



Nemko Test Report: 1028473RUS1

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

Equipment Under Test: TFAH-US7/17
(E.U.T.)

FCC Identifier: BCR-TFAHUS717

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', is written over a horizontal line.

David Light, Senior Wireless Engineer

DATE: 01 June 2011

APPROVED BY:

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

Tom Tidwell, Reviewer

DATE: 17 June 2011

Number of Pages: 51

Table of Contents

SECTION 1.	SUMMARY OF TEST RESULTS	3
SECTION 2.	GENERAL EQUIPMENT SPECIFICATION	5
SECTION 3.	RF POWER OUTPUT	7
SECTION 4.	OCCUPIED BANDWIDTH	8
SECTION 5.	SPURIOUS EMISSIONS AT ANTENNA TERMINALS	19
SECTION 6.	FIELD STRENGTH OF SPURIOUS	40
SECTION 7.	TEST EQUIPMENT LIST	42
ANNEX A - TEST DETAILS		43
ANNEX B - TEST DIAGRAMS		48

Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAH-US7/17

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".



NVLAP Lab Code 100426-0

Nemko USA, Inc. authorizes the above named company to reproduce this report provided it is reproduced in its entirety, for use by the company's employees only.

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government. Nemko USA, Inc. is a NVLAP accredited laboratory.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko USA, Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

Summary Of Test Data

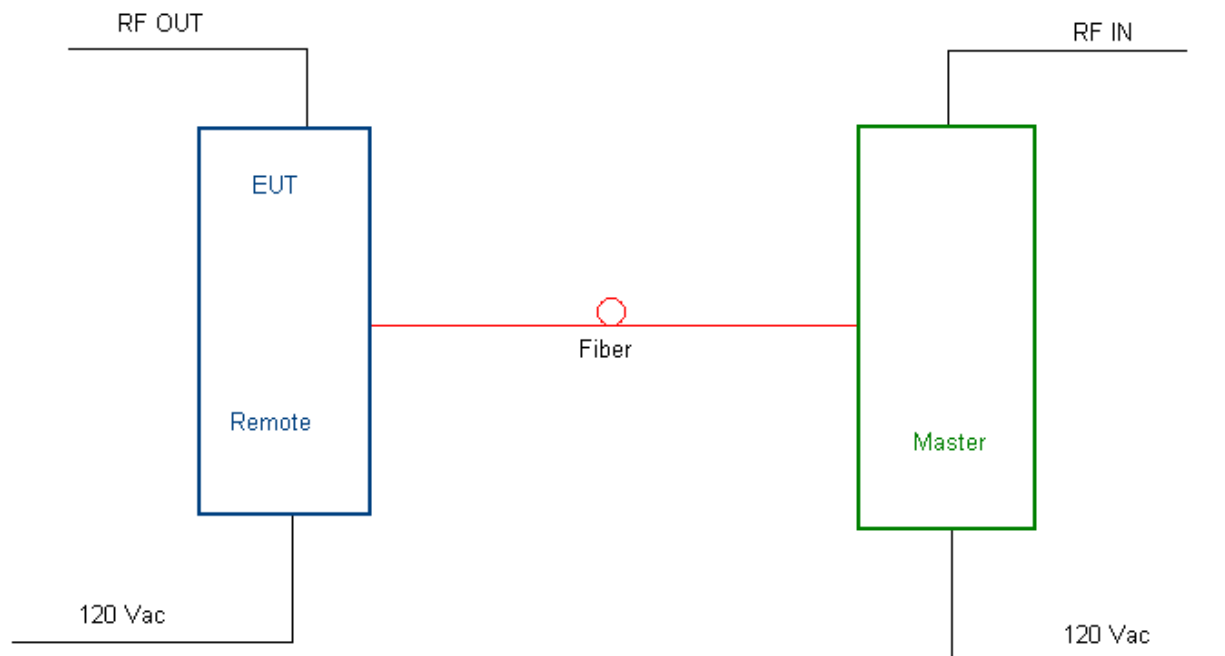
NAME OF TEST	PARA. NO.	RESULT
RF Power Output	27.50(d)	Complies
Occupied Bandwidth	2.1049	Complies
Spurious Emissions at Antenna Terminals	27.53(g)	Complies
Field Strength of Spurious Emissions	27.53(f)	Complies
Field Strength of Spurious Emissions	27.53(g)	Complies
Frequency Stability	27.54	NA

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	$\frac{NA}{NA} \text{ W}$ dBm		
Frequency Translation:	F1-F1 ☒	F1-F2 ☐	N/A ☐
Band Selection:	Software ☐	Duplexer ☐	Fullband ☒

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

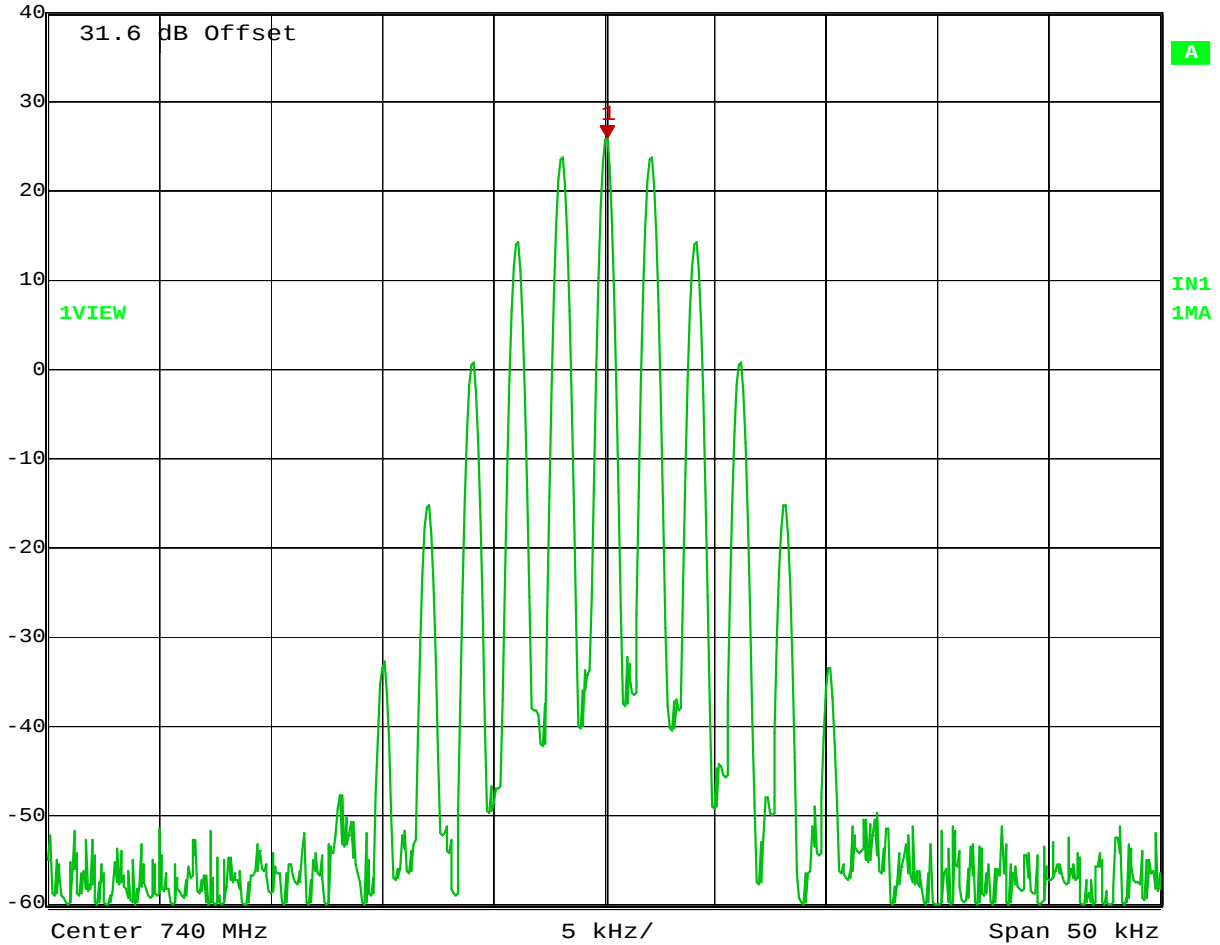
Analog

2 kHz tone / 2.5 kHz deviation

Output



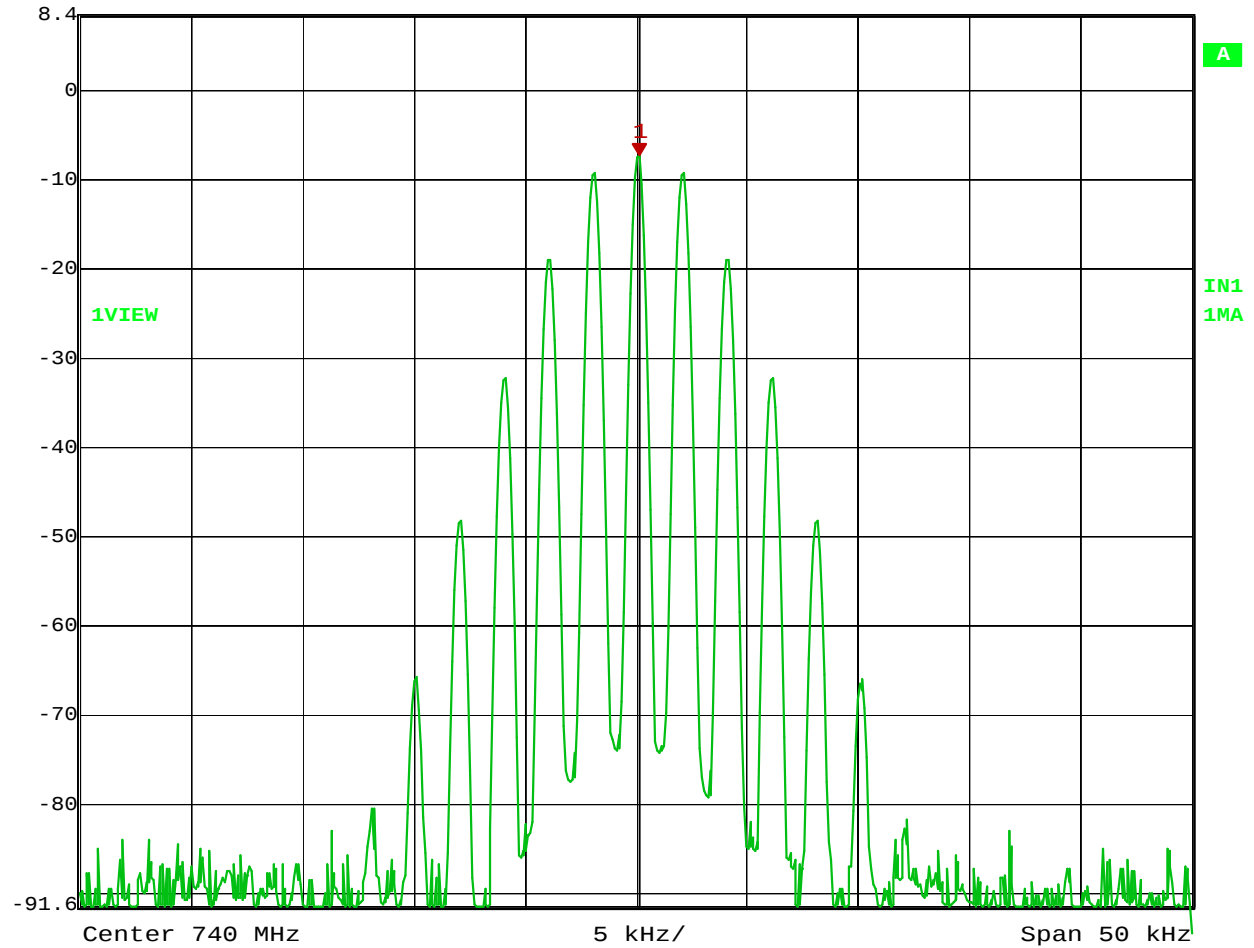
Ref Lvl	Marker 1 [T1]	RBW	300 Hz	RF Att	30 dB
40 dBm	25.79 dBm	VBW	300 Hz		
	740.00015030 MHz	SWT	2.8 s	Unit	dBm



Test Data – Occupied Bandwidth

Analog
Input

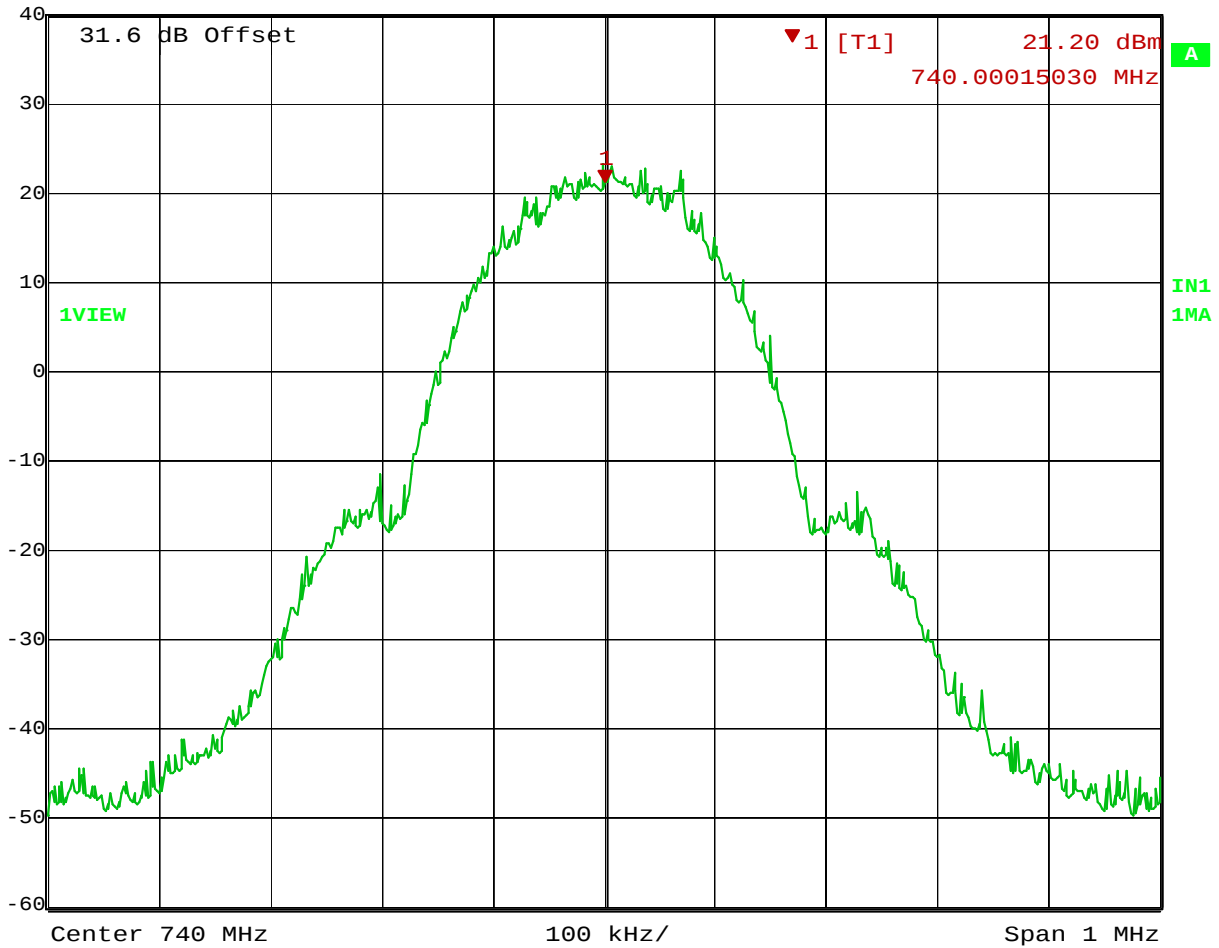
 Ref Lvl 8.4 dBm Marker 1 [T1] -7.41 dBm RBW 300 Hz RF Att 30 dB
740.00015030 MHz VBW 300 Hz Unit dBm
SWT 2.8 s



Test Data – Occupied Bandwidth

GSM
Output


 Marker 1 [T1] RBW 3 kHz RF Att 30 dB
 Ref Lvl 21.20 dBm VBW 3 kHz
 40 dBm 740.00015030 MHz SWT 280 ms Unit dBm

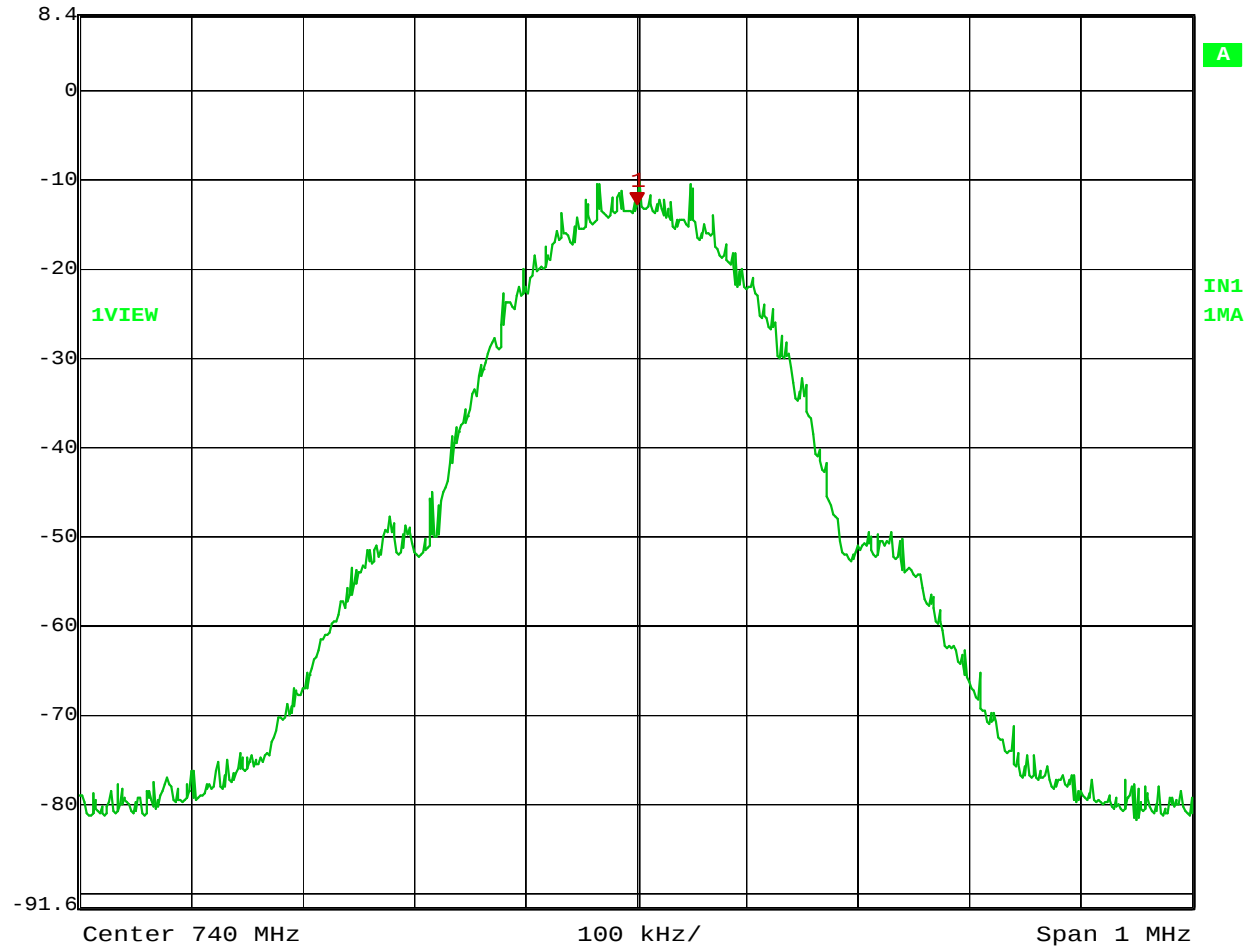


Test Data – Occupied Bandwidth

Input
GSM

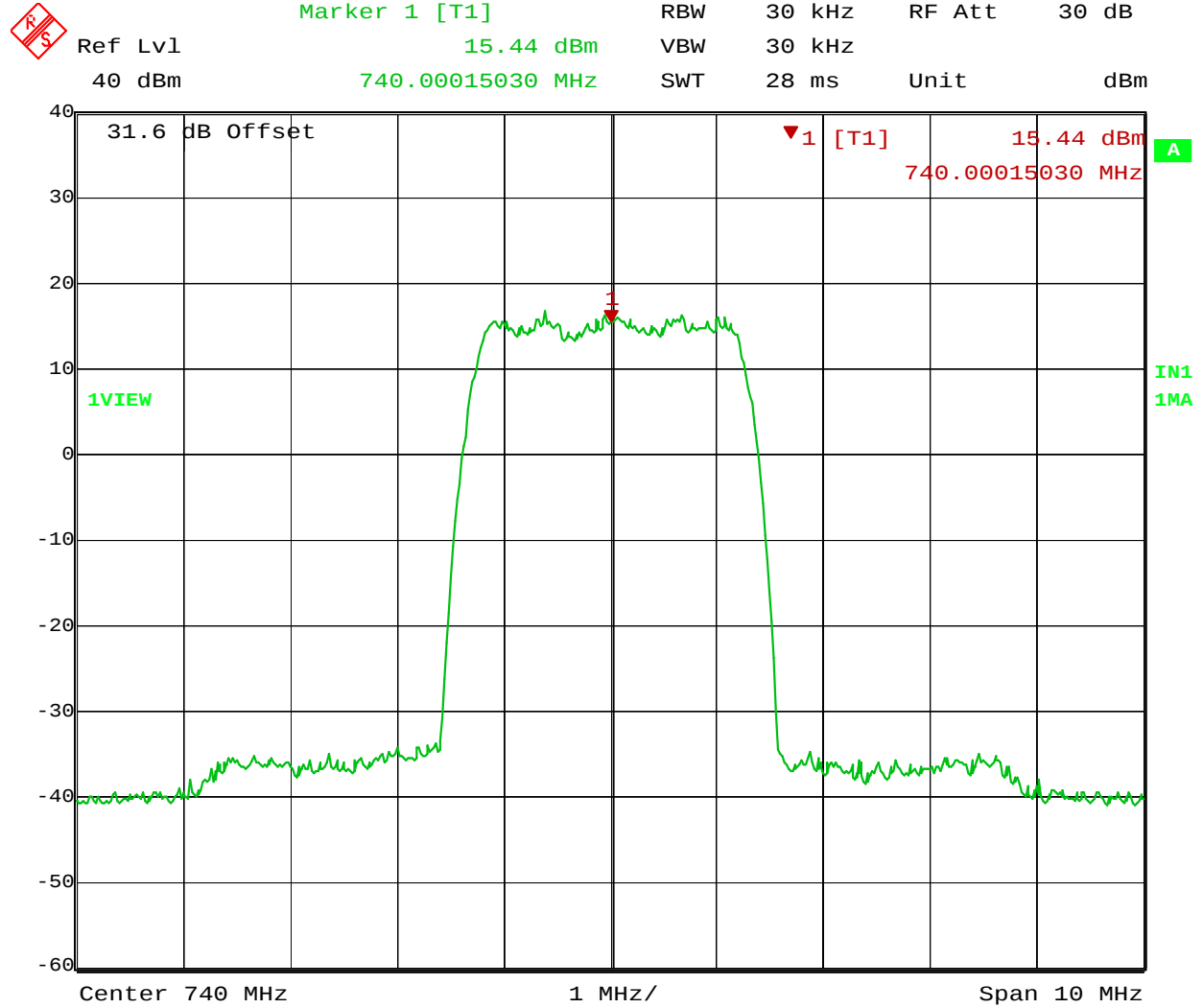


Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	30 dB
8.4 dBm	-12.85 dBm	VBW	3 kHz		
	740.00015030 MHz	SWT	280 ms	Unit	dBm



Test Data – Occupied Bandwidth LTE

Output

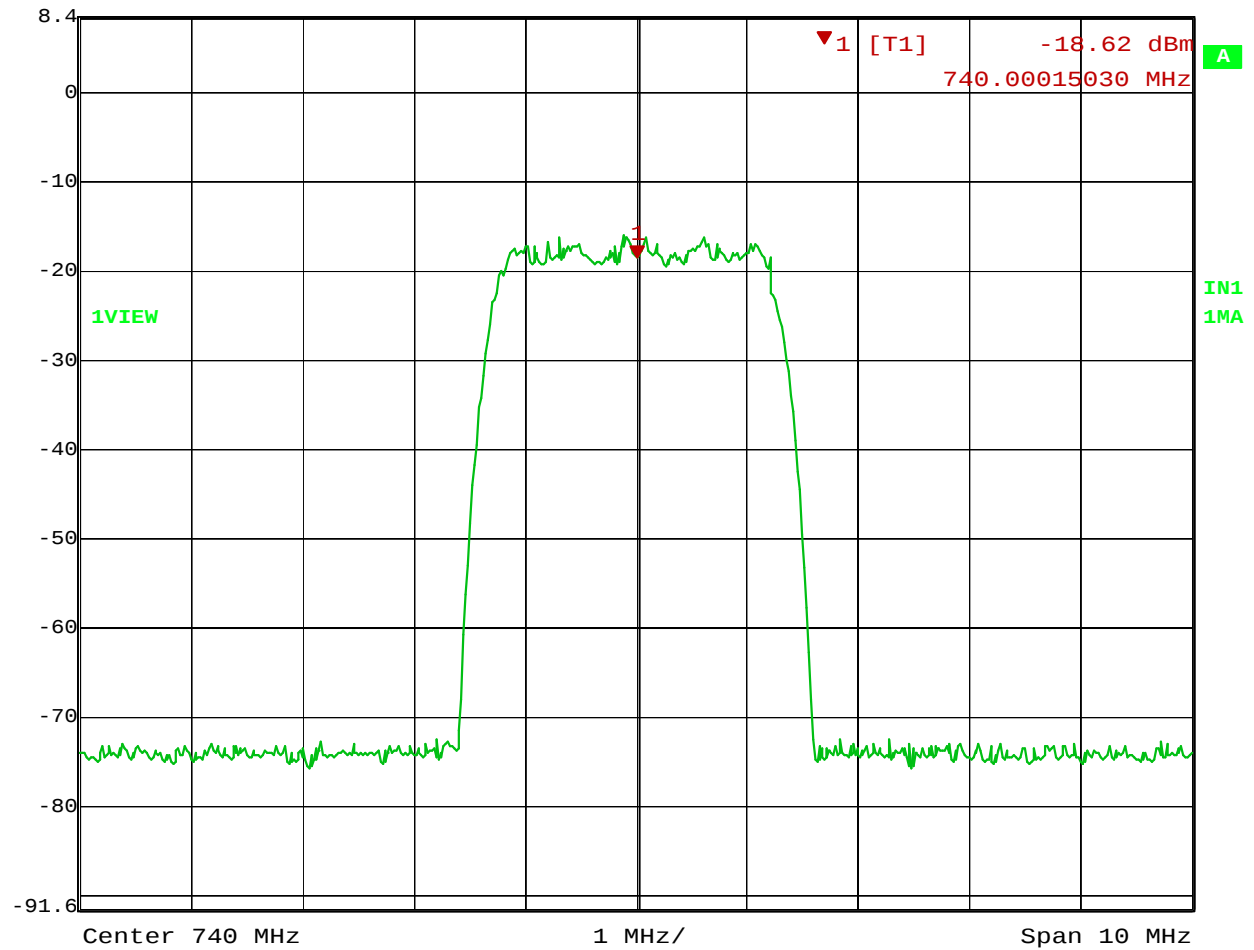


Test Data – Occupied Bandwidth

LTE

Input

	Ref Lvl	Marker 1 [T1]	RBW	30 kHz	RF Att	30 dB
	8.4 dBm	-18.62 dBm	VBW	30 kHz		
		740.00015030 MHz	SWT	28 ms	Unit	dBm

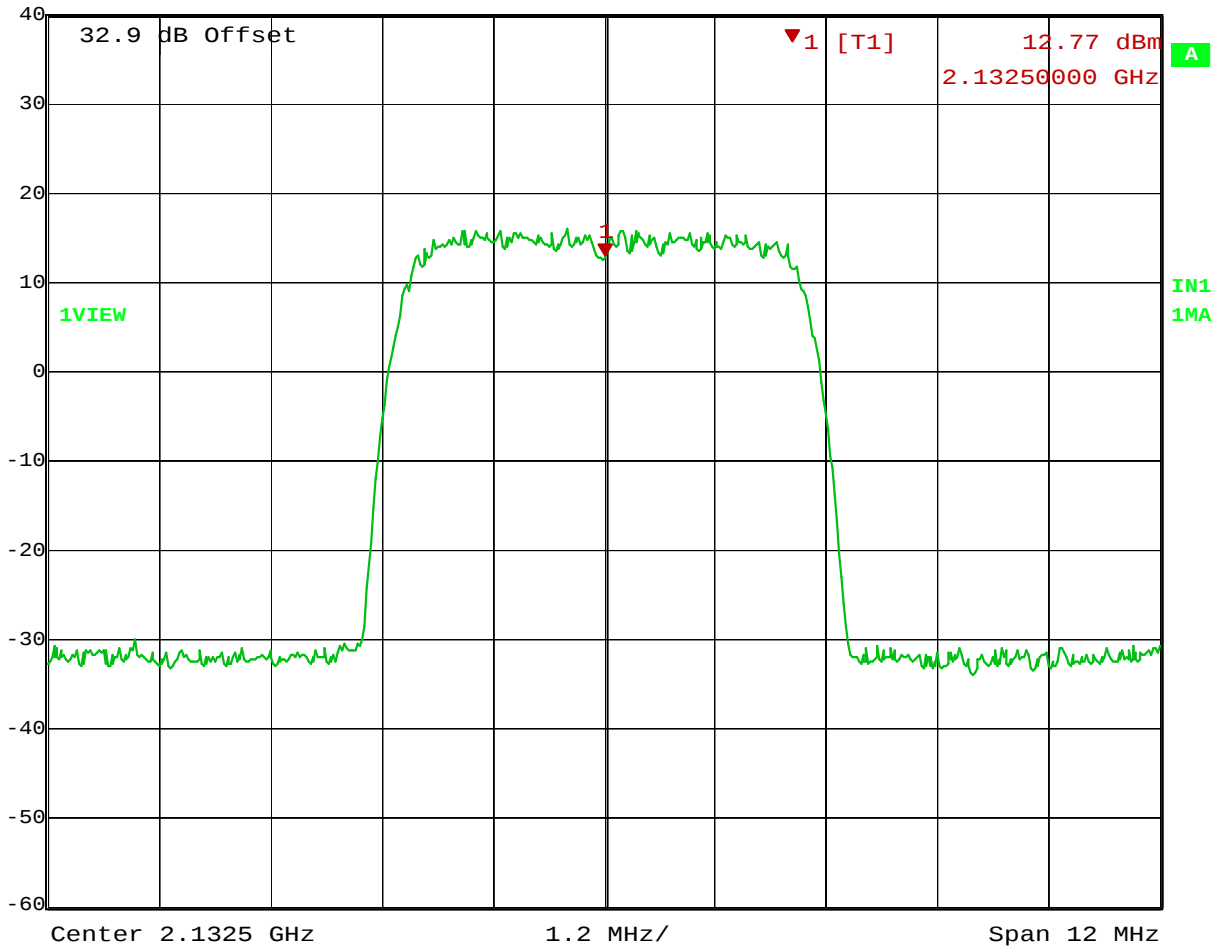


Test Data – Occupied Bandwidth

WCDMA

Output

	Marker 1 [T1]	RBW	50 kHz	RF Att	30 dB
	Ref Lvl	12.77 dBm	VBW	50 kHz	
	40 dBm	2.13250000 GHz	SWT	12 ms	Unit dBm

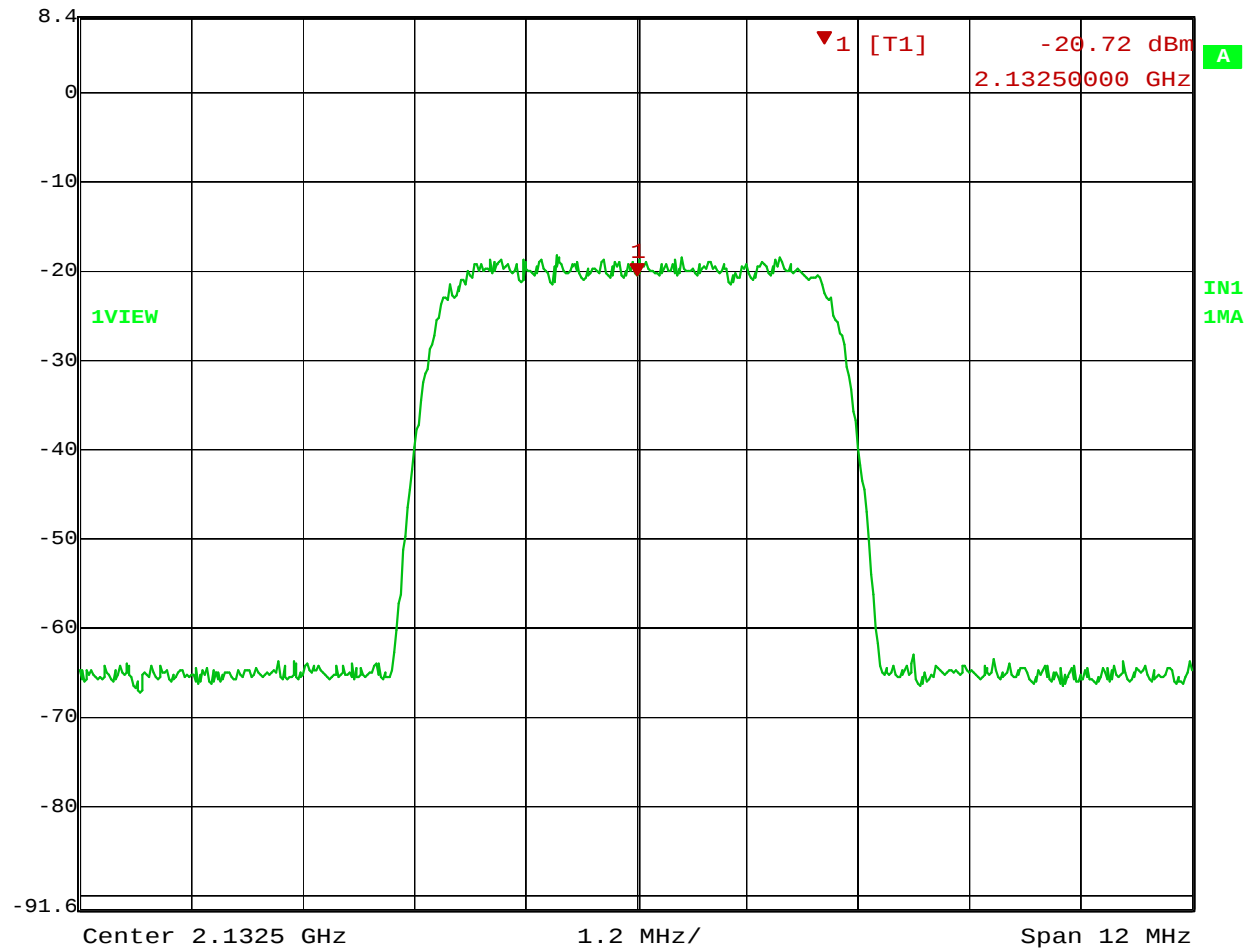


Test Data – Occupied Bandwidth

WCDMA

Input

	Marker 1 [T1]	RBW	50 kHz	RF Att	30 dB
	Ref Lvl	-20.72 dBm	VBW	50 kHz	
	8.4 dBm	2.13250000 GHz	SWT	12 ms	Unit dBm

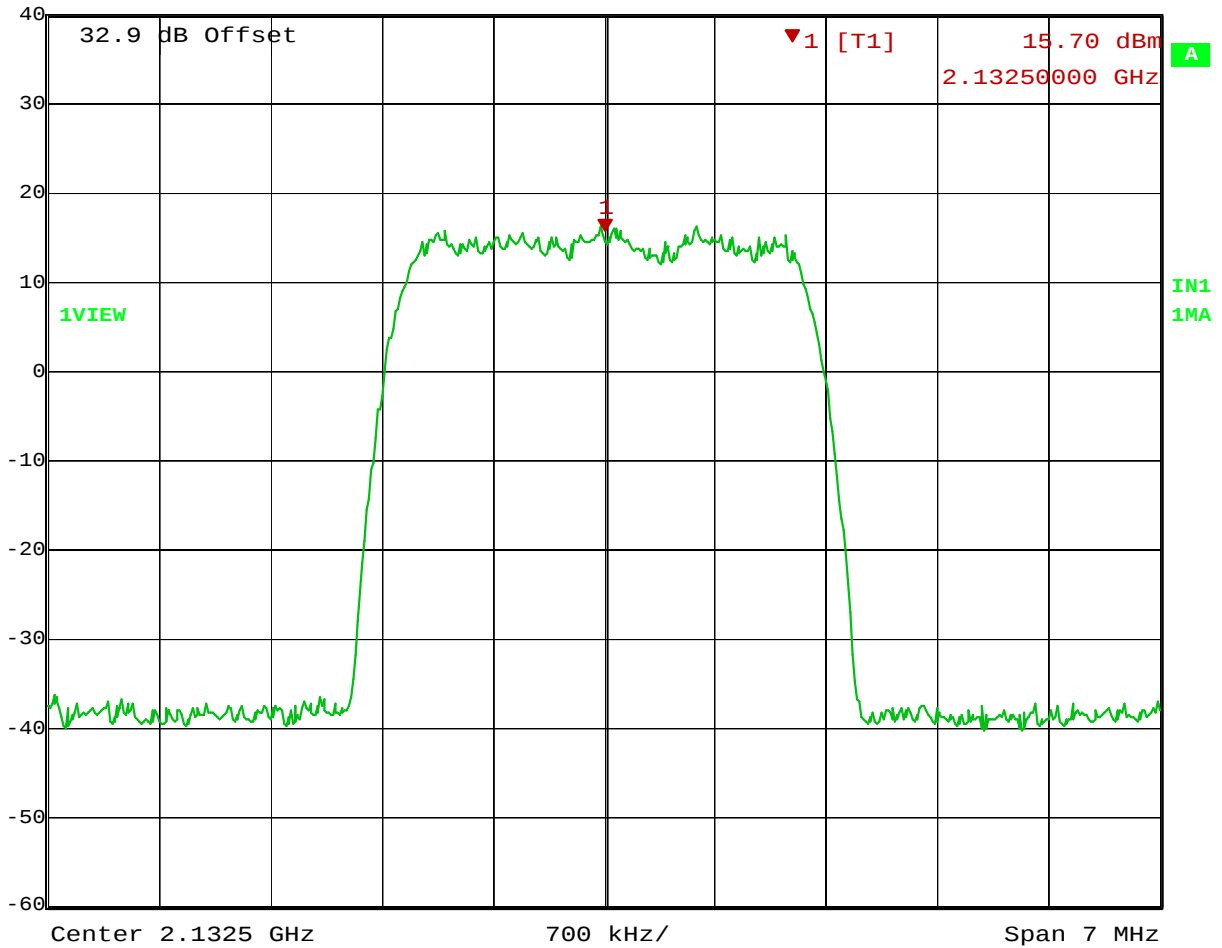


Test Data – Occupied Bandwidth

LTE

Output

	Marker 1 [T1]	RBW	30 kHz	RF Att	30 dB
	Ref Lvl	15.70 dBm	VBW	30 kHz	
	40 dBm	2.13250000 GHz	SWT	19.5 ms	Unit dBm

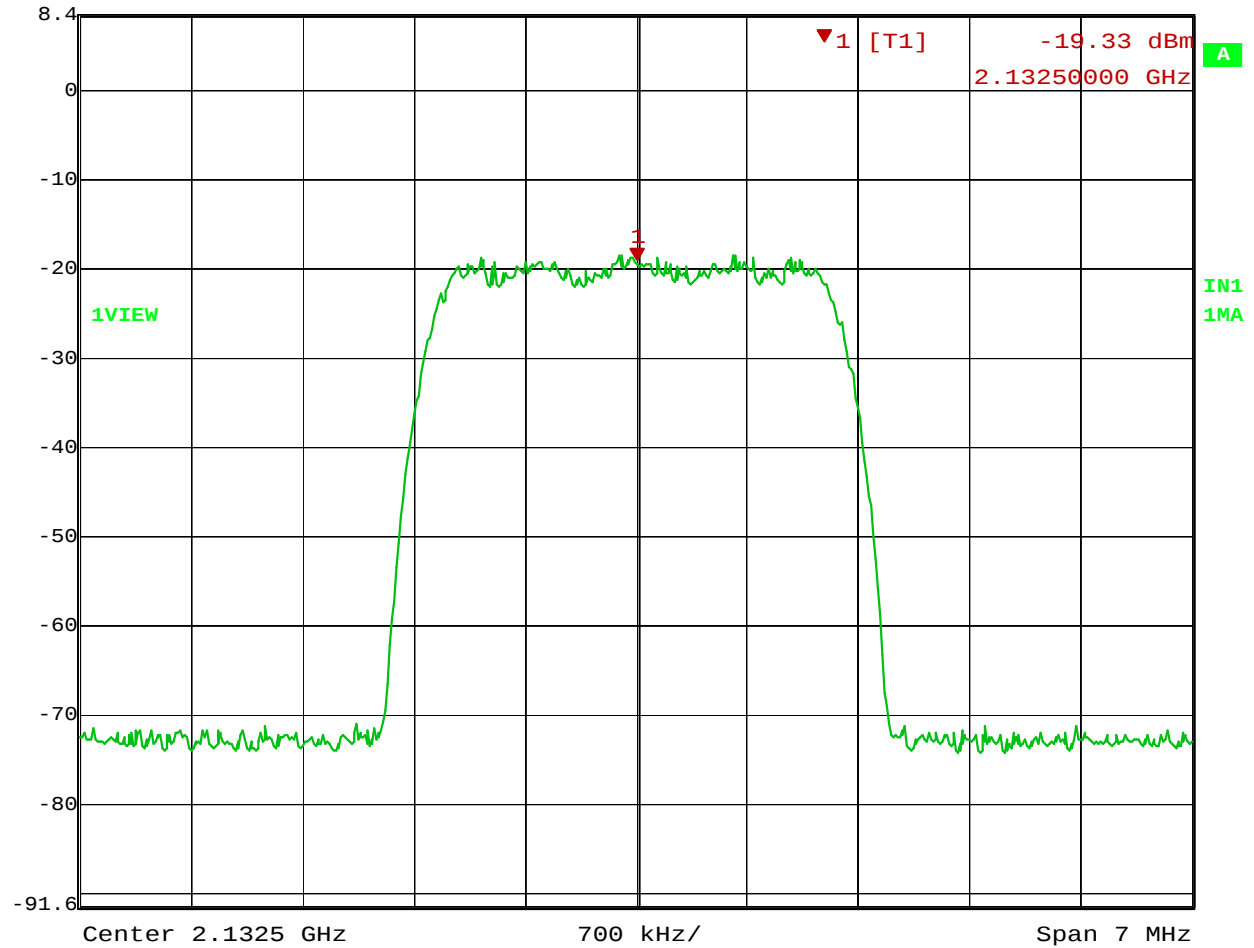


Test Data – Occupied Bandwidth

Input
LTE



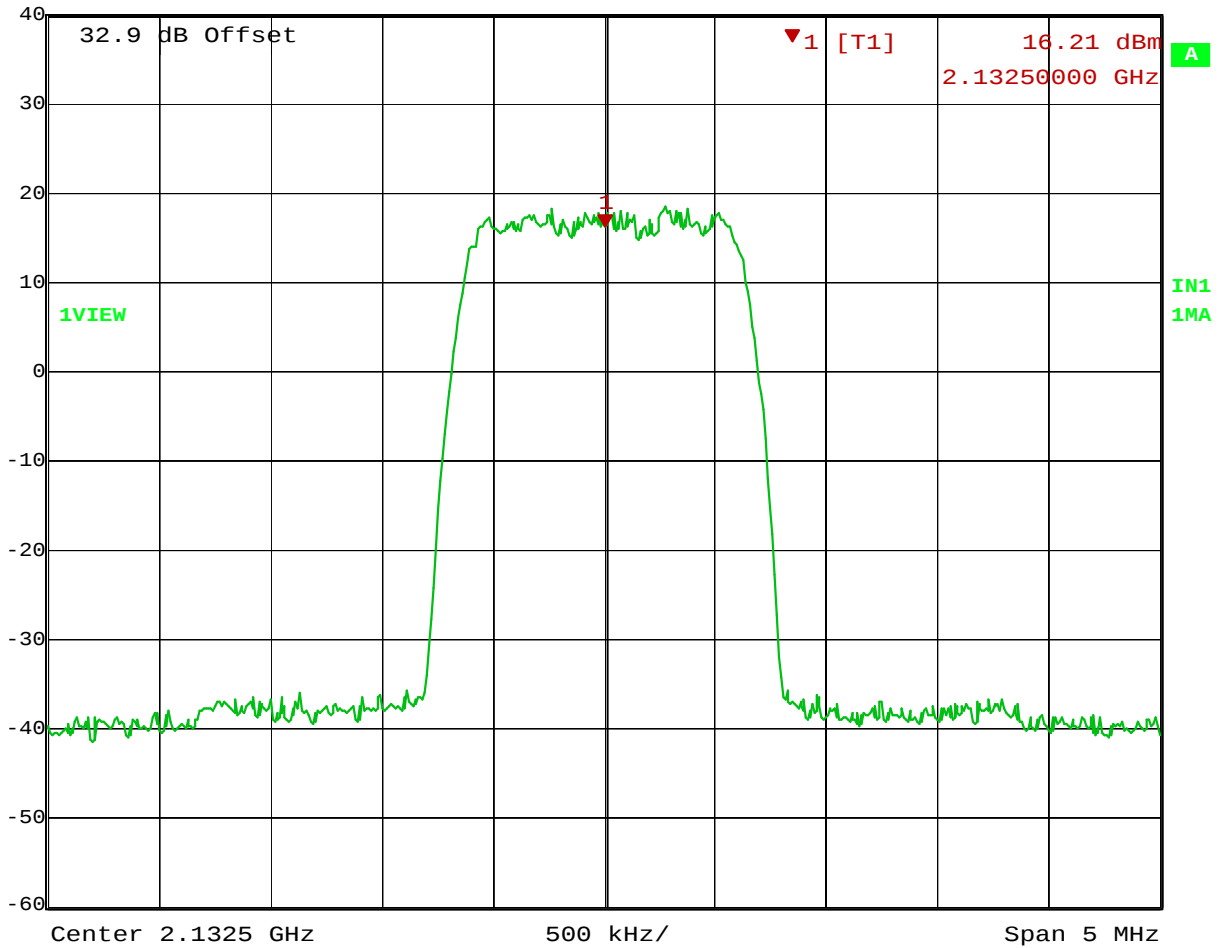
Ref Lvl	Marker 1 [T1]	RBW	30 kHz	RF Att	30 dB
8.4 dBm	-19.33 dBm	VBW	30 kHz		
	2.13250000 GHz	SWT	19.5 ms	Unit	dBm



Test Data – Occupied Bandwidth

CDMA
Output

	Marker 1 [T1]	RBW	30 kHz	RF Att	30 dB
	Ref Lvl	16.21 dBm	VBW	30 kHz	
	40 dBm	2.13250000 GHz	SWT	14 ms	Unit dBm

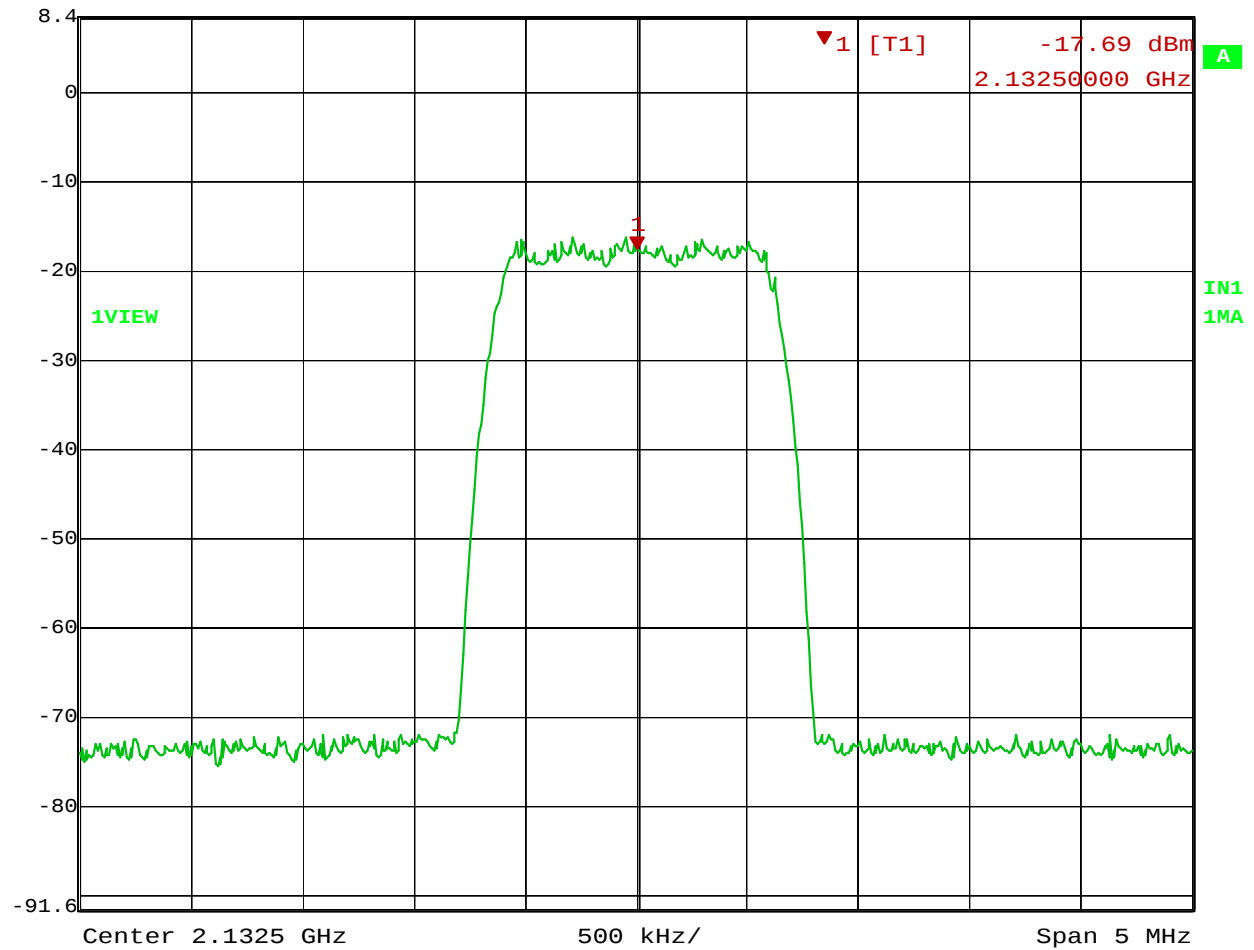


Test Data – Occupied Bandwidth

CDMA

Input

	Marker 1 [T1]	RBW	30 kHz	RF Att	30 dB
	Ref Lvl	-17.69 dBm	VBW	30 kHz	
	8.4 dBm	2.13250000 GHz	SWT	14 ms	Unit dBm



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

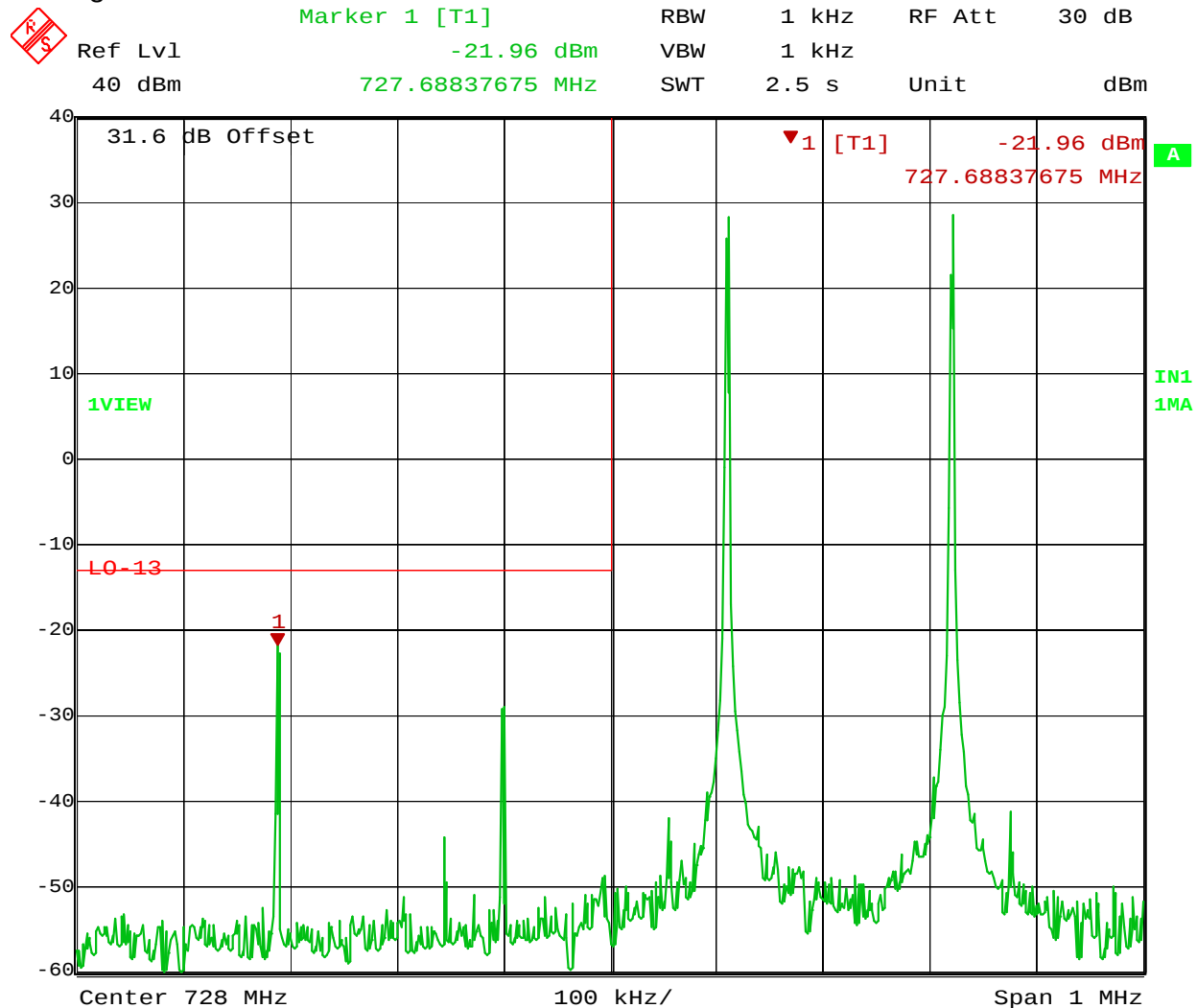
Temperature: 22 °C

Relative Humidity: 48 %

Test Data – Spurious Emissions at Antenna Terminals

Low Edge

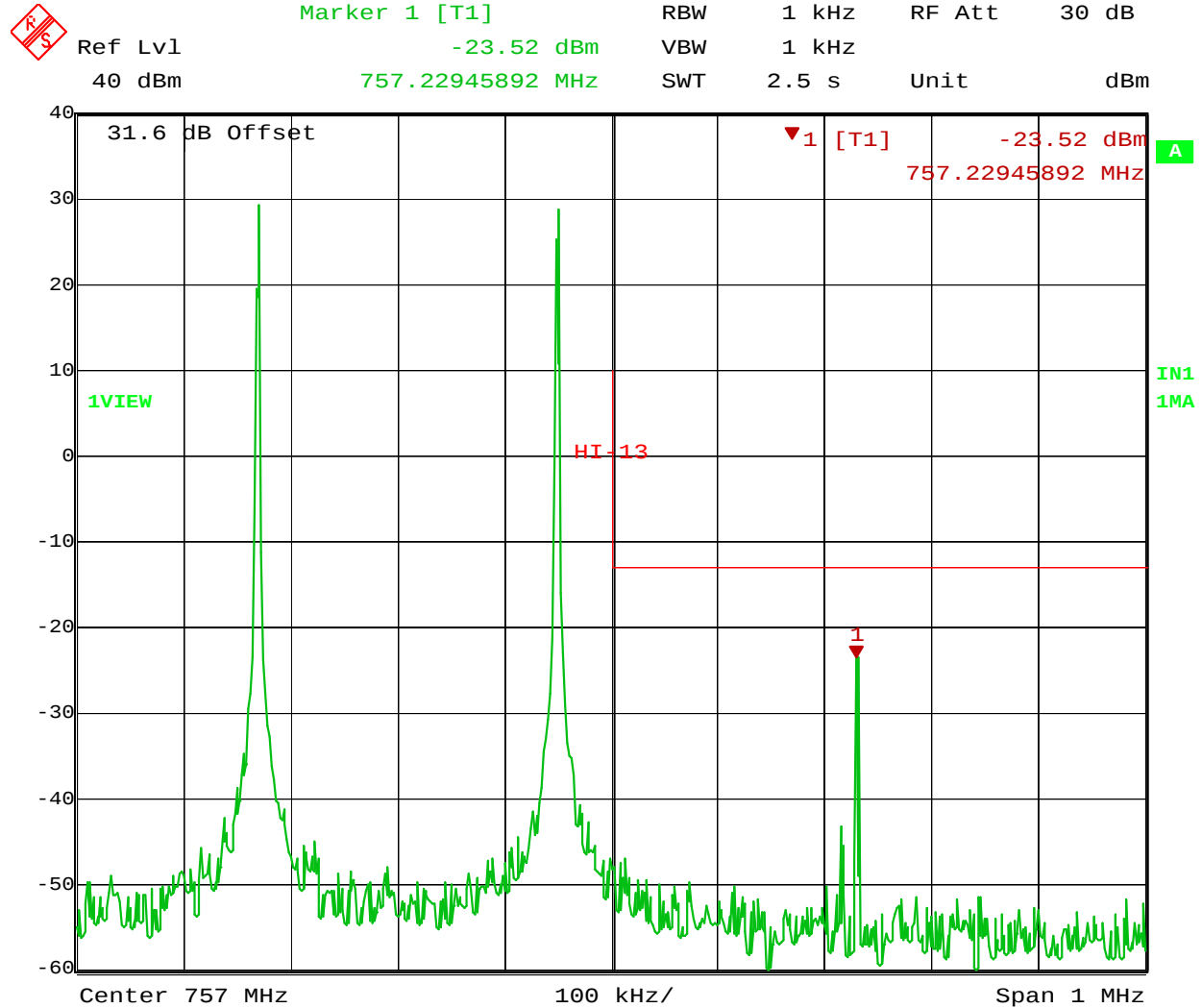
Analog



Test Data – Spurious Emissions at Antenna Terminals

High Edge

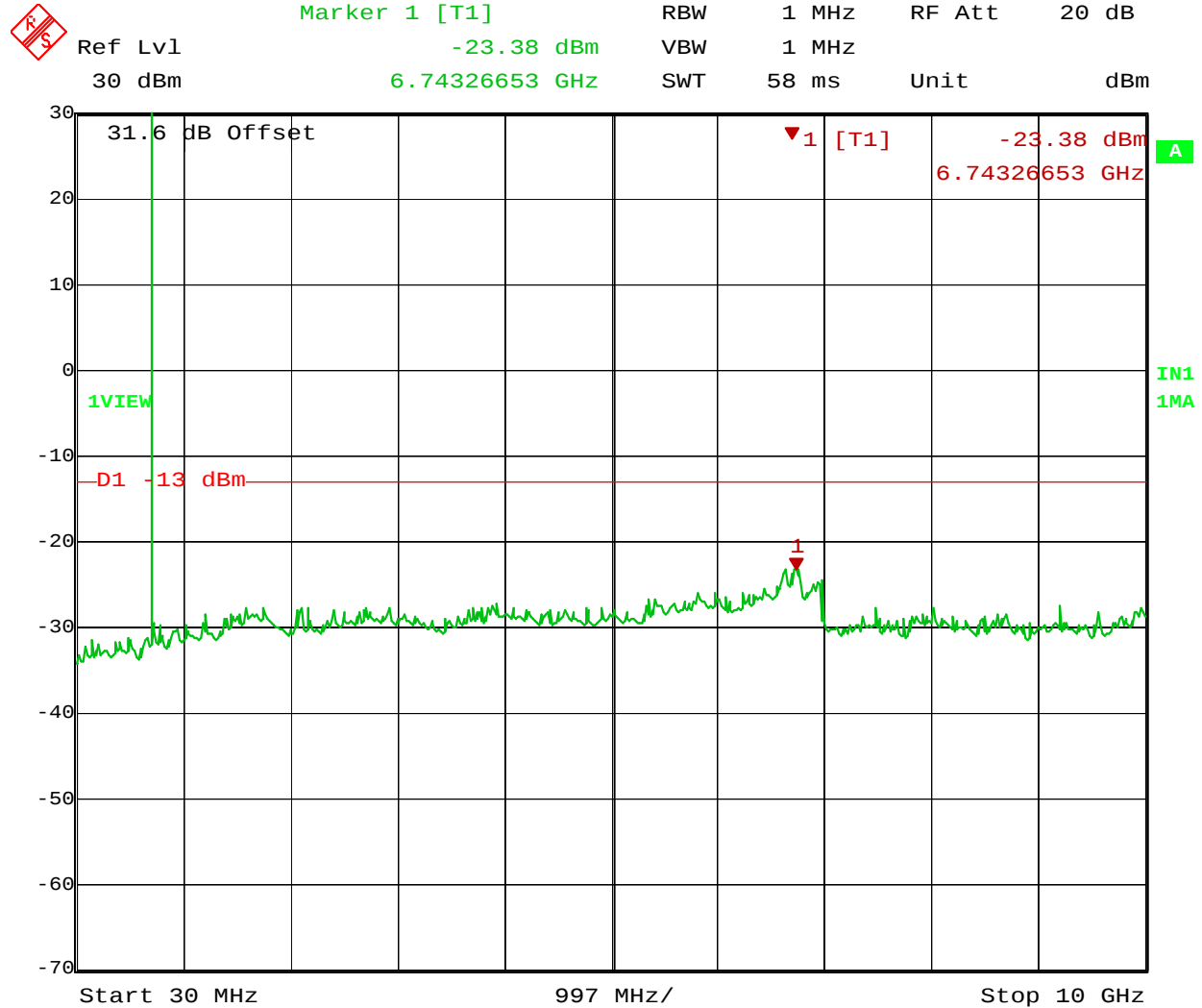
Analog



Test Data – Spurious Emissions at Antenna Terminals

Spurs

Analog

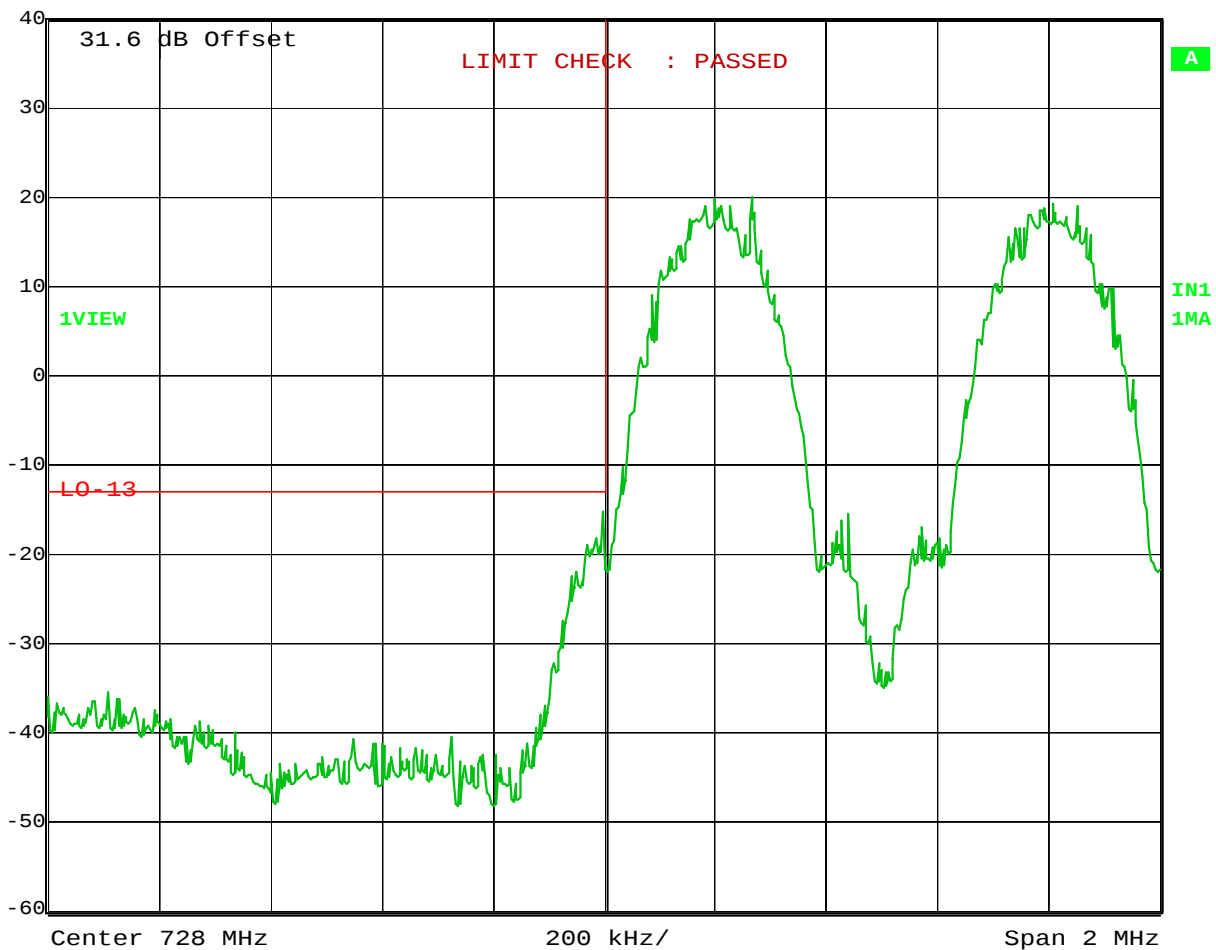


Test Data – Spurious Emissions at Antenna Terminals

GSM

Lower Edge

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



Test Data – Spurious Emissions at Antenna Terminals

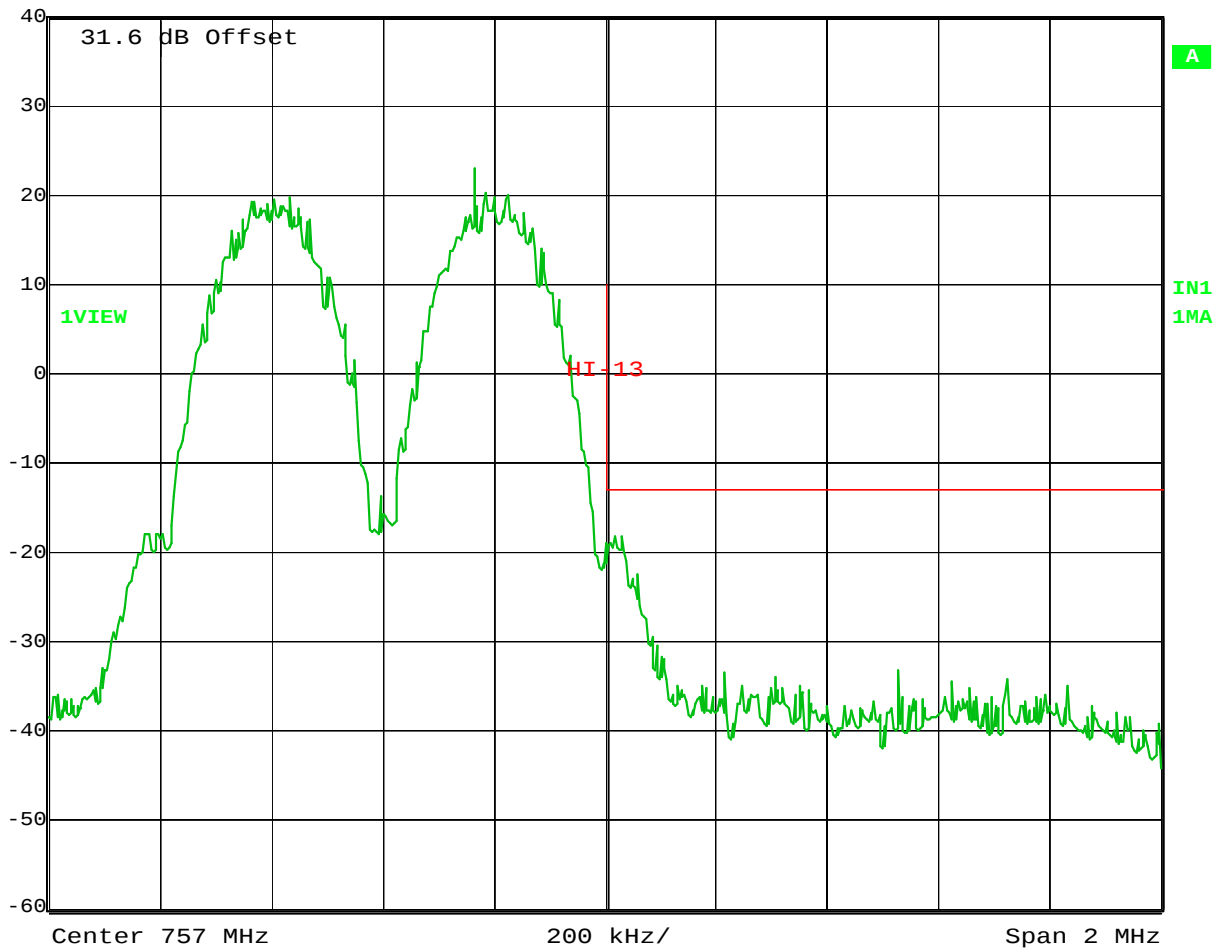
GSM

Upper Edge



Ref Lvl
40 dBm

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



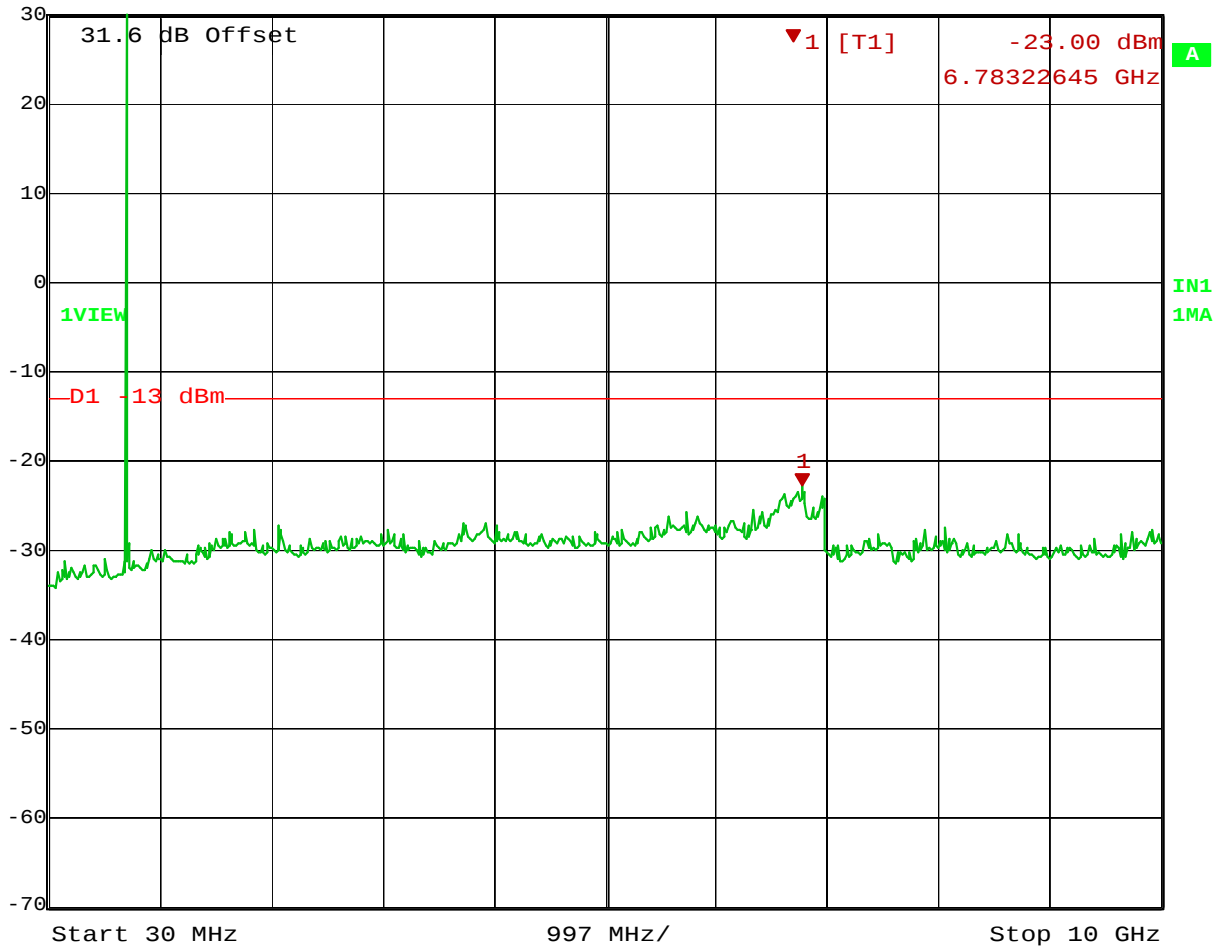
Test Data – Spurious Emissions at Antenna Terminals

Spurs

GSM



Marker 1 [T1] RBW 1 MHz RF Att 20 dB
 Ref Lvl -23.00 dBm VBW 1 MHz
 30 dBm 6.78322645 GHz SWT 58 ms Unit dBm



Test Data – Spurious Emissions at Antenna Terminals

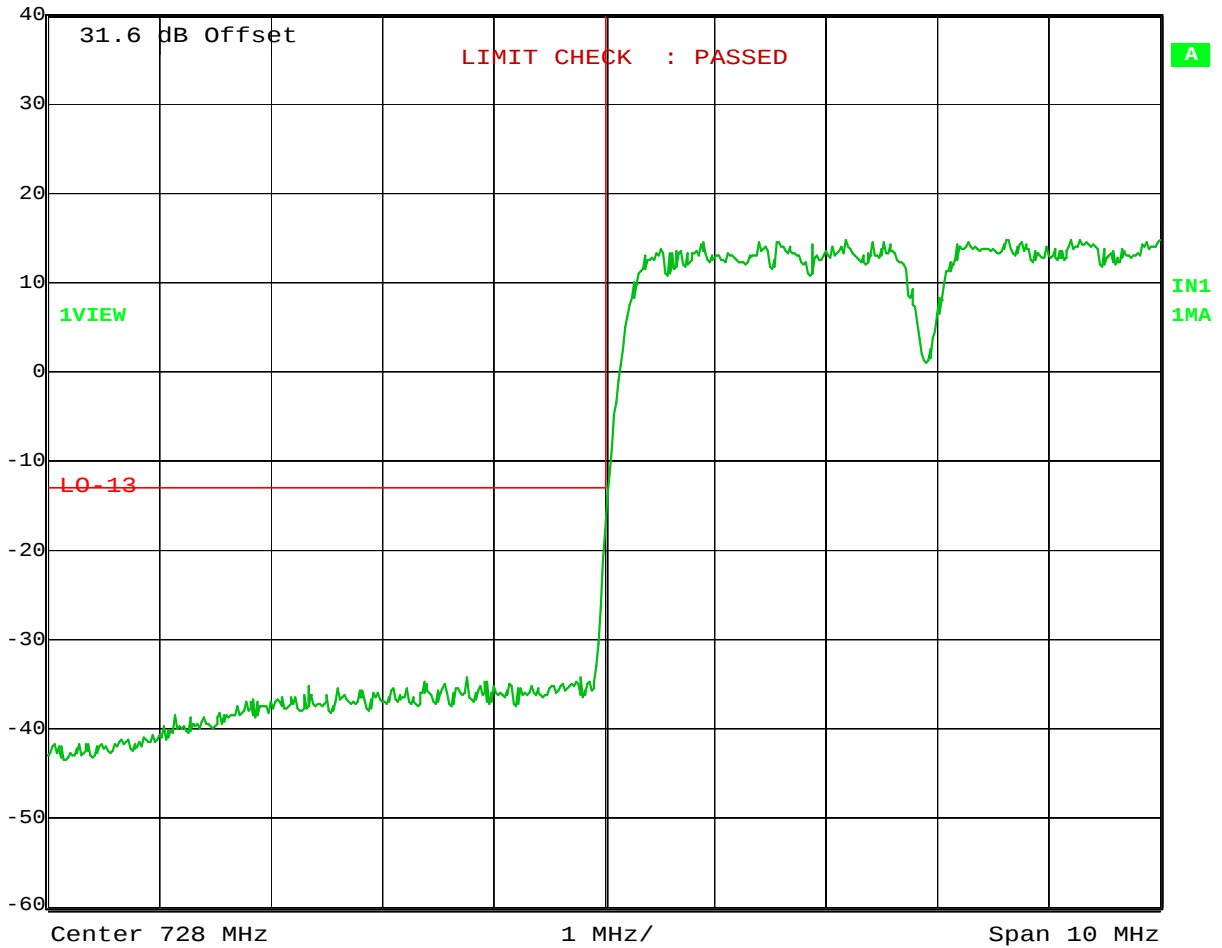
Lower Edge

LTE



Ref Lvl
40 dBm

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



Test Data – Spurious Emissions at Antenna Terminals

Upper Edge

LTE



Ref Lvl

40 dBm

RBW

30 kHz

RF Att

30 dB

VBW

30 kHz

SWT

28 ms

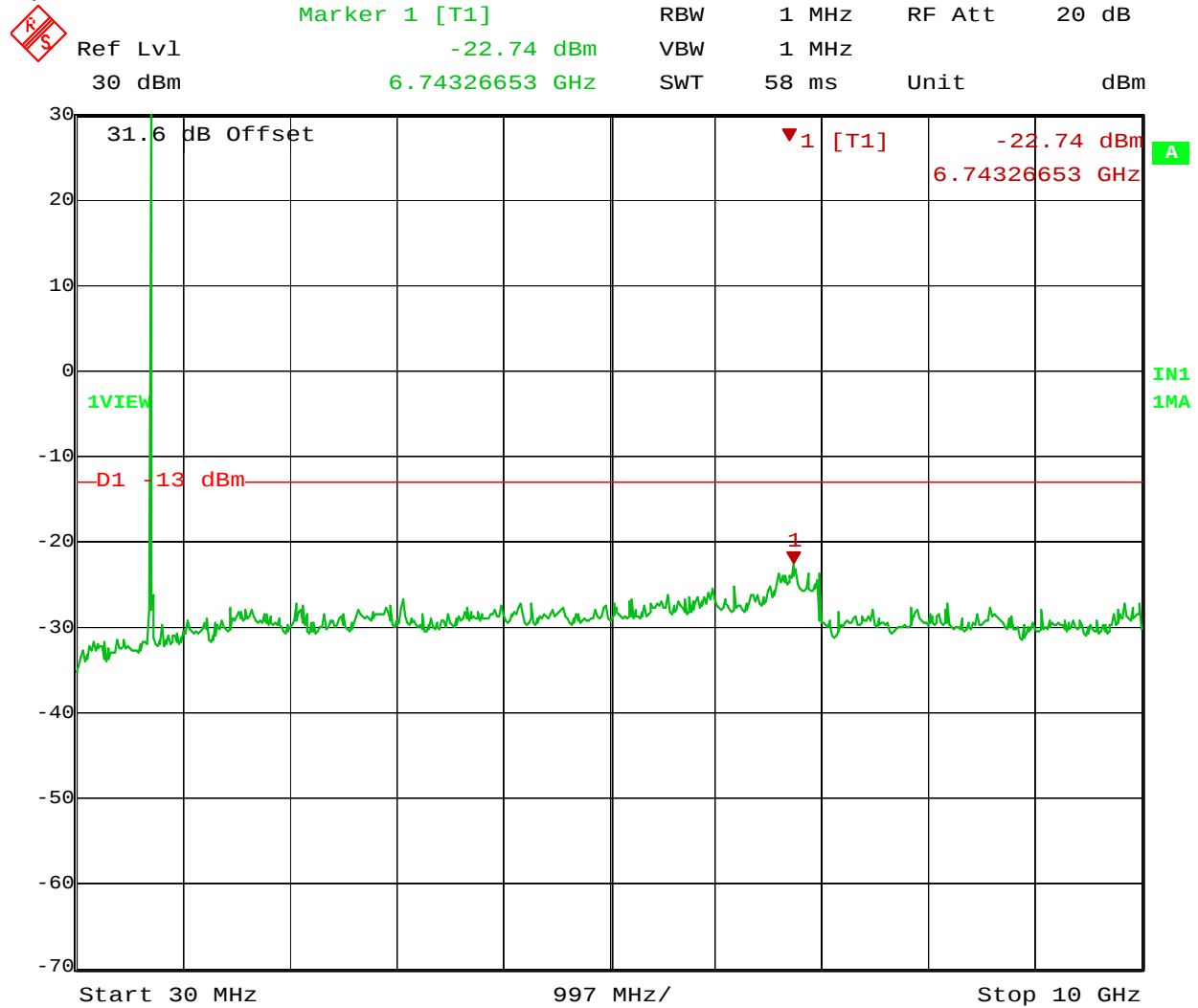
Unit

dBm



Test Data – Spurious Emissions at Antenna Terminals

LTE
Spurs



Test Data – Spurious Emissions at Antenna Terminals

Low Edge

WCDMA



Ref Lvl

40 dBm

RBW

30 kHz

RF Att

30 dB

VBW

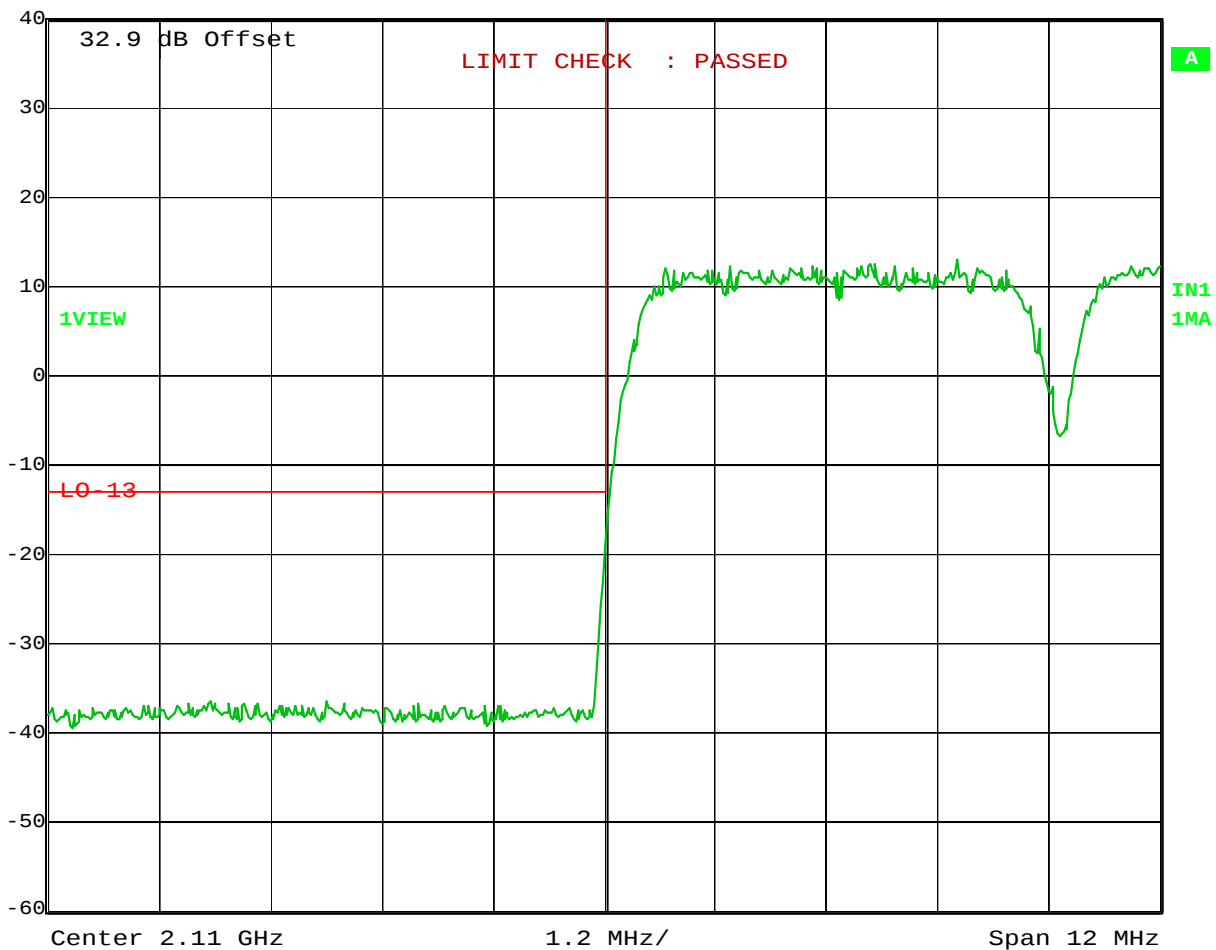
30 kHz

SWT

34 ms

Unit

dBm



Test Data – Spurious Emissions at Antenna Terminals

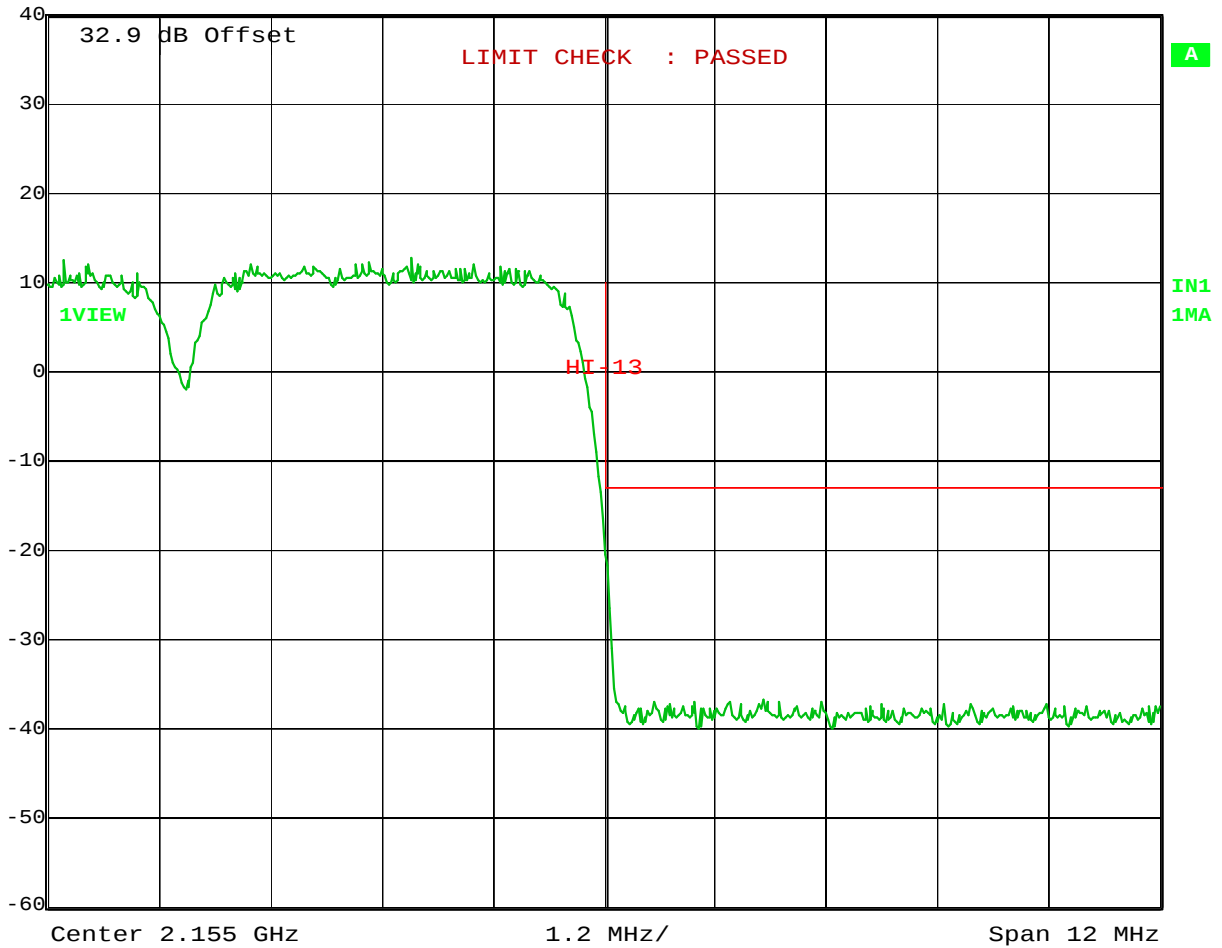
High Edge

WCDMA



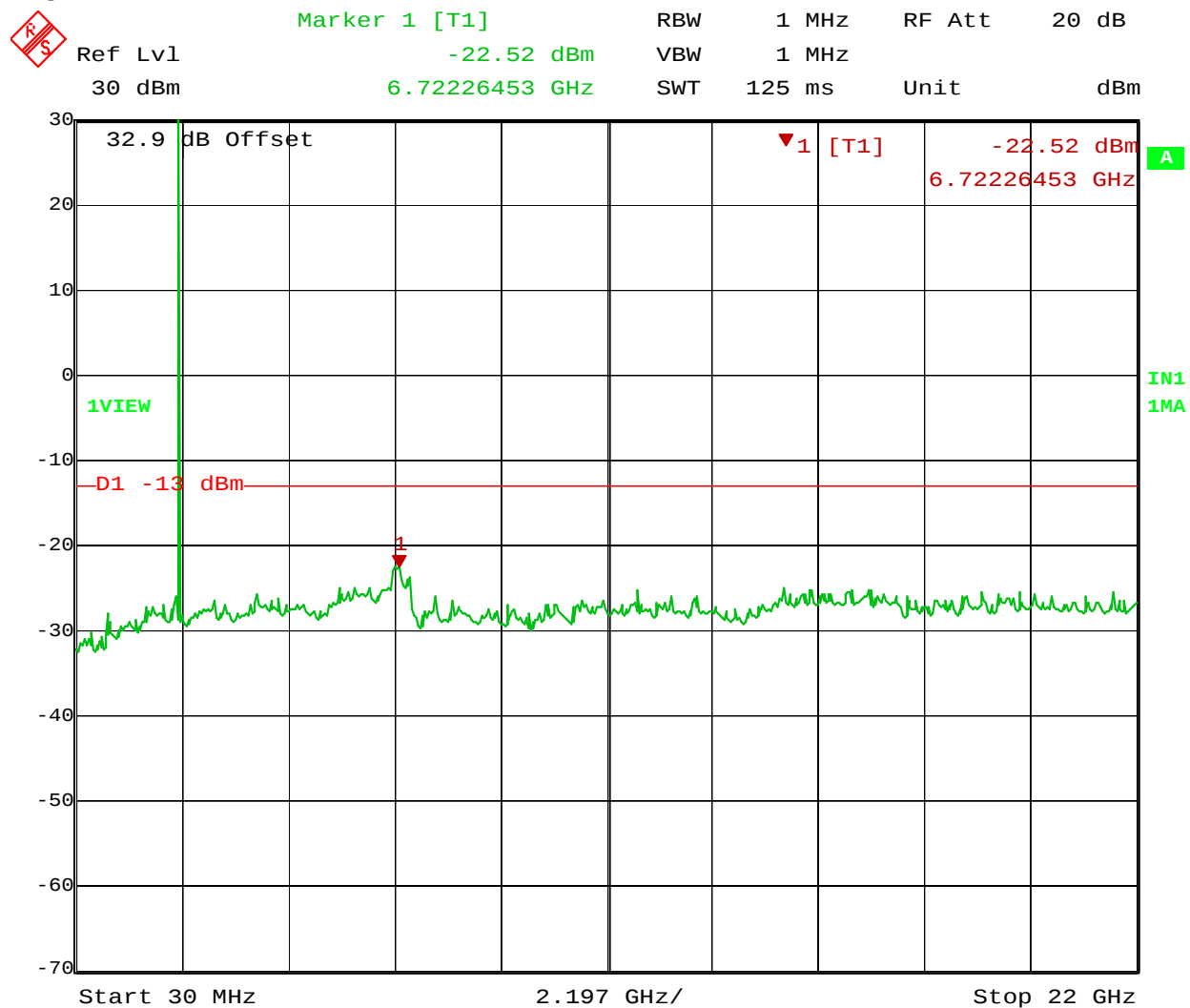
Ref Lvl
40 dBm

RBW	30 kHz	RF Att	30 dB
VBW	30 kHz		
SWT	34 ms	Unit	dBm



Test Data – Spurious Emissions at Antenna Terminals

Spurs
WCDMA



Test Data – Spurious Emissions at Antenna Terminals

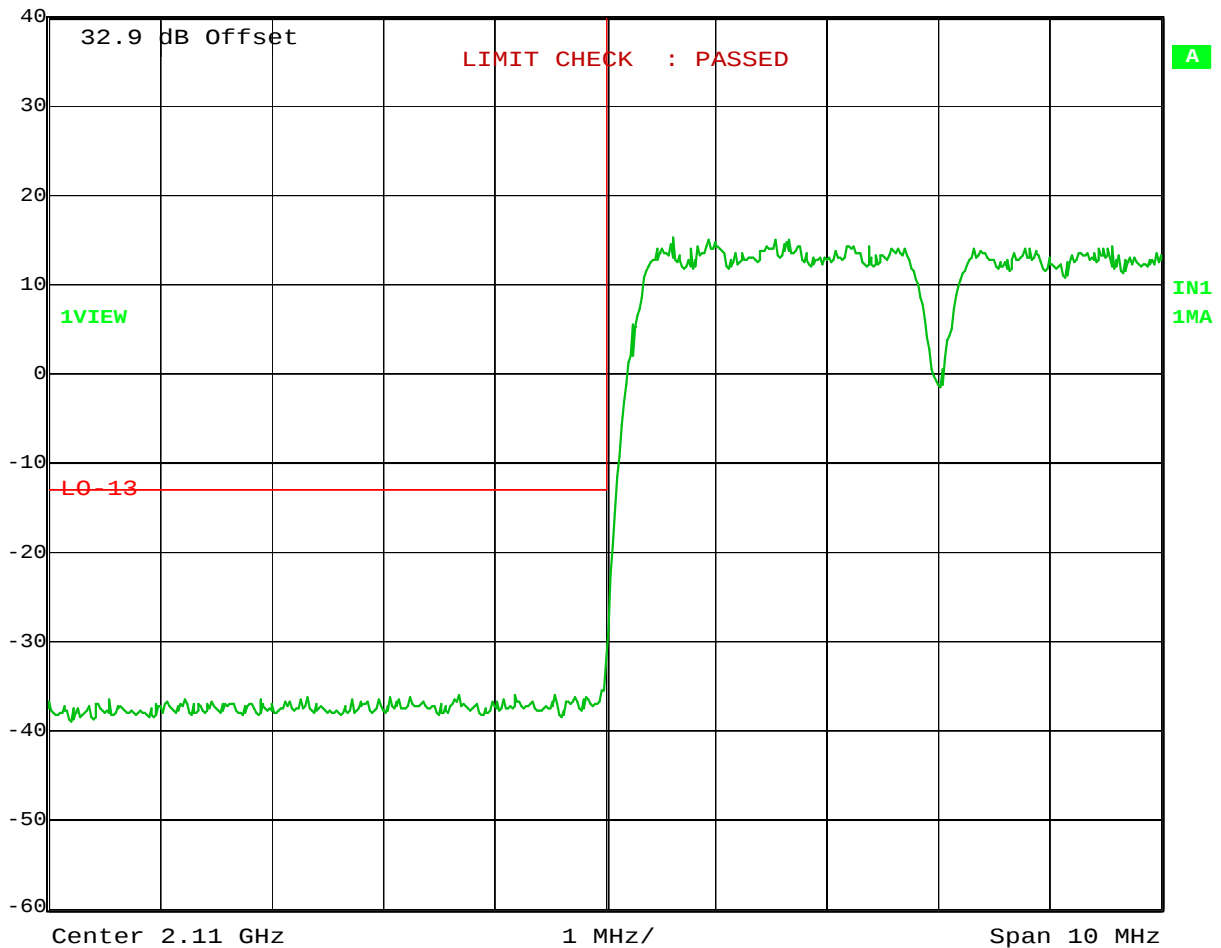
LTE

Lower Edge



Ref Lvl
40 dBm

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



Test Data – Spurious Emissions at Antenna Terminals

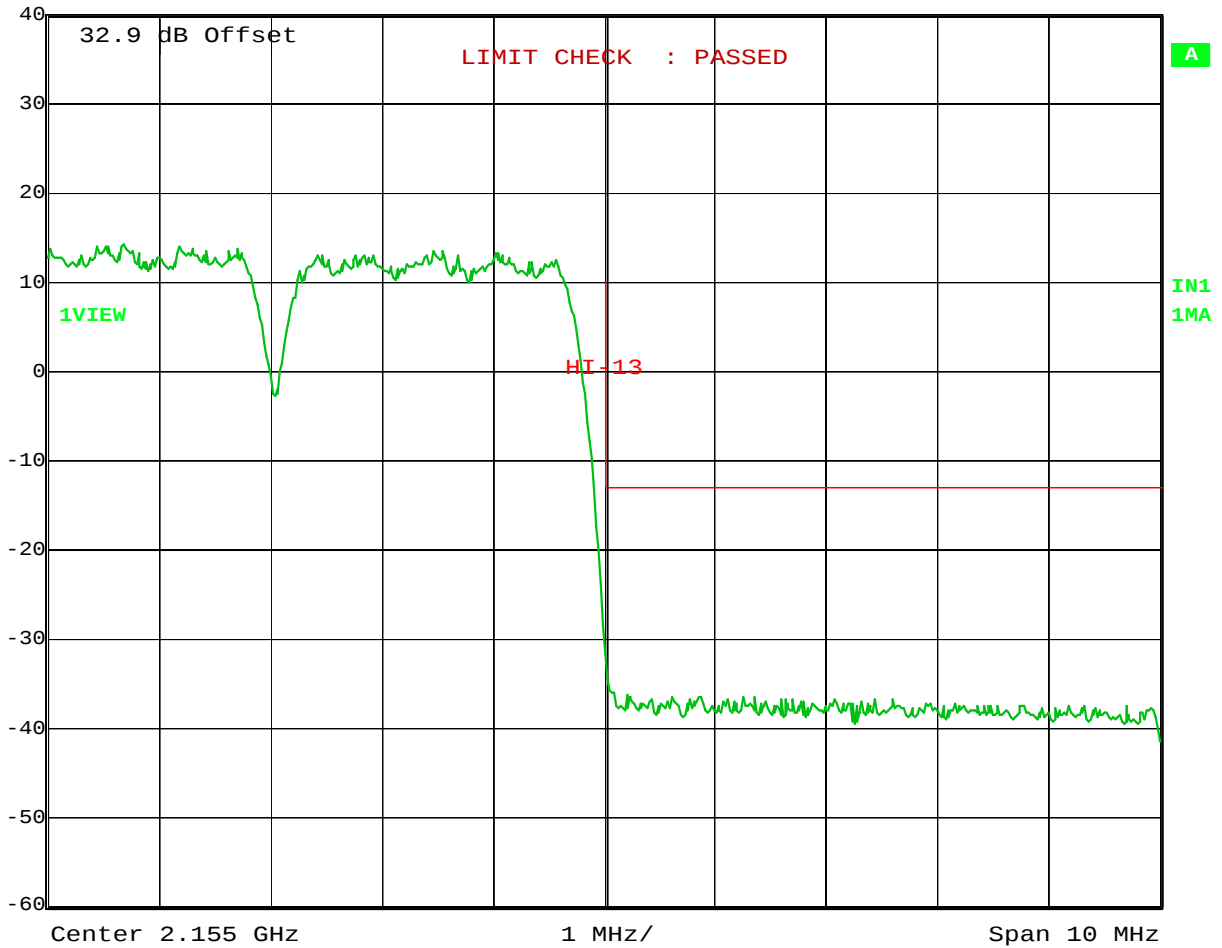
LTE

Upper Edge



Ref Lvl
40 dBm

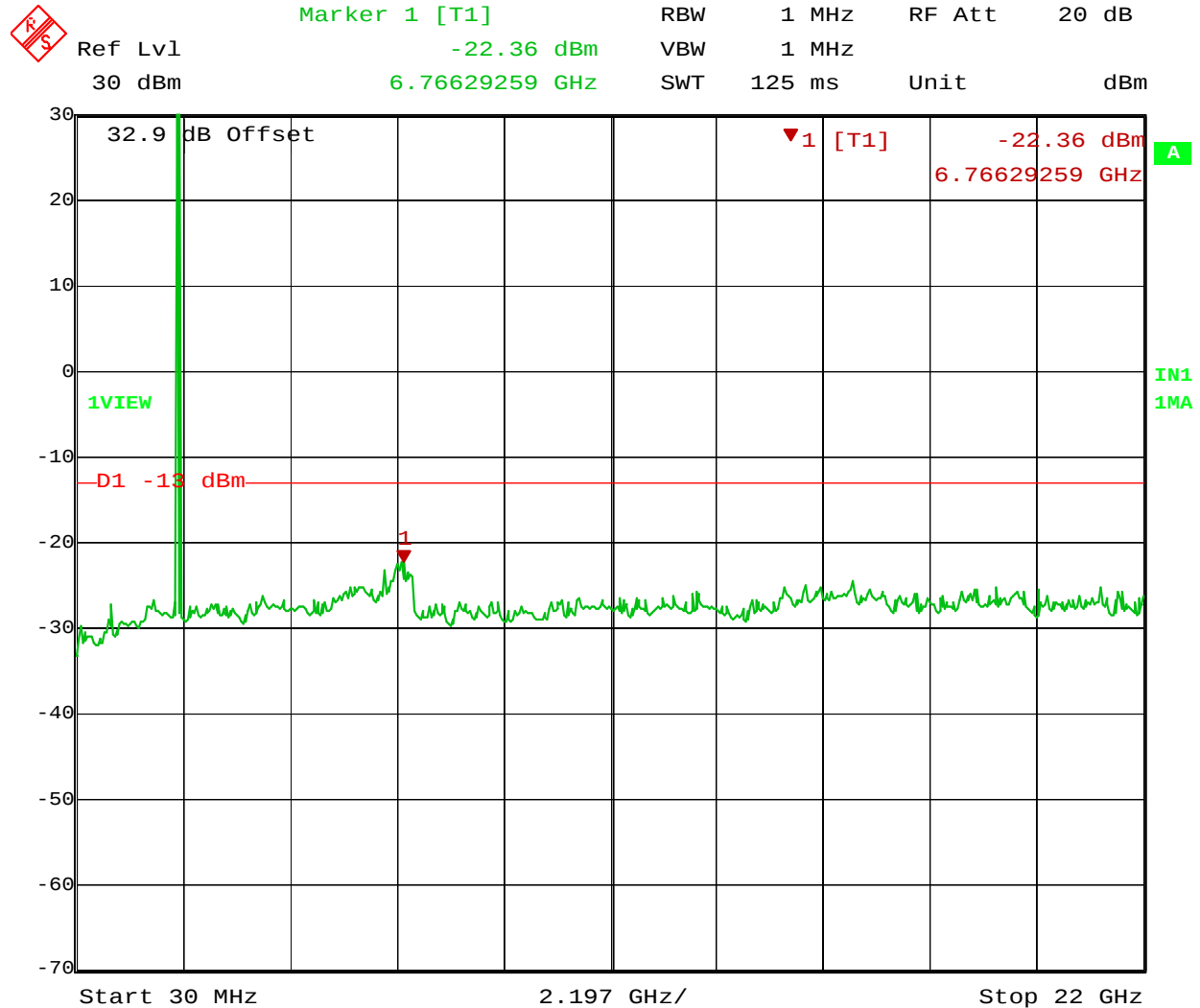
RBW	30 kHz	RF Att	30 dB
VBW	30 kHz		
SWT	28 ms	Unit	dBm



Test Data – Spurious Emissions at Antenna Terminals

Spurs

LTE



Test Data – Spurious Emissions at Antenna Terminals

Lower Edge

CDMA



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	30 dB
VBW	30 kHz		
SWT	14 ms	Unit	dBm



Test Data – Spurious Emissions at Antenna Terminals

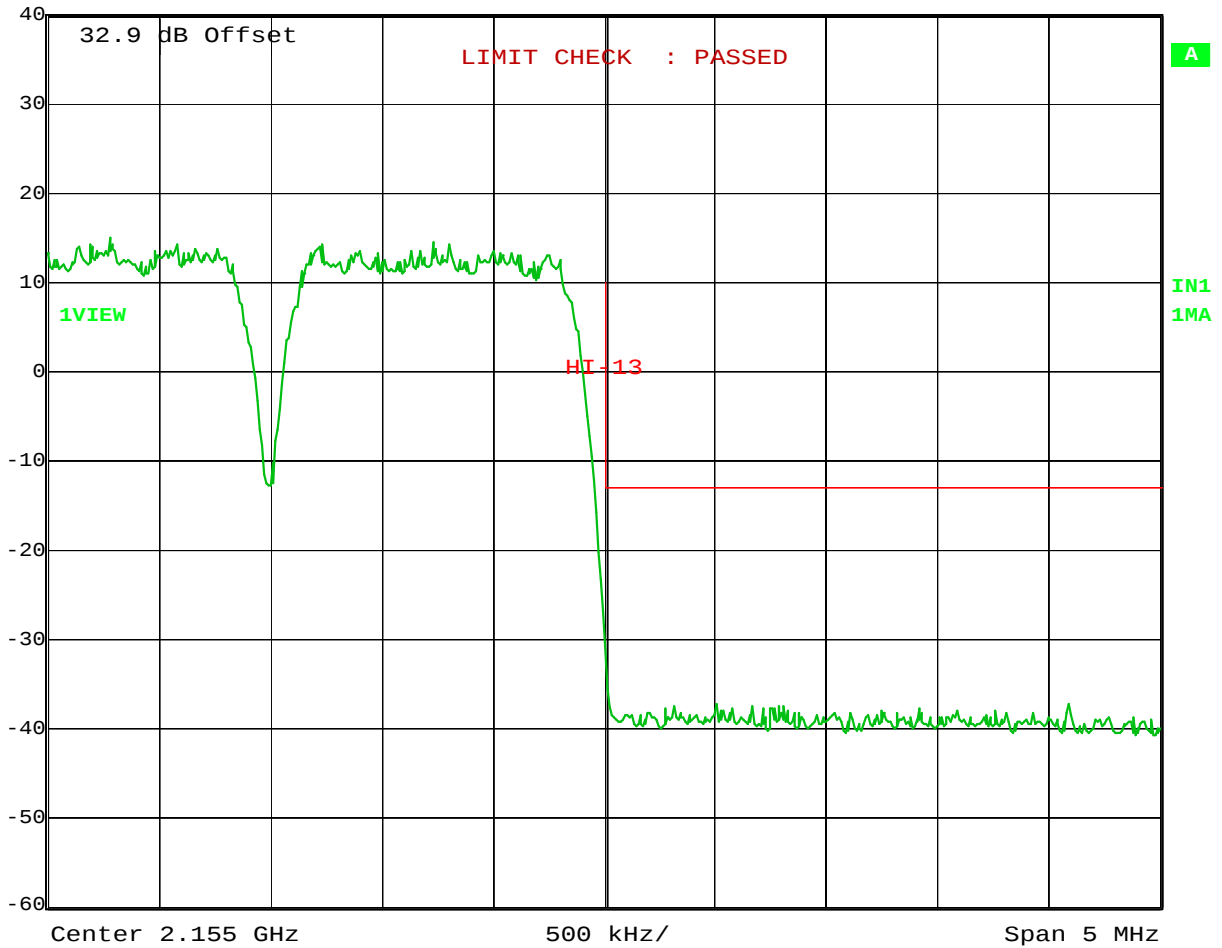
Upper Edge

CDMA



Ref Lvl
40 dBm

RBW	30 kHz	RF Att	30 dB
VBW	30 kHz		
SWT	14 ms	Unit	dBm



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(f) & (g)
TESTED BY: David Light	DATE: 24 May 2011

Test Results: Complies.

Test Data: 27.53(g) 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.

See table below for 27.53(f) data.

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 %

Test Data - Field Strength of Spurious Emissions in GPS Band 27.53(f)

Frequency (MHz)	Meter Reading (dBm)	Substitution Level (dBm)		Pre-Amp Gain (dB)	Substitution Antenna (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Polarity	Comments
1584.5	-76.0	-77.9		33	8.4	-69.5	-50.0	-19.4700	V	Noise floor
1584.5	-76.0	-75.5		33	8.4	-67.1	-50.0	-17.0700	H	Noise floor
Notes:										

Transmit Frequency = 742.5 MHz (CW)

Spectrum Searched = 1559-1610 MHz

RBW = 1 MHz

VBW = 1 MHz

Detector = Peak

Power Output = +31.0 dBm

Antenna Manufacturer = Andrew Corp.

Model = CELLMAX-EXT-CPUSE

Serial = S21008300040

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.

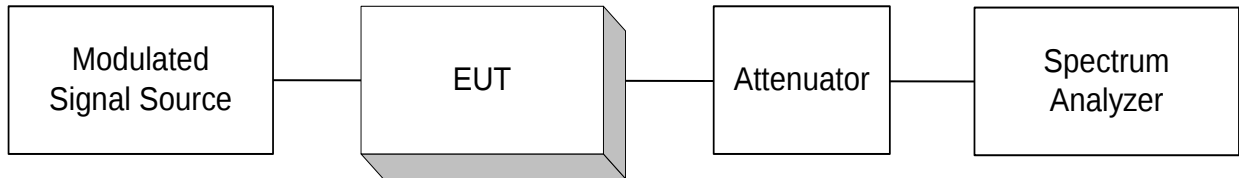
Method of Measurement

ANSI/TIA -603-C-2004

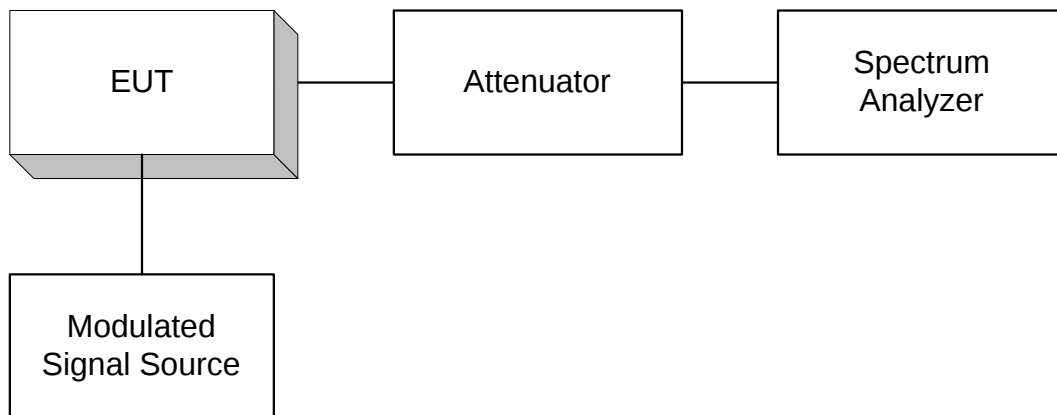
The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna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

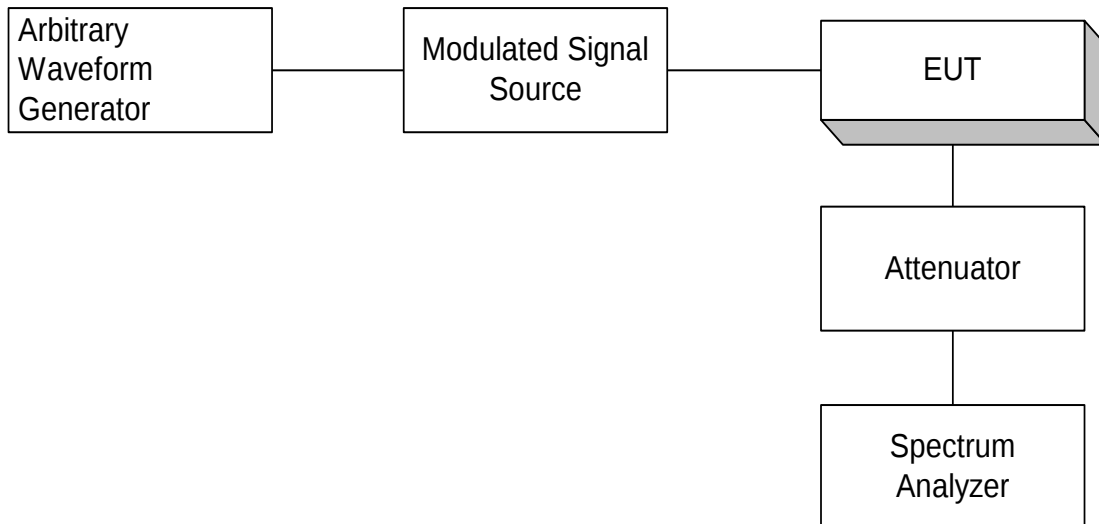
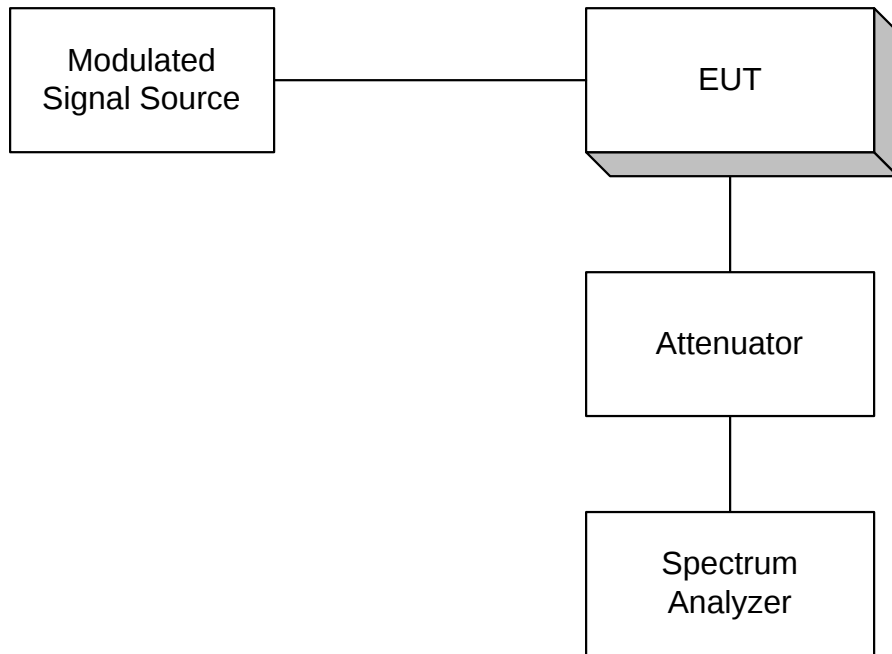
Para. No. 2.985 - R.F. Power Output



Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation

