ITS Intertek Testing Services

Raytheon TI Systems

Testing
Performed
on the
Cellular Transceiver
Model No.: CELL-TRAC™ II

FCC Part 22 Type Acceptance

Date of Test: August 17, 1998 & September 16, 1998

LTO# J98023875

Date of Report: September 17, 1998

Total No. of Pages Contained in this Report: 21

Intertek Testing Services NA Inc.
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ITS Intertek Testing Services

VERIFICATION OF COMPLIANCE
Report No. J98023875

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment tested hereon for use under the rules and regulations listed below

Equipment Under Test (EUT):	Cellular Transceiver
Trade Name:	Raytheon TI Systems
Model No.:	CELL-TRAC™ II
Serial No.:	Not Labelled
FCC ID:	
Applicant:	Raytheon TI Systems
Contact:	Ron Cleveland/Curt Larsen
Address:	13532 N. Central Expwy. Dallas, Texas 75243 Mail Stop 64
Tel. number:	(972) 344-4350
Fax. number:	(972) 344-3504
Applicable Regulation:	FCC Part 22 Type Acceptance
SAR Exposure Class:	N/A
Test Site Location:	Intertek Testing Services 1365 Adams Court Menlo Park, CA 94025, USA
Date of Test:	August 17, 1998 & September 16, 1998

Based on the test results, the tested sample was found to be in compliance with FCC Part 22 requirements.

We attest to the accuracy of this report:

Xi-Ming Yang
Xi-Ming Yang
Test Engineer

David Chernomordik
David Chernomordik
EMC Site Manager

Intertek Testing Services NA Inc.
1365 Adams Court, Menlo Park, CA 94025
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Xi-Ming Yang
Xi-Ming Yang
Test Engineer

9-16-1998
Date

1.2 Product Description

The Raytheon TI Systems Model No. CELL-TRACTM II is a cell phone with modem and GPS receiver for report vehicle position to data control center.

2.0 **RF Power Output**

Requirements: FCC Part 2.985(a)

2.1 Test Procedure

The antenna was removed and a TNC connector was connected to the transmitter output. The transmitter output was connected to a calibrated coaxial attenuator (50 ohm), the other end of which was connected to a spectrum analyzer. Transmitter output was read off the spectrum analyzer in dBm. The power output at the transmitter was determined by adding the value of the attenuator to the spectrum analyzer reading.

A power meter was connected to the transmitter output and its reading was compared to the spectrum analyzer data. The meter reading was 0.3 dB less than the spectrum analyzer reading.

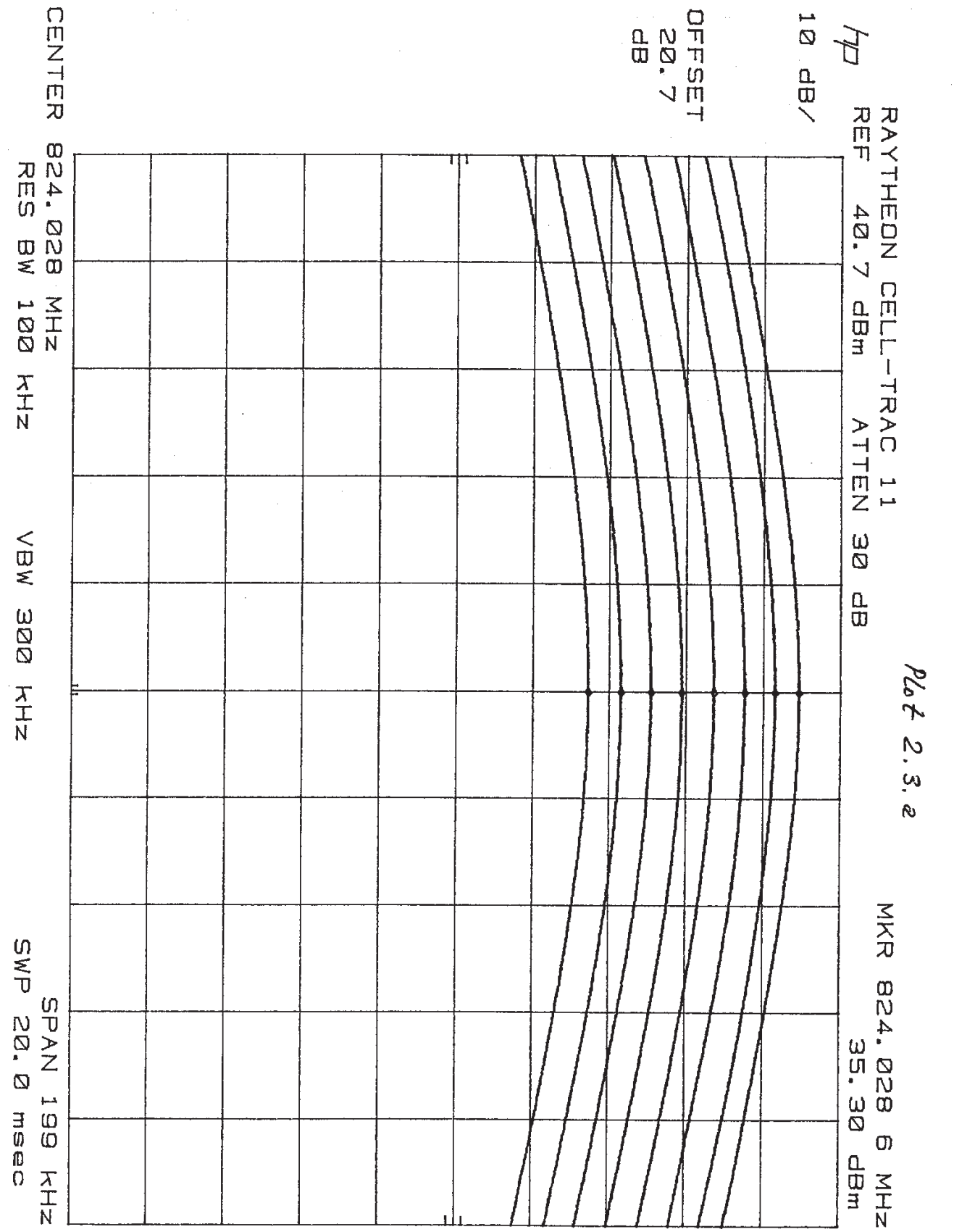
The test was performed at three frequencies (low, middle, and high channels) and on all power levels which can be setup on the transmitter.

2.2 Test Equipment

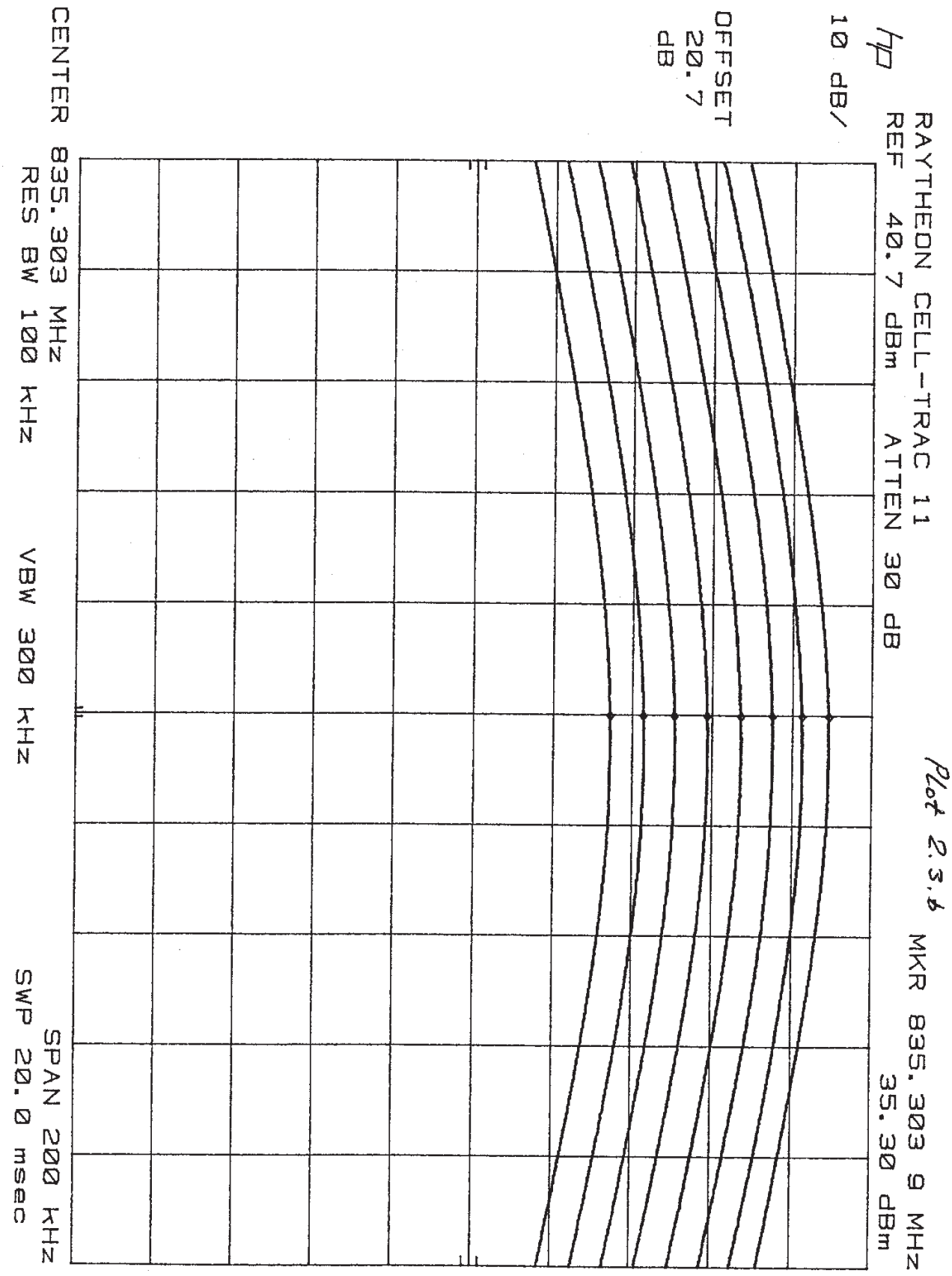
Hewlett Packard HP8566B Spectrum Analyzer
Hewlett Packard HP 7470A Plotter
Hewlett Packard HP 435A Power Meter

2.3 Test Results

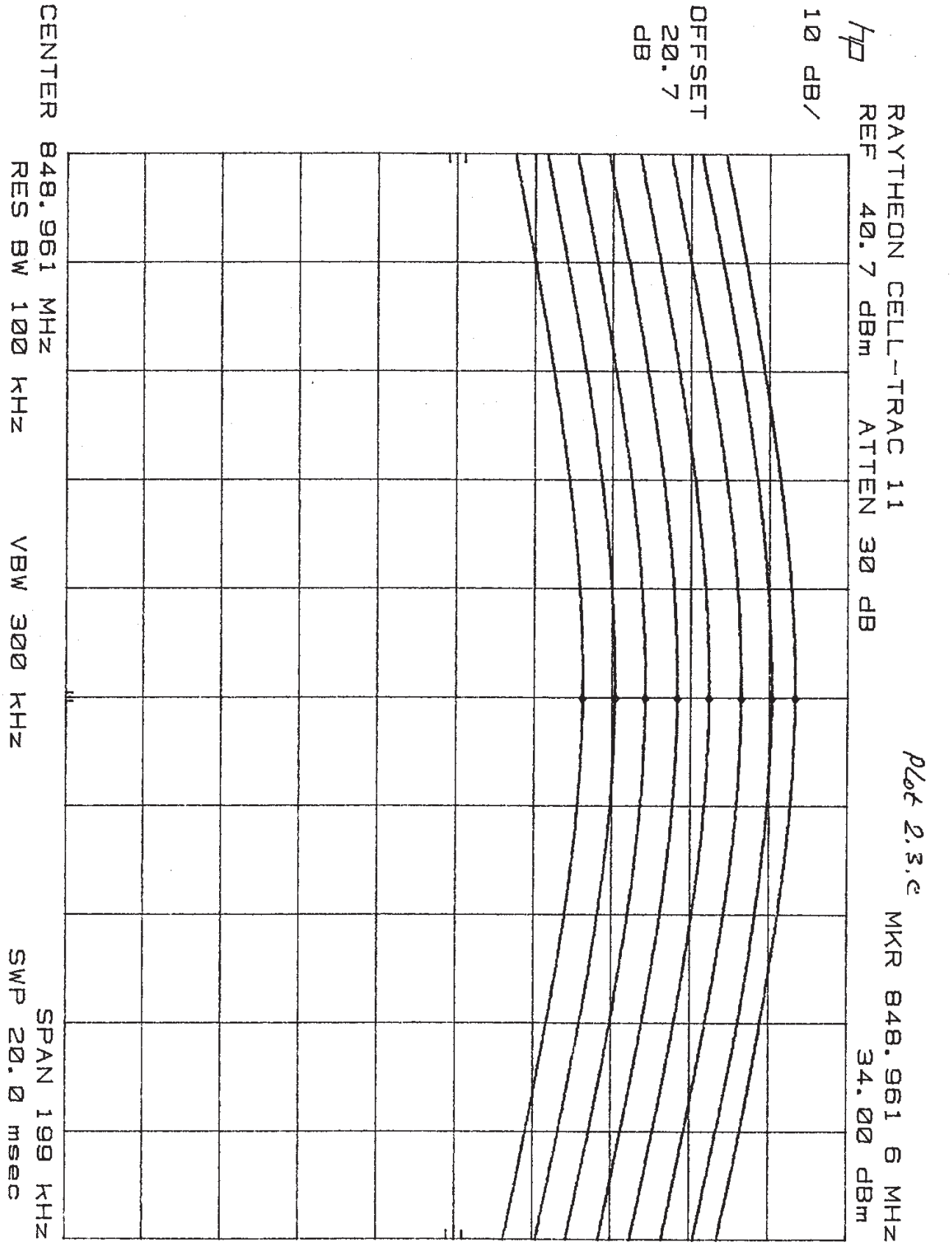
Refer to the attached plots: 2.3.a - 2.3.c and data sheet


RAYTHEON CELL-TRAC 11
REF 40.7 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
MKR 824.028 6 MHz
35.30 dBm
CENTER 824.028 MHz
RES BW 100 kHz
VBW 300 kHz
SPAN 199 kHz
SWP 20.0 msec

Plot 2.3.2


RAYTHEON CELL-TRAC 11
REF 40.7 dBm
ATTEN 30 dB
MKR 835.303 9 MHz
35.30 dBm
10 dB/
OFFSET
20.7
dB
CENTER 835.303 MHz
RES BW 100 kHz
VBW 300 kHz
SPAN 200 kHz
SWP 20.0 msec

Plot 2.3.6


RAYTHEON CELL-TRAC 11
REF 40.7 dBm
ATTEN 30 dB
MKR 848.961 6 MHz
34.00 dBm
10 dB/
OFFSET
20.7
dB
CENTER 848.961 MHz
RES BW 100 kHz
VBW 300 kHz
SPAN 199 kHz
SWP 20.0 msec

Plot 2.3.c

Level	Output Power, dBm		
	835.32 MHz Channel 344	**824.04 MHz Channel 991**	**848.97 MHz Channel 799**
0	35.3	35.3	34.0
1	31.9	32.2	31.0
2	28.2	28.3	27.1
3	24.3	24.3	23.0
4	20.1	20.2	19.0
5	16.0	16.1	14.9
6	12.1	12.2	11.1
7	7.9	7.9	6.9

3.0 **Effective Radiated Power**

Requirements: FCC 22.913

The Effective Radiated Power (ERP) of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

3.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site.

The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidths of the spectrum analyzer were set to 100 kHz. Worst case emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading was recorded.

The ERP was calculated as follows:

$$ERP(dBm) = E(dBuV/m) + 20 \log D - 10 \log 30 - 10 \log G - 90$$

Where G = 1.64 is the gain of half-wave dipole

The test was performed at three frequencies (low, middle, and high channels).

In addition, the Equivalent Isotropic Radiated Power (EIRP) in dBpW was calculated as follows:

$$EIRP(dBpW) = ERP(dBm) + 90 + 10 \log 1.64$$

3.2 Test Equipment

Rhode & Schwartz SMH Signal Generator
Hewlett Packard HP8566B Spectrum Analyzer
CDI Roberts Antenna

3.3 Test Results

Refer to the attached data sheet. The EUT passed the test.

ITS Intertek Testing Services

Company: **Raytheon Systems company**
Project #:
Model:
Engineer: **Xi-Ming Yang**
Date of Text: **August 17, 1998**

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	EIRP	ERP
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(pW)	dBm
824.1	V	109.3	22.4	0.0	2.2	133.9	128.7	36.5
836.5	V	108.0	22.4	0.0	2.2	132.6	127.4	35.2
849.0	V	107.0	22.4	0.0	2.2	131.6	126.4	34.2

Note: 1. All measurement were made at 3 meters

4.0 **Modulation Deviation Limiting**

Requirements: FCC 2.987, 22.915(c)s

4.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings. An audio signal generator with a variable attenuator on the output connected to the pins 2 and 1 of the headphone connector pads.

At three different modulating frequencies, the output level of the audio generator was varied and the FM deviation level was recorded (Table 4.1.a).

The audio input was adjusted for 8 kHz deviation at 1 kHz tone with the 2:1 compressor enabled and the SAT disabled. The audio input was increased by 20 dB in one step. Both the initial and the subsequent steady state values of the peak frequency deviation, at and following the time of the 20 dB increase, were measured and recorded in the frequency range 300 Hz - 3 kHz (Table 4.1.b).

4.2 Test Equipment

Rhode & Schwartz ESVP (in FM deviation measurement mode)
Marconi 2955A Radio Communication Test Set
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

4.3 Test Results

The EUT passed the test.

Table 4.1a
Modulation Limiting

Output Level (mV)	FM Deviation In kHz At Indicated Modulating Frequency		
	3000 Hz	1000 Hz	300 Hz
1	2.3	1.3	0.5
2	3.3	1.8	0.6
5	5.2	2.9	0.9
10	7.0	4.1	1.2
20	7.0	5.7	1.6
40	7.0	7.9	2.1
60	7.0	9.7	2.6
80	7.0	10.3	3.0
100	7.0	10.4	3.5
160	7.0	11.1	5.8
200	7.0	10.7	6.2
300	7.0	9.8	5.9
500	7.0	9.4	5.1
600	7.0	9.2	5.0
800	7.0	9.1	4.7
1000	7.0	9.1	4.6

Table 4.1b
Peak Frequency Deviation

Frequency kHz	Initial Deviation	Peak Deviation	Steady State Deviation
0.3	2.3	11.2	5.3
0.5	4.0	11.2	11.1
0.7	5.7	10.4	10.2
0.9	7.1	9.8	9.8
1.0	7.1	9.6	9.4
1.2	9.2	10.0	8.0
1.4	10.0	10.1	9.4
1.6	10.1	10.1	9.5
1.8	10.2	10.2	9.8
2.0	10.3	10.3	10.1
2.4	10.5	10.5	10.3
2.8	8.6	8.6	8.6
3.0	6.9	7.1	7.0

Test Conditions:

V_{inp} = 45 mV
Deviation = 8 kHz at modulation frequency 1 kHz
Middle Channel f = 835.32 MHz

5.0 **Audio Filter Characteristics**

Requirements: FCC 22.915(d)

For mobile stations, these signals must be attenuated, relative to the level at 1 kHz, as follows:

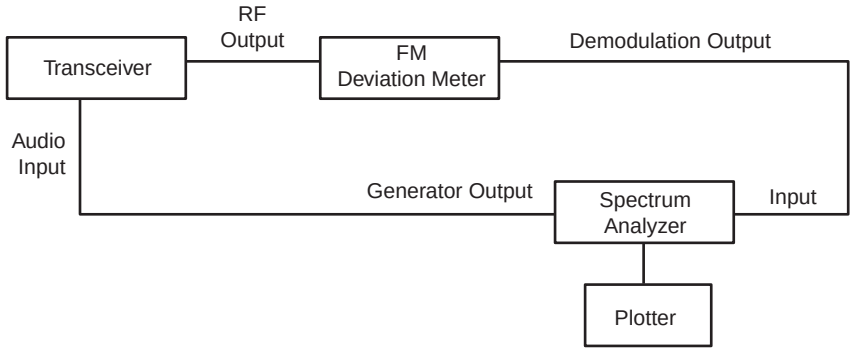
(i) In the frequency ranges of 3.0 to 5.9 kHz and 6.1 to 15.0 kHz, signals must be attenuated by at least 40 log (f/3) dB, where f is the frequency of the signal in kHz.

(ii) In the frequency range of 5.9 to 6.1 kHz, signals must be attenuated at least 35 dB.

(iii) In the frequency range above 15 kHz, signals must be attenuated at least 28 dB.

5.1 Test Procedure

The RF output of the transceiver was connected to the input of an FM deviation meter through sufficient attenuation so as not to overload the meter or distort the readings.
The measurements were performed using the block diagram of the test setup shown below.



On that block diagram, the HP 3885A spectrum analyzer having the tracing generator, and the Marconi 2955A Radio Communication Test Set having an output of a demodulator, are used. After the calibration was made (the -20 dBm reading of the spectrum analyzer corresponds to the 9 kHz deviation) the spectrum analyzer was set to scan the frequency from 300 Hz to 30 kHz, with the same audio input level as described above.

The audio filter response was plotted directly from the spectrum analyzer (Refer to Plots # 5.1.a, 5.1.b, & 5.1.c).

The relative level was obtained from the plots and the attenuation was calculated with reference to the level at 1 kHz.

5.2 Test Equipment

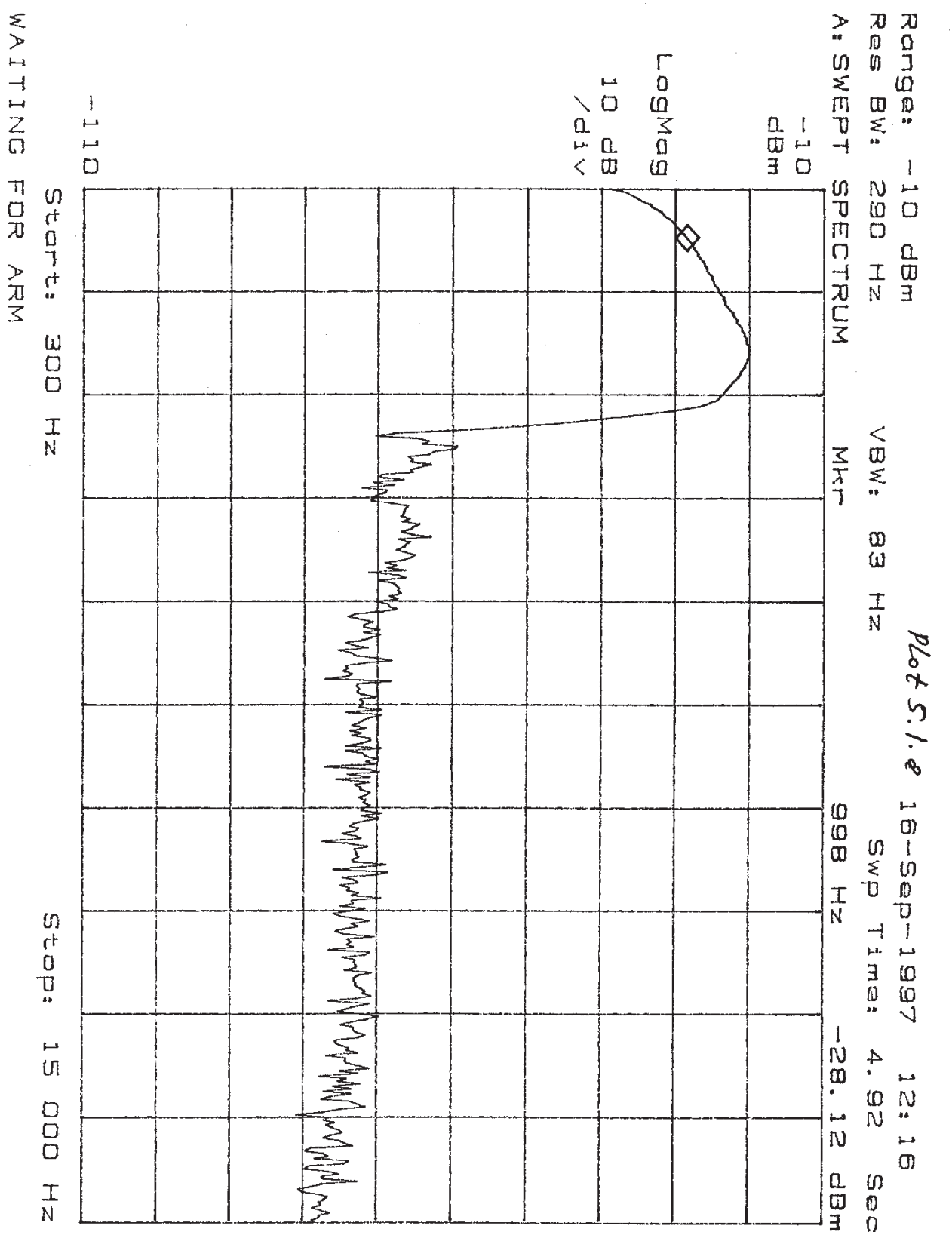
Rohde & Schwartz ESVP (in FM deviation measurement mode)
Marconi Instruments 2955A Radio Communications Test Set
HP 3588A Spectrum Analyzer
HP 7470A Plotter
Leader LFG-1300S Function Generator
LMV-182 AC Millivoltmeter

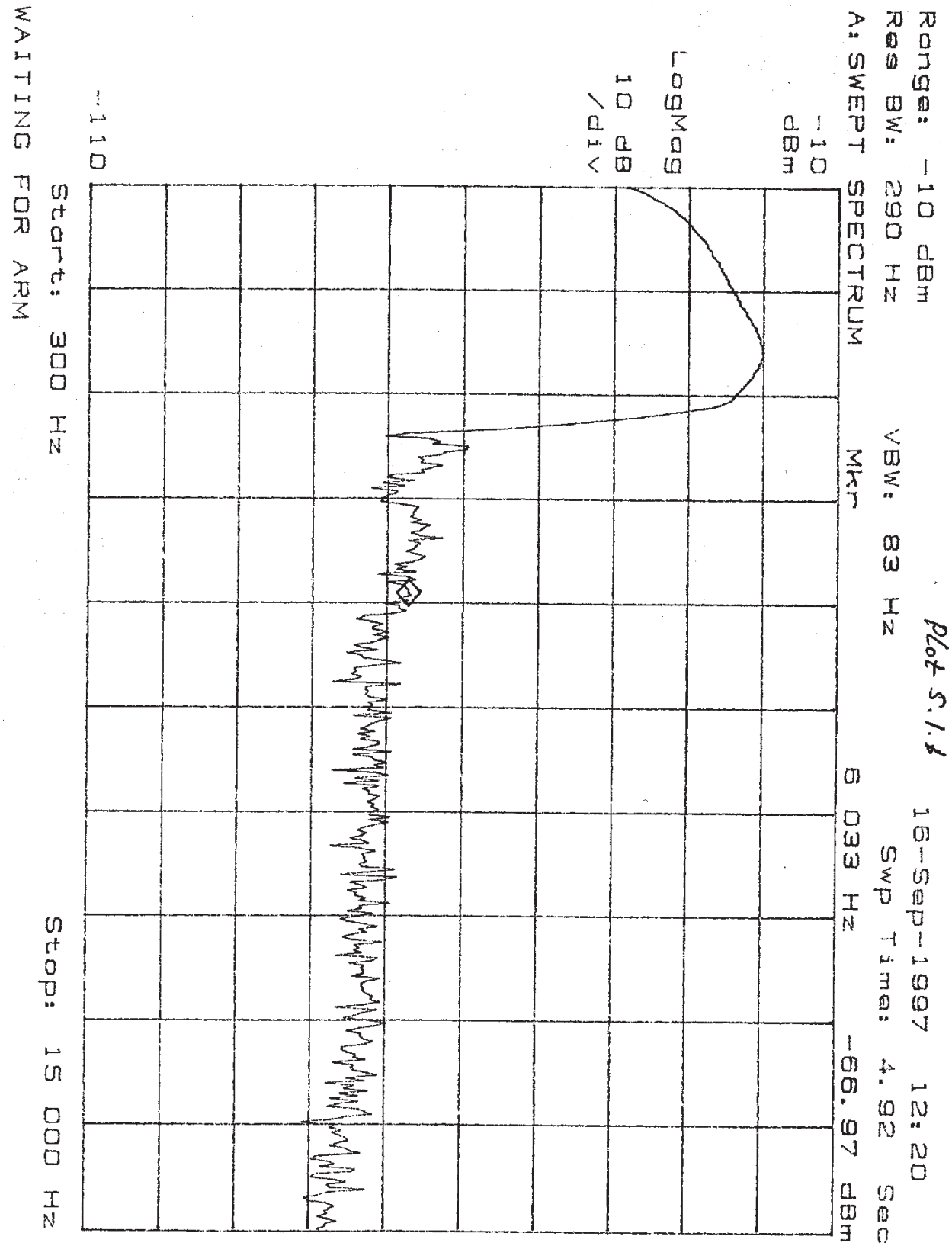
5.3 Test Results

The EUT passed the test.

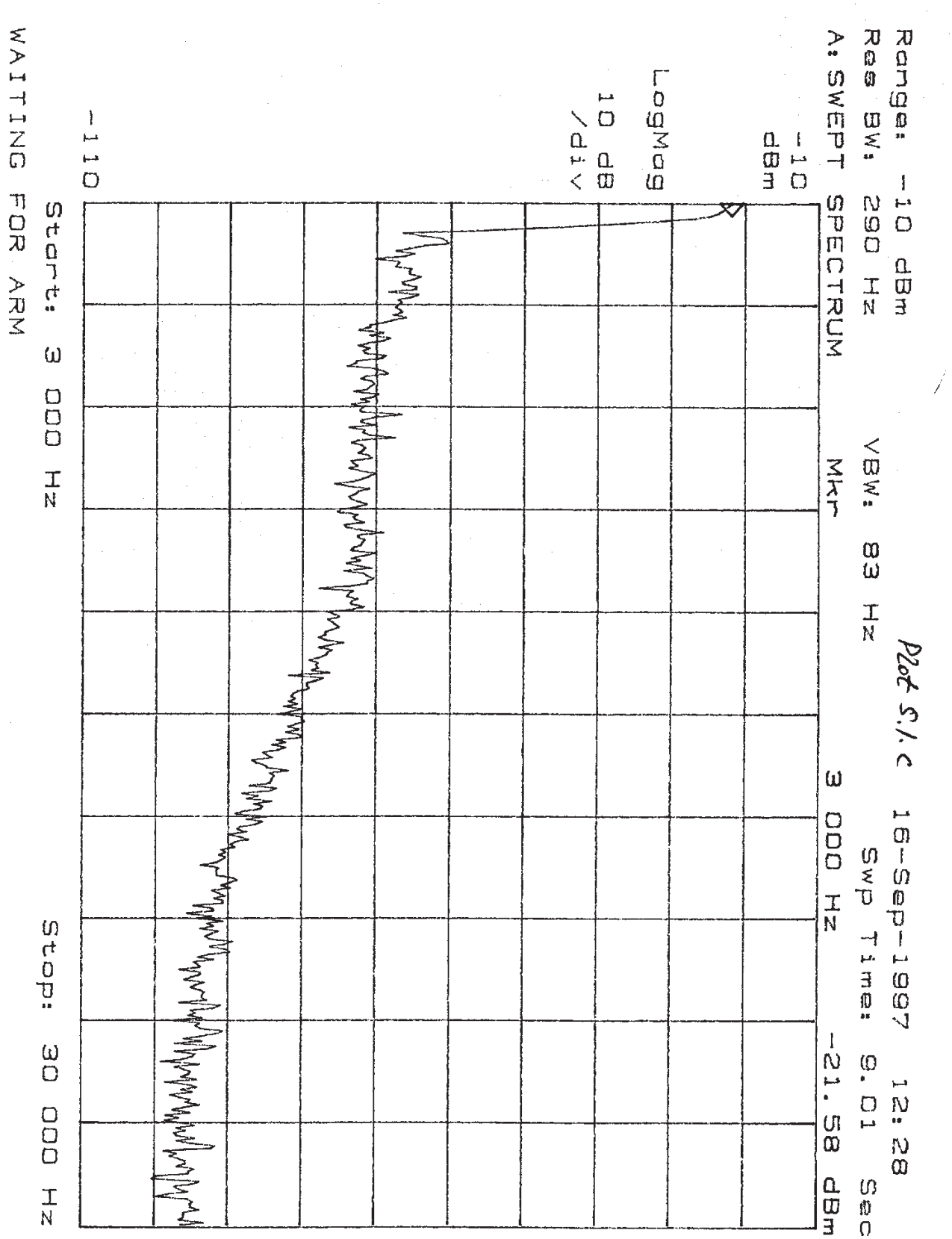
Table 5.1 Audio Filter Characteristics		
Modulation Frequency kHz	**Relative Level dBm**	**Attenuation dB**
0.3	-38.3	10.2
0.4	-35.5	7.4
0.5	-34.0	5.9
0.6	-32.3	4.2
0.7	-30.9	2.8
0.8	-29.7	1.6
0.9	-28.7	0.6
1.0	-28.1	0
1.2	-26.7	-1.4
1.4	-25.7	-2.4
1.6	-24.5	-3.6
1.8	-23.5	-4.6
2.0	-22.2	-5.9
2.5	-19.9	-8.2
2.6	-19.8	-8.3
3.0	-21.7	-6.4
3.2	-23.1	-5.0
3.5	-32.9	4.8
4.5	-67.7	39.6
5.0	-66.8	38.7
5.5	-65.0	36.9
5.9	-67.7	39.6
6.0	-67.0	38.9
6.1	-68.4	40.3
8.0	-73.7	45.6
10.0	-68.4	40.3
15.0	-78.6	50.5
20.0	-89.1	61.0
30.0	-96.2	68.1

Deviation 0.2 kHz is the noise floor.


Range: -10 dBm
Res BW: 290 Hz
VBW: 83 Hz
A: SWEPT SPECTRUM
Mkr
Swp Time: 4.92 Sec
998 Hz
-28.12 dBm
-10
dBm
LogMag
10 dB
/div
-110
WAITING FOR ARM
Start: 300 Hz
Stop: 15 000 Hz
Plot S.1.e 16-Sep-1997 12:16


Range: -10 dBm
Res BW: 290 Hz
A: SWEPT SPECTRUM
-10
dBm
LogMag
10 dB
/div
-110
Start: 300 Hz
WAITING FOR ARM
VBW: 83 Hz
Mkr
6 033 Hz
-66.97 dBm
16-Sep-1997 12:20
Swp Time: 4.92 Sec
Stop: 15 000 Hz

Plot S.1.4


Range: -10 dBm
Res BW: 290 Hz
VBW: 83 Hz
A: SWEPT SPECTRUM
Mkr
3 000 Hz
-21.58 dBm
Swp Time: 9.01 Sec
16-Sep-1997 12:28
Plot S.I.C
-10 dBm
LogMag
10 dB /div
-110
WAITING FOR ARM
Start: 3 000 Hz
Stop: 30 000 Hz

6.0 **Emission Limitations, Occupied Bandwidth**

Requirements: FCC 22.917(b)(d), FCC 2.989(b)(1)

F3E/F3D emission mask for use with audio filter. The mean power of emissions must be attenuated below the mean power of the unmodulated carrier wave (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz: at least 26 dB;

(2) On any frequency removed from the carrier frequency by more than 45 kHz, up to the first multiple of the carrier frequency: at least 60 dB or 43 + 10 log P dB, whichever is the lesser attenuation.

F1D emission mask. The mean power of emissions must be attenuated below the mean power of the unmodualted carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but no more than 45 kHz: at least 26 dB;

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz: at least 45 dB;

(2) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple ofthe carrier frequency: at least 60 dB or 43 +10 log P db, whichever is the lesser attenuation.

6.1 Test Procedure

The RF output of the transceiver was connected to the input of the spectrum analyzer through sufficient attenuation. The audio generator was connected to the audio input of the transceiver.

The spectrum with no modulation was recorded. The audio input signal was adjusted to obtain the frequencies deviation equal 6 kHz at the audio frequency of maximum response which was determined measuring deviation versus frequency from 300 Hz to 3.5 kHz and was found 2.4 kHz. The audio input level was increased by 16 dB. The audio frequency was set to the frequency 2.5 kHz.

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band ±50 kHz from the carrier frequency. The same plots has been done for wideband emissions, SAT, ST, DTMF9 and some of the combinations of these modulating signals.

6.2 Test Equipment

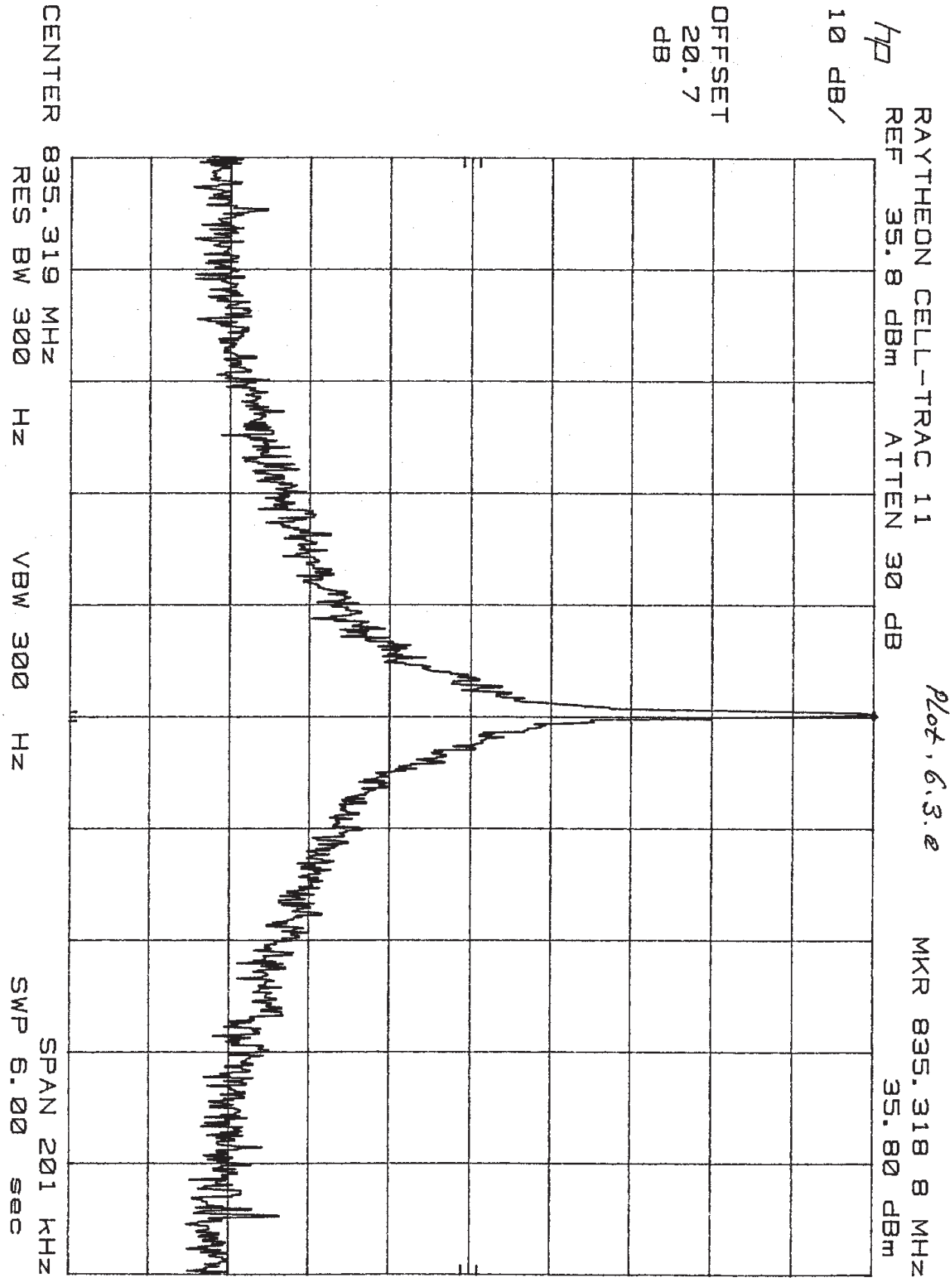
HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter
Marconi 2955A Radio Communication Test Set
HP 7470A Plotter

6.3 Test Results

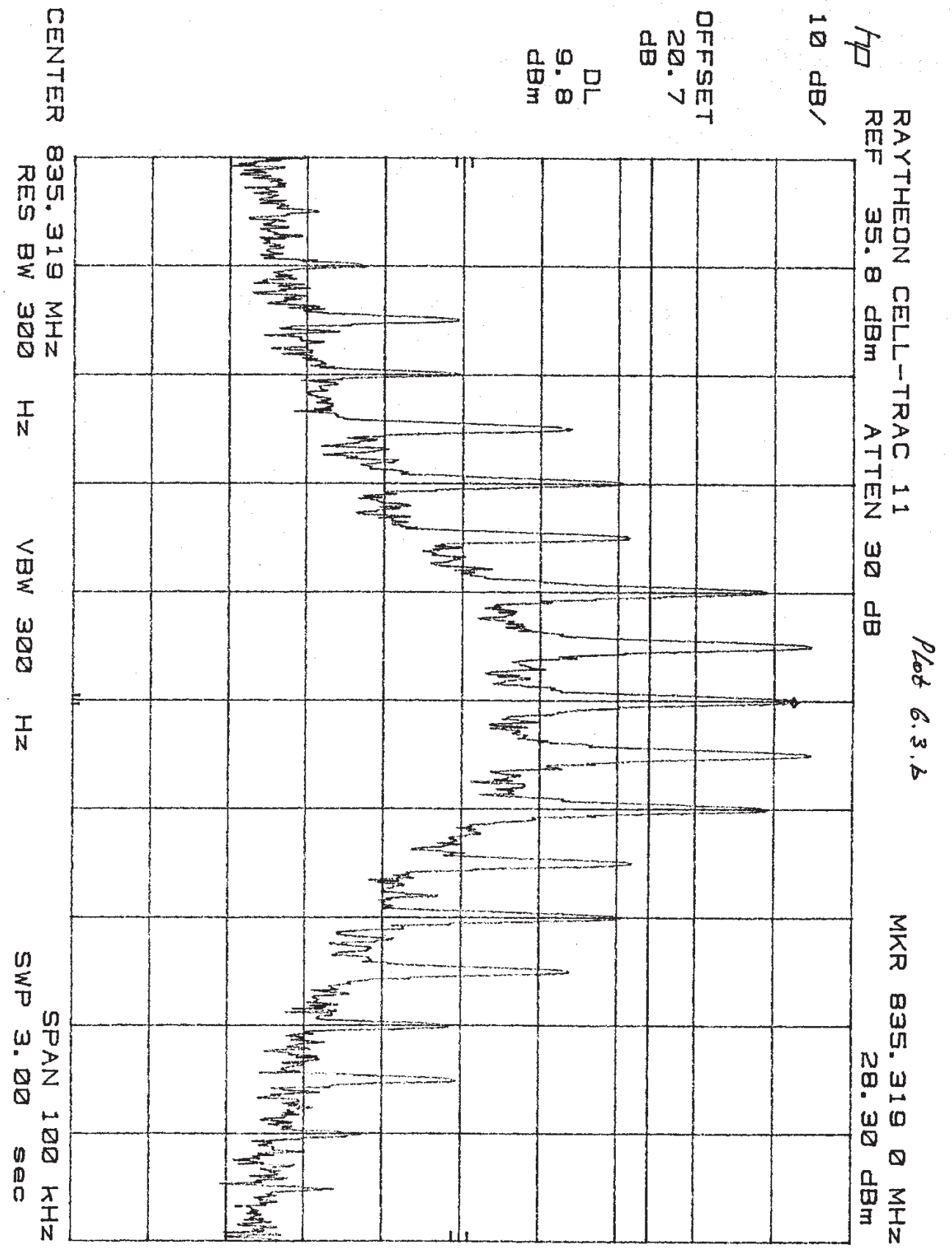
Refer to the attached plots.

The EUT passed the test.

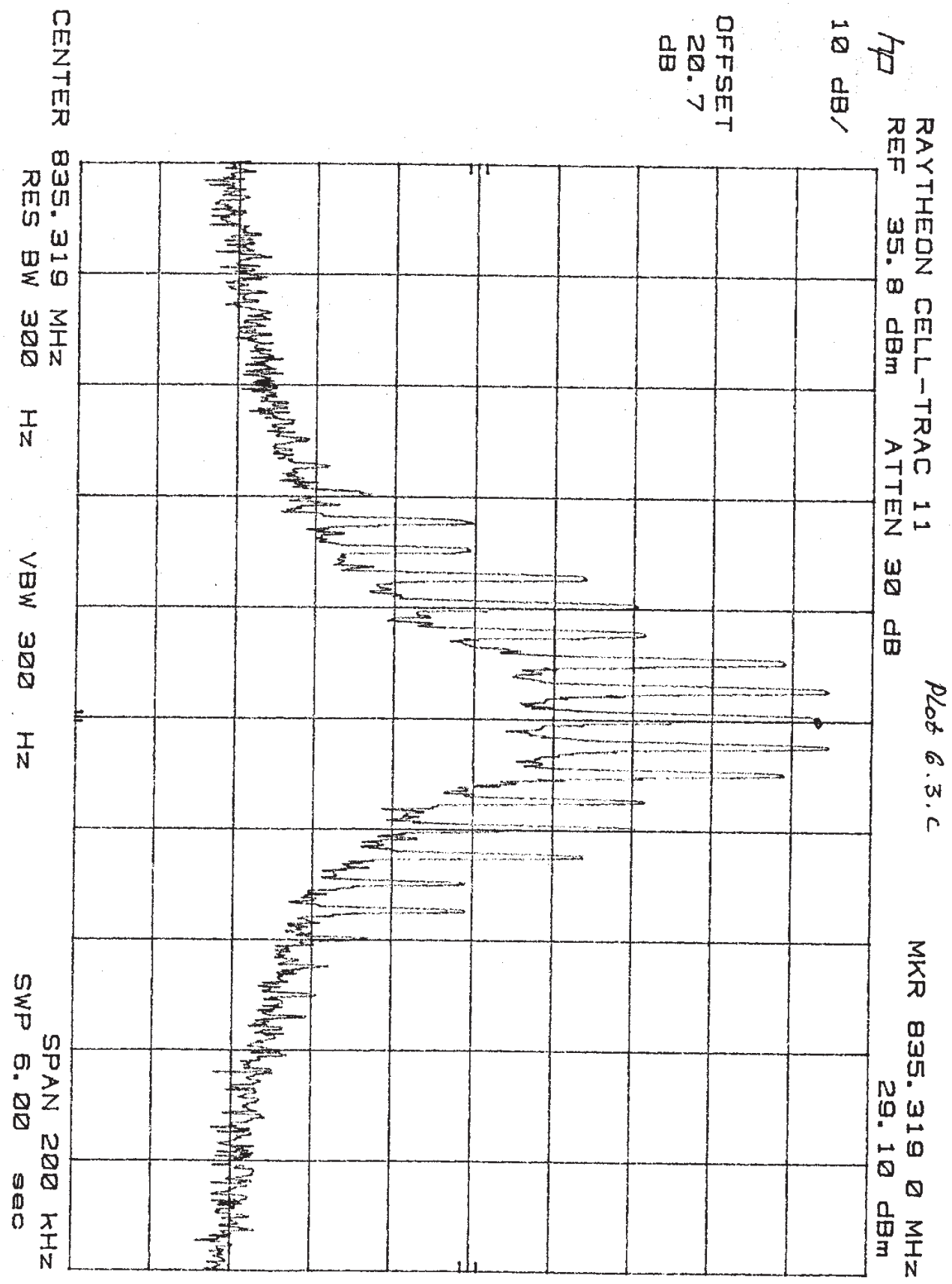
Plot #	Description
6.3.a	Carrier frequency, no modulation
6.3.b	Wideband emissions (010101), scan 100 kHz
6.3.c	Wideband emissions (010101), scan 200 kHz
6.3.d	DTMF "9"
6.3.e	SAT (6 kHz, 2 kHz deviation), scan 100 kHz
6.3.f	DTMF + SAT, scan 100 kHz
6.3.g	DTMF + SAT, scan 200 kHz
6.3.h	ST (10 kHz, 8 kHz deviation), scan 50 kHz RBW = 300 Hz
6.3.i	ST (10 kHz, 8 kHz deviation), scan 50 kHz RBW = 100 Hz
6.3.j	ST (10 kHz, 8 kHz deviation), scan 200 kHz
6.3.k	ST & SAT, scan 200 kHz
6.3.l	Voice (2.5 kHz), scan 100 kHz
6.3.m	Voice (2.5 kHz), scan 200 kHz
6.3.n	Voice & SAT, scan 200 kHz
6.3.o	Voice & SAT, low power

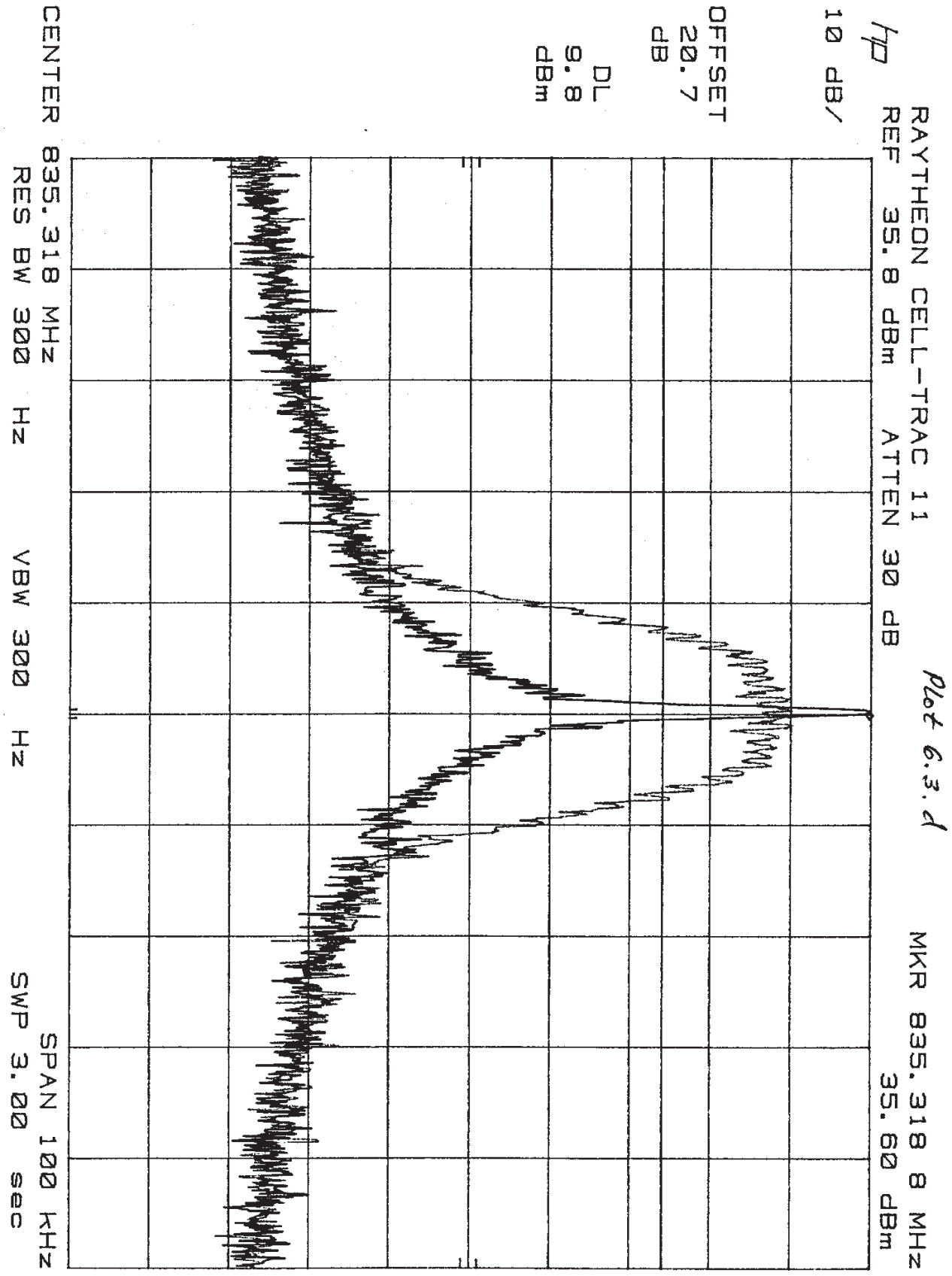

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 201 kHz
SWP 6.00 sec
MKR 835.318 8 MHz
35.80 dBm

Plot 6.3.2

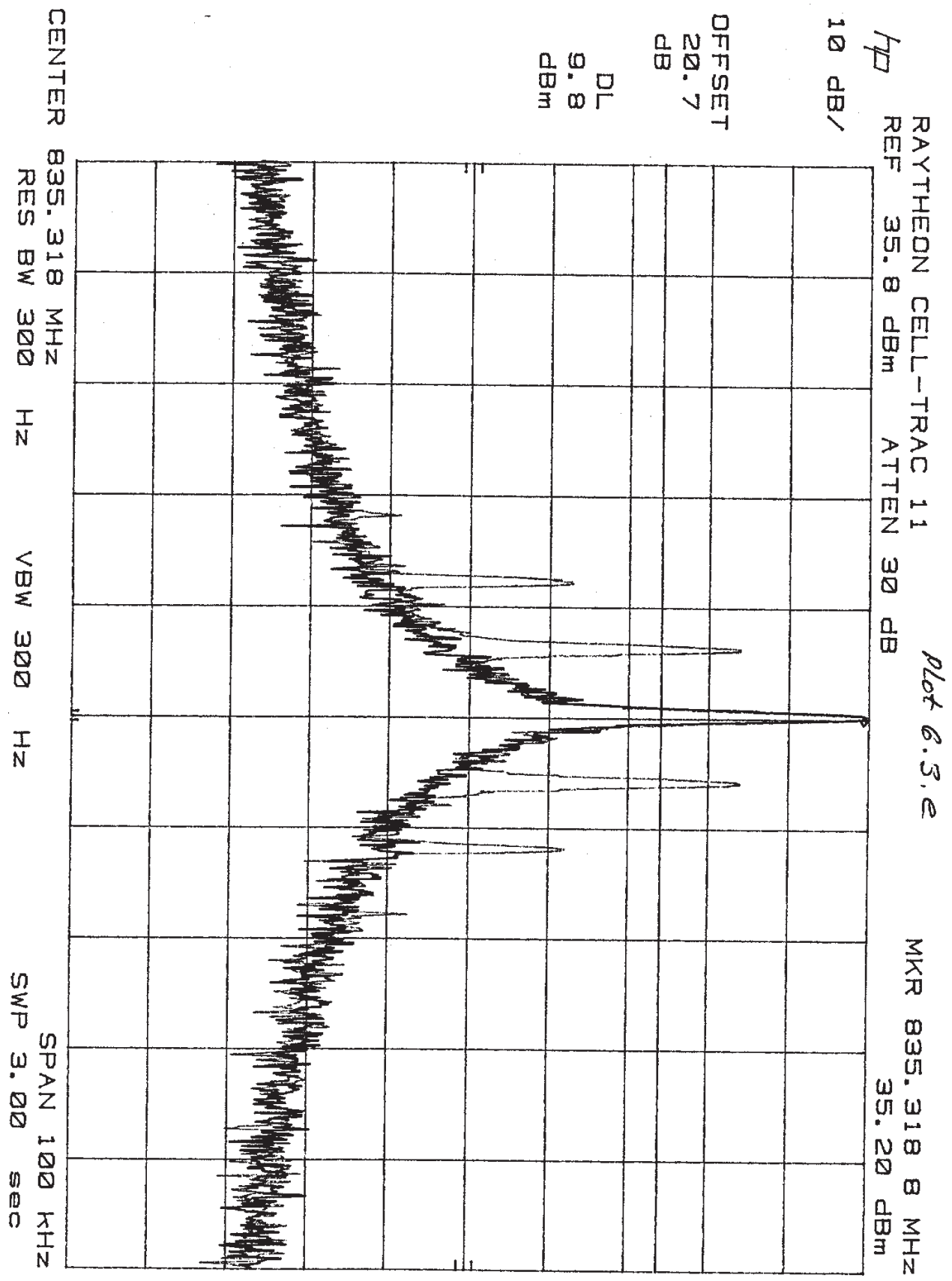

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
DL
9.8
dBm
MKR 835.319 0 MHz
28.30 dBm
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

Plot 6.3.6

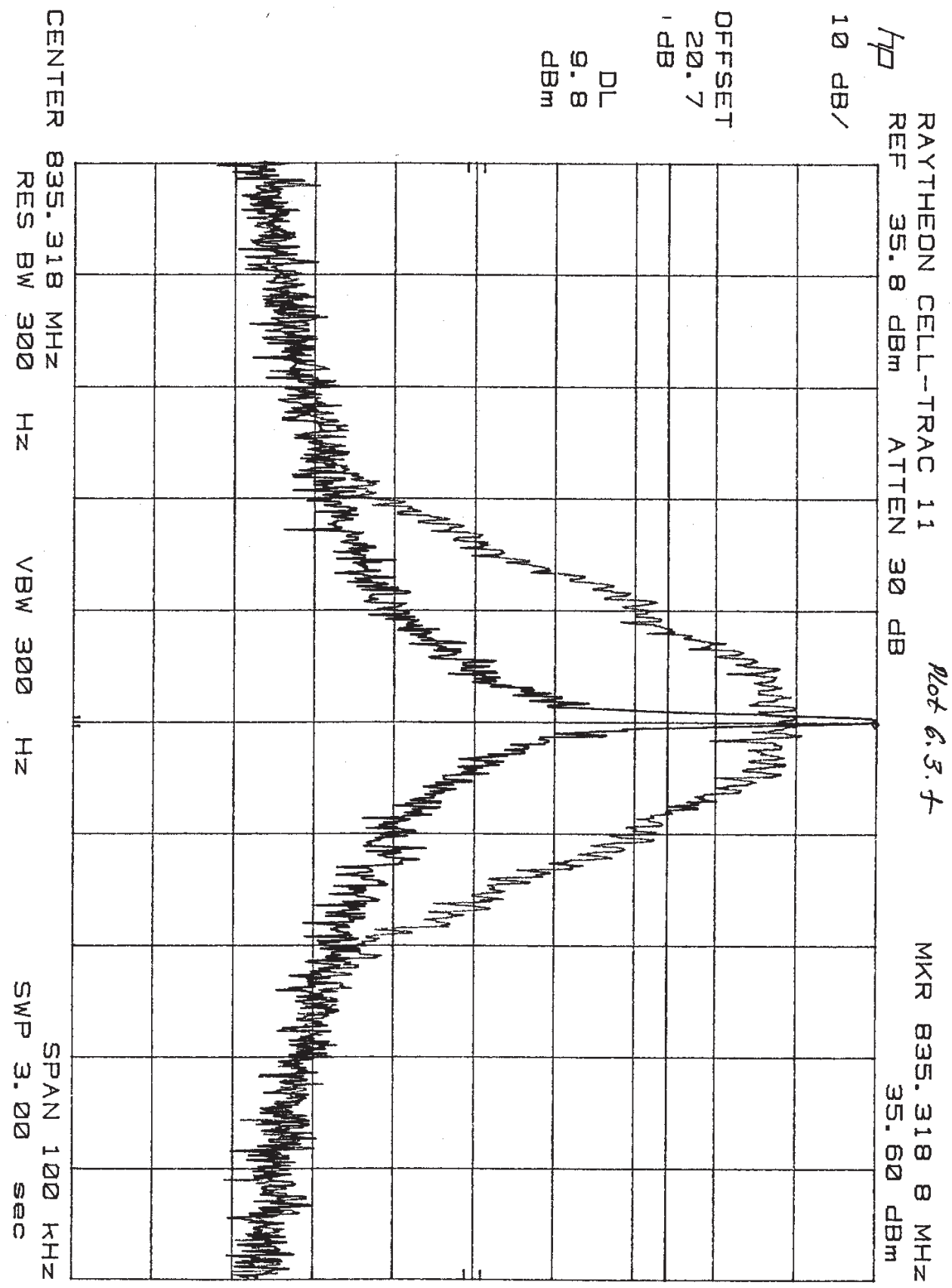

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 200 kHz
SWP 6.00 sec
MKR 835.319 0 MHz
29.10 dBm
Plot 6.3.c


RAYTHEON CELL-TRAC 11
hp
10 dB/
REF 35.8 dBm
ATTEN 30 dB
OFFSET
20.7
dB
DL
9.8
dBm
MKR 835.318 8 MHz
35.60 dBm
CENTER 835.318 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

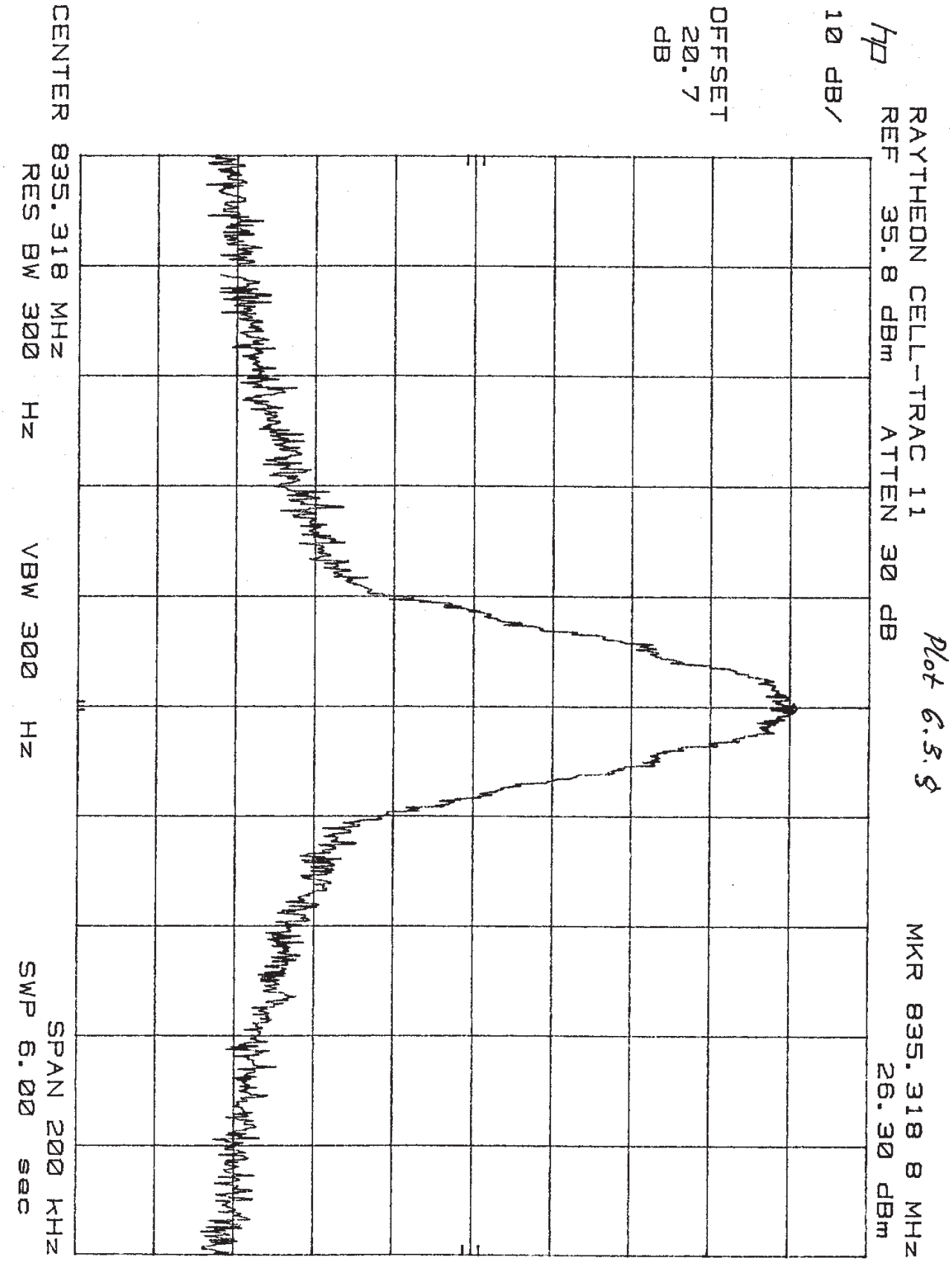
Plot 6.3.d

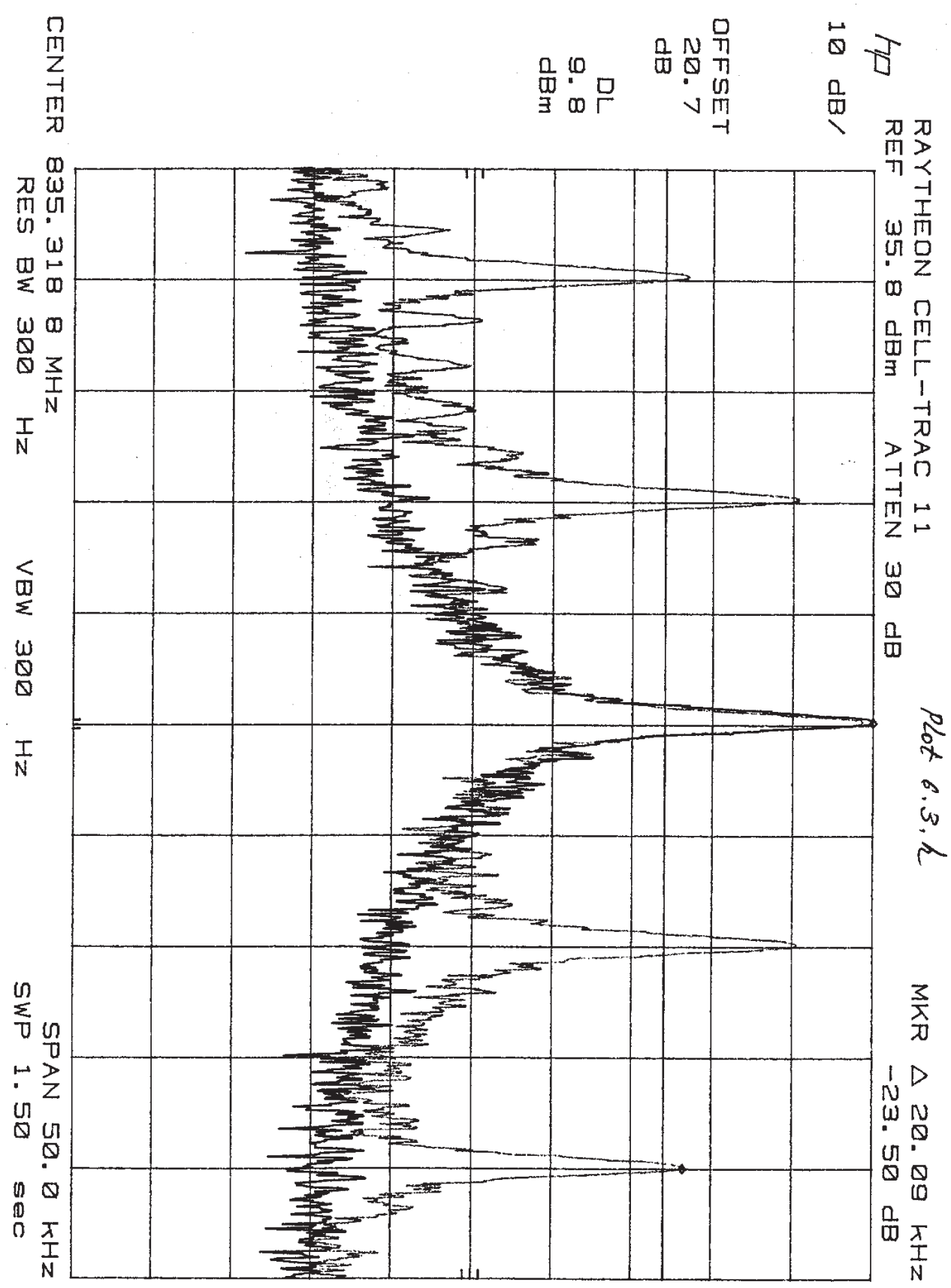

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
DL
9.8
dBm
MKR 835.318 8 MHz
35.20 dBm
CENTER 835.318 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

Plot 6.3.e

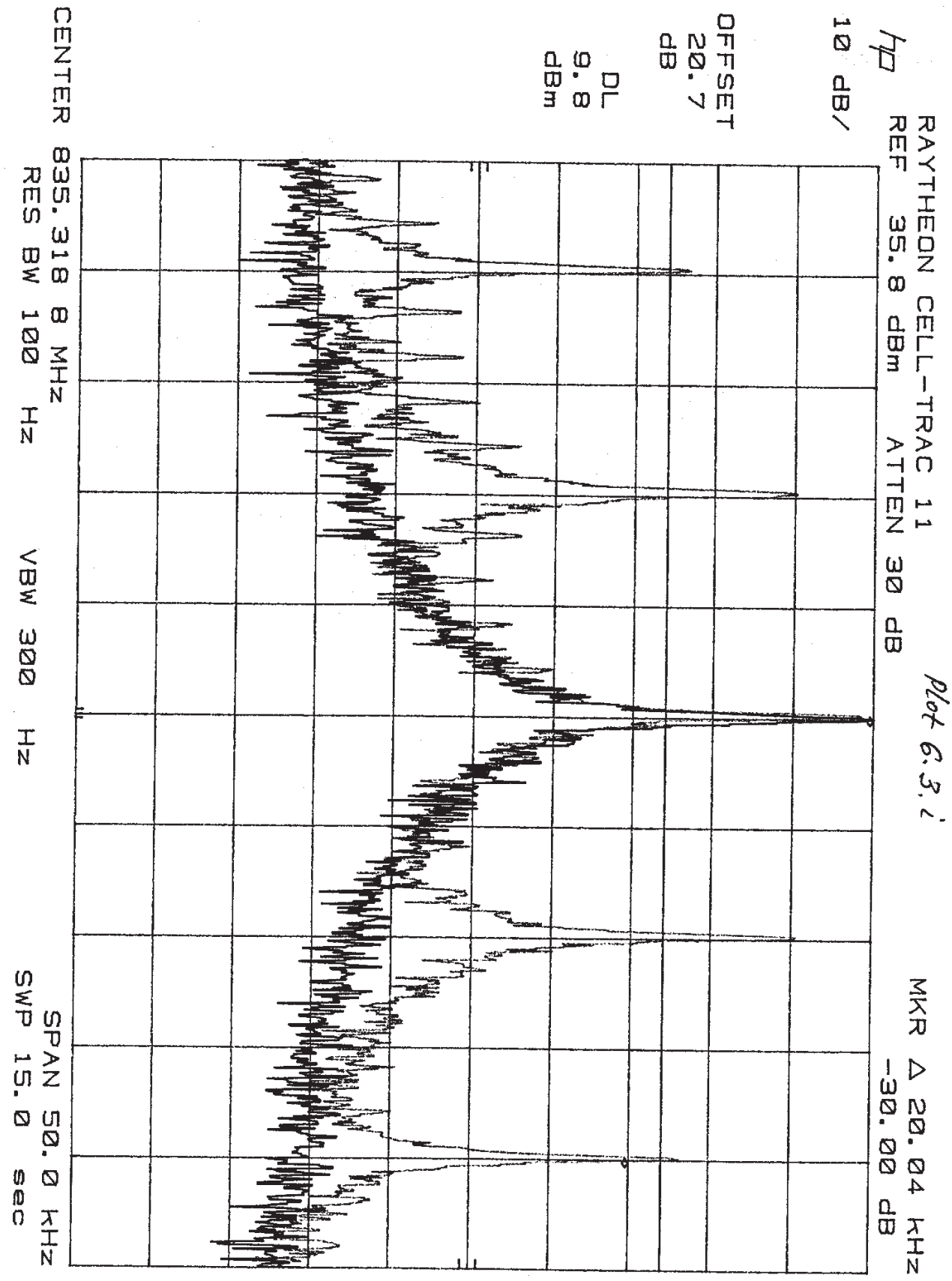

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
DL
9.8
dBm
MKR 835.318 8 MHz
35.60 dBm
CENTER 835.318 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec

Plot 6.3.4

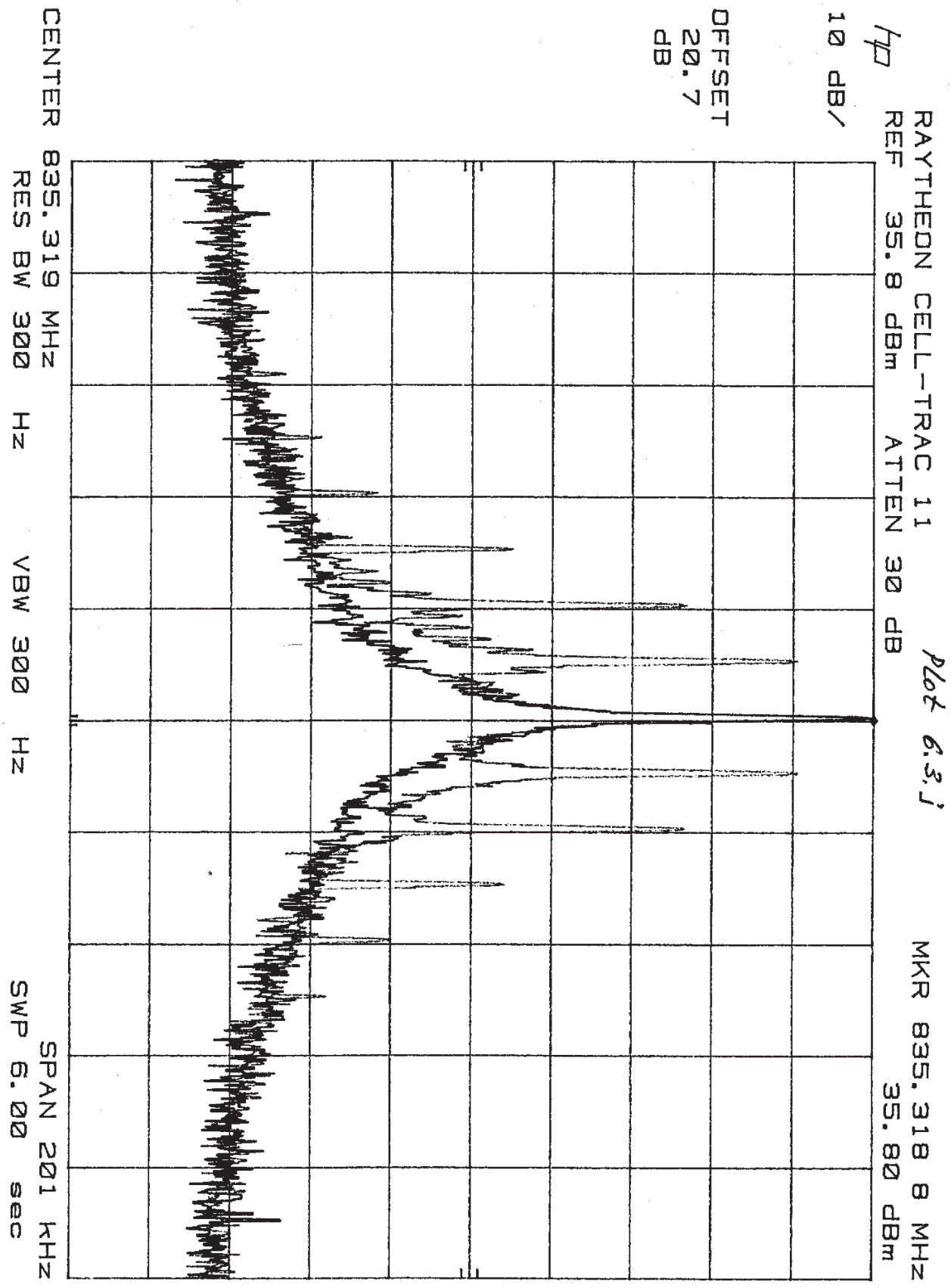

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
MKR 835.318 8 MHz
26.30 dBm
10 dB/
OFFSET
20.7
dB
CENTER 835.318 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 200 kHz
SWP 6.00 sec
Plot 6.3.8

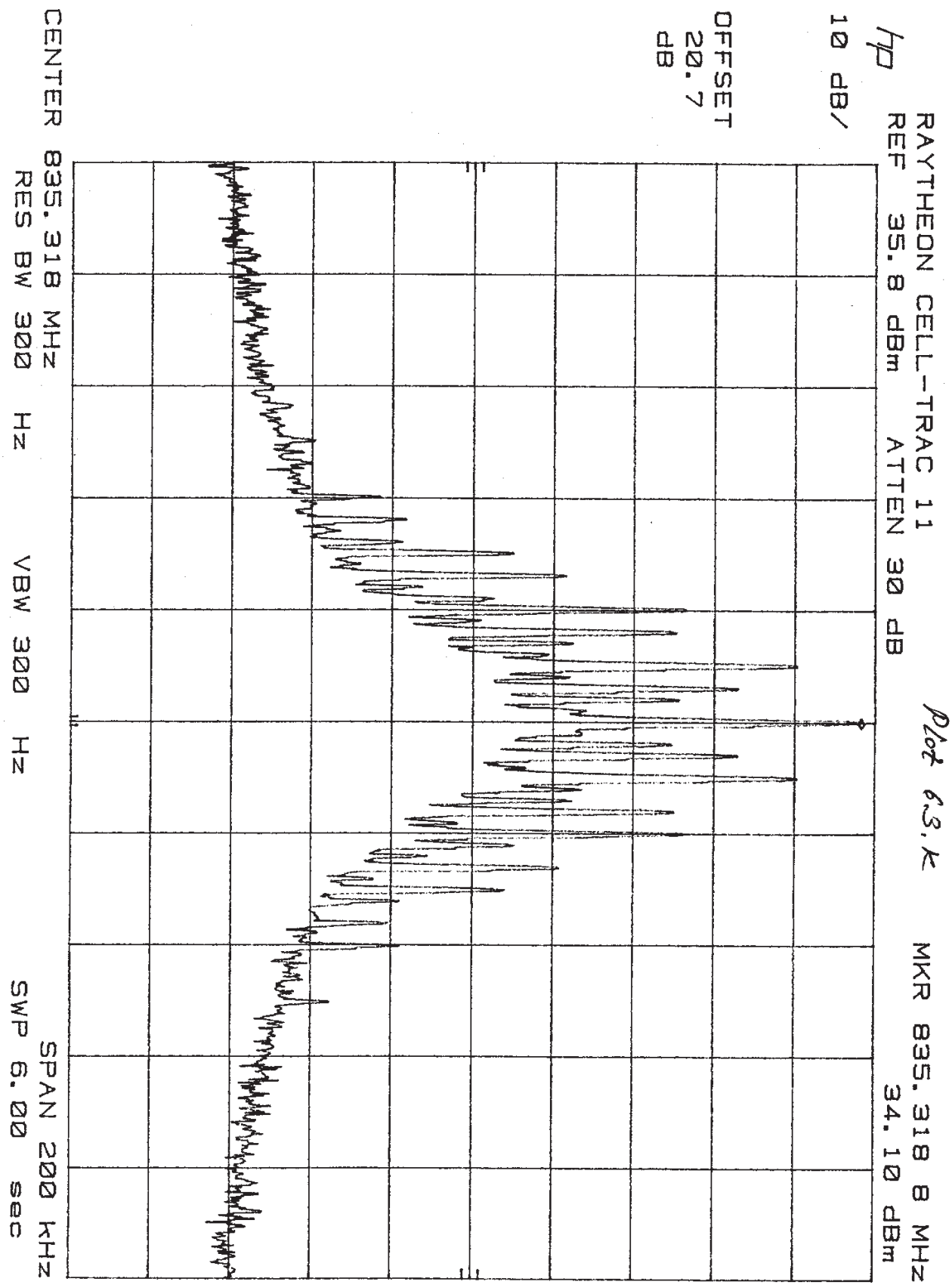

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
DL
9.8
dBm
CENTER 835.318 8 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 50.0 kHz
SWP 1.50 sec
MKR Δ 20.09 kHz
-23.50 dB

Plot 6.3.2

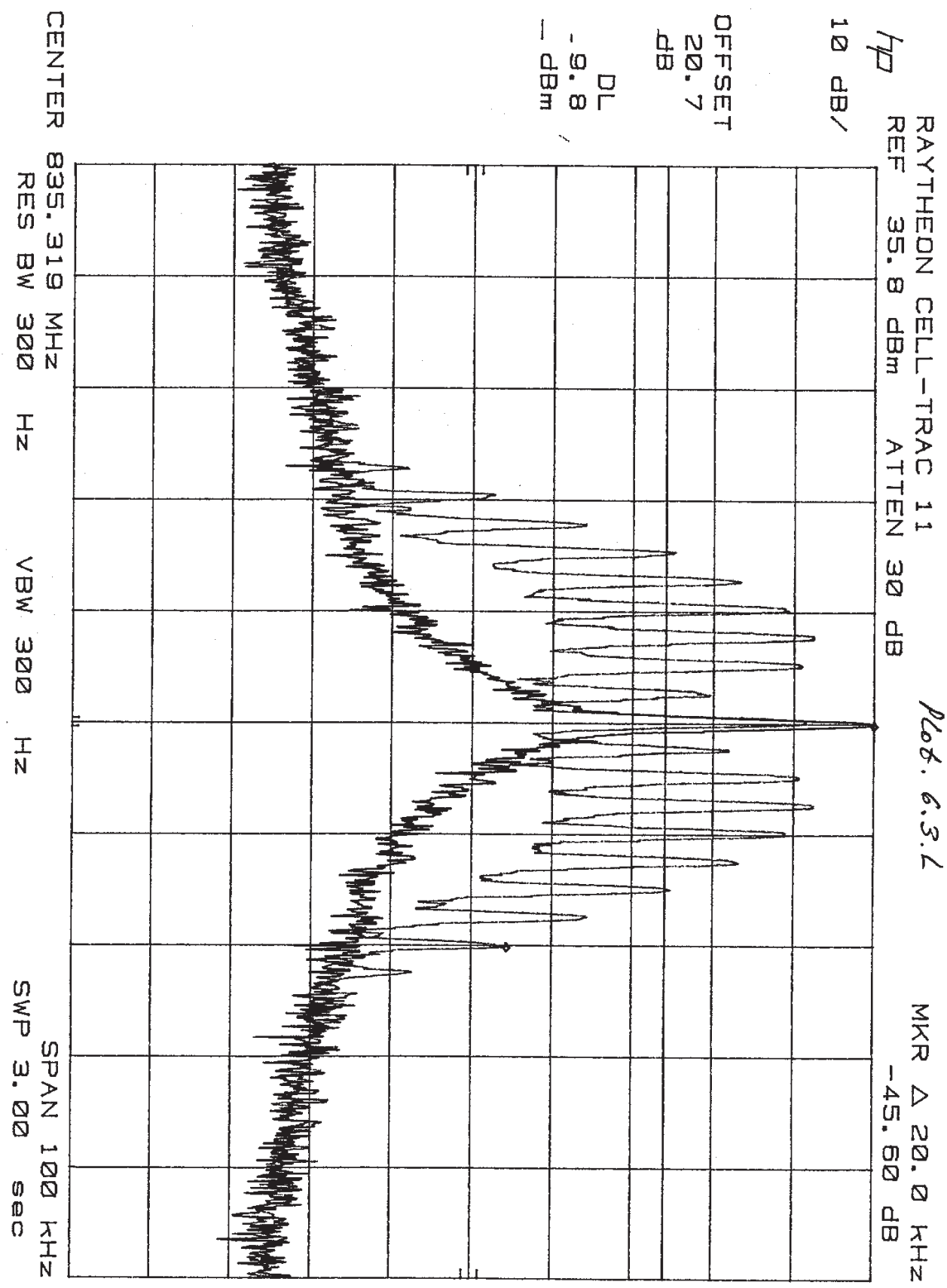

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
DL
9.8
dBm
CENTER 835.318 8 MHz
RES BW 100 Hz
VBW 300 Hz
SPAN 50.0 kHz
SWP 15.0 sec
MKR Δ 20.04 kHz
-30.00 dB

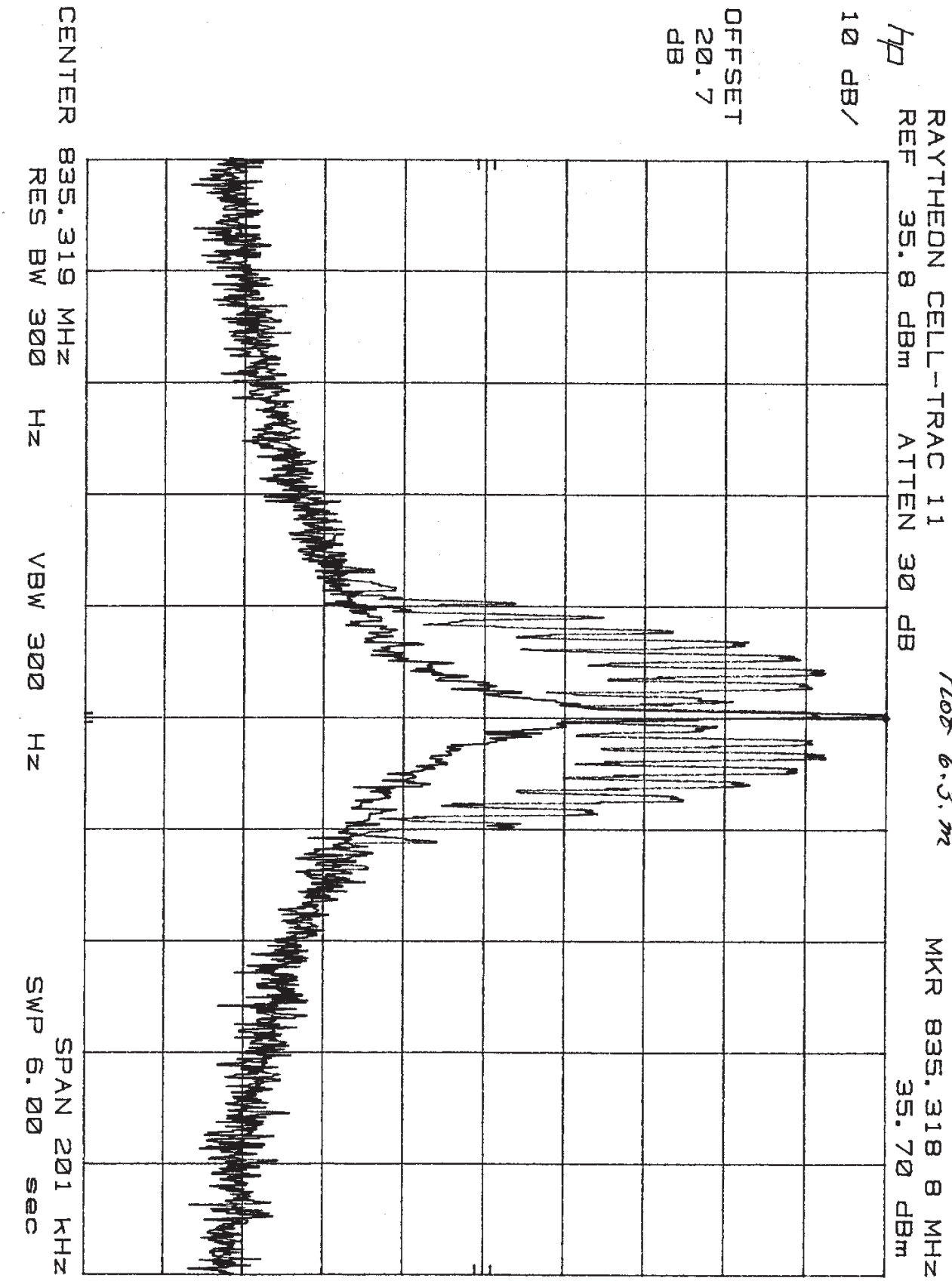
Plot 6.3.1


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 201 kHz
SWP 6.00 sec
MKR 835.318 8 MHz
35.80 dBm
Plot 6.3.j

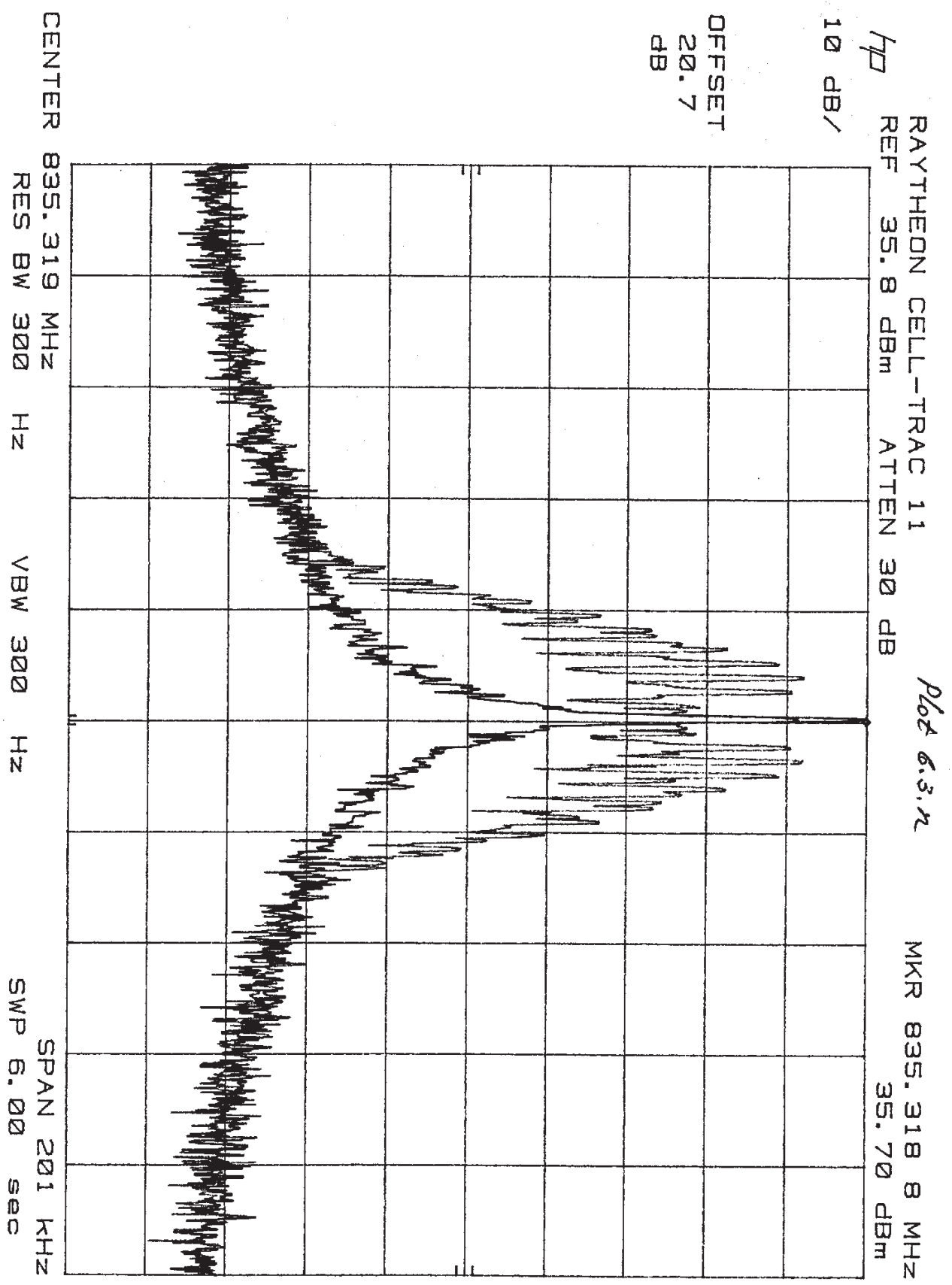

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
MKR 835.318 8 MHz
34.10 dBm
10 dB/
OFFSET
20.7
dB
CENTER 835.318 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 200 kHz
SWP 6.00 sec

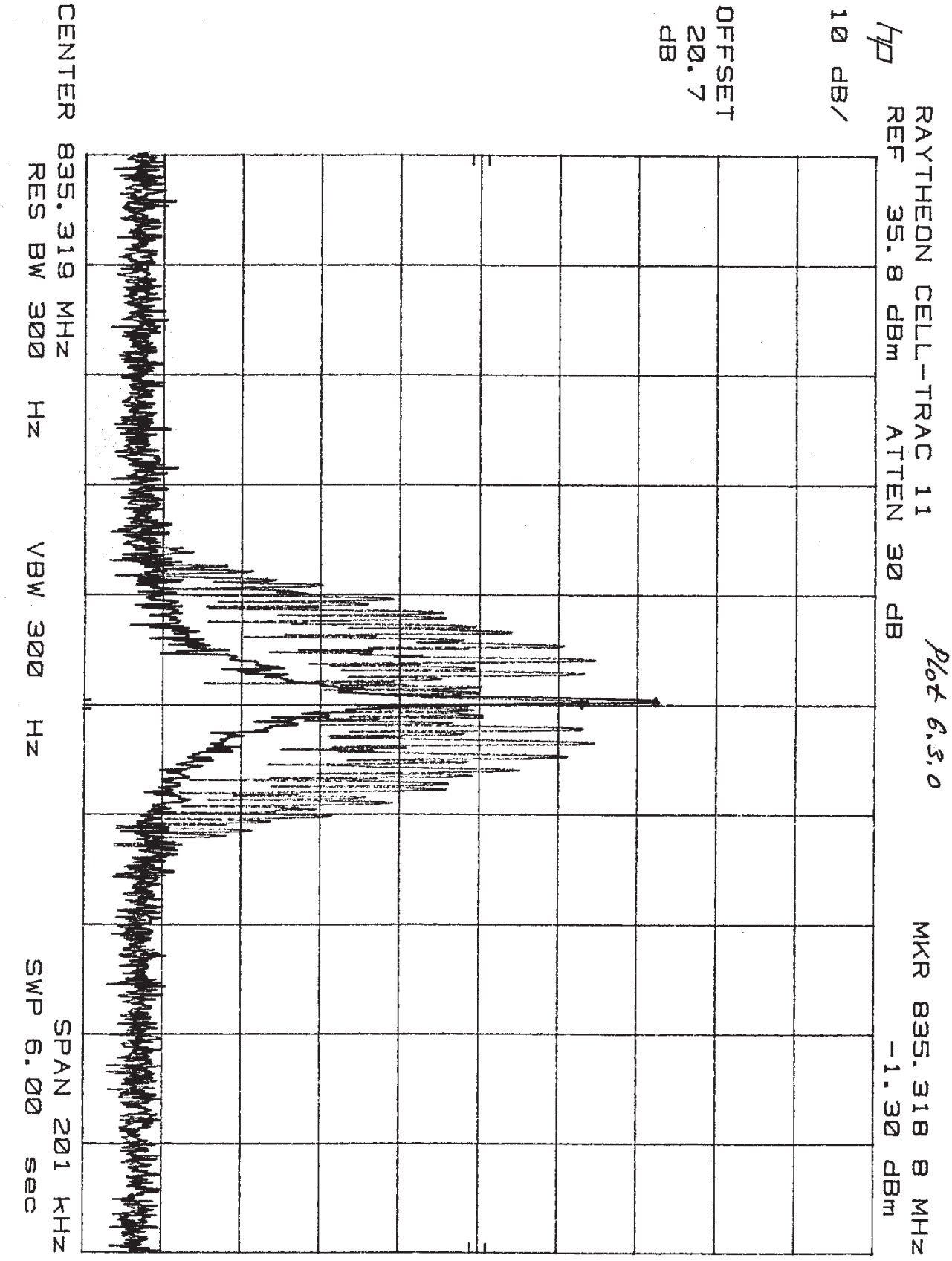
Plot 63.k


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
DL
-9.8
dBm
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 100 kHz
SWP 3.00 sec
MKR Δ 20.0 kHz
-45.60 dB
Plot. 6.3.7


RAYTHEON CELL-TRAC 11
hp
10 dB/
OFFSET
20.7
dB
REF 35.8 dBm
ATTEN 30 dB
MKR 835.318 8 MHz
35.70 dBm
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 201 kHz
SWP 6.00 sec

Plot 6.3.m


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 201 kHz
SWP 6.00 sec
MKR 835.318 8 MHz
35.70 dBm
Plot 6.3.12


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
CENTER 835.319 MHz
RES BW 300 Hz
VBW 300 Hz
SPAN 201 kHz
SWP 6.00 sec
MKR 835.318 8 MHz
-1.30 dBm
Plot 6.3.0

7.0 **Out of Band Emissions at Antenna Terminals**

Requirements: FCC 22.917(e), FCC 22.917(f)

Out of Band Emissions:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least 43 + 10 log P dB.

Mobile Emissions in Base Frequency Range:

The mean power of any emissions appearing in the base station frequency range from cellular mobile transmitters operated must be attenuated to a level not to exceed -80 dBm at the transmit antenna connector.

7.1 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 30 kHz. The audio modulating signal was adjusted like it is described in Section 6.1 of this report. Sufficient scans were taken to show the outband emissions if any up to 10th harmonic.

7.2 Test Equipment

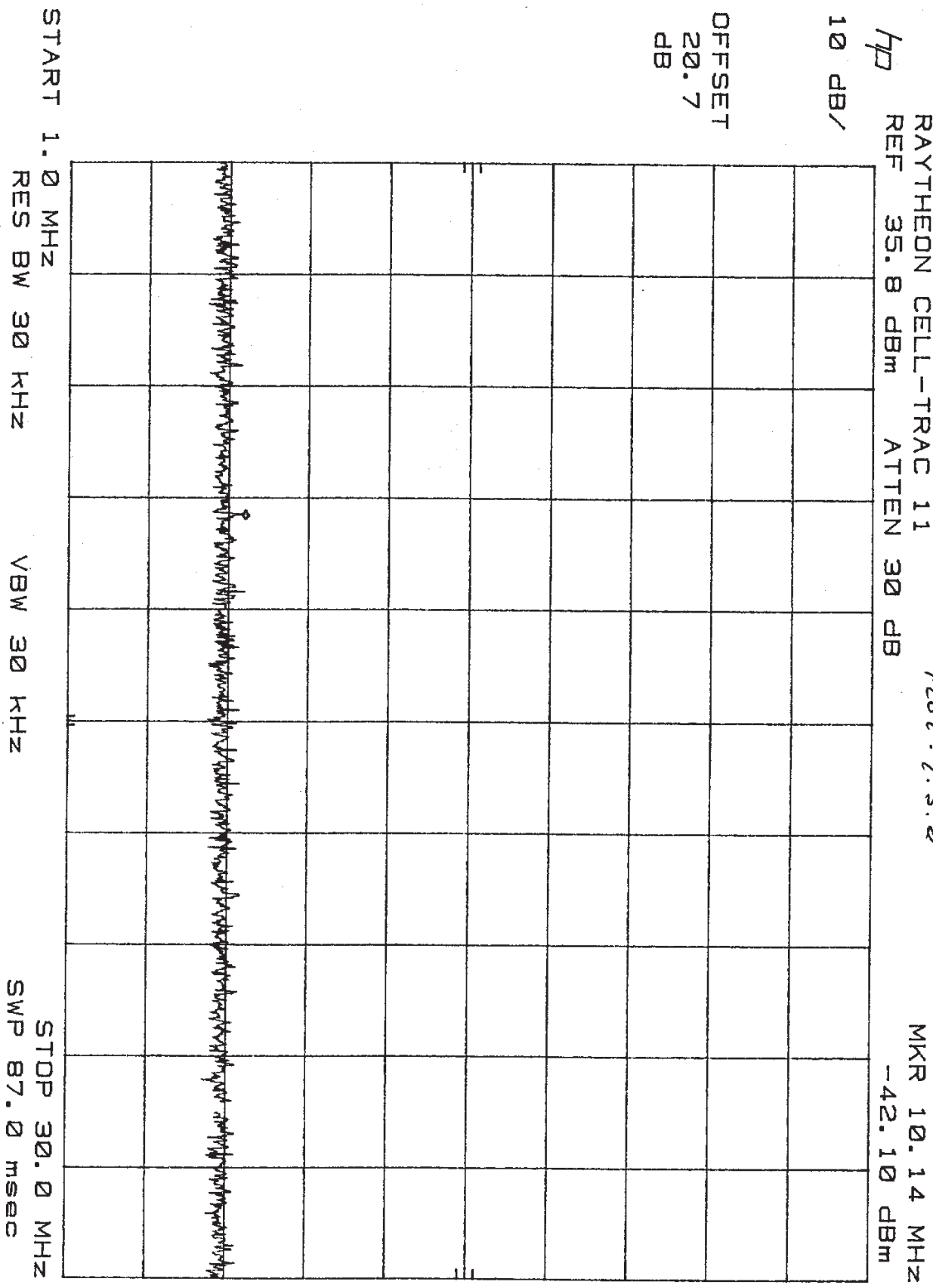
HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter
HP 7470A Plotter

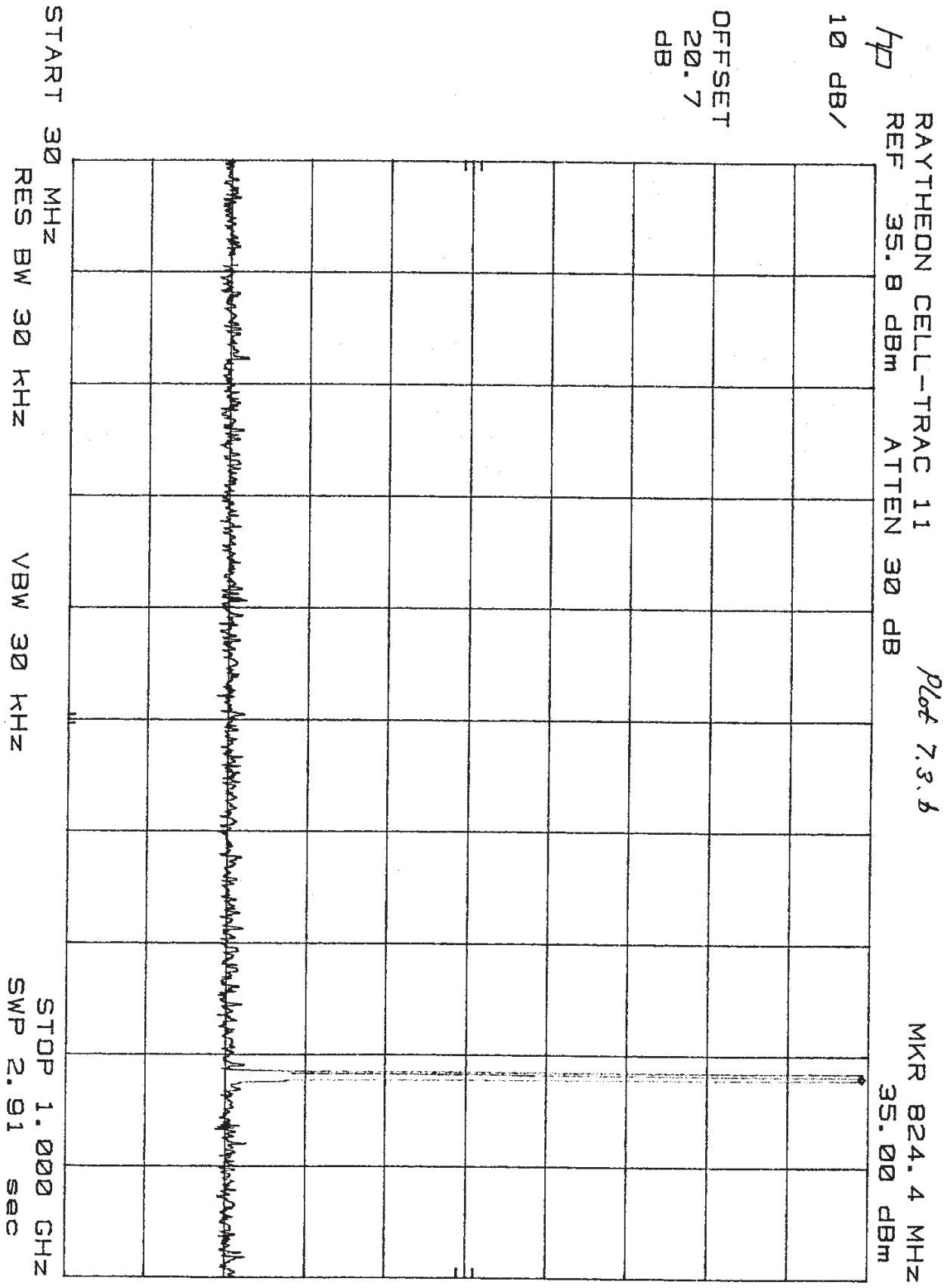
7.3 Test Results

Refer to the attached plots.

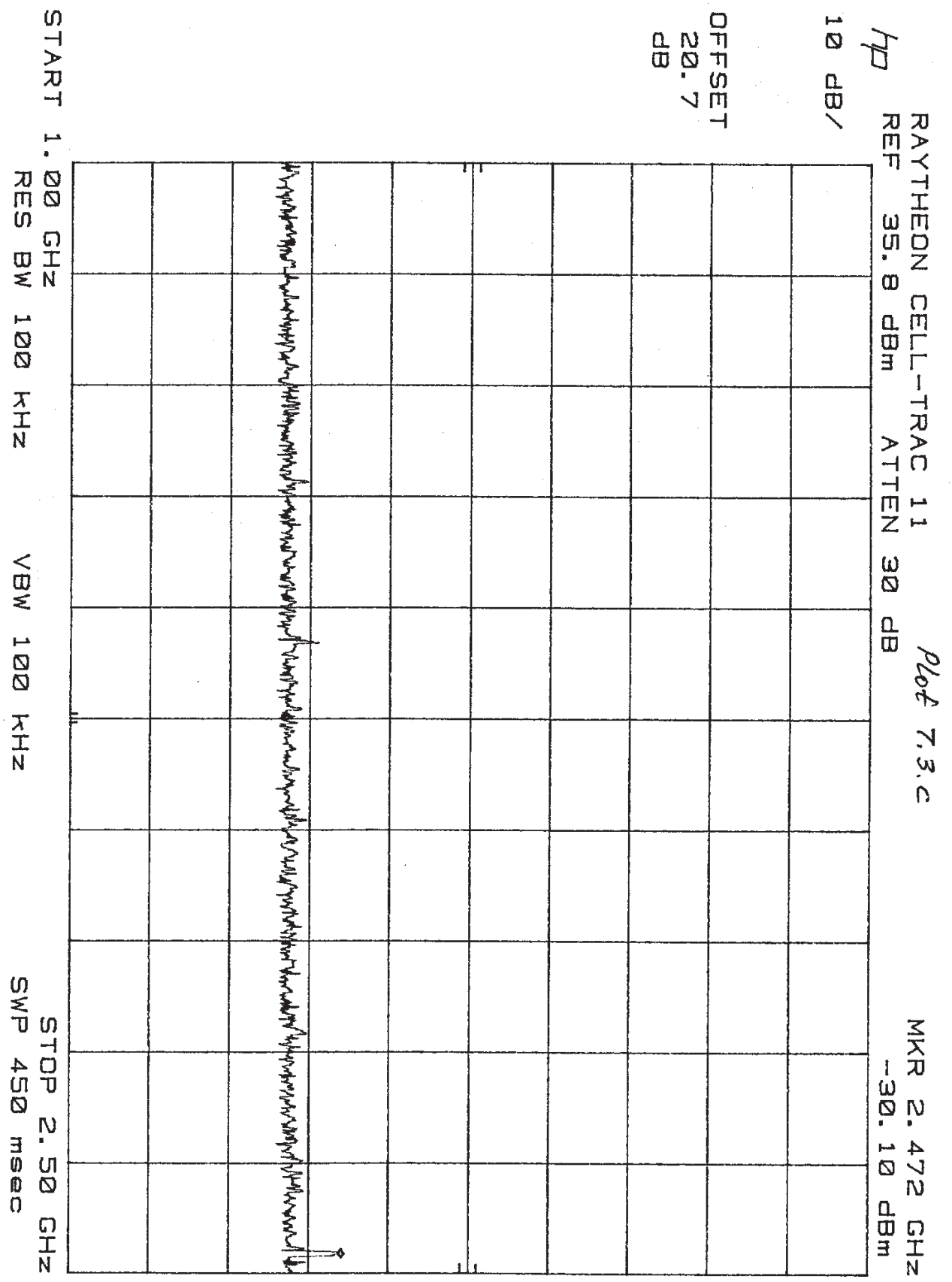
The EUT passed the test.

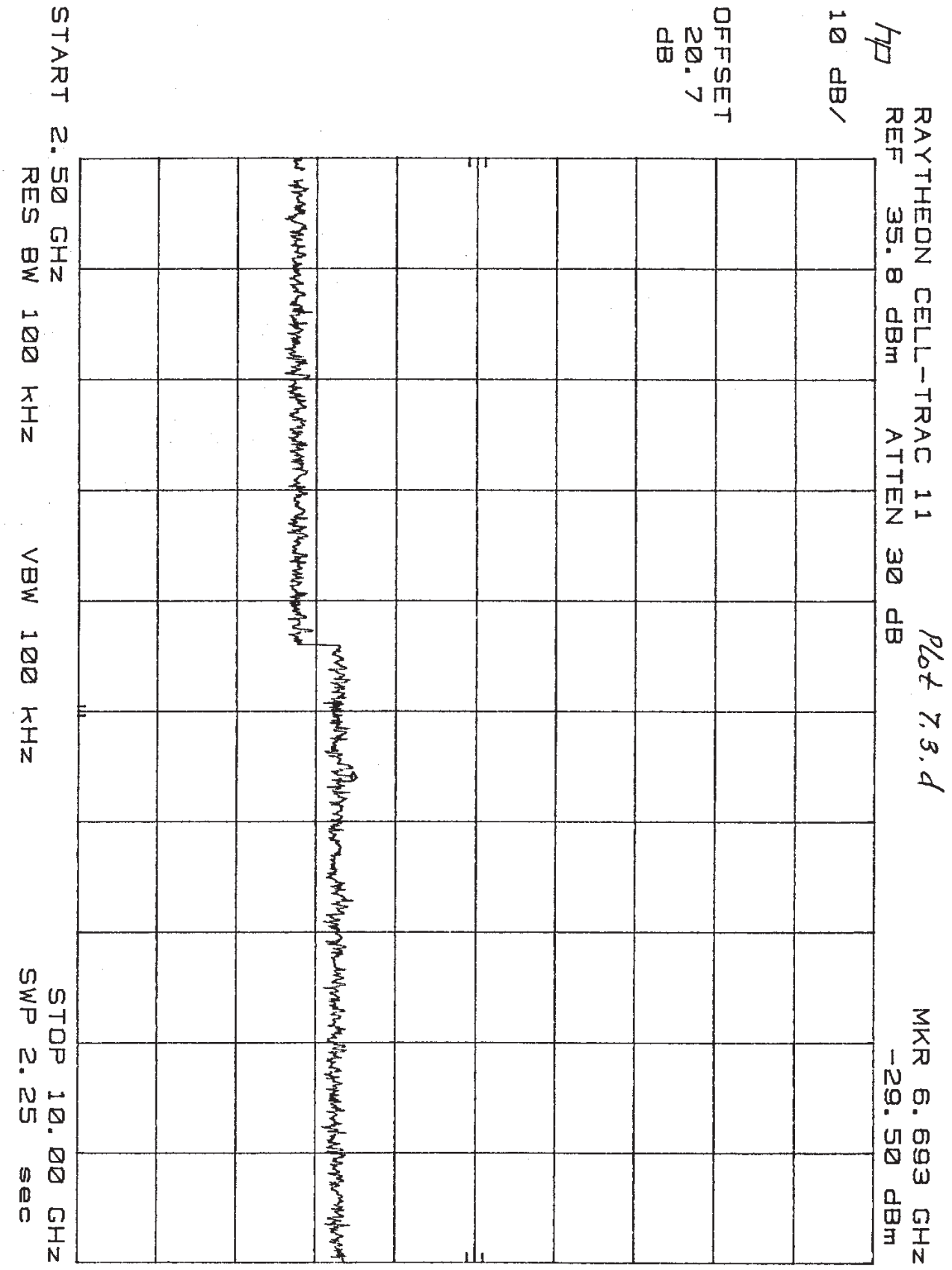
Plot #	Description
7.3.a	1 MHz - 30 MHz (Low Channel)
7.3.b	30 MHz - 1 GHz (Low Channel)
7.3.c	1 GHz - 2.5 GHz (Low Channel)
7.3.d	2.5 GHz - 10 GHz (Low Channel)
7.3.e	1 MHz - 30 MHz (Middle Channel)
7.3.f	30 MHz - 1 GHz (Middle Channel)
7.3.g	1 GHz - 2.5 GHz (Middle Channel)
7.3.h	2.5 GHz - 10 GHz (Middle Channel)
7.3.i	1 MHz - 30 MHz (High Channel)
7.3.j	30 MHz - 1 GHz (High Channel)
7.3.k	1 GHz - 2.5 GHz (High Channel)
7.3.l	2.5 GHz - 10 GHz (High Channel)
7.3.m	869 MHz - 894 MHz (Low Channel)
7.3.n	869 MHz - 894 MHz (Middle Channel)
7.3.o	869 MHz - 894 MHz (High Channel)

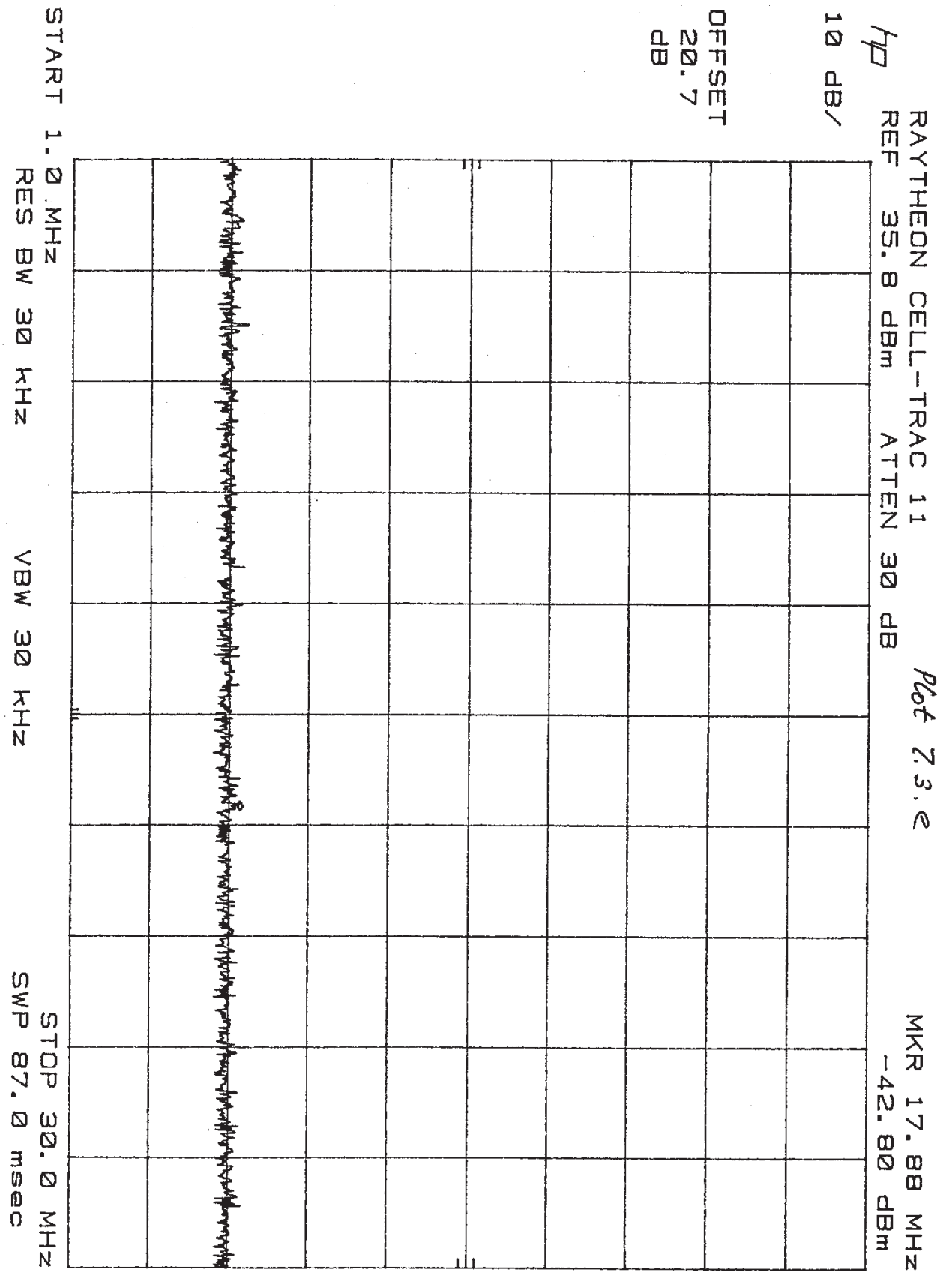

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
Plot 7.3.2
MKR 10.14 MHz
-42.10 dBm
START 1.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 87.0 msec


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
MKR 824.4 MHz
35.00 dBm
START 30 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 1.000 GHz
SWP 2.91 sec

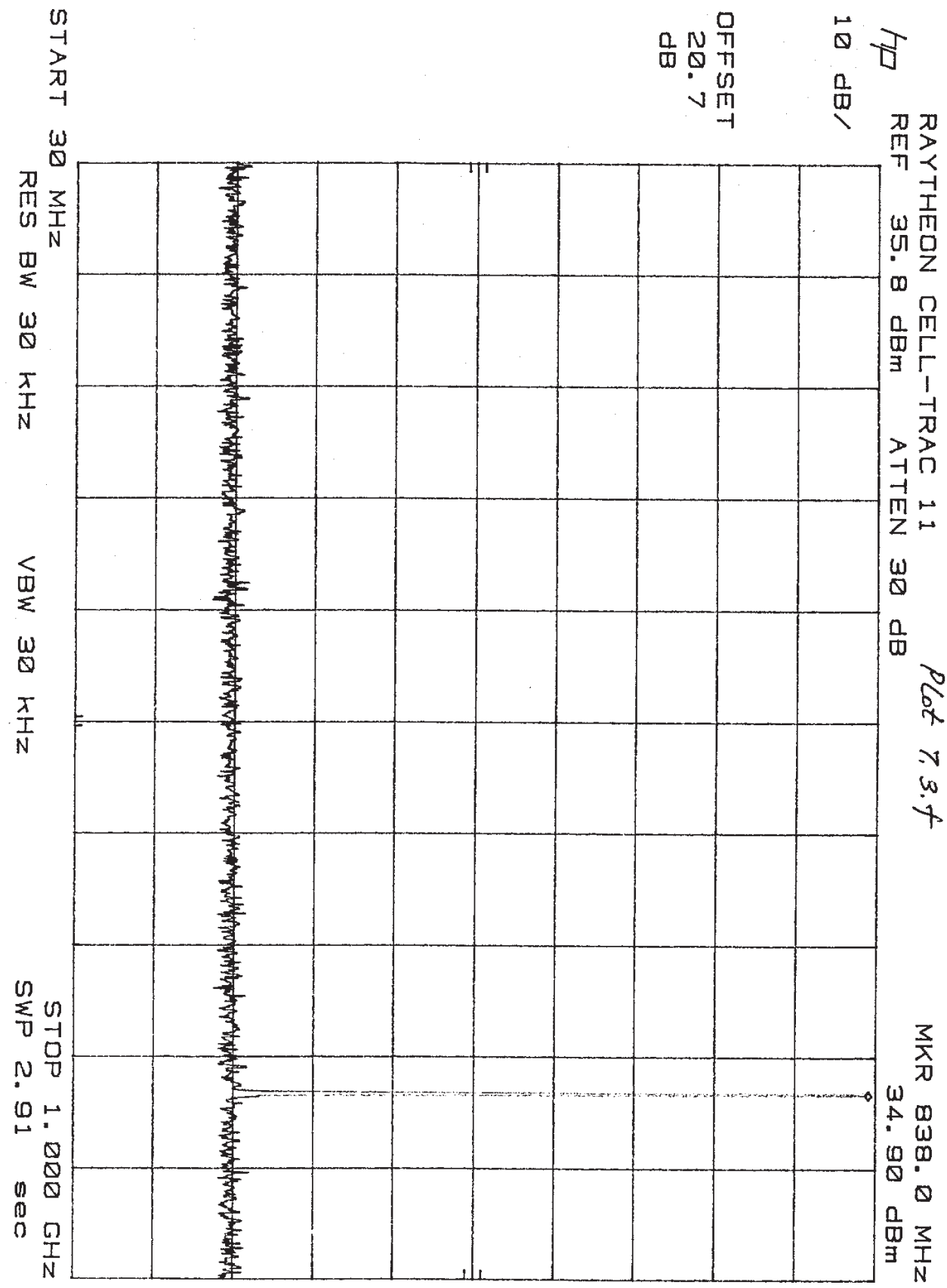
Plot 7.3.6


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7.3.c
hp
10 dB/
OFFSET
20.7
dB
MKR 2.472 GHz
-30.10 dBm
START 1.00 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 450 msec

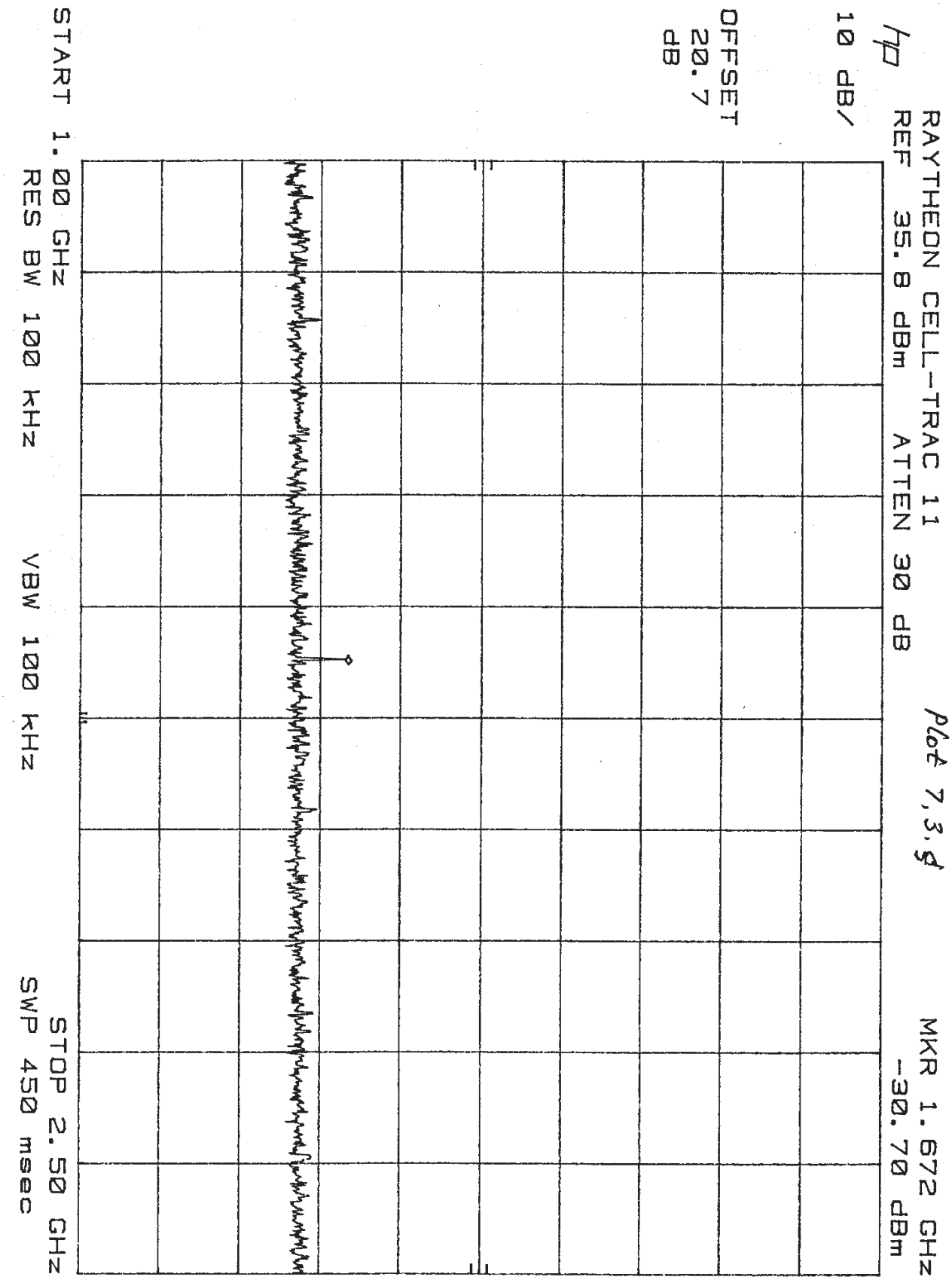

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7.3.d
hp
10 dB/
OFFSET
20.7
dB
MKR 6.693 GHz
-29.50 dBm
START 2.50 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 2.25 sec

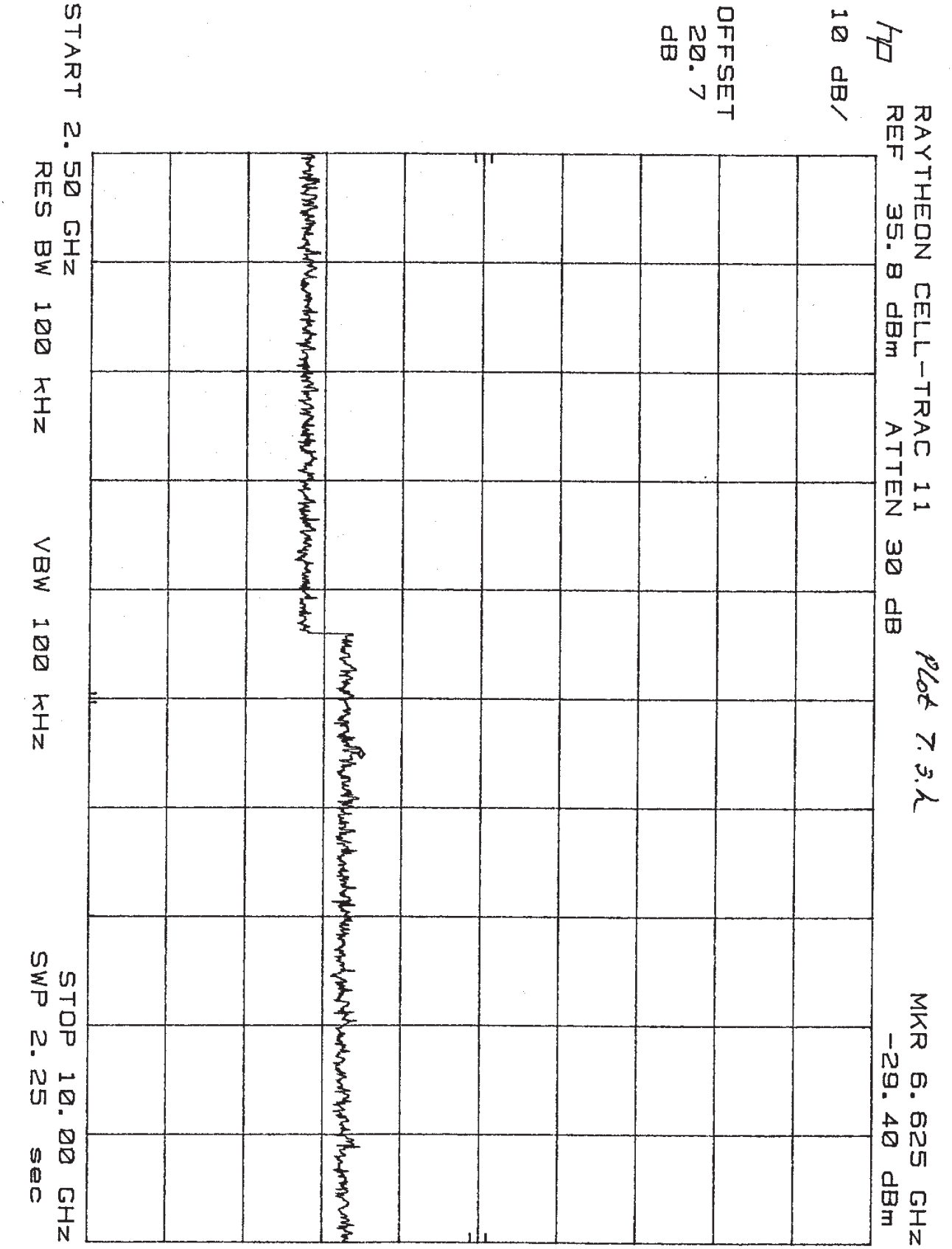

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
MKR 17.88 MHz
-42.80 dBm
START 1.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 87.0 msec

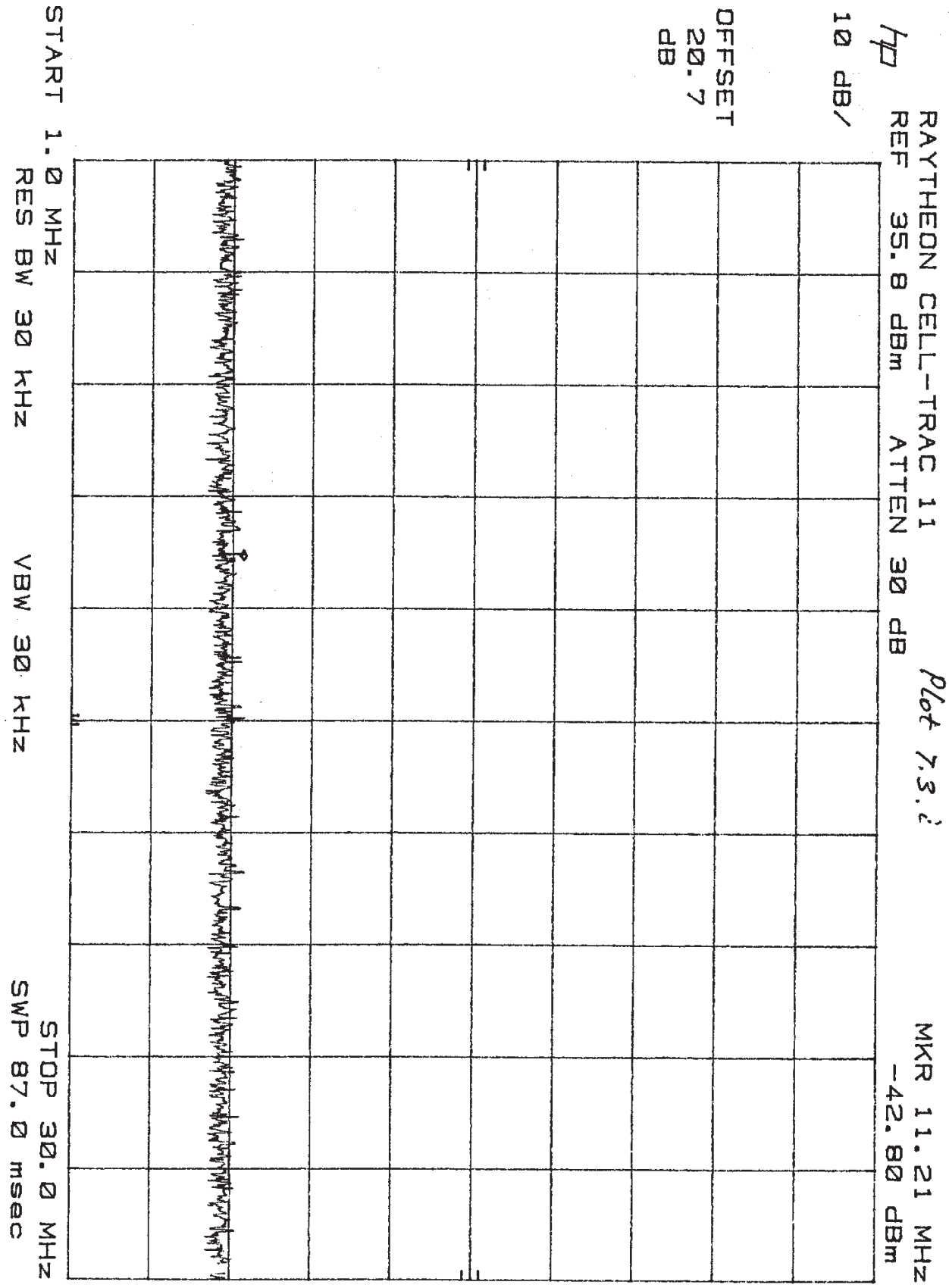
Plot 7.3.2

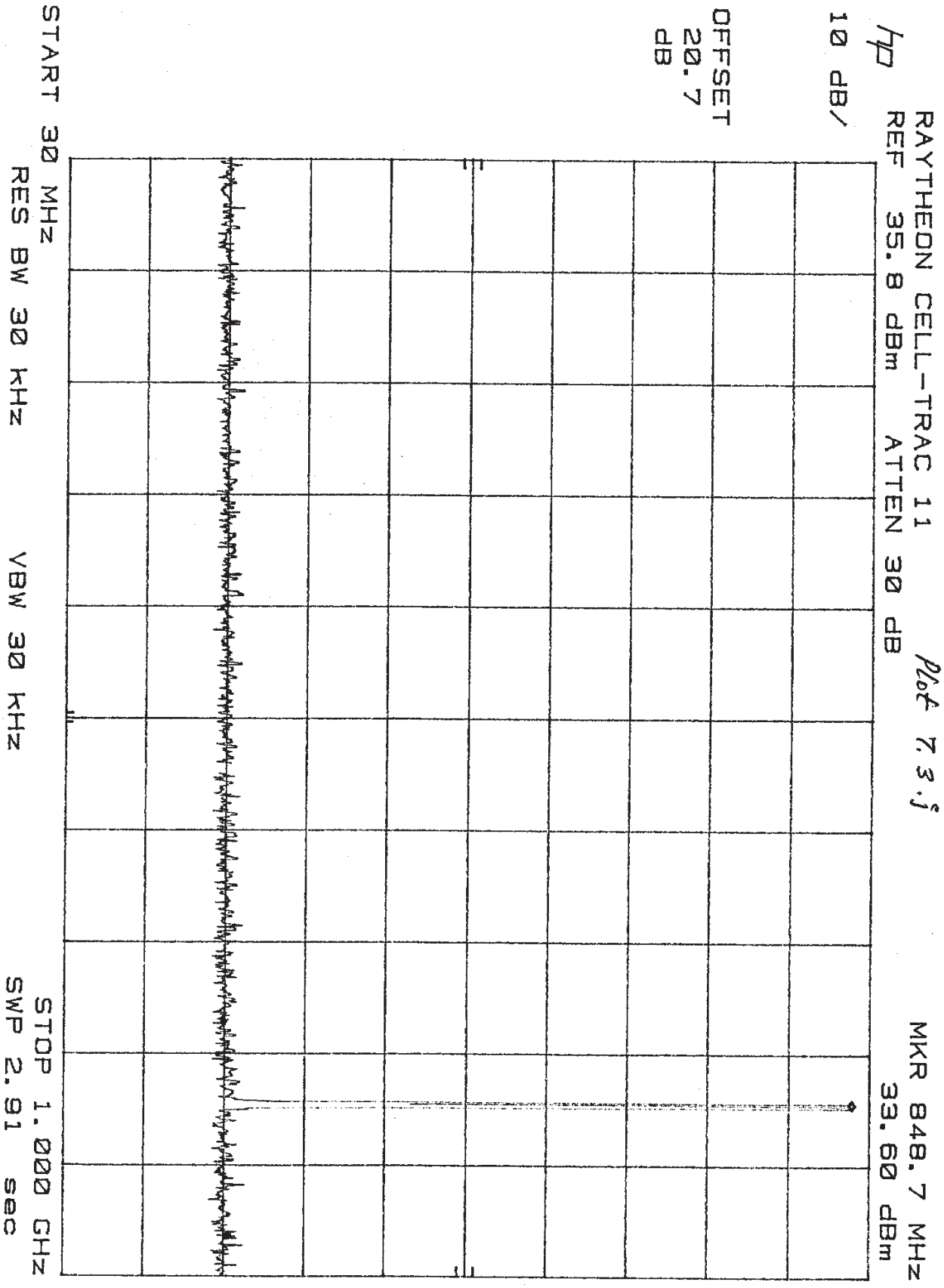

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
MKR 838.0 MHz
34.90 dBm
START 30 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 1.000 GHz
SWP 2.91 sec

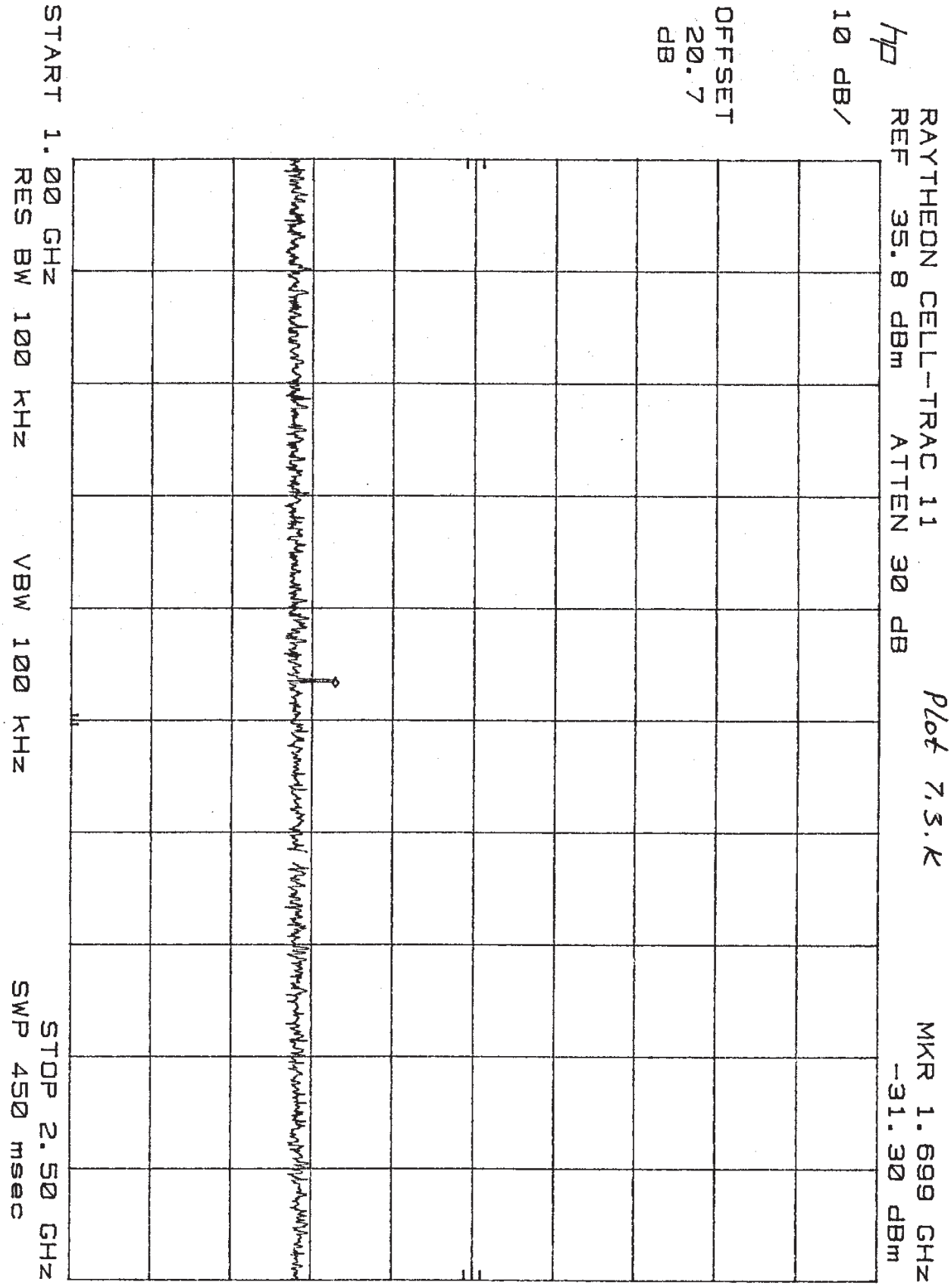
Plot 7.3.f


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7,3,4
MKR 1.672 GHz
-30.70 dBm
10 dB/
OFFSET
20.7
dB
START 1.00 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 450 msec

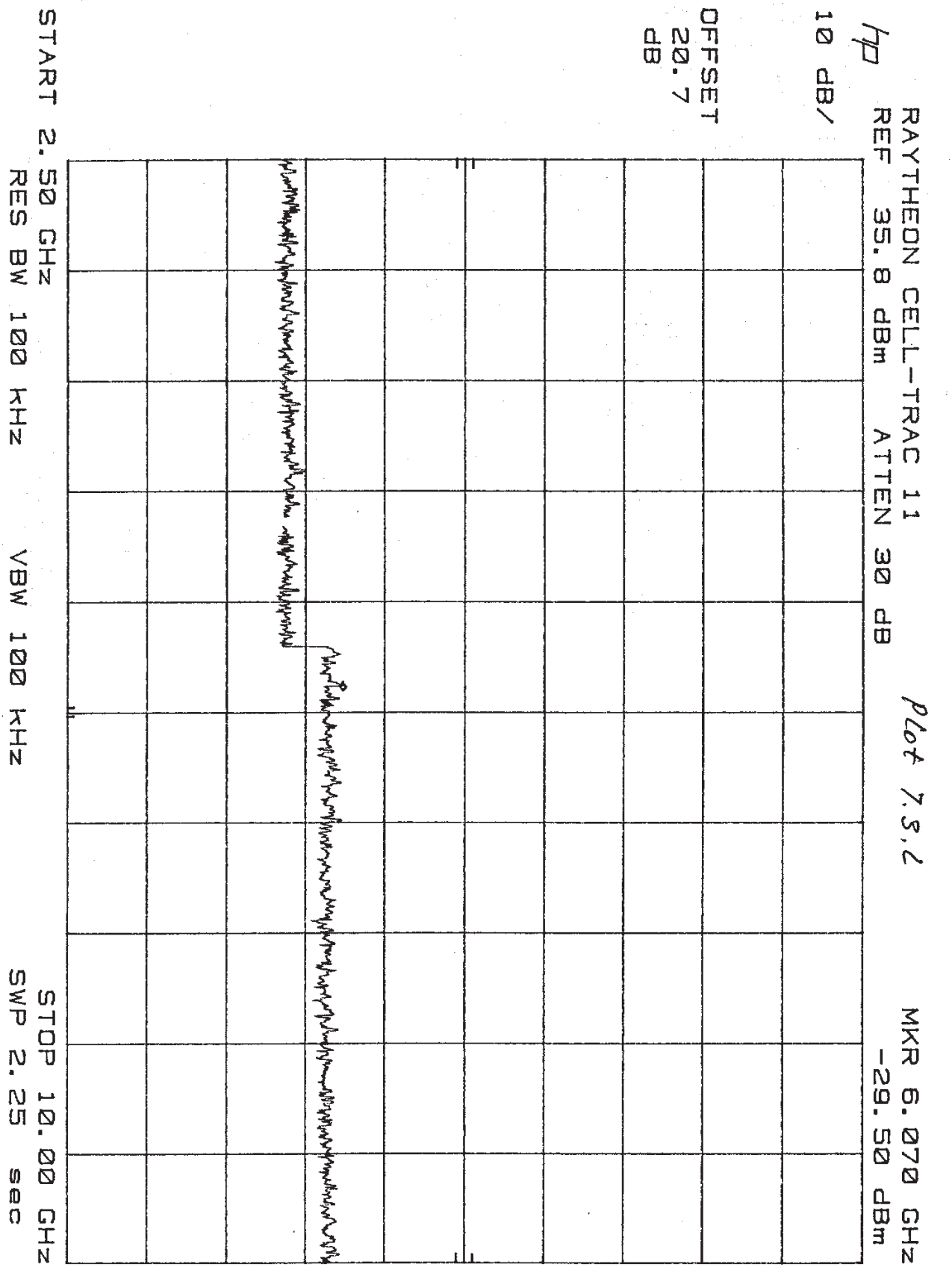

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7.3.2
MKR 6.625 GHz
-29.40 dBm
10 dB/
OFFSET
20.7
dB
START 2.50 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 2.25 sec

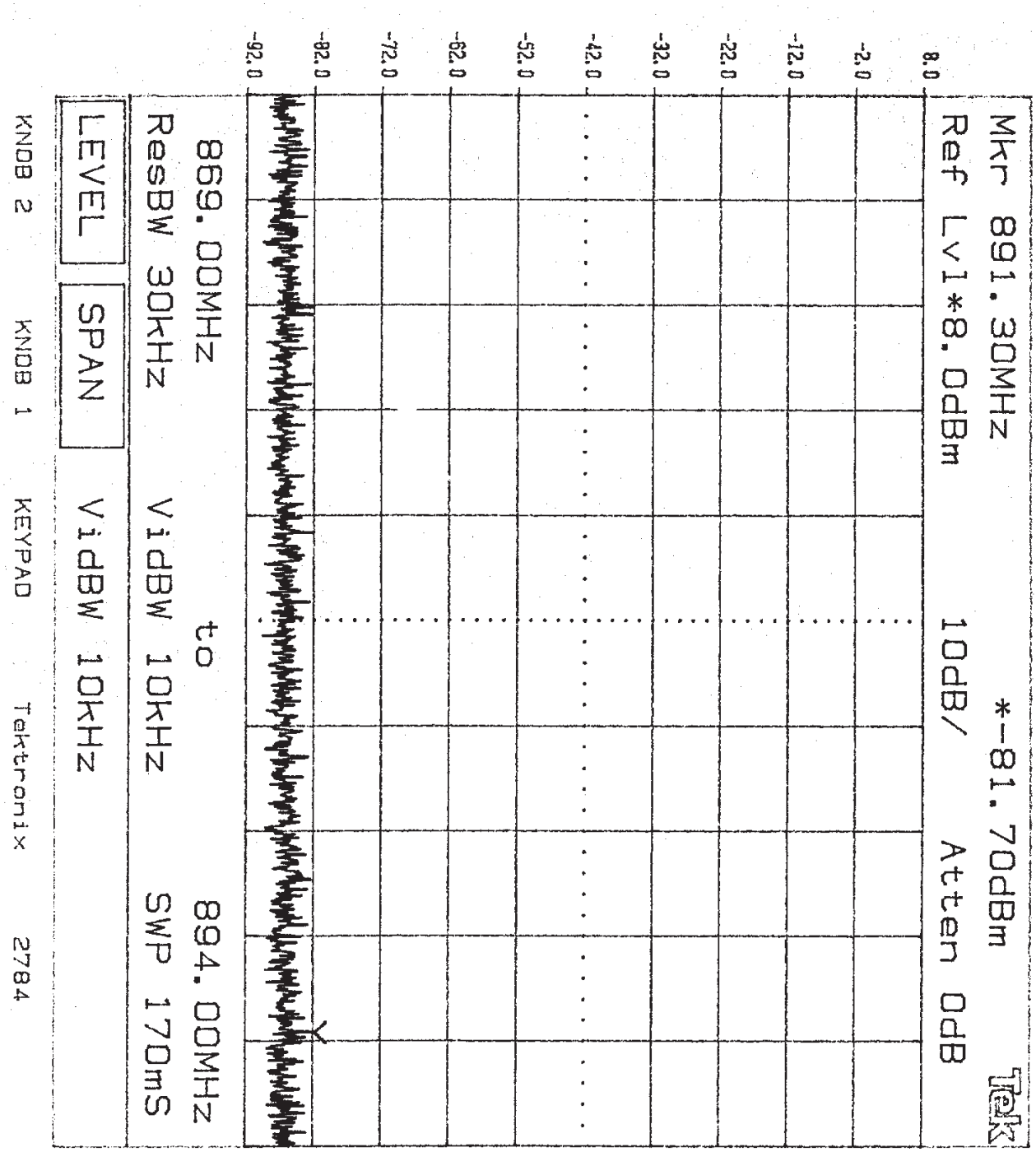

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7.3.2
hp
10 dB/
OFFSET
20.7
dB
MKR 11.21 MHz
-42.80 dBm
START 1.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.0 MHz
SWP 87.0 msec


RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7.3.j
10 dB/
OFFSET
20.7
dB
MKR 848.7 MHz
33.60 dBm
START 30 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 1.000 GHz
SWP 2.91 sec

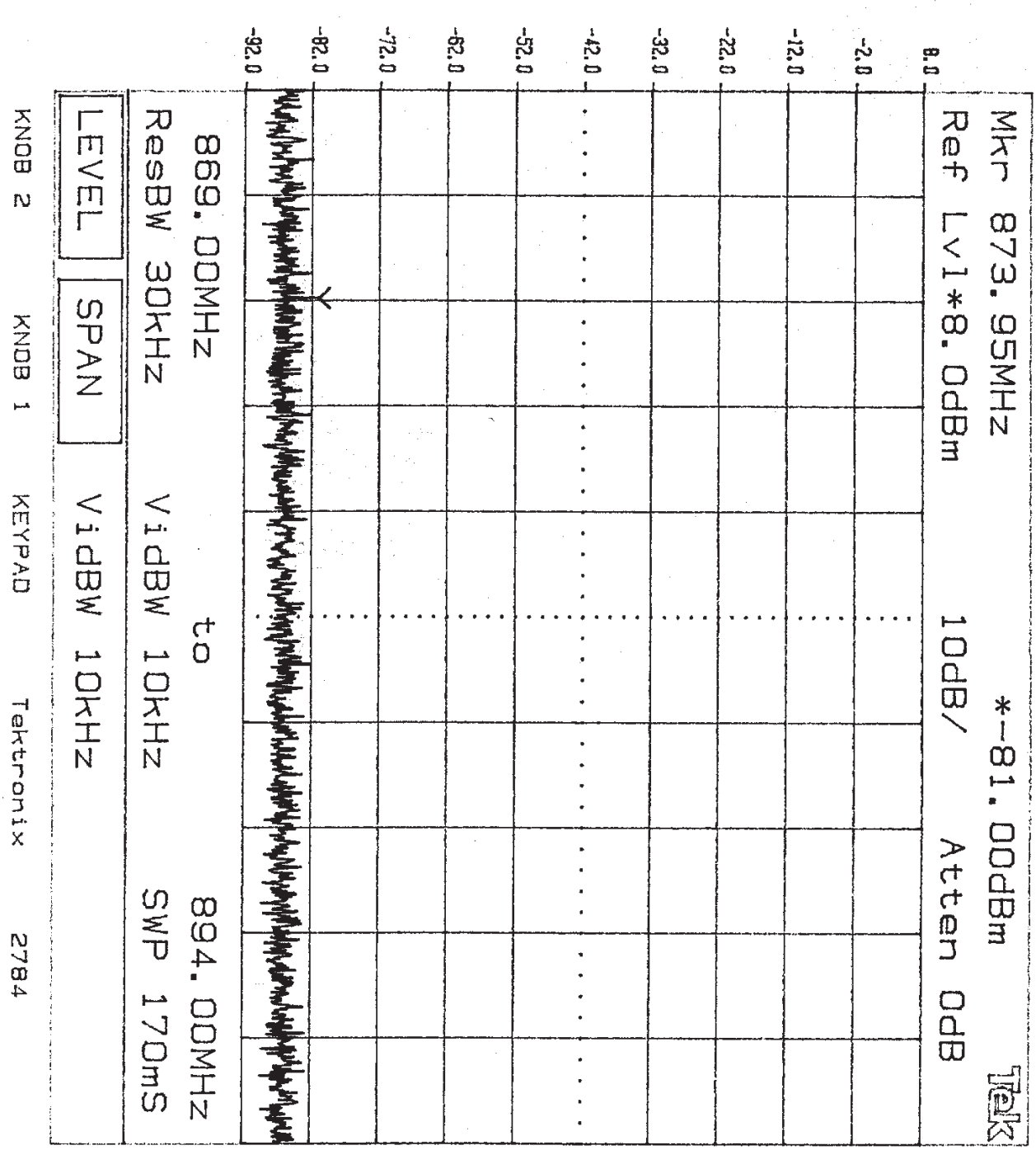

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
10 dB/
OFFSET
20.7
dB
MKR 1.699 GHz
-31.30 dBm
START 1.00 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 450 msec

Plot 7.3.K

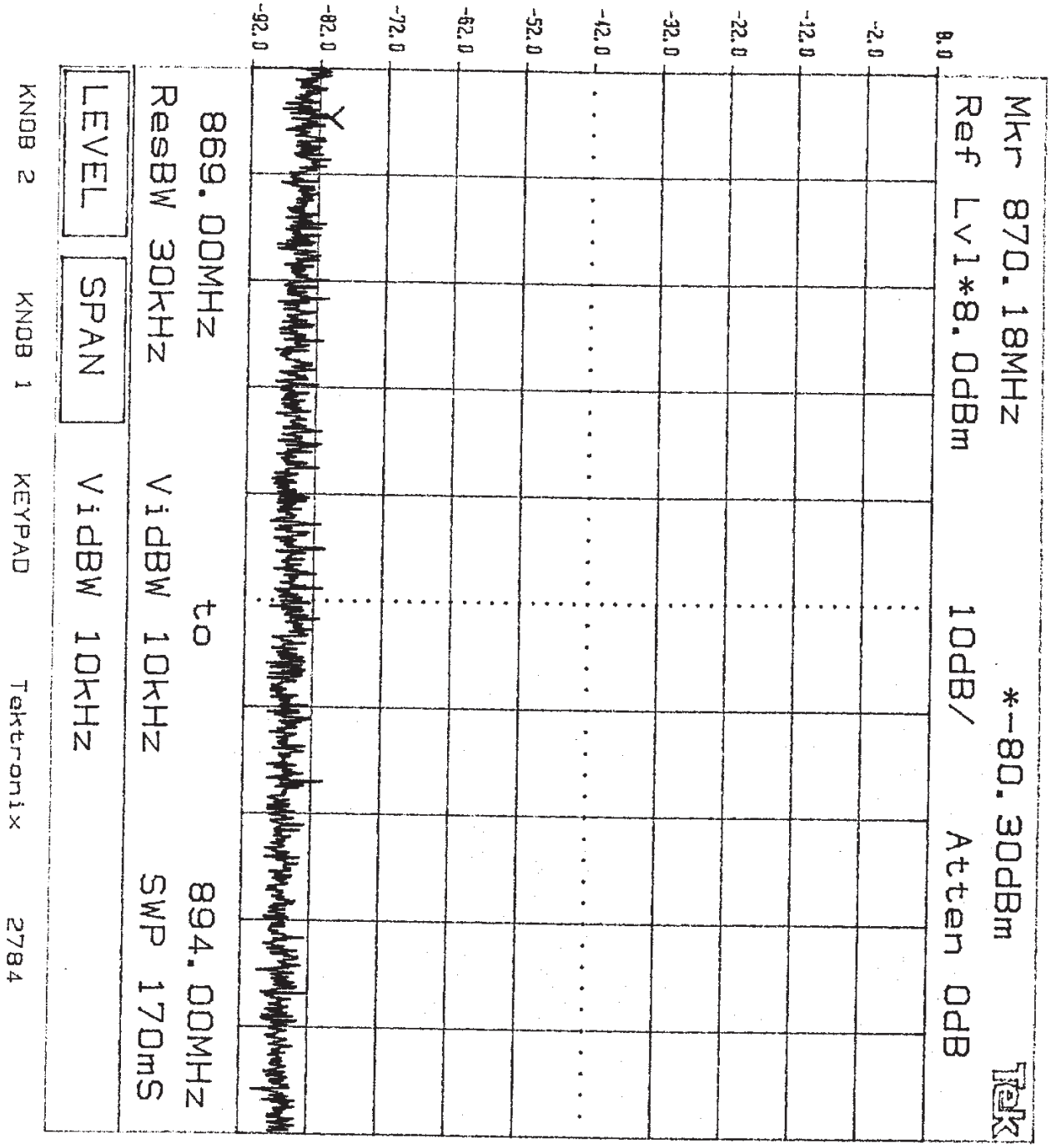

RAYTHEON CELL-TRAC 11
REF 35.8 dBm
ATTEN 30 dB
Plot 7.3.2
MKR 6.070 GHz
-29.50 dBm
hp
10 dB/
OFFSET
20.7
dB
START 2.50 GHz
RES BW 100 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 2.25 sec


Mkr 891.30MHz
*-81.70dBm
Ref Lvl*8.0dBm
10dB/
Atten 0dB
Tek
8.0
-2.0
-12.0
-22.0
-32.0
-42.0
-52.0
-62.0
-72.0
-82.0
-92.0
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 10kHz
SWP 170mS
LEVEL
SPAN
VidBW 10kHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 7.3.m


Mkr 873.95MHz
*-81.00dBm
Ref Lvl*8.0dBm
10dB/
Atten 0dB
Tek
8.0
-2.0
-12.0
-22.0
-32.0
-42.0
-52.0
-62.0
-72.0
-82.0
-92.0
869.00MHz
to
894.00MHz
ResBW 30kHz
VidBW 10kHz
SWP 170mS
LEVEL
SPAN
VidBW 10kHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 7.3.2


Mkr 870.18MHz
Ref Lvl*8.0dBm
*-80.30dBm
10dB/ Atten 0dB
Tek
8.0
-2.0
-12.0
-22.0
-32.0
-42.0
-52.0
-62.0
-72.0
-82.0
-92.0
869.00MHz
ResBW 30kHz
to
894.00MHz
VidBW 10kHz
SWP 170mS
LEVEL
SPAN
VidBW 10kHz
KNOB 2
KNOB 1
KEYPAD
Tektronix
2784

Plot 7.3.0

8.0 **Field Strength of Spurious Radiation**

Requirements: FCC 2.993, 22.917(e)

8.1 Test Procedure

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of each of the three fundamental frequency (low, middle, and high channels) was investigated.

The spurious emissions attenuation was calculated as the difference between field strength in dBuV/m at the fundamental frequency (See Section 3) and at the spurious emissions frequency.

8.2 Test Equipment

EMCO 3115 Horn Antenna
HP 8566B Spectrum Analyzer
Tektronix 2782 Spectrum Analyzer
Low Pass Filter
Preamplifier

8.3 Test Results

Refer to the attached data sheets.

The EUT passed the test.

ITS Intertek Testing Services

Company: Raytheon Systems Company
Project #:
Model: Tx@824.04 MHz
Engineer: Xi-Ming Yang
Date of test: August 17, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1648.1	V	74.0	26.7	-29.6	2.1	73.2	55.5	-8.6
2472.3	H	57.0	30.5	-28.4	3.6	62.7	66.0	-19.1
3296.2	H	52.0	32.7	-27.8	4.1	61.0	67.7	-20.8
4120.3	H	54.0	34.0	-27.6	4.5	64.9	63.8	-16.9
4944.2	H	52.0	35.1	-27.8	4.7	64.0	64.7	-17.8
5768.2	H	44.0	36.1	-28.0	5.1	57.2	71.5	-24.6
6592.3	H	35.0	37.2	-28.5	5.7	49.4	79.3	-32.4
7416.3	H	32.0	37.8	-29.0	6.1	46.9	81.8	-34.9
8240.3	H	36.0	38.8	-29.0	6.3	52.1	76.6	-29.7

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 128.7 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 46.9 dB**

ITS Intertek Testing Services

Company: Raytheon Systems Company
Project #:
Model: Tx@836.52 MHz
Engineer: Xi-Ming Yang
Date of test: August 17, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1673.0	V	72.5	26.7	-29.6	2.1	71.7	60.9	-12.7
2509.6	V	59.0	30.5	-28.4	3.6	64.7	67.9	-19.7
3396.1	H	55.6	32.7	-27.8	4.1	64.6	68.0	-19.8
4182.6	V	54.0	34.0	-27.6	4.5	64.9	67.7	-19.5
5019.1	V	47.0	35.1	-27.8	4.7	59.0	73.6	-25.4
5856.6	H	42.0	36.1	-28.0	5.1	55.2	77.4	-29.2
6692.2	H	36.0	37.2	-28.5	5.7	50.4	82.2	-34.0
7528.7	H	35.0	37.8	-29.0	6.1	49.9	82.7	-34.5
8365.2	H	32.0	38.8	-29.0	6.3	48.1	84.5	-36.3

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 132.6 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 48.2 dB**

ITS Intertek Testing Services

Company: Raytheon Systems Company
Project #:
Model: Tx@848.97 MHz
Engineer: Xi-Ming Yang
Date of test: August 17, 1998

FCC Part 22 Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Field Strength	Spurious Attenuation	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB	dB
1696.8	V	72.7	26.7	-29.6	2.1	71.9	59.7	-11.6
2545.1	H	66.6	30.5	-28.4	3.6	72.3	59.3	-11.2
3393.4	H	52.9	32.7	-27.8	4.1	61.9	69.7	-21.6
4241.2	H	51.0	34.0	-27.6	4.5	61.9	69.7	-21.6
5089.5	V	43.0	35.1	-27.8	4.7	55.0	76.6	-28.5
5937.8	H	38.0	36.1	-28.0	5.1	51.2	80.4	-32.3
6786.1	V	30.0	37.2	-28.5	5.7	44.4	87.2	-39.1
7634.4	V	37.0	37.8	-29.0	6.1	51.9	79.7	-31.6
8482.8	V	31.0	38.8	-29.0	6.3	47.1	84.5	-36.4

Note:
1. **All measurement were made at 3 meters**
2. **Field Strength at the fundamental frequency equals 131.6 dBuV/m**
3. **Spurious emissions attenuation limit equals 43+10log P = 48.1 dB**

ITS Intertek Testing Services

Company: Raytheon Systems Company
Project #:
Model:
Engineer: Xi-Ming Yang
Date of test: August 17, 1998

FCC 15 Class B Radiated Emissions

Low Channel

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Cable Loss	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
914.0	V	26.0	23.0	-14.1	1.7	36.6	46.0	-9.4
1828.0	V	28.6	30.0	-29.1	2.3	31.8	54.0	-22.2
2742.1	V	34.6	31.3	-28.2	2.3	40.0	54.0	-14.0
3656.1	H	24.0	33.5	-27.8	2.8	32.5	54.0	-21.5
Mid Channel								
926.5	V	24.0	23.3	-14.1	1.7	34.9	46.0	-11.1
1853.0	V	29.0	30.0	-29.1	2.3	32.2	54.0	-21.8
2779.5	H	42.0	31.3	-28.2	2.3	47.4	54.0	-6.6
3706.0	H	27.0	33.5	-27.8	2.8	35.5	54.0	-18.5
High Channel								
933.0	V	25.0	23.3	-14.1	1.7	35.9	46.0	-10.1
1878.0	V	30.0	30.0	-29.1	2.3	33.2	54.0	-20.8
2816.9	H	38.0	31.3	-28.2	2.3	43.4	54.0	-10.6
3755.9	H	27.0	33.5	-27.8	2.8	35.5	54.0	-18.5

Note: 1. All measurement were made at 3 meters
2. Negative signs (-) in the margin column signify levels below the limit.

ITS Intertek Testing Services

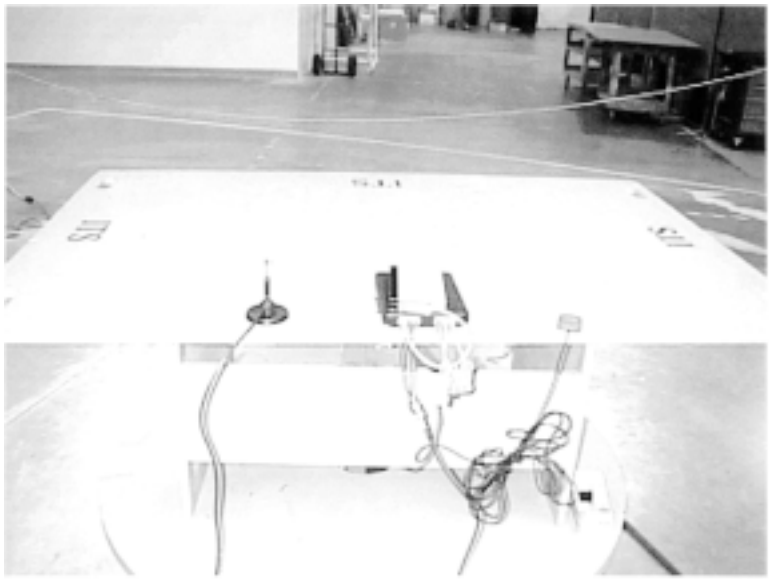
Company: Raytheon Systems Company
Project #:
Model:
Engineer: Xi-Ming Yang
Date of test: August 17, 1998

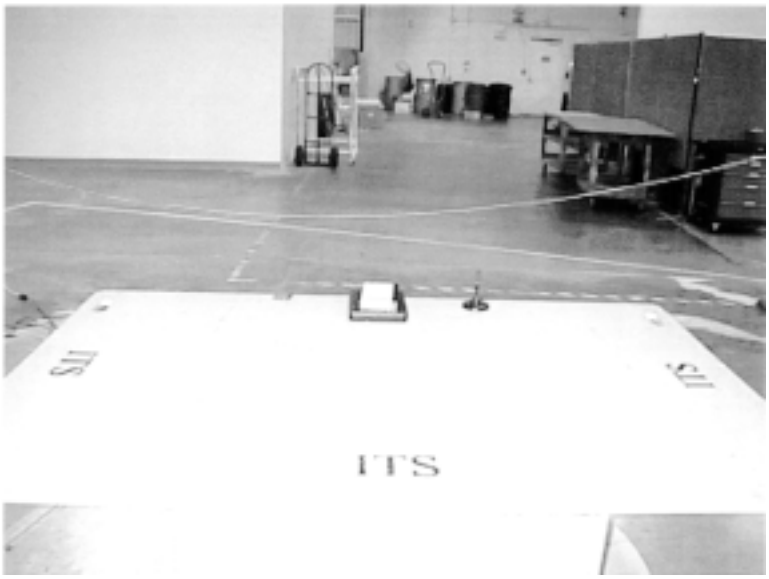
FCC15 Class B Radiated Emissions

Frequency	Antenna Polarity	Reading	Antenna Factor	Pre-amp	Distance Factor	Corrected Reading	Limit	Margin
MHz	H/V	dB(uV)	dB(1/m)	dB	dB	dB(uV/m)	dB(uV/m)	dB
87.0	V	24.5	7.6	0.0	0.0	32.1	40.0	-7.9
109.4	V	22.0	11.8	0.0	0.0	33.8	43.5	-9.7
113.7	V	21.0	12.2	0.0	0.0	33.2	43.5	-10.3
196.0	V	17.0	17.0	0.0	0.0	34.0	43.5	-9.5
280.0	H	9.0	14.1	0.0	0.0	23.1	46.0	-22.9
368.8	H	5.0	14.9	0.0	0.0	19.9	46.0	-26.1

Note:
1. **All measurement were made at 3 meters**
2. **Negative signs (-) in the margin column signify levels below the limit.**

8.4 Test Configuration Setup





9.0 **AC Line Conducted Emission**

9.1 Test Procedure

The test was done according to the ANSI C63.4 procedure.

9.2 Test Equipment

HP 8566B Spectrum Analyzer
EMCO LISN

9.3 Test Results

Not applicable, the EUT is battery operated only.

10.0 **Frequency Stability vs Temperature**

Requirements: FCC 2.995(a), 22.355
Frequency Tolerance: ±2.5 ppm

10.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a calibrated coaxial attenuator, the other end of which was connected to a frequency counter. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, and external computer control cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 20 minutes, the external computer activated the transmitter and the frequency output was recorded from the counter.

10.2 Test Equipment

Temperature Chamber, -50C to +100C
Hewlett Packard 5383A Frequency Counter
Goldstar DC Power Supply, GR303
Rohde & Schwarz ESVP Test Receiver

10.3 Test Results

Refer to the attached data sheet.

The EUT passed the test.

INTERTEK TESTING SERVICES

Raytheon TI Systems, Cellular Transceiver — Date of Test: Aug. 17, 1998 & Sept. 16, 1998

Company: Raytheon TI Systems
Model No.: CELL-TRAC™ II
Test Mode: TX @836.01 MHz

LTO# J98023875
Test Site #1
Engineer: Xi-Ming Yang

Frequency Stability vs. Temperature
Frequency: 835.32 MHz
Tolerance: +/-2088 Hz

Temperature (C)	Frequency (MHz)	Difference (Hz)	Output Power (dBm)
50	835.318880	-1120	34.8
40	835.318710	-1290	35.1
30	835.318420	-1580	35.6
20	835.318730	-1270	35.4
10	835.319510	-490	36.0
0	835.319900	-100	36.3
-10	835.320520	+520	36.1
-20	835.321610	+1610	35.4
-30	835.319000	-1000	34.7

11.0 **Frequency Stability vs Voltage**

Requirements: FCC 2.995(d)(2), 22.355
Frequency Tolerance: ±2.5 ppm

11.1 Test Procedure

An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminates; i.e., the battery end point. The output frequency was recorded for each battery voltage.

11.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
DC Power Supply
Goldstar Rohde & Schwarz ESVPGR303 Test Receiver

11.3 Test Results

Refer to the attached sheet.

The EUT passed the test.

INTERTEK TESTING SERVICES

Raytheon TI Systems, Cellular Transceiver — Date of Test: Aug. 17, 1998 & Sept. 16, 1998

Company: Raytheon TI Systems
Model No.: CELL-TRAC™ II
Test Mode: TX @836.01 MHz

LTO# J98023875
Test Site #1
Engineer: Xi-Ming Yang

Frequency Stability vs. Temperature
Frequency: 835.32 MHz
Tolerance: +/-2088 Hz

DC Volts		Frequency (MHz)	Difference (Hz)
85%	10.5	835.319970	-30
100%	12.35	835.320050	+50
115%	14.2	835.320010	+10
Minimum	10.0	835.320395	+395