EESI
An Employee Owned Company

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CFR 47, PART 87

TYPE ACCEPTANCE REPORT

FOR THE

COMMUNICATIONS TRANSCEIVER SYSTEM

MODEL: **CTX-1000**

FCC ID: NVSCTX-1000 (PENDING)

PREPARED FOR:

Cubic Communications, Inc.
9535 Waples Street
San Diego, CA 92121-2953

PREPARED ON:

APRIL 13, 1998

REPORT NUMBER 98-046

This report has been prepared in accordance with all applicable requirements of ANSI C63.4-1992

DOCUMENT HISTORY

Revision	Date	Comments
A	4/13/98	Initial Release T. B. Ketterling

NOTE: EESI hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (1992) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The units described in this report were received at EESI's facilities on December 10, 1997. Testing was performed on the units described in this report December 10, 1997 – February 11, 1998.
- The Test Results reported herein apply only to the Units actually tested, and to substantially identical Units.

TABLE OF CONTENTS

ATTACHMENTS:

Form 731 with Filing Fee
Attachment A: Label Design and Placement Diagrams
Attachment B1-B3: Circuit Diagrams
Attachment C1-C3: Draft User's Guide

CERTIFICATION

The Radio Frequency Interference (RFI) testing, data evaluation and this report have been prepared by Electromagnetic Engineering Services, Inc., an independent electromagnetic compatibility consulting and test laboratory.

The testing and data collection was accomplished in accordance with the requirements of the ANSI, C63.4-1992 standard and the applicable sections of CFR 47 Parts 2, 15 and 87 for intentionally radiating equipment. Refer to the Administrative Summary for a description of the test sample.

I certify the data, data evaluation and equipment configuration herein to be a true and accurate representation of the sample's radio frequency interference emission characteristics, as of the test date(s), and for the design of the test sample utilized to compile this report.

T. Bruce Ketterling
VP for Technical Operations

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1 Administrative Data

CLIENT: Cubic Communications, Inc.
9535 Waples Street
San Diego, CA 92121-2953
(619) 643-5873
(619) 643-5803 - fax

CONTACT: Curtis D. Riley / Michael Norman

DATE(S) OF TEST: December 10, 1997 – February 11, 1998

TEST SPECIFICATION: CFR 47, Part 87, for intentional radiators
CFR 47, Part 15B, Class "A" for unintentional radiators (Receive Mode) *

EQUIPMENT UNDER TEST: The CTX-1000 Communication Transceiver System is comprised of the following devices:

Component	*Model Number*
Exciter	T-4180
Power Amplifier	PA-5050A
Power Supply	PS-7130A

NOTE: The EUT is a system that can operate in either J3E or H3E mode (as defined in CFR 47) and at variable frequencies from 1.6 MHz up to 30 MHz. The EUT was tested at the following frequencies as representative in their associated band:

2 MHz
3 MHz
4 MHz
6 MHz
8.5 MHz
12 MHz
17 MHz
24.9 MHz

*In addition, the EUT was tested in Receive-only mode to Part 15B Class "A" limits. Representative data has been provided in this report as information items.

1.2 Tests Performed

The purpose of these tests is to verify compliance with the FCC requirements of CFR 47, Part 87.131, for aeronautical fixed base station operation. The modes of operation are Continuous Wave (CW), H3E and J3E. The following chart lists the specific tests performed and the test results.

Specification	*Frequency Range*	*Compliance Status*
FCC CFR 47, §15.107 Conducted Emissions for Intentional Radiators	0.45 MHz - 30.00 MHz	**PASS**
FCC CFR 47, §15.109 Radiated Emissions for Intentional Radiators	30.00 MHz - 1000 MHz	**PASS**
FCC CFR 47 Part 87, Subpart D, §2.985 RF Power Output	2-25 MHz *(using the transmitter frequencies listed on the previous page)*	**PASS**
FCC CFR 47 Part 87, Subpart D, §2.987 Modulation Characteristics	2-25 MHz *(using the transmitter frequencies listed on the previous page)*	**PASS**
FCC CFR 47 Part 87, Subpart D, §2.989 Occupied Bandwidth	2-25 MHz *(using the transmitter frequencies listed on the previous page)*	**PASS**
FCC CFR 47 Part 87, Subpart D, §2.991 Spurious Emissions	2-25 MHz *(using the transmitter frequencies listed on the previous page)*	**PASS**
FCC CFR 47 Part 87, Subpart D, §2.993 Field Strength Measurements	2-25 MHz *(using the transmitter frequencies listed on the previous page)*	**PASS**
FCC CFR 47 Part 87, Subpart D, §2.995 Frequency Stability	2-25 MHz *(using the transmitter frequencies listed on the previous page)*	**PASS**

T. Bruce Ketterling, EESI

Please refer to the Test Results section of this report for further details.

2. DESCRIPTION OF EUT

The CTX-1000 system is a communications transceiver consisting of the following three components:

1. PA-5050A MF/HF Power Amplifier
2. PS-7130A Power Supply
3. T-4180 Exciter

The PA-5050A linear power amplifier is a solid state unit that provides 1 kilowatt power amplification of RF signals between 1.6 and 30 MHz. The unit contains 4 independent power amplifier (PA) modules. If one or more of the PA modules fail, the unit will still operate with reduced power out.

The front panel contains a PWR LED with each PA module containing an individual PWR and FLT LED, and a multifunction display. Input power to the PA-5050A is derived from a separate +28VDC power supply providing five separate +28VDC outputs. Four independent modular PA modules provide the four stages of amplification. Each PA module is identical and interchangeable. When an individual PA module's gain is less than +10dB, the circuitry turns on the FLT LED. The individual module can then be removed and replaced.

The rear panel contains four connectors for the transmitter/exciter low power RF input, high power RF output to the antenna, remote control input and output, DC power and signal input, and a ground lug.

Four internal fans per PA module provide cooling across the heatsink of the unit.

The PS-7130A Power Supply provides four independent regulated +28VDC voltages at 30 amperes and one +28VDC voltage at 11 amperes using 160 to 264 volts, 50/60 Hz, single phase AC input power. The PS-7130A is normally used to supply power to the CCI PA-5050A power amplifier.

The front panel contains a PWR LED indicating when input power is on and a switch/circuit breaker to apply input power and protect the equipment. Four independent modular power supplies provide the five +28VDC outputs. The four power supply modules are identical and interchangeable. The front panel contains individual PS lamps indicating the +28VDC output is present.

The rear panel contains connectors for power and signal outputs, AC power input, and chassis grounding.

Two internal cooling fans provide ambient airflow through the unit in addition to the fans in each modular power supply.

The T-4180 is a multi-mode digital signal processing (DSP) exciter with a frequency range from 1.6 to 30MHz.

The exciter contains individually shielded modules mounted in an 8½ by 3½-inch desktop chassis. Two T-4180 exciters may be fastened together (using an optional dual rack-mount kit) to construct a standard 19-inch rack mount configuration.

A 19-button keypad and main adjustment knob used to select the exciter parameters control the exciter. Five "soft keys" work in conjunction with the vacuum fluorescent digital display immediately above the soft keys. In addition to soft key selections, the vacuum fluorescent digital display provides a variety of data including channel, modulation mode, frequency, bandwidth, gain, local/remote control, a RF level meter, and an AF level meter. Additional information is displayed depending on soft key selections.

The manufacturer's documentation specifies that the exciters can generate the following signals:

- On/Off keyed (CW)
- Amplitude Modulated (AM)
- Upper Sideband (USB)
- Upper Sideband – Full Carrier (USBfc)
- Upper Sideband – Partial Carrier (USBpc)
- Lower Sideband (LSB)
- Lower Sideband – Full Carrier (LSBfc)
- Lower Sideband – Partial Carrier (LSBpc)
- Independent Sideband (ISB) – Suppressed carrier and independent
- Frequency Shift Keyed (FSK)
- Frequency Modulation (FM)
- Frequency Modulation Facsimile (FMfax)

The selected audio input is provided on a 600Ω balanced line. Normal and alternate (LSB audio when ISB is selected) audio are simultaneously input on separate 600Ω balanced lines.

A MIC/KEY jack on the front panel provides for connection of an external microphone or CW key. The audio level is automatic. The audio is automatically applied to the correct modulator depending on the modulation mode. However, when ISB modulation is selected the microphone is directed to the normal audio channel only.

Either an internal (OCXO) or external reference frequency may be used. The external reference frequency is automatically sensed and used when connected to the rear panel.

The exciters may be remotely controlled by any suitable bus controller using a serial interface bus, RS-232 or RS-422, or an IEEE-488 parallel interface bus.

3. DESIGN MODIFICATIONS FOR COMPLIANCE

Device: Cubic Communications, Inc. Exciter and Power Amplifier

Model: T-4180 and PA-5050A

No design modifications were made to this unit during testing.

4. SYSTEM CONFIGURATION

4.1 System Configuration and Power Cables

DEVICE	MANUFACTURER MODEL # SERIAL #	POWER AND I/O CABLE
EUT: Exciter	Cubic Communications, Inc. T-4180 N/A	*(To 120V AC Power)*: 2.5m, unshielded, 12 AWG, 4-wire, 4-pin circular screw-type connector
EUT: Power Amplifier	Cubic Communications PA-5050A N/A	*(To DC Power Supply)*: 1m, shielded, 10 AWG, 10-wire, 10-pin circular locking connector (MS3476L24-19P)
EUT: Power Supply	Cubic Communications PS-7130A N/A	*(To 208V AC Power)*: 2m, unshielded, 18 AWG, 3-wire, IEC connectors
Signal Generator	Hewlett Packard 3326A Two Channel Synthesizer 2Y37A00156	2m, unshielded, 18 AWG, 3-wire, IEC connectors
Attenuator	Bird 2kW 30dB 8329-300 4414	5m, unshielded, 18 AWG, 3-wire, IEC connectors
Dummy Load	Bird 200W DA-139/URM 1099	N/A

NOTE: 5/8" tubular grounding straps were attached between the Power Amplifier, Power Supply, and Exciter. This grounding strap was then connected to an Earth ground at a 1m distance.

4.2 Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
EUT (Power Amplifier) to Attenuator	8m, shielded, RG8/U, N connectors
Attenuator to Dummy Load	1m, shielded, RG142B/U, BNC connectors with 50Ω termination
EUT (Exciter) to Signal Generator	7m, shielded, RG58A/U, BNC to DB15 connector
EUT (Power Amplifier J1 Input) to EUT (Exciter J3 Output)	1m, shielded, RG-142B/U, N connectors with BNC adapters
EUT (Power Amplifier J4 Sense) to EUT (Power Supply Sense)	0.75m, shielded, 24 AWG, DB15 to DB25 connectors
EUT (Power Amplifier J5 Control) to EUT (Exciter J5 PA Control)	0.75m, shielded, 24 AWG, DB15 connectors

4.3 Procedure for Exercising EUT

For transmit mode, the EUT was connected to a power attenuator and a dummy load and set to radiate at one frequency at a time in each band from 2 MHz to 25 MHz. Either a microphone input or line input was connected to the signal source and the input voltage was varied as required in specific tests listed below. The output of the Power Amplifier was measured as required in the following tests.

5. DESCRIPTION OF TESTING METHODS

5.1 Introduction

As required in 47 CFR, Parts 15 and 87, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document C63.4-1992, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure #1 on page 11.

5.2 Part 15 Test Descriptions

5.2.1 Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a "normally operating" mode. The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 Hz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

For Conducted Emissions Test Configuration please refer to Figure #2 on page 12.

5.2.2 Configuration for Determining Location of Maximum Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Normally this is done inside a shielded or shielded, anechoic chamber to eliminate ambients. Next, the EUT and associated system are placed on a turntable on an open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten or three meters from the EUT.

The EUT and associated system are configured to operate in a continuous transmitting mode, representing a "normally operating" mode. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to produce horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration.

For Frequency ID and Radiated Emissions test configuration please refer to Figures #3 and #4 on pages 13-14.

5.3 FCC Part 87 Test Descriptions

FCC CFR 47 Part 87, Subpart D, and Part 2, sections §2.985, §2.987, §2.989, §2.991, §2.993 and §2.995 specify the general emission specification limits and several specific parameter measures for high power transmitters. Compliance to the specific sections is listed below.

5.3.1 RF Power Output

The device under test is a single-sideband transmitter operating in either the H3E mode or the J3E mode. Maximum peak envelope power output is limited to 6 kW measured at the RF output terminals. A 30 dB power attenuator and a 200 W load are placed on the RF output terminals. A 1500 Hz tone is used as the modulating signal in H3E mode and both a 400 Hz and an 1800 Hz signal are used in the J3E mode. The device under test does not exceed 6 kW peak output power as specified in §87.131. This complies with the requirements of this section.

5.3.2 Modulation Characteristics

Data representing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz is included in this report in accordance with §2.987. Additionally, data representing the peak envelope power output versus the modulation input voltage (as specified in the Occupied Bandwidth test) is also provided. This reflects the requirements of §2.987. The provisions of this section are met. The relationships of carrier power to peak power of §87.141 are met.

5.3.3 Occupied Bandwidth

§87.139(c) specifies that the peak envelope power of any emission must be within the limits contained in paragraphs (1) through (3) relative to the assigned frequency. The requirements of this section are met.

5.3.4 Spurious Emissions

At rated output power, while transmitting a modulated single carrier, the composite spurious and noise output shall be attenuated below the mean power of the transmitter by at least 60 dB as specified in §87.139(c)(3). This attenuation is expressed in dB below the carrier referenced to a 4 kHz bandwidth and relative to the maximum emission envelope level. The provisions of this section are met.

5.3.5 Field Strength Measurements wrong

Field strength emissions are measured on an open area test site in accordance with §2.993. The device under test is also compared to FCC Class "A" limits. The provisions of this section are met.

5.3.6 Frequency Stability

§2.995 requires that the device under test maintain a 20 Hz tolerance of frequency stability with variation of ambient temperature (-30°C to +50°C) as well as with variation of supply voltage (85% to 115% of V_{nom}). The provisions of this section are met.

6. DESCRIPTION OF TEST SITE

The test site is located at:
11696 Sorrento Valley Road, Suite F
San Diego, CA 92121

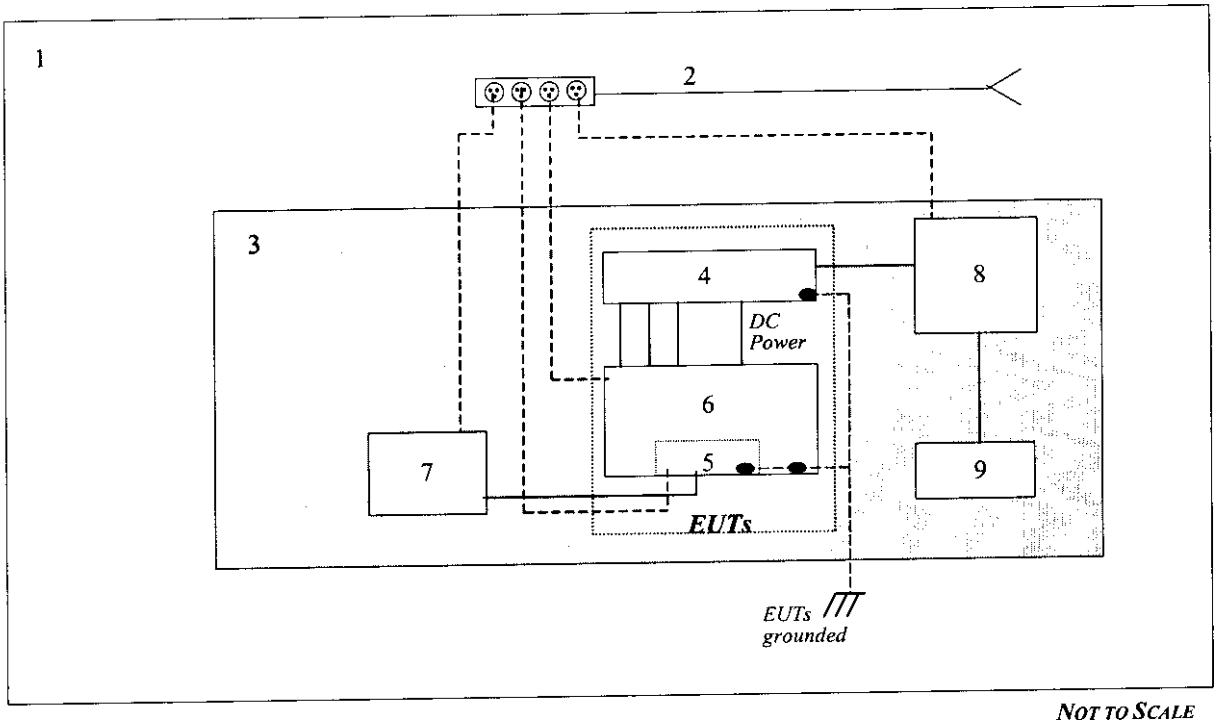
This 11 x 17 meter open area test site is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-1992 documents. The site attenuation characteristics are verified for compliance every three years and was last registered with the Federal Communications Commission on October 21, 1996, FCC Document Number 31040/SIT (1300B3). The test site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications.

7. TEST EQUIPMENT

The following test equipment were used to collect data for this report. All devices used were of current calibration and of the type required in the applicable document section of this report.

EQUIPMENT	MODEL #
Spectrum Analyzer System:	
Quasi Peak Adapter	HP 85650A
Spectrum Analyzer	HP 8566B
RF Preselector	HP 85685A
Field Intensity Probe Set	Electrometrics EM4422
Power Line filter	Lindgren C-150-30-2
Line Impedance Stabilization Network (LISN)	EMCO 3825/2
Line Impedance Stabilization Network (LISN)	EMCO 8602-50-TS-50-N
High pass filter	Solar Electronics 7801-5.0
Ridged Guide Antenna, Xmit	Electrometrics RGA-25
Biconical Antenna, Xmit	EMCO 3101
Biconical Antenna	EMCO 3104
Log Periodic Antenna	Electrometrics LPA-25
Amplifier	Mini-Circuits, Amplifier ZHL-2 (SMA),
Power Source, AC	Elgar 2751 w/ series 400V variable frequency/ voltage oscillator
Multimeter	Fluke 77
Multimeter	Goldstar DM-9183
Electronic Counter	Hewlett Packard HP 5244L
Temperature/Humidity Chamber	Thermotron Industries SM-32S-SH
Limiter	Cubic provided
Directional Coupler	Cubic provided
Power Attenuator	Cubic provided
Terminating Dummy Load	Cubic provided 200W 50Ω
Power Meter	Client provided

Figure 1: EUT and Associated System - General Configuration

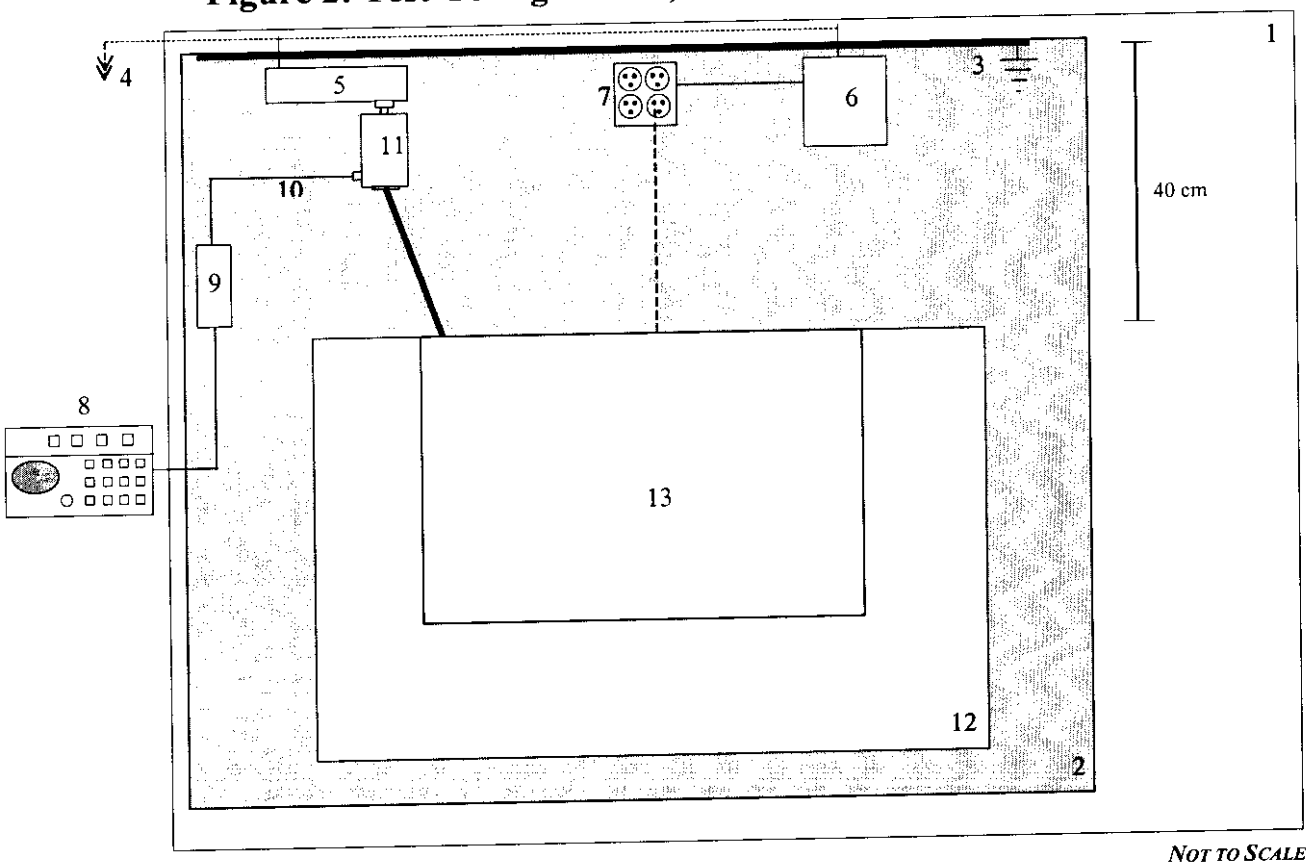


NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. AC Power for Devices (120V/208V, 60 cycles, single phase)
3. Non-Conducting table 80 cm above ground plane
4. EUT: Power Amplifier
5. EUT: Exciter (installed inside Power Supply)
6. EUT: Power Supply
7. Signal Generator
8. Attenuator
9. Dummy Load

Figure 2: Test Configuration, Conducted Emissions

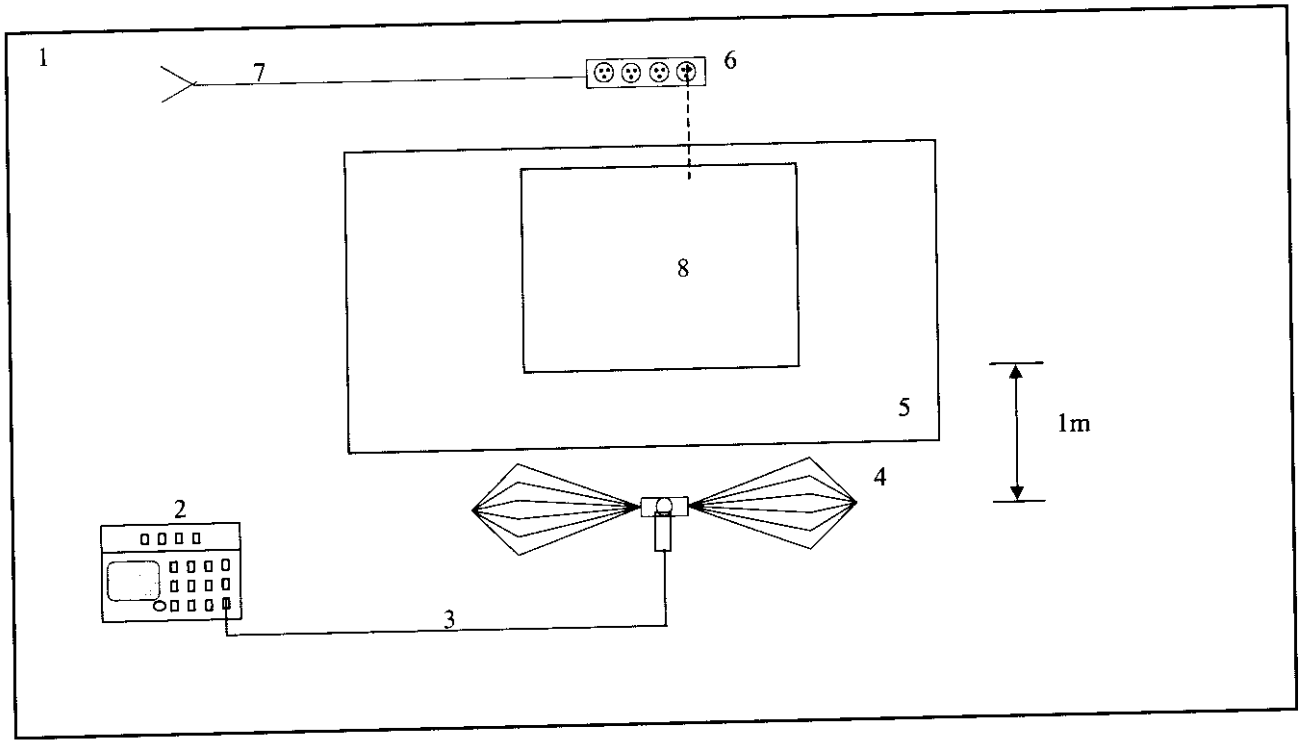


NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory (6 X 6 meters)
2. Ground Plane (15 square meters)
3. Vertical Conducting Wall (Grounded through Ground Plane via 10' ground rod)
4. AC Power for Devices (120V/208V, 60 cycles, single phase)
5. Power Line Filter, Lindgren, 120 dB, 30 amp
6. Line Impedance Stabilization Network (LISN) for peripheral devices
7. Power Distribution Box for peripheral devices
8. Spectrum Analyzer with Quasi-Peak Adapter
9. High Pass Filter
10. Coax input from EUT LISN to Spectrum Analyzer
11. LISN for EUT
12. Non-Conducting table 80 cm above ground plane
13. EUTs and associated system

Figure 3. Test Configuration, Frequency Identification of Radiated Emissions

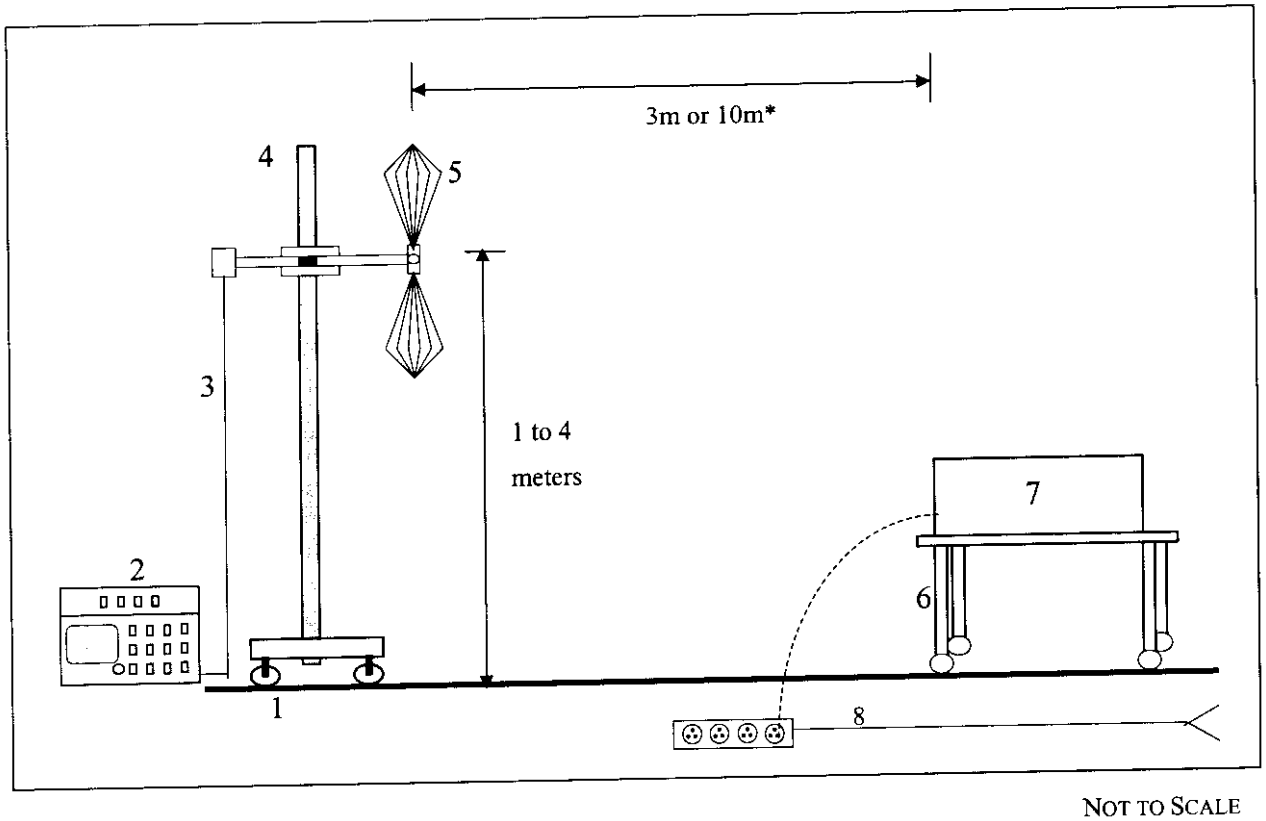


NOT TO SCALE

CONFIGURATION LEGEND

1. Test Laboratory
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Antenna to Spectrum Analyzer
4. Receive Antenna (basic relative position)
5. Non-Conducting table 80 cm above ground plane
6. Power strip for EUT and peripherals
7. AC power for devices (120V/208V, 60 cycles, single phase)
8. EUTs and Associated System

Figure 4: Test Configuration, Radiated Emissions, 10-Meter Open Field Site



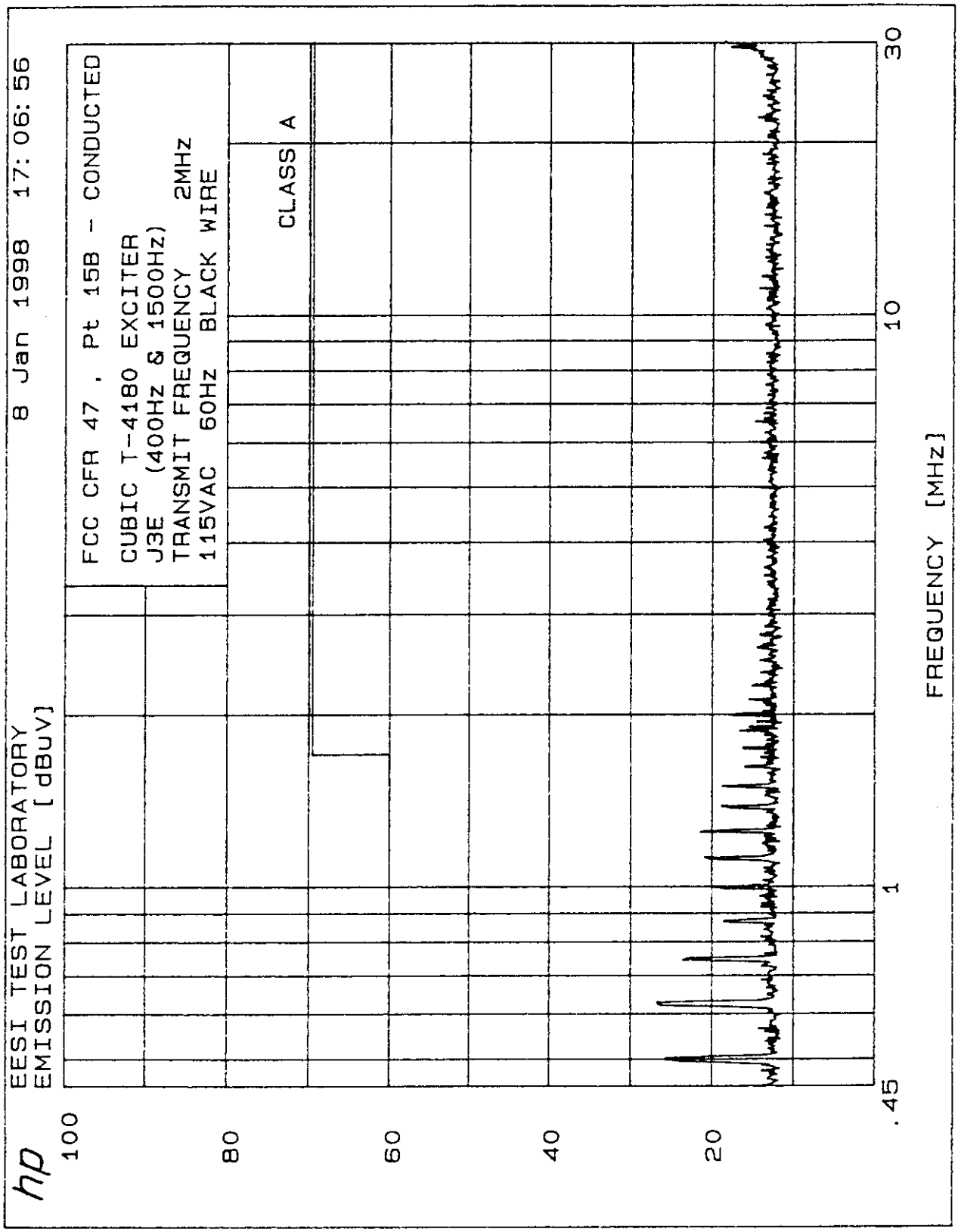
NOT TO SCALE

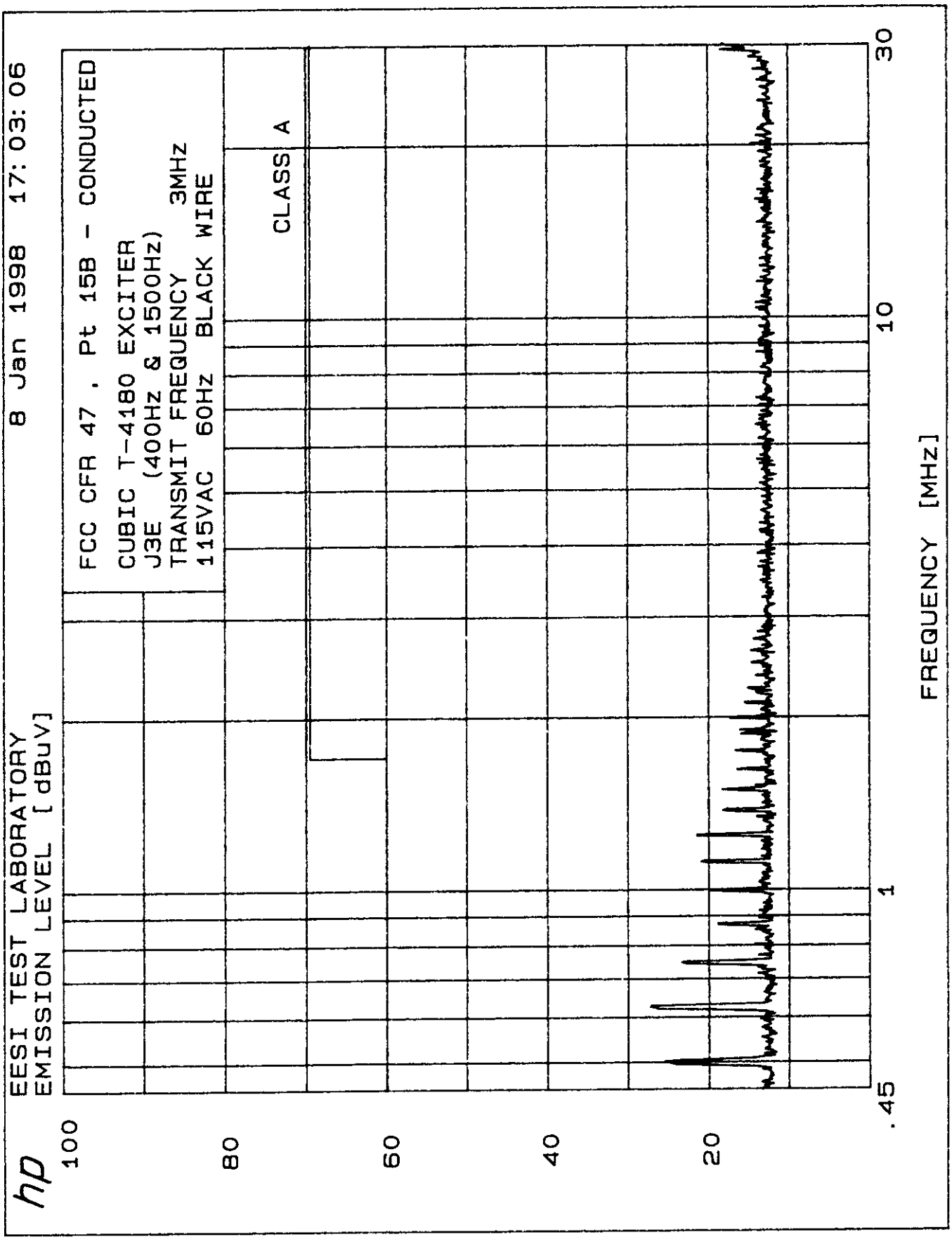
CONFIGURATION LEGEND

1. Ground plane (11 X 17 meters)
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Receive Antenna to Spectrum Analyzer
4. Antenna Mast with motorized mounting assembly
5. Receive Antenna (* 3m distance from EUT on transmitter spurs and 10m distance for Class "A" Receive Mode emissions)
6. Non-Conducting table 80 cm above ground plane
7. EUT and associated system
8. AC power for devices (120/230 VAC, 50/60 cycles, single phase)

8. TEST RESULTS DATA

8.1 Conducted Emissions Test Results

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J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 3MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
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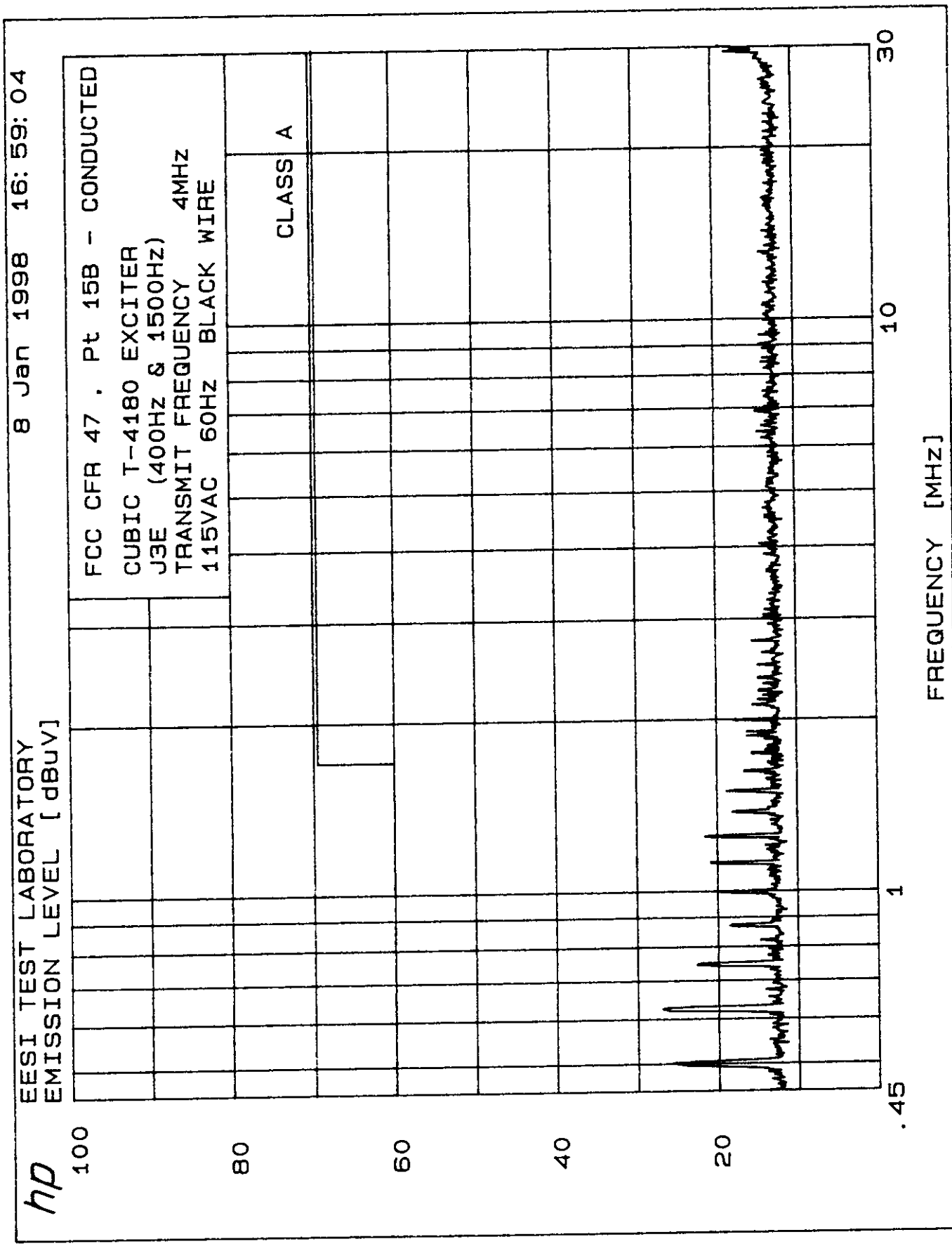
1
10
30
FREQUENCY [MHz]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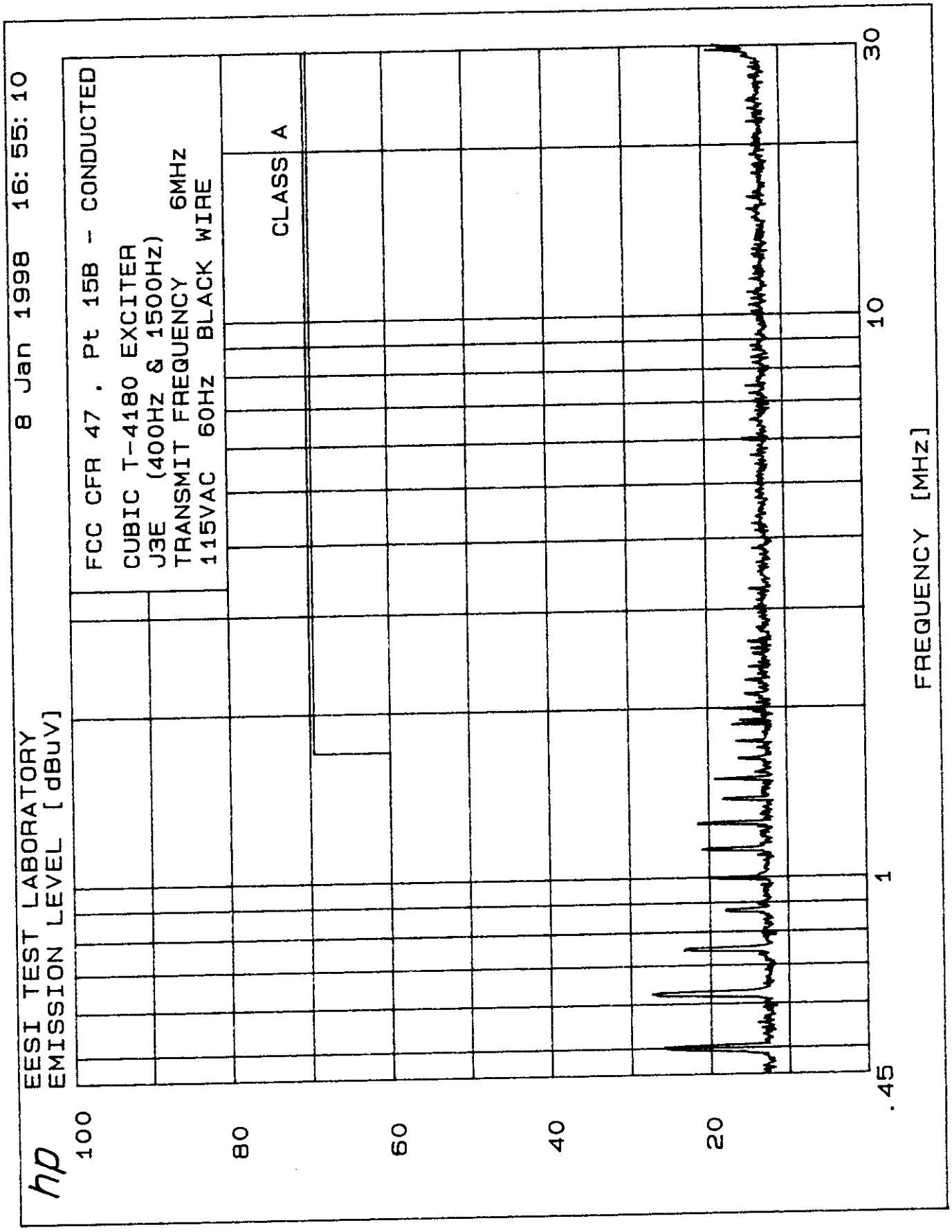
FREQUENCY [MHz]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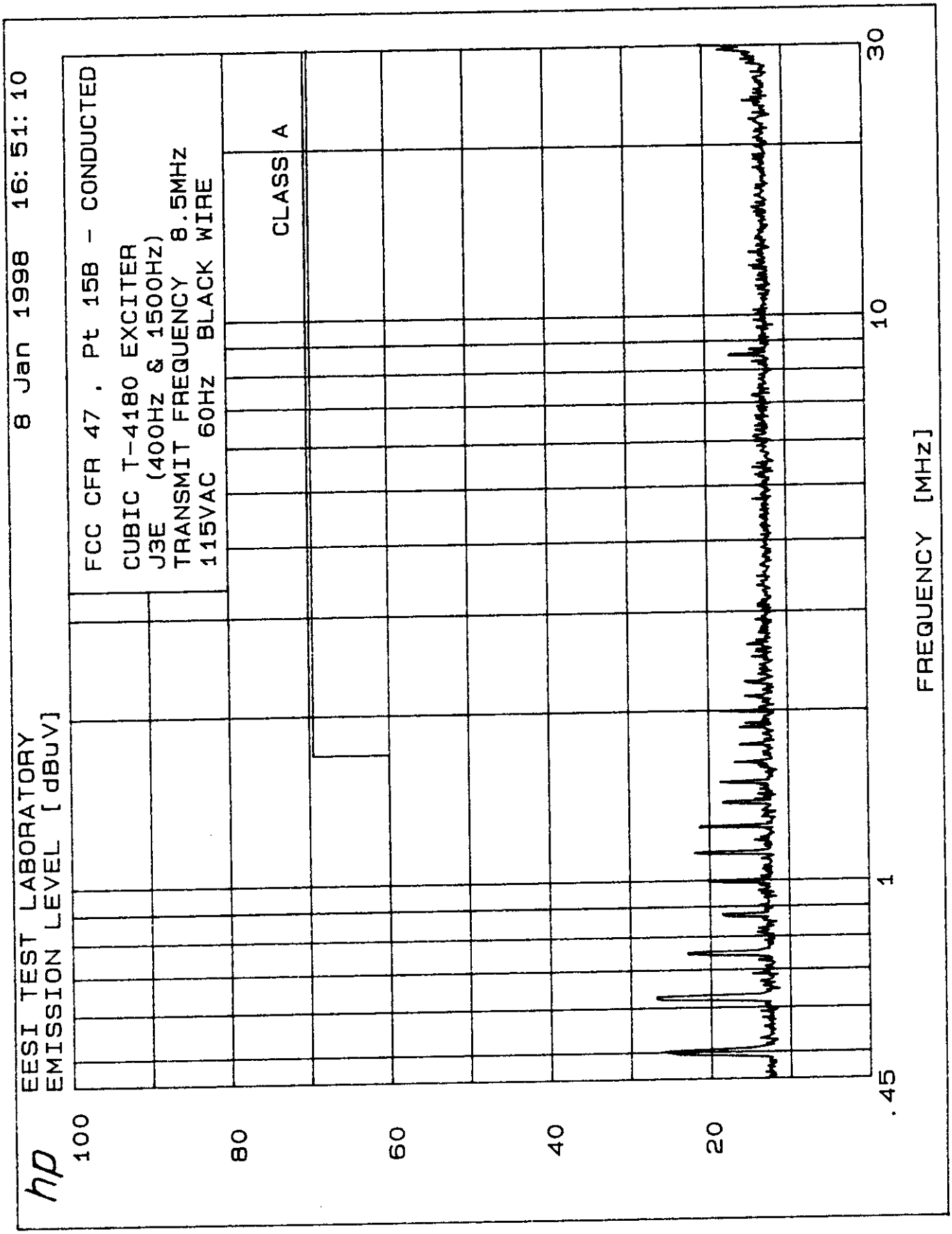
FREQUENCY [MHz]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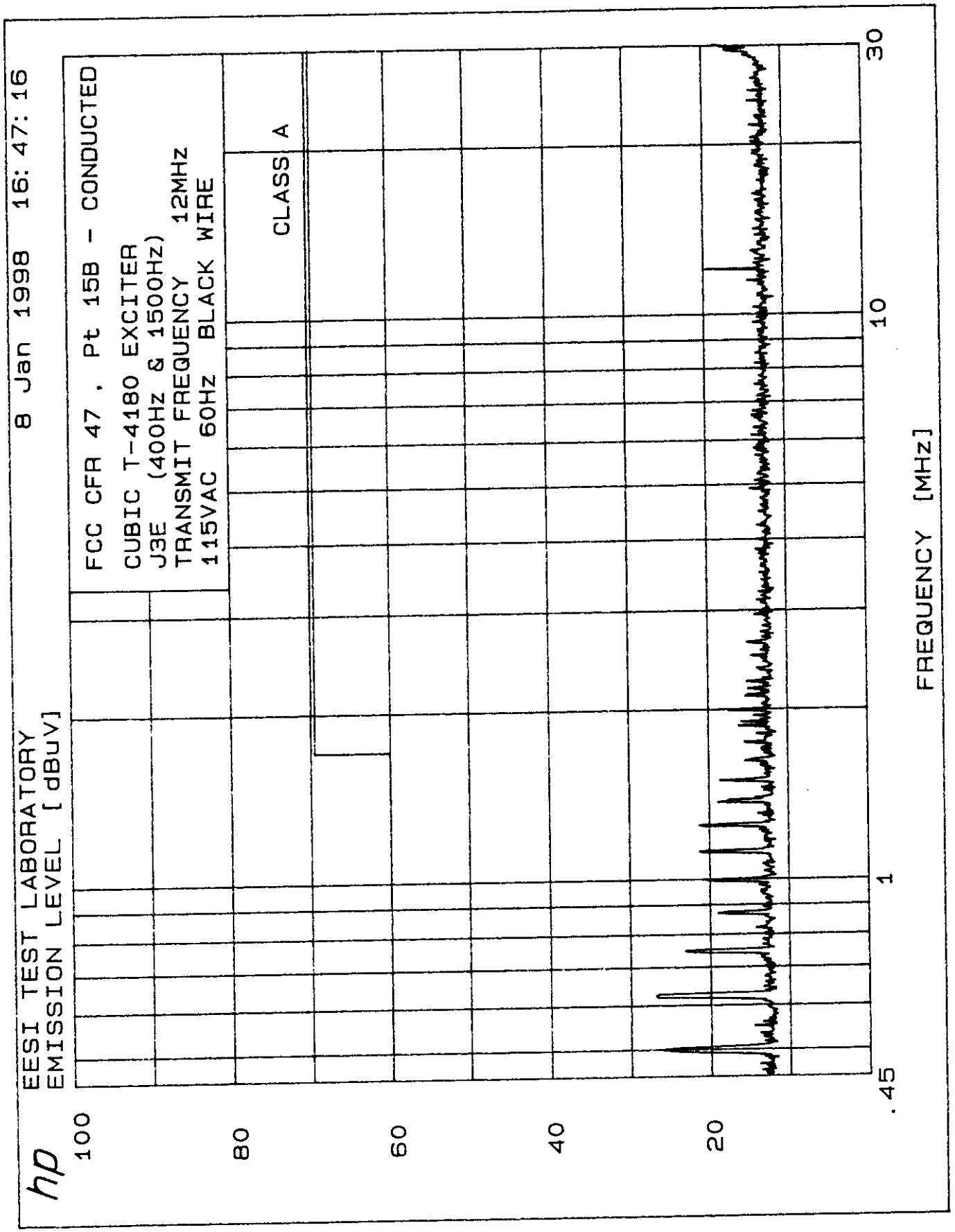
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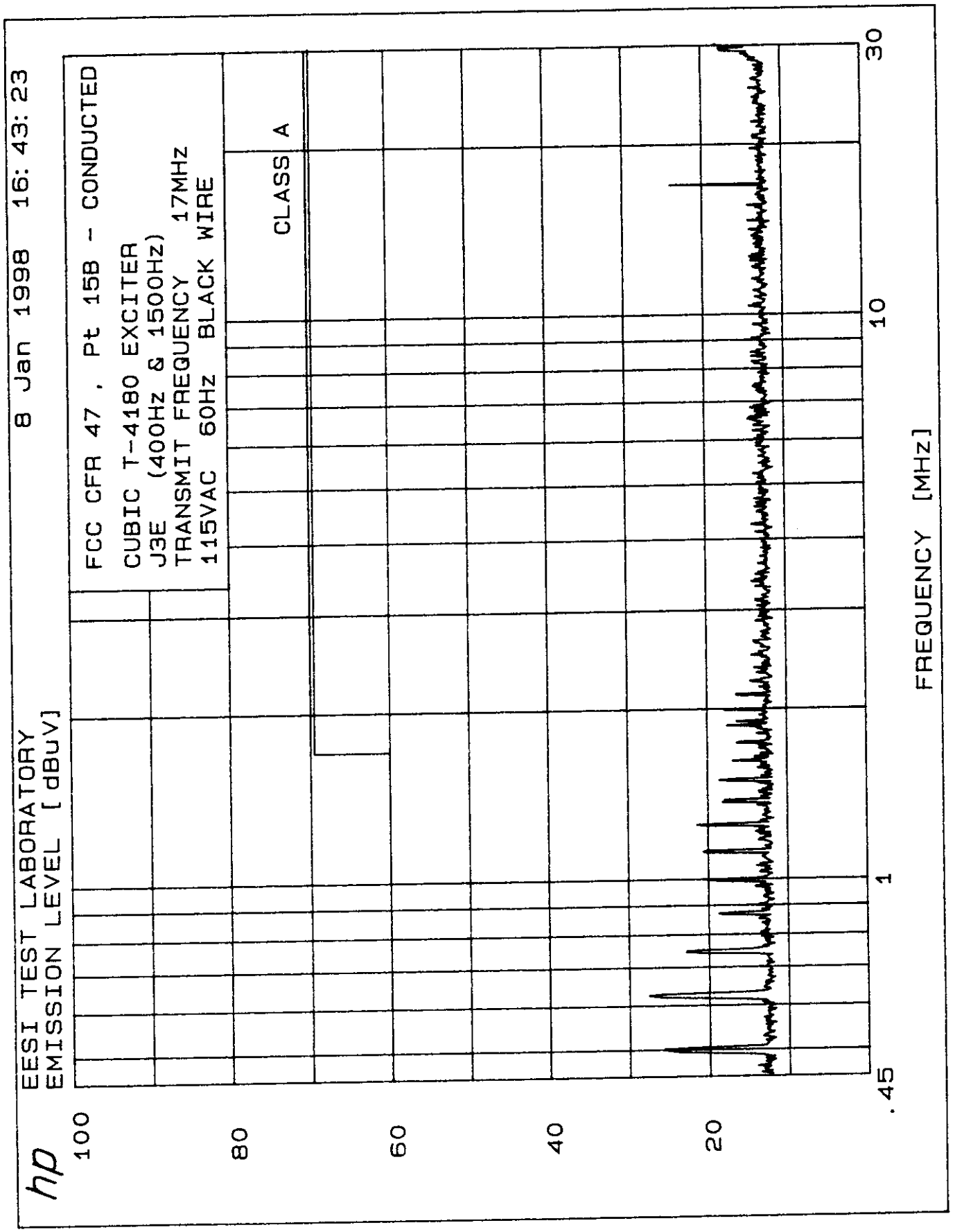
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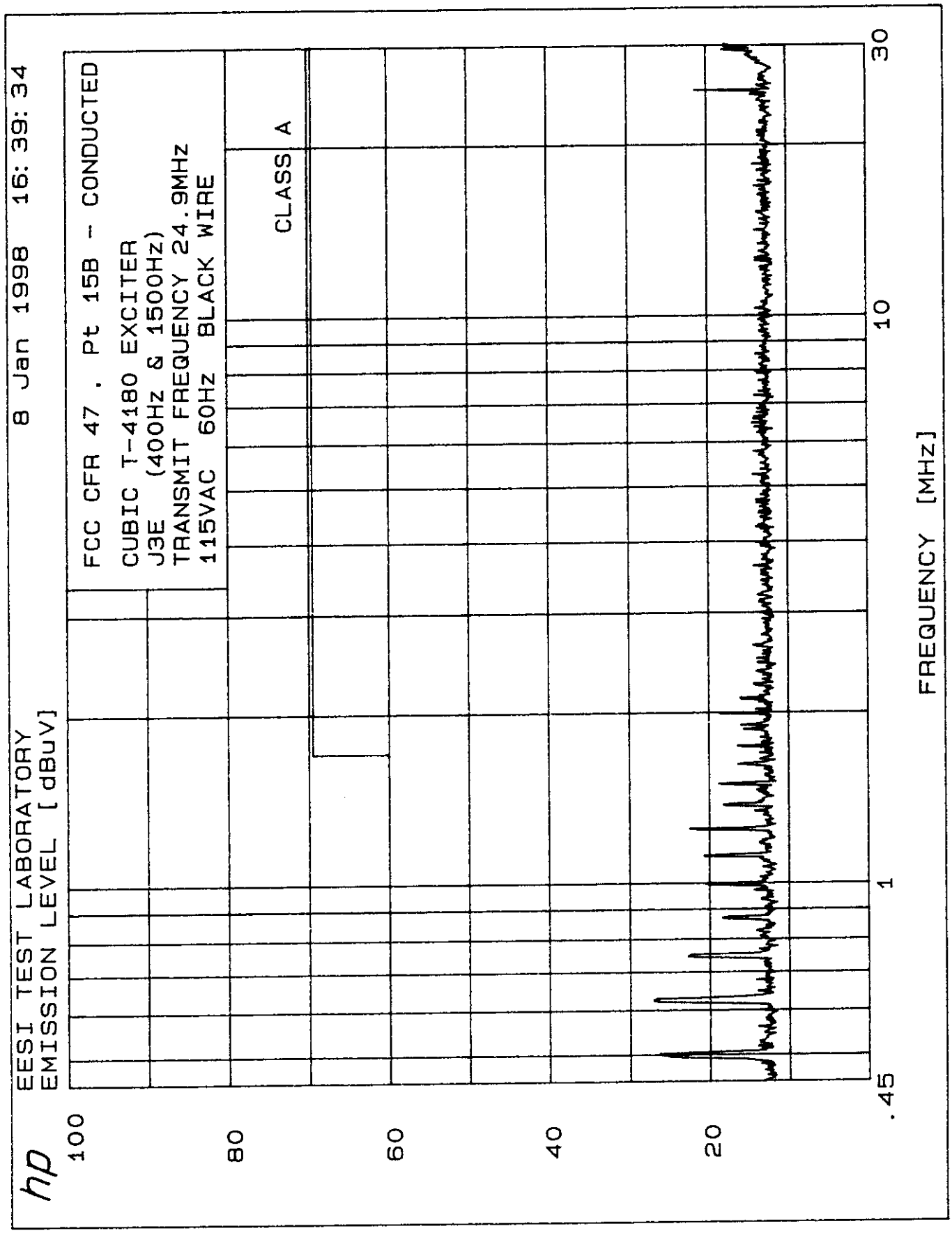
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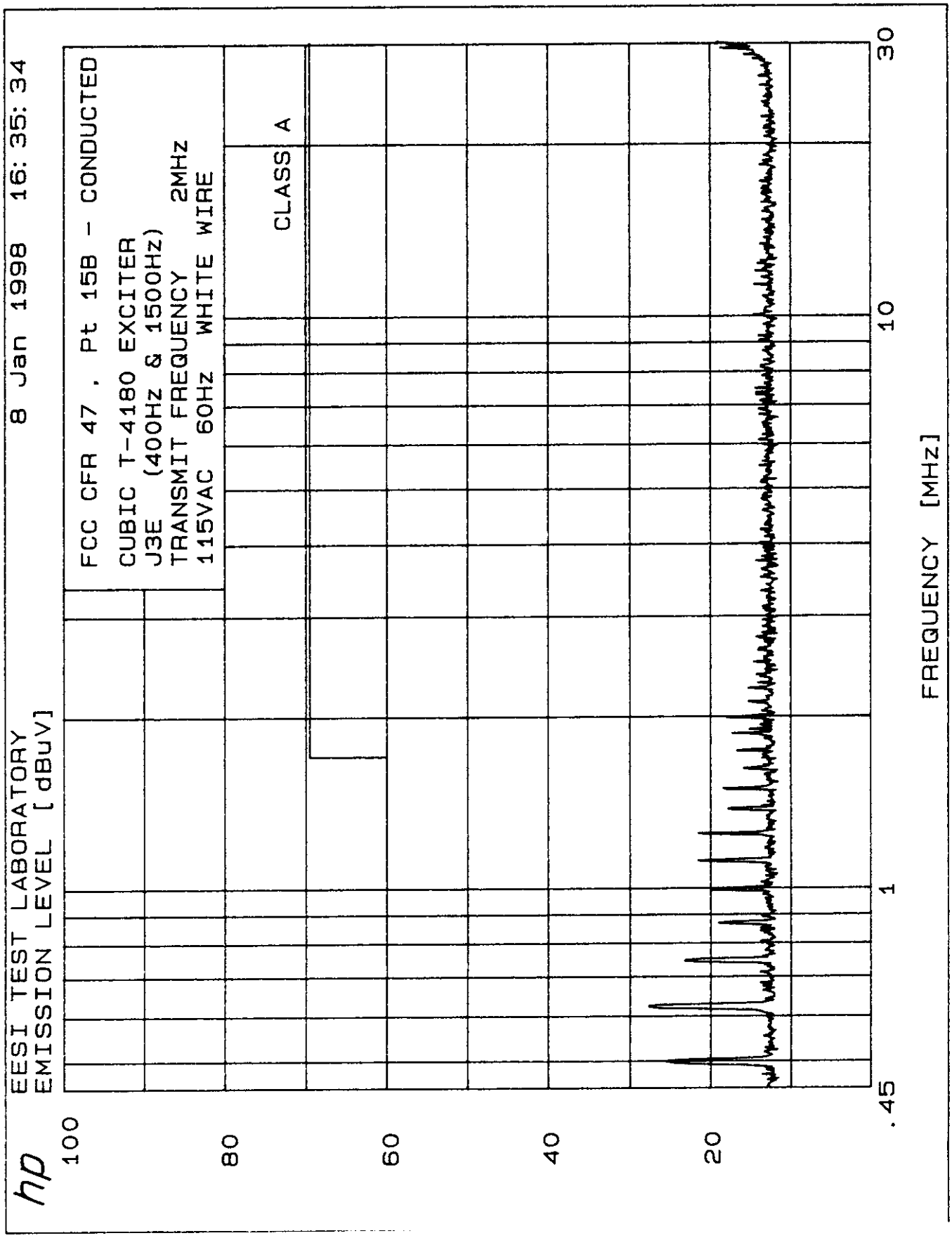
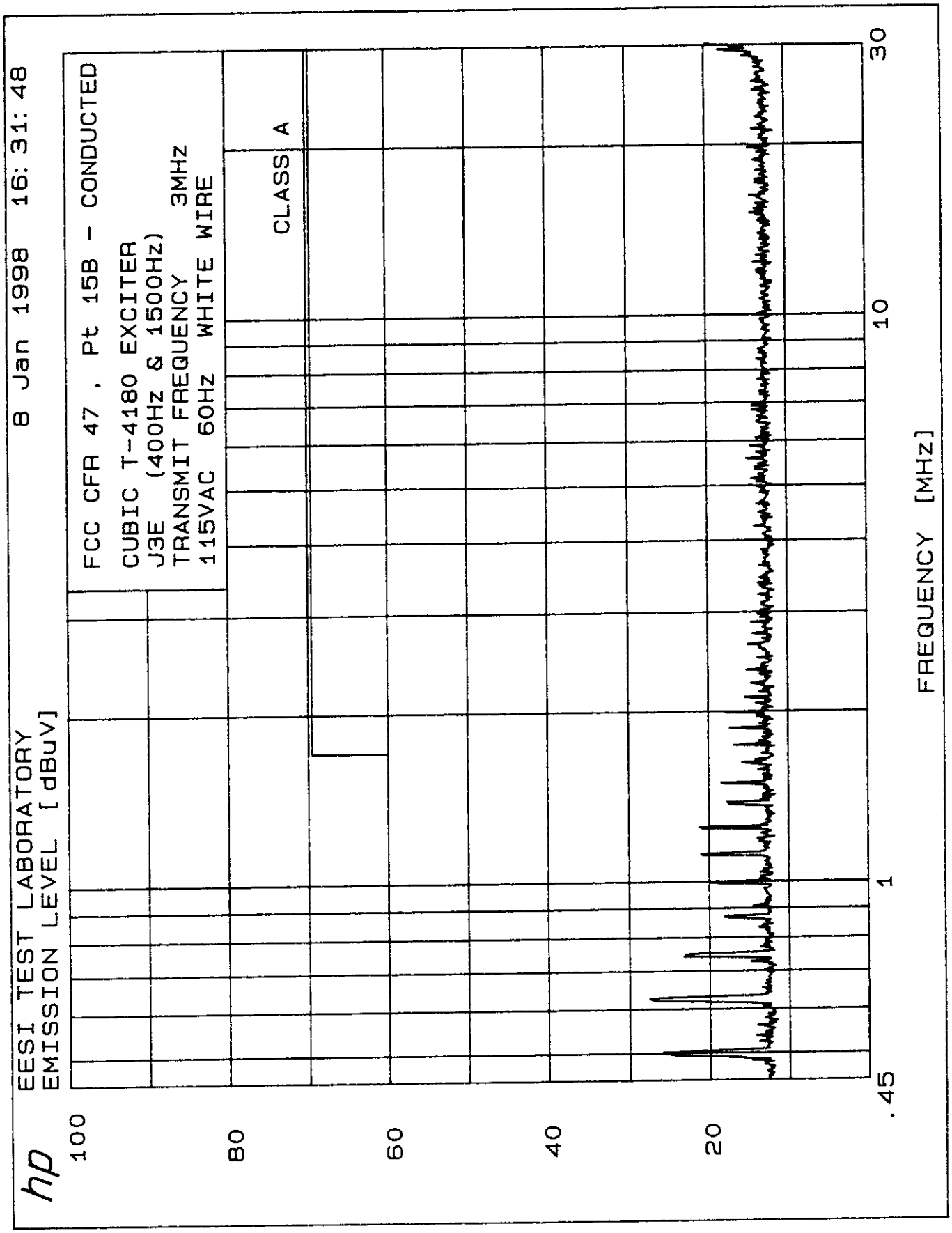
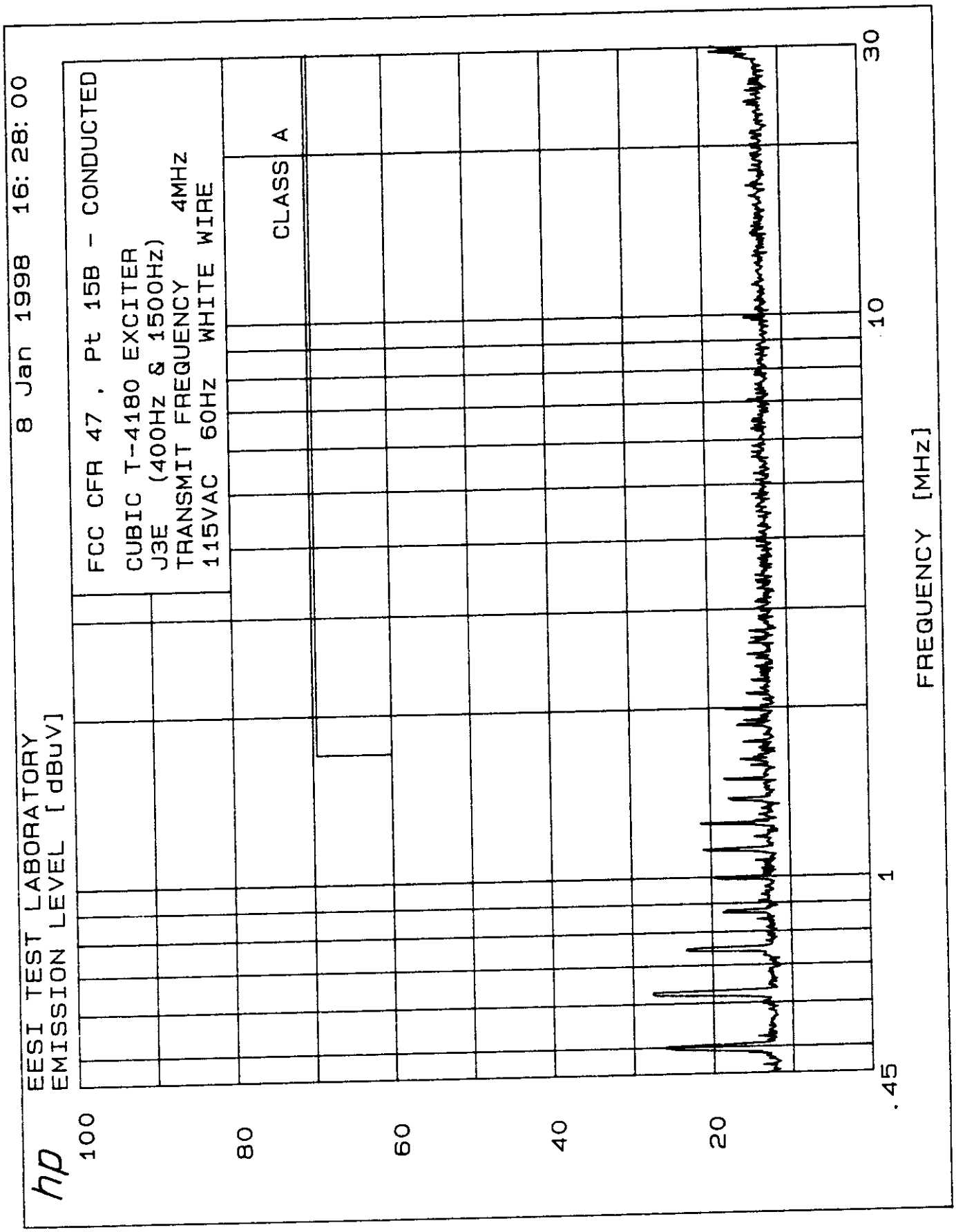
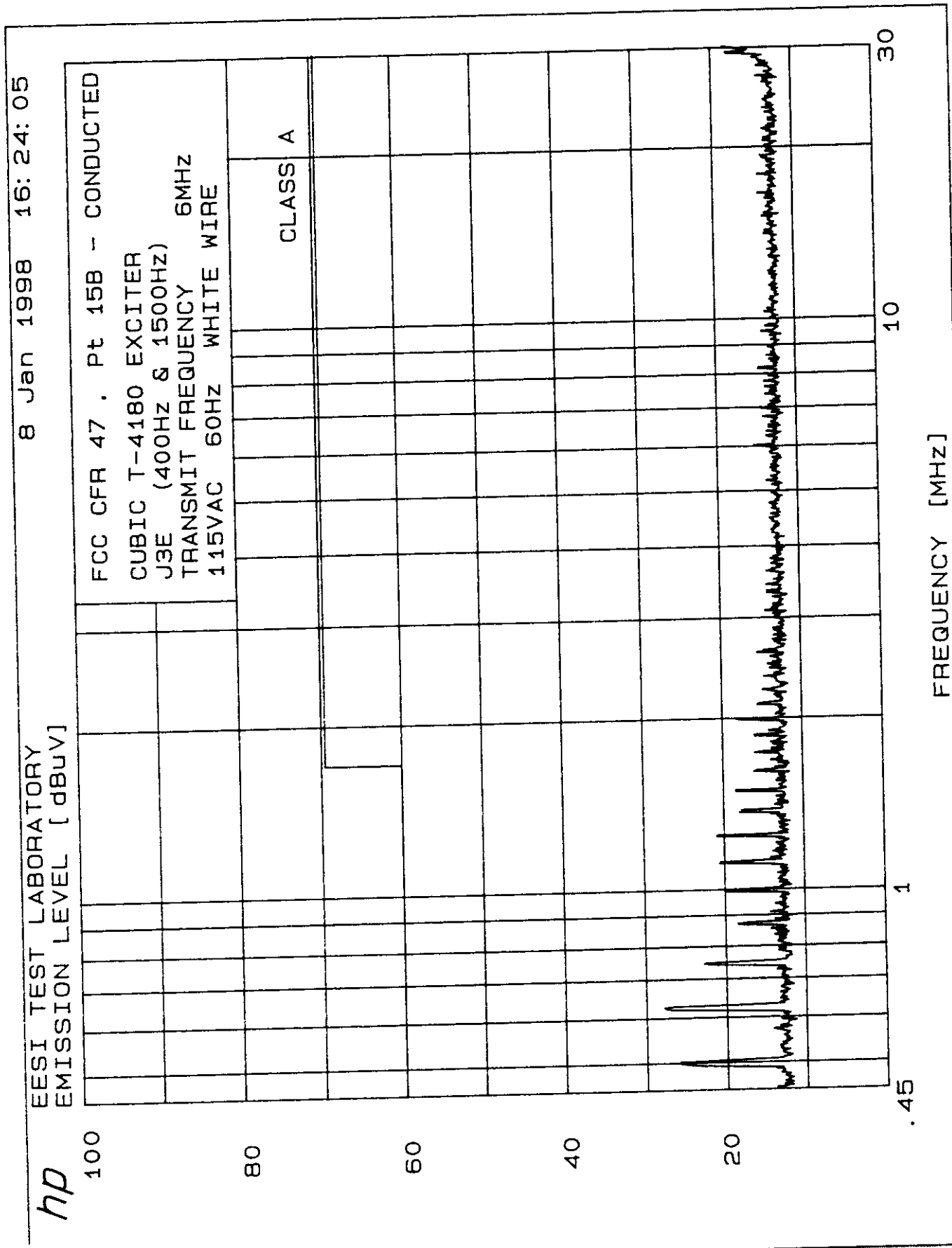
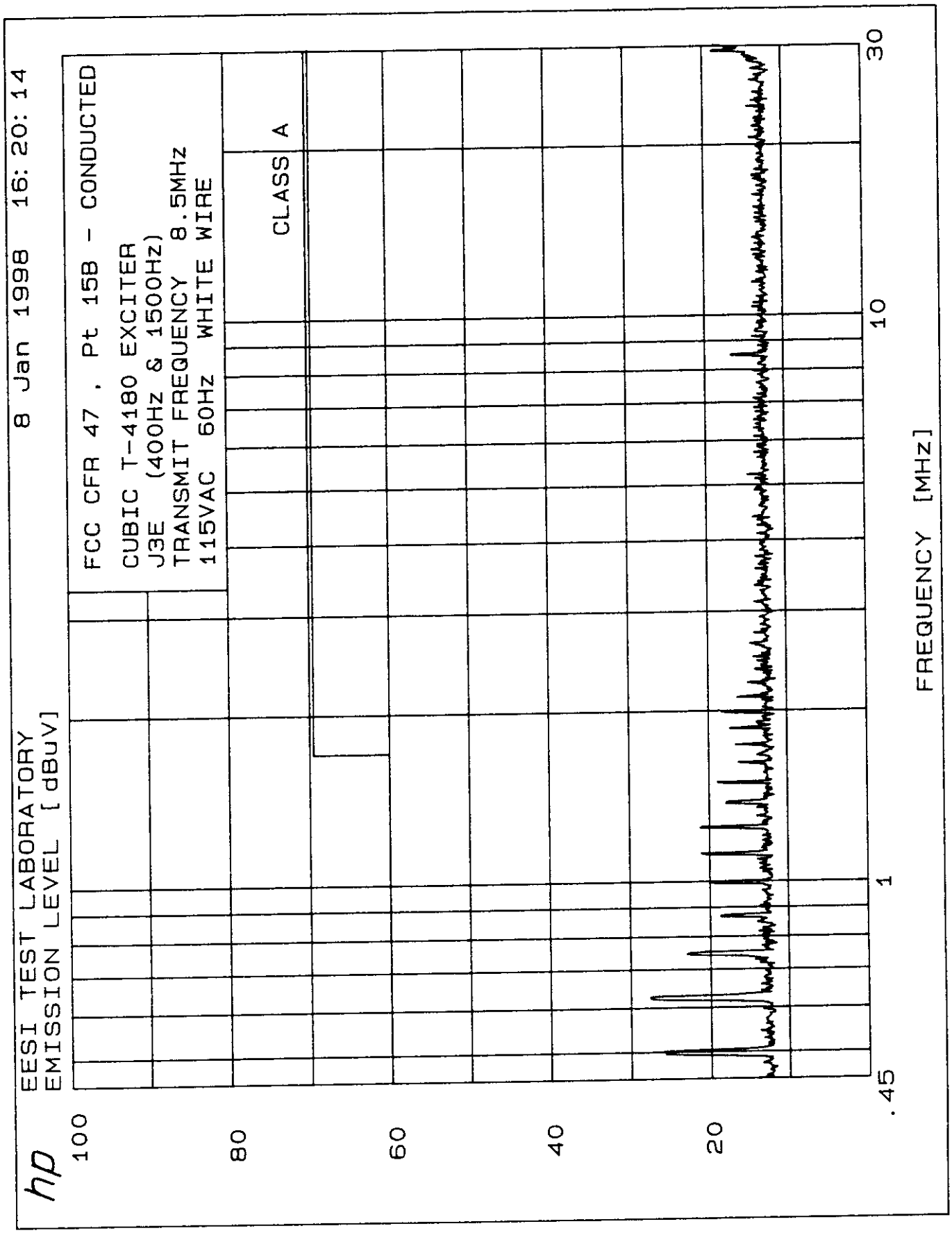
TRANSMIT FREQUENCY 24.9MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

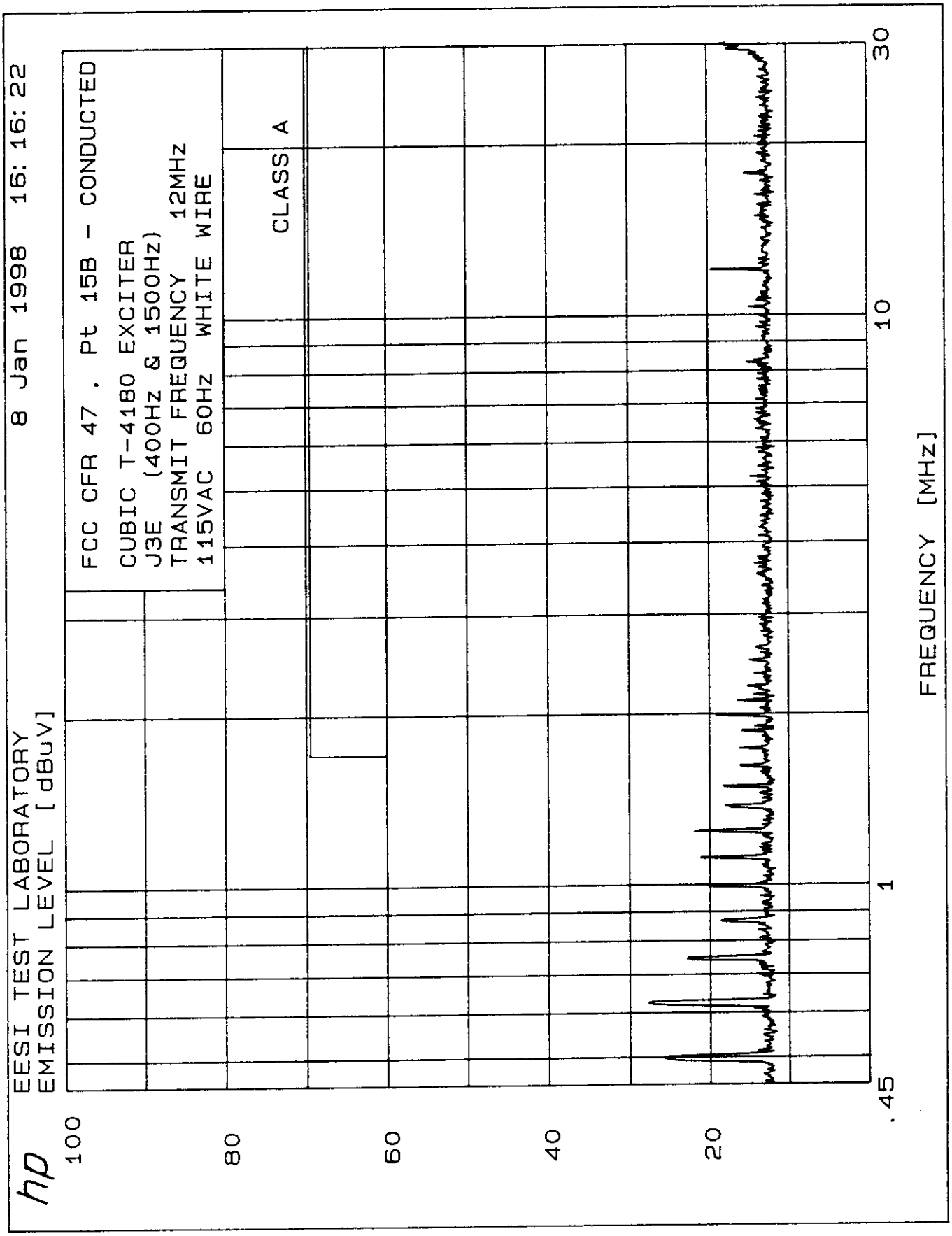

hp
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 16: 35: 34
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 2MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

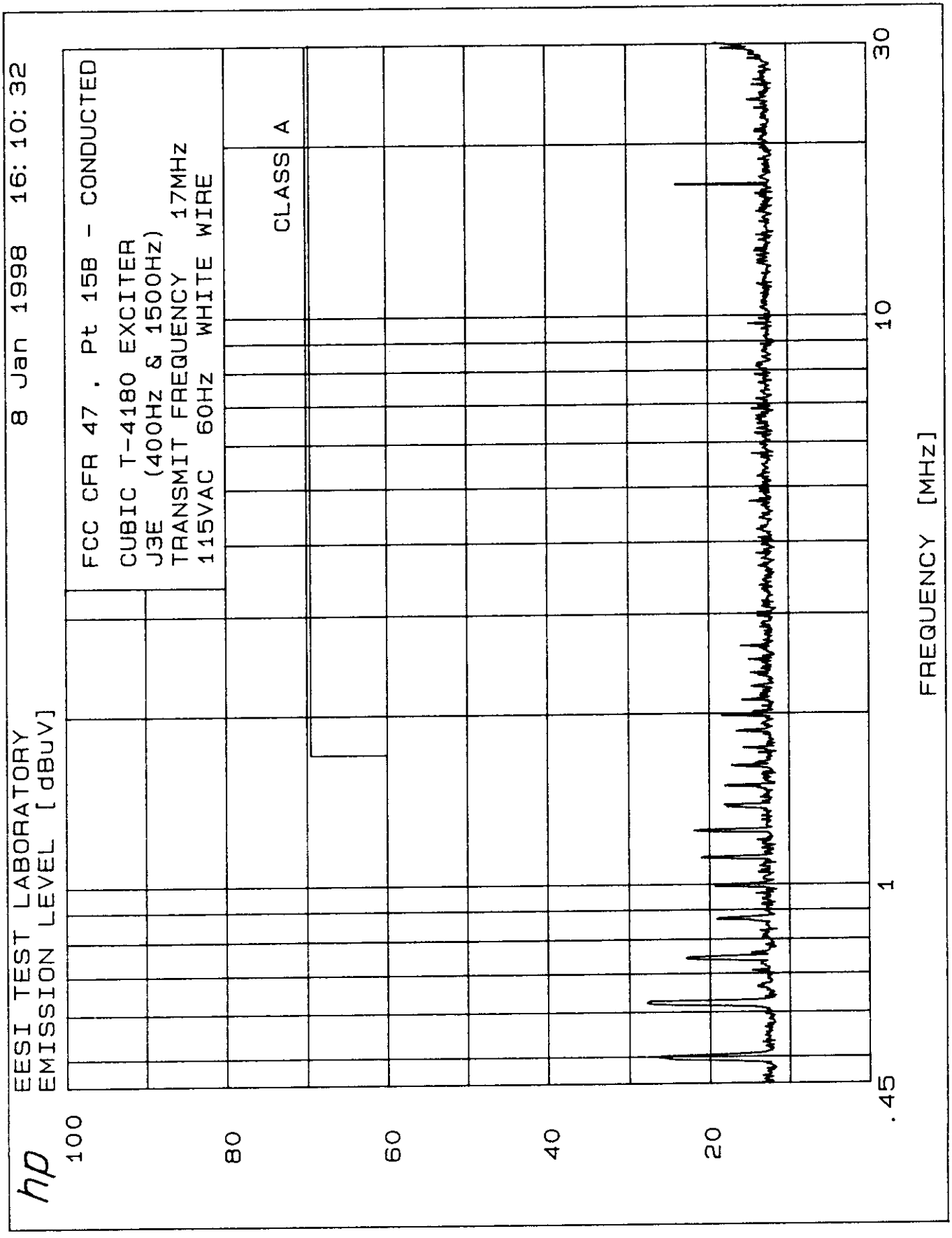

8 Jan 1998 16:31:48
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 3MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

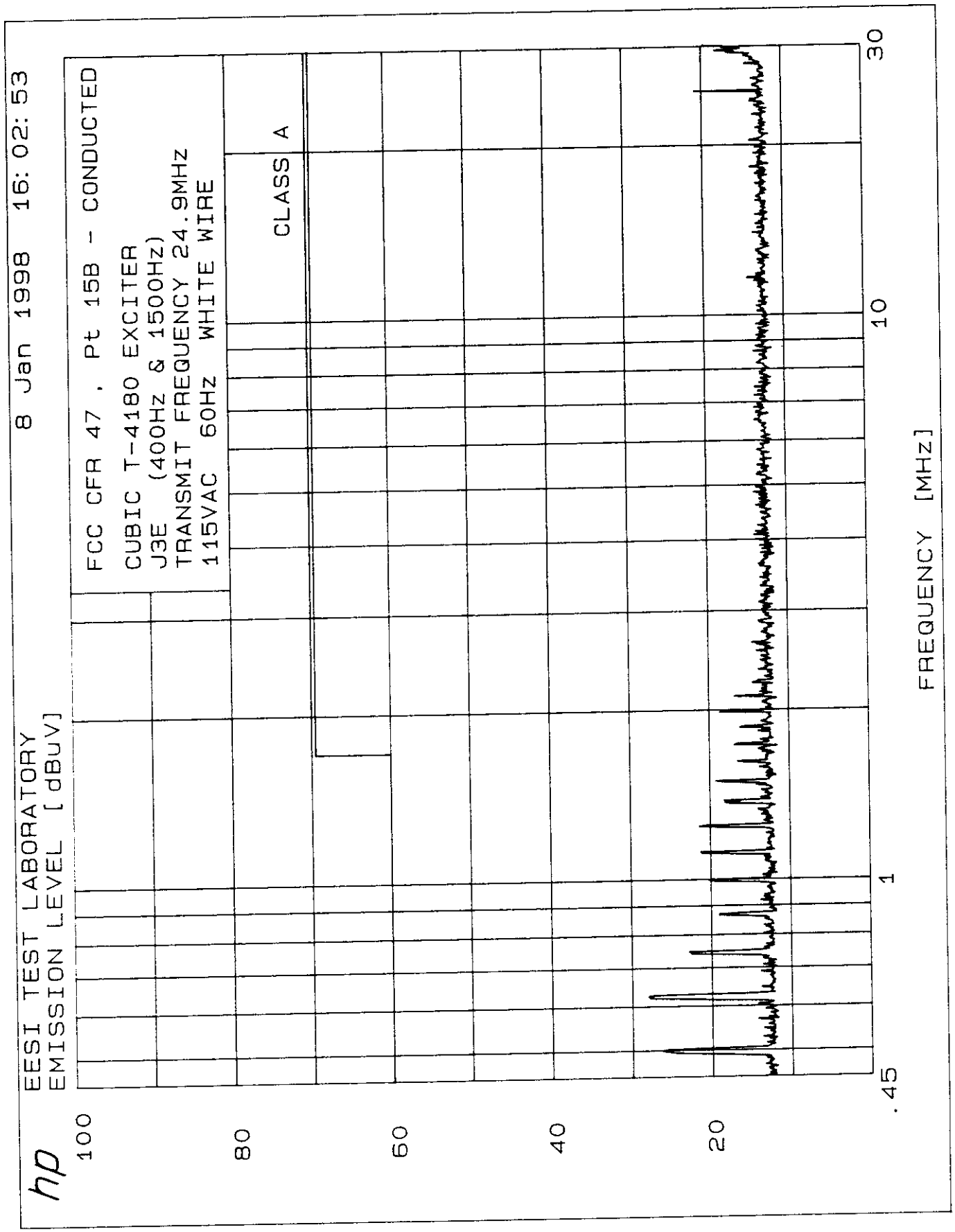

8 Jan 1998 16:28:00
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 4MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

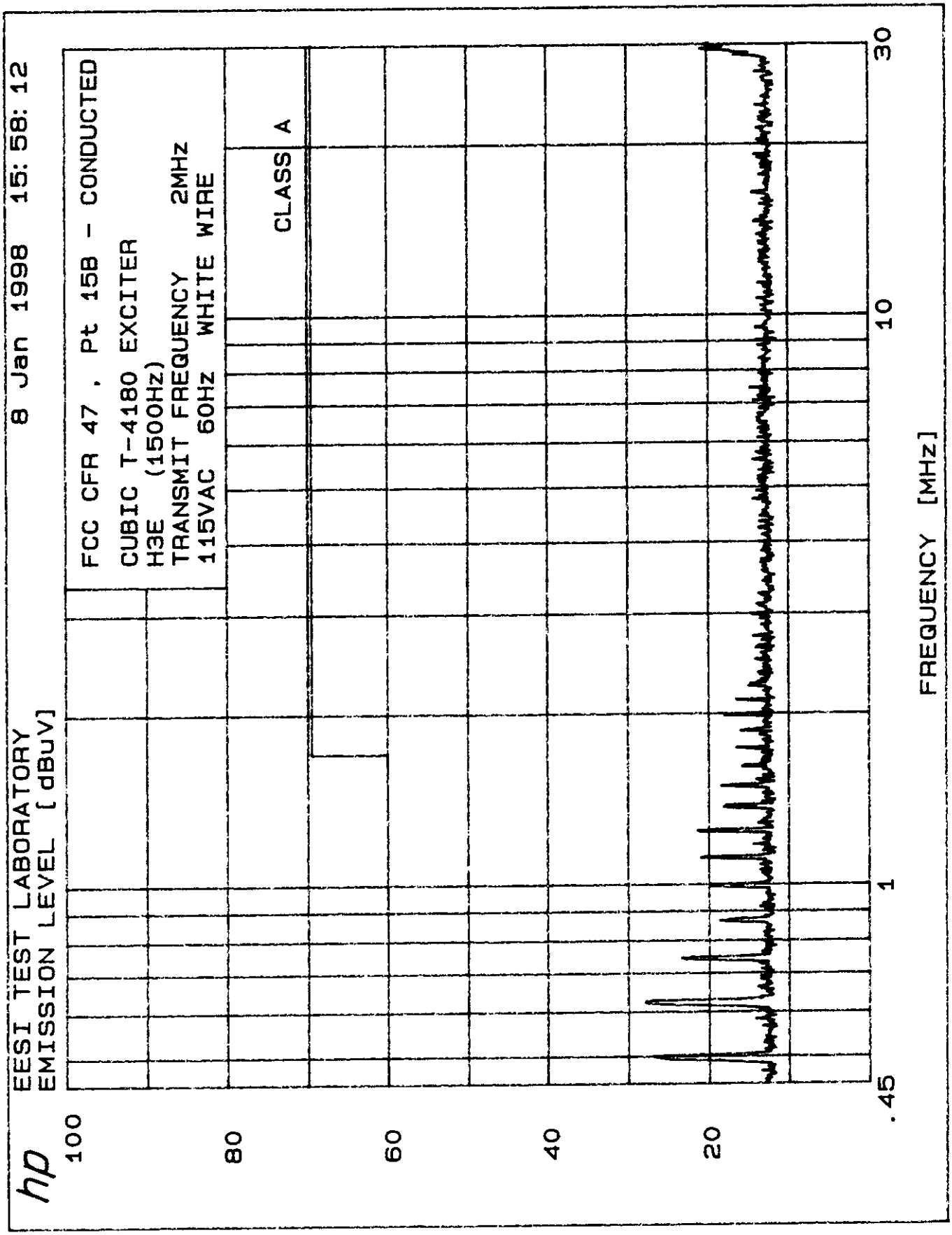

8 Jan 1998 16: 24: 05
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 6MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

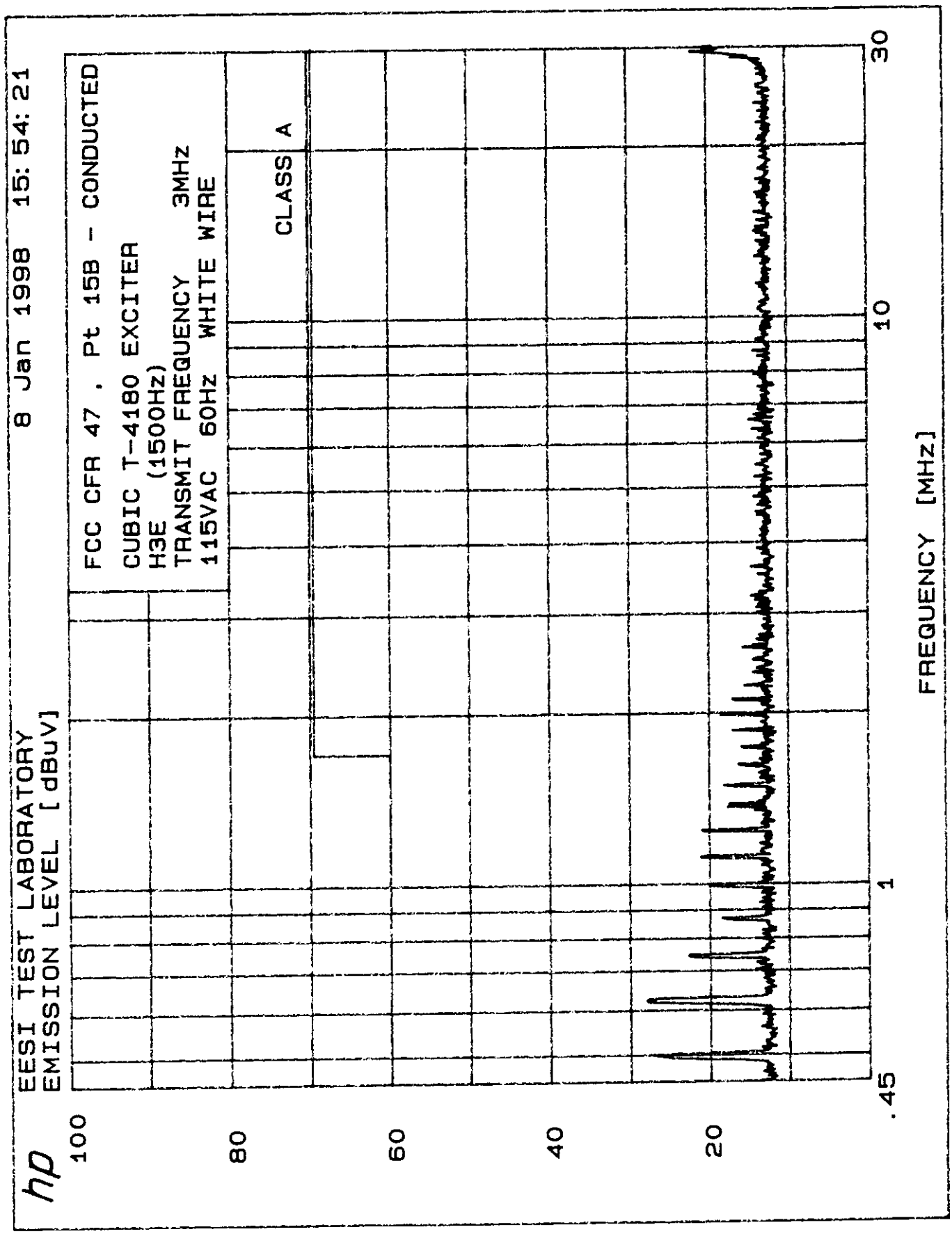

8 Jan 1998 16: 20: 14
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 8.5MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

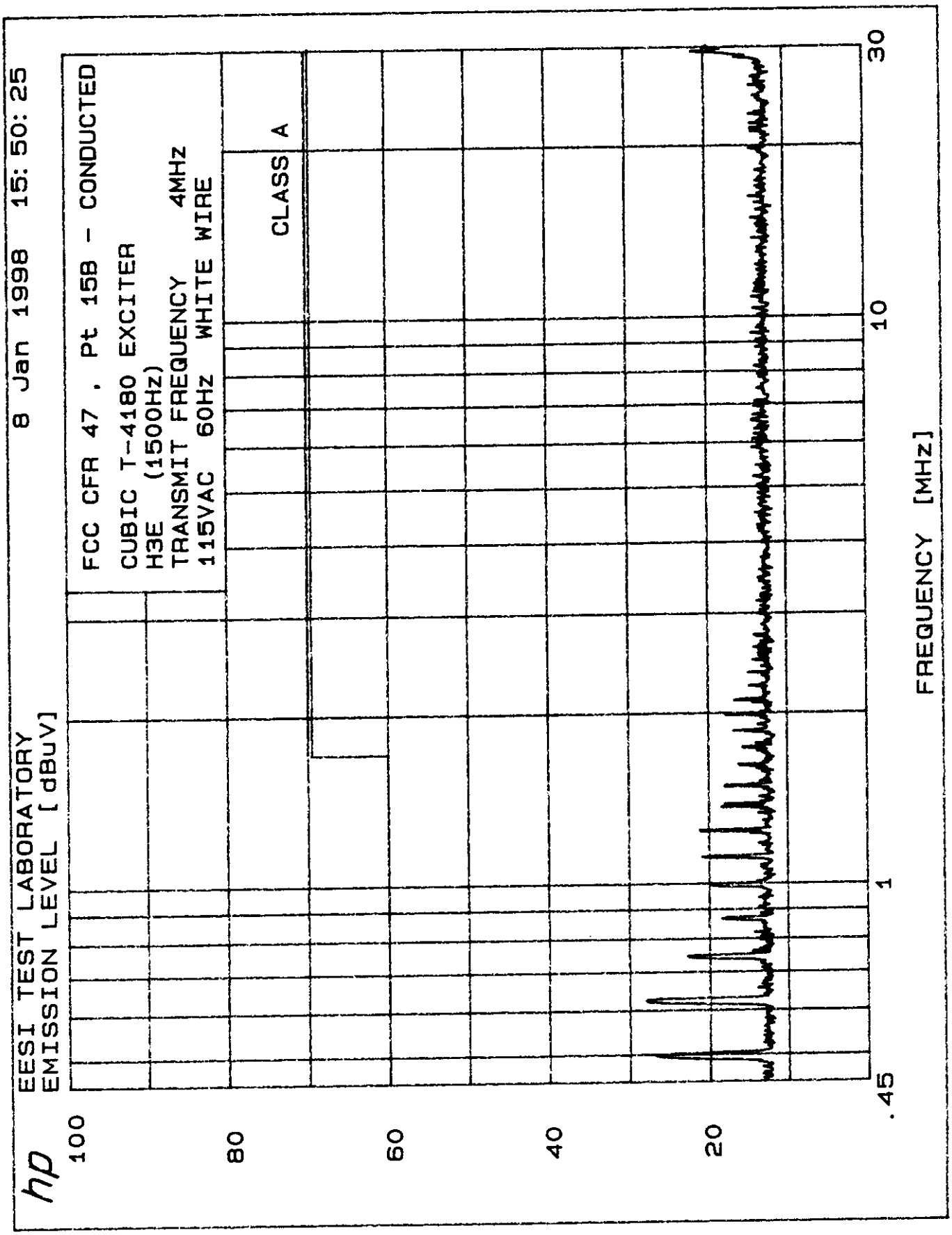

8 Jan 1998 16: 16: 22
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 12MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

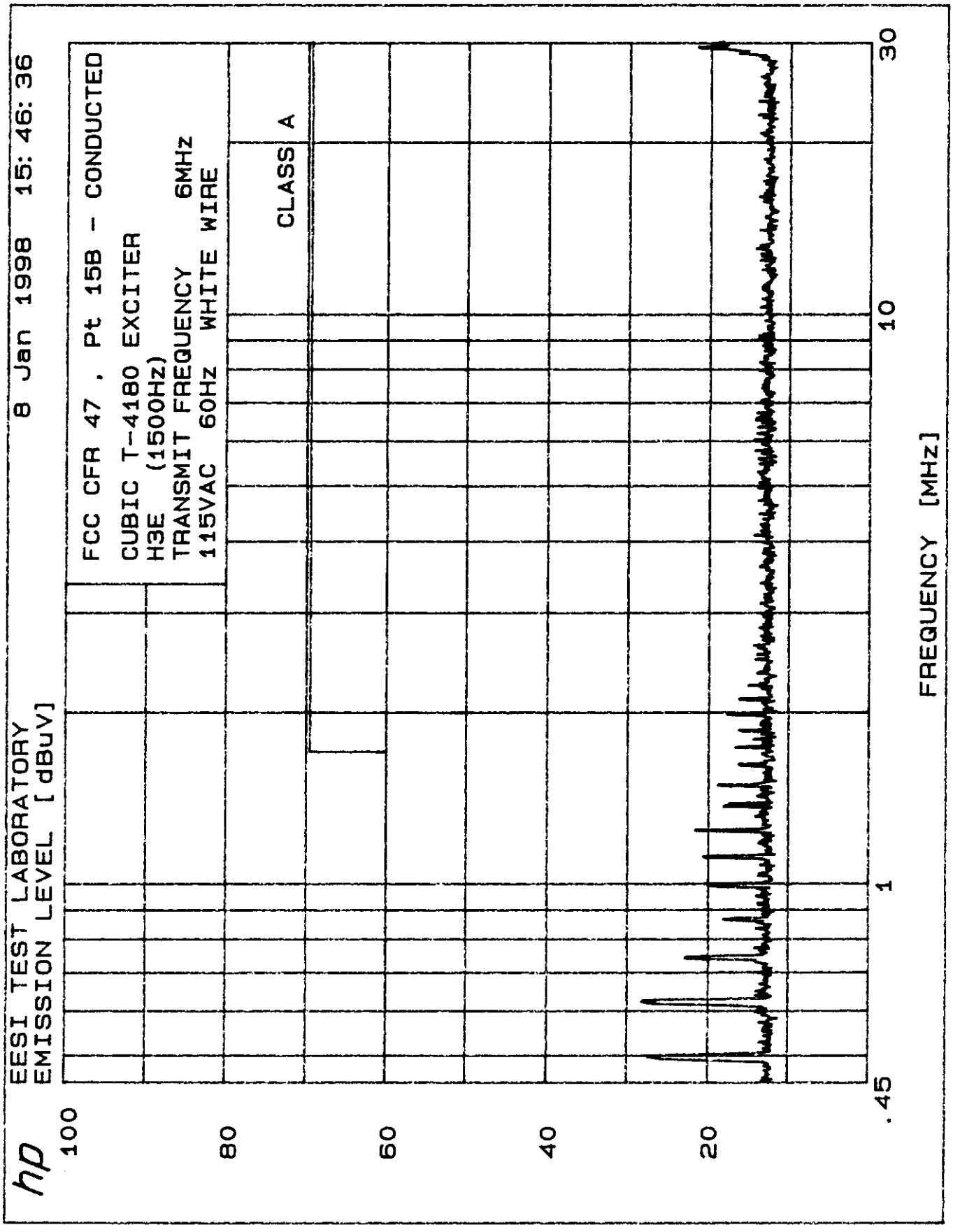

EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 16:10:32
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 17MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

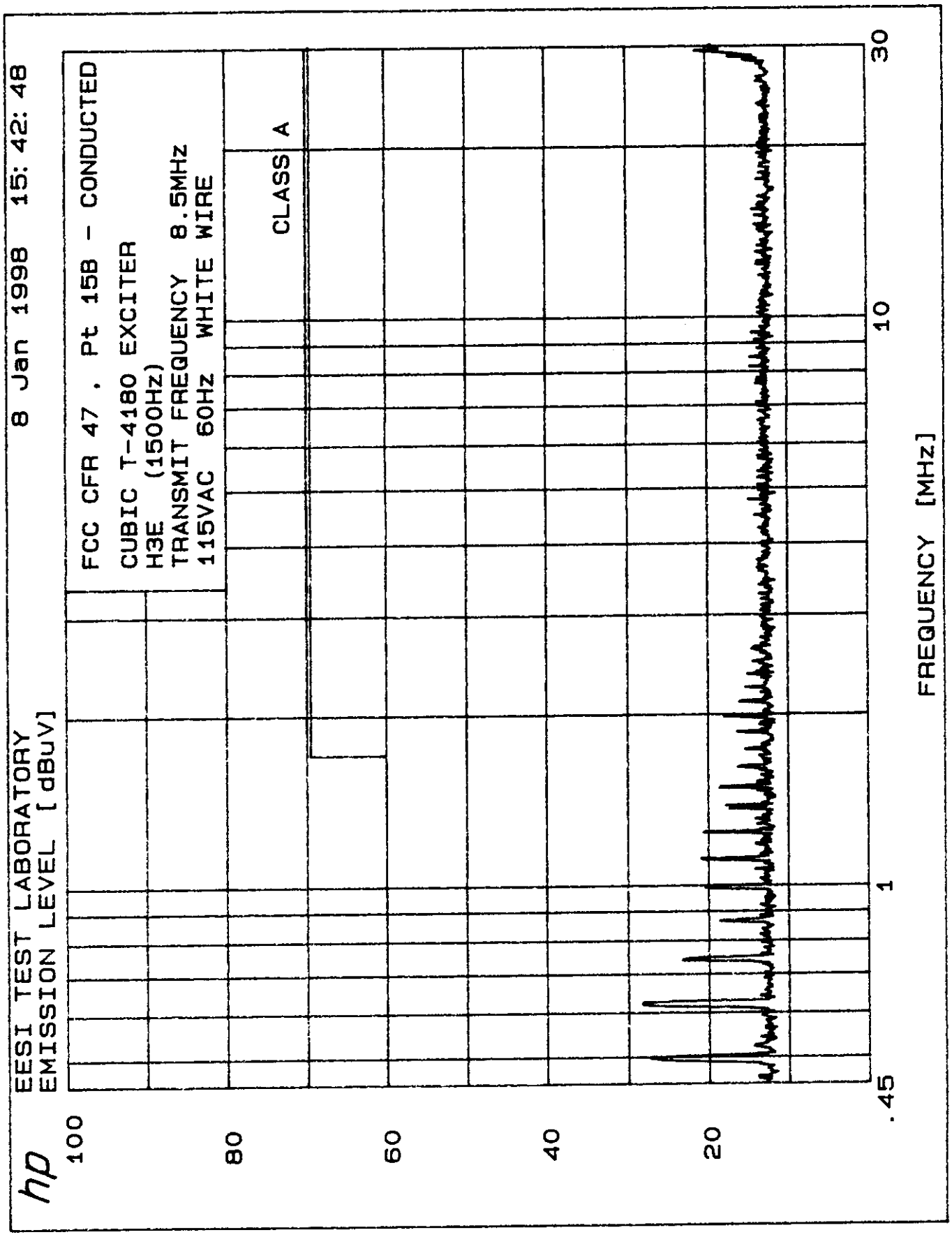

8 Jan 1998 16:02:53
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
J3E (400Hz & 1500Hz)
TRANSMIT FREQUENCY 24.9MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

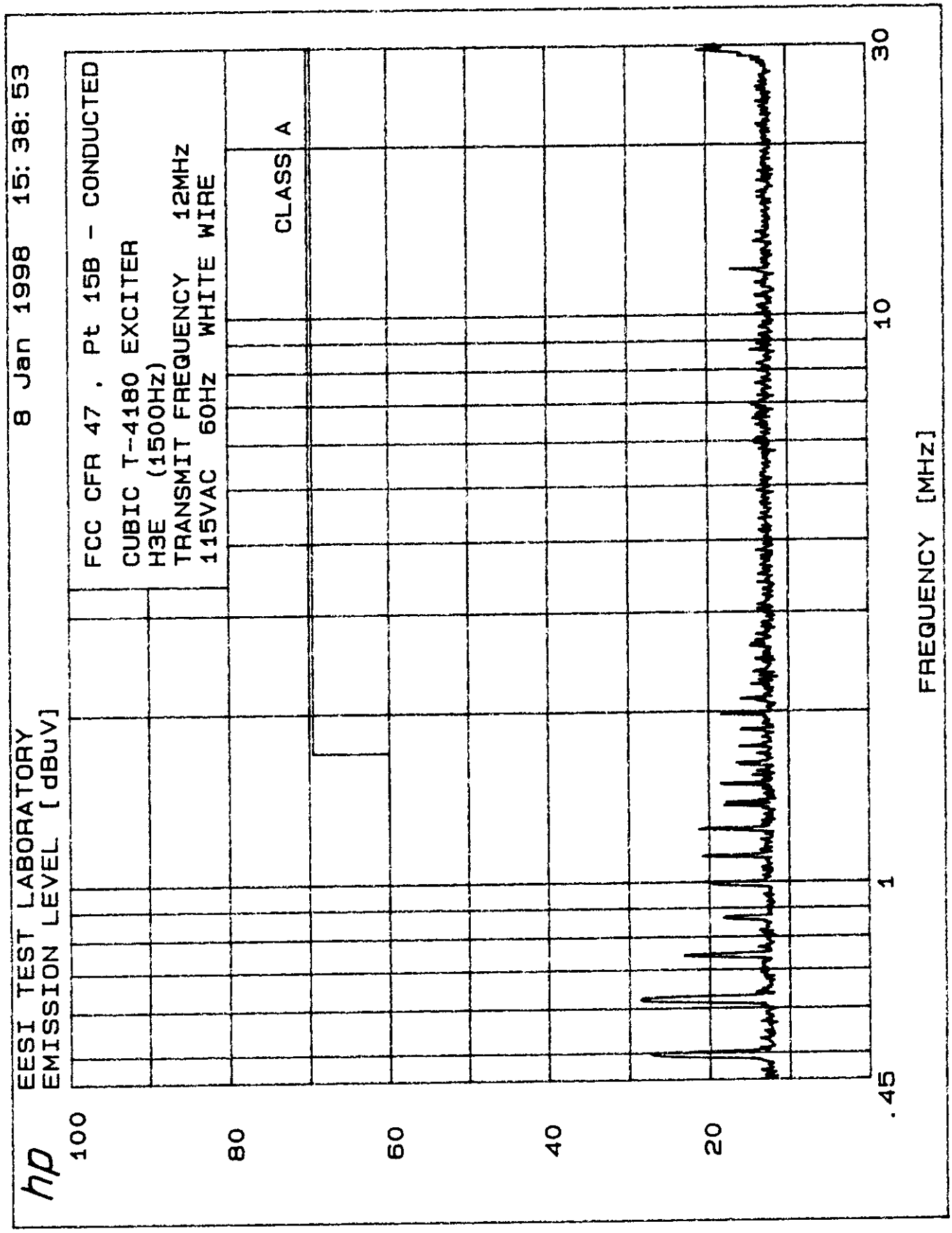

EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 15: 58: 12
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 2MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

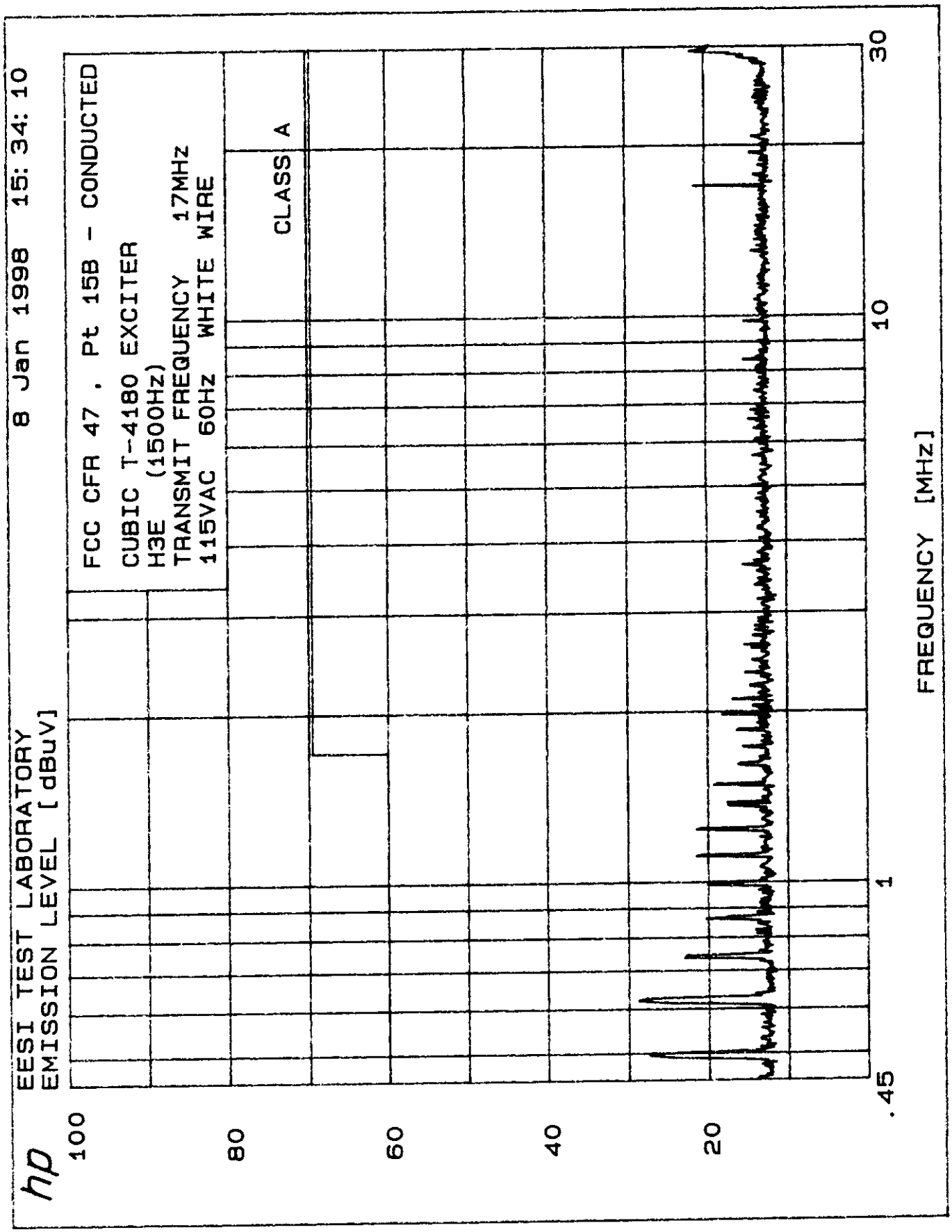

8 Jan 1998 15:54:21
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 3MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

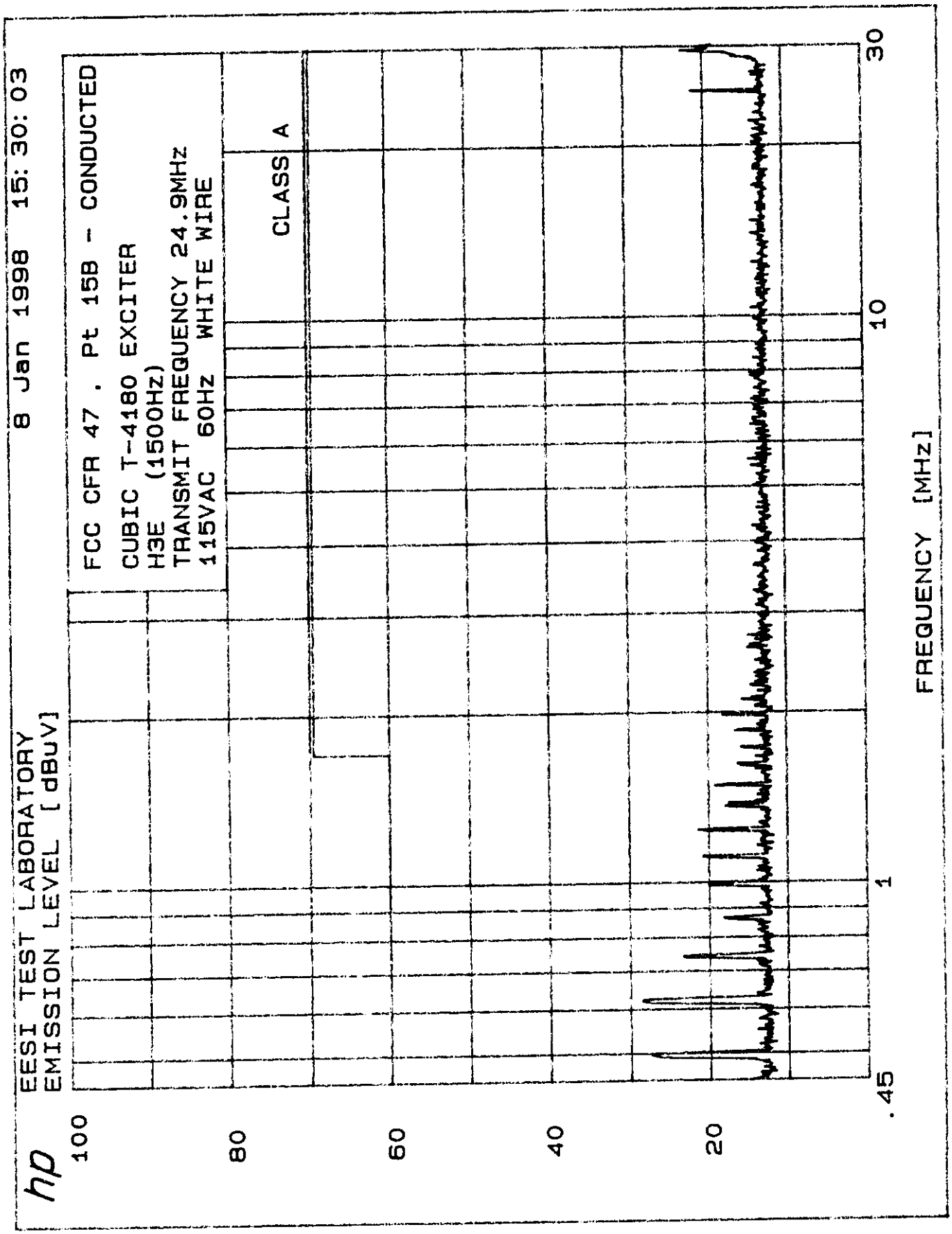

8 Jan 1998 15: 50: 25
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 4MHz
115VAC 60Hz WHITE WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

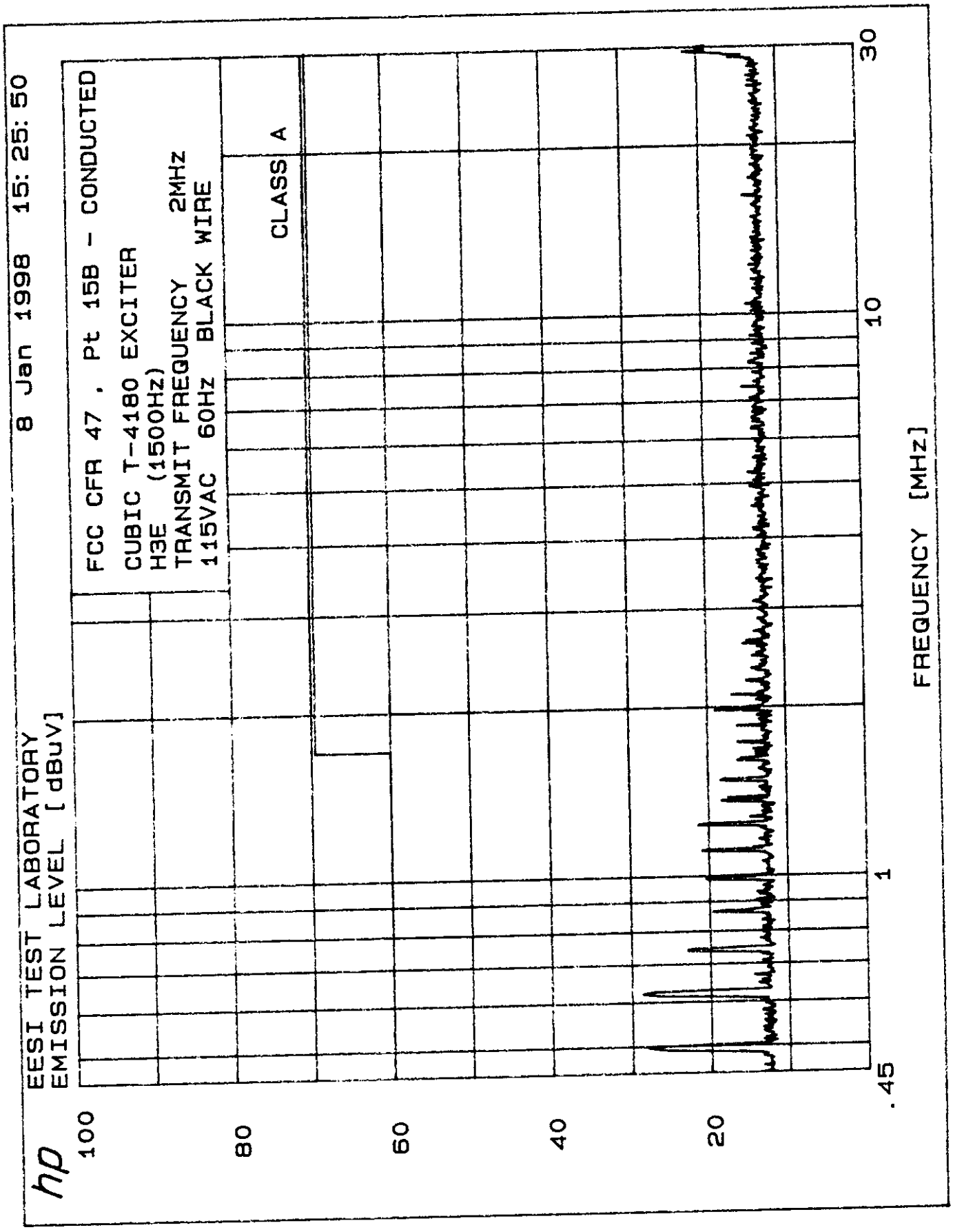

8 Jan 1998 15: 46: 36
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 6MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

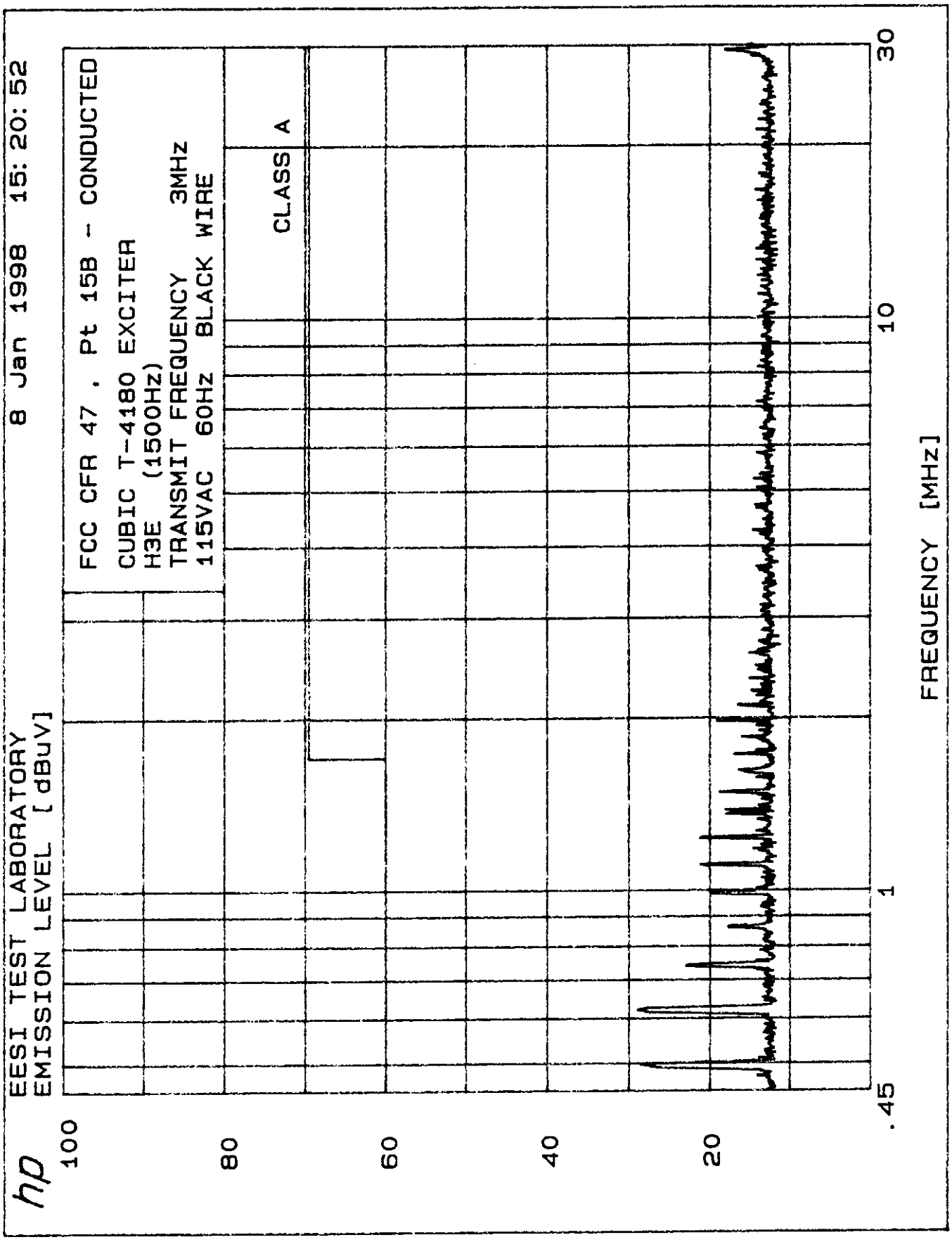

8 Jan 1998 15: 42: 48
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 8.5MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

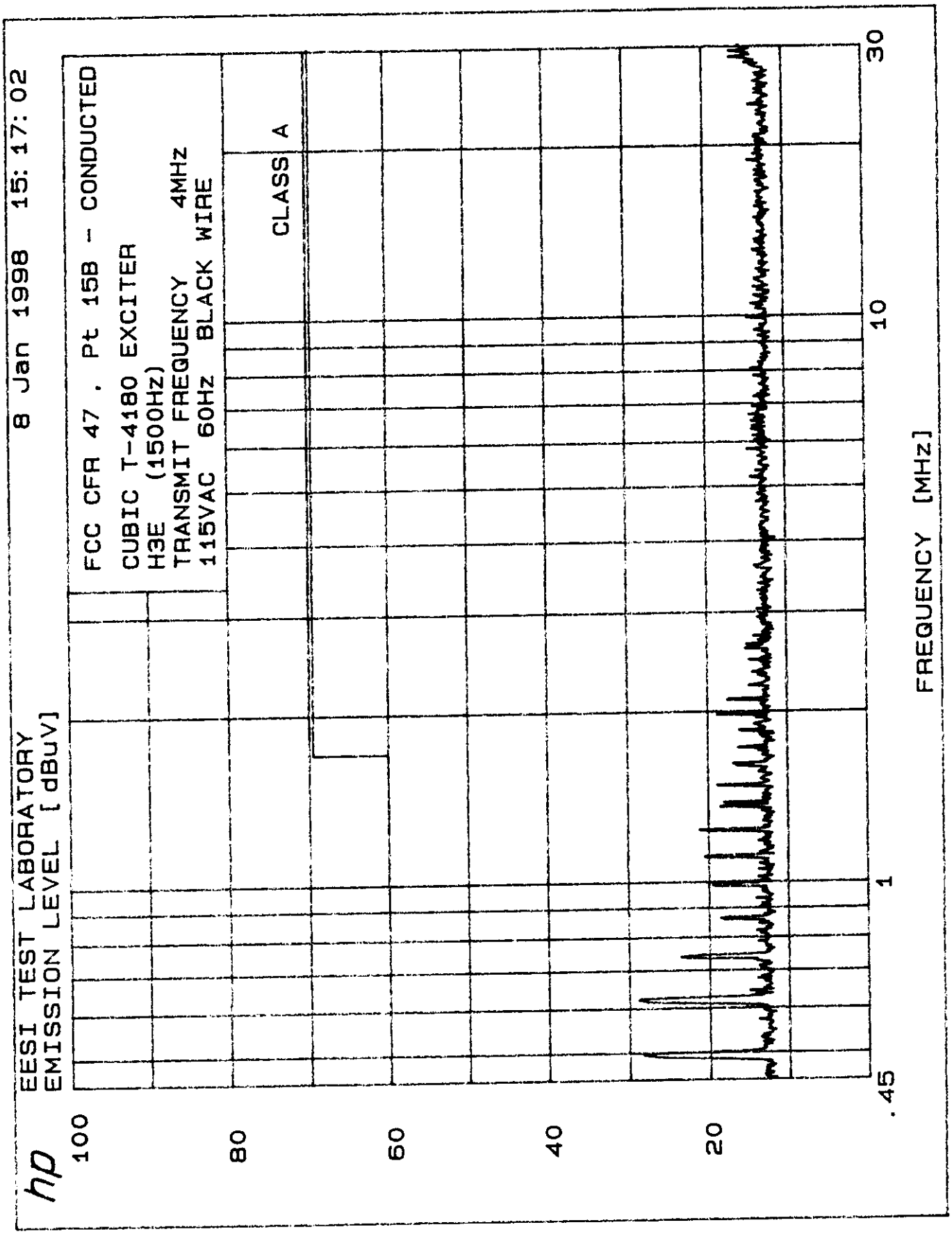

8 Jan 1998 15: 38: 53
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 12MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

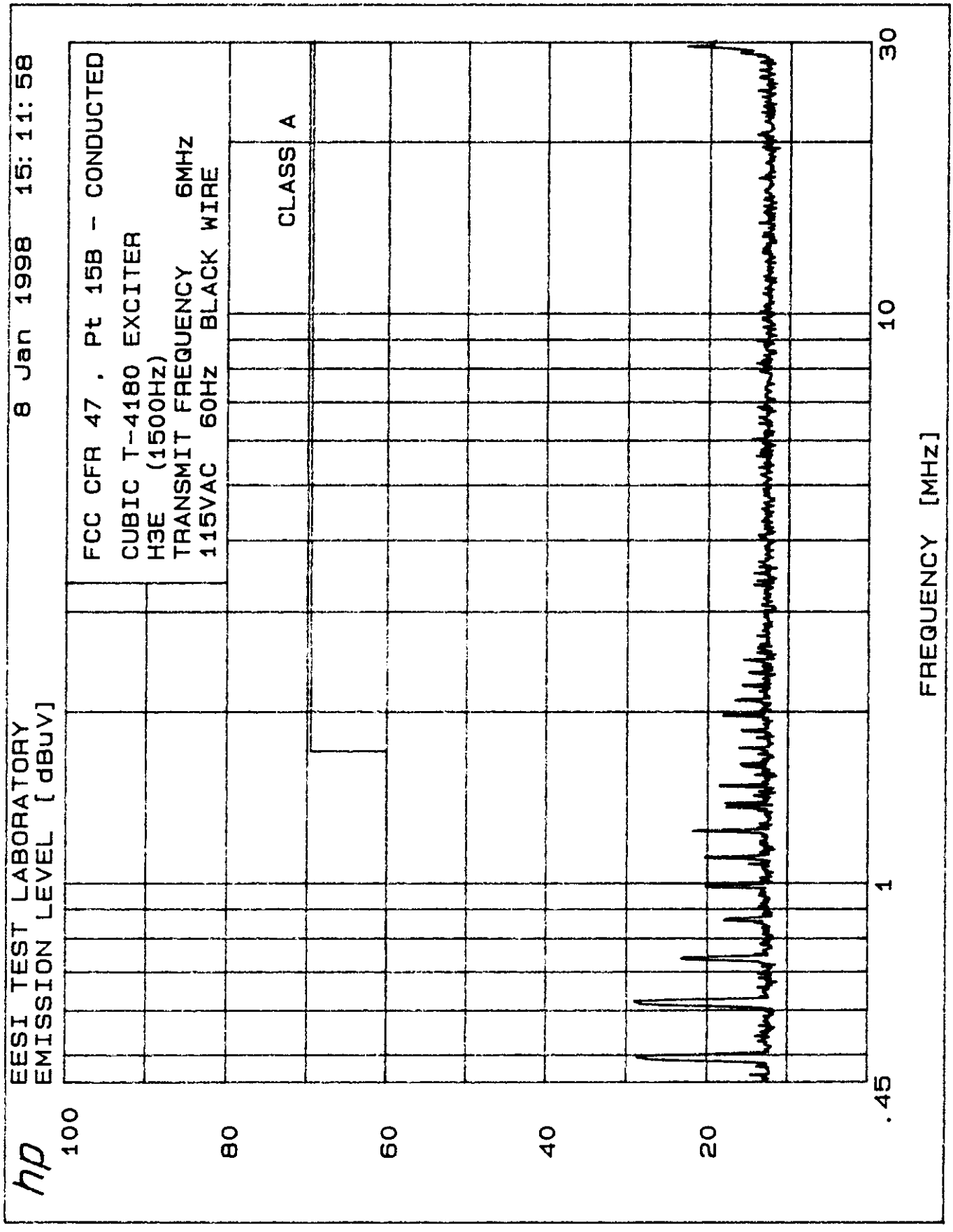

8 Jan 1998 15: 34: 10
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 17MHz
115VAC 60Hz WHITE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

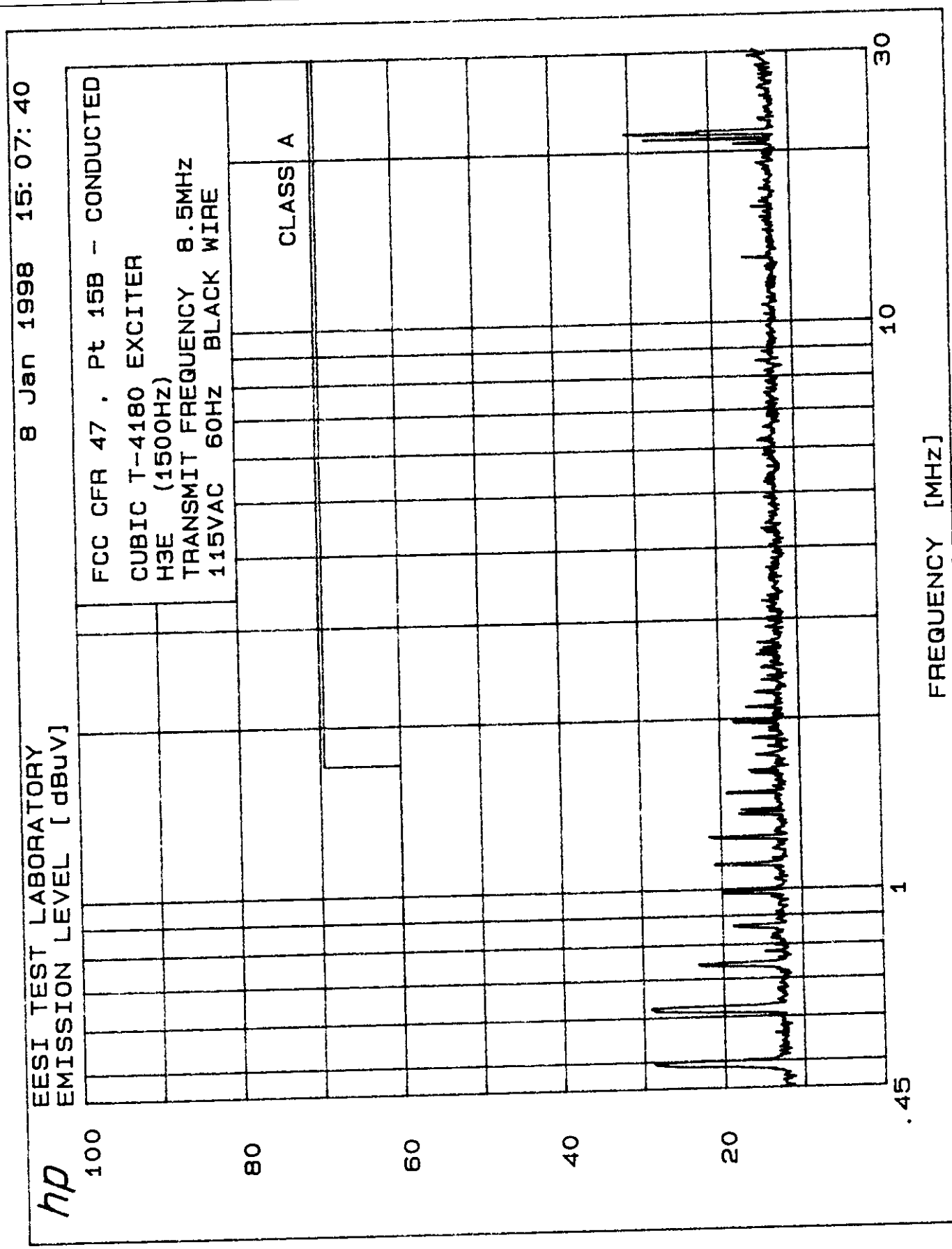

8 Jan 1998 15:30:03
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 24.9MHz
115VAC 60Hz WHITE WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

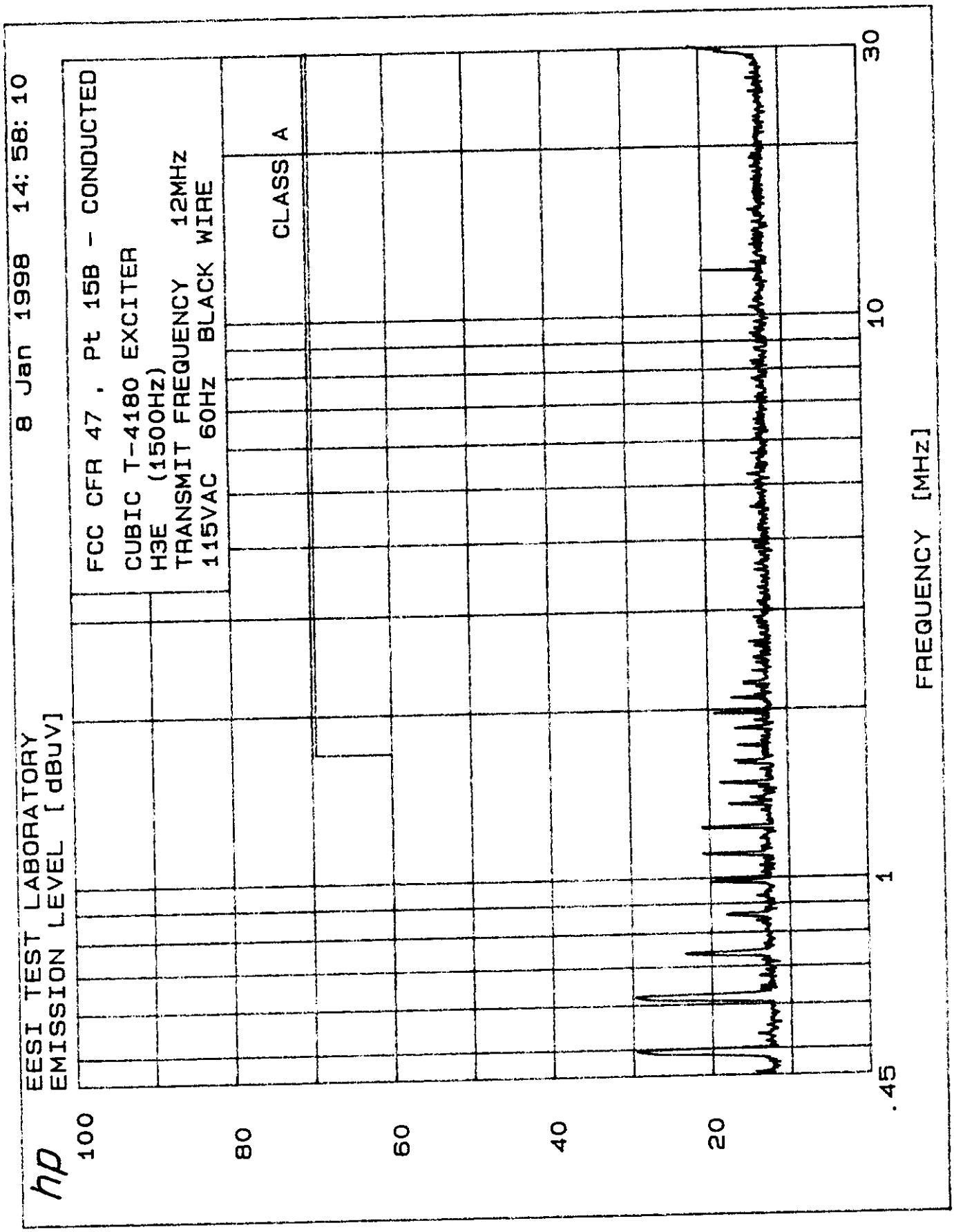

8 Jan 1998 15:25:50
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 2MHz
115VAC 60Hz BLACK WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

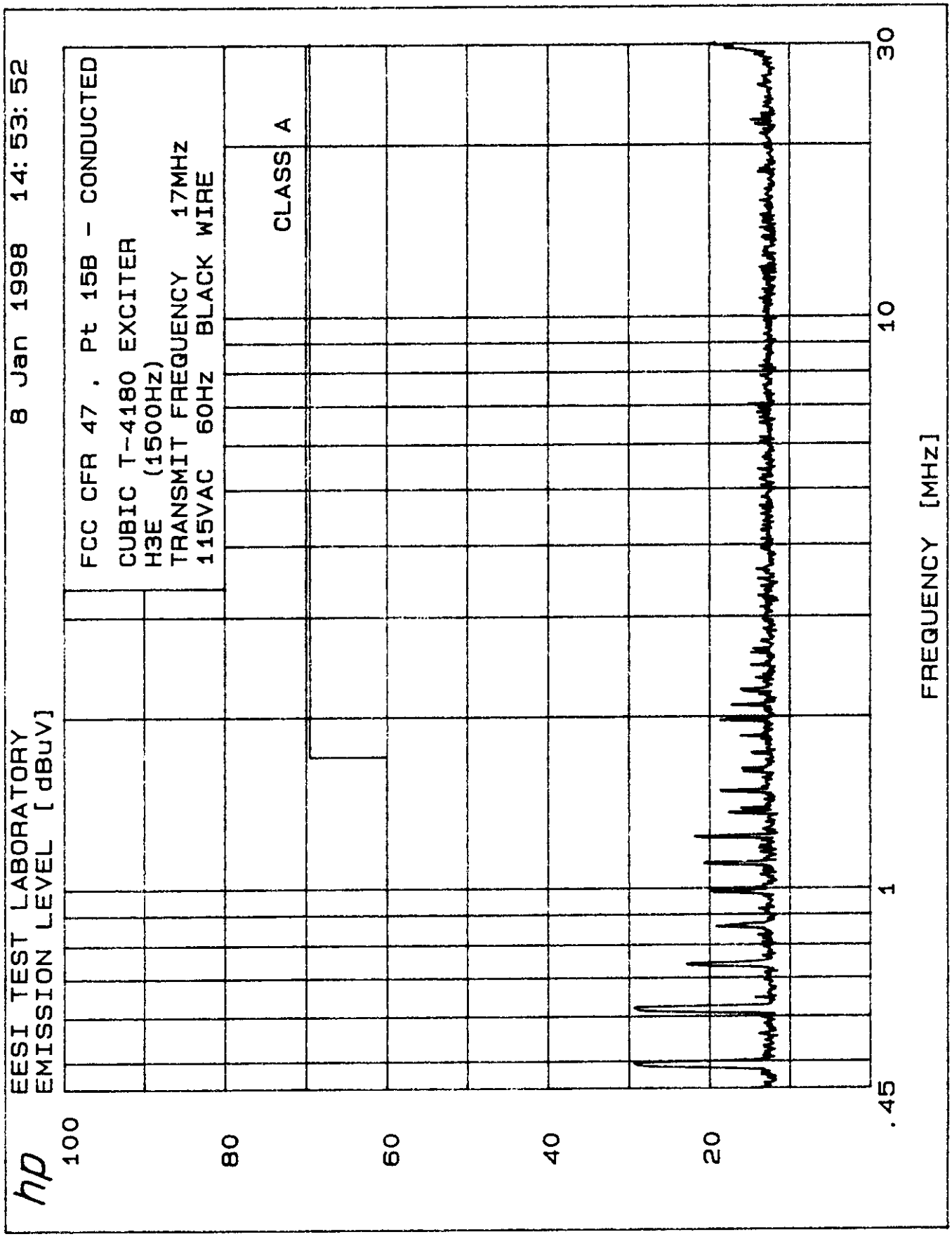

8 Jan 1998 15:20:52
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 3MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

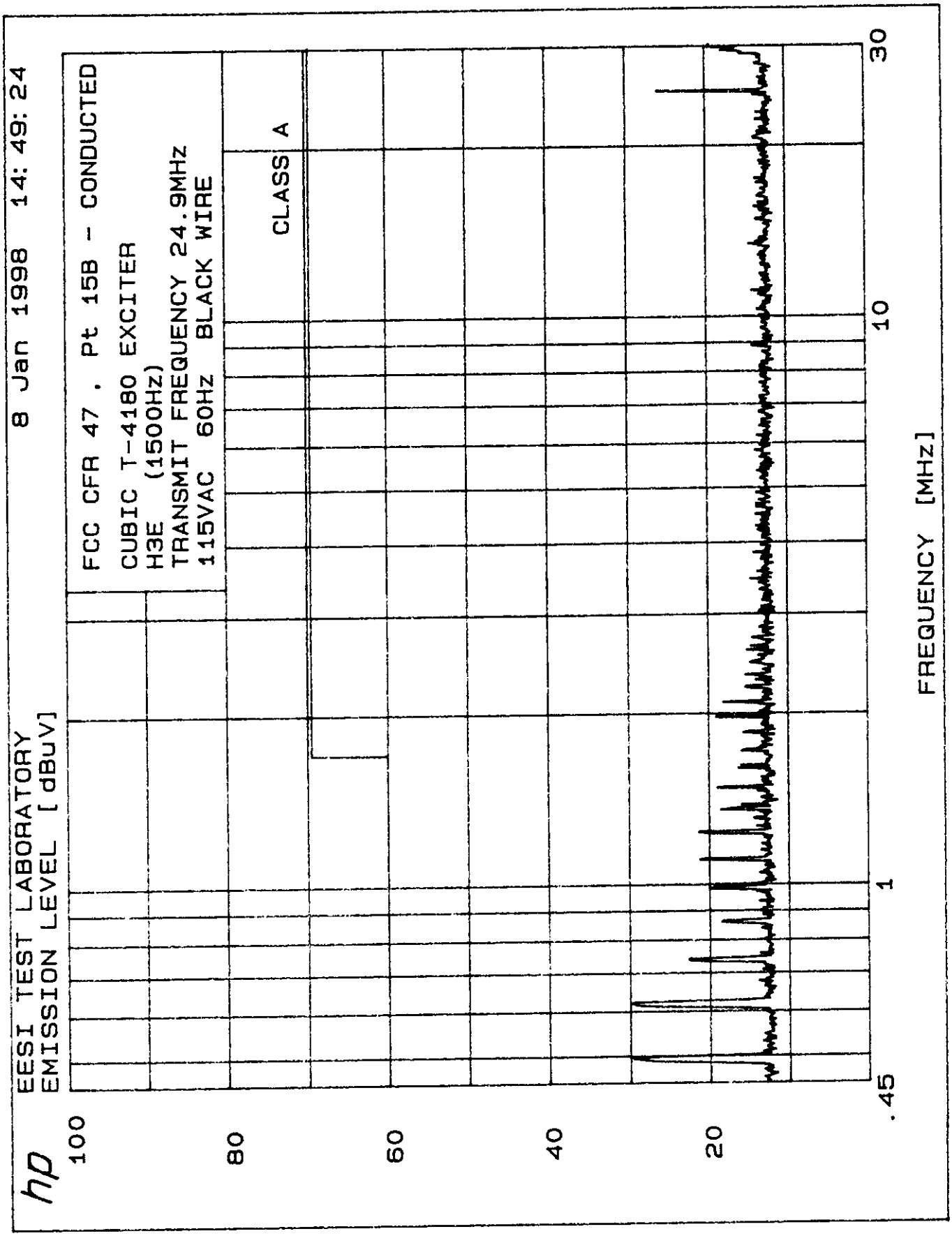

8 Jan 1998 15:17:02
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 4MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

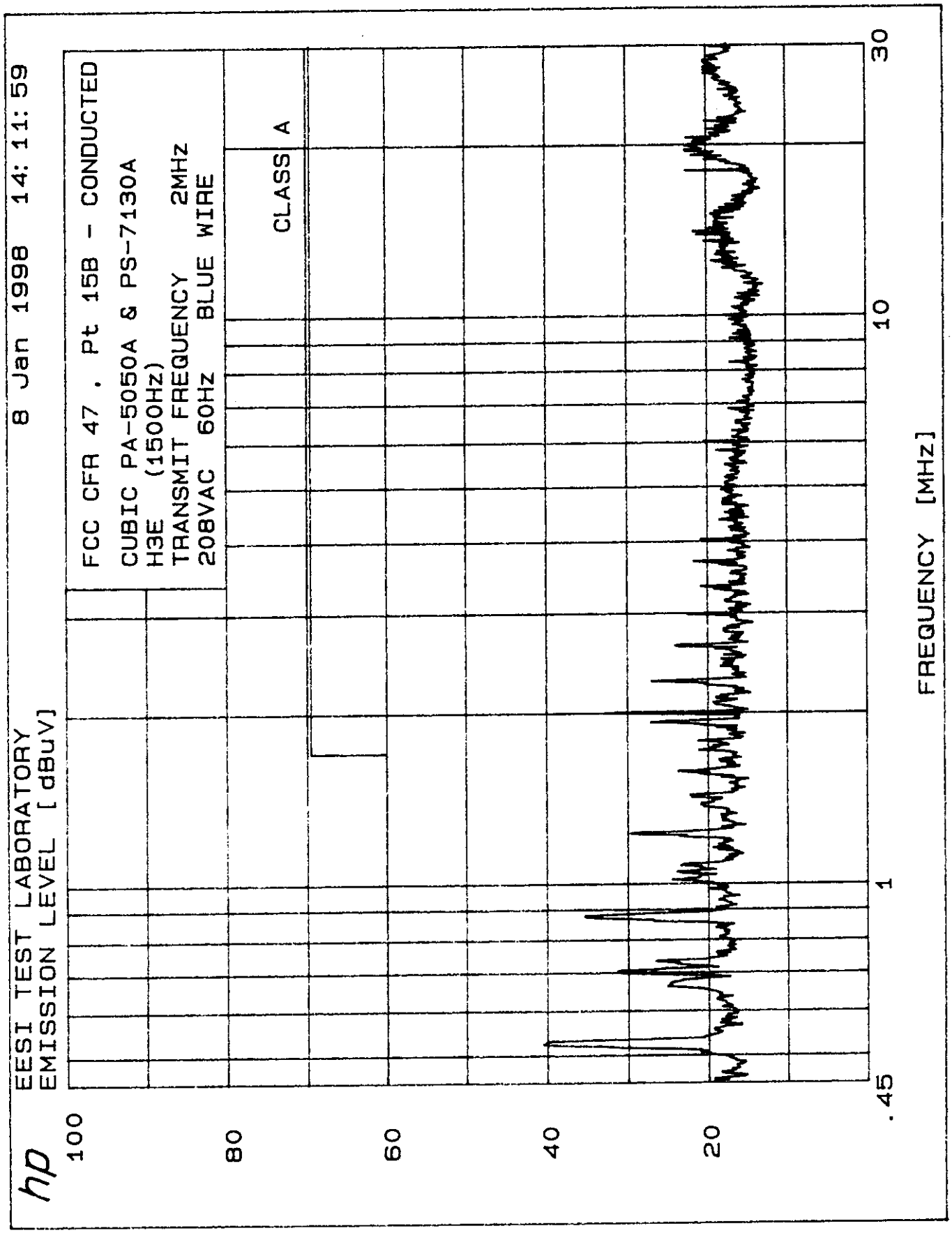

EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 15: 11: 58
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 6MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

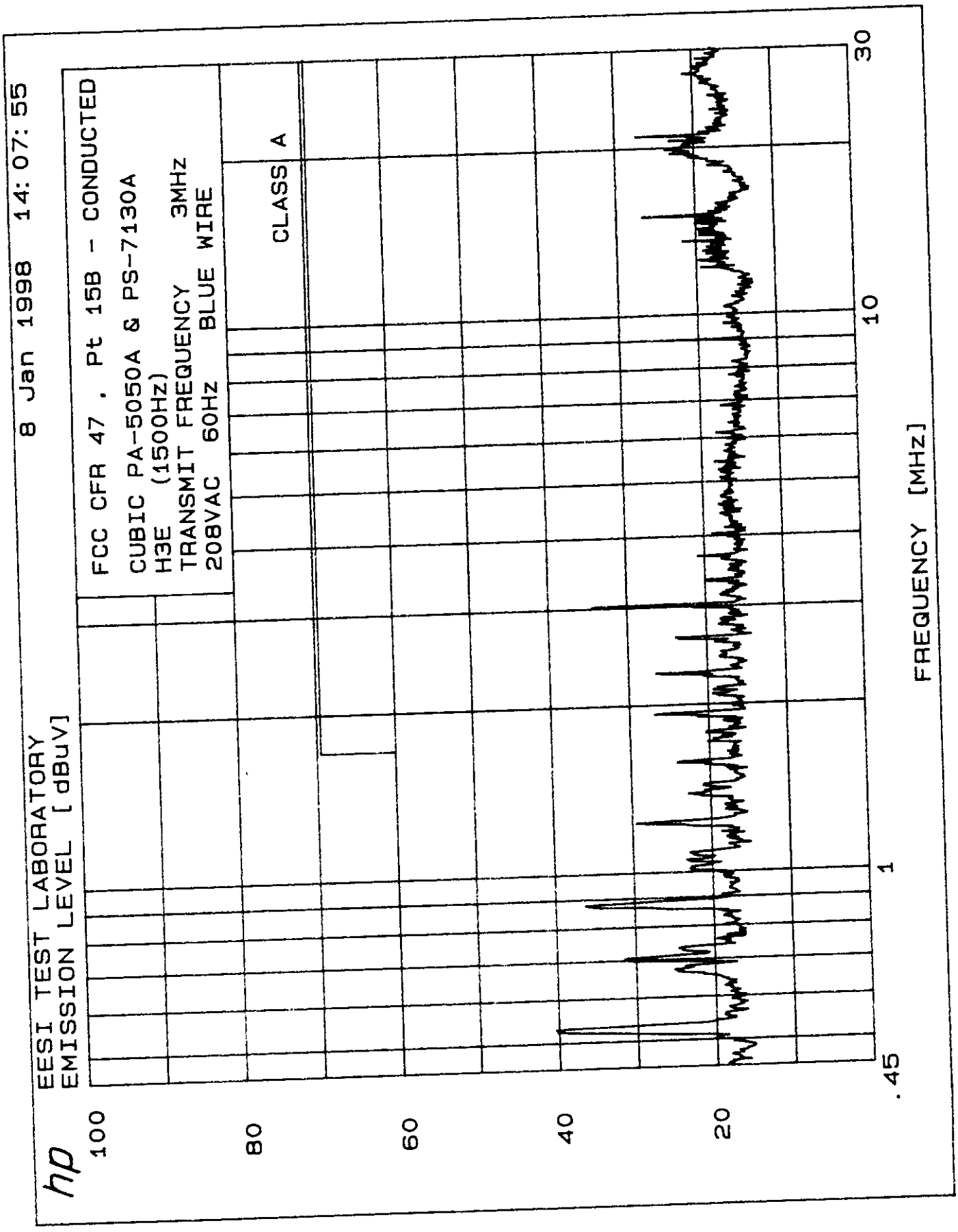

8 Jan 1998 15: 07: 40
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 8.5MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

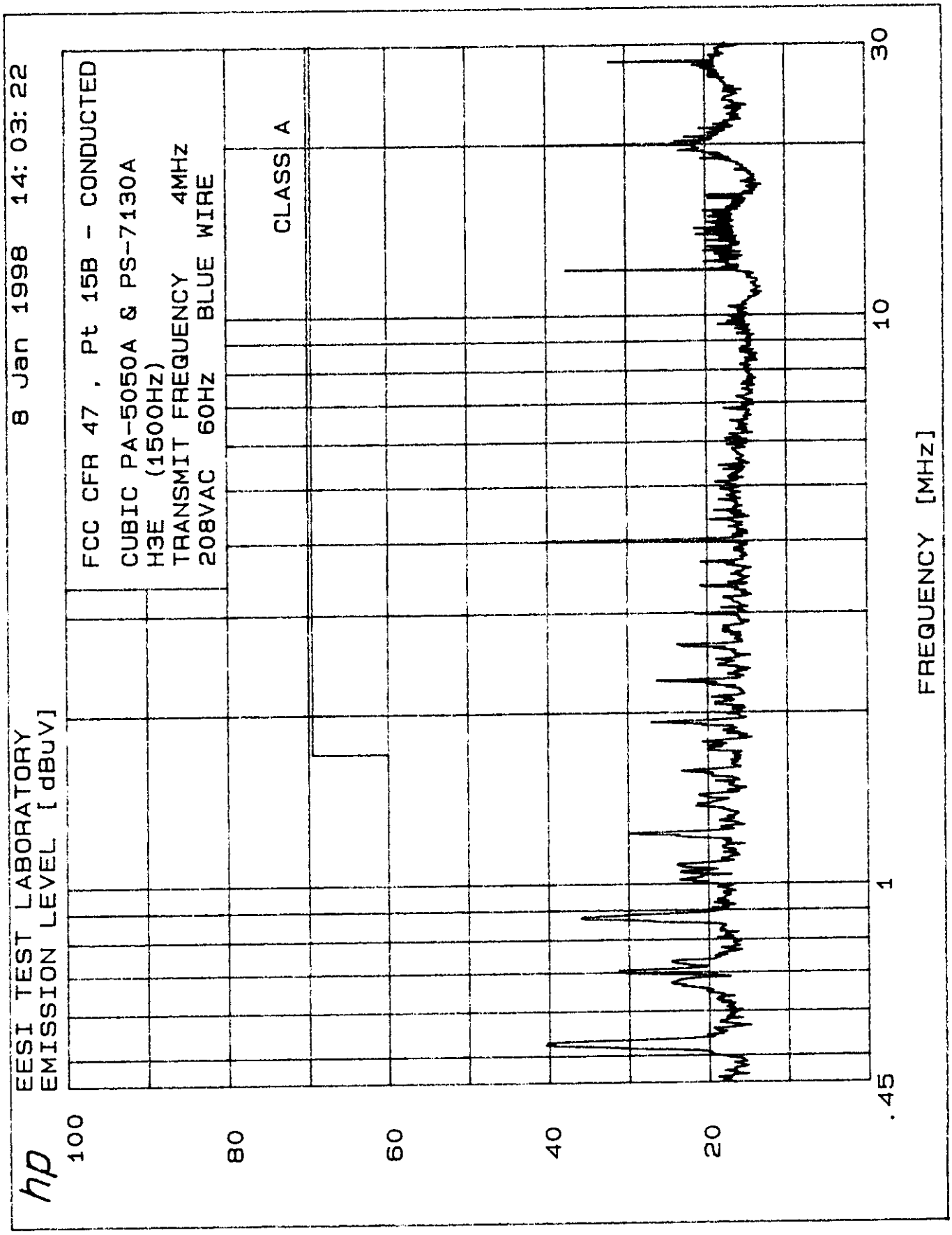

8 Jan 1998 14:58:10
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500HZ)
TRANSMIT FREQUENCY 12MHz
115VAC 60Hz BLACK WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

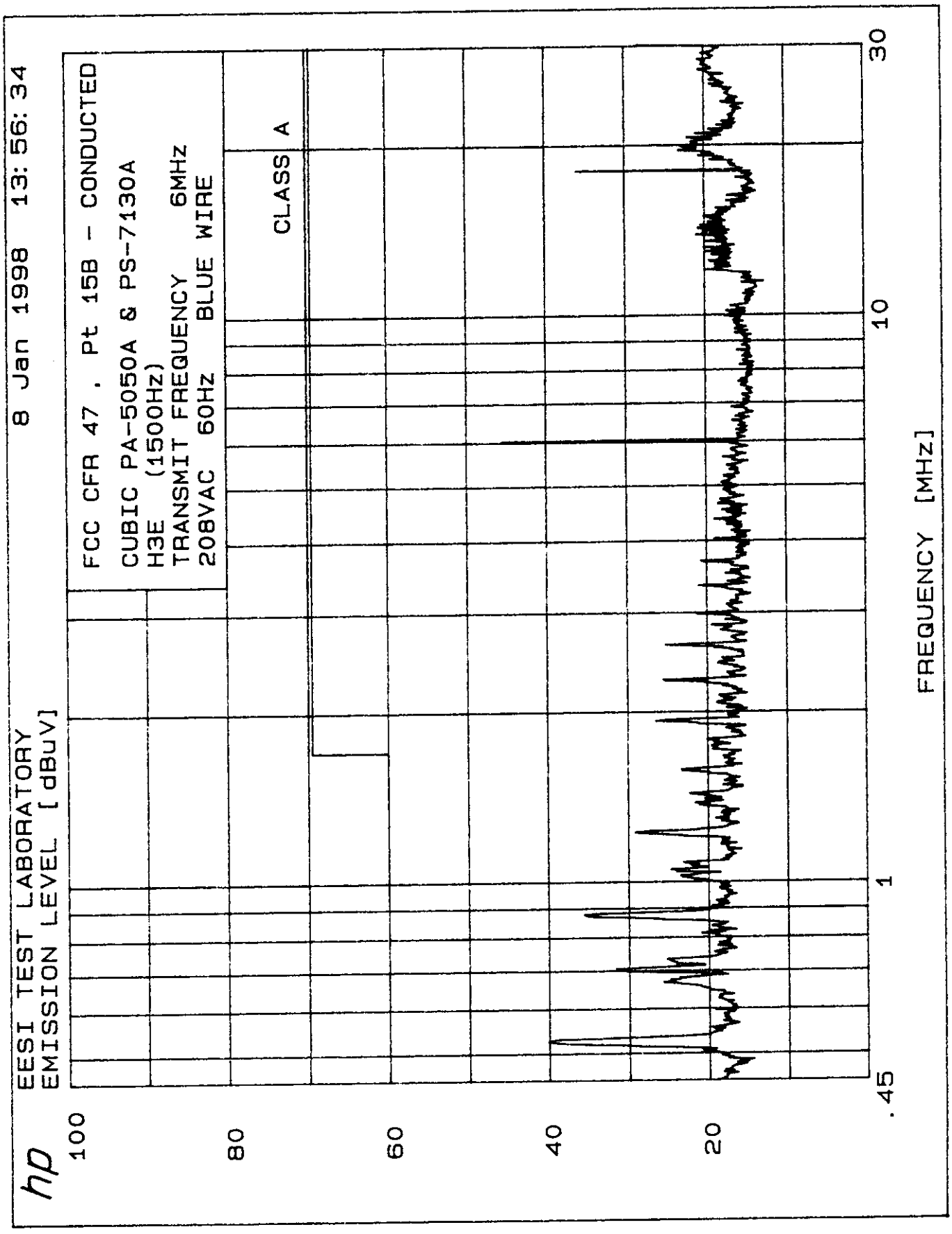

8 Jan 1998 14:53:52
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 17MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

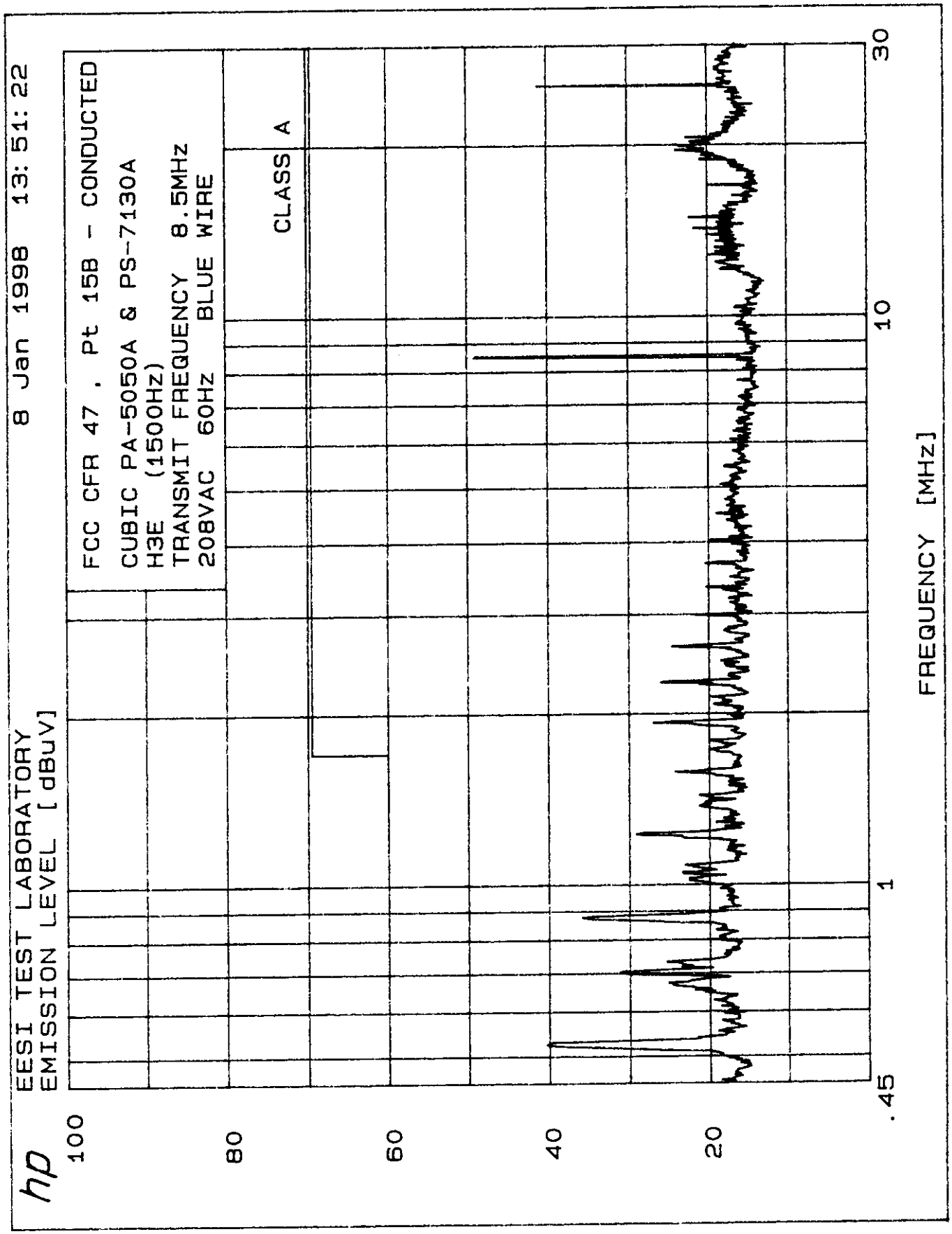

8 Jan 1998 14:49:24
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC T-4180 EXCITER
H3E (1500Hz)
TRANSMIT FREQUENCY 24.9MHz
115VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

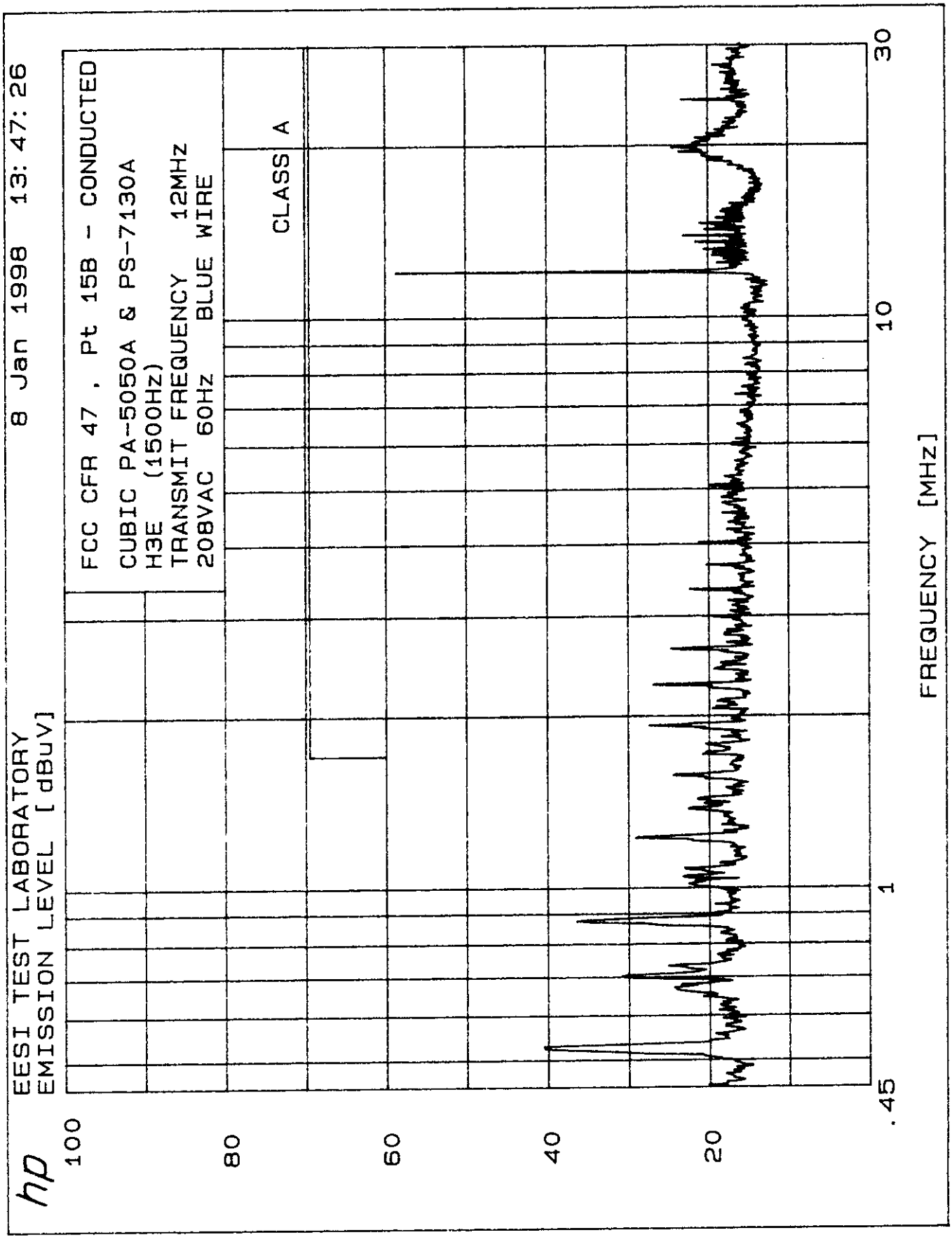

8 Jan 1998 14:11:59
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 2MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

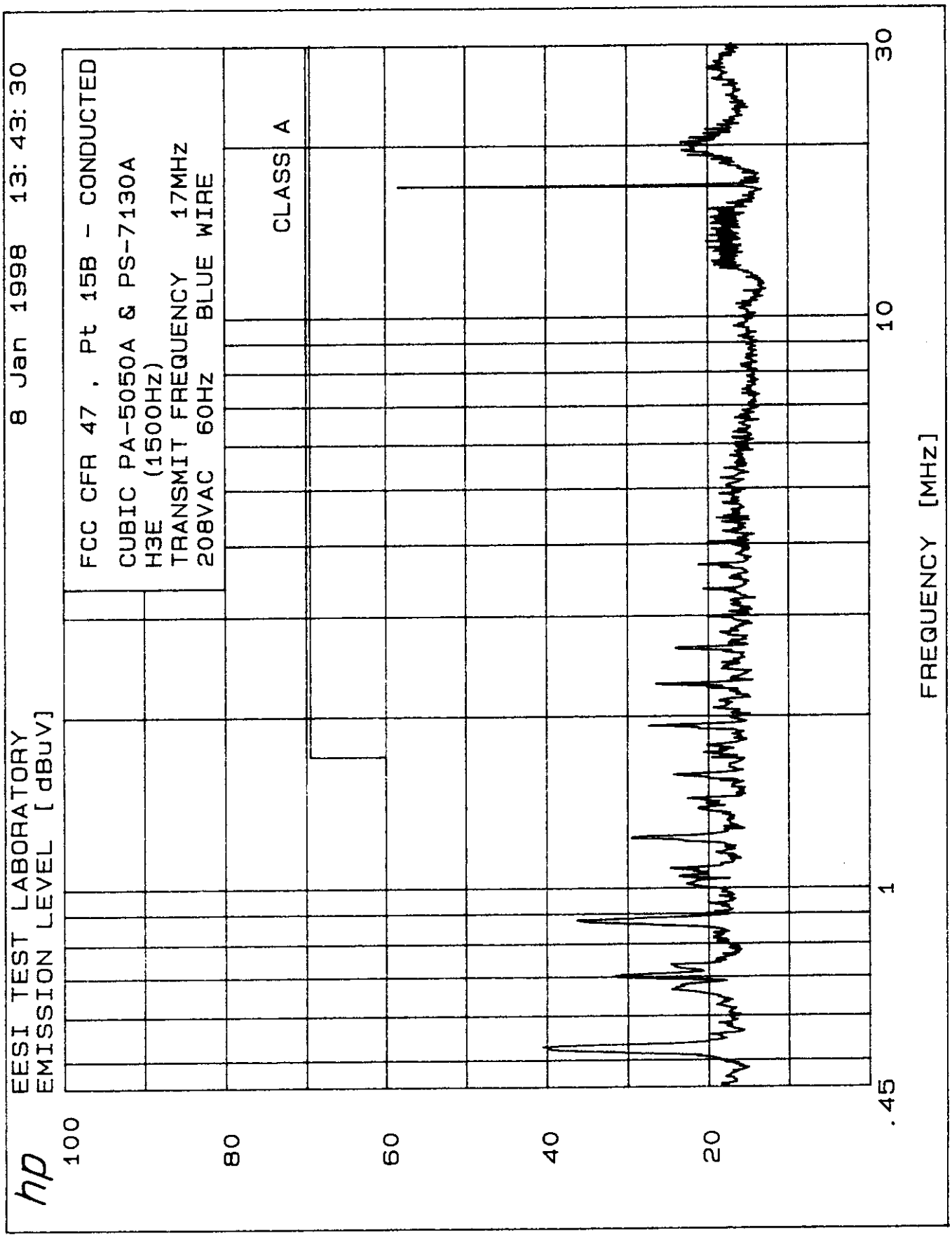

8 Jan 1998 14:07:55
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 3MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

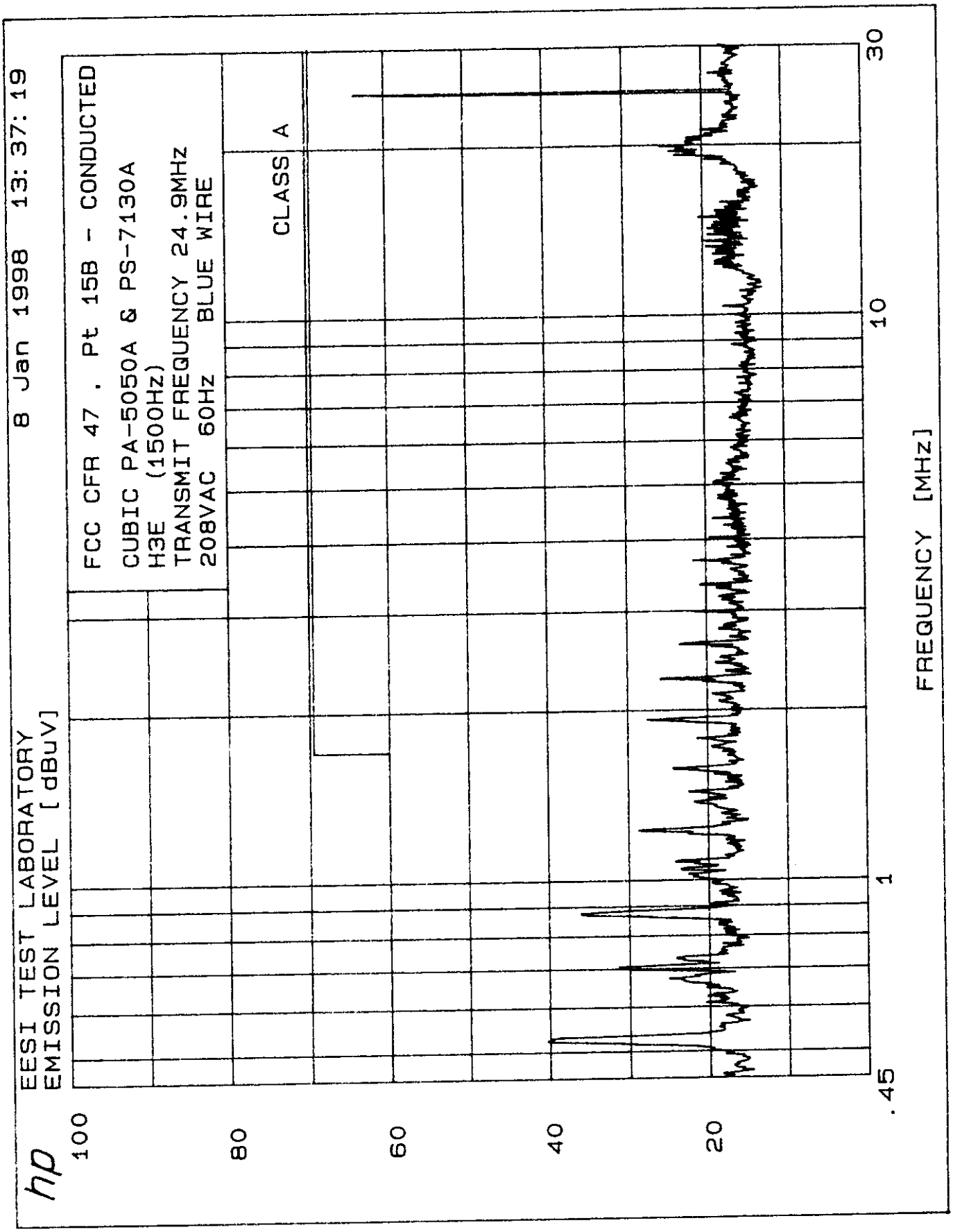

8 Jan 1998 14:03:22
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 4MHz
208VAC 60Hz BLUE WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

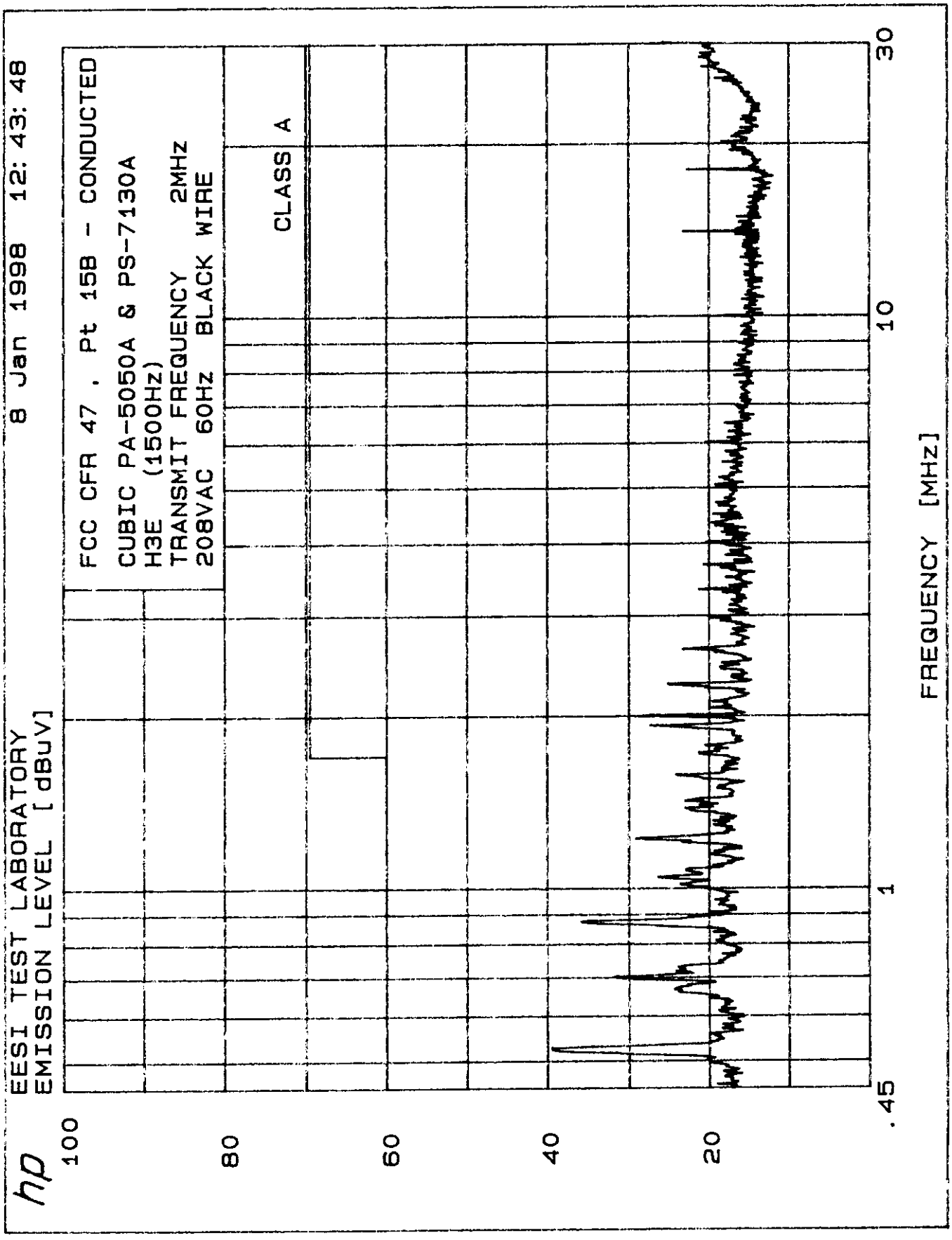

8 Jan 1998 13:56:34
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 6MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

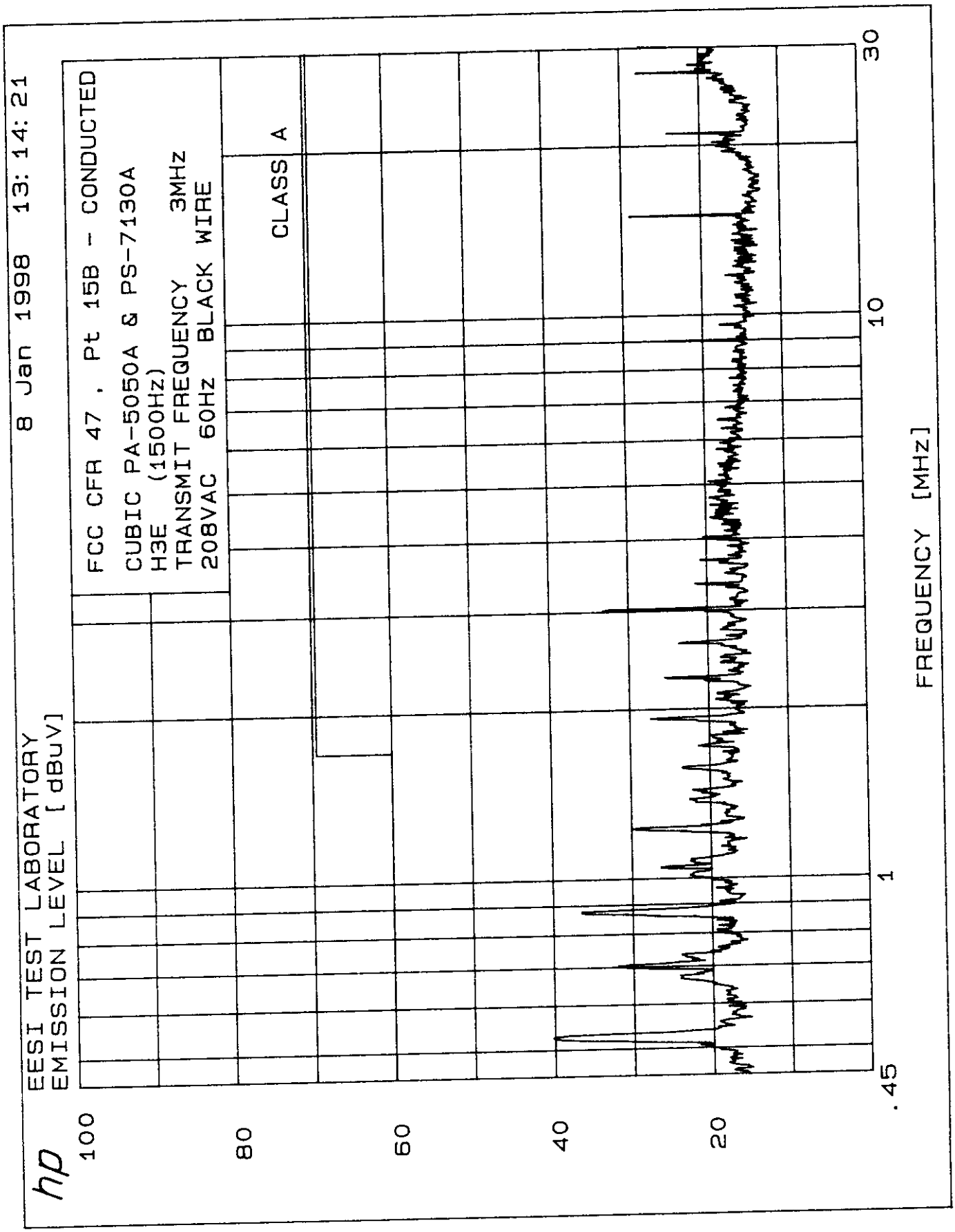

8 Jan 1998 13:51:22
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 8.5MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

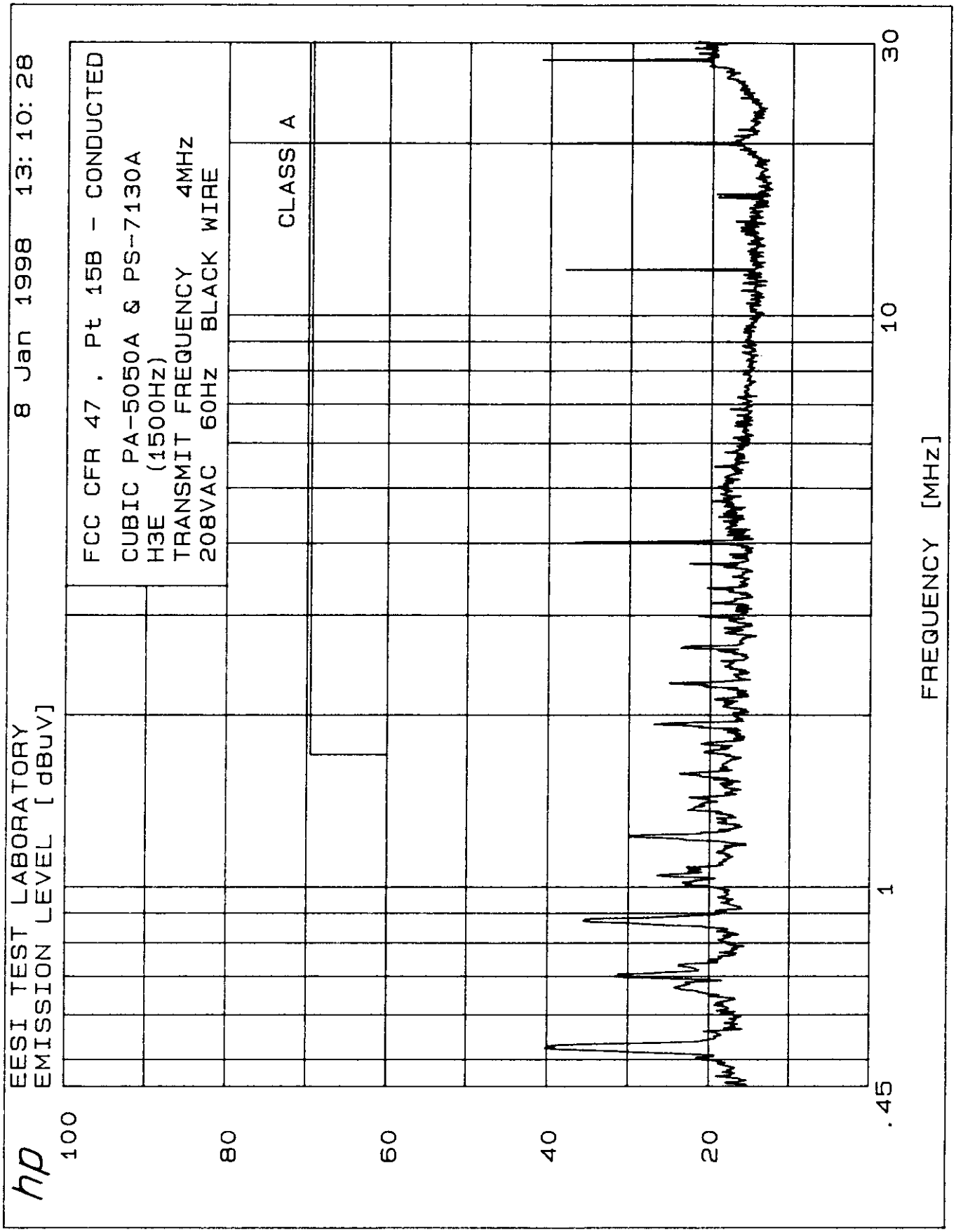

8 Jan 1998 13: 47: 26
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 12MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

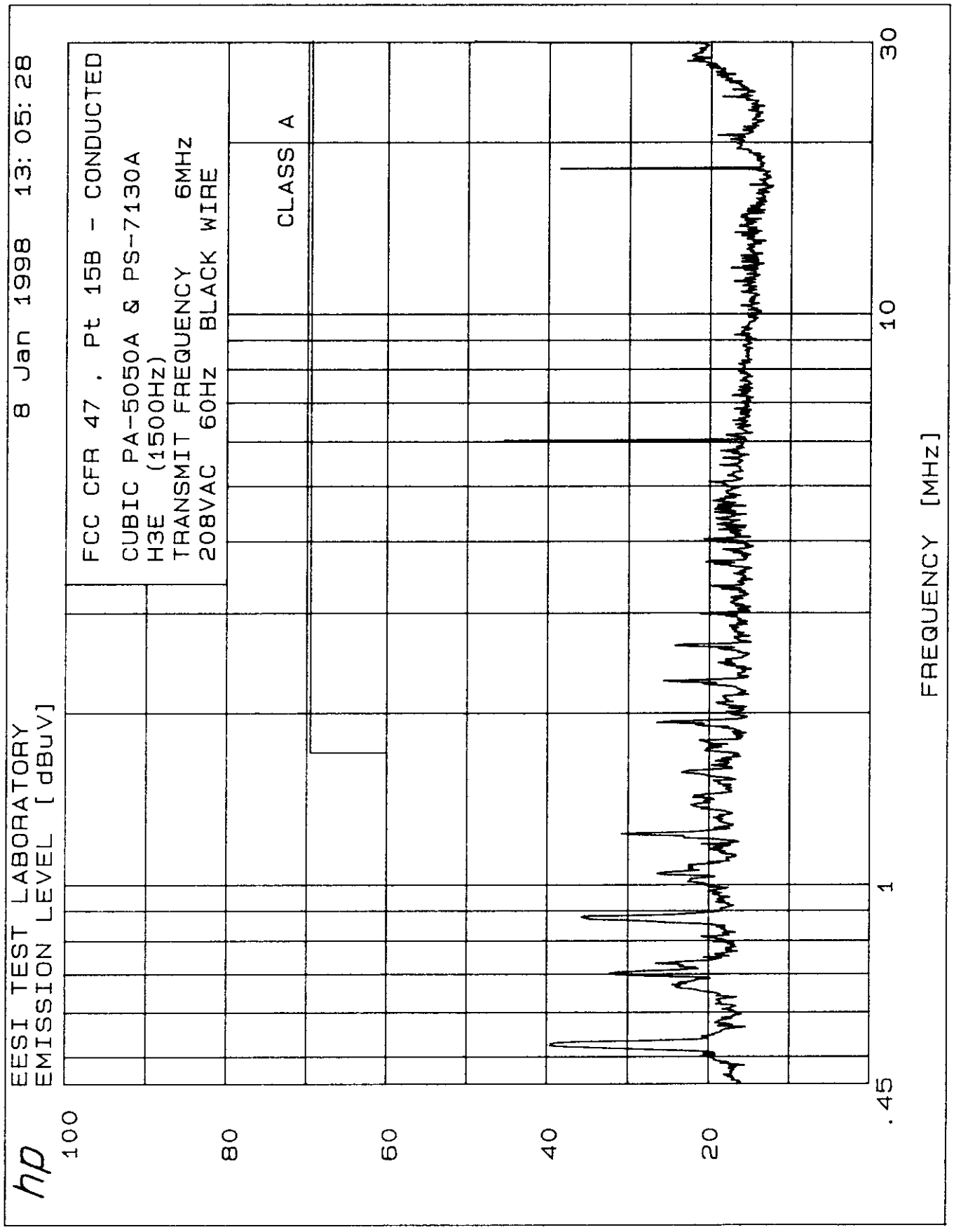

8 Jan 1998 13:43:30
EESI TEST LABORATORY
EMISSION LEVEL [dBUV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 17MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 13:37:19
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 24.9MHz
208VAC 60Hz BLUE WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 12: 43: 48
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 2MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


8 Jan 1998 13:14:21
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 3MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 13: 10: 28
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 4MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]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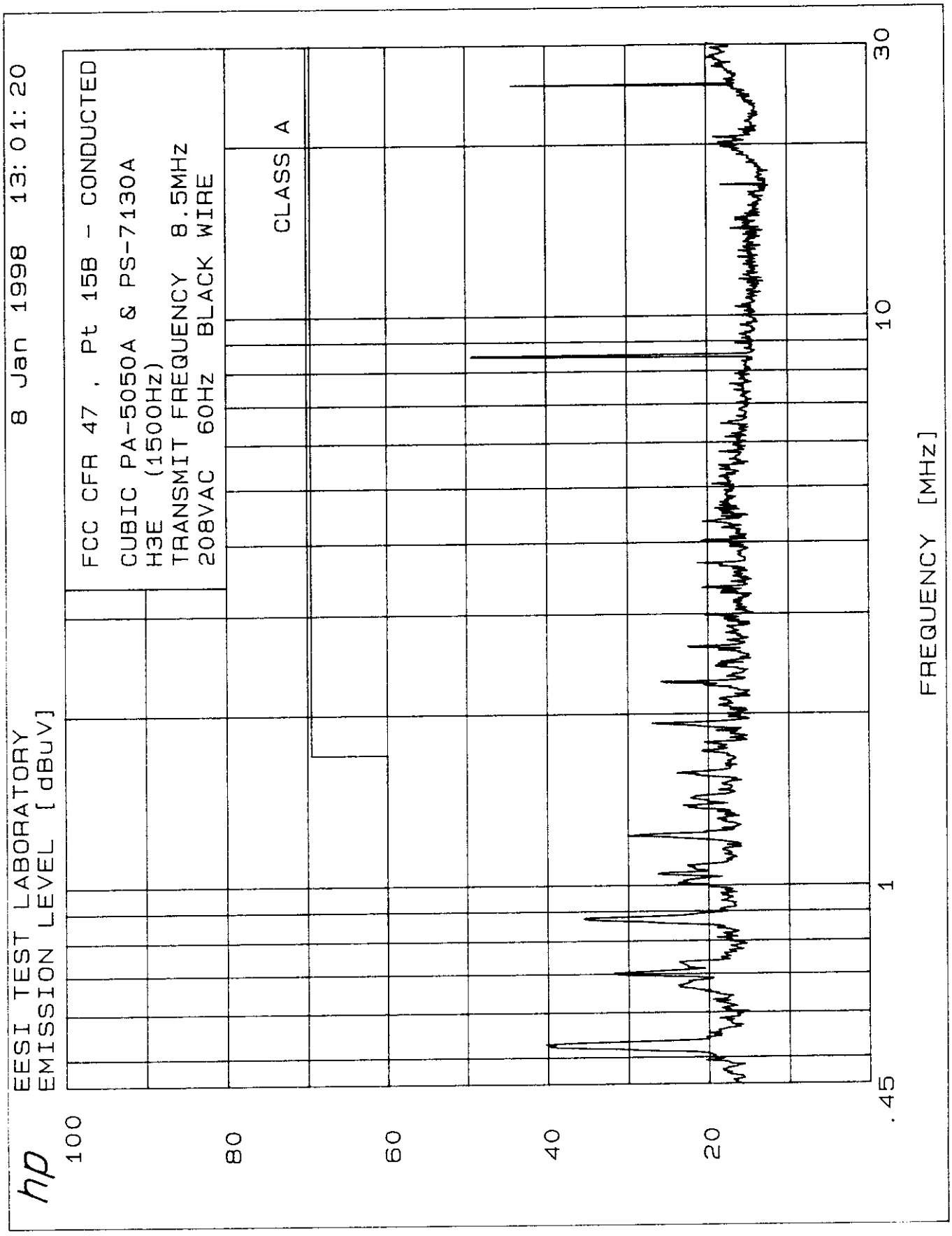
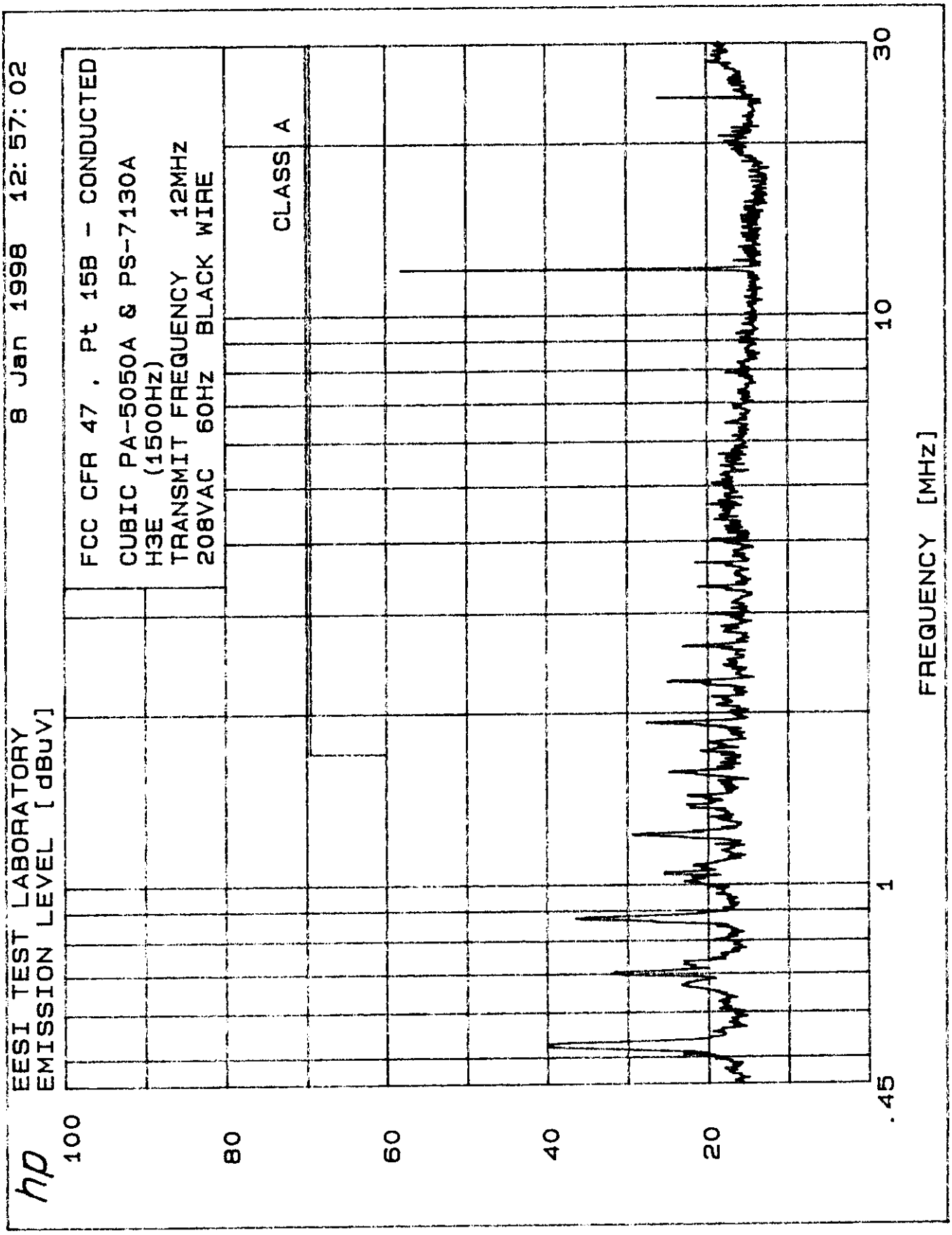
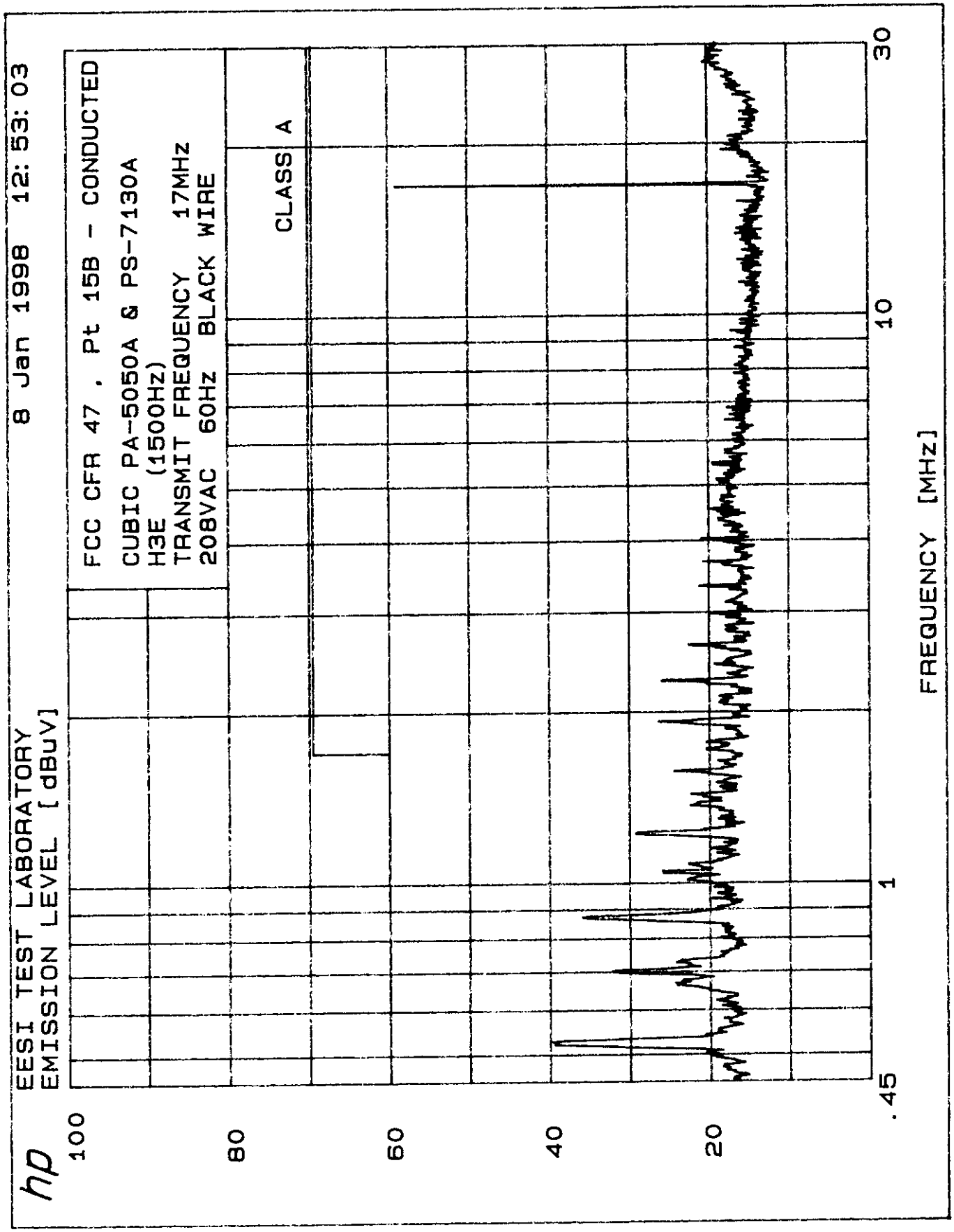
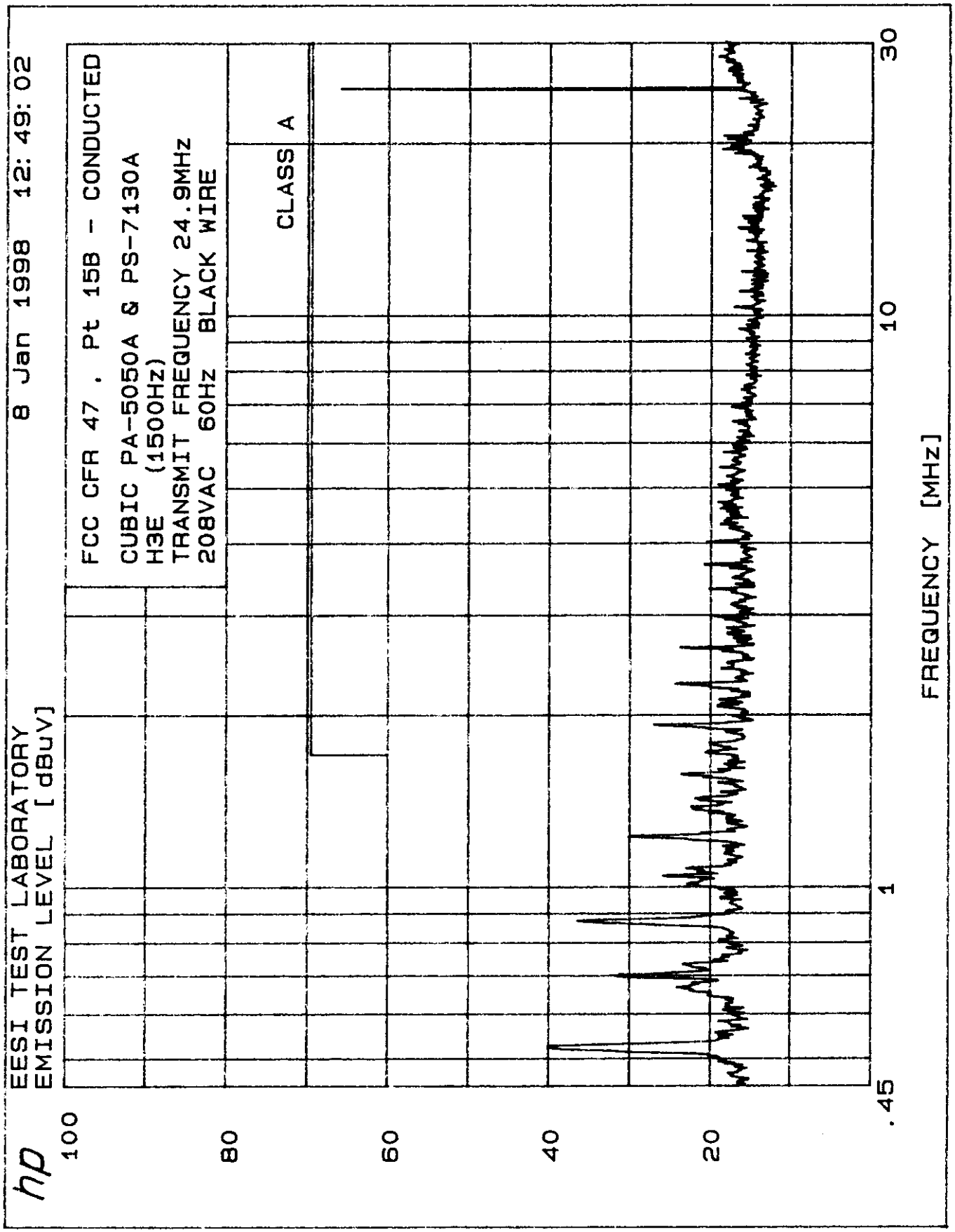
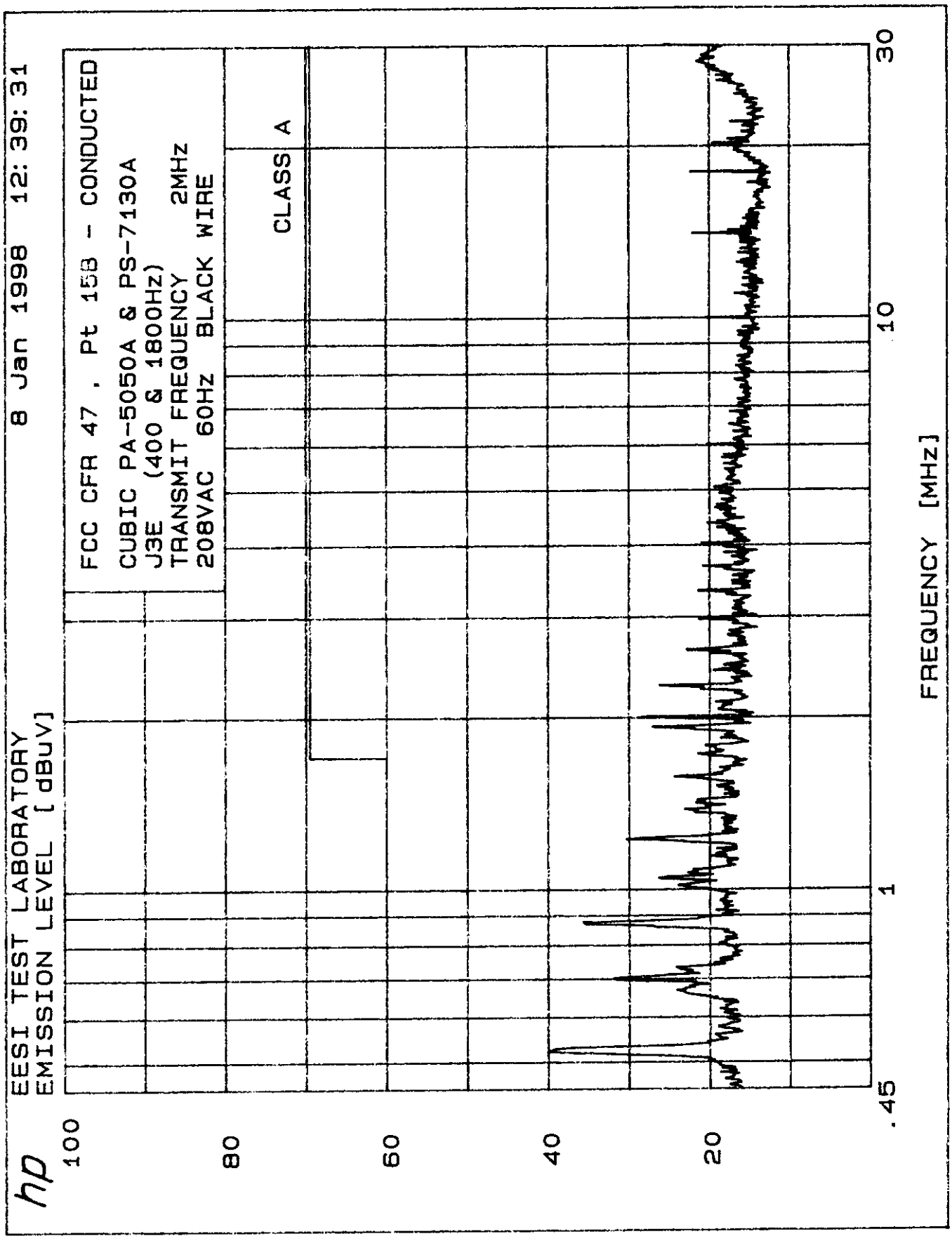
EMISSION LEVEL [dBuV]
8 Jan 1998 13:05:28
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 6MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

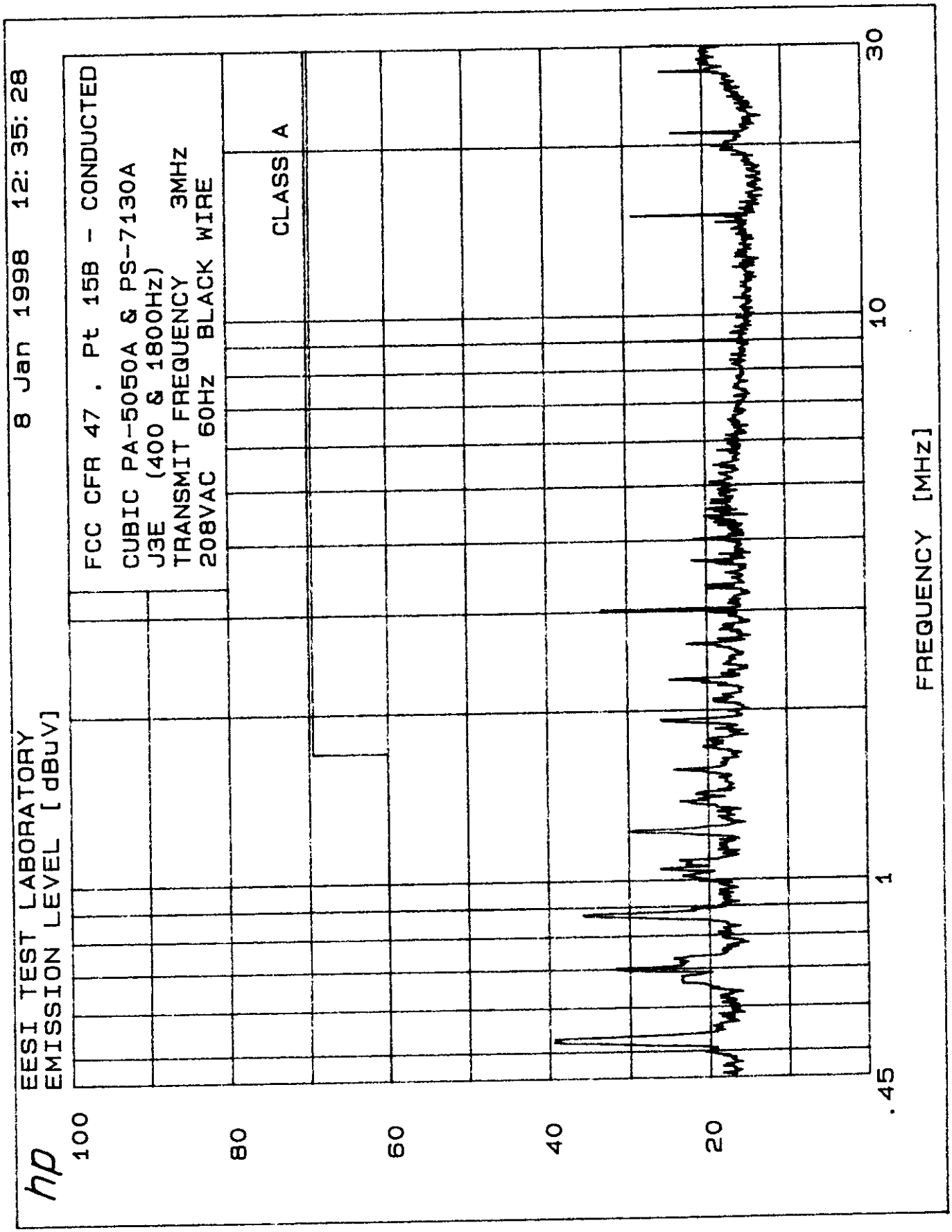

8 Jan 1998 13:01:20
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 8.5MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

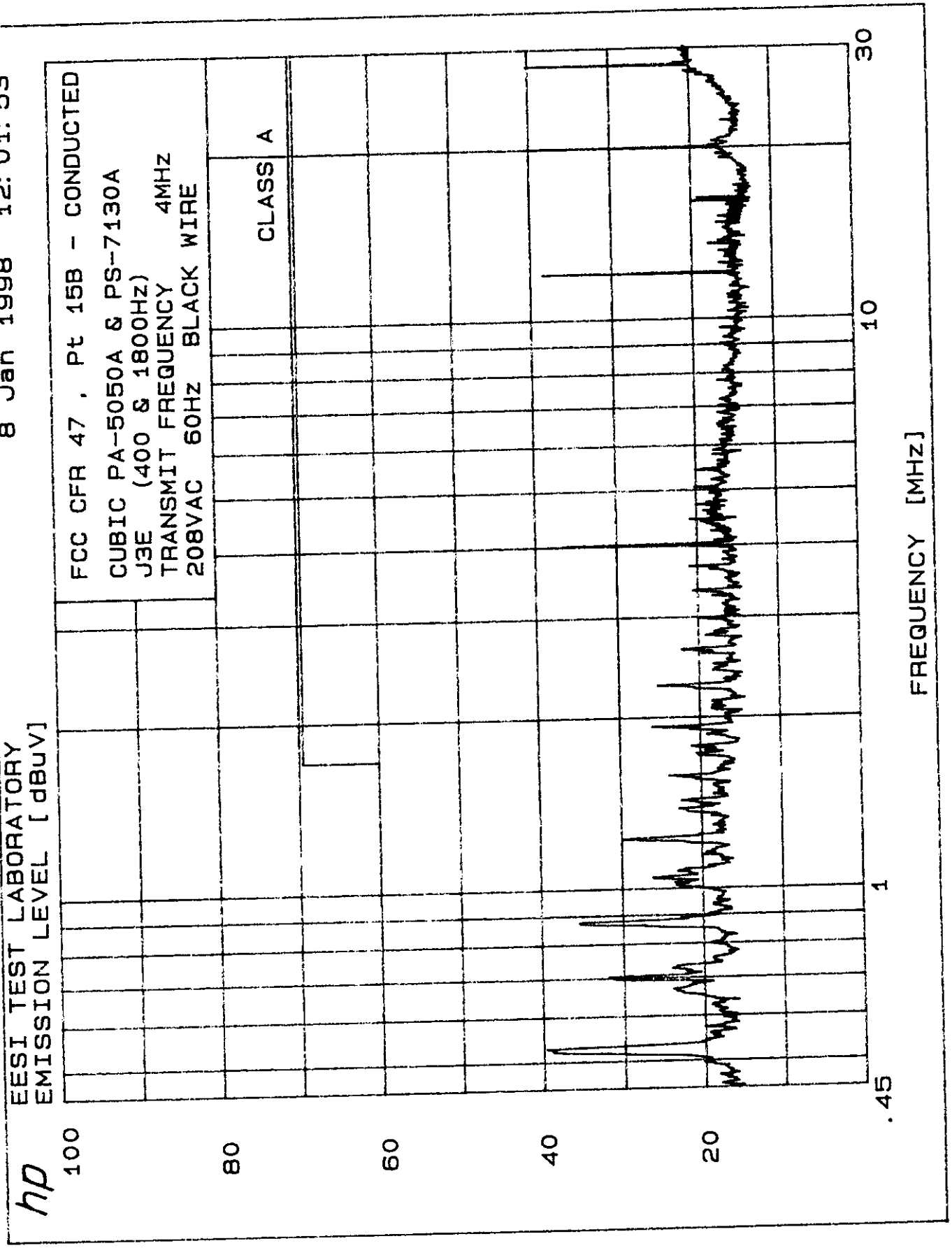

8 Jan 1998 12:57:02
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 12MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]

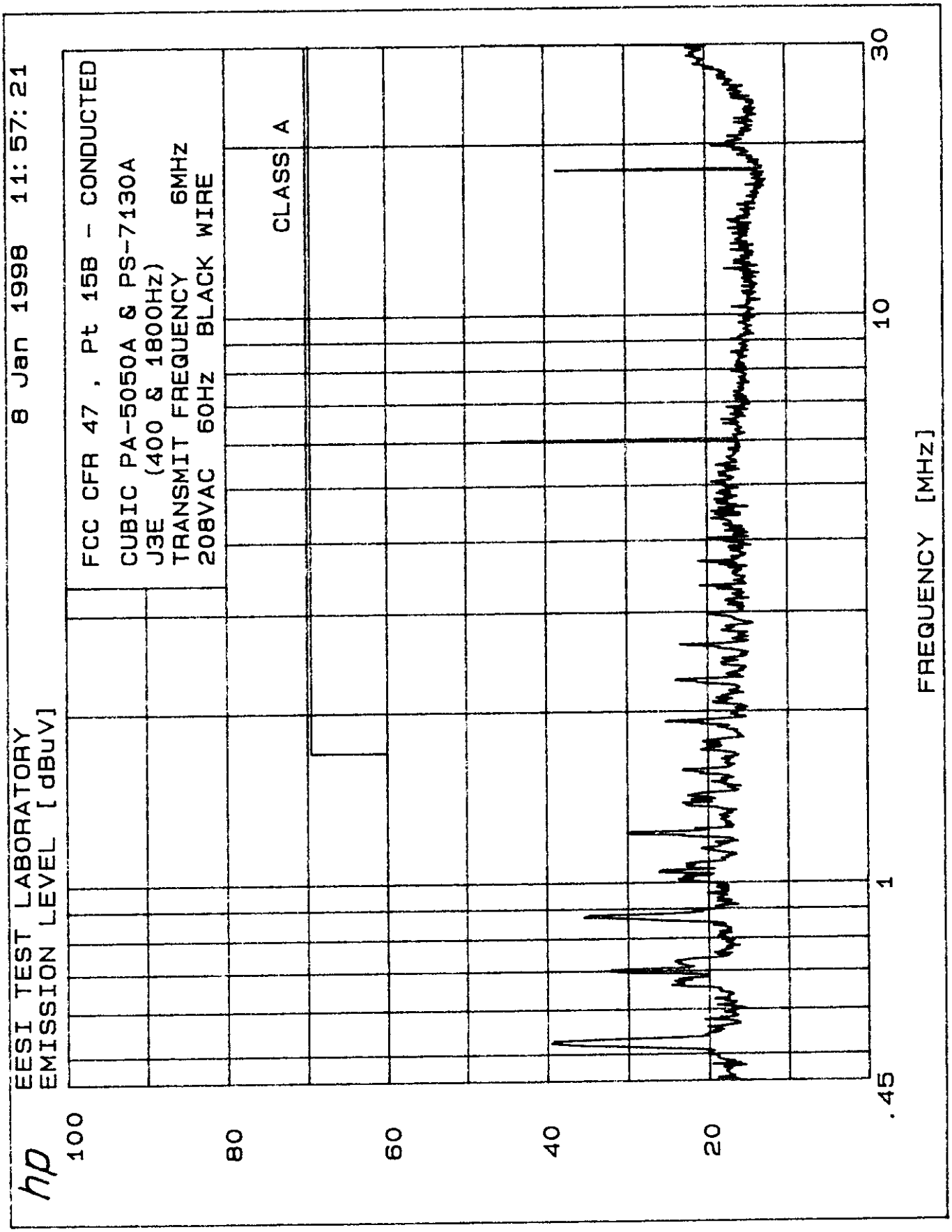

8 Jan 1998 12:53:03
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 17MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

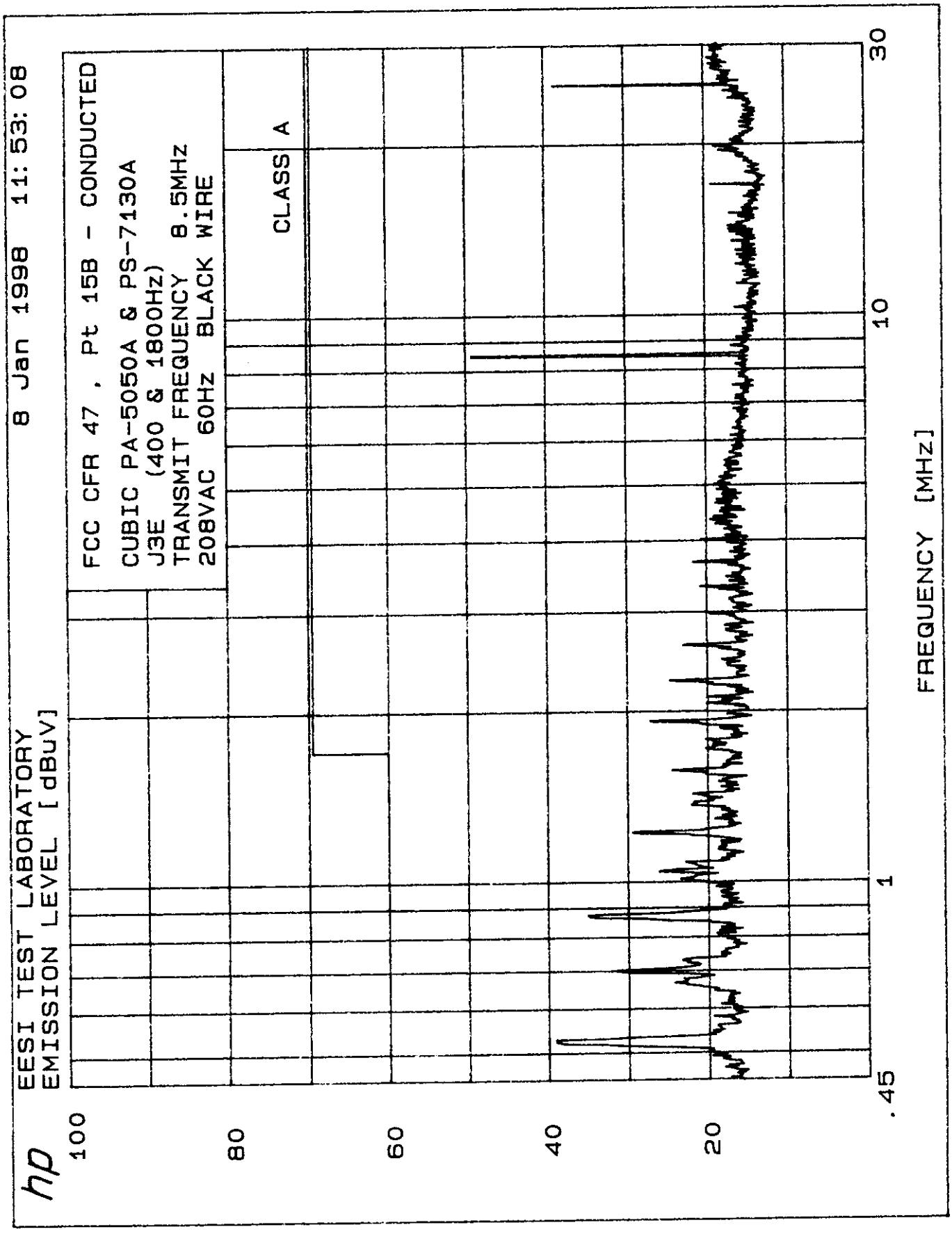

hp
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 12: 49: 02
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
H3E (1500Hz)
TRANSMIT FREQUENCY 24.9MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
8 Jan 1998 12: 39: 31
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 2MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 12:35:28
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 . Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 3MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


8 Jan 1998 12:01:53
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 4MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 11:57:21
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 6MHz
208VAC 60Hz BLACK WIRE
CLASS A
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]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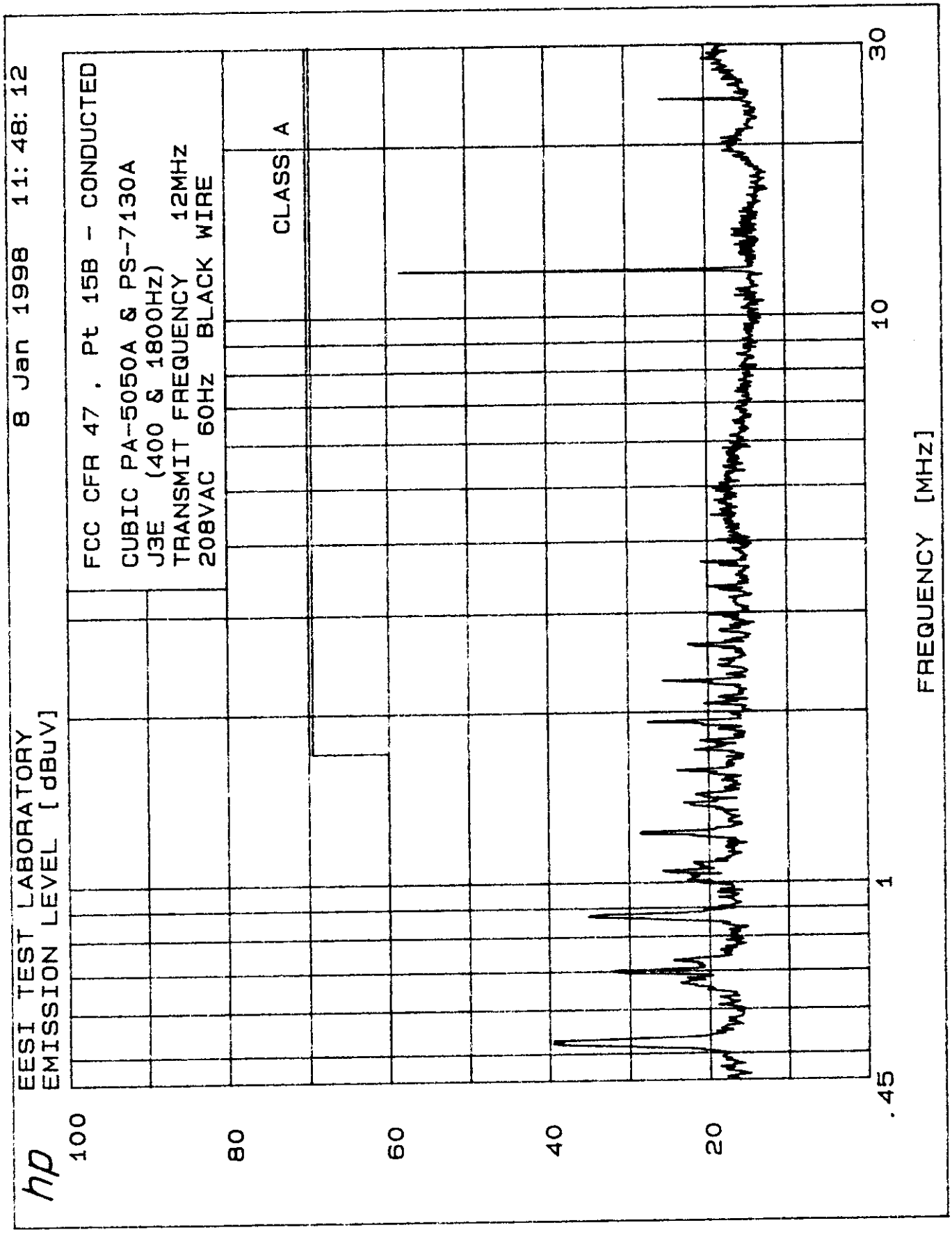
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 8.5MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]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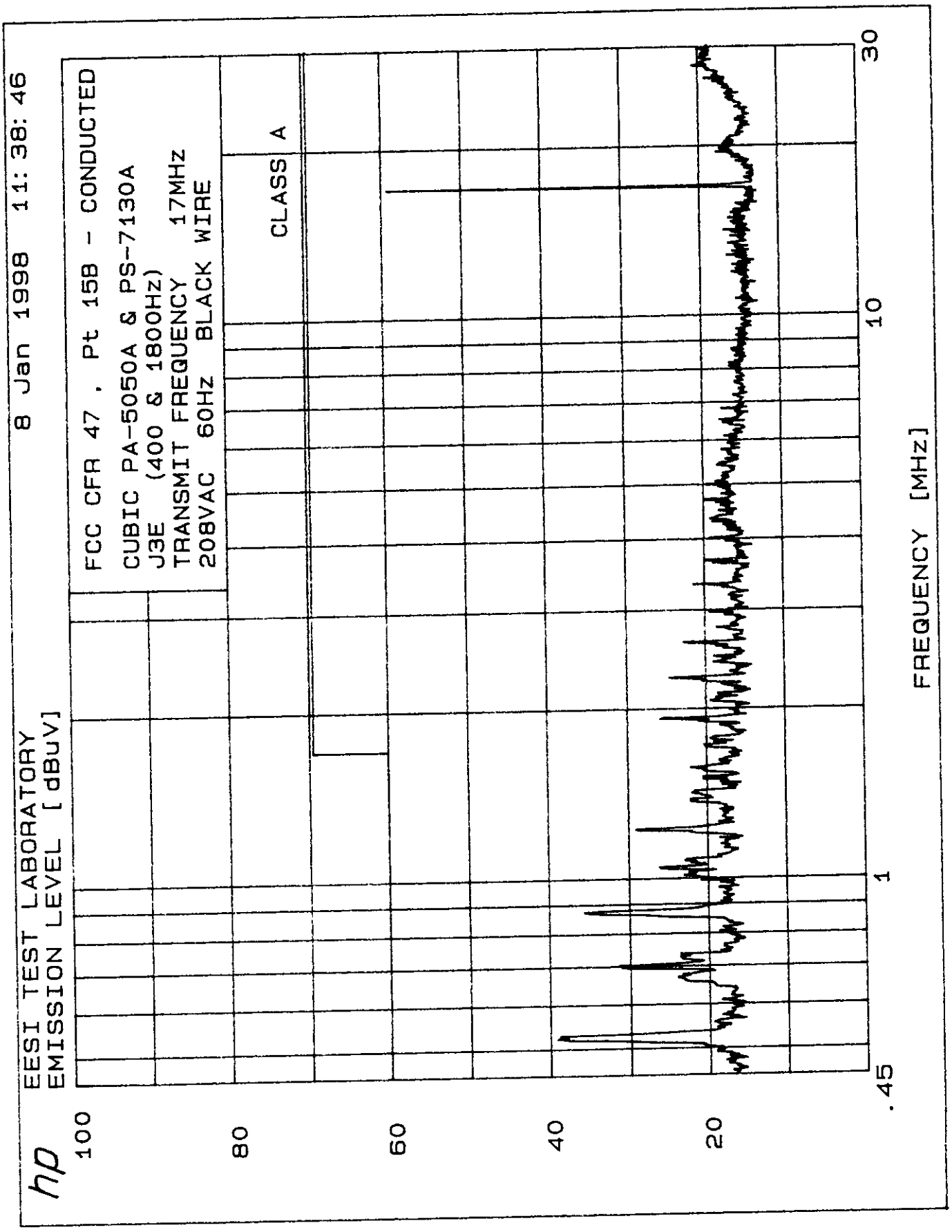
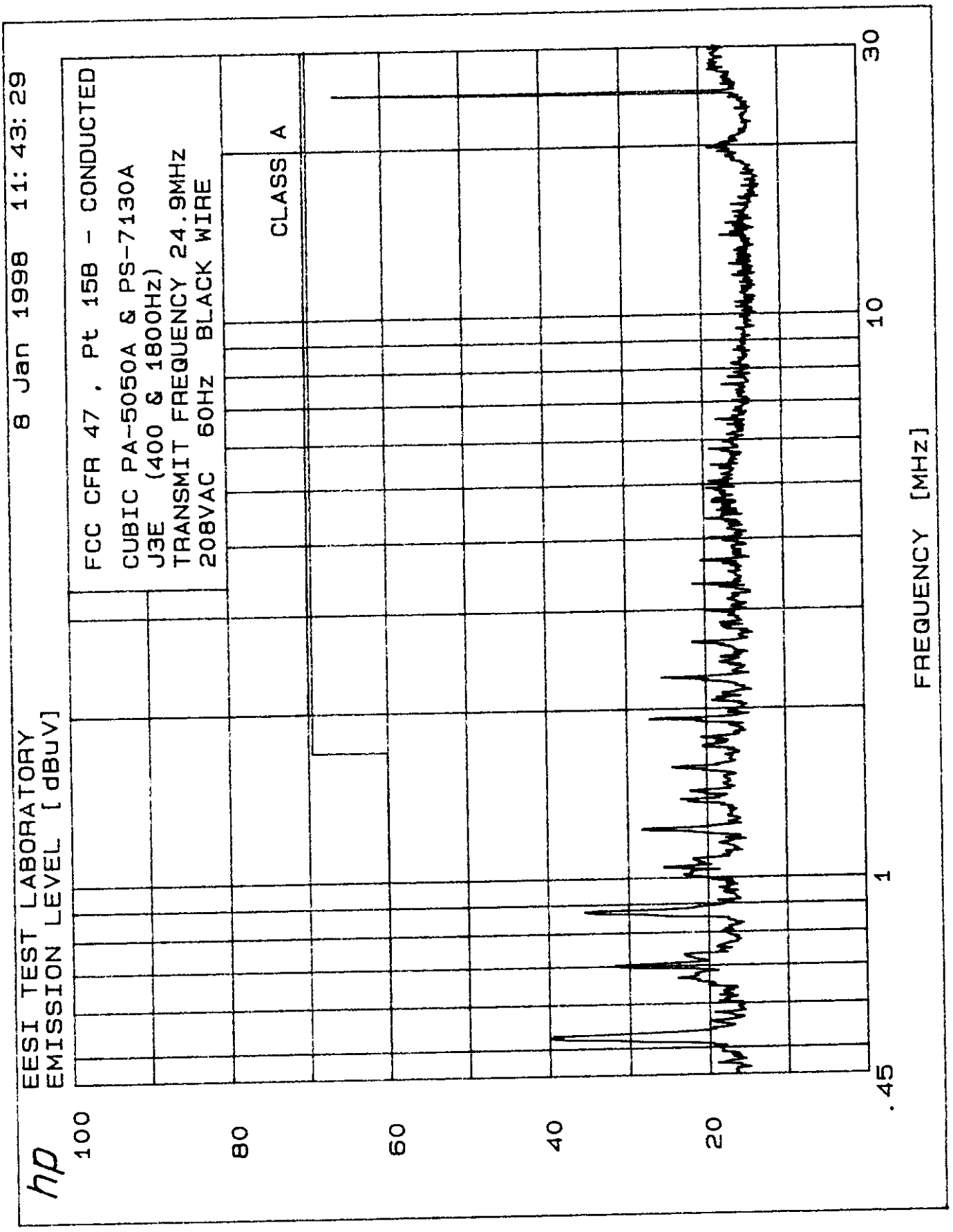
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 12MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 11:38:46
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 17MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 11:43:29
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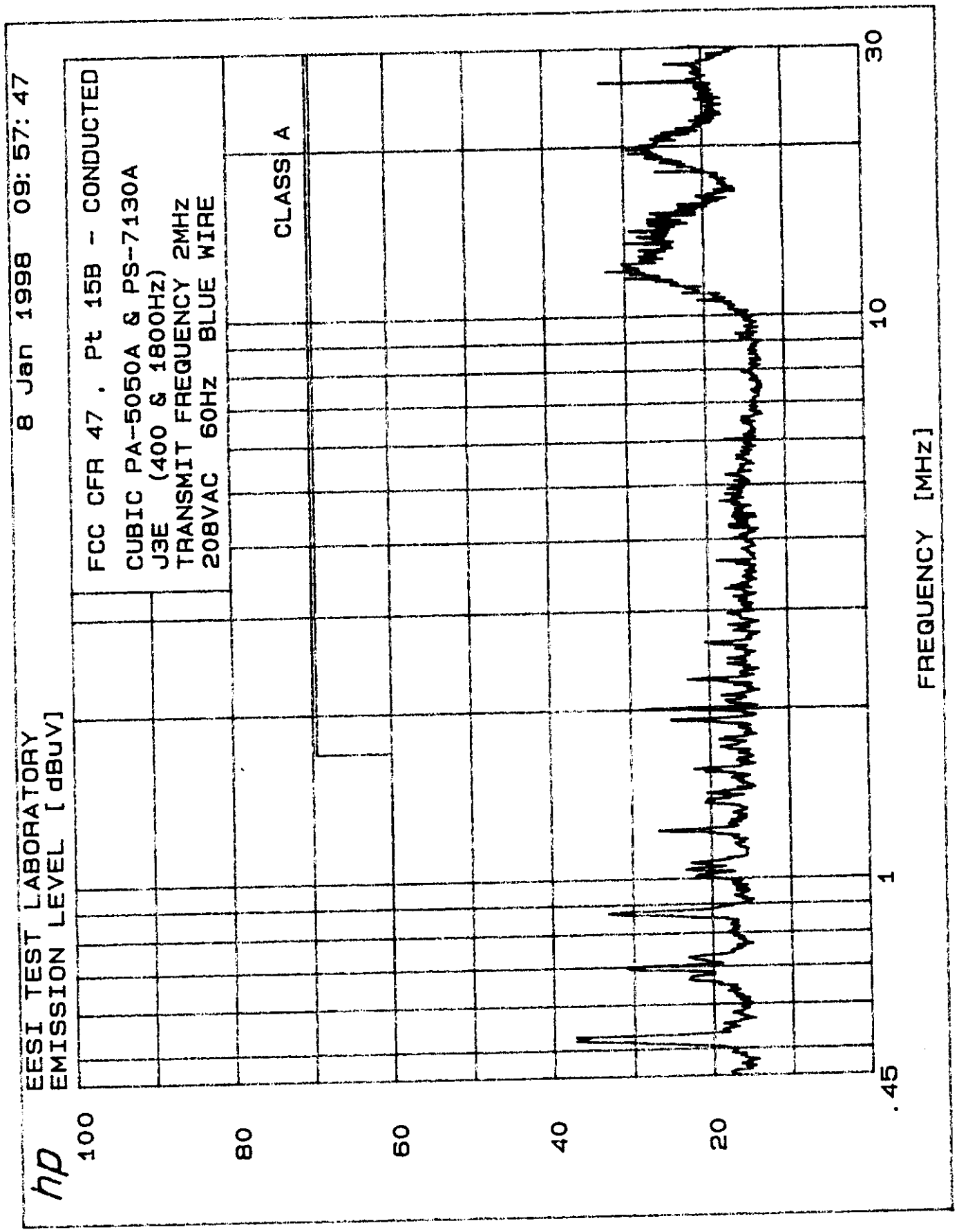
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 24.9MHz
208VAC 60Hz BLACK WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 09:57:47
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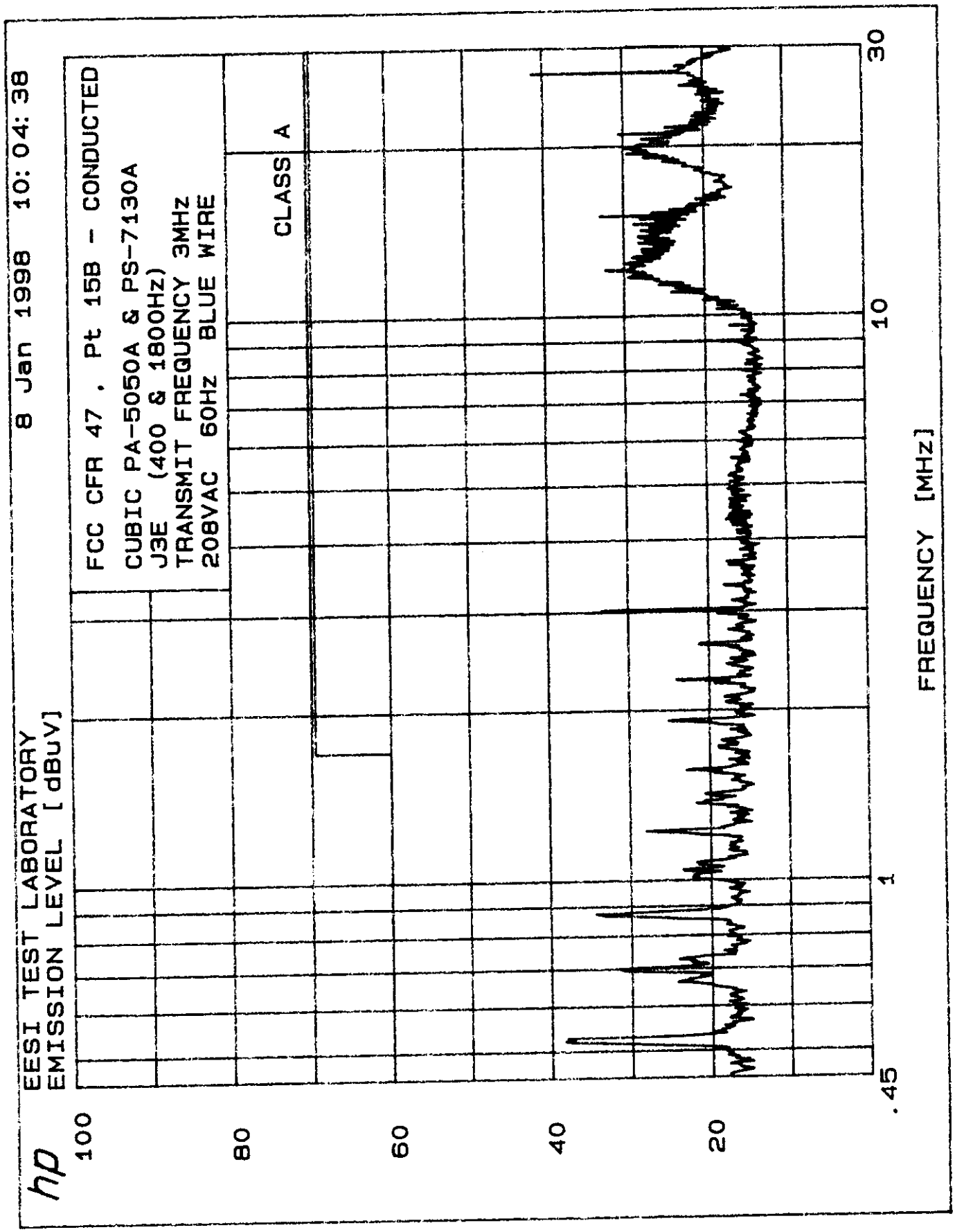
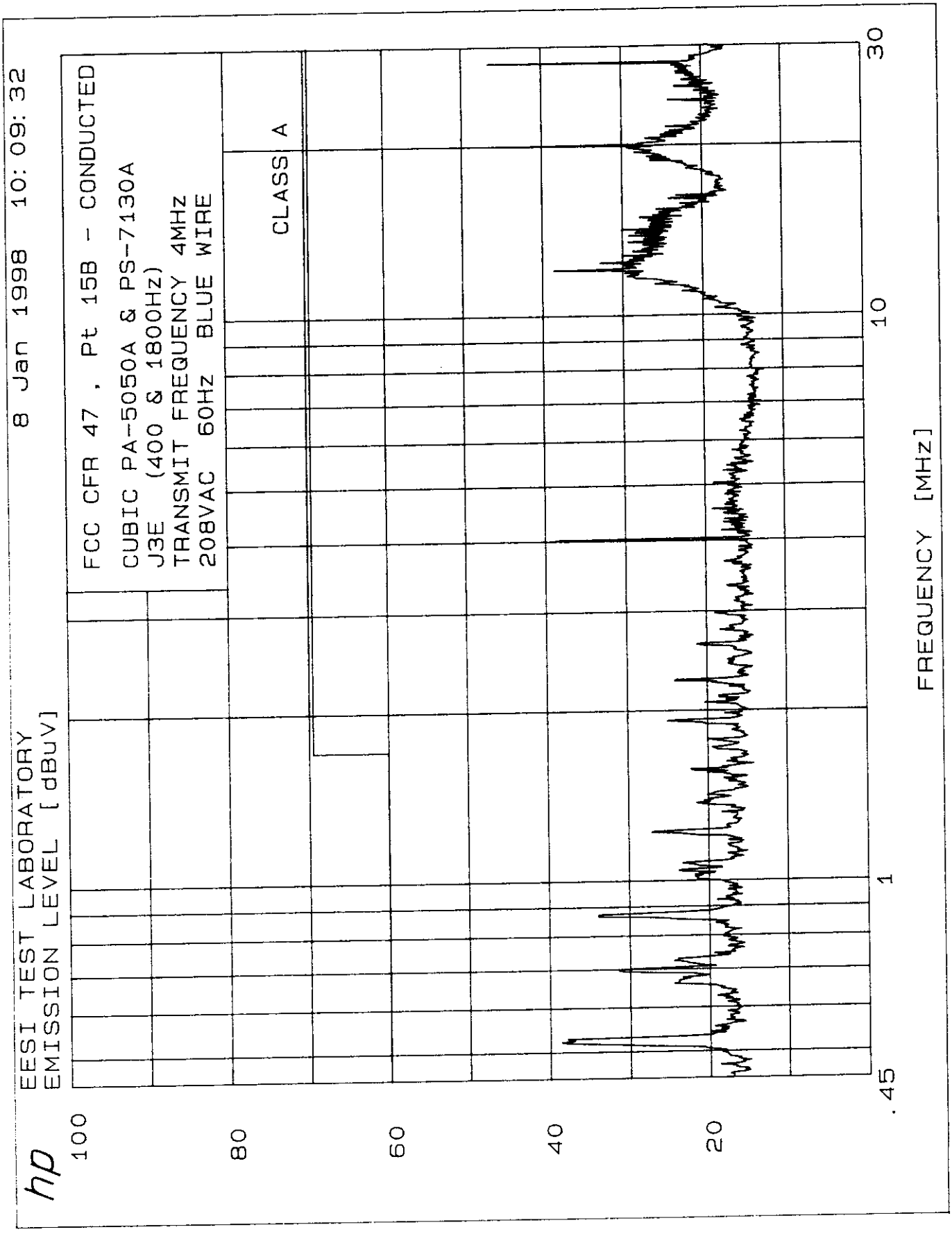
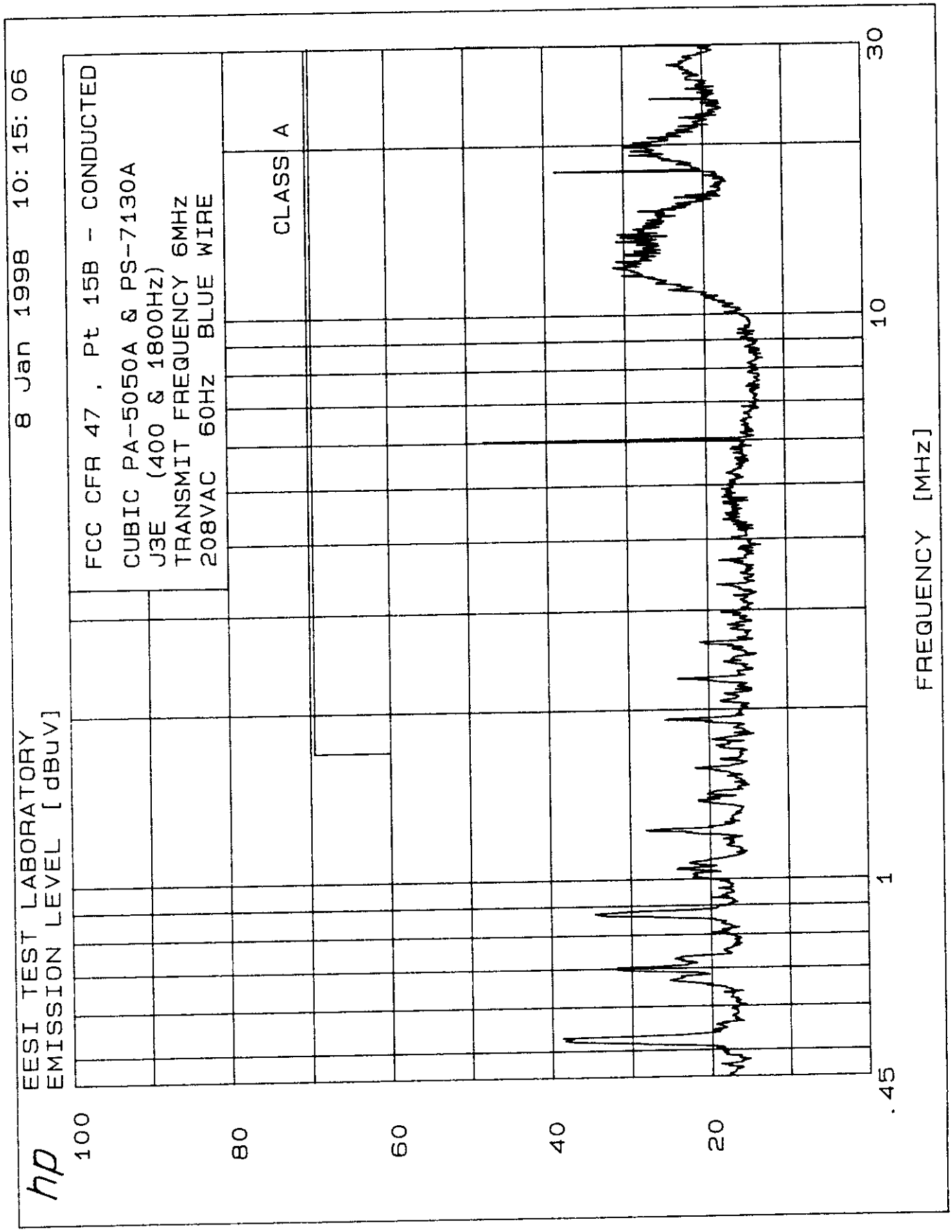
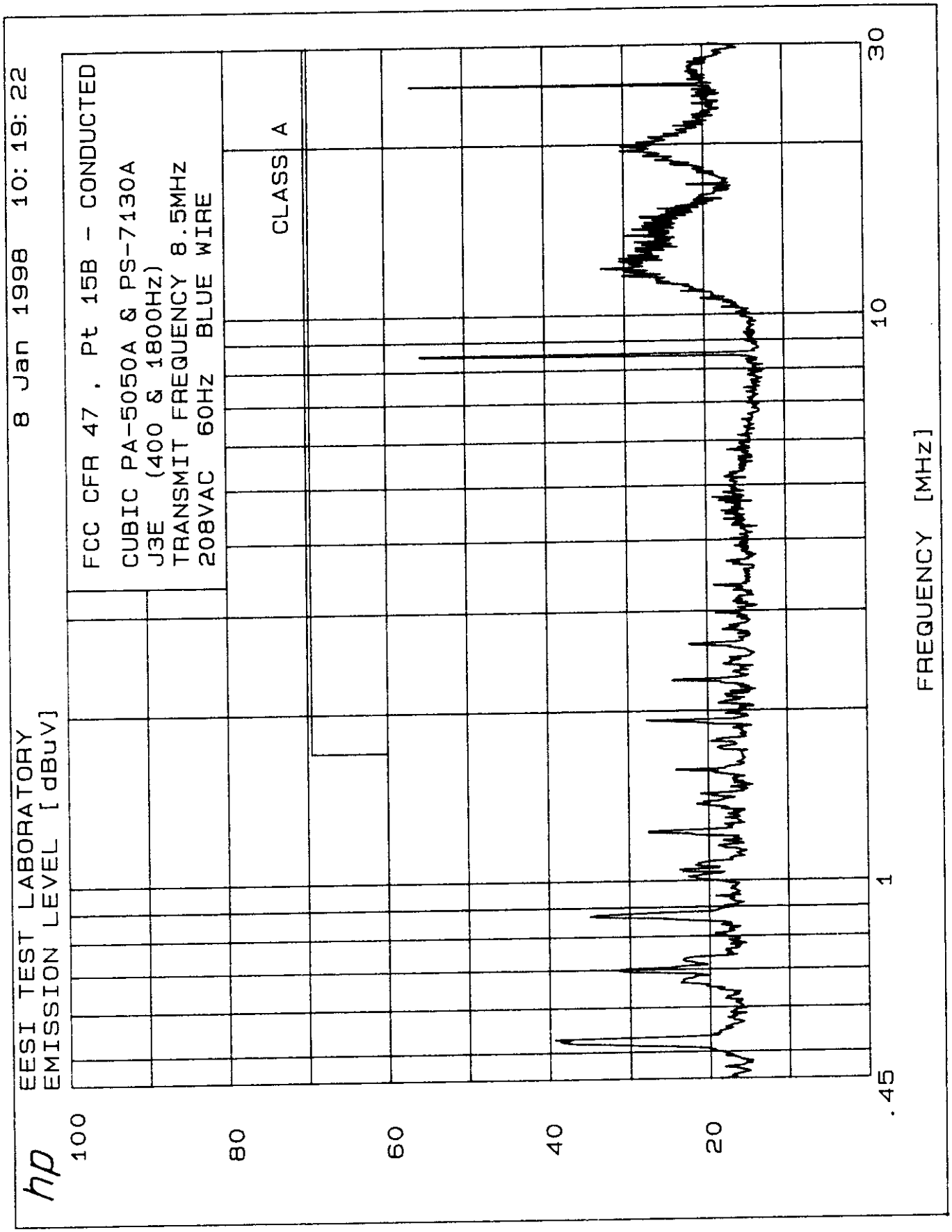
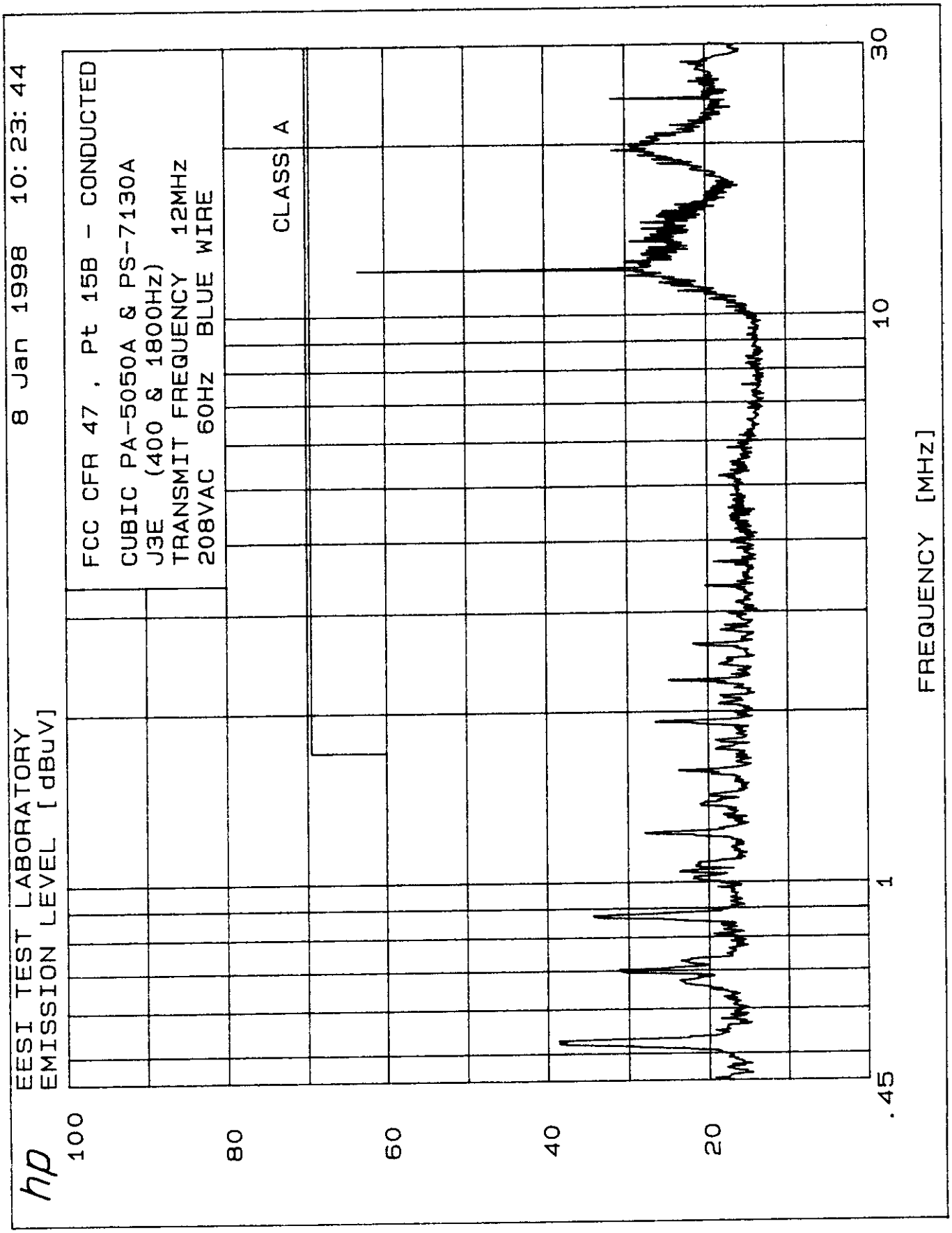
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 2MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

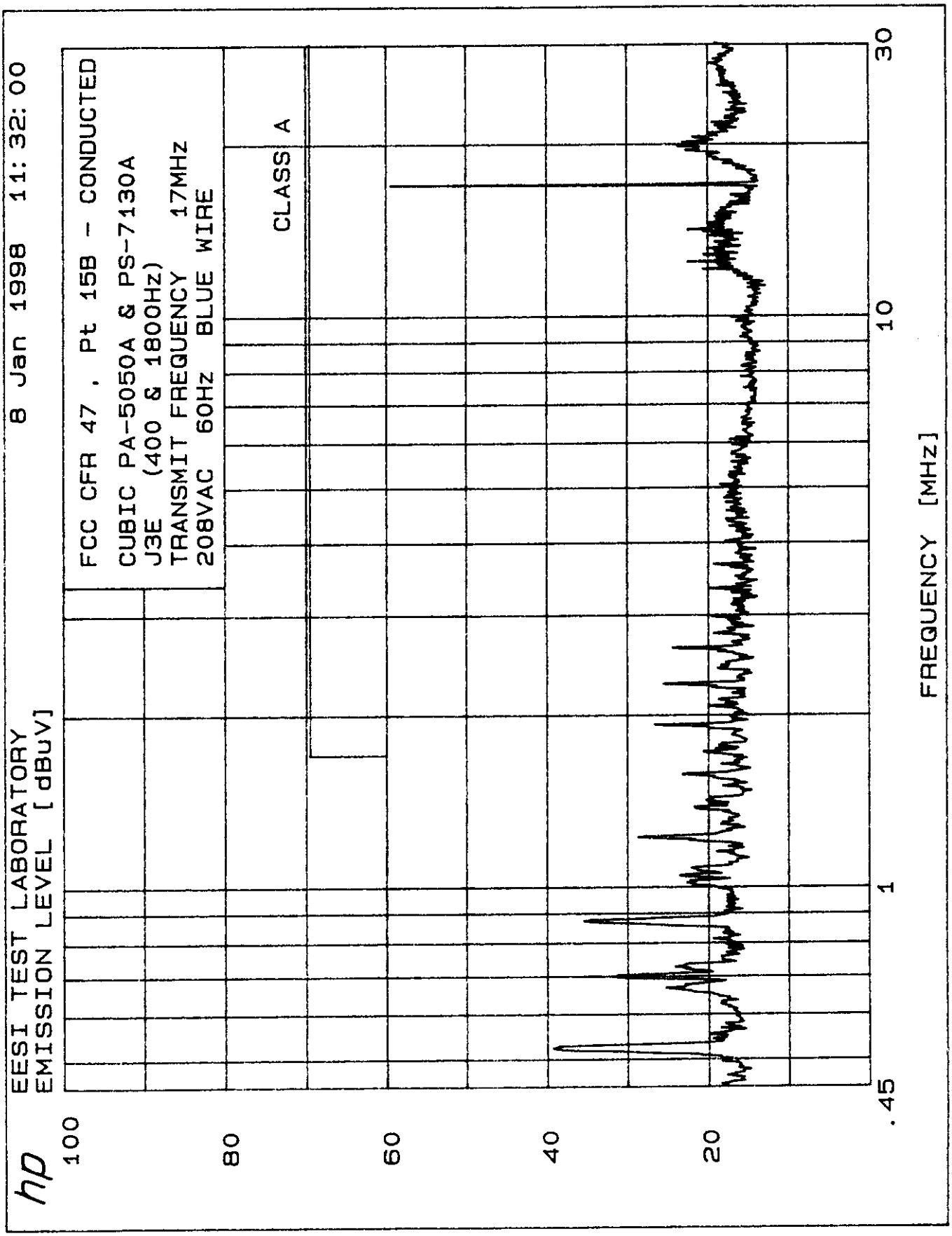

8 Jan 1998 10:04:38
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 3MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

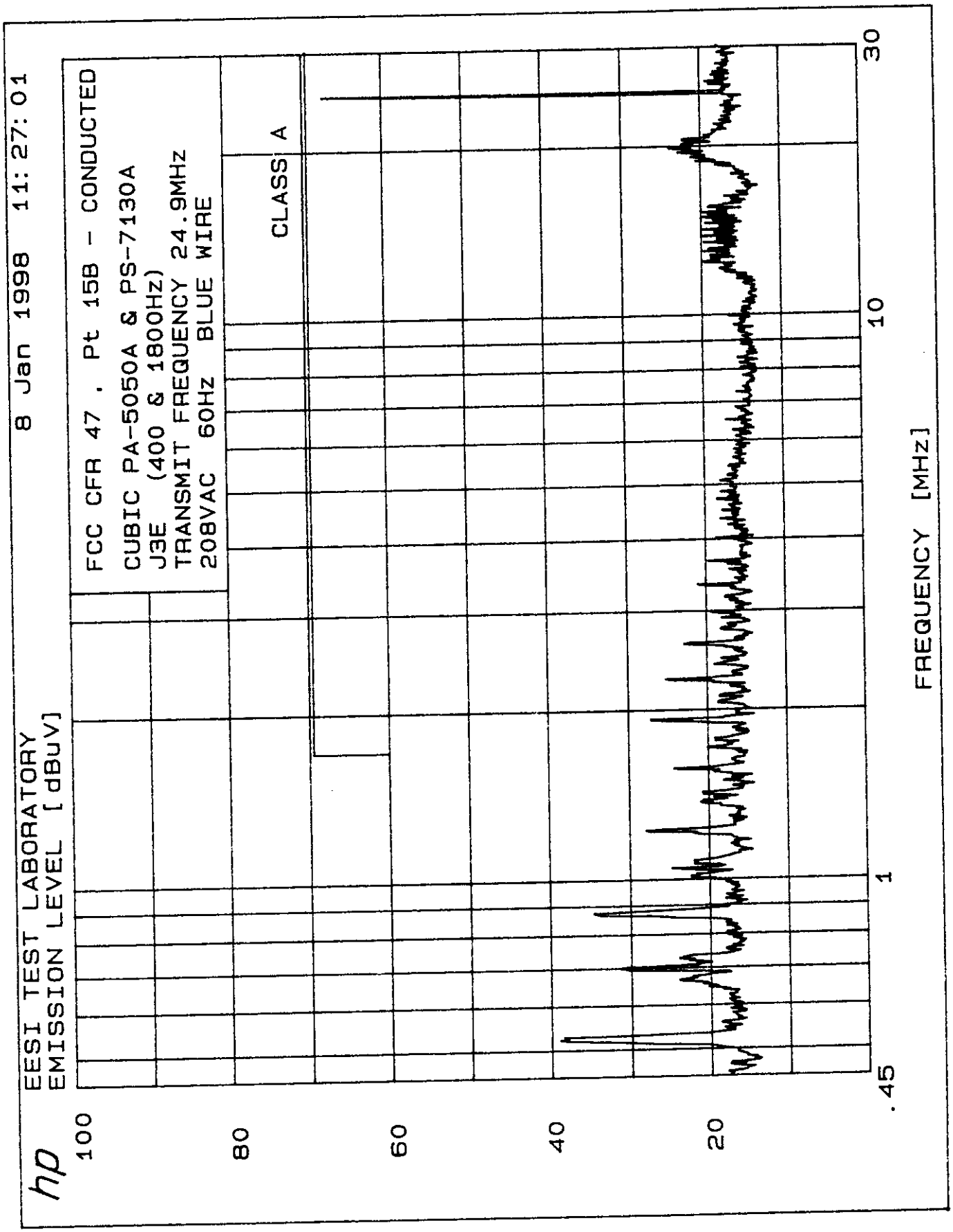

8 Jan 1998 10:09:32
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 4MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


8 Jan 1998 10:15:06
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 6MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]


8 Jan 1998 10:19:22
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 8.5MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


8 Jan 1998 10:23:44
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 12MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


8 Jan 1998 11:32:00
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 17MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
.45
1
10
30
FREQUENCY [MHz]


8 Jan 1998 11:27:01
EESI TEST LABORATORY
EMISSION LEVEL [dBuV]
FCC CFR 47 , Pt 15B - CONDUCTED
CUBIC PA-5050A & PS-7130A
J3E (400 & 1800Hz)
TRANSMIT FREQUENCY 24.9MHz
208VAC 60Hz BLUE WIRE
CLASS A
100
80
60
40
20
30
10
1
.45
FREQUENCY [MHz]

8.2 Radiated Emissions Test Results

Electromagnetic Engineering Services, Incorporated
FCC, Part 15B, Class 'A' Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (Receive Mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by: C. Rinehart
Date of Test: **2-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
144.000	9.6	v	16.1	25.7	43.5	-17.8
153.700	7.2	v	18.5	25.7	43.5	-17.8
210.740	3.8	v	16.2	20.0	43.5	-23.6
239.990	9.6	v	16.9	26.5	46.4	-19.9
288.000	9.6	v	19.9	29.5	46.4	-17.0
336.000	9.6	v	21.1	30.7	46.4	-15.8
384.000	9.1	v	22.0	31.1	46.4	-15.3
432.000	4.2	v	23.8	28.0	46.4	-18.5
528.000	10.1	v	27.0	37.1	46.4	-9.3
624.000	11.6	v	28.6	40.2	46.4	-6.3

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

8.3 RF Power Output Test Results (§2.985)

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.985, Peak Output Power Data Sheet

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by: C. Richard
Date of Test: **12-10-97**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Mode (H3E/J3E)	Spectrum Analyzer Reading* (dBm)	T-4180 1-Tone Attenuation (dB)	T-4180 2-Tone Attenuation (dB)	Power Output (Wpep)
2.0	H3E	20.0	-13.4	-13.0	4009
2.0	J3E	19.9	-13.1	-12.8	3915
3.0	H3E	20.1	-12.9	-12.9	4103
3.0	J3E	20.1	-14.2	-14.2	4103
4.0	H3E	20.1	-14.0	-14.0	4103
4.0	J3E	20.1	-14.0	-14.0	4103
6.0	H3E	19.9	-12.5	-12.5	3915
6.0	J3E	19.9	-12.5	-12.6	3915
8.5	H3E	20.0	-15.2	-15.2	4009
8.5	J3E	20.0	-15.2	-15.2	4009
12.0	H3E	20.1	-15.4	-15.4	4103
12.0	J3E	20.0	-15.4	-15.4	4009
17.0	H3E	20.1	-14.1	-14.1	4103
17.0	J3E	20.0	-14.1	-14.1	4009
25.0	H3E	20.1	-13.4	-13.4	4103
25.0	J3E	20.1	-13.4	-13.4	4103

** Power (measured in dBm) after 40dB attenuation via a directional coupler*

8.4 Modulation Characteristics Test Results (§2.987)

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply**
Model #: **T-4180, PA-5050A, PS-7130A**
(Line Input, H3E Mode, 1500Hz Mod.)

Conducted by: C. Richard
Date of Test: **12-12-97**
Test Distance, Amp. gain: **10 m, 0 dB**

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
2.00000	10.0	1117	1211	1156	1239
0.63000	0.0*	1130	1211	1156	1239
0.20000	-10.0	1117	1211	1156	1239
0.06300	-20.0	549	592	565	618
0.02000	-30.0	358	385	366	397
0.00630	-40.0	305	327	312	336
0.00200	-50.0	290	310	296	318
0.00063	-60.0	284	305	291	312
0.00020	-70.0	283	303	290	311

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	10.0	1104.0	1007.0	1019.0	1104.0
0.63000	0.0	1104.0	1007.0	1007.0	1104.0
0.20000	-10.0	1104.0	996.0	1007.0	1104.0
0.06300	-20.0	536.0	486.0	502.0	547.0
0.02000	-30.0	351.0	318.0	323.0	352.0
0.00630	-40.0	298.0	272.0	273.0	298.0
0.00200	-50.0	283.0	258.0	258.0	293.0
0.00063	-60.0	278.0	254.0	254.0	278.0
0.00020	-70.0	277.0	252.0	252.0	277.0

** -30dBm is nominal imput level. At his level, carrier=modulation power. All readings below 0dBm input are of the modulation power (carrier stays the same).*

*** Readings are sideband power pep (Peak Envelope Power).*

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply**
Model #: **T-4180, PA-5050A, PS-7130A**
(Microphone Input, H3E Mode, 1500Hz Mod.)

Conducted by: C. Pinkard
Date of Test: **12-12-97**
Test Distance, Amp. gain: **10 m, 0 dB**

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
40.0000	-24.0	996.0	984.0	984.0	1007.0
20.0000	-30.0	1007.0	984.0	984.0	1007.0
6.3000	-40.0	984.0	984.0	984.0	984.0
2.0000	-50.0	931.0	930.0	909.0	872.0
0.6300	-60.0	425.0	429.0	411.0	412.0
0.2000	-70.0	300.0	296.0	295.0	297.0
0.0630	-80.0	268.0	261.0	259.0	266.0
0.0200	-90.0	257.0	251.0	250.0	256.0
0.0063	-100.0	254.0	248.0	247.0	253.0

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
40.0000	-24.0	984.0	1031.0	1007.0	1007.0
20.0000	-30.0	984.0	1031.0	1007.0	1019.0
6.3000	-40.0	951.0	1007.0	1007.0	996.0
2.0000	-50.0	852.0	963.0	962.0	952.0
0.6300	-60.0	394.0	441.0	446.0	429.0
0.2000	-70.0	291.0	311.0	309.0	303.0
0.0630	-80.0	260.0	274.0	270.0	269.0
0.0200	-90.0	250.0	263.0	258.0	257.0
0.0063	-100.0	248.0	259.0	253.0	253.0

-30dBm is nominal imput level. At his level, carrier=modulation power. All readings below -30dBm input are of the modulation power (carrier stays the same).

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications** *Conducted by:* C. Richard

EUT: **HF Exciter, Amp, Power Supply** *Date of Test:* **12-12-97**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

(Line Input, J3E Mode, 400 & 1800Hz Mod.)

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
2.00000	10.0	4296.0	4499.0	4820.0	5048.0
0.63000	0.0*	4296.0	4499.0	4820.0	5048.0
0.20000	-10.0	4198.0	4396.0	4820.0	5048.0
0.06300	-20.0	2321.0	2530.0	2774.0	3185.0
0.02000	-30.0	136.0	160.0	149.0	206.0
0.00630	-40.0	8.4	10.1	9.0	12.7
0.00200	-50.0	0.8	1.0	0.8	1.3
0.00063	-60.0	0.1	0.1	0.1	0.1

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	10.0	4396.0	4103.0	5165.0	4711.0
0.63000	0.0	4396.0	4103.0	5165.0	4711.0
0.20000	-10.0	4296.0	4103.0	5165.0	4711.0
0.06300	-20.0	2416.0	2307.0	3657.0	2972.0
0.02000	-30.0	149.0	149.0	242.0	206.0
0.00630	-40.0	10.1	10.1	17.1	14.6
0.00200	-50.0	0.9	1.0	1.7	1.3
0.00063	-60.0	0.1	0.1	0.2	0.1

** 0dBm is nominal imput level.*

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply**
Model #: **T-4180, PA-5050A, PS-7130A**
(Microphone Input, J3E Mode, 400 & 1800Hz Mod.)

Conducted by: C. Pinkard
Date of Test: **12-12-97**
Test Distance, Amp. gain: **10 m, 0 dB**

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)	8.5 MHz Output (Wpep)
2.00000	-24.0	5664.0	5664.0	5664.0	5535.0
0.63000	-30.0	4499.0	4604.0	4820.0	4396.0
0.20000	-40.0	4499.0	4604.0	4604.0	4396.0
0.06300	-50.0	4198.0	4604.0	4604.0	4296.0
0.02000	-60.0	1560.0	1596.0	1750.0	1524.0
0.00630	-70.0	85.7	85.7	96.2	89.8
0.00200	-80.0	5.8	6.4	7.3	10.1
0.00063	-90.0	0.6	0.6	0.9	1.0
0.00020	-100.0	0.1	0.1	0.1	0.1

Input Voltage (Vpep)	Input (dBm)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	-24.0	5409.0	5795.0	5048.0
0.63000	-30.0	4296.0	5165.0	4103.0
0.20000	-40.0	4198.0	5165.0	4103.0
0.06300	-50.0	4009.0	5048.0	4103.0
0.02000	-60.0	1390.0	2255.0	1524.0
0.00630	-70.0	85.7	149.0	100.7
0.00200	-80.0	6.4	10.1	7.3
0.00063	-90.0	0.8	0.9	0.6
0.00020	-100.0	0.1	0.1	0.1

-30dBm is nominal imput level.

Electromagnetic Engineering Services, Incorporated

FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications** *Conducted by:* C. Rickard

EUT: **HF Exciter, Amp, Power Supply** *Date of Test:* **12-12-97**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

(Microphone Input, H3E Mode, 1500Hz Mod.)

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
40.0000	-24.0	1117	1211	1156	1239
20.0000	-30.0	1130	1211	1156	1239
6.3000	-40.0	1117	1211	1156	1239
2.0000	-50.0	549	592	565	618
0.6300	-60.0	358	385	366	397
0.2000	-70.0	305	327	312	336
0.0630	-80.0	290	310	296	318
0.0200	-90.0	284	305	291	312
0.0063	-100.0	283	303	290	311

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
40.0000	-24.0	117.0	1007.0	1019.0	117.0
20.0000	-30.0	117.0	1007.0	1007.0	117.0
6.3000	-40.0	117.0	996.0	1007.0	117.0
2.0000	-50.0	536.0	486.0	502.0	547.0
0.6300	-60.0	351.0	318.0	323.0	352.0
0.2000	-70.0	298.0	272.0	273.0	298.0
0.0630	-80.0	283.0	258.0	258.0	283.0
0.0200	-90.0	278.0	254.0	254.0	305.0
0.0063	-100.0	277.0	252.0	252.0	303.0

-0dBm is nominal imput level. At his level, carrier=modulation power. All readings below -30dBm input are of the modulation power (carrier stays the same).

Reading are sideband power pep (Peak Envelope Power)

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications** *Conducted by:* C. Richard

EUT: **HF Exciter, Amp, Power Supply** *Date of Test:* **12-12-97**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

(Line Input, J3E Mode, 400 & 1800Hz Mod.)

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	3 MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)
2.00000	10.0	4296.0	4499.0	4820.0	5048.0
0.63000	0.0*	4296.0	4499.0	4820.0	5048.0
0.20000	-10.0	4198.0	4396.0	4820.0	5048.0
0.06300	-20.0	2321.0	2530.0	2774.0	3185.0
0.02000	-30.0	136.0	160.0	149.0	206.0
0.00630	-40.0	8.4	10.1	9.0	12.7
0.00200	-50.0	0.8	1.0	0.8	1.3
0.00063	-60.0	0.1	0.1	0.1	0.1

Input Voltage (Vpep)	Input (dBm)	8.5 MHz Output (Wpep)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	10.0	4396.0	4103.0	5165.0	4711.0
0.63000	0.0	4396.0	4103.0	5165.0	4711.0
0.20000	-10.0	4296.0	4103.0	5165.0	4711.0
0.06300	-20.0	2416.0	2307.0	3657.0	2972.0
0.02000	-30.0	149.0	149.0	242.0	206.0
0.00630	-40.0	10.1	10.1	17.1	14.6
0.00200	-50.0	0.9	1.0	1.7	1.3
0.00063	-60.0	0.1	0.1	0.2	0.1

** 0dBm is nominal imput level.*

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.987, Peak Output Power for Input Voltage Data Sheet

Client: **Cubic Communications** *Conducted by:* C. Richard

EUT: **HF Exciter, Amp, Power Supply** *Date of Test:* **12-12-97**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

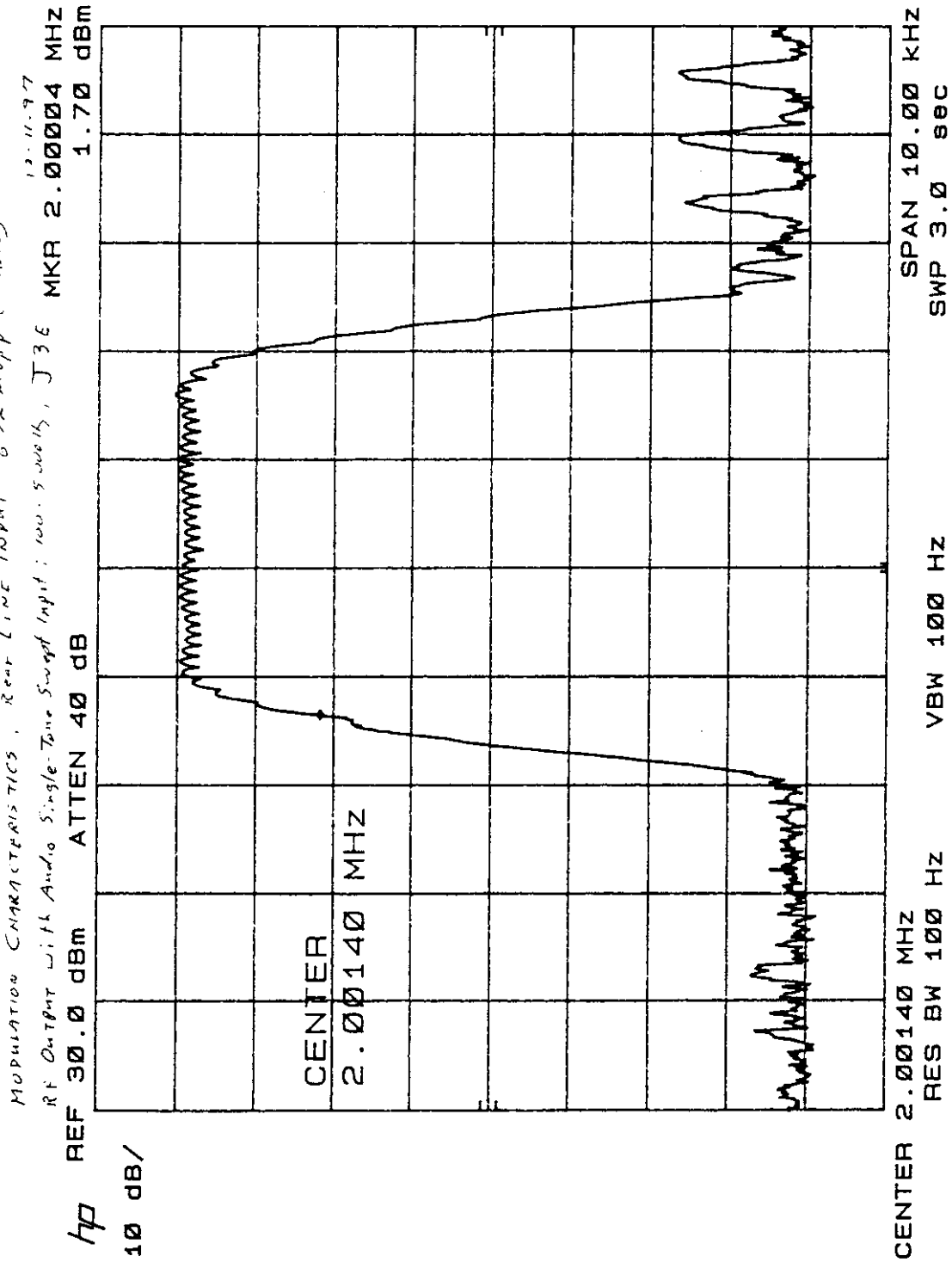
(Microphone Input, J3E Mode, 400 & 1800Hz Mod.)

Input Voltage (Vpep)	Input (dBm)	2MHz Output (Wpep)	4 MHz Output (Wpep)	6 MHz Output (Wpep)	8.5 MHz Output (Wpep)
2.00000	-24.0	5664.0	5664.0	5664.0	5535.0
0.63000	-30.0	4499.0	4604.0	4820.0	4396.0
0.20000	-40.0	4499.0	4604.0	4604.0	4396.0
0.06300	-50.0	4198.0	4604.0	4604.0	4296.0
0.02000	-60.0	1560.0	1596.0	1750.0	1524.0
0.00630	-70.0	85.7	85.7	96.2	89.8
0.00200	-80.0	5.8	6.4	7.3	10.1
0.00063	-90.0	0.6	0.6	0.9	1.0
0.00020	-100.0	0.1	0.1	0.1	0.1

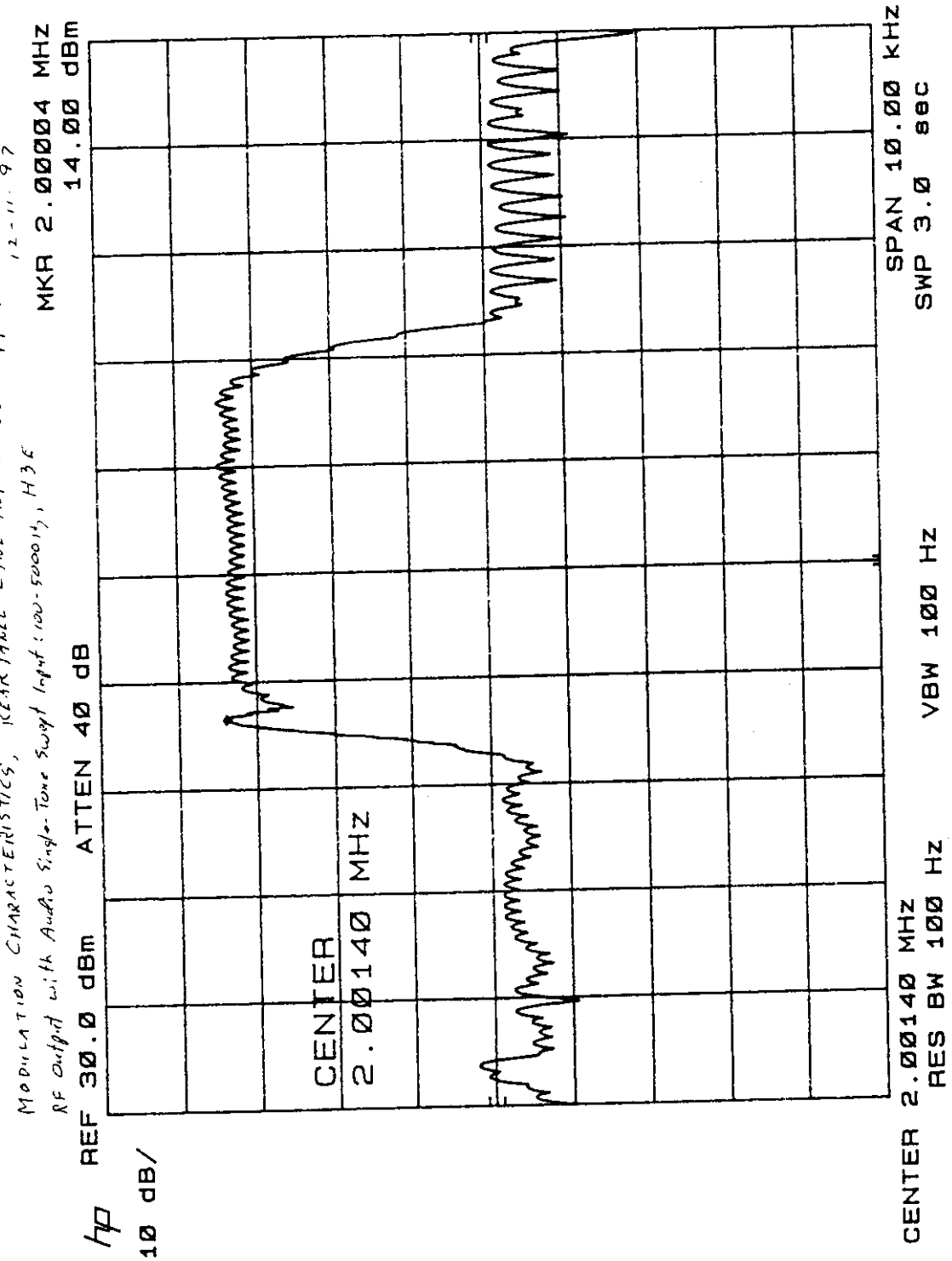
Input Voltage (Vpep)	Input (dBm)	12 MHz Output (Wpep)	17 MHz Output (Wpep)	24.5 MHz Output (Wpep)
2.00000	-24.0	5409.0	5795.0	5048.0
0.63000	-30.0	4296.0	5165.0	4103.0
0.20000	-40.0	4198.0	5165.0	4103.0
0.06300	-50.0	4009.0	5048.0	4103.0
0.02000	-60.0	1390.0	2255.0	1524.0
0.00630	-70.0	85.7	149.0	100.7
0.00200	-80.0	6.4	10.1	7.3
0.00063	-90.0	0.8	0.9	0.6
0.00020	-100.0	0.1	0.1	0.1

-30dBm is nominal imput level.

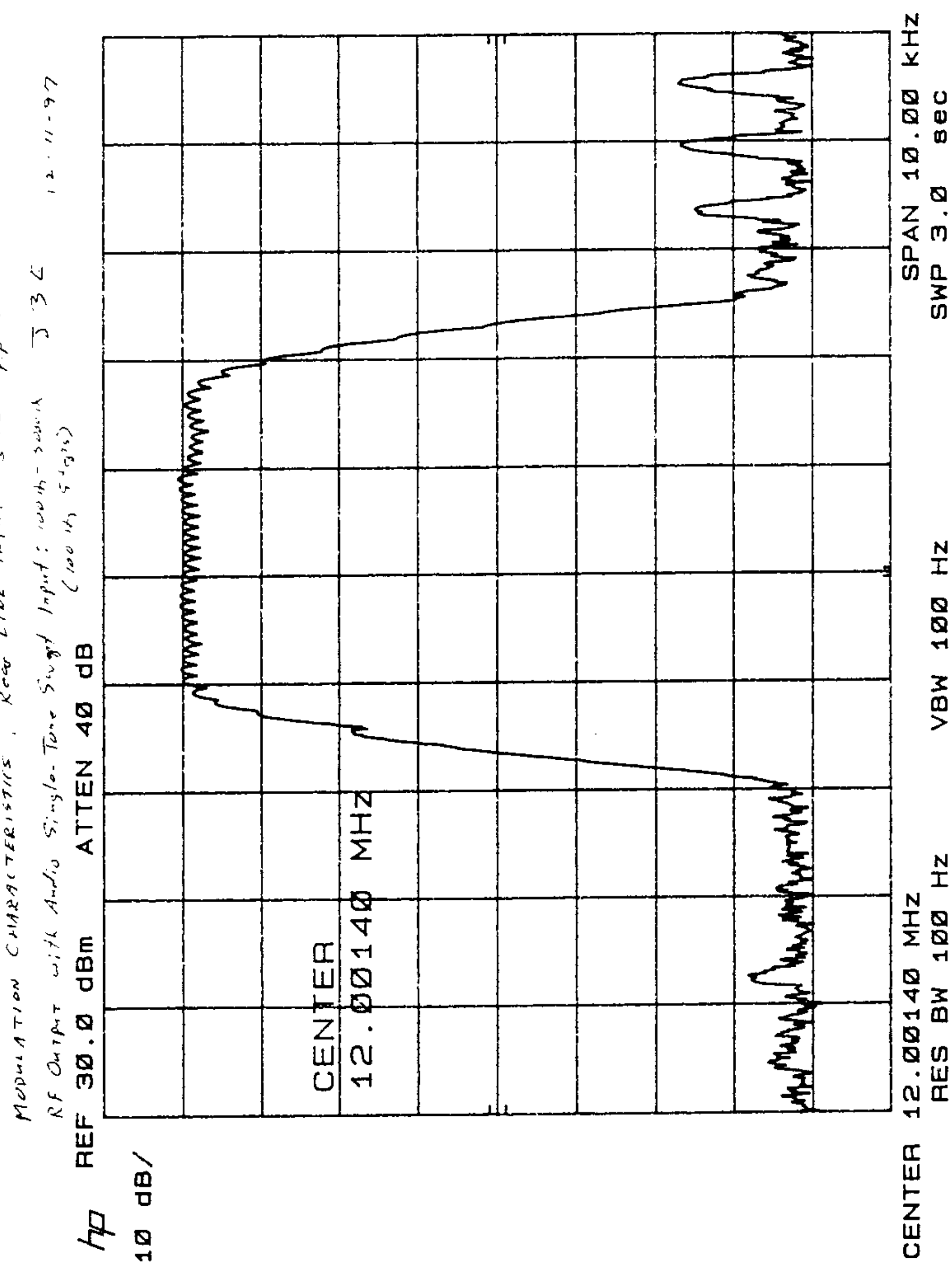
J3E at 2MHz


Modulation Characteristics, Rear Line Input 632 mVpp (0.1dBm)
RF Output with Audio Single-Tone Swept Input; 100-5000Hz, J3E
12-11-97
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
MKR 2.00004 MHz
1.70 dBm
CENTER
2.00140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 2.00140 MHz
RES BW 100 Hz

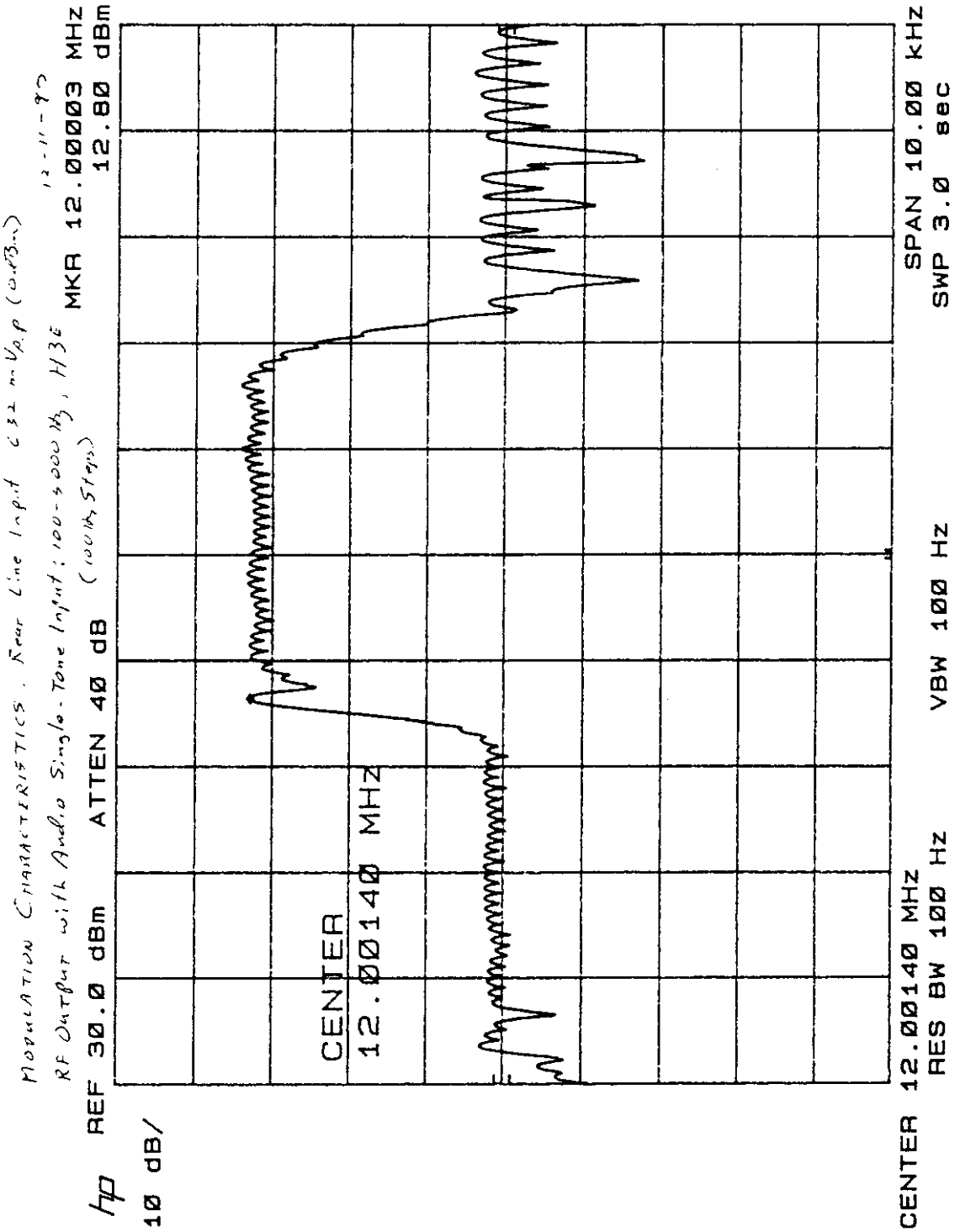
H3E @ 2MHz

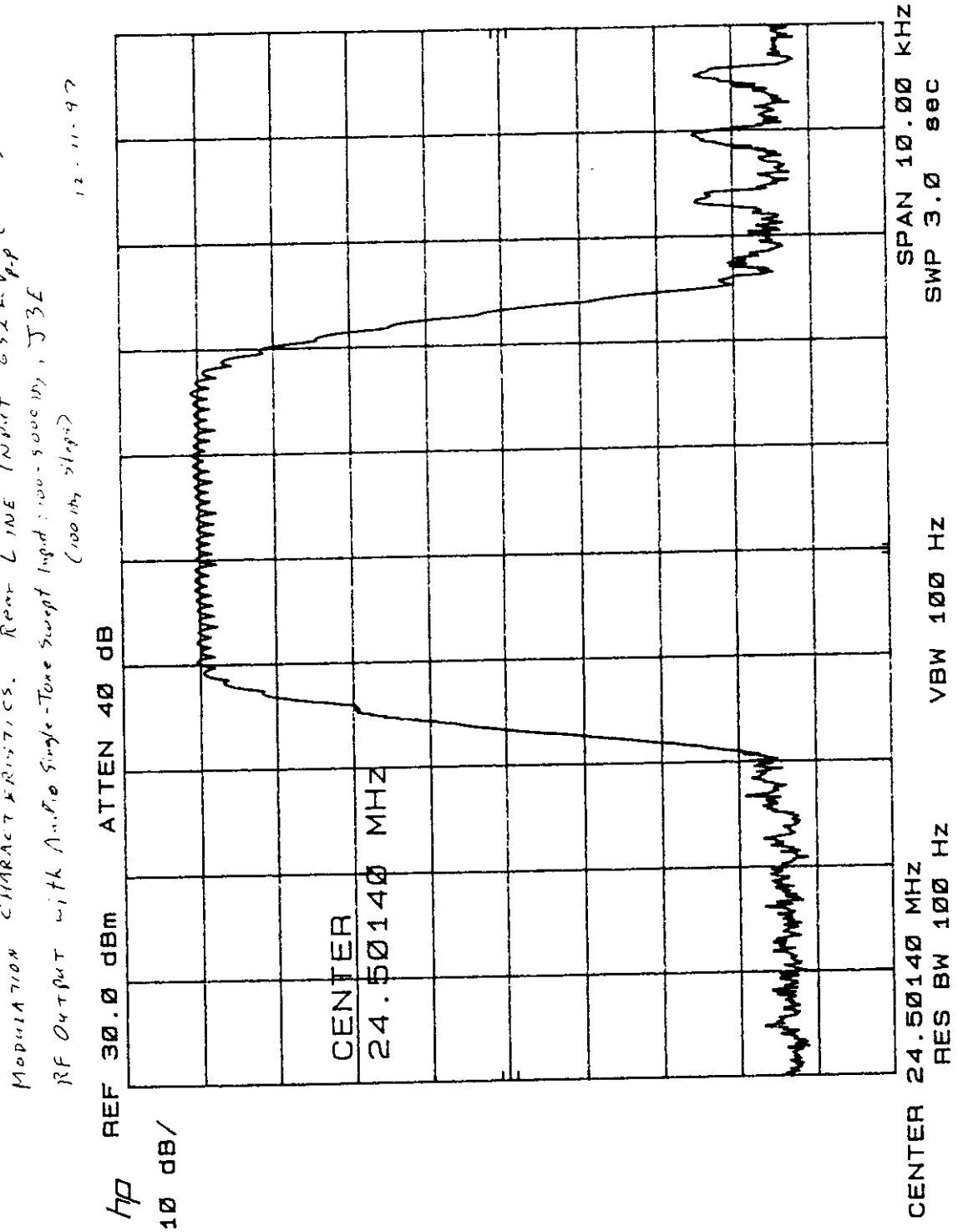

MKR 2.00004 MHz
14.00 dBm
SPAN 10.00 kHz
SWP 3.0 sec
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
2.00140 MHz
VBW 100 Hz
CENTER 2.00140 MHz
RES BW 100 Hz
MODULATION CHARACTERISTICS, REAR PANEL LINE INPUT 632 mVpp (0dB)
RF Output with Audio Single Tone Swept Input (100-5000Hz), H3E
12-11-97

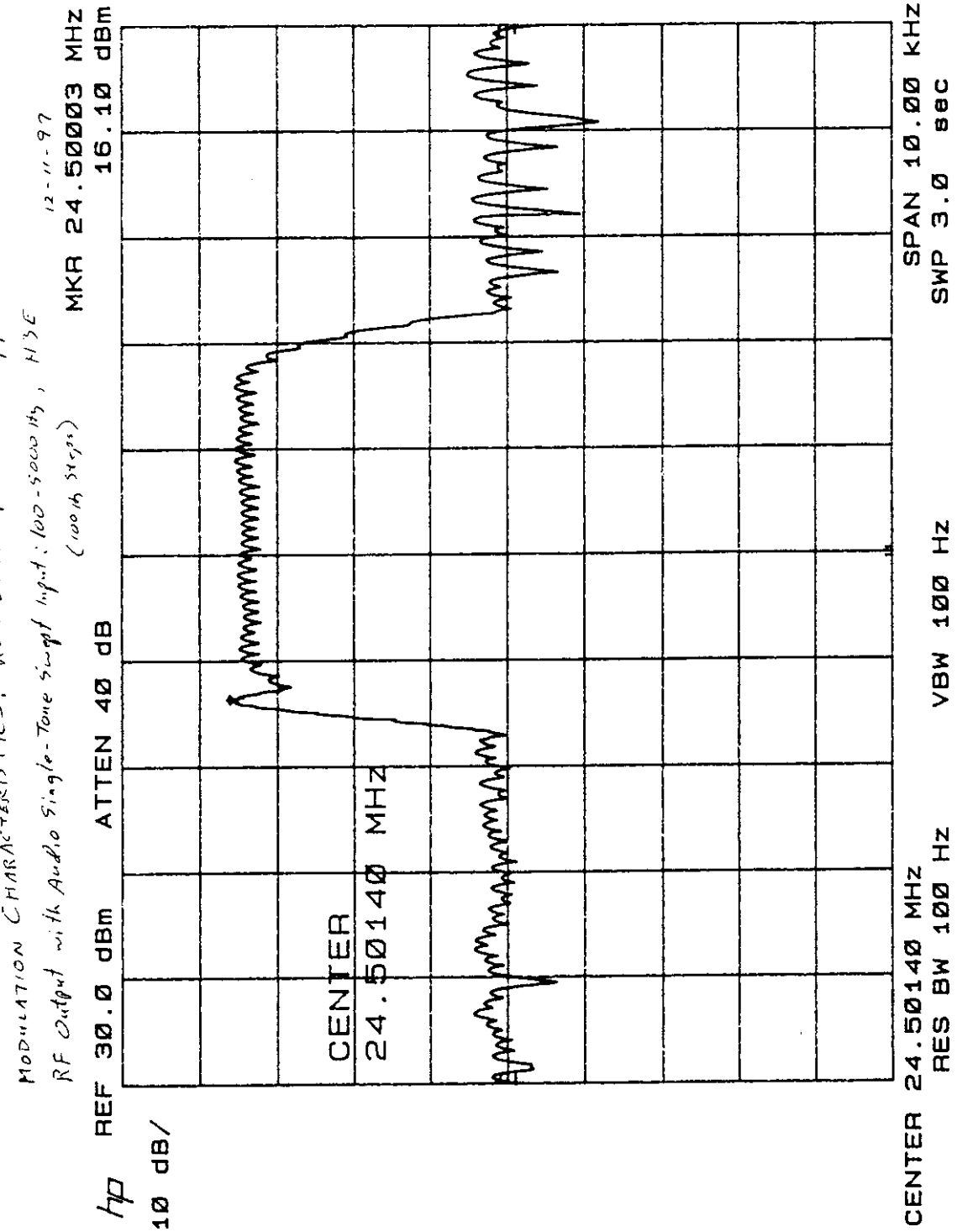
J3E @ 12MHz

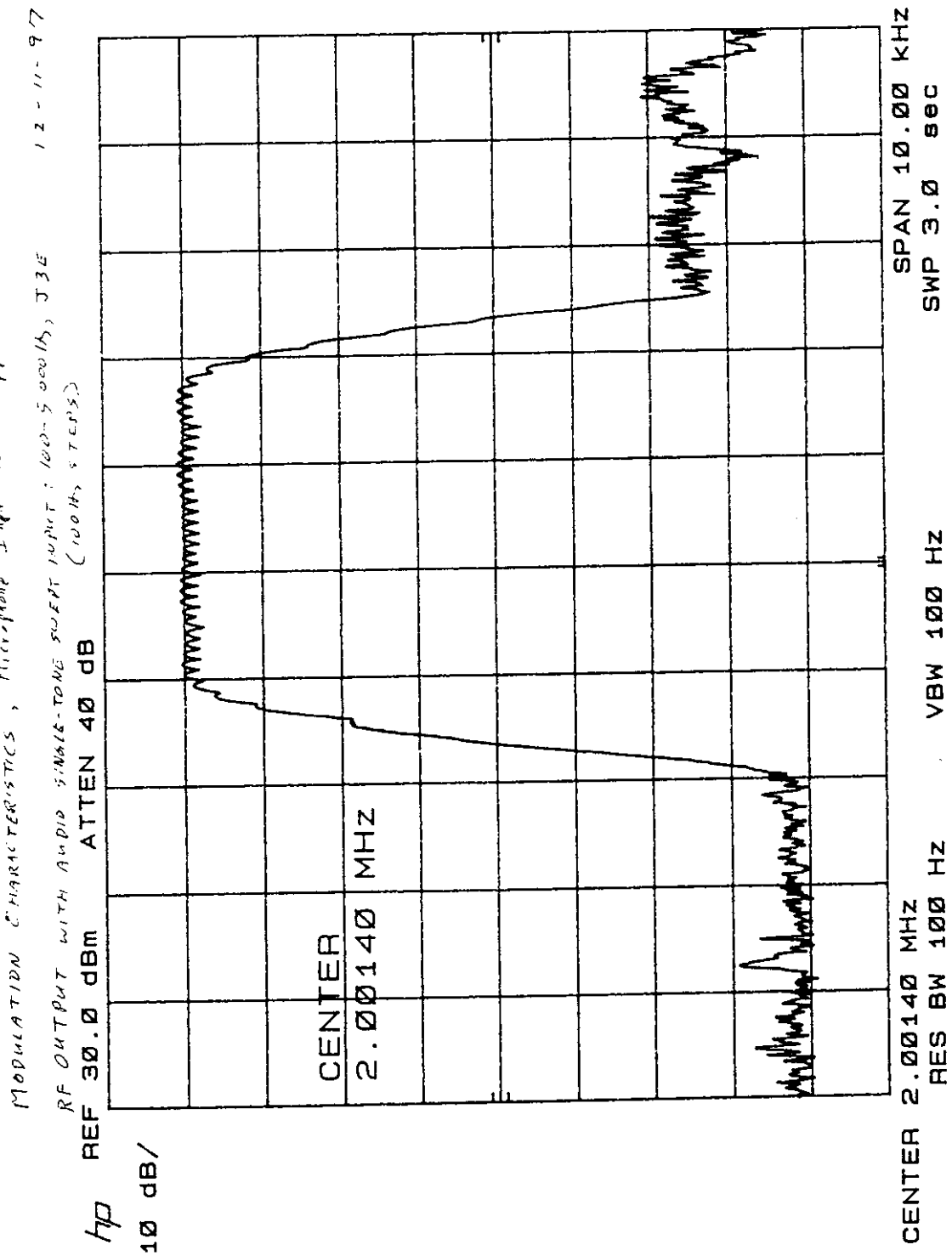


hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
CENTER
12.00140 MHz
CENTER 12.00140 MHz
RES BW 100 Hz
VBW 100 Hz
SPAN 10.00 kHz
SWP 3.0 sec
MODULATION CHARACTERISTICS , Rear LINE Input
J3E
12-11-97

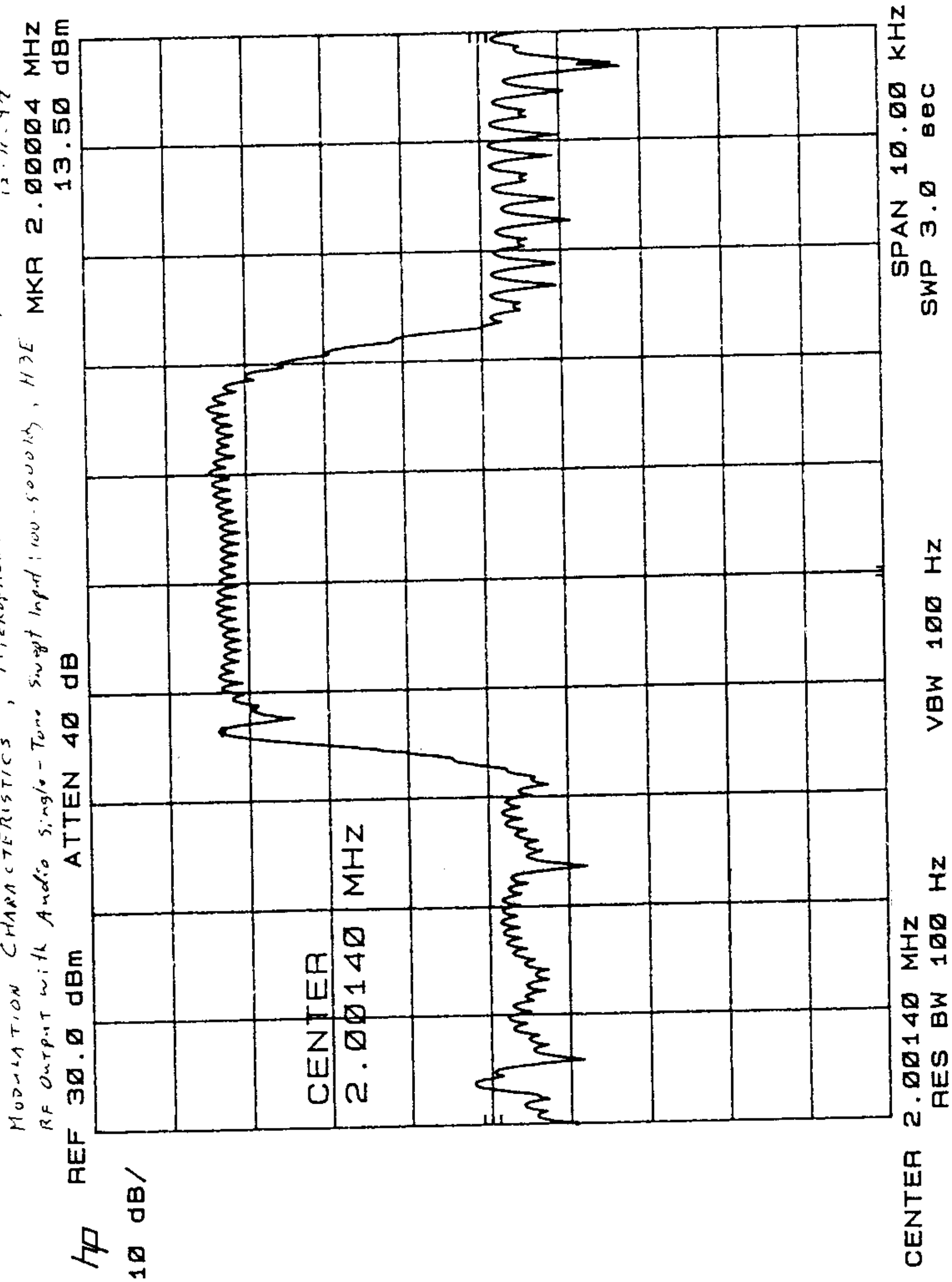

Modulation Characteristics, Rear Line Input 632 mVp.p (with)
RF Output with Audio Single-Tone Input: 100-5000 Hz, 1/3E
12-11-97
MKR 12.00003 MHz
12.80 dBm
SPAN 10.00 kHz
SWP 3.0 sec
REF 30.0 dBm
ATTEN 40 dB
(100 Hz Steps)
10 dB/
CENTER
12.00140 MHz
VBW 100 Hz
CENTER 12.00140 MHz
RES BW 100 Hz


MODULATION CHARACTERISTICS. REAR LINE INPUT 632 mV p-p (0.0dBm)
RF OUTPUT WITH AUDIO SINGLE-TONE SWEPT (100 Hz - 5000 Hz, 3kHz)
12-11-97
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER 24.50140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 24.50140 MHz
RES BW 100 Hz

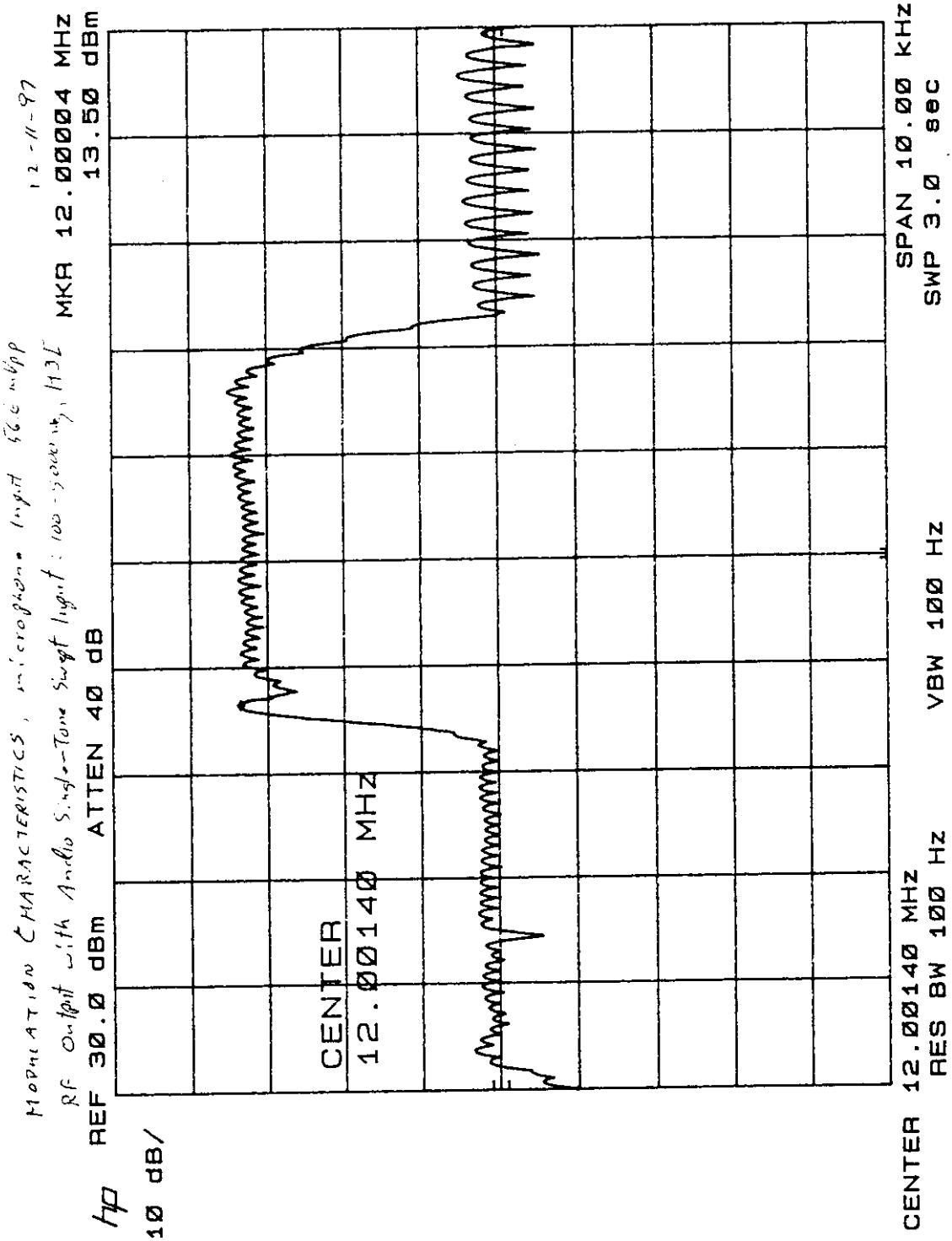

MODULATION CHARACTERISTICS, Rear Line Input 0.32 mVp-p (0 dB...)
RF Output with Audio Single-Tone Swept Input: 100-5000 Hz, FM
(100 Hz Steps)
12-11-97
hp
MKR 24.50003 MHz
16.10 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
24.50140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 24.50140 MHz
RES BW 100 Hz


MODULATION CHARACTERISTICS, Microphone Input 54.6 mVpp
RF OUTPUT WITH AUDIO SINGLE-TONE SWEPT INPUT: 100-5,000 Hz, 3 kHz
(100 Hz steps)
12-11-97
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
CENTER
2.00140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 2.00140 MHz
RES BW 100 Hz

Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	**Date**	**Document Name**	**Document #**	**FCC ID#**	**Page #**
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	95

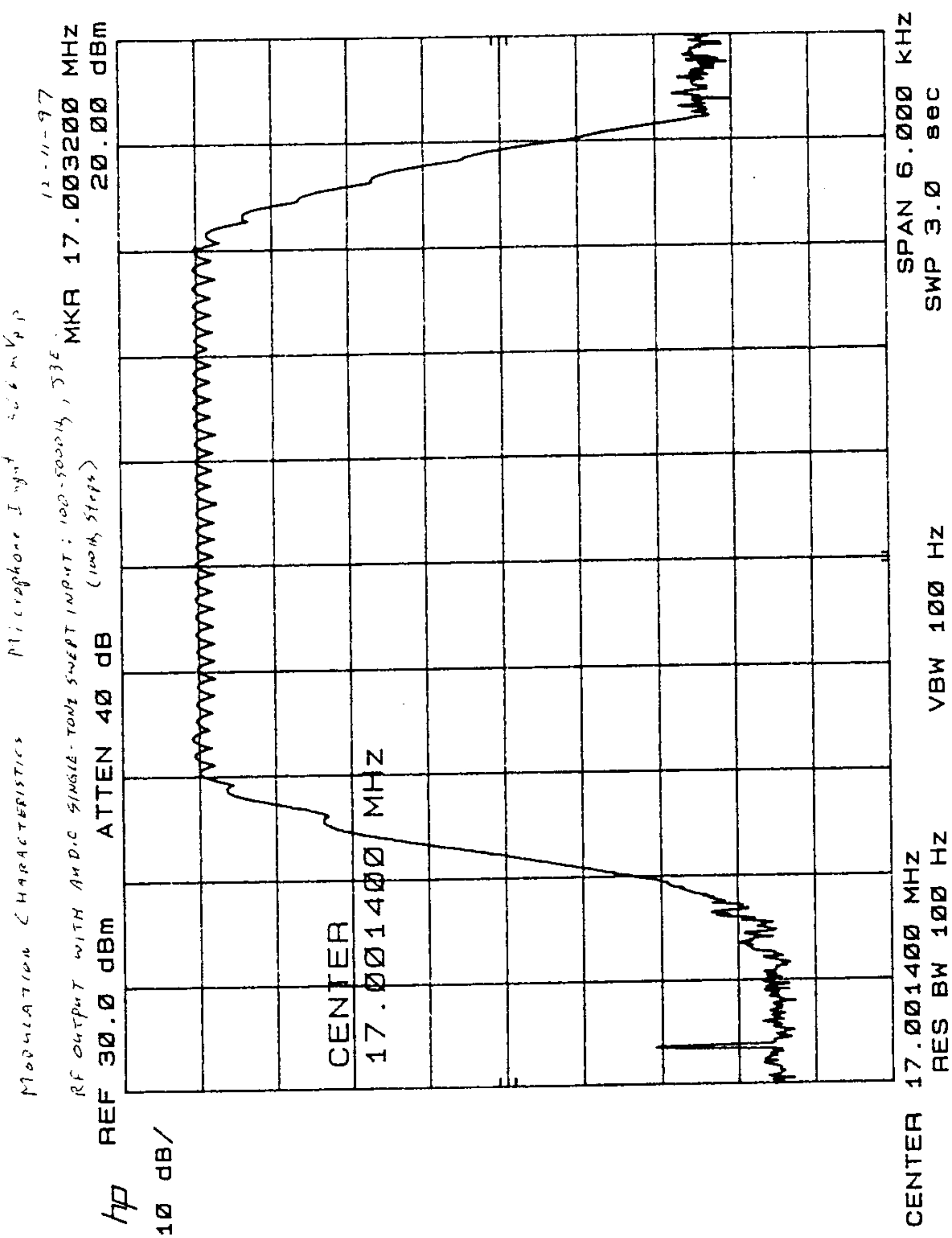


H3E 40 12 MHz

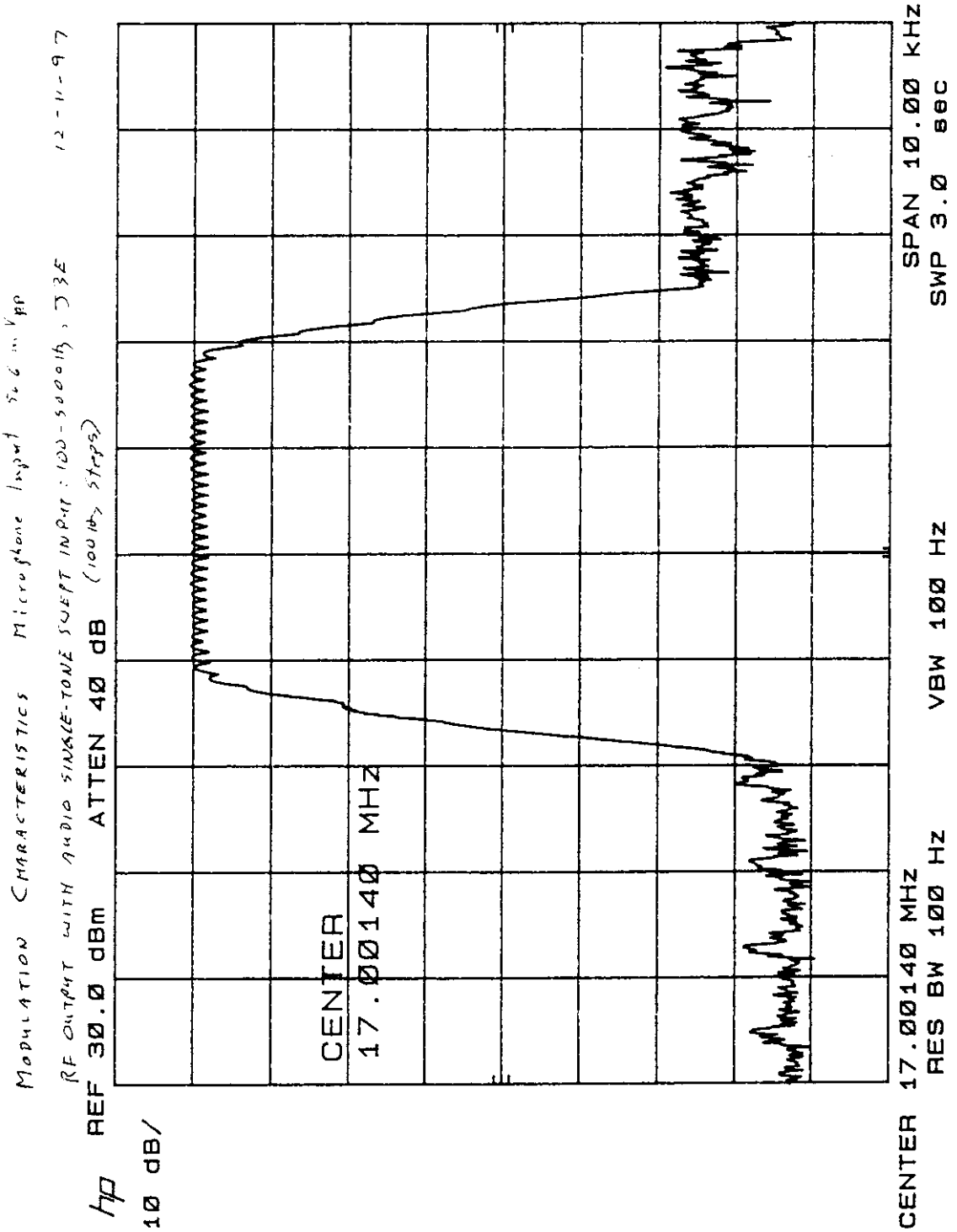

MKR 12.00004 MHz
13.50 dBm
12-11-97
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
12.00140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
CENTER 12.00140 MHz
RES BW 100 Hz
VBW 100 Hz

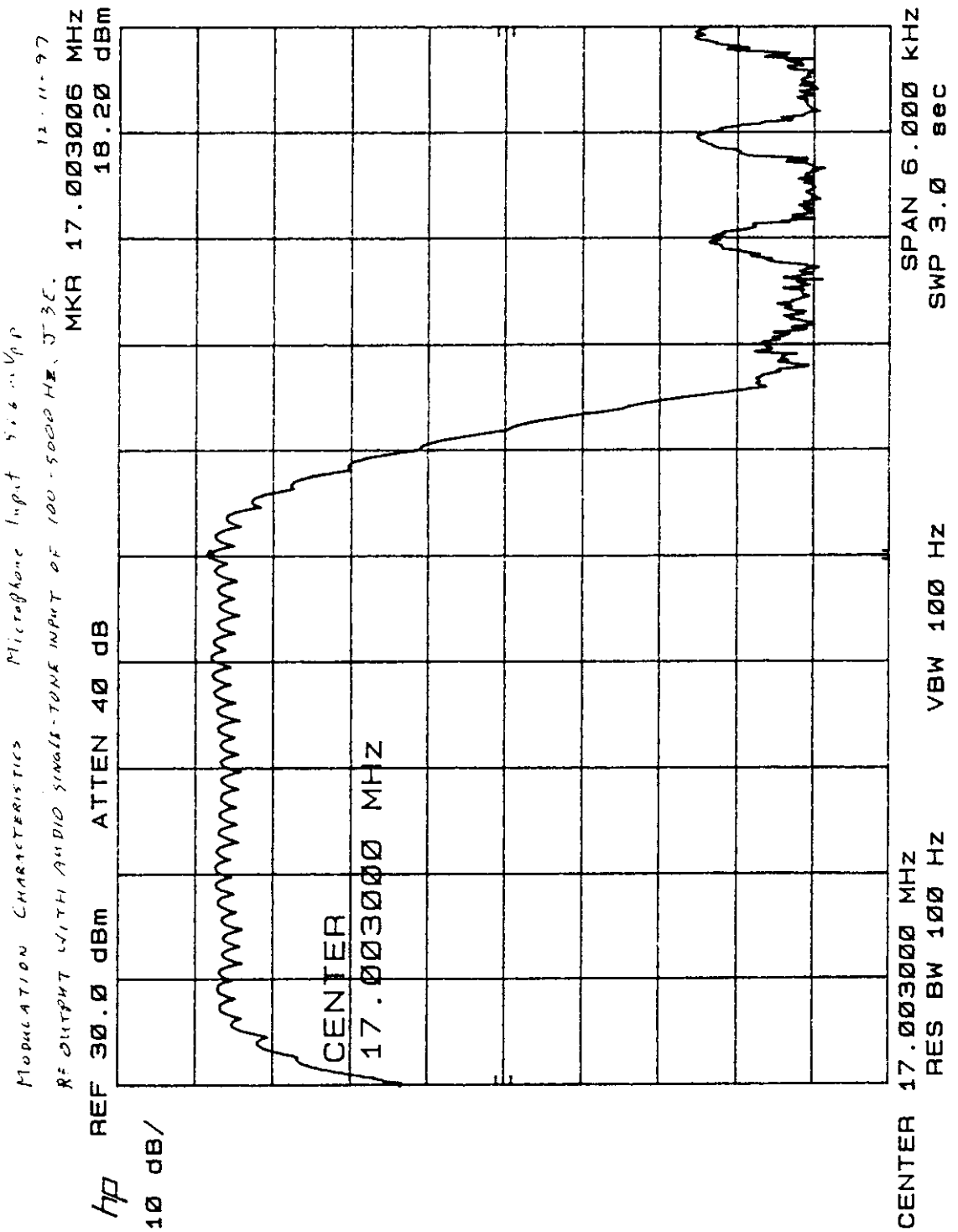
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	**Date**	**Document Name**	**Document #**	**FCC ID#**	**Page #**
A	4/13/98	**Cubic Communications CTX-1000 Part 87 Type Acceptance Report**	**98-046**	**NVSCTX-1000**	**97**

J3E at 17MHz

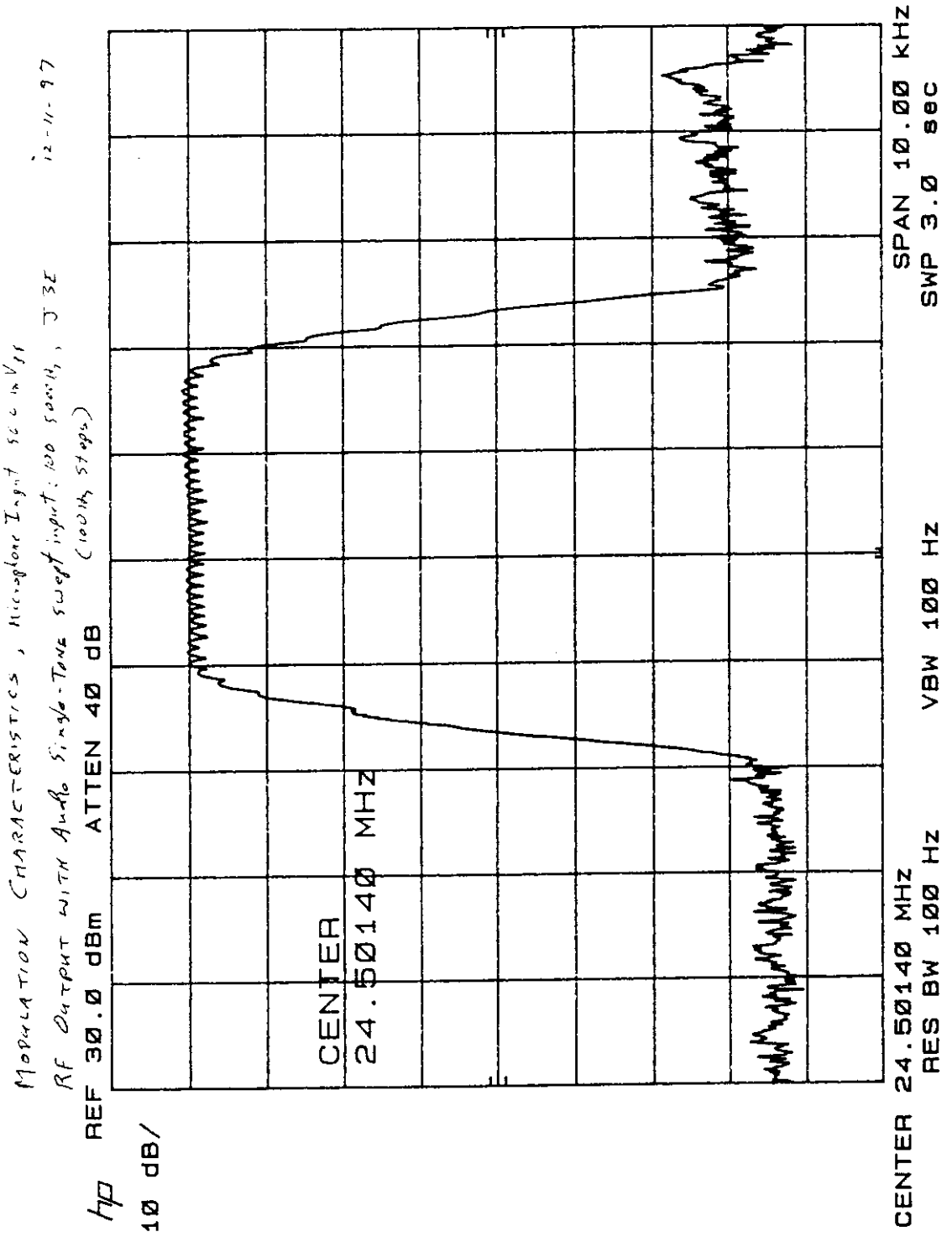


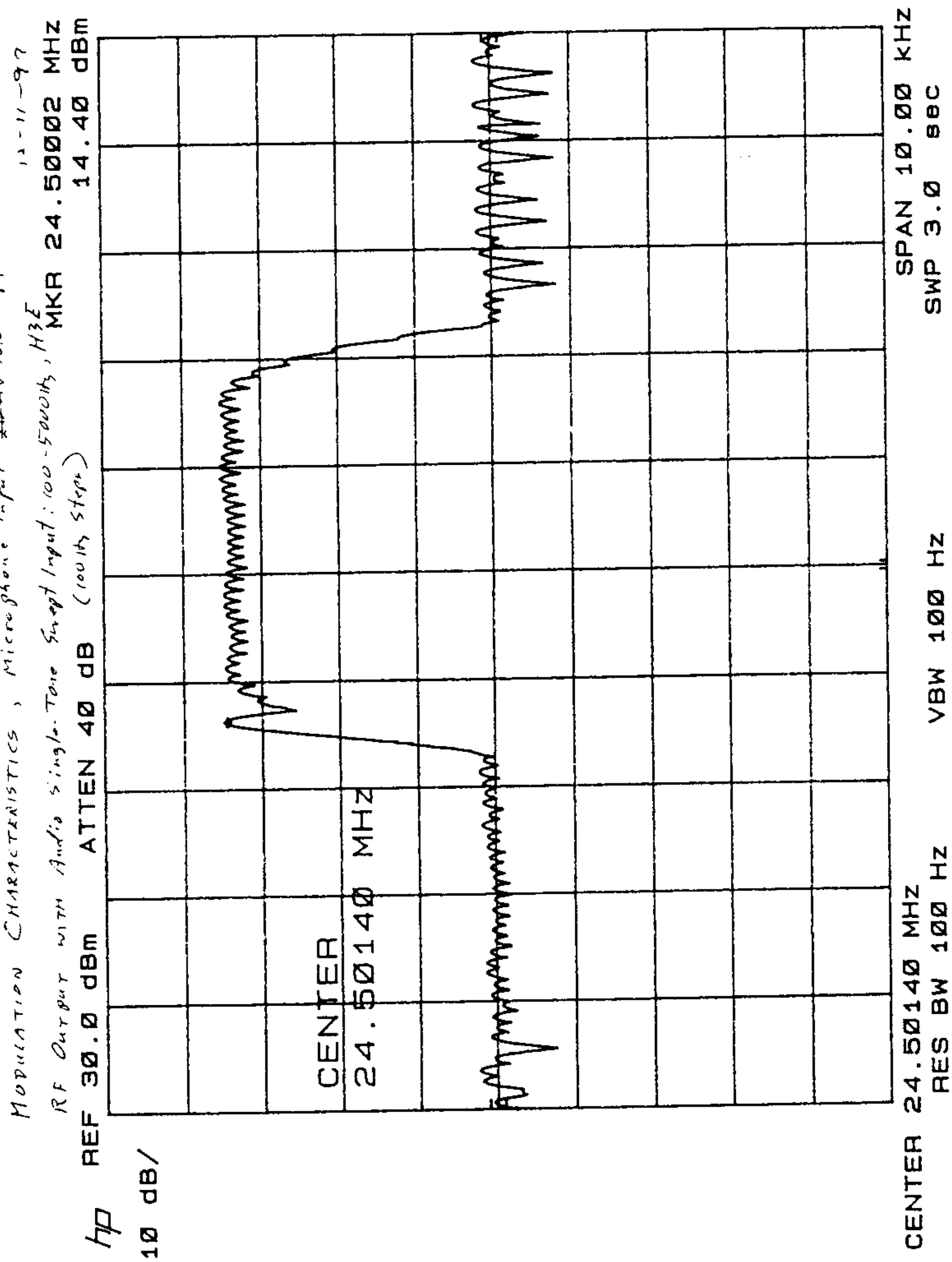
J3E at 17 MHz


MODULATION CHARACTERISTICS Microphone Input 5.6 mVpp
RF OUTPUT WITH AUDIO SINGLE-TONE SWEPT INPUT: 100-3000Hz, J3E 12-11-97
(100 log steps)
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER 17.00140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 17.00140 MHz
RES BW 100 Hz


MODULATION CHARACTERISTICS
RF OUTPUT WITH AUDIO SINGLE-TONE INPUT OF 100 - 5000 Hz, 3 KC.
Microphone Input 5.6 mVp-p
12-11-97
MKR 17.003006 MHz
18.20 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
17.003000 MHz
SPAN 6.000 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 17.003000 MHz
RES BW 100 Hz

J3C 24.5MHz

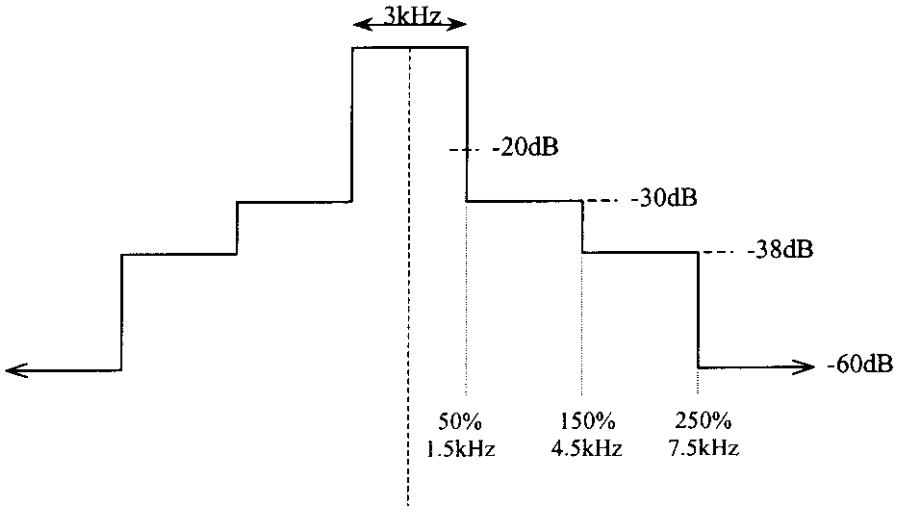

Modulation Characteristics, Microphone Input set to 1kHz
RF Output with Audio Single-Tone sweep input: 100 points, J3E
(100Hz steps)
12-11-97
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
CENTER
24.50140 MHz
CENTER 24.50140 MHz
RES BW 100 Hz
VBW 100 Hz
SPAN 10.00 kHz
SWP 3.0 sec



MKR 24.50002 MHz
14.40 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
24.50140 MHz
SPAN 10.00 kHz
SWP 3.0 sec
VBW 100 Hz
CENTER 24.50140 MHz
RES BW 100 Hz

8.5 Occupied Bandwidth Test Results (§2.989)

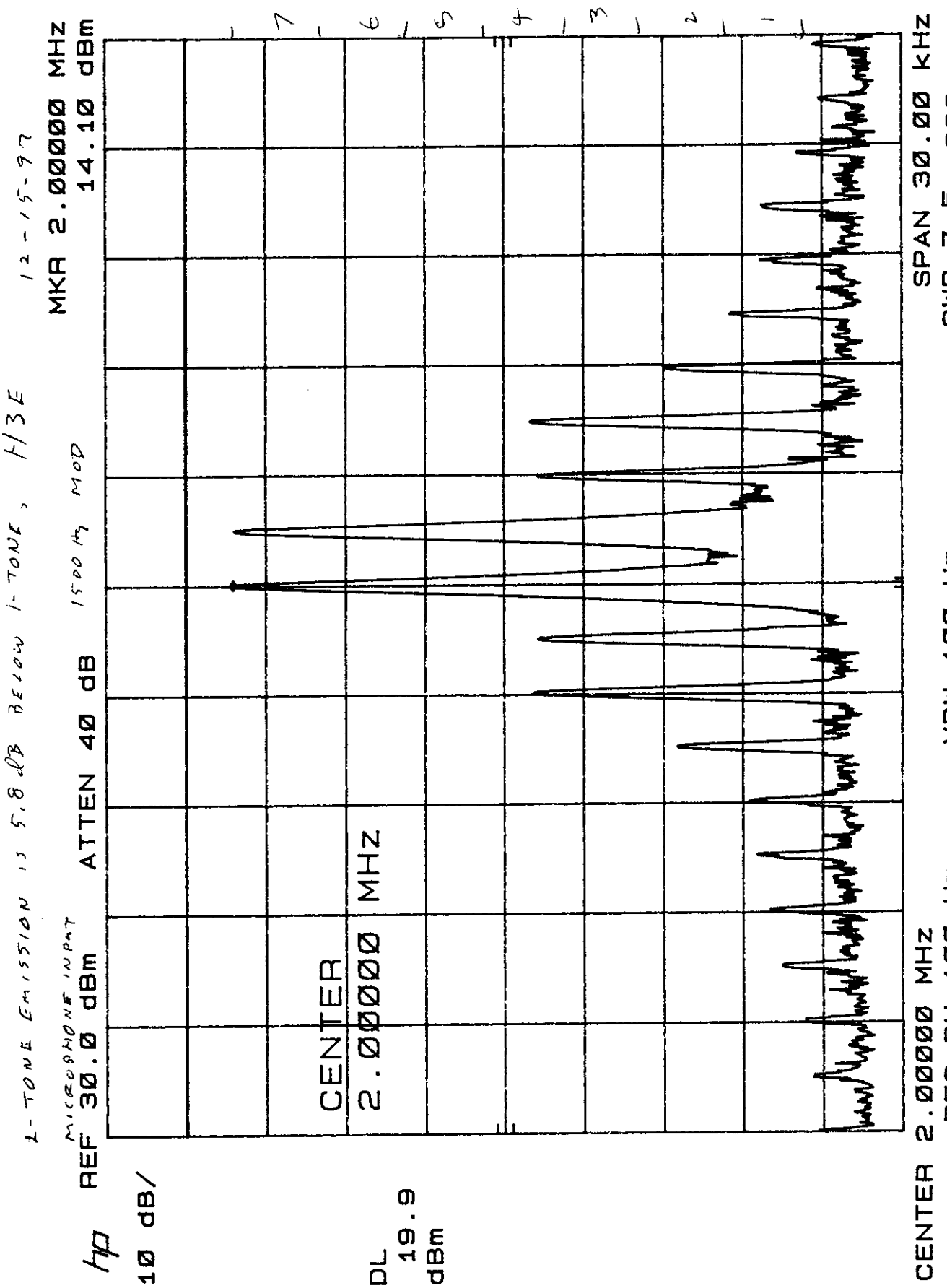
The overlay illustrated below (not to scale) was used to determine compliance with the Occupied Bandwidth test requirements of FCC CFR 47, Parts 87 and 2.

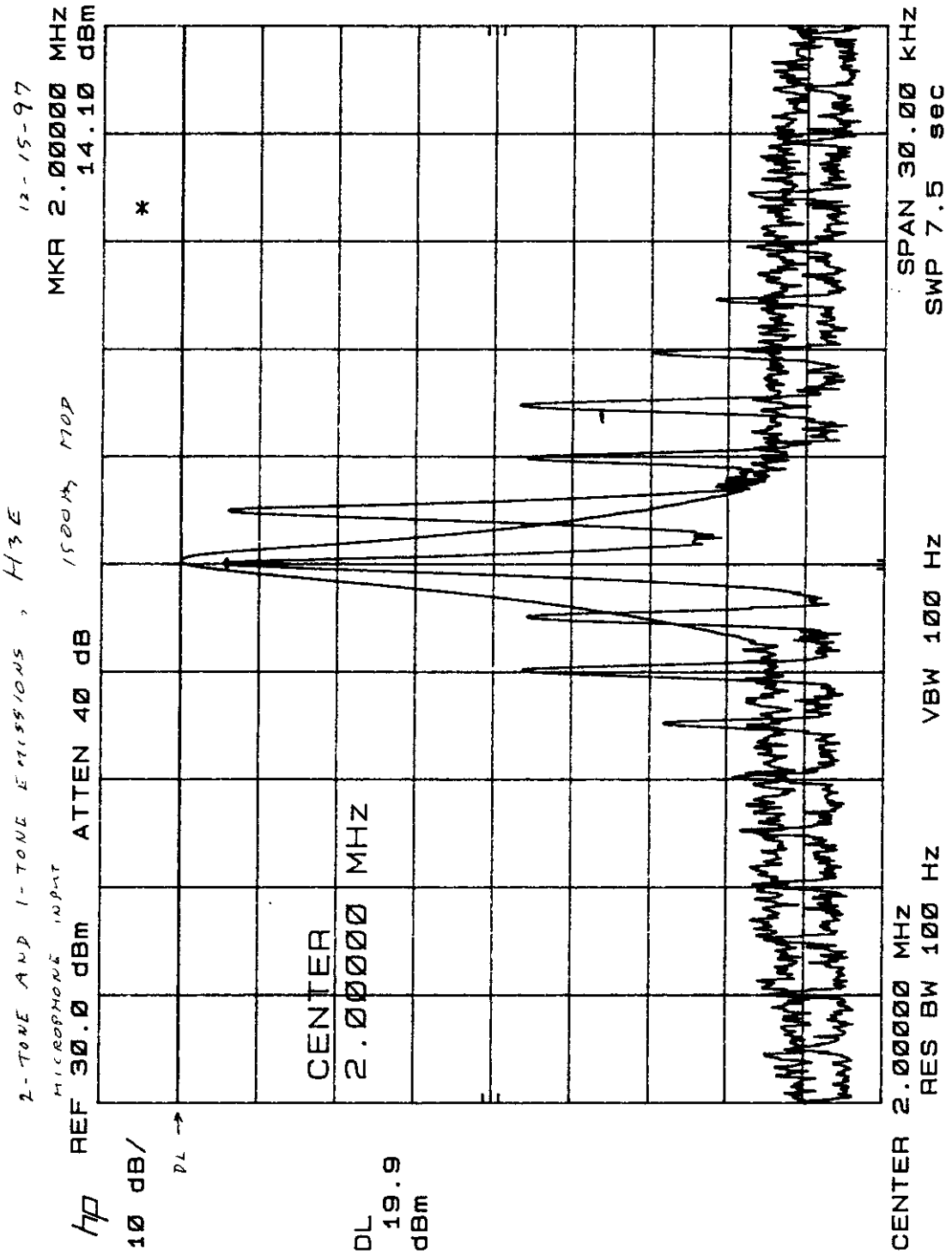


F_o + 1400 Hz
"Assigned Frequency"

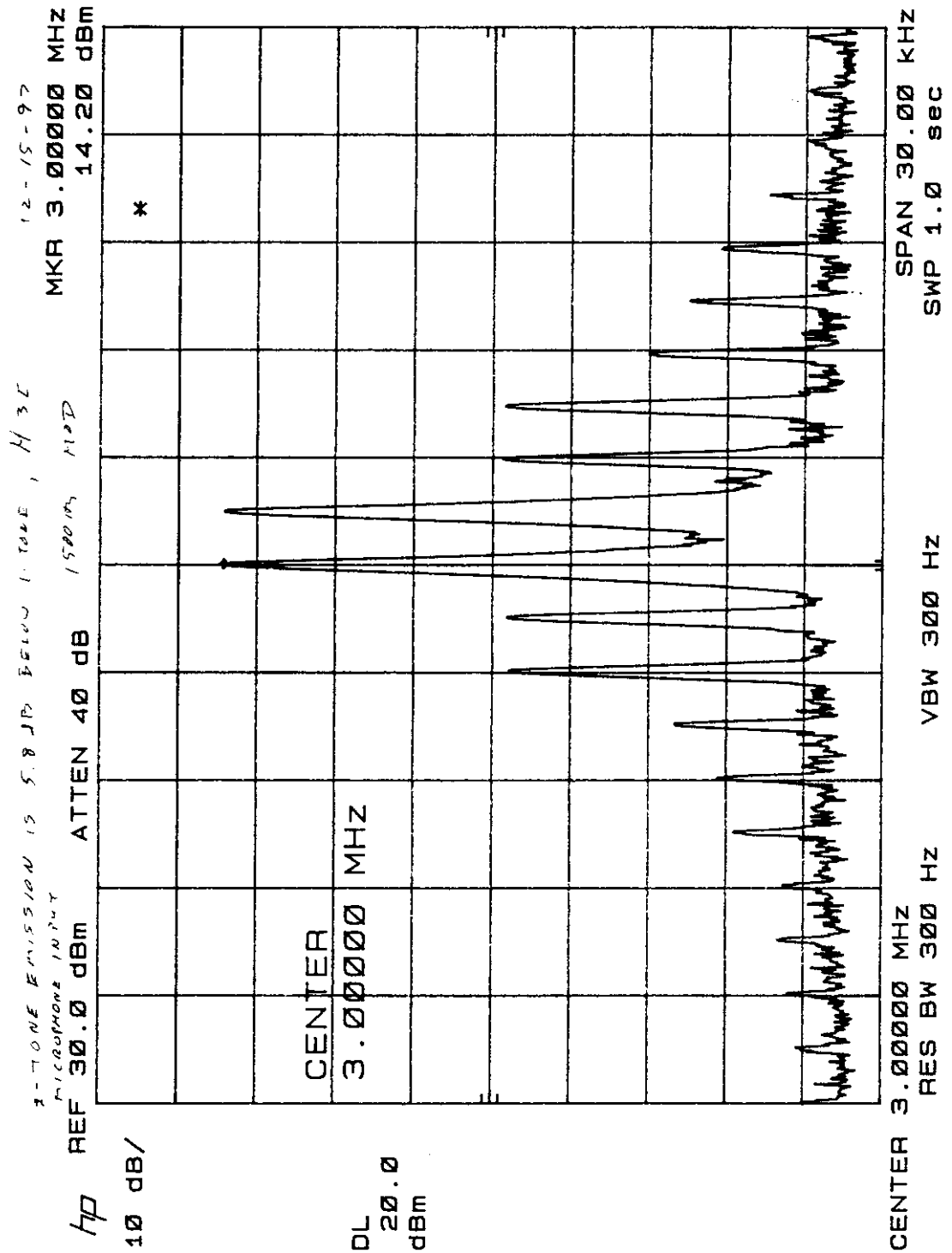
(NOT TO SCALE)

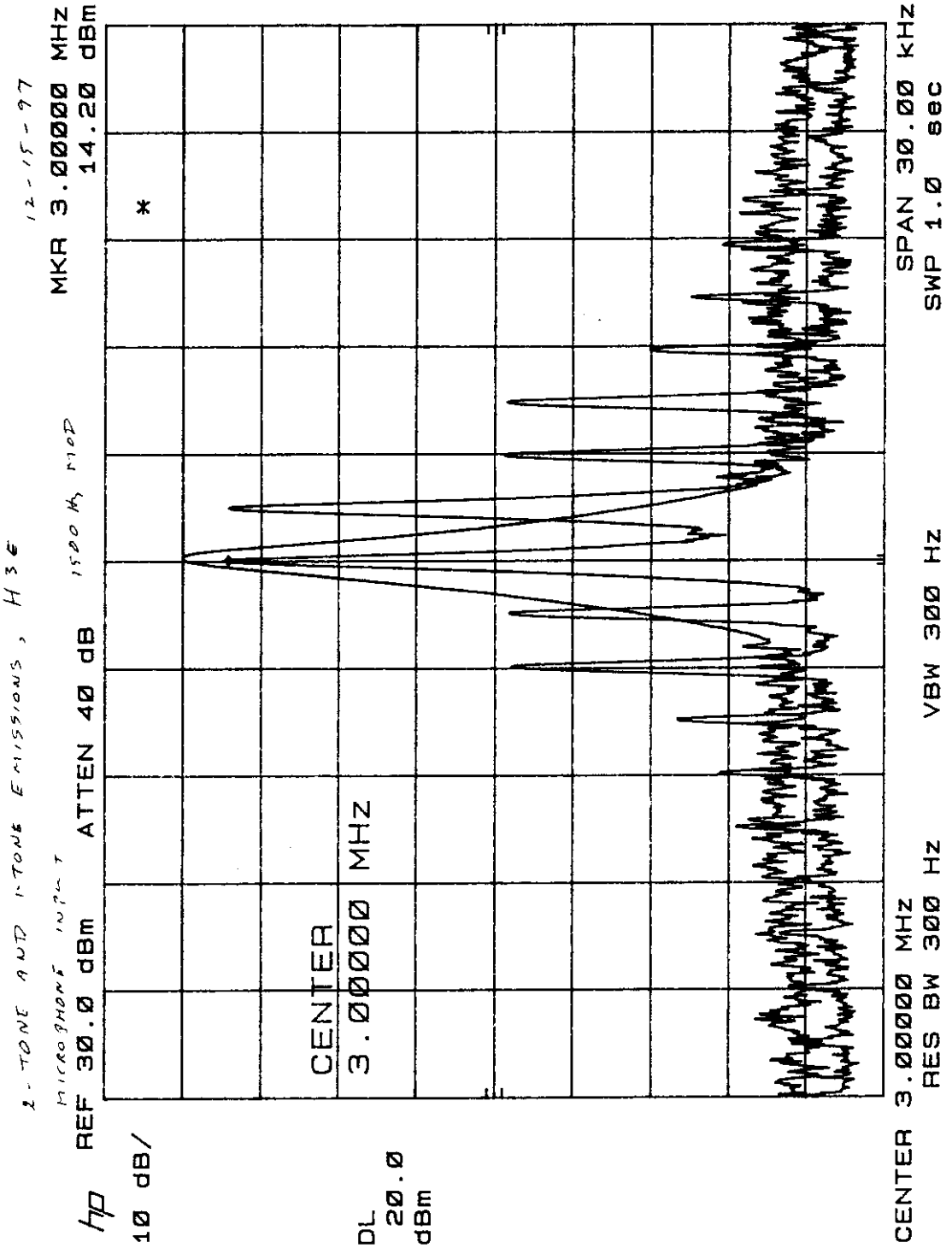
H3E at 2 kHz

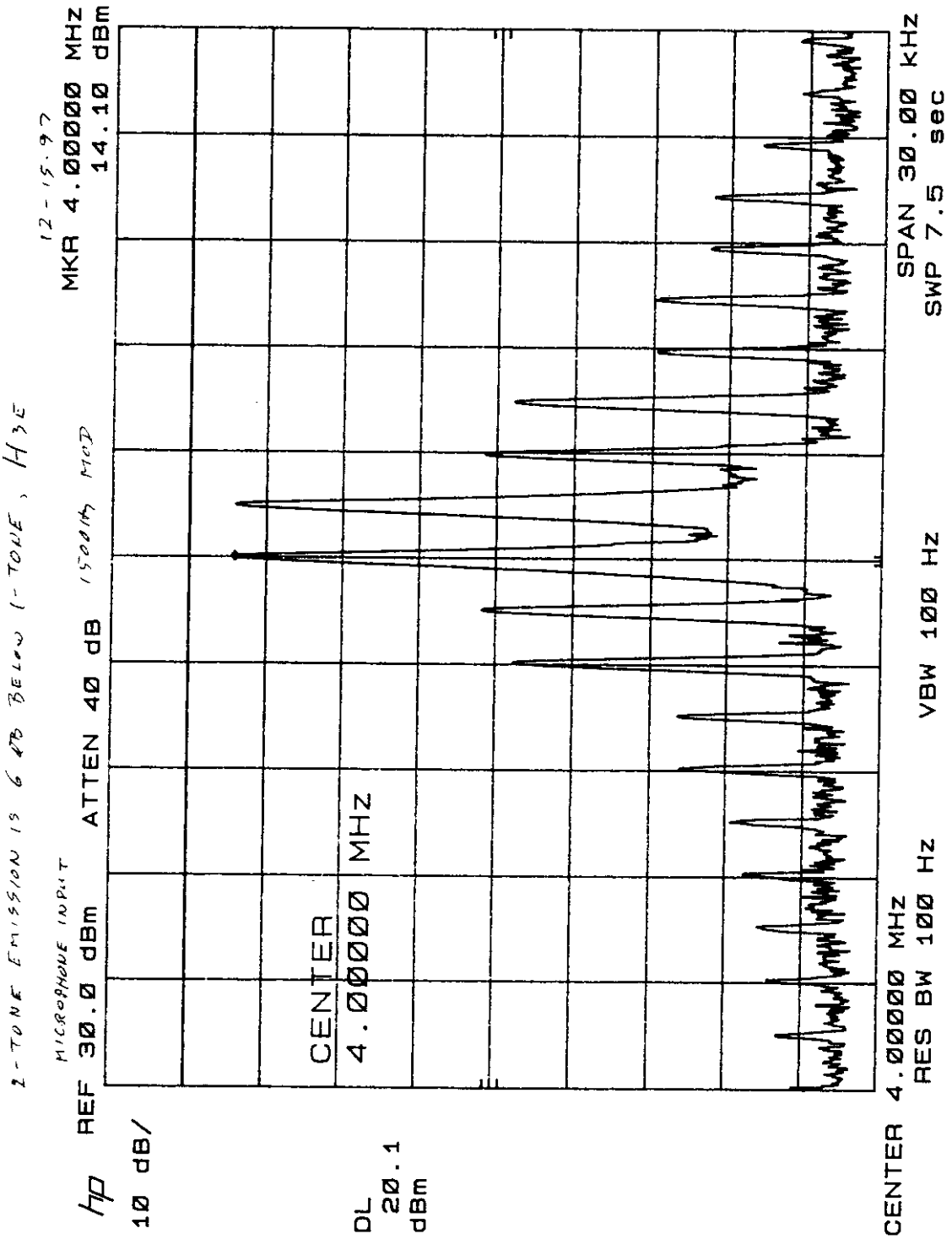

1-TONE EMISSION IS 5.8 dB BELOW 1-TONE, H3E
MICROPHONE INPUT
hp
REF 30.0 dBm
10 dB/
ATTEN 40 dB
1500 Hz MOD
12-15-97
MKR 2.00000 MHz
14.10 dBm
CENTER
2.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
RES BW 100 Hz
CENTER 2.00000 MHz
DL
19.9
dBm

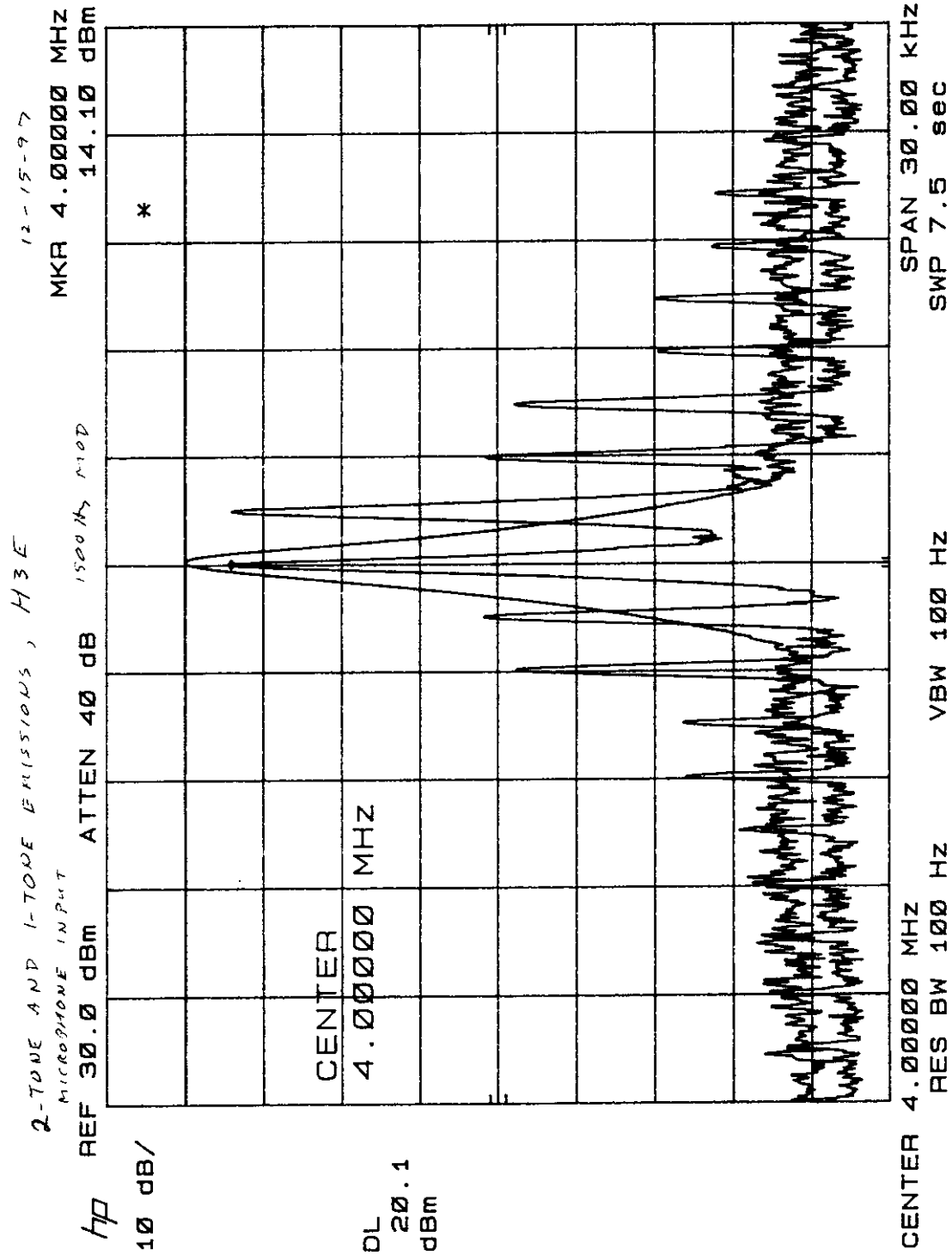

2-TONE AND 1-TONE EMISSIONS , H3E
MICROPHONE INPUT
12-15-97
hp
REF 30.0 dBm
ATTEN 40 dB
MKR 2.00000 MHz
14.10 dBm
10 dB/
DL
DL 19.9 dBm
CENTER 2.00000 MHz
2.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
CENTER 2.00000 MHz
RES BW 100 Hz
VBW 100 Hz

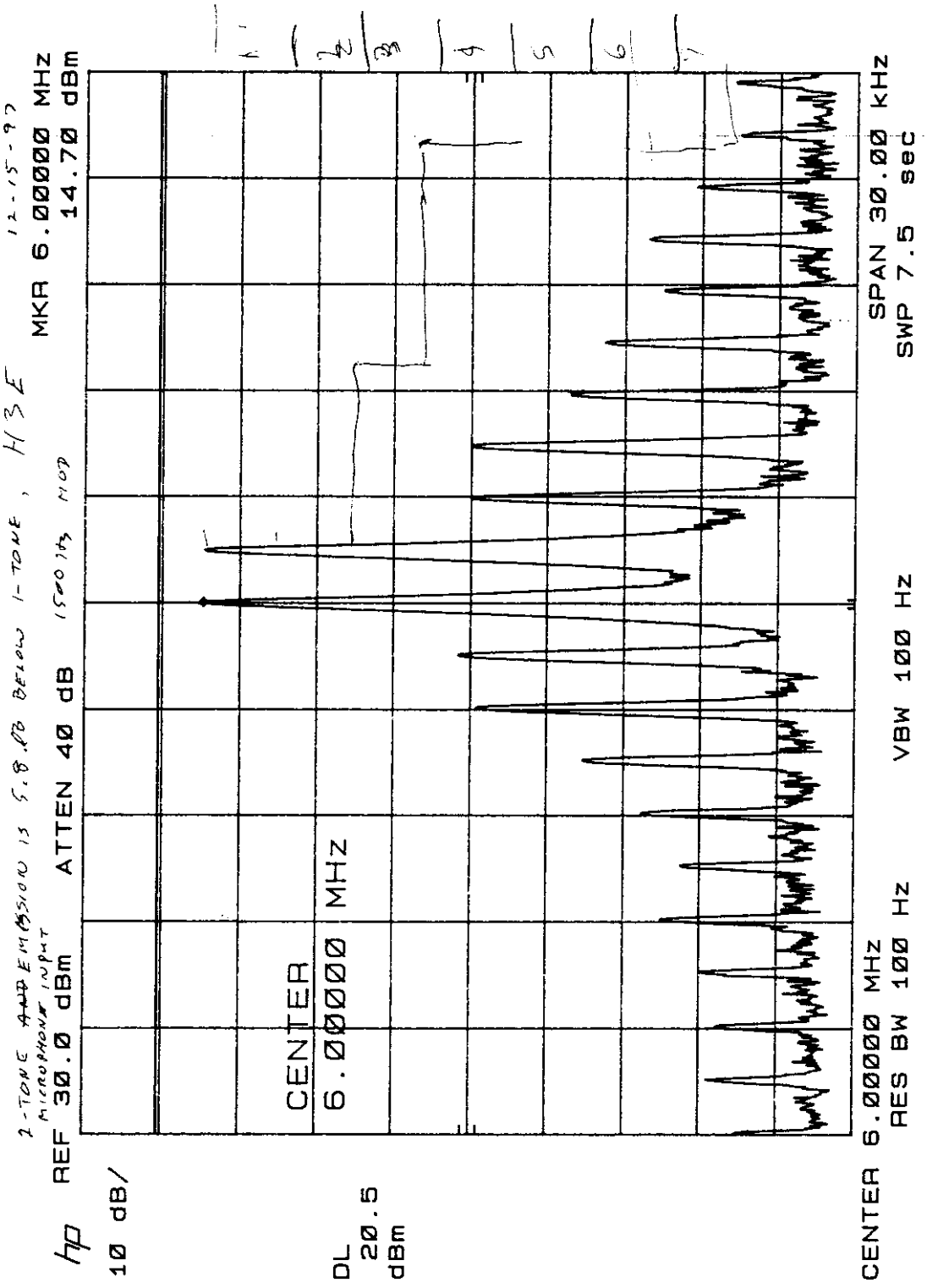
H36 3MHz

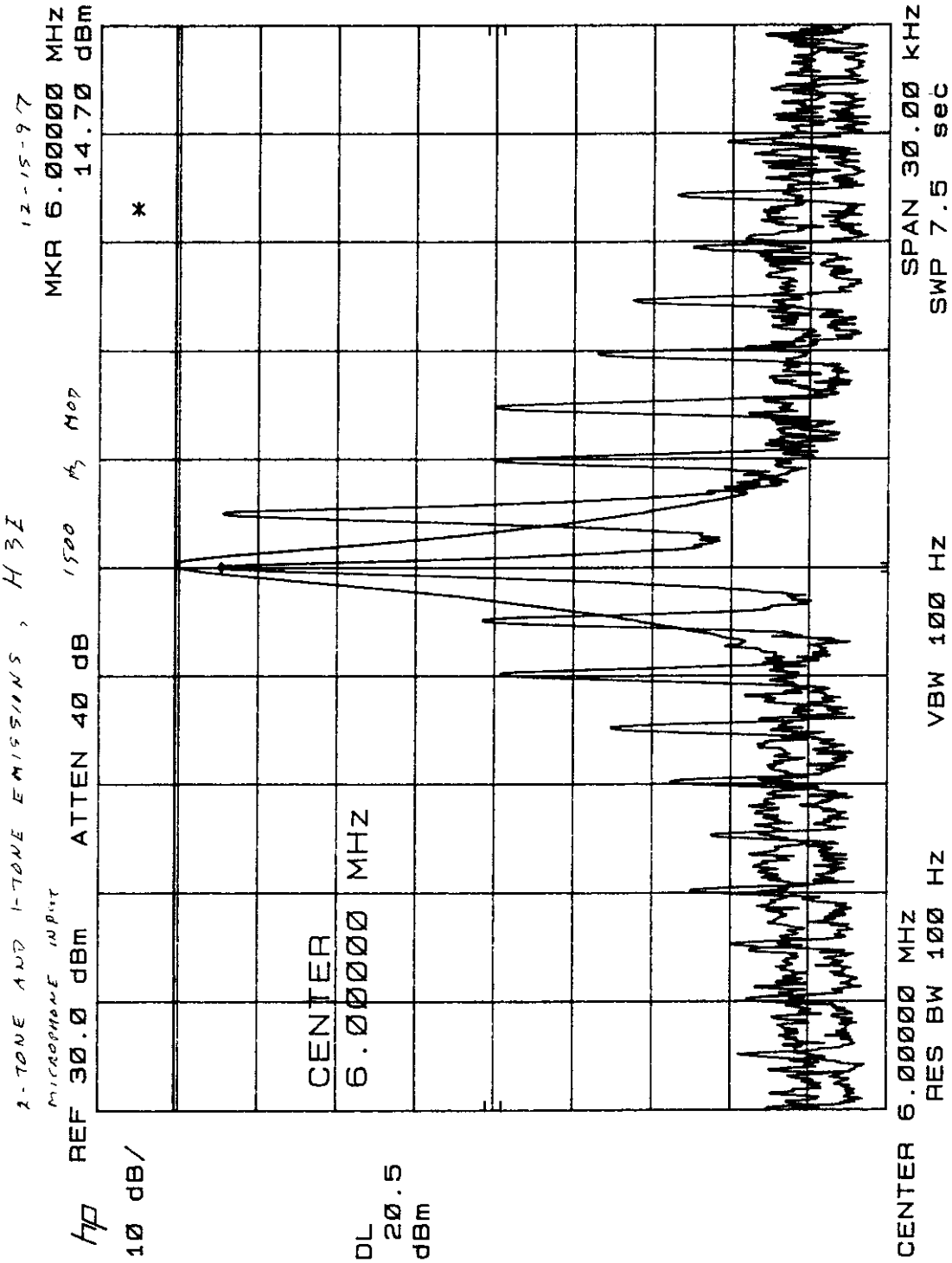

12-15-97
MKR 3.00000 MHz
14.20 dBm
*
SPAN 30.00 kHz
SWP 1.0 sec
REF 30.0 dBm
ATTEN 40 dB
CENTER
3.00000 MHz
VBW 300 Hz
RES BW 300 Hz
CENTER 3.00000 MHz
10 dB/
DL
20.0
dBm

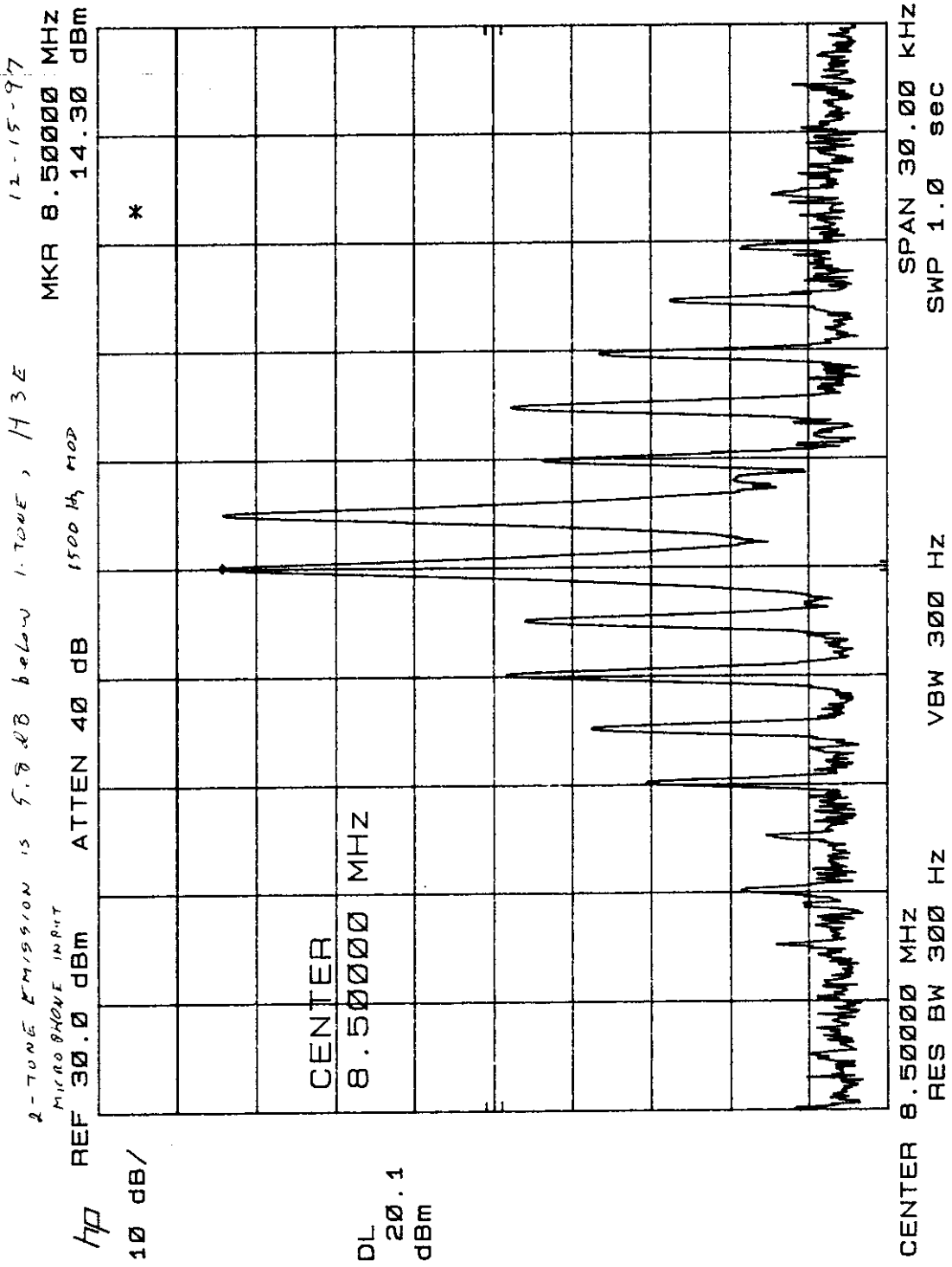

12-15-97
2-TONE AND 1-TONE EMISSIONS, H3E
MICROPHONE INPUT
1500 Hz MOD
MKR 3.00000 MHz
14.20 dBm
*
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
3.00000 MHz
DL
20.0
dBm
SPAN 30.00 kHz
SWP 1.0 sec
VBW 300 Hz
CENTER 3.00000 MHz
RES BW 300 Hz

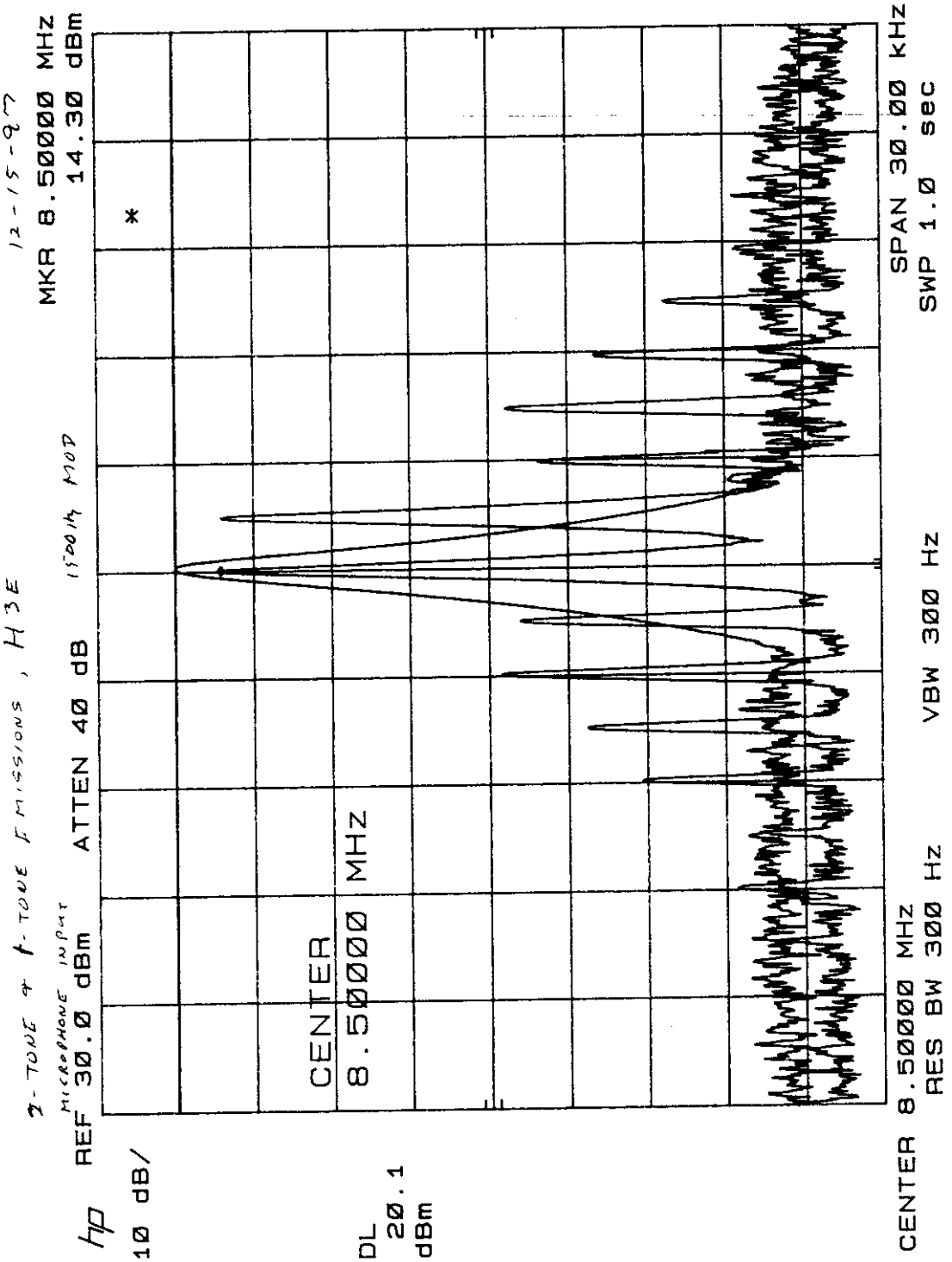

12-15-97
MKR 4.000000 MHz
14.10 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
4.000000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
RES BW 100 Hz
CENTER 4.000000 MHz
DL
20.1
dBm
1-TONE EMISSION IS 6 dB BELOW 1-TONE, H3E
MICROPHONE INPUT
1500Hz MOD

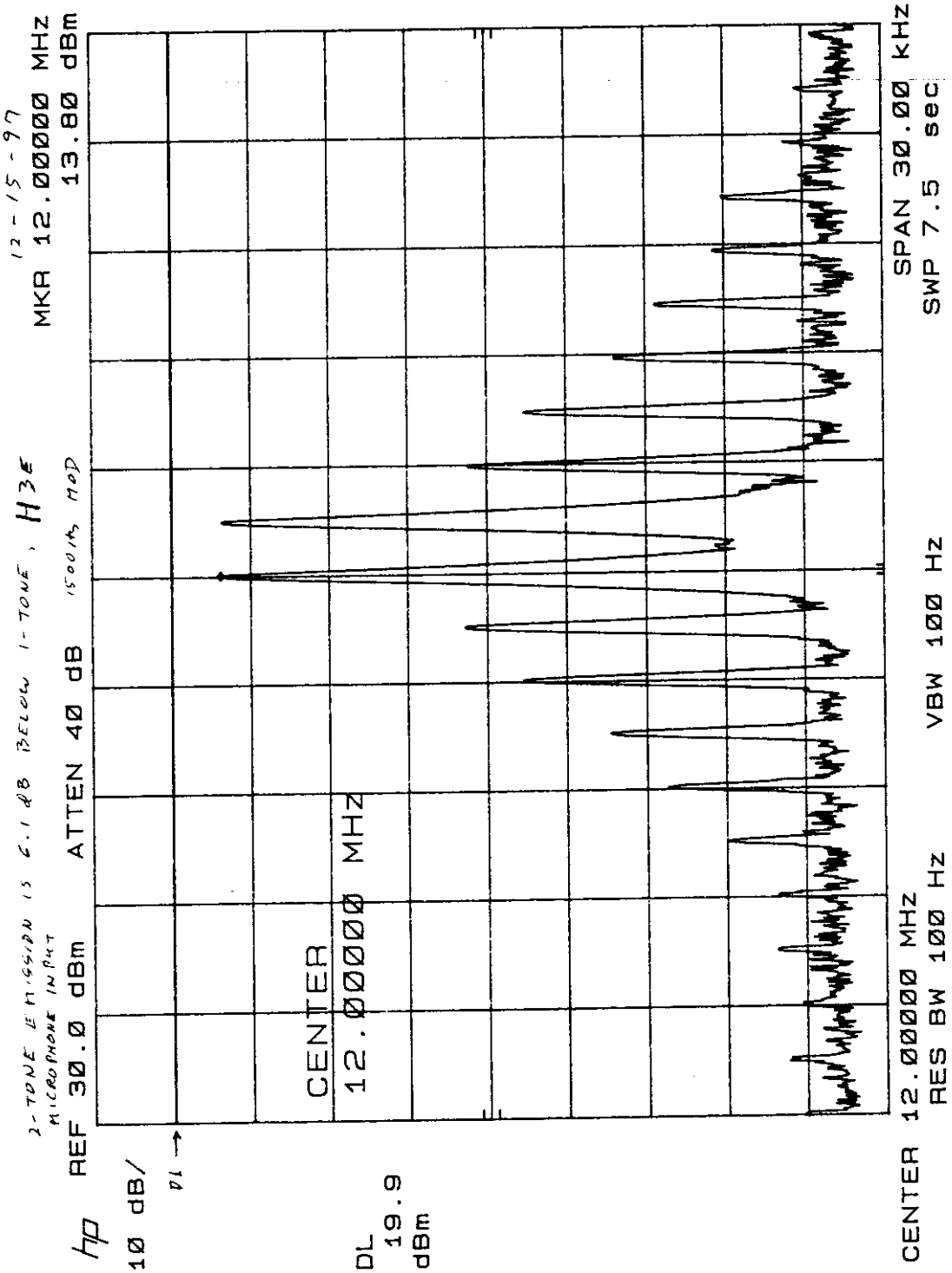

12-15-97
2-TONE AND 1-TONE EMISSIONS, H3E
MICROPHONE INPUT
1500 Hz MOD
MKR 4.000000 MHz
14.10 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
4.000000 MHz
DL
20.1
dBm
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 4.000000 MHz
RES BW 100 Hz

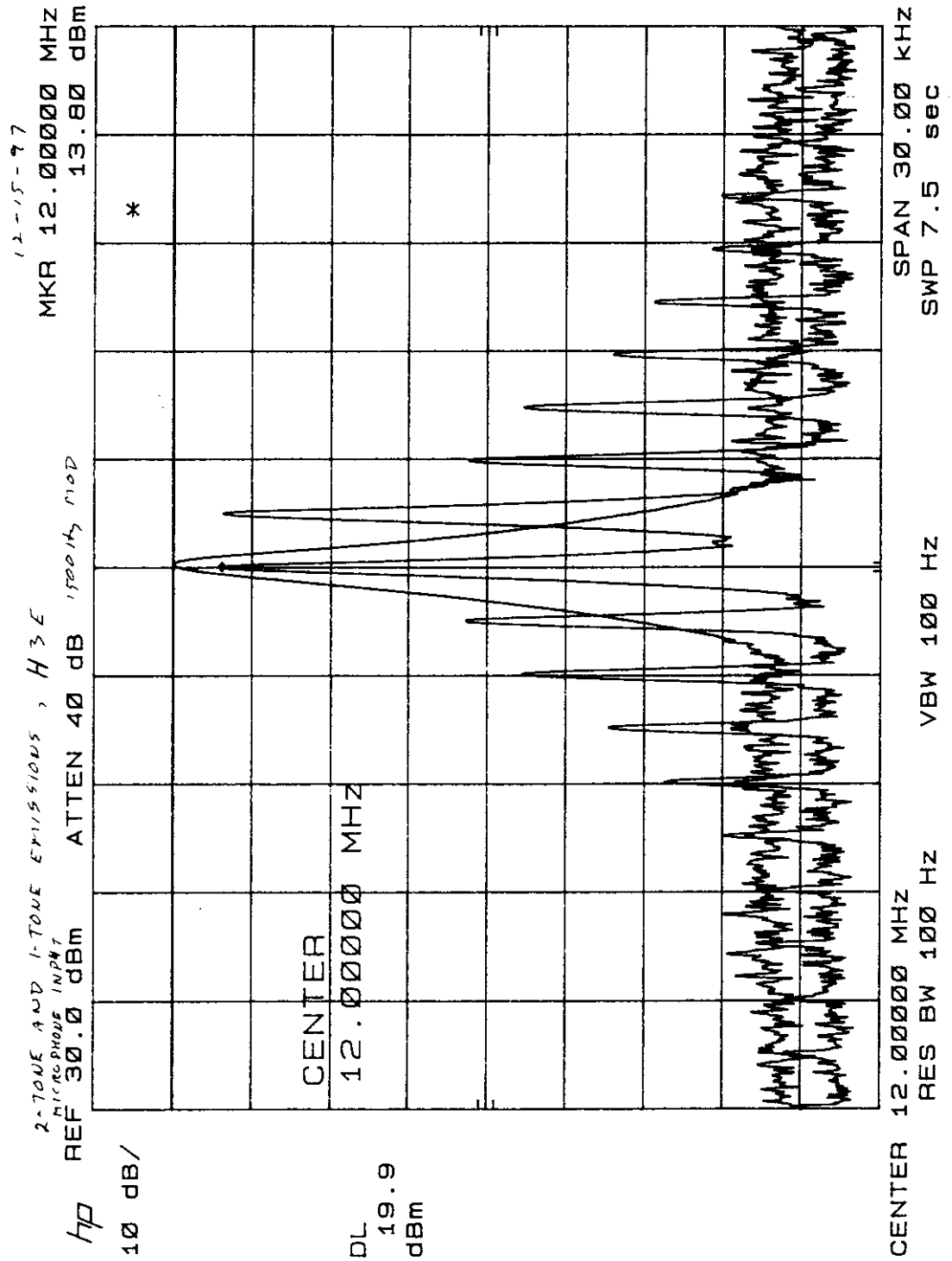

2-TONE AMB EMISSION IS 5.8 dB BELOW 1-TONE, H3E
MICROPHONE INPUT
12-15-97
MKR 6.00000 MHz
14.70 dBm
REF 30.0 dBm
ATTEN 40 dB
1500 Hz MOD
10 dB/
DL 20.5 dBm
CENTER 6.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 6.00000 MHz
RES BW 100 Hz

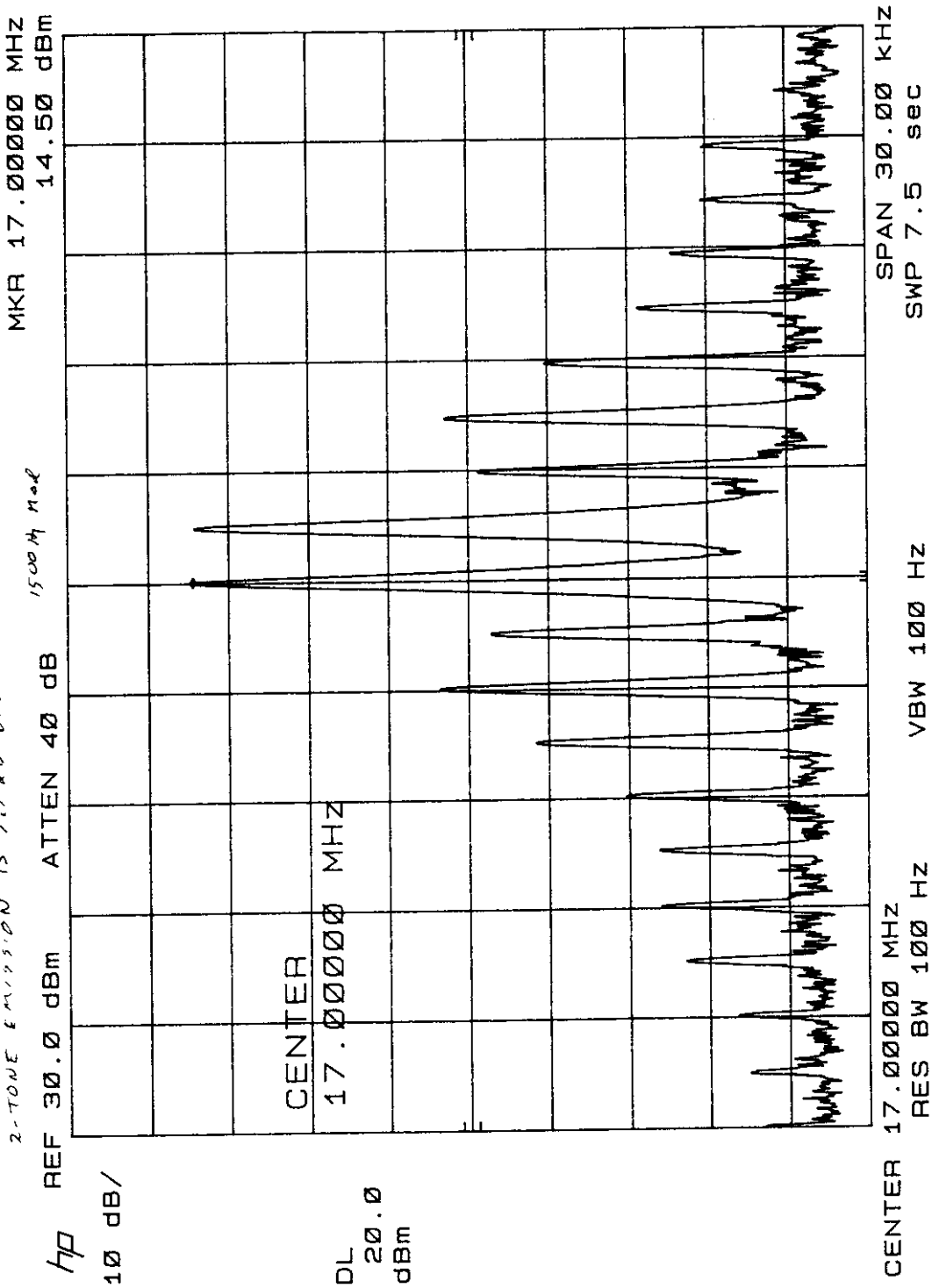

2-TONE AND 1-TONE EMISSIONS, H3E
MICROPHONE INPUT
12-15-97
hp
REF 30.0 dBm
ATTEN 40 dB
1500 Hz MOD
MKR 6.00000 MHz
14.70 dBm
10 dB/
DL 20.5 dBm
CENTER 6.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
RES BW 100 Hz
VBW 100 Hz
CENTER 6.00000 MHz

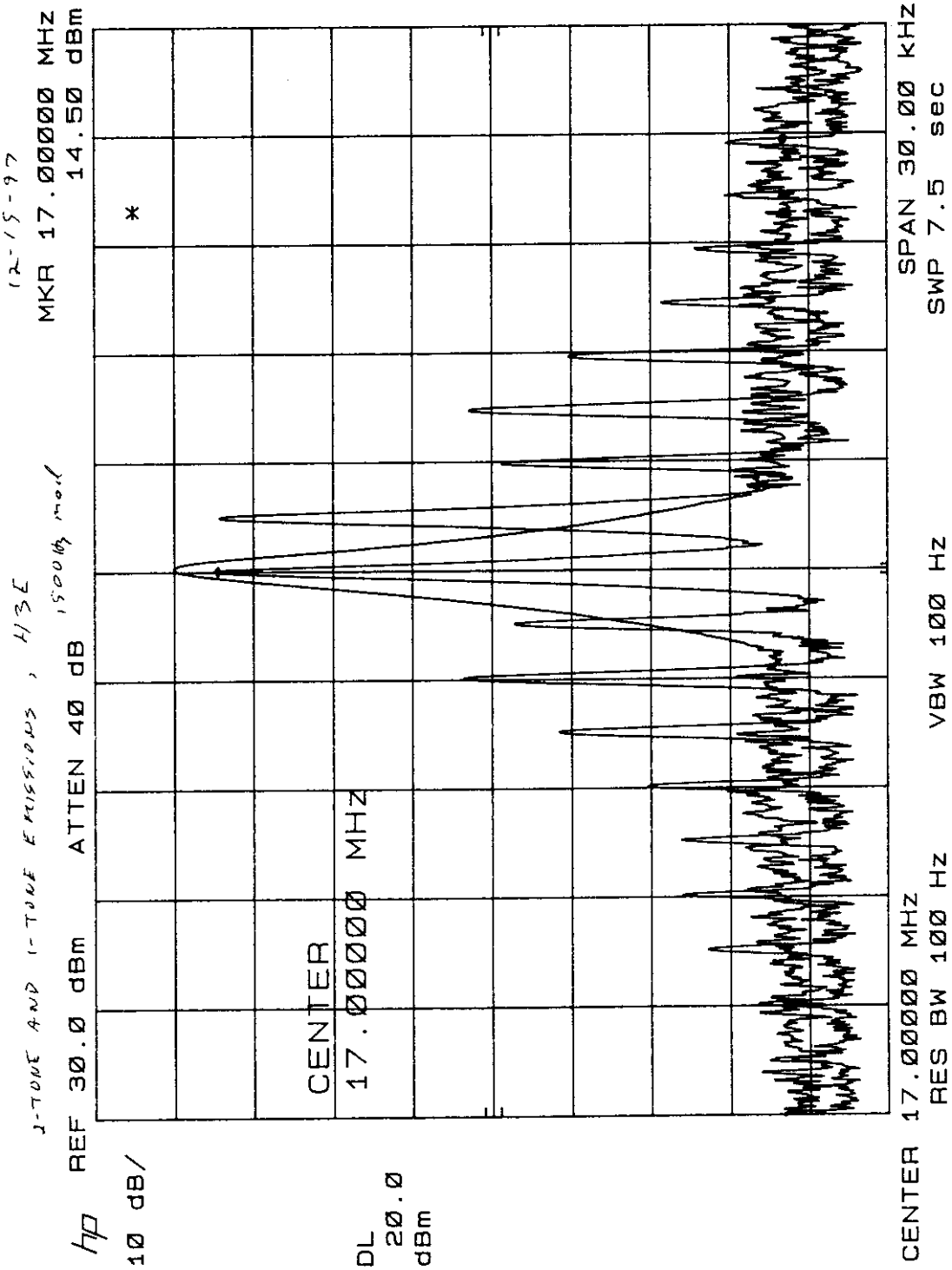

12-15-97
2-TONE EMISSION IS 5.9 dB below 1-TONE, 134E
MICROPHONE INPUT
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
1500 Hz MOD
MKR 8.50000 MHz
14.30 dBm
*
CENTER
8.50000 MHz
DL
20.1
dBm
SPAN 30.00 kHz
SWP 1.0 sec
VBW 300 Hz
CENTER 8.50000 MHz
RES BW 300 Hz

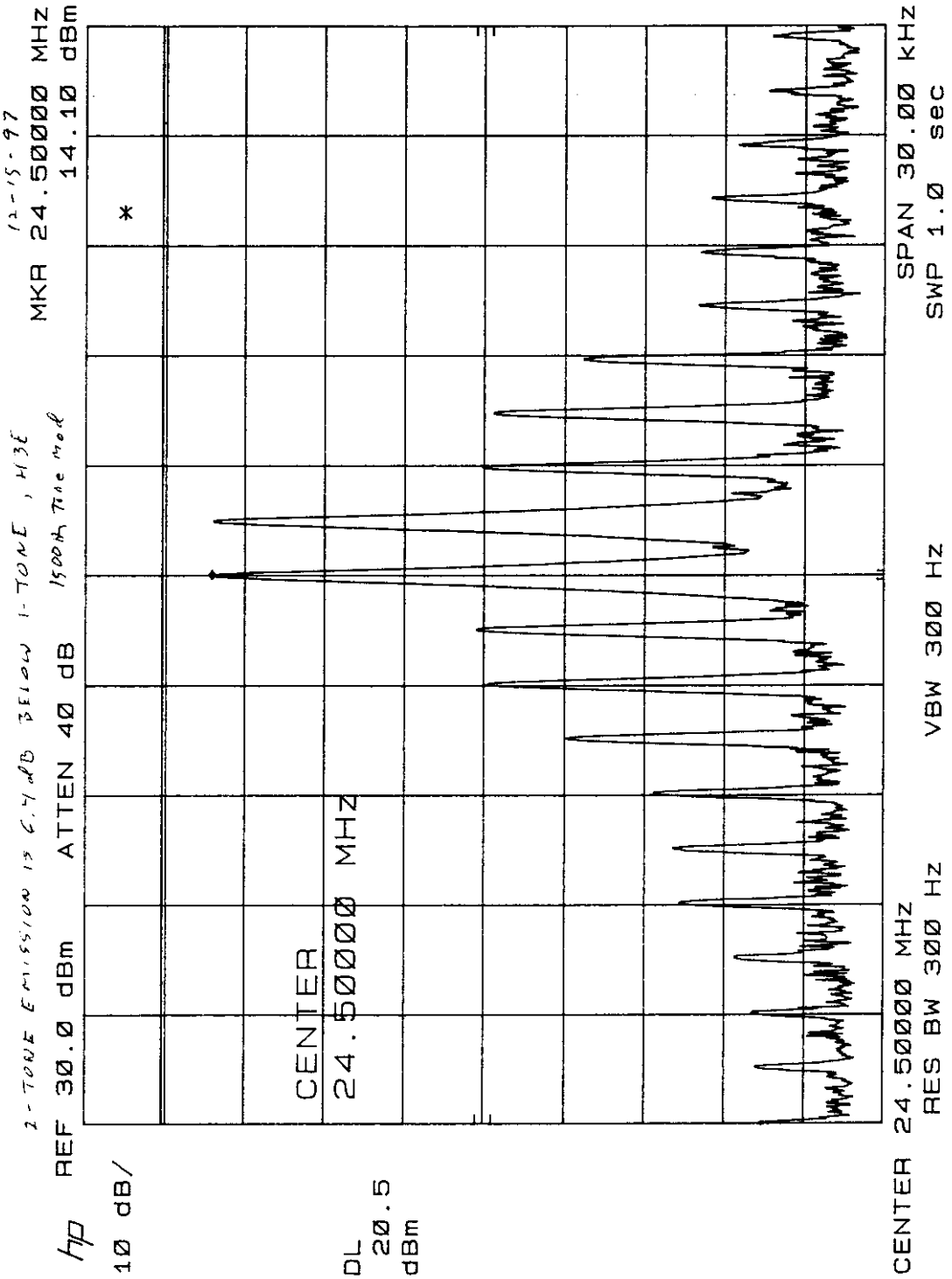

12-15-97
2-TONE & 1-TONE EMISSIONS, H3E
MICROPHONE INPUT
1500Hz MOD
hp
REF 30.0 dBm
ATTEN 40 dB
MKR 8.50000 MHz
14.30 dBm
10 dB/
DL 20.1 dBm
CENTER 8.50000 MHz
SPAN 30.00 kHz
SWP 1.0 sec
RES BW 300 Hz
VBW 300 Hz
CENTER 8.50000 MHz

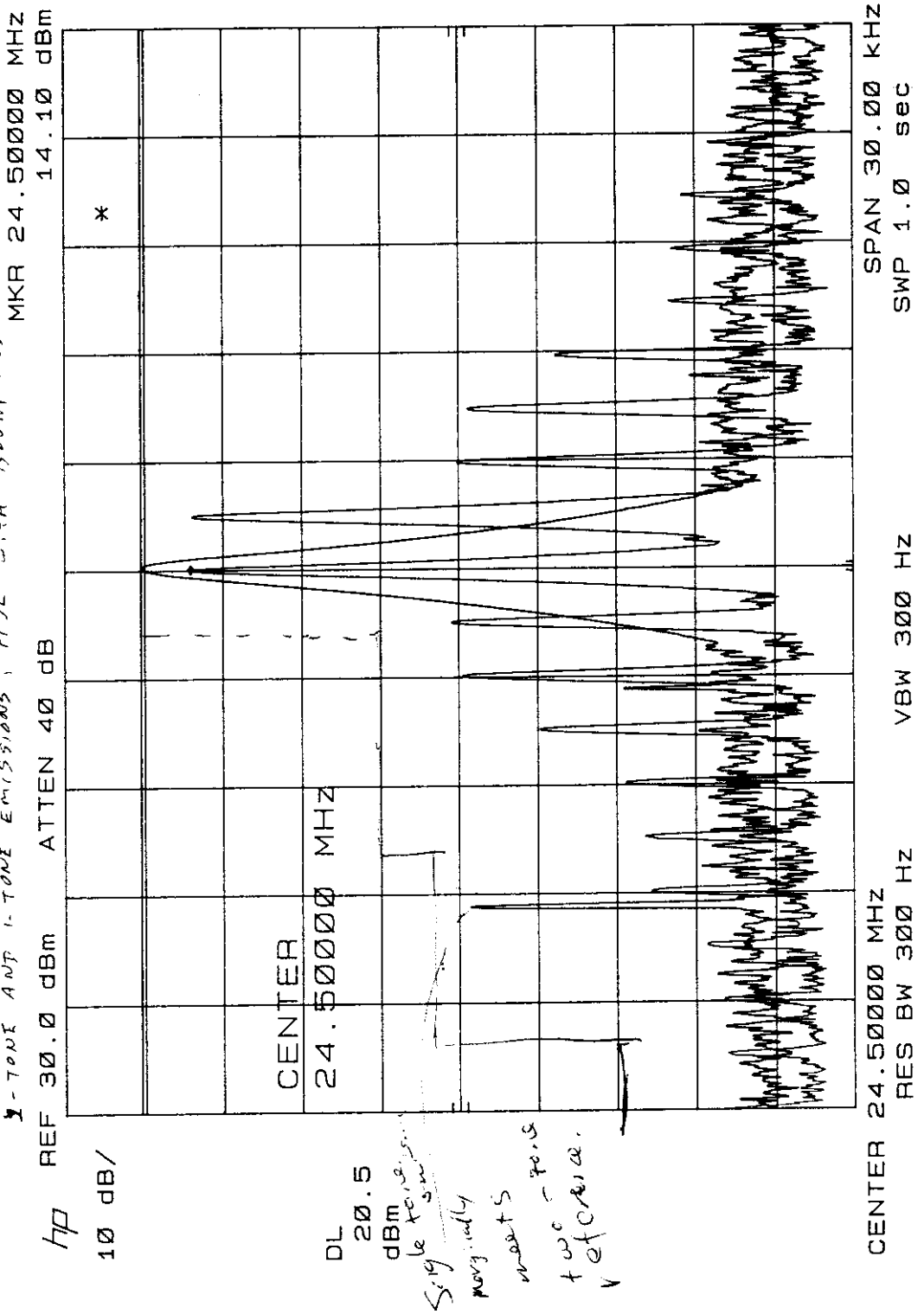

12-15-97
MKR 12.00000 MHz
13.80 dBm
2-TONE EMISSION IS 6.1 dB BELOW 1-TONE, H3E
MICROPHONE INPUT
1500Hz MOD
REF 30.0 dBm
ATTEN 40 dB
10 dB/
D1
CENTER
12.00000 MHz
DL
19.9
dBm
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 12.00000 MHz
RES BW 100 Hz

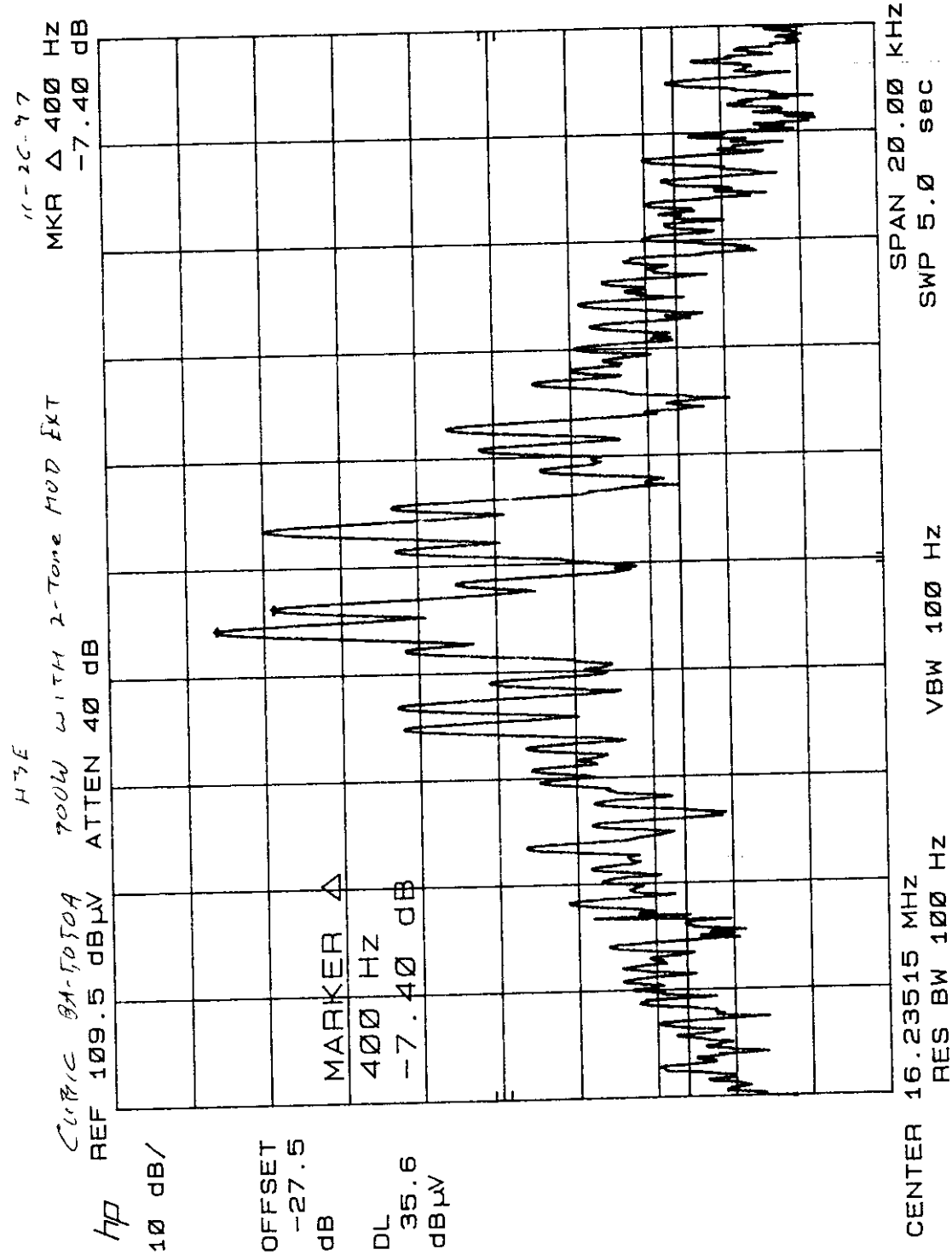

12-15-97
MKR 12.000000 MHz
13.80 dBm
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE AND 1-TONE EMISSIONS, H3E
MICROPHONE INPUT
REF 30.0 dBm
ATTEN 40 dB
1500 Hz MOD
CENTER
12.000000 MHz
VBW 100 Hz
RES BW 100 Hz
10 dB/
DL
19.9
dBm
CENTER 12.000000 MHz

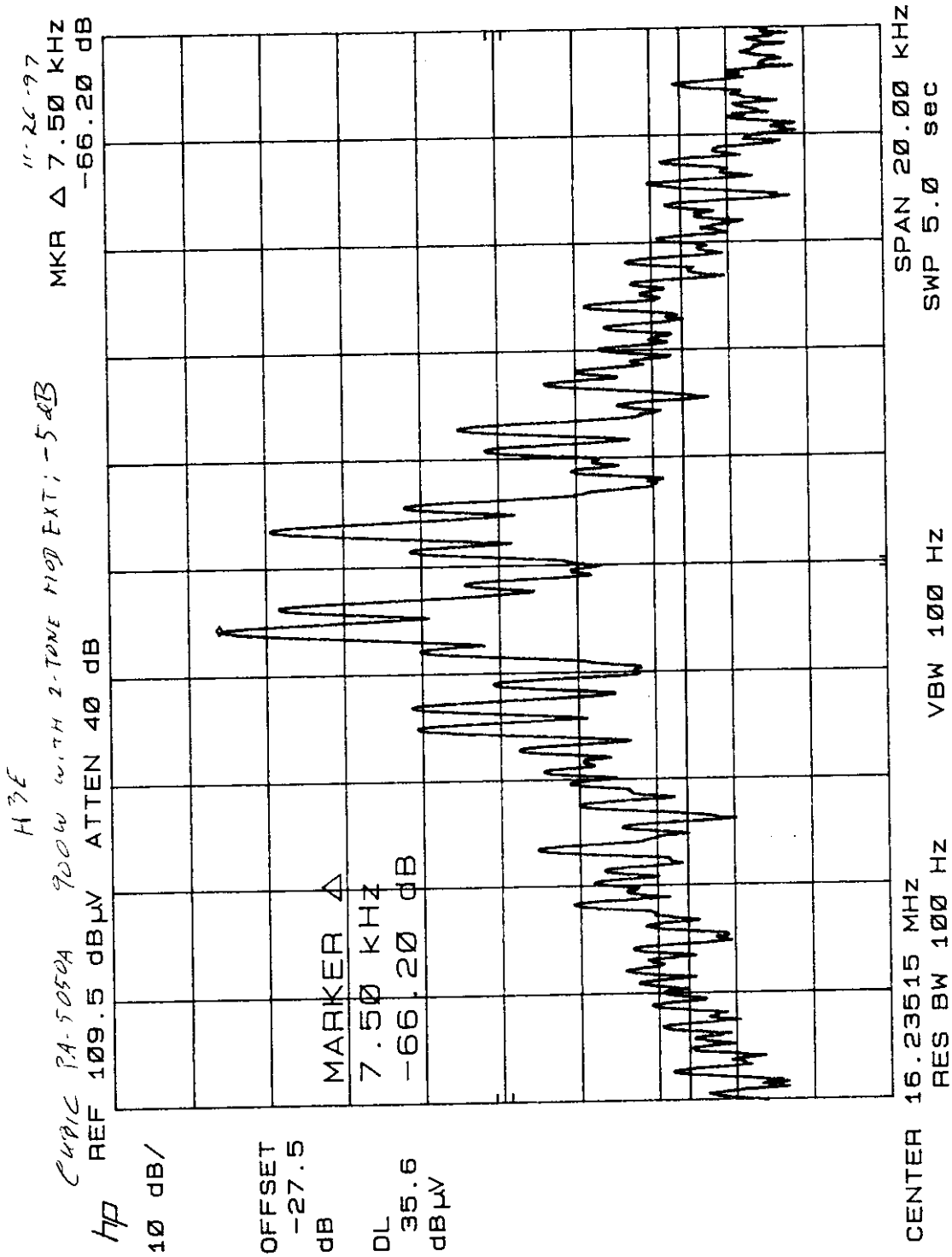

12-15-97
MKR 17.00000 MHz
14.50 dBm
2-TONE EMISSION IS 5.5 dB BELOW 1-TONE, H3E
1500 Hz mod
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
17.00000 MHz
DL
20.0
dBm
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 17.00000 MHz
RES BW 100 Hz

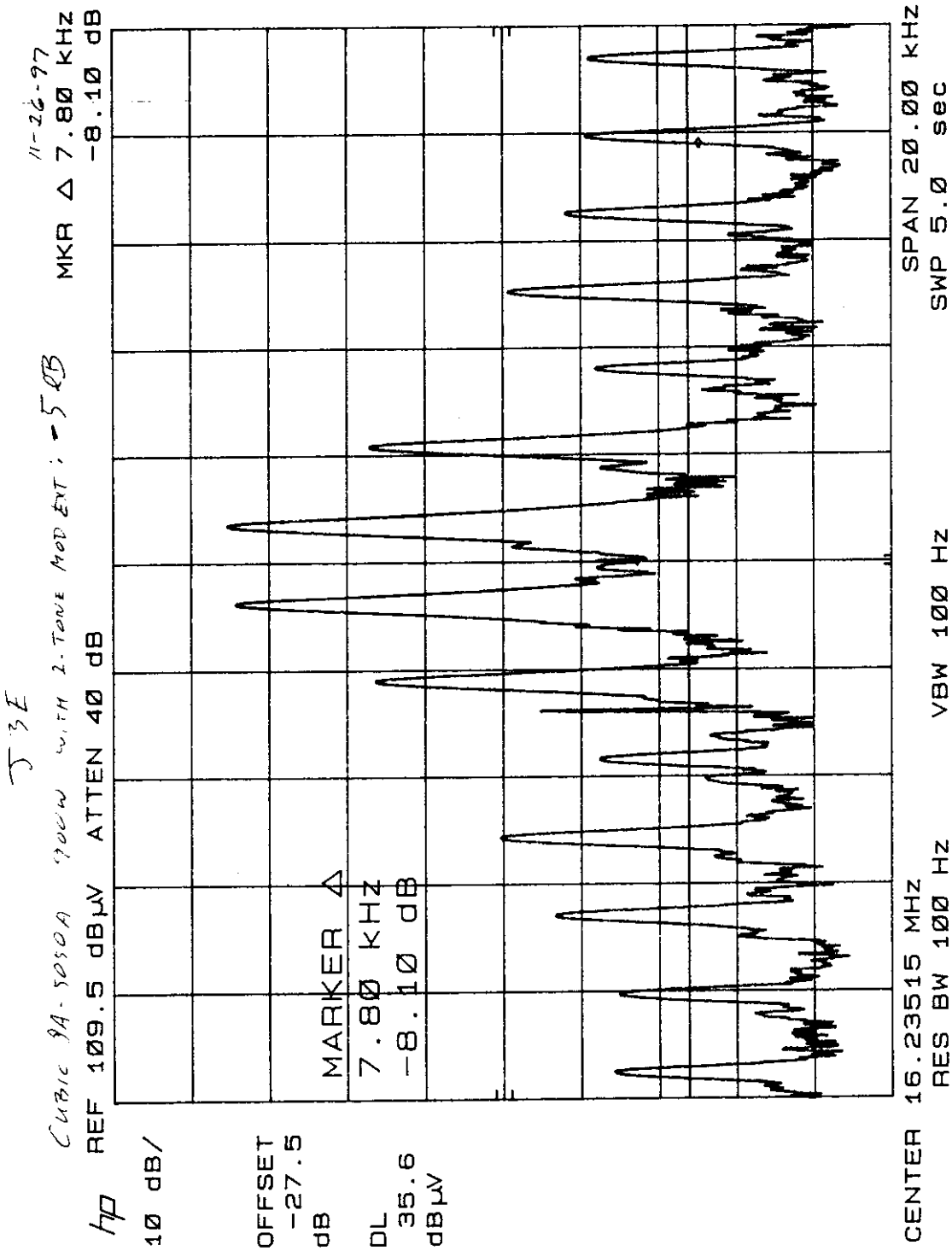

12-15-97
MKR 17.00000 MHz
14.50 dBm
*
SPAN 30.00 kHz
SWP 7.5 sec
3-TONE AND 1-TONE EMISSIONS, H3E
1500Hz mod
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
CENTER
17.00000 MHz
DL
20.0
dBm
CENTER 17.00000 MHz
RES BW 100 Hz
VBW 100 Hz

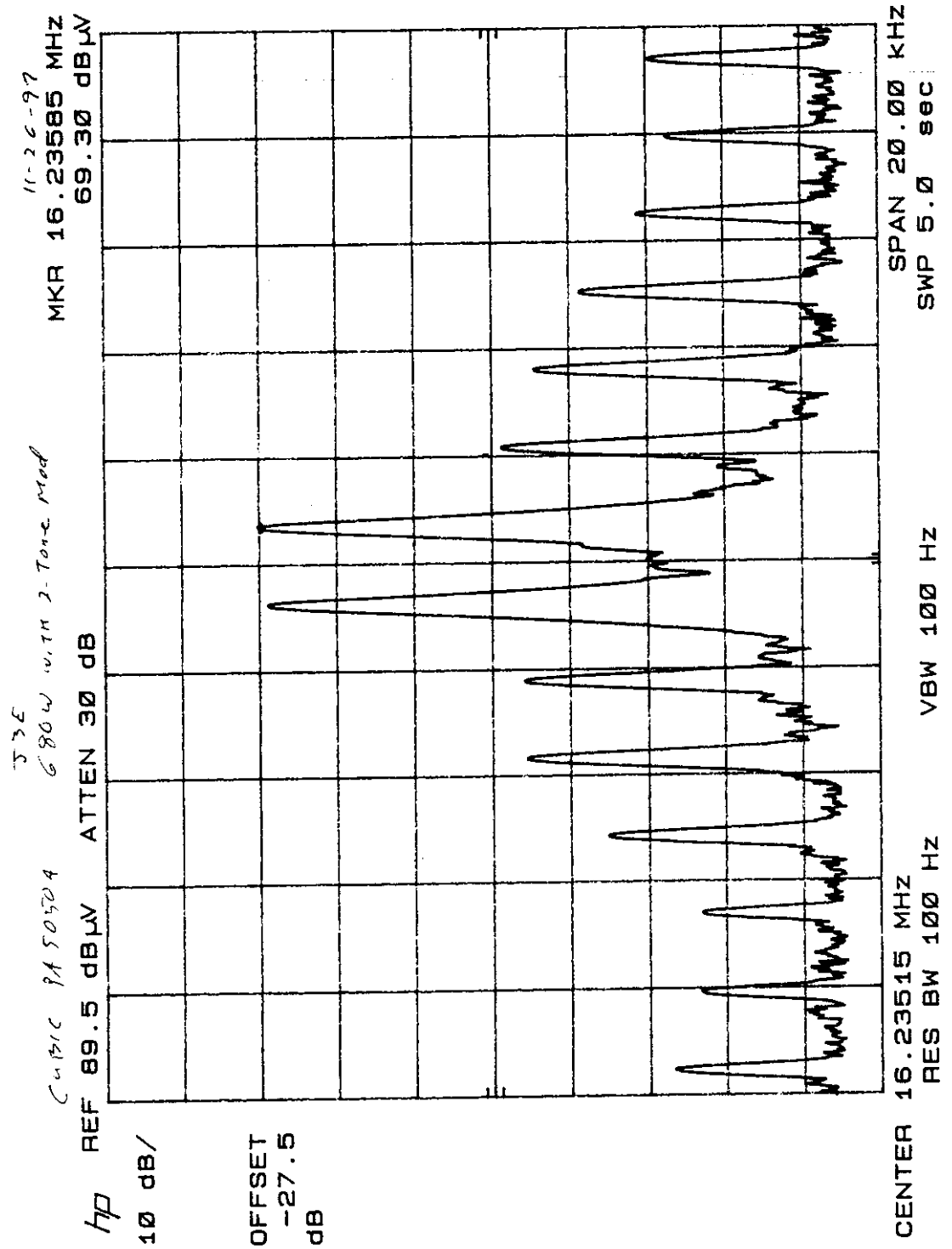

12-15-97
2-TONE EMISSION IS 6.7dB BELOW 1-TONE, H3E
1500Hz Tone Mod
MKR 24.50000 MHz
14.10 dBm
*
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL 20.5 dBm
CENTER 24.50000 MHz
SPAN 30.00 kHz
SWP 1.0 sec
VBW 300 Hz
CENTER 24.50000 MHz
RES BW 300 Hz

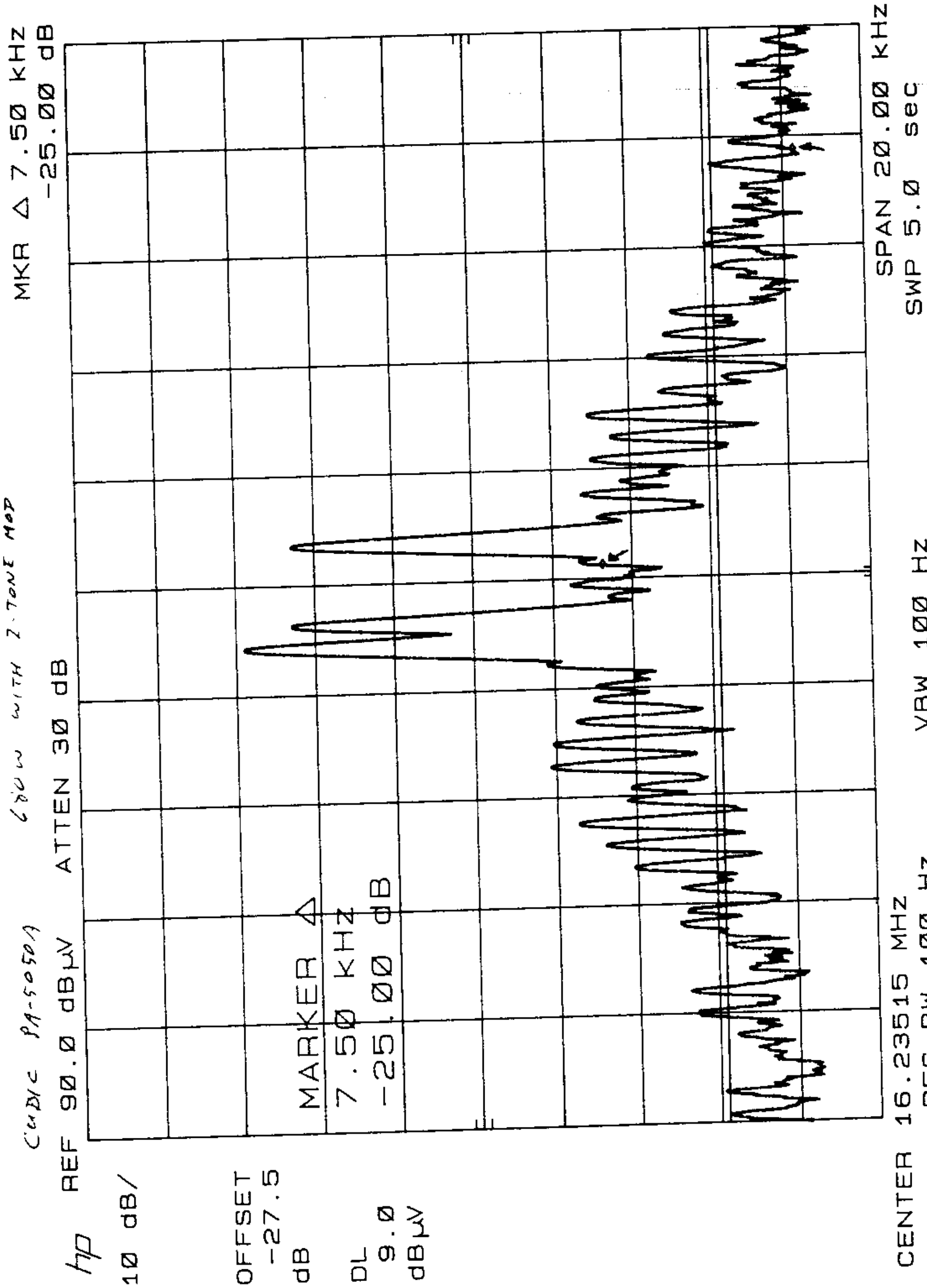

2-TONE AMP 1-TONE EMISSIONS, H3E WITH 1500Hz MOD
12-15-97
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MKR 24.500000 MHz
14.10 dBm
CENTER
24.500000 MHz
SPAN 30.00 kHz
SWP 1.0 sec
VBW 300 Hz
CENTER 24.500000 MHz
RES BW 300 Hz
DL
20.5
dBm


11-26-97
MKR Δ 400 Hz
-7.40 dB
SPAN 20.00 kHz
SWP 5.0 sec
Cubic BA-5050A 700W WITH 2-Tone MOD EXT
REF 109.5 dBµV
ATTEN 40 dB
VBW 100 Hz
MARKER Δ
400 Hz
-7.40 dB
hp
10 dB/
OFFSET
-27.5
dB
DL
35.6
dBµV
CENTER 16.23515 MHz
RES BW 100 Hz


11-26-97
MKR Δ 7.50 kHz
-66.20 dB
SPAN 20.00 kHz
SWP 5.0 sec
Cubic PA-5050A 200W with 2-Tone Mod EXT; -5dB
H3E
REF 109.5 dBµV
ATTEN 40 dB
VBW 100 Hz
MARKER Δ
7.50 kHz
-66.20 dB
10 dB/
OFFSET -27.5 dB
DL 35.6 dBµV
CENTER 16.23515 MHz
RES BW 100 Hz

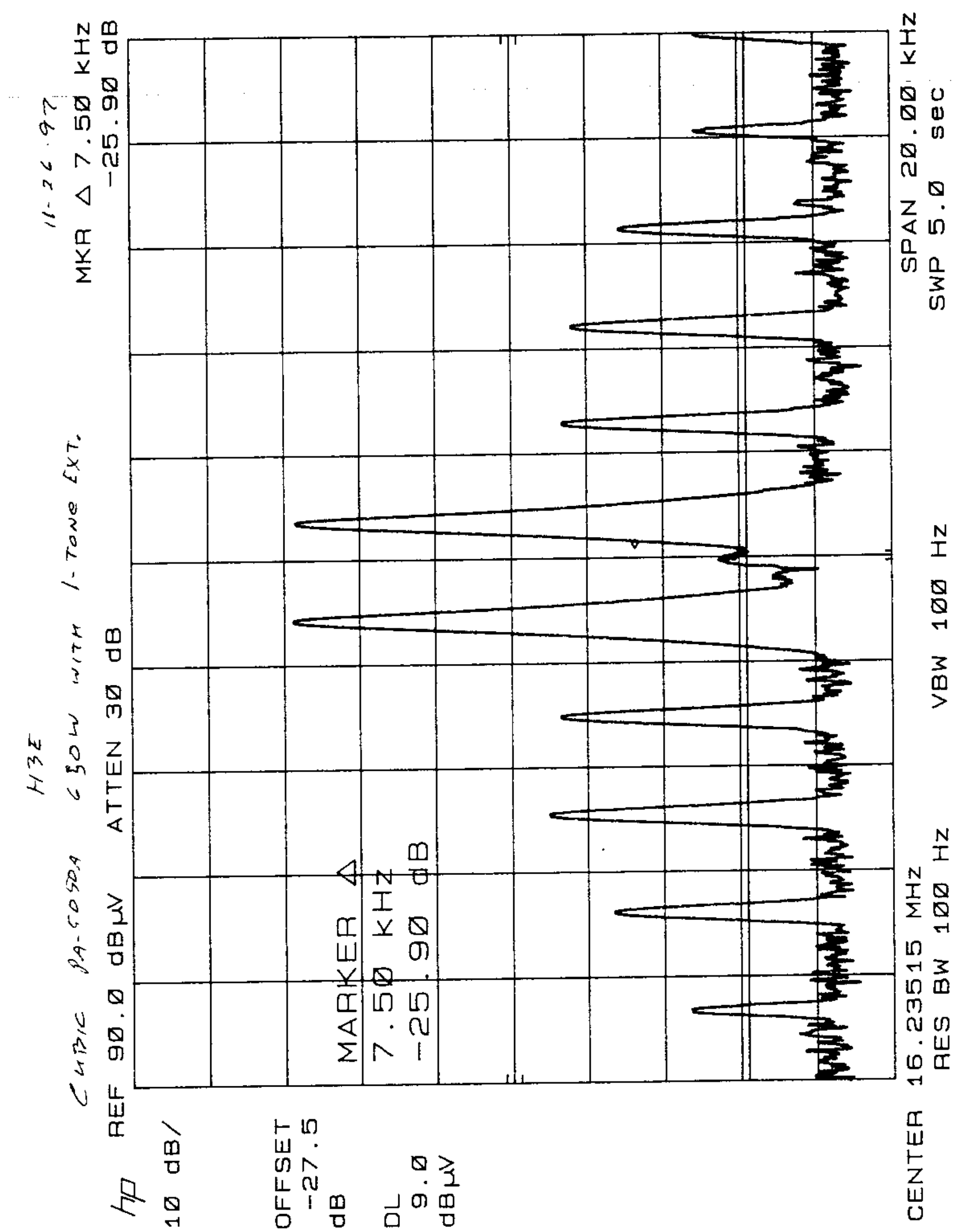

11-26-97
MKR Δ 7.80 kHz
-8.10 dB
REF 109.5 dBµV
ATTEN 40 dB
10 dB/
OFFSET
-27.5
dB
DL
35.6
dBµV
MARKER Δ
7.80 kHz
-8.10 dB
SPAN 20.00 kHz
SWP 5.0 sec
VBW 100 Hz
CENTER 16.23515 MHz
RES BW 100 Hz

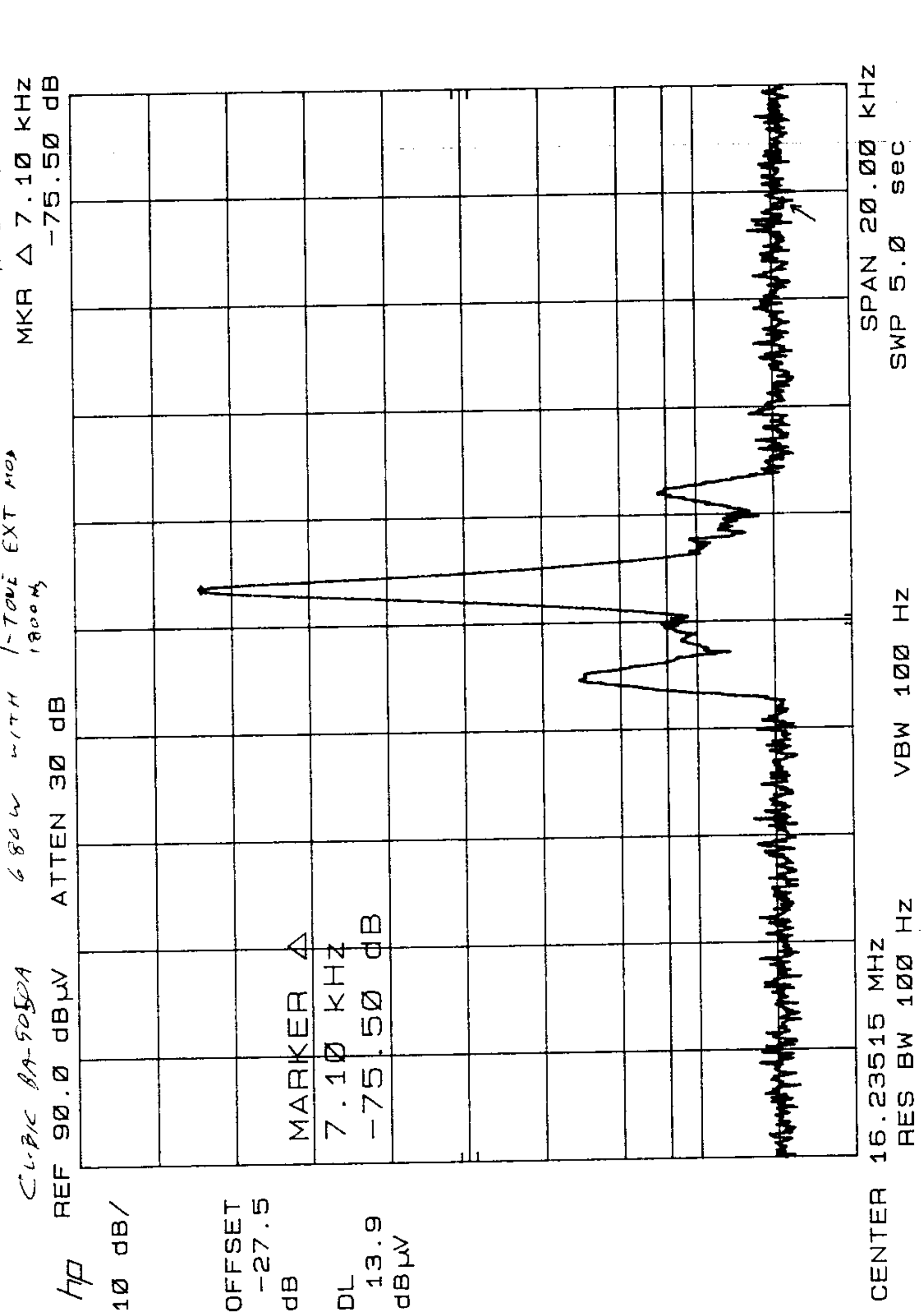

11-26-97
MKR 16.23585 MHz
69.30 dBµV
SPAN 20.00 kHz
SWP 5.0 sec
Cubic PA 50504
806 with 2-Tone Mod
REF 89.5 dBµV
ATTEN 30 dB
VBW 100 Hz
10 dB/
OFFSET -27.5 dB
CENTER 16.23515 MHz
RES BW 100 Hz



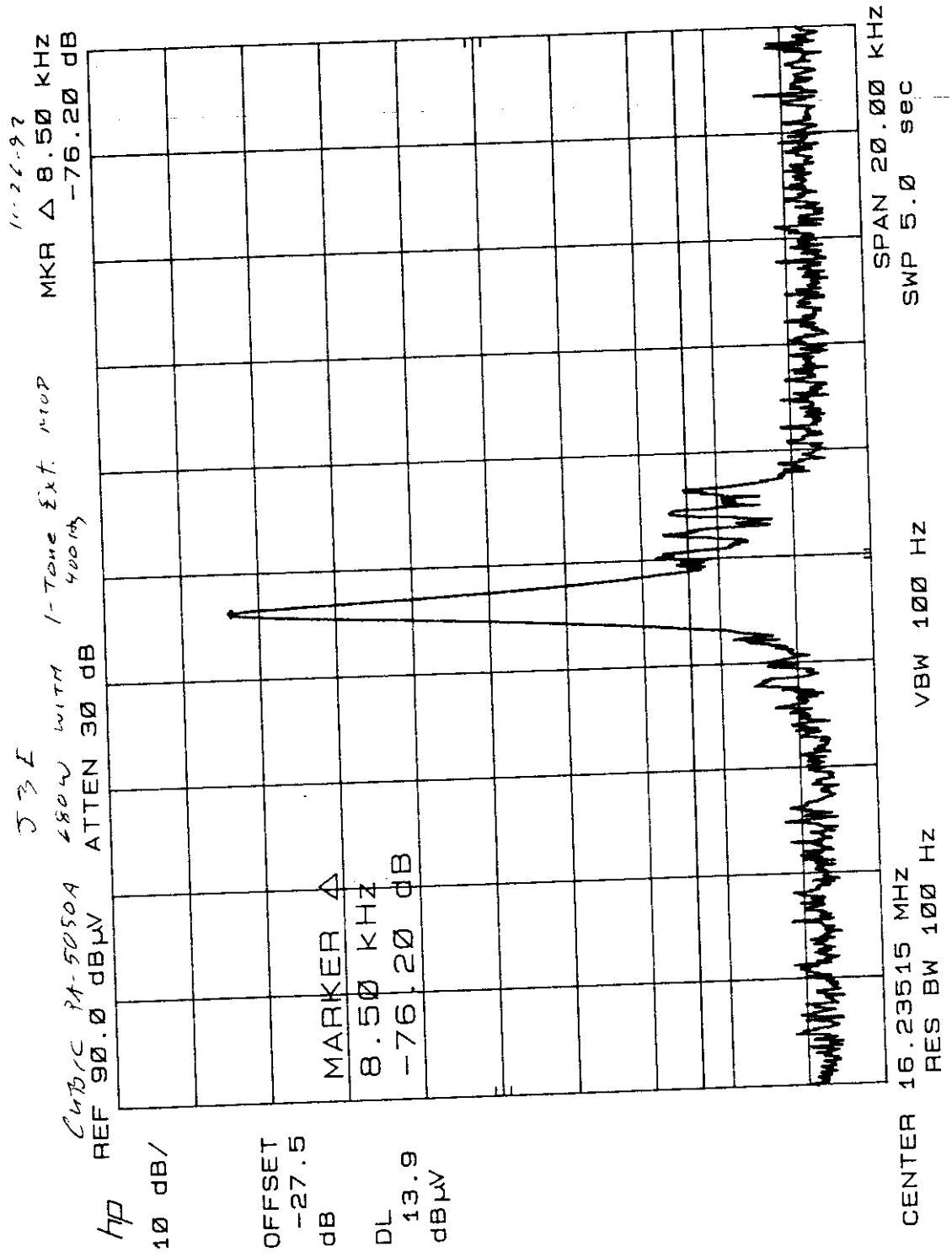
hp
REF 90.0 dBµV
ATTEN 30 dB
MKR Δ 7.50 kHz
-25.00 dB
10 dB/
OFFSET
-27.5
dB
DL
9.0
dBµV
MARKER Δ
7.50 kHz
-25.00 dB
CENTER 16.23515 MHz
SPAN 20.00 kHz
RES BW 100 Hz
VBW 100 Hz
SWP 5.0 sec
H3E
11-26-97

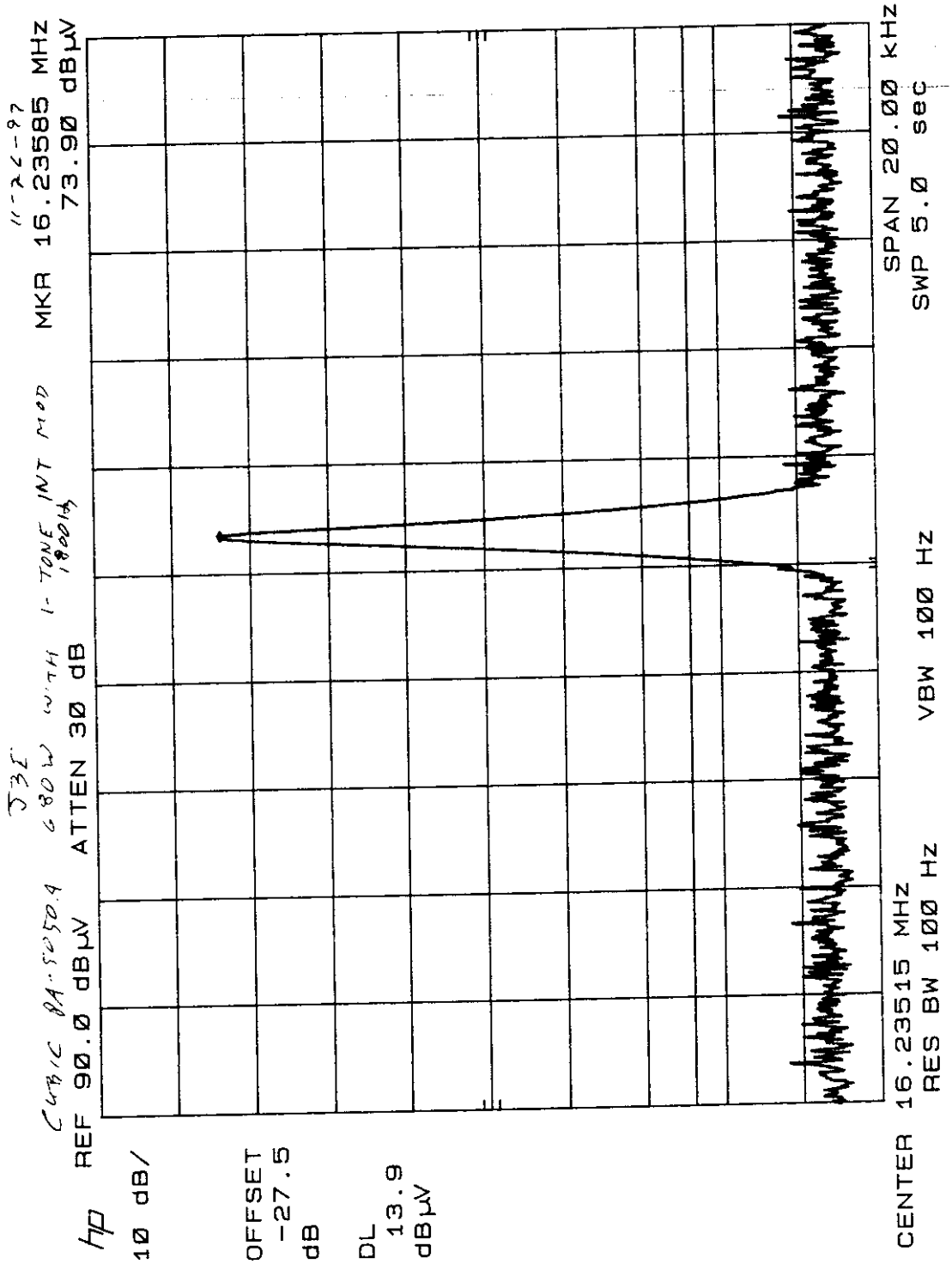
Electromagnetic Engineering Services, Inc.			11696 Sorrento Valley Road, Suite. F, San Diego, CA 92121 (619) 259-4940 Voice (619) 259-7170 Fax		
Revision	**Date**	**Document Name**	**Document #**	**FCC ID#**	**Page #**
A	4/13/98	Cubic Communications CTX-1000 Part 87 Type Acceptance Report	98-046	NVSCTX-1000	124

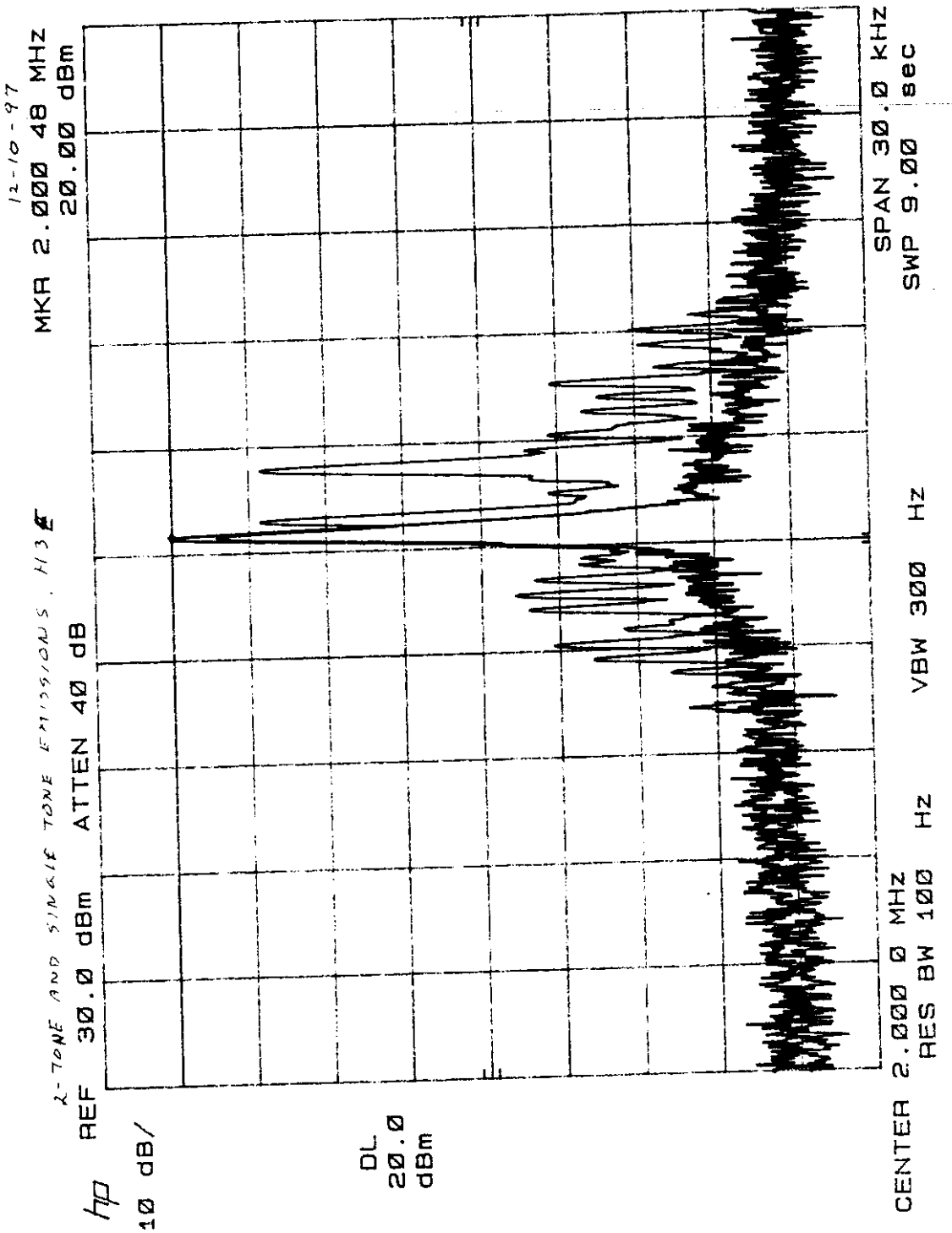


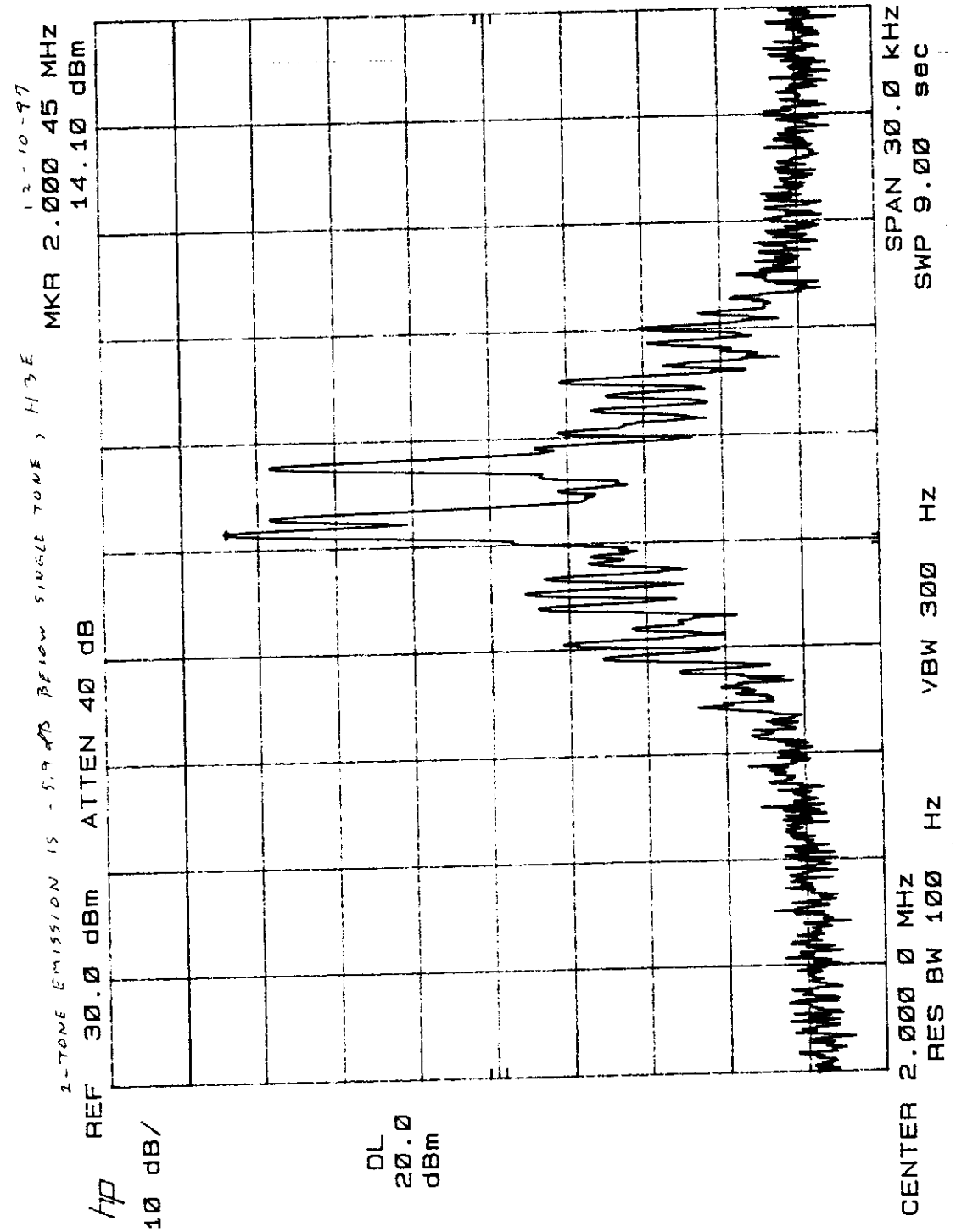


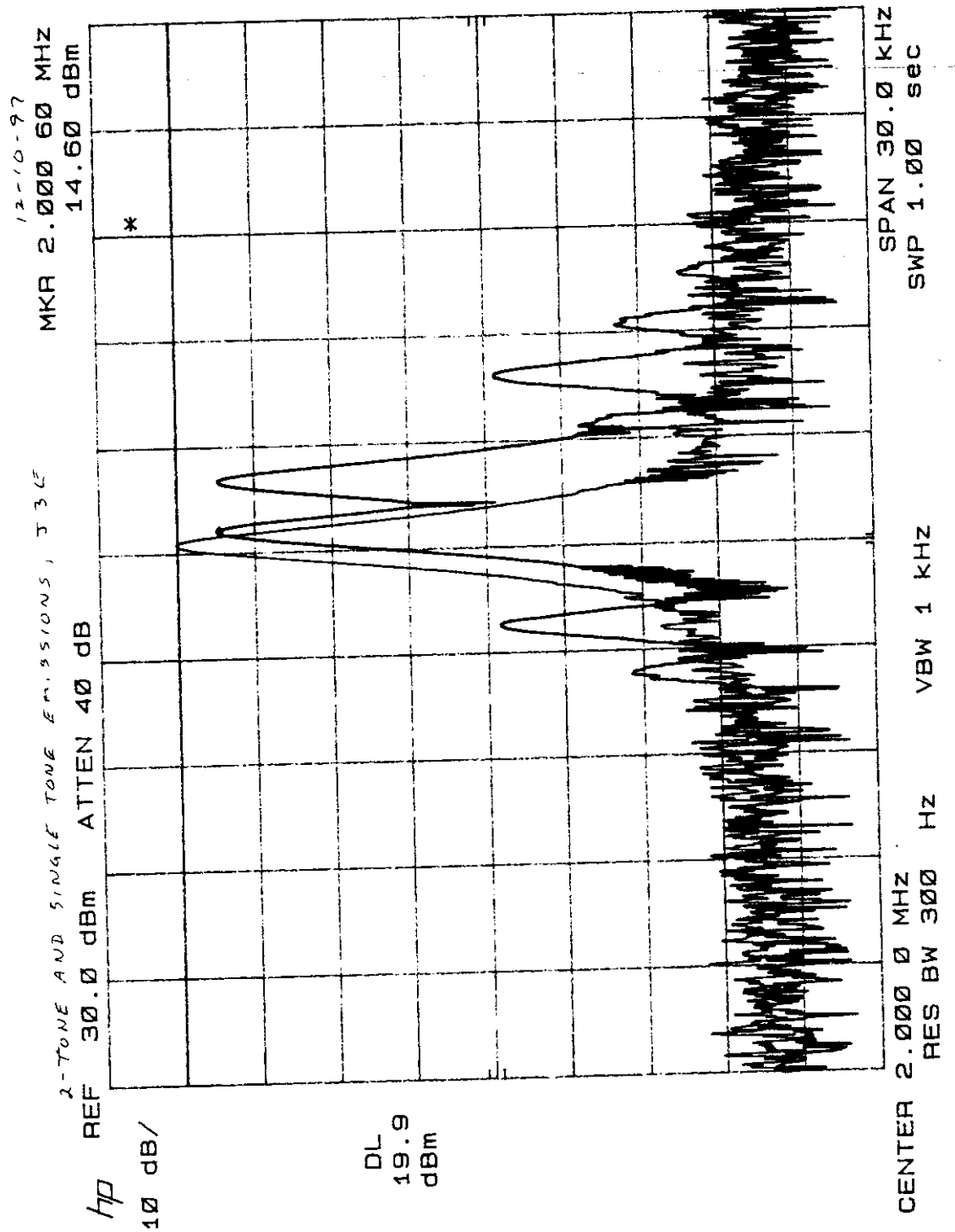
hp
REF 90.0 dBµV
ATTEN 30 dB
MKR Δ 7.10 kHz
-75.50 dB
10 dB/
OFFSET
-27.5
dB
DL
13.9
dBµV
MARKER Δ
7.10 kHz
-75.50 dB
CENTER 16.23515 MHz
SPAN 20.00 kHz
RES BW 100 Hz
VBW 100 Hz
SWP 5.0 sec

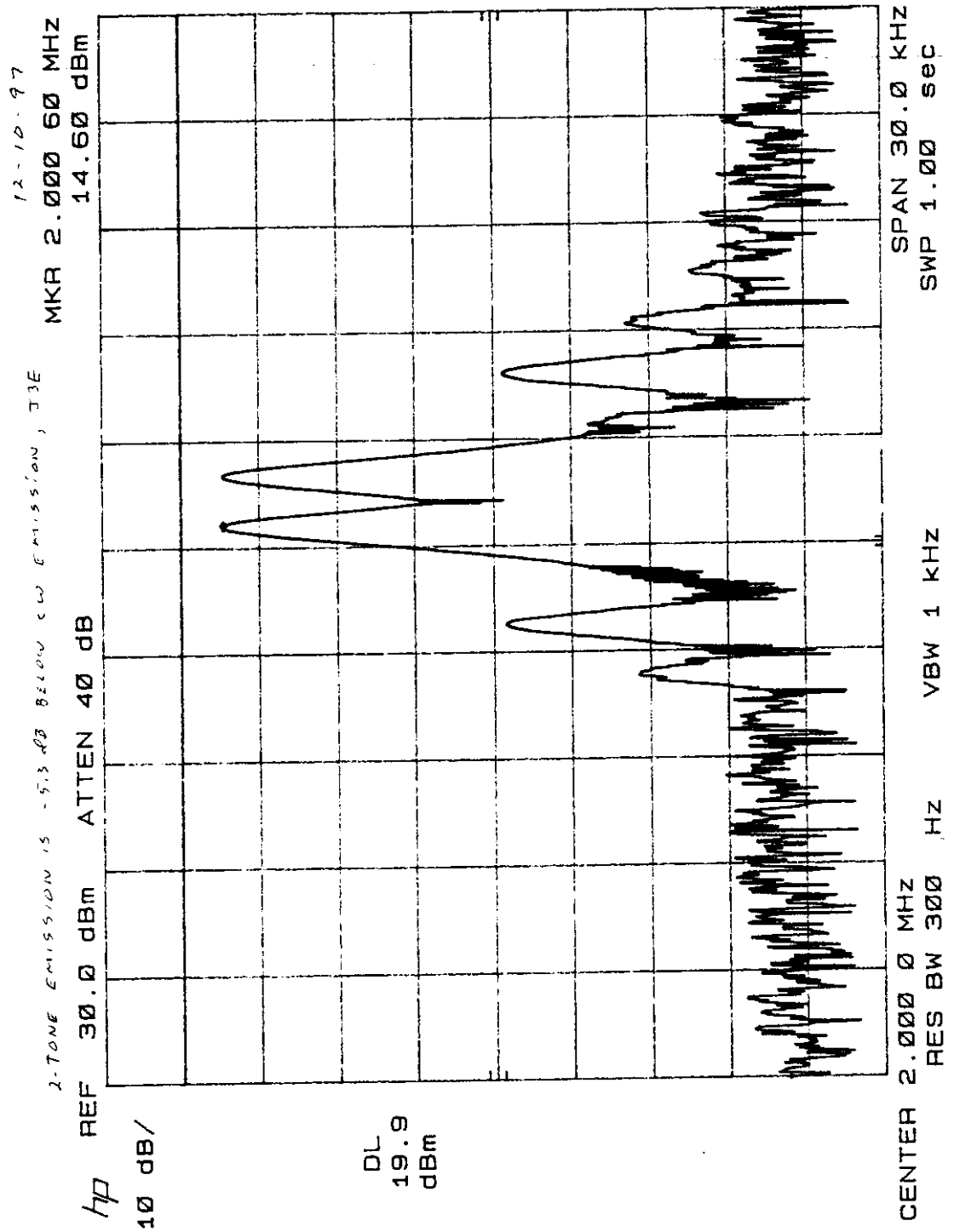

11-26-97
MKR Δ 8.50 kHz
-76.20 dB
SPAN 20.00 kHz
SWP 5.0 sec
Cubic PA-5050A 4804 with 1-Tone Ext. mod
400 Hz
REF 90.0 dBµV
ATTEN 30 dB
VBW 100 Hz
MARKER Δ
8.50 kHz
-76.20 dB
hp
10 dB/
OFFSET
-27.5
dB
DL
13.9
dBµV
CENTER 16.23515 MHz
RES BW 100 Hz

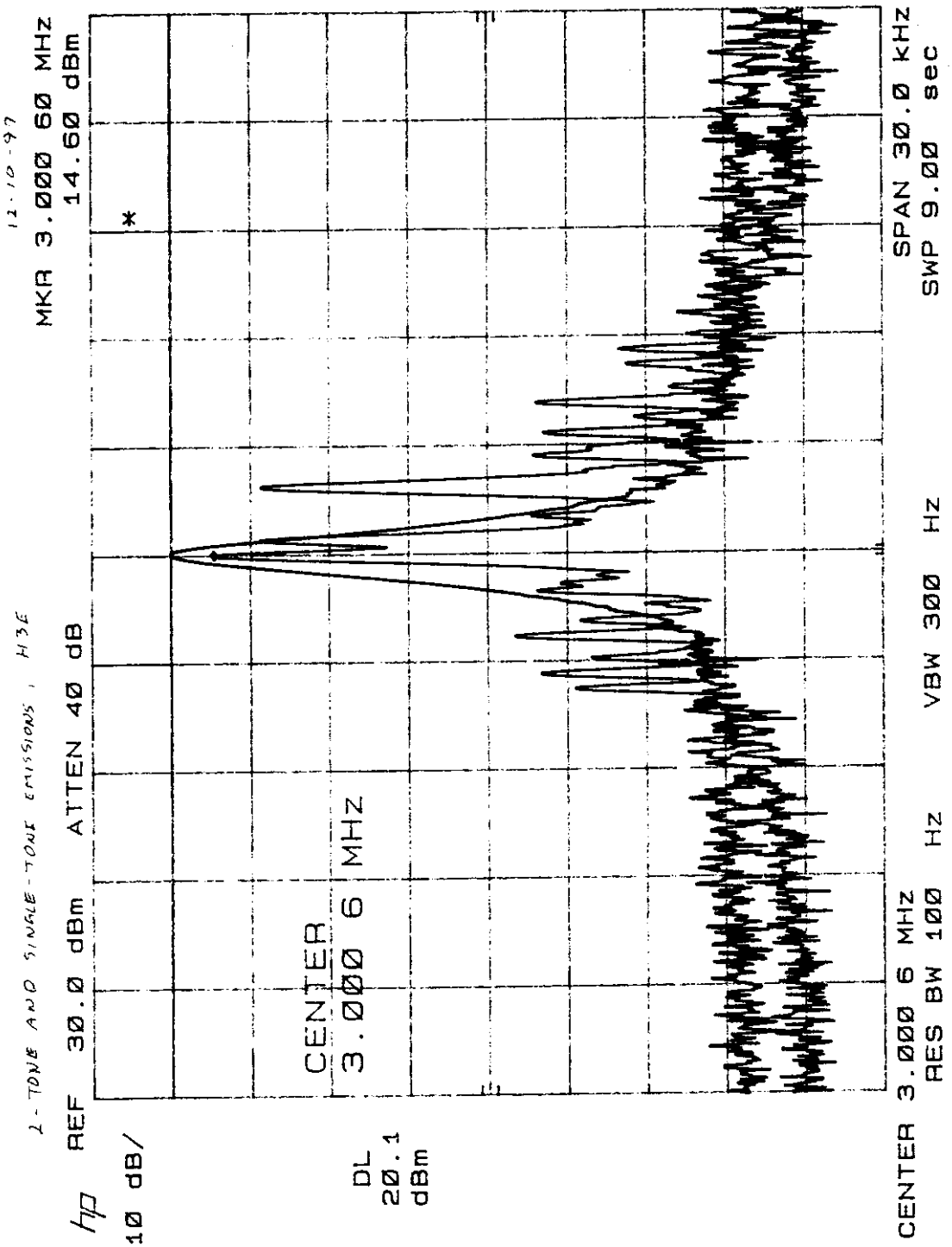

MKR 16.23585 MHz
73.90 dBµV
SPAN 20.00 kHz
SWP 5.0 sec
REF 90.0 dBµV
ATTEN 30 dB
VBW 100 Hz
10 dB/
OFFSET
-27.5
dB
DL
13.9
dBµV
CENTER 16.23515 MHz
RES BW 100 Hz

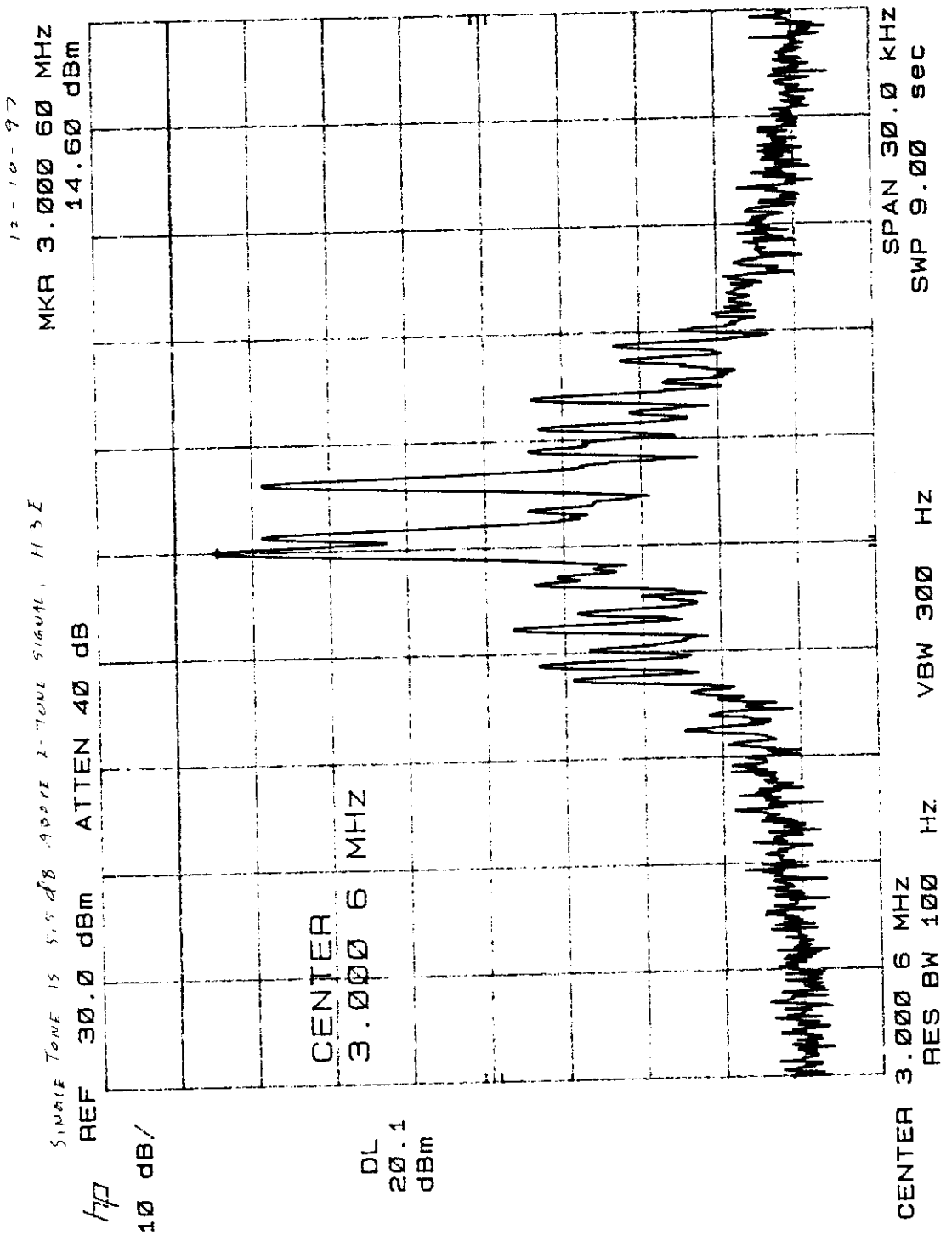

12-10-97
MKR 2.000 48 MHz
20.00 dBm
2-TONE AND SINGLE TONE EMISSIONS, H3E
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
20.0
dBm
SPAN 30.0 kHz
SWP 9.00 sec
VBW 300 Hz
CENTER 2.000 0 MHz
RES BW 100 Hz

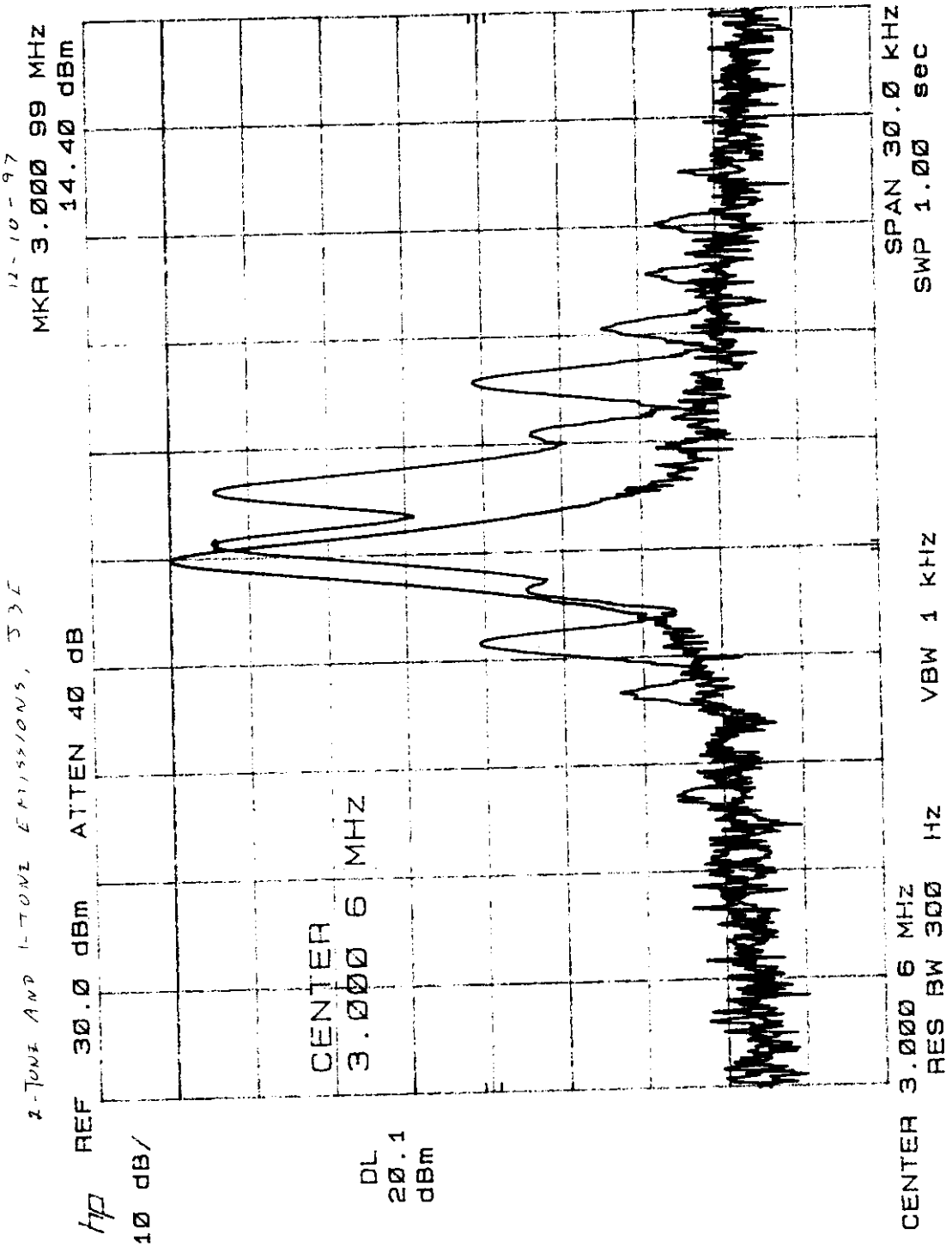

12-10-97
2-TONE EMISSION IS -5.9 dB BELOW SINGLE TONE, H3E
MKR 2.000 45 MHz
14.10 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
20.0
dBm
SPAN 30.0 kHz
SWP 9.00 sec
VBW 300 Hz
CENTER 2.000 0 MHz
RES BW 100 Hz

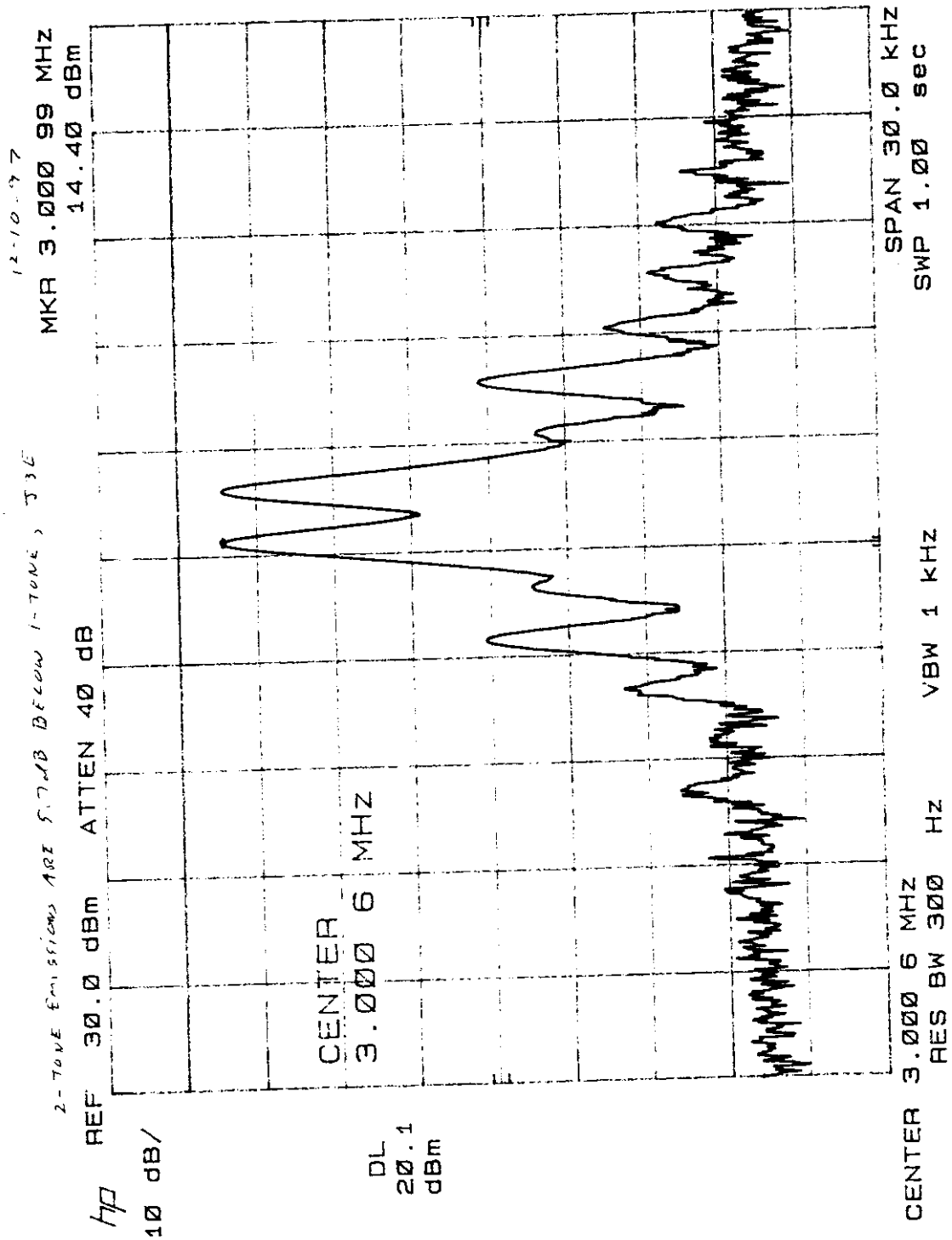

12-10-97
MKR 2.000 60 MHz
14.60 dBm
SPAN 30.0 kHz
SWP 1.00 sec
2-TONE AND SINGLE TONE EMISSIONS, 3 OF 3
REF 30.0 dBm
ATTEN 40 dB
VBW 1 kHz
10 dB/
DL
19.9
dBm
CENTER 2.000 0 MHz
RES BW 300 Hz

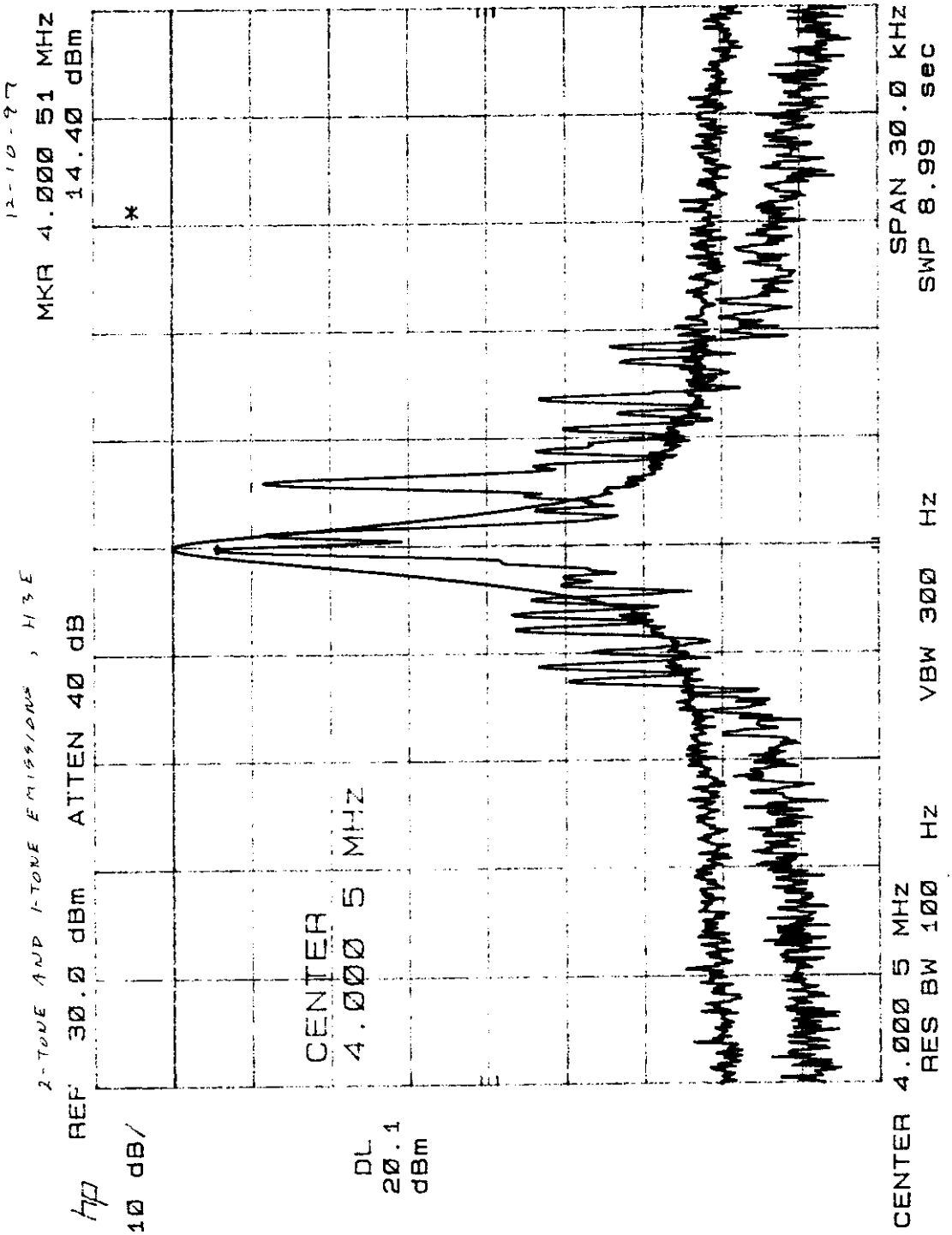

12-10-97
2-TONE EMISSION IS -53 dB BELOW CW EMISSION, TJE
MKR 2.000 60 MHz
14.60 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
19.9
dBm
SPAN 30.0 kHz
SWP 1.00 sec
VBW 1 kHz
CENTER 2.000 0 MHz
RES BW 300 Hz

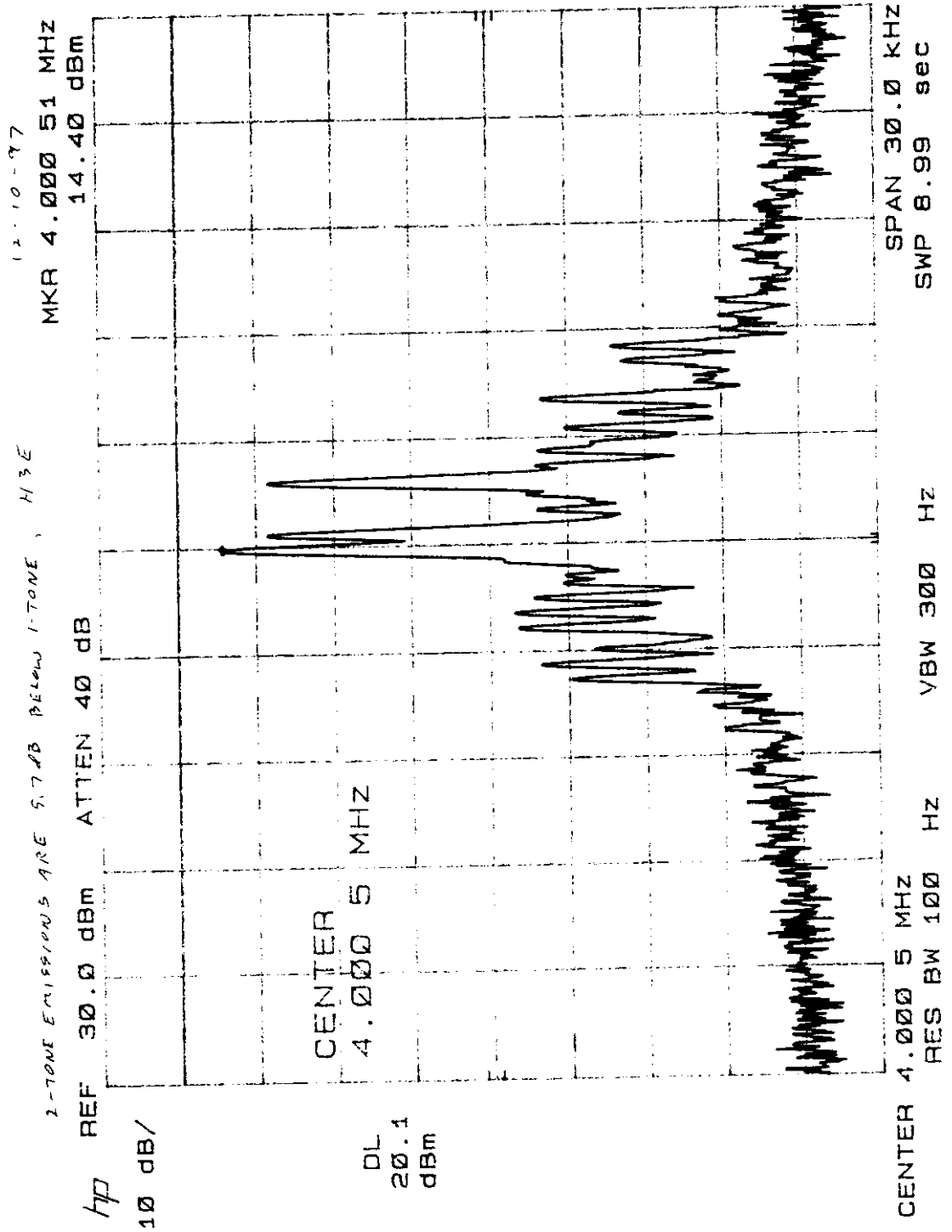

12-10-97
MKR 3.000 60 MHz
14.60 dBm
SPAN 30.0 kHz
SWP 9.00 sec
2-TONE AND SINGLE-TONE EMISSIONS, H3E
REF 30.0 dBm
ATTEN 40 dB
CENTER 3.000 6 MHz
VBW 300 Hz
10 dB/
DL 20.1 dBm
CENTER 3.000 6 MHz
RES BW 100 Hz

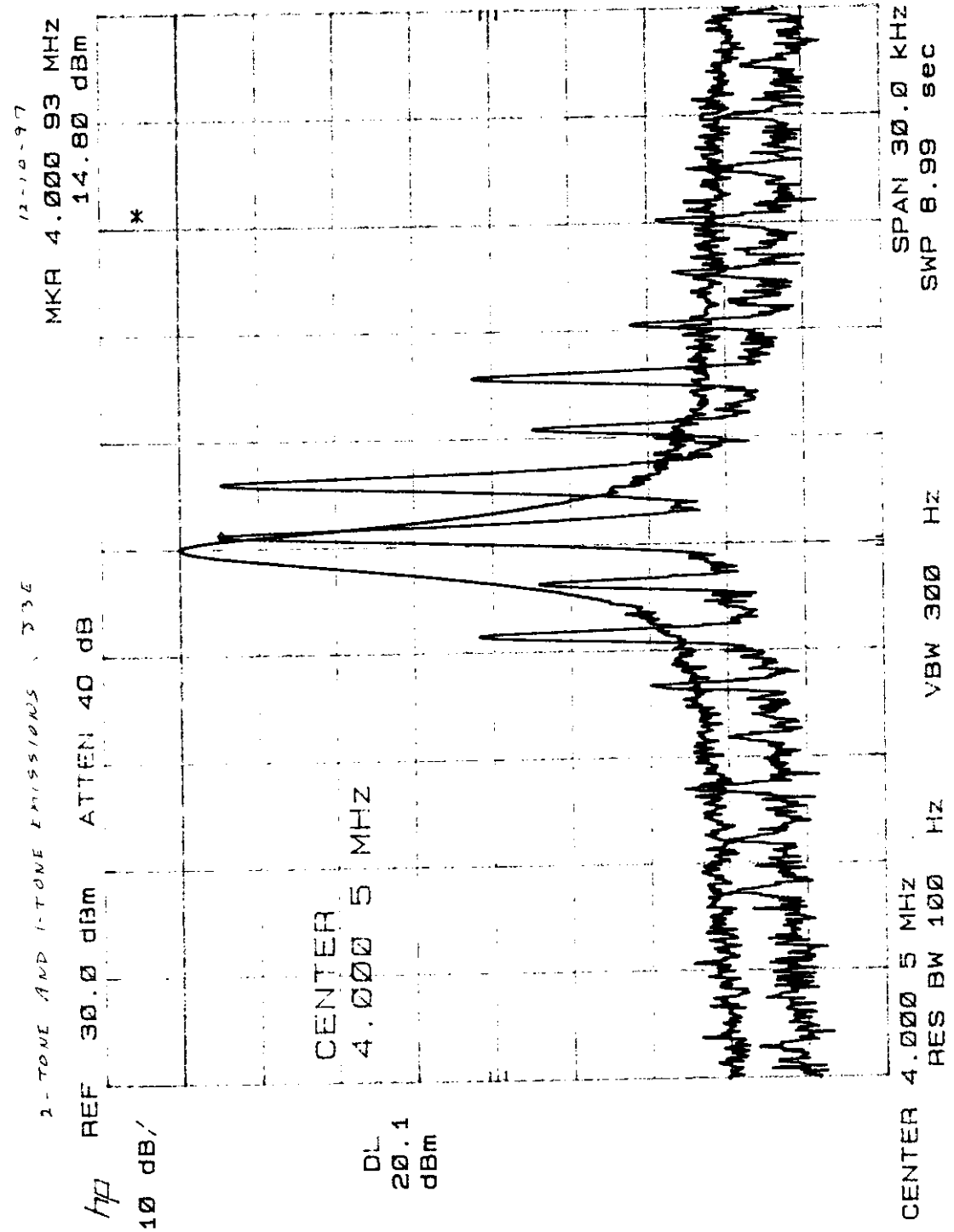

12-10-97
MKR 3.000 60 MHz
14.60 dBm
SPAN 30.0 kHz
SWP 9.00 sec
SINGLE TONE IS 5.5 dB ABOVE 2-TONE SIGNAL, H3E
REF 30.0 dBm
ATTEN 40 dB
CENTER 3.000 6 MHz
VBW 300 Hz
10 dB/
DL 20.1 dBm
CENTER 3.000 6 MHz
RES BW 100 Hz

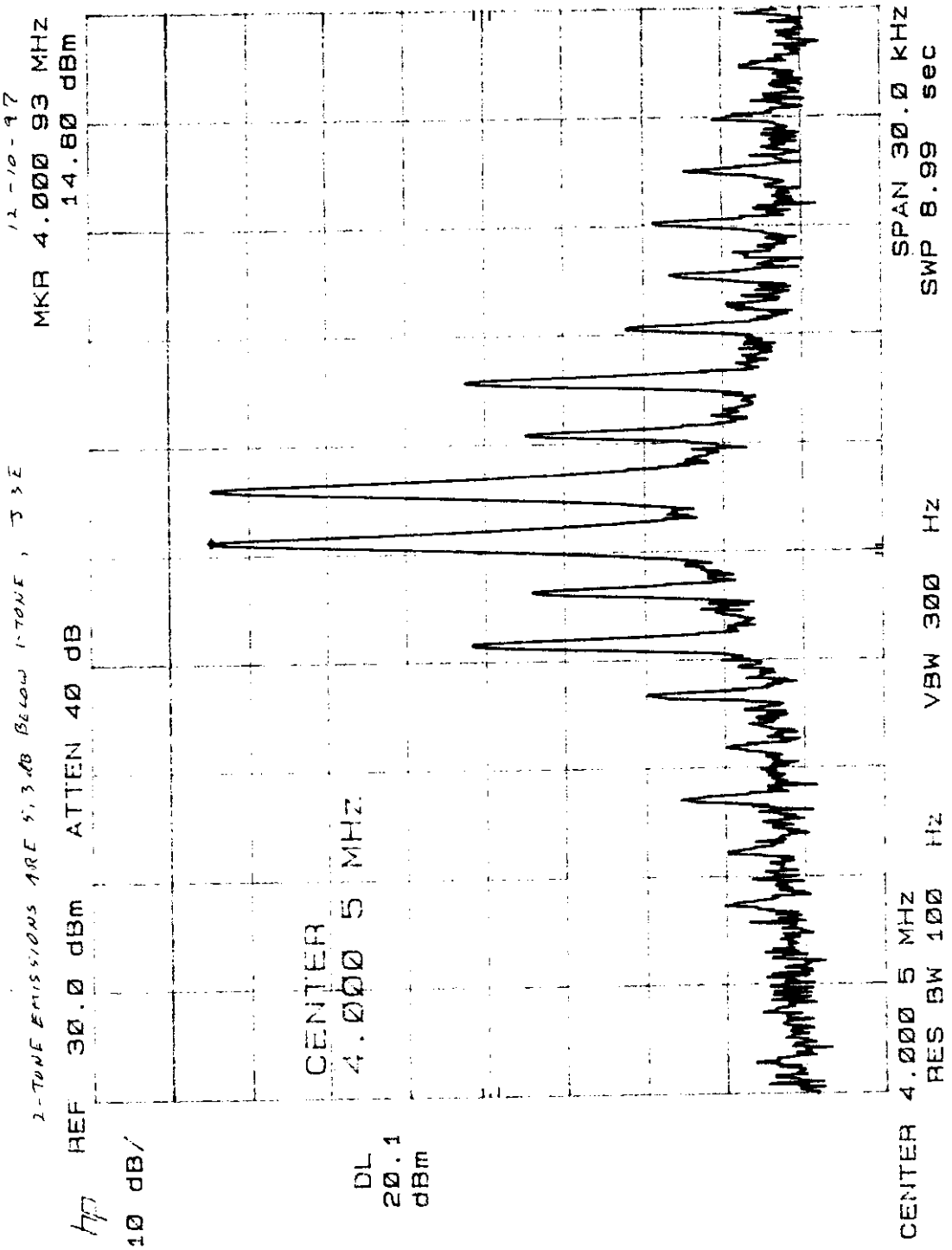

12-10-97
MKR 3.000 99 MHz
14.40 dBm
SPAN 30.0 kHz
SWP 1.00 sec
1-TONE AND 1-TONE EMISSIONS, 33E
REF 30.0 dBm
ATTEN 40 dB
VBW 1 kHz
10 dB/
CENTER 3.000 6 MHz
DL 20.1 dBm
CENTER 3.000 6 MHz
RES BW 300 Hz

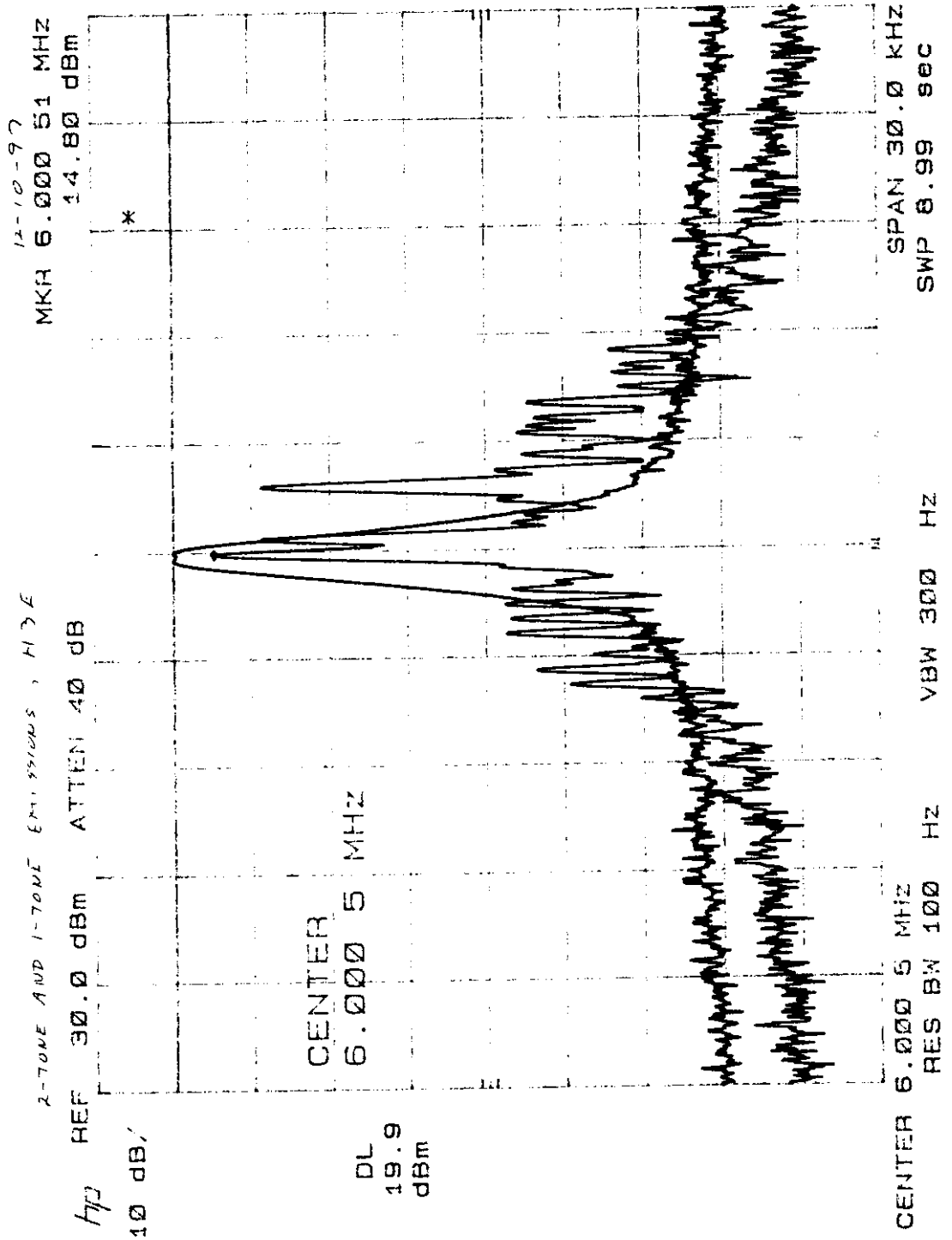

12-10-97
MKR 3.000 99 MHz
14.40 dBm
SPAN 30.0 kHz
SWP 1.00 sec
2-TONE EMISSIONS ARE 57dB BELOW 1-TONE, PSE
REF 30.0 dBm
ATTEN 40 dB
VBW 1 kHz
CENTER 3.000 6 MHz
RES BW 300 Hz
10 dB/
DL 20.1 dBm
CENTER 3.000 6 MHz

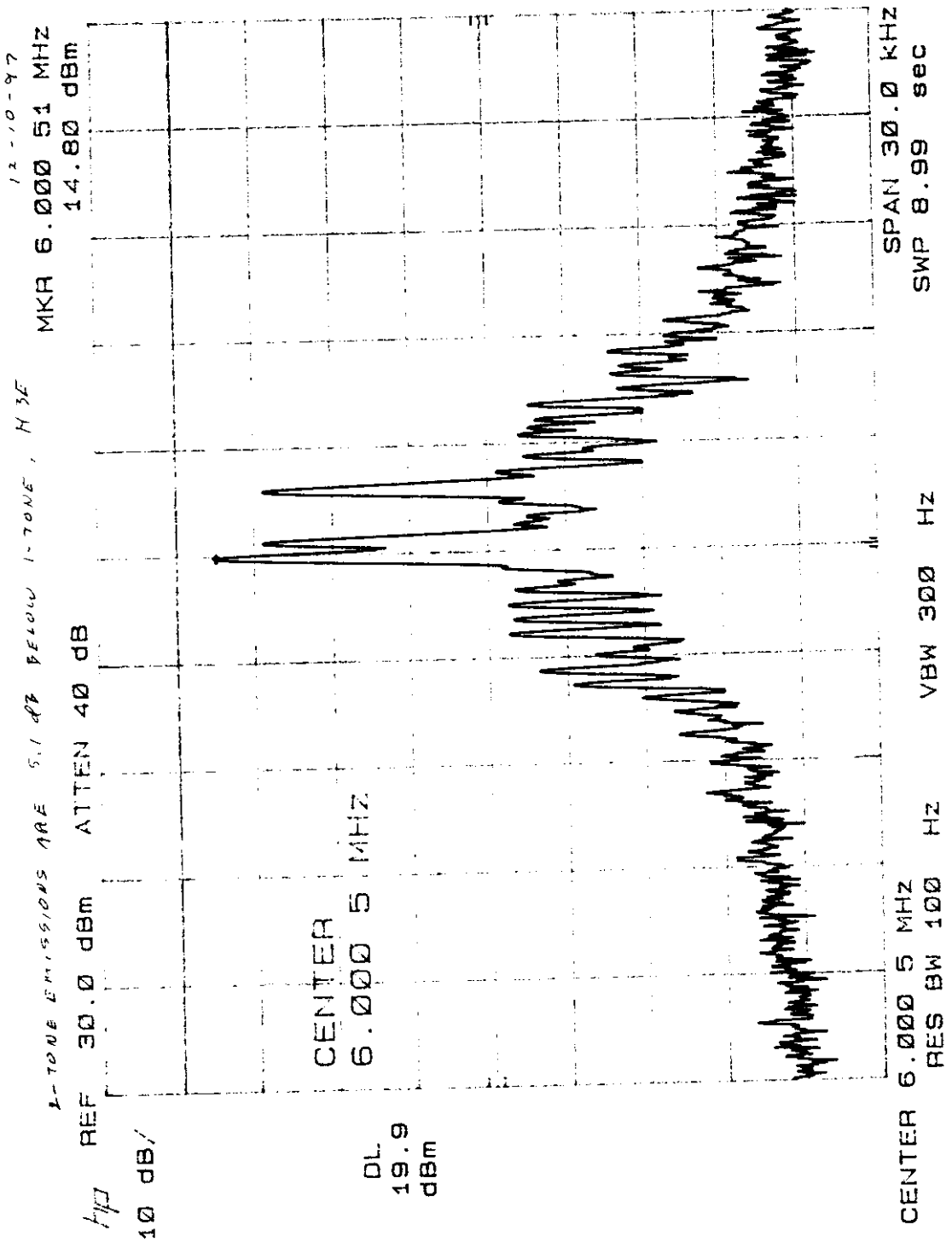

12-10-97
MKR 4.000 51 MHz
14.40 dBm
SPAN 30.0 kHz
SWP 8.99 sec
2-TONE AND 1-TONE EMISSIONS, H3E
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
4.000 5 MHz
DL
20.1
dBm
VBW 300 Hz
CENTER 4.000 5 MHz
RES BW 100 Hz

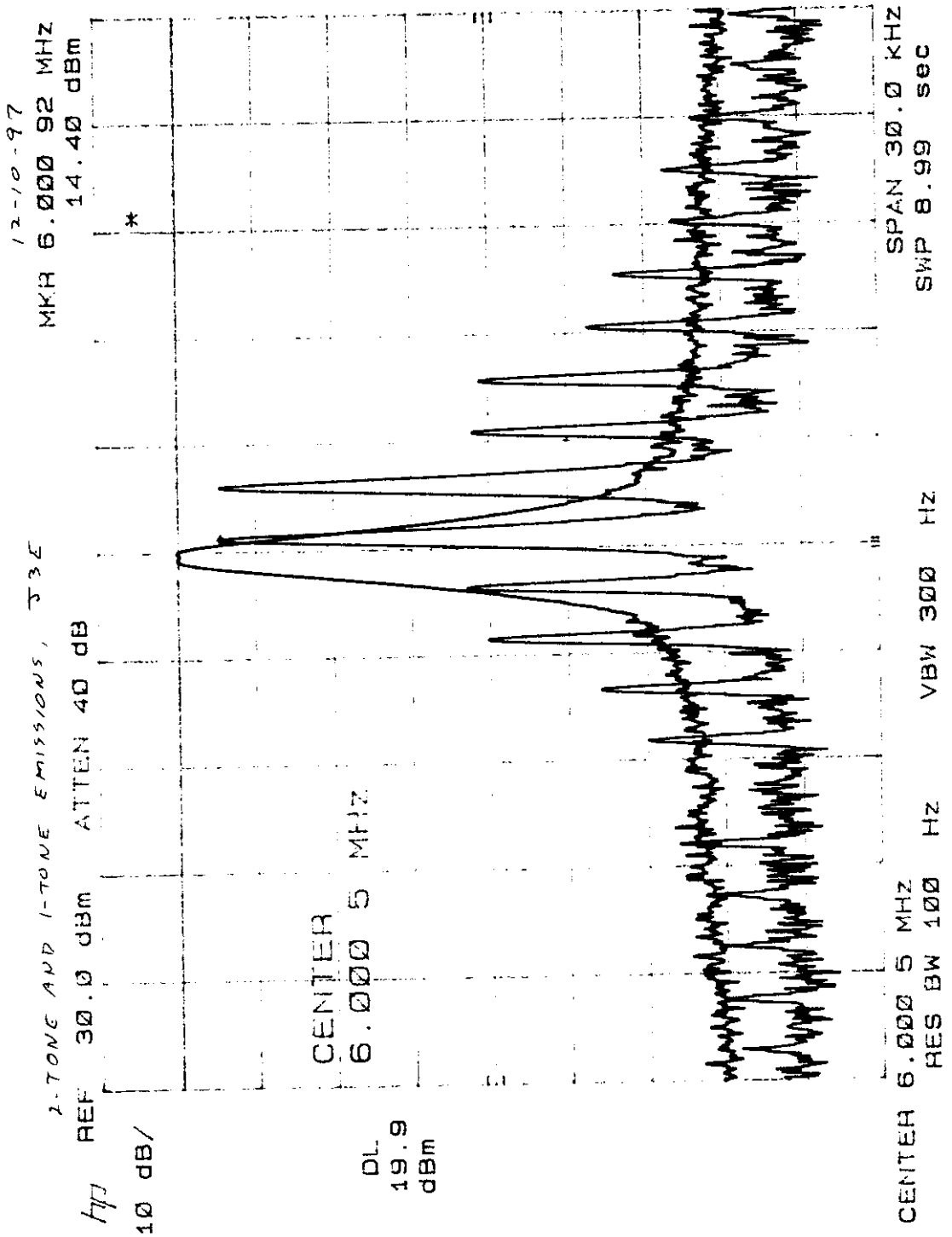

12-10-97
MKR 4.000 51 MHz
14.40 dBm
SPAN 30.0 kHz
SWP 8.99 sec
2-TONE EMISSIONS ARE 5.7 dB BELOW 1-TONE, H3E
REF 30.0 dBm
ATTEN 40 dB
VBW 300 Hz
CENTER 4.000 5 MHz
10 dB/
DL 20.1 dBm
CENTER 4.000 5 MHz
RES BW 100 Hz

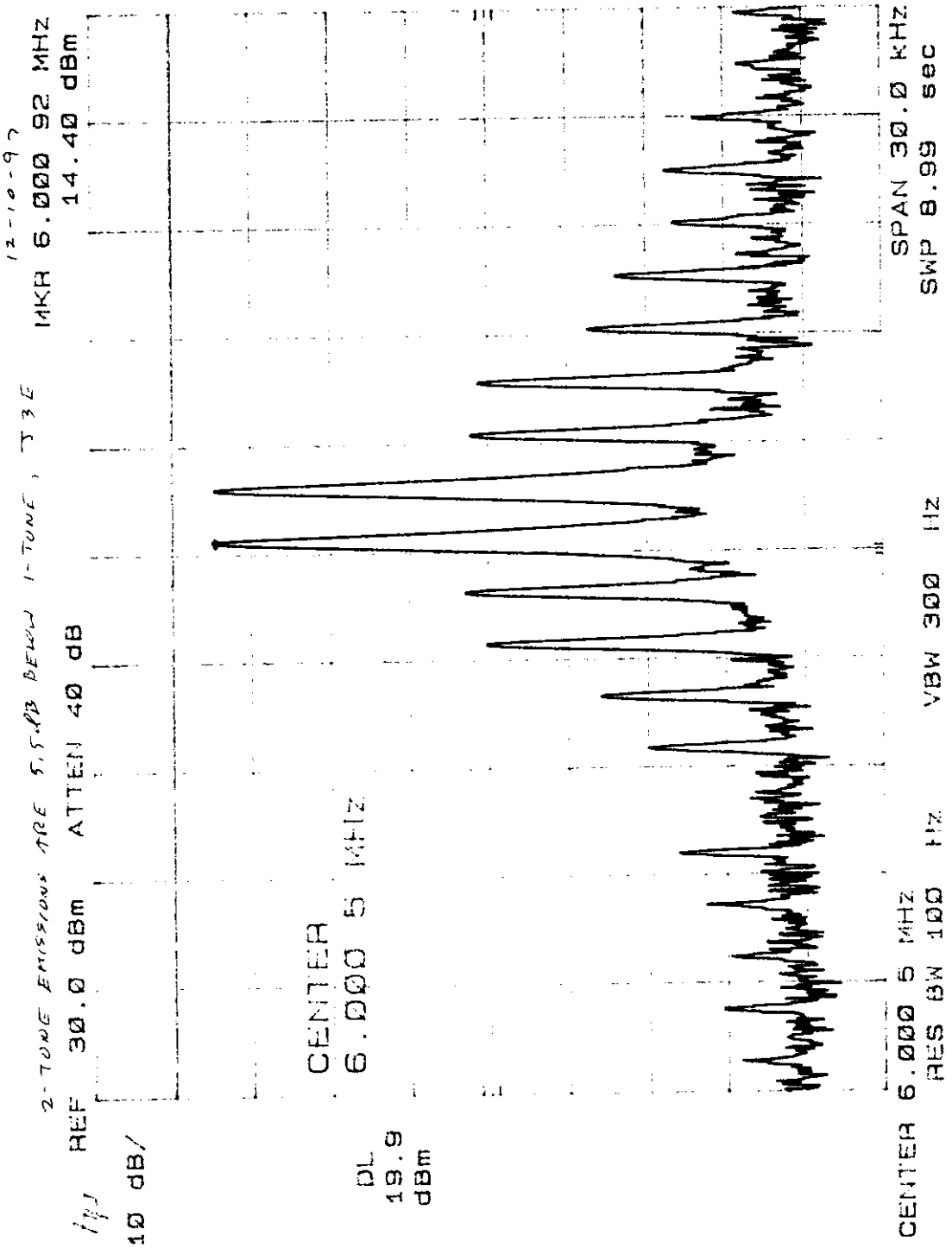

12-10-97
MKR 4.000 93 MHz
14.80 dBm
SPAN 30.0 kHz
SWP 8.99 sec
2-TONE AND 1-TONE EMISSIONS, 25E
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER 4.000 5 MHz
VBW 300 Hz
RES BW 100 Hz
DL 20.1 dBm
CENTER 4.000 5 MHz

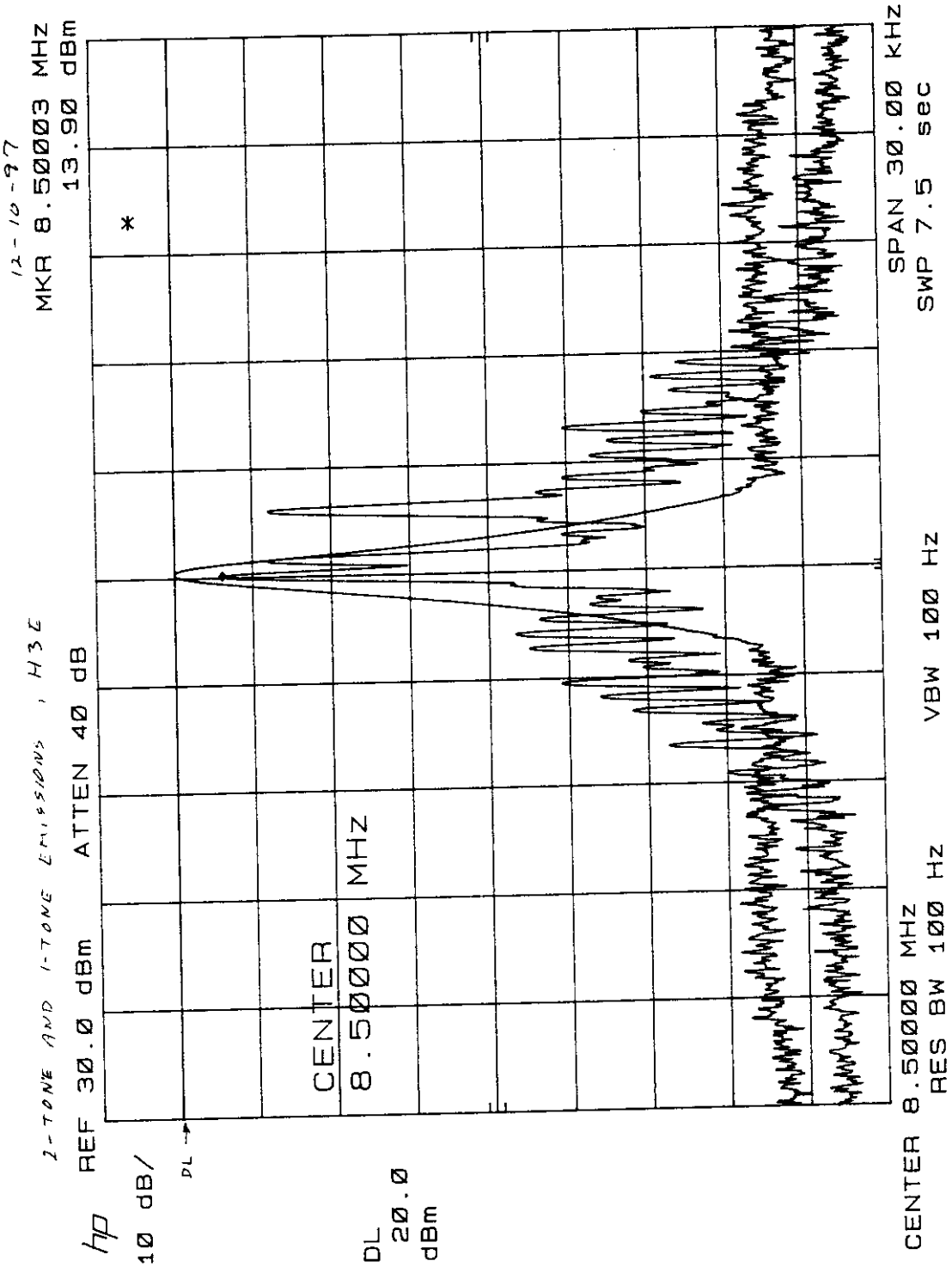

12-10-97
MKR 4.000 93 MHz
14.80 dBm
2-TONE EMISSIONS ARE 51.3 dB BELOW 1-TONE, PSE
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER 4.000 5 MHz
DL 20.1 dBm
SPAN 30.0 kHz
SWP 8.99 sec
VBW 300 Hz
CENTER 4.000 5 MHz
RES BW 100 Hz

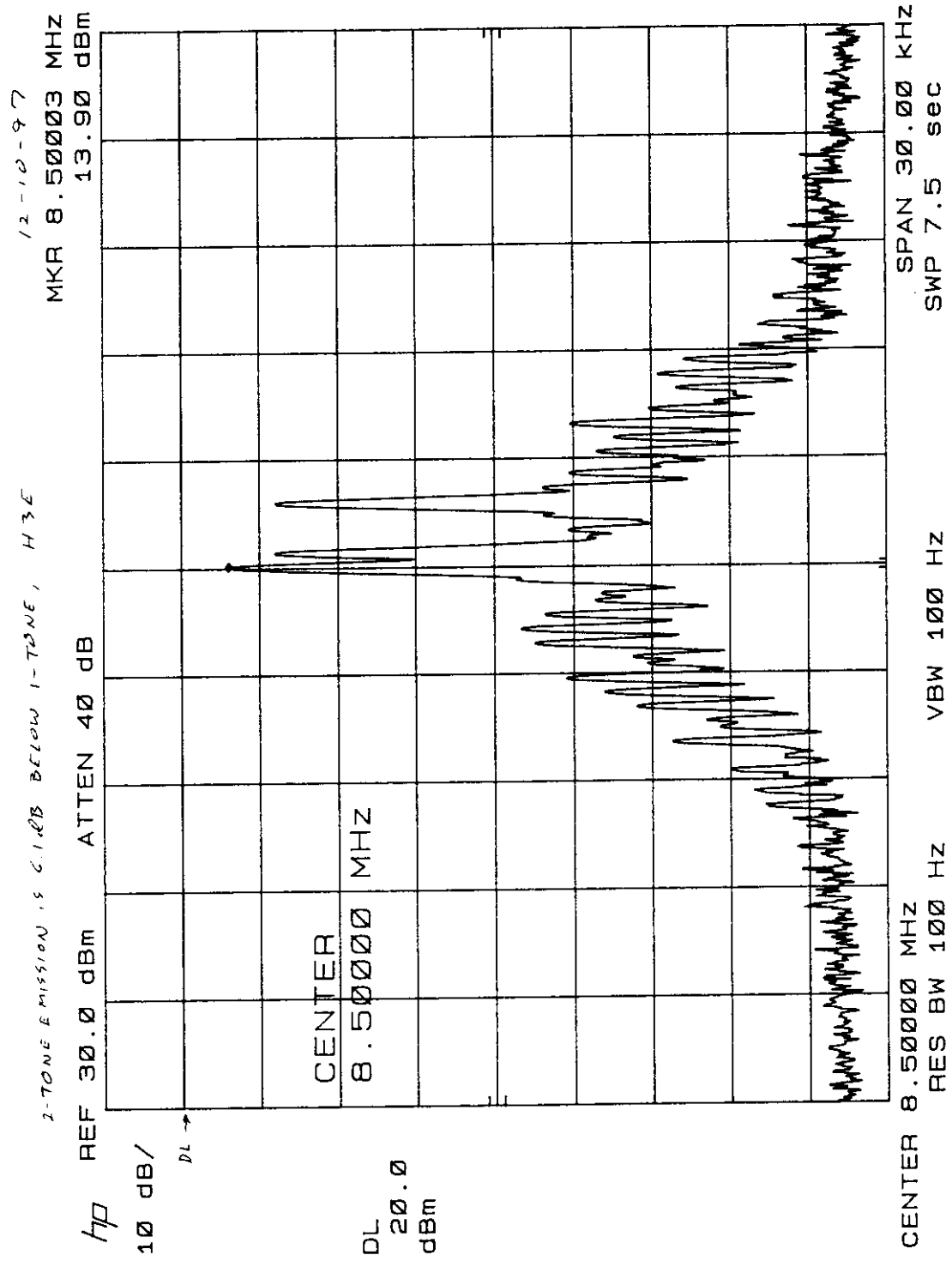

12-10-97
MKR 6.000 51 MHz
14.80 dBm
SPAN 30.0 kHz
SWP 8.99 sec
2-TONE AND 1-TONE EMISSIONS, MODE
REF 30.0 dBm
ATTEN 40 dB
VBW 300 Hz
CENTER
6.000 5 MHz
10 dB/
DL
19.9
dBm
CENTER 6.000 5 MHz
RES BW 100 Hz

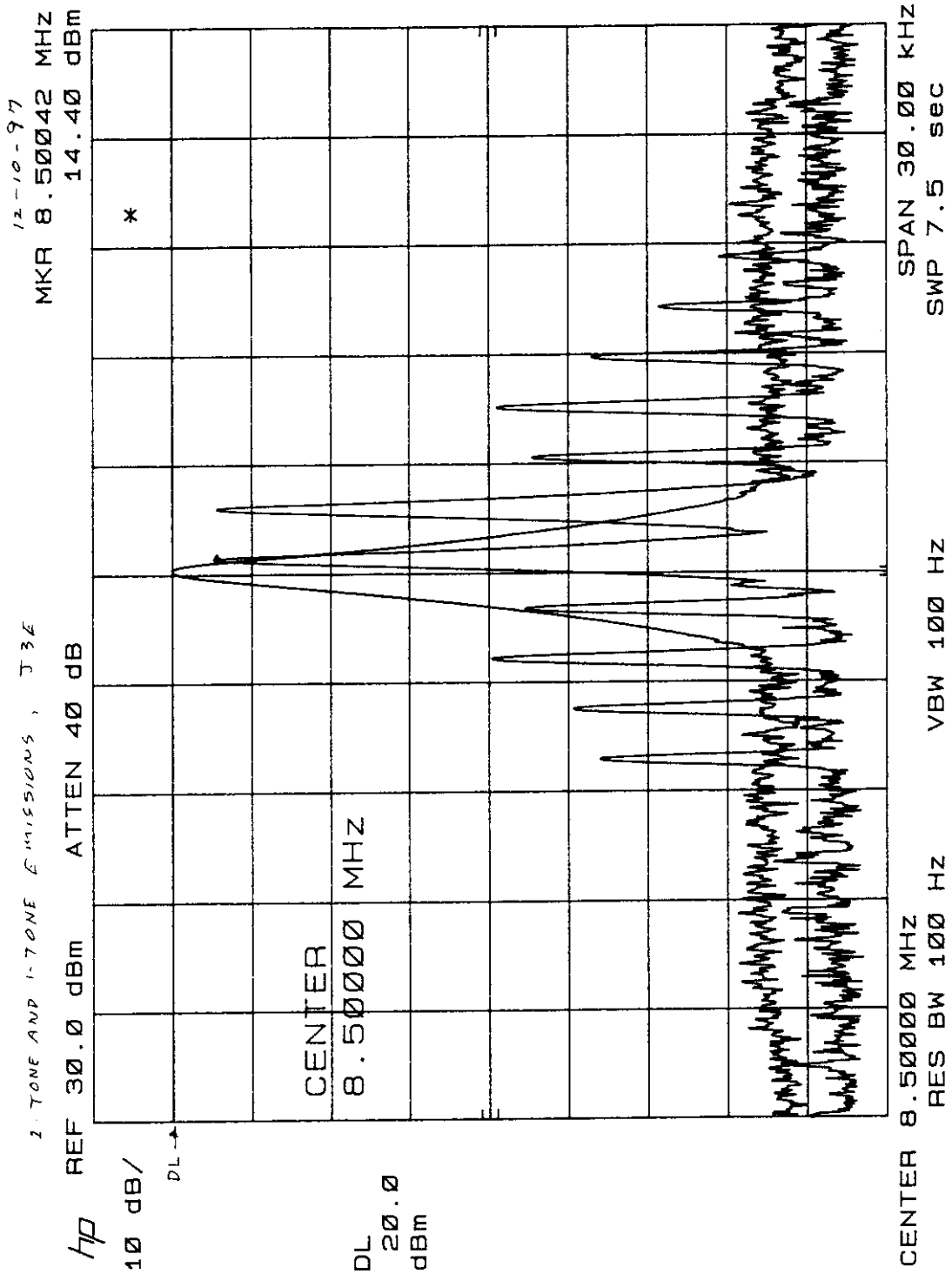

12-10-97
MKR 6.000 51 MHz
14.80 dBm
SPAN 30.0 kHz
SWP 8.99 sec
1-TONE EMISSIONS ARE 51 dB BELOW 1-TONE, H 3E
REF 30.0 dBm
ATTEN 40 dB
CENTER 6.000 5 MHz
VBW 300 Hz
10 dB/
DL 19.9 dBm
CENTER 6.000 5 MHz
RES BW 100 Hz

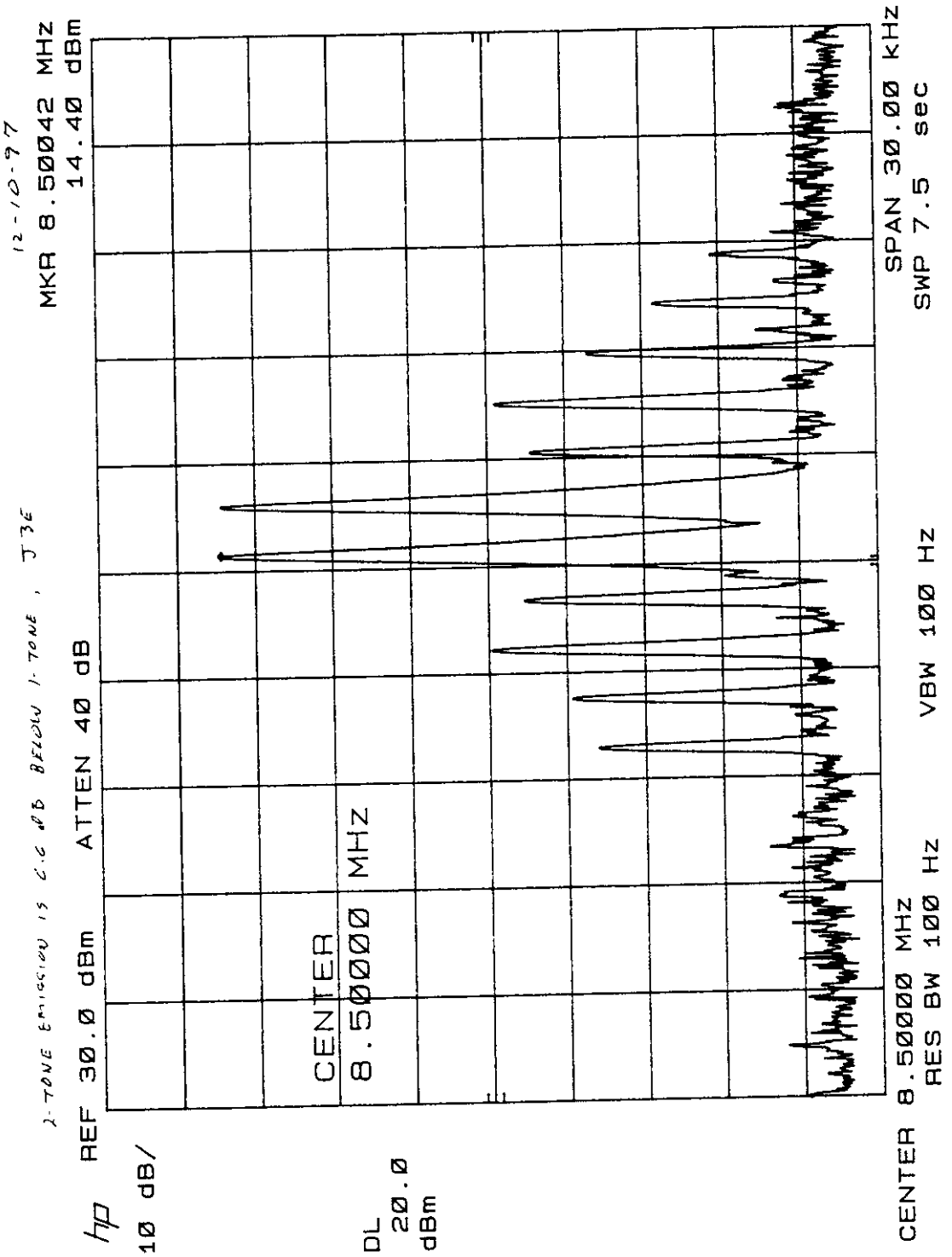

12-10-97
MKR 6.000 92 MHz
14.40 dBm
SPAN 30.0 kHz
SWP 8.99 sec
2-TONE AND 1-TONE EMISSIONS, 73E
REF 30.0 dBm
ATTEN 40 dB
VBW 300 Hz
CENTER
6.000 5 MHz
hp
10 dB/
DL
19.9
dBm
CENTER 6.000 5 MHz
RES BW 100 Hz

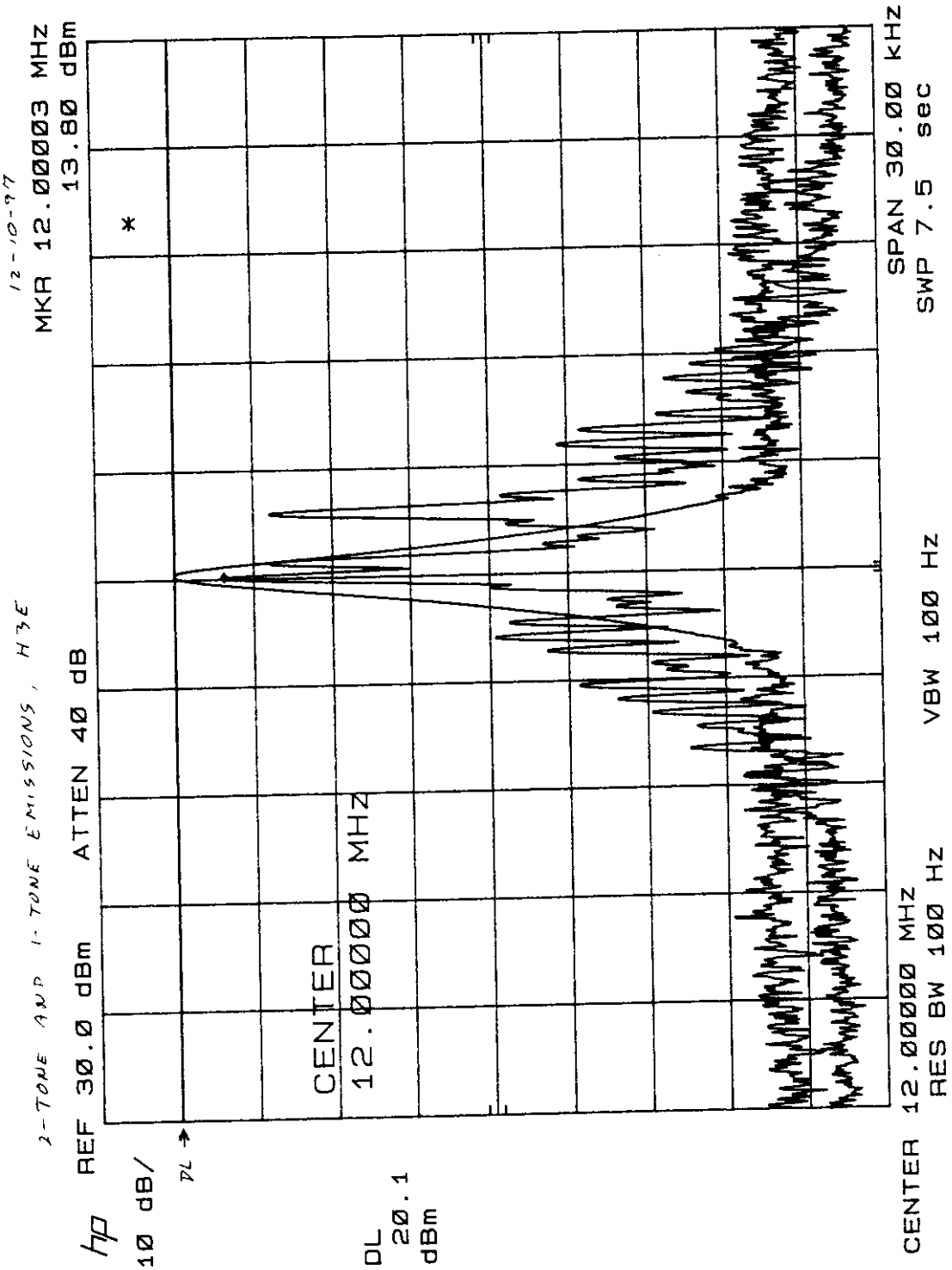

12-10-97
MKR 6.000 92 MHz
14.40 dBm
2-TONE EMISSIONS ARE 5.5dB BELOW 1-TONE, T3E
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
6.000 5 MHz
DL
19.9
dBm
SPAN 30.0 kHz
SWP 8.99 sec
VBW 300 Hz
CENTER 6.000 5 MHz
RES BW 100 Hz

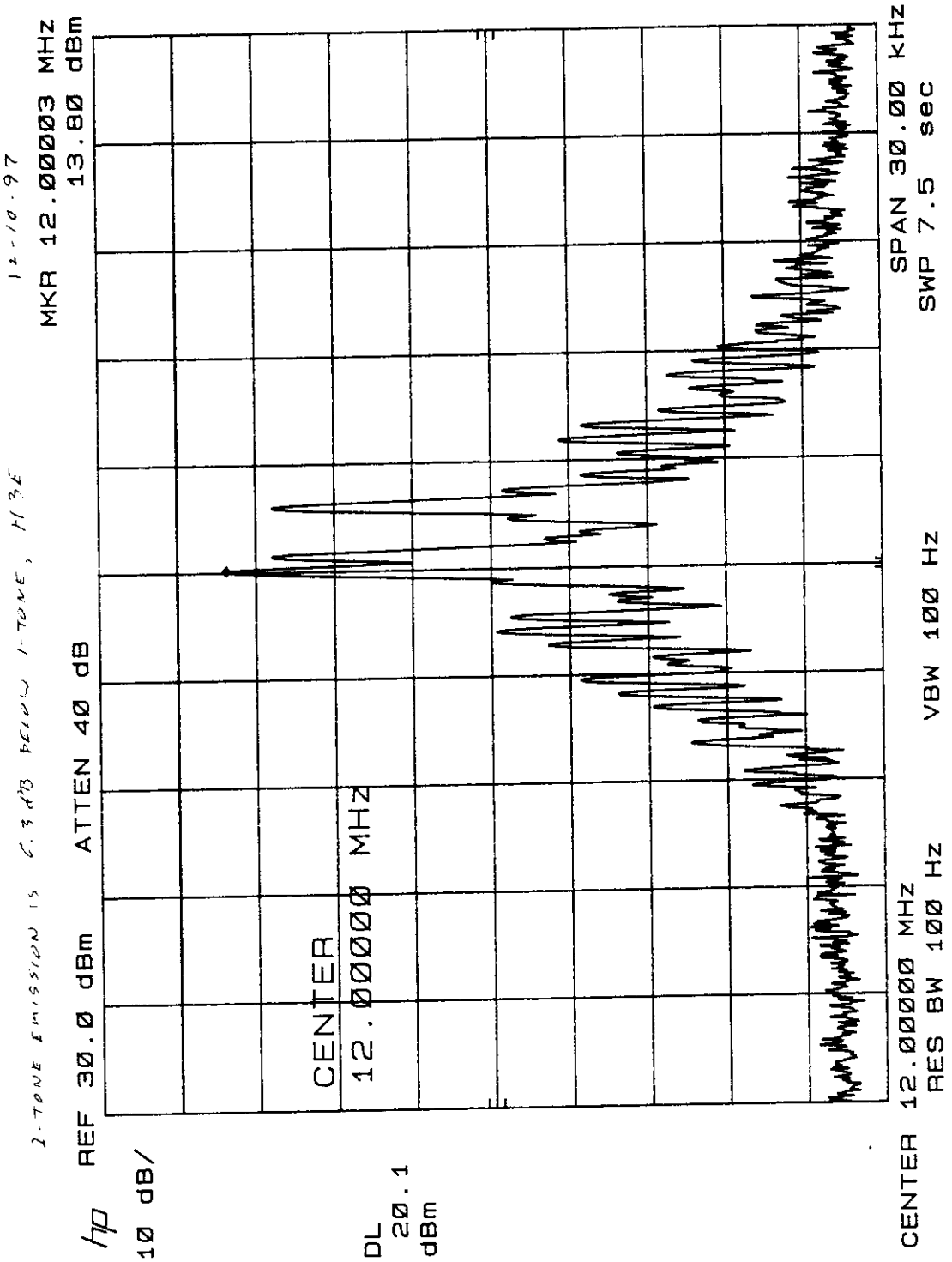

12-10-97
MKR 8.50003 MHz
13.90 dBm
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE AND 1-TONE EMISSIONS, H3E
REF 30.0 dBm
ATTEN 40 dB
VBW 100 Hz
CENTER
8.50000 MHz
10 dB/
DL
DL
20.0
dBm
CENTER 8.50000 MHz
RES BW 100 Hz

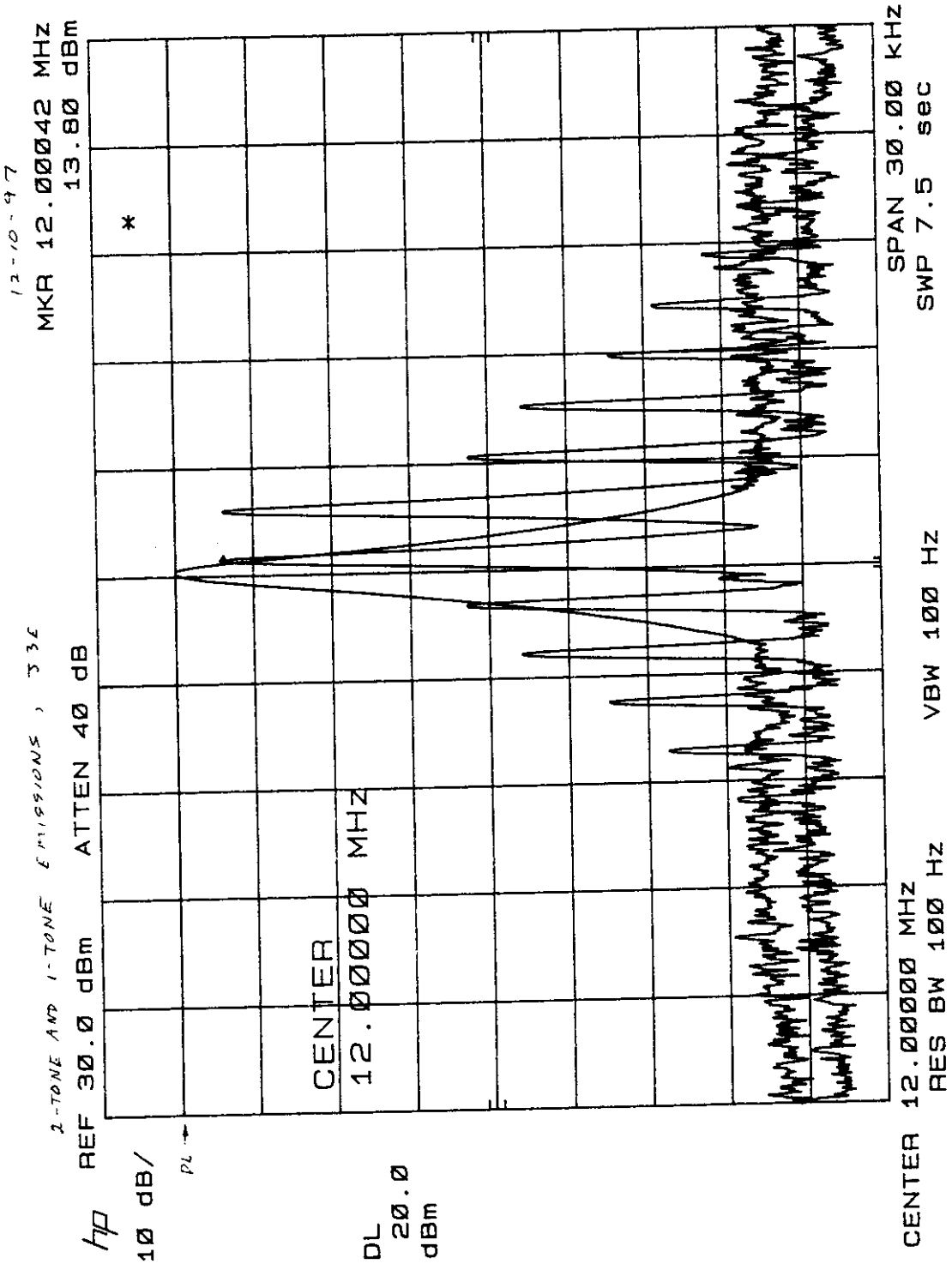

12-10-97
MKR 8.50003 MHz
13.90 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
2-TONE EMISSION IS 61dB BELOW 1-TONE, H3E
CENTER
8.50000 MHz
DL
20.0
dBm
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 8.50000 MHz
RES BW 100 Hz

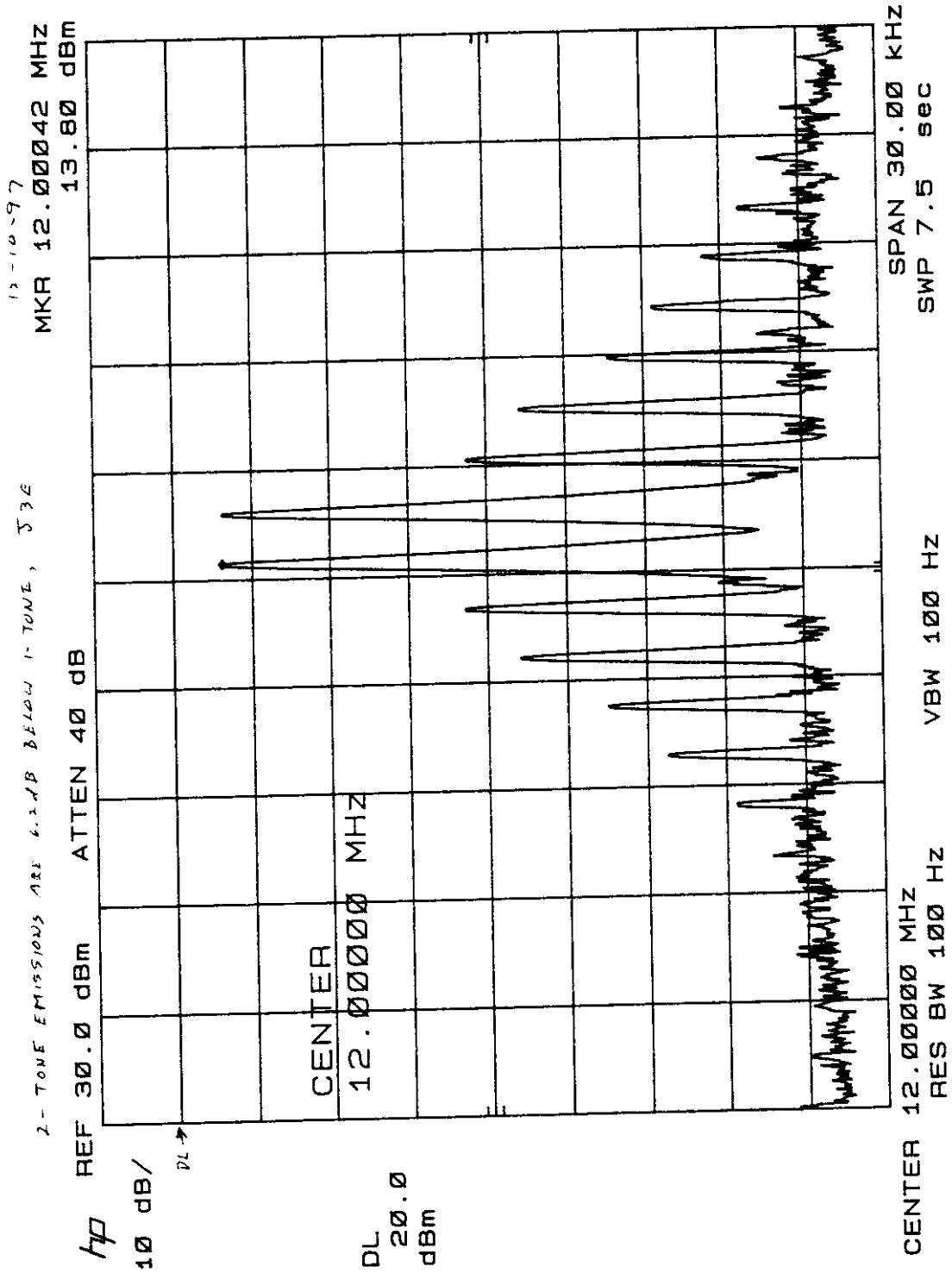

12-10-97
MKR 8.50042 MHz
14.40 dBm
*
SPAN 30.00 kHz
SWP 7.5 sec
2 TONE AND 1 TONE EMISSIONS, J3E
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
CENTER
8.50000 MHz
VBW 100 Hz
DL
20.0
dBm
CENTER 8.50000 MHz
RES BW 100 Hz

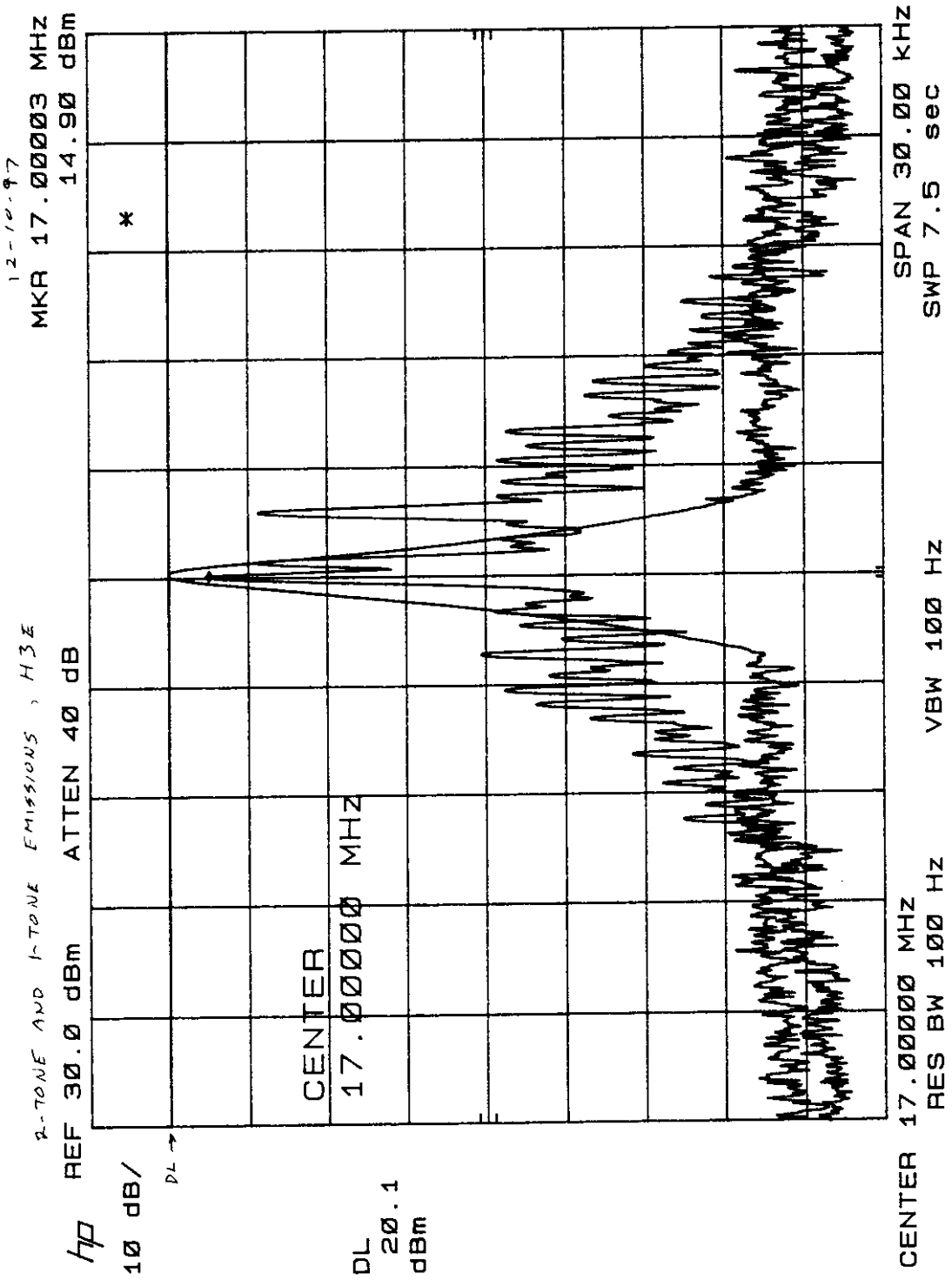

12-10-97
MKR 8.50042 MHz
14.40 dBm
2-TONE EMISSION IS 2.6 dB BELOW 1-TONE, JTE
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
DL
20.0
dBm
CENTER
8.50000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 8.50000 MHz
RES BW 100 Hz

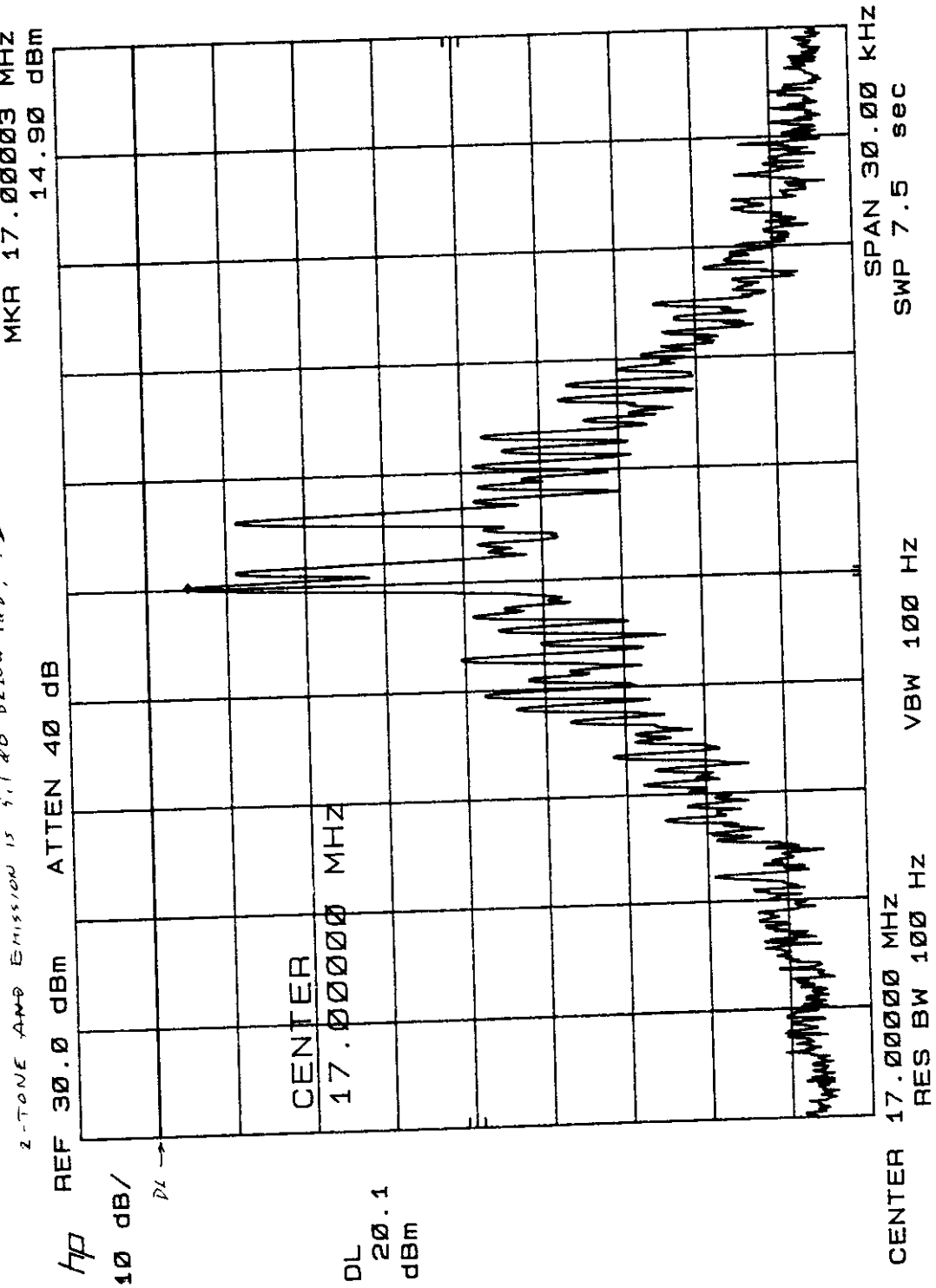

12-10-97
MKR 12.00003 MHz
13.80 dBm
*
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE AND 1-TONE EMISSIONS, H3E
REF 30.0 dBm
ATTEN 40 dB
10 dB/
PL
CENTER
12.00000 MHz
VBW 100 Hz
DL
20.1
dBm
CENTER 12.00000 MHz
RES BW 100 Hz

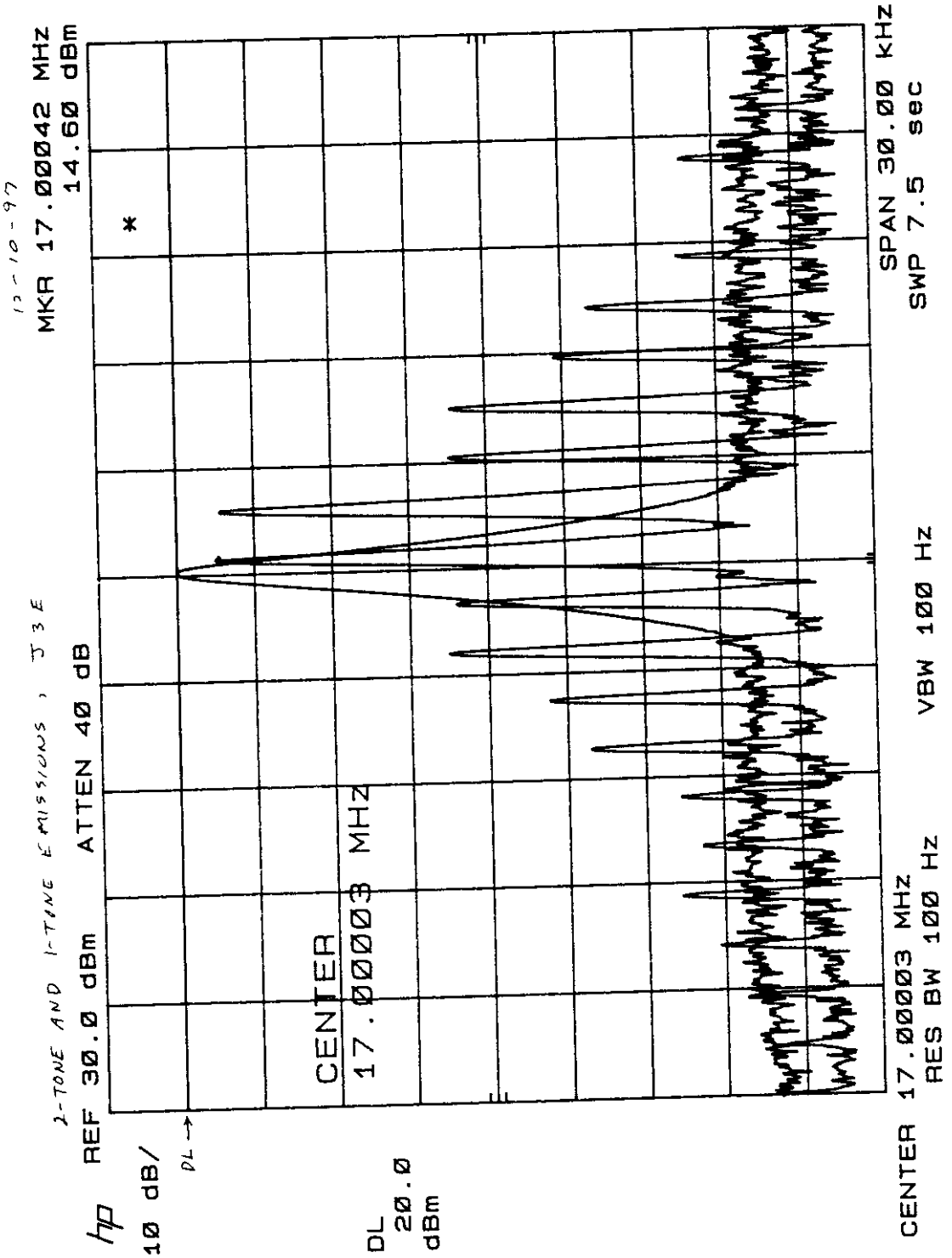

12-10-97
MKR 12.00003 MHz
13.80 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
12.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 12.00000 MHz
RES BW 100 Hz
DL
20.1
dBm
2-TONE EMISSION IS 6.3 dB BELOW 1-TONE, PER

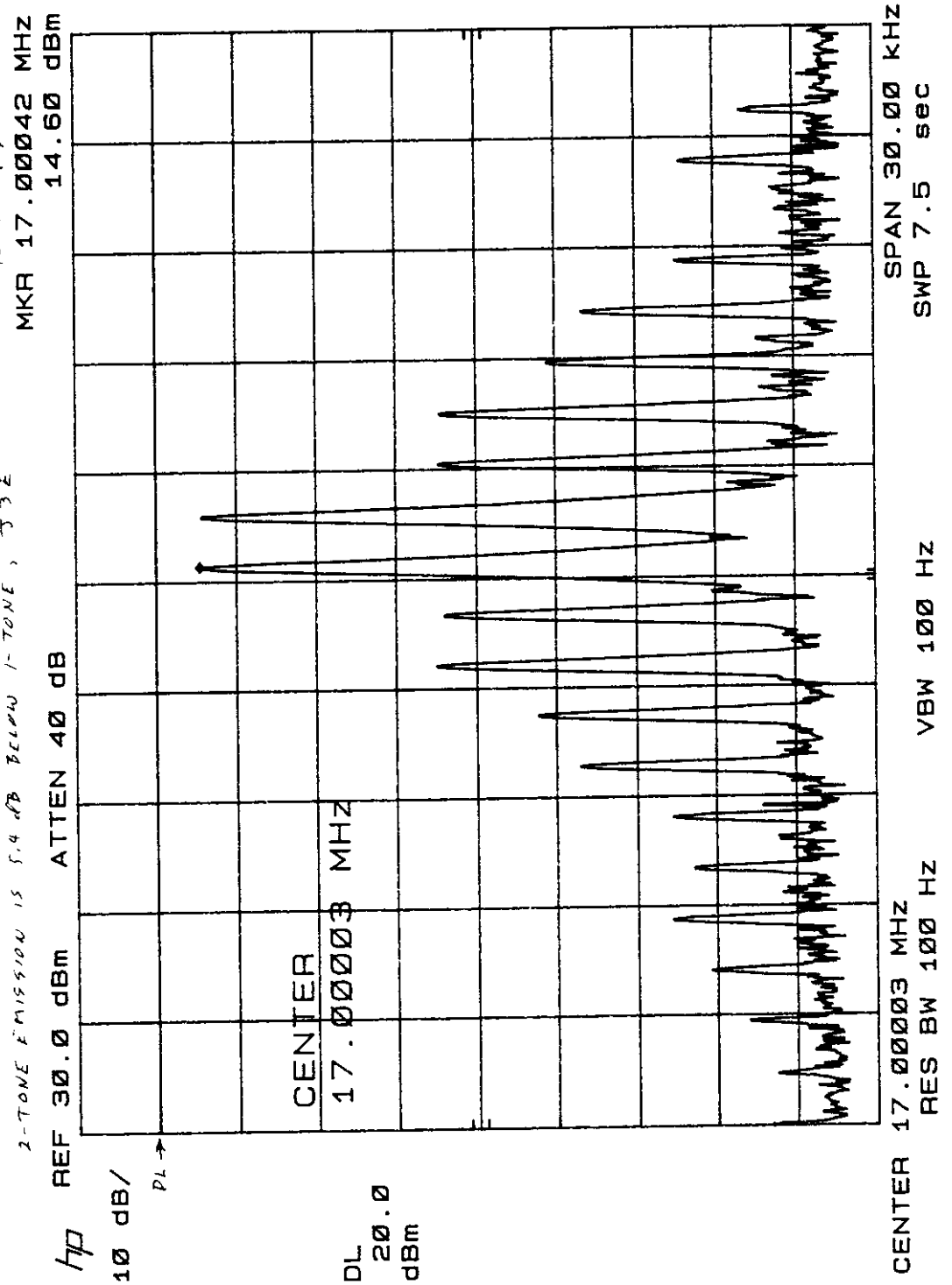

12-10-97
MKR 12.00042 MHz
13.80 dBm
*
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE AND 1-TONE EMISSIONS, 33E
REF 30.0 dBm
ATTEN 40 dB
CENTER
12.00000 MHz
VBW 100 Hz
hp
10 dB/
DL
20.0
dBm
CENTER 12.00000 MHz
RES BW 100 Hz

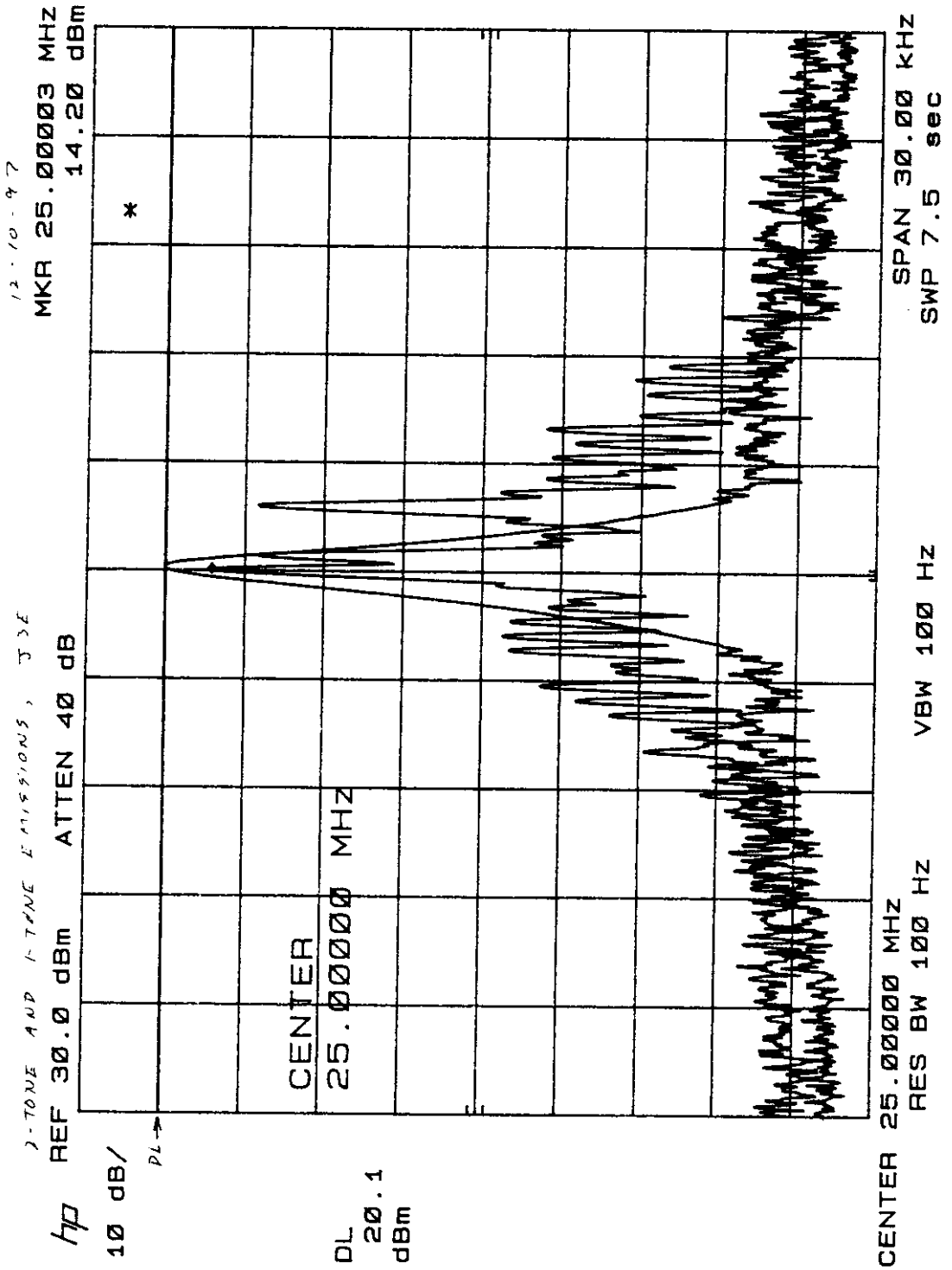

12-10-97
MKR 12.000042 MHz
13.80 dBm
2-TONE EMISSIONS ARE 6.2dB BELOW 1-TONE, 536
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
CENTER
12.000000 MHz
DL
20.0
dBm
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 12.000000 MHz
RES BW 100 Hz

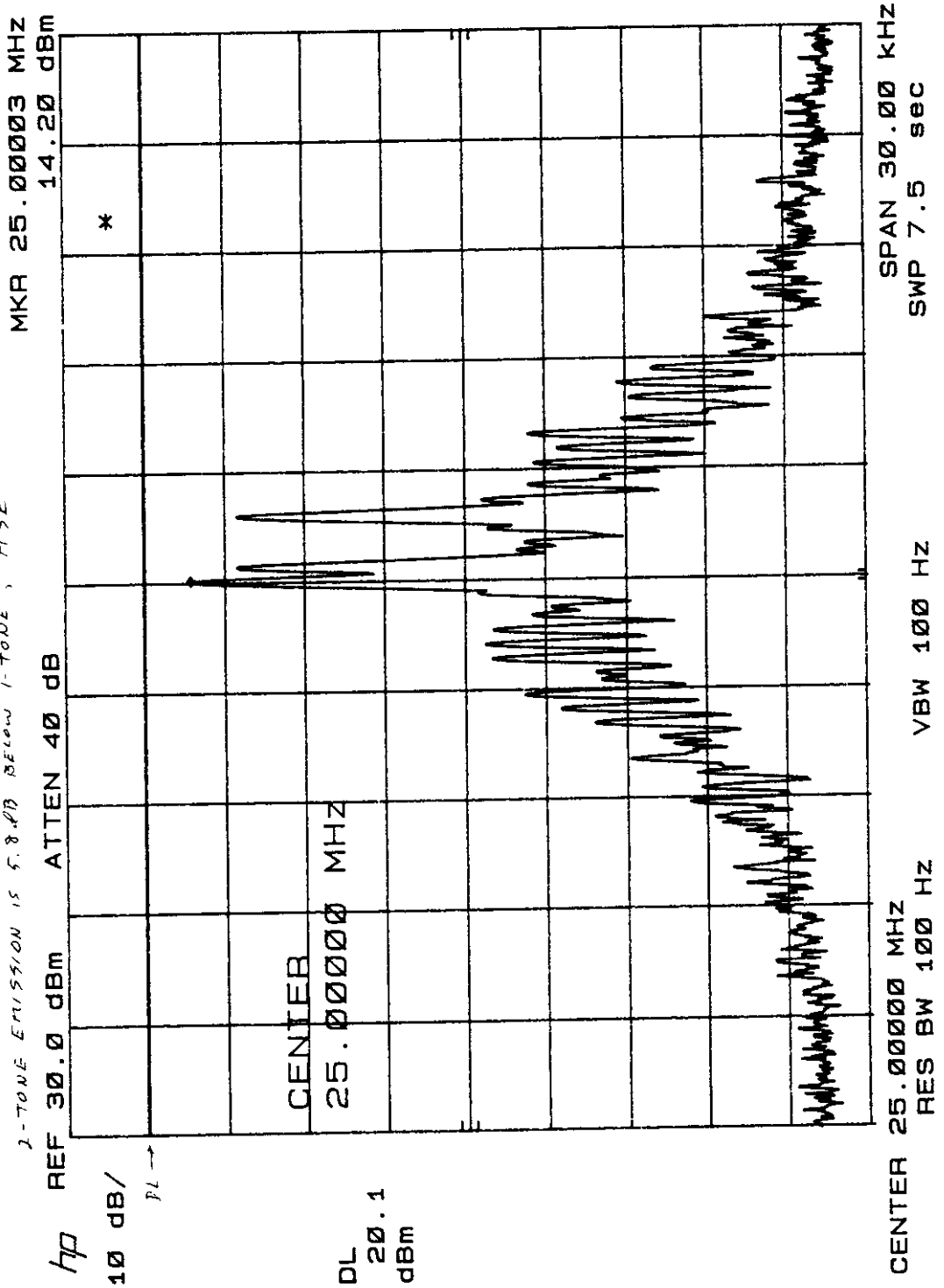

12-10-97
2-TONE AND 1-TONE EMISSIONS, H3E
MKR 17.00003 MHz
14.90 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
DL
20.1
dBm
CENTER
17.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 17.00000 MHz
RES BW 100 Hz

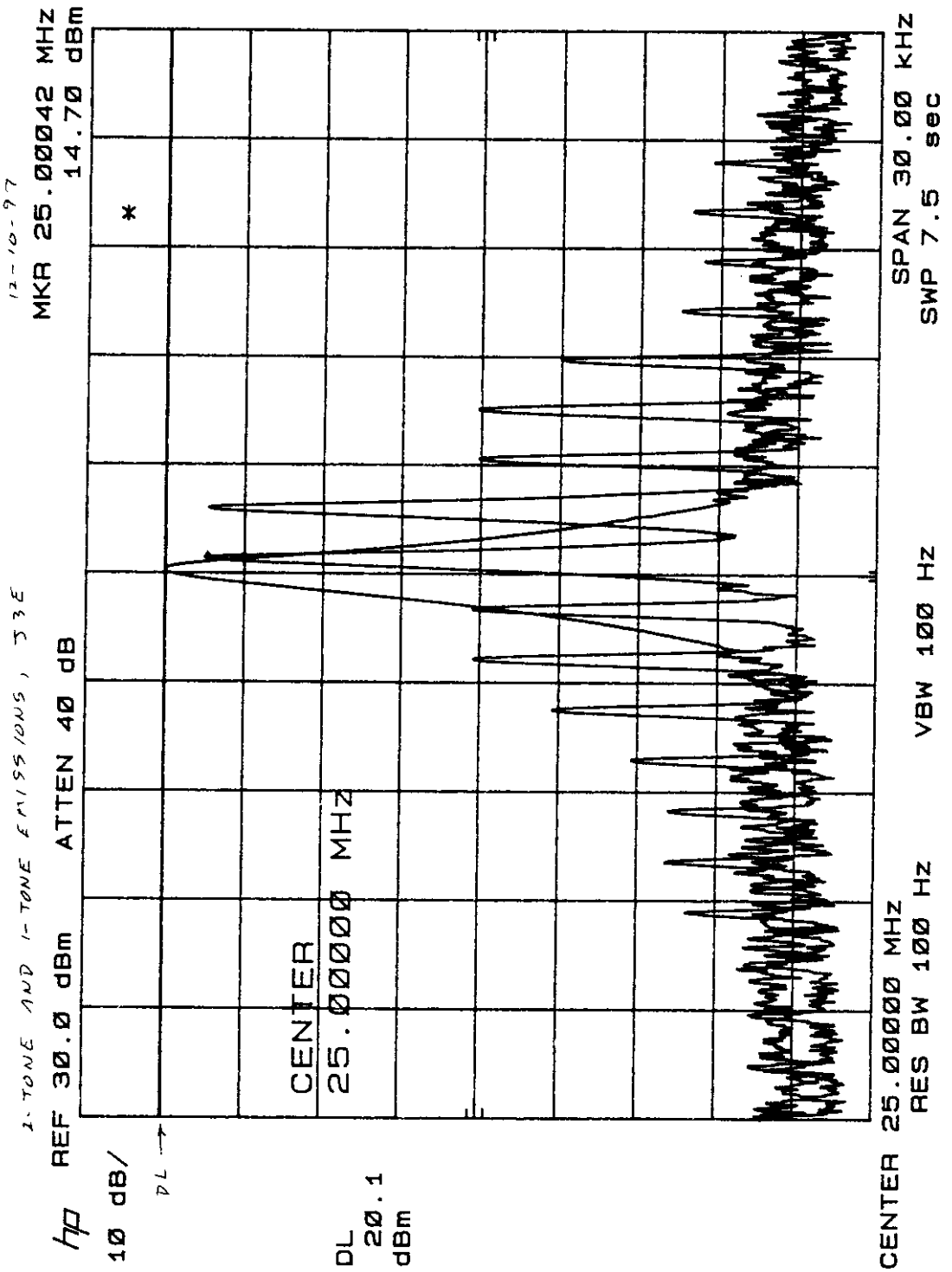

12-10-97
MKR 17.00003 MHz
14.90 dBm
2-TONE AMB EMISSION IS 41 dB BELOW 1dB, PASS
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
17.00000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 17.00000 MHz
RES BW 100 Hz
DL
20.1
dBm

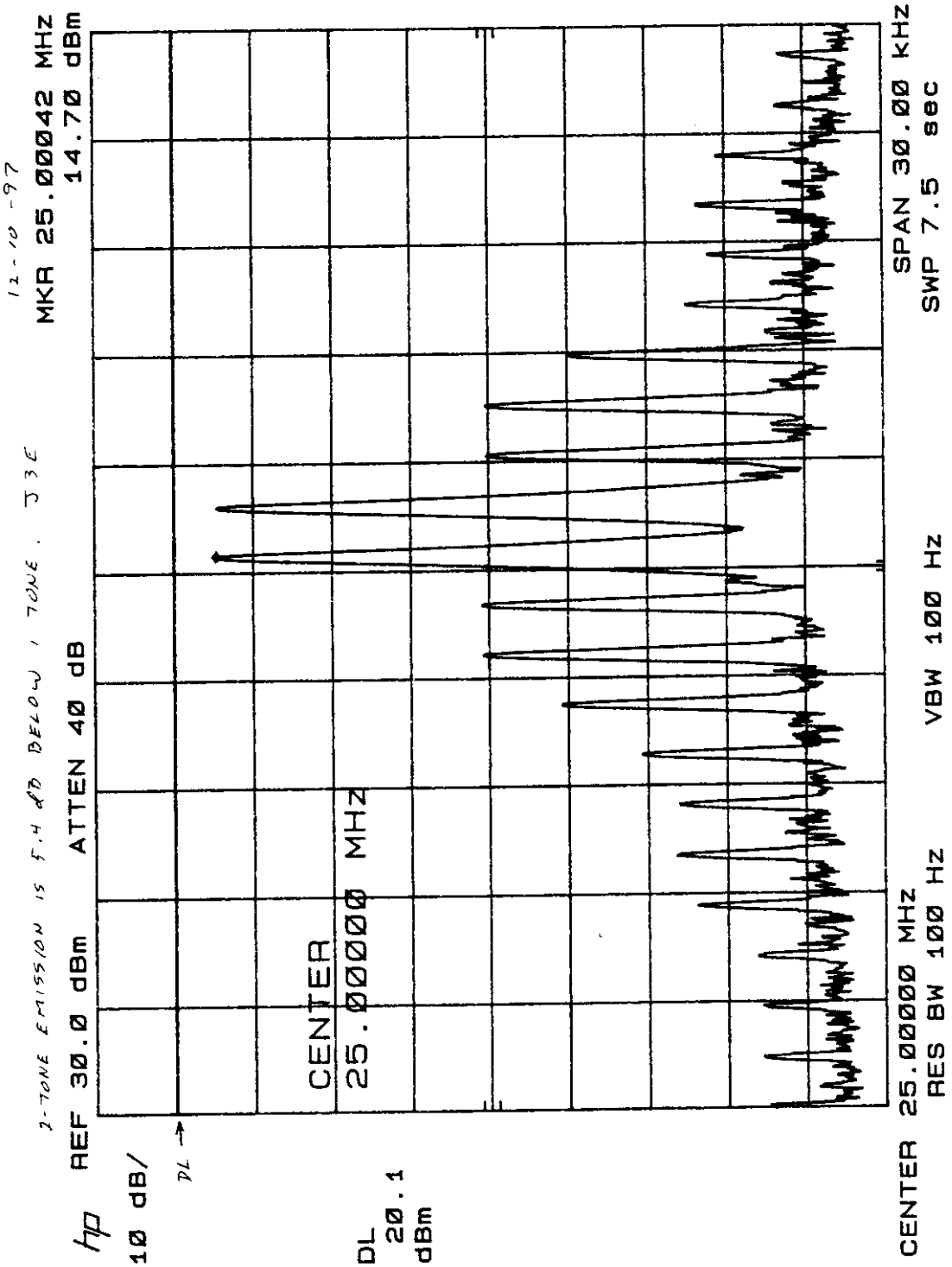

12-10-97
MKR 17.00042 MHz
14.60 dBm
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE AND 1-TONE EMISSIONS, J3E
REF 30.0 dBm
ATTEN 40 dB
CENTER
17.00003 MHz
VBW 100 Hz
10 dB/
DL
DL
20.0
dBm
CENTER 17.00003 MHz
RES BW 100 Hz


12-10-97
MKR 17.00042 MHz
14.60 dBm
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE EMISSION IS 5.4 dB BELOW 1-TONE, PASS
REF 30.0 dBm
ATTEN 40 dB
CENTER
17.00003 MHz
VBW 100 Hz
10 dB/
DL
20.0
dBm
CENTER 17.00003 MHz
RES BW 100 Hz

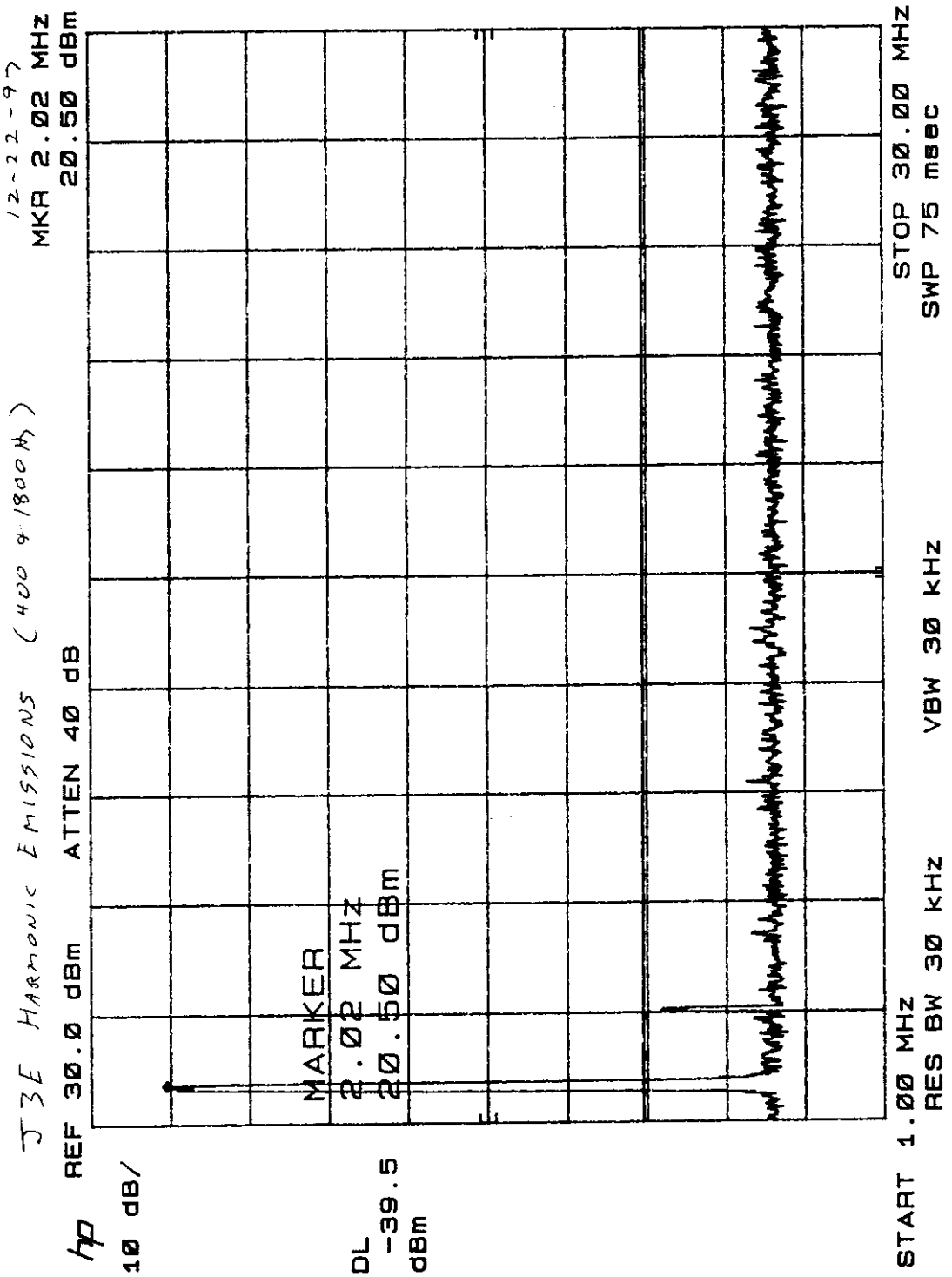

12-10-97
MKR 25.00003 MHz
14.20 dBm
SPAN 30.00 kHz
SWP 7.5 sec
2-TONE AND 1-TONE EMISSIONS, JSE
REF 30.0 dBm
ATTEN 40 dB
VBW 100 Hz
CENTER
25.00000 MHz
10 dB/
DL
DL
20.1
dBm
CENTER 25.00000 MHz
RES BW 100 Hz

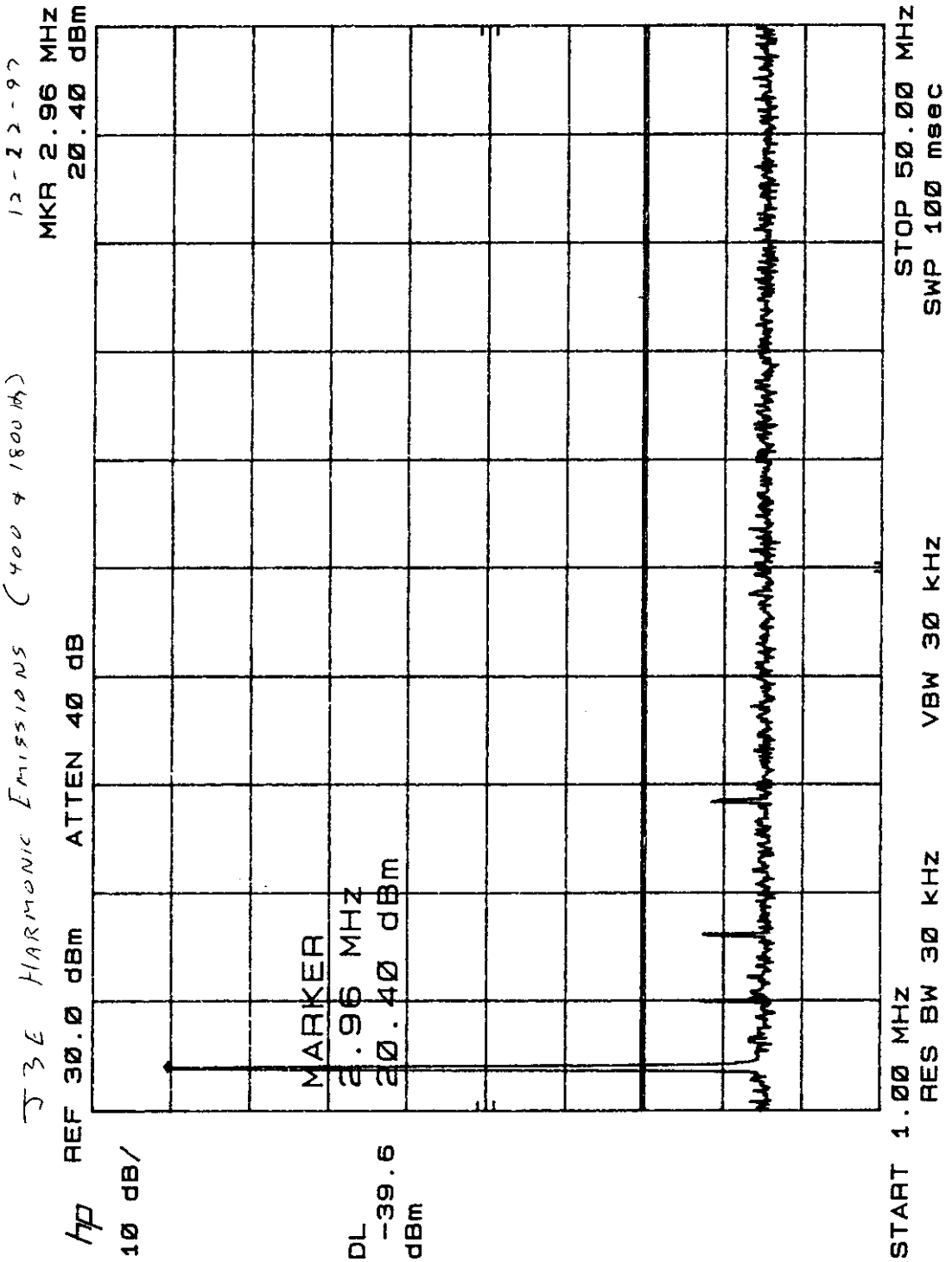

12-10-97
MKR 25.00003 MHz
14.20 dBm
*
REF 30.0 dBm
ATTEN 40 dB
10 dB/
CENTER
25.000000 MHz
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
RES BW 100 Hz
CENTER 25.00000 MHz
DL
20.1
dBm
2-TONE EMISSION IS 5.8dB BELOW 1-TONE, H3E

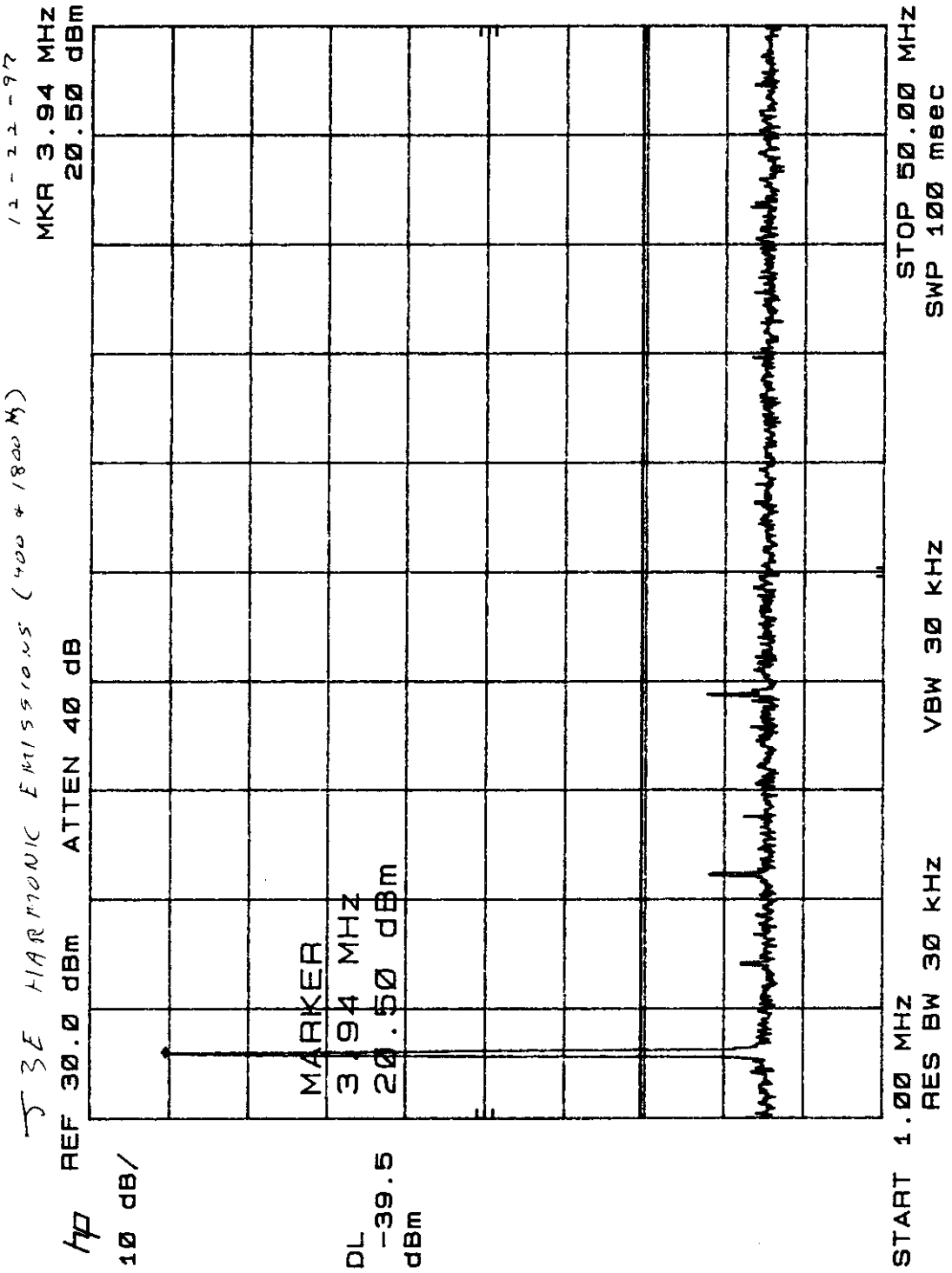

12-10-97
MKR 25.00042 MHz
14.70 dBm
SPAN 30.00 kHz
SWP 7.5 sec
1-TONE AND 1-TONE EMISSIONS, 33E
REF 30.0 dBm
ATTEN 40 dB
VBW 100 Hz
CENTER
25.00000 MHz
10 dB/
DL
DL
20.1
dBm
CENTER 25.00000 MHz
RES BW 100 Hz

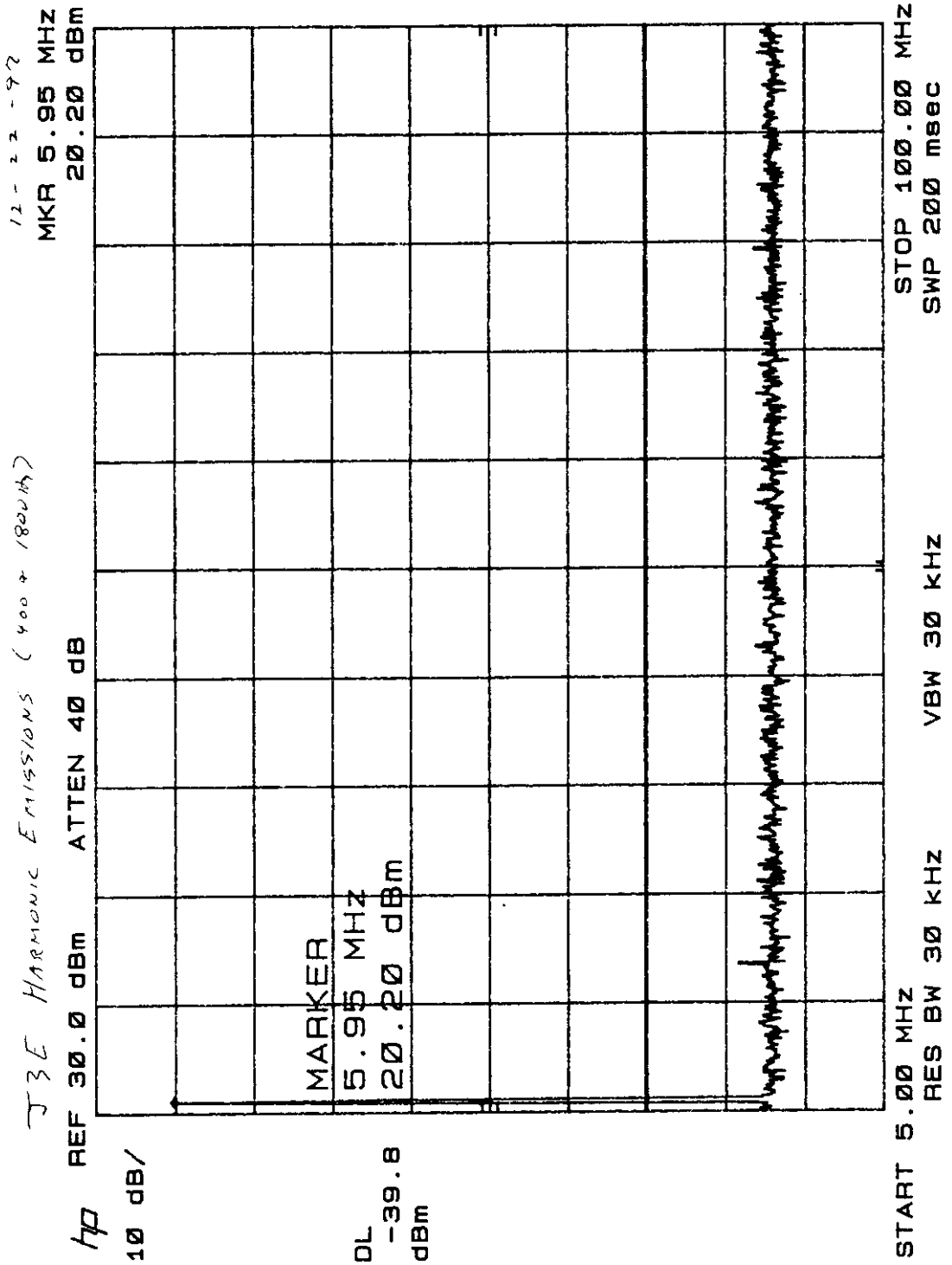

12-10-97
MKR 25.000042 MHz
14.70 dBm
2-TONE EMISSION IS 5.4 dB BELOW 1 TONE. 73E
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
PL
CENTER
25.000000 MHz
DL
20.1
dBm
SPAN 30.00 kHz
SWP 7.5 sec
VBW 100 Hz
CENTER 25.000000 MHz
RES BW 100 Hz

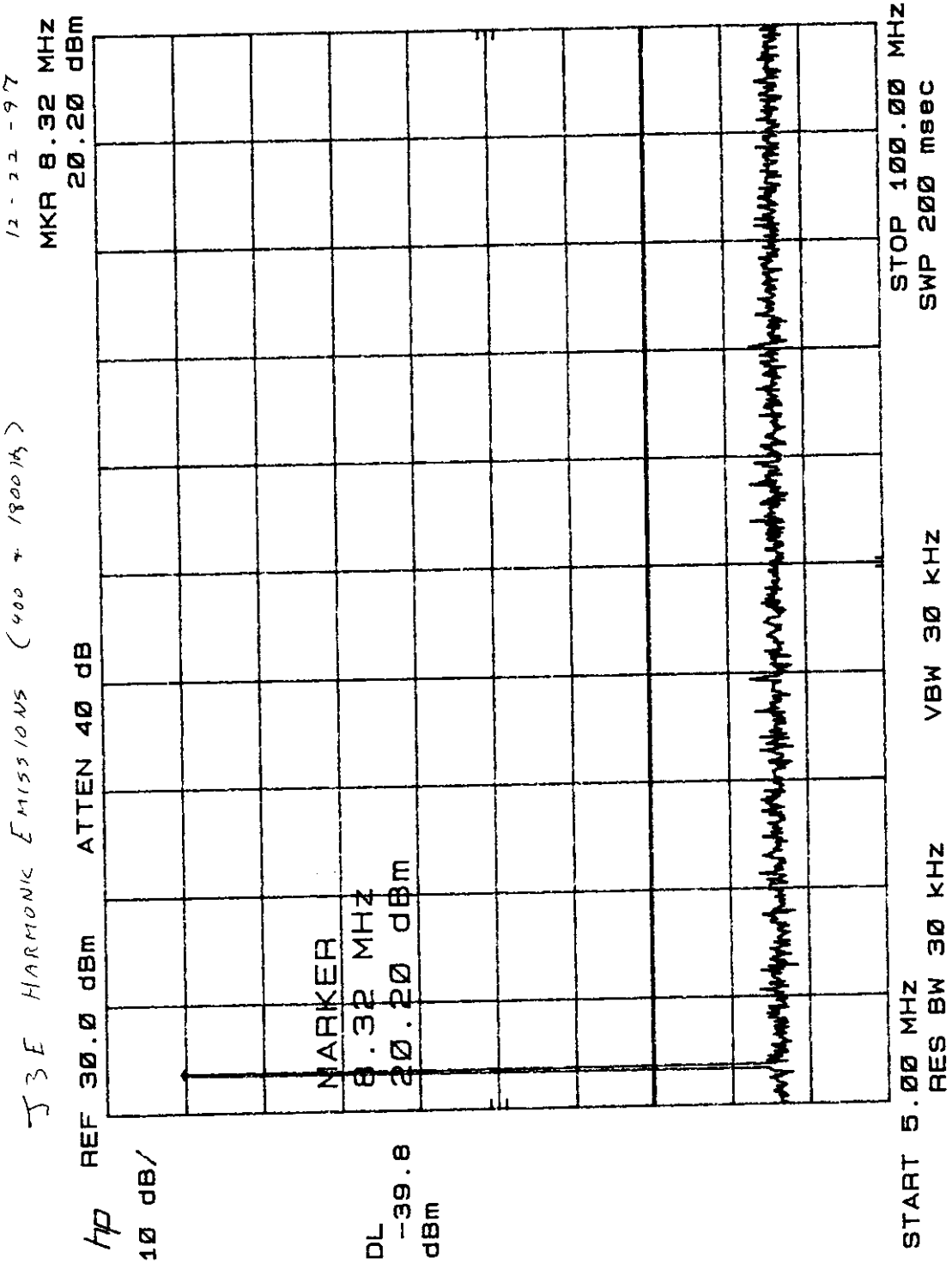
8.6 Spurious Emissions Test Results (§2.991)

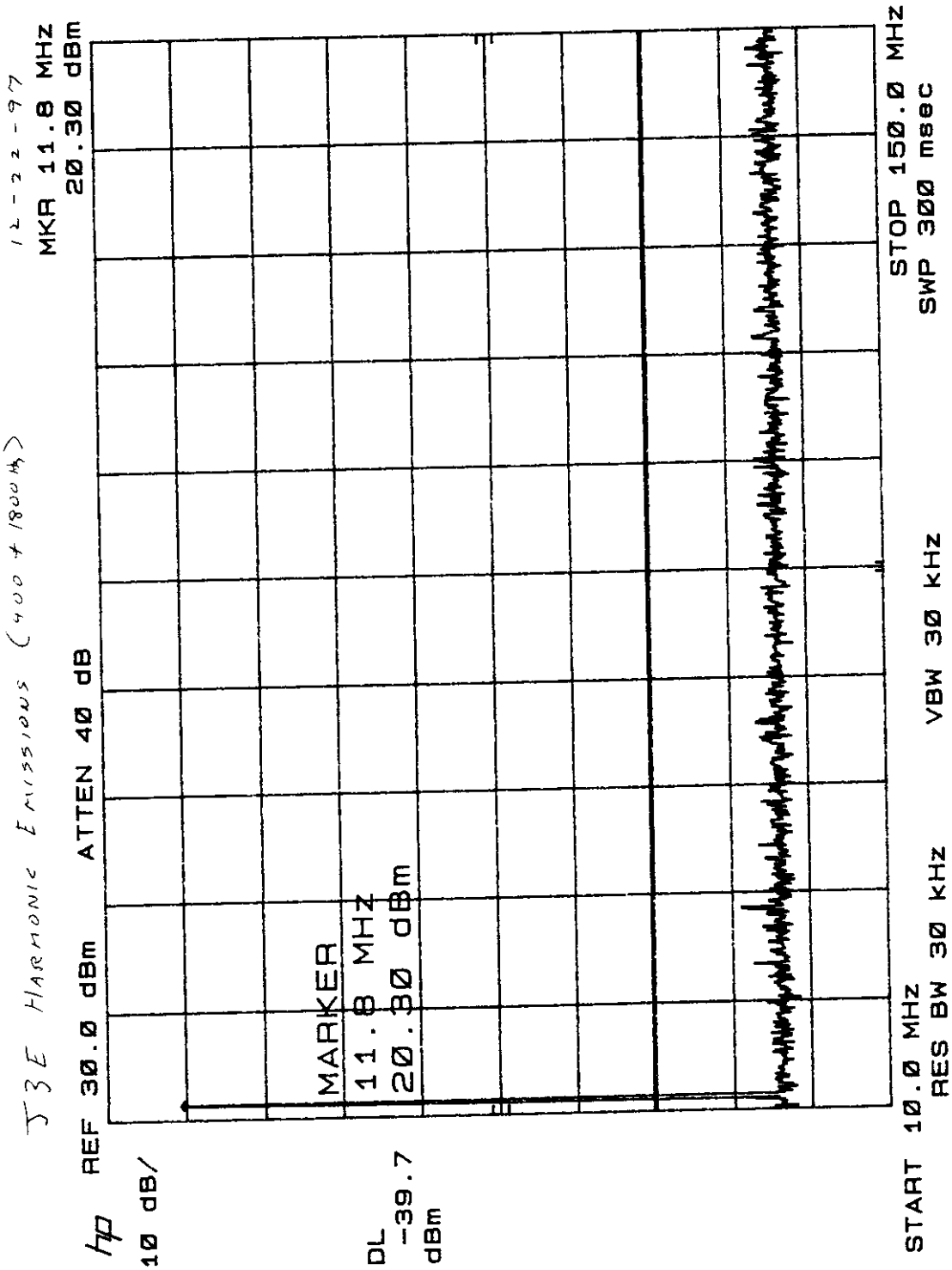



12-22-97
MKR 2.96 MHz
20.40 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL -39.6 dBm
MARKER
2.96 MHz
20.40 dBm
START 1.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 50.00 MHz
SWP 100 msec

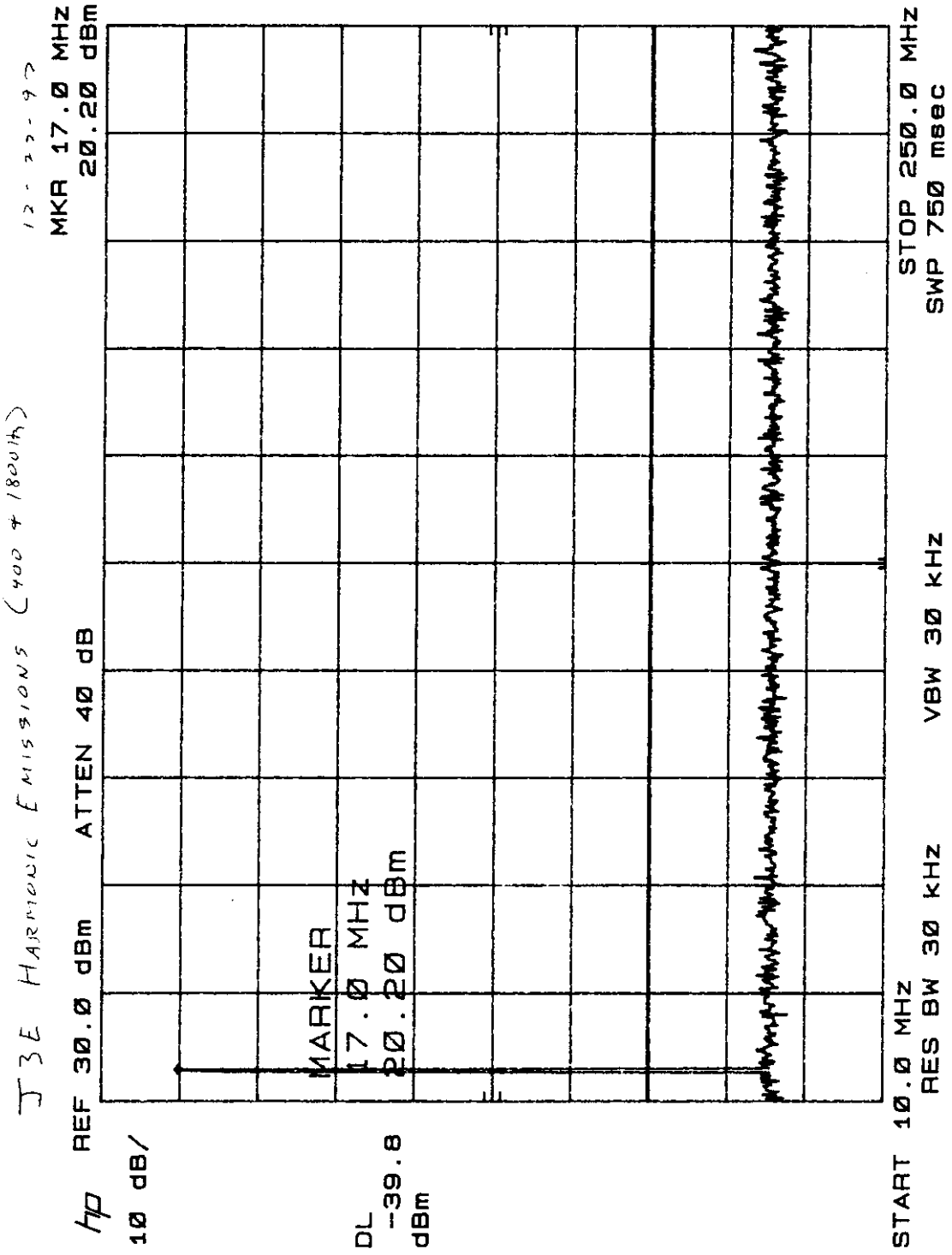

12-22-97
MKR 3.94 MHz
20.50 dBm
TSE HARMONIC EMISSIONS (400 & 1800 MHz)
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
3.94 MHz
20.50 dBm
DL
-39.5
dBm
START 1.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 50.00 MHz
SWP 100 msec

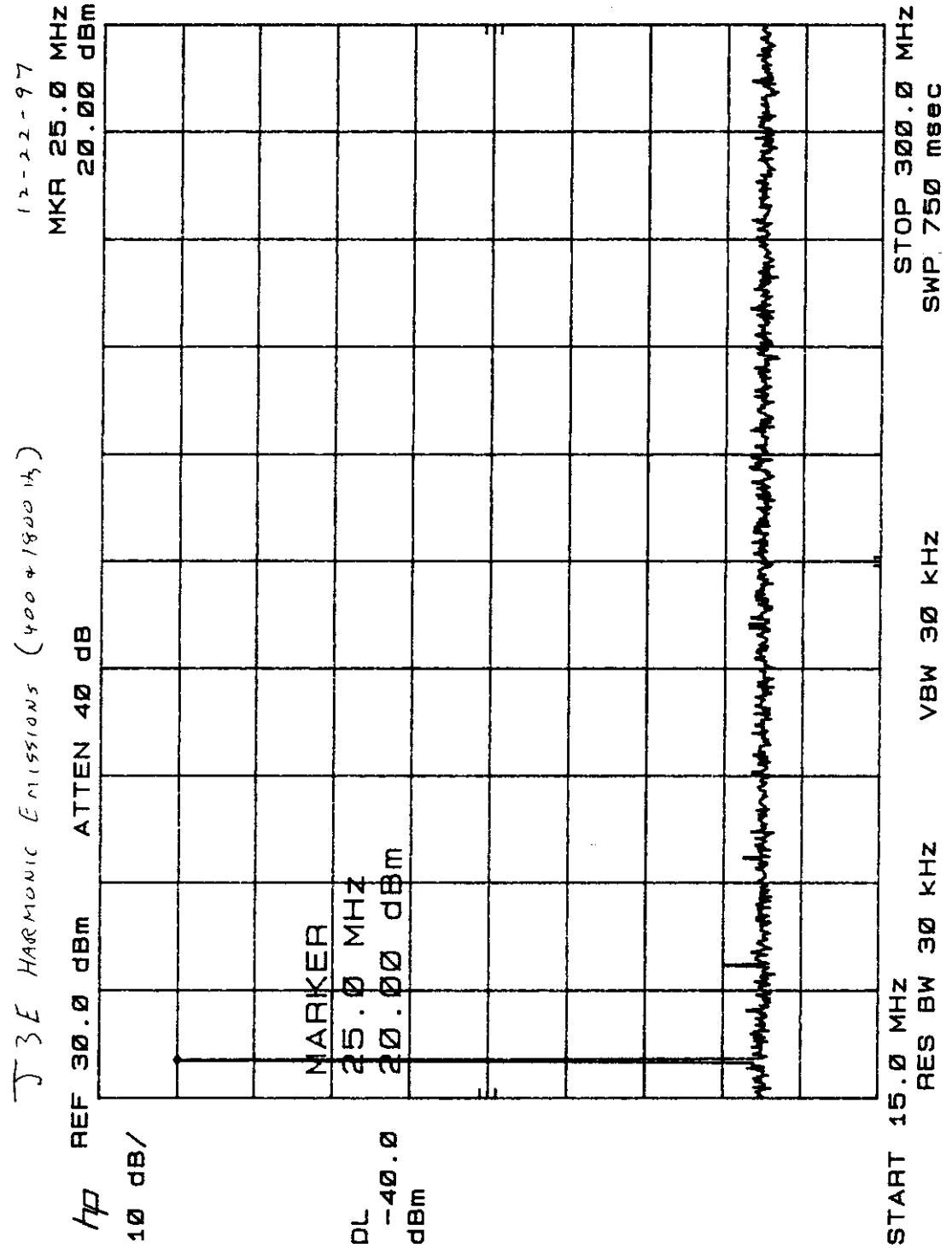

12-22-97
MKR 5.95 MHz
20.20 dBm
TSE Harmonic Emissions (400 + 180uW)
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
DL
-39.8
dBm
MARKER
5.95 MHz
20.20 dBm
START 5.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 100.00 MHz
SWP 200 msec


12-22-97
MKR 8.32 MHz
20.20 dBm
J3E HARMONIC EMISSIONS (400 + 1800 MHz)
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
8.32 MHz
20.20 dBm
DL
-39.8
dBm
STOP 100.00 MHz
SWP 200 msec
VBW 30 kHz
START 5.00 MHz
RES BW 30 kHz

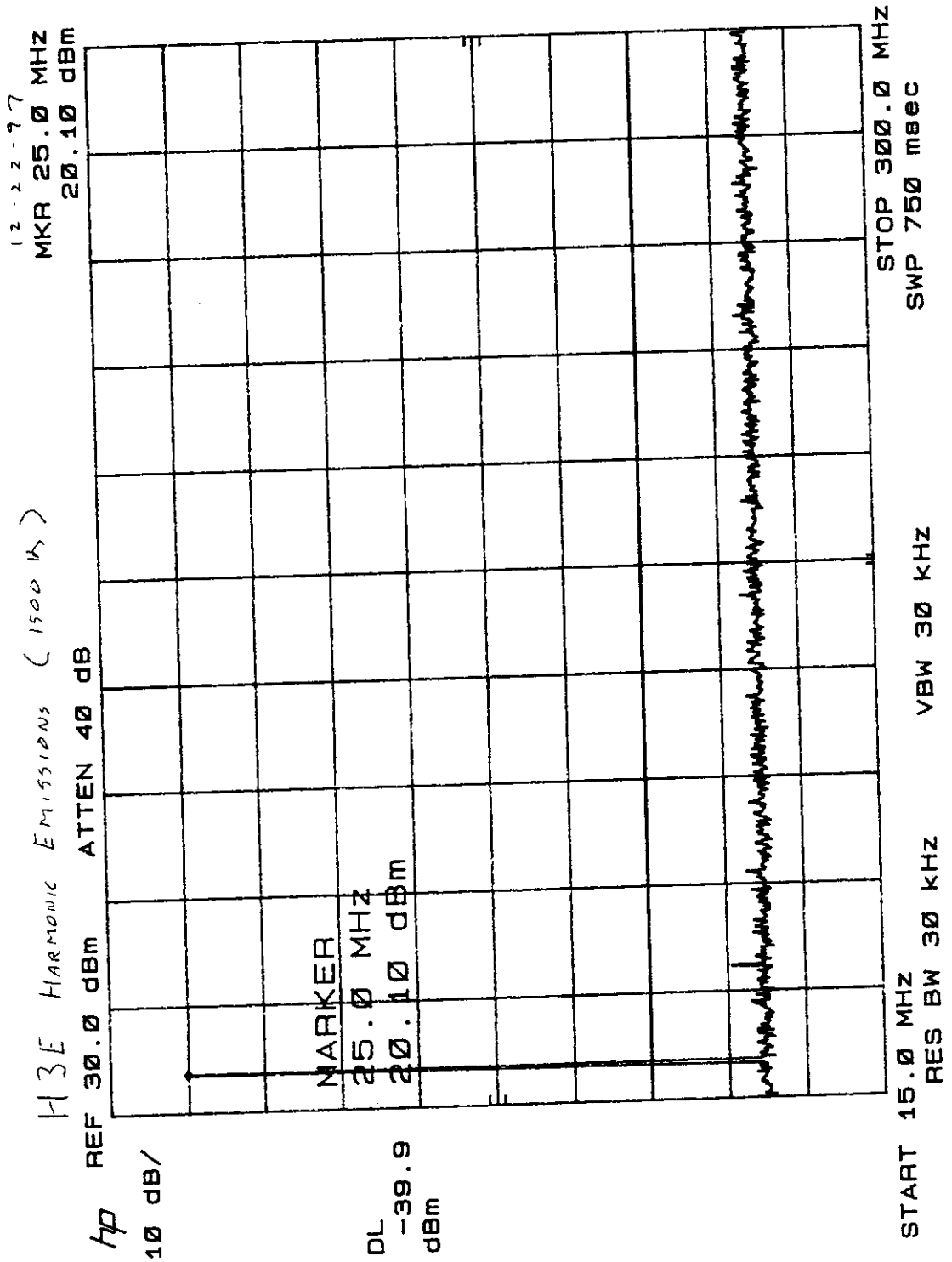


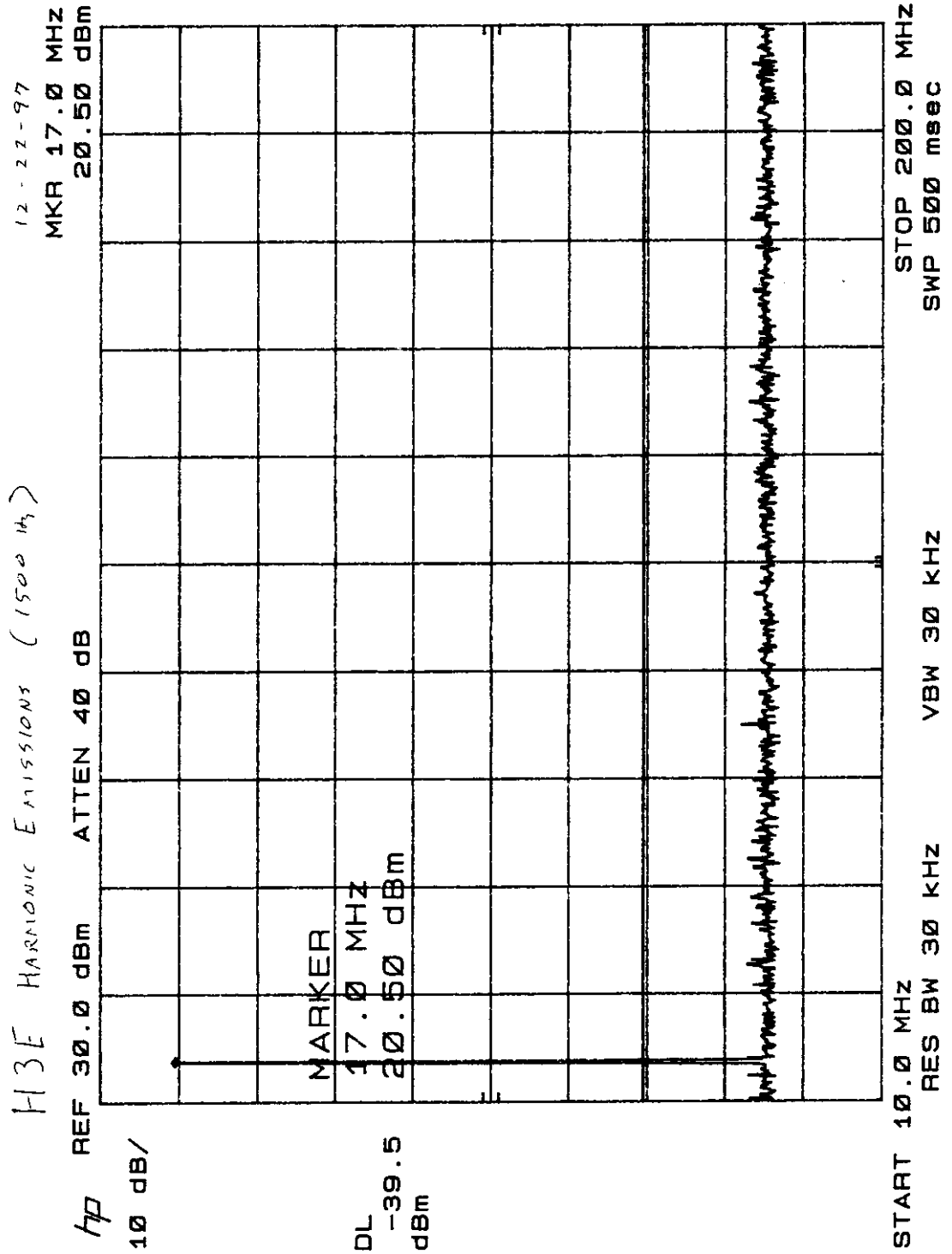
T3E Harmonic Emissions (400 + 1800 Hz)

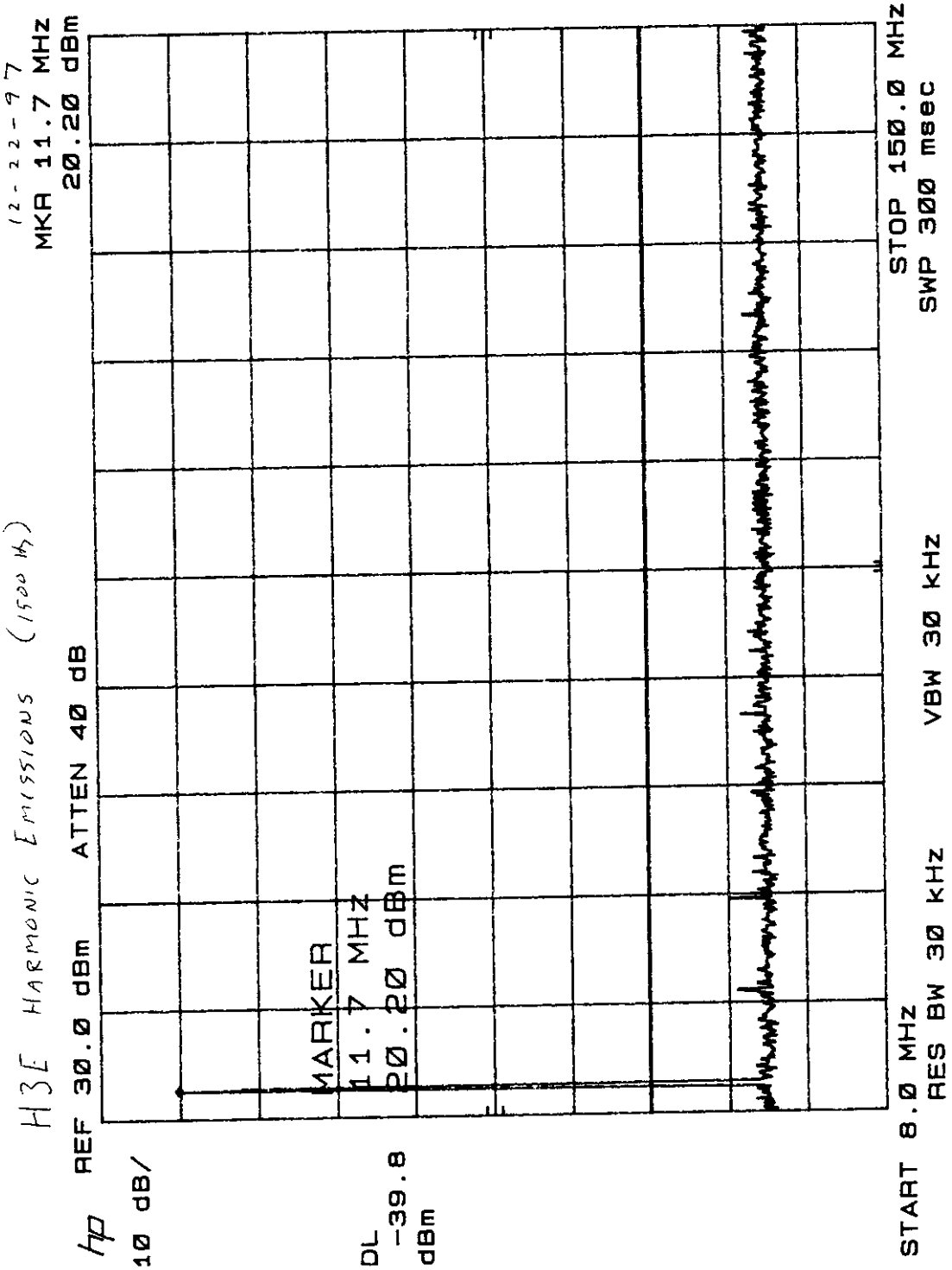

12-22-97
MKR 17.0 MHz
20.20 dBm
STOP 250.0 MHz
SWP 750 msec
J3E Harmonic Emissions (400 & 1800 Hz)
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
17.0 MHz
20.20 dBm
DL
-39.8
dBm
START 10.0 MHz
RES BW 30 kHz
VBW 30 kHz

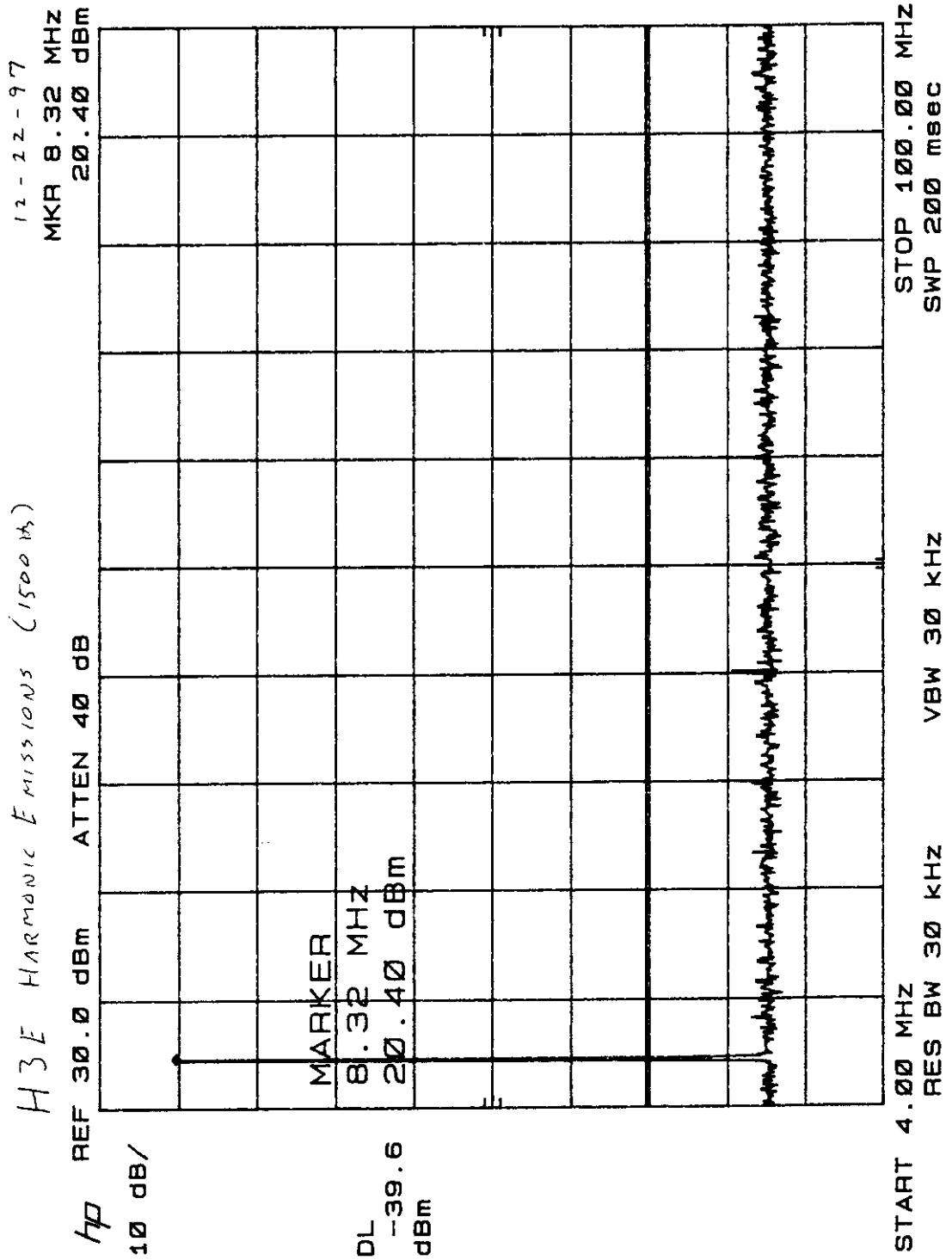


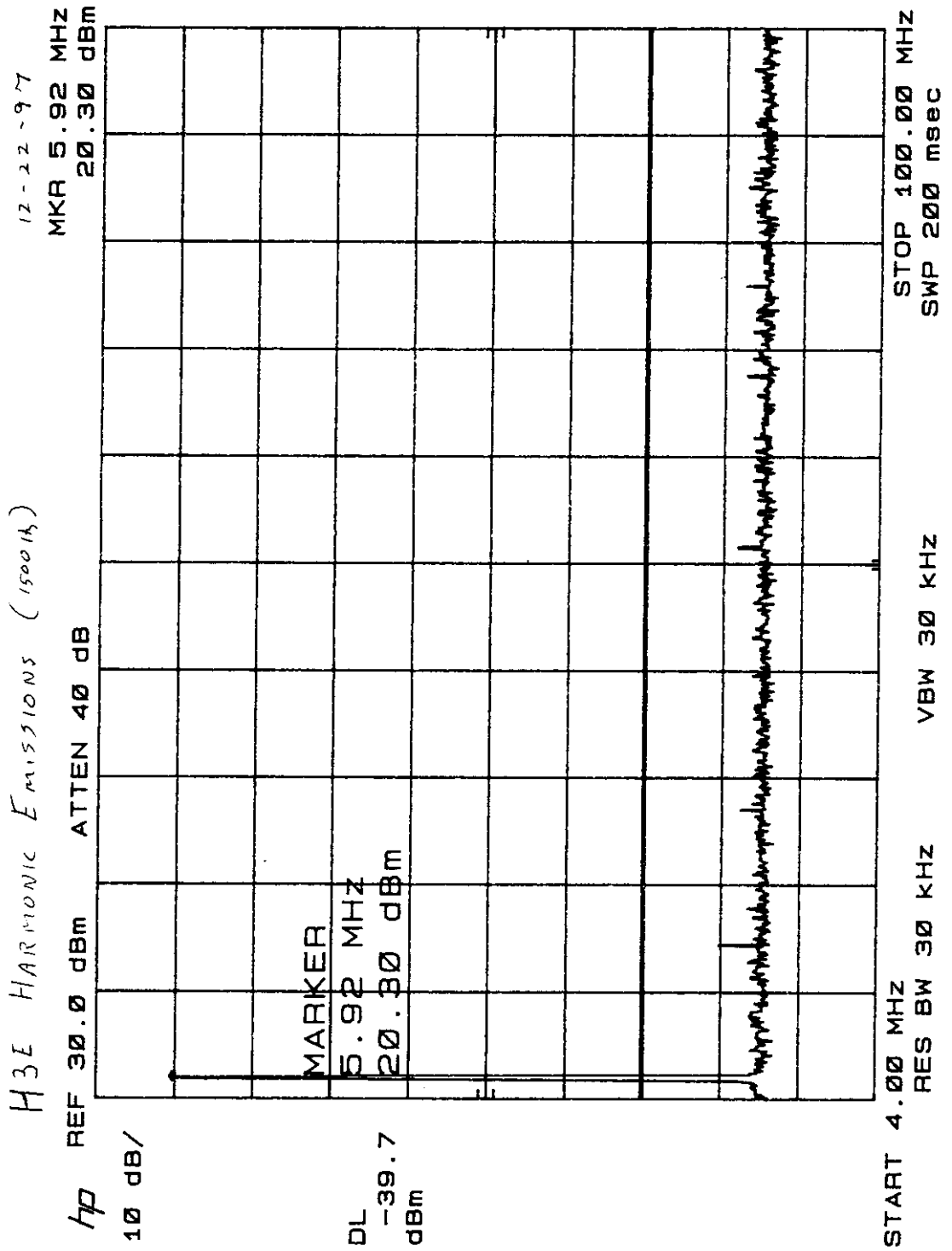
J3E HARMONIC EMISSIONS (400 & 1800 Hz)

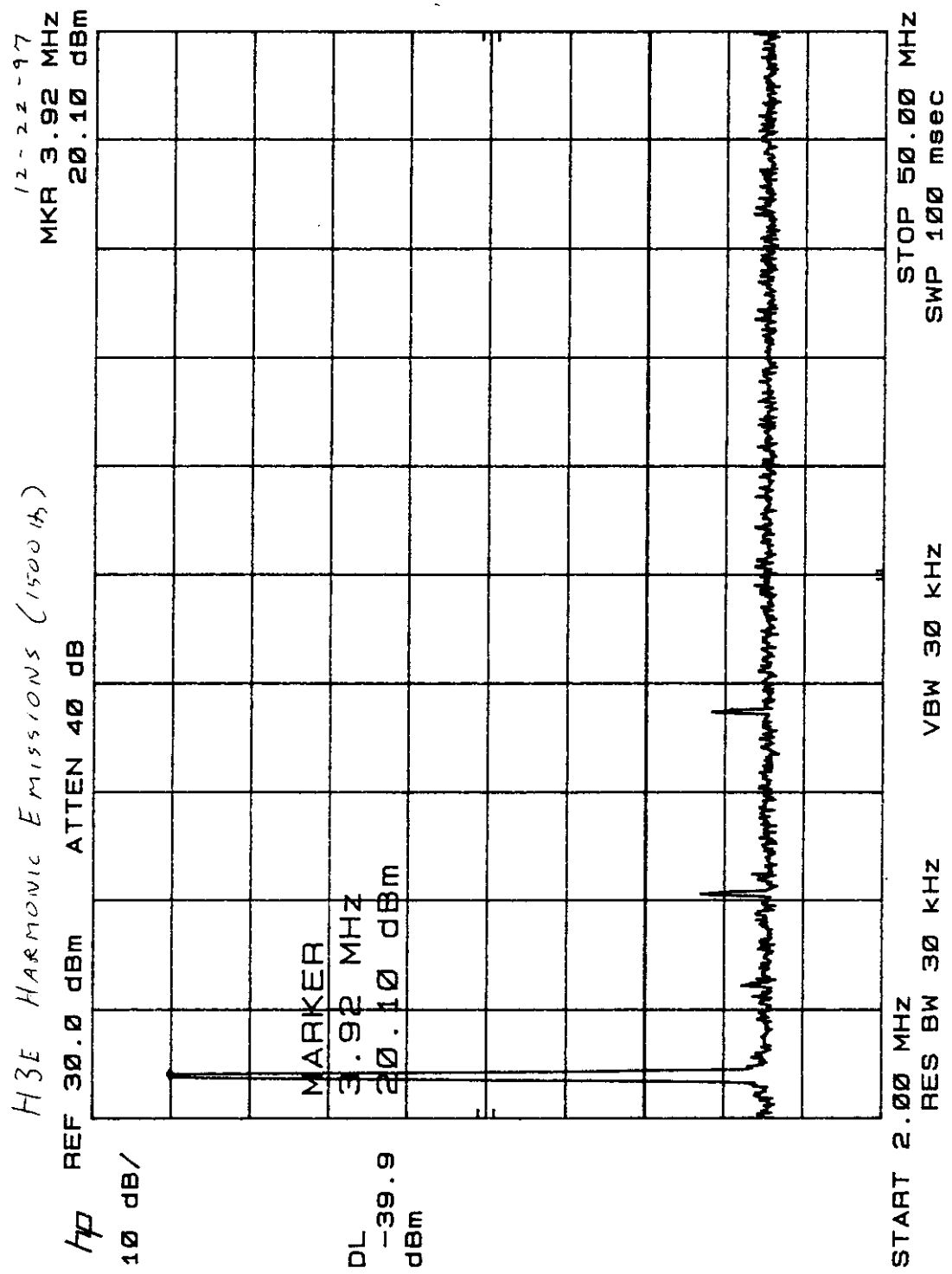

12-22-97
MKR 25.0 MHz
20.10 dBm
H3E Harmonic Emissions (1500 W)
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
25.0 MHz
20.10 dBm
DL
-39.9
dBm
STOP 300.0 MHz
SWP 750 msec
VBW 30 kHz
START 15.0 MHz
RES BW 30 kHz

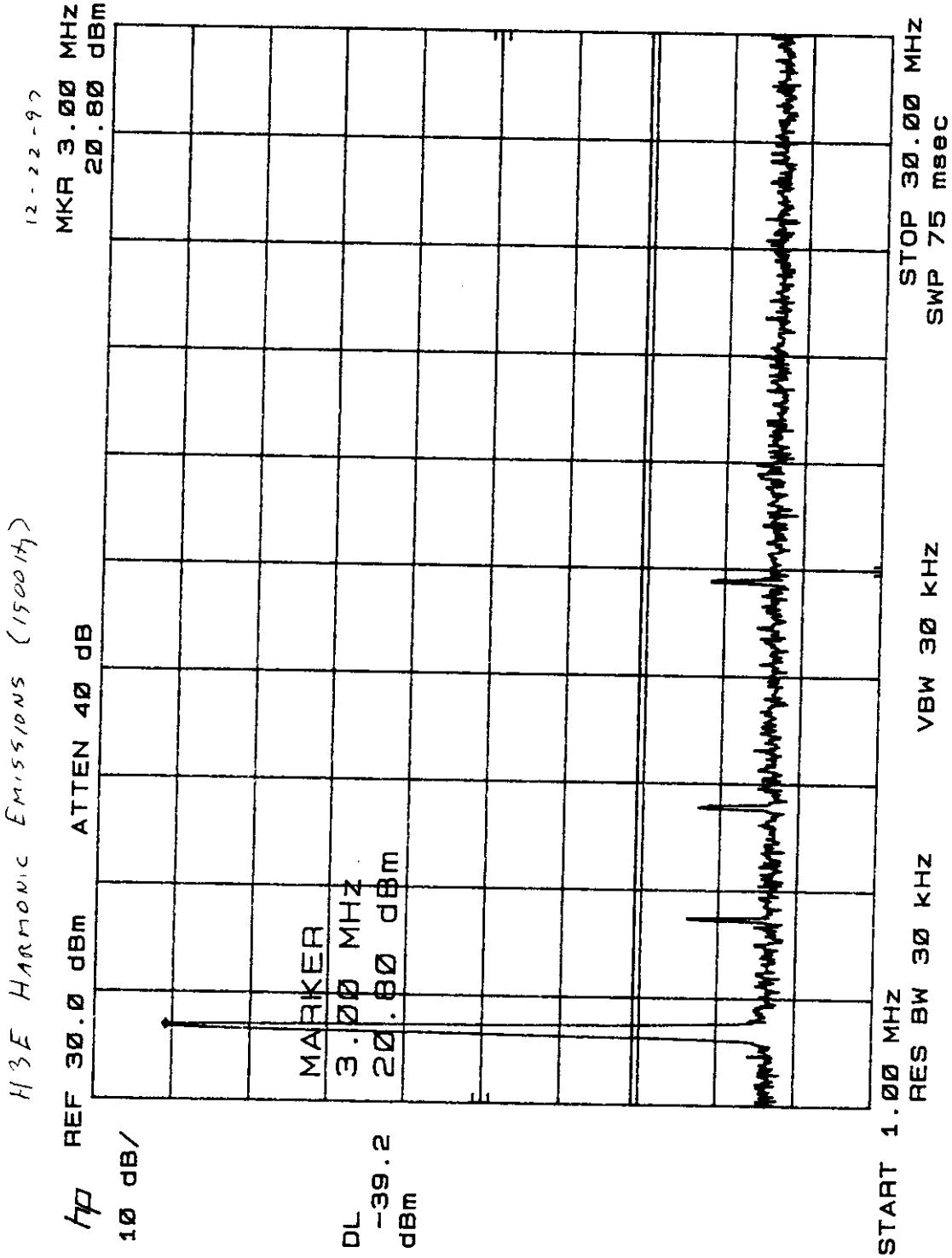

12-22-97
MKR 17.0 MHz
20.50 dBm
H3E Harmonic Emissions (1500 Hz)
hp
10 dB/
REF 30.0 dBm
ATTEN 40 dB
DL
-39.5
dBm
MARKER
17.0 MHz
20.50 dBm
START 10.0 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 200.0 MHz
SWP 500 msec


12-22-97
MKR 11.7 MHz
20.20 dBm
H3E HARMONIC EMISSIONS (1500 W)
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
11.7 MHz
20.20 dBm
DL
-39.8
dBm
STOP 150.0 MHz
SWP 300 msec
VBW 30 kHz
START 8.0 MHz
RES BW 30 kHz

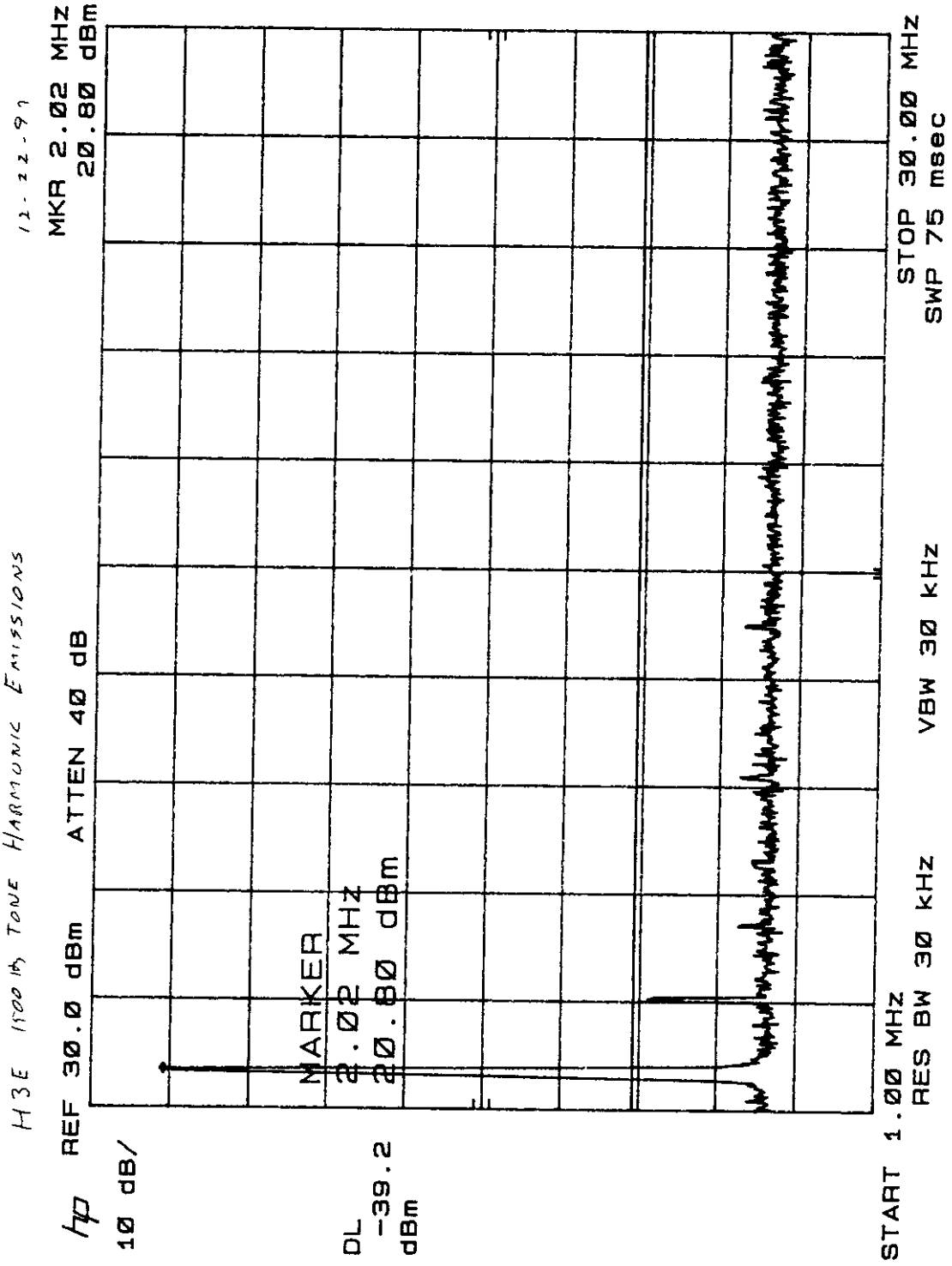

12-22-97
H3E Harmonic Emissions (1500 W)
MKR 8.32 MHz
20.40 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL -39.6 dBm
MARKER
8.32 MHz
20.40 dBm
START 4.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 100.00 MHz
SWP 200 msec


H3E HARMONIC EMISSIONS (150W)
12-22-97
MKR 5.92 MHz
20.30 dBm
hp
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
5.92 MHz
20.30 dBm
DL
-39.7
dBm
START 4.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 100.00 MHz
SWP 200 msec


12-22-97
MKR 3.92 MHz
20.10 dBm
H3E Harmonic Emissions (1500 W)
REF 30.0 dBm
ATTEN 40 dB
10 dB/
DL
-39.9
dBm
MARKER
3.92 MHz
20.10 dBm
START 2.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 50.00 MHz
SWP 100 msec



H3E Harmonic Emissions (1500 Hz)


12-22-97
H3E 1000 Hz TONE HARMONIC EMISSIONS
MKR 2.02 MHz
20.80 dBm
REF 30.0 dBm
ATTEN 40 dB
10 dB/
MARKER
2.02 MHz
20.80 dBm
DL
-39.2
dBm
START 1.00 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 30.00 MHz
SWP 75 msec

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (24.9MHz, J3E mode)** *Date of Test:* **02-10-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

400 & 1800 Hz modulation

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
24.900	66.1	v	28.0	94.1	146.9	-52.8
49.800	19.6	v	15.3	34.9	74.0	-39.1
74.700	42.1	h	10.9	53.0	74.0	-21.0
99.500	27.8	v	16.8	44.6	74.0	-29.4
124.500	26.0	v	16.1	42.1	74.0	-31.9
149.400	12.1	v	17.8	29.9	74.0	-44.1
174.300	25.8	v	20.8	46.6	74.0	-27.4
199.200	19.4	h	21.3	40.7	74.0	-33.3
224.100	16.4	v	16.0	32.4	74.0	-41.6
249.000	21.1	v	17.5	38.6	74.0	-35.4

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (24.9MHz, H3E mode)** *Date of Test:* **02-10-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

1500 Hz modulation

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
24.900	67.5	h	28.0	95.5	146.9	-51.4
49.800	24.8	v	15.3	40.1	74.0	-33.9
74.700	58.2	v	10.9	69.1	74.0	-4.9
99.500	16.7	v	16.8	33.5	74.0	-40.5
124.500	27.9	v	16.1	44.0	74.0	-30.0
149.400	34.9	v	17.8	52.7	74.0	-21.3
174.300	33.8	h	20.8	54.6	74.0	-19.4
199.200	20.8	v	21.3	42.1	74.0	-31.9
224.100	19.8	h	16.0	35.8	74.0	-38.2
249.000	18.8	h	17.5	36.3	74.0	-37.7

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (17.3MHz, H3E mode)** *Date of Test:* **02-10-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

1500 Hz modulation

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
17.300	30.3	v	25.8	56.1	146.9	-90.8
34.600	16.1	v	14.1	30.2	74.0	-43.8
51.900	43.3	v	15.4	58.7	74.0	-15.3
69.200	32.1	v	12.2	44.3	74.0	-29.7
86.500	42.6	v	13.6	56.2	74.0	-17.8
103.900	24.3	v	17.5	41.8	74.0	-32.2
121.300	20.5	h	16.9	37.4	74.0	-36.6
138.700	25.1	v	16.2	41.3	74.0	-32.7
156.000	40.3	v	18.8	59.1	74.0	-14.9
173.300	17.2	v	20.7	37.9	74.0	-36.1

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (17.3MHz, J3E mode)** *Date of Test:* **02-10-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

400Hz & 1800 Hz modulation

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
17.300	29.5	v	25.8	55.3	146.9	-91.6
34.600	13.4	v	14.1	27.5	74.0	-46.5
51.900	35.9	v	15.4	51.3	74.0	-22.7
69.200	26.1	v	12.2	38.3	74.0	-35.7
86.500	37.0	v	13.6	50.6	74.0	-23.4
103.900	21.3	v	17.5	38.8	74.0	-35.2
121.300	20.7	v	16.9	37.6	74.0	-36.4
138.700	22.6	v	16.2	38.8	74.0	-35.2
156.000	38.6	v	18.8	57.4	74.0	-16.6
173.300	16.5	v	20.7	37.2	74.0	-36.8

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (12MHz, J3E mode)** *Date of Test:* **02-10-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
12.000	34.2	v	31.5	65.7	146.9	-81.2
24.000	21.3	v	27.2	48.5	74.0	-25.5
36.000	36.3	v	13.9	50.2	74.0	-23.8
48.000	20.0	v	15.0	35.0	74.0	-39.0
60.000	37.0	v	15.0	52.0	74.0	-22.0
72.000	26.7	v	11.5	38.2	74.0	-35.8
84.000	39.6	v	11.4	51.0	74.0	-23.0
96.000	20.8	v	16.0	36.8	74.0	-37.2
108.000	30.5	v	18.8	49.3	74.0	-24.7
120.000	11.4	v	17.3	28.7	74.0	-45.3

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (12MHz, H3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-10-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
12.000	36.5	v	31.5	68.0	146.9	-78.9
24.000	25.1	h	27.2	52.3	74.0	-21.7
36.000	41.3	v	13.9	55.2	74.0	-18.8
48.000	19.4	v	15.0	34.4	74.0	-39.6
60.000	40.4	v	15.0	55.4	74.0	-18.6
72.000	29.4	v	11.5	40.9	74.0	-33.1
84.000	43.8	v	11.4	55.2	74.0	-18.8
96.000	20.4	v	16.0	36.4	74.0	-37.6
108.000	36.2	v	18.8	55.0	74.0	-19.0
120.000	14.2	h	17.3	31.5	74.0	-42.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (8.5MHz, J3E mode)** *Date of Test:* **02-11-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBµV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBµV/m)	Emission Spec. Limit at 10 m (dBµV/m)	Difference Margin
8.500	26.4	v	30.5	56.9	146.9	-90.0
17.000	6.0	v	25.7	31.7	74.0	-42.3
25.500	41.4	v	28.0	69.4	74.0	-4.6
34.000	18.8	v	14.2	33.0	74.0	-41.0
42.500	39.8	v	14.1	53.9	74.0	-20.1
51.000	25.2	v	15.4	40.6	74.0	-33.4
59.500	49.1	v	15.1	64.2	74.0	-9.8
68.000	27.0	v	12.6	39.6	74.0	-34.4
76.500	35.6	v	10.7	46.3	74.0	-27.7
85.000	25.0	v	11.7	36.7	74.0	-37.3

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (8.5MHz, H3E mode)** *Date of Test:* **02-11-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
8.500	26.4	v	30.5	56.9	146.9	-90.0
17.000	9.0	v	25.7	34.7	74.0	-39.3
25.500	36.5	v	28.0	64.5	74.0	-9.5
34.000	25.1	v	14.2	39.3	74.0	-34.7
42.500	46.1	v	14.1	60.2	74.0	-13.8
51.000	21.8	v	15.4	37.2	74.0	-36.8
59.500	42.0	v	15.1	57.1	74.0	-16.9
68.000	33.3	v	12.6	45.9	74.0	-28.1
76.500	36.5	v	10.7	47.2	74.0	-26.8
85.000	30.7	v	11.7	42.4	74.0	-31.6

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (6MHz, J3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
6.000	25.8	v	29.7	55.5	146.9	-91.4
12.000	3.2	v	31.5	34.7	74.0	-39.3
18.000	5.7	v	26.0	31.7	74.0	-42.3
24.000	20.2	v	27.2	47.4	74.0	-26.6
30.000	14.0	v	15.3	29.3	74.0	-44.7
36.000	14.0	v	13.9	27.9	74.0	-46.1
42.000	20.2	v	14.0	34.2	74.0	-39.8
48.000	12.5	v	15.0	27.5	74.0	-46.5
54.000	14.0	v	15.5	29.5	74.0	-44.5
60.000	19.5	h	15.0	34.5	74.0	-39.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (6MHz, H3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
6.000	25.2	v	29.7	54.9	146.9	-92.0
12.000	3.2	v	31.5	34.7	74.0	-39.3
18.000	3.1	v	26.0	29.1	74.0	-44.9
24.000	18.5	h	27.2	45.7	74.0	-28.3
30.000	18.5	v	15.3	33.8	74.0	-40.2
36.000	13.0	v	13.9	26.9	74.0	-47.1
42.000	22.3	h	14.0	36.3	74.0	-37.7
48.000	14.7	h	15.0	29.7	74.0	-44.3
54.000	23.3	v	15.5	38.8	74.0	-35.2
60.000	21.8	h	15.0	36.8	74.0	-37.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications** *Conducted by:*

EUT: **HF Exciter, Amp, Power Supply (4MHz, H3E mode)** *Date of Test:* **02-11-98**

Model #: **T-4180, PA-5050A, PS-7130A** *Test Distance, Amp. gain:* **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
4.000	31.8	v	33.8	65.6	146.9	-81.3
8.000	1.2	v	30.3	31.5	74.0	-42.5
12.000	8.6	v	31.5	40.1	74.0	-33.9
16.000	1.9	h	25.6	27.5	74.0	-46.5
20.000	28.4	h	26.7	55.1	74.0	-18.9
24.000	18.7	v	27.2	45.9	74.0	-28.1
28.000	11.7	v	29.3	41.0	74.0	-33.0
32.000	24.8	v	14.8	39.6	74.0	-34.4
36.000	18.0	v	13.9	31.9	74.0	-42.1
40.000	29.2	v	13.6	42.8	74.0	-31.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (4MHz, J3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
4.000	31.5	v	33.8	65.3	146.9	-81.6
8.000	1.9	v	30.3	32.2	74.0	-41.8
12.000	6.9	v	31.5	38.4	74.0	-35.6
16.000	1.3	v	25.6	26.9	74.0	-47.1
20.000	35.9	v	26.7	62.6	74.0	-11.4
24.000	19.9	v	27.2	47.1	74.0	-26.9
28.000	16.3	v	29.3	45.6	74.0	-28.4
32.000	13.6	v	14.8	28.4	74.0	-45.6
36.000	20.8	h	13.9	34.7	74.0	-39.3
40.000	14.9	v	13.6	28.5	74.0	-45.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (3MHz, J3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
3.000	34.2	v	33.0	67.2	146.9	-79.7
6.000	0.6	v	29.7	30.3	74.0	-43.7
9.000	0.6	v	30.8	31.4	74.0	-42.6
12.000	0.6	v	31.5	32.1	74.0	-41.9
15.000	0.6	v	25.2	25.8	74.0	-48.2
18.000	1.2	v	26.0	27.2	74.0	-46.8
21.000	15.4	v	26.9	42.3	74.0	-31.8
24.000	17.7	v	27.2	44.9	74.0	-29.1
27.000	17.6	h	28.7	46.3	74.0	-27.8
30.000	12.3	v	15.3	27.6	74.0	-46.4

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (3MHz, H3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
3.000	36.2	v	33.0	69.2	146.9	-77.7
6.000	0.5	v	29.7	30.2	74.0	-43.8
9.000	0.5	v	30.8	31.3	74.0	-42.7
12.000	0.5	v	31.5	32.0	74.0	-42.0
15.000	0.5	v	25.2	25.7	74.0	-48.3
18.000	-0.8	v	26.0	25.2	74.0	-48.8
21.000	14.3	v	26.9	41.2	74.0	-32.9
24.000	17.0	h	27.2	44.2	74.0	-29.8
27.000	15.6	v	28.7	44.3	74.0	-29.8
30.000	9.5	v	15.3	24.8	74.0	-49.2

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

Electromagnetic Engineering Services, Incorporated
FCC, Part 87 (Section 2.993) Radiated Emissions Data Sheet
(10 m Open Area Test Site)

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply (2MHz, J3E mode)**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by:
Date of Test: **02-11-98**
Test Distance, Amp. gain: **10 m, 0 dB**

Frequency (MHz)	Spectrum Analyzer Reading (dBμV)	Antenna Polarization (V or H)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for10 m (dBuV/m)	Total Interference Level Corrected for 10 m (dBμV/m)	Emission Spec. Limit at 10 m (dBμV/m)	Difference Margin
2.000	30.9	v	37.7	68.6	146.9	-78.3
4.000	3.2	v	33.8	37.0	74.0	-37.0
6.000	1.7	v	29.7	31.4	74.0	-42.6
8.000	-0.4	v	30.3	29.9	74.0	-44.1
10.000	1.0	v	31.0	32.0	74.0	-42.0
12.000	1.0	v	31.5	32.5	74.0	-41.5
14.000	1.0	v	24.7	25.7	74.0	-48.3
16.000	-1.4	v	25.6	24.2	74.0	-49.8
18.000	-0.8	v	26.0	25.2	74.0	-48.8
20.000	7.8	v	26.7	34.5	74.0	-39.5

Test Conditions: Standard radiated emissions test set up on FCC registered open field site. The highest emissions for all antenna heights, polarities, and table orientations are the only emissions recorded.

8.8 Frequency Stability Test Results (§2.995)

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.995, Voltage Input Variation Data Sheet

Client: **Cubic Communications** *Conducted by:* C. Richard

EUT: **HF Exciter, Amp, Power Supply** *Date of Test:* **12/19/97**

Model #: **T-4180, PA-5050A, PS-7130A** **(Frequency = 24.9MHz, CW mode)**

Power Type	208 Input Power Mode (VAC)	Frequency (Hz)	115 Input Power Mode (VAC)	Frequency (Hz)
Nominal Power	208 VAC	24899995.6	115 VAC	24899994.4
Low Power	176 VAC	24899995.6	97 VAC	24899994.4
High Power	240 VAC	24899995.4	133 VAC	24899994.2
Nominal Power	208 VAC	24899995.2	115 VAC	24899994.2

Conclusion: The frequency deviated less than 10 Hz from nominal in all modes

Test Engineer: _____

Electromagnetic Engineering Services, Incorporated
FCC, Part 87, Sec. 2.995, Frequency Stability Data Sheet

Client: **Cubic Communications**
EUT: **HF Exciter, Amp, Power Supply**
Model #: **T-4180, PA-5050A, PS-7130A**

Conducted by: C. Anstead
Date of Test: **12-18-97**

(Excitation at 1500Hz)

Temp. (C)	Frequency (Hz) CW	Frequency (Hz) J3E Mode	Frequency (Hz) H3E Mode
-30.0	24900005.4	24901505.4	24900005.4
-20.0	24900004.2	24901504.2	24900004.2
-10.0	24900003.4	24901503.4	24900003.4
0.0	24900002.8	24901502.8	24900002.8
10.0	24901001.2	24901501.2	24900001.2
20.0	24900001.2	24901501.2	24900001.2
30.0	24899996.8	24901497.0	24899997.2
40.0	24899995.8	24901495.8	24899995.8
50.0	24899999.0	24901499.2	24899999.0

Conclusion: The frequency deviated less than 10 Hz from nominal in all modes

APPENDIX A

EESI'S TEST EQUIPMENT & TEST FACILITIES CALIBRATION PROGRAM

EESI operates a comprehensive equipment calibration program in order to ensure the validity of all test data. EESI's calibration program is fully compliant to the requirements of ANSI/NCSL Z540-1 (1994) and of ISO 10012-1 (1993-05-01). EESI's calibration program therefore meets or exceeds the US national commercial and military requirements (N.B. ANSI/NCSL Z540-1 (1994) replaces MIL-STD-45662A) and meets the requirements of ISO-9000. Specifically, all of EESI's primary reference standard devices (e.g., resistor and capacitor decade boxes, vector voltmeters, multimeters, attenuators and terminations, RF power meters (and their detector heads), oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, etc.) and certain secondary standard devices (e.g., RF preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are calibrated by EESI-approved independent (third party) metrology laboratories, using NIST-traceable standards. In all cases, the metrology laboratory furnishes EESI with Certificates Of Calibration on each item of equipment that has been successfully recalibrated.

Calibration intervals are normally one year, except when the manufacturer advises a shorter interval (e.g., the HP 8568B Spectrum Analyzer is recalibrated every 6 months) or if US Government directives demand a shorter interval (e.g., the Eaton 533X-11 Impulse Generator is required to be recalibrated every six months for use in TEMPEST testing). Items of equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either by the EESI-approved independent (third party) metrology laboratories, or by the manufacturer of the equipment.

EESI typically determines the Antenna Factors in its test antennas in-house. Antennas used for CISPR 11, CISPR 22, and FCC Part 15 and Part 18 Radiated Emissions testing (and for testing to the European Norms) are calibrated against NIST-traceable, FCC-approved Roberts™ Dipoles, using the methods specified in both Annex G.5 of CISPR 16-1 (1993) and ANSI C63.5 (1991), including the "Three-Antenna Method." Certain other antennas (e.g., log-conic spirals) are calibrated using the procedures specified in SAE ARP-958A. In accordance with FCC regulations, EESI recalibrates its suite of antennas used for FCC tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of EESI's Open Area Test Site1. In those instances where antennas are acquired directly from the manufacturer, EESI will purchase an Antenna Factor Calibration Data Package. Finally, EESI may send antennas out to NIST-traceable/military-approved independent antenna range laboratories, or to the original equipment manufacturer.

[1] EESI uses the procedures contained in both Subclause 16.6 and Annex G.2 of CISPR 16-1 (1993), and ANSI C63.4 (1992) when performing Normalized Site Attenuation measurement for calibration of EESI's Open Area Test Site.