

Nemko Test Report: 4L0490RUS2REV2

Applicant: Andrew Corporation

**Equipment Under Test:
(E.U.T.)** TFAN 80/19

In Accordance With: **FCC Part 90, Subpart I**
Private Land Mobile Repeater

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, TX 75057-3136

Authorized By:



Tom Tidwell, Frontline Group Manager

Date: 18 October, 2004

Total Number of Pages: 36

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EQUIPMENT: TFAN 80/19**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 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

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EQUIPMENT: TFAN 80/19**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	Plots	Complies
Field Strength of Spurious Emissions	90.210		Complies
Frequency Stability	90.213		N/A
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: 115 Vac

Frequency Range: 851 to 869 MHz

Tunable Bands: Full band coverage

Type(s) of Modulation:	F3E (Voice)	F1D	F2D	D7W (iDEN)	Other
	☒	☒	☐	☒	☐

Maximum Input: +10 dBm

Output Impedance: 50 ohms

RF Power Output (rated):	Single:	21 dBm (125.9mW)
	Composite:	17.5 dBm (56 mW)

Operator Selection of Operating Frequency: None

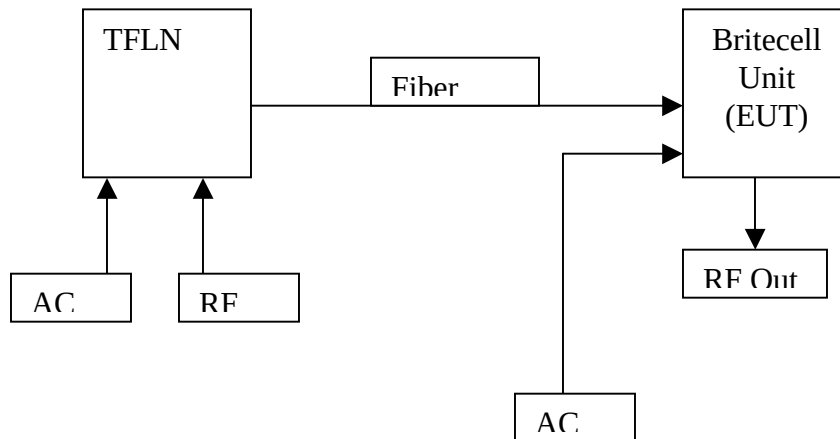
Power Output Adjustment Capability: Software

Frequency Translation:	F1-F1	F1-F2	N/A
	☒	☐	☐

Band Selection:	Software	Duplexer Change	Fullband Coverage
	☐	☐	☒

Description of Operation

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

System Diagram

EQUIPMENT: TFAN 80/19**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Dustin Oaks	DATE: 8/13/04

Test Results: Complies.**Measurement Data:**

Modulation	Measured Power (mW)	Measured Power (dBm)	Rated Power (dBm)
Analog	11.4mW	21.14	21.00
iDEN	5.7mW	15.12	15.00

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 7/29/04

Test Results: Complies.

Test Data: See attached graph(s).

EQUIPMENT: TFAN 80/19

Test Data – Occupied Bandwidth (Input/Output)



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Data Plot

Page 1 of 4

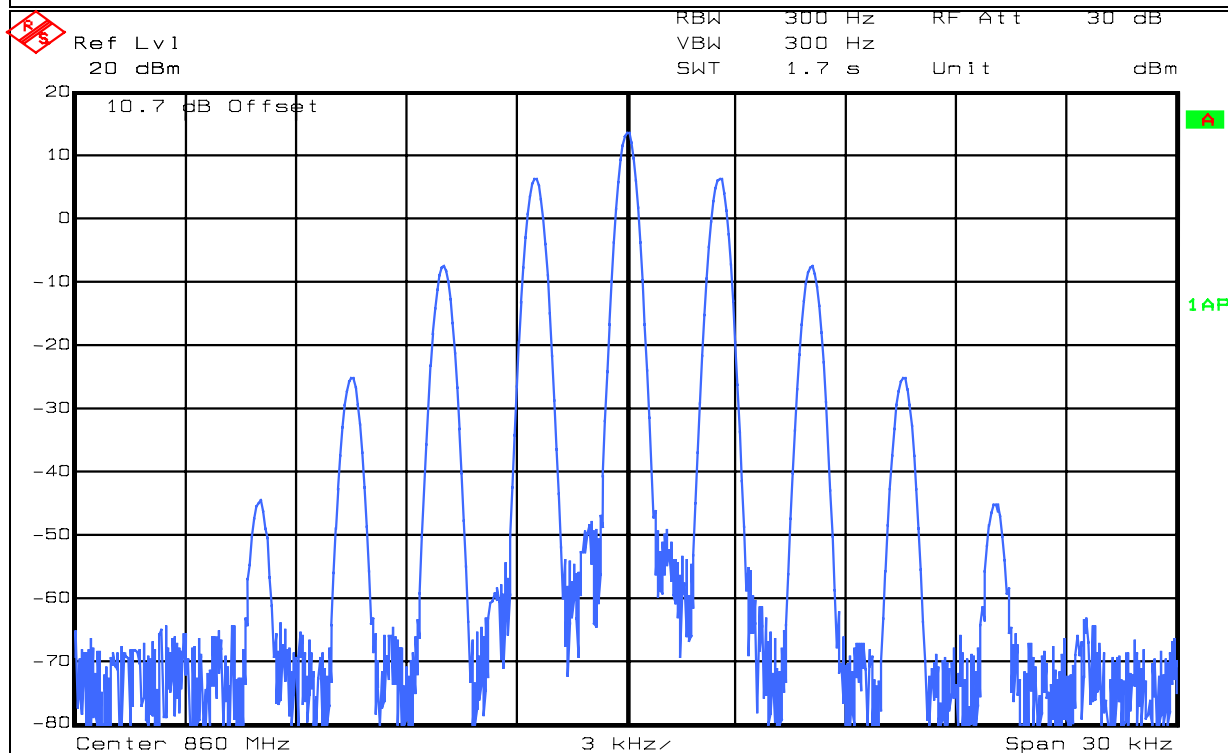
Occupied Bandwidth

Job No.: _____ Date: 7/28/2004
Specification: _____ 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
Detector Type: Peak VBW: Refer to plots

Complete X
Preliminary: _____Measurement
Distance: na 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



Date: 28.JUL.2004 06:03:37

Notes: ANALOG OUTPUT
2.5 kHz TONE - 2 kHz DEVIATION

EQUIPMENT: TFAN 80/19

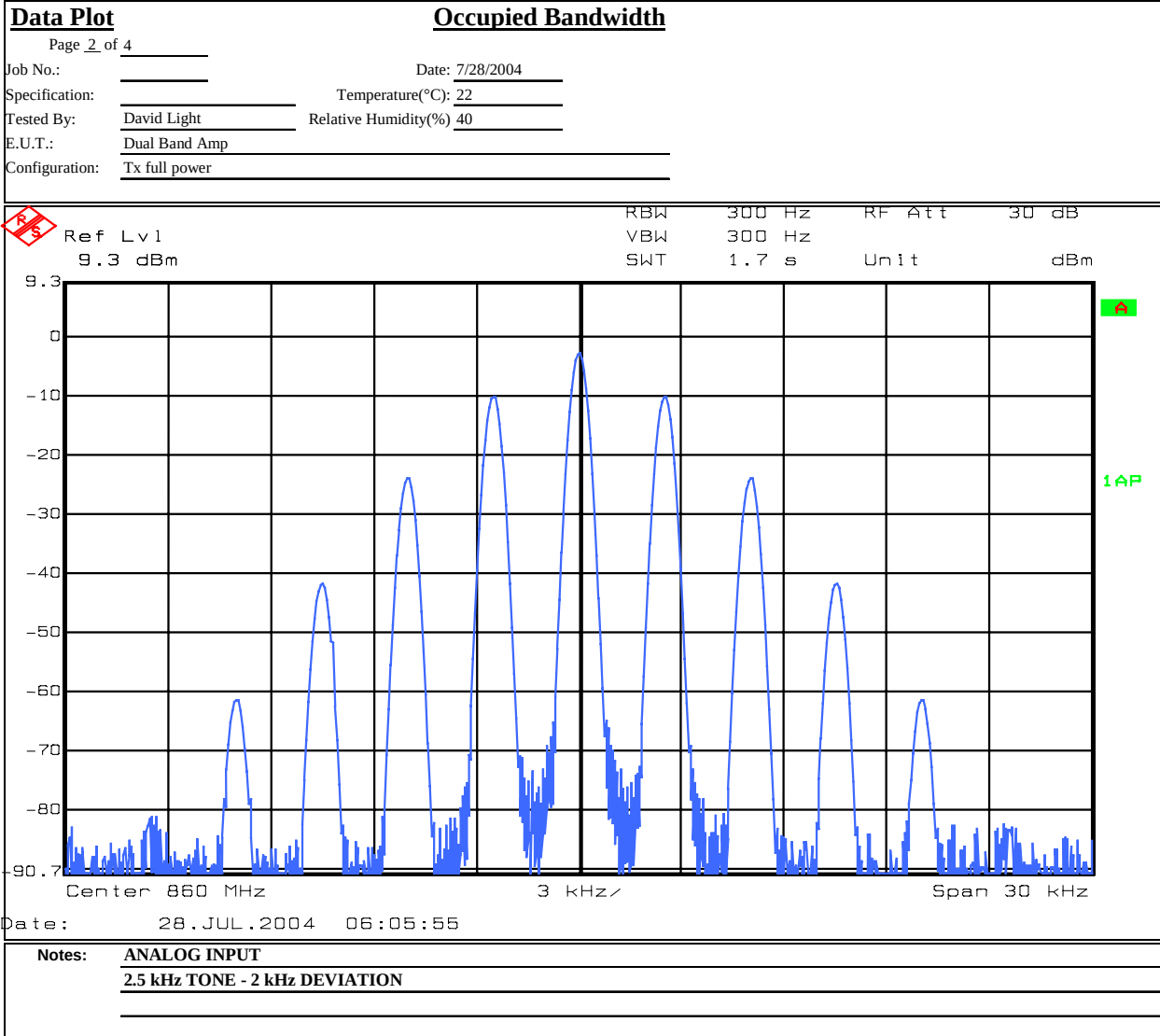
Test Data – Occupied Bandwidth (Input/Output)



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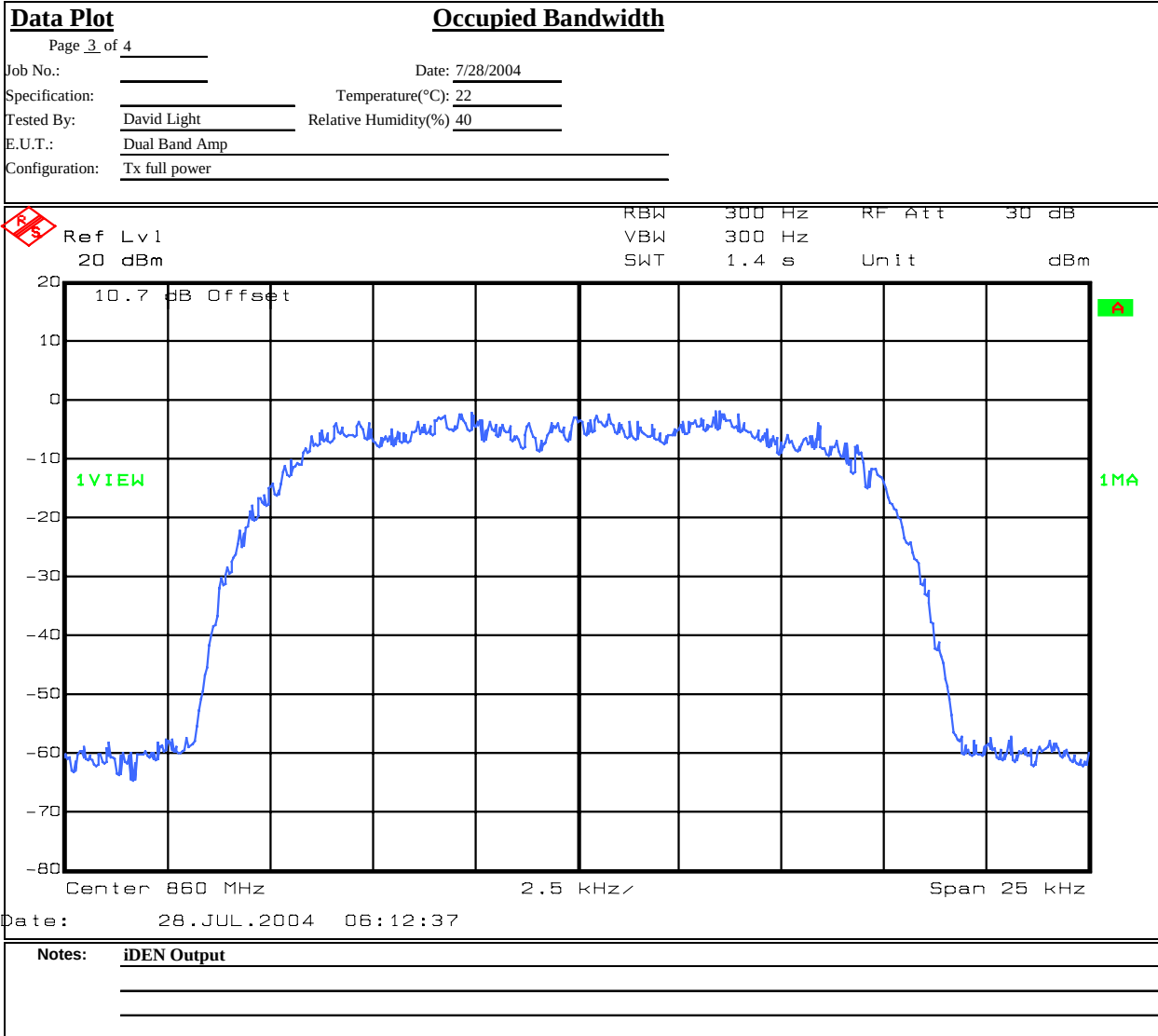
EQUIPMENT: TFAN 80/19

Test Data – Occupied Bandwidth (Input/Output)



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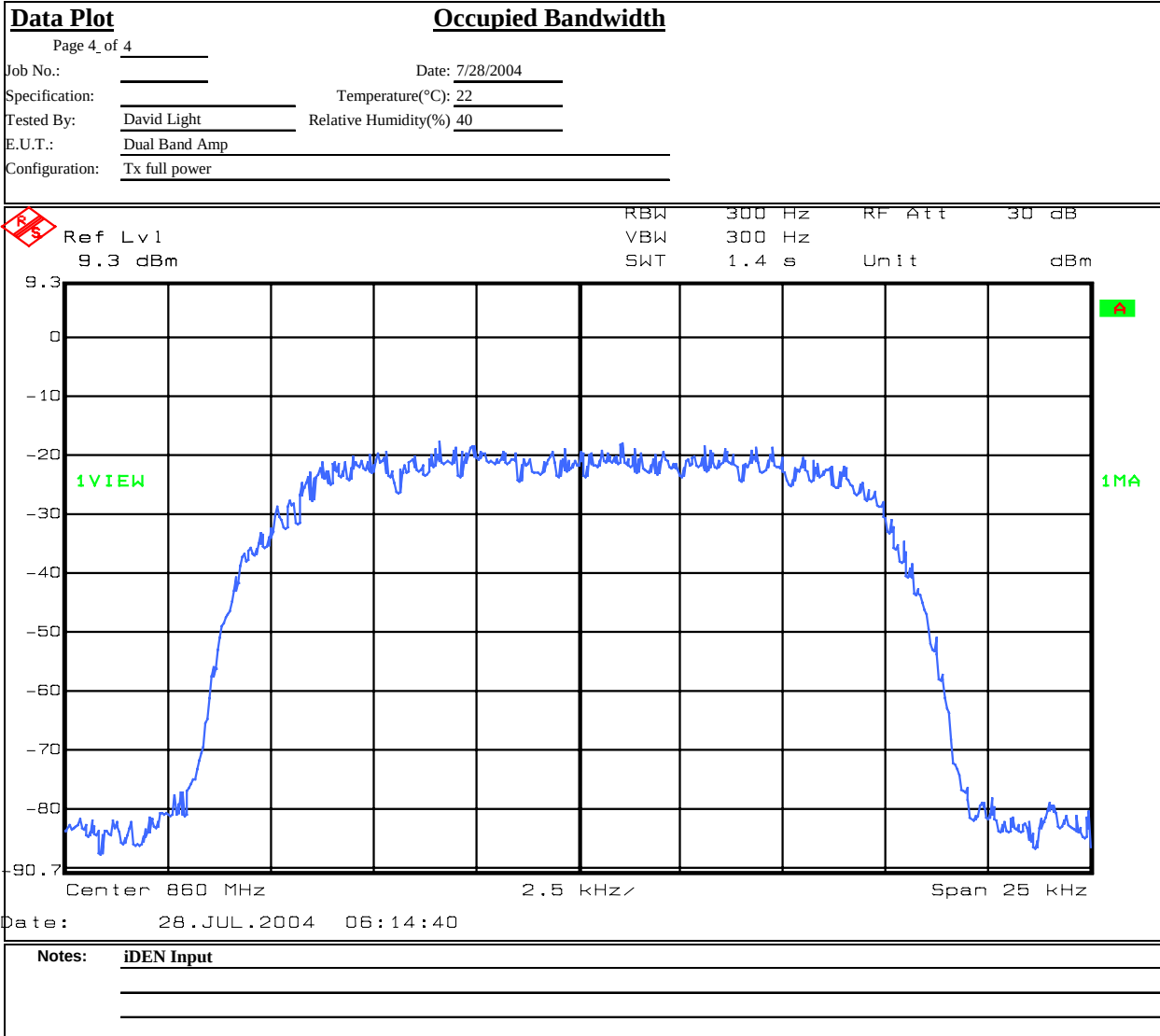
EQUIPMENT: TFAN 80/19

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.: 2.991
TESTED BY: David Light	DATE: 7/27/04

Test Results: Complies.

Test Data: See attached graph(s).

EQUIPMENT: TFAN 80/19

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot

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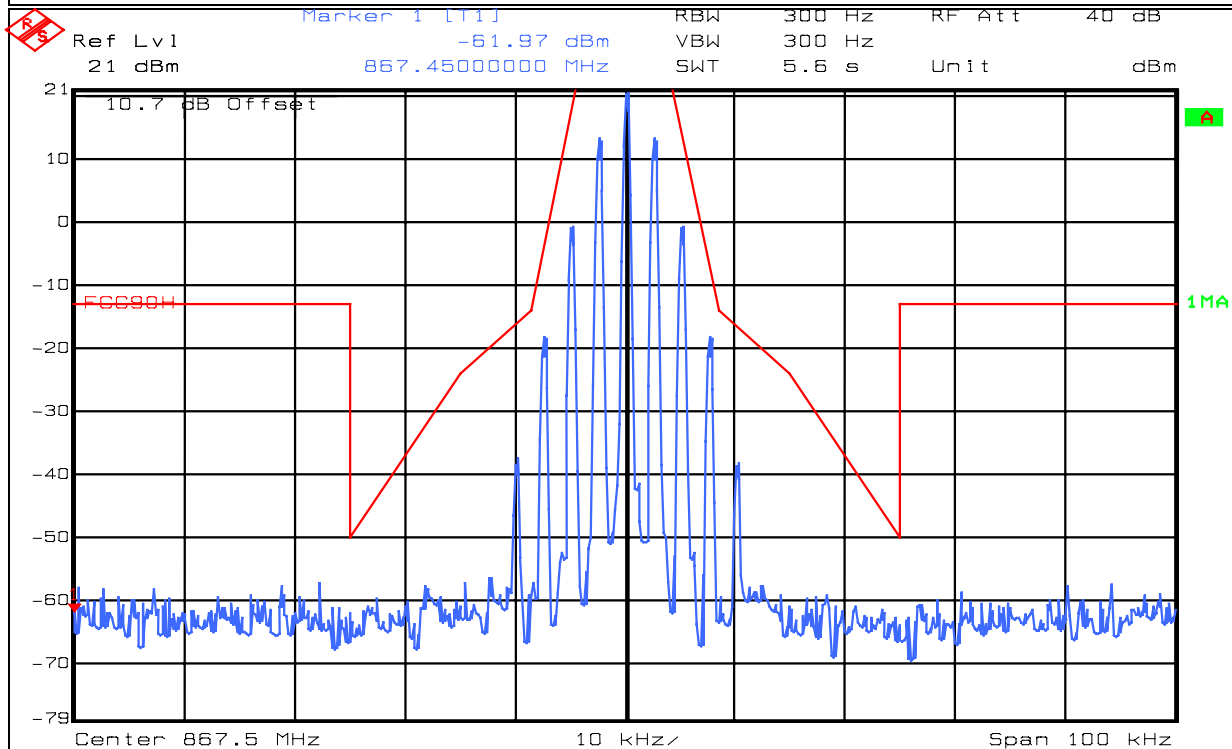
Job No.: 4L0490R Date: 7/28/2004
Specification: PT90 Temperature(°C): 22
Tested By: David Light Relative Humidity(%): 40
E.U.T.: DUAL BAND AMP
Configuration: TX FULL POWER
Sample Number: 1
Location: Lab 1
Detector Type: Peak

Emission Masks

Complete X
Preliminary: _____RBW: Refer to plots
VBW: Refer to plotsMeasurement
Distance: NA m

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1627
Filter: _____ Cable #2: 1628
Receiver: 1036 Cable #3: _____
Attenuator #1: 1471 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB



Date: 28.JUL.2004 06:29:21

Notes: ANALOG

Test Data – Spurious Emissions at Antenna Terminals



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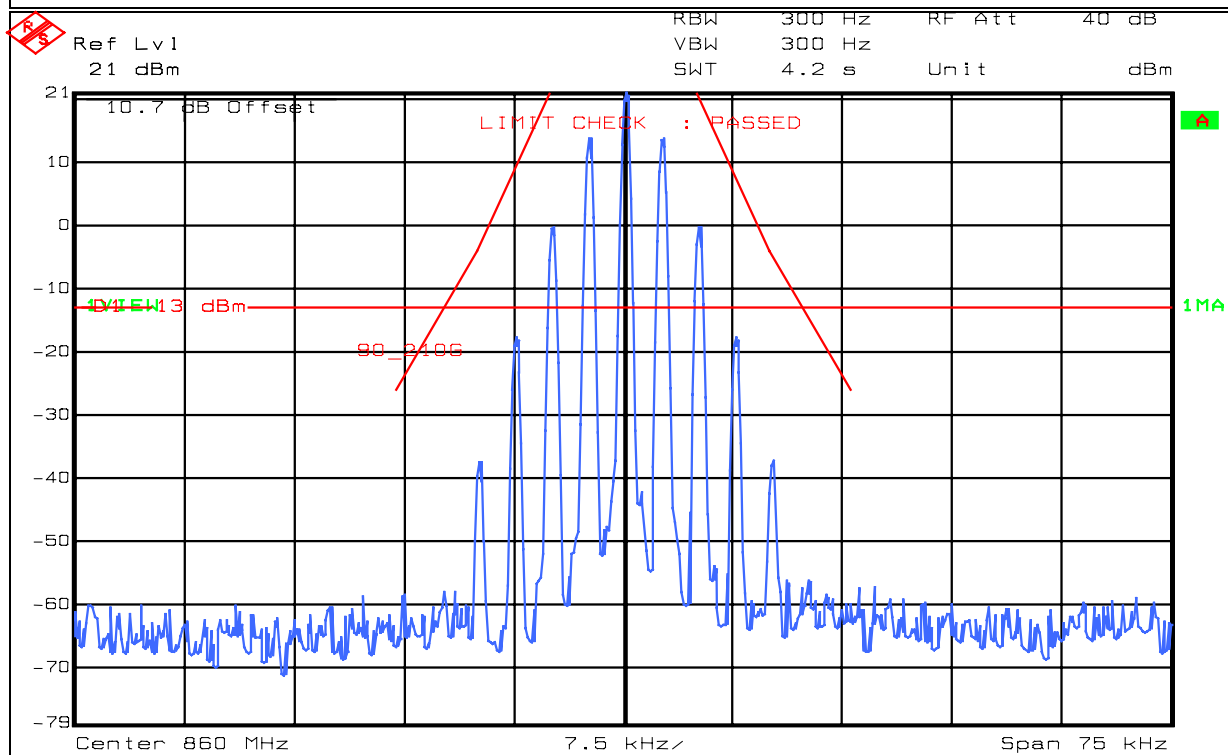
Nemko Dallas, Inc.

Data Plot

Page 2 of 4

Job No.:	4L0490R	Date:	7/28/2004
Specification:	PT90	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	DUAL BAND AMP		
Configuration:	TX FULL POWER		

Emission Masks



Date: 28.JUL.2004 06:40:39

Notes: ANALOG

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot

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Job No.:	4L0490R
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Date: 7/28/2004

Specification:	PT90
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Temperature(°C): 22

Tested By:	David Light
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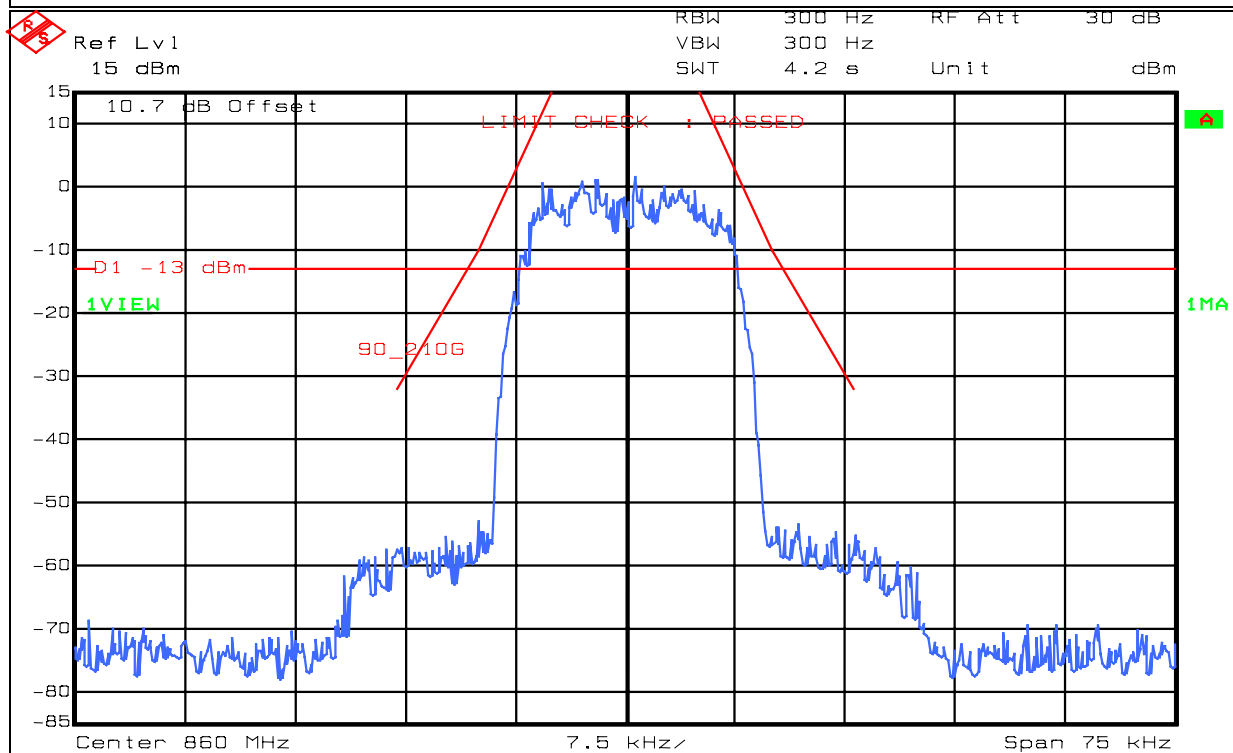
Relative Humidity(%) 40

E.U.T.:	DUAL BAND AMP
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Configuration:	TX FULL POWER
----------------	---------------

Emission Masks

RBW	300 Hz	RF Att	30 dB
VBW	300 Hz		
SWT	4.2 s	Unit	dBm



Date: 28.JUL.2004 06:38:23

Notes: iDEN

EQUIPMENT: TFAN 80/19

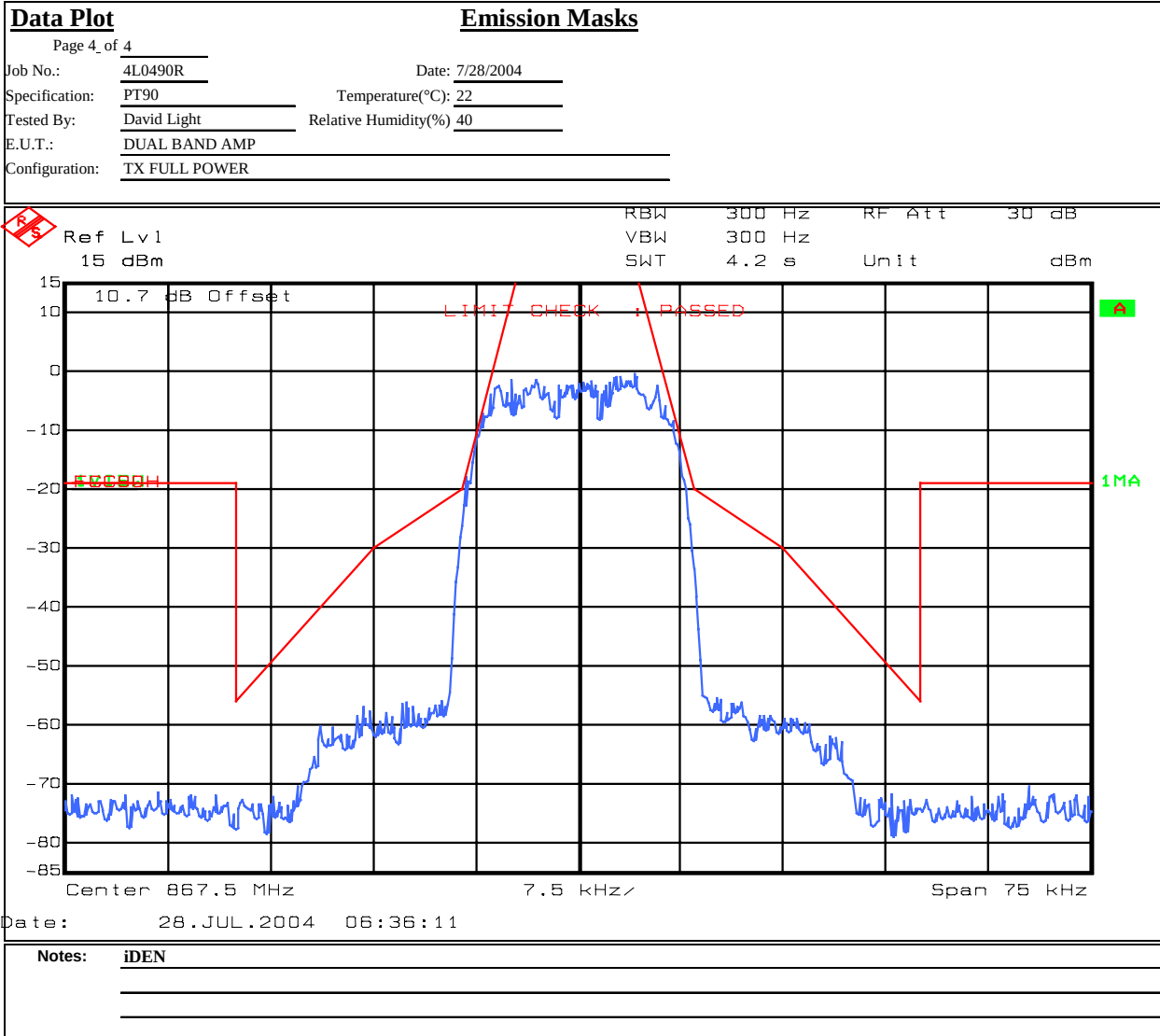
Test Data – Spurious Emissions at Antenna Terminals



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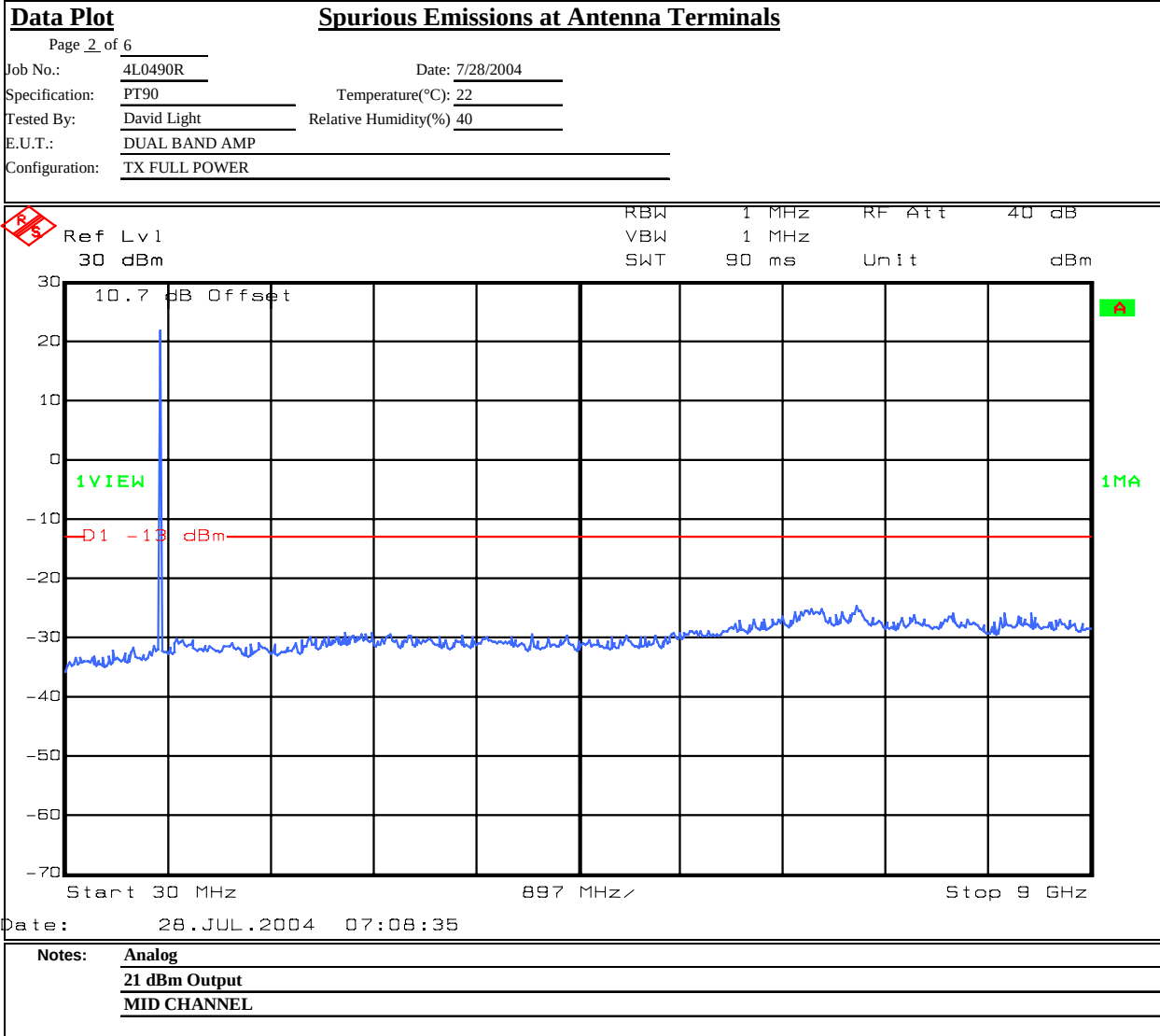


EQUIPMENT: TFAN 80/19

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Data Plot

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Job No.:	4L0490R
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Date: 7/28/2004

Specification:	PT90
----------------	------

Temperature(°C): 22

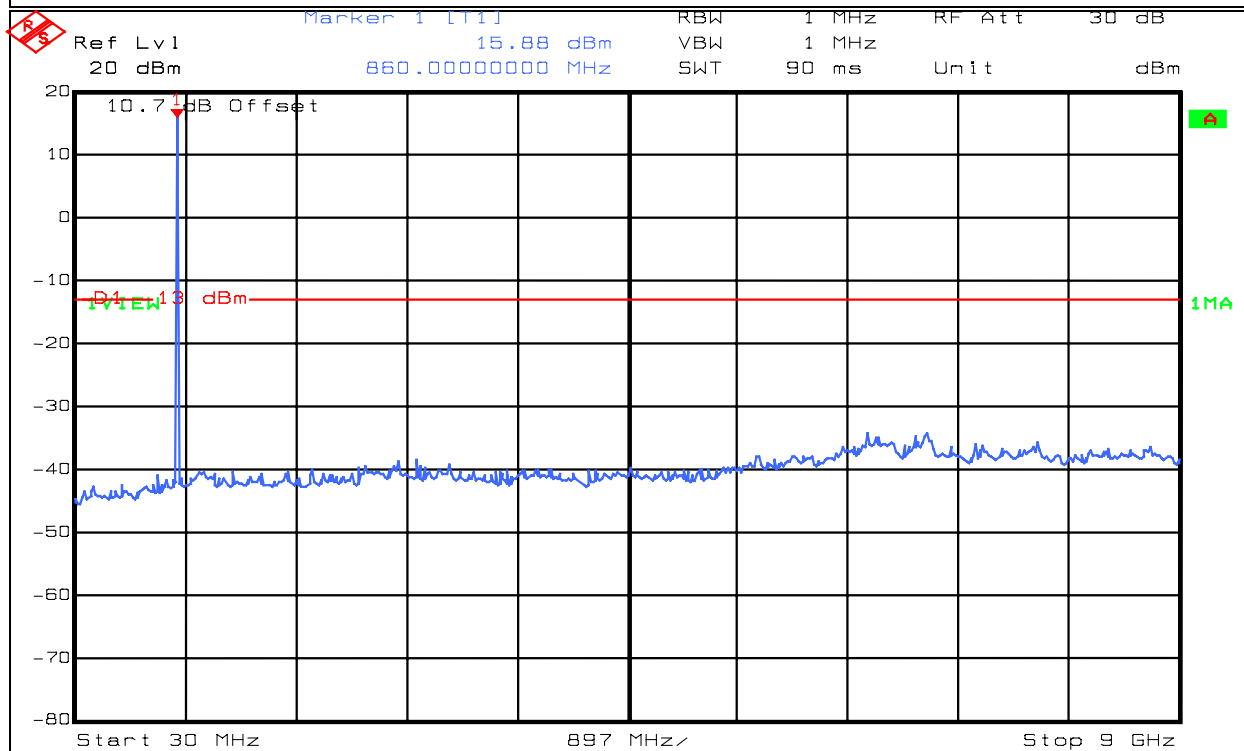
Tested By:	David Light
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Relative Humidity(%) 40

E.U.T.:	DUAL BAND AMP
---------	---------------

Configuration:	TX FULL POWER
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Spurious Emissions at Antenna Terminals



Date: 28.JUL.2004 07:05:20

Notes:	iDEN
	15 dBm Output
	MID CHANNEL

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.

EQUIPMENT: TFAN 80/19

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Occupied Bandwidth	
Page 1 of 4			
Job No.: 4L0490	Date: 7/28/2004	Complete: ☒	Preliminary: ☐
Specification: PT90	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 40		
E.U.T.: SMR BAND BOOSTER			
Configuration: TX			
Sample Number: 1			
Location: Lab 1	RBW: Refer to plots	Measurement Distance: na m	
Detector Type: Peak	VBW: Refer to plots		
Test Equipment Used			
Antenna:	Directional Coupler:		
Pre-Amp:	Cable #1: 1627		
Filter:	Cable #2: 1628		
Receiver: 1036	Cable #3:		
Attenuator #1: 1471	Cable #4:		
Attenuator #2:	Mixer:		
Additional equipment used:			
Measurement Uncertainty: +/-1.7 dB			

Ref	Lvl	Marker 1 [111]	RBW	30 kHz	RF Att	30 dB
20	dBm	-25.88 dBm	VBW	30 kHz		
		850.78857715 MHz	SWT	5 ms	Unit	dBm

Center 851 MHz 100 kHz Span 1 MHz

Date: 28.JUL.2004 06:49:40

Notes: Analog
14.5 dBm per carrier - 17.5 dBm Composite

EQUIPMENT: TFAN 80/19

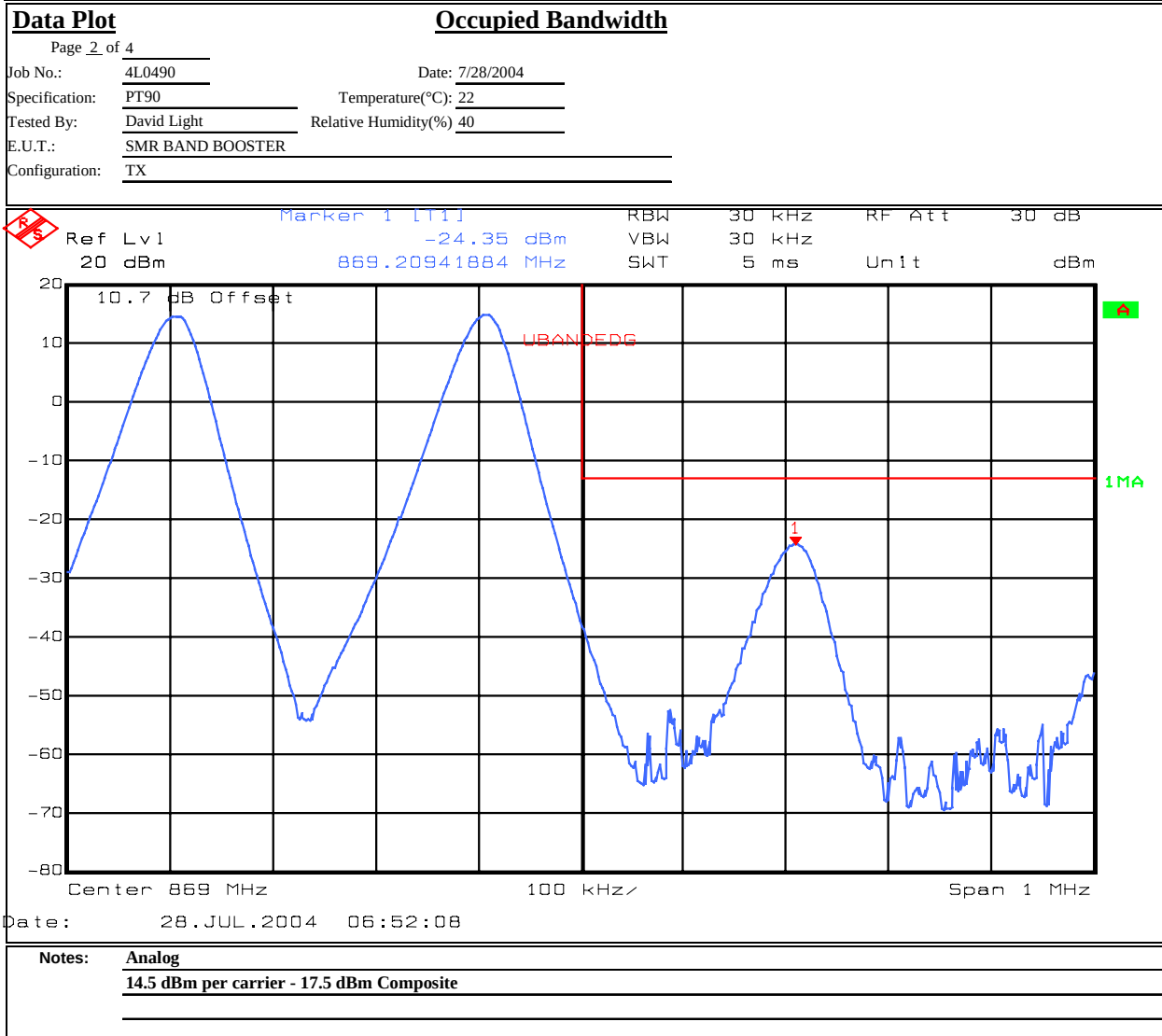
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EQUIPMENT: TFAN 80/19

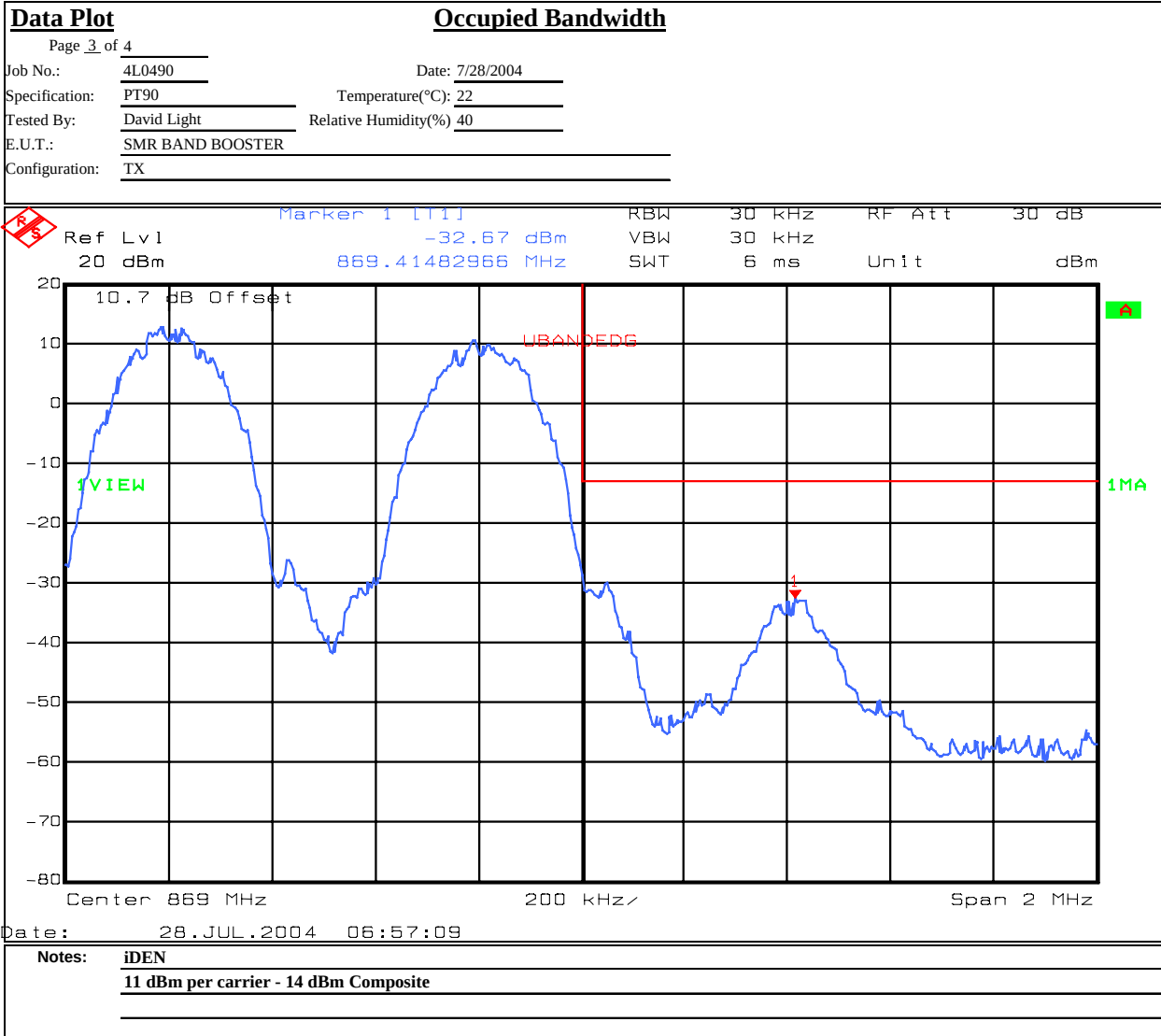
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EQUIPMENT: TFAN 80/19

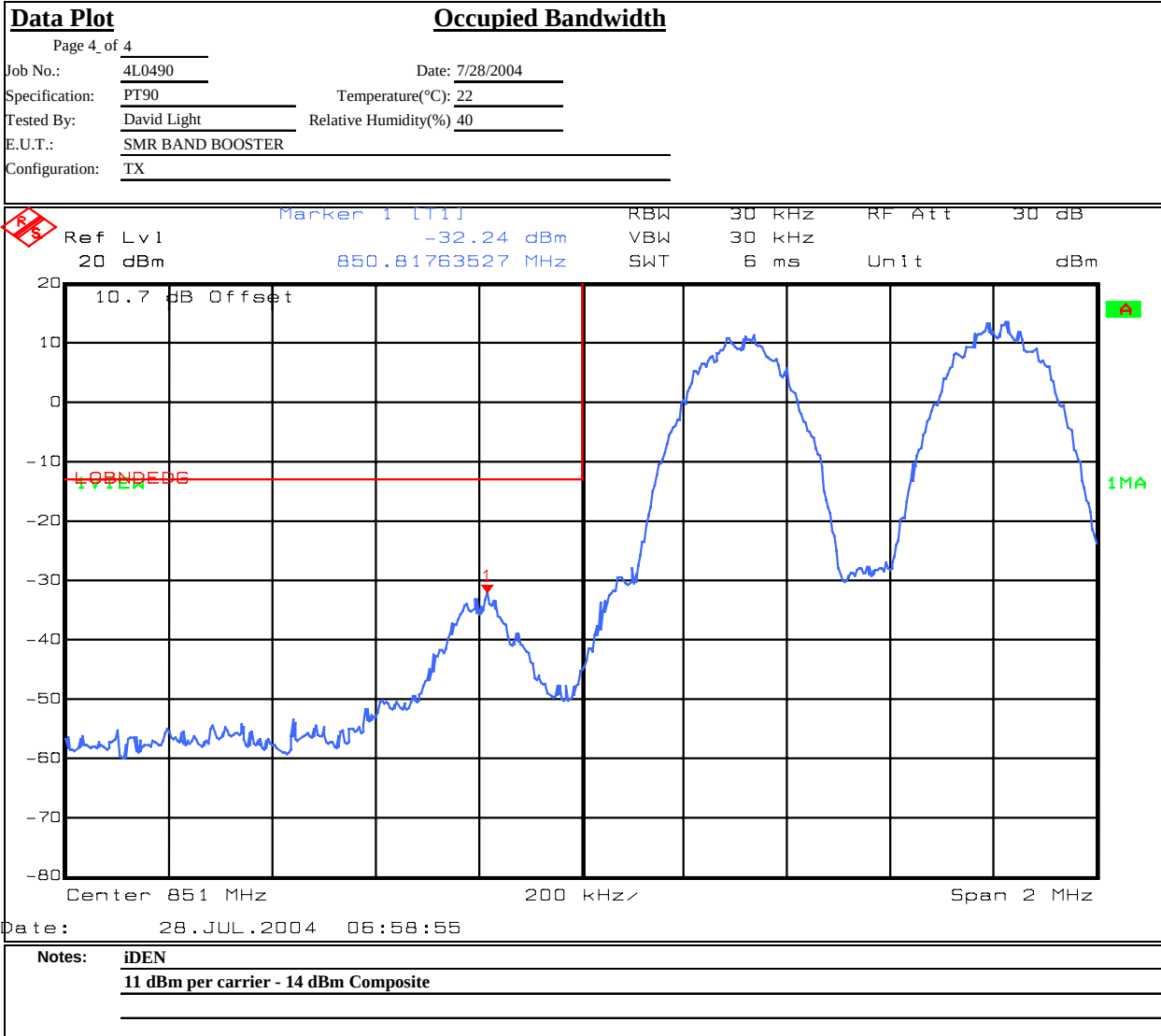
Test Data – Spurious Emissions at Antenna Terminals



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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: Brian Boyea	DATE: 7/29/04

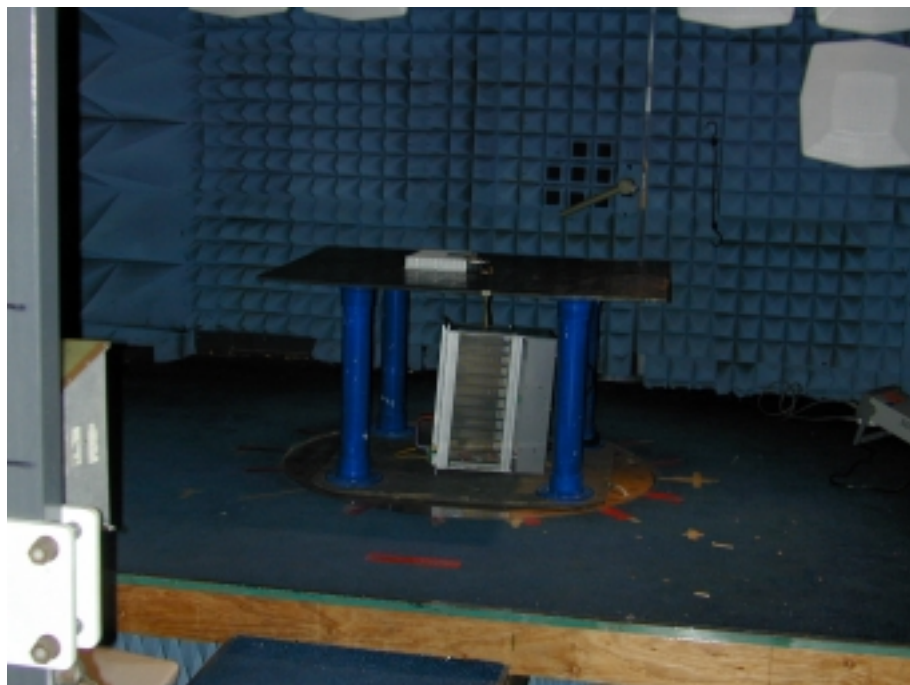
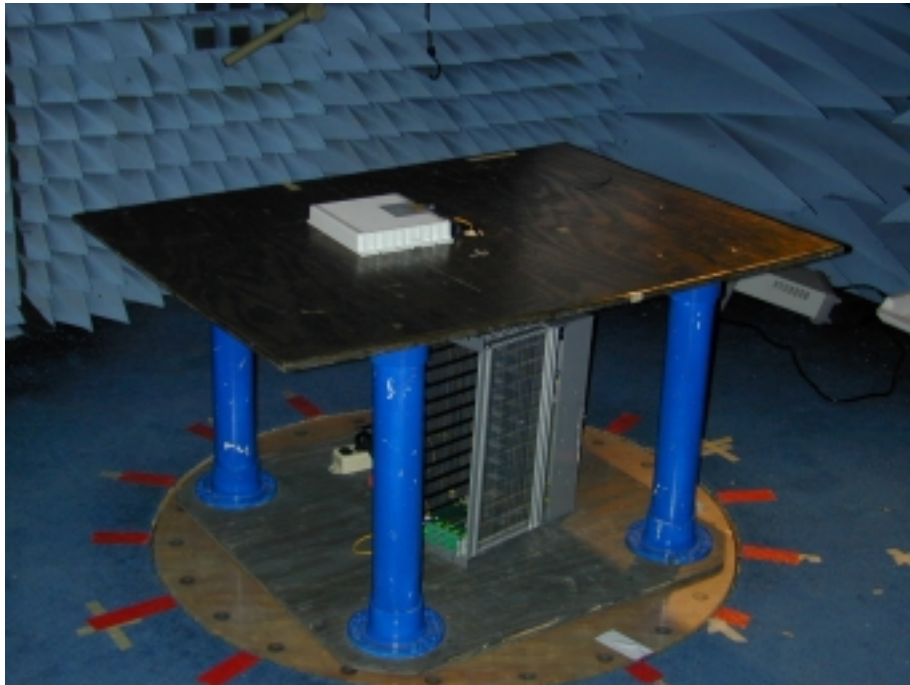
Test Results: Complies.

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

Note: See page A5 for applicable limit.

EQUIPMENT: TFAN 80/19

Photographs of Test Setup



EQUIPMENT: TFAN 80/19

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 METHODOLOGIES

EQUIPMENT: **TFAN 80/19**

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).

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.

PARA. NO.: 2.991

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

$$\text{VBW} = \text{RBW}$$

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

EQUIPMENT: TFAN 80/19

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: The substitution antenna method was used to measure erp 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 a dipole. The substitution antenna is fed with a calibrated signal which is adjusted until the previously recorded value is repeated. The erp of the spurious signal is the level required to repeat the previously measured level. If the substitution antenna gain is calibrated and expressed as dBi (referenced to an isotropic radiator instead of a dipole), the result is adjusted by 2.15 dB so that the result is erp not eirp.

EQUIPMENT: TFAN 80/19

NAME OF TEST: Frequency Stability

PARA. NO.: 2.995

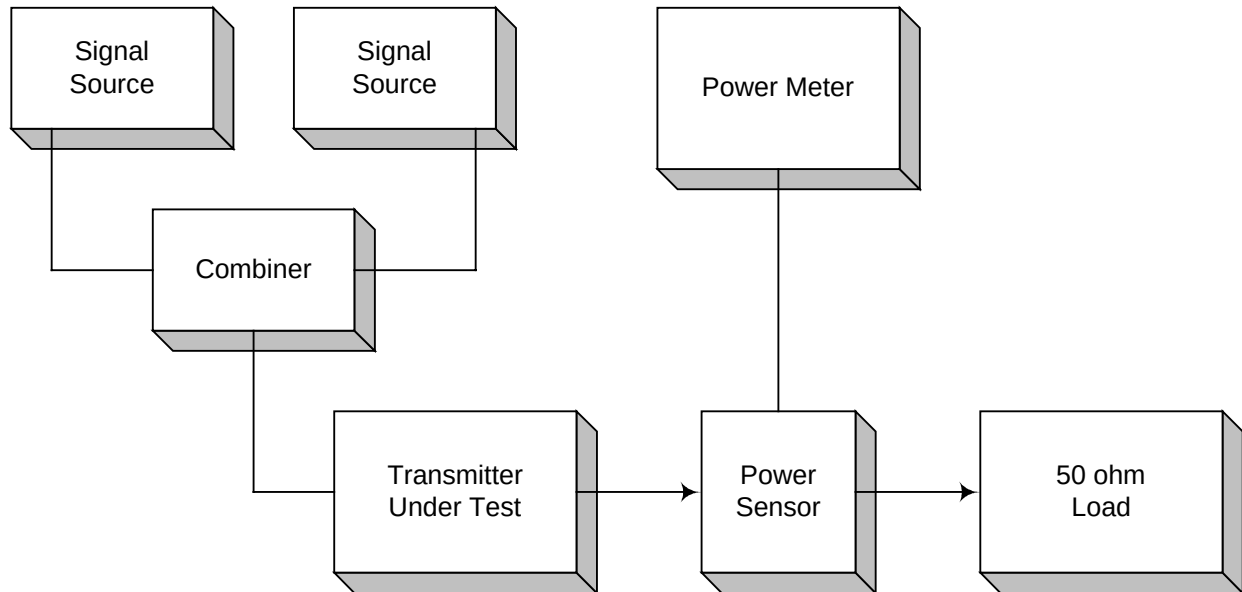
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

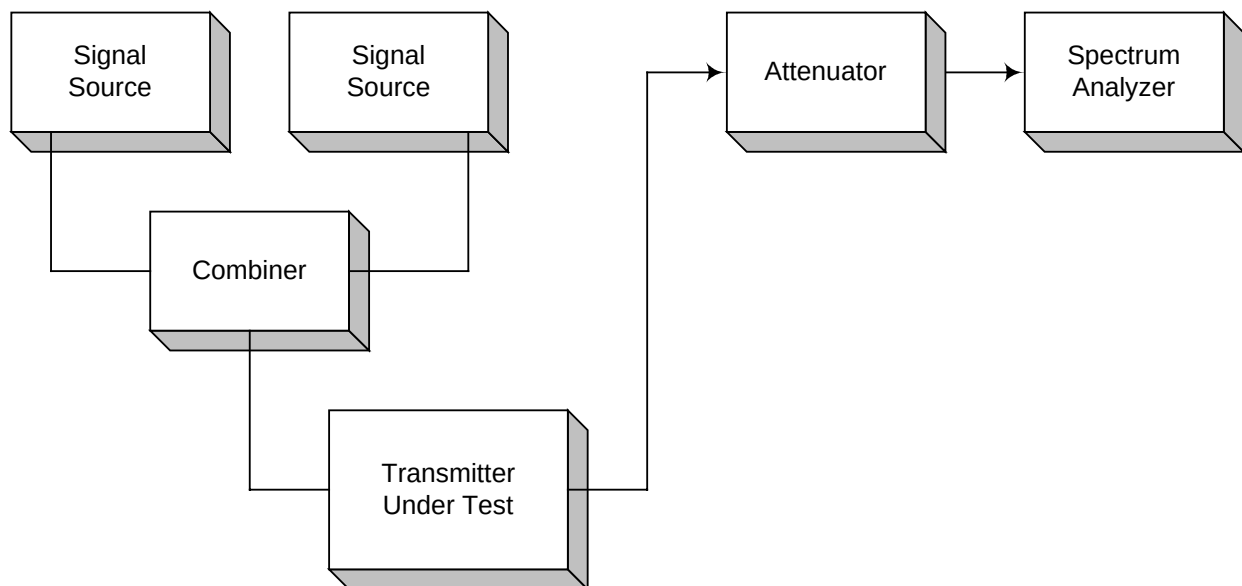
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 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	-	-	-

ANNEX B - TEST DIAGRAMS

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

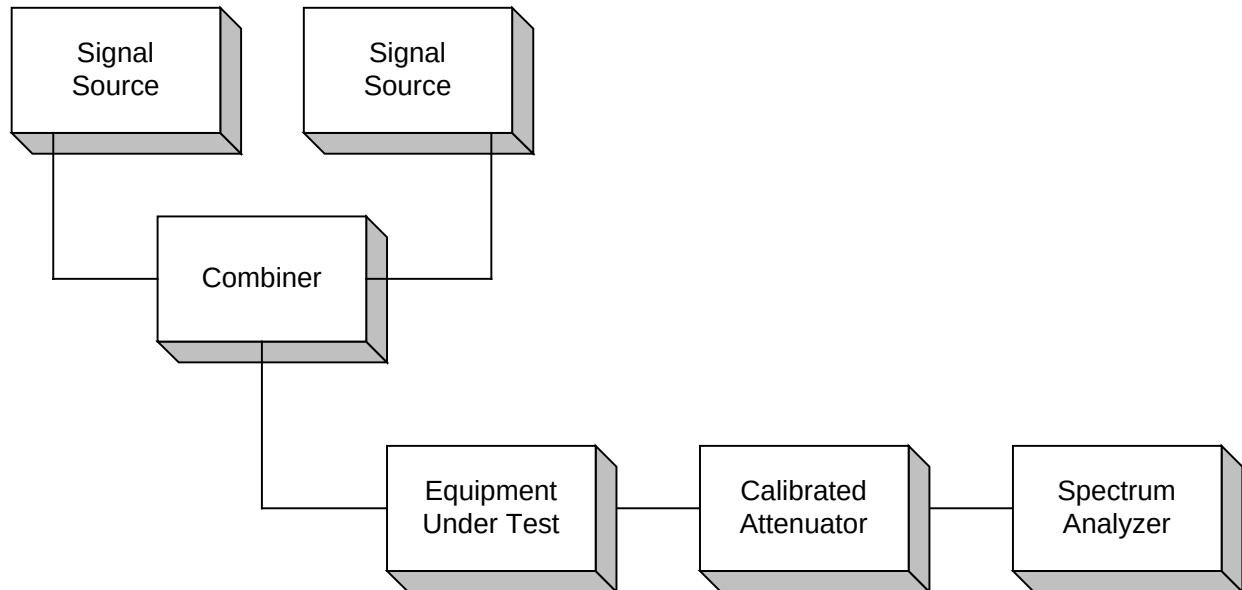


Para. No. 2.989 - Occupied Bandwidth

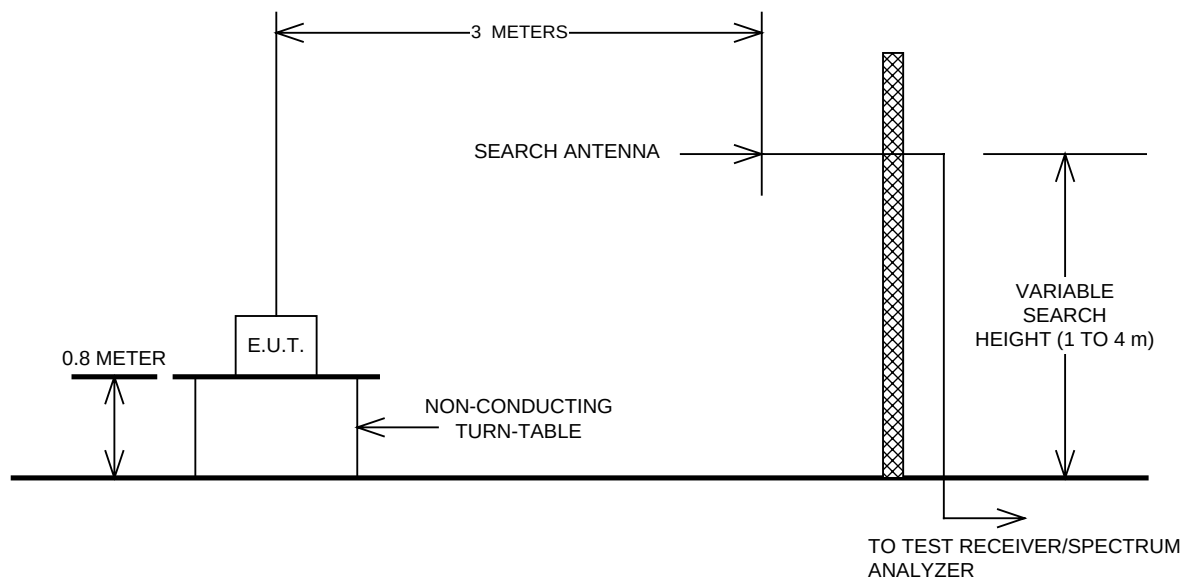


EQUIPMENT: TFAN 80/19

Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

