Nemko Test Report No.:	6L0172RUS1
Applicant:	Andrew Corporation 108 Rand Park Drive Garner, NC 27529
Equipment Under Test:	TFAM80/92/19E
In Accordance With:	**FCC Part 24, Subpart E** Broadband PCS Repeaters
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, Texas 75057-3136
Authorized By:	 Kevin Rose Wireless Engineer
Date:	June 30, 2006

Table of Contents

Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: TFAM80/92/19E

Serial No.: 062200923

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 FCC 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".

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	24.232	100W	Complies
Occupied Bandwidth	24.238	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:

Measurement uncertainty for each test configuration is expressed to 95% probability.

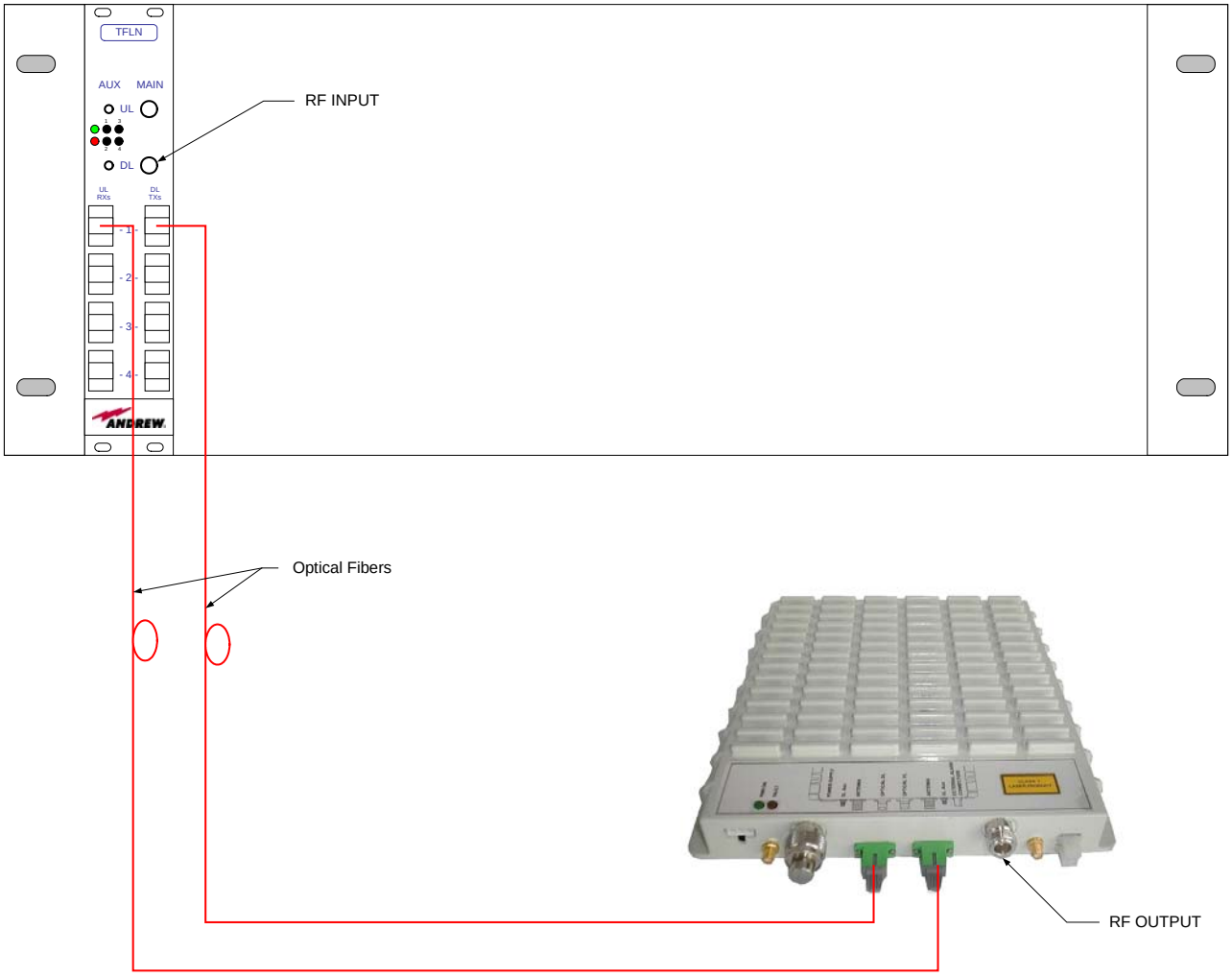
Section 2. General Equipment Specification

Supply Voltage Input:		120 Vac
Frequency Range:	**Downlink:**	1930.03 to 1989.97 MHz
	Uplink:	NA
Type of Modulation and Designator:		**CDMA (F9W)** ☒ **GSM (GXW)** ☒ **TDMA (DXW)** ☒ **EDGE (G7W)** ☒ **WCDMA (F9W)** ☒
	CDMA	1M25F9W
	GSM	300KGXW
	TDMA	30K0DXW
	EDGE	300KG7W
	WCDMA	4M20F9W
System Gain:		19 dB 1900 Band
Output Impedance:		50 ohms
RF Output (Rated):	**Uplink**	NA
Rated RF Output (dB):	**Downlink**	Number of Carriers: 1 / 2 / 4 / 8 CW1900: 22 / .19 / .16 / 13 TDMA1900: 21 / .18 / .15 / 12 CDMA1900: 19 / .16 / .13 / 10 W-CDMA1900: 18 / .14 / .10 / 6
Frequency Translation:		**F1-F1** ☐ **F1-F2** ☐ **N/A** ☒
Band Selection:		**Software** ☐ **Duplexer** ☐ **Fullband** ☒

Description of Operation

The TFAM80/92/19E is a triple band remote unit designed to distribute LMR800, LMR900 and PCS1900 extended band signals along the same fiber.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 28 June 2006

Test Results: Complies.

Measurement Data:

Frequency (MHz)	Modulation Type	Per Channel Output Power (dBm)
1931.25	CDMA	18.92
1960.00	CDMA	19.06
1988.75	CDMA	19.05
1930.2	GSM	21.28
1960	GSM	21.27
1989.8	GSM	21.18
1930.2	EDGE	21.25
1960	EDGE	21.08
1989.8	EDGE	21.01
1930.03	TDMA	21.27
1960.00	TDMA	21.11
1989.97	TDMA	21.13
1932.5	WCDMA	18.06
1960	WCDMA	18.22
1987.5	WCDMA	18.15

Equipment Used: 1036-1042-1472-1469

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 40 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 28 June 2006

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1042-1472-1469

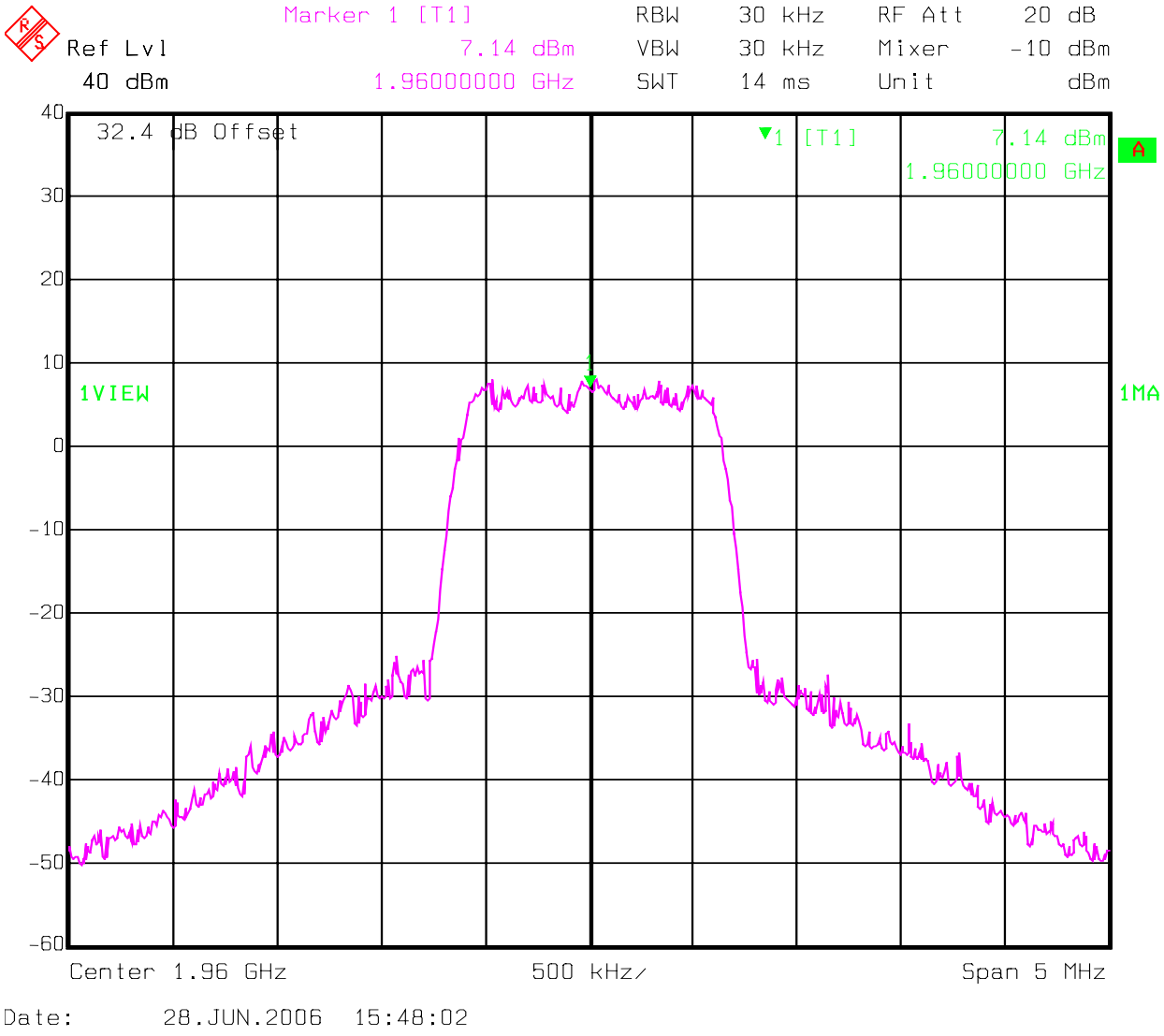
Measurement Uncertainty: +/- 1.6 dB

Temperature: 22 °C

Relative Humidity: 40 %

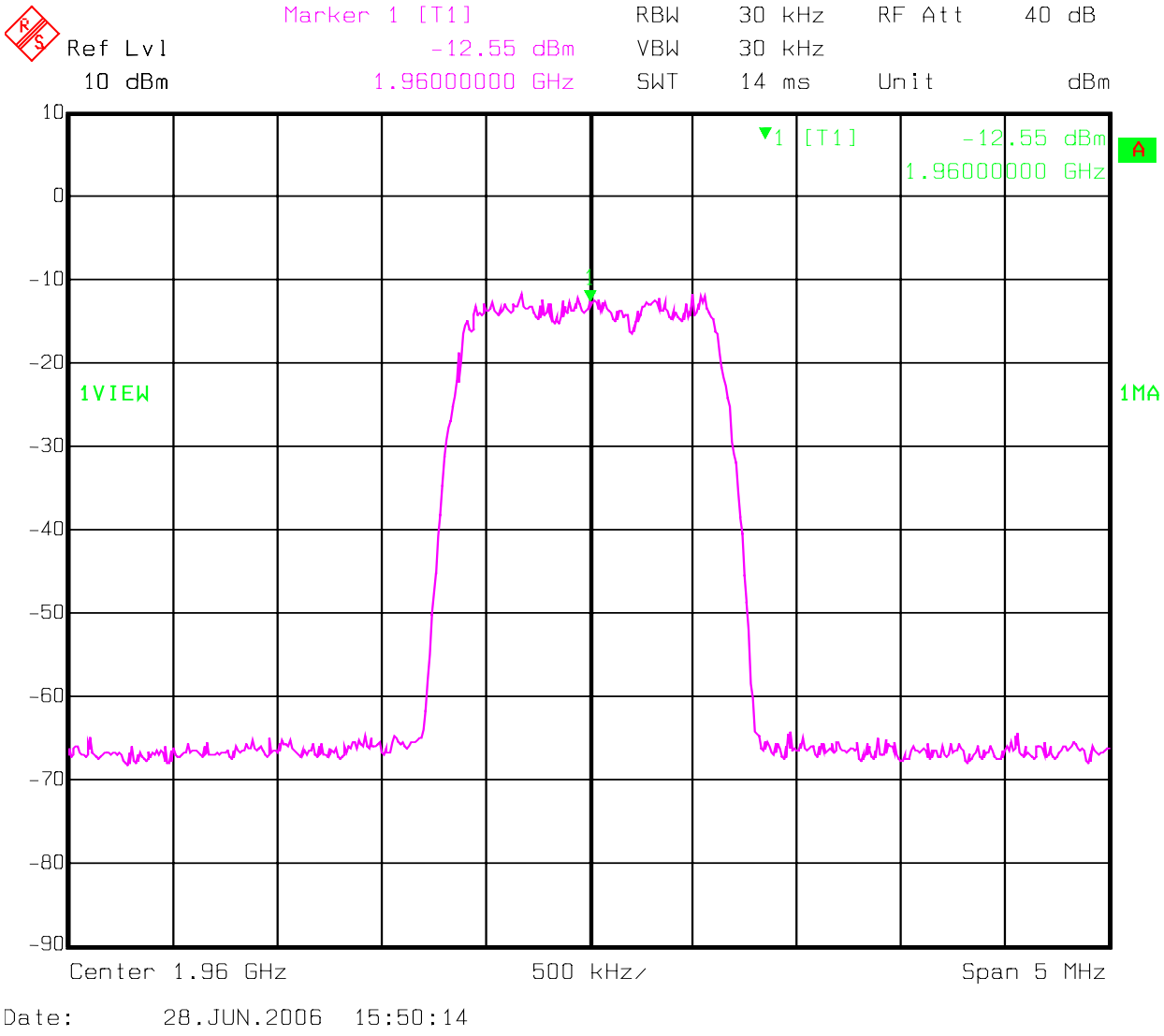
Test Data – Occupied Bandwidth

CDMA OUTPUT



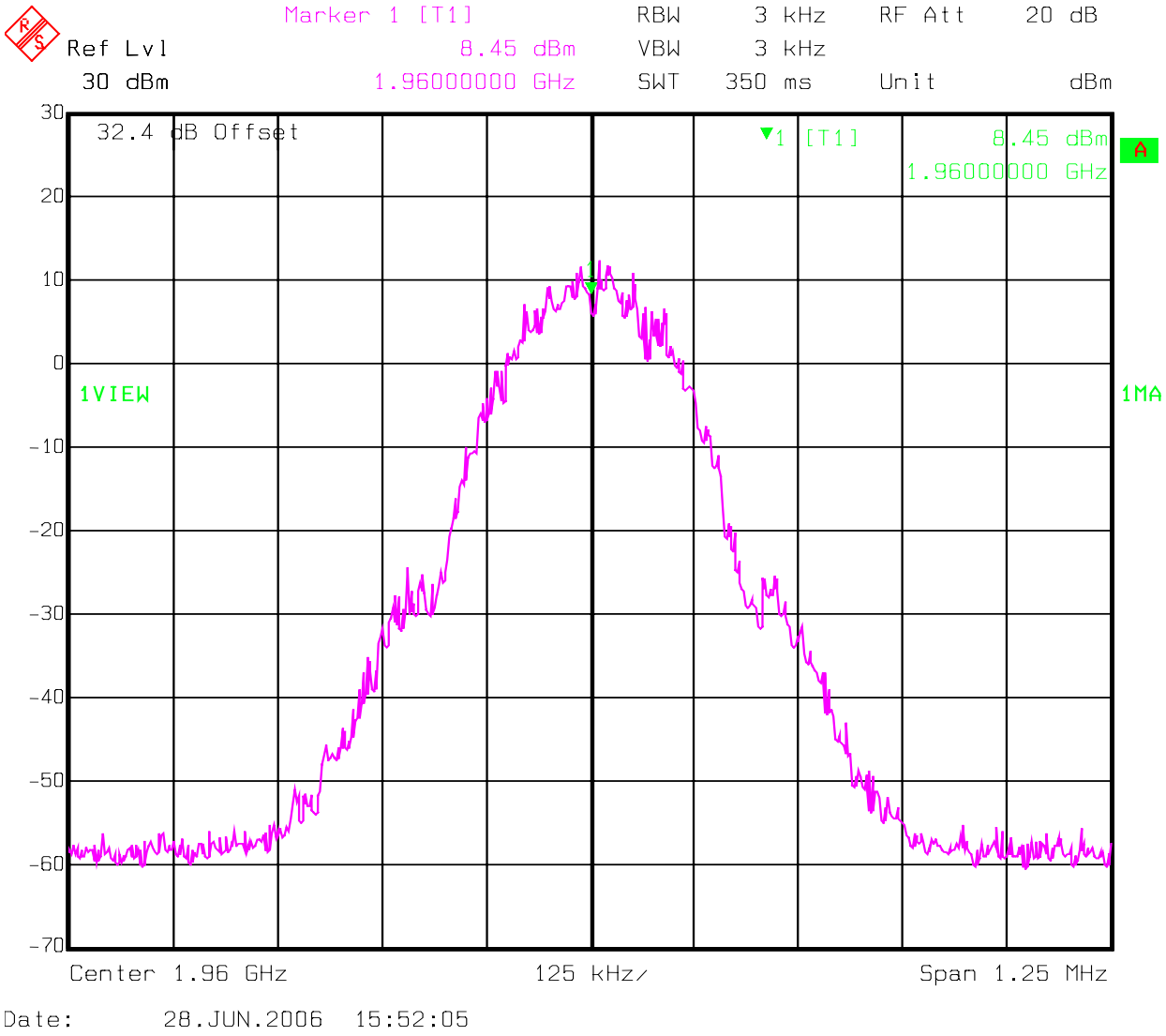
Test Data – Occupied Bandwidth

CDMA INPUT



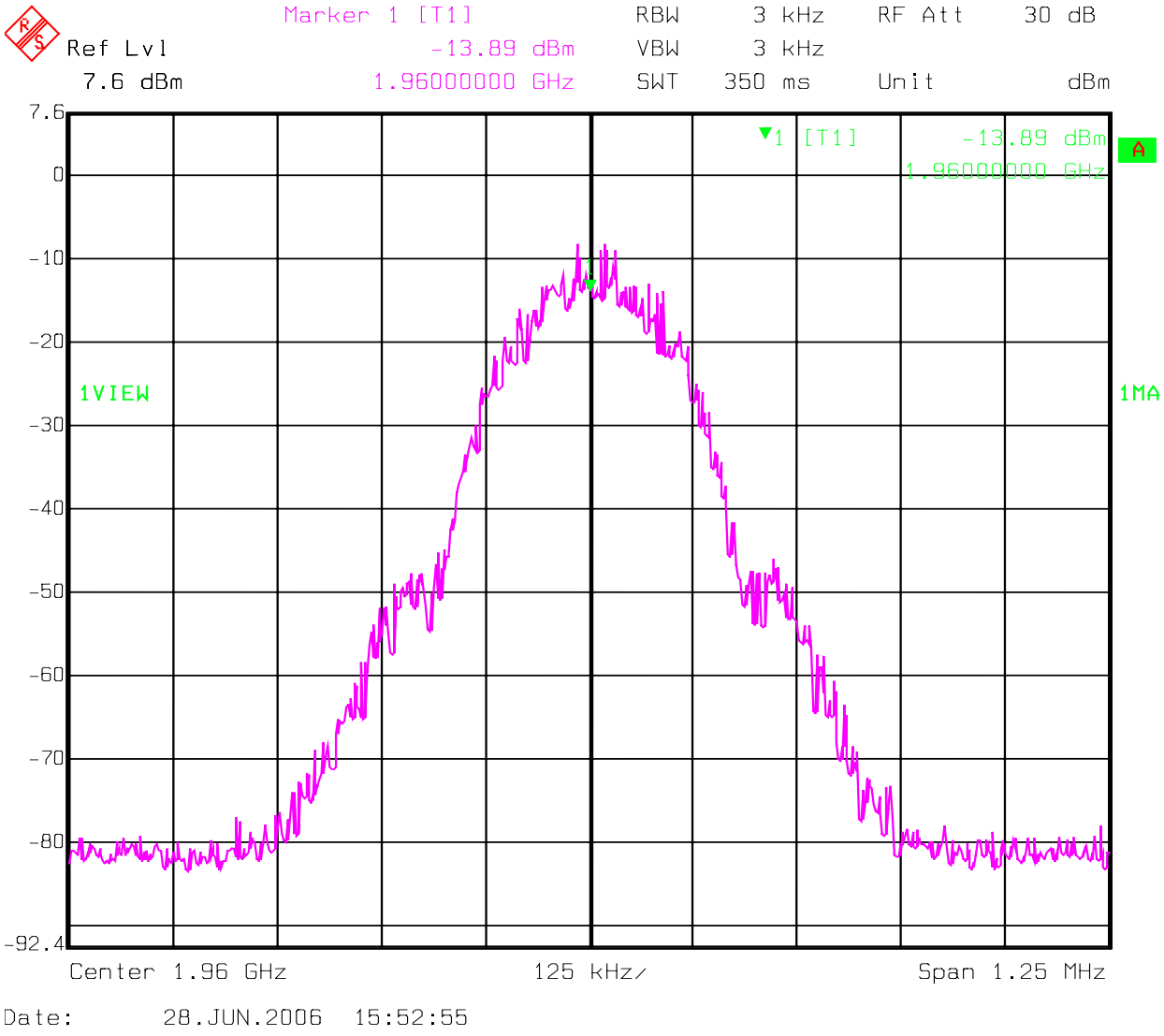
Test Data – Occupied Bandwidth

GSM OUTPUT



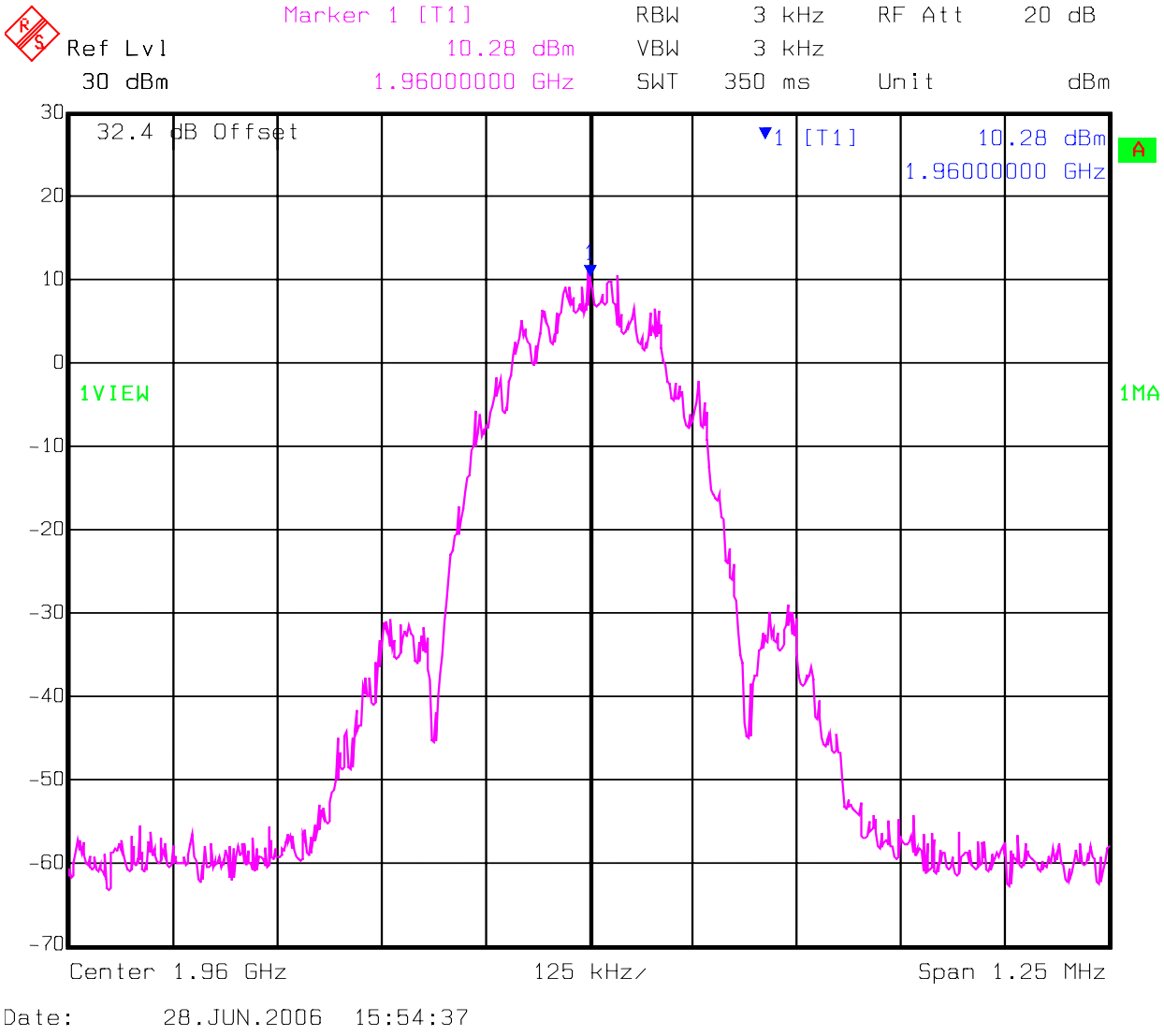
Test Data – Occupied Bandwidth

GSM INPUT



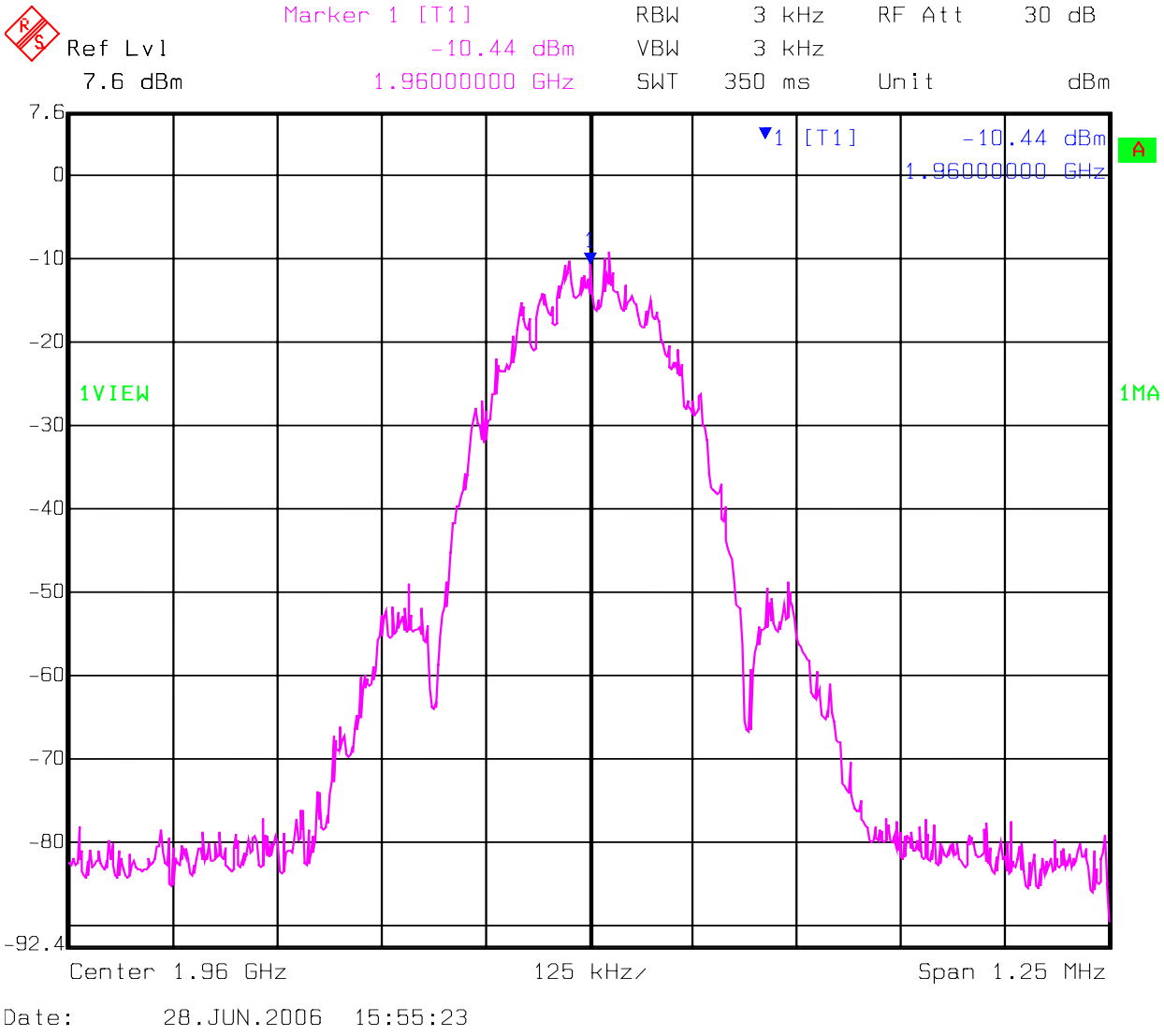
Test Data – Occupied Bandwidth

EDGE OUTPUT



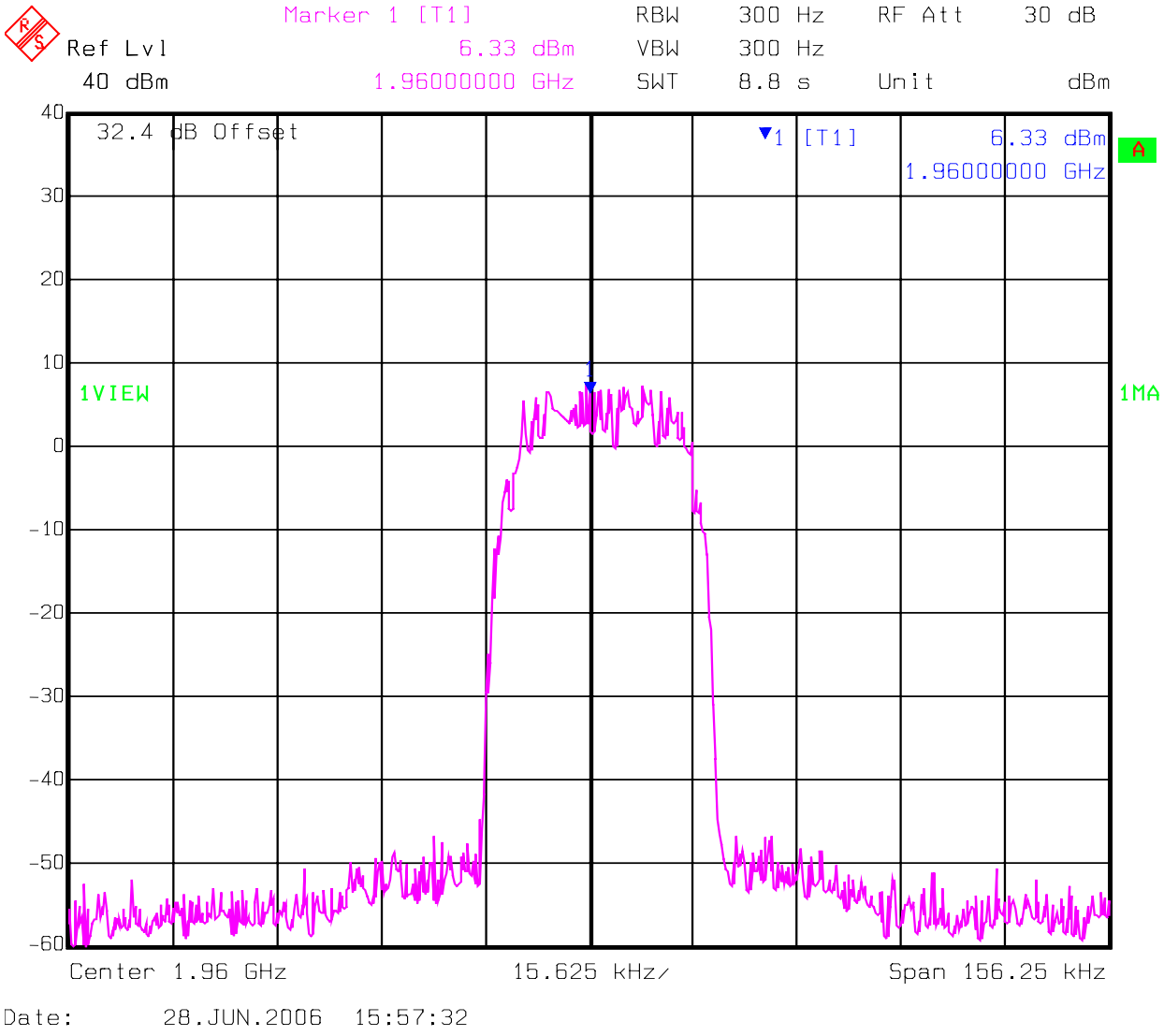
Test Data – Occupied Bandwidth

EDGE INPUT



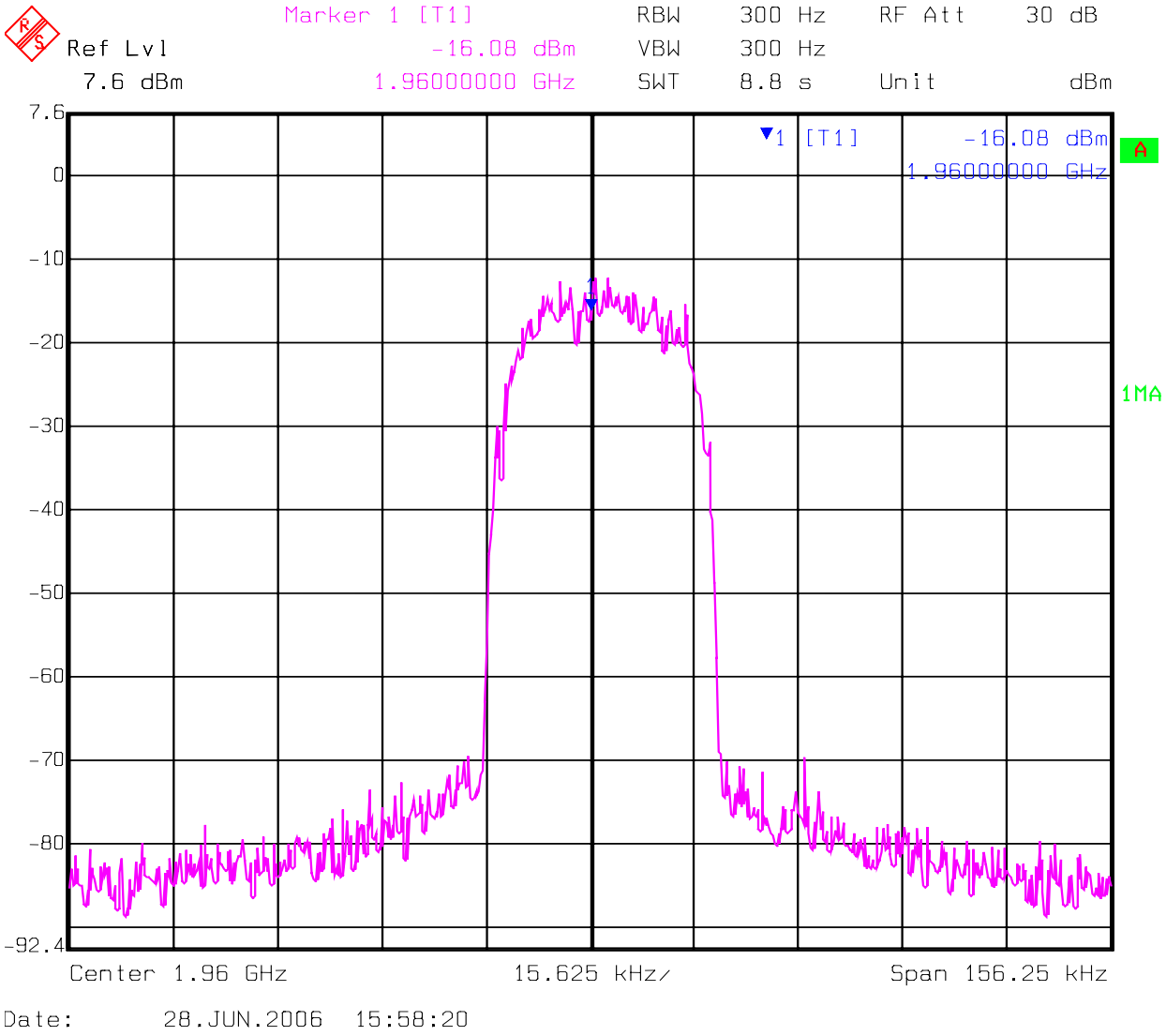
Test Data – Occupied Bandwidth

TDMA OUTPUT



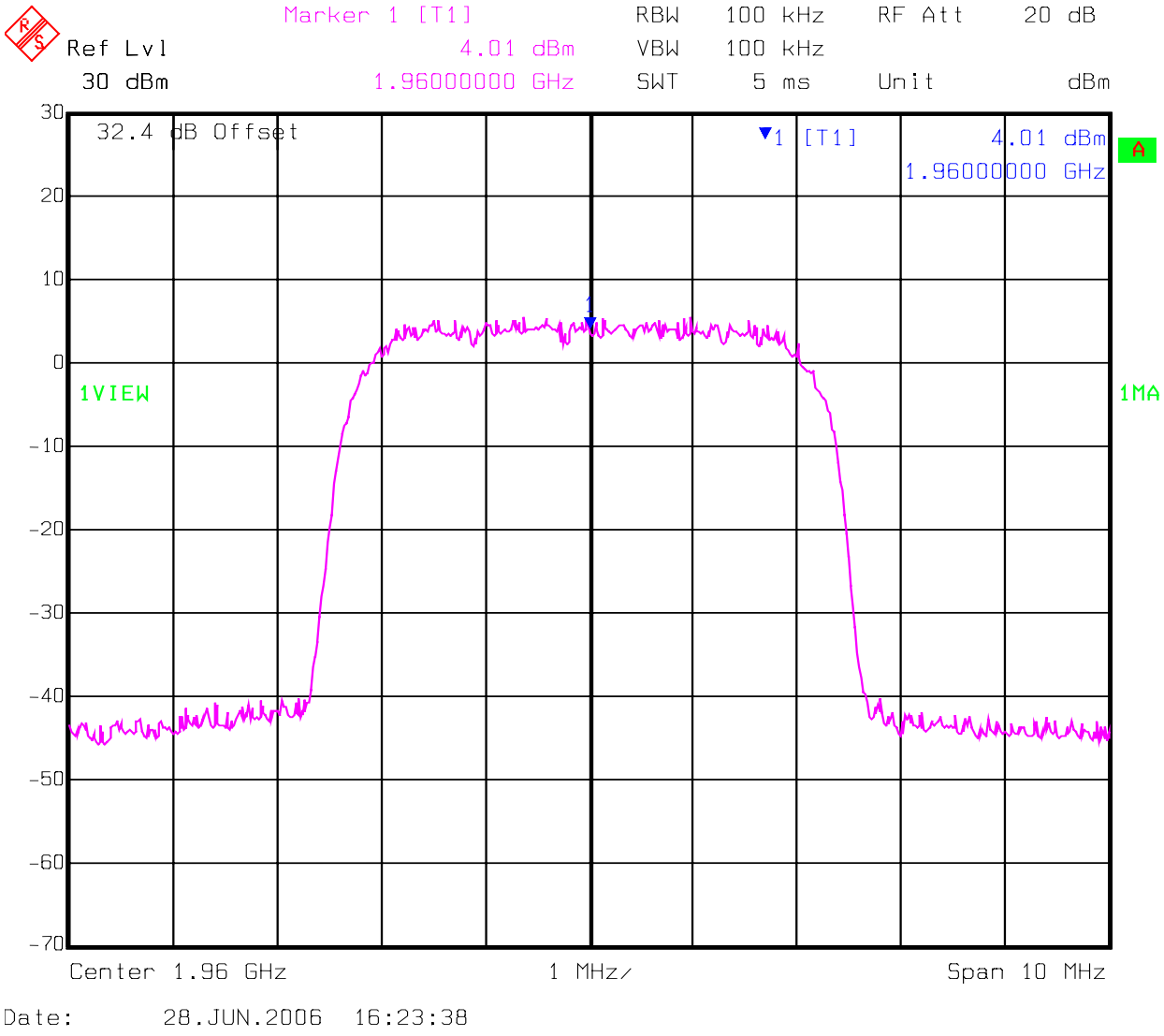
Test Data – Occupied Bandwidth

TDMA INPUT



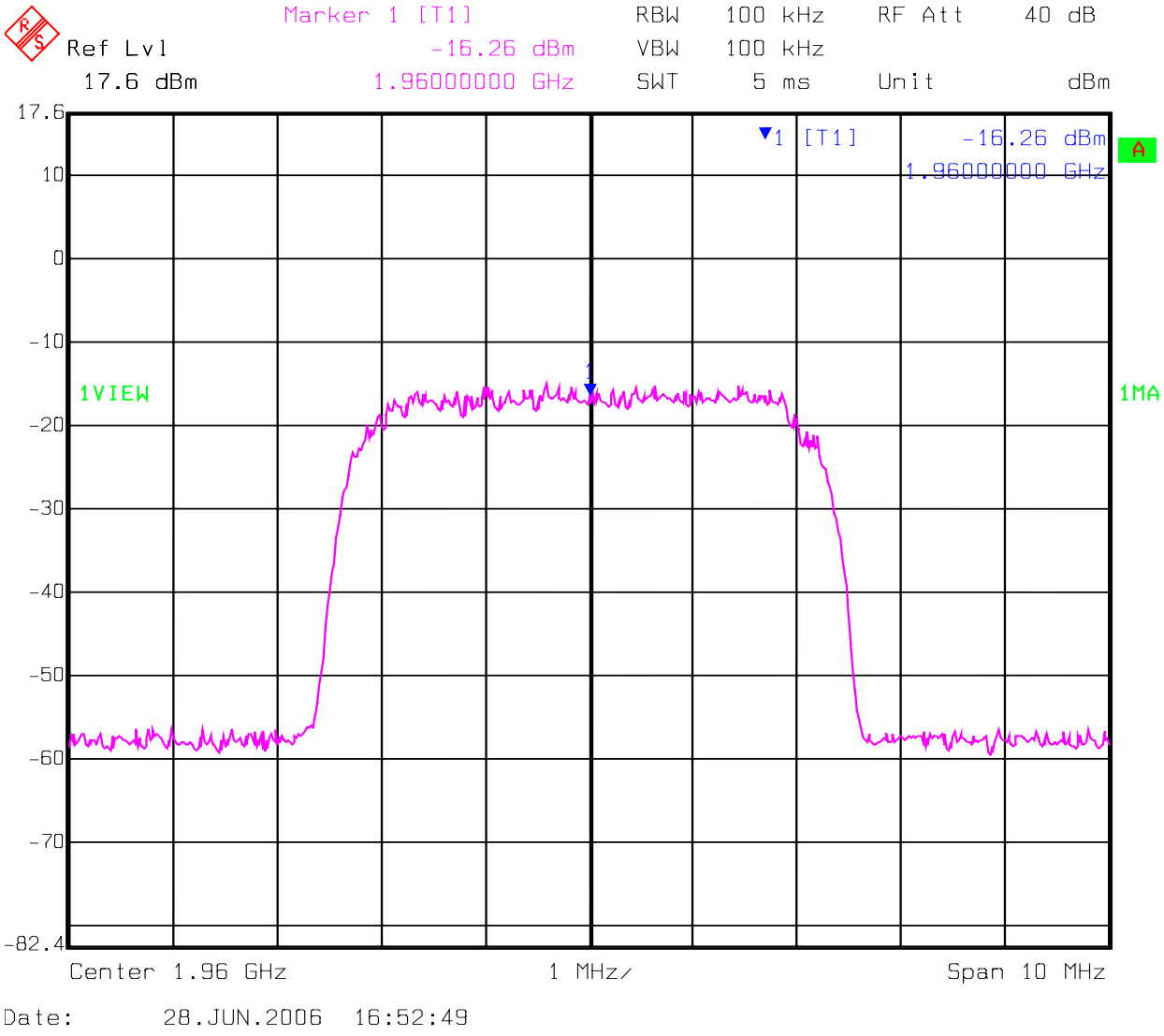
Test Data – Occupied Bandwidth

WCDMA OUTPUT



Test Data – Occupied Bandwidth

WCDMA INPUT



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 29 June 2006

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1042-1472-1469

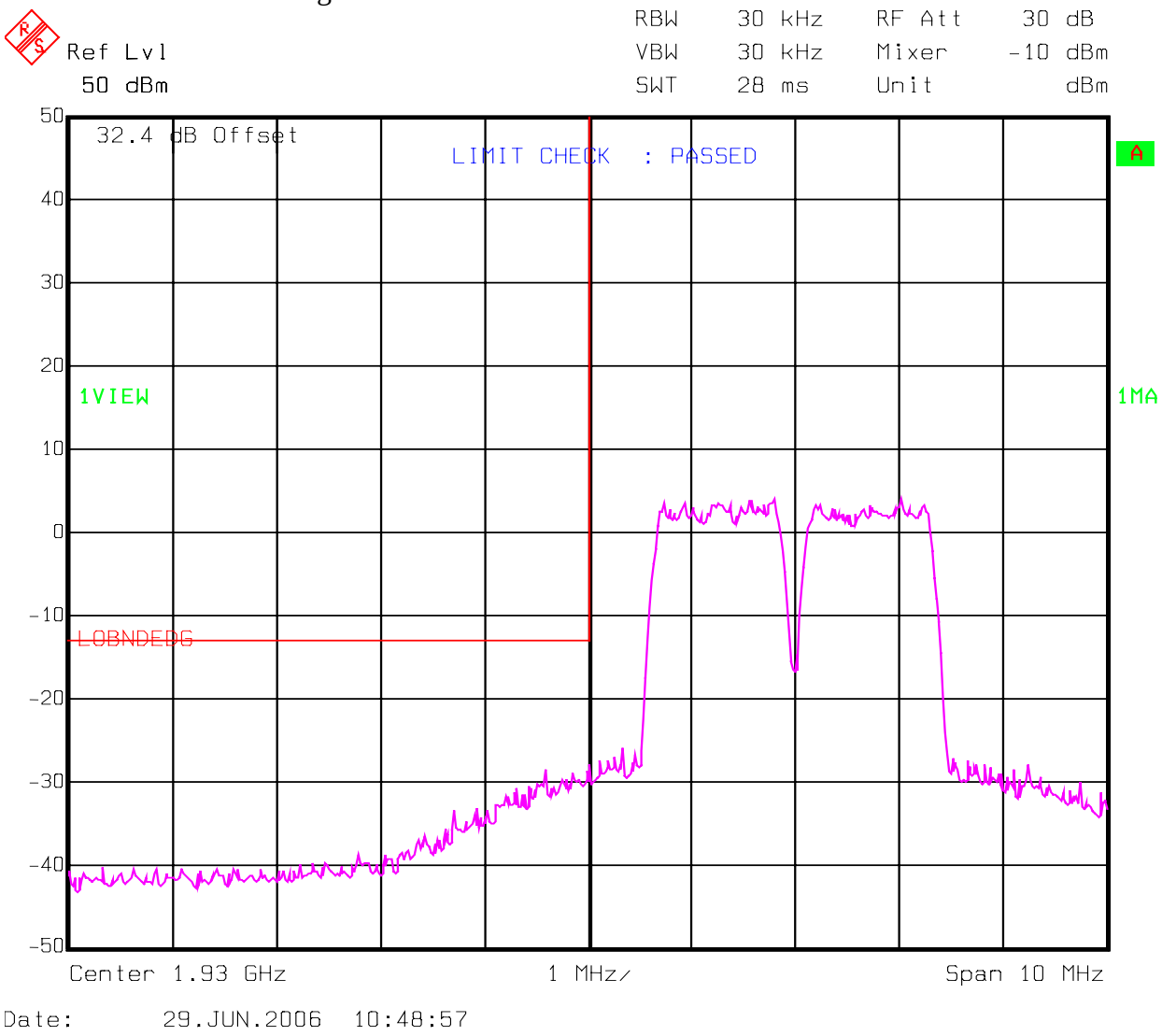
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

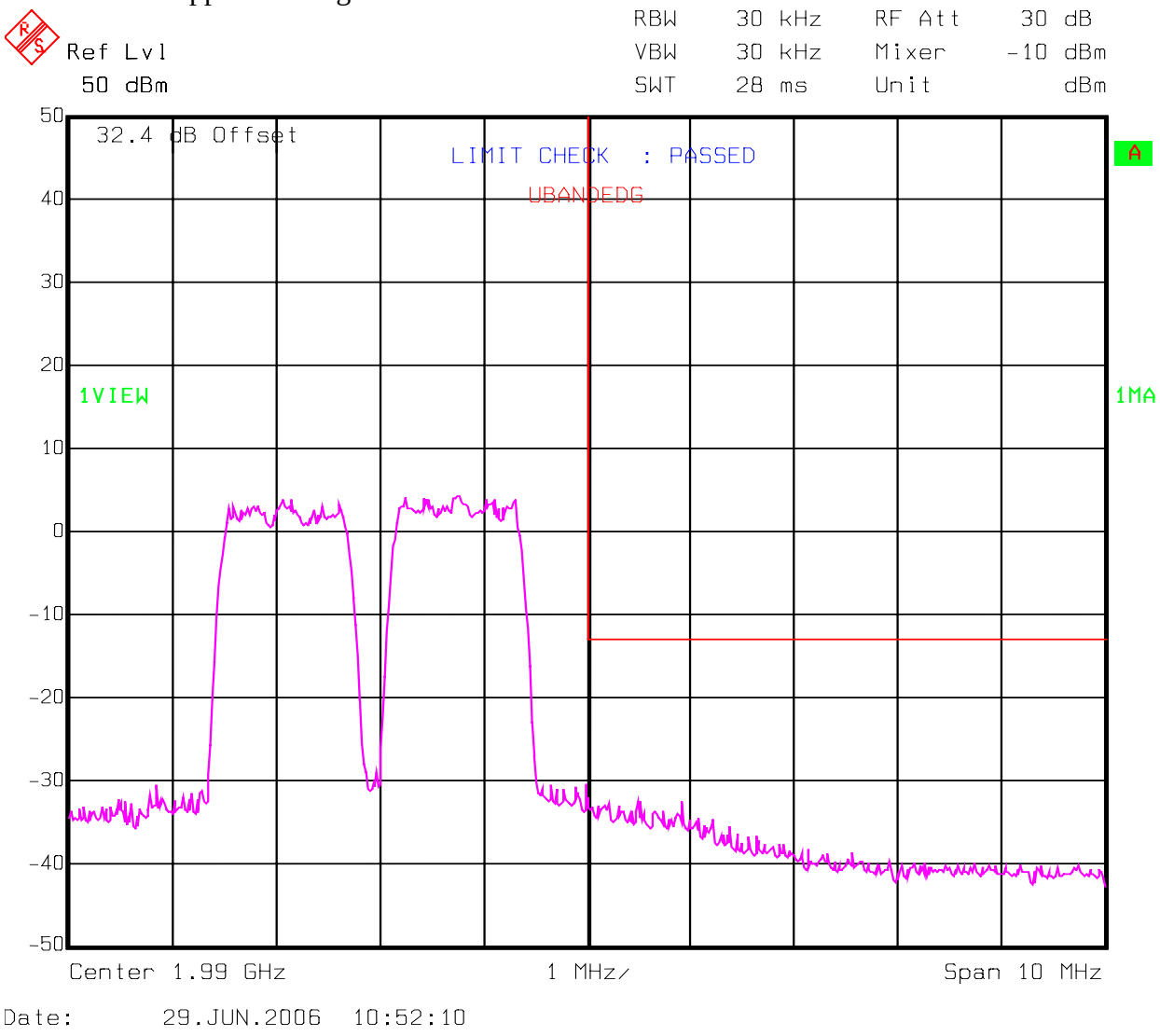
Test Data – Spurious Emissions

IM – CDMA Low bandedge



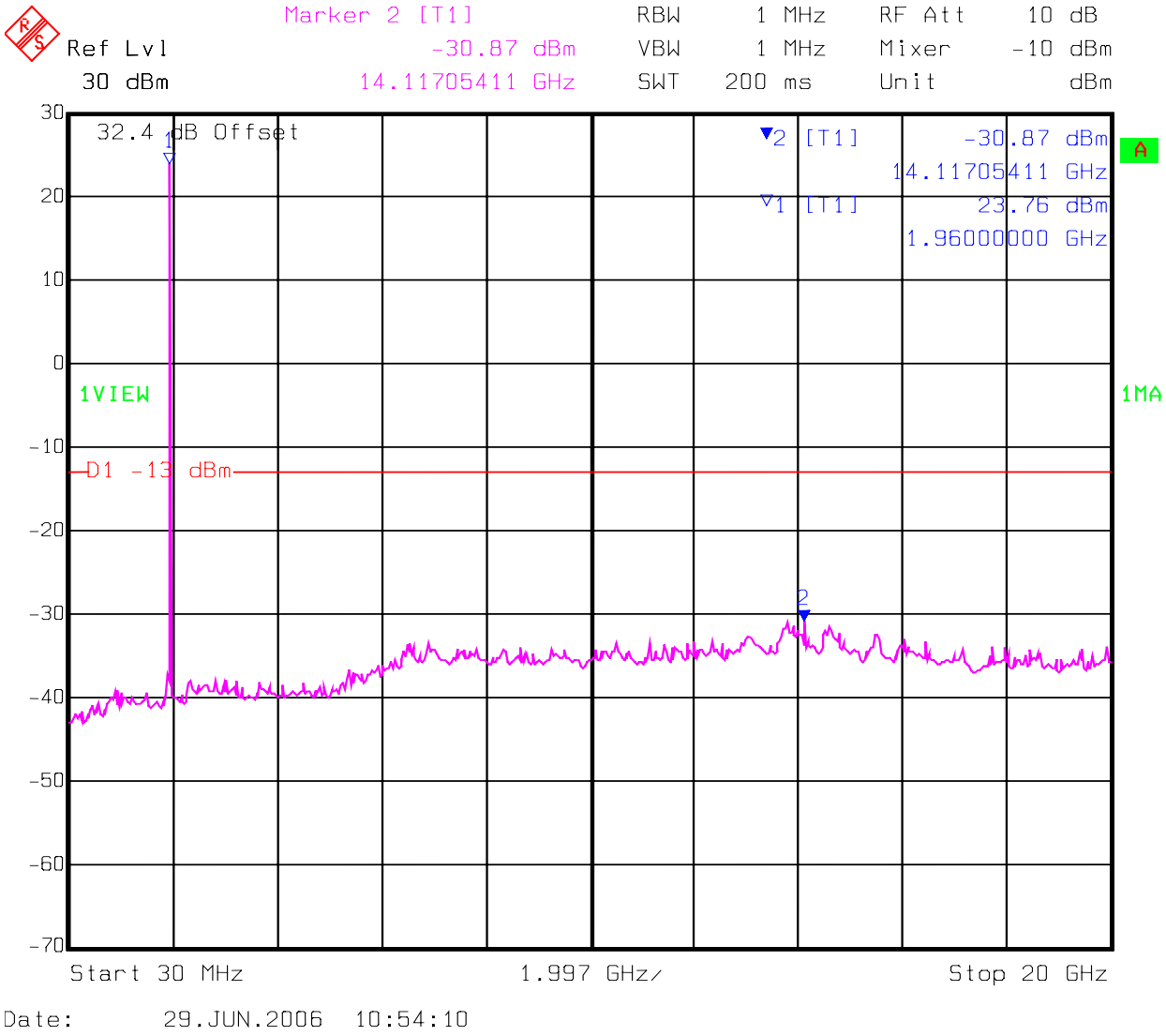
Test Data – Spurious Emissions

IM – CDMA Upper bandedge



Test Data – Spurious Emissions

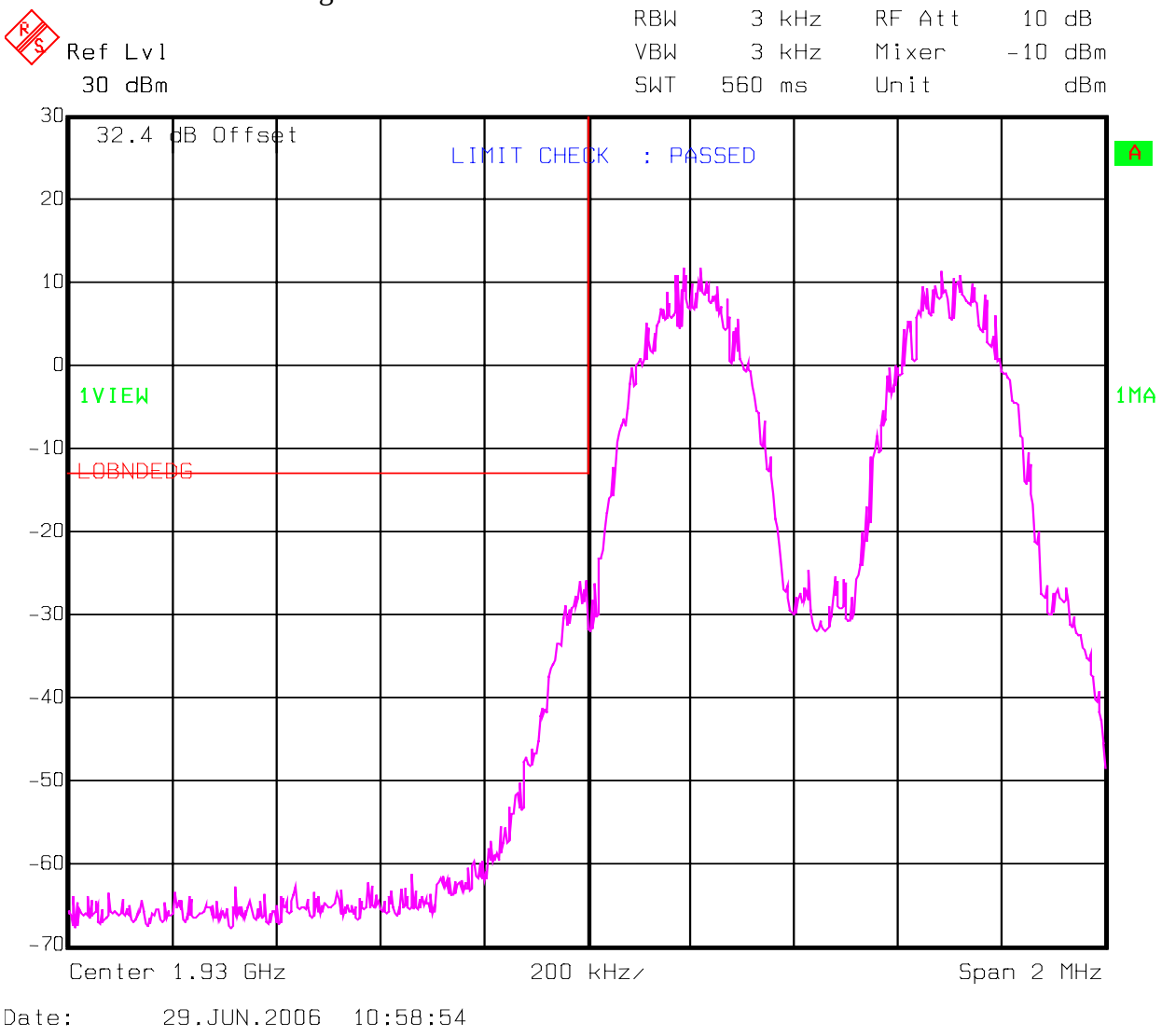
Tx at center band



Note: Emissions were investigated on three channels. The noise floor measurements presented are indicative of all channels tested.

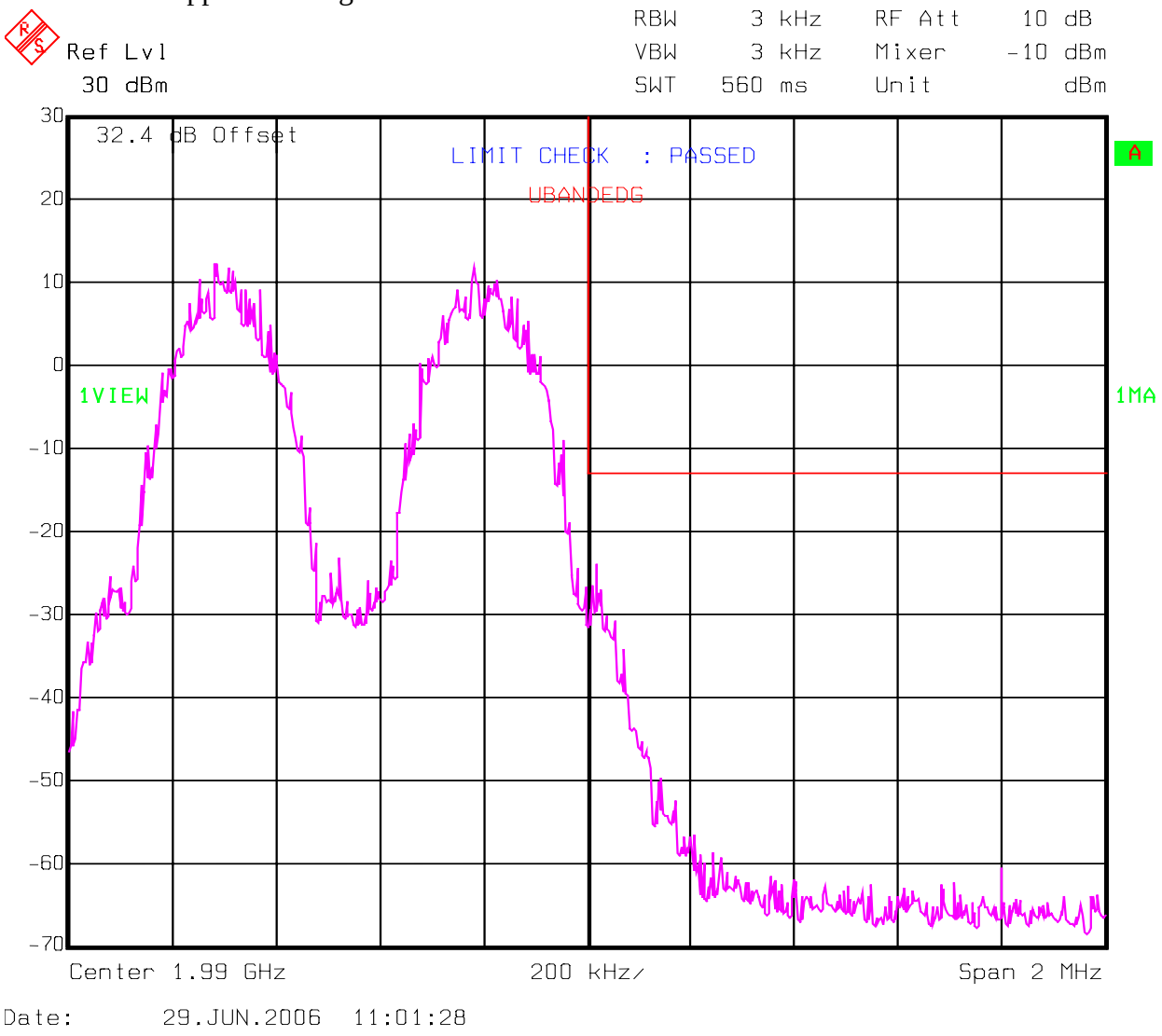
Test Data – Spurious Emissions

IM – GSM – Low Bandedge



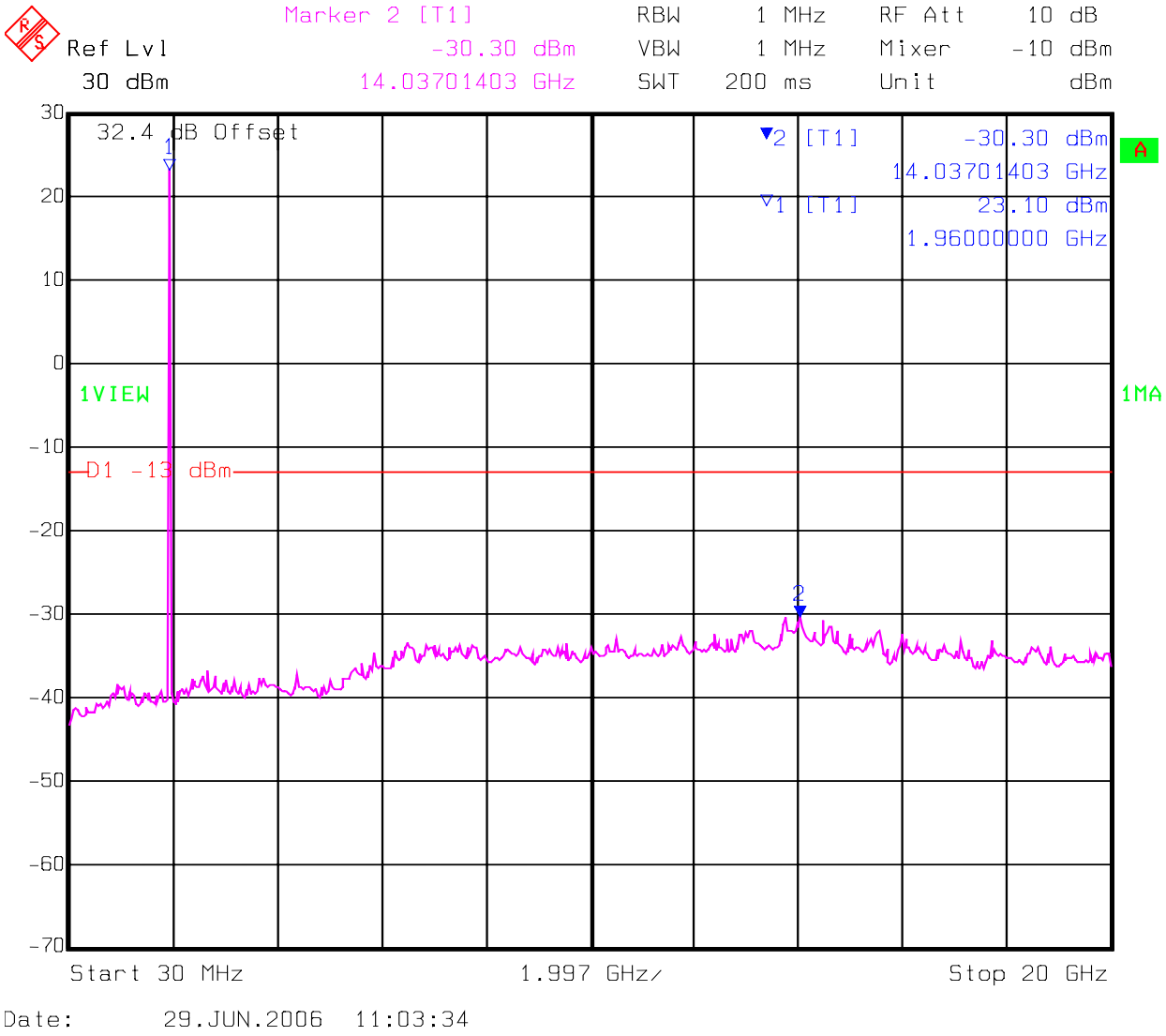
Test Data – Spurious Emissions

IM – GSM – Upper Bandedge



Test Data – Spurious Emissions

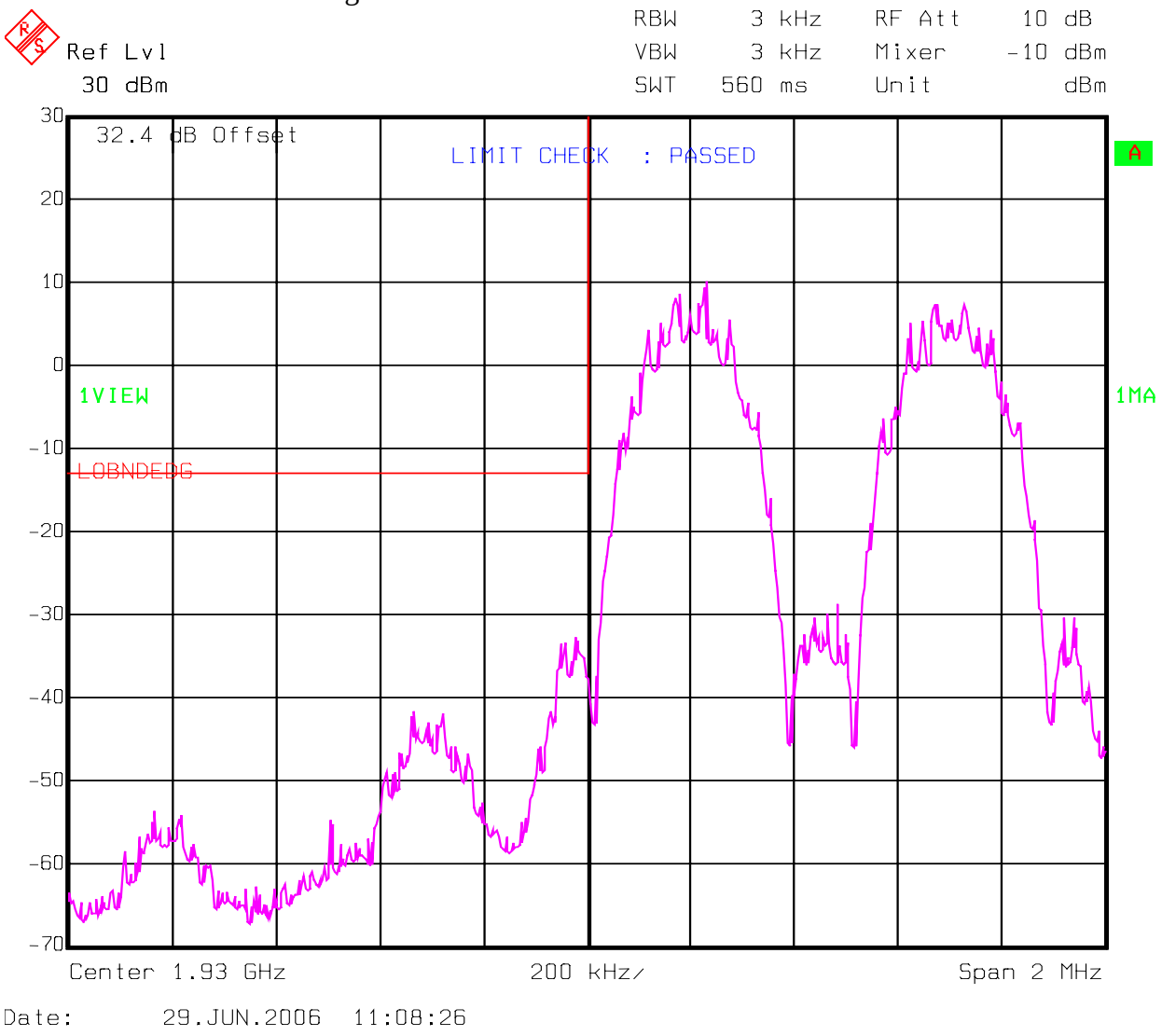
Tx at center band



Note: Emissions were investigated on three channels. The noise floor measurements presented are indicative of all channels tested.

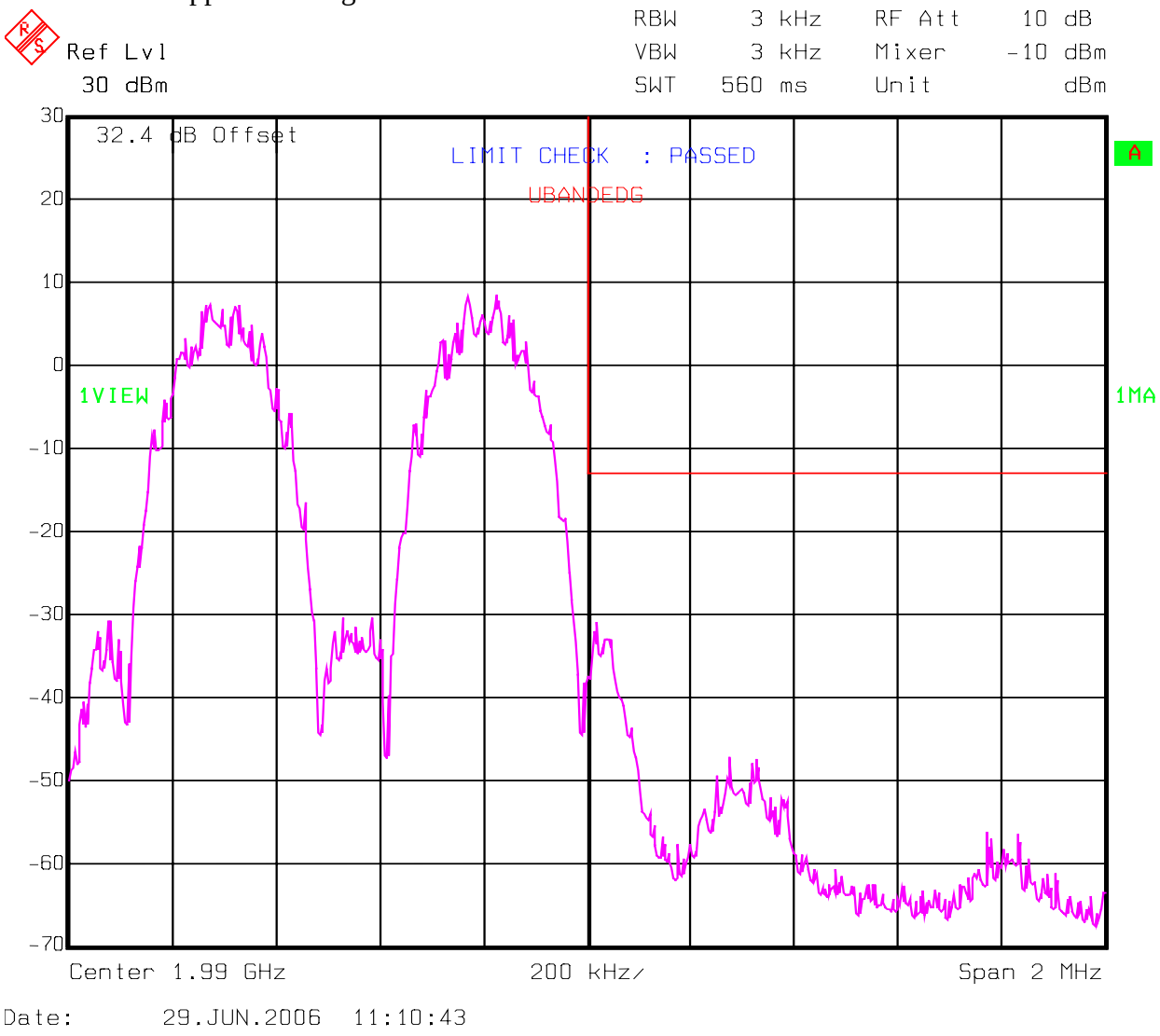
Test Data – Spurious Emissions

IM- EDGE – Lower Bandedge



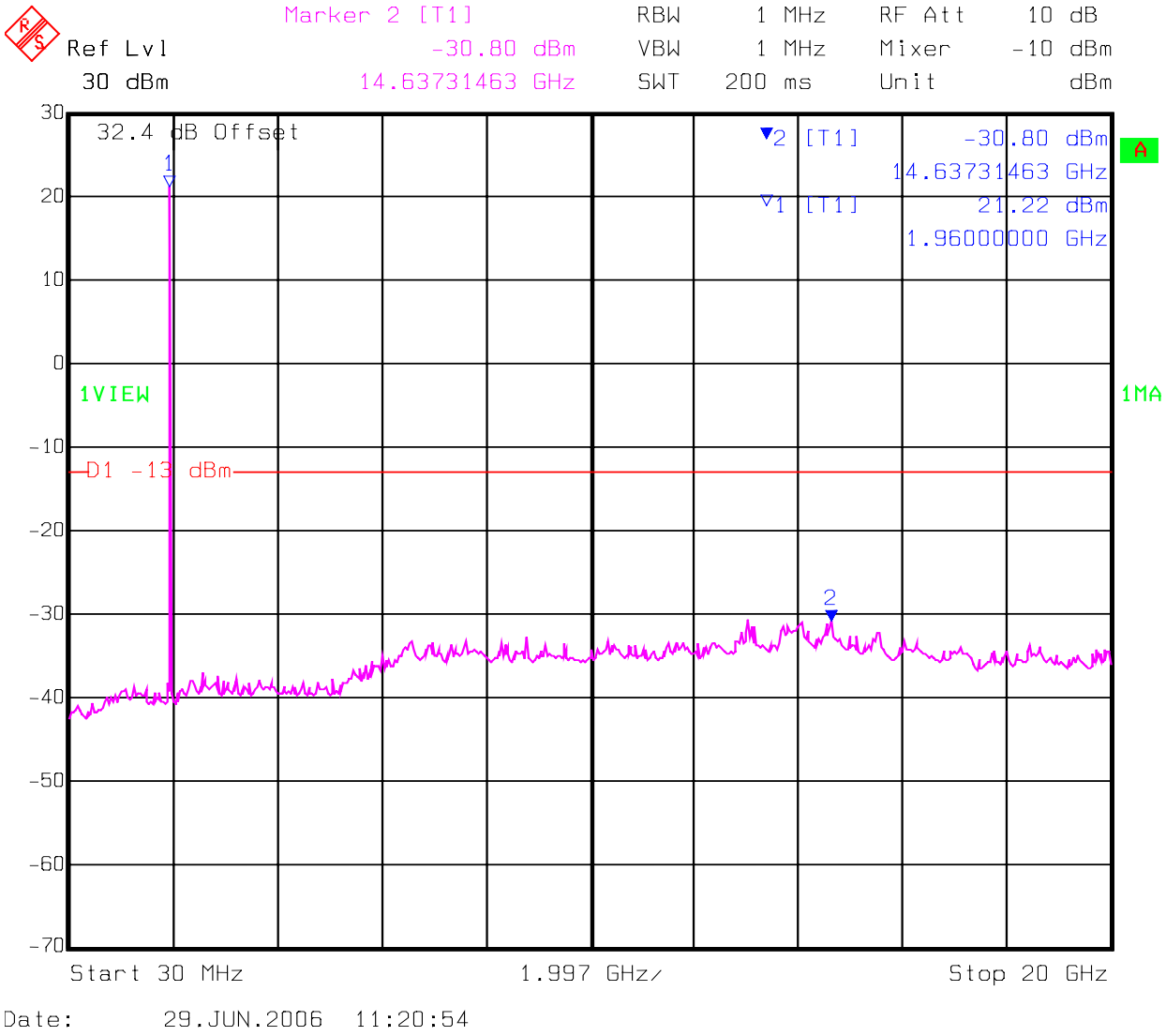
Test Data – Spurious Emissions

IM- EDGE – Upper Bandedge



Test Data – Spurious Emissions

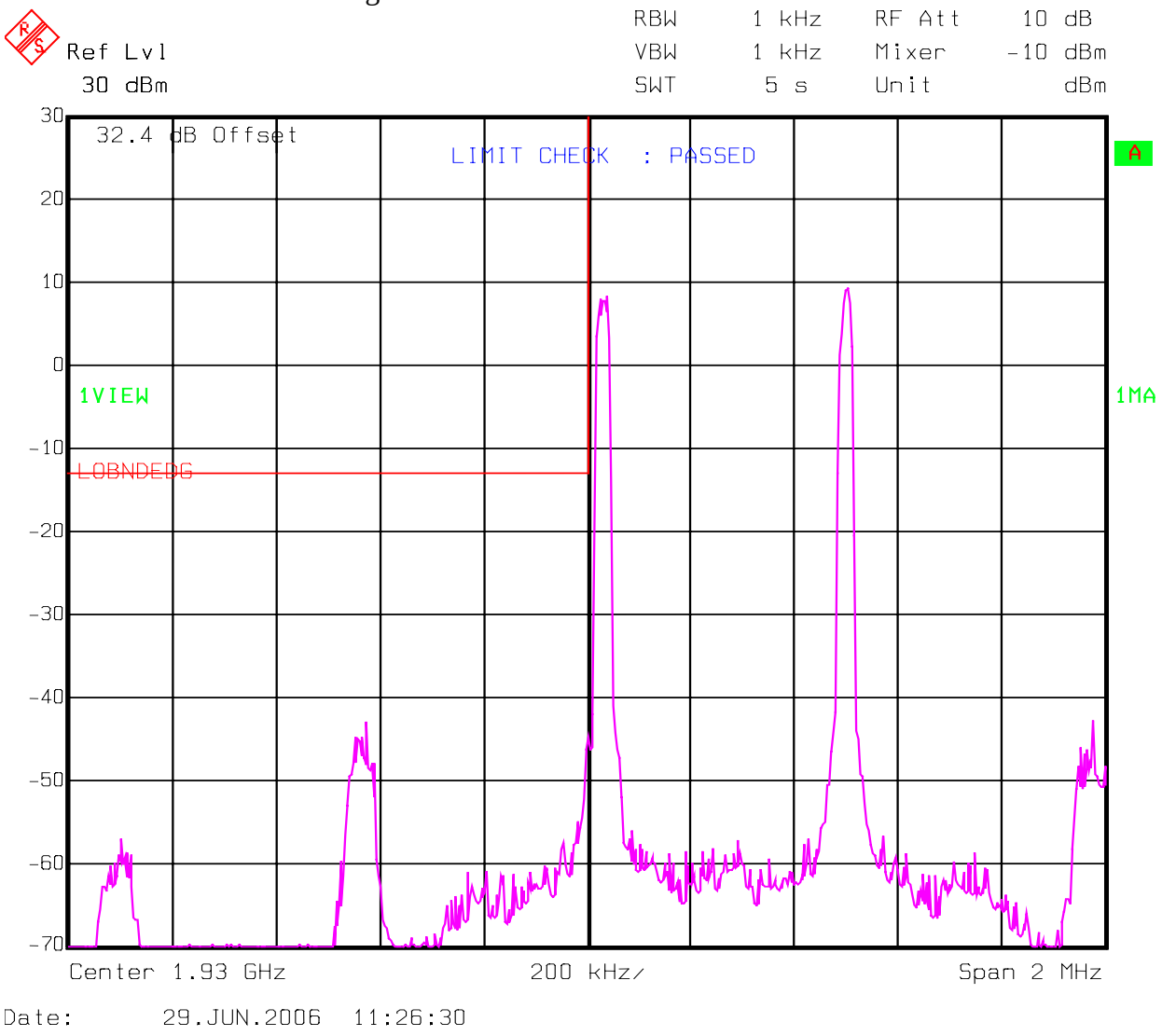
Tx center band



Note: Emissions were investigated on three channels. The noise floor measurements presented are indicative of all channels tested.

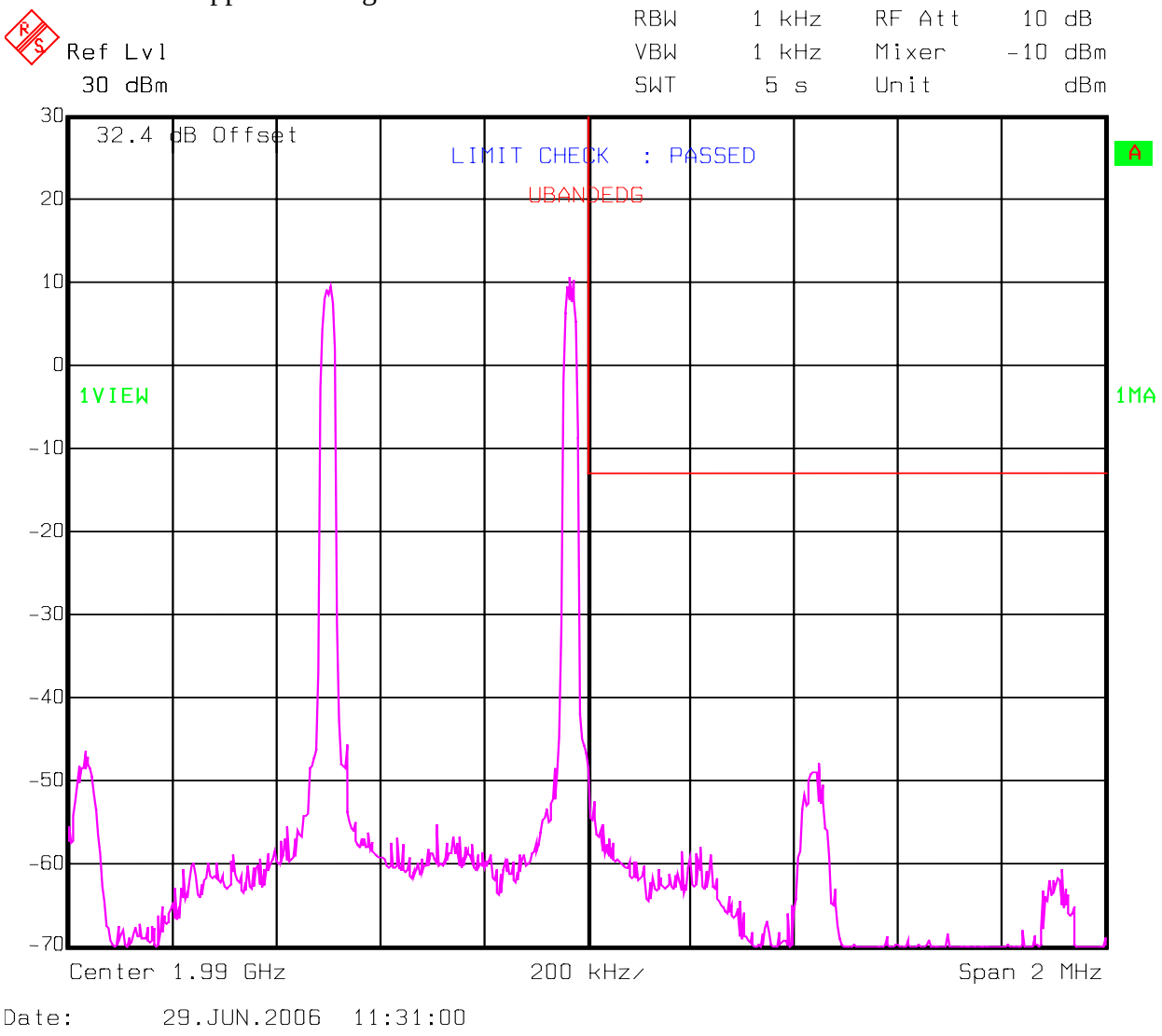
Test Data – Spurious Emissions

IM – TDMA – Lower Bandedge



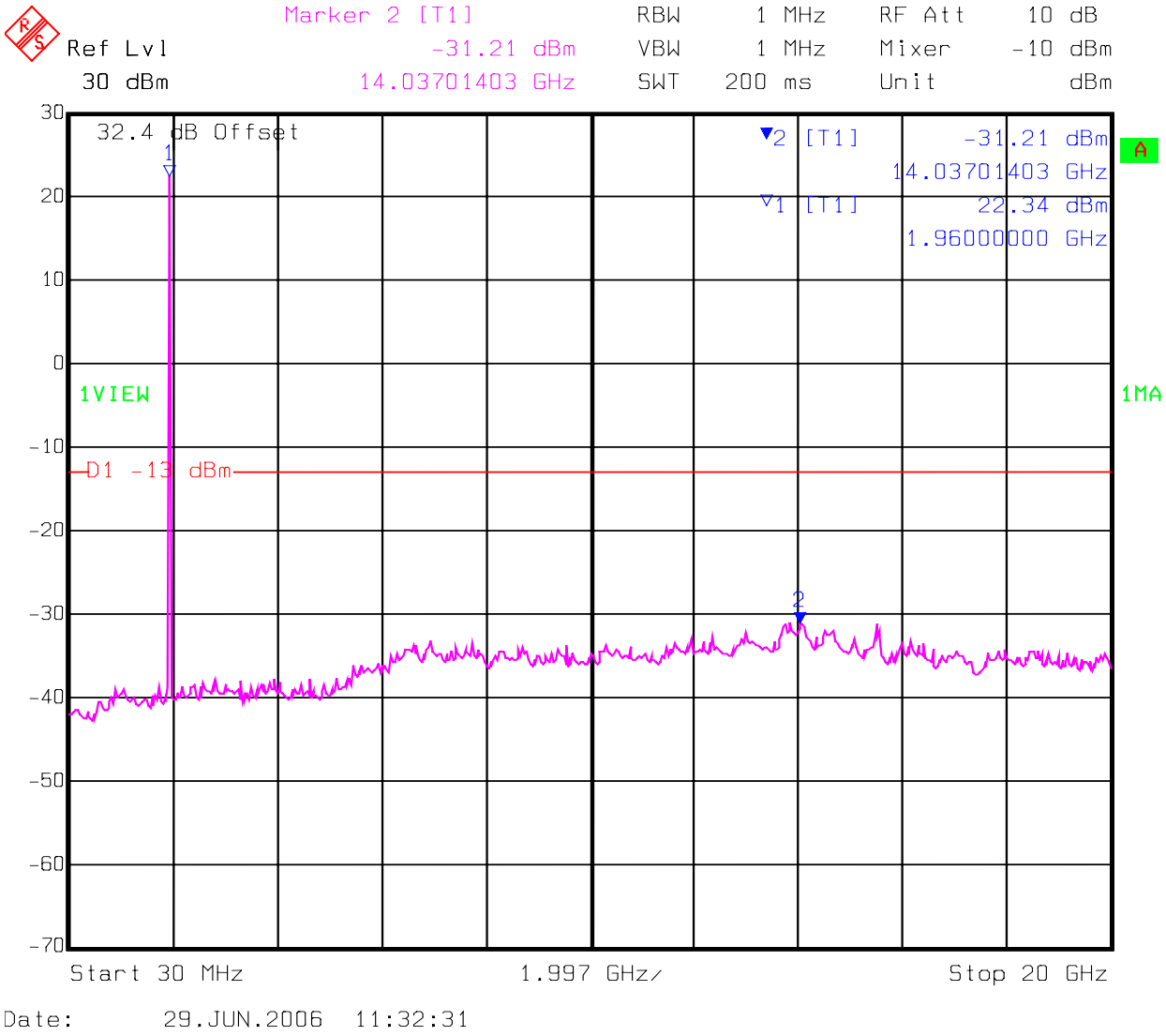
Test Data – Spurious Emissions

IM – TDMA – Upper Bandedge



Test Data – Spurious Emissions

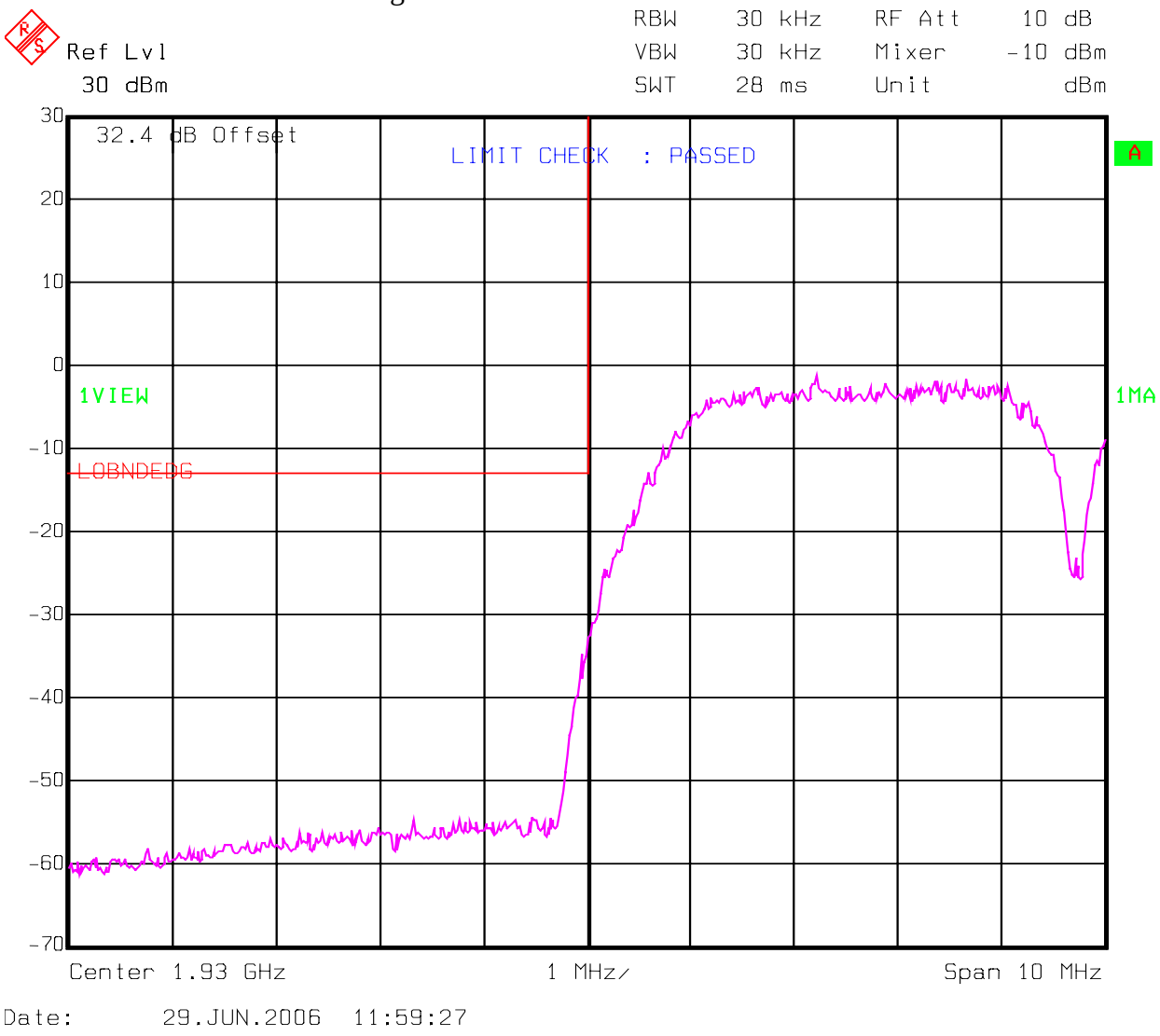
Tx Center Band



Note: Emissions were investigated on three channels. The noise floor measurements presented are indicative of all channels tested.

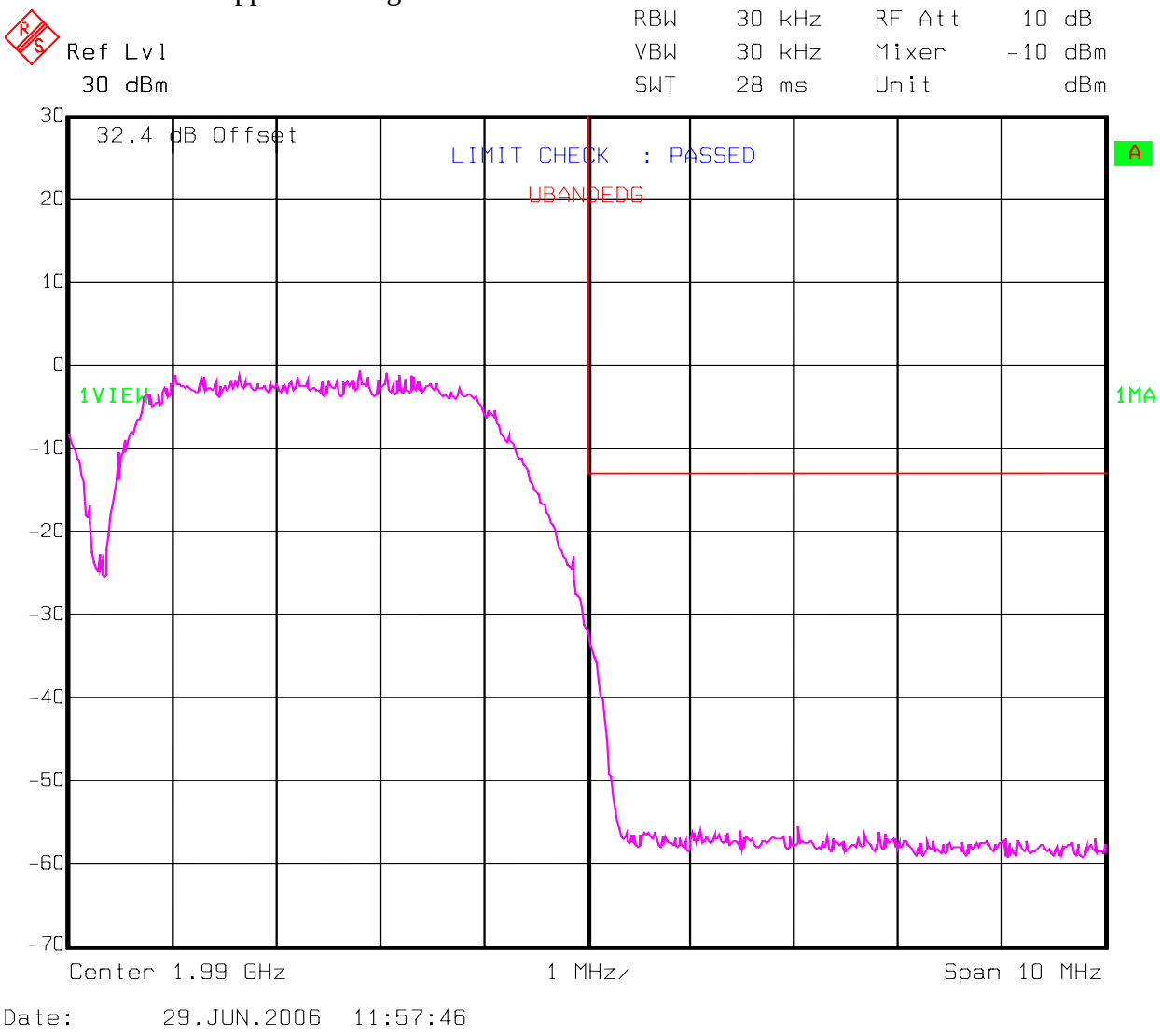
Test Data – Spurious Emissions

IM – WCDMA - Lower Bandedge



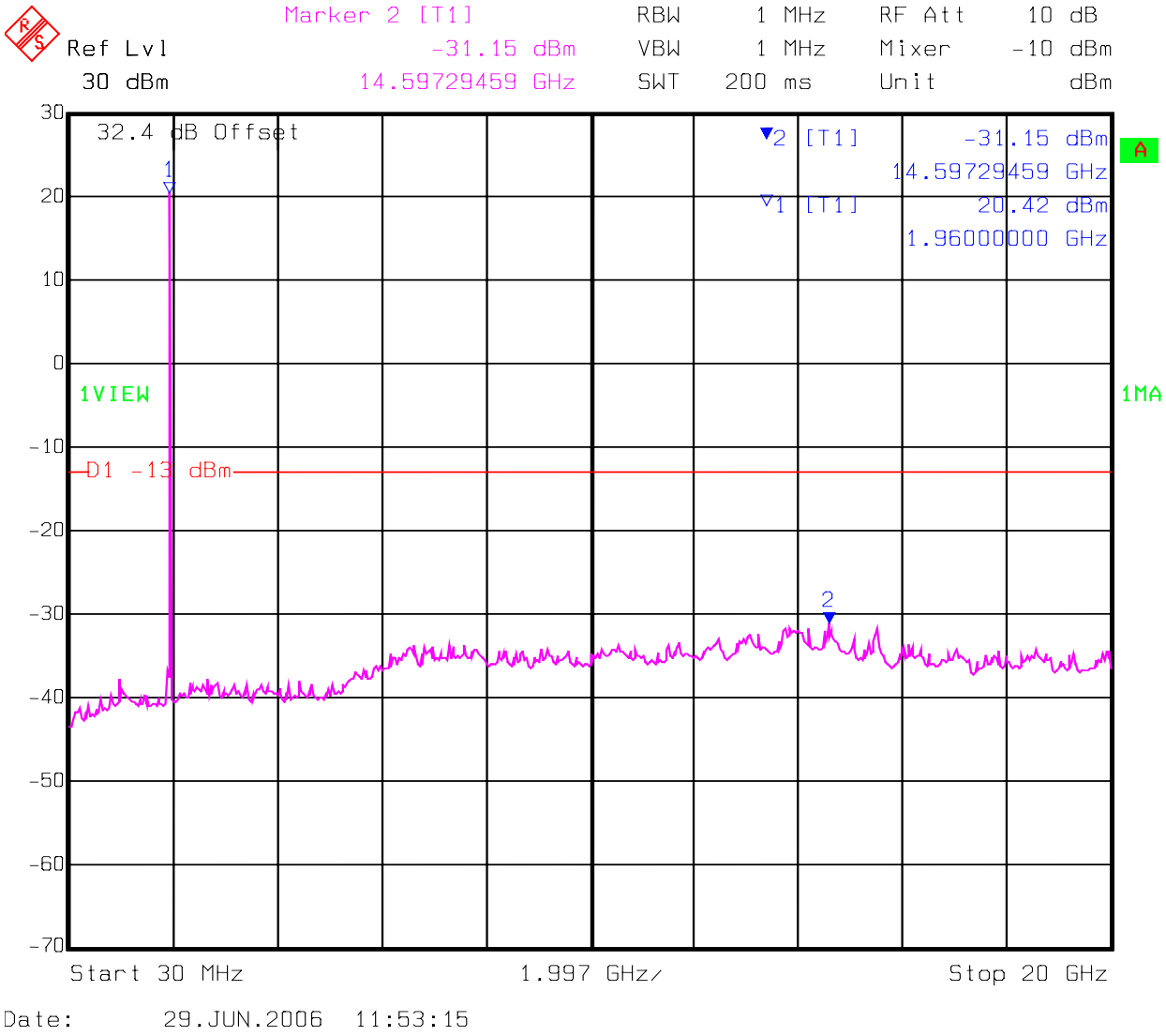
Test Data – Spurious Emissions

IM – WCDMA - Upper Bandedge



Test Data – Spurious Emissions

Tx Center band



Note: Emissions were investigated on three channels. The noise floor measurements presented are indicative of all channels tested.

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1051
TESTED BY: David Light	DATE: 30 June 2006

Test Results: Complies.

Test Data: No emissions were detected above the noise floor which was at least 20 dB below the specification limit of -13 dBm. No emissions are reported per 2.1057(c).

Note: The spectrum was searched from 30 MHz to the tenth harmonic of the highest frequency generated.

RBW=VBW=1 MHz

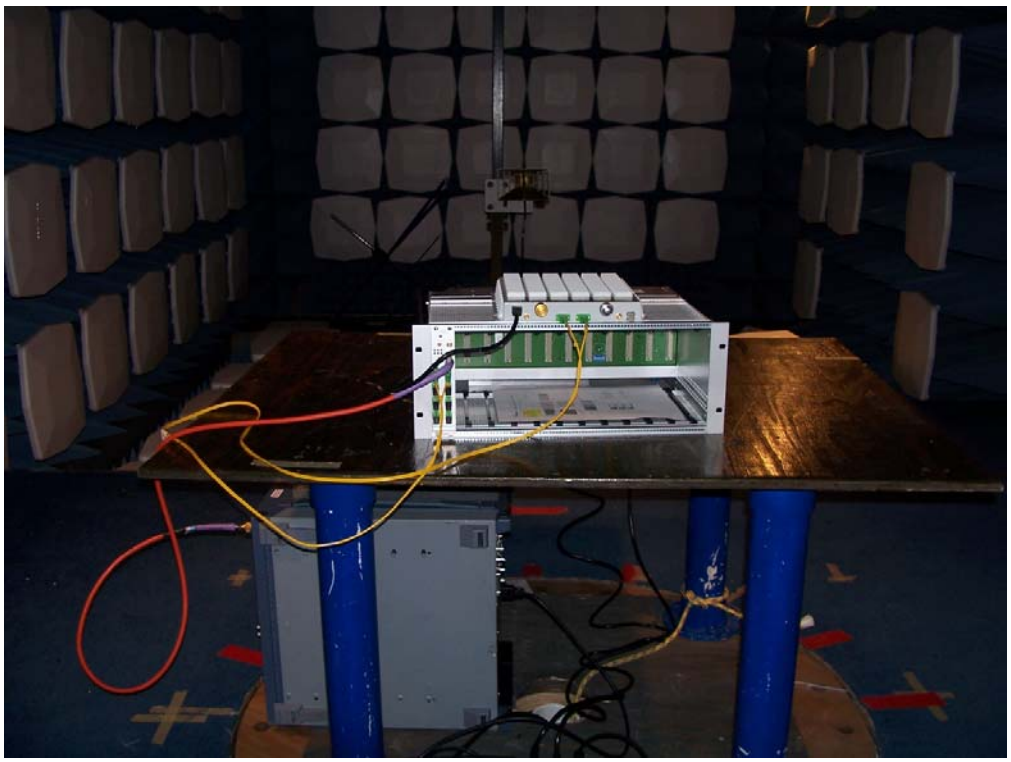
Equipment Used: 759-760-791-1464-1484-1485-993-1016

Measurement Uncertainty: +/- 1.7 dB

Temperature: 23 °C

Relative Humidity: 40 %

Photographs of Test Setup



Section. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1042	CABLE, 4M	STORM PR90-010-144	N/A	06/15/06	06/15/07
1472	20db Attenuator	Omni Spectra 20600-20db	NONE	CBU	N/A
1469	10 db Attenuator	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/13/06	02/13/07
760	Antenna biconical	Electro Metrics MFC-25	477	08/04/05	08/04/06
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	04/20/06	04/20/07
1484	Cable	Storm PR90-010-072	N/A	08/26/05	08/26/06
1485	Cable	Storm PR90-010-216	N/A	08/26/05	08/26/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	04/20/06	04/20/07

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 a spectrum analyzer. Power output is measured with the maximum rated input level.

Integral Antenna:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

NAME OF TEST: Occupied Bandwidth **PARA. NO.: 2.1047**

Minimum Standard: Para. No. 24.238(b). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB.

Method Of Measurement:

CDMA

Spectrum analyzer settings:
RBW: 30 kHz
VBW: ≥ RBW
Span: 5 MHz
Sweep: Auto
Compare input signal to output signal

GSM

RBW: 3 kHz
VBW: ≥ RBW
Span: 2 MHz
Sweep: Auto
Compare input signal to output signal

TDMA

RBW: 1 kHz
VBW: ≥ RBW
Span: 1 MHz
Sweep: Auto
Compare input signal to output signal

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 2.1051

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: ≥ RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM

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

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.: 2.1053**

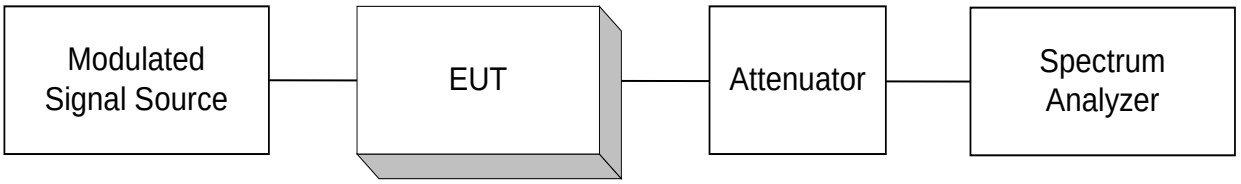
Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least 43 + 10 log (P) dB.

Test Method: TIA/EIA-603-1992

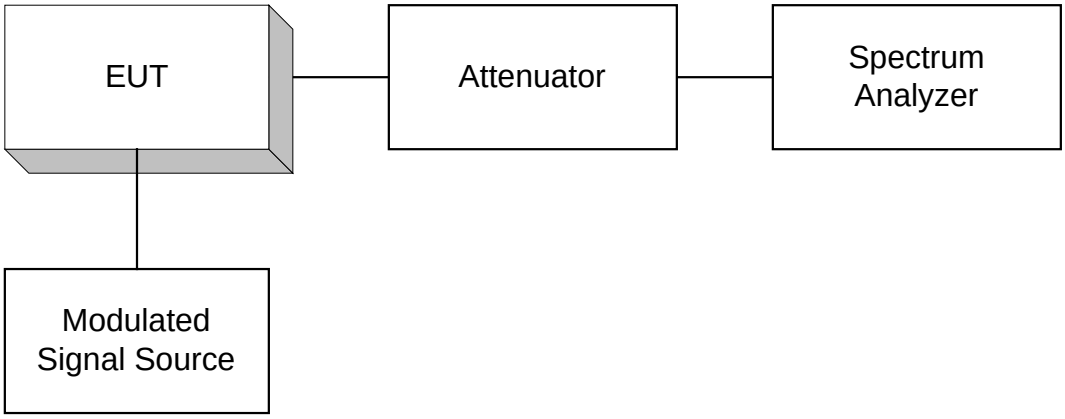
The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was 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.

ANNEX B - TEST DIAGRAMS

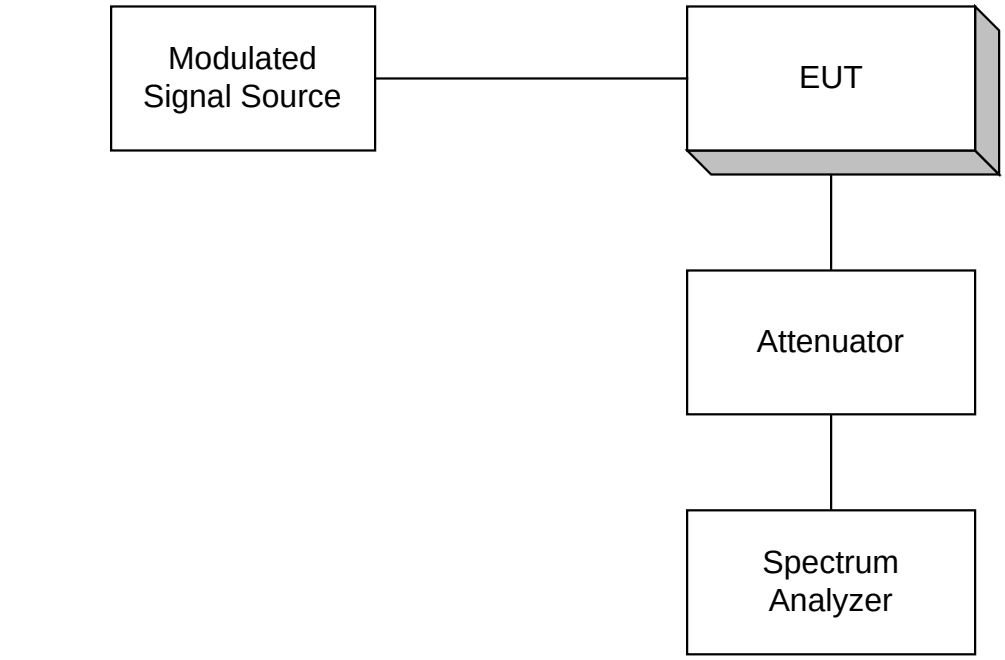
Para. No. 2.985 - R.F. Power Output

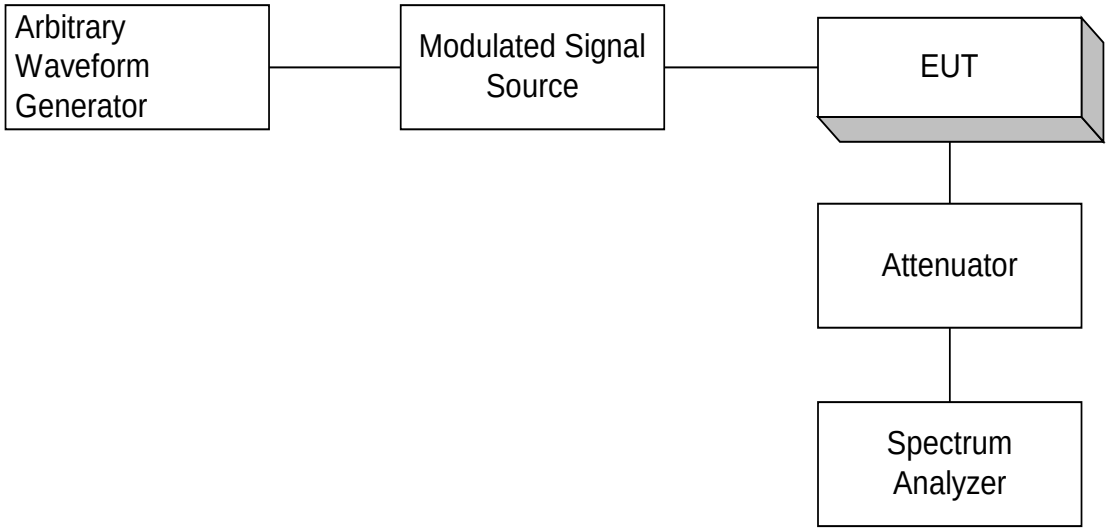


Para. No. 2.989 - Occupied Bandwidth

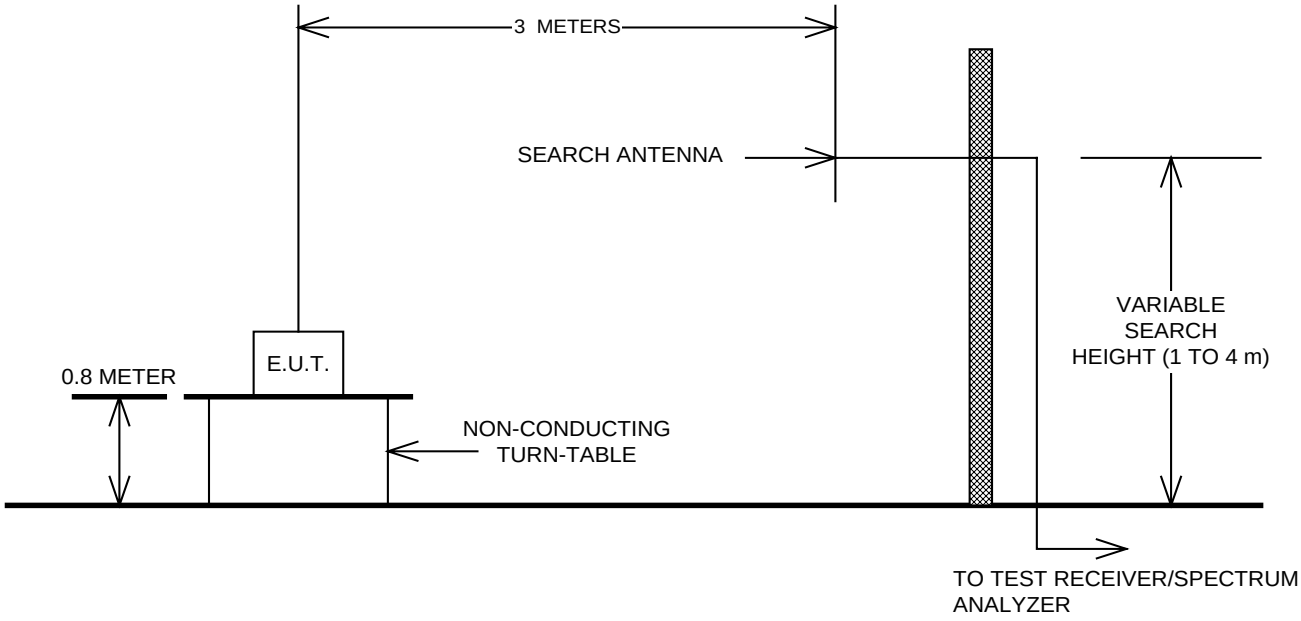


Para. No. 2.991 Spurious Emissions at Antenna Terminals





Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability