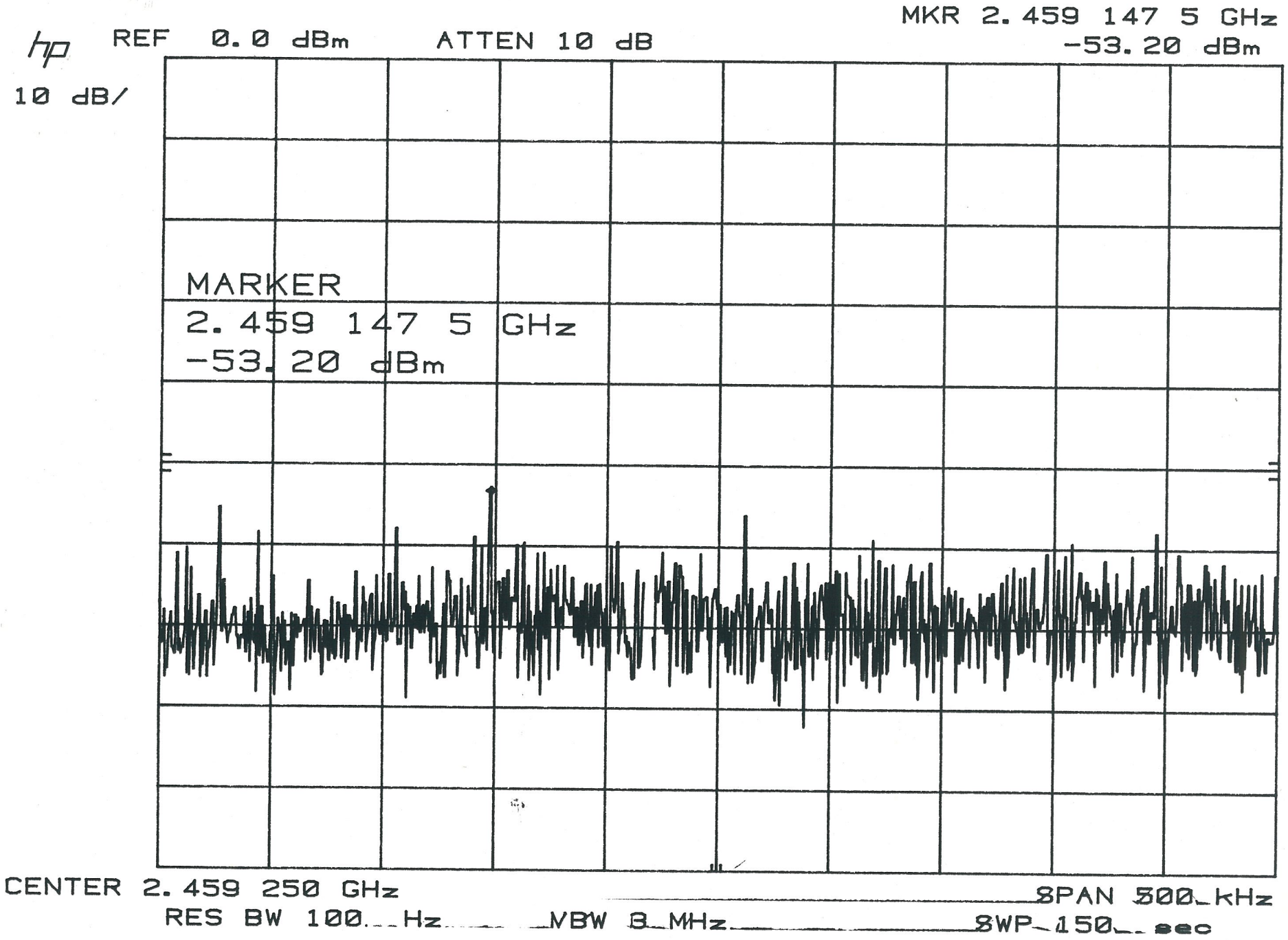

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.444 925 0 GHz
-55.30 dBm
10 dB/
MARKER
2.444 925 0 GHz
-55.30 dBm
CENTER 2.444 715 GHz
SPAN 500 kHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec.

Lost 5/6 cup of the original 1 1/2 cups water

10 minutes

Kenmore #2
1400W
2450MHZ

Figure 5-10


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.459 147 5 GHz
-53.20 dBm
10 dB/
MARKER
2.459 147 5 GHz
-53.20 dBm
CENTER 2.459 250 GHz
SPAN 500 kHz
RES BW 100 Hz
VBW 3 MHz
SWP 150 sec

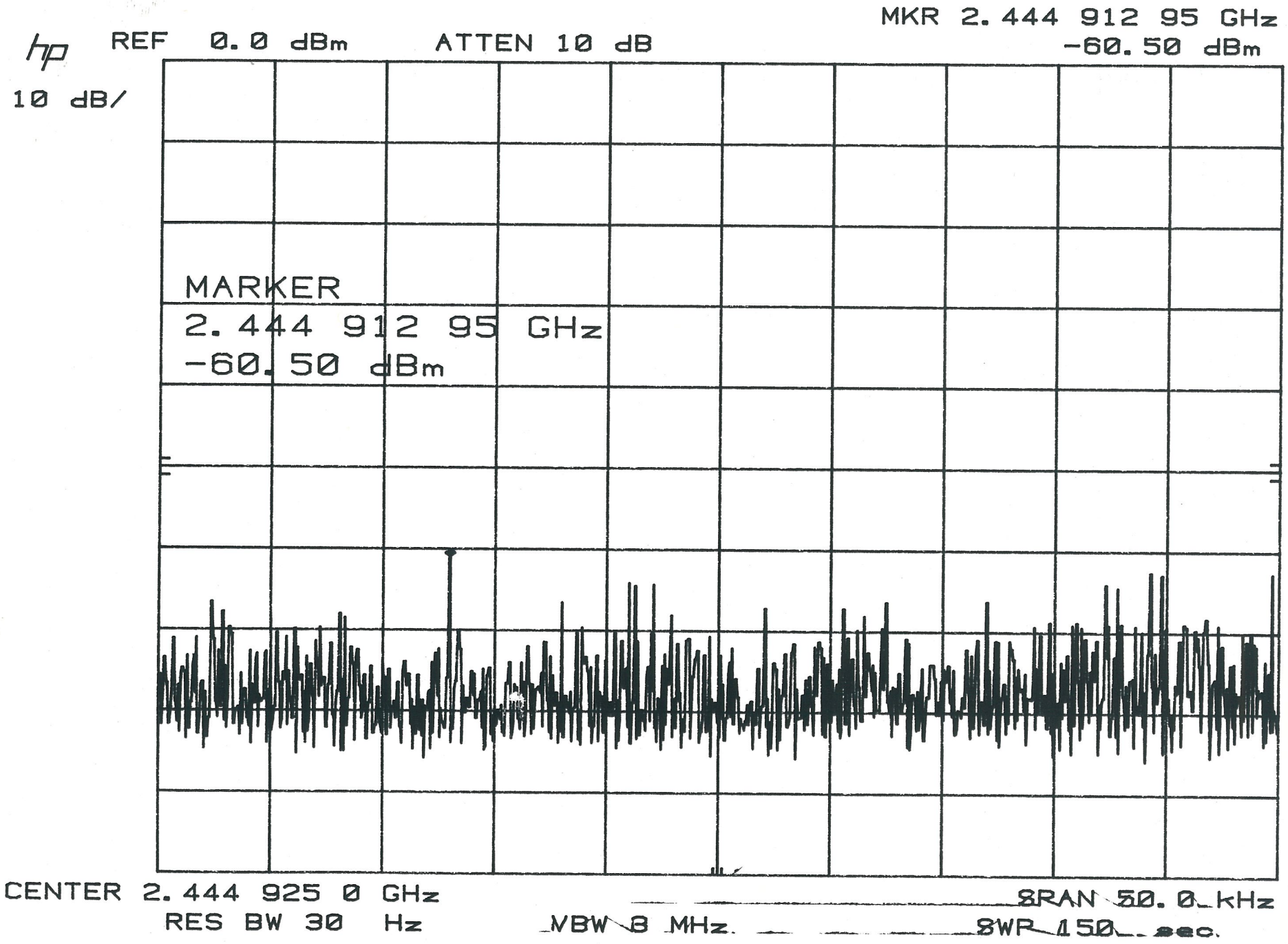
Lost 1/2 cup of the original 1 1/2 cups water

10 minutes

Kenmore #2
1400 W

2450 MHz

Figure 5-11

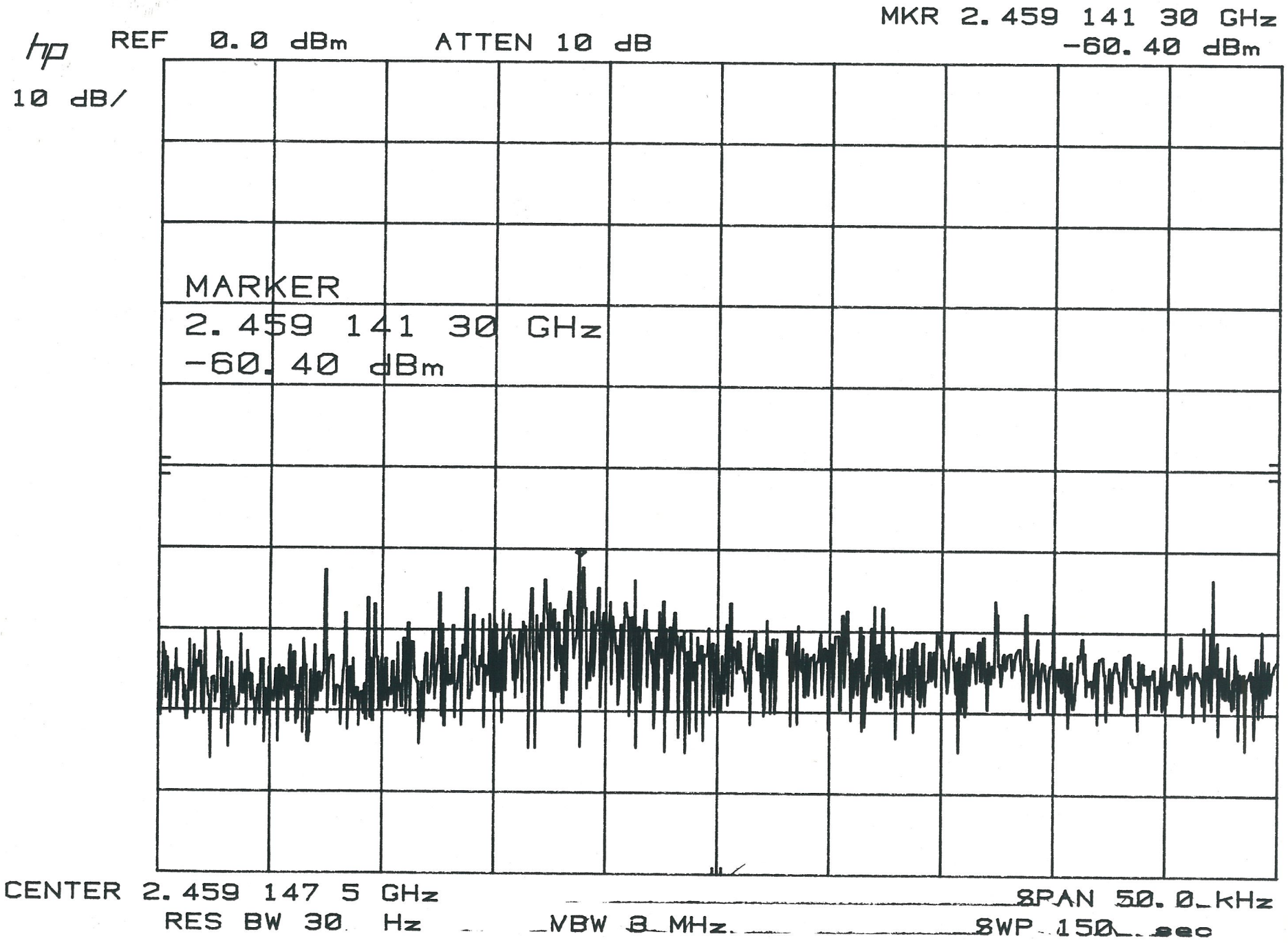

MKR 2.444 912 95 GHz
-60.50 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.444 912 95 GHz
-60.50 dBm
CENTER 2.444 925 0 GHz
RES BW 30 Hz
VBW 3 MHz
SPAN 50.0 kHz
SWP 150 sec

Lost 1/4 cup of the original 1 1/2 cups water

10 minutes

Kenmore #2
1400W
2450MHZ

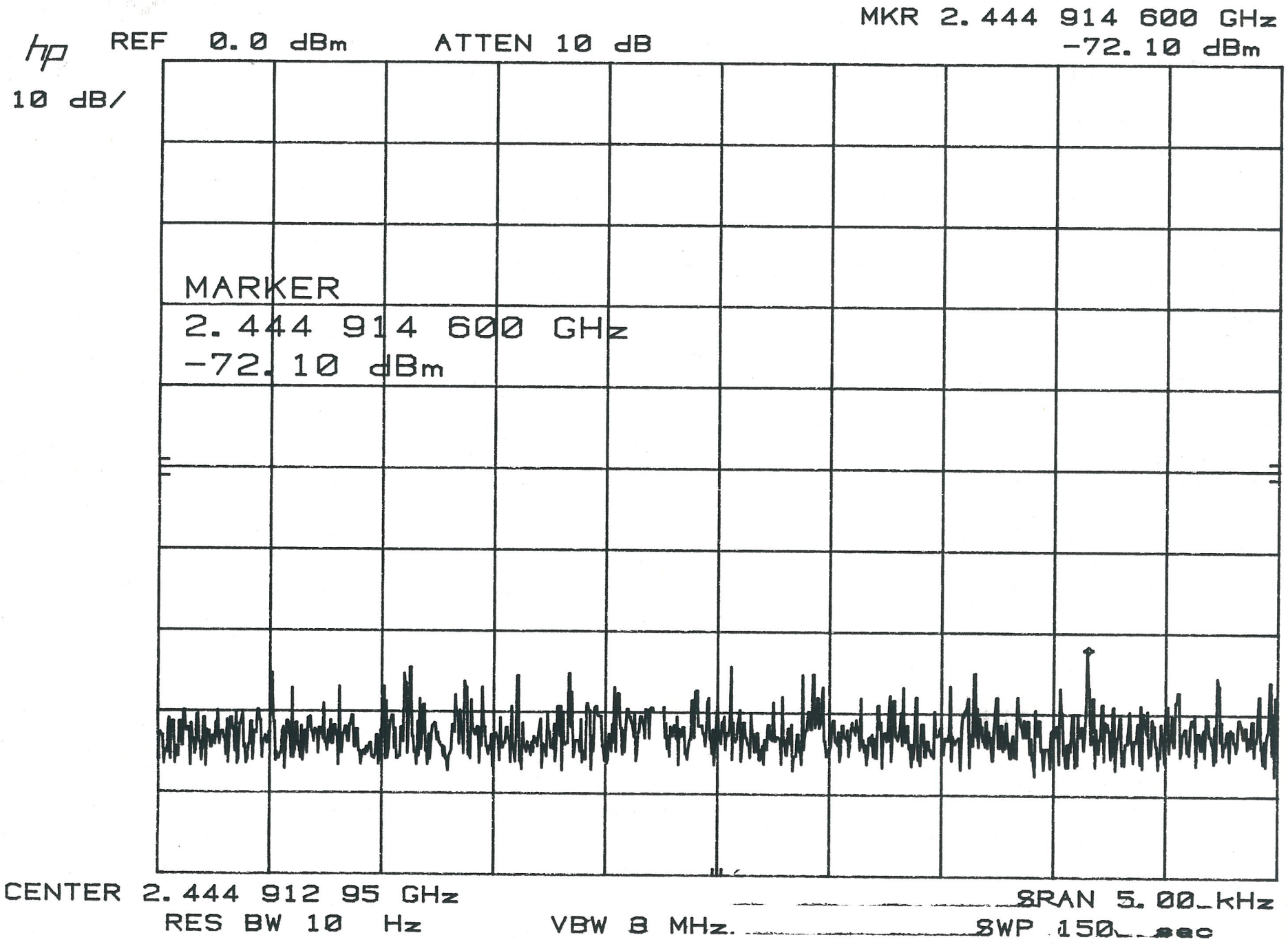
Figure 5-12


hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.459 141 30 GHz
-60.40 dBm
10 dB/
MARKER
2.459 141 30 GHz
-60.40 dBm
CENTER 2.459 147 5 GHz
RES BW 30 Hz
VBW 3 MHz
SPAN 50.0 kHz
SWP 150 sec

10 minutes

Kenmore #2
1400 W
2450 MHz

Figure 5-13

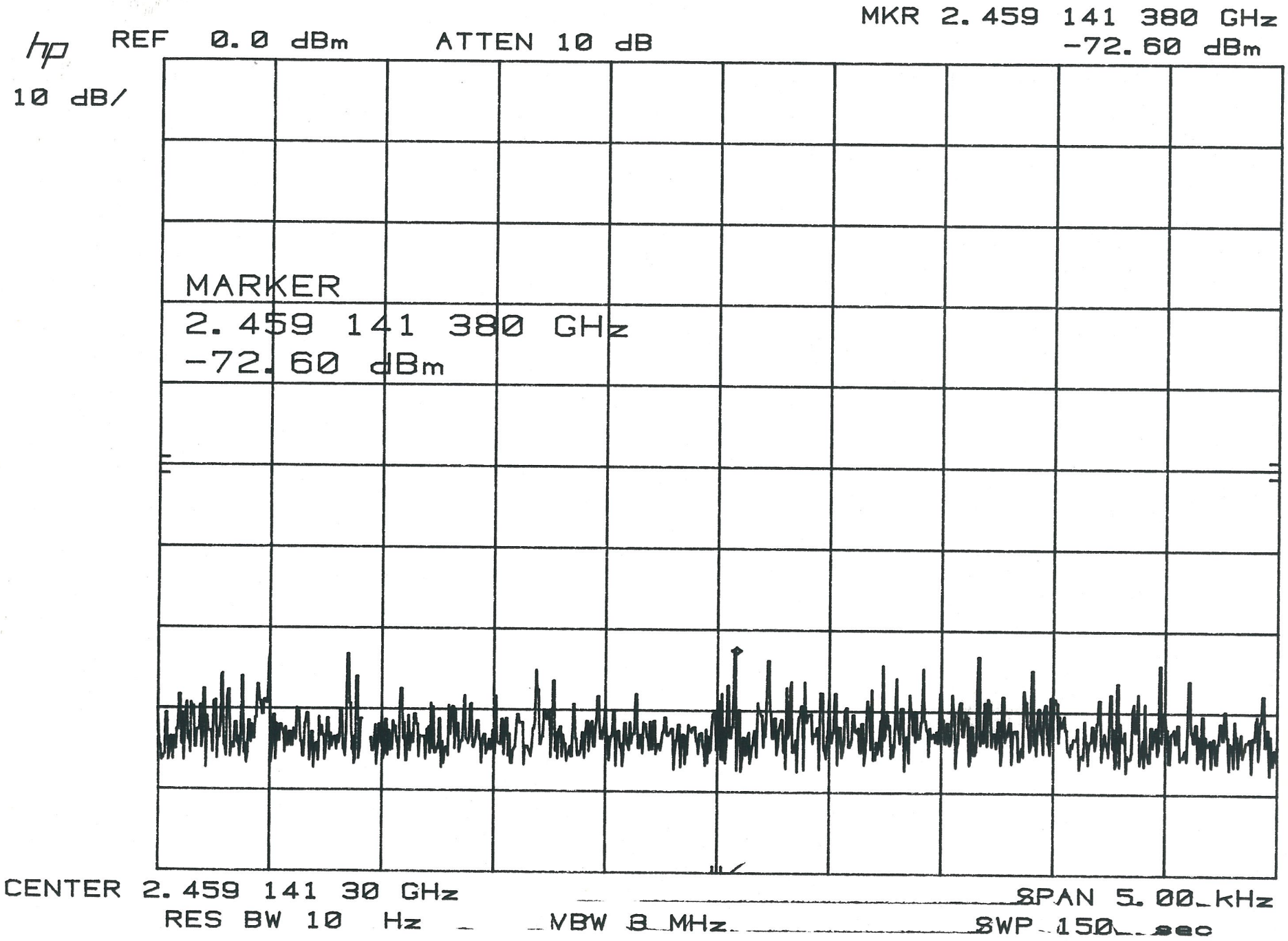

MKR 2.444 914 600 GHz
-72.10 dBm
hp
REF 0.0 dBm
ATTEN 10 dB
10 dB/
MARKER
2.444 914 600 GHz
-72.10 dBm
CENTER 2.444 912 95 GHz
SPAN 5.00 kHz
RES BW 10 Hz
VBW 8 MHz
SWP 150 sec

Lost 5oz of the original 12oz of water

10 minutes

Kenmore #2
1400W
2450MHz

Figure 5-14

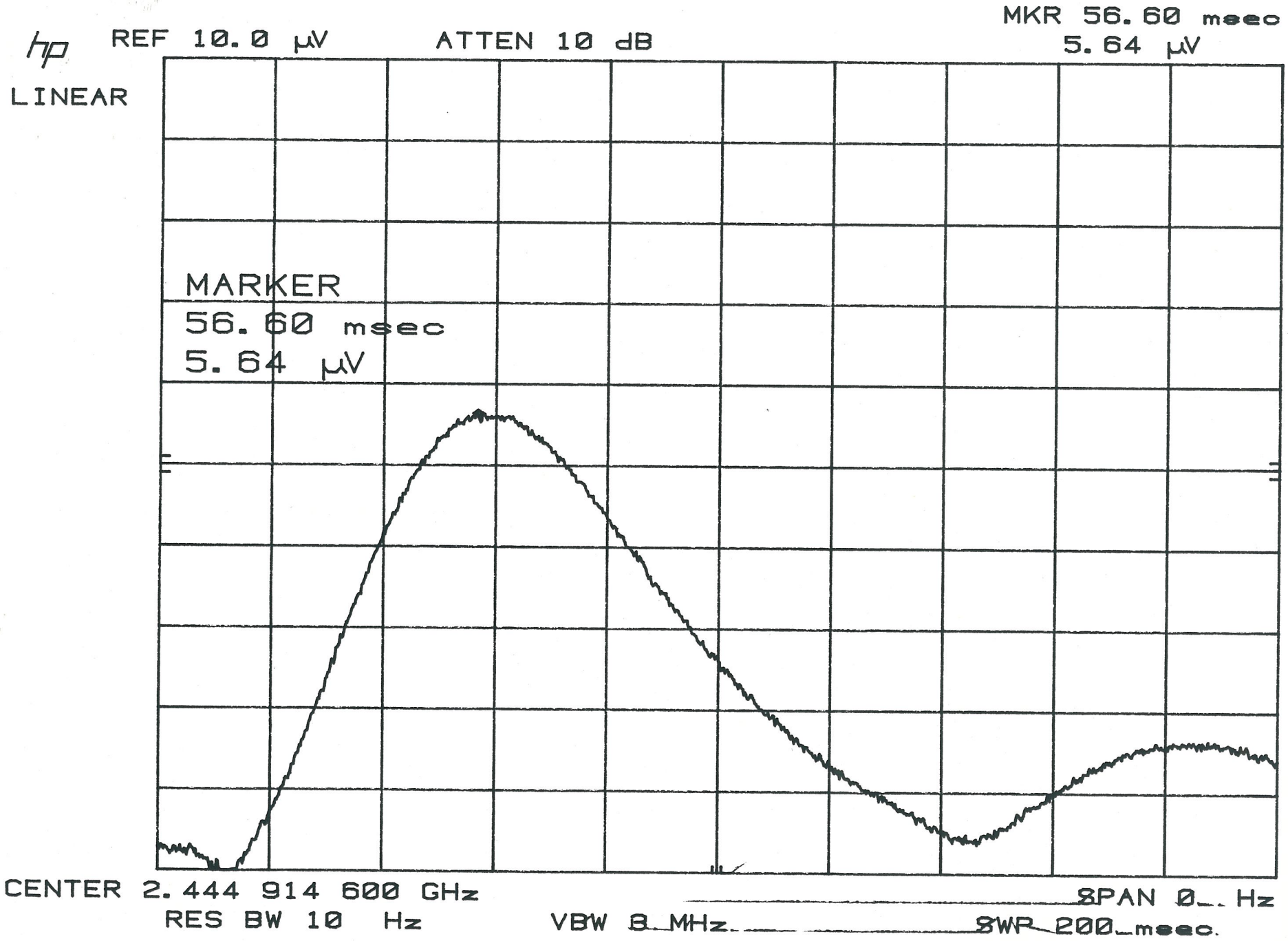

hp
REF 0.0 dBm
ATTEN 10 dB
MKR 2.459 141 380 GHz
-72.60 dBm
10 dB/
MARKER
2.459 141 380 GHz
-72.60 dBm
CENTER 2.459 141 30 GHz
SPAN 5.00 kHz
RES BW 10 Hz
VBW 8 MHz
SWP 150 sec

Lost 3 oz of the original 12 oz of water

10 minutes

Kenmore #2
1400 W
2450 MHz

Figure 5-15

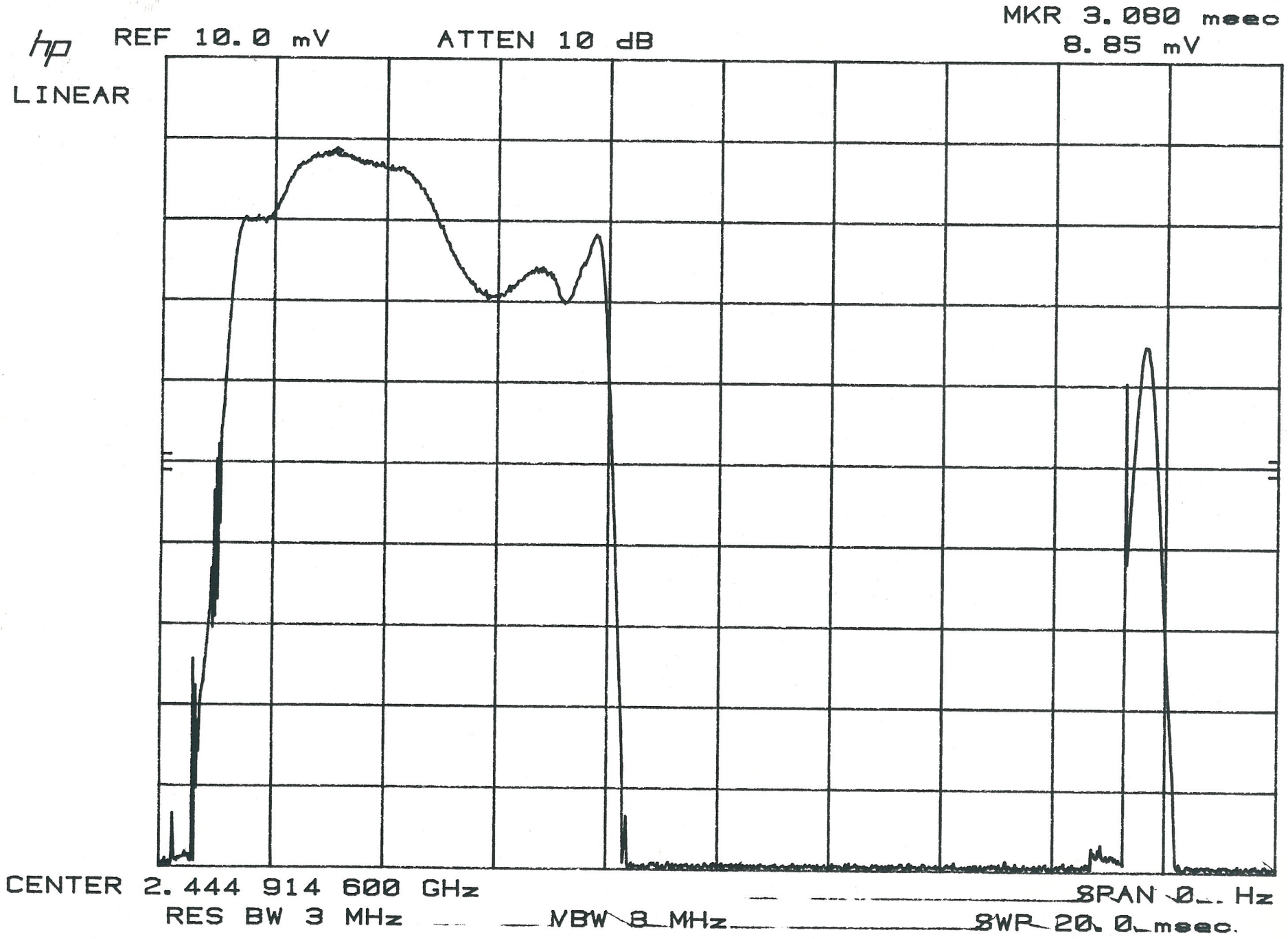

hp
REF 10.0 µV
ATTEN 10 dB
MKR 56.60 msec
5.64 µV
LINEAR
MARKER
56.60 msec
5.64 µV
CENTER 2.444 914 600 GHz
SPAN 0 Hz
RES BW 10 Hz
VBW 8 MHz
SWP 200 msec

Kenmore #2

1400 W

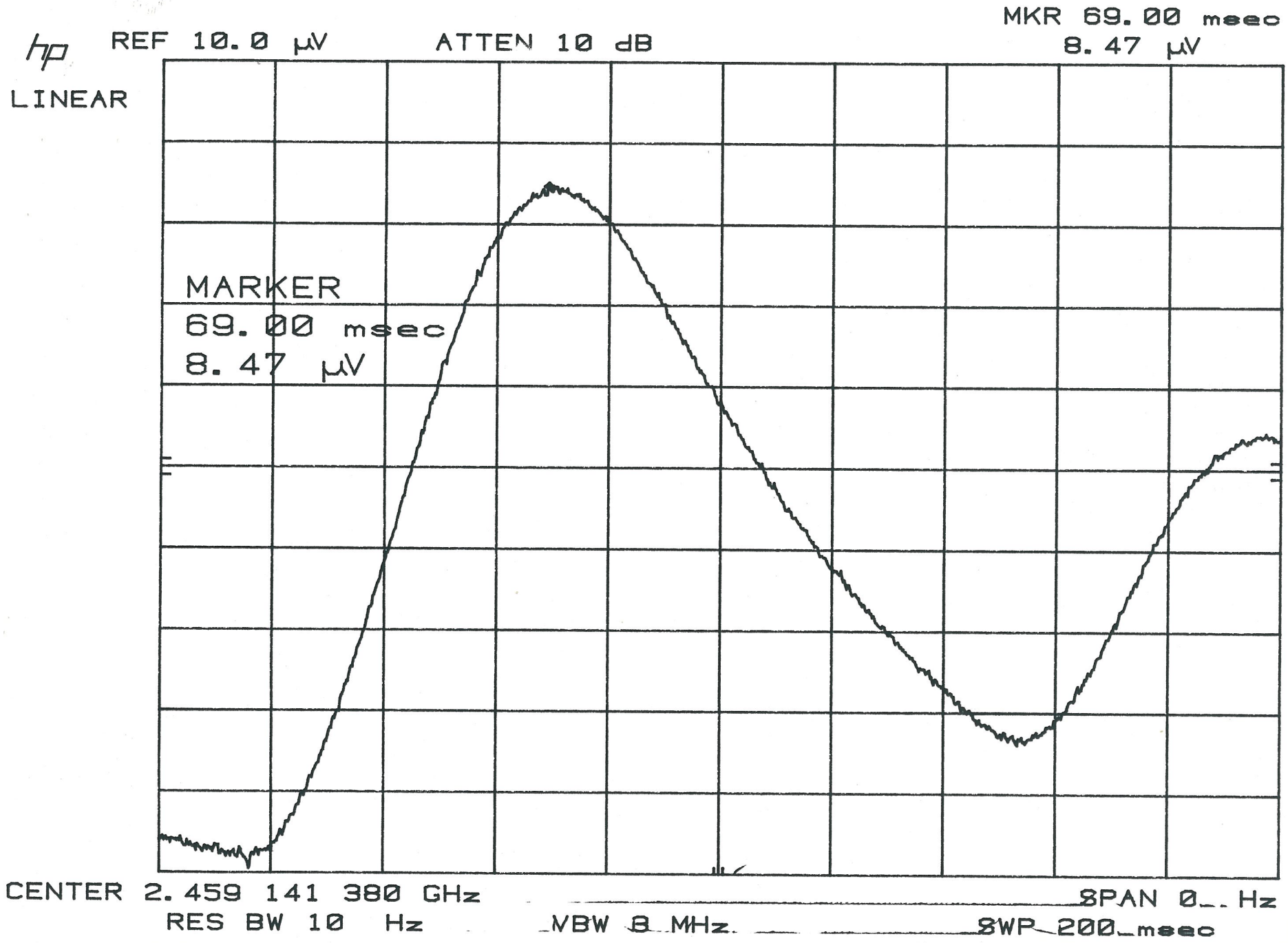
2450 MHz

Figure 5-16


hp
REF 10.0 mV
ATTEN 10 dB
MKR 3.080 msec
8.85 mV
LINEAR
CENTER 2.444 914 600 GHz
SPAN 0. Hz
RES BW 3 MHz
VBW 3 MHz
SWP 20.0 msec.

Kenmore #2
1400W
2450MHz

Figure 5-17


hp
REF 10.0 µV
ATTEN 10 dB
MKR 69.00 msec
8.47 µV
LINEAR
MARKER
69.00 msec
8.47 µV
CENTER 2.459 141 380 GHz
SPAN 0 Hz
RES BW 10 Hz
VBW 8 MHz
SWP 200 msec

Kenmore #2
140DW
2450MHz

Figure 5-18