

Nemko Test Report: 2L0612RUS1

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

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

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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EQUIPMENT: **264524C Series**Test Report Number **2L0612RUS1****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.



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**

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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:	6 Watts
	Composite:	N/A (The EUT will have channel filters installed upon installation)

Operator Selection of Operating Frequency: Channel filter (end user)**Power Output Adjustment Capability:** None

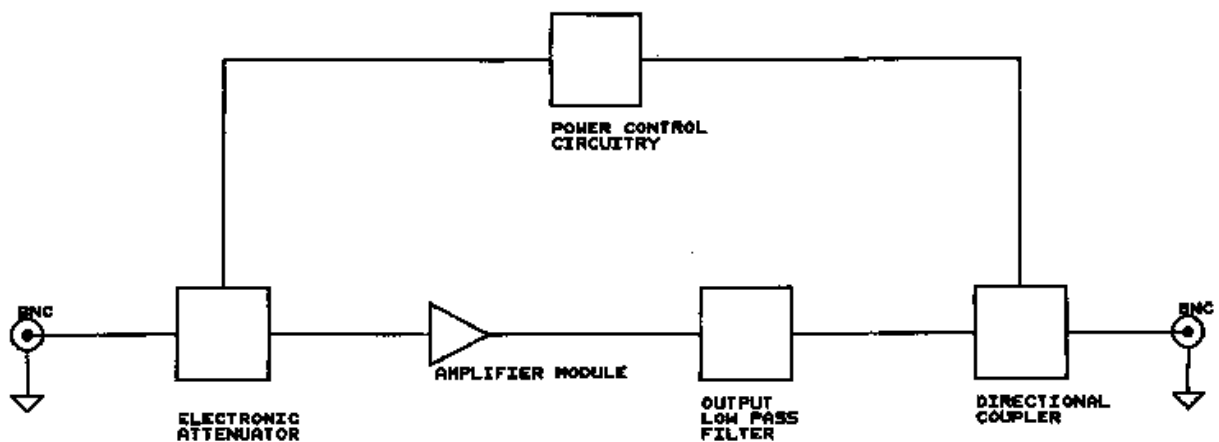
Frequency Translation:	F1-F1	F1-F2	N/A
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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%


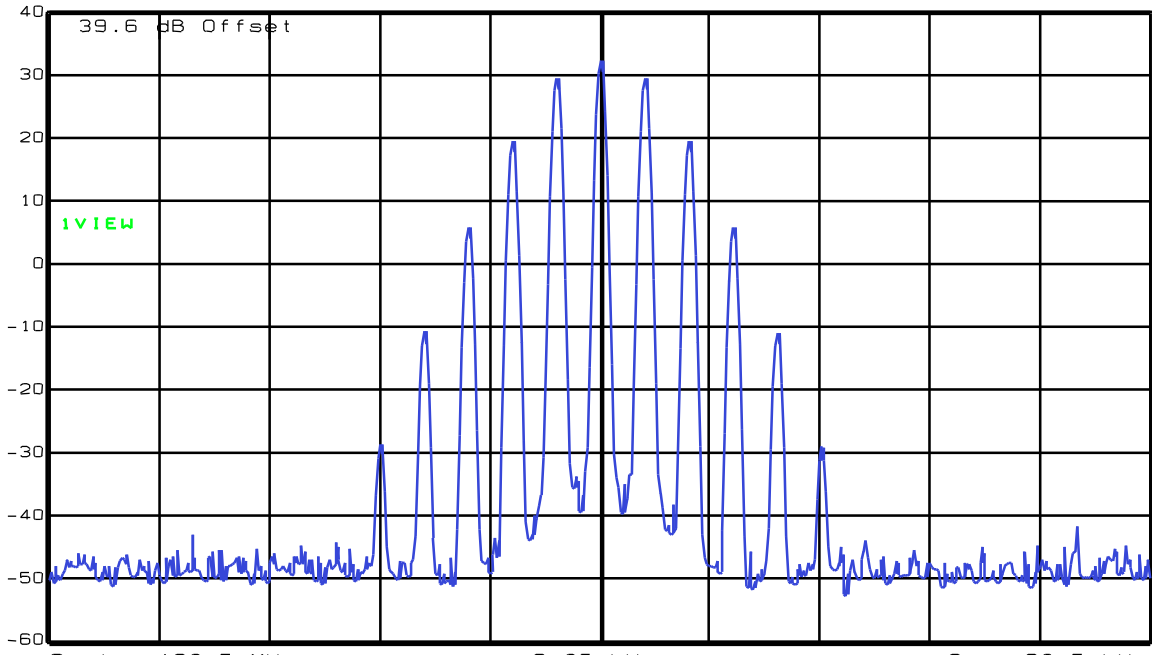
Test Data – Occupied Bandwidth



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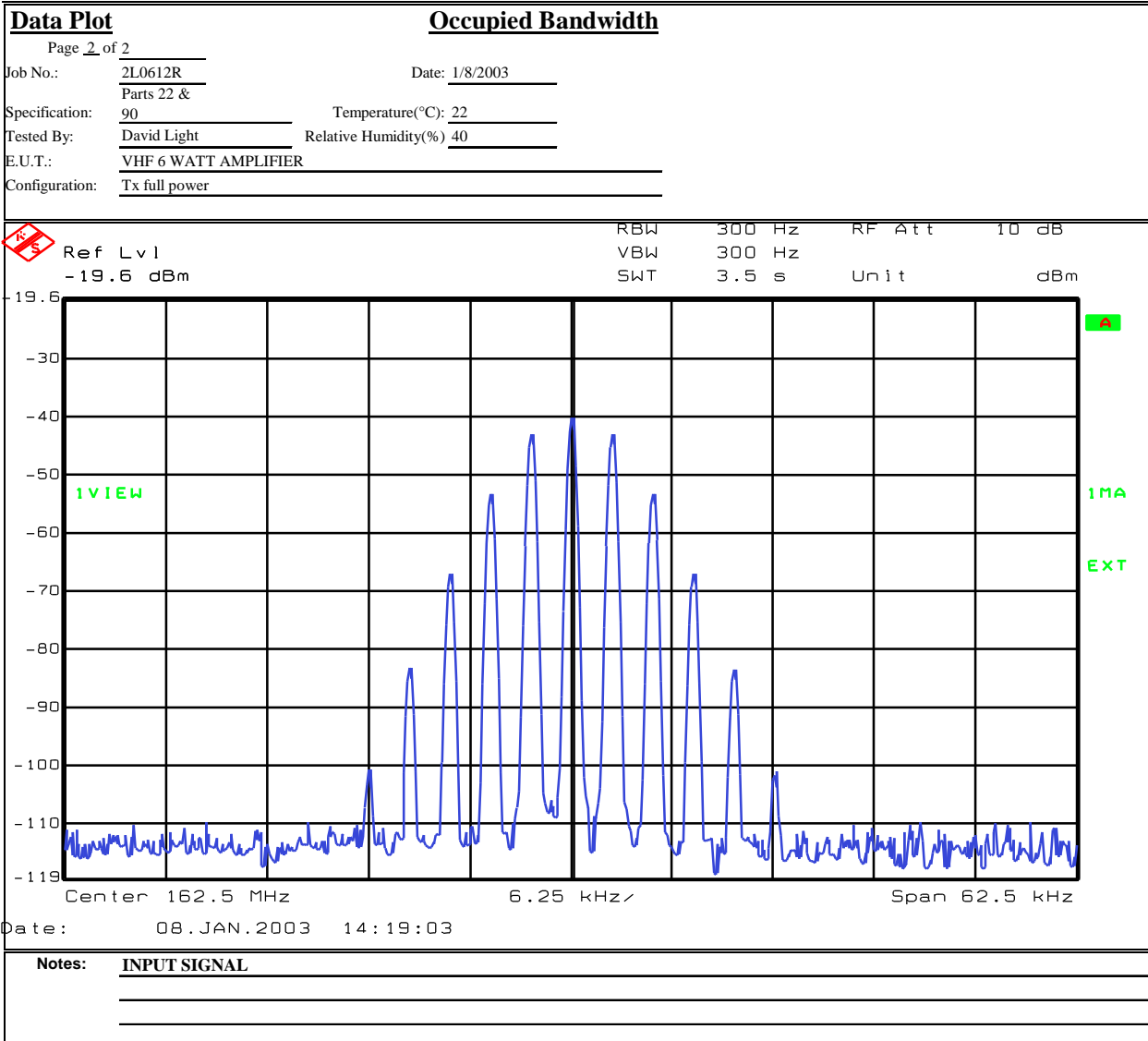
Data Plot		Occupied Bandwidth	
Page 1 of 2			
Job No.:	2L0612R	Date:	1/8/2003
Specification:	Parts 22 & 90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	VHF 6 WATT AMPLIFIER		
Configuration:	Tx full power		
Sample Number:	1		
Location:	Lab 1	RBW:	Refer to plots
Detector Type: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

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

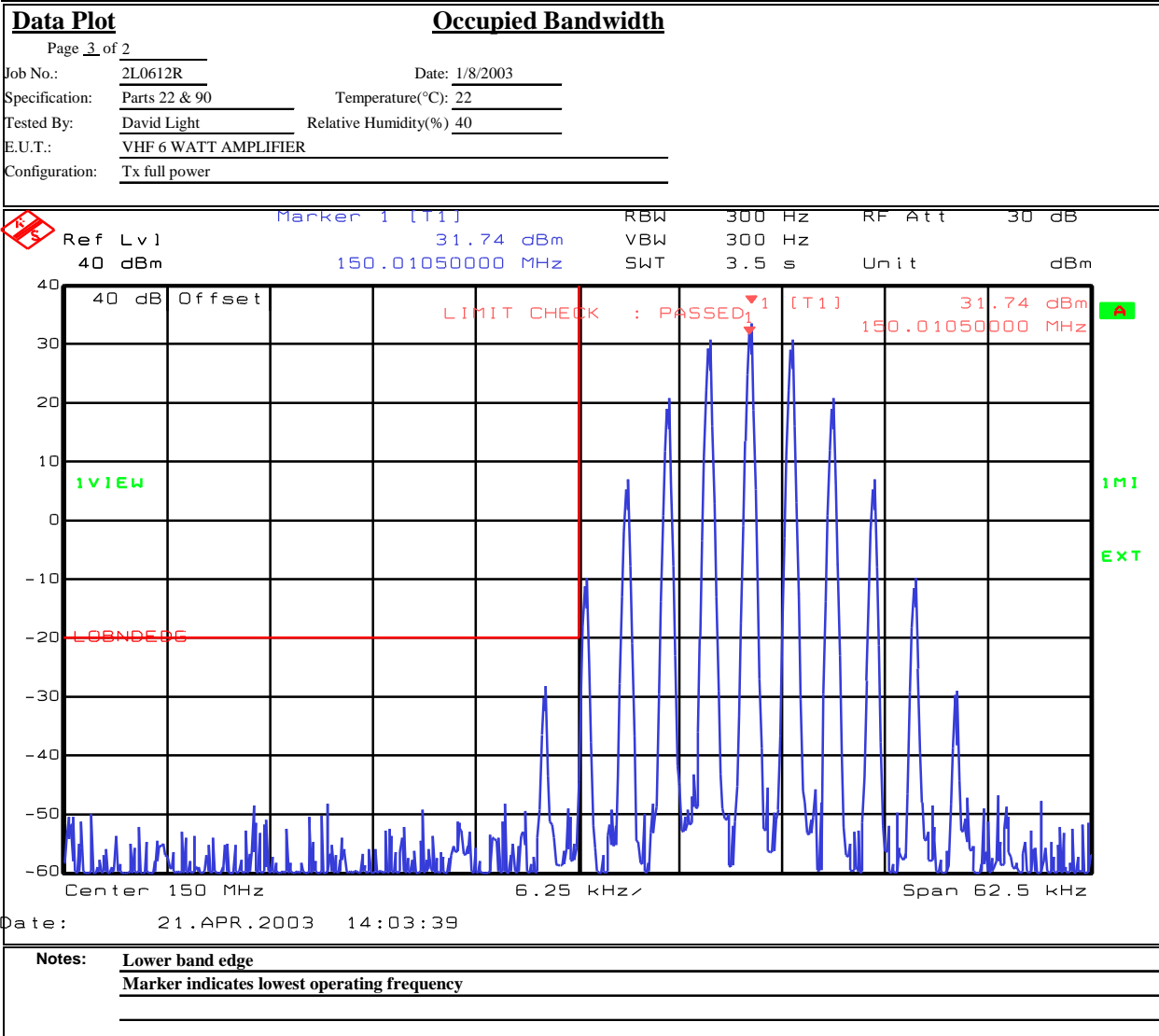
Relative humidity: 40%

Test Data – Spurious Emissions at Antenna Terminals



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Test Data – Spurious Emissions at Antenna Terminals



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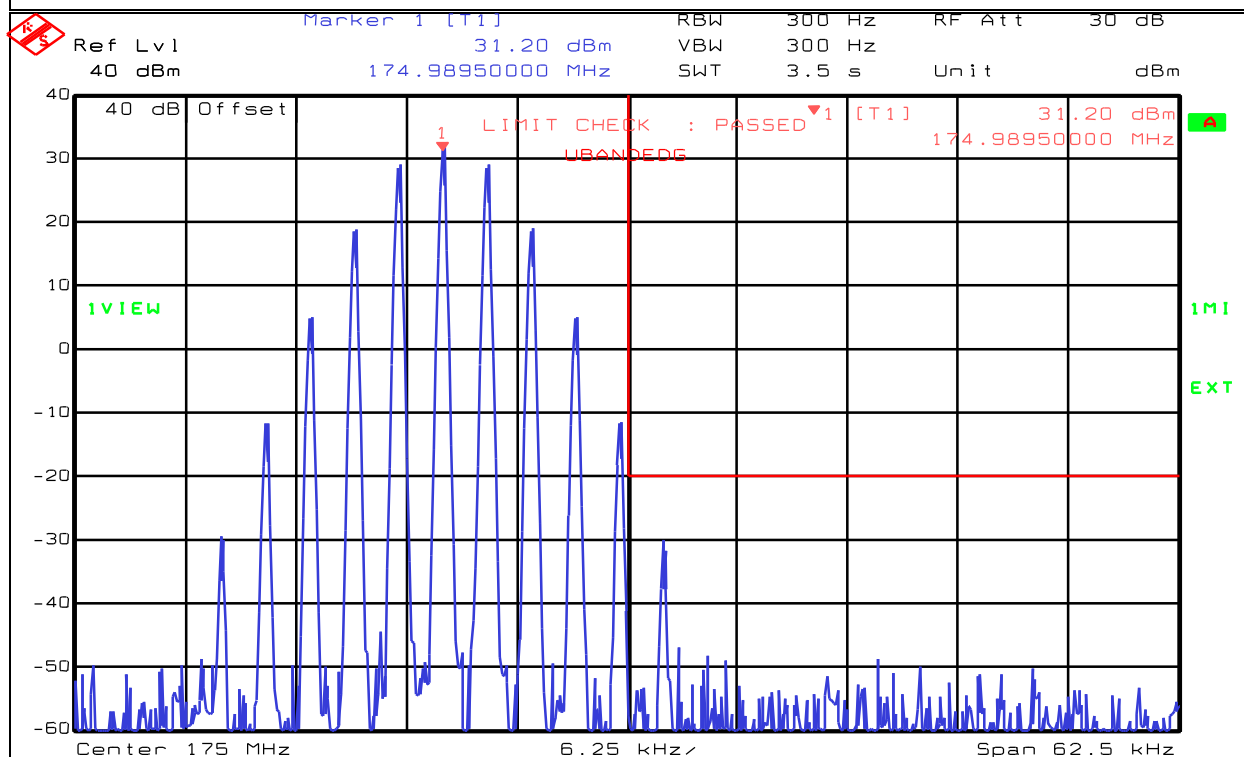
Nemko Dallas, Inc.

Test Plot:

Occupied Bandwidth

Page 4 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



Date: 21.APR.2003 14:06:11

Notes: Upper bandedge
Marker indicates highest operating frequency

Test Data – Spurious Emissions at Antenna Terminals



Nemko Dallas, Inc.

Dallas Headquarters:

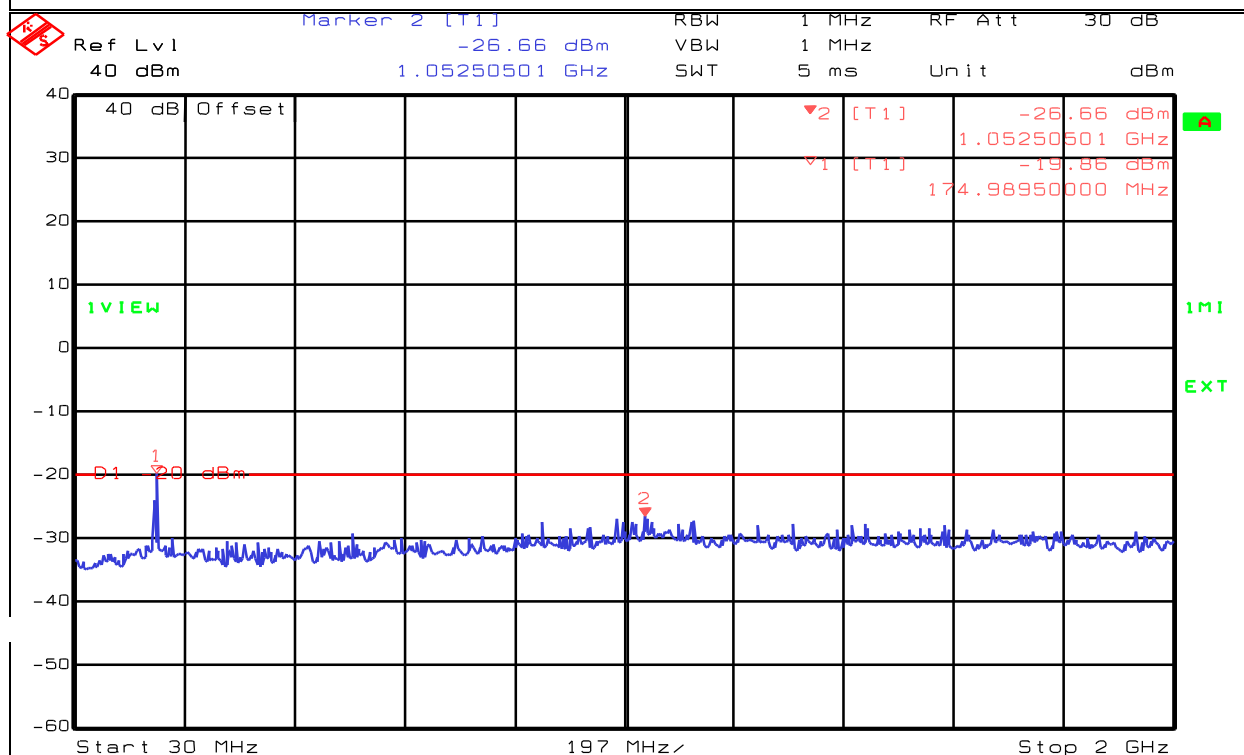
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Test Plot:

Occupied Bandwidth

Page 5 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



Date: 21.APR.2003 14:09:52

Notes: Marker 1 indicates carrier (Notched)
Marker 2 indicates highest emission (Noise floor)

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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ERP Substitution Method

Page 1 of 1

Job No.: 2L0612R Date: 4/22/03 Complete X
Preliminary _____

Specification: PTS 22 & 90 Temperature(°C): 22
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

Test Equipment Used

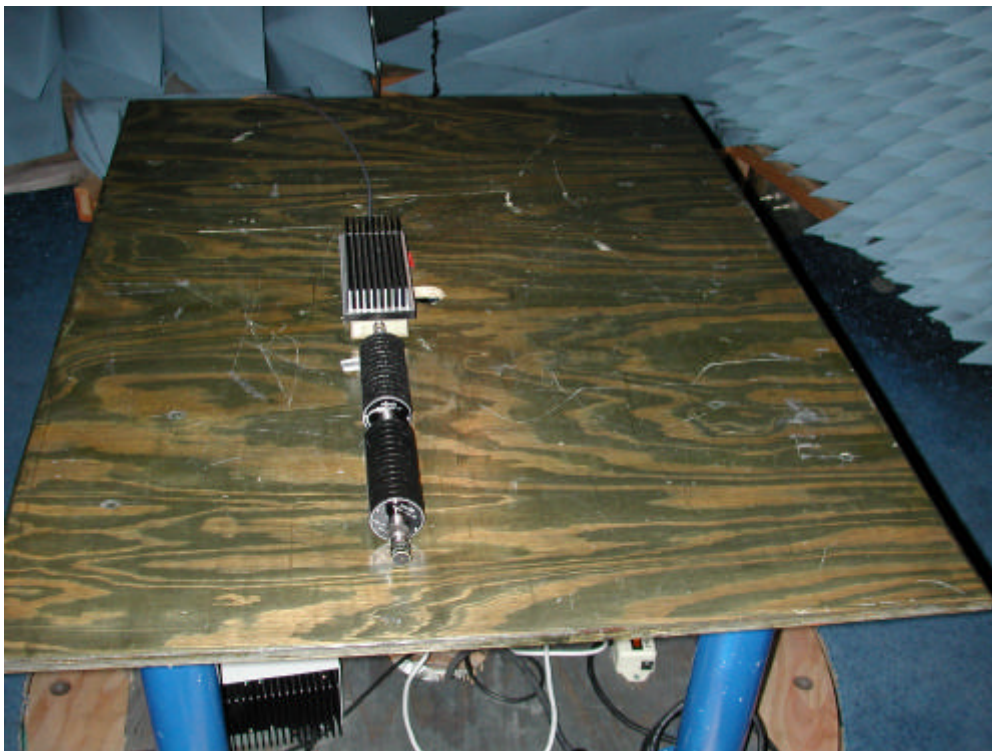
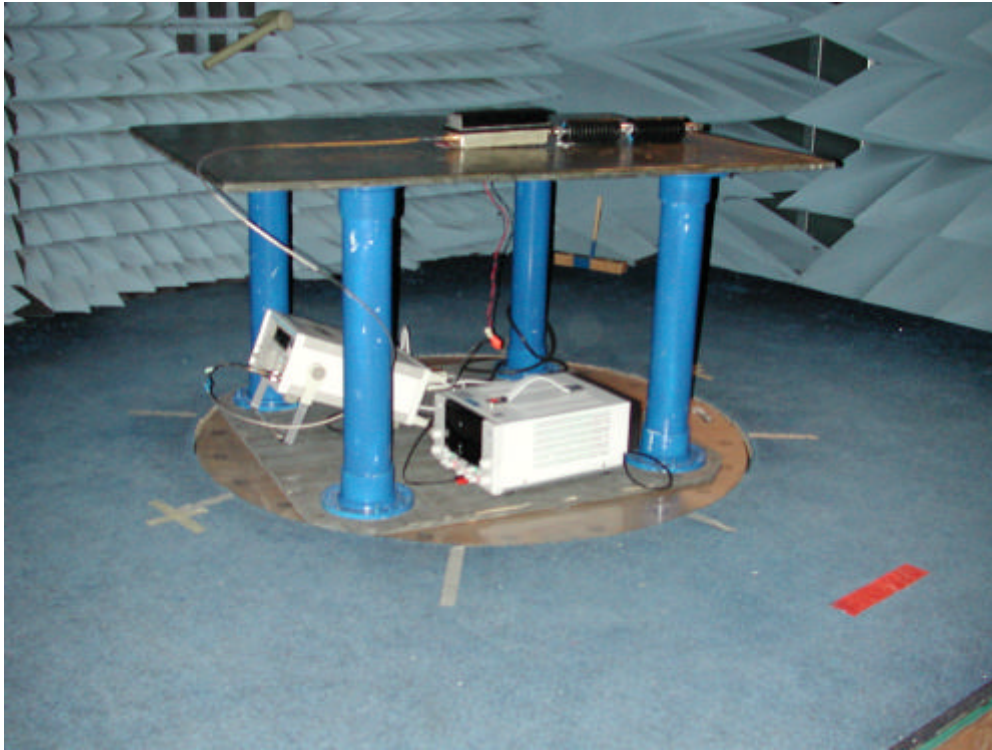
Antenna: 1480 Directional Coupler: _____
Pre-Amp: 791 Cable #1: 1484
Filter: Cable #2: 1485
Receiver: 1464 Cable #3: _____
Attenuator #1: Cable #4: _____
Attenuator #2: Mixer: _____
Additional equipment used: 993 1016
Measurement Uncertainty: +/-1.7 dB

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)	ERP (dBm)	Limit (dBm)	Margin (dB)	Polarity	Comments
										Tx @ 162.5 MHz
812.5	-72.3	-64.2		24.1	4.9	-64.2	-20.0	-44.2333	V	Noise floor
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

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.

Frequency range (MHz)	Maximum ERP (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.

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 2.1051
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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:**
mask.

Para. No. 90.210, see table 1 below for applicable

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:**

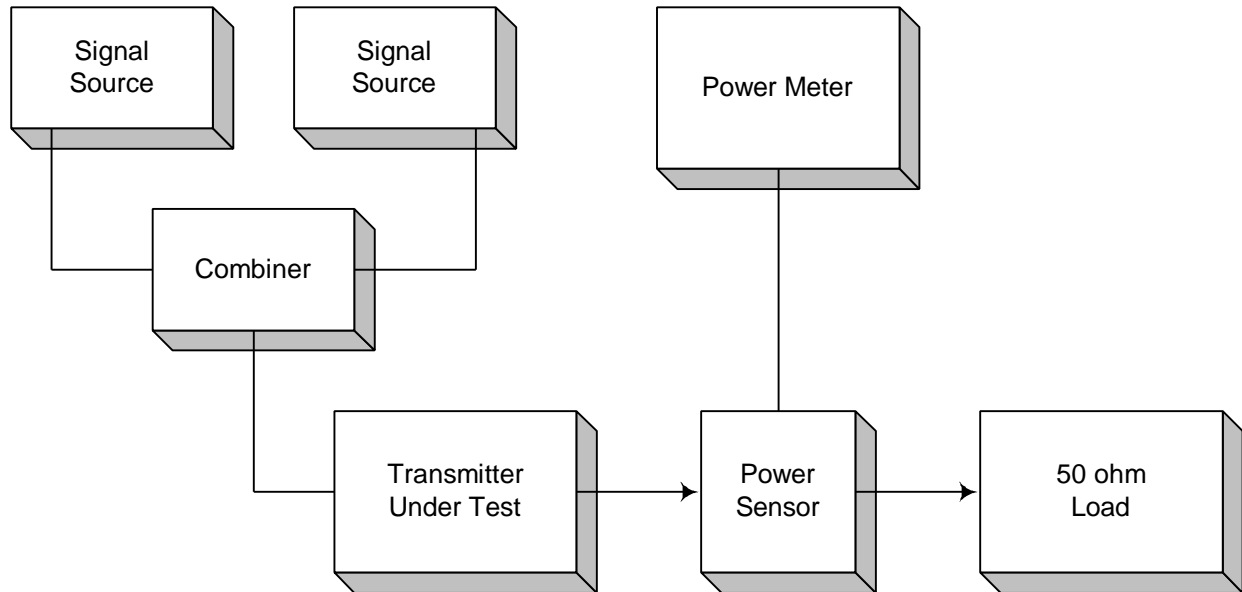
Para. No. 90.210, see table 1 for applicable mask.

Method of measurement

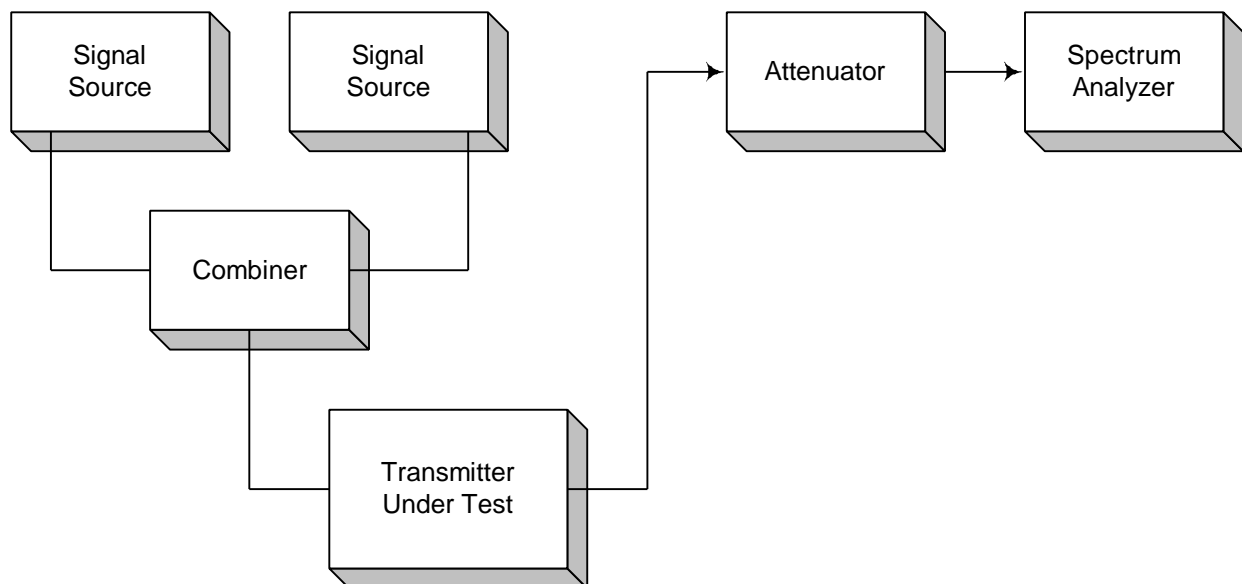
The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with 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.

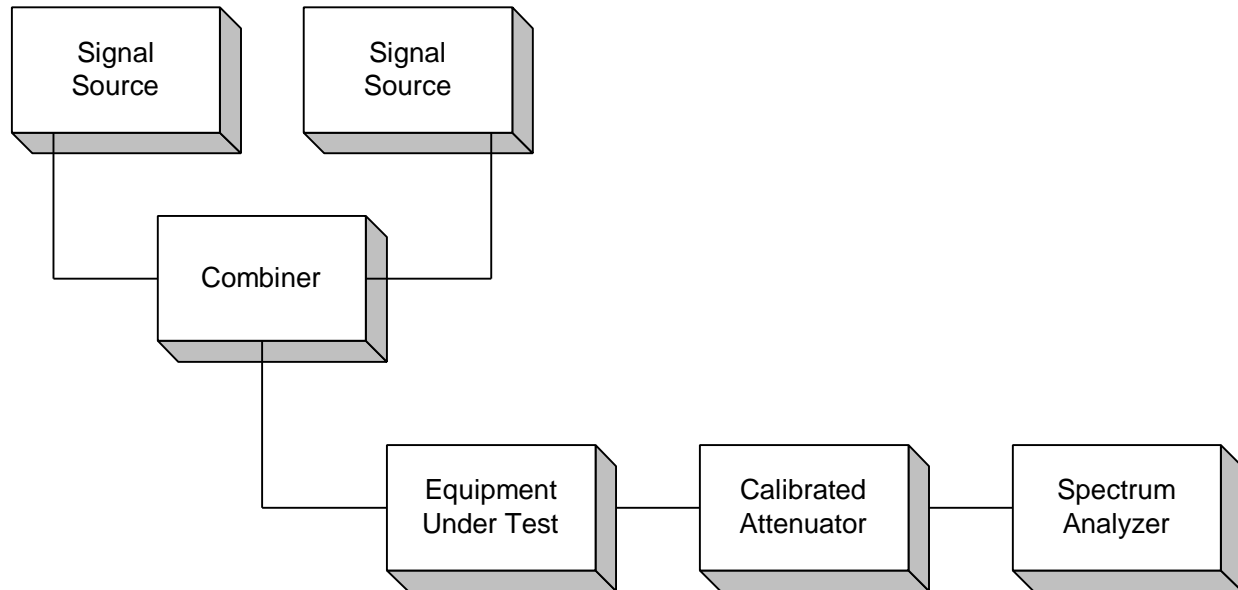
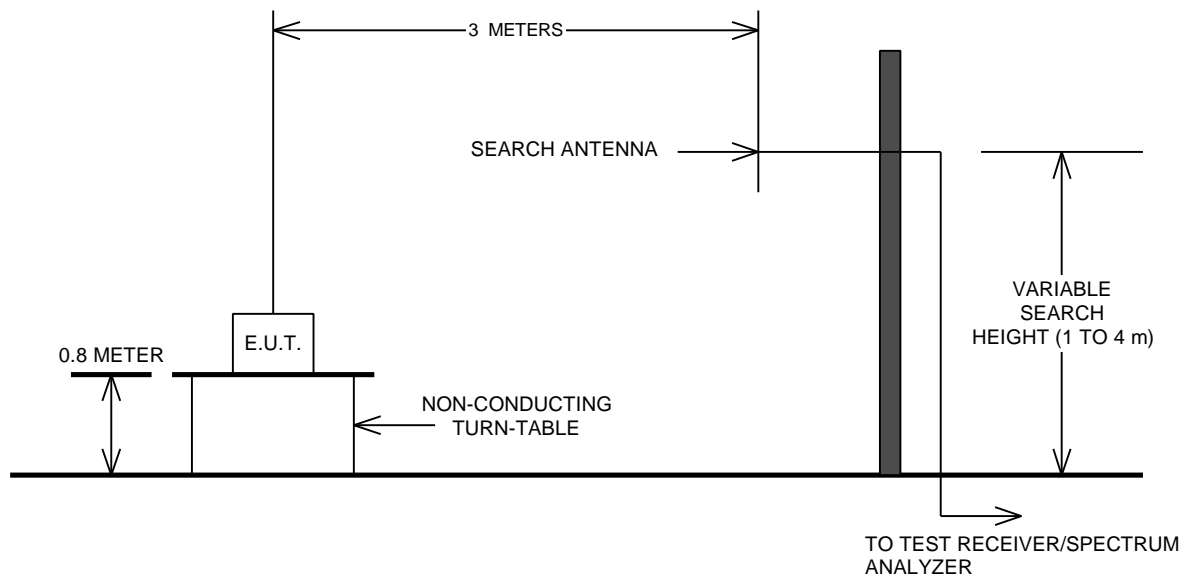
ANNEX B - TEST DIAGRAMS

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

