



Nemko Test Report: 8671RUS1

Applicant: AirWalk Communications
1830 N. Greenville Avenue
Richardson, TX 75081
USA

**Equipment Under Test:
(E.U.T.)** SLIM RU Ext 20W AMP 800 MHz

In Accordance With: **CFR 47, Part 22, Subpart H**
Cellular Band Repeaters

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, TX
75057-3136

TESTED BY: 

David Light, Senior Wireless Engineer

DATE: 25 February 2008

APPROVED BY: 

DATE: 26 February 2008

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EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz PROJECT NO.: 8671RUS1

Section 1. Summary of Test Results

Manufacturer: [AirWalk Communications](#)
Model No.: [SLIM RU Ext 20W AMP 800 MHz](#)
Serial No.: [KTCG2-800MAC0710008](#)

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 CFR 47, Part 22, Subpart H.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | 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".



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EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz *PROJECT NO.:* 8671RUS1

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth	Not defined	Input/Output	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Complies
Frequency Stability	22.355	1.5 ppm	NA

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz PROJECT NO.: 8671RUS1

Section 2. General Equipment Specification

Supply Voltage Input:	120 Vac											
Frequency Range:	Downlink:	869 – 894 MHz										
Frequency Range:	Uplink:	NA										
Type of Modulation and Designator:	CDMA (F9W)	GSM (GXW)	TDMA (DXW)	EDGE (G7W)								
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>								
				W-CDMA (F9W)								
				<input type="checkbox"/>								
Output Impedance:	50 ohms											
RF Output (Rated):	Downlink:	20	W									
		43	dBm									
	Power must not exceed the following maximum levels:											
	<table border="1"> <thead> <tr> <th>Channel</th> <th>Maximum Power</th> </tr> </thead> <tbody> <tr> <td>1013 - 1015</td> <td>0.140 W</td> </tr> <tr> <td>1016 - 773</td> <td>20 W</td> </tr> <tr> <td>774 - 777</td> <td>0.500 W</td> </tr> </tbody> </table>				Channel	Maximum Power	1013 - 1015	0.140 W	1016 - 773	20 W	774 - 777	0.500 W
Channel	Maximum Power											
1013 - 1015	0.140 W											
1016 - 773	20 W											
774 - 777	0.500 W											
Frequency Translation:	F1-F1	F1-F2	N/A									
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>									
Band Selection:	Software	Duplexer Change	Fullband Coverage									
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>									

Description of EUT

20 Watt CDMA2000 single channel base station amplifier

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz PROJECT NO.: 8671RUS1

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 22.913
TESTED BY: David Light	DATE: 22 February 2008

Test Results: Complies.

Test Data:

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
DL	CDMA	21.47	21.47	0.14
DL	CDMA	43.58	43.58	22.80
DL	CDMA	17.03	17.03	0.50

Maximum power must not exceed the following levels:

Channel	Maximum Power
1013 - 1015	0.140 W
1016 - 773	20 W
774 - 777	0.500 W

Spectrum analyzer settings:

Span: 5 MHz
RBW: 3 MHz
VBW: 5 MHz

Note: Power reduction is required at the band edges to comply with the limits specified in 22.913

Equipment Used: 1036-1082-1472-1469

Measurement Uncertainty: +/- 1.7 dB

Nemko USA, Inc.

CFR 47, PART 22, SUBPART H
CELLULAR BAND AMPLIFIERS

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz *PROJECT NO.:* 8671RUS1

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz

PROJECT NO.: 8671RUS1

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 22 February 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1469-1472-1082-1036

Measurement Uncertainty: 1X10⁻⁷ Ppm

Temperature: 22 °C

Relative Humidity: 36 %

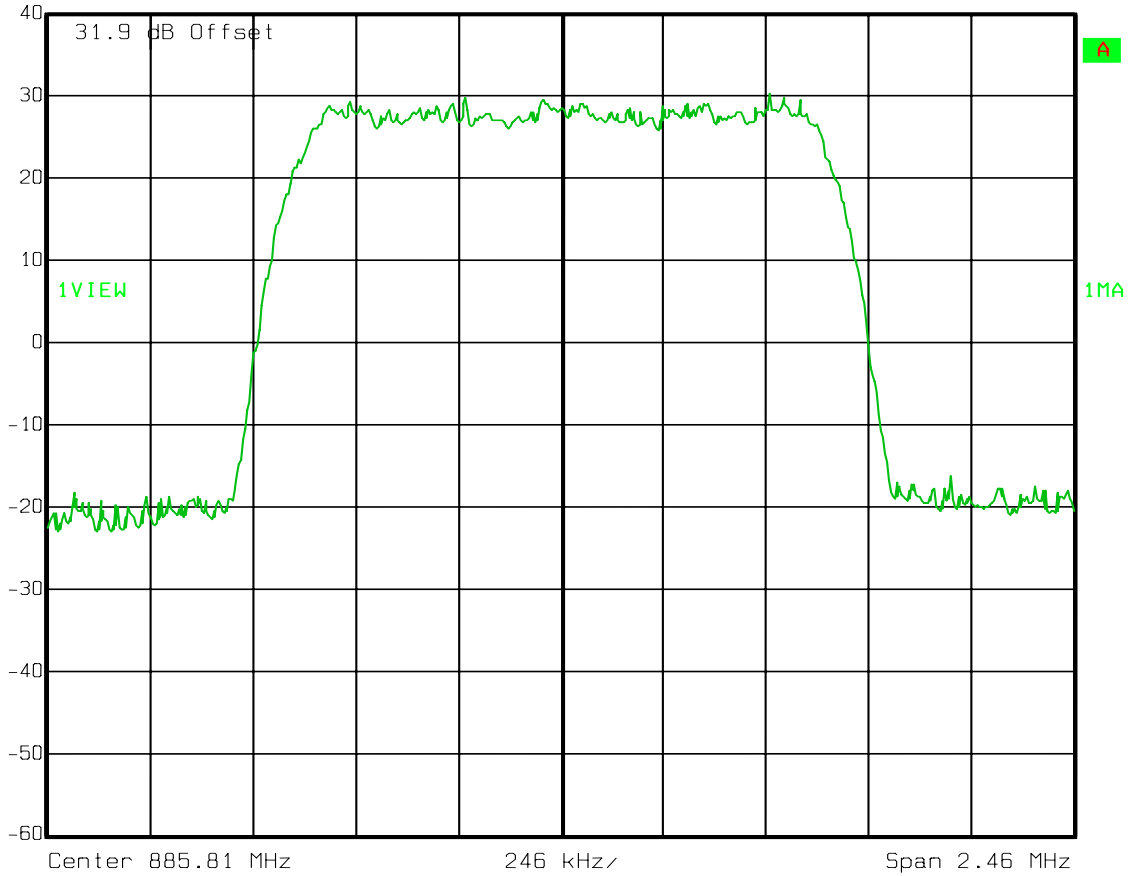
Test Data – Occupied Bandwidth

CDMA - Output



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	7 ms	Unit	dBm



Date: 22.FEB.2008 13:18:32

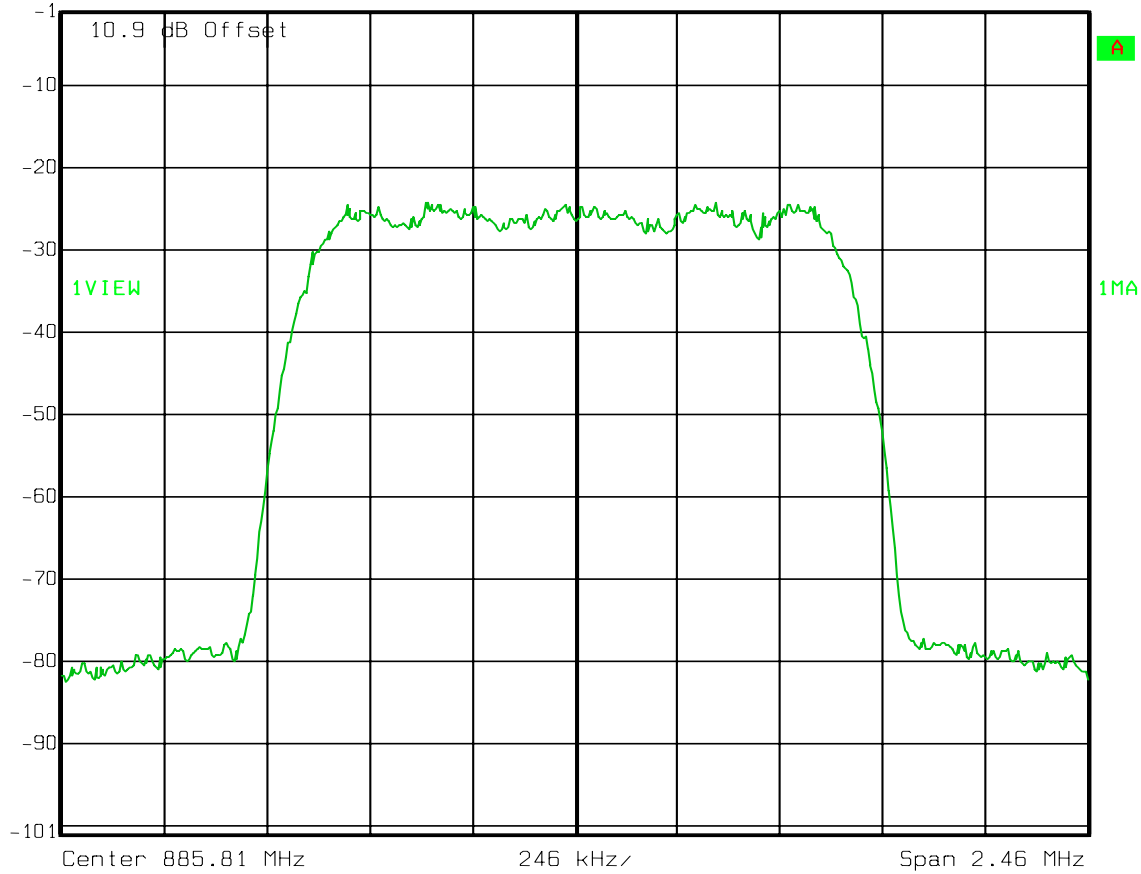
Test Data – Occupied Bandwidth

CDMA - Input



Ref Lvl
-1 dBm

RBW	30 kHz	RF Att	10 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	7 ms	Unit	dBm



Date: 22.FEB.2008 13:20:03

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz *PROJECT NO.:* 8671RUS1

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 22 Feb 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1082-1472-1469

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

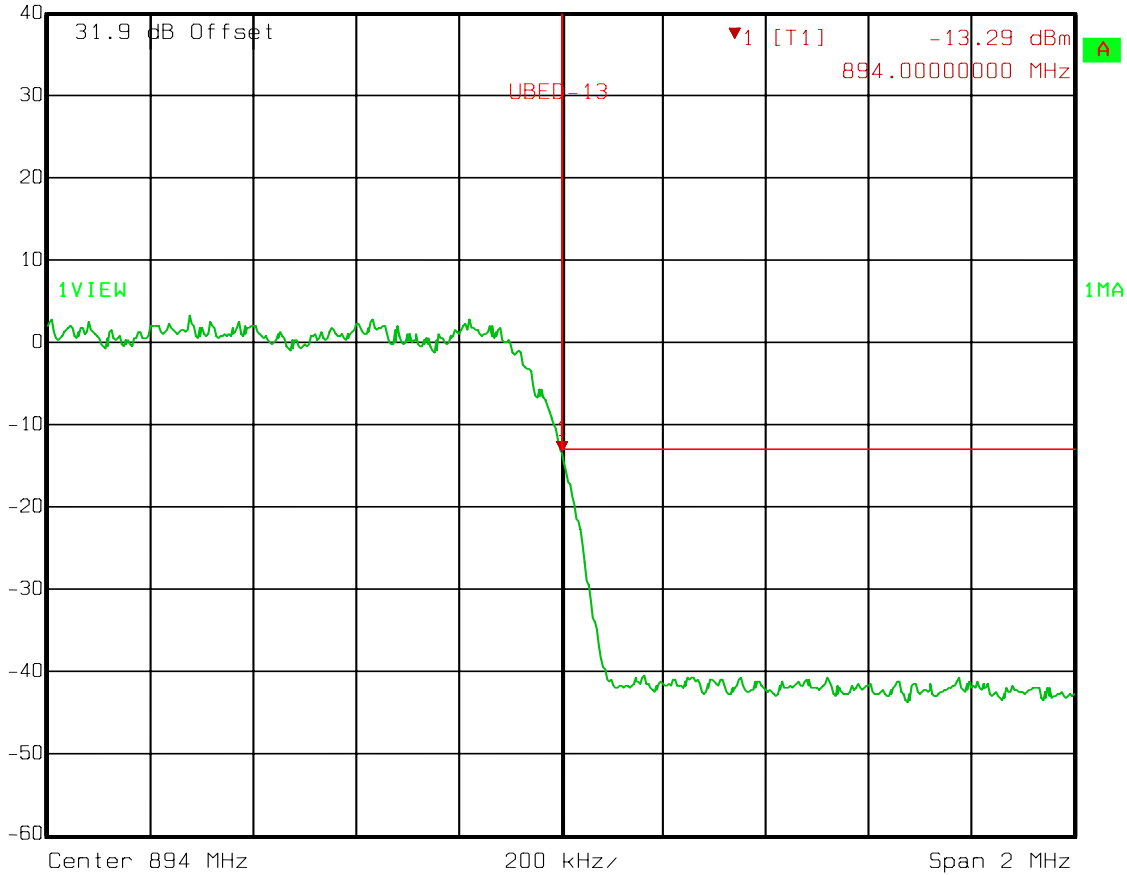
Relative Humidity: 36 %

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge
CDMA



Ref Lvl 40 dBm
Marker 1 [T1] 894.00000000 MHz
RBW 30 kHz
VBW 30 kHz
SWT 6 ms
RF Att 20 dB
Mixer -10 dB
Unit dBm



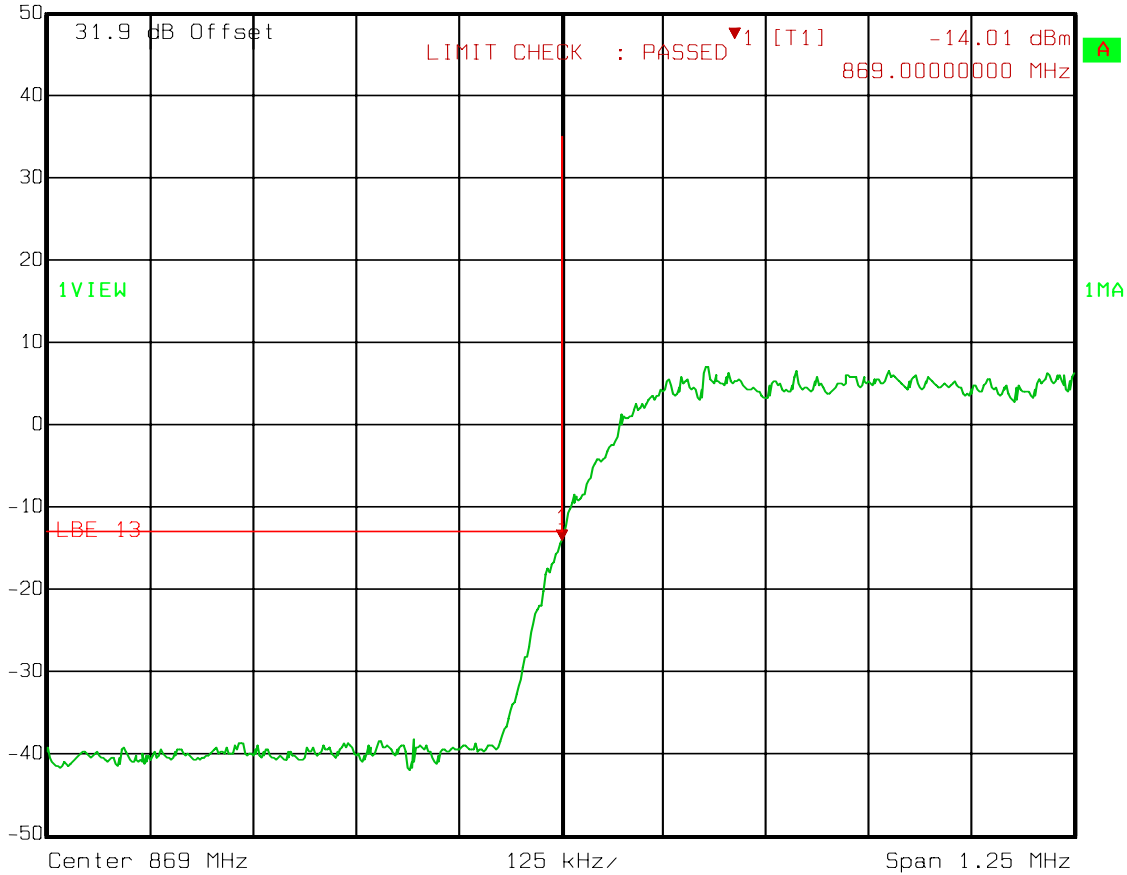
Date: 22.FEB.2008 13:28:54

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge
CDMA



Ref Lvl 50 dBm
Marker 1 [T1] 869.00000000 MHz
RBW 30 kHz
VBW 30 kHz
SWT 5 ms
RF Att 30 dB
Mixer -10 dBm
Unit dBm



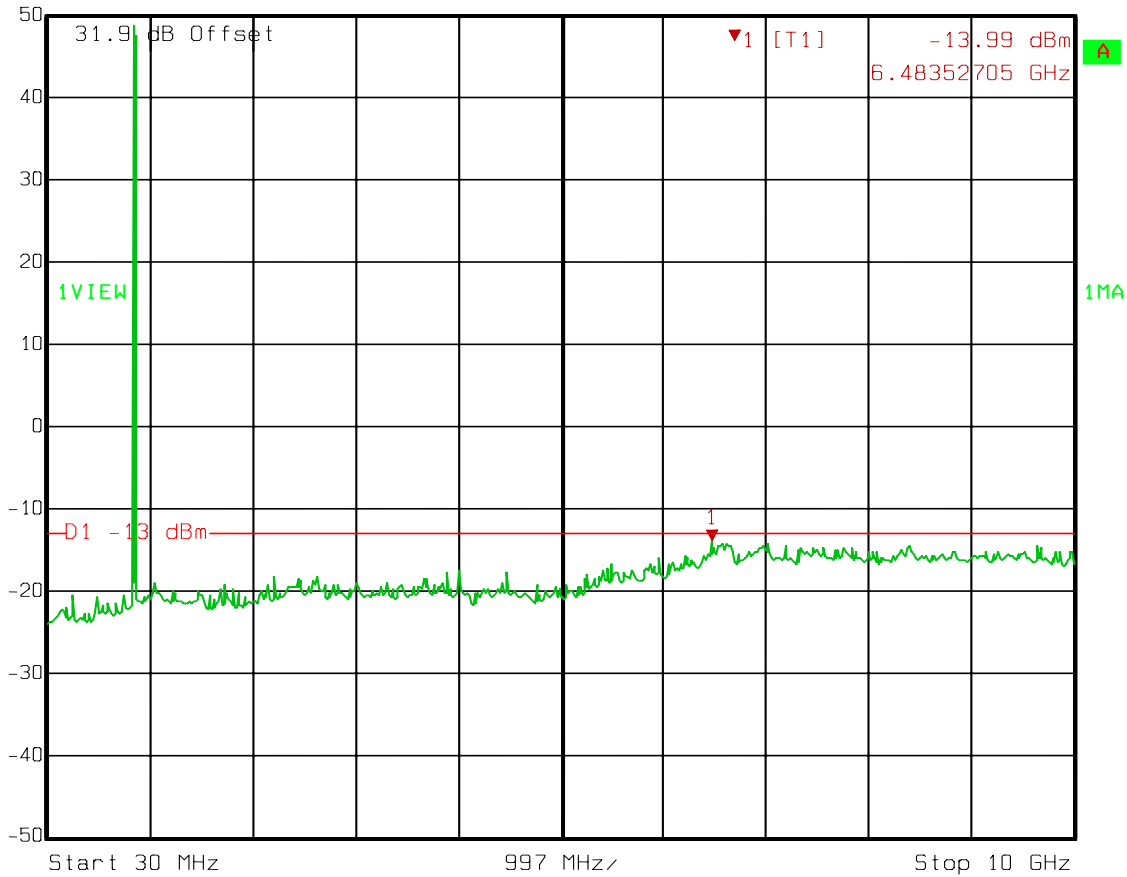
Date: 22.FEB.2008 13:25:36

Test Data – Spurious Emissions at Antenna Terminals

Spurs
CDMA



Ref Lvl 50 dBm
Marker 1 [T1] -13.99 dBm
6.48352705 GHz
RBW 1 MHz
RF Att 30 dB
VBW 1 MHz
Mixer -10 dBm
SWT 100 ms
Unit dBm



Date: 22.FEB.2008 13:21:53

Note: The EUT was tested on three channels. The spurious emissions presented for mid channel at 20 watts output are representative of all channels and lower powers tested.

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz PROJECT NO.: 8671RUS1

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 22 Feb 2008

Test Results: Complies.

Test Data: There were no emissions detected above the noise floor which was at least 20 dB below the specification limit of -13 dBm.

Equipment Used: 1469-1484-1485-1016-993-759-760-791

Measurement Uncertainty: +/-1.7 dB

Temperature: 22 °C

Relative Humidity: 36 %

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz PROJECT NO.: 8671RUS1

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1484	Cable	Storm PR90-010-072	N/A	05/02/07	05/01/08
1485	Cable	Storm PR90-010-216	N/A	05/02/07	05/01/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/01/07	04/30/08
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	03/30/07	03/29/08
760	Antenna biconical	Electro Metrics MFC-25	477	01/19/07	01/19/08
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	NA	NA
619	THERMOMETER	FLUKE 51	4520028	03/01/07	02/29/08

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz *PROJECT NO.:* 8671RUS1

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 a spectrum analyzer. Power output is measured with the maximum rated input level.

Integral Antenna:

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna is fed with a signal at the spurious frequency. The level of the signal is 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: SLIM RU Ext 20W AMP 800 MHz

PROJECT NO.: 8671RUS1

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: Not defined (Input/Output)

Method Of Measurement:

CDMA

Spectrum analyzer settings:

RBW=VBW=30 kHz

Span: 5 MHz

Sweep: Auto

GSM / EDGE

RBW=VBW= 3 kHz

Span: 1 MHz

Sweep: Auto

TDMA

RBW=VBW= 1 kHz

Span: 1 MHz

Sweep: Auto

W-CDMA

RBW=VBW= 100 kHz

Span: 10 MHz

Sweep: Auto

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz

PROJECT NO.: 8671RUS1

**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:

Method Of Measurement:

Spectrum analyzer settings:

CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM / EDGE

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: Disabled

TDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: Disabled

W-CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 100 kHz (< 1MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: 6 Sweeps

EQUIPMENT: SLIM RU Ext 20W AMP 800 MHz *PROJECT NO.:* 8671RUS1

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
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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 TIA/EIA-603-1992

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna is fed with a signal at the spurious frequency. The level of the signal is 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: SLIM RU Ext 20W AMP 800 MHz PROJECT NO.: 8671RUS1

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

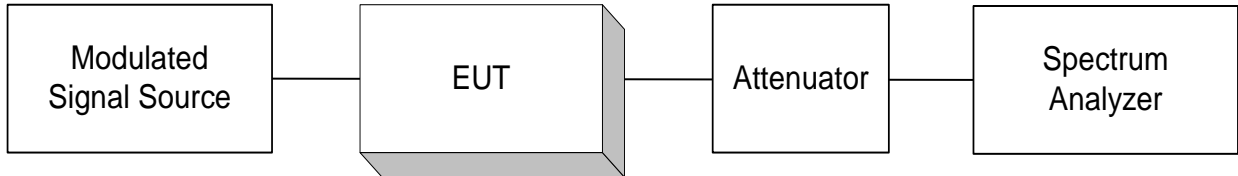
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the 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:

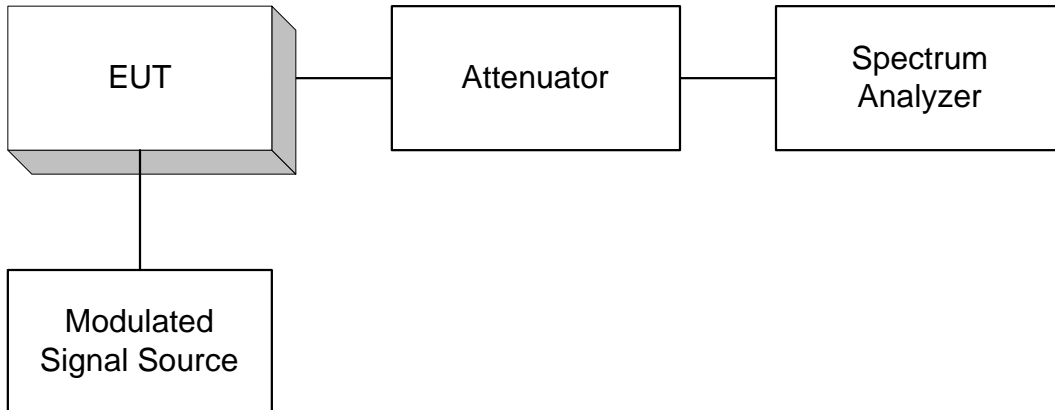
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

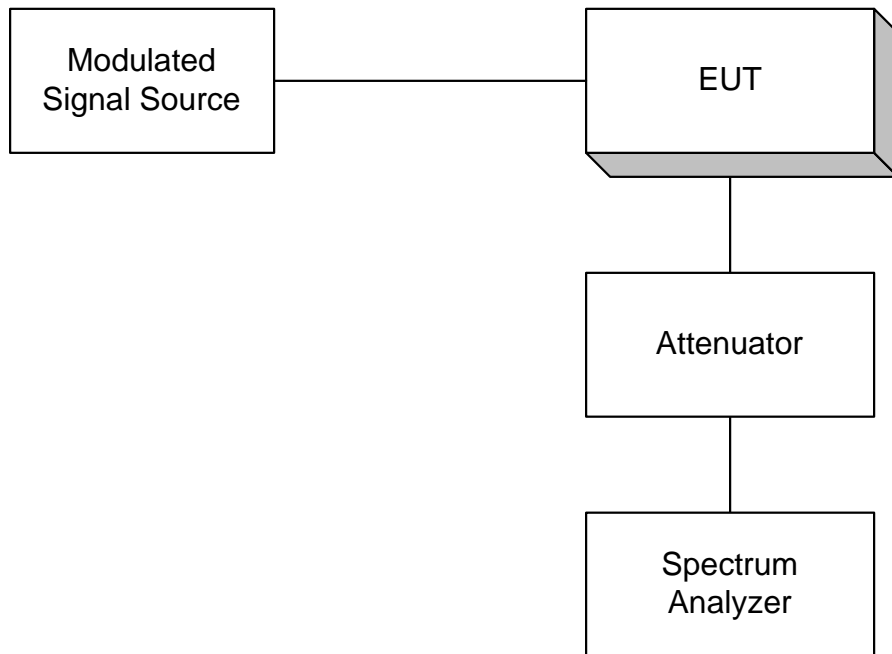
Para. No. 2.1046 - R.F. Power Output



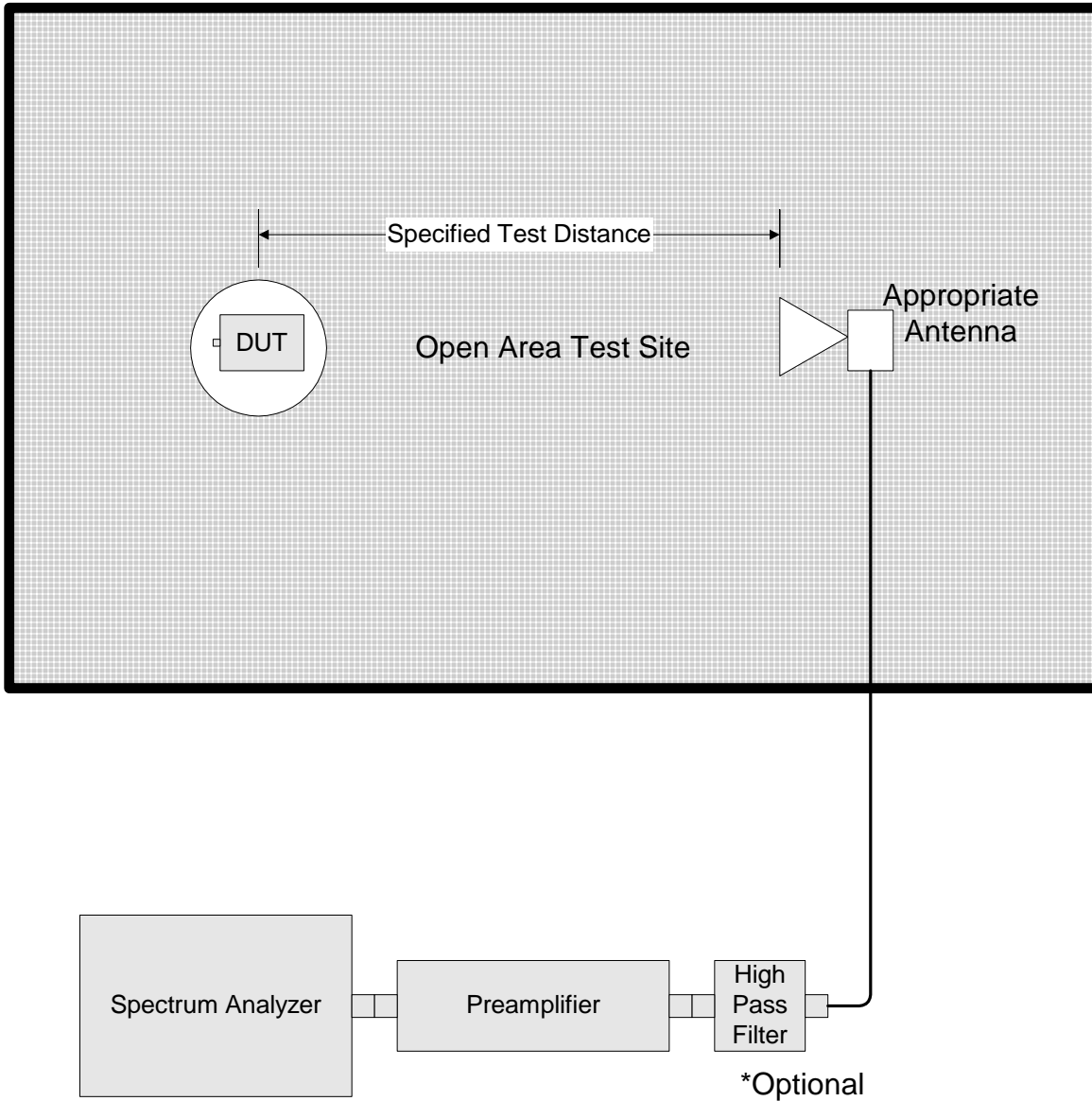
Para. No. 2.1049 - Occupied Bandwidth

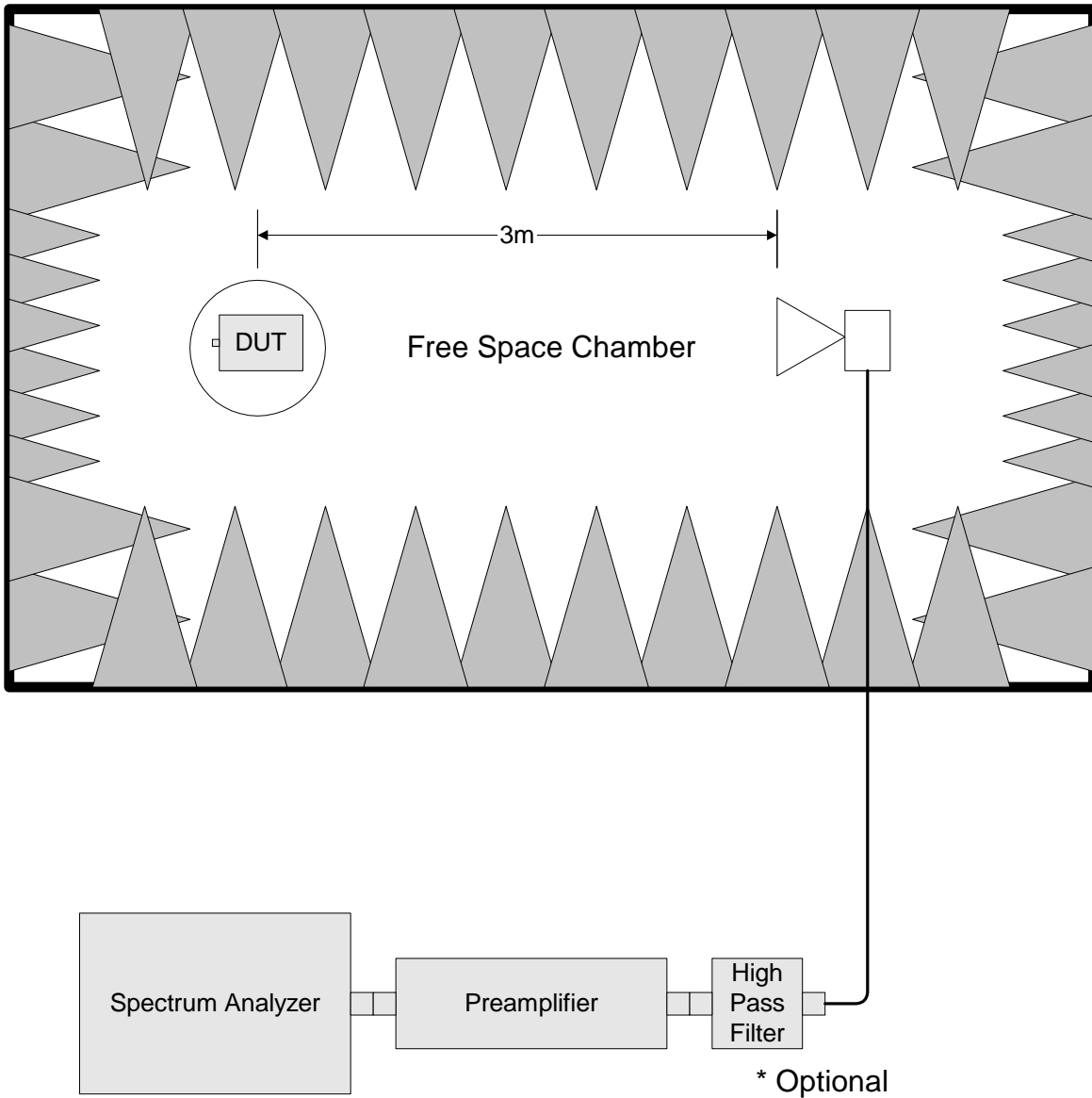


Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation





Para. No. 2.1055 - Frequency Stability

