

***FCC Part 22 Test Report***

Performed on the

**Cellular Alarm Transmission System**  
**Model: T100C001, T200C001, T300C001**  
For  
**Telular Corporation**

**FCC ID: MTF09000**

Date of Test: August 20-29, 2000

Report #: 2016073

Job # J20016073

**Total No. of Pages Contained in this Report: 18 + data pages**

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Lab Code 200201-01

FCC Parts 22 Certification, Ver 7/98

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Warnock Hersey



emc



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Telular Corp. Cellular Alarm System  
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## 1.0 Introduction

## 1.1 Test Summary

FCC RULE	DESCRIPTION OF TEST	RESULT	PAGE
2.1046	RF Power Output	Pass	3
22.913	ERP	Pass	4
2.915(a)(b)	Modulation Requirements	Pass	5
22.915(d)(1)	Audio Filter Characteristics	N/A	-
2.1049, 22.917(b)(d)	Emission Limitation, Occupied Bandwidth	Pass	7
2.1051, 22.917(e)(f)	Out of Band Emissions at Antenna Terminal. Mobile Emissions in Base Frequency Range	Pass	9
2.1053, 15.109	Field Strength of Spurious Radiation	Pass	10
15.107	Line Conducted Emissions	Pass	14
2.1055	Frequency Stability vs. Temperature	Pass	16
2.1055	Frequency Stability vs. Voltage	Pass	17
2.1091, 2.1093	RF Exposure Requirements	Pass	18

Tested By:

  
Suresh Kondapalli

Date

10/15/00

Approved By:

  
David Chernomordik

Date

10/15/00

Telular Corp. Cellular Alarm System  
FCC ID: MTF09000

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## 1.2 Product Description

The Telular Models T100C001, T200C001, T300C001 are Telguard DataBurst Models, used in Cellular Alarm Transmission Systems. All 3 models have identical electronics. The T100C001 is in flame-retardant plastic enclosure with spike antenna, the T200C001 is in metal enclosure (with lock and key) and used with Magnetic-mount antenna with 12 foot cable, the T300C001 is in attack resistance enclosure (with lock and key) and used with Magnetic-mount antenna with 12 foot cable.

For more information, please refer to the attached product description.

Use of Product	Cellular Alarm System
Whether quantity (> 1) production is planned	<input checked="" type="checkbox"/> Yes, <input type="checkbox"/> No
Cellular Phone standards	AMPS
Type(s) of Emission	40K0F1D, 40K0F3E
Deviation	8 kHz $\pm$ 10% (wideband data signals)
RF Output	36 dBm
Frequency Range (transmitter)	824- 849 MHz
Number of Control Channels	42
Channel Spacing	30 kHz
Data Rate	10 kbs
Antenna(e) & Gain	1, 3, 5 dBi
Detachable antenna ?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Receiver L.O. frequency	955.85 - 980.85 MHz

## 1.3 Related Submittal(s) Grants

None

DOC for computer section, a separate DOC is prepared.

**2.0 RF Power Output, FCC sec 2.1046****2.1 Test Procedure**

The transmitter output was connected to a calibrated coaxial attenuator, 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 antenna port was determined by adding the value of the attenuator to the spectrum analyzer reading. An HP power meter was also used to measure the RF power.

Tests were performed at three frequencies (low, middle, and high channels) and on all power levels, which can be setup on the transmitters.

**2.2 Test Equipment**

Hewlett Packard 8481A Power Sensor, 435B Power Meter  
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz

**2.3 Test Results**

Frequency (MHz)	Measured Power (dBm)	Measured Power (Watt)
824.09	35.6	3.63
836.57	35.3	3.39
848.95	33.2	2.09

For more details refer to the attached plots:

Plot Number	Description
2.3.a	Low Channel
2.3.b	Middle Channel
2.3.c	High Channel

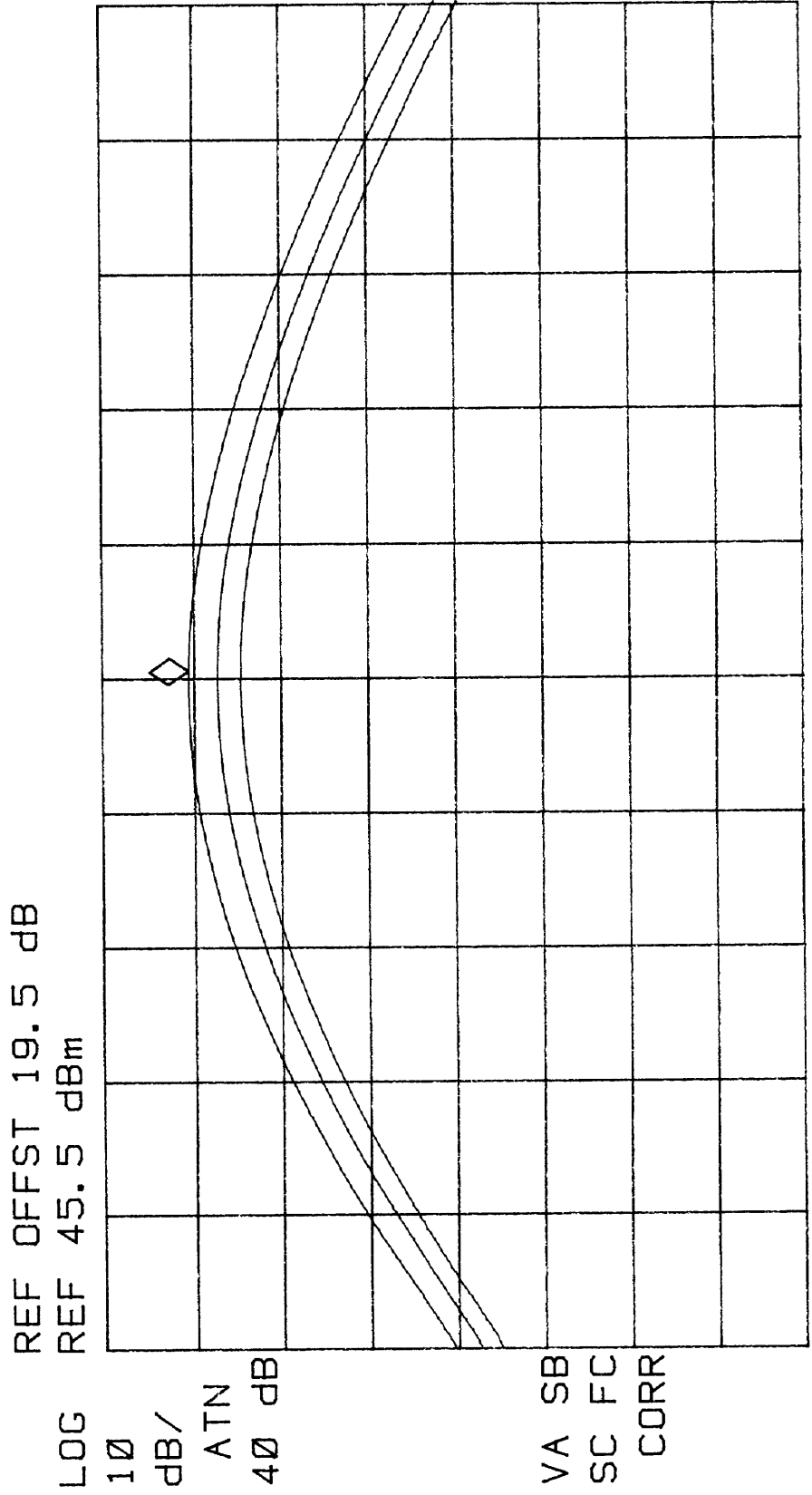
**Pass**

**3.0 Radiated Power, FCC sec. 22.913**

Plot 2.3.a

12:36:08 JUL 21, 2000  
TELULAR#2

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 824.09 MHz  
35.61 dBm

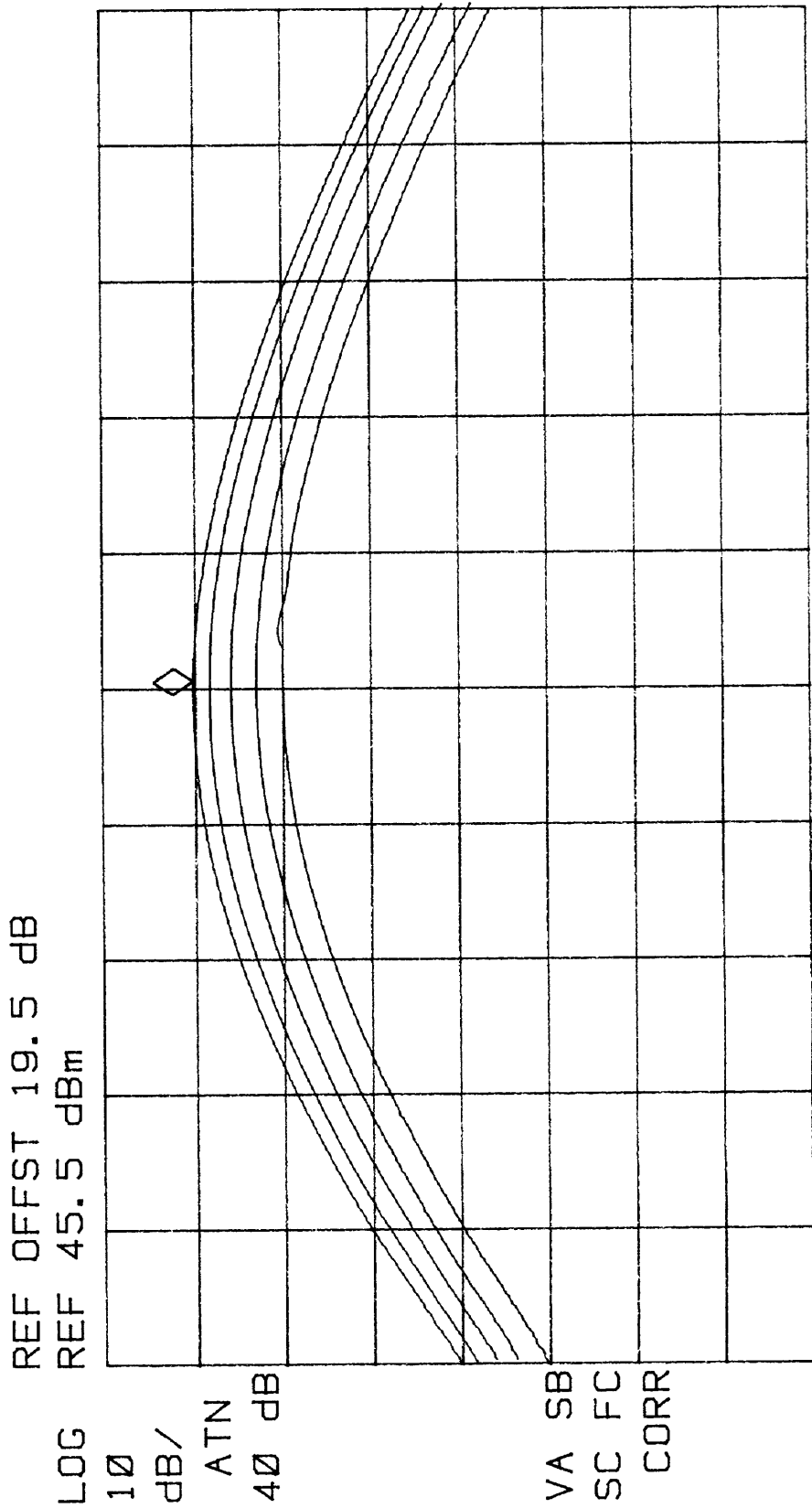


CENTER 824.04 MHz  
#IF BW 3.0 MHz #AVG BW 3 MHz SPAN 10.00 MHz  
SWP 20.0 msec

Plot 2.3.6

12:09:04 JUL 21, 2000  
TELULAR#2

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 836.57 MHz  
35.25 dBm



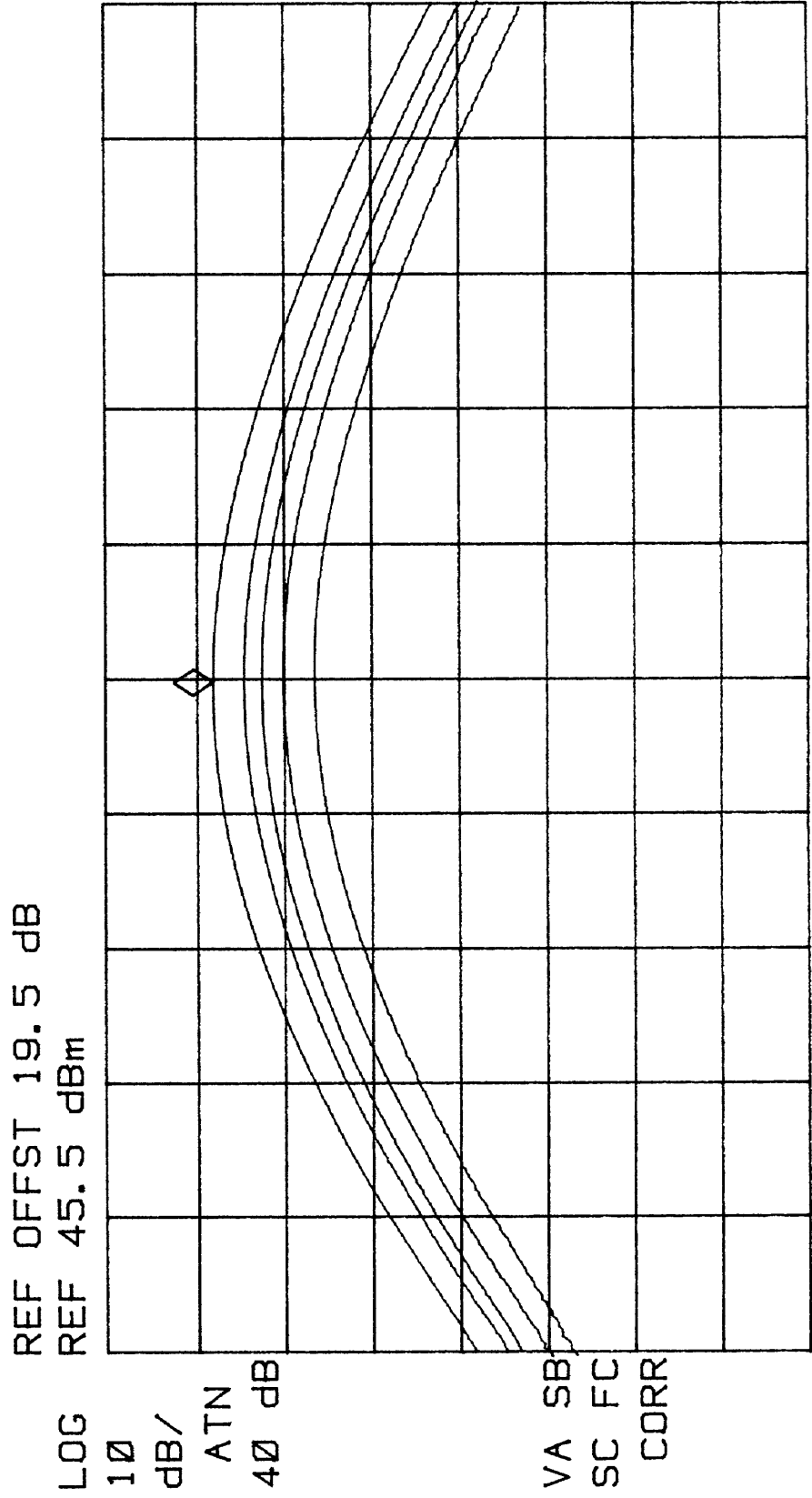
CENTER 836.52 MHz SPAN 10.00 MHz  
#IF BW 3.0 MHz #AVG BW 3 MHz SWP 20.0 msec



Plot 2,3,C

13:05:08 JUL 21, 2000  
TELULAR#2

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 848.95 MHz  
33.20 dBm



CENTER 848.97 MHz #IF BW 3.0 MHz #AVG BW 3 MHz SPAN 10.00 MHz SWP 20.0 msec

Requirement

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

## 3.1 Test Procedure

ERP was calculated by adding an antenna gain (in dBd) to the maximum output power (in dBm). For antennas #2 and #3 used with 12 feet RG58 cable, a cable loss (cl) of 2 dB is taken into account.

For antenna #1 (G=1 dBi):                    ERP = 35.6 -1.1=34.5 dBm (2.8 Watts)  
For antenna #2 (G=3 dBi, cl=2 dB):    ERP = 35.6+0.9-2=34.5 dBm (2.8 Watts)  
For antenna #3 (G=5 dBi, cl=2 dB):    ERP = 35.6+2.9-2=36.5 dBm (4.5 Watts)

## 3.2 Test Equipment

Hewlett Packard HP8566B Spectrum Analyzer

## 3.3 Test Results

**Pass**

The ERP does not exceed 4.5 Watts

**4.0 Modulation Deviation Limiting**, FCC sec. 2.1047, sec. 22.915(b)(c)**4.1 Test Procedure**

The RF output of the transmitter was connected to the input of the Marconi Test Set through sufficient attenuation so as not to overload the meter or distort the readings. The transmitter was set up to transmit a modulated signal (Wideband data, SAT, ST). The deviation was read off from the instrument.

**Note:**

All transmitter modulation sources are integral to the terminal itself and are not accessible to the user.

**4.2 Test Equipment**

Marconi 2955A Radio Communication Test Set

**4.3 Test Results**

The test data is in the table below.

Type of modulation	Modulation frequency, kHz	Measured deviation, kHz	Deviation limit, kHz
Wideband data	10.0	7.82	8±10%
SAT	6.0	2.02	2±10%
ST	10.0	7.73	8±10%

<b>Test Results</b>	<b>Pass</b>
---------------------	-------------

## 5.0 Audio Filter Characteristics, FCC sec. 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 a 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 was coupled into the external microphone jack of the transceiver, or alternatively, the microphone element was removed and the generator output was connected to the microphone wires by clip leads.

The audio signal at the transceiver audio input was adjusted to obtain 8-9 kHz deviation at the more sensitive modulation frequency. The audio frequency was varied from 300 Hz to 30 kHz and the deviation was measured while maintaining a constant input level. Using the level measured at 1 kHz as a reference (0 dB), the audio filter response was calculated.

## 5.2 Test Equipment

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

Not Applicable

All transmitter modulation sources are integral to the terminal itself and are not accessible to the user

**6.0 Emission Limitations, Occupied Bandwidth, FCC sec. 2.1049, 22.917(b)(d)**

For F3E/F3D emission mask uses 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.

For F1D emission mask, the mean power of emissions must be attenuated below the mean power of the unmodulated 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 of the carrier frequency: at least 60 dB or  $[43 + 10 \log P(W)]$  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 EUT was set up to transmit wideband data signal, which is generated internally by EUT.

The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the frequency band plus/minus 50 kHz and plus/minus 100 kHz from the carrier frequency. The same plots have been done for SAT, ST.

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## 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

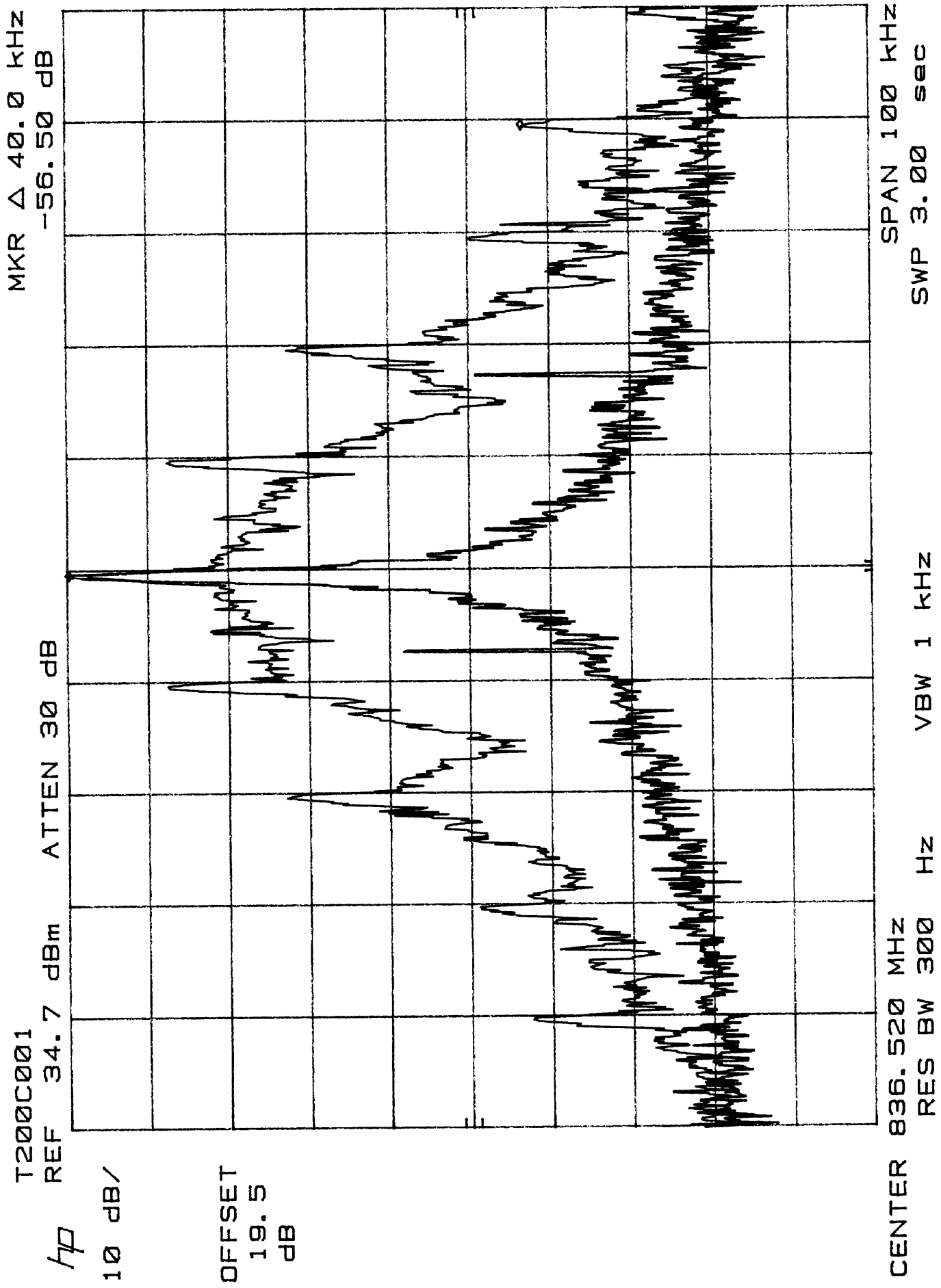
## 6.3 Test Results

<b>Test Results</b>	<b>Passes.</b> Refer to the attached plots.
---------------------	---

<b>Plot Number</b>	<b>Description</b>
6.3.a	Wideband data modulation, 100 kHz Span
6.3.b	Wideband data modulation, 200 kHz Span
6.3.c	Signalling Tone modulation, 50 kHz Span
6.3.d	Signaling Tone modulation, 100 kHz Span
6.3.e	Signaling Tone modulation, 200 kHz Span
6.3.f	Supervisory Audio Tone modulation, 100 kHz Span 1
6.3.g	Supervisory Audio Tone modulation, 100 kHz Span 2

Wide Band Modulation

Plot 6.3.A



wid data modulation

Plot 6.3.b

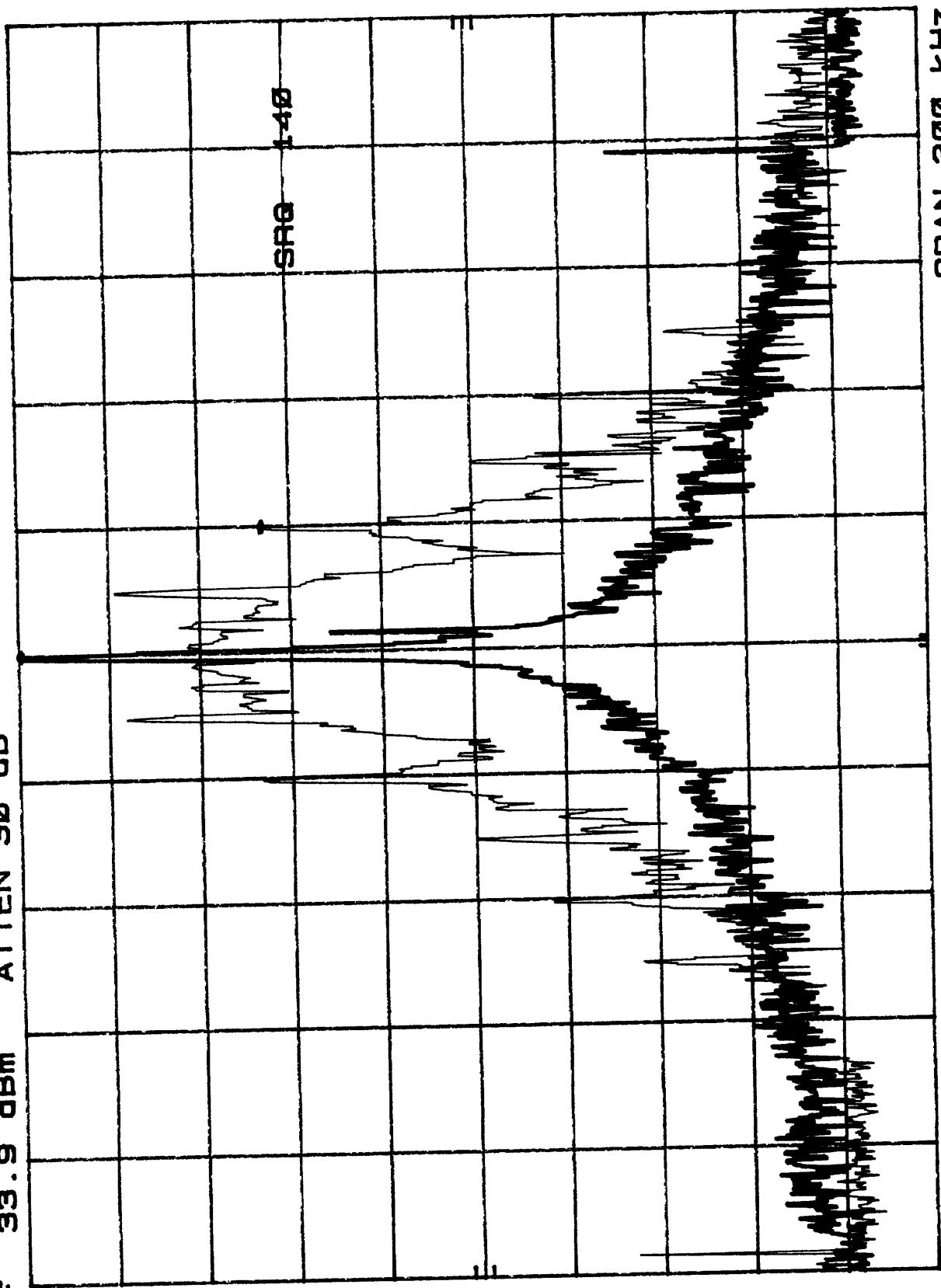
MKR  $\Delta$  20.0 KHZ  
-26.60 dB

TELULAR, T200C001  
REF 33.9 dBm ATTEN 30 dB

HP

10 dB/

OFFSET  
19.0  
dB



SPAN 200 KHZ  
SWP 6.00 sec

VBW 300 HZ

HZ

RES BW 300

HZ

CENTER 836.520 MHz



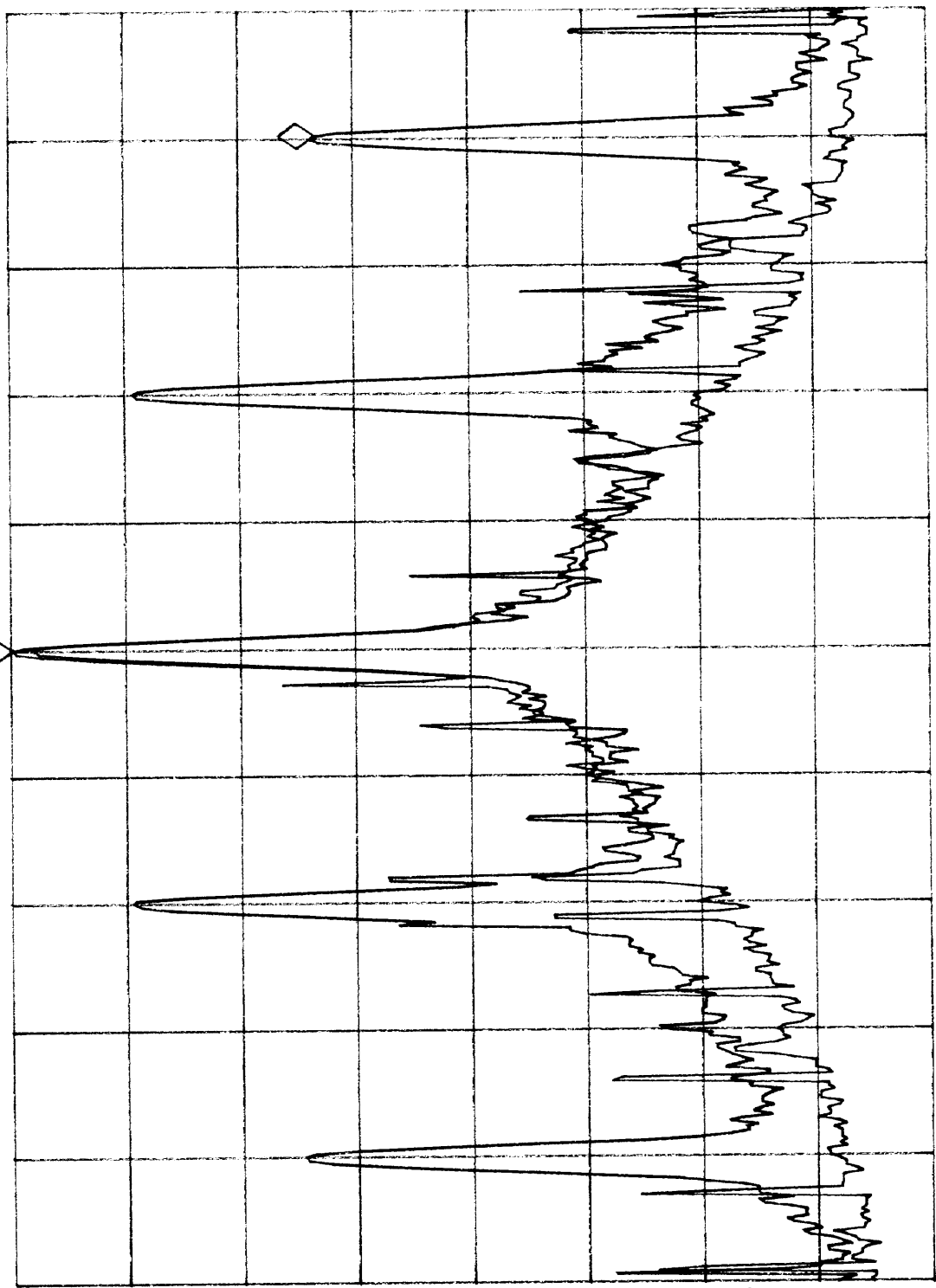
Plot 6.3.c

17:59:03 OCT 12. 2000  
AP

MKR  $\Delta$  20.13 KHZ  
-26.56 dB

REF 35.2 dBm AT 50 dB

PEAK  
LOG  
10  
dB/



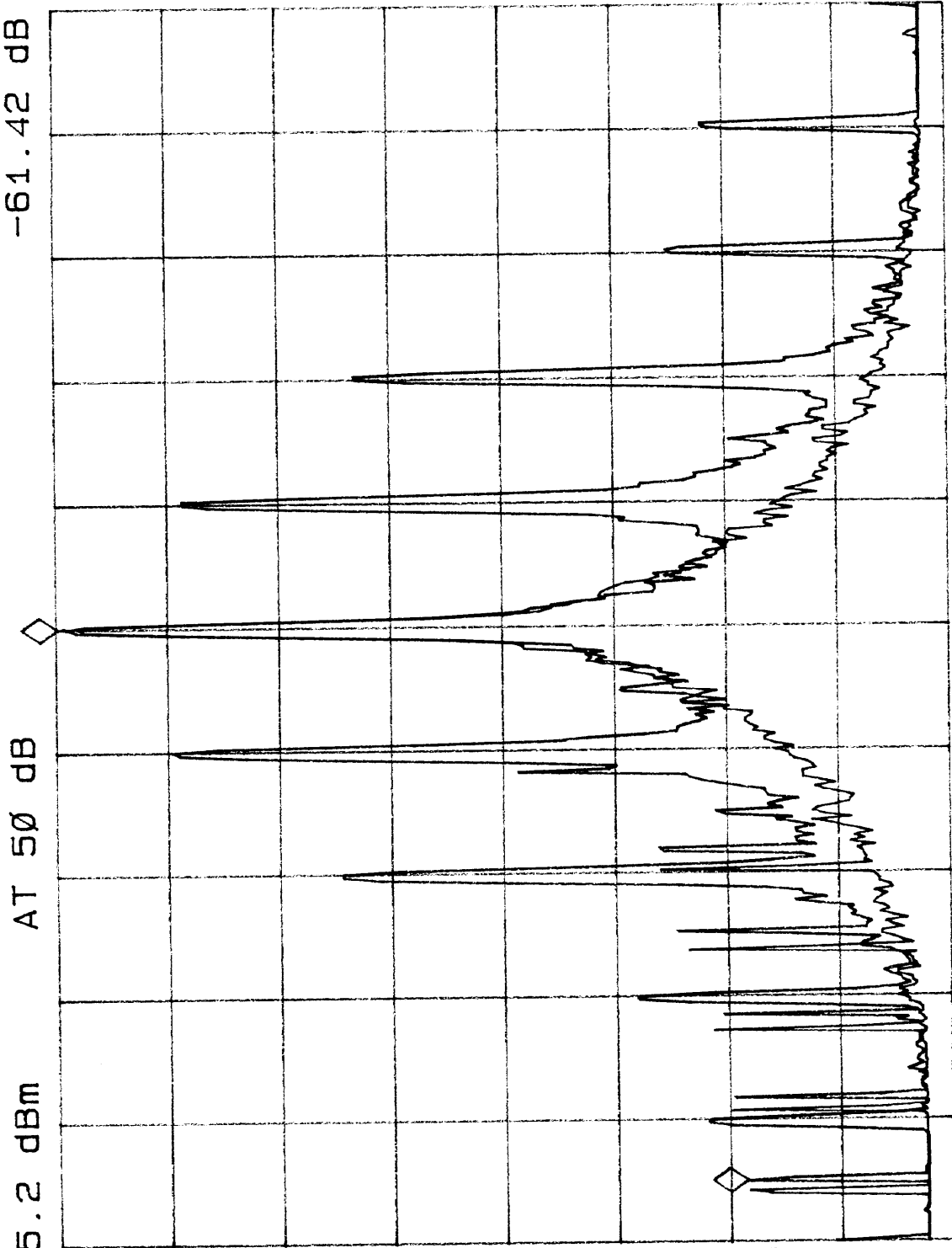
VA VB  
SC FC  
CORR

CENTER 836.52000 MHZ  
#RES BW 300 HZ  
SPAN 50.00 KHZ  
VBW 300 HZ  
SWP 1.67 sec

Plot 6.3d

18: 12: 36 OCT 12, 2000  
70

MKR  $\Delta$  -45.0 KHZ  
-61.42 dB



REF 35.2 dBm

AT 50 dB

PEAK  
LOG  
10  
dB/

VA VB  
SC FC  
CORR

SPAN 100.0 KHZ  
SWP 3.33 sec

VBW 300 HZ

CENTER 836.5200 MHZ  
#RES BW 300 HZ

*Plot 6.3 e*

18: 29: 21 OCT 12. 2000

MKR  $\Delta$  94.5 KHZ

-68.21 dB

AT 50 dB

REF 35.2 dBm

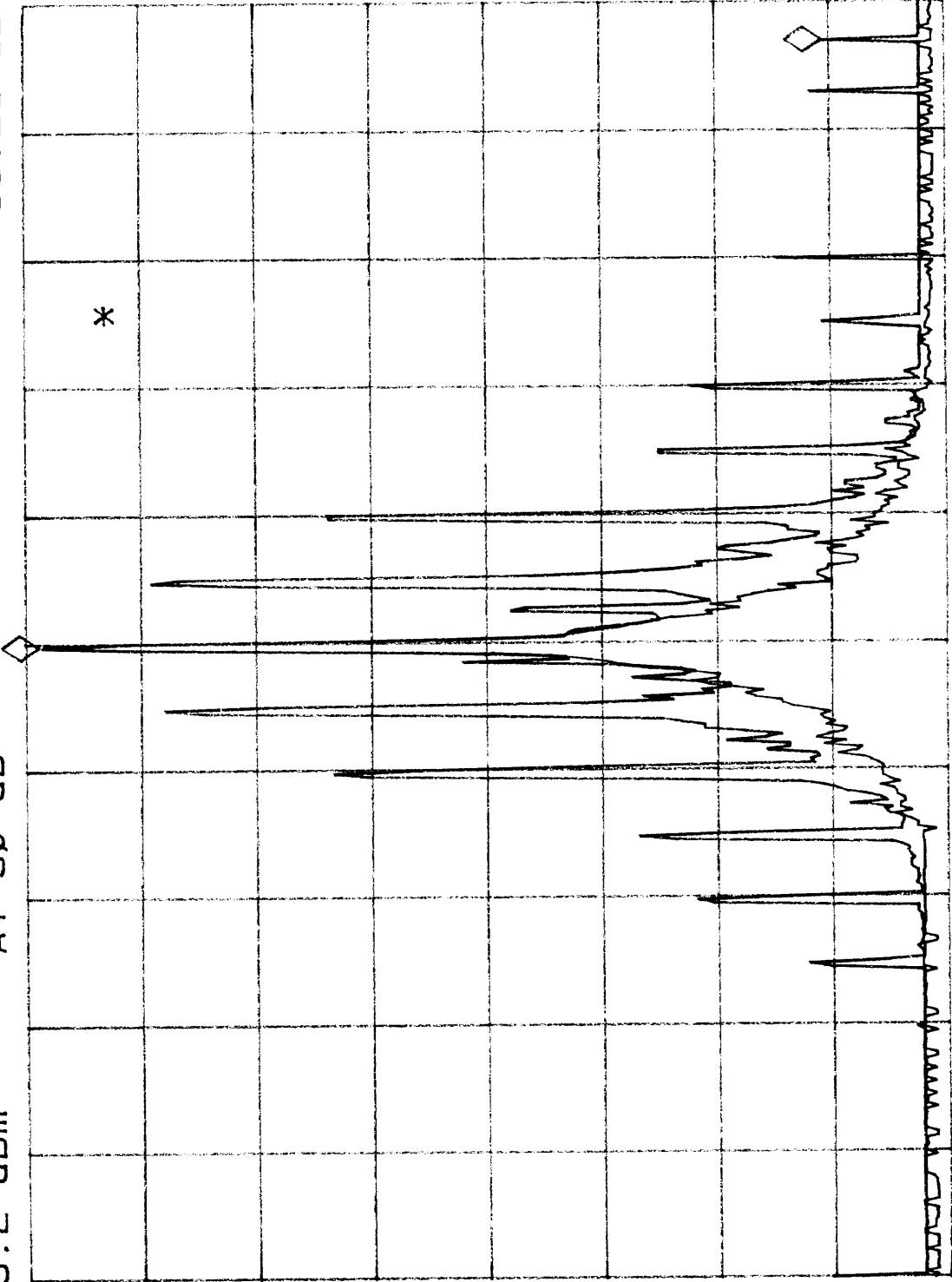
PEAK

LOG

10

dB/

\*



VA VB  
SC FC  
CORR

CENTER 836.5200 MHZ

#RES BW 300 HZ

SPAN 200.0 KHZ

VBW 300 HZ

SWP 6.67 sec

Plot 603.f

SAT ①

T200C001

REF 35.2 dBm

ATTEN 30 dB

MKR  $\Delta$ -18.8 KHZ  
-54.40 dB

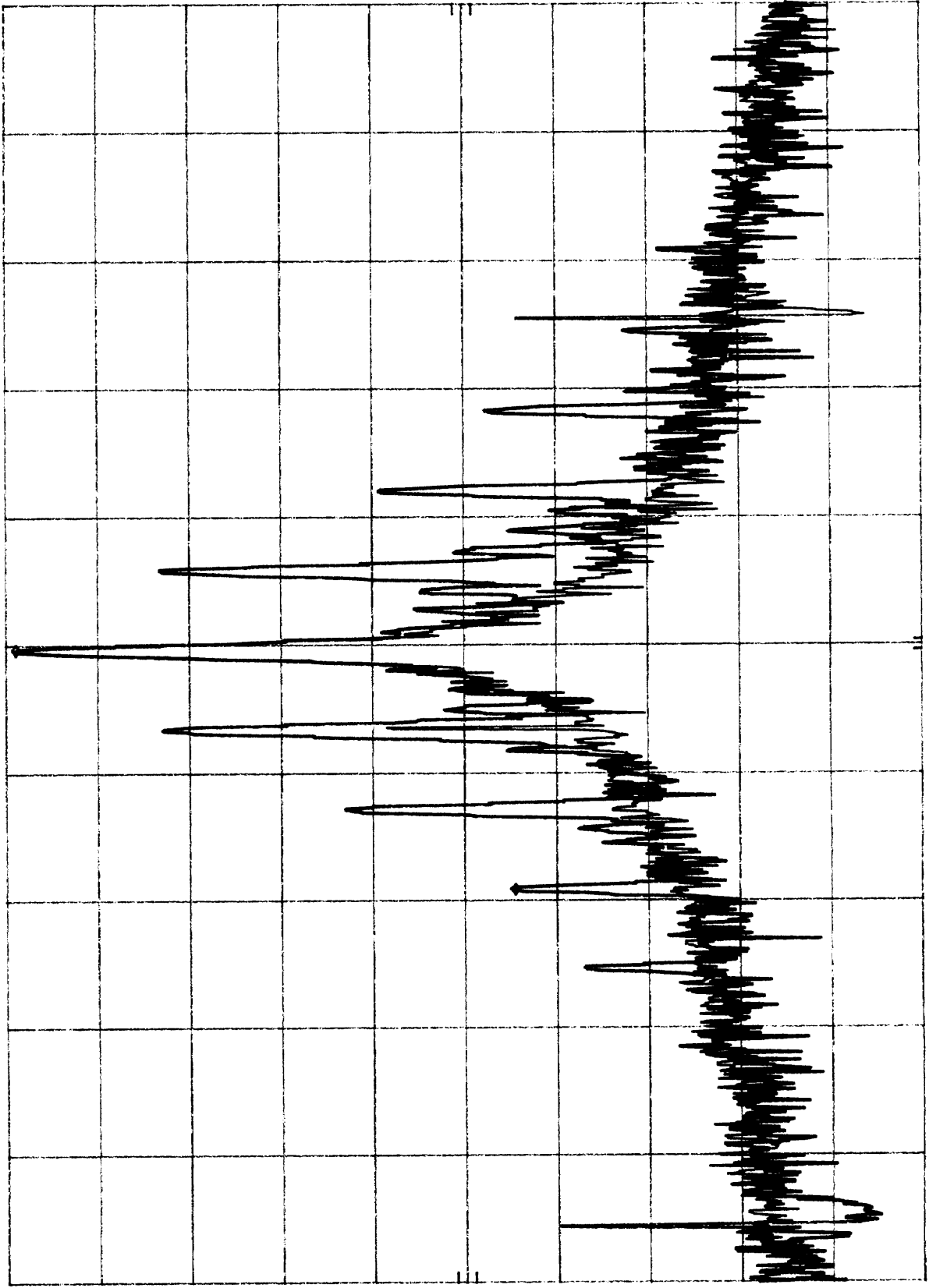
HP

10 dB/

OFFSET

19.5

dB



CENTER 836.520 MHZ

RES BW 300 Hz

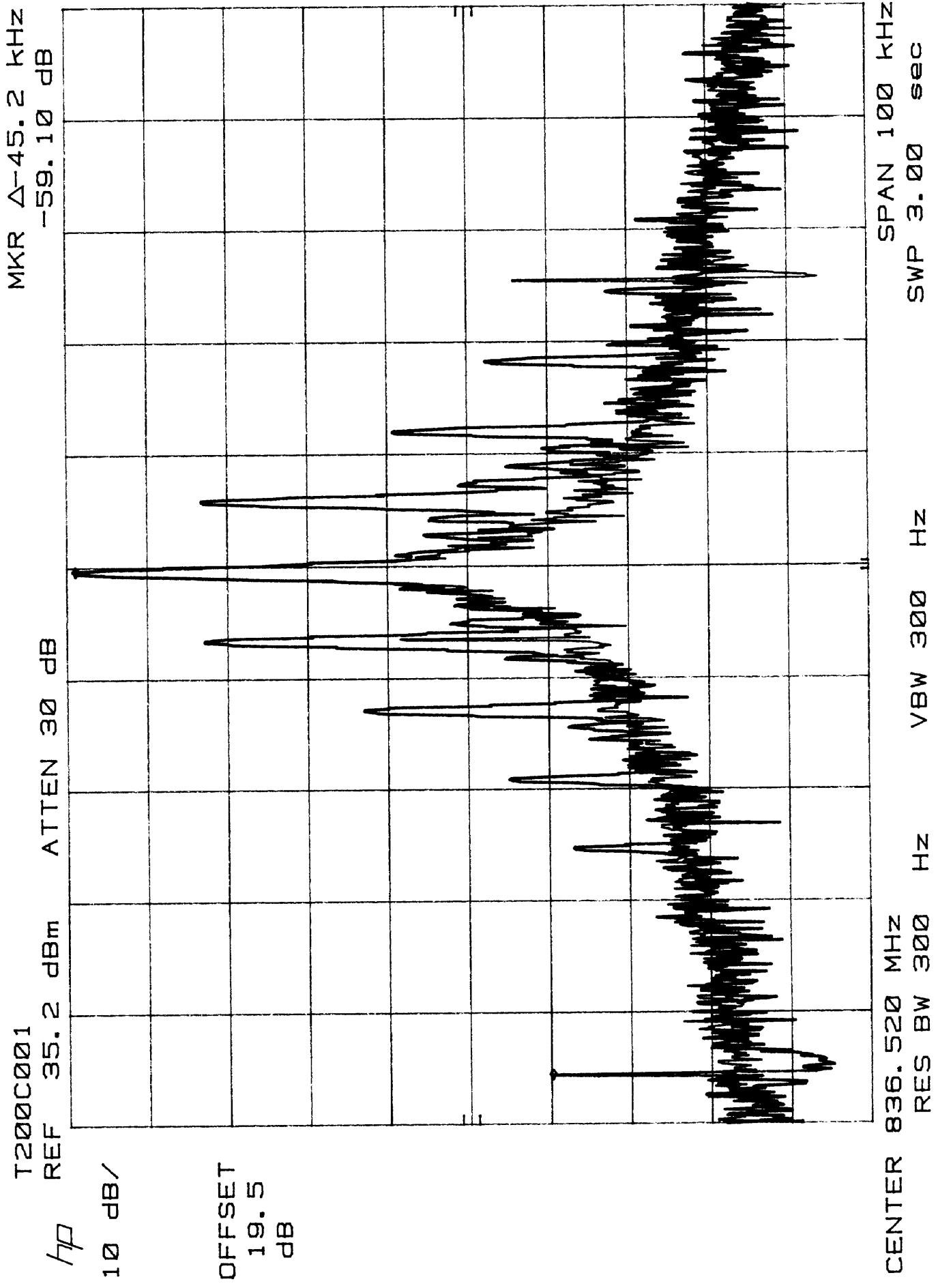
VBW 300 Hz

SPAN 100 KHZ

SWP 3.00 sec

Plot 6.3.g

SAT ②



**7.0 Out of Band Emissions at Antenna Terminals** , FCC sec. 22.917(e), 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 out-of-band emissions if any up to 10th harmonic.

**7.2 Test Equipment**

HP 8566B Spectrum Analyzer  
Attenuators

**7.3 Test Results**

<b>Test Results</b>	<b>Pass.</b> Refer to the attached plots.
---------------------	---

<b>Plot Number</b>	<b>Description</b>
7.3.1.a - 7.3.1.d	Low Channel
7.3.2.a - 7.3.2.d	Middle Channel
7.3.3.a - 7.3.3.d	High Channel
7.3.4.a	Low Channel, emission in receiving band
7.3.4.b	Middle Channel, emission in receiving band
7.3.4.c	High Channel, emission in receiving band

7.3.1.a

T200C001

REF 34.7 dBm

ATTEN 30 dB

MKR 67.13 MHz

-44.20 dBm

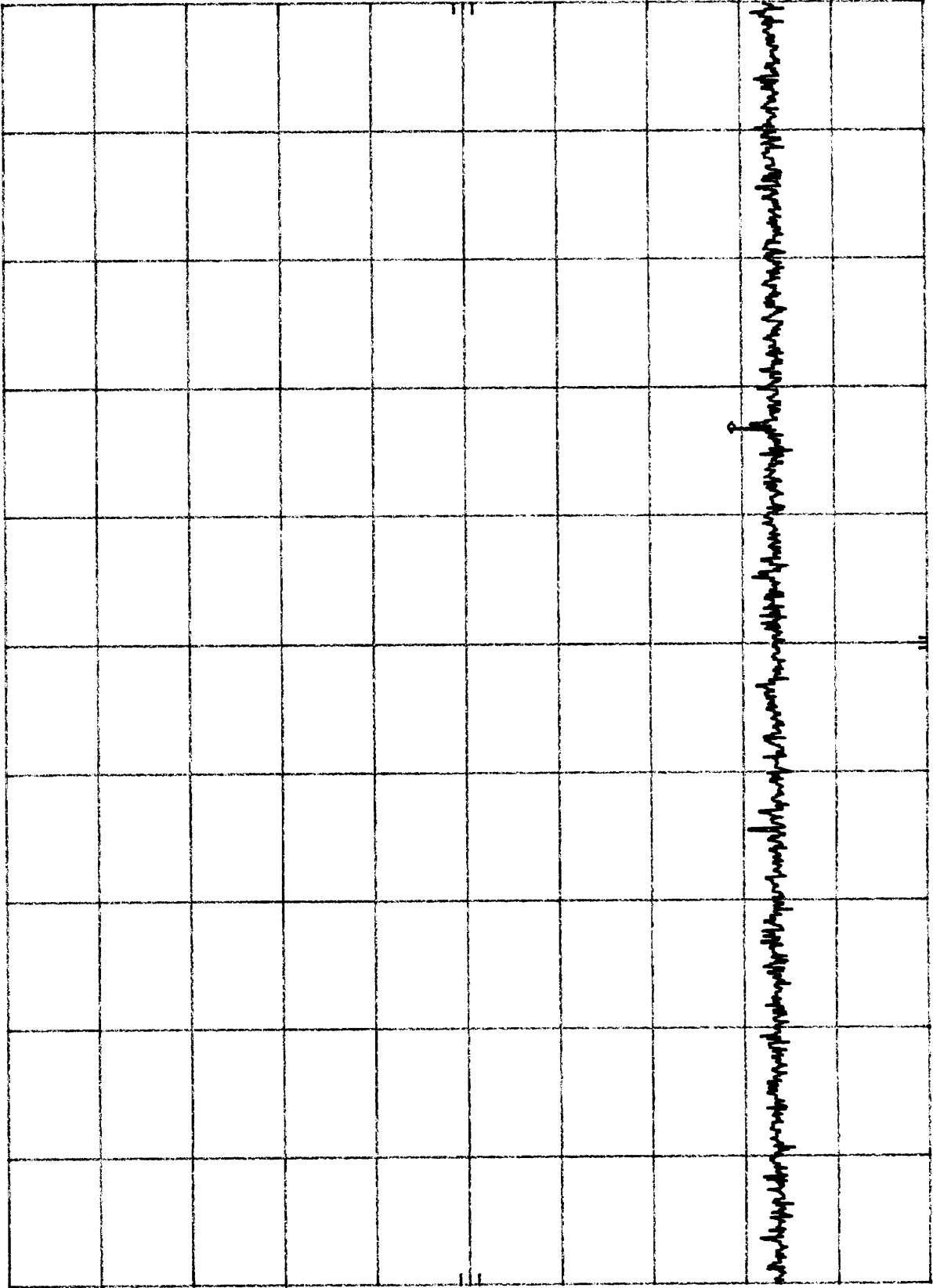
HP

10 dB/

OFFSET

19.5

dB



START 1.0 MHz

RES BW 10 kHz

VBW 100 kHz

STOP 100.0 MHz

SWP 2.97 sec

7.3.1.b

MKR 825.4 MHz  
33.90 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

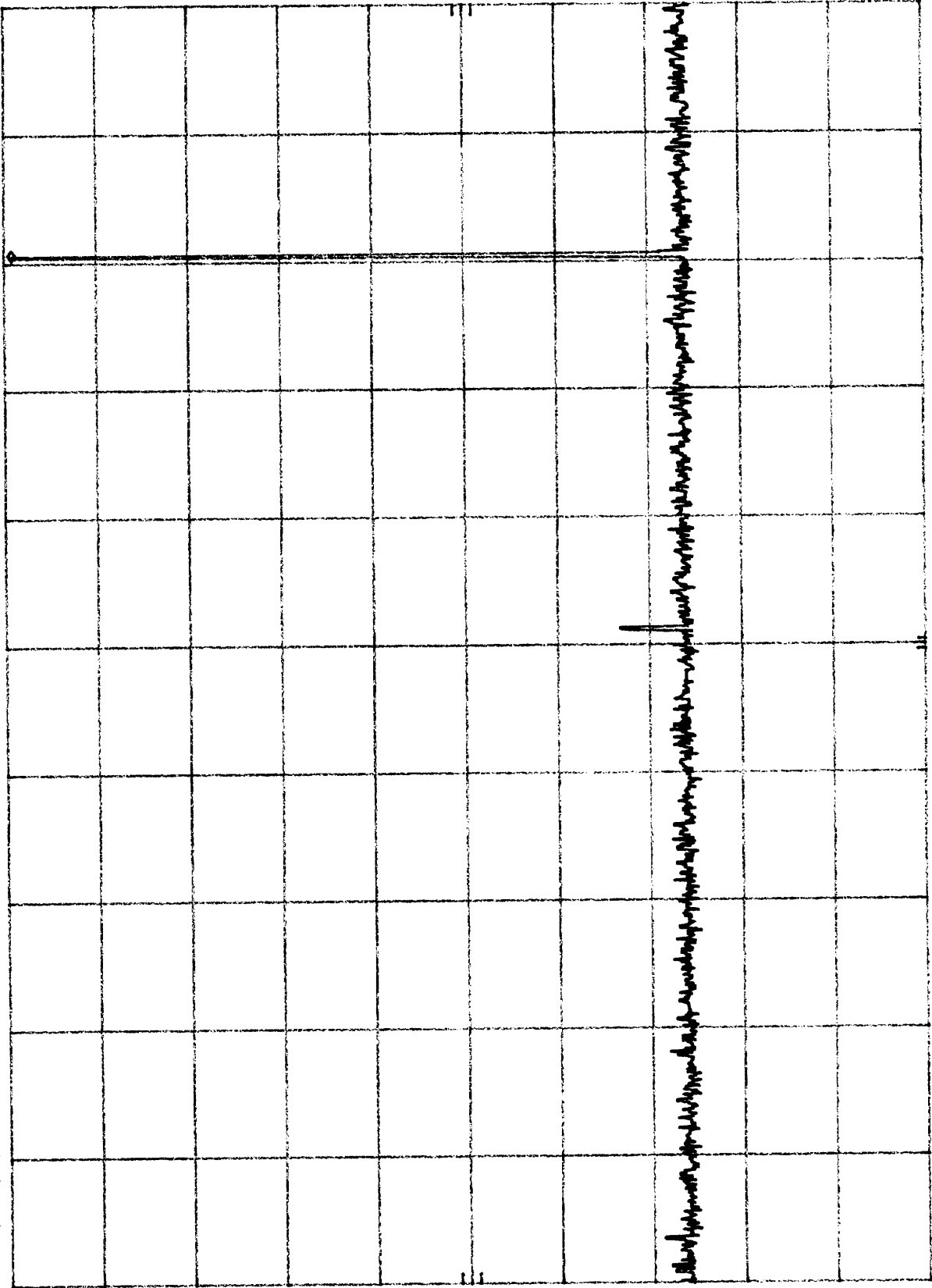
HP

10 dB/

OFFSET

19.5

dB



START 100 MHz

RES BW 100 MHz

VBW 100 kHz

STOP 1.000 GHz

SWP 270 msec



7.3.1.C

MKR 1.650 GHz  
-27.20 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

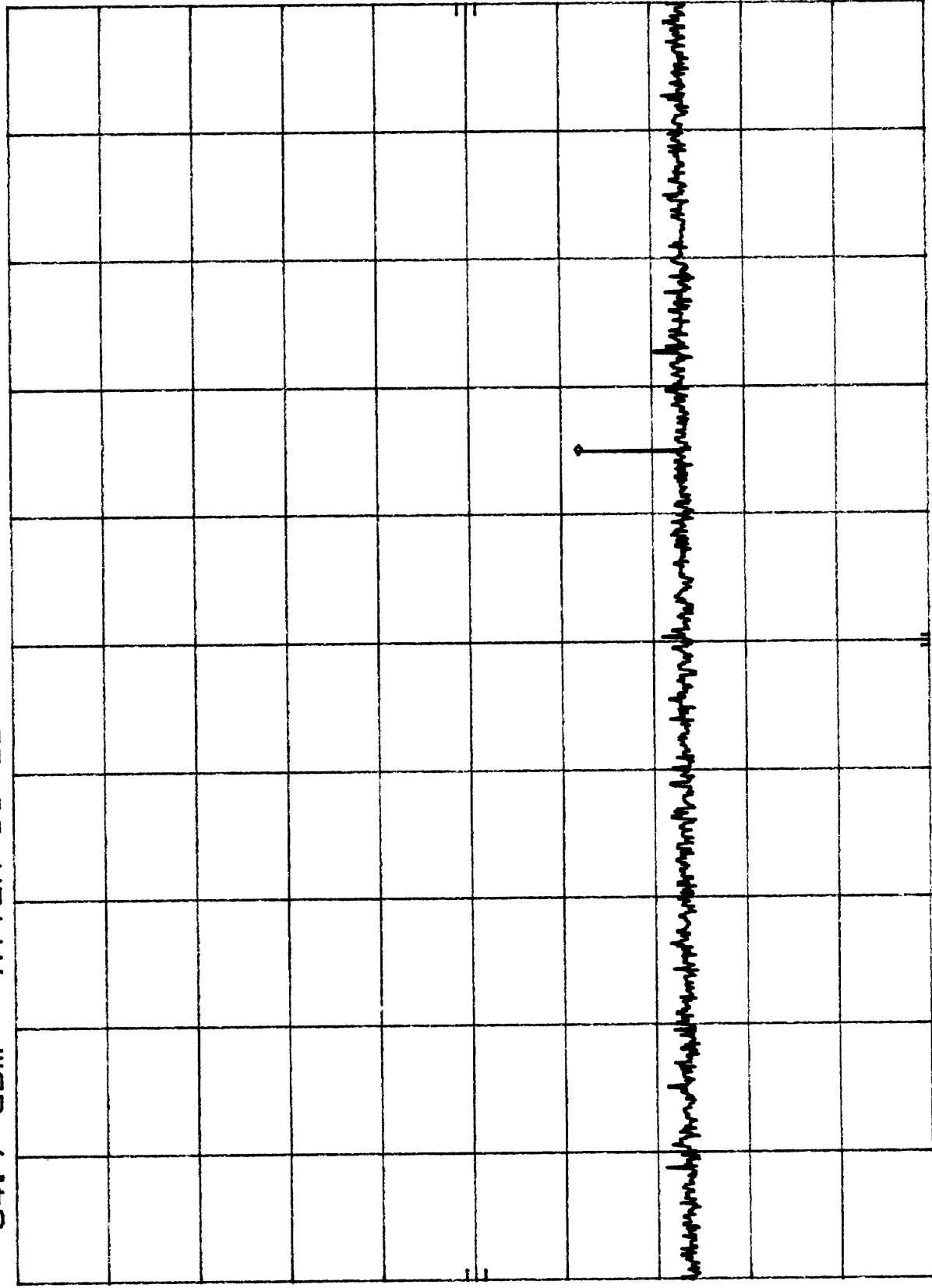
hp

10 dB/

OFFSET

19.5

dB



START 1.00 GHz  
RES BW 100 KHz

STOP 2.00 GHz  
SWP 300 msec

VBW 100 KHz

7.3.1.1.d

MKR 7.592 GHz  
-33.70 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

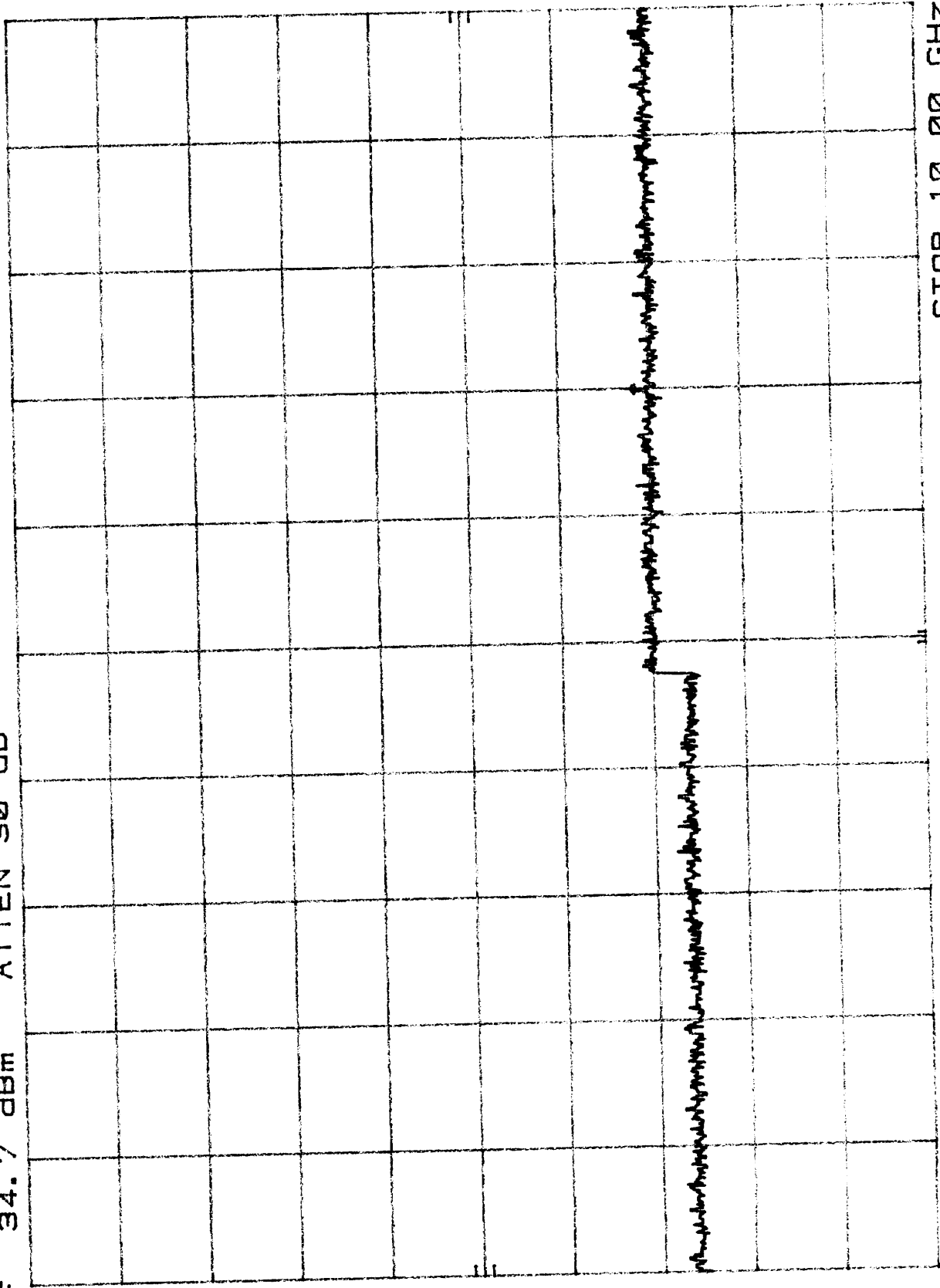
HP

10 dB/

OFFSET

19.5

dB



STOP 10.00 GHz  
SWP 2.40 sec

START 2.00 GHz  
RES BW 100 kHz  
VBW 100 kHz

7.3.2.9

MKR 89.31 MHz  
-51.10 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

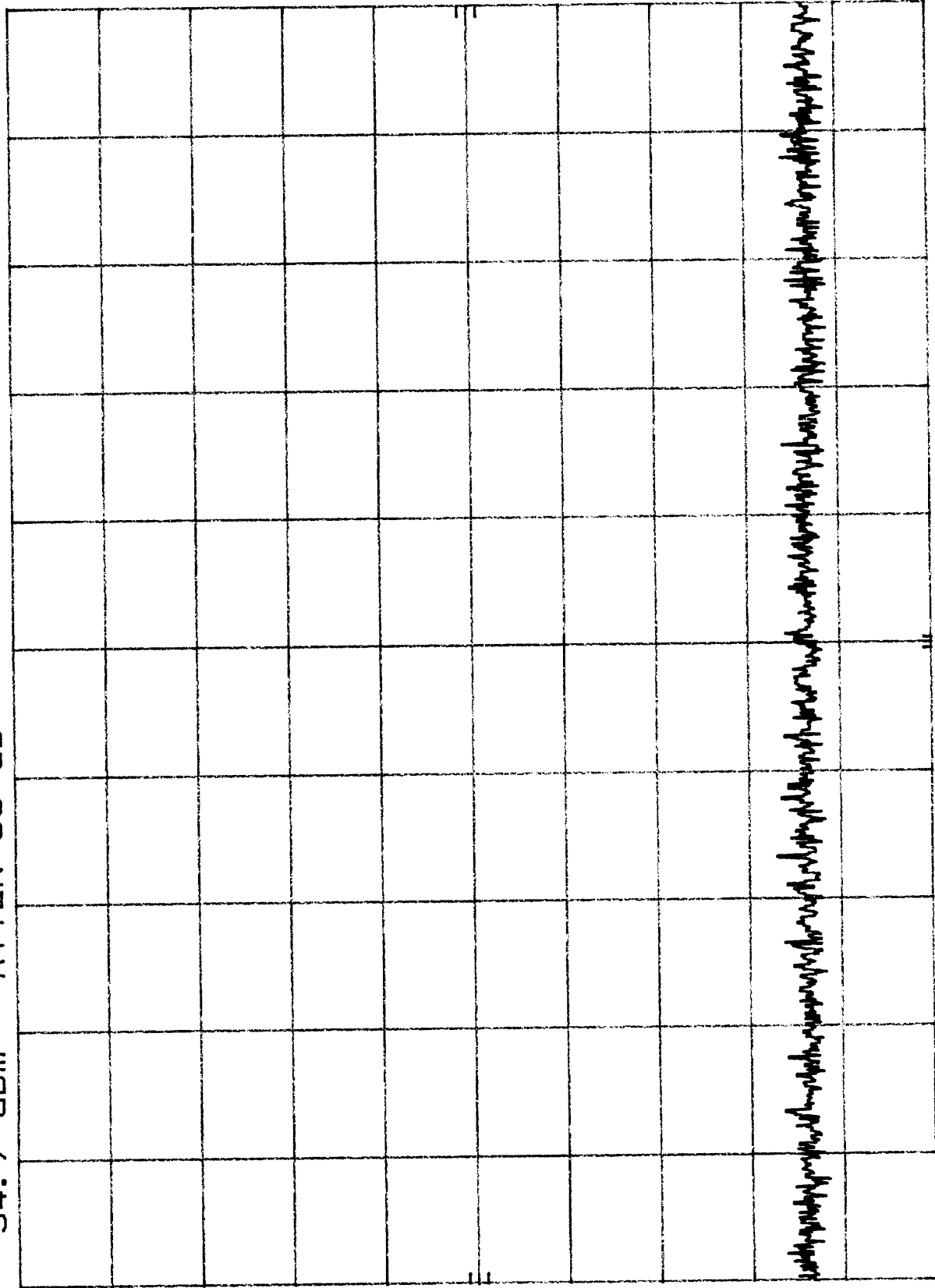
HP

10 dB/

OFFSET

19.5

dB



START 1.0 MHz

RES BW 10 KHz

VBW 10 KHz

STOP 100.0 MHz

SWP 2.97 sec

7.3.2.b

MKR 837.1 MHz  
33.50 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

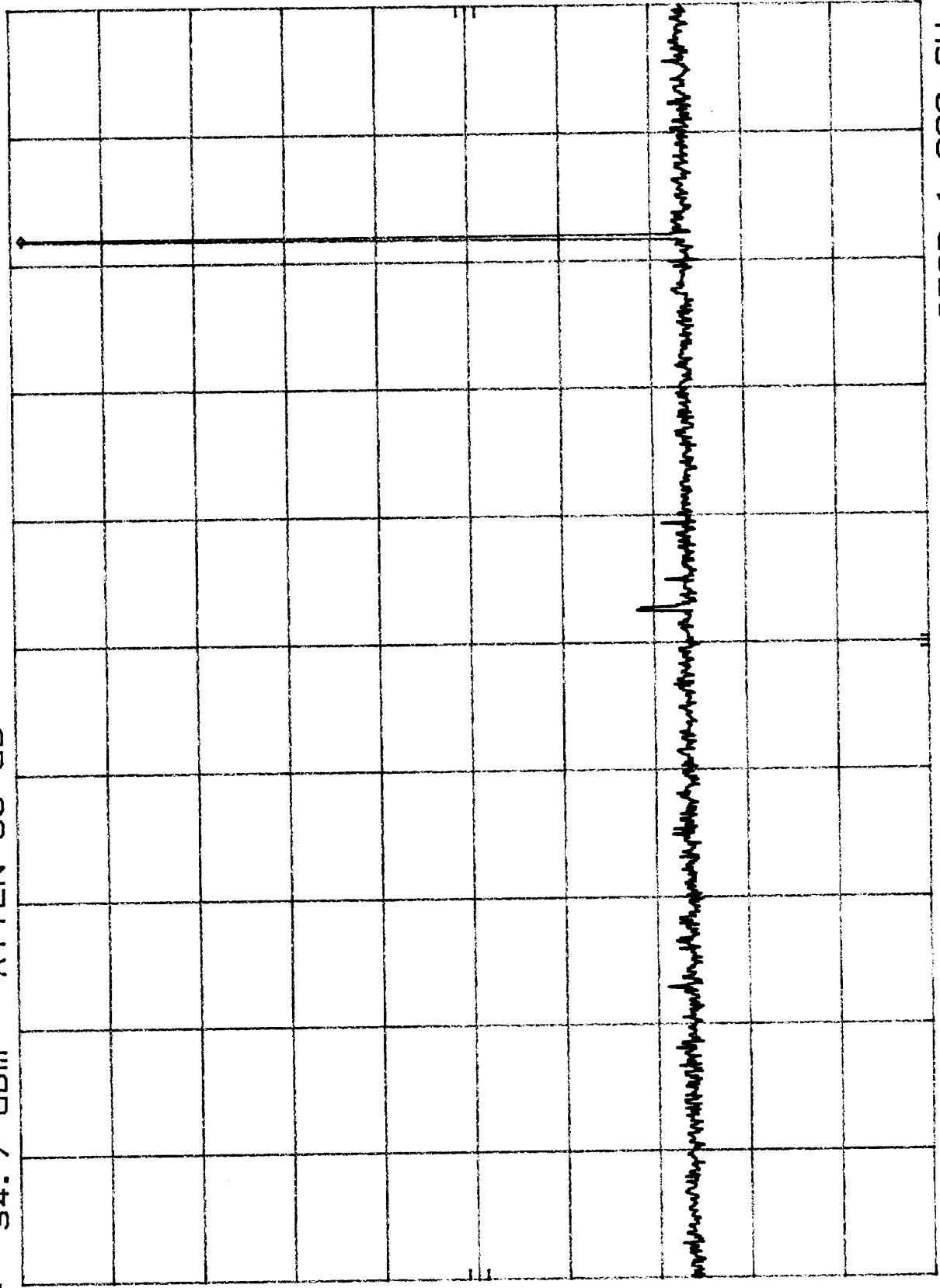
HP

10 dB/

OFFSET

19.5

dB



STOP 1.000 GHz  
SWP 270 msac

START 100 MHz  
RES BW 100 kHz  
VBW 100 kHz

7.3.2, C

MKR 1.675 GHz  
-28.70 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

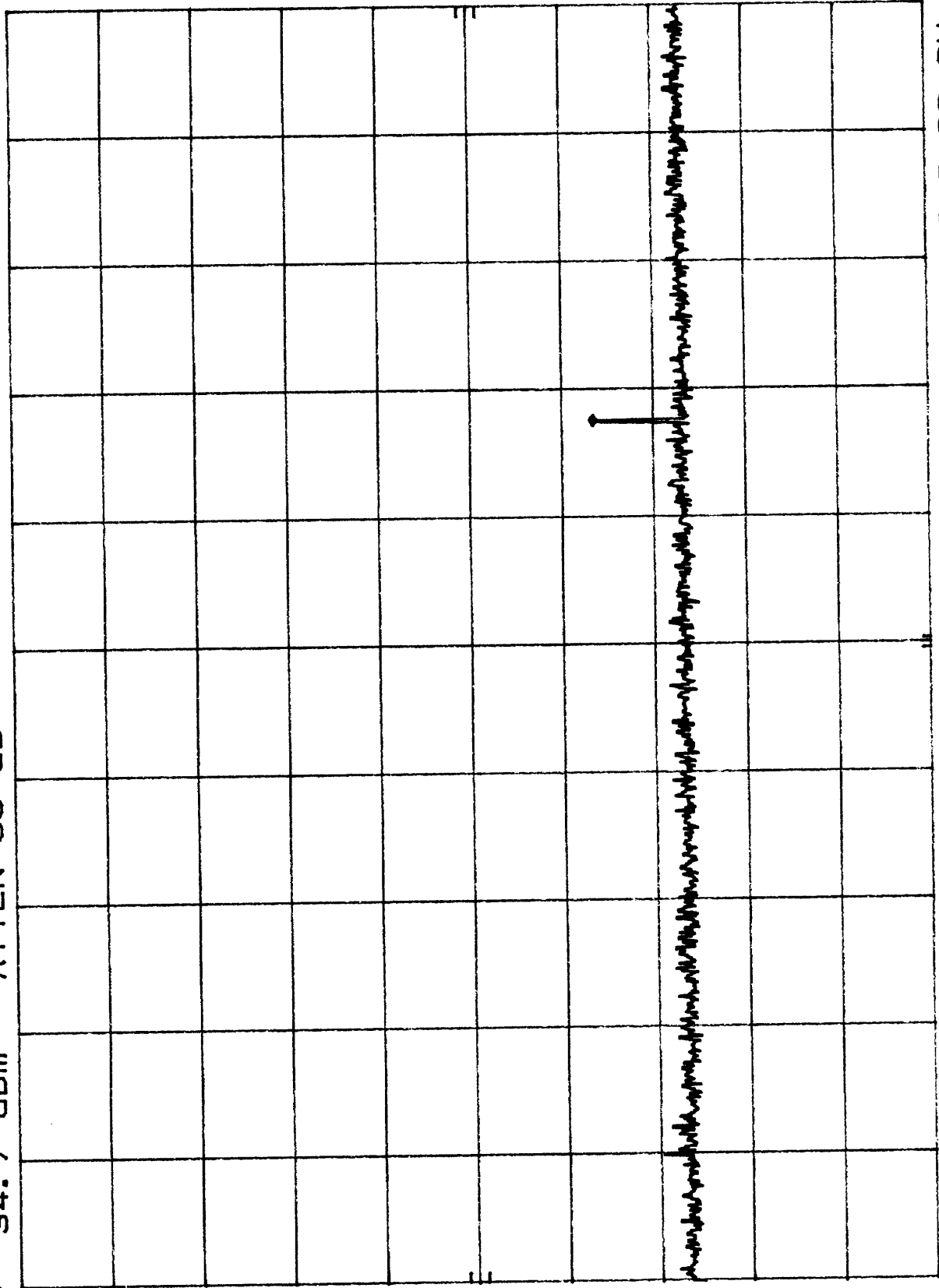
hp

10 dB/

OFFSET

19.5

dB



STOP 2.00 GHz  
SWP 300 msec

START 1.00 GHz  
RES BW 100 kHz  
VBW 100 kHz

7.3.2.d

MKR 8.840 GHz  
-33.50 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

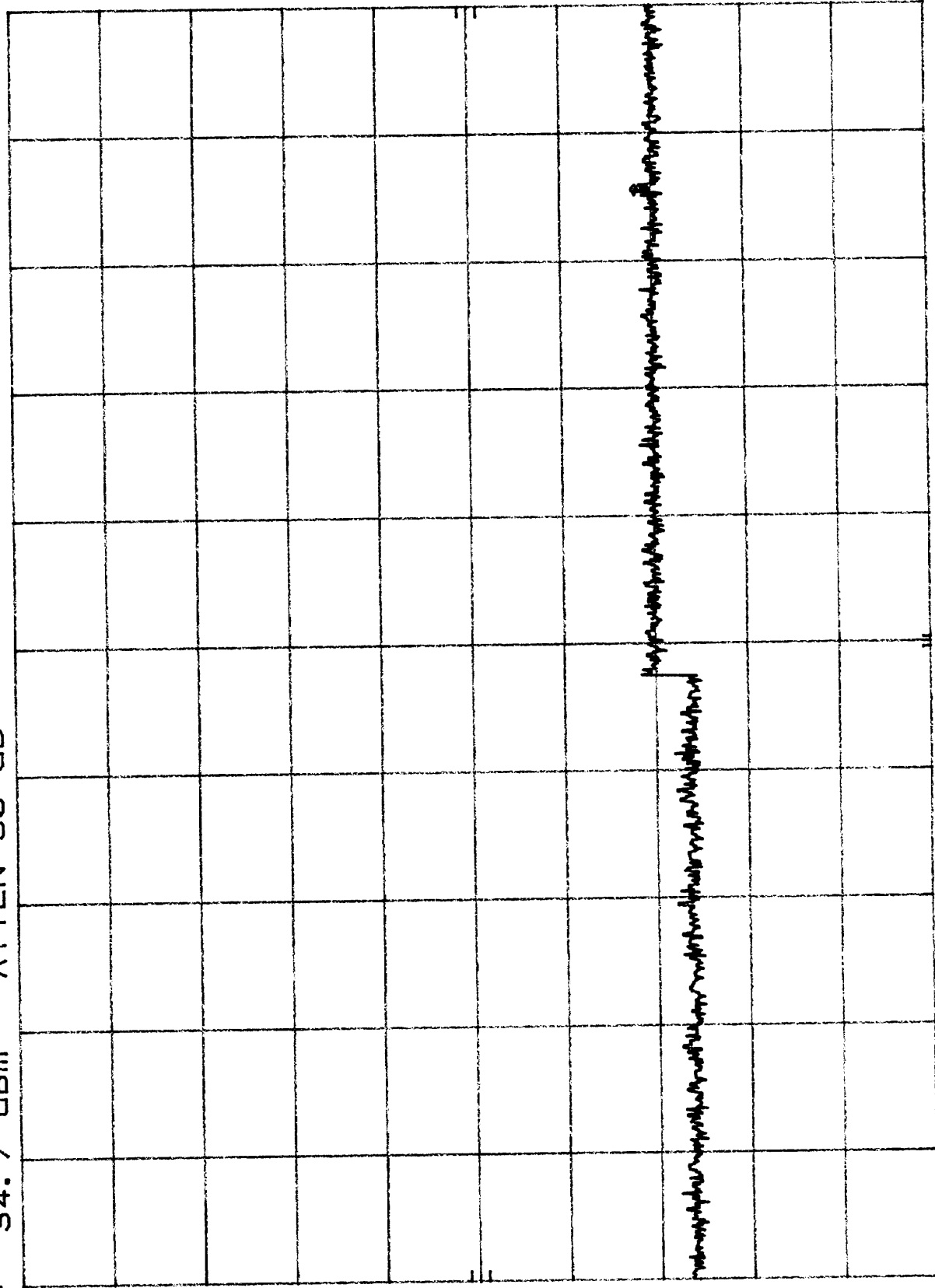
hp

10 dB/

OFFSET

19.5

dB



START 2.00 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 10.00 GHz

SWP 2.40 sec

7.3.3.a

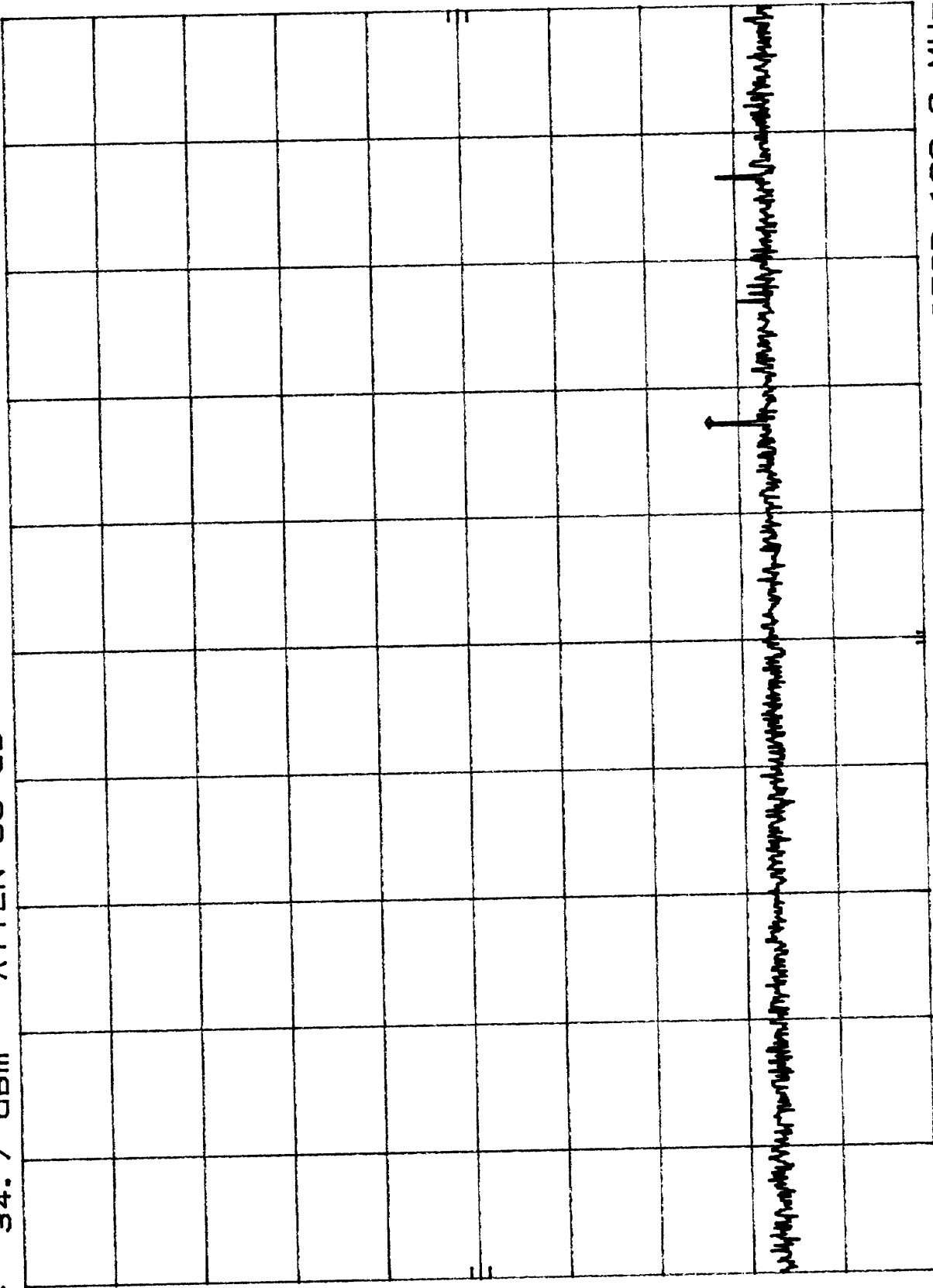
MKR 67.43 MHz  
-42.20 dBm

T200C001  
REF 34.7 dBm  
ATTEN 30 dB

HP

10 dB/

OFFSET  
19.5  
dB



STOP 100.0 MHz  
SWP 2.97 sec

START 1.0 MHz  
RES BW 10 kHz  
VBW 100 kHz

7.3.3.b

T200C001

REF 34.7 dBm

ATTEN 30 dB

MKR 849.7 MHz

31.60 dBm

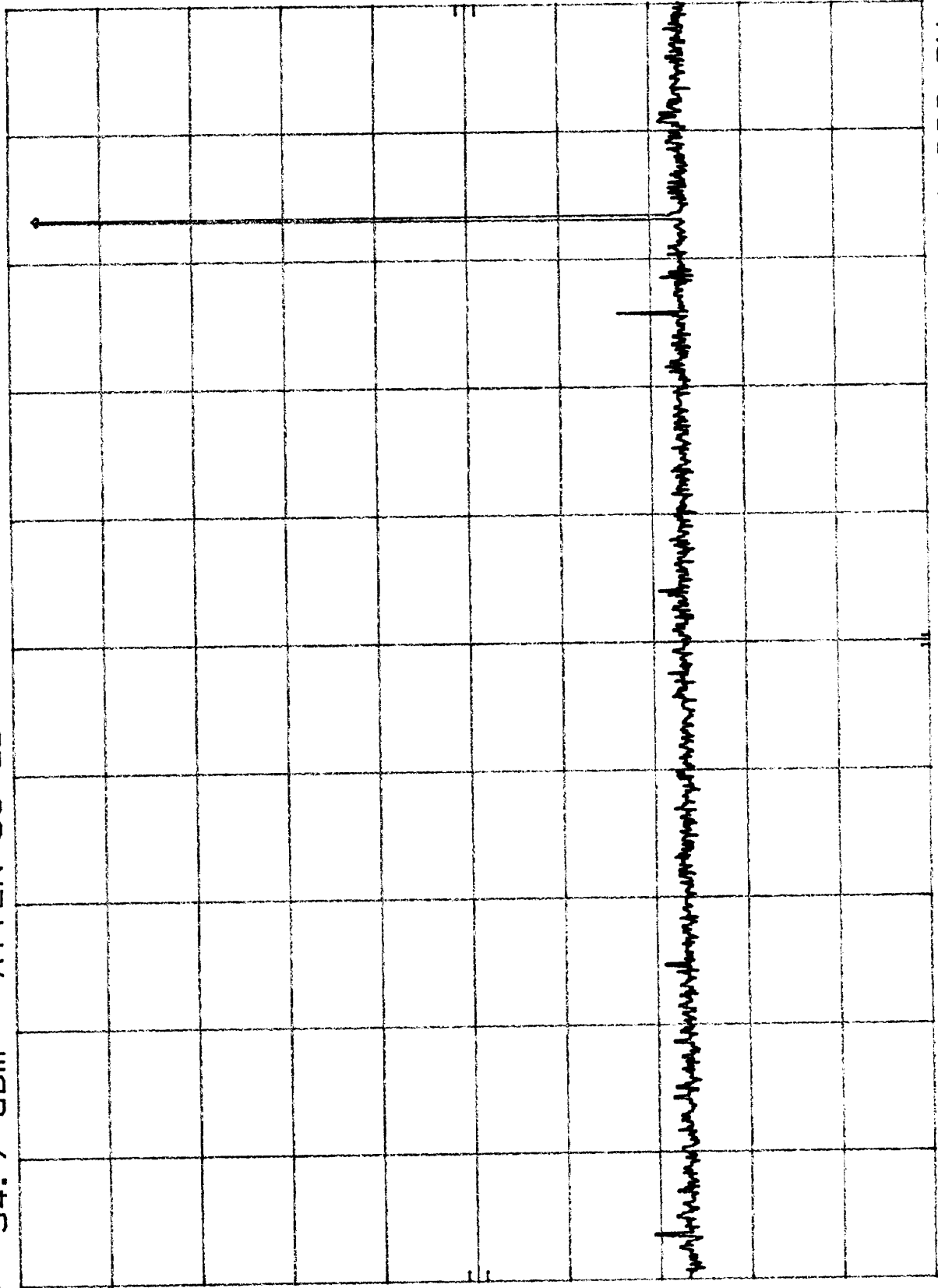
hp

10 dB/

OFFSET

19.5

dB



START 100 MHz

RES BW 100 KHz

VBW 100 KHz

STOP 1.000 GHz

SWP 270 msec



7.3.3.C

MKR 1.700 GHz  
-32.10 dBm

T200C001

REF 34.7 dBm

ATTEN 30 dB

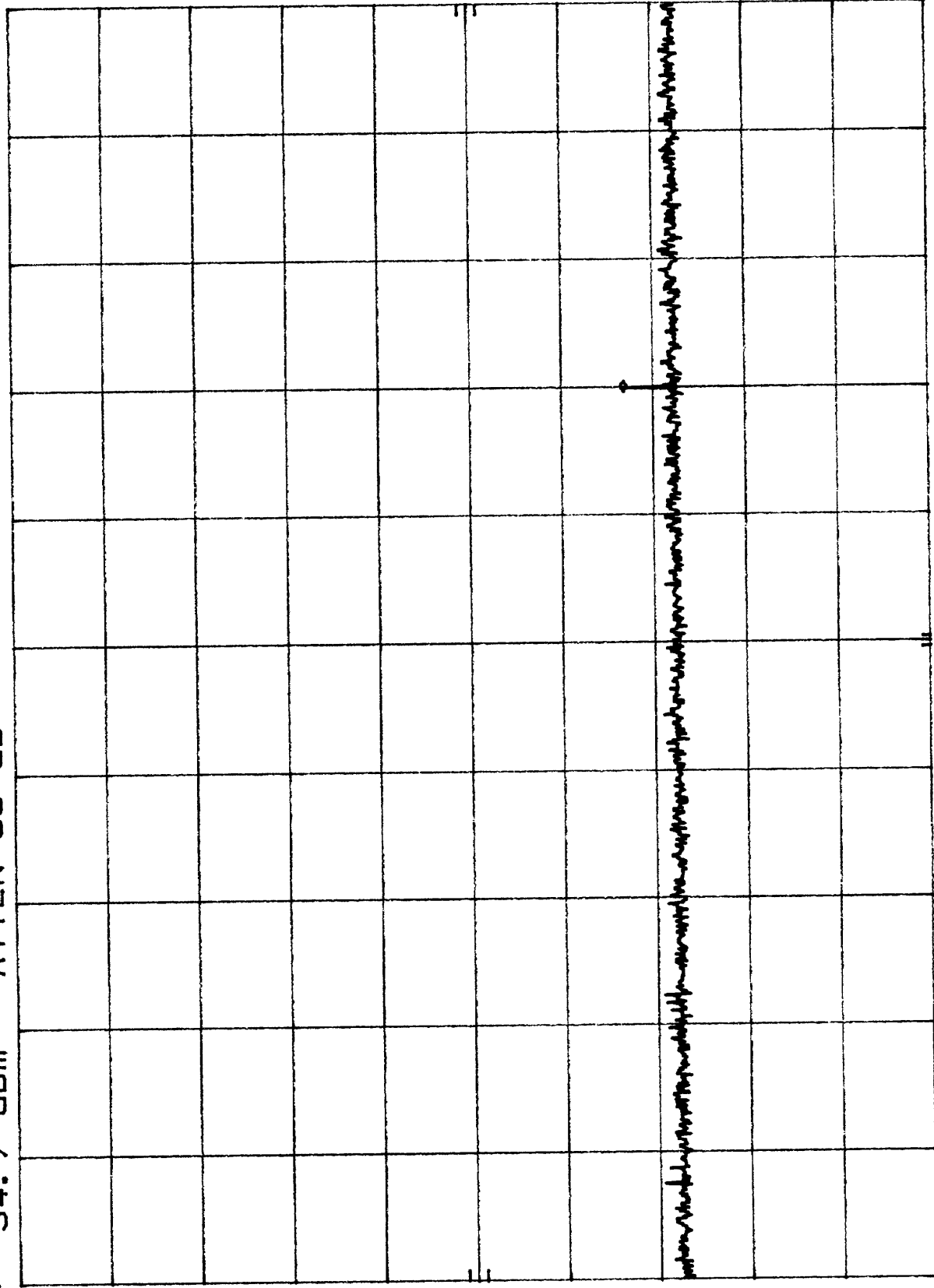
hp

10 dB/

OFFSET

19.5

dB



START 1.00 GHz

RES BW 100 KHz

VBW 100 KHz

STOP 2.00 GHz

SWP 300 msec

7.3.3.d

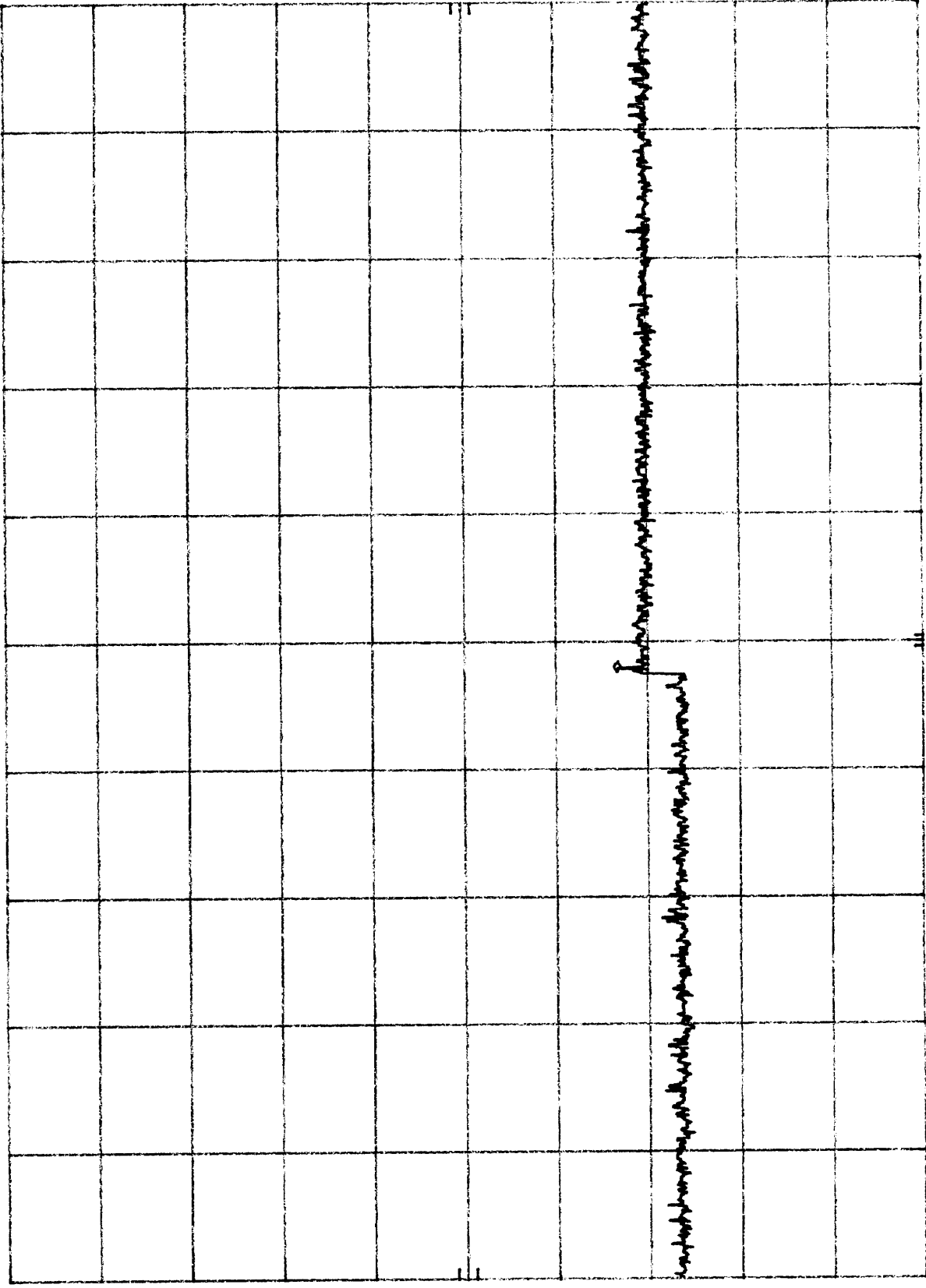
MKR 5.840 GHz  
-32.00 dBm

T200C001  
REF 34.7 dBm ATTEN 30 dB

HP

10 dB/

OFFSET  
19.5  
dB



START 2.00 GHz RES BW 100 kHz  
STOP 10.00 GHz SWP 2.40 sec  
VBW 100 kHz

7.3.4.a

MKR 891.15 MHz  
-84.10 dBm

ATTEN 0 dB

REF -27.0 dBm

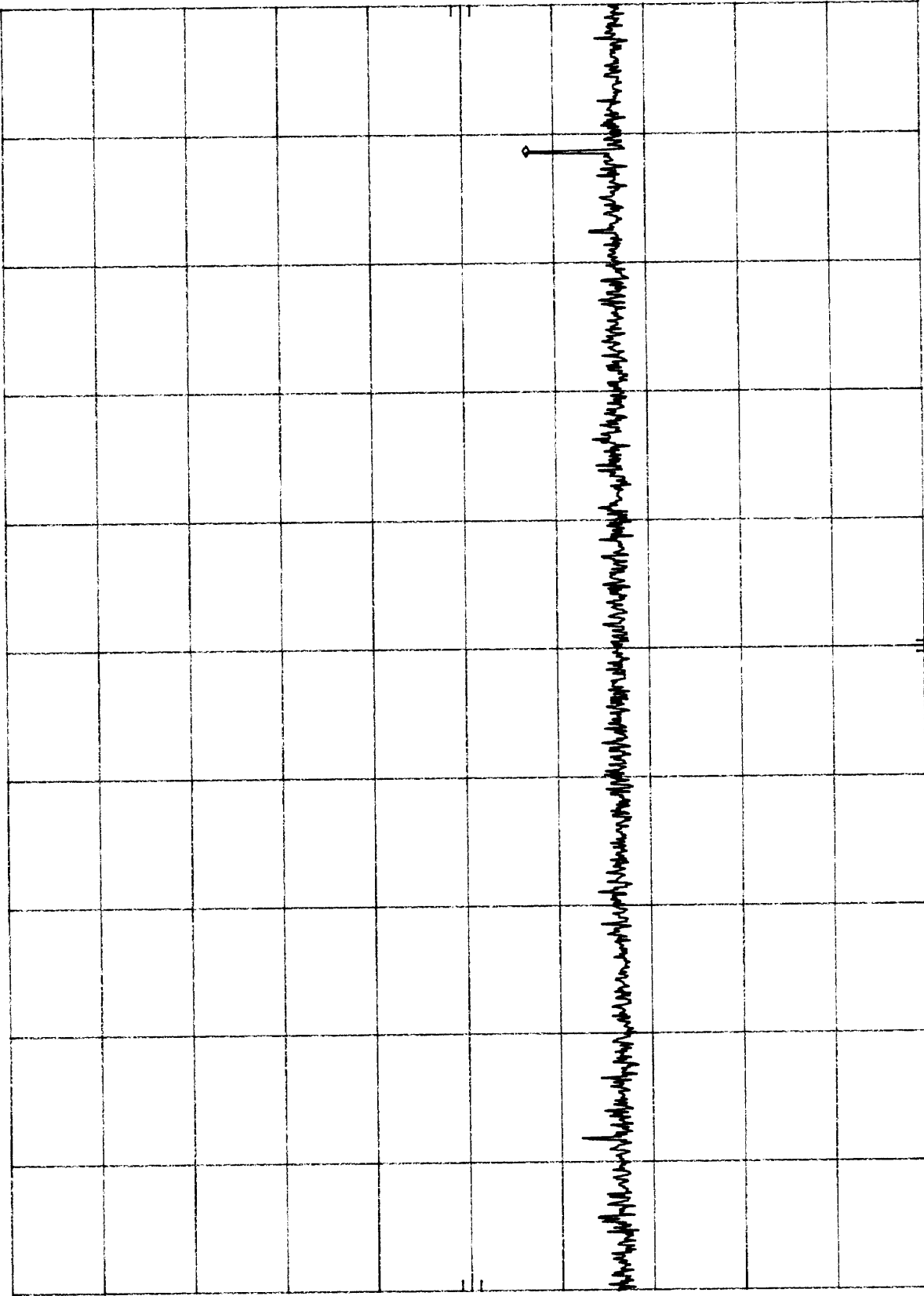
hp

10 dB/

OFFSET

3.0

dB



STOP 894.00 MHz  
SWP 75 msec

VBW 30 kHz

RES BW 30 kHz

START 869.00 MHz

7.3.4, b

MKR 883.97 MHz  
-90.10 dBm

hp REF -17.0 dBm ATTN 0 dB

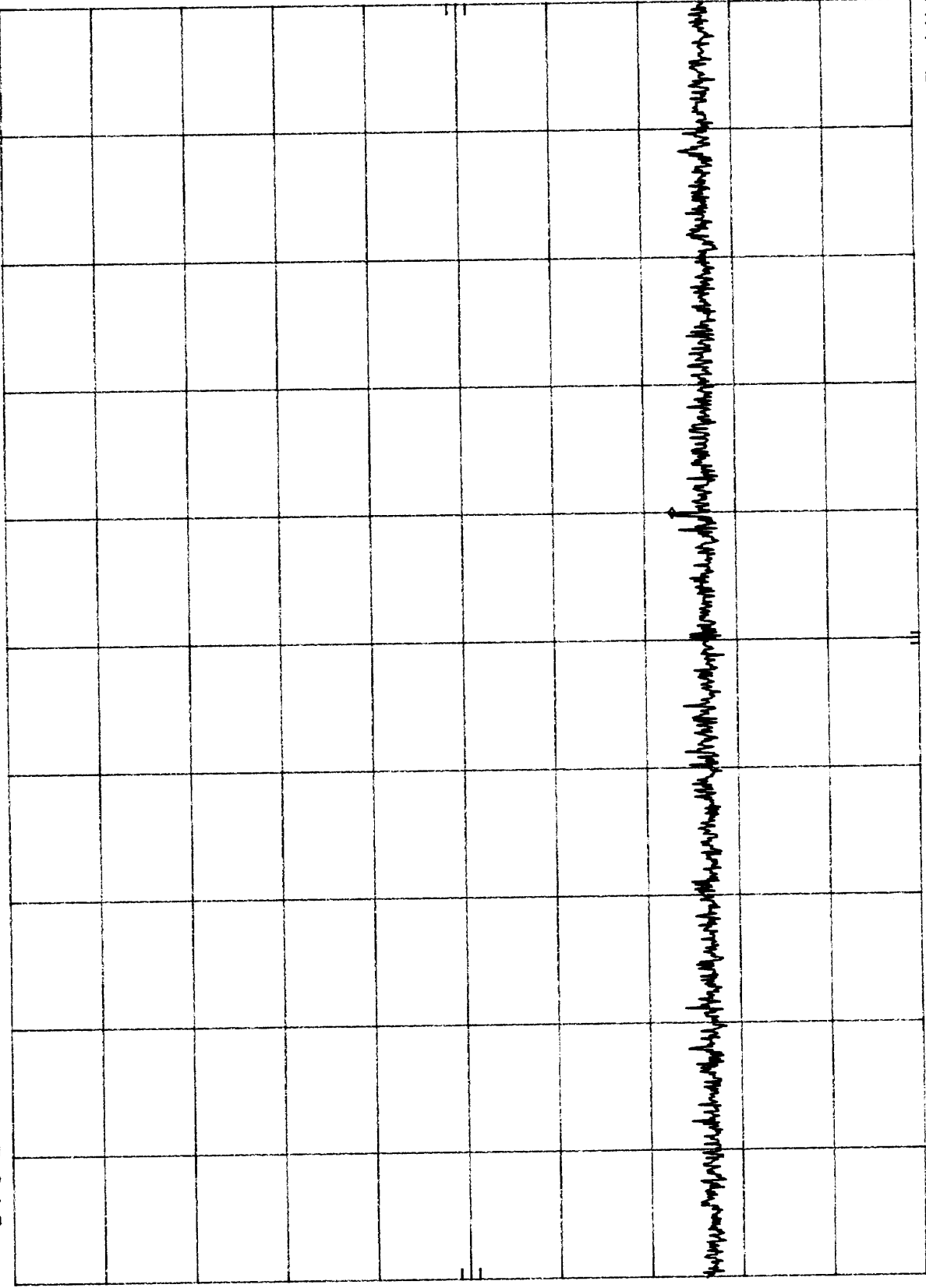
hp

10 dB/

OFFSET

3.0

dB



START 869.00 MHz  
RES BW 30 KHZ

VBW 30 KHZ

STOP 894.00 MHz  
SWP 75 msec

7.3.4.C

MKR 886.27 MHz  
-87.40 dBm

hp REF -17.0 dBm ATTN 0 dB

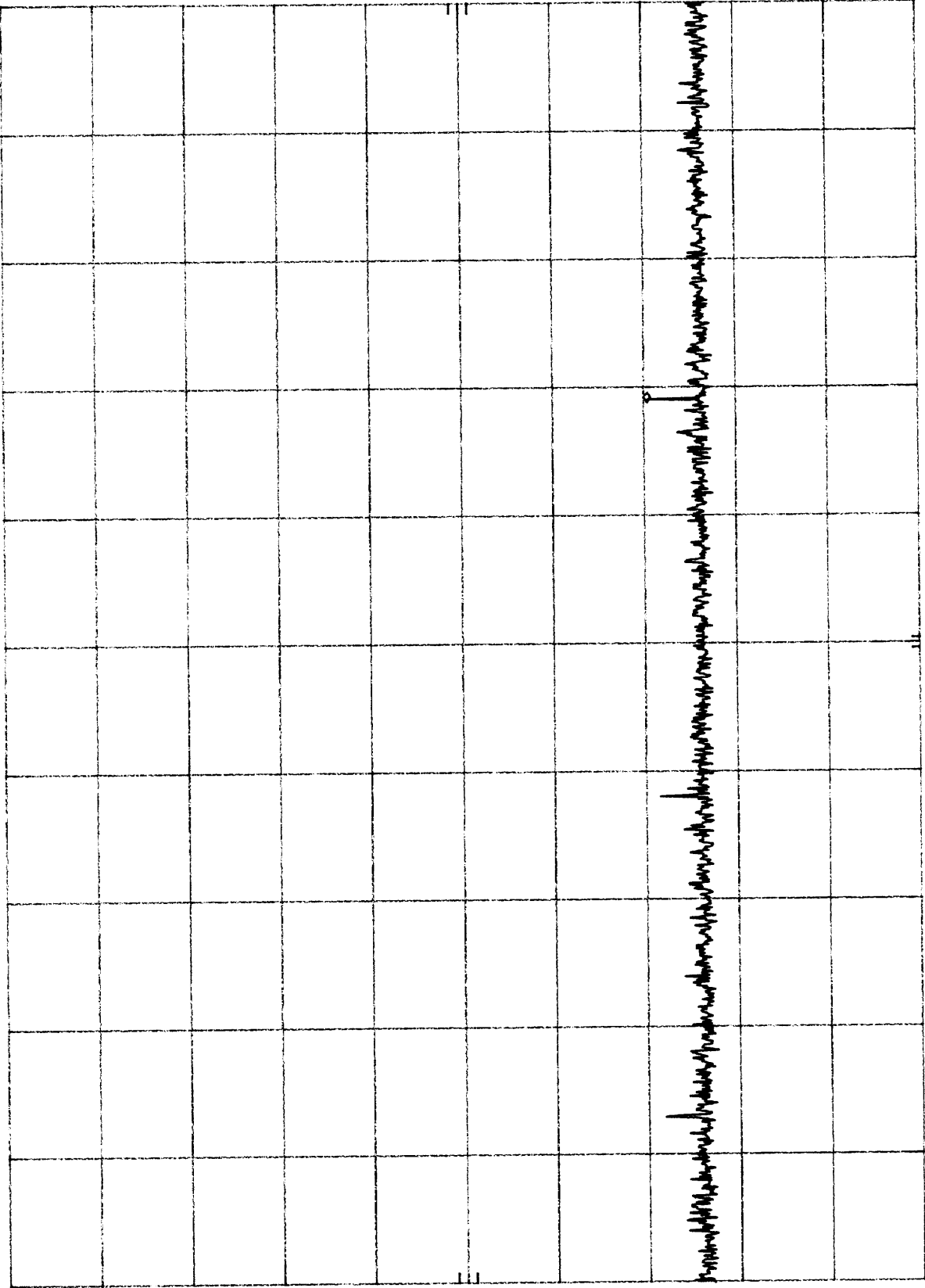
hp

10 dB/

OFFSET

3.0

dB



START 869.00 MHz

RES BW 30 kHz

VBW 30 kHz

STOP 894.00 MHz

SWP 75 msec

## 8.0 Field Strength of Spurious Radiation, FCC sec. 2.1053

### 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 and at the spurious emissions frequency.

The Field strength at the fundamental frequency was calculated as following.

$$E = \sqrt{(30 \times \text{EIRP}) / D}$$

EIRP (in dBm) equal  $P + G - cl$

At 824.0 MHz EIRP = 35.6 + 1 = 36.6 dBm or 4.57 W  
At 836.5 MHz EIRP = 35.3 + 3 - 2 = 36.3 dBm or 4.27 W  
At 848.9 MHz EIRP = 33.2 + 5 - 2 = 36.2 dBm or 4.17 W

At 824.0 MHz E = 3.9 V/m or 131.8 dBuV/m  
At 836.5 MHz E = 3.8 V/m or 131.6 dBuV/m  
At 848.9 MHz E = 3.7 V/m or 131.4 dBuV/m

### 8.2 Test Equipment

EMCO 3115 Horn Antenna  
HP 8566B Spectrum Analyzer  
High Pass Filter  
Preamplifier

### 8.3 Test Results

Test Result:	Pass. Refer to the attached data sheets
--------------	---

Telular Corp. Cellular Alarm System  
FCC ID: MTF09000

Date of Test: July 24-25, Aug. 29-30, 2000

Data Sheet Number	Description
8.3.a	Low Channel
8.3.b	Middle Channel
8.3.c	High Channel
8.3.d	Radiated Emissions 15.109
8.3.e	Plot of Local Oscillator conducted Emissions
8.3.f	Local Oscillator Radiated Emissions

### Radiated Emissions Test Data

Company:	Telular	Model #:	T200C001	Req.	FCC 2.993
EUT:	Telgurad	FCC #:	MTF0900	Test Dist.	3 meters
Project #:	J20016073	Test Date:	Aug 29, 2000	TP	3.00 Watt
Test Mode:	Low Channel with Dipole Antenna	Engineer:	Suresh	Min. Attn.	47.77 dBc

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	18	12	0	3	13	21	0	0	0
Model:	EMCO 3115	0	EMCO 3104	None	MC 15642	ACO/400	Gr. M+L	None	None	None

Frequency	Reading	Detector	Ant. #	Amp #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	Net	ERP	Attn.	Margin
MHz	dB( $\mu$ V)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB( $\mu$ V/m)	mW	dBc	dB
824.00	-	-	-	-	-	-	-	-	131.9	2.83E+03	-	-
1648.00	40.2	Peak	8	0	V	26.7	0.0	3.0	69.9	1.79E-03	62.0	-14.2
2472.00	36.1	Peak	8	0	V	29.1	0.0	2.3	67.5	1.03E-03	64.4	-16.6
3296.00	37.5	Peak	8	0	V	31.3	0.0	2.5	71.3	2.47E-03	60.6	-12.8
4120.00	27.7	Peak	8	0	V	34.5	0.0	2.9	65.1	5.92E-04	66.8	-19.0
3345.80	27.7	Peak	8	0	V	31.3	0.0	2.5	61.5	2.58E-04	70.4	-22.6
4944.00	32.5	Peak	8	0	V	34.0	0.0	3.2	69.7	1.71E-03	62.2	-14.4
5768.00	18.8	Peak	8	0	V	36.6	0.0	3.7	59.1	1.49E-04	72.8	-25.0
6592.00	25.1	Peak	8	0	V	36.4	0.0	4.2	65.7	6.80E-04	66.2	-18.4
7416.00	23.8	Peak	8	0	V	37.0	0.0	4.3	65.1	5.92E-04	66.8	-19.0
8240.00	22.8	Peak	8	0	V	37.5	0.0	4.8	65.1	5.92E-04	66.8	-19.0

- Notes:**
- a) O.C.F.: Other Correction Factor
  - b) Insert. Loss = Cable A + Cable B + Cable C + Transducer.
  - c) Net = Reading + Antenna Factor - Pre-Amp + Insert. Loss.
  - d) Attn. = Field Strength (Fundamental) - Field Strength (Harmonics).
  - e) Negative signs (-) in Margin column signify levels below the limits.



**Radiated Emissions Test Data**

<b>Company</b>	Telular Corporation	<b>Model #:</b>	T200C001	<b>Req</b>	FCC 2.993
<b>EUT:</b>	Telgurard	<b>FCC #:</b>	MTF0900	<b>Test Dist</b>	3 meter
<b>Project #:</b>	J20016073	<b>Test Date:</b>	Aug29, 2000	<b>TP</b>	3.00 Watt
<b>Test Mode:</b>	Mid Channel with Dipole Antenna	<b>Engineer:</b>	Suresh	<b>Min. Attn.</b>	47.77 dBc

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
<b>Number:</b>	18	8	12	0	3	13	21	0	0	0
<b>Model:</b>	0	EMCO 3115	EMCO 3104	None	MC 18542	ACO/400	Gm_M+L	None	None	None

Frequency MHz	Reading dB(µV)	Detector P/A/Q	Ant #	Amp #	Ant. Pol H/V	Ant. Factor dB(1/m)	Pre-Amp dB	Insert. Loss dB	Net dB(µV/m)	ERP mW	Attn. dBc	Margin dB
836.47	-	-	-	-	-	-	-	-	131.9	2.83E+03	-	N/A
1673.00	36.6	Peak	8	0	V	26.7	0.0	3.0	66.3	7.80E-04	65.6	-17.8
2509.40	28.4	Peak	8	0	V	30.6	0.0	2.3	61.3	2.47E-04	70.6	-22.8
3345.80	27.7	Peak	8	0	V	31.3	0.0	2.5	61.5	2.58E-04	70.4	-22.6
4182.25	29.1	Peak	8	0	V	34.5	0.0	2.9	66.5	8.17E-04	65.4	-17.6
5018.70	25.8	Peak	8	0	V	35.4	0.0	3.5	64.7	5.40E-04	67.2	-19.4
5855.15	25.5	Peak	8	0	V	36.6	0.0	3.7	65.8	6.95E-04	66.1	-18.3
6691.60	25.2	Peak	8	0	V	36.4	0.0	4.2	65.8	6.95E-04	66.1	-18.3
7528.00	25.4	Peak	8	0	V	37.8	0.0	4.6	67.8	1.10E-03	64.1	-16.3
8364.70	23.9	Peak	8	0	V	37.5	0.0	4.8	66.2	7.63E-04	65.7	-17.9

**Notes:**

- a) O.C.F. .Other Correction Factor
- b) Insert. Loss = Cable A + Cable B + Cable C + Transducer.
- c) Net = Reading + Antenna Factor - Pre-Amp + Insert. Loss.
- d) Attn. = Field Strength (Fundamental) - Field Strength (Harmonics).
- e) Negative signs (-) in Margin column signify levels below the limits.

**Radiated Emissions Test Data**

Company:	Telular	Model #:	T200C001	Req.	FCC 2.993
EUT:	Telguard Cellular Alarm System	FCC #:	MTF09000	Test Dist.	3 meters
Project #:	J20016073	Test Date:	Aug 30,2000	TP	3.00 Watt
Test Mode:	High Channel with Dipole Antenna	Engineer:	Suresh	Min Attn	47.77 dBc

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	8	18	0	0	3	13	21	0	0	0
Model:	EMCO 3115	0	None	None	MC 15542	ACC400	Gr. M+L	None	None	None

Frequency MHz	Reading dB(µV)	Detector P/A/Q	Ant #	Amp #	Ant. Pol. H/V	Ant. Factor dB(1/m)	Pre-Amp dB	Insert. Loss dB	Net dB(µV/m)	ERP mW	Attn. dBc	Margin dB
848.97	106.6	Peak	18	0	V	23.3	0.0	2.0	131.9	2.83E+03	0.0	N/A
1697.94	35.6	Peak	8	0	V	26.7	0.0	3.0	65.3	6.20E-04	66.6	-18.8
2546.90	29.0	Peak	8	0	V	30.6	0.0	2.3	61.9	2.83E-04	70.0	-22.2
3395.88	28.7	Peak	8	0	V	31.3	0.0	2.5	62.5	3.25E-04	69.4	-21.6
4244.80	31.5	Peak	8	0	V	34.5	0.0	2.9	68.9	1.42E-03	63.0	-15.2
5093.80	21.5	Peak	8	0	V	35.4	0.0	3.5	60.4	2.01E-04	71.5	-23.7
5942.80	25.3	Peak	8	0	V	36.6	0.0	3.7	65.6	6.64E-04	66.3	-18.5
6791.76	24.5	Peak	8	0	V	36.4	0.0	4.2	65.1	5.92E-04	66.8	-19.0
7640.93	24.1	Peak	8	0	V	37.8	0.0	4.6	66.5	8.17E-04	65.4	-17.6
8489.70	24.1	Peak	8	0	V	37.5	0.0	4.8	66.4	7.99E-04	65.5	-17.7

- Notes:**
- a) O.C.F.: Other Correction Factor
  - b) Insert. Loss = Cable A + Cable B + Cable C + Transducer.
  - c) Net = Reading + Antenna Factor - Pre-Amp + Insert. Loss.
  - d) Attn. = Field Strength (Fundamental) - Field Strength (Harmonics).
  - e) Negative signs (-) in Margin column signify levels below the limits.

**Radiated Emissions  
Test Data**

<b>Company:</b> Telular Corporation	<b>Model #:</b> T200C001	<b>Standard_</b>	<b>FCC § 15B</b>
<b>EUT:</b> Telguard	<b>FCC ID #:</b> MTF09000	<b>Limits</b>	2
<b>Project #:</b> J20016073	<b>Test Date:</b> July 25,2000	<b>Test Distance_</b>	3 meters
<b>Test Mode:</b> Normal	<b>Engineer:</b> Suresh	<b>Duty Relaxation</b>	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
<b>Number:</b>	1	0	0	7	1	0	2	7	13	0
<b>Model:</b>	EMCO 3143	None	None	CPPA_10 2	HP 8447D	None	Site 2 10m	NPS120 -1	NPS256 3	None

Frequency	Reading	Detector	Ant #	Amp #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
38.55	9.2	Peak	1	0	V	7.7	0.0	1.4	0.0	18.3	40.0	-21.7
42.78	44.6	Peak	1	1	V	8.4	27.4	1.5	0.0	27.1	40.0	-12.9
86.70	44.9	Peak	1	1	V	7.1	27.8	2.6	0.0	26.8	40.0	-13.2
115.35	12.9	Peak	1	0	H	6.8	0.0	3.0	0.0	22.7	43.5	-20.8
163.10	38.2	Peak	1	1	H	9.0	27.4	3.8	0.0	23.6	43.5	-19.9
211.26	17.1	Peak	1	0	H	10.8	0.0	3.8	0.0	31.7	43.5	-11.8
221.50	39.1	Peak	1	1	V	11.4	29.4	3.8	0.0	24.9	46.0	-21.1
240.50	39.5	Peak	1	1	H	11.7	29.6	3.9	0.0	25.5	46.0	-20.5
												---
												---

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

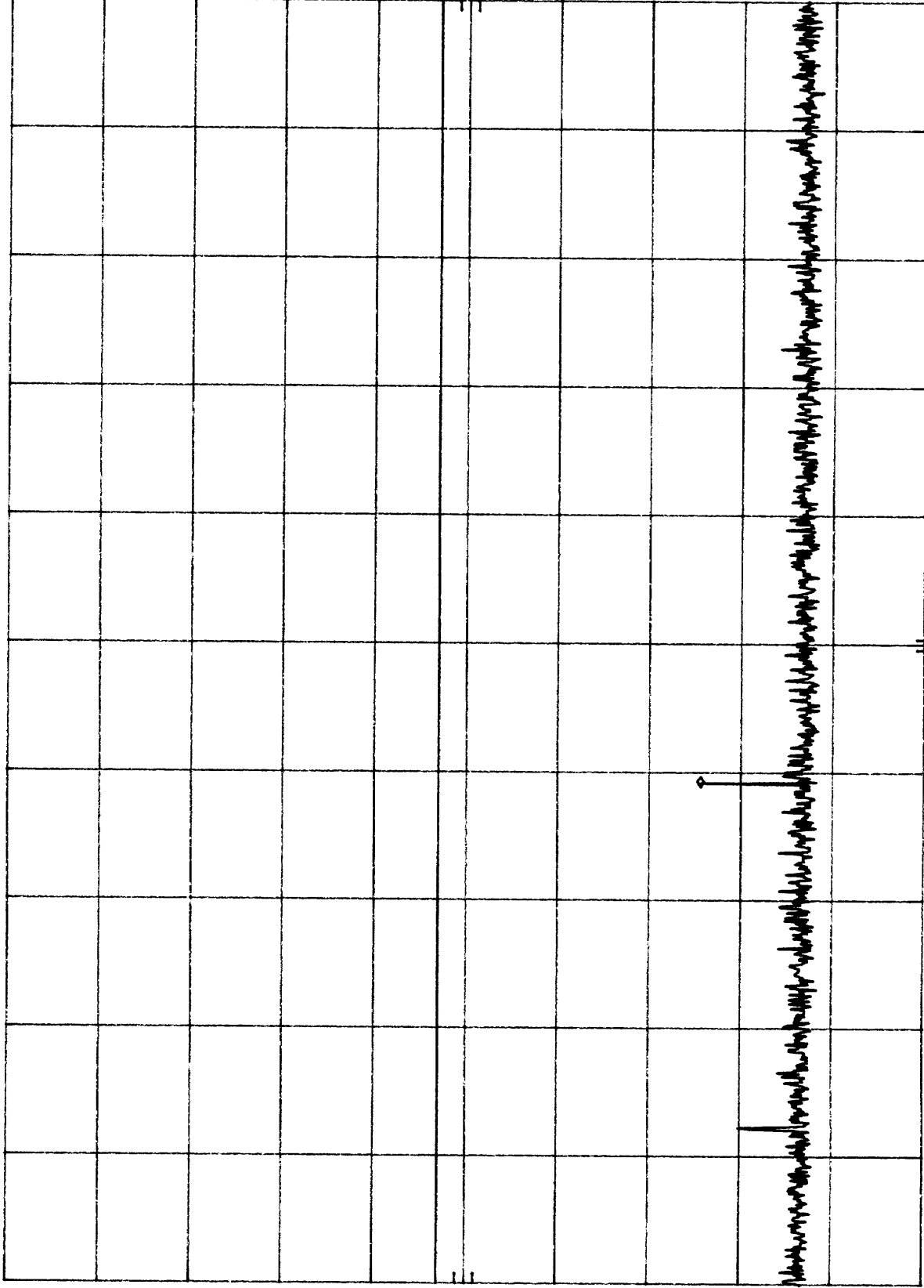
8-3.e

MKR 835.2 MHz  
-85.60 dBm

T200C001  
REF -10.0 dBm  
ATTEN 0 dB

hp  
10 dB/

DL  
-57.0  
dBm



START 600.0 MHz  
RES BW 30 kHz  
STOP 1200.0 MHz  
SWP 1.5 sec  
VBW 30 kHz

## Radiated Emissions Test Data

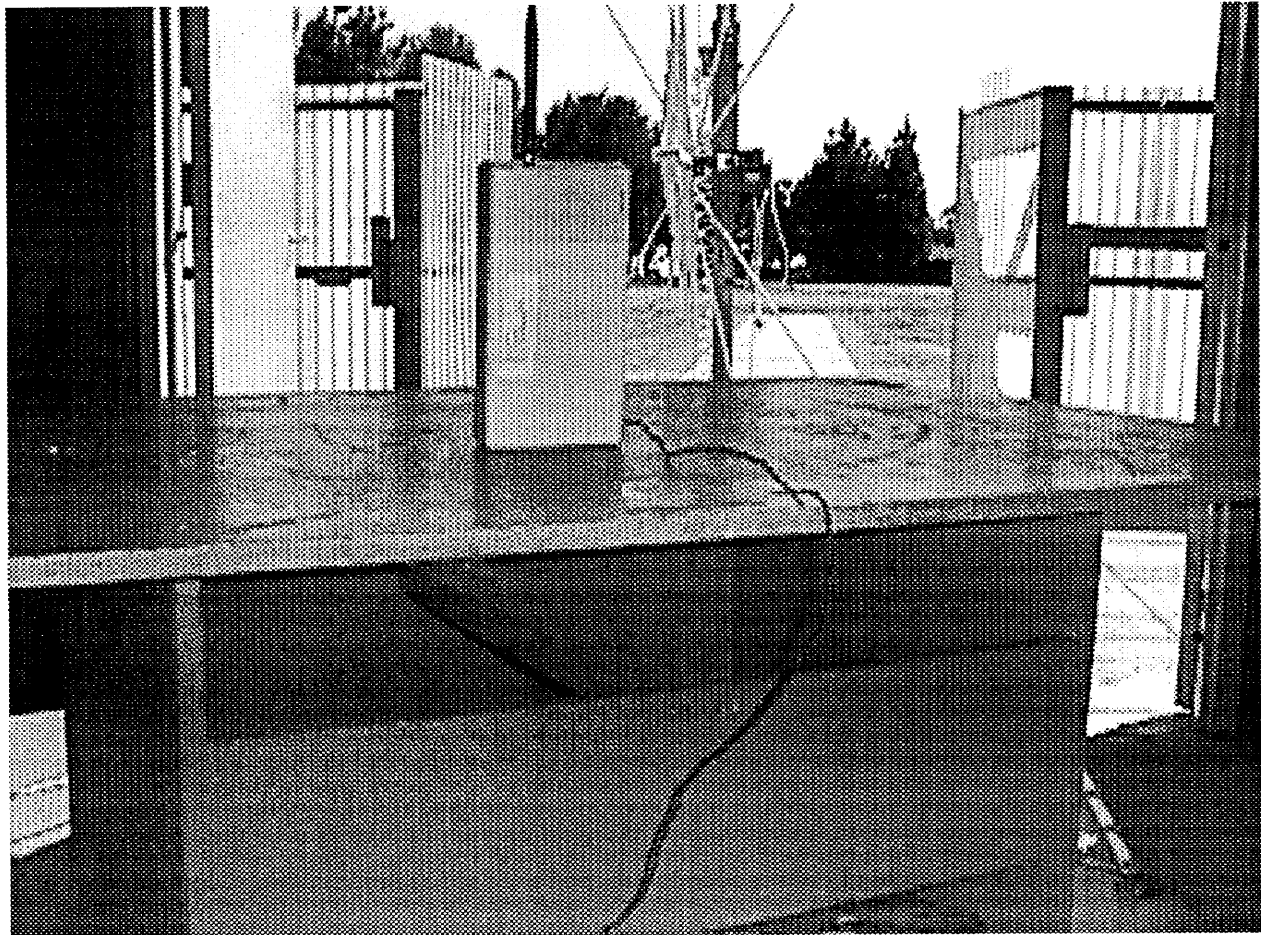
Company: Telular	Model #: T200C001	Standard_	FCC § 15B	
EUT: Telguard	FCC ID: MTF09000	Limits_	2	
Project #: J20016073	Test Date: Aug30, 2000	Test Distance_	3	meters
Test Mode: Normal	Engineer: Suresh	Duty Relaxation	0	dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Use
Number:	18	8	0	5	0	0	21	0	0	0
Model:	0	EMCO 3115	None	CDE P9 50	None	None	Grn_M+L	None	None	None

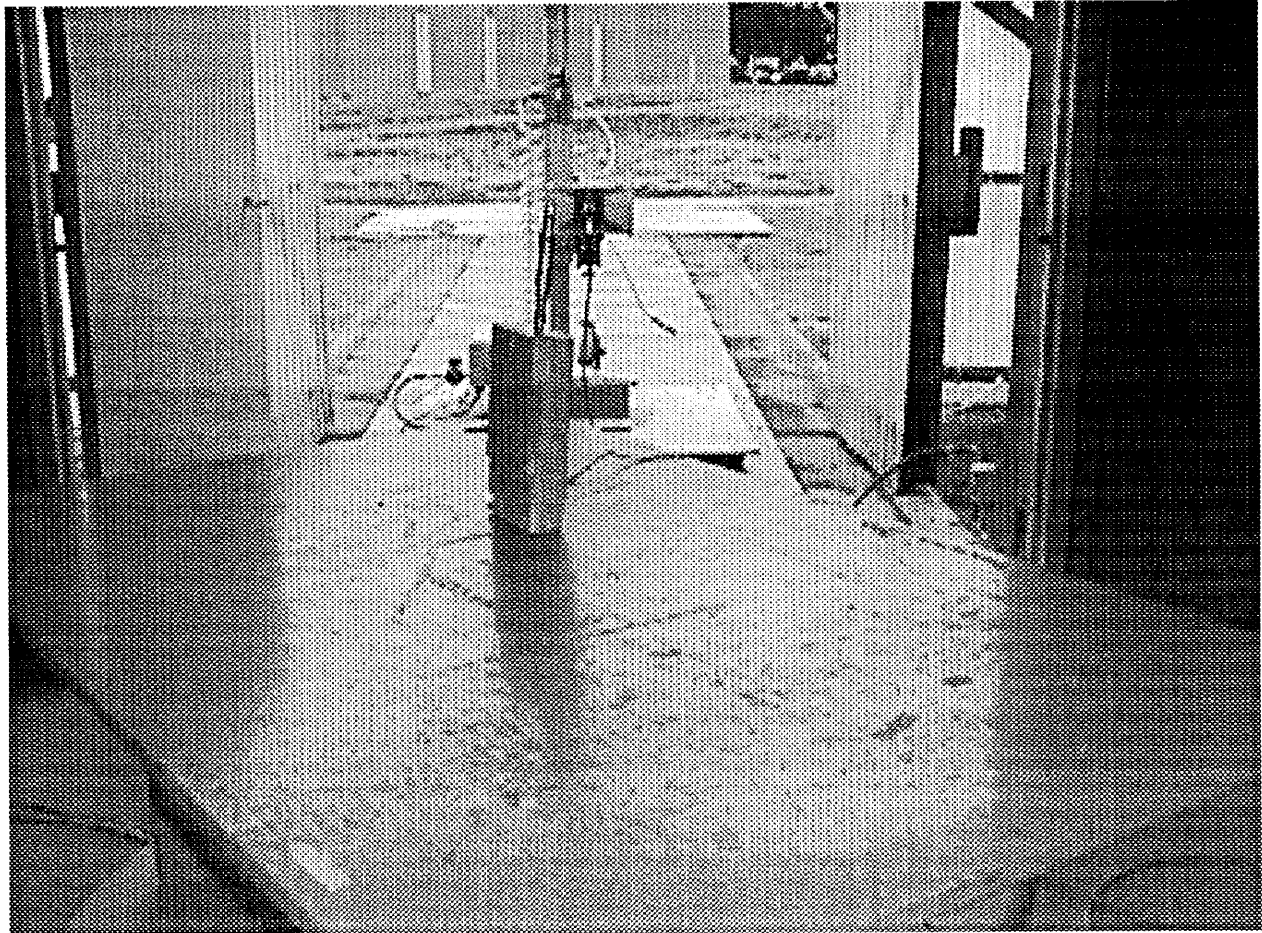
Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/O	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
967.60	22.9	Peak	18	5	V	24.0	9.4	2.3	0.0	39.8	54.0	-14.2
1935.68	20.6	Peak	8	0	V	26.7	0.0	2.2	0.0	49.5	54.0	-4.5
956.42	26.5	Peak	18	5	V	24.0	9.4	2.3	0.0	43.4	46.0	-2.6
980.86	22.0	Peak	18	5	V	23.8	9.4	2.3	0.0	38.7	54.0	-15.3
1960.66	18.1	Peak	8	0	V	26.7	0.0	2.2	0.0	47.0	54.0	-7.0
1910.72	18.2	Peak	18	0	V	28.8	0.0	2.2	0.0	49.2	54.0	-4.8

- Notes:**
- D.C.F.: Distance Correction Factor
  - Insert. Loss (dB) = Cable A + Cable B + Cable C .
  - Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
  - Negative signs (-) in Margin column signify levels below the limits.
  - All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Radiated Emission Test – Configuration Photograph



Radiated Emission Test - Configuration Photograph



Telular Corp. Cellular Alarm System  
FCC ID: MTF09000

Date of Test: July 24-25, Aug. 29-30, 2000

**9.0 Line Conducted Emissions, FCC sec. 15.107****9.1 Test Procedure**

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to the AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

**9.2 Test Results**

Test Result:	Passed by 5 dB. Refer to the attached plots
--------------	---

Plot Number	Description
9.2.a	Line1 (HOT)
9.2.b	Line2 (NEUTRAL)



9.2.a

26 Jul 2000 10:03:24

hp

EMISSION LEVEL [ dBuV ]

100

FCC. Pt 15 - AC LINE CONDUCTED  
TELULAR CORPORATION  
TELGUARD  
MODEL: T200C001  
LINE [ ] LINE [ ]

80

CLASS A

60

CLASS B

40

20

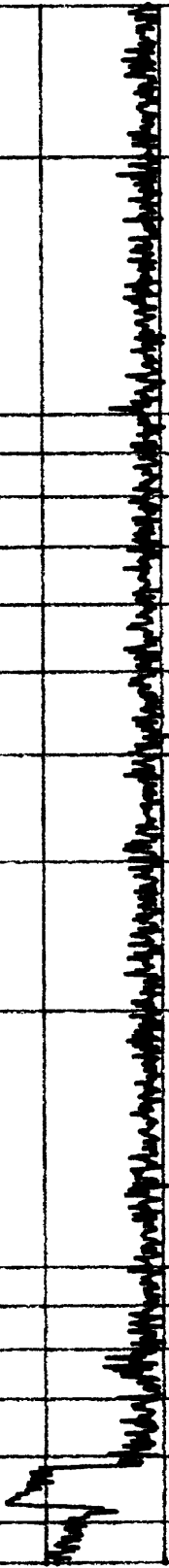
.45

1

10

30

FREQUENCY [ MHz ]

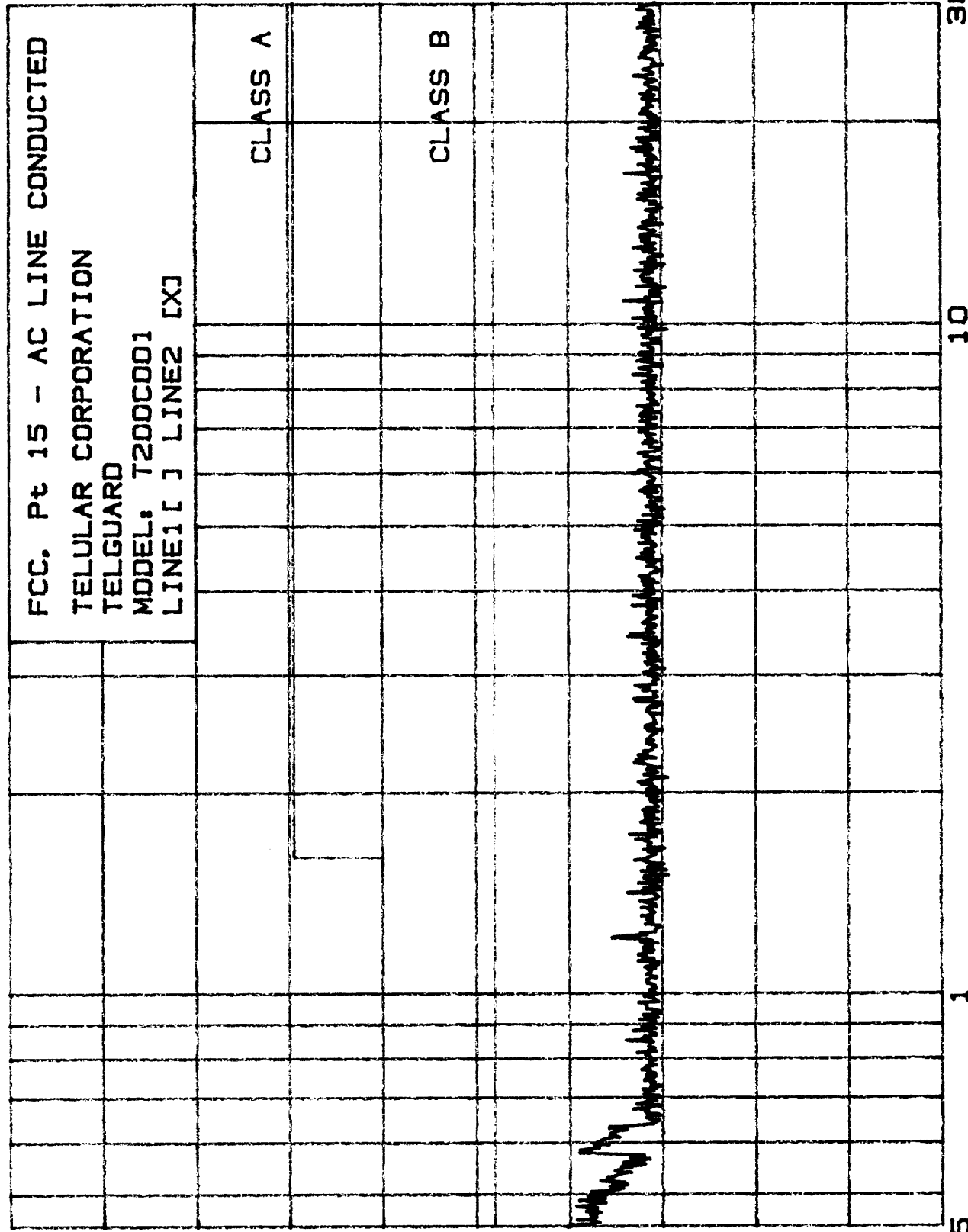


9.2.6

26 Jul 2000 10:25:23

hp

EMISSION LEVEL [dBuV]



FCC. Pt 15 - AC LINE CONDUCTED  
TELULAR CORPORATION  
TELGUARD  
MODEL: T200C001  
LINE1 [ J ] LINE2 [ X ]

CLASS A

CLASS B

100

80

60

40

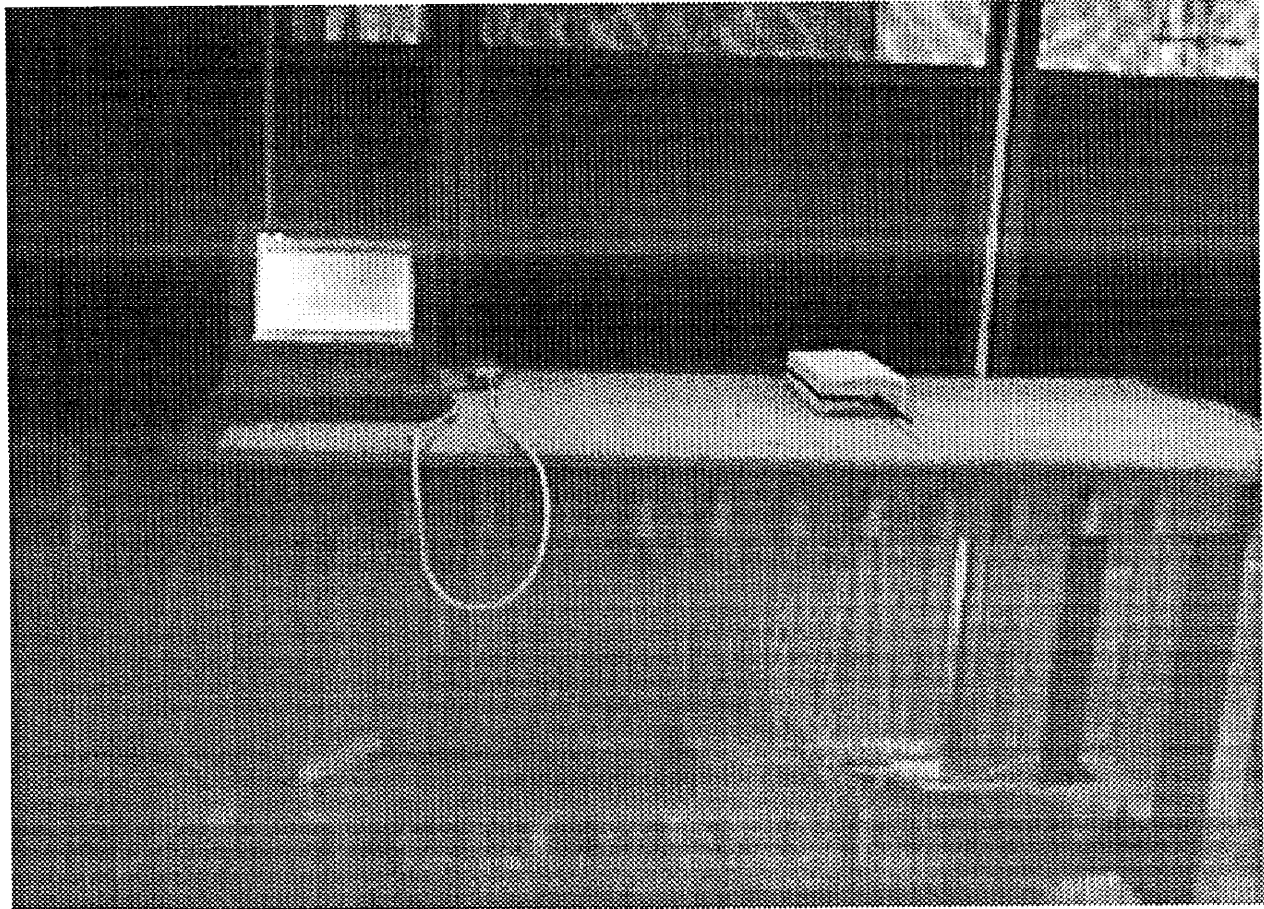
20

30

10

FREQUENCY [MHz]

AC Line Conducted Emission Test - Configuration Photograph



**10.0 Frequency Stability vs Temperature, FCC sec. 2.1055, 22.355**  
Frequency Tolerance:  $\pm 2.5$  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 frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, and external PTT cable exited the chamber through an opening made for that purpose.

After the temperature stabilized for approximately 20 minutes, the external PTT switch was activated, 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**

<b>Test Result:</b>	Passed. The maximum deviation is 1.2 ppm
---------------------	--

Frequency: 836.52 MHz (Middle Channel)		
Temperature, C	Frequency (MHz)	Difference (Hz)
50	836,518,975	1025
40	836,519,400	600
30	836,519,763	237
20	836,520,563	563
10	836,520,588	588
0	836,520,025	025
-10	836,519,813	087
-20	836,519,500	500
-30	836,519,250	750

**11.0 Frequency Stability vs Voltage, FCC sec. 2.1055, 22.355**  
Frequency Tolerance:  $\pm 2.5$  ppm**11.1 Test Procedure**

An autotransformer was connected to power terminals of the EUT. The voltage was set to the nominal voltage, 115% of the nominal voltage, and 85% of normal voltage. The output frequency was recorded for each voltage. The test also was performed when the EUT was powered from a DC power supply. The DC voltage was set the nominal voltage (12.4 V), 115% of the nominal voltage, 85% of the normal voltage, and to the lowest level of the battery (according to the specification of the battery used in the EUT). The output frequency was recorded for each voltage.

**11.2 Test Equipment**

Hewlett Packard 5383A Frequency Counter  
Goldstar DC Power Supply, GR303  
Rohde & Schwarz ESVP Test Receiver

**11.3 Test Results.**

<b>Test Result:</b> Passed. The maximum deviation is 0.6 ppm
--

Frequency: 836.52 MHz (Middle Channel)		
A.C. Volt (60Hz)	Frequency (MHz)	Difference (Hz)
120	836.519934	66
138	836.519670	330
102	836.519670	330

Frequency: 836.52 MHz (Middle Channel)		
D.C. Volt	Frequency (MHz)	Difference (Hz)
12.4	836.519574	426
14.26	836.519532	468
10.54	836.519514	486
10.50	836.519514	486

## RF Exposure Requirements

The EUT is considered as a mobile device. Therefore the Electromagnetic Field Strength (E) was calculated and compared with FCC Maximum Permissible Exposure (MPE) limit. The Power Density (S) can be calculated using the formula

$$S = (30 \times \text{EIRP}) / (120 \times \pi) / D^2 \quad (\text{W/m}^2)$$

The maximum EIRP in dBm equal  $P + G - \text{cl} = 35.6 + 5 - 2 = 38.6$  dBm or 7.24 W.

Therefore,  $S = 0.576 / D^2$  (W/m<sup>2</sup>)

The Duty Cycle can be taking into account.

$$S = 0.576 \times \text{DC} / D^2$$

According Microburst protocol, the worst case of Duty Cycle (DC) is 16.7%, (e.g. the transmitter in ON for 3 s, and OFF for 15 s). However, in practice in back-up mode, once an hour the resulting transmitter DC would be approximately 0.08%.

In the Table below is shown the MPE calculated data for different distances, for DC=0.167, DC=0.0008, and the FCC Limit, which for uncontrolled environment equal F/1500 (mW/cm<sup>2</sup>) or F/150 (W/m<sup>2</sup>) where F is a frequency in MHz.

F=836.5 MHz

Distance. m	Calculated S, W/ m <sup>2</sup> DC=0.167	Calculated S, W/ m <sup>2</sup> DC=0.0008	MPE Limit W/ m <sup>2</sup>
0.1	9.62	0.046	5.58
0.2	2.40	0.012	5.58
0.3	1.07	0.005	5.58
0.4	0.60	0.003	5.58
0.5	0.38	0.002	5.58

As can be seen, at 0.2 m the Power Density is well below the Limit.