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

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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.

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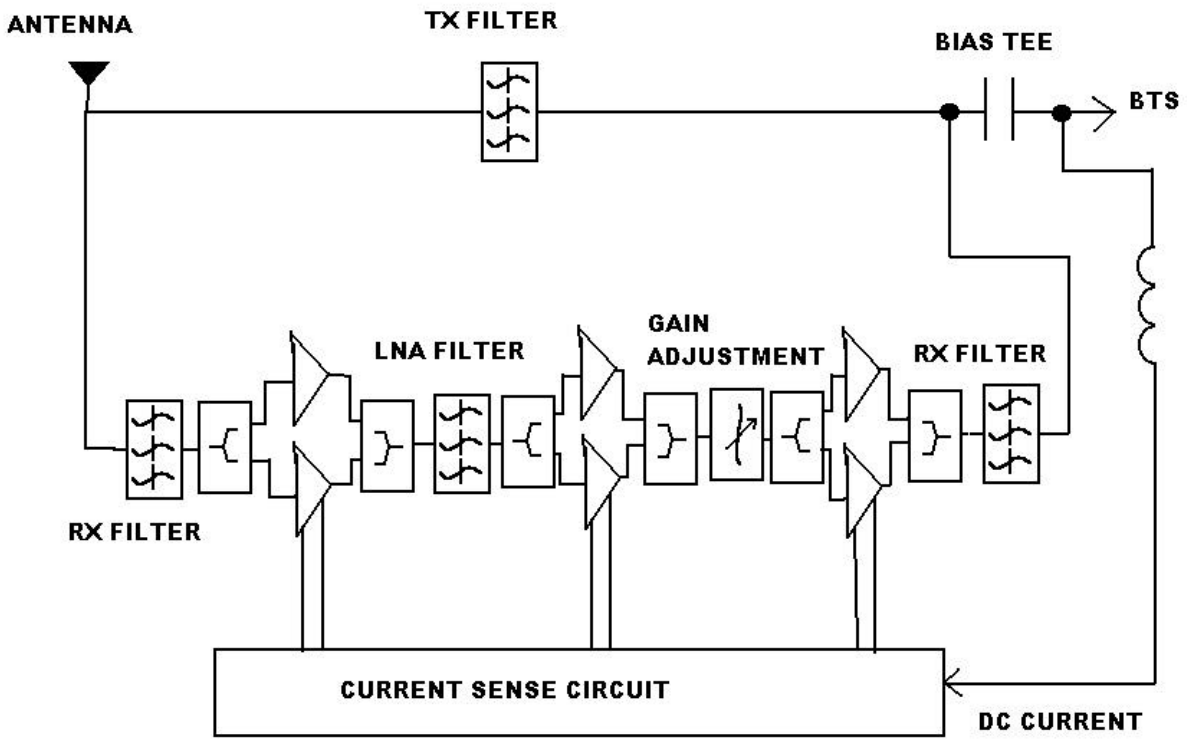
Section 2. General Equipment Specification

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)** ☒ **CDPD (F9W)** ☐ **AMPS (F8W, F1D)** ☒
Output Impedance:		50 ohms
Frequency Translation:		**F1-F1** ☒ **F1-F2** ☐ **N/A** ☐ **Software** ☐ **Duplexer Change** ☐ **Fullband Coverage** ☒

Description of Operation

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

System Diagram



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

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

Test Data – Occupied Bandwidth

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

Data Plot **Occupied Bandwidth - Voice & SAT**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

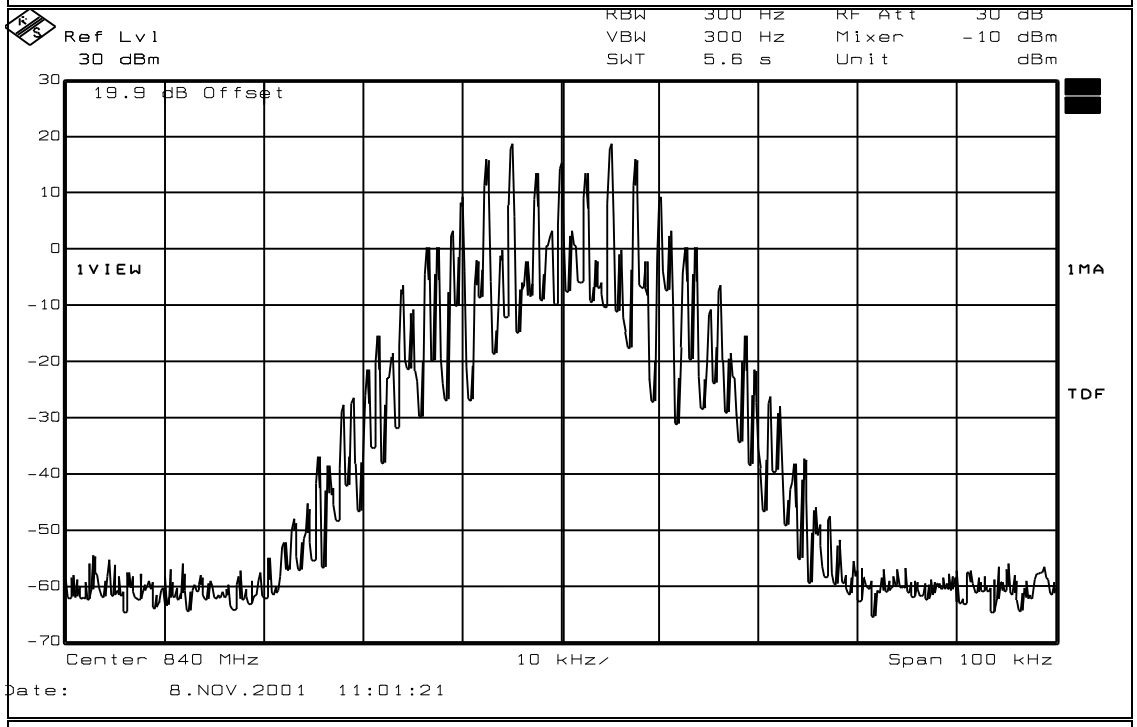
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **OUTPUT**
UPLINK

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Test Data – Occupied Bandwidth

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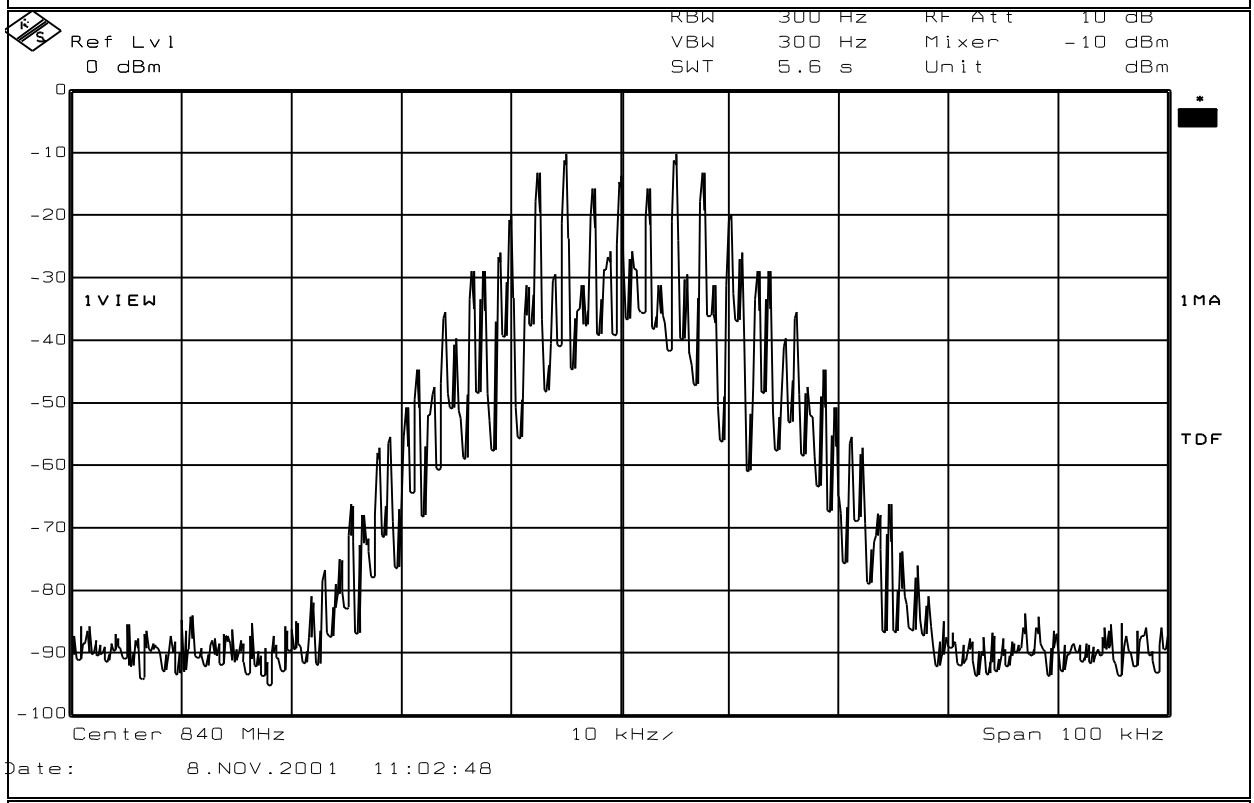
Data Plot **Occupied Bandwidth - Voice & SAT**

Page 2 of 4

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		



Notes: **INPUT**
UPLINK

Test Data – Occupied Bandwidth

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Data Plot **Occupied Bandwidth - Digital**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

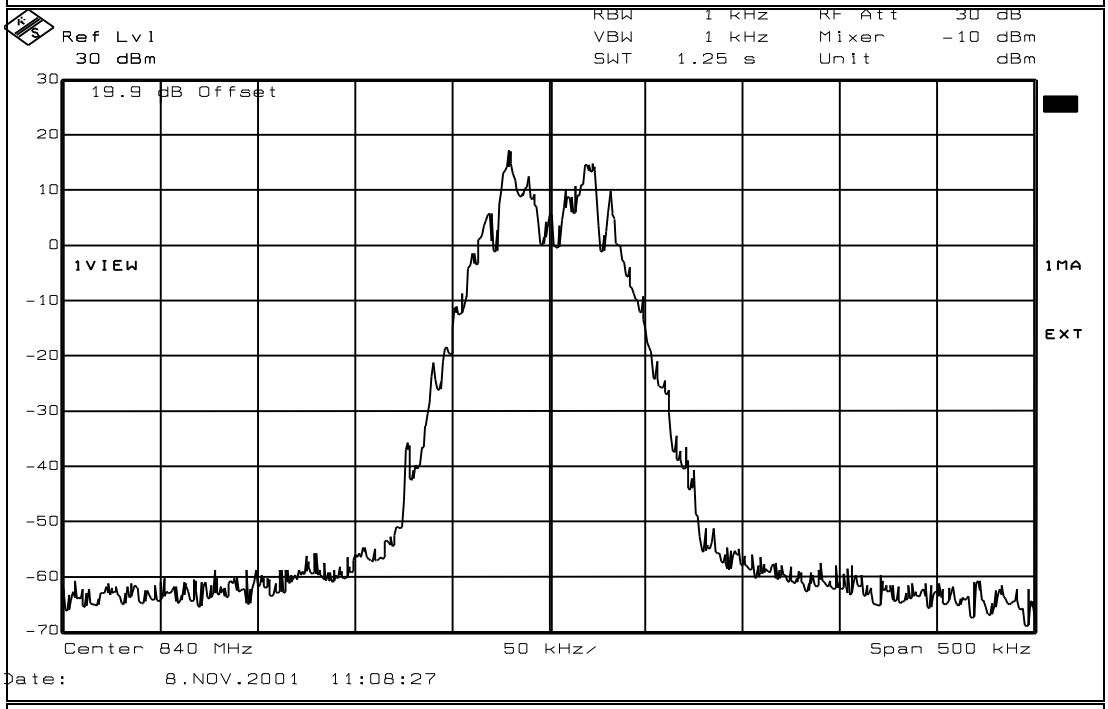
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **OUTPUT**
UPLINK
2FSK

Test Data – Occupied Bandwidth

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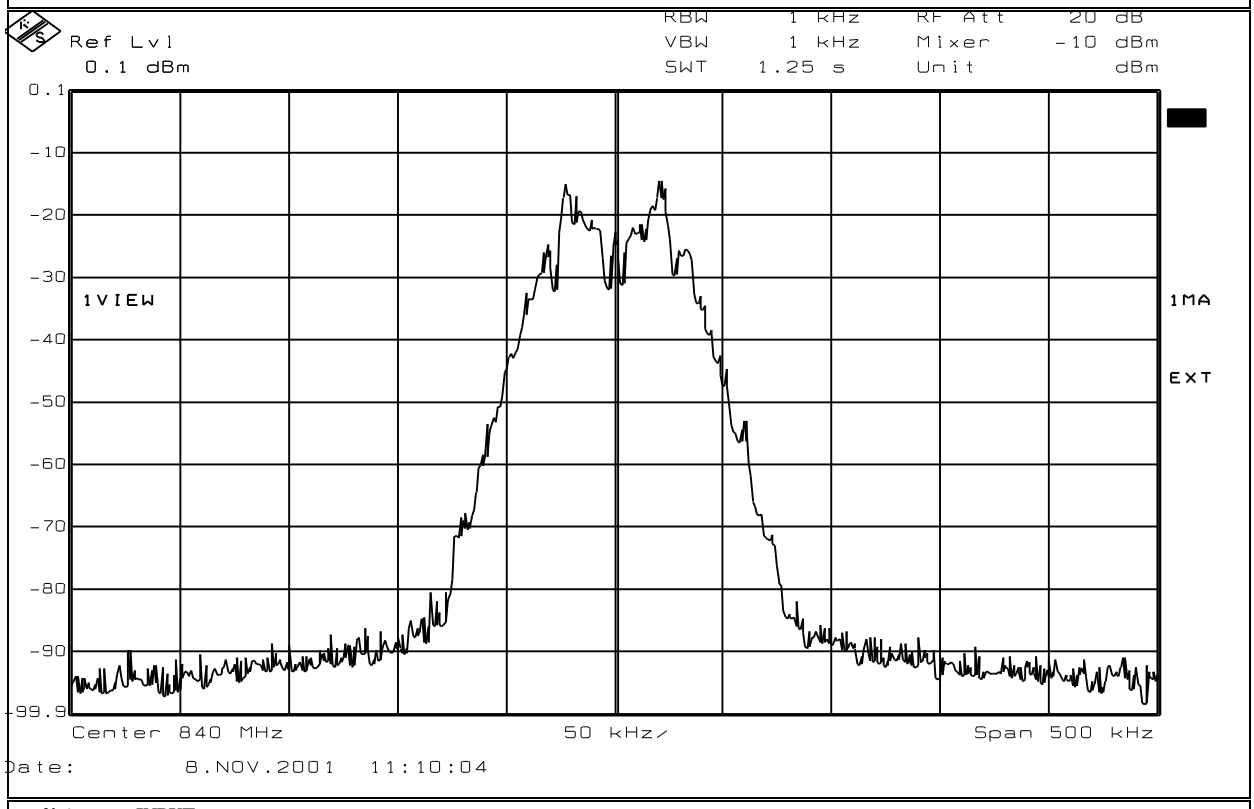
Data Plot **Occupied Bandwidth - Digital**

Page 2 of 4

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		



Notes: **INPUT**
UPLINK
2FSK

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Occupied Bandwidth

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Data Plot **Occupied Bandwidth - NADC**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

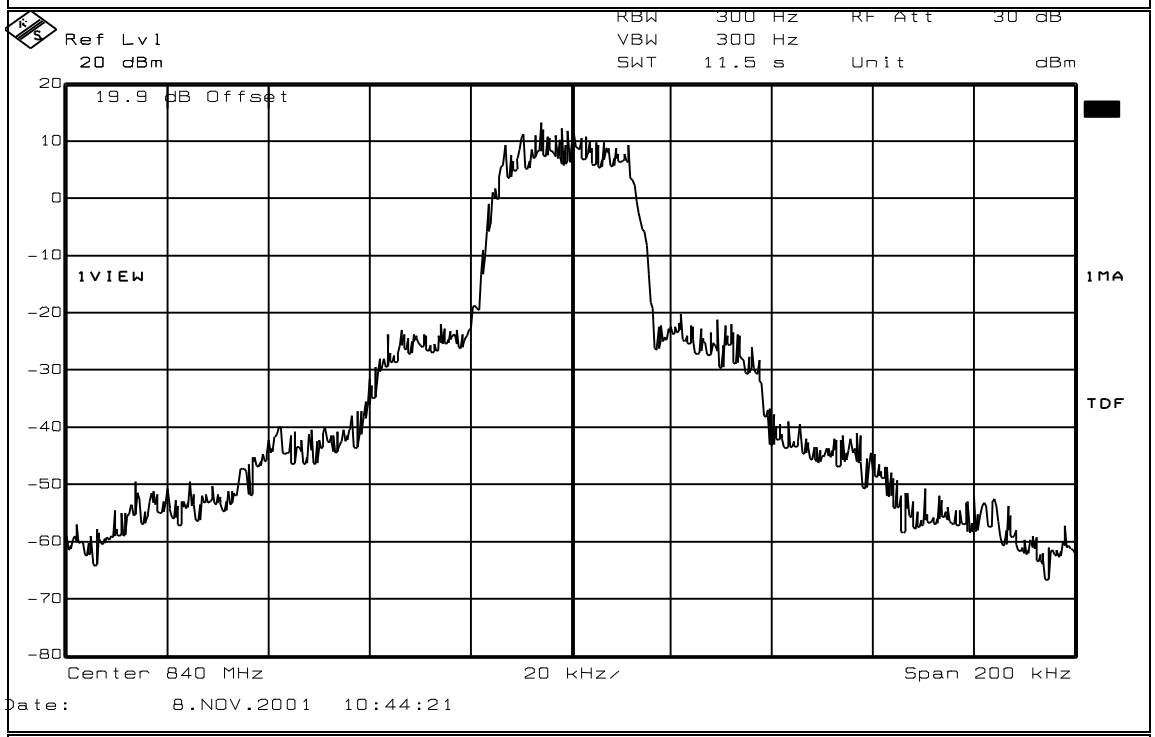
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **OUTPUT**
UPLINK

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Test Data – Occupied Bandwidth

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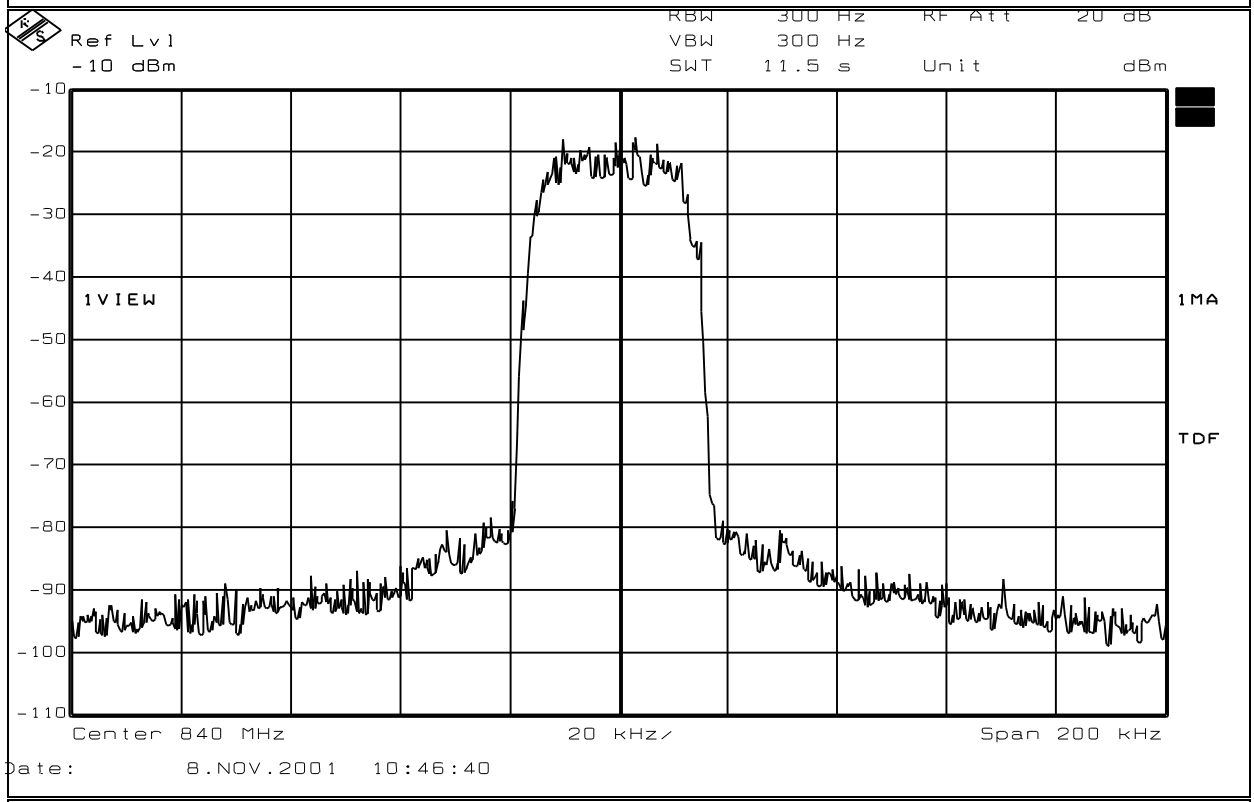
Data Plot **Occupied Bandwidth - NADC**

Page 2 of 4

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		



Notes: **INPUT**
UPLINK

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Occupied Bandwidth

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Data Plot **Occupied Bandwidth - CDMA**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

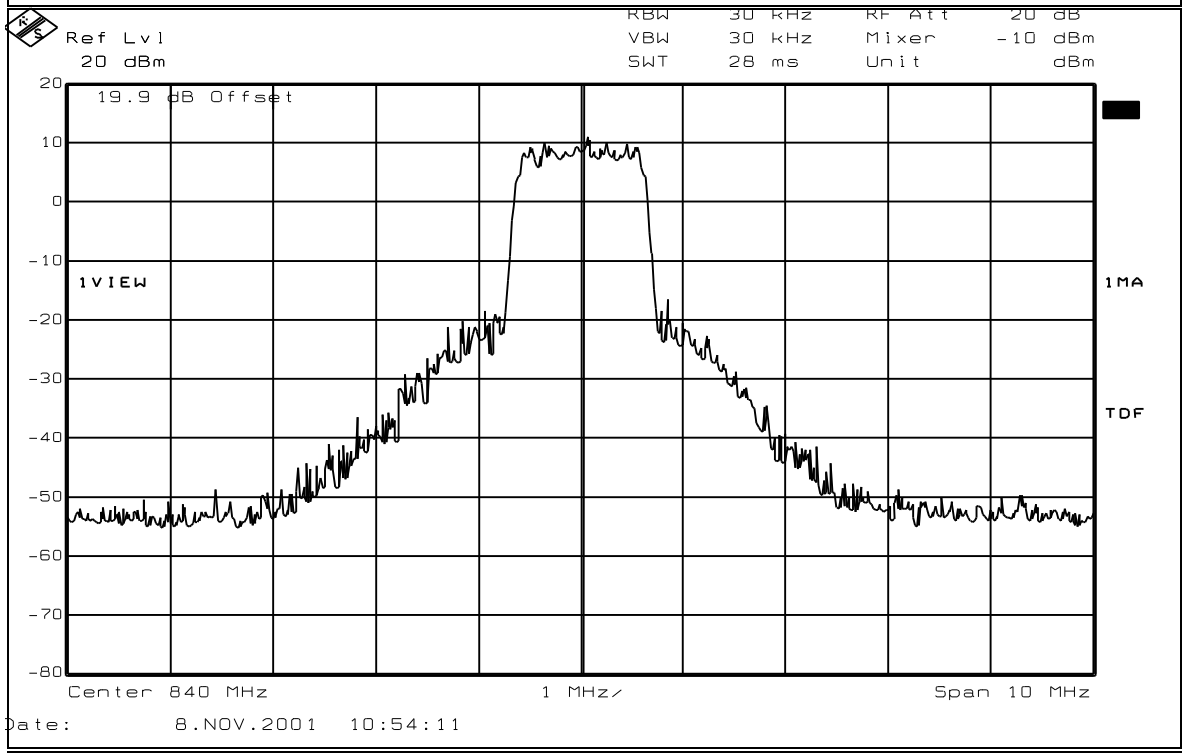
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **OUTPUT**
UPLINK

EQUIPMENT: EPUMA EDGE 850

PROJECT NO.: 1L0616RUS1

Test Data – Occupied Bandwidth

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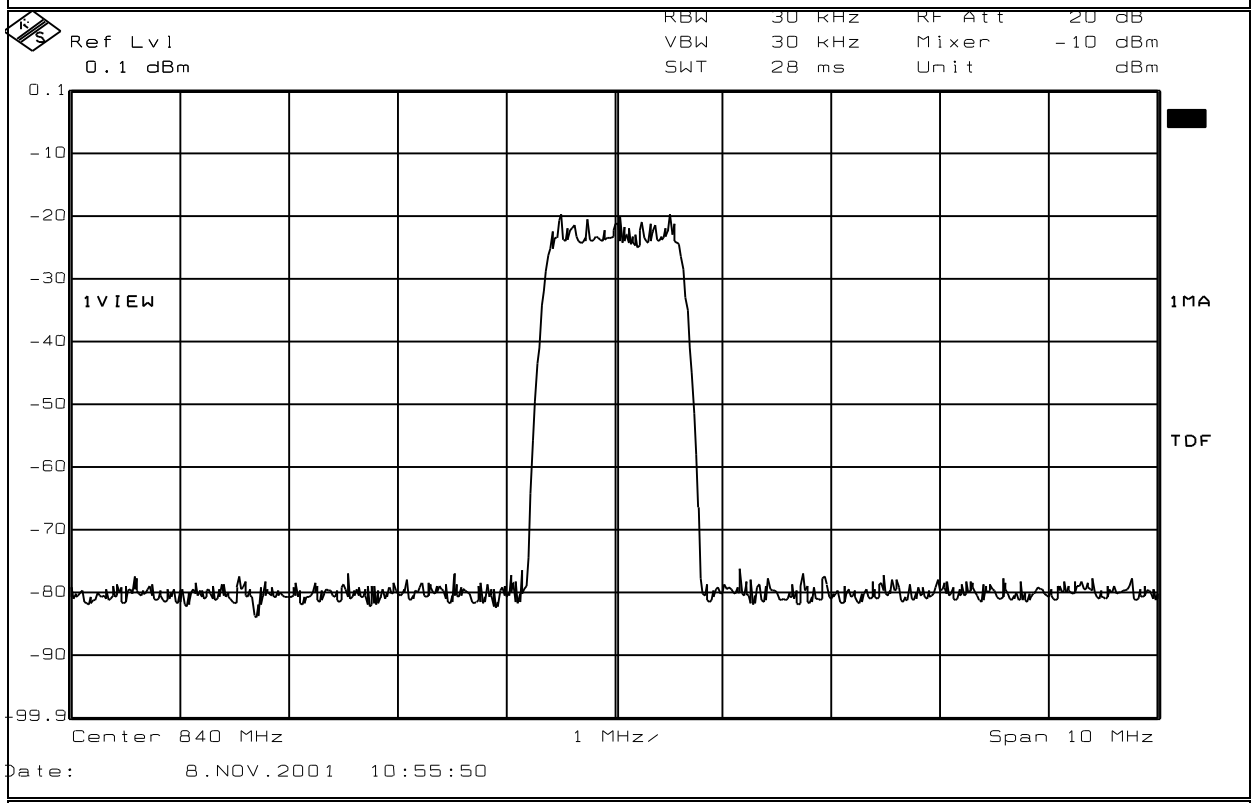
Data Plot **Occupied Bandwidth - CDMA**

Page 2 of 4

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		



Notes: **INPUT**
UPLINK

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

Test Data – Spurious Emissions at Antenna Terminals

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Data Plot **Spurious Emissions at Antenna Terminals - Voice**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

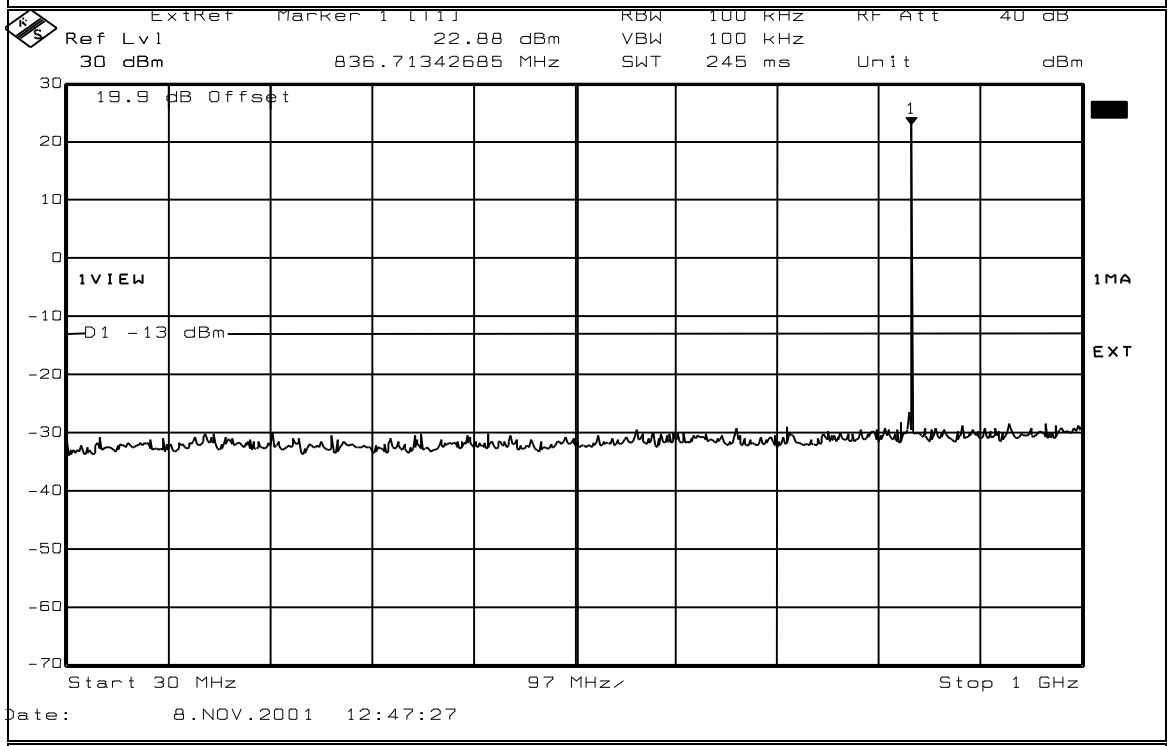
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Uplink**
Marker indicates carrier

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

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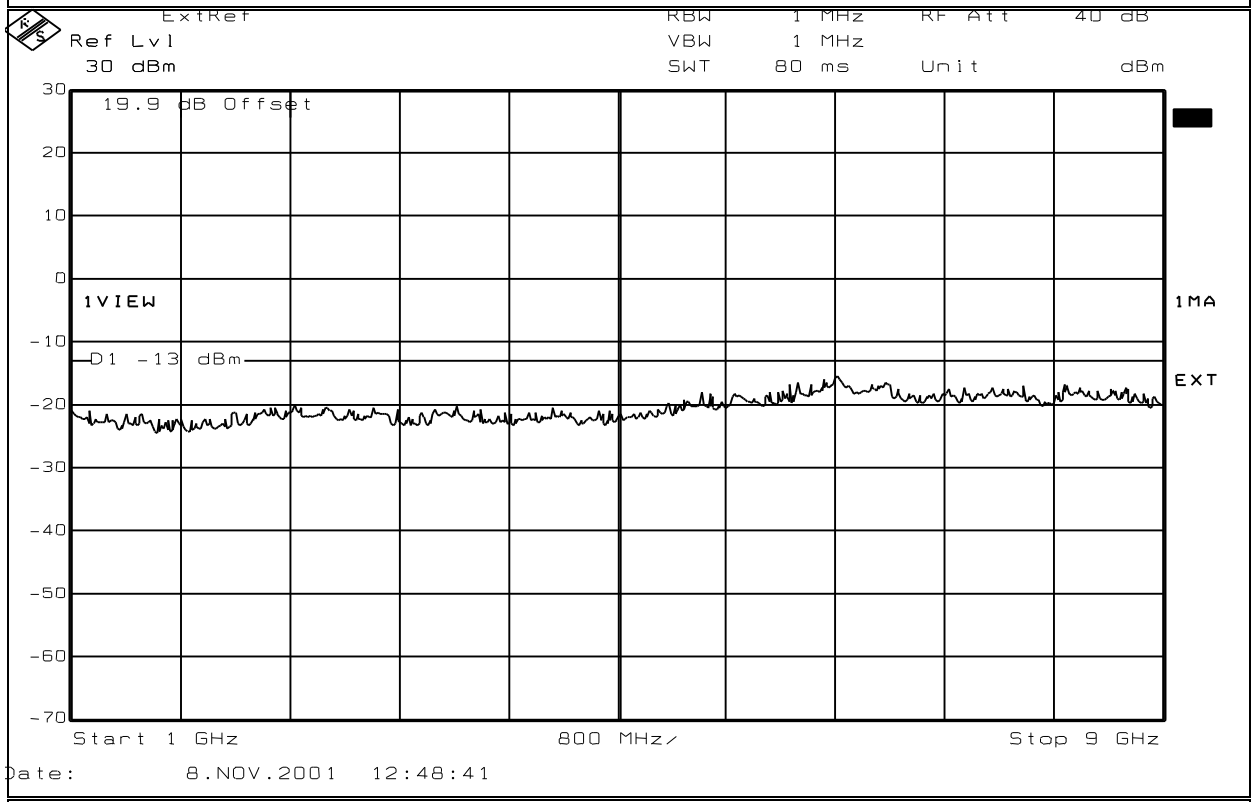
Data Plot **Spurious Emissions at Antenna Terminals - Voice**

Page 2 of 4

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		



Notes: **Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

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Data Plot **Intermodulation Characteristics - Voice**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

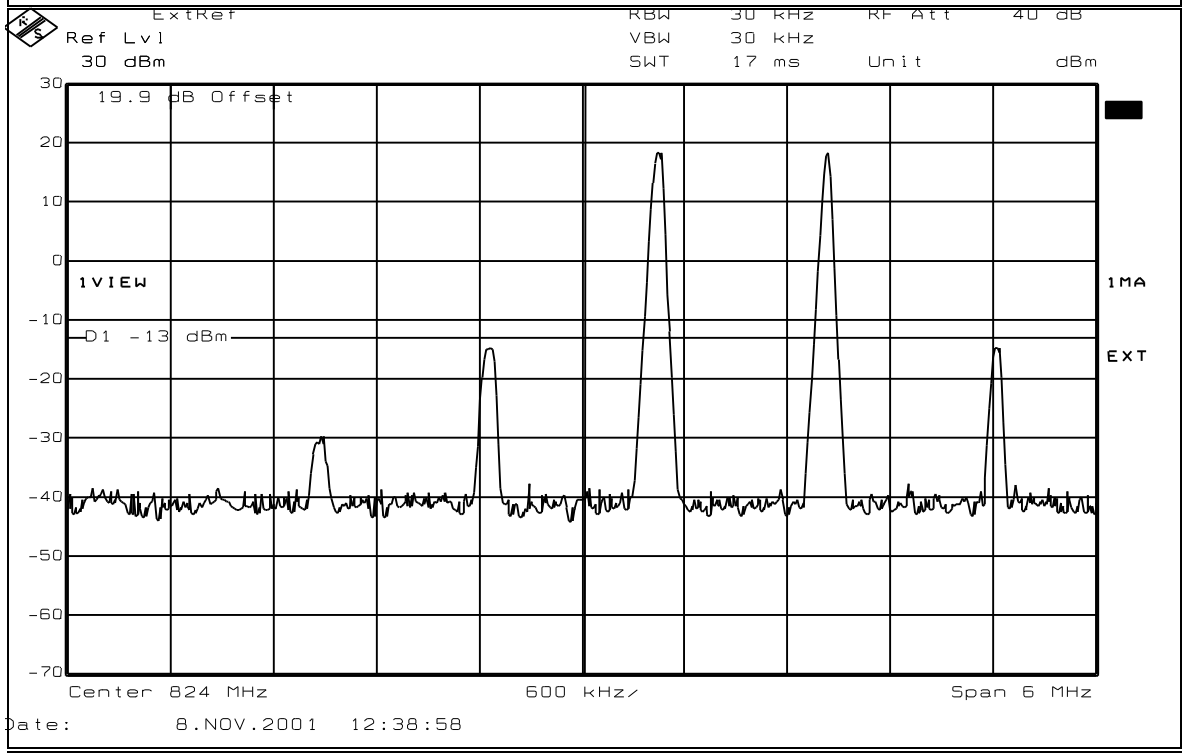
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Lower bandedge - Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

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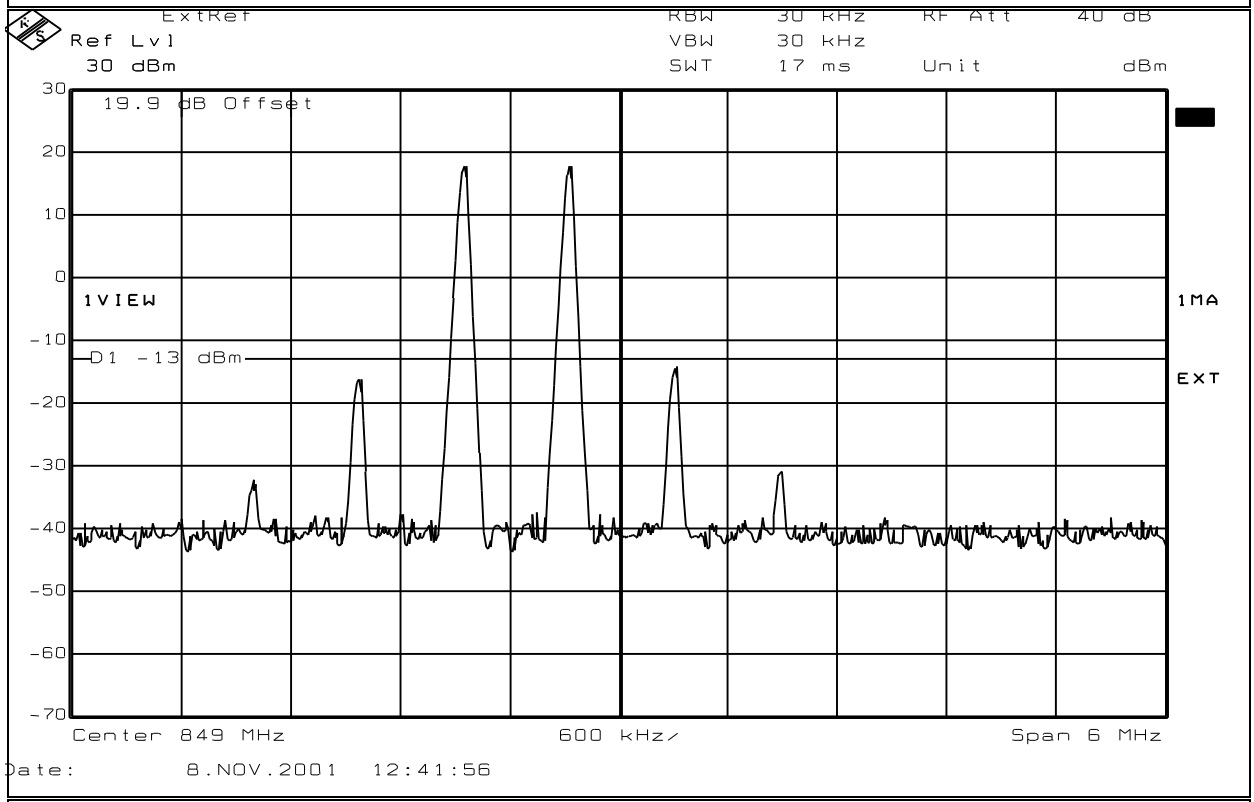
Data Plot **Intermodulation Characteristics - Voice**

Page 2 of 4

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		



Notes: **Upper bandedge - Uplink**

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 - TDMA**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

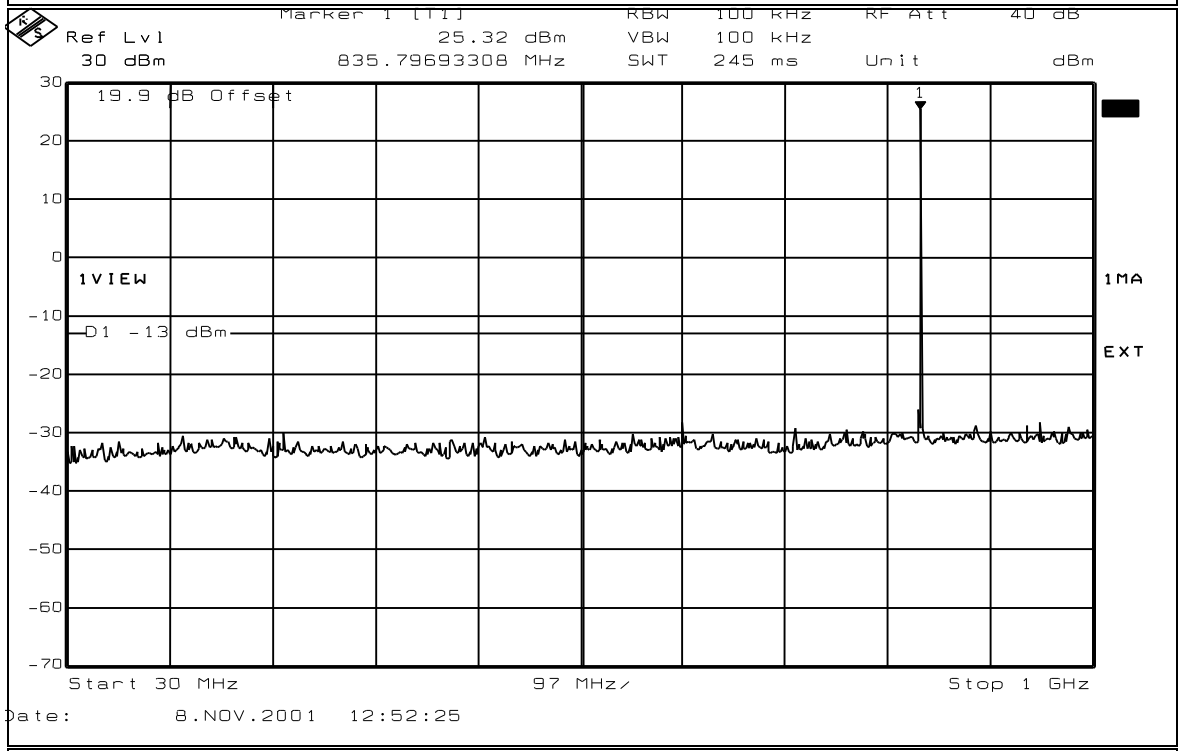
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Uplink**
Marker indicates carrier

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

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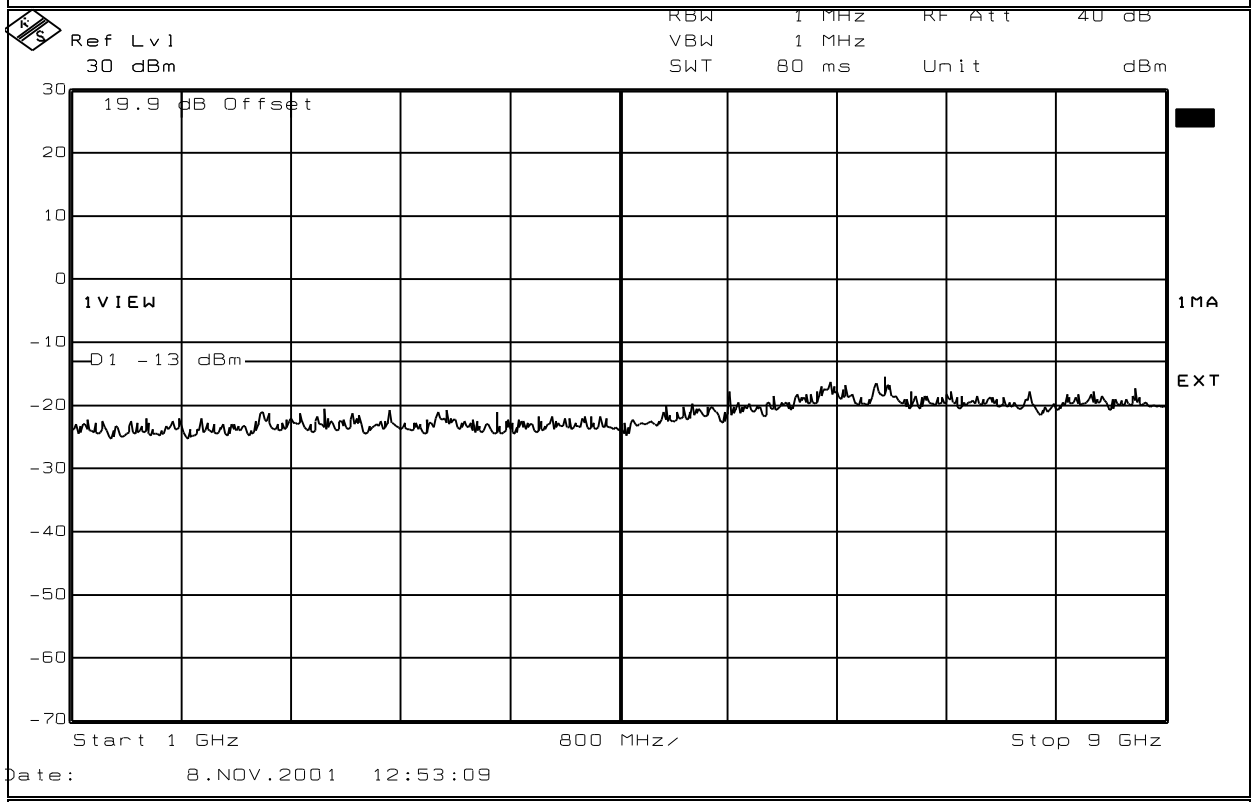
Data Plot **Spurious Emissions at Antenna Terminals - TDMA**

Page 2 of 4

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		



Notes: **Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

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Data Plot **Intermodulation Characteristics - TDMA**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

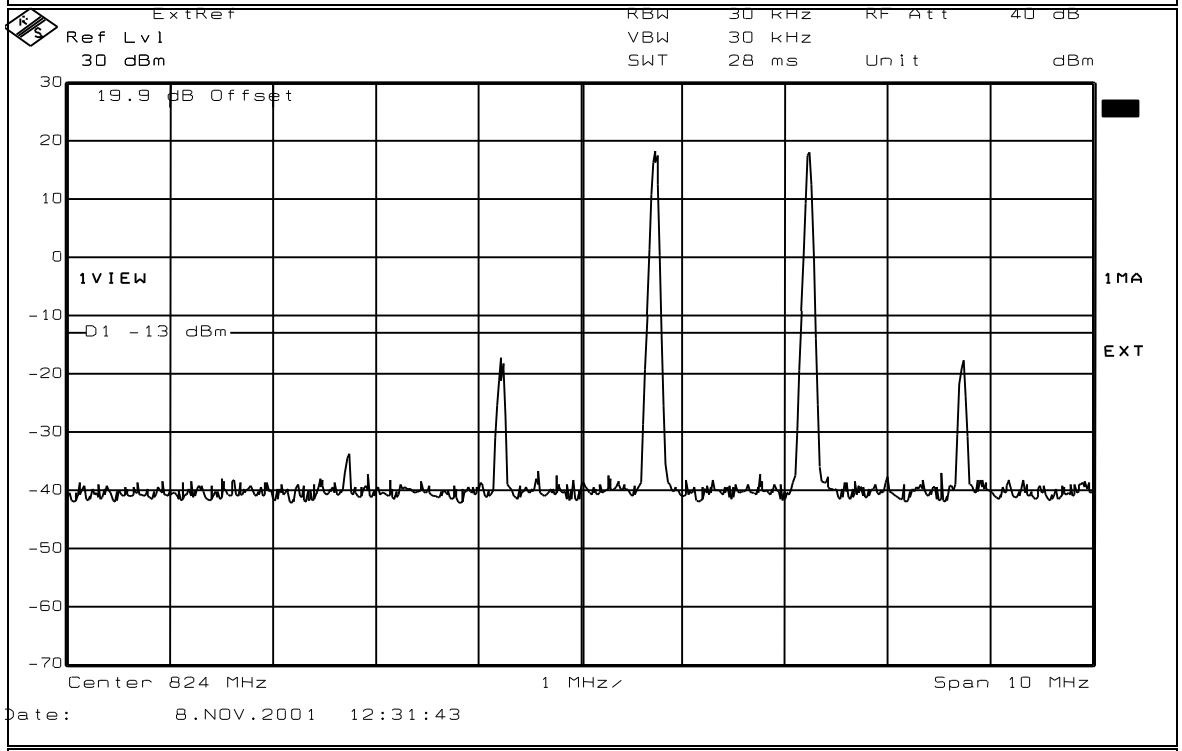
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Lower bandedge - Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

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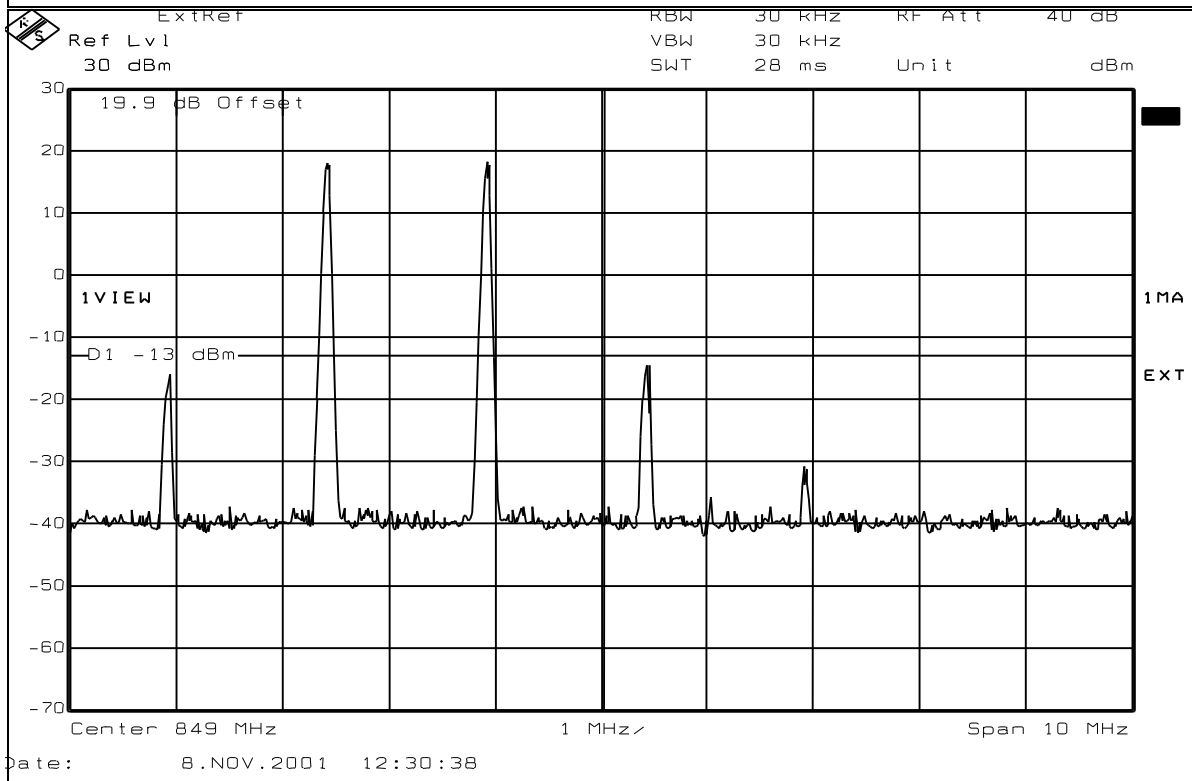
Data Plot **Intermodulation Characteristics - TDMA**

Page 2 of 4

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		



Notes: **Upper bandedge - Uplink**

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 - CDMA**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

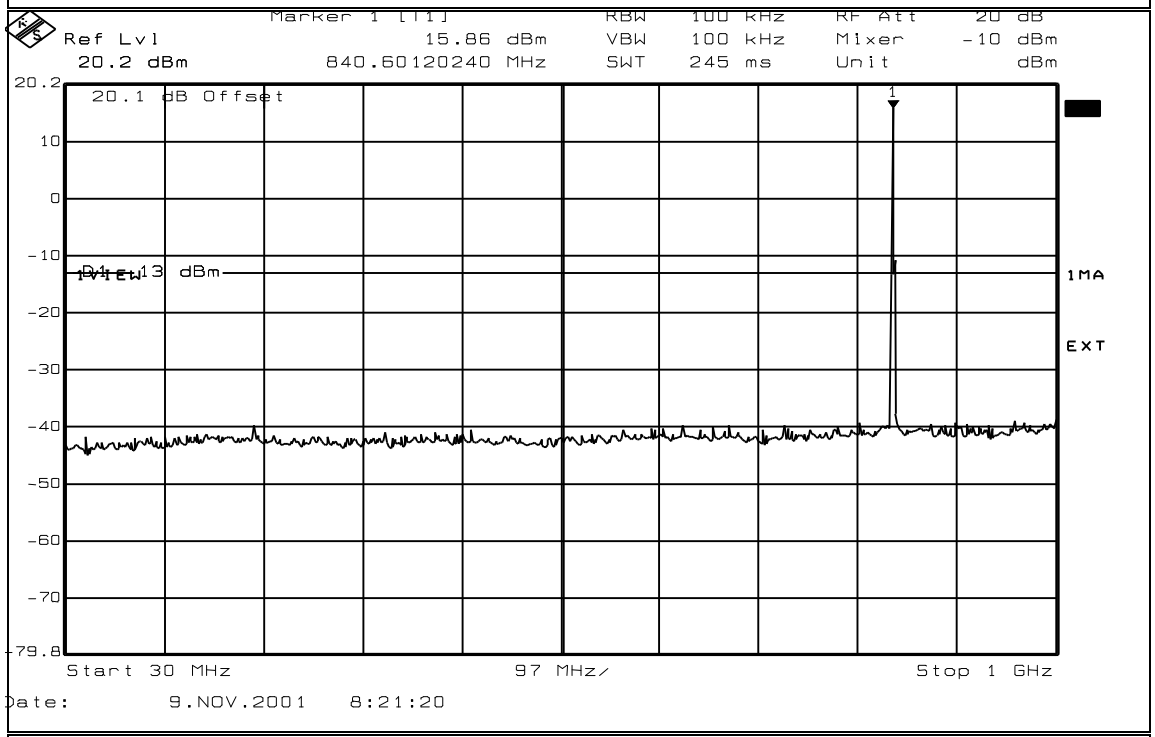
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Uplink**
Marker indicates carrier

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

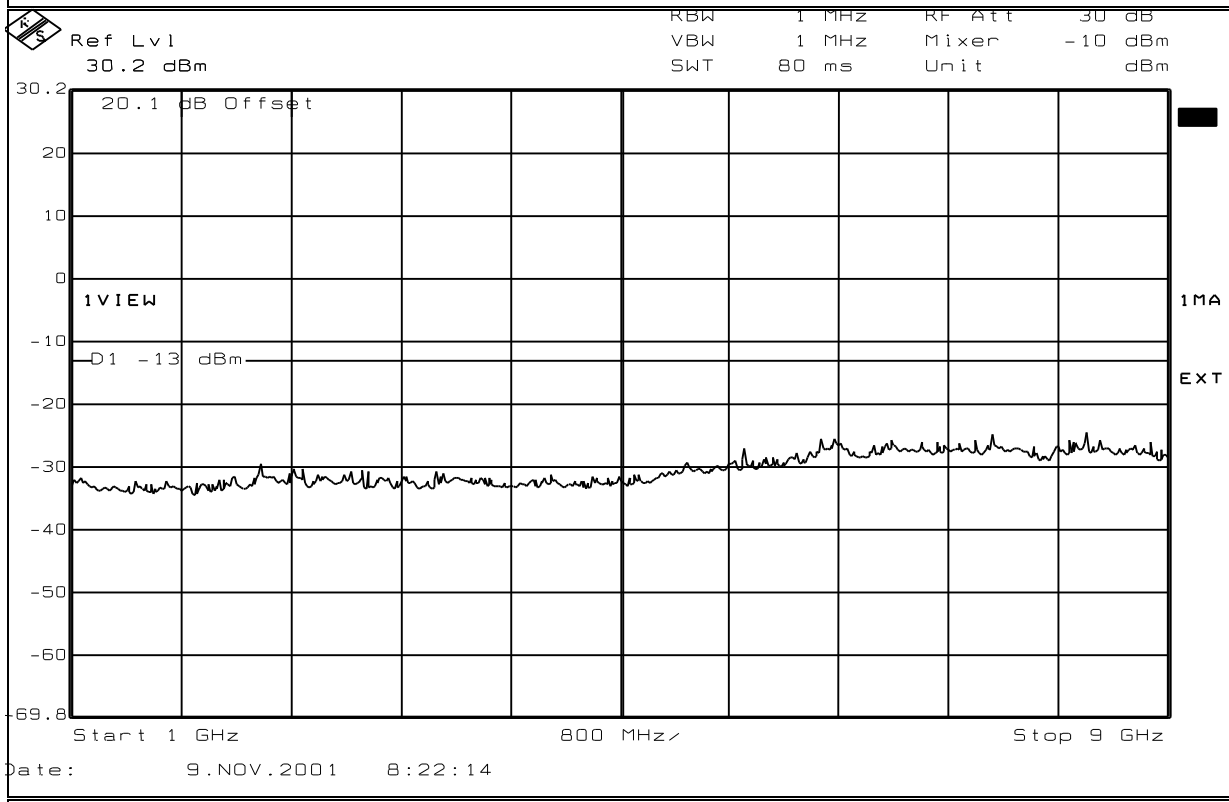
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Spurious Emissions at Antenna Terminals - CDMA**

Page 2 of 4

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		



Notes: **Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

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.

Data Plot **Intermodulation Characteristics - CDMA**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

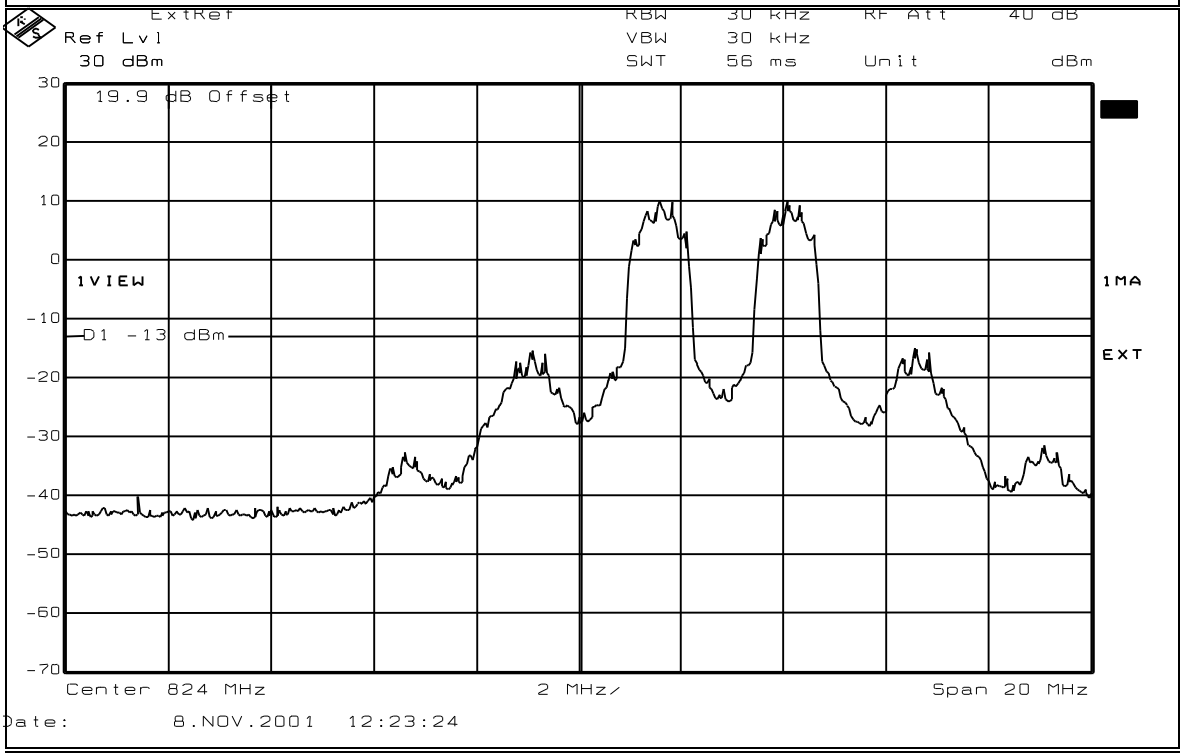
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Lower bandedge - Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

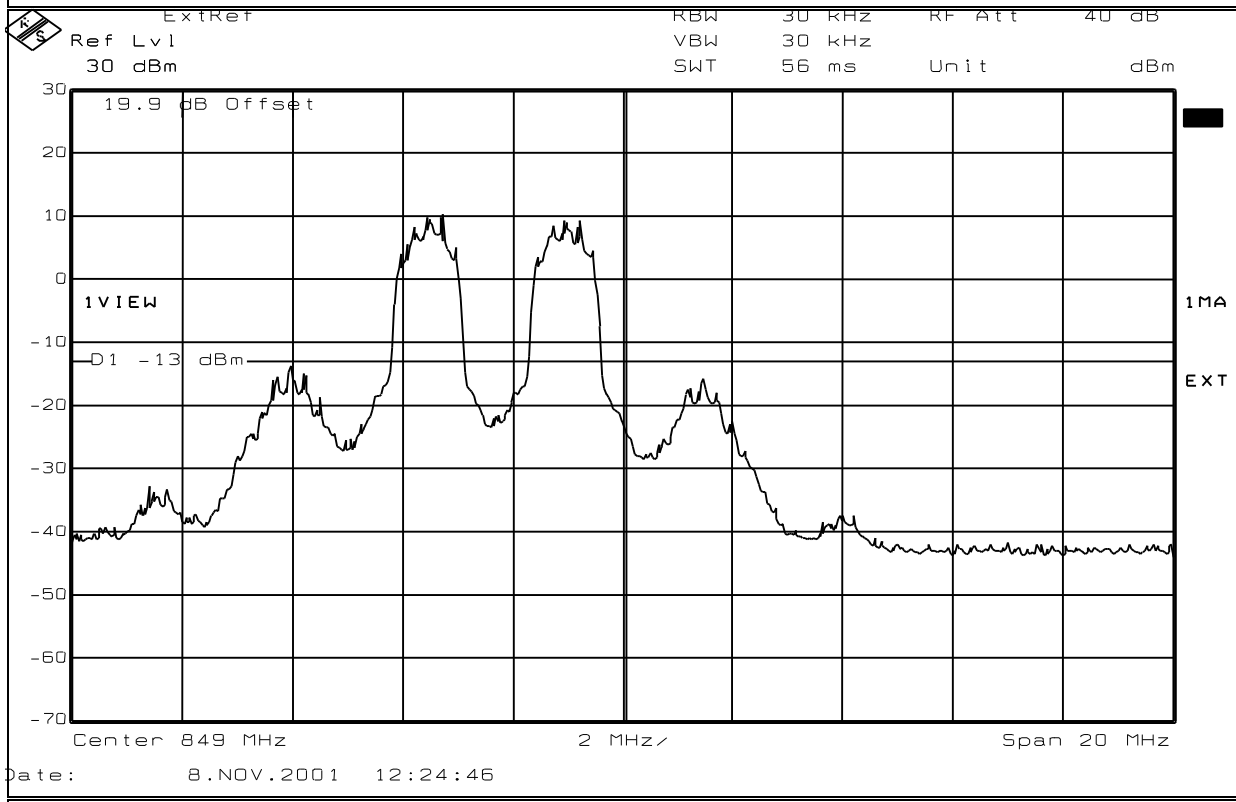
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Intermodulation Characteristics - CDMA**

Page 2 of 4

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		



Notes: **Upper bandedge - Uplink**

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

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.

Data Plot **Band Edges - CDMA**

Page 1 of 4 Complete X

Job No.: 1L0616R Date: 11/8/2001 Preliminary:

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:

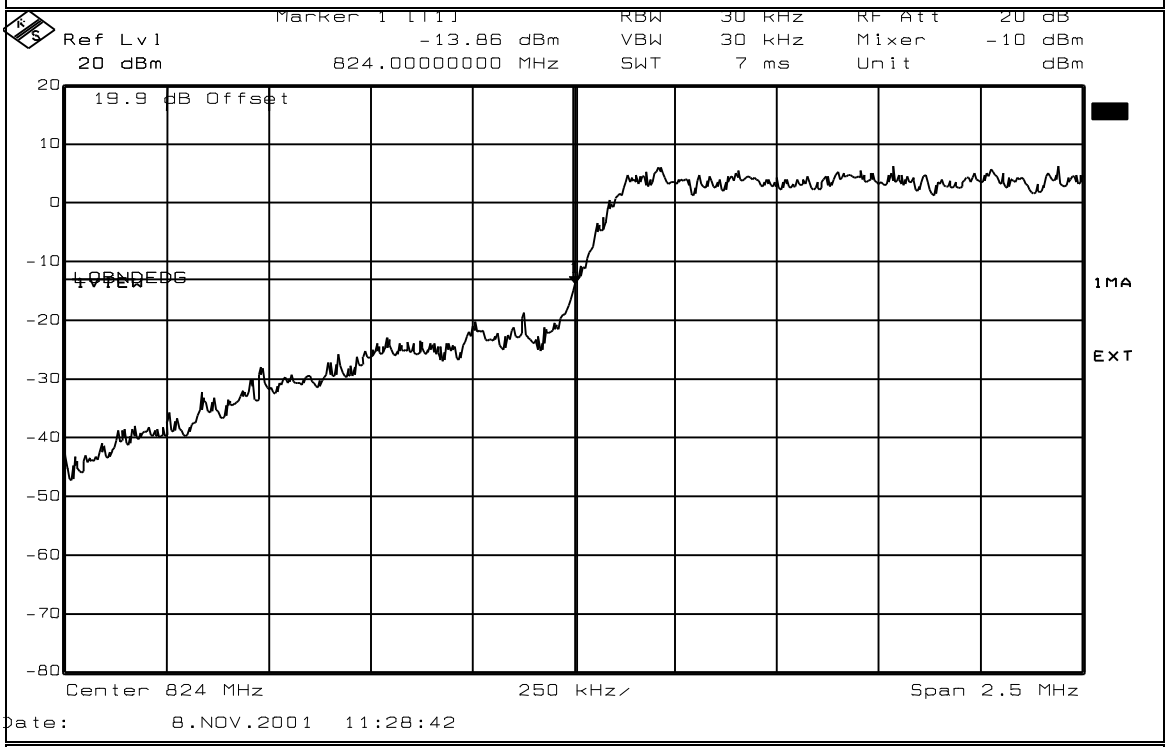
Receiver: 1036 Cable #3:

Attenuator #1 1604 Cable #4:

Attenuator #2: Mixer:

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB



Notes: **Lower bandedge - Uplink**
Channel 1013

EQUIPMENT: EPUMA EDGE 850 PROJECT NO.: 1L0616RUS1

Test Data – Spurious Emissions at Antenna Terminals

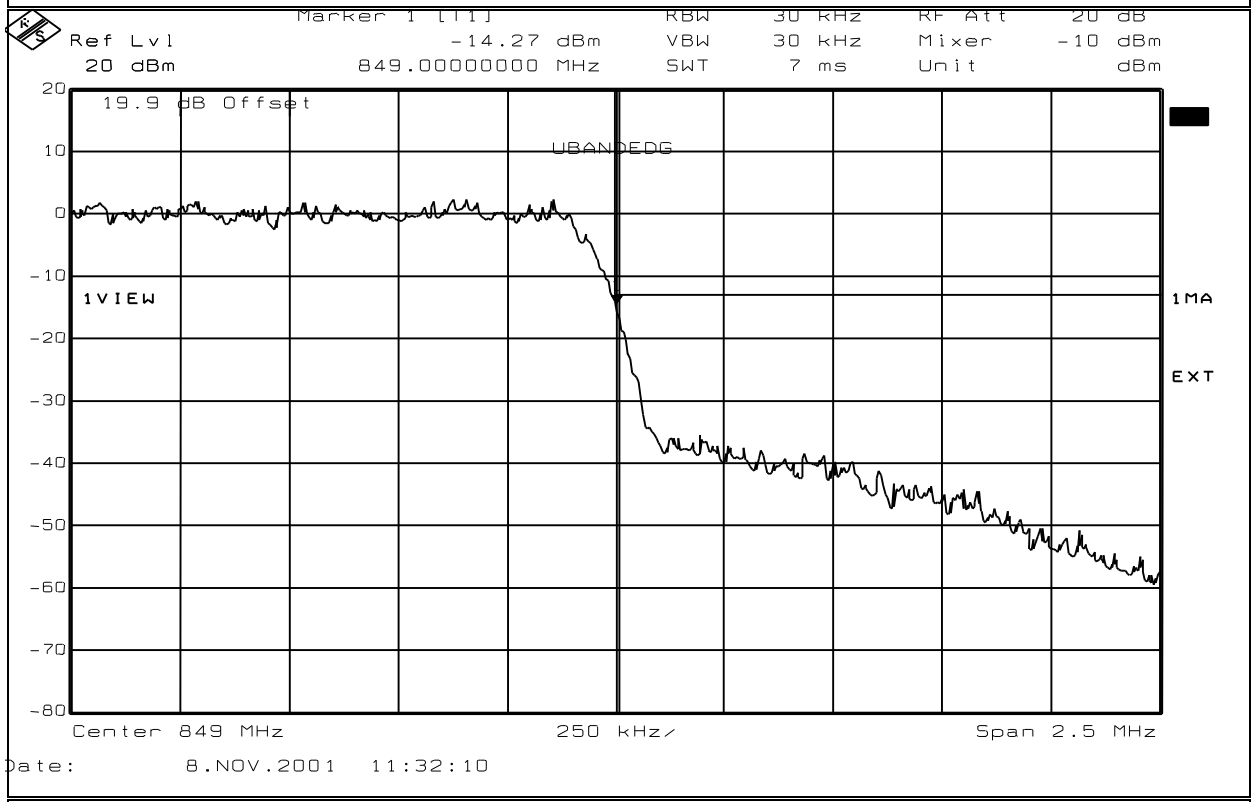
Dallas Headquarters:
802 N. Kealy
Lewisville, TX 75057
Tel: (972) 436-9600
Fax: (972) 436-2667

Nemko Dallas, Inc.

Data Plot **Band Edges - CDMA**

Page 2 of 4

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		



Notes: **Upper bandedge - Uplink**
Channel 777

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

Test Data – Field Strength of Spurious

Field Strength of Spurious Emissions

Page 1 of 1

Complete X
Preliminary

Job No.: 1L0616R
Date: 11/8/2001
Specification: PT 22
Temperature(°C): 22
Tested By: Tom Tidwell
Relative Humidity(%) 45
E.U.T.: AMPS BAND REPEATER
Configuration: TYPICAL
Sample No: 1
Location: AC 3
RBW: 500 kHz
Measurement Distance: 3 m
Detector Type: Peak
VBW: 1 MHz

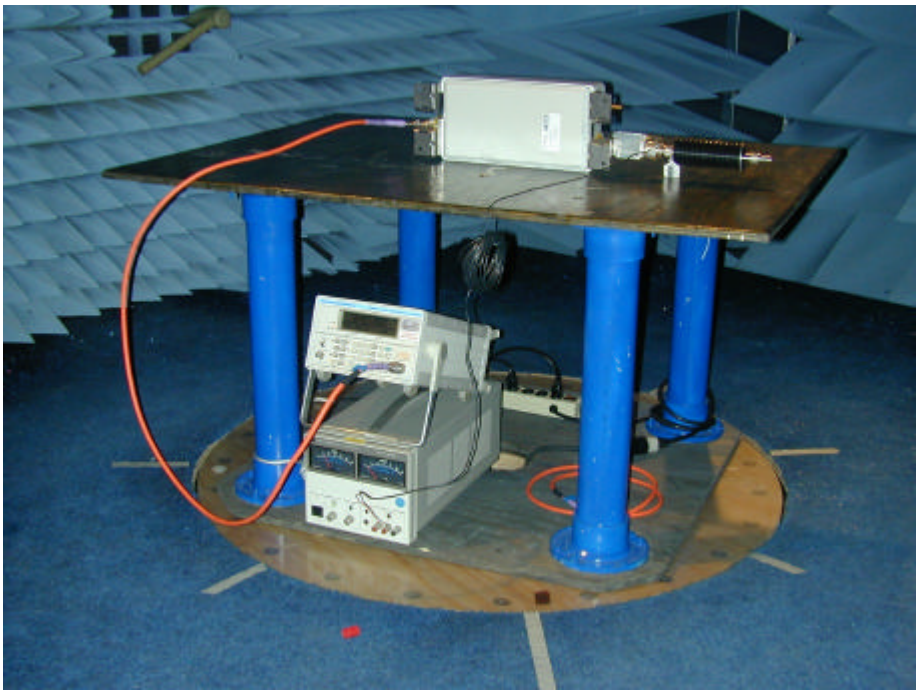
Test Equipment Used

Antenna: 993
Directional Coupler:
Pre-Amp:
Cable #1: 1483
Filter:
Cable #2: 1485
Receiver: 1464
Cable #3:
Attenuator #1
Cable #4:
Attenuator #2:
Mixer:
Measurement Uncertainty: +/-3.6 dB

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)**

Test Setup Photographs – Field Strength of Spurious



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:

Not Applicable

Equipment Used:

Measurement Uncertainty: +/- 1 x 10^{-7} ppm

Temperature: °C

Relative Humidity: %

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

ANNEX A - TEST DETAILS

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

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.

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

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

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

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

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.

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

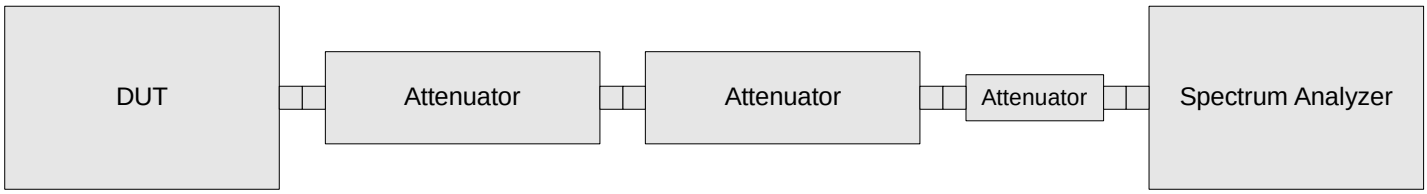
Method Of Measurement:

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.

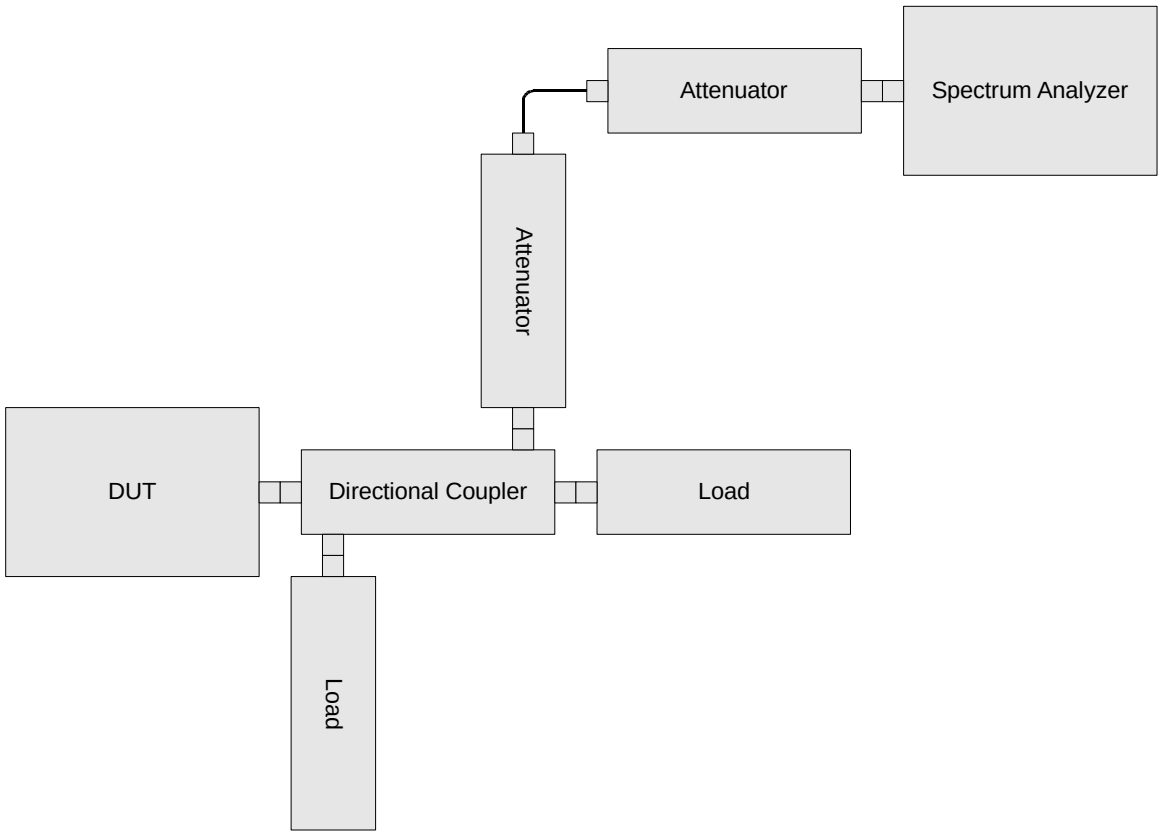
Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30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

ANNEX B - TEST DIAGRAMS

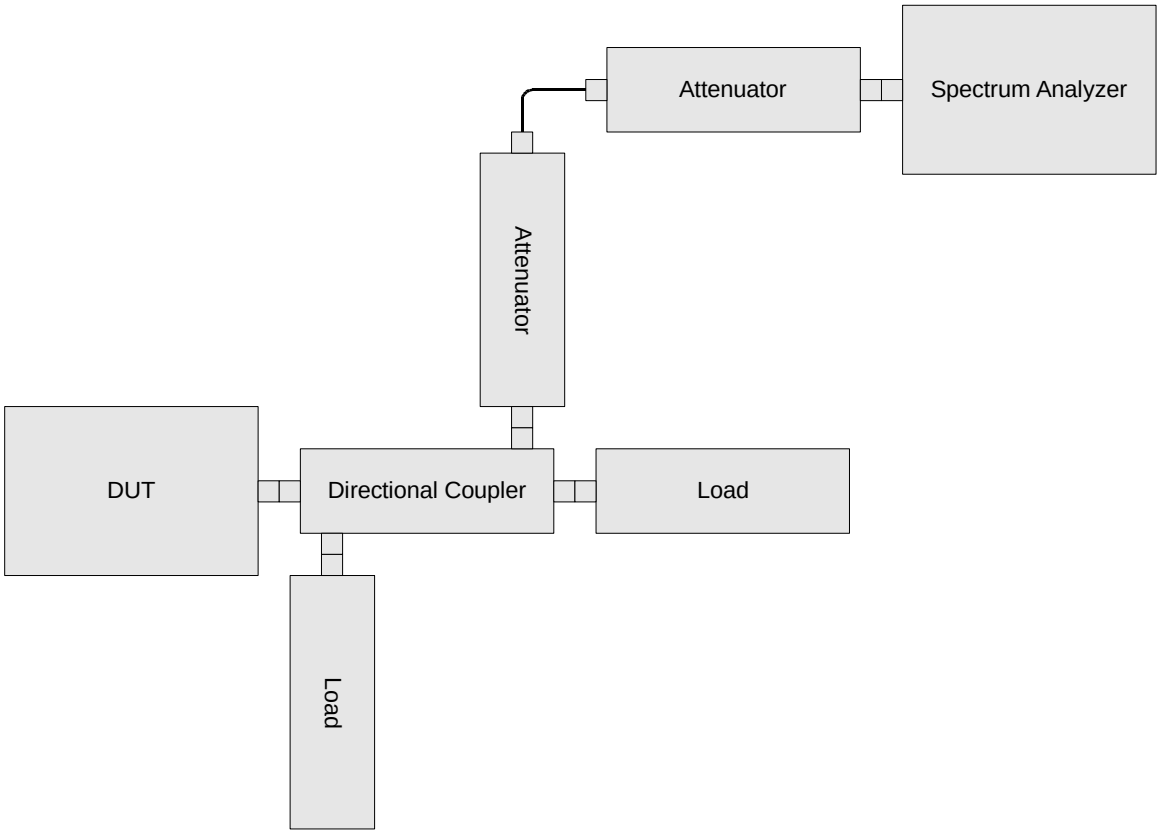
Para. No. 2.1046 - R.F. Power Output

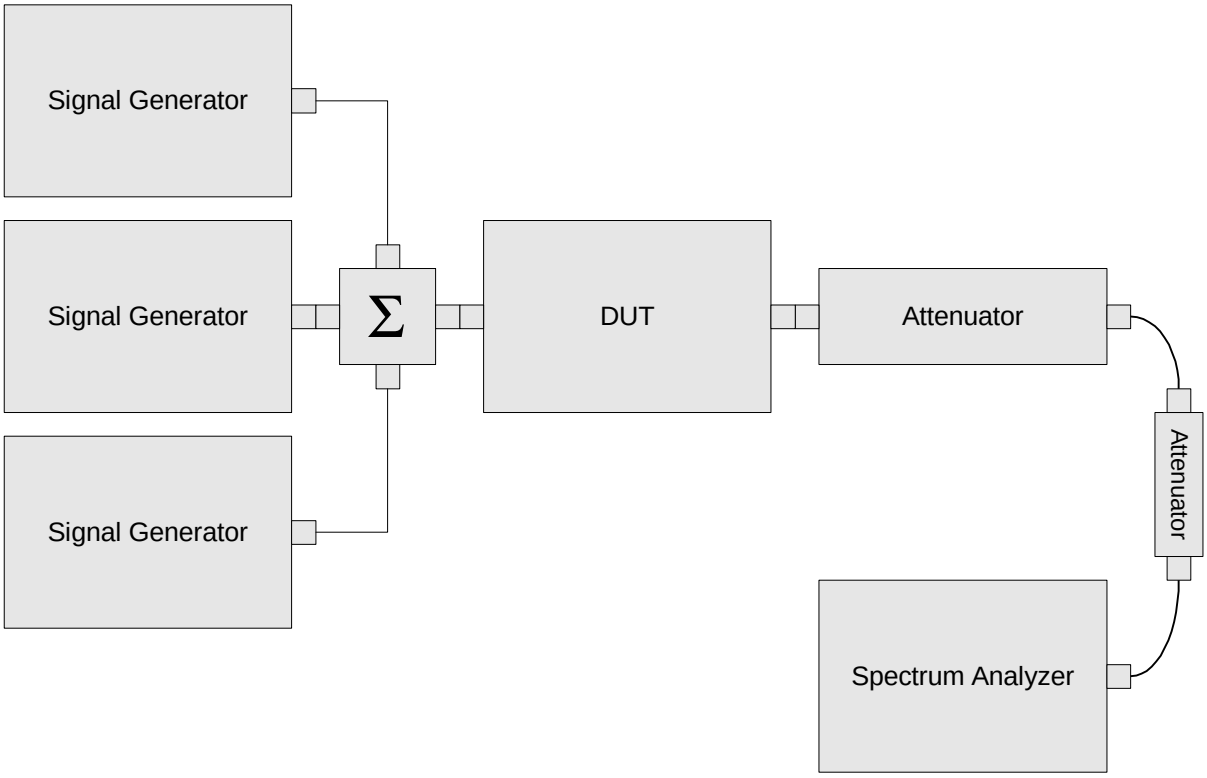


Para. No. 2.1049 - Occupied Bandwidth

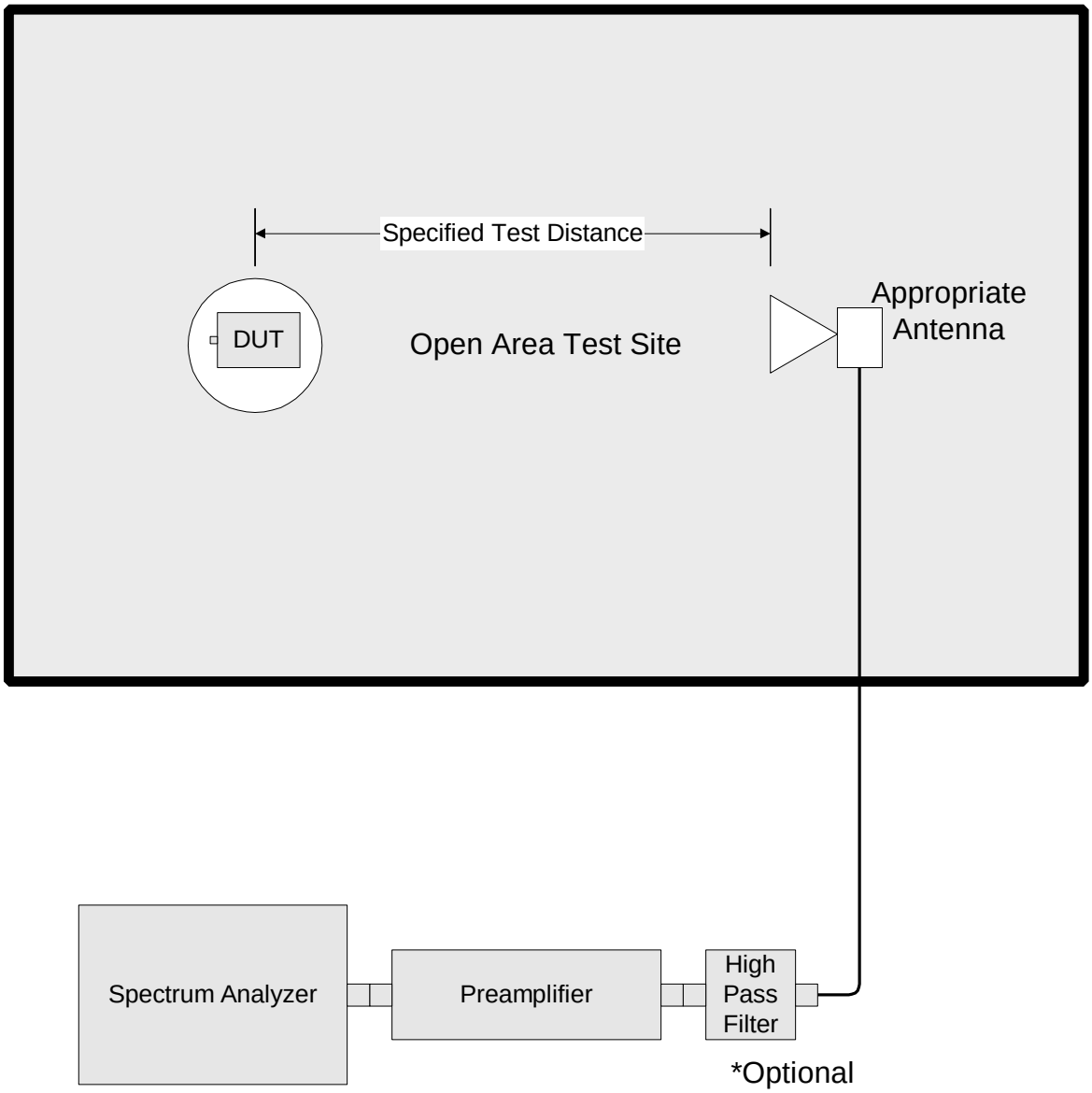


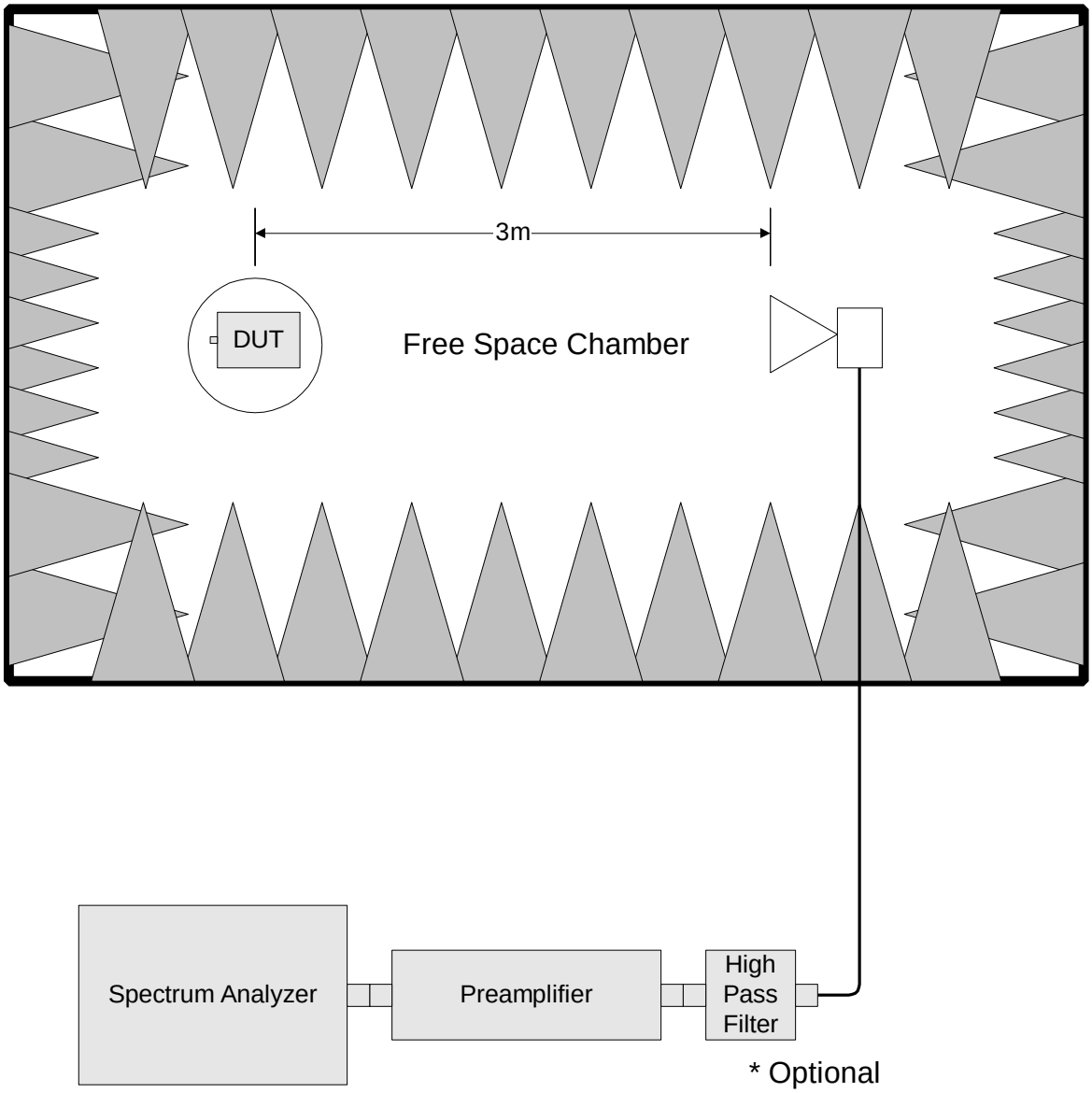
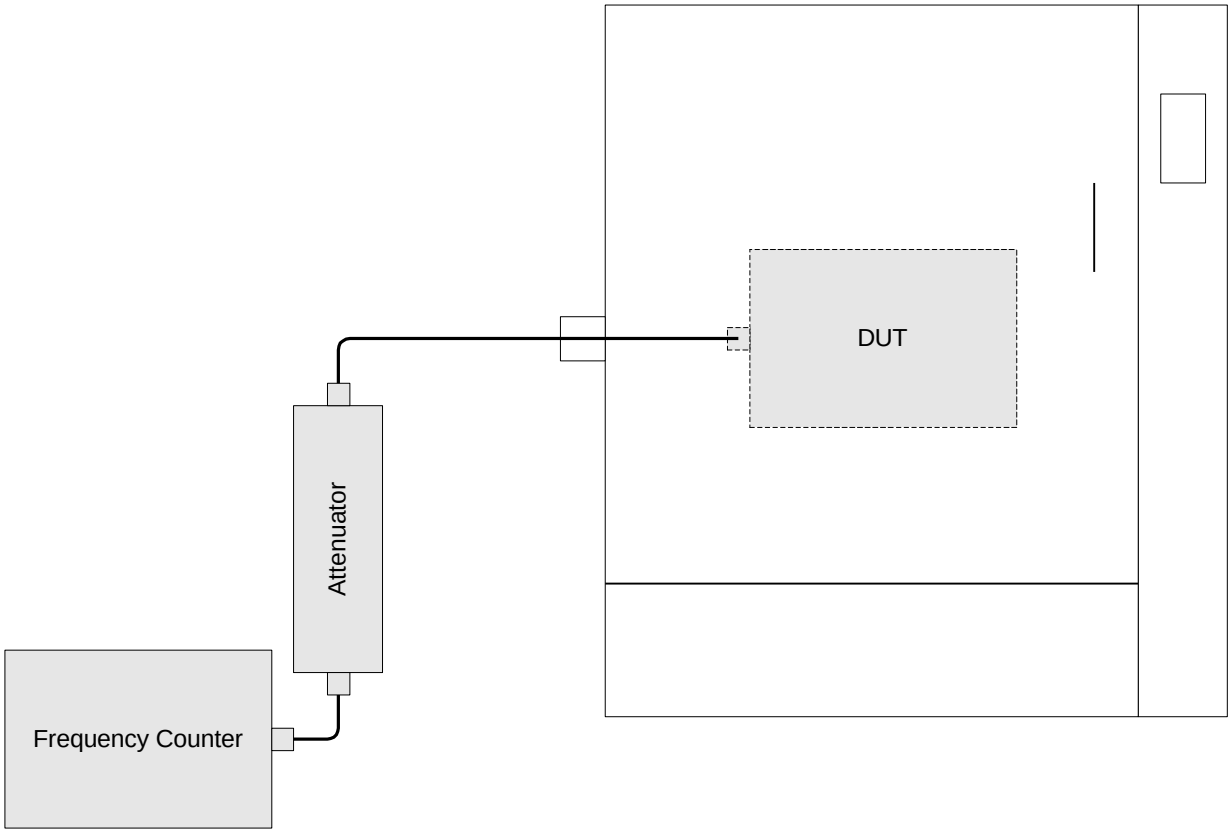
Para. No. 2.1051 Spurious Emissions at Antenna Terminals




Signal Generator
Signal Generator
Signal Generator
Σ
DUT
Attenuator
Attenuator
Spectrum Analyzer

Para. No. 2.1053 - Field Strength of Spurious Radiation




3m
DUT
Free Space Chamber
Spectrum Analyzer
Preamplifier
High Pass Filter
* Optional

Para. No. 2.1055 - Frequency Stability