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
480 MHz	45 Watts	35 Watts	45.7 Watts

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 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.

PA6-1ABH-M   OCCUPIED BANDWIDTH   PART 90   MKR 480.000 2 MHz

REF 46.5 dBm   ATTEN 10 dB   33.50 dBm

10 dB/

POS PK

OFFSET
60.0
dB

Fcc LIMIT

60dBC

SPAN 100 kHz
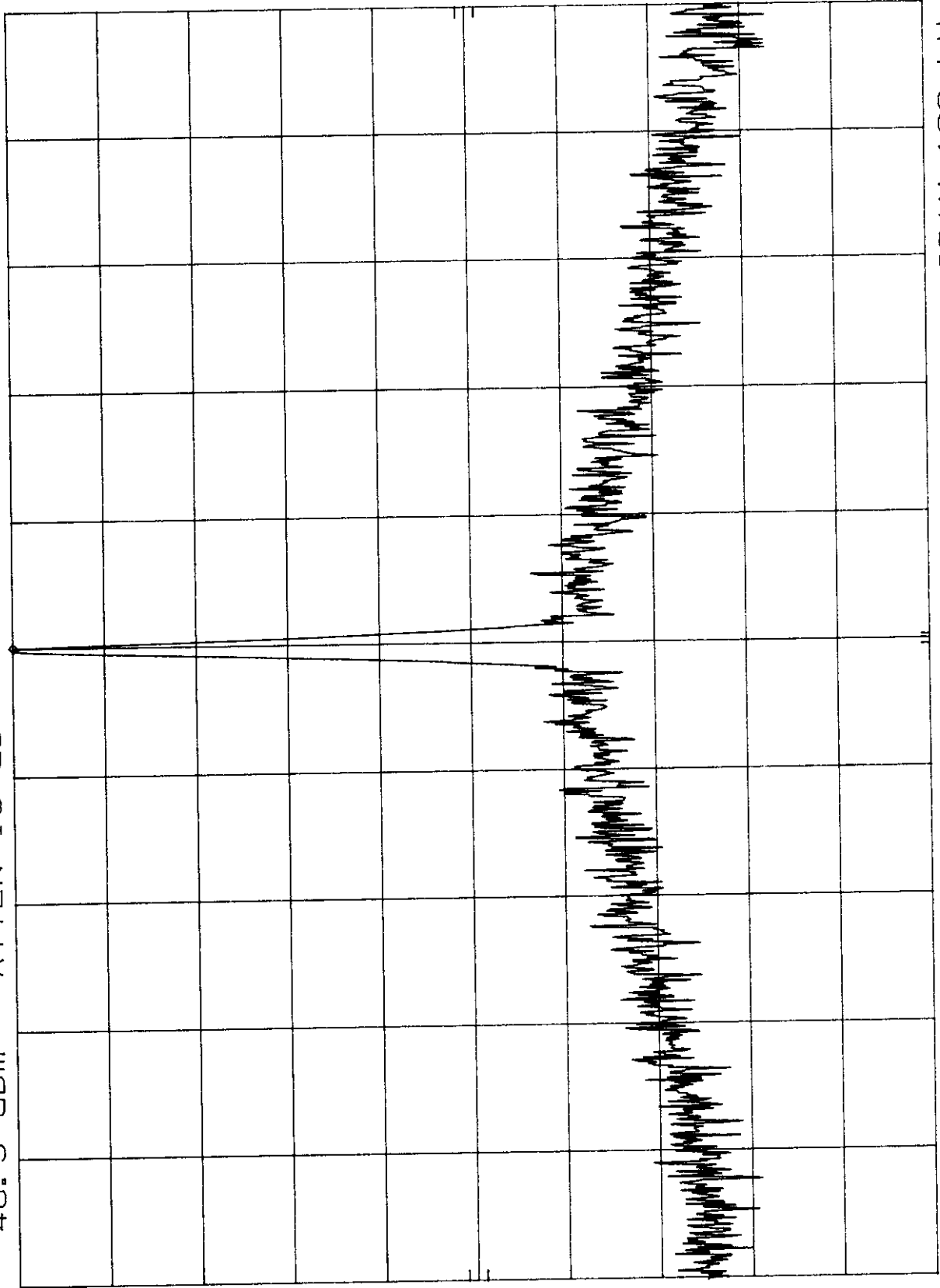
SWP 3.00 sec

VBW 1 kHz

CENTER 480.000 MHz   RES BW 300 Hz

SHEET 13

PA6-1ABH-M   OCCUPIED BANDWIDTH PART 22   MKR 480.000 2 MHz
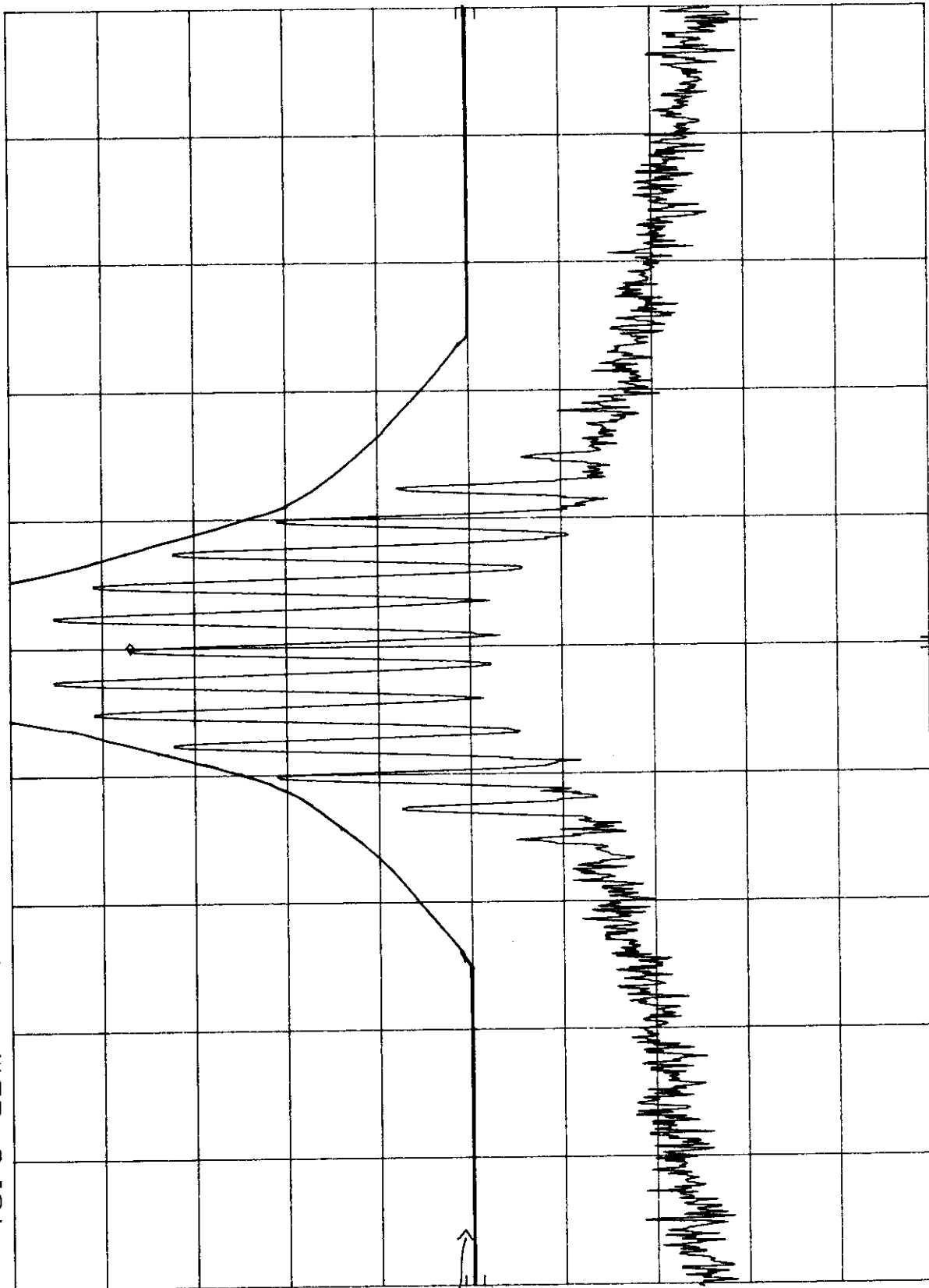REF 46.5 dBm   ATTEN 10 dB   33.50 dBm
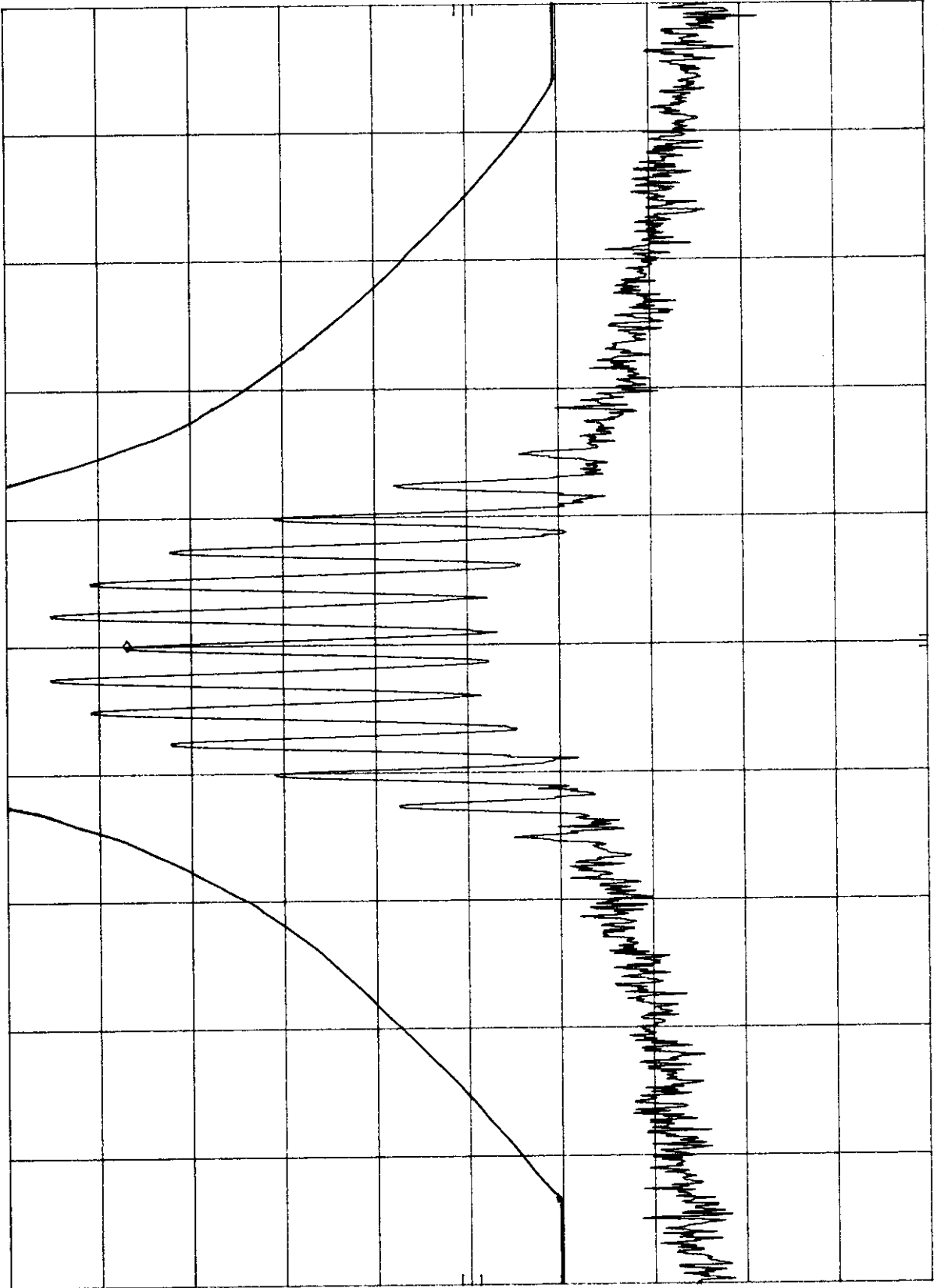
hp

10 dB/

POS PK

OFFSET
60.0
dB

SHEET 14 FCC LIMIT

5 0.5BC

CENTER 480.000 MHz   SPAN 100 kHz
RES BW 300 Hz   VBW 1 kHz   SWP 3.00 sec

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

<u>Definition:</u>

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:

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

$$\text{Where } Po = \text{Output in Watts}$$

$$= 43 + 10 \log_{10}(45)$$

$$= 60 \text{ dB}$$

<u>Test Method:</u> 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 a 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.

<u>Test Results:</u> See Plots following FIGURE 4.

All spurious antenna conducted emissions are below the FCC Specifications.

PA6-1ABH-M   ANT.   CONDUCTED SPURIOUS
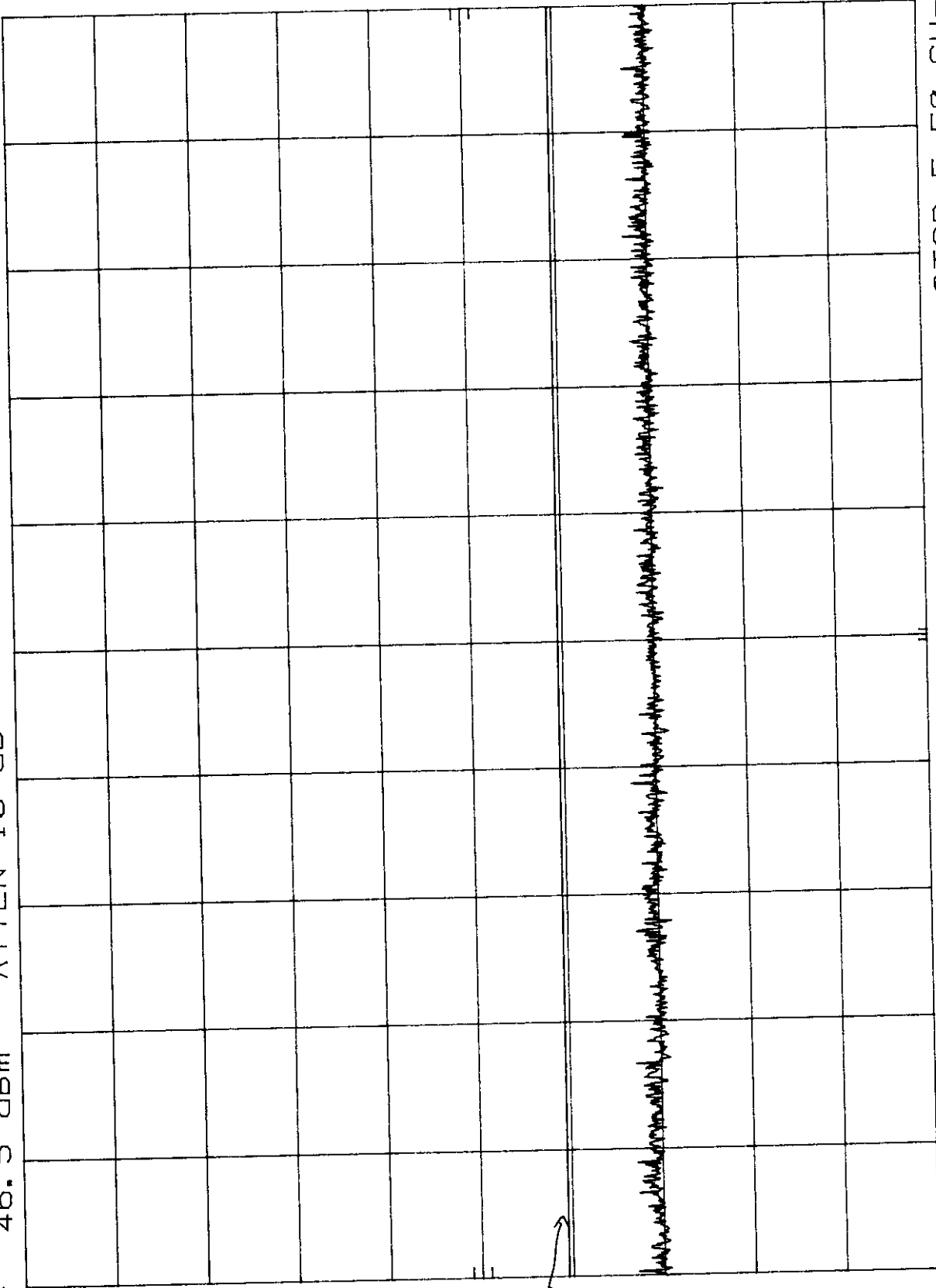REF 46.5 dBm   ATTEN 10 dB

hp

10 dB/

POS PK

OFFSET
60.0
dB

DL
-13.0
dBm

FCC LIMIT

59.5 dBC

SHEET 17

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

MKR △ 479 MHz
−70.10 dB

PA6-1ABH-M   ANT. CONDUCTED SPURIOUS
REF 46.5 dBm   ATTEN 10 dB

10 dB/

POS PK

OFFSET
60.0
dB

DL
−13.0
dBm

SHEET 18   FCC LIMIT

59.5 dBc
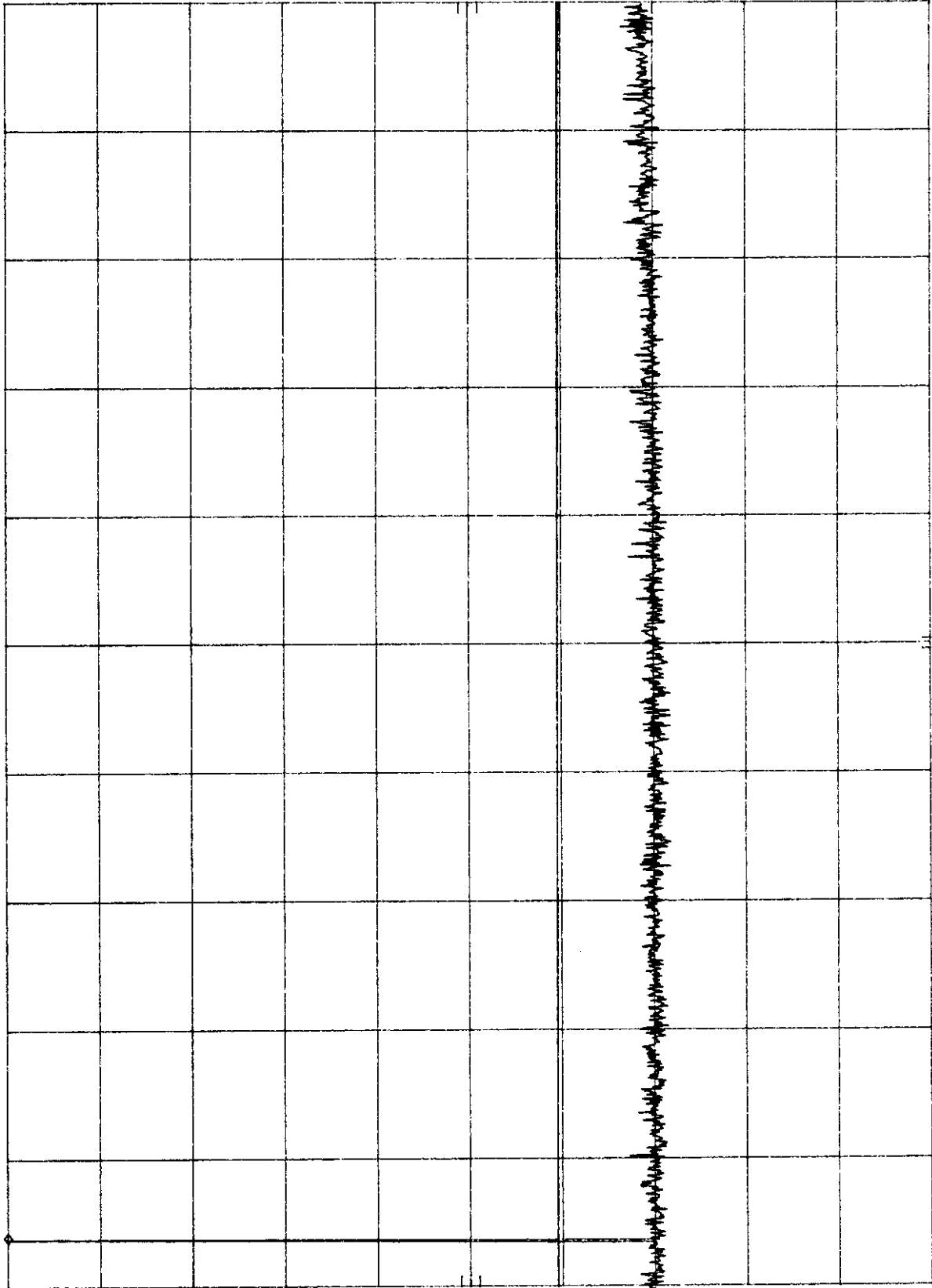
START 400 MHz   STOP 2.50 GHz
                        SWP 6.30 sec
RES BW 30 kHz   VBW 100 kHz

2.983(e)(5) Measurement of Radiated Spurious Emissions per 2.993

Definition:
Emissions from the equipment when connected into a non-radiating load 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.

Test Method: Per EIA RS 152-B.

Connect the equipment and follow the procedure described in paragraph 2.2.1.1 and paragraph 5.0. Measure the amplitude of each spurious radiated signal through the 10th harmonic. The level in dBuV/m is calculated on the following page. The spurious signals are then measured on the 3 meter range.

$$\text{Spurious attenuation dB} = 10 \log \frac{\text{Po Watts}}{\text{Calc. Spurious power}}$$

Test Results: See TABLE I on following Page.

All radiated spurious emissions are below the FCC Specifications.

SPURIOUS RADIATED SIGNAL MEASUREMENTS

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

Date ___7-23-99___   Pass __✓__ Fail _____ (at Freq. _____)

EUT _RF POWER AMPLIFIER_   Operating Power ___45 WATTS___

Part No. _PA6-1ABH-M_   Operating Mode _SATURATED_

Serial No. _0001_   Test Engineer _CHI CAI_

FREQUENCY TUNED TO _480,_____ 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)
H	960	48.9	23.5	2.5	22	52.9	143.9	91
H	1440	28.6	28.0	5.0	22	39.6	143.9	104.3
H	1920	36.1	32.5	6.0	22	52.6	143.9	91.3
H	2400	46.8	29.5	6.5	42	40.8	143.9	103.1
H	2880	43.6	30.5	7.5	42	39.6	143.9	104.3
H	3360	46.8	32	8.0	42	44.8	143.9	99.1
H	3840	46.6	33	9.5	42	46.1	143.9	97.8
H	4320	40.2	33.5	10.0	42	41.7	143.9	102.2
H	4800	31.3	34	11.0	42	34.3	143.9	109.6

Fundamental Field Strength (V/m) = $1/3 (Ro \times Po)^{\frac{1}{2}}$ $= 1/3 (50 \times 45)^{1/2}$

Ro = Amplifier Output Impedance (Ohms) = 50 Ω   = 15.8 V/m

Po = Amplifier Output Power (Watts) = 45W   = 143.9 dBμV/m

Conversion from μV/m to dBμV/m = $(\mu V/m)^{\log} \times 20$

FCC LIMIT = 43 ~~SHEET log~~ (45) = 63 dBc

SPURIOUS RADIATED SIGNAL MEASUREMENTS

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

Date __7-23-99__   Pass __✓__   Fail ____ (at Freq. ____)

EUT __RF POWER AMPLIFIER__   Operating Power __45 WATTS__

Part No. __PAG-1ABH-M__   Operating Mode __SATURATED__

Serial No. ____0001____   Test Engineer __CHI CAI__

FREQUENCY TUNED TO __480__ 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	960	57.5	23.5	2.5	22	61.5	143.9	82.4
V	1440	21.0	28.0	5.0	22	42		101.9
V	1920	35.5	32.5	6.0	22	52		91.9
V	2400	54.7	29.5	6.5	42	48.7		99.2
V	2880	50.0	30.5	7.5	42	46		97.9
V	3360	46.7	32	8.0	42	44.7		99.2
V	3840	48.4	33	9.5	42	48.9		95.0
V	4320	39.3	33.5	10.0	42	40.8		103.1
V	4800	32.7	34	11.	42	35.7	143.9	108.2

Fundamental Field Strength (V/m) = 1/3 (Ro x Po)$^{1/2}$ $= 1/3 (50 \times 45)^{1/2}$

Ro = Amplifier Output Impedance (Ohms) $= 50\,\Omega$ $= 15.8$ V/m

Po = Amplifier Output Power (Watts) $= 45W$ $= 143.9$ dBµV/m

Conversion from µV/m to dBµV/m = (µV/m) $^{\log}$ x 20

-- FCC LIMIT = 43 log (45) = 60 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.

APPENDIX A
TEST EQUIPMENT

TEST EQUIPMENT LOG

TYPE OF TEST : FCC TYPE ACCEPTANCE

DATE _08-03-99_ TEST PROCEDURE _PART 2, 22, &90_

EUT _RF AMP_ OTHER _____

MODEL # / SERIAL # _PA6-1ABH-M_

TEST ENGINEER _CHI CAI_

DESCRIPTION	MANUFACTURER	MODEL # / SERIAL #	CAL. DUE DATE
SIGNAL GEN.	MARCONI	2024 / 112236-002	3-17-2000
SPEC. ANALYZER	HP	8566B/2403A06307&2407A03212	2-10-2000
PLOTTER	HP	7070A	N/R
DUAL DIR. COUPLER	HP	778D	CAL @ TIME OF TEST
50 OHM LOAD	ELECTRO IMPULSE LAB.	DA-242A/4/7940097	CAL @ TIME OF TEST
50 OHM LOAD	TERMALINE	8053 / 8945	CAL @ TIME OF TEST
50 OHM LOAD	INMET	IN020M-100W	CAL @ TIME OF TEST
40 Db ATT.	INMET	18N50W-40Db	CAL @ TIME OF TEST
POWER SUPPLY	ACOPIAN	28PT10AFHP / 6	N/R
MULTI-VOLTMETER	GOLDSTAR	DM-333 / S61004151	4-1-2000
LOG PERIODIC ANT.	A.H. SYSTEMS.	SAA-200-512 / 347	10-10-1999
DRG ANT.	EMCO	3115 / 2280	1-8-2000
WIDEBAND AMP.	IFI	5500	N/R
PREAMP.	MINI-CIRCUITS	ZFL-2000 / 001	5-7-2000
PREAMP.	AVANTEK	SWL88-6176 / 1847	5-7-2000

FCC/TA