



**Test Report:** 6W59398.4

**Applicant:** KL Industries Inc.  
1790 Sun Dolphin Drive  
Muskegon, MI  
49444 USA

**Apparatus:** BeaconBuoy (M/N: 91000 and 91001)

**FCC ID:** T5O-BuoyTX

**In Accordance With:** FCC Part 15 Subpart C, 15.231  
Periodic operation in the band 40.66-40.70MHz and  
above 70 MHz.

**Tested By:** Nemko Canada Inc.  
303 River Road  
Ottawa, Ontario  
K1V 1H2

**Authorized By:**   
Jin Xu, Wireless Specialist

**Date:** April 26, 2006

**Total Number of Pages:** 19

## Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

<b>Apparatus Assessed:</b>	BeaconBuoy (M/N: 91000 and 91001)
<b>Specification:</b>	FCC Part 15 Subpart C, 15.231
<b>Compliance Status:</b>	Complies
<b>Exclusions:</b>	None
<b>Non-compliances:</b>	None
<b>Report Release History:</b>	Original Release

Author: Jason Nixon, Telecom Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

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## **Section 1 : Equipment Under Test**

### **1.1 Product Identification**

The Equipment Under Test was identified as follows:

BeaconBuoy transmitter

### **1.2 Samples Submitted for Assessment**

The following samples of the apparatus have been submitted for type assessment:

<b>Sample No.</b>	<b>Description</b>	<b>Serial No.</b>
1	Beaconboy TAG TX	NONE

The first samples were received on: March 8, 2006

### **1.3 Theory of Operation**

The EUT is a used in conjunction with the BeaconBuoy receiver, to remotely turn the light on and off on.

### **1.4 Technical Specifications of the EUT**

<b>Manufacturer:</b>	Tospo Lighting
<b>Operating Frequency:</b>	433.92MHz
<b>Emission Designator:</b>	L1D
<b>Modulation:</b>	Pulse width modulated
<b>Antenna Data:</b>	Integral
<b>Power Source:</b>	12VDC Battery

## Section 2 : Test Conditions

### 2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.231

Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

### 2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

### 2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

### 2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSP	FA001920	March 17/07
Spectrum Analyzer	Hewlett-Packard	8565E	FA000981	Sept. 15/06
Biconical (1) Antenna	EMCO	3109	FA000805	April 22/06
Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Aug. 29/06
Horn Antenna #1	EMCO	3115	FA000649	Jan. 12/07
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	July 14/06
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	July 14/06
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	July 14/06

## **Section 3 : Observations**

### **3.1 Modifications Performed During Assessment**

No modifications were performed during assessment.

### **3.2 Record Of Technical Judgements**

No technical judgements were made during the assessment.

### **3.3 EUT Parameters Affecting Compliance**

The user of the apparatus could not alter parameters that would affect compliance.

### **3.4 Test Deleted**

No Tests were deleted from this assessment.

### **3.5 Additional Observations**

The following observation was made during this assessment:

#### **3.5.1 Model Differences**

The BeaconBuoy comes in two models, the 91000 and 91001. The difference between the models is the battery pack used in the BeaconBuoy receiver. One of the battery packs has a longer charge life than the other.

## **Section 4 : Results Summary**

This section contains the following:

FCC Part 15 Subpart C : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N      No : not applicable / not relevant.
- Y      Yes : Mandatory i.e. the apparatus shall conform to these tests.
- N/T    Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

**4.1 FCC Part 15 Subpart C : Test Results**

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	N	PASS
15.209(a)	Radiated Emissions within Restricted Bands	Y	
15.231(a)(1)	Manually operated transmitter	Y	
15.231(a)(2)	Automatically activated transmitter	N	
15.231(a)(3)	Periodic transmissions at regular predetermined intervals	N	
15.231(a)(4)	Radiators used in cases of emergency	N	PASS
15.231(a)(5)	Set-up information for security systems	N	
15.231(b)	Radiated Emissions	Y	
15.231(c)	20dB Bandwidth	Y	
15.231(d)	Devices operating within the frequency band 40.66-40.70 MHz	N	
15.231(e)	Radiated emissions for Periodic radiators	N	

Notes:



## Appendix A : Test Results

### Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009-0.490	2400/F (kHz)	300
0.490-1.705	24000/F (kHz)	30
1.705-30.0	30	30
30-88	1001	3
88-216	1502	3
216-960	2003	3
Above 960	500	3

### Test Conditions:

<b>Sample Number:</b>	1	<b>Temperature:</b>	10
<b>Date:</b>	March 15, 2006	<b>Humidity:</b>	35
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	OATS

### Test Results:

See Attached Table for Results

### Additional Observations:

The Spectrum was searched from 30MHz to 4.5GHz.

These results apply to emissions found in the Restricted bands defined in FCC Part 15 Subpart C, 15.205.

The EUT was measured on three orthogonal axis.

All measurements were performed using a Peak Detector with 100kHz RBW/VBW below 1GHz and a 1MHz RBW/VBW above 1GHz at a distance of 3 meters.

	Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr.	Cable Loss (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1301.7000	Horn1	V	80.2	25.1	48.0	-9.0	3.4	60.7 51.7	74.0 54.0	13.3 2.3	Peak Average
2	1301.7000	Horn1	H	80.3	25.1	48.0	-9.0	3.4	60.8 51.8	74.0 54.0	13.2 2.2	Peak Average
3	3905.1000	Horn1	V	74.2	32.7	57.4	-9.0	7.1	56.6 47.6	74.0 54.0	17.4 6.4	Peak Average
4	3905.1000	Horn1	H	76.5	32.8	57.4	-9.0	7.1	59.0 50.0	74.0 54.0	15.0 4.0	Peak Average
5	4339.0000	Horn1	V	69.8	32.5	54.2	-9.0	7.9	56.0 47.0	74.0 54.0	18.0 7.0	Peak Average
6	4339.0000	Horn1	H	73.8	32.5	54.2	-9.0	7.9	60.1 51.1	74.0 54.0	13.9 2.9	Peak Average

**Clause 15.231(a) Conditions for intentional radiators to comply with periodic operation**

The provisions of this section are restricted to periodic operation within the band 40.66-40.70 MHz and above 70 MHz. Except as shown in paragraph (e) of this section, the intentional radiator is restricted to the transmission of a control signal such as those used with alarm systems, door openers, remote switches, etc. Continuous transmissions, voice, video and the radio control of toys are not permitted. Data is permitted to be sent with a control signal. The following conditions shall be met to comply with the provisions for this periodic operation:

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators, which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in paragraphs (a)(1) and (a)(2) of this section, provided such transmissions are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	23
<b>Date:</b>	March 16, 2006	<b>Humidity:</b>	15
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	Wireless

**Test Results:**

- 1) The EUT stops transmitting immediately following the release of the switch.
- 2) The EUT is not automatically activated.
- 3) The EUT does not periodically transmit.
- 4) The EUT is not part of a security system.
- 5) The EUT is not part of a security system.

**Clause 15.231(b) Radiated Emissions**

In addition to the provisions of 15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750	125 to 375
174-260	3,750	375
260-470	3,750 to 12,500	375 to 1,250
Above 470	12,500	1,250

**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	10
<b>Date:</b>	March 15, 2006	<b>Humidity:</b>	35
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	OATS

**Test Results:**

See Attached Table for Results

**Additional Observations:**

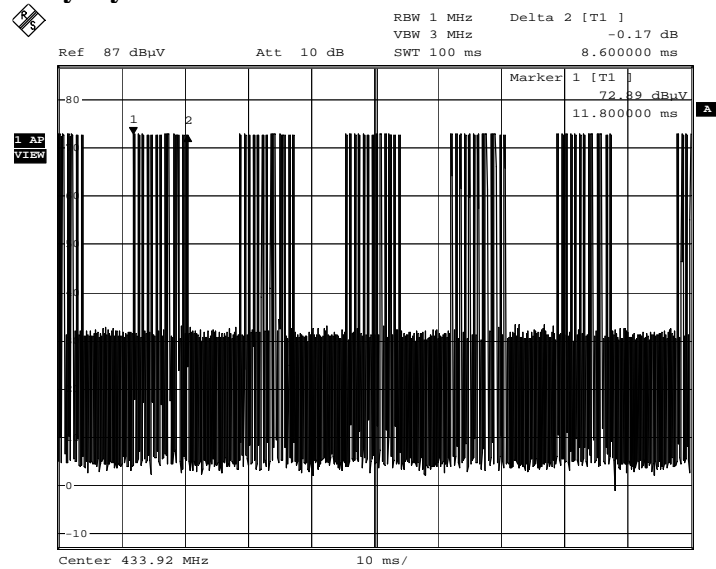
The Spectrum was searched from 30MHz to 4.5GHz.

The EUT was measured on three orthogonal axis.

All measurements were performed using a Peak Detector with 100kHz RBW/VBW below 1GHz and a 1MHz RBW/VBW above 1GHz at a distance of 3 meters.

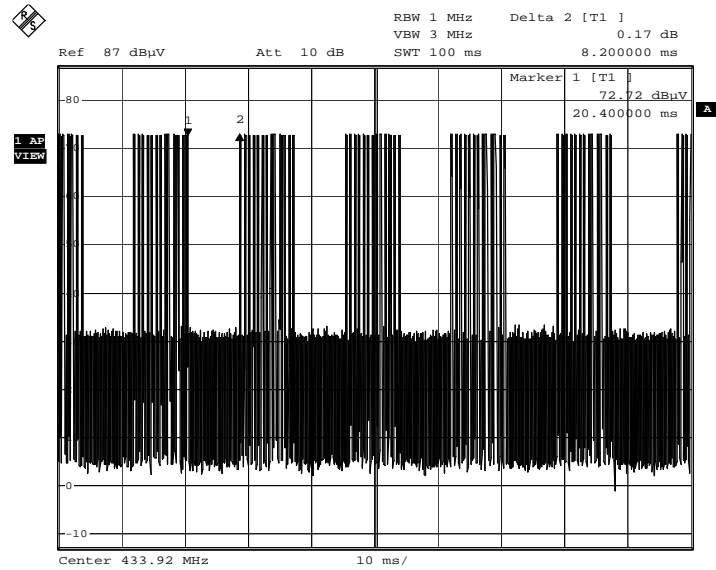
Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr. (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
433.9000	LP1	V	62.0	16.1	N/A	-9.0	3.1	72.2	80.8	8.6
433.9000	LP1	H	62.3	16.8	N/A	-9.0	3.1	73.2	80.8	7.6
867.8000	LP1	V	38.7	22.1	N/A	-9.0	4.3	56.1	60.8	4.7
867.8000	LP1	H	38.8	23.1	N/A	-9.0	4.3	57.2	60.8	3.6
1735.6000	Horn1	V	79.3	27.2	47.8	-9.0	4.0	53.9	60.8	6.9
1735.6000	Horn1	H	80.7	27.3	47.8	-9.0	4.0	55.3	60.8	5.5
2169.5000	Horn1	V	85.2	28.7	57.7	-9.0	4.7	51.8	60.8	9.0
2169.5000	Horn1	H	83.0	28.7	57.7	-9.0	4.7	49.7	60.8	11.1
2603.4000	Horn1	V	72.8	30.2	58.9	-9.0	5.3	40.4	60.8	20.4
2603.4000	Horn1	H	75.5	30.2	58.9	-9.0	5.3	43.1	60.8	17.7
3037.3000	Horn1	V	73.2	31.2	59.2	-9.0	5.8	41.9	60.8	18.9
3037.3000	Horn1	H	76.0	31.3	59.2	-9.0	5.8	44.8	60.8	16.0
3471.2000	Horn1	V	77.2	31.3	58.5	-9.0	6.4	47.4	60.8	13.4
3471.2000	Horn1	H	69.8	31.4	58.5	-9.0	6.4	40.1	60.8	20.7
Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole										

# Duty Cycle:



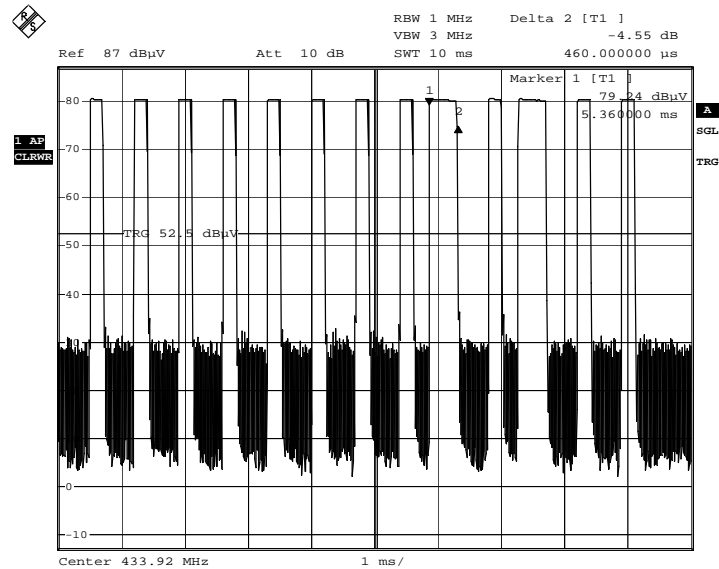
Pulses during 100msec

Date: 13.MAR.2006 15:53:37



Pulses during 100msec

Date: 13.MAR.2006 15:54:16



Pulse Time

Date: 13.MAR.2006 16:13:01

Long pulse on-time = 460usec

Number of pulses per packet = 13

Number of packets in 100msec =  $100 / (8.6 + 8.2) = 5.95$

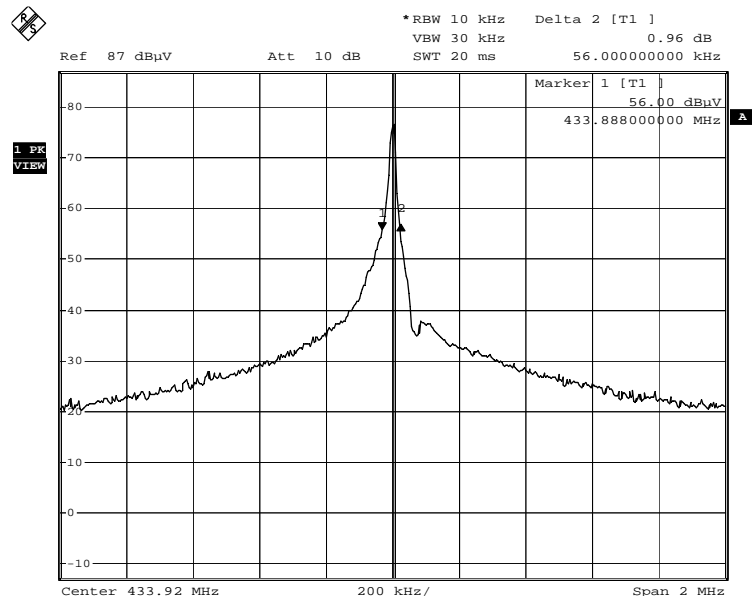
Duty Cycle =  $20\log((13 \times 0.46 \times 5.95) / 100) = -9\text{dB}$

**Clause 15.231(c) 20dB Bandwidth**

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**Test Conditions:**

<b>Sample Number:</b>	1	<b>Temperature:</b>	23
<b>Date:</b>	Mar 13, 2006	<b>Humidity:</b>	15
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	Wireless

**Test Results:****20dB Bandwidth:**

20dB Bandwidth

Date: 13.MAR.2006 15:51:59



## **Appendix B : Setup Photographs**

### **Spurious Emissions Setup:**





## Appendix C : Block Diagram of Test Setups

### Test Site For Radiated Emissions

