Application for Certification
For an RF Power Amplifier

TPL Communications
3370 San Fernando Rd. #206
Los Angeles, CA 90065

RF Power Amplifier:

Part # KVC-9A

FCC ID: BBD3-KVC9A

REPORT # RA054891/10076

This report was prepared in accordance with the requirements of the FCC Rules and Regulations Part 2, Subpart J, 2.1031 through 2.1057, Part 22, Part 90 and other applicable sections of the rules as indicated herein.

Prepared By:

Fred Gurule

DNB Engineering, Inc.
3535 W. Commonwealth Ave.
Fullerton, CA 92833

12 JANUARY 2001

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Note:

Paragraph numbers in this report follow the application section numbers found in the FEDERAL COMMUNICATIONS COMMISSION Rules and Regulations, Part 2, Subpart J for Certification of electronic equipment.

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2.1033 ADMINISTRATIVE DATA

2.1033 Certifications and Qualifications

I certify that DNB Engineering, Inc conducted the tests performed in order to obtain the technical data presented in this application. Also, based on the results of the enclosed data, I have concluded that the equipment tested meets or exceeds the requirements of the Rules and Regulations governing this application.

2.1033 Measurement Repeatability Information

The test data presented in this report has been acquired using the guidelines set forth in FCC Part 2.1031 through 2.1057, Part 22, and Part 90. The test results presented in this document are valid only for the equipment identified herein under the test conditions described. Repeatability of these test results will only be achieved with identical measurement conditions. These conditions include: The same test distance, EUT Height, Measurement Site Characteristics, and the same EUT System Components. The system must have the same Interconnecting Cables arranged in identical placement to that in the test set-up, with the system and/or EUT functioning in the identical mode of operation (i.e. software and so on) as on the date of the test. Any deviation from the test conditions and the environment on the date of the test may result in measurement repeatability difficulties.
All changes made to the EUT during the course of testing as identified in this test report must be incorporated into the EUT or identical models to ensure compliance with the FCC regulations.

Bryan Broaddus (Para. 1.1)
Manager, Test Dept.
DNB Engineering, Inc.
Tel. (714) 870-7781 FAX (714) 870-5081

2.1033 (C) (1) Application for Certification

Name of Applicant:		TPL Communications 3370 San Fernando Rd. #206 Phoenix, AZ 85027
Applicant is:	X	Manufacturer Vendor Licensee Prospective Licensee Other
Description:		Mobile Vehicle Amplifier
Part Number:		KVC-9A
Anticipated Production Quantity:		Multiple Units

2.1033 (C) (2) FCC Identifier

FCC ID: BBD3-KVC9A

2.1033 (C) (3) Installation and Operating Instructions

See the Service Manual Included in Appendix A herein for the complete description.

2.1033 (C) (4) Type of Emission

F3E

2.1033 (C) (5) Frequency Range

450 MHz to 512 MHz

2.1033 (C) (6) Operating Power

30 Watts

2.1033 (C) (7) Maximum Power Allowed in Applicable Part(s) of theRules

RULES PART	MAXIMUM POWER (WATTS)
Part 22.757	500 Watts
Part 90.205	500 Watts (ERP)

2.1033 (C)(8) Final RF Amplifier Input Power Characteristics

Input Voltage:	13.6 Vdc Nominal
Input Current:	5.0 Adc Nominal 7.0 Adc Max

2.1033 (C) (9) Tune Up Procedure

Refer to Figure in Appendix A.

2.1033 (C) (10) Schematic Diagram and Circuit Description

Refer to figure in Appendix A.

2.1033 (C) (11) Equipment Identification Plate

CANADA

KENWOOD VEHICULAR ADAPTER

MODEL NO. KVC-9A

VOLTAGE 13.6VDC-7A PWR OUTPUT: 30W

FCC ID: BBD3-KVC9A SERIAL NO.

KENWOOD CORPORATION MADE IN USA

NOTES:
Label will be constructed of 0.02 inch aluminum as shown on the equipment with permanent adhesive.

All information on the label will be etched or stamped. Both methods will exceed the expected lifetime of the equipment.

The label will be large enough to allow all information to be legible.

2.1033 (C) (12) Equipment Photographs

Note: The Main Circuit Board shown in these photos has no components on the reverse side.

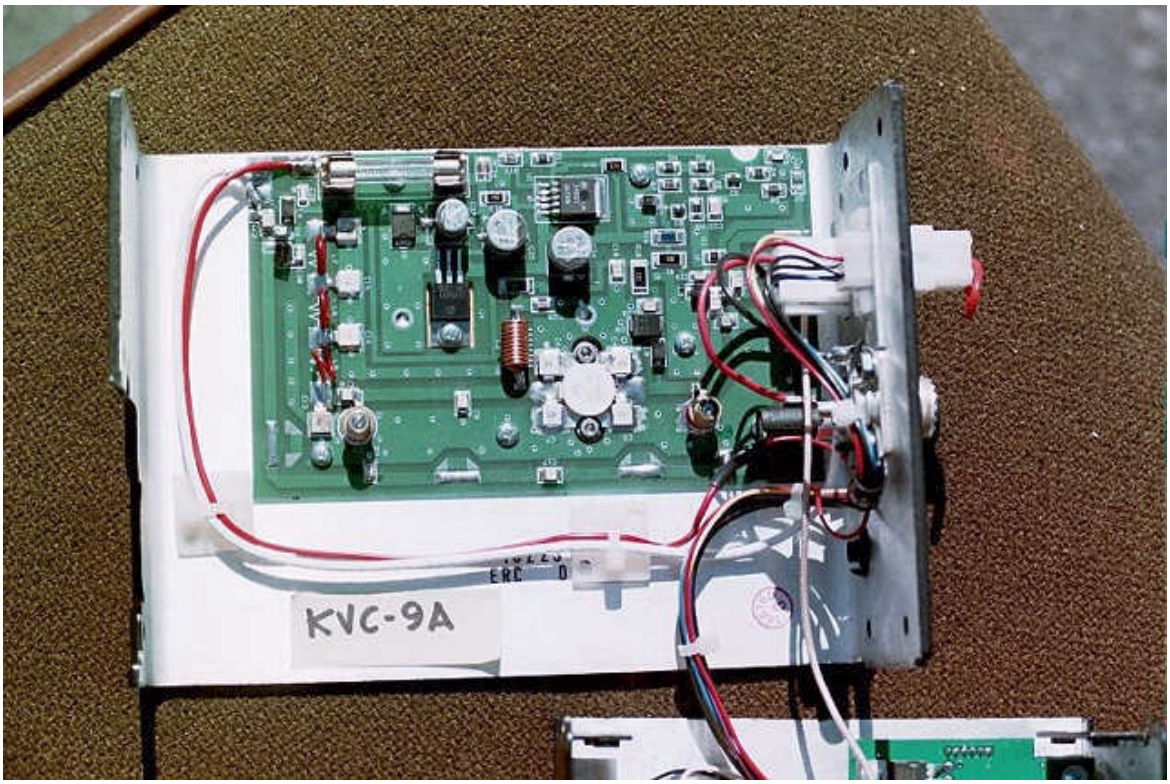
Photo 1 Main Circuit Board (Overall View)

Photo 2 Main Circuit Board (Detail)

Photo 3 External Front View

Photo 4 External ¾ View

Photo 1 Main Circuit Board (Overall View)



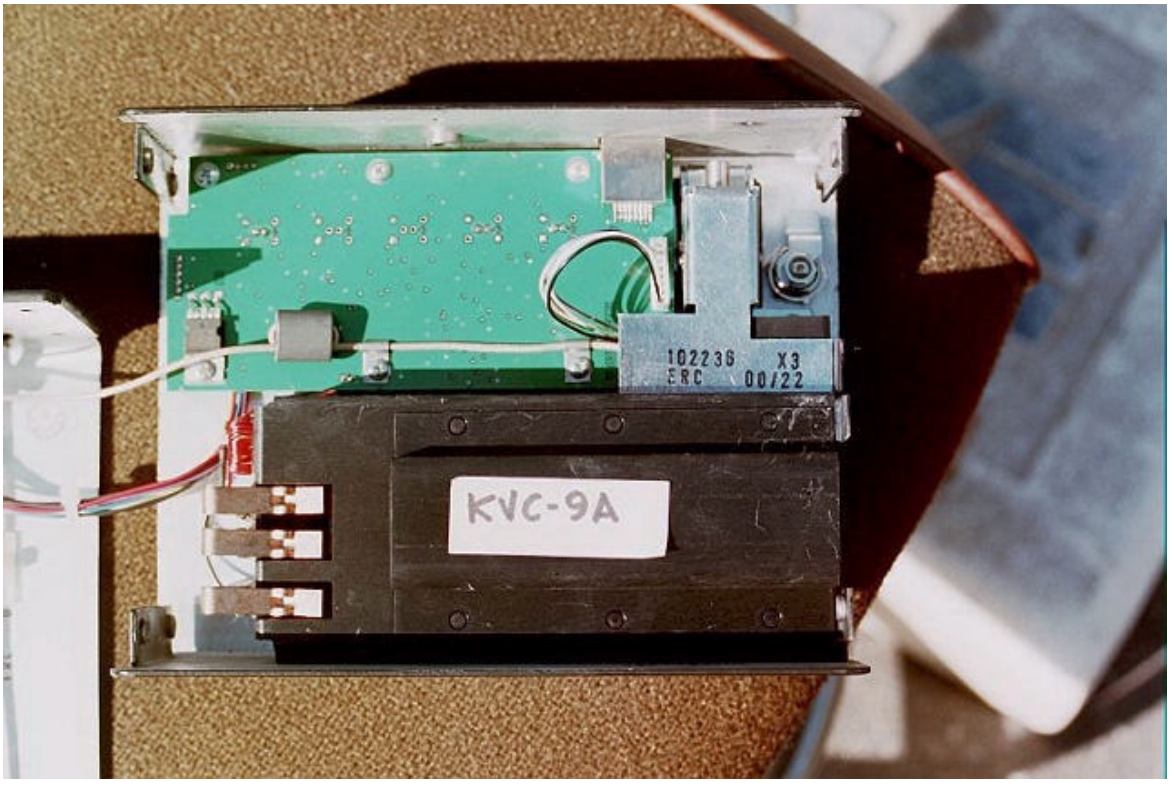
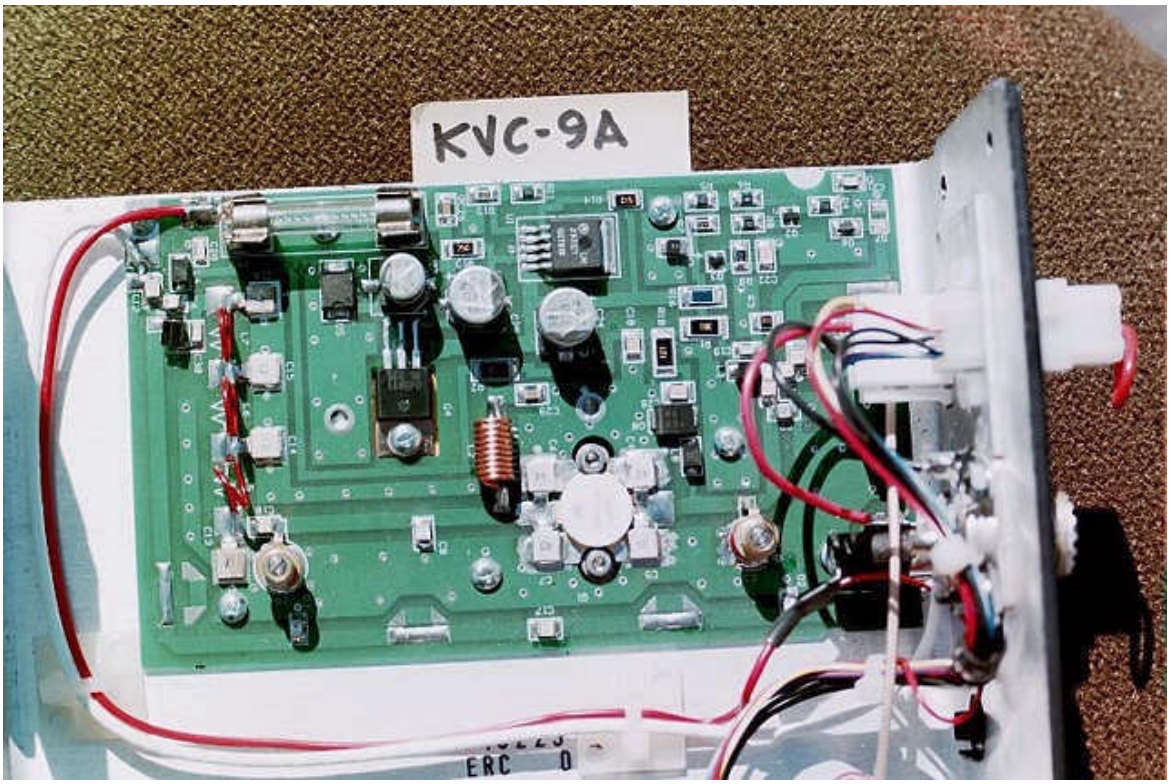


Photo 2 Main Circuit Board (Detail)



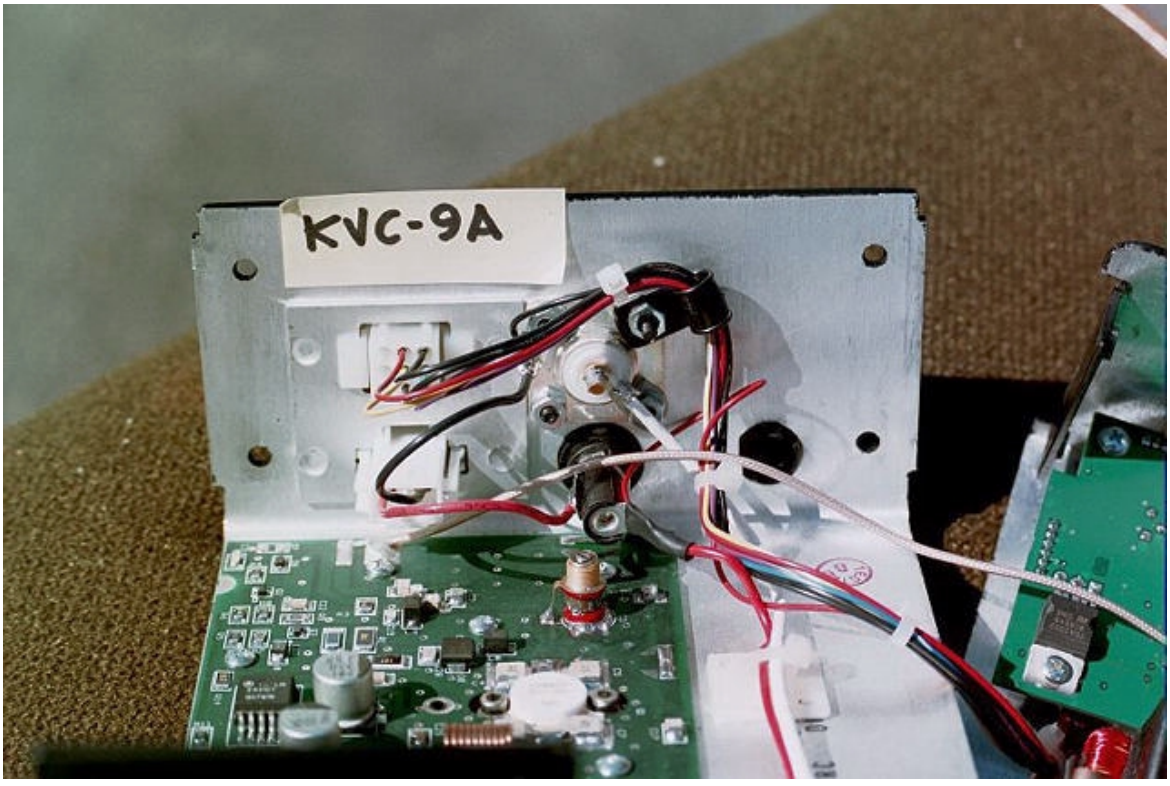


Photo 3 External Front View

Photo 4 External ¾ View

2.1033 (C) (13) Digital Modulation Techniques

Not Applicable

2.1033 (C) (14) Test Data

Refer to 2.1046 through 2.1057

2.1046 Measurement of RF Power Output

Definition: For RF Power Amplifiers.

Test Method: See Figure 1.

Output Power is measured across a precision 50 ohm load with a Spectrum Analyzer

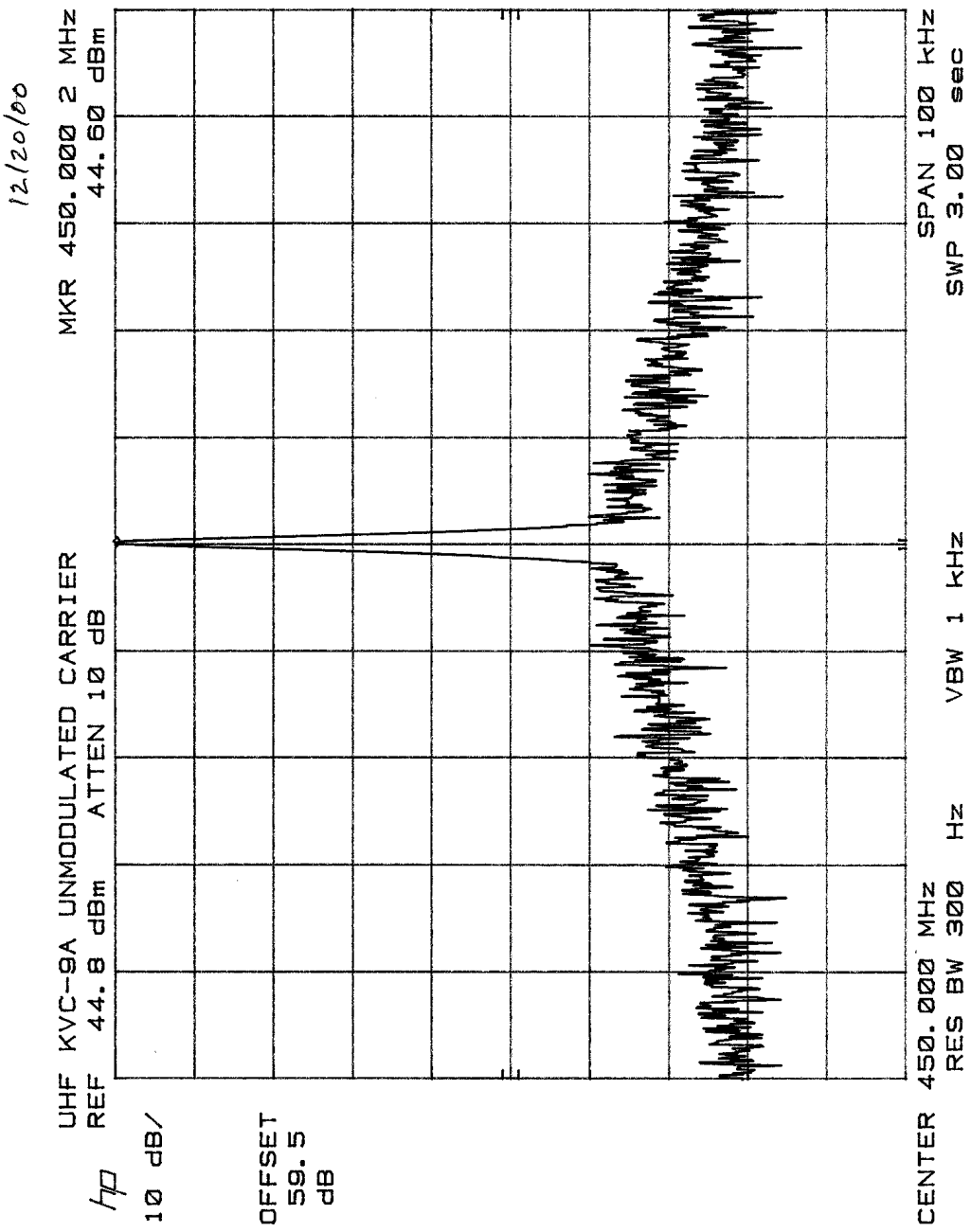
Test Results:

POWER OUTPUT (Published)

FREQUENCY	NOMINAL VOLTAGE 13.8 VDC	85% VOLTAGE 11.73 VDC	115% VOLTAGE 15.87 VDC
450 – 512 MHz	30 Watts	25 Watts	35 Watts

POWER OUTPUT MEASURED AT NOMINAL VOLTAGE WAS:

Frequency (MHz)	Power (dBm)	Power (Watts)
450	44.6	28.8
481	44.5	28.2
512	44.4	27.5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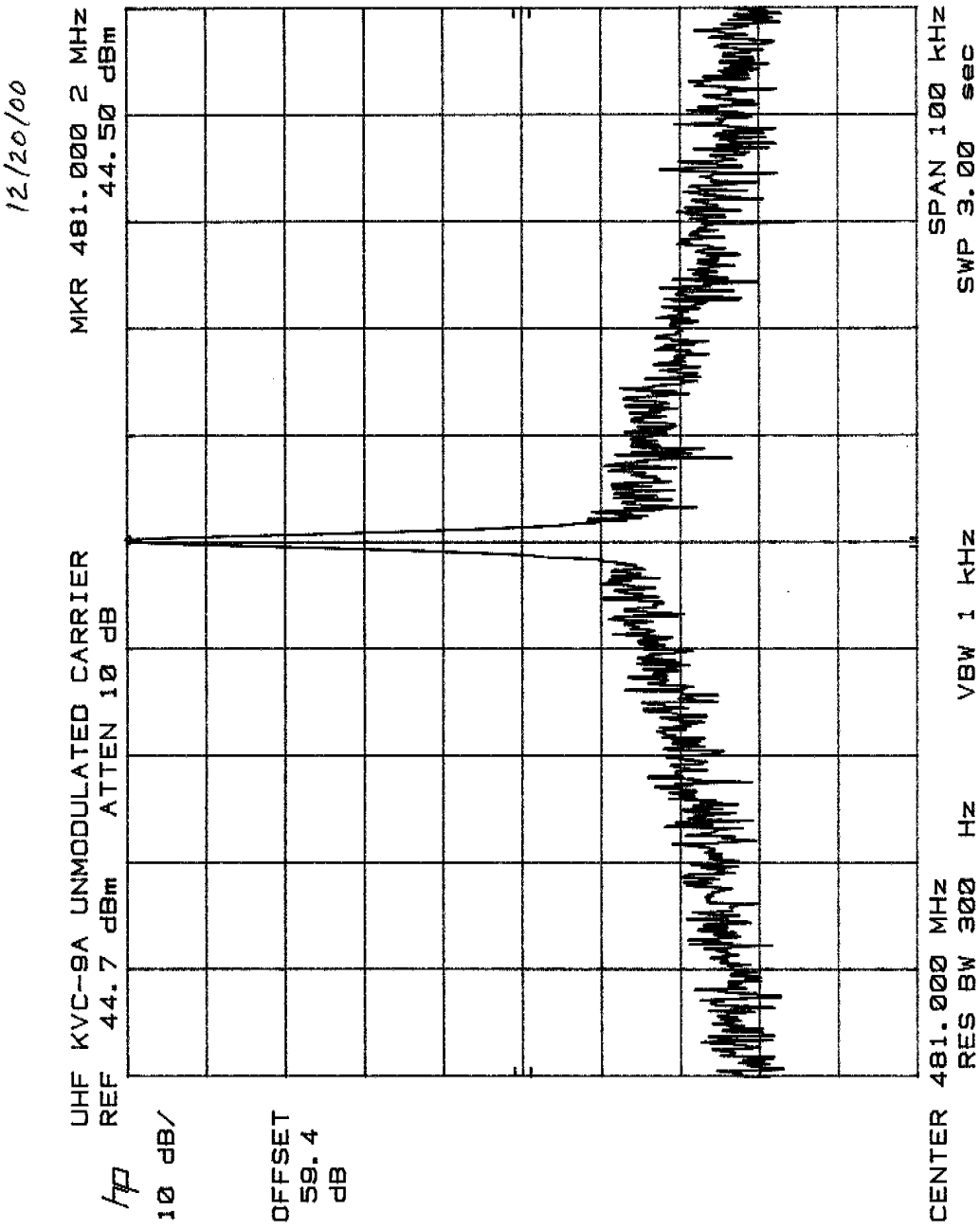
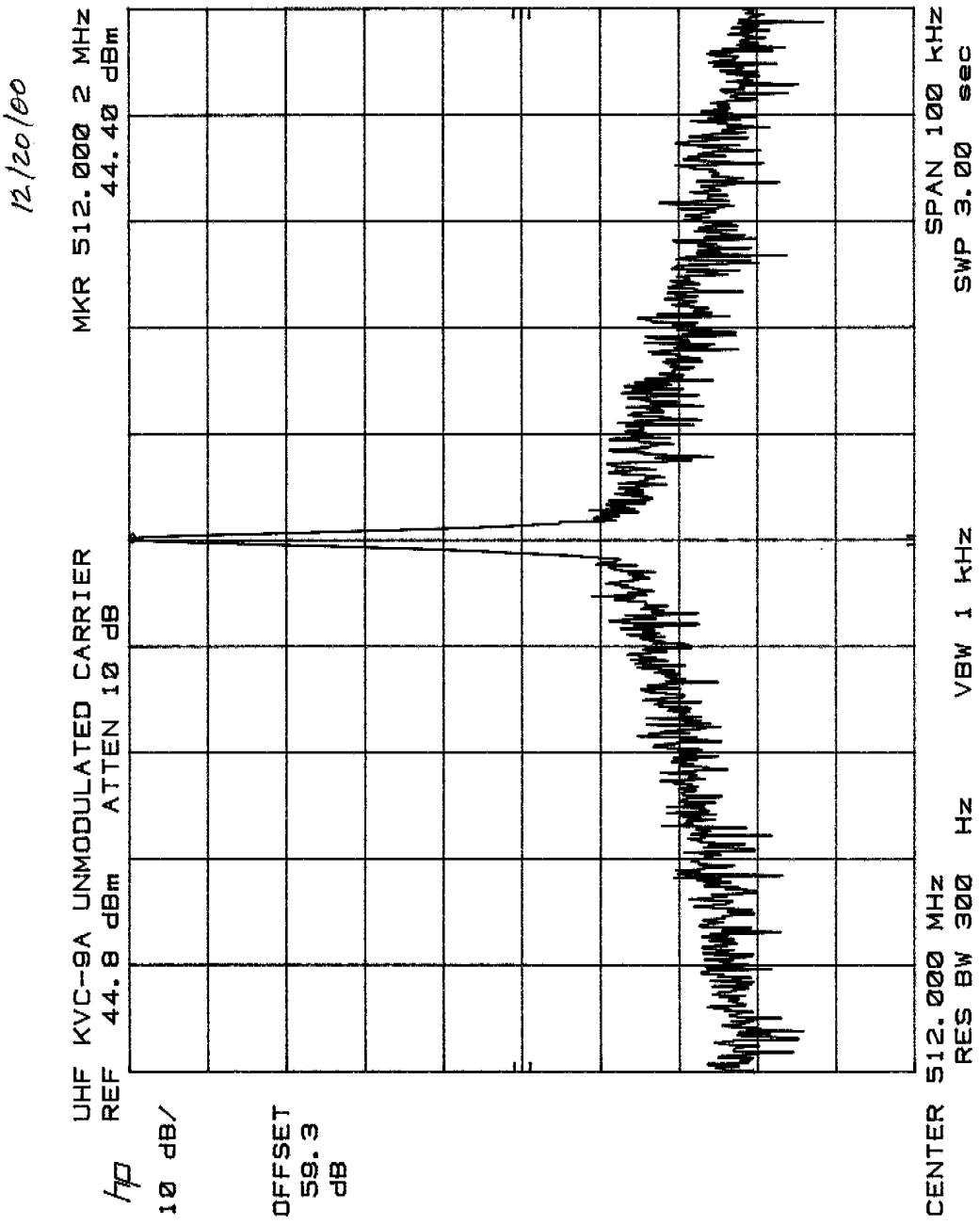
UHF KVC-9A UNMODULATED CARRIER
REF 44.8 dBm ATTEN 10 dB
MKR 450.000 2 MHz
44.60 dBm
10 dB/
OFFSET
59.5
dB
CENTER 450.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


12/20/00
UHF KVC-9A UNMODULATED CARRIER
REF 44.7 dBm ATTEN 10 dB
MKR 481.000 2 MHz
44.50 dBm
10 dB/
OFFSET
59.4
dB
CENTER 481.000 MHz
RES BW 300 Hz VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


12/20/00
UHF KVC-9A UNMODULATED CARRIER
REF 44.8 dBm
ATTEN 10 dB
MKR 512.000 2 MHz
44.40 dBm
10 dB/
OFFSET
59.3
dB
CENTER 512.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

2.1049 Measurement of Occupied Bandwidth

Definition:
Occupied Bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are equal to 0.5 percent of the total mean power radiated by a given emission.

Test Method: Connect the Equipment per Figure 2.
Measurements were made with the modulating signal at 2.5 kHz with 5 kHz of FM deviation.

Test Results: See Plots following Figure 2.

The center frequency of the signal did not shift with modulation. The Spectrum Bandwidth was well within the limits specified in the FCC Regulations.

TEST EQUIPMENT LOG

12/20/00

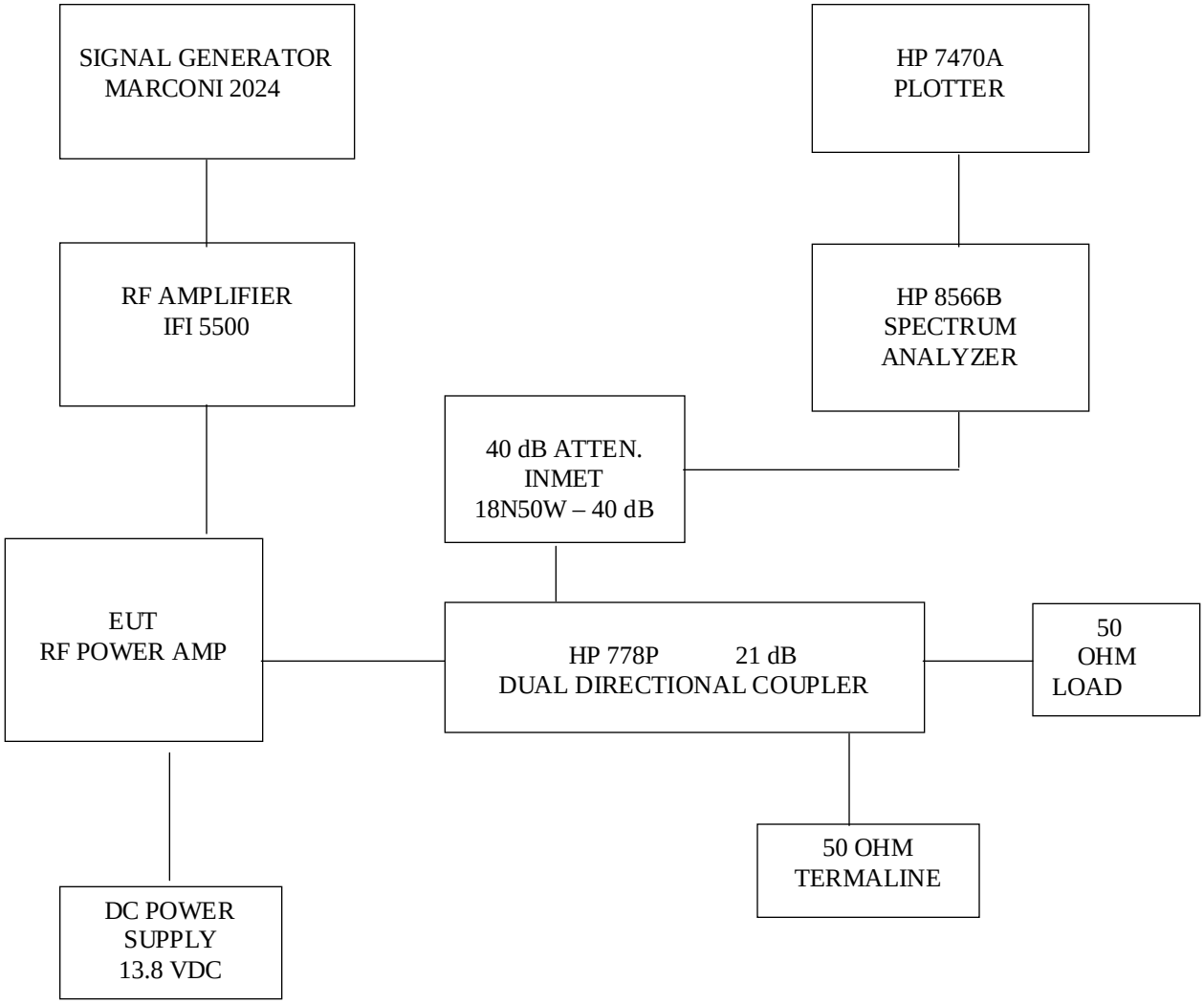
Customer: TPL Communications
EUT: UHF Amplifier, 450 – 512 MHz
Model / Part #: KVC-9A
Serial #: N/A

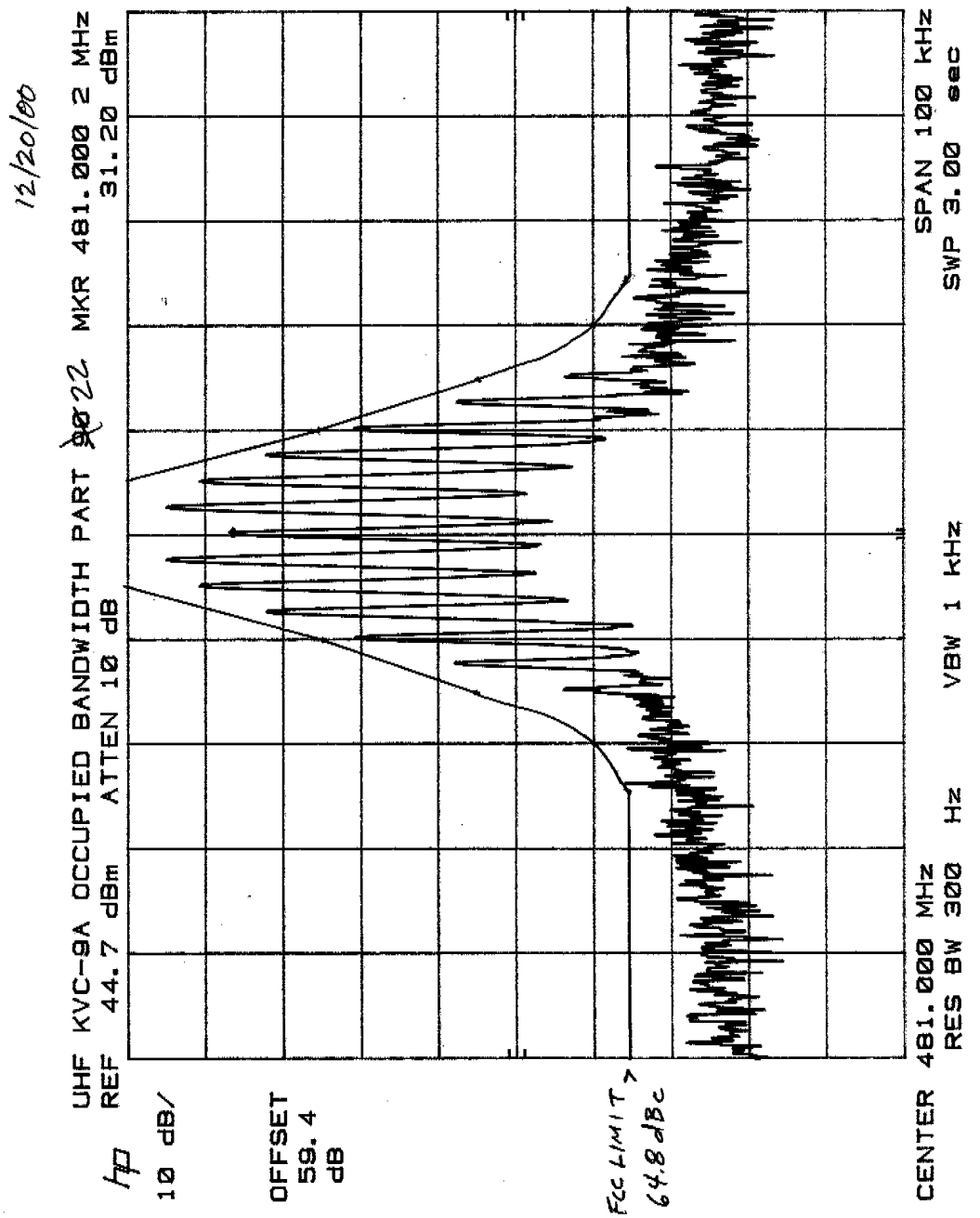
Test Procedure: FCC, Part 90, 2, 22
Test Specification: Conducted Spurious
Test Engineer: John Stanford
Customer Rep: Jim Briggs

DESCRIPTION	MANUFACTURER	MODEL # / SERIAL #	CAL. DUE
Spectrum Analyzer	Hewlett-Packard	8566B/2673A03865	05/25/01
Directional Coupler	HP	778D	Cal prior to test
Directional Coupler	HP	11691	Cal prior to test
Attenuator (6 dB)	JFW	50FH-006-100	Cal prior to test
Attenuator (20 dB)	Inmet	18N50W/64671	Cal prior to test
Signal Generator	Marconi	2024, 112236/202	04/28/01
Amplifier	Eaton	3552B	Cal prior to test
50 ohm load (500W)	Electro Impulse Labs	DA-242A/U, 7940097	Reference
50 ohm load (5W)	Narda	370BNM	Reference
Wattmeter	Bird	43P	Reference
Coaxial Cable	RG-214/U	N/A	Cal prior to test
Power Supply (0-36 Vdc, 24A)	Lambda	LES-F-03-DB	Reference

FORM 0010

Figure 1: Block Diagram
(Occupied Bandwidth tests)

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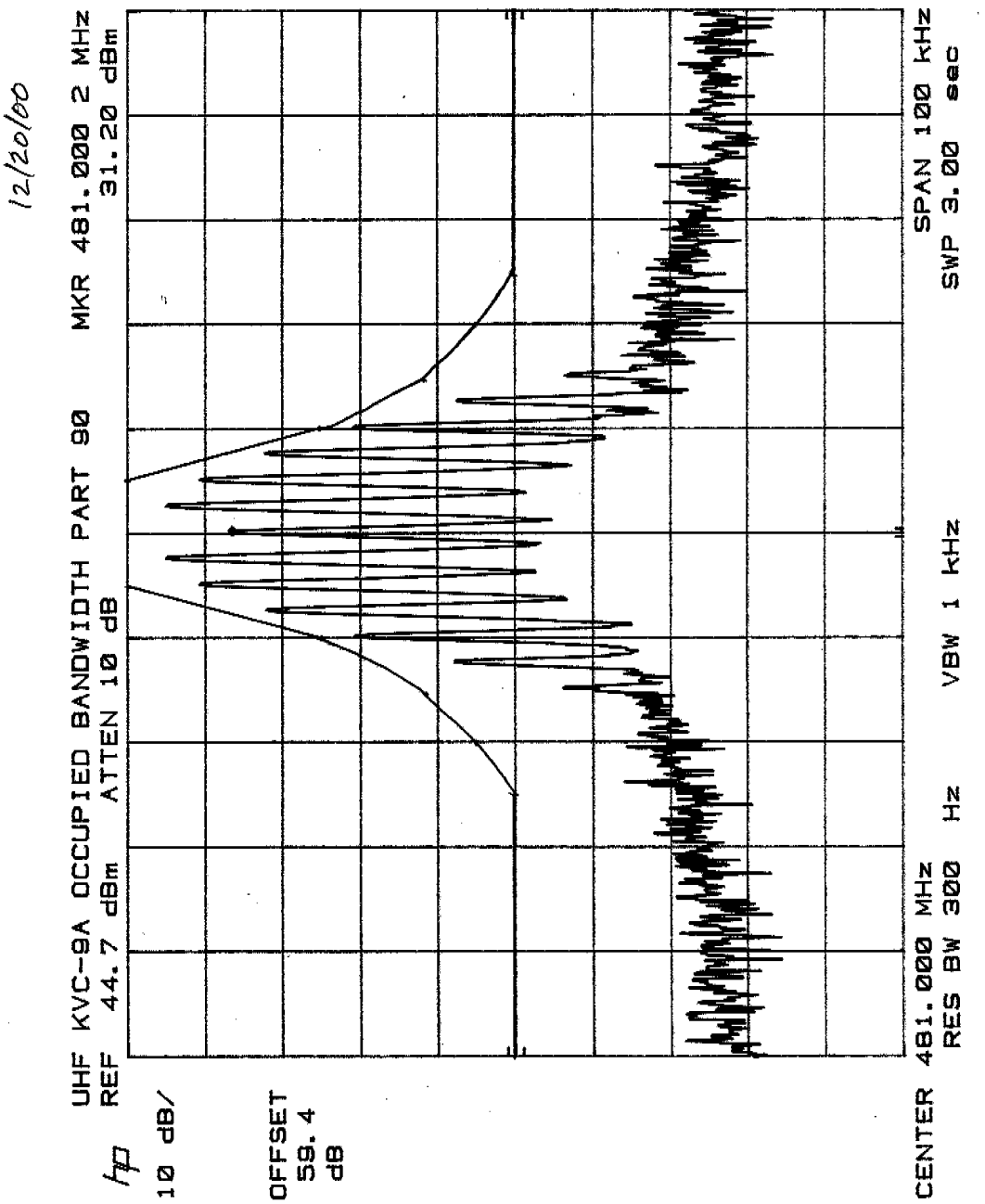
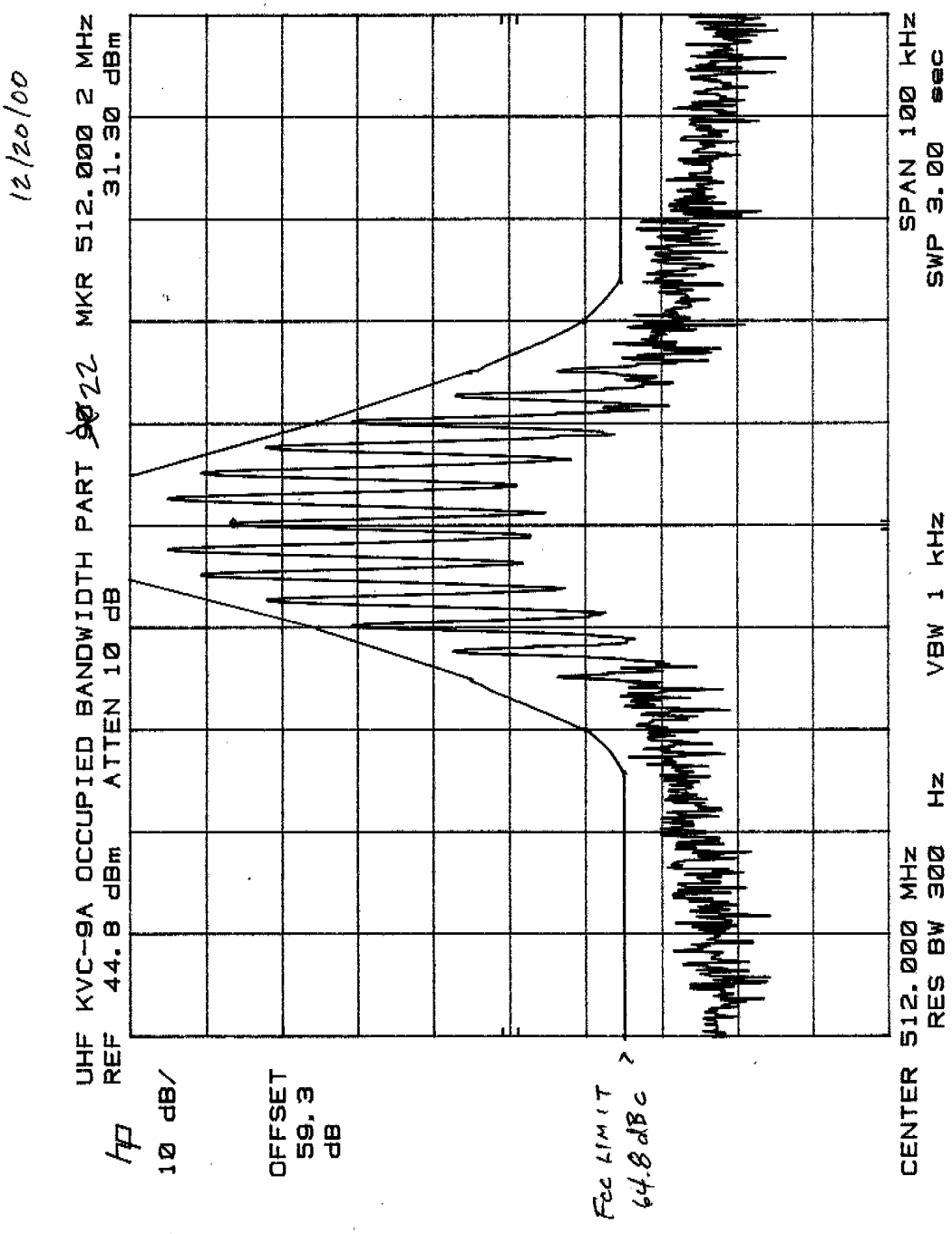
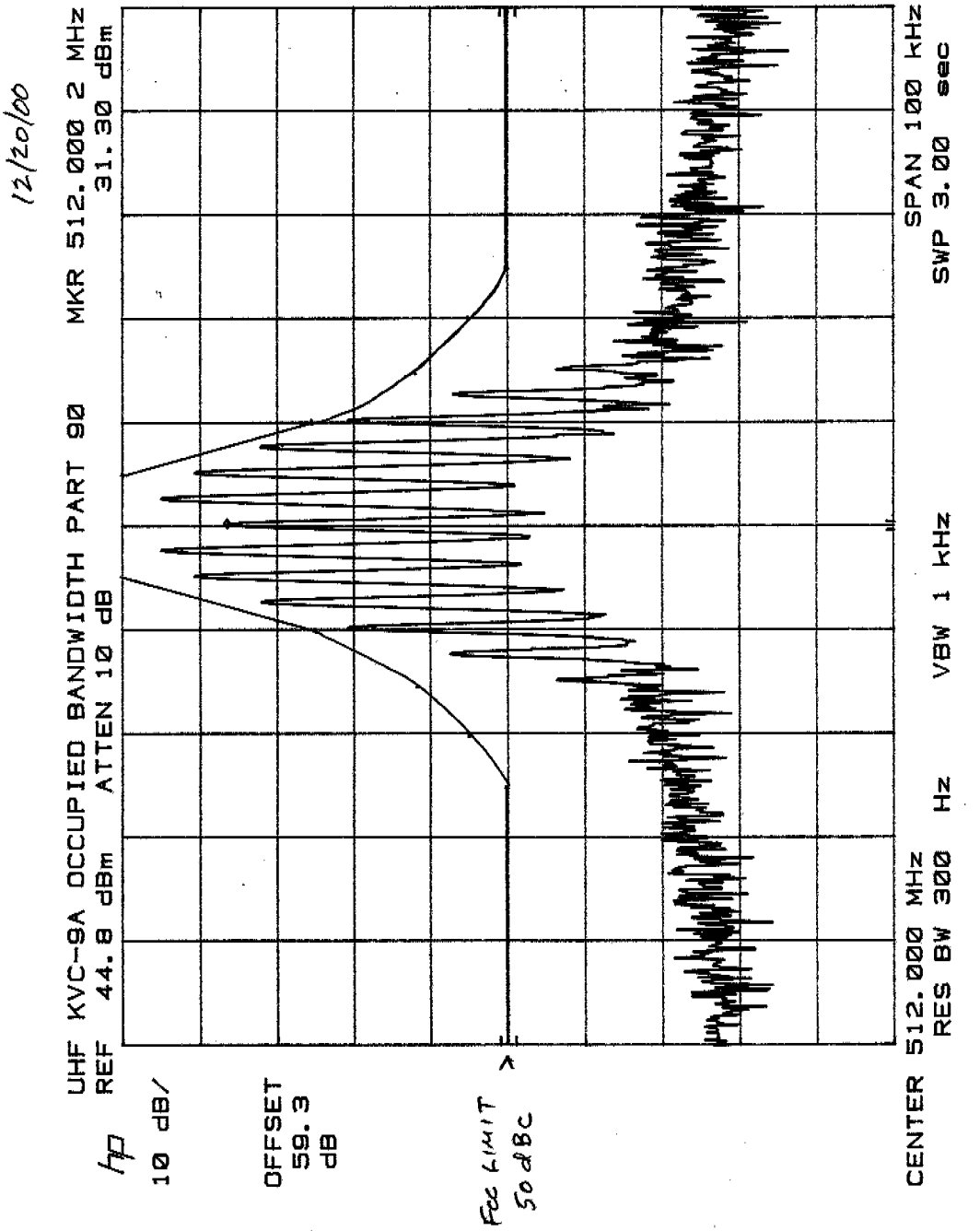
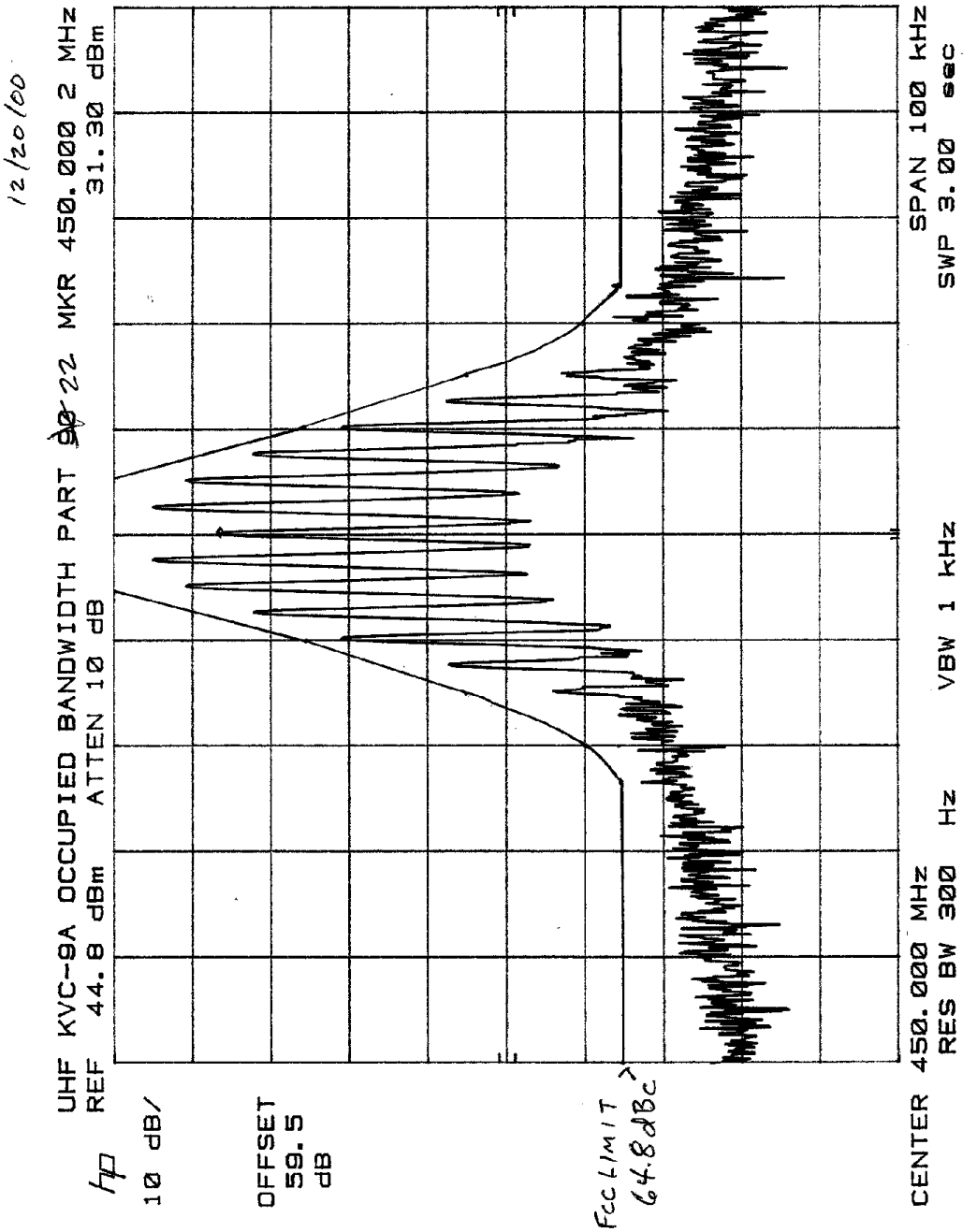
UHF KVC-9A OCCUPIED BANDWIDTH PART 90 22
REF 44.7 dBm ATTEN 10 dB
MKR 481.000 2 MHz
31.20 dBm
10 dB/
OFFSET
59.4
dB
FCC LIMIT >
64.8 dBc
CENTER 481.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


12/20/00
UHF KVC-9A OCCUPIED BANDWIDTH PART 90
MKR 481.000 2 MHz
31.20 dBm
REF 44.7 dBm
ATTEN 10 dB
10 dB/
OFFSET
59.4
dB
SPAN 100 kHz
SWP 3.00 sec
CENTER 481.000 MHz
RES BW 300 Hz
VBW 1 kHz


12/20/00
UHF KVC-9A OCCUPIED BANDWIDTH PART 22
MKR 512.000 2 MHz
31.30 dBm
REF 44.8 dBm
ATTEN 10 dB
10 dB/
OFFSET
59.3
dB
FCC LIMIT
-64.8 dBc
CENTER 512.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


12/20/00
UHF KVC-9A OCCUPIED BANDWIDTH PART 90
REF 44.8 dBm
ATTEN 10 dB
MKR 512.000 2 MHz
31.30 dBm
10 dB/
OFFSET
59.3
dB
Fcc LIMIT
50 dBc
CENTER 512.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec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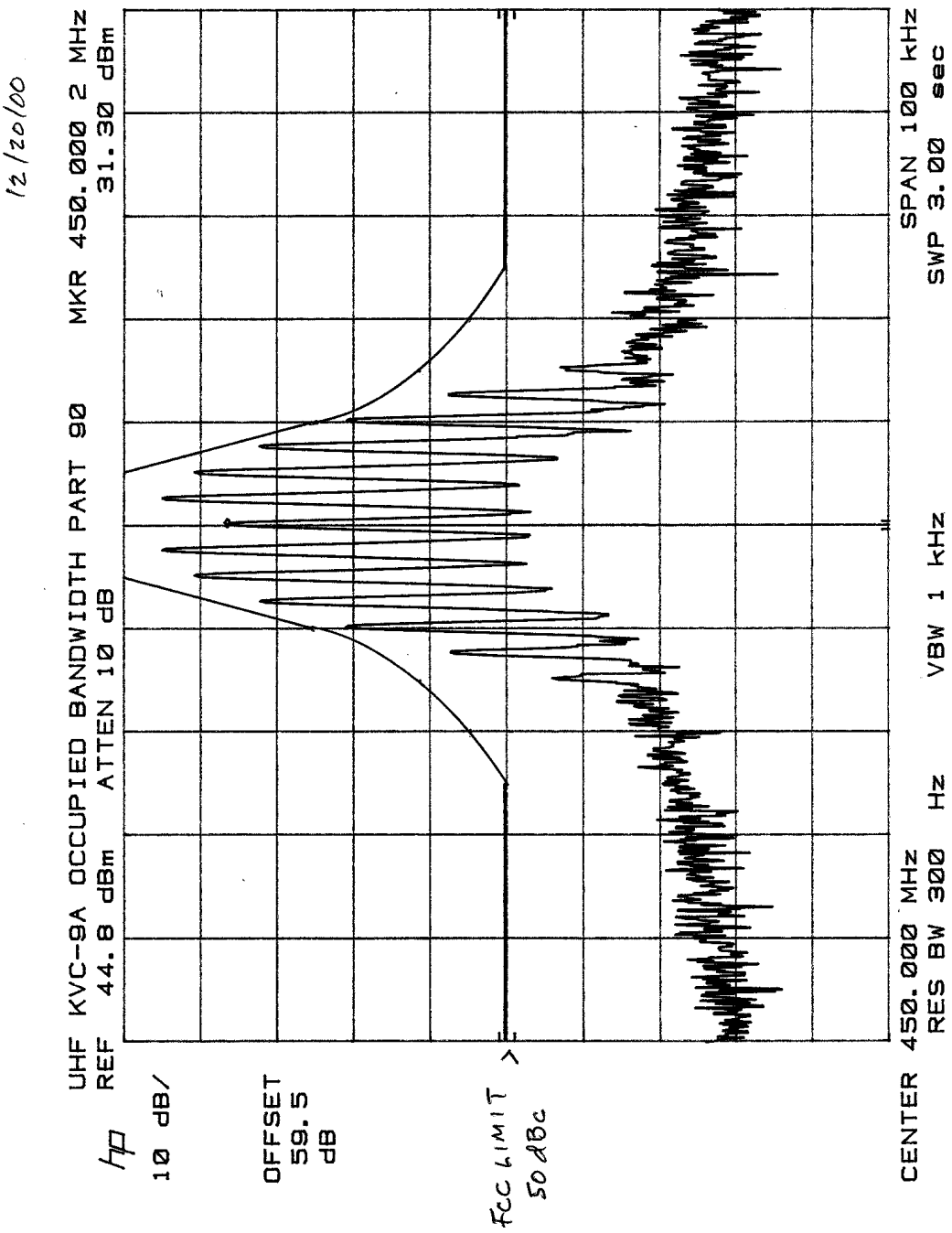
UHF KVC-9A OCCUPIED BANDWIDTH PART 22 MKR 450.000 2 MHz
31.30 dBm
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET
59.5
dB
FCC LIMIT
64.8dBc
CENTER 450.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec


12/20/00
UHF KVC-9A OCCUPIED BANDWIDTH PART 90
REF 44.8 dBm
ATTEN 10 dB
MKR 450.000 2 MHz
31.30 dBm
hp
10 dB/
OFFSET
59.5
dB
FCC LIMIT
50 dBc
CENTER 450.000 MHz
RES BW 300 Hz
VBW 1 kHz
SPAN 100 kHz
SWP 3.00 sec

2.1051 Spurious Emissions at Antenna Terminals

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

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

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

Where Po = Output in Watts

= $43 + 10 \log_{10} (30)$

= 57.8 dB

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

Connect the equipment as shown in Figure 2.

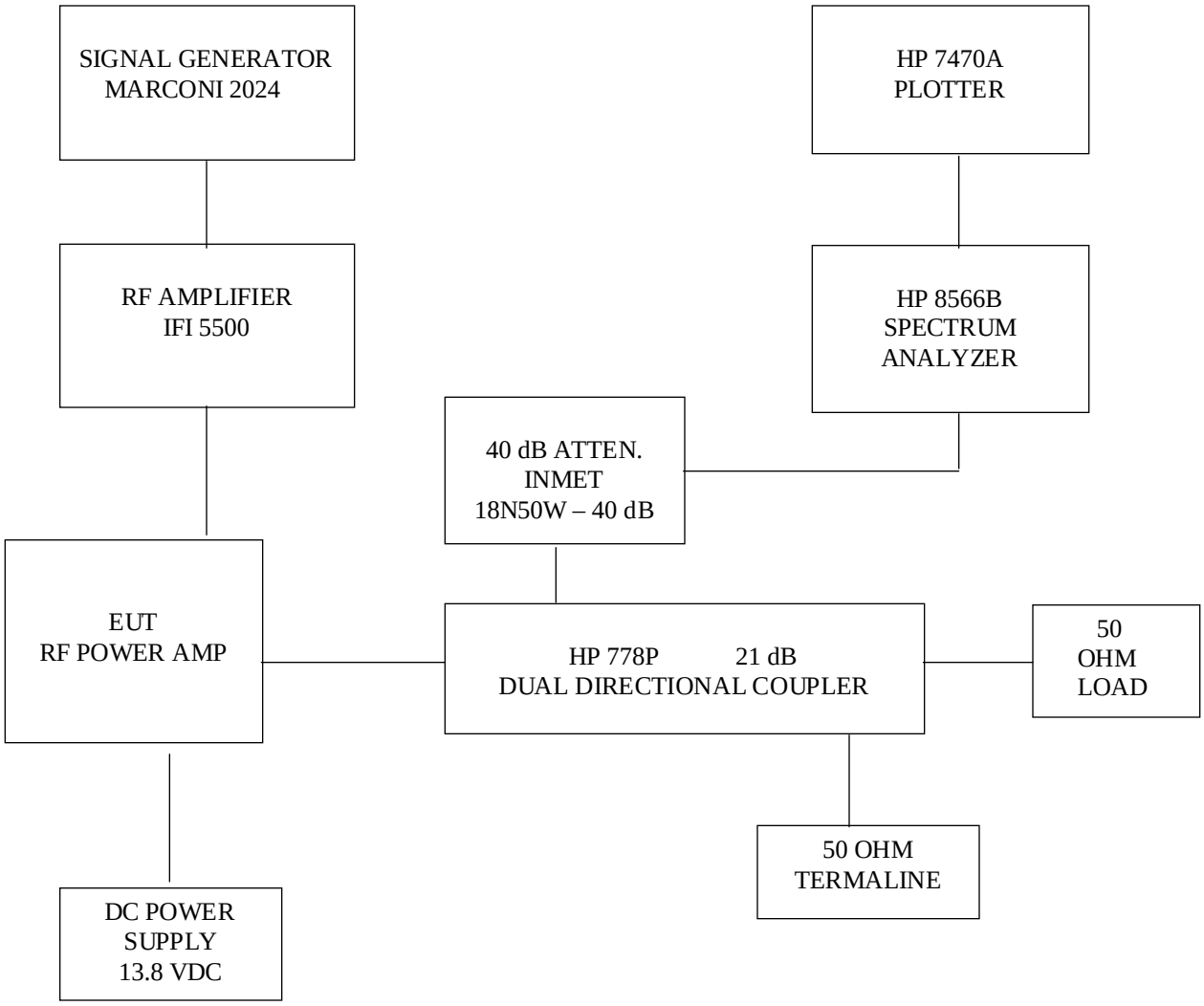
Adjust the Audio Oscillator so that the frequency deviation of the transmitter is a 5 kHz at a modulation frequency of 2.5 kHz. Adjust the Spectrum Analyzer to display the Modulated Carrier.

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

Test Results: See Plots following Figure 2.

All spurious emissions at the antenna terminals are below the FCC specifications

Figure 2: Block Diagram
(Spurious Emissions tests)



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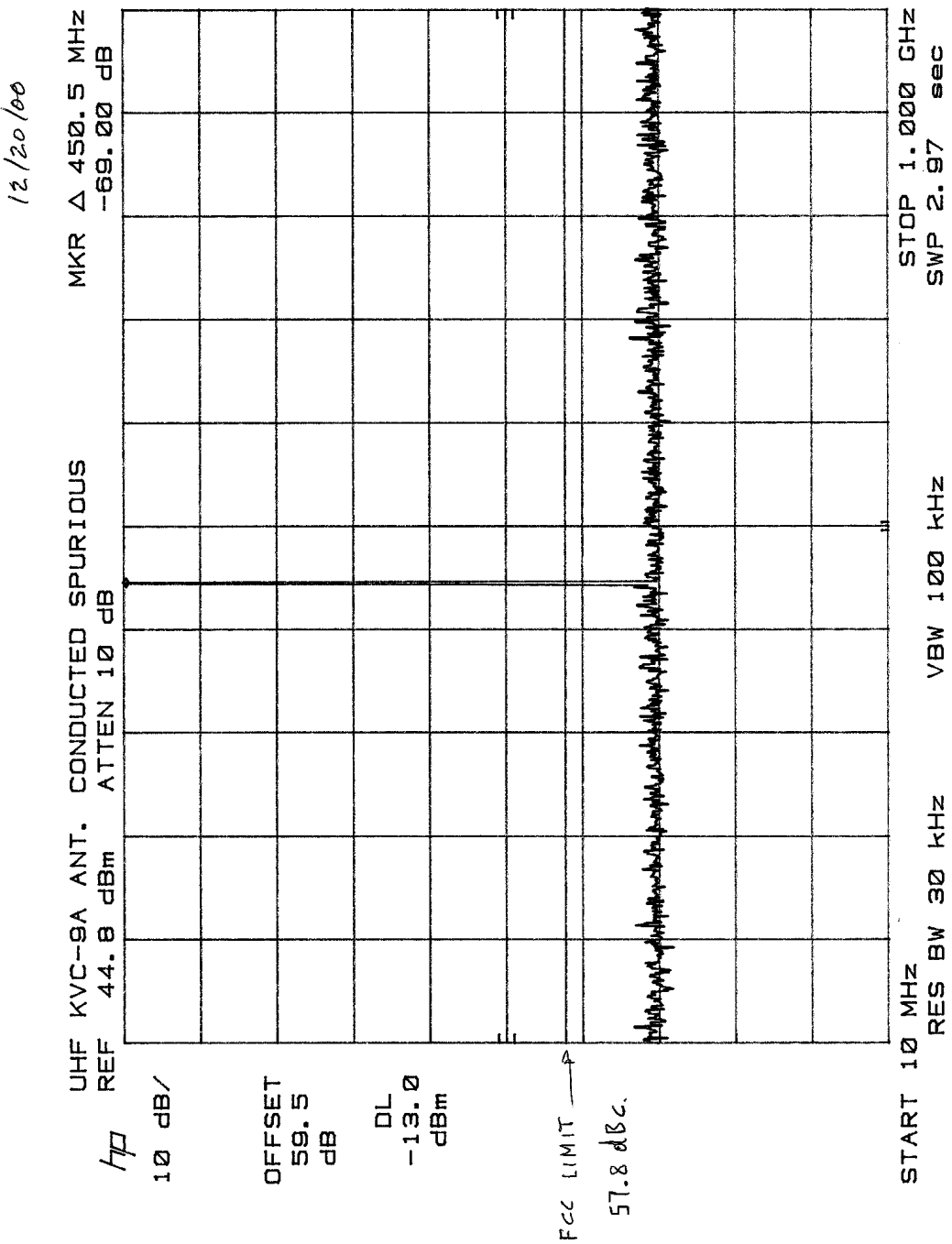
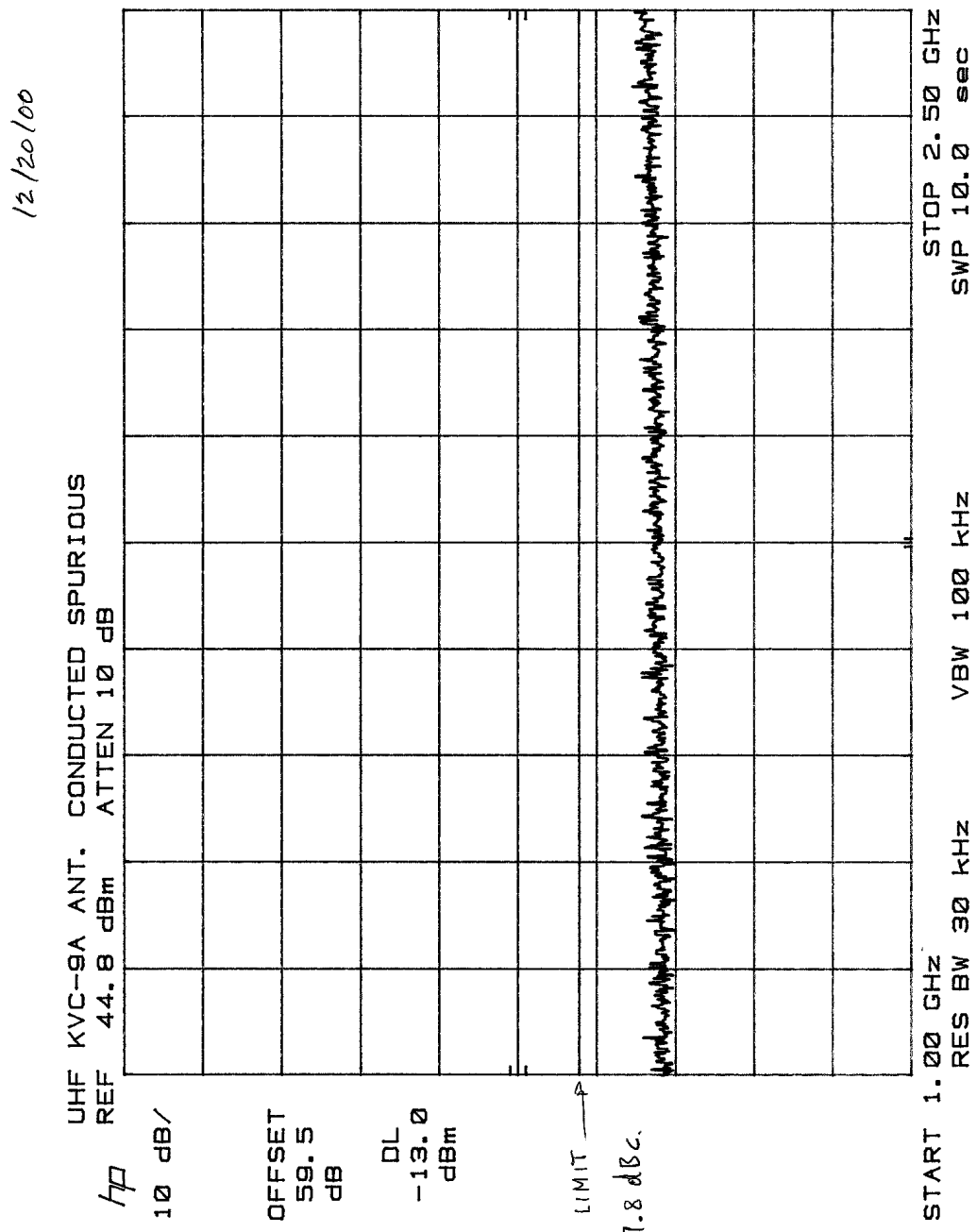

UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
MKR Δ 450.5 MHz
-69.00 dB
10 dB/
OFFSET
59.5
dB
DL
-13.0
dBm
FCC LIMIT
57.8 dBc.
START 10 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 1.000 GHz
SWP 2.97 sec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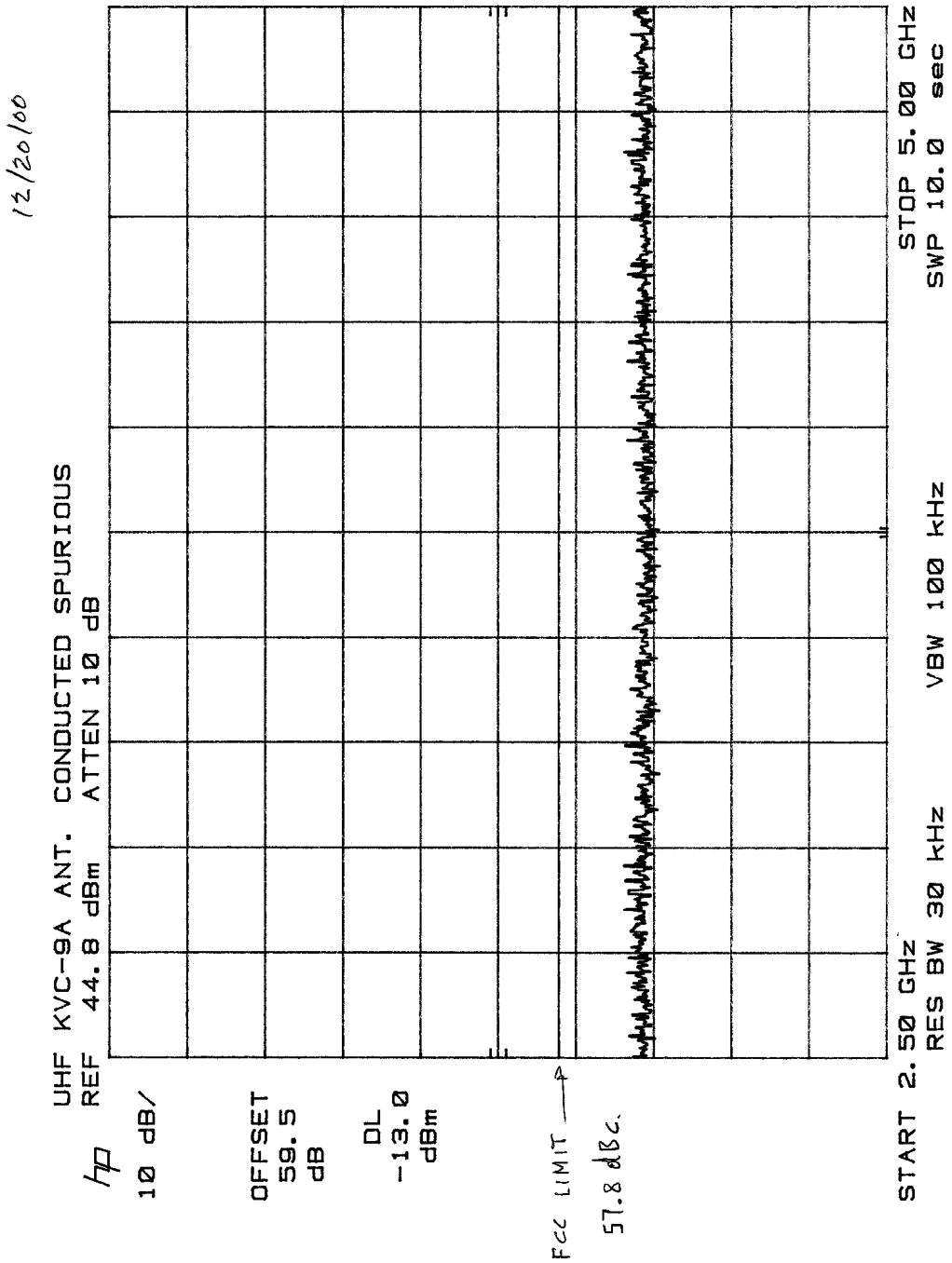
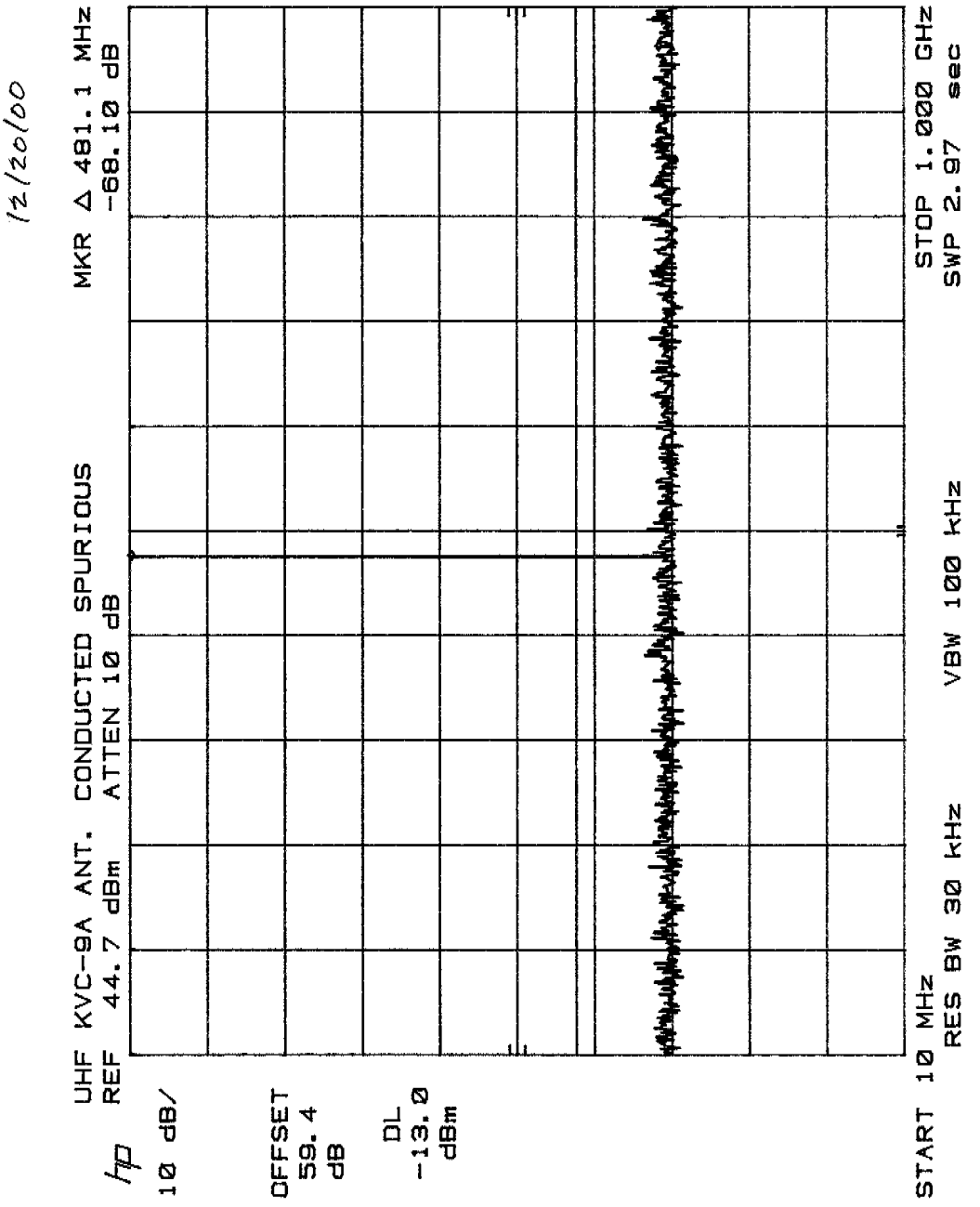
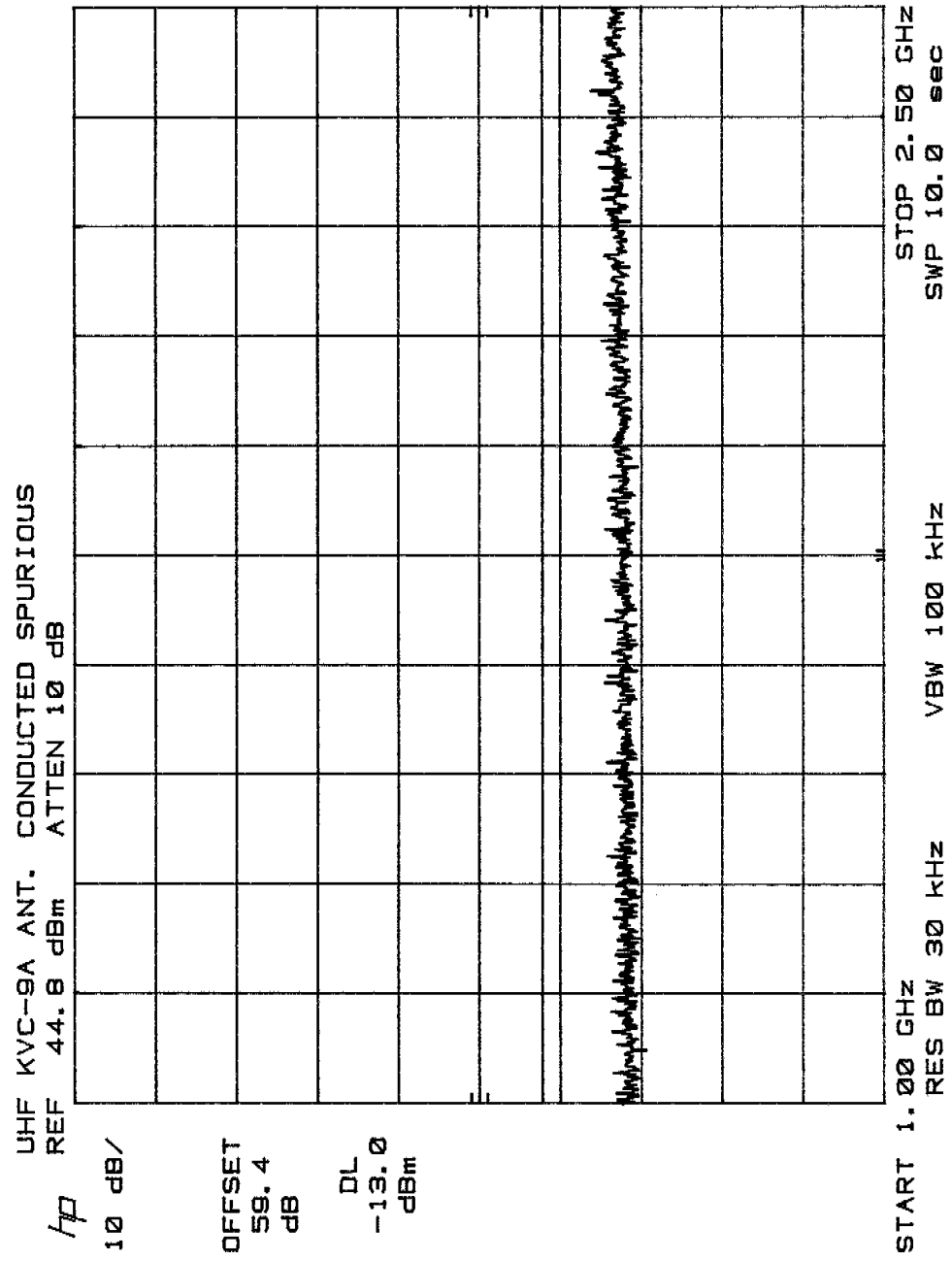
UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET 59.5 dB
DL -13.0 dBm
FCC LIMIT
57.8 dBc
START 1.00 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 10.0 sec


12/20/00
UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET 59.5 dB
DL -13.0 dBm
FCC LIMIT
57.8 dBc.
START 2.50 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 5.00 GHz
SWP 10.0 sec

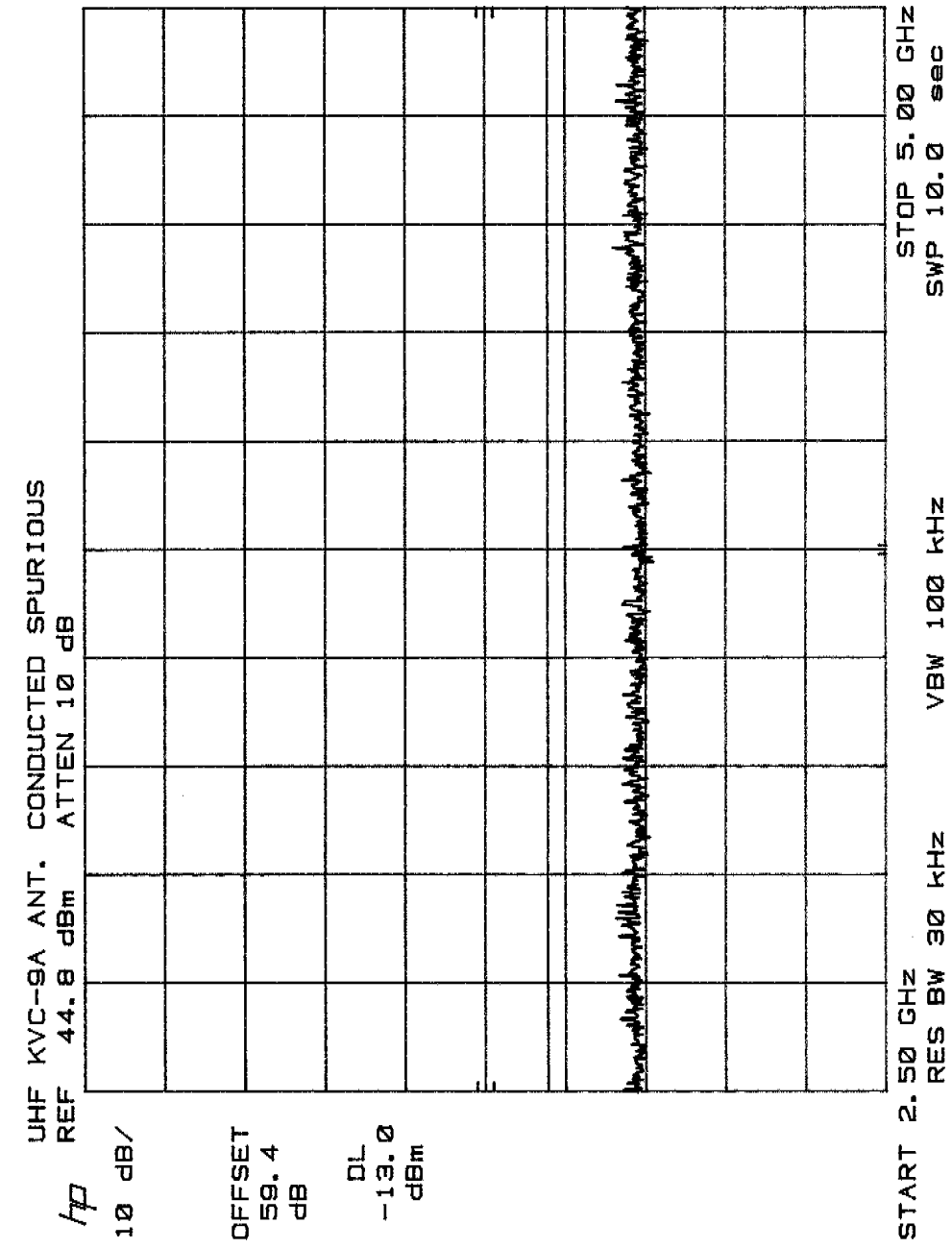
12/20/00

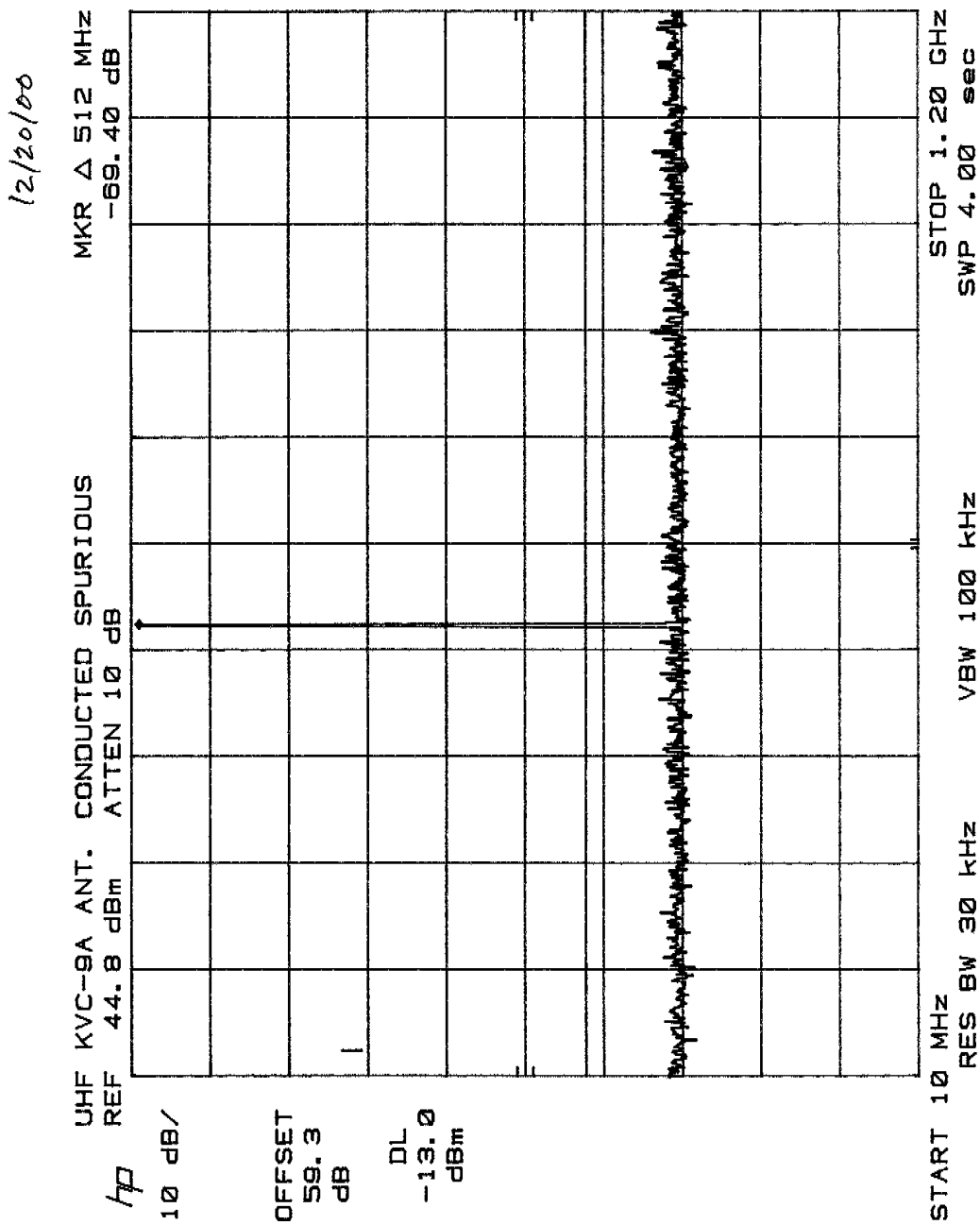

UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.7 dBm ATTEN 10 dB
MKR Δ 481.1 MHz
-68.10 dB
10 dB/
OFFSET
59.4
dB
DL
-13.0
dBm
START 10 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 1.000 GHz
SWP 2.97 sec

12/20/00

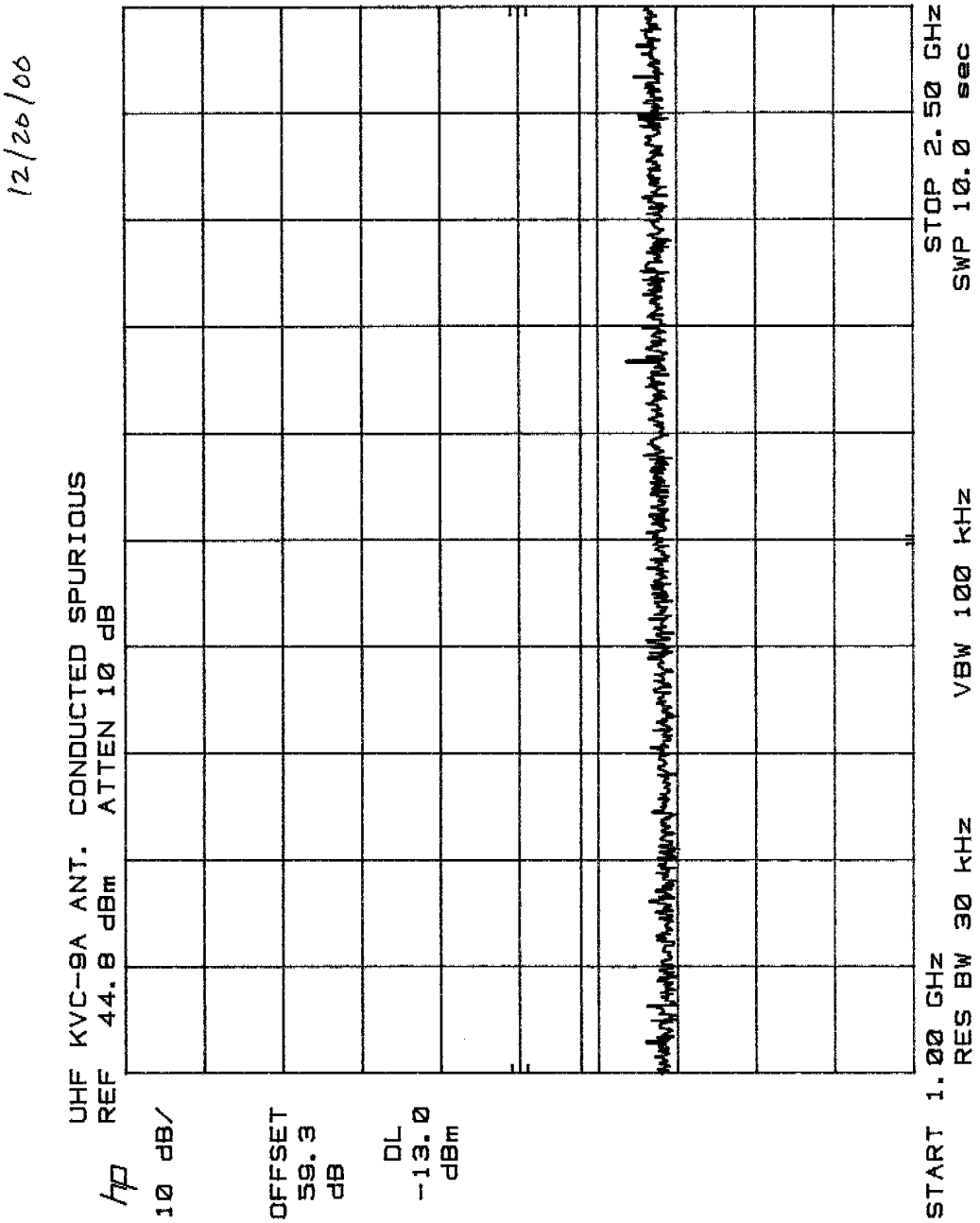

UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET 59.4 dB
DL -13.0 dBm
START 1.00 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 10.0 sec

12/20/00

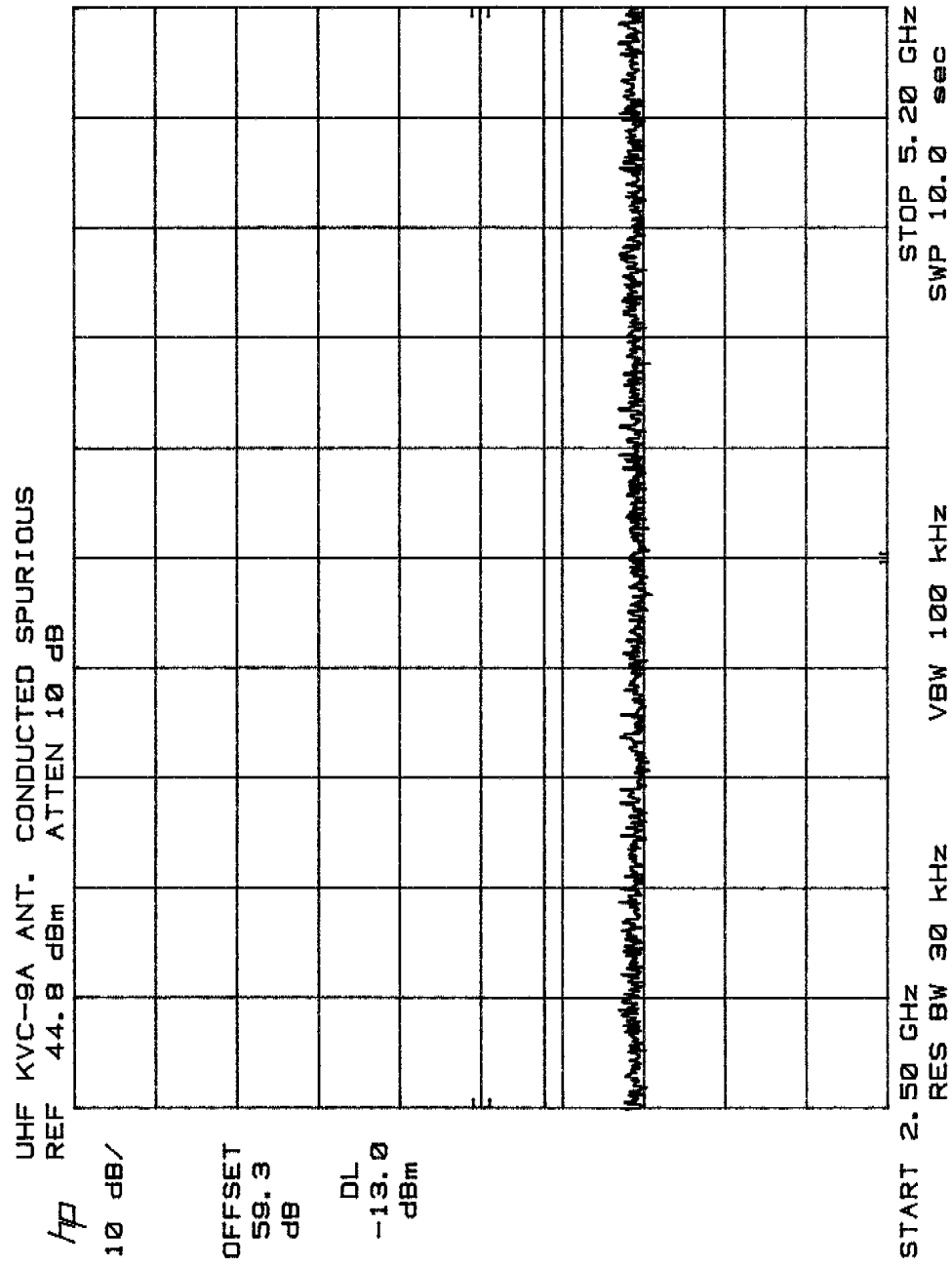

UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET 59.4 dB
DL -13.0 dBm
START 2.50 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 5.00 GHz
SWP 10.0 sec


12/20/05
UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
MKR Δ 512 MHz
-69.40 dB
10 dB/
OFFSET
59.3
dB
DL
-13.0
dBm
START 10 MHz
RES BW 30 kHz
VBW 100 kHz
STOP 1.20 GHz
SWP 4.00 sec

12/20/00


UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET 59.3 dB
DL -13.0 dBm
START 1.00 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 2.50 GHz
SWP 10.0 sec

12/20/00


UHF KVC-9A ANT. CONDUCTED SPURIOUS
REF 44.8 dBm ATTEN 10 dB
10 dB/
OFFSET 59.3 dB
DL -13.0 dBm
START 2.50 GHz
RES BW 30 kHz
VBW 100 kHz
STOP 5.20 GHz
SWP 10.0 sec

2.1053 Field Strength of Spurious Radiation

Definition:
Emissions from the equipment when connected into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communication desired. The reduction in the level of these spurious emissions will not affect the quality of the information being transmitted.

Test Method: Per EIA RS 152-B.

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

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

Test Results: See Table on following Page.

All radiated spurious emissions are below the FCC Specifications.

RF Exposure

The information contained in "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65; August 1997 is applicable when a radiating antenna is connected to this amplifier. Paging stations that utilize this amplifier authorized under Part 22 (Subpart E) and Part 90 are subject to routine environmental evaluation for RF exposure if an antenna is located on a rooftop and if its ERP exceeds 1000 watts.

This product is certified to meet the RF exposure guidelines of OET-65 as a stand-alone RF power amplifier. The RF spurious emissions recorded when the antenna output connector is terminated into a non-radiating 50 ohm load do not exceed the 27.5 V/m limit specified for General Population/Uncontrolled Exposure in OET Bulletin 65.

TEST EQUIPMENT LOG

12/8/00

Customer: TPL Communications
EUT: UHF Amplifier, 450 – 512 MHz
Model / Part #: KVC-9A
Serial #: N/A

Test Procedure: FCC, Part 90, Z, 22
Test Specification: Radiated Spurious
Test Engineer: Mike Green
Customer Rep: Jim Briggs

DESCRIPTION	MANUFACTURER	MODEL # / SERIAL #	CAL. DUE
Spectrum Analyzer	Hewlett-Packard	8566B/2407A13212	03/08/01
Signal Generator	Marconi	2024, 112231/034	Reference
Amplifier	Eaton	3552B	Reference
Antenna, Log-Periodic	Electro-Metrics	3146/1284	01/31/01
Antenna, DRG Horn	EMCO	3115/2280	01/31/01
50 ohm load (500W)	Electro Impulse Labs	DA-242A/U, 7940097	Reference
Power Supply (0-36 Vdc, 24A)	Lambda	LES-F-03-DB	Reference
Coaxial Cable	RG-214/U	10 feet	Cal prior to test
Coaxial Cable	RG-214/U	Random length	Reference

FORM 0010

SPURIOUS RADIATED SIGNAL MEASUREMENTS
(Ref: Part 2, Subpart J, 2.1053 and 2.1057)

Date	8-Dec-00	
Customer	TPL Communications	
EUT	RF Power Amplifier	
P/N	KVC-9A	
S/N	NA	
Pass/Fail	PASS	
Operating Mode	FM, 2.5 kHz	
Test Engineer	Mike Green	
Fund. Freq.	481	MHz
Output Power	30	W
Output Impedance	50	ohms
Fund. Field Strength	12.9	V/m
Fund. Field Strength	142.2	dBuV/m
FCC Limit	57.8	dBc

Antenna Polarization	Freq (MHz)	Measured Signal (dBuV)	AF (dB/m)	Cable Loss (dB)	Amp Gain (dB)	Corrected Measurement (dBuV/m)	Fundamental Field Strength (dBuV/m)	Spurious Below Carrier (dBc)	FCC Limit (dBc)
H	962	34.2	24.4	0.86	0	59.46	142.2	82.8	57.8
H	1443	33.9	25.6	1.10	0	60.60	142.2	81.6	57.8
H	1924	15.7	28.1	1.40	0	45.20	142.2	97.0	57.8
H	2405	22.0	29.3	1.60	0	52.90	142.2	89.3	57.8
H	2886	21.3	30.7	1.70	0	53.70	142.2	88.5	57.8
H	3367	11.1	31.8	1.90	0	44.80	142.2	97.4	57.8
H	3848	11.8	32.7	2.00	0	46.50	142.2	95.7	57.8
H	4329	11.3	33.4	2.20	0	46.90	142.2	95.3	57.8
H	4810	11.5	33.8	2.40	0	47.70	142.2	94.5	57.8

2.1055 Measurement of Frequency Stability

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

2.1057 Frequency Spectrum to be investigated

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