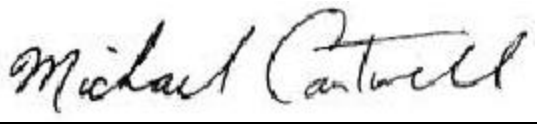
Nemko Test Report:	12249RUS1
Applicant:	Andrew Corporation 108 Rand Park Drive Garner, NC 27529 USA
Equipment Under Test: (E.U.T.)	ION-B TFAH-US85/19
In Accordance With:	**CFR 47, Part 22, Subpart H** Cellular Band Repeaters
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, TX 75057-3136

TESTED BY:  **DATE:** **14 April, 2008**

David Light, Senior Wireless Engineer

APPROVED BY:  **DATE:** **21 April, 2008**

Mike Cantwell, Frontline Manager

Number of Pages: 48

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: ION-B TFAH-US85/19

Serial No.: 074605735

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.

☒ 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.	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

Footnotes:

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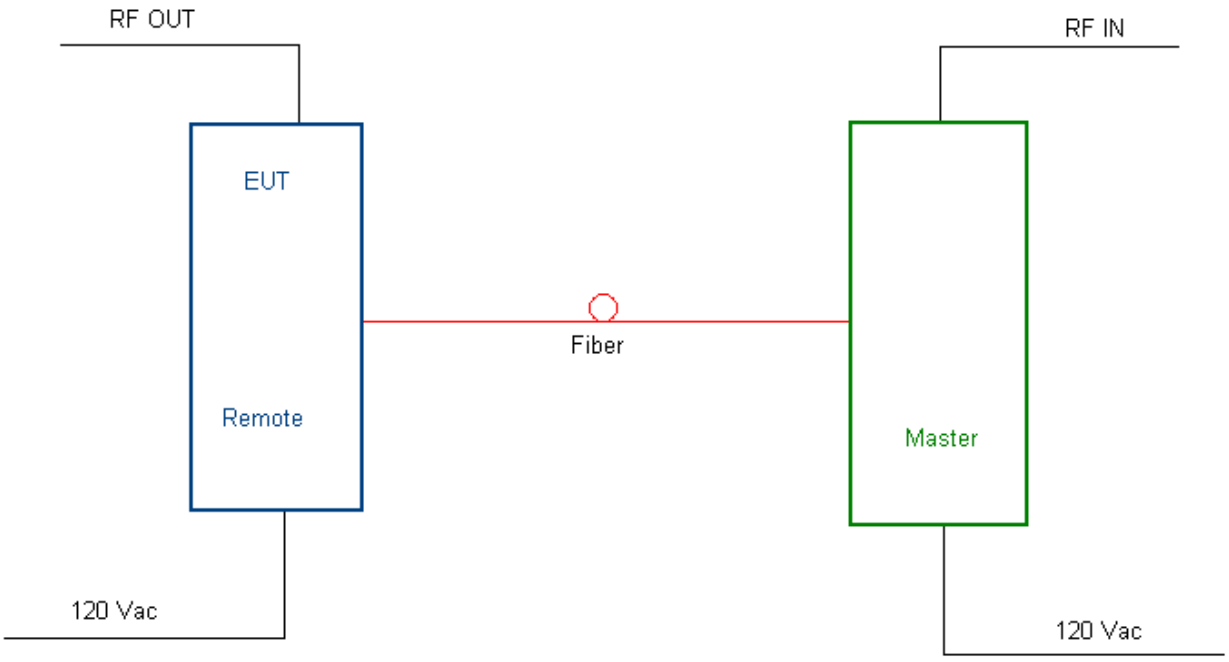
Section 2. General Equipment Specification

Supply Voltage Input:		120 Vac			
Frequency Range:	**Downlink:**	869 to 894 MHz 1930 to 1995 MHz			
Frequency Range:	**Uplink:**	NA			
Type of Modulation and Designator:		CDMA (G7W)	GSM (GXW)	EDGE (G7W)	AMPS (F8W, F1D)
Output Impedance:		50 ohms			
RF Output (Rated):	**Downlink**	31 dBm max (1.26 Watts)			
RF Output (Rated):	**Uplink**	NA			
Frequency Translation:		**F1-F1** ☐	**F1-F2** ☐	**N/A** ☒	
Band Selection:		**Software** ☐	**Duplexer Change** ☐	**Fullband Coverage** ☒	

Description of EUT

The TFAH-US85/19 is a dual band high power remote unit designed to distribute Cellular850 and PCS1900 band signals along the same fiber.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 22.913
TESTED BY: David Light	DATE: 09 April 2008

Test Results: Complies.

Test Data:

	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
	CDMA	27	30	1.0
	EDGE	28	31	1.26
	GSM	28	31	1.26
	W-CDMA	25	28	0.631
	Analog	28	31	1.26

Equipment Used: 1036-1082-1472-1469

Measurement Uncertainty: +/- 1.7 dB

Temperature: 23 °C

Relative Humidity: 30 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 14 April 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used:

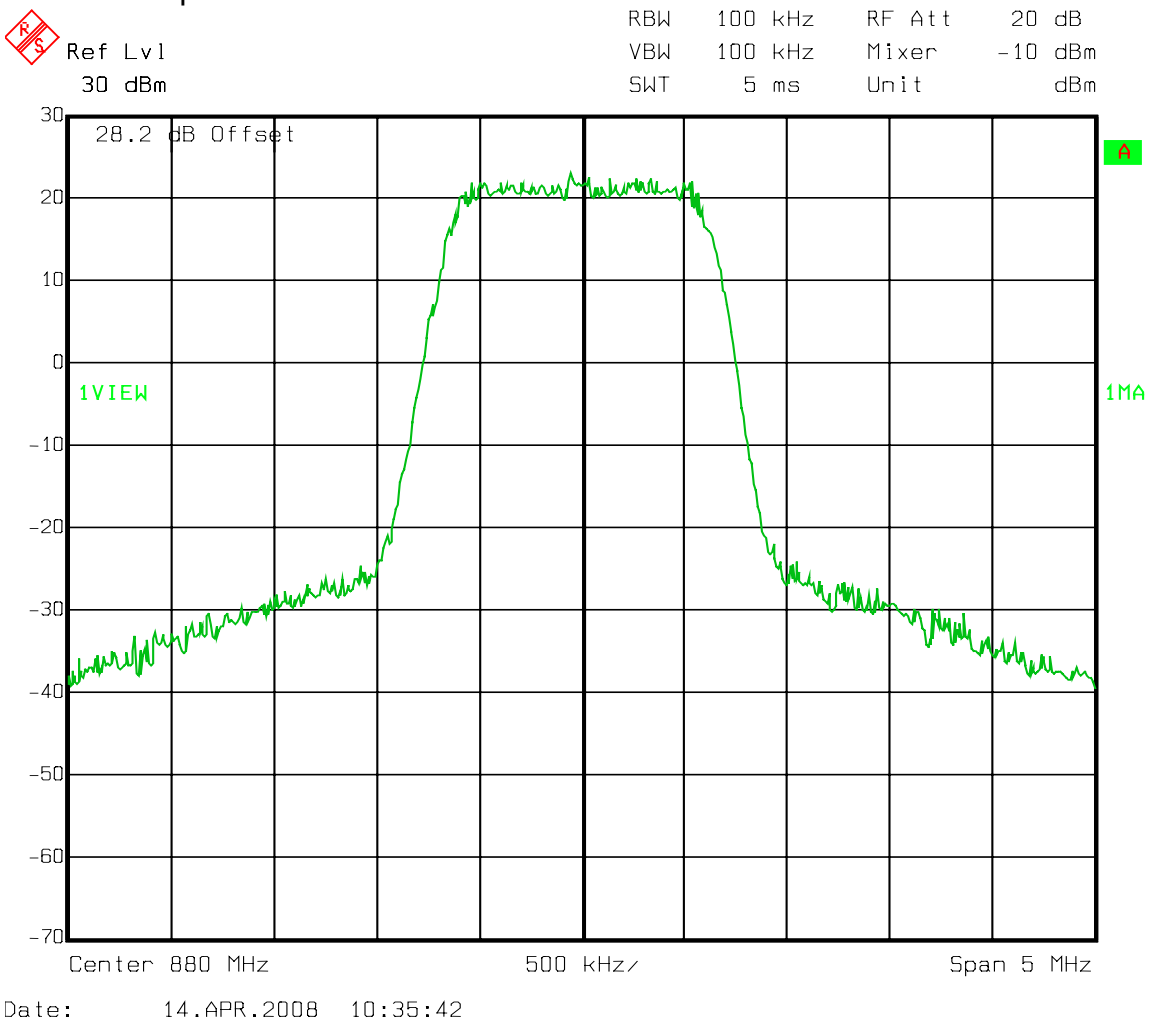
Measurement Uncertainty: $1X10^{-7}$ ppm

Temperature: ____ °C

Relative Humidity: ____ %

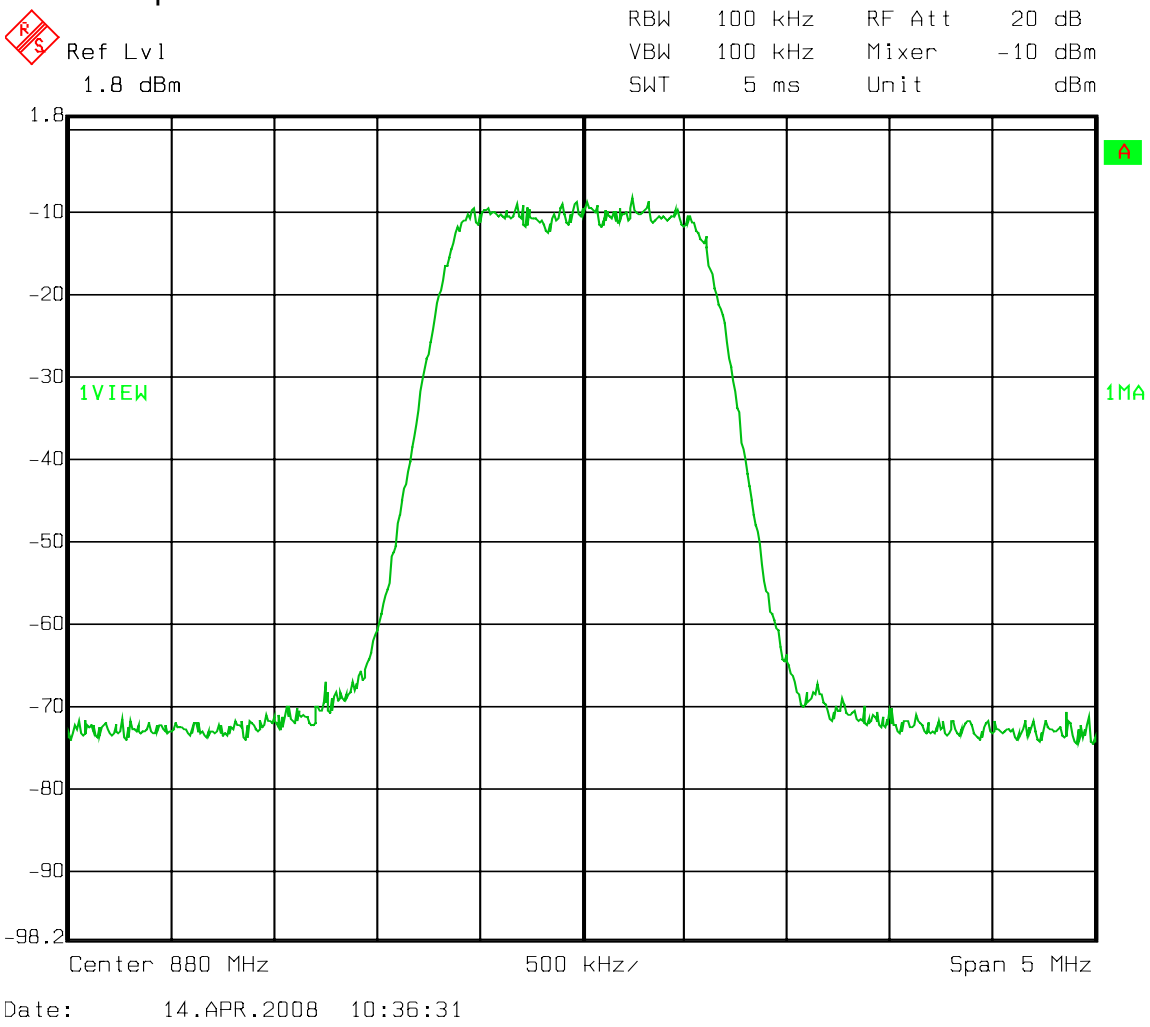
Test Data – Occupied Bandwidth

CDMA - Output



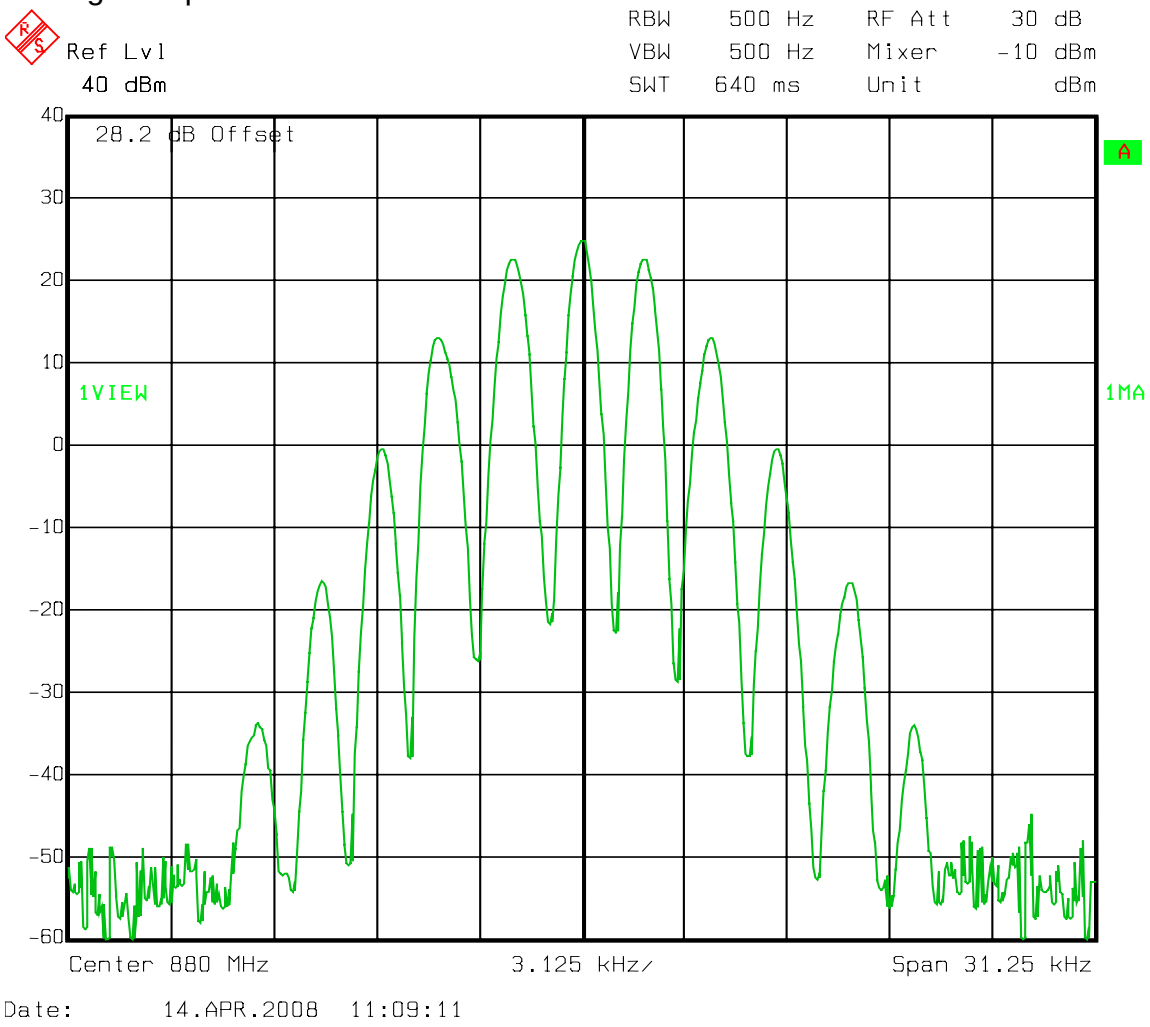
Test Data – Occupied Bandwidth

CDMA - Input



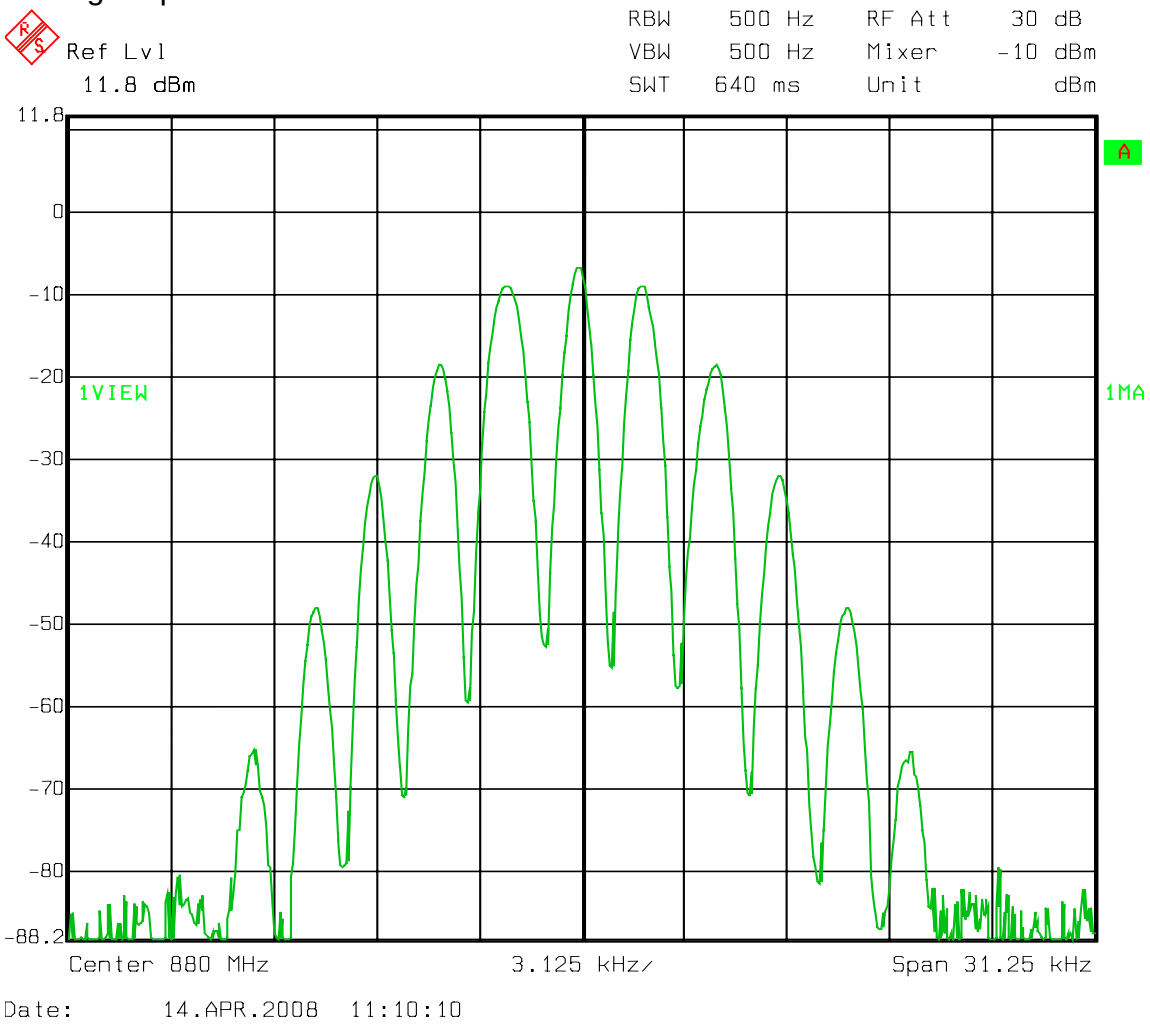
Test Data – Occupied Bandwidth

Analog - Output



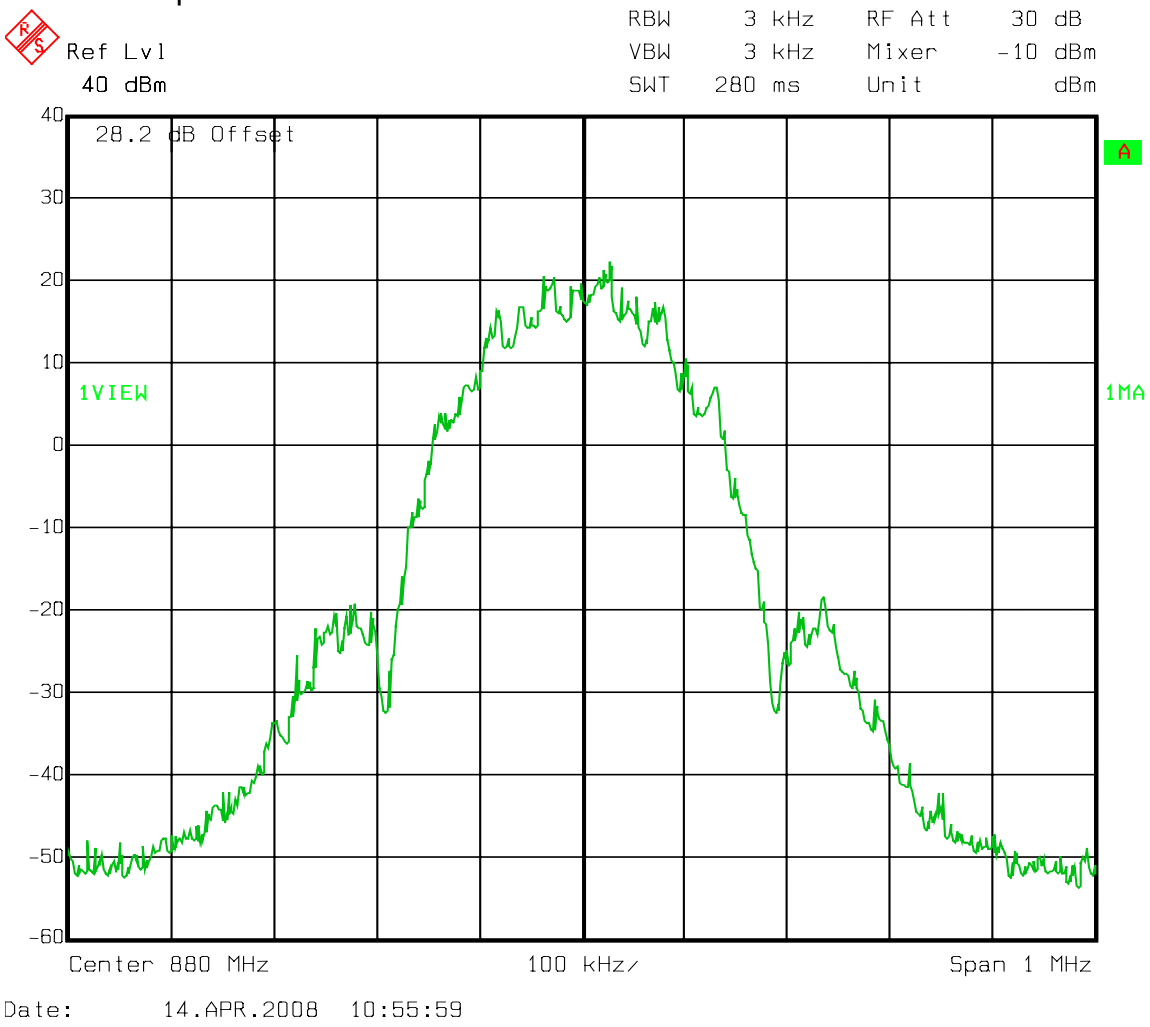
Test Data – Occupied Bandwidth

Analog - Input



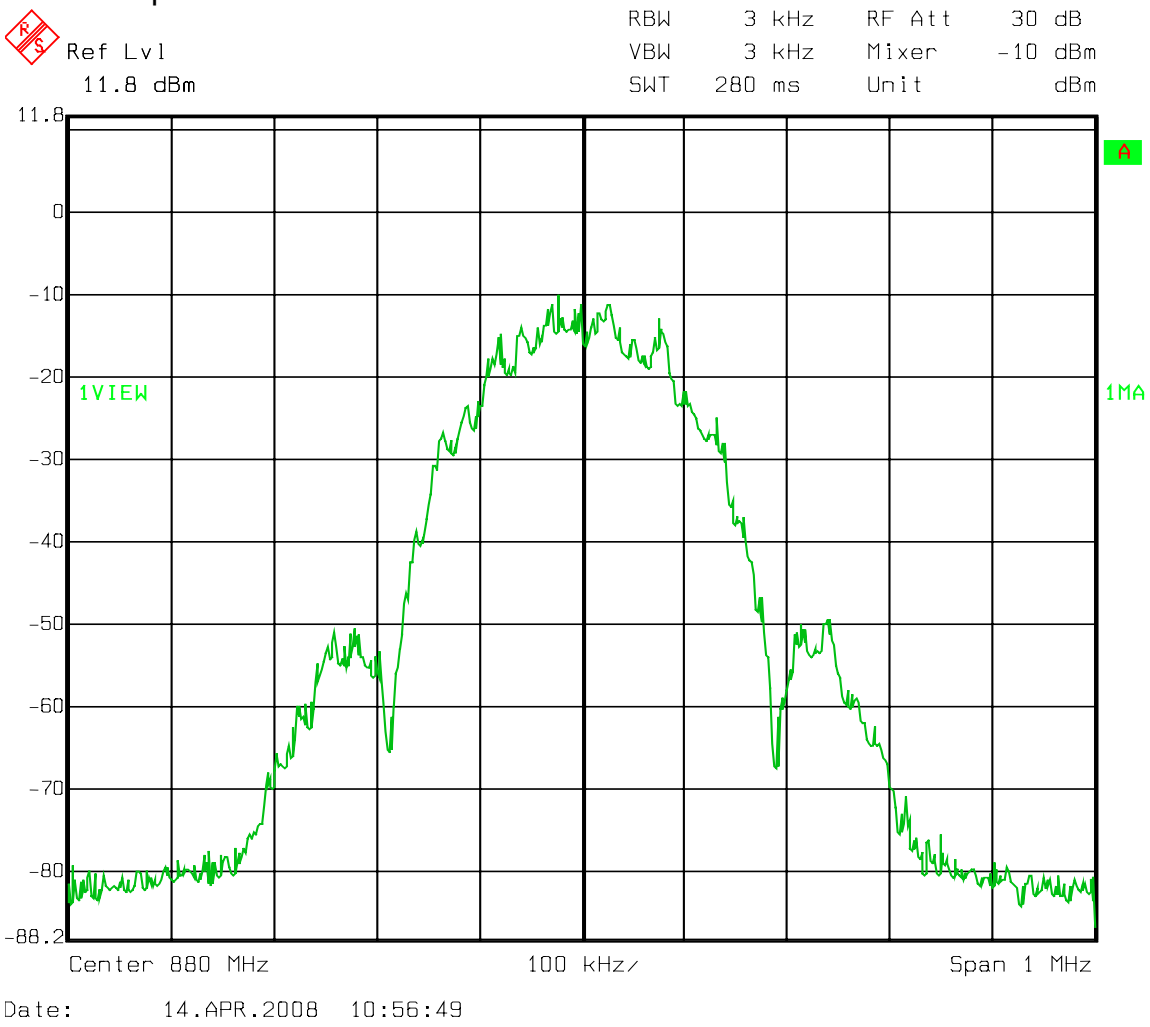
Test Data – Occupied Bandwidth

EDGE - Output



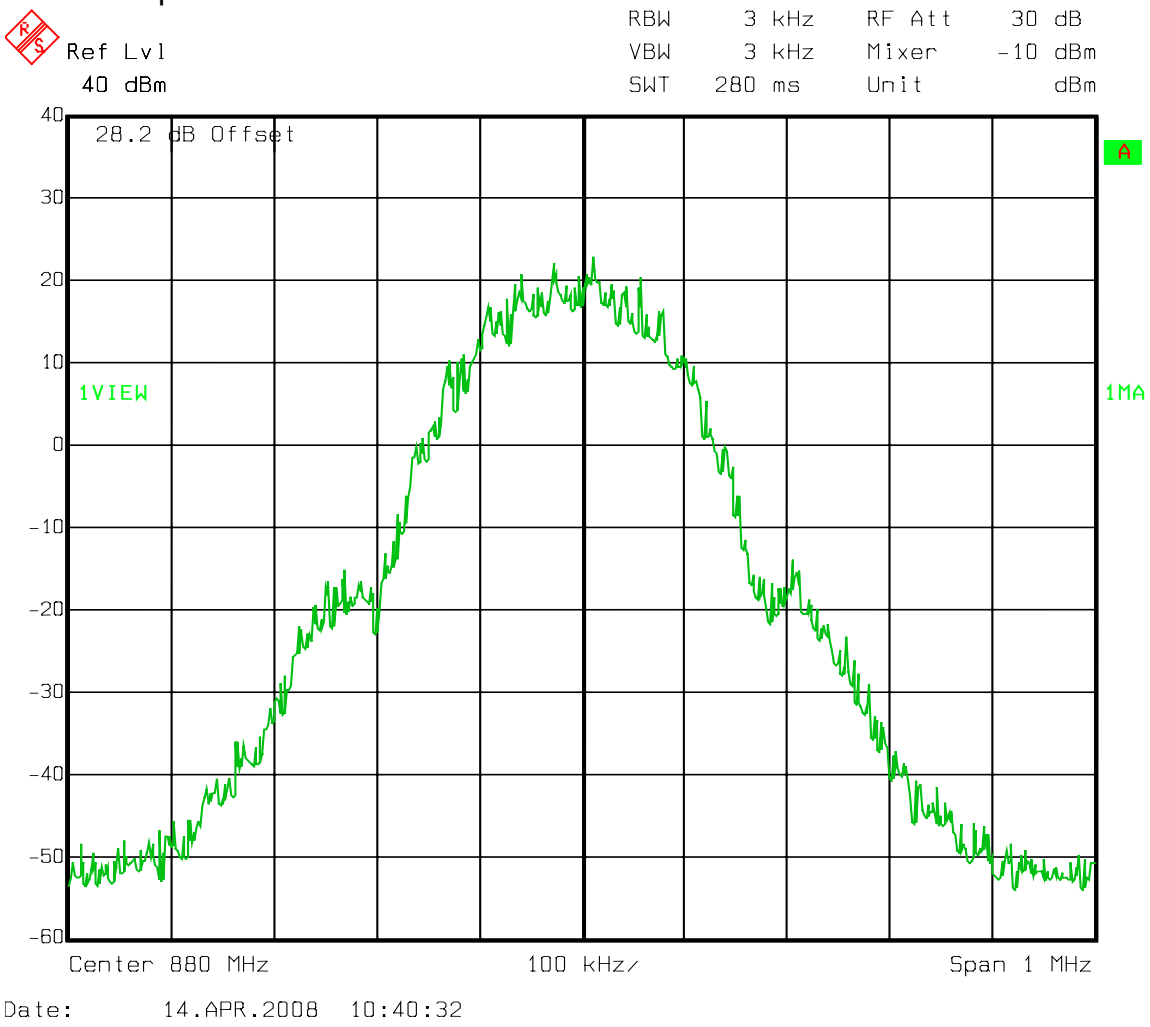
Test Data – Occupied Bandwidth

EDGE - Input



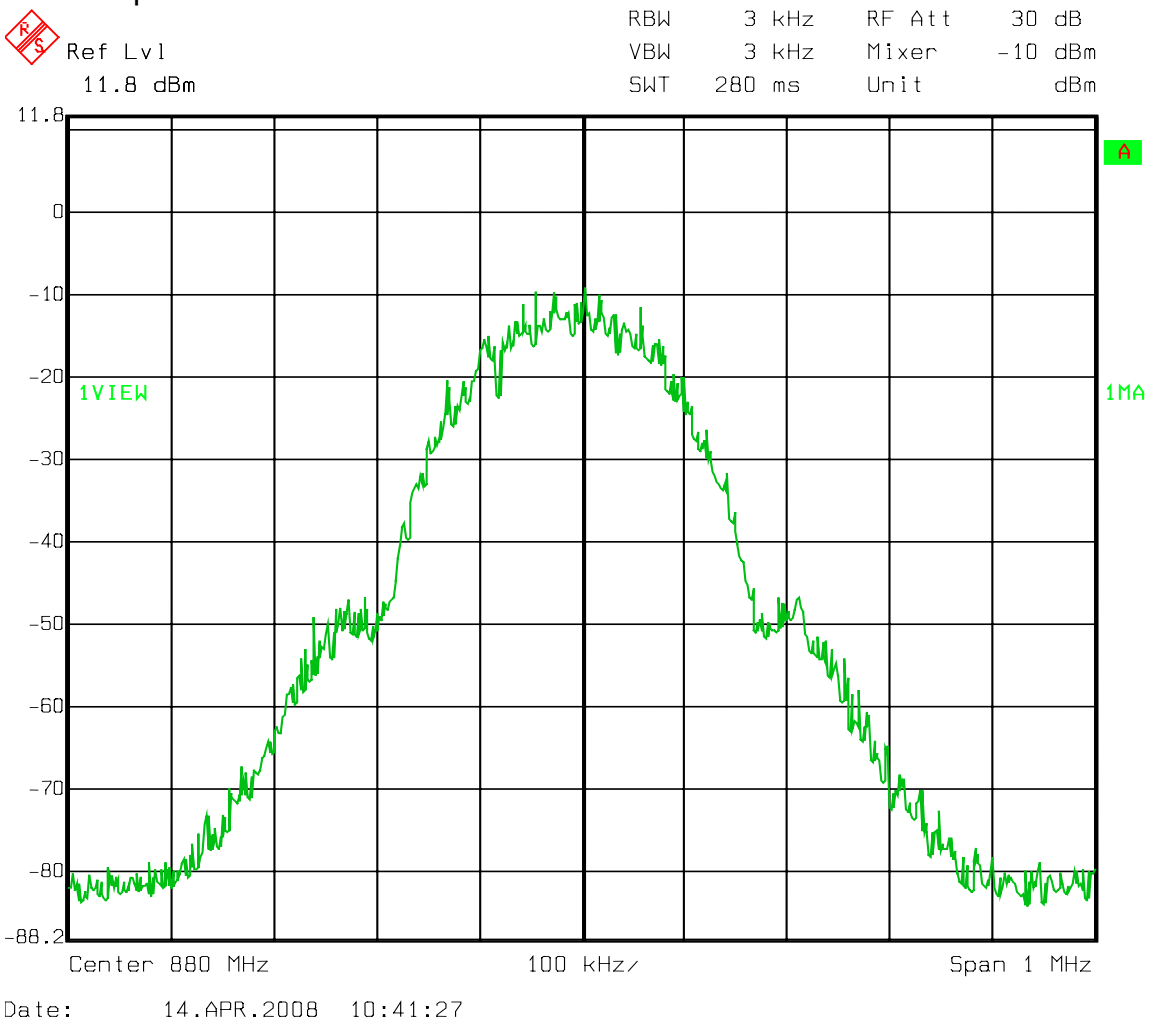
Test Data – Occupied Bandwidth

GSM - Output



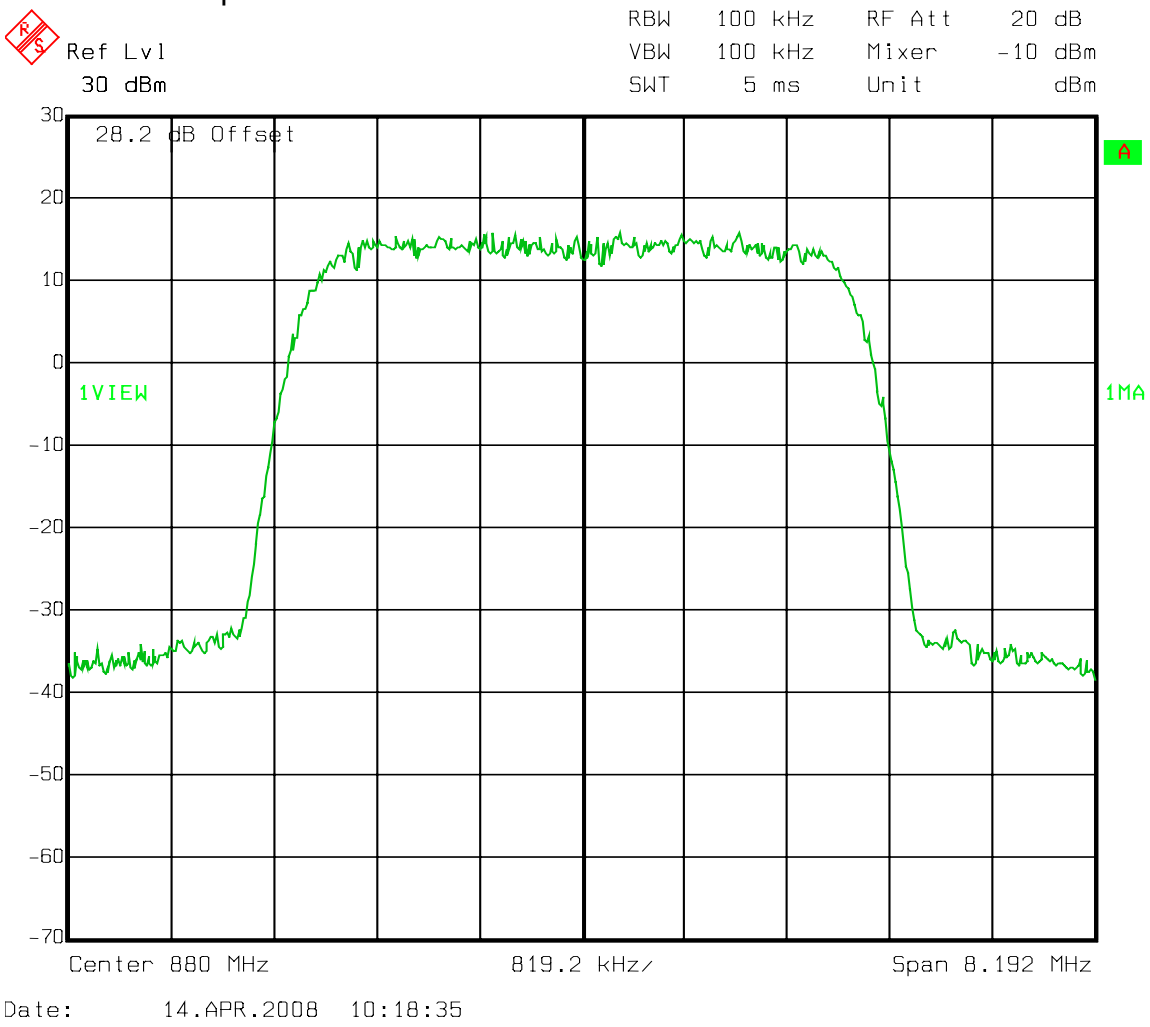
Test Data – Occupied Bandwidth

GSM - Input



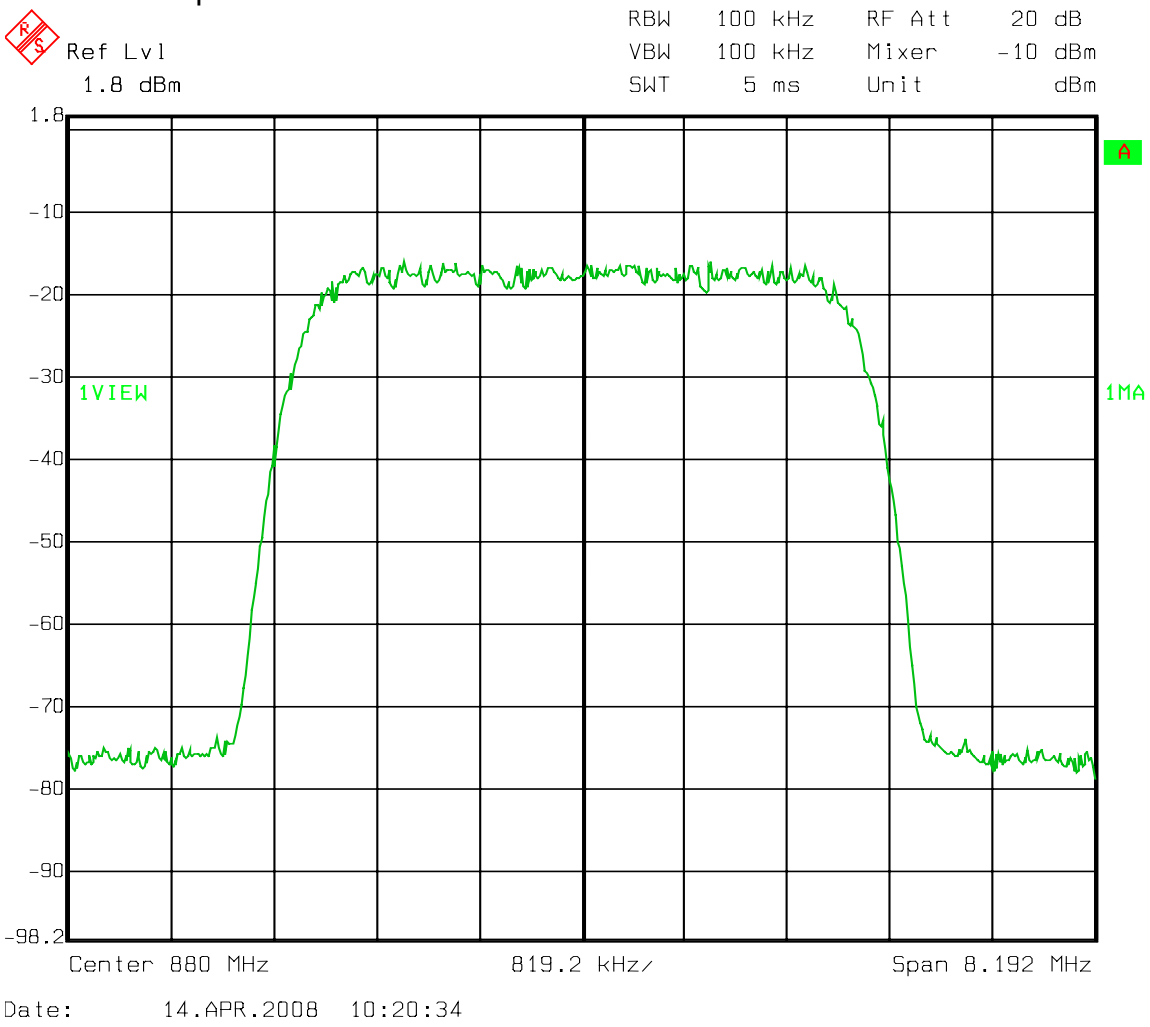
Test Data – Occupied Bandwidth

W-CDMA - Output



Test Data – Occupied Bandwidth

W-CDMA - Input



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 14 April 208

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1082-1472-1469

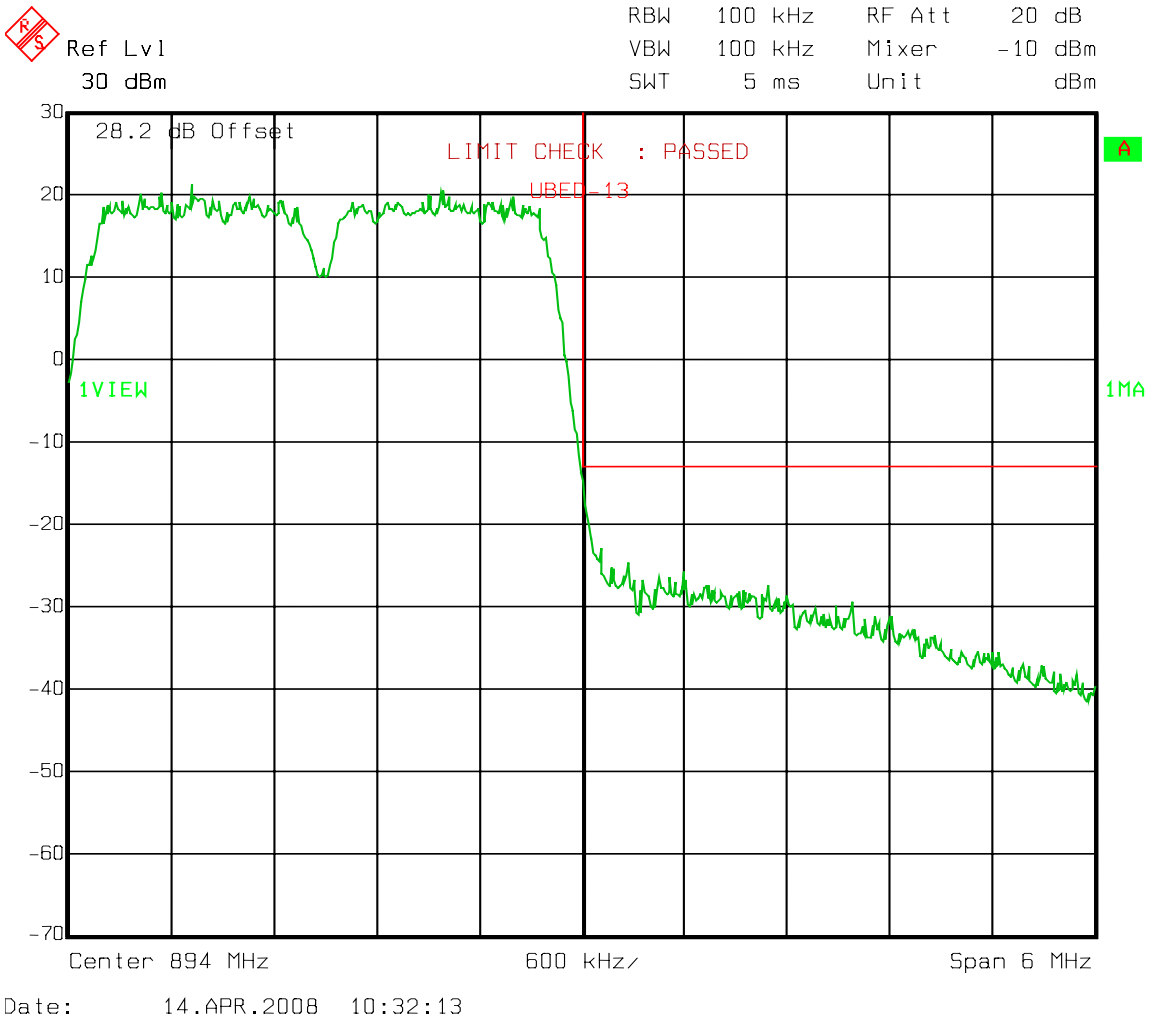
Measurement Uncertainty: +/- 1.7 dB

Temperature: 20 °C

Relative Humidity: 30 %

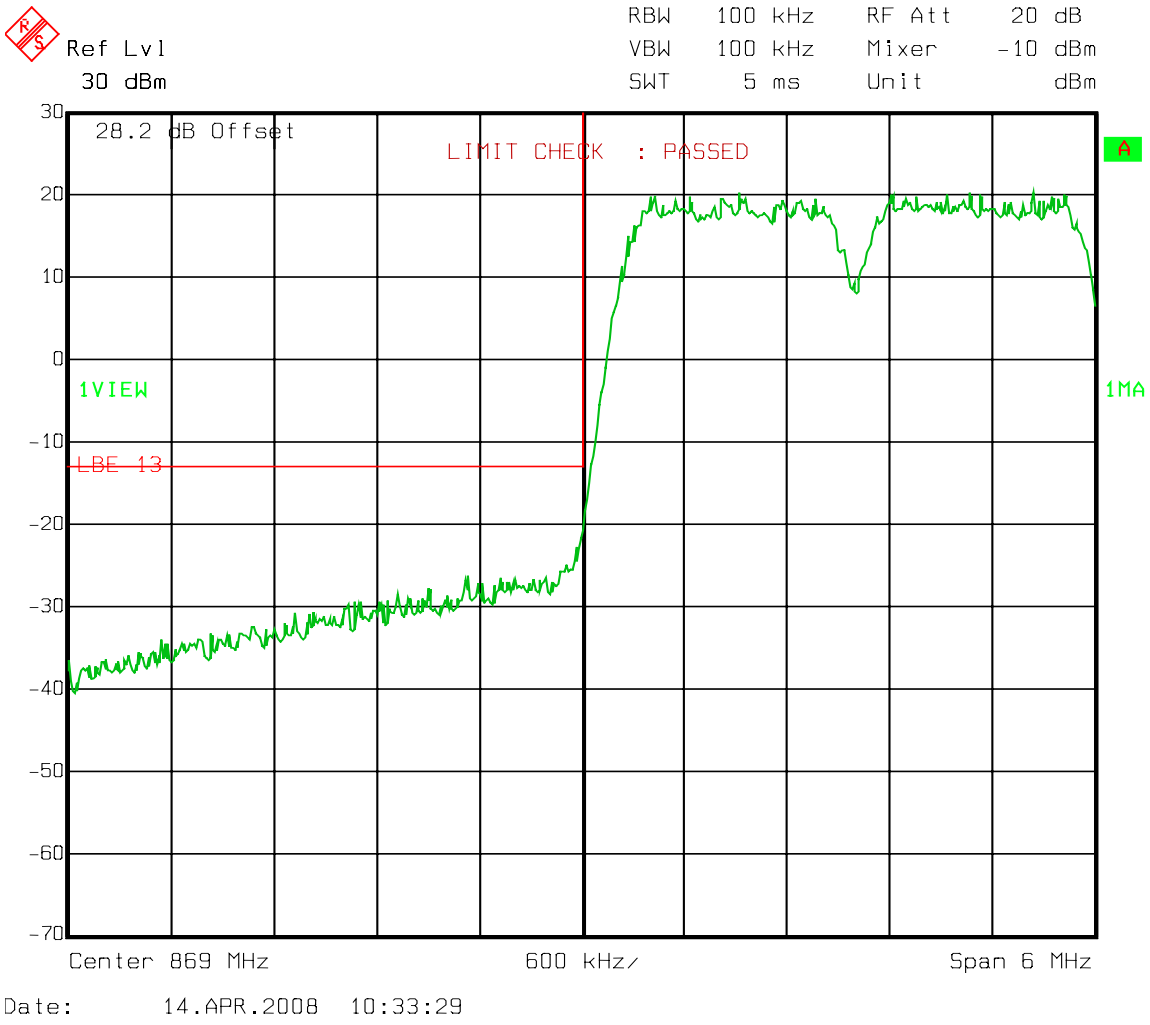
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
CDMA



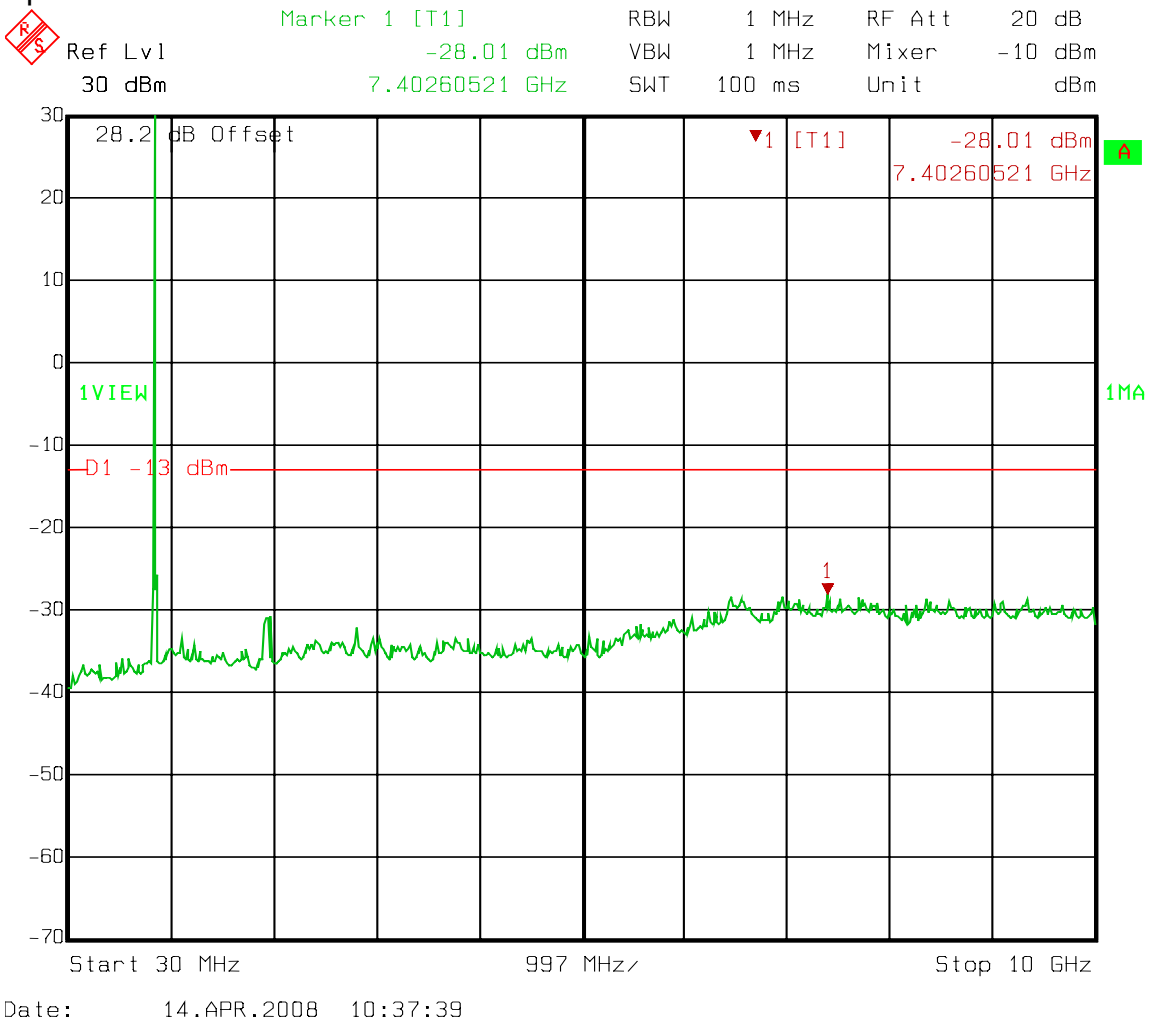
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
CDMA



Test Data – Spurious Emissions at Antenna Terminals

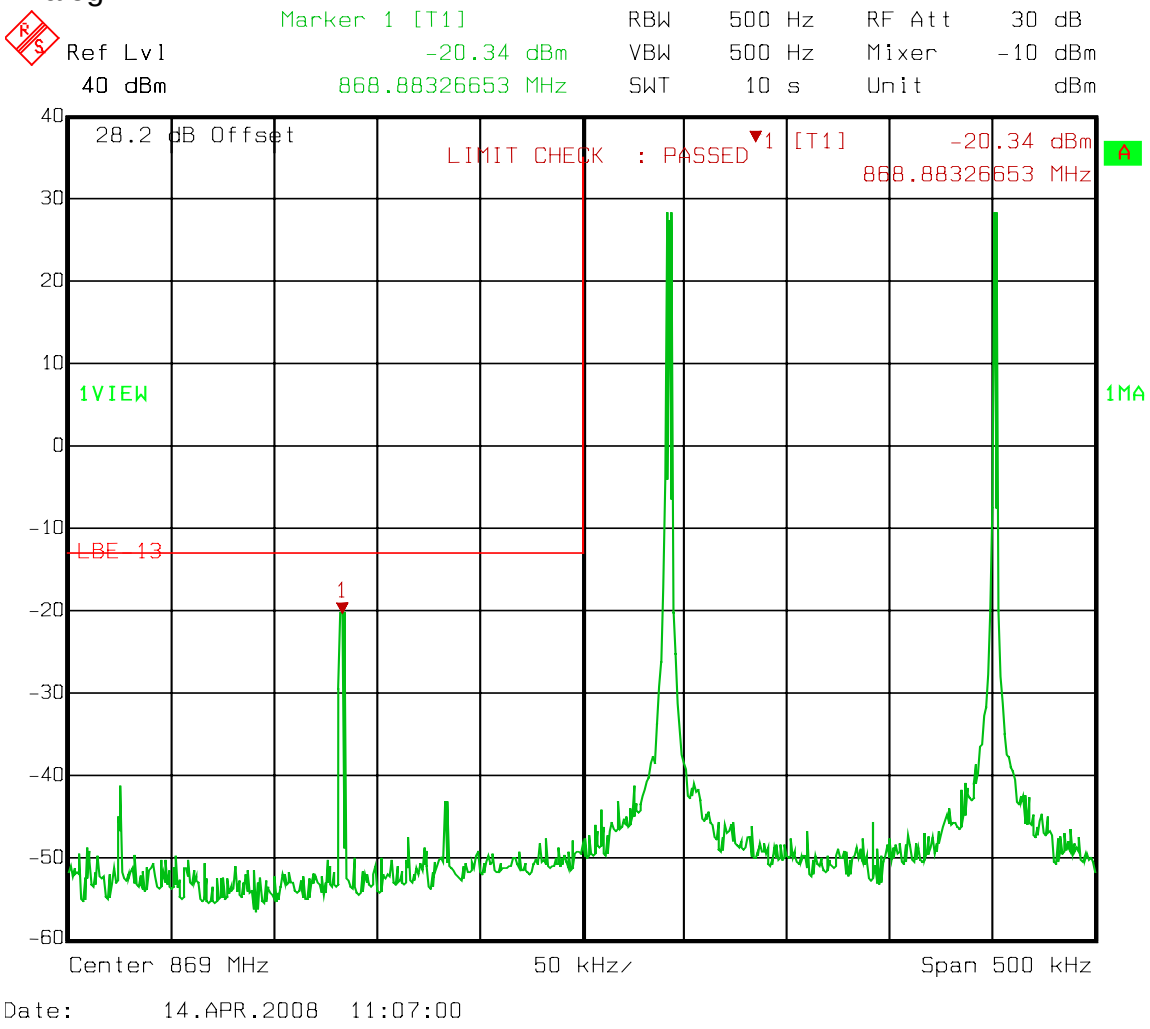
Spurs – CDMA



Test Data – Spurious Emissions at Antenna Terminals

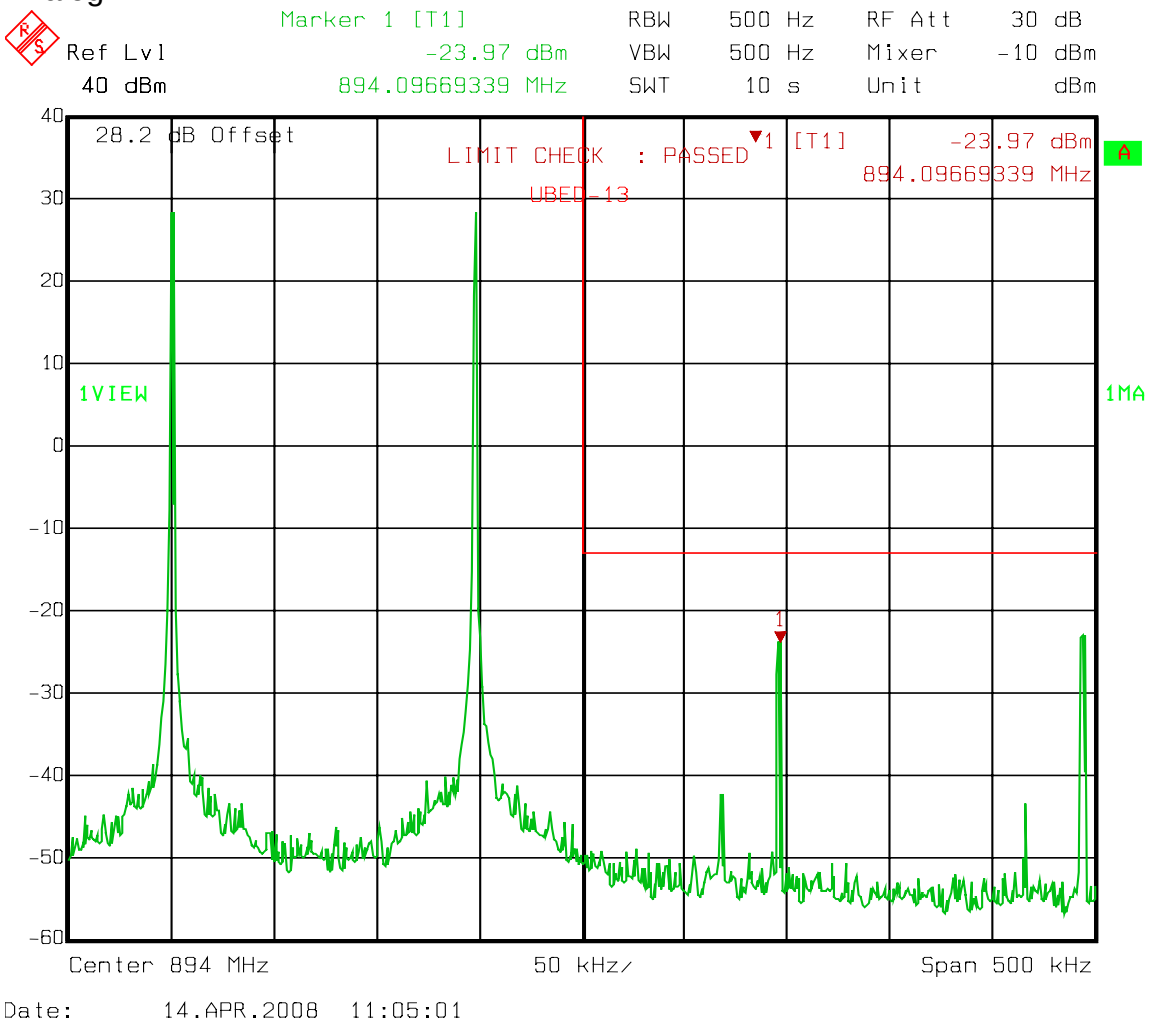
Lower Bandedge Intermodulation

Analog



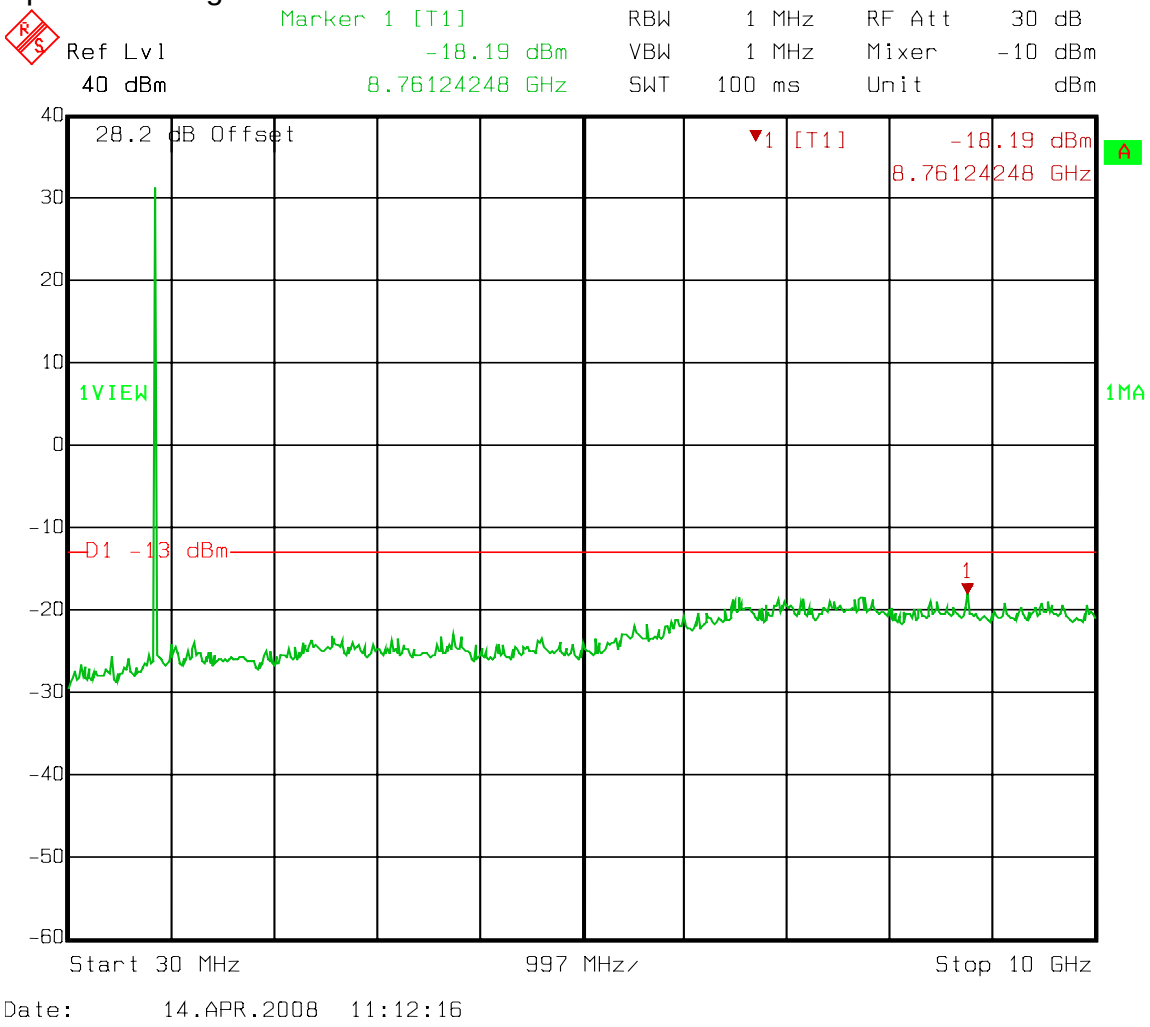
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
Analog



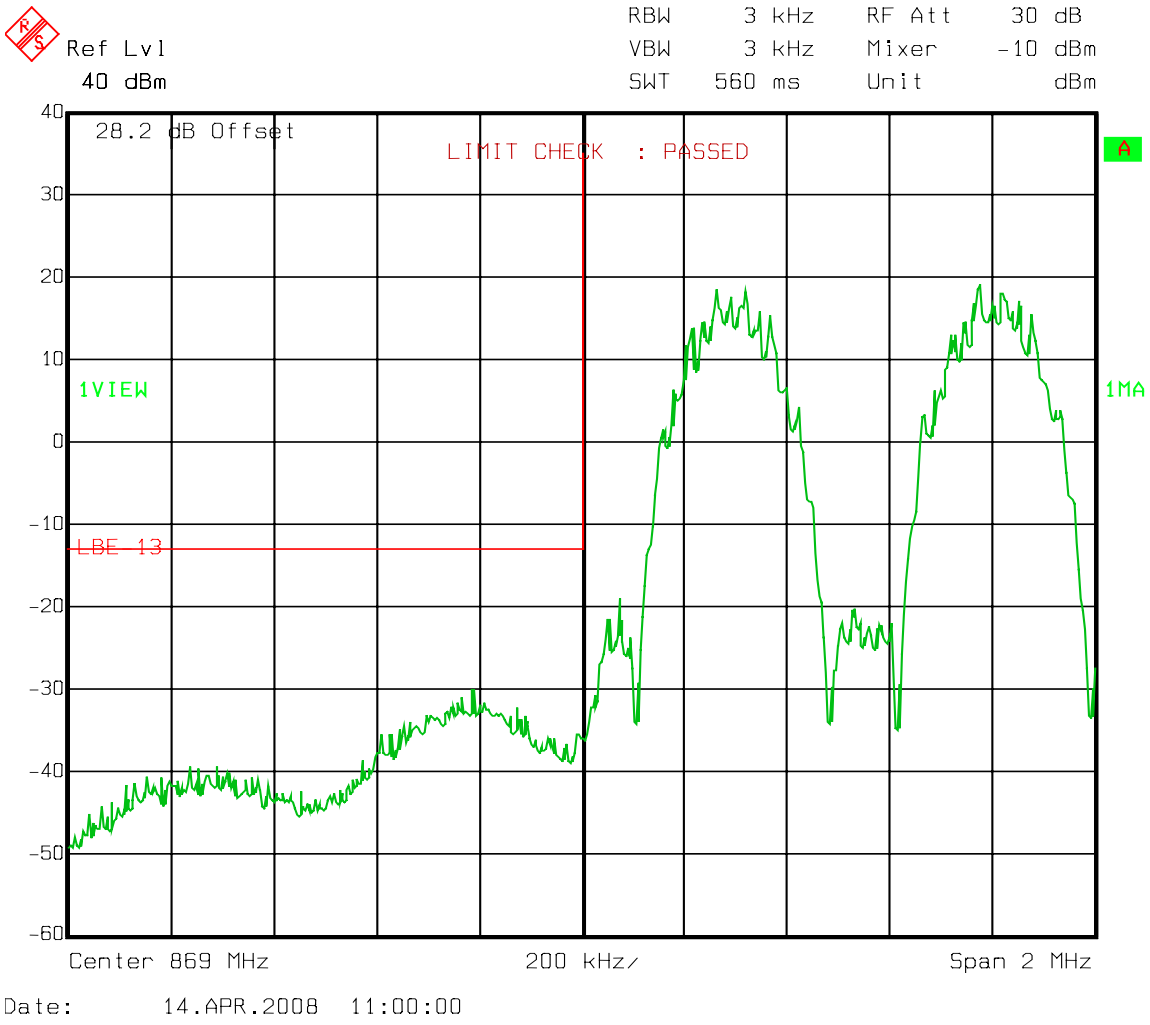
Test Data – Spurious Emissions at Antenna Terminals

Spurs – Analog



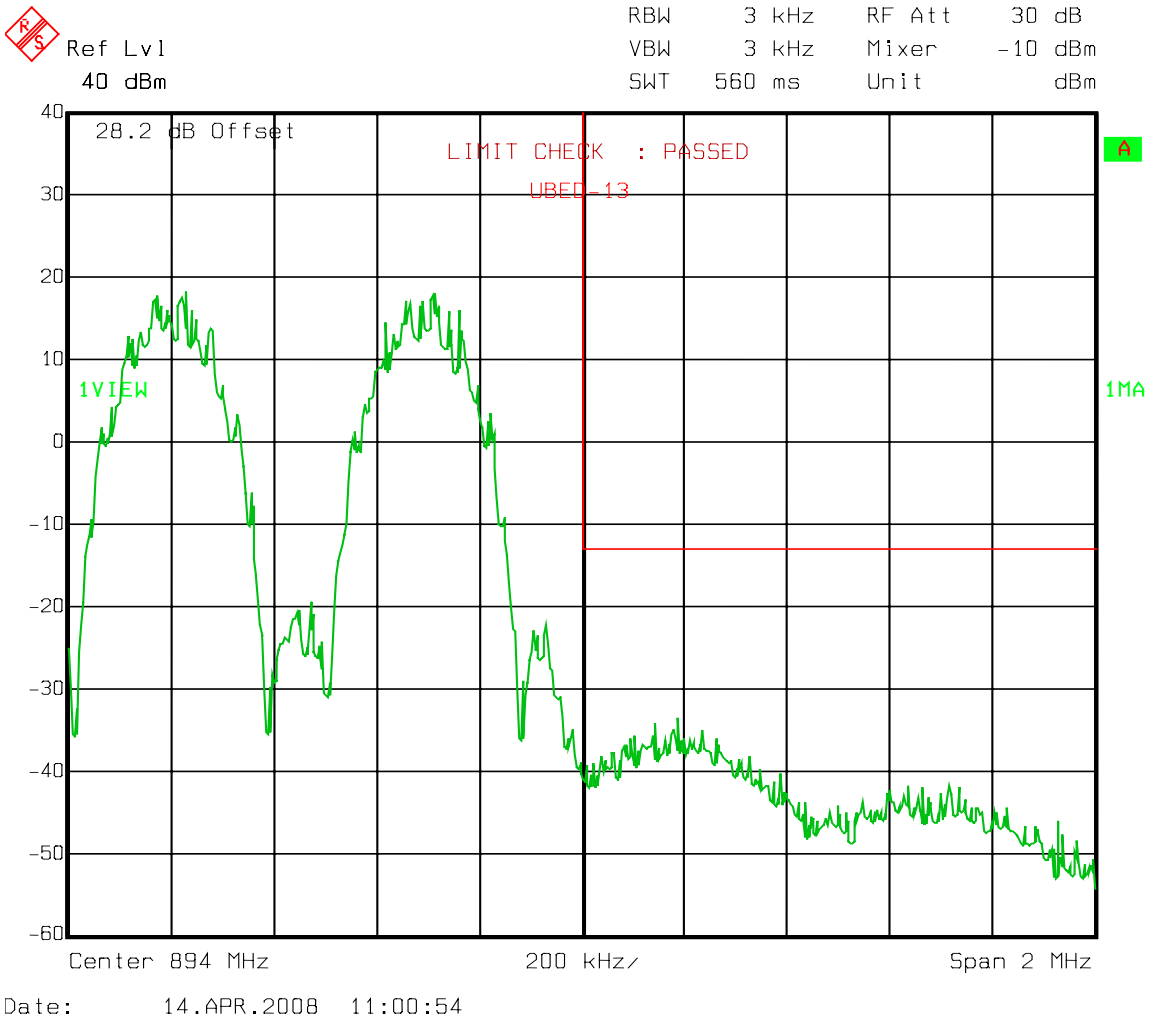
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
EDGE



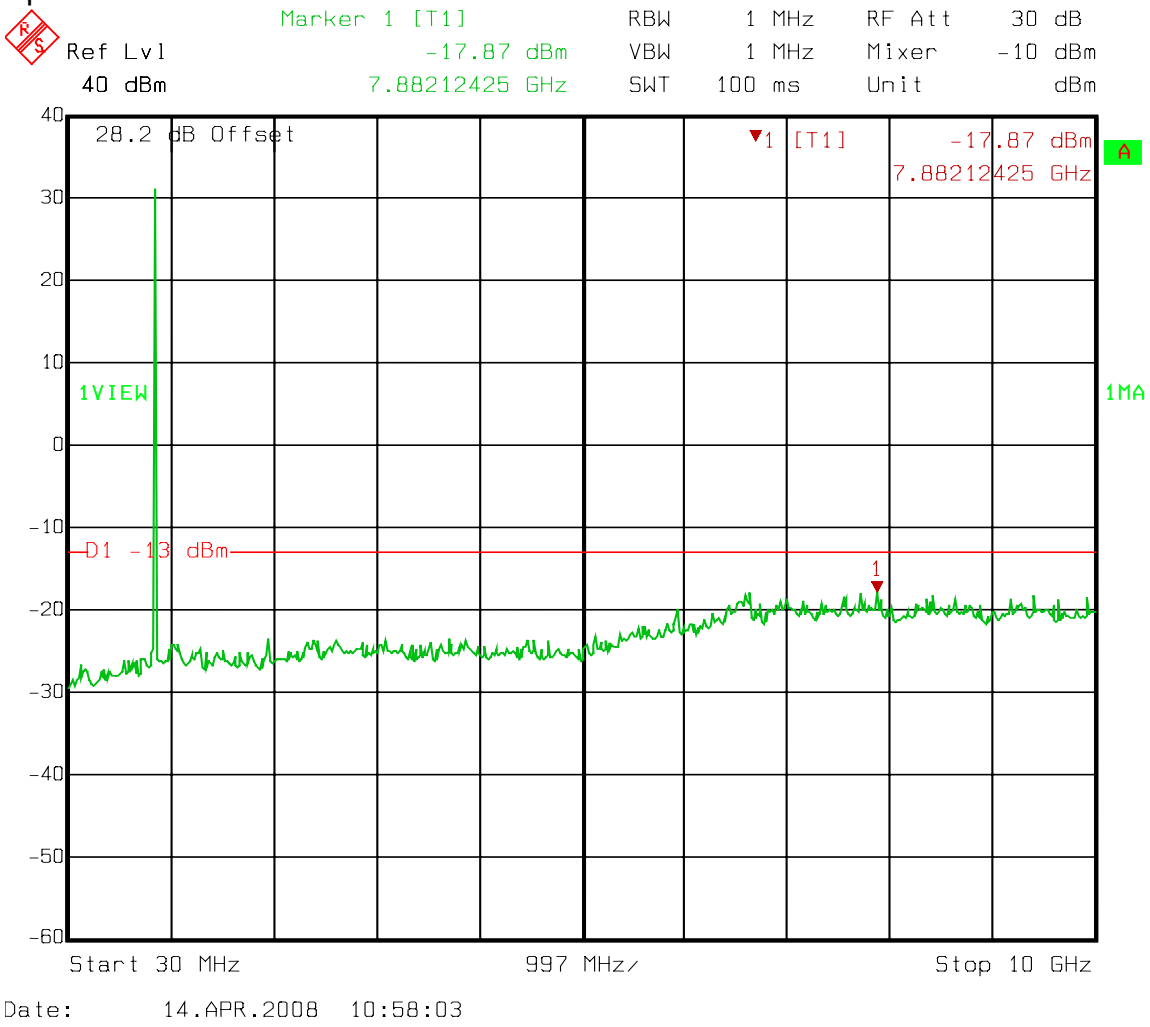
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
EDGE



Test Data – Spurious Emissions at Antenna Terminals

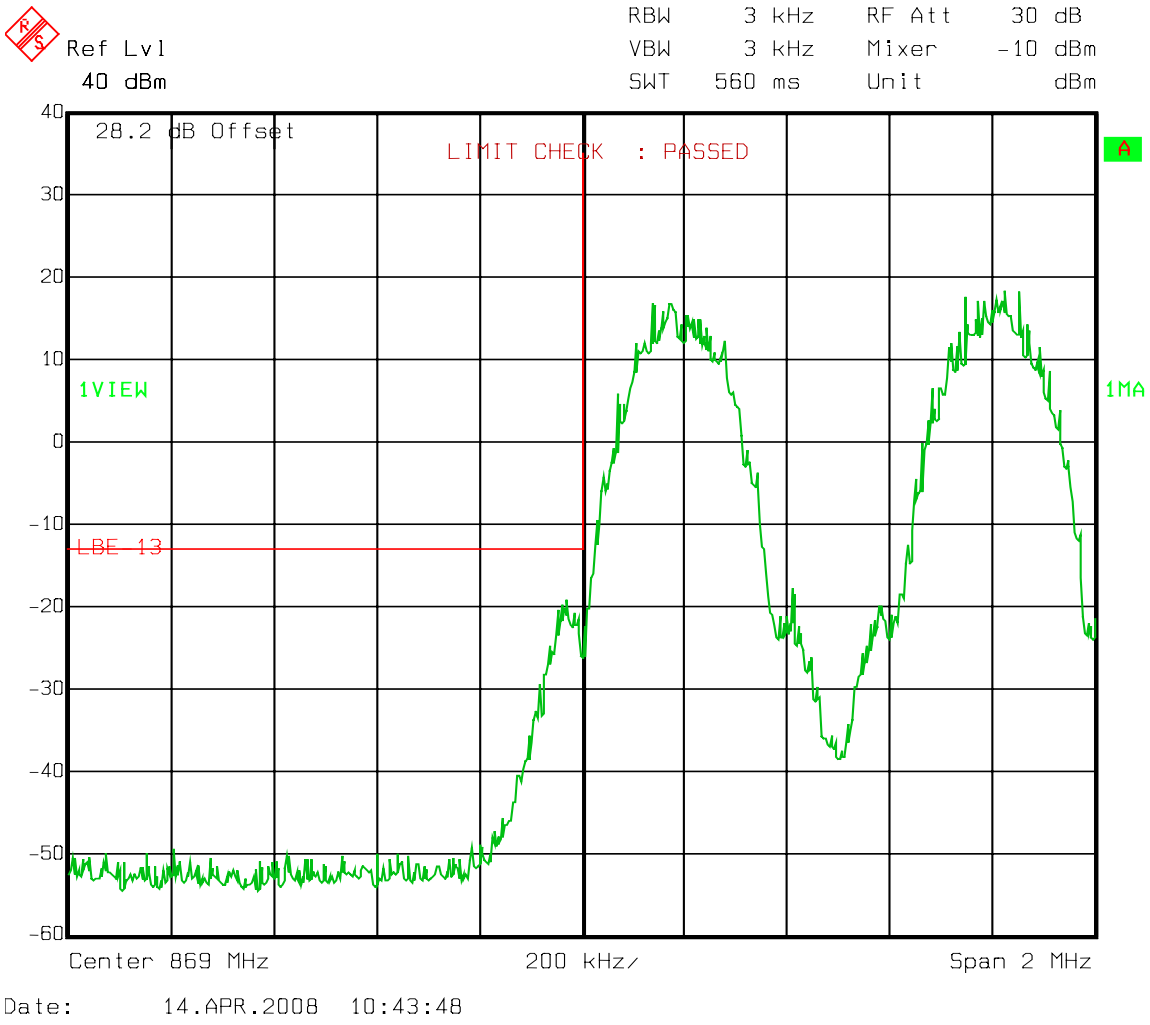
Spurs – EDGE



Test Data – Spurious Emissions at Antenna Terminals

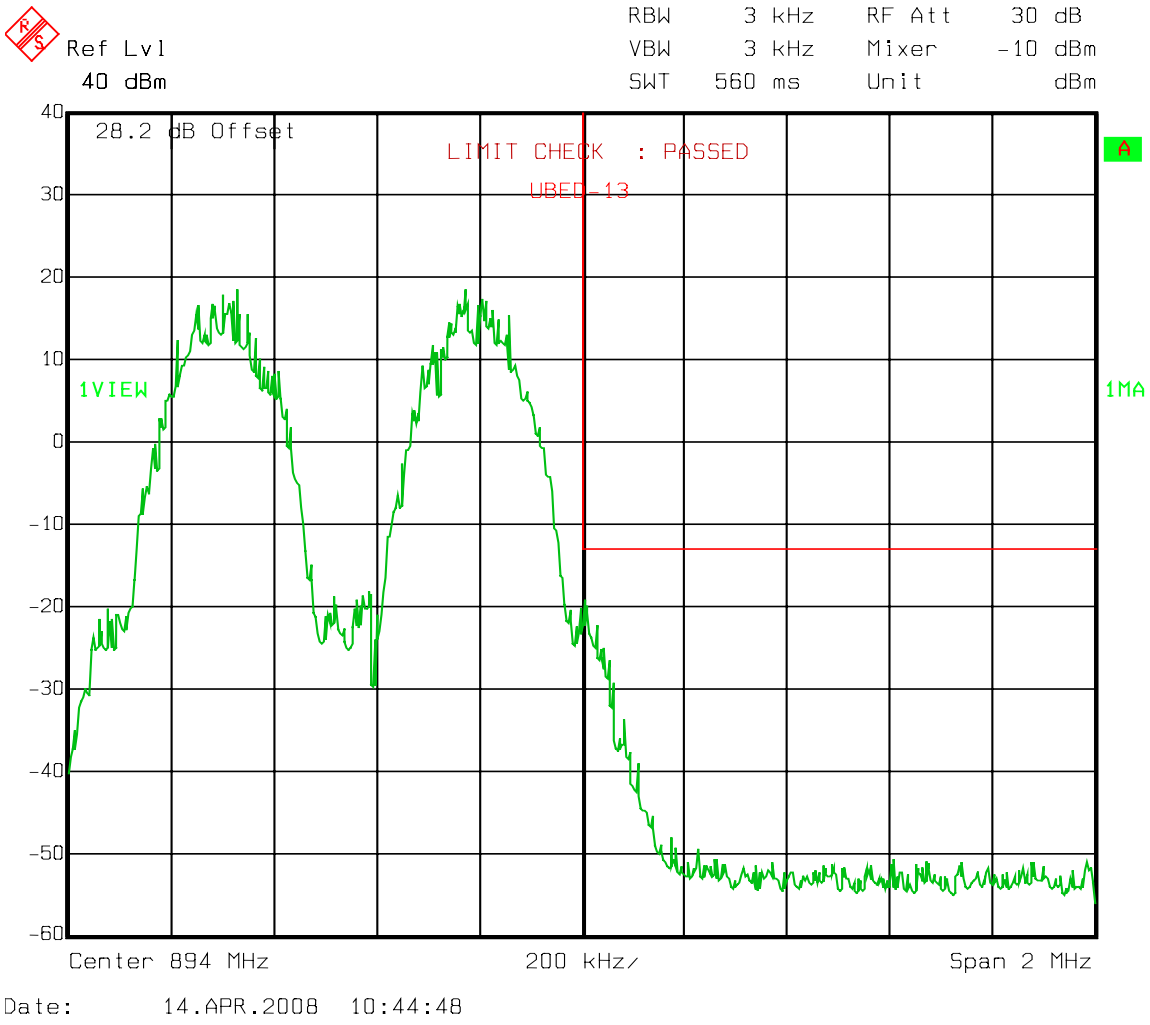
Lower Bandedge Intermodulation

GSM



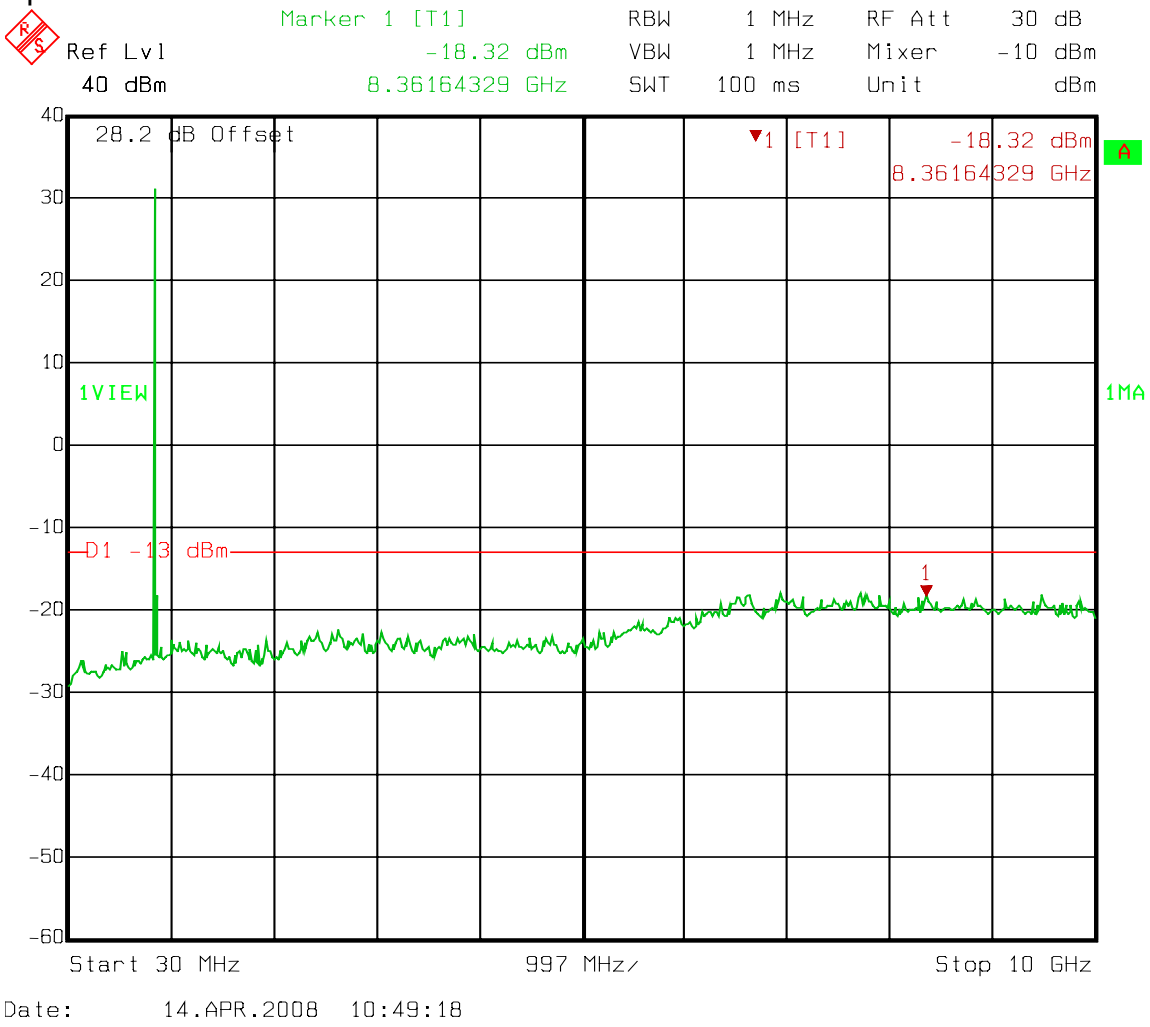
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
GSM



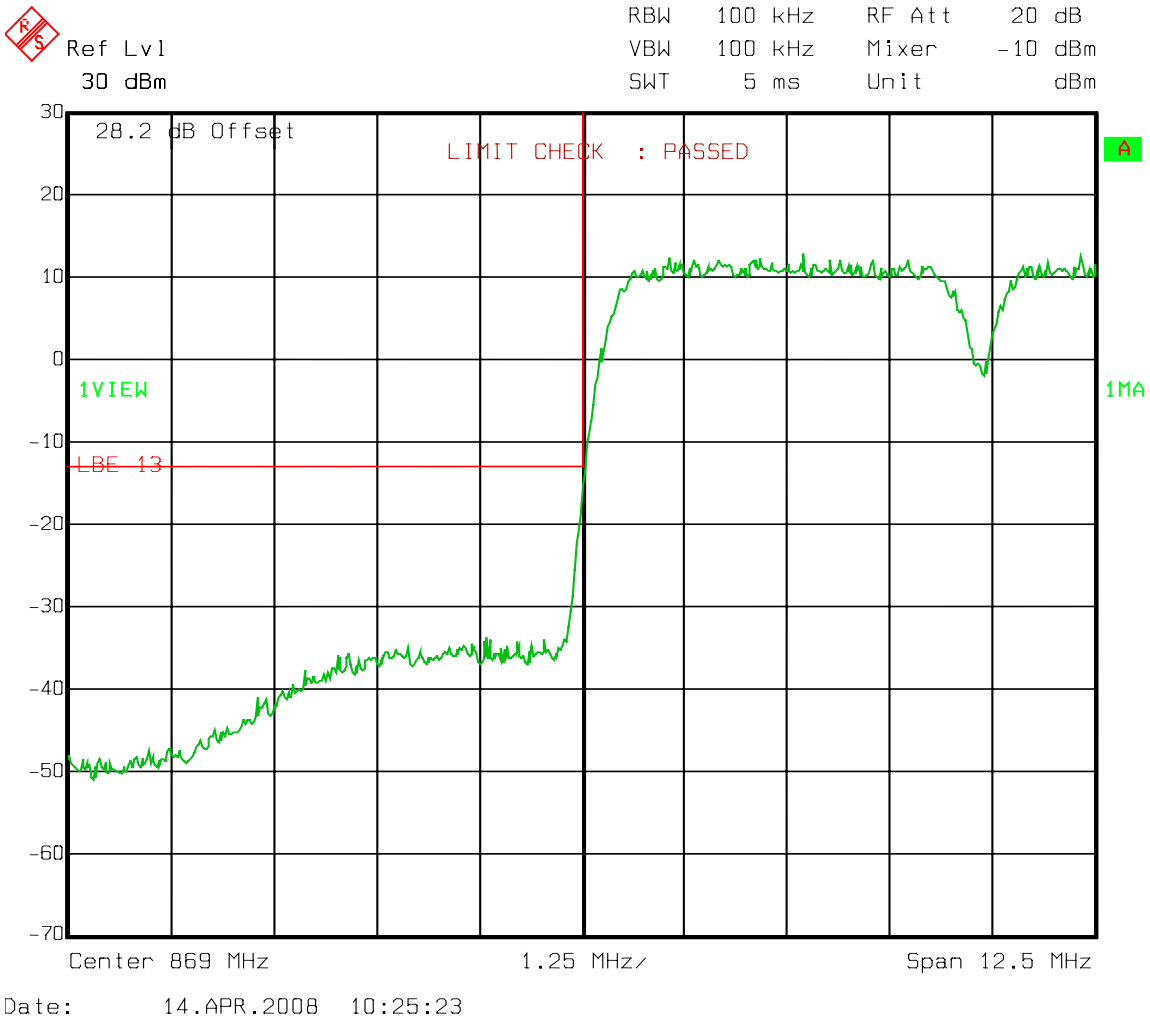
Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM



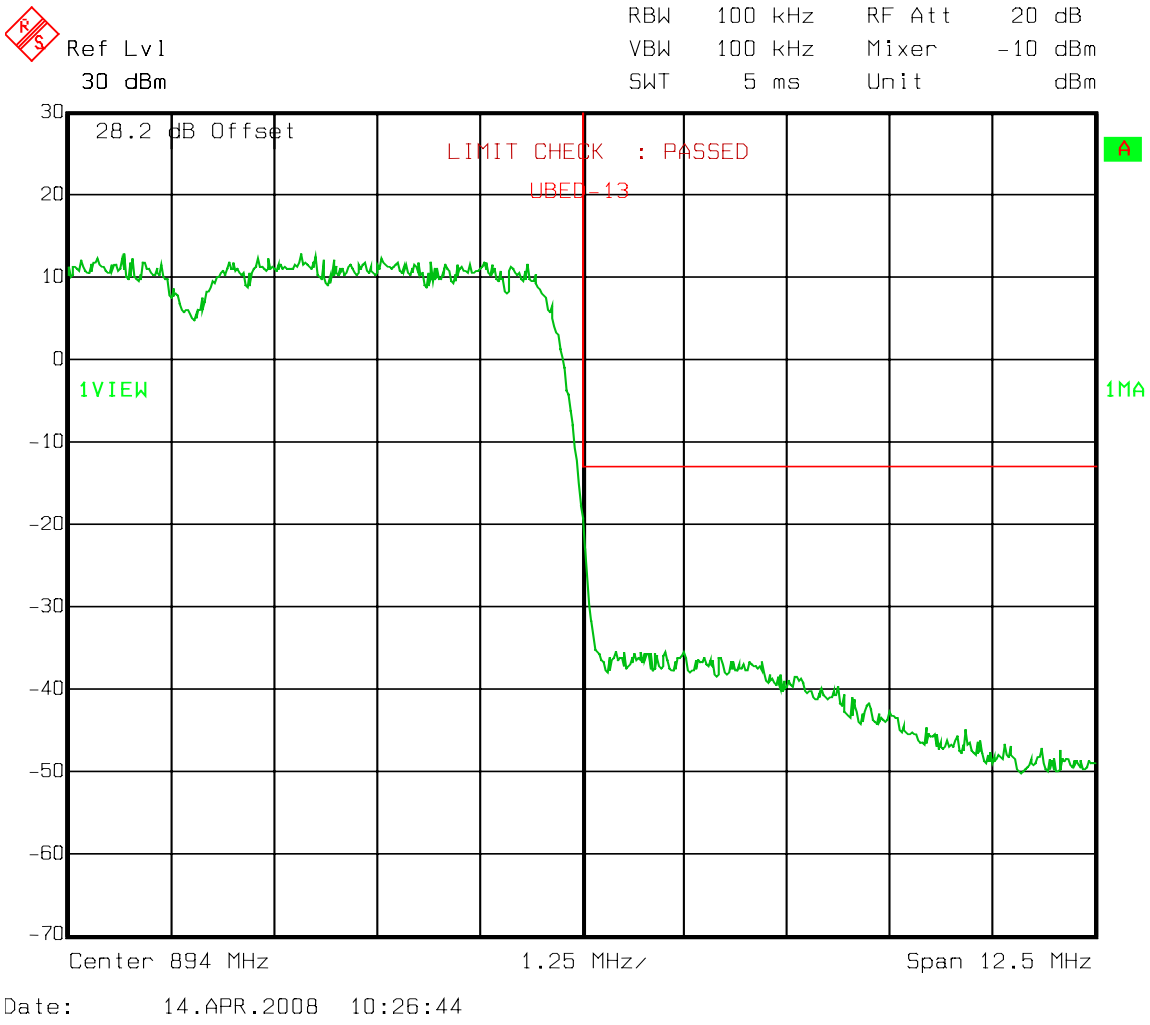
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
W-CDMA



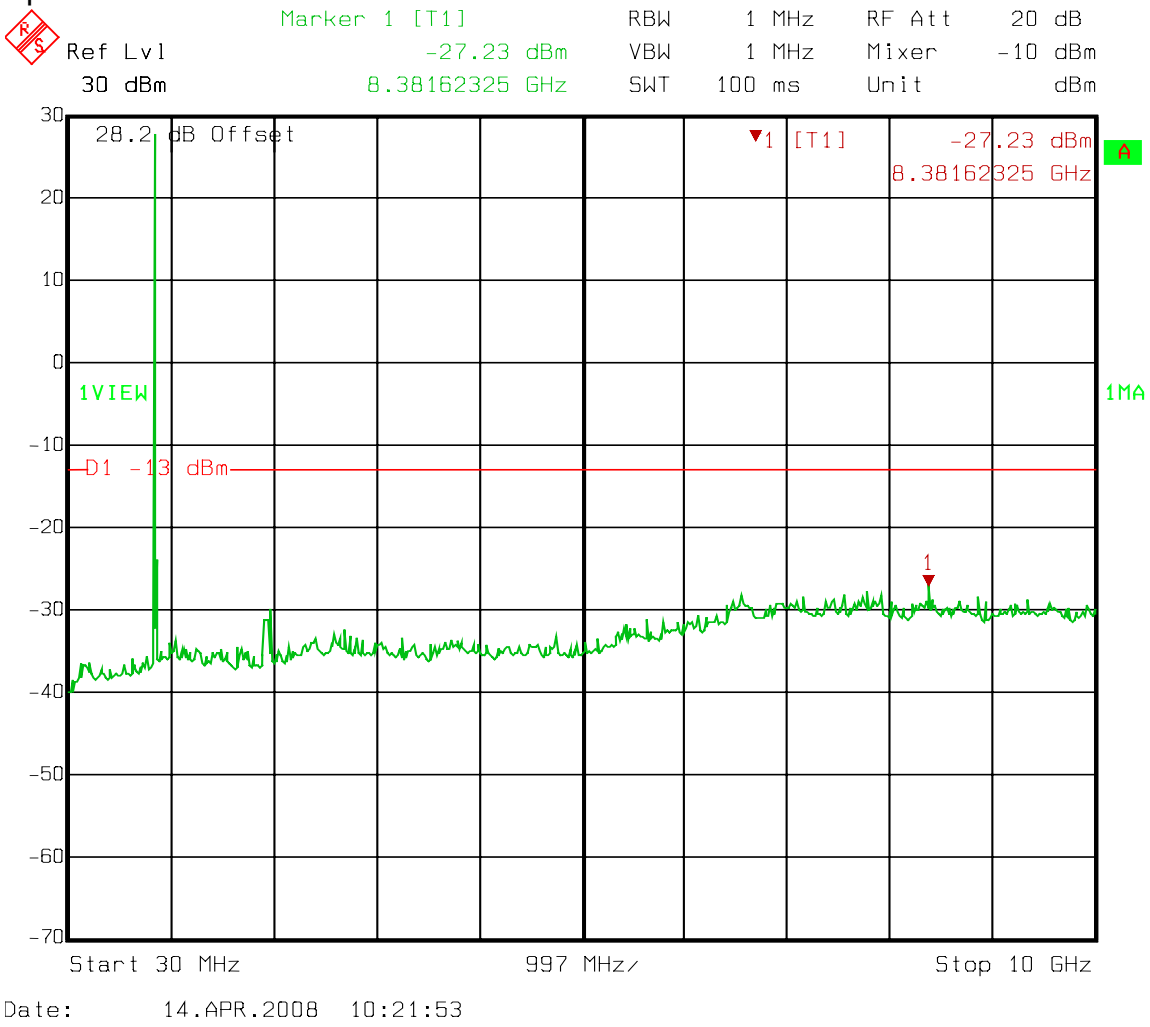
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
W-CDMA



Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 10 April 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.

The spectrum was searched from 30 MHz to 10 GHz

RBW = VBW = 1 MHz, Peak detector

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

Measurement Uncertainty: +/-1.7 dB

Temperature: 20 °C

Relative Humidity: 30 %

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
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
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08

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:
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.

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

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: ≥ 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: ≥ RBW
Sweep: Auto
Video Avg: Disabled

TDMA

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

W-CDMA

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

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.

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.

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

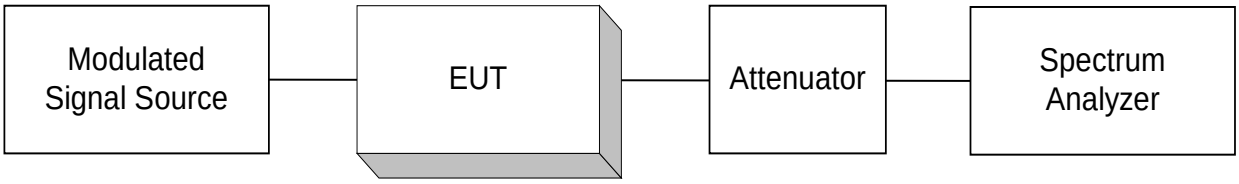
Method Of Measurement:

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.

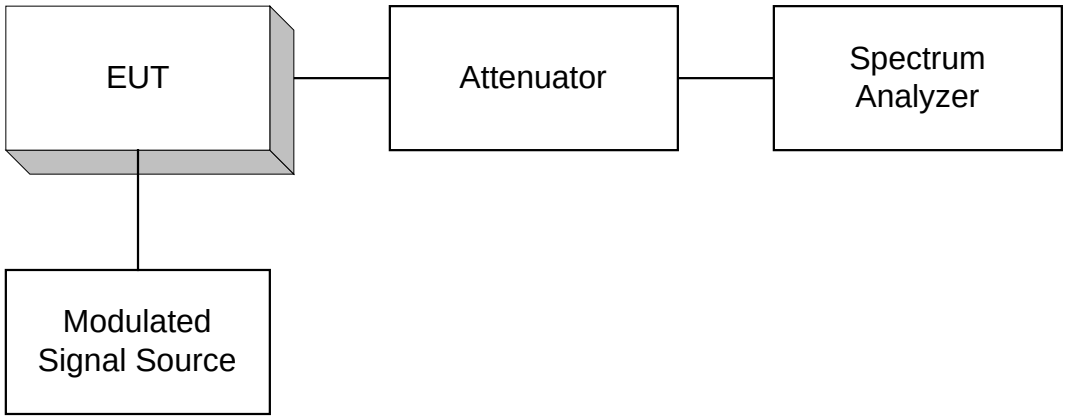
Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30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

ANNEX B - TEST DIAGRAMS

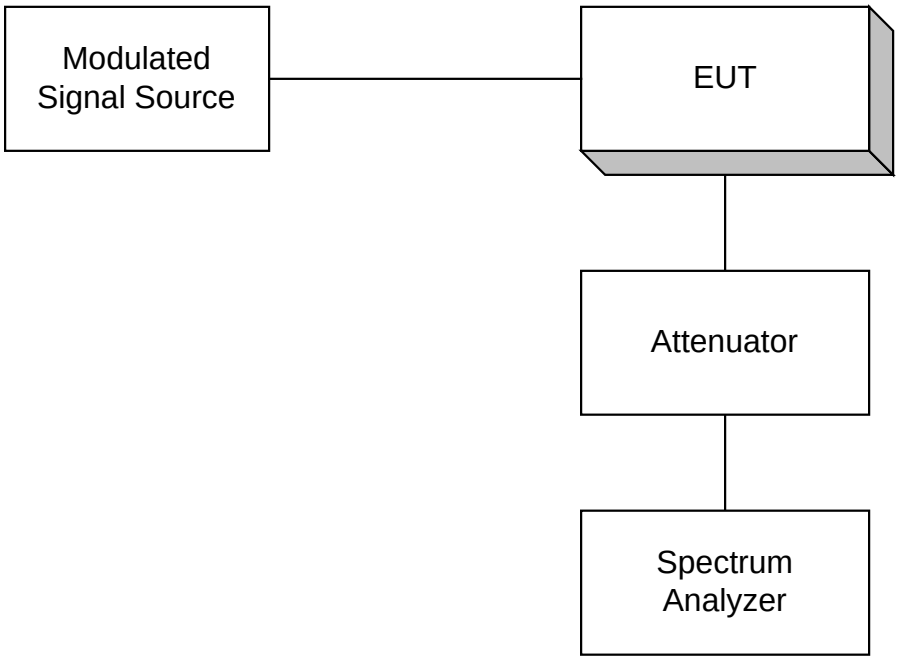
Para. No. 2.1046 - R.F. Power Output



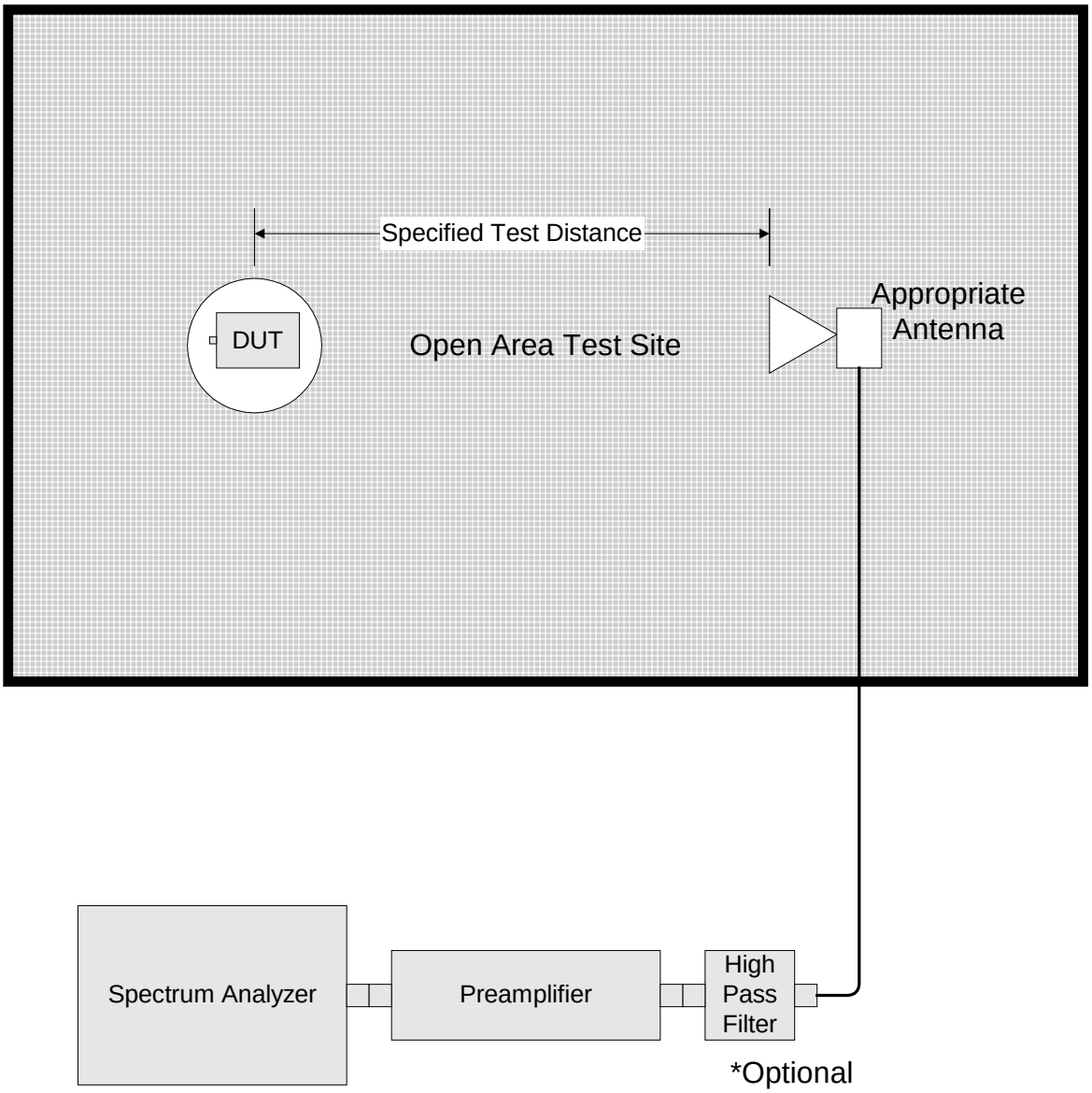
Para. No. 2.1049 - Occupied Bandwidth

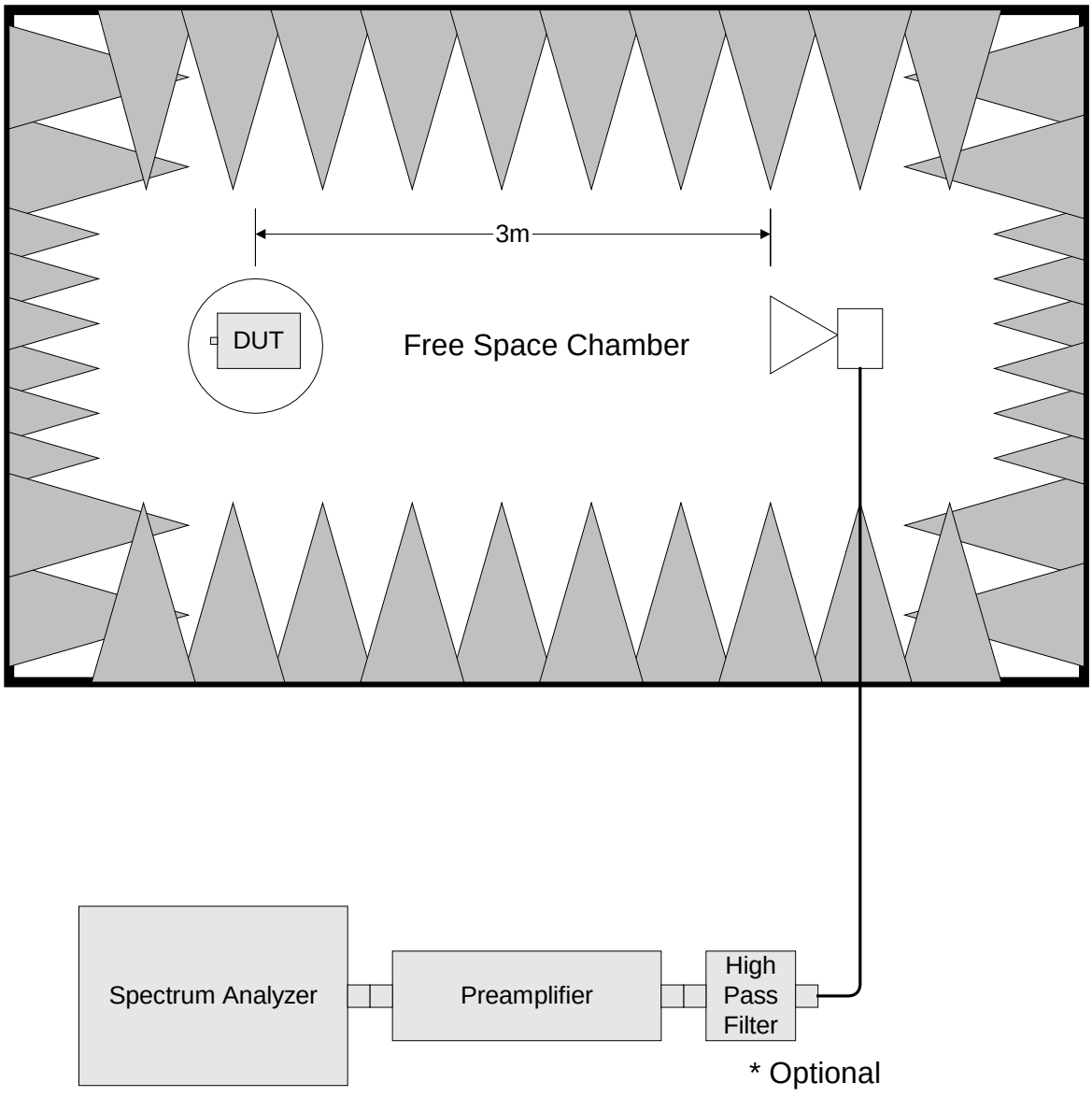


Para. No. 2.1051 Spurious Emissions at Antenna Terminals



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