

Nemko Test Report No.: 4L0490RUS1REV2

Applicant: Andrew Corporation

Equipment Under Test: TFAN 80/19

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 Group Manager

Date: 18 October, 2004

Total Number of Pages: 42

Table of Contents

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

Section 2. General Equipment Specification5

Section 3. RF Power Output.....7

Section 4. Occupied Bandwidth8

Section 5. Spurious Emissions at Antenna Terminals17

Section 6. Field Strength of Spurious30

Section 7. Test Equipment List32

ANNEX A - TEST DETAILS.....33

ANNEX B - TEST DIAGRAMS39

Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAN 80/19

Serial No.: 042202202

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

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	100W	Complies
Occupied Bandwidth (CDMA)	24.238	Input/Output	Complies
Occupied Bandwidth (GSM)	24.238	Input/Output	Complies
Occupied Bandwidth (NADC)	24.238	Input/Output	Complies
Occupied Bandwidth (EDGE)	24.238	Input/Output	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235		NA

Footnotes:

(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.

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

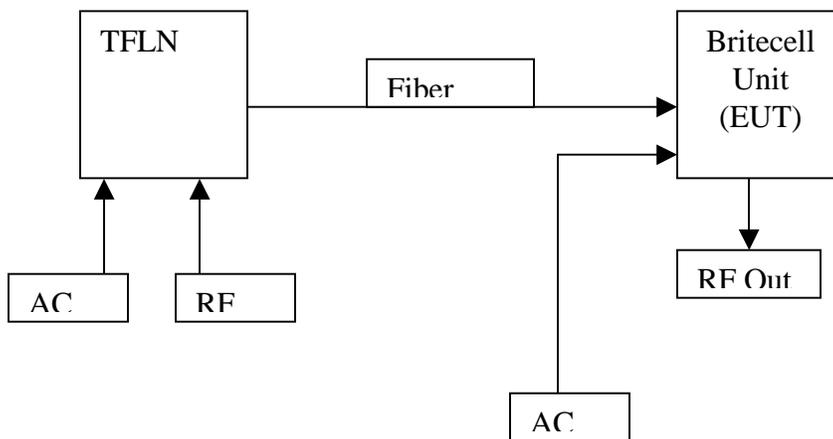
Section 2. General Equipment Specification

Supply Voltage Input:										
Frequency Bands:	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								
Frequency Bands:	Uplink:	<input type="checkbox"/> Block A : 1850 – 1865 MHz <input type="checkbox"/> Block B : 1865 – 1870 MHz <input type="checkbox"/> Block C : 1870 – 1885 MHz <input type="checkbox"/> Block D : 1885 – 1890 MHz <input type="checkbox"/> Block E : 1890 – 1895 MHz <input type="checkbox"/> Block F : 1895 – 1910 MHz								
Type of Modulation and Designator:		<table border="0"> <tr> <td>CDMA (F9W)</td> <td>GSM (G7W)</td> <td>NADC (DXW)</td> <td>EDGE (GXW)</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table>	CDMA (F9W)	GSM (G7W)	NADC (DXW)	EDGE (GXW)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CDMA (F9W)	GSM (G7W)	NADC (DXW)	EDGE (GXW)							
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
Output Impedance:		50 ohms								
Max Input:		+10 dBm								
RF Output (Rated):	Uplink	N/A								
RF Output (Rated):	Downlink	28.1 mW max								
Frequency Translation:		<table border="0"> <tr> <td>F1-F1</td> <td>F1-F2</td> <td>N/A</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	F1-F1	F1-F2	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
F1-F1	F1-F2	N/A								
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
Band Selection:		<table border="0"> <tr> <td>Software</td> <td>Duplexer</td> <td>Fullband</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Software	Duplexer	Fullband	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Software	Duplexer	Fullband								
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>								

Description of Operation

Britecell Plus is a radio over fiber system operation in the 1900 PCS and SMR bands.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Dustin Oaks	DATE:8/13/04

Test Results: Complies.

Measurement Data:

	Modulation Type	Per Channel Output Power (mW)	Per Channel Output Power (dBm)
Uplink	NA		
Downlink	CDMA	5.63	15.01
Uplink	NA		
Downlink	GSM	11.50	21.21
Uplink	NA		
Downlink	EDGE	7.60	17.61
Uplink	NA		
Downlink	NADC	8.50	18.59

Equipment Used: 1627-1036-1604

Measurement Uncertainty: +/- 1.6 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:7/28/04

Test Results: Complies.

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.6 dB

EQUIPMENT: TFAN 80/19

Test Data – Occupied Bandwidth (Input/Output)



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 Fax: (972) 436-2667

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<u>Data Plot</u>		<u>Occupied Bandwidth</u>																			
Page 1 of 8		Date: 7/28/2004	Complete: <u>X</u>																		
Job No.:		Temperature(°C): 22	Preliminary: _____																		
Specification:		Relative Humidity(%): 40																			
Tested By: David Light																					
E.U.T.: dual band amp																					
Configuration: Tx Full power																					
Sample Number: 1																					
Location: Lab 1		RBW: Refer to plots	Measurement																		
Detector Type: Peak		VBW: Refer to plots	Distance: <u>na</u> m																		
Test Equipment Used																					
Antenna: _____		Directional Coupler: _____																			
Pre-Amp: _____		Cable #1: 1626																			
Filter: _____		Cable #2: 1627																			
Receiver: 1036		Cable #3: _____																			
Attenuator #1: 1471		Cable #4: _____																			
Attenuator #2: _____		Mixer: _____																			
Additional equipment used: _____																					
Measurement Uncertainty: +/-1.7 dB																					
<table border="1"> <tr> <td>Ref</td> <td>Lvl</td> <td>RBW</td> <td>30 KHz</td> <td>RF Att</td> <td>30 dB</td> </tr> <tr> <td></td> <td>30 dBm</td> <td>VBW</td> <td>30 KHz</td> <td>Mixer</td> <td>-10 dBm</td> </tr> <tr> <td></td> <td></td> <td>SWT</td> <td>7 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>				Ref	Lvl	RBW	30 KHz	RF Att	30 dB		30 dBm	VBW	30 KHz	Mixer	-10 dBm			SWT	7 ms	Unit	dBm
Ref	Lvl	RBW	30 KHz	RF Att	30 dB																
	30 dBm	VBW	30 KHz	Mixer	-10 dBm																
		SWT	7 ms	Unit	dBm																
<p>10.7 dB Offset 1V VIEW 1MA</p> <p>Center 1.96 GHz 246 kHz Span 2.46 MHz</p>																					
Date: 28.JUL.2004 08:56:13																					
Notes: <u>OUTPUT CDMA</u>																					

EQUIPMENT: **TFAN 80/19**

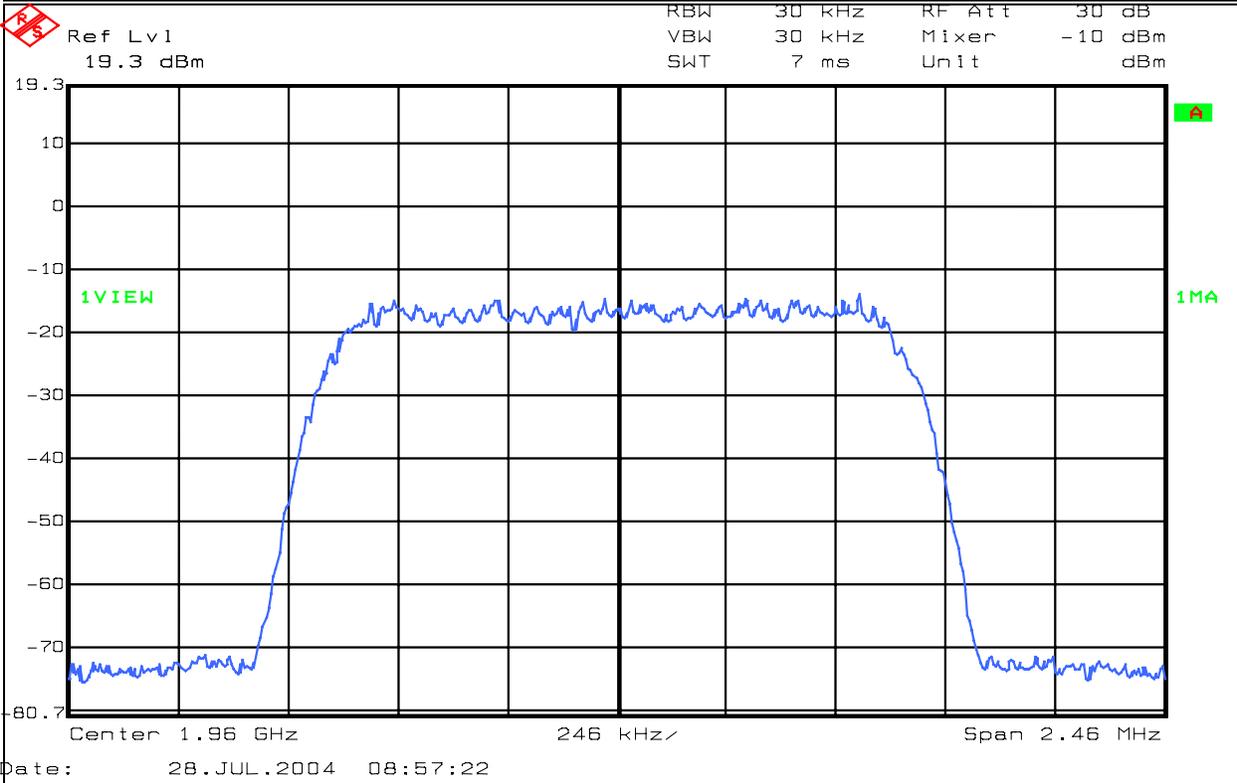
Test Data – Occupied Bandwidth (Input/Output)



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<u>Data Plot</u>	<u>Occupied Bandwidth</u>
Page <u>2</u> of 8	
Job No.: _____	Date: <u>7/28/2004</u>
Specification: _____	Temperature(°C): <u>22</u>
Tested By: <u>David Light</u>	Relative Humidity(%) <u>40</u>
E.U.T.: <u>dual band amp</u>	
Configuration: <u>Tx Full power</u>	



Notes: INPUT CDMA

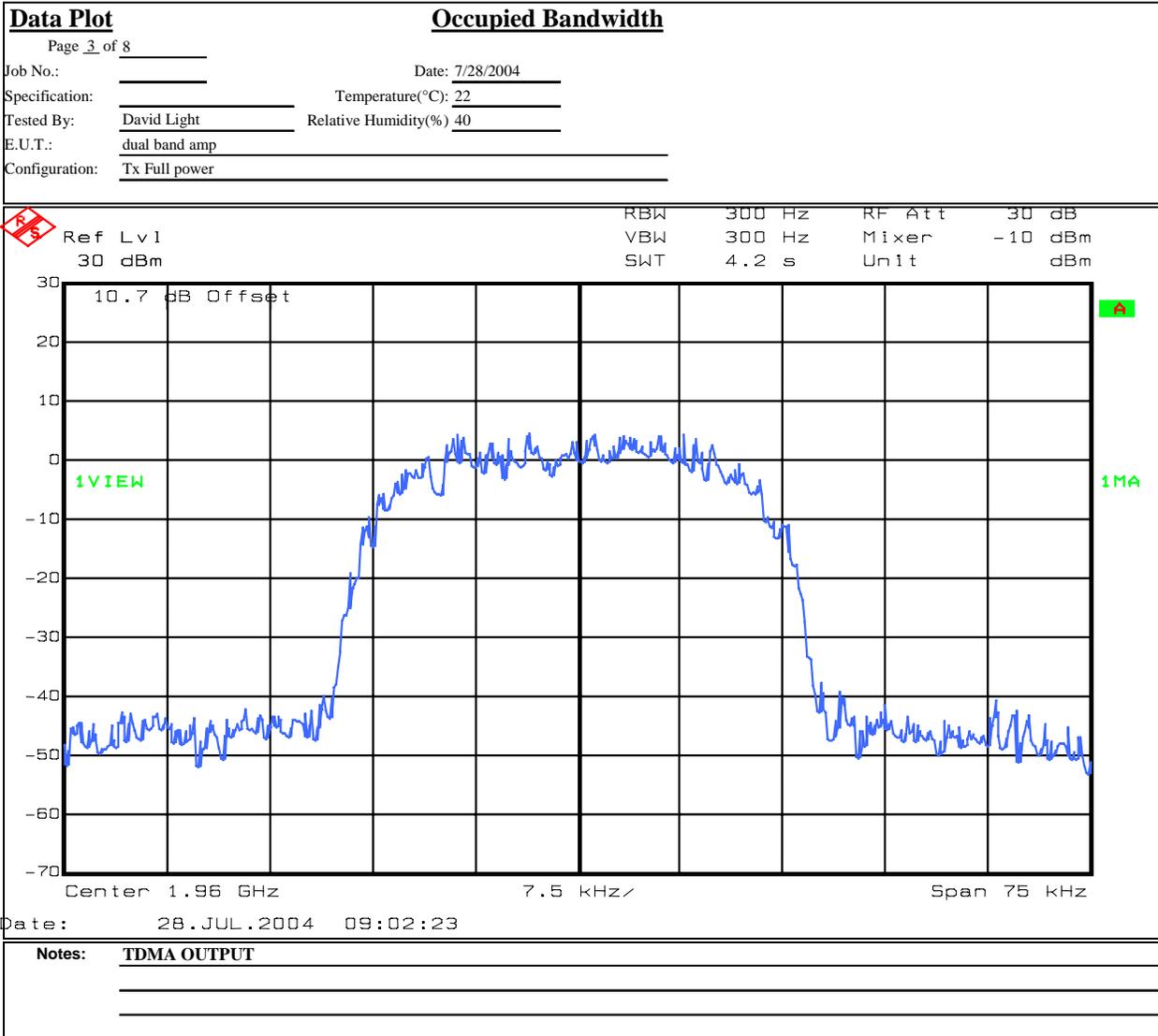
EQUIPMENT: TFAN 80/19

Test Data – Occupied Bandwidth (Input/Output)



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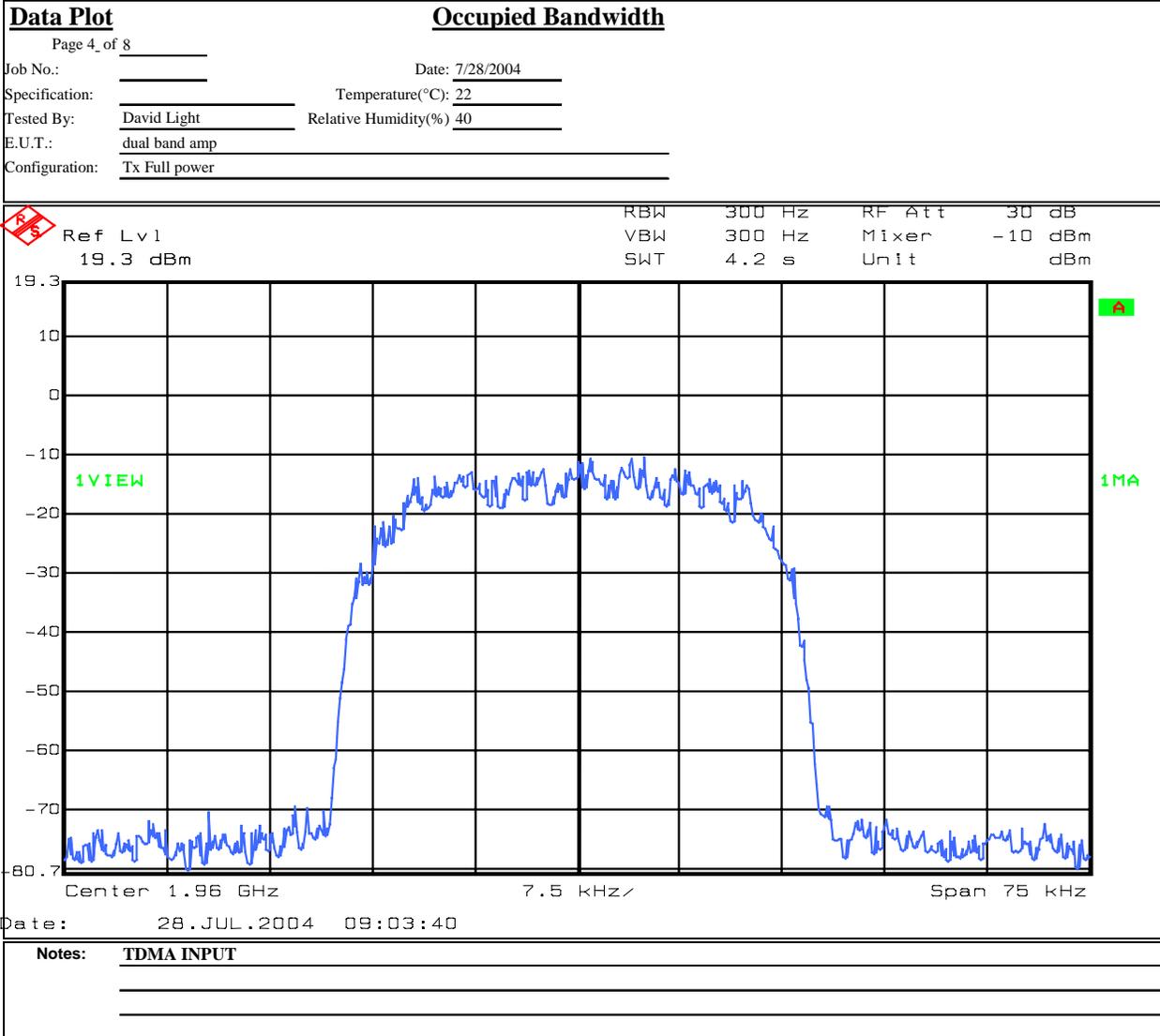


Test Data – Occupied Bandwidth (Input/Output)



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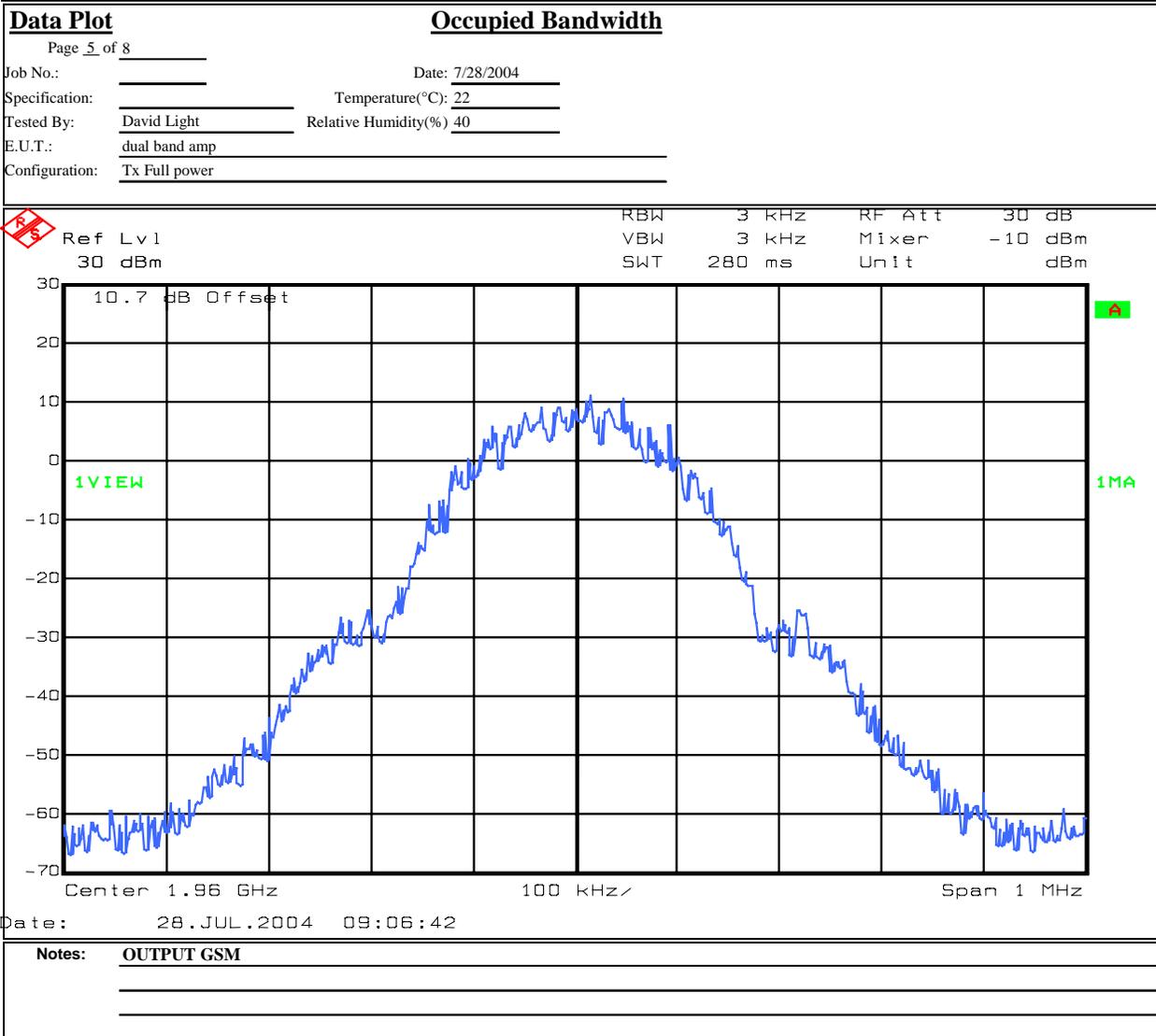
EQUIPMENT: TFAN 80/19

Test Data – Occupied Bandwidth (Input/Output)



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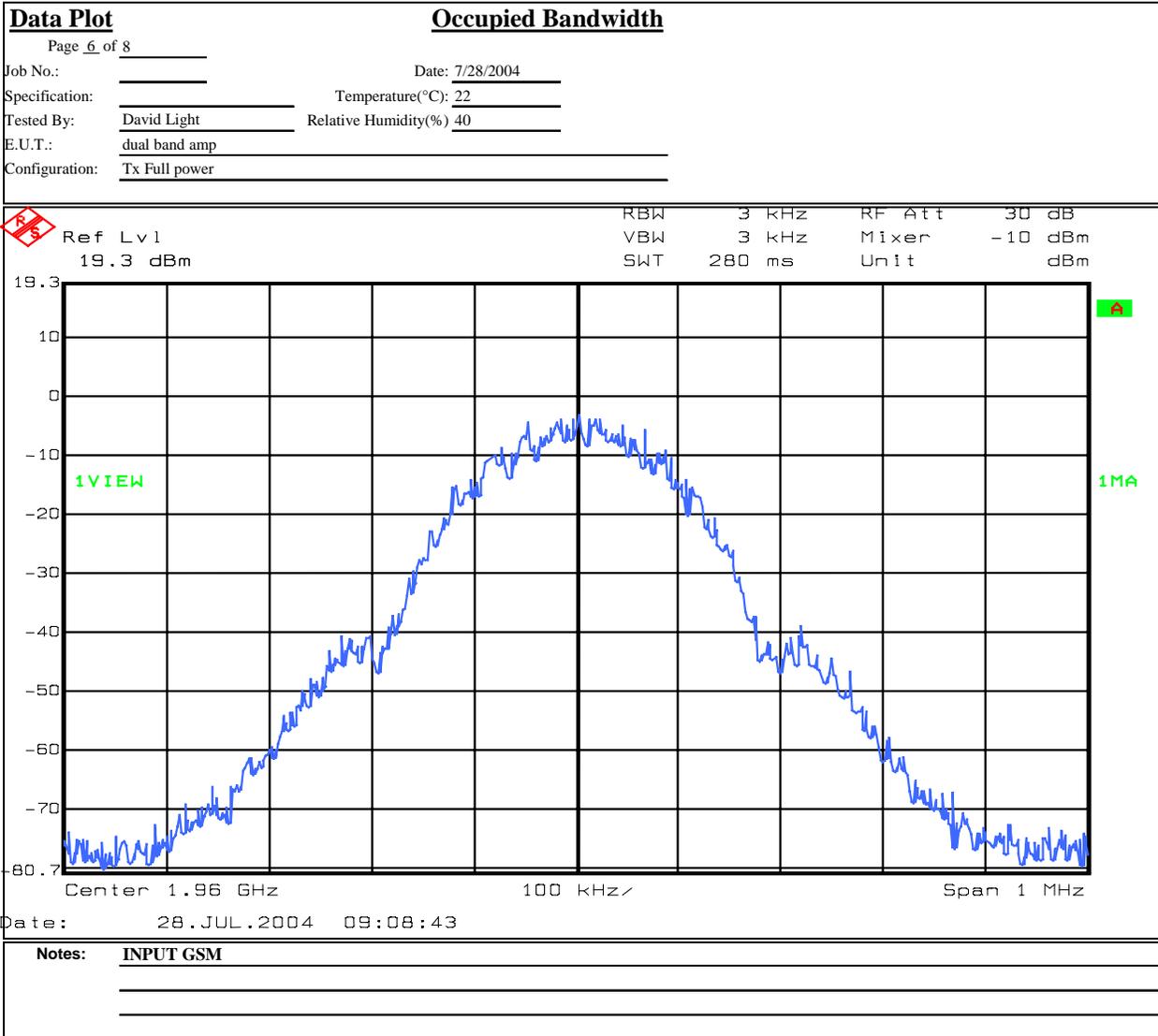
EQUIPMENT: **TFAN 80/19**

Test Data – Occupied Bandwidth (Input/Output)



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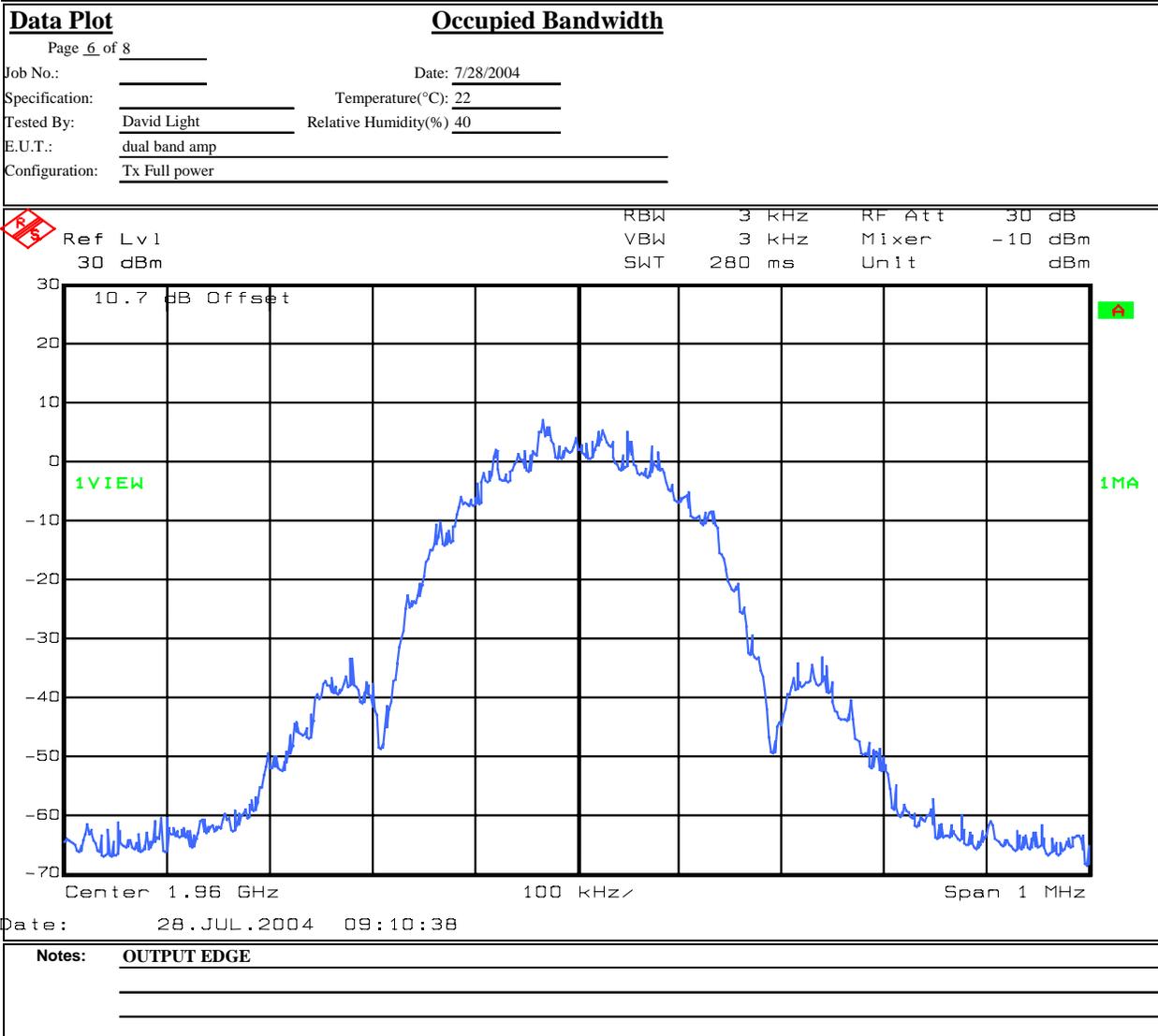
EQUIPMENT: TFAN 80/19

Test Data – Occupied Bandwidth (Input/Output)



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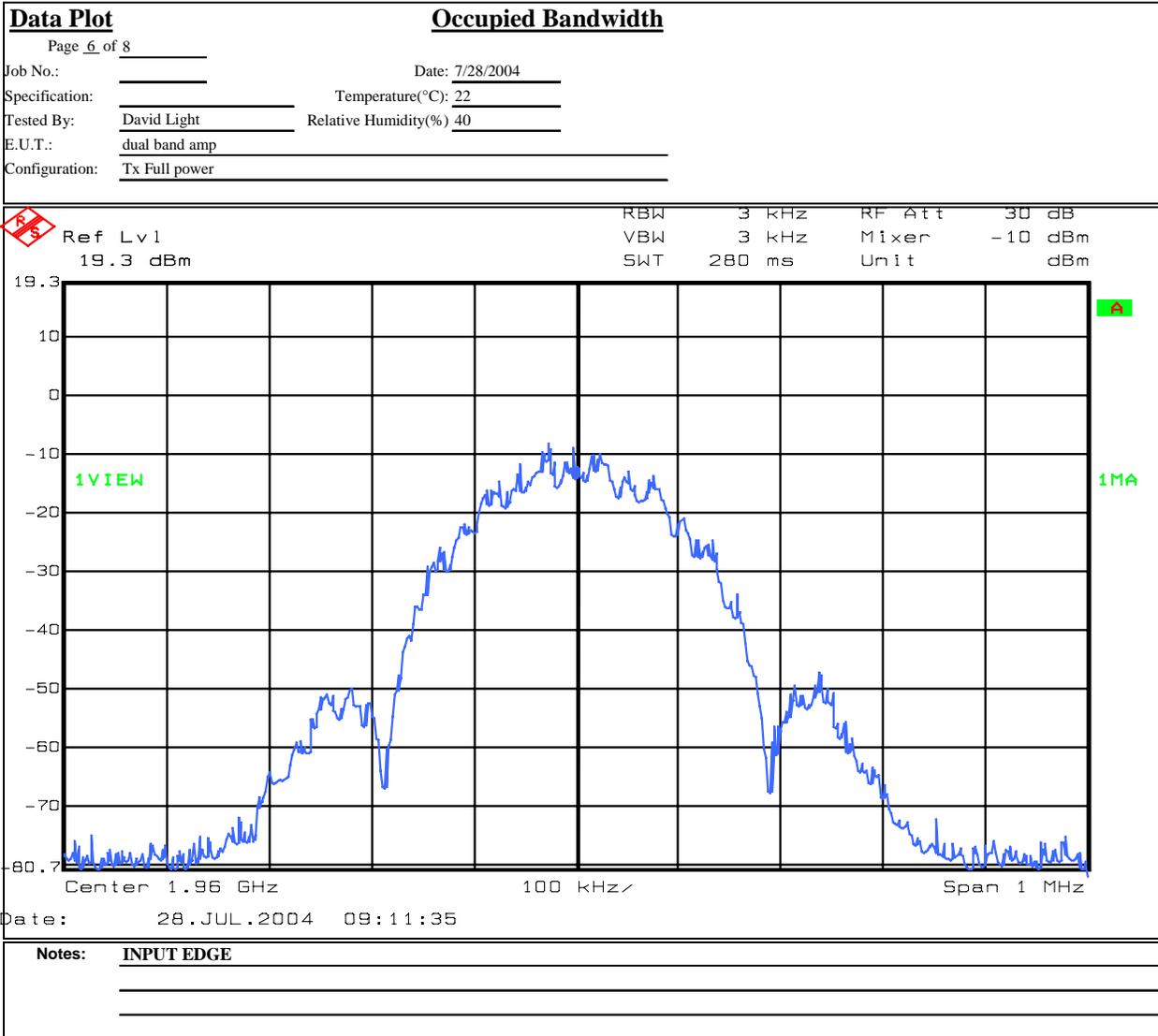
EQUIPMENT: **TFAN 80/19**

Test Data – Occupied Bandwidth (Input/Output)



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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:7/28/04

Test Results: Complies.

Test Data: See attached plot(s).

Measurement Uncertainty: +/- 1.6 dB

EQUIPMENT: **TFAN 80/19**

Test Data – Spurious Emissions at Antenna Terminals



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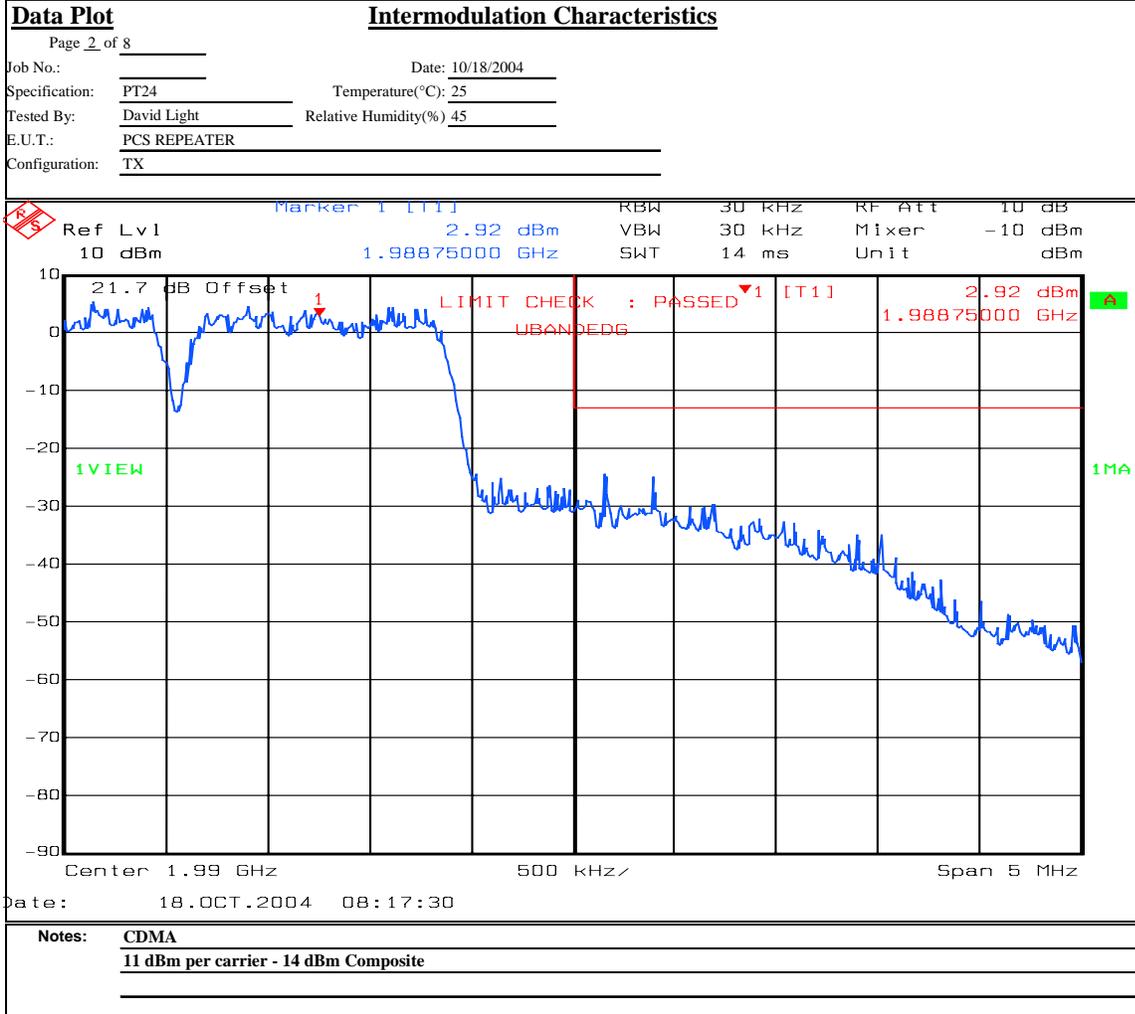
Data Plot	<u>Intermodulation Characteristics</u>		Complete <u> X </u>																		
Page <u>1</u> of <u>8</u>	Date: <u>10/18/2004</u>	Preliminary: _____																			
Job No.: _____	Specification: <u>PT24</u>	Temperature(°C): <u>25</u>																			
Tested By: <u>David Light</u>	Relative Humidity(%): <u>45</u>																				
E.U.T.: <u>PCS REPEATER</u>	Configuration: <u>TX</u>																				
Sample Number: <u>1</u>																					
Location: <u>Lab 1</u>	RBW: Refer to plots	Measurement																			
Detector Type: <u>Refer to plots</u>	VBW: Refer to plots	Distance: <u>na</u> m																			
Test Equipment Used																					
Antenna: _____	Directional Coupler: _____																				
Pre-Amp: _____	Cable #1: <u>1629</u>																				
Filter: _____	Cable #2: _____																				
Receiver: <u>1036</u>	Cable #3: _____																				
Attenuator #1: <u>1064</u>	Cable #4: _____																				
Attenuator #2: _____	Mixer: _____																				
Additional equipment used: _____																					
Measurement Uncertainty: <u>+/-1.7 dB</u>																					
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="text-align: left;">Ref Lvl</td> <td style="text-align: center;">3.30 dBm</td> <td>RBW</td> <td>30 kHz</td> <td>RF Att</td> <td>10 dB</td> </tr> <tr> <td style="text-align: left;">10 dBm</td> <td style="text-align: center;">1.93125000 GHz</td> <td>VBW</td> <td>30 kHz</td> <td>Mixer</td> <td>-10 dBm</td> </tr> <tr> <td></td> <td></td> <td>SWT</td> <td>14 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>				Ref Lvl	3.30 dBm	RBW	30 kHz	RF Att	10 dB	10 dBm	1.93125000 GHz	VBW	30 kHz	Mixer	-10 dBm			SWT	14 ms	Unit	dBm
Ref Lvl	3.30 dBm	RBW	30 kHz	RF Att	10 dB																
10 dBm	1.93125000 GHz	VBW	30 kHz	Mixer	-10 dBm																
		SWT	14 ms	Unit	dBm																
Center 1.93 GHz 500 kHz/ Span 5 MHz																					
Date: 18.OCT.2004 08:13:57																					
Notes: <u>CDMA</u>																					
<u>11 dBm per carrier - 14 dBm Composite</u>																					

Test Data – Spurious Emissions at Antenna Terminals



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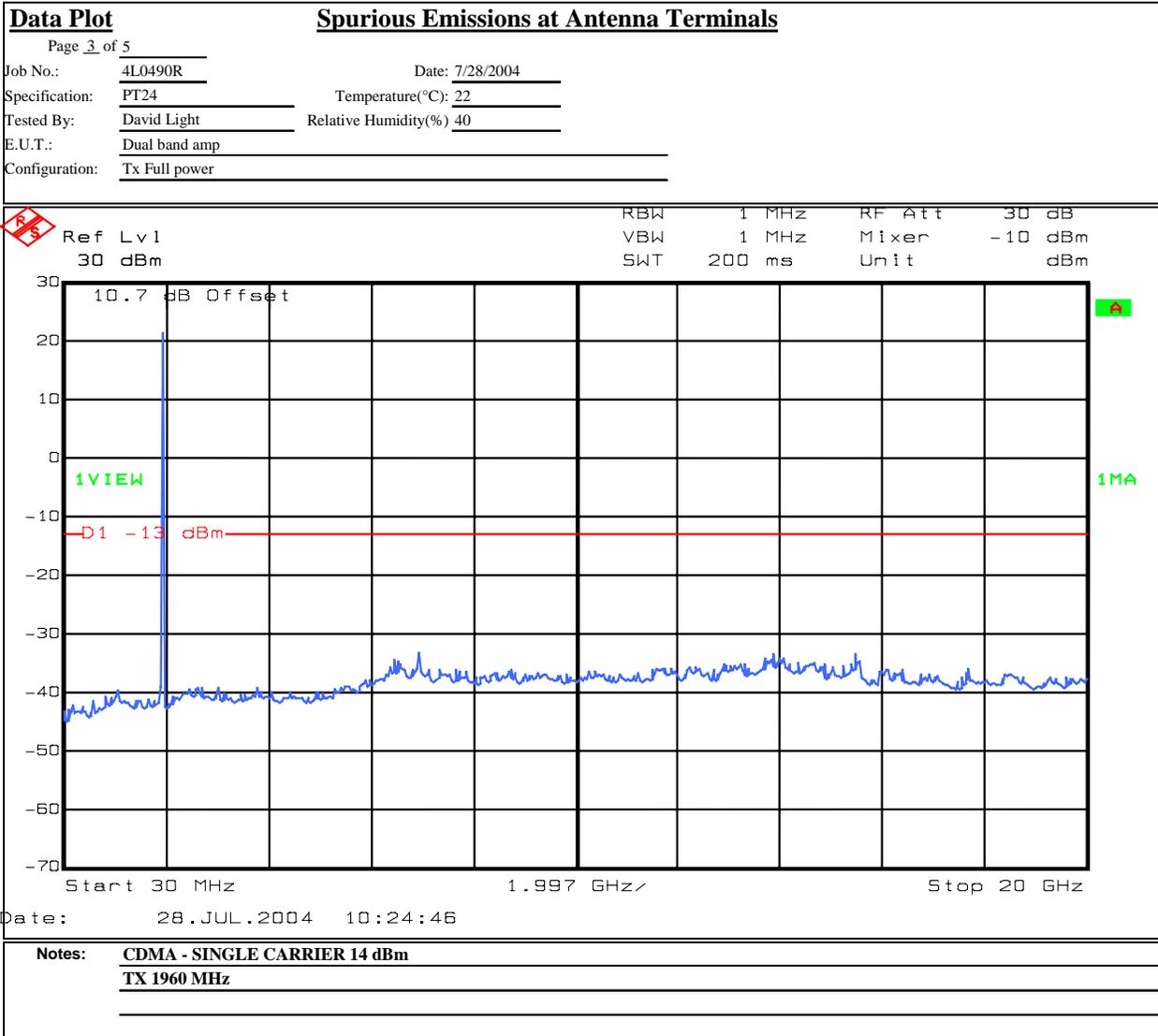


Test Data – Spurious Emissions at Antenna Terminals



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The spectrum was investigated in detail on three channels. The plot shown is indicative of the noise floor readings found for all channels and modulations.

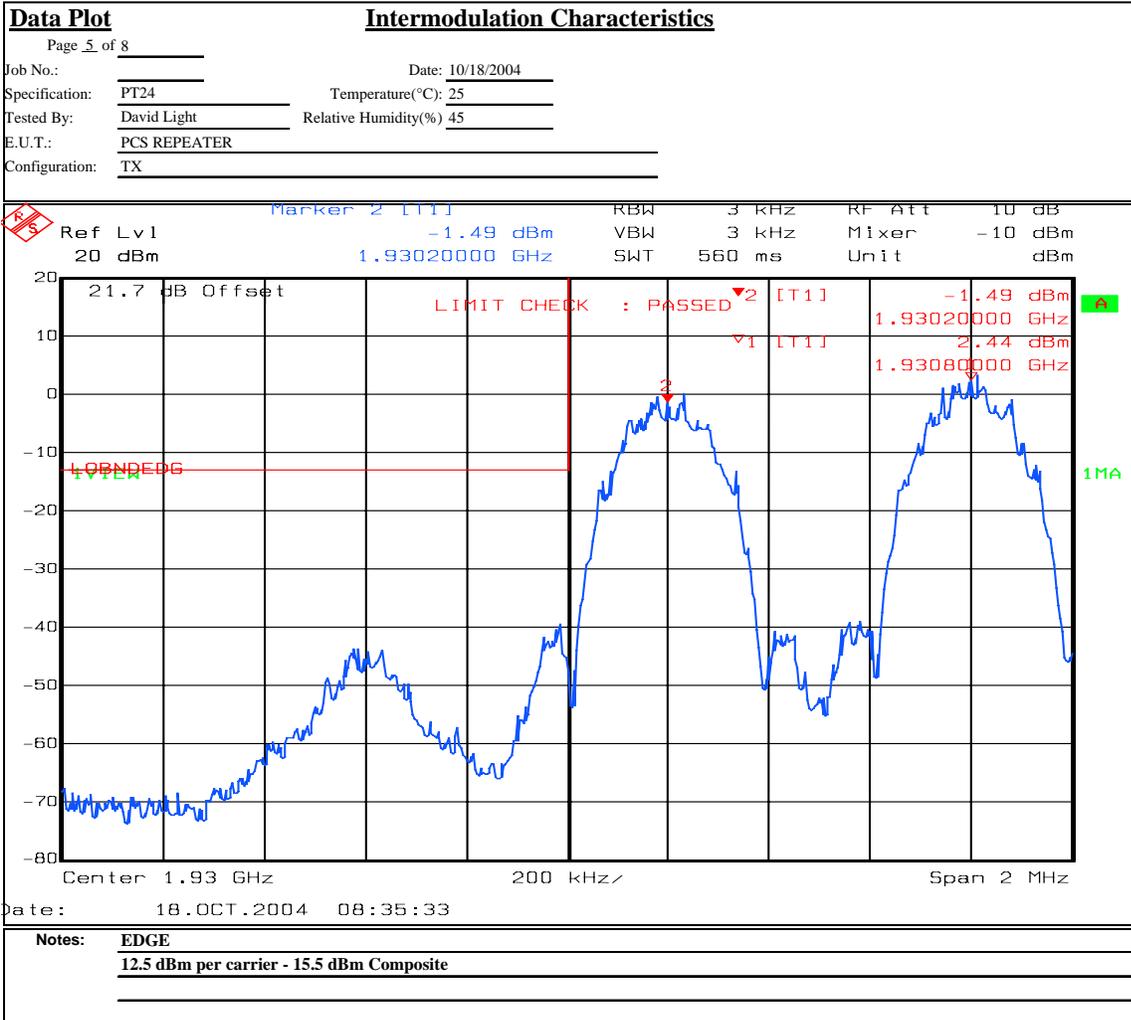
Test Data – Spurious Emissions at Antenna Terminals



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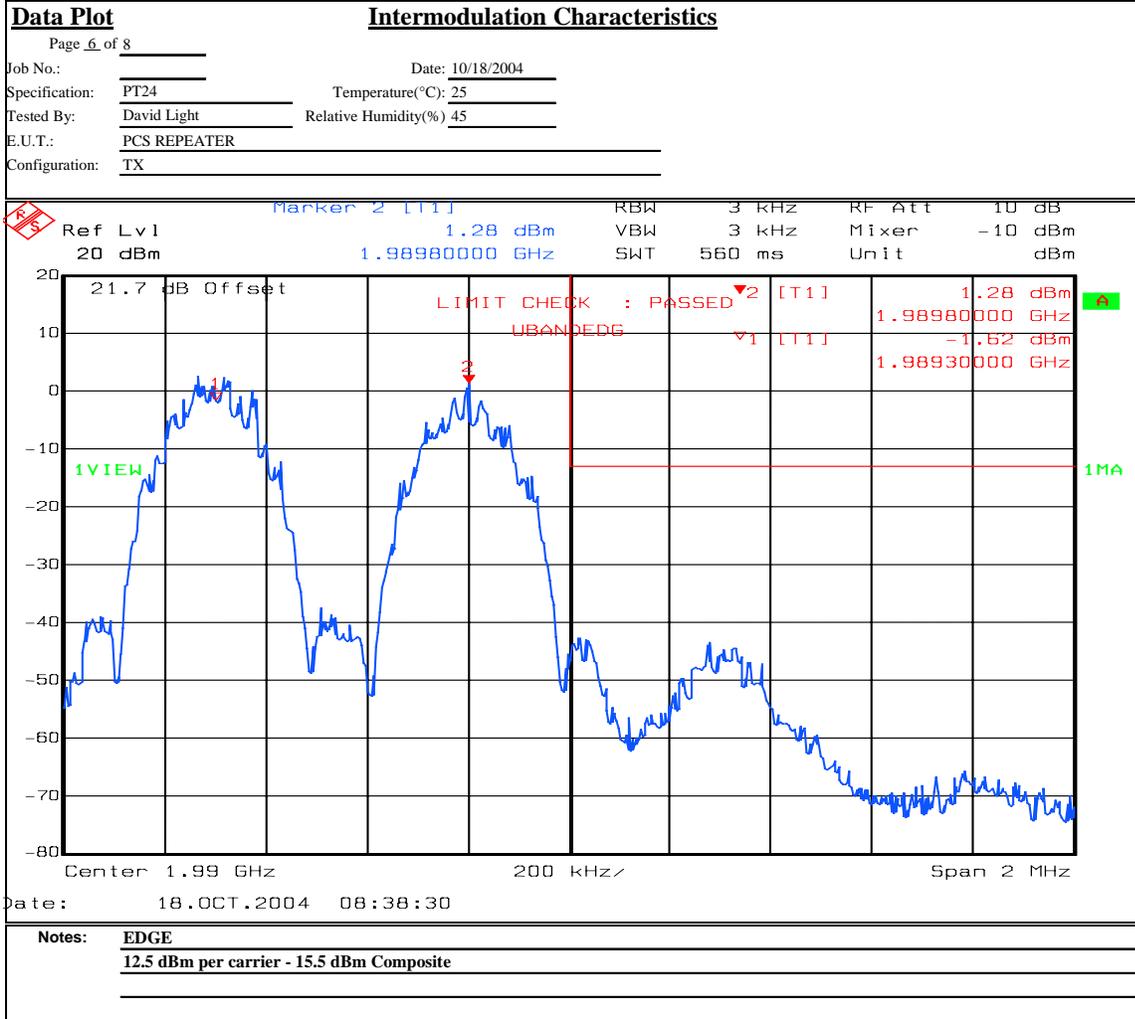


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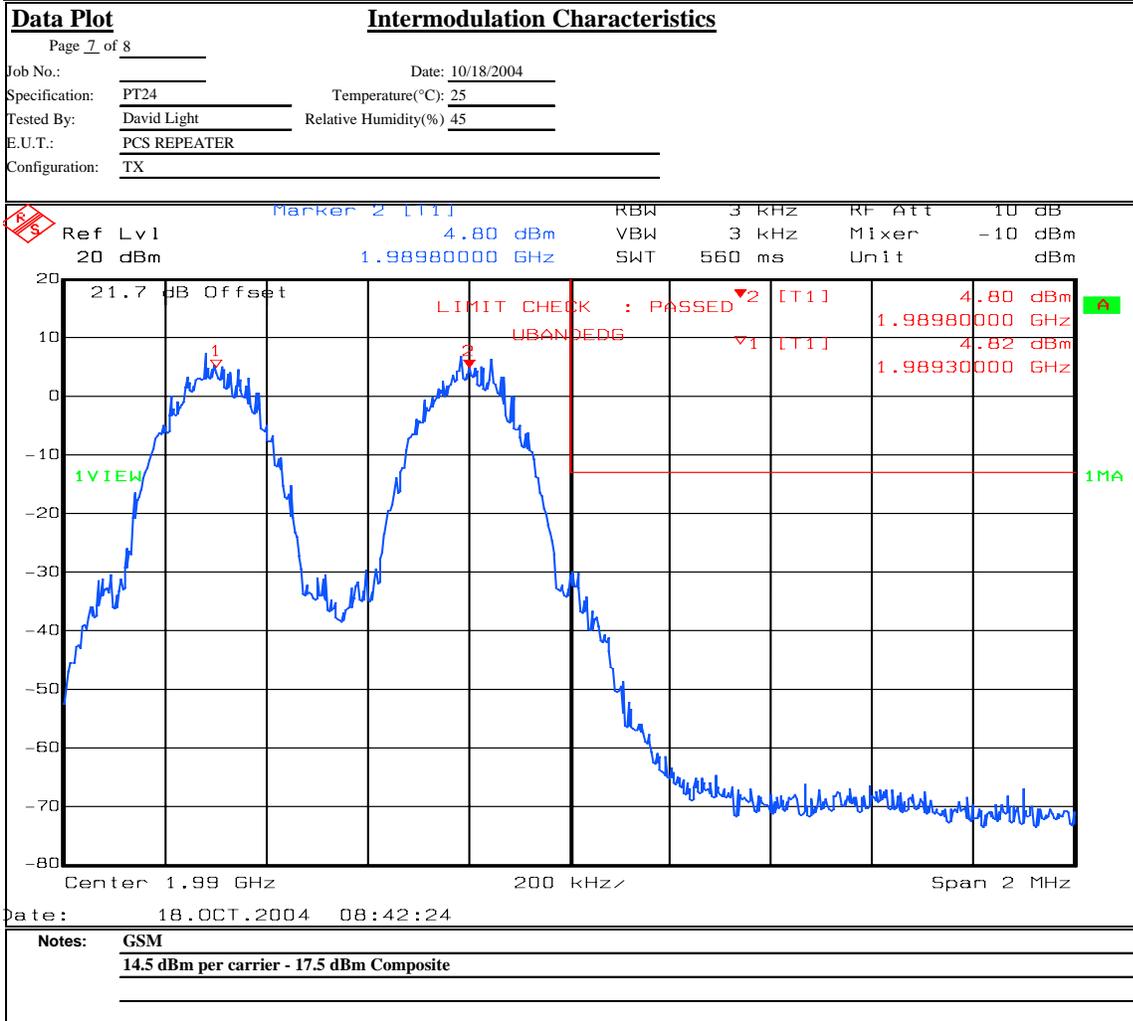


Test Data – Spurious Emissions at Antenna Terminals



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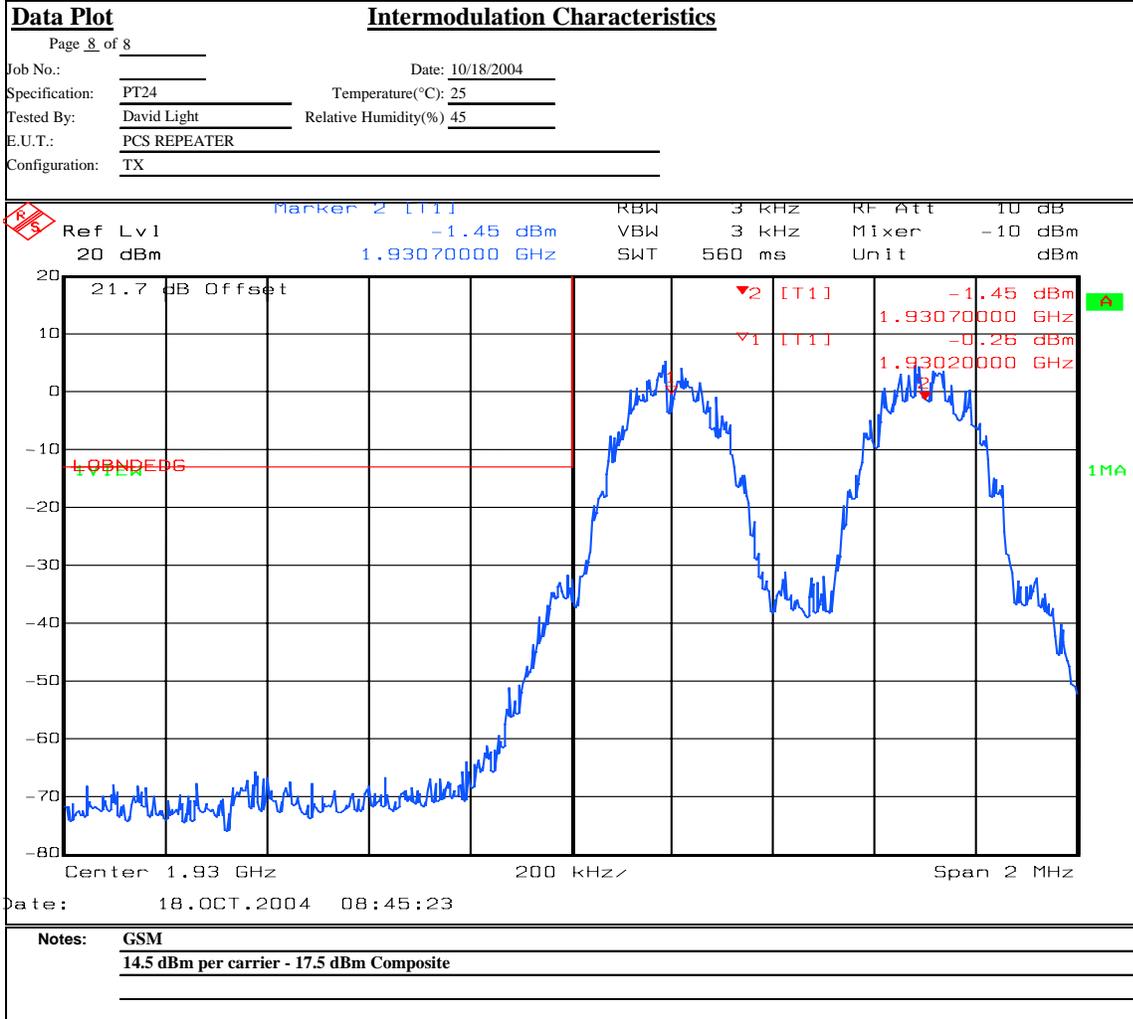


Test Data – Spurious Emissions at Antenna Terminals



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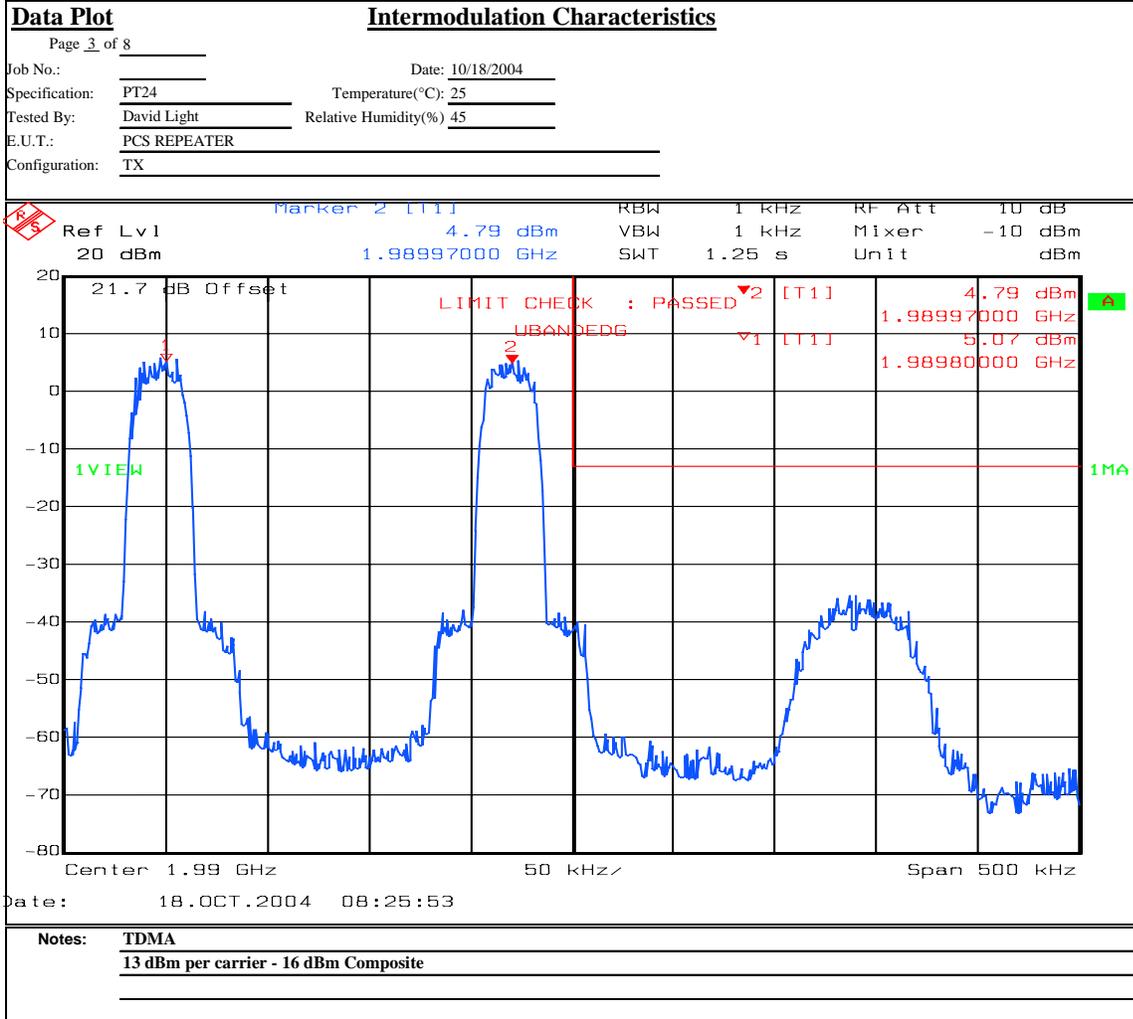


Test Data – Spurious Emissions at Antenna Terminals



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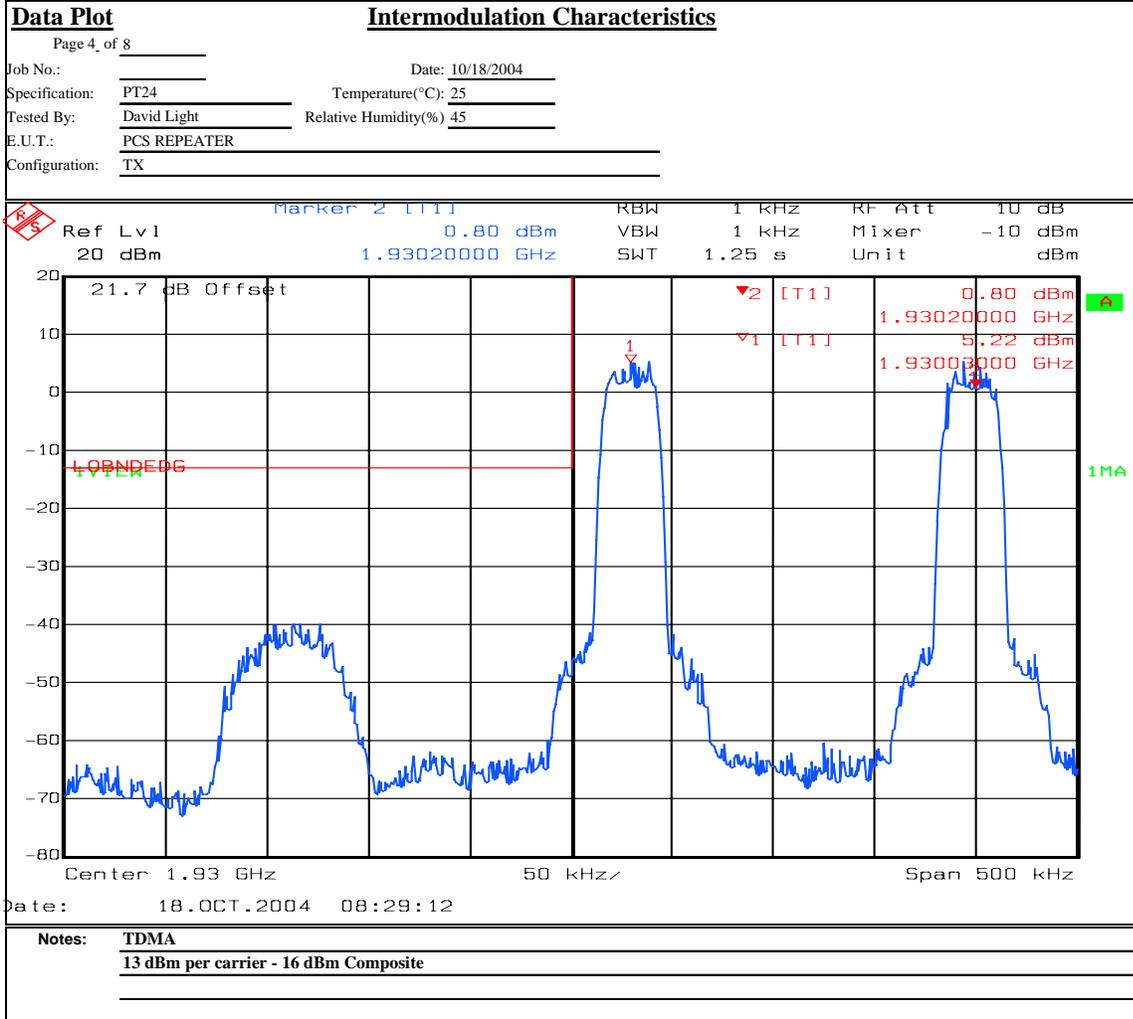


Test Data – Spurious Emissions at Antenna Terminals



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Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: Brian Boyea	DATE: 7/29/04

Test Results: Complies.

Test Data: There were no emissions detected above the noise floor which was at least 20 dB below the specification limit of -13 dBm EIRP. The spectrum was searched to the 10th harmonic of the carrier and was investigated on 3 channels.

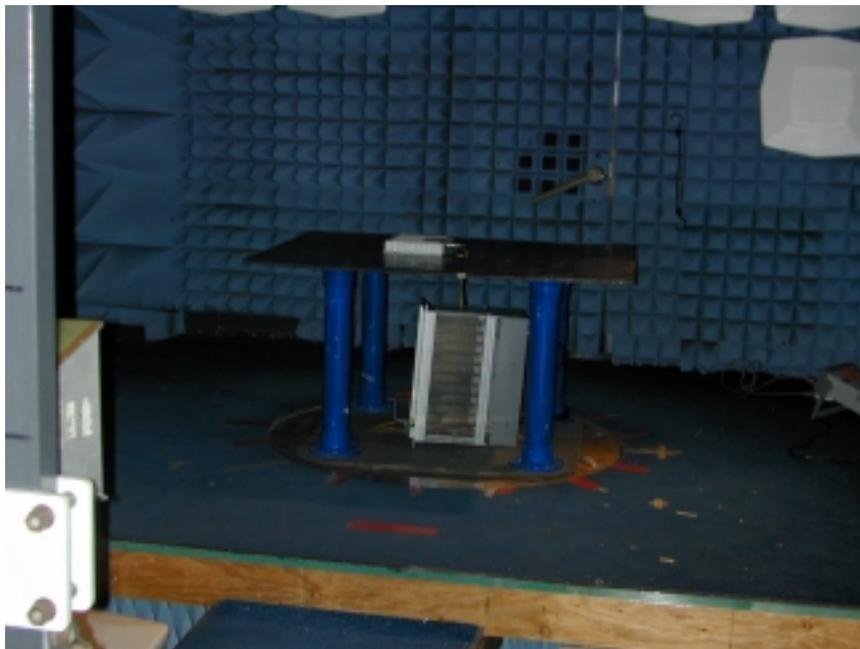
Equipment Used: 1484-1485-1016-1464

Measurement Uncertainty: +/- 1.7 dB

Temperature: 21 °C

Relative Humidity: 42 %

Photographs of Test Setup



Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1471	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1627	CABLE, 5 ft	MEGAPHASE 10312 1GVT4	N/A	CBU	N/A
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/30/04	07/30/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/30/04	07/30/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05

ANNEX A - TEST DETAILS

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

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.

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 (< 1MHz from Band Edge)
VBW: ≥ 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: ≥ 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.

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: The substitution antenna method was used to measure eirp of spurious emissions. This method is described in EIA/TIA 603. The field strength of the emission is measured and recorded. The EUT is then replaced with a substitution antenna of known gain against an isotropic radiator. The substitution antenna is fed with a calibrated signal which is adjusted until the previously recorded value is repeated. The eirp of the spurious signal is the level required to repeat the previously measured level.

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

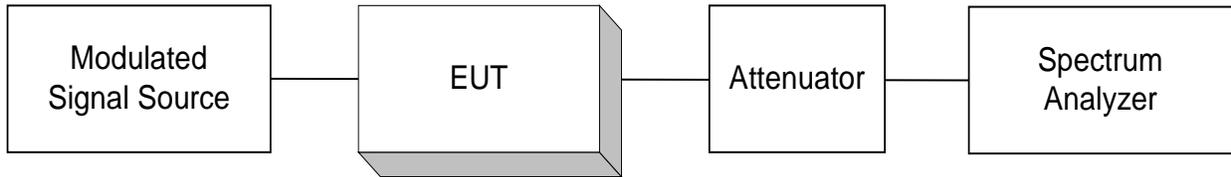
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the 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

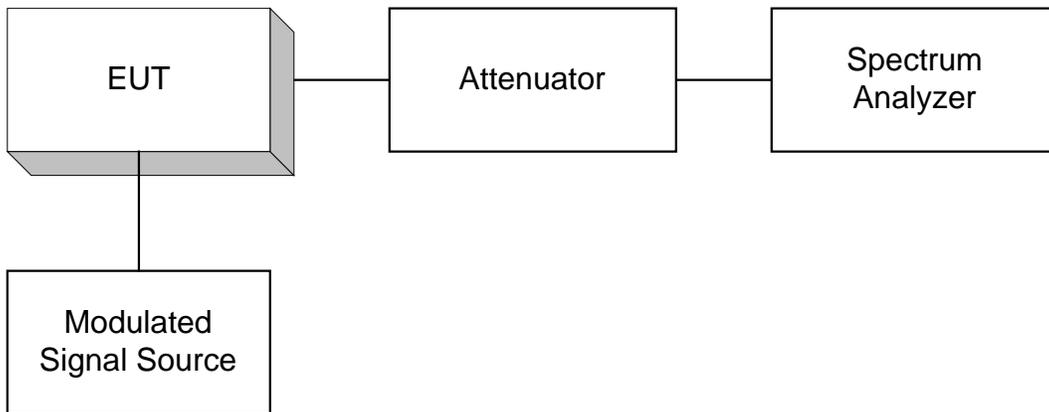
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

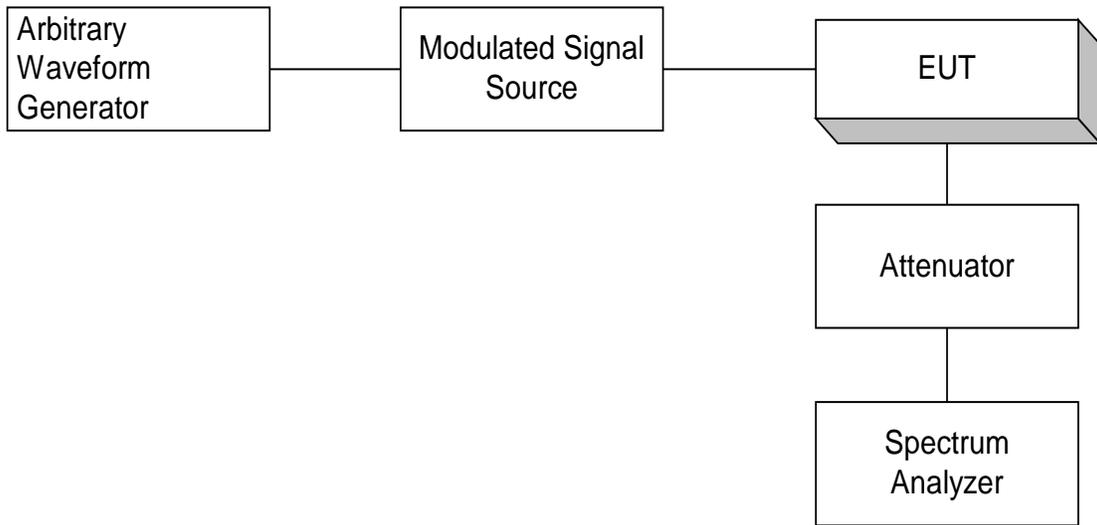
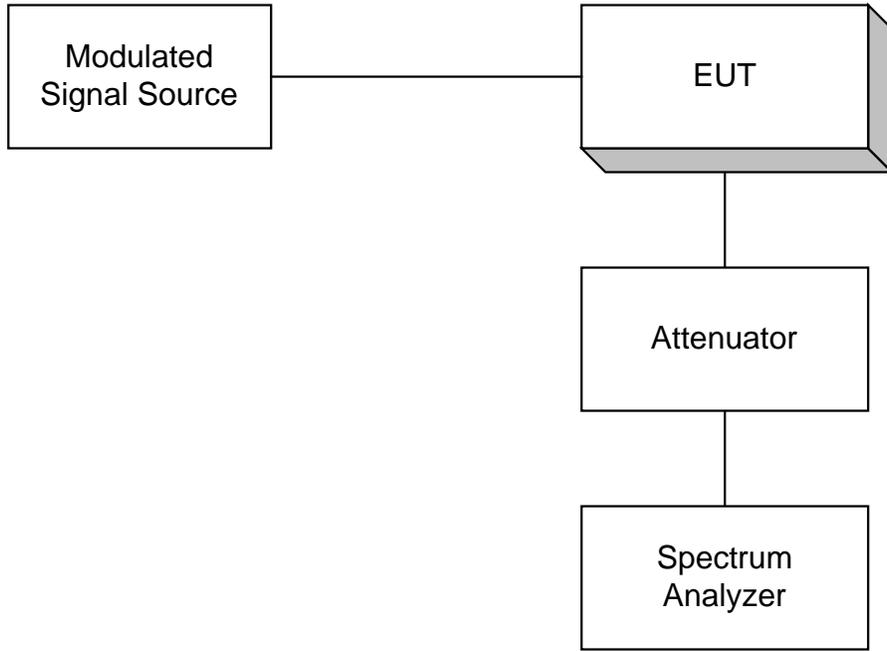
Para. No. 2.985 - R.F. Power Output



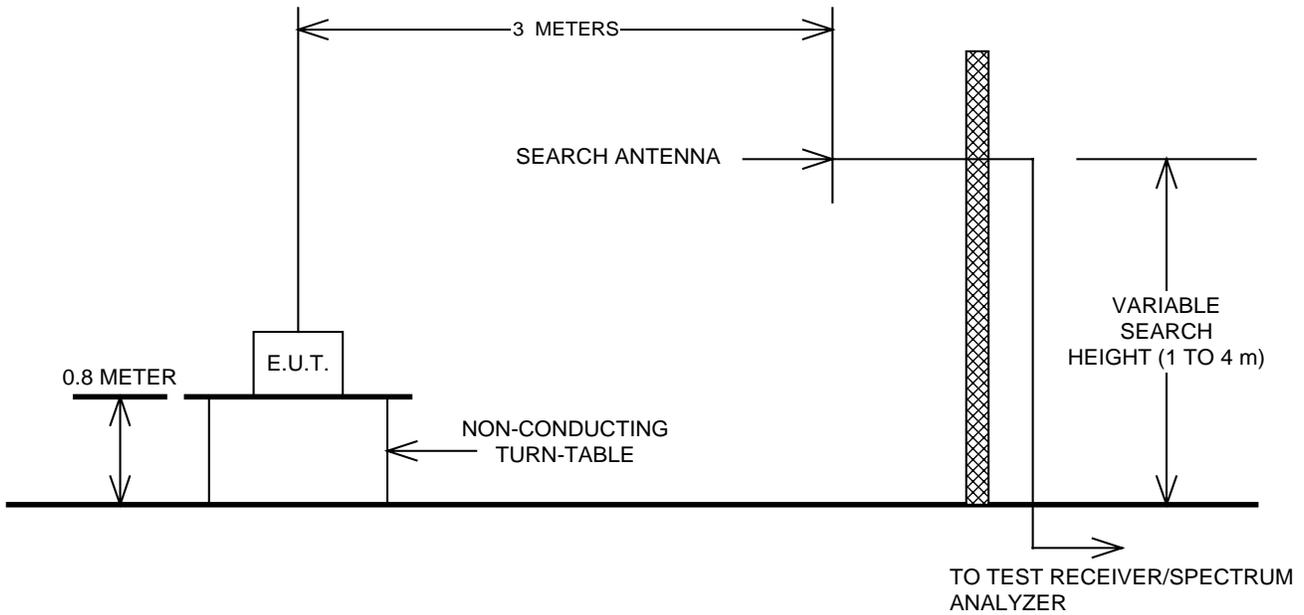
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

