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A2LA ACCREDITED
Certificate Number 1953-01

Amendment to Test Report
R071002-01

Company: Lester Electrical
625 West A Street
Lincoln, NE, USA 68522
Contact: Joe Krause
Product: Temp Sender Model #22250
FCC ID: OBH22250

Test Report No: R071002-01A

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General Manager

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Test Engineer

DATE: 23 July 2002
Total Pages: 13

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1.0 Summary of test results

1.1 Test Results

Test	Test Specification	Results
CFR 47, FCC Part 15.109, Rx verification	Part 15.109, Class B	Complies
CFR 47, FCC Part 15.203	Part 15.203	Complies
CFR 47, FCC Part 15.249	Part 15.249	Complies

1.2 Test Methods

1.2.1 Radiated Emissions

All measurements were taken at a distance of 3 meters using the methods outlined in ANSI/IEEE C63.4, 2001. Measurements were taken from 30MHz to 1Gz, then from 1GHz to 10GHz. All data presented is the measured results with any applicable correction factors applied via the test software.

1.3 Reason for amendment

This report has been amended to more clearly express the results of emissions measurements and to provide data about the duration of the transmitted signal.

2.0 Description

2.1 Equipment under test

The EUT was a temperature sensor that typically is placed on top of large battery cells and transmits the temperature to a base station once every 10 minutes. An internal battery powers the unit. The unit can also receive a signal from a base station requesting a transmission.

2.1.1 Identification: Temp Sender Model #22250

2.1.2 EUT received date: 9 July 2002

2.1.3 EUT tested date: 9 July 2002

2.1.4 Manufacturer: Lester Electrical

2.1.5 Serial number: *protoytpe*

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC registered lab. This site has been fully described in a report submitted to the FCC, and accepted in a letter dated May 4, 2001. Laboratory environmental conditions varied slightly throughout the tests:

Relative humidity of 46 ± 5%
Temperature of 21 ± 3° Celsius

2.3 Special equipment or setup

The EUT was configured to transmit almost continuously.

3.0 Test equipment used

Serial #	*Manufacturer*	*Model*	*Description*	*Last cal.*
1654	EMCO	3142B	Biconilog antenna	3-May-02
6415	EMCO	3115	DRG Horn	24-Oct-01
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	11-Jun-02
082001/003	Rohde & Schwarz	TS-PR18	Preamplifier	10-Aug-01
2575	Rohde & Schwarz	ES-K1	Software v1.60	N/A

4.0 Detailed Results

4.1 Rx verification

The emissions from the EUT while not transmitting were verified to be below the limits for Class B unintentional radiators as shown in 15.109.

4.2 FCC Part 15.203, Tx

The antenna is mounted to the circuit board internal to the unit with no external antenna jacks and thus still consistent with the original grant.

4.3 FCC Part 15.249 Radiated Emissions, Tx

The EUT was placed on a non-conducting table 80cm from the ground plane with the antenna positioned at a distance of 3m. The EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters. Measurements were made from 30 MHz to 10GHz in both horizontal and vertical polarizations. The setup can be seen in Figures 1 through 3. The occupied bandwidth, as shown in Appendix B, was less than 500kHz. The carrier frequency of the tested unit was 916.504 MHz. The highest emission measured at this frequency was 77.15 dBµV/m. All measurements seen below were taken using a peak detector with 120kHz bandwidth; an averaging factor was then applied.

Frequency MHz	1) Level dBuV/m	2) Level dBuV/m	Limit dBuV/m	Margin dB	Height cm	Azimuth deg
916.50	71.15	77.15	94	16.9	250	271
1833.00	50.09	56.09	53.9	3.8	128	36
2749.50	44.42	50.42	53.9	9.5	100	0
3666.00	38.66	44.66	53.9	15.2	100	0
4582.50	37.46	43.46	53.9	16.4	100	0

The maximum duration of a signal pulse is less than 50ms, as shown in Figure 5. This is averaged over 100ms corresponds to a -6dB (20log0.5) correction in the

measured values. Level column 1 shows the value after the –6dB correction is applied. Level column 2 shows the original measured results after correction for antenna, amplifiers and signal path. The limit is then applied to column 1.

All measurement results are located in the corresponding interval with a probability of approximately 95% (coverage factor k=2). The interval for these measurements is U_x (expanded uncertainty).

Radiated Emissions, 30MHz – 1GHz, 3m distance: U_x = +/- 3.4 dB
Radiated Emissions, 1GHz – 10GHz, 3m distance: U_x = +/- 3.6 dB

Appendix A

Test setup photos

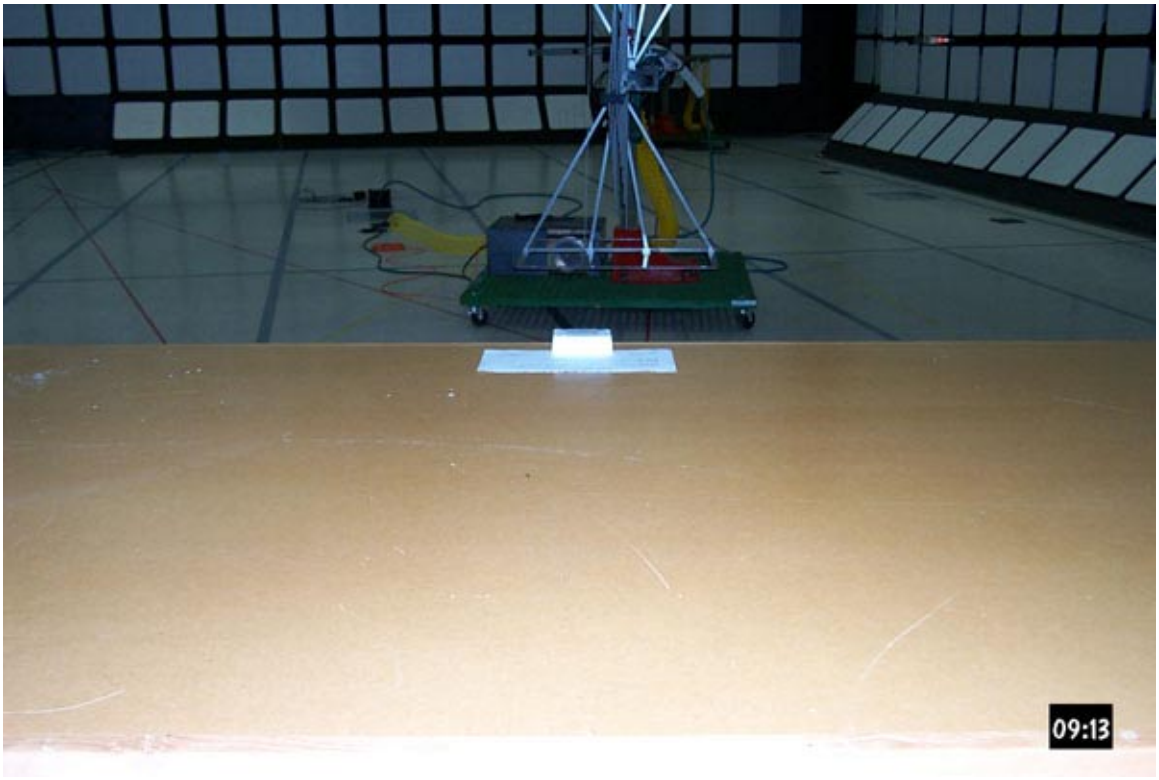

Figure 1 Test setup

Figure 2 Test setup

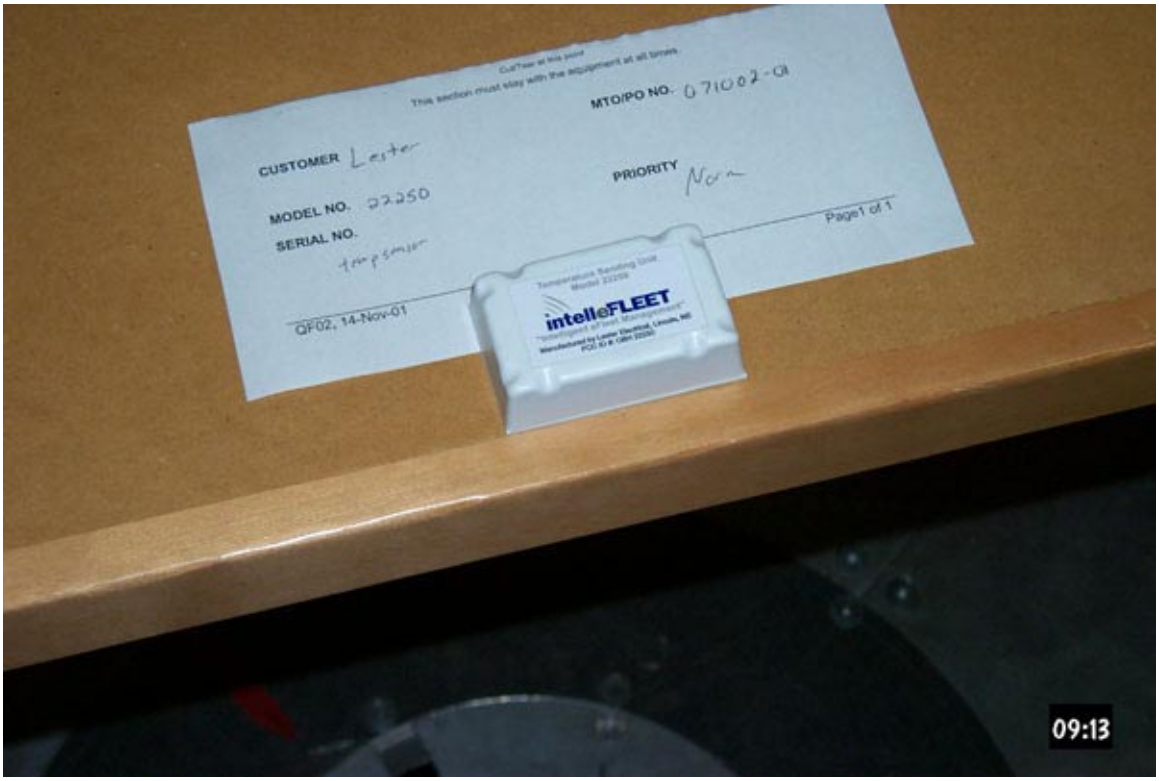

Figure 3 Test setup

Appendix B

Results

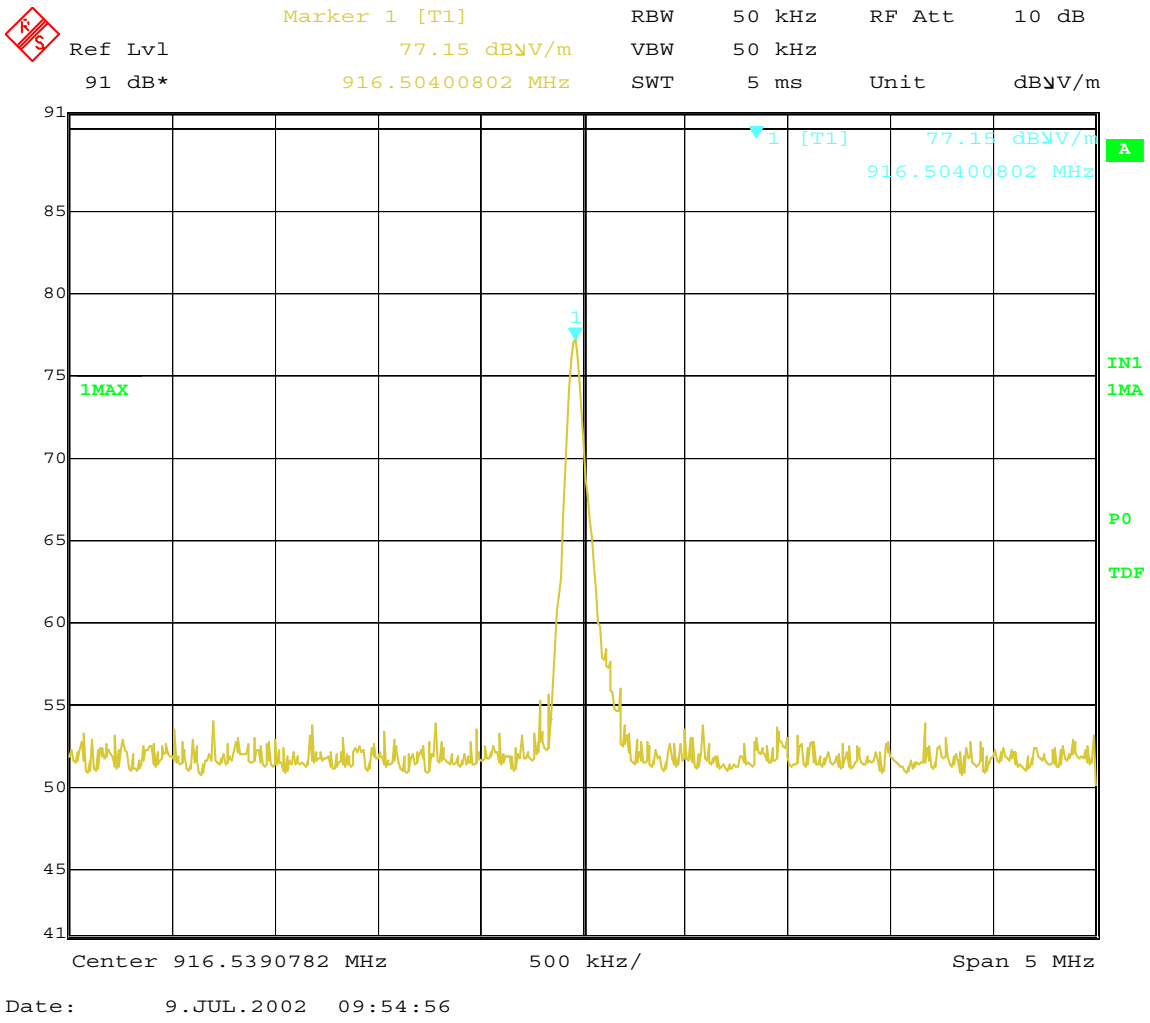

Figure 4 Bandwidth of carrier

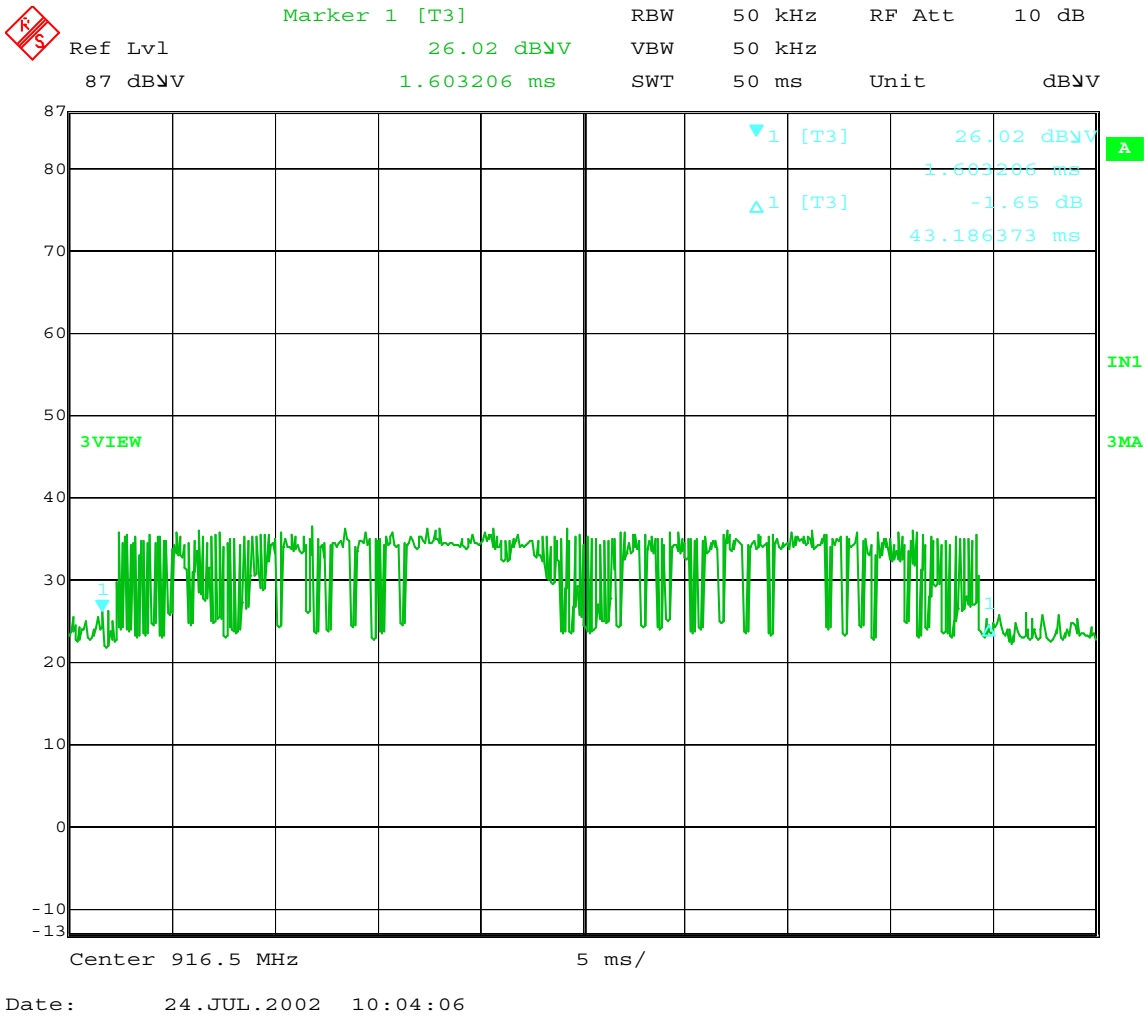

Figure 5 Duration of pulse

Appendix C

Sample calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 55 dBµV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBµV/m.

FS = 55 + 12 + 1.1 - 20 = 48.1 dBµV/m

The 48.1 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/m = Common Antilogarithm [(48.1 dBµV/m)/20]= 254.1 µV/m