



PERMISSIVE CHANGE REPORT

for

M/A COM PRIVATE RADIO SYSTEMS

3315 Old Forest Road
Lynchburg, VA 24501

MASTRIII with Crescend Power Amplifier

FCC ID: OWDTR-197-A2

Industry Canada Certification: IC 36361931032C

Revision 1

Prepared By:

**Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879**



WLL PROJECT #:7147X

This report shall not be reproduced, except in full, without the prior written consent of Washington Laboratories, Ltd.

TABLE OF CONTENTS

1	INTRODUCTION.....	1
1.1	SUMMARY.....	1
2	DESCRIPTION OF EQUIPMENT AND CHANGES TO EQUIPMENT.....	2
3	TEST CONFIGURATION.....	4
3.1	TESTING ALGORITHM.....	5
3.2	POWER OUTPUT TESTING.....	5
3.3	CARRIER BANDWIDTH TESTING.....	5
3.4	SPURIOUS EMISSIONS AT ANTENNA TERMINAL TESTING.....	5
3.5	MPE CALCULATIONS.....	5

TABLES

Table 1. Test Results Summary.....	2
Table 2. Occupied Bandwidth-Analog Modulation.....	5
Table 3. Occupied Bandwidth-Digital Modulation	5
Table 4. MPE Results.....	6
Table 5. Equipment Under Test.....	6
Table 6. Equipment Calibration List.....	7
Figure 1. EUT Photograph (Front).....	3
Figure 2. EUT Photograph (rear).....	4
Figure 3. Conducted Power Measurement 150.025 MHz.....	8
Figure 4. Bandwidth Measurement: Analog Modulation	9
Figure 5. Bandwidth Measurement: Digital Modulation.....	10
Figure 6. Emission Mask Narrowband: Analog Modulation 50kHz Span	12
Figure 7. Emission Mask Narrowband: Analog Modulation 100kHz Span	13
Figure 8. Emission Mask Narrowband: Analog Modulation 500kHz Span	14
Figure 9. Emission Mask Narrowband: Digital Modulation 50kHz Span	15
Figure 10. Emission Mask Narrowband: Digital Modulation 100kHz Span.....	16
Figure 11. Emission Mask Narrowband: Digital Modulation 500kHz Span	17
Figure 12. Emission Mask Broadband: Analog Modulation 50kHz Span.....	18
Figure 13. Emission Mask Broadband: Analog Modulation 100kHz Span.....	19
Figure 14. Emission Mask Broadband: Analog Modulation 500kHz Span	20
Figure 15. Emission Mask Broadband: Digital Modulation 50kHz Span.....	21
Figure 16. Emission Mask Broadband: Digital Modulation 100kHz Span	22
Figure 17. Emission Mask Broadband: Digital Modulation 500kHz Span.....	23
Figure 18. Spurious Emissions Narrowband Limit 30 MHz-500MHz.....	25
Figure 19. Spurious Emissions Narrowband Limit 30 MHz-500MHz	26
Figure 20. Spurious Emissions Broadband Limit 30 MHz-500MHz	27
Figure 21. Spurious Emissions Broadband Limit 30 MHz-500MHz	28

FCC CLASS II PERMISSIVE CHANGE REPORT

for

M/A COM PRIVATE RADIO SYSTEMS FCC ID: OWDTR-197-A2

1 Introduction

This report has been prepared on behalf of M/A COM PRIVATE RADIO SYSTEMS to support a Permissive Change for the above referenced unit. The test and report are assembled to document compliance with the following regulations:

Part 90 of the FCC Rules and Regulations
Industry Canada RSS-119, Issue 6

The Equipment Under Test was the M/A COM PRIVATE RADIO SYSTEMS MASTR III with SitePro Controller.

All measurements herein were performed according to:

TIA/EIA-603-A. Land Mobile FM or PM Communications Equipment Measurement and Performance Standards. Aug. 2001

The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and field Strength Instrumentation.

All measurements are 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, Ltd. has been approved by the FCC, and Industry Canada (Industry Canada file numbers IC 3035-1 [Site 1] and IC 3035-2 [Site 2]), and NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent test laboratory.

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

1.1 Summary

The M/A COM PRIVATE RADIO SYSTEMS MASTRIII Station complies with the following requirements:

- Emissions Masks per FCC Part 90.210
- Emissions Masks per IC RSS-119

Table 1. Test Results Summary

Parameter	Result
Measured Power Output	123.9 Watts (125 Watts Rated)
Occupied Bandwidth	
Analog Modulation	5.58 kHz
Digital Modulation	4.917 kHz

Analog Modulation Parameters:

Modulation Frequency: 1250 Hertz
Deviation: 1.75 kHz (Maximum)

Digital Modulation Parameters:

9600 B pseudo-random
Deviation: 1.5 kHz

2 Description of Equipment and Changes to Equipment

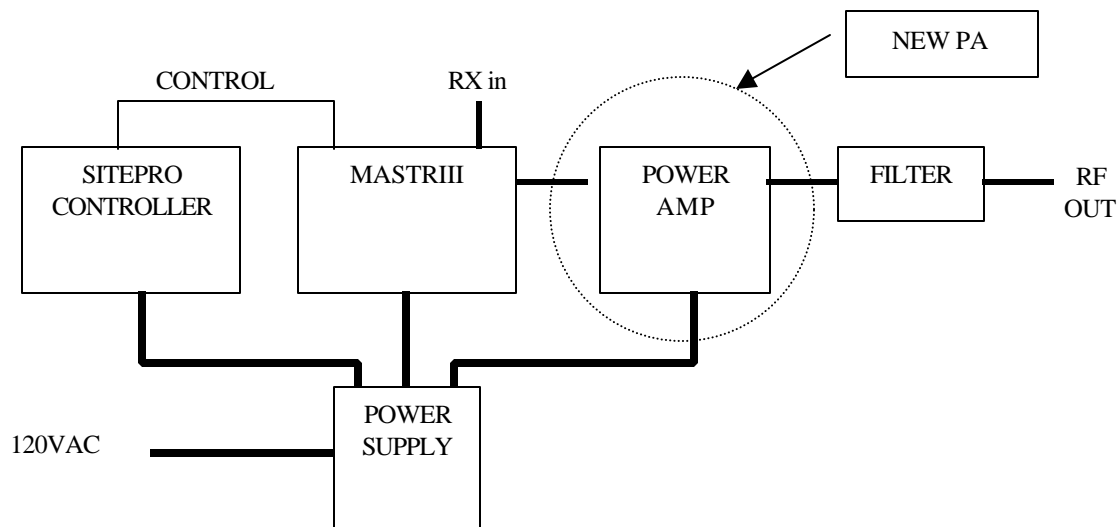
This Class II change request includes the following equipment changes:

1. Replace existing power amplifier with Crescend power amplifier; Model Number EA101292VIO
2. Replace power supply; Model Number 289PS15

All modulation, frequency-determining circuits and RF characteristics are housed in the MASTRIII station. The same emissions designators shall be used in the new configuration.

The power amplifier is a separate module that is integrated together with the SitePro Controller, MASTRIII and power supply modules that, together, make up the MASTRIII Base Station.

A block diagram is shown below.



The EUT is pictured in Figure 1 and Figure 2.

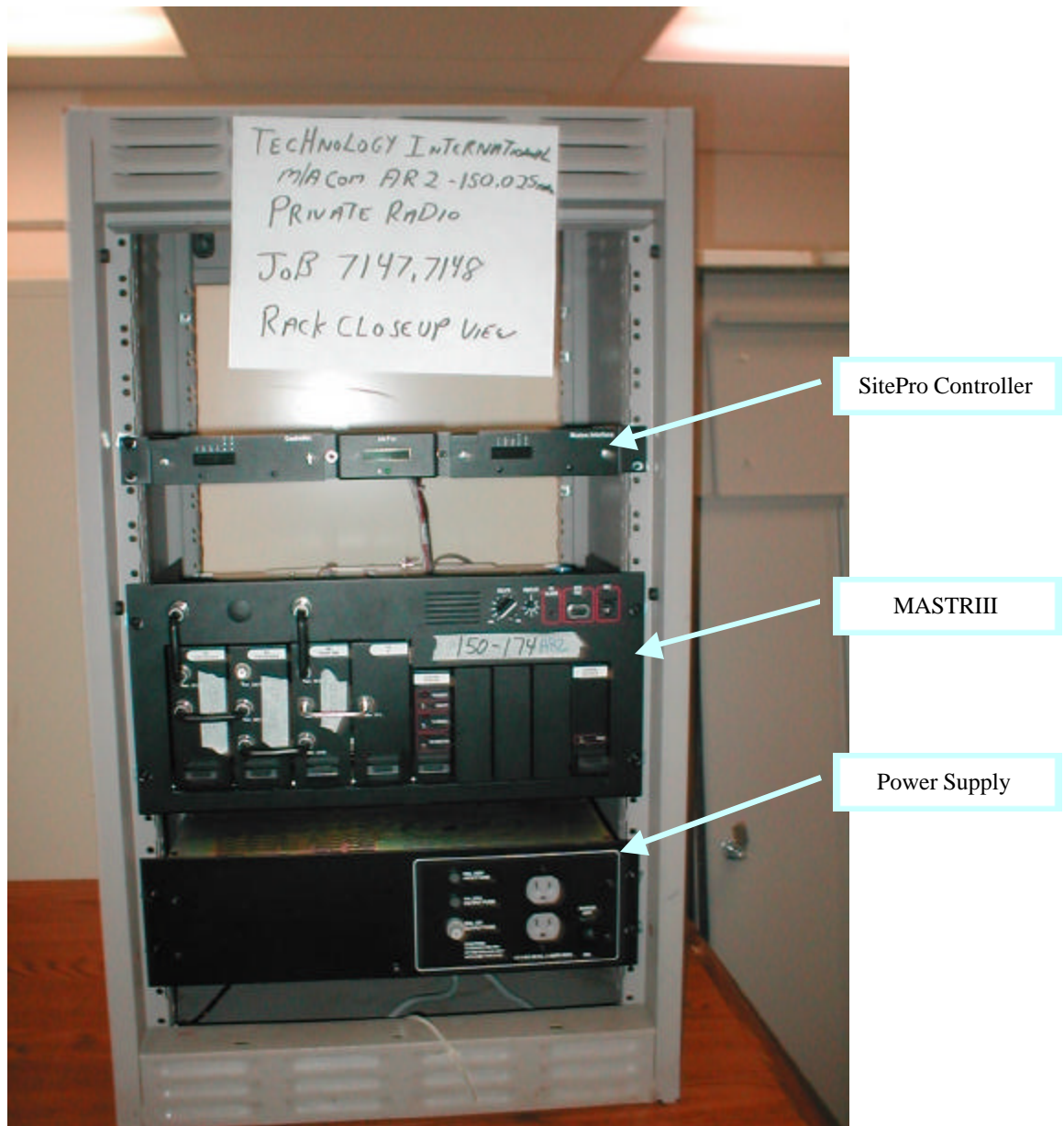


Figure 1. EUT Photograph (Front)

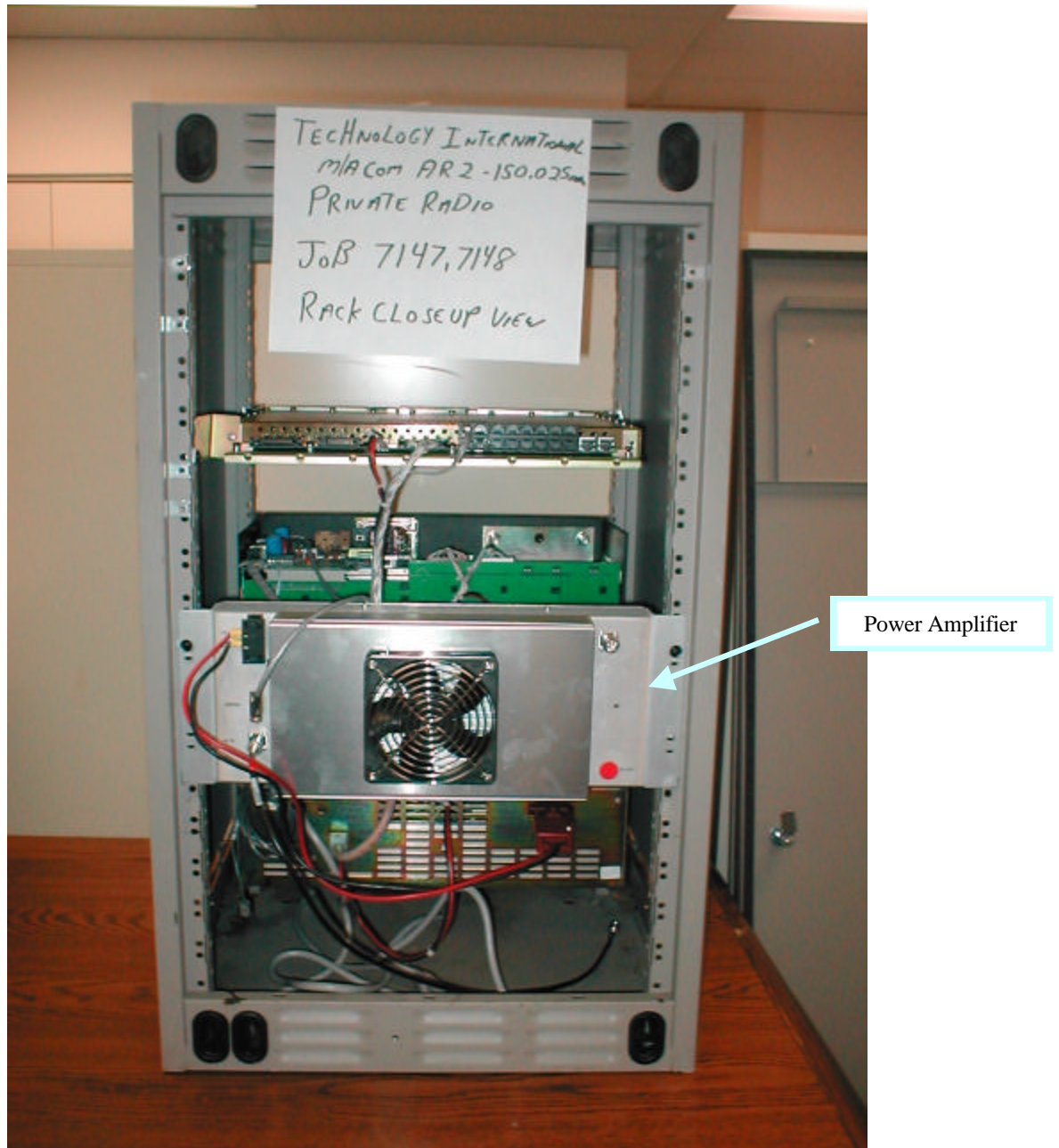


Figure 2. EUT Photograph (rear)

3 Test Configuration

The EUT was installed in a 19" rack. The RF out was connected to a low harmonic 200W attenuator. The output of the attenuator was connected to the input of a spectrum analyzer.

3.1 Testing Algorithm

The EUT was set to transmit at maximum rated power and modulated for 25 kHz channel spacing and for 12.5 kHz channel spacing ("Broadband" and "Narrowband", respectively).

Two types of modulation were applied to the unit:

1. Analog Modulation: 1250 Hz at maximum deviation (clipping)
2. Digital Modulation: 9600 Baud (maximum data rate)

3.2 Power Output Testing

The EUT antenna was replaced with a coaxial cable and the cable was connected to the spectrum analyzer input through an attenuator and filter, as appropriate. An offset was programmed into the spectrum analyzer to compensate for the loss of the external attenuator.

This power was recorded as the peak power of the unit and used to set the reference for the various emissions masks.

The measured power output was 123.9 Watts. The rated power output is 125 Watts.

3.3 Carrier Bandwidth Testing

The EUT antenna was connected to the input of a spectrum analyzer through attenuators for measurement of the RF conducted power. An offset was programmed into the spectrum analyzer to compensate for the loss of the external attenuator.

Measurements were made at two frequencies for this permissive change request.

Table 2. Occupied Bandwidth-Analog Modulation

Frequency (MHz)	Resolution Bandwidth	Video Bandwidth	Measured BW (kHz)
150.025	300 Hz	300 Hz	5.58 kHz

Table 3. Occupied Bandwidth-Digital Modulation

Frequency (MHz)	Resolution Bandwidth	Video Bandwidth	Measured BW (kHz)
150.025	300 Hz	300 Hz	4.917 kHz

A spectrum analyzer plot of the bandwidth can be found in Exhibit 2.

3.4 Spurious Emissions At Antenna Terminal Testing

The EUT antenna was connected to the input of a spectrum analyzer through attenuators and appropriate filters for measurement of the RF conducted power.

An offset was programmed into the spectrum analyzer to compensate for the loss of the external attenuator and filter insertion losses. The amplitude of the EUT carrier frequency was measured to determine the reference level for the emissions masks. The emissions were characterized at the carrier channel and out-of-band from 30 MHz up to a frequency of at least 10 times the operating frequency.

Spectrum analyzer plots of the spurious emissions are in Exhibit 2.

3.5 MPE Calculations

Maximum permissible exposure calculations have been performed for the maximum ERP level allowed.

The calculations are shown in Exhibit 4

Table 4. MPE Results

For 150 MHz (FCC ID: OWDTR-197-A2), use the following:

ERP	Separation Distance (m)
500	5.7

Table 5. Equipment Under Test

EUT:

M/A COM PRIVATE RADIO SYSTEMS MASTR III Station

Table 6. Equipment Calibration List

Equipment	Serial Number	Cal Date	Cal Due
Hewlett-Packard Spectrum Analyzer: HP 8564E	WLL #0067	4/18/02	4/18/03
30 dB 100W Power Attenuator	N/A	Cal in Use	Cal in Use
Hi-Pass Filter	N/A	Cal in Use	Cal in Use
Tunable Notch Filter TTR 190-3EE	92166-1	Cal in Use	Cal in Use
HP Network Analyzer	WLL S00420	4/24/02	4/24/03

Exhibit 1. Bandwidth Plots

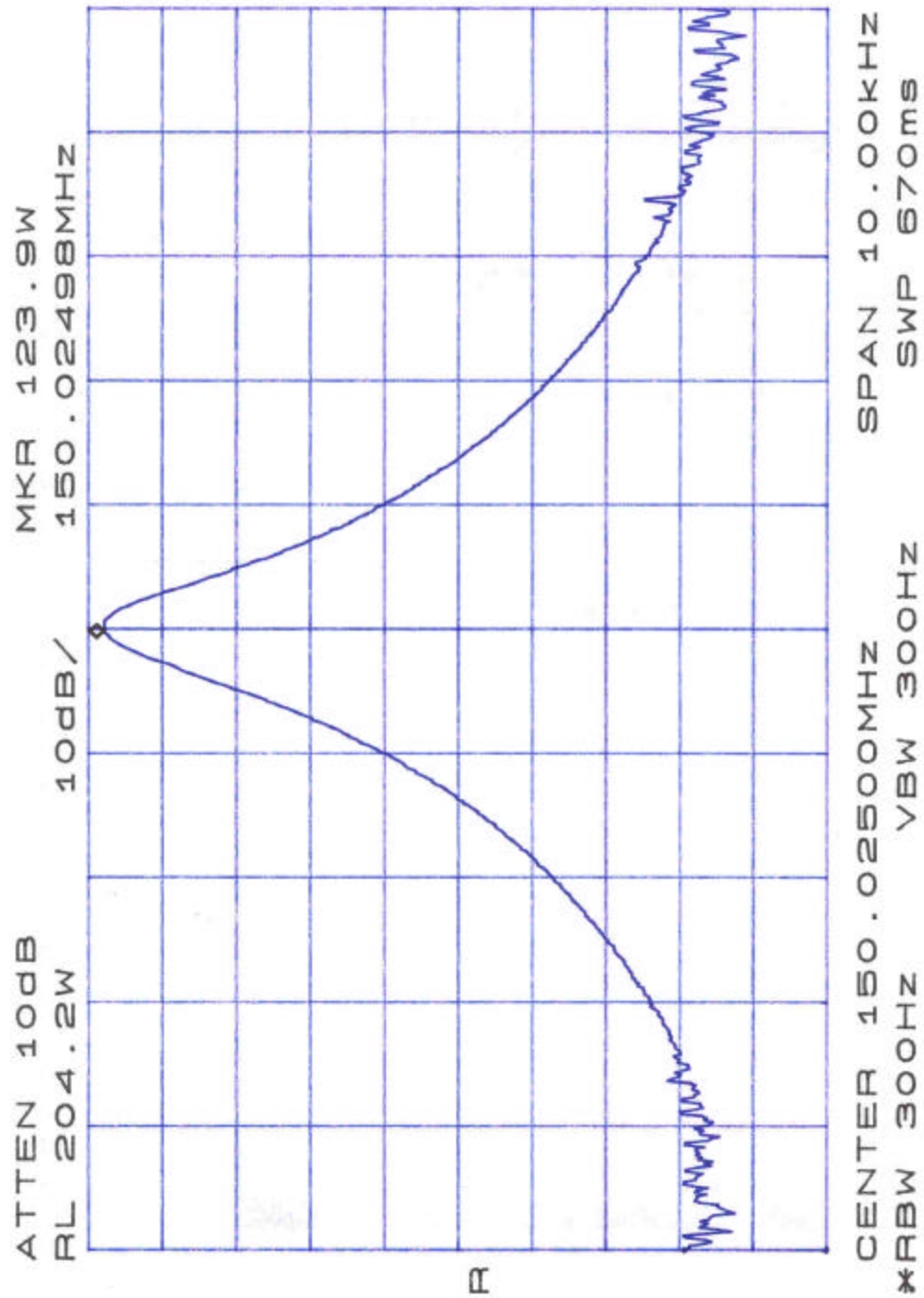


Figure 3. Conducted Power Measurement 150.025 MHz

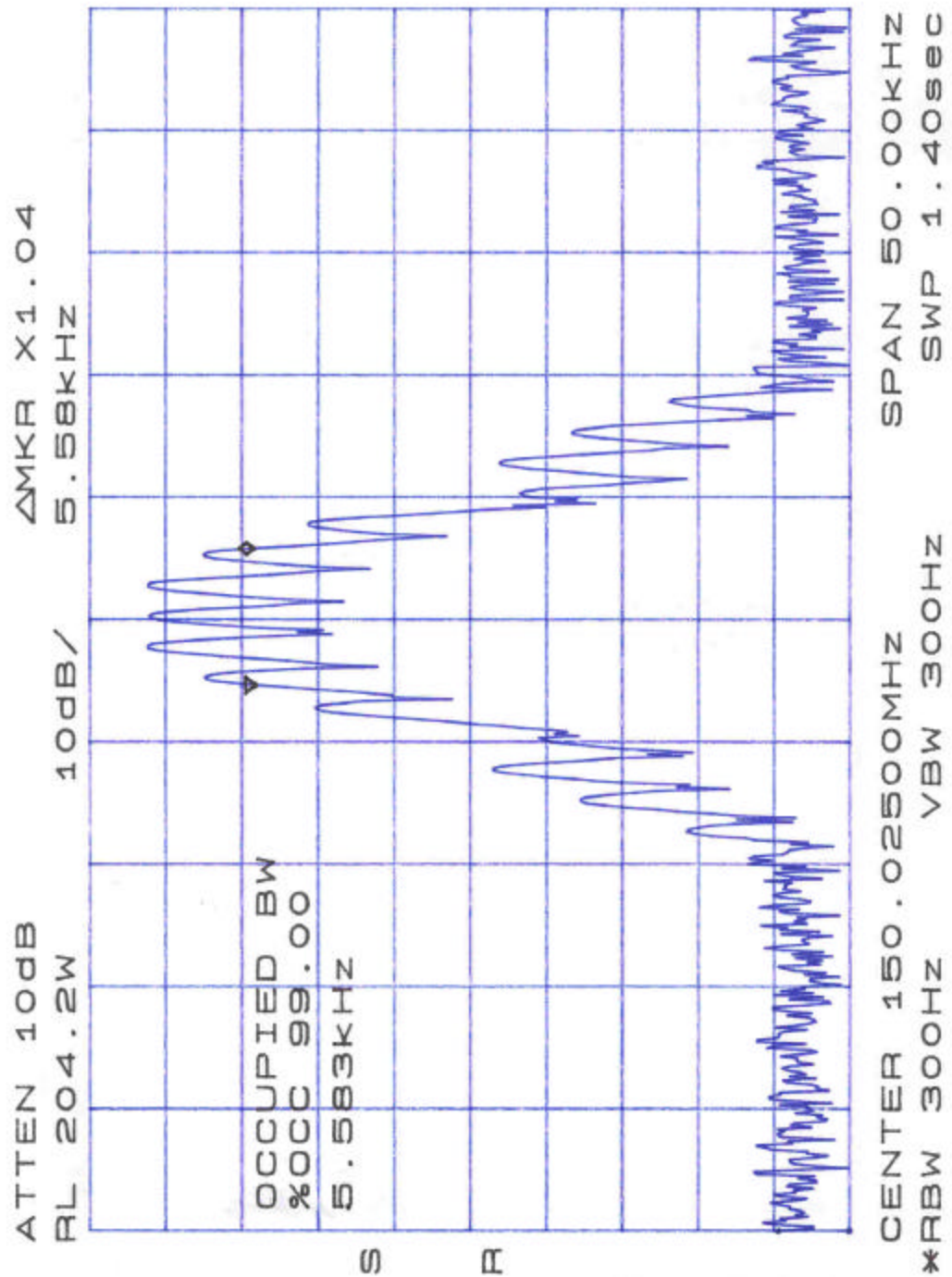


Figure 4. Bandwidth Measurement: Analog Modulation

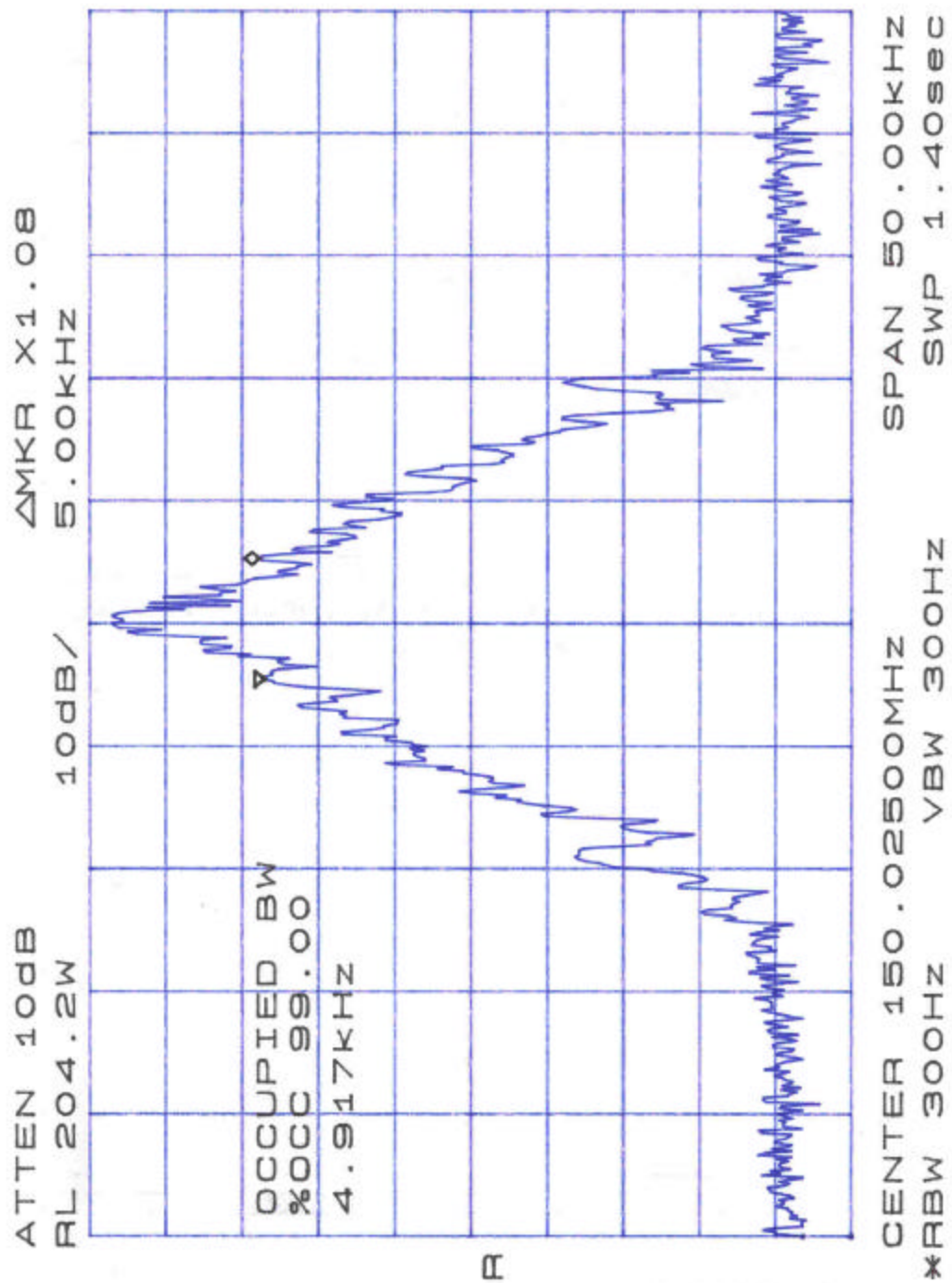


Figure 5. Bandwidth Measurement: Digital Modulation

Exhibit 2. Emission at Antenna Terminal Plots: Mask Plots

Thu 25/Jul/2002 17:58:32

1

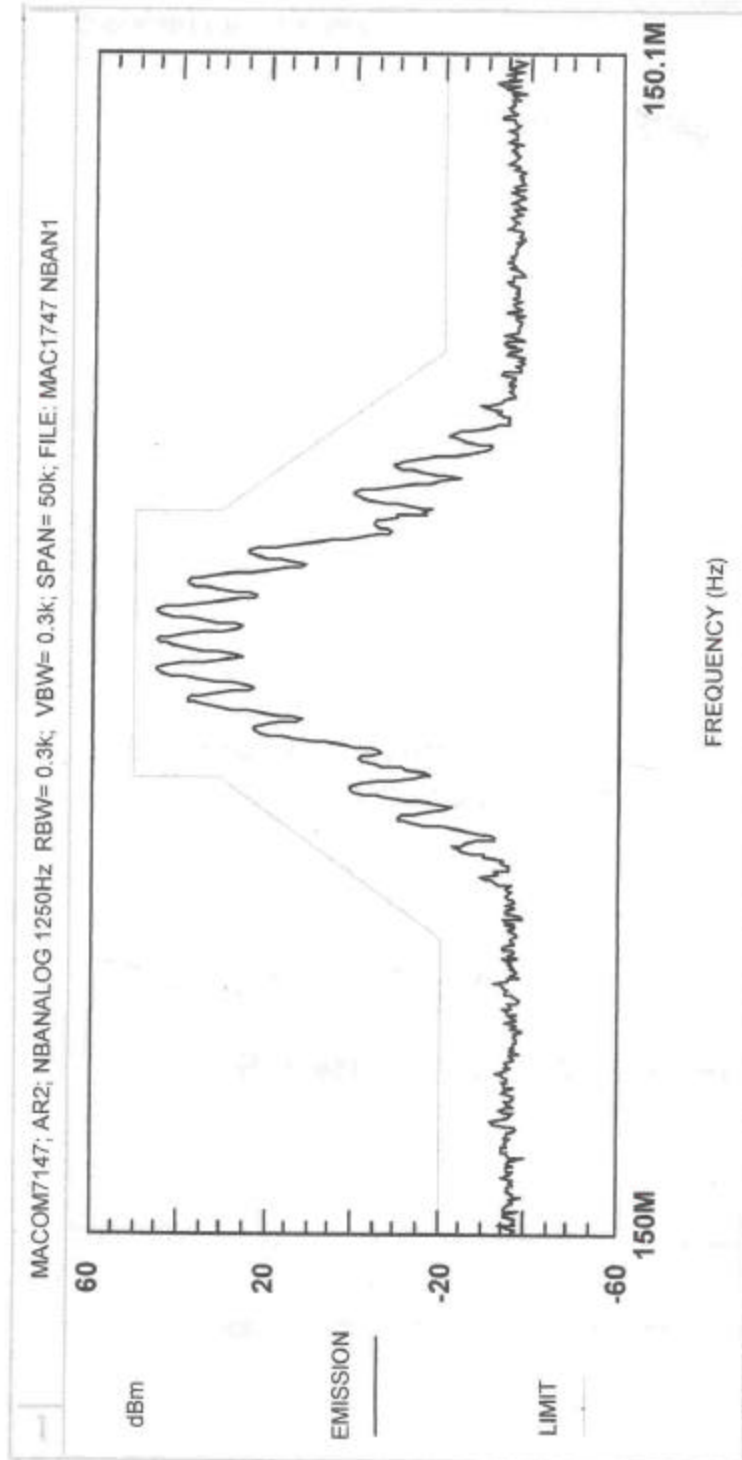


Figure 6. Emission Mask Narrowband: Analog Modulation 50kHz Span

Thu 25/Jul/2002 17:59:00

1

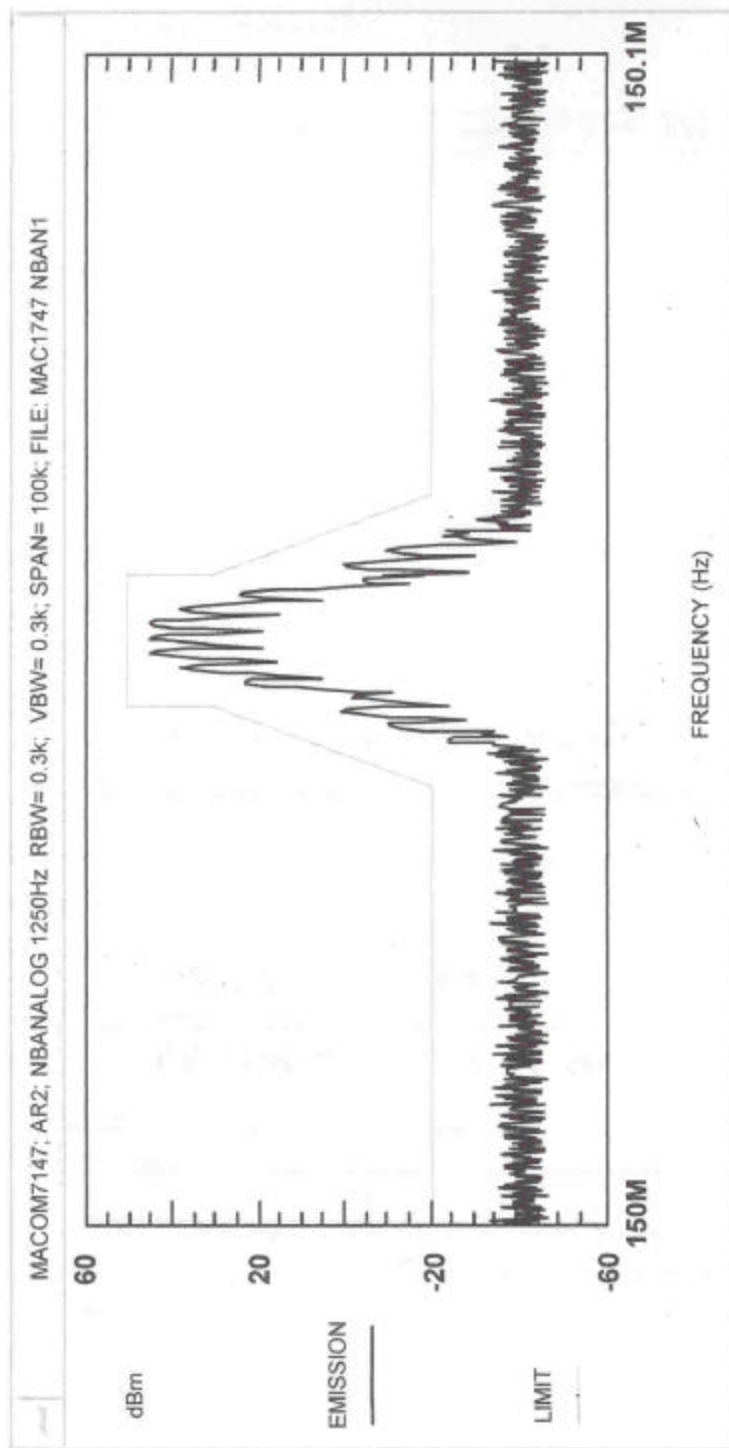


Figure 7. Emission Mask Narrowband: Analog Modulation 100kHz Span

Thu 25/Jul/2002 17:59:55

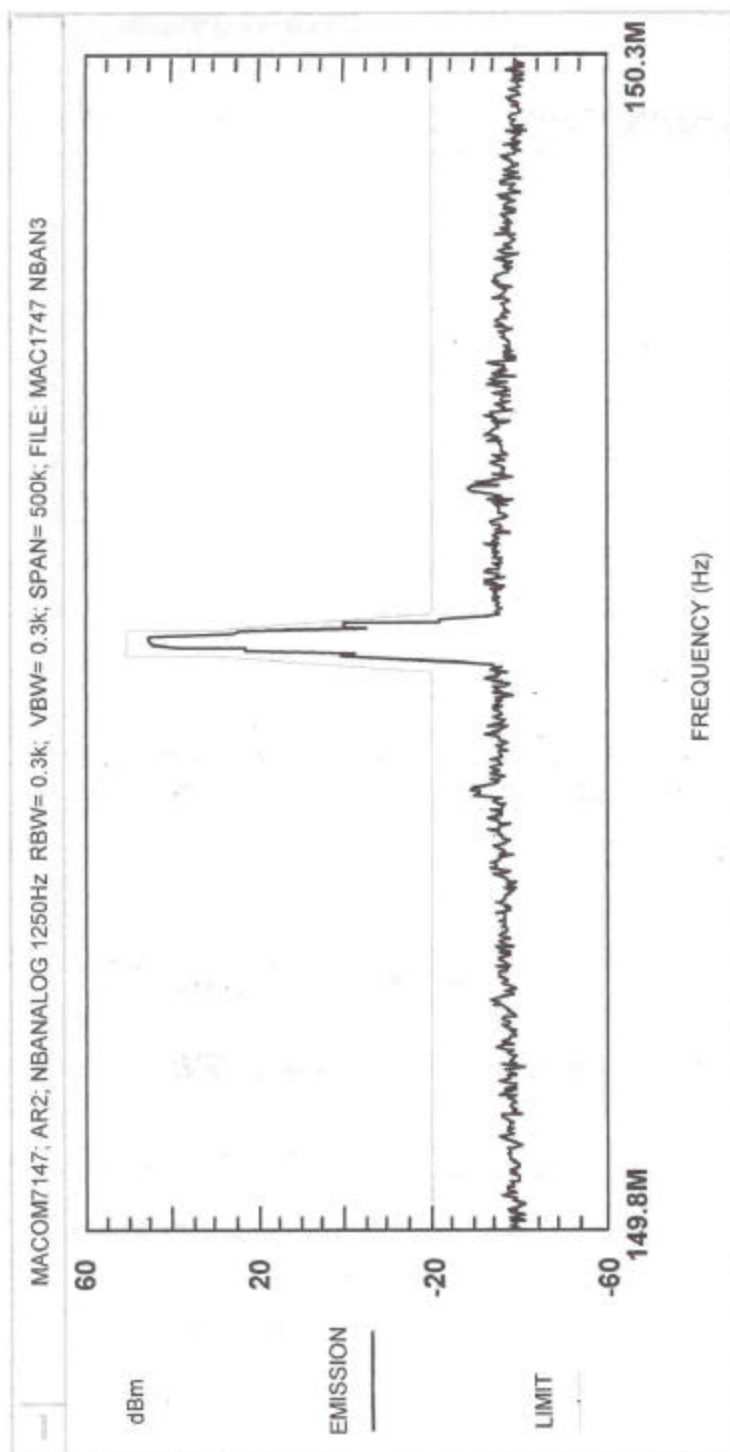


Figure 8. Emission Mask Narrowband: Analog Modulation 500kHz Span

Thu 25/Jul/2002 17:53:57

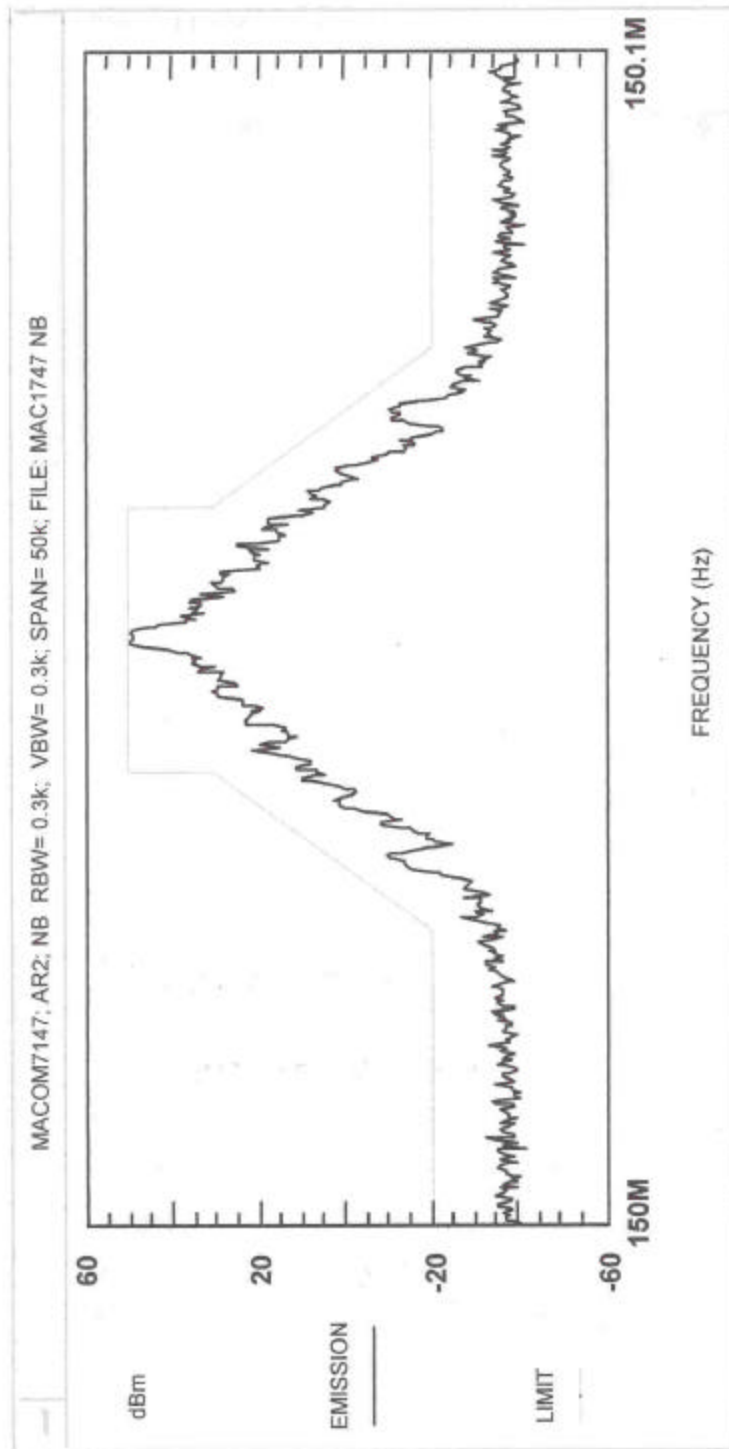


Figure 9. Emission Mask Narrowband: Digital Modulation 50kHz Span

Thu 25/Jul/2002 17:54:33

1

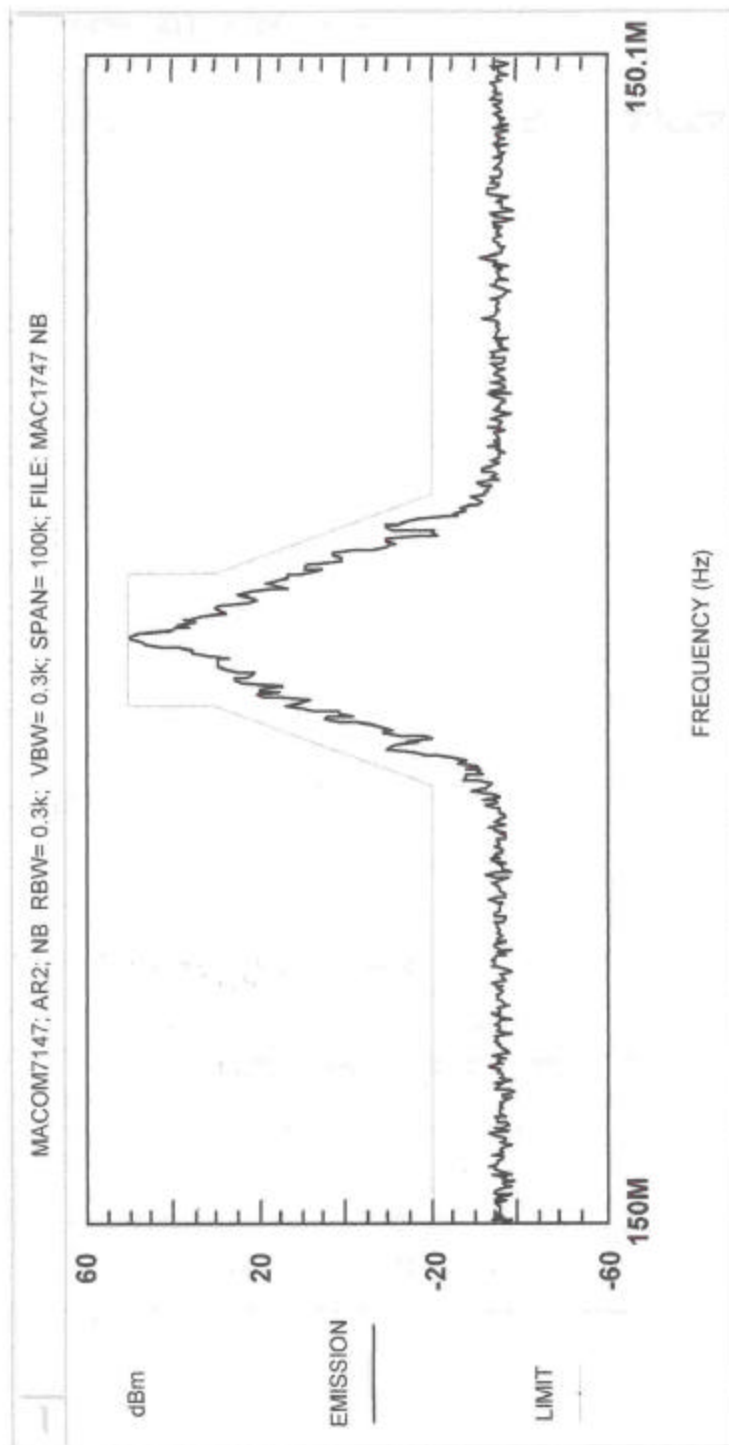


Figure 10. Emission Mask Narrowband: Digital Modulation 100kHz Span

Thu 25/Jul/2002 17:55:10

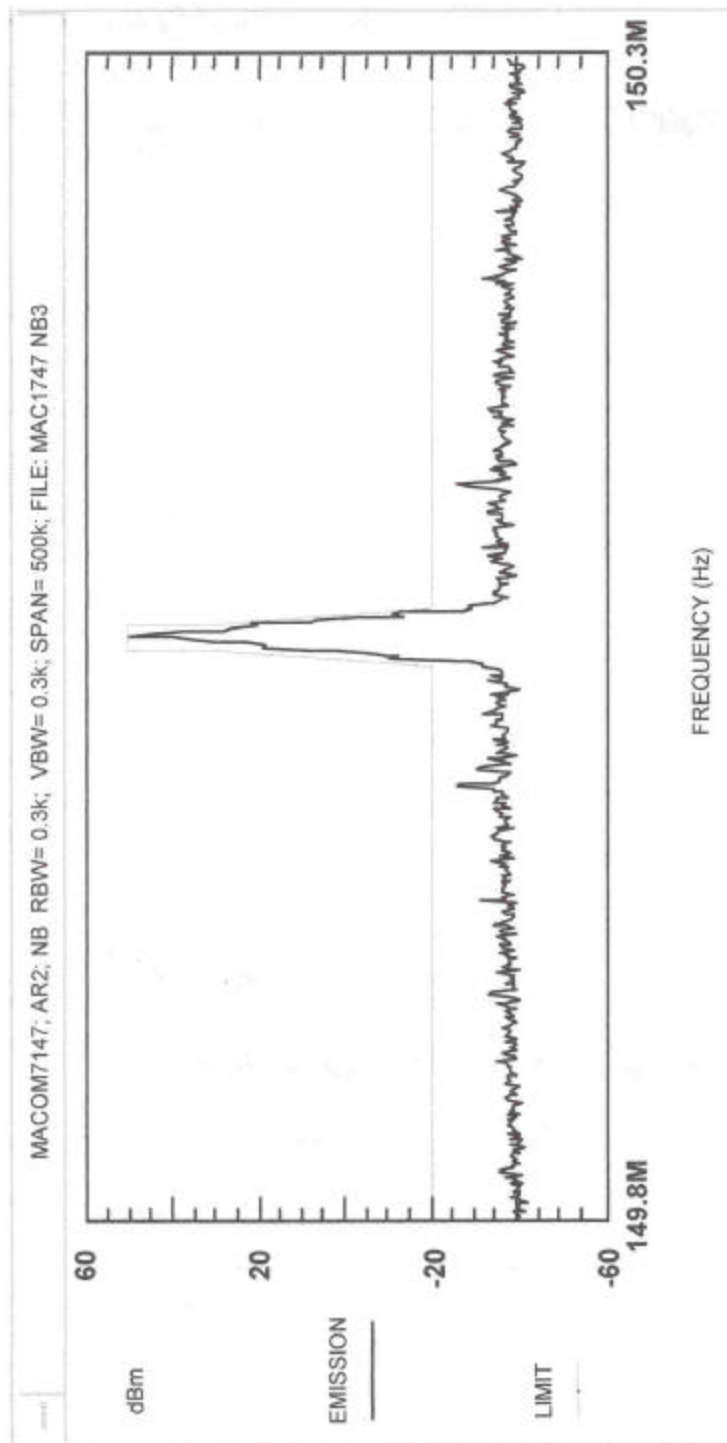


Figure 11. Emission Mask Narrowband: Digital Modulation 500kHz Span

Fri 26/Jul/2002 09:49:51

1

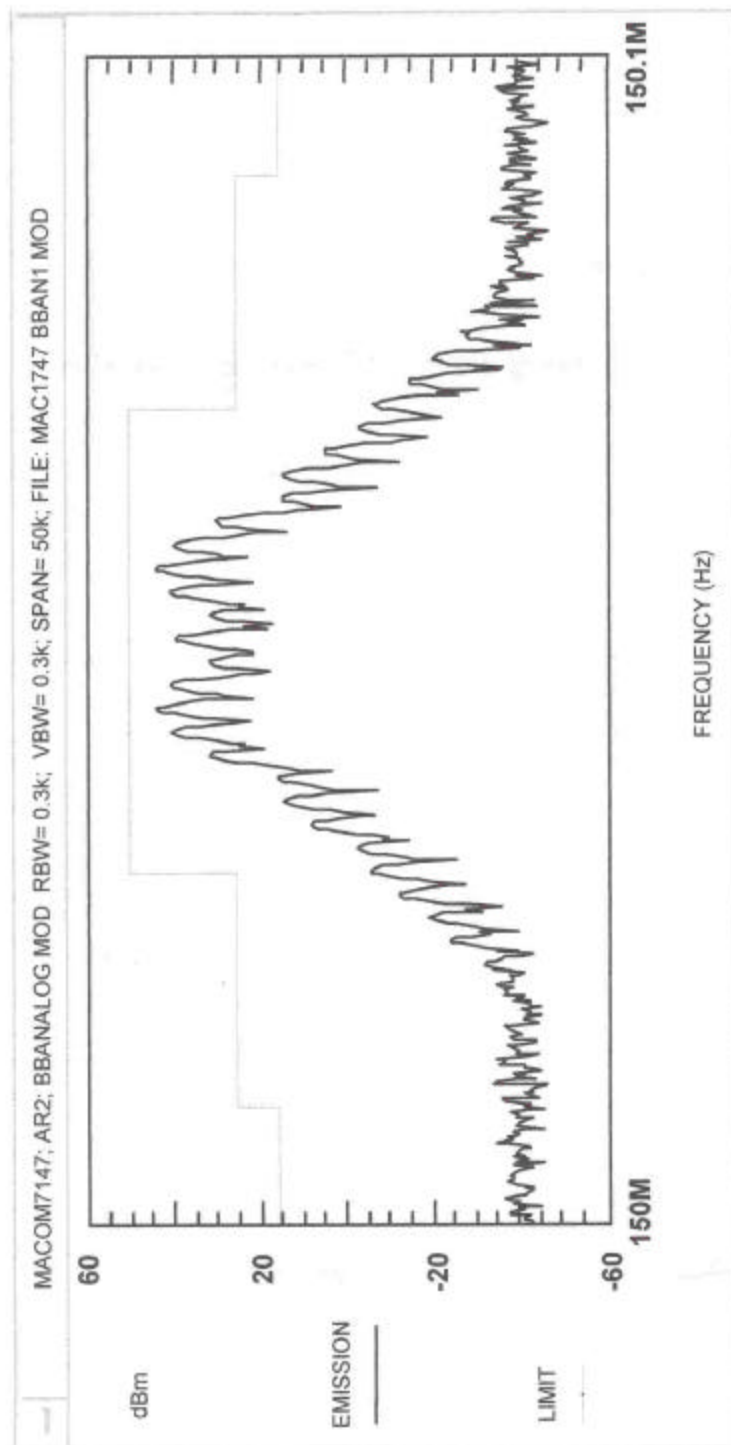


Figure 12. Emission Mask Broadband: Analog Modulation 50kHz Span

Fri 26/Jul/2002 09:52:21

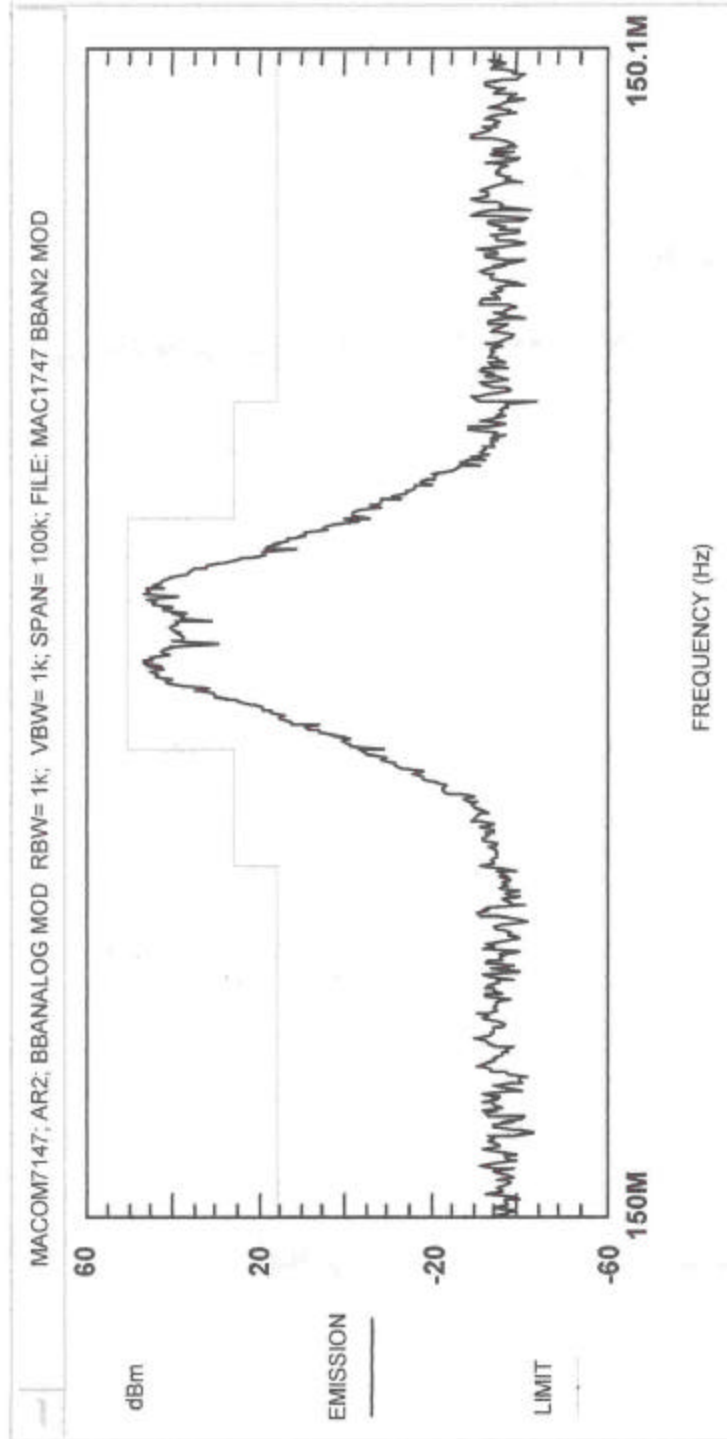


Figure 13. Emission Mask Broadband: Analog Modulation 100kHz Span

Fri 26/Jul/2002 09:53:46

1

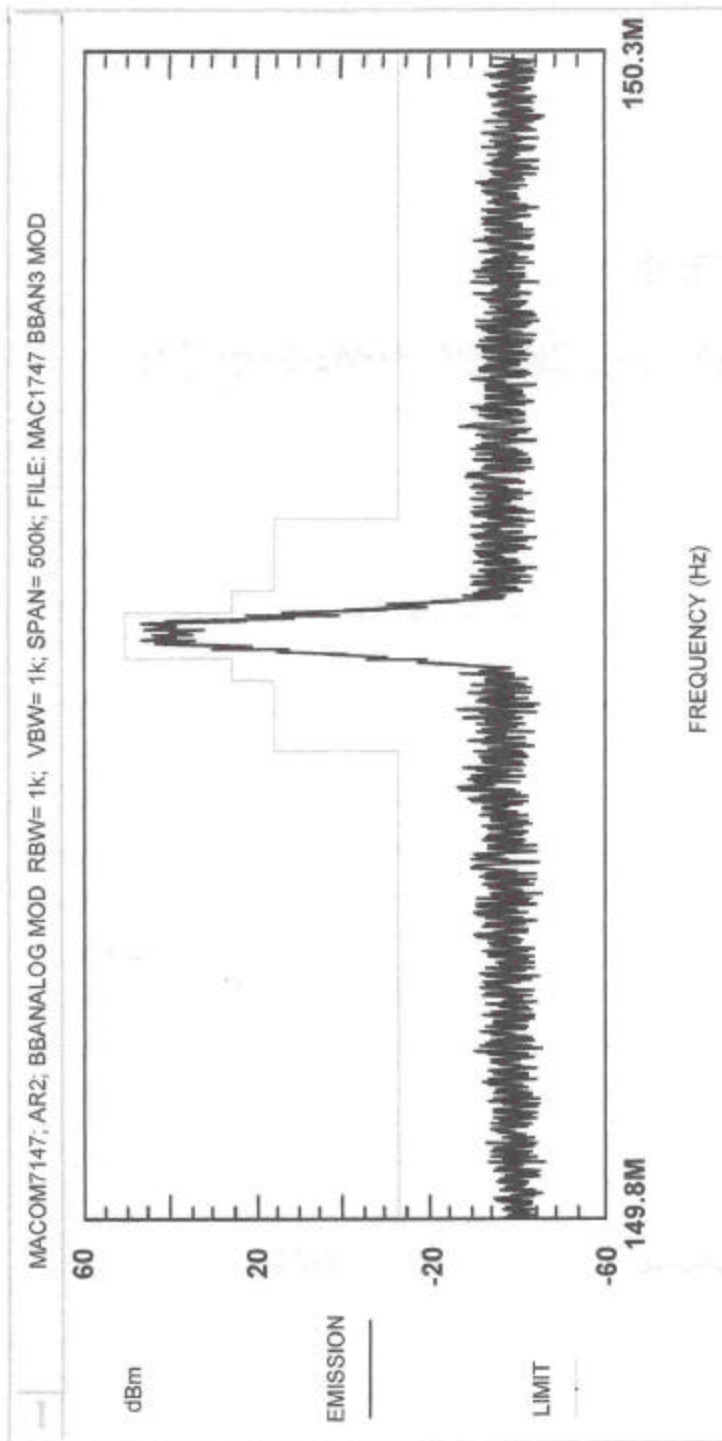


Figure 14. Emission Mask Broadband: Analog Modulation 500kHz Span

Fri 26/Jul/2002 10:04:31

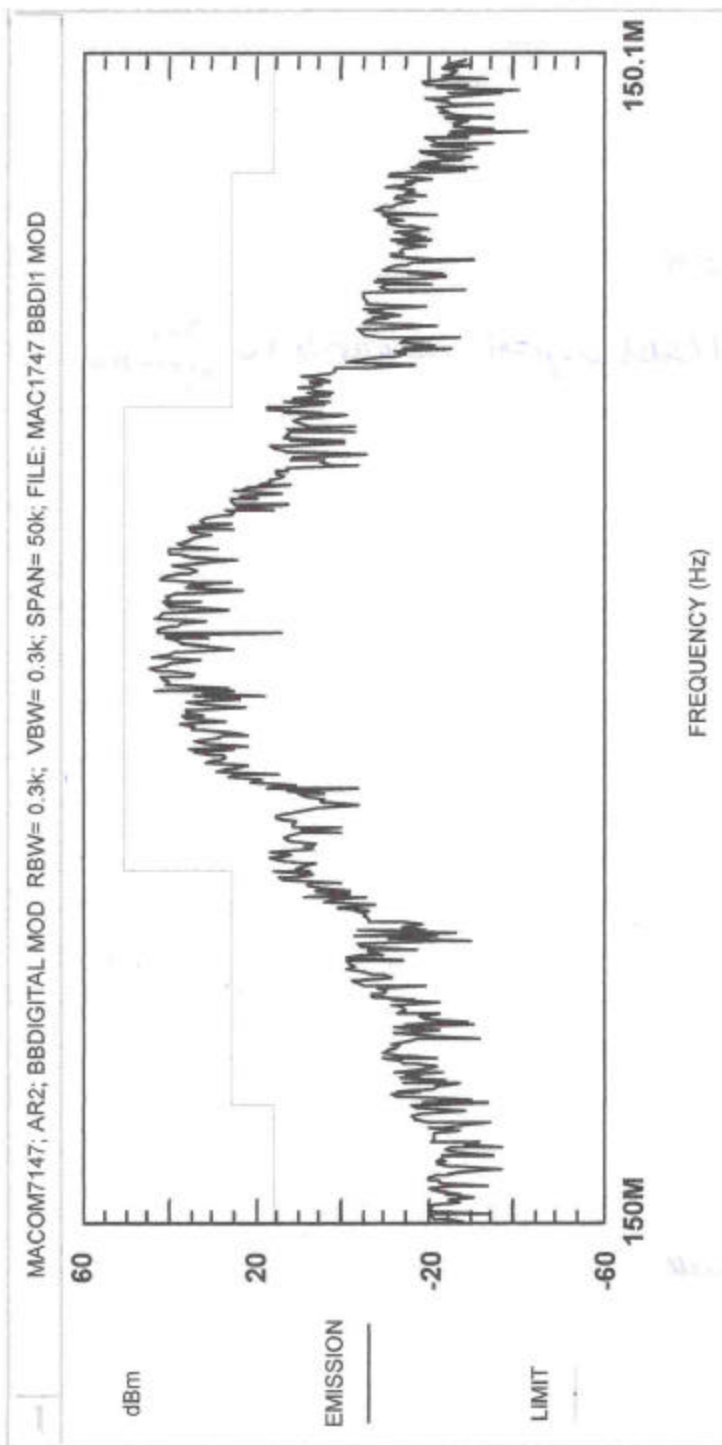


Figure 15. Emission Mask Broadband: Digital Modulation 50kHz Span

Fri 26/Jul/2002 10:00:51

1

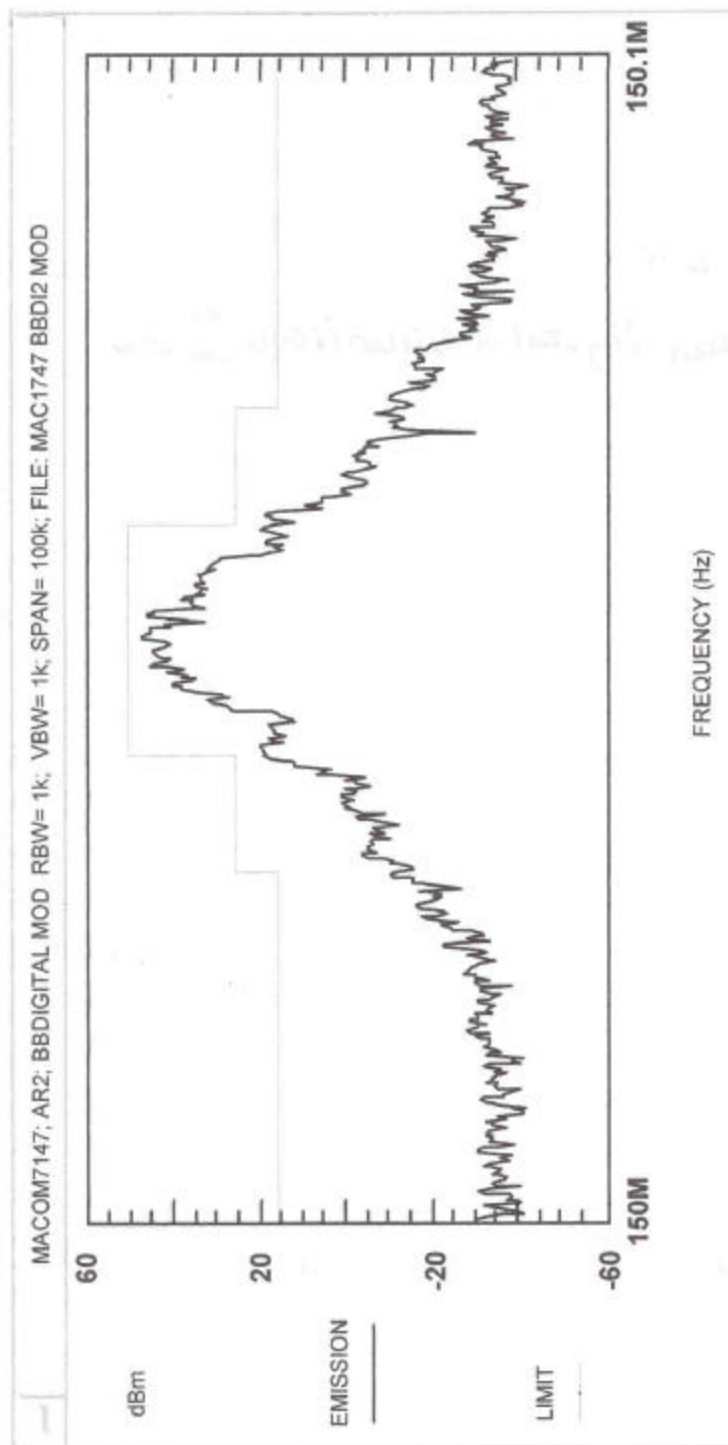


Figure 16. Emission Mask Broadband: Digital Modulation 100kHz Span

Fri 26/Jul/2002 09:58:58

1

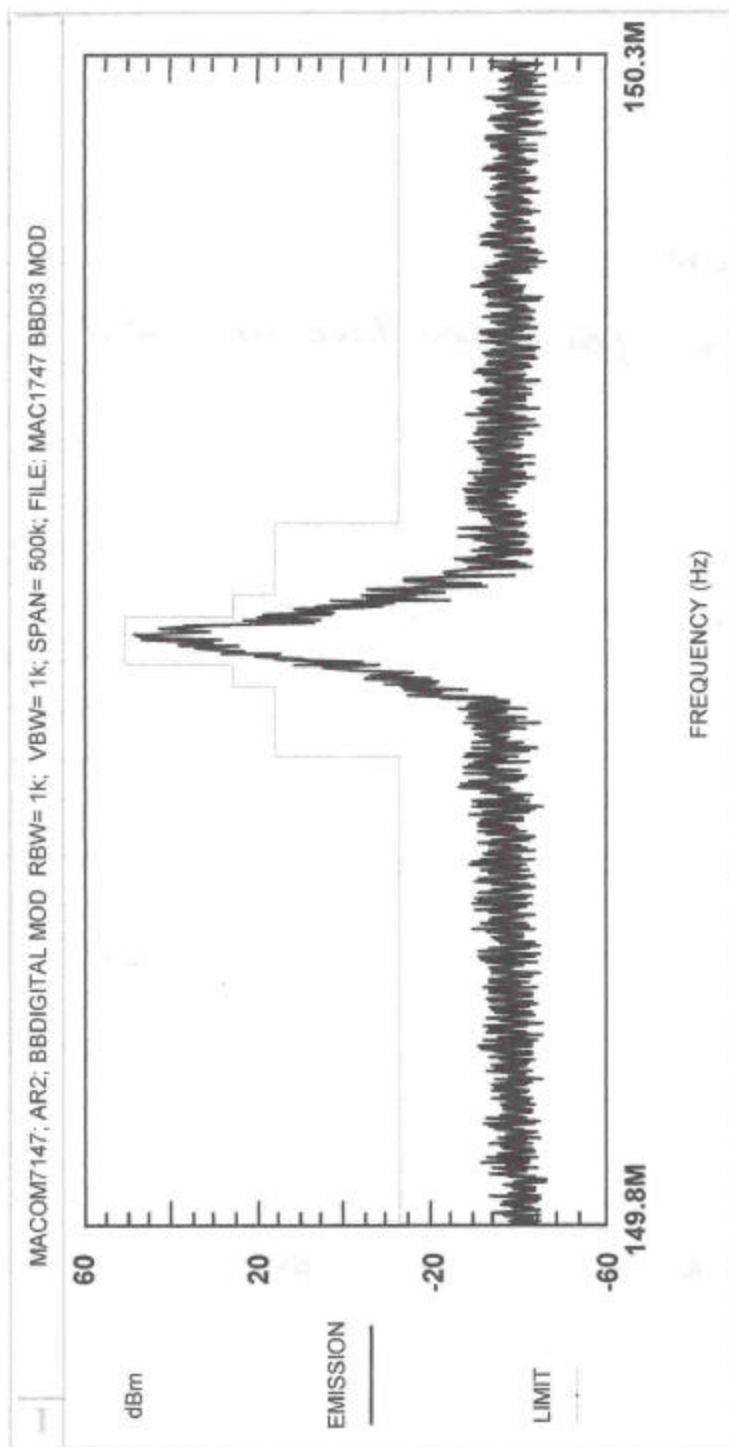


Figure 17. Emission Mask Broadband: Digital Modulation 500kHz Span

Exhibit 3.Out of Band Emissions Plots

Note: The emissions plots are taken with the Narrowband and Broadband emissions mask plotted as the limit.

Fri 26/Jul/2002 10:52:25

1

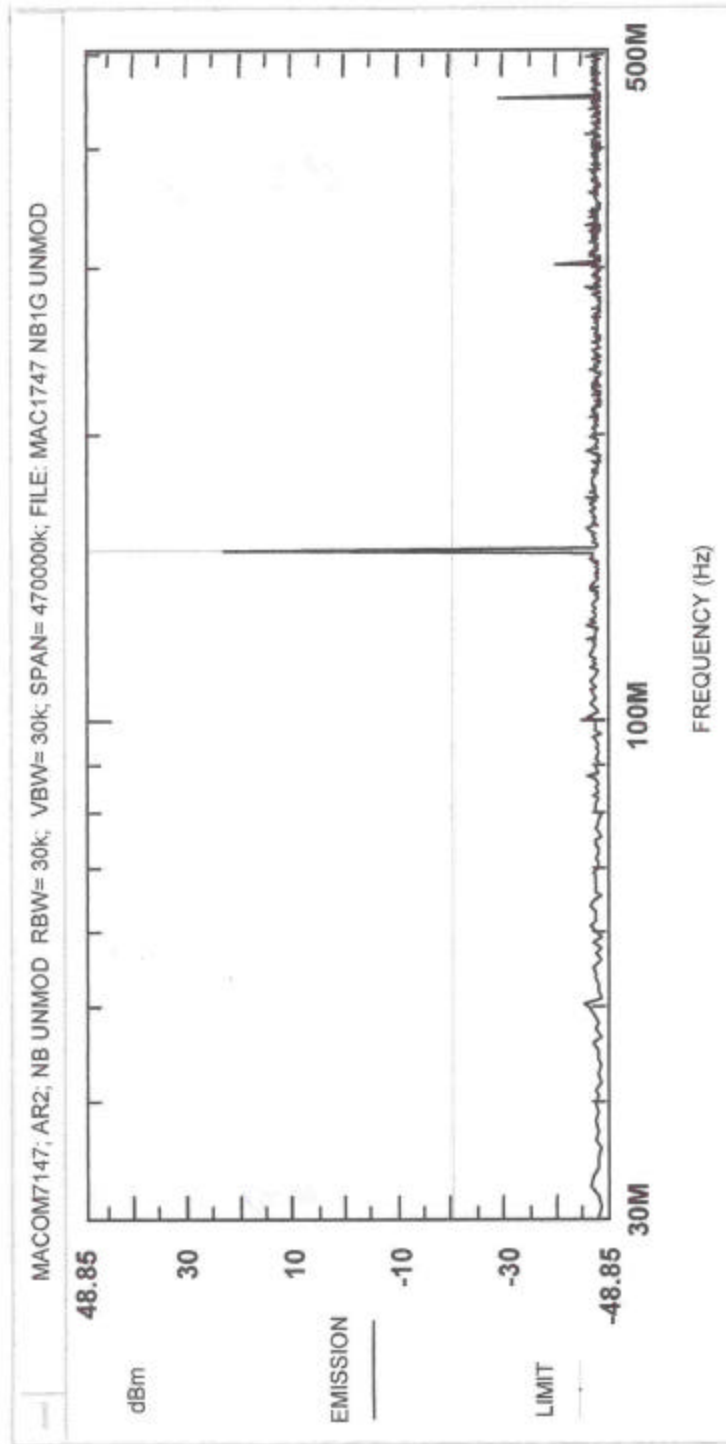


Figure 18. Spurious Emissions Narrowband Limit 30 MHz-500MHz

Fri 26/Jul/2002 10:46:48

1

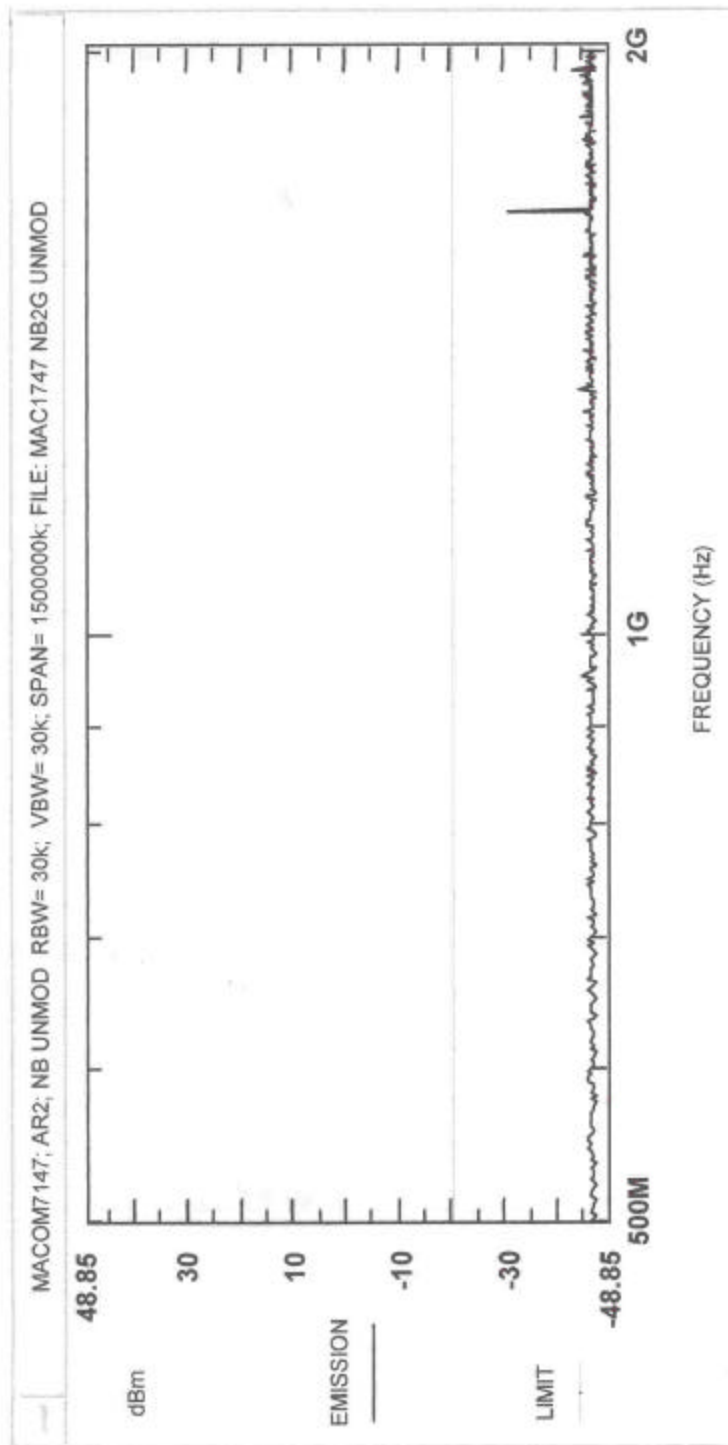


Figure 19. Spurious Emissions Narrowband Limit 30 MHz-500MHz

Fri 26/Jul/2002 10:53:54

1

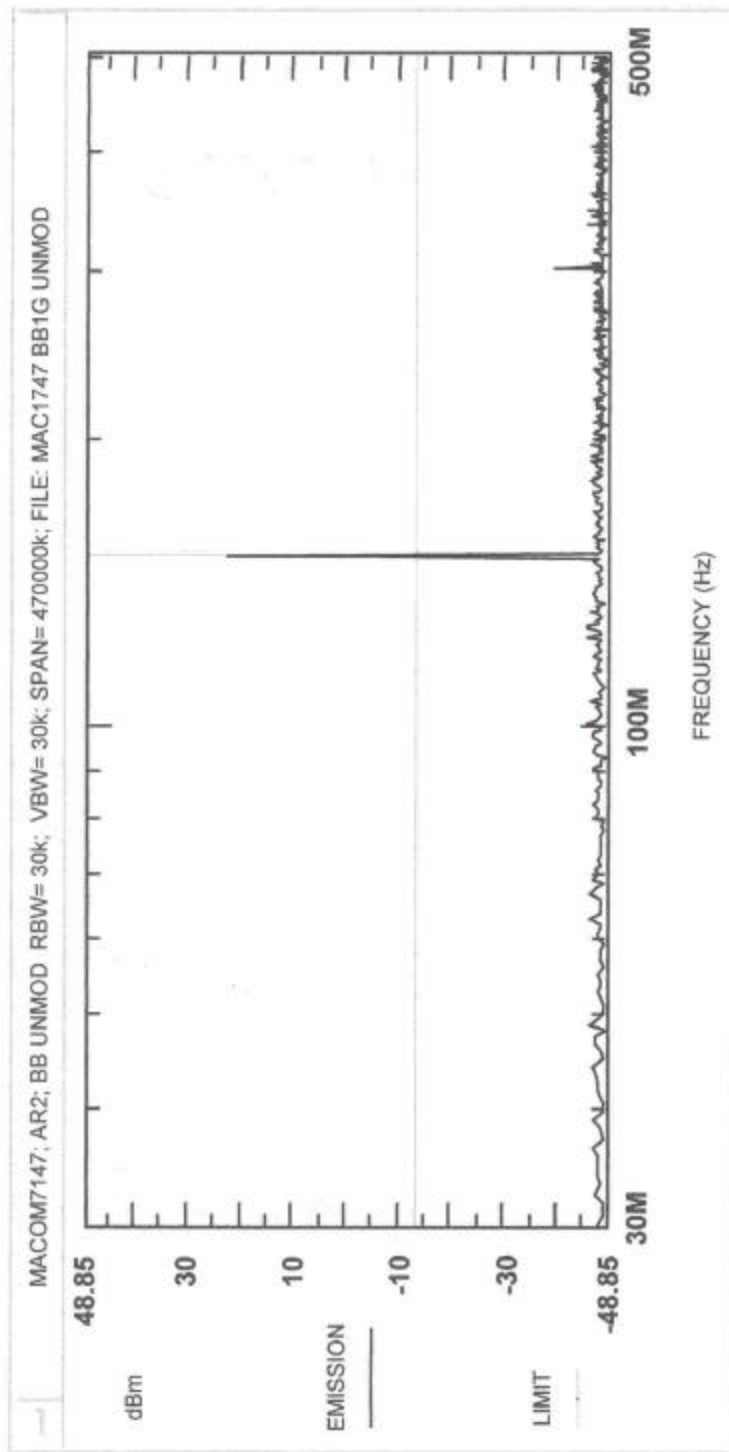


Figure 20. Spurious Emissions Broadband Limit 30 MHz-500MHz

Fri 26/Jul/2002 10:44:23

1

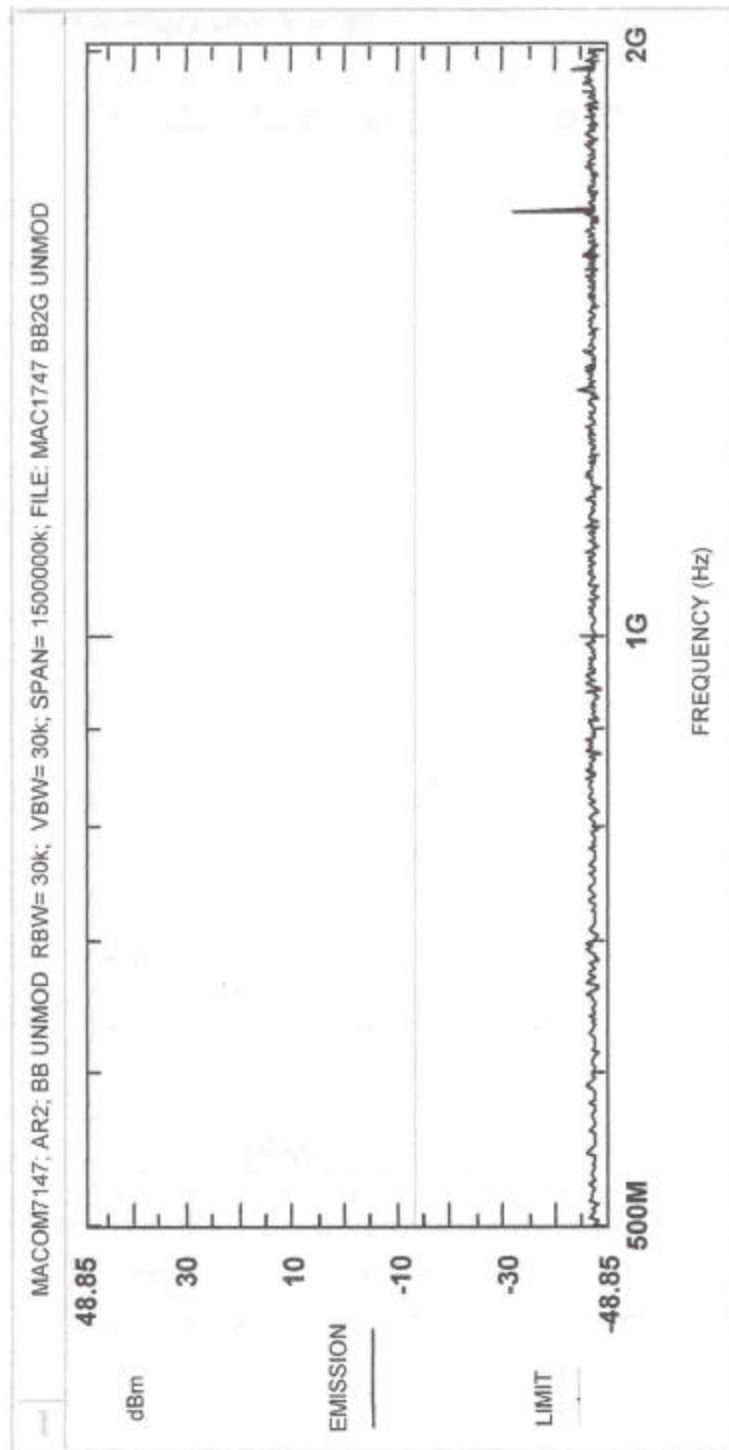


Figure 21. Spurious Emissions Broadband Limit 30 MHz-500MHz

Exhibit 4. MPE Calculation

```
STUDENT >
STUDENT > evalf( ( ( ( 1000 1.64 ) ( 1/2 ) ) , 15 )
               ( .001 4 π 851 / 1500 ) )
cm assuming a maximum 1000 Watts ERP per 90.635 479.620614869999

STUDENT > evalf( ( ( ( 1000 1.64 ) ( 1/2 ) ) )
               ( .001 4 π 851 / 1500 ) )
               2.54 , 15 )
inches assuming a maximum 1000 Watts ERP per 90.635 188.827013707022
STUDENT > 188.827013707022
               12
feet assuming a maximum 1000 Watts ERP per 90.635 15.73558447
STUDENT >
```

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

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