Nemko Test Report:	4L0491RUS1
Applicant:	Andrew Corporation
Equipment Under Test: (E.U.T.)	TFAN 85/19
In Accordance With:	FCC Part 22, Subpart H Cellular Band Repeaters
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	Tom Tidwell, Frontline Group Manager
Date:	18 August, 2004
Total Number of Pages:	52

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

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FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Section 1. Summary of Test Result

Manufacturer: Andrew Corporation

Model No.: TFAN 85/19

Serial No.: 042202189

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 22, Subpart H.

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 85/19 TEST REPORT NO.: 4L0491RUS1

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth	22.917(c)	Mask	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Complies
Frequency Stability	22.355	1.5 ppm	NA

Footnotes: The device has no modulation circuitry and only reproduces a signal.

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

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EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Section 2. General Equipment Specification

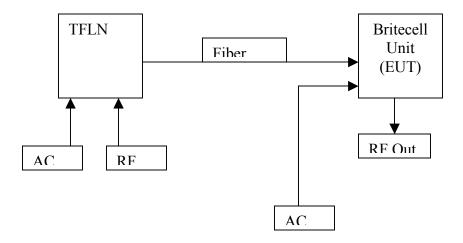
Supply Voltage Input:		115 VAc				
Frequency Range:	Downlink:	869 – 894 N	ИНz			
Frequency Range:	Uplink:	NA				
Type of Modulation and Designator:		CDMA (F9W)	GSM (G7W)	NADC (DXW)	EDGE (GXW)	AMPS (F8W, F1D)
Output Impedance:		50 ohms				
Max Input Power:		+10 dB1	n			
RF Output (Rated):	Downlink: Uplink:	21 dBm (12 17.5 dBm (NA				iers
Frequency Translation:		F1-F1		F1-F2		N/A
Band Selection:		Softwar	re	Duplexer Change		Fullband Coverage

EQUIPMENT: **TFAN 85/19** TEST REPORT NO.: 4L0491RUS1

Description of Operation

Britecell Plus is a radio over fiber system operation in the 1900 PCS and 800 MHz cellular bands.

System Diagram



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FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

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.

Test Data:

	Modulation Type	Per Channel Power Output (mW)	Per Channel Power Output (dBm)
Uplink	NA		
Downlink	AMPS	11.4	21.14
Uplink	NA		
Downlink	CDMA	5.8	15.29
Uplink	NA		
Downlink	GSM	11.3	21.06
Uplink	NA		
Downlink	NADC	8.5	18.59
Uplink	NA		
Downlink	EDGE	7.6	17.62

Equipment Used: 1036-1626-1627-1471

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 41 %

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FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth PARA. NO.: 2.1049

TESTED BY: David Light DATE: 7/29/04

Test Results: Complies.

Test Data: See attached plots

Measurement Uncertainty: +/- 1.7 dB

EQUIPMENT: **TFAN 85/19** TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



Dallas Headquarters: 802 N. Kealy Lewisville, TX 75057

Tel: (972) 436-9600 Fax: (972) 436-2667

Ner	nko Dall	as, Inc.									
Data Plot				Oc	cupied B	andwidth					
				Date:	7/28/2004			Preliminary	:	•	
Specification:	PT22		Temp	erature(°C):	22					•	
Tested By:	David Lig	ght	Relative F	Humidity(%)	40						
E.U.T.:	DUAL B	AND AMP		_							
Configuration:	TX										
Sample Number	1					_					
Location:	Lab 1				RBW:	Refer to plots		Measuremen	t		
Detector Type:	Peak				VBW:	Refer to plots		Distance	: NA	·m	
Гest Equipm	ent Used										
Antenna:				Direct	ional Coupler:						
Pre-Amp:					Cable #1:	1626					
filter:					Cable #2:	1627					
Attenuator #1	1471				Cable #4:						
Attenuator #2:					Mixer:						
Measurement U1	ncertainty:	+/-1.7 d	В								
\sim						RBW	30	kHz R	F Att	30 dB	
Ref	L v 1										n
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-60					1		ļ	1			1
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ate:		.JUL.2	UU4 14	:07:11							
Notes:	OUTPU	T CDMA									

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. **Occupied Bandwidth** Data Plot Page 2 of 10 4L0491R Date: 7/28/2004 Job No.: Specification: PT22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: TX Ref Lvl VBW 30 kHz -10 dBm Mixer 19.3 dBm SWT 7 ms dBm Unit 19.3 Α - 1 O 1VIEW 1MA -20 -30 -40 -50 -60 -80.7 Center 880 MHz 246 kHz/ Span 2.46 MHz 28.JUL.2004 Date: 14:08:03 INPUT CDMA Notes:

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. **Data Plot Occupied Bandwidth** Page 3 of 10 4L0491R Job No.: Date: 7/28/2004 PT22 Temperature(°C): 22 Specification: Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: RBU 300 Hz 40 dB Ref Lv1 VBW 300 Hz 30 dBm SWT 2.8 s Un i t dBm 30 10.7 dB Offset A 20 **1VIEW** 1MA -10 -20 -30 -40 -50 -60 Center 880 MHz 5 kHz/ Span 50 kHz Date: 28.JUL.2004 13:37:43 TDMA OUTPUT Notes:

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. **Data Plot** Occupied Bandwidth Page 4_ of 10 4L0491R Job No.: Date: 7/28/2004 PT22 Temperature(°C): 22 Specification: Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: 300 Hz Ref Lvl VBW 300 Hz 19.3 dBm SWT 2.8 s Un i t dBm 19.3 Α 10 -10**1VIEW** 1MA -20 -30 -40 -50 -60 5 kHz/ Span 50 kHz Date: 28.JUL.2004 13:38:33 TDMA INPUT Notes:

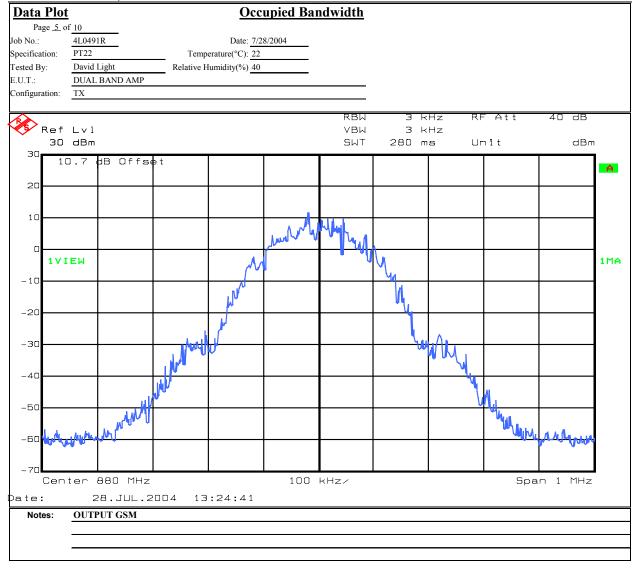
EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



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Test Data - Occupied Bandwidth



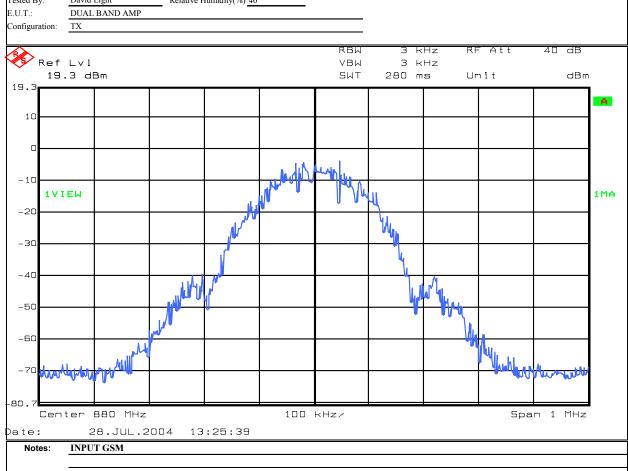
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Data Plot

Nemko Dallas, Inc.

Occupied Bandwidth Page 6 of 10 4L0491R Job No.: Date: 7/28/2004 PT22 Specification: Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 DUAL BAND AMP



EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Occupied Bandwidth

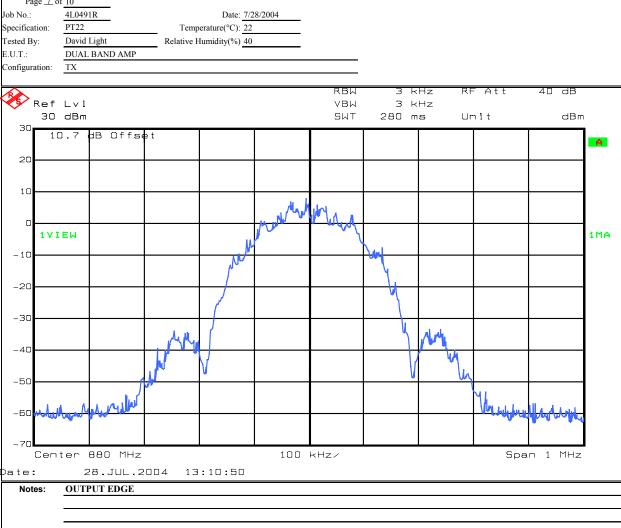
Test Data - Occupied Bandwidth



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Data Plot Page 7 of 10



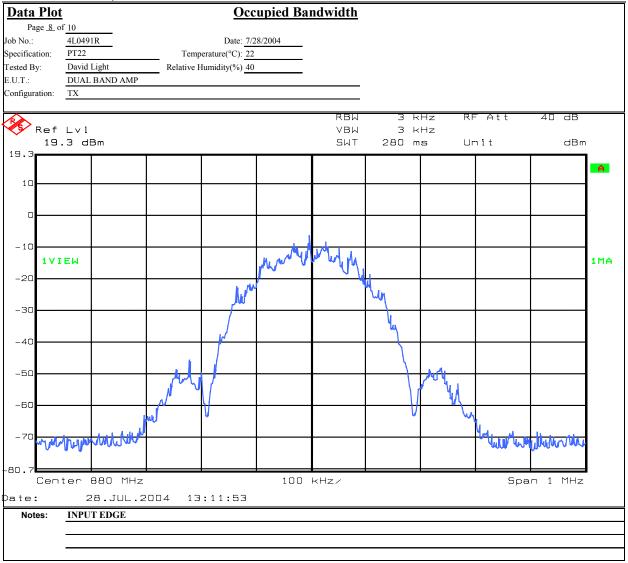
EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



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Test Data - Occupied Bandwidth



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Data Plot					<u>C</u>)ccup	ied B	an	dwidt	h							
Page 9 of Job No.: Specification: Tested By: E.U.T.:	4L049 PT22 David			Tempe elative H	Date erature(°C) umidity(%	: 7/28/20 : 22) 40	004			_							
									RB VB SW	W	300 300 1.7	+	lz	F Att	:	40 dB dBm	
20	7.7	dB Off	set					/									Α
10								$\frac{1}{1}$		Λ		+					
1 V I	EW				\overline{A}			1			Λ	1					1AP
-20																	
-30 -40		Λ												1			
-50						1	1	1									
-60 -70							- 1 '										
Date: Notes:	2	880 MH 28.JUL PUT ANAI	.2004	12	:51:0	3	3	ΚH	Z/					5	pan	30 kHz	

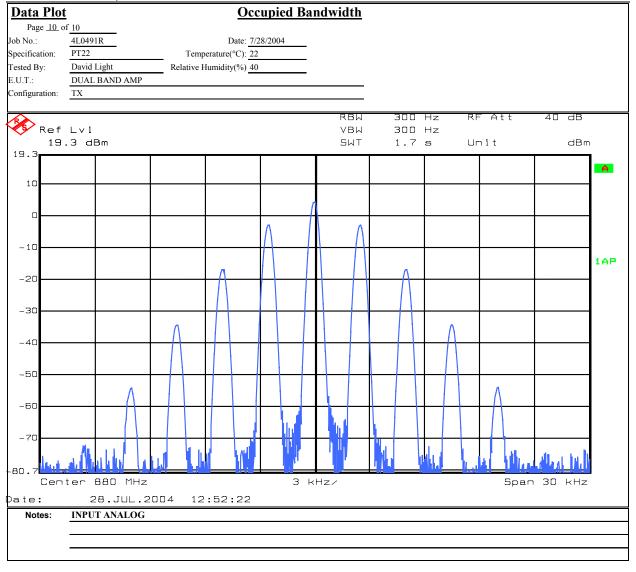
EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Occupied Bandwidth



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FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals PARA. NO.: 2.1051

TESTED BY: David Light DATE: 7/29/04

Test Results: Complies.

Test Data: See attached plots

Measurement Uncertainty: +/- 1.7 dB

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data – Spurious Emissions at Antenna Terminals

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Fax: (972) 436-2667

Page Lot See May May	Nem	ko Dallas	, Inc.									
Page 1 of 5 No. 41,049 Date: 72,82004 Preliminary:	Data Plot			Spur	ious Emis	sions at	Antenna T	<u> Fermina</u>	ls			
Specification F12		` <u>5</u>								e X		
Tested By David Light Relative Humidity(%) 40	Job No.:	4L0491			Date:	7/28/2004			Preliminary		_	
Distance NA	Specification:	PT22		Temp	erature(°C):	22						
Configuration: IX Sample Number: 1	Tested By:	David Light		Relative I	Humidity(%)	40						
Alternator #2	E.U.T.:	DUAL BAN	D AMP									
Location: Location: Location: Location: Peak VBW; Refer to plots VBW; Refer to plots Distance: NA m												
Detector Type: Peak VBW; Refer to plots Distance: NA m m	Sample Number:											
Directional Coupler: Cable #1: 1626 1627 1627 1628 1627 1628 1627 1629 16	Location:		•			-						
Anteman: Directional Coupler: Cable #1: 1626 Cable #3: 1627 Cable #3: Cable #3: Cable #4: Cable	Detector Type:	Peak				VBW:	Refer to plots		Distance	: NA	_ m	
Pre-Amp: Cable #1: 1626 Cable #2: 1627 Cable #2: 1627 Cable #3: 1471 Cable #4:	Test Equipme	ent Used										
Filter: Cable #2: 1627 Receiver: 1036	Antenna:		•		Direction	nal Coupler:						
Receiver: 1036	Pre-Amp:		•			Cable #1:	1626					
Attenuator #1	Filter:		1			Cable #2:	1627					
Attenuator #2:	Receiver:		•			-						
Additional equipment used: Measurement Uncertainty: +/-1.7 dB	Attenuator #1	1471	•			Cable #4:						
Measurement Uncertainty:	Attenuator #2:					Mixer:						
Ref Lv1												
Ref Lv1 30 dBm 10.7 dB Offset LIMIT CHECK: PASSED 10 10 1VIEW -10 LOBNDEDS -20 -40 -50 Center 869 MHz 500 kHz/ Sym 14 ms Unit dBm 1MA 1MA SWT 14 ms Unit dBm SWT 14 ms Unit dBm 1MA 1MA SWT 14 ms Unit dBm 1MA 1MA SPAN 5 MHz	Measurement Unc	certainty:	+/-1.7 d	В								
30 dBm SWT 14 ms Unit dBm 10.7 dB Offset LIMIT CHECK : PASSED 10 1VIEW -10 LOBNDEGS -20 -40 -50 -60 WHz 500 KHz/ Span 5 MHz	Ŕ						RBW	30	kHz RF	- Att	30 dB	
10.7 BB Offset LINIT CHECK: PASSED 10 110 1VIEW -10 LOBNDEOS -30 -40 -50 Center 869 MHz 500 kHz/ Span 5 MHz												
10.7 dB Offset LINIT CHECK : PASSED 10 1VIEW 1MA 1MA 1MA 10 Center 869 MHz 500 kHz/ Span 5 MHz		dBm					SWT	14	ms Ur	n i t	dBm	
20 10 1VIEW -10 LOBNDEDG -20 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz	30	.7 dB	Offse	e t								
10 1VIEW -10 LOBNDEDG -20 -30 -40 -50 Center 869 MHz 500 KHz/ Span 5 MHz					LII	1IT CHE	1 0 K : Pi	ASSED				A
1VIEW 1MA -10 LOBNDEDG -20 -30 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz	20										+	
1VIEW 1MA -10 LOBNDEDG -20 -30 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz												
1VIEW -10 LOBNDEDG -20 -30 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz	10								-			
1VIEW -10 LOBNDEDG -20 -30 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz												
1VIEW -10 LOBNDEDG -20 -30 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz	n											
-10 LOBNDEDS -20 -30 -40 -50 -50 -70 Center 869 MHz 500 kHz/ Span 5 MHz		EΜ					More	www	myrry	Mark	myself hym	1MA
-20 -30 -40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz							<i>J</i>			/ ~		
-30 -40 -50 -60 -70 Center 869 MHz 500 kHz/ Span 5 MHz	-1U	NDEDG					/					
-30 -40 -50 -60 -70 Center 869 MHz 500 kHz/ Span 5 MHz							/		1	1/		
-40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz	-20						 		+			
-40 -50 -60 Center 869 MHz 500 kHz/ Span 5 MHz												
-70 Center 869 MHz 500 kHz/ Span 5 MHz	-30						/	-	 			
-70 Center 869 MHz 500 kHz/ Span 5 MHz									'			
-70 Center 869 MHz 500 kHz/ Span 5 MHz	-40											
-70 Center 869 MHz 500 kHz/ Span 5 MHz						NIMM						
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-70 Center 869 MHz 500 kHz/ Span 5 MHz	-50	. M. NV	<u> </u>									
-70 Center 869 MHz 500 kHz/ Span 5 MHz	MMA	W Y										
Center 869 MHz 500 kHz/ Span 5 MHz	-60						+	-	+		+	
Center 869 MHz 500 kHz/ Span 5 MHz												
Date: 28.JUL.2004 14:16:16	Cent	er 869	MHz			500	KHz/			Sp	an 5 MHz	
	Date:	28.	JUL.2	004 14	:16:16							
Notes: 2 CDMA CHANNELS AT 11 dBm EACH	Notes:	2 CDMA C	HANNE	LS AT 11 dB	m EACH							
869.7 AND 871.2 MHz	1	869.7 AND	871.2 M	Hz			-			-		

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



Dallas Headquarters:

802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667

Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals** Data Plot Page 2 of 5 4L0491 Job No.: Date: 7/28/2004 Specification: PT22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: TXRef Lvl 30 kHz VBW -10 dBm Mixer 30 dBm SWT 14 ms dBm Unit 10.7 dB Offset Α LIMIT CHE : PASSED 20 10 1MA -10 -20 -30 -40 William MANA Mary Mary -50 -60 Center 894 MHz 500 kHz/ Span 5 MHz 28.JUL.2004 14:18:11 Date: 2 CDMA CHANNELS AT 11 dBm EACH Notes: 893.31 AND 891.83 MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data – Spurious Emissions at Antenna Terminals



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Nem	iko Da	allas, Inc.						ax. (972) 4			
Data Plot			Spui	ious Emi	issions at A	Antenna T	Termina	l <u>s</u>			
Page 3 of											
b No.:	4L049	1		_	/28/2004						
pecification:	PT22			perature(°C): 22							
ested By: U.T.:	David	_	Relative	Humidity(%) 40	0						
O.1.: onfiguration:	TX	BAND AMP									
miguration.	171										
2						RBW		MHz	RF Att	30 dB	
Ref						VBW		MHz	Mixer	-10 dBr	
30 	dBm					SWT	90	ms	Unit	dBr	n _
10	1.7	dB Offs	e t								A
20											
20											
4.5											
10											1
1 1 1											1 MA
1141	- N										1111
-10	- 1 B	dBm-									1
		d Dill									
-20								+	+	+	┨
-30								+		-	-
								, Alu	Marian	100.6.	
-40		Menen	Market Park	Molchia	1000 C	A CHILLIAN CHIN'S	melyan	A CO	- William William	whathu	l.
melon	Mary Mark			0.000							
-50											4
-60											1
-70											
	`t 31	0 MHz			897	MHz/			5	top 9 GHz	_
ate:	2	8.JUL.2	2004 14	1:11:57							
Notes:	SINC	I F CDMA C	ARRIER AT	960 7 MHz							
Notes:		m OUTPUT3		OUF./ NITIZ							
	15 GD	5011010									

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 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data – Spurious Emissions at Antenna Terminals



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Fax: (972) 436-9600

Nem	nko Dallas	s, Inc.							(372) 430-20		
Data Plot			Spur	ious Emi	ssions at A	Antenna T	Terminals				
Page 1 of	f <u>5</u>							Complete	X		
Job No.:	4L0491R			Date:	7/28/2004			Preliminary:			
Specification:	PT22		Temp	erature(°C):	22						
Tested By:	David Light	i	Relative H	Iumidity(%)	40						
E.U.T.:	DUAL BAN	ND AMP									
Configuration:	TX										
Sample Number:	1										
Location:	Lab 1	_			RBW: I	Refer to plots		Measurement			
Detector Type:	Peak	_			VBW: I	Refer to plots		Distance:	NA n	1	
Test Equipme	ent Used										
Antenna:		_		Directi	onal Coupler:						
Pre-Amp:					Cable #1:	1626					
Filter:		_			Cable #2:	1627					
Receiver:	1036	_			Cable #3:						
Attenuator #1	1471	_			Cable #4:						
Attenuator #2:					Mixer:						
Additional equip	ment used:										
Measurement Un	certainty:	+/-1.7 d	В								
\$						RBU		Hz RF	Att	40 dB	
Ref	L∨1 dBm					VBW SWT	3 k 560 m		nit	dBm	,
30						341	300 111	01		GB11	
1 🗆	1.7 b B	Offse	e t	LΙ	MIT CHE	ck : Pr	ASSED				A
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10						1		<u> </u>			ł
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0						4	به الم		-a /a		1
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-10							<u> </u>	 	(
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-40					M	<u> </u>		MAL			
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			∕الفلية		444 JV					``	
-60 ujuvul		AL MINISTER	Medical March		WV.	-					
, T		* W *									
-70											
	ter 869	3 MHz			200	kHz/			Spa	n 2 MHz	
Date:	28.	JUL.2	004 13	:17:20							
Notes:	EDGE - 1	3 dBm per	carrier								
1	869.2 ANI										

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



Dallas Headquarters:

802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667

Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals** Data Plot Page 2 of 5 4L0491R Job No.: Date: 7/28/2004 Specification: PT22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: TXRef Lvl 3 kHz VBW 30 dBm SWT 560 ms Unit dBm 10.7 dB Offset Α MIT CHE : PASSED 20 10 1VIEW 1MA - 1C -20 -30 Who you -40 WWW. -50 -60 Center 894 MHz 200 kHz/ Span 2 MHz 13:18:39 bate: 28.JUL.2004 EDGE - 13 dBm per carrier Notes: 893.8 AND MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Data Plot Spurious Emissions at Antenna Terminals** Page <u>3</u> of 5 4L0491R Job No.: Date: 7/28/2004 PT22 Temperature(°C): 22 Specification: Relative Humidity(%) 40 Tested By: David Light E.U.T.: DUAL BAND AMP Configuration: 40 dB Ref Lvl VBW 1 MHz 30 dBm SWT 90 ms Unit dBm 10.7 dB Offset Α 20 **1VIEW** 1MA dBm -20 -30 -40 -50 -60 Start 30 MHz 897 MHz/ Stop 9 GHz Date: 28.JUL.2004 13:20:12 EDGE - SINGLE CARRIER 17.5 dBm Notes: TX 869.2 MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot **Spurious Emissions at Antenna Terminals** Page <u>1</u> of <u>5</u> Complete 7/28/2004 Date: Preliminary: Job No.: 4L0491R Specification: PT22 Temperature(°C): 22 Tested By: Relative Humidity(%) David Light DUAL BAND AMP E.U.T.: Configuration: Sample Number: Lab 1 RBW: Refer to plots Location: Measurement Distance: NA Detector Type: Peak VBW: Refer to plots Test Equipment Used Directional Coupler: Antenna Cable #1: Pre-Amp: Cable #2: 1627 Filter: Receiver: 1036 Cable #3: Attenuator #1 1471 Cable #4: Attenuator #2 Mixer Additional equipment used: +/-1.7 dB Measurement Uncertainty: Ref Lvl VBW 3 kHz 20 dBm SWT 560 ms Un i t 10.7 dB Offset 1IT CHE SSED A 10 – 1C 1MA -20 -30 -40 -50 -60 -80 Center 869 MHz 200 kHz/ Span 2 MHz Date: 28.JUL.2004 13:30:32 GSM - 14.5 dBm per carrier Notes: 869.2 AND 869.7 MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals** Data Plot Page 2 of 5 4L0491R Job No.: Date: 7/28/2004 Specification: PT22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: TXRef Lvl VBW 3 kHz 20 dBm SWT 560 ms Unit dBm 10.7 dB Offset Α 1IT CHE SSED 1Ω -101VIEW 1MA -20 -30 -40 -50 -60 ment rander was and -70 -80 Center 894 MHz 200 kHz/ Span 2 MHz 28.JUL.2004 13:31:47 Date: GSM - 14.5 dBm per carrier Notes: 893.8 AND 893.3 MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals

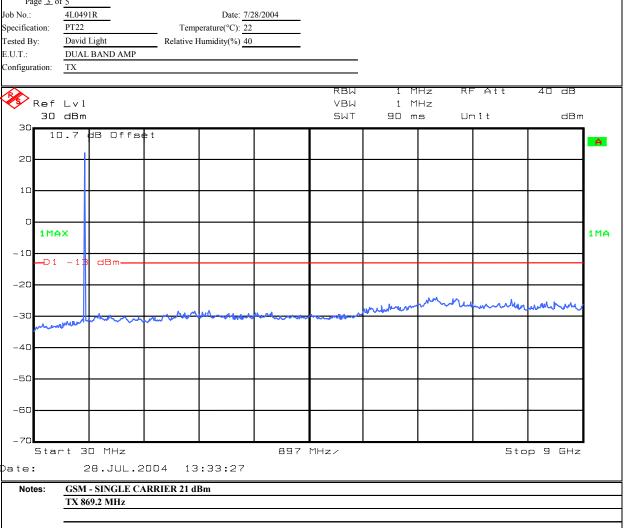


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Data PlotPage 3 of 5

Spurious Emissions at Antenna Terminals



EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot **Spurious Emissions at Antenna Terminals** Page <u>1</u> of <u>5</u> Complete 7/28/2004 Date: Preliminary: Job No.: 4L0491R Specification: PT22 Temperature(°C): 22 Tested By: Relative Humidity(%) David Light DUAL BAND AMP E.U.T.: Configuration: Sample Number: Lab 1 RBW: Refer to plots Location: Measurement Distance: NA Detector Type: Peak VBW: Refer to plots Test Equipment Used Directional Coupler: Antenna Cable #1: Pre-Amp: Cable #2: 1627 Filter: Receiver: 1036 Cable #3: Attenuator #1 1471 Cable #4: Attenuator #2. Mixer Additional equipment used: +/-1.7 dB Measurement Uncertainty: Ref Lvl 1 kHz VBW 30 dBm SWT 2.5 s Un i t dBm 10.7 dB Offset MIT CHE SSED A 20 10 1VIEW 1MA -10 -20 -30 -4r -50 -60 Who My Will Why Why Why Why I Mynarly Life 100 kHz/ 869 MHz Span 1 MHz Date: 28.JUL.2004 14:00:30 TDMA - 13 dBm per carrier Notes: 869.04 AND 869.4MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals** Data Plot Page 2 of 5 4L0491R Job No.: Date: 7/28/2004 Specification: PT22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: TXRef Lv1 1 kHz VBW 30 dBm SWT 2.5 s Unit dBm 30 10.7 dB Offset A LIMIT CHE ASSED 20 10 1VIEW 1MA - 1 C -20 -30 -40 -50 White while the same of the 100 kHz/ Center 894 MHz Span 1 MHz Date: 28.JUL.2004 13:58:36 TDMA - 13 dBm per carrier Notes: 893.97 AND 893.65 MHz

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Data Plot Spurious Emissions at Antenna Terminals** Page <u>3</u> of 5 4L0491R Job No.: Date: 7/28/2004 PT22 Temperature(°C): 22 Specification: Relative Humidity(%) 40 Tested By: David Light E.U.T.: DUAL BAND AMP Configuration: RBU 40 dB Ref Lv1 VBW 1 MHz 30 dBm SWT 90 ms Un i t dBm 10.7 dB Offset Α 20 10 1 V I E W 1MA - 1 C dBm -20 -30 -40 -50 -60 Start 30 MHz 897 MHz/ Stop 9 GHz Date: 28.JUL.2004 13:55:13 TDMA - SINGLE CARRIER 18.5 dBm Notes: TX 869.04 MHz

EQUIPMENT: **TFAN 85/19** TEST REPORT NO.: 4L0491RUS1

<u>Test Data – Spurious Emissions at Antenna Terminals</u>

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802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667

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Page 1 of	f <u>5</u>								Co	omplete ninary:	X	_		
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EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data - Spurious Emissions at Antenna Terminals



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802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667

Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals** Data Plot Page 2 of 5 4L0491R Job No.: Date: 7/28/2004 Specification: PT22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 40 E.U.T.: DUAL BAND AMP Configuration: TXRef Lvl VBW 300 Hz 30 dBm SWT 56 s dBm Un i t 30 10.7 dB Offset Α LIMIT CHE : PASSED 20 10 1MA -10 -20 -30 -40 -50 While Y will Center 894 MHz 100 kHz/ Span 1 MHz 28.JUL.2004 13:03:29 Date: ANALOG - 2.5 kHz TONE / 2 kHz DEVIATION Notes: 14.5 dBm PER CARRIER

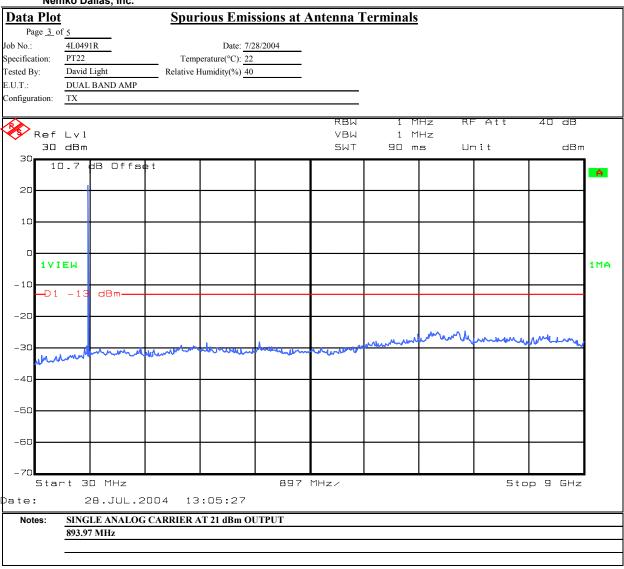
EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Test Data – Spurious Emissions at Antenna Terminals



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Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious PARA. NO.: 2.1053

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: 1484-1485-1464-1304-1016

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 41 %

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

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	

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: **TFAN 85/19** TEST REPORT NO.: 4L0491RUS1

ANNEX A - TEST DETAILS

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: RF Power Output PARA. NO.: 2.1046

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP)

of base transmitters and cellular repeaters must not exceed 500

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.

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Occupied Bandwidth (Voice & SAT) PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the

carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as

follows:

(i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least 117 $\log (f_d/12)$

(ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least $100 \log (f_d/11) dB$ or $43 + 10 \log (P) dB$, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz VBW: ≥ RBW Span: 100 kHz Sweep: Auto

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer

AF1 frequency: 6 kHz

AF1 level: sufficient to produce 2 kHz deviation

AF2 frequency: 2.5 kHz

AF2 level: sufficient to produce 12 kHz deviation.

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Occupied Bandwidth (WB Data) PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the

carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as

follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P) dB$, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz VBW: ≥ RBW Span: 200 kHz Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz, random bit sequence AF1 level: sufficient to produce 8 kHz deviation

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Occupied Bandwidth (ST) PARA. NO.: 2.1049

Minimum Standard: 22.917(c) The mean power of any emission removed from the

carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as

follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P) dB$, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz VBW: ≥ RBW Span: 200 kHz Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz tone

AF1 level: sufficient to produce 8 kHz deviation

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Occupied Bandwidth (Digital Modulation) PARA. NO.: 2.1049

Minimum Standard: Not defined by FCC. Input vs. Output.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)

VBW: ≥ RBW Span: As required Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

Page 42 of 52

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be

attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute

power.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 30 kHz (AMPS). As required for digital modulations.

VBW: ≥RBW

Start Frequency: 0 MHz Stop Frequency: 10 GHz

Sweep: Auto

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 2.1053

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be

attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute

power.

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.

The spectrum is searched to 10 GHz.

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

NAME OF TEST: Frequency Stability PARA. NO.: 2.1055

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain

within the tolerances given in Table C-1.

Table C-1

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

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:

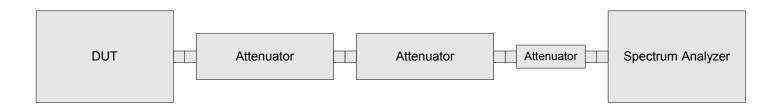
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

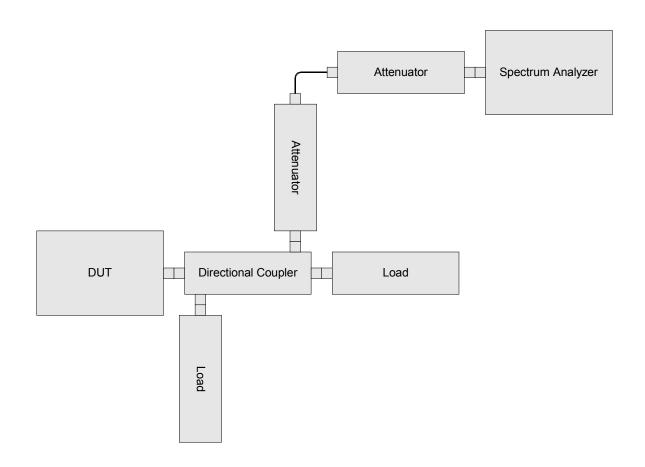
EQUIPMENT: TFAN 85/19 TEST REPORT NO.: 4L0491RUS1

ANNEX B - TEST DIAGRAMS

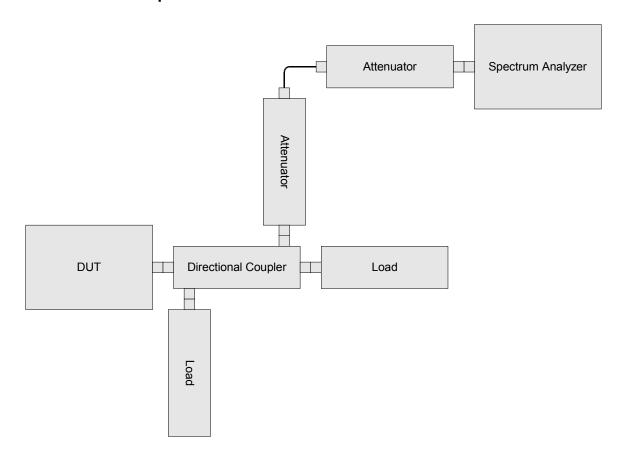
Para. No. 2.1046 - R.F. Power Output

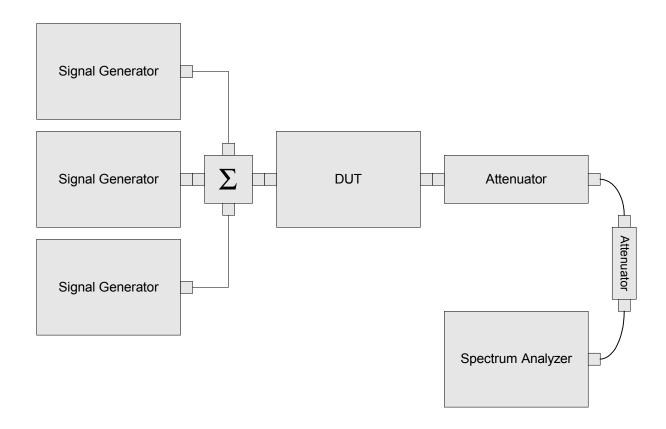


Para. No. 2.1049 - Occupied Bandwidth

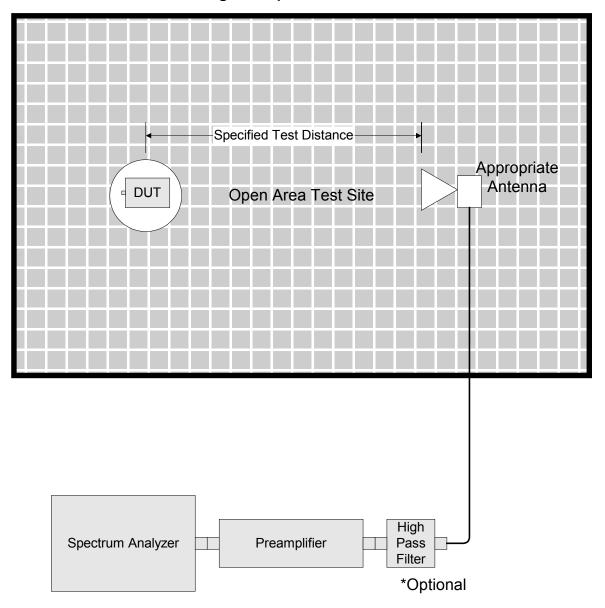


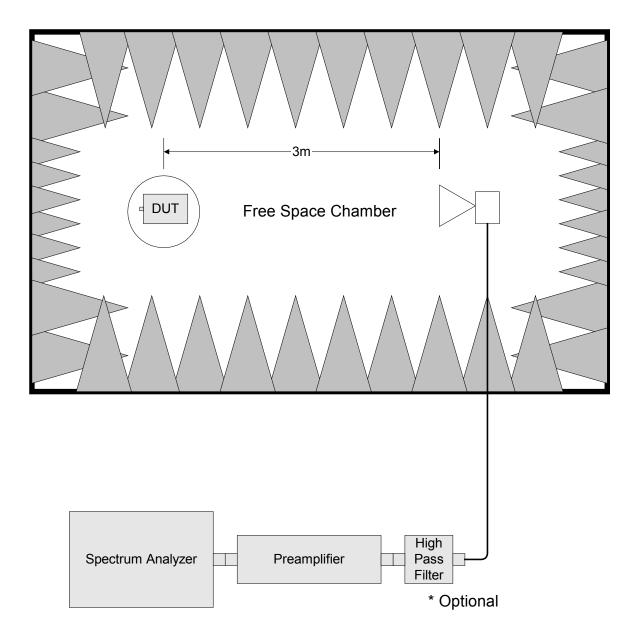
Para. No. 2.1051 Spurious Emissions at Antenna Terminals





Para. No. 2.1053 - Field Strength of Spurious Radiation





Para. No. 2.1055 - Frequency Stability

