

Nemko Test Report No.:

4L0348RUS2

Applicant:

Andrew Corporation
108 Rand Park Drive
Garner, NC 27529

Equipment Under Test:

TFAM2632/4

In Accordance With:

FCC Part 24, Subpart E
Broadband PCS

Tested By:

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

Authorized By:



Dustin Oaks, Account Manager

Date:

05/28/2004

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAM2632/4

Serial No.: 041501104

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	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		Complies

Footnotes:

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

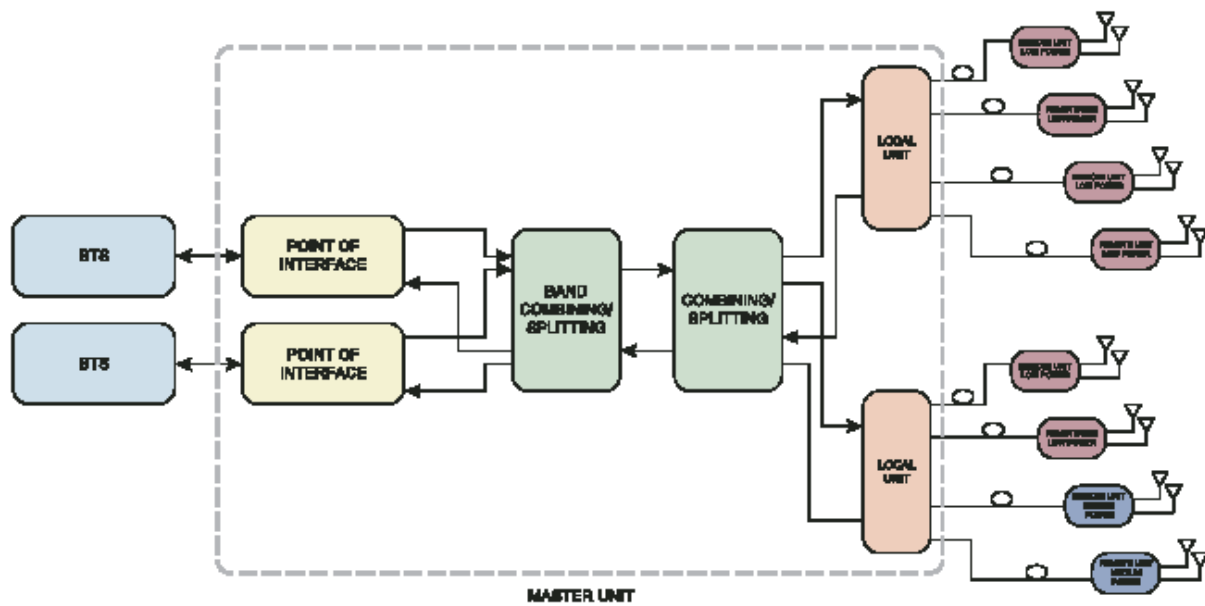
Section 2. General Equipment Specification

Supply Voltage Input:					
Frequency Bands:	Downlink:	1930.03 TO 1989.97 MHz			
Type of Modulation and Designator:		CDMA (F7W)	GSM (GXW)	NADC (D7W)	EDGE (G7W)
		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
System Gain:		18 dB			
Output Impedance:		50 ohms			
RF Output (Rated per carrier):					
	Number of Carriers:	1	2	4	8
	CDMA:	21	17	13	9
	GSM:	27	20	17	13
	NADC:	24	18.5	15	11
	EDGE:	23	18	15	11
Frequency Translation:		F1-F1	F1-F2	N/A	
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Band Selection:		Software	Duplexer	Fullband	
		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

Description of Operation

Britecell Plus is a radio over fiber system

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE:5/24/04

Test Results: Complies.

Measurement Data:

Modulation Type	Single Carrier (dBm)	Per Channel Power Output (dBm)	Composite Power Output (dBm)
CDMA	21	17	20
GSM	27	20	23
NADC	24	18.5	21.5
EDGE	23	18	21

Equipment Used: 1036-1029-1064-1065

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:5/24/2004

Test Results: Complies.

Test Data: See attached plot(s).

Test Data – Occupied Bandwidth



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Data Plot		Occupied Bandwidth	
Page 1 of 4		Complete <u>X</u>	
Job No.: 4L0347/48	Date: 5/24/2004	Preliminary: _____	
Specification: PT24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
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: NA m	
Test Equipment Used			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: #N/A		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: 1064	Cable #4: _____		
Attenuator #2: 1065	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
<div><div><div>Ref Lvl</div><div>20 dBm</div></div><div><div>Marker 1 [T1]</div><div>-12.82 dBm</div><div>1.96071944 GHz</div></div><div><div>RBW</div><div>20 kHz</div><div>VBW</div><div>20 kHz</div><div>SWT</div><div>10 s</div></div><div><div>RF Att</div><div>10 dB</div><div>Mixer</div><div>-10 dBm</div><div>Unit</div><div>dBm</div></div></div> <div><div>31.8 dB Offset</div><div>▼1 [T1]</div><div>-12.82 dBm</div><div>1.96071944 GHz</div><div>▲1 [T1]</div><div>0.84 dB</div><div>-1.43486974 MHz</div></div> <div><div>Date: 25.MAY 2004 14:34:06</div><div>Notes: 26 dB Bandwidth</div><div>CDMA</div></div>			

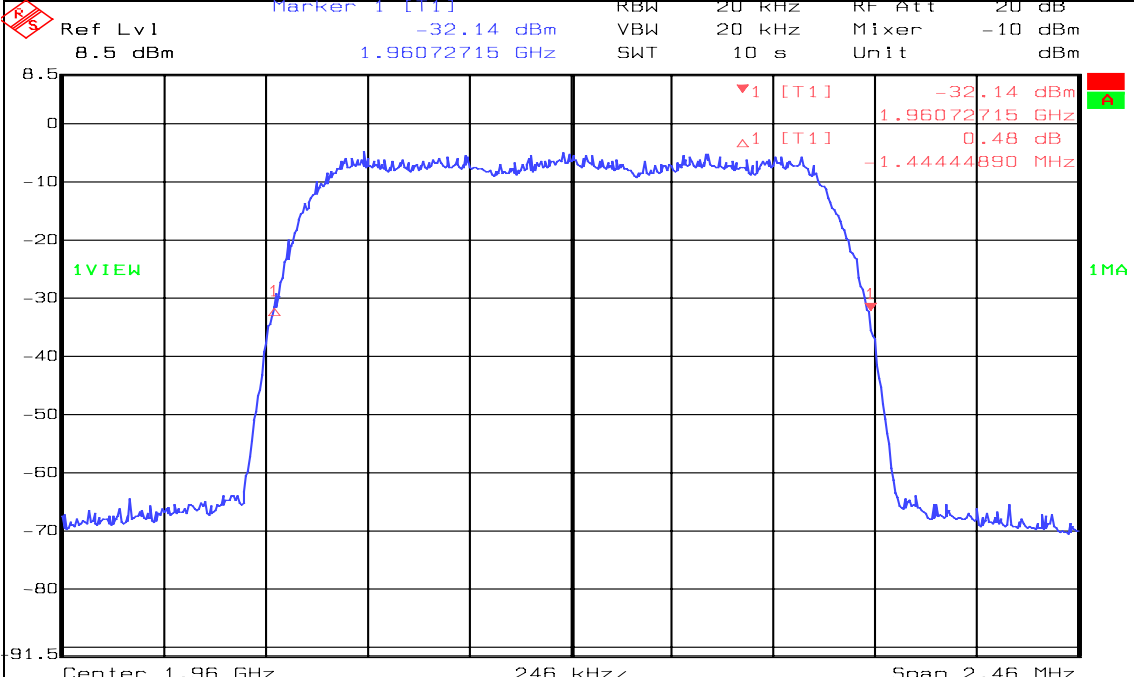
Test Data – Occupied Bandwidth



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Data Plot		Occupied Bandwidth	
Page 1 of 4		Complete <u>X</u>	
Job No.: 4L0347/48	Date: 6/22/2004	Preliminary: _____	
Specification: PT24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: DUAL BAND AMP			
Configuration: Input plots			
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: #N/A		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: _____	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
			
Date: 22.JUN.2004 14:09:48			
Notes: <u>Input</u>			
<u>CDMA</u>			

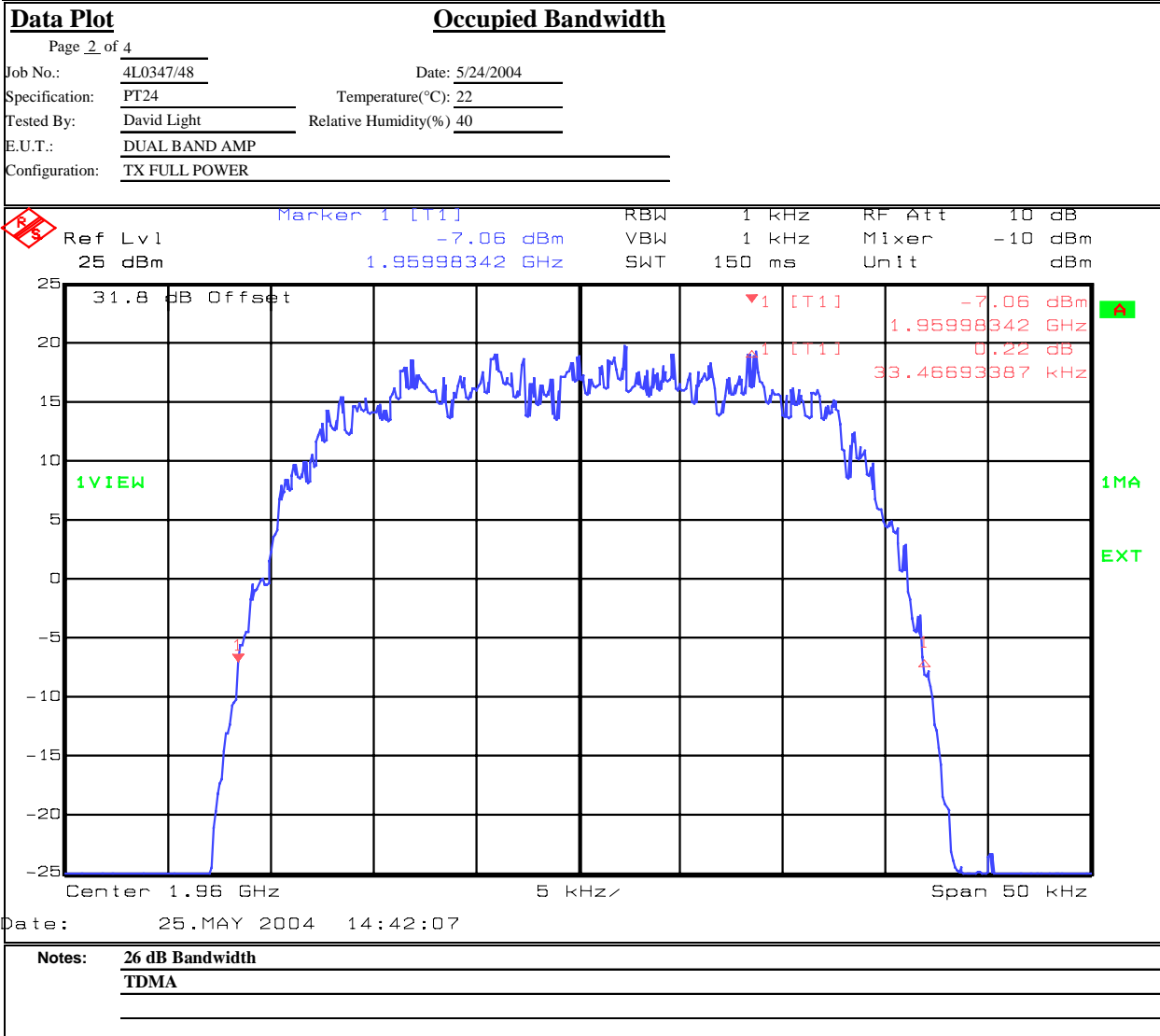
Test Data – Occupied Bandwidth



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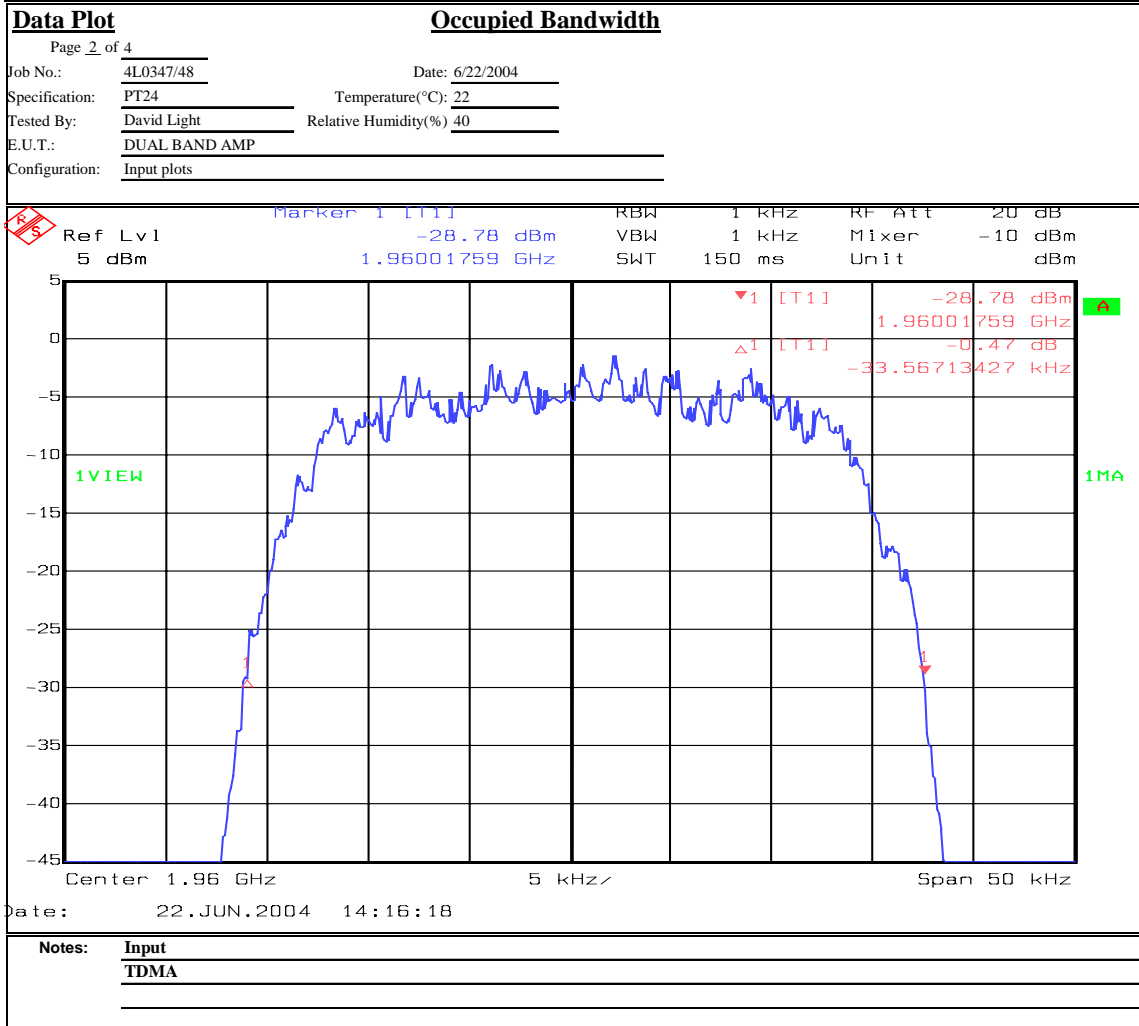
Test Data – Occupied Bandwidth



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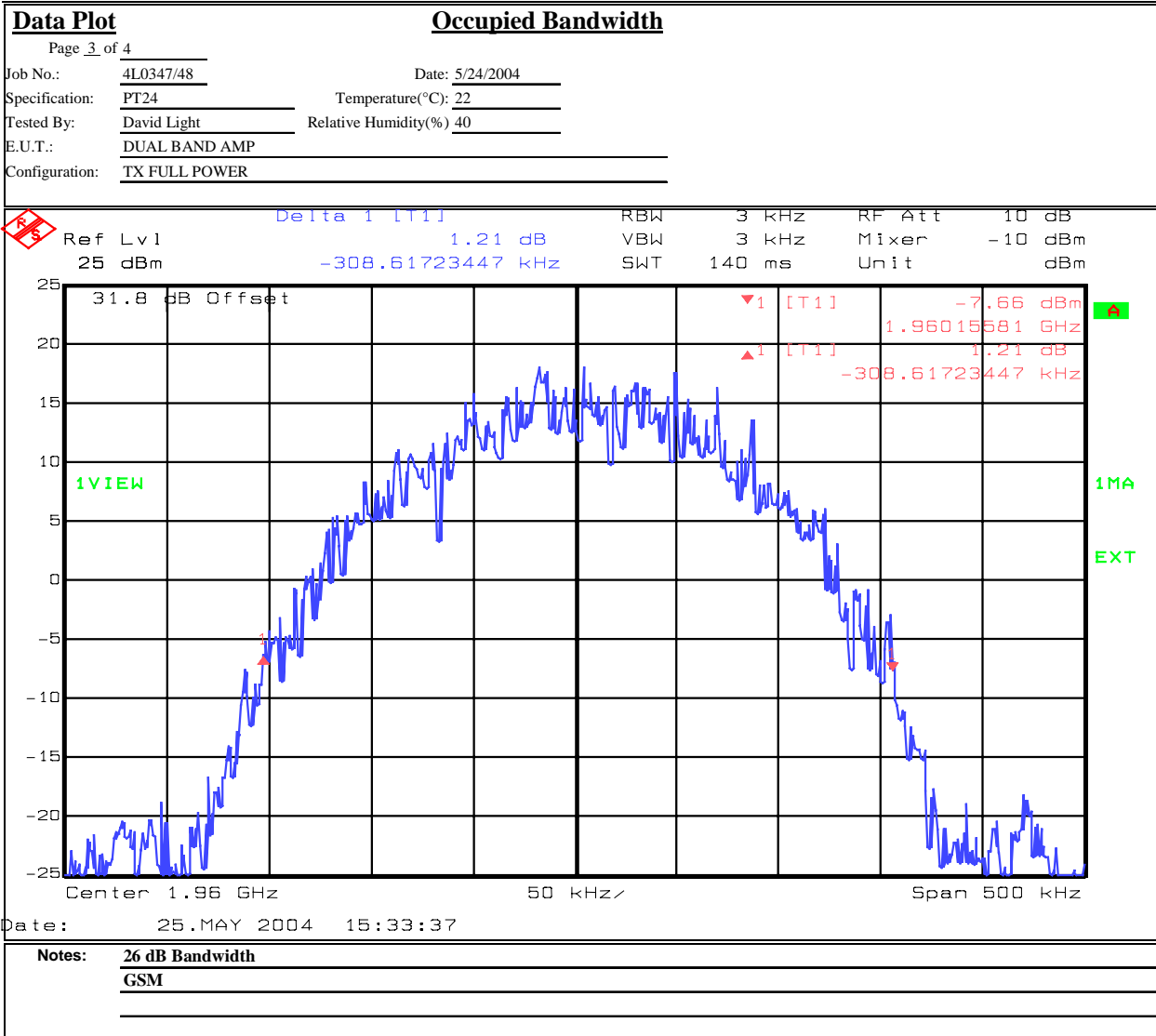
Test Data – Occupied Bandwidth



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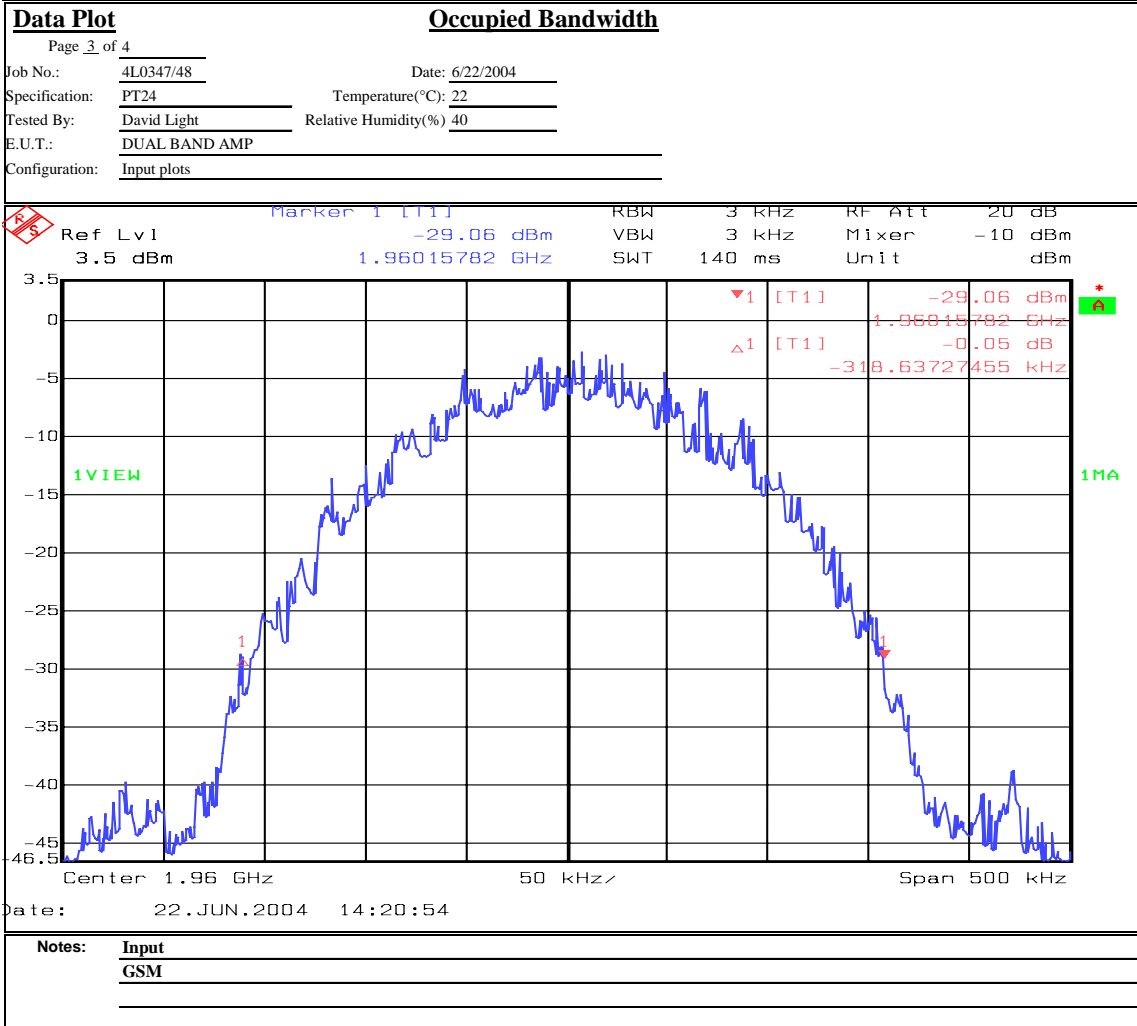
Test Data – Occupied Bandwidth



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Test Data – Occupied Bandwidth



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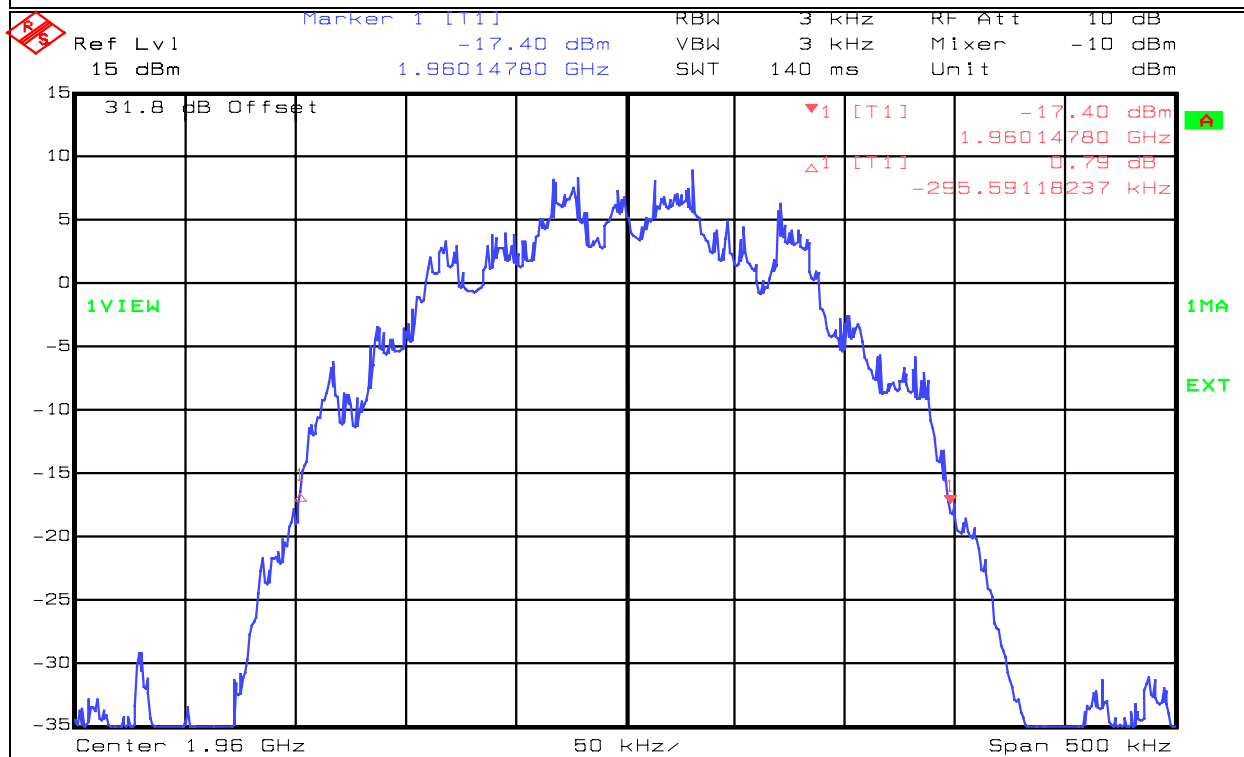
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Test Plot:

Occupied Bandwidth

Page 4 of 4

Job No.: 4L0347/48 Date: 5/24/2004
Specification: PT24 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: DUAL BAND AMP
Configuration: TX FULL POWER



Date: 25.MAY 2004 15:41:30

Notes: EDGE
26 dB Bandwidth

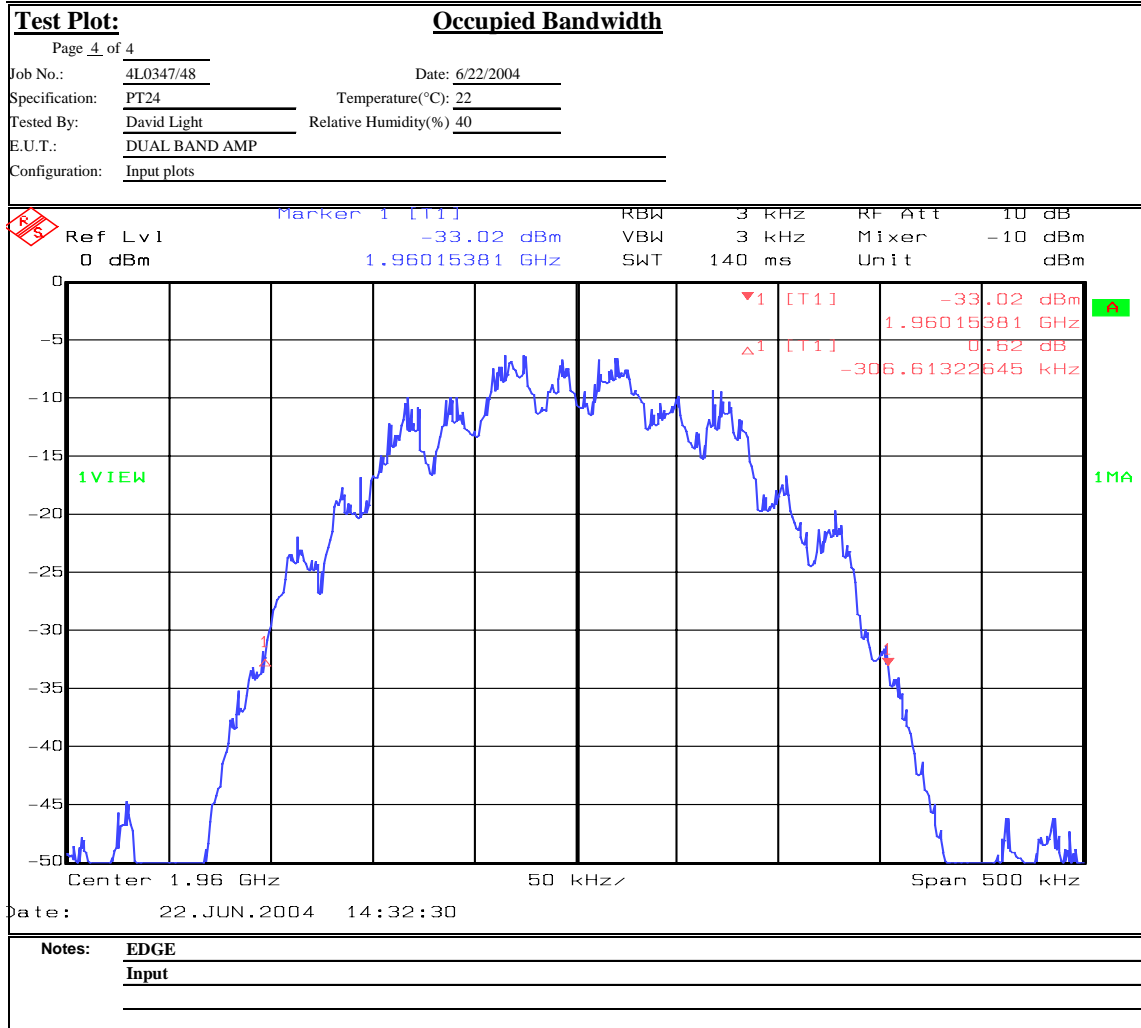
Test Data – Occupied Bandwidth



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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:5/24/04

Test Results: Complies.

Test Data: See attached plot(s).

Note: Spurious emission testing was performed on three channels (high, mid and low). The data presented for mid channel is representative of all measurements as no emissions were detected above the noise floor.

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 3		Complete	X
Job No.: 4L0347/48	Date: 5/24/2004	Preliminary:	
Specification: PT24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
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: NA	m
Test Equipment Used			
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1: #N/A		
Filter:	Cable #2:		
Receiver: 1036	Cable #3:		
Attenuator #1: 1065	Cable #4:		
Attenuator #2: 1064	Mixer:		
Additional equipment used:			
Measurement Uncertainty: +/-1.7 dB			
<div><div>Ref Lvl 30 dBm</div><div>Marker 1 [T1] 11.16 dBm 1.93125000 GHz</div><div>RBW 30 kHz RF Att 10 dB</div><div>VBW 30 kHz Mixer -10 dBm</div><div>SWT 14 ms Unit dBm</div></div> <div>31.8 dB Offset</div> <div>LIMIT CHECK : PASSED</div> <div>11.16 dBm</div> <div>1.93125000 GHz</div> <div>1VIEW</div> <div>LOBNDEG</div> <div>1MA</div> <div>EXT</div> <div>Center 1.93 GHz 500 kHz Span 5 MHz</div>			
Date: 25.MAY 2004 14:02:51			
Notes: Tx @ 1931.25 and 1933 MHz - 17 dBm per carrier			
20 dBm Composite			
CDMA			

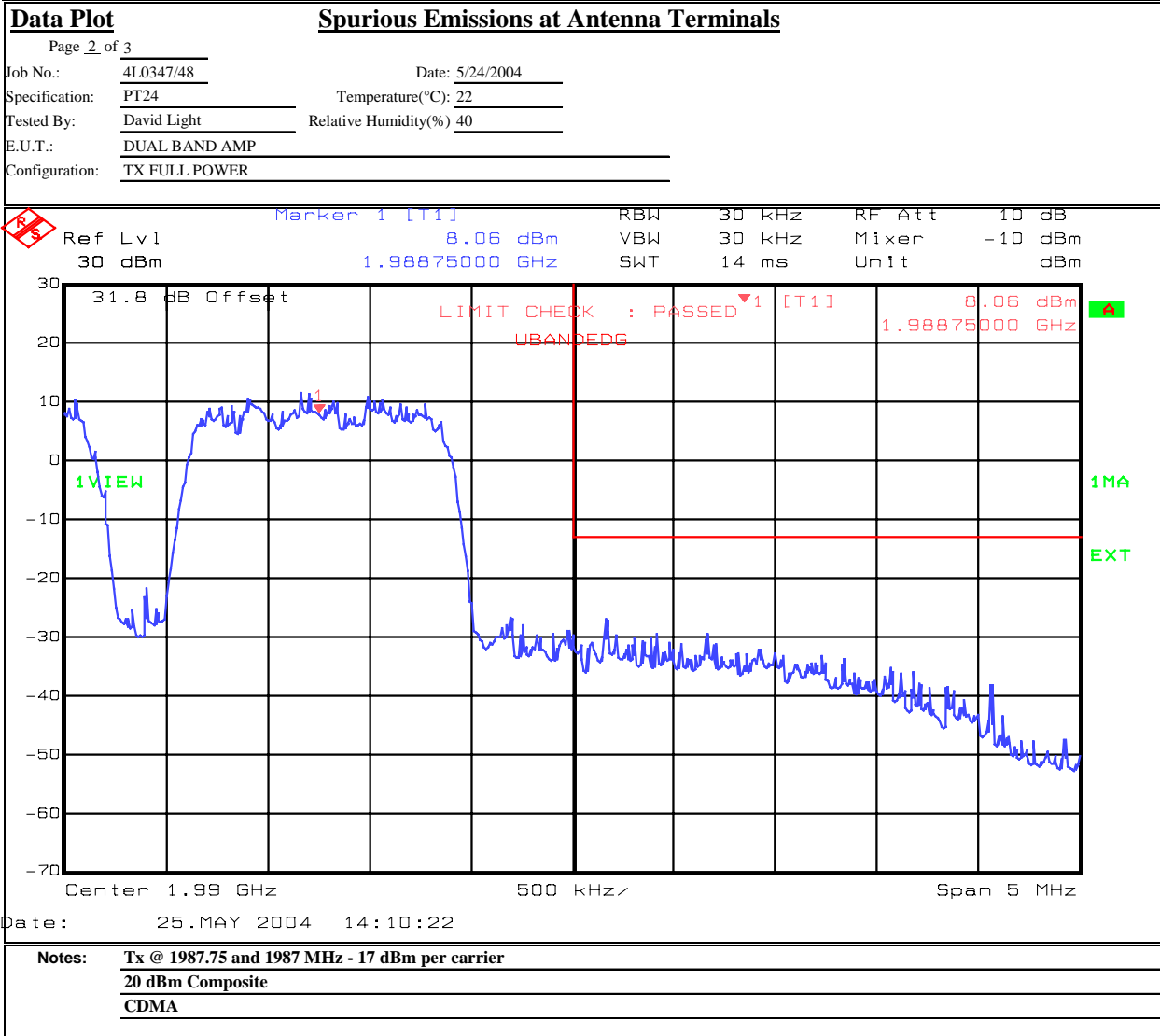
Test Data – Spurious Emissions at Antenna Terminals



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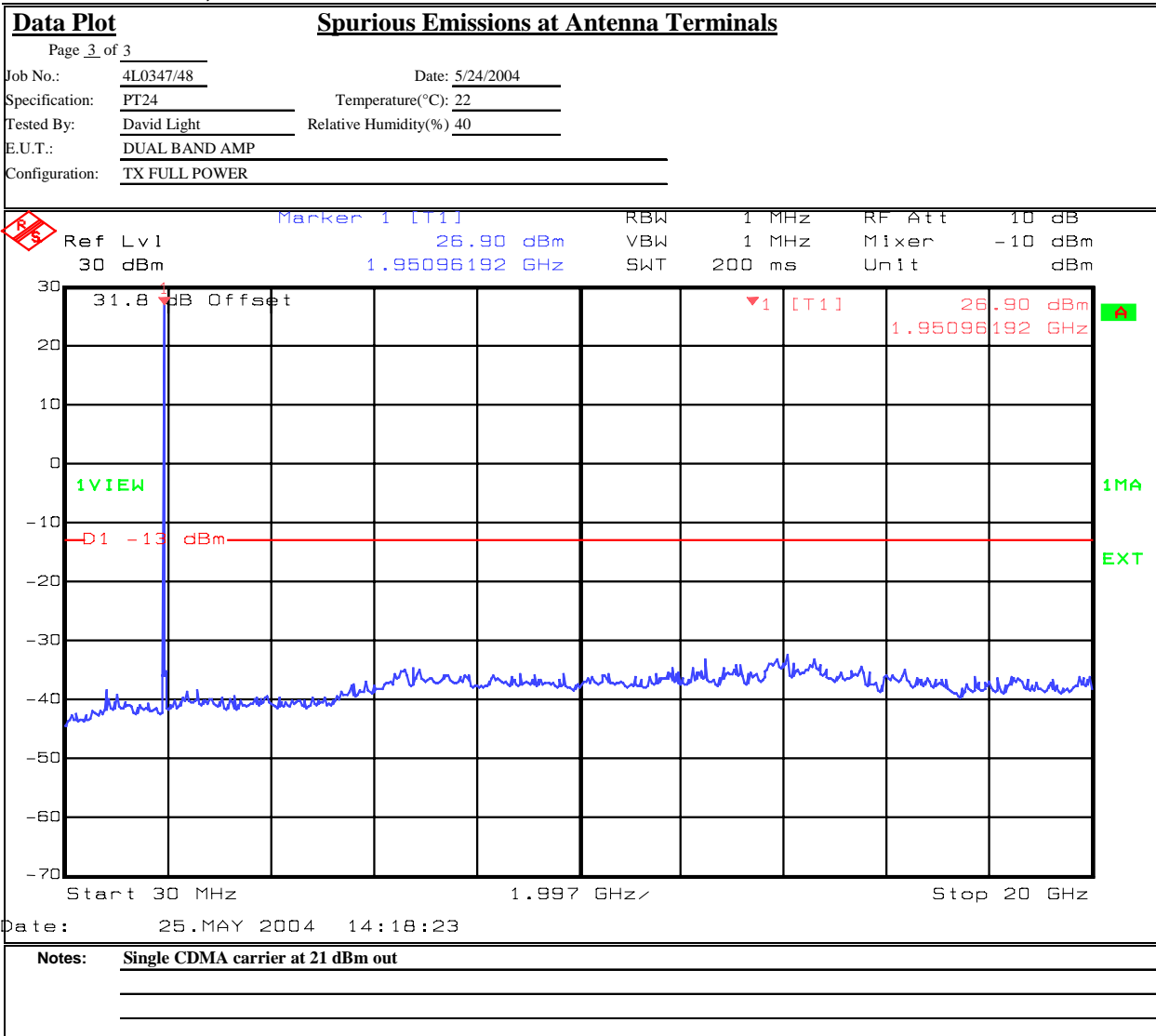
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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 3		Complete	X
Job No.: 4L0347/48	Date: 5/24/2004	Preliminary:	
Specification: PT24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: DUAL BAND AMP			
Configuration: TX FULL POWER			
Sample Number: 1			
Location: Lab 1	RBW: Refer to plots	Measurement	
Detector Type: Peak	VBW: Refer to plots	Distance: NA	m
Test Equipment Used			
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1: #N/A		
Filter:	Cable #2:		
Receiver: 1036	Cable #3:		
Attenuator #1: 1064	Cable #4:		
Attenuator #2: 1065	Mixer:		
Additional equipment used:			
Measurement Uncertainty: +/-1.7 dB			
<div><div><div>Ref Lvl 30 dBm</div><div>31.8 dB Offset</div><div>1VIEW</div><div>LOBNDEB</div></div><div><div>RBW 3 kHz</div><div>VBW 3 kHz</div><div>SWT 560 ms</div></div><div><div>RF Att 10 dB</div><div>Mixer -10 dBm</div><div>Unit dBm</div></div><div><div>30</div><div>20</div><div>10</div><div>0</div><div>-10</div><div>-20</div><div>-30</div><div>-40</div><div>-50</div><div>-60</div><div>-70</div></div><div><div>Center 1.93 GHz</div><div>200 kHz</div><div>Span 2 MHz</div></div><div><div>LIMIT CHECK : PASSED</div><div>1MA</div><div>EXT</div></div></div>			
Date: 25.MAY 2004 15:26:11			
Notes: Tx @ 1930.2 and 1930.7 MHz - 20 dBm per carrier			
23 dBm Composite			
GSM			

Test Data – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

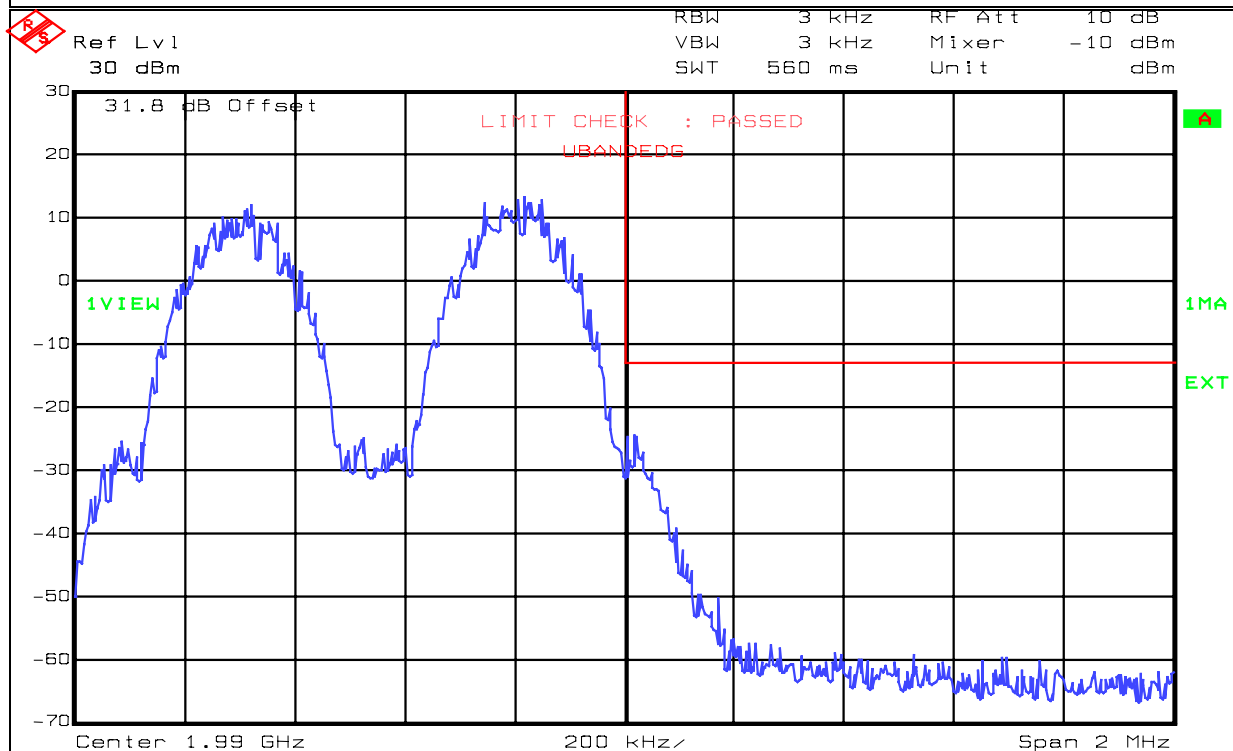
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Data Plot**Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.: 4L0347/48 Date: 5/24/2004
Specification: PT24 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: DUAL BAND AMP
Configuration: TX FULL POWER



Date: 25.MAY 2004 15:28:16

Notes: Tx @ 1989.8 and 1989.3 MHz - 20 dBm per carrier
23 dBm Composite
GSM

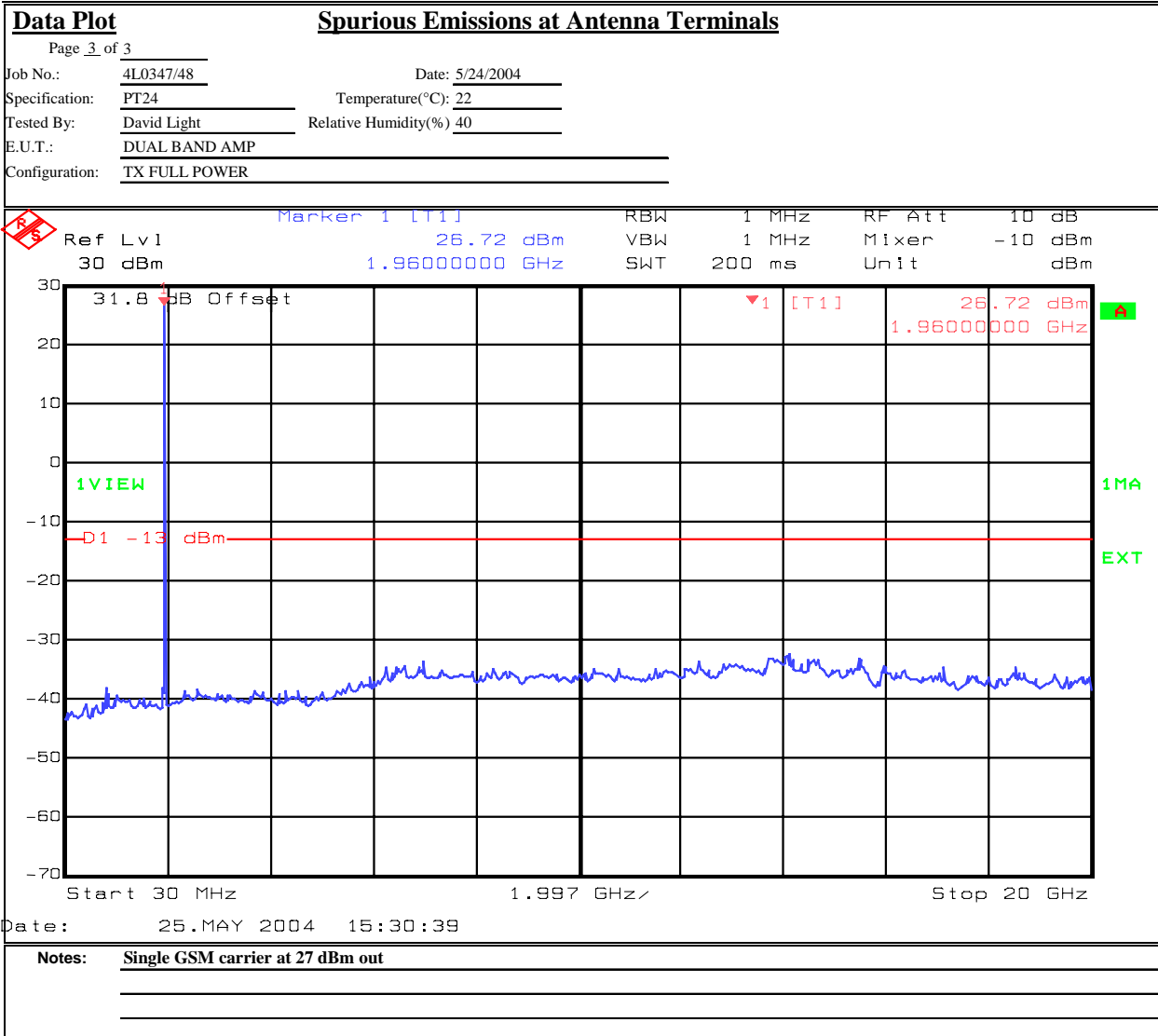
Test Data – Spurious Emissions at Antenna Terminals



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Test Data – Spurious Emissions at Antenna Terminals



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Data Plot

Page 1 of 3

Spurious Emissions at Antenna Terminals

Job No.: 4L0347/48

Date: 5/24/2004

Complete X

Specification: PT24

Temperature(°C): 22

Preliminary: _____

Tested By: David Light

Relative Humidity(%) 40

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: NA m

Test Equipment Used

Antenna: _____

Directional Coupler: _____

Pre-Amp: _____

Cable #1: #N/A

Filter: _____

Cable #2: _____

Receiver: 1036

Cable #3: _____

Attenuator #1: 1064

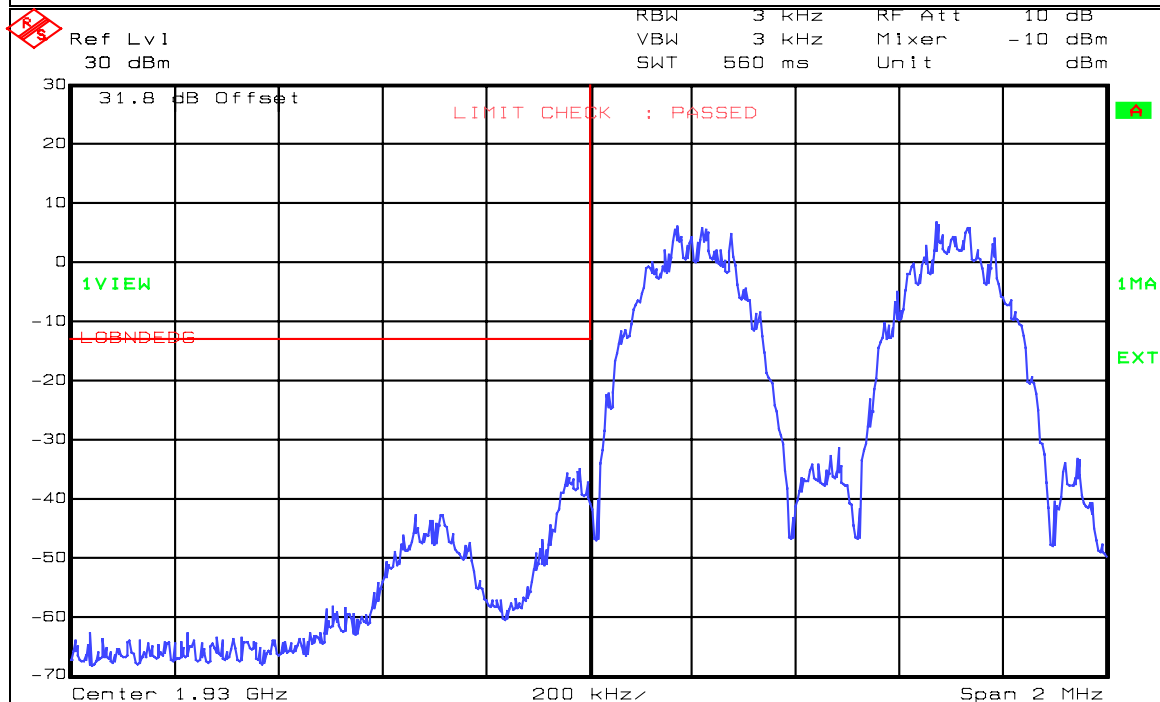
Cable #4: _____

Attenuator #2: 1065

Mixer: _____

Additional equipment used: _____

Measurement Uncertainty: +/-1.7 dB



Date: 25.MAY 2004 15:49:04

Notes: Tx @ 1930.2 and 1930.7 MHz - 18 dBm per carrier

21 dBm Composite

EDGE

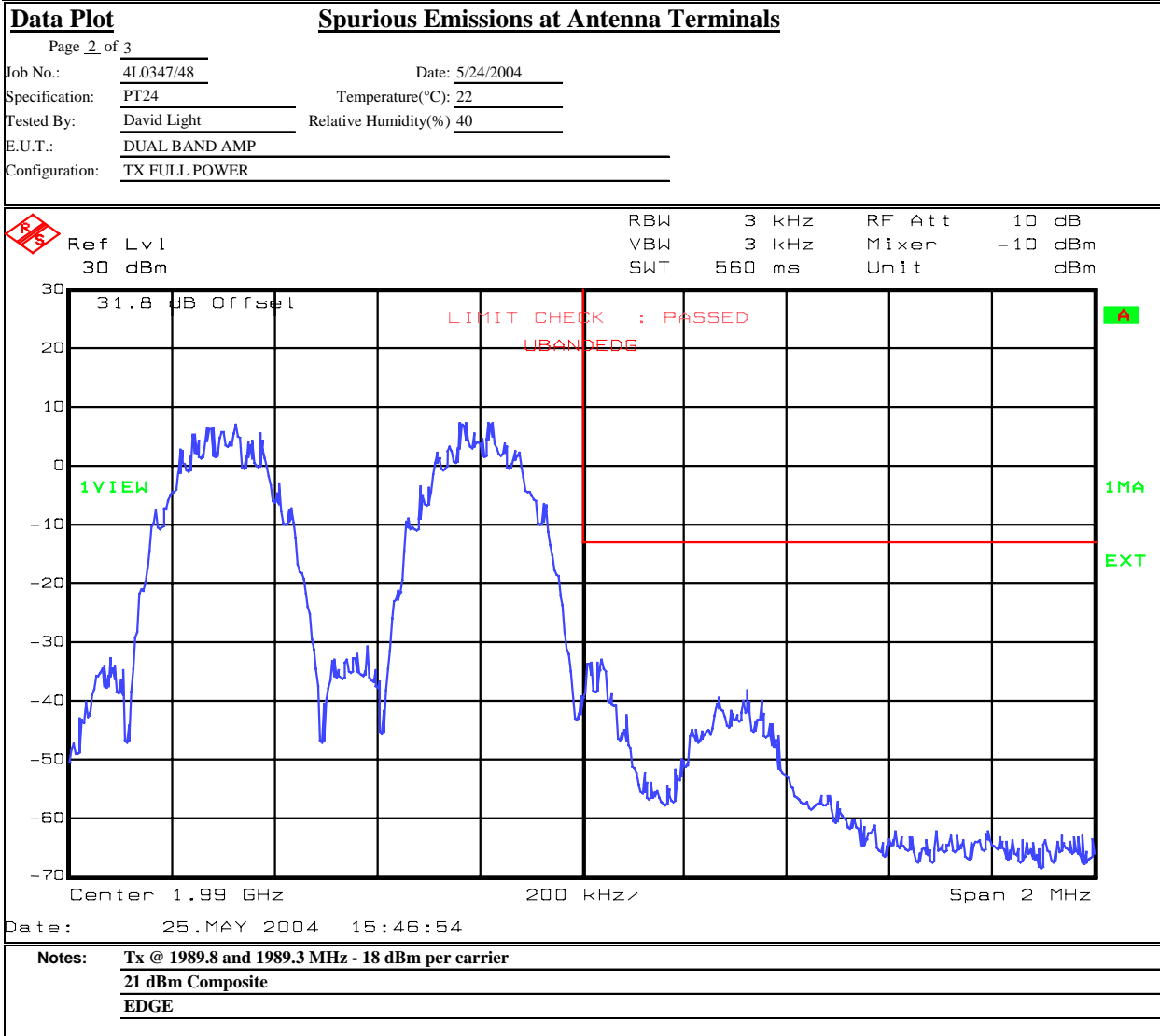
Test Data – Spurious Emissions at Antenna Terminals



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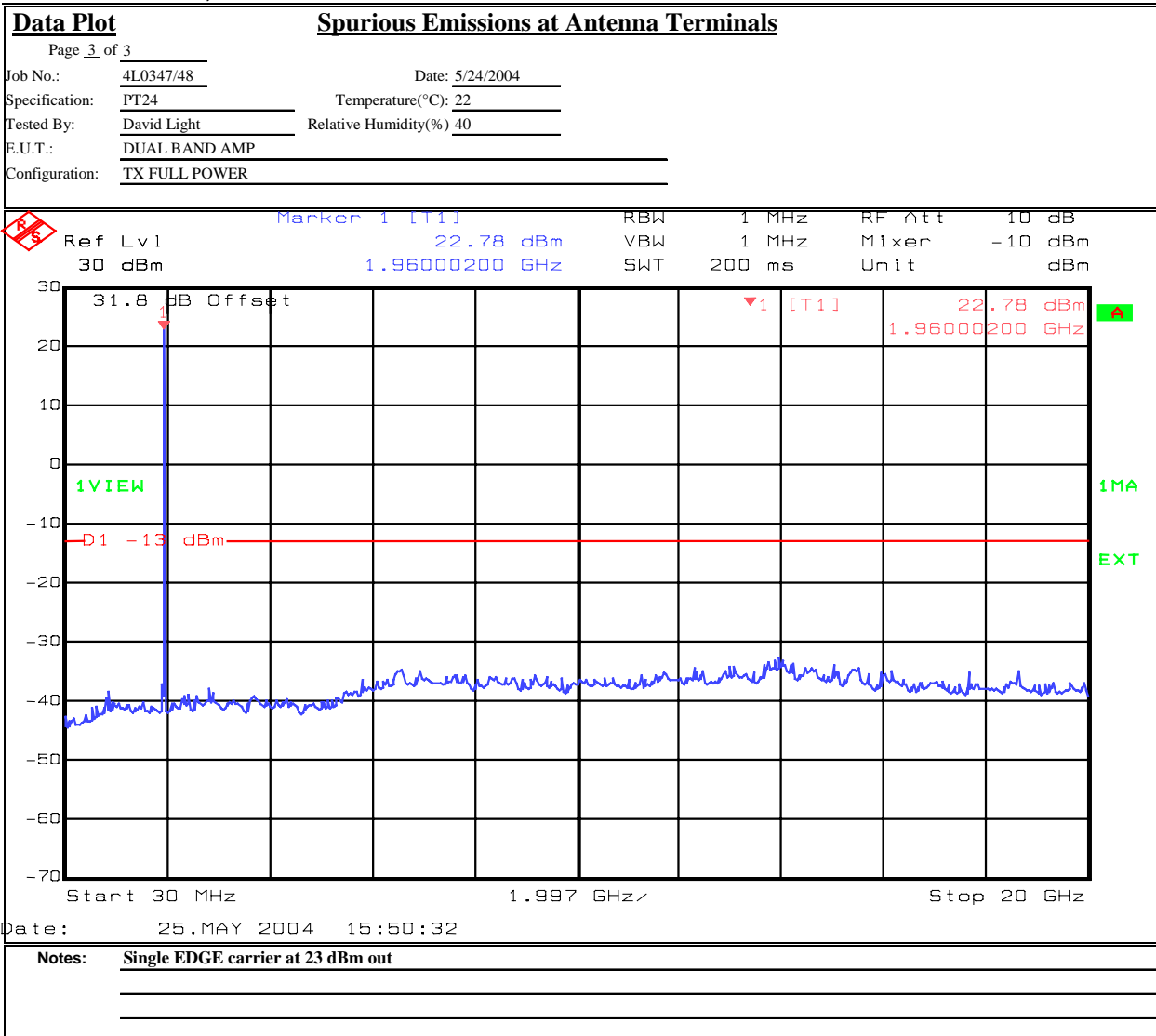
Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 3		Complete <u>X</u>	
Job No.: 4L0347/48	Date: 5/24/2004	Preliminary: _____	
Specification: PT24	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
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: NA m	
Test Equipment Used			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: #N/A		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: 1064	Cable #4: _____		
Attenuator #2: 1065	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
<div></div>			
Date: 25.MAY 2004 14:59:23			
Notes: Tx @ 1930.03 and 1930.3 MHz - 18 dBm per carrier			
21 dBm Composite			
TDMA			

Test Data – Spurious Emissions at Antenna Terminals



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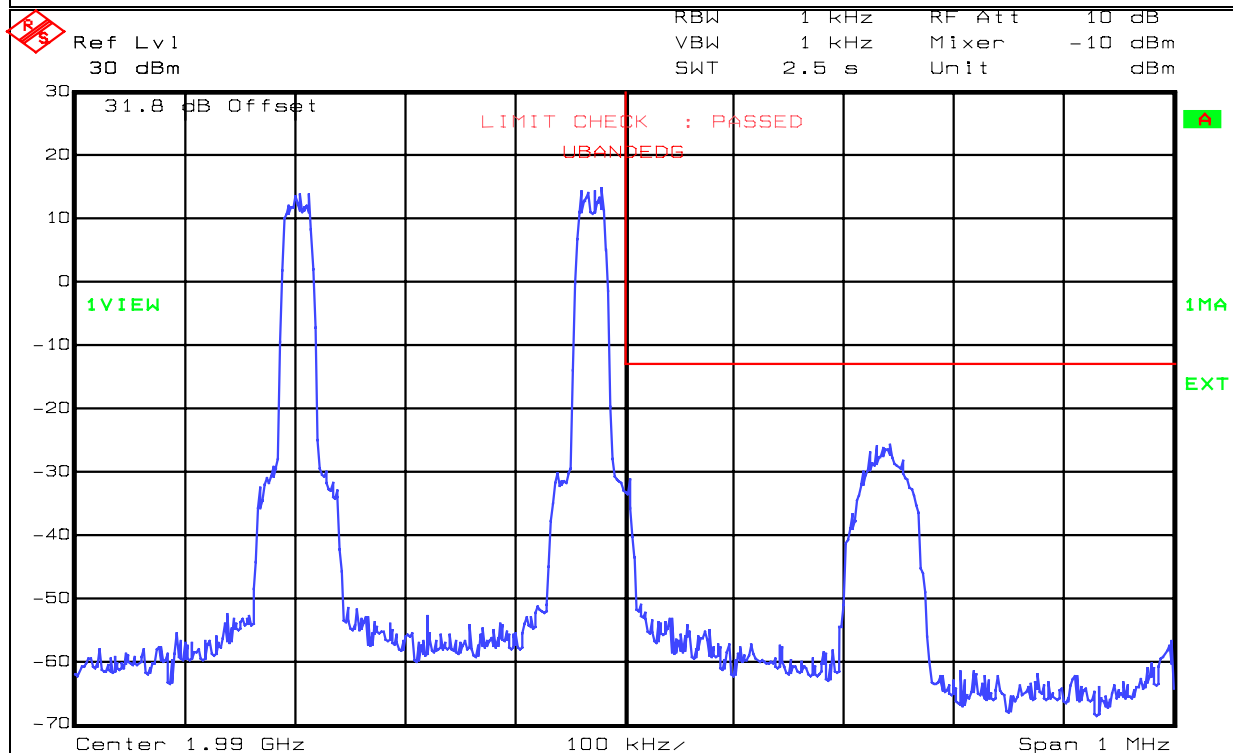
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Data Plot

Spurious Emissions at Antenna Terminals

Page 2 of 3

Job No.: 4L0347/48 Date: 5/24/2004
Specification: PT24 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: DUAL BAND AMP
Configuration: TX FULL POWER



Date: 25.MAY 2004 15:02:08

Notes: Tx @ 1989.97 and 1989.7 MHz - 18 dBm per carrier
21 dBm Composite
TDMA

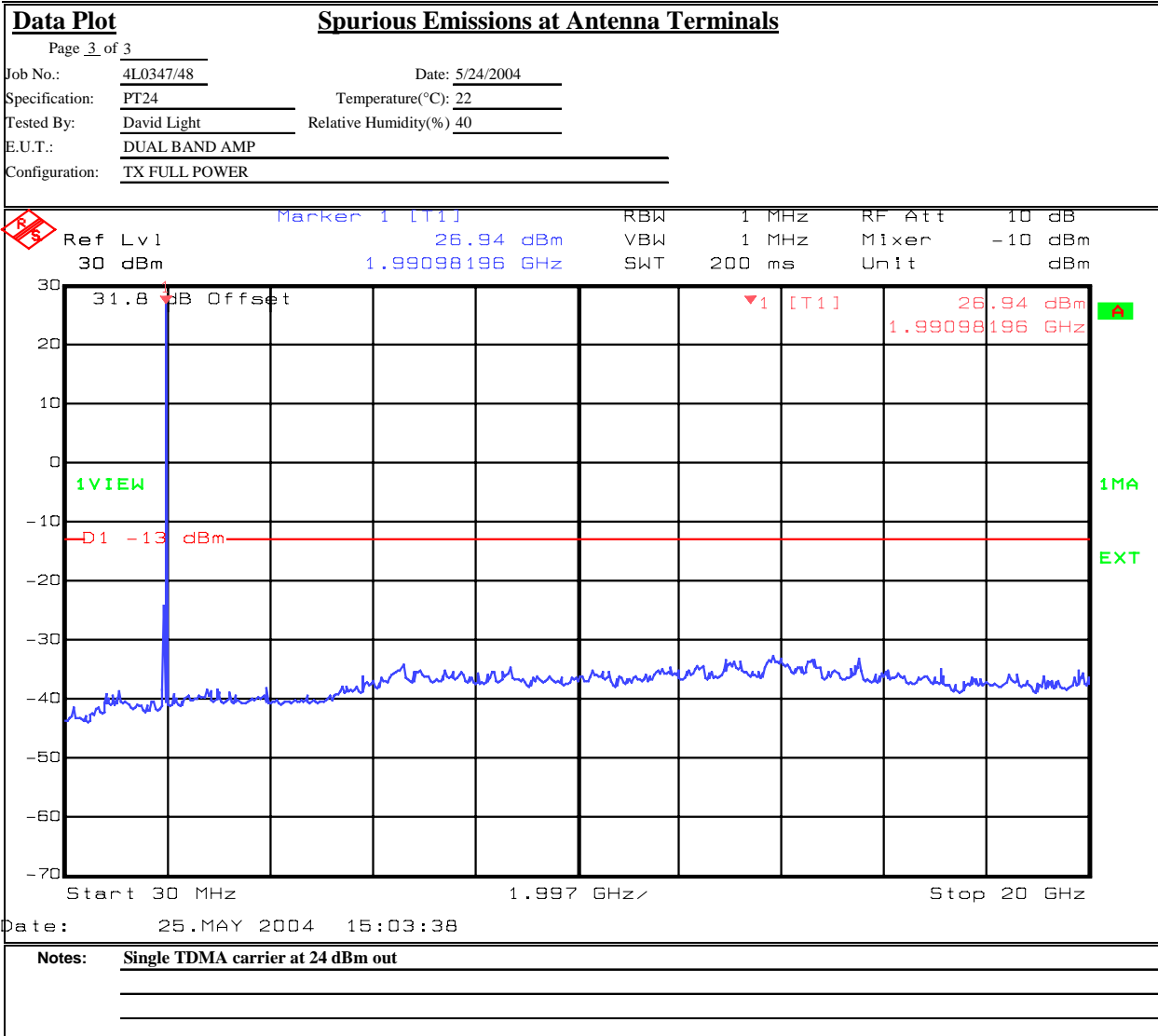
Test Data – Spurious Emissions at Antenna Terminals



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Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE:5/27/04

Test Results: Complies.

Test Data: There were no emissions detected above the noise floor, which was more than 20 dB below the specification limit of -13 dBm.

The device was tested at 3 frequencies, Low, Mid and High

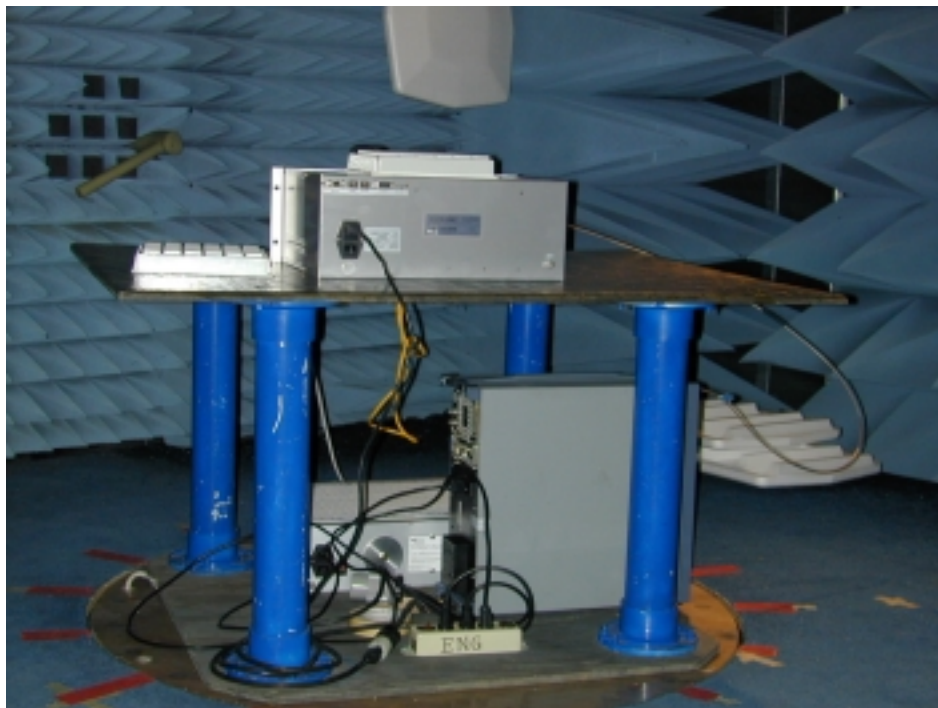
Equipment Used: 1464-1484-1485-1016-1304

Measurement Uncertainty: +/-1.7 dB

Temperature: 20 °C

Relative Humidity: 40 %

Photographs of Test Setup



Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: David Light	DATE:5/27/04

Test Results: Complies.

Measurement Data: See attached table.

Standard Test Frequency: 1960 MHz

Standard Test Voltage: -48 Vdc

Test Data – Frequency Stability



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Frequency StabilityPage 1 of 1

Job No.: 4L0347 Date: 5/27/2004
Specification: PT24 Temperature(°C): 20
Tested By: David Light Relative Humidity(%) 45
E.U.T.: Dual Band Amp
Configuration: TX CENTER BAND
Sample Number: 1

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1042
Filter: _____ Cable #2: _____
Receiver: 1026
Attenuator #1: 1064
Attenuator #2: _____

Measurement Uncertainty: 1x10⁻¹⁷ ppm Standard Test Frequency 1960.000000 MHz

Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	1960.000000		-48	0	2940.0	0.0	
20	1960.000000		-56.2	0	2940.0	0.0	
20	1960.000000		-40.8	0	2940.0	0.0	
50	1960.000000		-48	0	2940.0	0.0	
40	1960.000000		-48	0	2940.0	0.0	
30	1960.000000		-48	0	2940.0	0.0	
10	1960.000000		-48	0	2940.0	0.0	
0	1960.000000		-48	0	2940.0	0.0	
-10	1960.000000		-48	0	2940.0	0.0	
-20	1960.000000		-48	0	2940.0	0.0	
-30	1960.000000		-48	0	2940.0	0.0	

Notes:

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/26/04	03/26/05
1042	CABLE, 4M	STORM PR90-010-144	N/A	09/02/03	09/01/04
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/24/03	07/23/04
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/24/03	07/23/04
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	05/06/04	05/06/05
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A

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:

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 an isotropic. 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 corrected for gain referenced to an isotropic.

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
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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: \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.

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 an isotropic. 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 corrected for gain referenced to an isotropic.

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

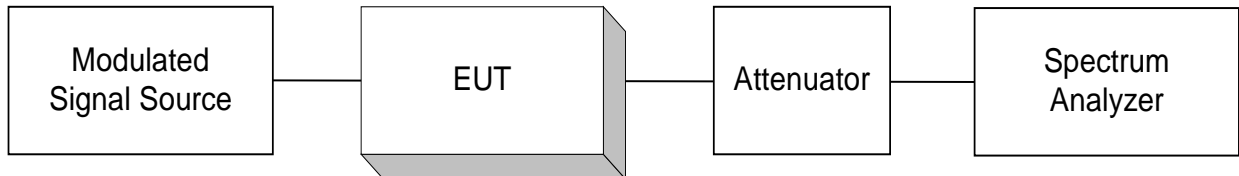
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the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

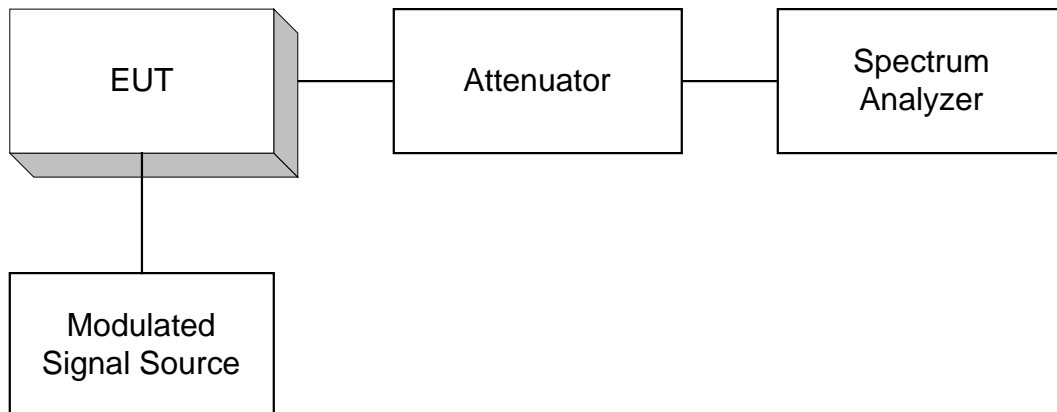
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

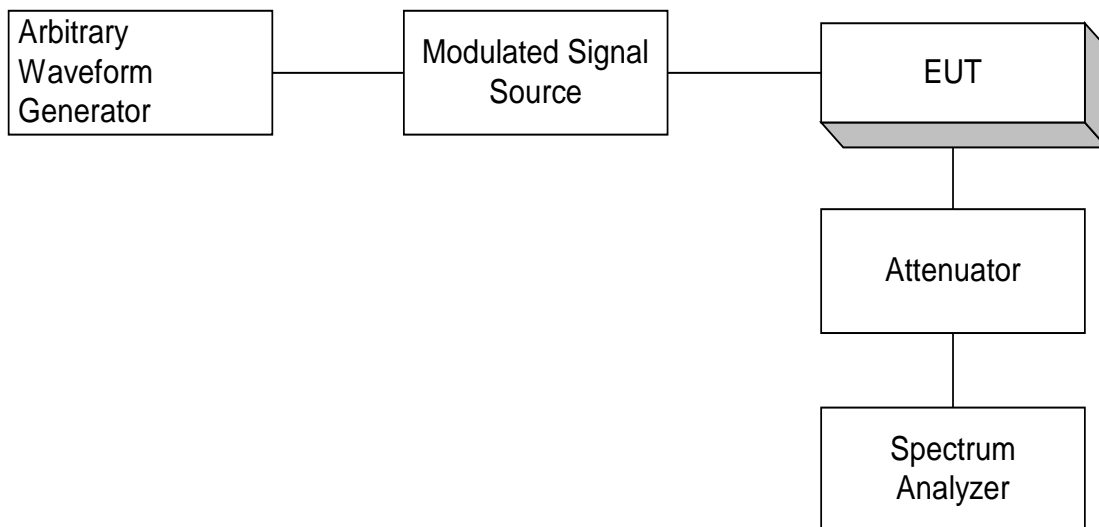
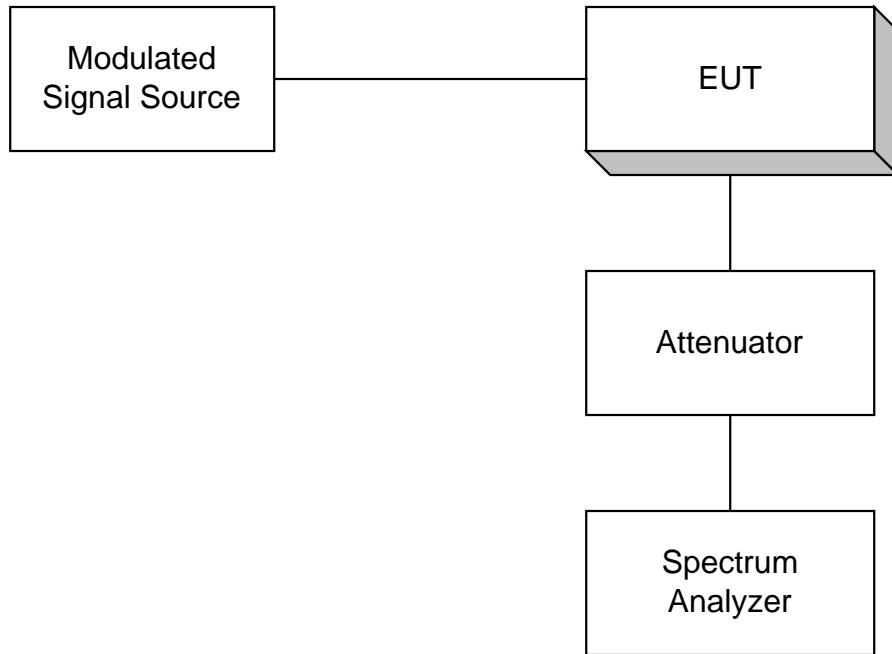
Para. No. 2.985 - R.F. Power Output



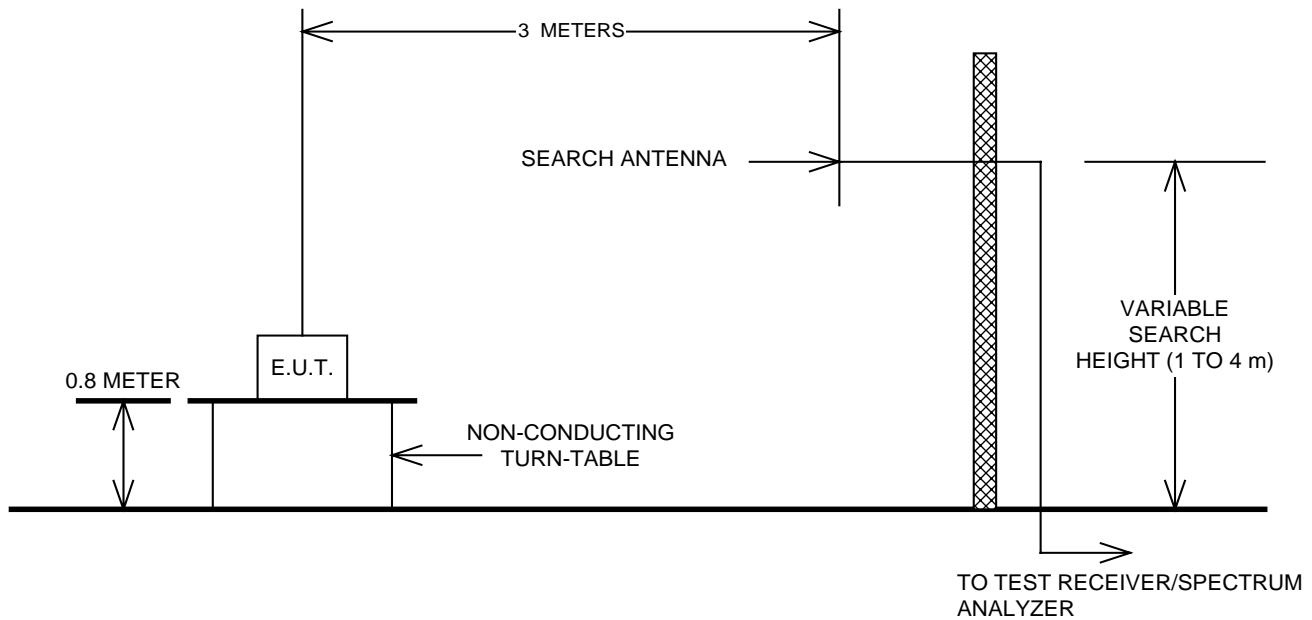
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

