Nemko Test Report:	2L0344RUS1
Applicant:	Robinson Engineering Co. 1914 Silver Street Garland, Texas 75042
Equipment Under Test: (E.U.T.)	CraneBoss Remote Control Transmitter
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

Table Of Contents

Section 1. Summary Of Test Results 3

Section 2. General Equipment Specification 6

Section 3. Powerline Conducted Emissions 8

Section 4. Radiated Emissions 12

Section 5. Occupied Bandwidth 16

Section 6. Test Equipment List 19

ANNEX A TEST DIAGRAMS 20

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

D	S	C

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

Summary Of Test Data

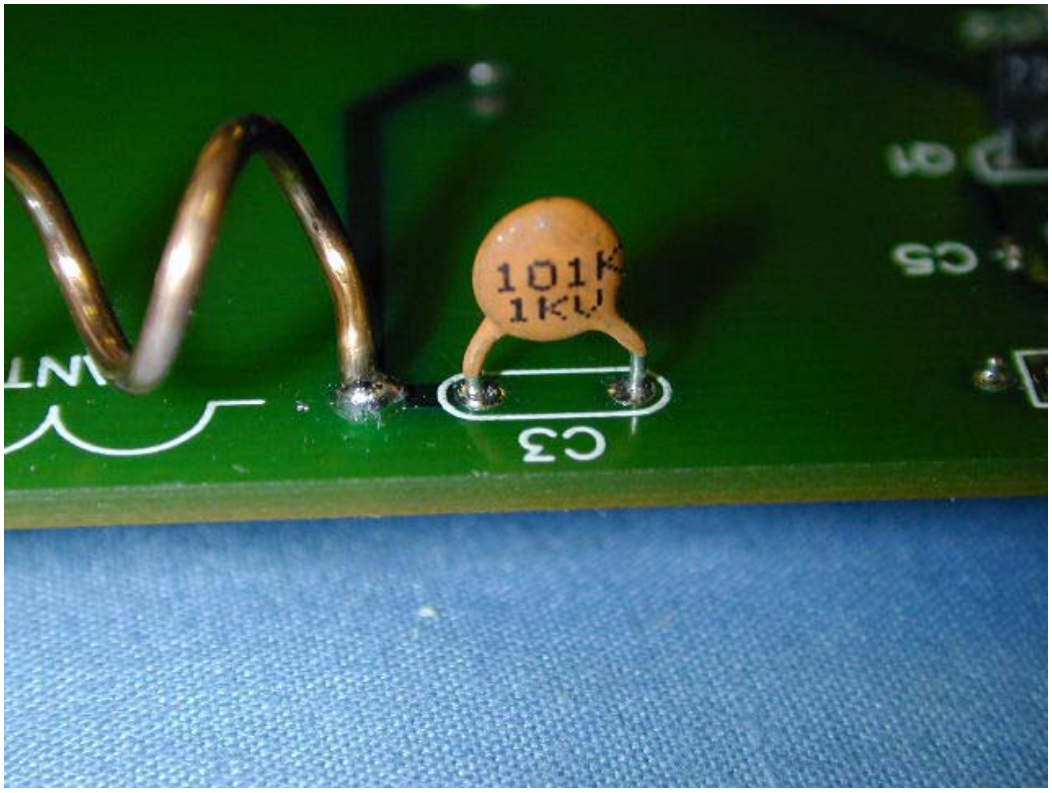
NAME OF TEST	PARA. NO.	RESULT
Conducted Emissions	15.207	Complies
Radiated Emissions	15.249	Complies

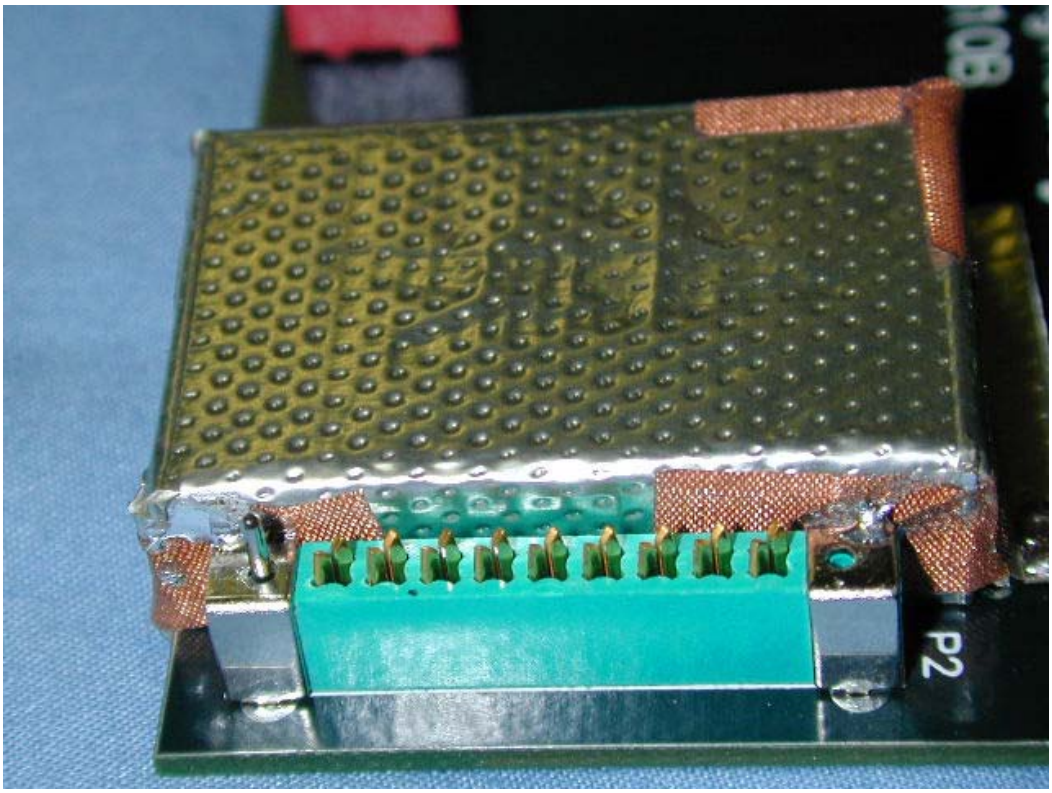
Footnotes:

Modifications made During Testing:

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

Refer to photos


101K
1KV
C3


P2

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

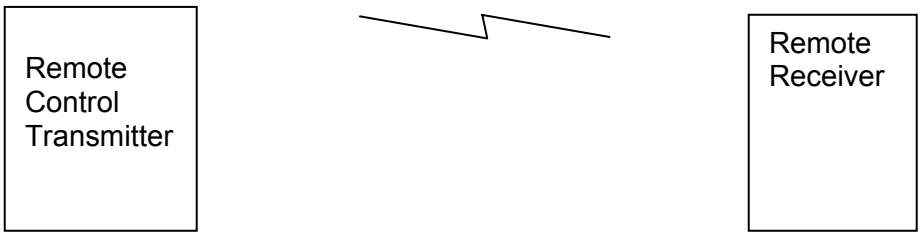
	Yes	No
Integral Antenna	☒	☐

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

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



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 (μV)	($dB\mu V$)
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.

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Data Plot — Powerline Conducted Emissions

Page 1 of 2

Complete: X
Preliminary:

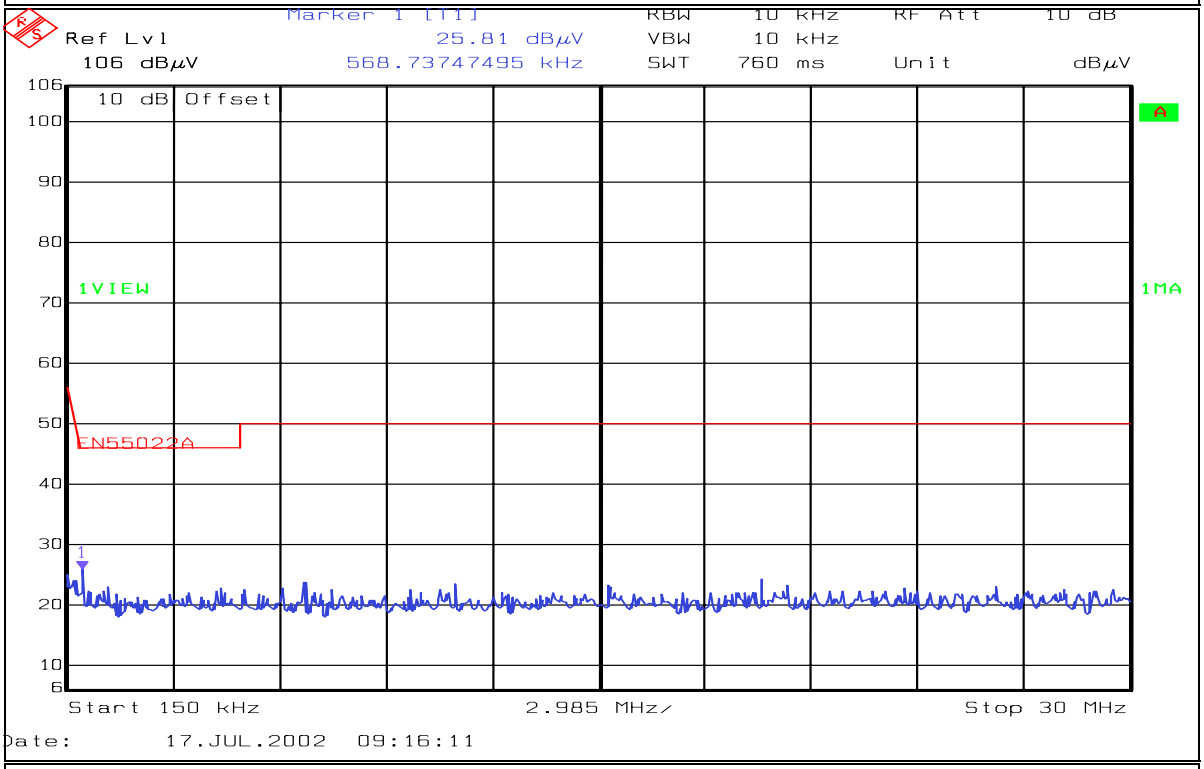
Job No.:	2L0344	Date:	7/17/2002
Specification:	15.209	Temperature(°C):	22
Tested By:	Tom Tidwell	Relative Humidity(%)	50
E.U.T.:	TRANSMITTER		
Configuration:	CHARGING		
Sample Number:	1		
Location:	Lab 4	RBW:	10 kHz
Detector Type:	Peak	VBW:	10 kHz

Measurement 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



Notes: **NEUTRAL LINE**
PEAK DETECTOR / AVERAGE LIMIT

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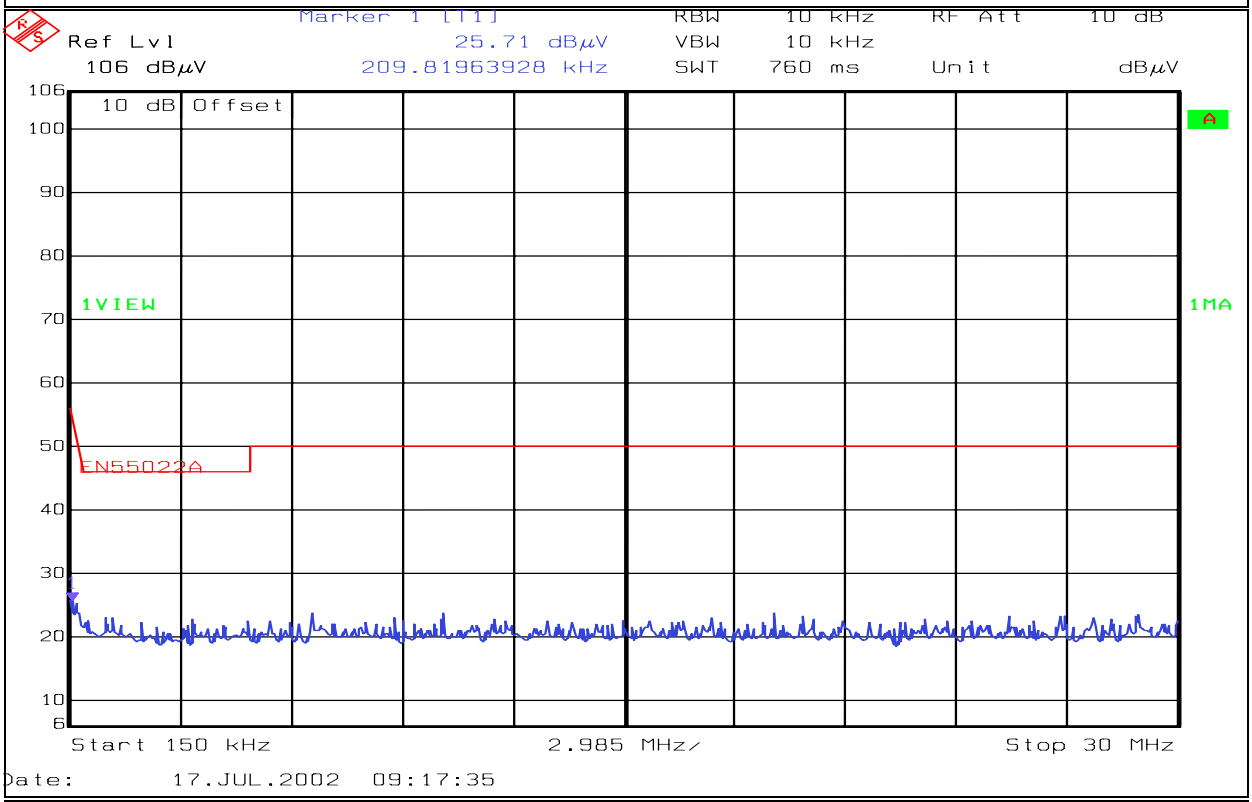
Data Plot — Powerline Conducted Emissions

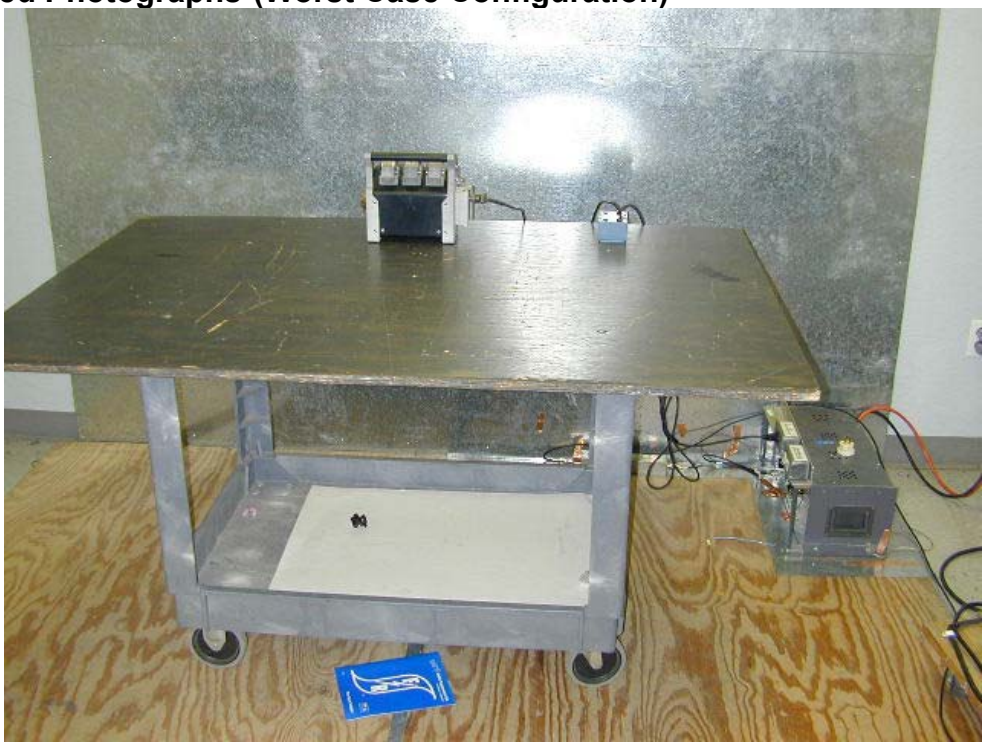
Page 2 of 2

Job No.:	2L0344	Date:	7/17/2002
Specification:	15.2	Temperature(°C):	22
Tested By:	Tom Tidwell	Relative Humidity(%)	50
E.U.T.:	TRANSMITTER		
Configuration:	CHARGING		



Notes: **HOT LINE**
PEAK DETECTOR / AVERAGE LIMIT

Conducted Photographs (Worst Case Configuration)



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 (dBμV)	Harmonic (mV/m)	Harmonic (dBμV)
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.

Test Data - Radiated Emissions

Radiated Emissions

Page 1 of 2

Job No.:	2L0344R	Date:	7/8/2002
Specification:	CFR 47, 15.249	Temperature(°C):	23
Tested By:	Tom Tidwell	Relative Humidity(%)	45
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

Test Equipment Used

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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Radiated Spurious Emissions

Page 2 of 2 **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

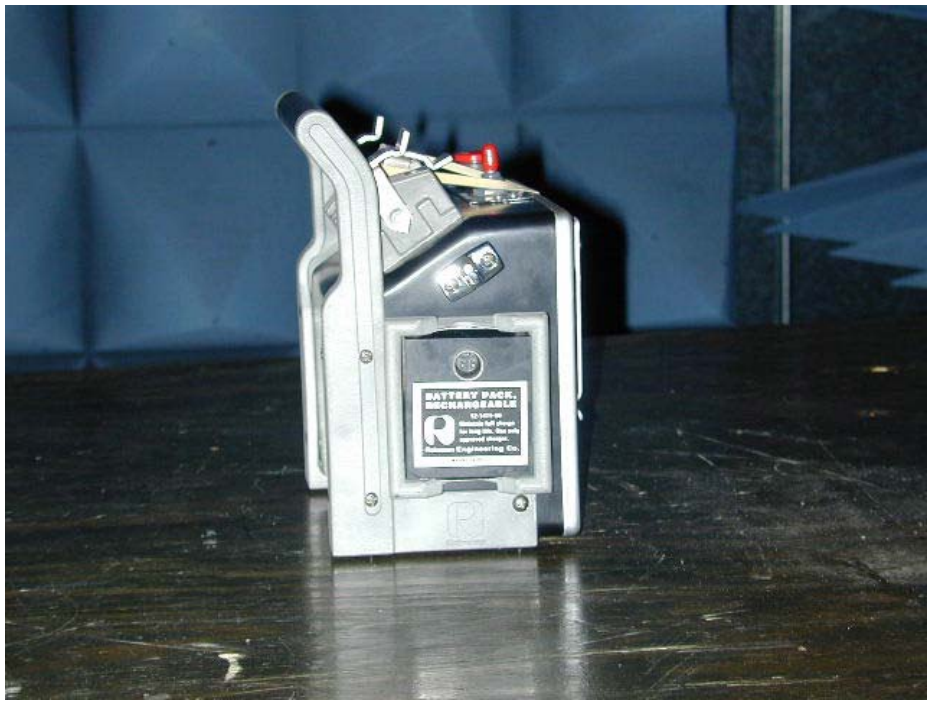
Configuration: Full Continuous TX mode

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

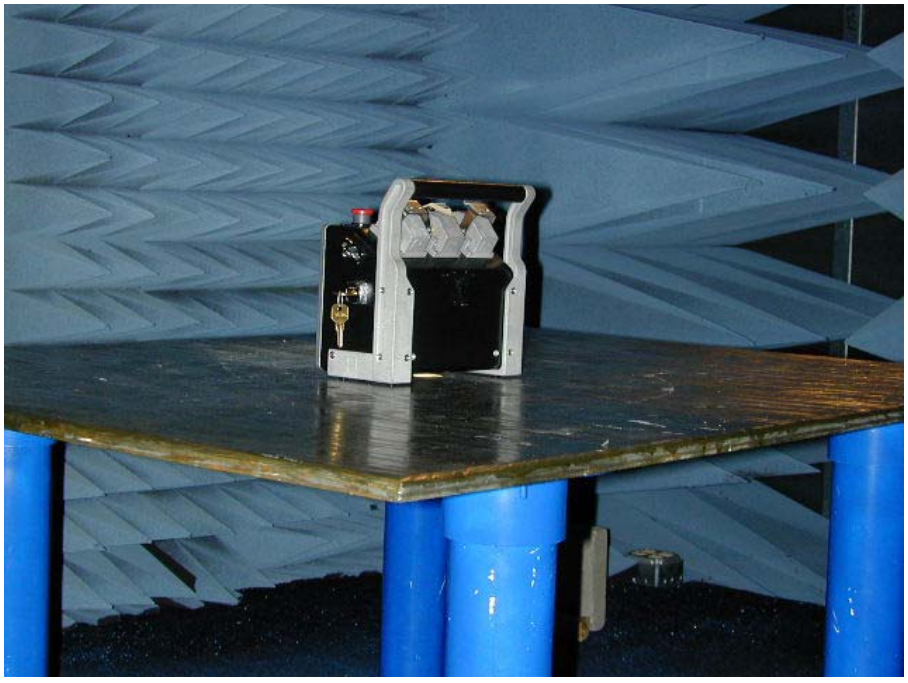
Notes: Low Channel and Mid Channel

Radiated Photographs (Worst Case Configuration)

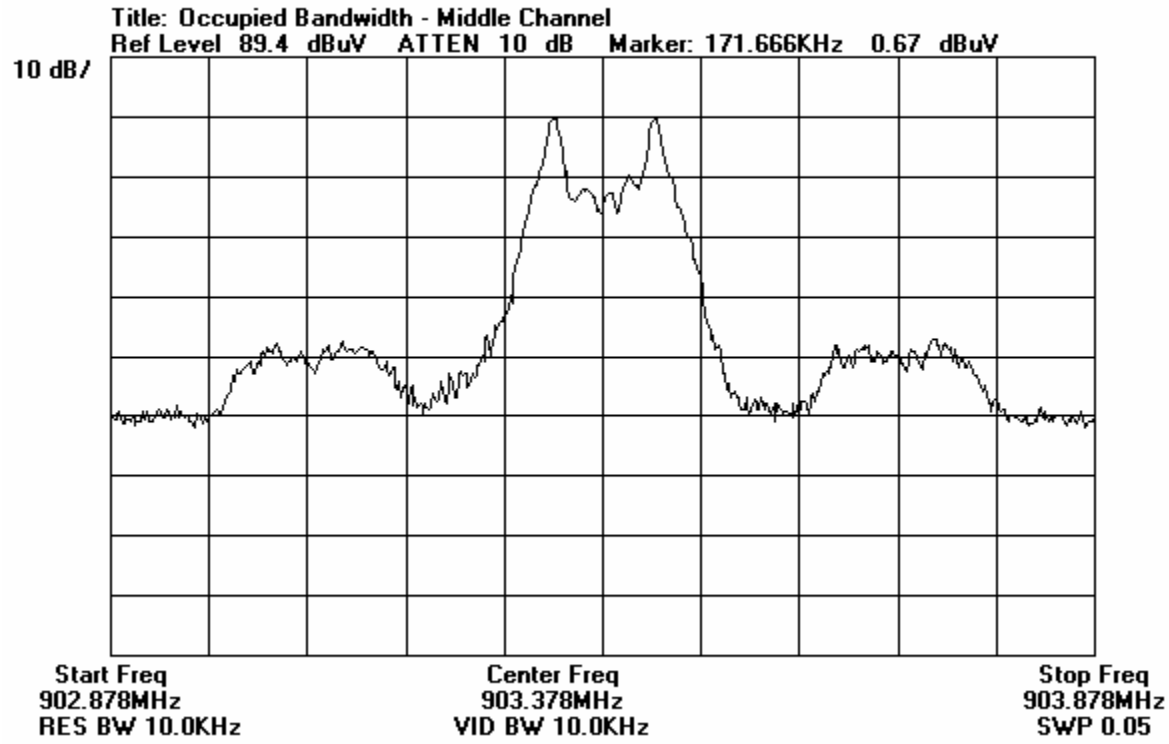
SIDE VIEW

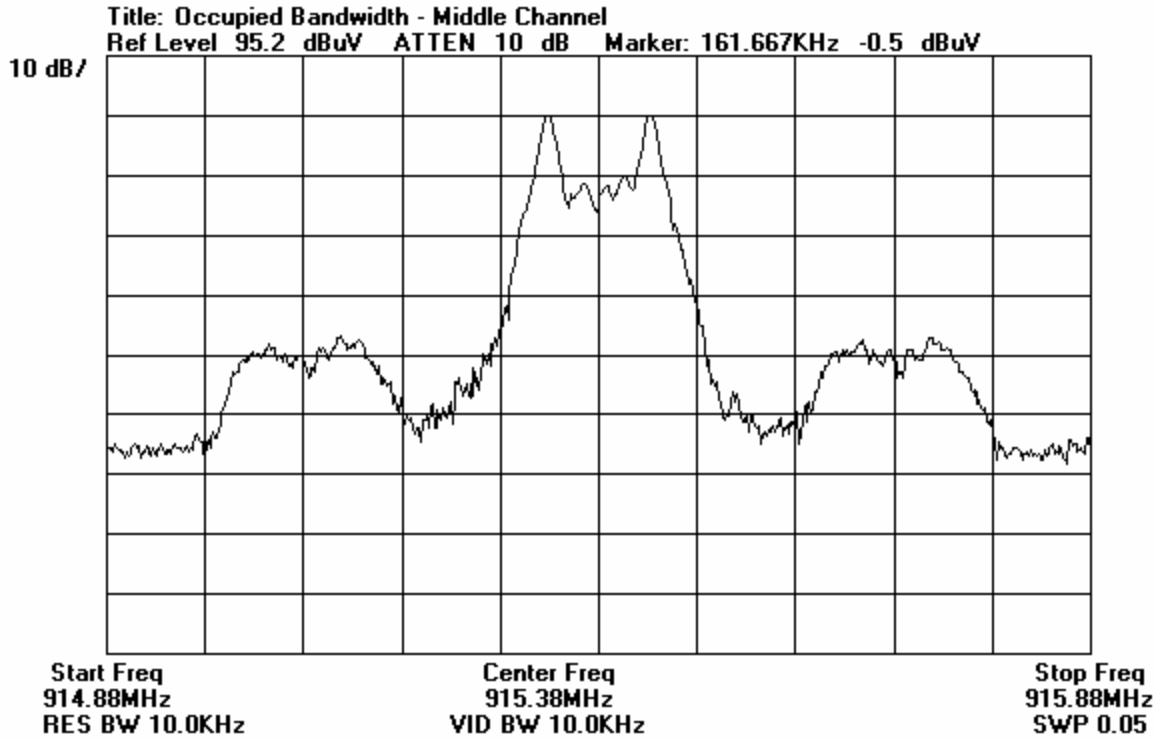


REAR VIEW



Section 5. Occupied Bandwidth

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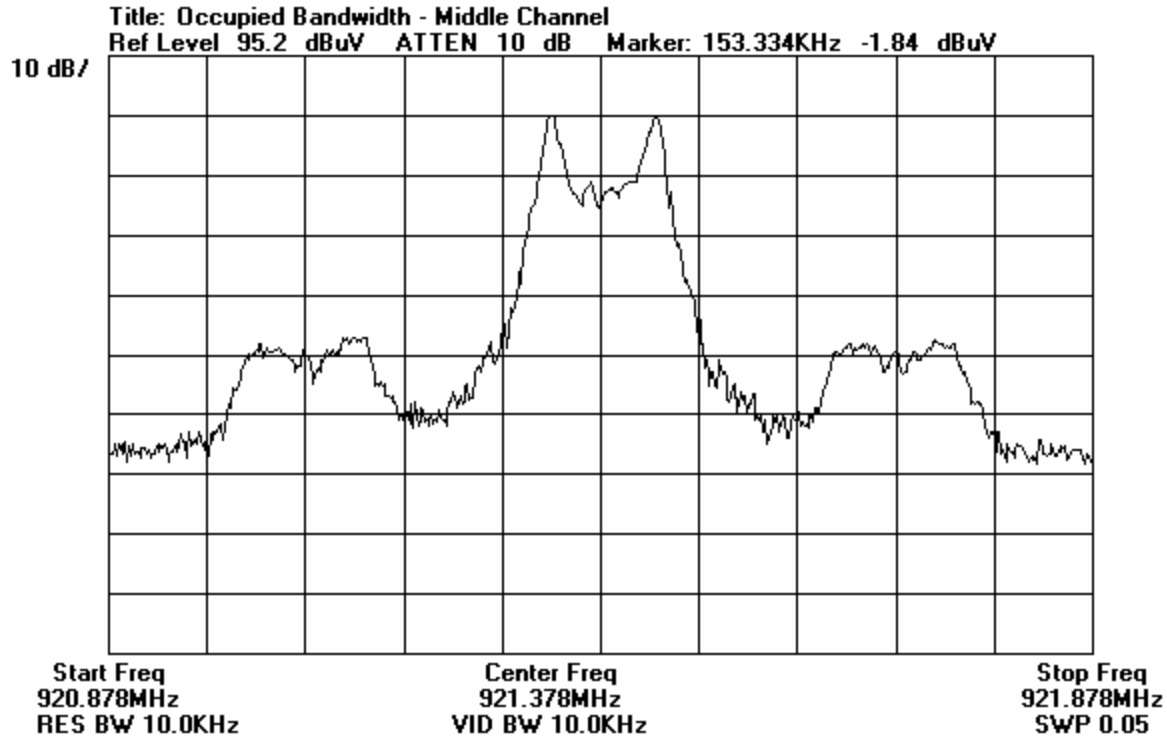
Ref Level 95.2 dBuV ATTEN 10 dB Marker: 161.667KHz -0.5 dBuV
10 dB/
Start Freq
914.88MHz
RES BW 10.0KHz
Center Freq
915.38MHz
VID BW 10.0KHz
Stop Freq
915.88MHz
SWP 0.05


Title: Occupied Bandwidth - Middle Channel
Ref Level 95.2 dBuV ATTEN 10 dB Marker: 153.334KHz -1.84 dBuV
10 dB/
Start Freq
920.878MHz
RES BW 10.0KHz
Center Freq
921.378MHz
VID BW 10.0KHz
Stop Freq
921.878MHz
SWP 0.05

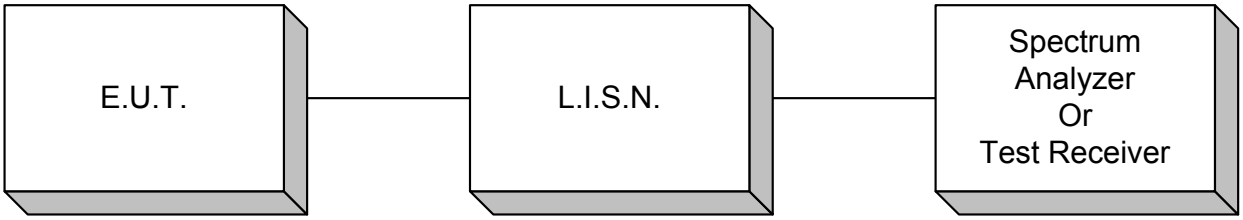
Section 6. Test Equipment List

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

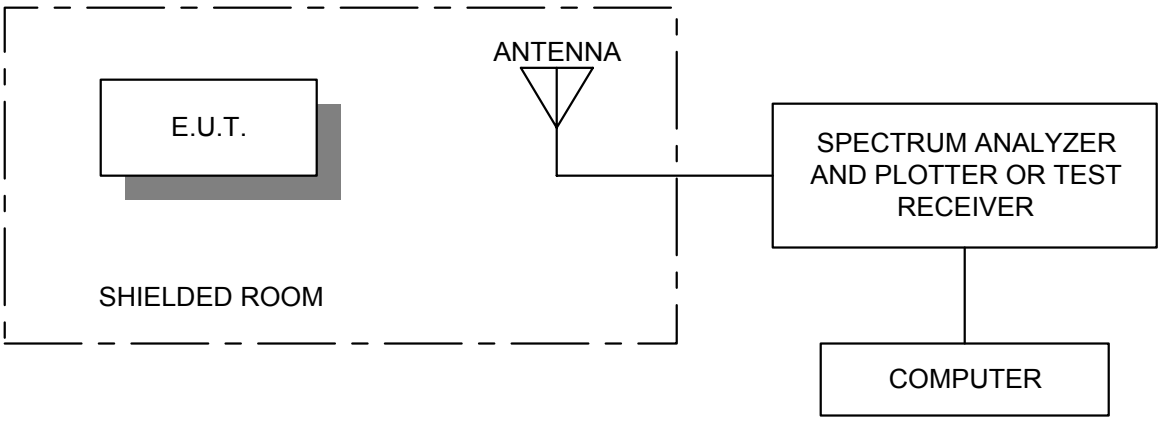
ANNEX A

TEST DIAGRAMS

Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions