

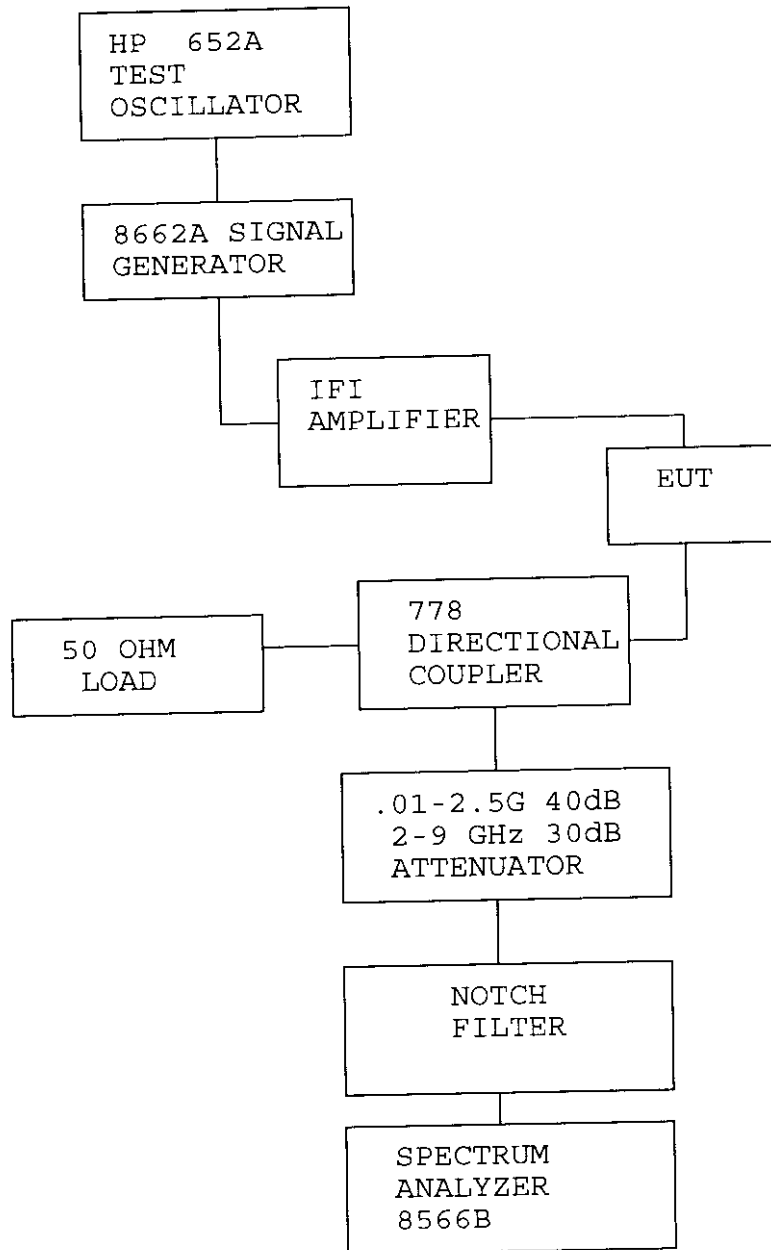


FIGURE 2. BLOCK DIAGRAM.
(POWER INPUT/OUTPUT TESTS)

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:

Frequency	POWER OUTPUT		
	Nominal	85%	115%
	Voltage 115 VAC	Voltage 97.75 VDC	Voltage 132.25 VDC
460 MHz	300.0 W	300.0 W	300.0 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 Bandwidth per 2.989**

Definition: Occupied bandwidth, that is the frequency bandwidth 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 bandwidth was well within the limits specified in the FCC regulations

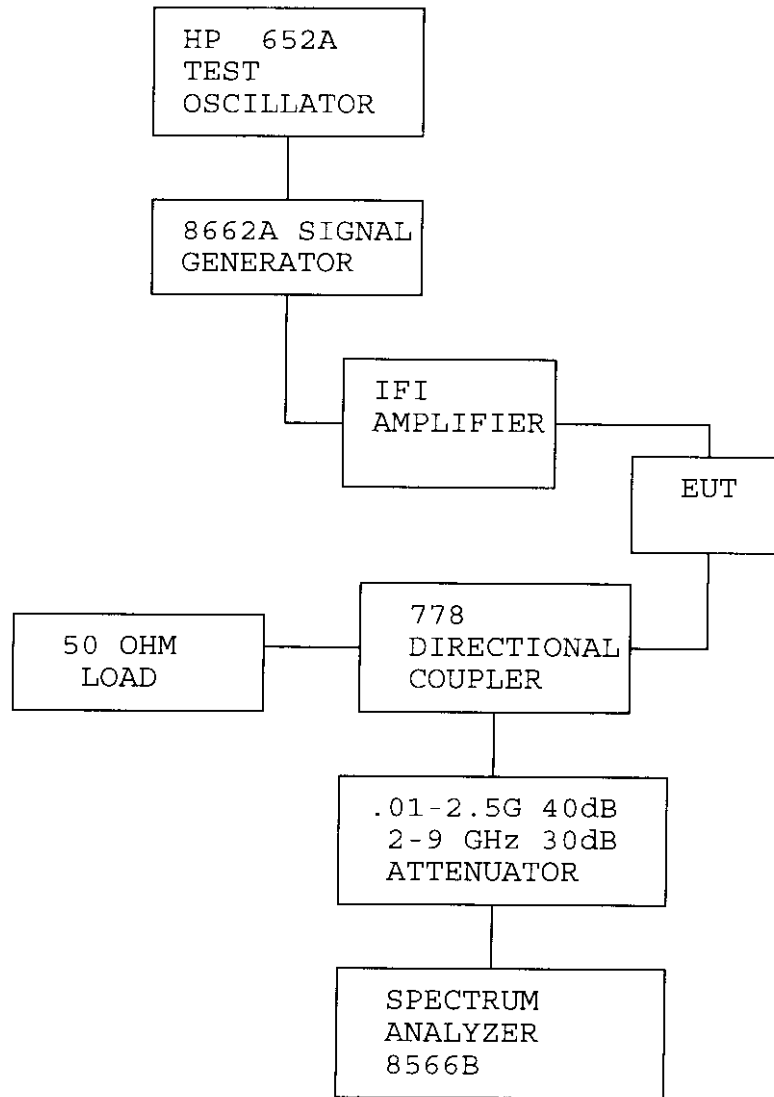


FIGURE 3. BLOCK DIAGRAM.
(OCCUPIED BANDWIDTH)

PAG-2EF-HMS

UNMODULATED CARRIER.

MKR 460.000 0 MHz
54.80 dBm

300 WATTS

ATTEN 10 dB

REF 66.0 dBm

h₀

10 dB/

POS PK

OFFSET

66.0

dB

DL

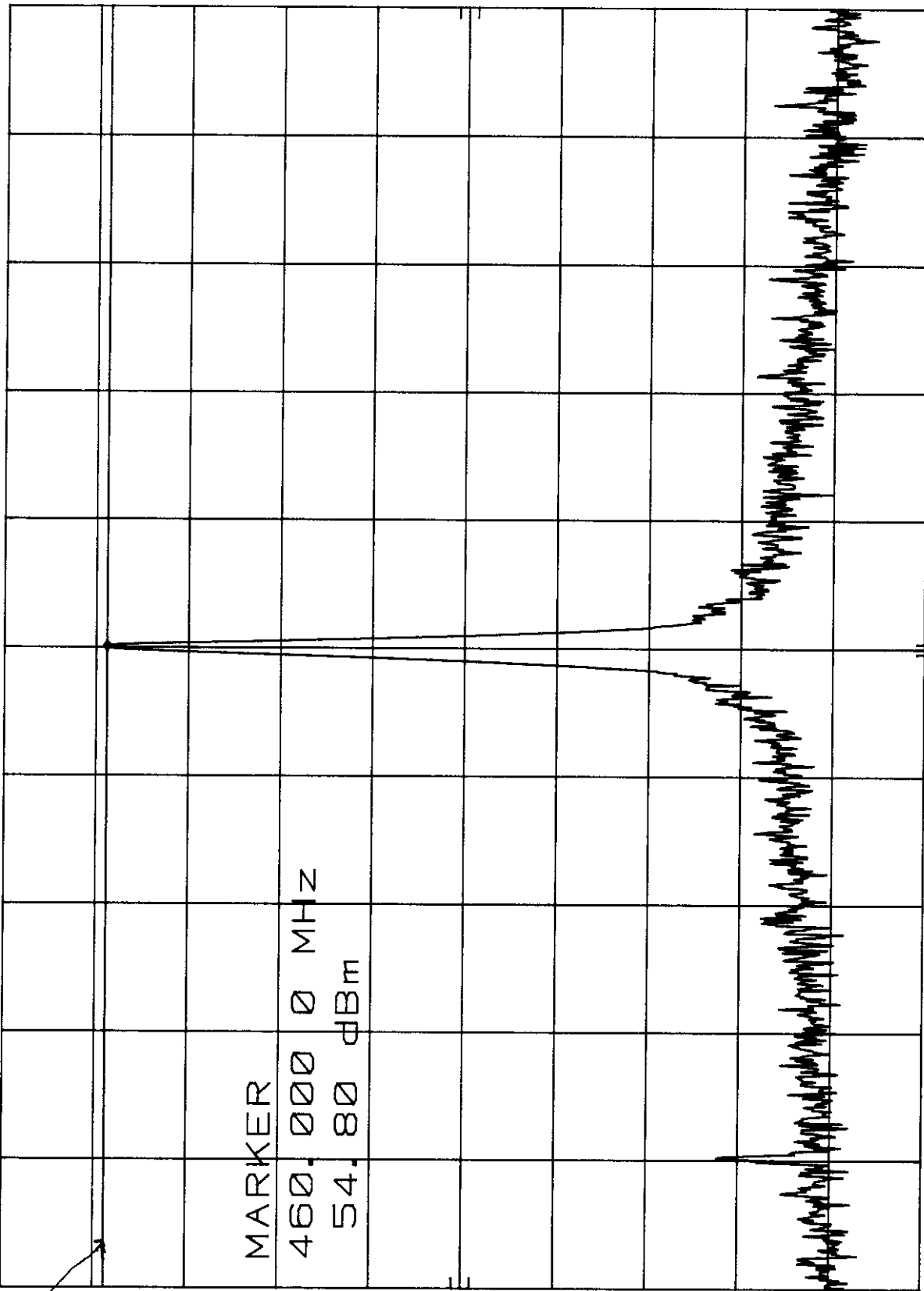
54.8

dBm

MARKER

460.000 0 MHz

54.80 dBm



CENTER 460.000 MHz

RES BW 300 Hz

VBW 1 kHz

SPAN 100 kHz

SWP 3.00 sec

PAG-2EF-HMS

ATTEN 10 dB

REF ID: A66088

74

10 dB/

PK
S
P

TEST 30

99.

29

300 WKTTS

70

54.8

332

13

2870 (6105)

FCC UNITS

CENTER 460.000 MHZ

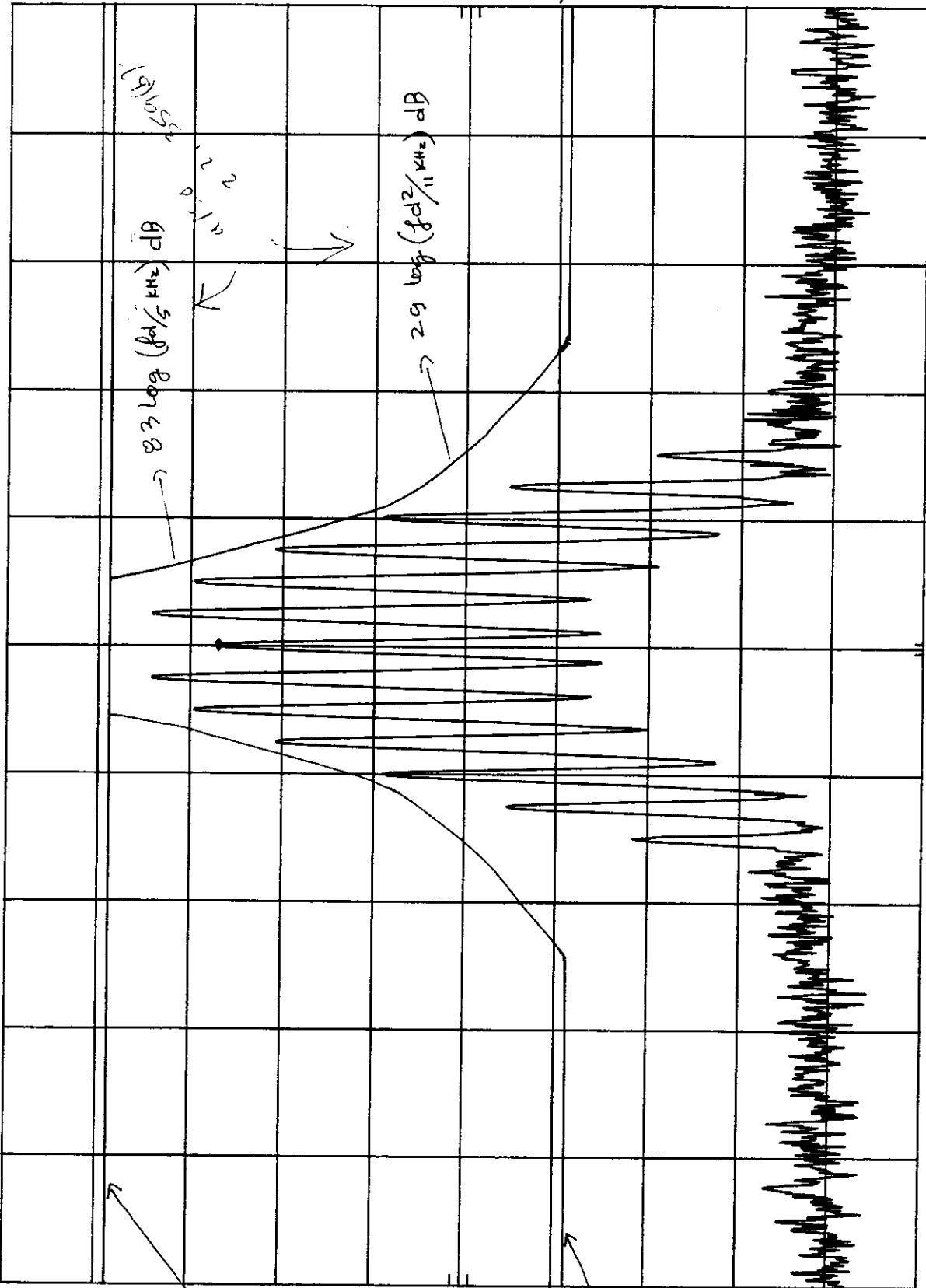
RES BW 300

NH

VBW 1 KHZ

SPAN 100 KHZ

SWP 3.00 sec



DRIVER OUTPUT : UNMODULATED CARRIER.

MKR 460.000 0 MHz
19.00 dBm

HP REF 40.0 dBm ATTEN 10 dB

10 dB/

POS PK

OFFSET

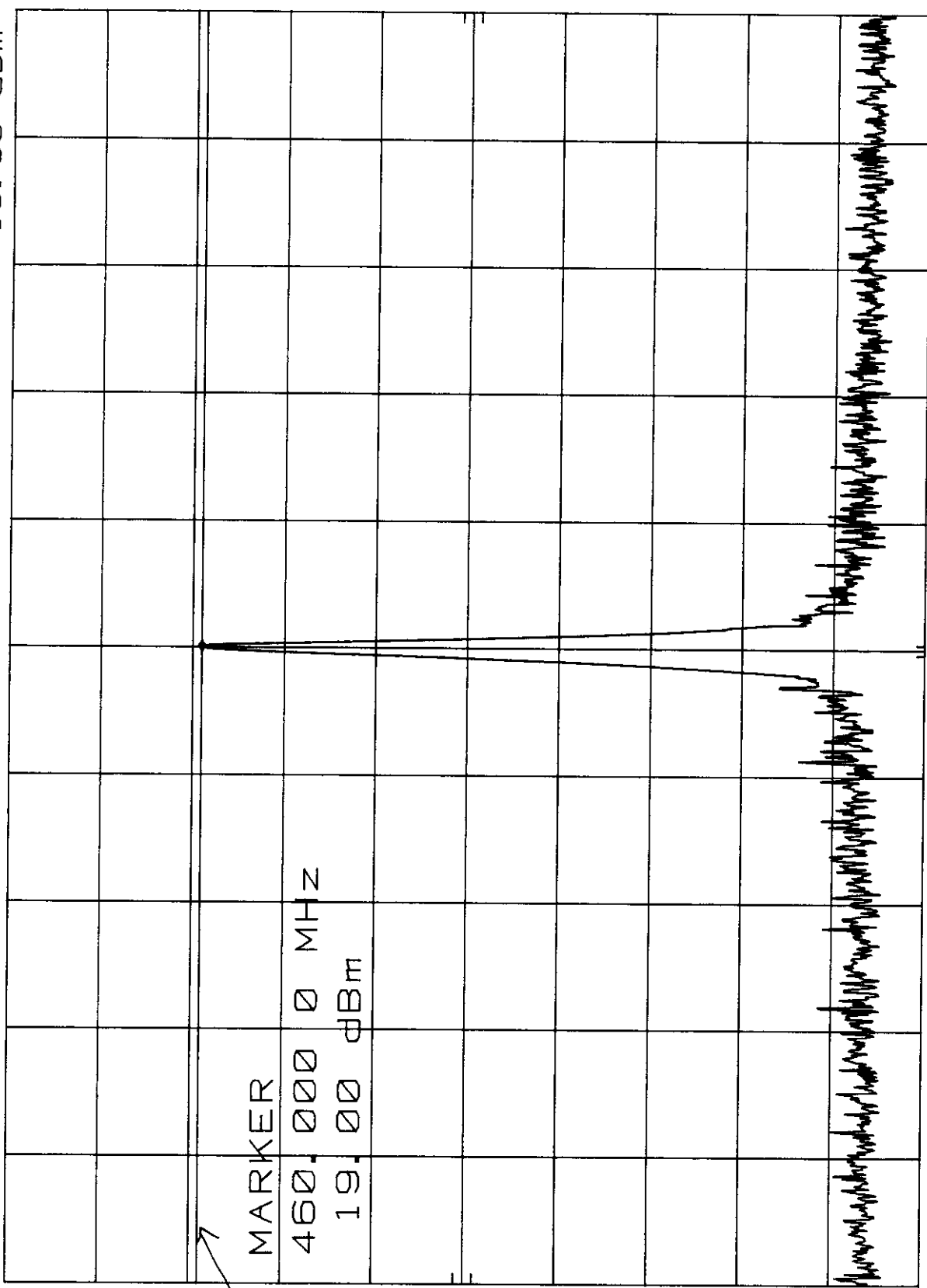
40.0
dB

MARKER

460.000 0 MHz

19.00 dBm

DL
80 mV/ 19.0
dBm



CENTER 460.000 MHz
RES BW 300 Hz
SPAN 100 KHz
SWP 3.00 sec
VBW 1 KHz

DRIVER OUTPUT : MODULATED CARRIER.

MKR 460.000 0 MHz
6.30 dBm

HP REF 40.0 dBm ATTN 10 dB

10 dB/

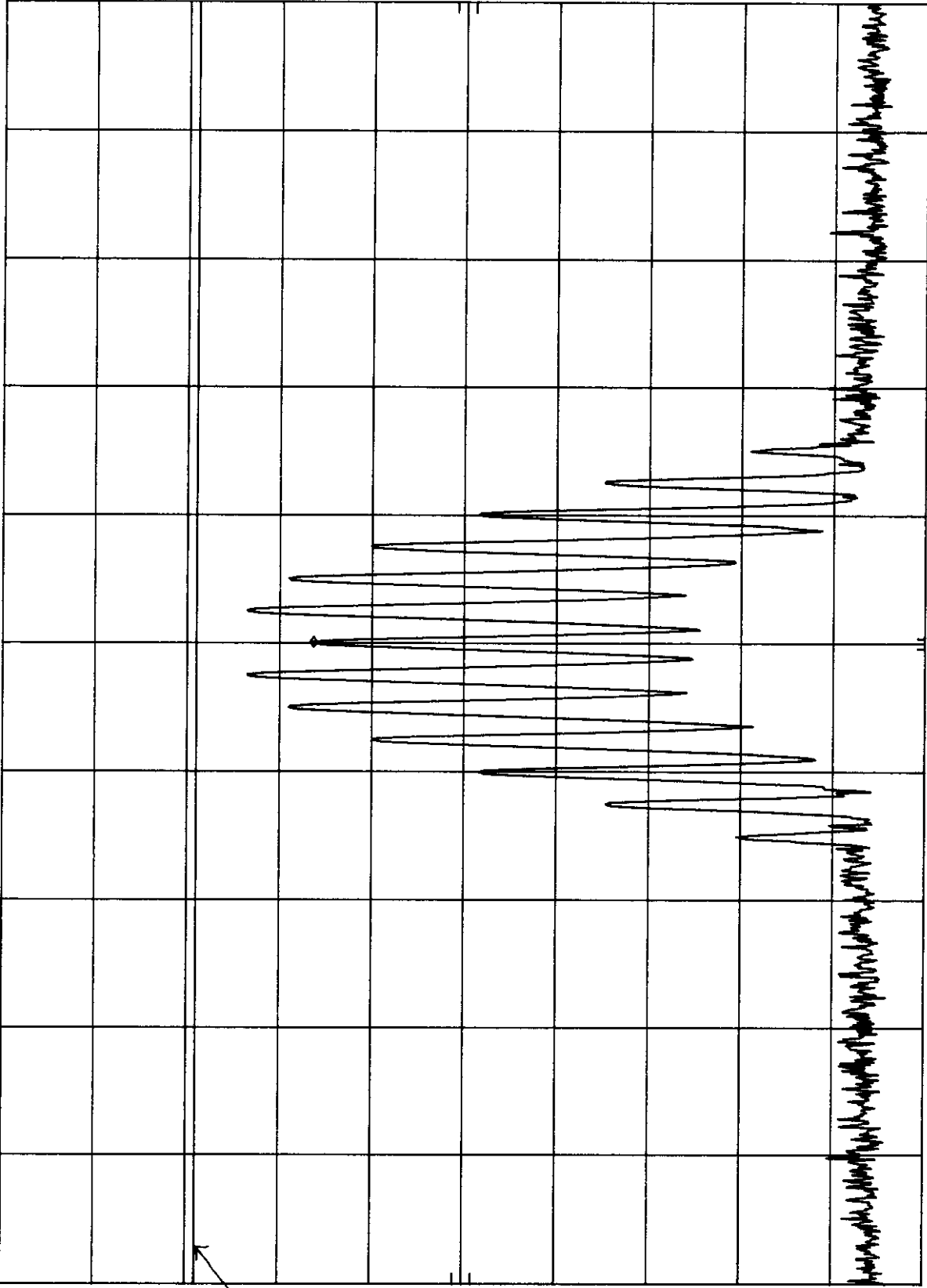
POS PK

OFFSET

40.0
dB

DL
19.0
dBm

80 mW¹⁵



CENTER 460.000 MHz
RES BW 300 Hz
SPAN 100 kHz
SWP 3.00 sec
VBW 1 kHz

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:

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

Where P_o = output in watts

$$= 43 + 10 \log_{10} (300)$$

$$= 67.8 \text{ dB}$$

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 spurious antenna conducted emissions are below the FCC specifications.

PA6-2EF-HMS

ANTENNA CONDUCTED SPURIOUS

MKR 461 MHz
0.70 dBm

ATTEN 10 dB

REF 46.0 dBm

h_p

10 dB/

POS PK

OFFSET

46.0

dB

DL

-13.0

dBm

MARKER

461 MHz

0.70 dBm

→

WITH NOTCH FILTER AT SPECTRUM ANALYZER
to prevent overload of spectrum Analyzer

67.77 dBc

START 300 MHz

RES BW 30 KHz

VBW 100 KHz

STOP 2.50 GHz

SWP 6.60 sec

PAG-2EF-HMS
ANTENNA CONDUCTED SPURIOUS

MKR 2.758 GHz
-25.80 dBm

HP REF 46.0 dBm ATTN 10 dB

10 dB/

POS PK

OFFSET

46.0
dB

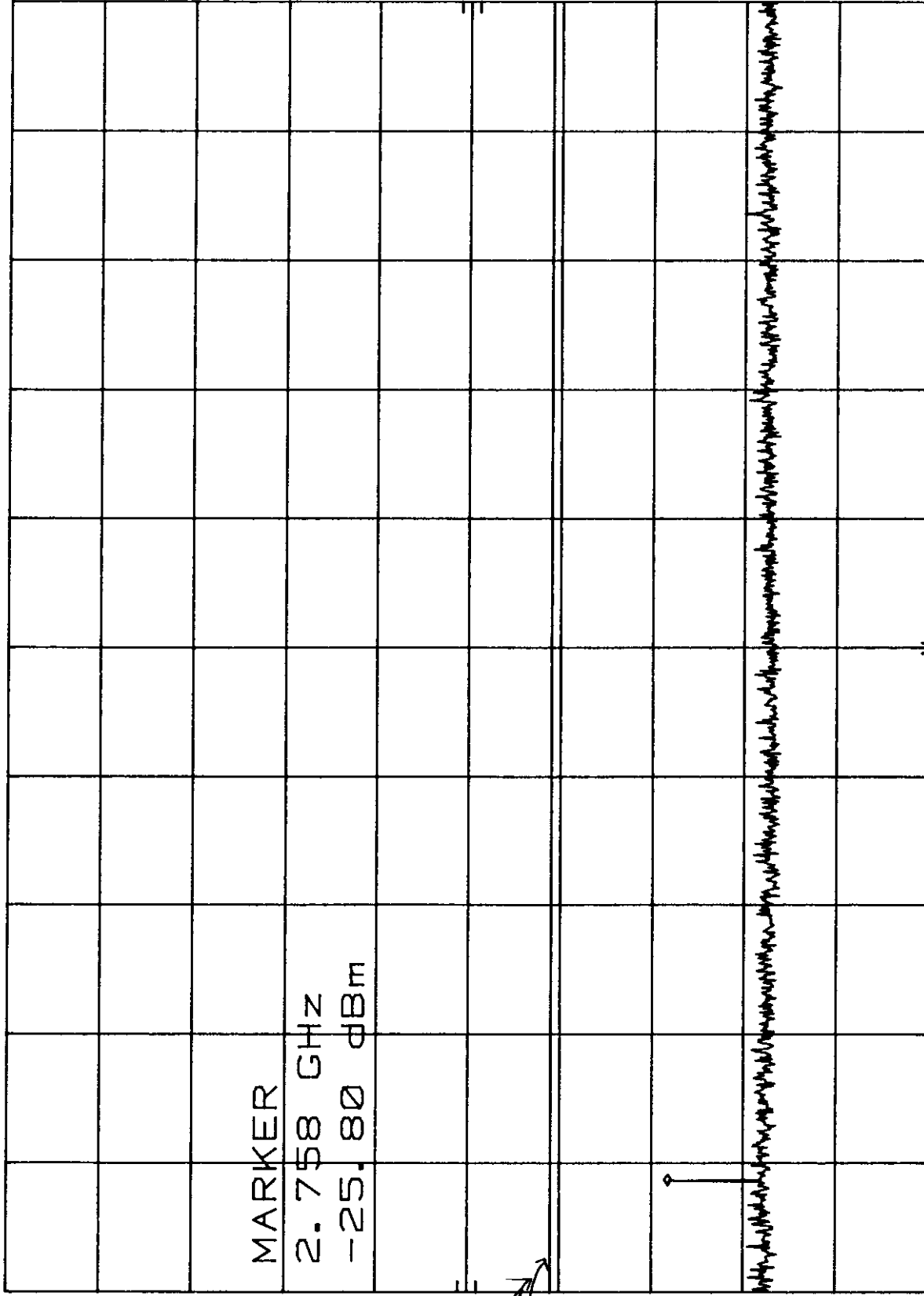
DL

-13.0
dBm

MARKER

2.758 GHz
-25.80 dBm

18
67.77 dBc



START 2.50 GHz RES BW 30 kHz STOP 5.50 GHz SWP 9.00 sec VBW 100 kHz

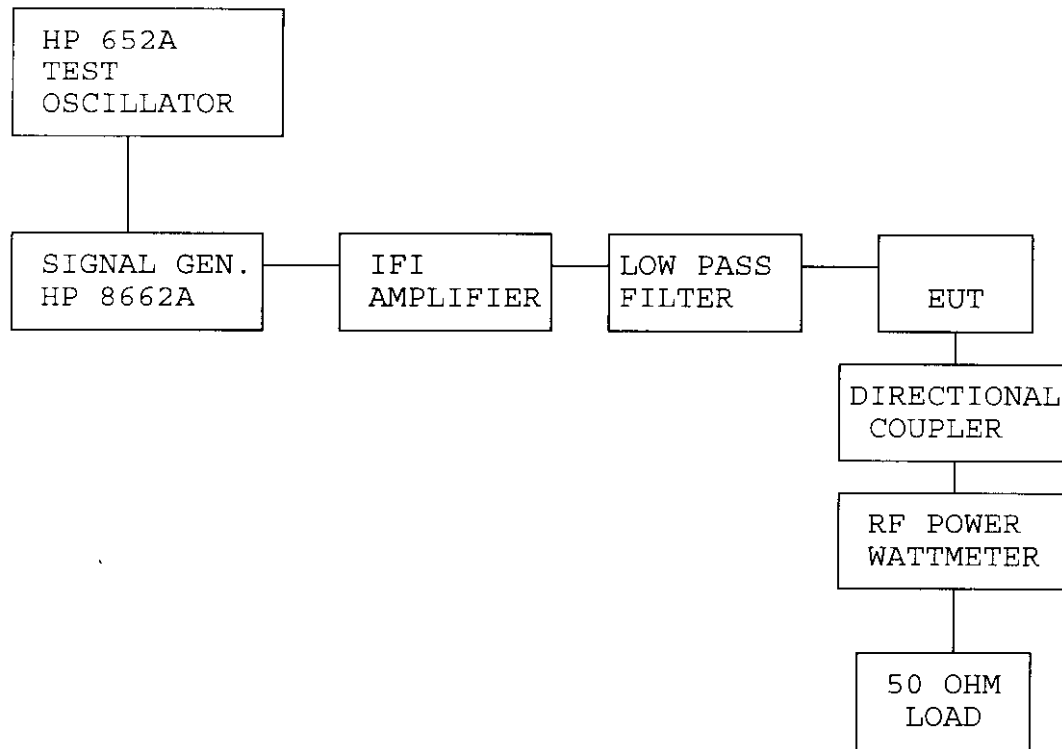


FIGURE 4. BLOCK DIAGRAM.
(SPURIOUS EMISSIONS TEST)

SPURIOUS RADIATED SIGNAL MEASUREMENTS

(Ref: Part 2, Subpart J, 2.991 & 2.993)

Date <u>3-2-98</u>	Pass <u>X</u> Fail <u> </u> (at Freq. <u> </u>)
EUT <u>RF Power Amplifier</u>	Operating Power <u>300 watts</u>
Part No. <u>PA6-2EF-HMS</u>	Operating Mode <u>Saturated</u>
Serial No. <u> </u>	Test Engineer <u>Bjorn</u>

FREQUENCY TUNED TO 460 MHz

ANT POL	FREQ MHz	SPECTRUM ANALYZER (dBμV)	ANT. FACTOR (dB)	CABLE LOSS (dB)	AMP GAIN (dB)	dBμV/m	FUND FIELD STRENGTH dBμV/m	SPUR BELOW CARR- IER (dBc)
H	920	86.1	23.7	2.3	30.5	81.6	152.2	70.6
H	1380	85.0	25.5	2.9	30.5	82.9	/	69.3
H	1840	79.0	28.0	3.6	30.5	80.1		72.1
H	2300	72.9	30.3	4.0	30.5	76.7		75.5
H	2760	75.2	29.9	4.5	30.5	79.1		73.1
H	3230	76.8	31.7	5.1	30.5	83.1		69.1
H	3680	66.4	32.8	5.7	30.5	74.4		77.8
H	4140	66.4	33.2	6.2	30.5	75.3		76.9
H	4600	74.9	33.8	6.4	42	73.1		79.1

$$\text{Fundamental Field Strength (V/m)} = 1/3 (R_o \times P_o)^{1/2} = 1/3 (50 \times 300)^{1/2} = 40.78 \text{ V/m}$$

R_o = Amplifier Output Impedance (Ohms)

P_o = Amplifier Output Power (Watts)

$$\text{FCC Limit} = 67.8 \text{ dBc}$$

Conversion From $\mu\text{V/m}$ to $\text{dB}\mu\text{V/m}$ = $(\mu\text{V/m})^{\log} \times 20$

$$40,780,000^{\log} \cdot 20 = 152.2 \text{ dB}\mu\text{V/m}$$

SPURIOUS RADIATED SIGNAL MEASUREMENTS

(Ref: Part 2, Subpart J, 2.991 & 2.993)

Date <u>3-2-98</u>	Pass <u>X</u> Fail <u> </u> (at Freq. <u> </u>)
EUT <u>RF Power Amplifier</u>	Operating Power <u>300 Watts</u>
Part No. <u>PA6-2EF-HMS</u>	Operating Mode <u>Saturated</u>
Serial No. <u> </u>	Test Engineer <u>Bjorn B.</u>

FREQUENCY TUNED TO 460 MHz

ANT POL	FREQ MHz	SPECTRUM ANALYZER (dBμV)	ANT. FACTOR (dB)	CABLE LOSS (dB)	AMP GAIN (dB)	dBμV/m	FUND FIELD STRENGTH dBμV/m	SPUR BELOW CARRIER (dBc)
V	920	83.1	23.7	2.3	30.5	78.6	152.2	73.6
V	1380	80.5	25.5	2.9	30.5	78.4	/	73.8
V	1840	80.0	28.0	3.6	30.5	81.1	/	71.1
V	2300	75.5	30.3	4.0	30.5	79.3	/	72.9
V	2760	72.6	29.9	4.5	30.5	76.5	/	75.7
V	3230	76.2	31.7	5.1	30.5	82.5	/	69.7
V	3680	68.1	32.8	5.7	30.5	76.1	/	76.1
V	4140	64.5	33.2	6.2	30.5	73.4	/	78.8
V	4600	75.7	33.8	6.4	42	73.9	/	78.3

$$\text{Fundamental Field Strength (V/m)} = 1/3 (R_o \times P_o)^{1/2} = 1/3 (50 \times 300)^{1/2} = 40.78 \text{ V/m}$$

R_o = Amplifier Output Impedance (Ohms)

P_o = Amplifier Output Power (Watts)

Conversion From $\mu\text{V/m}$ to $\text{dB}\mu\text{V/m}$ = $(\mu\text{V/m})^{\log} \times 20$

$$40,780,000^{\log} \cdot 20 = 152.2 \text{ dB}\mu\text{V/m}$$

$$\text{FCC Limit} = 67.8 \text{ dBc}$$

2.983(e)(6) **Measurement of Frequency Stability Per 2.995**

The EUT is a power amplifier and contains no circuitry for generating or stabilizing the RF signal. The driver will be responsible for this task.

2.983(e)(7) **Frequency Spectrum to be Investigated per 2.997**

The frequency was searched from the lowest radio frequency generated in the equipment through the 10th harmonic of the carrier frequency.

2.983 (h) **Description and Test Data For Encoding Device(s)**

This section does not apply.

2.983 (i) **Type acceptance Data For an External Power
Amplifier Used In Amateur Radio Service - Part 97**

This section does not apply

APPENDIX A
TEST EQUIPMENT

DNB ENGINEERING, INC. EMC TEST EQUIPMENT

<u>MANUFACTURER</u>	<u>DESCRIPTION</u>	<u>MODEL</u>
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

DNB ENGINEERING, INC. EMC TEST EQUIPMENT

Solar	Coupling Network	7835-896
Solar	LISN (5 μ h)	6338-5
Solar	LISN (50 μ h)	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 50 Ω Load	376NM
Eaton	WBA 500 - 1000 MHz	15100B
ENI	WBA 250 KHz - 150 MHz	3100LA
ENI	WBA 1.5 - 500 MHz	5501
Avantek	Low Noise Amplifier 6-12.4 GHz	AFT12635
Hewlett Packard	500 MHz Digitizing Oscilloscope	54111D
Tenney	Temperature Chamber	THjr

DNB ENGINEERING, INC. 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	50 Ω Load 10 W 50's	80-53
Stoddart	50 Ω Load	90514
Micro Lab	50 Ω Load	TB-5MN
Tekscan	50 Ω Attenuator Kit	FP-50
Tenuline	50 Ω 100 W 20 dB Attenuator	8343-200
Micro Lab	50 Ω 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

<u>MANUFACTURER</u>	<u>DESCRIPTION</u>	<u>MODEL</u>
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