ENGINEERING STATEMENT
IN REGARD TO MEASUREMENTS OF

TX RX SYSTEMS INC.

Model No. 60-96-00400-G1
One-Way Broadband Repeater Amplifier

FCC ID: EZZ5PI001103

1.0 Introduction

Hyak Laboratories, Inc. has been authorized to perform measurements on the TX RX Systems Inc. Model 60-96-00400-G1 to determine compliance with Part 2 of the FCC Rules.

The Model 60-96-00400-G1 is a one-way broadband repeater amplifier intended for repeater application in landmobile communication systems. It includes multiple linear amplifiers with cavity resonators as selective elements. The system is operated from a 117 Vac power supply which provides 21 volts dc to the amplifiers.

2.0 Description of Measurement Facilities

A description of the Hyak Laboratories radiation test facility is a matter of record with the FCC. The facility was approved for radiation measurements on October 1, 1976, and is currently listed as an acceptable site.

3.0 D.C. Voltage and Current to Final Stage

21.0 V, 880 mA.

4.0 RF Power Output
(Paragraph 2.985 of the Rules)

RF power output was measured with a Bird 4421 RF power meter and 4420 power sensor using a Narda 765-20 50 ohm attenuator as a dummy load. Input RF was provided by a HP 8640B signal generator.

Input signal was increased until manufacturer's rated power was observed, and then increased 30 dB.

4.0 RF Power Output
(Paragraph 2.985 of the Rules) (Continued)

Test Frequency	RF Power Out
931.000 MHz	+28.5 dBm (0.71 W)

5.0 Occupied Bandwidth
(Paragraph 2.989(c) of the Rules)

Figure 1a is a plot of the sideband envelope of the transmitter taken from the display unit of a Tektronix 494P spectrum analyzer. Modulation corresponded to conditions and consisted of a 2500 Hz tone with full rated system deviation of 5 kHz supplied by the HP 8640B signal generator.

Figure 1b is a plot under the above conditions, but with 85% AM modulation.

The plots demonstrate linear amplification of a modulated signal. The horizontal scale (frequency) is 10 kHz per division and the vertical scale (amplitude) is a logarithmic presentation equal to 10 dB per division.

6.0 Spurious Emissions at the Antenna Terminals
(Paragraph 2.991 of the Rules)

Each of the amplification paths were tested for spurious emissions at the antenna terminals while the equipment was amplifying a signal with 5 kHz deviation.

The amplifiers are equipped with output level control (OLC) which maintains rated nominal 0.7 watt output power with up to 30 dB of input overload. Measurements were made at an input signal corresponding to 0.7 watt output and remeasured with 30 dB of input overload. No significant difference in spurious emission was observed.

Measurements were made with a Tektronix 494P spectrum analyzer coupled directly to the transmitter output terminals through a Narda 765-20 microwave attenuator.

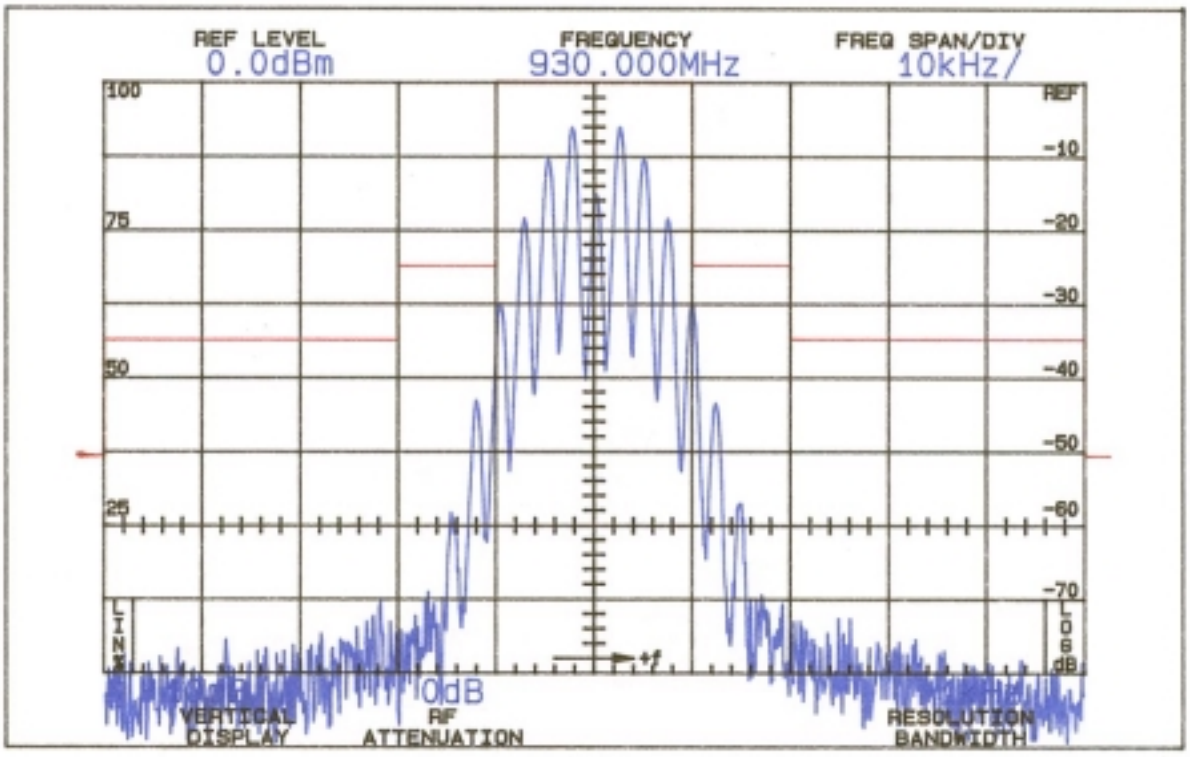
During the tests, the transmitter was terminated in the Bird attenuator; ac supply was 117 volts throughout the tests.

Spurious emissions were measured throughout the RF spectrum from 10 MHz to the tenth harmonic. Any emissions that were between the

required attenuation and the noise floor of the spectrum analyzer were recorded. All emissions were 20 dB or more below FCC limit for both channels. Data are shown in Table 1.

FIGURE 1a

MODULATION CHARACTERISTICS



MODULATION CHARACTERISTICS
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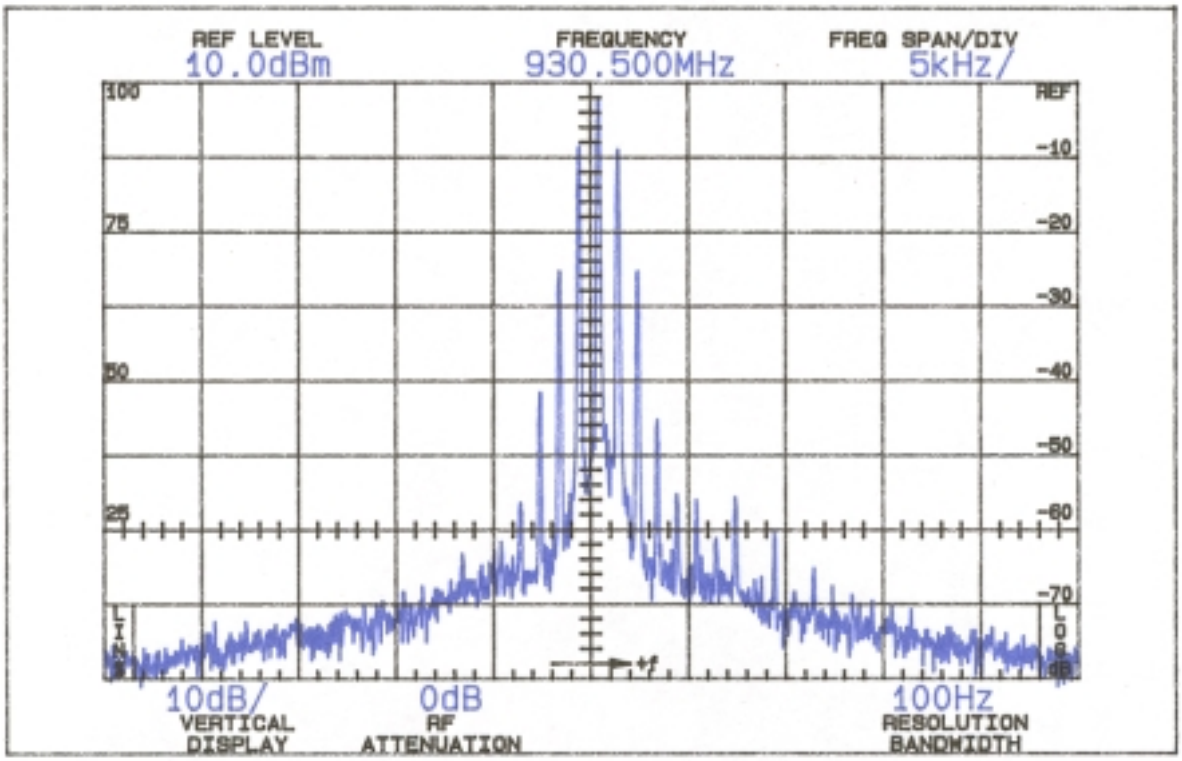
FIGURE 1a (FM)

FIGURE 1b

MODULATION CHARCTERISTICS



MODULATION CHARACTERISTICS
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FIGURE 1b (AM)

TABLE 1

ANTENNA TERMINAL CONDUCTED SPURIOUS

930.000 MHz; 0.7 watt Output; 117 Vac Supply

Spurious Frequency MHz	dB to Carrier Reference
930.000	97
1860.000	>100
2790.000	100
3720.000	>100
4650.000	>100
5580.000	>100
6510.000	> 90
7440.000	> 87
8370.000	> 87

Required: 43+10LogP = 41

All other spurious emissions were 20 dB or more below FCC limit, from 10 to 4600 MHz.

(Carrier was attenuated with a notch filter.)

7.0 Measurements of Spurious Radiation
(Paragraph 2.993(a), (b)(2) of the Rules)

Field intensity measurements of radiated spurious emissions were made with Tektronix 494P spectrum analyzer using Singer DM105A calibrated test antenna for the measurements to 1 GHz, and Emco 3115 Horn to 9.3 GHZ. The transmitter and dummy load were located in an open field 3 meters from the test antenna. Supply voltage was a power supply with a terminal voltage under load of 117 Vac. The transmitter and test antenna were arranged to maximize pickup. Both vertical and horizontal test antenna polarization were employed.

Reference level for the spurious radiations was taken as an ideal dipole excited by 0.7 watt, the output power of the transmitter.

Measurements, by substitution, were made from 10 MHz to 10 times operating frequency. See Table 2.

8.0 Intermodulation

Three-signal IM measurements were made using frequencies of 929, 930 and 932 MHz. Maximum power per frequency was 158 mW and composite power was 478 mW based on manufacturer's rating. On the plots, P Mean Ref. is 4.8 dB above the individual carrier power; the 43+10LogP limit is shown in green.

Plots: Figure 2 A1, F1, G1
Figure 3 A3 2500 Hz, 85% AM
Figure 4 F3, (G3) 2500Hz, 5 kHz deviation

TABLE 2

RADIATED SPURIOUS EMISSIONS

930.000 MHz; 0.7 watt Output: 117 Vac Supply

Spurious Frequency MHz	dB to Carrier Reference
930.000	>80
1860.000	>80
2790.000	>80
3720.000	>80
4650.000	>80
5580.000	>80
6510.000	>80
7440.000	>80
8370.000	>80

Required: 43+10LogP = 41

All other spurious from 10 MHz to 9.3 GHz were 20 dB or more below FCC limit.

FIGURE 2

INTERMODULATION

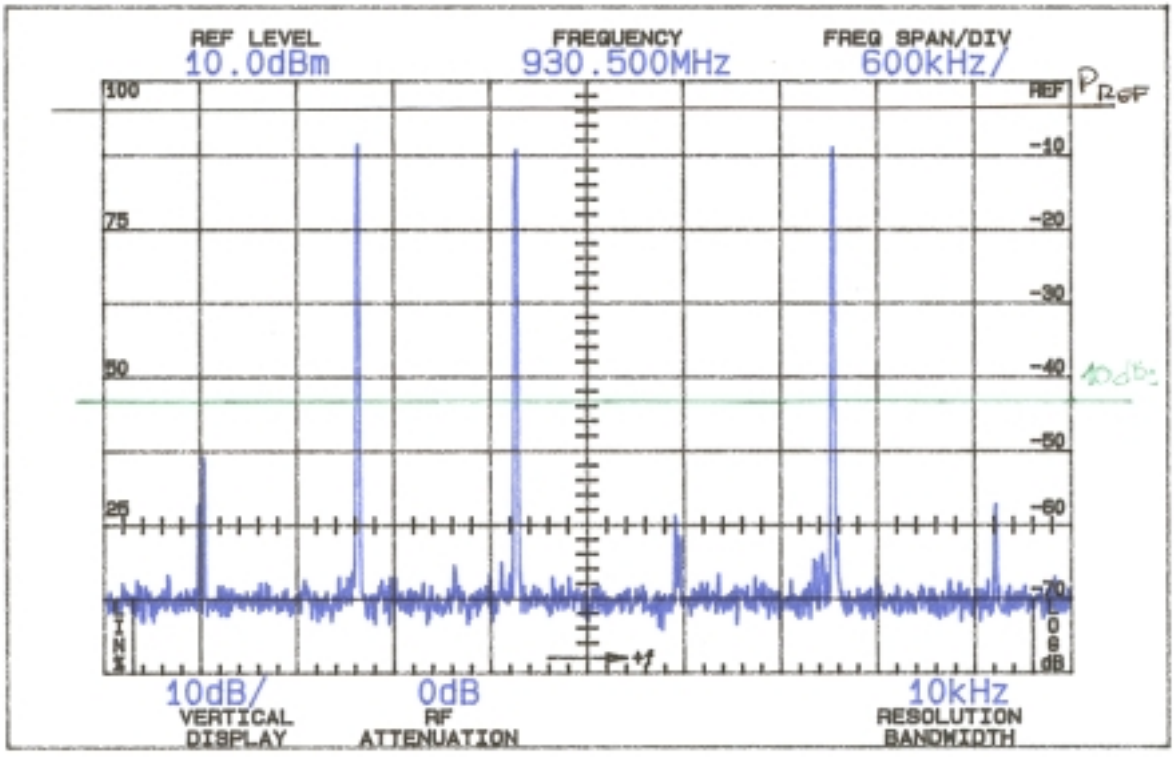

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FIGURE 2 (A1,F1,G1)

FIGURE 3

INTERMODULATION

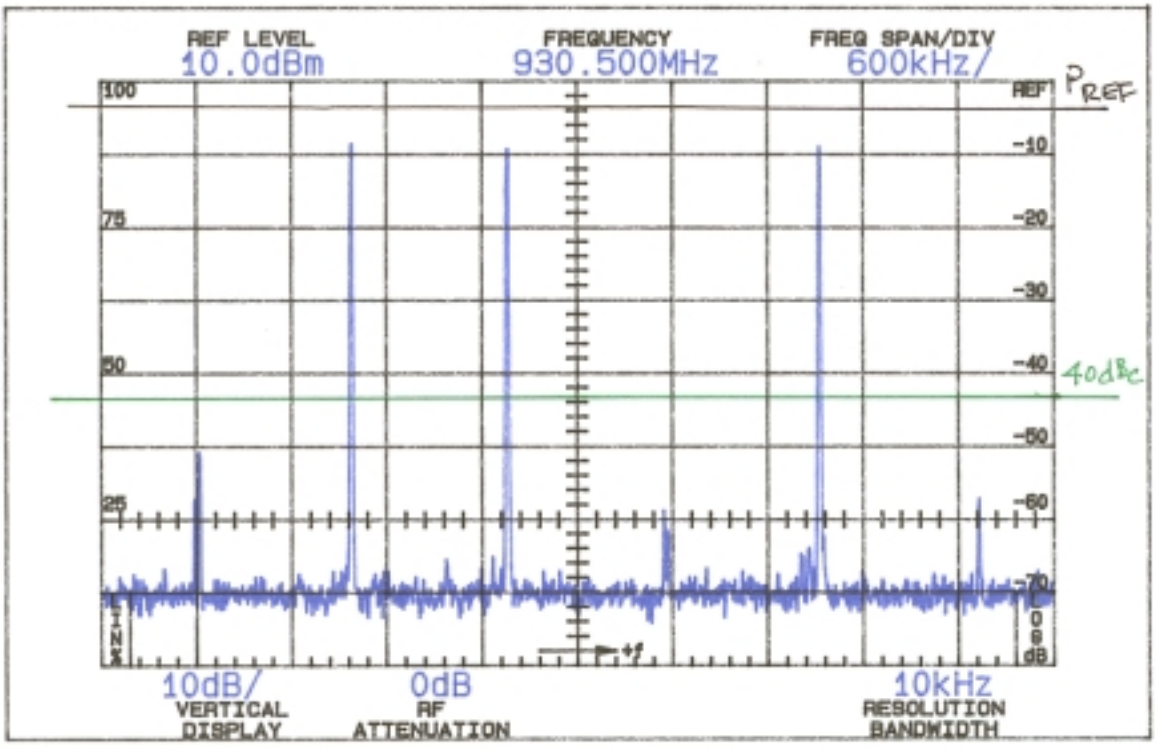

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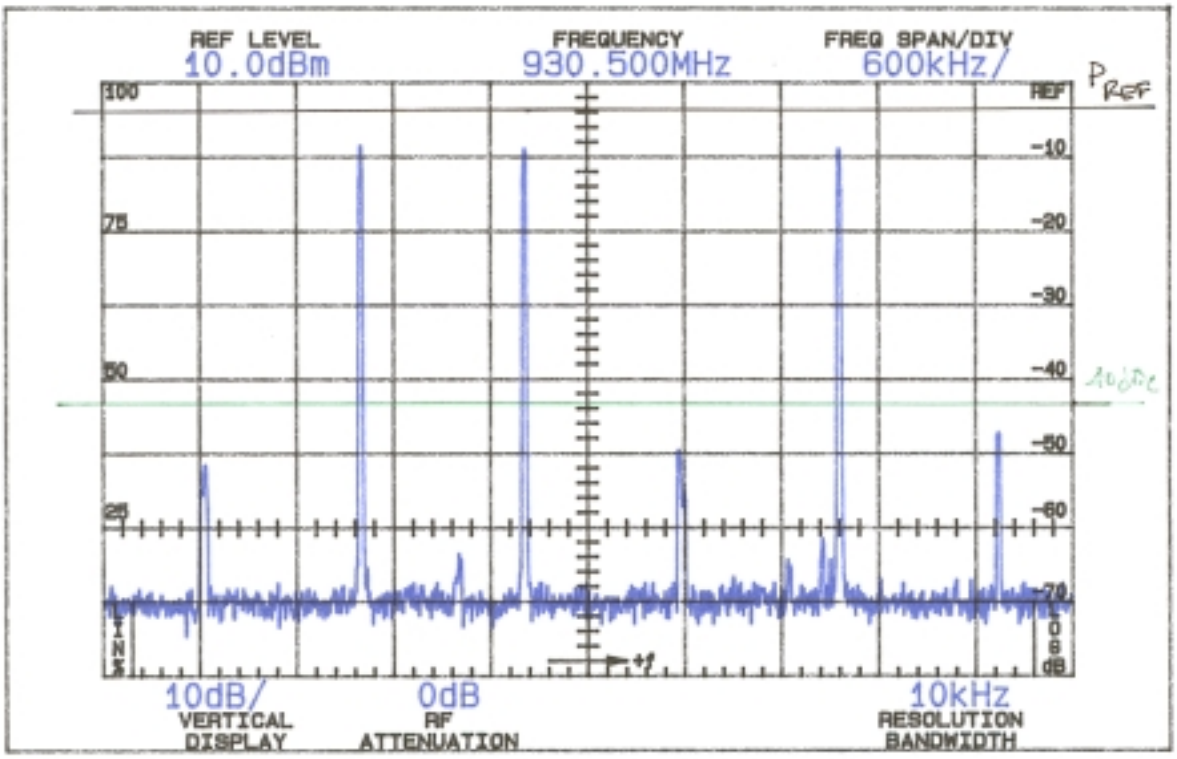
FIGURE 3 (A3 2500 Hz,
85% AM)

FIGURE 4

INTERMODULATION



INTERMODULATION
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FIGURE 4 (F3 (G3) 2500 Hz,
5 kHz deviation)

9.0 Statement

Technical test data herein are from tests performed by me or under my supervision. My qualifications are a matter of record

with the Federal Communications Commission. I personally attest to the accuracy of the test data submitted as part of this engineering statement.

Rowland S. Johnson

Dated: January 26, 2000