Nemko Test Report:	1028403RUS2
Applicant:	Andrew Corporation 620 N. Greenfield Parkway Garner, NC 27529 USA
Equipment Under Test: (E.U.T.)	TFAH-US4B
In Accordance With:	**CFR 47, Part 22, Subpart H** Cellular Band Repeaters
FCC Identifier:	BCR-TFAHUS4B
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, TX 75057-3136

TESTED BY: _____ **DATE:** **01 June 2011**

David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** **03 June 2011**

Mike Cantwell, GM

Number of Pages: 43

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAH-US4B

Serial No.: 10

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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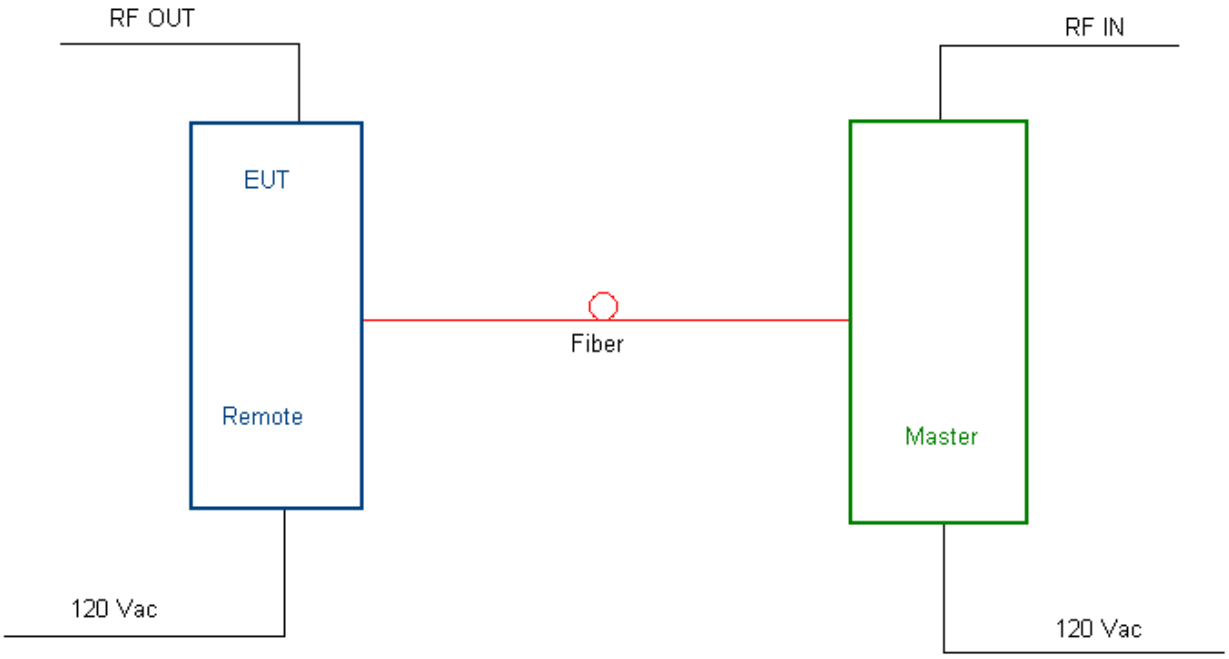
Section 2. General Equipment Specification

Supply Voltage Input:		120 Vac				
Frequency Range:	**Downlink:**	869 to 894 MHz				
Frequency Range:	**Uplink:**	NA				
Type of Modulation and Designator:		**CDMA (F9W)** ☒	**GSM (GXW)** ☒	**EDGE (G7W)** ☒	**Analog (F1D, F1E)** ☒	
Output Impedance:		50 ohms				
RF Output (Rated):	**Downlink:**	1.25 W				
		31.0 dBm				
	Uplink:	NA mW				
		NA dBm				
Frequency Translation:		**F1-F1** ☒	**F1-F2** ☐	**N/A** ☐		
Band Selection:		**Software** ☐	**Duplexer Change** ☐	**Fullband Coverage** ☒		

Description of EUT

The TFAH-US4B is a four band high power remote unit designed to distribute Cell700, Cell850, AWS, and Extended 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: 23 May 2011

Test Results: Complies.

Test Data:

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	CDMA	NA	NA	NA
Downlink	CDMA	28	31	1.25
Uplink	EDGE	NA	NA	NA
Downlink	EDGE	28	31	1.25
Uplink	GSM	NA	NA	NA
Downlink	GSM	28	31	1.25
Uplink	Analog	NA	NA	NA
Downlink	Analog	28	31	1.25

Equipment Used: 1767-1082-1472-1469

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 45 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 23 May 2011

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1767-1082-1472-1469

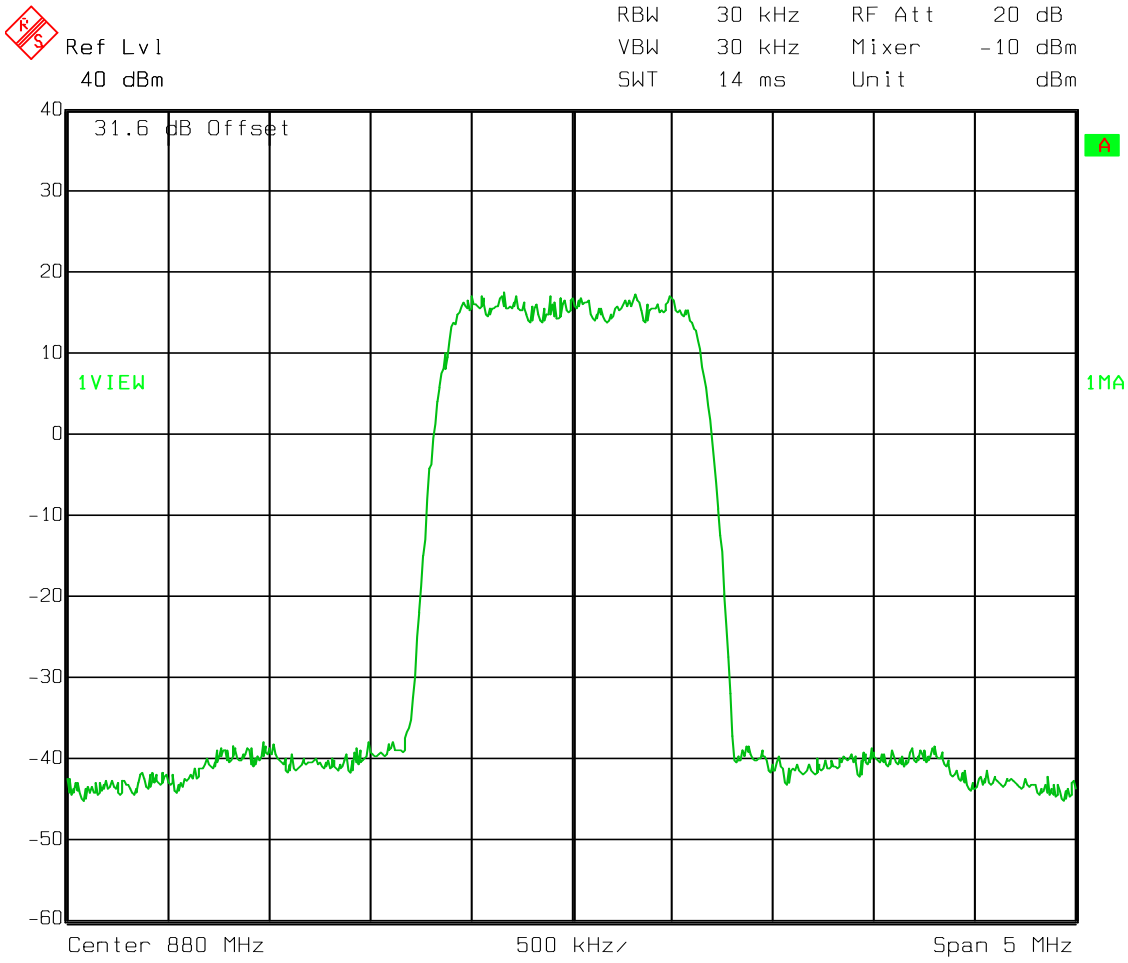
Measurement Uncertainty: $1X10^{-7}$ ppm

Temperature: 22 °C

Relative Humidity: 45 %

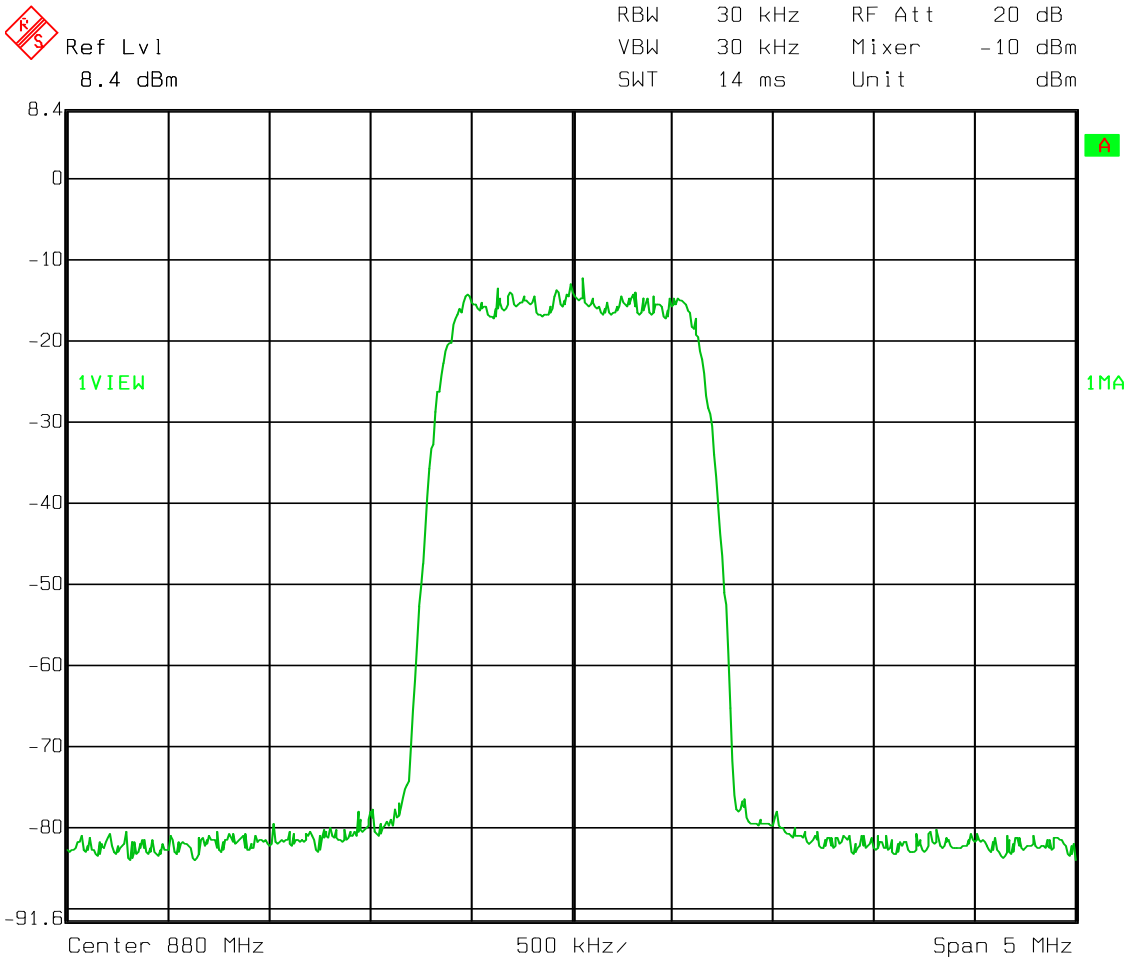
Test Data – Occupied Bandwidth

CDMA - Output
Downlink



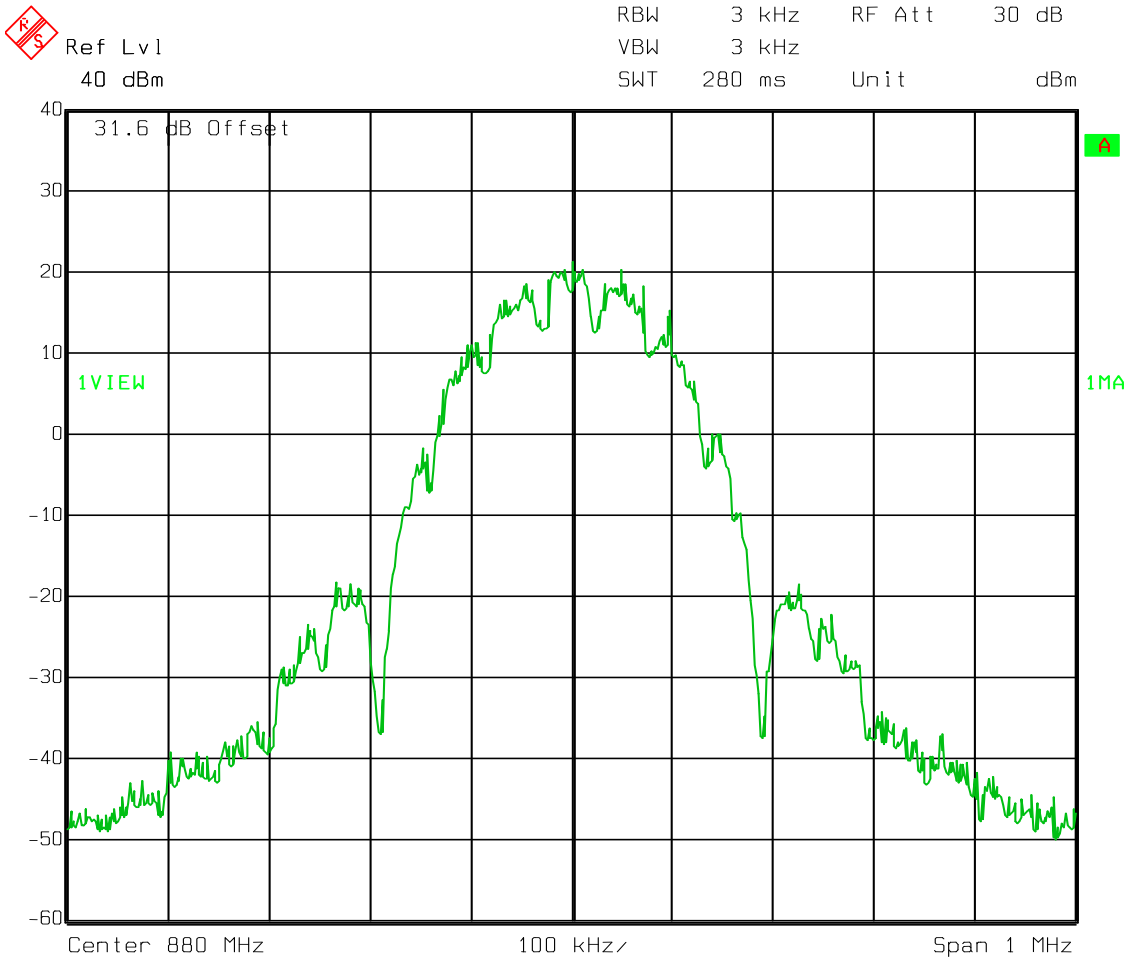
Test Data – Occupied Bandwidth

CDMA - Input
Downlink



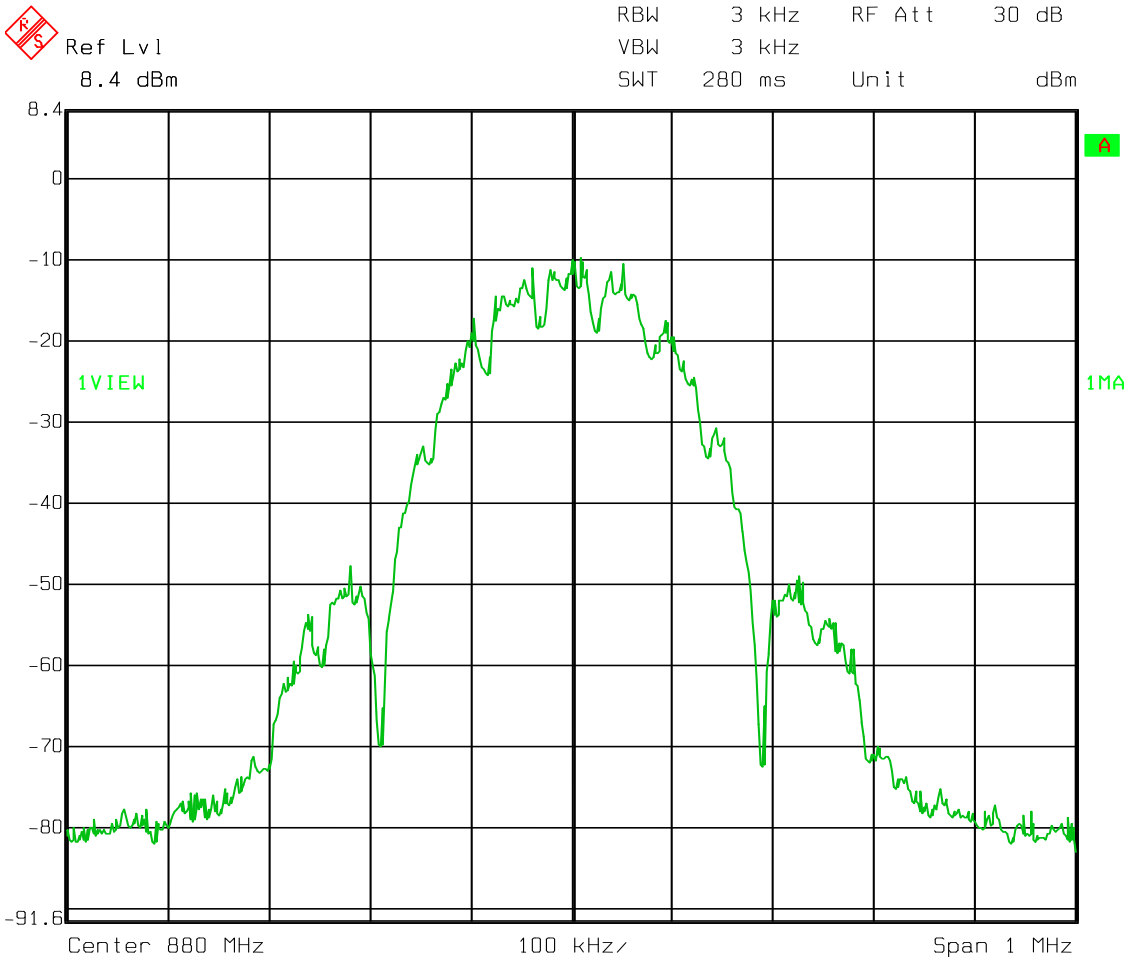
Test Data – Occupied Bandwidth

EDGE - Output
Downlink



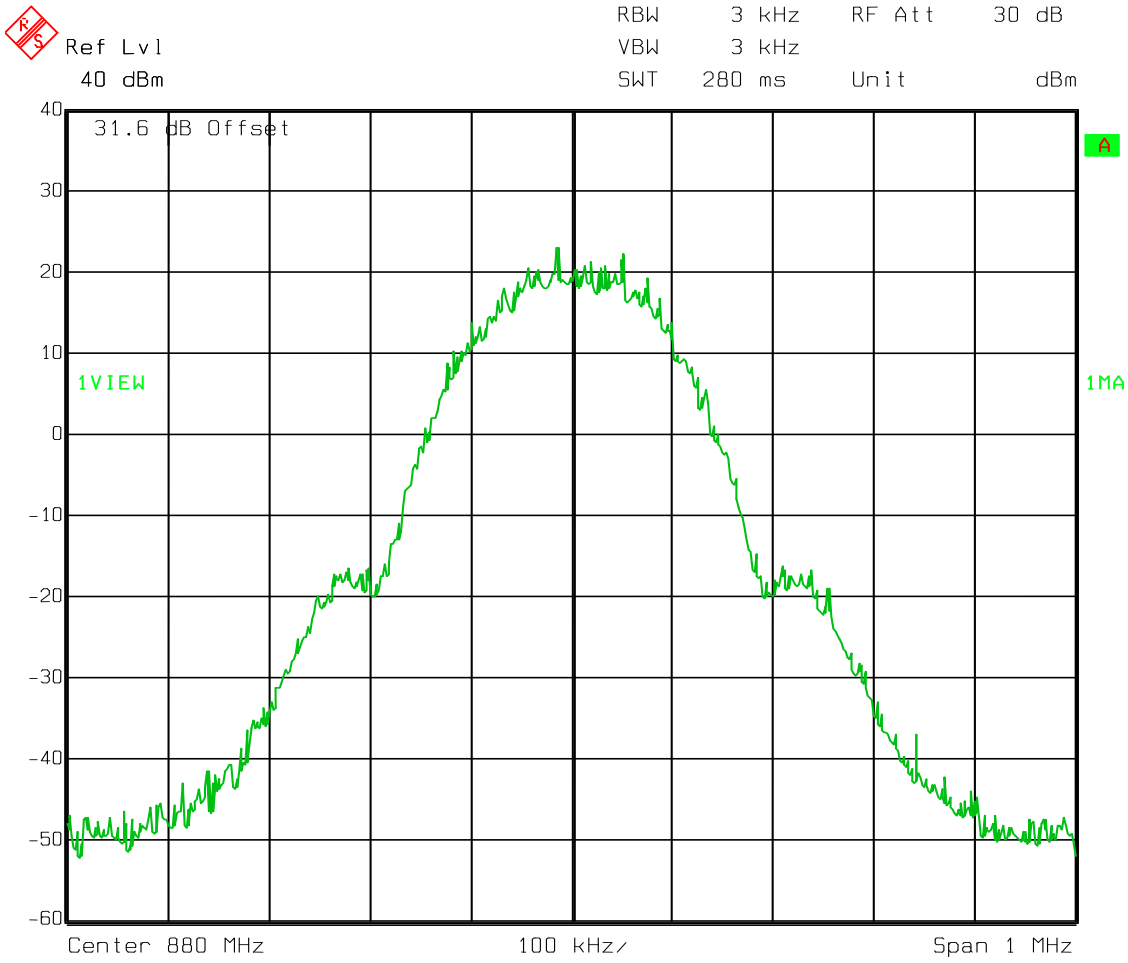
Test Data – Occupied Bandwidth

EDGE - Input
Downlink



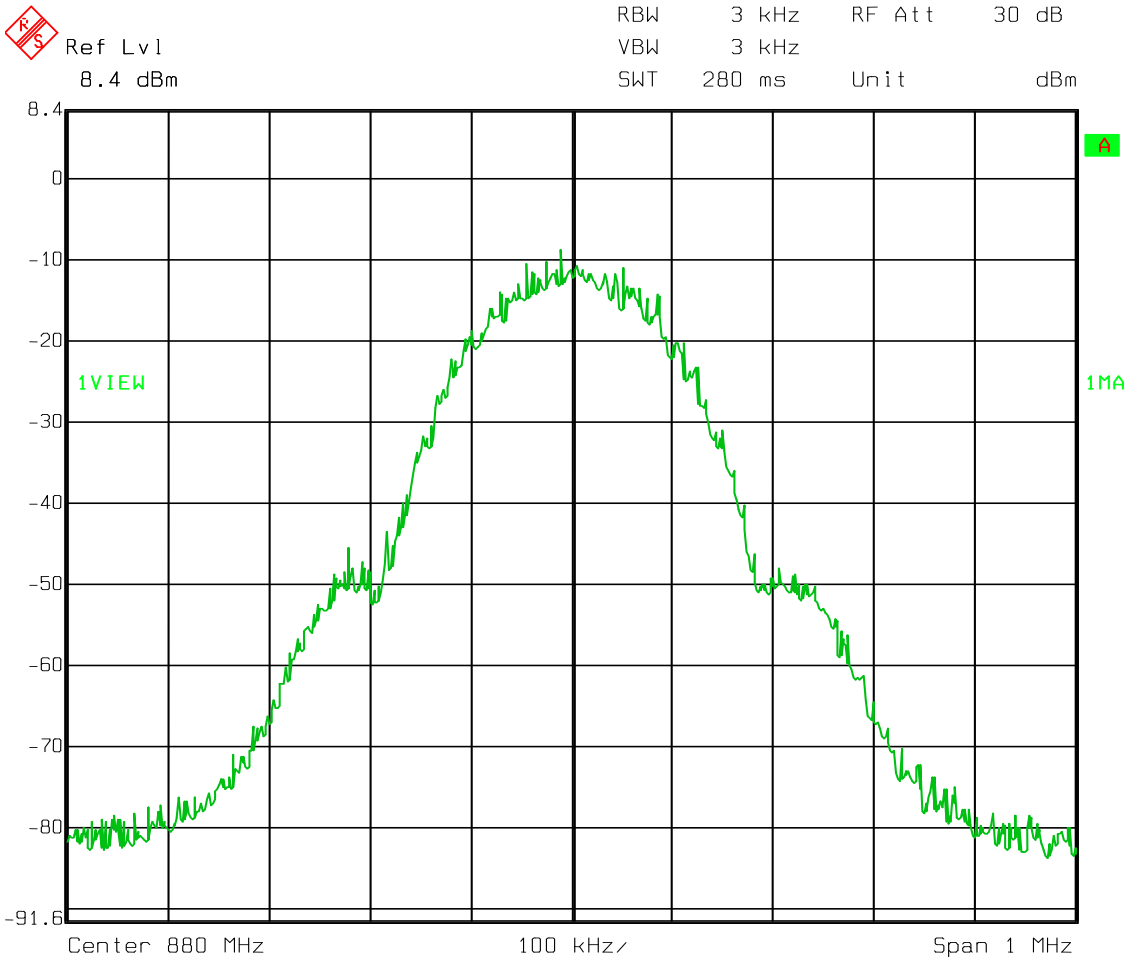
Test Data – Occupied Bandwidth

GSM - Output
Downlink



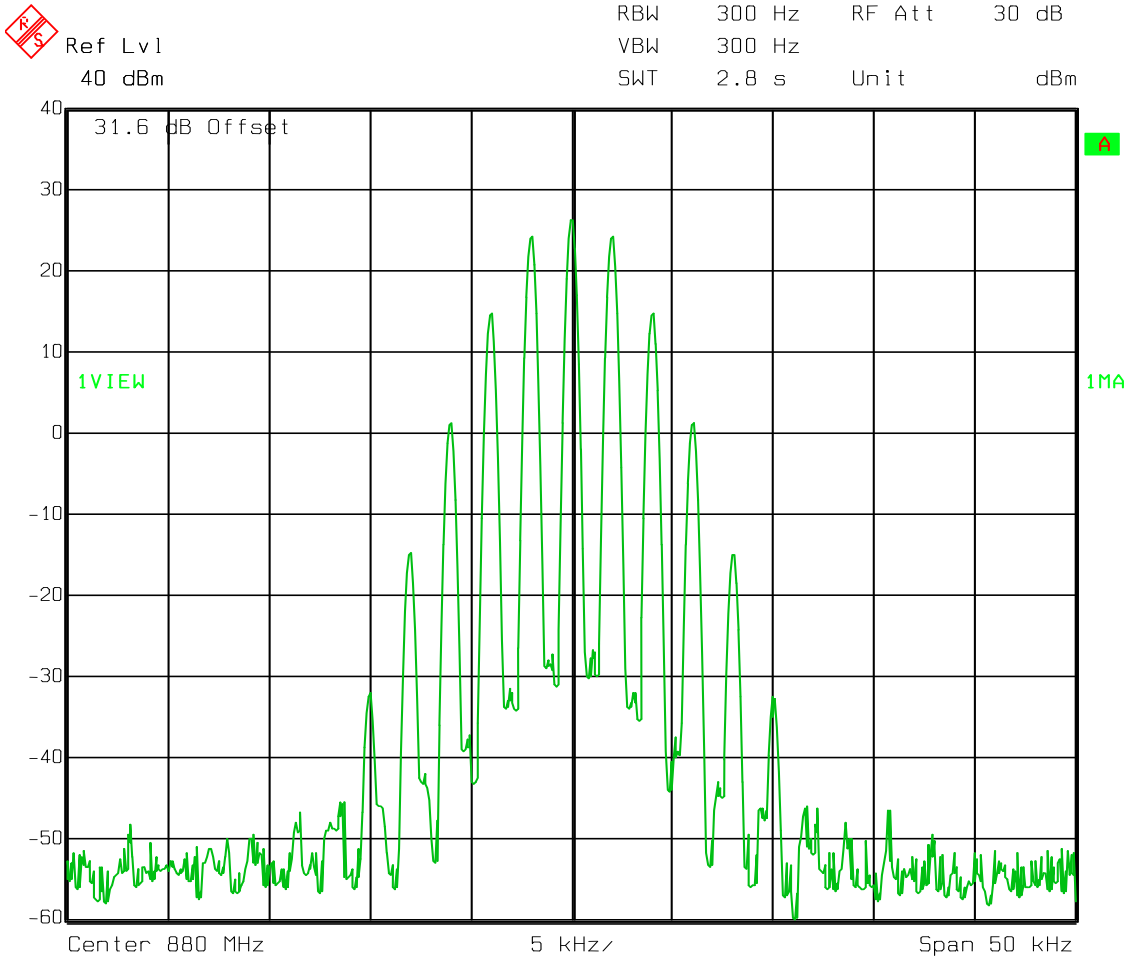
Test Data – Occupied Bandwidth

GSM - Input
Downlink



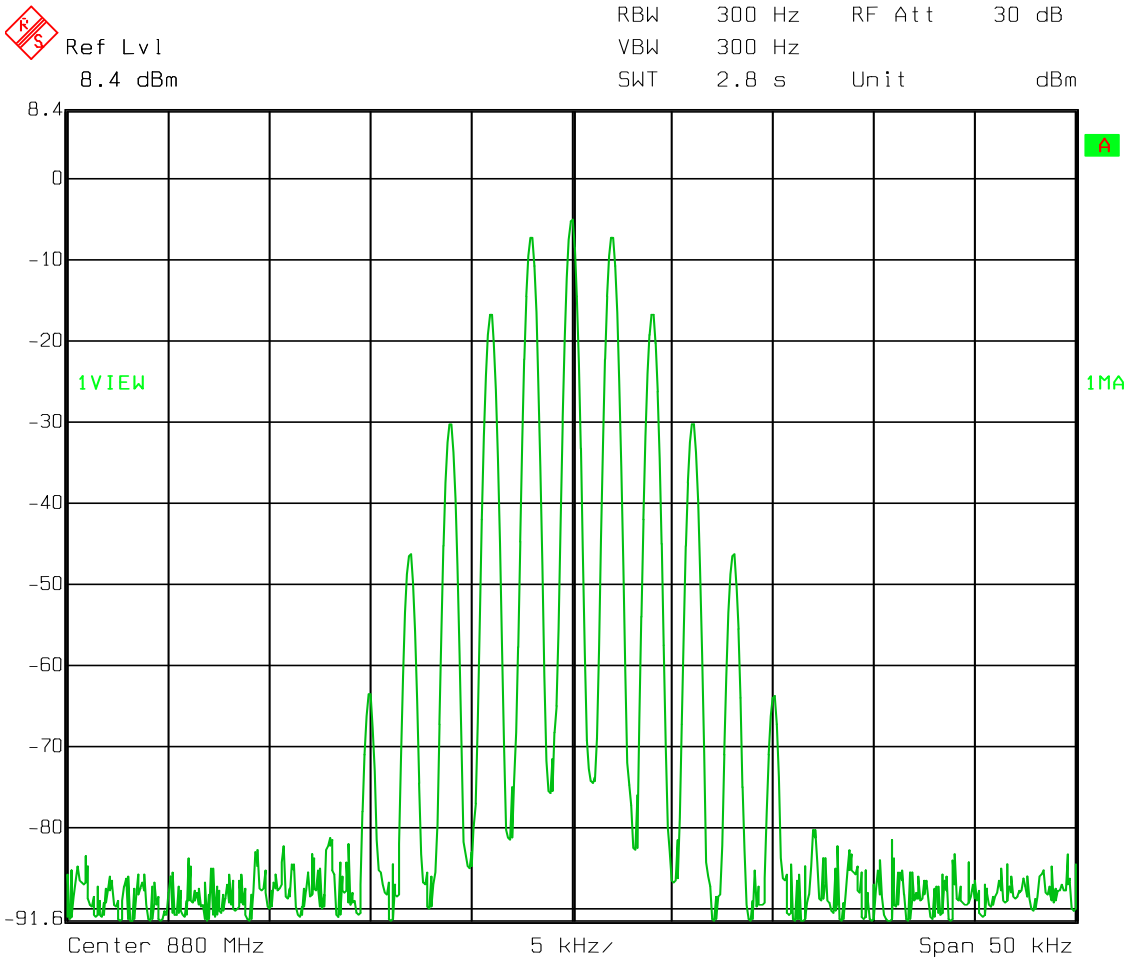
Test Data – Occupied Bandwidth

Analog - Output
Downlink
2 kHz tone / 2.5 kHz deviation



Test Data – Occupied Bandwidth

Analog - Input
Downlink



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 23 May 2011

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1767-1082-1472-1469

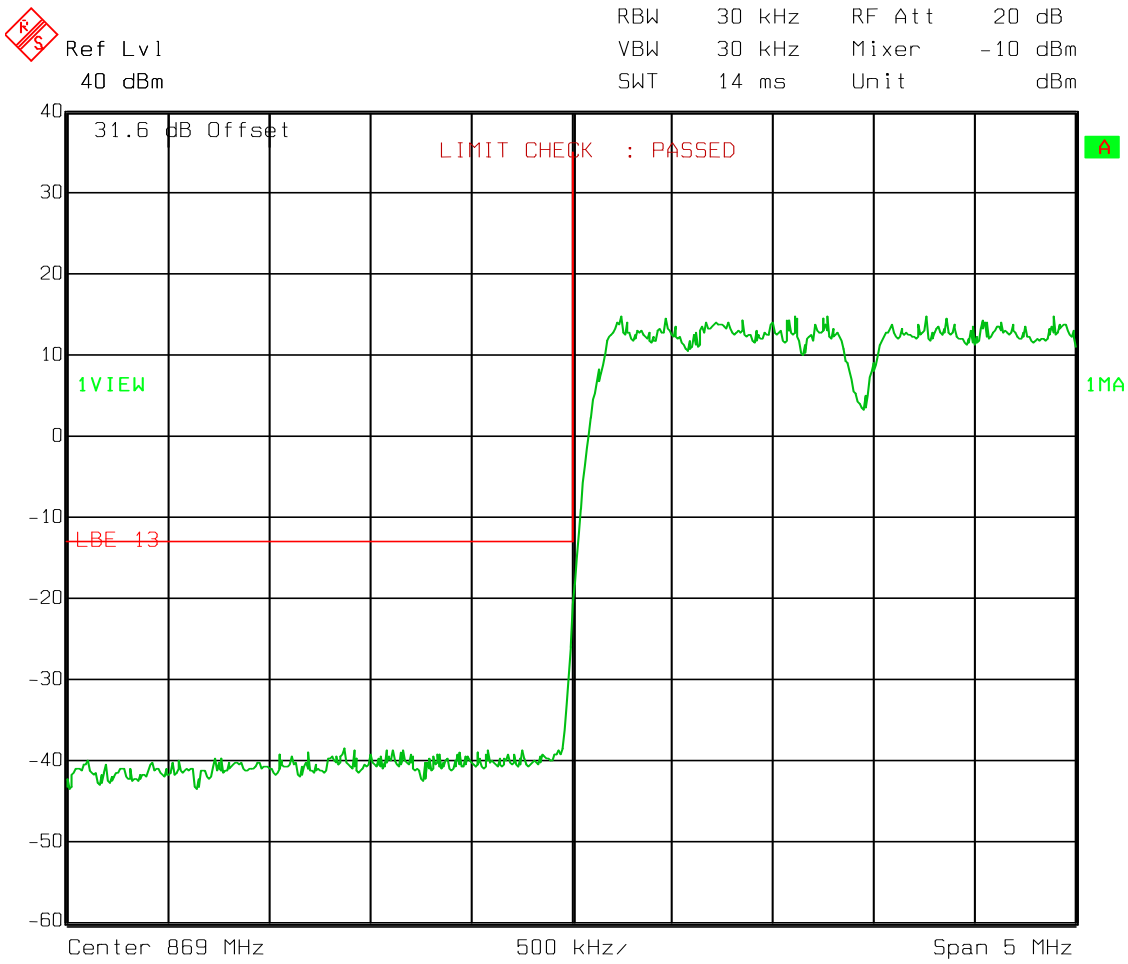
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 45 %

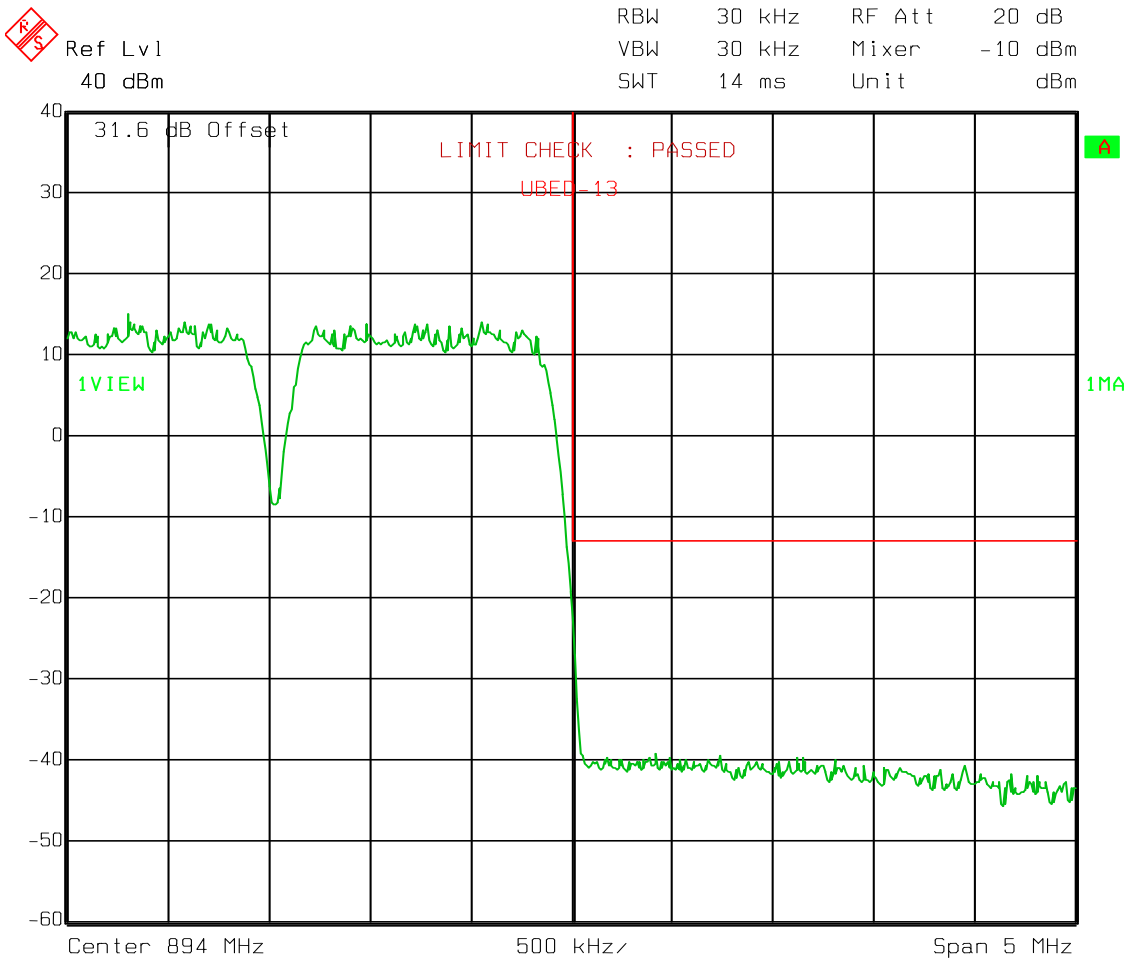
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
CDMA
Downlink



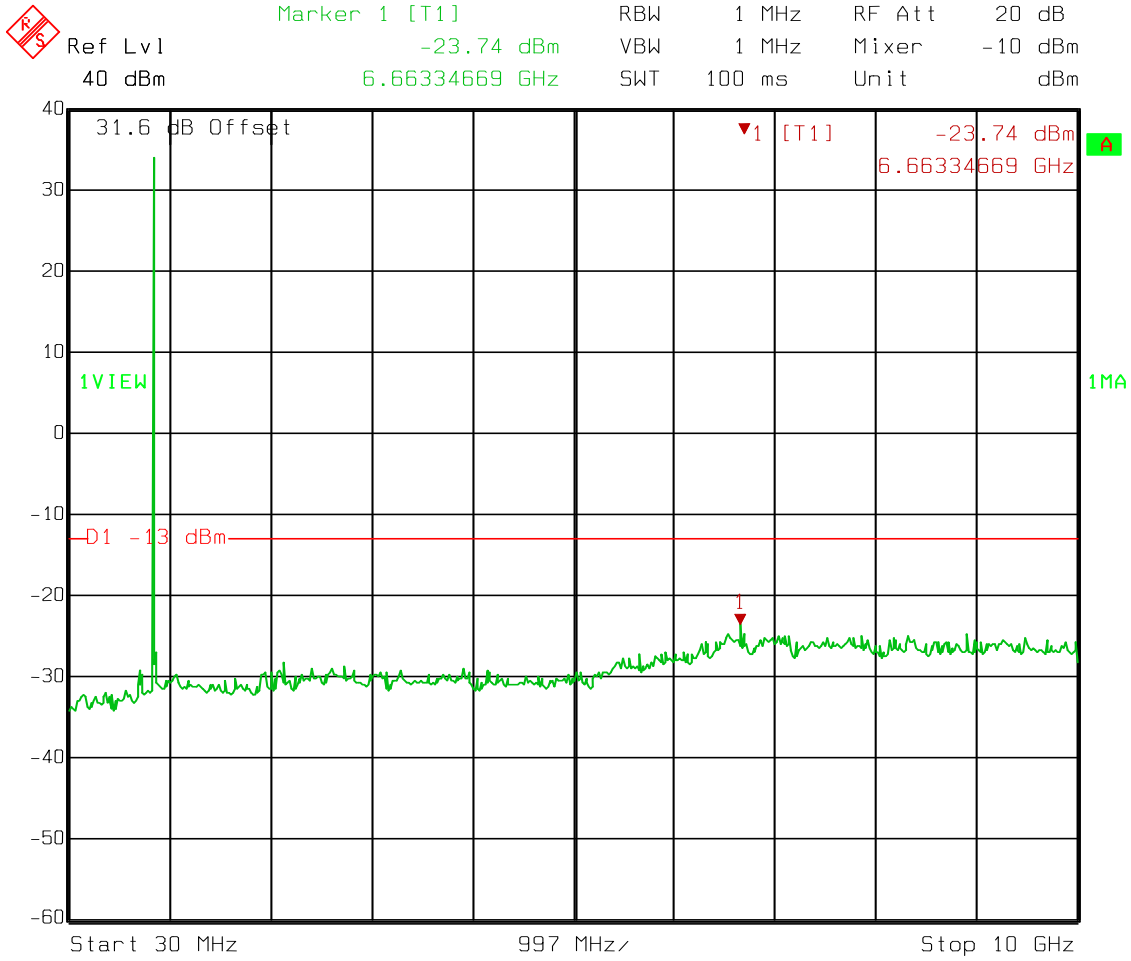
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
CDMA
Downlink



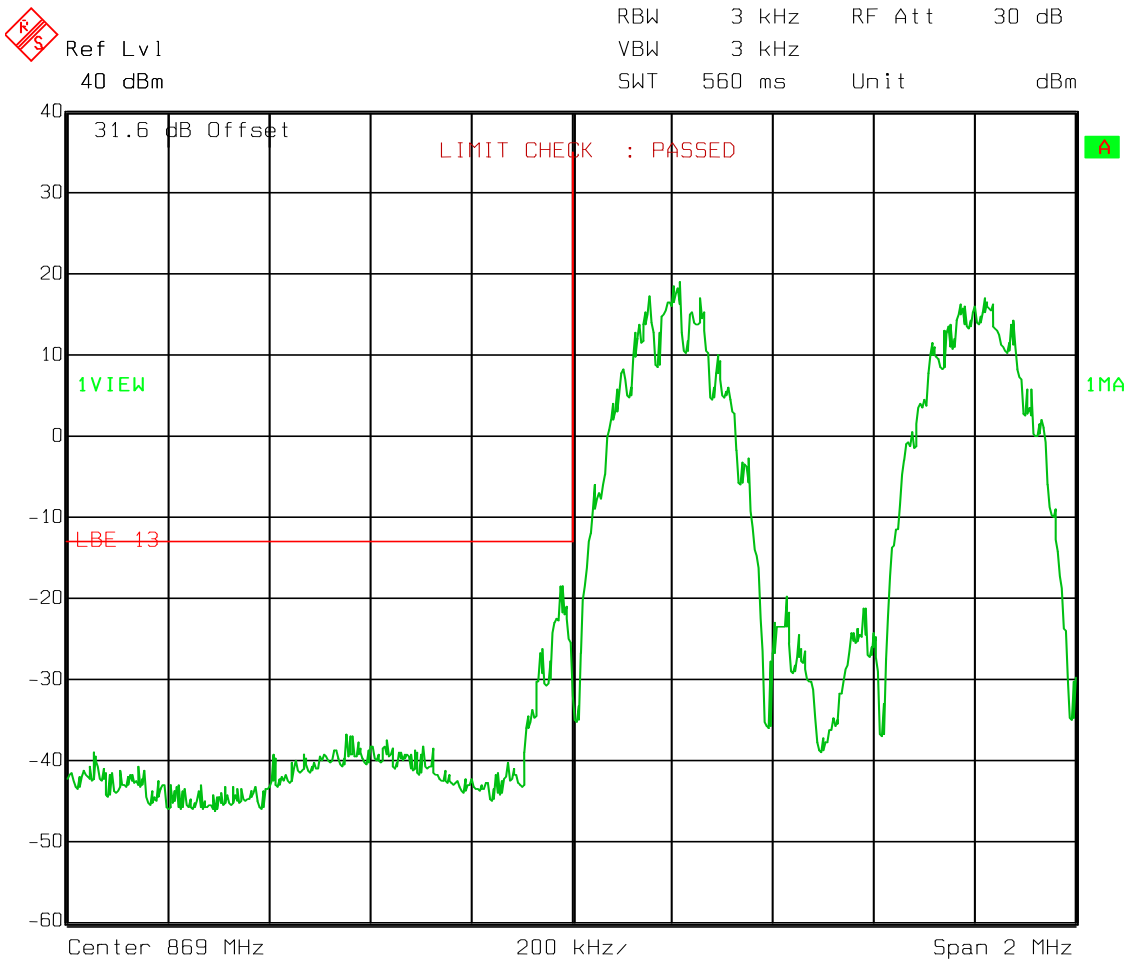
Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA - Downlink



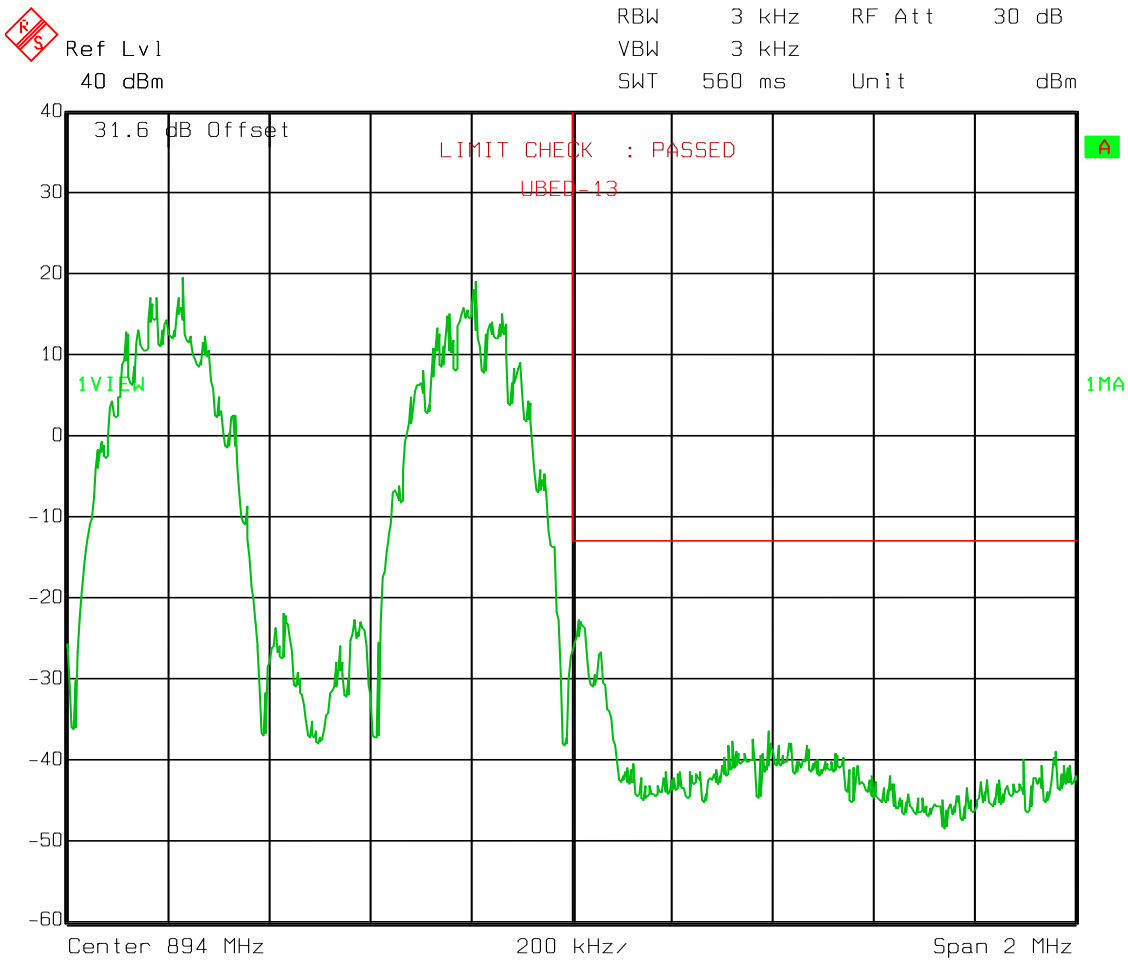
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
EDGE
Downlink



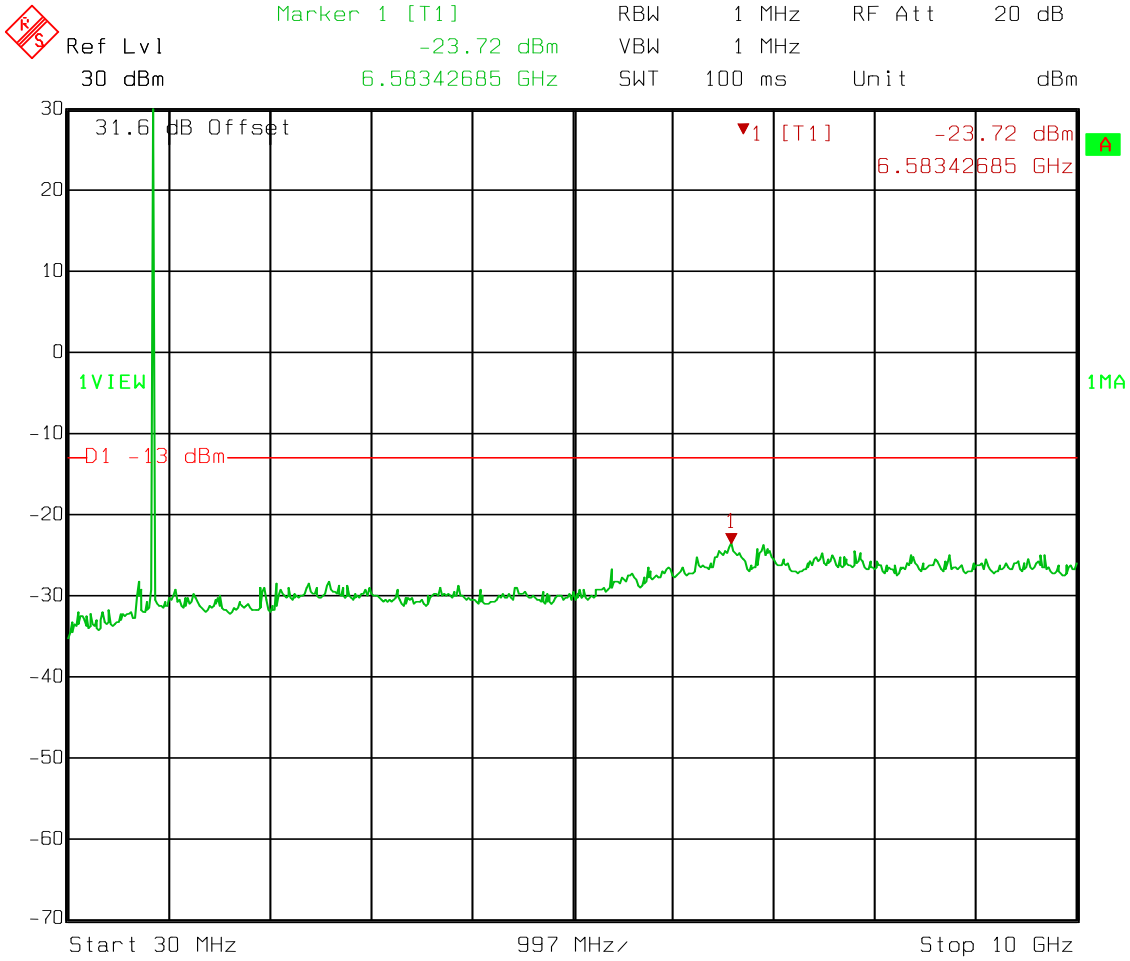
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
EDGE
Downlink



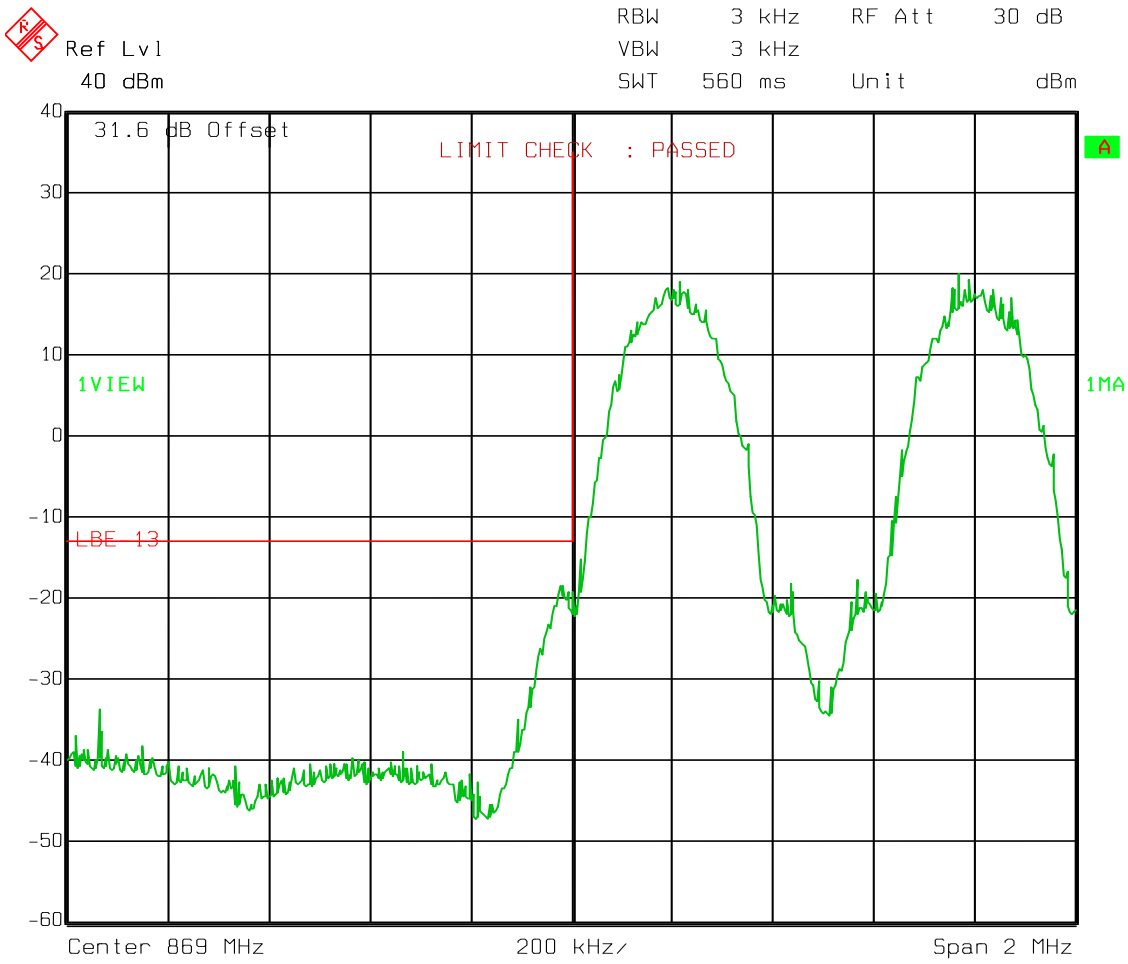
Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE - Downlink



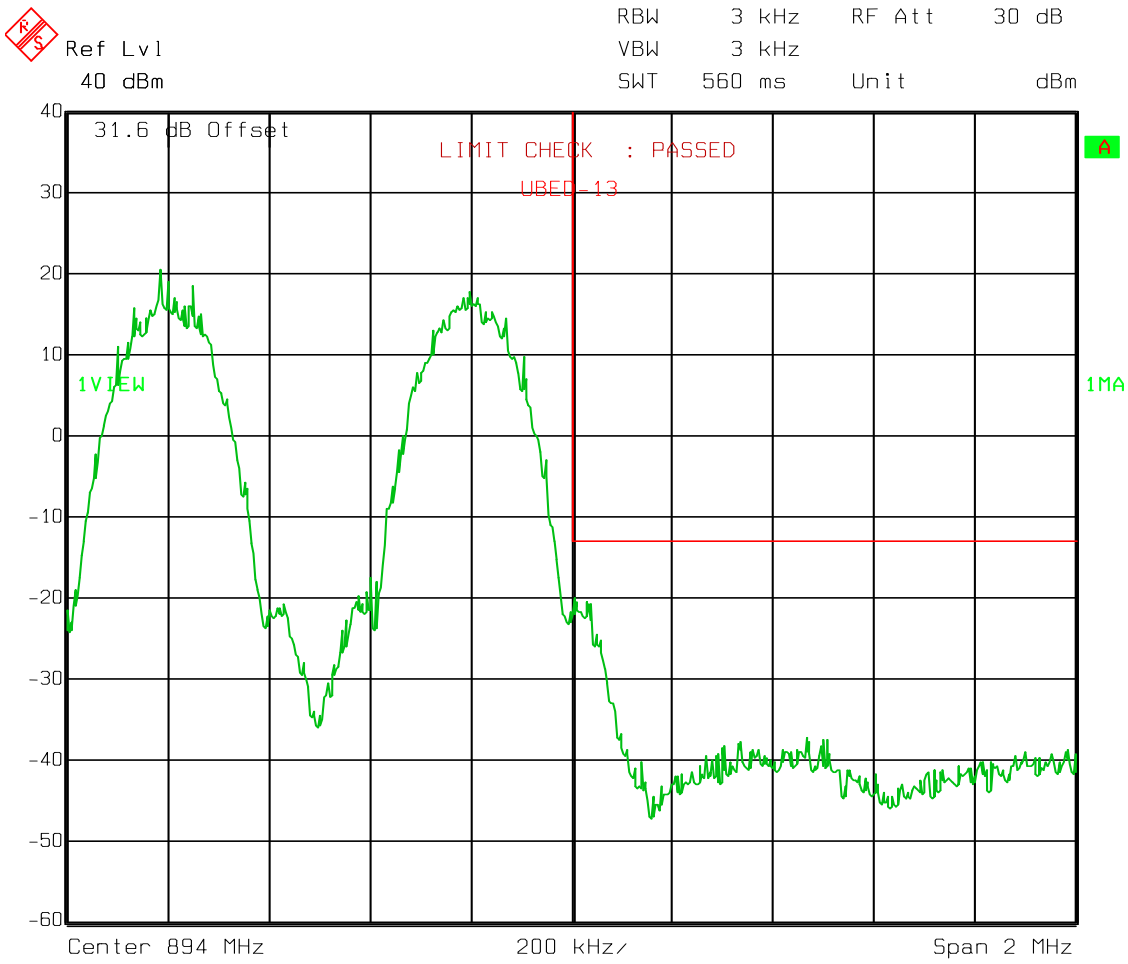
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
GSM
Downlink



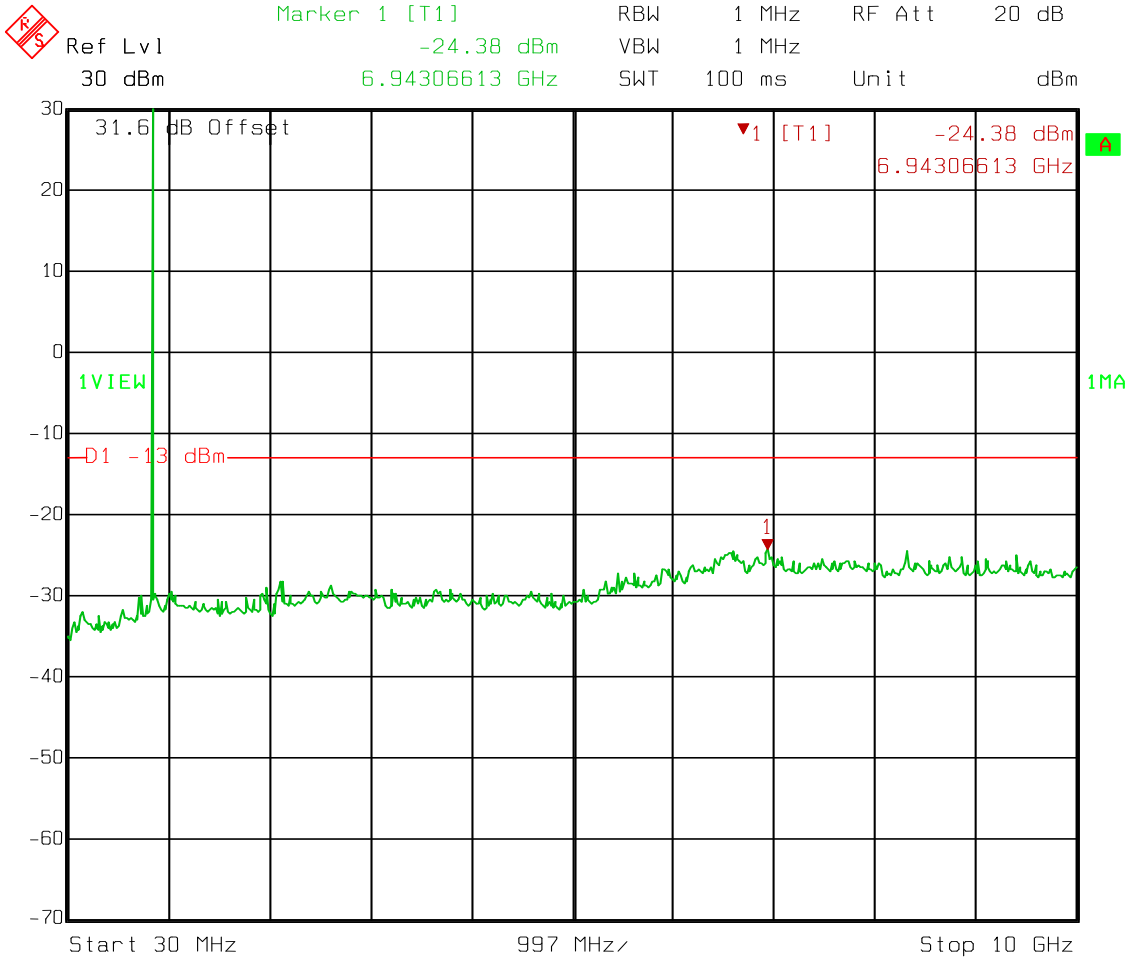
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
GSM
Downlink



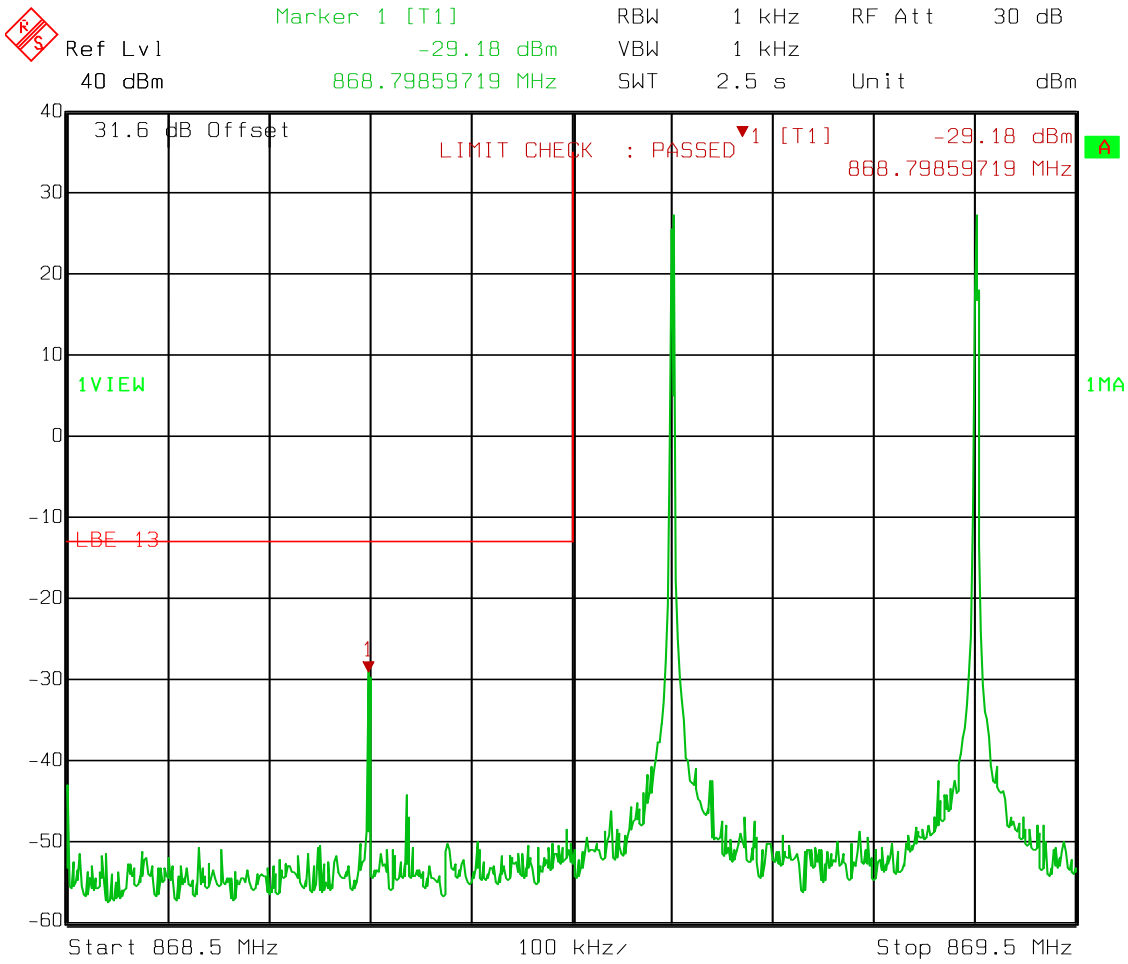
Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM - Downlink



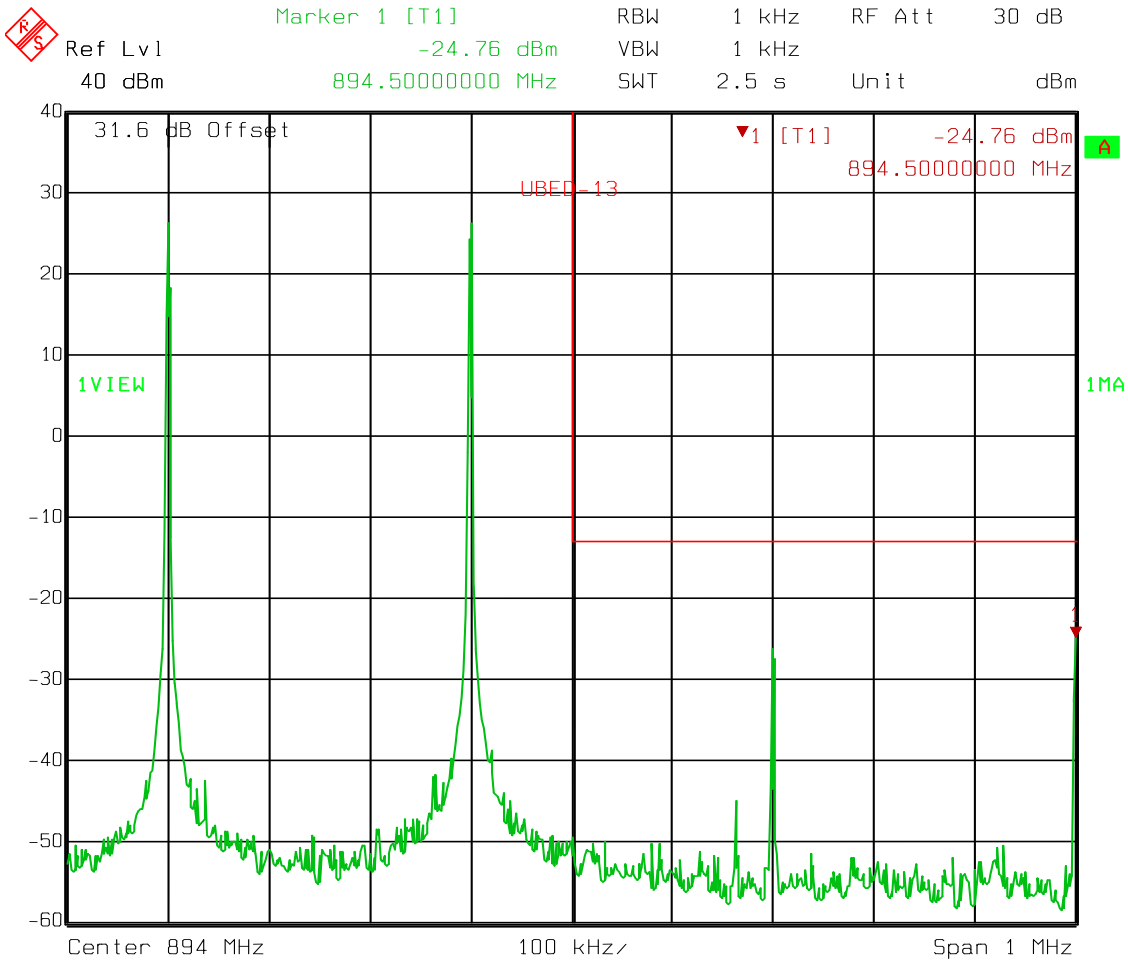
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
Analog
Downlink



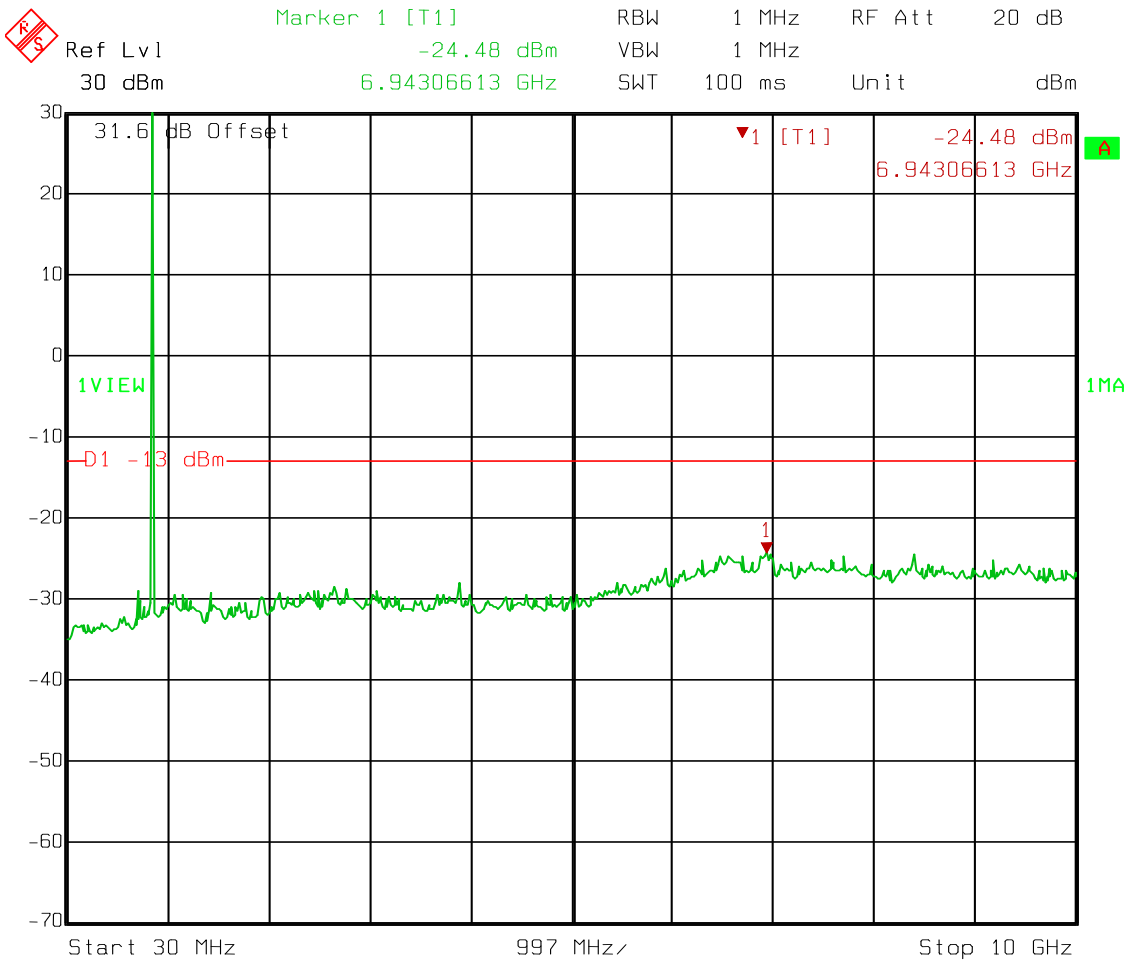
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
Analog
Downlink



Test Data – Spurious Emissions at Antenna Terminals

Spurs – Analog - Downlink



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 24 May 2011

Test Results: Complies.

Test Data: The spectrum was searched from 30 MHz to the tenth harmonic of the carrier. There were no emissions detected above the noise floor, which was at least 20 dB below the specification limit of -13 dBm.

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz
Peak detector

Equipment Used: 1767-1484-1485-1016-993-791-1763

Measurement Uncertainty: +/-1.7 dB

Temperature: 24 °C

Relative Humidity: 49 %

Section 7. Test Equipment List

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	09-Sep-2009	09-Sep-2011
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	19-Jun-2010	19-Jun-2011
1082	Cable	Astrolab	32027-2-29094-72TC		N/R	
1469	Attenuator,	MCL Inc.	BW-S10W2 10db-2WDC		N/R	
1472	Attenuator,	Omni Spectra	20600-20db		N/R	
1484	Cable	Storm	PR90-010-072		19-Jun-2010	19-Jun-2011
1485	Cable	Storm	PR90-010-216		19-Jun-2010	19-Jun-2011
1763	Antenna, Bilog	Schaffner	CBL 6111D	22926	11-Feb-2011	11-Feb-2012
1767	Receiver	Rohde & Schwartz	ESIB26	837491/0002	01-Dec-2010	01-Dec-2011
791	Pre Amplifier	Nemko, USA	CRA69 321003 9605	119	19-May-2011	19-May-2012

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 ANSI/TIA -603-C-2004

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

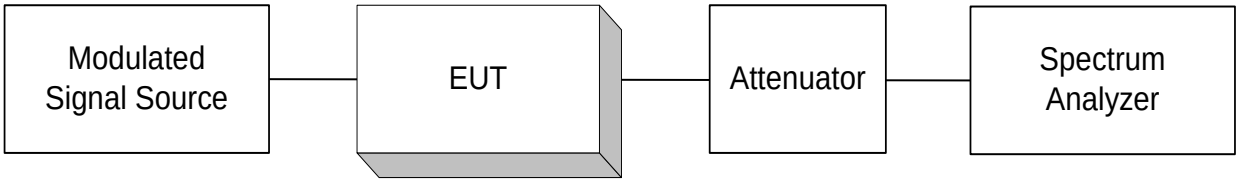
Method Of Measurement:

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.

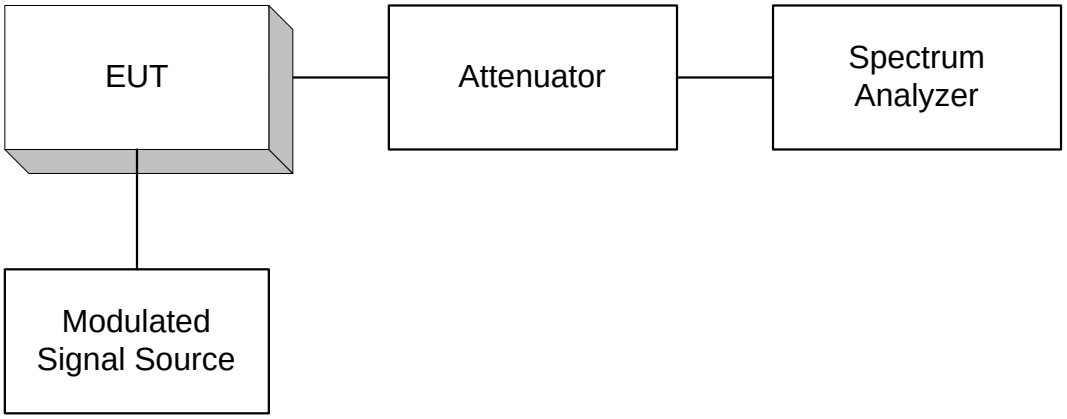
Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30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

ANNEX B - TEST DIAGRAMS

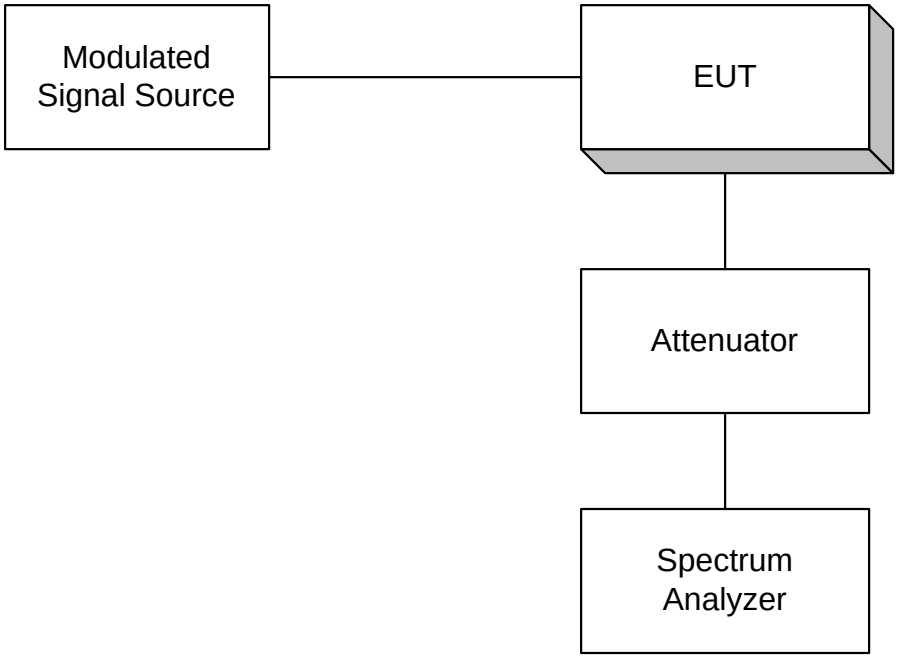
Para. No. 2.1046 - R.F. Power Output



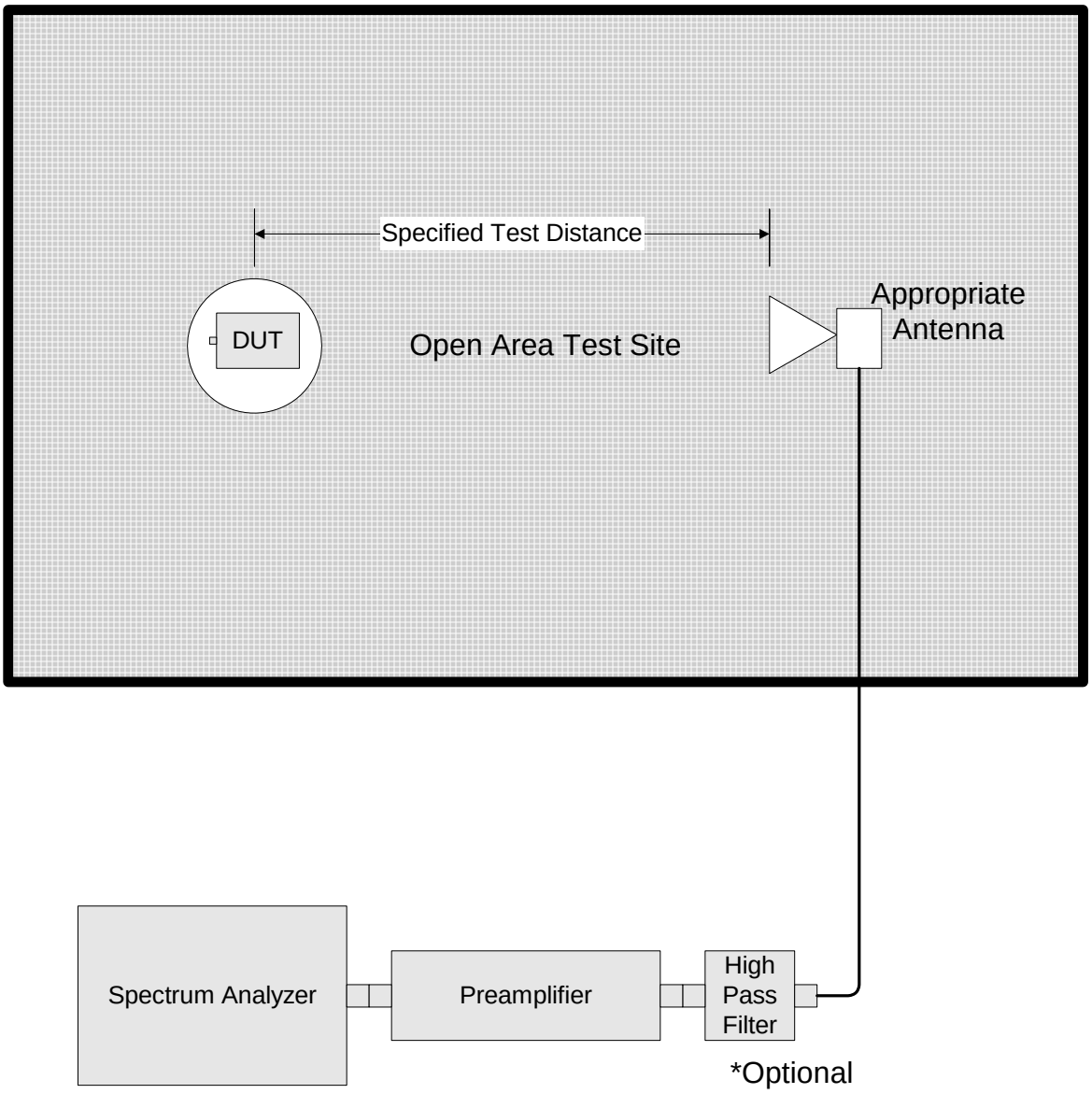
Para. No. 2.1049 - Occupied Bandwidth

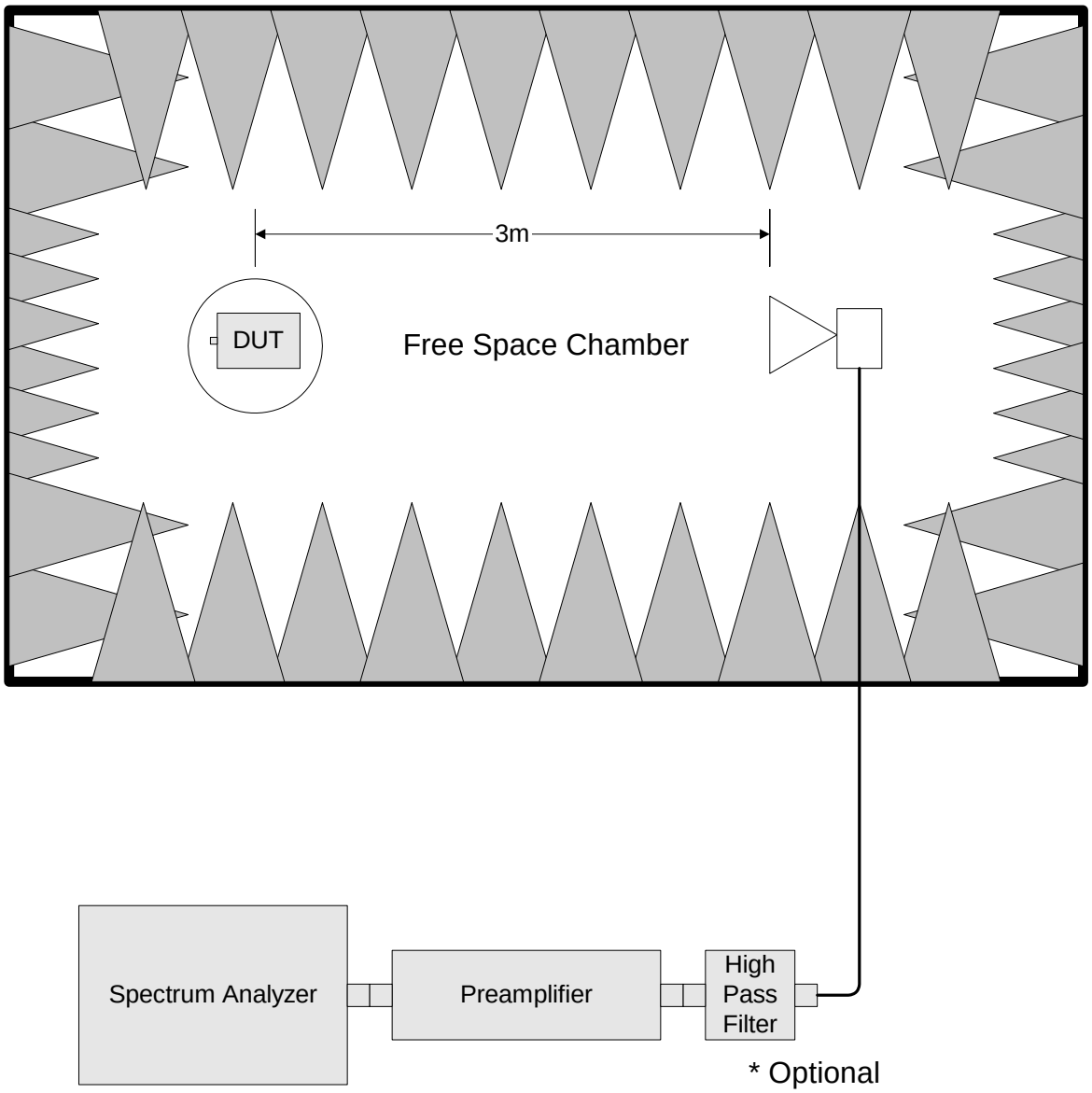


Para. No. 2.1051 Spurious Emissions at Antenna Terminals



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