FCC CERTIFICATION REPORT

prepared for

EMR Corporation

22402 North 19th Avenue
Phoenix, AZ 85027

FCC ID: M7G-HUHF 800-40

March 27, 2001

WLL PROJECT #: 6179X

TABLE OF CONTENTS

Statement of Qualifications

Letter of Agency

1.0 INTRODUCTION 3

1.1 SUMMARY 3

2.0 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) 3

3.0 TEST CONFIGURATION 4

3.1 RF OUTPUT POWER (FCC RULE PART 2.1046) 4
3.2 MODULATION CHARACTERISTICS (FCC RULE PART 2.1047) 4
3.3 OCCUPIED BANDWIDTH (FCC RULE PART 2.1049) 4
3.4 SPURIOUS EMISSIONS AT ANTENNA TERMINALS (FCC RULE PART 2.1051) 7
3.5 RADIATED EMISSIONS TESTING (FCC RULE PART 2.1053) 12
3.6 FREQUENCY STABILITY (FCC RULE PART 2.1055) 14
3.7 TRANSIENT FREQUENCY BEHAVIOR (FCC PART 90.214) 14

TABLES

Table 1. Radiated Emissions Data
Table 2. Measurement Equipment Used

APPENDICES:

Appendix A Statement of Measurement Uncertainty

STATEMENT OF QUALIFICATIONS

for

Santo V. Lavorata

Washington Laboratories, Ltd.

I have fifteen years of EMC/EMI, RF and microwave testing experience, with the last seven years as an EMC Test Engineer. I hold a Bachelor of Science in Electronics Engineering Technology. I am qualified to perform EMC testing to the methods described in this test report. The measurements taken within this report are accurate within my ability to perform the tests and within the tolerance of the measuring instrumentation.

By: _____
Santo V. Lavorata
Compliance Engineer

Date: January 17, 2001

FCC CERTIFICATION REPORT

For

EMR Corporation

1.0 Introduction

This report has been prepared on behalf of EMR Corporation in support of their application for FCC Certification under Part 90 of the FCC Rules and Regulations.

The Equipment Under Test was a Rack Mounted UHF Power Amplifier (Model: HUHF 800-40).

All measurements were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code 200066-0) as an independent FCC test laboratory.

Measurements were made on the Equipment Under Test in accordance with FCC Rule Part 2, specifically the requirements stipulated in:

2.1046 RF Power Output
2.1047 Modulation Characteristics
2.1049 Occupied Bandwidth
2.1051 Spurious Emissions at Antenna Terminals
2.1053 Field Strength of Spurious Radiation
2.1055 Frequency Stability

All results reported herein relate only to the item tested. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government. The measurement uncertainty of the data contained herein is ±2.3 dB. Refer to Appendix A for Statement of Measurement Uncertainty.

1.1 Summary

The UHF Amplifier complies with the technical requirements of Part 90 of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The UHF Amplifier series is intended for use in commercial communication systems. Applications include land mobile repeaters, trunking, and data systems. The amplifier is a 40-watt power amplifier operating in the frequency range of 850-875 MHz. The amplifier is powered by an externally supplied 13.6 VDC power source. Testing was performed at the low, middle, and high frequencies of operation for the amplifier.

3.0 Test Configuration

3.1 RF Output Power (FCC Rule Part 2.1046)

A 2 Watt unmodulated carrier signal was connected to the input of the UHF amplifier. The output from the amplifier was connected to a 40 Watt attenuator and then to the input of an HP 8564E RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the 40 dB attenuator. The RF output power across a 50 ohm load termination was measured directly by the analyzer. The following table lists the measured output power.

Frequency (MHz)	Input Power to Amplifier	Power Output at Nominal Voltage (13.6 Vdc)
850	2 Watts	40.7 Watts
862	2 Watts	38.9 Watts
875	2 Watts	44.7 Watts

3.2 Modulation Characteristics (FCC Rule Part 2.1047)

The EUT is an amplifier only and contains no circuitry to modify the RF signal supplied from an approved radio. Only the power level will be raised.

3.3 Occupied Bandwidth (FCC Rule Part 2.1049)

A 2 Watt, 2.5 kHz FM modulated signal with 5 kHz FM deviation was connected to the input of the amplifier and the occupied bandwidth observed. A plot depicting the Occupied Bandwidth of the input signal followed by a plot showing the Occupied Bandwidth of the amplifier signal are shown in Figures 1 and 2.

Figure 1: Occupied Bandwidth, Input Signal

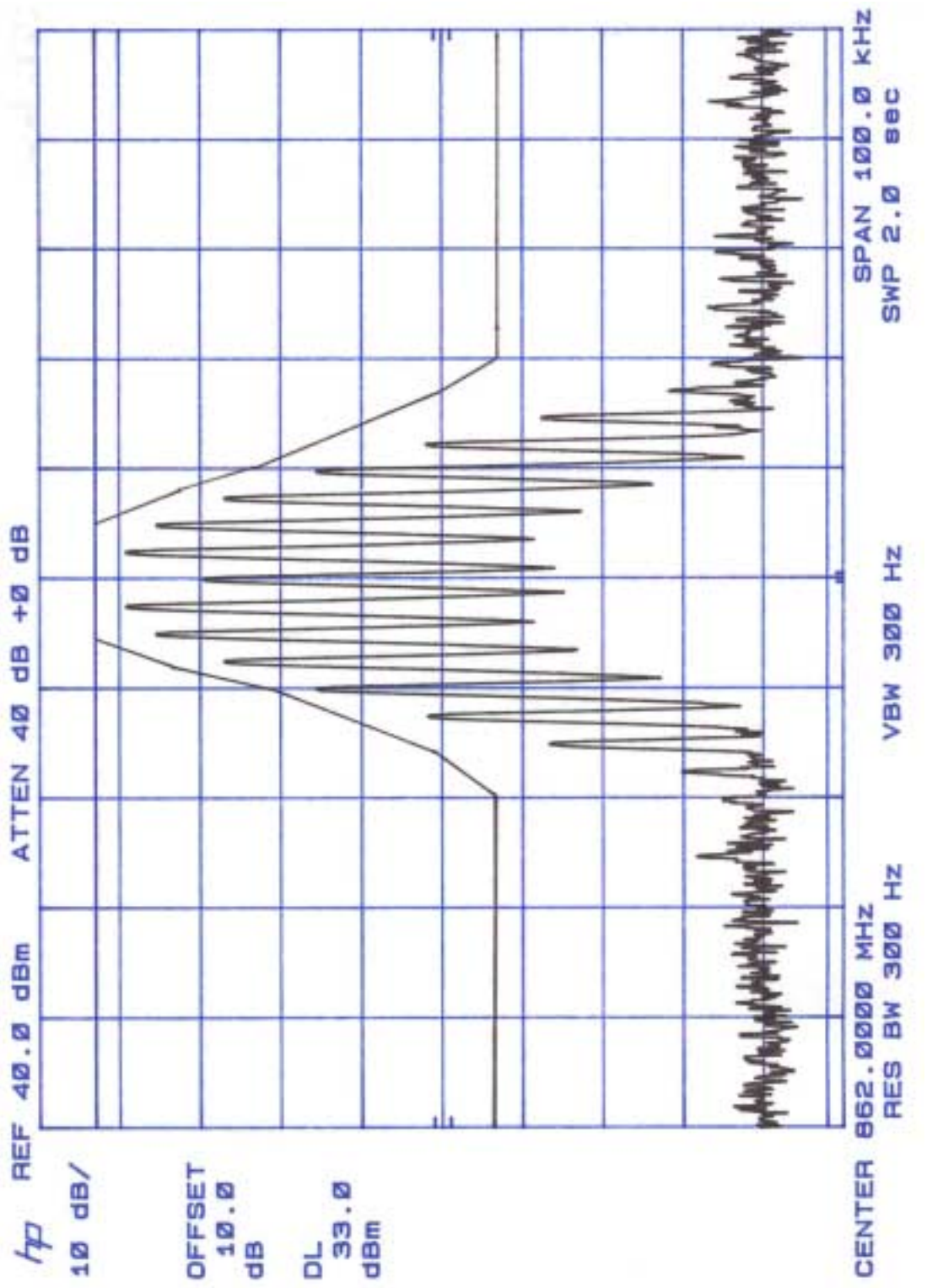
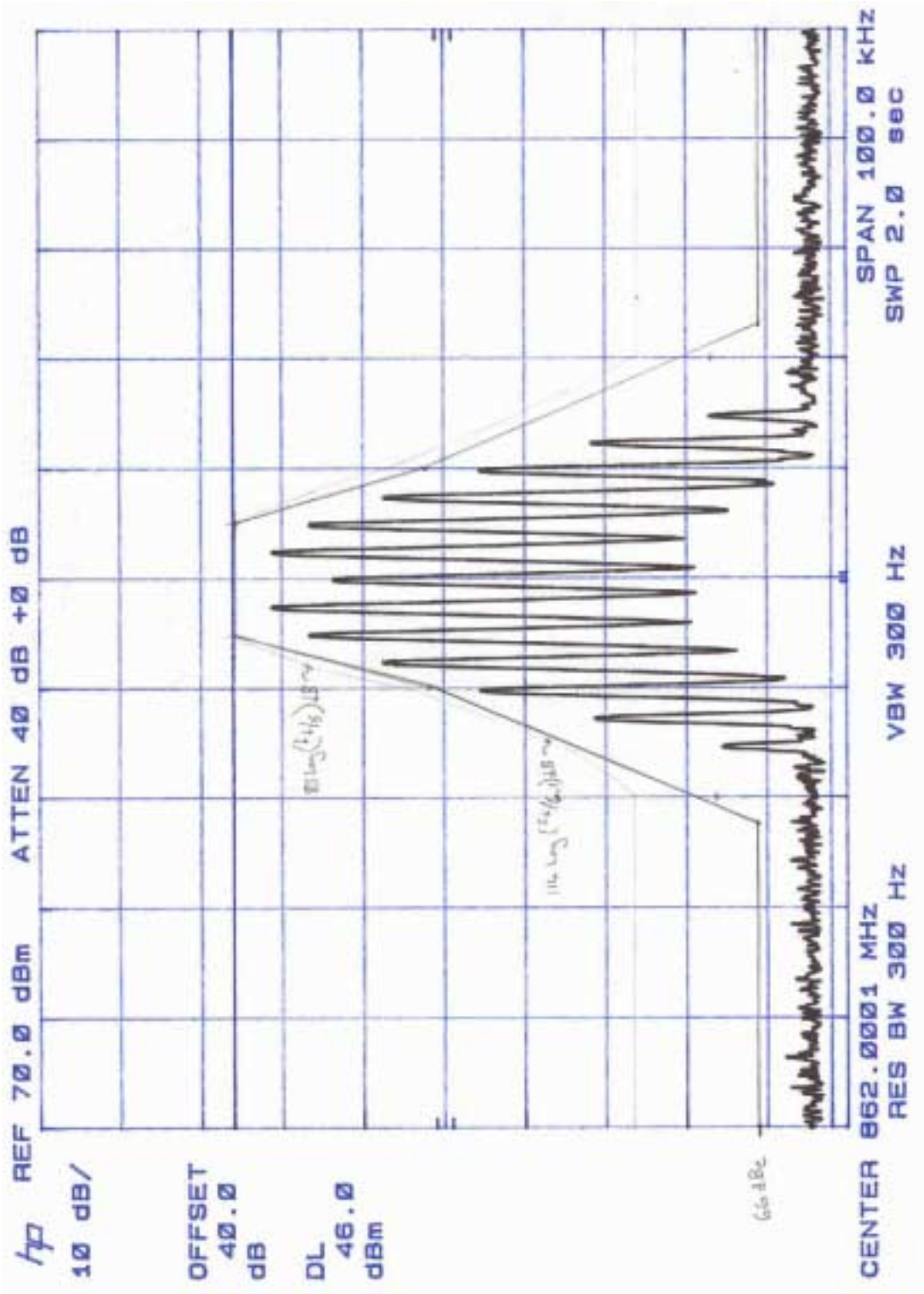


Figure 2: Occupied Bandwidth, Output Signal



3.4 Spurious Emissions at Antenna Terminals (FCC Rule Part 2.1051)

Spurious emissions were measured by connecting the antenna terminal of the amplifier to the input of an HP 8564E spectrum analyzer. The amplifier was supplied with a 2 Watt, 2.5 kHz FM modulated signal with 5 kHz FM deviation. Per Section 90.210(g) of the FCC Rules, any emission shall be attenuated below the unmodulated carrier power by the following:

1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but no more than 10 kHz: At least 83 log (f_d/5) dB;

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least 116 log (f_d / 6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation;

3) On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least 43 + 10 Log (P) dB.

Figure 3 through 5 are spurious emissions plots of the output of the amplifier. input signal supplied to the input of the amplifier via the FCC approved radio.

Figure 3: Conducted Spurious Emissions
FCC §90.210(g)

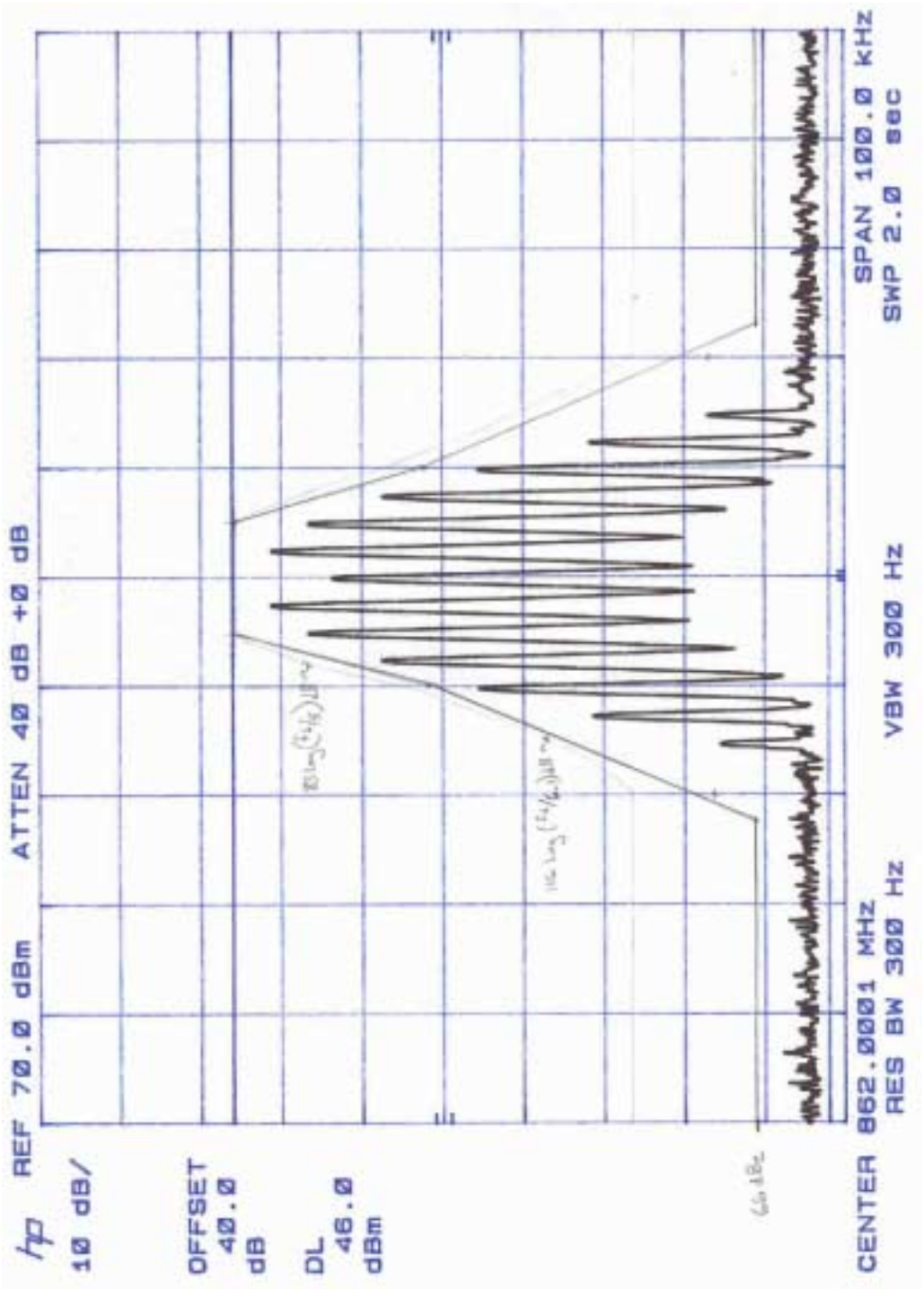


Figure 4: Conducted Spurious Emissions
FCC §90.210(g)

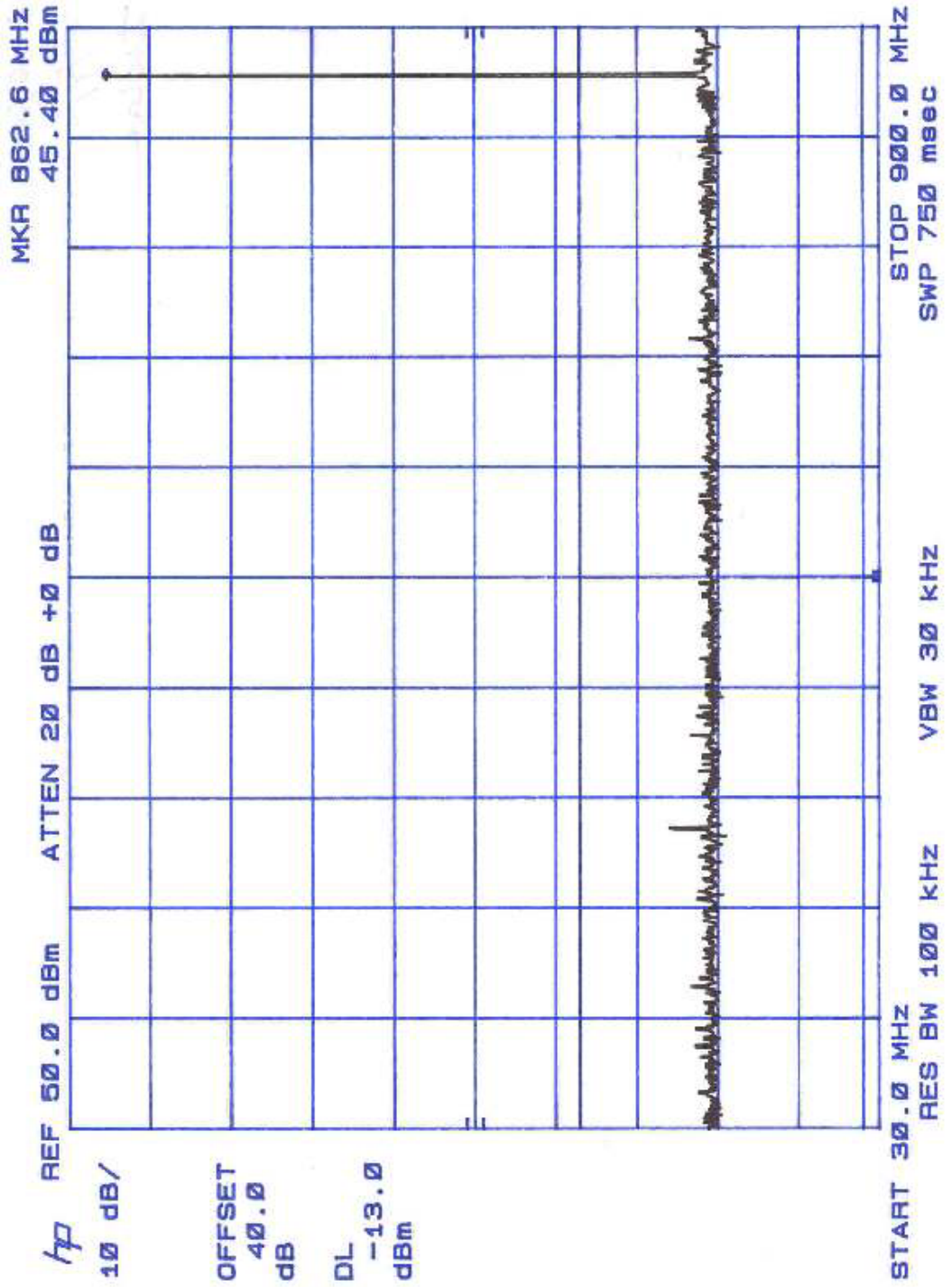


Figure 5: Conducted Spurious Emissions
FCC §90.210(g)

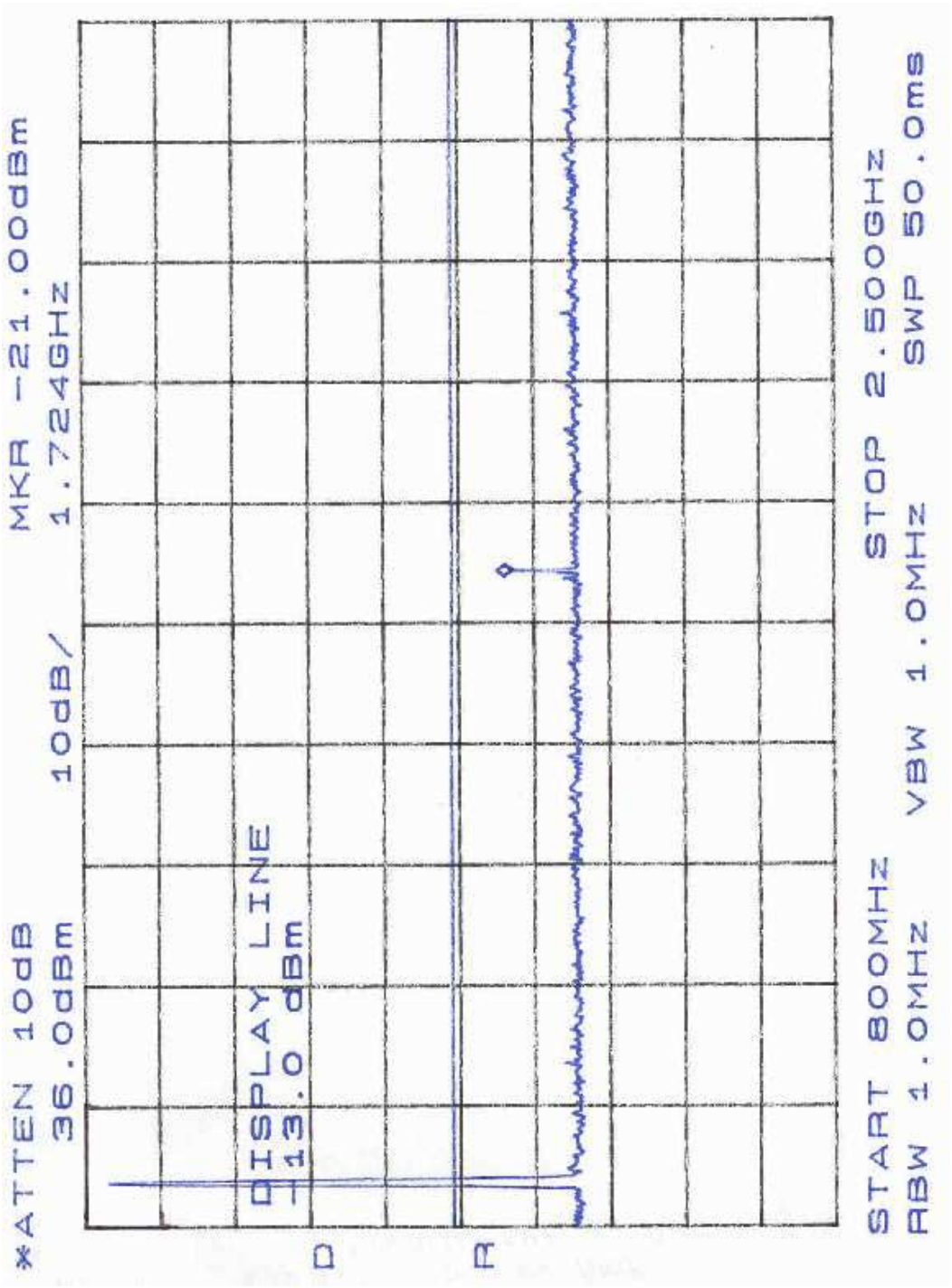
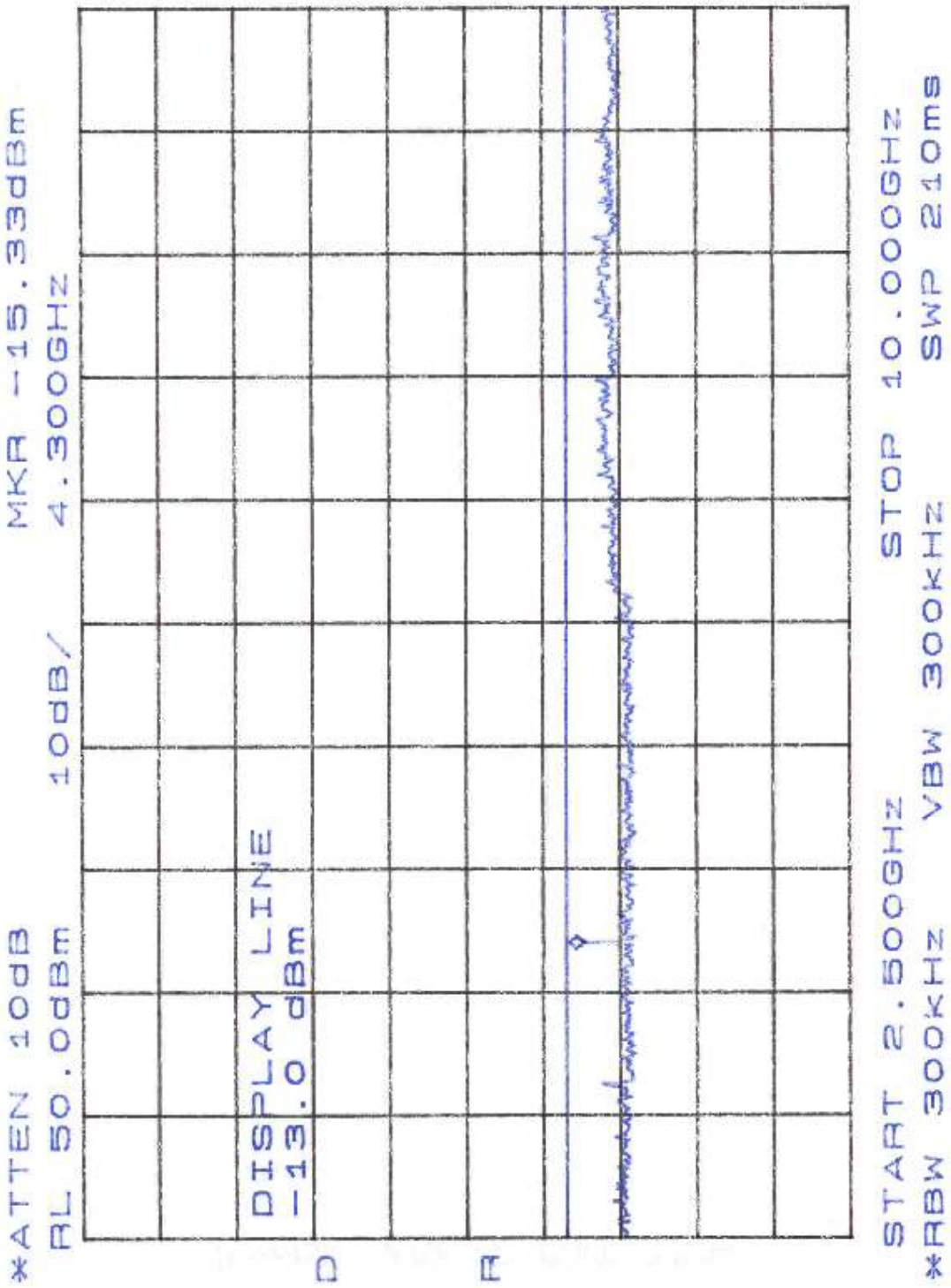


Figure 5: Conducted Spurious Emissions
FCC §90.210(g)



3.5 Radiated Emissions Testing (FCC Rule Part 2.1053)

The amplifier was tested with a 2 Watt, 2.5 kHz FM modulated signal with 5 kHz FM deviation supplied to the input terminal and a 50 ohm load (the output impedance of the antenna port) attached to the antenna port.

The EUT was placed on an 80 cm high, 1 X 1.5 meters non-conductive motorized turntable for radiated testing on a 3 meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Once the emission levels were obtained, the EUT was replaced with an antenna and signal generator for performing the signal substitution measurements. These substitution levels were then corrected for the gain of the substitution antenna and the ERP level in dBm was recorded.

The limit for spurious radiated emissions is –13dBm. The ERP levels are compared to this level and the margins are listed in the margin column of the data sheet.

Table 1: FCC Part 90 3M Radiated Emissions Data - Site 2

CLIENT: EMR
MODEL NO: HUF800-40
DATE: 3/19/01
BY: Chad Beattie
JOB #: 6179

Substitution Method per TIA/EIA 603

Frequency	Polarity	Azimuth	Substitution Level	Tx Antenna Gain Ref. to 1/2 wave dipole	ERP Level	Limit (59 dBc)	Margin
MHz	H/V	Degree	dBm	dB	dBm	dBm	dB
862.00	V	45.00	-39.2	4.5	-34.7	-13.0	-21.7
1742.05	V	180.00	-47.5	2.9	-44.7	-13.0	-31.7
2586.00	V	112.00	-20.0	1.9	-18.2	-13.0	-5.2
3448.00	V	225.00	-30.0	4.4	-25.7	-13.0	-12.7
4310.00	V	112.00	-27.2	4.9	-22.4	-13.0	-9.4
5172.00	V	202.00	-35.0	5.5	-29.6	-13.0	-16.6
6034.00	V	202.00	-33.5	6.1	-27.4	-13.0	-14.4
6896.00	V	270.00	-41.7	5.3	-36.5	-13.0	-23.5
7758.00	V	112.00	-48.7	3.9	-44.9	-13.0	-31.9
8620.00	V	135.00	-36.0	3.4	-32.7	-13.0	-19.7
9482.00	V	135.00	-37.5	2.9	-34.7	-13.0	-21.7
431.00	H	202.00	-40.2	3.5	-36.7	-13.0	-23.7
862.00	H	0.00	-38.7	4.5	-34.2	-13.0	-21.2
1742.05	H	180.00	-29.8	2.9	-27.0	-13.0	-14.0
2586.00	H	180.00	-26.0	1.9	-24.2	-13.0	-11.2
3448.00	H	180.00	-24.3	4.4	-20.0	-13.0	-7.0
4310.00	H	225.00	-23.5	4.9	-18.7	-13.0	-5.7
5172.00	H	180.00	-29.7	5.5	-24.3	-13.0	-11.3
6034.00	H	135.00	-27.5	6.1	-21.4	-13.0	-8.4
6896.00	H	315.00	-38.8	5.3	-33.6	-13.0	-20.6
7758.00	H	112.00	-31.8	3.9	-28.0	-13.0	-15.0
8620.00	H	158.00	-33.2	3.4	-29.9	-13.0	-16.9
9482.00	H	225.00	-35.8	2.9	-33.0	-13.0	-20.0

3.6 Frequency Stability (FCC Rule Part 2.1055)

The requirements of Section 2.1055 call for the carrier frequency to be stable under different power supply voltages and over a wide temperature extreme. The amplifier was not tested for frequency stability, as it contains no circuitry for generating or stabilizing the RF signal.

3.7 Transient Frequency Behavior (FCC Part 90.214)

The requirements of Section 90.214 call out transient frequency behavior for the carrier frequency. The amplifier was not tested for the transient frequency behavior, as its purpose is to amplify the signal from the transmitter module and not generate a carrier frequency.

Table 2: EMC Test Equipment Calibration Information

Equipment	Serial Number	Date Calibrated	Calibration Due
Antenna Research Associates, Inc. Biconical Log Periodic Antenna LPB-2520A (Site 2)	1118	5/17/00	5/17/01
Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 2)	2926U07140	7/3/00	7/03/01
Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 2)	2811A01283	7/3/00	7/03/01
Hewlett-Packard RF Preselector: HP 85685A (Site 2)	3221A01395	7/3/00	7/03/01
Solar Electronics LISN 8012-50-R-24-BNC	8379493	8/29/00	8/29/01
Solar Electronics LISN 8028-50-TS-24-BNC	N/A	8/29/00	8/29/01
Solar Electronics LISN 8028-50-TS-24-BNC	N/A	8/29/00	8/29/01
Hewlett-Packard Spectrum Analyzer: HP 8564E	3643A00657	3/28/00	3/28/01
Hewlett-Packard Preamplifier: HP 8449B	3008A00729	12/07/00	12/07/01
Hewlett-Packard Preamplifier: HP 8449B	3008A00385	9/07/00	9/07/01
Antenna Research Associates, Inc. Horn Antenna DRG-118/A	1010	9/10/99	9/10/01
Hewlett-Packard Spectrum Analyzer: HP 8593A	3009A00739	5/25/00	5/25/01
Hewlett-Packard Signal Generator: HP 8656B	2926U8140	9/14/00	9/14/01
Hewlett-Packard Signal Generator HP 8648A	3426A00665	7/27/00	7/27/01
Hewlett-Packard Signal Generator: HP 8648C	3347A00242	5/12/00	5/12/01
Racal Dana Frequency Counter 1992	2806	2/24/00	2/24/01
Tektronix Oscilloscope TDS-540	B0101162	5/01/00	5/01/01

APPENDIX A

STATEMENT OF MEASUREMENT UNCERTAINTY

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:
A = Antenna calibration uncertainty, in dB = 2 dB
B = Spectrum Analyzer uncertainty, in dB = 1 dB
C = Site uncertainty, in dB = 4 dB
n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\,(2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB