Nemko Test Report:	4L0570RUS1
Applicant:	Andrew Corporation 108 Rand Park Drive Garner, NC 27529
Equipment Under Test: (E.U.T.)	TFAH 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:	9/1/04
Total Number of Pages:	53

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ANNEX B -	TEST DIAGRAMS

Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

Pre-Production Unit

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Section 1.	Summary of Tes	t Results	
Manufacturer	Andrew Corporation		
Model No.:	TFAH 85/19		
Serial No.:	043003041		
General:	All measurements are tracea	able to national stan	dards.
	re conducted on a sample of the the FCC Part 22, Subpart H.	ne equipment for the	purpose of demonstrating
	New Submission		Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

Class II Permissive Change

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	22.913(a)	500W ERP	Complies
Occupied Bandwidth	22.917(c)	Input/Output	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:

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

.

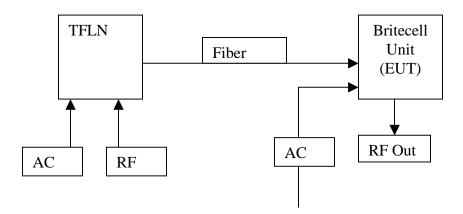
Section 2. General Equipment Specification

Supply Voltage Input:	115 Vac	115 Vac					
Frequency Range: Downlink:	869 – 894 MHz						
Frequency Range: Uplink:	NA						
Type of Modulation and Designator:		SM NADC XW) (D7W)	EDGE AMPS (D7W) (F8W, F1D)				
Output Impedance:	50 ohms						
RF Output (Rated): Downlink:	Modulation	1 Carrier	2 Carriers				
	Analog 37		27				
	CDMA	31	24.5				
	GSM EDGE	37 33.5	27 25				
	TDMA	34.5	25.5				
Frequency Translation:	F1-F1						
	G. Br	Duplexer	Fullband				
Band Selection:	Software	Change	Coverage				

Description of Operation

TFAH 85/19 is a fiber based tri-band repeater operating in the 800 MHz SMR, the 800 MHz cellular and the 1900 MHz PCS bands

System Diagram



Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Section 3. RF Power Output

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

TESTED BY: David Light DATE: 8/30/04

Test Results: Complies.

Test Data:

Direction	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Downlink	AMPS	27	30
Downlink	CDMA	24.5	27.5
Downlink	GSM	27	30
Downlink	NADC	25	28
Downlink	CDPD	25.5	28.5

Equipment Used: 1036-1065-1604-1629

Measurement Uncertainty: +/- 1.7 dB

Temperature: 25 °C

Relative Humidity: 40 %

Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Section 4. Occupied Bandwidth

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

TESTED BY: David Light DATE: 8/30/04

Test Results: Complies.

Test Data: See attached plots

Dallas Headquarters: 802 N. Kealy

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



2 kHz Tone - 2.5 kHz Deviation

Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667

Nemko Dallas, Inc. Data Plot **Occupied Bandwidth** Page <u>1</u> of <u>2</u> Complete 8/30/2004 Preliminary: Job No.: 4L0570 Date: Specification: PT22 Temperature(°C): 25 Tested By: David Light Relative Humidity(%) E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Location: Lab 1 RBW: Refer to plots Measurement Detector Type: Peak VBW: Refer to plots Distance: NA Test Equipment Used Antenna: Directional Coupler: Cable #1: 1629 Pre-Amp: Filter: Cable #2: 1036 Receiver: Cable #3: Attenuator #1 1065 Cable #4: Attenuator #2: 1604 Mixer: Additional equipment used: Measurement Uncertainty: +/-1.7 dB 300 Hz dВ Ref Lvl -0.15 dB 300 Hz VBW 40 dBm -10.04008016 kHz SWT 1.7 s Un i t dBm 30.5 dB Offs∉t \mathbf{v}_1 [T1] 19 dBn 880.00508016 MHz 30 đВ 016 kHz 20 1 V I EW 1MA -20 -30 -40 -50 -60 Center 880 MHz 3 kHz/ Span 30 kHz 30.AUG.2004 14:40:04 Date: ANALOG OUTPUT Notes: MAX POWER 37 dBm

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. **Occupied Bandwidth Data Plot** Page 2 of 2 Date: 8/30/2004 Job No.: 4L0570 Specification: PT22 Temperature(°C): 25 Relative Humidity(%) 40 Tested By: David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 300 Hz 30 dB Ref Lvl 0.00 dB VBW 300 Hz 9.5 dBm -10.04008016 kHz SWT 1.7 s Un i t dBm [T1] 880.00508 016 MHz .00 dB 0.04008<mark>016 kHz</mark> - 1C -20 1VIEW 1MA -30 -40 -50 -60 -75 -80 W 90.5 3 kHz/ Span 30 kHz 880 MHz Date: 30.AUG.2004 14:41:29 ANALOG INPUT Notes:

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. Data Plot Occupied Bandwidth Page <u>1</u> of <u>2</u> Complete 8/30/2004 Job No.: 4L0570 Date: Preliminary: Specification: PT22 Temperature(°C): 25 Relative Humidity(%) Tested By: David Light E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Lab 1 RBW: 30 kHz Location: Measurement Detector Type: Peak VBW: 30 kHz Distance: NA Test Equipment Used Antenna: Directional Coupler: Pre-Amp: Cable #1: Filter: Cable #2: 1036 Cable #3: Receiver: Cable #4: Attenuator #1 Attenuator #2: 1604 Mixer: Additional equipment used: +/-1.7 dB Measurement Uncertainty: 🥙 Ref Lvl VBW 30 kHz Mixer -10 dBm 40 dBm SWT 14 ms Unit dBm 30.5 dB Offset Α 30 20 10 1VIEW 1MA thumus. - 10 "White -20 -30 MIM -40 -50 -60 Center 880 MHz 500 kHz/ Span 5 MHz 30.AUG.2004 15:00:28 bate: CDMA OUTPUT MAX POWER 31 dBm

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

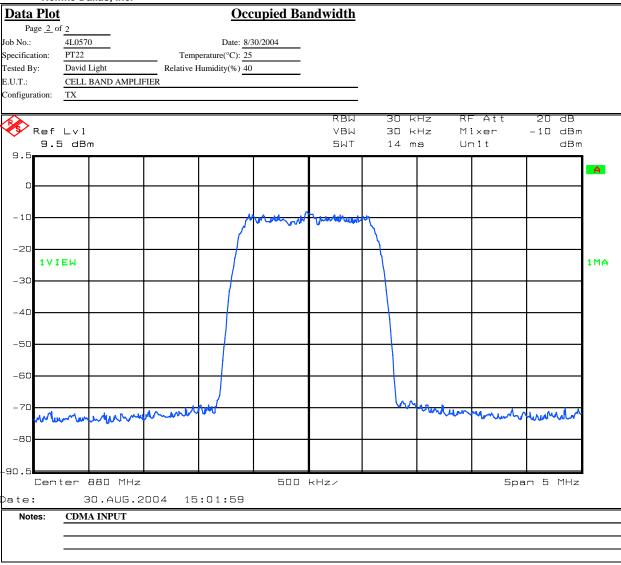
Test Data - Occupied Bandwidth



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EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Data 1					Occ	upied B	andwidth					
Pag	ge <u>1</u> of	2							Complete Preliminary:	<u> X</u>		
Job No.:		4L057)		Date:	8/30/2004			Preliminary:			
Specificat	ion:	PT22		Temp	erature(°C):	25						
Tested By	·:	David	Light	Relative F	Humidity(%)	40						
E.U.T.:		CELL	BAND AMPLI				•					
Configura	tion:	TX										
Sample N	umber:	1										
Location:		Lat	1	_		RBW:	Refer to plots		Measuremen	t		
Detector 7	Гуре:	Pe	ak				Refer to plots		Distance	: NA	m	
	71											
Test Eq	uipme	nt Us	ed									
Antenna:					Direction	onal Coupler:						
Pre-Amp:						Cable #1:	1629					
Filter:						Cable #2:						
Receiver:		10:	36			Cable #3:						
Attenuato	r #1	10				Cable #4:						
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Date:			31.AUG.2	2004 07	:15:05							
Note			OUTPUT		-							
		MAX	POWER 37	dBm								
1												

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. **Occupied Bandwidth Data Plot** Page 2 of 2 Date: 8/30/2004 Job No.: 4L0570 Temperature(°C): 25 Specification: PT22 Tested By: Relative Humidity(%) 40 David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 20 dB Ref Lvl VBW 3 kHz -20 dBm Mixer 9.5 dBm SWT 560 ms Unit dBm - 1C -20 1VIEW 1MA -30 EXT -40 -50 -60 Center 880 MHz 200 kHz/ Span 2 MHz 31.AUG.2004 07:16:22 GSM INPUT Notes:

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Fax: (972) 436-2667

Nen	nko Dallas, Inc.							
Data Plot			Occupied B	andwidth				
Page 1 o	f 2				Co	omplete X		
Job No.:	4L0570	D	ate: 8/30/2004		Prelim	omplete X ninary:	_	
Specification:	PT22	Temperature		-				
Tested By:	David Light	Relative Humidit		-				
E.U.T.:	CELL BAND AMPL			-				
Configuration:	TX							
Sample Number:	1							
Location:	Lab 1		RBW:	Refer to plots	Measu	irement		
Detector Type:	Peak		VBW:	Refer to plots	D	istance: NA	_ m	
Test Equipme	ent Used							
Antenna:			Directional Coupler:					
Pre-Amp:			Cable #1:					
Filter: Receiver:	1026		Cable #2:					
Attenuator #1	1036		Cable #3:					
Attenuator #2:	1604		Mixer:					
Additional equip			Mixer:					
Measurement Un		dB						
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Ref		004 55	0.58 dB	VBW	3 kHz	Mixer	-20 dB	
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Cen	ter 880 MHz	:	200) kHz/		Sı	ban 2 MHz	_
Date:	31.AUG.:	2004 07:20	:52					
Notes:	EDGE OUTPUT							
	MAX POWER 33.	5 dBm	_			_	-	

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Dallas Headquarters:

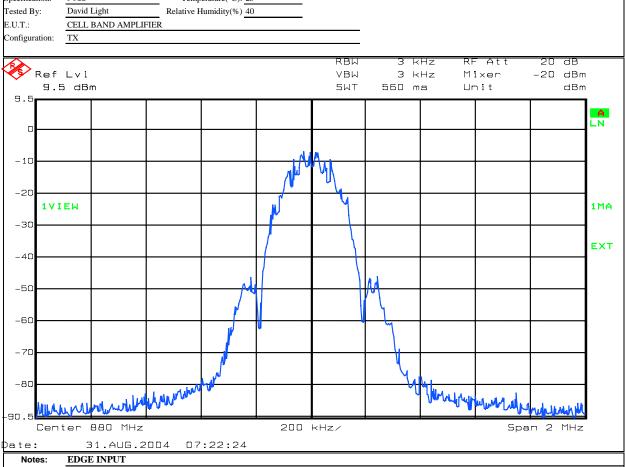
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 Data Plot
 Occupied Bandwidth

 Page 2 of 2
 Iob No.:
 4L0570
 Date: 8/30/2004

 Specification:
 PT22
 Temperature(°C): 25

 Tested By:
 David Light
 Relative Humidity(%) 40



-20

-30

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

Dallas Headquarters:

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Fax: (972) 436-2667 Nemko Dallas, Inc. Occupied Bandwidth Data Plot Page <u>1</u> of <u>2</u> Complete Job No.: 4L0570 Date: 8/30/2004 Preliminary: Specification: PT22 Temperature(°C): 25 Tested By: David Light Relative Humidity(%) E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Lab 1 RBW: Refer to plots Distance: NA VBW: Refer to plots Detector Type: Peak Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Filter: 1036 Cable #3: Receiver: Attenuator #1 Cable #4: Attenuator #2: 1604 Mixer: Additional equipment used: +/-1.7 dB Measurement Uncertainty: Ref Lvl 2.33 dB VΒW 1 kHz Mixer -20 dBm 32.46492986 kHz 40 dBm SWT 250 ms Unit dBm 40 30.5 dB Offset dBm A 879.98486 374 MHz 30 2.46492 986 KH: 20 10 4D/11 ESN. 13 dBm 1MA EXT -10

-40
-50
-60
Center 880 MHz
10 kHz/
Span 100 kHz

Date: 31,AUG.2004 06:45:20

Notes: TDMA OUTPUT
MAX POWER 34.5 dBm

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data - Occupied Bandwidth



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Nemko Dallas, Inc. **Occupied Bandwidth Data Plot** Page 2 of 2 Date: 8/30/2004 Job No.: 4L0570 Specification: PT22 Temperature(°C): 25 Tested By: Relative Humidity(%) 40 David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 20 dB Ref Lvl VBW 1 kHz -20 dBm Mixer 9.5 dBm SWT 250 ms Unit dBm -10 -20 1VIEW 1MA -30 EXT -40 -50 -60 What was her -80 -90.5 Center 880 MHz 10 kHz/ Span 100 kHz Date: 31.AUG.2004 06:46:50 TDMA INPUT Notes:

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Section 5. Spurious Emissions at Antenna Terminals

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

TESTED BY: David Light DATE: 8/30/04

Test Results: Complies.

Test Data: See attached plots

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Data – Spurious Emissions at Antenna Terminals



ANALOG

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Nemko Dallas, Inc. Data Plot **Spurious Emissions at Antenna Terminals** Page <u>1</u> of <u>3</u> Complete 8/30/2004 Preliminary: Job No.: 4L0570 Date: Specification: PT22 $Temperature (^{\circ}C):$ 25 Tested By: David Light Relative Humidity(%) E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Location: Lab 1 RBW: Refer to plots Measurement Detector Type: Peak VBW: Refer to plots Distance: NA Test Equipment Used Directional Coupler: Antenna: Cable #1: 1629 Pre-Amp: Filter: Cable #2: Receiver: 1036 Cable #3: Attenuator #1 1065 Cable #4: Attenuator #2: 1604 Mixer: Additional equipment used: Measurement Uncertainty: +/-1.7 dB dВ Ref Lvl 27.00 dBm 300 Hz VBW 40 dBm 869.03857715 MHz SWT 28 dBm 30.5 dB Offset 00 dBr A LIMIT CHE : PASSED 869.03857 715 MHz 30 9.2000 оо мн 20 10 1 V I EW 1MA -10 -20 -30 -40 -50 -60 868.75 MHz Stop 869.25 MHz Date: 30.AUG.2004 14:48:41 LOWER BAND EDGE Notes: 2 CHANNELS AT 27 dBm EACH

Test Data – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals Data Plot** Page 2 of 3 Job No.: 4L0570 Date: 8/30/2004 Temperature(°C): 25 Specification: PT22 Relative Humidity(%) 40 Tested By: David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 300 30 dB Ref Lvl 27.01 dBm VBW 300 Hz 40 dBm 893.81813627 MHz SWT 28 s Unit dBm 30.5 dB Offset [T1] .01 dBn CHE SSED 893.81813 627 MHz 30 893.97000000 MHz 20 1 C **1VIEW** 1MA -10-20 -30 -40 -50 Mulululu hallelander Center 894 MHz 50 kHz/ Span 500 kHz 30.AUG.2004 UPPER BAND EDGE - ANALOG 2 CHANNELS AT 27 dBm EACH ANALOG

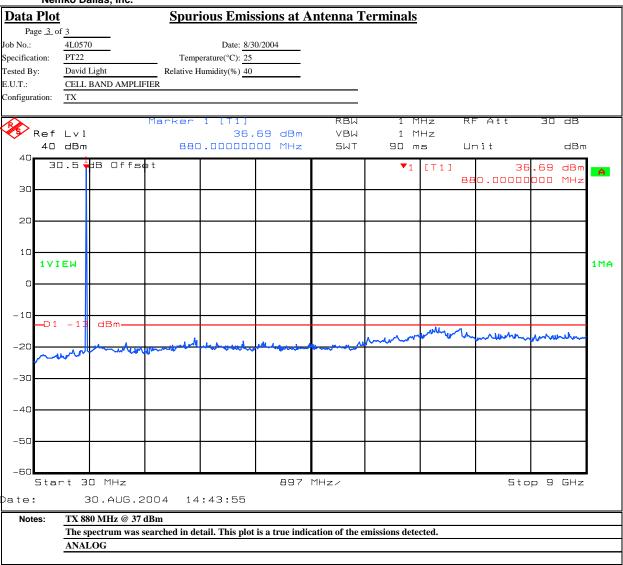
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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>3</u> Complete Job No.: 4L0570 Date: 9/1/2004 Preliminary: Specification: PT22 $Temperature (^{\circ}C):$ 22 Tested By: Relative Humidity(%) David Light E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Lab 1 RBW: 30 kHz Location: Measurement Peak VBW: 30 kHz Distance: NA Detector Type: Test Equipment Used Antenna: Directional Coupler: 1629 Pre-Amp: Cable #1: Filter: Cable #2: 1036 Cable #3: Receiver: Cable #4: Attenuator #1 Attenuator #2: 1604 Mixer: Additional equipment used: Measurement Uncertainty: +/-1.7 dB 10 dB Ref Lvl 11.67 dBm VBW 30 kHz Mixer -10 dBm 20.5 dBm 869.70000000 MHz SWT 8.5 ms Unit dBm 30.5 A LIMIT CHE 869.70000 000 MHz 10 -101MA -20 -30 1 may y when work work the -50 -60 -70 79.5 Center 869 MHz 300 kHz/ Span 3 MHz 01.SEP.2004 Date: 07:25:41 LOWER BAND EDGE Notes: 2 CHANNELS AT 24.5 dBm EACH CDMA

Test Data - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot **Spurious Emissions at Antenna Terminals** Page <u>2</u> of 3 4L0570 Date: 9/1/2004 Job No.: Specification: PT22 Temperature(°C): 22 David Light Relative Humidity(%) 40 Tested By: CELL BAND AMPLIFIER E.U.T.: Configuration: TXRBW 30 kHz RF Att 10 dB Ref Lvl 9.94 dBm VBW 30 kHz Mixer -10 dBm 20.5 dBm 893.28000000 MHz SWT 8.5 ms Un i t dBm 20.5 30.5 [T1] .94 dBn A 3.28000 000 MHz -101VIEW 1MA -20 -30 Myly lay my francopy man fly -40 -50 -60 300 kHz/ Center 894 MHz Span 3 MHz Date: 01.SEP.2004 07:22:45 UPPER BAND EDGE Notes: 2 CHANNELS AT 24.5 dBm EACH CDMA

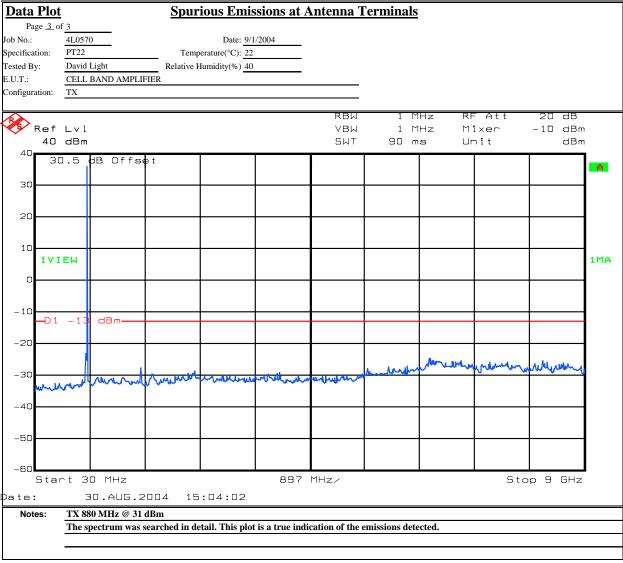
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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>3</u> Complete 8/30/2004 Preliminary: Job No.: 4L0570 Date: Specification: PT22 $Temperature (^{\circ}C):$ 25 Tested By: David Light Relative Humidity(%) E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Location: Lab 1 RBW: 30 kHz Measurement Detector Type: Peak VBW: 30 kHz Distance: NA Test Equipment Used Directional Coupler: Antenna: Cable #1: 1629 Pre-Amp: Filter: Cable #2: 1036 Receiver: Cable #3: Attenuator #1 1065 Cable #4: Attenuator #2: 1604 Mixer: Additional equipment used: Measurement Uncertainty: +/-1.7 dB Ref Lvl 17.68 dBm 3 kHz Mixer VBW -20 dBm 30 dBm 869.70000000 MHz SWT 560 ms Unit dBm 30.5 dB Offset 68 dBr SSED LIMIT CHE 9.70000<mark>000 MH</mark>z 20 000 MH2 10 **1VIEW** 1MA - 1C EXT -20 -30 -40 -50 Much hand with a marting" -60 Center 869 MHz 200 kHz/ Span 2 MHz 31.AUG.2004 07:08:05 Date: LOWER BAND EDGE GSM Notes: 2 CHANNELS AT 27 dBm EACH

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 3 Job No.: 4L0570 Date: 8/30/2004 Specification: PT22 Temperature(°C): 25 Relative Humidity(%) 40 Tested By: David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 10 dB Ref Lvl 14.34 dBm VBW 3 kHz Mixer -20 dBm 30 dBm 893.30000000 MHz SWT $560 \, \text{ms}$ Un i t dBm dB Offset 30.5 34 dBr 1IT CHE SSED 3.30000 ooo MHz 20 893.80000 000 MHz 1VIEW 1MA EXT -20 -30 -40 -50 -60 200 kHz/ Center 894 MHz Date: 31.AUG.2004 07:01:46 UPPER BAND EDGE - GSM Notes: 2 CHANNELS AT 27 dBm EACH

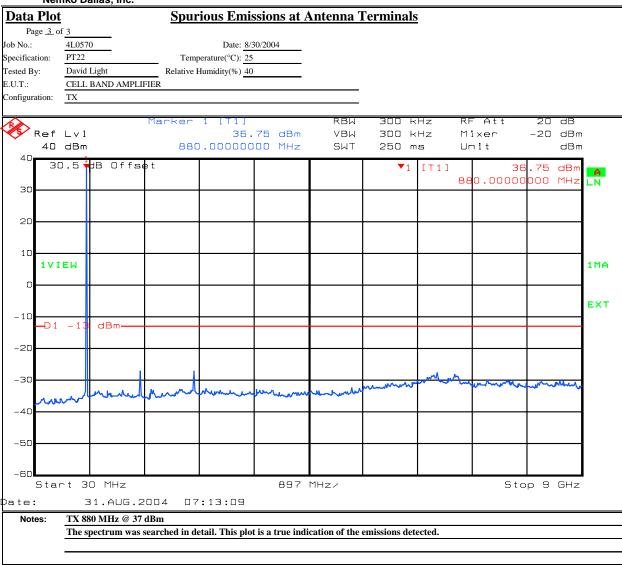
Test Data – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc.



EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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>3</u> Complete 8/30/2004 Preliminary: Job No.: 4L0570 Date: Specification: PT22 $Temperature (^{\circ}C):$ 25 Tested By: David Light Relative Humidity(%) E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Location: Lab 1 RBW: Refer to plots Measurement Detector Type: Peak VBW: Refer to plots Distance: NA Test Equipment Used Directional Coupler: Antenna: Cable #1: 1629 Pre-Amp: Filter: Cable #2: 1036 Receiver: Cable #3: Attenuator #1 1065 Cable #4: Attenuator #2: 1604 Mixer: Additional equipment used: Measurement Uncertainty: +/-1.7 dB Ref Lvl 13.39 dBm 3 kHz VBW -20 dBm Mixer 40 dBm 869.20000000 MHz SWT 560 ms dBm 30.5 dB Offset 39 LIMIT CHE 869.20000000 MHz 30 000 MH2 20 10 1 V I EW 1MA EXT -20 -30 Wy, -40 -50 -60 869 MHz 200 kHz/ Span 2 MHz Date: 31.AUG.2004 07:27:11 LOWER BAND EDGE EDGE Notes: 2 CHANNELS AT 25 dBm EACH

Test Data – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals Data Plot** Page 2 of 3 Job No.: 4L0570 Date: 8/30/2004 Specification: PT22 Temperature(°C): 25 Relative Humidity(%) 40 Tested By: David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 20 dB Ref Lvl VBW 10.15 dBm 3 kHz Mixer -20 dBm 40 dBm 893.30000000 MHz SWT 560 msUn i t dBm 30.5 dB Offset 15 LIMIT CHE SSED 3.30000<mark>0</mark>00 MHz 89 30 893.80000000 MHz 20 10 1VIEW 1 MA EXT -10 -30 -50 ahallajand_{eral} -60 200 kHz/ Center 894 MHz 31.AUG.2004 07:29:20 UPPER BAND EDGE - EDGE Notes: 2 CHANNELS AT 25 dBm EACH

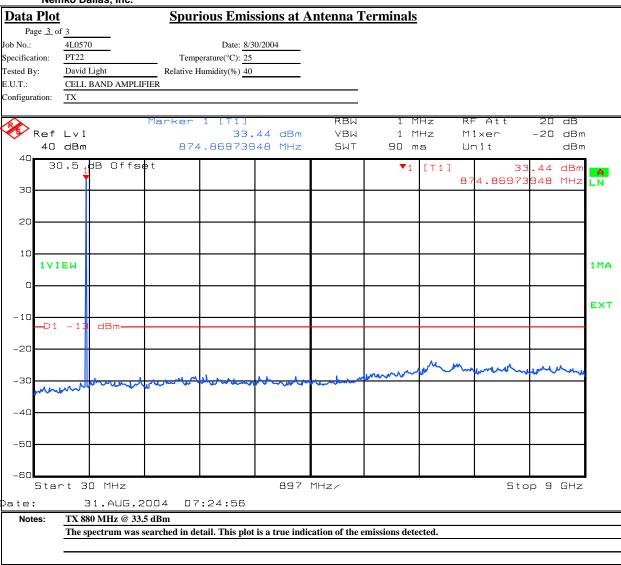
Test Data – Spurious Emissions at Antenna Terminals



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EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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>3</u> Complete 8/30/2004 Preliminary: Job No.: 4L0570 Date: Specification: PT22 $Temperature (^{\circ}C):$ 25 Tested By: David Light Relative Humidity(%) E.U.T.: CELL BAND AMPLIFIER Configuration: Sample Number: Location: Lab 1 RBW: Refer to plots Measurement Detector Type: Peak VBW: Refer to plots Distance: NA Test Equipment Used Directional Coupler: Antenna: Cable #1: 1629 Pre-Amp: Filter: Cable #2: 1036 Receiver: Cable #3: Attenuator #1 1065 Cable #4: Attenuator #2: 1604 Mixer: Additional equipment used: Measurement Uncertainty: +/-1.7 dB Ref Lvl 16.43 dBm VBW 1 kHz Mixer -20 dBm 30 dBm 869.50000000 MHz SWT 5 s Un i t dBm 30.5 dB Offset 43 dBr : PASSED LIMIT CHE 869.50000 000 MHz 20 000 MHz 10 1MA — 1 Г EXT -20 -30 -40 -50 Mulher -60 Start 868 MHz 200 kHz/ Stop 870 MHz 31.AUG.2004 06:53:04 Date: LOWER BAND EDGE Notes: 2 CHANNELS AT 25.5 dBm EACH TDMA

Test Data – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. **Spurious Emissions at Antenna Terminals Data Plot** Page 2 of 3 Job No.: 4L0570 Date: 8/30/2004 Specification: PT22 Temperature(°C): 25 Relative Humidity(%) 40 Tested By: David Light E.U.T.: CELL BAND AMPLIFIER Configuration: RBW 10 dB Ref Lvl VBW 16.39 dBm 1 kHz Mixer -20 dBm 30 dBm 893.50000000 MHz SWT 5 s Un i t dBm 30.5 dB Offset [T1] 39 LIMIT CHE 3.50000<mark>000 MHz</mark> A C 20 893.97000000 MHz 1VIEW 1 MA -10**EXT** -20 -30 -40 -50 -60 Center 894 MHz 200 kHz/ Span 2 MHz 31.AUG.2004 UPPER BAND EDGE - TDMA 2 CHANNELS AT 25.5 dBm EACH TDMA

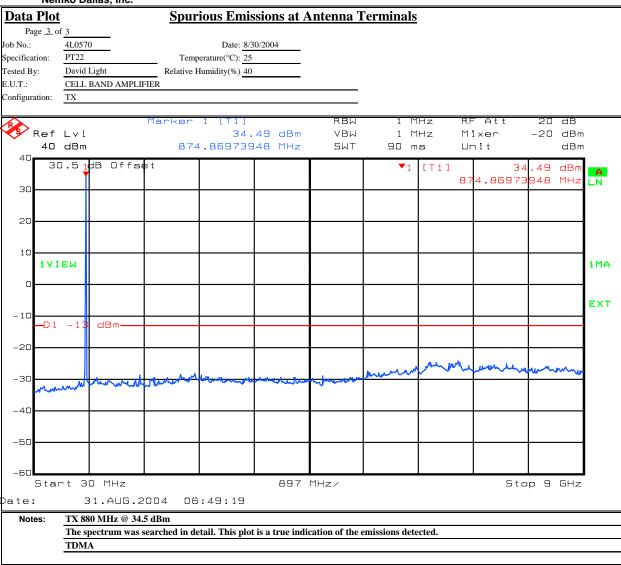
Test Data – Spurious Emissions at Antenna Terminals



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FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Section 6. Field Strength of Spurious

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

TESTED BY: Brian Boyea DATE: 8/31/04

Test Results: Complies.

Test Data: There were no emissions detected within 20 dB of the

specification of -13 dBm. The spectrum was searched to the 10th harmonic of the carrier (880 MHz) with the amplifier operating at

full rated power.

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

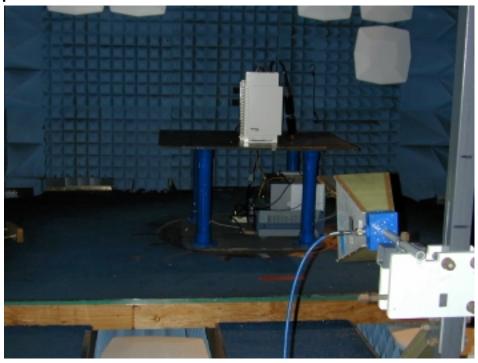
Measurement Uncertainty: +/- 1.7 dB

Temperature: 25 °C

Relative Humidity: 40 %

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Test Setup Photos





EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	07/30/04	07/31/06
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	08/26/04	08/26/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	08/02/04	08/02/05
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

ANNEX A - TEST DETAILS

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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.

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi$ $R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R =the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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: TFAH 85/19 Test Report No.: 4L0570RUS1

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: TFAH 85/19 Test Report No.: 4L0570RUS1

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: TFAH 85/19 Test Report No.: 4L0570RUS1

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 43 of 53

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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: TFAH 85/19 Test Report No.: 4L0570RUS1

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 maximum field strength of the spurious emission is measured at a distance of 3 meters. The device under test is then replaced with a substitution antenna of known gain with respect to a ½ wave dipole antenna. A calibrated signal source is used to feed the substitution antenna. The rf level to the substitution antenna is adjusted to repeat the previously measured field strength. The rf input level to the substitution antenna is the effective radiated power of the spurious emission after any correction for substitution antenna gain against a ¼ wave dipole.

The spectrum is searched to 10 GHz.

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

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.

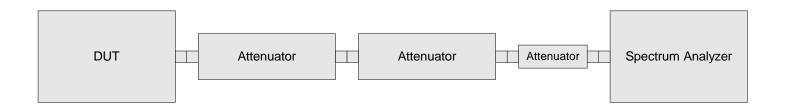
Frequency Stability With Temperature Variation:

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.

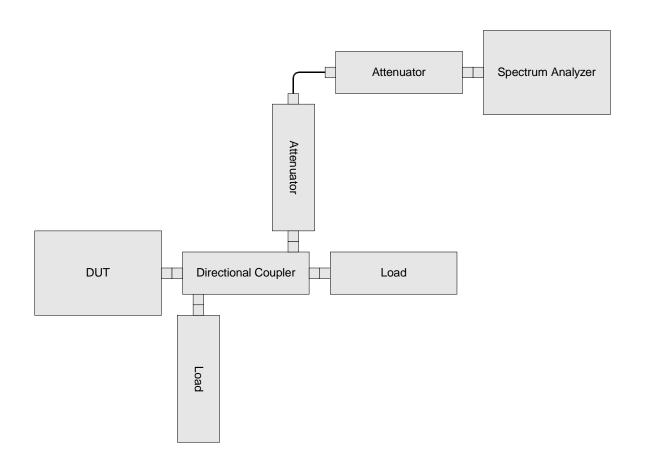
EQUIPMENT: TFAH 85/19 Test Report No.: 4L0570RUS1

ANNEX B - TEST DIAGRAMS

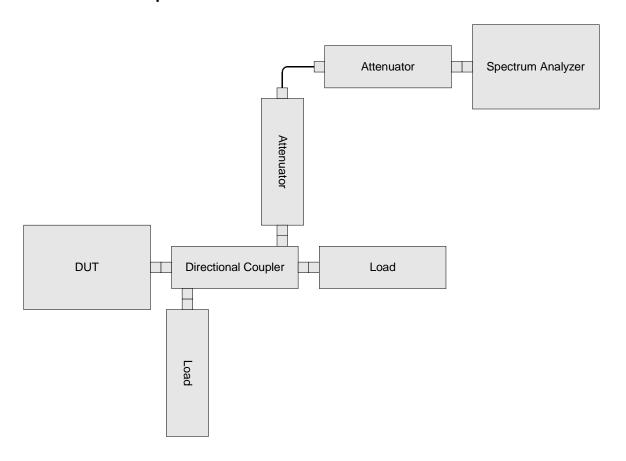
Para. No. 2.1046 - R.F. Power Output

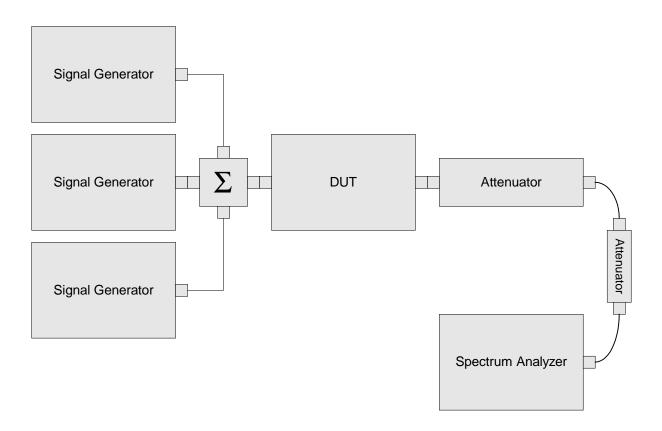


Para. No. 2.1049 - Occupied Bandwidth

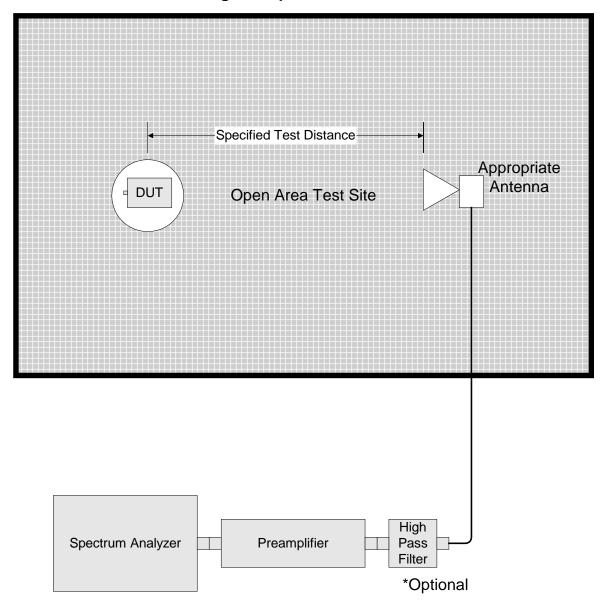


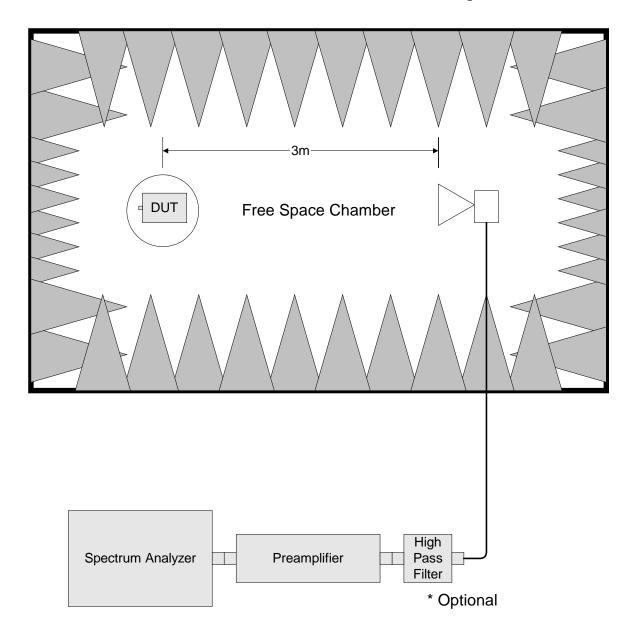
Para. No. 2.1051 Spurious Emissions at Antenna Terminals





Para. No. 2.1053 - Field Strength of Spurious Radiation





Para. No. 2.1055 - Frequency Stability

