

Nemko Test Report No.:

3L0074RUS1

Applicant:

Communication Components
89 Leuning Street
Second Floor
Hackensack, NJ 07606

Equipment Under Test:

20 Watt Repeater

In Accordance With:

FCC Part 24, Subpart E
Broadband PCS Repeaters

Tested By:

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



Authorized By:

Tom Tidwell, Frontline Manager

Date:

4/2/03

Total Number of Pages:

37

Table of Contents

Section 1. Summary of Test Results..... 3

Section 2. General Equipment Specification..... 5

Section 3. RF Power Output 7

Section 4. Occupied Bandwidth 8

Section 5. Spurious Emissions at Antenna Terminals 13

Section 6. Field Strength of Spurious 24

Section 7. Test Equipment List 27

ANNEX A - TEST DETAILS 28

ANNEX B - TEST DIAGRAMS..... 34

EQUIPMENT:

Section 1. Summary of Test Results

Manufacturer: Communication Components

Model No.: CE-1819-10

Serial No.: 130441

FCC PRODUCT CODE: AMP

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 24, Subpart E.



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. NONE

See “ Summary of Test Data”.

Nemko Dallas Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Dallas Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

EQUIPMENT:

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	24.232	Complies
Occupied Bandwidth (CDMA)	24.238	Complies
Occupied Bandwidth (GSM)	24.238	Complies
Occupied Bandwidth (NADC)	24.238	N/A
Spurious Emissions at Antenna Terminals	24.238(a)	Complies
Field Strength of Spurious Emissions	24.238(a)	Complies
Frequency Stability	24.235	N/A

Footnotes:

- (1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.
- (2) The amplifier is not intended for TDMA signals.
- (3) The amplifier does not translate the frequency of the input, therefore frequency stability is not applicable.

Measurement uncertainty for each test configuration is expressed to 95% probability.

EQUIPMENT:

Section 2. General Equipment Specification

Supply Voltage Input:	115 Vac		
Frequency Bands:	1931.25 to 1988.75 MHz (F9W) 1930.3 to 1989.7 MHz (GXW)		
Downlink:	<input checked="" type="checkbox"/> Block A : 1930 – 1945 MHz <input checked="" type="checkbox"/> Block D : 1945 – 1950 MHz <input checked="" type="checkbox"/> Block B : 1950 – 1965 MHz <input checked="" type="checkbox"/> Block E : 1965 – 1970 MHz <input checked="" type="checkbox"/> Block F : 1970 – 1975 MHz <input checked="" type="checkbox"/> Block C : 1975 – 1990 MHz		
Output Impedance:	50 ohms		
	CDMA (F9W) <input checked="" type="checkbox"/>	GSM (GXW) <input checked="" type="checkbox"/>	NADC (DXW) <input type="checkbox"/>
	CDMA: 20 W GSM: 40 W		
	F1-F1 <input checked="" type="checkbox"/>	F1-F2 <input type="checkbox"/>	N/A <input type="checkbox"/>
	Software <input type="checkbox"/>	Duplexer <input checked="" type="checkbox"/>	Fullband <input type="checkbox"/>

EQUIPMENT:

Description of Operation

The device is a repeater for use in the PCS band. The device works in either a GSM or CDMA network.

System Diagram

Refer to separate exhibit.

EQUIPMENT:

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 3/25/03

Test Results: Complies.

Measurement Data:

	Modulation Type	Per Channel Output Power (dBm)	Composite Output Power (dBm)	Composite Output Power (W)
Uplink	CDMA	N/A	N/A	N/A
Downlink	CDMA	40	43	20
Uplink	GSM	N/A	N/A	N/A
Downlink	GSM	43	46	39.8

Equipment Used: 1036-1064-1604-1081

Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 40 %

EQUIPMENT:

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE:3/25/03

Test Results: Complies.

Test Data: See attached plot(s).

EQUIPMENT:

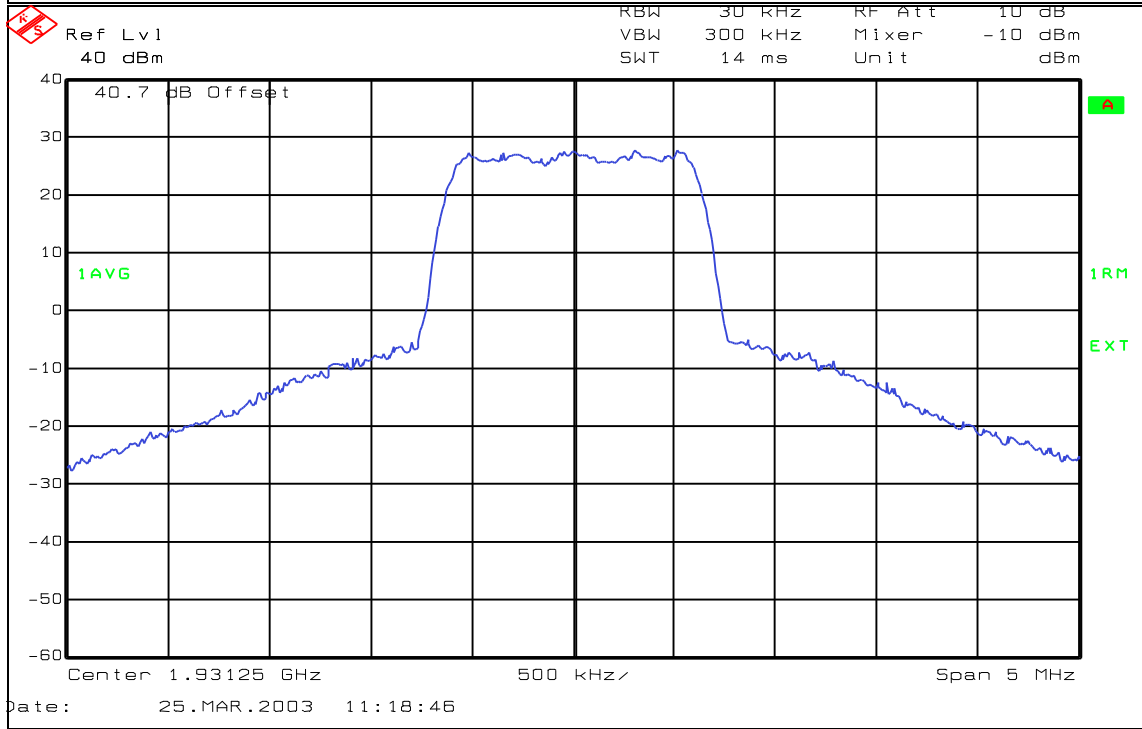
Test Data – Occupied Bandwidth



Nemko Dallas, Inc.

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

Data Plot		Occupied Bandwidth	
Page 1 of 4			
Job No.: 3L0074R	Date: 3/25/2003	Complete: _____	
Specification: PART 24	Temperature(°C): 22	Preliminary: _____	
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: PCS AMPLIFIER			
Configuration: TX FULL POWER			
Sample Number: 1			
Location: Lab 1	RBW: Refer to plots	Measurement	
Detector Type: Refer to plots	VBW: Refer to plots	Distance: na	m
Test Equipment Used			
Antenna: _____	Directional Coupler: 1054		
Pre-Amp: _____	Cable #1: 1081		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: 1064	Cable #4: _____		
Attenuator #2: 1604	Mixer: _____		
Additional equipment used: 1055 1056			
Measurement Uncertainty: +/-1.7 dB			



Notes: **OUTPUT CDMA**
20 WATTS

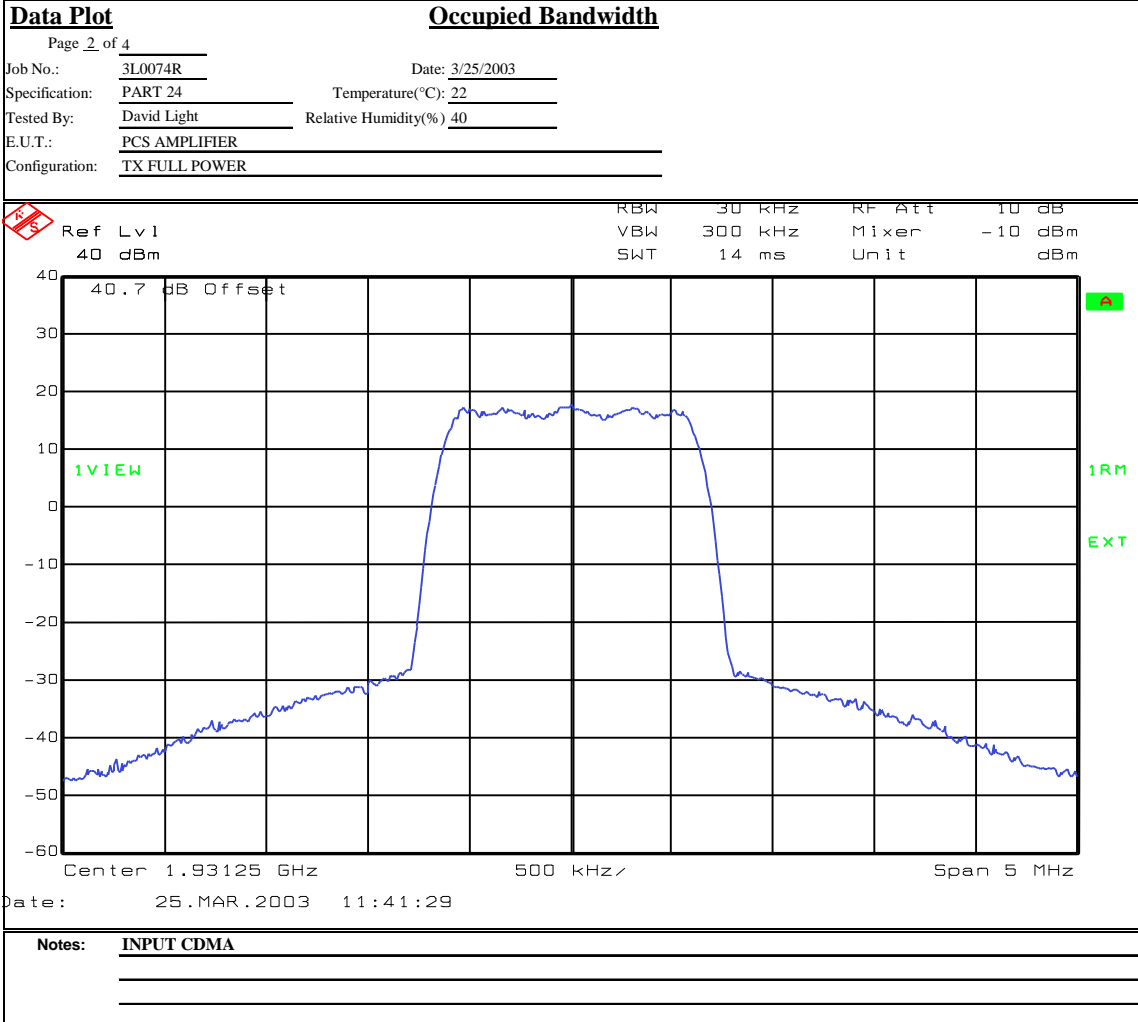
EQUIPMENT:

Test Data – Occupied Bandwidth



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

Nemko Dallas, Inc.



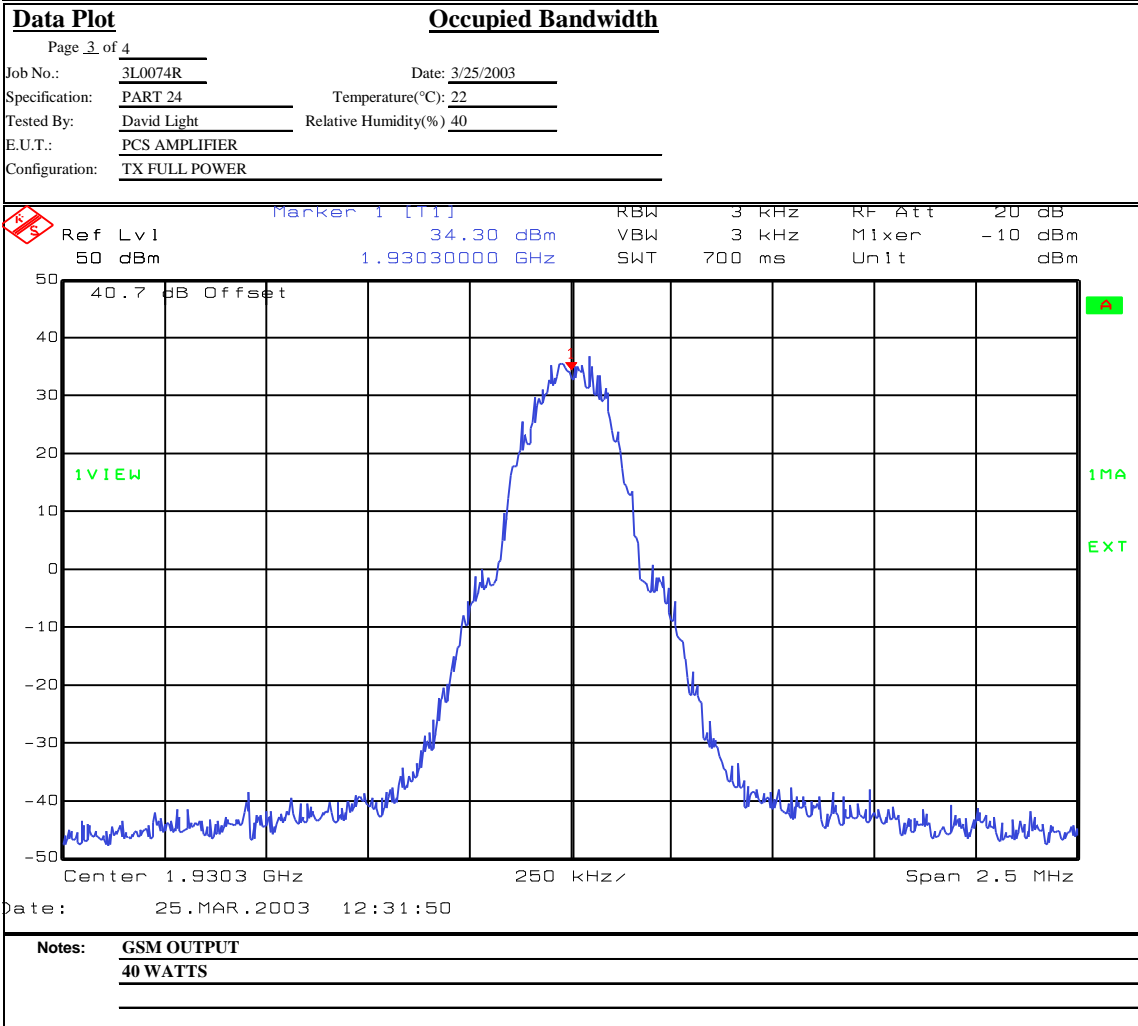
EQUIPMENT:

Test Data – Occupied Bandwidth



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

Nemko Dallas, Inc.



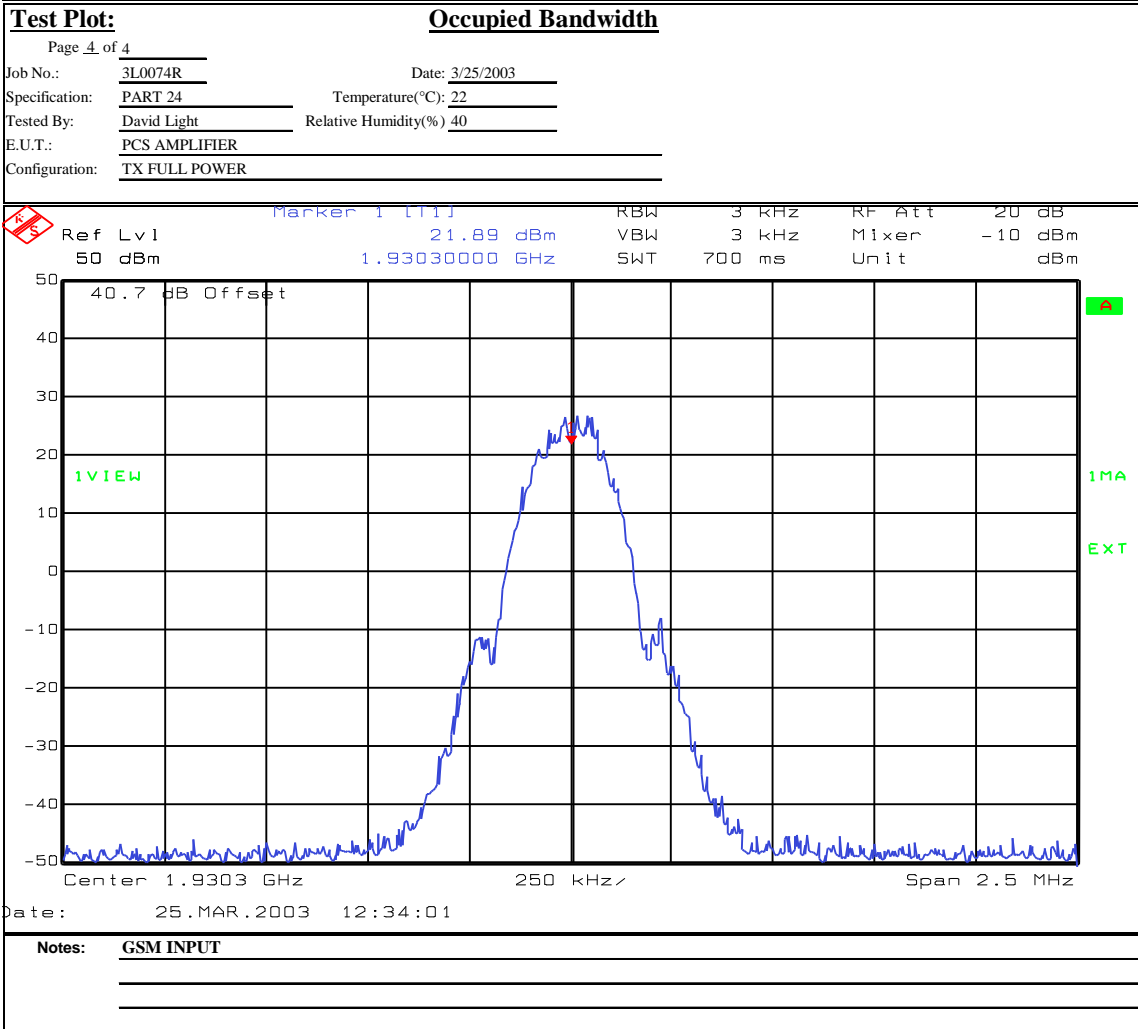
EQUIPMENT:

Test Data – Occupied Bandwidth



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

Nemko Dallas, Inc.



EQUIPMENT:

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE:3/25/03

Test Results: Complies.

Test Data: See attached plot(s).

EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.

Data Plot		Bandedges		Complete <u>X</u>																									
Page 1 of 4		Date: 3/25/2003		Preliminary: _____																									
Job No.: 3L0074R		Temperature(°C): 22																											
Specification: PART 24		Relative Humidity(%): 40																											
Tested By: David Light																													
E.U.T.: PCS AMPLIFIER																													
Configuration: TX FULL POWER																													
Sample Number: 1																													
Location: Lab 1		RBW: Refer to plots		Measurement																									
Detector Type: Refer to plots		VBW: Refer to plots		Distance: na m																									
Test Equipment Used																													
Antenna: _____		Directional Coupler: 1054																											
Pre-Amp: _____		Cable #1: 1081																											
Filter: _____		Cable #2: _____																											
Receiver: 1036		Cable #3: _____																											
Attenuator #1: 1064		Cable #4: _____																											
Attenuator #2: 1604		Mixer: _____																											
Additional equipment used: 1055 1056																													
Measurement Uncertainty: +/-1.7 dB																													
<table border="1"> <tr> <td>Ref Lvl</td> <td>40 dBm</td> <td>Marker 2 [T1]</td> <td>24.37 dBm</td> <td>RBW</td> <td>30 KHz</td> <td>RF Att</td> <td>10 dB</td> </tr> <tr> <td></td> <td></td> <td></td> <td>1.93281563 GHz</td> <td>VBW</td> <td>300 kHz</td> <td>Mixer</td> <td>-10 dBm</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>SWT</td> <td>28 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>						Ref Lvl	40 dBm	Marker 2 [T1]	24.37 dBm	RBW	30 KHz	RF Att	10 dB				1.93281563 GHz	VBW	300 kHz	Mixer	-10 dBm					SWT	28 ms	Unit	dBm
Ref Lvl	40 dBm	Marker 2 [T1]	24.37 dBm	RBW	30 KHz	RF Att	10 dB																						
			1.93281563 GHz	VBW	300 kHz	Mixer	-10 dBm																						
				SWT	28 ms	Unit	dBm																						
Date: 25.MAR.2003 09:52:12																													
Notes: LOWER BAND EDGE CDMA 10 WATTS PER CHANNEL																													

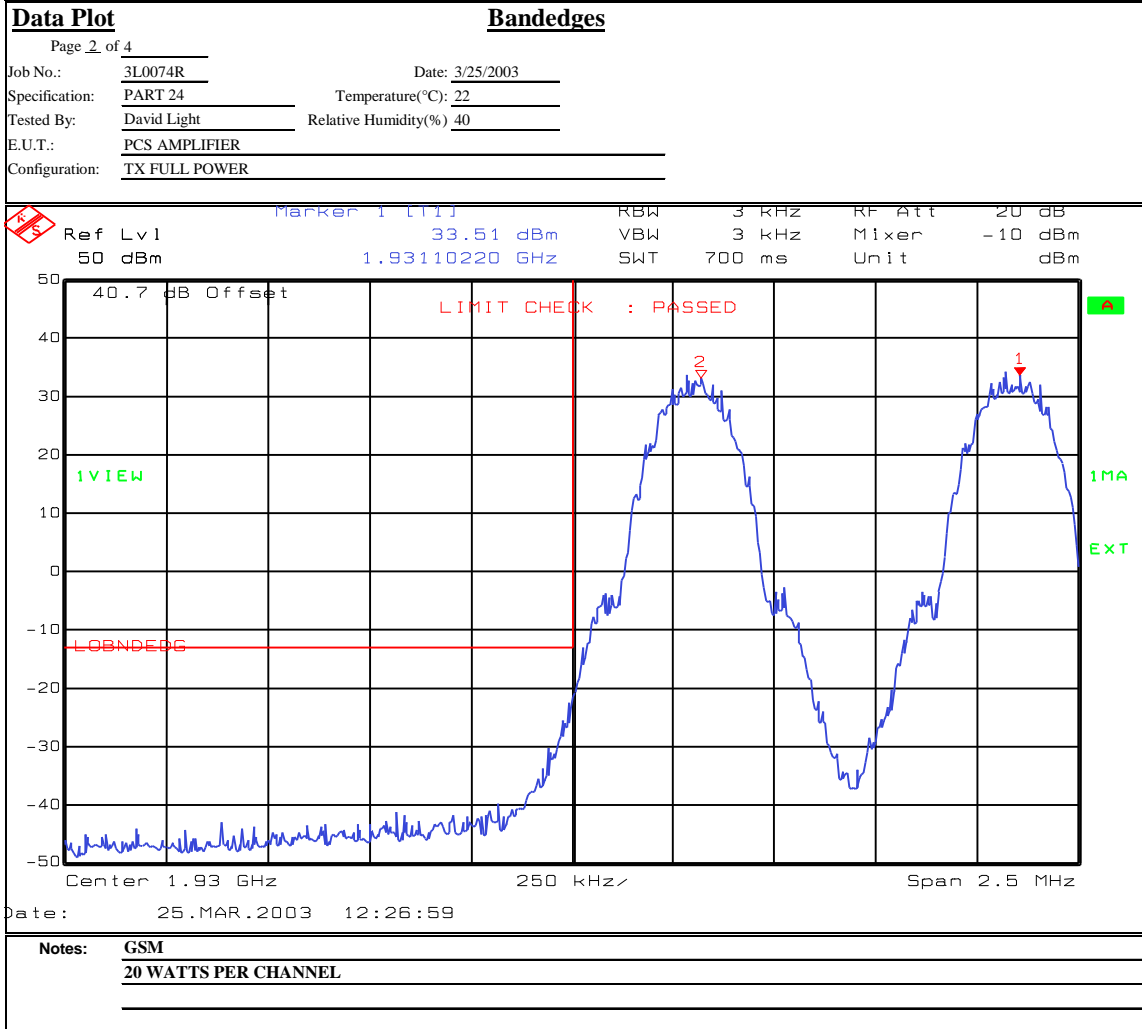
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



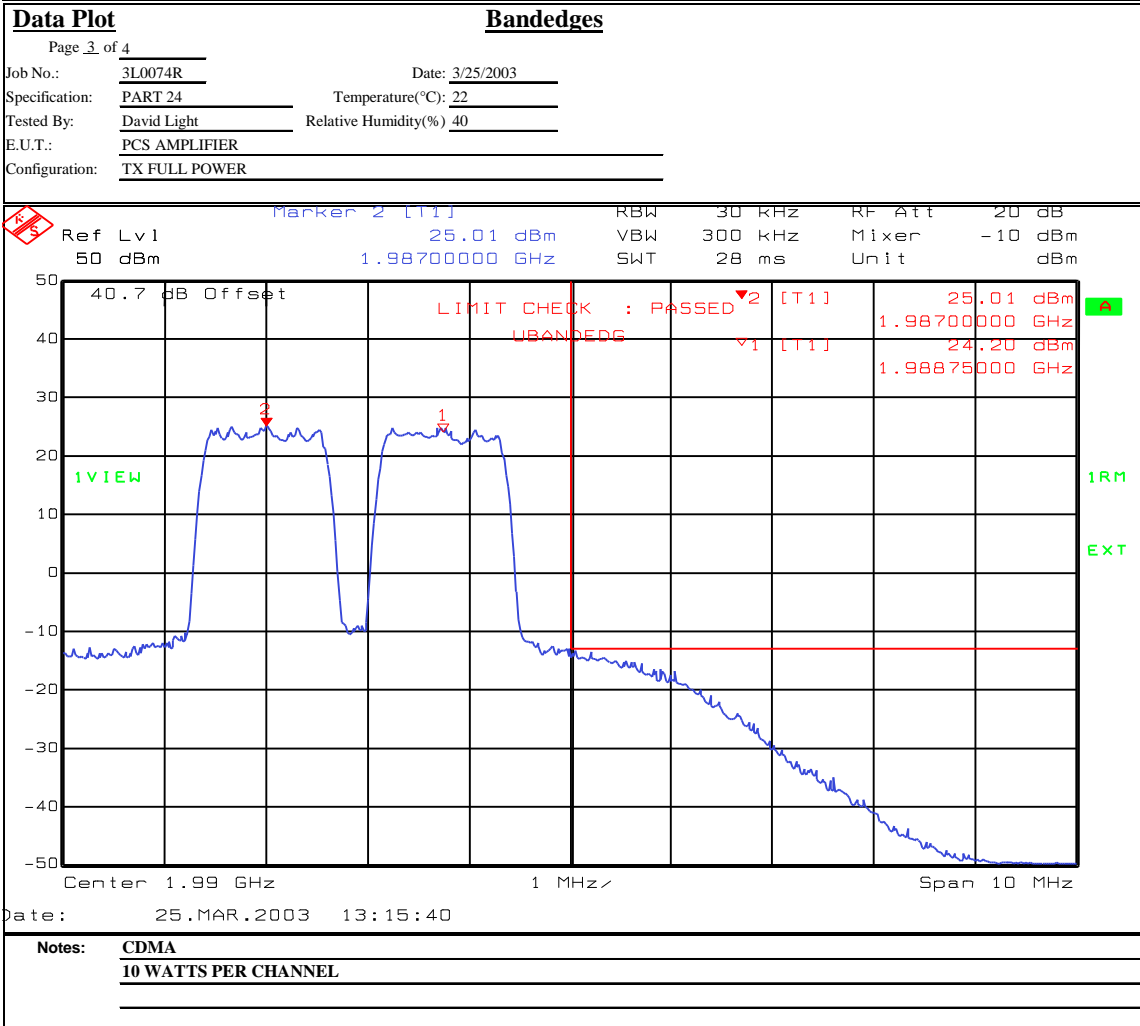
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



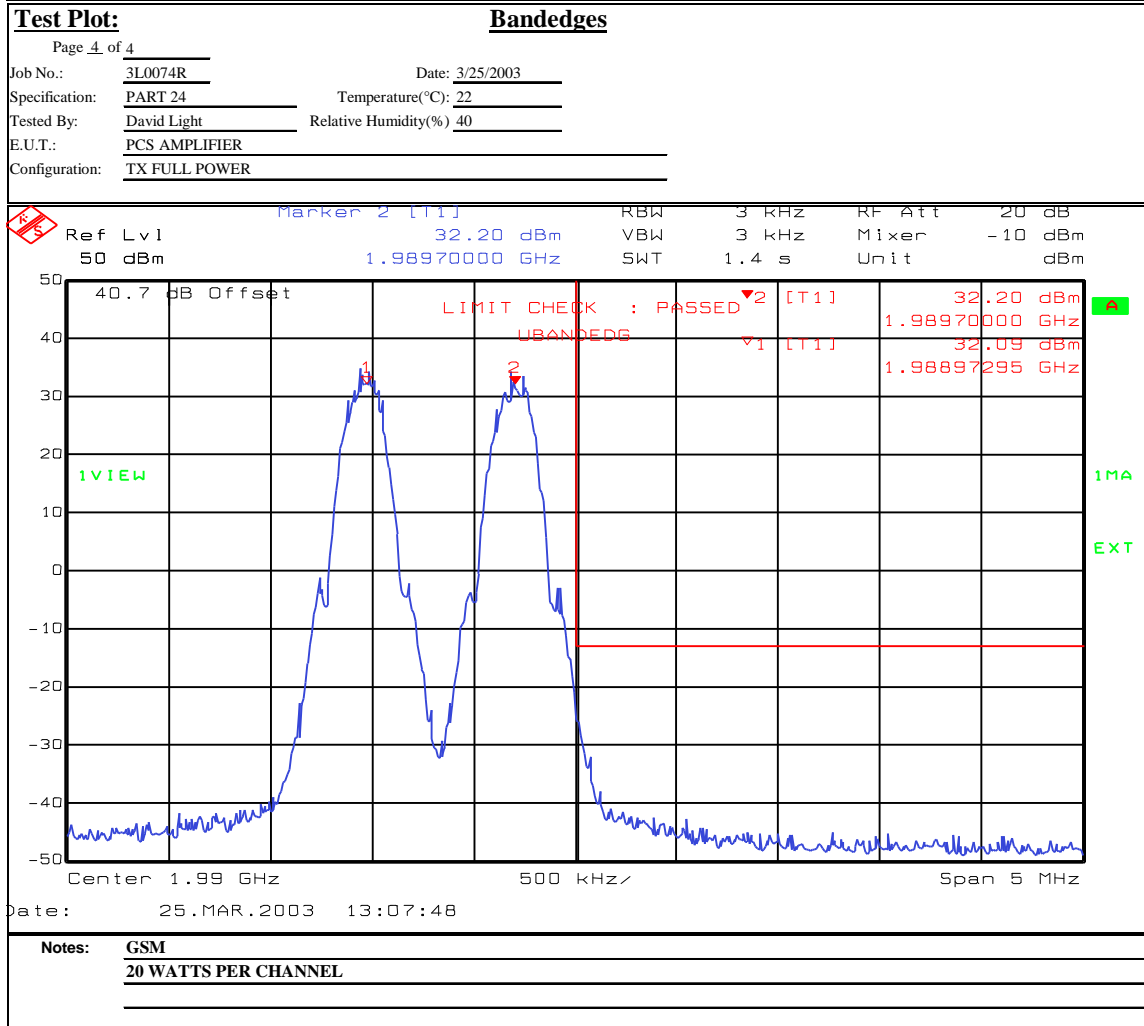
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



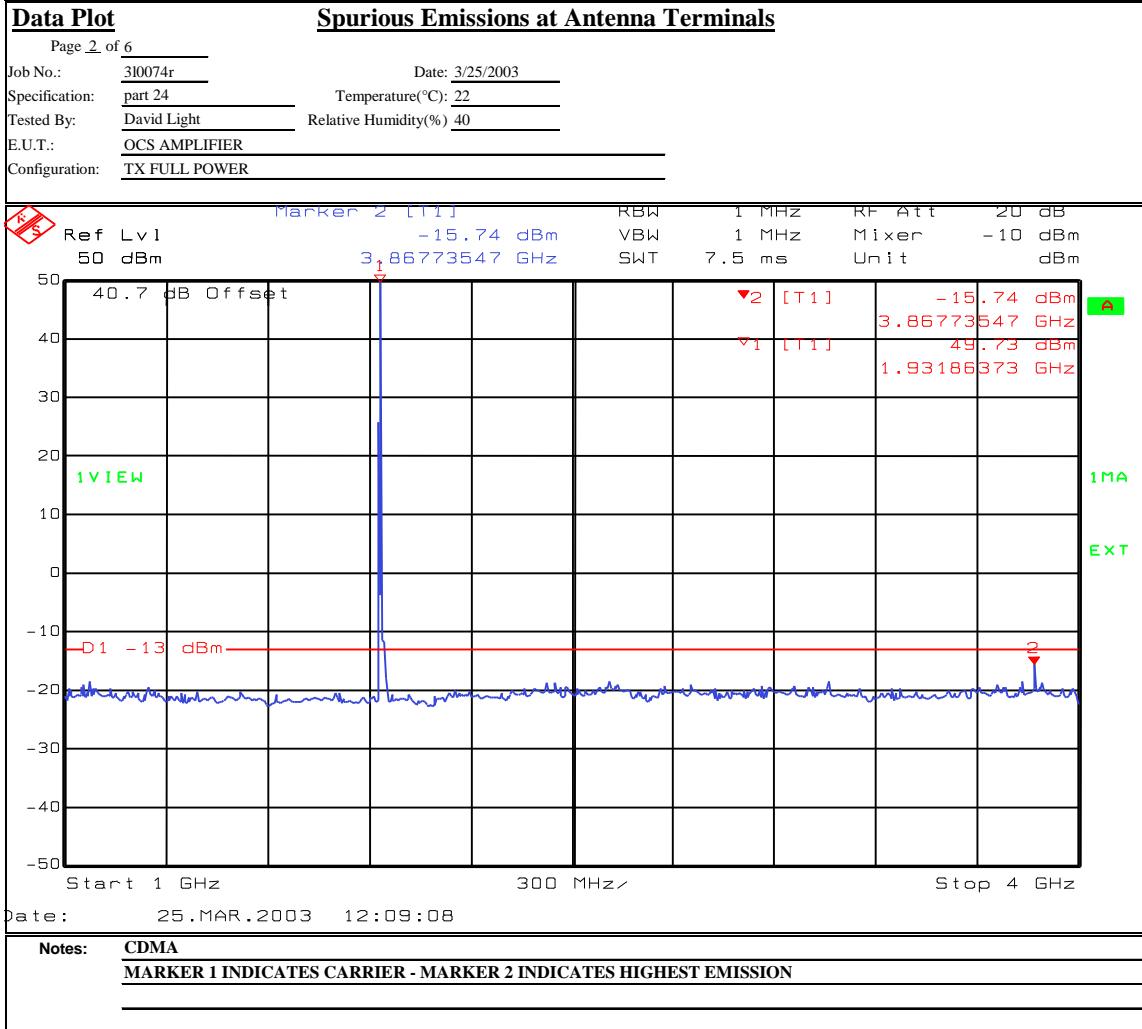
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



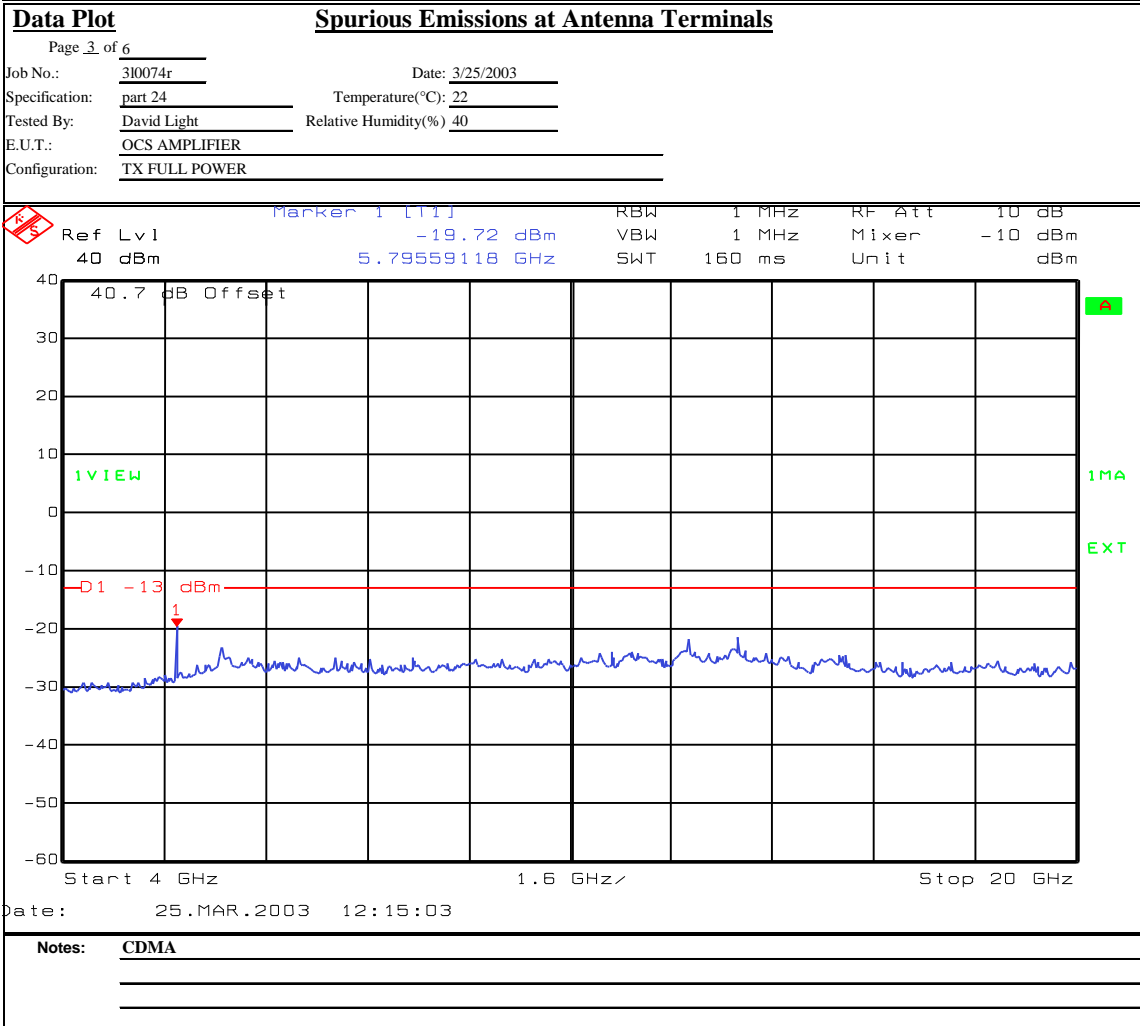
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



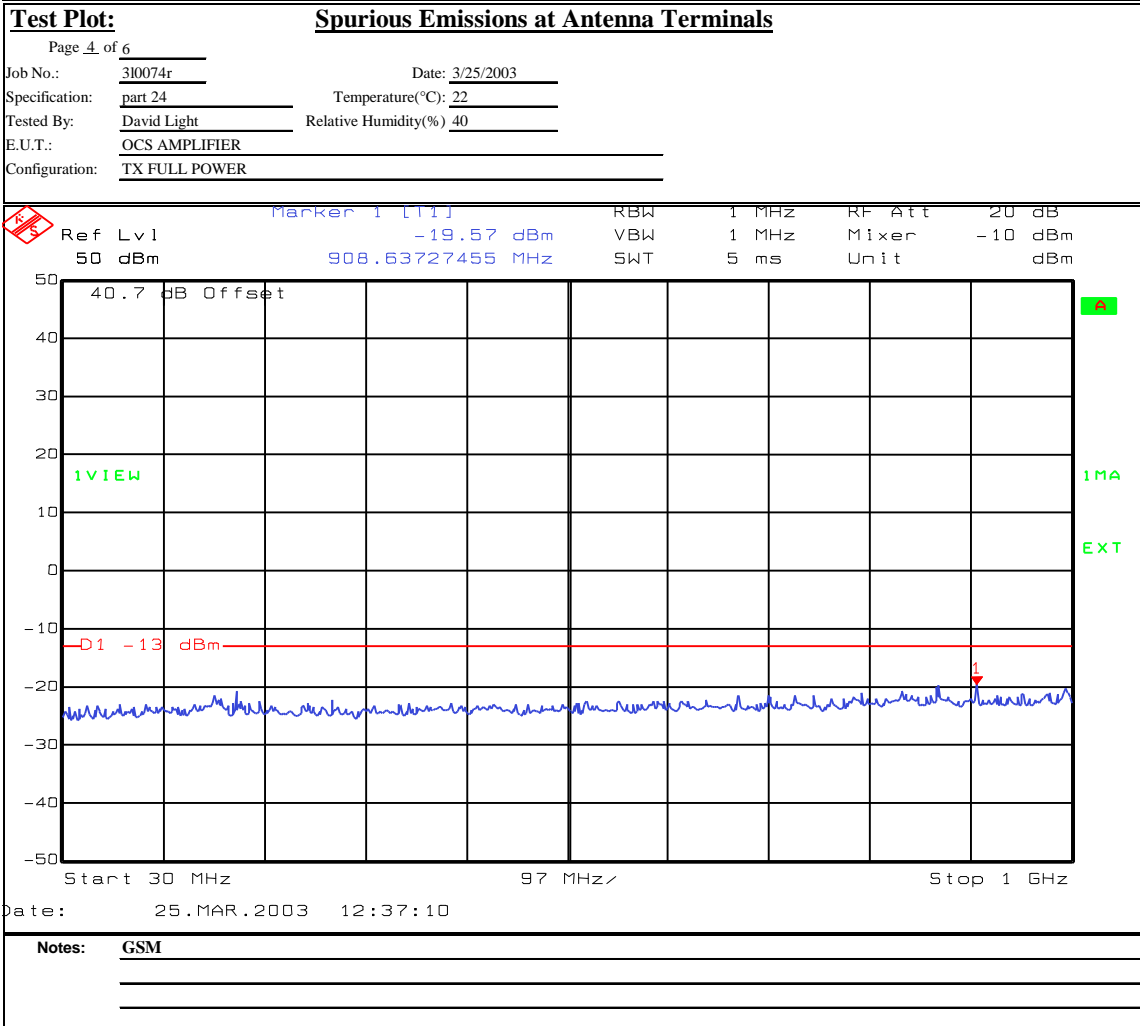
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



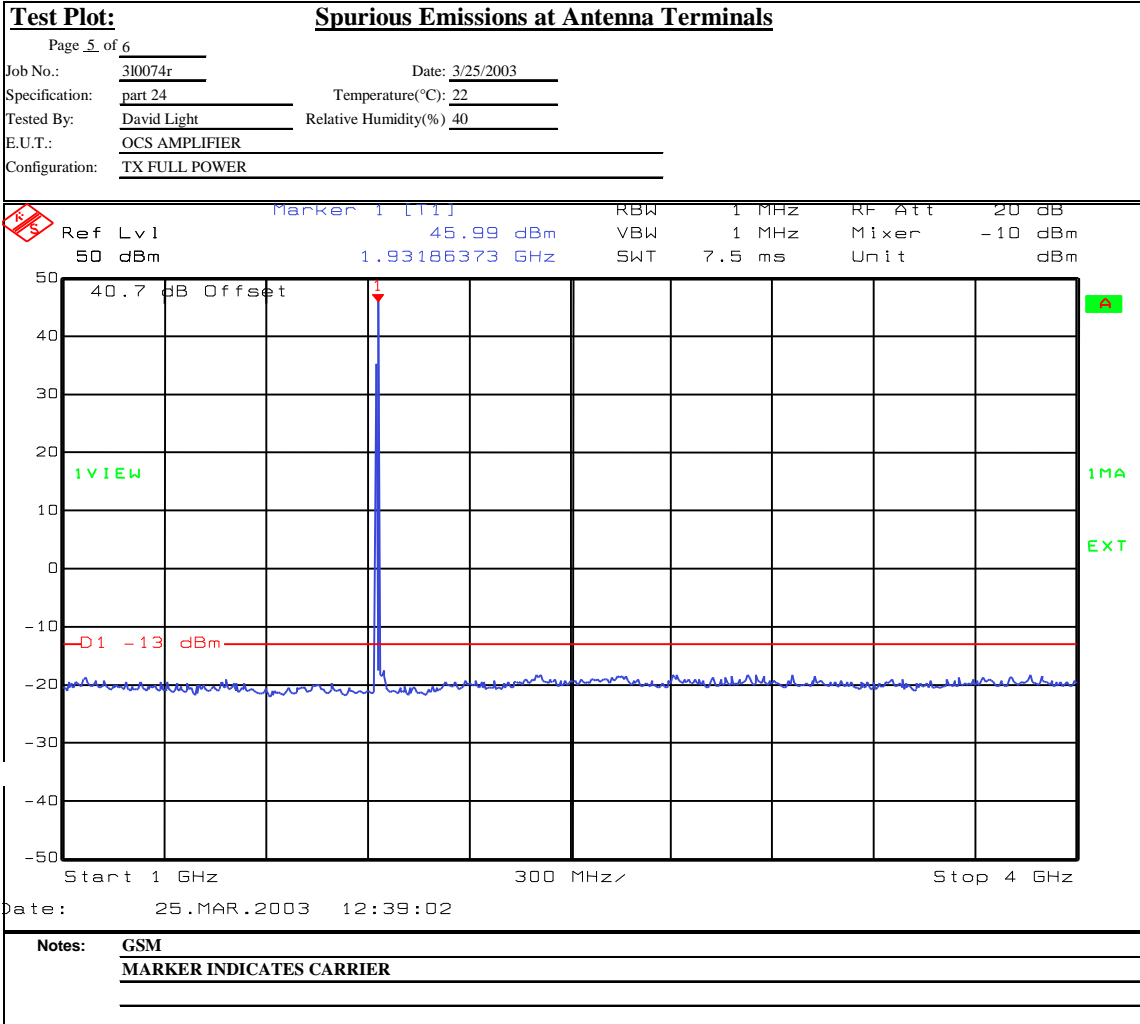
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



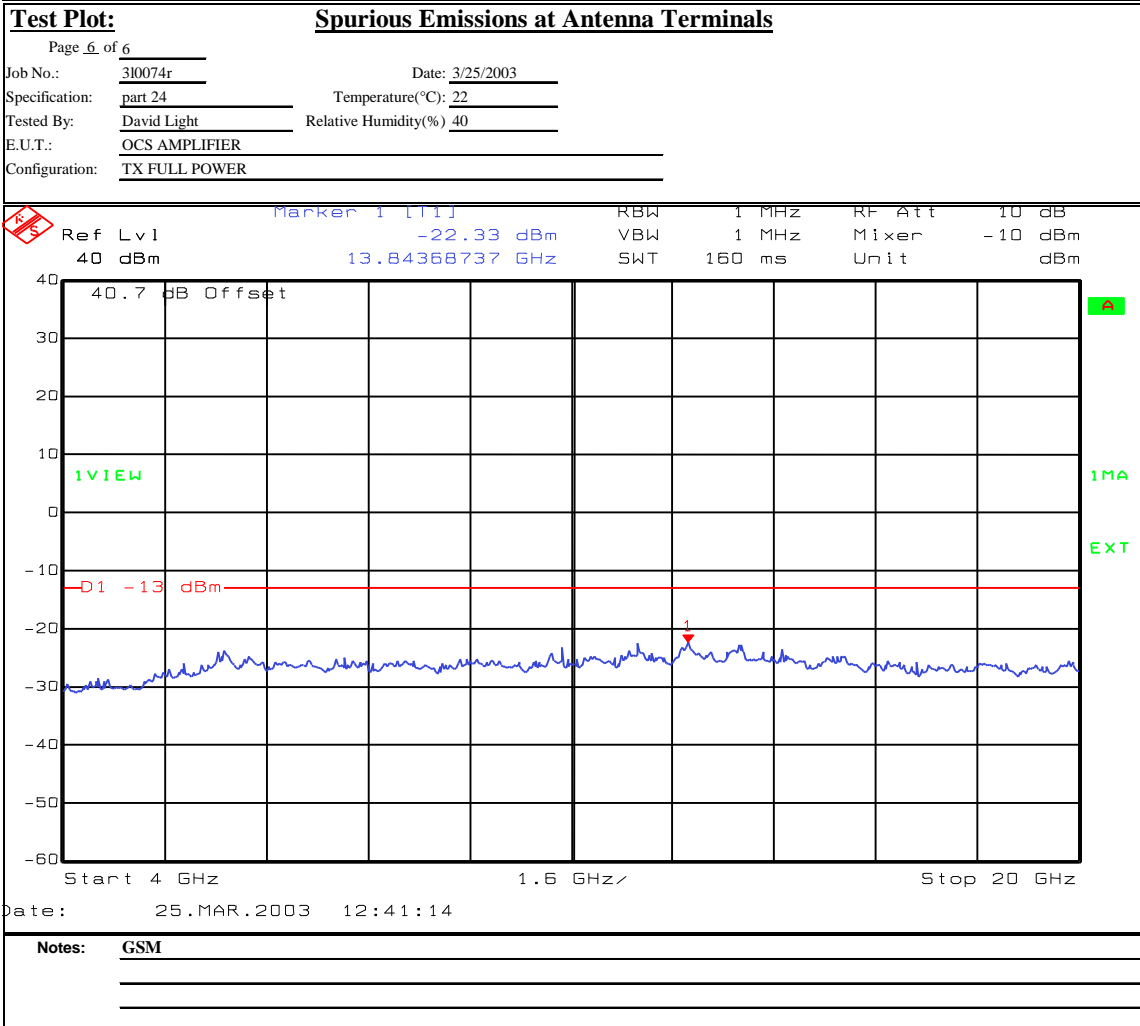
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc.



EQUIPMENT:

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 3/27/03

Test Results: Complies.

Test Data: See attached table.

NOTE: The frequency spectrum was searched from 30 MHz up to the 10th harmonic of the fundamental transmission.

EQUIPMENT:

Test Data - Radiated Spurious Emissions



Nemko Dallas, Inc.

Dallas Headquarters:

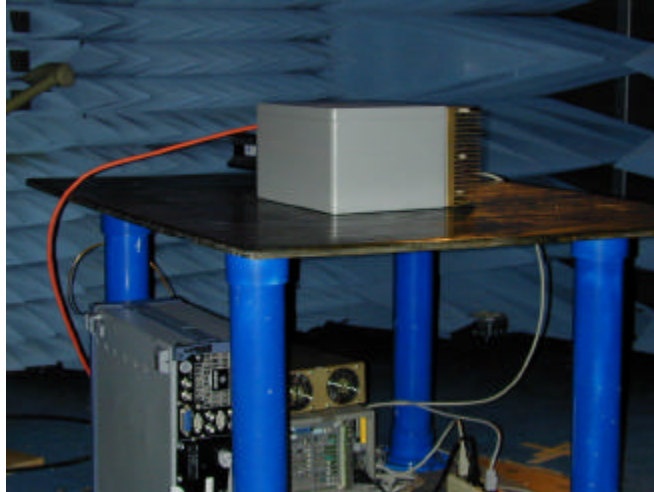
802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

EIRP Substitution Method										
Page <u>1</u> of <u>1</u>								Complete _____		
Job No.:	3L0074R	Date:		3/27/03		Preliminary _____				
Specification:	PART 24	Temperature(°C):		22						
Tested By:	David Light	Relative Humidity(%):		40						
E.U.T.:	PCS REPEATER									
Configuration:	TX FULL POWER									
Sample No:	1									
Location:	AC 3	RBW:		1 MHz		Measurement				
Detector Type:	Peak	VBW:		1 MHz		Distance:		3 m		
Test Equipment Used										
Antenna:	1304	Directional Coupler:								
Pre-Amp:	1016	Cable #1:		1484						
Filter:		Cable #2:		1485						
Receiver:	1464	Cable #3:								
Attenuator #1:		Cable #4:								
Attenuator #2:		Mixer:								
Additional equipment used:										
Measurement Uncertainty:	+/-1.7 dB									
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	Limit (dBm)	EIRP (dBm)	EIRP (mW)	Polarity	Comments
3978	-56.7	43.3		33	10.7	-13	-35.7	0.0003	V	
5967	-63.0	39.8		31.6	11.4	-13	-43.4	0.0000	V	Noise floor
7956	-63.0	41.8		32.9	11.3	-13	-42.8	0.0001	V	Noise floor
9945	-62.0	41.8		35.1	12.4	-13	-42.9	0.0001	V	Noise floor
11934	-62.0	42.8		34.7	12.6	-13	-41.3	0.0001	V	Noise floor
13923	-62.0	47.7		33.5	12.7	-13	-35.1	0.0003	V	Noise floor
15912	-62.8	44.3		33.9	15.0	-13	-37.4	0.0002	V	Noise floor
17901	-62.5	50.3		34.1	12.5	-13	-33.8	0.0004	V	Noise floor
3978	-55.8	35.5		33	10.7	-13	-42.6	0.0001	H	
5967	-60.7	37.8		31.6	11.4	-13	-43.1	0.0000	H	
7956	-63.0	41.5		32.9	11.3	-13	-43.1	0.0000	H	Noise floor
9945	-62.0	43.3		35.1	12.4	-13	-41.4	0.0001	H	Noise floor
11934	-62.0	47.0		34.7	12.6	-13	-37.1	0.0002	H	Noise floor
13923	-62.0	47.7		33.5	12.7	-13	-35.1	0.0003	H	Noise floor
15912	-62.8	45.5		33.9	15.0	-13	-36.2	0.0002	H	Noise floor
17901	-62.5	53.5		34.1	12.5	-13	-30.6	0.0009	H	Noise floor
Notes: Searched spectrum to the 10th harmonic of carrier (1989 MHz)										

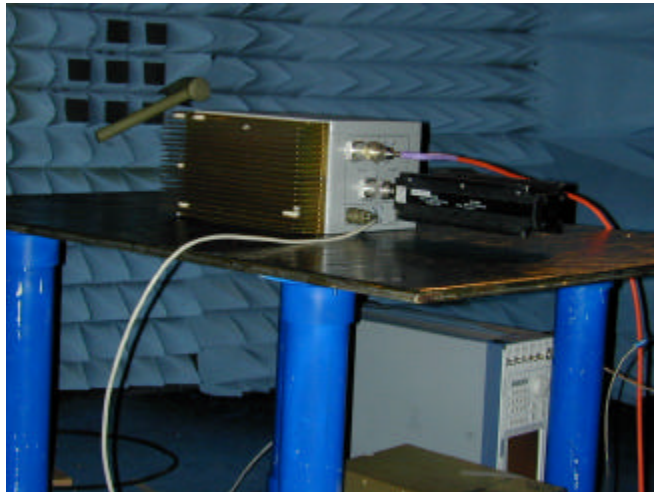
EQUIPMENT:

Photographs of Test Setup

FRONT VIEW



REAR VIEW



*EQUIPMENT:***Section 7. Test Equipment List**

ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
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
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/04
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	07/15/02	07/15/03
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01	07/30/03
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	12/18/03
1604	ATTENUATOR	NARDA 776B-20	NONE	CBU	CBU
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	CBU
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	CBU
1055	DUAL DIRECTIONAL COUPLER	NARDA 3022	73393	CBU	CBU
1056	POWER SENSOR (2 - 26.5 GHz)	HEWLETT PACKARD 8485A (50ohm,1.0uW-100mW)	2347A02782	10/4/02	10/4/03
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	CBU

EQUIPMENT:

ANNEX A - TEST DETAILS

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

Minimum Standard: Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

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:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

EQUIPMENT:

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1047
---	--------------------------

Minimum Standard: Para. No. 24.238(b). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB.

Method Of Measurement:

CDMA

Spectrum analyzer settings:

RBW: 30 kHz

VBW: \geq RBW

Span: 5 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

GSM

RBW: 3 kHz

VBW: \geq RBW

Span: 2 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

NADC

RBW: 1 kHz

VBW: \geq RBW

Span: 1 MHz

Sweep: Auto

Mask: Set markers to -26 dB from peak of CW.

EQUIPMENT:

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA

GSM

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: 6 Sweeps

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

NADC

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: ≥ RBW
Sweep: Auto
Video Avg: Disabled

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

EQUIPMENT:

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
---	--------------------------

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Test Method: TIA/EIA-603-1992, Section 2.2.12

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 eirp is the signal level fed to the reference antenna.

EQUIPMENT:

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
--	--------------------------

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:

Frequency Stability With Voltage Variation

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

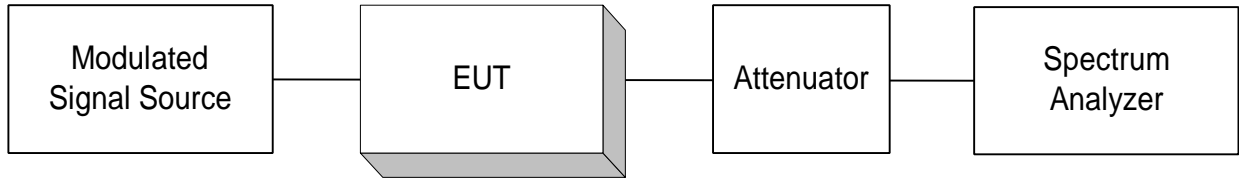
Frequency Stability With Temperature Variation

The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

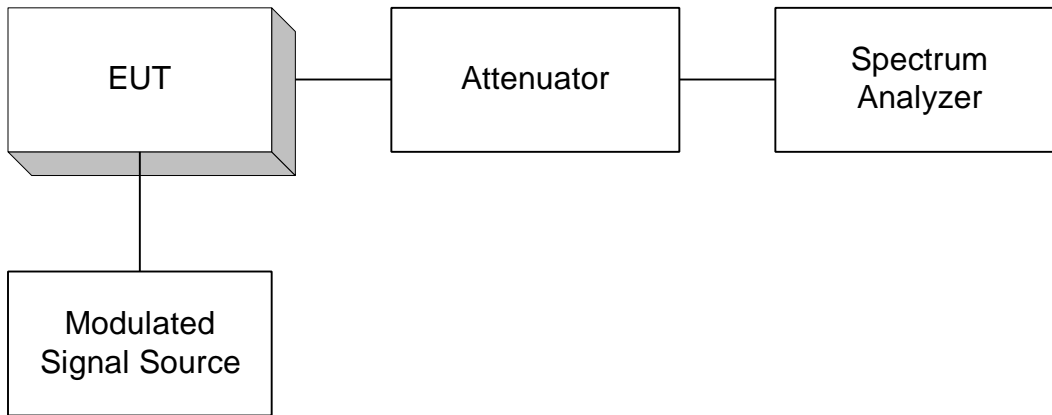
ANNEX B - TEST DIAGRAMS

EQUIPMENT:

Para. No. 2.985 - R.F. Power Output

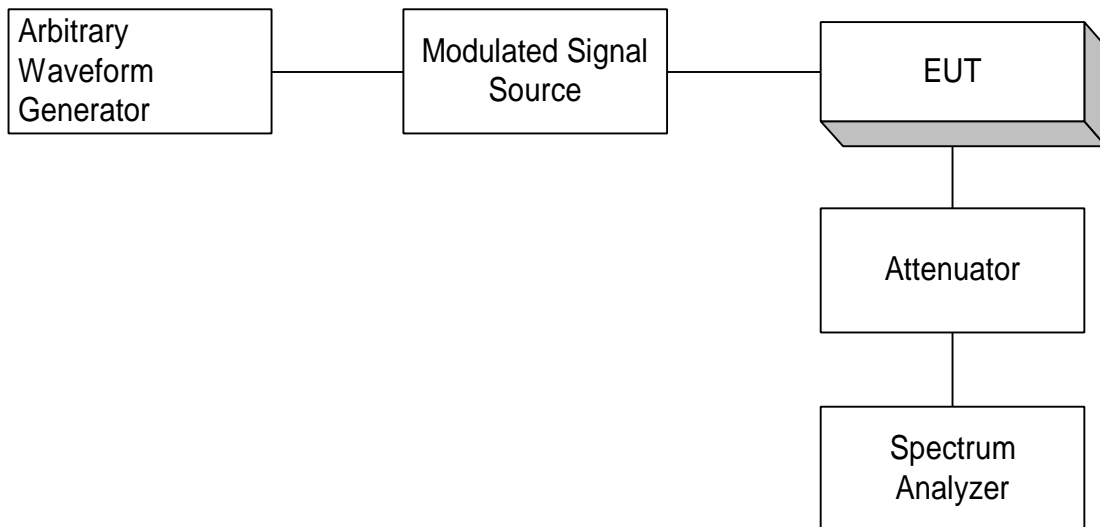
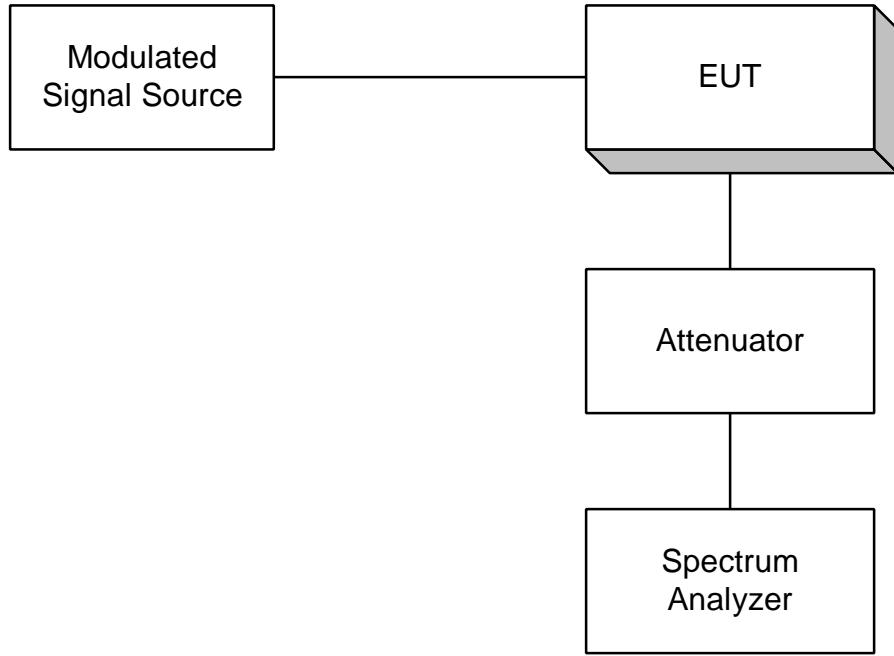


Para. No. 2.989 - Occupied Bandwidth



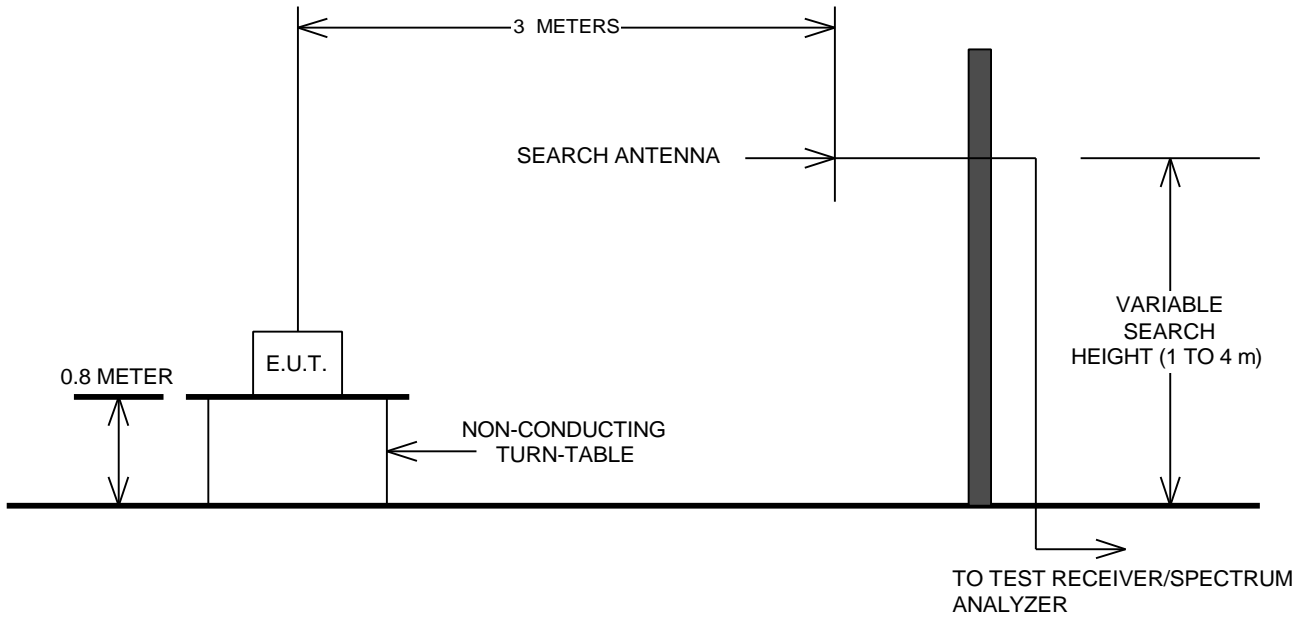
EQUIPMENT:

Para. No. 2.991 Spurious Emissions at Antenna Terminals



EQUIPMENT:

Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

