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TECHNICAL REPORT - FCC Part 2.983 and Part 95

FCC REFERENCE.

2.983 (a) Applicant

Clarion Co. Ltd.  
50 Kamitoda  
Toda Saitama  
JAPAN 335-8511

Manufacturer

Tochigi Clarion Electronics Co., Ltd.  
1824 Oaza-Motegi, Motegi Haga-gun, Tochigi  
Japan 321-3531

(b) FCC Identifier

AX292AJC215R

- (c) Quantity production is planned. Clarion Co., Ltd. is planning to manufacturer about 500 units per month for both Yamaha and Honda.

95.645	<u>Control Accessibility:</u>	No user control can be adjusted to result in violation of the rules.
95.647	<u>FRS Unit and R/C Transmitter Antennas:</u>	Device does not transmit in 72-76 MHz band.
95.649	<u>Power Capability:</u>	There are no provisions for exceeding power level.
95.651	<u>Crystal Control Required:</u>	Product is crystal controlled.
95.653	<u>Instructions and Warnings:</u>	User manual is included as Exhibit C. There are no adjustments or parts replacement that could result in a violation of the rules.
95.655	<u>Frequency Capability:</u>	Transmitter frequencies are listed in 95.625 and there are no external controls to change these frequencies.
95.667	<u>CB Transmitter Power:</u>	4W
95.669	<u>External Controls:</u>	External controls are shown in user's manual Exhibit C.
95.671	<u>Serial Number:</u>	Serial Number is engraved on the chassis.
95.673	<u>Copy of Rules:</u>	Copy of rules will be furnished with each unit.

EXHIBIT E

[FCC Ref. 2.983(e)]

“Report of Measurements”

Exhibit E(1) to E(10)

*MARSTECH LIMITED*

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EXHIBIT E(1)

DEVICE MEASURED

[FCC Ref. 2.983(e)]

APPLICANT:

CLARION CO. LTD.  
50 Kamitoda  
Toda Saitama  
JAPAN 335-8511

MANUFACTURER:

Tochigi Clarion Electronics Co., Ltd.  
1824 Oaza-Motegi, Motegi Haga-gun, Tochigi  
JAPAN 321-3531

FCC IDENTIFIER:

AX292AJC215R

TRADE NAME:

YAMAHA

MODEL NUMBER:

JC-215R

Marstech Limited  
11 Kelfield Street  
Etobicoke, Ontario  
M9W 5A1 CANADA

TECHNICIANS:  
Jim Sims - Com-Serve Corp.  
Ed Chang - Marstech Ltd.

*for* *Ed. Chang*  
Robert G. Marshall, P. Eng.

Date: *13 / Oct. / 1998.*

EXHIBIT E(2)

TEST EQUIPMENT LIST AND TEST FACILITIES

[FCC Ref. 2.948]

Test Site & Equipment

Electrohome Electronics Ltd., 809 Wellington St. N., Kitchener, Ontario, Canada

Description of the measurement facility is on file with the Commission.

Refer Exhibit E(2)-2 attached.

and

Marstech Limited

Spectrum Analyzer Anritsu Model MS2601A

# FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road  
Columbia, MD 21046  
Telephone: 301-725-1585 (ext-218)  
Facsimile: 301-344-2050

September 23, 1997

IN REPLY REFER TO  
31040/SIT  
1300F2

Electrohome Electronics Ltd  
809 Wellington Street, North  
Kitchener, Ontario N2G 4J6, Canada

Attention: Gerry Gallagher

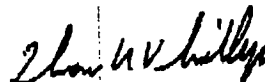
Re: Measurement facility located at Roseville  
(3 meter site)

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 or 18 of the Commission's Rules. Our list will also indicate that the facility complies with the radiated and AC line conducted test site criteria in ANSI C63.4-1992. Please note that this filing must be updated for any changes made to the facility, and at least every three years the data on file must be certified as current.

Per your request, the above mentioned facility has been also added to our list of those who perform these measurement services for the public on a fee basis. This list is published periodically and is also available on the Laboratory's Public Access Link as described in the enclosed Public Notice.

Sincerely,



Thomas W. Phillips  
Electronics Engineer  
Customer Service Branch

EXHIBIT E(3)

**TEST SUMMARY**

2.985 [95.639]	RF Power Output	Exhibit E(4)-1 to -4
2.987 [95.637]	Modulation Characteristics	Exhibit E(5)-1 and -3
2.989 [95.633]	Occupied Bandwidth	Exhibit E(6)-1 to -10
2.991 [95.635]	Spurious Emissions at Antenna Terminals	Exhibit E(7)-1
2.993 [95.635]	Field Strength of Spurious Radiation	Exhibit E(8)-1 to -5
2.995 [95.625]	Frequency Stability	Exhibit E(9)-1 to -3
	Overmodulation Transient Response	Exhibit E(10)-1 to -3

EXHIBIT E(4)

CFR 47 Part 2.

2.985 RF Power Output [95.639]

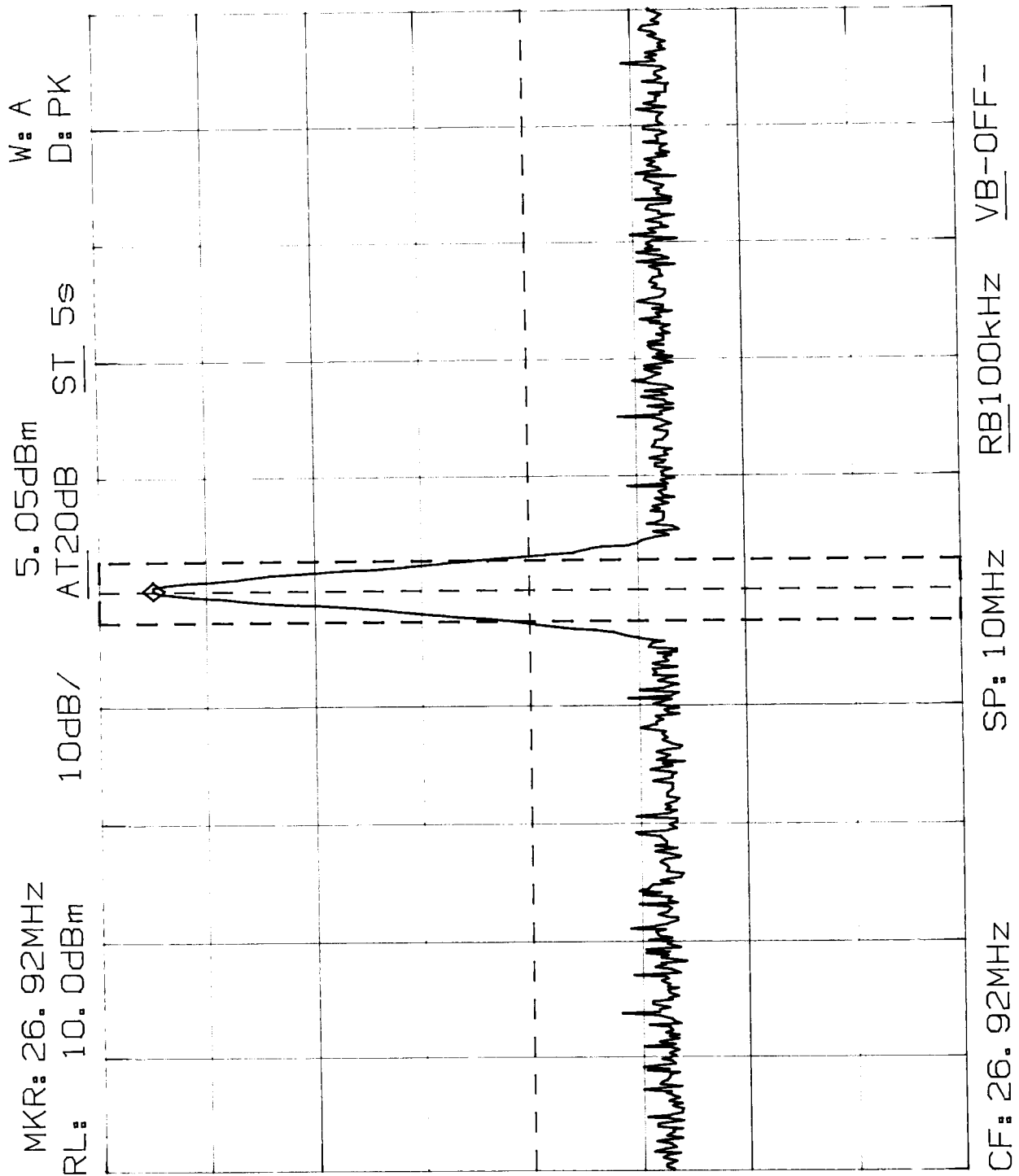
The CB transmitter was operated without modulation and was terminated into a resistive load (50 dB/20 Watt) having an equal impedance to that of the transmitter output stage. A portion of the output power was delivered to a calibrated Spectrum Analyzer with a 30 dB pad. The output (carrier) power was measured and recorded for channels #1, 20 and 40. The CB radio was operating pursuant to the manufacturers instructions.

Channel No.	Frequency (MHz)	Power (dBm)	With 30dB pad (dBm)	Power (W)
2	26.92	5.050	35.050	3.199
20	27.16	4.990	34.990	3.155
40	27.36	4.920	34.920	3.105

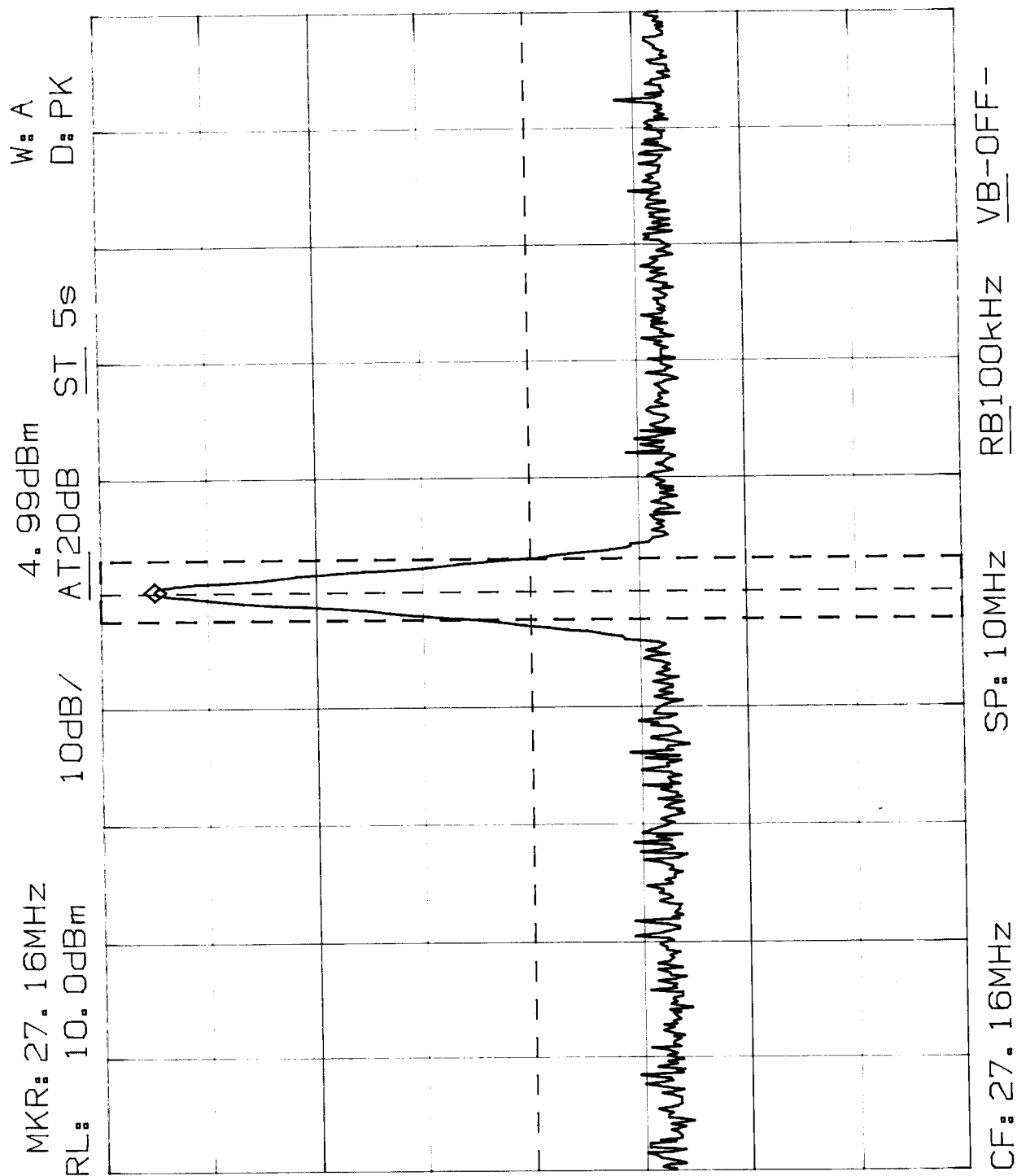
No components of the emission spectrum exceed the limits.



CHANNEL 2, 30dB PAD, TRANSMIT  
UNMODULATED CARRIER



CHANNEL 20, 30dB PAD, TRANSMIT  
UNMODULATED CARRIER



CHANNEL 40, 30dB PAD, TRANSMIT  
UNMODULATED CARRIER

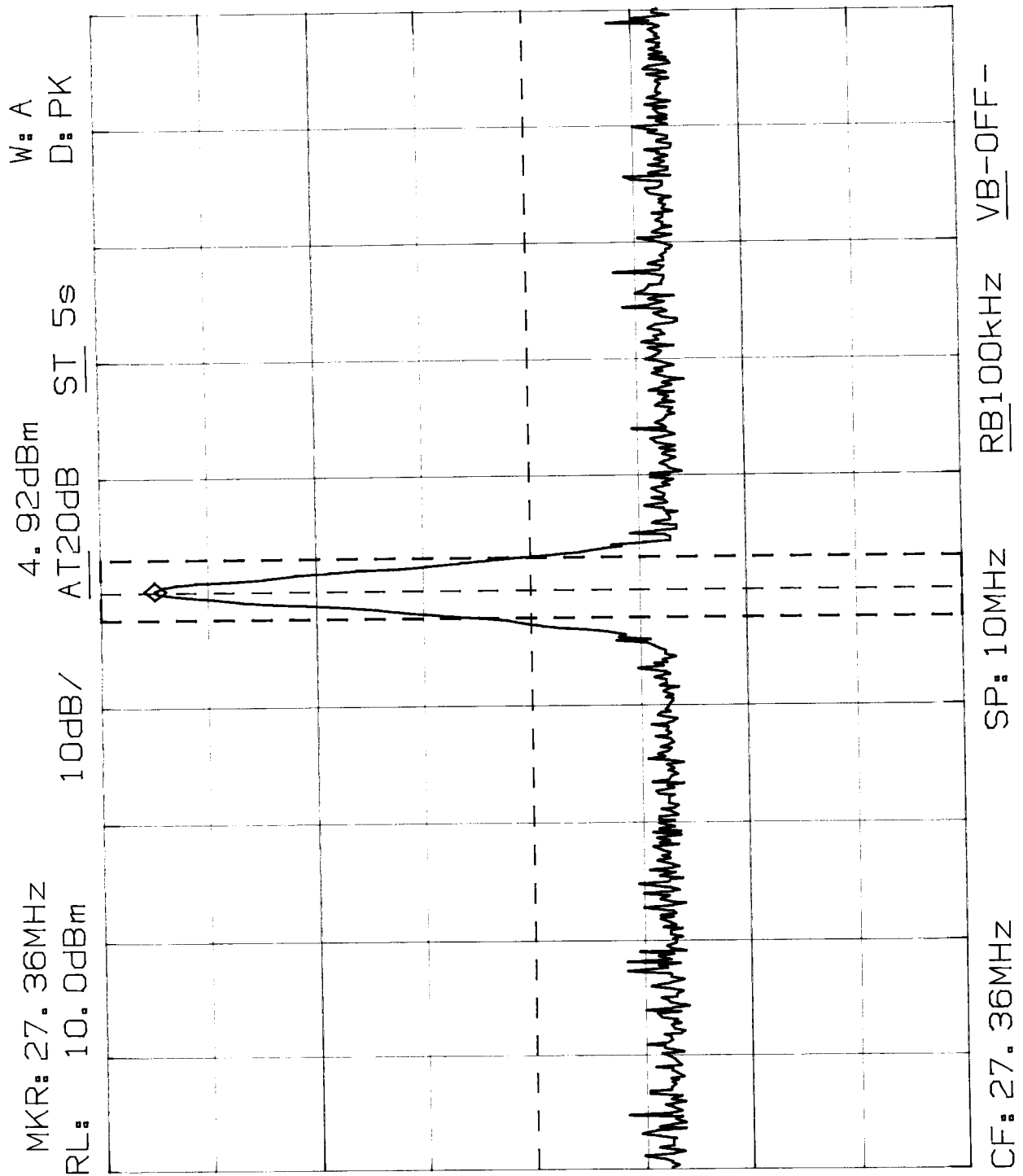


EXHIBIT E(5)

2.987 [95.637] Modulation Characteristics

The CB transmitter was operated with 2,500 Hz modulation at an audio input level which created varying levels of modulation and was terminated into a resistive load having equal impedance to that of the transmitter output stage. The audio input voltage was set at a level which created approximately 12.5% modulation and was increased in 6 dB increments to a point well above 100% modulation. A portion of the output power was delivered to a calibrated spectrum analyzer and the resulting modulation levels were observed and recorded. Both the upper and the lower sidebands were measured for each modulation "step" and the test was run at four frequencies (700, 1000, 1500 and 2500 Hz). Curves were drawn representing each sideband at all levels and clearly demonstrating the limiting action of the transmitter modulator. The CB radio was operating pursuant to the manufacturers instructions.

**MARSTECH LIMITED**

**MODULATION LIMITING DATA**

**Channel 20**

**Positive**

Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	90% (dBm)	94% (dBm)
700	-59.8	-54	-50.3	-48	-45.8	-44.5	-43.1	-41.8	-40.6	-39.3
Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	90% (dBm)	95% (dBm)
1000	-61.9	-55.7	-52.9	-50.2	-48	-46.5	-45.7	-43.7	-42.6	-39.5
Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	90% (dBm)	96% (dBm)
1500	-62.2	-56.1	-52.5	-50.4	-48.3	-46.6	-45.3	-44.1	-43.2	-42.3
Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	90% (dBm)	94% (dBm)
2500	-60.2	-54.2	-50.8	-48.6	-46.6	-45	-43.6	-42.4	-41.4	-40.3

**Negative**

Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	89% (dBm)	
700	-59.5	-55.1	-50.8	-48.4	-46.2	-44.6	-43.3	-41.8	-39.8	
Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	90% (dBm)	
1000	-61.8	-55.4	-52.3	-50.1	-48.1	-46.3	-44.9	-43.7	-42.6	
Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	90% (dBm)	
1500	-61.9	-55.8	-52.3	-50	-48	-46.6	-45.1	-43.2	-42.2	
Freq. (Hz)	10% (dBm)	20% (dBm)	30% (dBm)	40% (dBm)	50% (dBm)	60% (dBm)	70% (dBm)	80% (dBm)	86% (dBm)	
2500	-60.4	-54.3	-51.1	-48.4	-46.4	-44.6	-43.3	-41.7	-40.9	

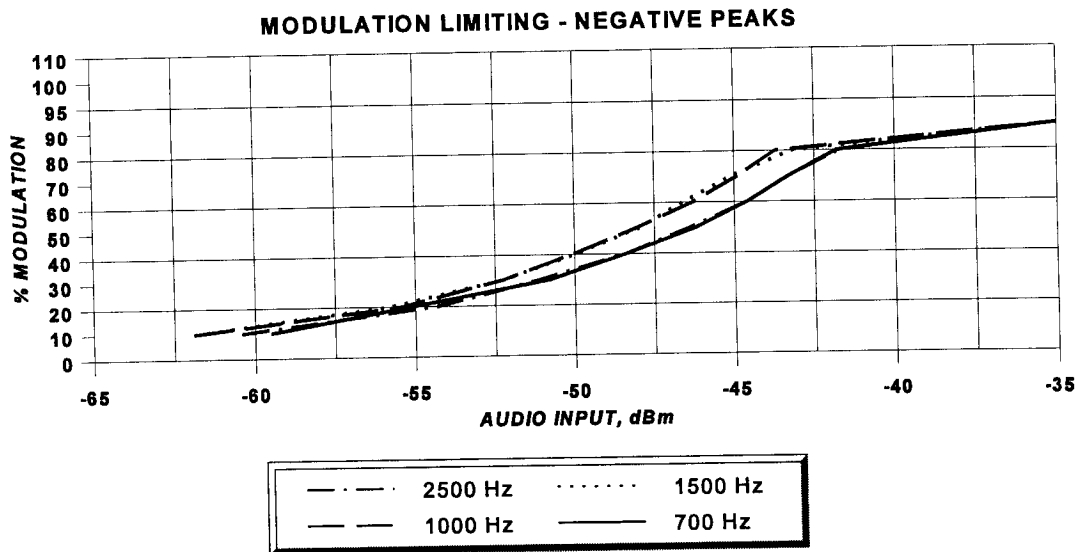
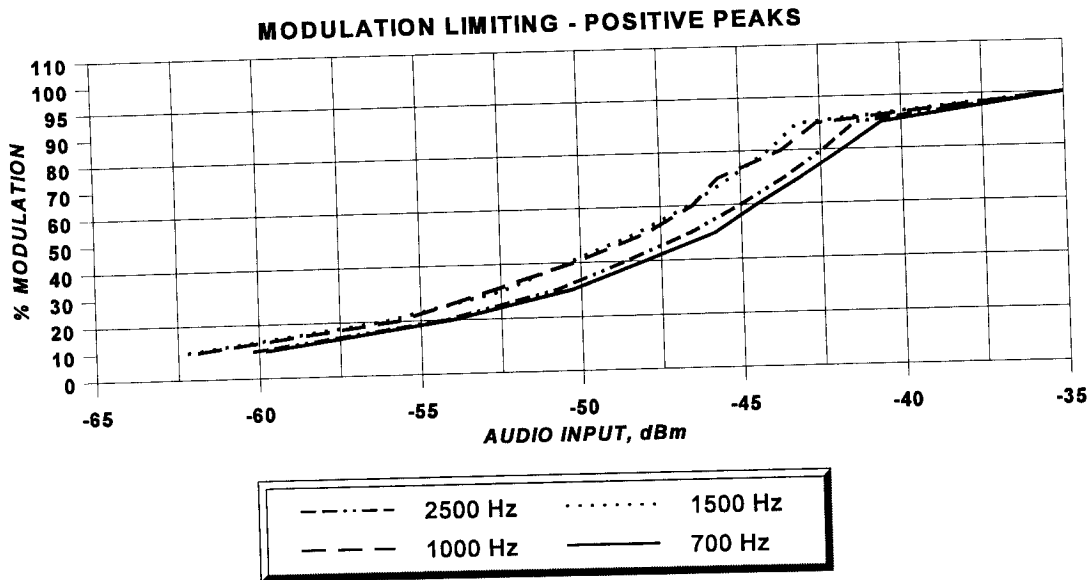
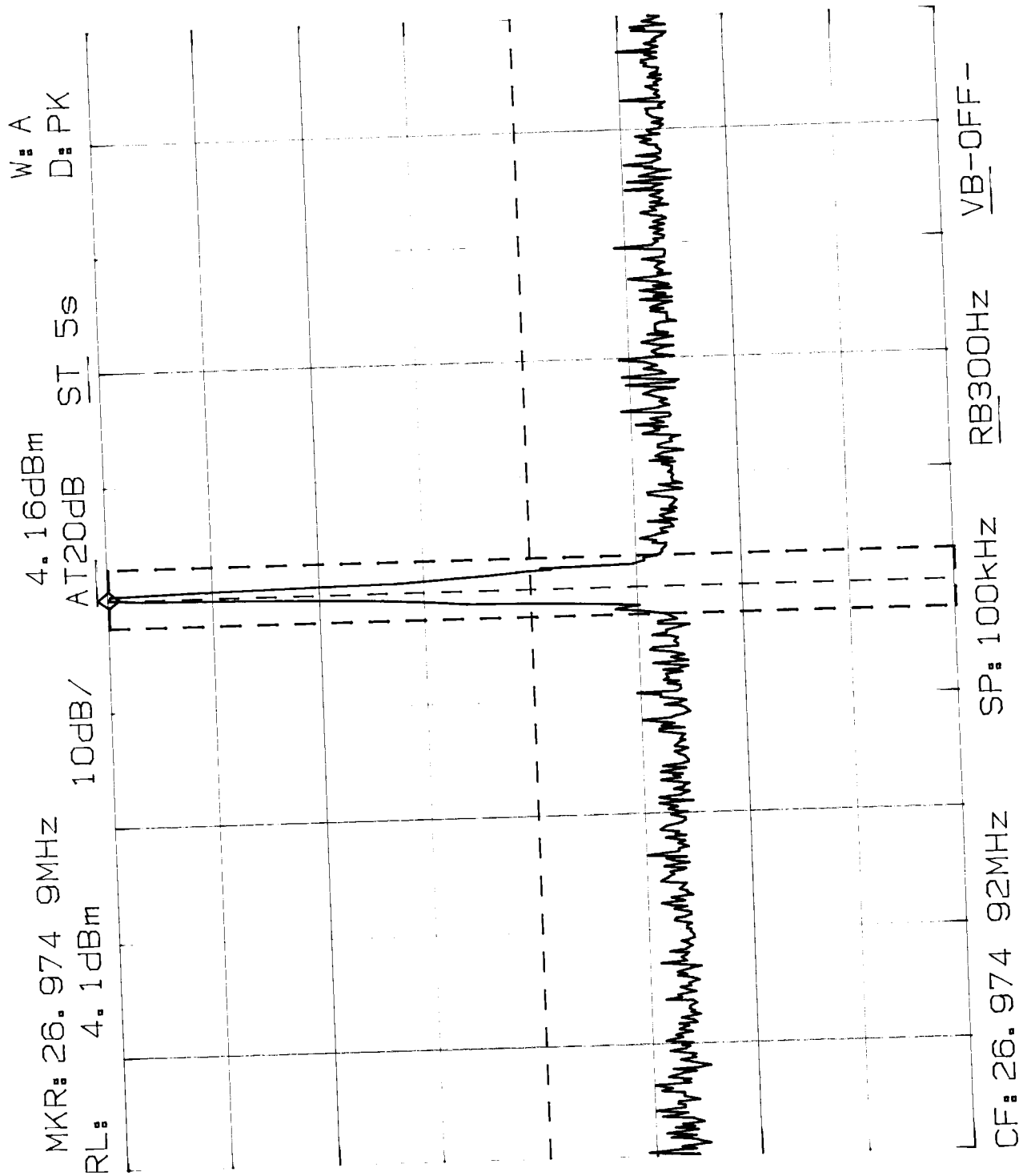


EXHIBIT E(6)

2.989 Occupied Bandwidth [95.633]

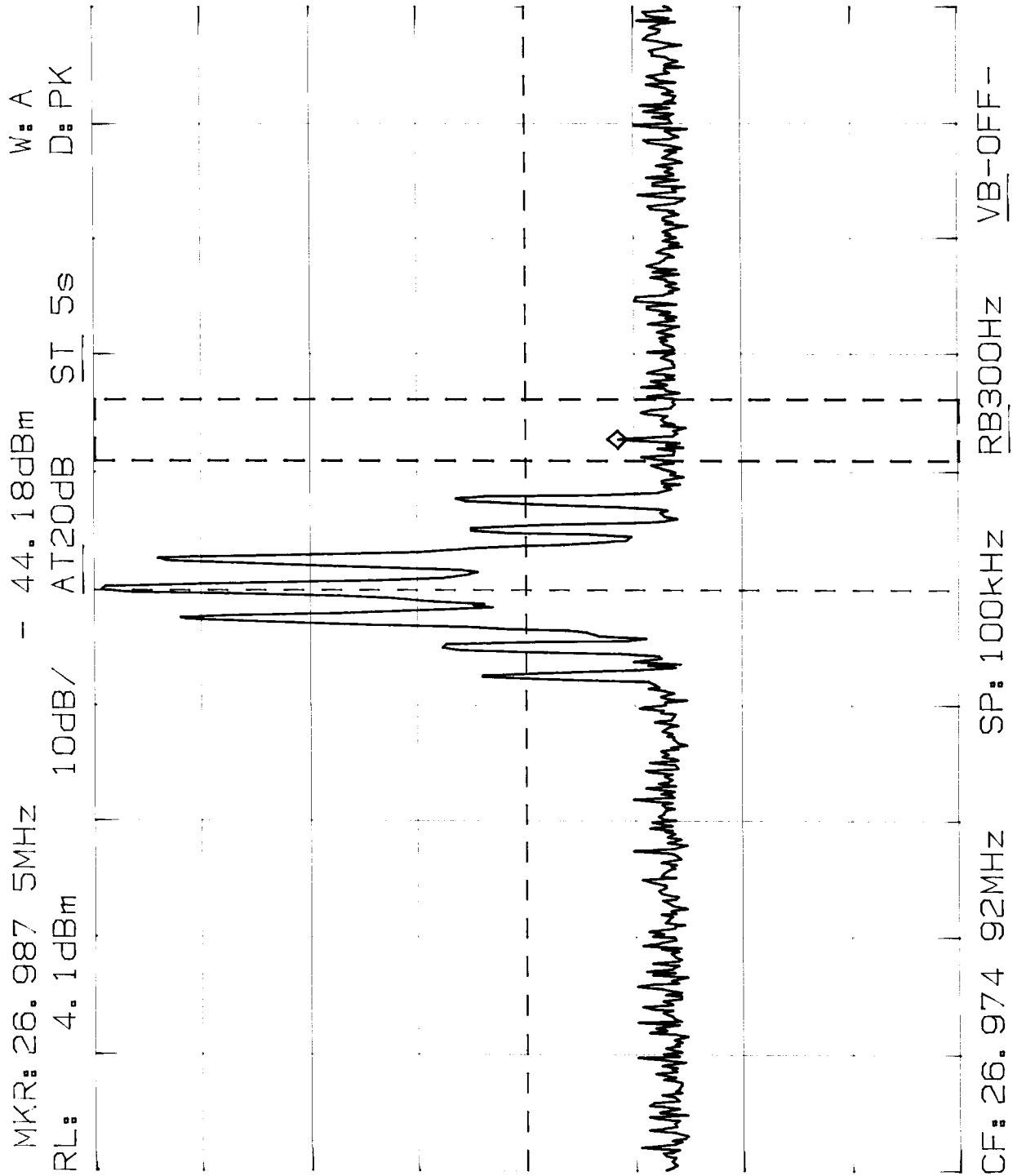
- c) Radiotelephone transmitters equipped with a device to limit modulation were modulated as follows:
  - 1) Other than single sideband or independent sideband transmitters when modulated by a 2500 Hz tone at an input level 16dB greater than that necessary to produce 50 percent modulation. The input level was established at the frequency of maximum response of the audio modulating circuit.

# CHANNEL 2, 30dB PAD UNMODULATED CARRIER

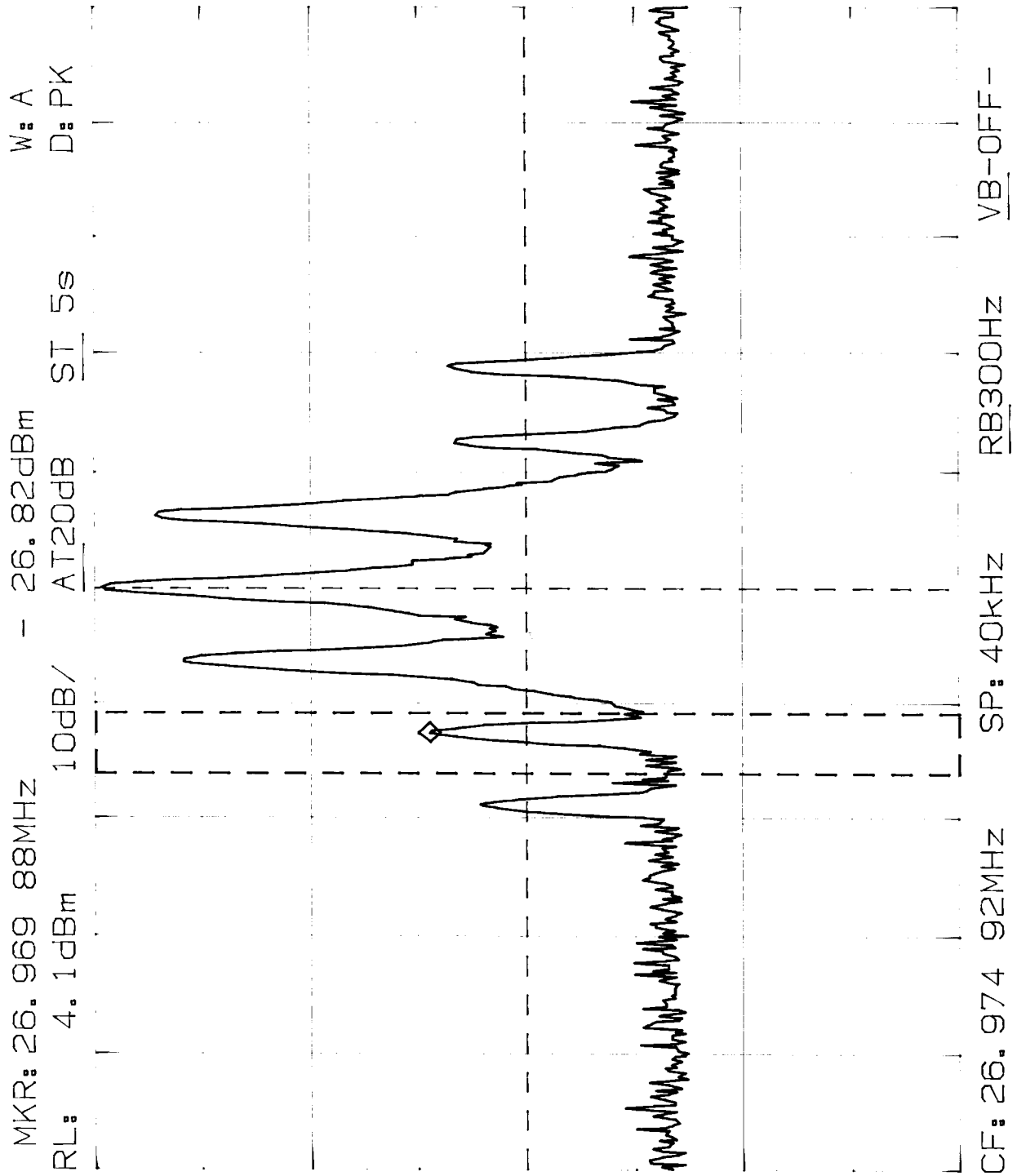




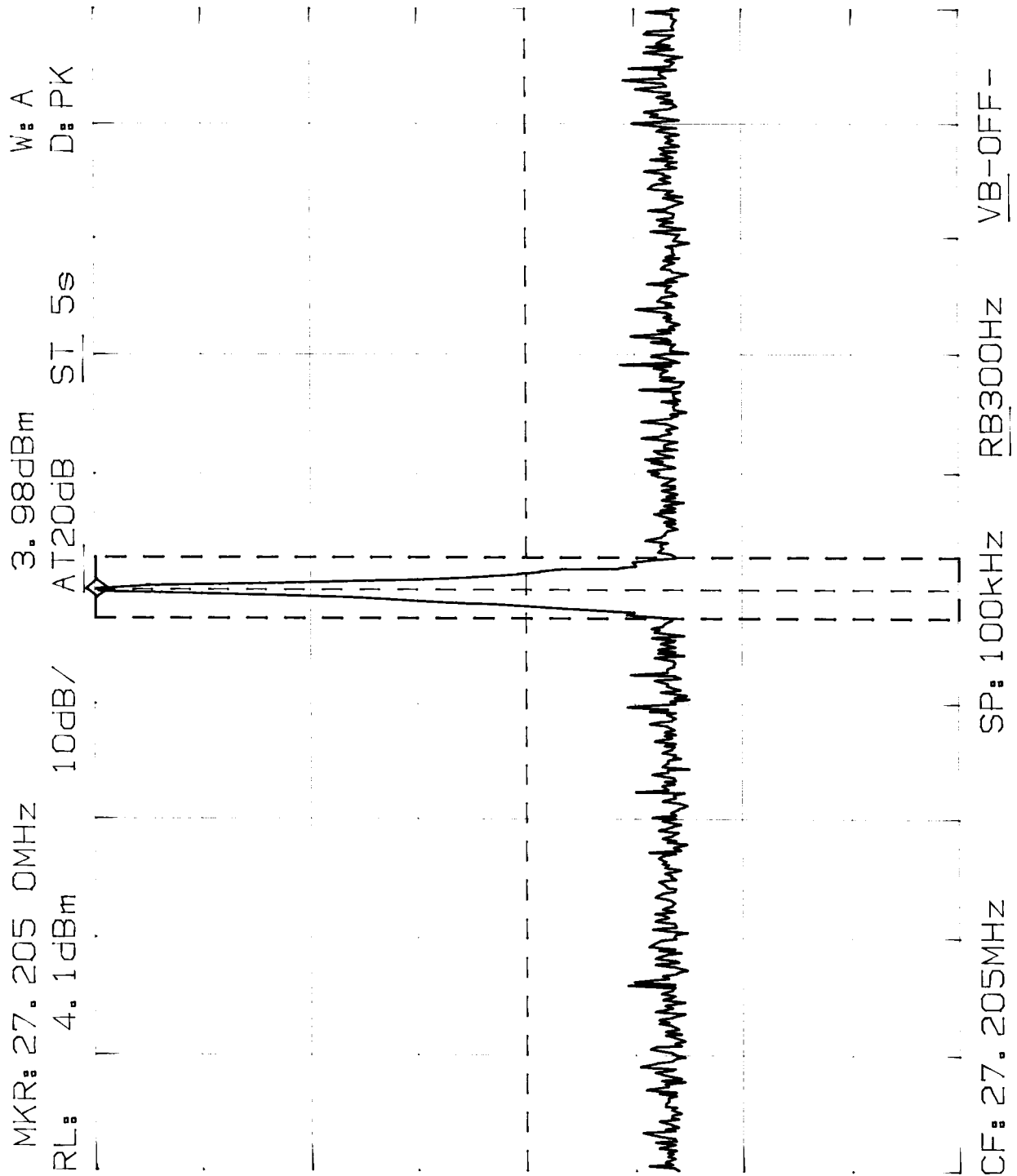
CHANNEL 2, 30dB PAD  
2500Hz SIGNAL  
16dB ABOVE 50% MODULATION



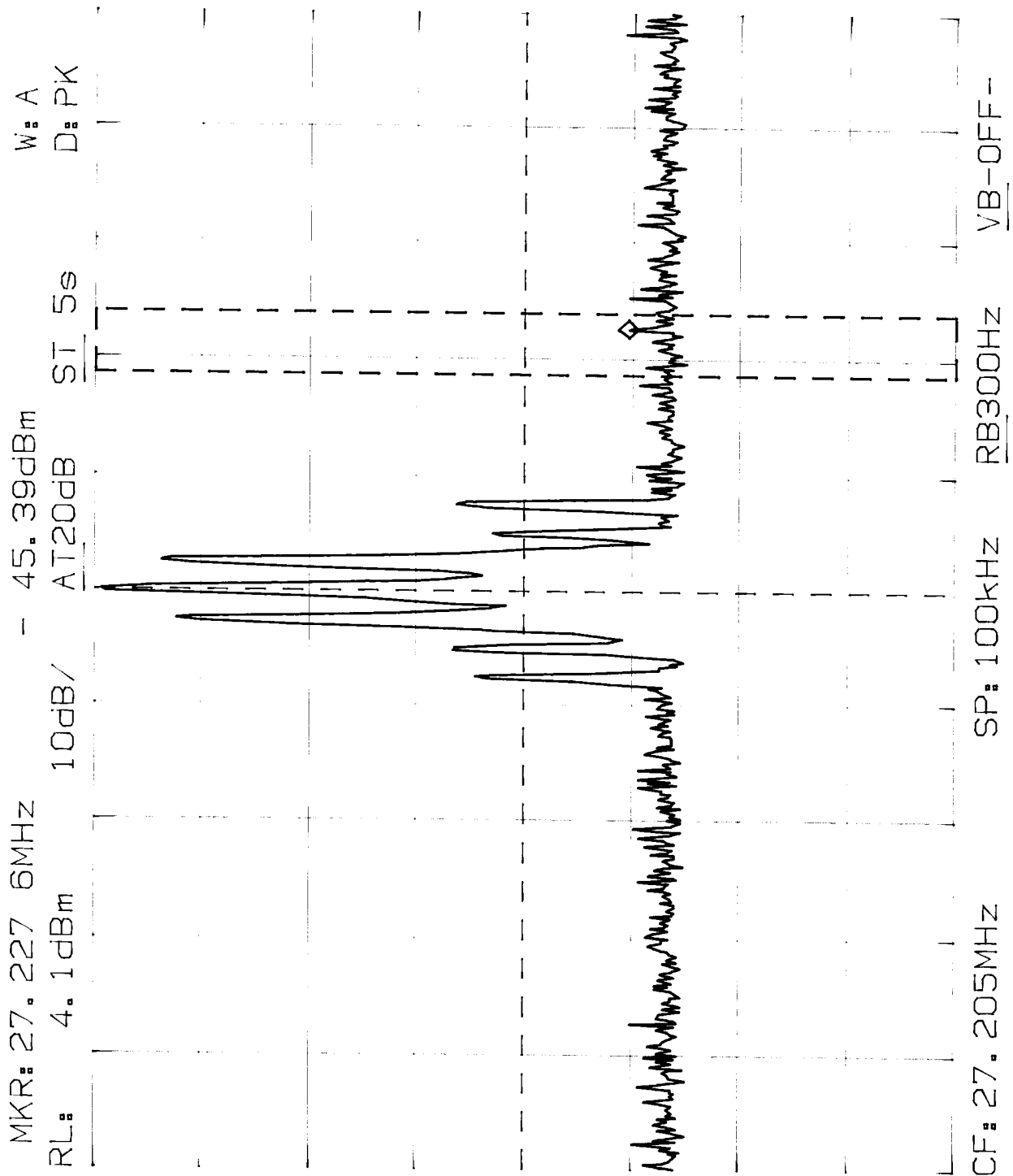
CHANNEL 2, 30dB PAD  
 2500Hz SIGNAL  
 16dB ABOVE 50% MODULATION



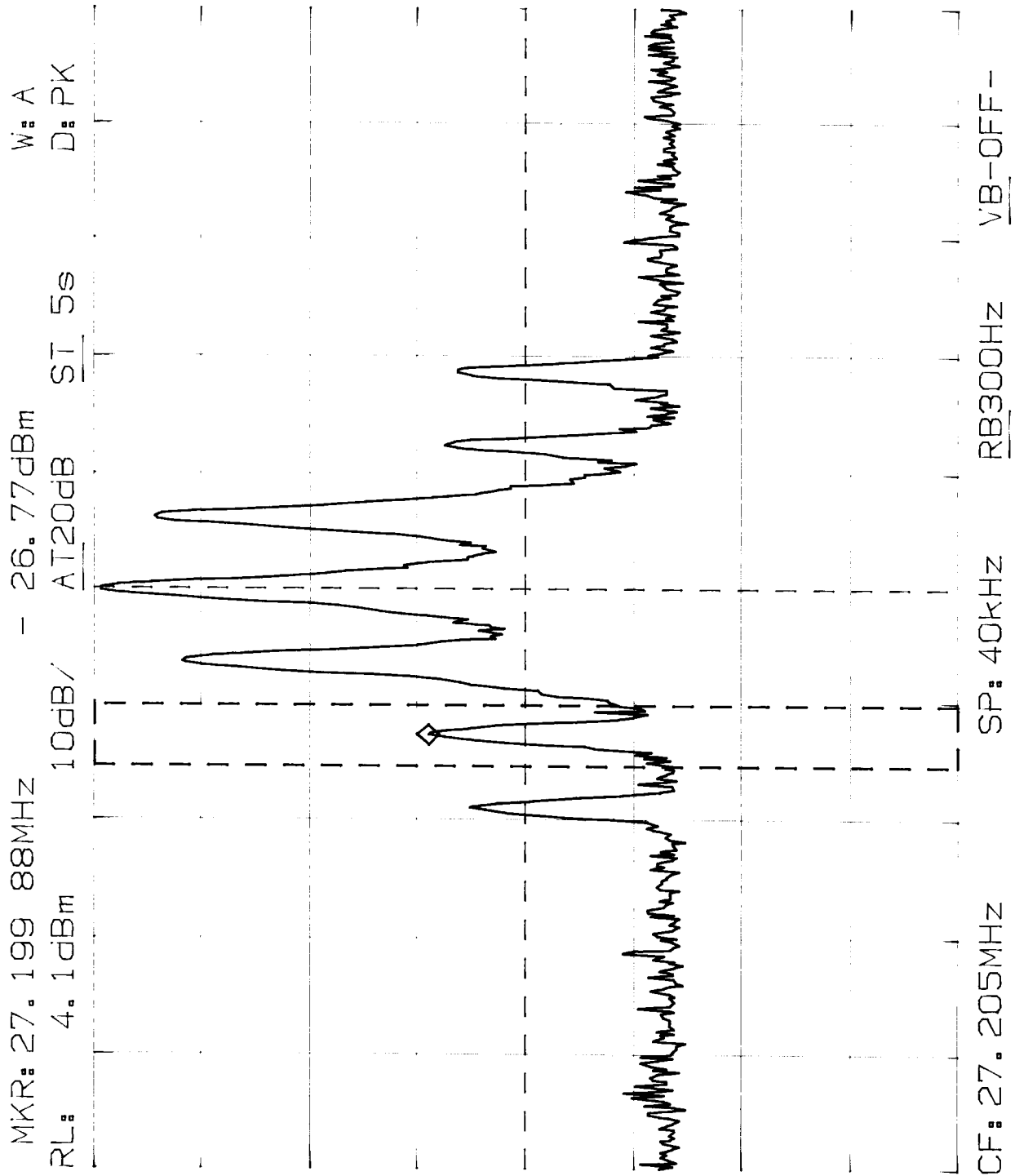
CHANNEL 20, 30dB PAD  
UNMODULATED CARRIER



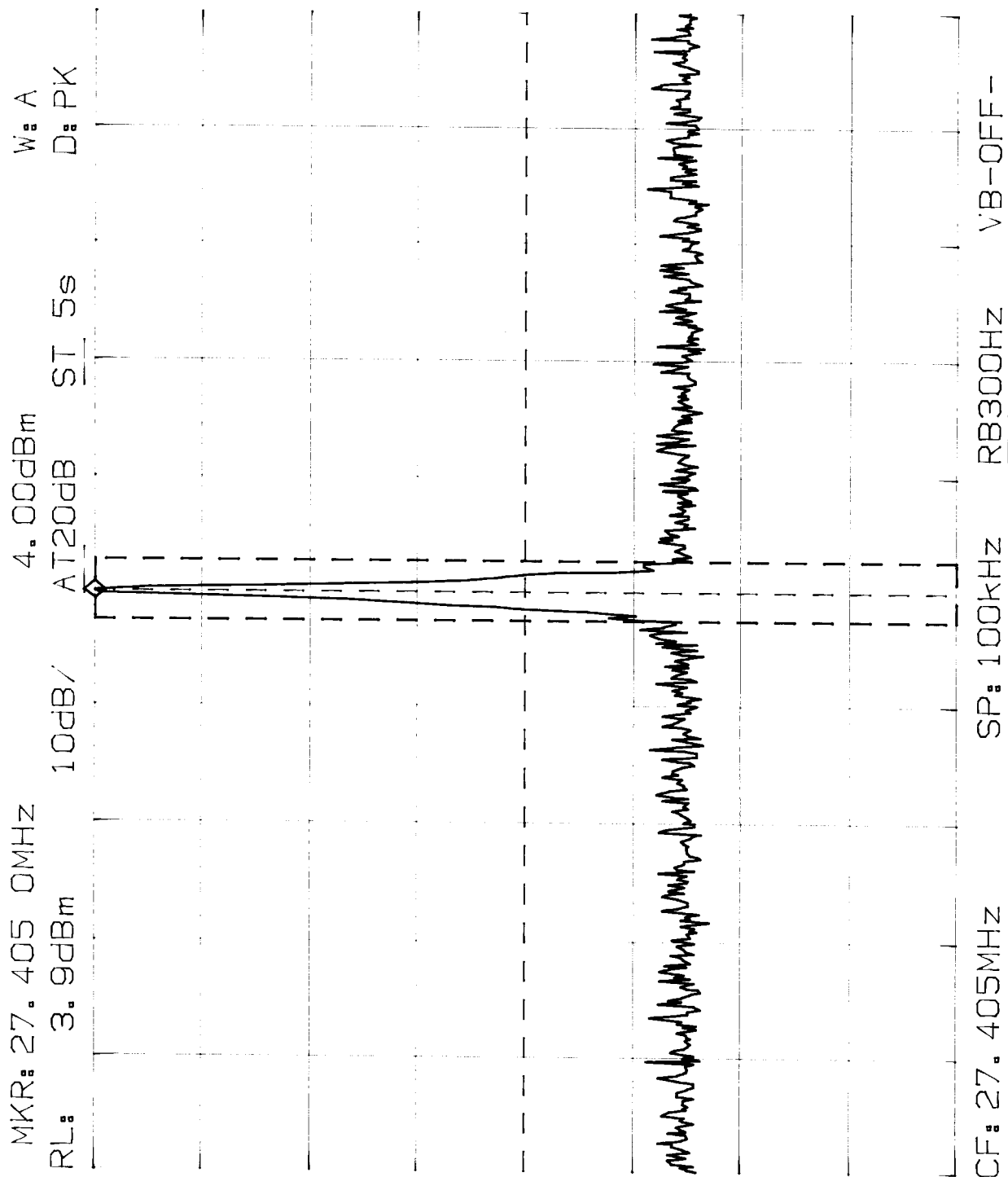
CHANNEL 20, 30dB PAD  
 2500Hz SIGNAL  
 16dB ABOVE 50% MODULATION



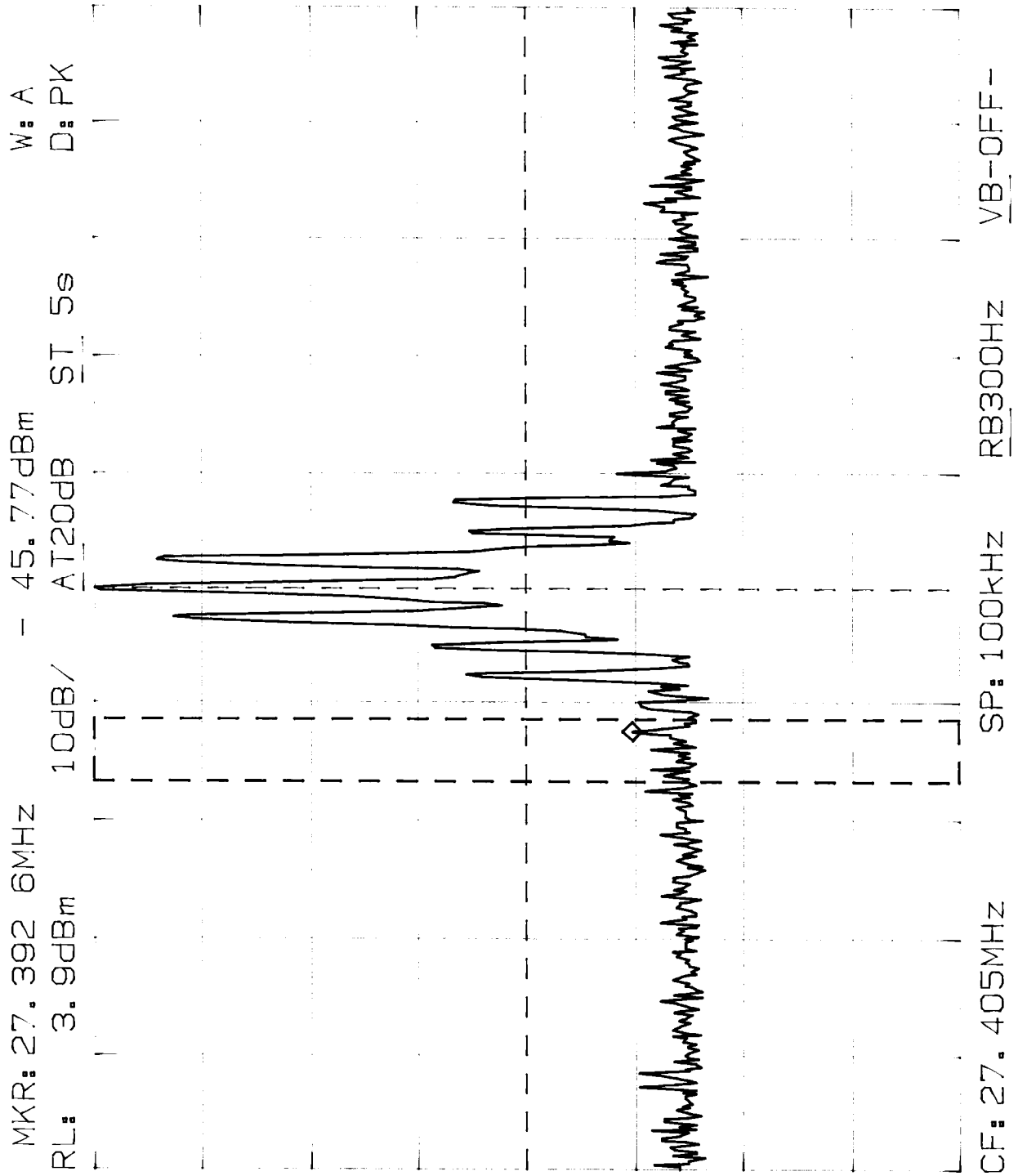
CHANNEL 20, 30dB PAD  
2500Hz SIGNAL  
16dB ABOVE 50% MODULATION



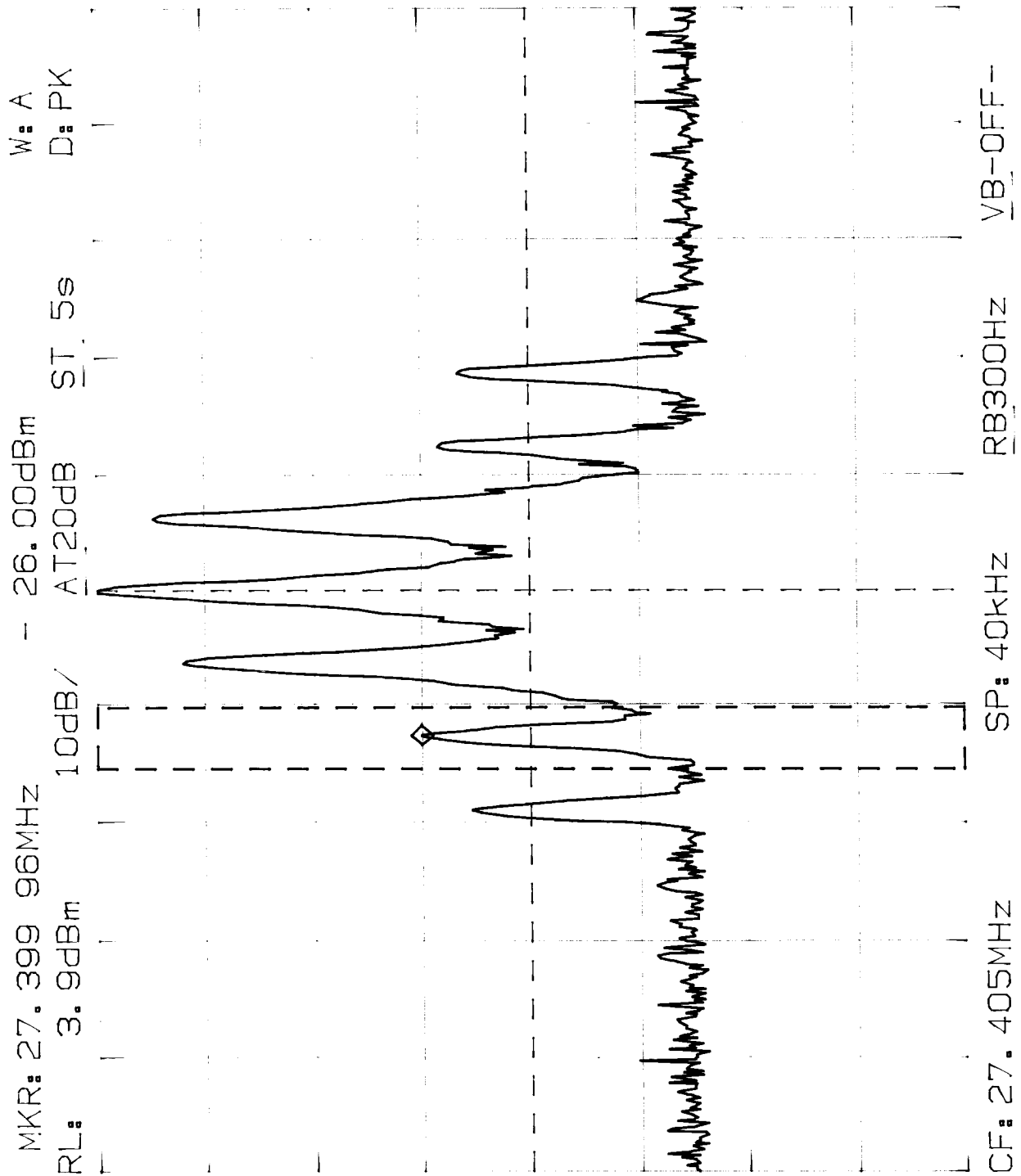
# CHANNEL 40, 30dB PAD UNMODULATED CARRIER



CHANNEL 40, 30dB PAD  
 2500Hz SIGNAL  
 16dB ABOVE 50% MODULATION



CHANNEL 40, 30dB PAD  
2500Hz SIGNAL  
16dB ABOVE 50% MODULATION





## EXHIBIT E(7)

2.991 Spurious Emissions at Antenna Terminals [95.635]

The radio frequency voltage or power generated within the equipment and appearing on a spurious frequency was checked at the equipment output terminals when loaded with an artificial antenna. The following data shows the magnitude of each harmonic and other spurious emission that was detected when the equipment was operated under the conditions specified in 2.989. The magnitude of the spurious emissions attenuated more than 20 dB below the permissible value are not shown.

NOTE: The values shown are with reference to the carrier (dBc).

Transmit (With 50dB Pad)

CHANNEL 2 [Carrier Level (-15.04 dBm)]			CHANNEL 20 [Carrier Level (-15.41 dBm)]			CHANNEL 40 [Carrier Level (-15.55 dBm)]		
FREQ. (MHz)	LEVEL (dBm)	dBc	FREQ. (MHz)	LEVEL (dBm)	dBc	FREQ. (MHz)	LEVEL (dBm)	dBc
30.73	-84.25	69.21	30.88	-84.16	68.75	30.68	-83.62	68.07
37.23	-83.51	68.47	37.40	-84.40	68.99	37.56	-85.14	69.59
53.96	-85.30	70.26	54.41	-83.29	67.88	54.74	-78.77	63.22
80.86	-75.13	60.09	81.63	-76.06	60.65	82.23	-76.09	60.54
134.88	-87.42	72.38	108.76	-77.99	62.58	109.58	-78.52	62.97
161.74	-89.26	74.22	136.03	-83.90	68.49	137.03	-82.83	67.28
187.26	-86.70	71.66	163.18	-92.85	77.44	164.92	-89.17	73.62
269.77	-87.12	72.08	190.4	-86.91	71.5	191.80	-83.65	68.1
296.74	-81.72	71.58	272.02	-87.86	72.45	246.40	-83.24	67.69
350.68	-89.65	74.61	299.28	79.18	63.77	301.30	-79.46	63.91
			326.30	-87.64	72.23	328.70	-79.14	63.59
			353.3	-84.81	69.4	356.10	-89.39	73.84

EXHIBIT E(8)

2.993 Field Strength of Spurious Radiation [95.635]

Measurements were made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads or intermediate circuit elements under normal conditions of installation and operation. The attached graphs and data show the magnitude of each harmonic and other spurious emission. Single sideband, independent sideband, and controlled carrier transmitters were modulated under the conditions of part (c) of 2.989 as appropriate. Equipment operating on frequencies below 890 MHz were tested at an open field test site with the measuring instrument antenna located in the far-field at all test frequencies. The details of the test site are included in Exhibit E(2). The attached test data shows the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

**SYSTEM DESCRIPTION**

The Clarion Co. Ltd. Model JC-215R, is a mobile "CB" transceiver specifically designed for use on a motorcycle. It comes equipped with a transceiver unit/controller, and two headsets with microphones.

For the purpose of conducting the required FCC emissions tests, both of the headsets were placed in a vertical plane simulating normal use. The radio transmitter was powered by a 13.8 VDC regulated power supply which was placed in close proximity to the transceiver. A 100 watt load, matching the correct output impedance of the transmitter, was connected directly to the transceiver output or antenna terminal.

All emission tests were performed with the transceiver connected in this manner, and all of the applicable accessories were attached. This configuration represents a worst case cable arrangement with regards to EMI radiation.

**SYSTEM DESCRIPTION Photos**



**TEST PROCEDURE**

**RADIATED:**

All tests were performed in accordance with FCC/ & ANSI C63.4.

The Clarion Co. Ltd. mobile "CB" transceiver, Model JC-215R, was connected together with a regulated power supply, 100 watt transmitter load and other accessories as described on the "Title and System Description" pages. The system was arranged in a typical configuration of use and placed on top of a one metre non-conducting turntable. All of the system parts were connected together with cables that are sold with each piece or generic cables purchased for the specific connection involved. Several different equipment placements were tried so as to establish the worst normal case of equipment positioning. In this case the Clarion "CB" transceiver, power supply and transmitter power load, were placed on top of the test table with the two headset and microphone attachments. All of the cables and cords were moved about so as to create the highest level of EMI. The transmitter was operated at maximum power output (3.4W) on channels 02, 20 and channel 40. All transmitter spurious and harmonic emissions were recorded. The turntable was rotated through 360 degrees.

A preliminary radio frequency scan was performed on the system to determine the worst case cable and equipment configuration. The attached results represent the system configuration maximized for worst case emissions in each frequency band. Please refer to the System Description.

The tests were conducted at a distance of three (3) metres with the receiving antennas in both the horizontal and vertical planes at each emission frequency.

**EQUIPMENT:**

Advantest R3261A Spectrum Analyzer  
Anritsu 2601 A Spectrum Analyzer  
Setting: BW: 100 KHz or 120 KHz (Q.P)  
Hewlett-Packard RF generator Model 8640 B with 002 dblr.  
A.H. Systems biconical antenna..... 20 MHz - 330 MHz  
A.H. Systems log periodic antenna..... 300 MHz - 1.8 GHz  
Eaton dipole antennas; T1, T2, T3..... 25 MHz - 1.0 GHz  
CDI Roberts dipole antennas; T1 T2 T3 T4.. 25 MHz - 1.0 GHz

**NOTE:**

The Anritsu 2601 A spectrum analyzer and the Advantest R3261A spectrum analyzer are calibrated annually, and that calibration is directly traceable to the National Research Council of Canada (NRC). This equipment is only used by qualified technicians and only for the purpose of EMI measurements. The three metre test range has been carefully evaluated to the ANSI C63.4, and will be remeasured for reflections and losses every three years. (FCC OET/55)

## MARSTECH LIMITED

RADIATED EMISSION RESULTS

BW: 100/120 KHz

Span: 05 to 50 MHz

CHANNEL #	FREQ. MHz	LEVEL $\mu$ V	ANT. TYPE (PZ)	ANT. FAC.	F.S. $\mu$ V/M	LIMIT $\mu$ V/M	DIFF. TO LIMIT; dB
02	53.93	243.4	B/C V	4.1	997.9	4311	-12.71
20	54.41	296.1	B/C V	4.1	1214.0	4311	-11.01
40	54.81	333.0	B/C V	4.1	1365.3	4311	-9.99
02	80.93	494.5	B/C V	3.9	1928.6	4311	-6.99
20	81.62	525.9	B/C V	3.8	1998.4	4311	-6.68
40	82.22	528.0	B/C V	3.8	2006.4	4311	-6.64
02	107.90	566.3	B/C V	4.5	2548.4	4311	-4.57
20	108.82	602.7	B/C V	4.5	2712.2	4311	-4.03
40	109.62	613.0	B/C V	4.5	2758.5	4311	-3.88
02	134.88	861.3	RT.2 H	4.4	3789.7	4311	-1.12
20	136.03	712.8	RT.2 H	4.4	3136.3	4311	-2.76
40	137.03	700.0	RT.2 H	4.5	3150.0	4311	-2.73
02	161.85	295.0	RT.2 H	5.4	1593.0	4311	-8.65
20	163.23	375.4	RT.2 H	5.5	2064.7	4311	-6.39
40	164.43	567.7	RT.2 H	5.5	3122.4	4311	-2.80
02	188.83	220.0	RT.3 H	6.4	1408.0	4311	-9.72
20	190.44	295.0	RT.3 H	6.5	1917.5	4311	-7.04
40	191.84	300.0	RT.3 H	6.5	1950.0	4311	-6.89
02	215.80	61.3	RT.3 H	7.4	453.6	4311	-19.56
20	217.64	84.1	RT.3 H	7.5	630.8	4311	-16.69
40	219.24	100.0	RT.3 H	7.6	760.0	4311	-15.08

RADIATED EMISSION RESULTS

BW: 100/120 KHz

Span: 05 to 50 MHz

CHANNEL #	FREQ. MHz	LEVEL $\mu$ V	ANT. TYPE (PZ)	ANT. FAC.	F.S. $\mu$ V/M	LIMIT $\mu$ V/M	DIFF. TO LIMIT; dB
02	242.78	63.1	RT.3 H	8.6	542.7	4311	-18.00
20	244.85	70.8	RT.3 H	8.7	616.0	4311	-16.90
40	246.65	120.0	RT.3 H	8.8	1056.0	4311	-12.22
02	269.75	66.3	RT.3 H	9.7	643.1	4311	-16.53
20	272.05	63.0	RT.3 H	9.7	611.1	4311	-16.97
40	274.05	50.0	RT.3 H	9.8	490.0	4311	-18.89
02	296.73	75.2	RT.3 H	10.7	804.6	4311	-14.58
20	299.26	60.0	RT.3 H	10.8	648.0	4311	-16.46
40	301.46	100.0	RT.3 H	10.9	1090.0	4311	-11.94

## NOTE:

The emission table(s) of results above, represent a worst case **general** configuration with regards to cable placement and turntable positioning. It should however be noted that each individual emission of note was separately evaluated, and when required dipole antennas were used to more accurately measure the field strength.

EXHIBIT E(9)

2.995 Frequency Stability [95.625]

The frequency stability shall be maintained within a frequency tolerance of 0.005%

- a) Temperature from -30 to +50 degrees Celsius at rated supply and with the supply voltage reduced to the battery operating end point.
- b) Supply voltage from 85 to 115% of nominal value.

TEST RESULTS:

The largest deviation from the authorized carrier frequency was -594Hz at -30 degrees Celsius. The limit is 2721Hz.

TEST CONDITIONS:

<u>Supply Voltage:</u>	13.8VDC
<u>Temperature:</u>	-30, -20, -10, 0, +10, +20, +30, +40, +50, $\pm 3$ degrees Celsius
<u>Supply Voltages:</u>	11.7 and 15.9VDC
<u>Temperature:</u>	+20 degrees Celsius
<u>Modulation:</u>	Transmitter was unmodulated.

METHOD OF MEASUREMENT:

The test sample was placed in a thermal chamber and the frequency was monitored by a spectrum analyzer and recorded at 1 minute intervals.

At +50 degrees Celsius, after the chamber had stabilized for at least 60 minutes and the sample had been turned off for 15 minutes, the transmitter was operated continuously for 5 minutes at each voltage condition. At the temperature extremes, the transmitter was operated for 10 minutes following stabilization. The frequencies were recorded at 1 minute intervals. The temperature was monitored by a thermocouple on the enclosure of the sample.

*MARSTECH LIMITED*

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ENVIRONMENTAL TEST RESULTS

CHANNEL 20

+50°C

13.8VDC

27205478  
27205496  
27205511  
27205530  
27205556

+40°C

13.8VDC

27205434  
27205446  
27205459  
27205480  
27205500

+30°C

13.8VDC

27205353  
27205363  
27205367  
27205382  
27205395

+20°C

11.7VDC

13.8VDC

15.9VDC

27205474  
27205480  
27205487  
27205496  
27205500

27205416  
27205431  
27205440  
27205455  
27205456

27205504  
27205506  
27205517  
27205526  
27205532

+10°C

13.8VDC

27205298  
27205298  
27205310  
27205305  
27205306



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13.8VDC

-10°C

13.8VDC

-20°C

13.8VDC

-30°C

13.8VDC

27204406  
27204455  
27204506  
27204571  
27204620

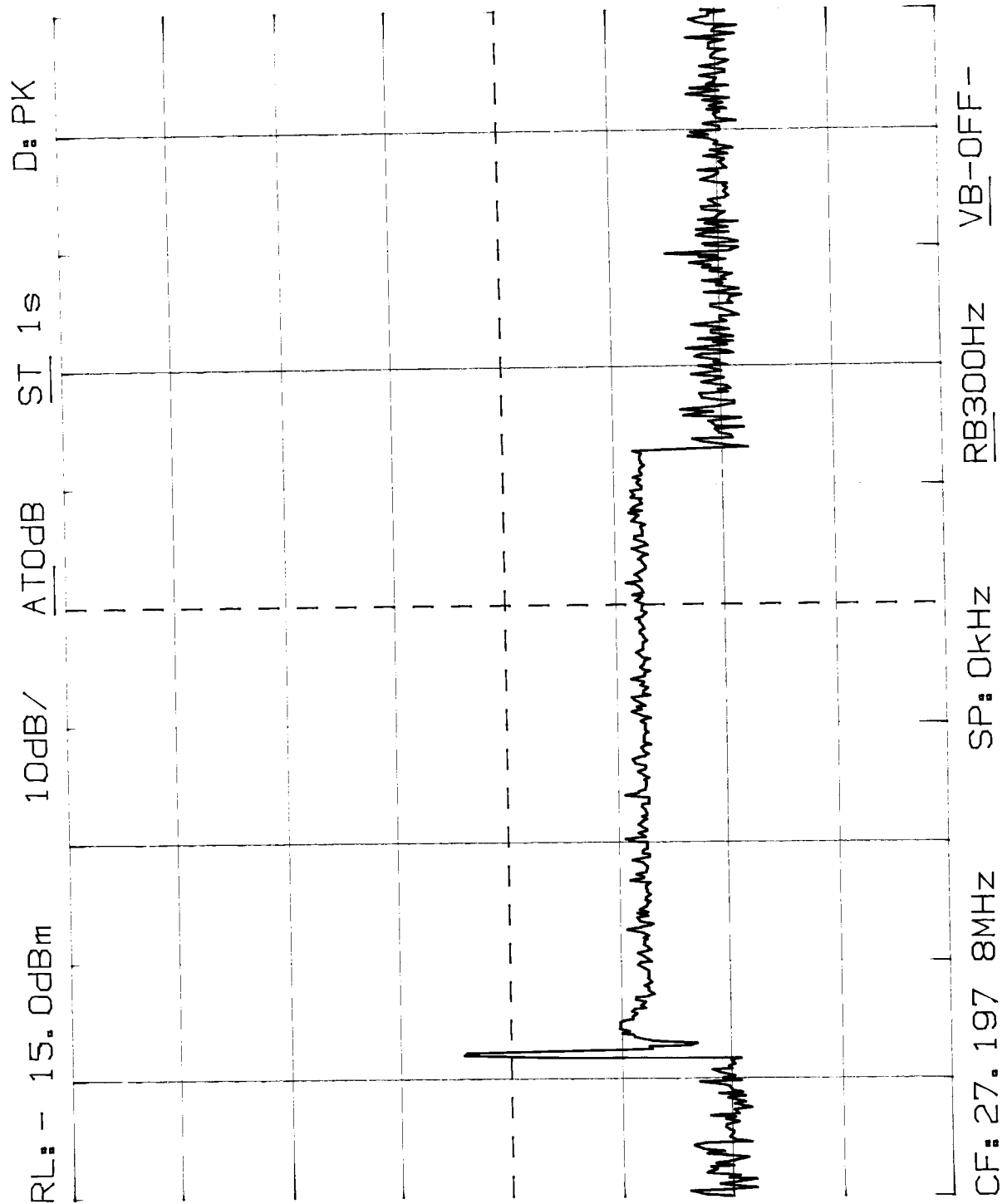
EXHIBIT E(9)-3

EXHIBIT E(10)

Overmodulation Transient Response:

An audio modulating signal of 2500Hz, at a level 16 dB greater than required for 50% modulation, was applied to the transmitter modulator via the "microphone input". This signal was pulsed at one P. P. S. with a pulse width of 0.5 seconds. A calibrated spectrum analyzer was then tuned to the channel directly above and below the transmitting frequency ( $\pm 10\text{KHz}$ ). The analyzer settings were similar to those used during the occupied bandwidth test and the scan width or span was set to ZERO. The transient caused by the pulsing modulation is indicated on the attached graphs. Any transient observed had a time of less than 100 m sec.

TRANSIENT MODULATION  
 RESPONSE DATA FOR CHANNEL 19  
 (CH 20 IS THE MODULATED CHANNEL)



TRANSIENT MODULATION  
 RESPONSE DATA FOR CHANNEL 21  
 (CH 20 IS THE MODULATED CHANNEL)

