

WAYNE LANGSTON, INC.

Model: UPT-250  
Date: 06-05-2001

FCC ID: LOK450-PA-2  
Number of Pages: 10  
WLI Project: 20011745

**FCC  
TYPE ACCEPTANCE**

**TEST/MEASUREMENT REPORT**

Product Name: 450 MHz Transmitter  
Model: UPT-250  
Applicant/Manufacturer: EAGLE WIRELESS INTERNATIONAL, INC.  
101 Courageous Drive  
League City, Texas 77573  
Tested By Request of: Eagle Wireless International, Inc.

Testing Laboratory:  
Wayne Langston, Inc.  
P.O. Box 1377, League City, Texas 77574-1377  
Tel: 281-337-6785; Fax: 281-337-7217; email: langstoninc@msn.com

**Test Results:**

I certify that I am the technically qualified person responsible for preparation of the technical information contained in this application, and that it is complete and accurate to the best of my knowledge.

Tested By: Wayne Langston

Date: 06-05-2001

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**THIS REPORT MUST NOT BE USED TO CLAIM PRODUCT ENDORSEMENT BY  
NV LAP OR ANY AGENCY OF THE U.S. GOVERNMENT**

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## **1. INTRODUCTION**

The following data has been taken in support of an Application for Type Acceptance for the Eagle Wireless International RF Power Amplifier (FCC ID: LOK450-PA-2) in accordance with Part 2, Subpart J, Part 90 of the Federal Communications Rules and Regulations. Under Part 90, 635 the maximum power allowable is 500 watts which is well over The PA available power of 250 watts. The equipment under test (EUT) is a 460 MHz Power Amplifier, which operates between 450-470 MHz. These bands are licensed under Part 90. This particular unit is capable of digital and audio and an exciter capable of both was used for the tests. Bands 450-470 are covered under Part 90 per clause 90.205 thru 90.214.

### **1.1 Test Facility:**

Noted and Complies.

This test site is located adjacent to the building in League City, Texas, 77573. All equipment is calibrated and traceable to NIST thru primary standards. Calibration period is 1 year and is accomplished in August of each year any alterations to this schedule is noted in the test data. Wayne Langston, Inc. has received NVLAP Accreditation, Certificate No. 200021-0.

### **1.2 Test Samples:**

A representative sample of the Equipment Under Test (EUT), was tested and the test results for this sample provided are located in the Appendix.

### **1.3 Test Results:**

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The results from this testing apply only to the sample that was tested. The findings do not

make any suggestions about how the product is to be used nor does Wayne Langston, Incorporated make any recommendations regarding the product's usage.

**2. INFORMATION REQUIRED FOR TYPE ACDEPTANCE / CERTIFICATION  
PER PART 2**

Paragraphs

- 2.1033(a)** A completed FCC Form 731 is included with this application.
- 2.1033(1)** Applicant/Vendor/Manufacturer:  
  
Eagle Wireless International, Inc.  
  
101 Courageous Drive  
  
League City, Texas 77573
- 2.1033(2)** This equipment is identified as the Eagle Power Transmitter  
  
FCC ID: LOK450-PA-2
- 2.1033(3)** Installation manual is not available to the user.
- 2.1033(4)** The circuit functions are described in the Appendix.
- 2.1033(5)** The frequency range of the amplifier is 450-470 MHz and the range of the exciter is controlled to within the allowable FCC limits
- 2.1033(6)** The output power level is watts (53. dBm) . This amplifier has an output power range of 250 Watts. The output power is factory set at the maximum level of 250 Watts. Although the unit is intended to be operated at its maximum output power of 250 Watts. It does include a safety feature

which will allow the user to lower the output power during extreme conditions in order to protect the unit. This function is intended to be used as a safety device only.

- 2.1033(7))** The maximum rated power of 250 watts (+ 53. dBm).
- 2.1033(8)** The DC hookup voltage is +27 volts with a range of +26 volts to +28 volts. Each of the 4 FET finals draws approximately seven amps with a drain to source voltage of 27 volts.
- The function of the special IC's and components are as follows:
- a). The Pre-Amp is capable of a variable RF output with voltage variations.
  - b). Each final is capable of approximately 90 Watts.
  - c). the low pass filter reduces the harmonics to meet the FCC limits.
- 2.1033(9)** All tune-up procedures are made at the factory. There are no power adjustments made during the installation of the equipment.
- 2.1033(10)** Complete circuit diagram is attached to this application.
- 2.1033(11)** Exhibit 1 is a label drawing and label placement.
- 2.1033(12)** Photographs are included in the exhibit section.
- 2.1033(13)** N/A
- 2.1033(14)** The data required by Paragraph 2.1046 through 2.1057 are included with this report.

### **3, MEASUREMENT REQUIREMENTS (Paragraphs 2.985 et.seq)**

This section contains the results of measurements taken to demonstrate compliance with the pre-conditions defined in the Commission's Rules, Part 90, Subpart I, for transmitters used in the Business Radio Service. Data are presented in tabular and/or graphical form. Measurement procedures are described within the text of each reported test. All bandwidth measurements were made using  $\pm 4.5$  KHz deviation .

#### **2.1046 Power Output**

The following power measurement was made at 450 MHz. The test setup was as follows:

EUT-----Power Meter -----50 $\mu$ /500 watt load  
50 dB pad -----2db coax loss-----8591

The amplifier's RF output power was measured using a Boonton Model 42B Micro watt meter. External attenuation was added to prevent overloading the equipment. The input of the micro watt meter presented a resistive load of 50 ohms to the amplifier which precisely matched the transmitter's output characteristics. The meter measured an output power of 53. dBm (250 Watts) at 460 MHz. This level is in compliance with the manufacturer's specified maximum rated power of 250 Watts.

Power Output:

Refer to Appendix C – 450 MHz

Input power is shown as a reference.

These measurements were made using a 50db pad with a 2 dB coax loss, therefore the pg gain is set to -52 dB on the spec-an.

This output is compliant with the requirements of Parts 90 for digital and analog transmission

**2.1047** Noted.

Modulation Characteristics: (d) defined by the exciter

The UPT-250 model Eagle Wireless International power amplifier uses a Ritron model DTX454 synthesized RF module. The RF modulator has an input of then 14.4 MHz High stability reference input as well as a 10.7 MHz Digital data modulated IF input. The binary FSK mode has a deviation of + 4.5 KHz for a binary one and -4.5 KHz for a zero. The data rate is from DC to 3200 bps. A detailed description of the exciter is available from the FCC ID number AIERIT11- 450.

**2.1049 Occupied Bandwidth /Emissions Mask**

For 12.5 KHz channel bandwidth

**Part 90.209** (d) Emission mask

Emission mask

- 1) On any frequency from the center of the authorized bandwidth  $f_0$  to 5.625 KHz removed From  $f_0$ : zero dB
- 2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency  $f_d$  in KHz of more than 5.625 KHz but no more than 12.5 KHz at least  $7.27 (f_d - 2.88 \text{ KHz}) \text{ dB}$ .
- 3) On any frequency removed from the authorized by a displacement frequency  $f_o$  in Hz of more than 12.5 KHz : at least  $50 + 10 \log P \text{ dB}$  or 70 dB whichever is the

lesserattenuation.

Note: Resolution bandwidth is 100 Hz

For 3) the attenuation should be  $50 + 24 = 74$  or 70. 70 is the lesser attenuation. With carrier at 53.dbm the max level would be  $-17.0\text{dbm}$  The exciter that was used for testing do comply with the limit requirements for the occupied bandwidth.

## **2.1051** Conducted Disturbance Emission

The test was performed using a 500watt resistive load with a 50 dB pad attached directly to the output of the transmitter. Disturbance emissions at the antenna terminals were measured using the test configuration illustrated below. External attenuation was added as necessary to prevent overloading the spectrum analyzer. The emission spectrum was examined up to the tenth harmonic of the carrier.

Every emission not recorded was more than 20 dB below the limit. The emission limitation specified in Paragraph 90 210 is expressed as  $50 + 10 \log P_{\text{db}}$  or 70 which ever is lesser.

With the carrier at 53.0 dbm the  $50 + 10 \log P_{\text{db}}$  is 74 therefore the 70 db level is the lesser Attenuation. With the carrier at 53.0 dbm the attenuation would put all emission below  $-17\text{dbm}$

The table demonstrate compliance with this specification.



## Test Setup

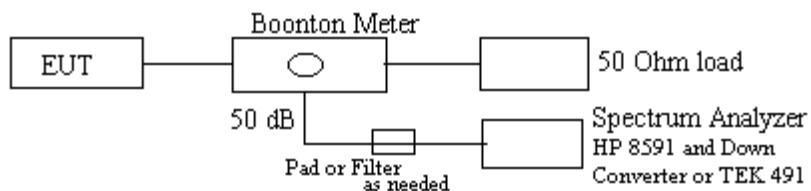


Table 1

Power Level: 54.7 dbm or 300 Watts

Frequency: 450 MHz

Carrier at: 53.5 dbm

| Frequency (MHz) | Emission Level (dBm) | Limit for (dBm) | Comments |
|-----------------|----------------------|-----------------|----------|
| 70              | -60.7                | -16.5           |          |
| 220.1           | -53.7                |                 |          |
| 762.8           | -62.1                |                 |          |
| 900             | -53.2                |                 |          |
| 1350            | -50.1                |                 |          |
| 2250            | -70.3                | -16.5           |          |

Emission Levels preceded by a “<” indicate frequencies which were found to be below the spectrum analyzer’s noise as indicated.

**2.1053** Field Strength of Spurious Radiated

## Part 90

The carrier is at 53. DBM. The maximum emissions allowable under 90. The limit would be – 17.0 DBM absolute. Field strength measurements of radiated spurious emissions were made on a three-meter range maintained by Wayne Langston,

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Incorporated, at the League City, Texas facility.

Complete description and measurement data have been placed on file with the

Commission. The equipment was scanned for radiated emissions in a Semi Anechoic Chamber prior to open-field testing.

The amplifier was placed on a rotating wooden test stand approximately one meter in height. The amplifier's output was terminated with a 50 ohm dummy load. The emission spectrum was examined up to 10 Gig using a TEK 491/HP 8591 Spectrum Analyzer/down converter and WLI log periodic antenna. A Mini Circuits broadband amplifier was used to provide approximately 20 dB gain when necessary. At each frequency, the device was rotated through 360 degrees, and the antenna was raised and lowered from one to four meters. Measurements were made using both vertically and horizontally polarized antennas. In each case, only the maximum radiation measured was recorded for

this report. All emissions not reported were more than 20 dB below the specified limit.

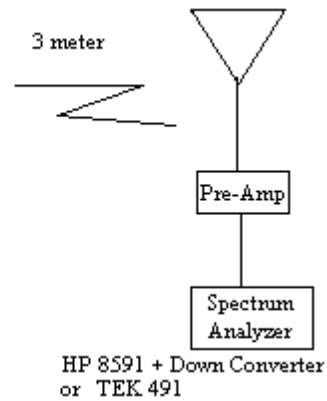
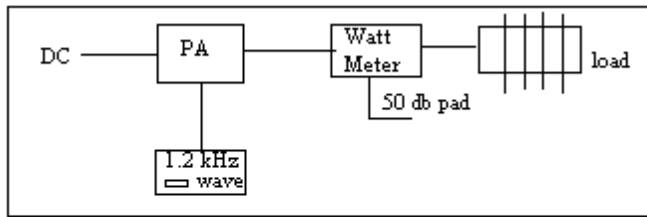
The reference level for spurious radiation's was taken at an ideal dipole excited by the rated output power according to the following relationship.

Calculation @ 3 meter measurement

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$$E_{w/m} = \frac{\sqrt{(49.2)(150)}}{3}$$

$$E_{w/m} = 28.6356$$

$$E_{dB} = 42 \text{ dbm}$$

$$= 149 \text{ dbuv}$$

For Limits per 90.209

All emission must be 50 plus 10 log pdb or 70 db whichever is lesser.

For a 250 Watt Amplifier

$$50 \text{ plus } 10 \text{ Log } (250)$$

$$= 50 \text{ plus } 24$$

$$= 74 \text{ db}$$

70 db is the lesser attenuation. Therefore with the carrier at 53dbm the max limit would be 53-70 or -17 dbm

| Frequency MHz | Level (dB) | A <sub>f</sub> / C <sub>1</sub> | Signal gen out | Limit   | Margin |
|---------------|------------|---------------------------------|----------------|---------|--------|
| 450           | Carrier    | Carrier                         |                |         |        |
| 1350          | -76dbm V   | 38                              | -38db          | -17dbm  | 21     |
| 2250          | -84 dbmV   | 41                              | -44            | -17 dbm | 27     |
| * 3716        | -90        | 43                              | -47            | -17 dbm | 30     |

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|        |             |    |     |         |    |
|--------|-------------|----|-----|---------|----|
|        | dbmH        |    |     |         |    |
| * 4645 | -91<br>dbmH | 48 | -43 | -17 dbm | 30 |
| * 5574 | -90<br>dbmV | 56 | -34 | -17 dbm | 33 |

All measurements were made by the dipole substitution method described in Tia603.

Antennae factors were supplied for reference only.

- At MIN floor of Spectrum Analyzer/mixer combination  
@ 470 MHz carrier

| Frequency<br>MHz | Level<br>(dB) | $A_f / C_1$ | Signal<br>Gen out | Limit | Margin |
|------------------|---------------|-------------|-------------------|-------|--------|
| 470              | Carrier       | Carrier     |                   |       |        |
| 1410             | -83           | -38         | -45               | -17   | 28     |
| 3290             | -89           | 43          | -46               | -17   | 29     |
| * 4650           | -91           | 48          | -43               | -13   | 30     |

@ 460 MHz carrier

| Frequency<br>MHz | Level<br>(dB) | $A_f / C_1$ | Total | Limit | Margin |
|------------------|---------------|-------------|-------|-------|--------|
| 1380             | Carrier       | Carrier     |       |       |        |
| 1862             | -78 V         | 38          | -40   | -17   | 23     |
| 2300             | -80           | 43          | -37   | -17   | 20     |
| * 5586           | -90 V         | 56          | -34   | -13   | 21     |

2.1055 Frequency stability

Conditions of the test