



Nemko Test Report: 51492RUS1


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

**Equipment Under Test:
(E.U.T.)** Part Number: TFAM17/19
Product Name: Remote Unit, ION-B, TFAM17/19

FCC ID: BCR-TFAM1719-W


In Accordance With: **CFR 47, Part 24, Subpart E**
Broadband PCS Repeaters

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

TESTED BY: 

David Light, Wireless Engineer

DATE: 25 June 2010

APPROVED BY: 

Tom Tidwell, Telecom Direct

DATE: 01 July 2010

Number of Pages: 46

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EQUIPMENT: **TFAM17/19**

Section 1. Summary of Test Results

Manufacturer Andrew Corporation

Part No.: TFAM17/19

Serial No.: 43

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 24, Subpart E.



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

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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	100W	Complies
Occupied Bandwidth	2.1049	Input/Output	Complies
Spurious Emissions at Antenna Terminals	24.238(a)	-13 dBm	Complies
Field Strength of Spurious Emissions	24.238(a)	-13 dBm E.I.R.P.	Complies
Frequency Stability	24.235		NA

Footnotes:

(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.

EQUIPMENT: **TFAM17/19****Section 2. General Equipment Specification**

Supply Voltage Input:	120 VAC				
Frequency Bands: Downlink:	1930 to 1990 MHz				
Frequency Bands: Uplink:	NA				
Type of Modulation and Designator:	CDMA (F9W) <input checked="" type="checkbox"/>	GSM (GXW) <input checked="" type="checkbox"/>	NADC (DXW) <input checked="" type="checkbox"/>	W-CDMA (F9W) <input checked="" type="checkbox"/>	EDGE (G7W) <input checked="" type="checkbox"/>
Output Impedance:	50 ohms				
RF Output (Rated): Downlink	$\frac{0.125}{21.0} \frac{W}{dBm}$				
RF Output (Rated): Uplink	$\frac{NA}{NA} \frac{W}{dBm}$				
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

Wireless over fiber repeater system.

System Diagram

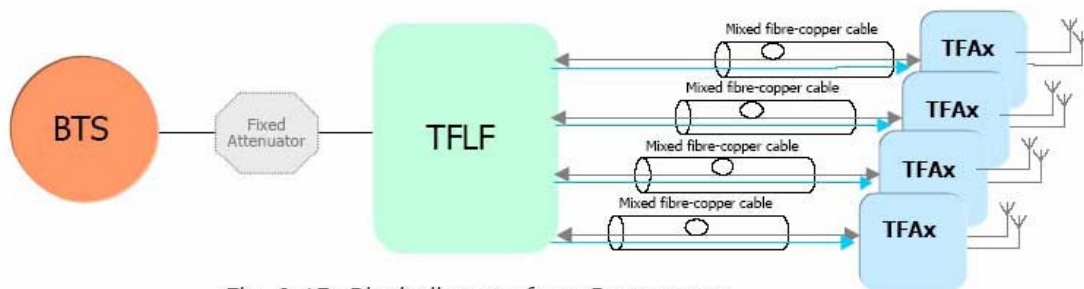


Fig. 2.17: Block diagram for a Fast system

EQUIPMENT: **TFAM17/19****Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 24.232
TESTED BY: David Light	DATE: 24-25 June 2010

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

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	CDMA	NA	NA	NA
Downlink	CDMA	18	21	0.125
Uplink	TDMA	NA	NA	NA
Downlink	TDMA	18	21	0.125
Uplink	EDGE	NA	NA	NA
Downlink	EDGE	18	21	0.125
Uplink	GSM	NA	NA	NA
Downlink	GSM	18	21	0.125
Uplink	W-CDMA	NA	NA	NA
Downlink	W-CDMA	18	21	0.125

Equipment Used: 1472-1469-1468-1036-1082-1026**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %

EQUIPMENT: **TFAM17/19**

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 24-25 June 2010

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1472-1468-1469-1082-1036-1026

Measurement Uncertainty: 1X10⁻⁷ ppm

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: **TFAM17/19**

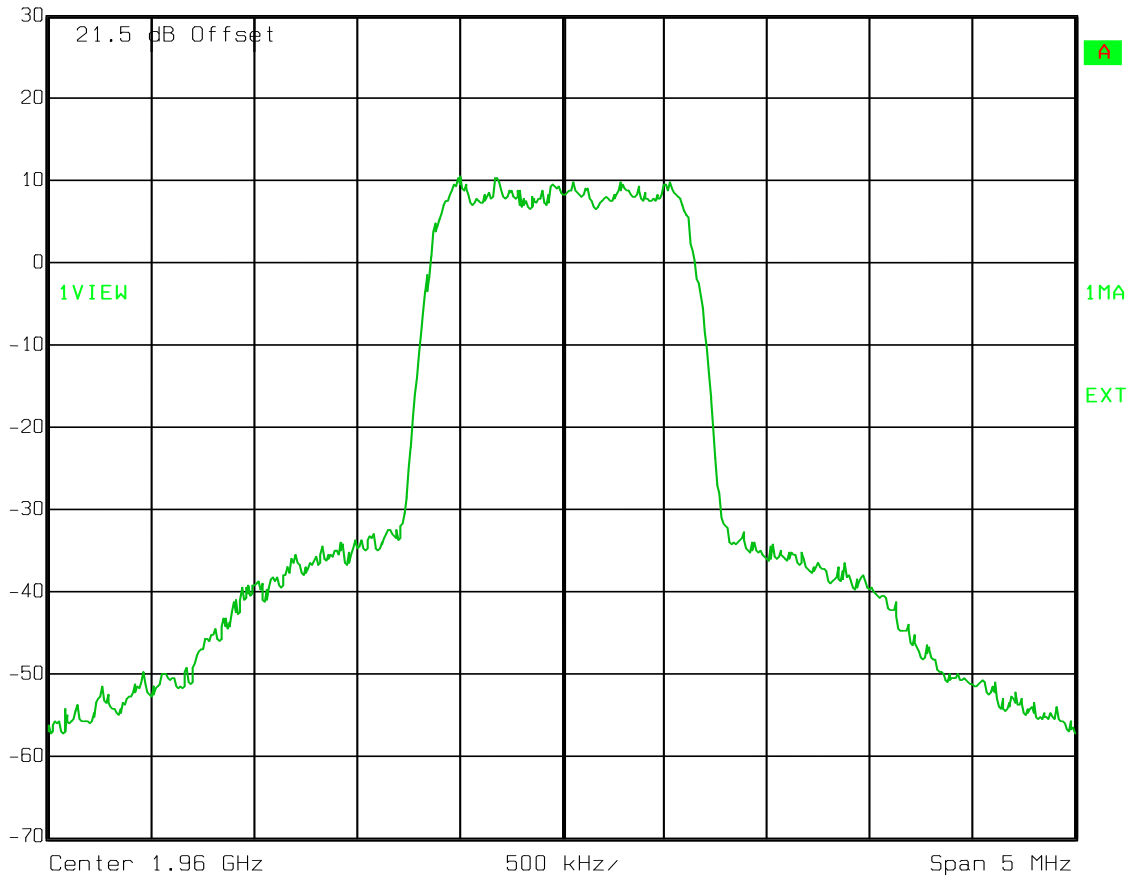
Test Data – Occupied Bandwidth

CDMA - Output



Ref Lvl
30 dBm

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



Date: 25.JUN.2010 10:27:01

EQUIPMENT: **TFAM17/19**

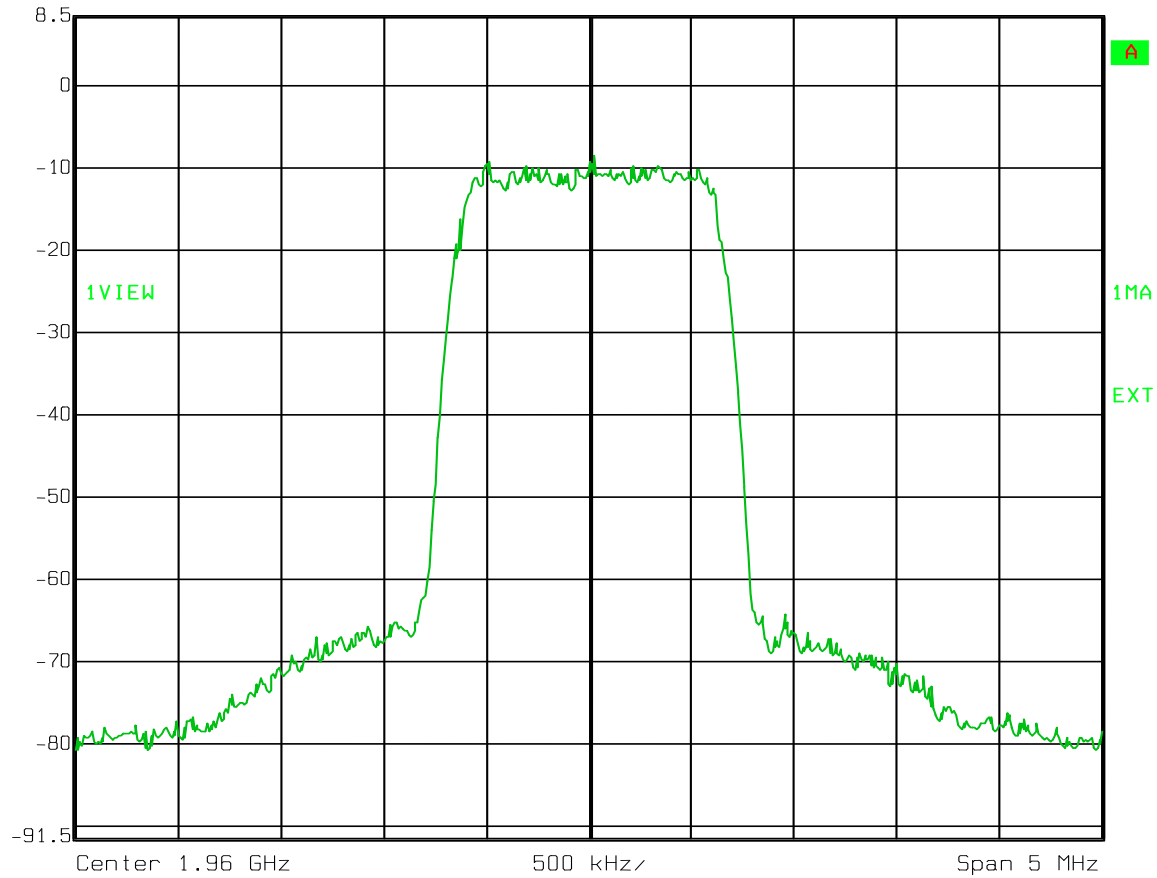
Test Data – Occupied Bandwidth

CDMA - Input



Ref Lvl
8.5 dBm

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



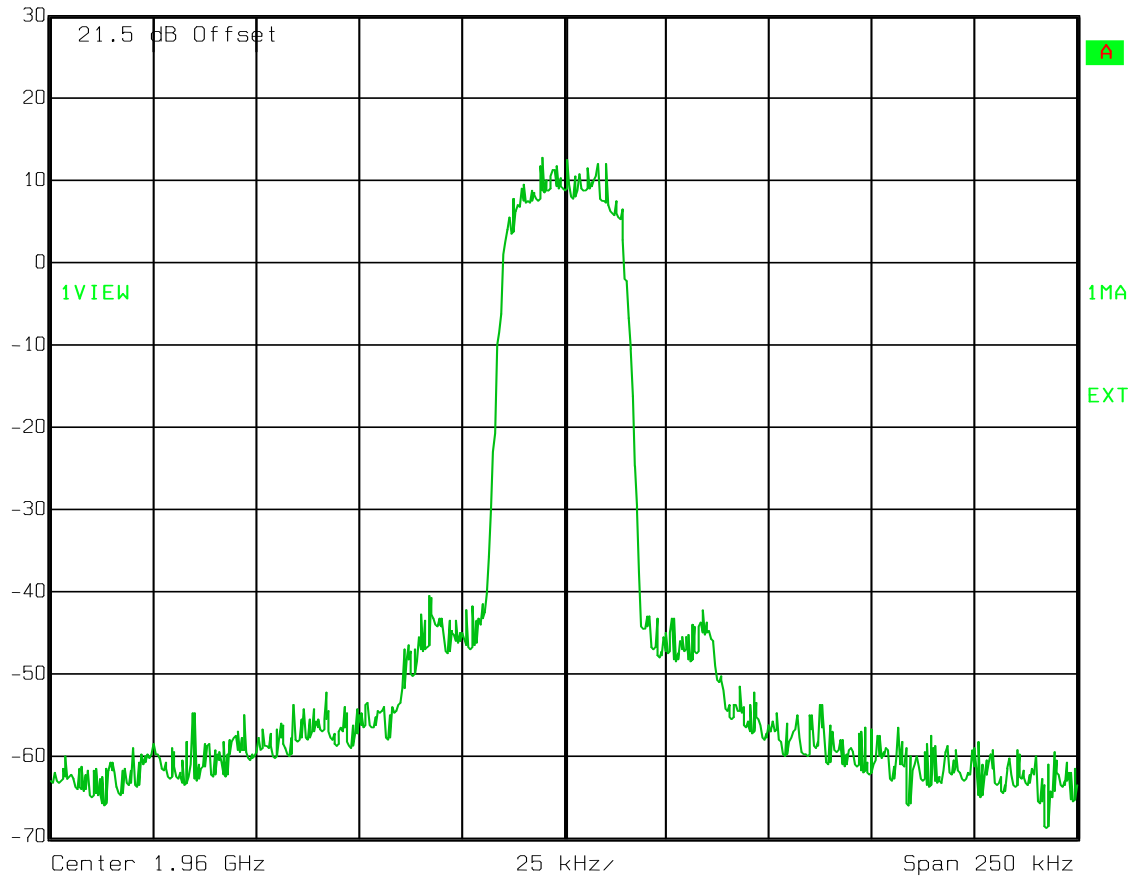
Date: 25.JUN.2010 10:28:12

EQUIPMENT: **TFAM17/19****Test Data – Occupied Bandwidth**

TDMA - Output

Ref Lvl
30 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	640 ms	Unit	dBm



Date: 25.JUN.2010 10:40:41

EQUIPMENT: **TFAM17/19**

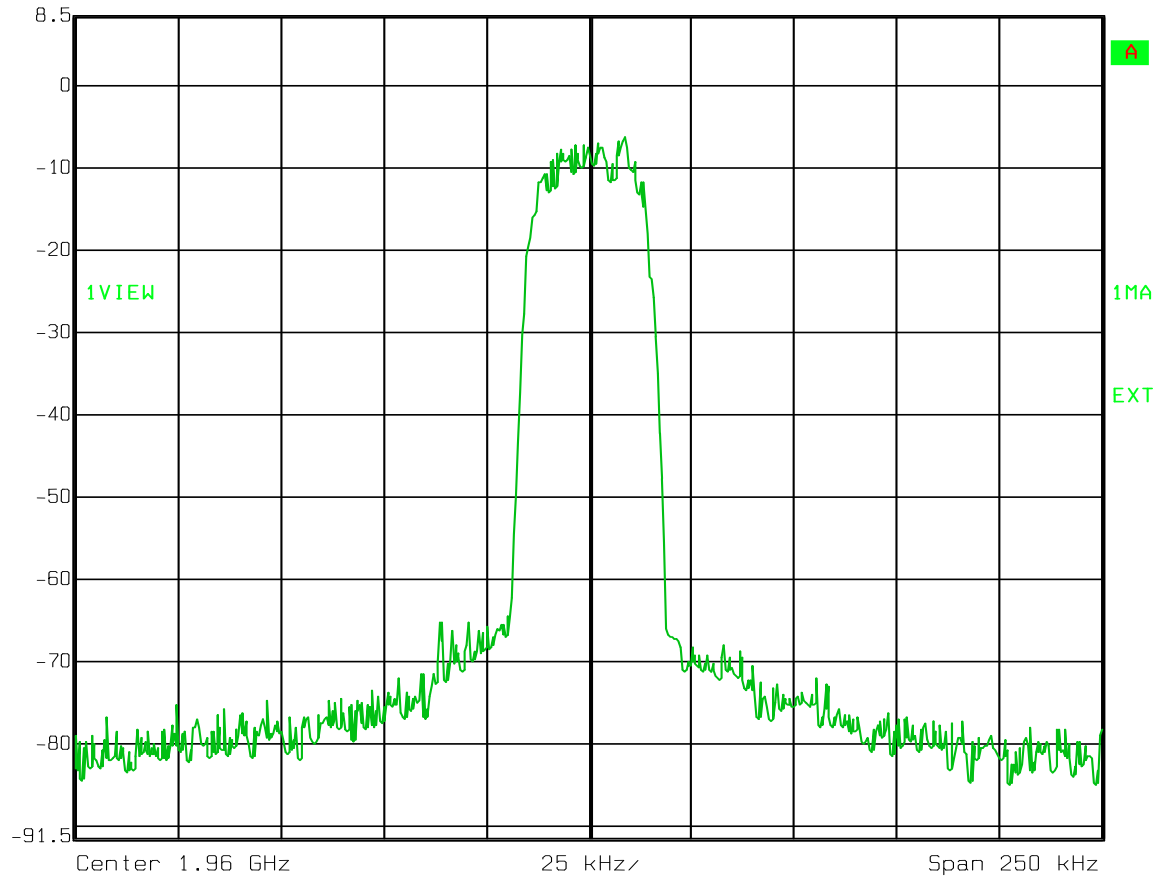
Test Data – Occupied Bandwidth

TDMA - Input



Ref Lvl
8.5 dBm

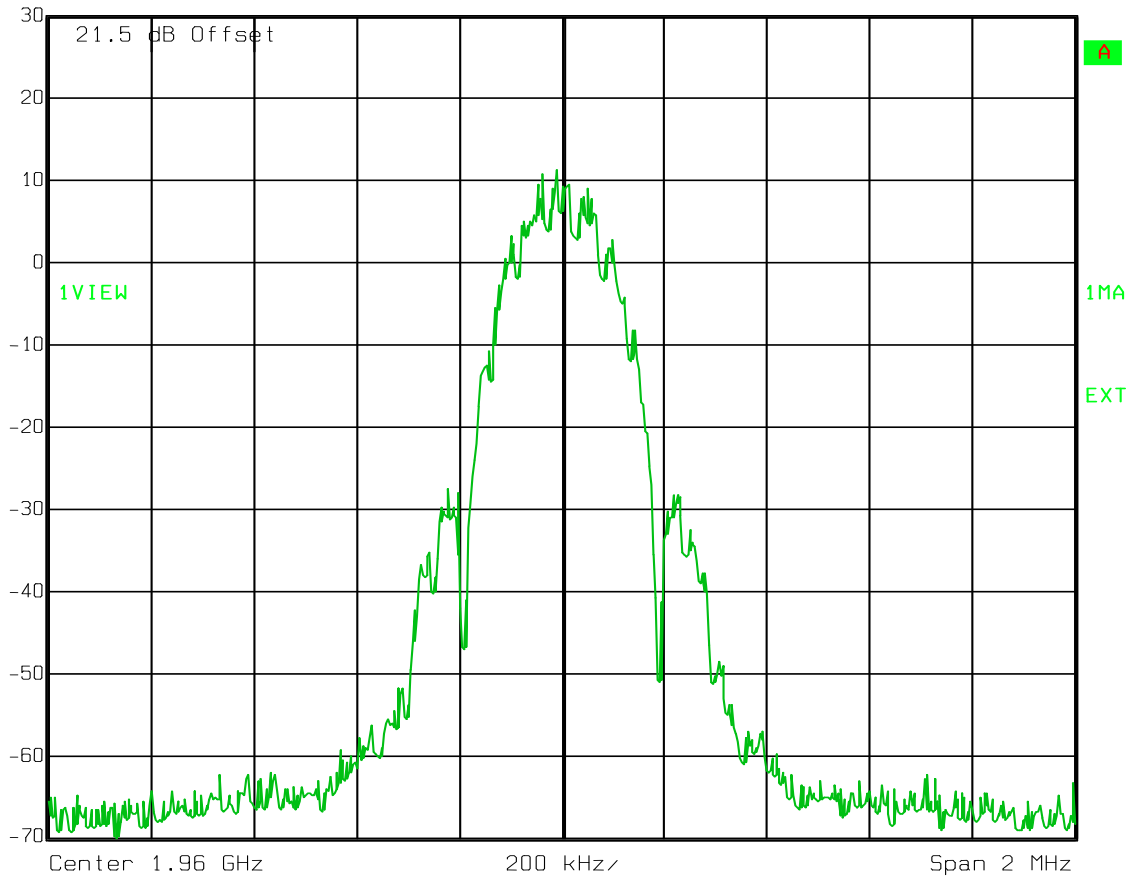
RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	640 ms	Unit	dBm



Date: 25.JUN.2010 10:41:27

EQUIPMENT: **TFAM17/19****Test Data – Occupied Bandwidth****EDGE - Output**Ref Lvl
30 dBm

RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:36:50

EQUIPMENT: **TFAM17/19**

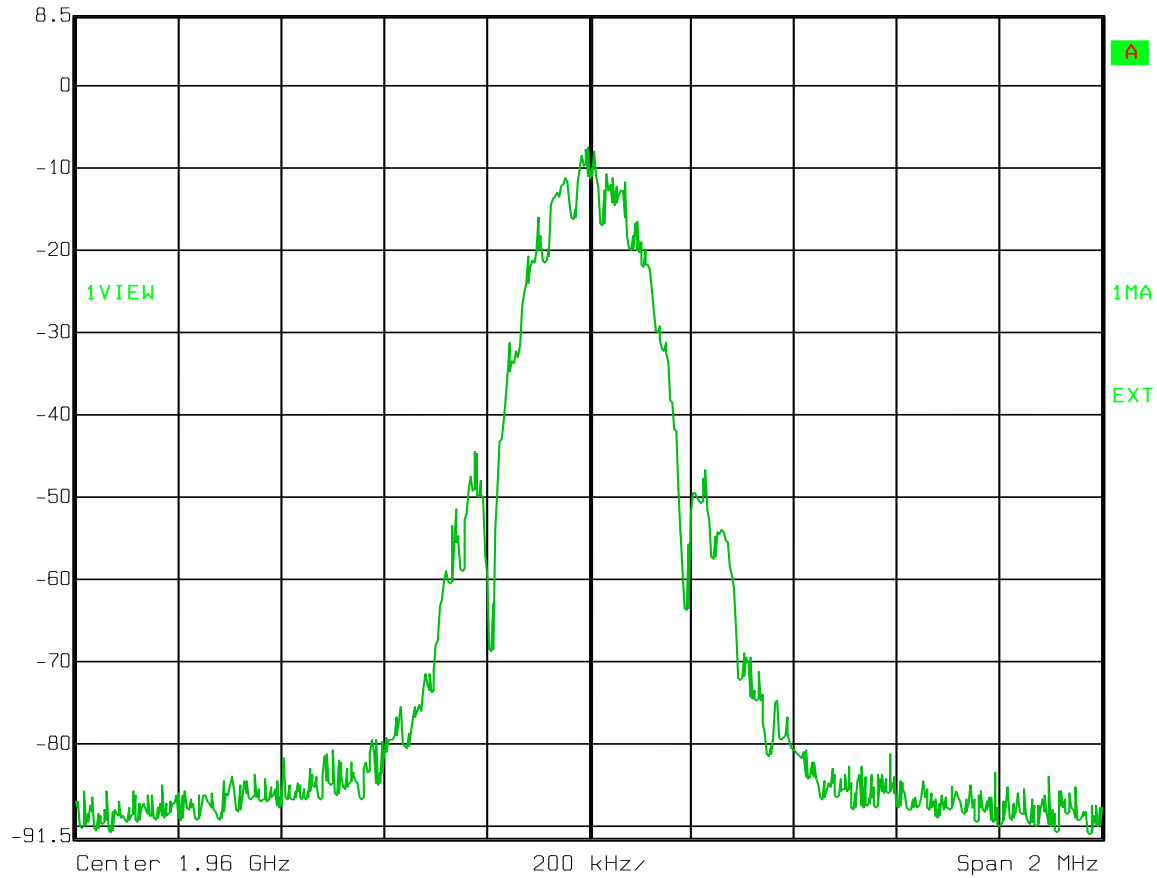
Test Data – Occupied Bandwidth

EDGE - Input



Ref Lvl
8.5 dBm

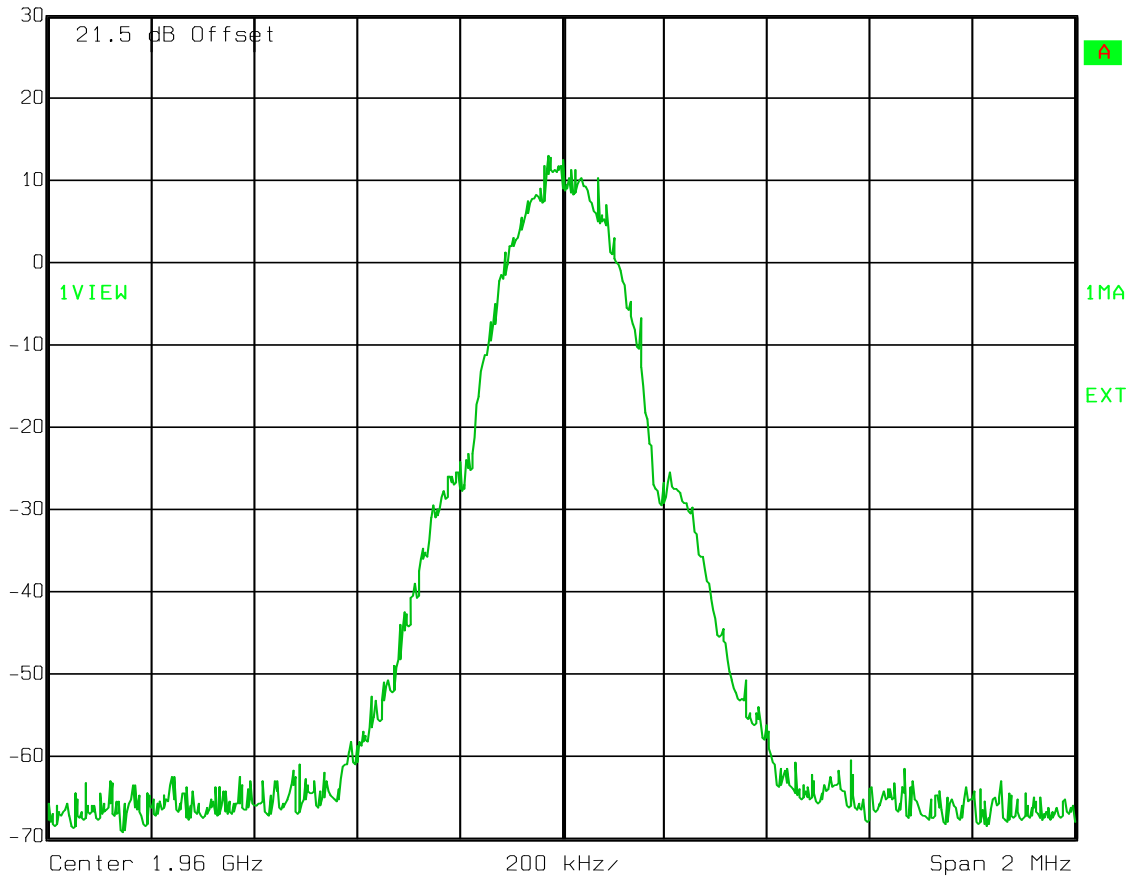
RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:37:39

EQUIPMENT: **TFAM17/19****Test Data – Occupied Bandwidth****GSM - Output**Ref Lvl
30 dBm

RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



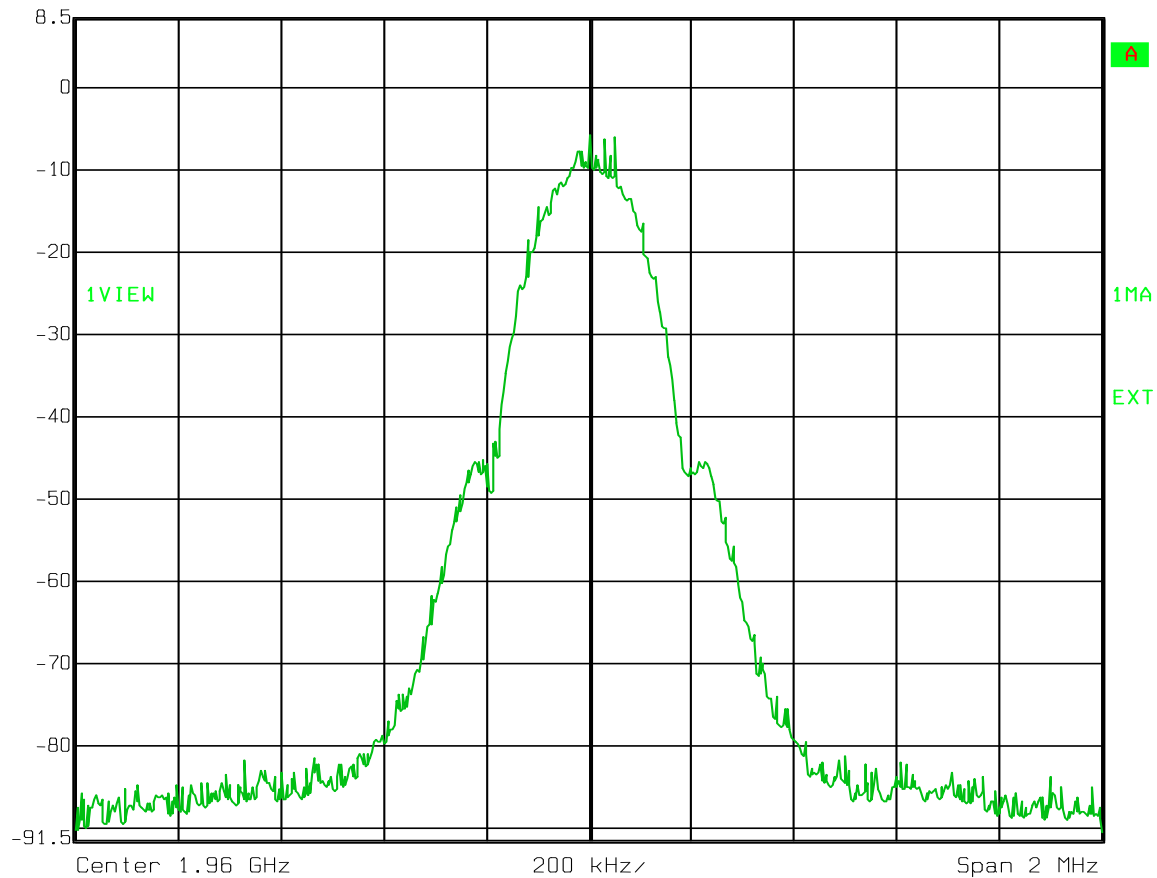
Date: 25.JUN.2010 10:31:28

EQUIPMENT: **TFAM17/19****Test Data – Occupied Bandwidth**

GSM - Input

Ref Lvl
8.5 dBm

RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:32:21

EQUIPMENT: **TFAM17/19**

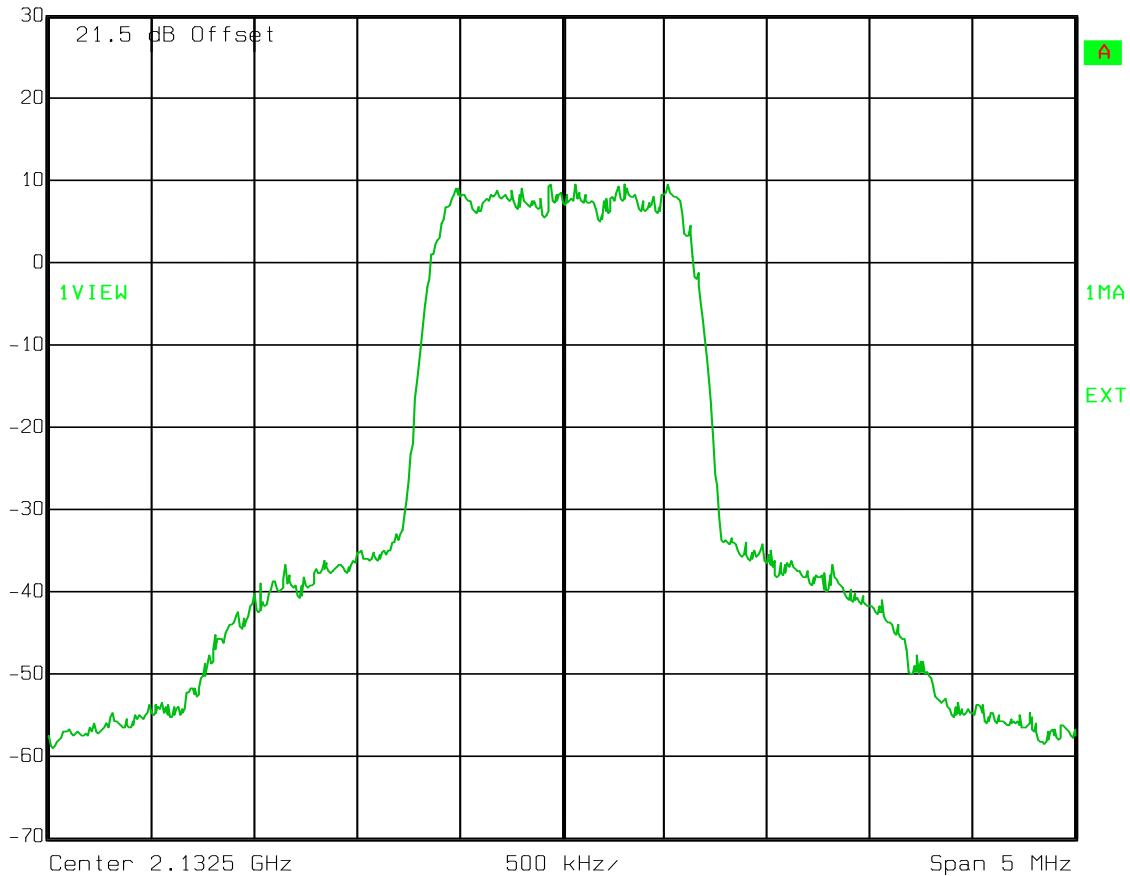
Test Data – Occupied Bandwidth

W-CDMA - Output



Ref Lvl
30 dBm

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



Date: 25.JUN.2010 12:11:26

EQUIPMENT: **TFAM17/19**

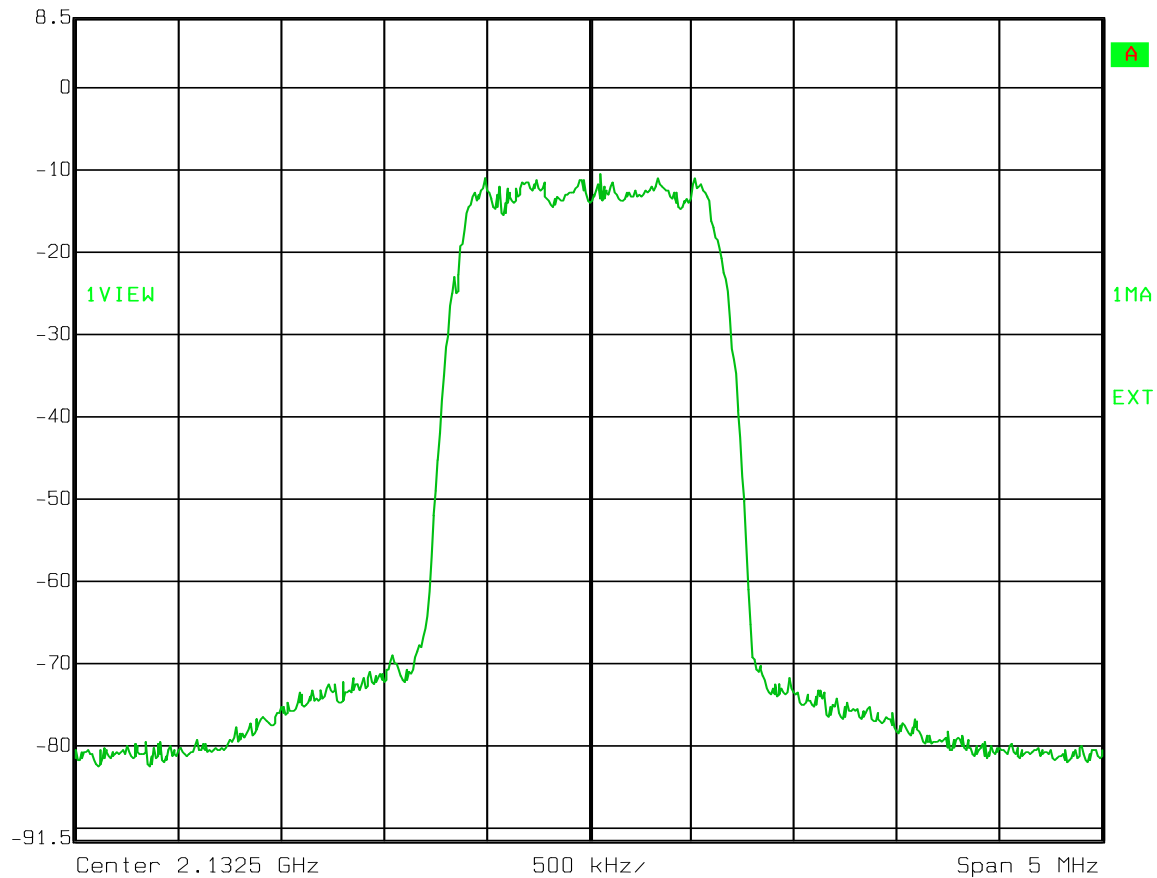
Test Data – Occupied Bandwidth

W-CDMA - Input



Ref Lvl
8.5 dBm

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



Date: 25.JUN.2010 12:12:37

EQUIPMENT: TFAM17/19

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 24-24 June 2010

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1472-1468-1469-1082-1036-1026

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: **TFAM17/19****Test Data – Spurious Emissions at Antenna Terminals**

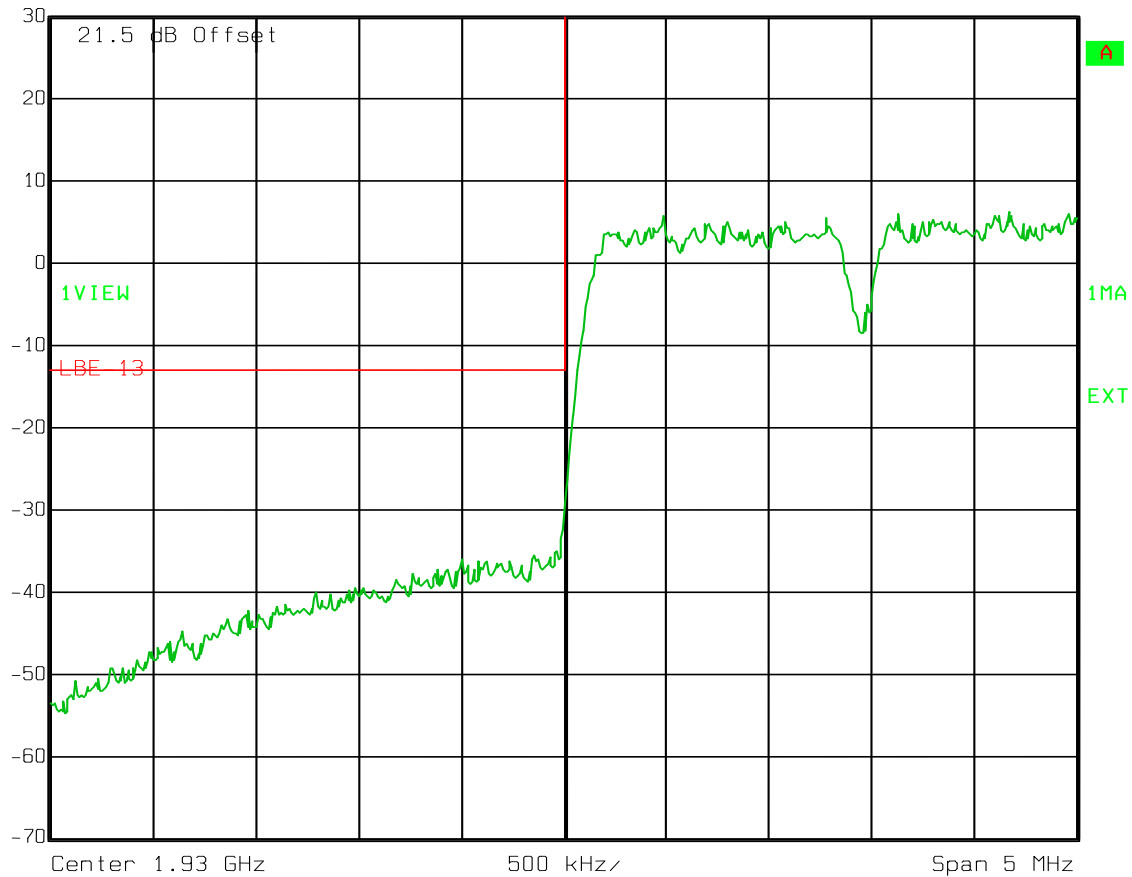
Lower Bandedge Intermodulation

CDMA

Downlink

Ref Lvl
30 dBm

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



Date: 25.JUN.2010 10:14:49

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

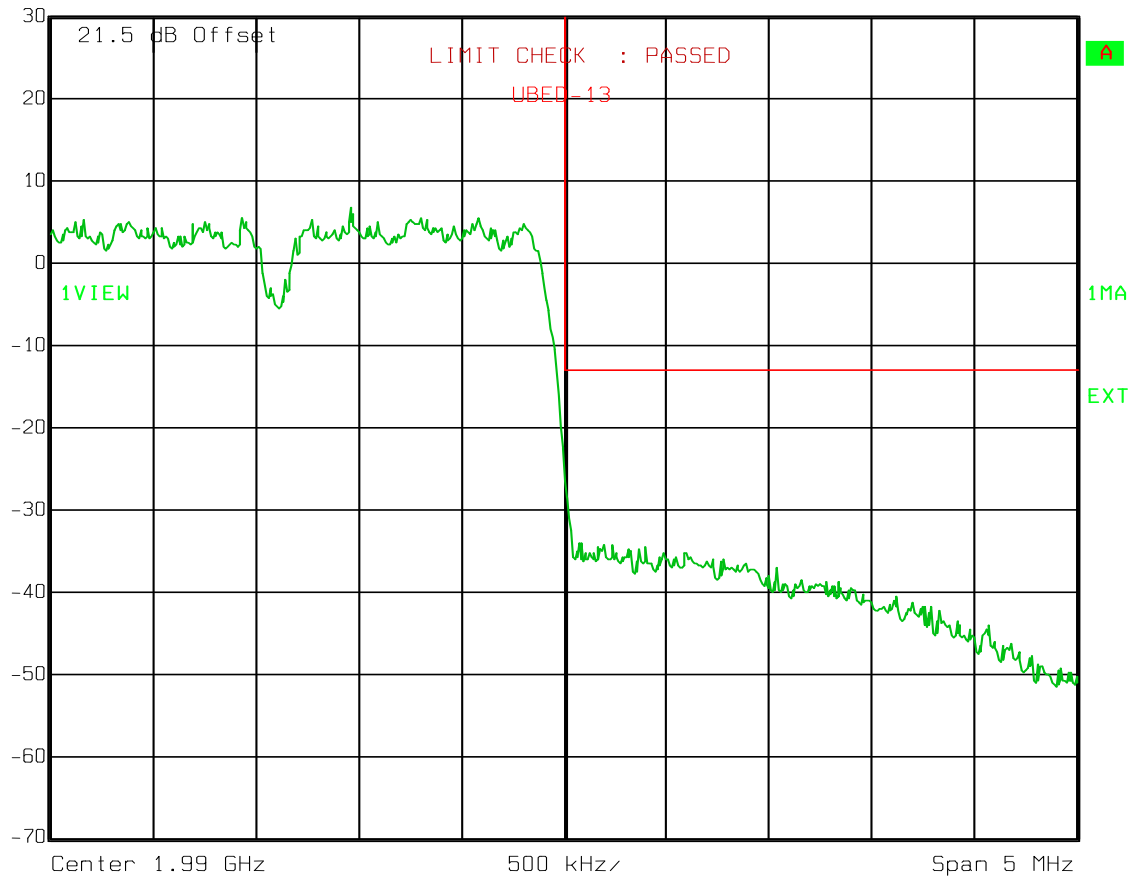
CDMA

Downlink

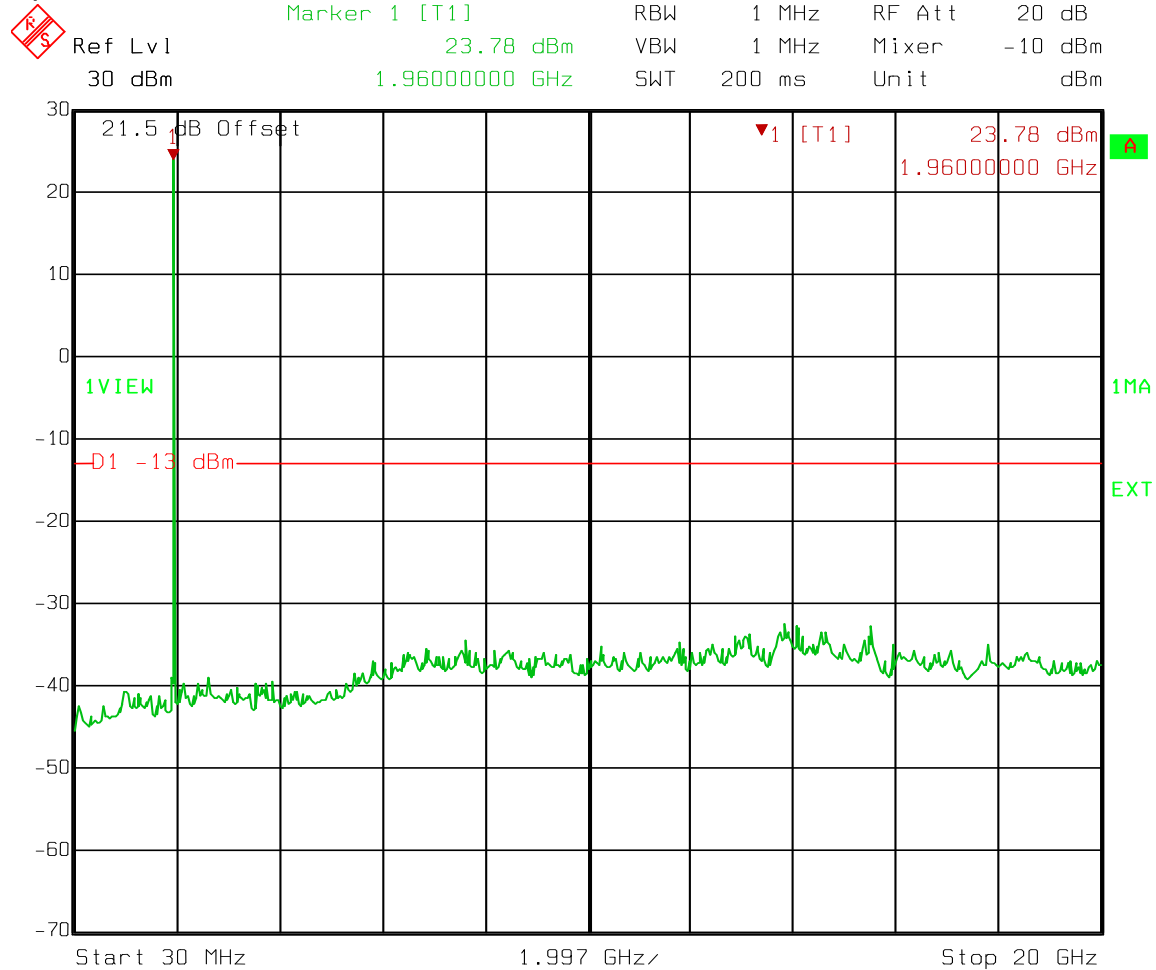


Ref Lvl
30 dBm

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



Date: 25.JUN.2010 10:25:46

EQUIPMENT: **TFAM17/19****Test Data – Spurious Emissions at Antenna Terminals****Spurs – CDMA - Downlink**

EQUIPMENT: **TFAM17/19****Test Data – Spurious Emissions at Antenna Terminals**

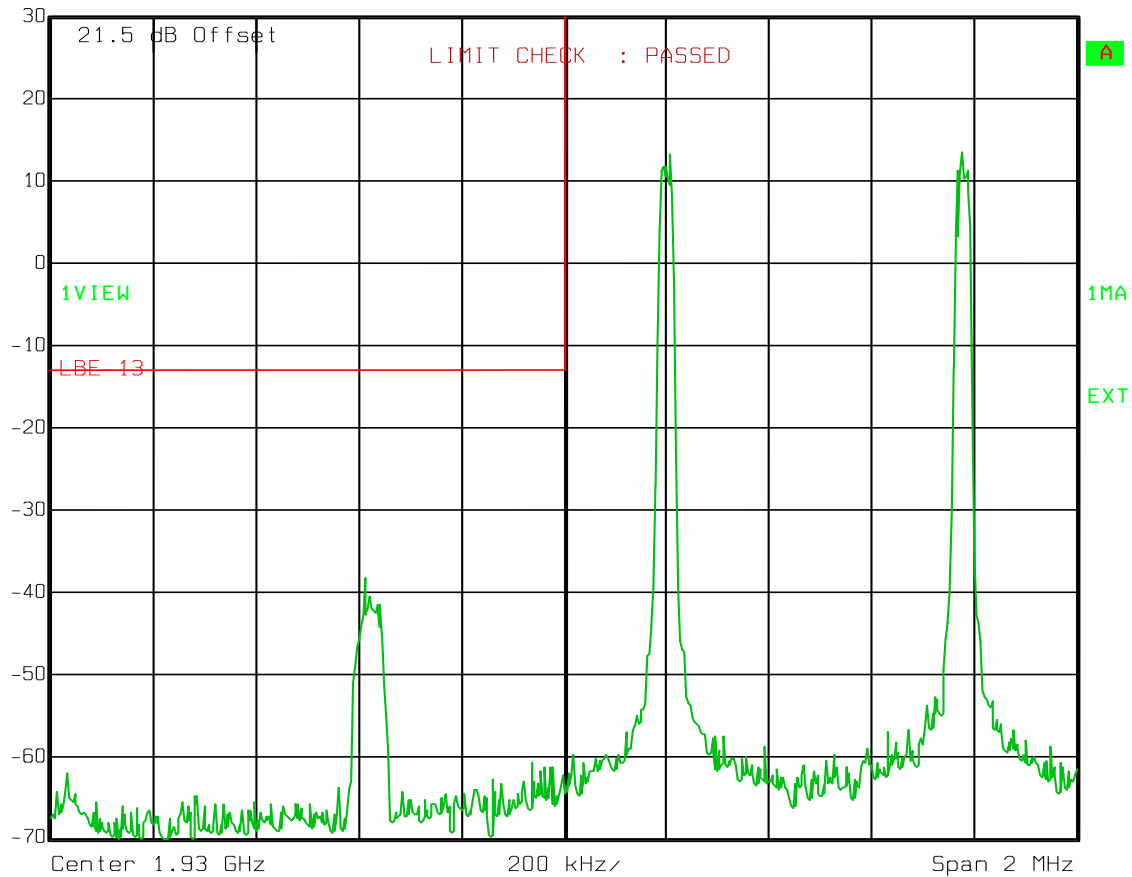
Lower Bandedge Intermodulation

TDMA

Downlink

Ref Lvl
30 dBm

RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:19:22

EQUIPMENT: **TFAM17/19****Test Data – Spurious Emissions at Antenna Terminals**

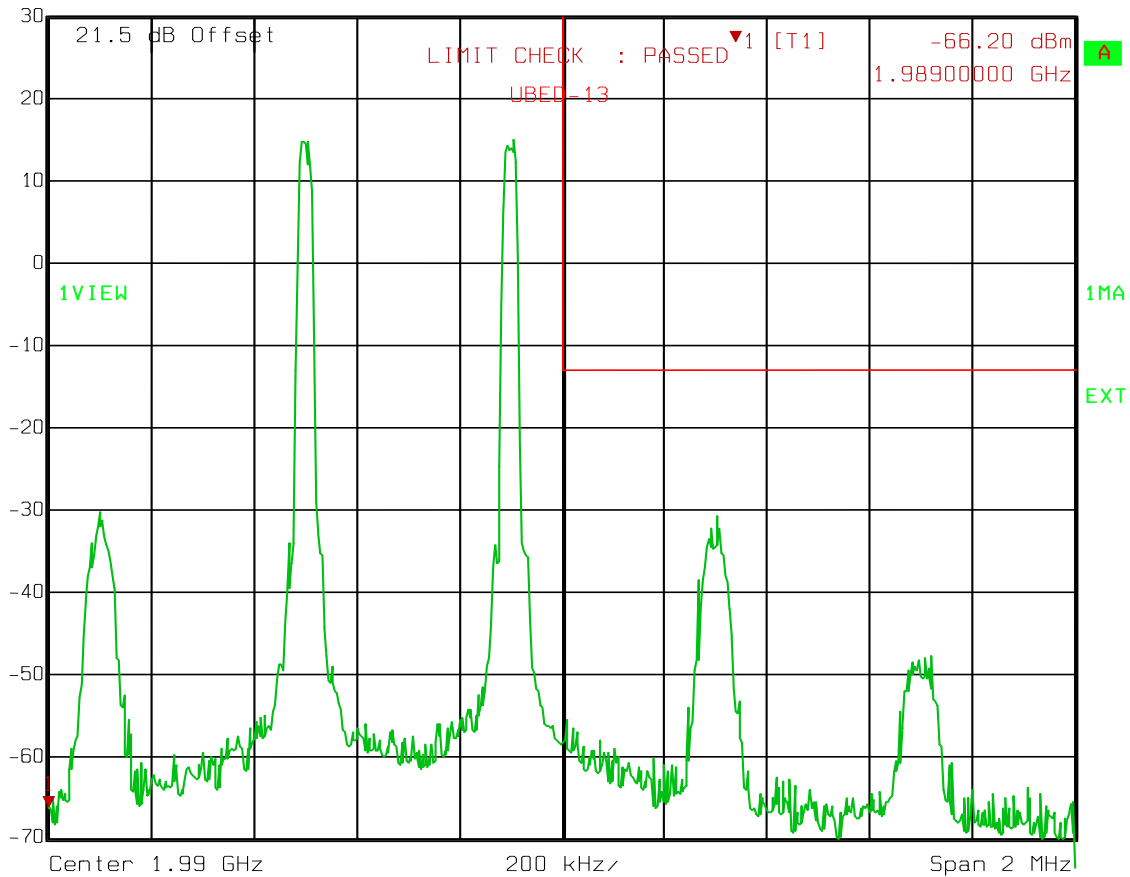
Upper Bandedge Intermodulation

TDMA

Downlink



Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	20 dB
30 dBm	-66.20 dBm	VBW	3 kHz	Mixer	-10 dBm
	1.98900000 GHz	SWT	560 ms	Unit	dBm

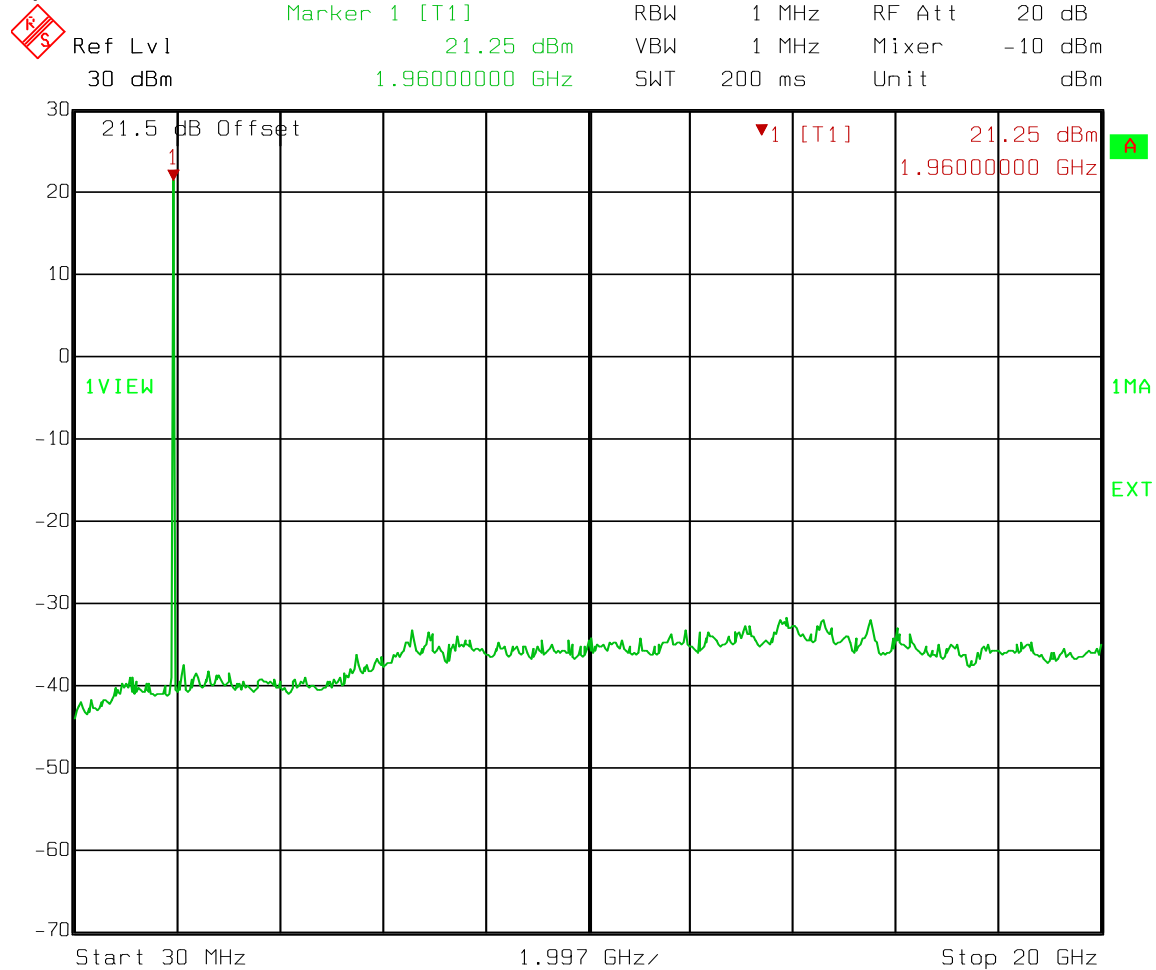


Date: 25.JUN.2010 10:21:09

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA - Downlink



Date: 25.JUN.2010 10:45:24

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

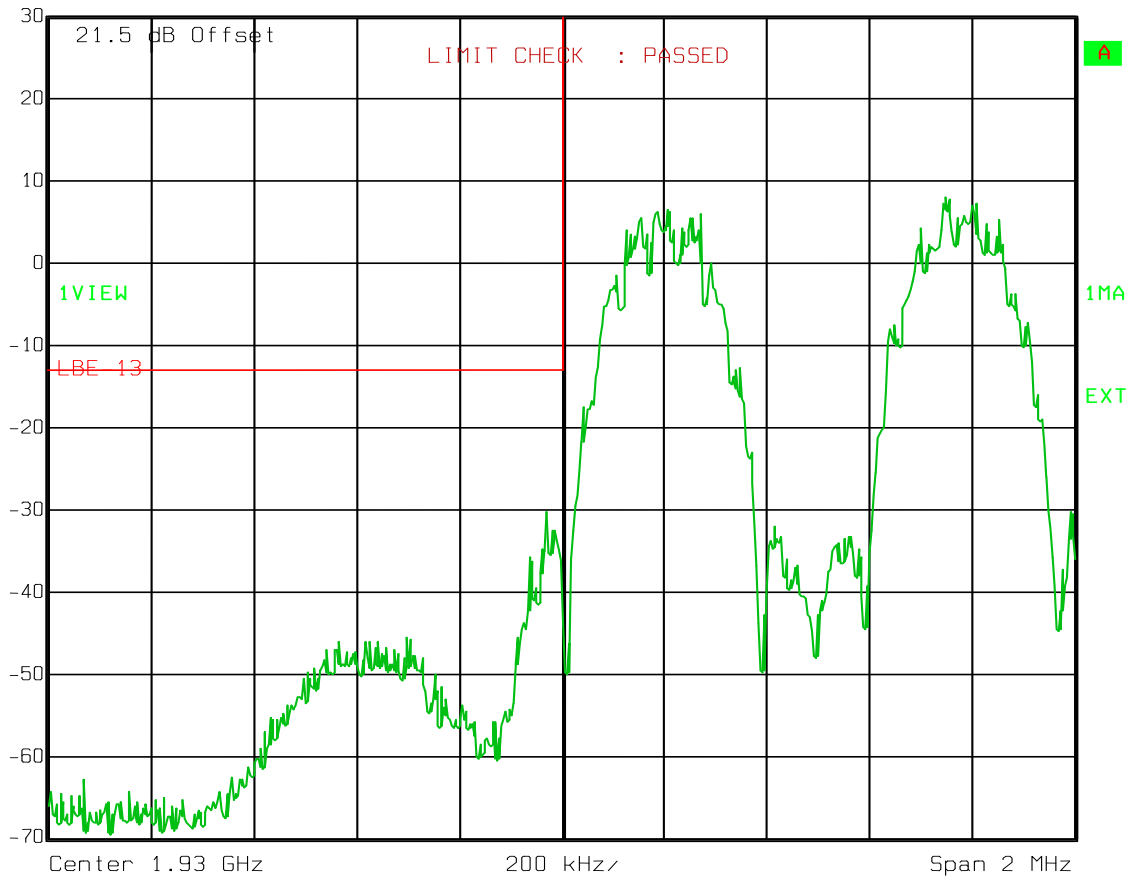
EDGE

Downlink



Ref Lvl
30 dBm

RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:17:52

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

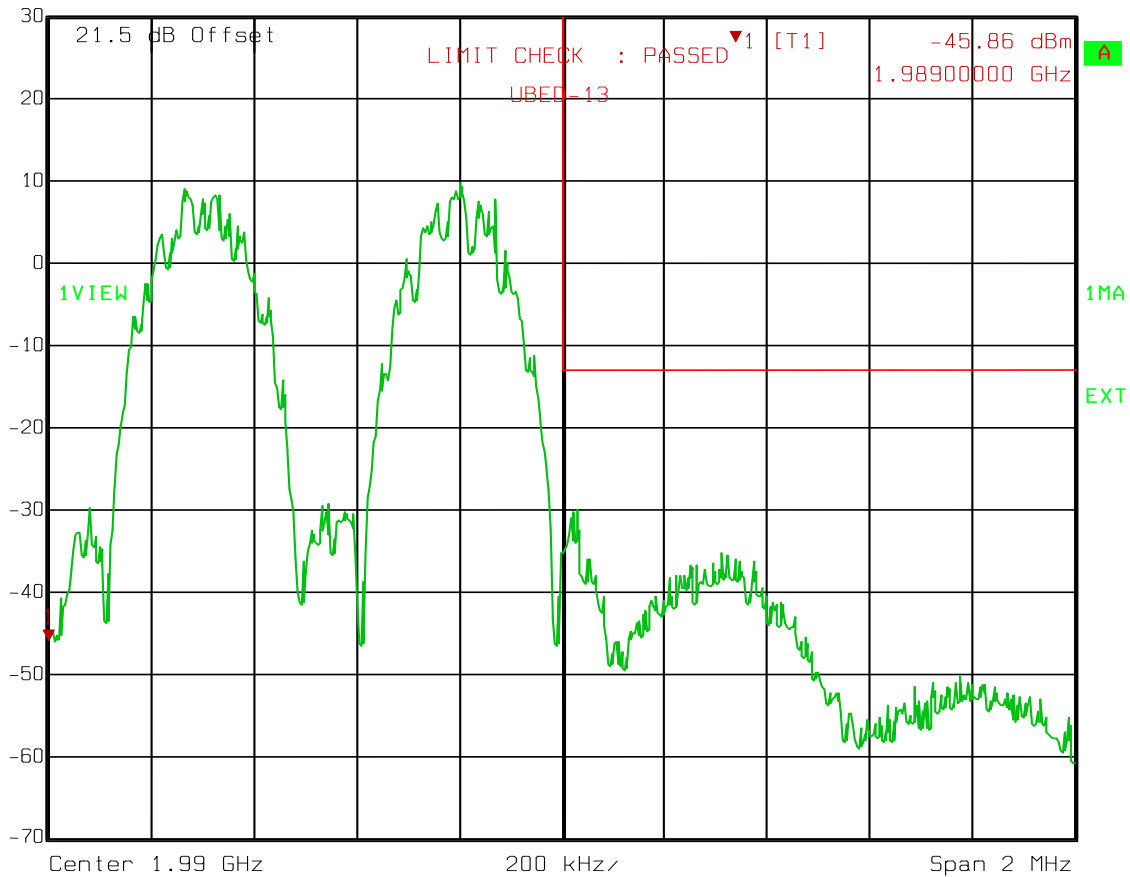
Upper Bandedge Intermodulation

EDGE

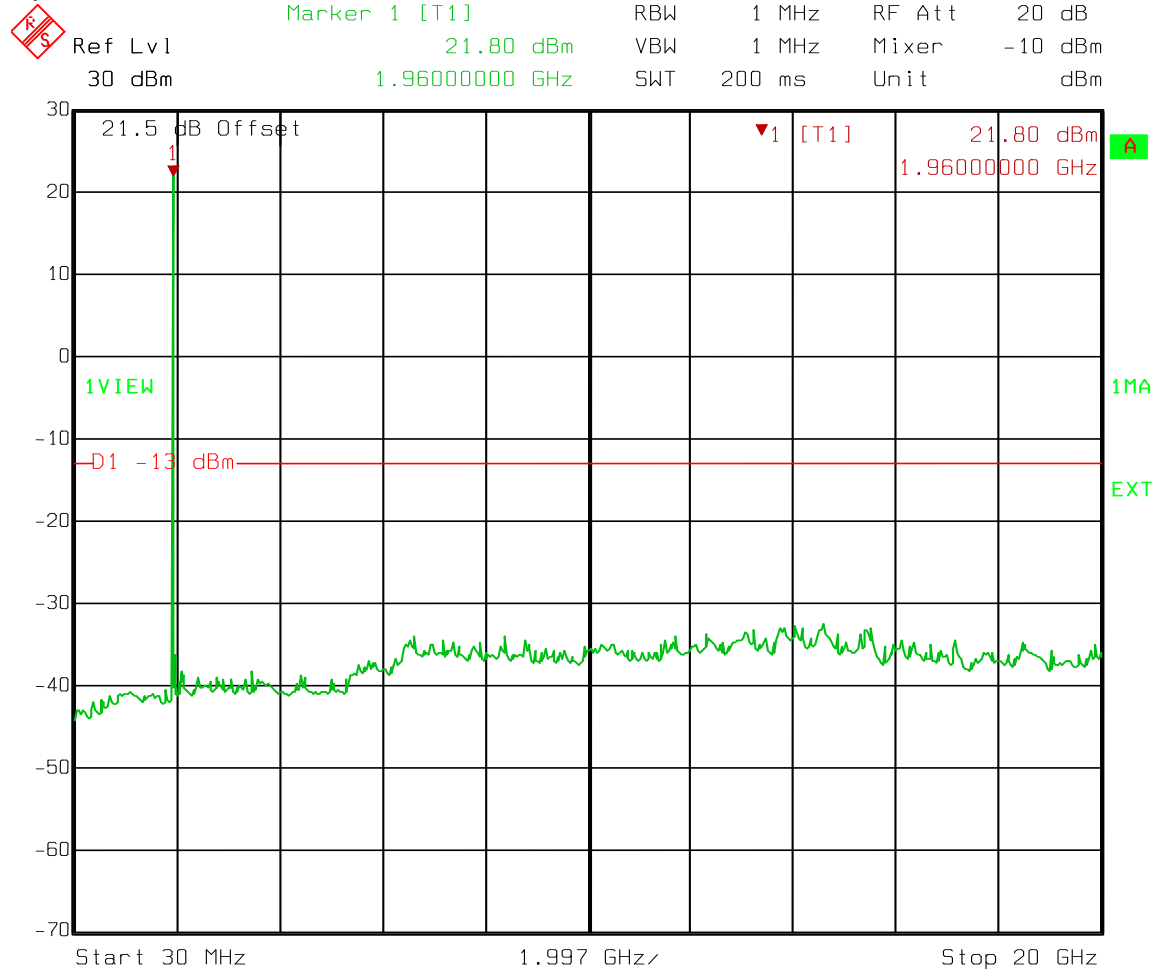
Downlink



Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	20 dB
30 dBm	-45.86 dBm	VBW	3 kHz	Mixer	-10 dBm
	1.98900000 GHz	SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:22:04

EQUIPMENT: **TFAM17/19****Test Data – Spurious Emissions at Antenna Terminals****Spurs – EDGE - Downlink**

Date: 25.JUN.2010 10:39:17

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

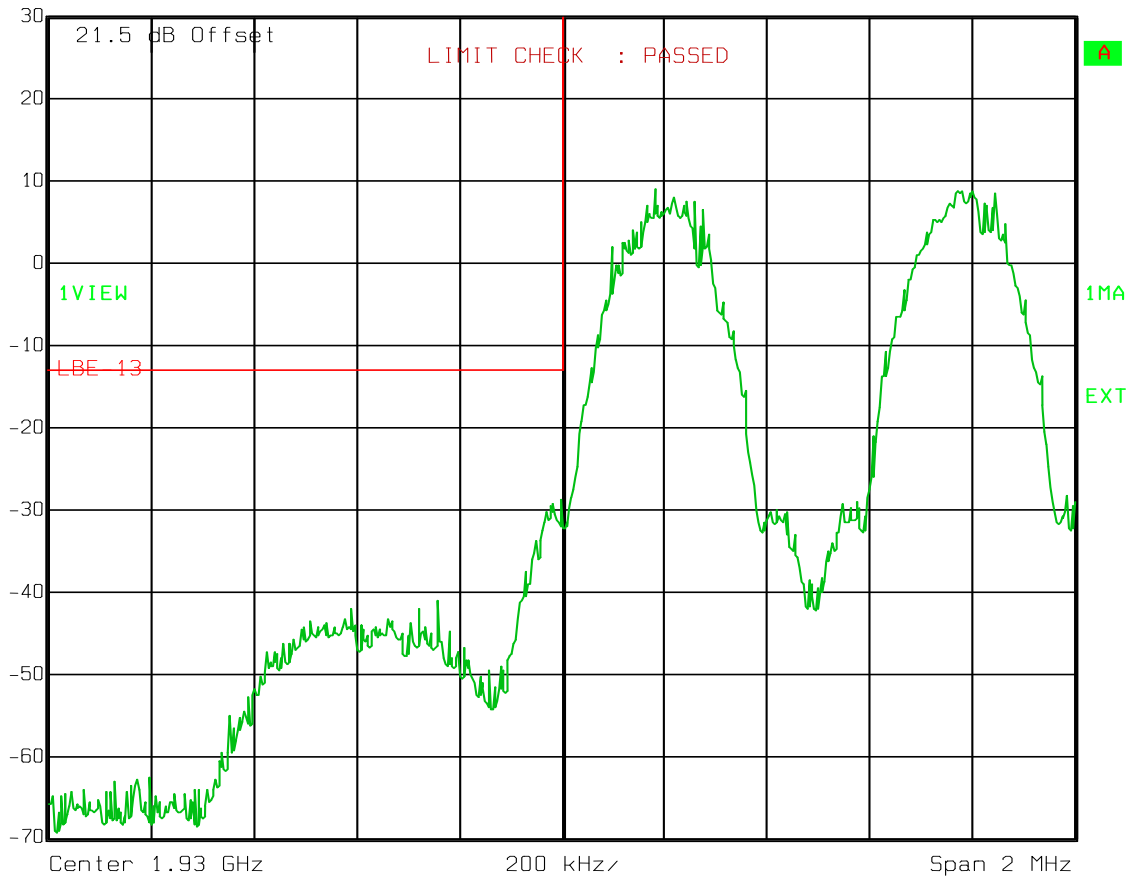
GSM

Downlink



Ref Lvl
30 dBm

RBW	3 kHz	RF Att	20 dB
VBW	3 kHz	Mixer	-10 dBm
SWT	560 ms	Unit	dBm



Date: 25.JUN.2010 10:16:50

EQUIPMENT: **TFAM17/19****Test Data – Spurious Emissions at Antenna Terminals**

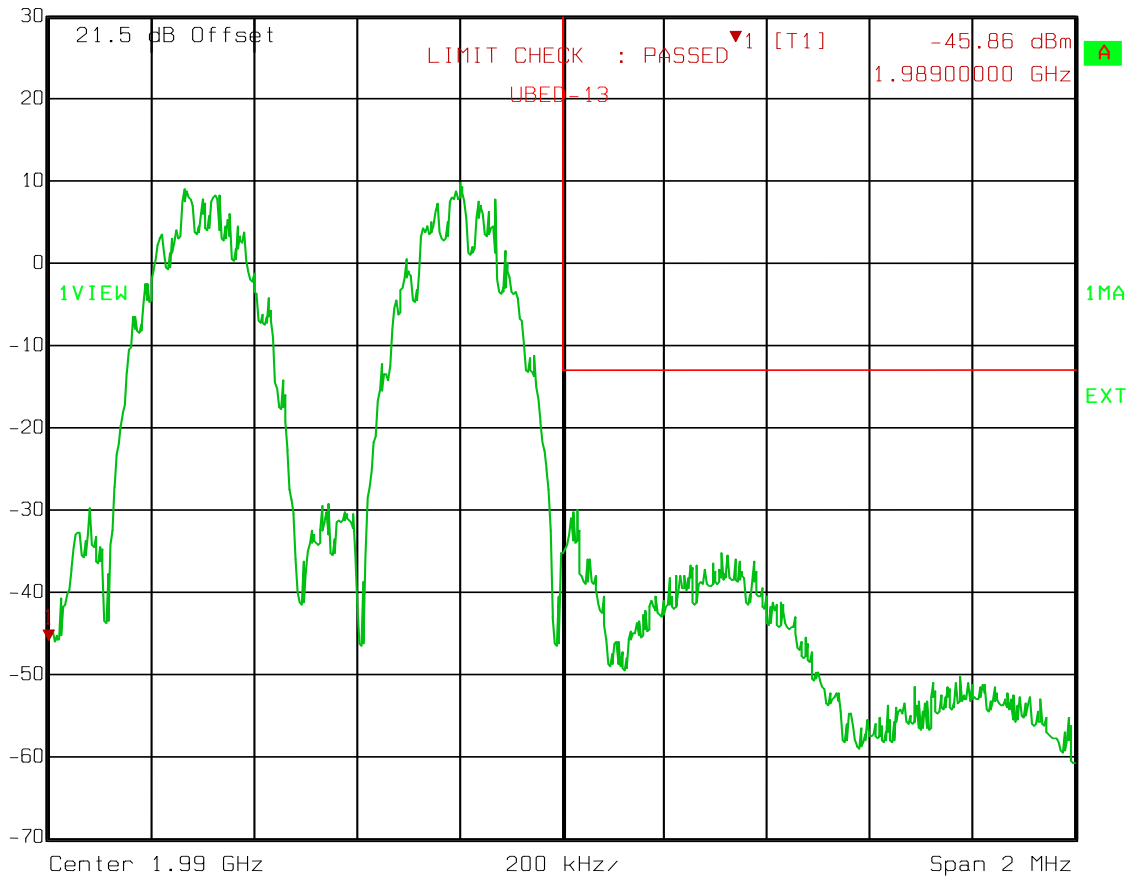
Upper Bandedge Intermodulation

GSM

Downlink



Ref Lvl	Marker 1 [T1]	RBW	3 kHz	RF Att	20 dB
30 dBm	-45.86 dBm	VBW	3 kHz	Mixer	-10 dBm
	1.98900000 GHz	SWT	560 ms	Unit	dBm

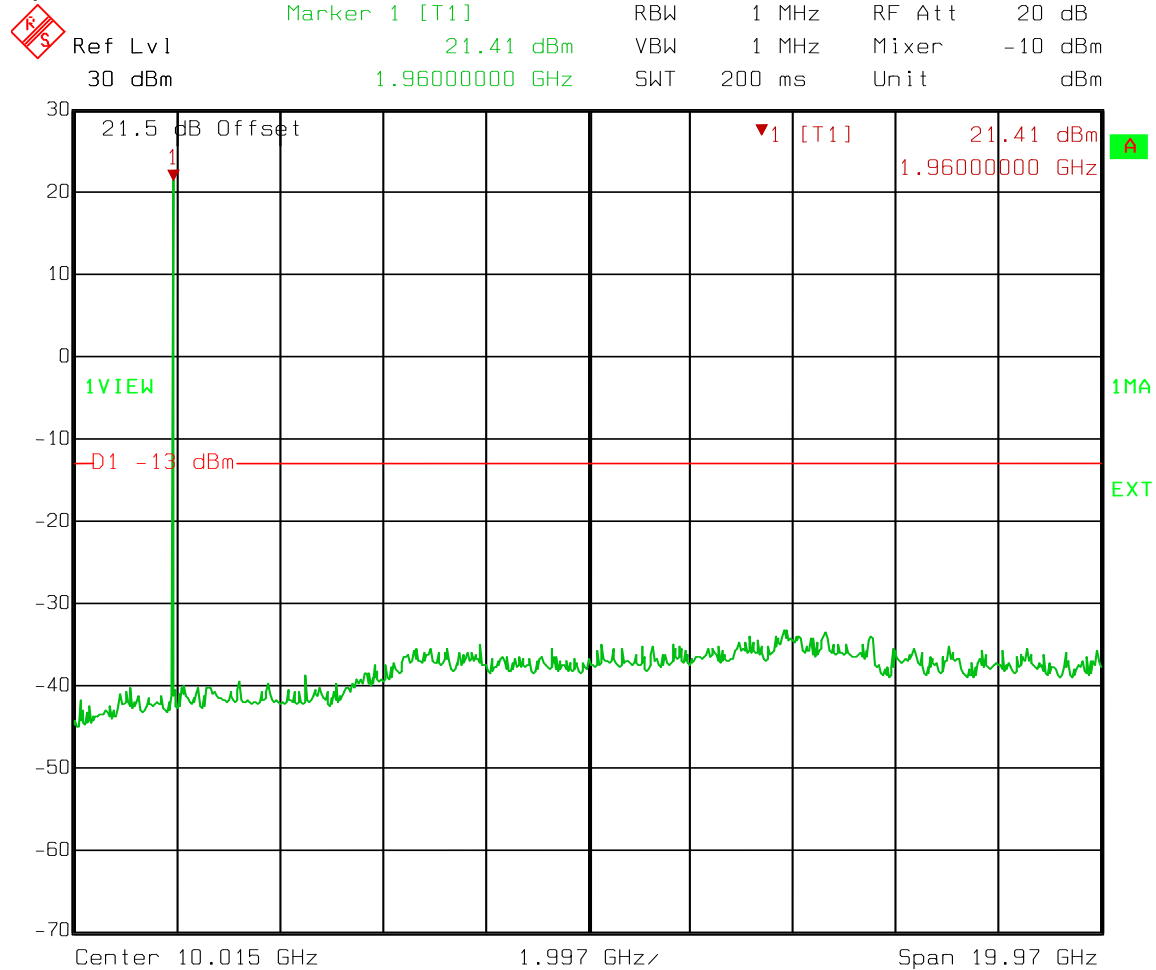


Date: 25.JUN.2010 10:22:04

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM - Downlink



Date: 25.JUN.2010 10:35:28

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

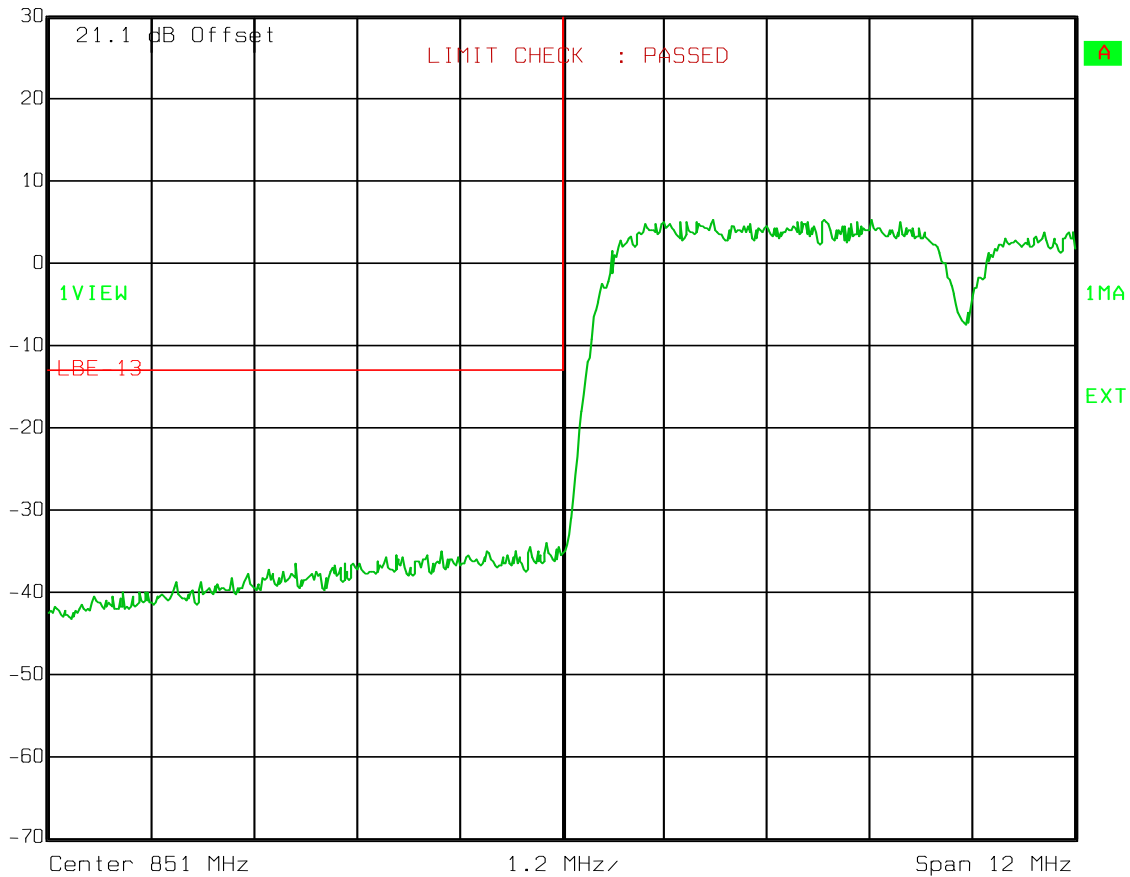
W-CDMA

Downlink



Ref Lvl
30 dBm

RBW 50 kHz RF Att 30 dB
VBW 50 kHz
SWT 12 ms Unit dBm



Date: 24.JUN.2010 10:03:38

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

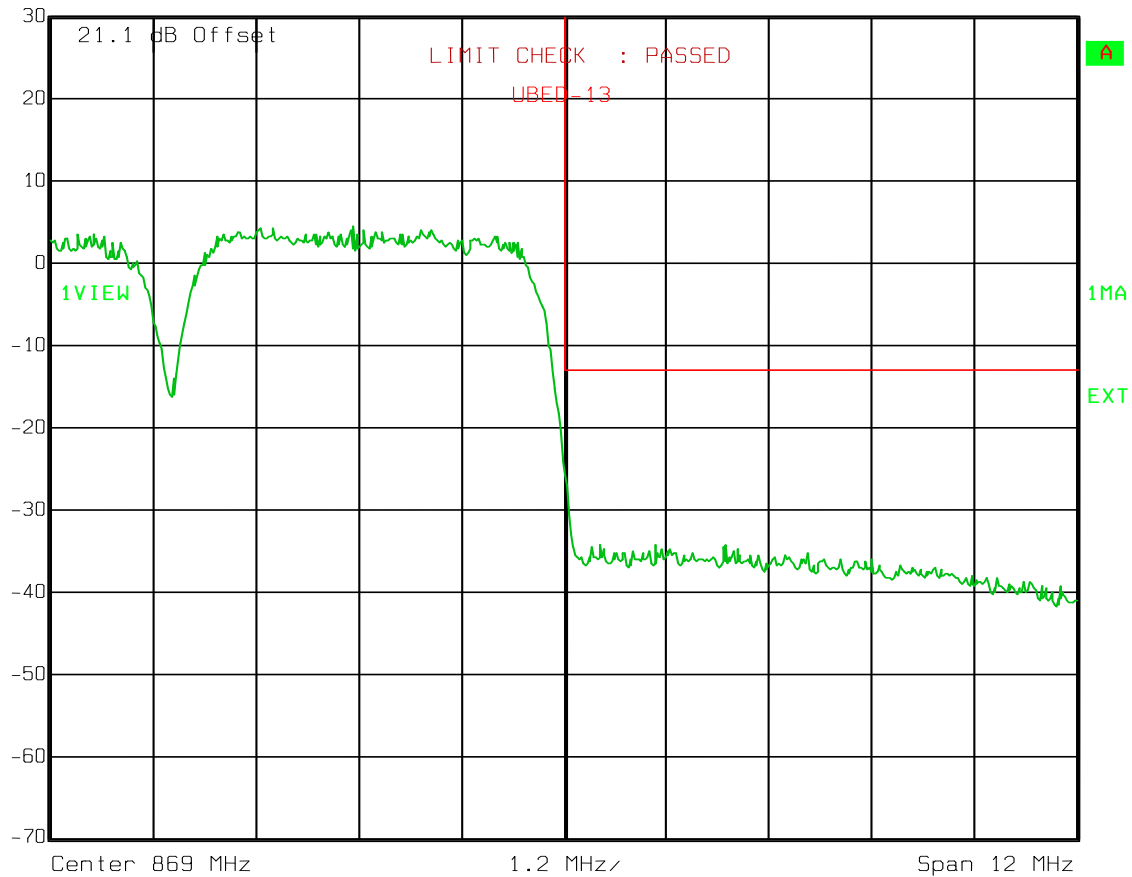
W-CDMA

Downlink



Ref Lvl
30 dBm

RBW 50 kHz RF Att 30 dB
VBW 50 kHz
SWT 12 ms Unit dBm

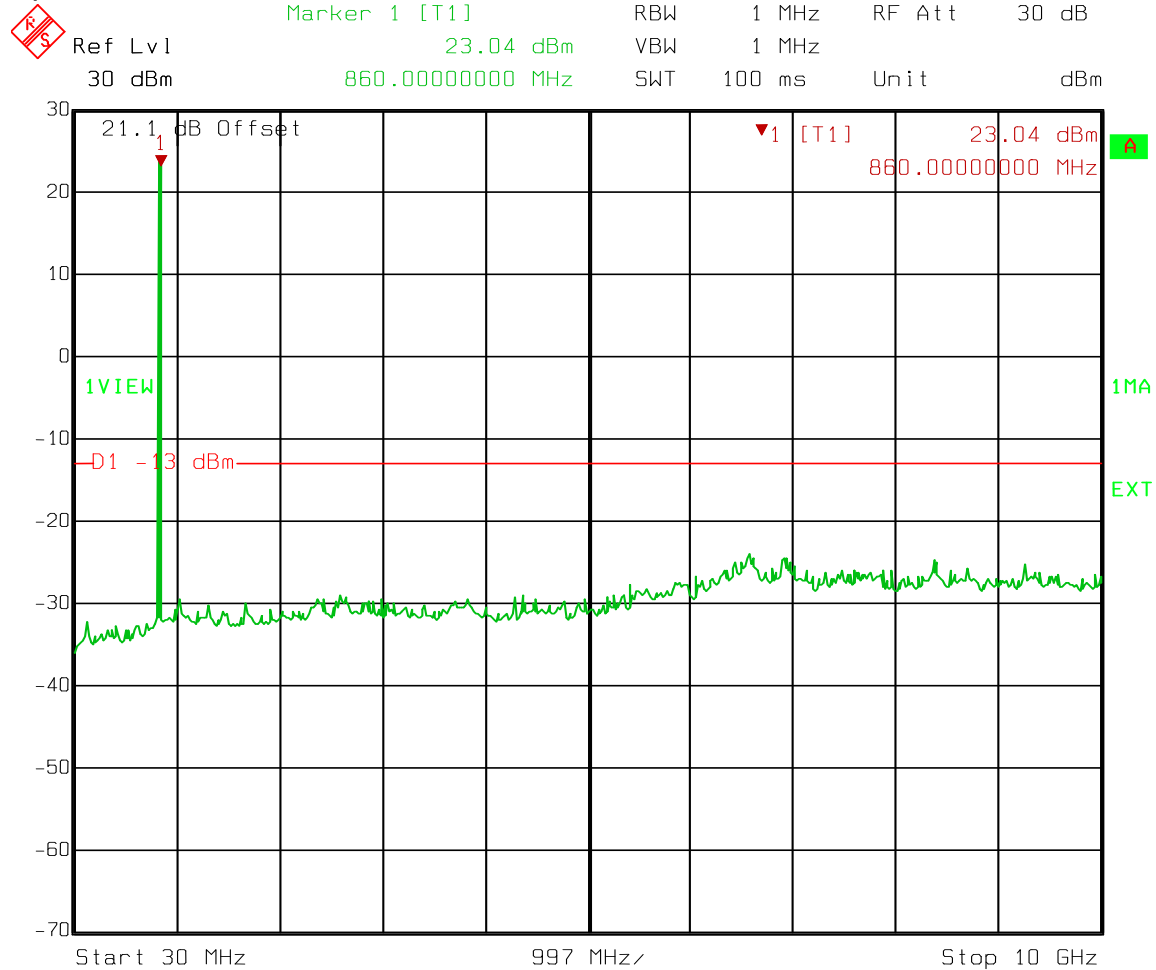


Date: 24.JUN.2010 10:05:26

EQUIPMENT: **TFAM17/19**

Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA - Downlink



EQUIPMENT: TFAM17/19

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 25 June 2010

Test Results: Complies.

Test Data: The spectrum was searched from 30 MHz to 20 GHz. No emissions were detected within 20 dB of the specification limit.

RBW = VBW = 1 MHz Peak detector

Equipment Used: 1464-1484-1485-1016-993-791-1480

Measurement Uncertainty: +/-1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: **TFAM17/19****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	30-Jun-2009	30-Jun-2010
1026	Frequency counter	Hewlett Packard	5350B	8232A01493	21-Dec-2007	21-Dec-2008
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
1468	Attenuator, 10 db, DC 18 Ghz	MCL Inc.	BW-S10W2 10db-2WDC		N/R	
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	
1480	Antenna, Bilog	Schaffner-Chase	CBL6111C	2572	18-Jan-2010	18-Jan-2011
1484	Cable	Storm	PR90-010-072		30-Jun-2009	30-Jun-2010
1485	Cable	Storm	PR90-010-216		30-Jun-2009	30-Jun-2010
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.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

Method Of Measurement:

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or 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.

EQUIPMENT: TFAM17/19

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= 100 kHz

Span: 10 MHz

Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 24.238**Minimum Standard:**

Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ 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: 100 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.: 24.238
---	--------------------------

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

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 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.

EQUIPMENT: TFAM17/19**NAME OF TEST: Frequency Stability****PARA. NO.: 2.1055**

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:

Frequency Stability With Voltage Variation

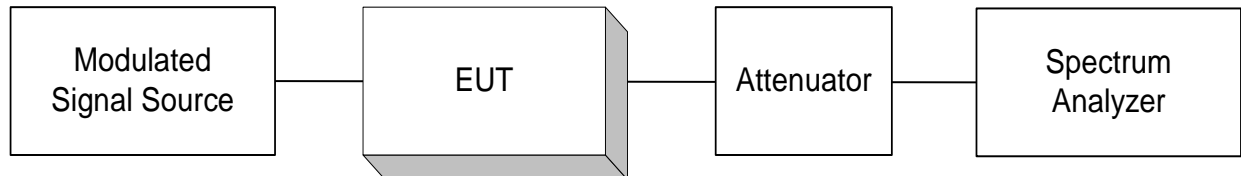
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the 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

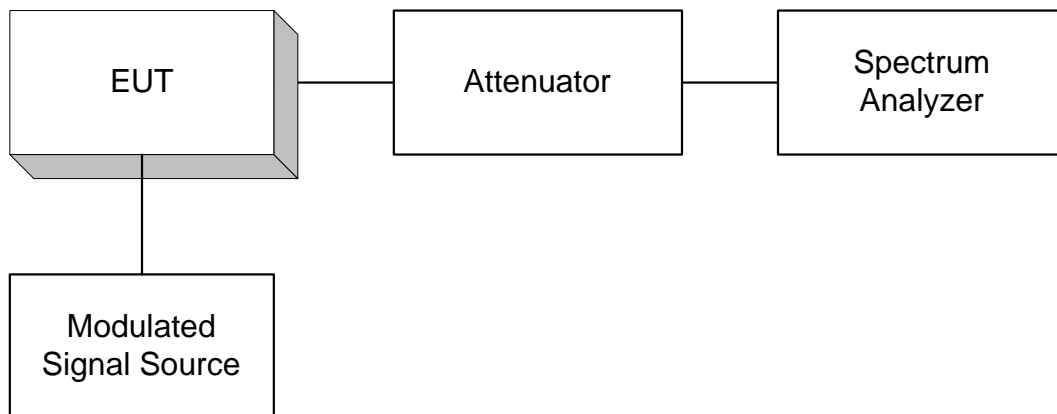
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

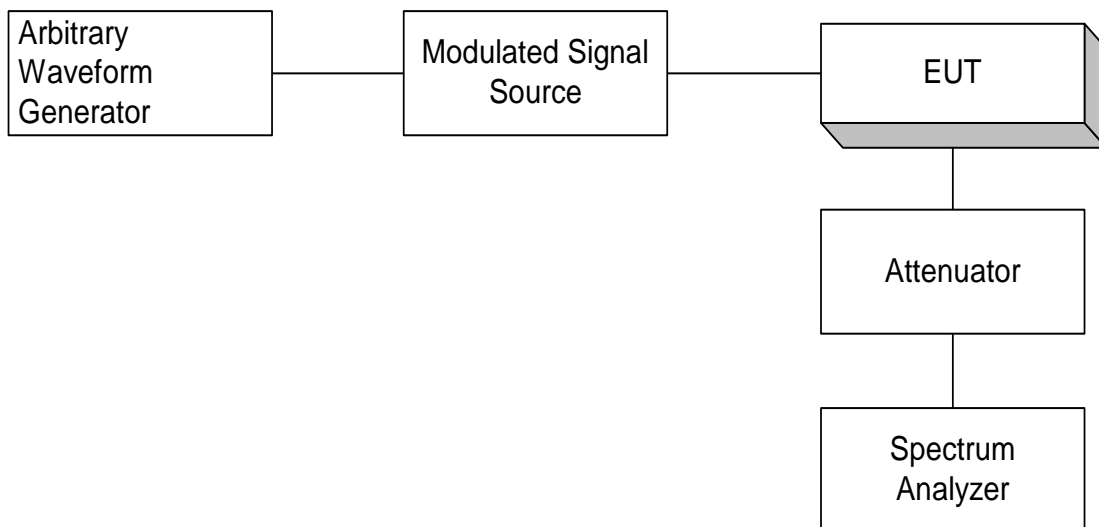
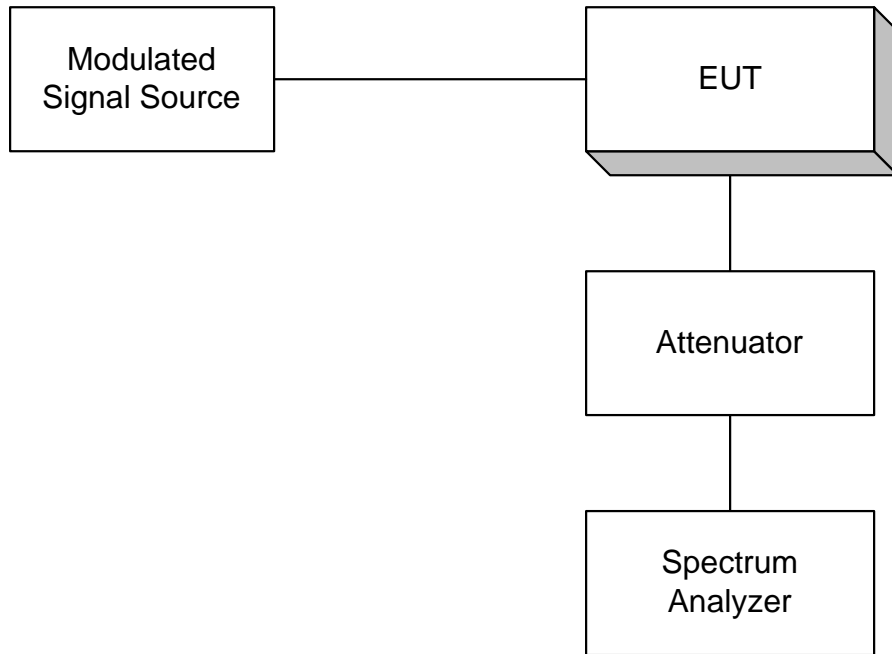
Para. No. 2.985 - R.F. Power Output



Para. No. 2.989 - Occupied Bandwidth

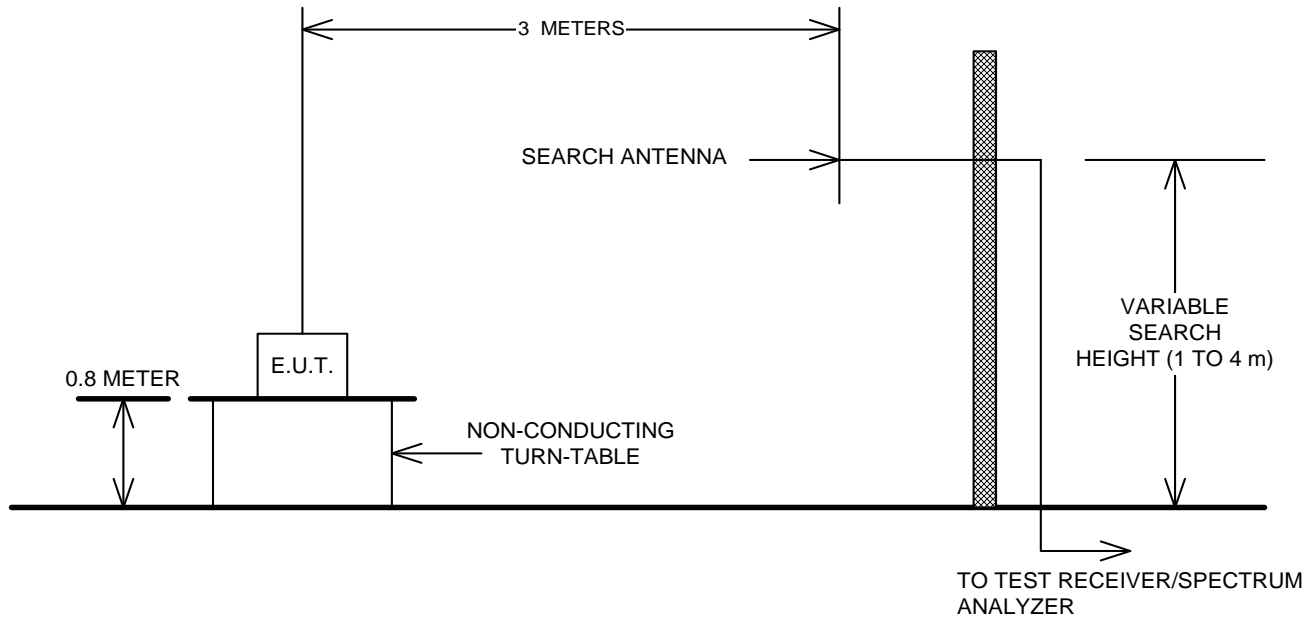


Para. No. 2.991 Spurious Emissions at Antenna Terminals



EQUIPMENT: **TFAM17/19**

Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

