KTL Test Report:	0L0265RUS2
Applicant:	Communication Components, Inc. 299 Forest Ave. Paramus, NJ 07652
Equipment Under Test: **(E.U.T.)**	BDA-8087-52
In Accordance With:	**FCC Part 22, Subpart H** Cellular Band Repeaters
Tested By:	KTL Dallas Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 Tom Tidwell, RF Group Manager
Date:	12/6/00
Total Number of Pages:	50

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Communication Components, Inc.

Model No.: BDA-8087-52

Serial No.: 0052

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

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	22.913(a)	500W ERP	.085	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask	N/A	N/A
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask	N/A	N/A
Occupied Bandwidth (ST)	22.917(d)	Mask	N/A	N/A
Occupied Bandwidth (Digital)	None	None	N/A	N/A
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.	-23.4 dBm	Complies
Frequency Stability	22.355	1.5 ppm	N/A	N/A

(1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
(2) Sice the E.U.T. only amplifies the signal it receives, Frequency Stability was not tested.

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Section 2. General Equipment Specification

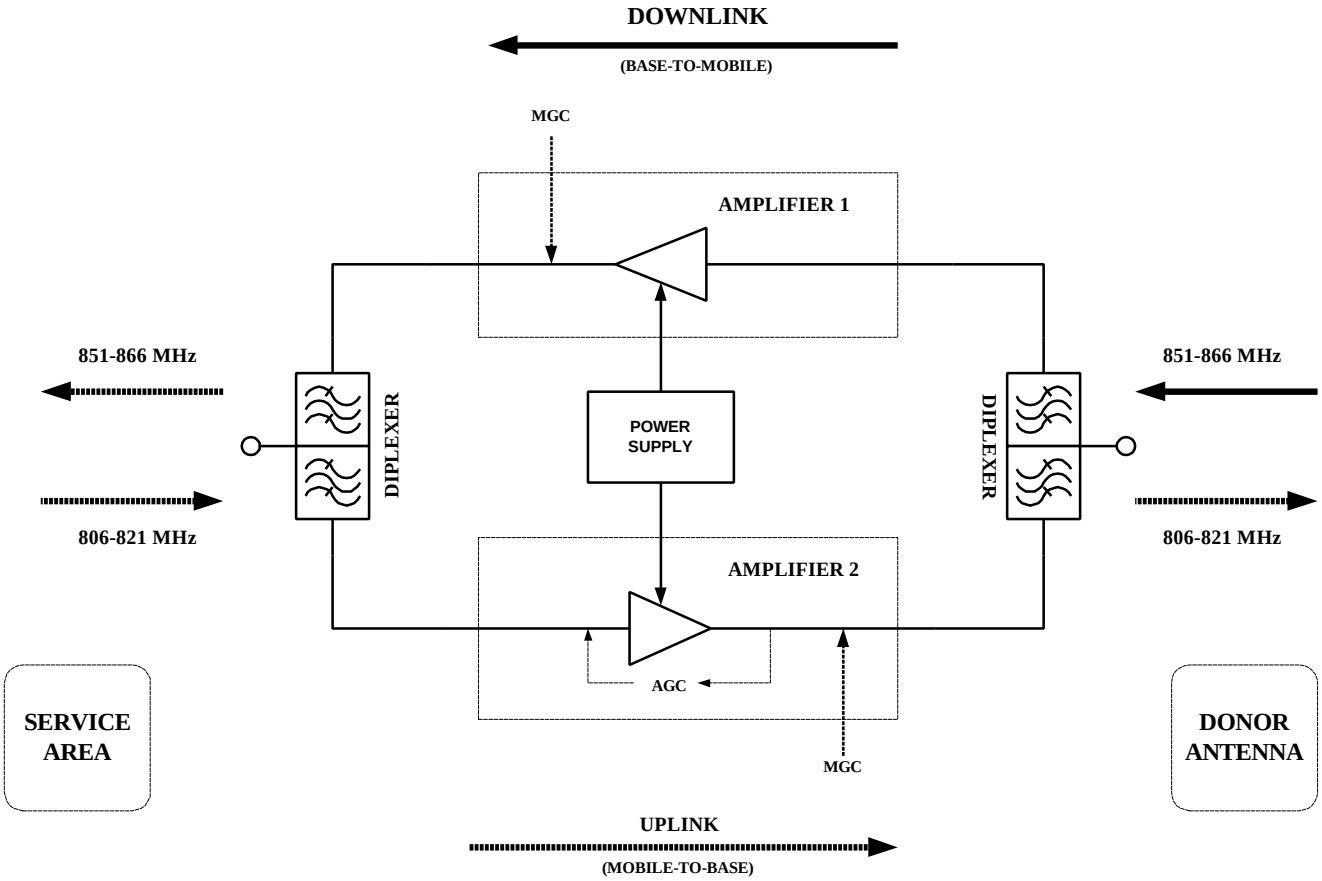
Supply Voltage Input:		115 VAC
Frequency Range:	**Downlink:**	869 – 894 MHz
Frequency Range:	**Uplink:**	824 – 849 MHz
Type of Modulation and Designator:		**CDMA (F9W)** ☒ **GSM (GXW)** ☐ **NADC (DXW)** ☒ **CDPD (F9W)** ☐ **AMPS (F8W, F1D)** ☐
Output Impedance:		50 ohms
RF Output (Rated):	**Downlink:**	Multi-channel: .100 W Single Channel: .316 W
	Uplink:	Multi-channel: .100 W Single Channel: .316 W
Frequency Translation:		**F1-F1** ☐ **F1-F2** ☐ **N/A** ☒
Band Selection:		**Software** ☐ **Duplexer Change** ☒ **Fullband Coverage** ☐

Description of Operation

The BDA is a Bi-directional amplifier. It is designed to exchange radio communications in buildings, basements, tunnels, and other RF shielded environments. It improves the sensitivity of base stations in indoor locations where there is a significant amount of cable loss in RF distribution systems.

It contains two amplifiers providing amplification of RF signals in Uplink and Downlink frequency bands. They are connected to the external cables via frequency selective duplexers in order to attenuate all signals that are not in the designated bands.

System Diagram



FUNCTIONAL BLOCK DIAGRAM
P/N: BDA-8087-52

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 10/3/00

Test Results: Complies.

Test Data:

	Modulation Type	Single Channel Power Output (dBm)	Total Power Output with 3 Carriers (dBm)
Uplink	CDMA	24.0	19.8
Downlink	CDMA	24.8	19.5
Uplink	NADC	24.8	19.3
Downlink	NADC	25.0	19.3

Equipment Used: 406, 1021

Measurement Uncertainty: +/-0.6 dB

Temperature: 24 °C

Relative Humidity: 50 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (Digital Mod.)	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 10/02/00

Test Results: Complies.

Test Data: See attached plots

Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 50 %

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

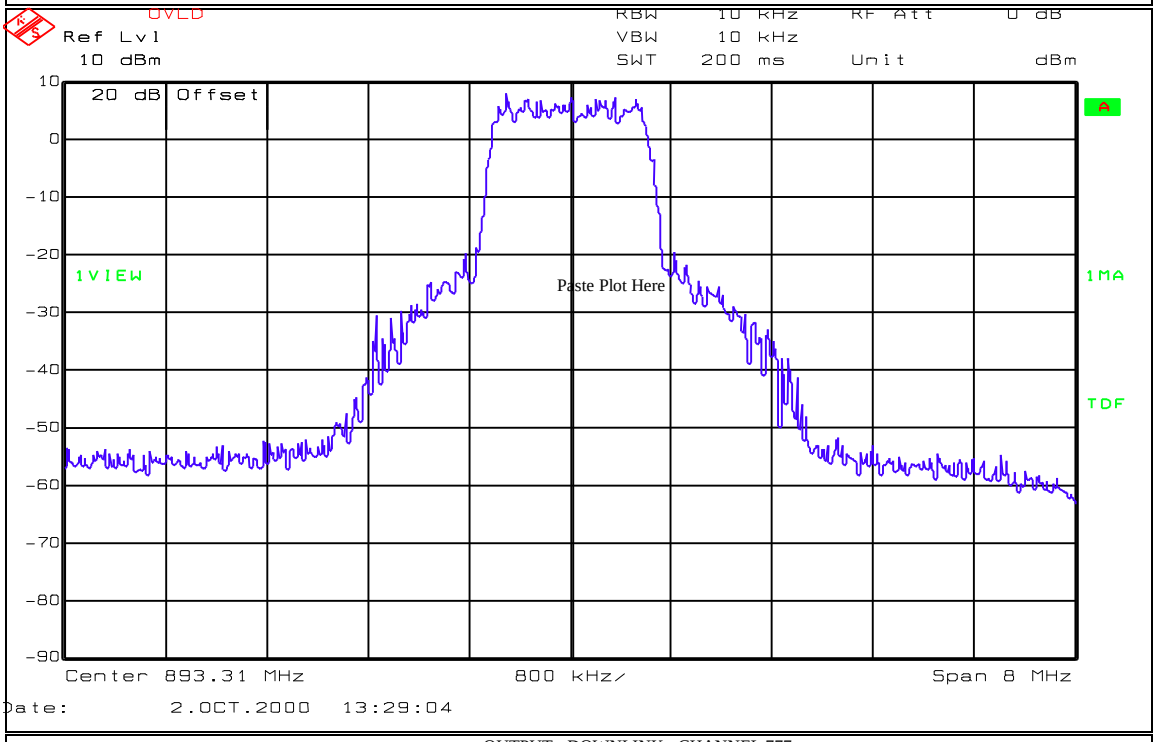
Page 1 of 4

Job No.:	0L0265R	Date: 10/02/00	
Specification:	Part 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		
Serial Number:	52		
Location:	Lab 1	RBW:	10 kHz
Detector Type:	Peak	VBW:	10 kHz

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1045
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:



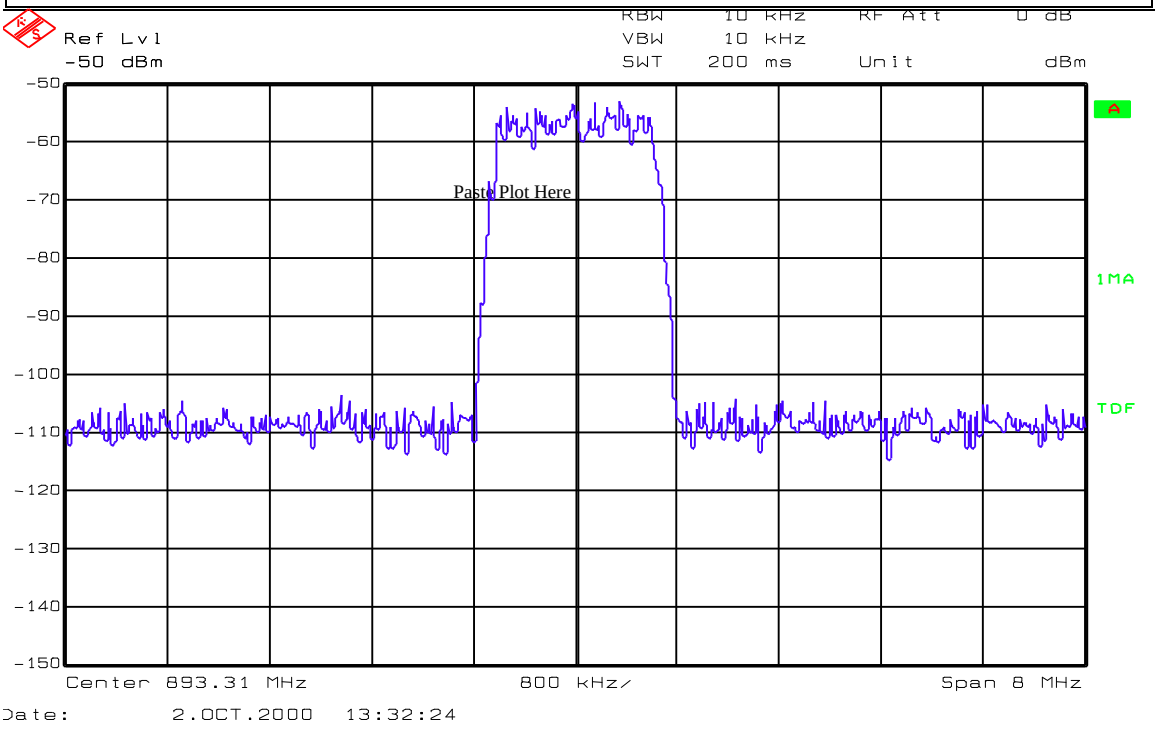
Notes: OUTPUT - DOWNLINK - CHANNEL 777

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

Page 2 of 4

Job No.:	0L0265R	Date:	10/2/00
Specification:	Part 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		



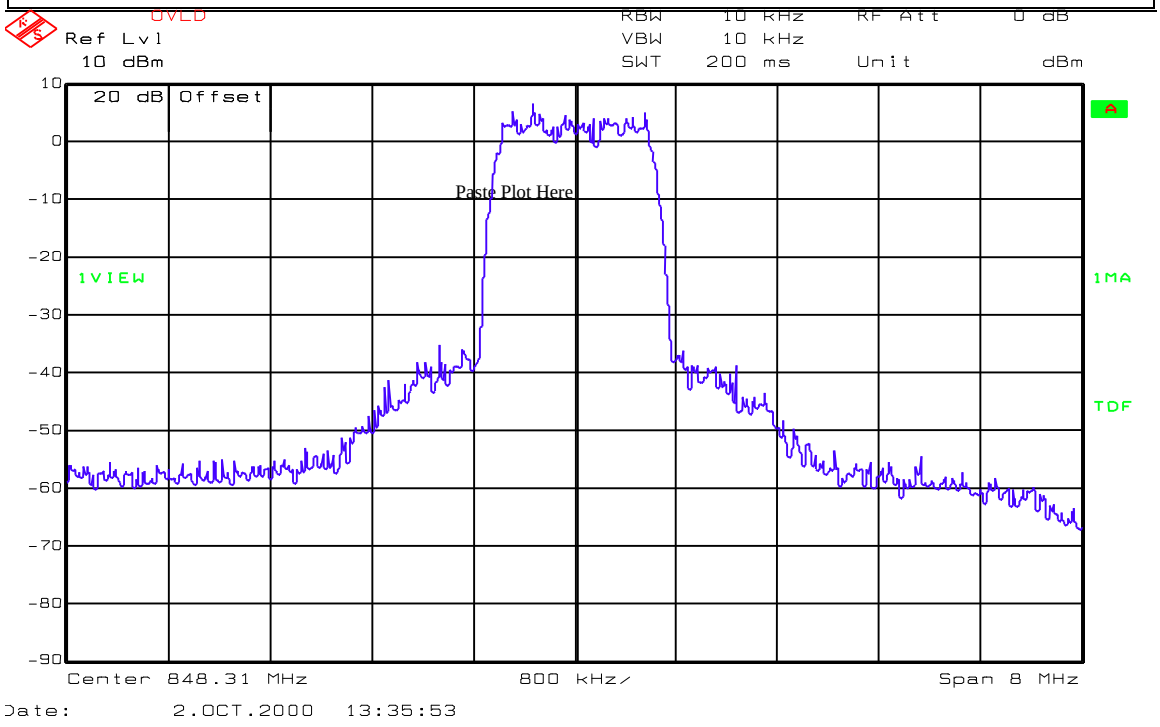
Notes: INPUT - DOWNLINK - CHANNEL 777

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

Page 3 of 4

Job No.:	0L0265R	Date:	10/2/00
Specification:	Part 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		



Notes: OUTPUT - UPLINK - CHANNEL 777

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

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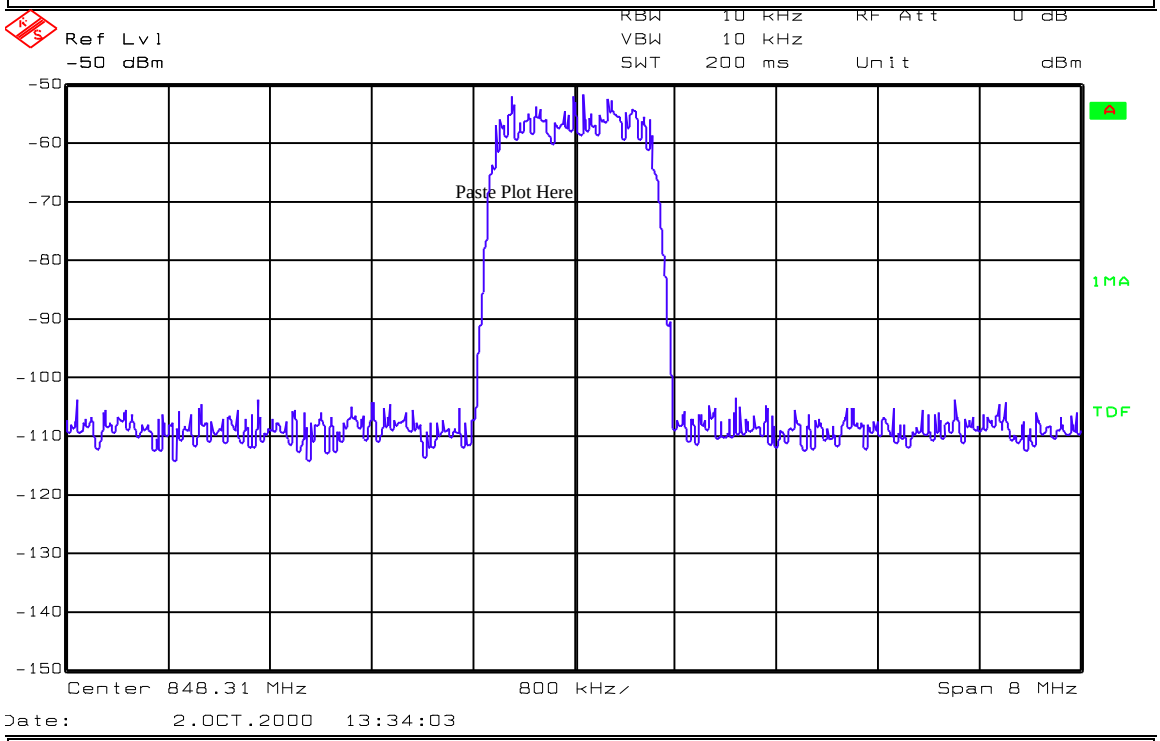
Job No.:	0L0265R	Date:	10/2/00
Specification:	Part 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		



Notes: INPUT - UPLINK - CHANNEL 777

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

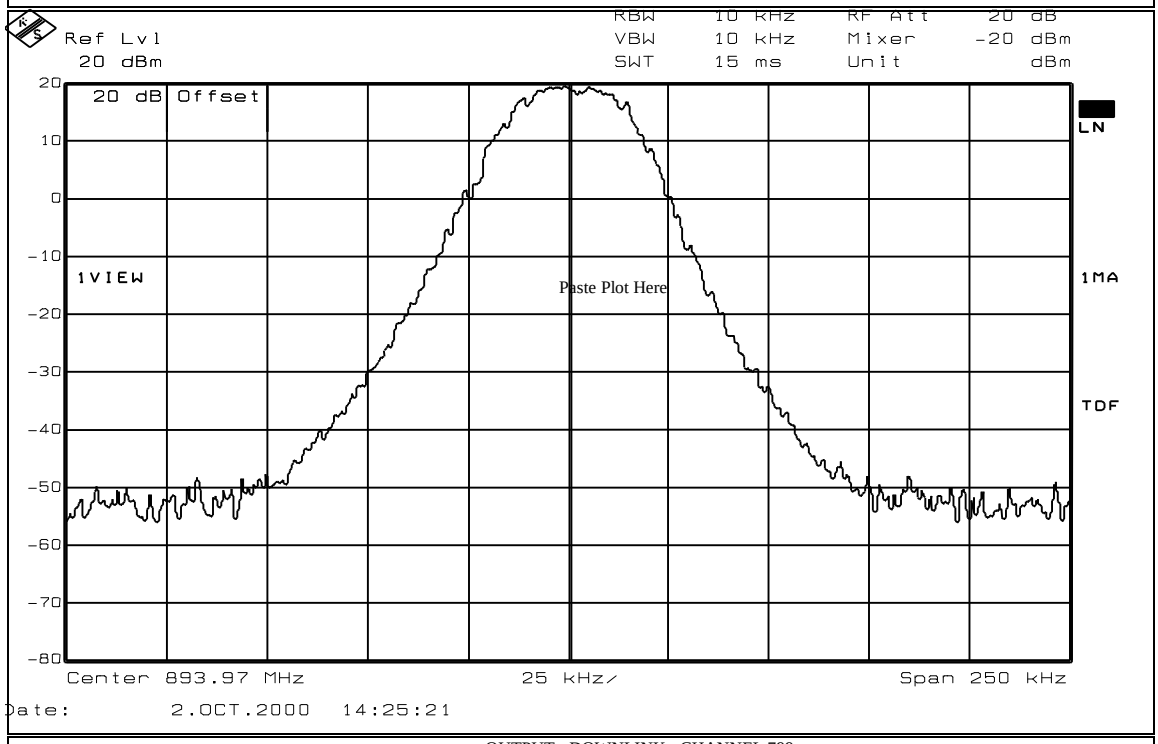
Page 1 of 4

Job No.:	0L0265R	Date: 10/02/00	
Specification:	Part 22	Temperature(°C): 24	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		
Serial Number:	52		
Location:	Lab 1	RBW: 10 kHz	
Detector Type:	Peak	VBW: 10 kHz	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1045
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:



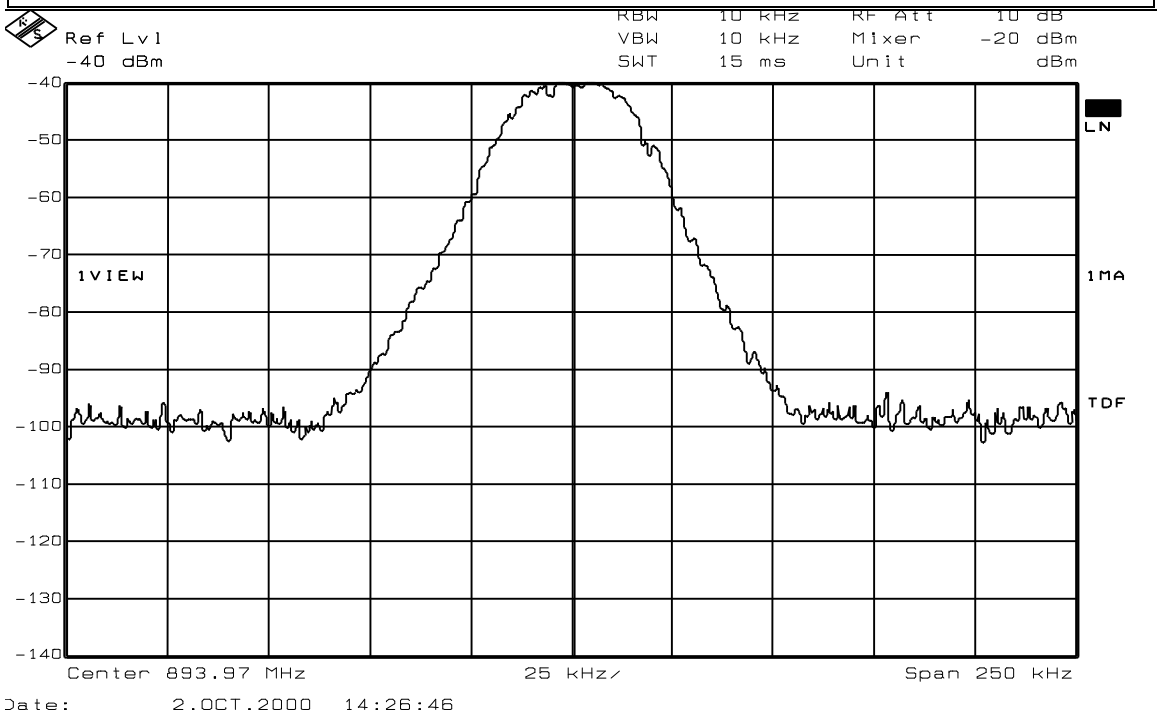
Notes: OUTPUT - DOWNLINK - CHANNEL 799

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

Page 2 of 4

Job No.:	0L0265R	Date:	10/2/00
Specification:	Part 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		



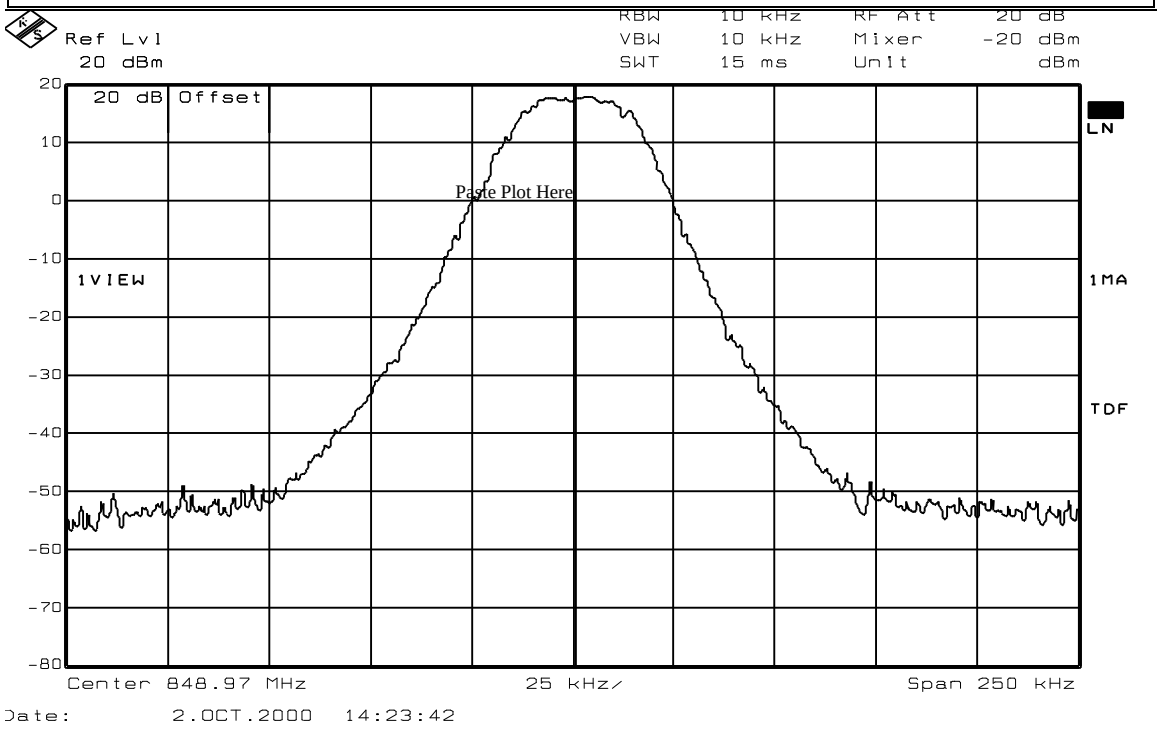
Notes: INPUT - DOWNLINK - CHANNEL 799

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

Page 3 of 4

Job No.: 0L0265R Date: 10/2/00
Specification: Part 22 Temperature(°C): 1/24/00
Tested By: David Light Relative Humidity(%) 2/19/00
E.U.T.: Cell Band Repeater
Configuration: Normal operation



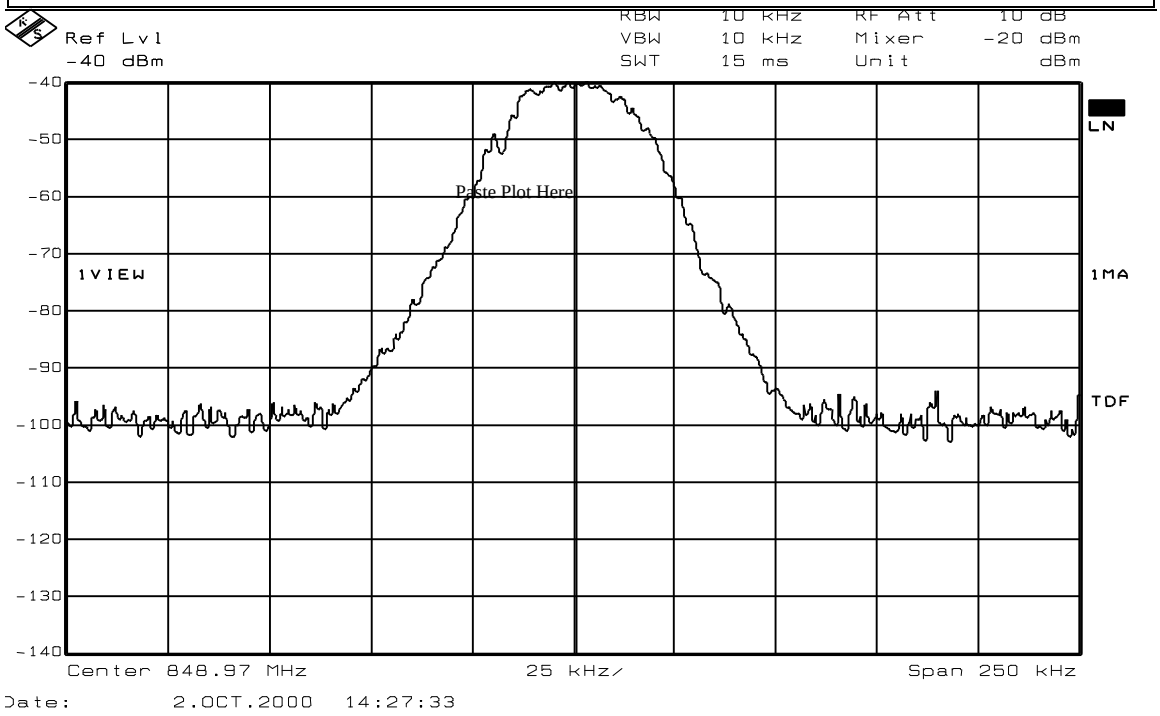
Notes: OUTPUT - UPLINK - CHANNEL 799

Occupied Bandwidth-Plots

Test Plot: Occupied Bandwidth (Input vs. Output)

Page 4 of 4

Job No.:	0L0265R	Date:	10/2/00
Specification:	Part 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	Cell Band Repeater		
Configuration:	Normal operation		



Notes: INPUT - UPLINK - CHANNEL 799

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 10/03/00

Test Results: Complies.

Test Data: See attached plots

Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 50 %

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Antenna Port Spurious Emissions

Page 1 of 2

Complete X
Preliminary

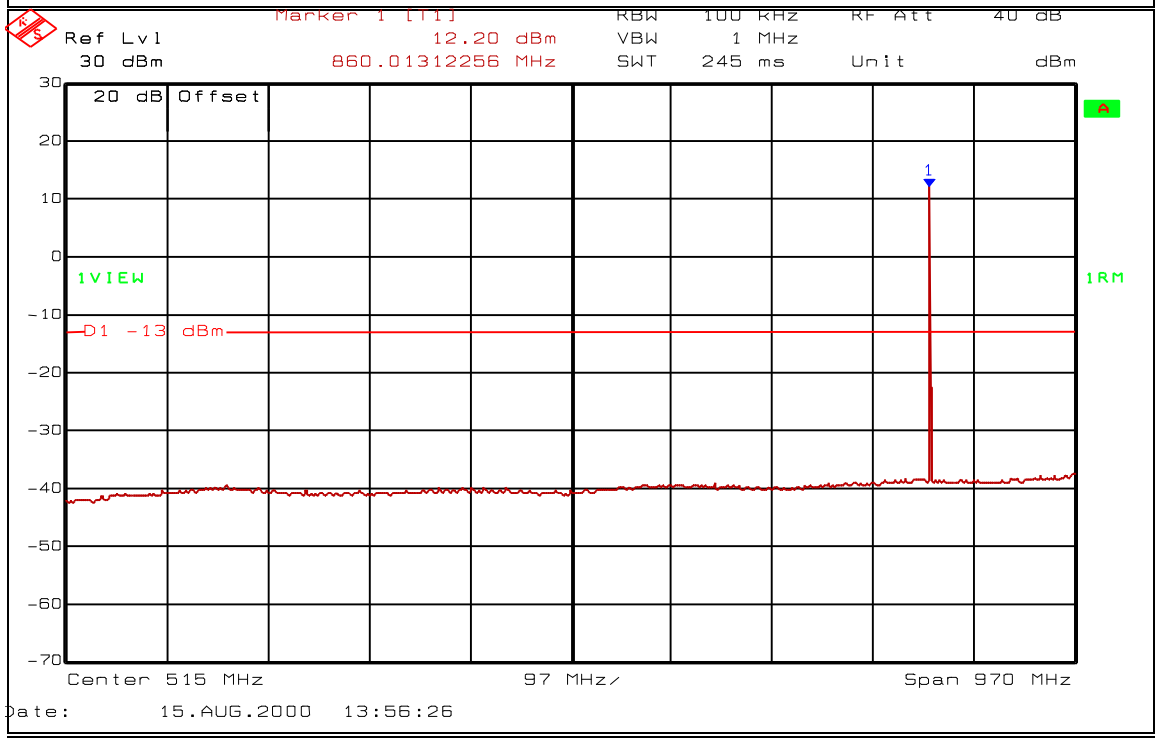
Job No.:	0L0265R	Date: 08/14/00	
Specification:	Part 2.1051	Temperature(°C): 22	
Tested By:	David Light	Relative Humidity(%) 50	
E.U.T.:	BDA-8087-52		
Configuration:	Transmit		
Sample Number:	S01		
Location:	Lab 1	RBW: See plots	
Detector Type:	Rms	VBW: See plots	

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1081
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:

Measurement Uncertainty: #N/A



Notes: **Downlink - Mid Channel**

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Antenna Port Spurious Emissions

Page 2 of 2 Complete

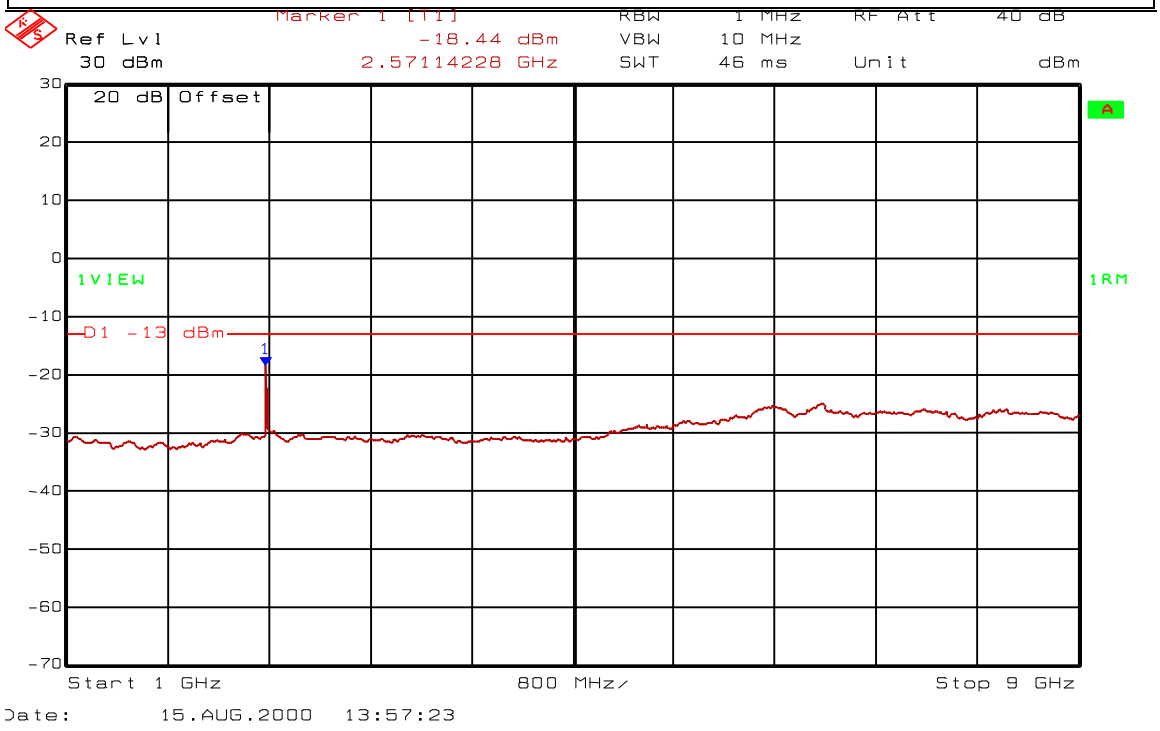
Job No.: 0L0265R Date: 8/14/00 Preliminary

Specification: Part 2.1051 Temperature(°C): 1/22/00

Tested By: David Light Relative Humidity(%) 2/19/00

E.U.T.: BDA-8087-52

Configuration: Transmit



Notes: **Downlink - Mid Channel**

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Antenna Port Spurious Emissions

Page 1 of 2

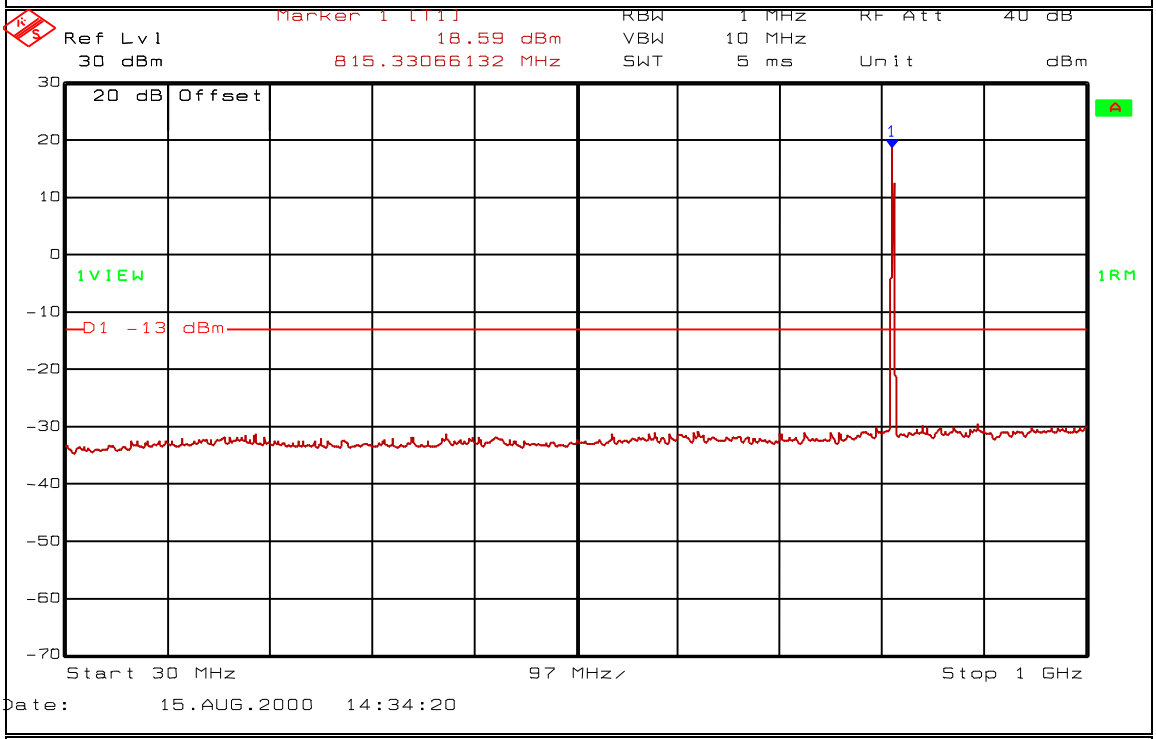
Complete X
Preliminary

Job No.: 0L0265R Date: 08/15/00
Specification: Part 2.1051 Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 50
E.U.T.: BDA-8087-52
Configuration: Transmit
Sample Number: S01
Location: Lab 1 RBW: See Plot
Detector Type: Rms VBW: See Plot

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1081
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:
Measurement Uncertainty: #N/A



Notes: Uplink - Mid Channel

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Antenna Port Spurious Emissions

Page 2 of 2 Complete

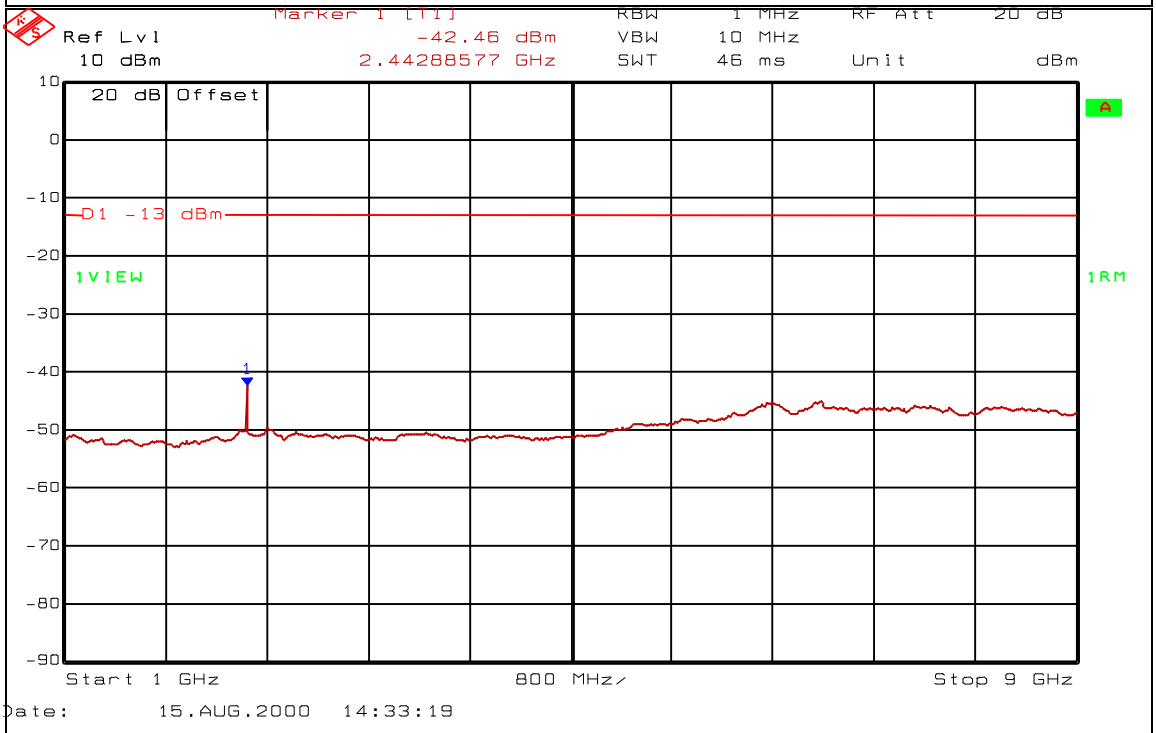
Job No.: 0L0265R Date: 8/15/00 Preliminary

Specification: Part 2.1051 Temperature(°C): 1/22/00

Tested By: David Light Relative Humidity(%) 2/19/00

E.U.T.: BDA-8087-52

Configuration: Transmit



Notes: **Uplink -Mid Channel**

Spurious Emissions at Antenna Terminals-Plots

Test Plot: IN BAND SPURIOUS - CDMA

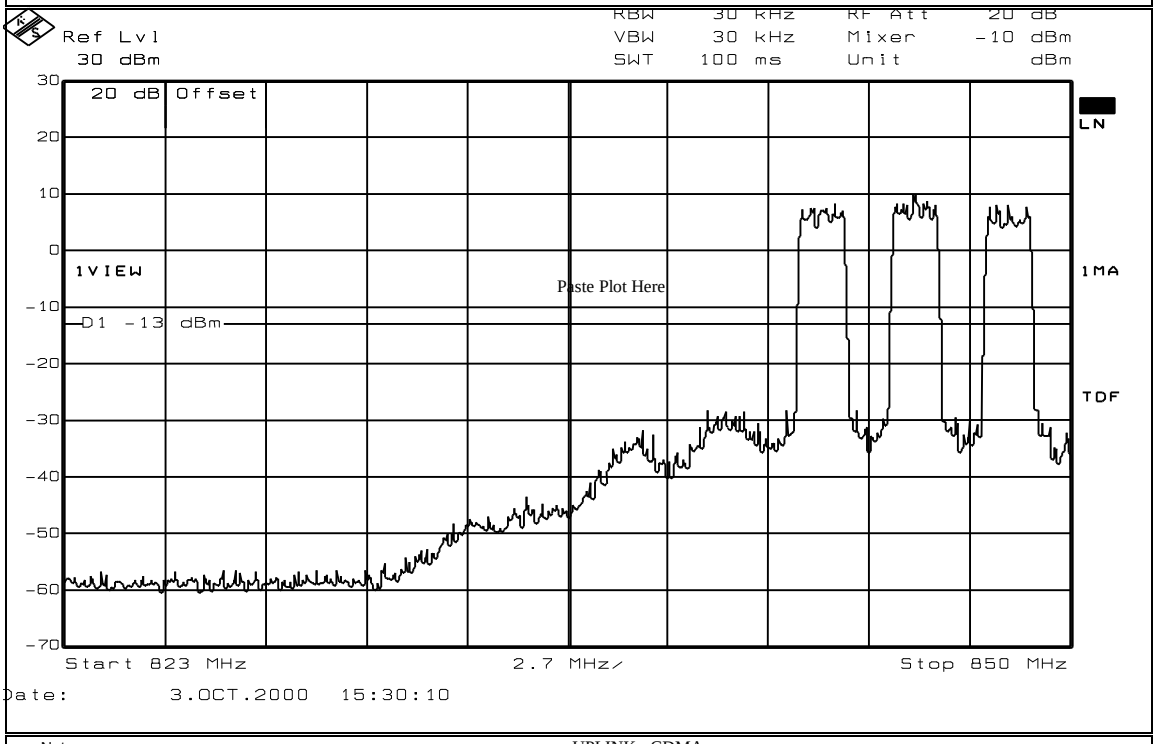
Page 1 of 4

Job No.:	0L0265R	Date: 10/03/00	
Specification:	PART 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		
Serial Number:			
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Peak	VBW:	30 kHz

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1045
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:



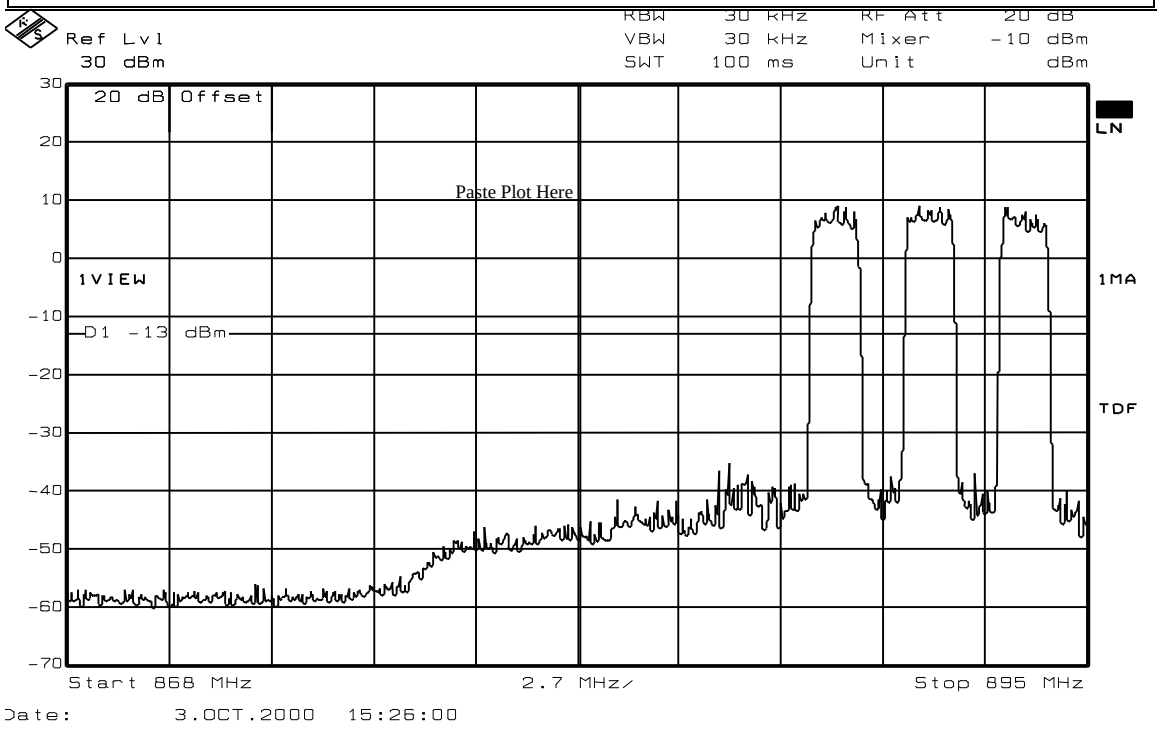
Notes: UPLINK - CDMA

Spurious Emissions at Antenna Terminals-Plots

Test Plot: IN BAND SPURIOUS - CDMA

Page 2 of 4

Job No.:	0L0265R	Date:	10/3/00
Specification:	PART 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		



Notes: DOWNLINK - CDMA

Spurious Emissions at Antenna Terminals-Plots

Test Plot: IN BAND SPURIOUS - CDMA

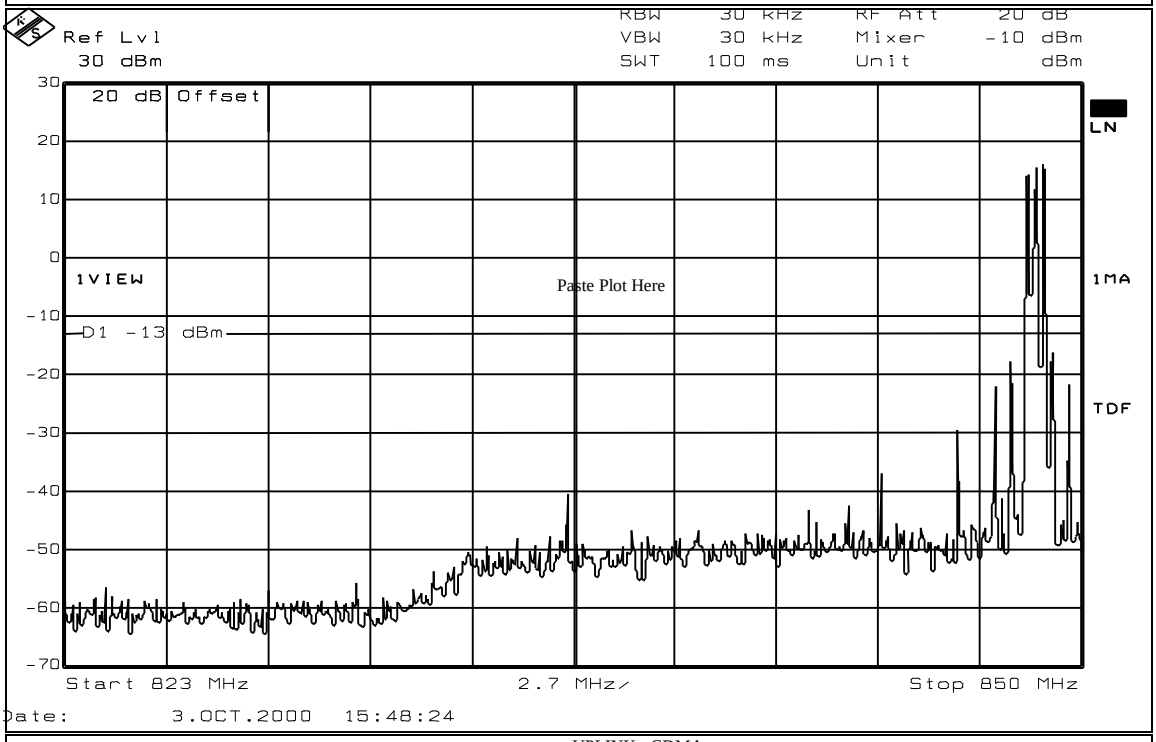
Page 1 of 4

Job No.:	0L0265R	Date: 10/03/00	
Specification:	PART 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		
Serial Number:			
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Peak	VBW:	30 kHz

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1045
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:



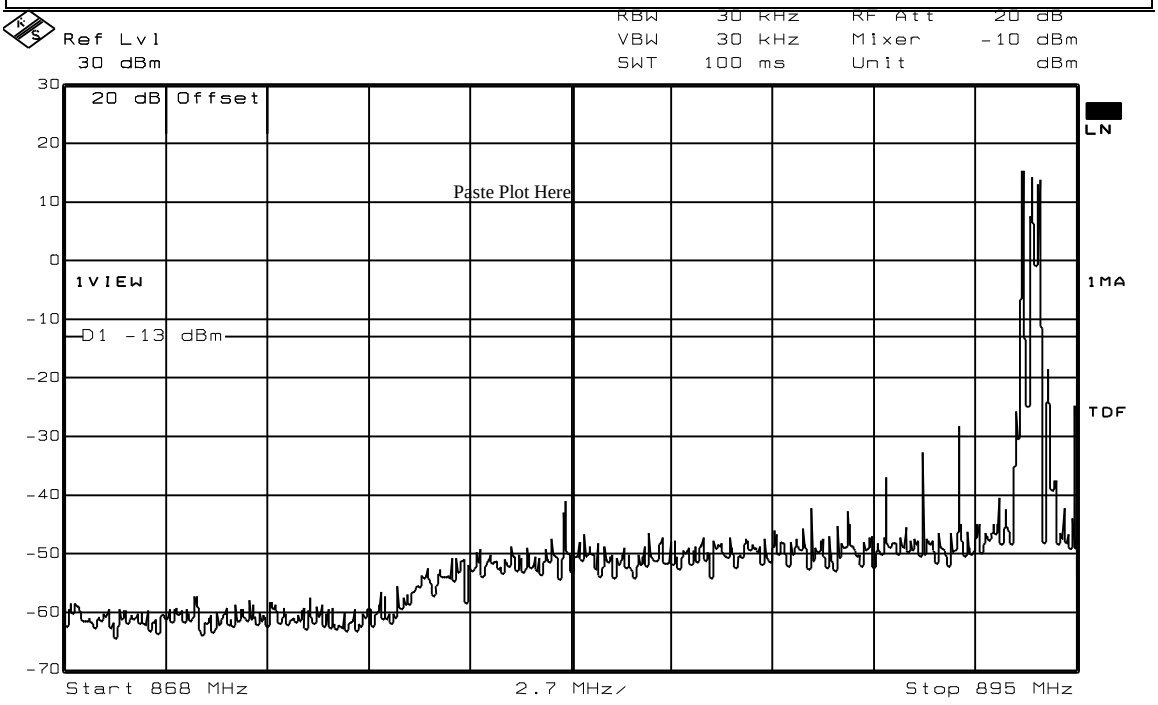
Notes: UPLINK - CDMA

Spurious Emissions at Antenna Terminals-Plots

Test Plot: IN BAND SPURIOUS - CDMA

Page 2 of 4

Job No.: 0L0265R Date: 10/3/00
Specification: PART 22 Temperature(°C): 1/24/00
Tested By: David Light Relative Humidity(%) 2/19/00
E.U.T.: REPEATER
Configuration: NORMAL OPERATION



Notes: DOWNLINK - CDMA

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Band Edges - CDMA

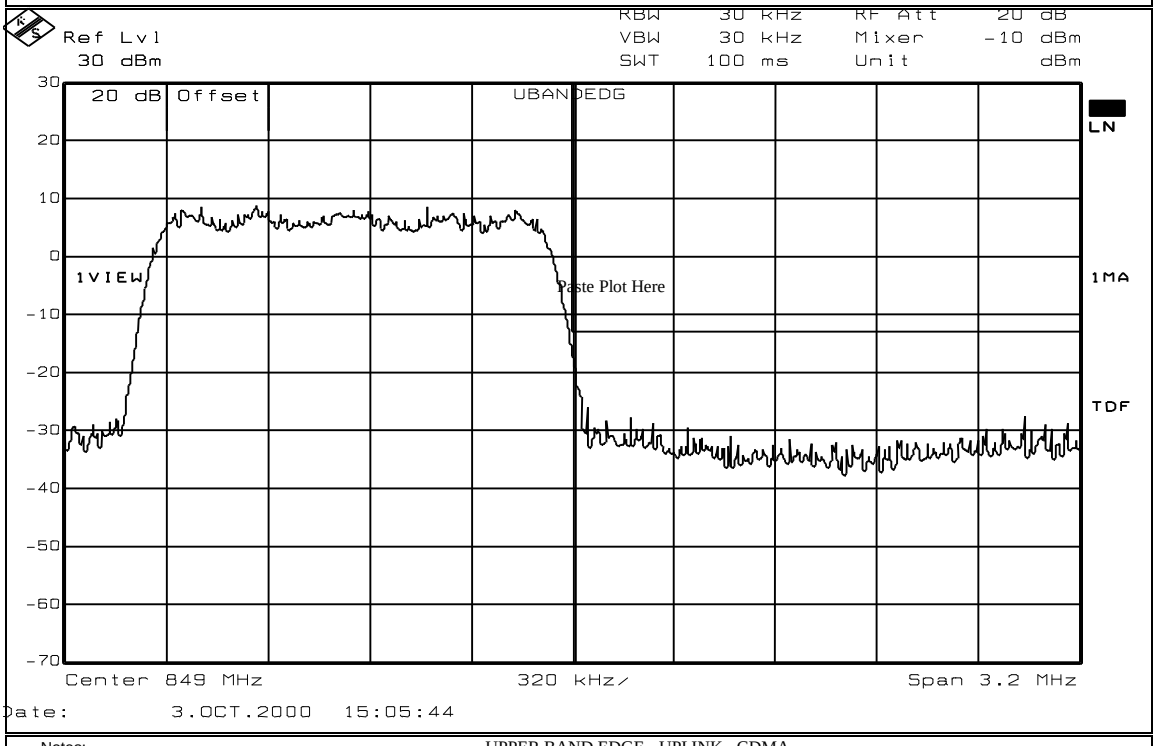
Page 1 of 4

Job No.:	0L0265R	Date:	10/03/00
Specification:	PART 22	Temperature(°C):	24
Tested By:	David Light	Relative Humidity(%)	50
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		
Serial Number:			
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Peak	VBW:	30 kHz

Test Equipment Used

Antenna:	#N/A	Directional Coupler:	#N/A
Pre-Amp:	#N/A	Cable #1:	1045
Filter:	#N/A	Cable #2:	#N/A
Receiver:	1036	Cable #3:	#N/A
Attenuator #1	1604	Cable #4:	#N/A
Attenuator #2:	#N/A	Mixer:	#N/A

Additional equipment used:



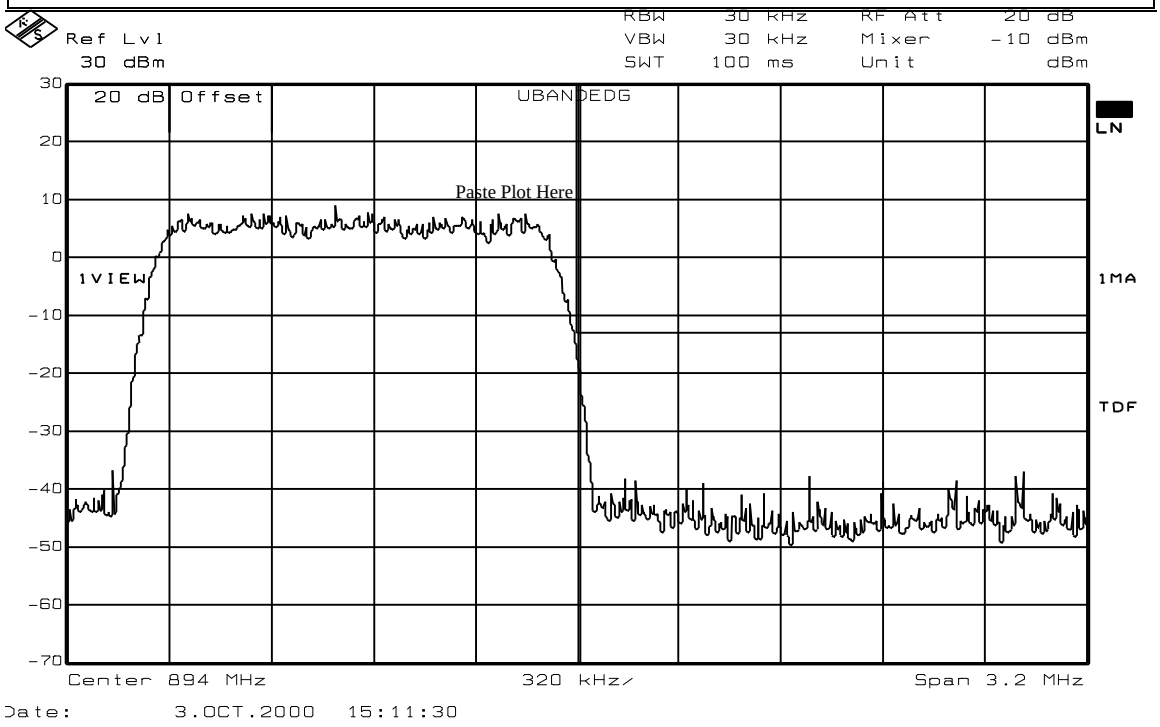
Notes: UPPER BAND EDGE - UPLINK - CDMA

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Band Edges - CDMA

Page 2 of 4

Job No.:	0L0265R	Date:	10/3/00
Specification:	PART 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		



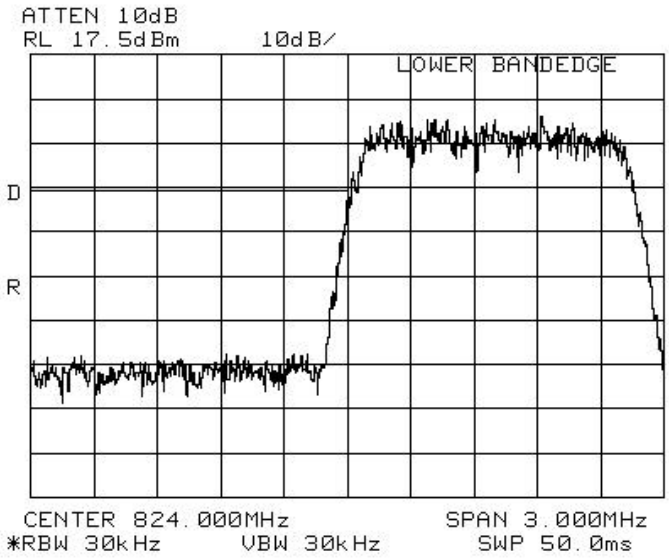
Notes: UPPER BAND EDGE - DOWNLINK - CDMA

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Band Edges - CDMA

Page 3 of 4

Job No.:	0L0265R	Date:	10/3/00
Specification:	PART 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		



LOWER BANDEDGE
CDMA
UPLINK
0L0265R

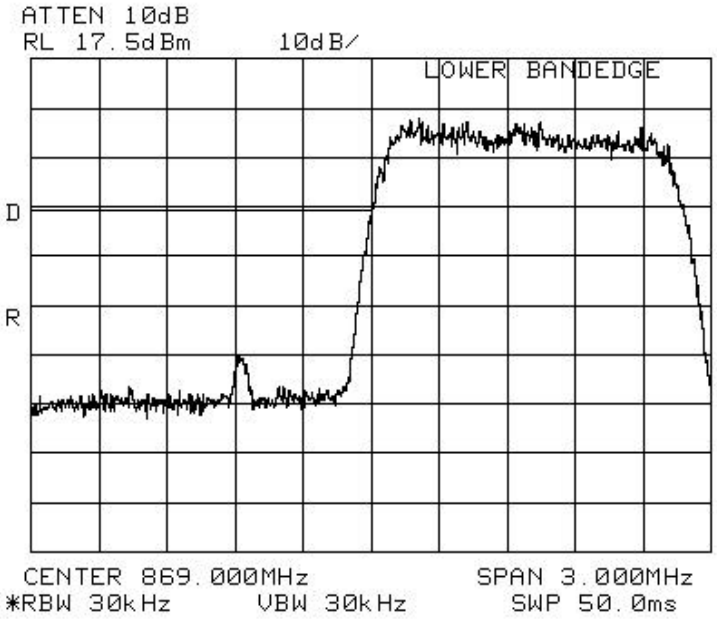
Notes:

Spurious Emissions at Antenna Terminals-Plots

Test Plot: Band Edges - CDMA

Page 4 of 4

Job No.:	0L0265R	Date:	10/3/00
Specification:	PART 22	Temperature(°C):	1/24/00
Tested By:	David Light	Relative Humidity(%)	2/19/00
E.U.T.:	REPEATER		
Configuration:	NORMAL OPERATION		



LOWER BANDEDGE
CDMA
DOWNLINK
0L0265R

Notes:

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 8/15/00

Test Results: Complies.

Test Data: See attached table.

Measurement Uncertainty: +/- 3.6 dB

Temperature: 22 °C

Relative Humidity: 50 %

Field Strength of Spurious - Data

Field Strength of Spurious Emissions

Page 1 of 1 Complete X

Job No.: 0L0265R Date: 8/15/00 Preliminary

Specification: PART 2.1053 Temperature(°C): 22

Tested By: David Light Relative Humidity(%) 50

E.U.T.: BDA

Configuration: TRANSMIT -FULL POWER Peak rf power output(dBm): 24

Sample Number: S01

Location: AC 3 RBW: 1 MHz Measurement Distance 3 m

Detector Type: Peak VBW: 1 MHz

Test Equipment Used

Antenna: 993 Directional Coupler: #N/A

Pre-Amp: 1016 Cable #1: 1484

Filter: #N/A Cable #2: 1485

Receiver: 1464 Cable #3: #N/A

Attenuator #1 #N/A Cable #4: #N/A

Attenuator #2: #N/A Mixer: #N/A

Additional equipment used:

Measurement Uncertainty: +/- .7 dB

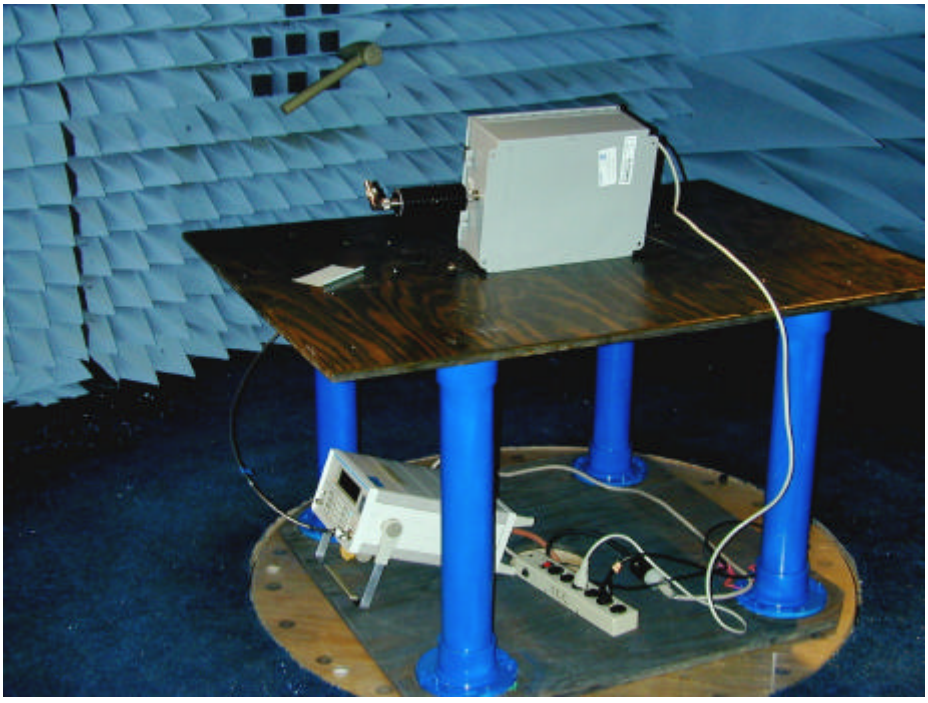
Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	EIRP (W)	EIRP (dBm)	dBc	Polarity	Comments
UPLINK										
1.63	42	25.5	2.6	31.5	39	0.00	-26.63	-50.63	H	NOISE FLOOR
2.45	42.5	29	3.1	32	43	0.00	-52.63	-52.63	H	NOISE FLOOR
3.26	38.2	29.8	3.4	32.4	39	0.00	-86.23	-86.23	H	NOISE FLOOR
4.08	39.7	31.7	3.9	31.3	44	0.00	-81.23	-84.23	H	NOISE FLOOR
8.15	38	37.5	5.7	33.1	48	0.00	-77.13	-77.13	H	NOISE FLOOR
1.63	42	25.5	2.6	31.5	39	0.00	-86.63	-86.63	V	NOISE FLOOR
2.45	42.5	29	3.1	32	43	0.00	-82.63	-82.63	V	NOISE FLOOR
3.26	38.2	29.8	3.4	32.4	39	0.00	-86.23	-86.23	V	NOISE FLOOR
4.08	39.7	31.7	3.9	31.3	44	0.00	-81.23	-81.23	V	NOISE FLOOR
8.15	38	37.5	5.7	33.1	48	0.00	-77.13	-77.13	V	NOISE FLOOR
DOWNLINK										
1.72	44.5	26.3	2.6	31.6	42	0.00	-23.43	-47.43	H	NOISE FLOOR
2.58	41.7	29.1	3.1	32.4	42	0.00	-53.73	-53.73	H	NOISE FLOOR
3.44	43.5	29.9	3.4	32.1	45	0.00	-80.53	-80.53	H	NOISE FLOOR
4.3	43.3	31.8	3.9	31.6	47	0.00	-77.83	-80.83	H	NOISE FLOOR
8.6	41.7	36.8	5.7	33	51	0.00	-74.03	-74.03	H	NOISE FLOOR
1.72	44.5	26.3	2.6	31.6	42	0.00	-83.43	-83.43	V	NOISE FLOOR
2.58	41.7	29.1	3.1	32.4	42	0.00	-83.73	-83.73	V	NOISE FLOOR
3.44	43.5	29.9	3.4	32.1	45	0.00	-80.53	-80.53	V	NOISE FLOOR
4.3	43.3	31.8	3.9	31.6	47	0.00	-77.83	-77.83	V	NOISE FLOOR
8.6	41.7	36.8	5.7	33	51	0.00	-74.03	-74.03	V	NOISE FLOOR

Notes: **SCANNED TO THE 10TH HARMONIC**

Field Strength of Spurious - Photos

Front View

Rear View



Section 7. Frequency Stability

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

Not Applicable

Test Results: Comply.

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

Equipment Used:

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

Temperature: °C

Relative Humidity: %

Section 8. Test Equipment List

KTL ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
1036	SPECTRUM ANALYZER *2 yr cal cycle	ROHDE & SCHWARZ FSEK30	830844/006	06/14/99
1604	ATTENUATOR Cal before use	NARDA 776B-20	NONE	09/30/99
1045	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	05/23/00
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	05/23/00
1464	Spectrum analyzer *2 yr cal cycle	Hewlett Packard 8563E	3551A04428	11/03/99
993	Horn antenna *2 yr cal cycle	A.H. Systems SAS-200/571	XXX	07/16/99
1016	AMPLIFIER	HEWLETT PACKARD 8449A	2749A00159	05/24/00
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	05/25/00
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	05/25/00
406	POWER METER	HP 436A	2512A22082	02/17/00
1021	Power sensor	Hewlett Packard A (50 ohm, 0.3 uw-100m)	2349A45632	02/17/00

All test equipment is on a one (1) year calibration cycle unless noted otherwise.

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:

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

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
Mask: CELLF3E

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
Mask: CELLF1D

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
Mask: CELLF1D

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
Mask:

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. 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)

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

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

For emissions > 1 GHz:

G = 1 (Isotropic Gain)
P = 1×10^{-5} Watts (Maximum spurious output power)
R = 3m (Measurement Distance)

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

The spectrum is searched to 10 GHz.

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.

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

Table C-1

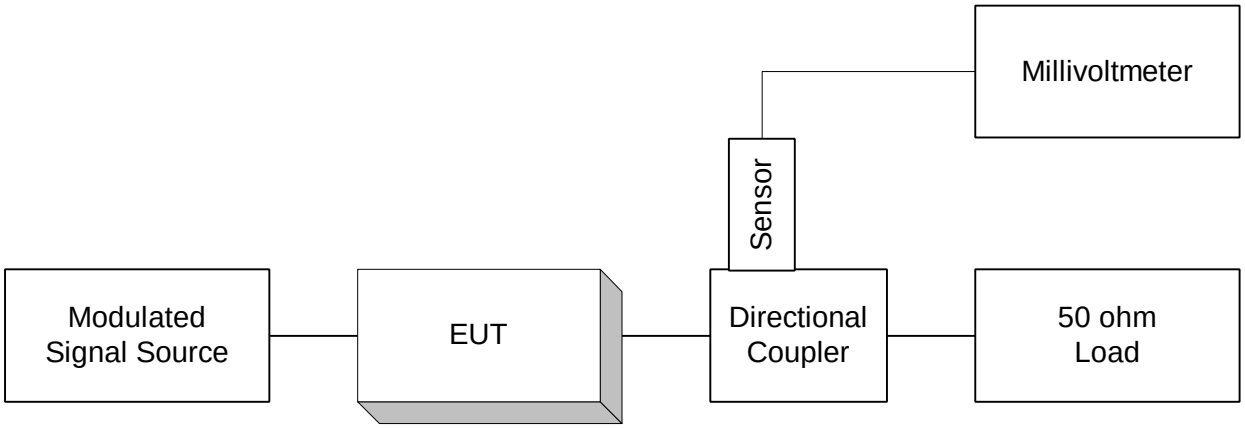
Method Of Measurement:

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.

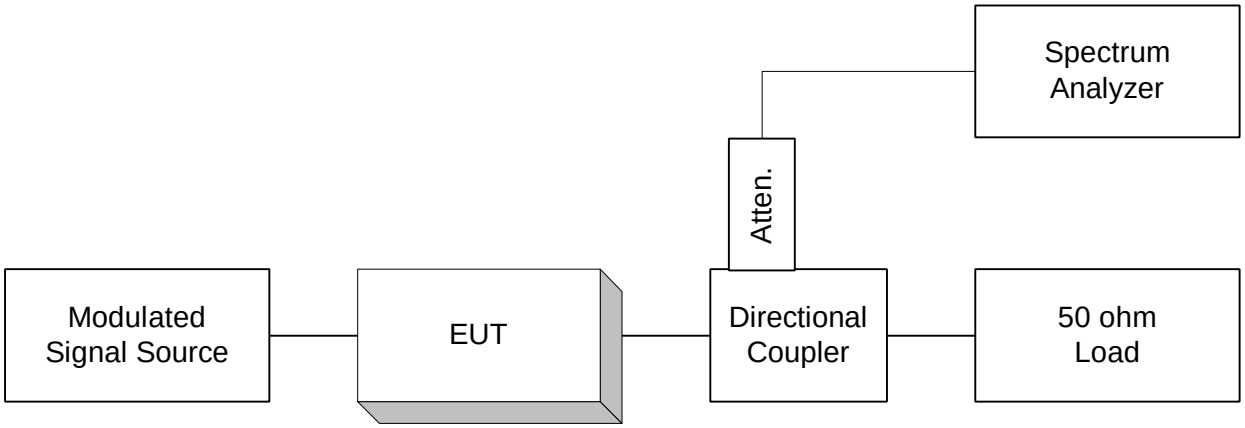
Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30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

ANNEX B - TEST DIAGRAMS

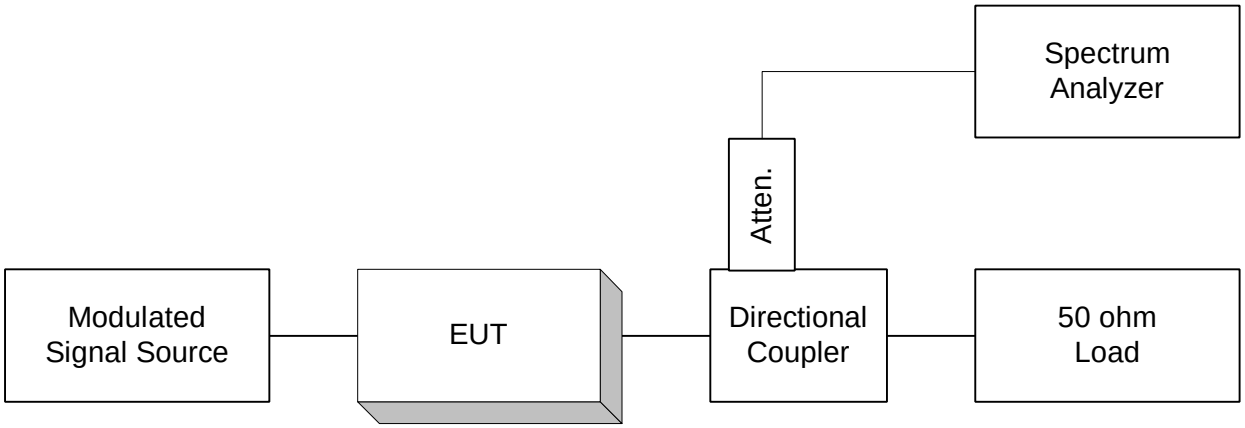
Para. No. 2.1046 - R.F. Power Output

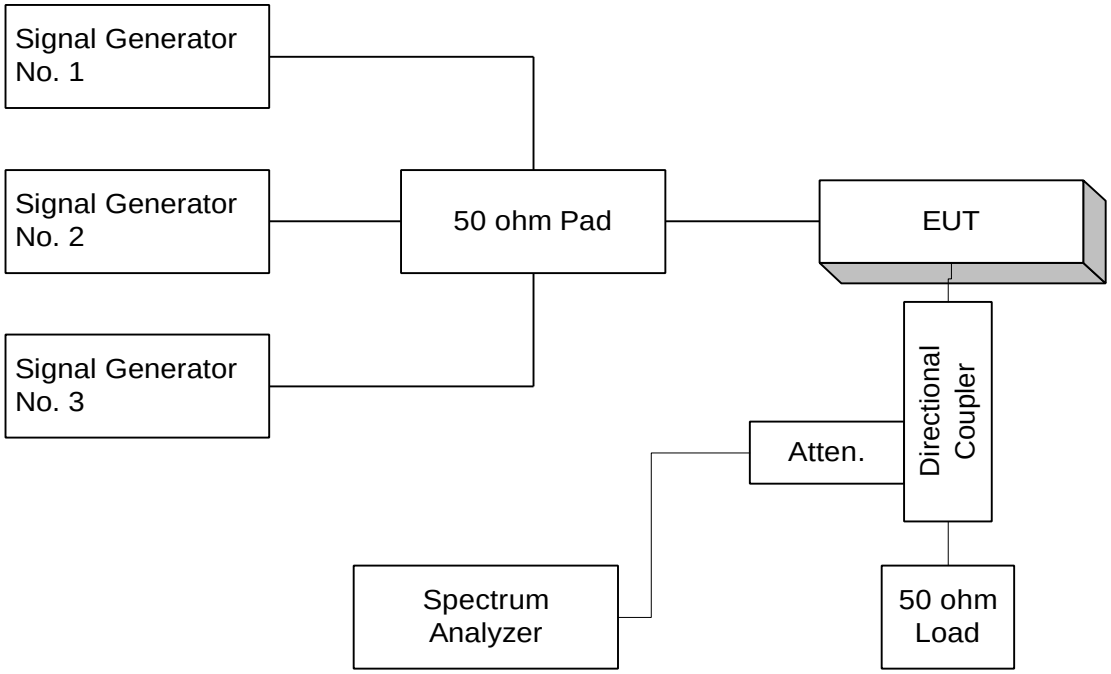


Para. No. 2.1049 - Occupied Bandwidth

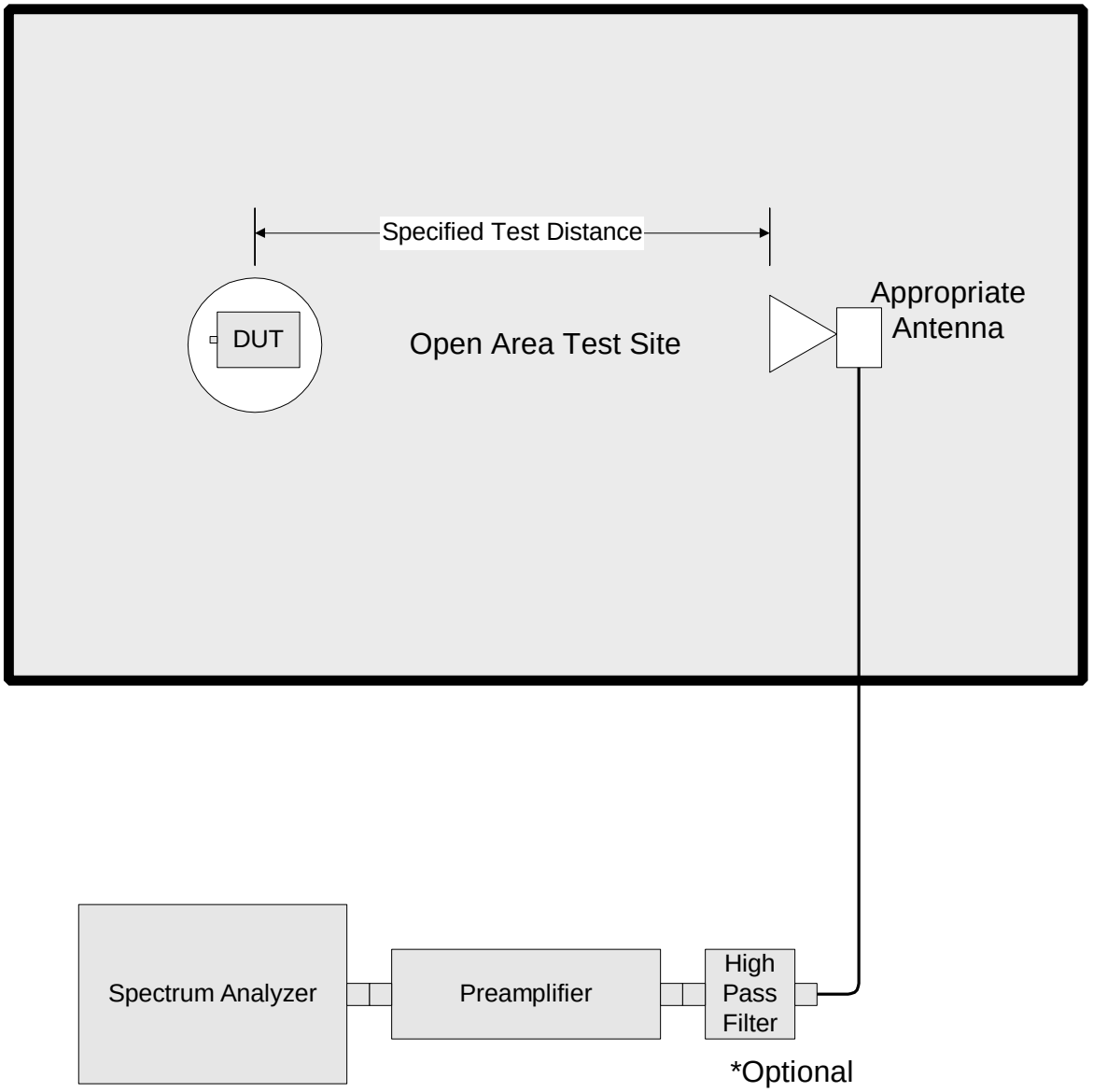


Para. No. 2.1051 Spurious Emissions at Antenna Terminals

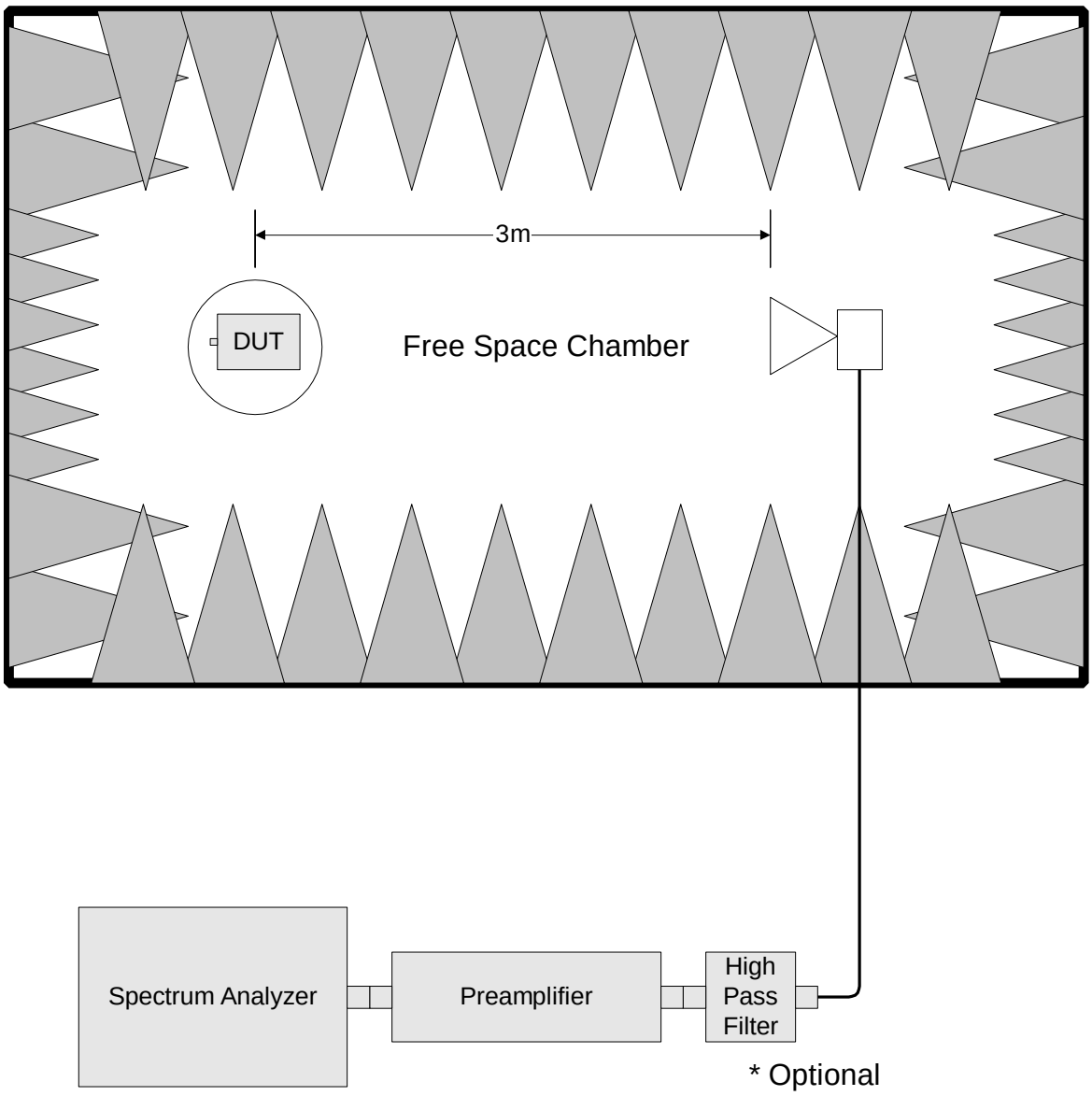




Para. No. 2.1053 - Field Strength of Spurious Radiation



Radiated Emissions 30 MHz - 1 GHz



Radiated Emissions above 1 GHz

Para. No. 2.1055 - Frequency Stability