FCC CERTIFICATION TEST REPORT

for

Logis-Tech, Inc.
5775 Barclay Drive
Suite 4
Alexandria, VA 22315

FCC ID: OVU-LTI-A-0100

10 May 2000

WLL PROJECT #: 5263X

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STATEMENT OF QUALIFICATIONS

for

Herbert W. Meadows

Washington Laboratories, Ltd.

I hold a Bachelor of Science in Electronics Engineering Technology. I have over three years of EMI testing experience and nine years of RF and microwave testing experience. I am qualified to perform EMC testing to the methods described in this test report. The measurements taken within this report are accurate within my ability to perform the tests and within the tolerance of the measuring instrumentation.

By: Herbert W. Meadows
Herbert W. Meadows
Compliance Engineer

Date: May 10, 2000

FCC CERTIFICATION TEST REPORT

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FCC ID: OVU-LTI-A-0100

1.0 Introduction

This report has been prepared on behalf of Company to support the attached Application for Equipment Authorization. The test and application are submitted for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations. The Equipment Under Test was the Logis-Tech, Inc. 315 MHz Low Power Transmitter used in an Automated Inventory Maintenance Management System.

All measurements herein 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. Calibration checks are made periodically to verify proper performance of the measuring instrumentation.

All measurements are 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.

All results reported herein relate only to the equipment tested. The measurement uncertainty of the data contained herein is ±2.3 dB. Refer to Appendix A for Statement of Measurement Uncertainty. This report shall not be used to claim product endorsement by NVLAP or any agency of the US Government.

1.1 Summary

The Logis-Tech, Inc, 315 MHz Low Power Transmitter, part of an Automated Inventory Maintenance Management System, complies with the limits for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations.

2.0 Description of Equipment Under Test (EUT)

The Logis-Tech, Inc. Transponder (EUT) is a 315 MHz transmitter unit that is part of a system used for tracking assets in a controlled area. The overall system is the Automated Inventory and Maintenance Management System (AIMMS). The system consists of a transceiver (separate certification, FCC ID: OVU-LTI-A-0101) which transmits a 132 kHz to a portal antenna which is used to activate the 315 MHz Transponder. The Transponder is located on the vehicle as the vehicle passes through the doorway. The vehicle Transponder then transmits a fixed length code that is received by the portal antenna and receiver (separate receiver DOC). This received signal then turns on an indicator light and changes a status from “out” to “in” which stops a timer from counting. The EUT operates from a 3V Lithium battery.

2.1 On-board Oscillators

The Logis-Tech, Inc. 315 MHz Transponder contains the following oscillators: 315 MHz SAW oscillator.

3.0 Test Configuration

To complete the test configuration required by the FCC, the transmitter was tested in all three orthogonal planes.

3.1 Testing Algorithm

The transmitter was turned on and constantly transmitting. The system was tested in all three orthogonal planes.

Worst case emissions are recorded in the data tables.

3.2 Conducted Emissions Testing

No conducted emissions testing was performed as the EUT is battery powered.

3.3 Radiated Emissions Testing

The EUT was placed on an 80 cm high 1 x 1.5 meters non-conductive 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. Broadband 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. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate. The measurement bandwidth on the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. For emissions above 1 GHz, the measurement bandwidth on the spectrum analyzer system was set to at least 1 MHz, with all post-detector filtering no less than 10 times the measurement bandwidth.

3.3.1 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are grouped into a composite antenna factor (AFc) and are supplied in the AFc column of Table 1. The AFc in dB/m is algebraically added to the Spectrum Analyzer Voltage in dbµV to obtain the Radiated Electric Field in dBµV/m. This level is then compared with the FCC limit.

Example:

Spectrum Analyzer Voltage: VdBµV

Composite Antenna Factor: AFcdB/m

Electric Field: EdBµV/m = VdBµV + AFcdB/m

To convert to linear units: EµV/m = antilog (EdBµV/m/20)

Data is recorded in Table 1.

TABLE 1
FCC 15.231 3M Radiated Emissions Data

CLIENT: Logis Tech
MODEL NO: 315MHz Transponder
DATE: 11/1/99
BY: Herb Meadows
JOB #: 5263X

Frequency MHz	Polarity H/V	Azimuth Degree	Antenna Height m	SA Level (QP) dBuV	AFc dB/m	E-Field dBuV/m	E-Field uV/m	Limit uV/m	Margin dB
315.00	H	225.00	1.0	48.8	16.5	65.3	1838.2	6042.0	-10.3
315.00	V	90.00	1.0	39.1	16.5	55.6	601.7	6042.0	-20.0
630.00	H	315.00	1.0	23.8	24.1	47.9	248.7	604.0	-7.7
630.00	V	292.50	1.0	25.1	24.1	49.2	288.8	604.0	-6.4
945.00	V	0.00	1.0	15.8	28.8	44.6	169.9	604.0	-11.0
945.00	H	202.50	1.0	12.4	28.8	41.2	114.9	604.0	-14.4
1260.00	H	180.00	1.0	46.2	-10.6	35.6	60.3	604.0	-20.0
1260.00	V	337.50	1.0	43.2	-10.6	32.6	42.7	604.0	-23.0
1575.00	H	0.00	1.0	38.3	-8.5	29.8	31.0	500.0	-24.1
1575.00	V	0.00	1.0	39.0	-8.5	30.5	33.7	500.0	-23.4
1890.00	H	0.00	1.0	38.7	-6.7	32.0	39.7	604.0	-23.6
1890.00	V	0.00	1.0	38.8	-6.7	32.1	40.2	604.0	-23.5
2205.00	H	0.00	1.0	37.7	-5.7	32.0	39.6	500.0	-22.0
2205.00	V	0.00	1.0	38.2	-5.7	32.5	41.9	500.0	-21.5
2520.00	H	0.00	1.0	38.3	-5.2	33.1	45.2	500.0	-20.9
2520.00	V	0.00	1.0	38.0	-5.2	32.8	43.7	500.0	-21.2
2835.00	H	0.00	1.0	37.9	-4.7	33.2	45.7	500.0	-20.8
2835.00	V	0.00	1.0	38.5	-4.7	33.8	48.9	500.0	-20.2
3150.00	H	0.00	1.0	39.7	-4.3	35.4	59.0	500.0	-18.6
3150.00	V	0.00	1.0	39.4	-4.3	35.1	57.0	500.0	-18.9

Note: All measurements from 1575MHz to 3150MHz are ambient levels. No emissions were detected.

TABLE 2
System Under Test

FCC ID: OVU-LTI-A-0100

EUT:	Logis-Tech, Inc., M/N: Transponder FCC ID: OVU-LTI-A-0100

TABLE 3
Interface Cables Used

The EUT contains no I/O cables and is powered by an internal battery.

TABLE 4
Measurement Equipment Used

The following equipment is used to perform measurements:

Hewlett-Packard Spectrum Analyzer: HP8564E

Hewlett-Packard Spectrum Analyzer: HP8568B

Hewlett-Packard Spectrum Analyzer: HP8593A

Hewlett-Packard Quasi-Peak Adapter: HP85650A

Hewlett-Packard Preselector: HP85685A

Hewlett-Packard Preamplifier: HP8449B

Antenna Research Associates, Inc. Biconical Log Periodic Antenna: LPB-2520A (Site 2)

Antenna Research Associates, Inc. Horn Antenna: DRG-118/A

Solar 50 Ω/50 µH Line Impedance Stabilization Network: 8012-50-R-24-BNC

Solar 50 Ω/50 µH Line Impedance Stabilization Network: 8028-50-TS-24-BNC

AH Systems, Inc. Portable Antenna Mast: AMS-4 (Site 2)

AH Systems, Inc. Motorized Turntable (Site 2)

RG-214 semi-rigid coaxial cable

RG-223 double-shielded coaxial cable

EXHIBIT A
Carrier Bandwidth Data

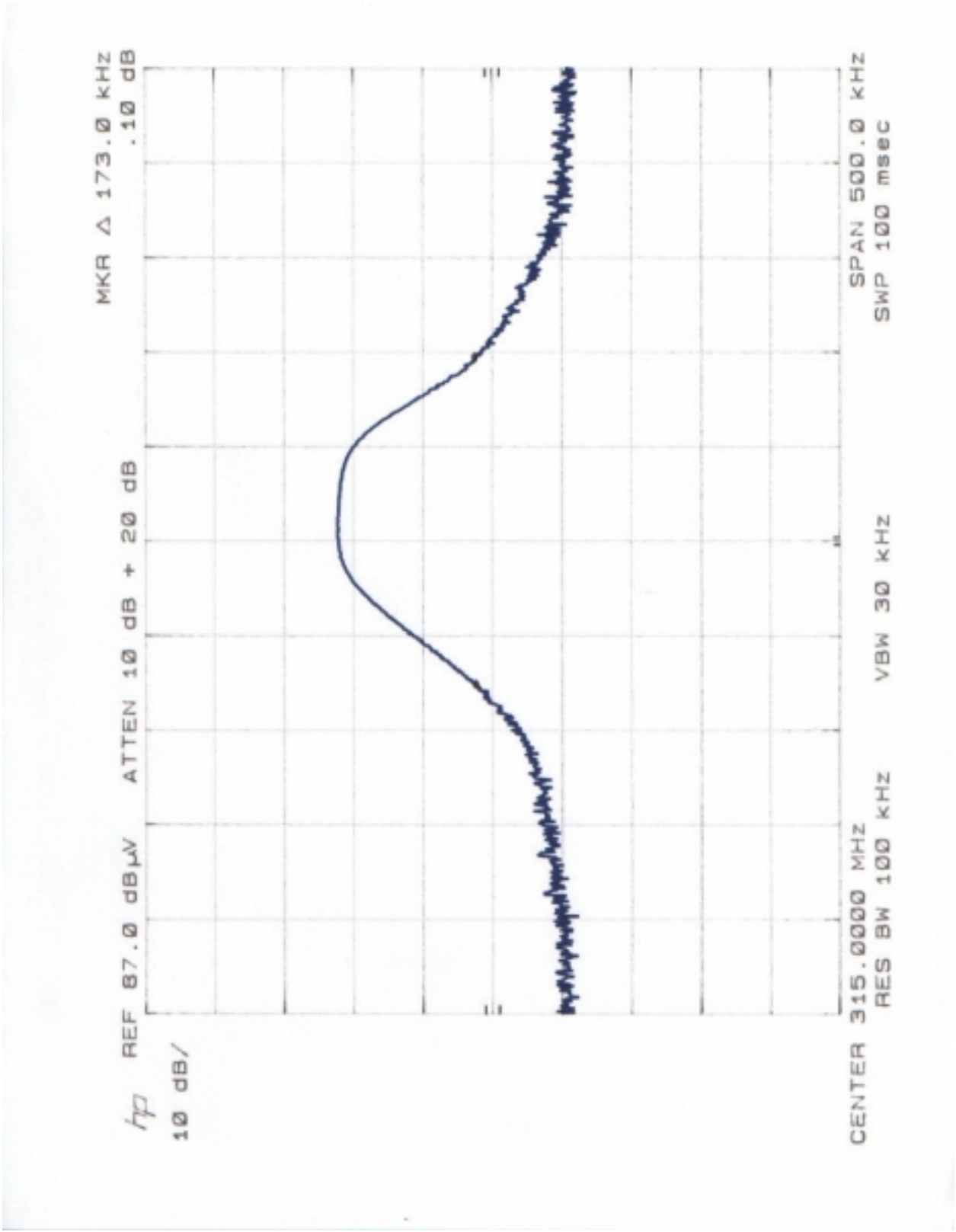
The 20 dB modulated bandwidth shall be no wider than 0.25% of the center frequency.

Bandwidth Limit = Carrier Frequency x .0025

Bandwidth Limit = 315 MHz x .0025 = 787.5 kHz

Measured EUT Bandwidth = 173 kHz

Bandwidth Plot



APPENDIX A
Statement of Measurement Uncertainty

For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 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:

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

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.