



**Test Report:** 6W64566


**Applicant:** Cranesmart Systems Inc  
4908-97 Street  
Edmonton, Alberta  
T6E 5S1

**Apparatus:** Cranesmart Angle

**FCC ID:** NFBLAB124

**In Accordance With:** FCC Part 15 Subpart C, 15.249  
Operation in the 902-928MHz, 2400 - 2483.5 MHz,  
5725-5850MHz and 24.0-24.25 GHz

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

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

**Date:** August 14, 2006

**Total Number of Pages:** 18

## 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>	Cranesmart Angle
<b>Specification:</b>	FCC Part 15 Subpart C, 15.249
<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:

Angle (M/N: 124)

### 1.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
7a	Boom angle transducer	None
7b	Boom angle transducer	None
7c	Boom angle transducer	None

The first samples were received on: April 10, 2006

### 1.3 Theory of Operation

The Crane Smart Angle is a wireless boom angle transducer for cranes and heavy lifting equipment. It measures the boom angle of the crane in real time, digitizes this angle, and then transmits the result using a 900 MHz packet transmitter.

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

**Manufacturer:** Cranesmart Systems Inc

**Operating Frequency:** 902.7 – 927.4MHz

**Emission Designator** F1D

**Modulation:** FSK

**Antenna Data:** Integral

**Power Source:** 3.6VDC battery

## Section 2 : Test Conditions

### 2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart C, 15.249

Operation in the 902-928MHz, 2400 - 2483.5 MHz, 5725-5850MHz  
and 24.0-24.25 GHz bands

### 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	FSP40	FA001920	Mar 17/07
Spectrum Analyzer	HP	8565E	FA00981	Sept 15/06
Receiver	Rohde & Schwarz	ESVS-30	FA001445	July 14/07
Biconical (1) Antenna	EMCO	3109	FA000805	May 03/07
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	Aug 2/07
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	Aug 2/07
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	Aug 2/07
5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409	COU

COU – Calibrate on Use

NCR – No Calibration Required

## **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**

There were no additional observations made during this assessment.

## **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	
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.215(c)	Occupied Bandwidth	Y	PASS
15.249(a)	Radiated emissions not in Restricted Bands	Y	PASS
15.249(b)	Fixed Point-to-Point operation in the 24.0-24.25 GHz Band	N	
15.249(d)	Spurious emissions (except Harmonics)	Y	PASS

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 (microvoltsmeter)	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	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

### Test Conditions:

<b>Sample Number:</b>	7	<b>Temperature:</b>	23
<b>Date:</b>	August 3, 2006	<b>Humidity:</b>	52
<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 the 10<sup>th</sup> Harmonic.

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. The EUT was tested with fresh new batteries.

All measurements were performed at 3m with a Peak detector of 100kHz RBW/VBW below 1GHz and a Peak detector of 1MHz RBW/VBW above 1GHz.

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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 2708.1000	Horn1	V	66.8	30.2	59.8	N/A	5.4	42.7	54.0	11.3	Peak
2 2708.1000	Horn1	H	71.3	30.2	59.8	N/A	5.4	47.2	54.0	6.8	Peak
3 2745.2100	Horn1	V	58.8	30.2	59.7	N/A	5.4	34.8	54.0	19.2	Peak
4 2745.2100	Horn1	H	70.2	30.3	59.7	N/A	5.4	46.1	54.0	7.9	Peak
5 2782.2000	Horn1	V	69.2	30.3	59.7	N/A	5.5	45.2	54.0	8.8	Peak
6 2782.2000	Horn1	H	67.8	30.3	59.7	N/A	5.5	43.9	54.0	10.1	Peak

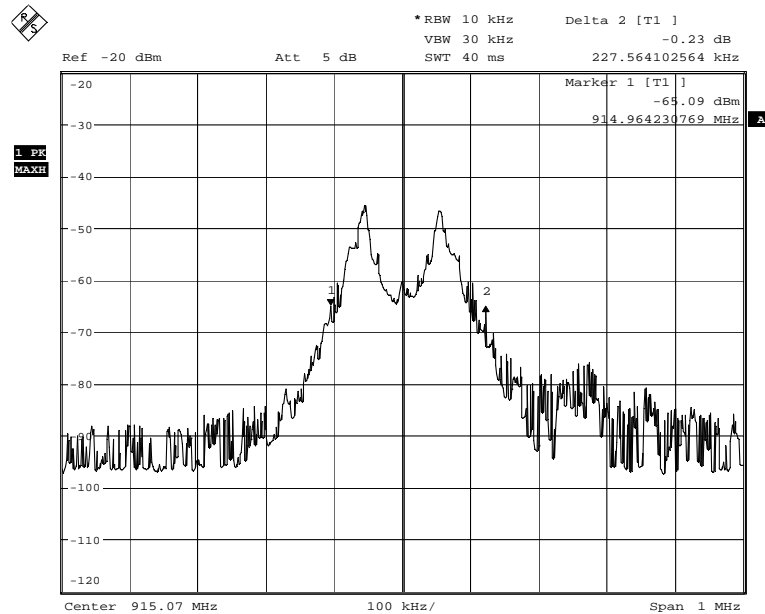
**Clause 15.215(c) Occupied Bandwidth**

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

**Test Conditions:**

<b>Sample Number:</b>	7	<b>Temperature:</b>	23
<b>Date:</b>	August 3, 2006	<b>Humidity:</b>	52
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	OATS

**Test Results:**



20dB Bandwidth  
 Date: 4.AUG.2006 10:52:25

**Clause 15.249(a) Radiated emissions not in Restricted Bands**

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field Strength of Fundamental (millivolts/meter)	Field Strength of Harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

**Test Conditions:**

<b>Sample Number:</b>	7	<b>Temperature:</b>	23
<b>Date:</b>	August 3, 2006	<b>Humidity:</b>	52
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	OATS

**Test Results:** See attached Table

**Additional Observations:**

The Spectrum was searched from 30MHz to the 10<sup>th</sup> Harmonic.

The EUT was measured on three orthogonal axis. The EUT was tested with fresh new batteries.

All measurements were performed at 3m with a Peak detector of 100kHz RBW/VBW below 1GHz and a Peak detector of 1MHz RBW/VBW above 1GHz.

Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 902.7000	LP1	V	56.2	23.0	N/A	4.5	83.7	94.0	10.3	Peak
2 902.7000	LP1	H	55.8	23.6	N/A	4.5	83.9	94.0	10.1	Peak
3 1805.5150	Horn1	V	55.3	27.3	49.1	4.1	37.7	54.0	16.3	Peak
4 1805.5150	Horn1	H	59.0	27.4	49.1	4.1	41.5	54.0	12.5	Peak
5 915.0700	LP1	V	48.1	23.0	N/A	4.6	75.7	94.0	18.3	Peak
6 915.0700	LP1	H	55.3	23.7	N/A	4.6	83.6	94.0	10.4	Peak
7 1830.1400	Horn1	V	56.2	27.4	49.1	4.1	38.6	54.0	15.4	Peak
8 1830.1400	Horn1	H	59.2	27.5	49.1	4.1	41.7	54.0	12.3	Peak
9 927.4000	LP1	V	49.6	23.1	N/A	4.6	77.3	94.0	16.7	Peak
10 927.4000	LP1	H	51.2	24.1	N/A	4.6	79.9	94.0	14.1	Peak
11 1854.8000	Horn1	V	53.3	27.4	49.1	4.2	35.8	54.0	18.2	Peak
12 1854.8000	Horn1	H	51.7	27.5	49.1	4.2	34.3	54.0	19.7	Peak

**Clause 15.249(d) Spurious emissions (except Harmonics)**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

**Test Conditions:**

<b>Sample Number:</b>	7	<b>Temperature:</b>	23
<b>Date:</b>	August 3, 2006	<b>Humidity:</b>	52
<b>Modification State:</b>	0	<b>Tester:</b>	Jason Nixon
		<b>Laboratory:</b>	OATS

**Test Results:**

Frequency (MHz)	Antenna	Polarity	RCVD Signal (dBuV)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1 902.0000	LP1	V	9.3	23.0	N/A	4.5	36.8	46.0	9.2	Q-Peak
2 928.0000	LP1	V	9.3	23.1	N/A	4.6	37.0	46.0	9.0	Q-Peak

**Additional Observations:**

The Spectrum was searched from 30MHz to the 10<sup>th</sup> Harmonic.

The EUT was measured on three orthogonal axis. The EUT was tested with fresh new batteries.

All measurements were performed at 3m with a Quasi-Peak detector below 1GHz and a Peak detector of 1MHz RBW/VBW above 1GHz.

## **Appendix B : Setup Photographs**

### **Spurious Emissions Setup:**







## Appendix C : Block Diagram of Test Setups

### Test Site For Radiated Emissions

