

## 2.5 Antenna Description

Antennas are 3<sup>rd</sup> party sourced.

Manufacturer: Centurioun

Type: Helical Wound Molded Rubber Flex

Model Number: LAA0870A (136-150 MHz)  
LAA0870B (150-162 MHz)  
LAA0870C (162-174 MHz)

Gain: Not specified by Relm Communications, Inc.

Connector: SMA

## **2.6 RF Power Output (FCC Section 2.1046)**

The EUT was directly connected to a spectrum analyzer with the input resistance set to 50Ω. An external 50 dB attenuation was used during the test. The measured results are shown in Table 3 and Figure 3.

### **FCC Minimum Standard**

#### FCC Part 22

<150 Watts

#### FCC Part 74.461

Power delivered to antenna must be < 100 Watts

#### FCC Part 80.215

Maximum power at the input terminal to the antenna is 50 Watts

#### FCC Part 90.205

Power dependent upon station's antenna HAAT and required service area and may be from 1 to 500 Watts.

**TABLE 3**  
**RF POWER OUTPUT**

**Test Date:** April 24, 2000  
**UST Project:** 00-0167  
**Customer:** RELM Communication, Inc.  
**Model:** Aurora (APV5240 & APV5016)

Frequency of Fundamental (MHz)	Measurement (Watt)*	FCC Limit (Watt)
136.3	4.8	Varies
155.5	5.2	Varies
173.8	4.9	Varies

Note: The power output may depend upon the intended use of the EUT. For all tests, the EUT was set to near maximum conditions. The EUT requires a FCC license and is programmed for use by local BK Radio Dealers.

**Test Results**  
**Reviewed By**  
**Signature:** \_\_\_\_\_

**Name:** Timothy R. Johnson

Figure 3a.  
RF Power Output (Low Channel)

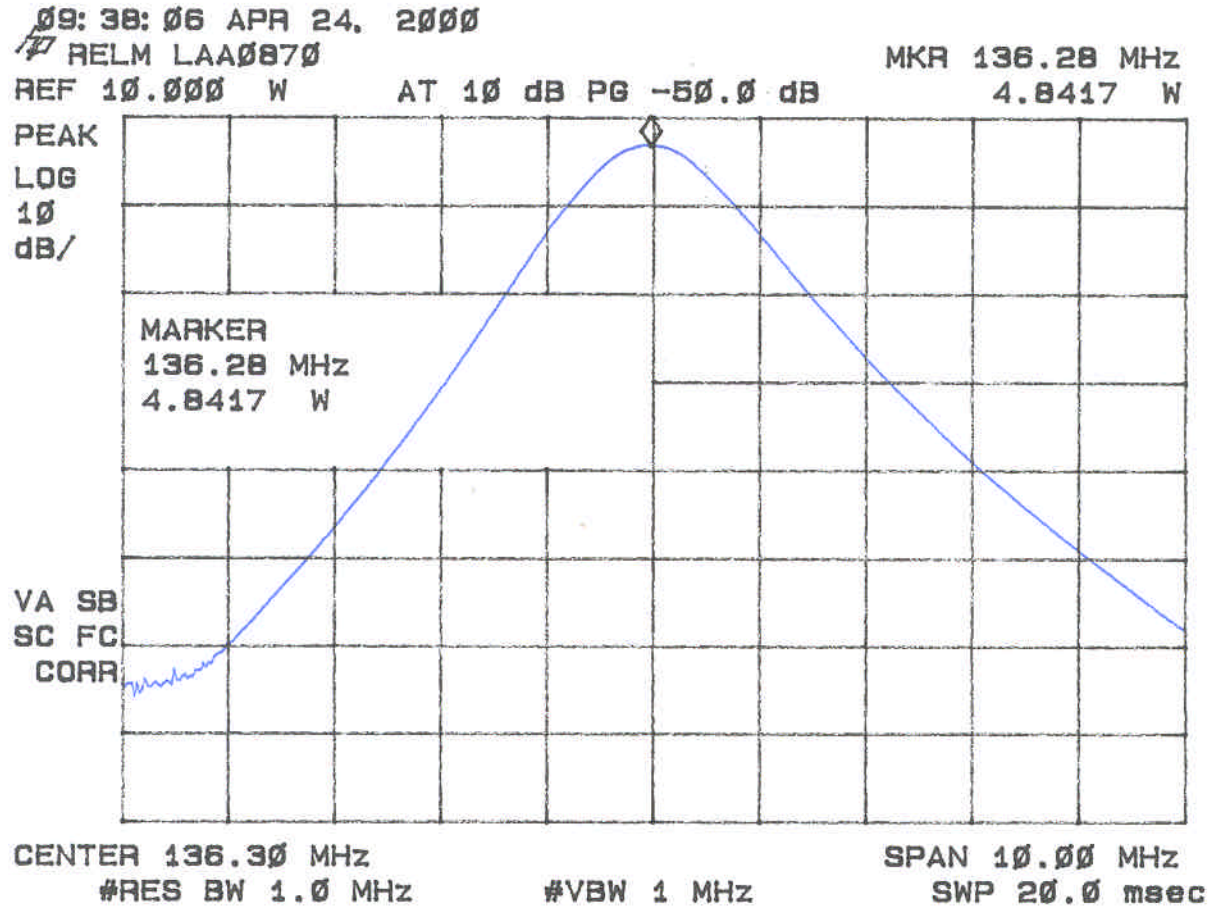


Figure 3b.  
RF Power Output (Low Channel)

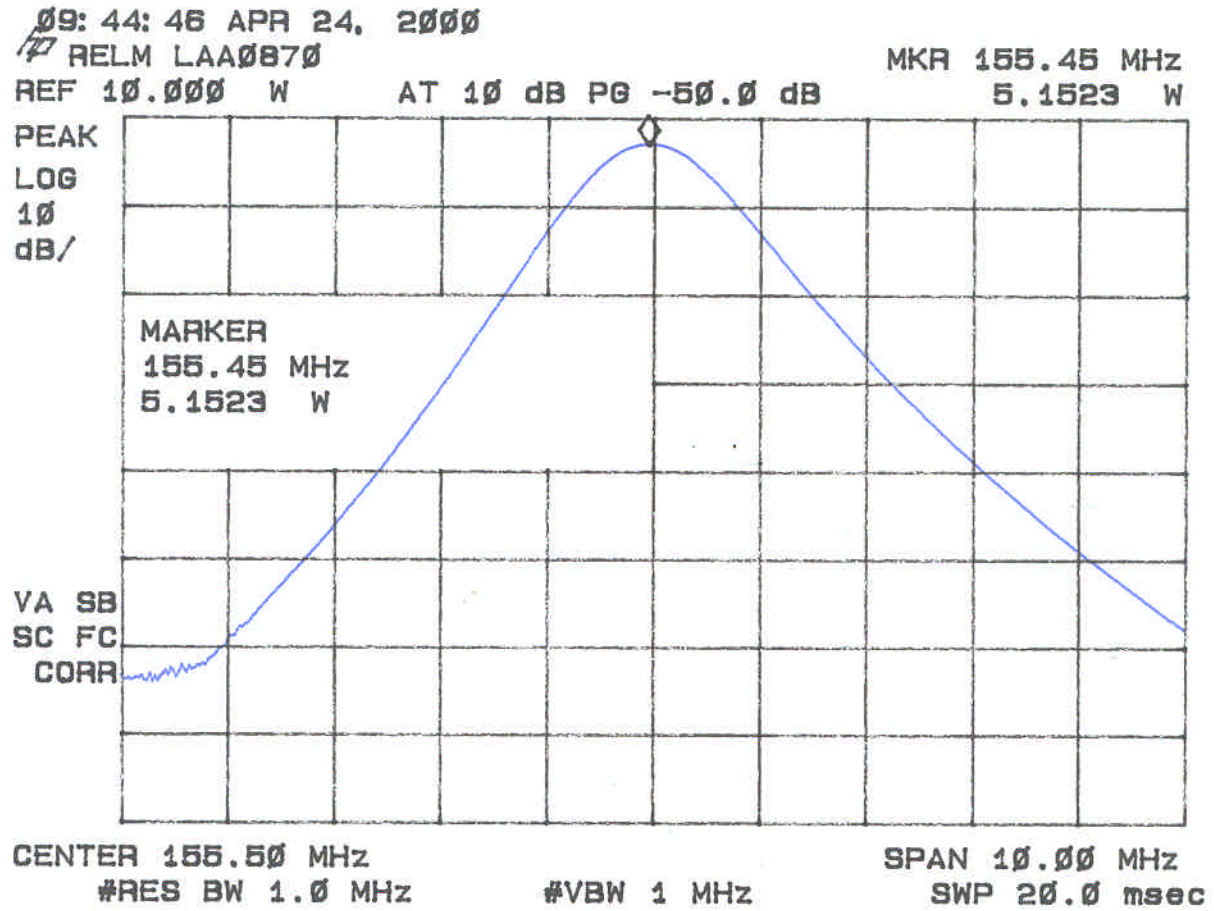
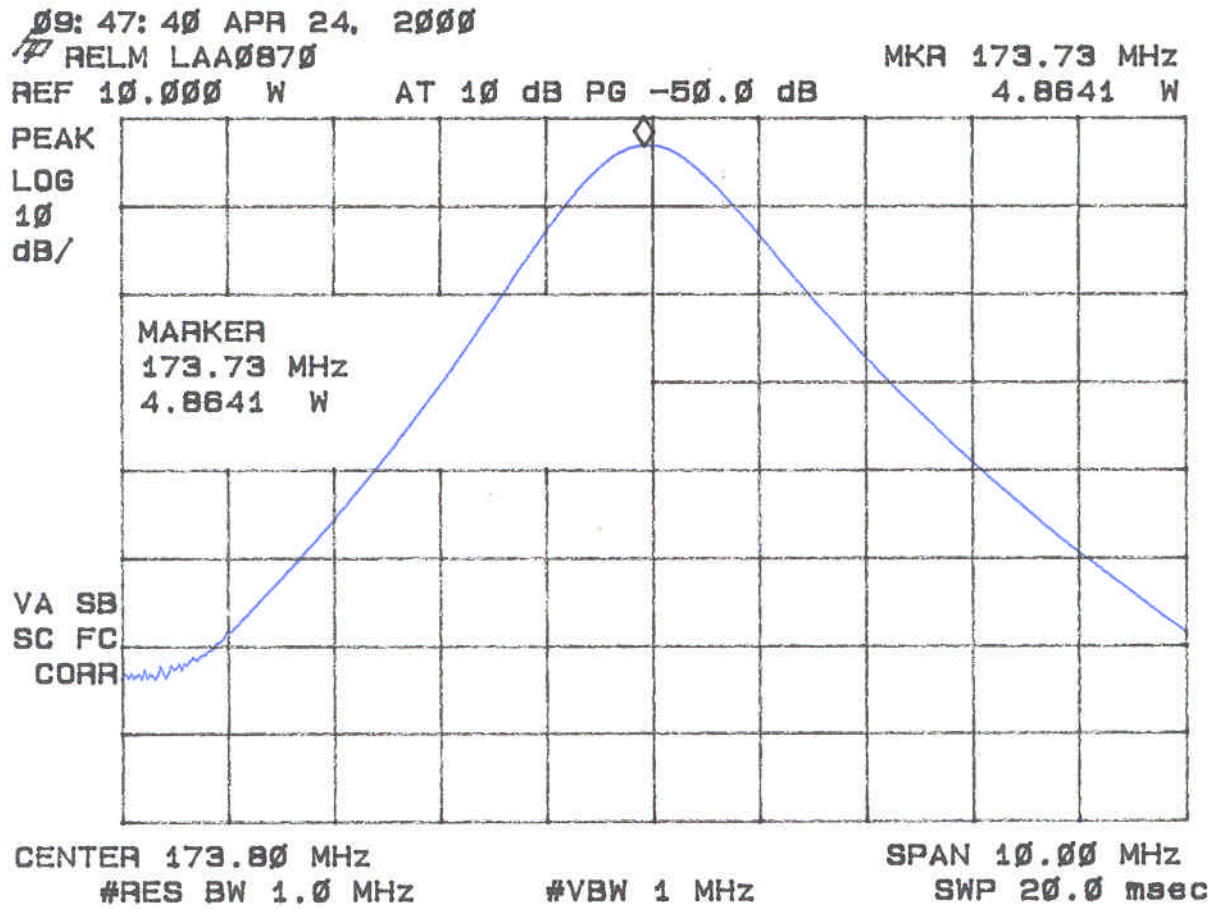


Figure 3c.  
RF Power Output (Low Channel)



## 2.7 Modulation Characteristics (FCC Section 2.1047)

Where applicable, the modulation characteristics of the EUT have been supplied by RELM Communication, Inc. as stipulated by the following FCC requirements:

- a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. For equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.
- b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.

### FCC Minimum Standard

#### FCC Part 22

None

#### FCC Part 74.463

Each new remote pickup broadcast station with a power output in excess of 3 watts shall be equipment with a device which will automatically prevent modulation in excess of the limits. If frequency modulation is employed, the emissions shall conform to the emission requirements of 74.462.

#### FCC Part 80.213

- (a) When phase of frequency modulation is used in the 156-162 MHz and 216-220 MHz bands, the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of  $\pm 5$  kHz is defined as 100 percent peak modulation.
- (b) Transmitters using F3E emission must have a modulation limiter to prevent any modulation over 100 percent
- (d) Ship and coast station transmitters operating in the 156-162 MHz and 216-220 MHz bands must be capable of proper operation with a frequency deviation of  $\pm 5$  kHz.
- (e) Coast station transmitters operated in the 156-162 MHz band must be equipped with an audio low-pass filter. The filter must be installed between the modulation limiter and the modulated radio frequency stage. At frequencies between 3 kHz and 20 kHz it must have an attenuation greater than at 1 kHz by at least 60 log (f/3) db. At frequencies above 20 kHz the attenuation must be at least 50 dB greater than at 1 kHz.

#### FCC Part 90.205

Transmitters utilizing analog emissions that are equipped with an audio low-pass filter must meet the emission limitations must meet proper emissions mask of 90.210.



Figure 4a.  
Modulation Characteristics

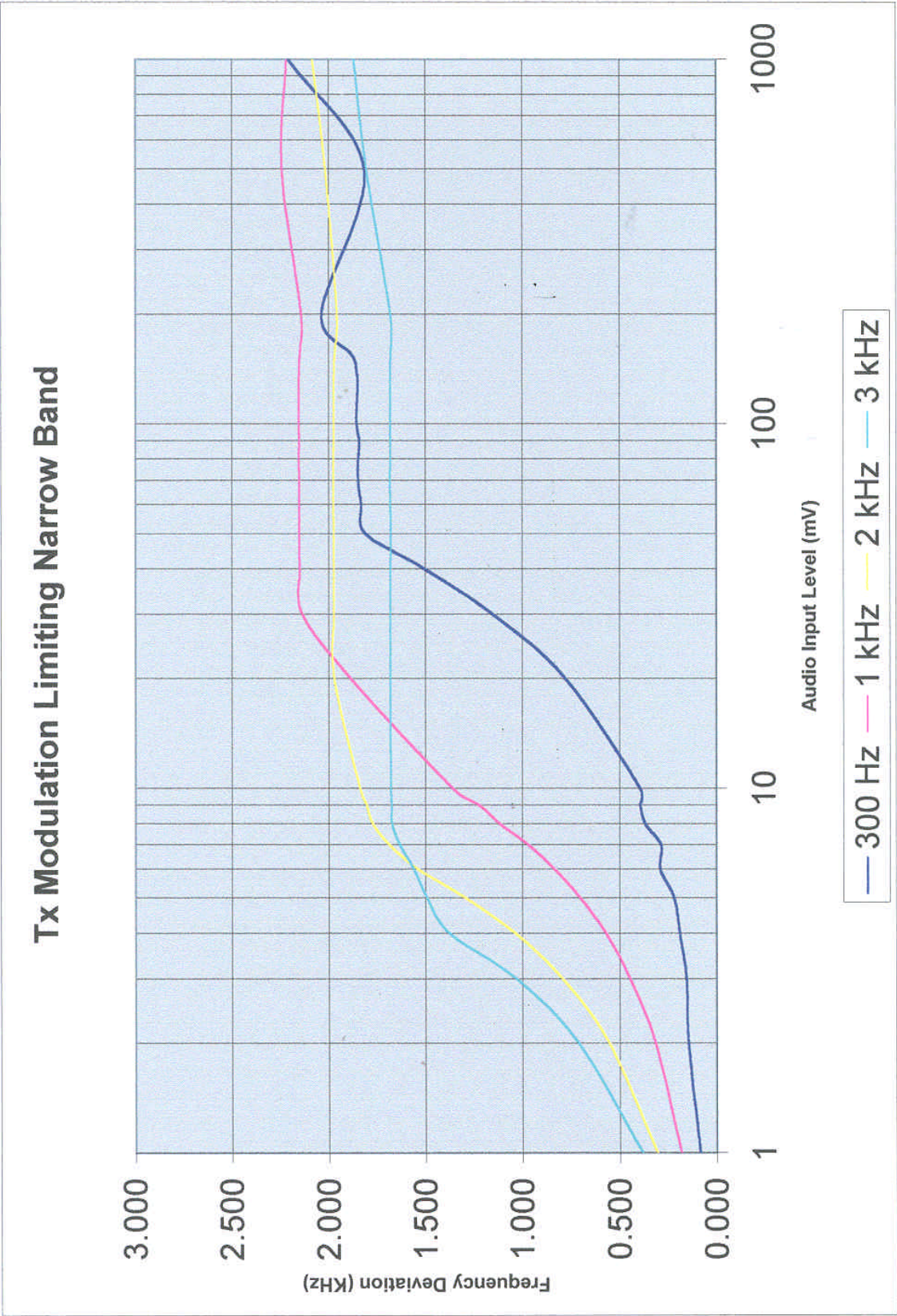




Figure 4b.  
Modulation Characteristics

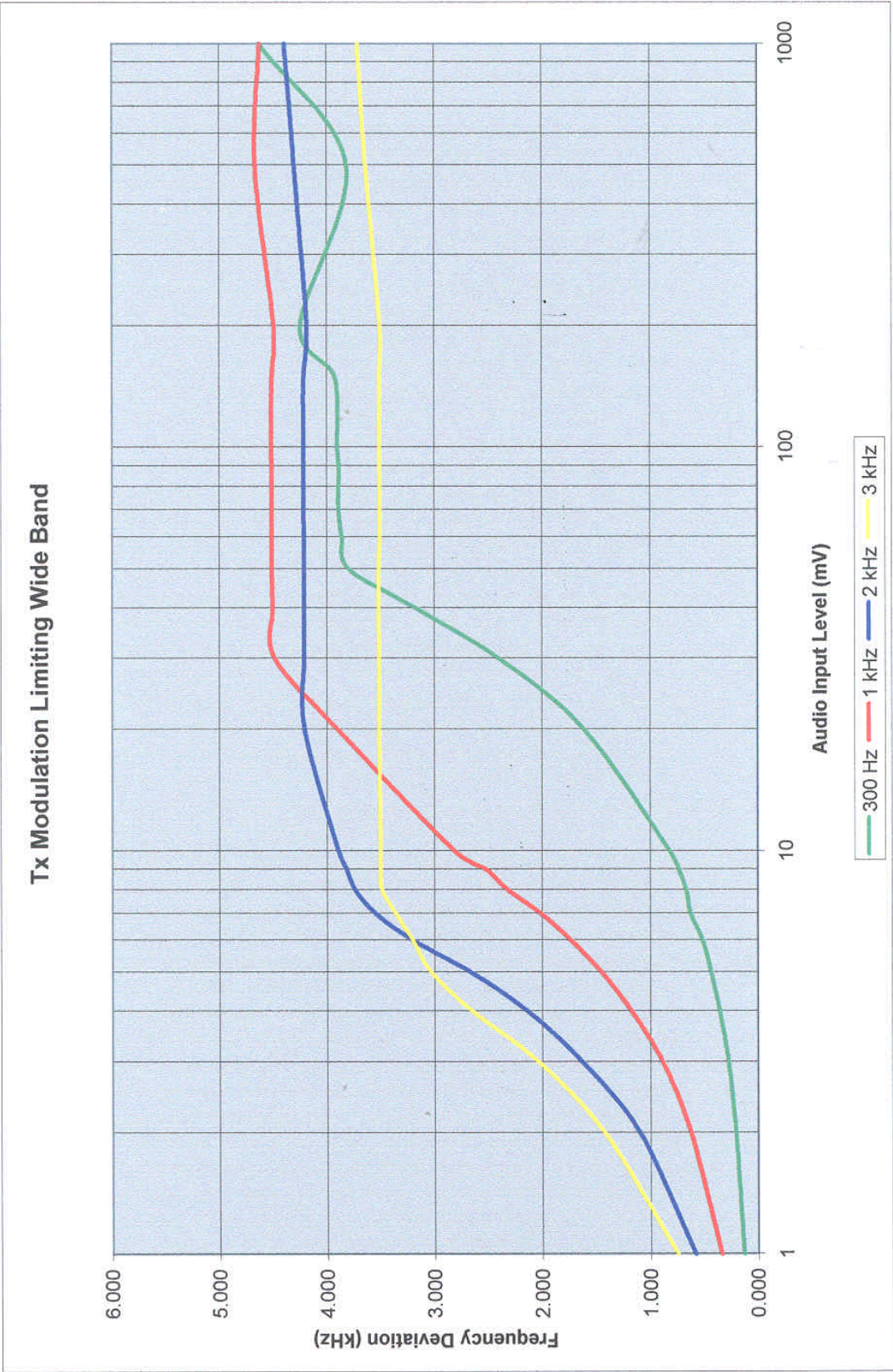
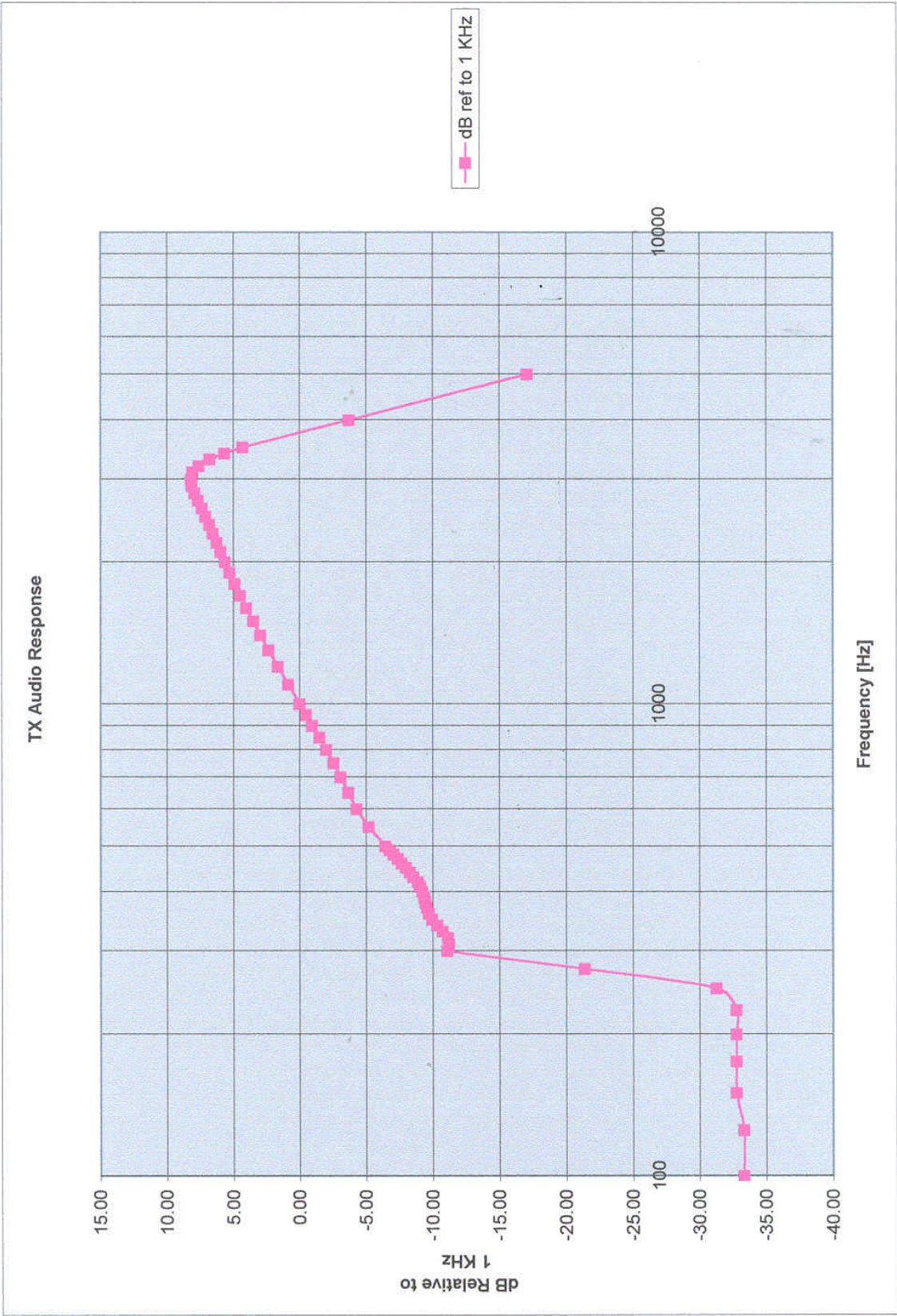


Figure 4c.  
Modulation Characteristics



## 2.8 Occupied Bandwidth (FCC Section 2.1049)

EUT was modulated by a 2500 Hz signal. The bandwidth of the fundamental was measured by RELM Communication, Inc. using a spectrum analyzer, as shown in Figure 5a through Figure 5b.

### FCC Minimum Standard

#### FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only)

For any frequency removed from the center of the assigned channel by more than 50 percent up to and including 100 percent of the authorized bandwidth, at least 25 dB.

On any frequency removed from the center of the assigned channel by more than 100 percent up to and including 250 percent, at least 35 dB.

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

Low:  $43 + 10 \log (P_{\text{Watts}}) = 43 + 10 \log (4.8) = 49.8 \text{ dB}$

Middle:  $43 + 10 \log (P_{\text{Watts}}) = 43 + 10 \log (5.2) = 50.2 \text{ dB}$

High:  $43 + 10 \log (P_{\text{Watts}}) = 43 + 10 \log (4.9) = 49.9 \text{ dB}$

The resolution bandwidth was 300 Hz or greater for measuring up to 250 kHz from the edge of the authorized frequency segment, and 30 kHz or greater for measuring more than 250 kHz from the authorized frequency segment.

#### FCC Part 90.210 (12.5 kHz Bandwidth only)

For any frequency removed from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ , 0 dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 ( $f_d$  - 2.88 kHz) dB.

On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz at least:

Low:  $50 + 10 \log (P_{\text{Watts}}) = 50 + 10 \log (4.8) = 56.8 \text{ dB}$

Middle:  $50 + 10 \log (P_{\text{Watts}}) = 50 + 10 \log (5.2) = 57.2 \text{ dB}$

High:  $50 + 10 \log (P_{\text{Watts}}) = 50 + 10 \log (4.9) = 56.9 \text{ dB}$



Figure 5a.  
Occupied Bandwidth (Wide Bandwidth)

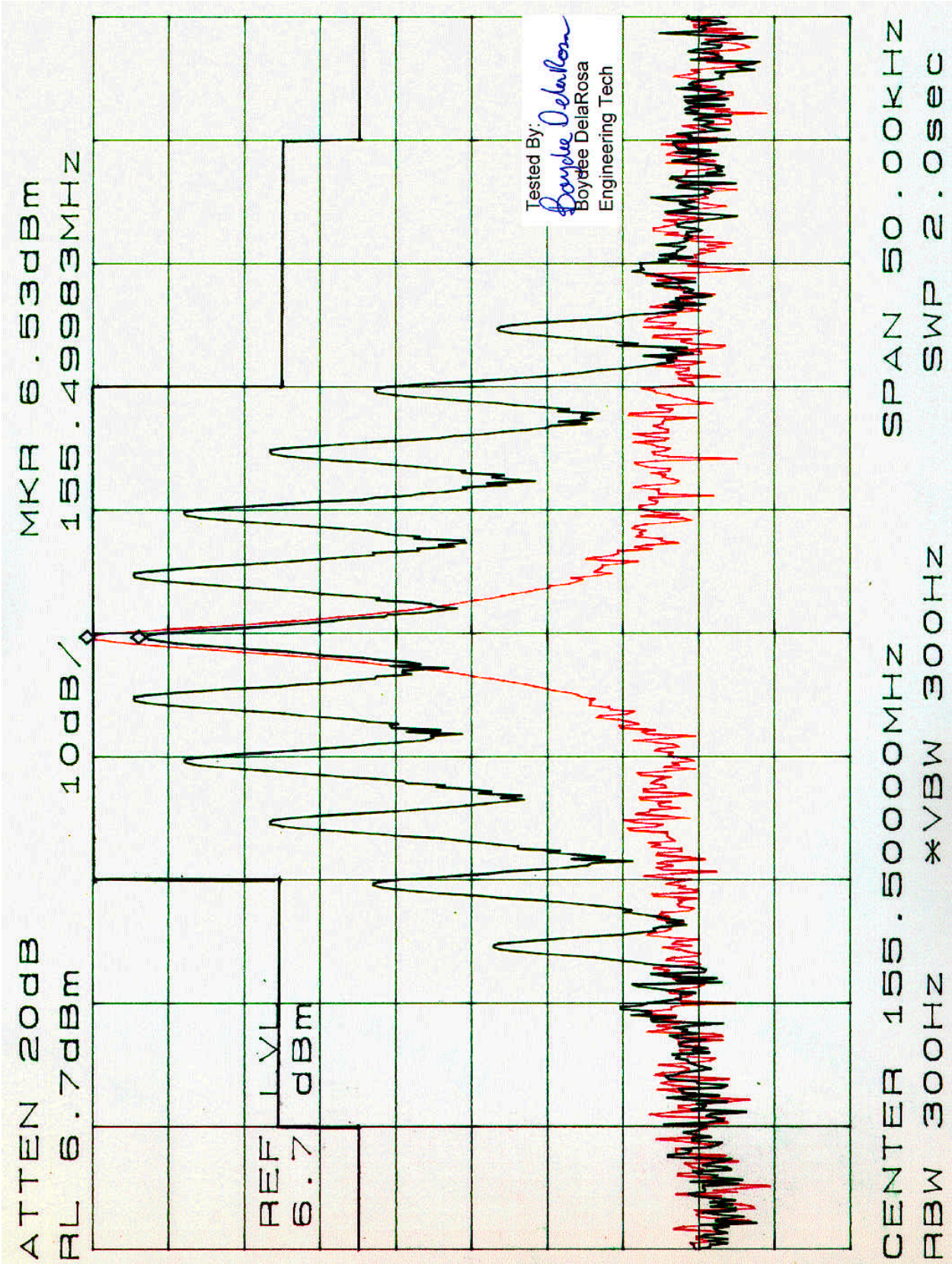
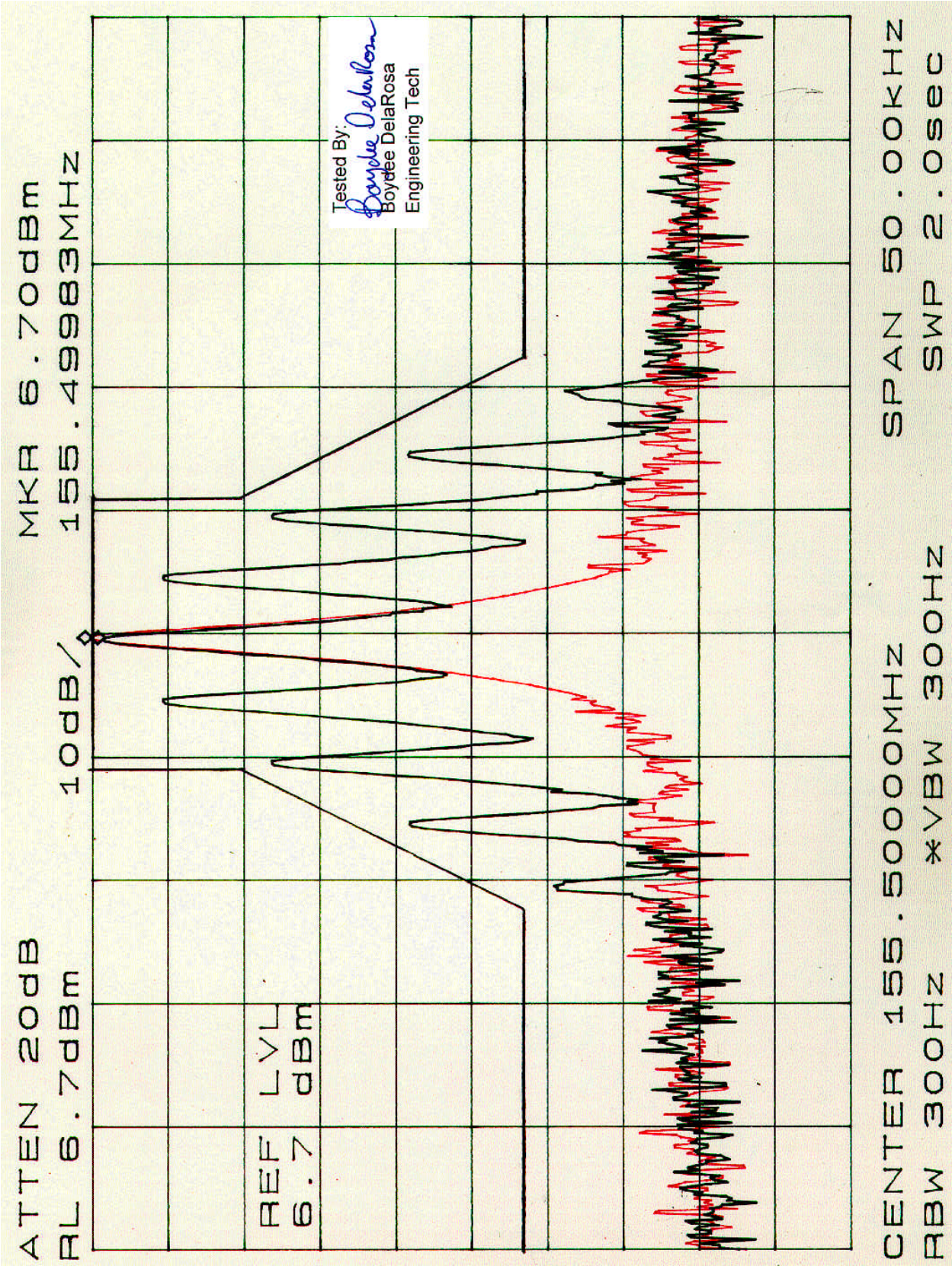




Figure 5b.  
Occupied Bandwidth (Narrow Bandwidth)



## 2.9 Spurious Emissions at Antenna Terminals (FCC Section 2.1051)

Spurious emissions appearing at the antenna terminals were measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. Results are shown in Figure 6.

### FCC Minimum Standard

#### FCC Part 22.359, 74.462, 80.211 and 90.210 (25 kHz bandwidth only)

On any frequency removed from the center of the assigned channel by more than 250 percent at least:

$$\text{Low: } 43 + 10 \log (P_{\text{Watts}}) = 43 + 10 \log (4.8) = 49.8 \text{ dB}$$

$$\text{Middle: } 43 + 10 \log (P_{\text{Watts}}) = 43 + 10 \log (5.2) = 50.2 \text{ dB}$$

$$\text{High: } 43 + 10 \log (P_{\text{Watts}}) = 43 + 10 \log (4.9) = 49.9 \text{ dB}$$

#### FCC Part 90.210 (12.5 kHz Bandwidth only)

On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz at least:

$$\text{Low: } 50 + 10 \log (P_{\text{Watts}}) = 50 + 10 \log (4.8) = 56.8 \text{ dB}$$

$$\text{Middle: } 50 + 10 \log (P_{\text{Watts}}) = 50 + 10 \log (5.2) = 57.2 \text{ dB}$$

$$\text{High: } 50 + 10 \log (P_{\text{Watts}}) = 50 + 10 \log (4.9) = 56.9 \text{ dB}$$

**NOTE: In general, the worse case attenuation requirement shown above was applied.**



## FCC Certification

RELM Communication, Inc.

Antenna Conducted Spurious Emissions (Low)

Test Performed By:

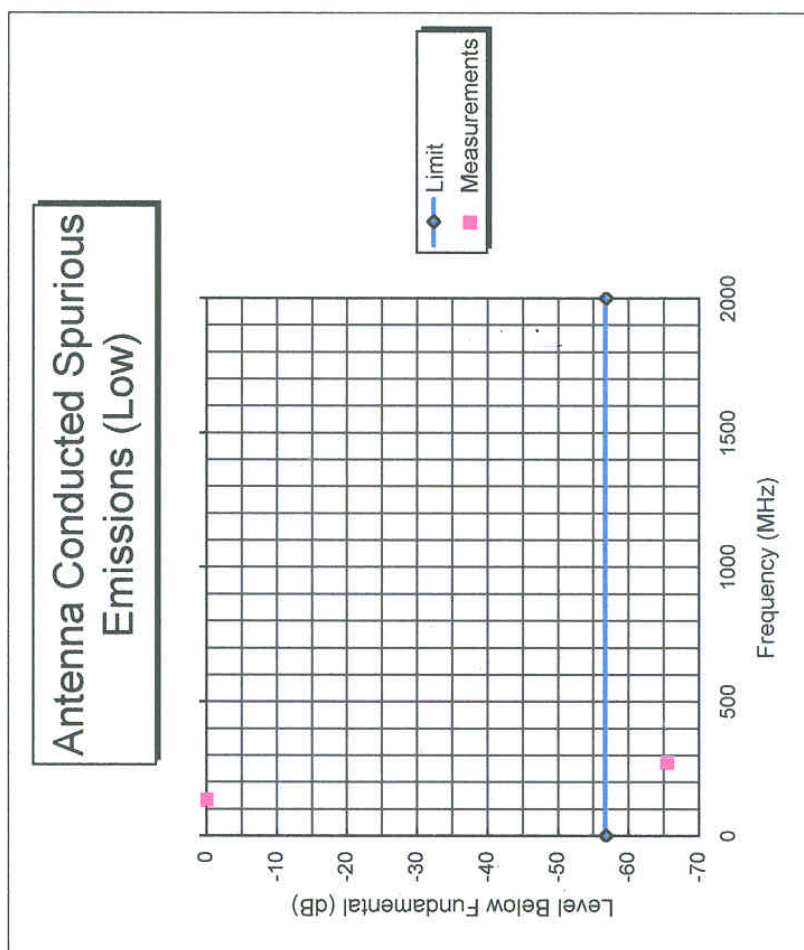


Tim Johnson

NARTE Certified Engineer

No. EMC-002205-NE

**Figure 6a**  
**Spurious Emissions at Antenna Terminals (Low)**

[illegible]
$$\text{Limit} = 50 + 10 \log(P) = 56.8 \text{ dB}$$