

Nemko Test Report: 4L0348RUS1

Applicant: Andrew Corporation
108 Rand Park Drive
Garner, NC 27529

**Equipment Under Test:
(E.U.T.)** TFAM2632/4

In Accordance With: **FCC Part 90, Subpart I**
Transmitter

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, TX 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 90, Subpart I.



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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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	90.205		Complies
Audio Frequency Response	TIA EIA-603.3.2.6	N/A	N/A
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A	N/A
Occupied Bandwidth	90.210	Plots	Complies
Spurious Emissions at Antenna Terminals	90.210	Mask G and H	Complies
Field Strength of Spurious Emissions	90.210		Complies
Frequency Stability	90.213		Complies
Transient Frequency Behavior	90.214	N/A	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.

Section 2. General Equipment Specification

Transmitter

Supply Voltage Input: 48 Vdc

Frequency Range: 851.0125 to 868.9875

Type(s) of Modulation:	F3E (Analog)	F1D	F2D	D7W (QAM)	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Gain: 18 dB

Output Impedance: 50 Ohms

RF Output (Rated per carrier):

Number of Carriers:	1	2	4	8
iDEN	21	17	13	9
Analog	27	27	17	13

Operator Selection of Operating Frequency: None – Full band coverage

Power Output Adjustment Capability: None

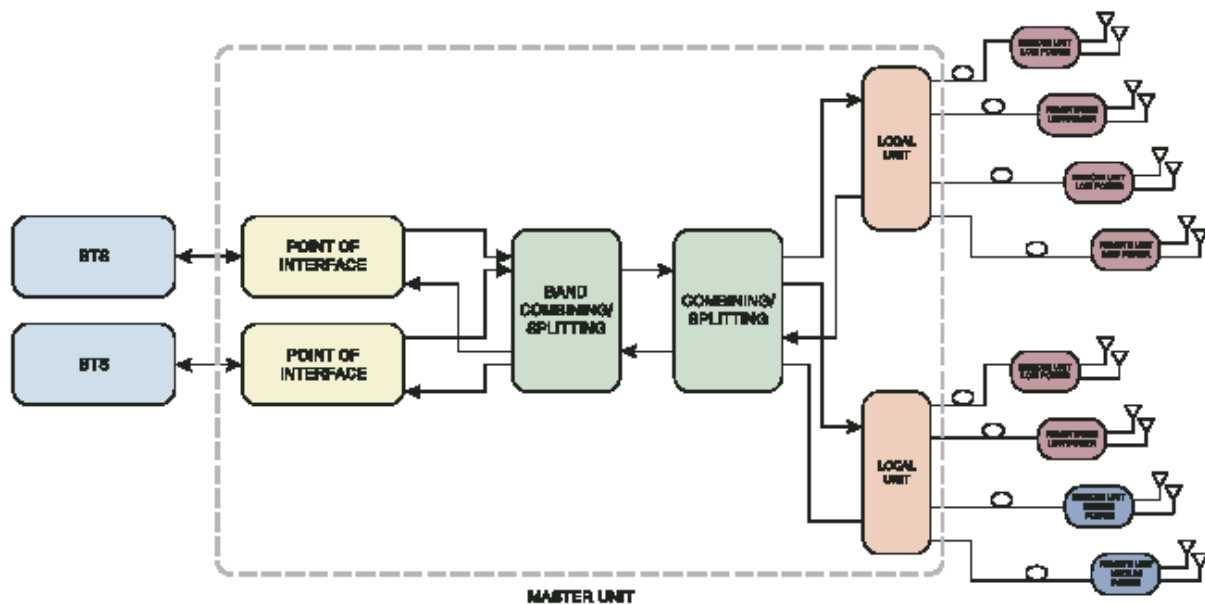
Frequency Translation:	F1-F1	F1-F2	N/A
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Band Selection:	Software	Duplexer Change	Fullband Coverage
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Description of EUT

Britecell Plus is a radio over fiber system

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE:5/26/04

Test Results: Complies.

Measurement Data:

Modulation Type	Single Carrier (dBm)	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Analog	27	20	23
iDEN	21	17	20

Equipment Used: 1036-1029-1064

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 40 %

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EQUIPMENT: TFAM2632/4

FCC PART 90, SUBPART I
TRANSMITTER
Test Report No.: 4L0348RUS1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE:5/26/04

Test Results: Complies.

Test Data: See attached graph(s).

Test Data – Occupied Bandwidth



Dallas Headquarters:

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Fax: (972) 436-2667

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Data Plot		Occupied Bandwidth	
Page 1 of 2		Complete <u>X</u>	
Job No.: 4L0348	Date: 5/26/2004	Preliminary: _____	
Specification: PT90	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: <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: 1064	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
<div><div><div>Ref Lvl 30 dBm</div><div>Delta 1 [T1] 0.01 dB</div><div>10.02004008 kHz</div></div><div><div>RBW 300 Hz</div><div>VBW 5 kHz</div><div>SWT 1.75 s</div></div><div><div>RF Att 30 dB</div><div>Unit dBm</div></div></div> <div>Center 860.0012212 MHz 3.125 kHz Span 31.25 kHz</div> <div>Date: 26.MAY 2004 08:52:55</div>			

Notes: Analog
2.5 kHz Tone - 2 kHz Deviation

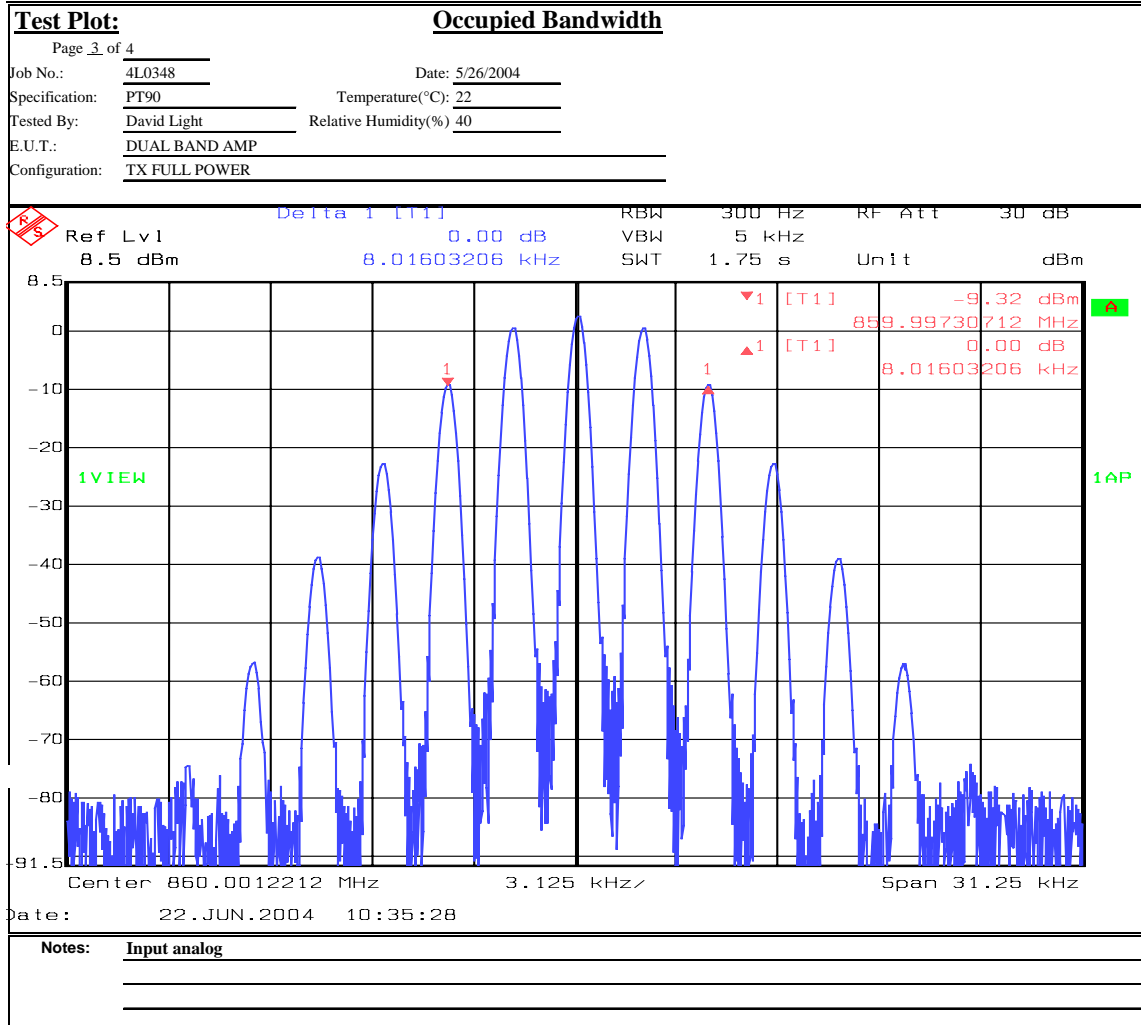
Test Data – Occupied Bandwidth



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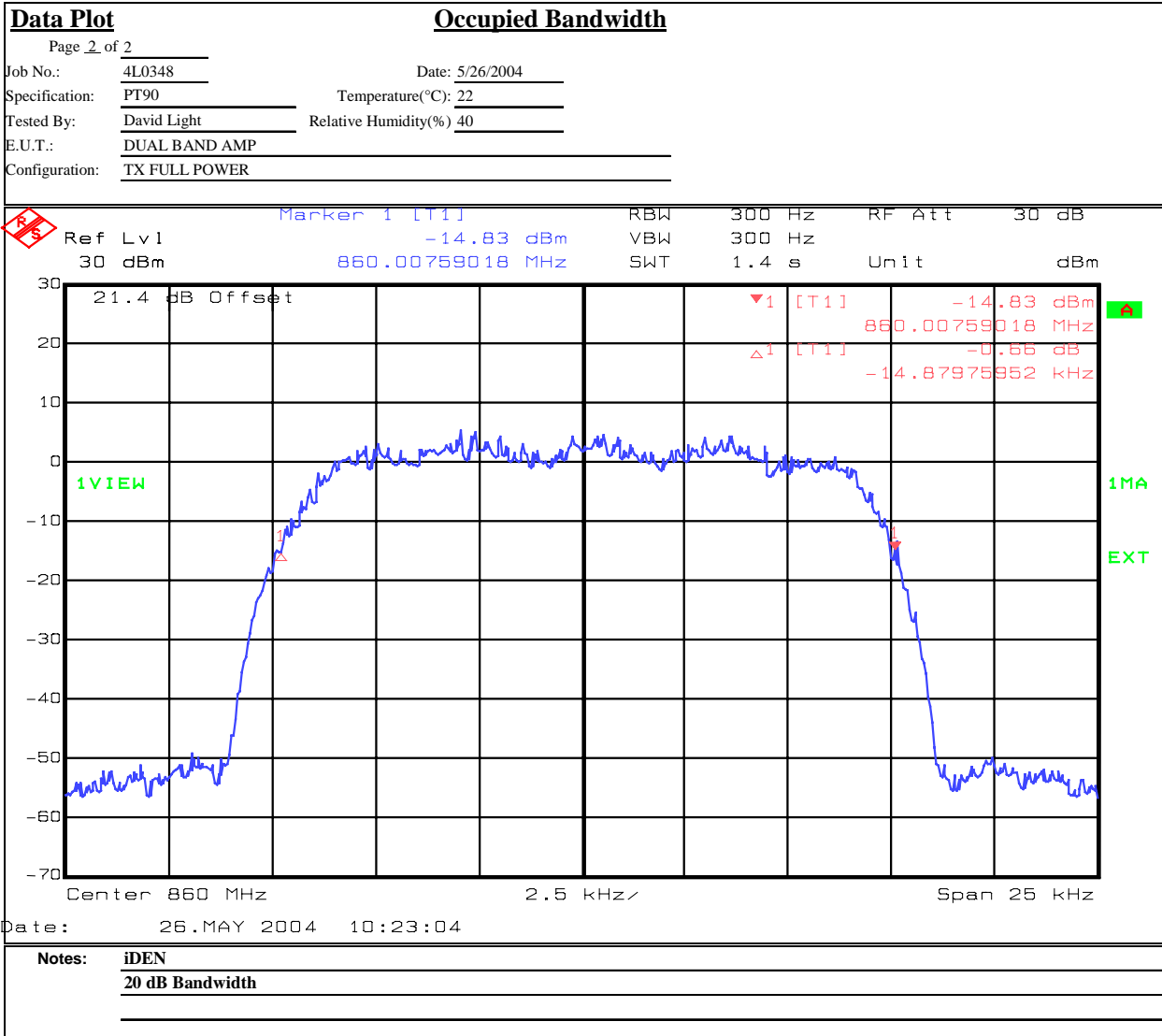
Test Data – Occupied Bandwidth



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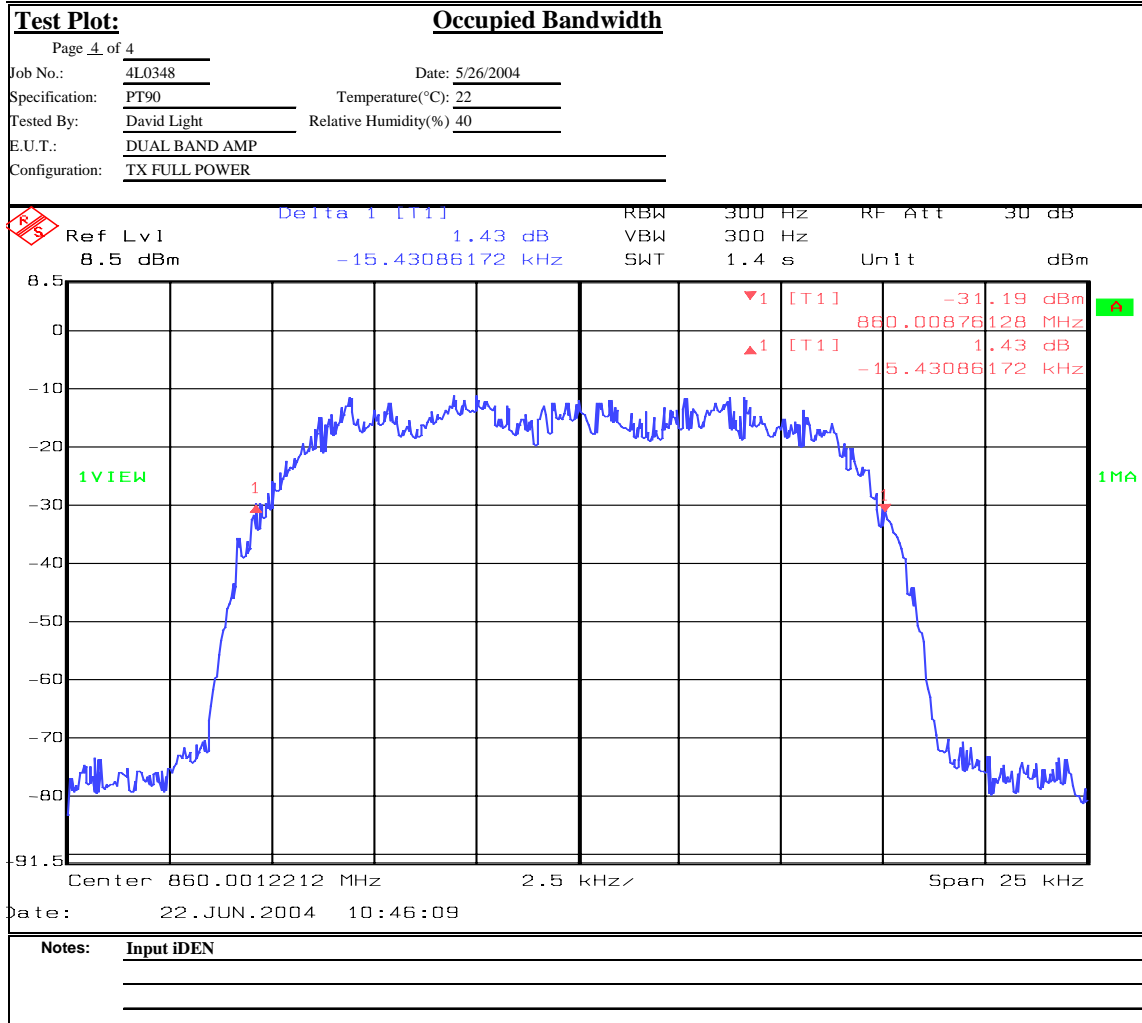
Test Data – Occupied Bandwidth



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TRANSMITTER

EQUIPMENT: TFAM2632/4

Test Report No.: 4L0348RUS1

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE:5/26/04

Test Results:

Complies.

Test Data:

See attached graph(s).

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 4		Complete <u>X</u>	
Job No.: 4L0348	Date: 5/26/2004	Preliminary: _____	
Specification: PT90	Temperature(°C): 22		
Tested By: Lance Walker	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: <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: 1064	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
<div style="display: flex; justify-content: space-between;"> <div> <p>Ref Lvl 27 dBm</p> <p>Marker 1 [T1] 25.11 dBm</p> <p>860.00010020 MHz</p> </div> <div> <p>RBW 300 Hz</p> <p>VBW 300 Hz</p> <p>SWT 5.6 s</p> </div> <div> <p>RF Att 30 dB</p> <p>Unit dBm</p> </div> </div> <p>Center 860 MHz 10 kHz Span 100 kHz</p>			
Date: 26.MAY 2004 09:49:48			
Notes: Analog			

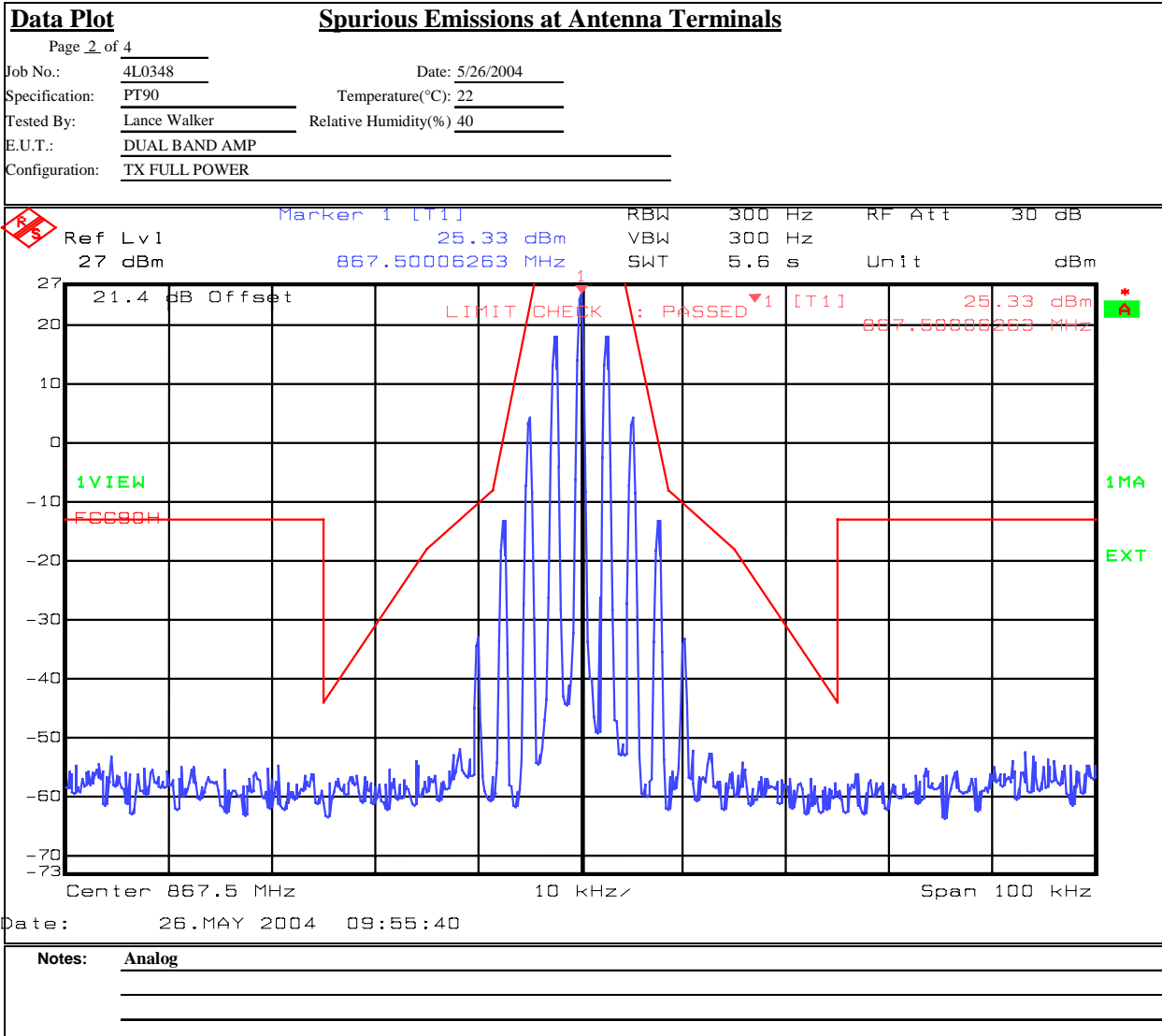
Test Data – Spurious Emissions at Antenna Terminals



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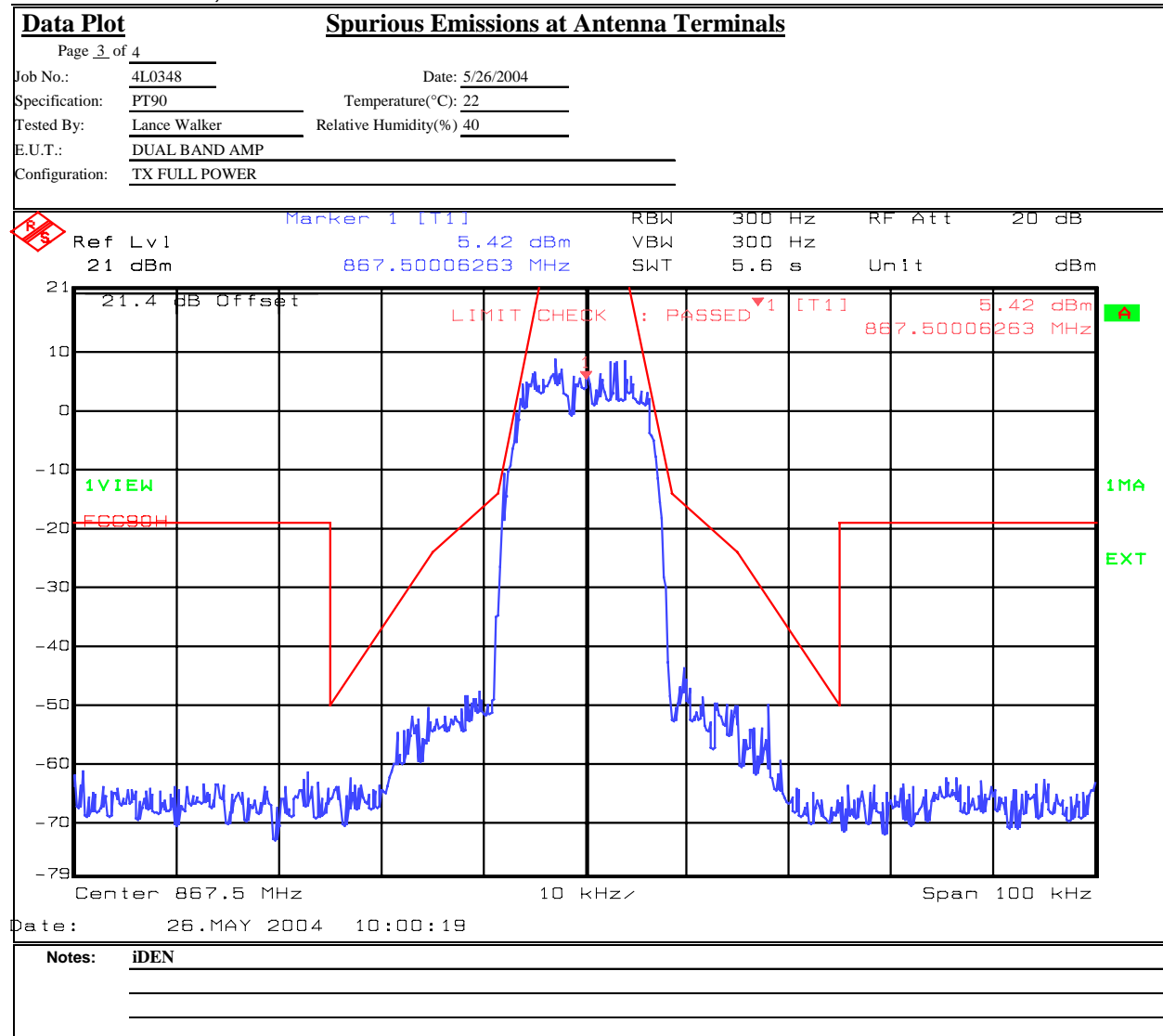
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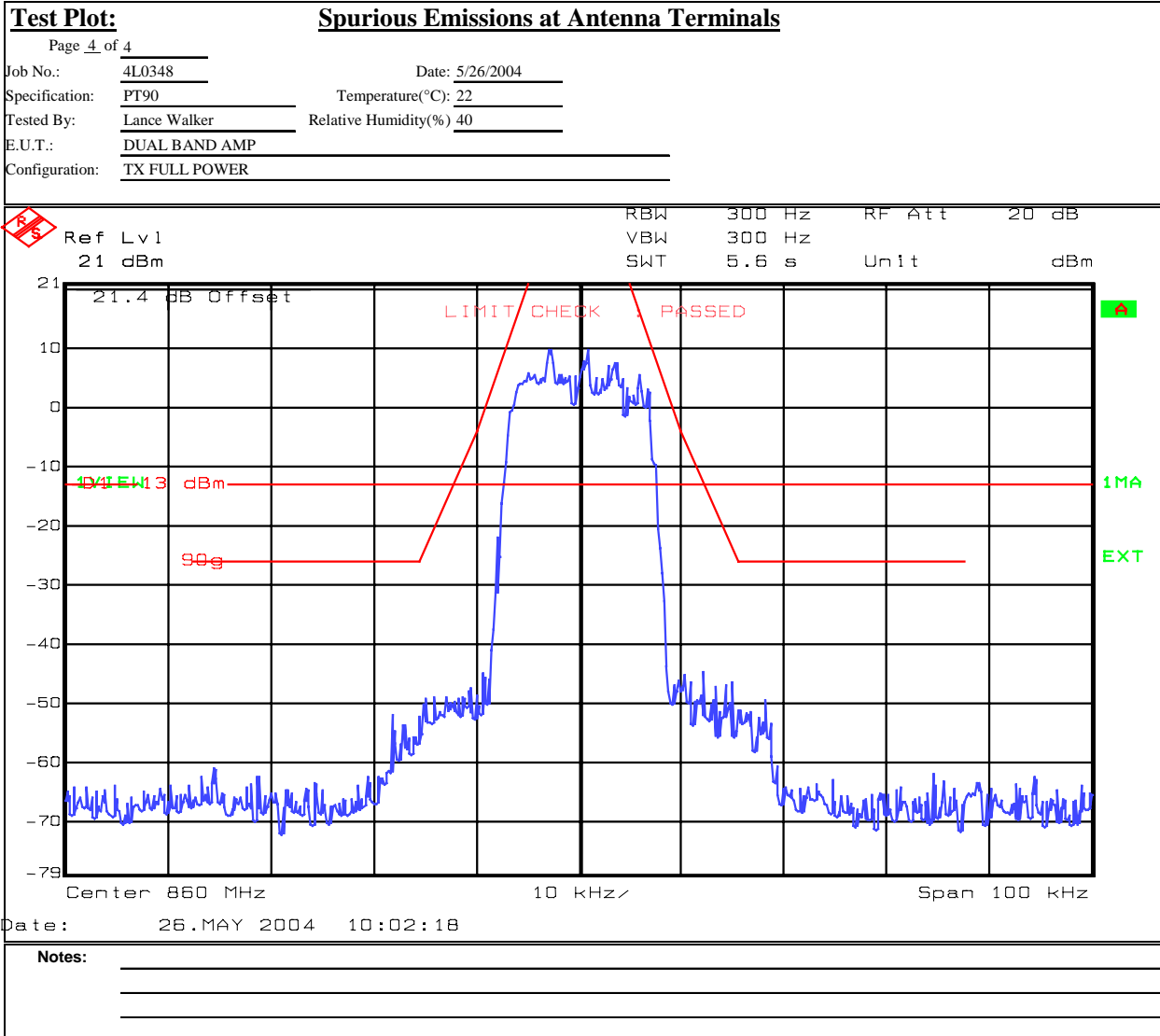
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Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Spurious Emissions at Antenna Terminals	
Page 1 of 6		Complete <u>X</u>	
Job No.: 4L0348	Date: 5/26/2004	Preliminary: _____	
Specification: PT90	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: <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: 1064	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
<div><div><div>Ref Lvl 30 dBm</div><div>Marker 1 [T1] -20.42 dBm 850.67635271 MHz</div></div><div><div>RBW 300 Hz VBW 300 Hz SWT 56 s</div><div>RF Att 30 dB Unit dBm</div></div></div> <div>Date: 26.MAY 2004 09:10:15</div> <div>Notes: Analog 20 dBm per carrier - 23 dBm Composite power</div>			

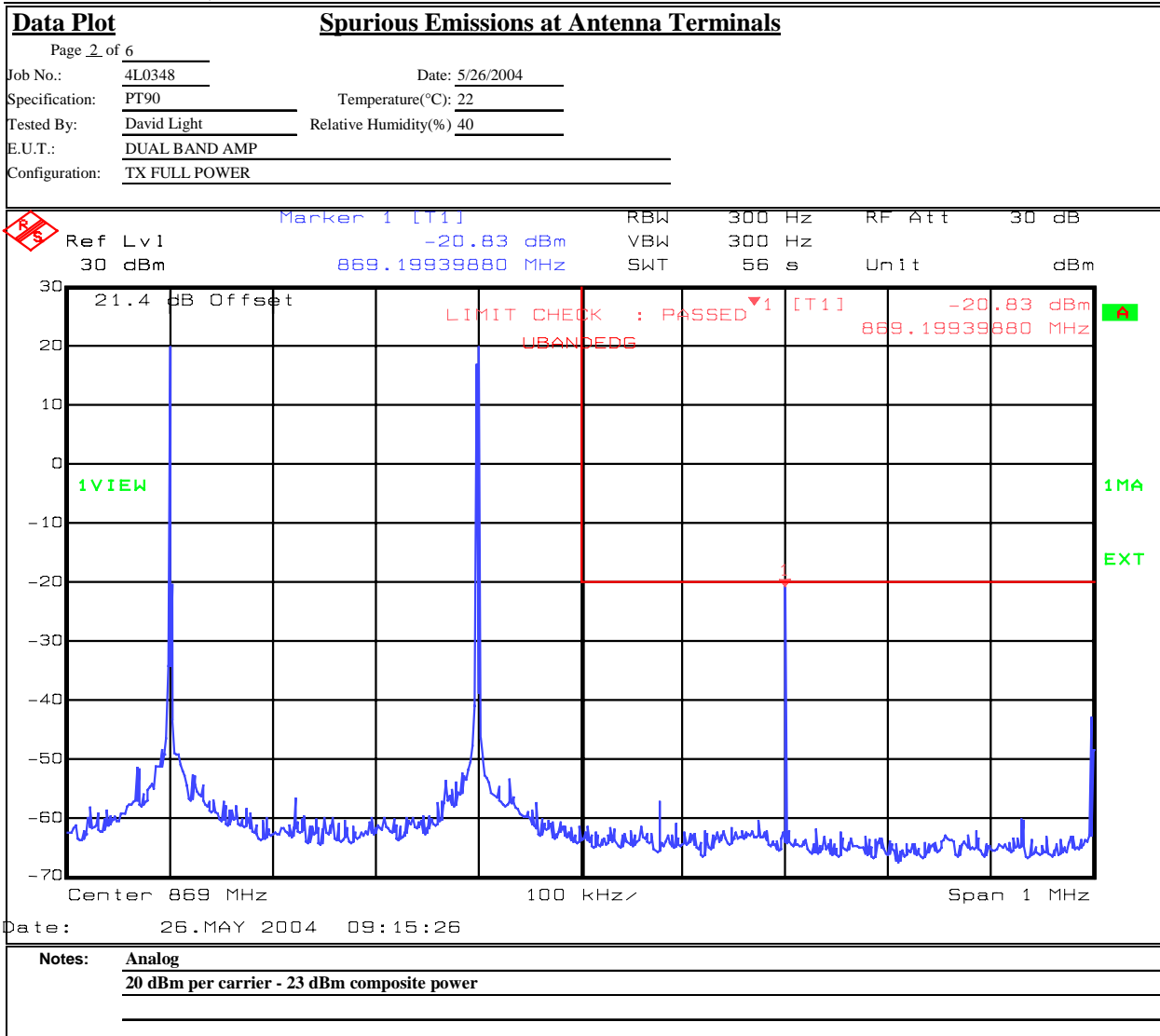
Test Data – Spurious Emissions at Antenna Terminals



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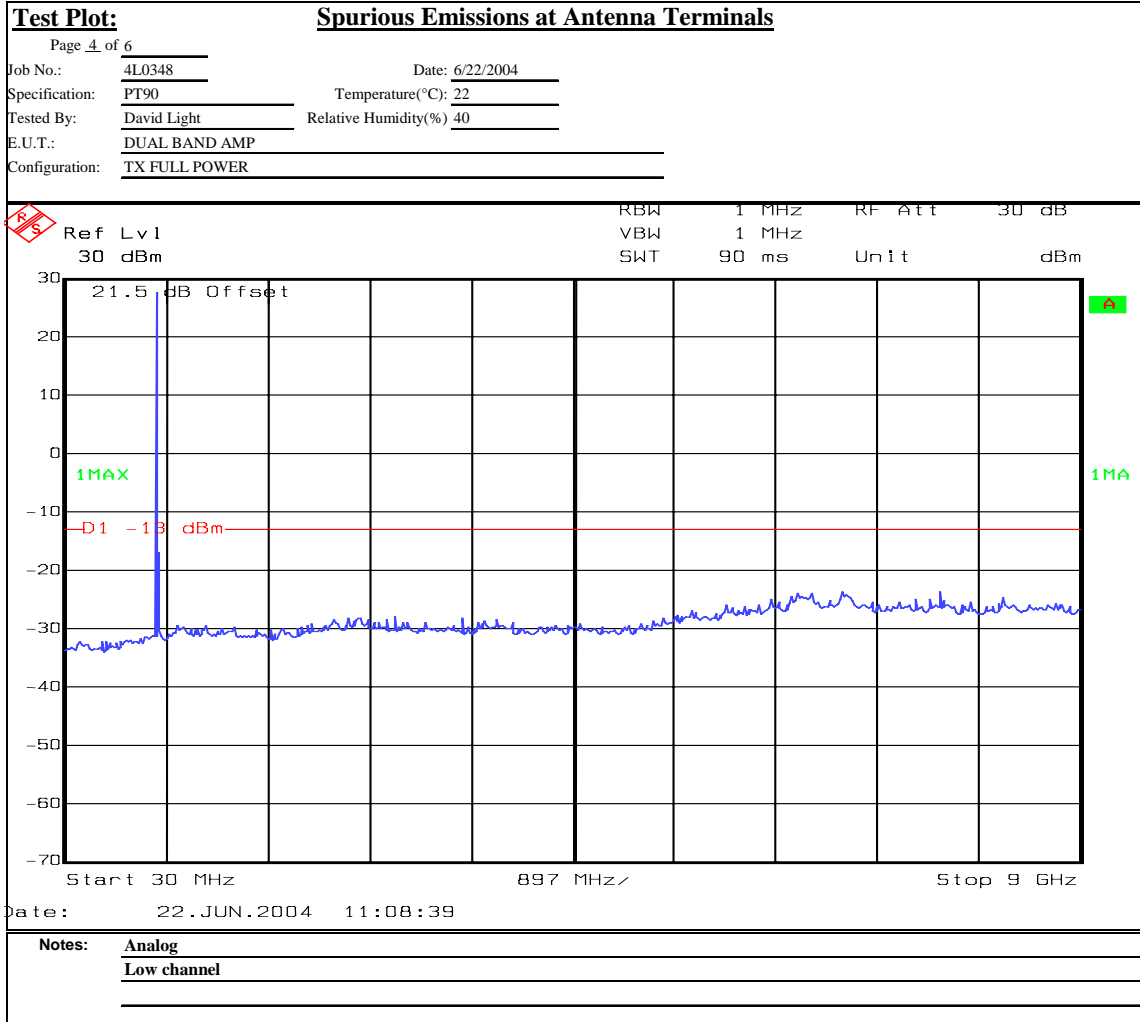
Test Data – Spurious Emissions at Antenna Terminals – Low Channel



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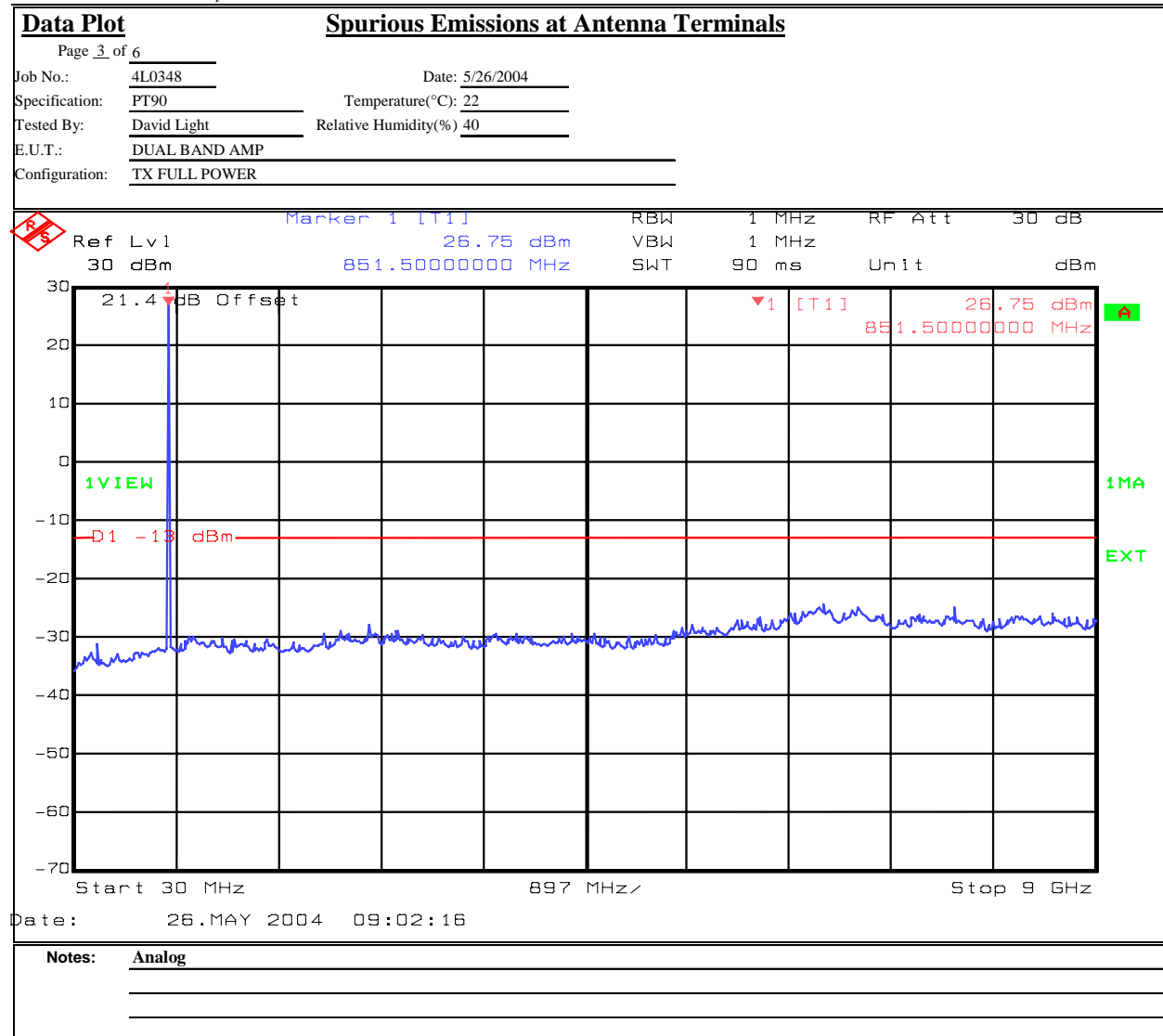
Test Data – Spurious Emissions at Antenna Terminals – Mid Channel



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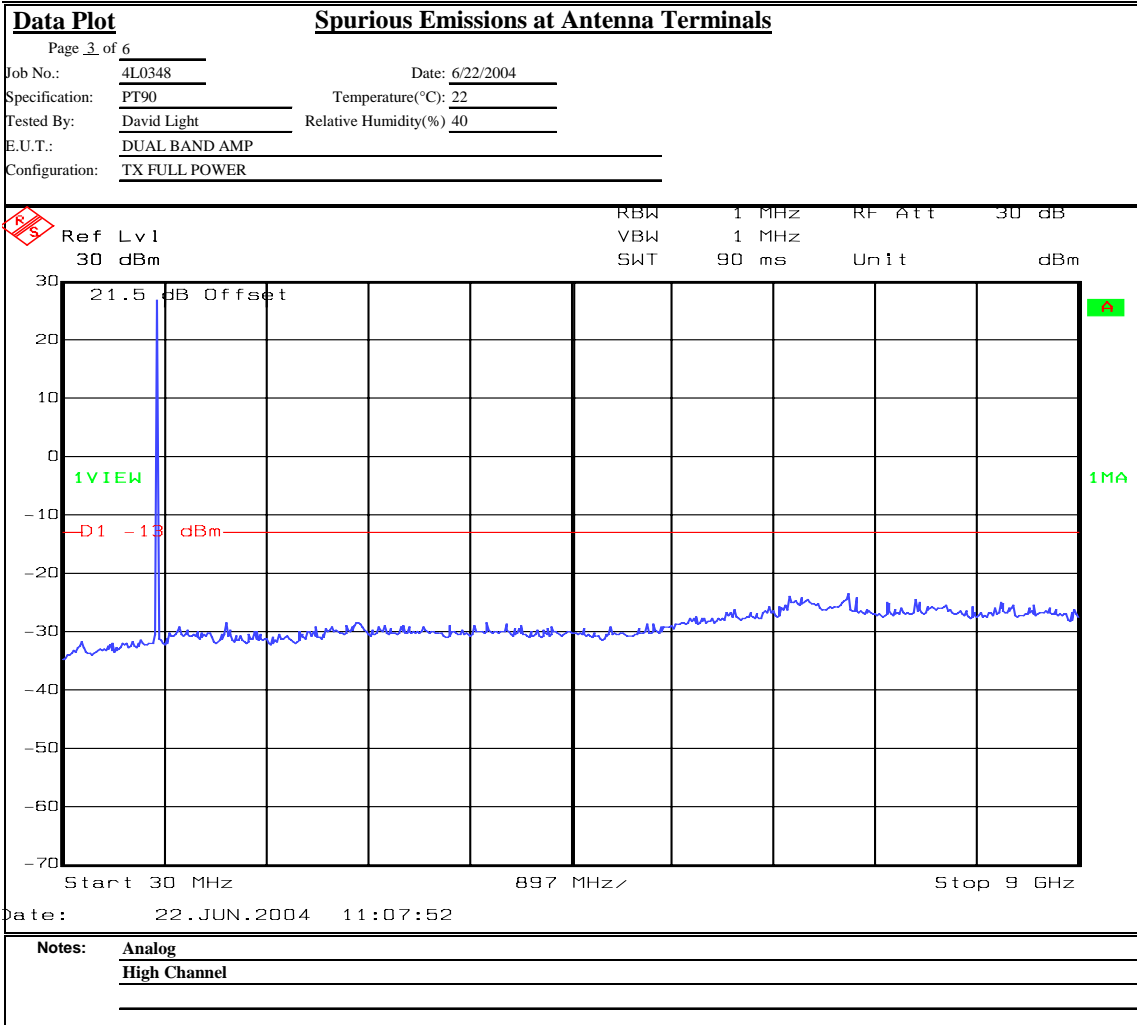
Test Data – Spurious Emissions at Antenna Terminals – High Channel



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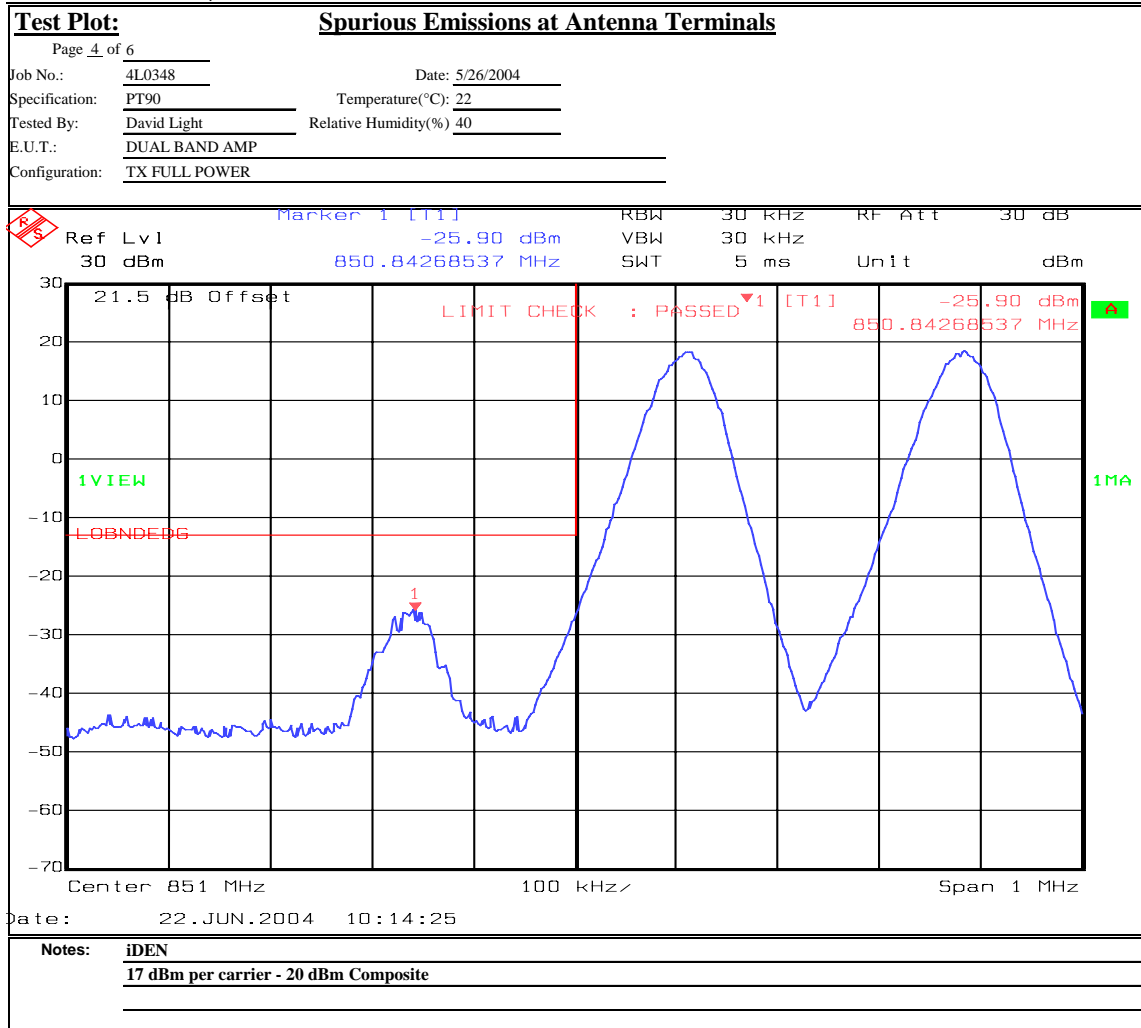
Test Data – Spurious Emissions at Antenna Terminals



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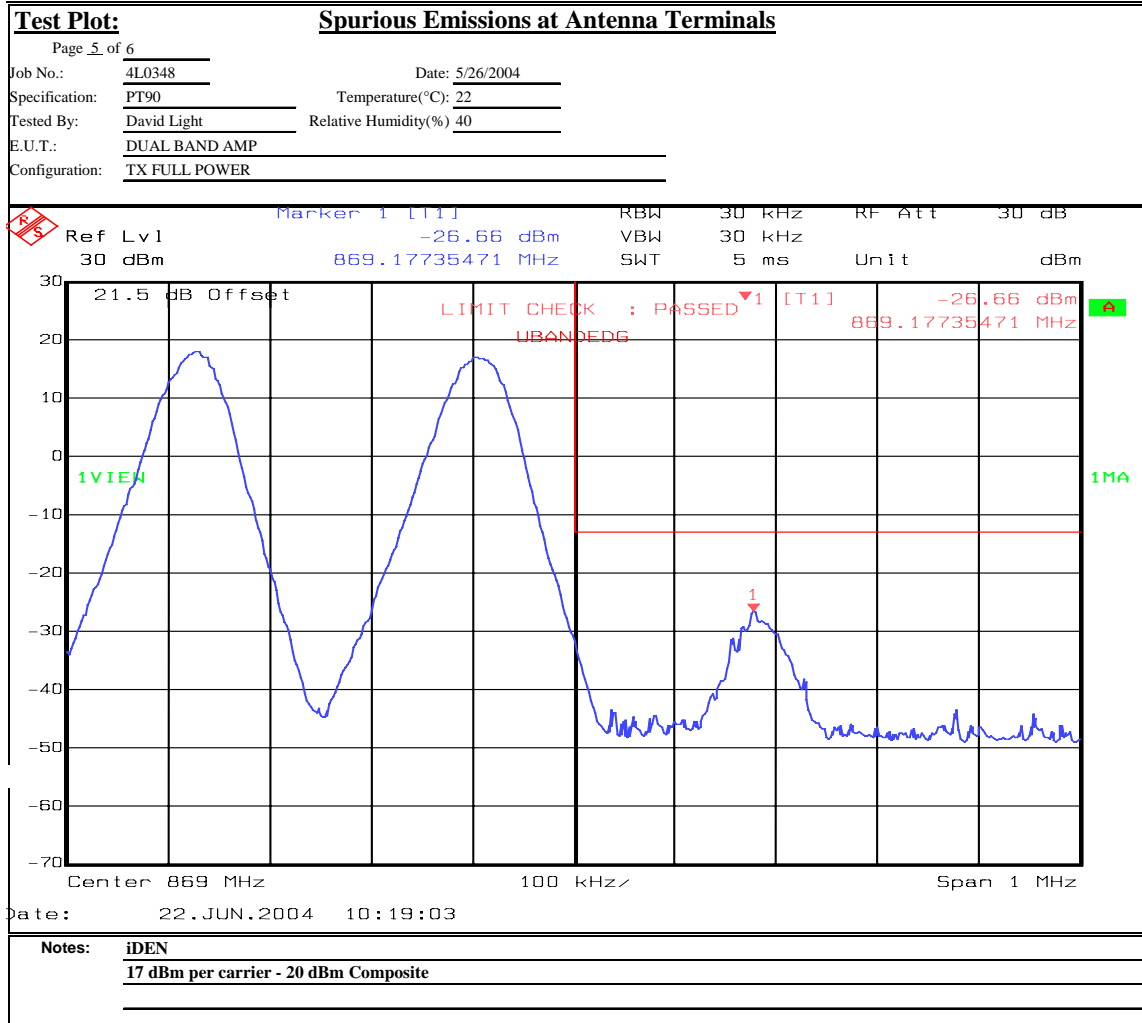
Test Data – Spurious Emissions at Antenna Terminals



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Test Data – Spurious Emissions at Antenna Terminals Low Channel



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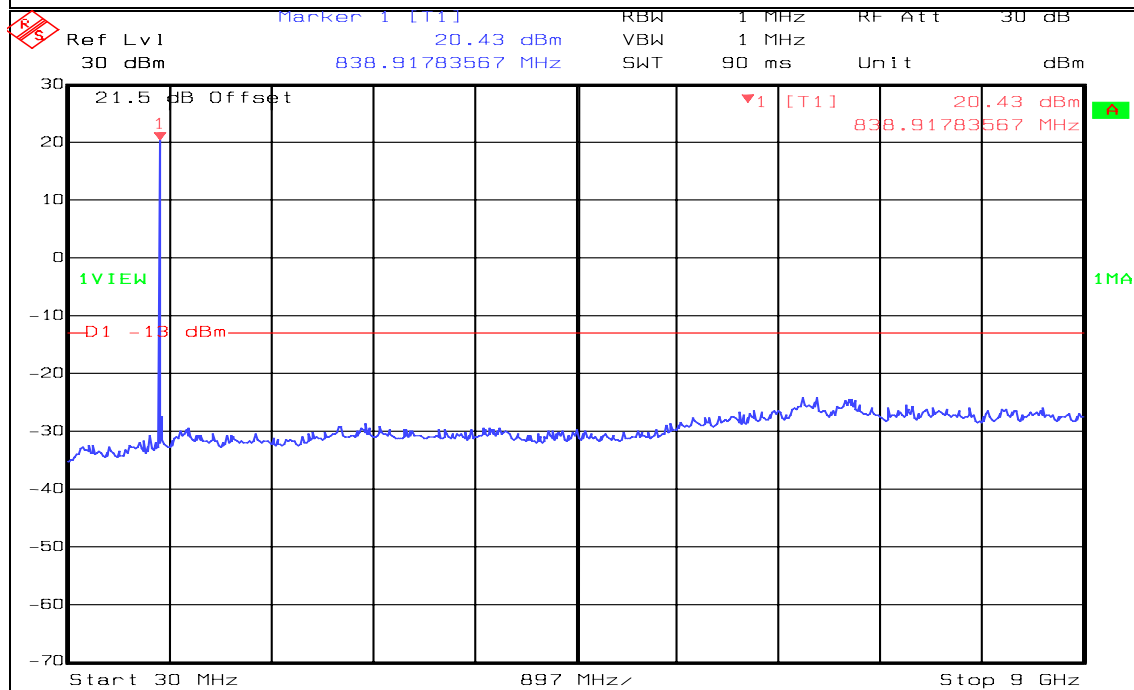
Data Plot

Spurious Emissions at Antenna Terminals

Page 1 of 6
Job No.: 4L0348 Date: 6/22/2004 Complete X
Specification: PT90 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: 1478 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB



Date: 22.JUN.2004 11:04:21

Notes: iDEN
Low channel

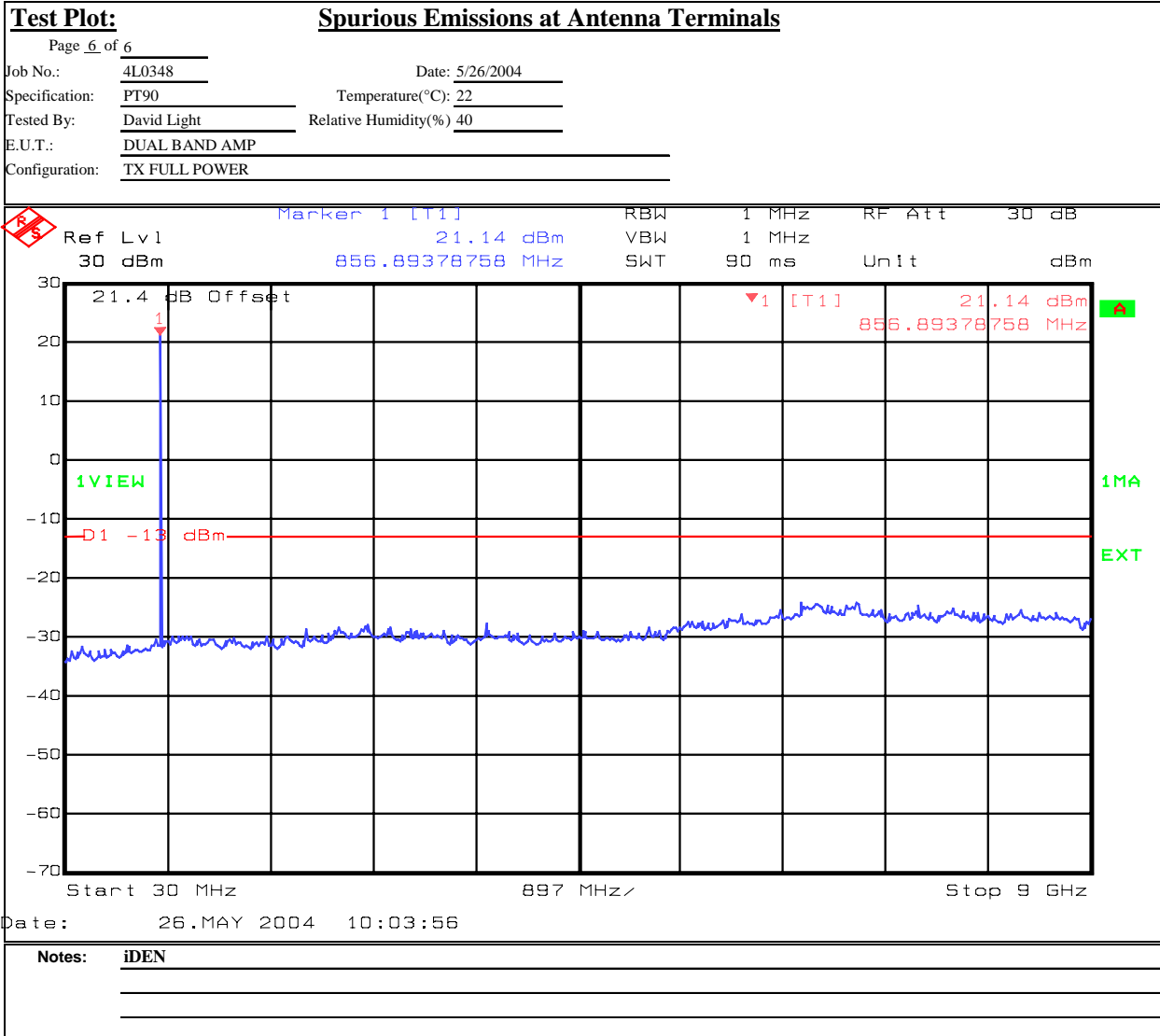
Test Data – Spurious Emissions at Antenna Terminals – Mid Channel



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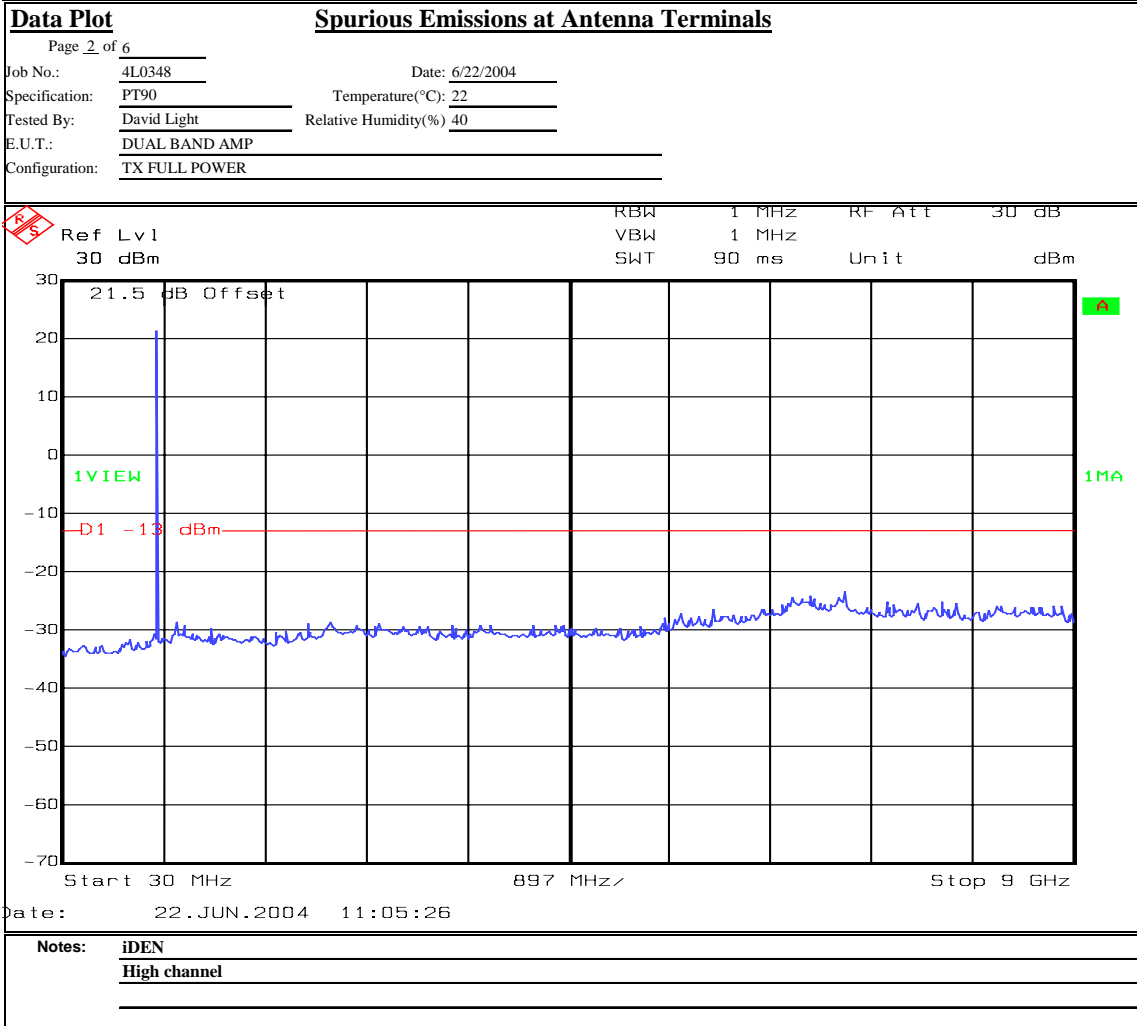
Test Data – Spurious Emissions at Antenna Terminals – High Channel



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Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE:5/26/04

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

Note: See page A5 for applicable limit.

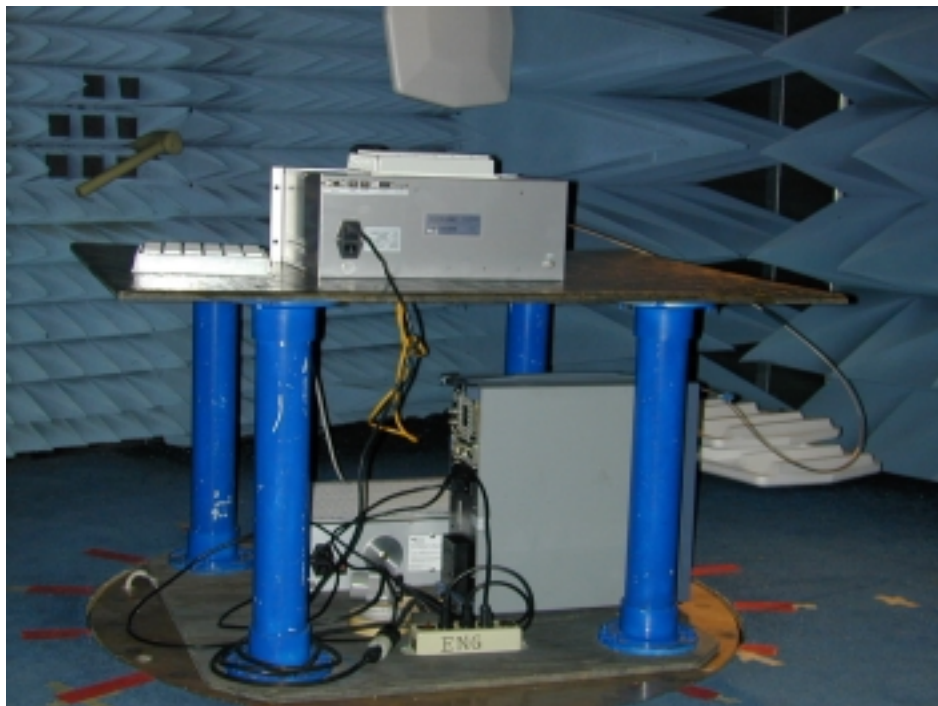
Equipment Used: 1464-1484-1485-1016-1304

Measurement Uncertainty: +/-1.7 dB

Temperature: 20 °C

Relative Humidity: 40 %

Photographs of Test Setup



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EQUIPMENT: TFAM2632/4

FCC PART 90, SUBPART I
TRANSMITTER
Test Report No.: 4L0348RUS1

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
TESTED BY: David Light	DATE:5/27/04

Test Results: Complies.

Measurement Data: See attached tables.

Test Data – Frequency Stability



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Frequency StabilityPage 1 of 1

Job No.: 4L0347

Date: 5/27/2004

Specification: PT24

Temperature(°C): 20Tested By: David LightRelative Humidity(%) 45E.U.T.: Dual Band AmpConfiguration: TX CENTER BANDSample Number: 1**Test Equipment Used**

Antenna: _____

Directional Coupler: _____

Pre-Amp: _____

Cable #1: 1042

Filter: _____

Cable #2: _____

Receiver: 1026Attenuator #1: 1064

Attenuator #2: _____

Measurement

Uncertainty: 1x10⁻¹⁷ ppmStandard Test Frequency 860.000000 MHz

Temp (°C)	Measured Frequency (MHz)	Rho	Test Voltage	Frequency Error (Hz)	Limit (+/-Hz)	Error (ppm)	Comment
20	860.000000		-48	0	860.0	0.0	
20	860.000000		-56.2	0	860.0	0.0	
20	860.000000		-40.8	0	860.0	0.0	
50	860.000000		-48	0	860.0	0.0	
40	860.000000		-48	0	860.0	0.0	
30	860.000000		-48	0	860.0	0.0	
10	860.000000		-48	0	860.0	0.0	
0	860.000000		-48	0	860.0	0.0	
-10	860.000000		-48	0	860.0	0.0	
-20	860.000000		-48	0	860.0	0.0	
-30	860.000000		-48	0	860.0	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

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EQUIPMENT: TFAM2632/4

FCC PART 90, SUBPART I

TRANSMITTER

Test Report No.: 4L0348RUS1

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output**PARA. NO.: 2.985**

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).

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 erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

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FCC PART 90, SUBPART I

TRANSMITTER

EQUIPMENT: TFAM2632/4

Test Report No.: 4L0348RUS1

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 2.991
--	-------------------------

Test Method:

RBW: 1% of emission bandwidth in the 0 - 1 GHz range.
1 MHz at frequencies above 1 GHz.

VBW: \Rightarrow RBW

The spectrum is searched up to 10 times the fundamental frequency.

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.989

Minimum Standard: Para. No. 90.210, see table 1 below for applicable mask.

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.: 2.993****Minimum Standard:** Para. No. 90.210, see table 1 for applicable mask.**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 erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

NAME OF TEST: Frequency Stability**PARA. NO.: 2.995**

Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

Nemko Dallas

EQUIPMENT: TFAM2632/4

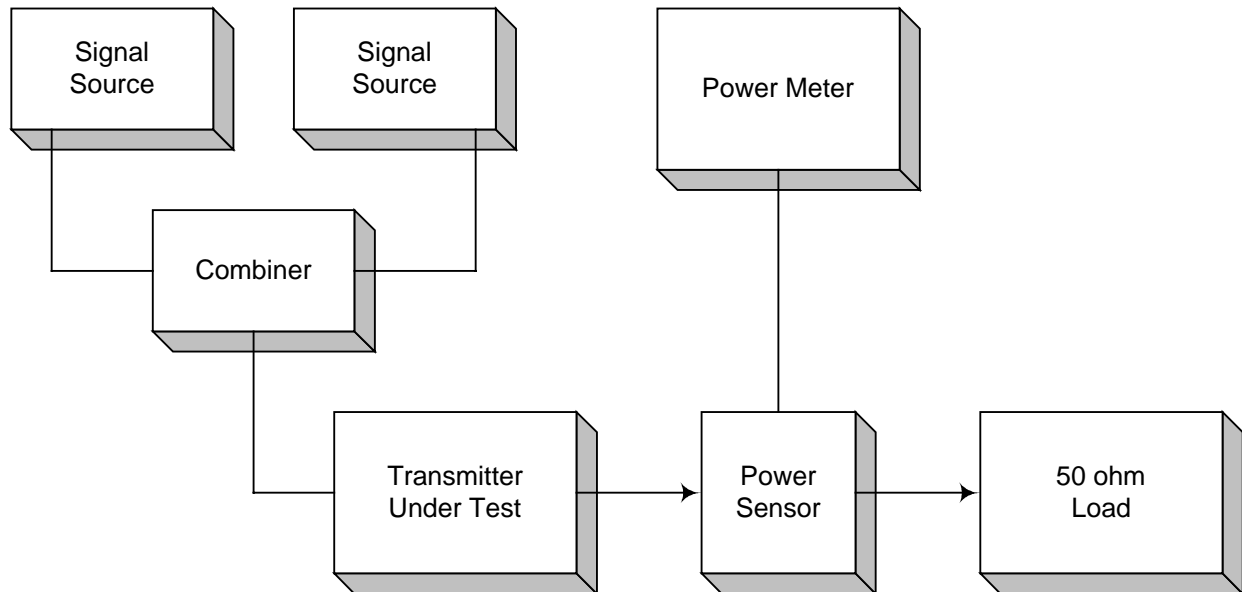
FCC PART 90, SUBPART I

TRANSMITTER

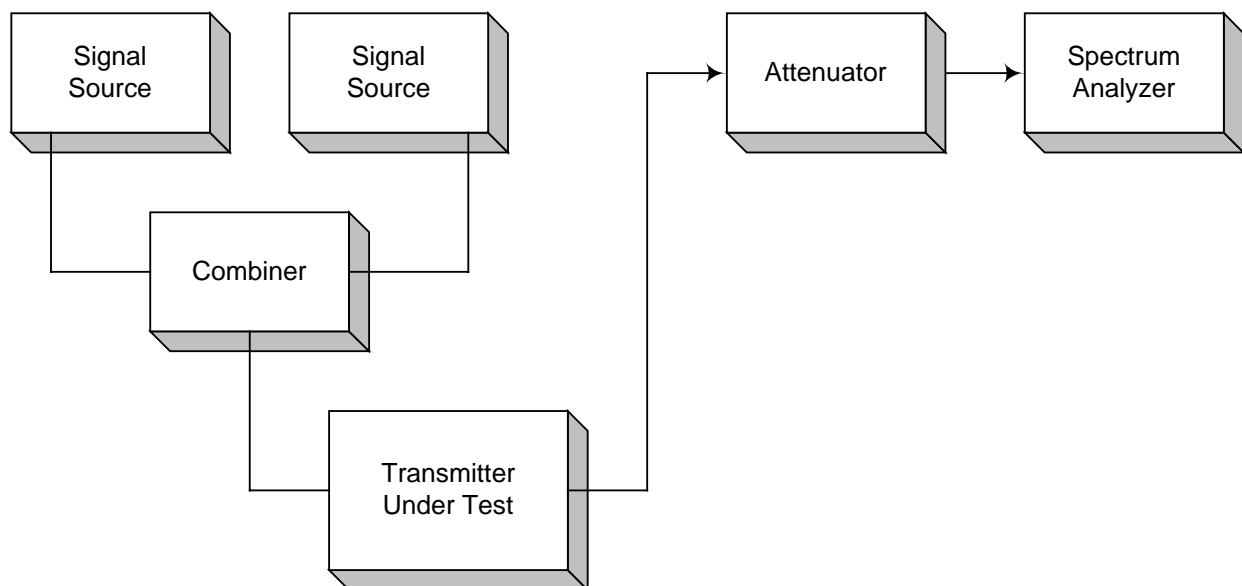
Test Report No.: 4L0348RUS1

ANNEX B - TEST DIAGRAMS

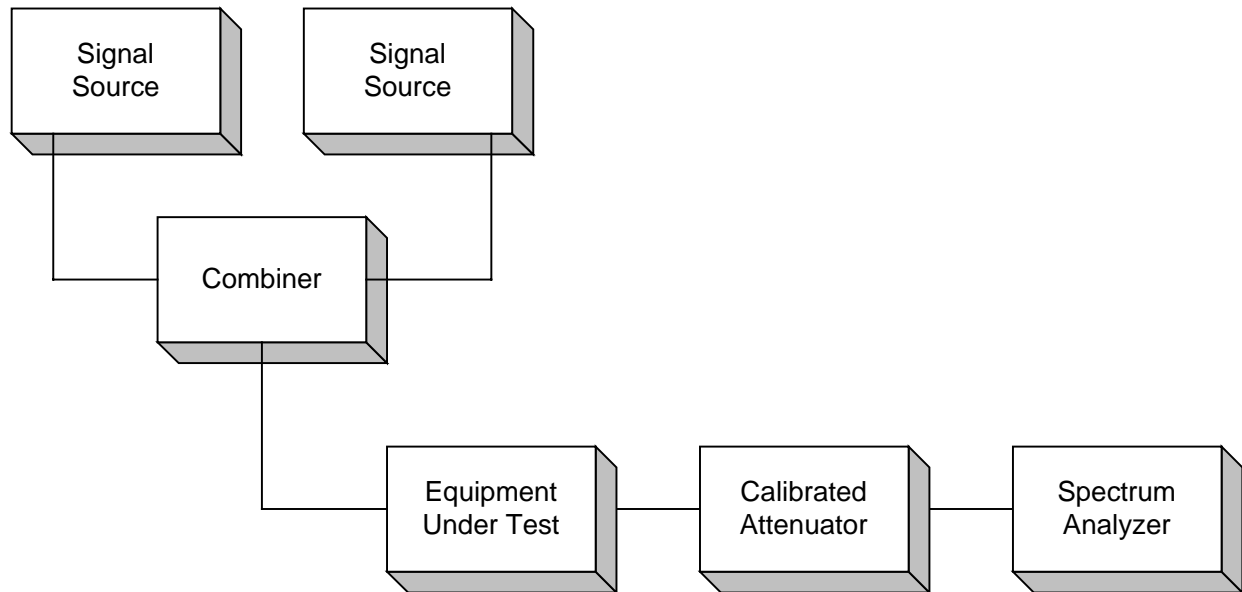
Para. No. 2.985 - R.F. Power Output



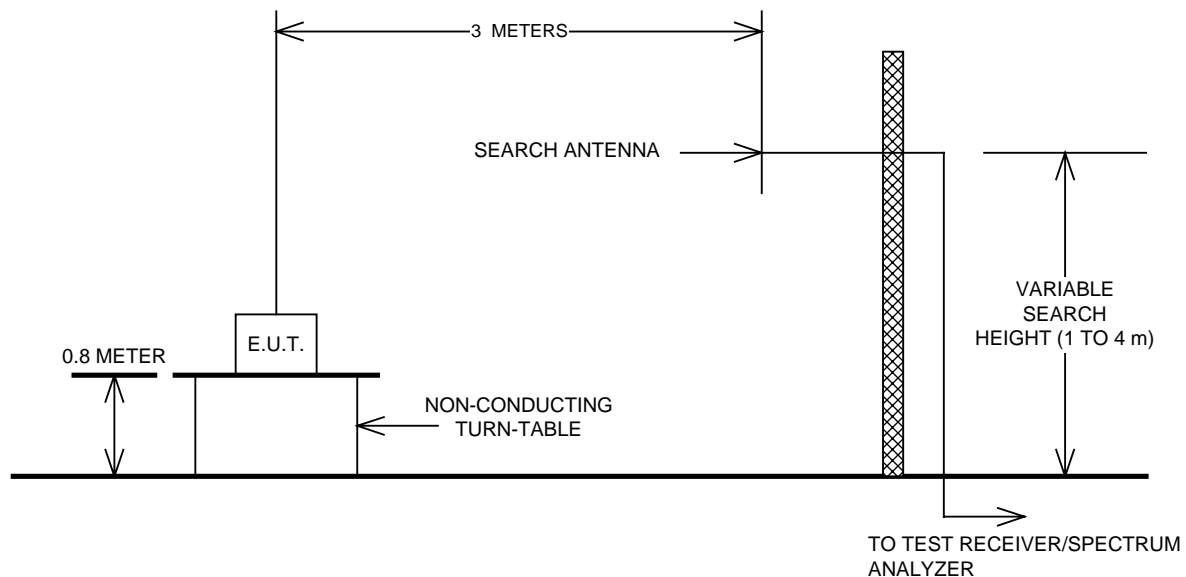
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

