APPENDIX A

TEST EQUIPMENT

DNB ENGINEERING, INC.
EMC TEST EQUIPMENT

MANUFACTURER	DESCRIPTION	MODEL
Hewlett Packard	Spectrum Analyzer	8566B
Hewlett Packard	Spectrum Analyzer	8568B
Hewlett Packard	Quasi Peak Adapter	85650A
Hewlett Packard	Computer/Controller	9825T
Hewlett Packard	Frequency Counter	5245L
Hewlett Packard	Printer	9876A
Hewlett Packard	Counter Plug-in	5253B
Hewlett Packard	Plotter	9872C
Hewlett Packard	Plotter	7470A
Hewlett Packard	Frequency Synthesizer	9662A
Hewlett Packard	Sweep Main Frame	8620C
Hewlett Packard	Plug-in 2-22 GHz	26290B
Polarad	Signal Generator 3.7 to 8.4 GHz	1107E
Telonics	Sweep Generator	4053A
Wiltron	Sweep Generator	6653A
Hewlett Packard	Signal Generator	614A
Hewlett Packard	Signal Generator	616B
Hewlett Packard	Signal Generator	618B
Hewlett Packard	Signal Generator	620B
Hewlett Packard	Signal Generator	626A
Hewlett Packard	Signal Generator	628A
Hewlett Packard	Signal Generator	8654A

DNB ENGINEERING, INC.
EMC TEST EQUIPMENT

Hewlett Packard	Signal Generator	8662A
Hewlett Packard	RF Voltmeter	3406A
Solar	Pulse Generator	8282-1
Solar (2)	Clamp on Probe	6747-1
Electro-Metrics	Clamp on Probe	PCL-10
Electro-Metrics	Clamp on Probe	PCL-25
Electro-Metrics	Loop Sensor	ELS-10
Electro-Metrics	Electro-Static Field Probe	EFP-25
Electro-Metrics	LISN	FCC-5-2
Solar	LISN	8012-50-r-24 BNC
Solar	Audio Isolation Transformer	6220-1A
Solar	Isolation Transformer	7032-1
Solar (14)	10 mfd Capacitors	6212-106R
Schaffner EMC, Inc.	Absorbing Clamp	MDS 21
Solar	100 W Audio Amplifier	6552-1A
Solar (2)	LISN	8018-50-TS-24 BNC
Stoddart	FIM	NM-12T
Krohn-Hite	Audio Oscillator	4400
Stoddart	FIM	URM-6
IFI	Field Strength Meter	EFS-1
Solar	Precision Resistor	7144-1.0
Solar	Precision Resistor	7144-10.0
Solar	Coupling Network	7835-891

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EMC TEST EQUIPMENT

Solar	Coupling Network	7835-896
Solar	LISN (5 μh)	6338-5
Solar	LISN (50 μh)	6338-57
Solar	High Pass Filter	7205-.35
Solar	High Pass Filter	7205-2.4
Mini Circuits	Amplifier Wide Band	ZHL42
Mini Circuits	Amplifier Wide Band	ZHL-1042J
Mini Circuits	Amplifier Wide Band	ZHL32A
Mini Circuits	Amplifier Wide Band	ZHL-1A
Mini Circuits	Amplifier Wide Band	ZHL2-8
ENI	Amplifier	510L
ENI	Amplifier	350L
Hewlett Packard	Preamplifier	11975A
Hewlett Packard	Preamplifier	8349A
IFI	1 kHz - 200 MHz Amplifier (15 Watt)	5300L
Narda	400 W 50Ω Load	376NM
Eaton	WBA 500 - 1000 MHz	15100B
ENI	WBA 250 KHz - 150 MHz	3100LA
ENI	WBA 1.5 - 500 MHz	550l
Avantek	Low Noise Amplifier 6-12.4 GHz	AFT12635
Hewlett Packard	500 MHz Digitizing Oscilloscope	54111D
Tenney	Temperature Chamber	THjr

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EMC TEST EQUIPMENT

Hewlett Packard	5 Hz - 200 MHz Network Analyzer	3577A
Hewlett Packard	Frequency Doubler	11721A
Hewlett Packard	Harmonic Mixers	11970A
Hewlett Packard	Harmonic Mixers	11970K
Hewlett Packard	Computer/Controller	9836
Hewlett Packard	Computer/Controller	9826
Avantest	Spectrum Analyzer	TR4131E
Hewlett Packard	Spectrum Analyzer	8558B
Hewlett Packard	Spectrum Analyzer	8554L
Hewlett Packard	Pulse Generator	212A
Hewlett Packard	Pulse Generator	214A
Hewlett Packard	Pulse Generator	215A
Tektronix	Oscilloscope	453A
John Fluke	High Voltage power Supply	408A
LeCroy	Digital Storage Scope (125 MHz)	9400
Biddle	Micro Ohm Meter	247800
Hewlett Packard	Pulse Modulator	11720A
Topaz	Ultra Isolation Transformer (2.5 kVA)	0211T21SR
ENI	Ultra Isolation Transformer (2.5 kVA)	91002-22
Singer (5)	Current Probe	91550-2
Stoddart (4)	Current Probe	91550-1

DNB ENGINEERING, INC.
EMC TEST EQUIPMENT

Hewlett Packard	Dual Directional Coupler	778D
Narda	Dual Directional Coupler	3022
Narda	Directional Coupler	3045C-20
Narda	Directional Coupler	3003-20
Narda	Directional Coupler	3002-10
Narda	Directional Coupler	23964
Narda (2)	Directional Coupler	22355
Narda	Power Divider	4326-2
Narda	Power Divider	4035C
Narda	Power Divider	4033C
Englemann	Power Divider	PSK-210
Bird	50Ω Load 10 W 50's	80-53
Stoddart	50Ω Load	90514
Micro Lab	50Ω Load	TB-5MN
Tekscan	50Ω Attenuator Kit	FP-50
Tenuline	50Ω 100 W 20 dB Attenuator	8343-200
Micro Lab	50Ω 40 dB Attenuator	AD-40N
Hughes	20 Watt TWT L Band	1277H04
Hughes	20 Watt TWT C Band	1277H04
Hughes	10 Watt TWT S Band	1177H
Hughes	10 X/Ku Band	1177H
IFI	2kW cw 1 kHz - 200 MHz Wide Band Power Amp	410ULP
DNB Engineering	EMP Pin/Wire Test Set	844

DNB ENGINEERING, INC.
EMC TEST EQUIPMENT

ANTENNAS

MANUFACTURER	DESCRIPTION	MODEL
AIL (3)	Dipole	DM105A-T1, T2, & T3
EMCO	Biconical	3109
EMCO	Log Periodic	3146
EMCO	Parallel Element	3107
Eaton	Vertical Rod	74607-1
Eaton (2)	Vertical Rod	75492-1
Ailtech	Loop	94608-1
Singer	Loop	LP-105 ASC
Electro-Metrics (2)	Biconical	BIA-25
Electro-Metrics (2)	Conical Log Spiral	LCA-25
Electro-Metrics (2)	Loop	ALP-10
Electro-Metrics (2)	Loop	ARL-25
Electro-Metrics (2)	Broadband Dipole	DBA-25
Electro-Metrics (3)	Turnable Dipole	TA-25, 25-1, & 25-2
EMCO	Double Ridge Guide	311525
Electro-Metrics (2)	Vertical Rod	RVR-25
Alpha	Standard Gain Horn	K861
Alpha	Standard Gain Horn	A861
Alpha	Standard Gain Horn	KV861
Solar	Loop Antenna	7429-1
Electro-Metrics	E Field SensorHorn	EFP-25

Circuit Diagram
2.983(d)(7)

SEE FIGURE IN APPENDIX B

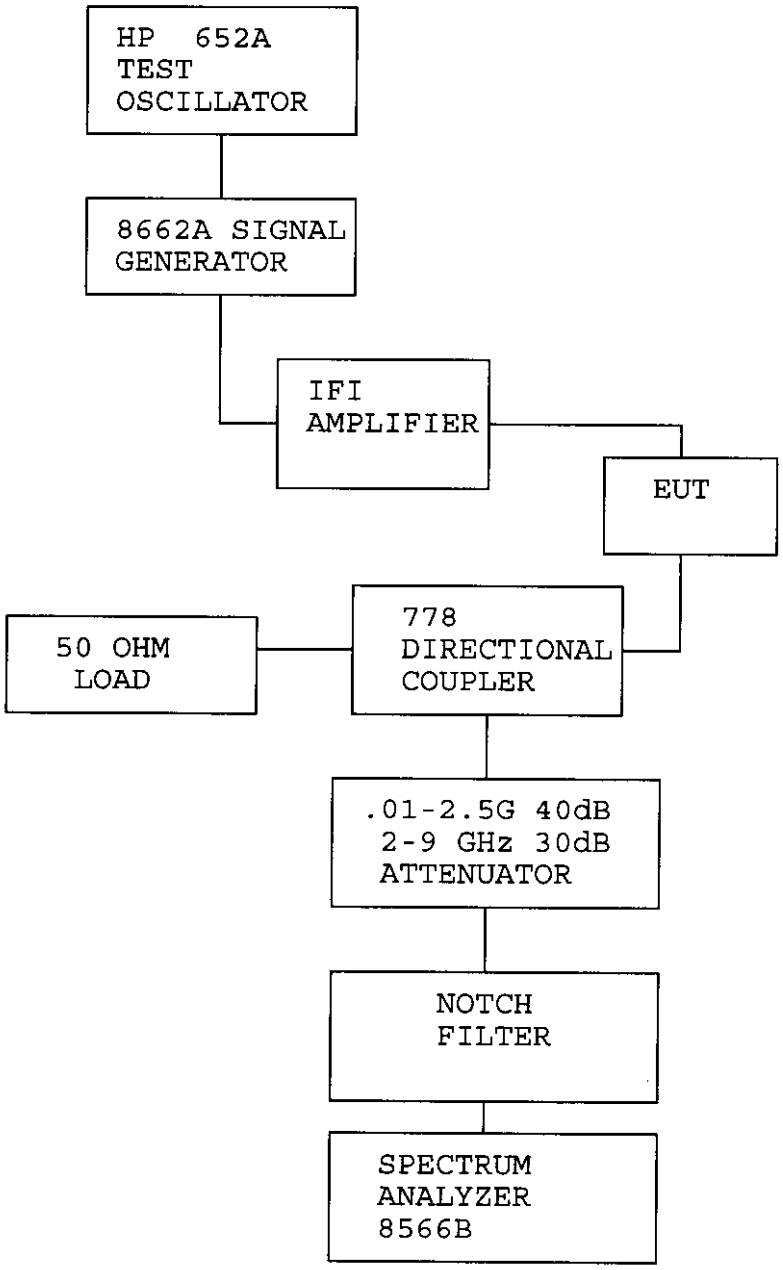


FIGURE 2. BLOCK DIAGRAM.
(POWER INPUT/OUTPUT TESTS)

2.983(e) Test Data

Refer to 2.983(e)(1) through 2.983(e)(7)

2.983(e)(1) Measurement of RF Power Output per 2.985

Definition: For RF Power Amplifiers.

Test Method: See Figure 2.
Output power is measured across a precision 50 ohm load with a wide-band sampling RF voltmeter.

Test Results:

	POWER OUTPUT		
Frequency	Nominal Voltage 13.8 VDC	85% Voltage 11.73 VDC	115% Voltage 15.87 VDC
806 MHz	26 W	26 W	26 W
870 MHz	12 W	12 W	12 W

2.983(e)(2) **Measurement of Modulation Characteristics per 2.987(b)(1)**

This EUT is a power amplifier and contains no circuitry to modify the RF signal provided by the driver except to raise the power level.

2.983(e)(3) **Measurement of Occupied Bandwith per 2.989**

Definition: Occupied bandwith, that is the frequency bandwith such that, below its lower and above its upper frequency limits, the mean power radiated by a given emission.

Test Method: Connect the equipment per Figure 3.

Measurements were made with the modulating signal at 2.5 kHz with 5 kHz of FM deviation.

Test Results: See Plots following Figure 3.

The center frequency of the signal did not shift with modulation. The spectrum bandwith was well within the limits specified in the FCC regulations

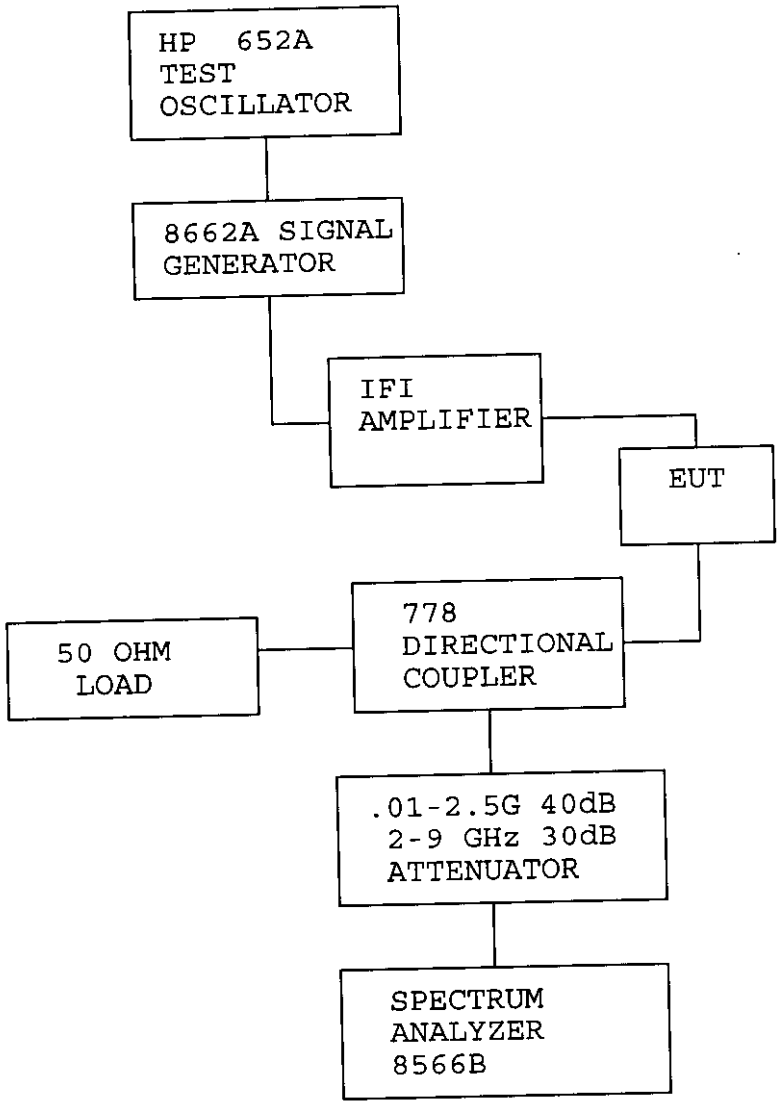
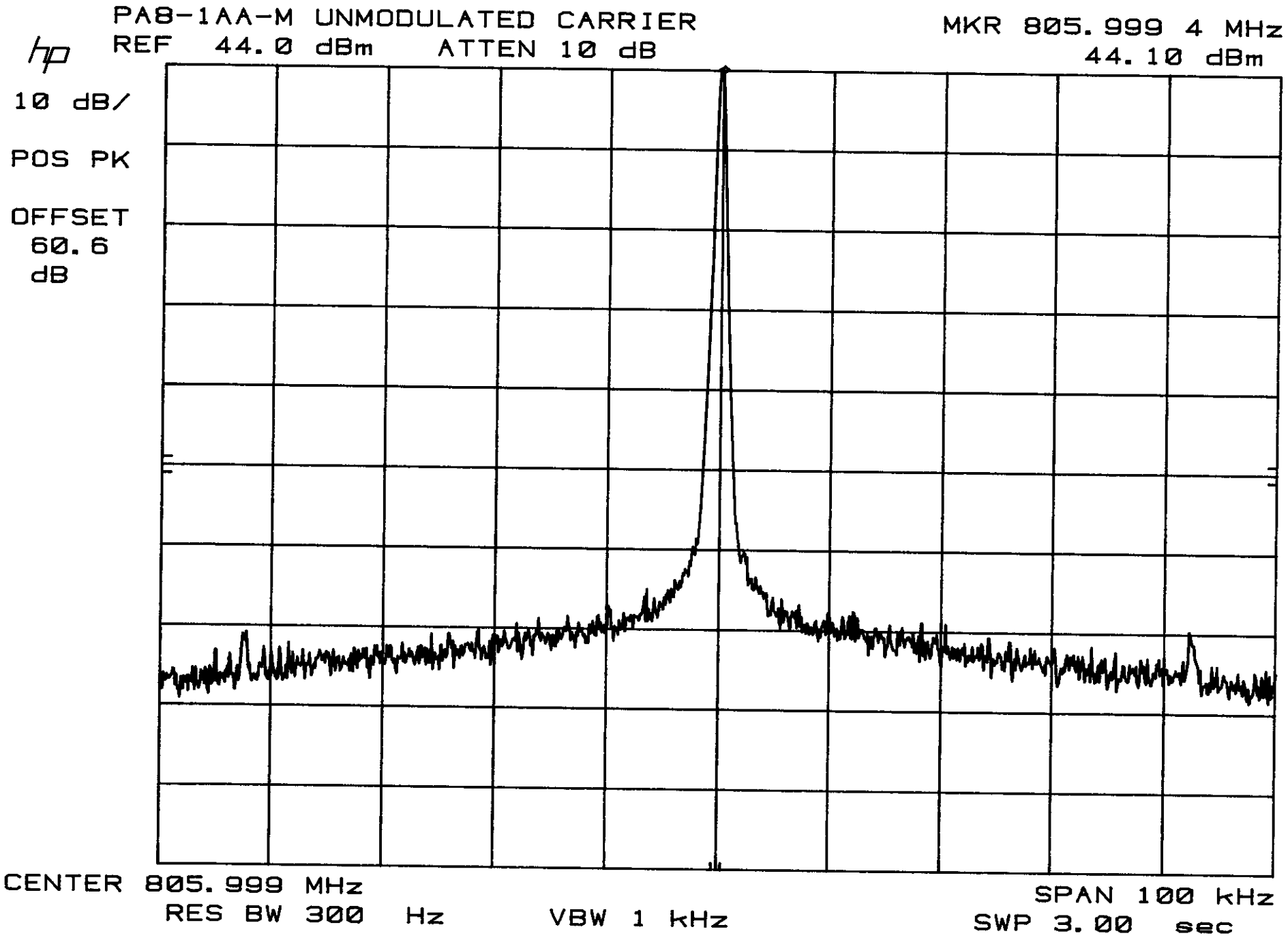
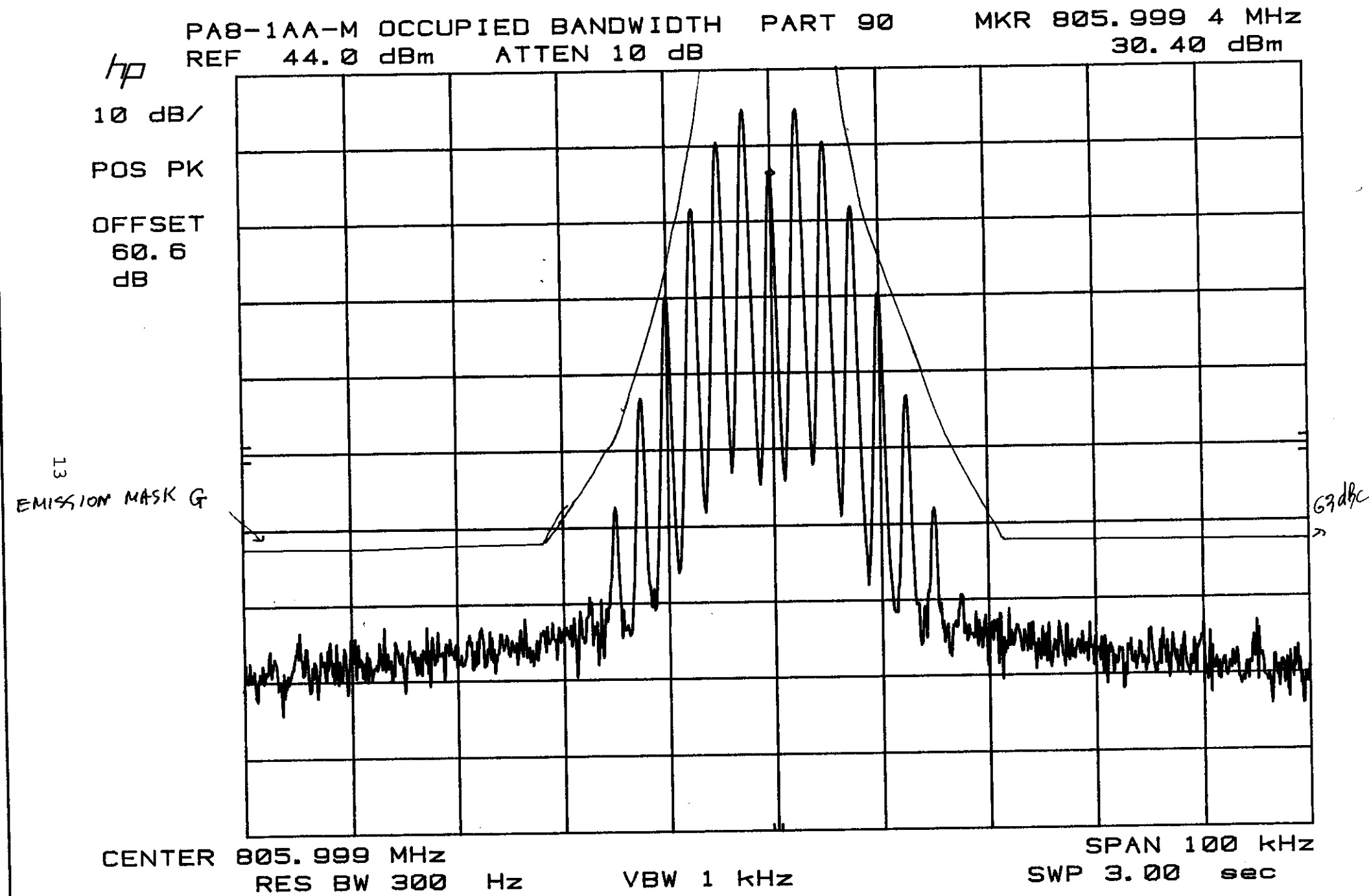


FIGURE 3. BLOCK DIAGRAM.
(OCCUPIED BANDWITH)

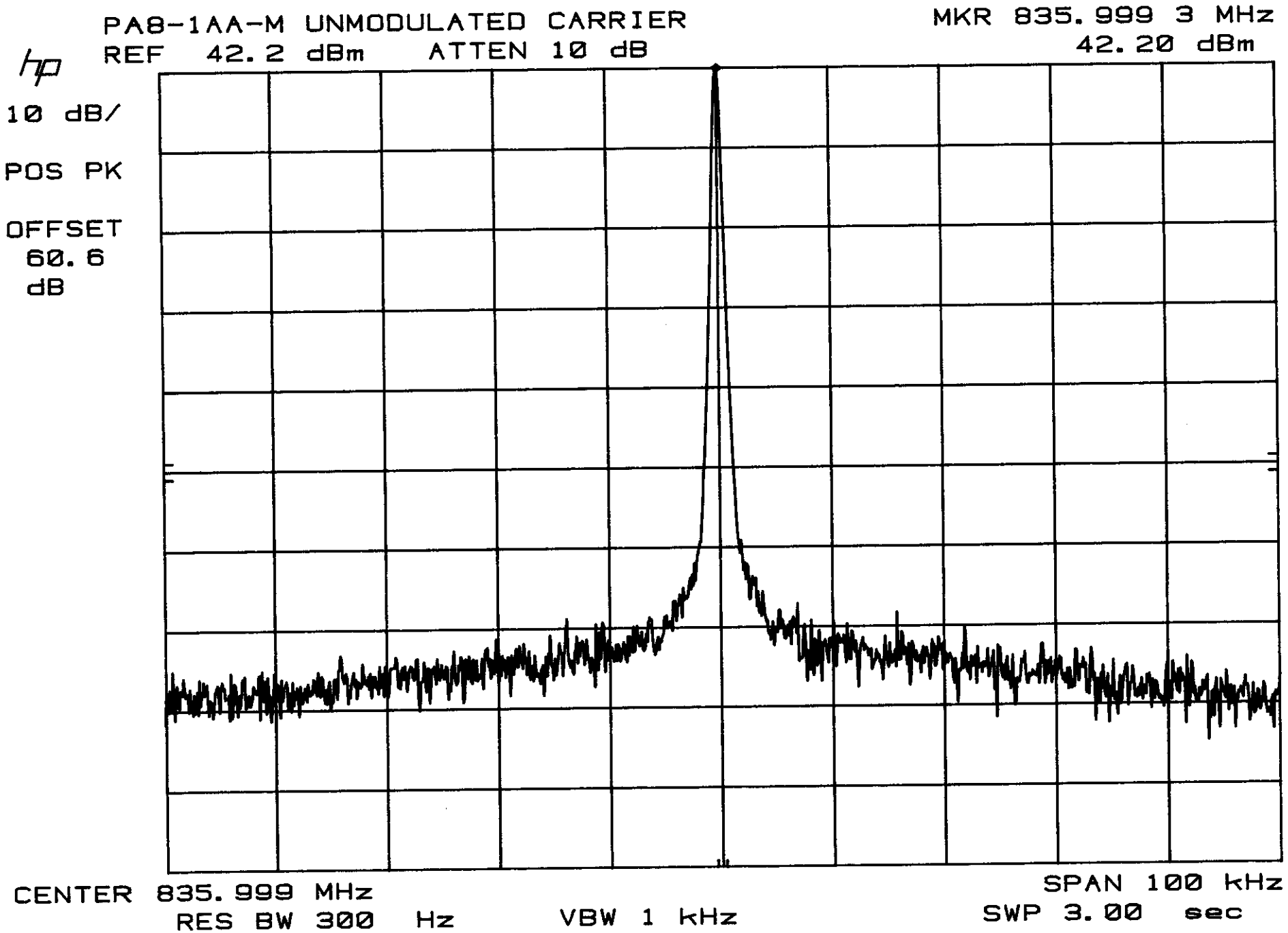

PA8-1AA-M UNMODULATED CARRIER
REF 44.0 dBm
ATTEN 10 dB
MKR 805.999 4 MHz
44.10 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 805.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

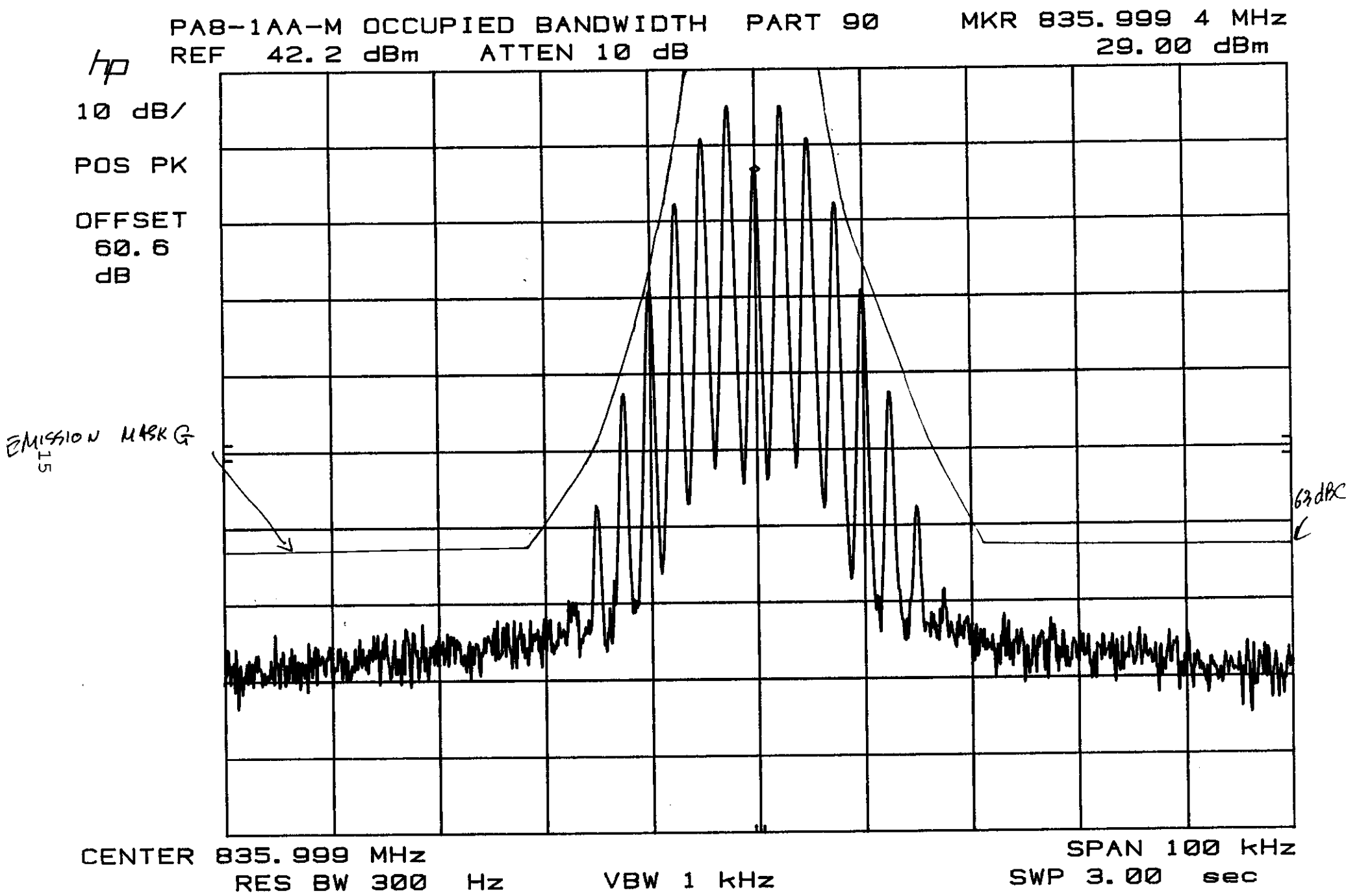


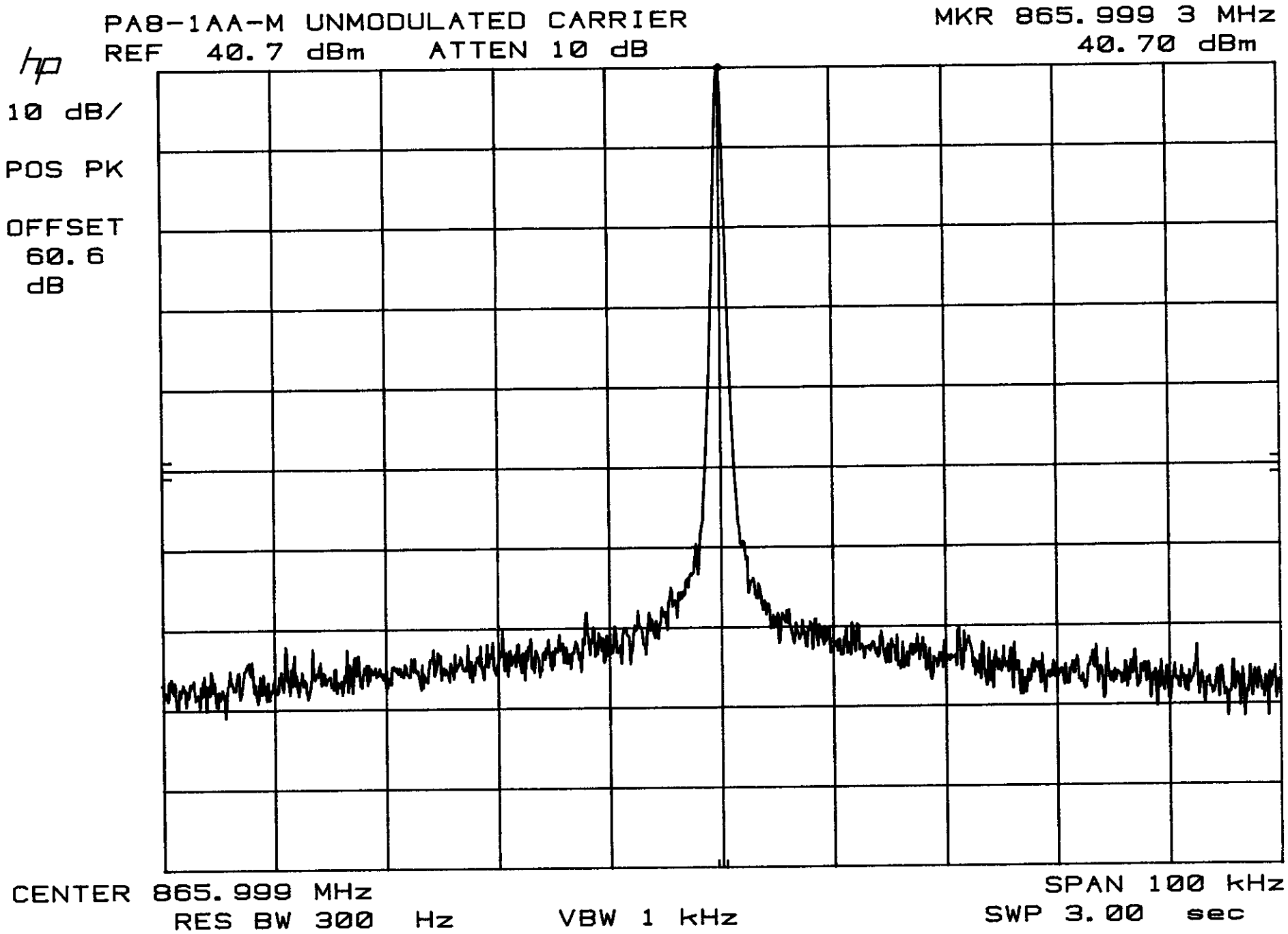
13

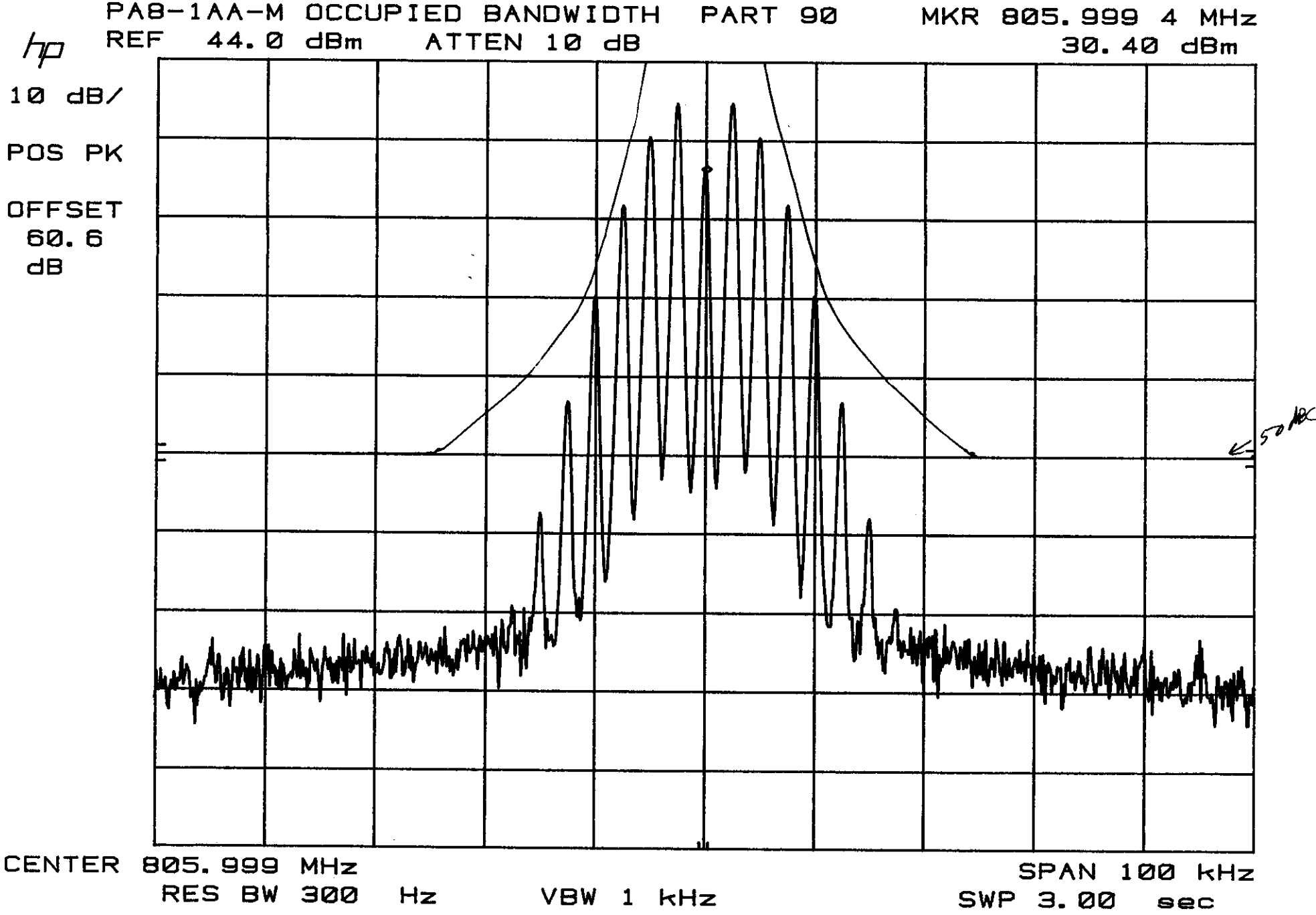
EMISSION MASK G

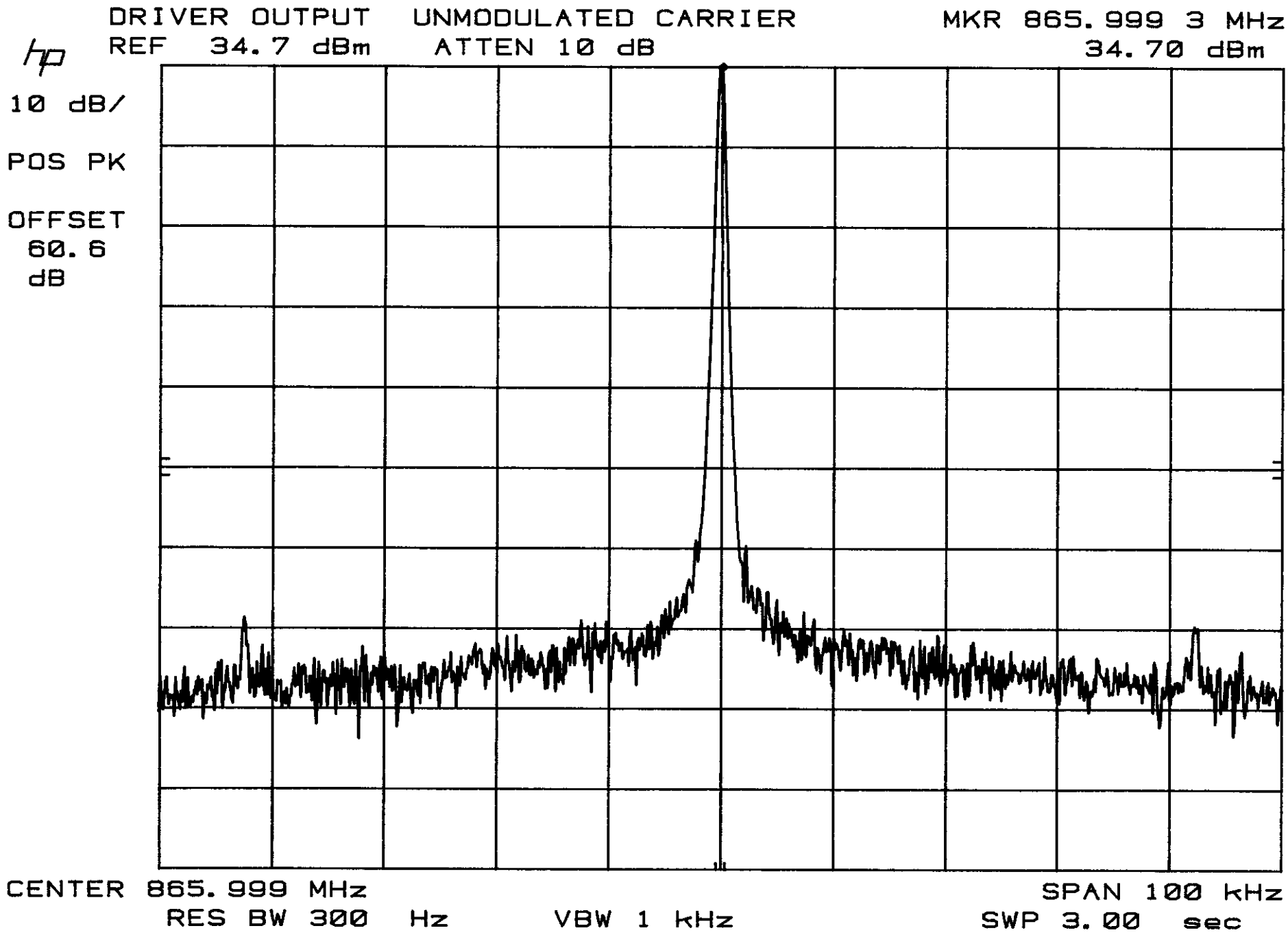
63dBc

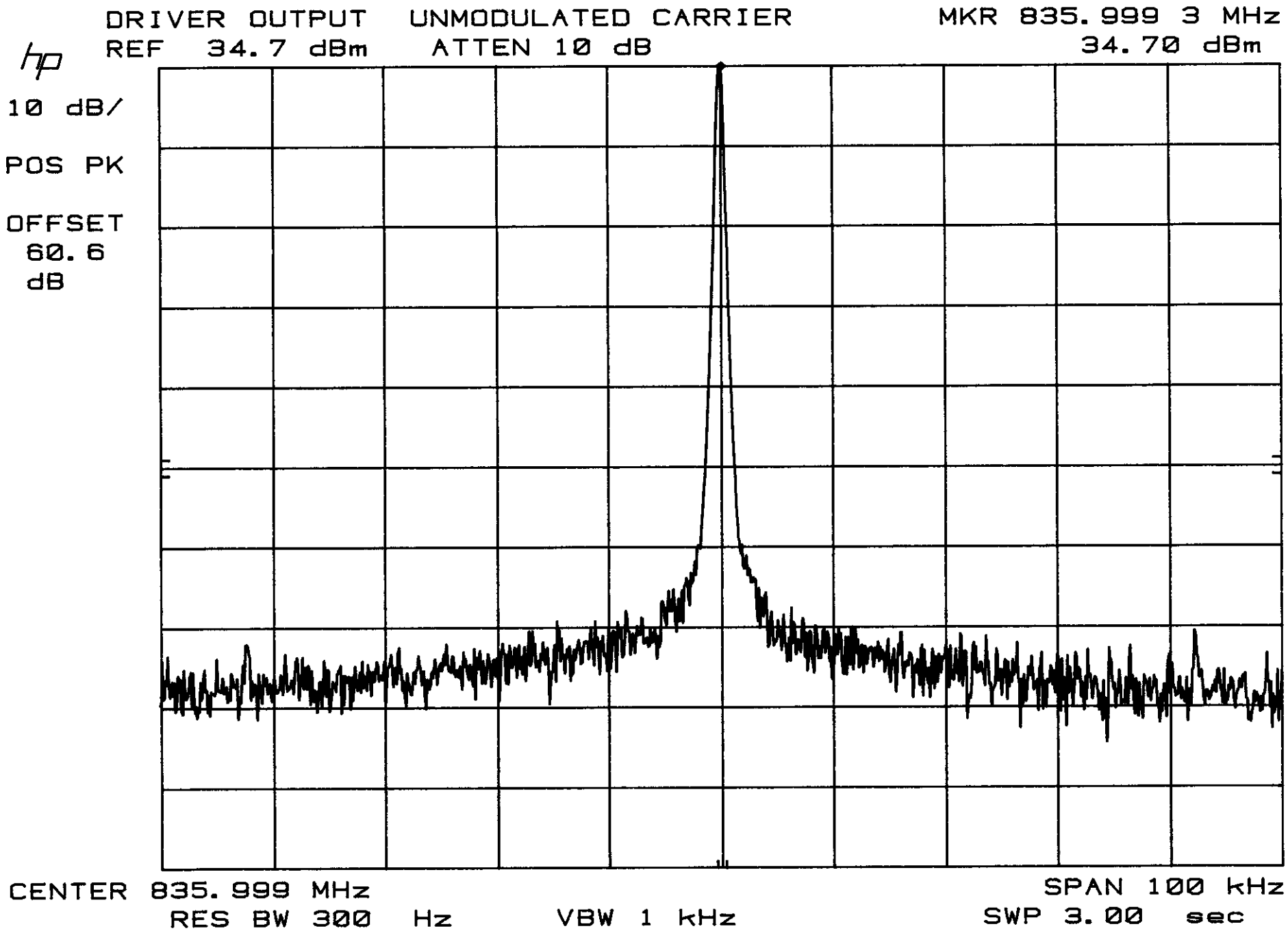

PA8-1AA-M UNMODULATED CARRIER
REF 42.2 dBm ATTEN 10 dB
MKR 835.999 3 MHz
42.20 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 835.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

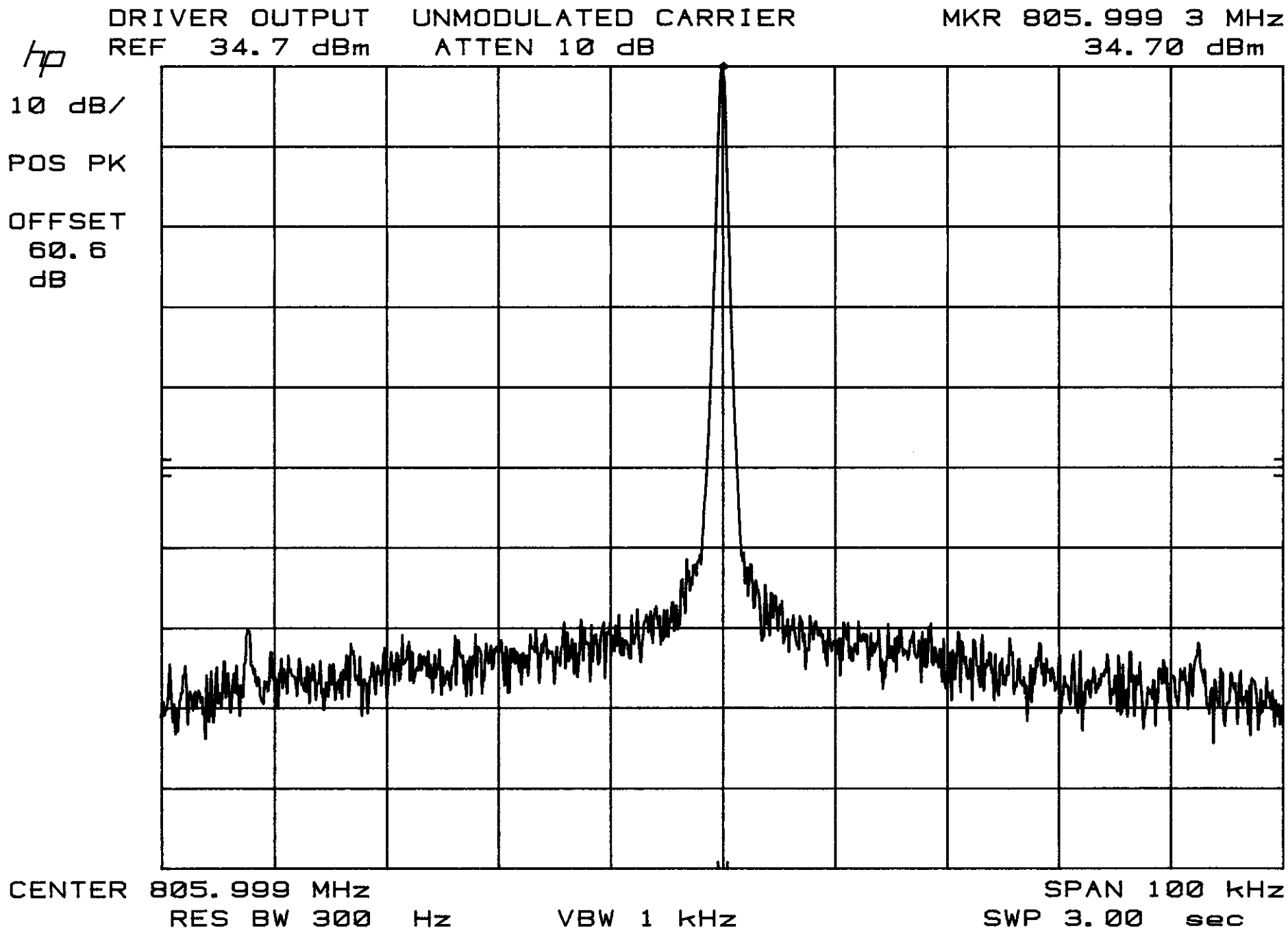

PA8-1AA-M OCCUPIED BANDWIDTH PART 90
MKR 835.999 4 MHz
29.00 dBm
REF 42.2 dBm
ATTEN 10 dB
10 dB/
POS PK
OFFSET
60.6
dB
EMISSION MASK G
63dBC
CENTER 835.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

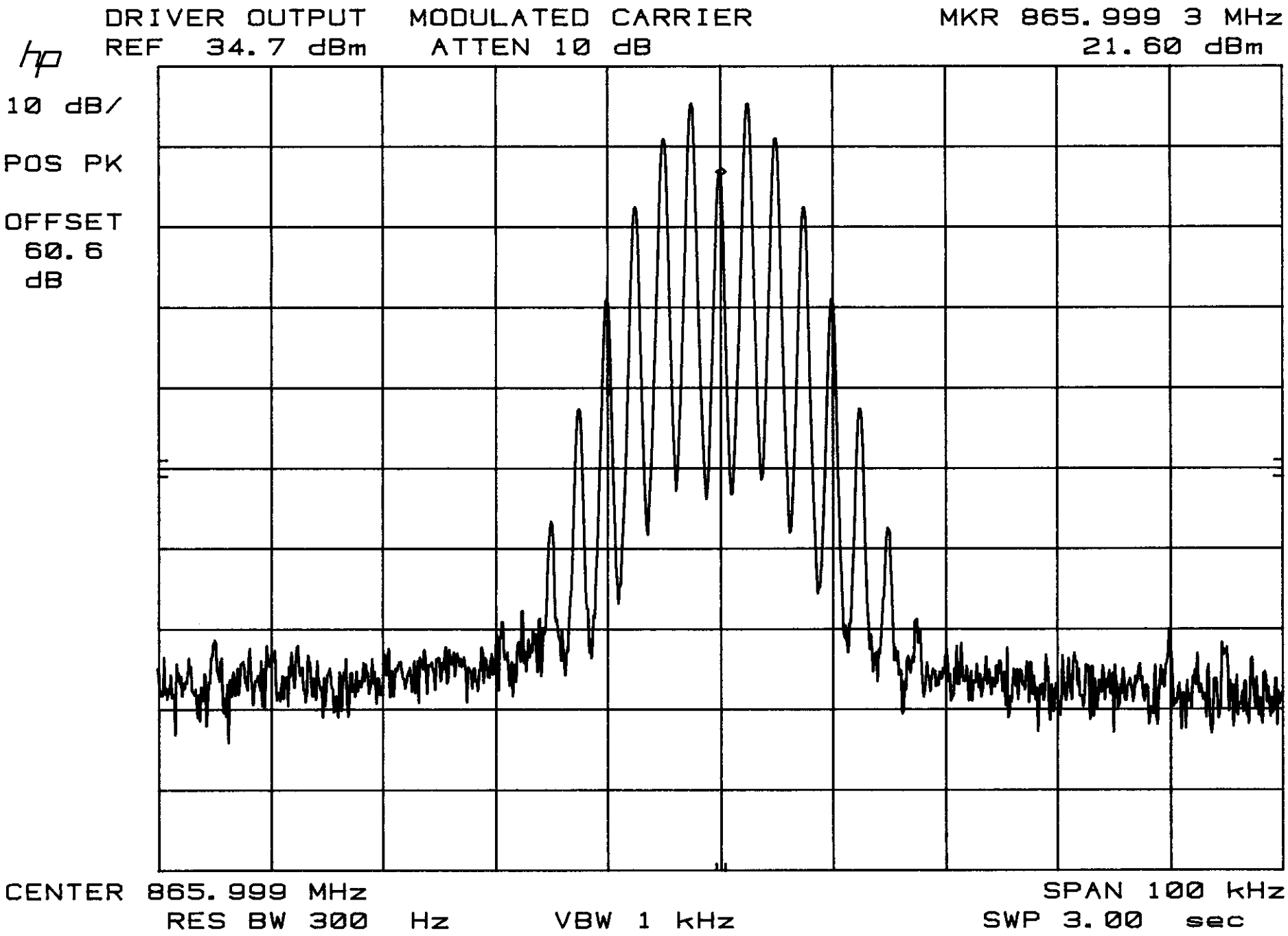

PA8-1AA-M UNMODULATED CARRIER
REF 40.7 dBm ATTEN 10 dB
MKR 865.999 3 MHz
40.70 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 865.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

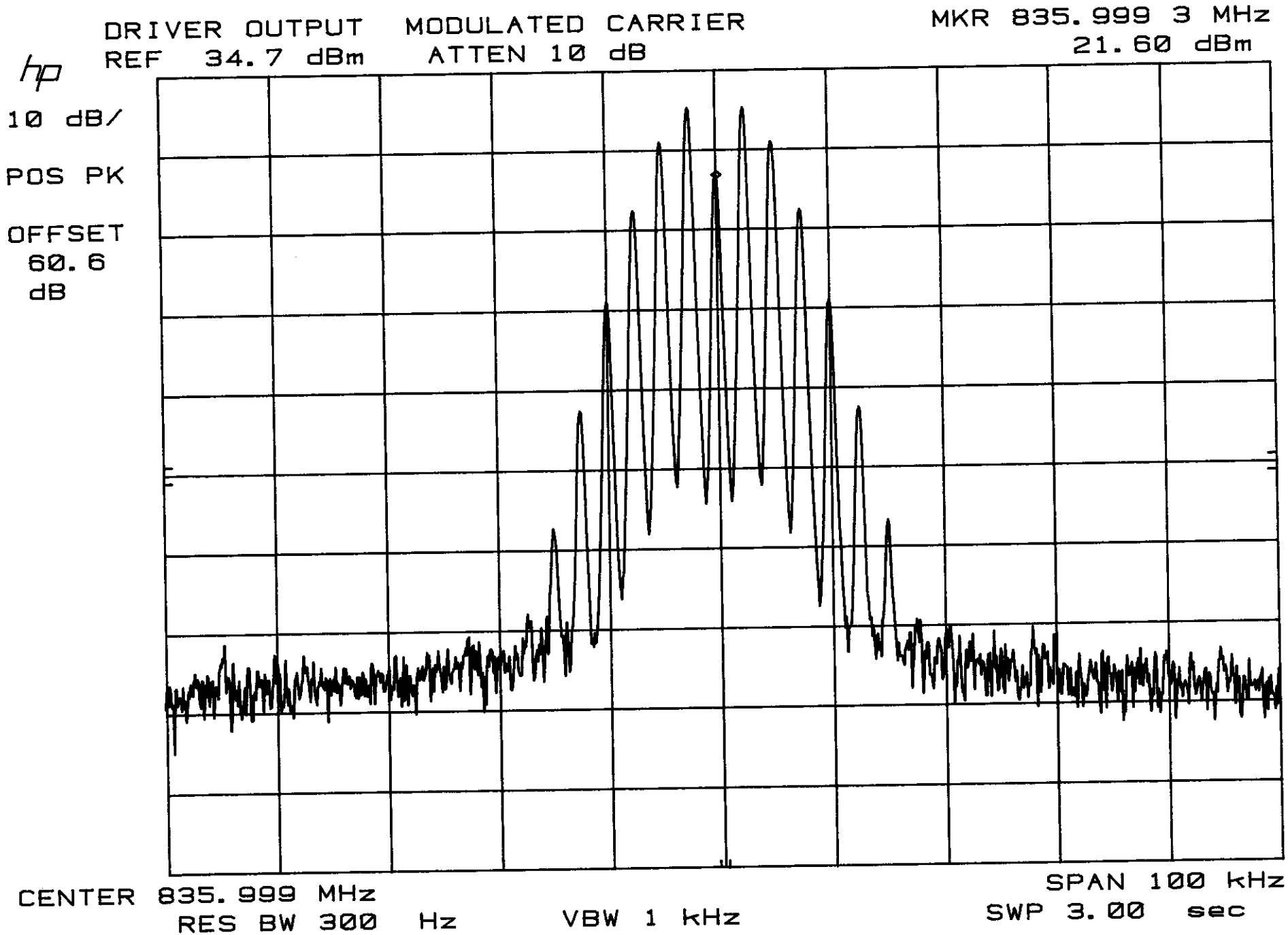

PA8-1AA-M OCCUPIED BANDWIDTH PART 90
MKR 805.999 4 MHz
REF 44.0 dBm ATTEN 10 dB
30.40 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 805.999 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 1 kHz
SWP 3.00 sec

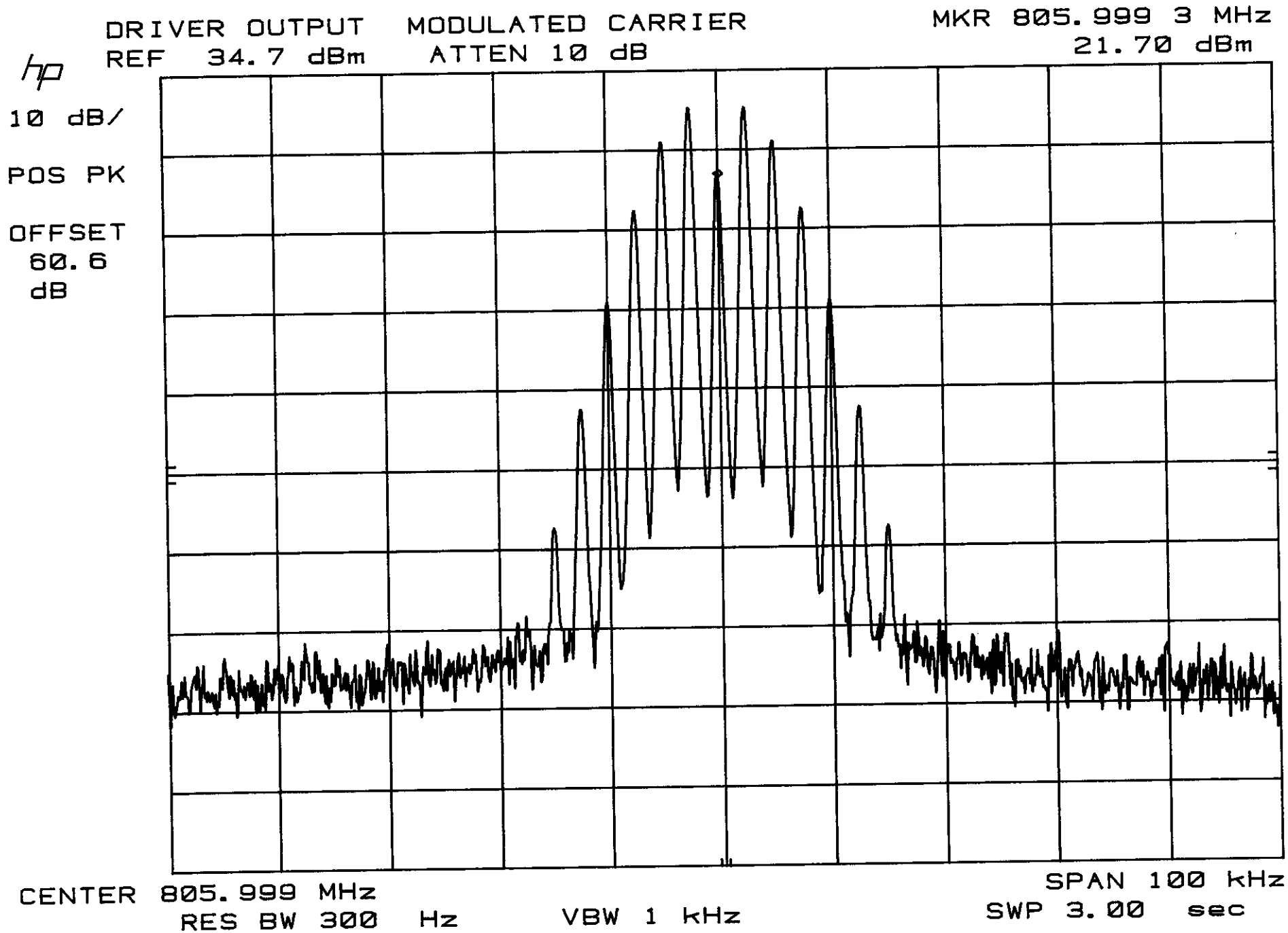

DRIVER OUTPUT UNMODULATED CARRIER
MKR 865.999 3 MHz
REF 34.7 dBm
ATTEN 10 dB
34.70 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 865.999 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 1 kHz
SWP 3.00 sec


DRIVER OUTPUT
REF 34.7 dBm
UNMODULATED CARRIER
ATTEN 10 dB
MKR 835.999 3 MHz
34.70 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 835.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


DRIVER OUTPUT UNMODULATED CARRIER
MKR 805.999 3 MHz
REF 34.7 dBm
ATTEN 10 dB
34.70 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 805.999 MHz
SPAN 100 kHz
RES BW 300 Hz
VBW 1 kHz
SWP 3.00 sec


DRIVER OUTPUT
REF 34.7 dBm
MODULATED CARRIER
ATTEN 10 dB
MKR 865.999 3 MHz
21.60 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 865.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


DRIVER OUTPUT
REF 34.7 dBm
MODULATED CARRIER
ATTEN 10 dB
MKR 835.999 3 MHz
21.60 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 835.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


DRIVER OUTPUT
REF 34.7 dBm
MODULATED CARRIER
ATTEN 10 dB
MKR 805.999 3 MHz
21.70 dBm
10 dB/
POS PK
OFFSET
60.6
dB
CENTER 805.999 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

2.983(e)(4) **Measurement of Antenna Conducted Spurious Emissions Per 2.991**

Definition: Conducted Spurious Emissions are emissions at the antenna terminals on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communication desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

Conducted spurious emissions shall be attenuated below the maximum level of the carrier frequency in accordance with the following formula:

Spurious attenuation in dB = $43 + 10 \log_{10} Po$

Where Po = output in watts

$= 43 + 10 \log_{10} (25)$

$= 56.9$ dB

Test Method: Per EIA RS 152-B, Paragraph 4.

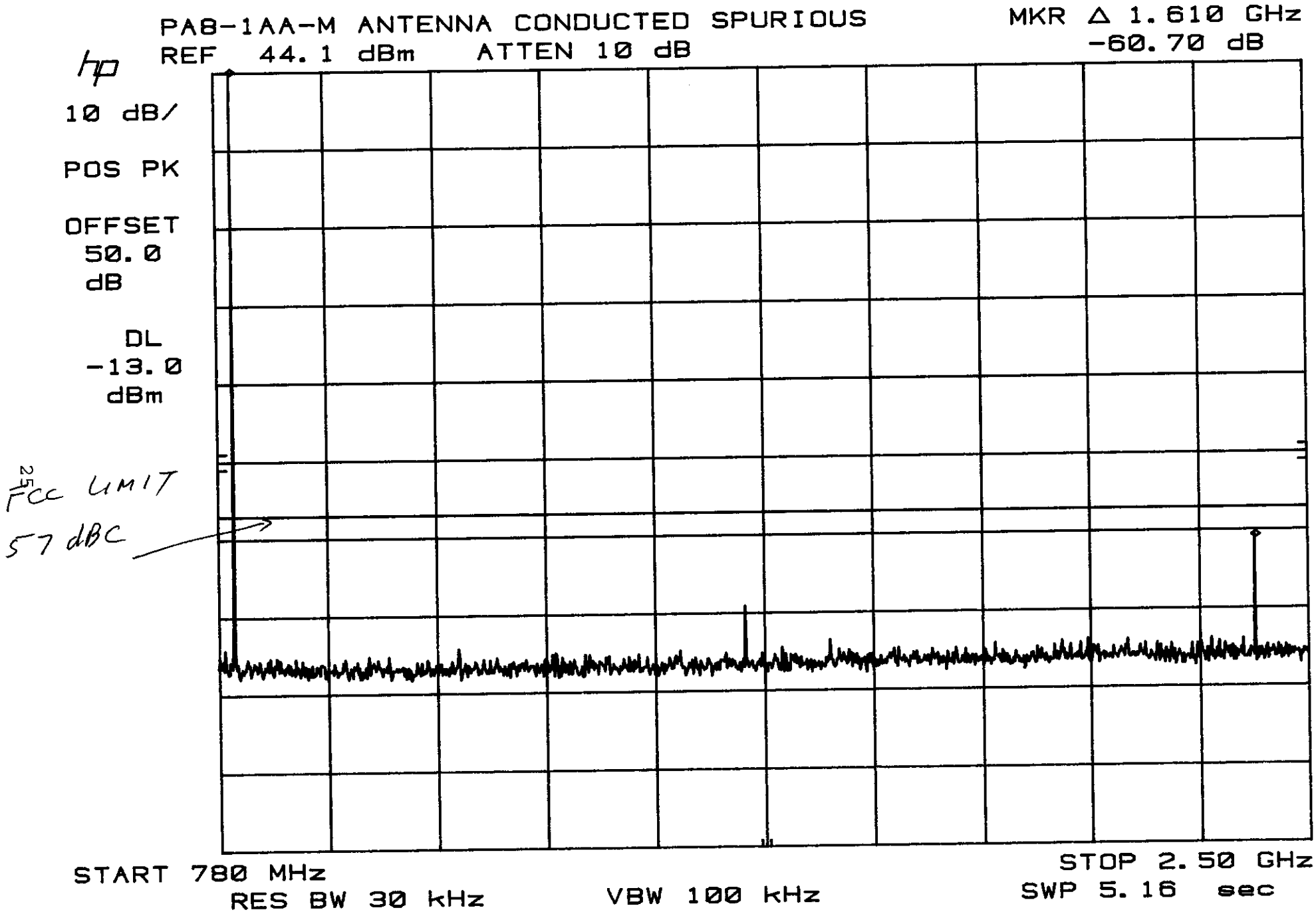
Connect the equipment as shown in FIGURE 4.

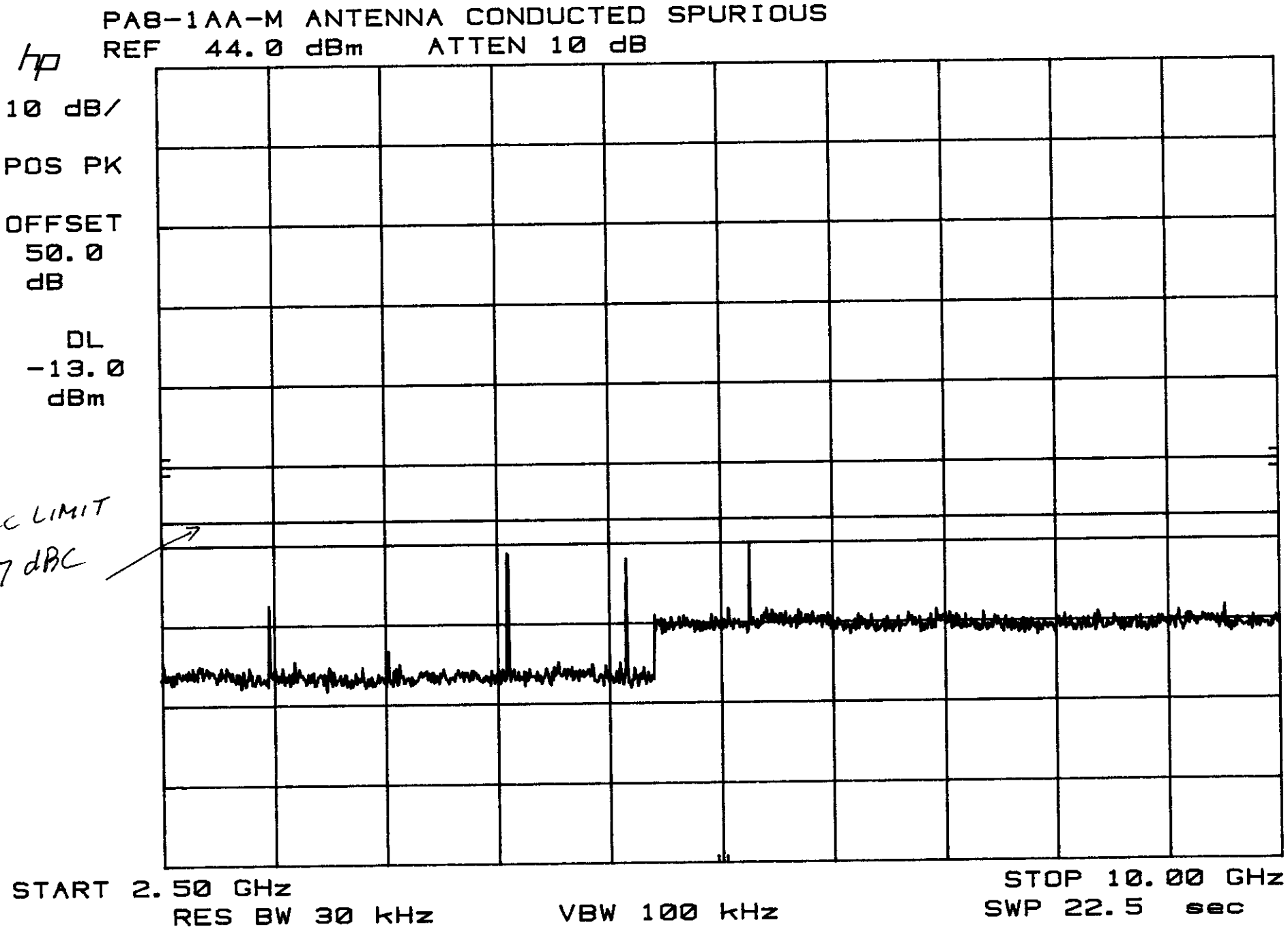
Adjust the audio oscillator so that the frequency deviation of the transmitter is 5 kHz at a modulation frequency of 2.5 kHz. Adjust the spectrum analyzer to display the modulated carrier.

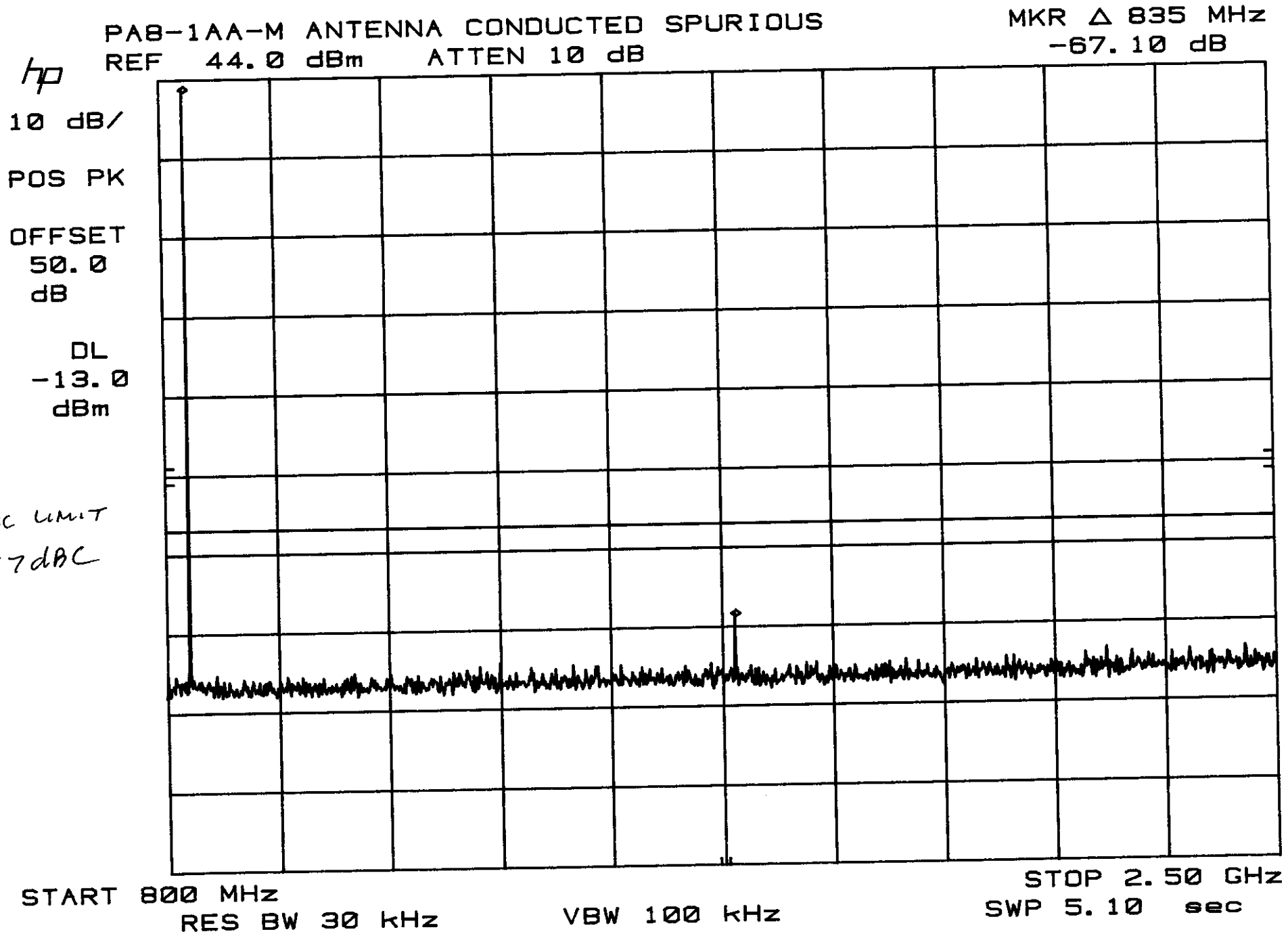
Scan the frequency spectrum from the lowest radio frequency generated in the equipment through the 10th harmonic of the carrier frequency.

Test Results: See Plots Following Figure 4.

All spuirious antenna conducted emissions are below the FCC specifications.


PA8-1AA-M ANTENNA CONDUCTED SPURIOUS
REF 44.1 dBm ATTEN 10 dB
MKR Δ 1.610 GHz
-60.70 dB
10 dB/
POS PK
OFFSET
50.0
dB
DL
-13.0
dBm
FCC LIMIT
57 dBC
START 780 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 5.16 sec

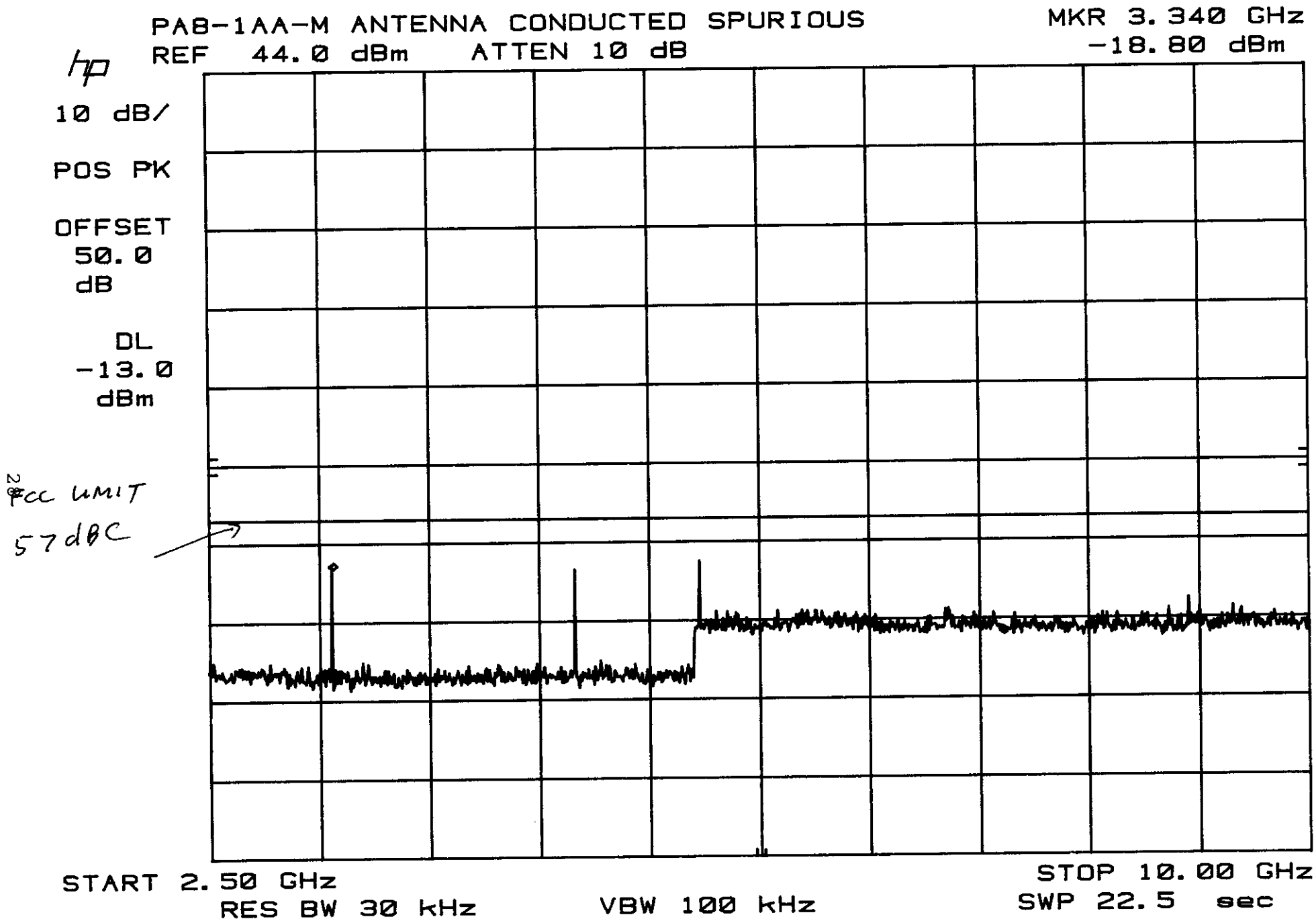

PA8-1AA-M ANTENNA CONDUCTED SPURIOUS
REF 44.0 dBm
ATTEN 10 dB
10 dB/
POS PK
OFFSET
50.0
dB
DL
-13.0
dBm
FCC LIMIT
57 dBC
START 2.50 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 22.5 sec

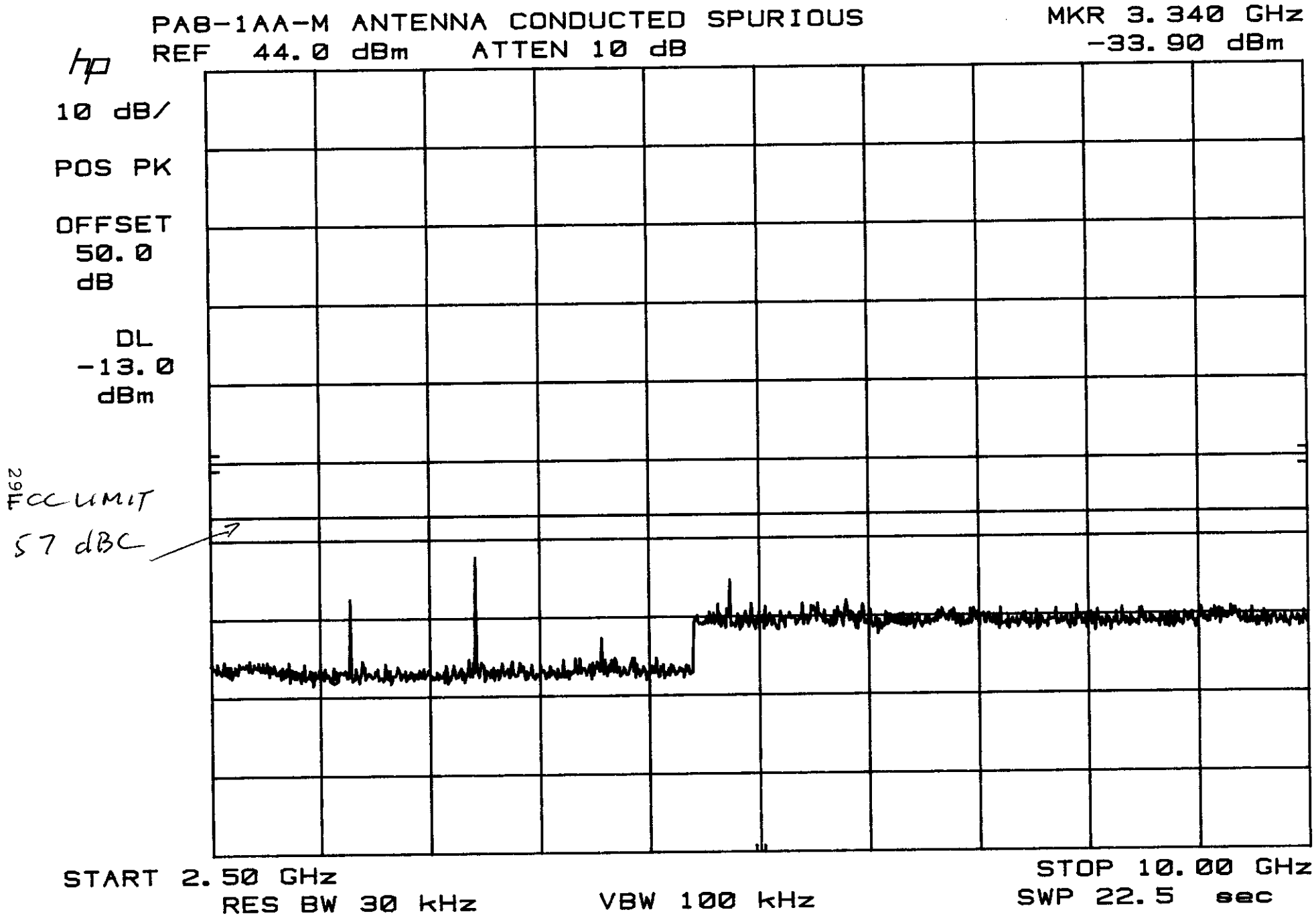


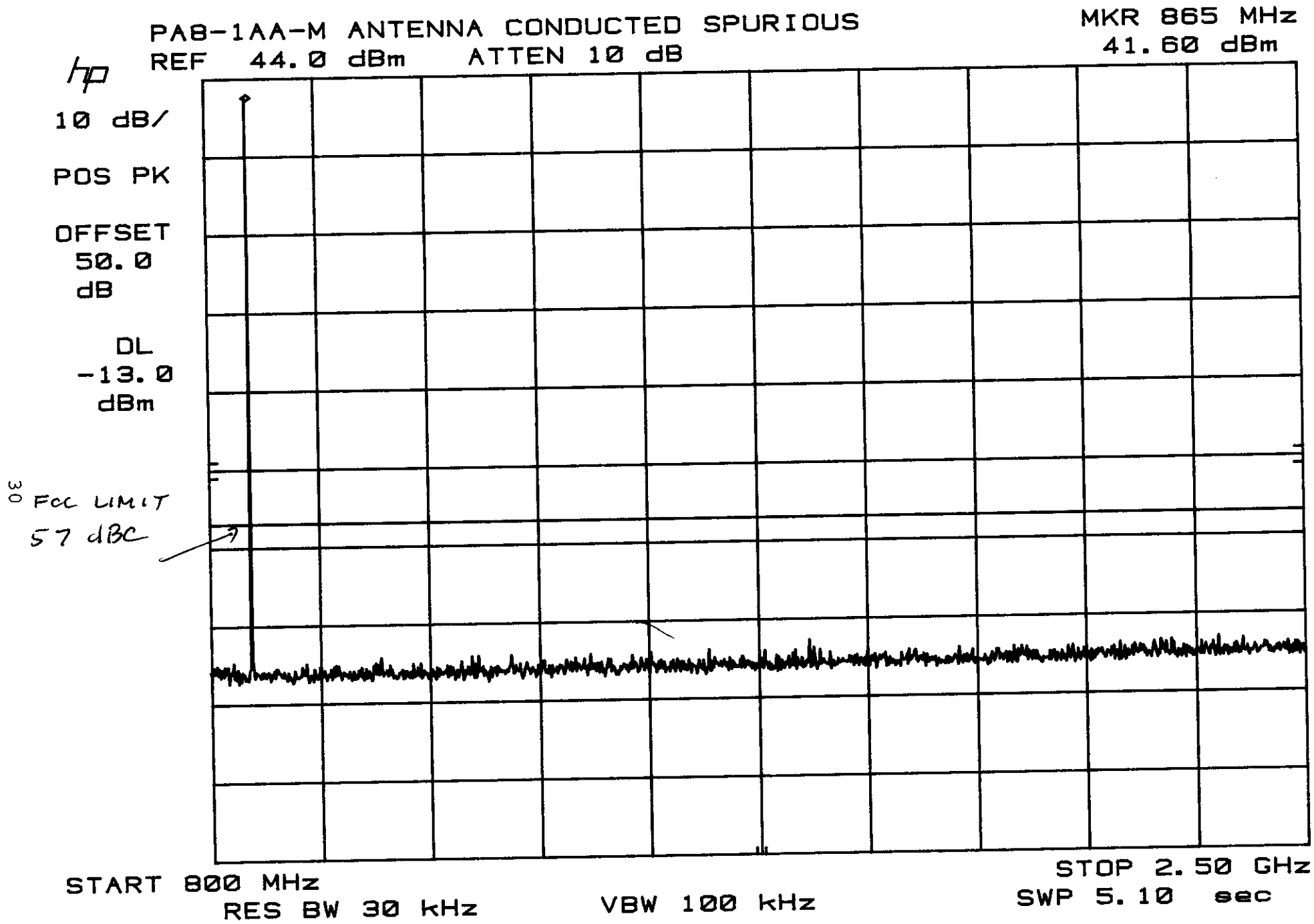
27

FCC LIMIT

57dBC


PA8-1AA-M ANTENNA CONDUCTED SPURIOUS
REF 44.0 dBm ATTEN 10 dB
MKR 3.340 GHz
-18.80 dBm
10 dB/
POS PK
OFFSET
50.0
dB
DL
-13.0
dBm
FCC LIMIT
57dBC
START 2.50 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 22.5 sec


PA8-1AA-M ANTENNA CONDUCTED SPURIOUS
REF 44.0 dBm ATTEN 10 dB
MKR 3.340 GHz
-33.90 dBm
hp
10 dB/
POS PK
OFFSET
50.0
dB
DL
-13.0
dBm
FCC LIMIT
57 dBC
START 2.50 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 10.00 GHz
SWP 22.5 sec


PA8-1AA-M ANTENNA CONDUCTED SPURIOUS
REF 44.0 dBm ATTEN 10 dB
MKR 865 MHz
41.60 dBm
10 dB/
POS PK
OFFSET
50.0
dB
DL
-13.0
dBm
30
FCC LIMIT
57 dBc
START 800 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 5.10 sec