Nemko Test Report:	1L0084RUS1
Applicant:	Withus Co., Ltd. 2F Miguempark B/D 150 Geumgok-dong, Bundang-gu, Seongnam-si, Kyongki-do, Republic of Korea
Equipment Under Test: (E.U.T.)	WER 824A AMPS REPEATER
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, RF Group Manager
Date:	7/6/01
Total Number of Pages:	74

PROJECT NO.: 1L0084RUS1

Table of Contents

SECTION 1.	SUMMARY OF TEST RESULTS	3
SECTION 2.	GENERAL EQUIPMENT SPECIFICATION	5
SECTION 3.	RF POWER OUTPUT	7
SECTION 4.	OCCUPIED BANDWIDTH	8
SECTION 5.	SPURIOUS EMISSIONS AT ANTENNA TERMINALS	9
SECTION 6.	FIELD STRENGTH OF SPURIOUS	.26
SECTION 7.	FREQUENCY STABILITY	55
SECTION 8.	TEST EQUIPMENT LIST	58
ANNEX A -	TEST DETAILS	.59
ANNEX B -	TEST DIAGRAMS	.68

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Section 1. Summary of Test Results

Manufacturer: AP Research

Model No.: WER 824A

Serial No.: None

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.

See "Summary of Test Data".

NVLAP

NVLAP LAB CODE: 100426-0

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PROJECT NO.: 1L0084RUS1

Summary Of Test Data

	PARA. NO.			
RF Power Output	22.913(a)	500W ERP	< 500 W ERP	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask	Plots	Complies
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask	Plots	Complies
Occupied Bandwidth (ST)	22.917(d)	Mask	Plots	Complies
Occupied Bandwidth (Digital)	None	None	Plots	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	< -13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	< -13 dBm EIRP	Complies
Frequency Stability	22.355	1.5 ppm	N/A	N/A

Footnotes:

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

PROJECT NO.: 1L0084RUS1

Section 2. General Equipment Specification

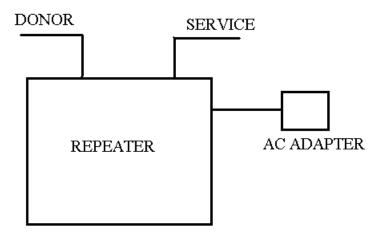
Supply Voltage Input:		100-240 VAC			
Frequency Range:	Downlink:	869 – 894 MHz			
Frequency Range:		824 – 849 MHz			
		CDMA GSM (F9W) (GXW)		CDPD AMPS (F9W) (F8W, F1D)	
Output Impedance:		50 ohms			
RF Output (Rated):	Downlink:	Per Channel: Total:	0.5 W 1.0 W		
-	Uplink:	Per Channel: Total:	0.5 W 1.0 W		
Frequency Translation:		F1-F1	F1-F2	N/A	
		Software	Duplexer Change	Fullband Coverage	

PROJECT NO.: 1L0084RUS1

Description of Operation

This repeater (model: WER-824) is a compact bi-directional linear amplifier for 800 MHz AMPS band. It is ideal for extending two-way voice and data communications for null areas. This unit features 80 dB gain and output IP3 level of +45 dBm.

System Diagram



Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Section 3. RF Power Output

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

TESTED BY: David LightTom Tidwell DATE: 6/20/01

Test Results: Complies.

Test Data:

	Modulation	Per Channel Power Output	Composite Power Output
	Type	(dBm)	(dBm)
Uplink	AMPS	26	29 (2 Chs)
Downlink	AMPS	24.5	27.5 (2 Chs)
Uplink	CDMA	29	32 (2 Chs)
Downlink	CDMA	27	30 (2 Chs)
Uplink	NADC	29	32 (2 Chs)
Downlink	NADC	27	30 (2 Chs)

Note: The device was tested at 98-132 VAC. Voltage input had no effect on power output.

Equipment Used: 1064-1065-1029-1030

Measurement Uncertainty: +/- 0.6 dB

Temperature: 22 °C

Relative Humidity: 50 %

PROJECT NO.: 1L0084RUS1

Section 4. Occupied Bandwidth

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

TESTED BY: David LightTom Tidwell DATE: 6/20/01

Test Results: Complies.

Test Data: See attached plots

Equipment Used: 1036-1064-1065-1083

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 50 %

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth CDMA



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

Nemko Dallas, Inc. OCCUPIED BANDWIDTH - CDMA Data Plot Page 1 of 2 Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: PART22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELL BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Peak VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: Ref Lvl VBW 30 kHz 30 dBm SWT 14 ms 30 dB Offset 20 ئر _اادرانیالدالدیدیالیالیانی 10 1 V I E W 1MA - 10 -20 - White the way of the -50 -60 Center 881.5 MHz 500 kHz/ Span 5 MHz 21.JUN.2001 B:10:01 Date: OUTPUT SIGNAL CDMA DOWNLINK

EQUIPMENT: WER 824A AMPS Repeater

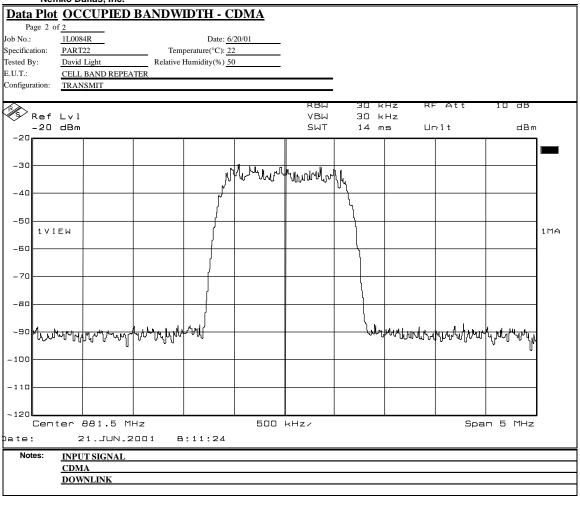
PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth CDMA



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EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth CDMA



Dallas Headquarters:

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

Nemko Dallas, Inc. Data Plot CDMA Page 2 of DOWNLINK Specification: Temperature(°C): Relative Humidity(%) Tested By: E.U.T.: Configuration: Ref Lvl VBW 30 kHz 30 dBm 14 ms 30 dB Offset 20 1 🗆 1 V I EW 1 MA -20 the property of the second of -40 www. when white white will be with the white white white will be with the white white white will be with the white white will be with the white wh -50 -60 Center 830 MHz 500 KHZ/ Span 5 MHz 21.JUN.2001 7:38:44 ate: Notes: OUTPUT SIGNAL **CDMA** UPLINK

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth CDMA



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Nemko Dallas, Inc. Data Plot CDMA Page 2 of DOWNLINK Specification: Temperature(°C): Relative Humidity(%) Tested By: E.U.T.: Configuration: Ref Lvl VBW 30 kHz -20 dBm SWT 14 ms dBm -20 -30 when the many the country -40 -50 1 V I E W 1 MA -60 -70 -80 ^ᢗᠲᡳ᠋^ᡣᢦᡀᡗ᠊ᢏᢧᡗᡫᡧᢂᡰᠾᡪᢛ᠆ᡶᢧᡀ_{᠈ᡊᢣ}ᡑᠰᡶᢔᡰᡌᡇ_ᠮᡰᡧᢣᢣᢔᡈᡙᢏ_ᢇᠰᢌᢢ_ᡎ -90 July hours of high way the way how with the first of -100 -110 -120 Center 830 MHz 500 KHz/ Span 5 MHz Date: 21.JUN.2001 7:40:09 Notes: INPUT SIGNAL **CDMA** UPLINK

PROJECT NO.: 1L0084RUS1

Dallas Headquarters:

Plot s - Occupied Bandwidth TDMA



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

Nemko Dallas, Inc. OCCUPIED BANDWIDTH - TDMA **Data Plot** Page 1 of 2 Complete 1L0084R Job No.: Date: 6/20/01 Preliminary Specification: PART22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELL BAND REPEATER Configuration: TRANSMIT Sample Number: RBW: Refer to plots Location: Lab 1 Measurement Distance: N/A VBW: Refer to plots Detector Type: Peak Test Equipment Used Antenna: Directional Coupler: Cable #1: 1043 Pre-Amp: Filter: Cable #2: Receiver: 1036 Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: 3 кнz 140 ms Un i t 30 dB Offset 30 20 1 V I E W 1MA White The Tarket of the Control of t -20 -30 hrandull, -50 -60 Center 881.5 MHz 50 KHz/ Span 500 kHz 20.JUN.2001 ate: 7:14:11 OUTPUT SIGNAL Notes: TDMA

EQUIPMENT: WER 824A AMPS Repeater

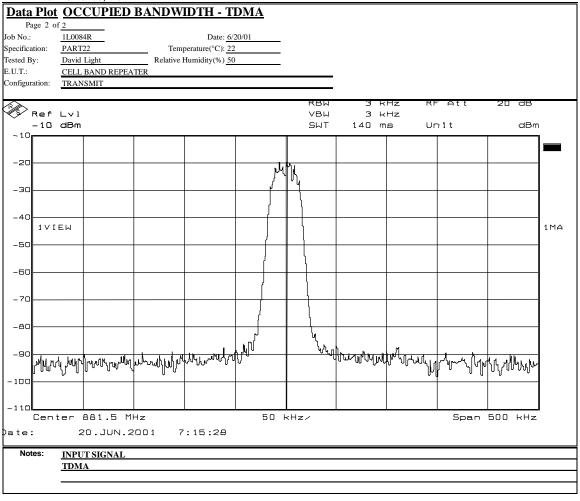
PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth TDMA



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EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth TDMA



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Data Plot TDMA	
Page 2 of DOWNLINK	
Job No.: Date:	
Specification: Temperature(°C):	
Tested By: Relative Humidity(%)	
E.U.T.:	
Configuration:	
RBW 3 KHZ RF Att 40 c	dB
	dBm
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30 dB Offset	
30	
30	
20	
10	_
1VIEW	1 MA
-10 WU	
-30	
1 -40	<u> </u>
-40 www.wd.ng.r.w.d.dl.lll.w.d.w.newledd.ll.de.de.de.de.de.de.de.de.de.de.de.de.de.	~UM
-50	
-60	
Center 830 MHz 50 kHz/ Span 500 k	Hz
Date: 21.JUN.2001 7:45:43	
Notes: OUTPUT SIGNAL	
TDMA	
UPLINK	

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth TDMA



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Nemko Dallas, Inc. Data Plot TDMA Page 2 of DOWNLINK Specification: Temperature(°C): Tested By: Relative Humidity(%) E.U.T.: Configuration: Ref Lvl VBW 3 kHz -10 dBm SWT 140 ms Unit dBm -10 -20 -40 1 V I E W 1 MA -50 -60 - 70 -80 That I wonder out a south of the south of th I will that hall for more after the forther problem. Center 830 MHz 50 kHz/ Span 500 kHz 21.JUN.2001 7:47:03 ate: Notes: INPUT SIGNAL TDMA UPLINK

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Wide Band Data



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Nemko Dallas, Inc. Data Plot OCCUPIED BANDWIDTH - WIDE BAND DATA Page <u>1</u> of 2 Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: PART22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELL BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Peak VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: Ref Lvl VBW 300 Hz 40 dBm SWT 8.4 s Unit dBm 30 dB Offset 30 20 1 🗆 1 V I E W 1 MA -10 -20 -30 Manual Ma -40 Center 881.5 MHz 15 kHz/ Span 150 kHz 20.JUN.2001 7:06:41 ate: OUTPUT SIGNAL WIDE BAND DATA

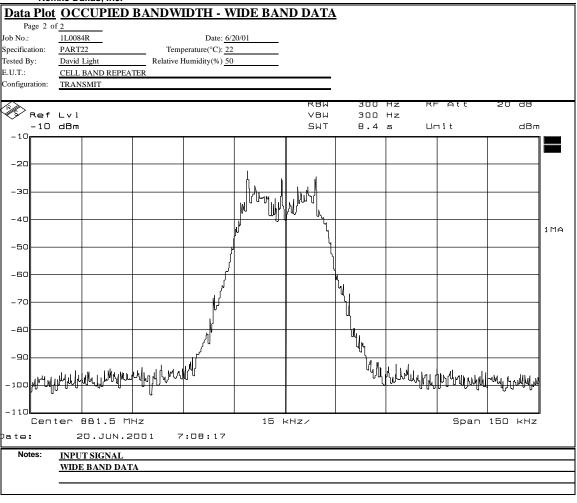
PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Wide Band Data



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EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Wide Band Data



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Nemko Dallas, Inc. Data Plot WIDE BAND DATA Page 2 of DOWNLINK Specification: Temperature(°C): Tested By: Relative Humidity(%) E.U.T.: Configuration: Ref Lvl VΒW 300 Hz 40 dBm 8.4 s 30 dB Offset 30 20 10 1 V I EW 1 MA -10 -20 -30 -60 Center 830 MHz 15 kHz/ Span 150 kHz 7:56:09 21.JUN.2001 bate: OUTPUT SIGNAL Notes: WIDE BAND DATA UPLINK

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Wide Band Data



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Nemko Dallas, Inc. Data Plot WIDE BAND DATA Page 2 of DOWNLINK Specification: Temperature(°C): Tested By: Relative Humidity(%) E.U.T.: Configuration: Ref Lvl VΒW 300 Hz 0 dBm SWT Ө.4 ธ Unit - 1 🗆 -20 -30 1 V I E W 1MA -40 -50 -60 -70 -80 -100 Center 830 MHz 15 KHZ/ Span 150 kHz 21.JUN.2001 ate: Notes: INPUT SIGNAL WIDE BAND DATA UPLINK

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Voice and SAT



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

Nemko Dallas, Inc. OCCUPIED BANDWIDTH - VOICE AND SAT Data Plot Page 1 of 2 Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: Temperature(°C): 22 PART22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELL BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Peak VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Filter: Cable #2: Receiver: Cable #3: Attenuator #1 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: 31111 40 GB Ref Lvl VBW 300 Hz 40 dBm 5WT 8.4 s Unit dBm 30 dB Offset 30 20 10 1 V I E W 1 MA -10-20 -30 -40 -50 -60 Center 881.5 MHz 15 kHz/ 5pan 150 kHz ate: 20.JUN.2001 6:39:22 OUTPUT SIGNAL VOICE AND SAT

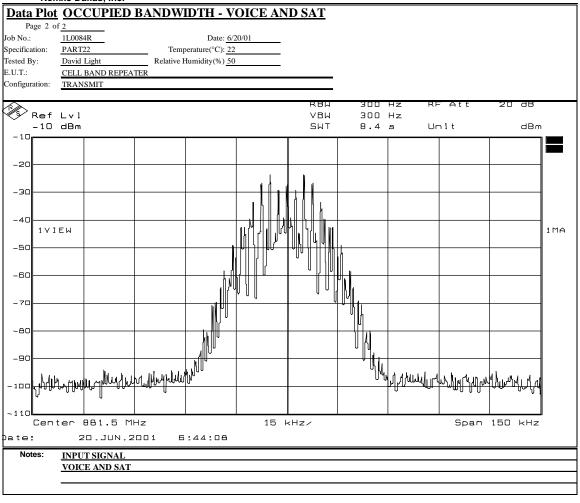
PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Voice and SAT



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PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Voice and SAT



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Nemko Dallas, Inc.						
Data Plot VOICE AND SAT						
Page 2 of						
Job No.: Date:						
Specification: Temperature(°C):	•					
Tested By: Relative Humidity(%)	_					
E.U.T.:						
Configuration:						
Ref Lvl	VBW VBW	300		- Att	4U dB	
40 dBm	SWT	8.4		ni t	dBm	
40	1	<u> </u>	1	111		
30 dB Offset						
30						
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-30						
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		""[MIN. 21 LM	الابلىك يتديا	
-20 Material and a start the second			7 0 0 0	1 A D .	Lag Almha	
					-	
-60	kHz/			Spac	150 kHz	
	11127			JPai i	100 KI12	
Pate: 21.JUN.2001 8:03:09						
Notes: OUTPUT SIGNAL						
VOICE AND SAT						
UPLINK						

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Occupied Bandwidth Voice and SAT



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Nemko Dallas, Inc.	
Data Plot VOICE AND SAT	
Page 2 of	
Job No.: Date:	
Specification: Temperature(°C):	
Tested By: Relative Humidity(%)	
E.U.T.:	
Configuration:	
RBW	300 Hz RF Att 30 dB
Ref Lv1 VBW	300 Hz
O dBm SWT	8.4 s Unit dBm
-10	
-20	
▎▗▖▎▕▗▕▍▋▓▓▋▊▖	
-30 1VIEW	1MA
│ -40 │ 	
_50	
-70	
	THE THE PROPERTY OF THE PROPER
	The the terms of the second of
-3a 14 hpppfortfilly_bpfortfinghzhr	Lan Daller Maril Maril Marilla Marilla
-100	Span 150 kHz
	Spail 130 Kilz
Date: 21.JUN.2001 B:04:41	
Notes: INPUT SIGNAL	
VOICE AND SAT	
UPLINK	

PROJECT NO.: 1L0084RUS1

Section 5. Spurious Emissions at Antenna Terminals

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

TESTED BY: David LightTom Tidwell DATE: 6/20/01

Test Results: Complies.

Test Data: See attached plots

Equipment Used: 1036-1064-1064-1083

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 50 %

PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot **SPURIOUS EMISSIONS - CONDUCTED** Page <u>1</u> of <u>4</u> Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: PART22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT FULL POWER Sample Number: 1 RBW: Refer to plots Detector Type: Peak VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-1.7 dB Measurement Uncertainty: RRI. 🦃 Ref Lvl VBW 100 kHz Mixer -10 dBm 35 dBm 5WT 245 ms Un i t dBm 30 dB Offset 30 20 10 1 V I E W 1 M A -D1 −13 dBm--20 -30 approximation of the supplemental properties and the supplemental properties of the supplemen -60 5tart 30 MHz 97 MHz/ Stop 1 GHz 20.JUN.2001 15:05:58 ate: CDMA MODULATION UPLINK

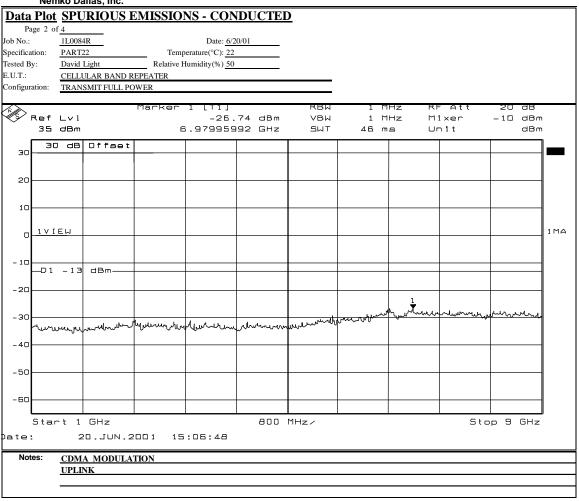
PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



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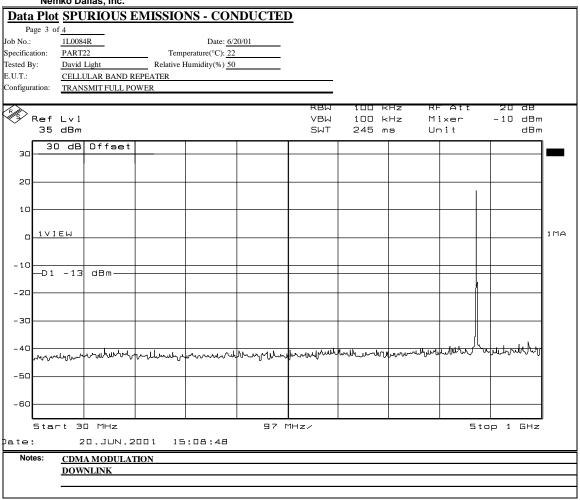
EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



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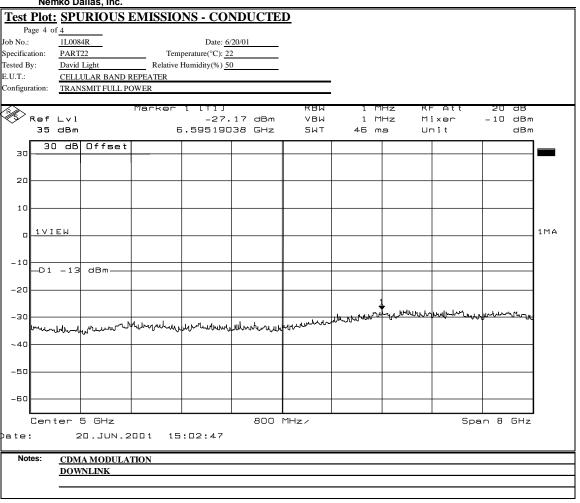
PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



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PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot BANDEDGE - CDMA Page <u>1</u> of <u>4</u> Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: PART 22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Rms VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: RBL Ref Lvl -17.42 dBm VBW 300 kHz Mixer -10 dBm 30 dBm 869.0000000 MHz 5WT 5 ms Unît dBm 30 dB Offset 20 10 Mary and market and market and the grand and the second se 1 V I E W 1RM - 1C LOBNOE -40 forther warmen with the forther fo -20 -50 -60 Center 869 MHz 200 kHz/ 5pan 2 MHz ate: 20.JUN.2001 10:29:40 CDMA LOWER BANDEDGE - DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. **BANDEDGE - CDMA** Data Plot Page 2 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl -15.88 dBm VBW 300 kHz Mixer -10 dBm 30 dBm 894.0000000 MHz 6 ms Un i t UBANDEDG 30 dB Offset 20 10 aymaranya ᢍᢔᡙᢇᠿ 1RM - 1 [□] -20 -30 textypopology with the particular of the particu -40 -50 -60 Center 894 MHz 200 kHz/ Span 2 MHz 20.JUN.2001 10:32:37 ate: Notes: CDMA UPPER BANDEDGE - DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc. **Data Plot BANDEDGE - CDMA** Page <u>3</u> of <u>4</u> 1L0084R Date: 6/20/01 Job No.: Temperature(°C): 22 Specification: PART 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT RBW Ref Lvl -15.97 dBm VBW 300 kHz Mixer -10 dBm 30 dBm 824.00000000 MHz SWT 6 ms Unit dBm 30 dB Offset 20 10 Land Strand Company Co 1 V I E W 1 R M **-10** LOBNOEDG -20 ht y father with y may be with the way -30 -40 -50 -60 Center 824 MHz 200 kHz/ Span 2 MHz 20.JUN.2001 10:23:20 ate: Notes: **CDMA** LOWER BANDEDGE - UPLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



UPPER BANDEDGE - UPLINK

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

Nemko Dallas, Inc. BANDEDGE - CDMA **Test Plot:** Page <u>4</u> of <u>4</u> Job No.: 1L0084R Date: 6/20/01 Specification: Temperature(°C): 22 PART 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl -14.08 dBm VBW 300 kHz -10 dBm Mixer 849.00000000 MHz 30 dBm 5WT 6 ms Unit dBm 30 dB Offset UBANDEDG 20 1 V I E W 1 R M -10 -20 -30 **-4**Ω - John My Colomban My Colomban -50 -60 200 kHz/ Center 849 MHz Span 2 MHz 20.JUN.2001 10:21:33 ate: Notes: **CDMA**

PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc. Data Plot INTERMODULATION CHARACTERISTICS - CDMA Page <u>1</u> of <u>4</u> Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: PART 22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Rms VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: Ref Lvl VBW 30 kHz Mixer -10 dBm 20 dBm 5WT 500 ms Un 1 t dBm 30 dB Offset 10 -10 -1□/11 3 dBm 1RM -20 -30 -40 -50 -60 -70 -aol Center 869 MHz Span 20 MHz 2 MHz/ ate: 20.JUN.2001 9:07:38 INBAND AND OUT OF BAND INTERMODULATION **CDMA** LOWER BANDEDGE - DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. INTERMODULATION CHARACTERISTICS - CDMA Data Plot Page 2 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 300 kHz Mixer -10 dBm 20 dBm SWT 500 ms Unit dBm 30 dB Offset 10 -10 -10√1_{1 E W}1 3 dBm 1RM -20 -30 -40 -50 -60 -70 -eol Center 894 MHz 1.968 MHz/ 5pan 19.68 MHz ate: 20.JUN.2001 9:13:01 INBAND AND OUT OF BAND INTERMODULATION Notes: **CDMA** UPPER BANDEDGE - DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots - 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. INTERMODULATION CHARACTERISTICS - CDMA **Data Plot** Page 3 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER TRANSMIT Configuration: Ref Lvl VBW 300 kHz Mixer -10 dBm 20 dBm SWT 500 ms Un i t dBm 30 dB Offset -10√1_{1 E W}1 3 dBm 1RM -20 -30 -40 -50 -60 -70 ~8al Center 824 MHz 2 MHz/ Span 20 MHz bate: 20.JUN.2001 9:23:19 Notes: INBAND AND OUT OF BAND INTERMODULATION **CDMA** LOWER BANDEDGE - UPLINK

PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. **Test Plot:** INTERMODULATION CHARACTERISTICS - CDMA Page 4 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 300 KHZ Mixer -10 dBm 500 ms Unit dBm 30 dB Offset _1D/1_{1 E 1/}1 3 dBm-1RM -20 -30 M -40 -50 -60 _aol Center 849 MHz 2 MHz/ Span 20 MHz 20.JUN.2001 9:20:13 Notes: INBAND AND OUT OF BAND INTERMODULATION **CDMA** UPPER BANDEDGE - UPLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc. Data Plot **SPURIOUS EMISSIONS - CONDUCTED** Complete X Page <u>1</u> of <u>4</u> Job No.: 1L0084R Date: 6/20/01 Preliminary_ Specification: PART22 Temperature(°C): 22 Relative Humidity(%) 50 Tested By: David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT FULL POWER Sample Number: Location: Lab 1 RBW: Refer to plots Measurement Detector Type: Peak VBW: Refer to plots Distance: N/A Test Equipment Used Antenna: Directional Coupler: Pre-Amp: Cable #1: Filter: Cable #2: 1036 Cable #3: Receiver: Cable #4: Attenuator #2: Mixer: Additional equipment used: Measurement Uncertainty: aВ Ref Lvl VBW 100 kHz Mixer -10 dBm 35 dBm 5WT 245 ms Unît dBm 30 dB Offset 30 20 10 1 V I E W 1 MA -D1 -13 dBm -30 handlernhadden word handre wednes was been for the formation of the word of the word of the word of the formation of the word -50 -60 Center 515 MHz 97 MHz/ 5pan 970 MHz 20.JUN.2001 15:29:41 ate: Notes: TDMA MODULATION UPLINK

PROJECT NO.: 1L0084RUS1

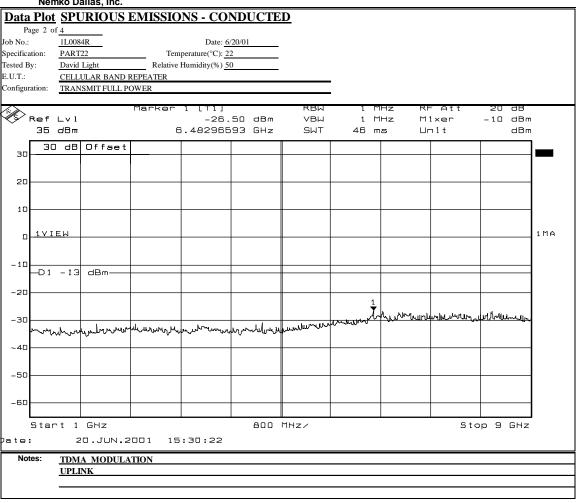
Plots - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc.



PROJECT NO.: 1L0084RUS1

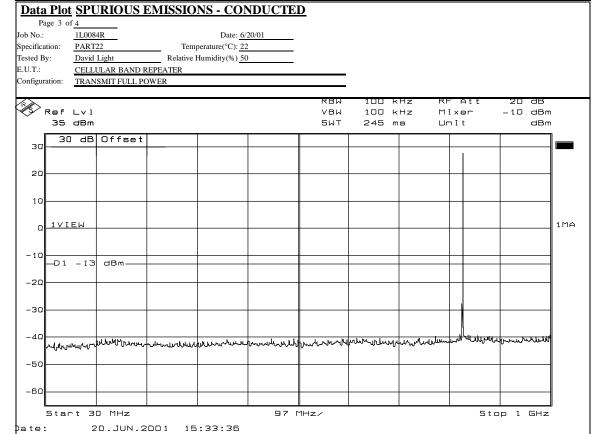
Plots – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc.



Notes: TDMA MODULATION
DOWNLINK

Page 40 of 40

PROJECT NO.: 1L0084RUS1

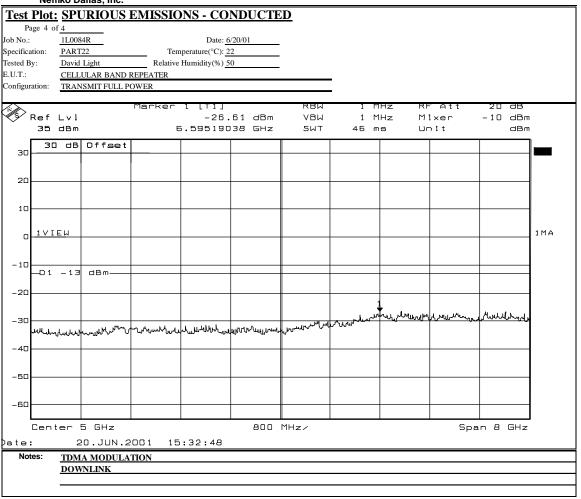
Plots - Spurious Emissions at Antenna Terminals



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PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot INTERMODULATION CHARACTERISTICS - TDMA Page <u>1</u> of <u>4</u> Complete 1L0084R Date: 6/20/01 Job No.: Preliminary_ Specification: PART 22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Rms VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: dВ Ref Lvl VBW 2 kHz Mixer -10 dBm 30 dBm SWT 6.4 s Unit 30 dB Offset 20 10 1MA 1 V I E W - 10 -20 -30 -4n -50 Lither Maniph -60 thoughpus ^{ՄՆ}ԽՎՄՎԱՆԸ^Մ Janpanja, المسالها Center 869 MHz Span 10 MHz 20.JUN.2001 13:59:50 bate: INBAND AND OUT OF BAND INTERMODULATION TDMA LOWER BANDEDGE - DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. INTERMODULATION CHARACTERISTICS - TDMA Data Plot Page 2 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 2 kHz Mixer -10 dBm 30 dBm 6.4 s Un 1 t 30 dB Offset 20 10 1 V I E W 1MA -D1 -13 dBm -20 -30 -40 -50 -60 MANAPARAMAPY Center 894 MHz 1 MHz/ Span 10 MHz 20.JUN.2001 14:01:57 late: Notes: INBAND AND OUT OF BAND INTERMODULATION TDMA UPPER BANDEDGE - DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. INTERMODULATION CHARACTERISTICS - TDMA **Data Plot** Page 3 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 2 kHz Mixer -10 dBm 30 dBm 6.4 s Unît 30 dB Offset 20 10 1 V I E W 1 M A -20 -30 -40 -50 Mander of the second of the se 4 hours -60 walnully havelie -70 myporughty horosoft Center 824 MHz 1 MHz/ Span 10 MHz 20.JUN.2001 13:56:00 Notes: INBAND AND OUT OF BAND INTERMODULATION TDMA LOWER BANDEDGE - UPLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. Test Plot: INTERMODULATION CHARACTERISTICS - TDMA Page 4 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 2 kHz Mixer -10 dBm 30 dBm 6.4 s 30 dB Offset 20 1 🗆 1 V I E W 1MA -20 -30 -40 -50 -60 turbolomoral bulocultorportelle homeword MANUMALAMAN Center 849 MHz 1 MHz/ Span 10 MHz 20.JUN.2001 13:54:11 Notes: INBAND AND OUT OF BAND INTERMODULATION TDMA UPPER BANDEDGE - UPLINK

PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc. Data Plot SPURIOUS EMISSIONS - ANALOG Page <u>1</u> of <u>6</u> Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Temperature(°C): 22 Specification: PART22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT FULL POWER Sample Number: 1 RBW: Refer to plots Detector Type: Peak VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-1.7 dB Measurement Uncertainty: R RI. Ref Lvl 29.92 dBm VBW 100 kHz Mixer -10 dBm 824.49958511 MHz 245 ms 30 dB Offset IVIEW 1MA -D1 -13 -30 my hours for the support of the supp -50 -60 Start 30 MHz 97 MHz/ Stop 1 GHz 20.JUN.2001 14:53:19 VOICE MODULATION UPLINK

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

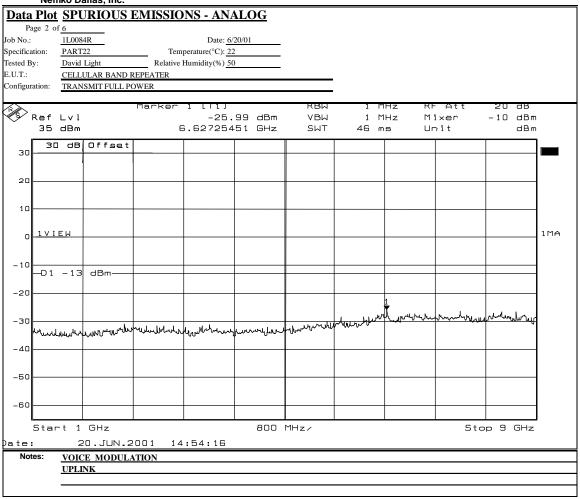
Plots – Spurious Emissions at Antenna Terminals



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Nemko Dallas, Inc.



FCC PART 22, SUBPART H **CELLULAR BAND REPEATERS**

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



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

	Nem	iko Da	allas, Inc.									
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ob No.:		1L008	4R		Date: 6	/20/01						
pecificat	ion:	PART		Tem	perature(°C): 2							
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PROJECT NO.: 1L0084RUS1

Plots – 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. Test Plot: SPURIOUS EMISSIONS - ANALOG Page 4 of 6 Job No.: 1L0084R Date: 6/20/01 Specification: PART22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER TRANSMIT FULL POWER Configuration: Ref Lvl -25.64 dBm VBW 1 MHz Mixer -10 dBm 35 dBm 7.81362725 GHz SWT 46 ms Unit dBm 30 dB Offset 20 10 1 V I E W 1 MA -D1 -13 -20 -30 Luce many work who was a second of the secon -50 -60 Stop 9 GHz Start 1 GHz 800 MHz/ bate: 20.JUN.2001 14:58:12 Notes: VOICE MODULATION DOWNLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



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

Nemko Dallas, Inc. Data Plot INTERMODULATION CHARACTERISTICS - AMPS Page <u>1</u> of <u>4</u> Complete 1L0084R Date: 6/20/01 Job No.: Preliminary Specification: PART 22 Temperature(°C): 22 Tested By: David Light Relative Humidity(%) 50 E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Sample Number: 1 RBW: Refer to plots Detector Type: Rms VBW: Refer to plots Distance: N/A Test Equipment Used Directional Coupler: Pre-Amp: Cable #1: Cable #2: Filter: Receiver: Cable #3: Attenuator #1 1064 Cable #4: Attenuator #2: Mixer: Additional equipment used: +/-3.6 dB Measurement Uncertainty: R BL Ref Lvl -66.25 dBm VBW 2 kHz Mixer -10 dBm 30 dBm 874.00000000 MHz SWT 6.4 s 30 dB Offset 1 V I EW 1 MA -D1 -13 -30 -50 -60 Lundy Mander Mary Thurst of the property of the Center 869 MHz 20.JUN.2001 14:19:51 Date: INBAND AND OUT OF BAND INTERMODULATION AMPS LOWER BANDEDGE - DOWNLINK

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

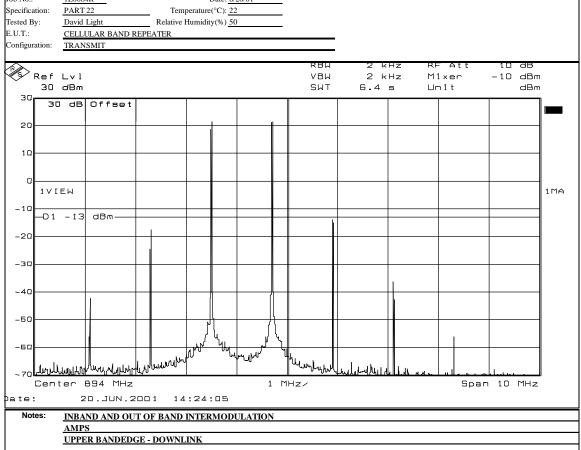
802 N. Kealy Lewisville, TX 75057 Tel: (972) 436-9600 Fax: (972) 436-2667

 Nemko Dallas, Inc.

 Data Plot
 INTERMODULATION CHARACTERISTICS - AMPS

 Page 2 of 4
 Job No.:
 1L0084R
 Date: 6/20/01

 Specification:
 PART 22
 Temperature(°C): 22



PROJECT NO.: 1L0084RUS1

Plots - Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. INTERMODULATION CHARACTERISTICS - AMPS **Data Plot** Page 3 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 2 kHz Mixer -10 dBm SWT 6.4 s Unit dBm 30 dB Offset 20 10 1 Y I E W 1MA -10 -D1 −13 dBm--20 -30 -40 -50 -60 landoraphy down a felicia Lulundhohi Mrdhrand Mhallan Handron Center 824 MHz Span 10 MHz bate: 20.JUN.2001 14:32:19 Notes: INBAND AND OUT OF BAND INTERMODULATION **AMPS** LOWER BANDEDGE - UPLINK

PROJECT NO.: 1L0084RUS1

Plots – Spurious Emissions at Antenna Terminals



Dallas Headquarters:

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

Nemko Dallas, Inc. Test Plot: INTERMODULATION CHARACTERISTICS - AMPS Page 4 of 4 Job No.: 1L0084R Date: 6/20/01 Specification: PART 22 Temperature(°C): 22 Tested By: Relative Humidity(%) 50 David Light E.U.T.: CELLULAR BAND REPEATER Configuration: TRANSMIT Ref Lvl VBW 2 kHz Mixer -10 dBm SWT 6.4 s Unit dBm 30 dB Offset 20 10 1 V I E W 1 MA -10 -D1 −13 dBm--20 -30 ~40 -50 Center 849 Mills 1 MHz/ Span 10 MHz 20.JUN.2001 14:28:25 Notes: INBAND AND OUT OF BAND INTERMODULATION **AMPS** UPPER BANDEDGE - UPLINK

Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

Section 6. Field Strength of Spurious

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

TESTED BY: David LightTom Tidwell DATE:6/20/01

Test Results: Complies.

Test Data: See attached table.

Equipment Used: 1464-1484-1485-993-1016

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 50 %

PROJECT NO.: 1L0084RUS1

Test Data – Field Strength of Spurious Emissions



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

			Fie	eld St	rength of S	purious !	Emissions			
Page 1 o	f 1		. <u></u>					Complete	X	_
Job No.:	1L0084R			Date: 6/	20/01			Preliminary		•
Specification:	PART 22		Temperatur	re(°C): 22	!					
Tested By:	David Light		Relative Humid	ity(%) 50)					
E.U.T.:	CELLULAI	R BAND REPEA	TER				_			
Configuration:	TRANSMIT	FULL POWER					=" =			
Sample No:	1									
Location:	AC 3				RBW:	1 MHz	_	Measurement		
Detector Type:	Peak				VBW:	1 MHz	=	Distance:	3	m
Test Equipm	ent Used									
Antenna:				Dire	ctional Coupler:		_			
Pre-Amp:	1016				Cable #1:	1484	_			
Filter:					Cable #2:	1485	_			
Receiver:	1464				Cable #3:		_			
Attenuator #1					Cable #4:		=" =			
Attenuator #2:					Mixer:		_			
Additional equip	ment used:						_			
Measurement Ur	ncertainty:	+/-1.76 dB								
Frequency	Meter	Correction	Pre-	Amp	Substitution		ERP	ERP	Polarity	Comments

Frequency	Meter Reading	Correction Factor	Pre-Amp Gain	Substitution Antenna Gain	ERP	ERP	Polarity	Comments
(MHz)	(dBm)	(dB)	(dB)	(dBd)	(dBm)	(mW)		
								Downlink (875 MHz
1750	-61.3	29.9	31.7	6.4	-56.8	0.000002	V	
2625	-69.3	35.6	32.5	8.0	-58.3	0.000001	V	
3500	-70.0	40.4	32	8.0	-53.6	0.000004	V	Noise floor
4375	-71.5	42.8	31.4	7.9	-52.2	0.000006	V	Noise floor
1750	-66.5	32.7	31.7	6.4	-59.2	0.000001	Н	
2625	-69.7	34.6	32.5	8.0	-59.6	0.000001	Н	Noise floor
3500	-70.0	34.3	32	8.0	-59.7	0.000001	Н	Noise floor
4375	-71.5	35.2	31.4	7.9	-59.8	0.000001	Н	Noise floor
								Uplink (830 MHz)
1660	-70.2	32.7	31.5	6.4	-62.7	0.000001	Н	Noise floor
2490	-69.8	36.7	32.2	6.9	-58.5	0.000001	Н	Noise floor
3320	-70.3	35.8	32.4	8.1	-58.8	0.000001	Н	Noise floor
4150	-72.0	35.2	31.4	7.9	-60.3	0.000001	Н	Noise floor
1660	-70.2	29.9	31.5	6.4	-65.5	0.000000	V	Noise floor
2490	-69.8	34.1	32.2	6.9	-61.1	0.000001	V	Noise floor
3320	-70.3	37.1	32.4	8.1	-57.5	0.000002	V	Noise floor
4150	-72.0	42.8	31.4	7.9	-52.7	0.000005	V	Noise floor
Notes:	SCANNEI	D SPECTRUM	TO THE TENTH H	ARMONIC OF (CARRIER FREQUENCY			•

PROJECT NO.: 1L0084RUS1

Photos – Test Setup

Front



Rear



PROJECT NO.: 1L0084RUS1

Section 7. **Frequency Stability**

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

TESTED BY: Tom Tidwell DATE:

Complies. **Test Results:**

See attached table. **Test Data:**

table.
Tologic Call WiHz

 $+/-1 \times 10^{-7}$ ppm **Measurement Uncertainty:**

Temperature: °C

Equipmer

% **Relative Humidity:**

PROJECT NO.: 1L0084RUS1

Section 8. Test Equipment List

ASSET	Description	Manufacturer Model Number	Serial Number	Cal. Date	Cal. Due
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/02/02
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/99	07/16/01
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01	05/30/02
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	05/25/00	05/25/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01	06/01/02
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1083	Cable 2m	Astrolab 32027-2-29094-72TC	N/A	06/01/01	06/01/02
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99	06/14/01
1029	PEAK POWER METER	HP 8900D	3303U0012	03/12/01	03/12/02
1030	PEAK POWER SENSOR	HP 84811A	2539A03573	03/12/01	03/12/02

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

ANNEX A - TEST DETAILS

PROJECT NO.: 1L0084RUS1

PARA. NO.: 2.1046

NAME OF TEST: RF Power Output

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: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

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.

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FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

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: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

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

Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

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

Nemko Dallas

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

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

PROJECT NO.: 1L0084RUS1

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.

Calculation Of Field Strength Limit:

An example of attenuation requirement of 43 + 10 Log P is equivalent to -13 dBm (5 x 10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions ≤ 1 GHz:

G = 1.64 (Dipole Gain)

 $P = 10^{-5}$ Watts (Maximum spurious output power)

R = 3m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$E = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V/m} = 84.4 \text{ dB} \text{mV/m}$$

For emissions > 1 GHz:

G = 1 (Isotropic Gain)

P = 1 x 10⁻⁵ Watts (Maximum spurious output power)

R = 3m (Measurement Distance)

$$E = 84.4 - 20 Log \sqrt{1.64} = 82.3 dBmV / m@3m$$

The spectrum is searched to 10 GHz.

FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

PROJECT NO.: 1L0084RUS1

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.

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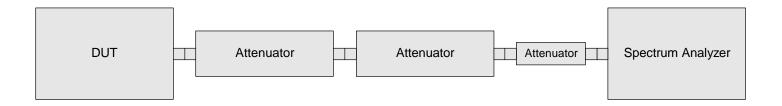
FCC PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: WER 824A AMPS Repeater

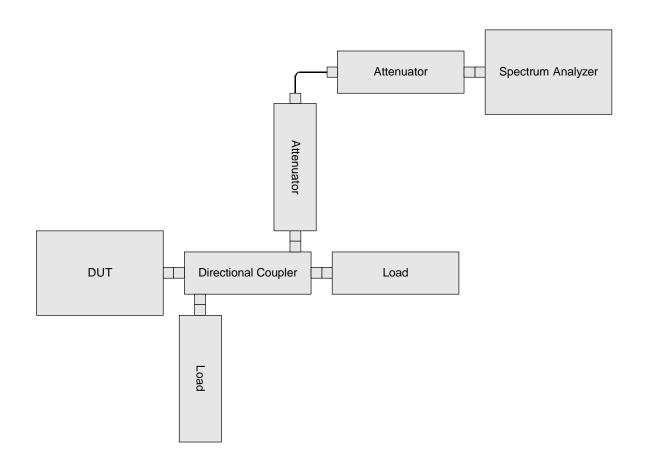
PROJECT NO.: 1L0084RUS1

ANNEX B - TEST DIAGRAMS

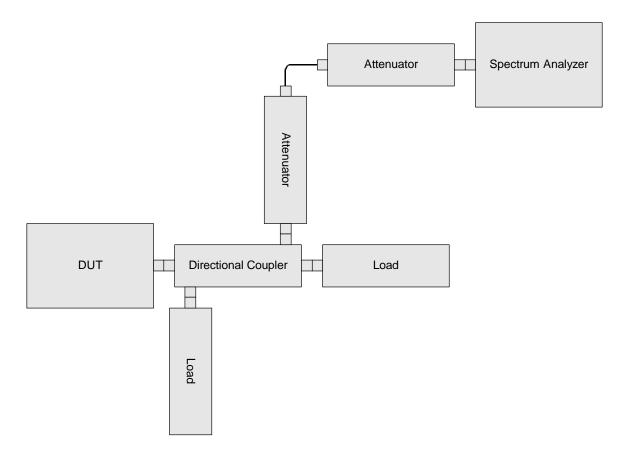
Para. No. 2.1046 - R.F. Power Output

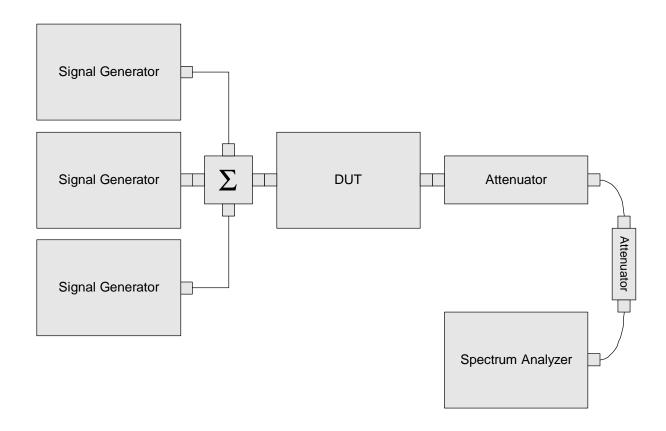


Para. No. 2.1049 - Occupied Bandwidth

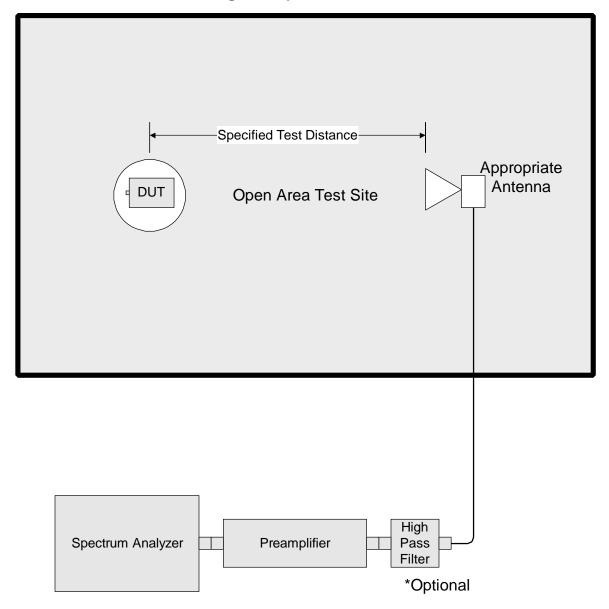


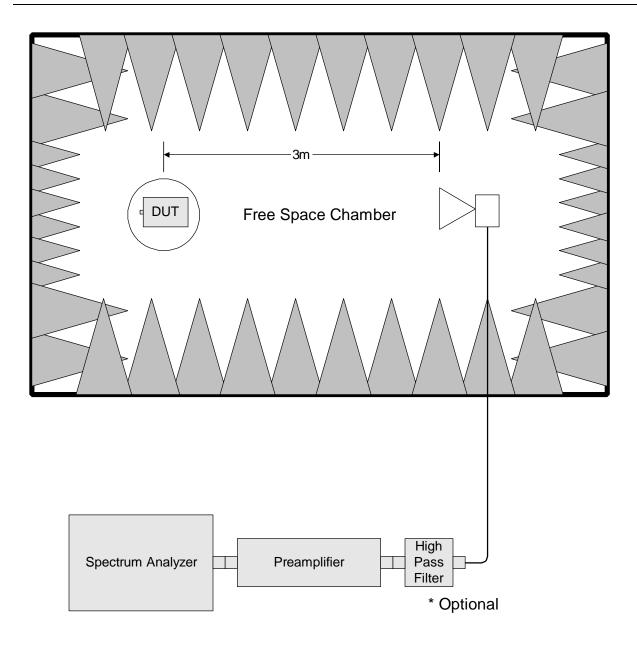
Para. No. 2.1051 Spurious Emissions at Antenna Terminals





Para. No. 2.1053 - Field Strength of Spurious Radiation





PROJECT NO.: 1L0084RUS1

Para. No. 2.1055 - Frequency Stability

