**NATIONAL CERTIFICATION LABORATORY**
**8370 Court Avenue, Suite B-1**
**Ellicott City MD 21043**
**(410) 461-5548**

# FCC REPORT OF CERTIFICATION

**for**

**Wildlife Technologies**
**22909-155th Ave. S.E.**
**Snowomish, WA 98290**

**FCC ID: NW6KAS-2000**

**November 2, 1998**

# TABLE OF CONTENTS



## TABLES



## EXHIBITS

## 1.0 Introduction

This report has been prepared on behalf of Wildlife Technologies to support the attached Application for Certification of a remote control transmitter, for use under FCC Part 95 Subpart B, as a Family Radio Service station. The Equipment Under Test was the Wildlife Technologies ***KAS-2000-RC Transmitter.***

Radio-Noise Emissions tests were performed according to Part 2, Subpart J and Part 95 Subpart E of the FCC Rules. The measuring equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

Testing was performed at National Certification Laboratory in Ellicott City, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch. FCC acceptance was granted on May 26, 1993.

## 1.1 Summary

The Wildlife Technologies ***KAS-2000-RC Transmitter*** complies with the technical standards for transmitters operating under FCC Rules Part 95 as a Family Radio Service station.

## 2.0 Description of Equipment Under Test (EUT)

The EUT Features:

462.5625-467.7125 MHz Operation

250 Milliwatts RF Power

FM Modulation

12.5 KHz Channel Spacing

+/- 2.5 kHz Freq. Deviation

9 DTMF Modulation Control Signals

4.5 VDC Battery Operation

## 3.0 Test Program

Testing was performed on the EUT to demonstrate performance to the following FCC Rule Parts:

| | | |
|---|---|---|
| 2.985(a) | ---------- | Power Rating |
| 2.995(a)/(d) | --------- | Frequency Tolerance |
| 2.989(c) | ---------- | Occupied Bandwidth |
| 2.991 | ---------- | Radiated Spurious Emissions |
| 2.987(a)/(b) | --------- | Modulation Characteristics |

The KAS-2000-RC Transmitter is essentially a Midland Model 75-501 FRS 2-Way Radio. This transceiver is FCC Certified under FCCID: MMA75501.

Wildlife Technologies has taken this Midland radio, removed the plastic housing, and installed it in a new housing along with a DTMF tone board with power switch. The output of the tone board is connected to the existing microphone input jack of the Midland radio. Additionally, two power leads are soldered to the plus and minus points of the Midland radio and connected to a battery pack which also powers the DTMF tone board. The DTMF tones are used to trigger communication request indicator lights for use in RF noisy environments. The receiver will be an unmodified Midland radio, with a relay device connected to the existing speaker output jack.

Since no real modifications were made to the radio, and certainly none to the RF generating and output circuitry, most of the original tests were not repeated by National Certification Laboratory. However, it was decided that a occupied bandwidth plot would be in order to demonstrate compliance with the DTMF modulation tone. All other tests are represented from a copy of the original Hyak Lab report used to certify the Midland radio.

The following Section 4.0 of this report provides Testing Configurations and Data.

C. RF Power Output (Paragraph 2.985(a) of the Rules)

The 75-501 has a permanently attached built-in antenna without provisions for a coaxial connector.

Therefore RF power output was measured using the procedures of TIA/EIA-603 Para. 2.2.17. (The transmitter was tuned by the factory according to the procedure of Exhibit 4.)

TABLE 1

| Operating Freq., MHz | Power watts into a dipole antenna |
|---|---|
| 462.5625 | 0.269 |

D. MODULATION CHARACTERISTICS

1. A curve showing frequency response of the transmitter is shown in Figure 1. Reference level was audio signal output from a Boonton 8220 modulation meter with one kHz deviation. Audio output was measured with a Audio Precision System One integrated test system.

2. Modulation limiting curves are shown in Figure 2, using a Boonton 8220 modulation meter. Signal level was established with a Audio Precision System One integrated test system. The curves show compliance with paragraphs 2.987(b).

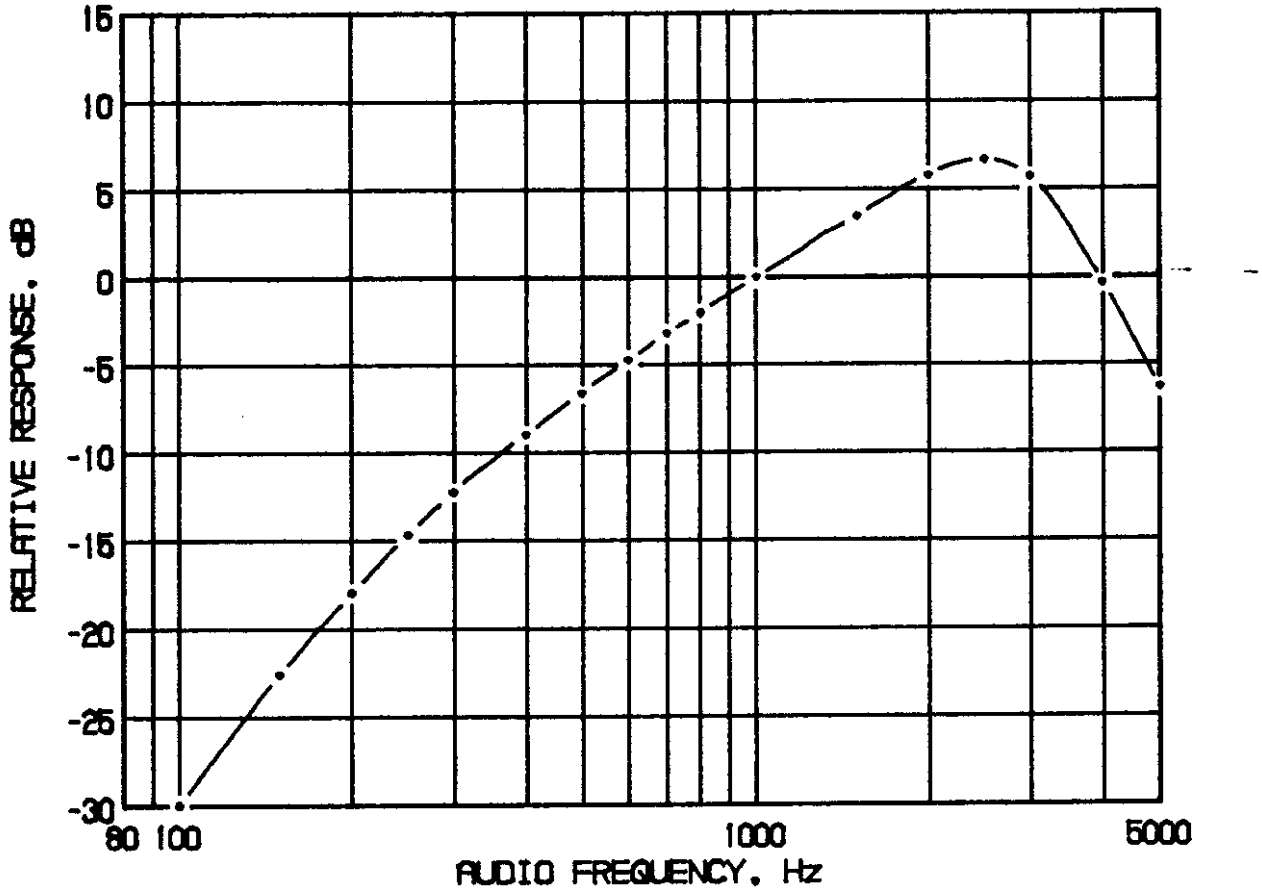
3. Figure 3 is a graph of the post-limiter low pass filter which provides a roll-off of 60Logf/3 dB where f is audio frequency in kHz. Measurements were made following EIA RS-152B with an Audio Precision System One integrated test system on the Boonton 8220 modulation meter audio output.

4. Occupied Bandwidth
(Paragraphs 2.989(c) of the Rules)

Figure 4 is a plot of the sideband envelope of the transmitter output taken with a Tektronix 494P spectrum analyzer. Modulation corresponded to conditions of 2.989(c)(1) and consisted of 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50% modulation at 2669 Hz, the frequency of maximum response. Measured modulation under these conditions was 2.3 kHz.

FIGURE 1

MODULATION FREQUENCY RESPONSE

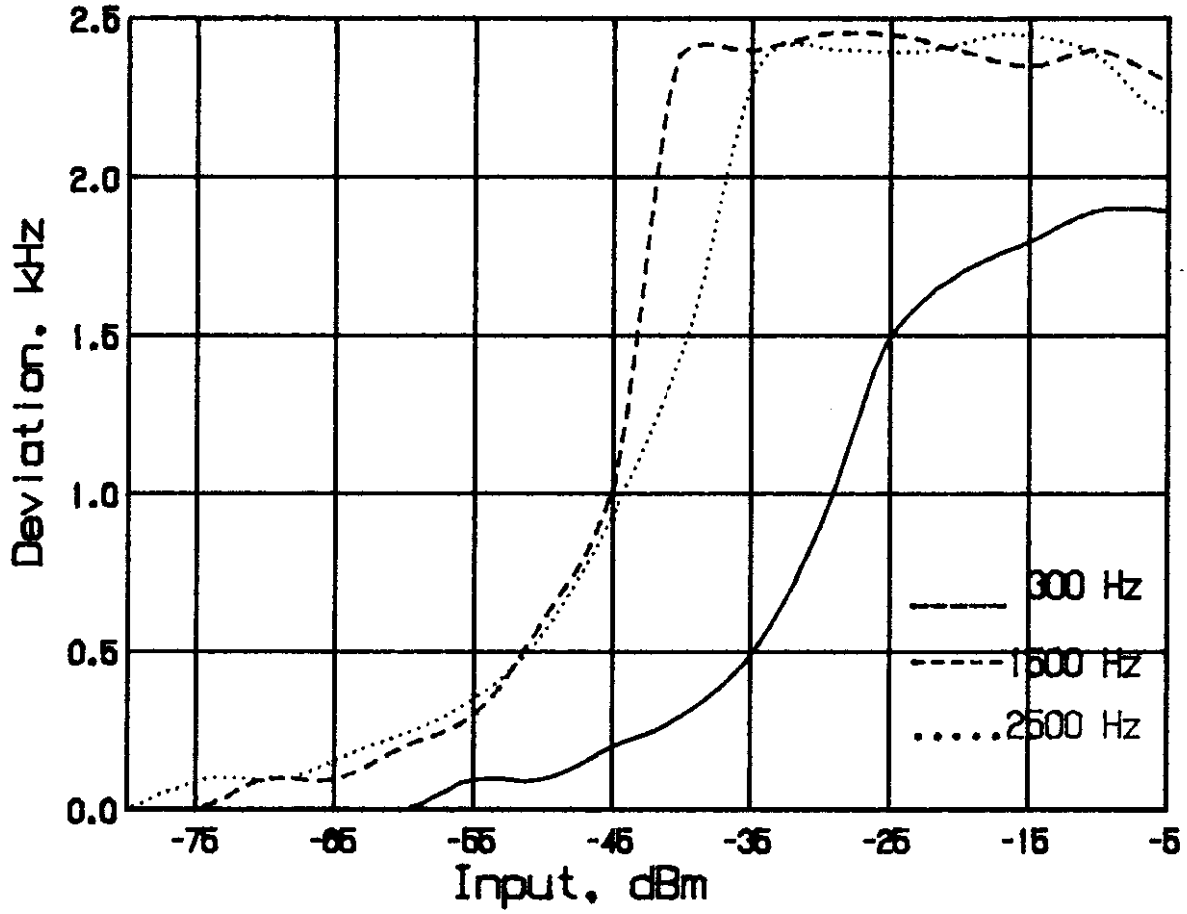



MODULATION FREQUENCY RESPONSE
FCC ID: MMA75501

FIGURE 1

FIGURE 2

AUDIO LIMITER CHARACTERISTICS

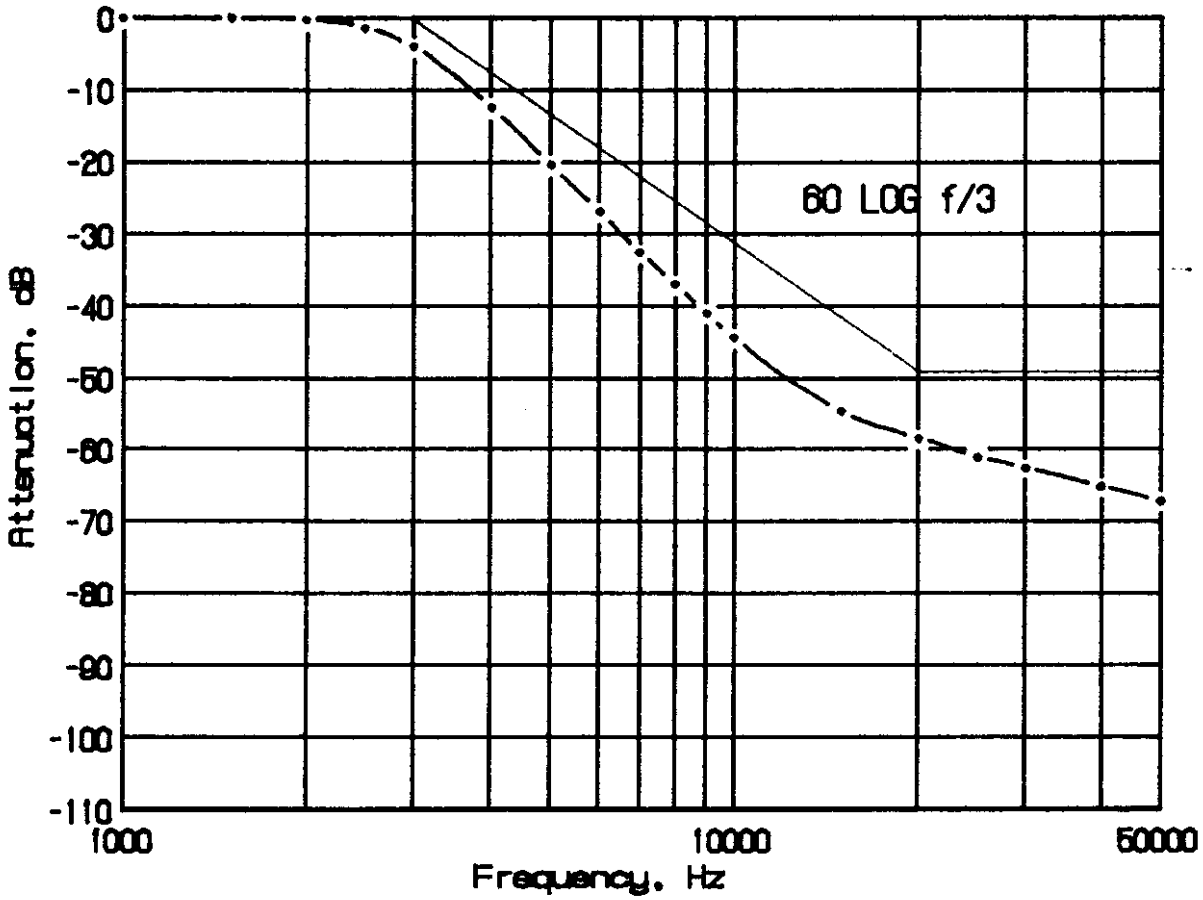



AUDIO LIMITER CHARACTERISTICS
FCC ID: MMA75501

FIGURE 2

FIGURE 3

AUDIO LOW PASS FILTER RESPONSE

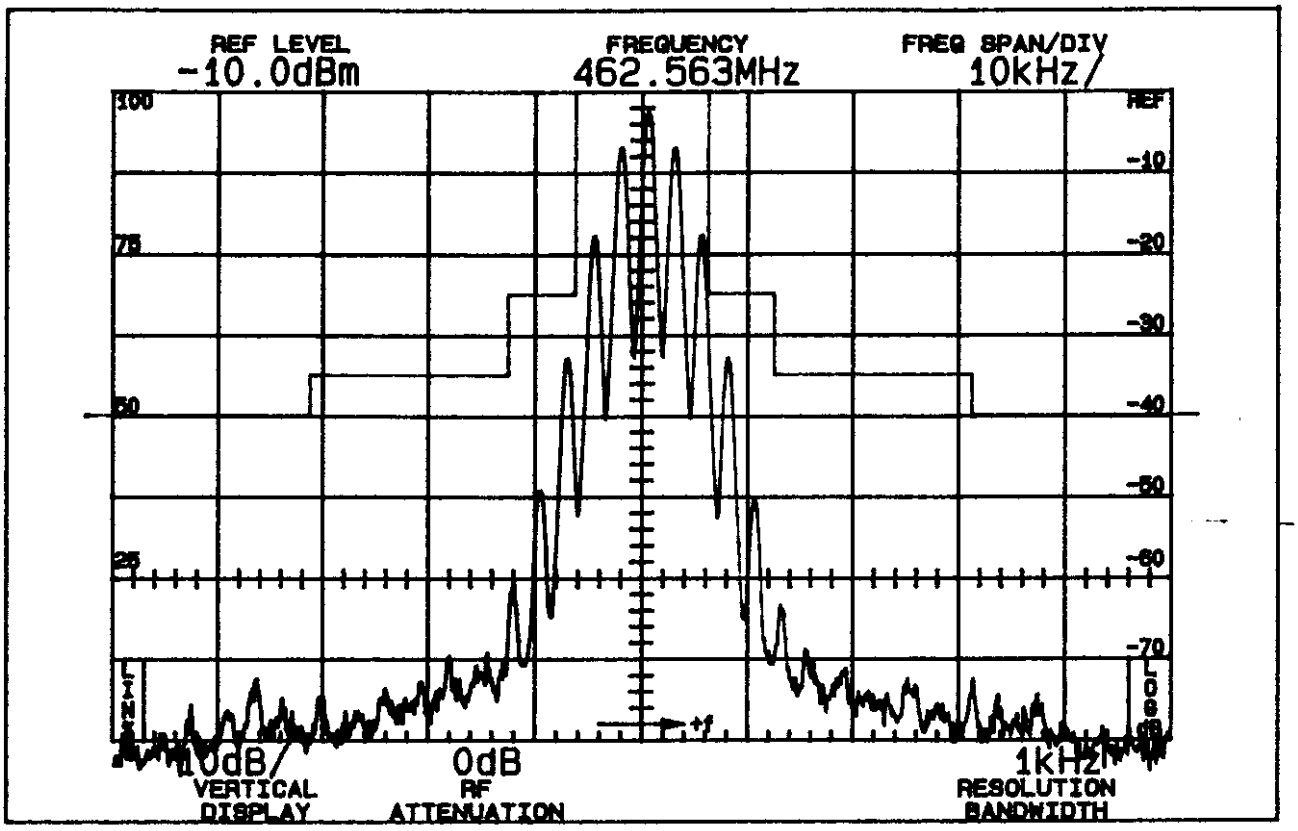



AUDIO LOW PASS FILTER
RESPONSE
FCC ID: MMA75501

FIGURE 3

FIGURE 4

OCCUPIED BANDWIDTH



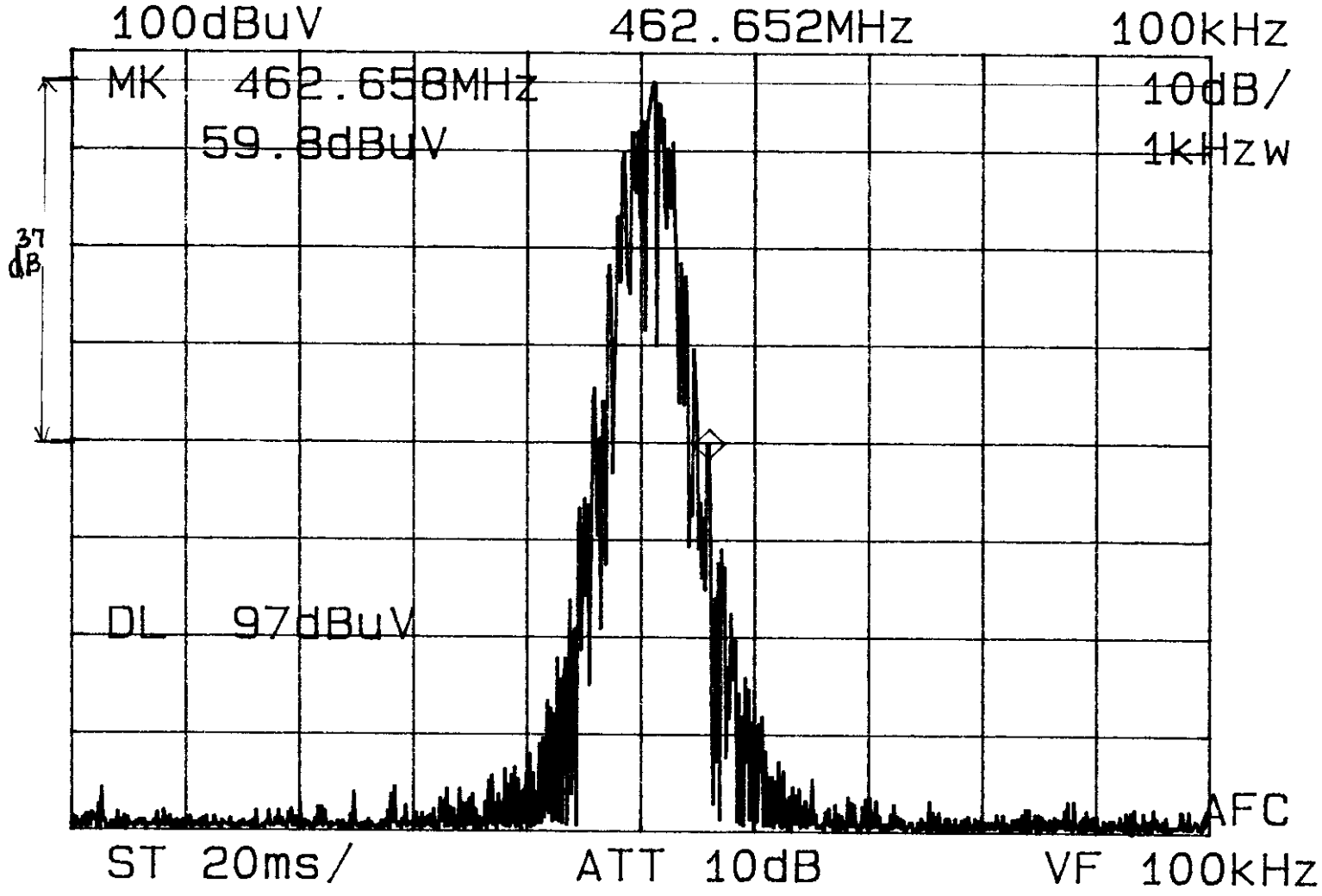

| | ATTENUATION IN dB BELOW MEAN OUTPUT POWER Required |
|---|---|
| On any frequency more than 50% up to and including 100% of the authorized bandwidth, 12.5 kHz (6.25-12.5 kHz) | 25 |
| On any frequency more than 100%, up to and including 250% of the authorized bandwidth (12.5-31.25 kHz) | 35 |
| On any frequency removed from the assigned frequency by more than 250% of the authorized bandwidth (over 31.25 kHz) | 43+10LogP = 37 (P = 0.269W) |

OCCUPIED BANDWIDTH
FCC ID: MMA75501

FIGURE 4

**OCCUPIED BANDWIDTH < 12 KHZ - MODULATED BY OUTPUT OF DTMF TONE GENERATOR**

**MODULATED** **100 KHZ SPAN** **1 KHZ RES. BW**



D. MODULATION CHARACTERISTICS (Continued)

The plots are within FCC limits. The horizontal scale (frequency) is 10 kHz per division and the vertical scale (amplitude) is a logarithmic presentation equal to 10 dB per division.

E. SPURIOUS EMISSIONS AT THE ANTENNA TERMINALS
(Paragraph 2.991 of the Rules)

The 75-501 has a permanently attached antenna. There is no connector for an external antenna. Therefore, no antenna terminal conducted measurements were made.

F. DESCRIPTION OF RADIATED SPURIOUS MEASUREMENT FACILITIES

A description of the Hyak Laboratories' radiation test facility is a matter of record with the FCC. The facility was accepted for radiation measurements from 25 to 1000 MHz on October 1, 1976 and is currently listed as an accepted site.

G. FIELD STRENGTH MEASUREMENTS OF SPURIOUS RADIATION

Field intensity measurements of radiated spurious emissions from the Midland 75-501 were made with a Tektronix 494P spectrum analyzer using Singer DM-105 for the measurements to 1 GHz, and EMCO 3115 horn to 4.8 GHz.

The transmitter was located in an open field 3 meters from the test antenna. Supply voltage was a power supply with a terminal voltage under load of 4.5 Vdc.

The transmitter and test antennae were arranged to maximize pickup. Both vertical and horizontal test antenna polarization were employed.

The measurement system was capable of detecting signals 100 dB or more below the reference level. Measurements were made from the lowest frequency generated within the unit (12 MHz), to 10 times operating frequency. Data after application of antenna factors and line loss corrections are shown in Table 3.

TABLE 3

TRANSMITTER CABINET RADIATED SPURIOUS

462.5625 MHz, 4.5 Vdc, 0.269 watts

| Emission Frequency MHz | Radiated Field uV/m @ 3M | dB Below Carrier Reference[1] |
|---|---|---|
| 462.563 | 1168153.7 | 0.0V |
| 925.126 | 4482.3 | 48 H |
| 1387.689 | 3072.6 | 51 H |
| 1850.252 | 520.0 | 67 V |
| 2312.814 | 2190.3 | 54 H |
| 2775.377 | 1700.2 | 56 V |
| 3237.940 | 1356.8 | 58 V |
| 3700.503 | 727.8 | 64 H |
| 4163.066 | 242.7 | 73 H |
| 4625.629 | 653.1 | 65 V |

Required: 43+10 Log(P) = 37

[1]Worst-case polarization, H-Horizontal, V-Vertical.

*Reference data only, more than 20 dB below FCC limit.

All other spurious from 12 MHz to the tenth harmonic were 20 dB or more below FCC limit.

H. FREQUENCY STABILITY
(Paragraph 2.995(a)(2))

Measurement of frequency stability versus temperature was made at temperatures from -30°C to +50°C. At each temperature, the unit was exposed to test chamber ambient a minimum of 60 minutes after indicated chamber temperature ambient had stabilized to within ±2° of the desired test temperature. Following the 1 hour soak at each temperature, the unit was turned on, keyed and frequency measured within 2 minutes. Test temperature was sequenced in the order shown in Table 4, starting with -30°C.

A Thermotron S1.2 temperature chamber was used. Temperature was monitored with a Keithley 871 digital thermometer. The transmitter output stage was terminated in a dummy load. Primary supply was 4.5 volts. Frequency was measured with a HP 5385A frequency counter connected to the transmitter through a power attenuator. Measurements were made at 462.5625 MHz. No transient keying effects were observed.

TABLE 4

FREQUENCY STABILITY AS A FUNCTION OF TEMPERATURE

462.5625 MHz, 4.5 Vdc, 0.269W

| Temperature, °C | Output Frequency, MHz | Error P.P.M. |
|---|---|---|
| -19.3 | 462.561958 | -1.2 |
| -10.0 | 462.563355 | 1.8 |
| - 0.1 | 462.563600 | 2.4 |
| 9.8 | 462.563574 | 2.3 |
| 19.9 | 462.562890 | 0.8 |
| 30.5 | 462.562063 | -0.9 |
| 40.3 | 462.561408 | -2.4 |
| 50.3 | 462.561350 | -2.5 |
| Maximum frequency error: | 462.562500 | |
| | 462.561350 | |
| | - .001150 MHz | |

FCC Rule 95.627(b) specifies .00025% (2.5 P.P.M.) or a maximum of ± 0.001156 MHz, which corresponds to:

| | |
|---|---|
| High Limit | 462.563656 MHz |
| Low Limit | 462.561344 MHz |

(Paragraph 2.995(d)(2) of the Rules)

Oscillator frequency as a function of power supply voltage was measured with a HP 5385A frequency counter as supply voltage provided by an HP 6264B variable dc power supply was varied from ±15% above the nominal 4.5 volt rating to below the battery end point. A Fluke 197 digital voltmeter was used to measure supply voltage at transmitter primary input terminals. Measurements were made at 20°C ambient.

TABLE 5

FREQUENCY STABILITY AS A FUNCTION OF SUPPLY VOLTAGE

462.5625 MHz, 4.5 Vdc Nominal; 0.269W

| Supply Voltage | | Output Frequency, MHz | Error P.P.M. |
|---|---|---|---|
| 5.17 | 115% | 462.562919 | 0.9 |
| 4.95 | 110% | 462.562896 | 0.9 |
| 4.73 | 105% | 462.562881 | 0.8 |
| 4.50 | 100% | 462.562890 | 0.8 |
| 4.28 | 95% | 462.562928 | 0.9 |
| 4.05 | 90% | 462.562993 | 1.1 |
| 3.83 | 85% | 462.563075 | 1.2 |
| 3.60 | 80% | 462.563172 | 1.5 |

Maximum frequency error: 462.563172
462.562500

\+ .000672 MHz

FCC Rule 95.627(b) specifies .00025% (2.5 P.P.M) or a maximum of ± 0.001169 MHz, corresponding to:

| | |
|---|---|
| High Limit | 462.563656 MHz |
| Low Limit | 462.561344 MHz |

*Battery end point.

## Table 1

### Measurement Equipment Used

The following equipment is used to perform measurements:

| EQUIPMENT | SERIAL NUMBER |
|---|---|
| Wavetek 2410A 1100 MHz Signal Generator | 1362016 |
| EMCO Model 3110 Biconical Antenna | 1619 |
| EMCO Model 3146 Log Periodic Antenna | 1222 |
| HP 8902A Modulation Analyzer | 10233-45 |
| Advantest Model R4131D Spectrum Analyzer | 54378A |
| EMCO Model 3115 Horn Antenna | |
| HP 8498A 20dB Attenuator | 924867 |
| Advantest TR4133B Spectrum Analyzer | 54432A |
| HP 3312A Function Generator | 72-4015 |

# EXHIBIT 1

# EUT PHOTGRAPHS