



**Nemko Test Report:** 60865RUS4

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

**Equipment Under Test:** TFAH-US7B  
(E.U.T.)

**FCC Identifier:** BCR-TFAHR4E

**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:**

A handwritten signature in black ink, appearing to read 'David Light', written over a horizontal line.

David Light, Senior Wireless Engineer

**DATE:** 27 September  
2010

**APPROVED BY:**

A handwritten signature in black ink, appearing to read 'Tom Tidwell', written over a horizontal line.

Tom Tidwell, Telecom Direct

**DATE:** 11 November  
2010

**Number of Pages: 40**

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## Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAH-US7B

Serial No.: 3

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**

<b>NAME OF TEST</b>	<b>PARA. NO.</b>	<b>SPEC.</b>	<b>RESULT</b>
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

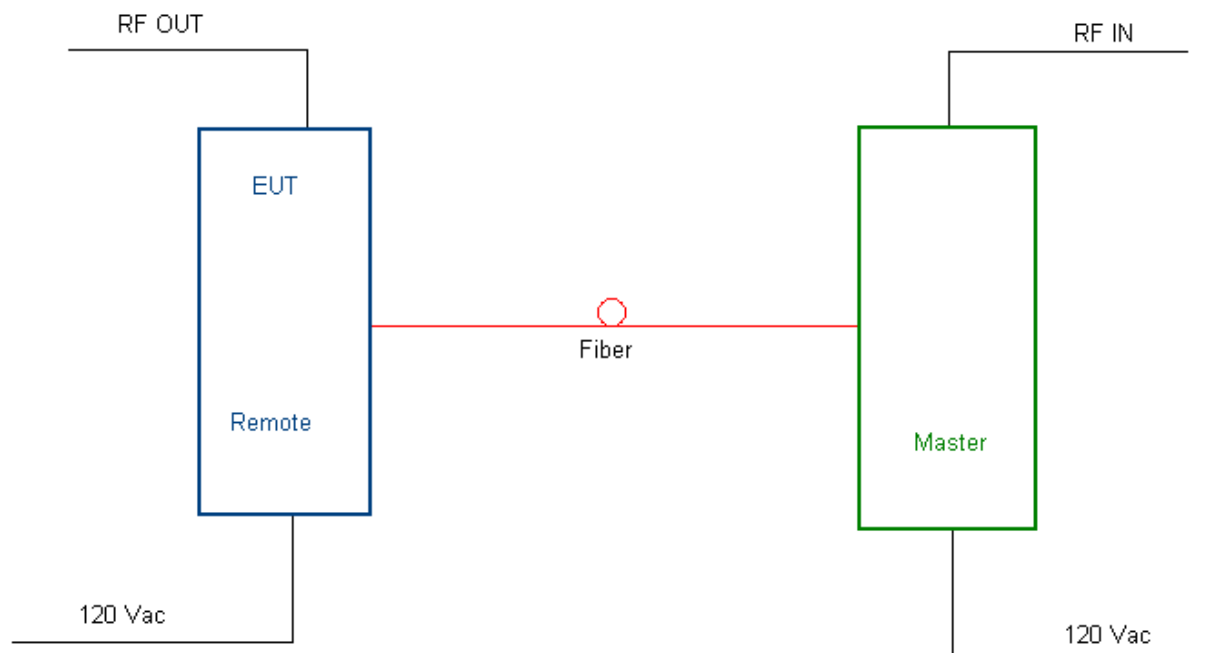
NOTE: Some data in this report is more than one year old. It has been confirmed that the device has not been changed in any way that would affect the rf performance since the original testing was done and the test results continue to be representative of the device as manufactured.

## Section 2. General Equipment Specification

<b>Supply Voltage Input:</b>	120 Vac										
<b>Frequency Bands: Downlink:</b>	2110 to 2155 MHz 2496 to 2690 MHz										
<b>Frequency Bands: Uplink:</b>	NA										
<b>Emission Designator(s):</b>	2100 MHz band F9W 2600 MHz band F9W										
<b>Output Impedance:</b>	50 ohms										
<b>RF Output (Rated): Downlink</b>	<table> <tr> <td>1.25</td> <td>W (2100 MHz band)</td> </tr> <tr> <td>31.0</td> <td>dBm</td> </tr> <tr> <td>0.315</td> <td>W (2600 MHz band)</td> </tr> <tr> <td>25.0</td> <td>dBm</td> </tr> </table>			1.25	W (2100 MHz band)	31.0	dBm	0.315	W (2600 MHz band)	25.0	dBm
1.25	W (2100 MHz band)										
31.0	dBm										
0.315	W (2600 MHz band)										
25.0	dBm										
<b>RF Output (Rated): Uplink</b>	<table> <tr> <td>NA</td> <td>W</td> </tr> <tr> <td>NA</td> <td>dBm</td> </tr> </table>			NA	W	NA	dBm				
NA	W										
NA	dBm										
<b>Frequency Translation:</b>	<b>F1-F1</b> <input checked="" type="checkbox"/>	<b>F1-F2</b> <input type="checkbox"/>	<b>N/A</b> <input type="checkbox"/>								
<b>Band Selection:</b>	<b>Software</b> <input type="checkbox"/>	<b>Duplexer</b> <input type="checkbox"/>	<b>Fullband</b> <input checked="" type="checkbox"/>								

**Description of EUT**

The TFAH-US7B is a seven band high power remote unit designed to distribute LMR700, LMR800, Cell850, LMR900, AWS, Extended PCS1900, and WiMax band signals along the same fiber. The device is classified as a signal booster with non-radiating host unit according to the EAB Reminder document on Amplifiers, Boosters, and Repeater Devices.

**System Diagram**

**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 27.50
TESTED BY: David Light	DATE: 27 August 2009

**Test Results:** Complies.

**Measurement Data:**

Band	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
700	APCO CQPSK	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
2600	LTE/WiMax	22	25	0.315

**Equipment Used:** 1036-1082-1472-1469

**Measurement Uncertainty:** +/- 1.7 dB

**Temperature:** 22 °C

**Relative Humidity:** 48 %

**Section 4. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 23 September 2010

**Test Results:** Complies.

**Test Data:** See attached plot(s).

**Equipment Used:** 1036-1082-1472-1469

**Measurement Uncertainty:** 1X10<sup>-7</sup> ppm

**Temperature:** 22 °C

**Relative Humidity:** 48 %



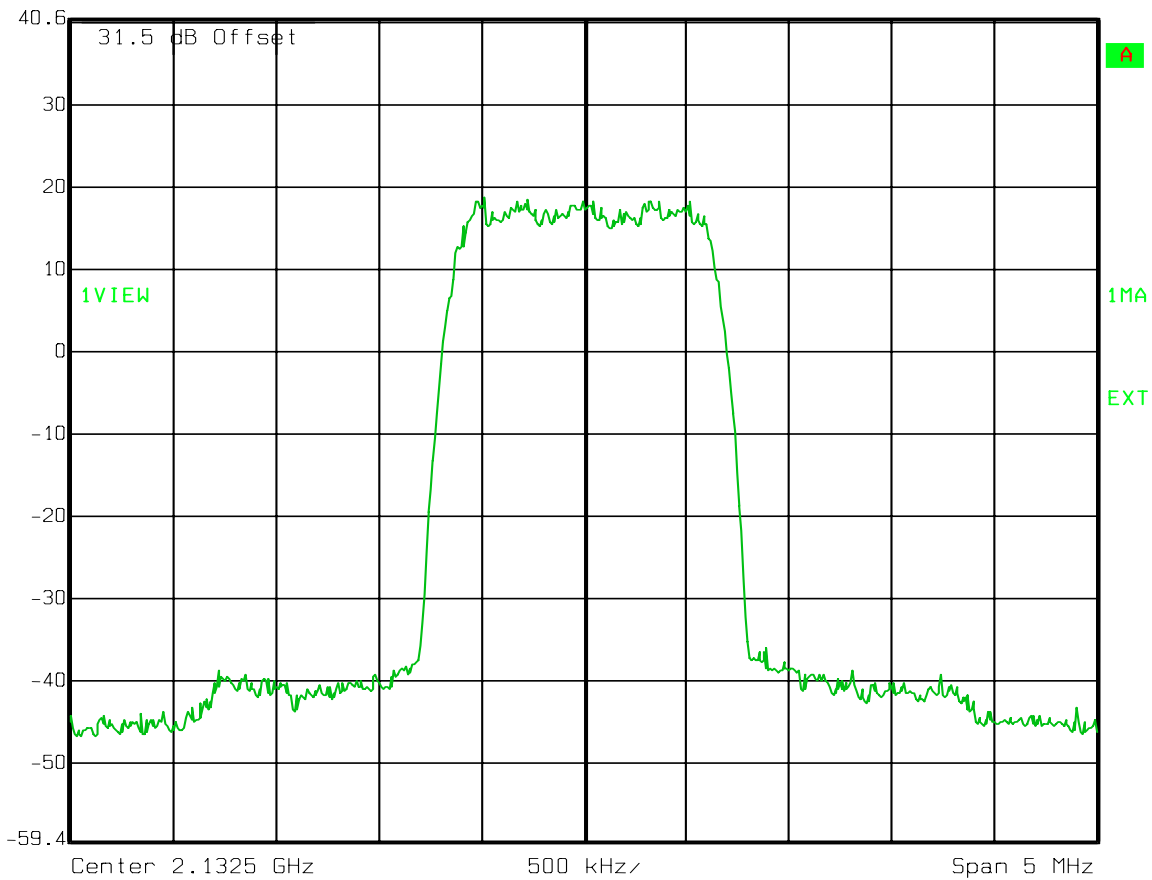
# Test Data – Occupied Bandwidth

CDMA/EV-DO  
OUTPUT



Ref Lvl  
40.6 dBm

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



Date: 23.SEP.2010 09:29:57

# Test Data – Occupied Bandwidth

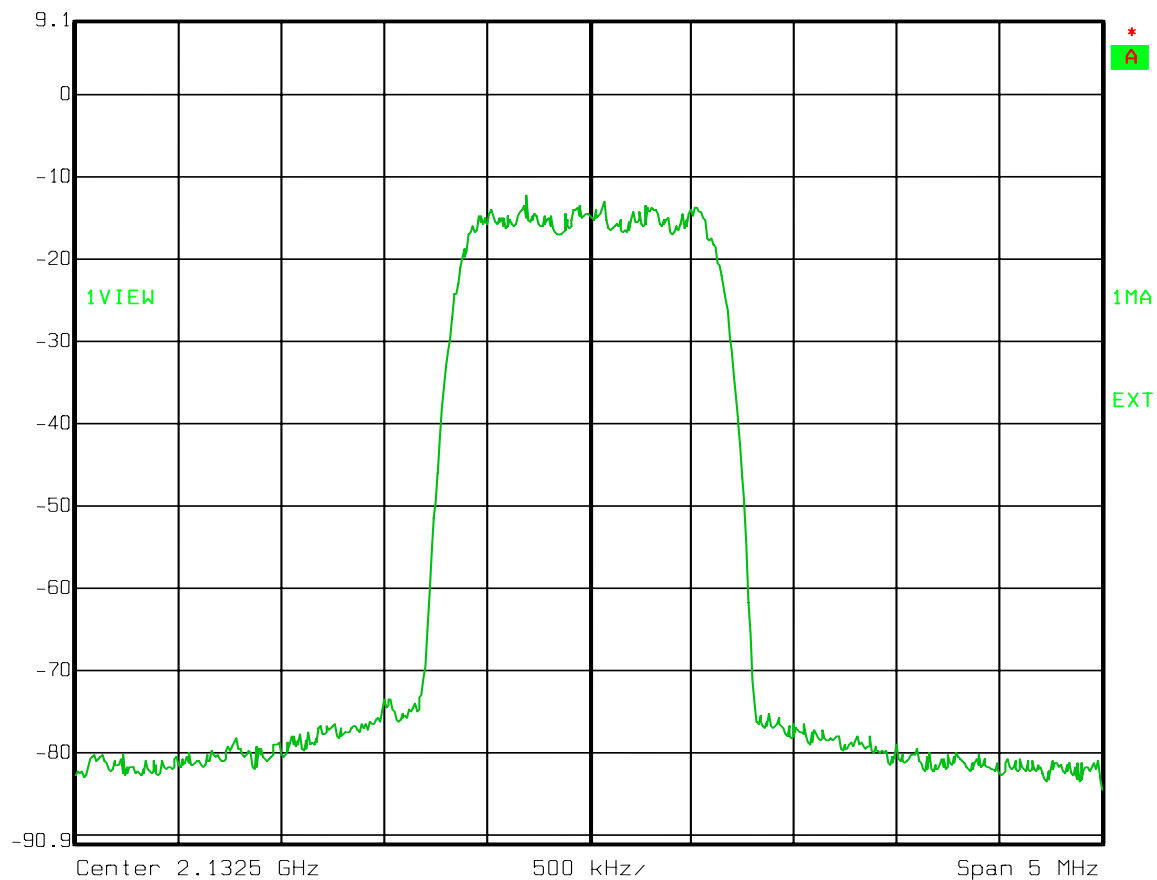
CDMA/EV-DO

INPUT



Ref Lvl  
9.1 dBm

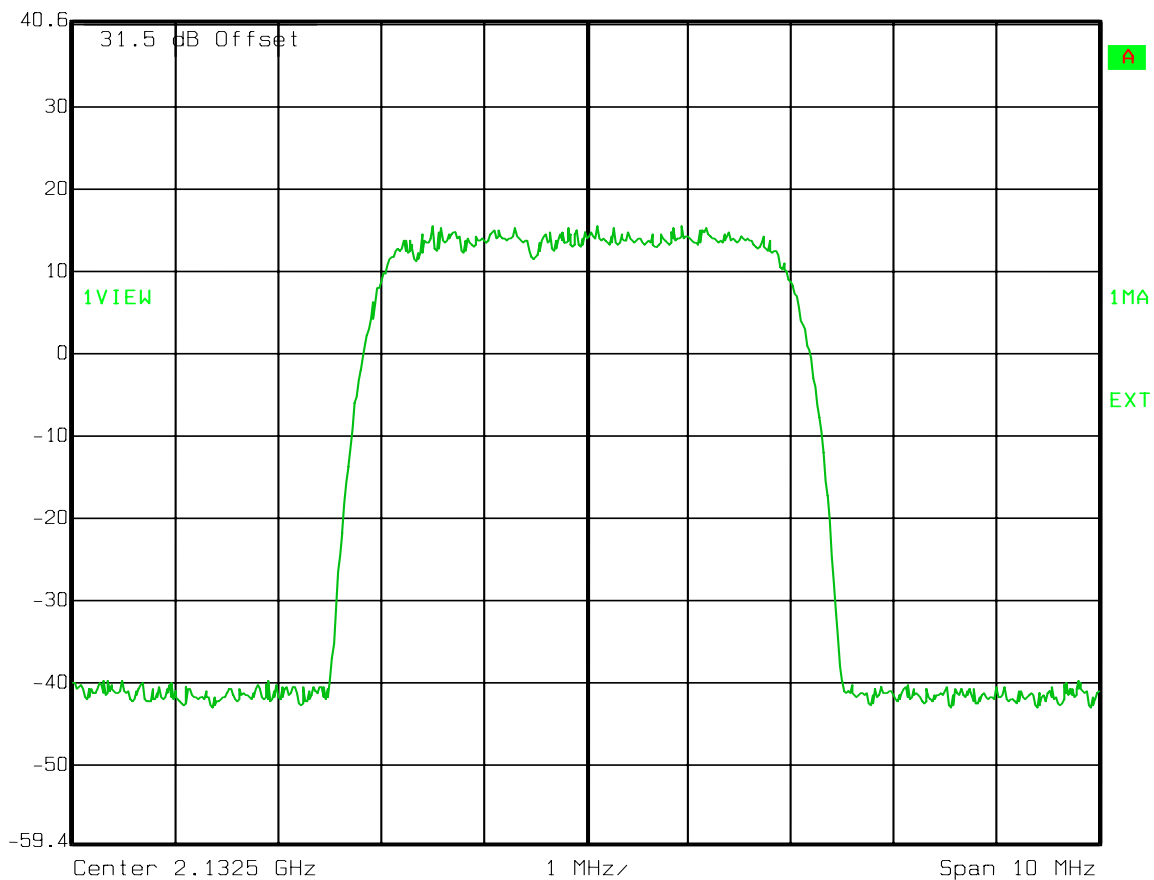
RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Date: 23.SEP.2010 09:30:55

**Test Data – Occupied Bandwidth****WCDMA/UMTS  
OUTPUT**Ref Lvl  
40.6 dBm

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



Date: 23.SEP.2010 09:43:35

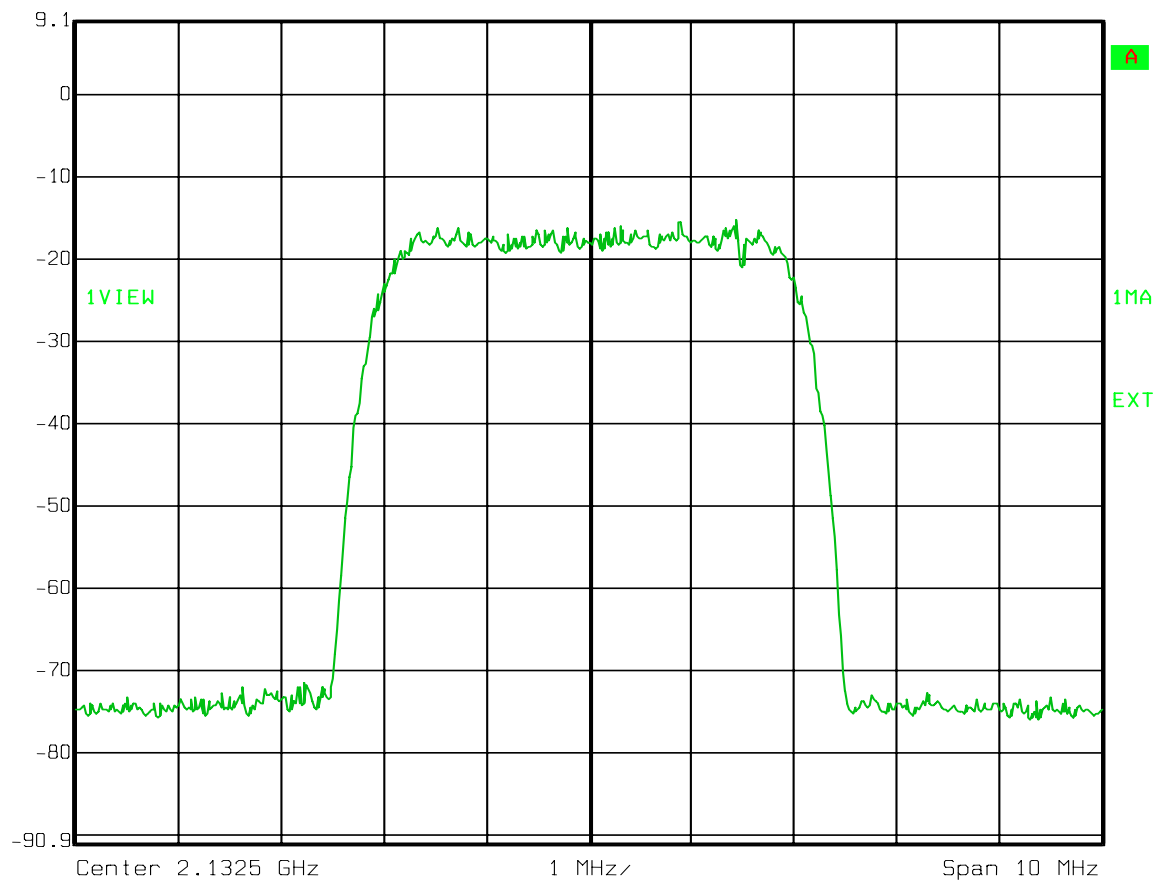
**Test Data – Occupied Bandwidth**

WCDMA/UMTS

INPUT

Ref Lvl  
9.1 dBm

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



Date: 23.SEP.2010 09:44:47

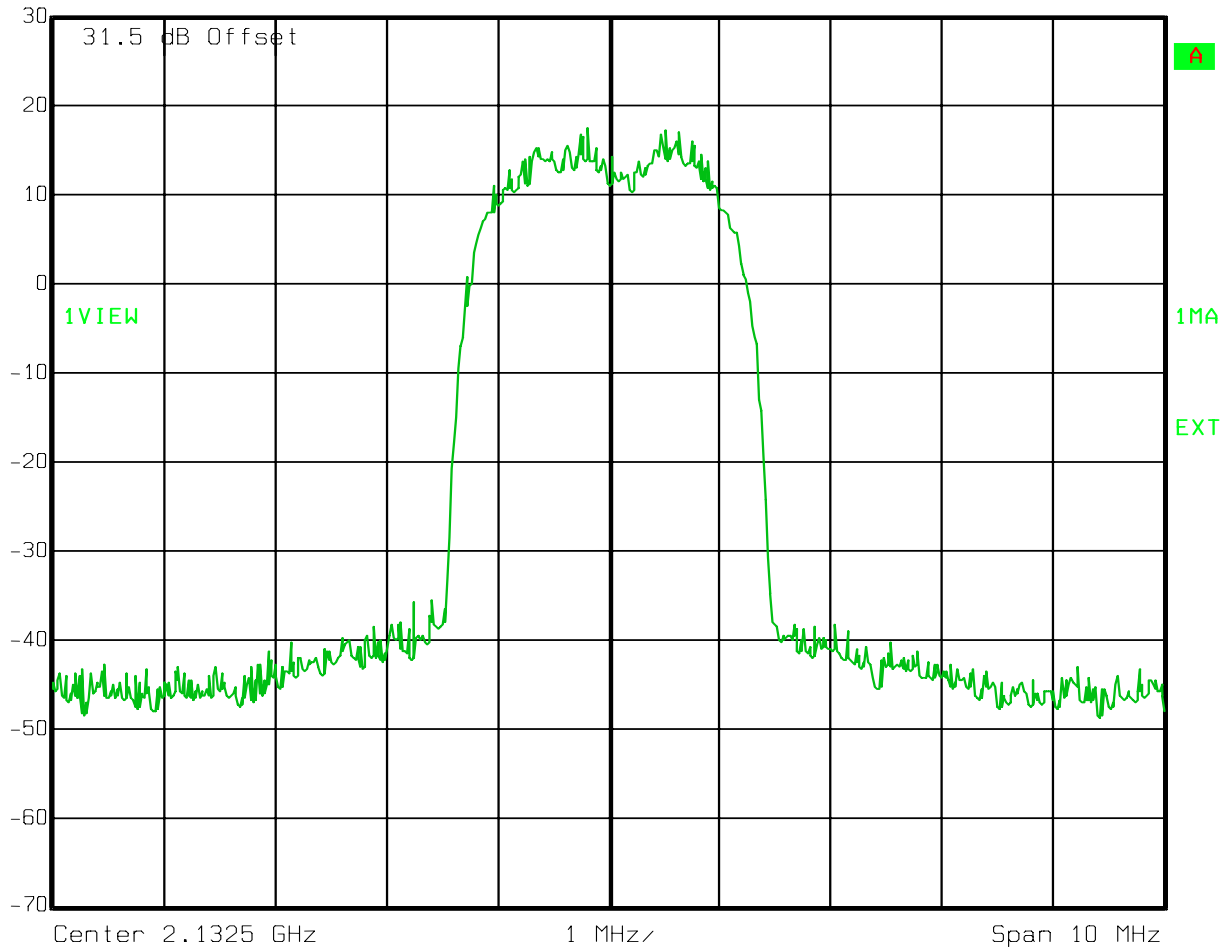
Test Data – Occupied Bandwidth

LTE Output  
2100 band



Ref Lvl  
30 dBm

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



Date: 13.OCT.2010 14:21:01

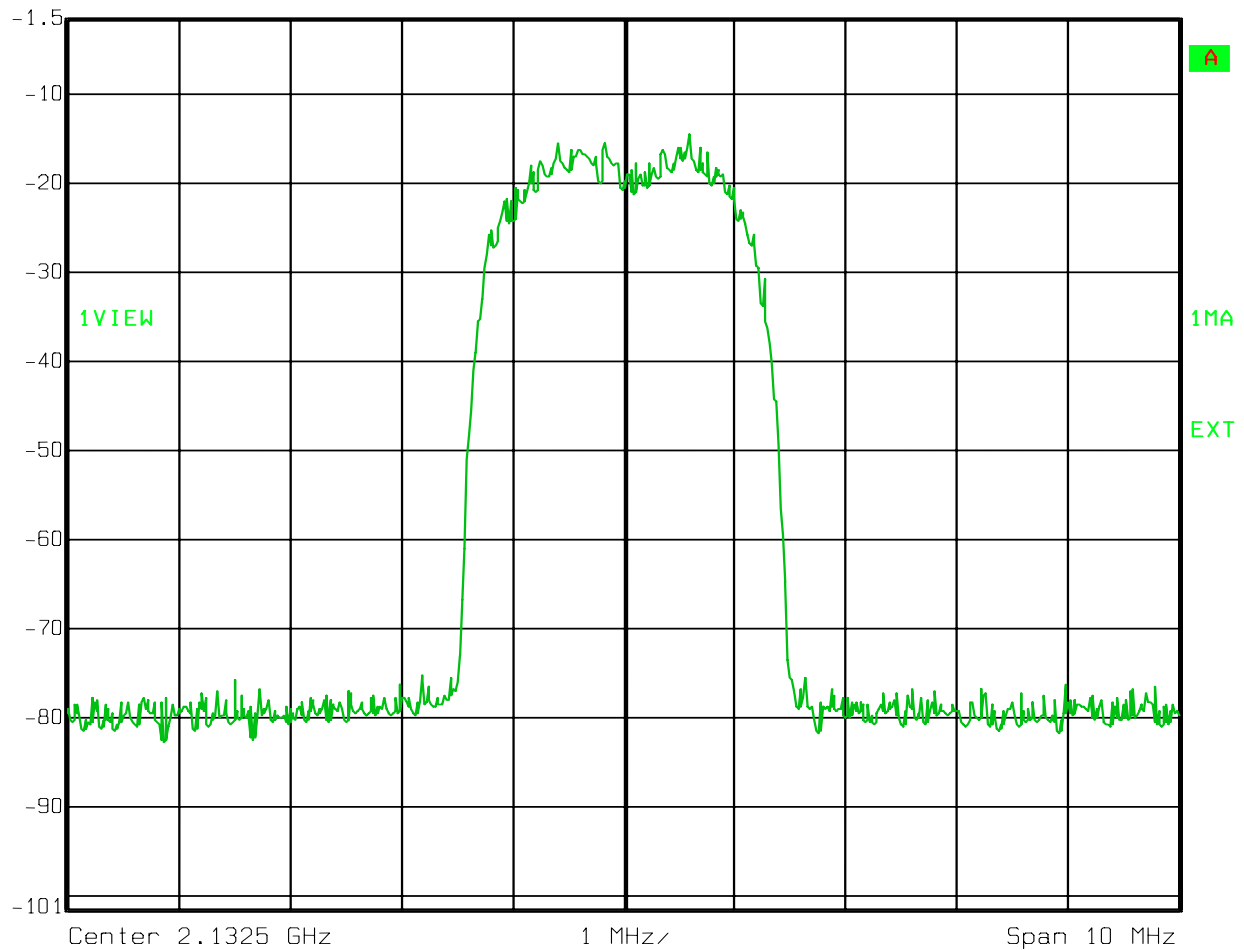
# Test Data – Occupied Bandwidth

LTE Input  
2100 band



Ref Lvl  
-1.5 dBm

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



Date: 13.OCT.2010 14:21:56

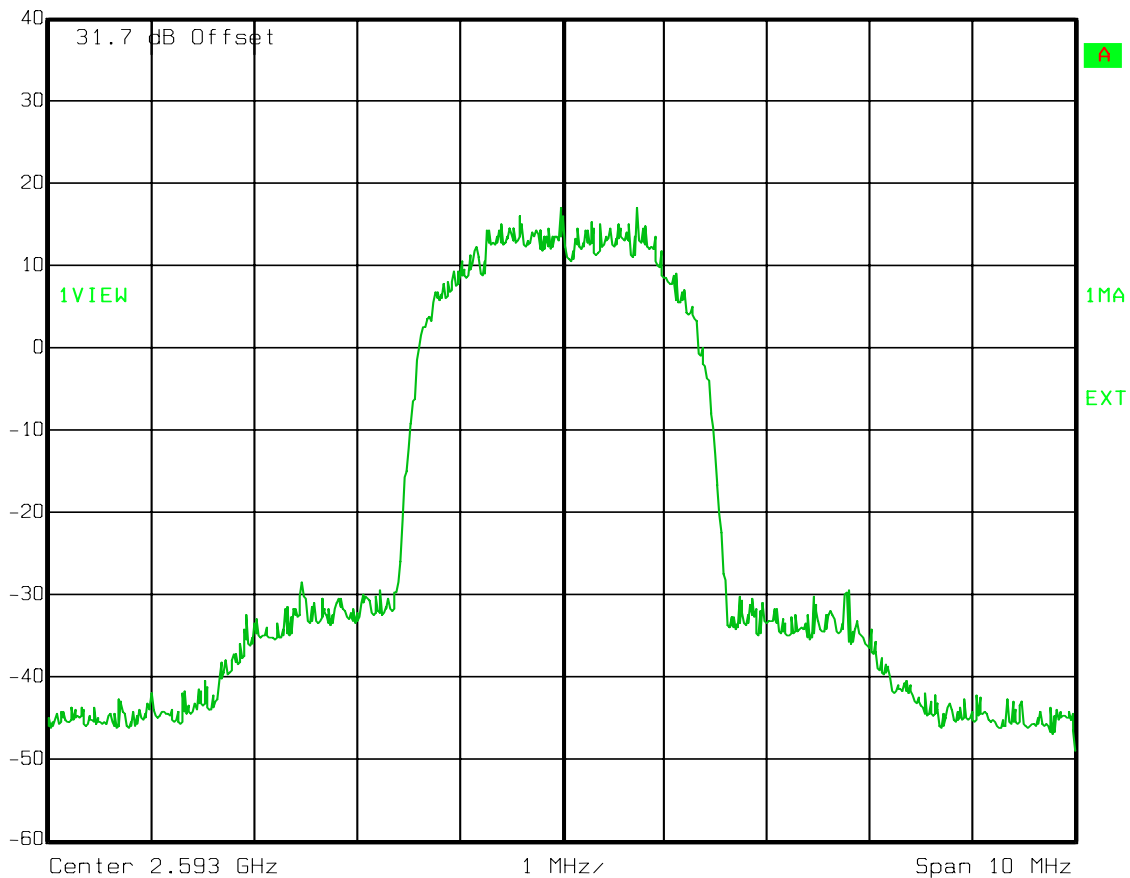
# Test Data – Occupied Bandwidth

LTE/WiMax  
OUTPUT



Ref Lvl  
40 dBm

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



Date: 23.SEP.2010 13:18:46

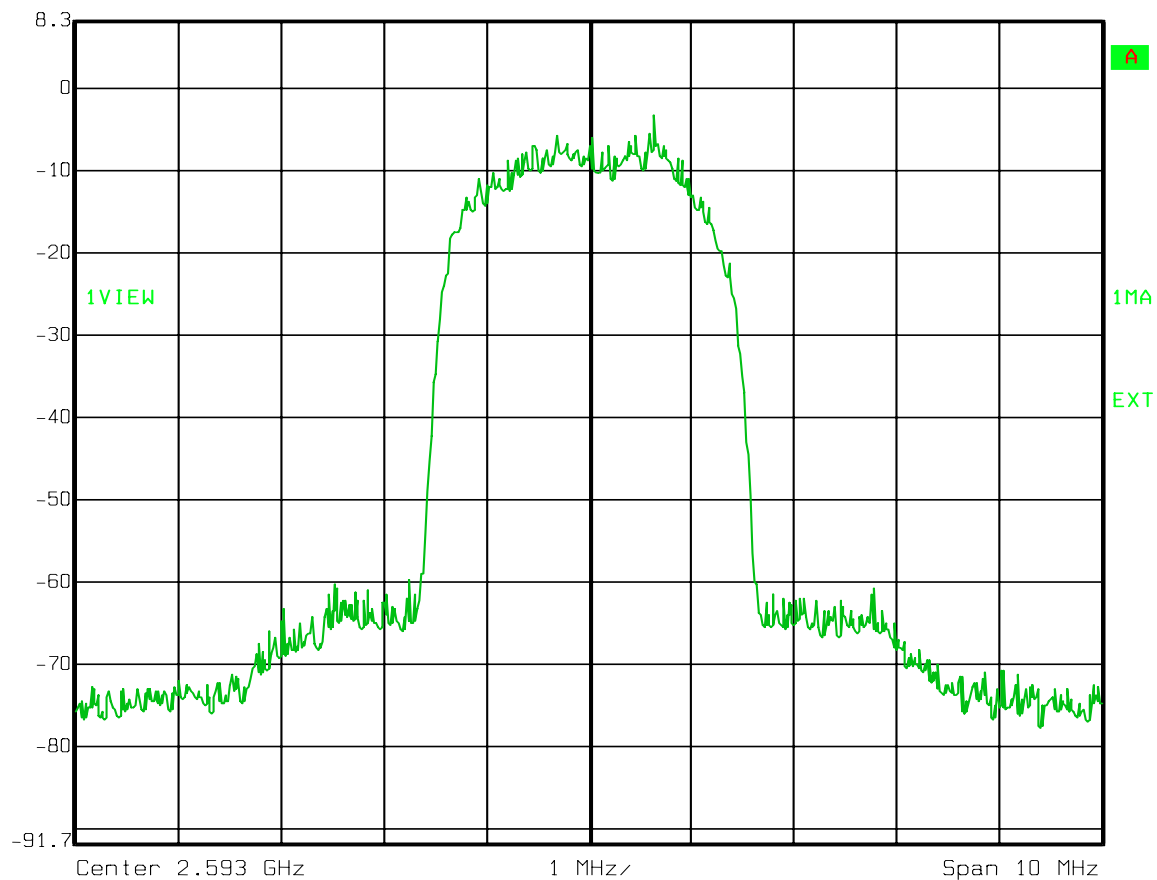
**Test Data – Occupied Bandwidth**

LTE/WiMax

INPUT

Ref Lvl  
8.3 dBm

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



Date: 23.SEP.2010 13:19:43



**Section 5. Conducted Spurious Emissions**

NAME OF TEST: Conducted Spurious Emissions	PARA. NO.: 27.53
TESTED BY: David Light	DATE: 23 September 2010

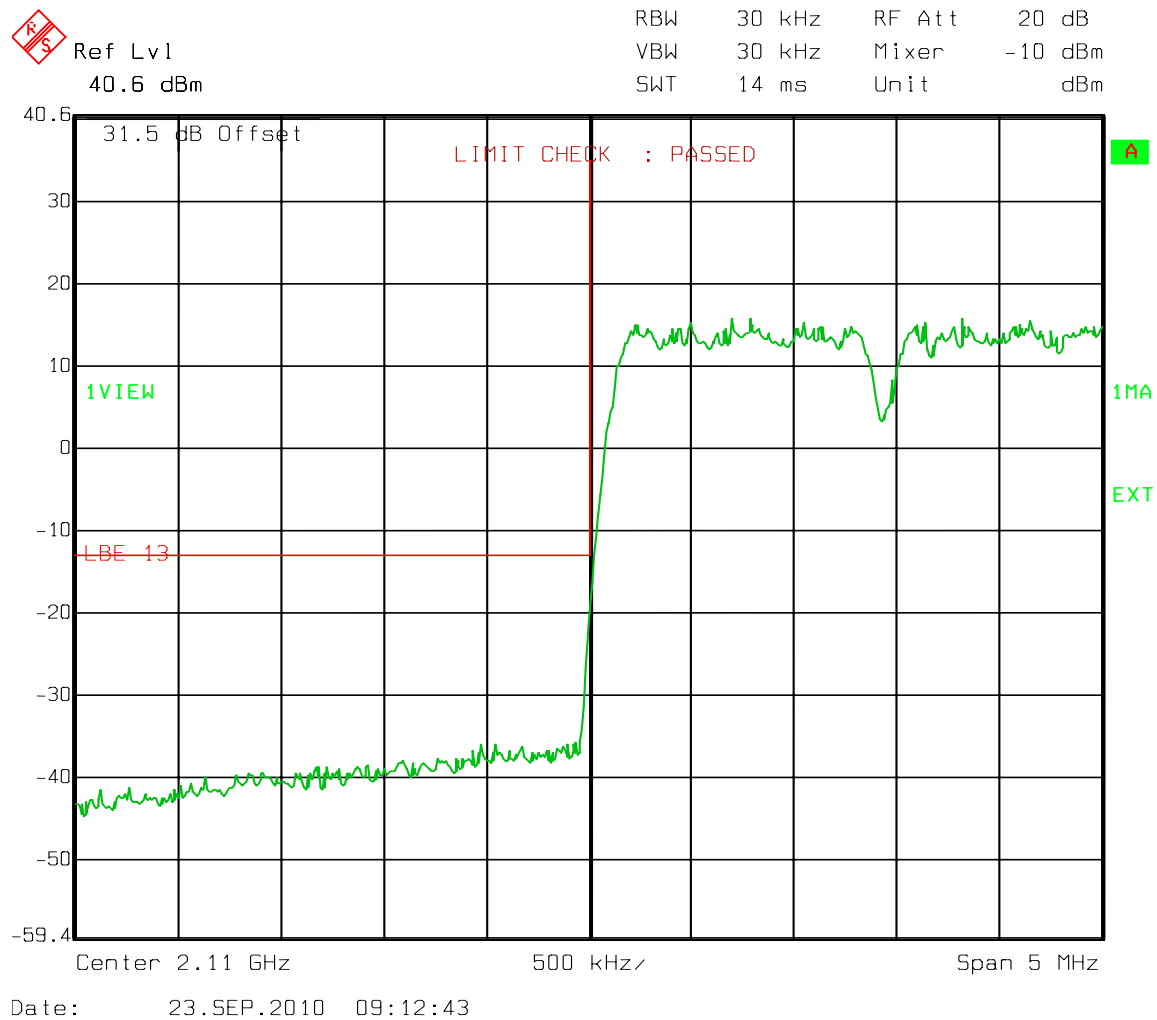
**Test Results:** Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1036-1082-1472-1469**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 48 %

# Test Data – Spurious Emissions at Antenna Terminals

CDMA/EV-DO

LOW BANDEDGE

2100 band

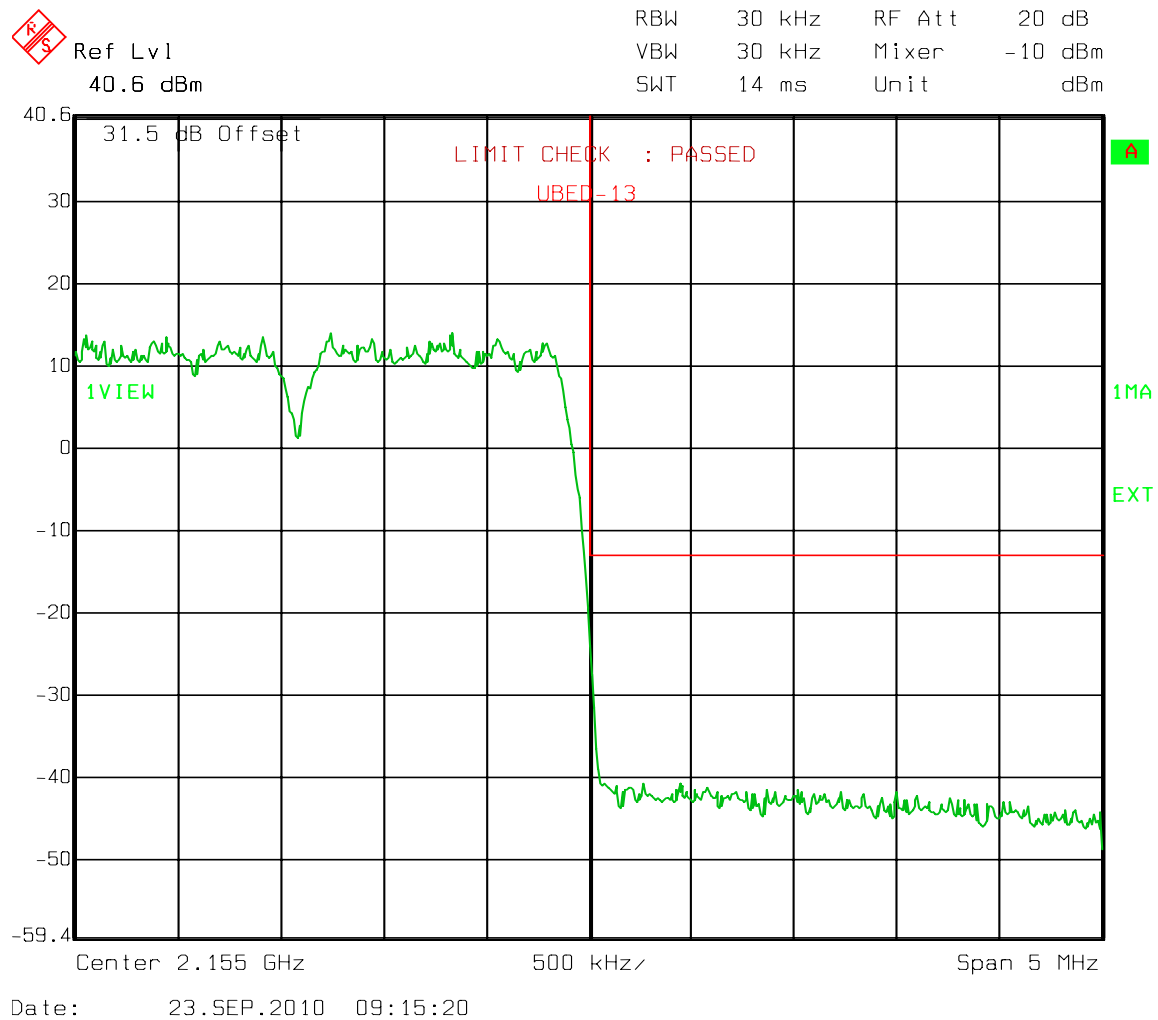


**Test Data – Spurious Emissions at Antenna Terminals**

CDMA/EV-DO

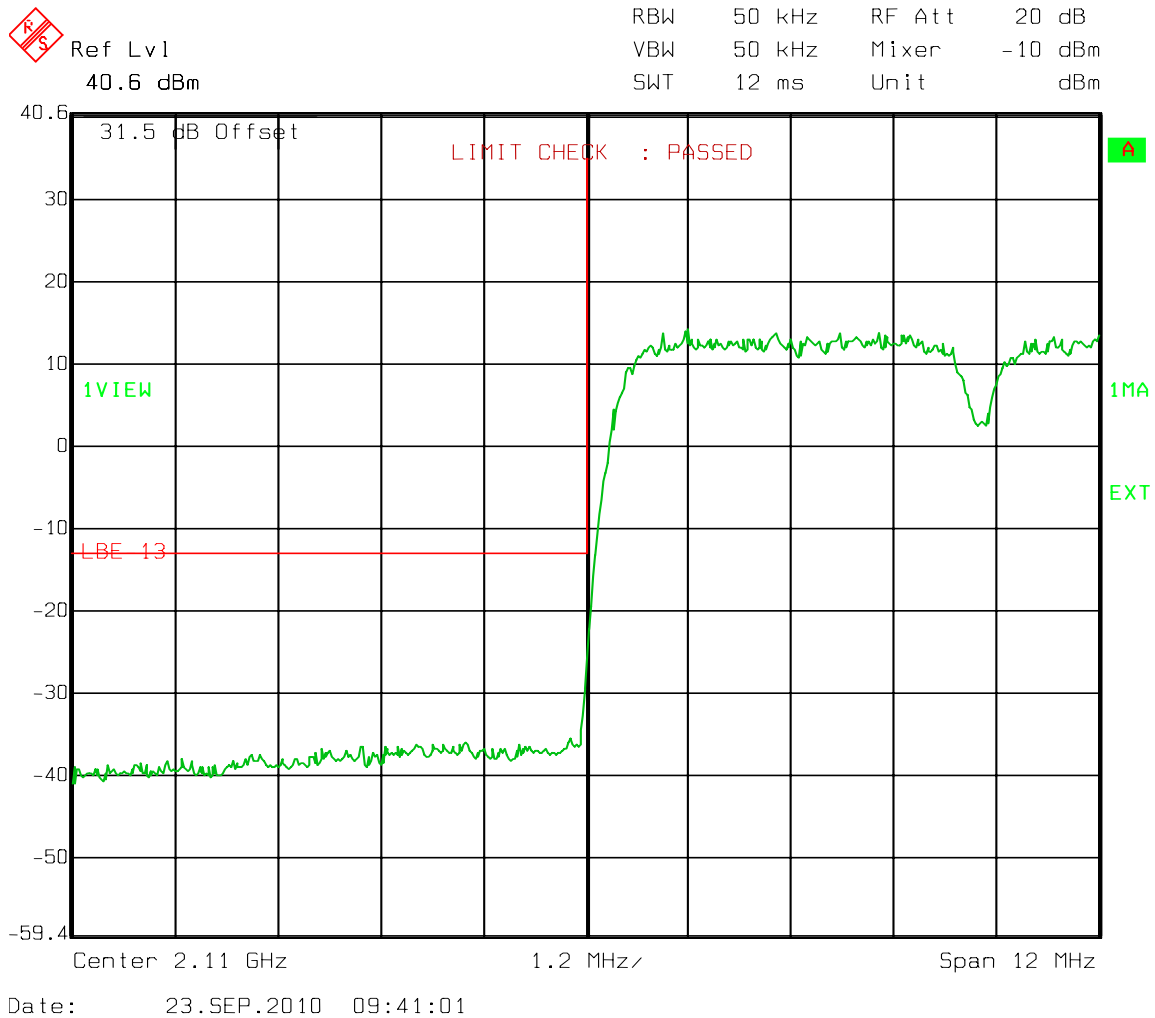
HIGH BAND EDGE

2100 band



**Test Data – Spurious Emissions at Antenna Terminals**

WCDMA/UMTS  
LOW BANDEDGE  
2100 band

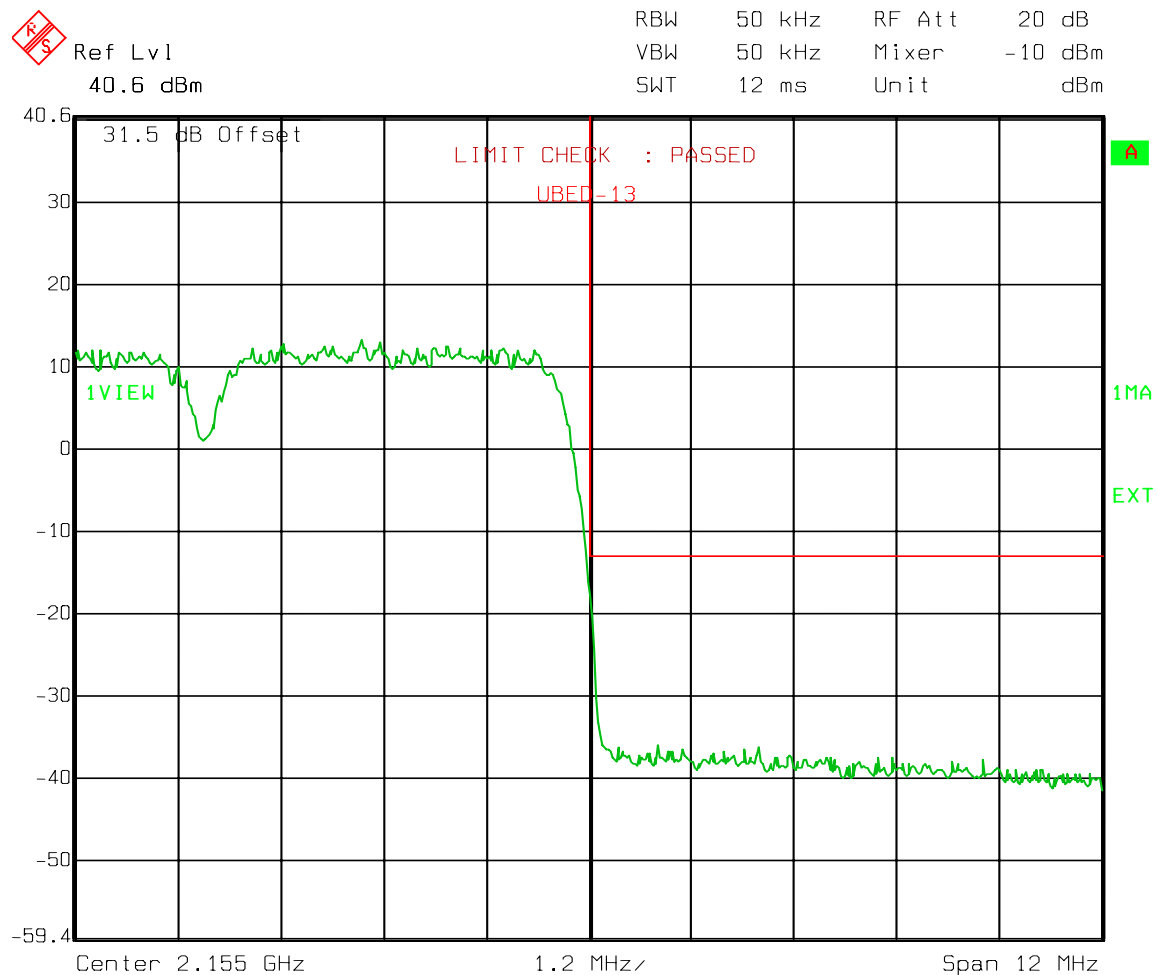


Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS

HIGH BAND EDGE

2100 band



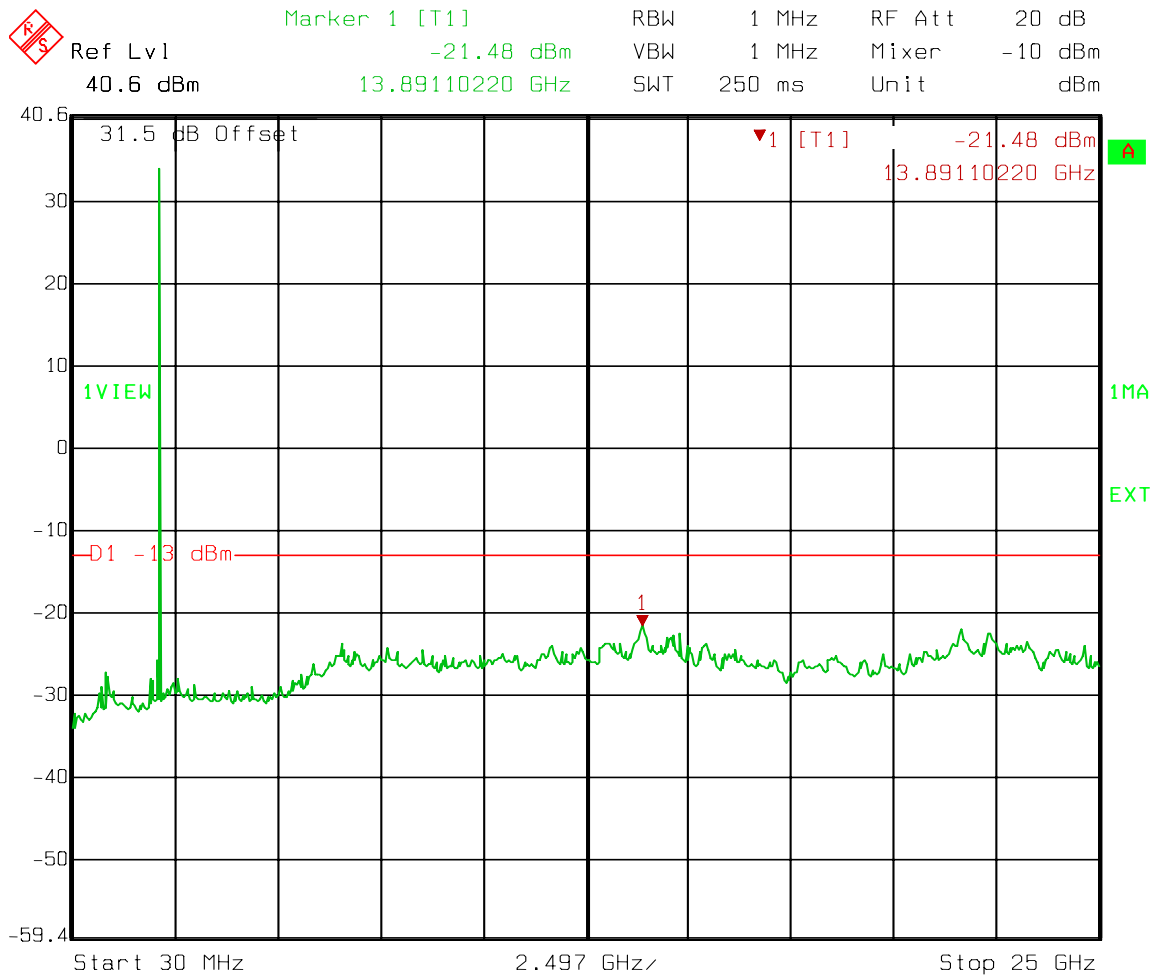
Date: 23.SEP.2010 09:40:05

**Test Data – Spurious Emissions at Antenna Terminals**

CDMA/EV-DO

SPURS

2100 band



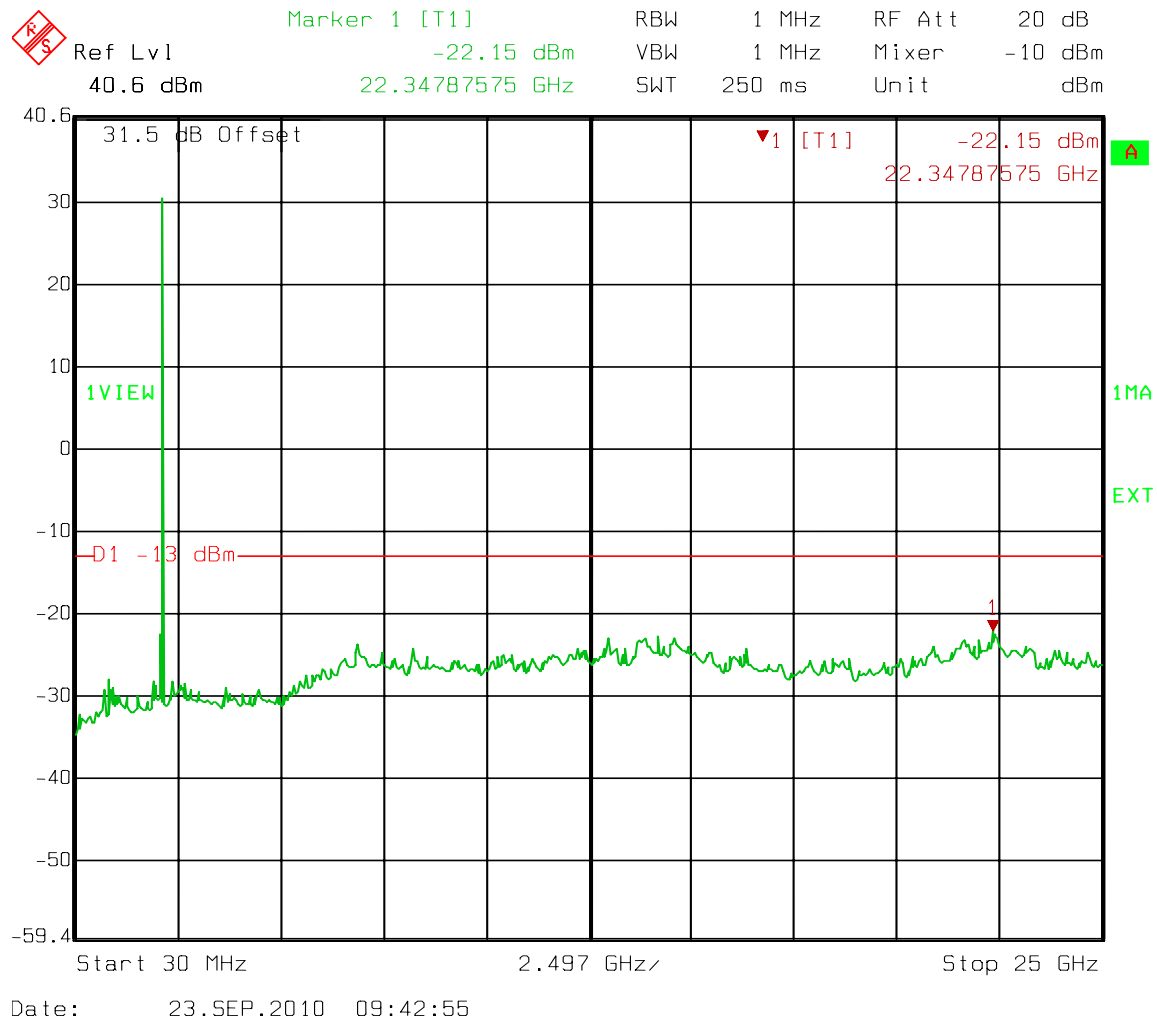
Date: 23.SEP.2010 09:28:52

**Test Data – Spurious Emissions at Antenna Terminals**

WCDMA/UMTS

SPURS

2100 band



Test Data – Spurious Emissions at Antenna Terminals

2100 Band

LTE

Lower band edge



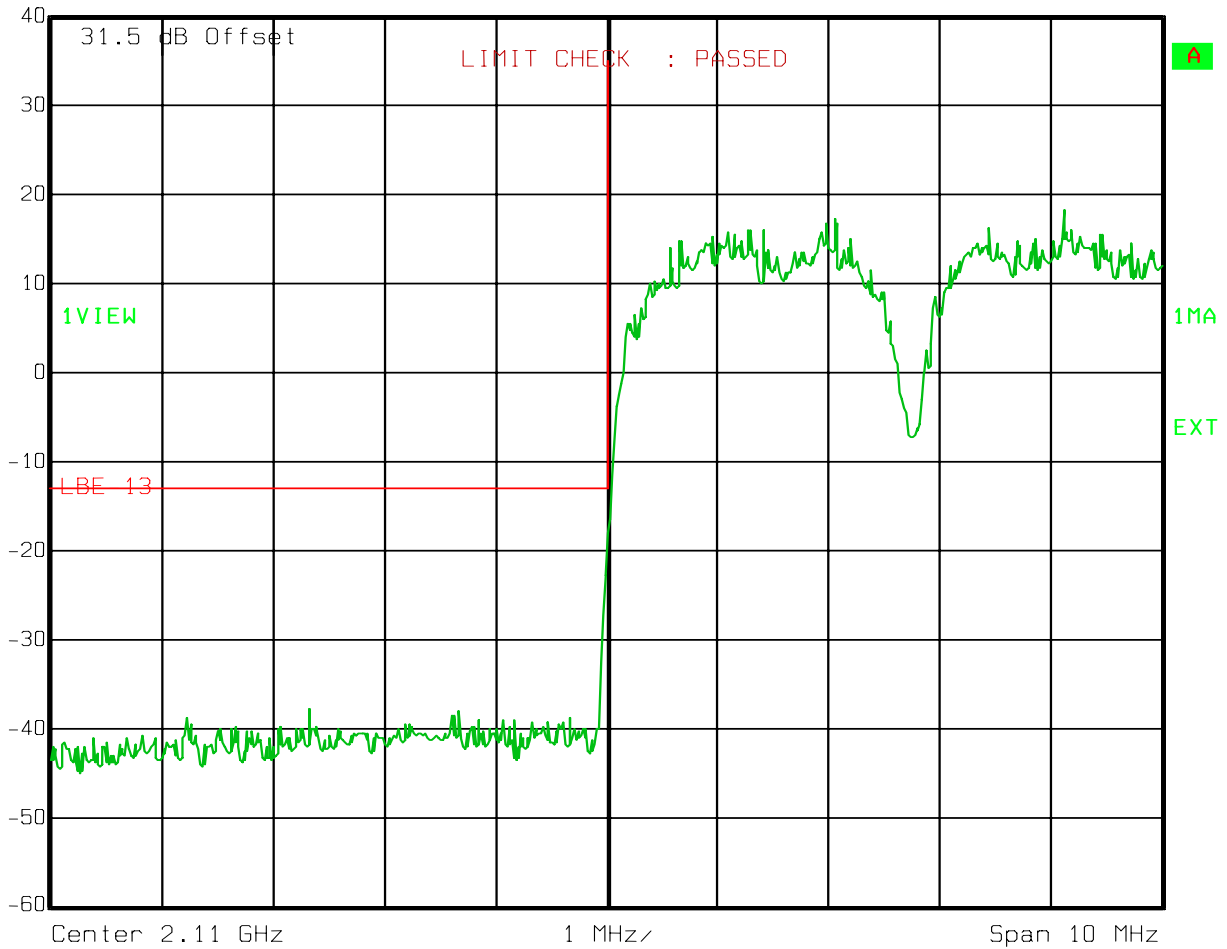
Ref Lvl

40 dBm

RBW 30 kHz RF Att 20 dB

VBW 30 kHz

SWT 28 ms Unit dBm



Date: 13.OCT.2010 14:25:15



Test Data – Spurious Emissions at Antenna Terminals

2100 Band

LTE

Upper band edge



Ref Lvl

40 dBm

RBW 30 kHz RF Att 20 dB

VBW 30 kHz

SWT 28 ms Unit dBm



Date: 13.OCT.2010 14:26:06

Test Data – Spurious Emissions at Antenna Terminals

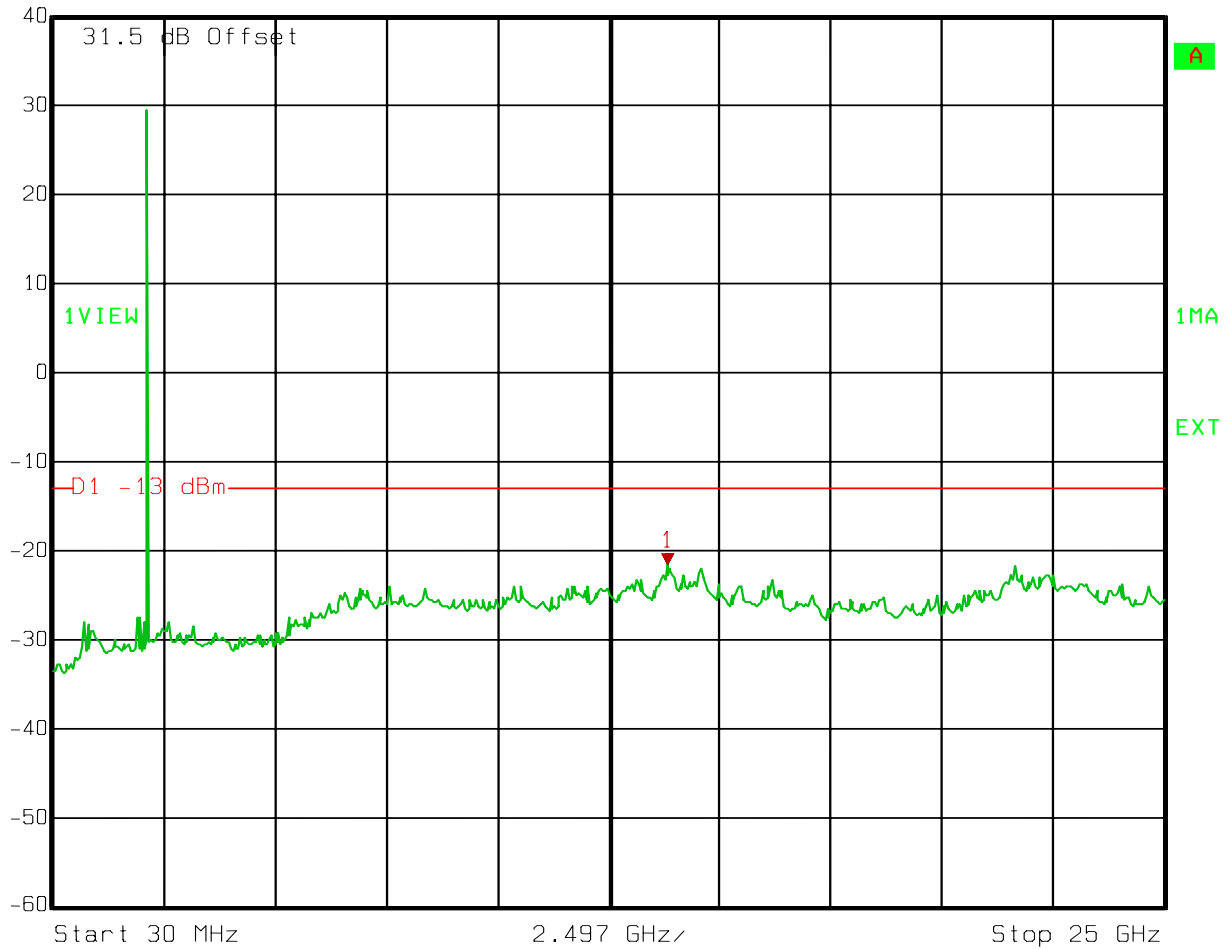
2100 Band

LTE

Spurious



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
 Ref Lvl -21.57 dBm VBW 1 MHz  
 40 dBm 13.84106212 GHz SWT 250 ms Unit dBm



Date: 13.OCT.2010 14:23:51

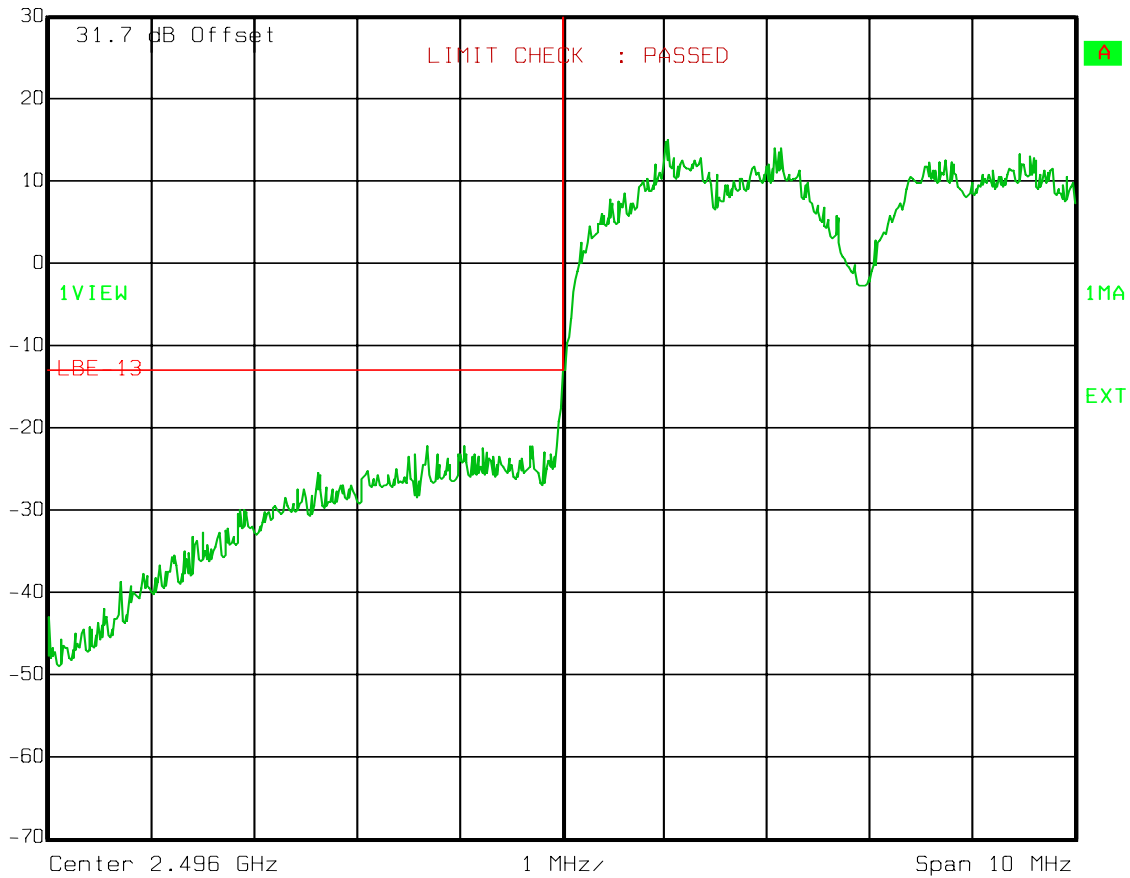
Test Data – Spurious Emissions at Antenna Terminals

Lower Edge  
LTE/WiMax  
2600 band



Ref Lvl  
30 dBm

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



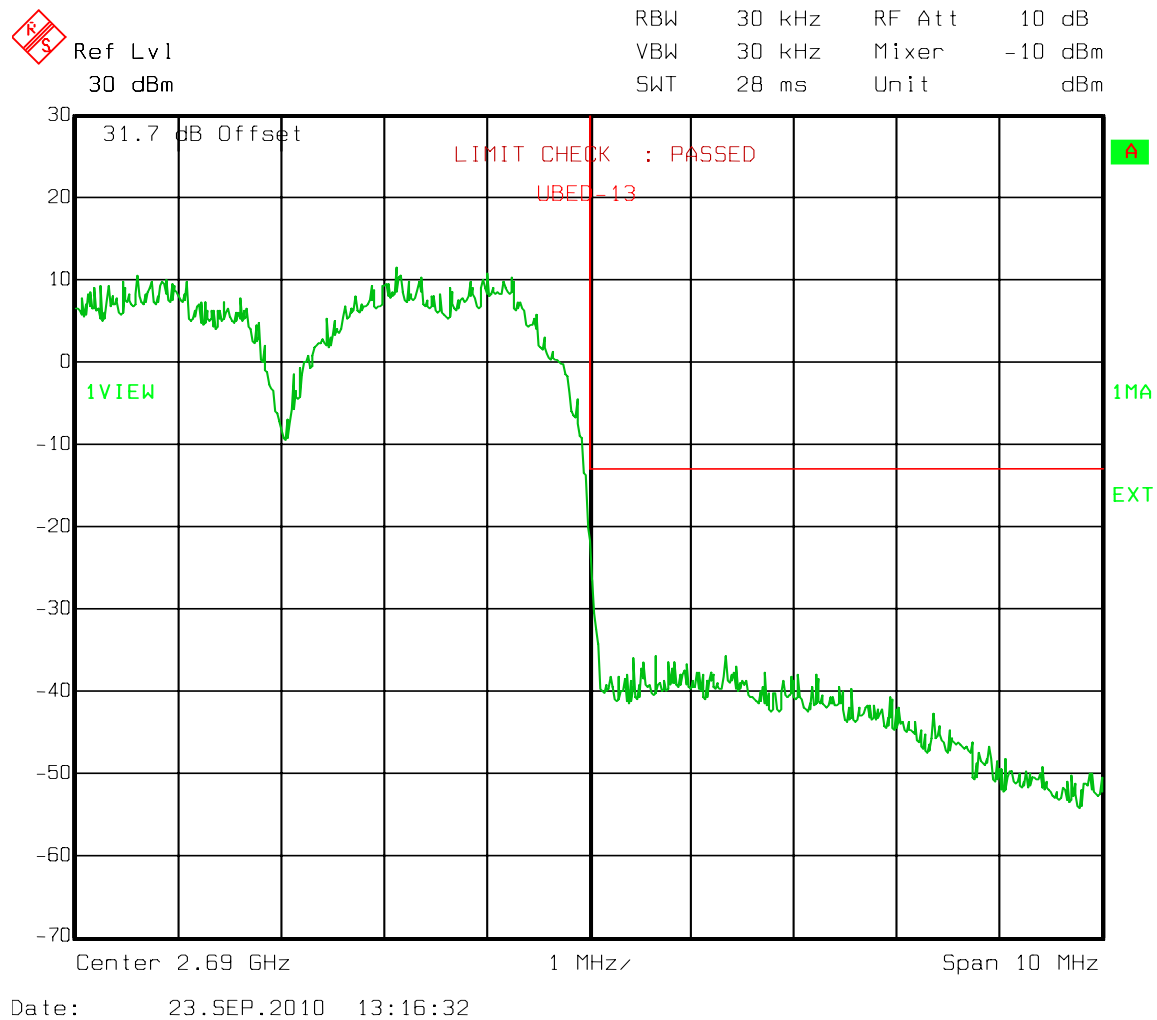
Date: 23.SEP.2010 13:15:16

**Test Data – Spurious Emissions at Antenna Terminals**

Upper Edge

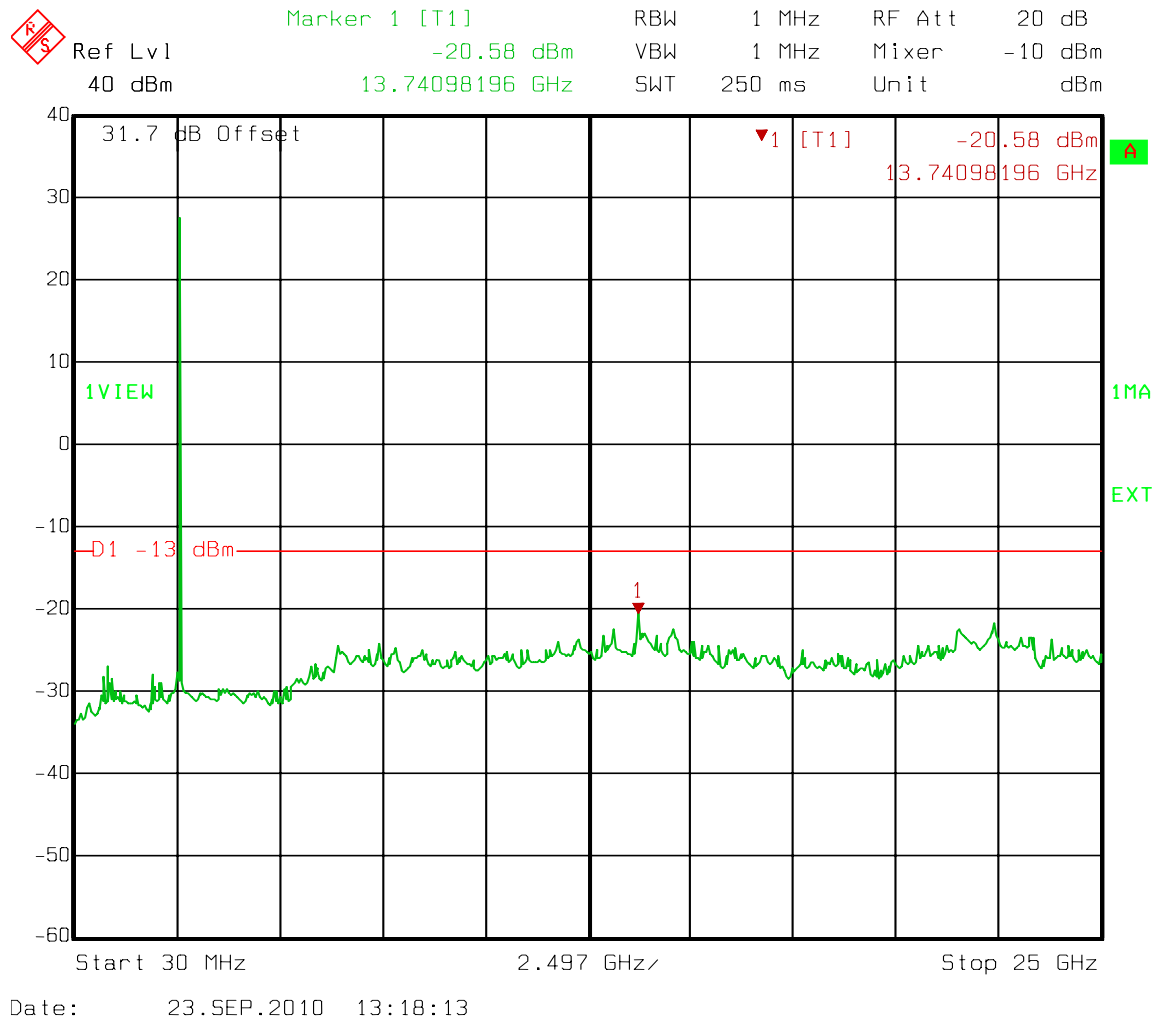
LTE/WiMax

2600 band



**Test Data – Spurious Emissions at Antenna Terminals**

Spurs  
LTE/WiMax  
2600 band



**Section 6. Field Strength of Spurious**

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 27.53
TESTED BY: David Light	DATE: 23 September 2010

**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.

**Equipment Used:** 1464-1484-1485-1016-993-791-1763

**Measurement Uncertainty:** +/-1.7 dB

**Temperature:** 22 °C

**Relative Humidity:** 48 %

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

**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
1036	Spectrum Analyzer	Rohde & Schwartz	FSEK30	830844/006	19-Jan-2009	19-Jan-2011
1082	Cable, 2m	Astrolab	32027-2- 29094-72TC		N/R	
1464	Spectrum Analyzer	Hewlett Packard	8563E	3551A04428	27-Feb-2009	27-Feb-2011
1469	Attenuator, 10 db, DC 18 Ghz	MCL Inc.	BW-S10W2 10db-2WDC		N/R	
1472	Attenuator, 20dB, DC 18 Ghz	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	28-Jan-2010	28-Jan-2011
791	PreAmp	Nemko, USA			08-Mar-2010	08-Mar-2011

## **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.

<b>NAME OF TEST: Field Strength of Spurious Radiation</b>	<b>PARA. NO.: 27.53</b>
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**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.

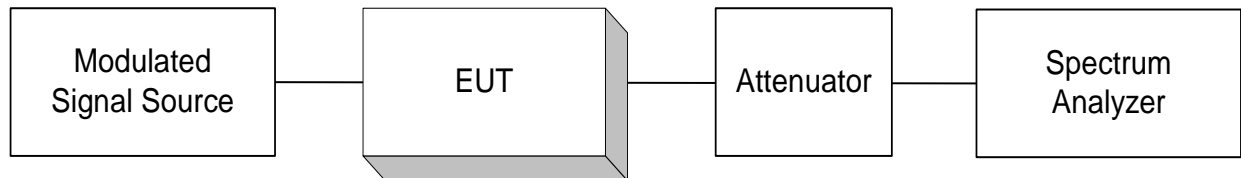
**Method of Measurement**

ANSI/TIA -603-C-2004

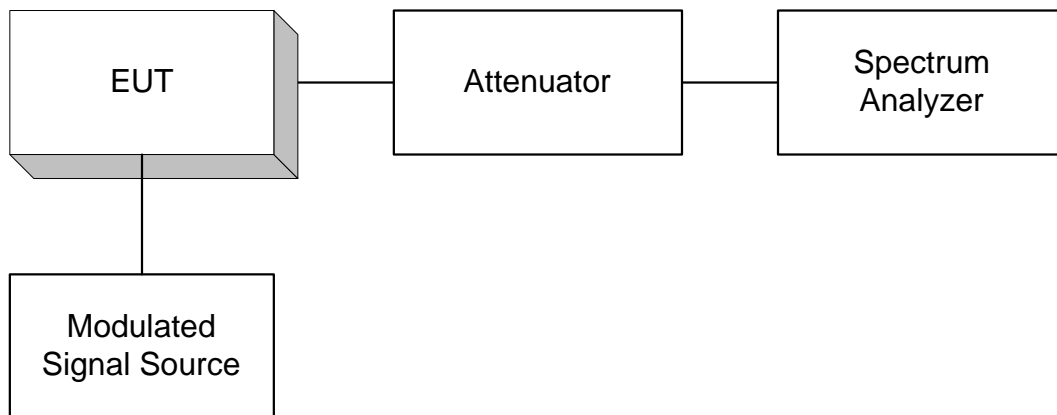
The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna 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**

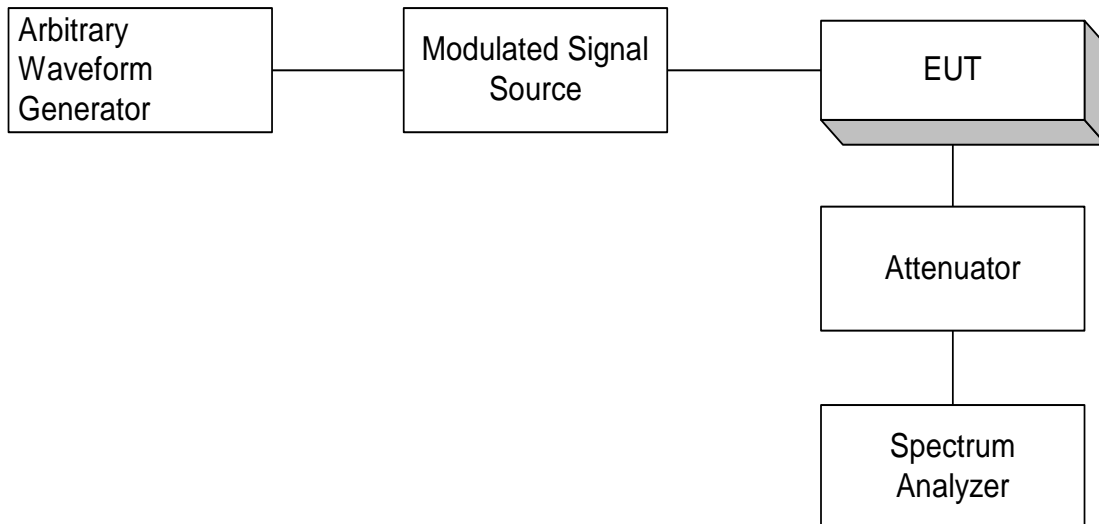
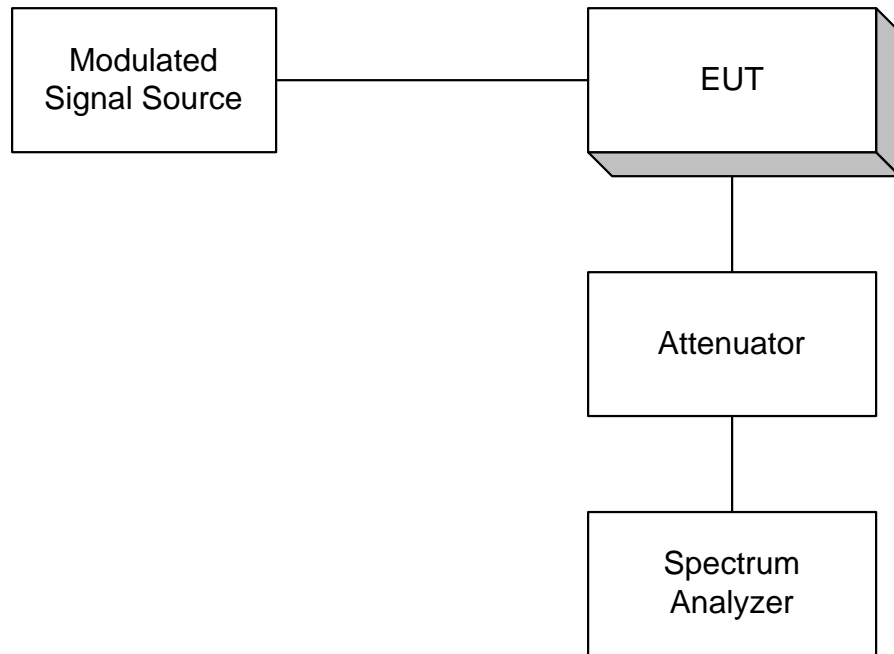
**Para. No. 2.985 - R.F. Power Output**



**Para. No. 2.989 - Occupied Bandwidth**



**Para. No. 2.991 Spurious Emissions at Antenna Terminals**



**Para. No. 2.993 - Field Strength of Spurious Radiation**

