



TEST SPECIFICATION:

FCC "Rules and Regulations", Part 74,
Experimental Radio, Auxiliary, Special Broadcast and Other Program
Distribution Services for Operation in the

614 to 806 MHz Band

Subpart H, Low Power Auxiliary Stations
Sections 74.801 to 74.882

THE FOLLOWING **MEETS** THE ABOVE TEST SPECIFICATION

Formal Name: Wireless Personal Monitor System

Kind of Equipment: FM Transmitter

Test Configuration: Modulated 16 dB>50%

Emission Designator: 120KF3E

Transmitter FCC ID: DD4P4T

Model Number: P4T

Serial Number: NA

Dates of Test: September 23 & 24, 1999

Test Conducted For: Shure, Inc.

222 Hartrey Avenue

Evanston, Illinois 60202

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SIGNATURE PAGE

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Brian J. Mattson
General Manager

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Shure, Inc.

United States Department of Commerce
National Institute of Standards and Technology

NVLAP[®]
Certificate of Accreditation

ISO/IEC GUIDE 25:1990
ISO 9002:1987



D.L.S. ELECTRONIC SYSTEMS, INC.
WHEELING, IL

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**ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS
FCC**

September 30, 1999

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For the National Institute of Standards and Technology

NVLAP Lab Code: 100276-0

NVLAP-01C (11-95)

National Institute
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ISO/IEC GUIDE 25:1990
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Scope of Accreditation



Page: 1 of 1

**ELECTROMAGNETIC COMPATIBILITY
AND TELECOMMUNICATIONS**

NVLAP LAB CODE 100276-0

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NVLAP Code Designation / Description

International Special Committee on Radio Interference (CISPR) Methods

12/CIS22 IEC/CISPR 22:1993: Limits and methods of measurement of radio disturbance characteristics of information technology equipment

Federal Communications Commission (FCC) Methods

12/F01 FCC Method - 47 CFR Part 15 - Digital Devices

12/F01a Conducted Emissions, Power Lines, 450 KHz to 30 MHz

12/F01b Radiated Emissions

Australian Standards referred to by clauses in AUSTEL Technical Standards

12/T51 AS/NZS 3548: Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment

September 30, 1999

Effective through

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For the National Institute of Standards and Technology



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1.0 SUMMARY OF TEST REPORT

It was found that the Wireless Personal Monitor System S/N NA **meets** the radio interference emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Sections 74.801 to 74.882 for Low Power Auxiliary Stations operating in the 720 to 806 MHz Frequency Band.

2.0 INTRODUCTION

On September 23 & 24, 1999, a series of radio frequency interference measurements were performed on FM Transmitter, S/N NA. The tests were performed according to the procedures of FCC as stated in Part 2 Subpart J, Equipment Authorization Procedures of the Code of Federal Regulations 47, by personnel of D.L.S. Electronic Systems, Inc. who are responsible to Donald L. Sweeney, Senior EMC Engineer.

3.0 OBJECT

The purpose of this series of tests was to determine if the test sample could meet the radio frequency emission requirements of the FCC "Rules and Regulations", Part 74, Subpart H, Sections 74.801 to 74.882 for Low Power Auxiliary Stations operating in the 720 to 806 MHz Frequency Band.

4.0 TEST SET-UP

All radiated emission tests were performed at D.L.S. Electronic Systems, Inc. The radiated tests were made with the test item placed on a wooden turntable located in the Test Room with the receive antenna placed one meter from the device under test.



5.0 TEST EQUIPMENT (Bandwidths and Detector Function)

All data was automatically plotted using peak detector function. This information was then used to determine the frequencies of maximum emissions. Manual measurements were performed on these frequencies using a peak detector function of the Analyzer with the bandwidths specified by the FCC. From 200 MHz to 1000 MHz a bandwidth of 100 kHz was used (except for Occupied Bandwidth), and above 1000 MHz, wide enough bandwidths were used, depending upon the test being made, to ensure proper measurement of the narrowband signal. A list of the equipment used can be found in Table 1. All equipment was calibrated per the instruction manuals supplied by the manufacturer.

6.0 RF POWER OUTPUT - PART 2.1046

As stated in PART 74.861 (e-1), the output power should not exceed 250 milliwatts (24 dBm). The Wireless Personal Monitor System was tuned according to the tune-up procedures specified in Part 2.1033 (c-9), and adjusted for its maximum output power. The RF output power was measured in the open field, using the following test method:

The radiated signal from the EUT was measured. The EUT was then substituted with a signal generator and a tuned dipole antenna. The output of the signal generator was increased until the level received by the tuned dipole equaled that of the previous measured from the EUT.

Actual Measurements Taken:

85.6 dBuV Measured output of the transmitter
+38.5dBuV Total system losses (Antenna, Pads & Cable)
124.10 dBuV which equals 0.05 watts

LIMIT:

Manufacturer's rated output power = 0.05 watts

MARGIN:

0.25 watts - 0.05 watts = 0.20 watts

NOTE:

See the following pages for the graphs of the actual measurements made:



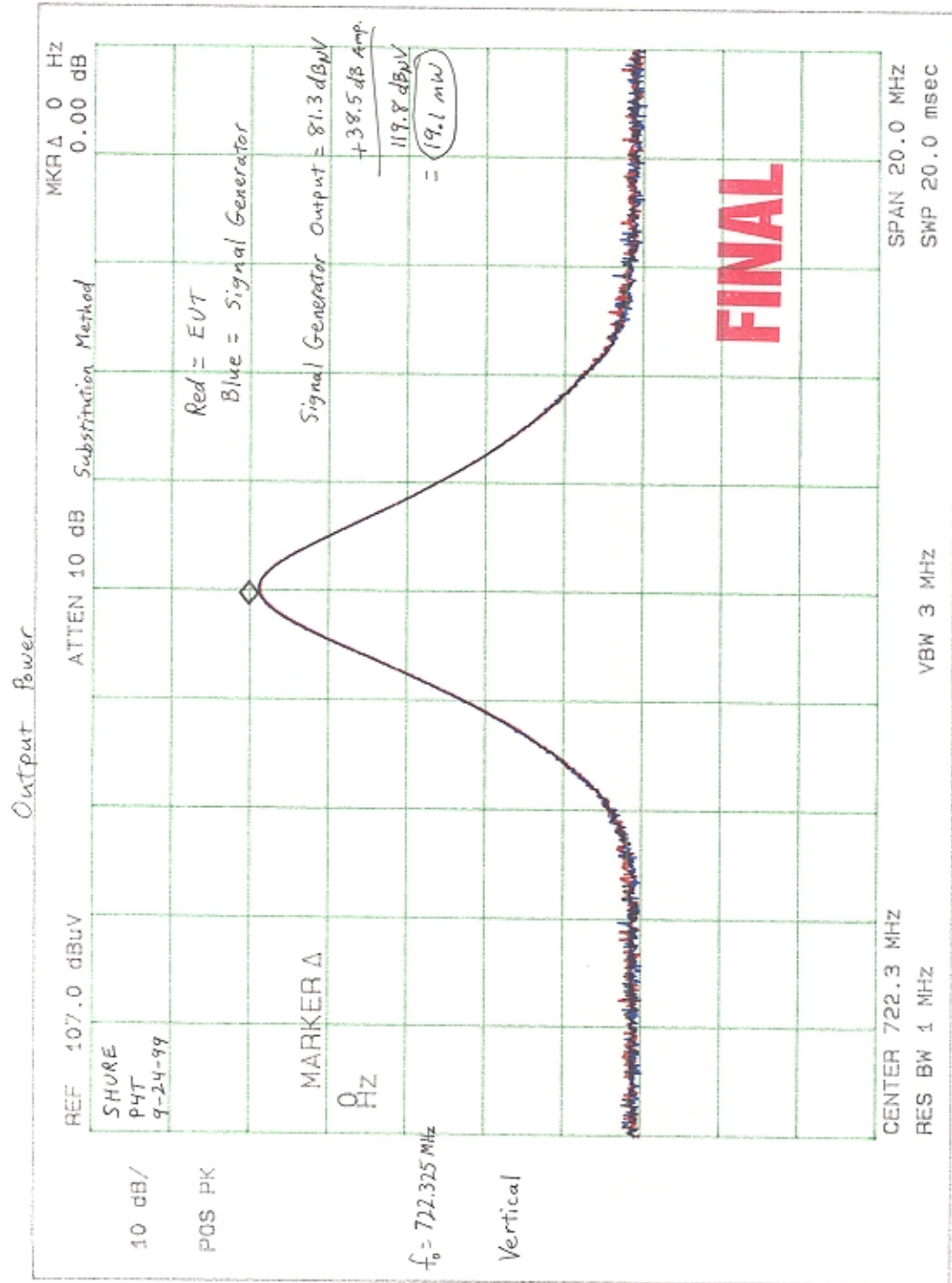
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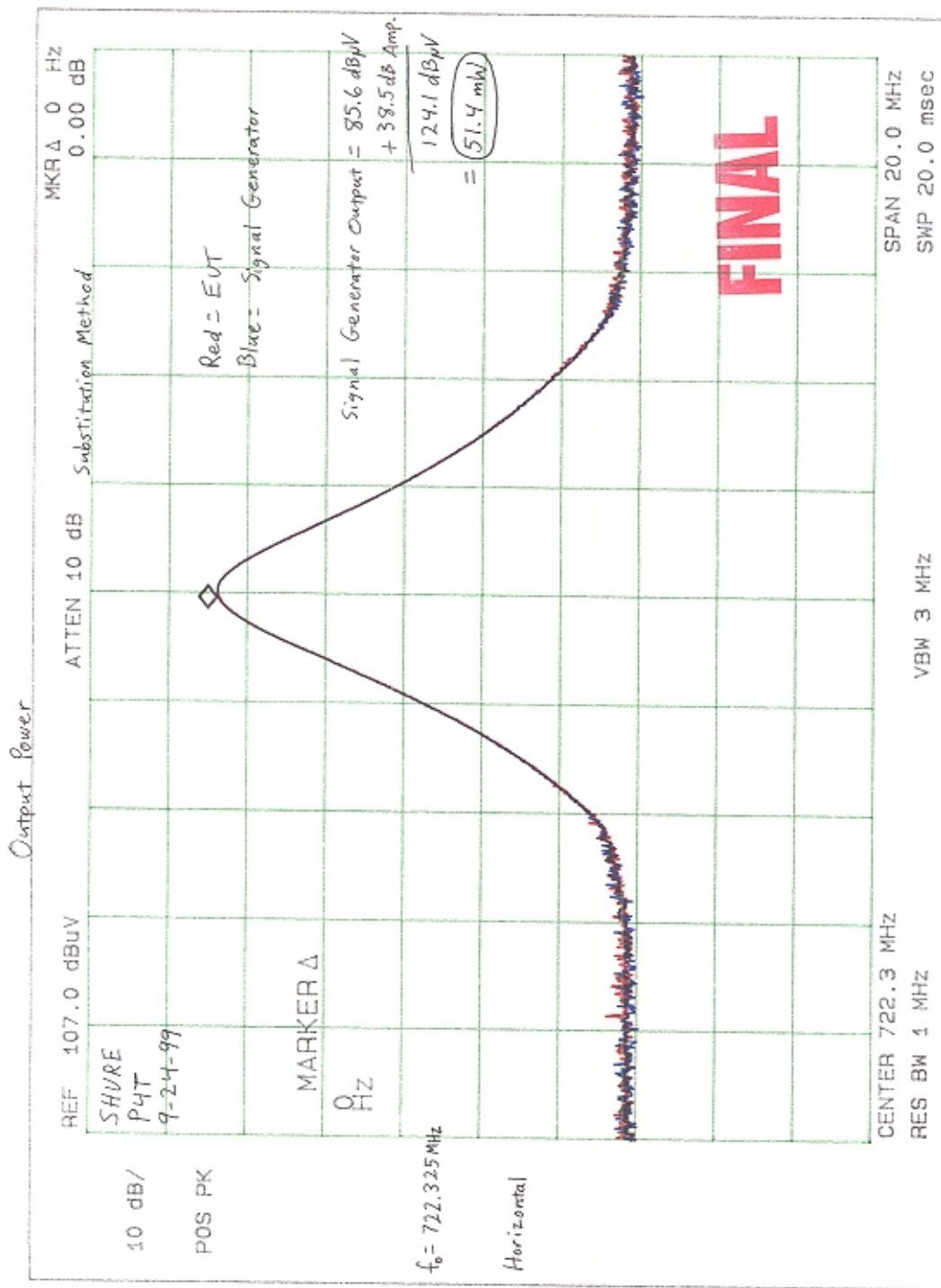
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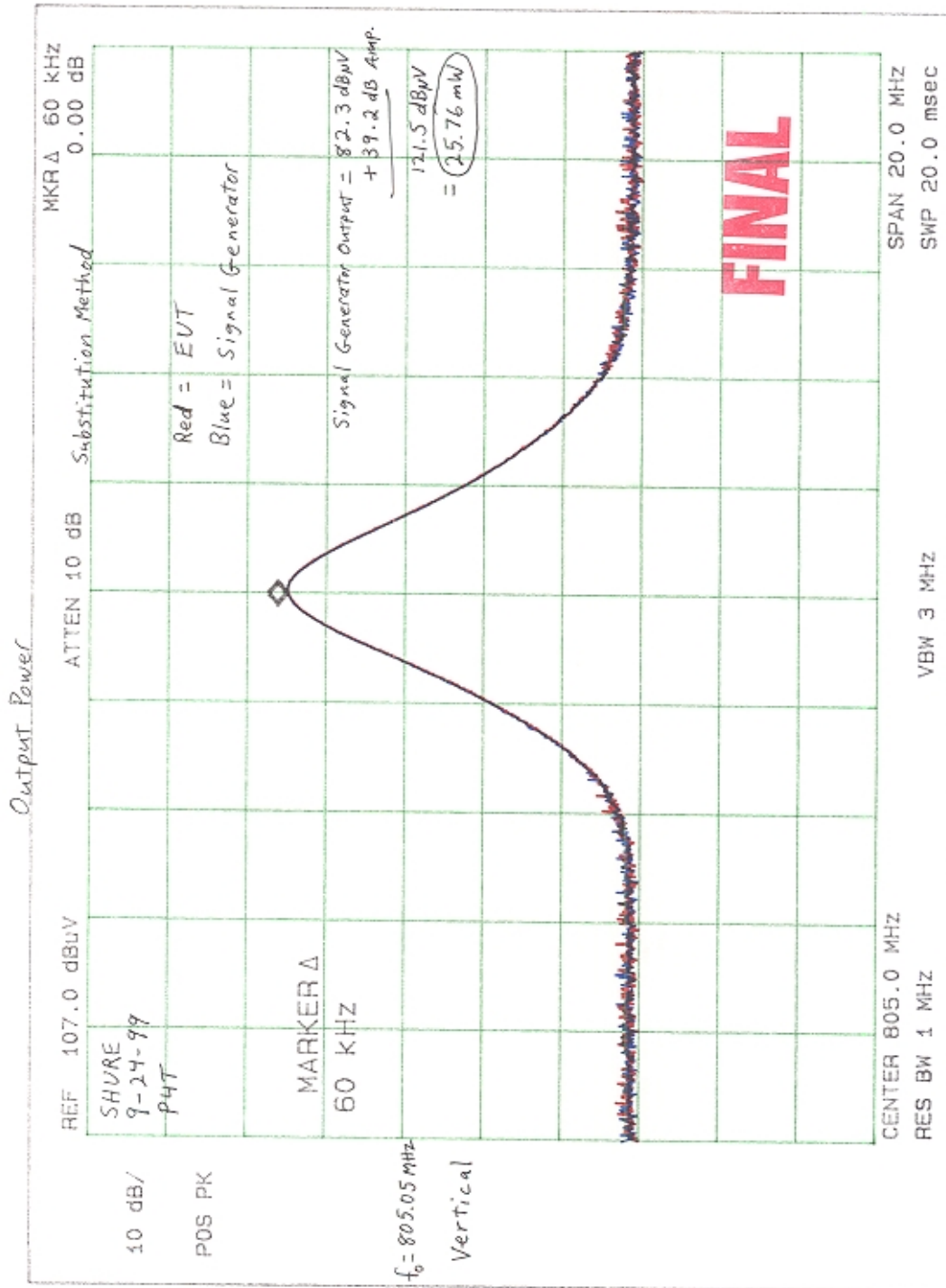
GRAPHS TAKEN OF THE RF POWER

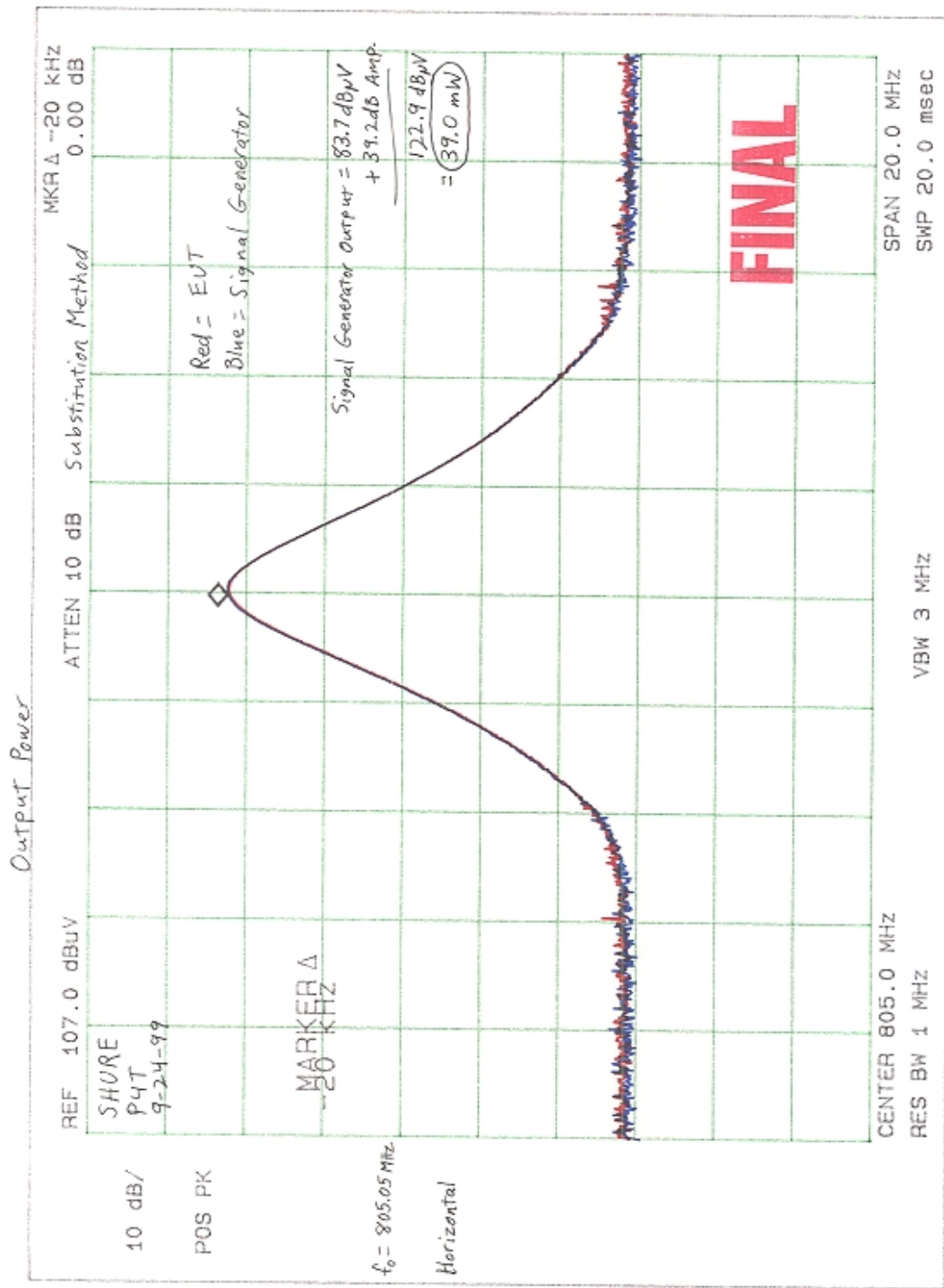
OUTPUT MEASUREMENTS

PART 2.1046











7.0 Modulation Characteristics - Part 2.1047

a. Voice modulated communication equipment

A curve showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz is submitted with this report.

b. Equipment which employs modulation limiting

A family of curves showing the percentage of modulation versus the modulation input voltage with sufficient information showing the modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

NOTE:

See the following pages for the graphs of the actual measurements made:



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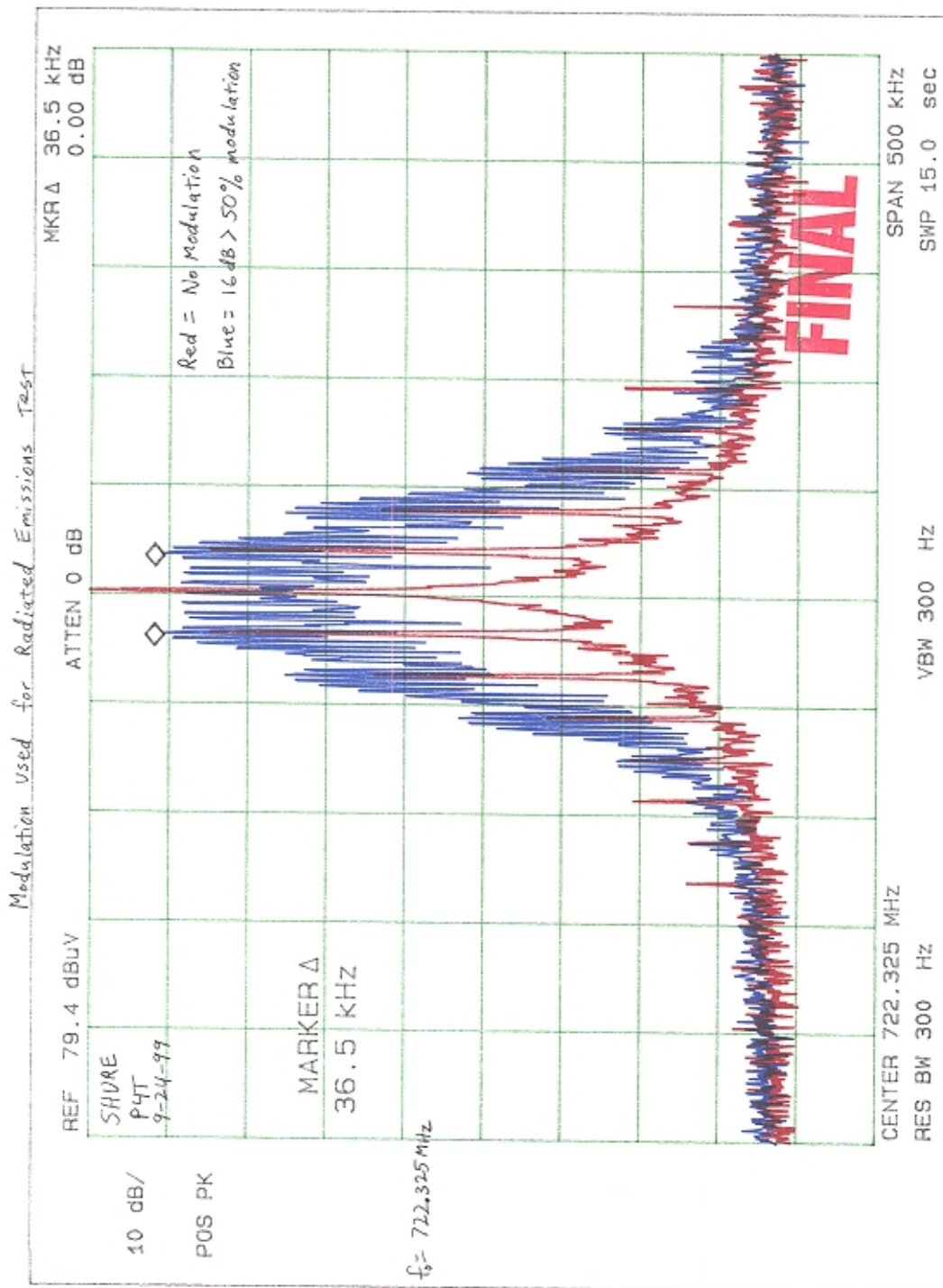
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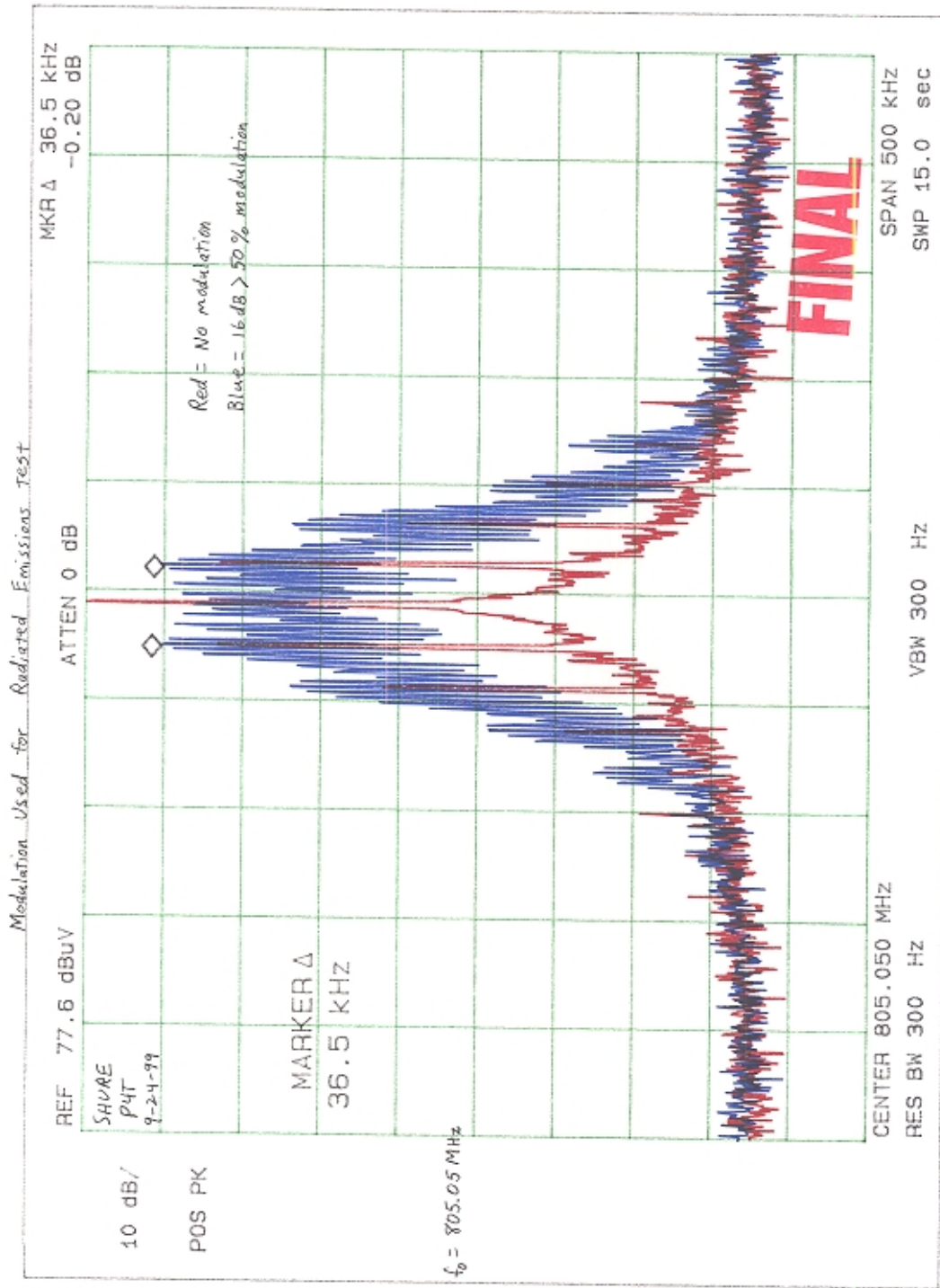
GRAPHS TAKEN SHOWING THE FREQUENCY

RESPONSE OF THE

AUDIO MODULATING CIRCUIT

PART 2.1047







8.0 OCCUPIED BANDWIDTH – PART 2.1049

The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to .5% of the total mean power radiated by a given emission.

As stated in Part 2.1049 c-1 the Wireless Personal Monitor System was modulated by a 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation. This input level was established at the frequency of maximum response of the audio modulating circuit.

The Wireless Personal Monitor System uses the same frequency range as television broadcast monaural transmitters so the test was also run using a 15 kHz input signal modulated by 85% as stated in Part 2.1049 e-6.

Paragraph e-5 states that the maximum authorized bandwidth shall be 200 kHz for all emissions inside these frequency bands.

Carson's Rule:

Section 2.202 (g)

$B_n = 2M_2DK, K=1$ $B_n =$ Bandwidth

$M = 15 \text{ kHz},$ $M =$ Maximum Modulating Frequency

$D = 45 \text{ kHz},$ $D =$ Peak Deviation

$B_n = 2(15) + 2(45)(1) = 120 \text{ kHz}$

NOTE:

The Occupied Bandwidth data measurements were not made at DLS.



GRAPHS TAKEN OF THE OCCUPIED BANDWIDTH

PART 2.1049

NOTE:

Charts showing the Occupied Bandwidth measurements were not made at DLS.



9.0 Frequency Deviation and Tolerance - PART 74.861

Paragraph e-3 states that the maximum authorized deviation shall be 75 kHz for all frequency modulation emissions in the frequency bands 720 to 806 MHz.

Frequency Deviation used:

Paragraph e-4 states that the frequency tolerance of the transmitter shall be .005 percent.

NOTE:

The Frequency Deviation data measurements were not made at DLS.



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GRAPHS TAKEN OF THE FREQUENCY DEVIATION

WITH MODULATION

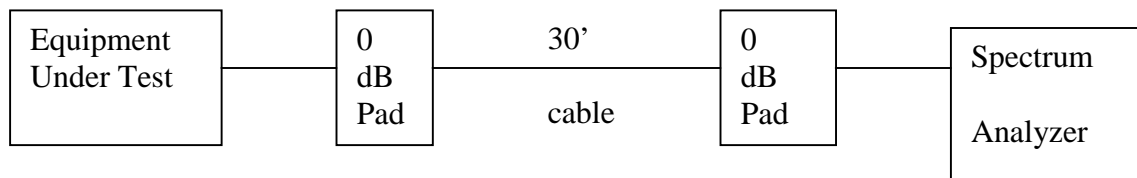
PART 2.1049

NOTE:

The Frequency Deviation Charts were not made at DLS.

10.0 SPURIOUS CONDUCTED EMISSION MEASUREMENTS AT ANTENNA TERMINALS PART 2.1051

Spurious conducted emissions were measured at the antenna terminals using an artificial load. Plots were made showing the amplitude of each harmonic emission with the equipment operated as specified in 2.1049. As shown by the radiated charts there was no reason to believe that there were any spurious emissions other than the harmonics that were than individually investigated when doing the conducted test at the antenna terminals. Measurements were made up to the 10th Harmonic of the fundamental. The following setup was used showing placement of the attenuators:



The allowed emissions for transmitters operating in the 720 to 806 MHz bands for Wireless Personal Monitor System equipment are found under Part 74, Section 74.861, Paragraph e-6 for Low Power Auxiliary Stations. This paragraph states the mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (1) On any frequency removed from the operating frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB.
- (2) On any frequency removed from the operating frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB.
- (3) On any frequency removed from the operating frequency by more than 250 percent of the authorized bandwidth: at least $43+10\text{Log}_{10}$ (mean output power in watts) dB.

NOTE: See the following pages for the data and graphs of the actual measurements made:

NOTE:

This test was not run because there is no antenna port.



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CONDUCTED EMISSION DATA TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 2.1051

NOTE:

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CONDUCTED EMISSION GRAPHS TAKEN FOR

SPURIOUS EMISSION MEASUREMENTS MADE

AT THE ANTENNA TERMINALS

PART 2.1051

NOTE:

This test was not run because there is no antenna port.