

**Nemko Test Report:** 2L0612RUS1

**Applicant:** EMR Corporation  
5 Circle Freeway Drive  
Cincinnati, OH 45246

**Equipment Under Test:** 264424C Series  
**(E.U.T.)**

**In Accordance With:** FCC Part 90, Subpart I & Part 22, Subpart E  
Amplifier

**Tested By:** Nemko Dallas Inc.  
802 N. Kealy

**Authorized By:**



Tom Tidwell, Frontline Manager

**Date:** 5/6/03

**Total Number of Pages:** 27

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**Section 1. Summary of Test Results**

Manufacturer: EMR Corporation

Model No.: 264424C

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 90, Subpart I and Part 22, Subpart E.

<input checked="" type="checkbox"/>	New Submission	<input checked="" type="checkbox"/>	Production Unit
<input type="checkbox"/>	Class II Permissive Change	<input type="checkbox"/>	Pre-Production Unit
<b>A   M   P</b>	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**

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**Summary Of Test Data**

RF Power Output	90.205 22.565	Complies
Audio Frequency Response	TIA EIA- 603.3.2.6	N/A
Audio Low-Pass Filter Response	TIA EIA- 603.3.2.6	N/A
Modulation Limiting	TIA EIA- 603.3.2.6	N/A
Occupied Bandwidth	90.210 22.561	Complies
Spurious Emissions at Antenna Terminals	90.210	Complies
Field Strength of Spurious Emissions	90.210	Complies
Frequency Stability	90.213	N/A
Transient Frequency Behavior	90.214	N/A

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

- (1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
- (2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.
- (3) Since the E.U.T. processes but does not produce a signal, frequency stability was not tested.

## Section 2. General Equipment Specification

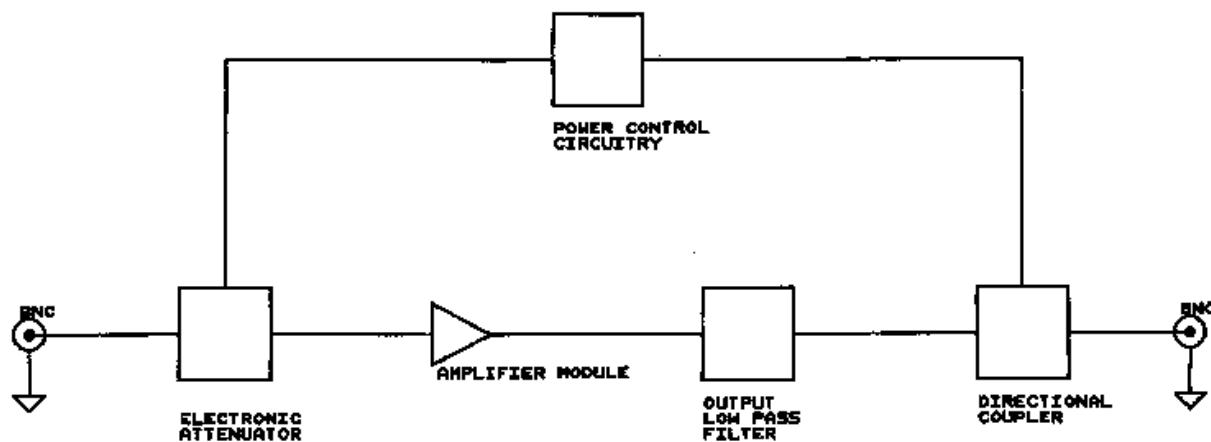
### Transmitter

Supply Voltage Input:	13.6 Vdc					
Frequency Range:	150.0105 to 174.9895 MHz					
Type(s) of Modulation:	F3E	F1D	F2D	D7W (QAM)	Other	
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Emission Designator:	25K0F3E					
Output Impedance:	50 ohms					
RF Power Output (rated):	Single: Composite:	6 Watts N/A <i>(The EUT will have channel filters installed upon installation)</i>				
Operator Selection of Operating Frequency:	Channel filter (end user)					
Power Output Adjustment Capability:	None					
Frequency Translation:	F1-F1	F1-F2	N/A			
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Band Selection:	Software	Duplexer Change	Fullband Coverage			
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>			

## Theory of Operation

The 264424C Series of EMR amplifiers are intended for use in low power amplification and reamplification systems. Applications include land mobile radio bi- and uni directional signal booster systems.

## System Diagram



**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 4/21/03

**Test Results:** Complies.**Measurement Data:**

Frequency (MHz)	Measured Power (dBm/Watts)	Rated Power (dBm/Watts)
162.5	37.8 / 6.0	37.8 / 6.0

Note- Tested at +/- 15% voltage variation with no effect on output power.

**Test equipment used:** 1036**Measurement uncertainty:** +/- 1.7 dB**Temperature:** 22°C**Relative humidity:** 40%

**Section 4. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 4/21/03

**Test Results:** Complies.**Test Data:** See attached graph(s).**Test equipment used:** 1036-1604-1064-1627**Measurement uncertainty:** +/- 1.7 dB**Temperature:** 22°C**Relative humidity:** 40%

## Test Data – Occupied Bandwidth



Nemko Dallas, Inc.

## Dallas Headquarters:

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 Lewisville, TX 75057  
 Tel: (972) 436-9600  
 Fax: (972) 436-2667

Data Plot		Occupied Bandwidth																				
Page 1 of 2																						
Job No.:	2L0612R	Date:	1/8/2003																			
Specification:	Parts 22 & 90	Temperature(°C):	22																			
Tested By:	David Light	Relative Humidity(%):	40																			
E.U.T.:	VHF 6 WATT AMPLIFIER																					
Configuration:	Tx full power																					
Sample Number:	1																					
Location:	Lab 1	RBW:	Refer to plots																			
Detector Type:	Peak	VBW:	Refer to plots																			
		Measurement																				
		Distance:	NA	m																		
<b>Test Equipment Used</b>																						
Antenna:																						
Pre-Amp:	Directional Coupler:																					
Filter:	Cable #1: 1627																					
Receiver:	1036	Cable #2:																				
Attenuator #1	1604	Cable #3:																				
Attenuator #2:	1064	Cable #4:																				
Mixer:																						
Additional equipment used:																						
Measurement Uncertainty: +/- 1.7 dB																						
<table border="1"> <tr> <td>Ref Lvl</td> <td>40 dBm</td> <td>RBW</td> <td>300 Hz</td> <td>RF Att</td> <td>30 dB</td> </tr> <tr> <td></td> <td></td> <td>VBW</td> <td>300 Hz</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>SWT</td> <td>3.5 s</td> <td>Unit</td> <td>dBm</td> </tr> </table>					Ref Lvl	40 dBm	RBW	300 Hz	RF Att	30 dB			VBW	300 Hz					SWT	3.5 s	Unit	dBm
Ref Lvl	40 dBm	RBW	300 Hz	RF Att	30 dB																	
		VBW	300 Hz																			
		SWT	3.5 s	Unit	dBm																	
Date: 08.JAN.2003 14:15:44																						
Notes: <b>OUTPUT SIGNAL</b> 2.5 kHz Input w/ 3 kHz Deviation																						

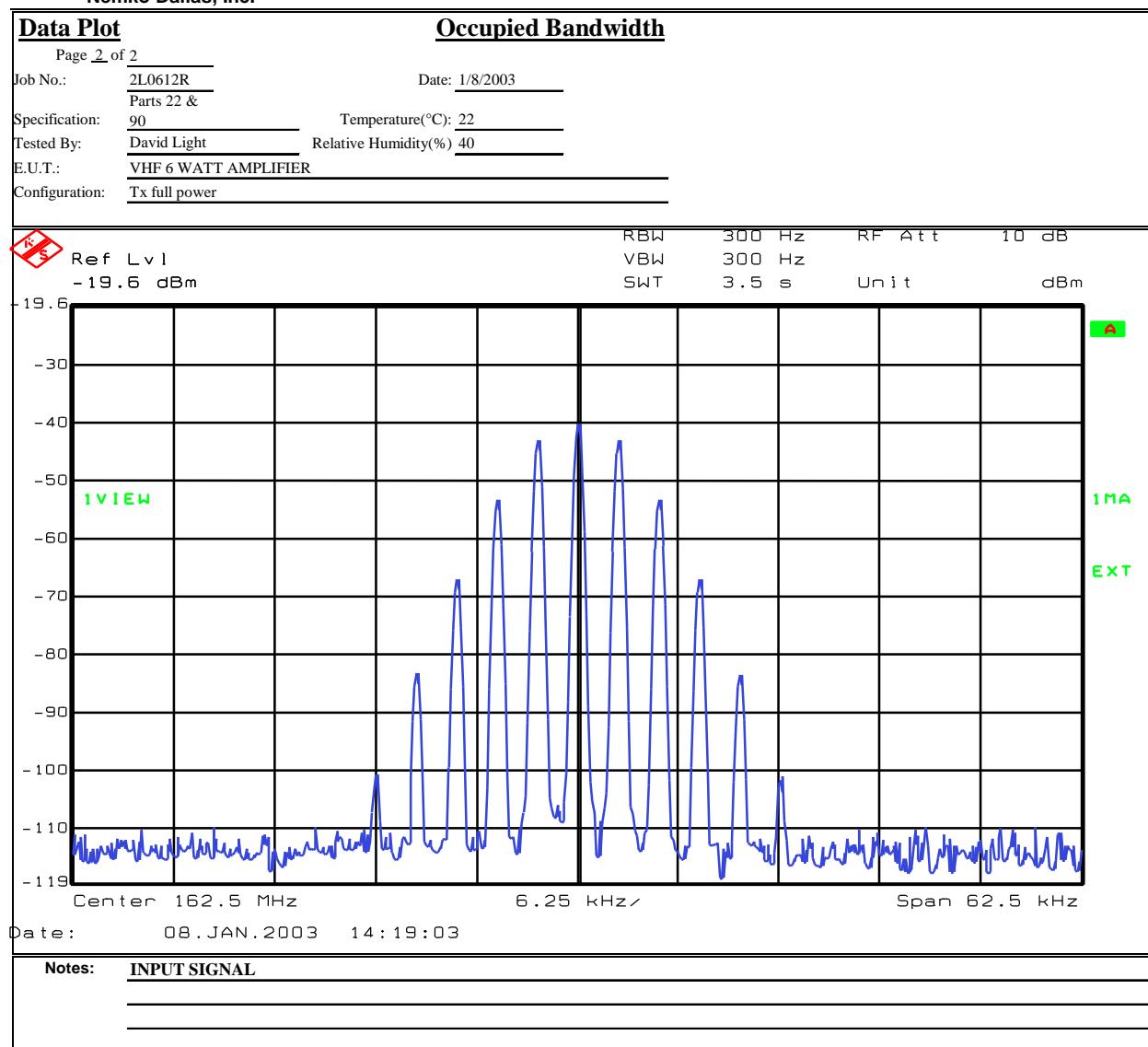
## Test Data – Occupied Bandwidth



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**Section 5. Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 4/21/03

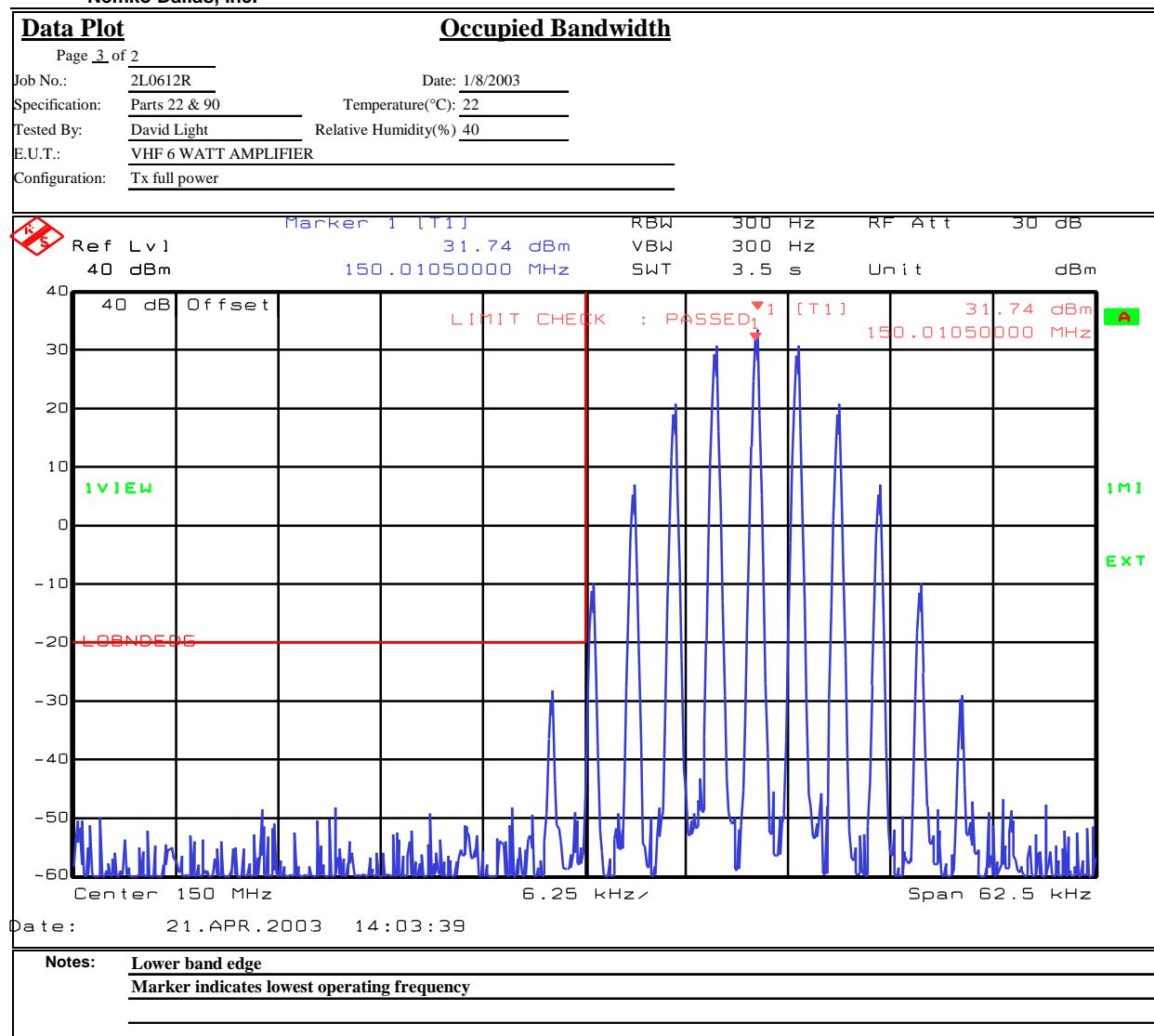
**Test Results:** Complies.**Test Data:** See attached graph(s).**Test equipment used:** 1036-1604-1064-1627**Measurement uncertainty:** +/- 1.7 dB**Temperature:** 22°C**Relative humidity:** 40%

## Test Data – Spurious Emissions at Antenna Terminals



Nemko Dallas, Inc.

## Dallas Headquarters:

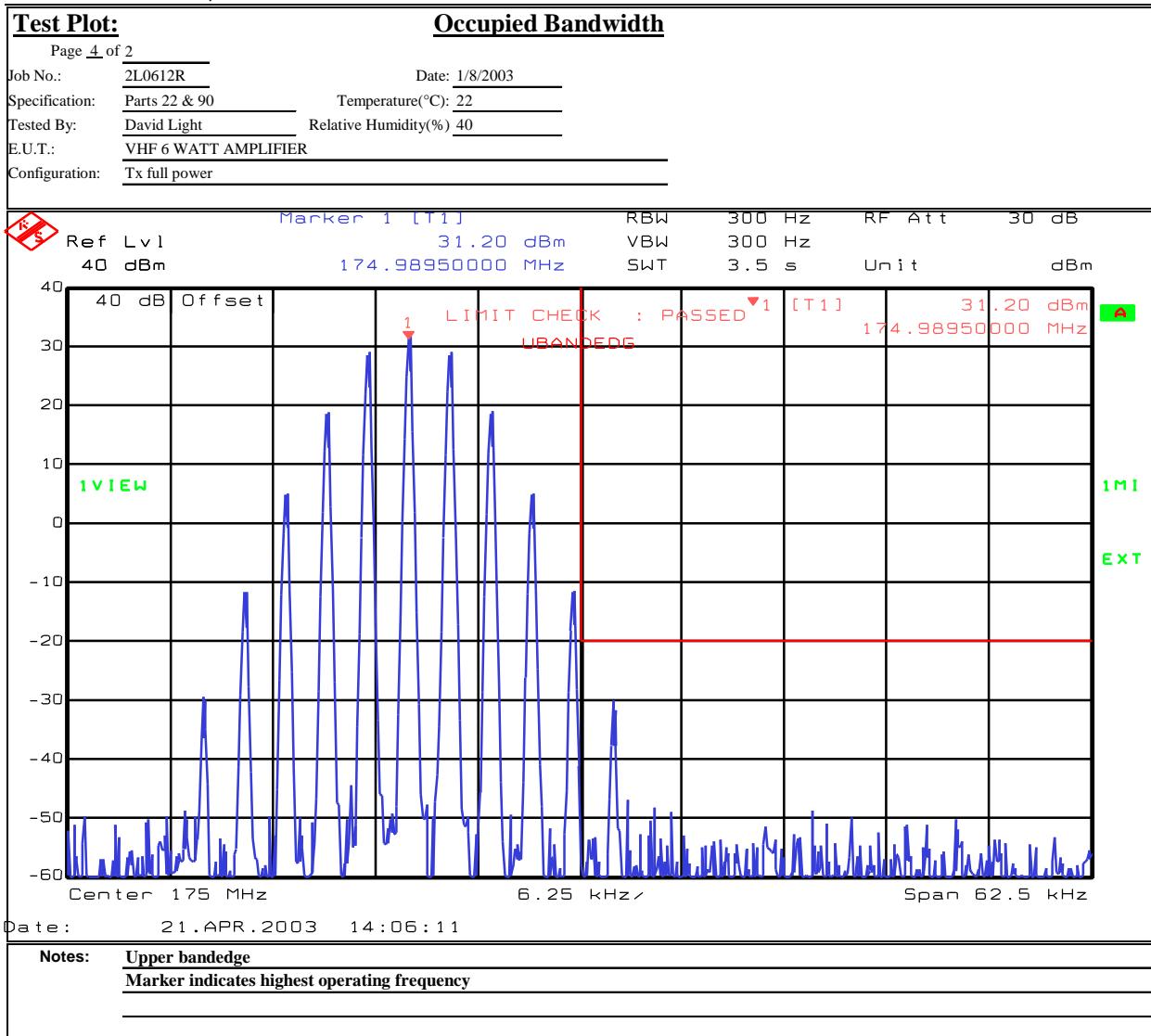
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 Lewisville, TX 75057  
 Tel: (972) 436-9600  
 Fax: (972) 436-2667


## Test Data – Spurious Emissions at Antenna Terminals



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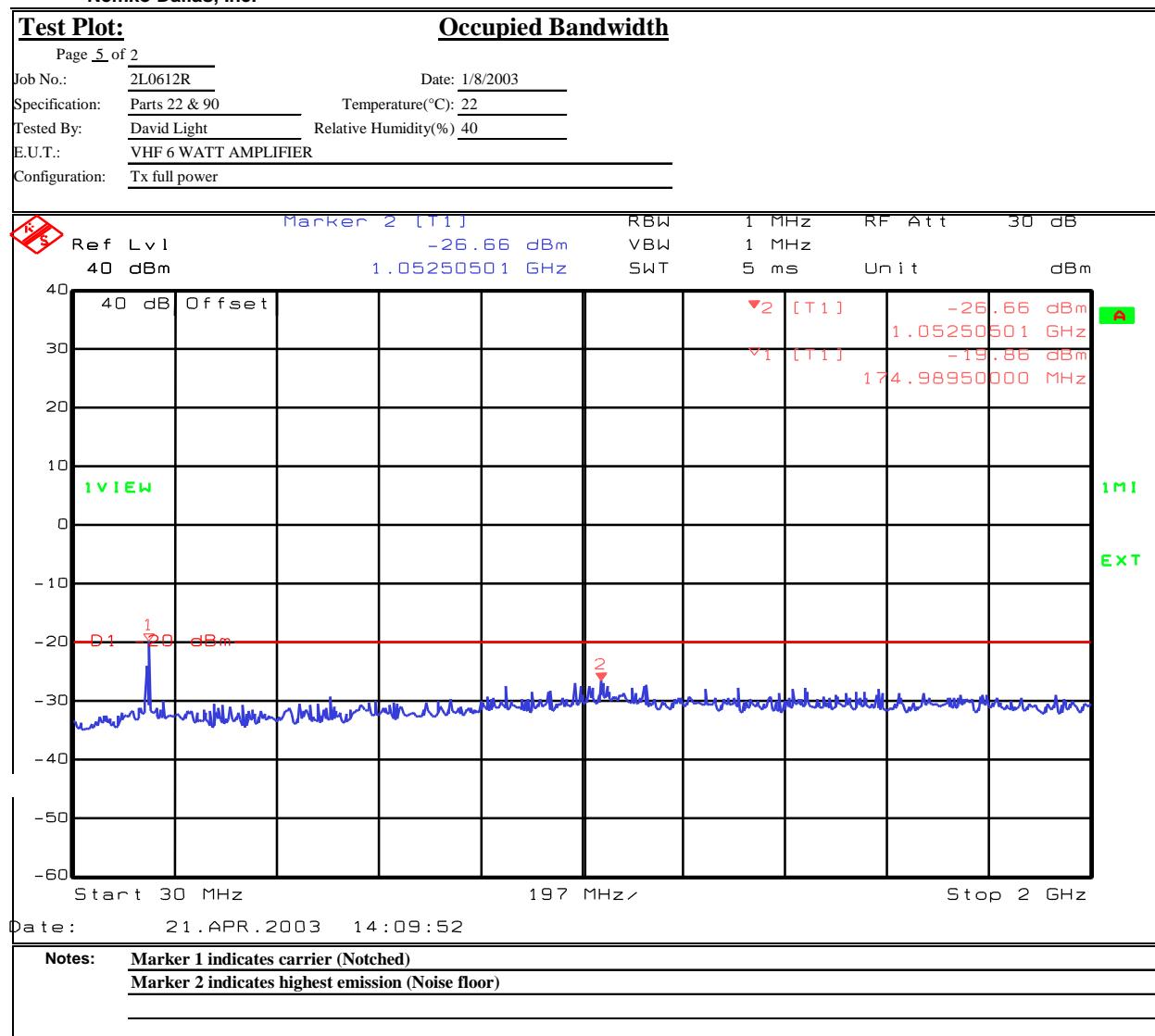
 802 N. Kealy  
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## Test Data – Spurious Emissions at Antenna Terminals



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**Nemko Dallas**

FCC PART 90, Subpart I & Part 22, Subpart E  
Amplifier

**EQUIPMENT: 264524C Series**

Test Report Number **2L0612RUS1**

## **Section 6. Field Strength of Spurious Emissions**

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 4/21/03

**Test Results:**

Complies.

**Test Data:**

See attached table.

## Test Data - Radiated Emissions



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## Dallas Headquarters:

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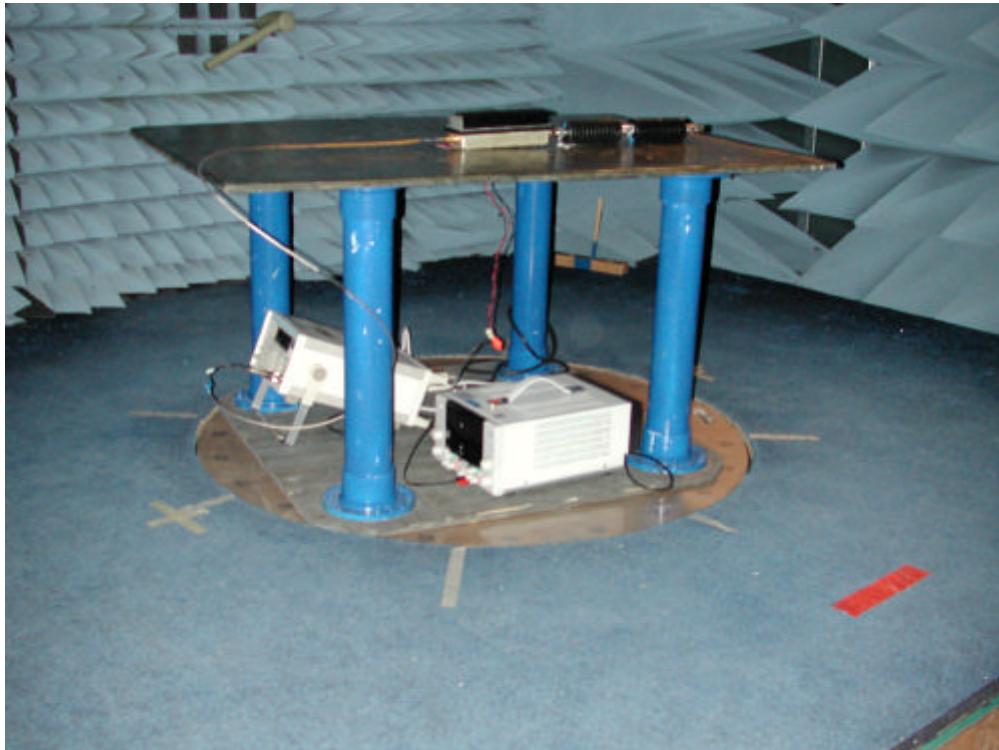
Lewisville, TX 75057

Tel: (972) 436-9600

Fax: (972) 436-2667

<u>ERP Substitution Method</u>										
Page <u>1</u> of <u>1</u>										
Job No.:	2L0612R			Date:	4/22/03			Complete	<input checked="" type="checkbox"/>	
Specification:	PTS 22 & 90			Temperature(°C):	22			Preliminary	<input type="checkbox"/>	
Tested By:	David Light			Relative Humidity(%)	40					
E.U.T.:	VHF AMPLIFIER									
Configuration:	TABLETOP									
Sample No.:	1									
Location:	Lab 1			RBW:	1 MHz			Measurement		
Detector Type:	Peak			VBW:	1 MHz			Distance:	3 m	
<b>Test Equipment Used</b>										
Antenna:	1480			Directional Coupler:						
Pre-Amp:	791			Cable #1:	1484					
Filter:				Cable #2:	1485					
Receiver:	1464			Cable #3:						
Attenuator #1				Cable #4:						
Attenuator #2:				Mixer:						
Additional equipment used:	993 1016									
Measurement Uncertainty:	+/-1.7 dB									
Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarity	Comments
812.5	-72.3	-64.2		24.1	4.9	-64.2	-20.0	-44.2333	V	Tx @ 162.5 MHz
975.0	-72.0	-66.8		24.1	5.0	-66.8	-20.0	-46.7667	V	Noise floor
1625.0		31.0			7.3	31.0	-20.0	51.0000	V	Noise floor
812.5	-72.3	-66.1		24.1	4.9	-66.1	-20.0	-46.0667	H	Noise floor
975.0	-72.0	-65.1		24.1	5.0	-65.1	-20.0	-45.1000	H	Noise floor
1625.0	-64.8	-64.7		32.9	7.3	-64.7	-20.0	-44.7000	H	Noise floor
Notes: Searched spectrum to the 10th harmonic of carrier No emissions were detected above the noise floor which was at least 20 dB below the spec limit of -20 dBm										

**Photographs of Test Setup**



**Section 7. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
993	Horn antenna	A.H. Systems SAS-200/571	XXX	01/08/02	01/09/04
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
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/19/03
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A

**Nemko Dallas**

**EQUIPMENT: 264524C Series**

FCC PART 90, Subpart I & Part 22, Subpart E  
Amplifier

Test Report Number **2L0612RUS1**

## **ANNEX A - TEST METHODOLOGIES**

**NAME OF TEST: RF Power Output****PARA. NO.: 2.1046****Minimum Standard:**

Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

Para. No. 22.565 Transmitting power limits. - The transmitting power of base, mobile and fixed transmitters operating on the channels listed in §22.561 must not exceed the limits in this section.

(a) Maximum ERP. The effective radiated power (ERP) of base and fixed transmitters must not exceed the applicable limits in this paragraph under any circumstances.

	Maximum ERP
Frequency range (MHz)	(watts)
152-153	1400
157-159	150
454-455	3500
459-460	150

**Method Of Measurement:****Detachable Antenna:**

The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

**Integral Antenna:**

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

**Nemko Dallas**

FCC PART 90, Subpart I & Part 22, Subpart E  
Amplifier

**EQUIPMENT: 264524C Series**

Test Report Number **2L0612RUS1**

**NAME OF TEST: Spurious Emissions at Antenna  
Terminals**

**PARA. NO.: 2.1051**

**Test Method:** RBW: 1% of emission bandwidth in the 0 - 1 GHz range.  
1 MHz at frequencies above 1 GHz.

VBW:  $\geq$  RBW

The spectrum is searched up to 10 times the fundamental frequency.

**NAME OF TEST: Occupied Bandwidth****PARA. NO.: 2.1049**

**Minimum Standard:** Para. No. 90.210, see table 1 below for applicable mask.

**Table 1**

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

**NAME OF TEST: Field Strength of Spurious****PARA. NO.: 2.1053****Minimum Standard:** Para. No. 90.210, see table 1 for applicable mask.**Method of measurement**

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

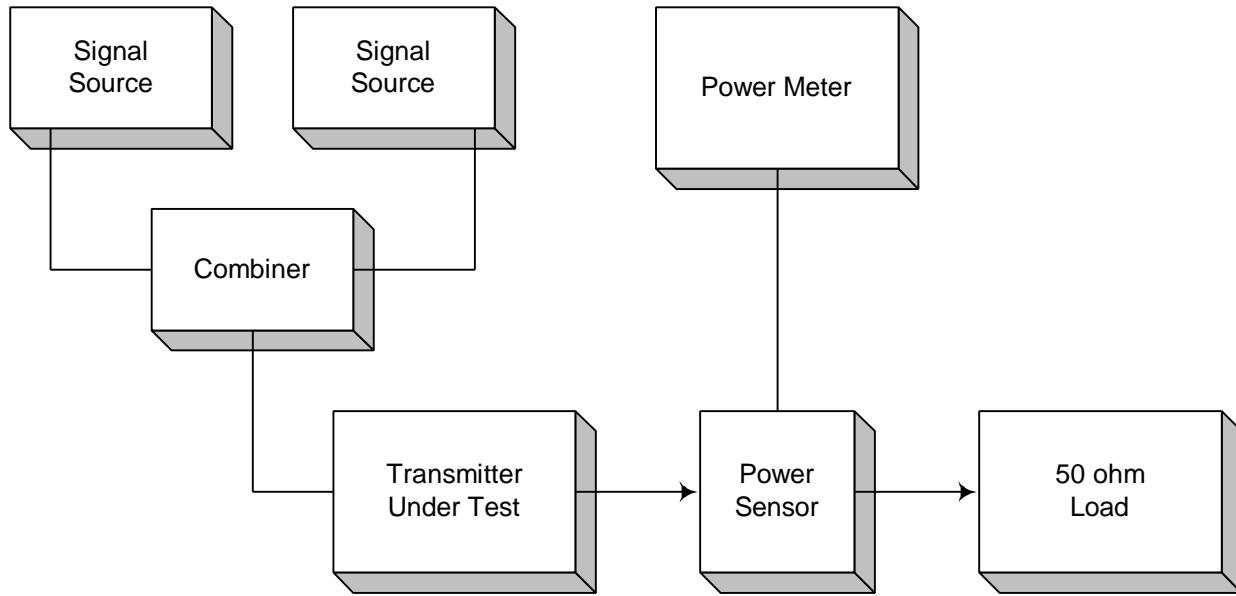
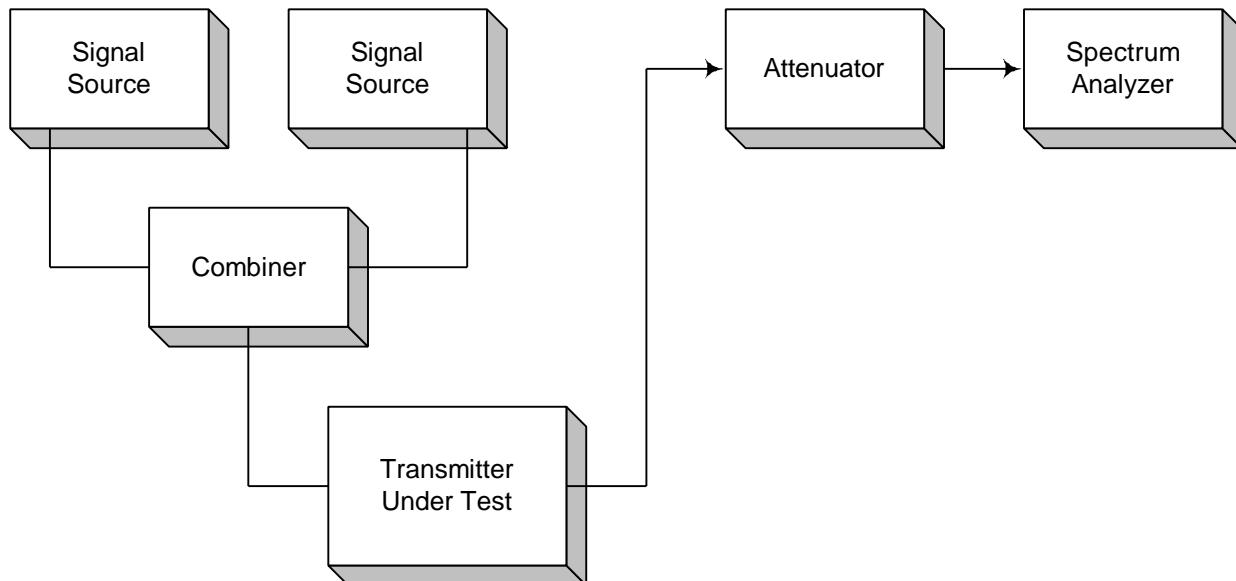
**Nemko Dallas**

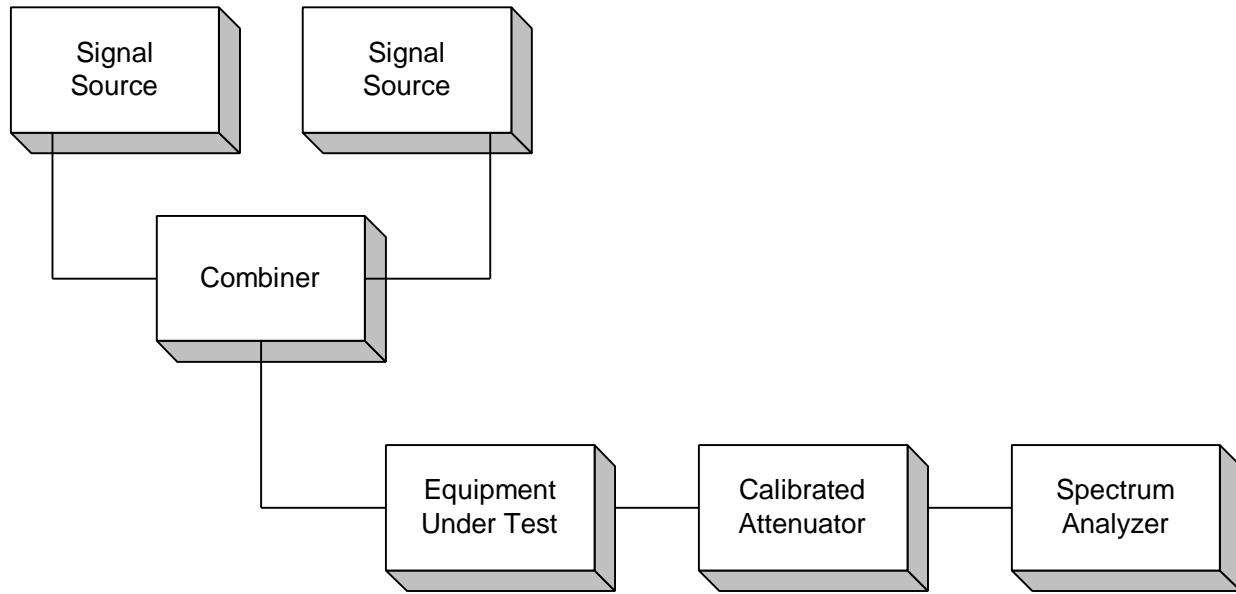
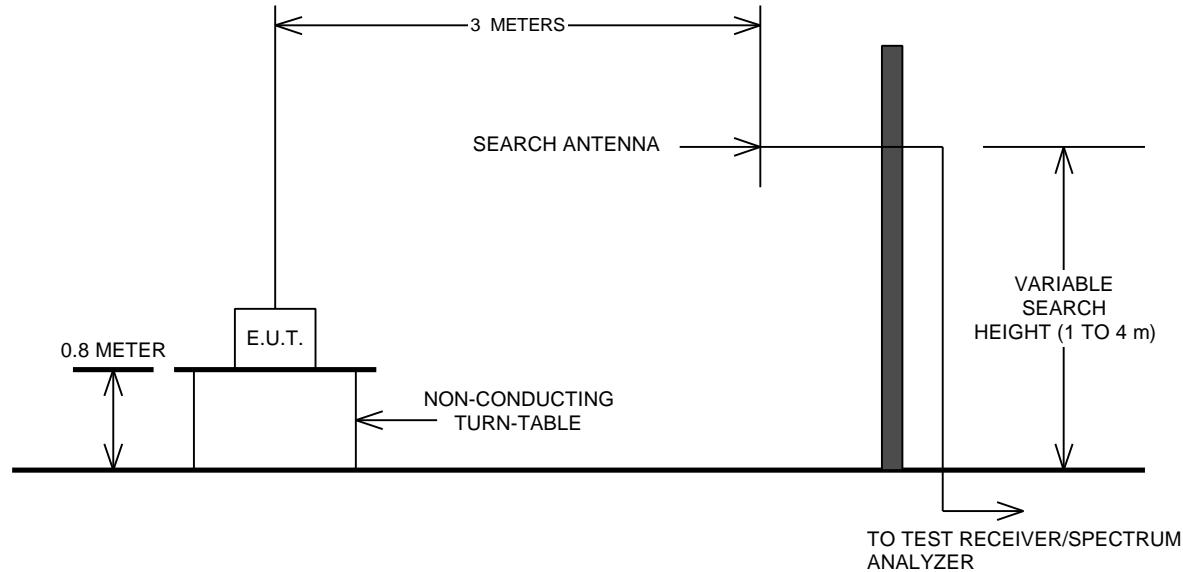
**EQUIPMENT: 264524C Series**

FCC PART 90, Subpart I & Part 22, Subpart E  
Amplifier

Test Report Number **2L0612RUS1**

**ANNEX B - TEST DIAGRAMS**

**Para. No. 2.1046 - R.F. Power Output****Para. No. 2.1049 - Occupied Bandwidth**

**Para. No. 2.1051 - Spurious Emissions at Antenna Terminals****Para. No. 2.1053 - Field Strength of Spurious Radiation**

**Para. No. 2.995 - Frequency Stability**