



**Nemko Test Report:** 6L0093RUS1

**Applicant:** RF Monolithics  
4441 Sigma Road  
USA, TX 75244  
USA

**Equipment Under Test:** CM2202N  
(E.U.T.)

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

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

**Authorized By:**

A handwritten signature in black ink, appearing to read "Kevin Rose".

Kevin Rose, Senior Wireless Engineer

**Date:** March 16, 2006

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FOR 900 MHz TRANSMITTERS  
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## **Section 1. Summary Of Test Results**

Manufacturer: RF Monolithics

Model No.: CM2202N

Serial No.: None

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 C63.4-2003. Radiated Emissions were made on an open area test site.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

**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.

See "Summary of Test Data".

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**Summary Of Test Data**

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

**Footnotes For N/A's:**

The device is battery powered. The device was tested with a fresh battery.

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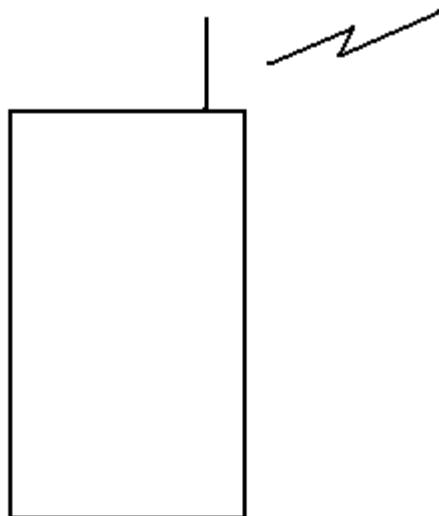
## **Section 2. General Equipment Specification**

<b>Frequency Range:</b>	916.5 MHz ( $\pm$ 200 kHz)	
<b>Operating Frequency(ies) of Sample:</b>	916.5 MHz	
<b>Tunable Bands:</b>	N/A	
<b>Number of Channels:</b>	One	
<b>Channel Spacing:</b>	NA	
<b>User Frequency Adjustment:</b>	None	
<b>Integral Antenna</b>	<b>Yes</b> <input checked="" type="checkbox"/>	<b>No</b> <input type="checkbox"/>

### **Theory of Operation**

The CM2202N is a 916.5 MHz transmitter module designed to monitor industrial alarm sensors. Communication range in an “open field” environment is typically 100 meters. The CM2202N combines RFM’s very low-current SAW resonator stabilized transmitter technology with low-power microcontroller technology to achieve long battery life.

### **System Diagram**



**Section 3. Radiated Emissions**

NAME OF TEST: Radiated Emissions	PARA. NO.: 15.249
TESTED BY: David Light	DATE: 3/13/06

**Minimum Standard:** Para no. 15.249

(a) The field strengths shall not exceed the following:

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

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

(c) 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.

(d) ...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.

## Test Data - Radiated Emissions

<u>Radiated Emissions</u>								
Page <u>1</u> of <u>1</u>								
Job No.:	6L0093	Date: 3/13/2006						
Specification:	15.249	Temperature(°C): 22						
Tested By:	David Light	Relative Humidity(%) 45						
E.U.T.:	RF Module							
Configuration:	Tx - Fresh batteries							
Sample Number:	1							
Location:	AC 3	RBW: 1 MHz						
Detector Type:	Peak	VBW: 1 MHz						
<u>Test Equipment Used</u>								
Antenna:	993	Directional Coupler: #N/A						
Pre-Amp:	1016	Cable #1: 1484						
Filter:	#N/A	Cable #2: 1485						
Receiver:	1036	Cable #3: #N/A						
Attenuator #1	#N/A	Cable #4: #N/A						
Attenuator #2:	#N/A	Mixer: #N/A						
Additional equipment:	759	760	791					
Measurement Uncertainty: +/- 3.6 dB								

Frequency (MHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Detector / Polarity
916.5	82.2	24.0	1.8	24.3	83.7	94		Peak/Vertical
916.5	70.0	24.0	1.8	24.3	71.5	94		Peak/Horizontal
1833.0	46.3	27.2	2.9	32.1	44.3	74	54	Peak/Vertical
2749.5	46.5	29.4	3.7	32.7	46.9	74	54	Peak/Vertical
3666.0	57.2	30.5	3.6	32.3	59.0	74		Peak/Vertical
3666.0	51.2	30.5	3.6	32.3	53.0		54	Average/Vertical
4582.5	47.0	32.3	4.1	32.3	51.1	74	54	Peak/Vertical
5499.0	43.2	33.6	4.7	33.6	47.9	74	54	Peak/Vertical
6415.5	41.3	35.1	5.2	35.1	46.5	74	54	Peak/Vertical
7332.0	41.0	35.8	5.2	35.8	46.2	74	54	Peak/Vertical
8248.5	41.0	37.3	5.7	33.2	50.8	74	54	Peak/Vertical
9165.0	41.3	37.0	5.7	34.8	49.2			Peak/Vertical
3666.0	50.0	30.5	3.6	32.3	51.8	74		Peak/Horizontal
3666.0	44.0	30.5	3.6	32.3	45.8		54	Average/Horizontal

Spectrum was searched from 30 MHz to 10 GHz

Average measurement is made by subtracting duty cycle correction from peak reading

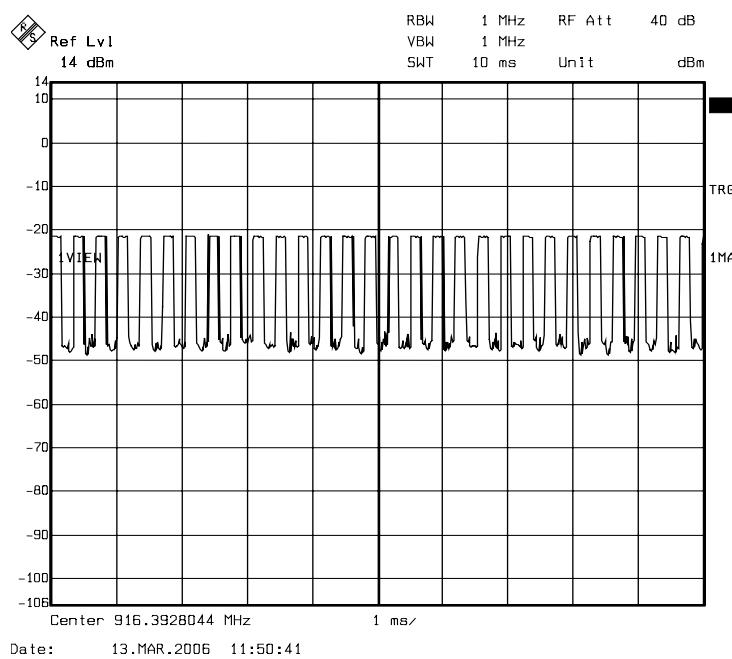
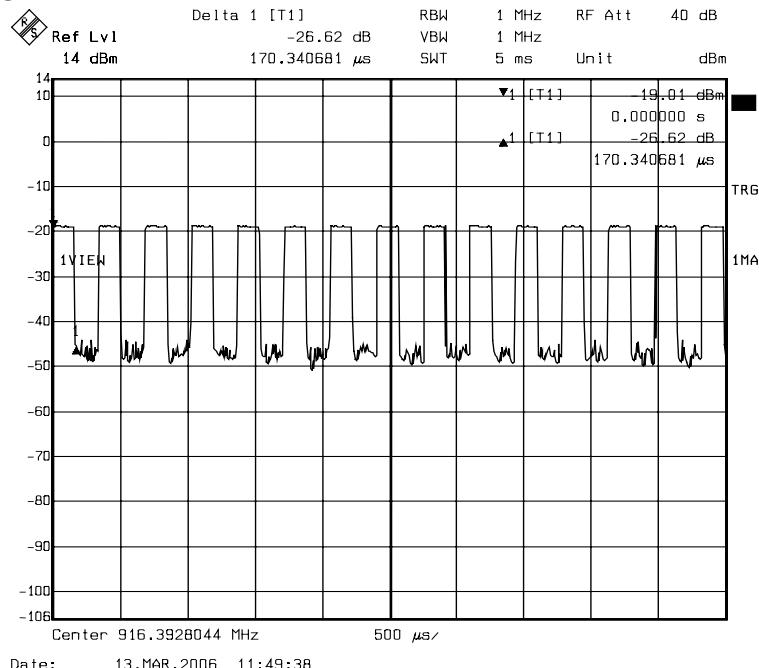
Carrier power was tested at +15% input voltage to battery cutoff. No change in output power was detected.  
The device was tested on three orthogonal axis'. Worse case emissions are reported.

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### Duty Cycle Plots

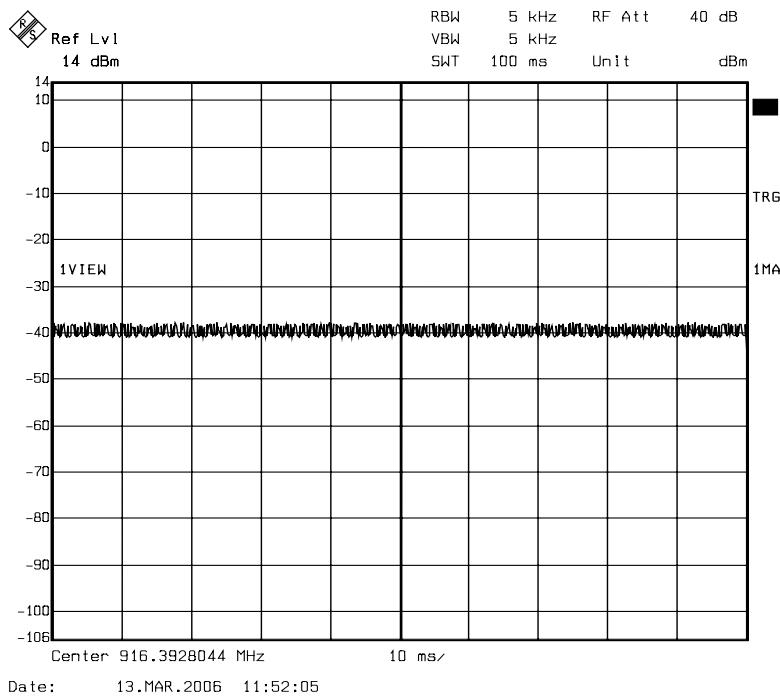


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### Duty Cycle Plots



Pulse = 170.34  $\mu$ s each

290 pulses / 100 mS

49.4 mS ON time in 100 mS

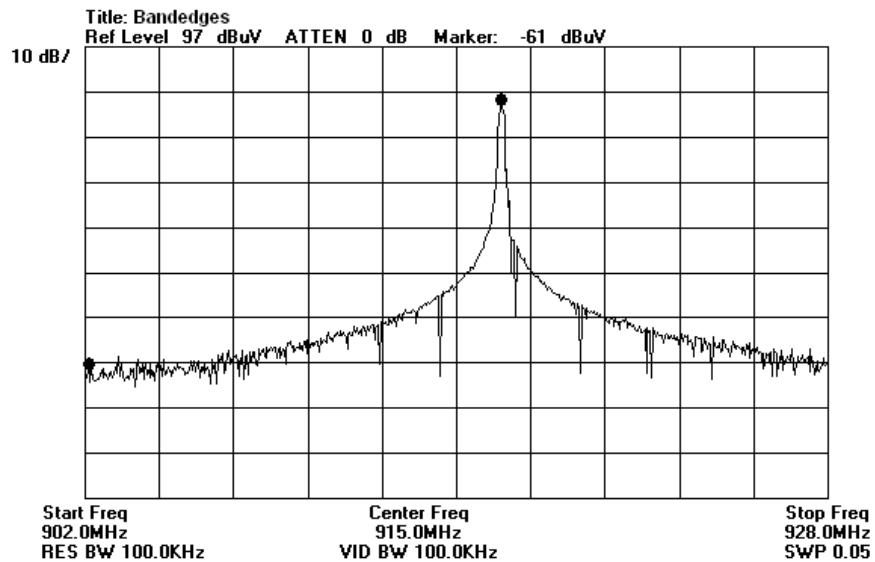
$20_{\log}(49.4/100) = -6.1$  dB duty cycle correction

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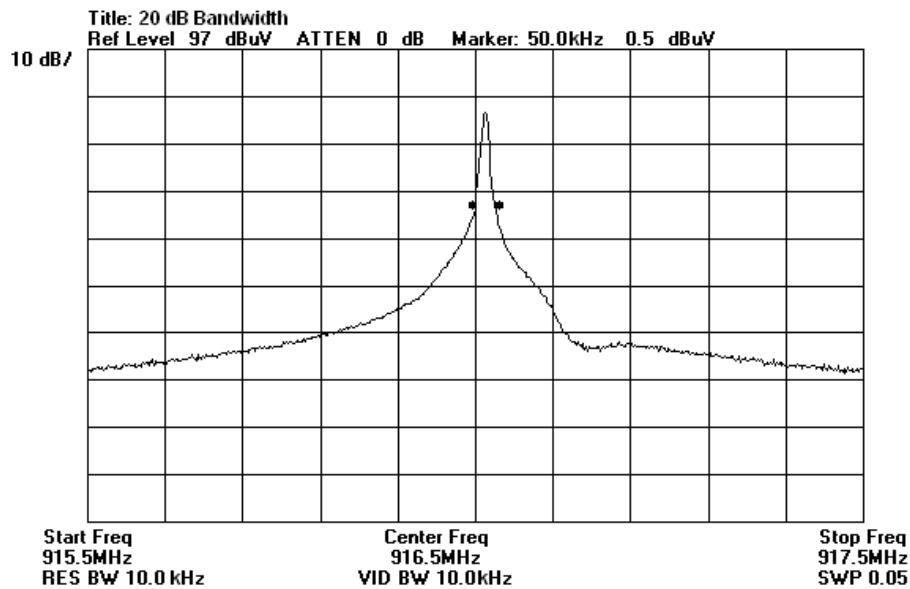
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## **Bandedges**



## **20 dB BW**

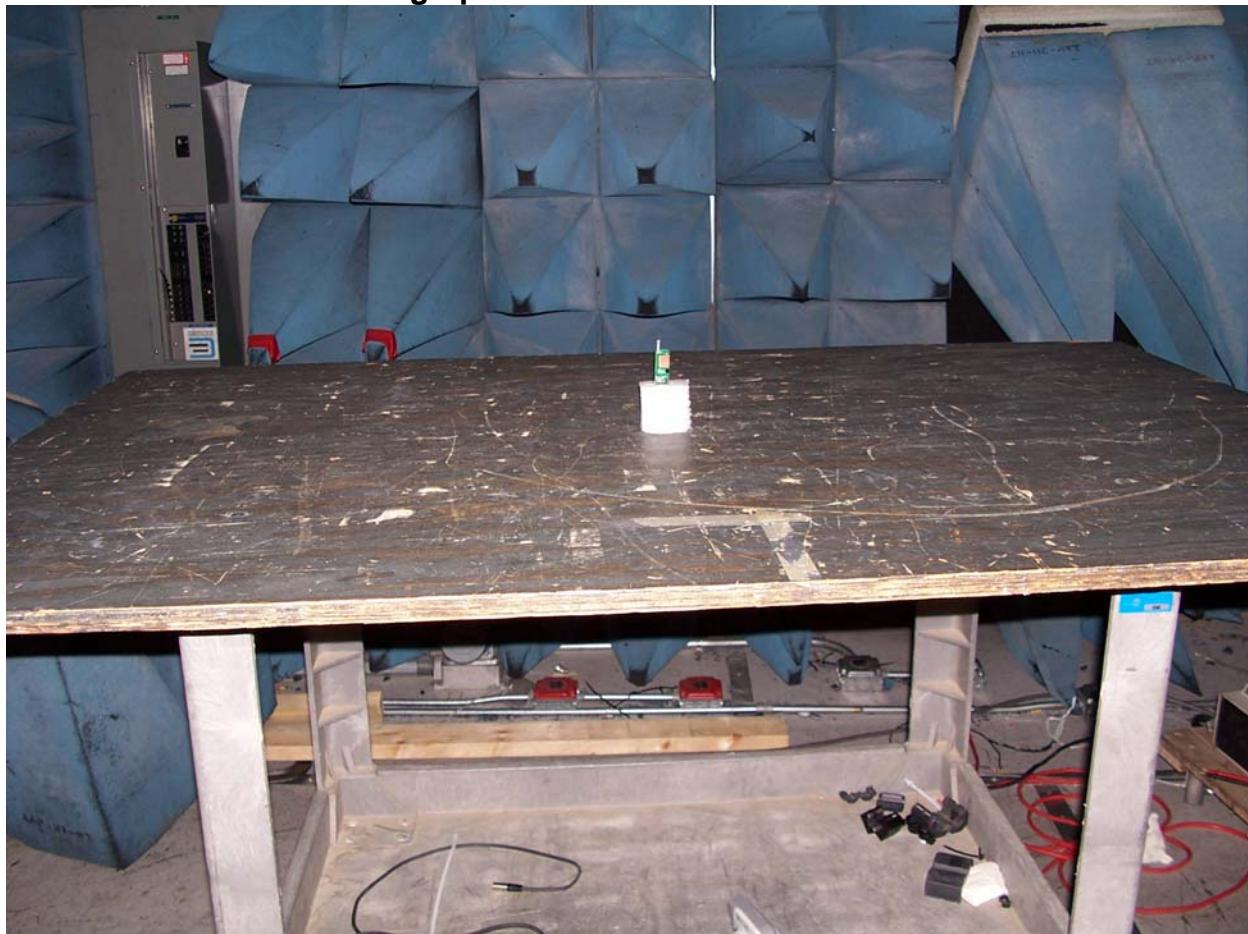


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**Radiated Emissions Photographs**



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## **Section 4. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/13/06	02/13/07
760	Antenna biconical	Electro Metrics MFC-25	477	08/04/05	08/04/06
791	PREAMP, 25dB	ICC LNA25	398	11/12/05	11/12/06
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/05	11/12/06
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/06/05	06/06/06
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/06/05	06/06/06

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**ANNEX A**

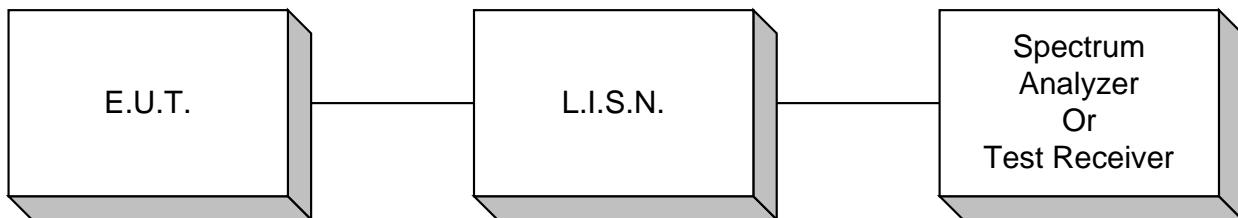
**TEST DIAGRAMS**

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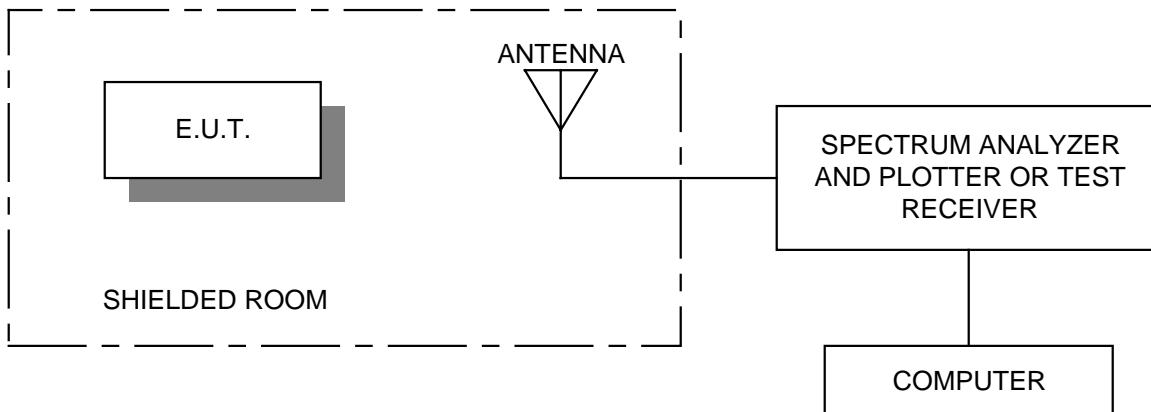
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**Conducted Emissions**



**Radiated Prescan**



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**Test Site For Radiated Emissions**

