*FCC Certification Test Report*

# FCC Certification Test Report
# for
# Trafcon Industries, Inc.
# PTB50069

**August 29, 2001**

Prepared for:

**Trafcon Industries, Inc.**
**81 Texaco Road**
**Mechanicsburg, PA 17050-2623**

Prepared By:

**Washington Laboratories, Ltd.**
**7560 Lindbergh Drive**
**Gaithersburg, Maryland 20879**

# FCC Certification Test Program

## FCC Certification Test Report
## for the
## Trafcon Industries, Inc.
## TX3 Transmitter
## PTB50069

**August 24, 2001**

WLL JOB# 6679

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Documentation Specialist

Reviewed by: Michael Violette
President

# Abstract

This report has been prepared on behalf of Trafcon Industries, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Periodic Intentional Radiator under Part 15.249 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Trafcon Industries, Inc. TX3 Transmitter.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The Trafcon Industries, Inc. TX3 Transmitter complies with the limits for a Periodic Intentional Radiator device under Part 15.249 of the FCC Rules and Regulations.

Table of Contents



List of Tables



List of Figures

# 1 Introduction

## 1.1 Compliance Statement

The Trafcon Industries, Inc. TX3 Transmitter complies with the limits for an Intentional Radiator device under Part 15.249 of the FCC Rules and Regulations.

## 1.2 Test Scope

Tests for radiated emissions were performed. All measurements were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

## 1.3 Contract Information

| | |
|---|---|
| Customer: | Trafcon Industries, Inc.<br>81 Texaco Road<br>Mechanicsburg, PA 17050-2623 |
| Quotation Number: | 59367 |

## 1.4 Test Dates

Testing was performed from August 9, 2001 to August 10, 2001.

## 1.5 Test and Support Personnel

| | |
|---|---|
| Washington Laboratories, LTD | Santo Lavorata |

## 1.6 Abbreviations

| | |
|---|---|
| A | Ampere |
| Ac | alternating current |
| AM | Amplitude Modulation |
| Amps | Amperes |
| b/s | bits per second |
| BW | Bandwidth |
| CE | Conducted Emission |
| Cm | centimeter |
| CW | Continuous Wave |
| DB | decibel |
| Dc | direct current |
| EMI | Electromagnetic Interference |
| EUT | Equipment Under Test |
| FM | Frequency Modulation |
| G | giga - prefix for $10^9$ multiplier |
| Hz | Hertz |

| | |
|---|---|
| IF | Intermediate Frequency |
| k | kilo - prefix for $10^3$ multiplier |
| M | Mega - prefix for $10^6$ multiplier |
| m | Meter |
| μ | micro - prefix for $10^{-6}$ multiplier |
| NB | Narrowband |
| LISN | Line Impedance Stabilization Network |
| RE | Radiated Emissions |
| RF | Radio Frequency |
| rms | root-mean-square |
| SN | Serial Number |
| S/A | Spectrum Analyzer |
| V | Volt |

# 2 Equipment Under Test

## 2.1 EUT Identification & Description

The Trafcon Industries, Inc. TX3 Transmitter is part of the Smart Flash Controller system used to remotely control operation of a vehicle trailer-mounted vehicle traffic Advance Warning Panel. It is used in conjunction with a RX3 Receiver. The desired pattern is selected on the Smart Flash control pad, and the "Enter" key is depressed to transmit the command to the RX3 receiver.

**Table 1. Device Summary**

| ITEM | DESCRIPTION |
|---|---|
| Manufacturer: | Trafcon Industries, Inc. |
| FCC ID Number | PTB50069 |
| EUT Name: | Transmitter |
| Model: | TX3 |
| FCC Rule Parts: | §15.249 |
| Frequency Range: | 914 MHz |
| Maximum Output Power: | 1 mW |
| Modulation: | FM |
| Necessary Bandwidth: | N/A |
| Keying: | Manual |
| Type of Information: | Data |
| Number of Channels: | 1 |
| Power Output Level | Fixed |
| Antenna Type | Integral |
| Frequency Tolerance: | N/A |
| Emission Type(s): | N/A |
| Interface Cables: | None |
| Power Source & Voltage: | 5VDC from internal regulator supplied with 12VDC from external source |

## 2.2 Test Configuration

The TX3 was tested mounted on a traffic control warning sign and in stand-alone arrangements. Initial scanning indicated that the stand-alone configuration provided the worst-case configuration. The TX3 was configured with the Smart Flash control pad, and antenna. Power was provided from a 12VDC source.

## 2.3 Testing Algorithm

The TX3 was operated by configuring the Smart Flash control pad to continuously send the transmit command to the TX3.

Worst case emission levels are provided in the test results data.

## 2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

## 2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

## 2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ±2.3 dB.

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

Total Uncertainty = $(A^2 + B^2 + C^2)^{1/2}/(n-1)$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, total uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

# 3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

**Table 2: Test Equipment List**

| Equipment | Serial Number | Date Calibrated | Calibration Due |
|---|---|---|---|
| Antenna Research Associates, Inc. Biconical Log Periodic Antenna LPB-2520 (Site 1) | 1044 | 6/13/01 | 6/13/02 |
| Hewlett-Packard Spectrum Analyzer: HP 8568B (Site 1) | 2928A04750 | 6/29/01 | 6/29/02 |
| Hewlett-Packard Quasi-Peak Adapter: HP 85650A (Site 1) | 3303A01786 | 6/29/01 | 6/29/02 |
| Hewlett-Packard RF Preselector: HP 85685A (Site 1) | 2817A00744 | 6/29/01 | 6/29/02 |

# 4 Test Results

## 4.1 Occupied Bandwidth

Occupied bandwidth was performed by coupling the signal of the EUT to the input of a spectrum analyzer.

At full modulation, the occupied bandwidth was measured as shown:

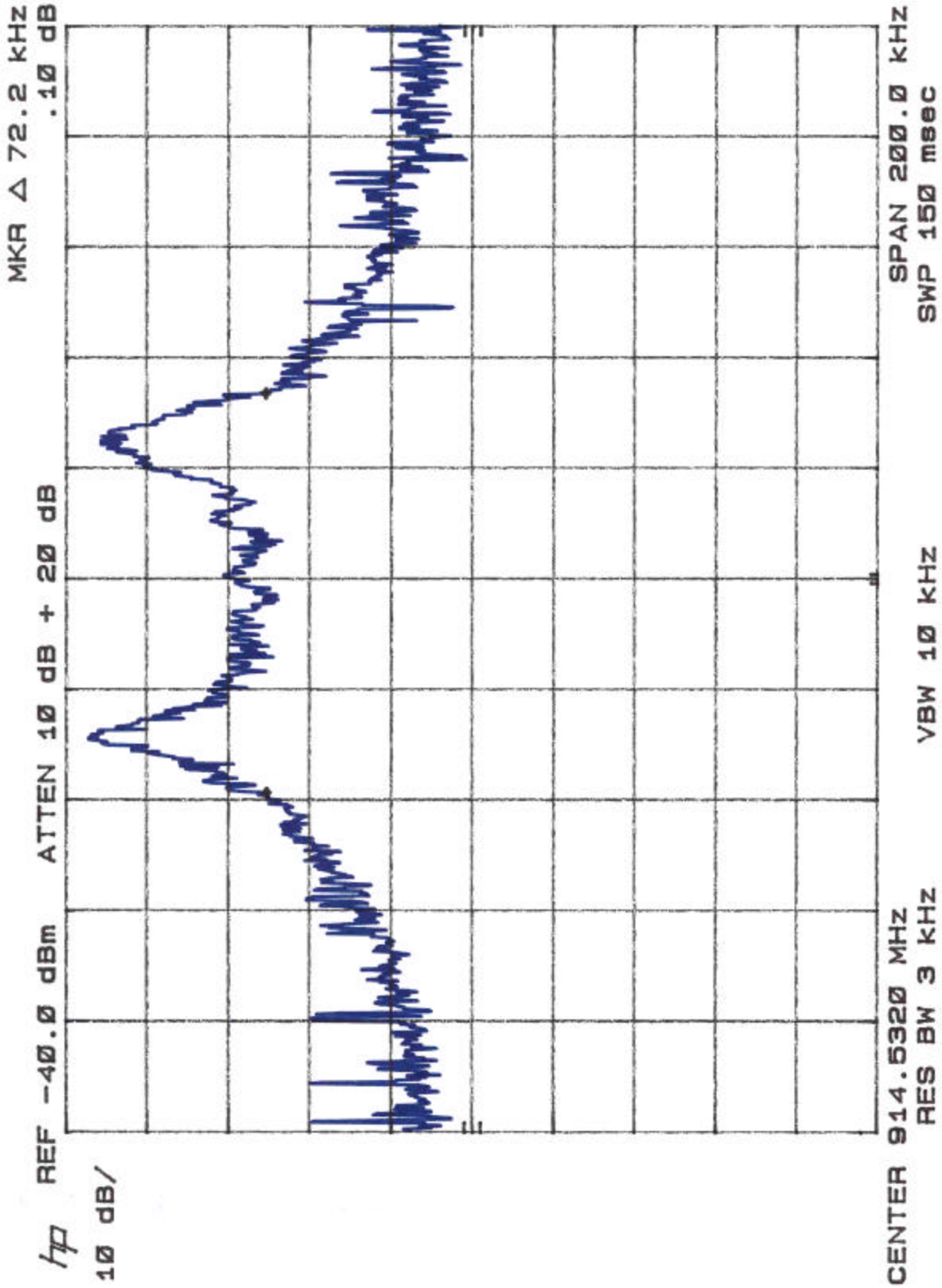


**Figure 1. Occupied Bandwidth**

Table 3 provides a summary of the Occupied Bandwidth Results.

**Table 3. Occupied Bandwidth Results**

| Frequency | Bandwidth |
|---|---|
| 914.53 MHz | 72.2 KHz |

## 4.2 Radiated Spurious Emissions

The EUT must comply with requirements for radiated spurious emissions. The limits are as shown in the following table.

**Table 4. Radiated Spurious Emissions Limits**

| Frequency | Fundamental uV/m | Level (-dBc or E-Field) |
|---|---|---|
| Fundamental | 50,000 | |
| Harmonics | | 500 uV/m |
| Spurious | | -50dBc or 15.109 |

### 4.2.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-1992. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

## Table 5: Radiated Emission Test Data

CLIENT: Trafcon Industries
MODEL: TX3 Transmitter S/N:FFF FF6
DATE: 8/9/01
CLK SPEED(S): 914.52 Fundamental transmit frequency
BY: S. Lavorata
JOB #: 6679
Configuration: Transmitter Enabled for continuous modulated transmission

See Notes Below regarding corrections factors.

| Frequency MHz | Polarity H/V | Azimuth Degree | Antenna m | SA Level dBuV | AFc dB/m | E-Field dBuV/m | E-Field uV/m | Limit uV/m | Margin dB | |
|---|---|---|---|---|---|---|---|---|---|---|
| 110.00 | H | 0.0 | 1 | 1.5 | 13.8 | 15.3 | 5.8 | 150.0 | -28.3 | amb |
| 530.00 | H | 0.0 | 1 | 1.0 | 22.4 | 23.4 | 14.8 | 200.0 | -22.6 | amb |
| 914.98 | H | 135.0 | 1 | 60.1 | 27.8 | 87.8 | 24668.7 | 50000.0 | -6.1 | qp |
| Antenna Factor adjusted for difference between cable losses for non-ambient signals only | | | | | | | | | | |
| 1829.95 | H | 135.0 | 1 | 57.8 | -1.0 | 56.8 | 691.8 | 5000.0 | -17.2 | pk |
| 1829.95 | H | 135.0 | 1 | 37.3 | -1.0 | 36.3 | 65.3 | 500.0 | -17.7 | av |
| 2744.93 | H | 135.0 | 1 | 48.0 | 1.6 | 49.6 | 302.0 | 500.0 | -4.4 | pk |
| 3659.90 | H | 0.0 | 1 | 46.0 | 1.8 | 47.8 | 245.5 | 500.0 | -6.2 | amb |
| 4574.88 | H | 0.0 | 1 | 43.0 | 2.7 | 45.7 | 192.8 | 500.0 | -8.3 | amb |
| 5489.86 | H | 0.0 | 1 | 44.0 | 4.7 | 48.7 | 272.3 | 500.0 | -5.3 | amb |
| 6404.83 | H | 0.0 | 1 | 44.2 | 4.1 | 48.3 | 260.5 | 500.0 | -5.7 | amb |
| 7319.81 | H | 0.0 | 1 | 33.0 | 6.7 | 39.7 | 96.6 | 500.0 | -14.3 | avamb |
| 8234.78 | H | 0.0 | 1 | 33.2 | 7.0 | 40.2 | 101.8 | 500.0 | -13.8 | avamb |
| 9149.76 | H | 0.0 | 1 | 34.0 | 7.3 | 41.3 | 116.2 | 500.0 | -12.7 | avamb |
| 110.00 | V | 0.0 | 1 | 2.2 | 13.8 | 16.0 | 6.3 | 150.0 | -27.6 | amb |
| 530.00 | V | 0.0 | 1 | 1.0 | 22.4 | 23.4 | 14.8 | 200.0 | -22.6 | amb |
| 914.98 | V | 68.0 | 1 | 54.0 | 27.8 | 81.8 | 12250.3 | 50000.0 | -12.2 | qp |
| Antenna Factor adjusted for difference between cable losses for non-ambient signals only | | | | | | | | | | |
| 1829.95 | V | 90.0 | 1 | 33.3 | -1.0 | 32.3 | 41.4 | 500.0 | -21.6 | av |
| 1829.95 | V | 90.0 | 1 | 57.3 | -1.0 | 56.3 | 653.1 | 5000.0 | -17.7 | pk |
| 2744.93 | V | 90.0 | 1 | 32.8 | 1.6 | 34.4 | 52.7 | 5000.0 | -39.5 | av |
| 2744.93 | V | 90.0 | 1 | 55.5 | 1.6 | 57.1 | 716.1 | 5000.0 | -16.9 | pk |
| 3659.90 | V | 90.0 | 1 | 47.3 | 1.8 | 49.1 | 285.1 | 500.0 | -4.9 | pk |
| 4574.88 | V | 0.0 | 1 | 44.5 | 2.7 | 47.2 | 229.1 | 500.0 | -6.8 | amb |
| 5489.86 | V | 0.0 | 1 | 44.3 | 4.7 | 49.0 | 281.8 | 500.0 | -5.0 | amb |
| 6404.83 | V | 0.0 | 1 | 44.0 | 4.1 | 48.1 | 254.5 | 500.0 | -5.9 | amb |
| 7319.81 | V | 0.0 | 1 | 43.5 | 6.7 | 50.2 | 323.5 | 500.0 | -3.8 | amb |
| 8234.78 | V | 0.0 | 1 | 33.3 | 7.0 | 40.3 | 103.0 | 500.0 | -13.7 | avamb |
| 9149.76 | V | 0.0 | 1 | 33.8 | 7.3 | 41.1 | 113.5 | 500.0 | -12.9 | avamb |