

**REPORT ON
CERTIFICATION MEASUREMENTS
OF
B8Q ACSR4 DOOR OPERATOR RECEIVER**

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MOTOR AND DRIVE CIRCUIT RADIATED EMISSIONS:

The radiated emissions data was gathered from the 3-meter range based on pre-scan data. The operator was activated and the emissions per 15-109 limits from the DC motor were measured at 3 meters (Table page 67).

RECEIVER RADIATED EMISSIONS:

The operator is delivered with a wire antenna when purchased. A kit will be available from service for owners requiring an external antenna for using the operator inside a garage with aluminum siding and a steel garage door. The receiver emissions per 15.109 limits were measured with both a wire antenna (Page 68) and per 15.111 using a 50 ohm termination at the antenna port (Page 69).

A set of plots follows with the information obtained from the conducted antenna test in accordance with 15.111 (Pages 70 – 80).

CONDUCTED EMISSIONS:

The last plots are the data from the conducted power line tests per 15.107 page 15-405. This test was performed using the quasi peak detector per 15.35(b) page 15-203, 15-407 page 15-405 (Plots Pages 81 – 84).

All tests were performed using ANSI C63.4 specifications.

Operator Radiated Emissions From Operator Electronics

Pre Scan	High	Measurement	Antenna	Coax	Amplifier	Meter	Limit	Delta
Frequency	Emmission	Span	Factor	Factor	Gain	Reading		Limit
Mhz	Mhz	Mhz	dB	dB	dB	dBm	dBm	dBm
30-50	40	20	2.3	1.05	27.13	-68.5	-43.2	25.3
50-70	60	10	4.5	1.35	26.88	-66.8	-46.0	20.8
70-88	80	1	6.4	1.6	26.75	-63.2	-48.2	15
88-108	103	1.5	8.2	1.8	26.62	-57.3	-46.9	10.4
108-128	110	2.7	10.1	2	26.62	-66.5	-49.0	17.5
128-150	135.3	20	11.5	2.2	26.8	-68.1	-50.4	17.7
150-170	160	20	12	2.4	26.62	-69	-51.3	17.7
170-190	184	1	13.7	2.6	25.96	-78	-53.8	24.2
190-210	200	1.5	15	2.75	26	-75.2	-55.2	20
190-210	208	4	15.5	2.8	26	-75	-55.8	19.2
210-216	213	1.5	15.9	2.9	26	-70.4	-56.3	14.1
216-240	228	20	16.4	3	26.05	-71.3	-56.8	14.5
240-260	250	20	16.8	3.15	25.75	-74.2	-55.2	19
260-280	270	20	17.2	3.3	25.6	-76	-55.9	20.1
280-300	290	20	17.7	3.4	25.45	-78.2	-56.6	21.6
300-320	310	20	18.2	3.6	25.3	-77	-57.4	19.6
320-340	330	20	18.9	3.7	23.65	-80.7	-59.9	20.8

Measurements made to 1 GHz. Readings above 340 MHz were below equipment noise floor.

A reduced span was required for some measurements, for example in the FM broadcast band, to avoid ambient signals above the allowed level for the operator.

Measurements made with Quasi-Peak detector. Sweep time was 0.1 second X Span (in MHz).

Video Bandwidth = 1MHz
Resolution Bandwidth = 1 MHz

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RADIATED EMISSIONS
RECEIVER WITH WIRE ANTENNA

Scan /Div Mhz	Res. Bandwidth Khz	DUT Frequency (Mhz)	Meter Frequency (Mhz)	Meter Reading (dBm)	Antenna Factor (dB)	Coax Factor (dB)	Amplifier Gain (dB)	Measurement Distance (Meters)	3 Meter Limit (uV/M)	Field Strength (uV/M)	Delta Limit (dBm)
0.5	100	390	390	-63.6	20.8	4.08	26.78	3	200	118.86	-4.52
0.5	100	390	780	-78.4	25.9	6.20	25.48	3	200	57.69	-10.80
0.5	1000	390	1170	-69.4	25.4	7.92	35.14	3	500	61.55	-18.20
0.5	1000	390	1560	-70.5	27.3	9.43	34.79	3	500	83.54	-15.54
0.5	1000	390	1950	-73.6	29.2	10.79	34.44	3	500	88.59	-15.03

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RADIATED EMISSIONS
RECIEVER WITH ANTENNA TERMINATED

Scan /Div Mhz	Res. Bandwidth KHz	DUT Frequency (Mhz)	Meter Frequency (Mhz)	Meter Reading (dBm)	Antenna Factor (dB)	Coax Factor (dB)	Amplifier Gain (dB)	Measurement Distance (Meters)	3 Meter Limit (uV/M)	Field Strength (uV/M)	Delta Limit (dBm)
0.5	100	390	390	-66.6	20.8	4.08	26.78	3	200	84.15	-7.52
0.5	100	390	780	-80.2	25.9	6.20	25.48	3	200	46.90	-12.60
0.5	1000	390	1170	-72.1	25.4	7.92	35.14	3	500	45.10	-20.90
0.5	1000	390	1560	-70.8	27.3	9.43	34.79	3	500	80.70	-15.84
0.5	1000	390	1950	-73.9	29.2	10.79	34.44	3	500	85.58	-15.33

CONDUCTED ANTENNA
REF -45.0 dBm ATTN 0 dB

HP

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

SFRQ 140

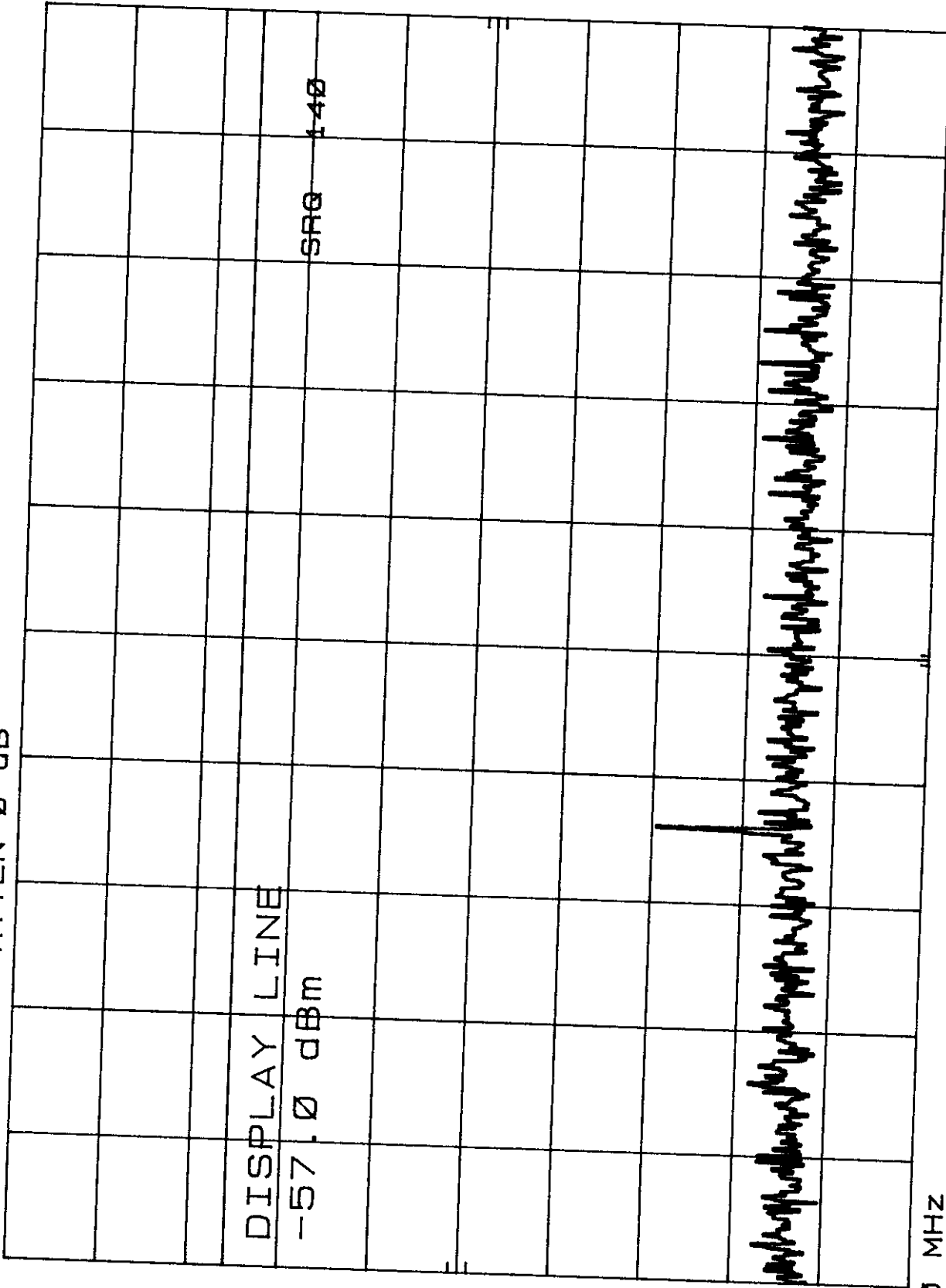
START 30 MHz

RES BW 100 KHz

VBW 300 KHz

STOP 200 MHz

SWP 51.0 msec



CONDUCTED ANTENNA
REF -45.0 dBm ATTEN 0 dB

hp

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

SR0 140

START 200 MHz

RES BW 100 KHz

VBW 300 KHz

STOP 400 MHz

SWP 60.0 msec

CONDUCTED ANTENNA
REF -45.0 dBm ATTEN 0 dB

hp

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

SFG 140

START 364.6 MHz

RES BW 100 KHz

VBW 300 KHz

STOP 407.1 MHz
SWP 20.0 msec

CONDUCTED ANTENNA
REF -45.0 dBm ATTN 0 dB

hp

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

SRQ 140

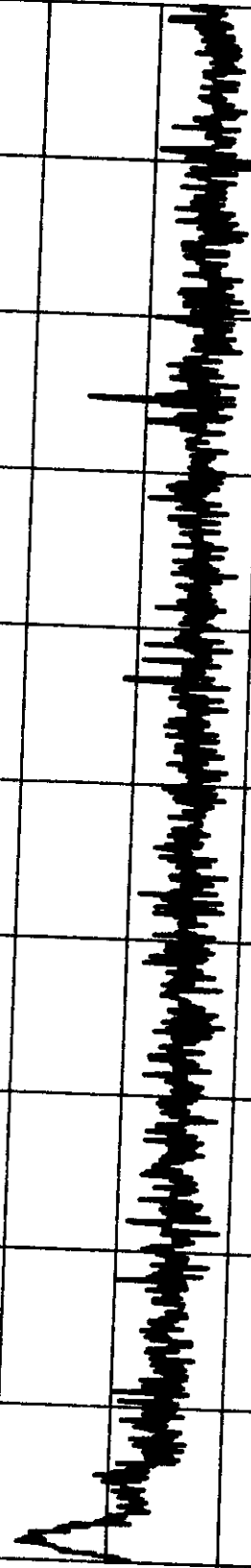
START 400 MHz

RES BW 100 KHz

VBW 300 KHz

STOP 600 MHz

SWP 60.0 msec



CONDUCTED ANTENNA
REF -45.0 dBm ATTN 0 dB

hp

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

SRA 140

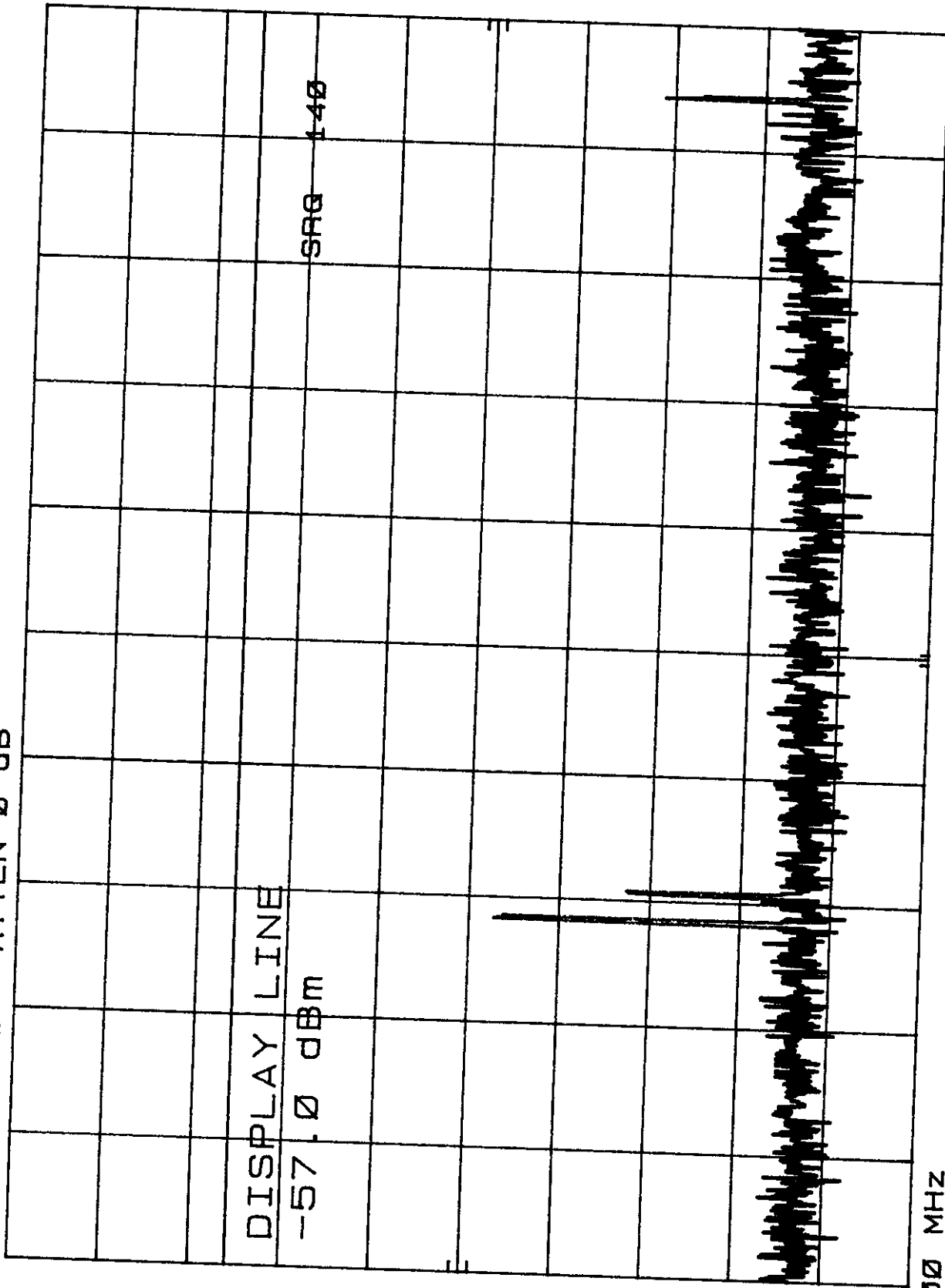
START 600 MHz

RES BW 100 KHz

VBW 300 KHz

STOP 800 MHz

SWP 60.0 msec



CONDUCTED ANTENNA
REF -45.0 dBm ATTEN 0 dB

h_p

5 dB/

DL
-57.0
dBm

DISPLAY LINE

-57.0 dBm

SRR 140

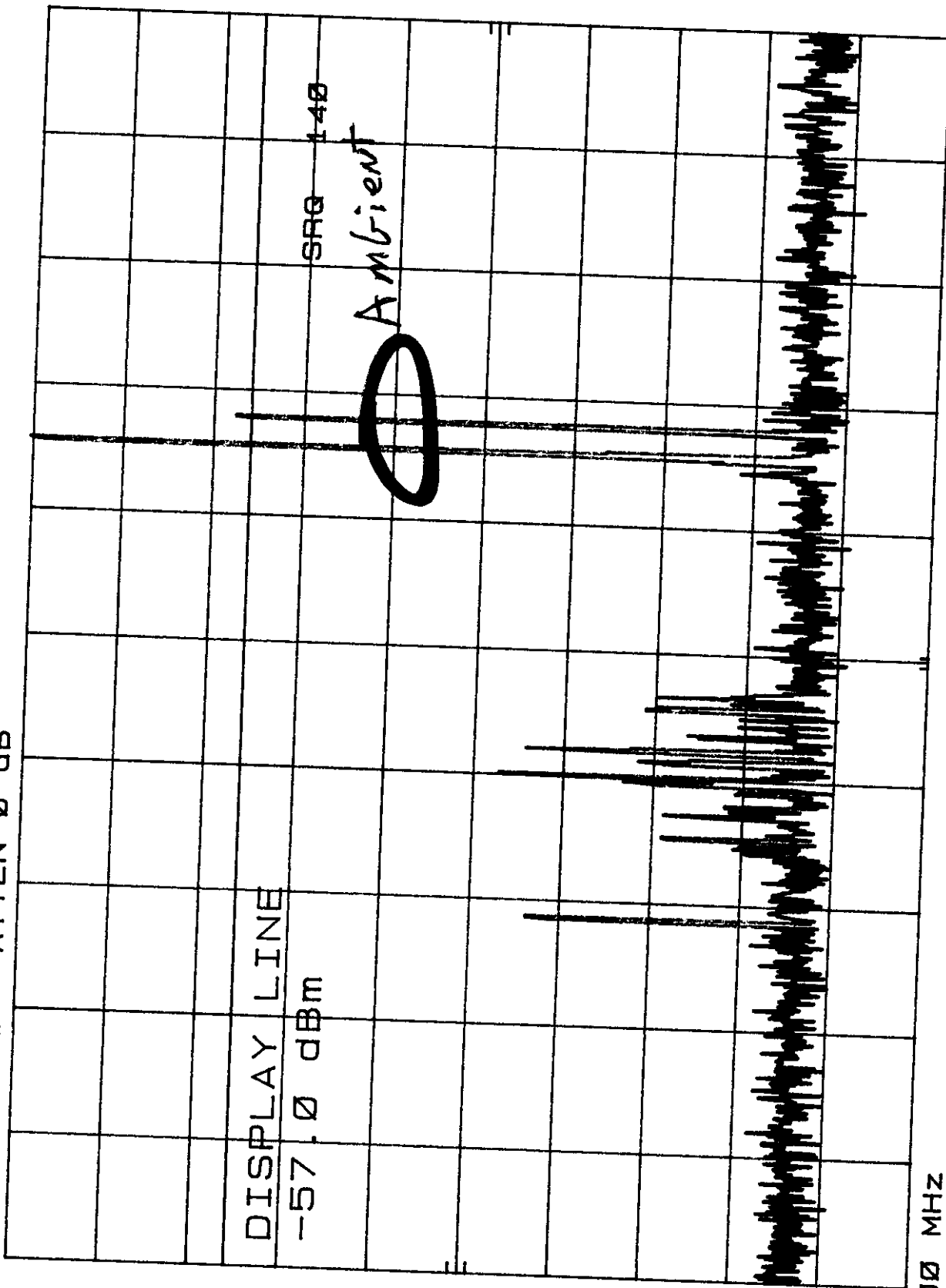
Ambient

START 800 MHz

RES BW 100 KHz

VBW 300 KHz

STOP 1.000 GHz
SWP 60.0 msec



CONDUCTED ANTENNA
REF -35.0 dBm ATTEN 0 dB

HP

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

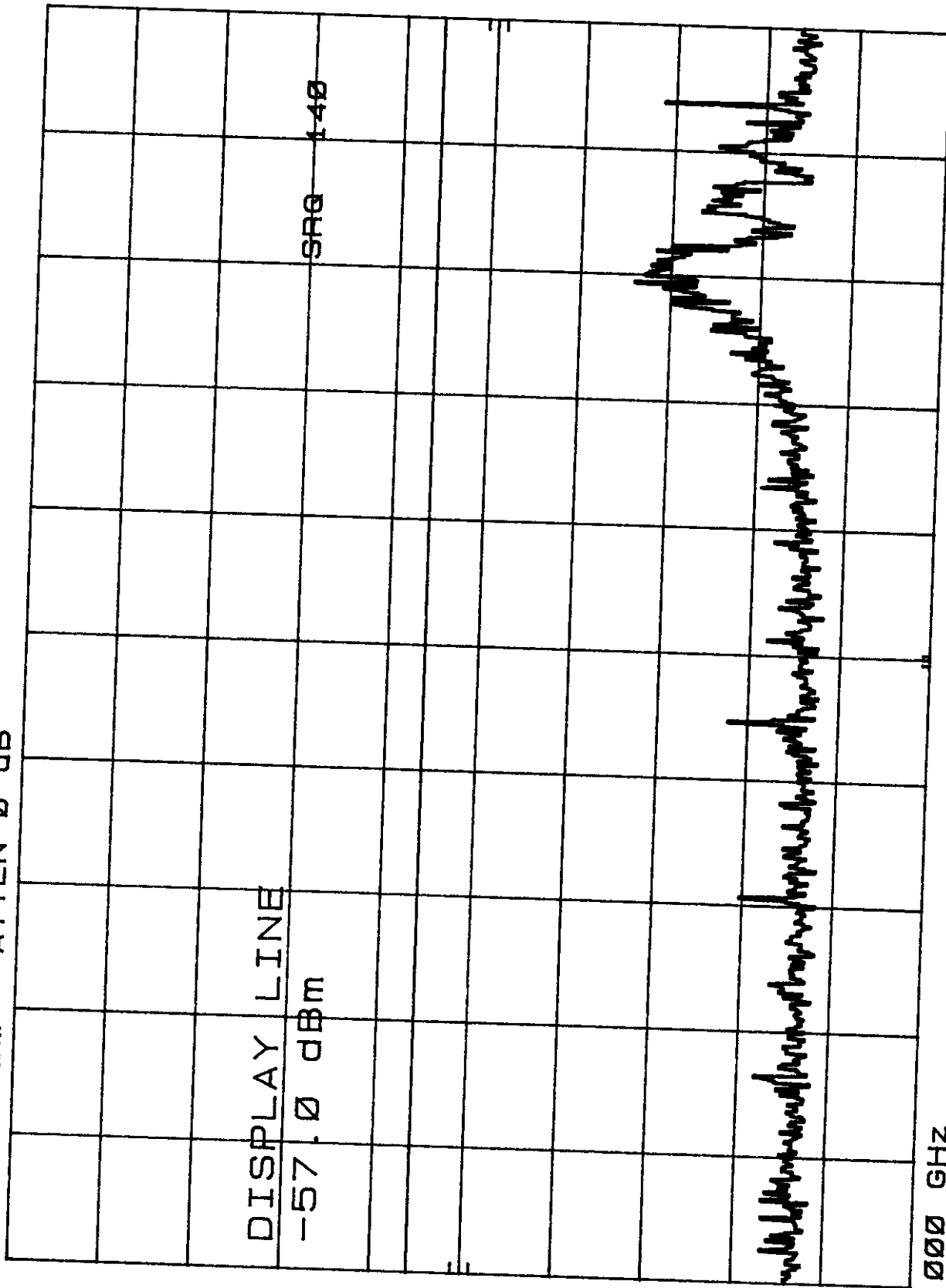
SFG 140

START 1.000 GHZ

RES BW 1 MHz

VBW 3 MHz

STOP 1.200 GHZ
SWP 20.0 msec



CONDUCTED ANTENNA
REF -35.0 dBm ATTN 0 dB

h₀

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

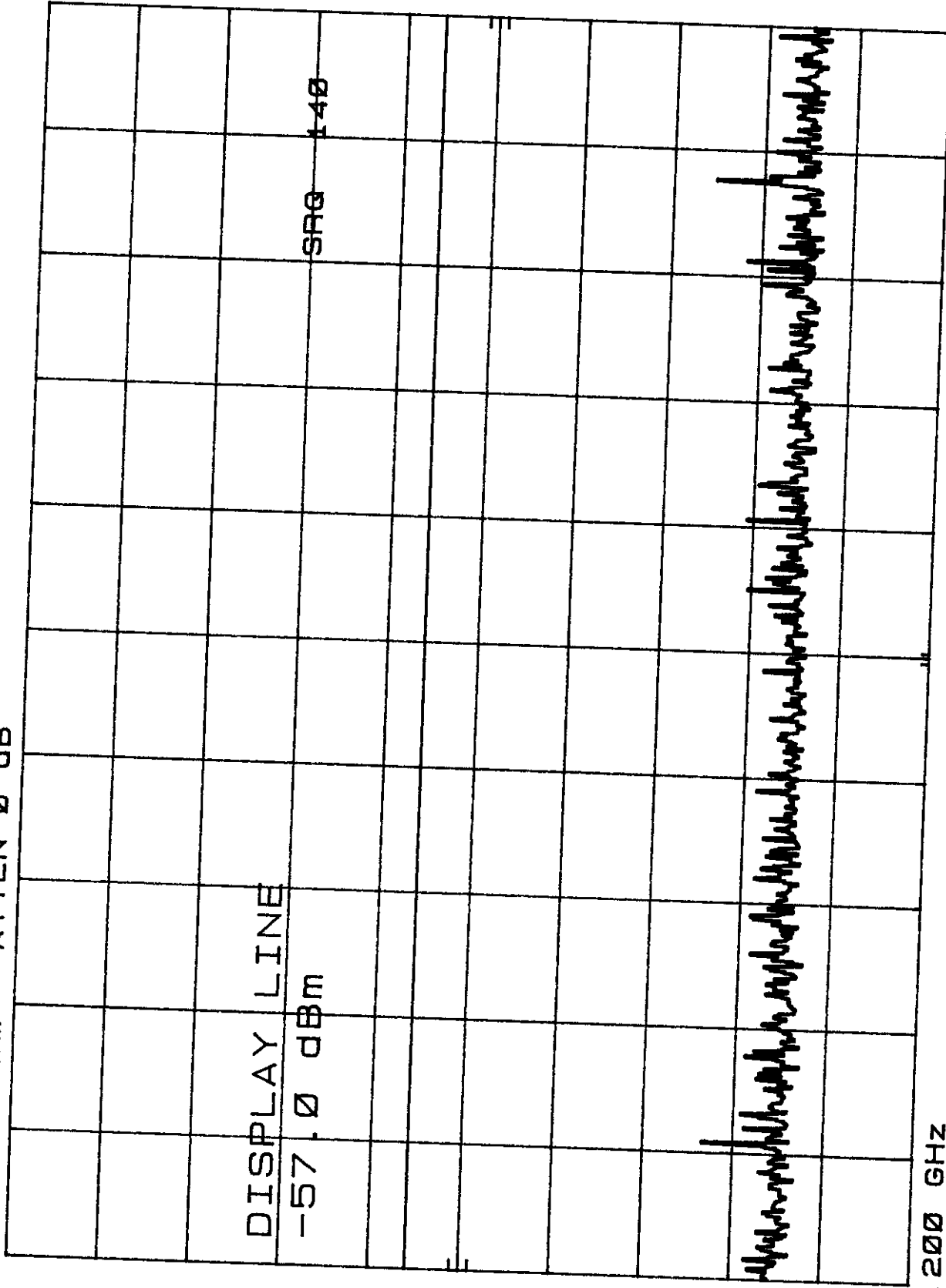
SFG 140

START 1.200 GHZ

RES BW 1 MHz

VBW 3 MHz

STOP 1.400 GHZ
SWP 20.0 msec



CONDUCTED ANTENNA
REF -35.0 dBm ATTN 0 dB

HP

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

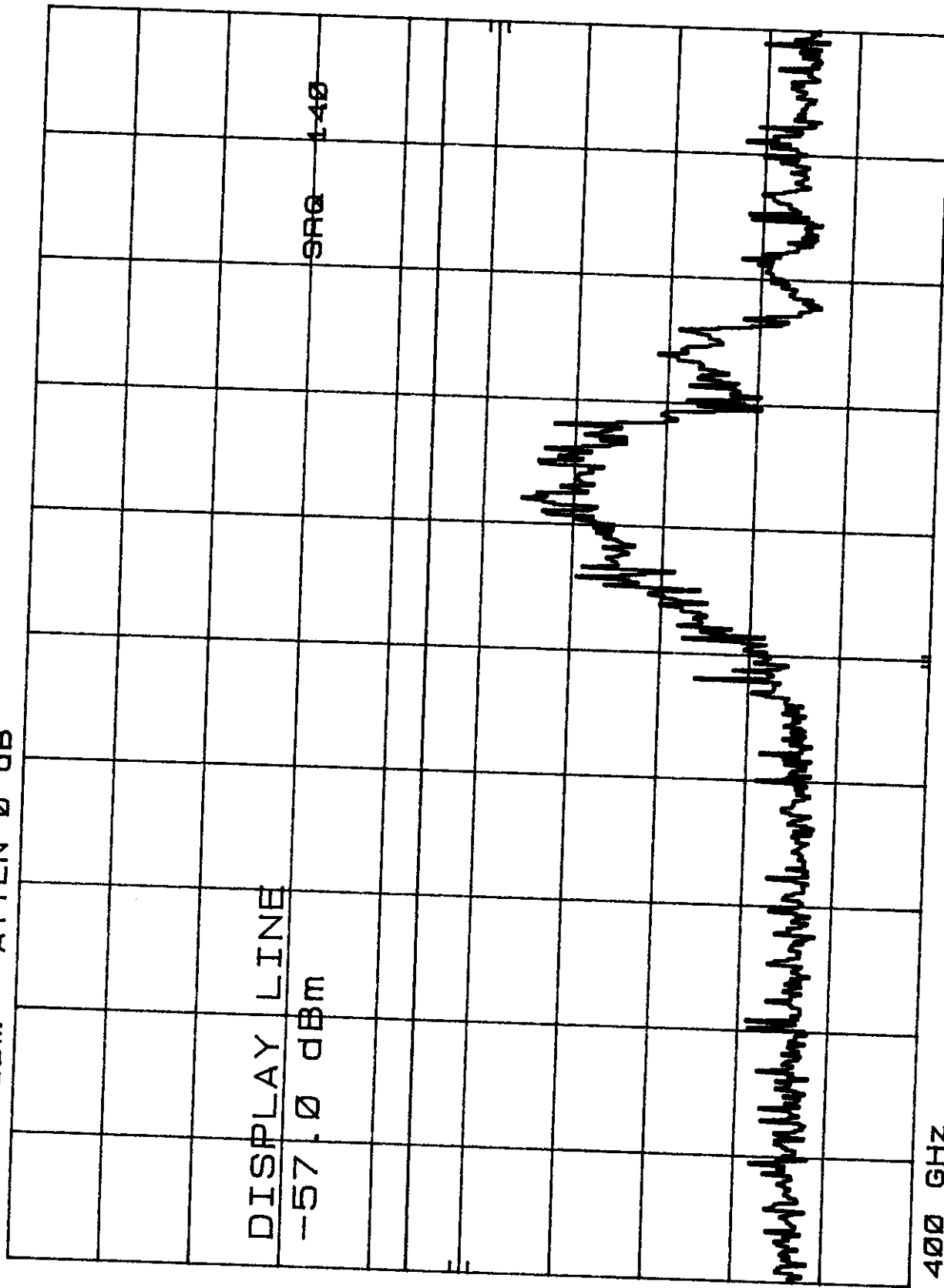
SRQ 140

START 1.400 GHz

RES BW 1 MHz

VBW 3 MHz

STOP 1.600 GHz
SWP 20.0 msec



CONDUCTED ANTENNA
REF -35.0 dBm ATTN 0 dB

hp

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

SRQ 140

START 1.600 GHZ

RES BW 1 MHz

VBW 3 MHz

STOP 1.800 GHZ
SWP 20.0 msec

CONDUCTED ANTENNA
REF -35.0 dBm ATTEN 0 dB

h₁₀

5 dB/

DISPLAY LINE

-57.0 dBm

DL
-57.0
dBm

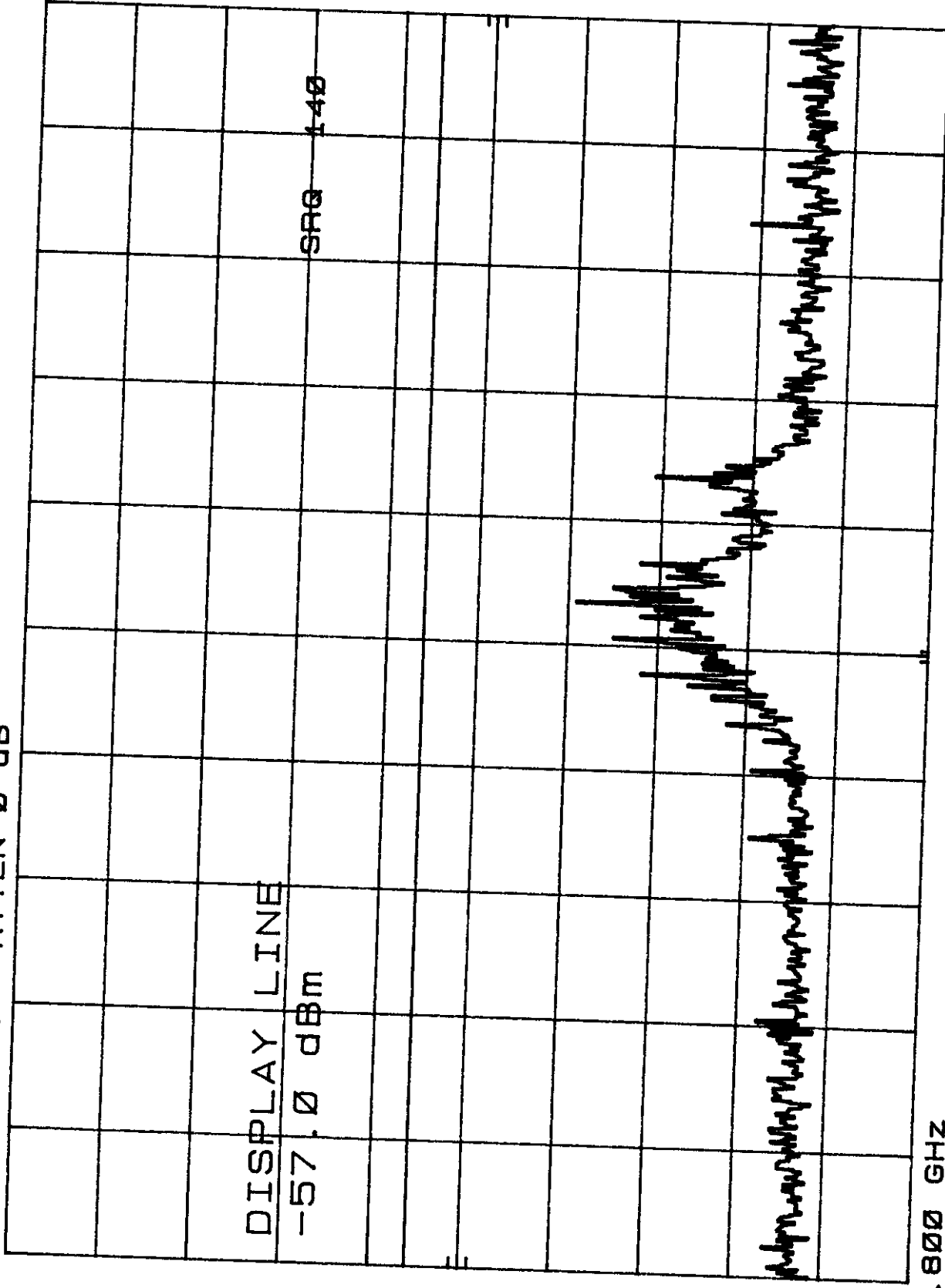
SFG 140

START 1.800 GHZ

RES BW 1 MHz

VBW 3 MHz

STOP 2.000 GHZ
SWP 20.0 msec



CONDUCTED LINE 1 QUASI PEAK
REF 70.8 mV ATTEN 10 dB

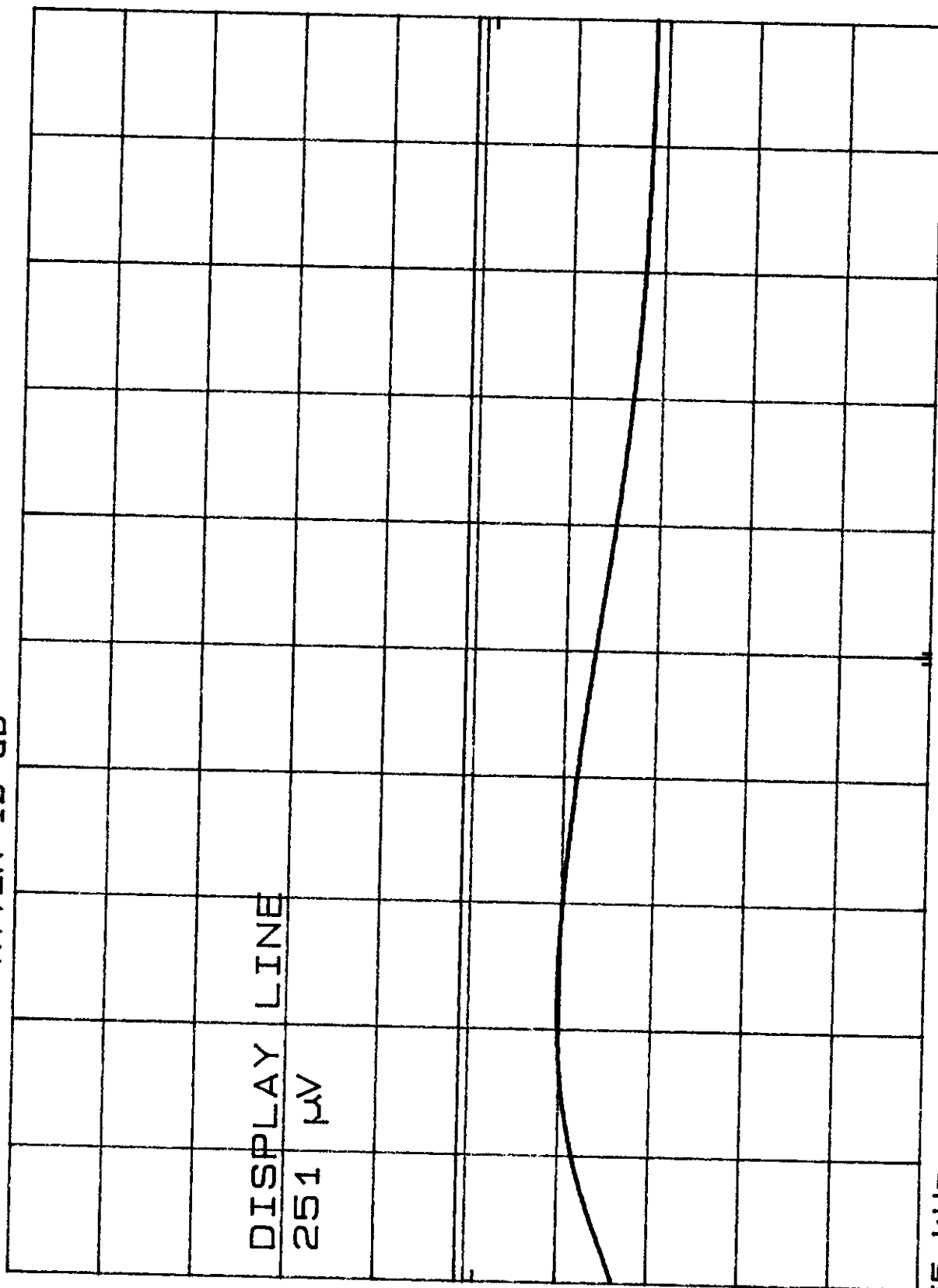
hp

10 dB/

DISPLAY LINE

251 μ V

DL
251
 μ V



START 455 KHz

RES BW 100 KHz

VBW 100 KHz

STOP 10.00 MHz
SWP 1.00 sec

CONDUCTED LINE 1 QUASI PEAK
 REF 70.8 mV ATTEN 10 dB

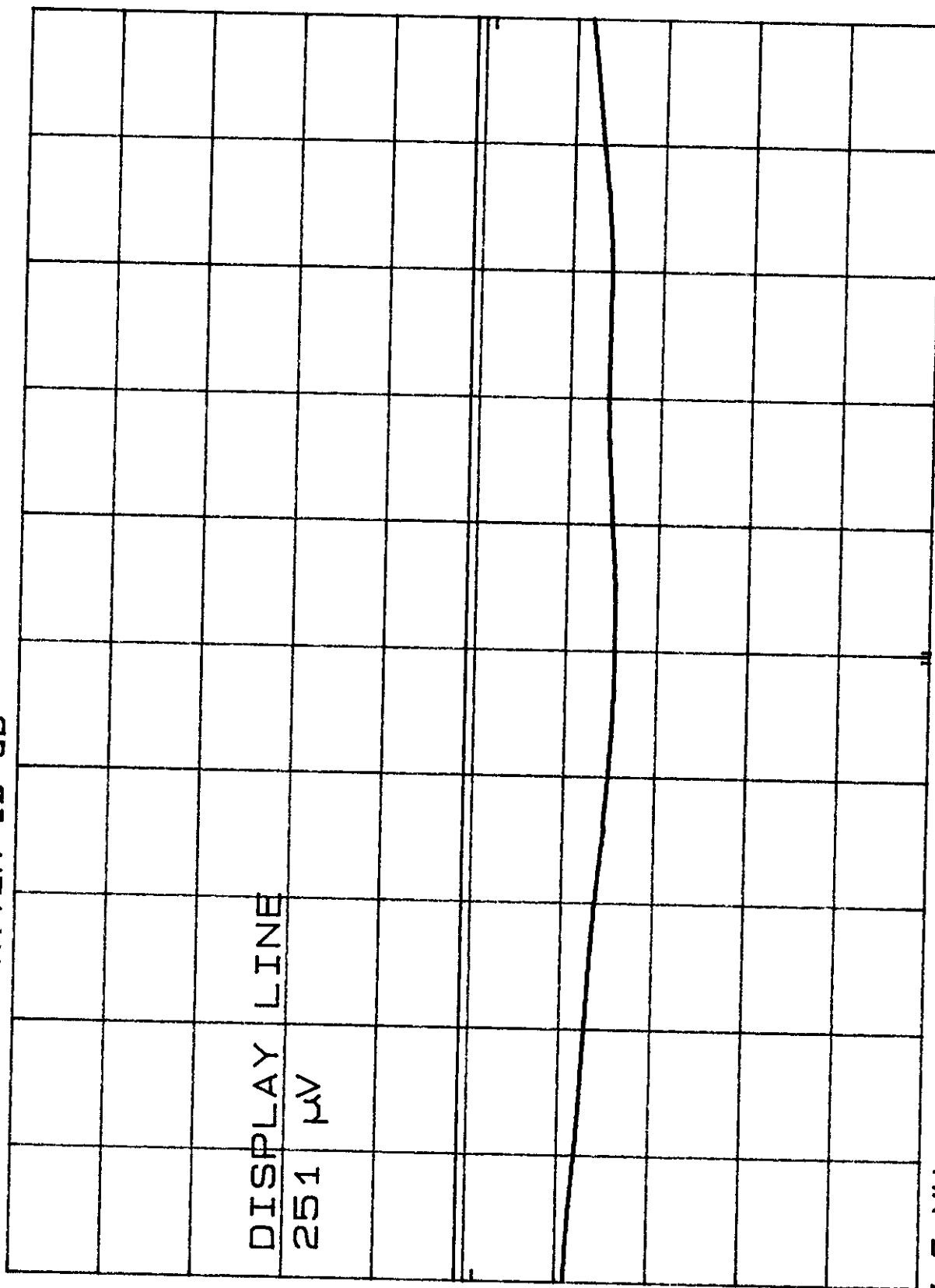
h_p

10 dB/

DL
 251
 μV

DISPLAY LINE

251 μV



START 10.0 MHz

RES BW 100 KHz

VBW 100 KHz

STOP 30.0 MHz
 SWP 1.00 sec

CONDUCTED LINE 2 QUASI PEAK
REF 70.8 mV ATTEN 10 dB

h₀

10 dB/

DISPLAY LINE

251 μ V

DL
251
 μ V

*

START 455 KHZ RES BW 100 KHZ VBW 100 KHZ STOP 10.00 MHz SWP 1.00 sec

CONDUCTED LINE 2 QUASI PEAK
REF 70.8 mV ATTEN 10 dB

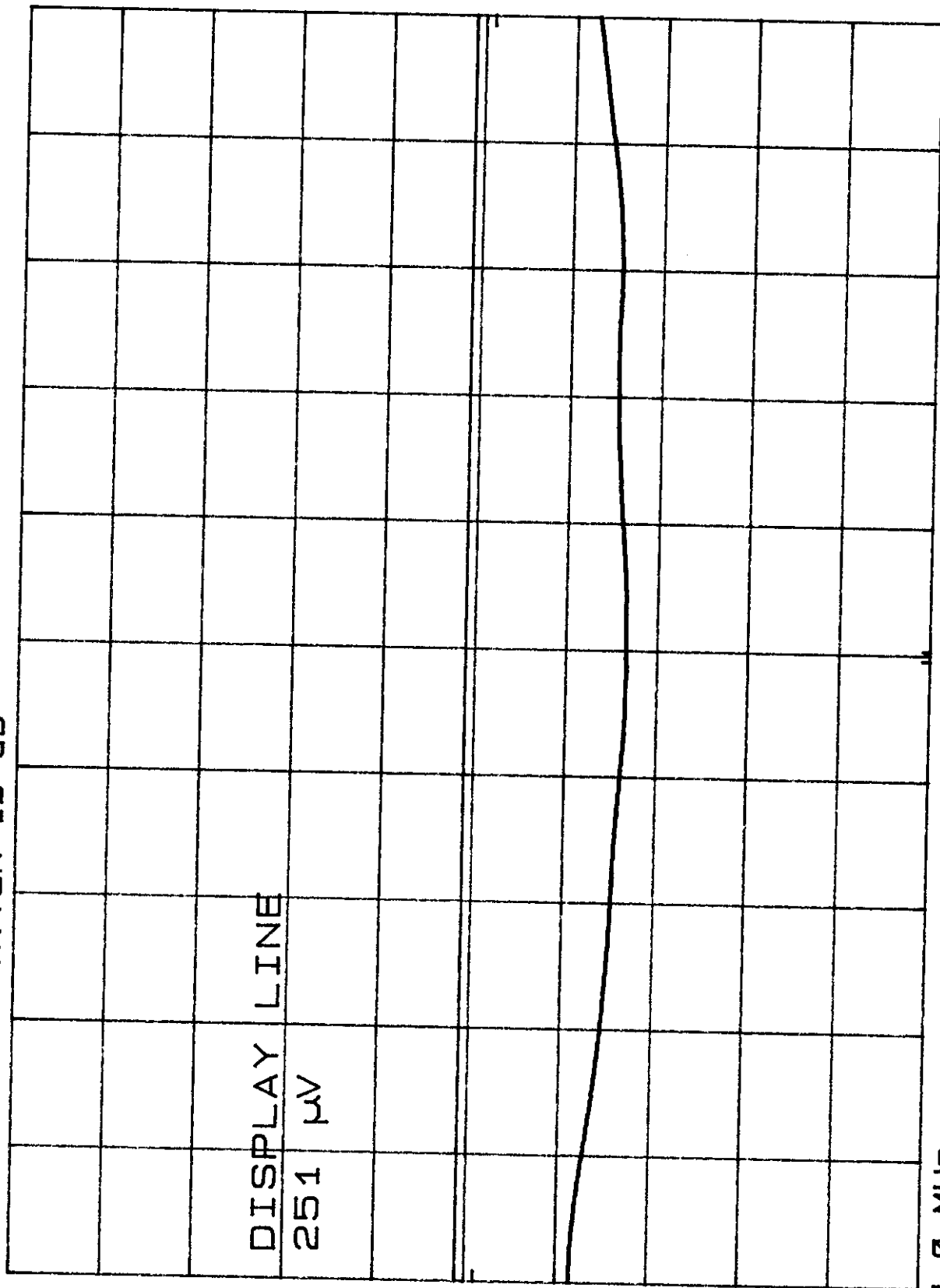
hp

10 dB/

DISPLAY LINE

251 μ V

DL
251
 μ V



START 10.0 MHz

RES BW 100 kHz

VBW 100 kHz

STOP 30.0 MHz
SWP 1.00 sec

NOTES ON RADIATED AND CONDUCTED EMISSIONS

B8Q ACSR4

June. 11, 1999

1) The reported receiver radiated meter readings are peak for frequencies under 1 GHz. For frequencies above 1 GHz average levels were obtained. The average levels were obtained using the average detector function on the spectrum analyzer. The averaging of each point depends upon the number of samples already taken and last average amplitude.

$$Y_n = \frac{n-1}{n} * Y_{(n-1)} + \frac{1}{n} Y_n$$

where Y_n latest average amplitude value in display units

n current sample number

$Y_{(n-1)}$ last average amplitude in trace memory

Y_n new amplitude entry from analyzer

The new amplitude value Y_n is weighted more heavily by the last average amplitude Y_{n-1} than the new amplitude entry, Y_n .

When n equals the limit set, the last average amplitude is gradually replaced with new data. Thus, the average will follow a slowly changing signal response, particularly if the sample limit is small.

2) The readings shown with an asterisk (*) represent the ambient noise floor. They are the lowest measurements possible with the equipment available at the given frequency. This level is below the allowed limit in each case.

3) The spectrum was scanned for radiated emissions from 1 MHz to 2 GHz.

4) Sample calculation: $\mu\text{V/m} = 10^{(107 + M + AF + CF - G) / 20}$

$$M = -28.0$$

$$AF = 2.0 \quad \mu\text{V/m} = 631$$

$$CF = 2.0$$

$$G = 27.0$$

5) AC Power-Conducted measurements were taken using the quasi-peak detector and the LISN.

6) A CW signal at 390 MHz was utilized to cohere the receiver during all testing.

7) All measurements were made using ANSI 63.4-1992.