

Nemko Test Report: 2L0344RUS1

Applicant: Robinson Engineering Co.
1914 Silver Street
Garland, Texas 75042

Equipment Under Test: CraneBoss Remote Control Transmitter
(E.U.T.)

In Accordance With: FCC Part 15, Subpart C, 15.249
For 900 MHz Transmitters

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

Authorized By: 
David Light, Wireless Group Supervisor

Date: 7/17/02

Total Number of Pages: 22

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EQUIPMENT: CraneBoss Remote Control Transmitter**Section 1. Summary Of Test Results**

Manufacturer: Robinson Engineering Co.

Model No.: CraneBoss Remote Control

Serial No.: S01

General: All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15.249. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated Emissions were made on an open area test site.



New Submission



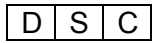
Production Unit



Class II Permissive Change



Pre-Production Unit



Equipment Code

This test report relates only to the item(s) tested.

The following deviations from, additions to, or exclusions from the test specifications have been made. None



NVLAP LAB CODE: 100426-0

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EQUIPMENT: CraneBoss Remote Control Transmitter**Summary Of Test Data**

NAME OF TEST	PARA. NO.	RESULT
Conducted Emissions	15.207	Complies
Radiated Emissions	15.249	Complies

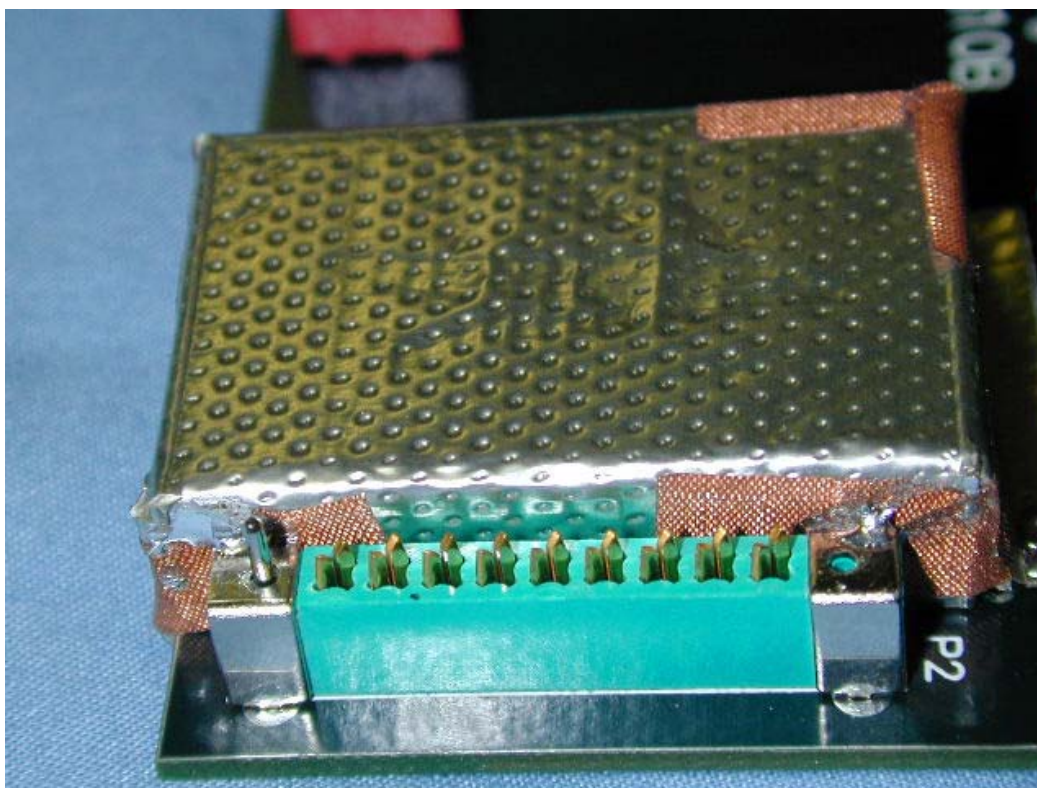
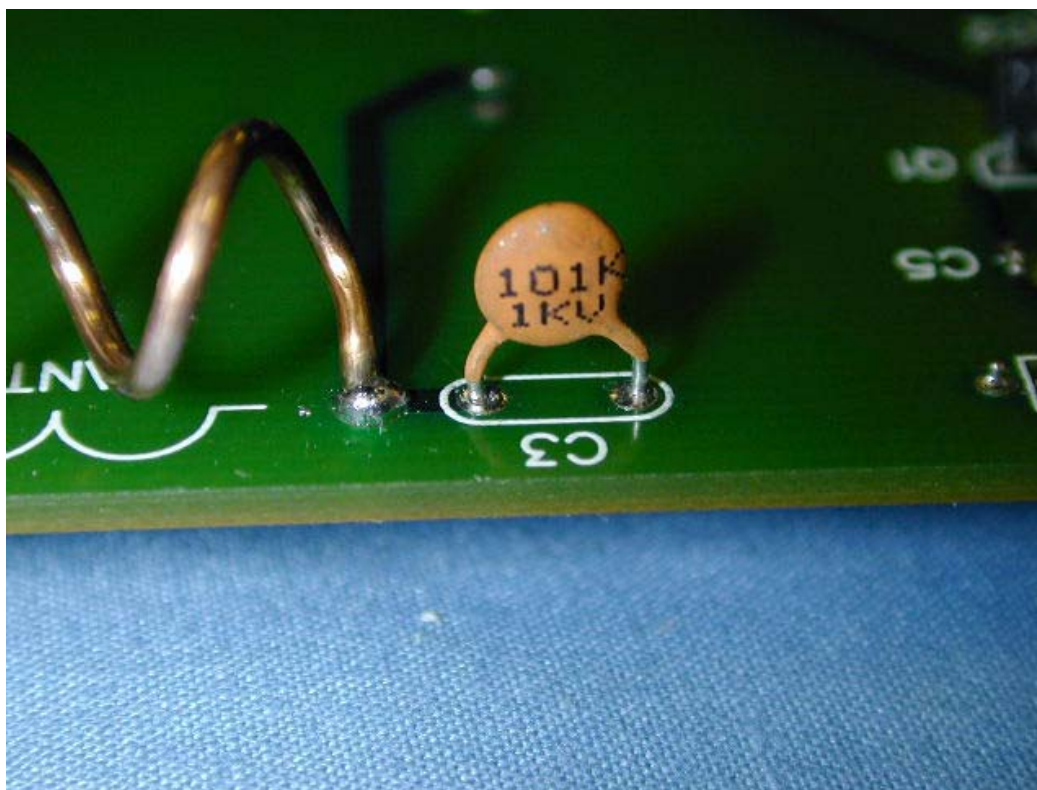
Footnotes:

Modifications made During Testing:

- 1) 10pF capacitor added at antenna to reduce harmonic levels
- 2) Shield added over RF section.

Refer to photos

EQUIPMENT: CraneBoss Remote Control Transmitter



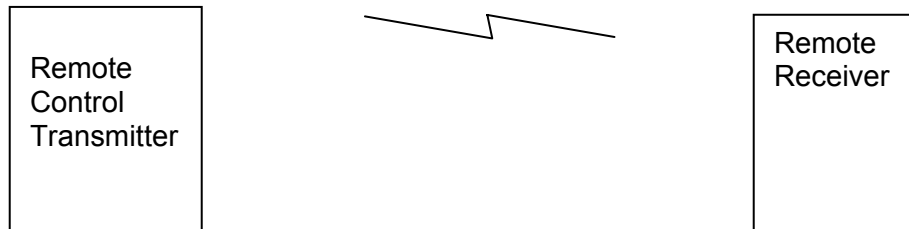
EQUIPMENT: CraneBoss Remote Control Transmitter**Section 2. General Equipment Specification**

Operating Frequency(ies) of Sample:	910.7-917.7 MHz
Tunable Bands:	N/A
Number of Channels:	Eight
Channel Spacing:	1 MHz
Modulation:	FSK
User Frequency Adjustment:	Dip Switches
Integral Antenna	Yes ☒ No ☐

Note: If antenna is not integral to transmitter explain method of attachment and type of unique connector:

EQUIPMENT: CraneBoss Remote Control Transmitter**Description of Operation:**

The transmitter is a simple FSK modulated transmitter that transmits control data signals to a remote receiver for the purpose of controlling crane systems. The transmitted signal falls wholly within the 902 – 928 MHz ISM band.

System Diagram

EQUIPMENT: CraneBoss Remote Control Transmitter**Section 3. Powerline Conducted Emissions**

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207
TESTED BY: Tom Tidwell	DATE: 7/17/2002

Minimum Standard:

Frequency (MHz)	Maximum Powerline Conducted RF Voltage	
	(μ V)	(dB μ V)
0.45 - 30.0	250	48

Test Results: Complies. See attached graph(s).**Measurement Data:** See attached graph(s).

Method of Measurement: (Procedure ANSI C63.4-1992)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak Detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak Detector.

EQUIPMENT: CraneBoss Remote Control Transmitter



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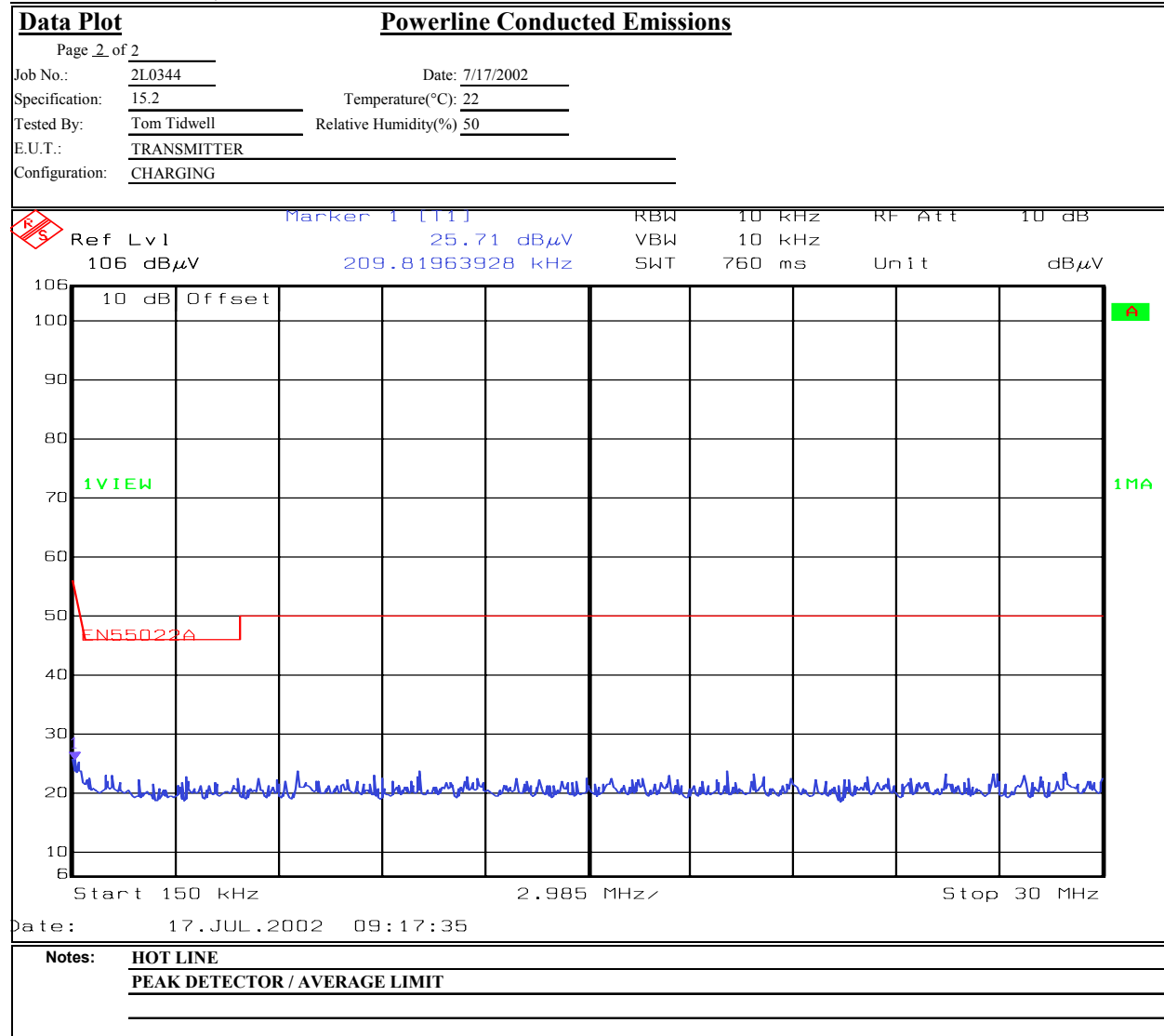
Data Plot		Powerline Conducted Emissions	
Page 1 of 2			
Job No.: 2L0344	Date: 7/17/2002	Complete: ☒	Preliminary: ☐
Specification: 15.209	Temperature(°C): 22		
Tested By: Tom Tidwell	Relative Humidity(%): 50		
E.U.T.: TRANSMITTER			
Configuration: CHARGING			
Sample Number: 1			
Location: Lab 4	RBW: 10 kHz	Measurement	
Detector Type: Peak	VBW: 10 kHz	Distance: NA	m
Test Equipment Used			
Antenna:	LISN: 969		
Pre-Amp:	Cable #1: 1266		
Filter: 758	Cable #2: 1999		
Receiver: 1036	Cable #3:		
Attenuator #1:	Cable #4:		
Attenuator #2:	Limiter: 674		
Additional equipment used:			
Measurement Uncertainty: +/-1.7 dB			
Ref Lvl 106 dBμV Marker 1 [11] 25.81 dBμV 568.73747495 kHz RBW 10 kHz VBW 10 kHz SWT 760 ms RF Att 10 dB Unit dBμV Start 150 kHz 2.985 MHz Stop 30 MHz			
Date: 17.JUL.2002 09:16:11			
Notes: NEUTRAL LINE			
PEAK DETECTOR / AVERAGE LIMIT			

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EQUIPMENT: CraneBoss Remote Control Transmitter

Conducted Photographs (Worst Case Configuration)



EQUIPMENT: CraneBoss Remote Control Transmitter**Section 4. Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.249
TESTED BY: Tom Tidwell	DATE: 7/18/02

Minimum Standard: Para no. 15.249

The field strengths shall not exceed the following:

Fundamental (MHz)	Field Strength (mV/m)	Field Strength (dB μ V)	Harmonic (mV/m)	Harmonic (dB μ V)
902-928	50	94	0.5	54

Field strength limits are specified at a distance of 3 metres.

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 limits of 15.209 whichever is the less attenuation.

For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Results: Complies

Measurement Data: See attached table.

Maximizing Emission Levels: The EUT is tested in three orthogonal axis in order to determine worst-case emission levels.

The transmitter was tested with a fully charged battery.

EQUIPMENT: CraneBoss Remote Control Transmitter**Test Data - Radiated Emissions**

<u>Radiated Emissions</u>								
Page <u>1</u> of <u>2</u>								
Job No.: 2L0344R		Date: 7/8/2002						
Specification: CFR 47, 15.249		Temperature(°C): <u>23</u>						
Tested By: Tom Tidwell		Relative Humidity(%) <u>45</u>						
E.U.T.: CraneBoss Control Transmitter								
Configuration: Full Continuous TX mode								
Sample Number: S01								
Location: AC 3		RBW: 1 MHz						
Detector Type: Peak		VBW: 1 MHz						
<u>Test Equipment Used</u>								
Antenna: 1304		Directional Coupler: #N/A						
Pre-Amp: 1016		Cable #1: 1484						
Filter: 1481		Cable #2: 1485						
Receiver: 1464		Cable #3: #N/A						
Attenuator #1: #N/A		Cable #4: #N/A						
Attenuator #2: #N/A		Mixer: #N/A						
Measurement Uncertainty: +/-1.6 dB								
Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
921.33	59.3	22.5	1.8	0	83.6	94	-10.4	Vertical (Peak)
921.3300	62.7	22.5	1.8	0.0	87.0	94	-7.0	Horizontal (Peak)
1842.6600	55.8	26.0	2.7	33.3	51.2	54	-2.8	Vertical (Peak)
1842.660	56.3	26.0	2.7	33.3	51.7	54	-2.3	Horizontal (Peak)
2763.99	53.5	28.5	3.7	33.6	52.1	54	-1.9	Vertical (Peak)
2763.99	53	28.5	3.7	33.6	51.6	54	-2.4	Horizontal (Peak)
3685.32	47.5	31.0	3.6	33.6	48.5	54	-5.5	Vertical (Peak)
3685.32	44.7	31.0	3.6	33.6	45.7	54	-8.3	Horizontal (Peak)
4606.6500	48.7	33.0	4.2	33.7	52.2	54	-1.8	Vertical (Peak)
4606.6500	45.8	33.0	4.2	33.7	49.3	54	-4.7	Horizontal (Peak)
9213.3	33.7	37.5	6.2	35.3	42.1	54	-11.9	Noise Floor
9213.3	33.5	37.5	6.2	35.3	41.9	54	-12.1	Noise Floor
Notes: The spectrum was searched up to 10 times the fundamental TX frequency.								

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Page 2 of 2		<u>Radiated Spurious Emissions</u>	
		Continuation Page	
Job No.:		Date:	7/8/2002
Specification:	CFR 47, Part 15.249	Temperature(°F):	23
Tested By:	#N/A	Relative Humidity(%)	45
E.U.T.:	CraneBoss Control Transmitter		
Configuration:	Full Continuous TX mode		

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
903.375	58.4	22.5	1.8	0	82.7	94	-11.3	Vertical (Peak)
903.3750	61.8	22.5	1.8	0.0	86.1	94	-7.9	Horizontal (Peak)
1806.6750	55.4	26.0	2.7	33.3	50.8	54	-3.2	Vertical (Peak)
1806.675	59.3	26.0	2.7	33.3	54.7	74	-19.3	Horizontal (Peak)
1806.675	56.7	26.0	2.7	33.3	52.1	54	-1.9	Horizontal (Average)
2710.125	55.6	28.5	3.7	33.6	54.2	74	-19.8	Vertical (Peak)
2710.125	52.7	28.5	3.7	33.6	51.3	54	-2.7	Vertical (Average)
2710.125	52.2	28.5	3.7	33.6	50.8	54	-3.2	Horizontal (Peak)
3613.5	45.5	31.0	3.6	33.6	46.5	54	-7.5	Vertical (Peak)
3613.5	46.8	31.0	3.6	33.6	47.8	54	-6.2	Horizontal (Peak)
4516.8750	46	33.0	4.2	33.7	49.5	54	-4.5	Vertical (Peak)
4516.8750	47.8	33.0	4.2	33.7	51.3	54	-2.7	Horizontal (Peak)
9033.8	34.4	37.5	6.2	35.3	42.8	54	-11.2	Noise Floor
9033.38	34.2	37.5	6.2	35.3	42.6	54	-11.4	Noise Floor
915.375	57.7	22.5	1.8	0	82.0	94	-12.0	Vertical (Peak)
915.3750	60.9	22.5	1.8	0.0	85.2	94	-8.8	Horizontal (Peak)
1830.7500	53.8	26.0	2.7	33.3	49.2	54	-4.8	Vertical (Peak)
1830.750	57.7	26.0	2.7	33.3	53.1	74	-20.9	Horizontal (Peak)
1830.750	54.6	26.0	2.7	33.3	50.0	54	-4.0	Horizontal (Average)
2746.125	55.1	28.5	3.7	33.6	53.7	74	-20.3	Vertical (Peak)
2746.125	52	28.5	3.7	33.6	50.6	54	-3.4	Vertical (Average)
2746.125	50.9	28.5	3.7	33.6	49.5	54	-4.5	Horizontal (Peak)
3661.5	44.7	31.0	3.6	33.6	45.7	54	-8.3	Vertical (Peak)
3661.5	45.5	31.0	3.6	33.6	46.5	54	-7.5	Horizontal (Peak)
4576.8750	41	33.0	4.2	33.7	44.5	54	-9.5	Noise Floor
4576.8750	41	33.0	4.2	33.7	44.5	54	-9.5	Noise Floor
9153.75	34.5	37.5	6.2	35.3	42.9	54	-11.1	Noise Floor
9153.75	34.5	37.5	6.2	35.3	42.9	54	-11.1	Noise Floor
Notes:	Low Channel and Mid Channel							

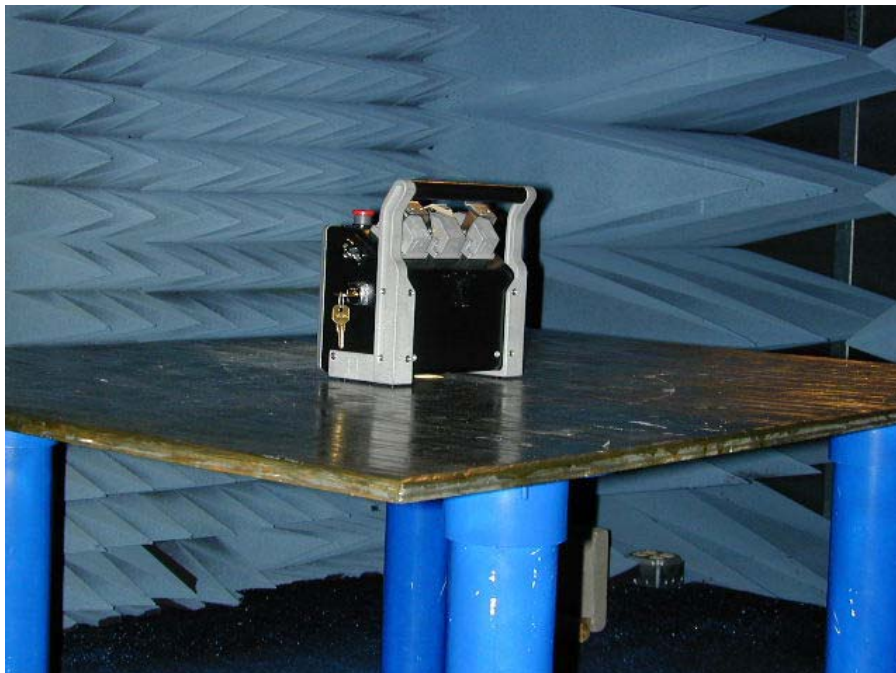
EQUIPMENT: CraneBoss Remote Control Transmitter

Radiated Photographs (Worst Case Configuration)

SIDE VIEW

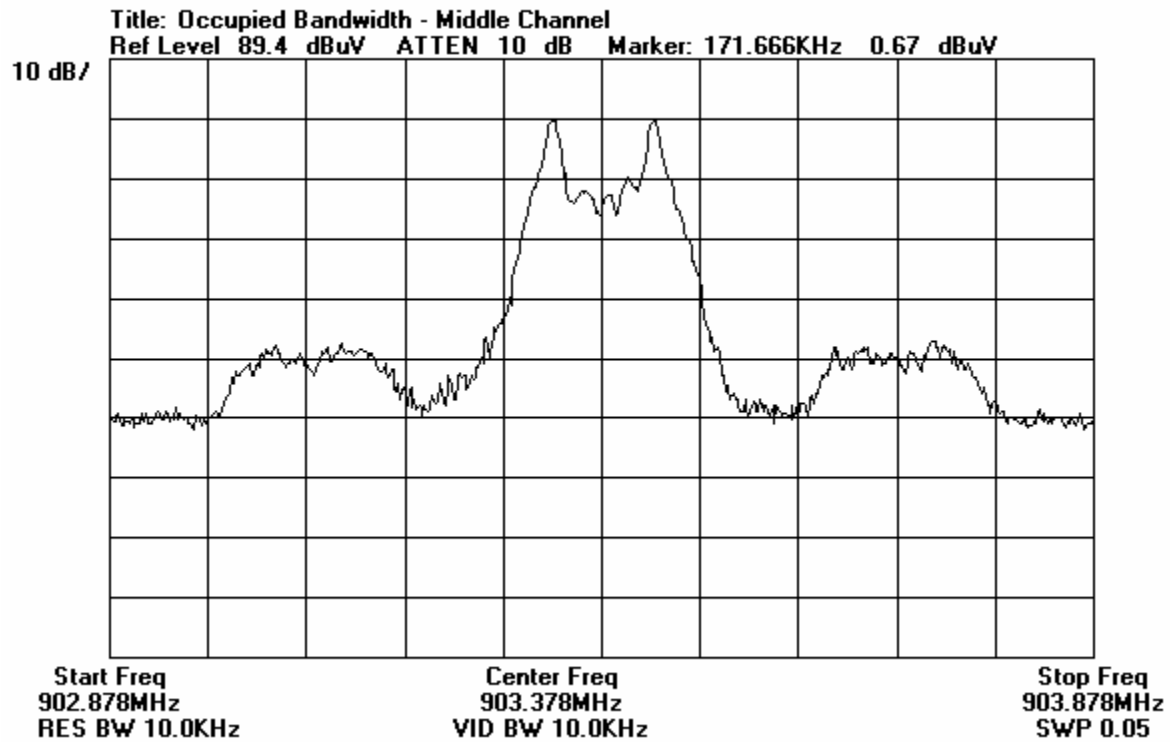


REAR VIEW

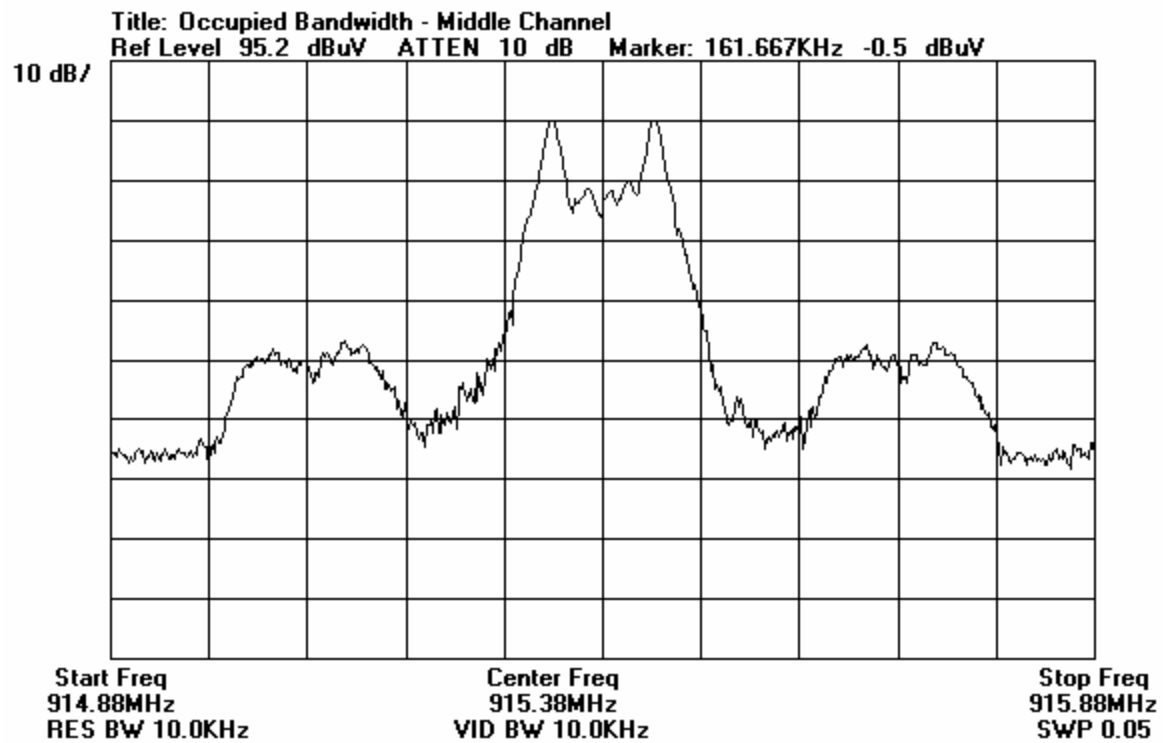


EQUIPMENT: CraneBoss Remote Control Transmitter

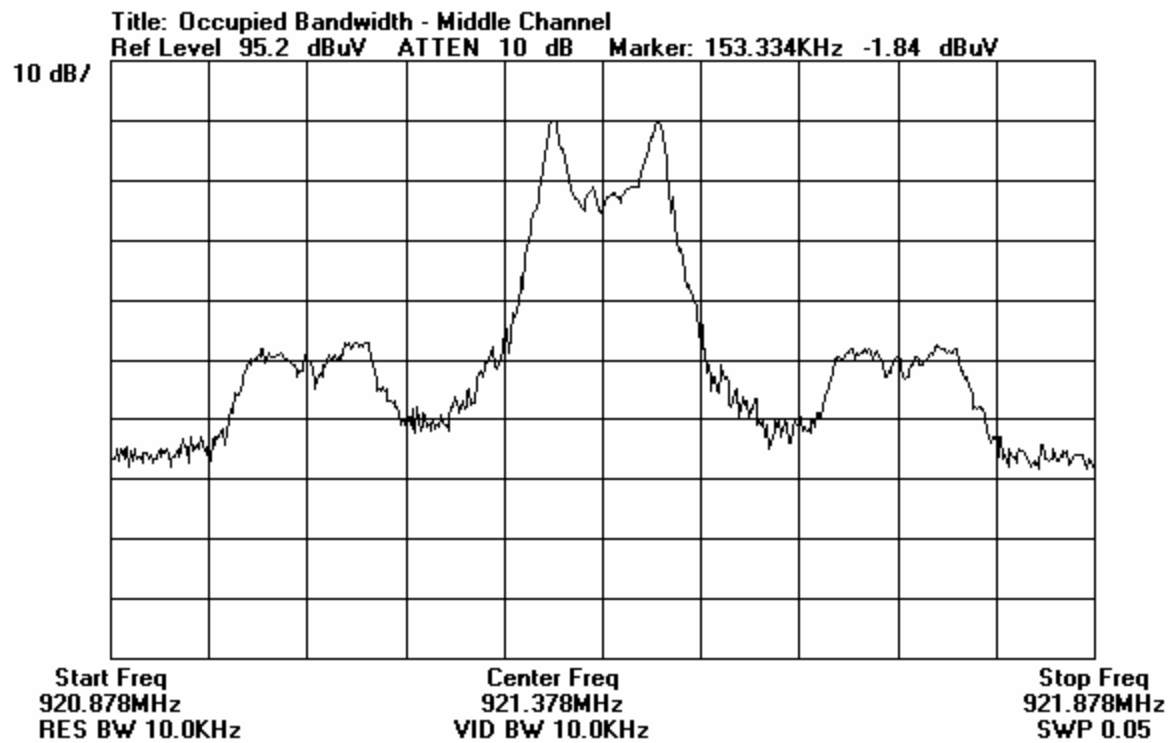
Section 5. Occupied Bandwidth



EQUIPMENT: CraneBoss Remote Control Transmitter



EQUIPMENT: CraneBoss Remote Control Transmitter



EQUIPMENT: CraneBoss Remote Control Transmitter**Section 6. Test Equipment List**

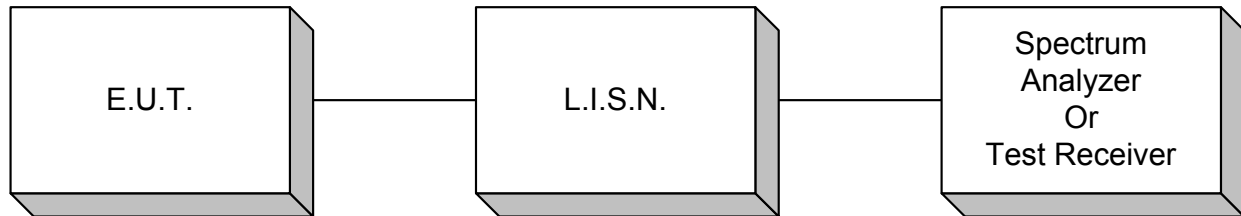
Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/31/03
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1481	Microwave Highpass Filter	K & L 3DH1-2000/T8000-0/0	4	Cal B4 Use	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/03/03
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/15/02	07/15/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/15/02	07/15/03
758	HIGH PASS FILTER	SOLAR 7930-5.0	197	07/18/01	07/18/02
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
969	L.I.S.N.	Schwarzbeck 8120	8120281	07/18/01	07/18/02
1266	CABLE, 10m	KTL RG223	N/A	06/03/02	06/03/03
1999	CABLE, .75m	KTL RG223	N/A	06/06/02	06/06/03
674	LIMITER	HP 11947A	3107A02200	CBU	N/A

ANNEX A

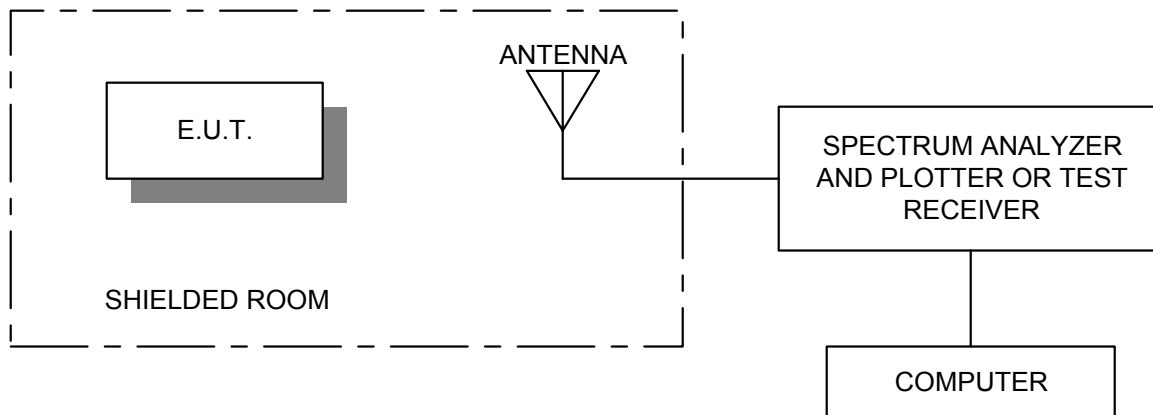
TEST DIAGRAMS

EQUIPMENT: CraneBoss Remote Control Transmitter

Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions

