

Nemko Test Report: 1L0616RUS1

Applicant: Remec/Waycom
3238 Southern Drive, Suite 303
Garland, TX 75043

**Equipment Under Test:
(E.U.T.)** EPUMA EDGE 850

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, Wireless Group Manager

Date: 11/14/01

Total Number of Pages: 55

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 1. Summary of Test Results

Manufacturer: Remec/Waycom

Model No.: EPUMA EDGE 850

Sample No.: S01

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 LAB CODE: 100426-0

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Summary Of Test Data

RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask	Complies
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask	Complies
Occupied Bandwidth (Digital)	22.917(d)	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	N/A

Footnotes: The device is an F1-F1 repeater, therefore this parameter was not tested. There is no frequency translation performed within the device.

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

EQUIPMENT: EPUMA EDGE 850

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Section 2. General Equipment Specification

Supply Voltage Input:	+12 Vdc		
Frequency Range:	Downlink:	869 – 894 MHz	
Frequency Range:	Uplink:	824 – 849 MHz Note-This repeater has active components for uplink only.	
	CDMA (F9W)	GSM (GXW)	NADC (DXW)
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	CDPD (F9W)	AMPS (F8W, F1D)	
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Output Impedance:	50 ohms		
Frequency Translation:	F1-F1	F1-F2	N/A
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Software	Duplexer Change	Fullband Coverage
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

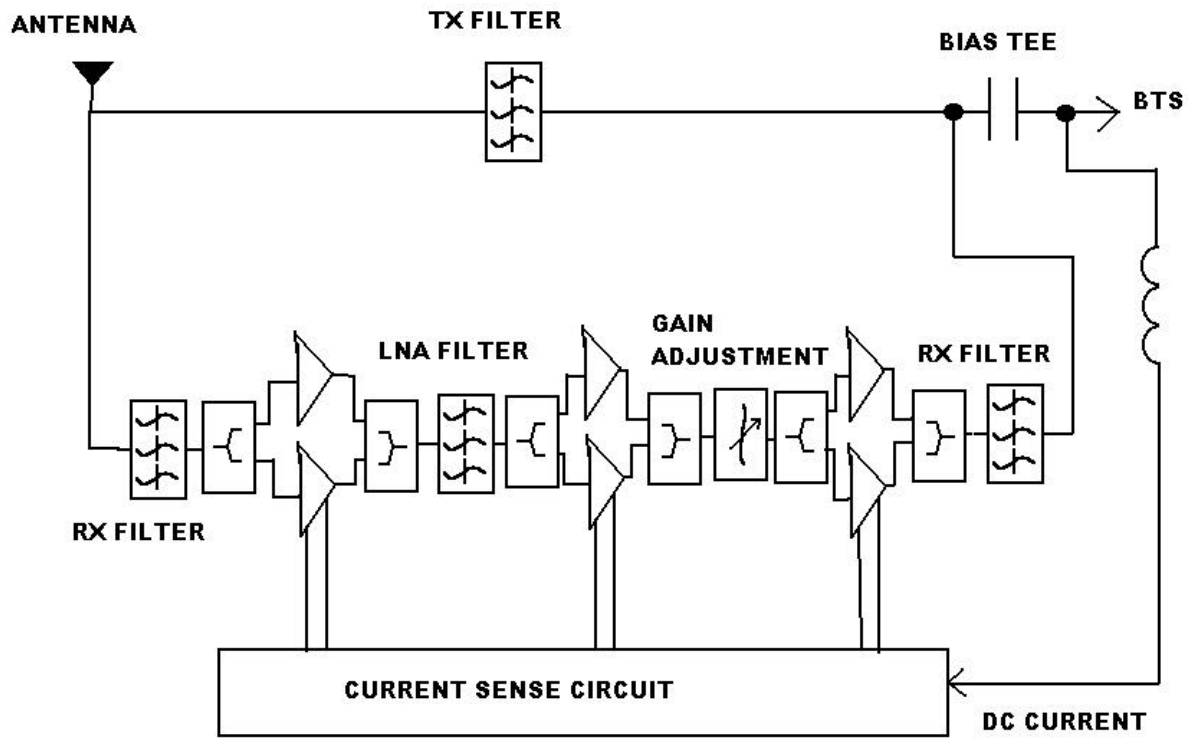
EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Description of Operation

The device is a repeater operating in the uplink spectrum of the AMPS band.

System Diagram



EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 11/8/2001

Test Results: Complies.

Test Data:

	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Uplink	AMPS	22.3 (Single channel)	21.0 (Two Channels@18.0 dBm ea.)
Downlink	AMPS	N/A	N/A
Uplink	CDMA	20.1 (Single channel)	21.7 (Two Channels@18.7 dBm ea.)
Downlink	CDMA	N/A	N/A
Uplink	NADC	21.2 (Single channel)	19.2 (Two Channels@16.2 dBm ea.)
Downlink	NADC	N/A	N/A

Power output was tested at +/- 10% of nominal with no change in output.

Measurement Uncertainty: +/- 0.6 dB

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 11/8/2001

Test Results: Complies.

Test Data: See attached plots

Measurement Uncertainty: +/- 1.7 dB

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Test Data – Occupied Bandwidth



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Fax: (972) 436-2667

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Data Plot		Occupied Bandwidth - Voice & SAT															
Page 1 of 4		Complete <u> X </u>															
Job No.:	1L0616R	Date:	11/8/2001														
Specification:	PT 22	Temperature(°C):	22														
Tested By:	David Light	Relative Humidity(%)	45														
E.U.T.:	REPEATER																
Configuration:	TYPICAL																
Sample Number:	1																
Location:	Lab 1	RBW:	Refer to plots														
Detector Type:	Peak	VBW:	Refer to plots														
Test Equipment Used																	
Antenna:		Directional Coupler:															
Pre-Amp:		Cable #1:	1626														
Filter:		Cable #2:															
Receiver:	1036	Cable #3:															
Attenuator #1:	1604	Cable #4:															
Attenuator #2:		Mixer:															
Additional equipment used:																	
Measurement Uncertainty:	+/-1.7 dB																
<table border="1"> <tr> <td>Ref Lvl</td> <td>30 dBm</td> </tr> </table>		Ref Lvl	30 dBm	<table border="1"> <tr> <td>RBW</td> <td>300 Hz</td> <td>RF Att</td> <td>30 dB</td> </tr> <tr> <td>VBW</td> <td>300 Hz</td> <td>Mixer</td> <td>-10 dBm</td> </tr> <tr> <td>SWT</td> <td>5.6 s</td> <td>Unit</td> <td>dBm</td> </tr> </table>		RBW	300 Hz	RF Att	30 dB	VBW	300 Hz	Mixer	-10 dBm	SWT	5.6 s	Unit	dBm
Ref Lvl	30 dBm																
RBW	300 Hz	RF Att	30 dB														
VBW	300 Hz	Mixer	-10 dBm														
SWT	5.6 s	Unit	dBm														
Date: 8.NOV.2001 11:01:21																	
Notes: <u> OUTPUT </u>																	
<u> UPLINK </u>																	

EQUIPMENT: EPUMA EDGE 850

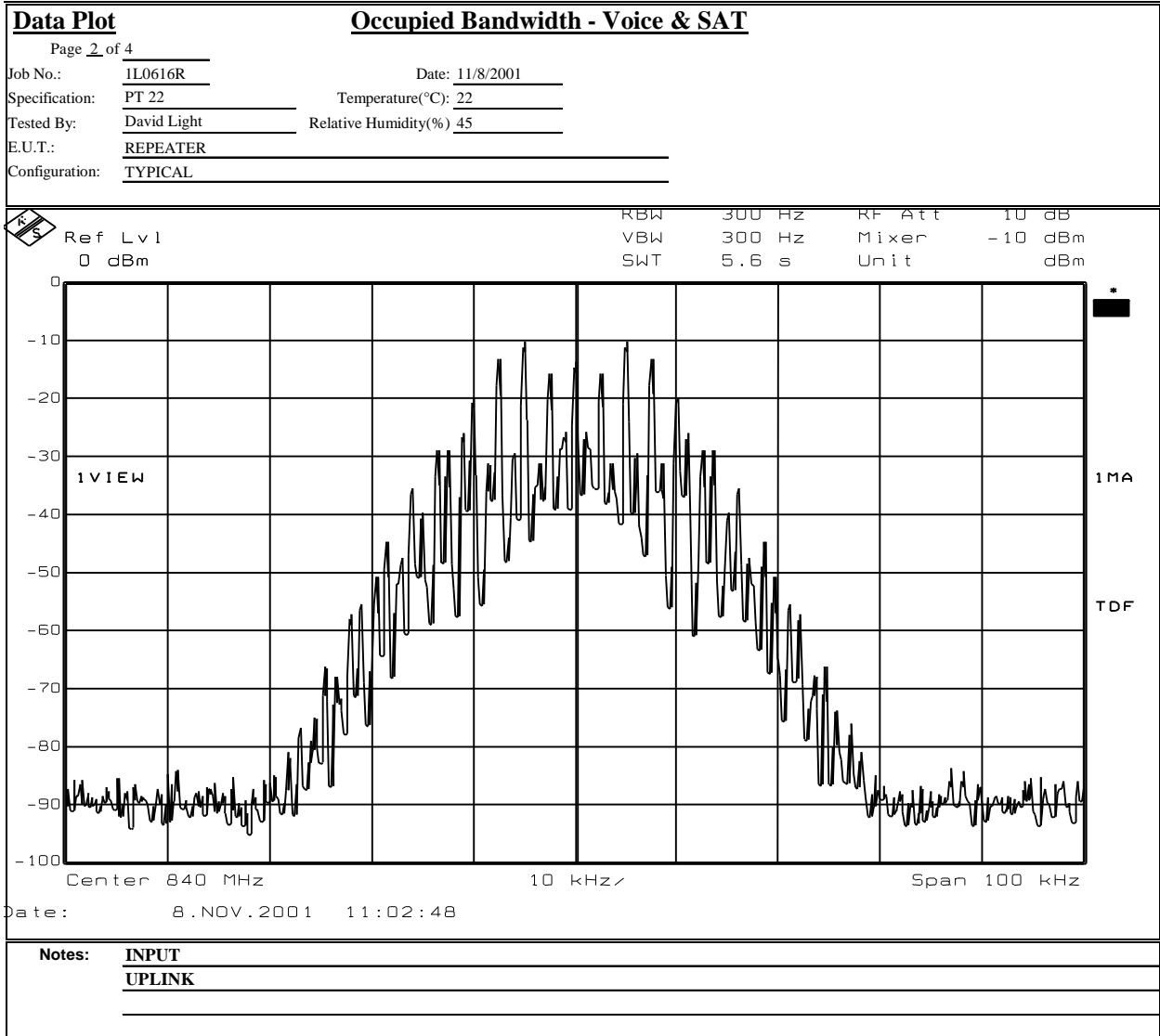
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Test Data – Occupied Bandwidth



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Data Plot		Occupied Bandwidth - Digital	
Page 1 of 4		Complete <input checked="" type="checkbox"/> Preliminary: <input type="checkbox"/>	
Job No.: 1L0616R	Date: 11/8/2001		
Specification: PT 22	Temperature(°C): 22		
Tested By: David Light	Relative Humidity(%): 45		
E.U.T.: REPEATER			
Configuration: TYPICAL			
Sample Number: 1			
Location: Lab 1	RBW: Refer to plots		
Detector Type: Peak	VBW: Refer to plots		
Test Equipment Used			
Antenna: _____	Directional Coupler: _____		
Pre-Amp: _____	Cable #1: 1626		
Filter: _____	Cable #2: _____		
Receiver: 1036	Cable #3: _____		
Attenuator #1: 1604	Cable #4: _____		
Attenuator #2: _____	Mixer: _____		
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			
Ref Lvl 30 dBm		RBW 1 kHz VBW 1 kHz SWT 1.25 s	RF Att 30 dB Mixer -10 dBm Unit dBm
Date: 8.NOV.2001 11:08:27			
Notes: <u>OUTPUT</u> <u>UPLINK</u> <u>2FSK</u>			

EQUIPMENT: EPUMA EDGE 850

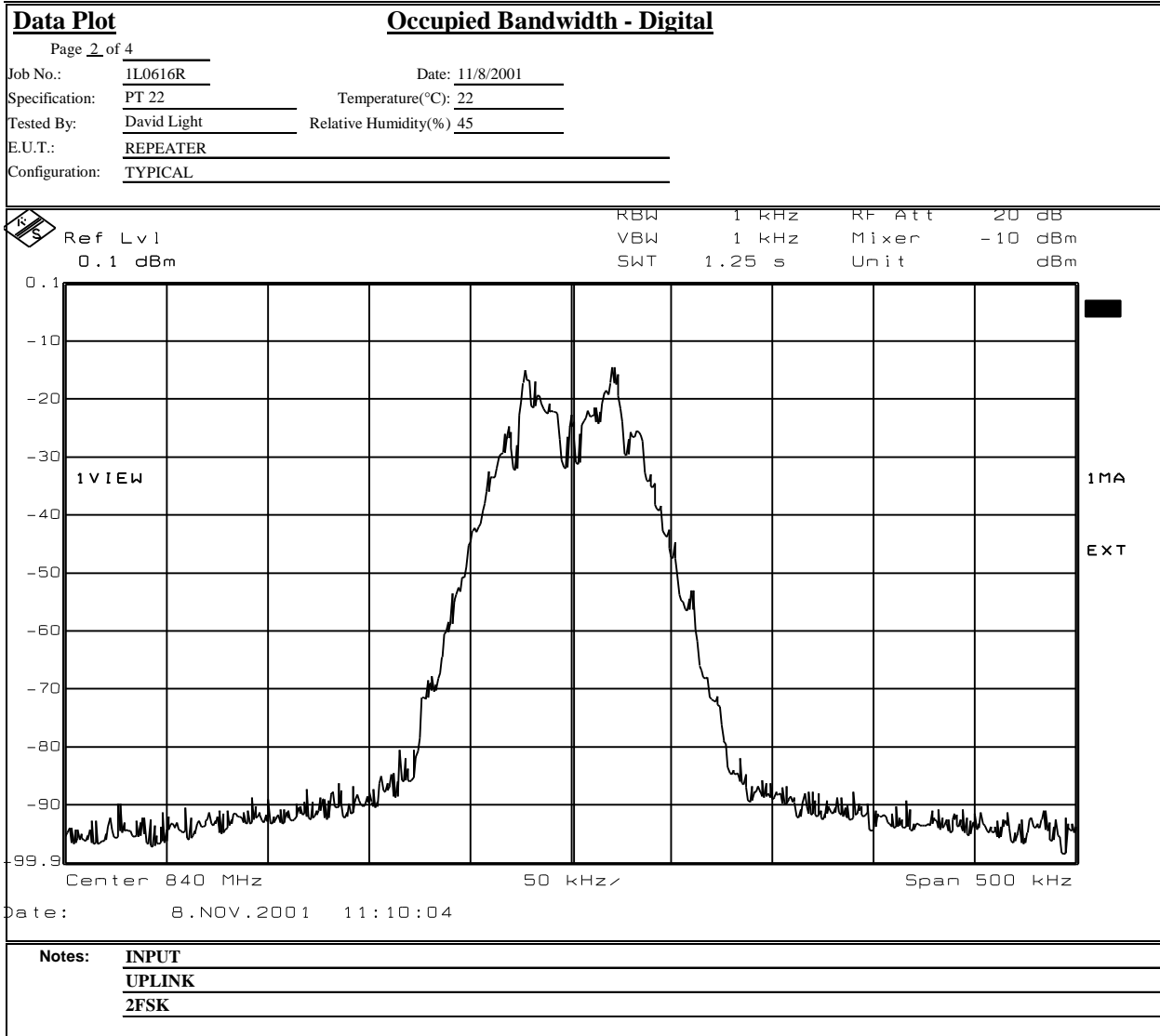
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Test Data – Occupied Bandwidth



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<u>Data Plot</u>		<u>Occupied Bandwidth - NADC</u>																
Page 1 of 4		Complete <u>X</u>																
Job No.: 1L0616R	Date: <u>11/8/2001</u>	Preliminary: _____																
Specification: PT 22	Temperature(°C): <u>22</u>																	
Tested By: <u>David Light</u>	Relative Humidity(%): <u>45</u>																	
E.U.T.: <u>REPEATER</u>																		
Configuration: <u>TYPICAL</u>																		
Sample Number: <u>1</u>																		
Location: <u>Lab 1</u>	RBW: <u>Refer to plots</u>																	
Detector Type: <u>Peak</u>	VBW: <u>Refer to plots</u>																	
Test Equipment Used																		
Antenna: _____	Directional Coupler: _____																	
Pre-Amp: _____	Cable #1: <u>1626</u>																	
Filter: _____	Cable #2: _____																	
Receiver: <u>1036</u>	Cable #3: _____																	
Attenuator #1: <u>1604</u>	Cable #4: _____																	
Attenuator #2: _____	Mixer: _____																	
Additional equipment used: _____																		
Measurement Uncertainty: <u>+/-1.7 dB</u>																		
<table border="1"> <tr> <td>Ref Lvl</td> <td>RBW</td> <td>300 Hz</td> <td>RF Att</td> <td>30 dB</td> </tr> <tr> <td>20 dBm</td> <td>VBW</td> <td>300 Hz</td> <td>Unit</td> <td>dBm</td> </tr> <tr> <td></td> <td>SWT</td> <td>11.5 s</td> <td></td> <td></td> </tr> </table>				Ref Lvl	RBW	300 Hz	RF Att	30 dB	20 dBm	VBW	300 Hz	Unit	dBm		SWT	11.5 s		
Ref Lvl	RBW	300 Hz	RF Att	30 dB														
20 dBm	VBW	300 Hz	Unit	dBm														
	SWT	11.5 s																
<p>19.9 dB Offset</p> <p>VIEW</p> <p>1 MA</p> <p>TDF</p> <p>Center 840 MHz 20 kHz</p> <p>Span 200 kHz</p>																		
Date: 8.NOV.2001 10:44:21																		
Notes: <u>OUTPUT</u>																		
<u>UPLINK</u>																		

EQUIPMENT: EPUMA EDGE 850

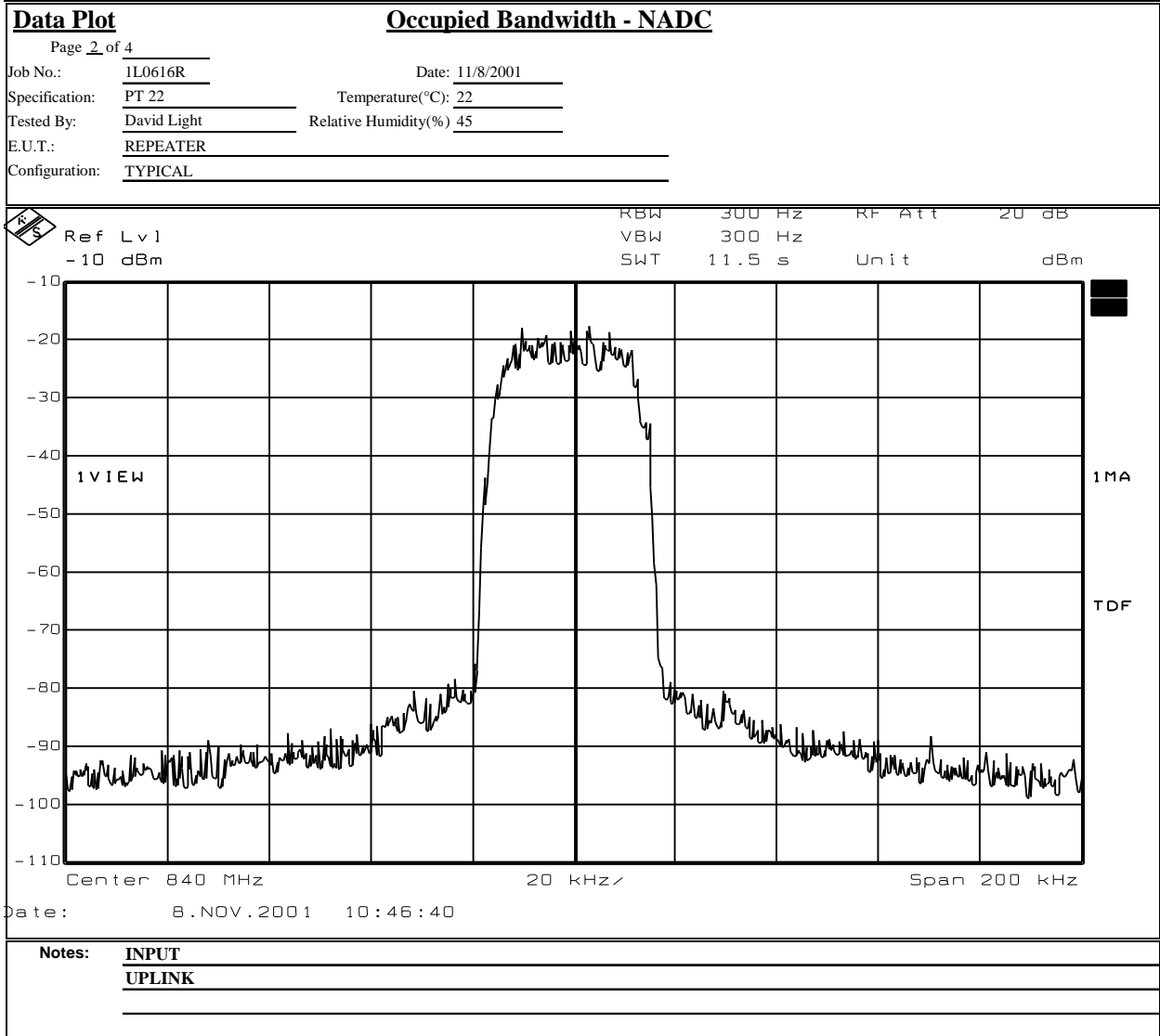
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Test Data – Occupied Bandwidth



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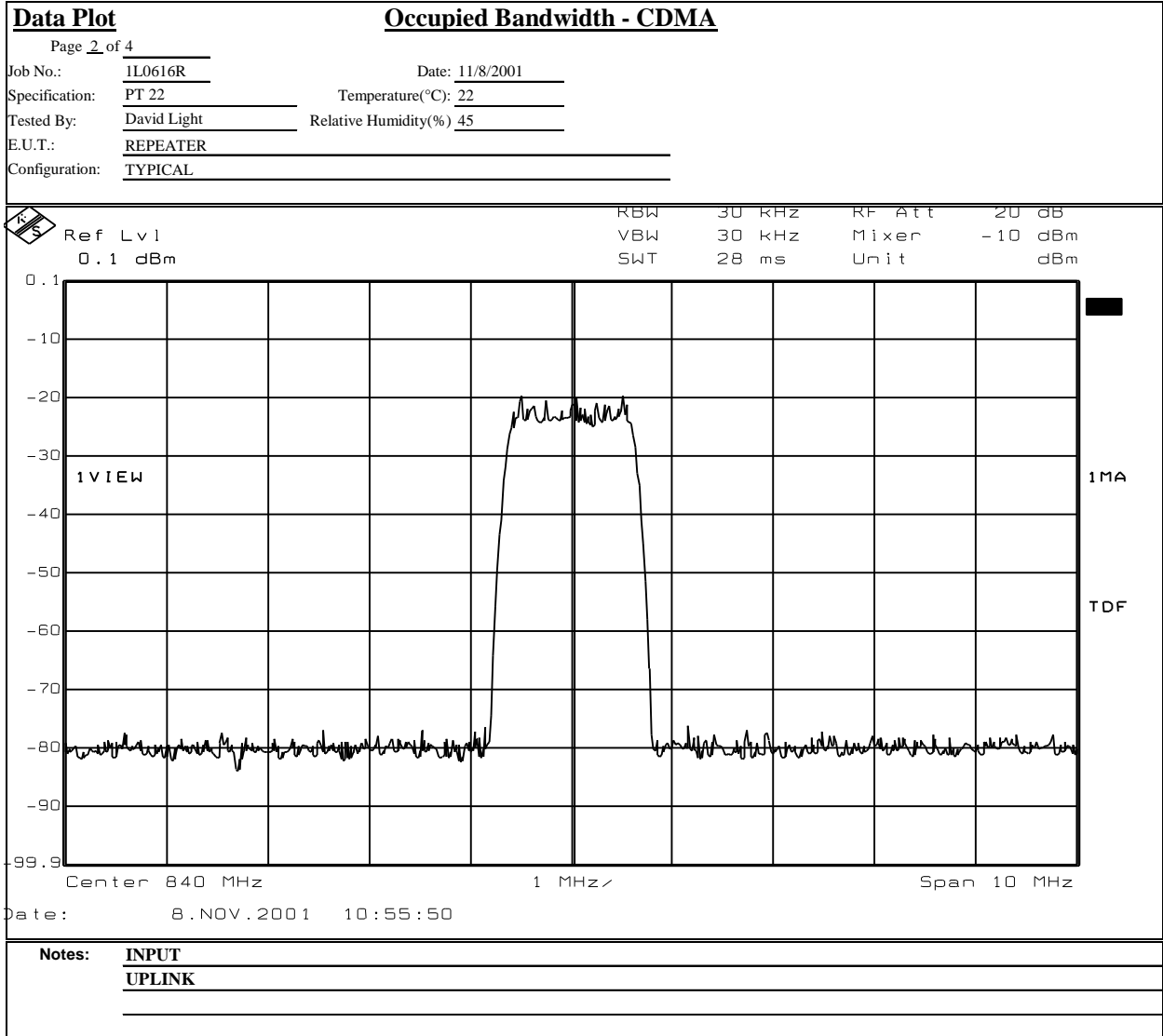
PROJECT NO.: 1L0616RUS1

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EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 11/8/2001

Test Results: Complies.

Test Data: See attached plots

Measurement Uncertainty: +/- 1.6 dB

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals



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Data Plot		Spurious Emissions at Antenna Terminals - Voice																			
Page 1 of 4	Date: 11/8/2001	Complete	X																		
Job No.: 1L0616R	Temperature(°C): 22	Preliminary:																			
Specification: PT 22	Relative Humidity(%): 45																				
Tested By: David Light																					
E.U.T.: REPEATER																					
Configuration: TYPICAL																					
Sample Number: 1																					
Location: Lab 1	RBW: Refer to plots																				
Detector Type: Peak	VBW: Refer to plots																				
Test Equipment Used																					
Antenna:	Directional Coupler:																				
Pre-Amp:	Cable #1: 1626																				
Filter:	Cable #2:																				
Receiver: 1036	Cable #3:																				
Attenuator #1: 1604	Cable #4:																				
Attenuator #2:	Mixer:																				
Additional equipment used:																					
Measurement Uncertainty: +/-1.7 dB																					
<table border="1"> <tr> <td>ExtRef</td> <td>Marker 1 [11]</td> <td>RBW</td> <td>100 kHz</td> <td>RF Att</td> <td>40 dB</td> </tr> <tr> <td>Ref Lvl</td> <td>22.88 dBm</td> <td>VBW</td> <td>100 kHz</td> <td></td> <td></td> </tr> <tr> <td>30 dBm</td> <td>836.71342685 MHz</td> <td>SWT</td> <td>245 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>				ExtRef	Marker 1 [11]	RBW	100 kHz	RF Att	40 dB	Ref Lvl	22.88 dBm	VBW	100 kHz			30 dBm	836.71342685 MHz	SWT	245 ms	Unit	dBm
ExtRef	Marker 1 [11]	RBW	100 kHz	RF Att	40 dB																
Ref Lvl	22.88 dBm	VBW	100 kHz																		
30 dBm	836.71342685 MHz	SWT	245 ms	Unit	dBm																
Date: 8.NOV.2001 12:47:27																					
Notes: Uplink Marker indicates carrier																					

EQUIPMENT: EPUMA EDGE 850

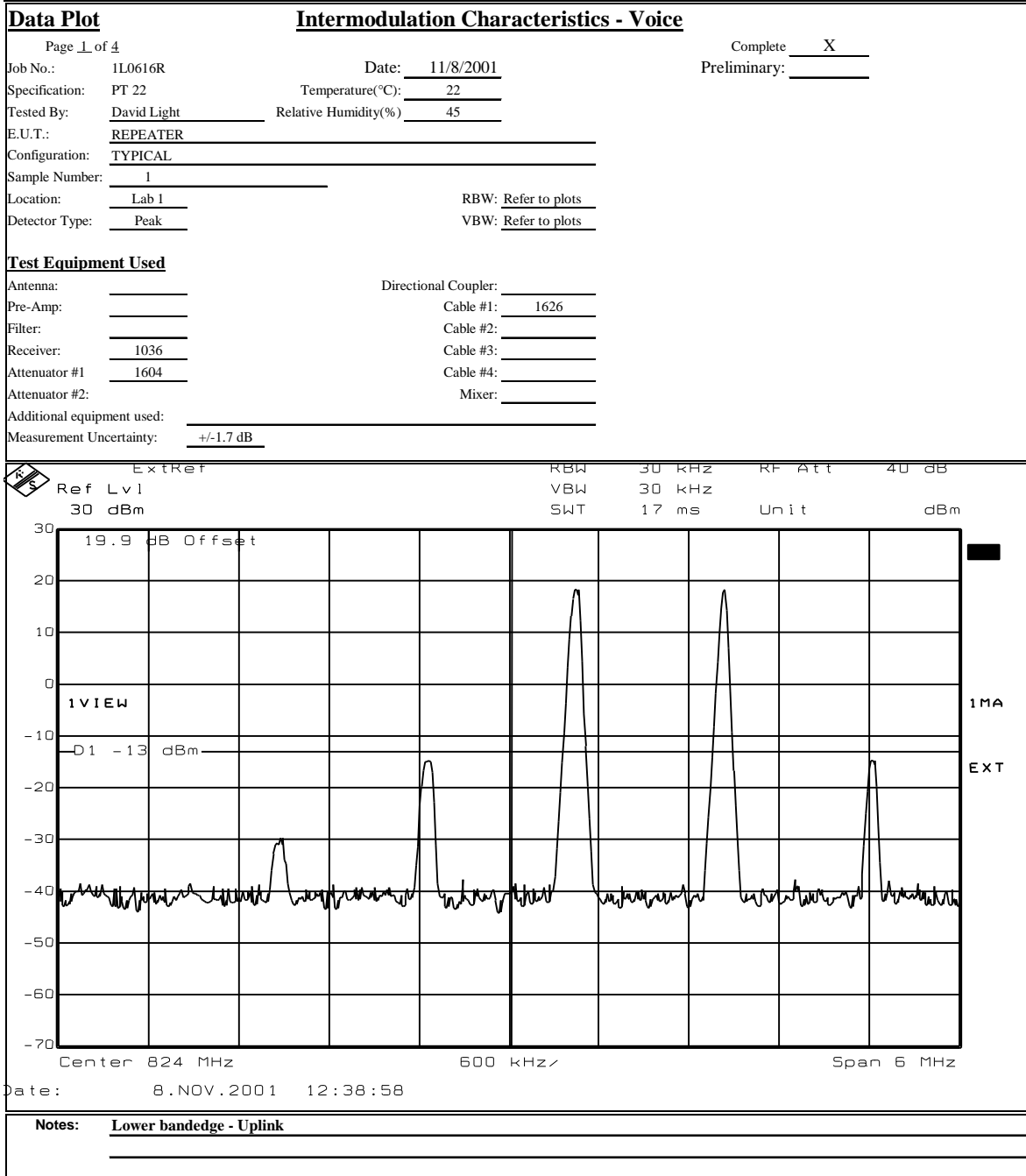
PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals



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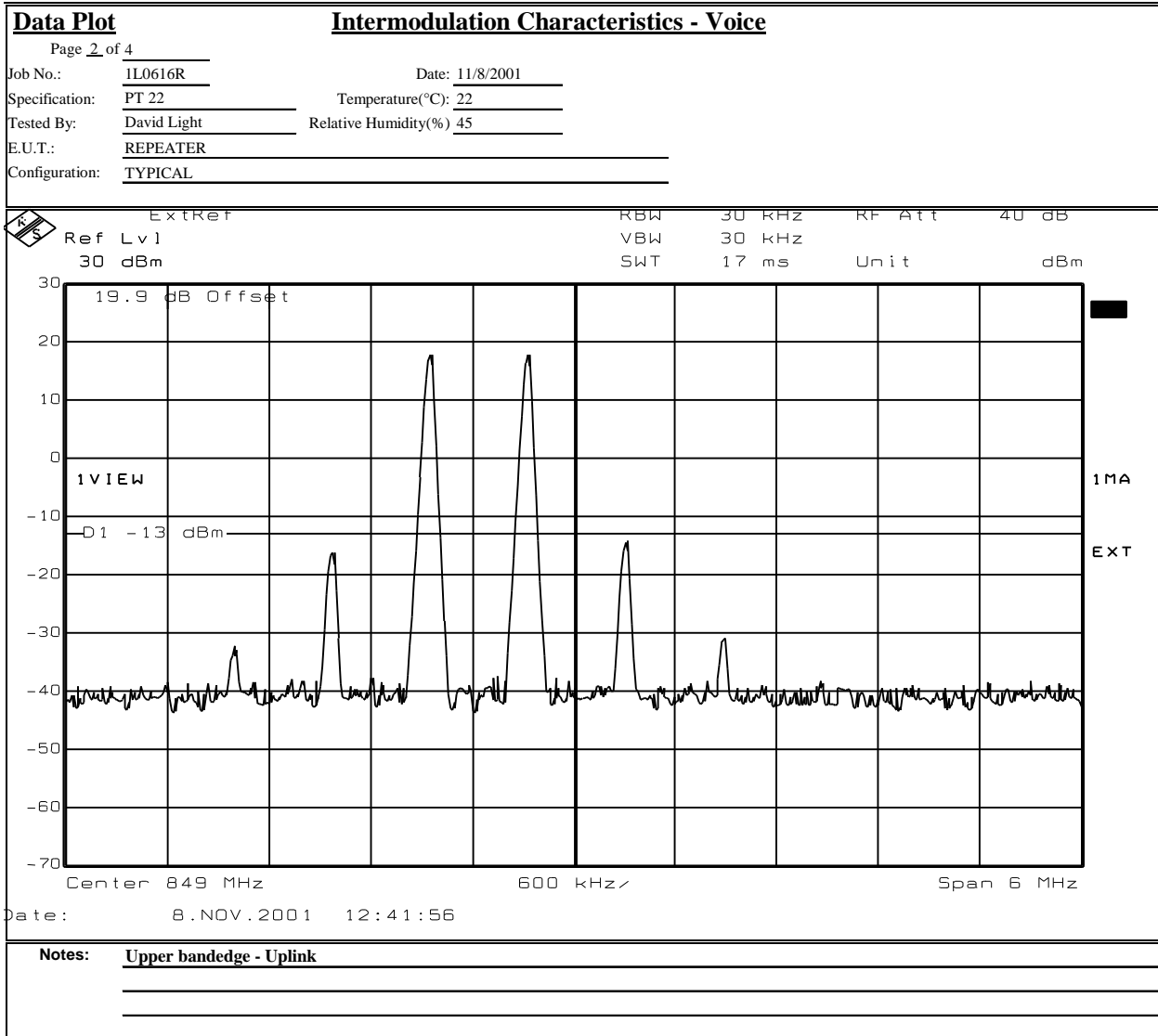
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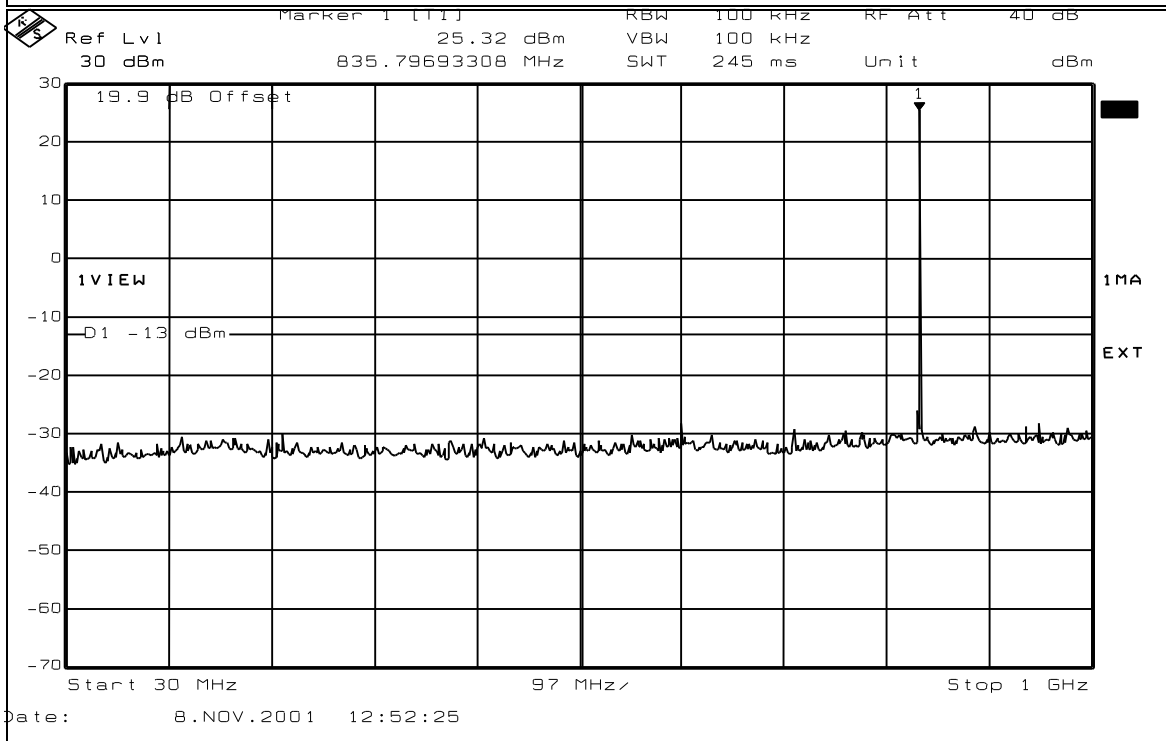
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Data Plot		Spurious Emissions at Antenna Terminals - TDMA	
Page 1 of 4		Date: 11/8/2001	Complete <input checked="" type="checkbox"/>
Job No.: 1L0616R		Temperature(°C): 22	Preliminary: <input type="checkbox"/>
Specification: PT 22		Relative Humidity(%): 45	
Tested By: David Light			
E.U.T.: REPEATER			
Configuration: TYPICAL			
Sample Number: 1			
Location: Lab 1		RBW: Refer to plots	
Detector Type: Peak		VBW: Refer to plots	
Test Equipment Used			
Antenna: _____		Directional Coupler: _____	
Pre-Amp: _____		Cable #1: 1626	
Filter: _____		Cable #2: _____	
Receiver: 1036		Cable #3: _____	
Attenuator #1: 1604		Cable #4: _____	
Attenuator #2: _____		Mixer: _____	
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			



Notes: Uplink
 Marker indicates carrier

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

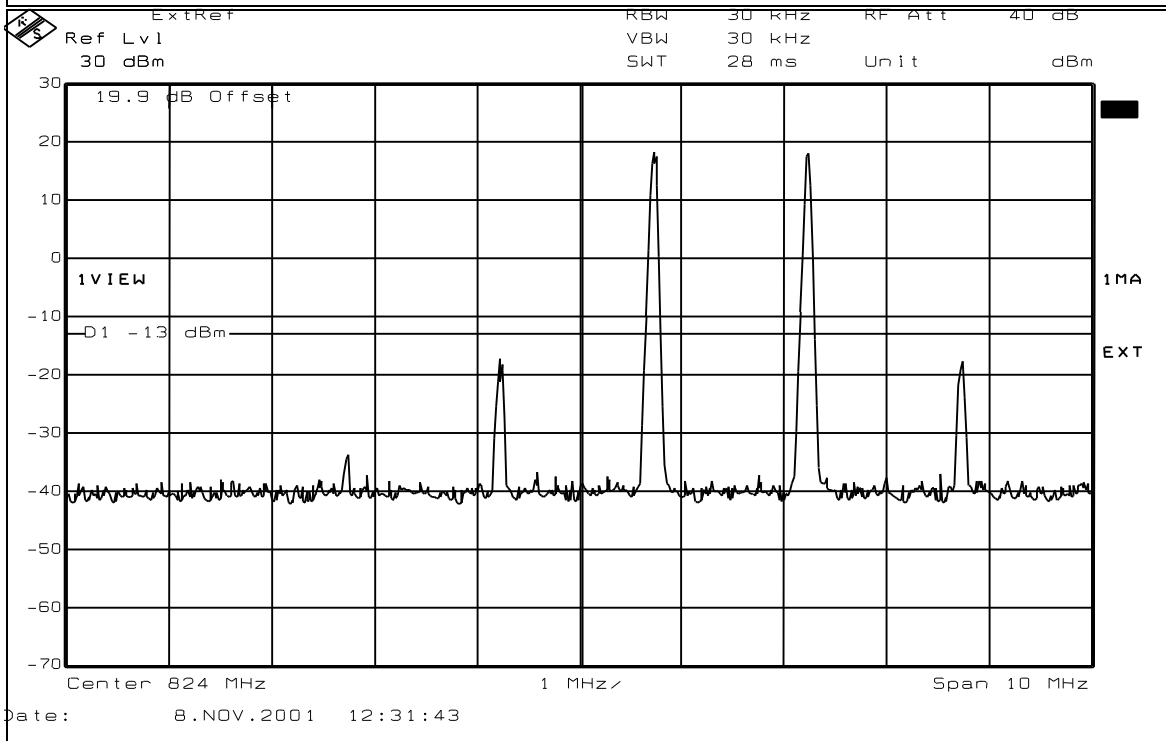
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Data Plot		Intermodulation Characteristics - TDMA	
Page 1 of 4		Date: 11/8/2001	Complete <u>X</u>
Job No.: 1L0616R		Temperature(°C): 22	Preliminary: _____
Specification: PT 22		Relative Humidity(%): 45	
Tested By: David Light			
E.U.T.: REPEATER			
Configuration: TYPICAL			
Sample Number: 1			
Location: Lab 1		RBW: Refer to plots	
Detector Type: Peak		VBW: Refer to plots	
Test Equipment Used			
Antenna: _____		Directional Coupler: _____	
Pre-Amp: _____		Cable #1: 1626	
Filter: _____		Cable #2: _____	
Receiver: 1036		Cable #3: _____	
Attenuator #1: 1604		Cable #4: _____	
Attenuator #2: _____		Mixer: _____	
Additional equipment used: _____			
Measurement Uncertainty: +/-1.7 dB			



Notes: Lower bandedge - Uplink

EQUIPMENT: EPUMA EDGE 850

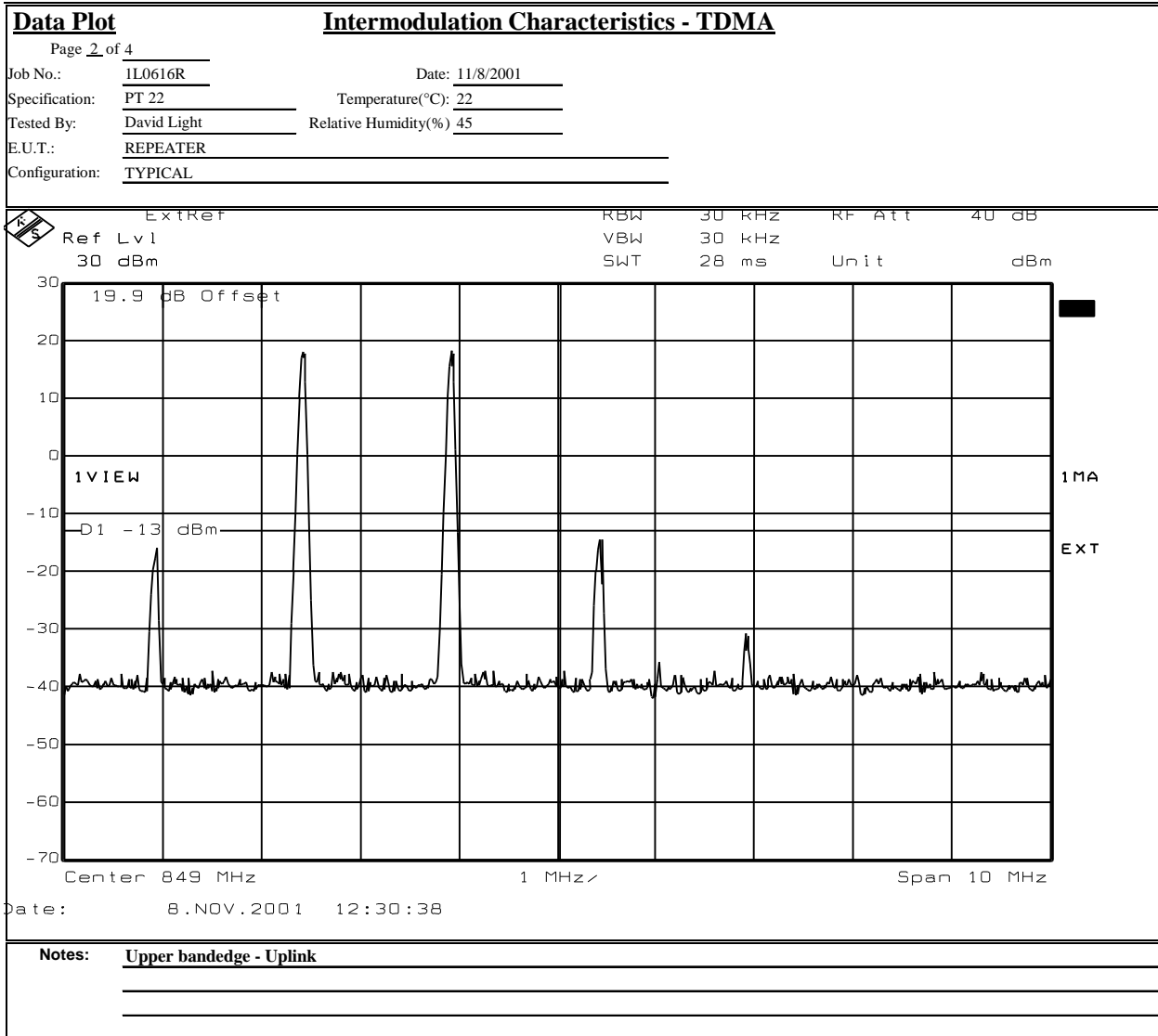
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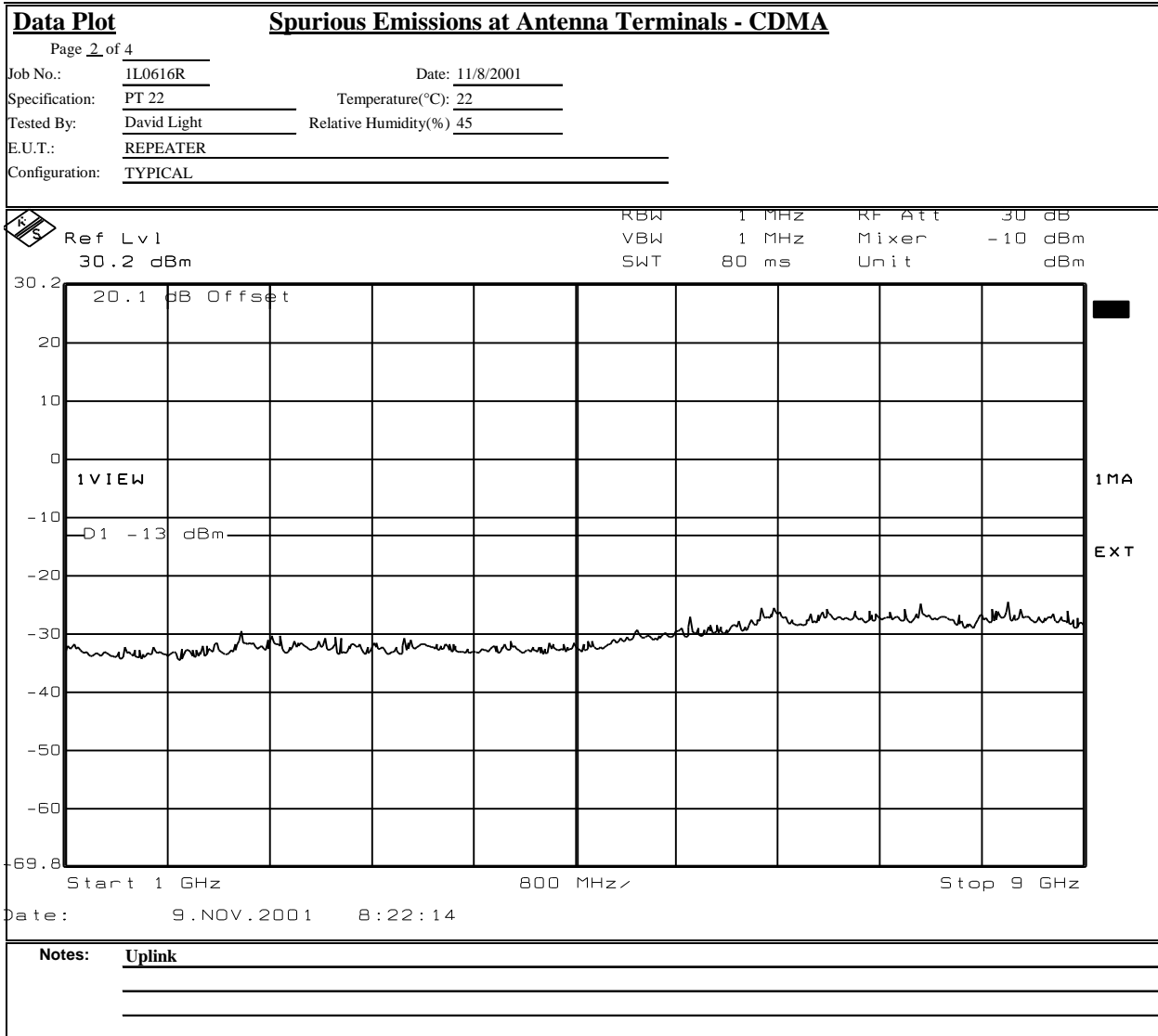
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Data Plot		Intermodulation Characteristics - CDMA																
Page 1 of 4		Date: 11/8/2001	Complete <u>X</u>															
Job No.: 1L0616R		Temperature(°C): 22	Preliminary: _____															
Specification: PT 22		Relative Humidity(%): 45																
Tested By: David Light																		
E.U.T.: REPEATER																		
Configuration: TYPICAL																		
Sample Number: 1		RBW: Refer to plots																
Location: Lab 1		VBW: Refer to plots																
Detector Type: Peak																		
Test Equipment Used																		
Antenna: _____	Directional Coupler: _____																	
Pre-Amp: _____	Cable #1: 1626																	
Filter: _____	Cable #2: _____																	
Receiver: 1036	Cable #3: _____																	
Attenuator #1: 1604	Cable #4: _____																	
Attenuator #2: _____	Mixer: _____																	
Additional equipment used: _____																		
Measurement Uncertainty: +/-1.7 dB																		
<table border="1"> <tr> <td>ExtRef</td> <td>RBW</td> <td>30 kHz</td> <td>RF Att</td> <td>40 dB</td> </tr> <tr> <td>Ref Lvl</td> <td>VBW</td> <td>30 kHz</td> <td></td> <td></td> </tr> <tr> <td>30 dBm</td> <td>SWT</td> <td>56 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>				ExtRef	RBW	30 kHz	RF Att	40 dB	Ref Lvl	VBW	30 kHz			30 dBm	SWT	56 ms	Unit	dBm
ExtRef	RBW	30 kHz	RF Att	40 dB														
Ref Lvl	VBW	30 kHz																
30 dBm	SWT	56 ms	Unit	dBm														
Date: 8.NOV.2001 12:23:24																		
Notes: Lower bandedge - Uplink																		

EQUIPMENT: EPUMA EDGE 850

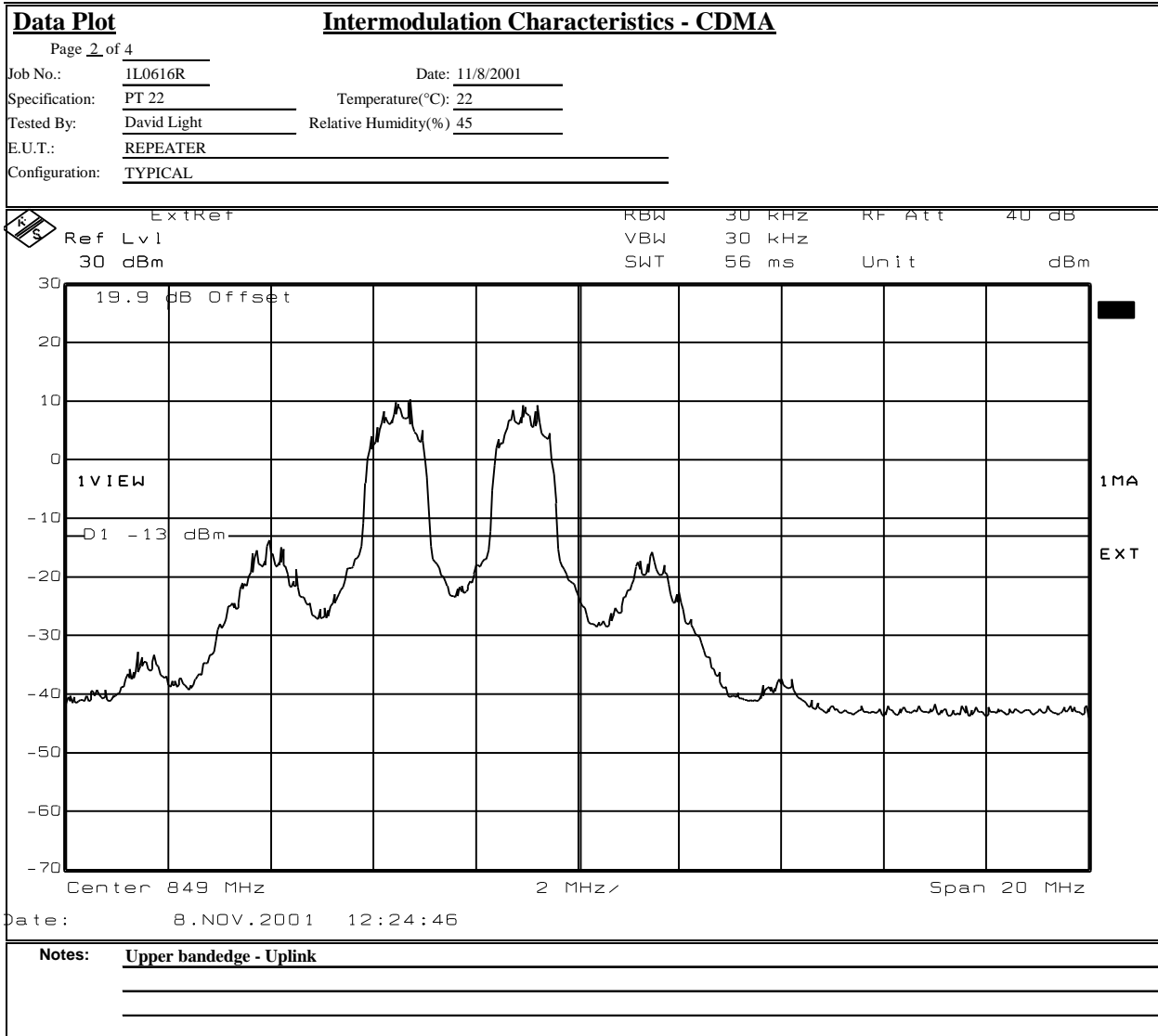
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Data Plot		Band Edges - CDMA																			
Page 1 of 4		Date: 11/8/2001	Complete <u>X</u>																		
Job No.: 1L0616R	Specification: PT 22	Temperature(°C): 22	Preliminary: _____																		
Tested By: David Light	Relative Humidity(%): 45																				
E.U.T.: REPEATER	Configuration: TYPICAL																				
Sample Number: 1	Location: Lab 1																				
Detector Type: Peak	RBW: Refer to plots		VBW: Refer to plots																		
Test Equipment Used																					
Antenna: _____	Directional Coupler: _____	Cable #1: 1626																			
Pre-Amp: _____		Cable #2: _____																			
Filter: _____		Cable #3: _____																			
Receiver: 1036		Cable #4: _____																			
Attenuator #1: 1604		Mixer: _____																			
Attenuator #2: _____	Additional equipment used: _____																				
Measurement Uncertainty: +/-1.7 dB																					
<table border="1"> <tr> <td>Ref Lvl</td> <td>Marker 1 [11]</td> <td>RBW</td> <td>30 kHz</td> <td>RF Att</td> <td>20 dB</td> </tr> <tr> <td>20 dBm</td> <td>-13.86 dBm</td> <td>VBW</td> <td>30 kHz</td> <td>Mixer</td> <td>-10 dBm</td> </tr> <tr> <td></td> <td>824.0000000 MHz</td> <td>SWT</td> <td>7 ms</td> <td>Unit</td> <td>dBm</td> </tr> </table>				Ref Lvl	Marker 1 [11]	RBW	30 kHz	RF Att	20 dB	20 dBm	-13.86 dBm	VBW	30 kHz	Mixer	-10 dBm		824.0000000 MHz	SWT	7 ms	Unit	dBm
Ref Lvl	Marker 1 [11]	RBW	30 kHz	RF Att	20 dB																
20 dBm	-13.86 dBm	VBW	30 kHz	Mixer	-10 dBm																
	824.0000000 MHz	SWT	7 ms	Unit	dBm																
Date: 8.NOV.2001 11:28:42																					
Notes: Lower bandedge - Uplink																					
Channel 1013																					

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

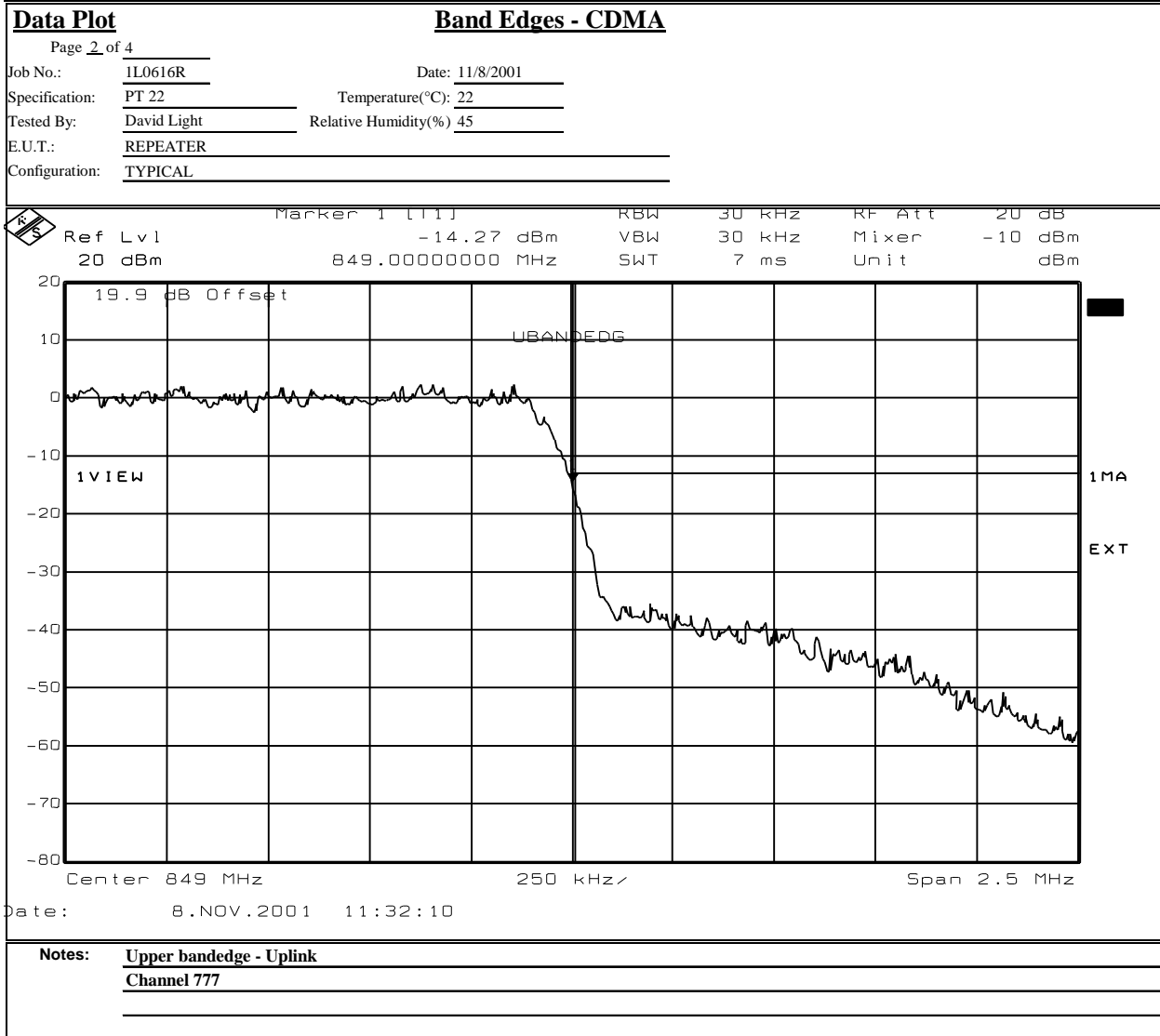
Test Data – Spurious Emissions at Antenna Terminals



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Lewisville, TX 75057
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Nemko Dallas, Inc.



EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 11/8/2001

Test Results: Complies.

Test Data: See attached table.

Measurement Uncertainty: +/- 3.6 dB

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

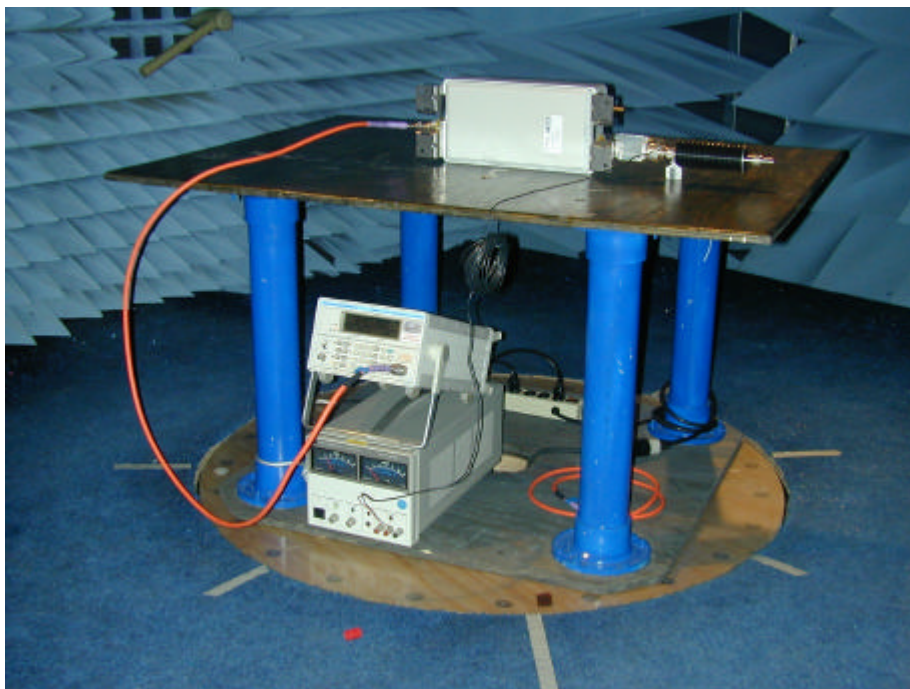
Test Data – Field Strength of Spurious

<u>Field Strength of Spurious Emissions</u>										
Page <u>1</u> of <u>1</u>								Complete <u>X</u>		
Job No.:	<u>1L0616R</u>	Date: <u>11/8/2001</u>				Preliminary <u> </u>				
Specification:	<u>PT 22</u>	Temperature(°C): <u>22</u>								
Tested By:	<u>Tom Tidwell</u>	Relative Humidity(%) <u>45</u>								
E.U.T.:	<u>AMPS BAND REPEATER</u>									
Configuration:	<u>TYPICAL</u>									
Sample No:	<u>1</u>									
Location:	<u>AC 3</u>	RBW: <u>500 kHz</u>				Measurement Distance: <u>3</u> m				
Detector Type:	<u>Peak</u>	VBW: <u>1 MHz</u>								
Test Equipment Used										
Antenna:	<u>993</u>	Directional Coupler: <u> </u>								
Pre-Amp:	<u> </u>	Cable #1: <u>1483</u>								
Filter:	<u> </u>	Cable #2: <u>1485</u>								
Receiver:	<u>1464</u>	Cable #3: <u> </u>								
Attenuator #1:	<u> </u>	Cable #4: <u> </u>								
Attenuator #2:	<u> </u>	Mixer: <u> </u>								
Measurement Uncertainty:	<u>+/-3.6 dB</u>									
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBd)		ERP (dBm)	ERP (mW)	Polarity	Comments
1693.0	-73.5	32.7		33.3	6.4		-67.8	0.00000	H	Noise floor
2539.5	-73.0	34.6		33.8	8.0		-64.2	0.00000	H	Noise floor
3386.0	-73.0	35.8		33.6	8.1		-62.7	0.00000	H	Noise floor
4232.5	-61.0	35.2		33.5	7.9		-51.4	0.00001	H	
5079.0	-65.0	36.3		33.5	9.1		-53.2	0.00000	H	
5925.5	-66.0	36.0		32.7	9.1		-53.6	0.00000	H	
6772.0	-75.5	37.8		32.8	10.1		-60.3	0.00000	H	Noise floor
7618.5	-78.0	39.8		33.0	9.4		-61.8	0.00000	H	Noise floor
8465.0	-77.0	42.2		34.3	9.7		-59.4	0.00000	H	Noise floor
1693.0	-73.5	29.9		33.3	6.4		-70.6	0.00000	V	Noise floor
2539.5	-73.0	35.6		33.8	8.0		-63.3	0.00000	V	Noise floor
3386.0	-63.0	37.1		33.6	8.1		-51.4	0.00001	V	
4232.5	-60.0	42.8		33.5	7.9		-42.8	0.00005	V	
5079.0	-75.0	40.6		33.5	9.1		-58.8	0.00000	V	Noise floor
5925.5	-75.0	38.5		32.7	9.1		-60.1	0.00000	V	Noise floor
6772.0	-75.5	38.3		32.8	10.1		-59.9	0.00000	V	Noise floor
7618.5	-78.0	40.4		33.0	9.4		-61.1	0.00000	V	Noise floor
8465.0	-77.0	41.6		34.3	9.7		-60.0	0.00000	V	Noise floor
Notes: Scanned spectrum to tenth harmonic of carrier (846.5 MHz)										

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Test Setup Photographs – Field Strength of Spurious



EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY:	DATE:

Test Results: Complies.

Test Data: See attached table.
 Standard Test Frequency: _____ MHz
 Standard Test Voltage: _____ V

Not Applicable

Equipment Used:

Measurement Uncertainty: +/- 1 x 10⁻⁷ ppm

Temperature: °C

Relative Humidity: %

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Section 8. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	09/17/01
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01
1604	ATTENUATOR	NARDA 776B-20	NONE	09/13/01
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU
993	Horn antenna	A.H. Systems SAS-200/571	XXX	07/16/01
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01

Nemko Dallas

FCC PART 22, SUBPART H
CELLULAR BAND REPEATERS

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

ANNEX A - TEST DETAILS

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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: \geq 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.

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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: \geq 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

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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: \geq 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: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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: \geq RBW

Span: As required

Sweep: Auto

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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: \geq RBW

Start Frequency: 0 MHz

Stop Frequency: 10 GHz

Sweep: Auto

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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 (5×10^{-5} Watts) at the antenna terminal.

Test Method: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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.

Nemko Dallas

FCC PART 22, SUBPART H
CELLULAR BAND REPEATERS

EQUIPMENT: EPUMA EDGE 850

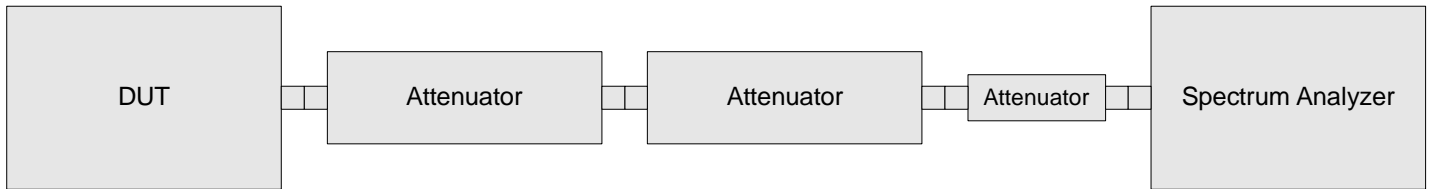
PROJECT NO.: 1L0616RUS1

ANNEX B - TEST DIAGRAMS

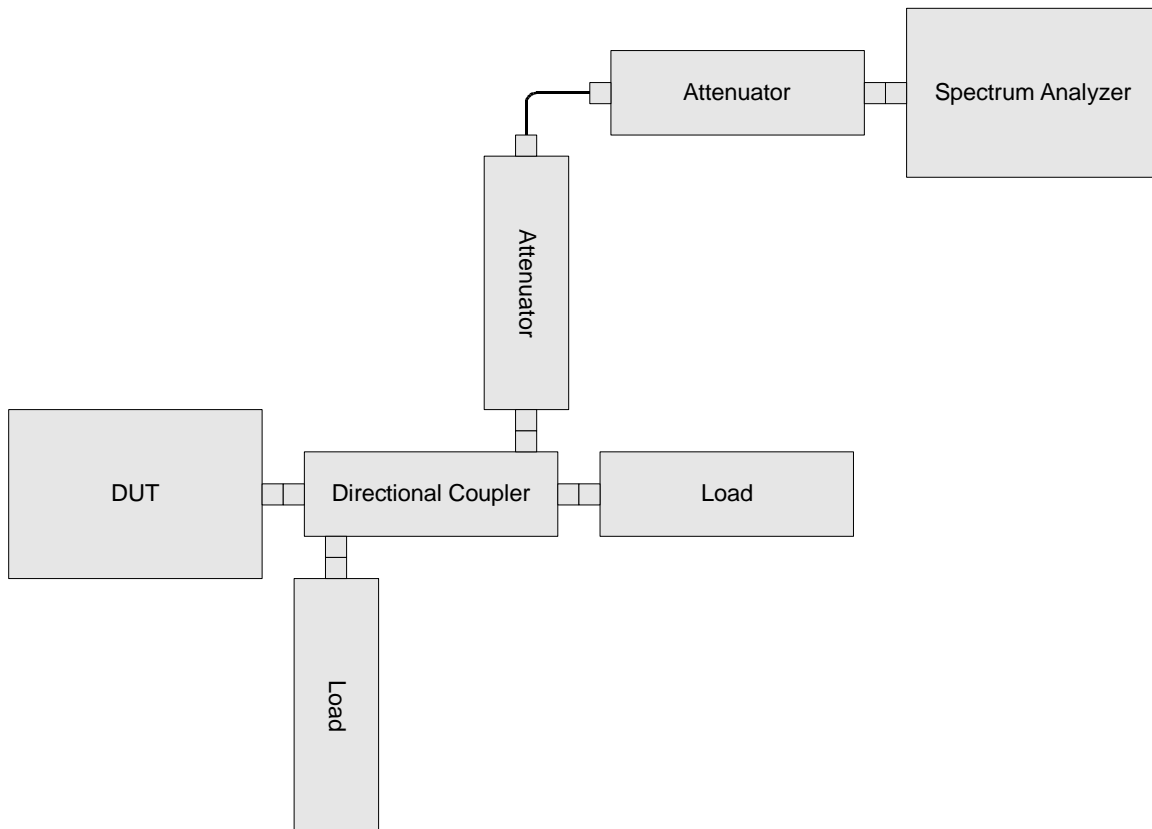
EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

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



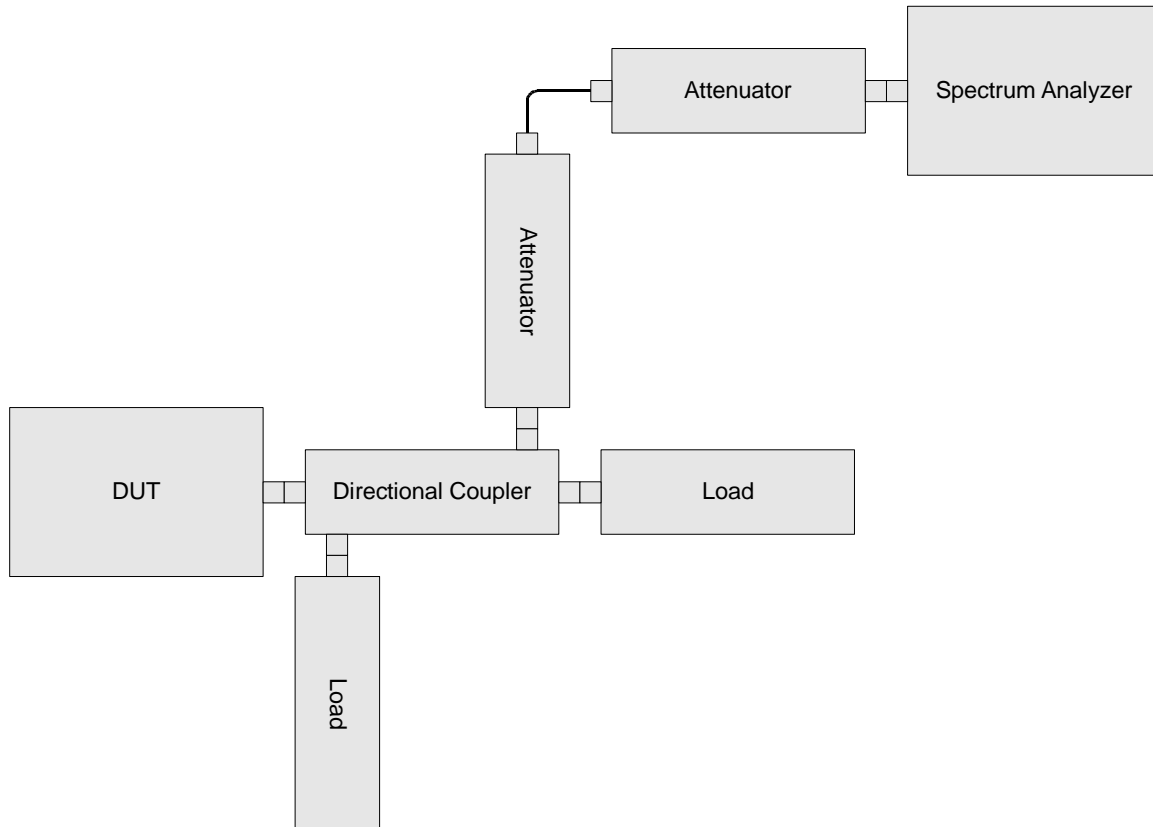
Para. No. 2.1049 - Occupied Bandwidth



EQUIPMENT: EPUMA EDGE 850

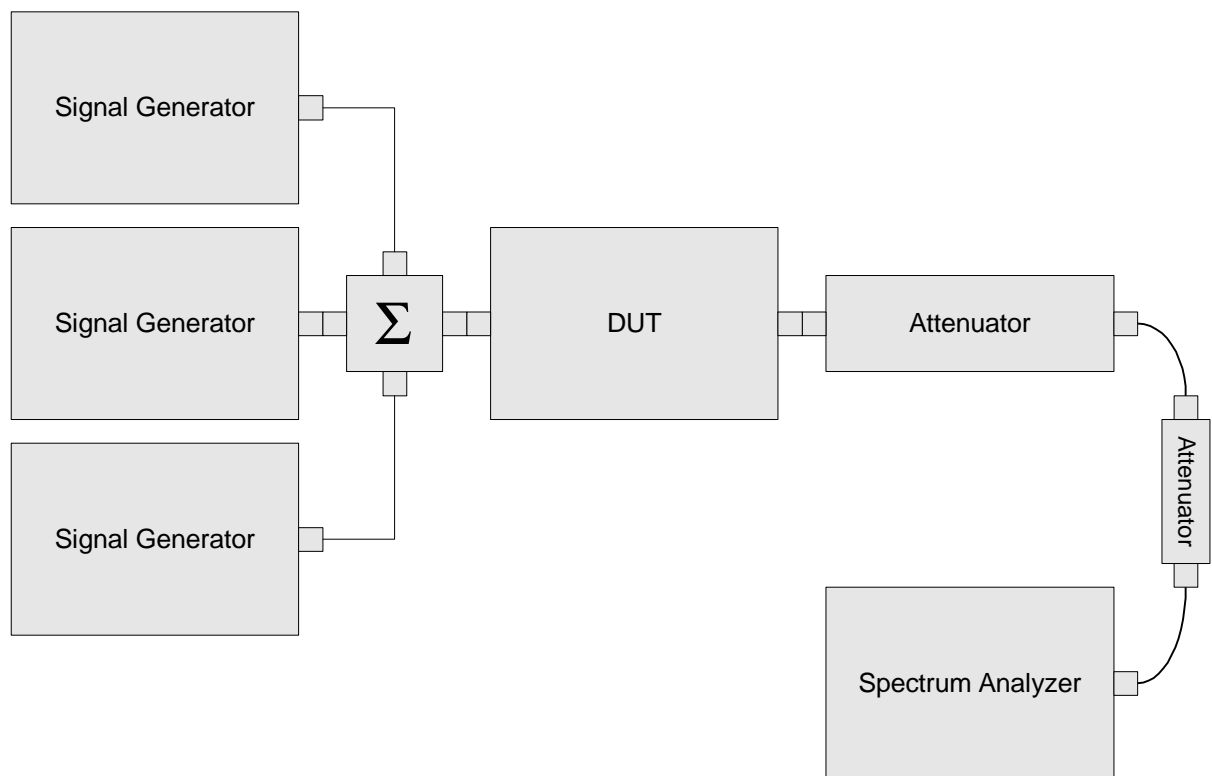
PROJECT NO.: 1L0616RUS1

Para. No. 2.1051 Spurious Emissions at Antenna Terminals



EQUIPMENT: EPUMA EDGE 850

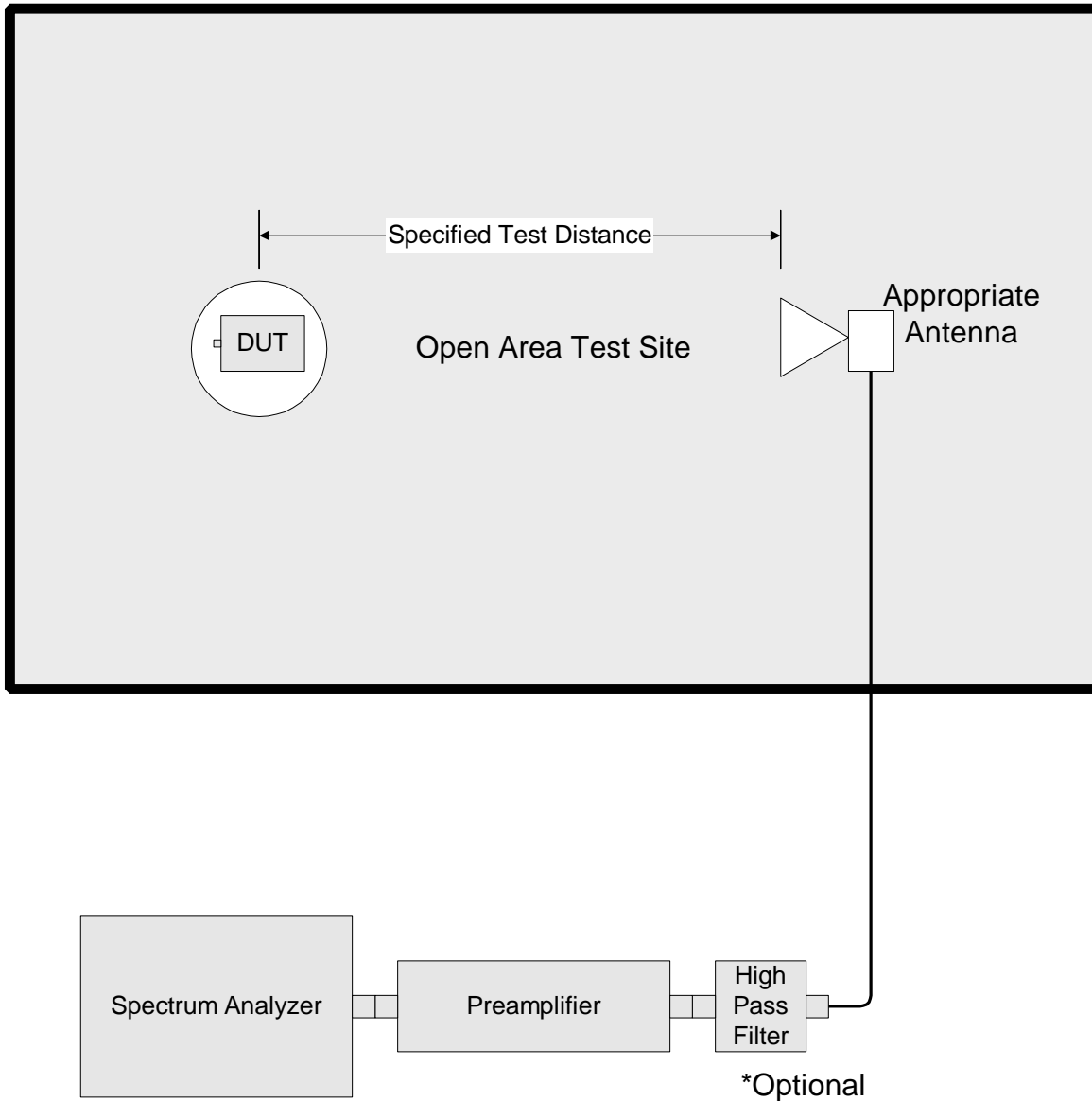
PROJECT NO.: 1L0616RUS1



EQUIPMENT: EPUMA EDGE 850

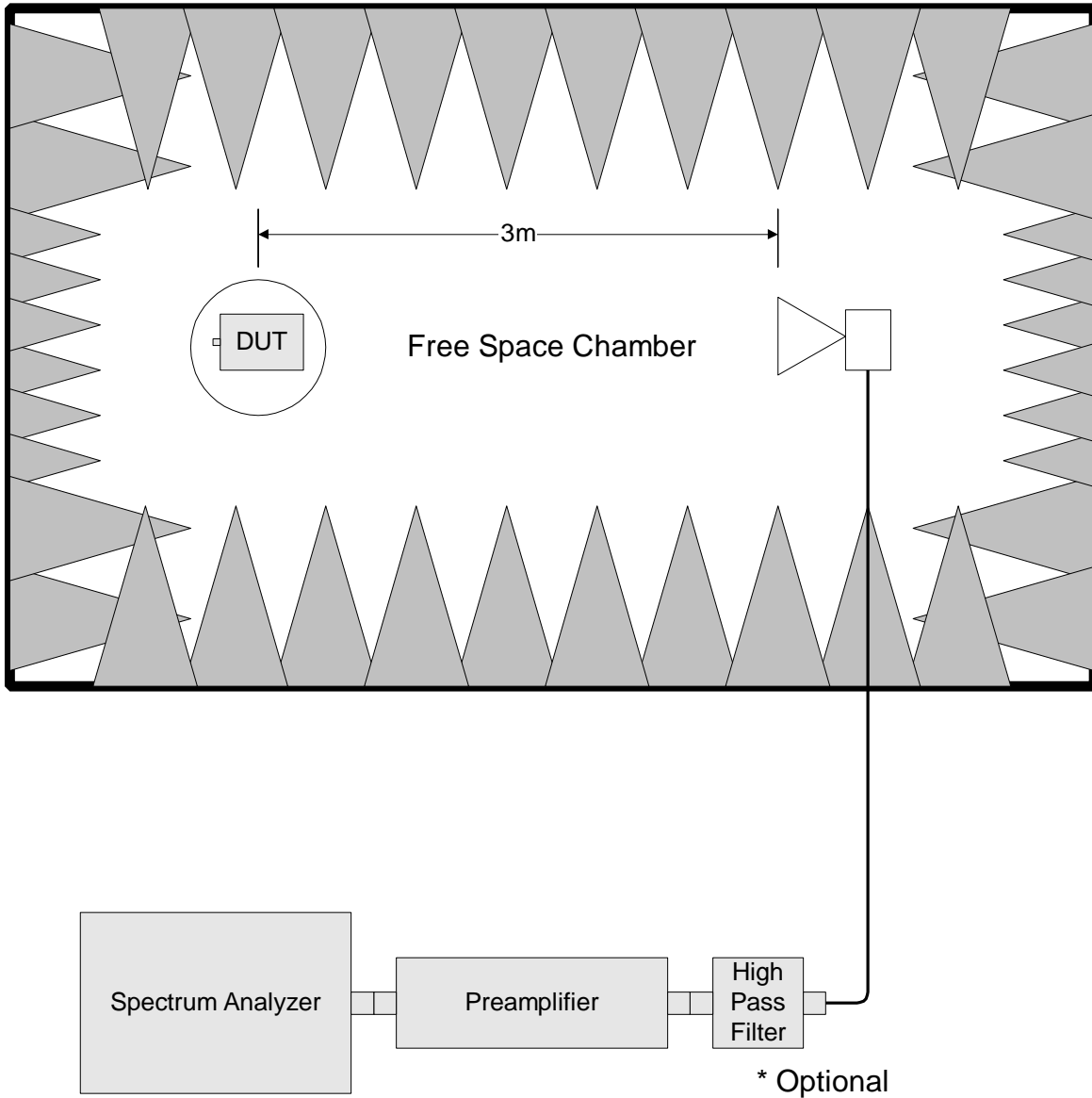
PROJECT NO.: 1L0616RUS1

Para. No. 2.1053 - Field Strength of Spurious Radiation



EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1



EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Para. No. 2.1055 - Frequency Stability

