

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”.

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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:	Downlink:	1931.25 to 1988.75 MHz (F9W) 1930.3 to 1989.7 MHz (GXW)	
		☒ Block A : 1930 – 1945 MHz ☒ Block D : 1945 – 1950 MHz ☒ Block B : 1950 – 1965 MHz ☒ Block E : 1965 – 1970 MHz ☒ Block F : 1970 – 1975 MHz ☒ Block C : 1975 – 1990 MHz	
		CDMA (F9W) ☒	GSM (GXW) ☒
		NADC (DXW) ☐	
Output Impedance:	50 ohms		
	CDMA: 20 W GSM: 40 W		
	F1-F1 ☒	F1-F2 ☐	N/A ☐
	Software ☐	Duplexer ☒	Fullband ☐

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



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Data Plot		Occupied Bandwidth	
Page 1 of 4			
Job No.:	3L0074R	Date:	3/25/2003
Specification:	PART 24	Temperature(°C):	22
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
Detector Type:	Refer to plots	VBW:	Refer to plots
Test Equipment Used		Measurement Distance: <u>na</u> m	
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		
Ref Lvl 40 dBm		RBW	30 kHz
		VBW	300 kHz
		SWT	14 ms
		RF Att	10 dB
		Mixer	-10 dBm
		Unit	dBm
Date: 25.MAR.2003 11:18:46			
Notes: OUTPUT CDMA 20 WATTS			

EQUIPMENT:

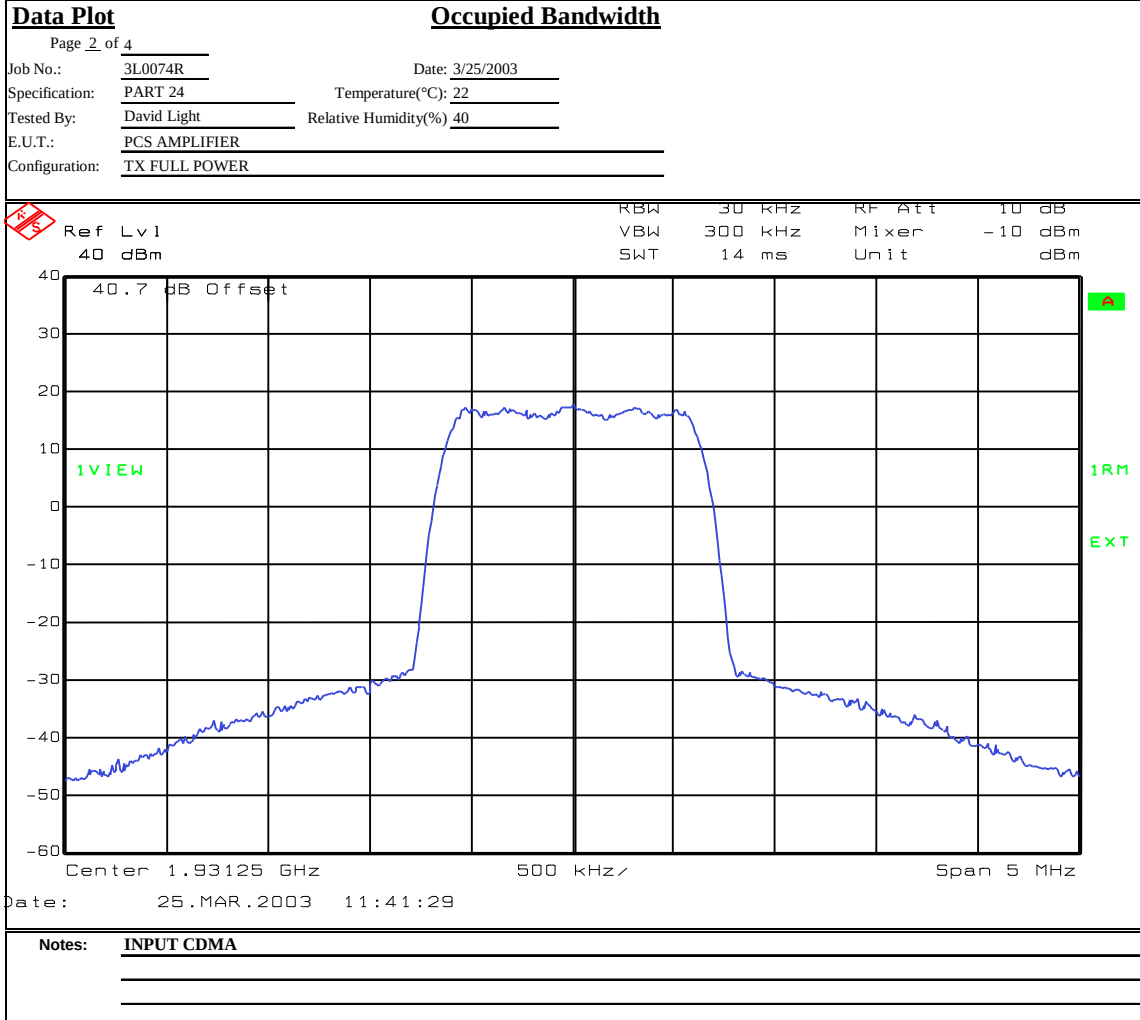
Test Data – Occupied Bandwidth



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EQUIPMENT:

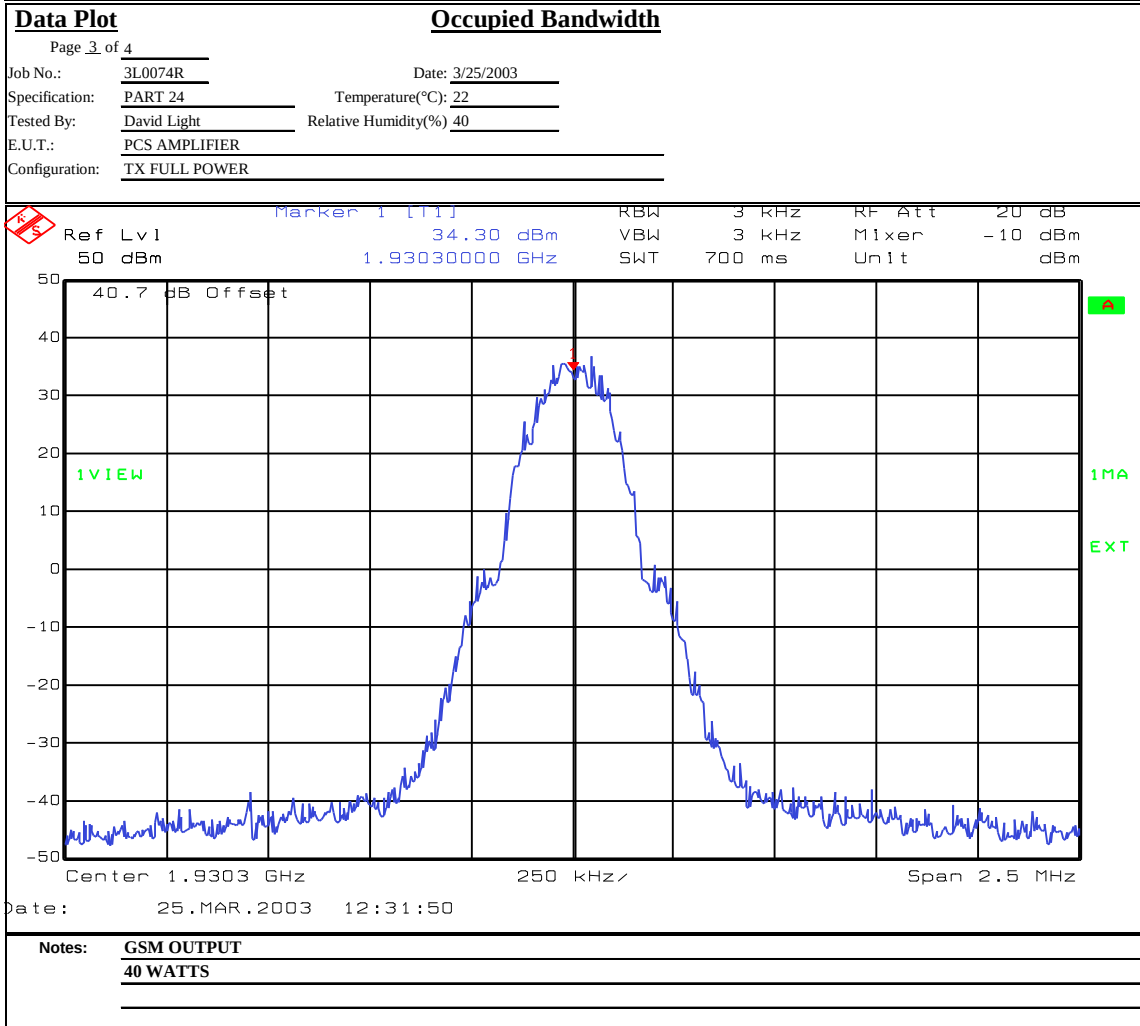
Test Data – Occupied Bandwidth



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EQUIPMENT:

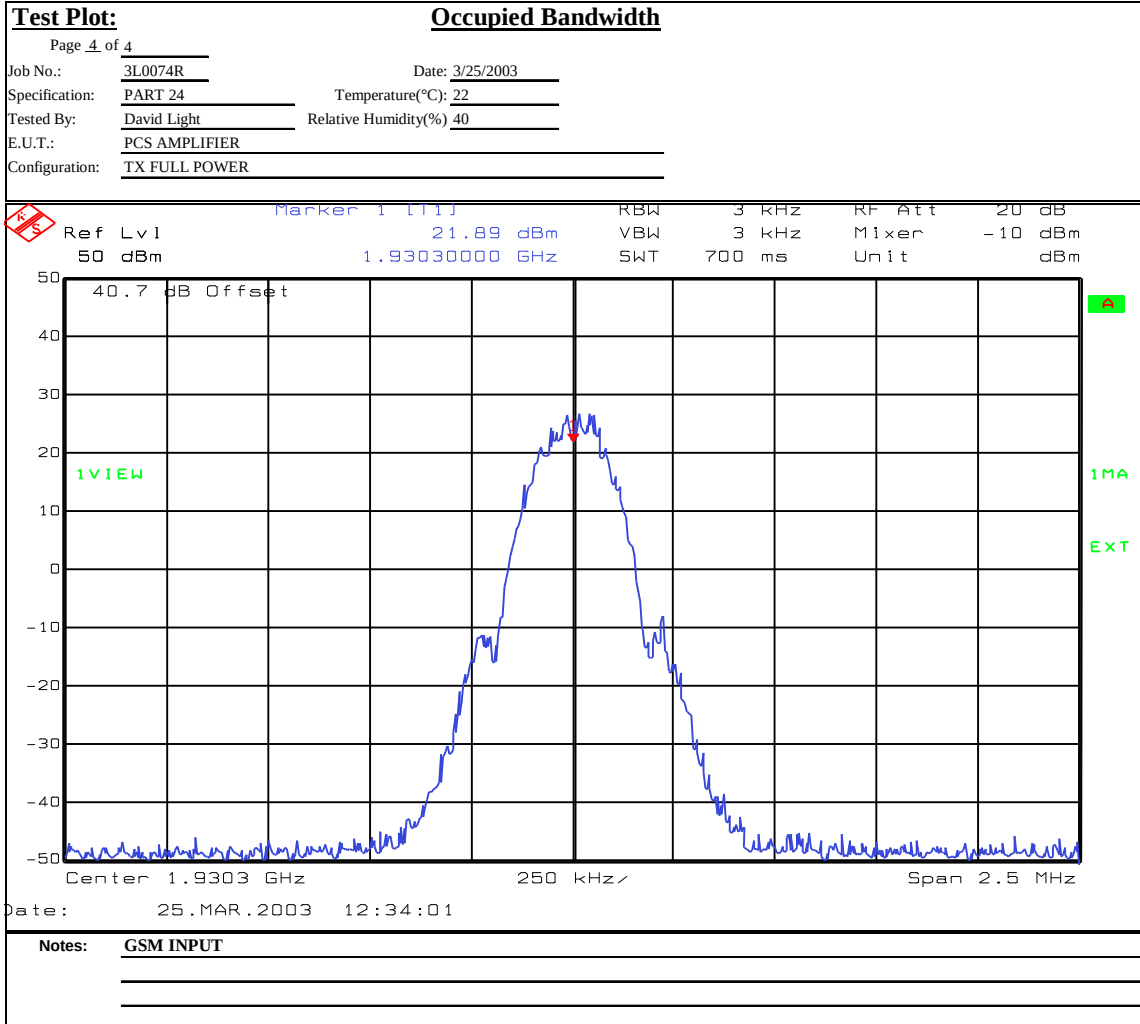
Test Data – Occupied Bandwidth



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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



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Data Plot		Bandedges	
Page 1 of 4			
Job No.:	3L0074R	Date:	3/25/2003
Specification:	PART 24	Temperature(°C):	22
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
Detector Type:	Refer to plots	VBW:	Refer to plots
		Measurement	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		
Date: 25.MAR.2003 09:52:12			
Notes: LOWER BAND EDGE CDMA 10 WATTS PER CHANNEL			

EQUIPMENT:

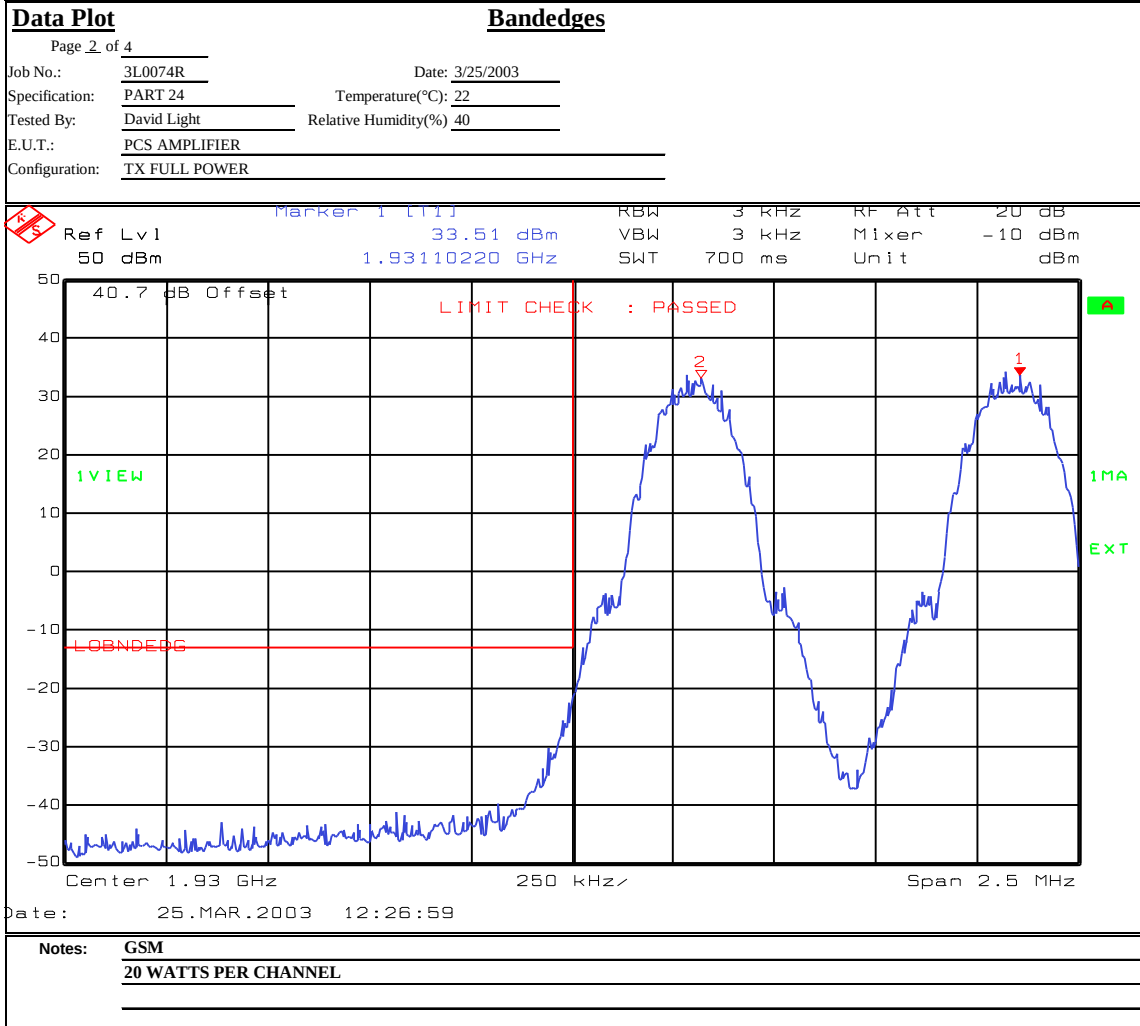
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT:

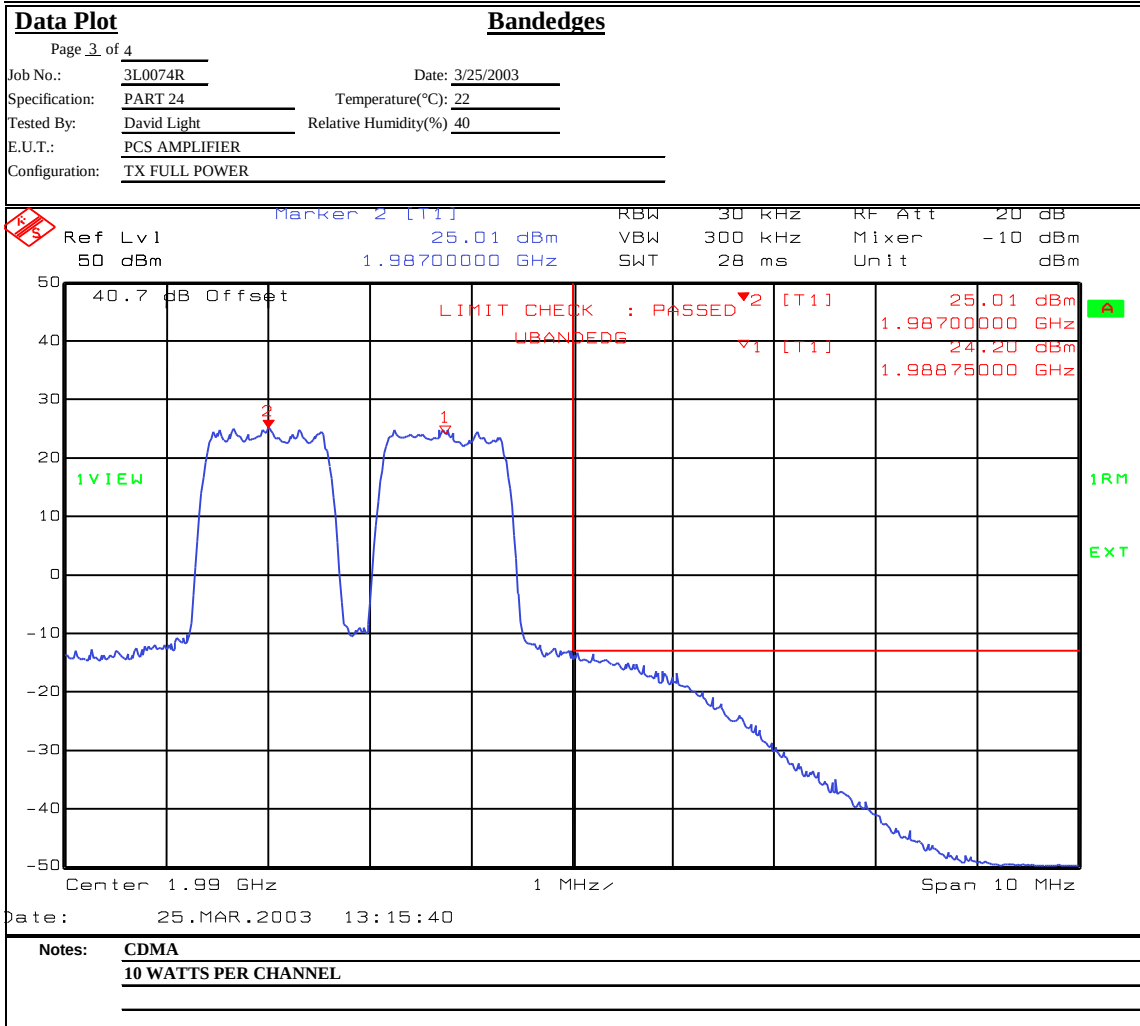
Test Data – Spurious Emissions at Antenna Terminals



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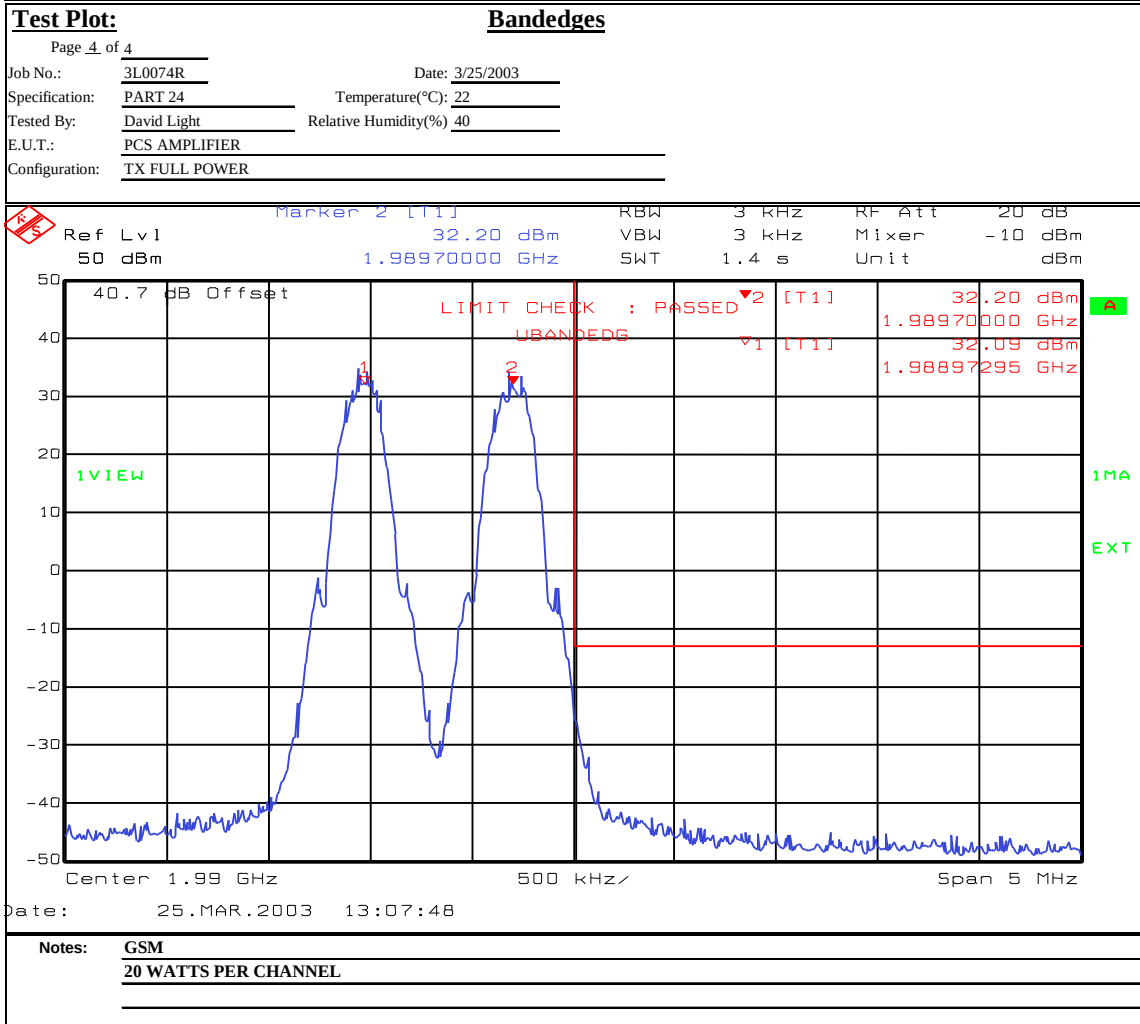
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 6		Complete	X
Job No.: 310074r	Date: 3/25/2003	Preliminary:	
Specification: part 24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: OCS AMPLIFIER			
Configuration: TX FULL POWER			
Sample Number: 1			
Location: Lab 1	RBW: 1 MHz	Measurement	
Detector Type: Peak	VBW: 1 MHz	Distance: N/A	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			
Date: 25.MAR.2003 12:05:03			
Notes: CDMA			

EQUIPMENT:

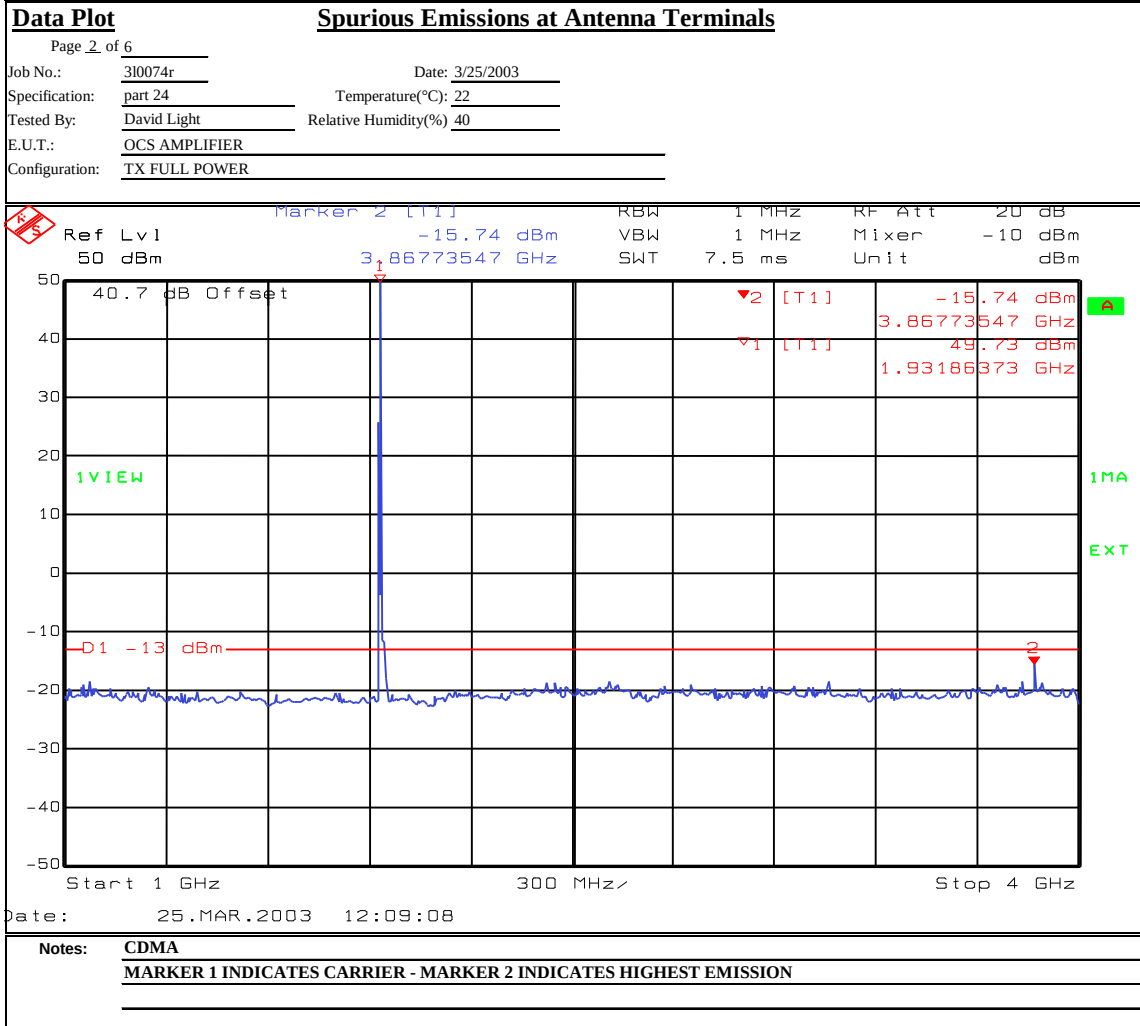
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT:

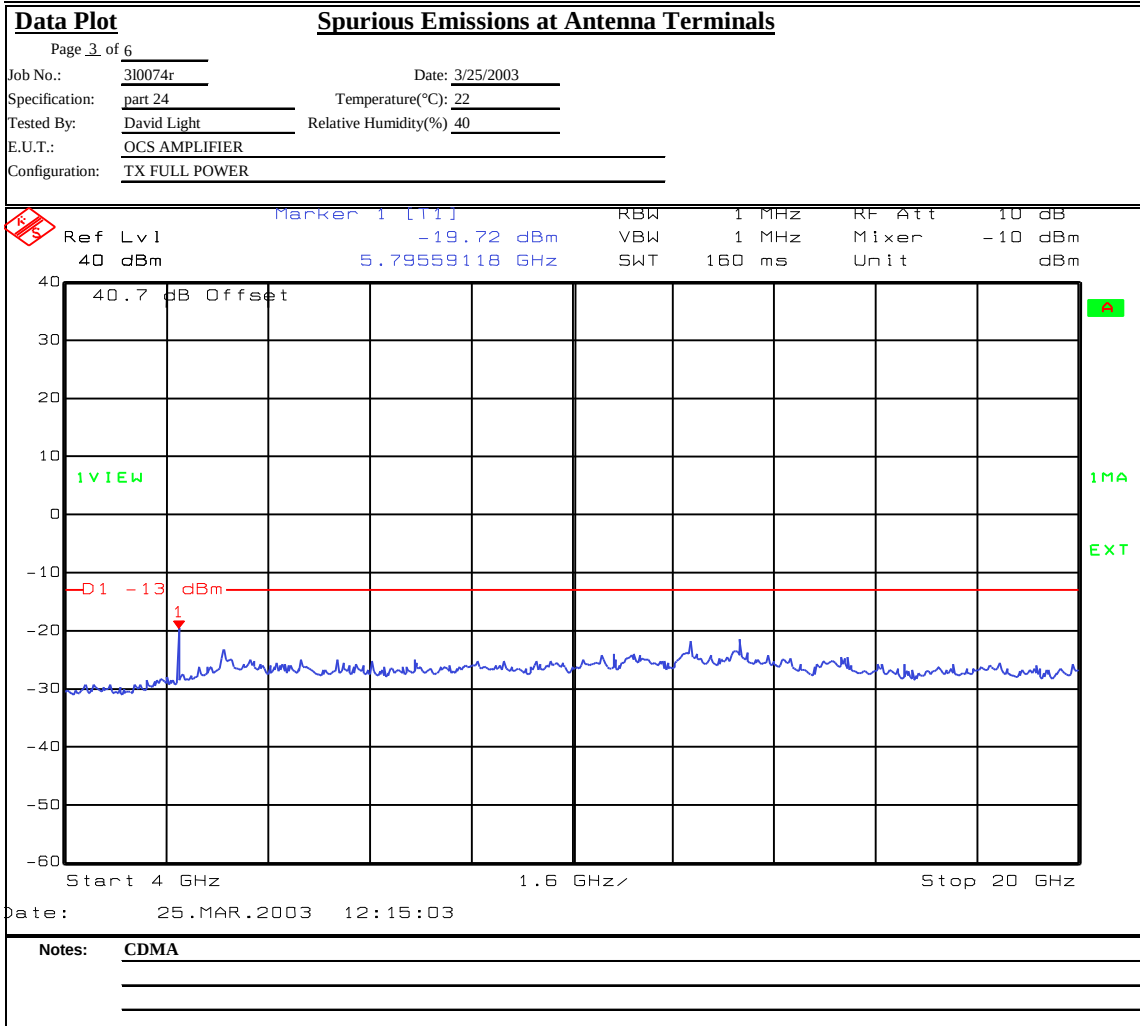
Test Data – Spurious Emissions at Antenna Terminals



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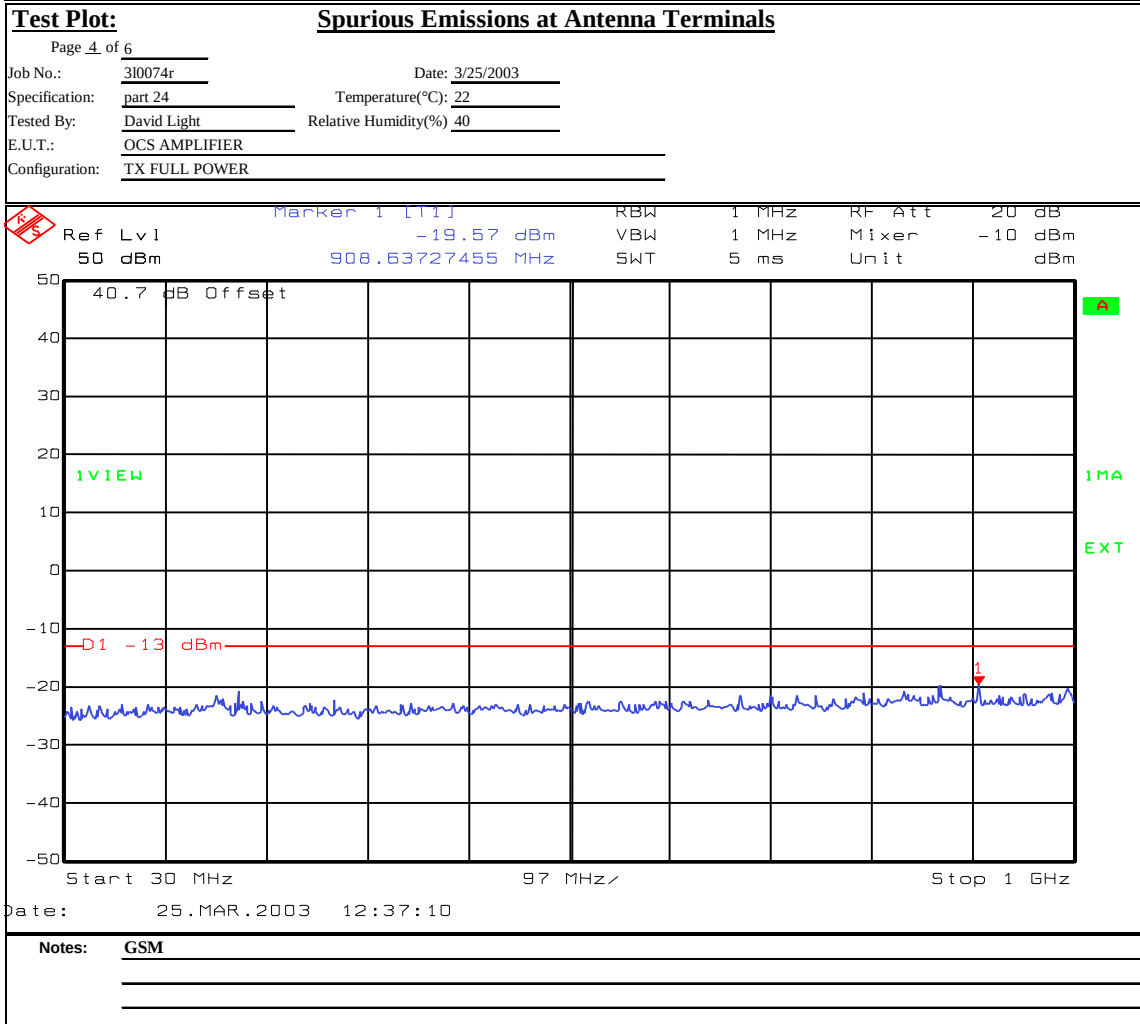
EQUIPMENT:

Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT:

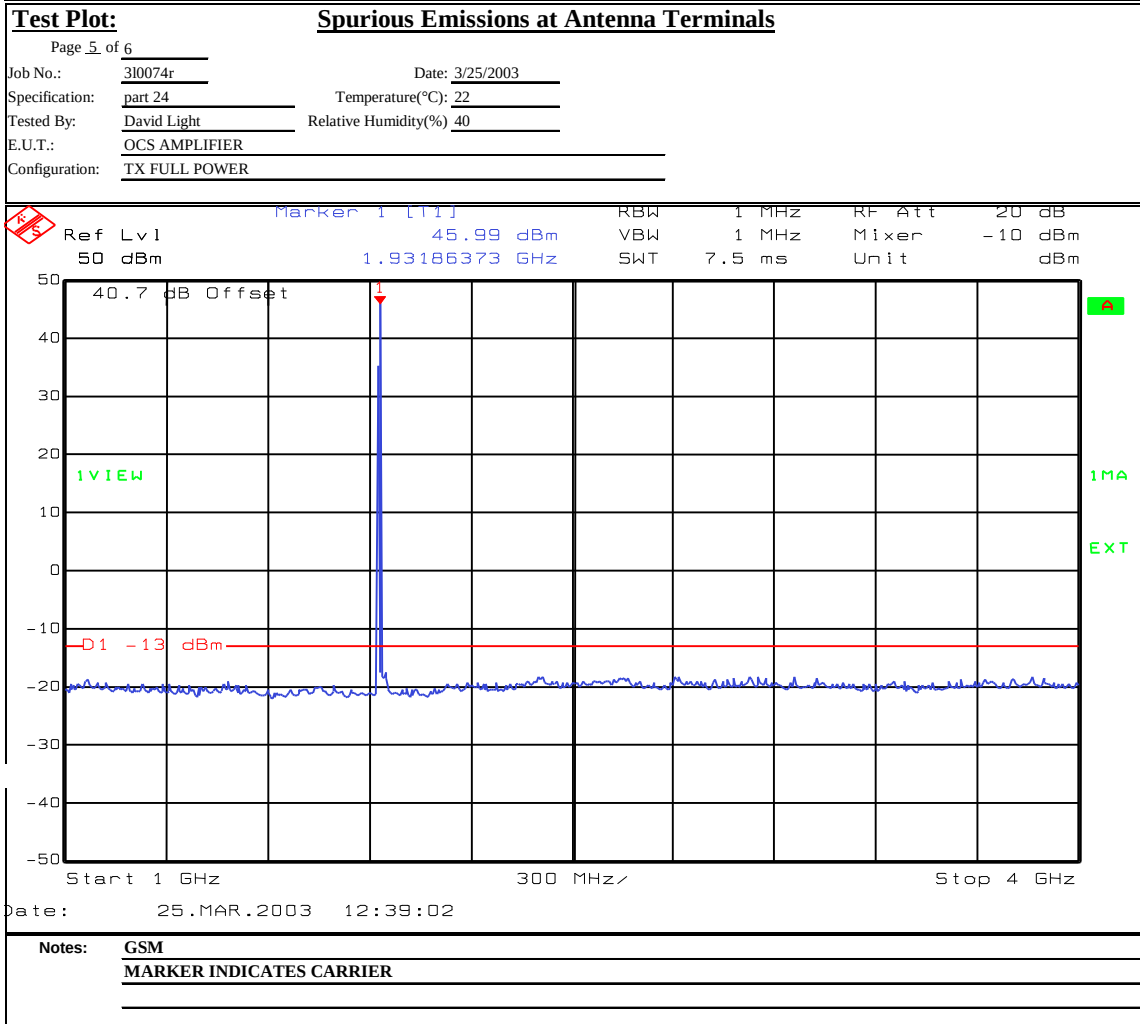
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT:

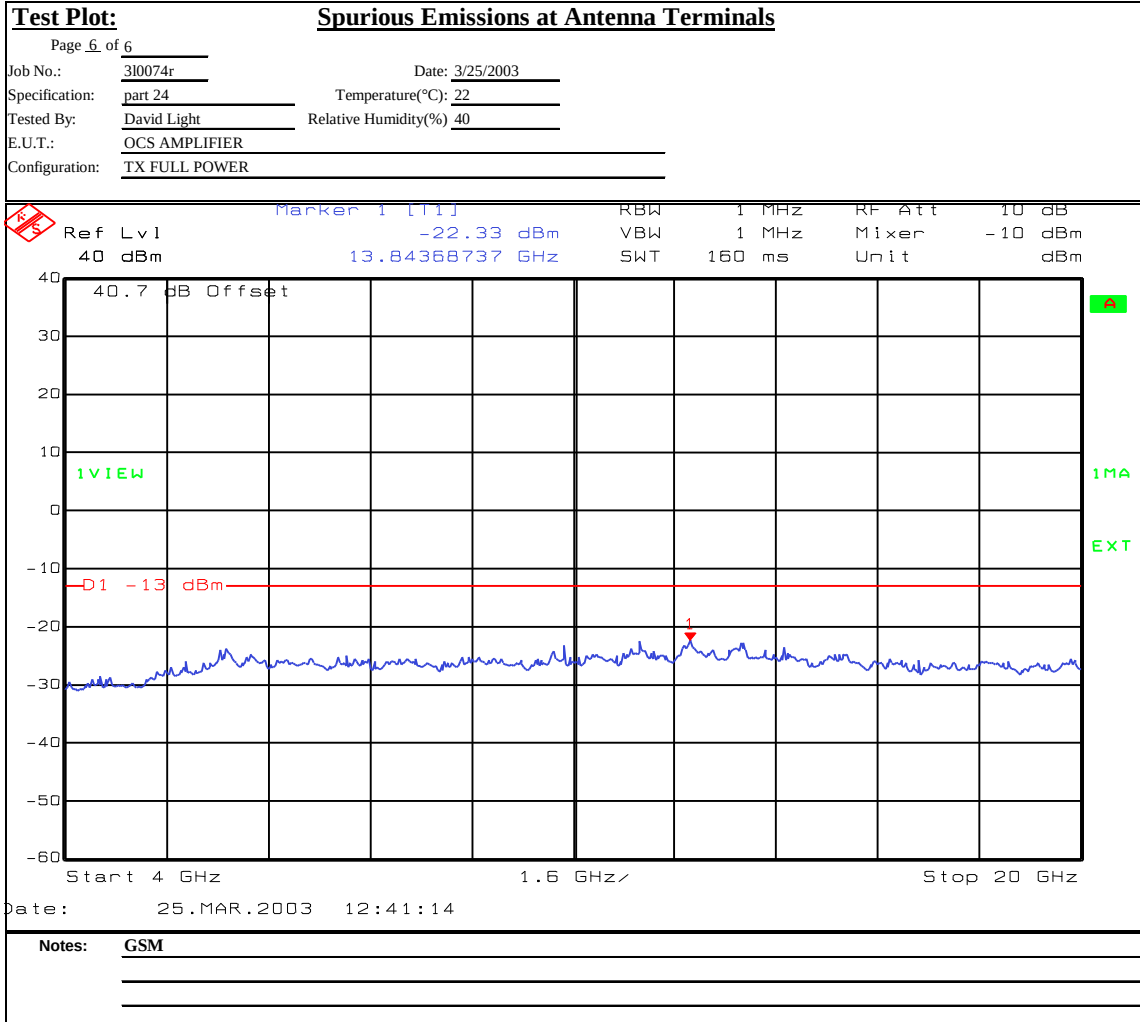
Test Data – Spurious Emissions at Antenna Terminals



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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:

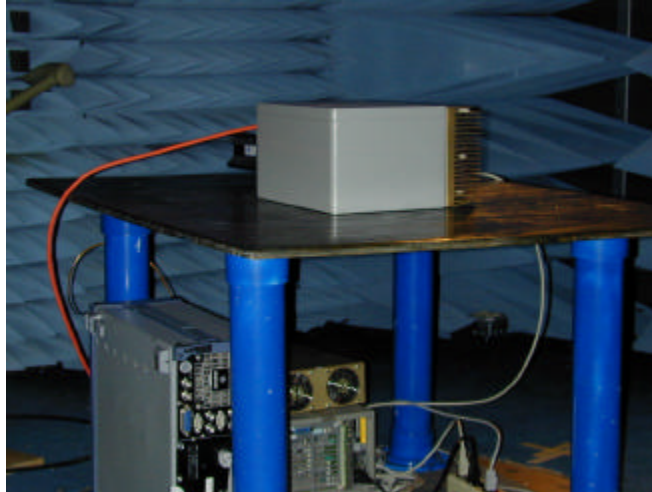
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EIRP Substitution Method										
Page <u>1</u> of <u>1</u>								Complete _____		
Job No.: 3L0074R		Date: 3/27/03						Preliminary _____		
Specification: PART 24		Temperature(°C): <u>22</u>								
Tested By: David Light		Relative Humidity(%) <u>40</u>								
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: <u>3</u> 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)										

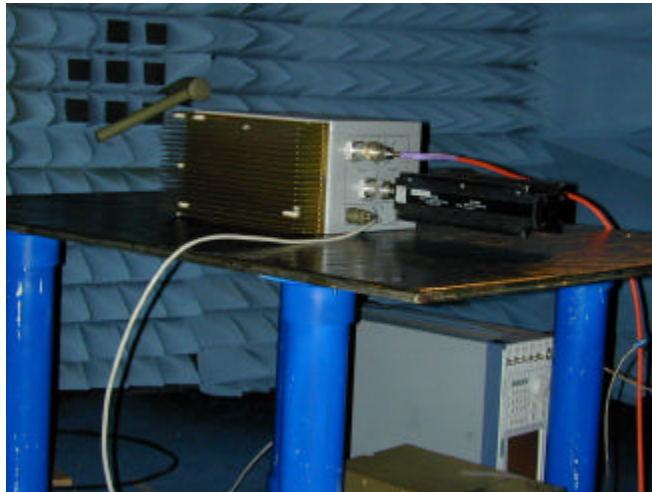
EQUIPMENT:

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

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

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

GSM

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

NADC

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: $\geq$ 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.

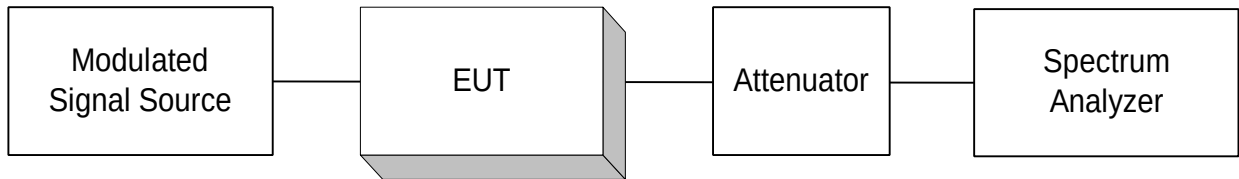
Frequency Stability With Temperature Variation

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.

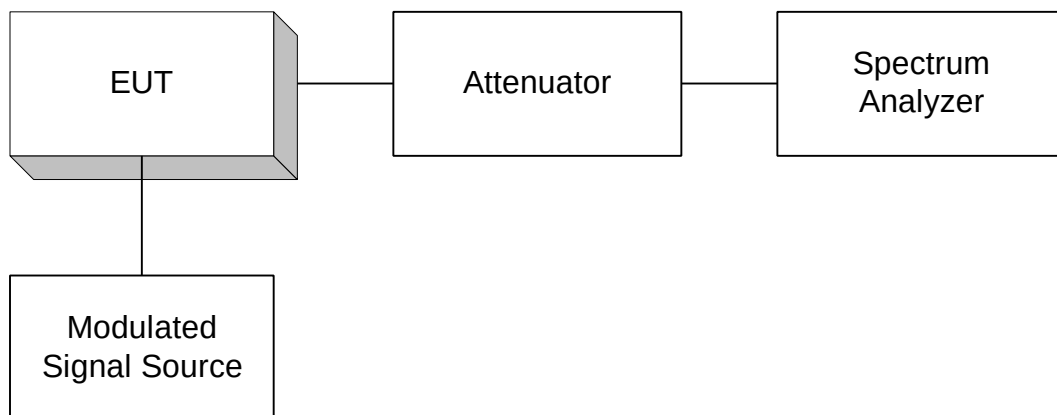
ANNEX B - TEST DIAGRAMS

EQUIPMENT:

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

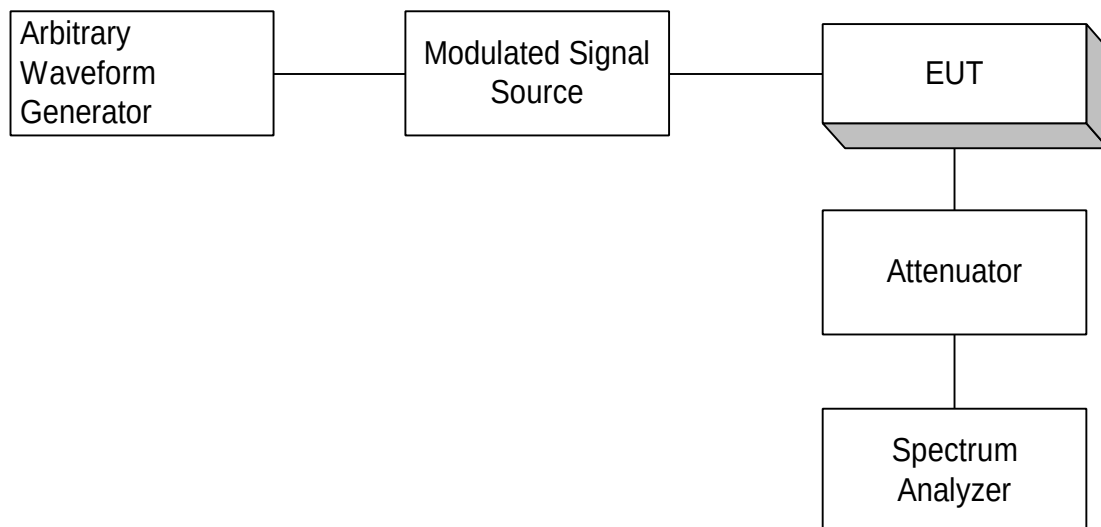
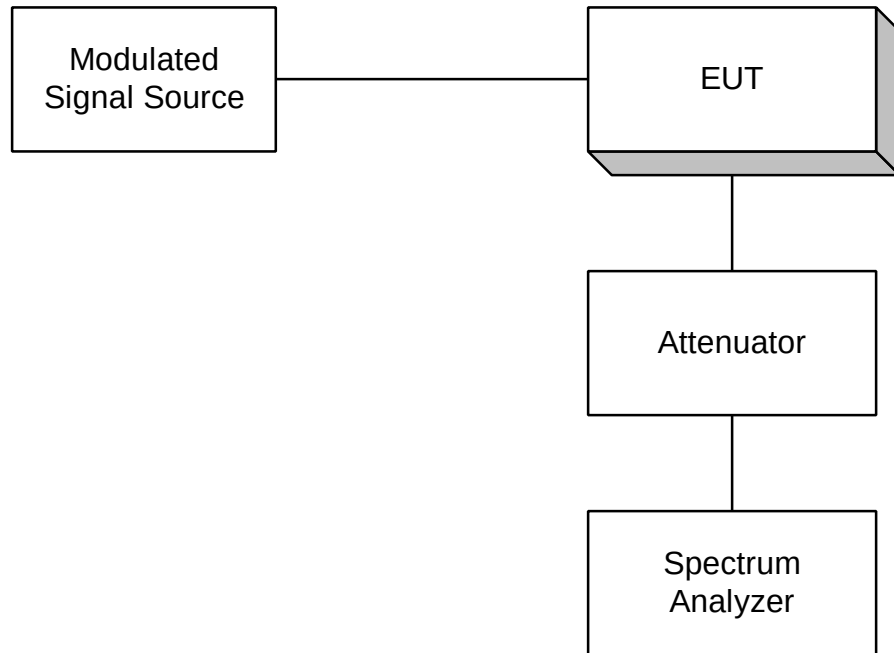


Para. No. 2.989 - Occupied Bandwidth



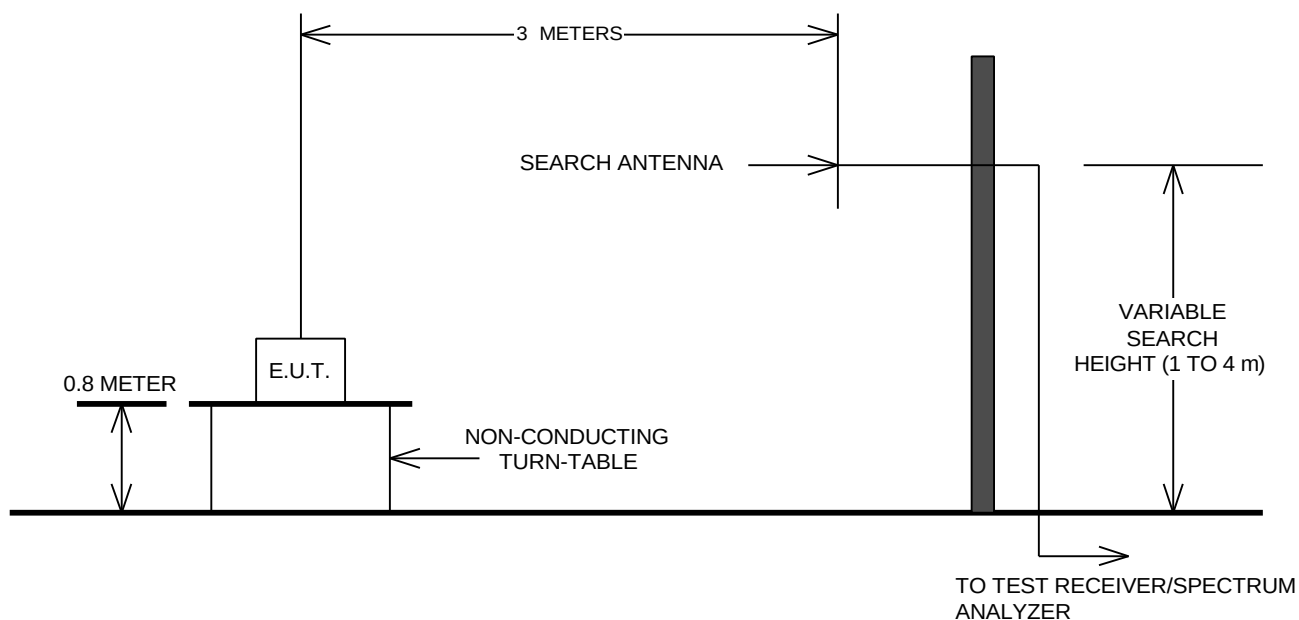
EQUIPMENT:

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

