



Nemko Test Report: 1028403RUS3

Applicant: Andrew Corporation
620 N. Greenfield Parkway
Garner, NC 27529
USA

**Equipment Under Test:
(E.U.T.)** TFAH-US4B

FCC Identifier: BCR-TFAHUS4B

In Accordance With: **CFR 47, Part 27, Subpart C**
Miscellaneous Wireless Communication Services

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

TESTED BY:

David Light, Senior Wireless Engineer

DATE: 01 June 2011

APPROVED BY:

Mike Cantwell, GM

DATE: 03 June 2011

Number of Pages: 50

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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 27, Subpart C.



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".



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Summary Of Test Data

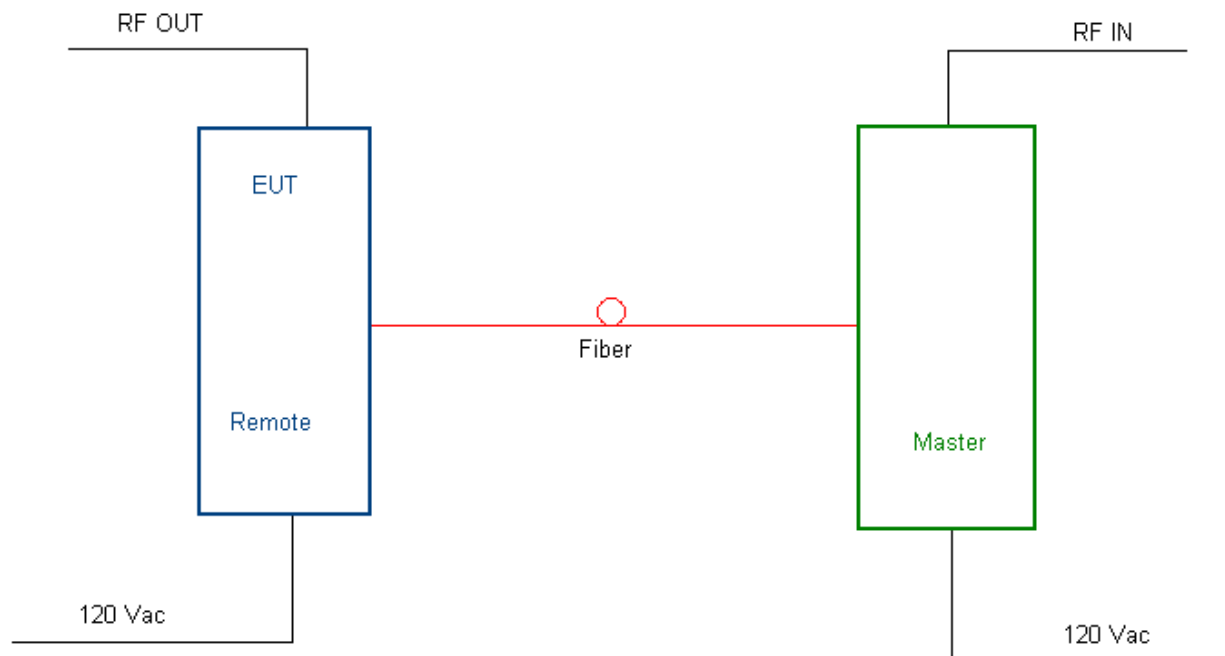
NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	27.50(d)	1640 Watts	Complies
Occupied Bandwidth	2.1049	Input/Output	Complies
Spurious Emissions at Antenna Terminals	27.53(g)	-13 dBm	Complies
Field Strength of Spurious Emissions	27.53(g)	-13 dBm E.I.R.P.	Complies
Frequency Stability	27.54	Must stay in band	NA

Section 2. General Equipment Specification

Supply Voltage Input:	120 Vac		
Frequency Bands: Downlink:	728 to 757 MHz 2110 to 2155 MHz		
Frequency Bands: Uplink:	NA		
Emission Designator(s):	F9W		
Output Impedance:	50 ohms		
RF Output (Rated): Downlink	$\frac{1.25}{31.0} \text{ W (2100 MHz band)}$ dBm		
RF Output (Rated): Uplink	$\frac{\text{NA}}{\text{NA}} \text{ W}$ dBm		
Frequency Translation:	F1-F1 <input checked="" type="checkbox"/>	F1-F2 <input type="checkbox"/>	N/A <input type="checkbox"/>
Band Selection:	Software <input type="checkbox"/>	Duplexer <input type="checkbox"/>	Fullband <input checked="" type="checkbox"/>

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.: 27.50
TESTED BY: David Light	DATE: 23 May 2011

Test Results: Complies.**Measurement Data:**

Band	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
700	Analog	28.0	31.0	1.25
700	LTE	28.0	31.0	1.25
700	GSM	28.0	31.0	1.25
2100	CDMA	28.0	31.0	1.25
2100	WCDMA	28.0	31.0	1.25
2100	LTE	28.0	31.0	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

Analog

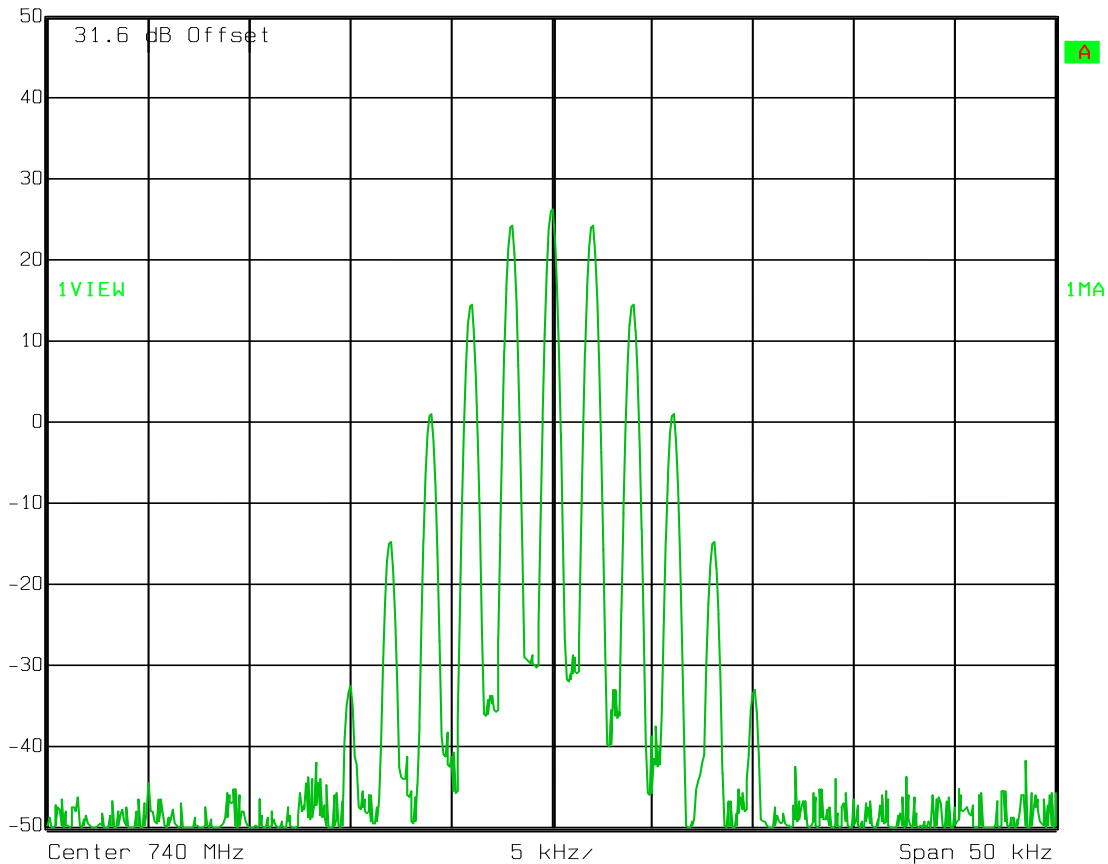
2 kHz tone / 2.5 kHz deviation

Output



Ref Lvl
50 dBm

RBW	300 Hz	RF Att	40 dB
VBW	300 Hz		
SWT	2.8 s	Unit	dBm



Test Data – Occupied Bandwidth

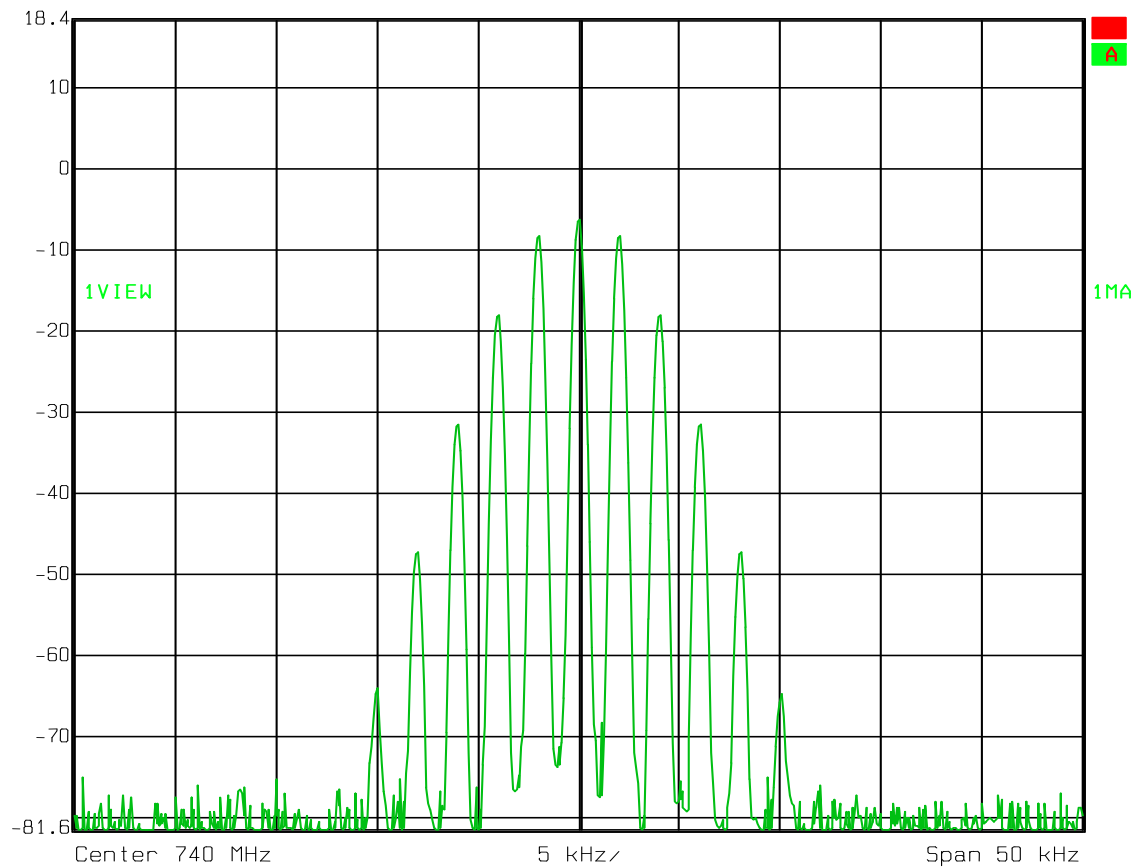
Analog

Input



Ref Lvl
18.4 dBm

RBW	300 Hz	RF Att	40 dB
VBW	300 Hz		
SWT	2.8 s	Unit	dBm



Test Data – Occupied Bandwidth

GSM

Output



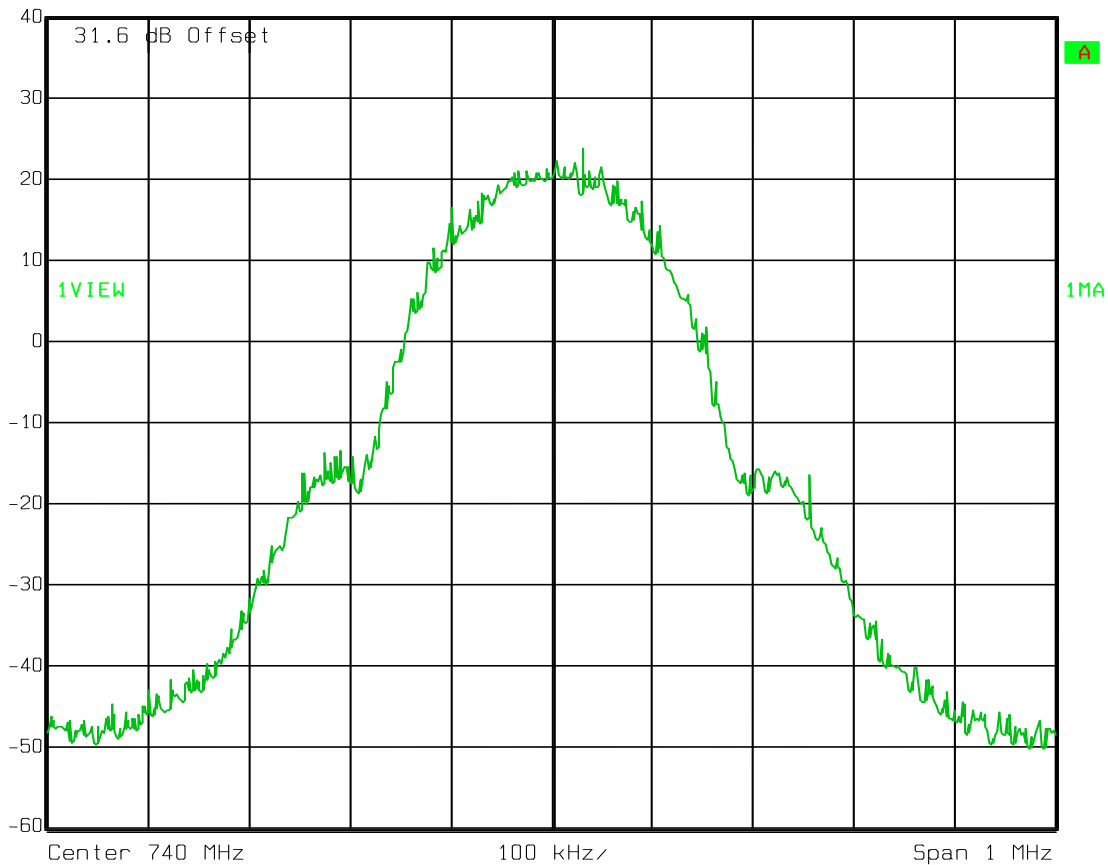
Ref Lvl

40 dBm

RBW 3 kHz RF Att 30 dB

VBW 3 kHz

SWT 280 ms Unit dBm



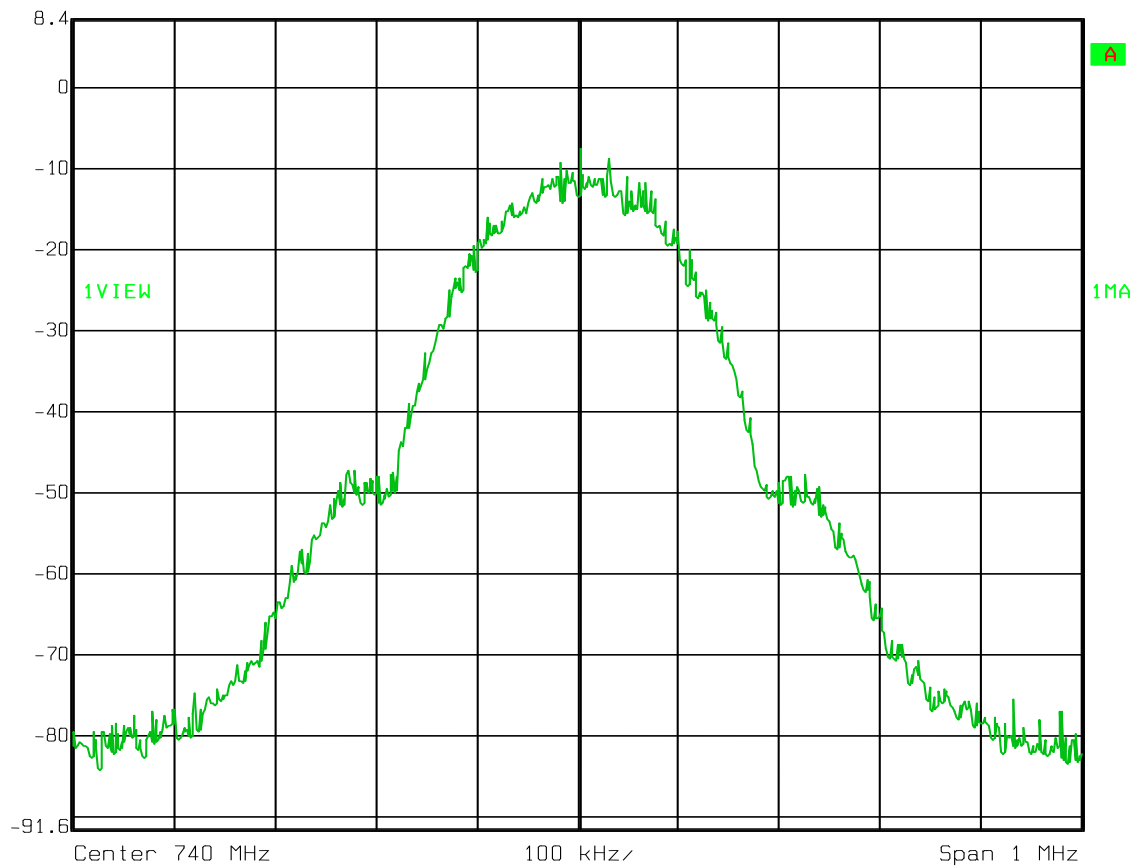
Test Data – Occupied Bandwidth

Input
GSM



Ref Lvl
8.4 dBm

RBW	3 kHz	RF Att	30 dB
VBW	3 kHz		
SWT	280 ms	Unit	dBm

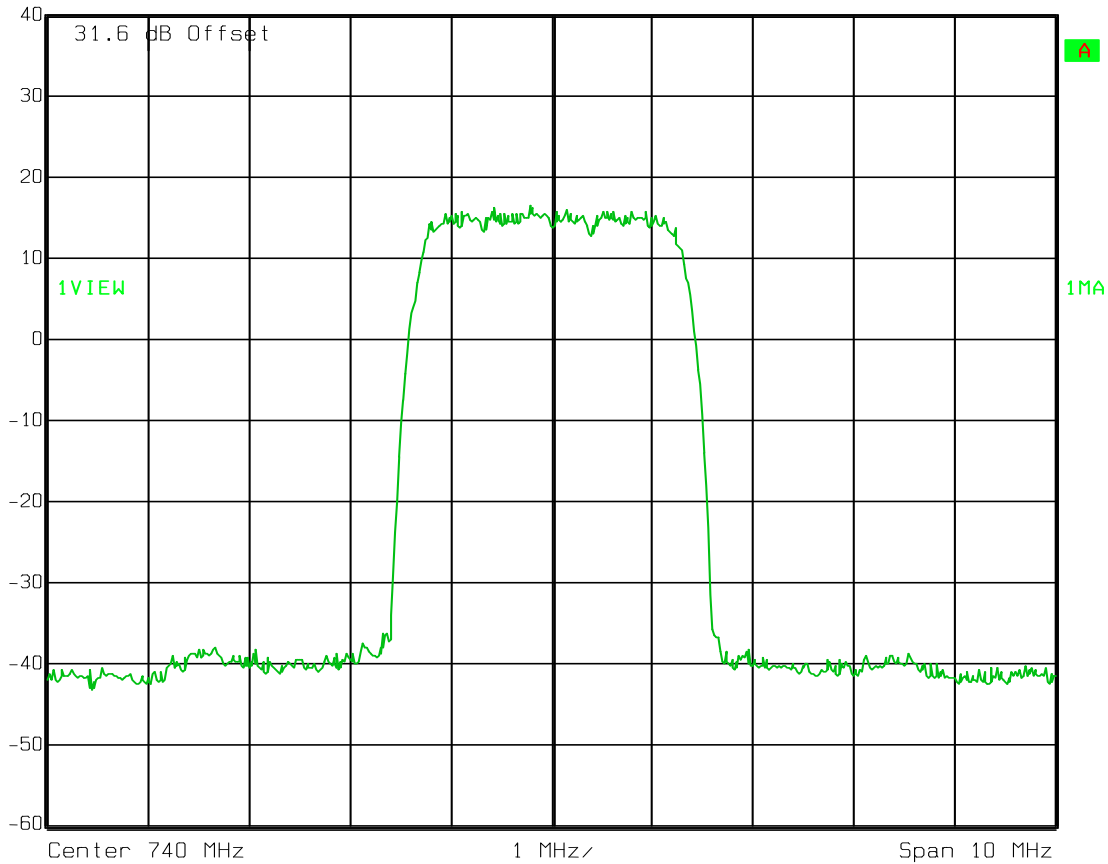


Test Data – Occupied Bandwidth LTE

Output



Ref Lvl	RBW	30 kHz	RF Att	30 dB
40 dBm	VBW	30 kHz		
	SWT	28 ms	Unit	dBm



Test Data – Occupied Bandwidth

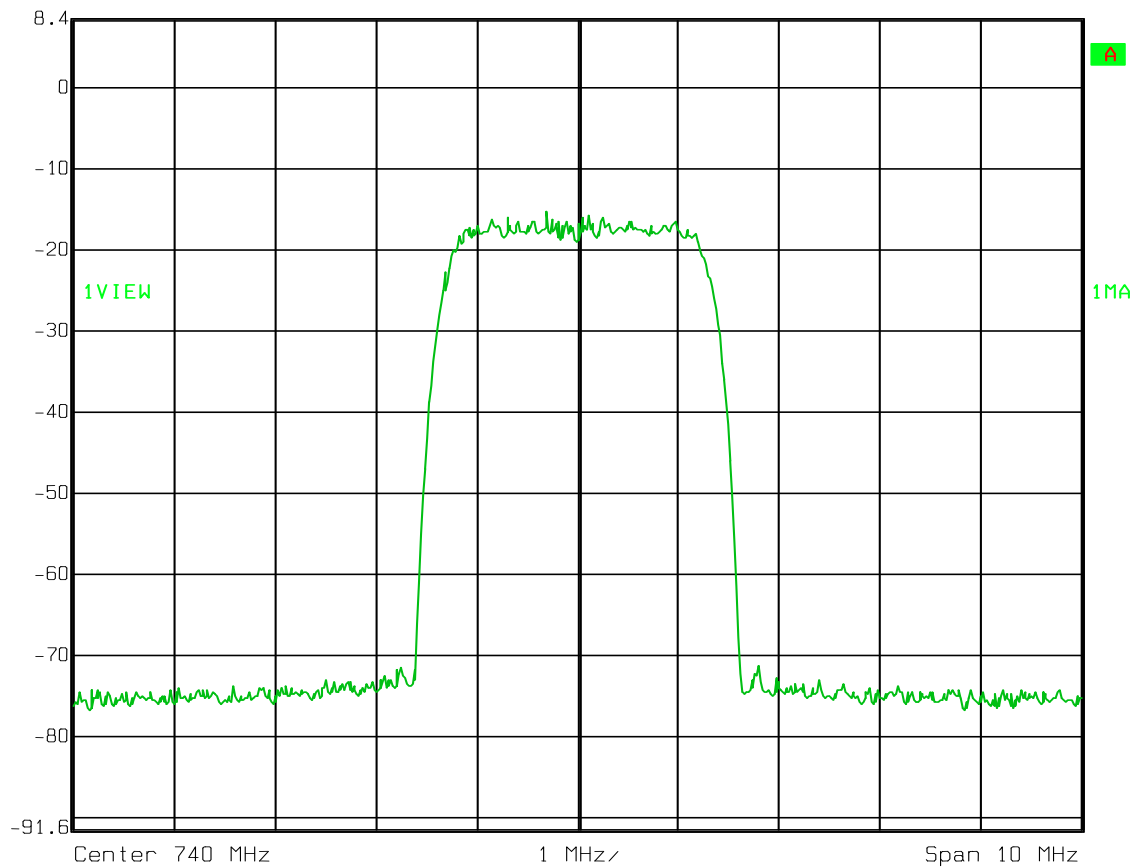
LTE

Input



Ref Lvl
8.4 dBm

RBW	30 kHz	RF Att	30 dB
VBW	30 kHz		
SWT	28 ms	Unit	dBm



Test Data – Occupied Bandwidth

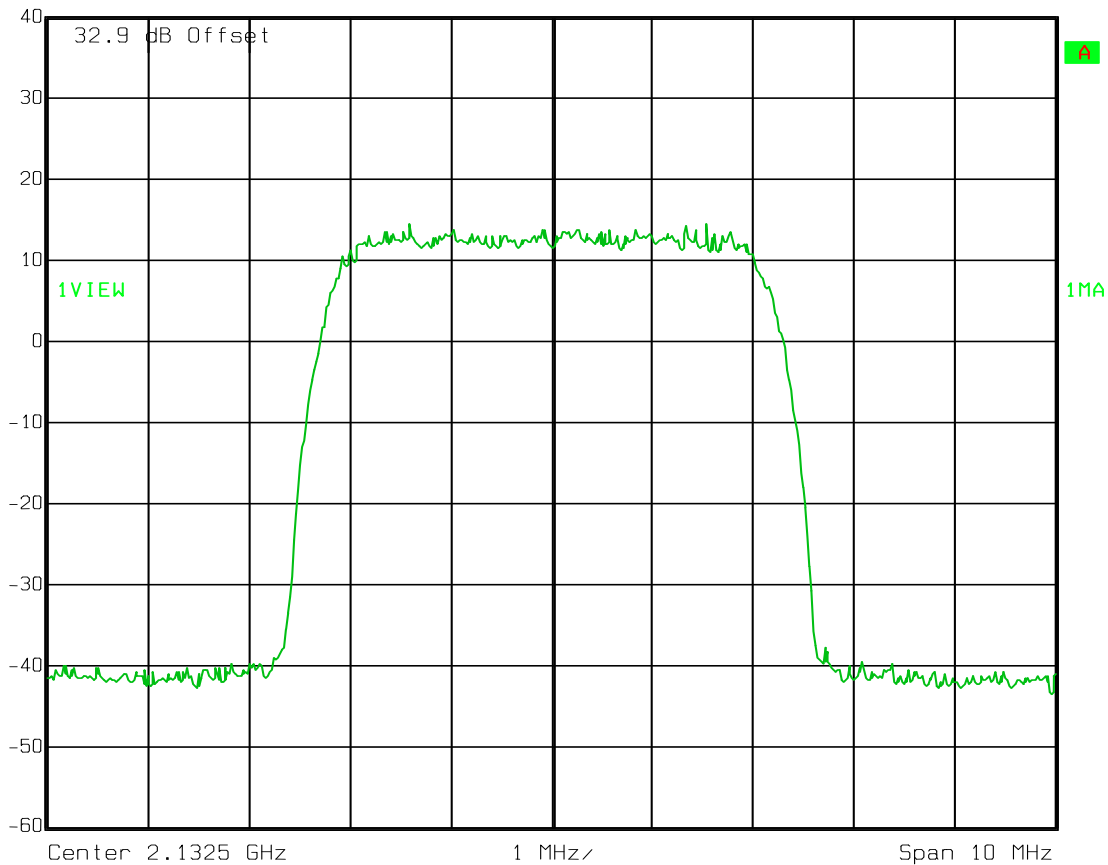
WCDMA

Output



Ref Lvl
40 dBm

RBW	50 kHz	RF Att	20 dB
VBW	50 kHz	Mixer	-10 dBm
SWT	10 ms	Unit	dBm



Test Data – Occupied Bandwidth

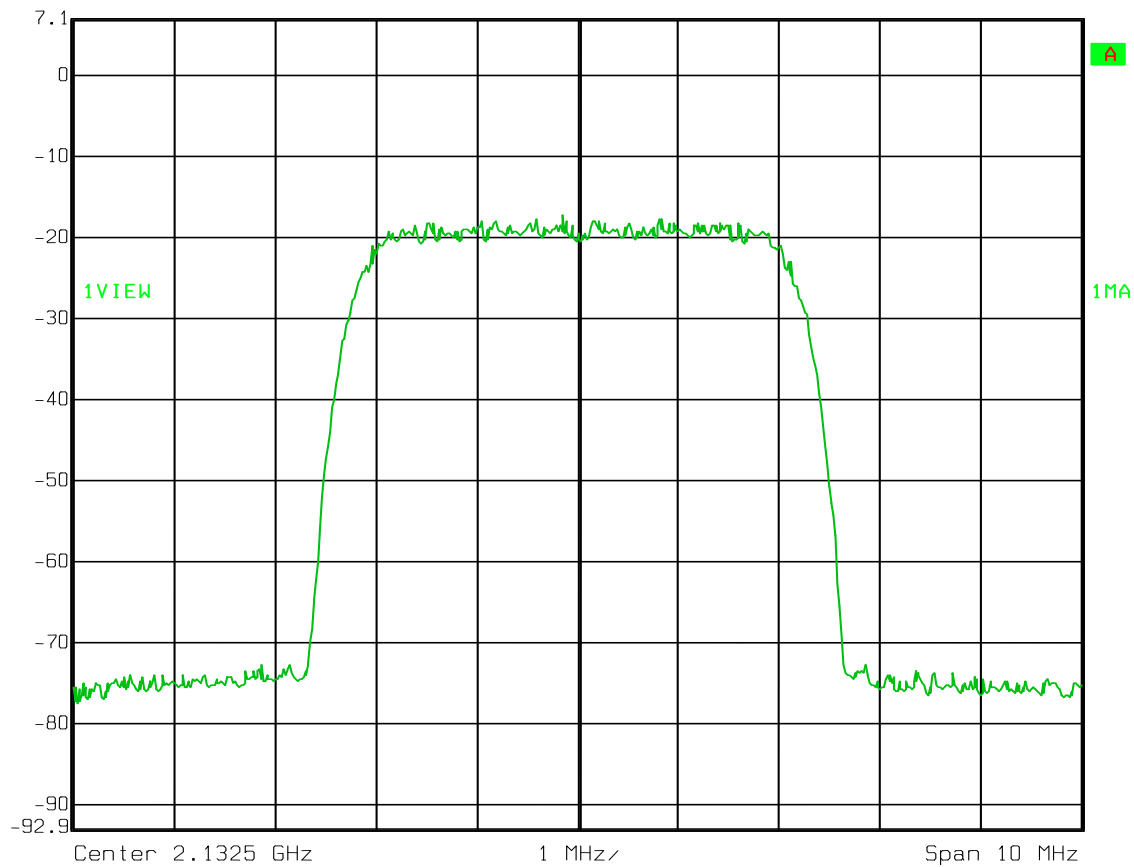
WCDMA

Input



Ref Lvl
7.1 dBm

RBW	50 kHz	RF Att	20 dB
VBW	50 kHz	Mixer	-10 dBm
SWT	10 ms	Unit	dBm



Test Data – Occupied Bandwidth

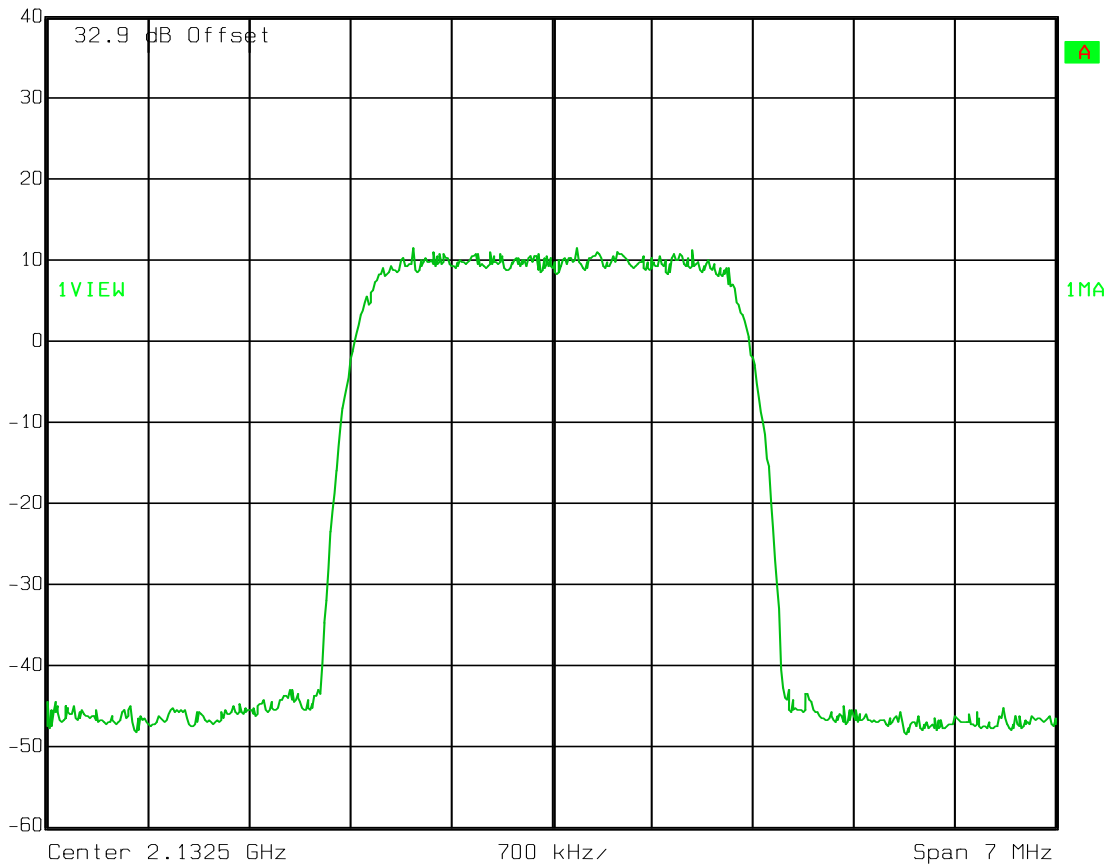
LTE

Output



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	19.5 ms	Unit	dBm



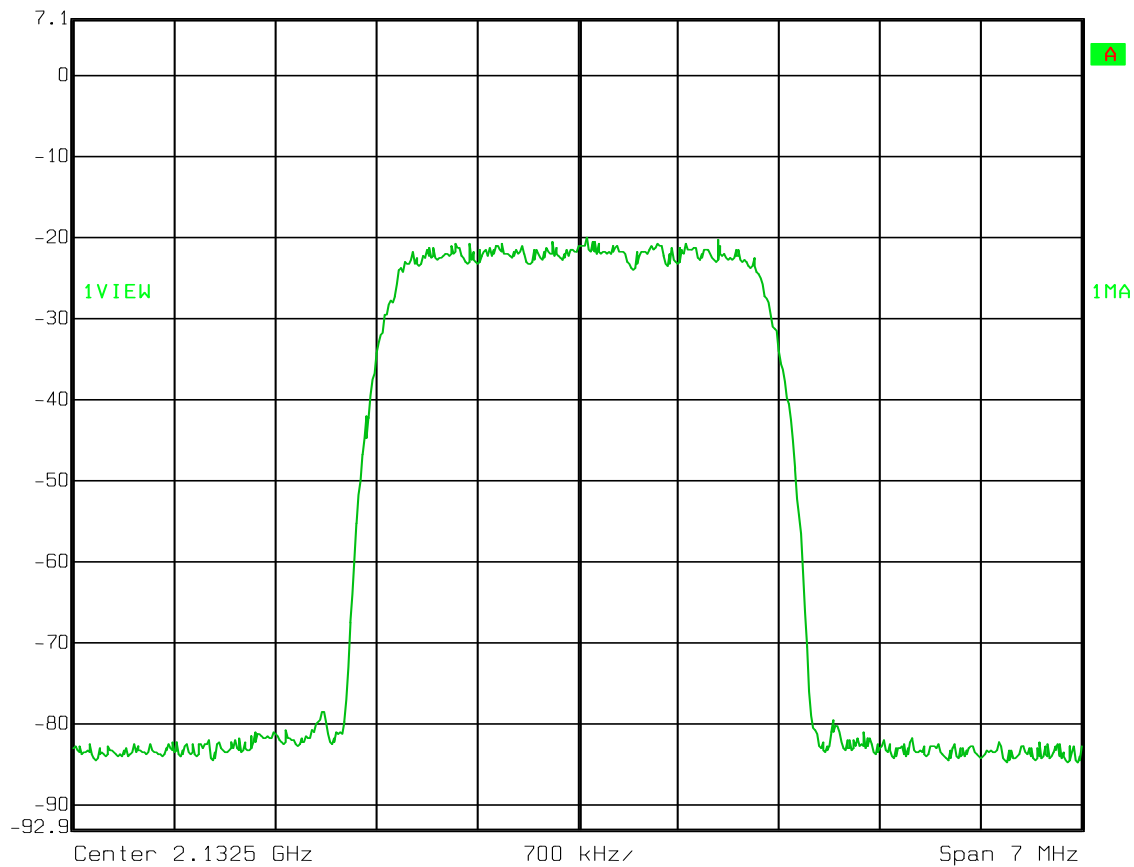
Test Data – Occupied Bandwidth

Input
LTE



Ref Lvl
7.1 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	19.5 ms	Unit	dBm



Test Data – Occupied Bandwidth

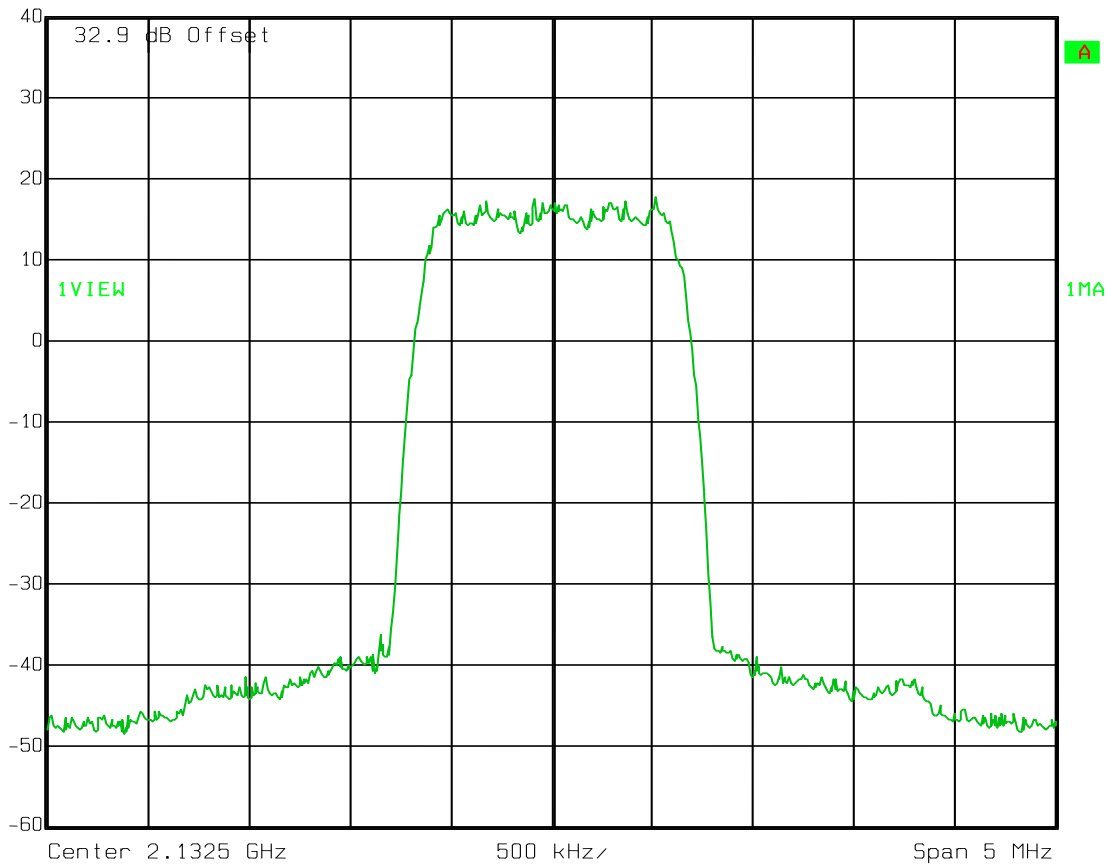
CDMA

Output



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Test Data – Occupied Bandwidth

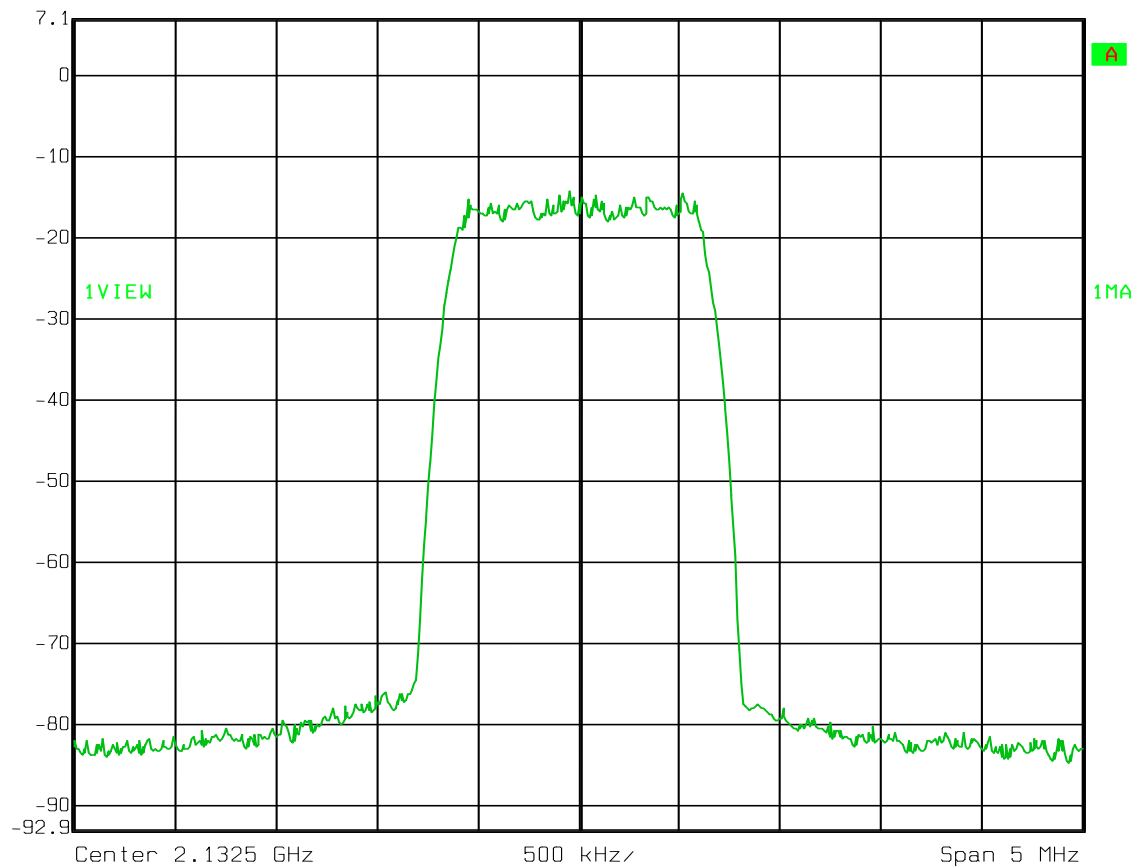
CDMA

Input



Ref Lvl
7.1 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Date: 18.MAY 2011 09:32:20

Section 5. Conducted Spurious Emissions

NAME OF TEST: Conducted Spurious Emissions	PARA. NO.: 27.53
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

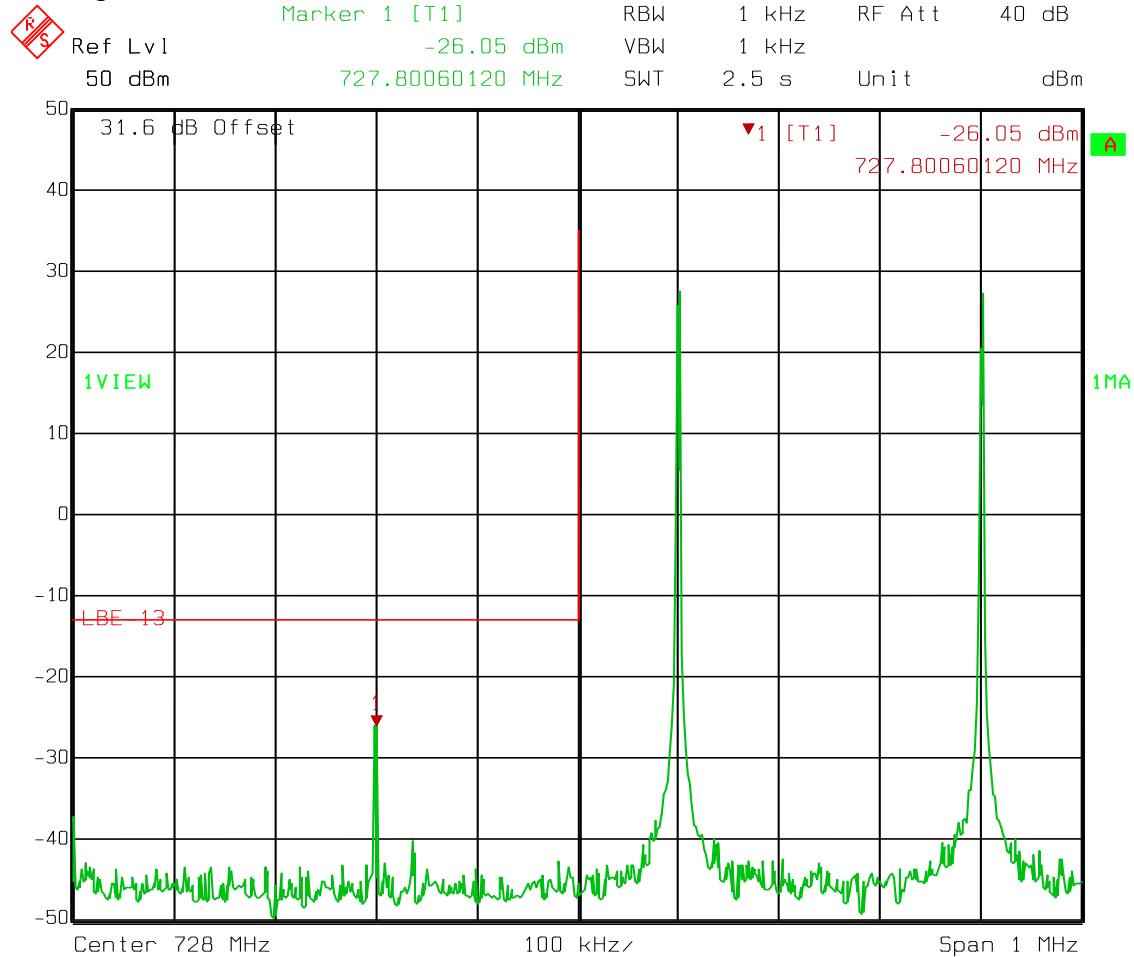
Temperature: 22 °C

Relative Humidity: 48 %

Test Data – Spurious Emissions at Antenna Terminals

Low Edge

Analog



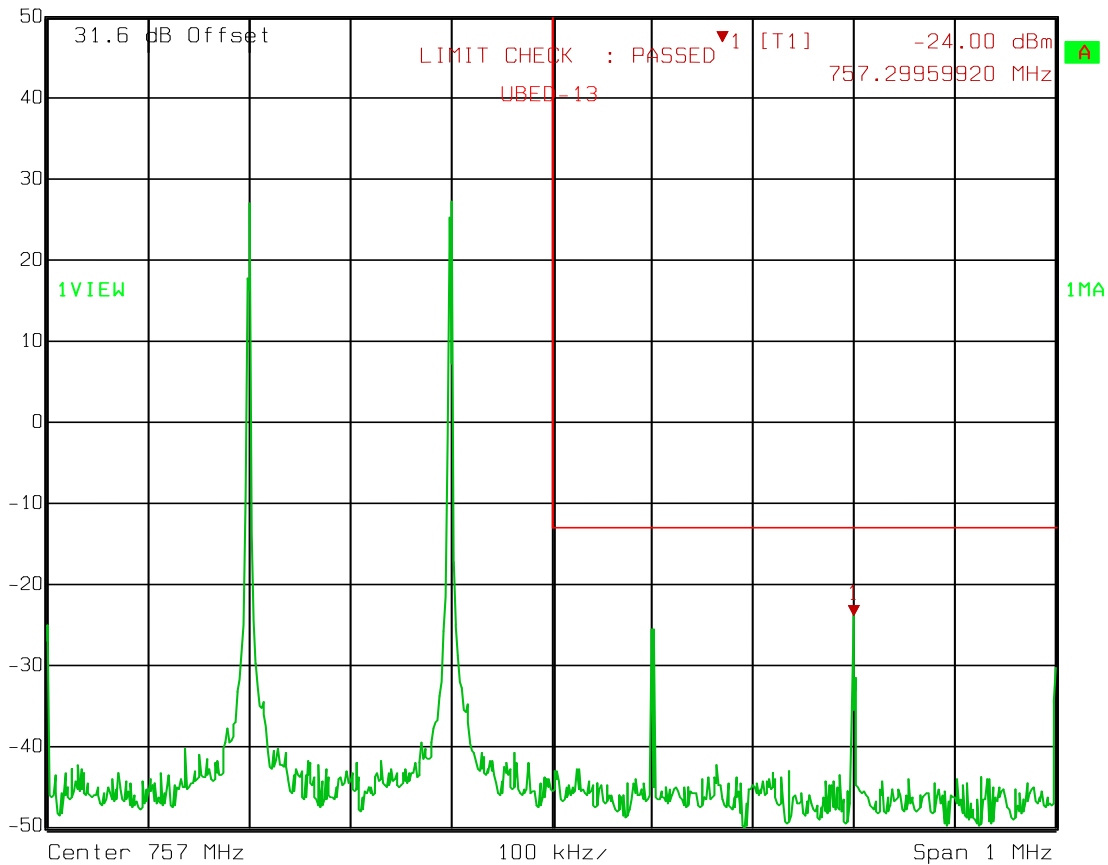
Test Data – Spurious Emissions at Antenna Terminals

High Edge

Analog

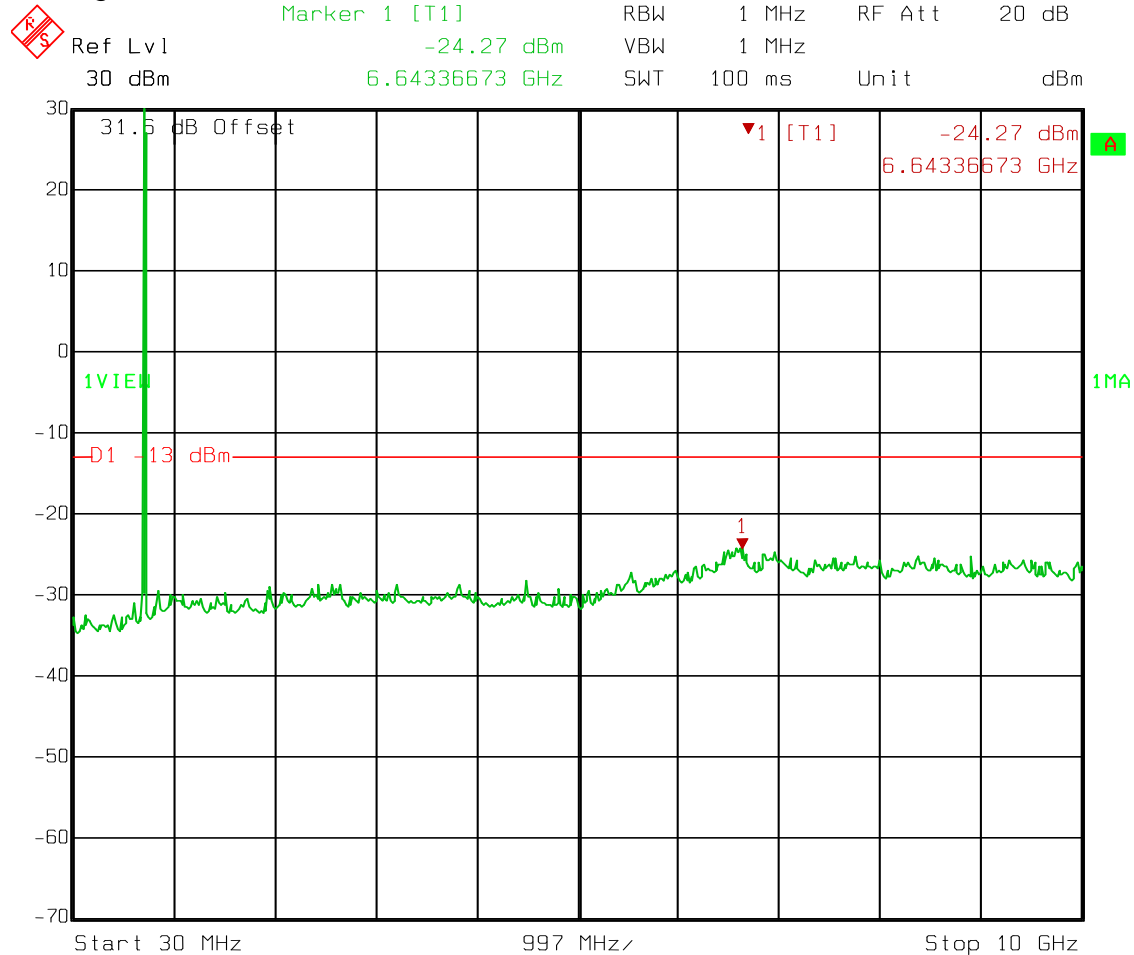


Marker 1 [T1] RBW 1 kHz RF Att 40 dB
 Ref Lvl -24.00 dBm VBW 1 kHz
 50 dBm 757.29959920 MHz SWT 2.5 s Unit dBm



Test Data – Spurious Emissions at Antenna Terminals

Spurs
Analog



Date: 17.MAY 2011 12:56:21

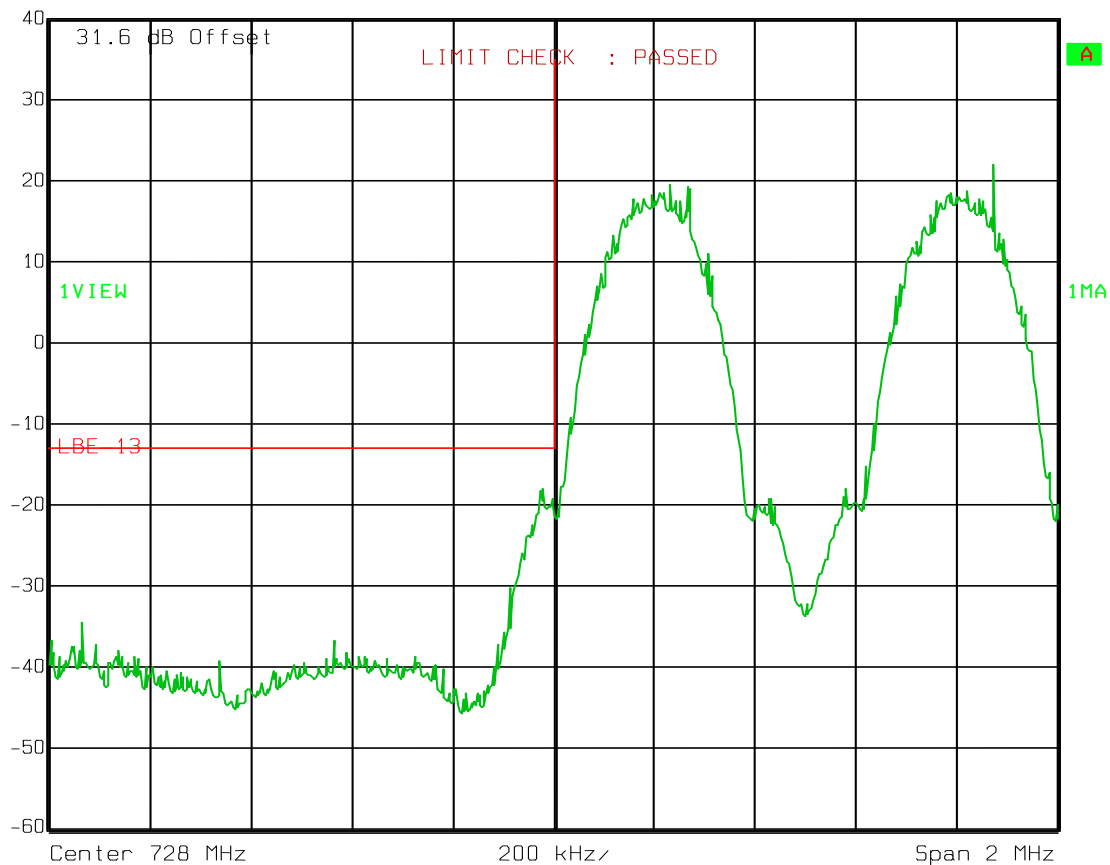
Test Data – Spurious Emissions at Antenna Terminals

GSM

Lower Edge

Ref Lvl
40 dBm

RBW	3 kHz	RF Att	30 dB
VBW	3 kHz		
SWT	560 ms	Unit	dBm



Test Data – Spurious Emissions at Antenna Terminals

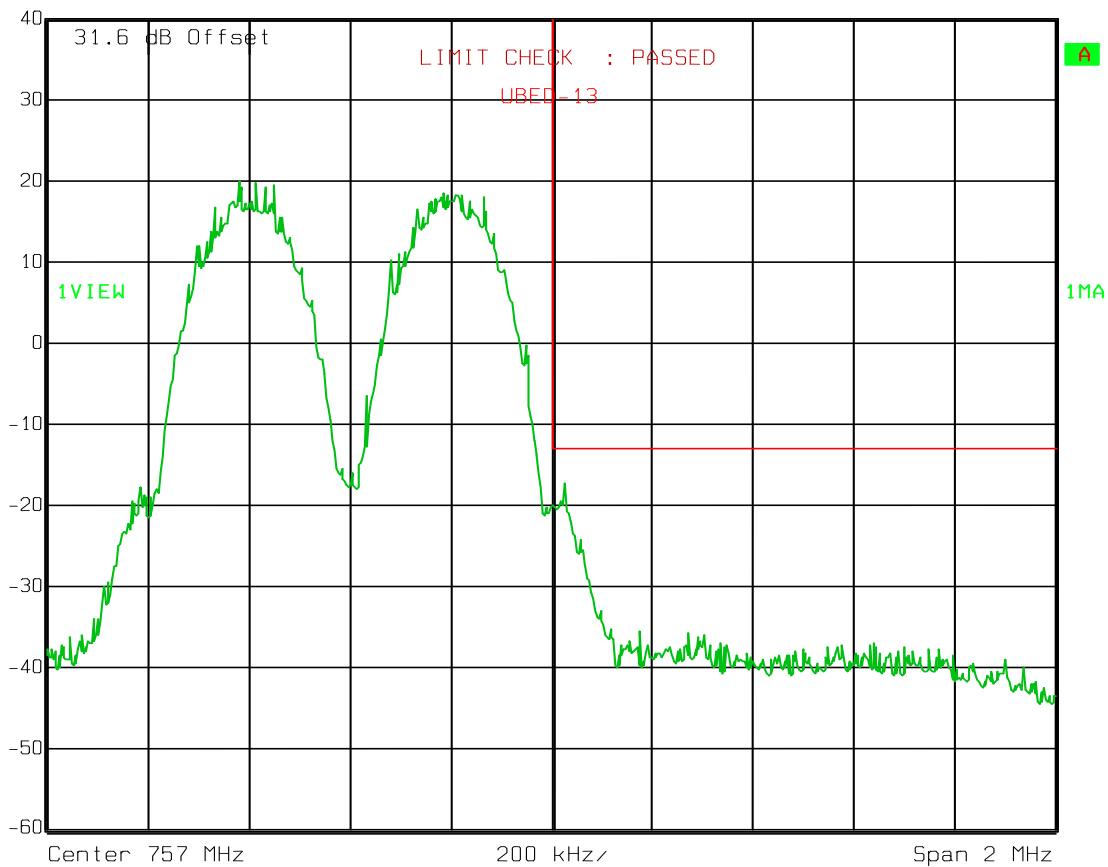
GSM

Upper Edge



Ref Lvl
40 dBm

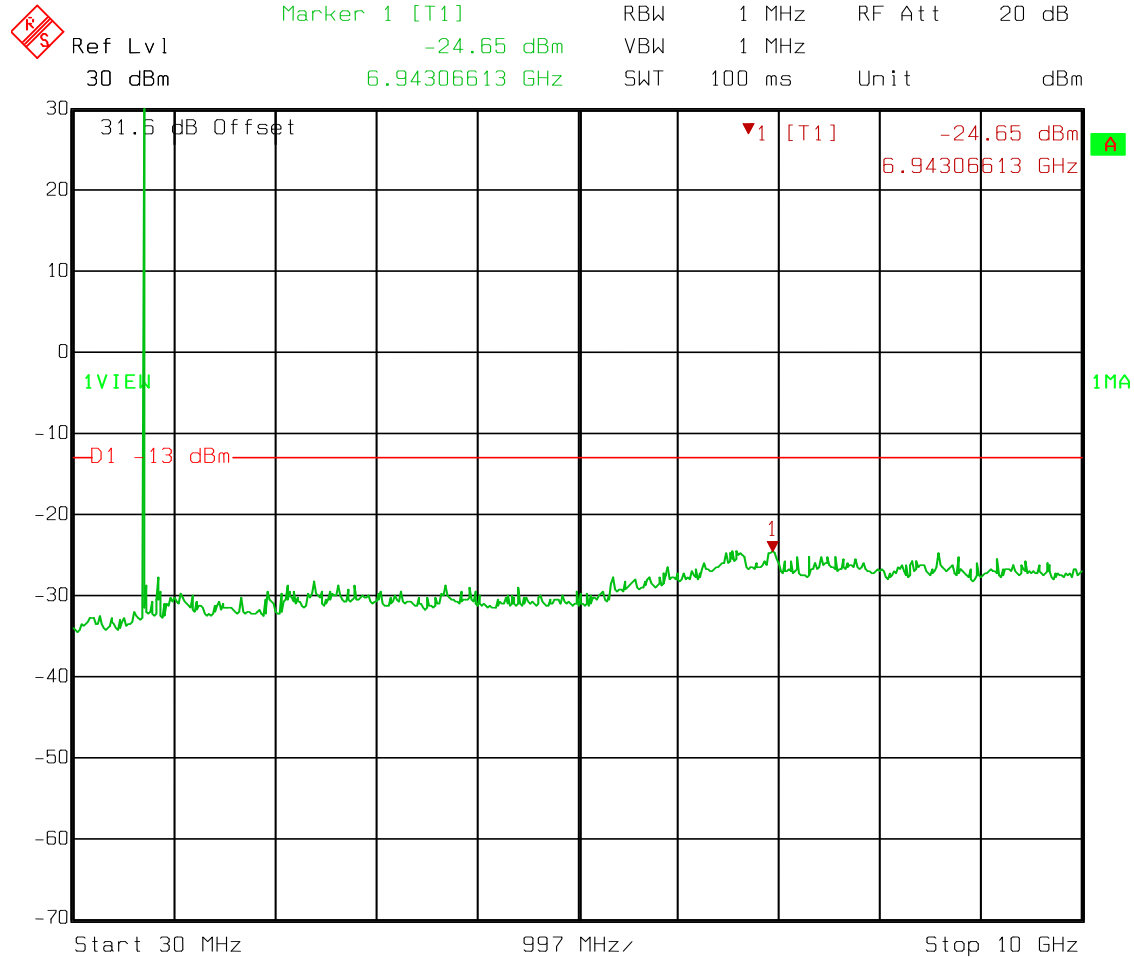
RBW 3 kHz RF Att 30 dB
VBW 3 kHz
SWT 560 ms Unit dBm



Test Data – Spurious Emissions at Antenna Terminals

Spurs

GSM



Test Data – Spurious Emissions at Antenna Terminals

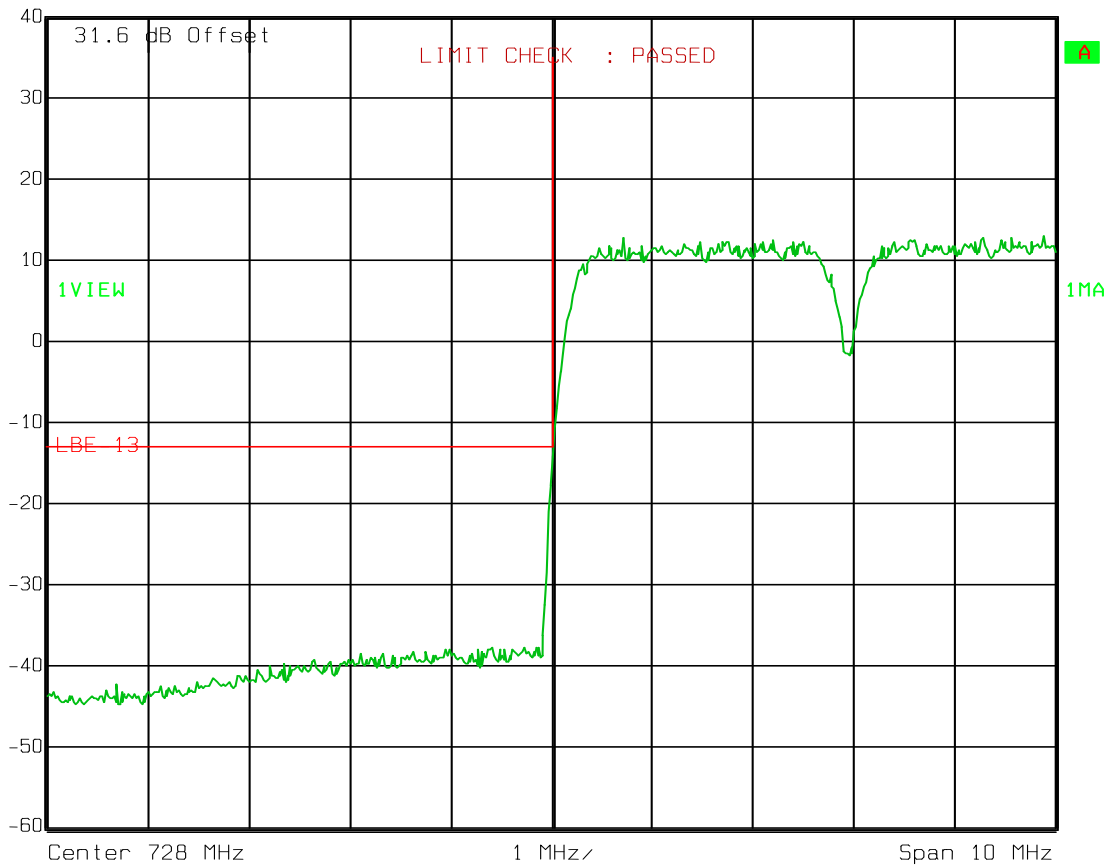
Lower Edge

LTE



Ref Lvl
40 dBm

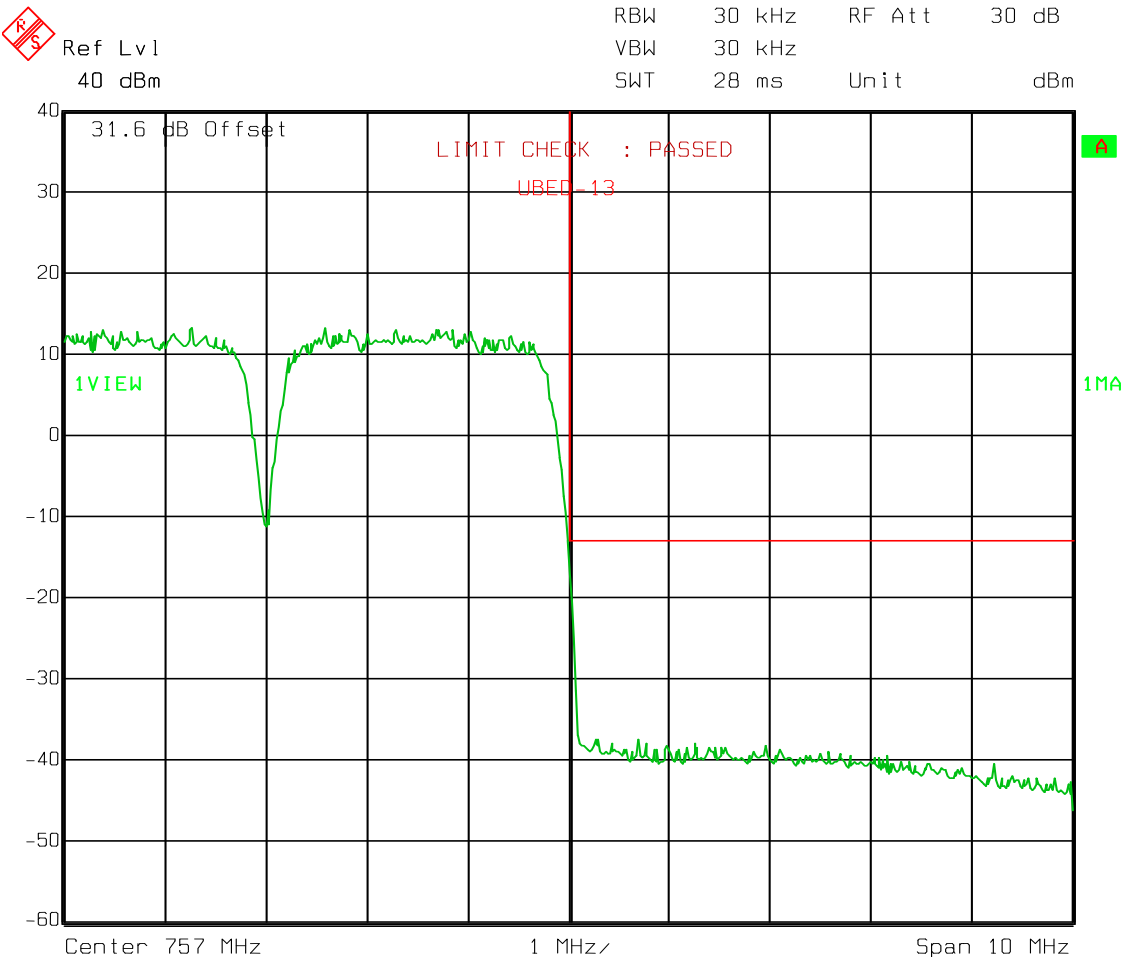
RBW 30 kHz RF Att 30 dB
VBW 30 kHz
SWT 28 ms Unit dBm



EQUIPMENT: TFAH-US4B

Test Data – Spurious Emissions at Antenna Terminals

Upper Edge
LTE



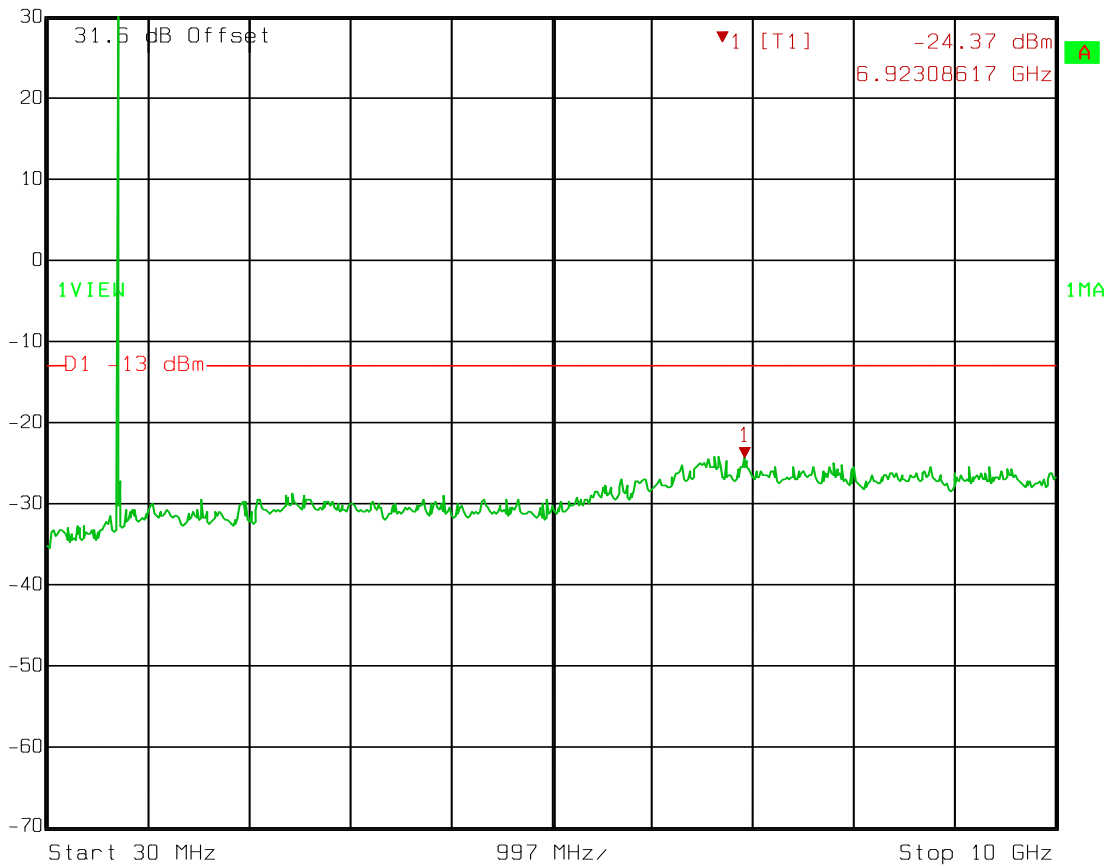
Test Data – Spurious Emissions at Antenna Terminals

LTE

Spurs



Marker 1 [T1] RBW 1 MHz RF Att 20 dB
 Ref Lvl -24.37 dBm VBW 1 MHz
 30 dBm 6.92308617 GHz SWT 100 ms Unit dBm



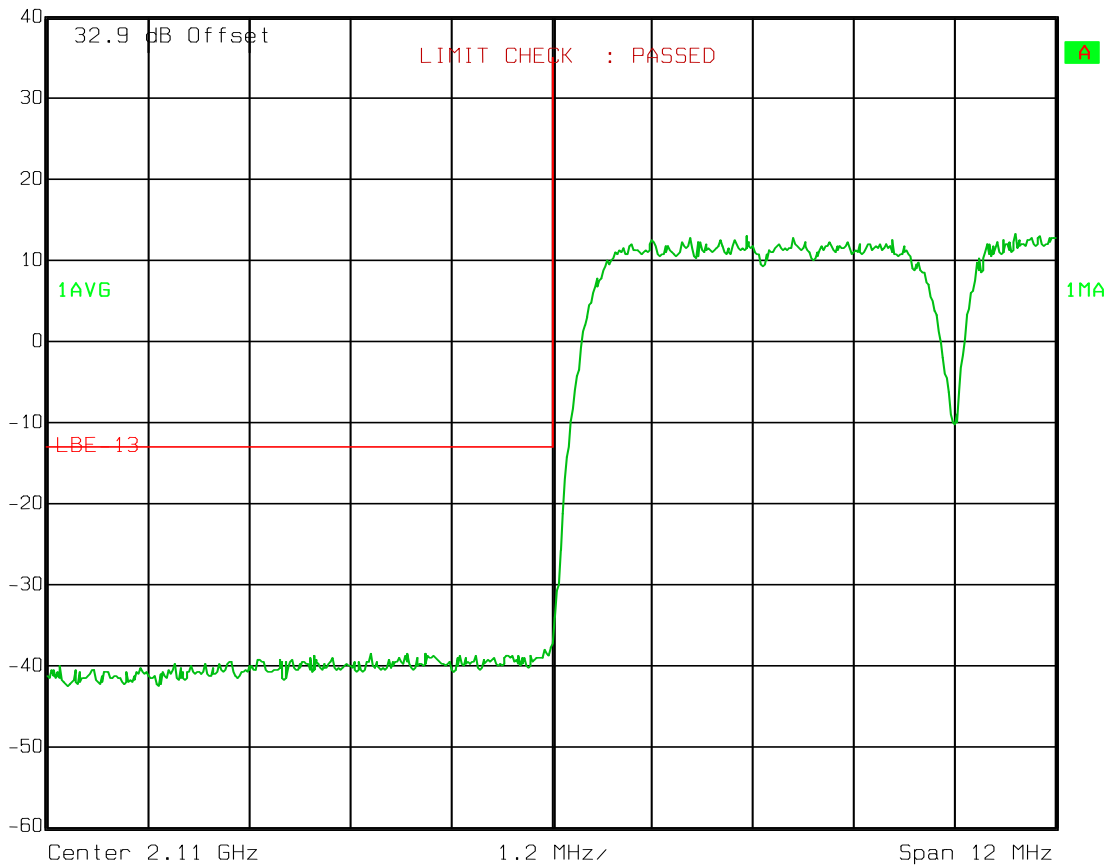
Test Data – Spurious Emissions at Antenna Terminals

Low Edge
WCDMA



Ref Lvl
40 dBm

RBW	50 kHz	RF Att	20 dB
VBW	50 kHz	Mixer	-10 dBm
SWT	12 ms	Unit	dBm



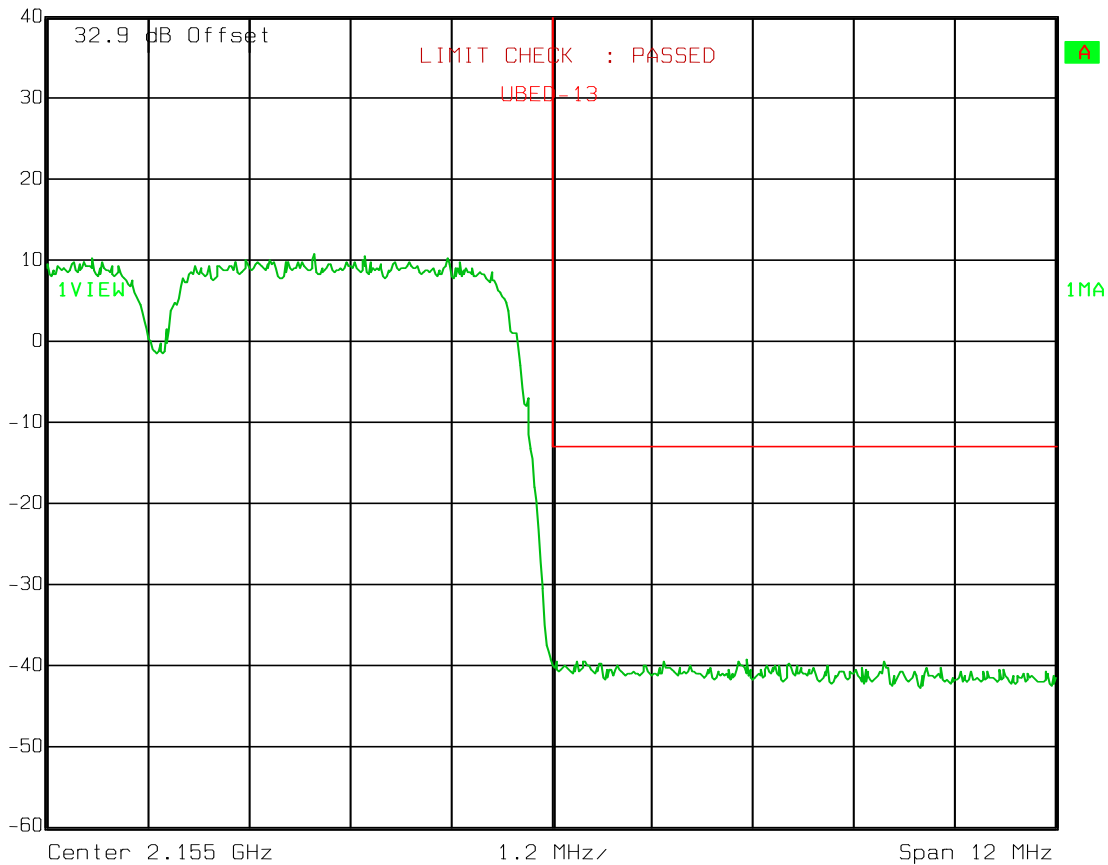
Test Data – Spurious Emissions at Antenna Terminals

High Edge
WCDMA



Ref Lvl
40 dBm

RBW	50 kHz	RF Att	20 dB
VBW	50 kHz	Mixer	-10 dBm
SWT	12 ms	Unit	dBm



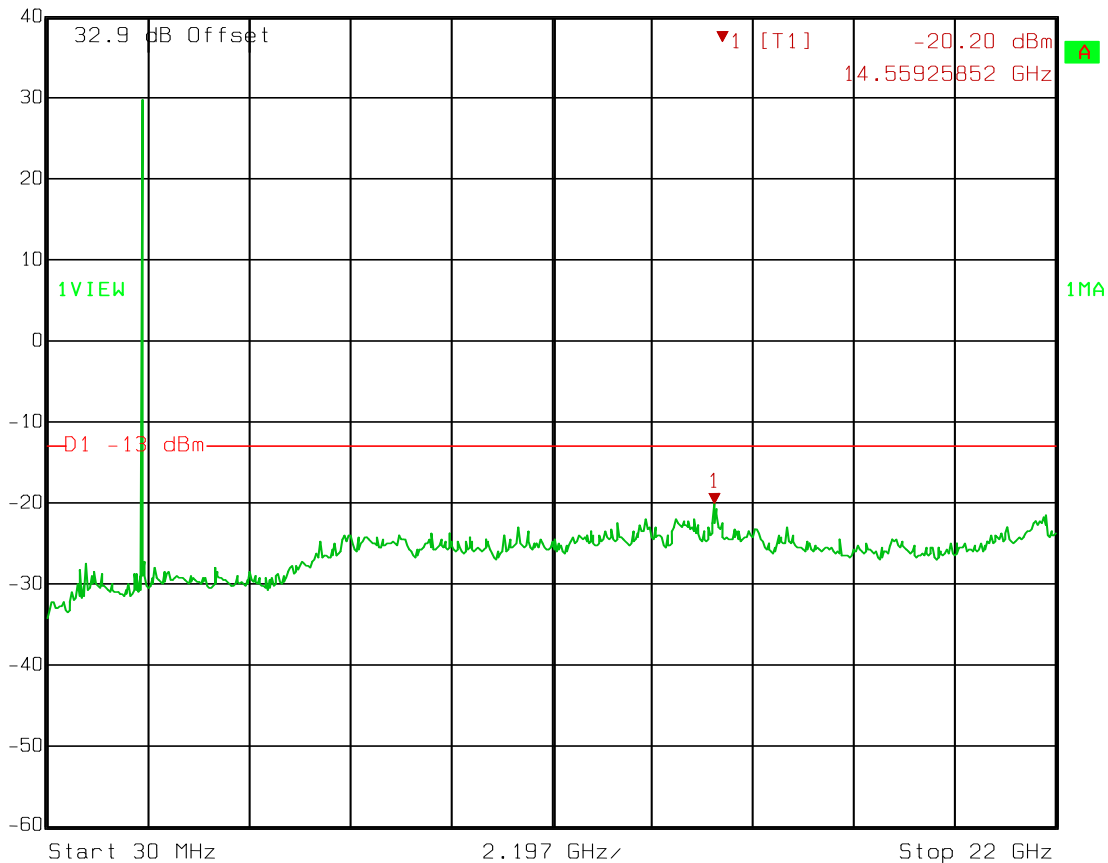
Test Data – Spurious Emissions at Antenna Terminals

Spurs

WCDMA



Ref Lvl 40 dBm
 Marker 1 [T1] -20.20 dBm 14.55925852 GHz
 RBW 1 MHz RF Att 20 dB
 VBW 1 MHz Mixer -10 dBm
 SWT 220 ms Unit dBm



Test Data – Spurious Emissions at Antenna Terminals

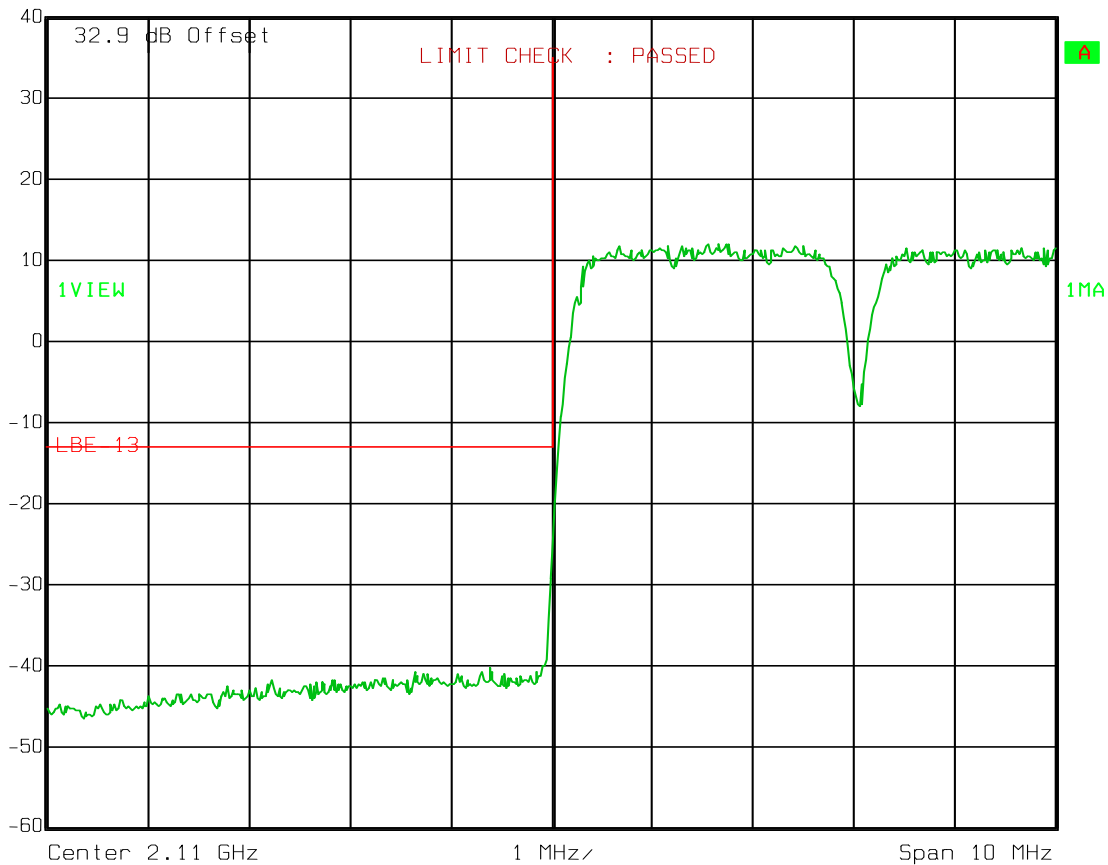
LTE

Lower Edge



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	28 ms	Unit	dBm



Test Data – Spurious Emissions at Antenna Terminals

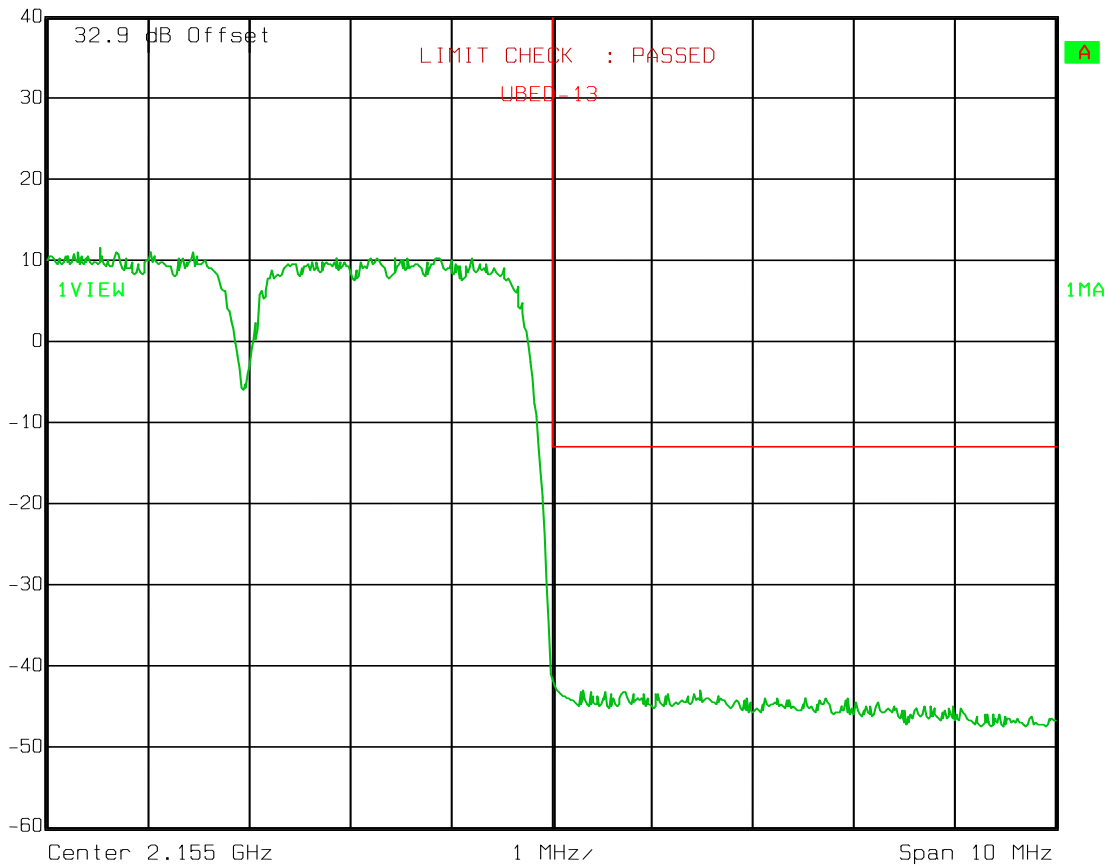
LTE

Upper Edge



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	28 ms	Unit	dBm



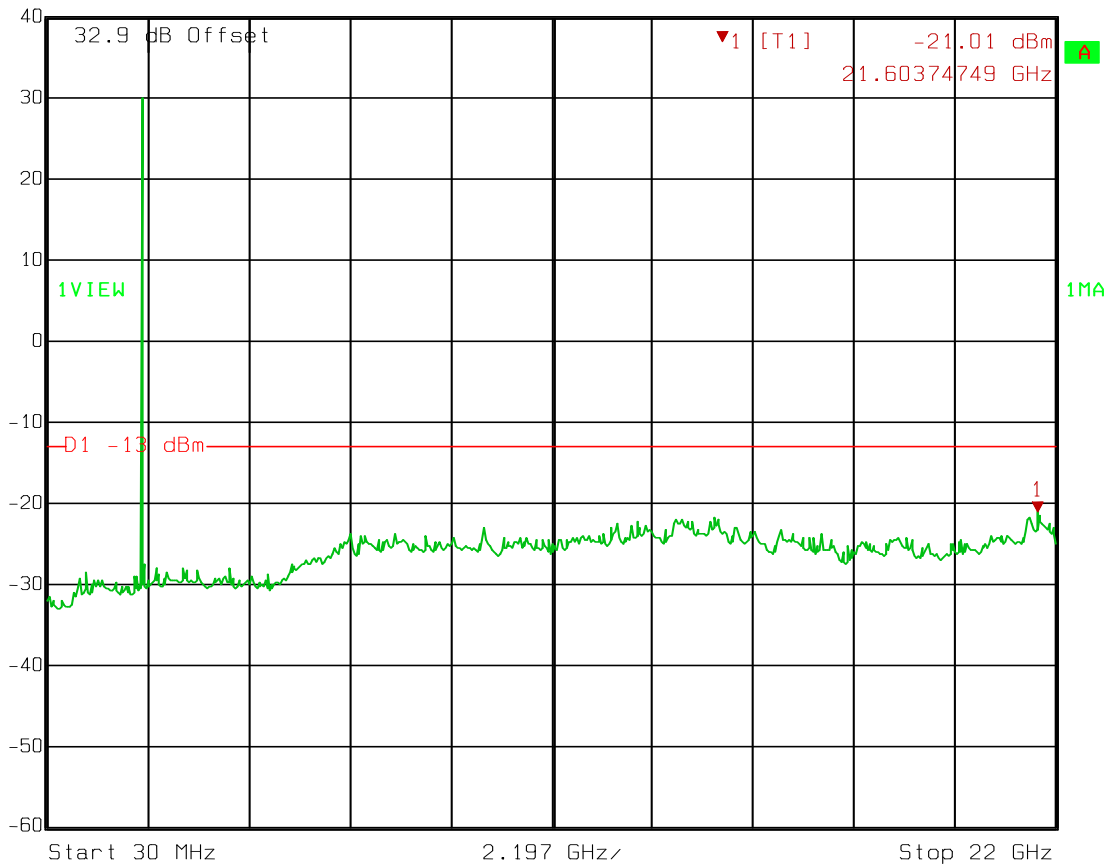
Test Data – Spurious Emissions at Antenna Terminals

Spurs

LTE



Ref Lvl 40 dBm
 Marker 1 [T1] -21.01 dBm
 21.60374749 GHz
 RBW 1 MHz
 VBW 1 MHz
 SWT 220 ms
 RF Att 20 dB
 Mixer -10 dBm
 Unit dBm



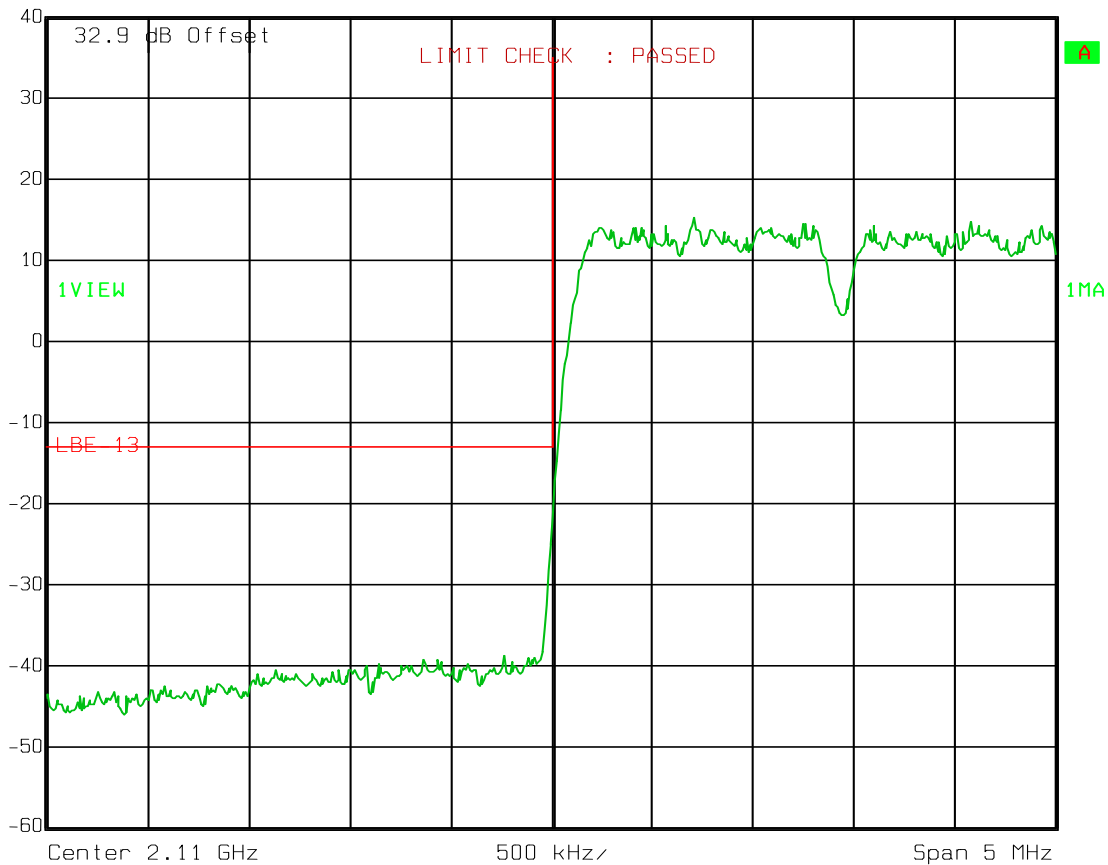
Test Data – Spurious Emissions at Antenna Terminals

Lower Edge
CDMA



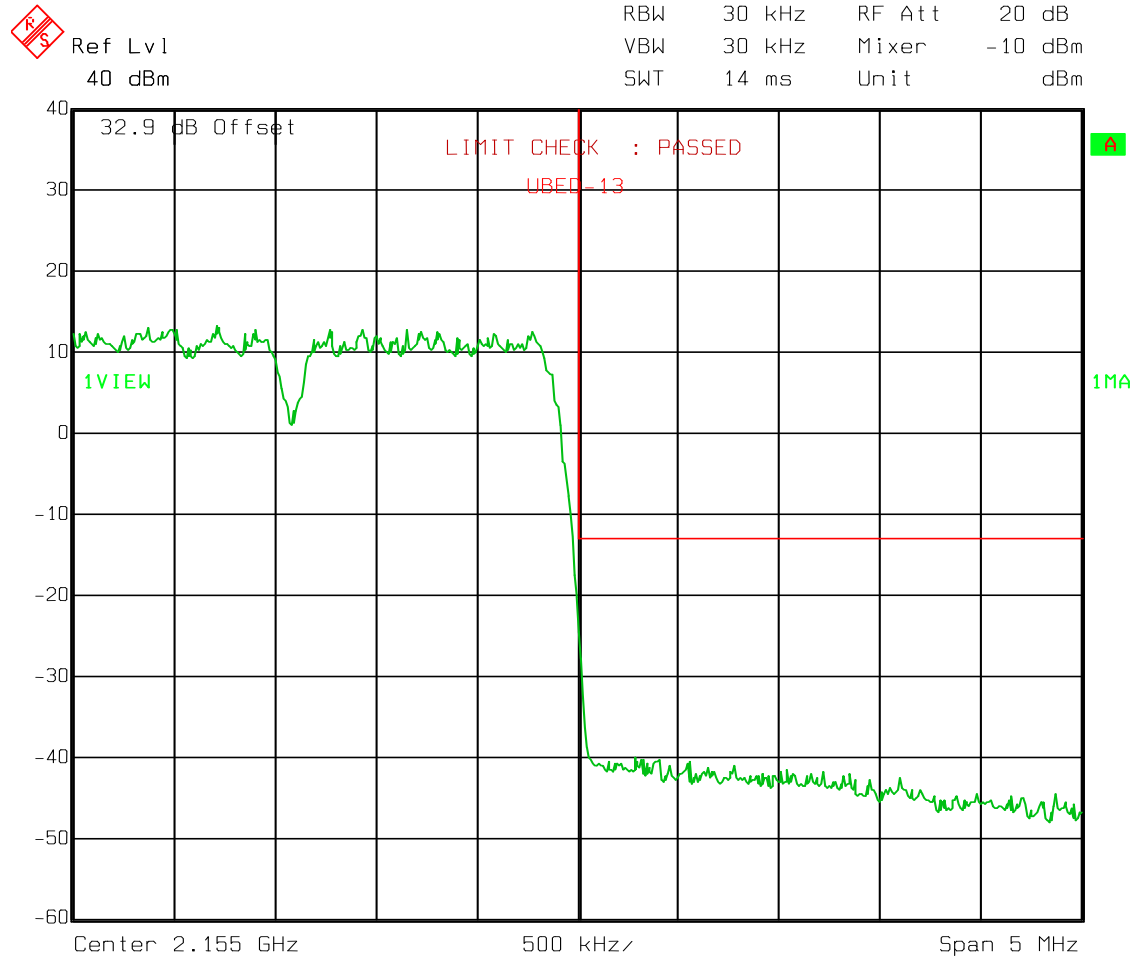
Ref Lvl
40 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Test Data – Spurious Emissions at Antenna Terminals

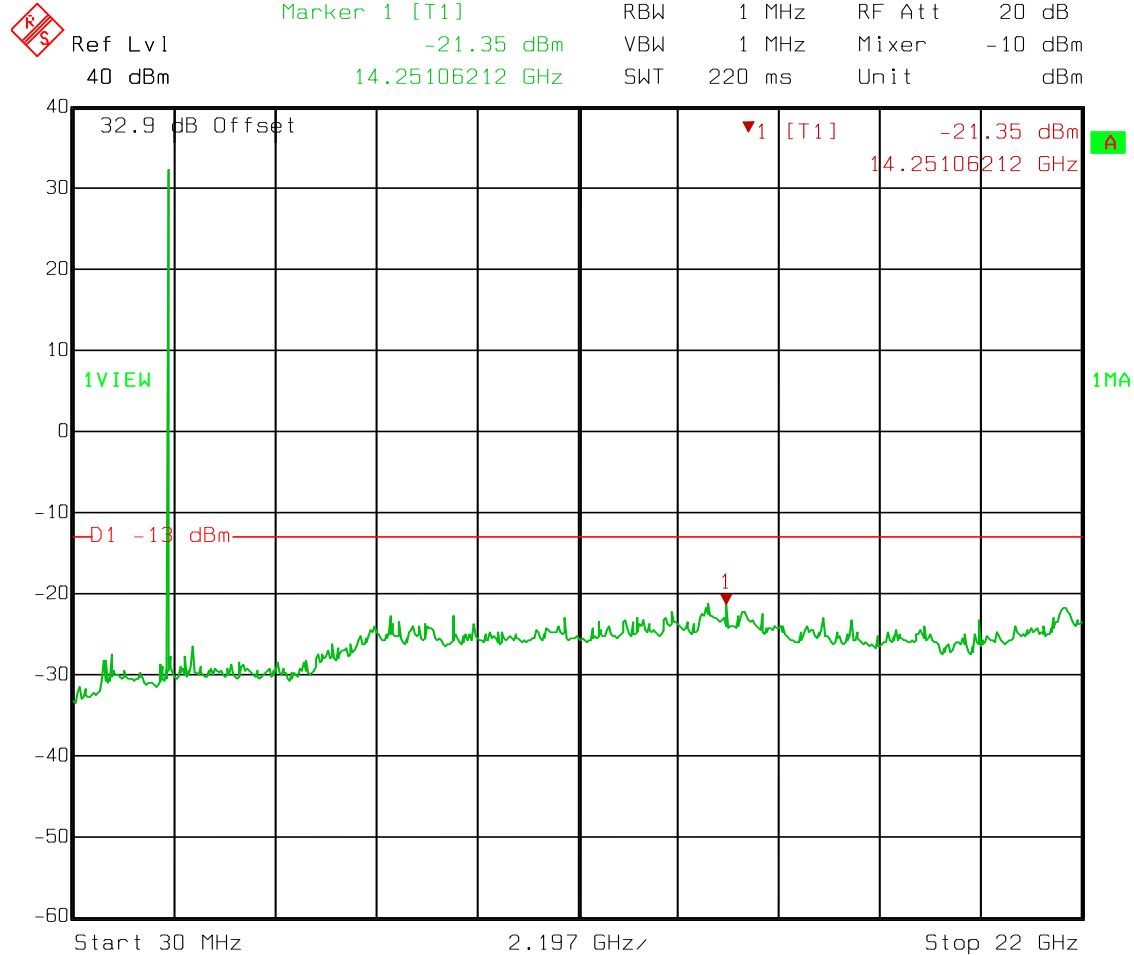
Upper Edge
CDMA



Test Data – Spurious Emissions at Antenna Terminals

CDMA

Spurs



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 27.53
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.

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.27.53(d)(1). The power of each fixed or base station transmitting in the 2110-2155 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to a peak equivalent isotropically radiated power (EIRP) of 3280 watts. The power of each fixed or base station transmitting in the 2110-2155 MHz band from any other location is limited to a peak EIRP of 1640 watts. A licensee operating a base or fixed station utilizing a power of more than 1640 watts EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025-2110 MHz band. Operations above 1640 watts EIRP must also be coordinated in advance with the following licensees within 120 kilometers (75 miles) of the base or fixed station: all Broadband Radio Service (BRS) licensees authorized under Part 27 in the 2155-2160 MHz band and all AWS licensees in the 2110-2155 MHz band.

Method Of Measurement:Detachable Antenna:

The channel power integrated across the carrier's bandwidth 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 an isotropic radiator. 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 eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: 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= 50 kHz

Span: 10 MHz

Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 27.53

Minimum Standard: Para. No.27.53(g) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10}(P)$ dB.

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

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 27.53
---	-------------------------

Minimum Standard:

Para. No.27.53(g) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ dB.

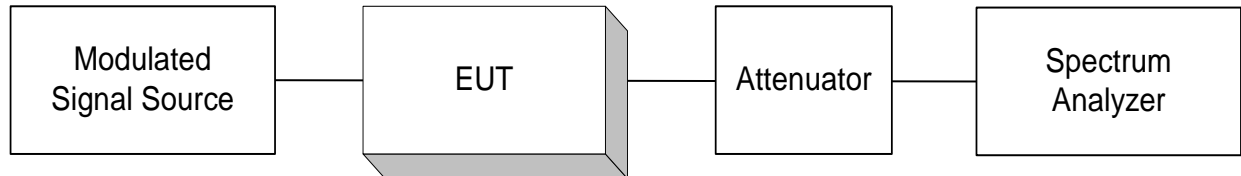
Method of Measurement

ANSI/TIA -603-C-2004

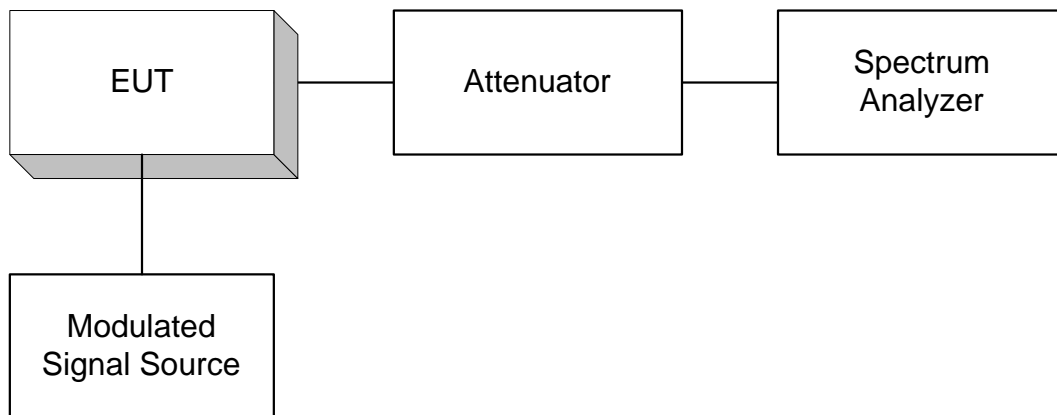
The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

ANNEX B - TEST DIAGRAMS

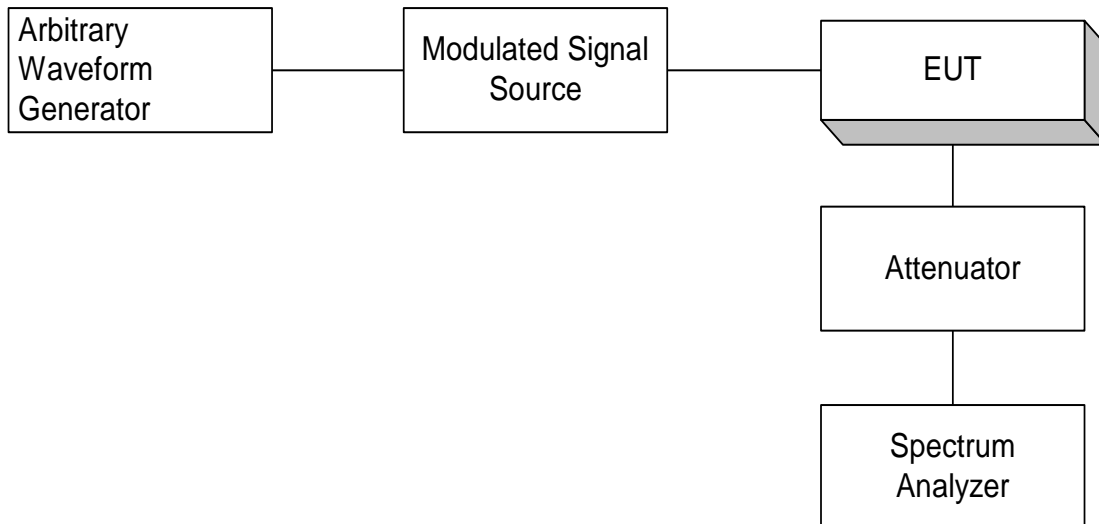
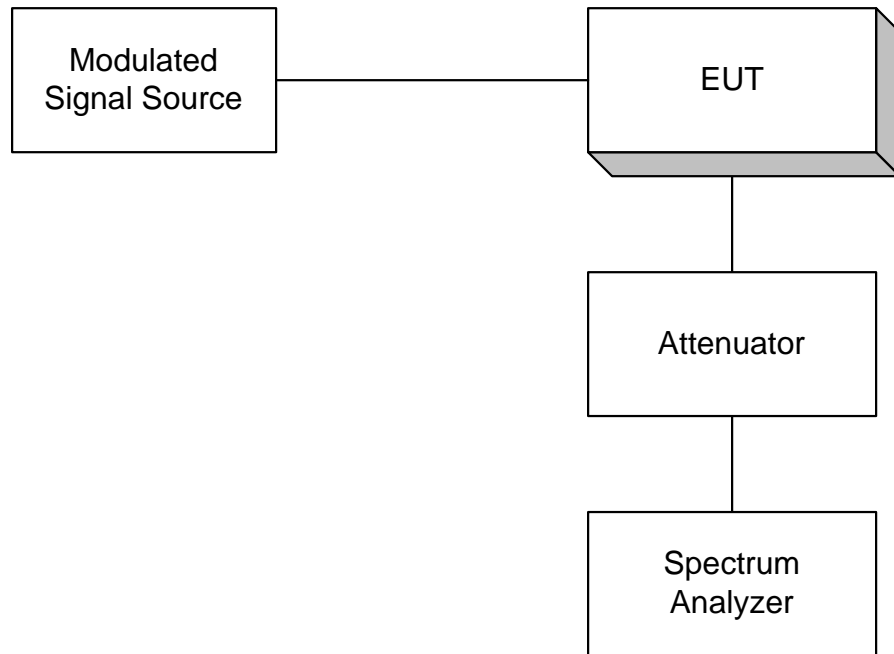
Para. No. 2.985 - R.F. Power Output



Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation

