



Nemko Test Report: 5058RUS2

Applicant: Andrew Corporation
108 Rand Park Drive
Garner, NC 27529
USA

Equipment Under Test: ION-M85/19P
(E.U.T.)

In Accordance With: **CFR 47, Part 22, Subpart H**
Cellular Band Repeaters

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: 29 June 2007

APPROVED BY:

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

Harry Ward, Verifier

DATE: 29 June 2007

Number of Pages: 45

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EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Section 1. Summary of Test Results

Manufacturer Andrew Corporation

Model No.: ION-M85/19P

Serial No.: 13

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 22, Subpart H.



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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EQUIPMENT: **ION-M85/19P**PROJECT NO.: 5058RUS2

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth	Not defined	Input/Output	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	Complies
Frequency Stability	22.355	1.5 ppm	NA

Footnotes:

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

EQUIPMENT: **ION-M85/19P**

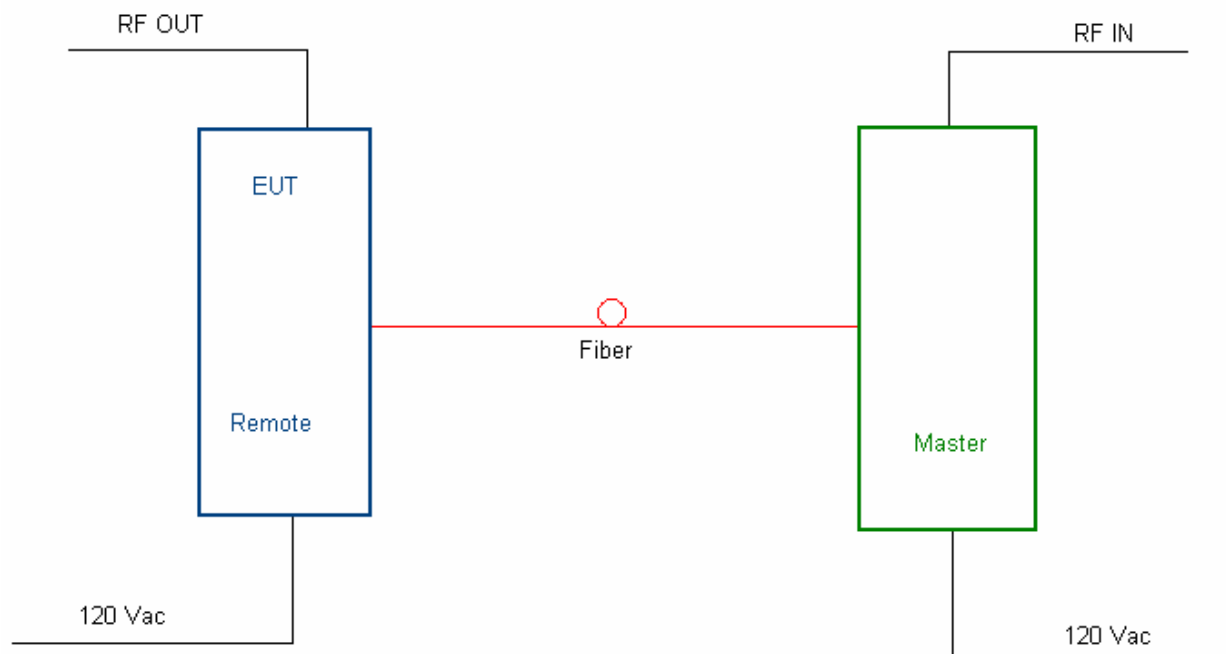
PROJECT NO.: 5058RUS2

Section 2. General Equipment Specification

Supply Voltage Input:		120 Vac		
Frequency Range:	Downlink:	869-894 MHz		
Frequency Range:	Uplink:			
Type of Modulation and Designator:		CDMA W-CDMA (F9W) ☒	GSM (GXW) ☒	TDMA (DXW) ☒
			EDGE (G7W) ☒	Analog (F3E/F1D) ☒
Output Impedance:		50 ohms		
RF Output (Rated):	Downlink:	10 W 40 dBm		
	Uplink:	Na W Na dBm		
Frequency Translation:		F1-F1 ☒	F1-F2 ☐	N/A ☐
Band Selection:		Software ☐	Duplexer Change ☐	Fullband Coverage ☒

Description of EUT

Andrew ION-M85/19P is a multiband multi-operator remote unit with various extension units. It is used in conjunction with a master unit in the ION optical distribution system. This system transports multiple frequency bands simultaneously (850 MHz, 1900 MHz and 2100 MHz), providing a cost-efficient solution for distributing capacity from one or more base stations.

System Diagram

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 22.913
TESTED BY: David Light	DATE: 27 June 2007

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

Direction	Frequency (MHz)	Modulation	RF Power (dBm)	RF Power (W)
Downlink Only	869.2	GSM	40.09	10.21
	880.0	GSM	40.22	10.52
	893.8	GSM	40.18	10.42
	869.2	EDGE	40.08	10.20
	880.0	EDGE	40.0	10.0
	893.8	EDGE	40.02	10.01
	869.04	TDMA	40.12	10.28
	880.0	TDMA	40.03	10.01
	893.97	TDMA	40.23	10.54
	869.75	CDMA	40.0	10.0
	880.0	CDMA	39.99	10.0
	893.25	CDMA	40.01	10.0
	871.5	W-CDMA	39.95	9.89
	880.0	W-CDMA	40.07	10.16
	891.5	W-CDMA	40.14	10.33
	869.04	Analog	40.04	10.02
	880.0	Analog	40.05	10.12
	893.97	Analog	40.0	10.0

Equipment Used: 1064-1604-1082-1036**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 48 %

EQUIPMENT: **ION-M85/19P**PROJECT NO.: 5058RUS2

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 28 June 2007

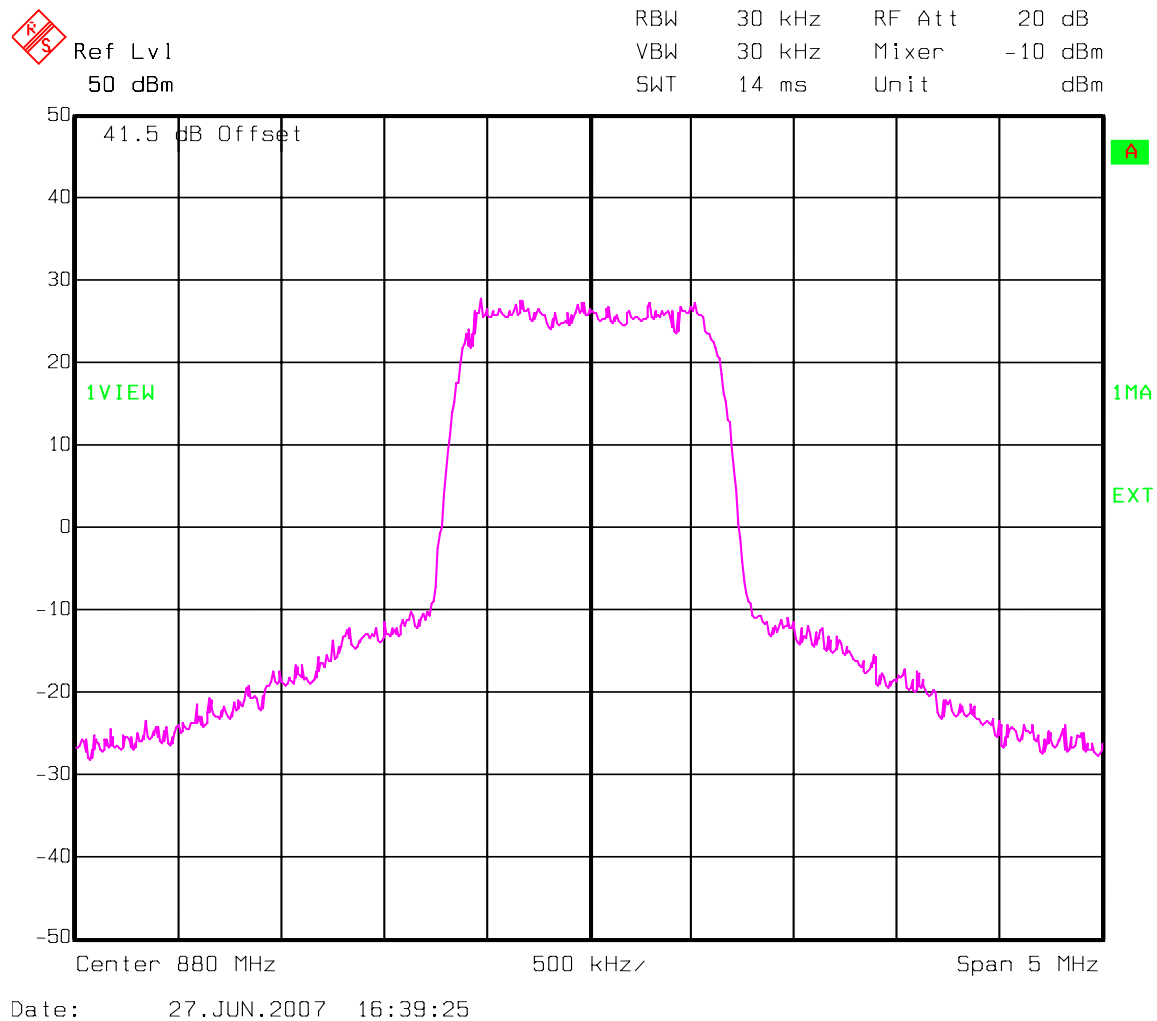
Test Results: Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1064-1604-1082-1036**Measurement Uncertainty:** 1X10⁻⁷ ppm**Temperature:** 22 °C**Relative Humidity:** 48 %

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

CDMA – Output

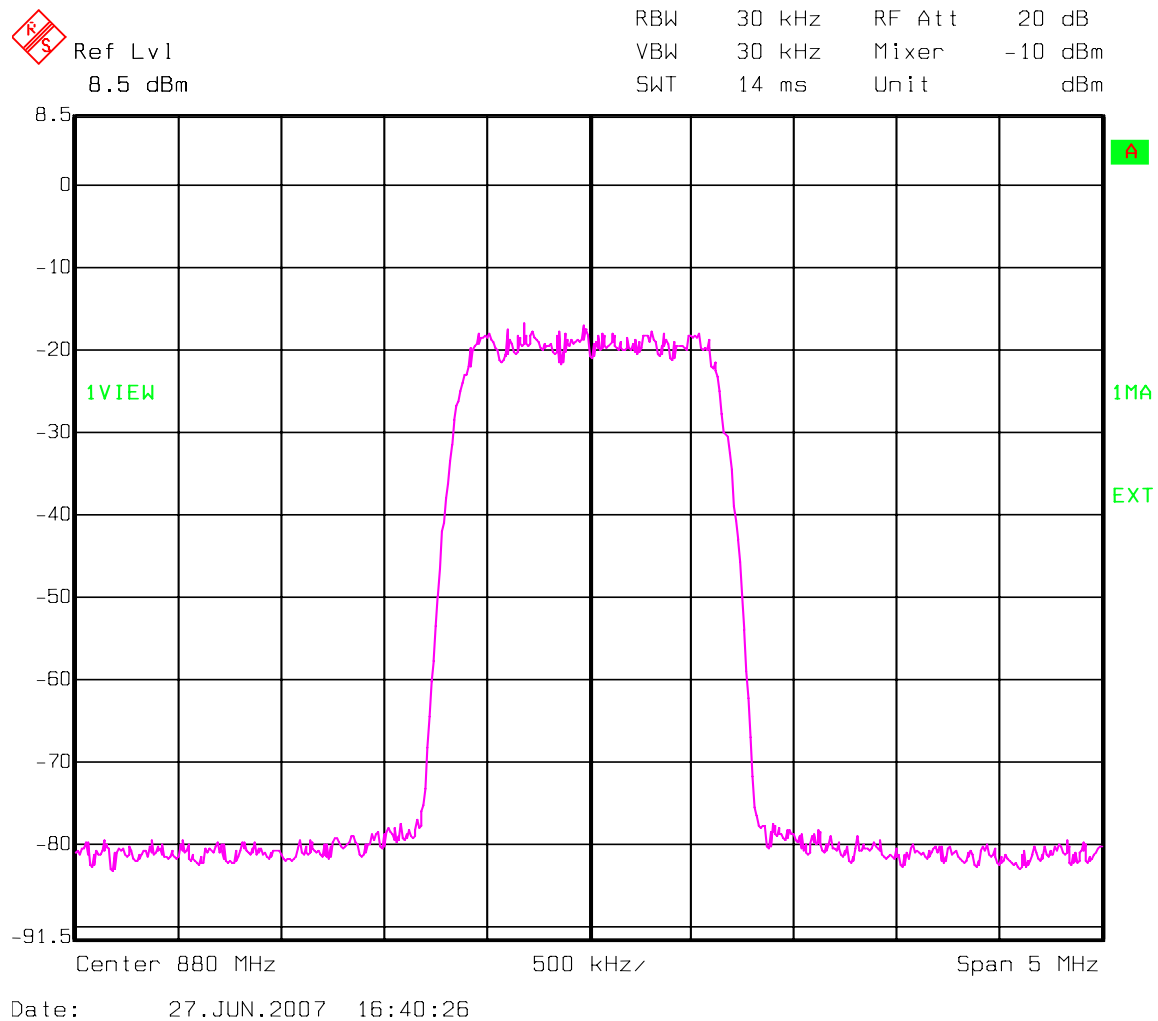


EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

CDMA – Input



EQUIPMENT: **ION-M85/19P**

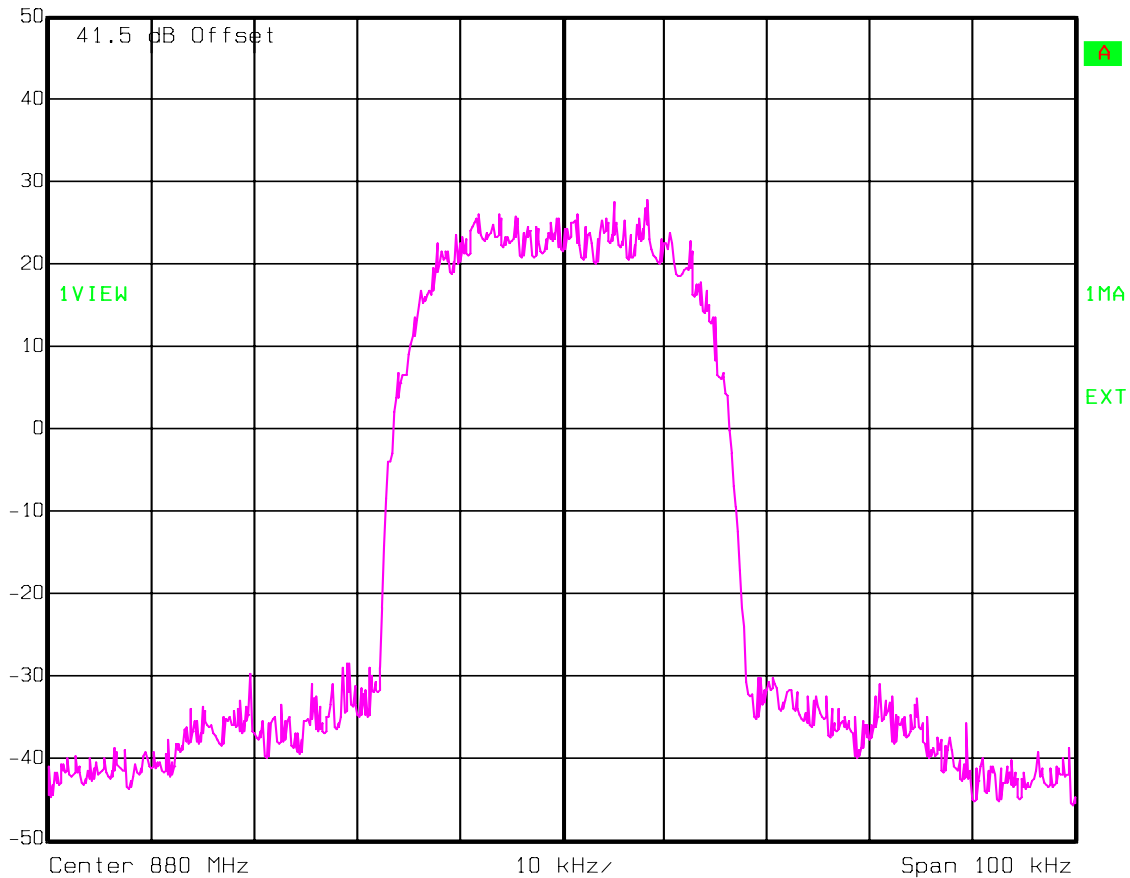
PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

TDMA - Output

Ref Lvl
50 dBm

RBW	300 Hz	RF Att	20 dB
VBW	300 Hz	Mixer	-10 dBm
SWT	5.6 s	Unit	dBm



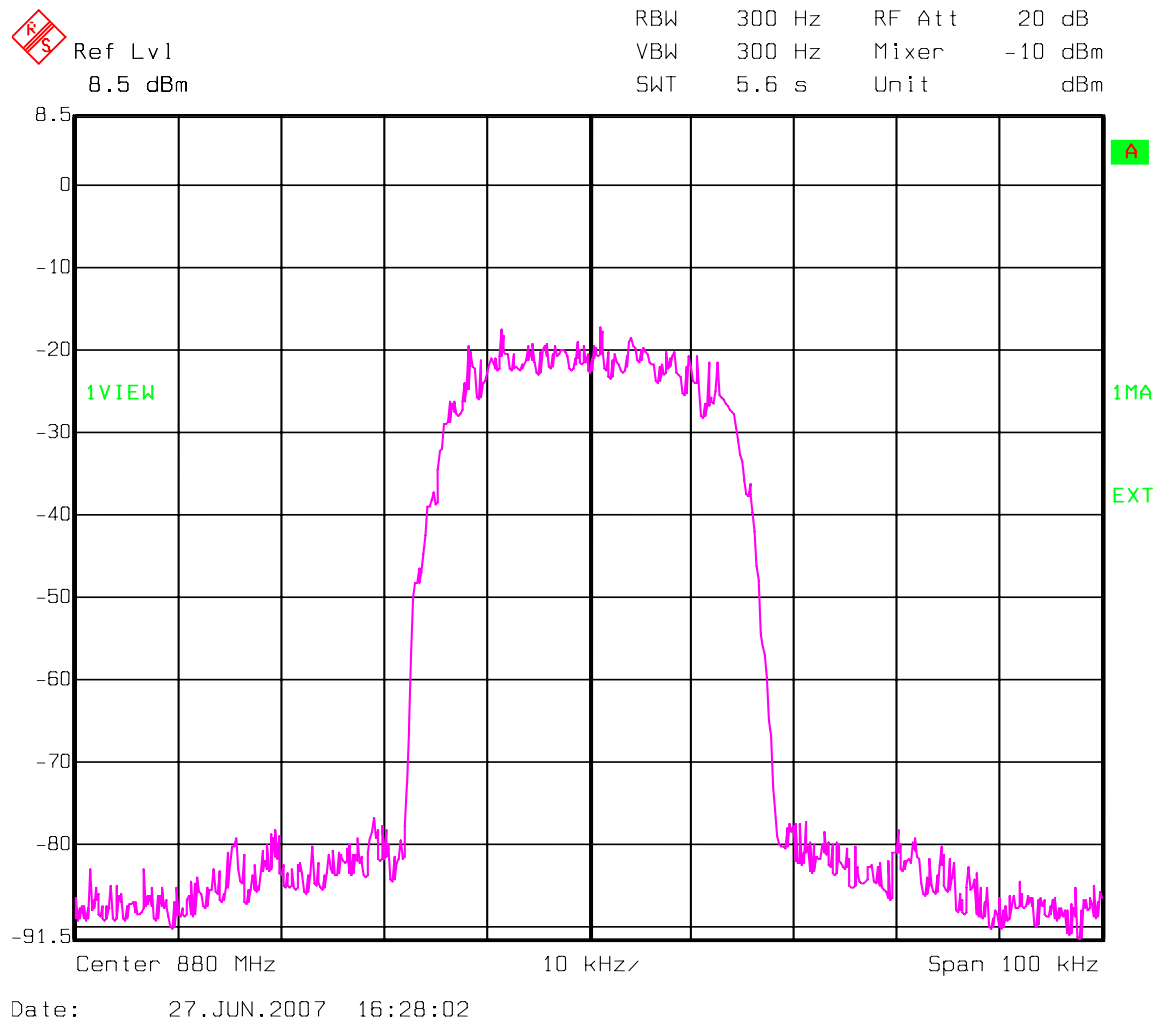
Date: 27.JUN.2007 16:27:12

EQUIPMENT: ION-M85/19P

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

TDMA – Input

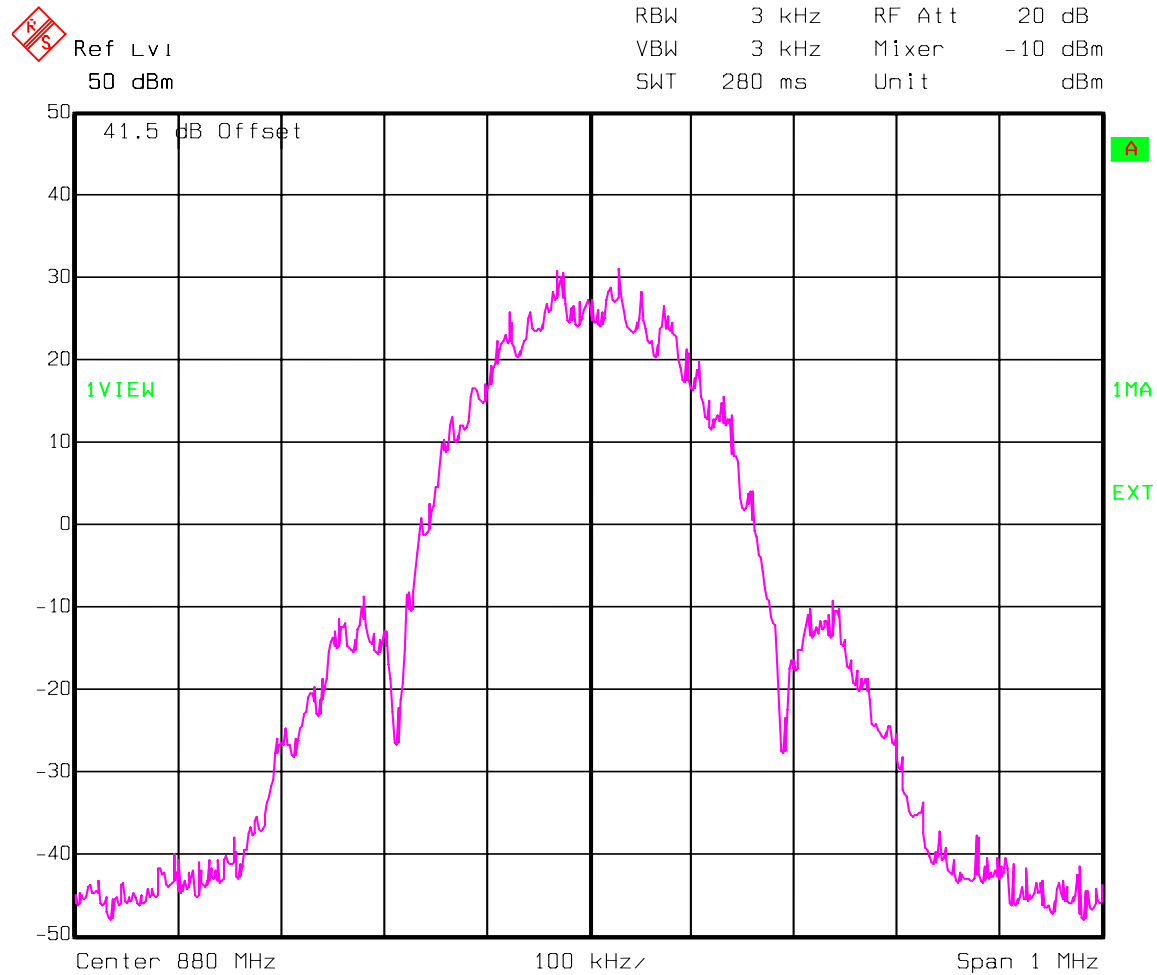


EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

EDGE – Output



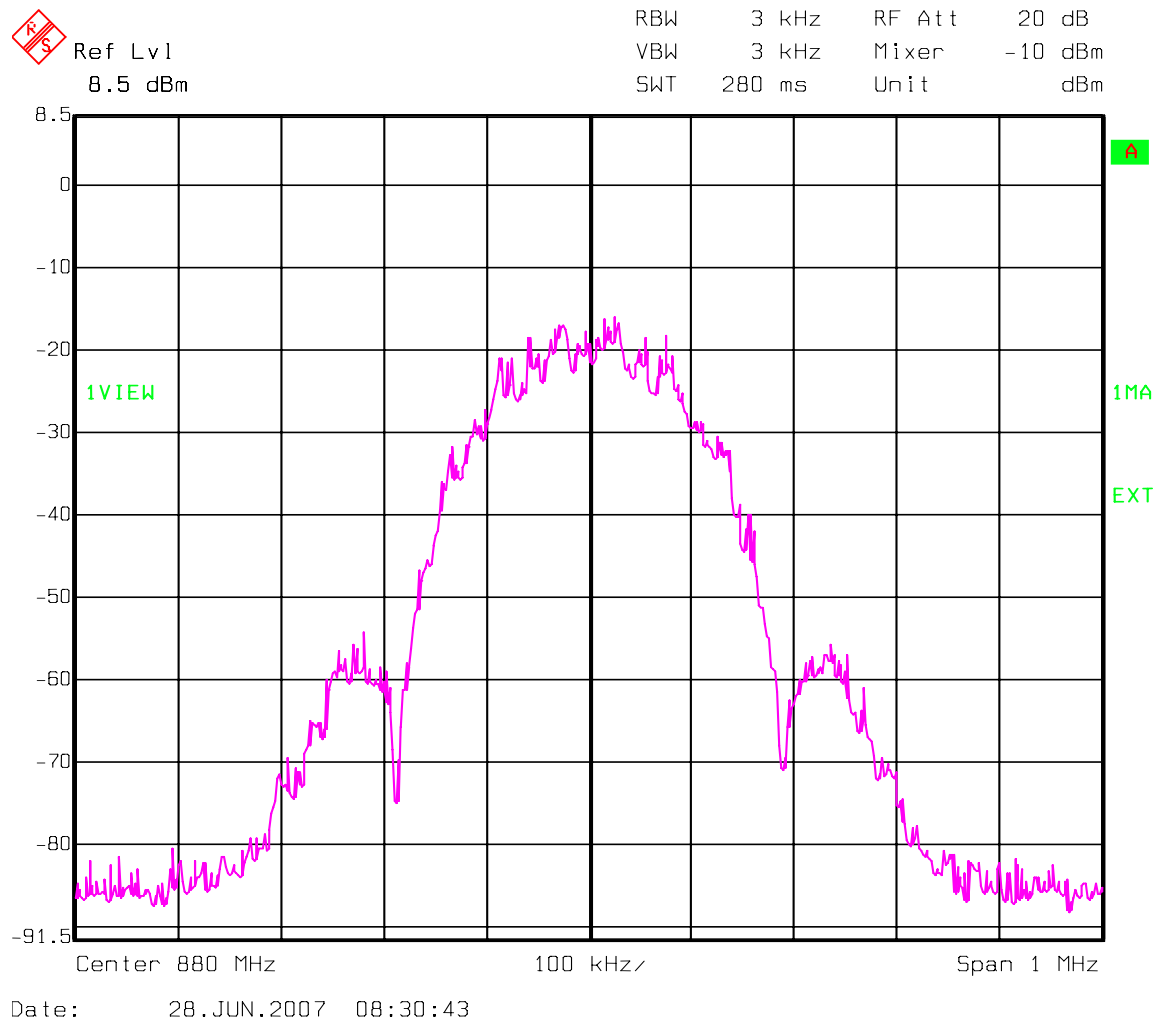
Date: 27.JUN.2007 16:15:53

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

EDGE – Input

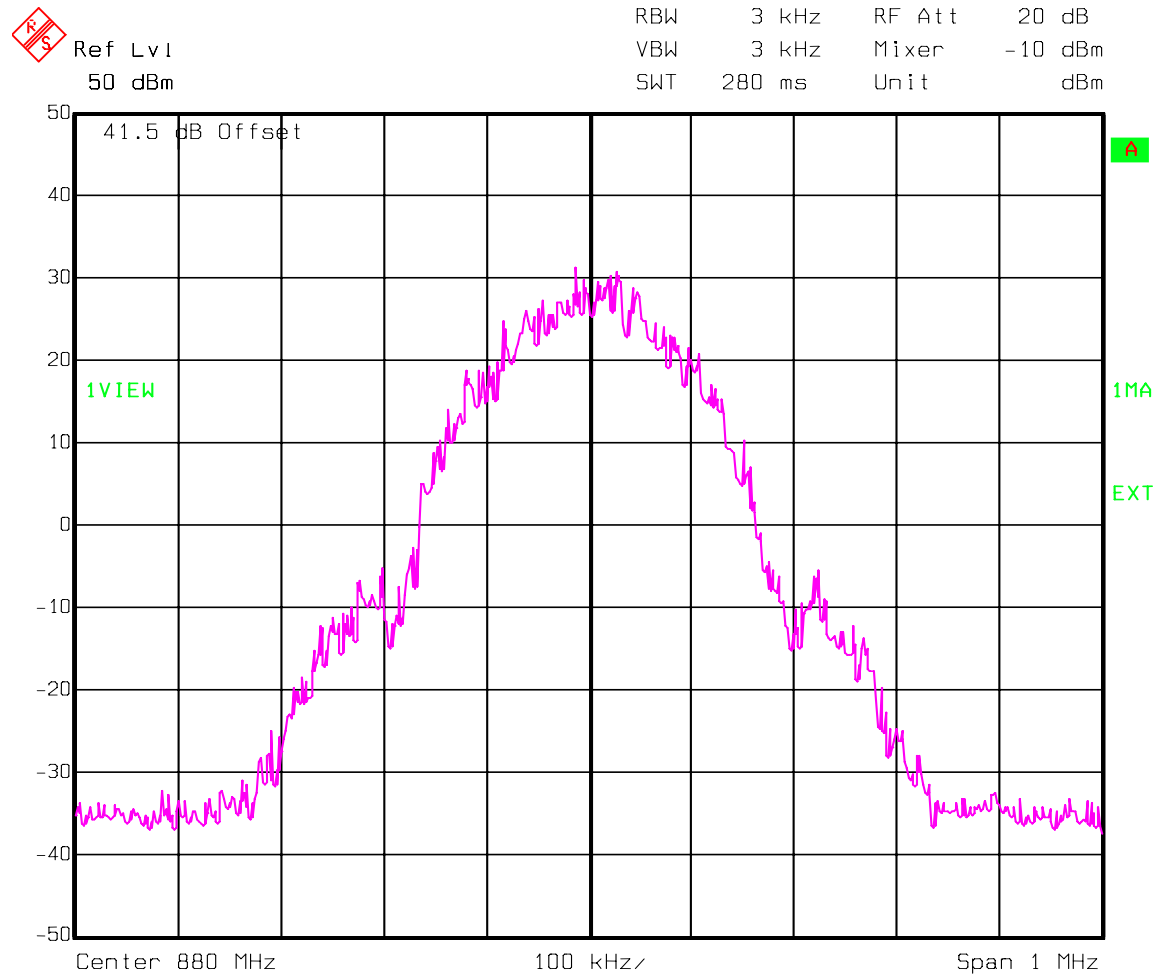


EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

GSM – Output



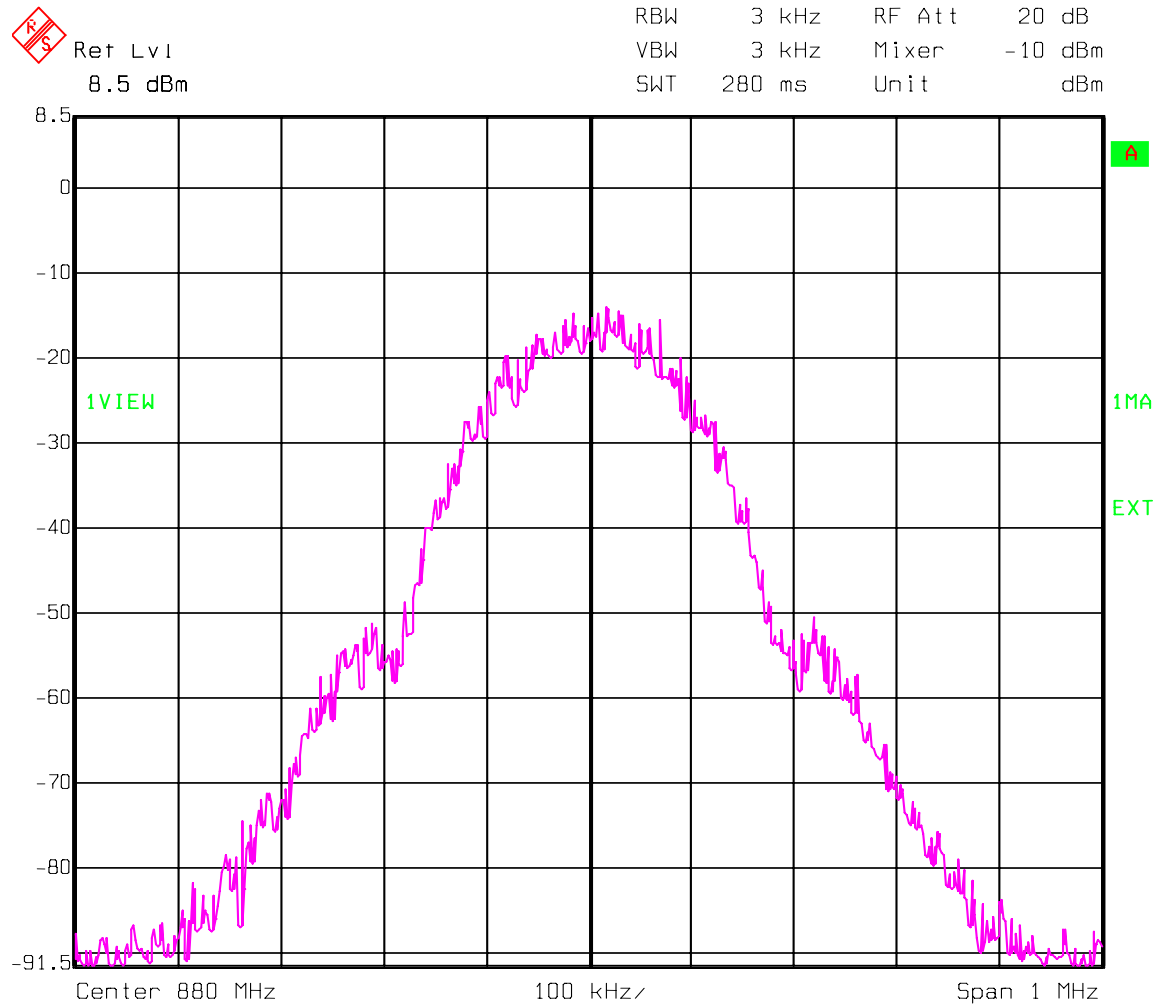
Date: 27.JUN.2007 16:06:04

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

GSM – Input



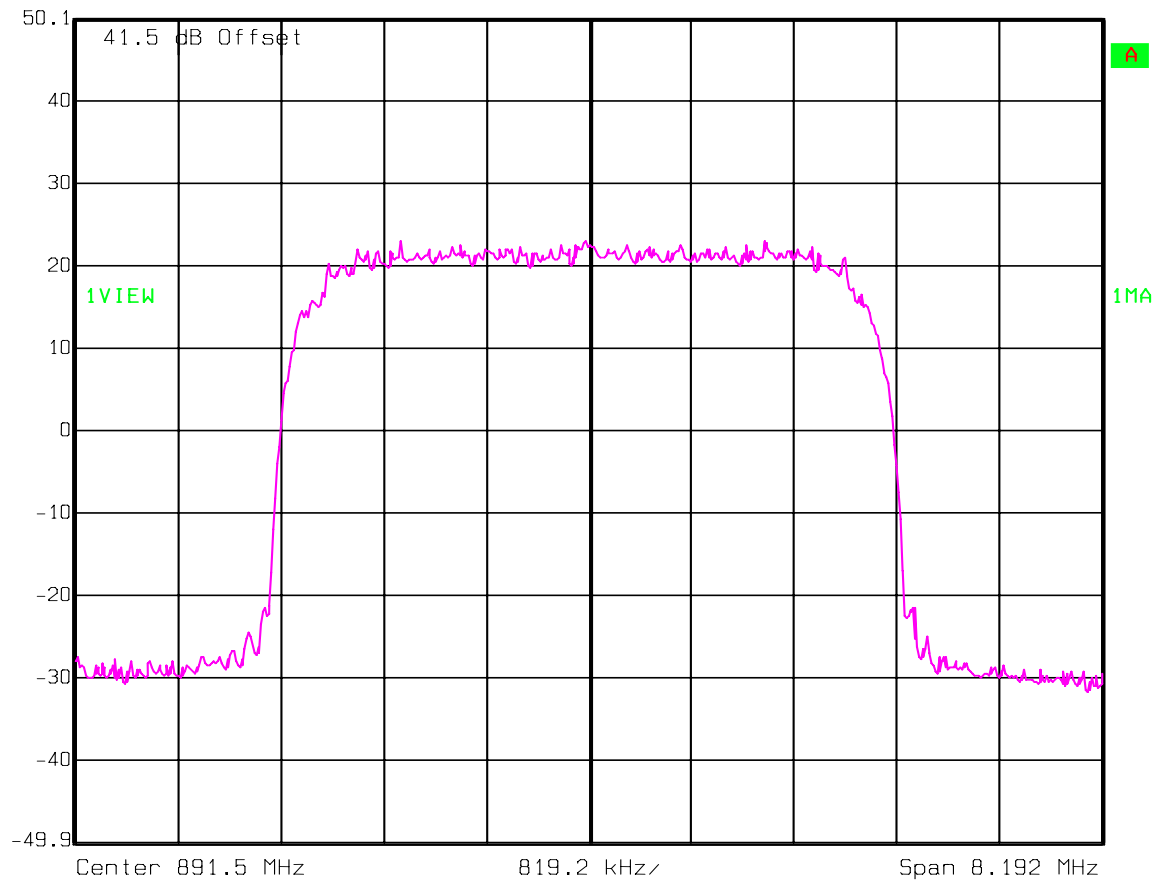
Date: 27.JUN.2007 16:07:04

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth**W-CDMA - Output**Ref Lvl
50.1 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	23 ms	Unit	dBm



Date: 27.JUN.2007 15:34:04

EQUIPMENT: ION-M85/19P

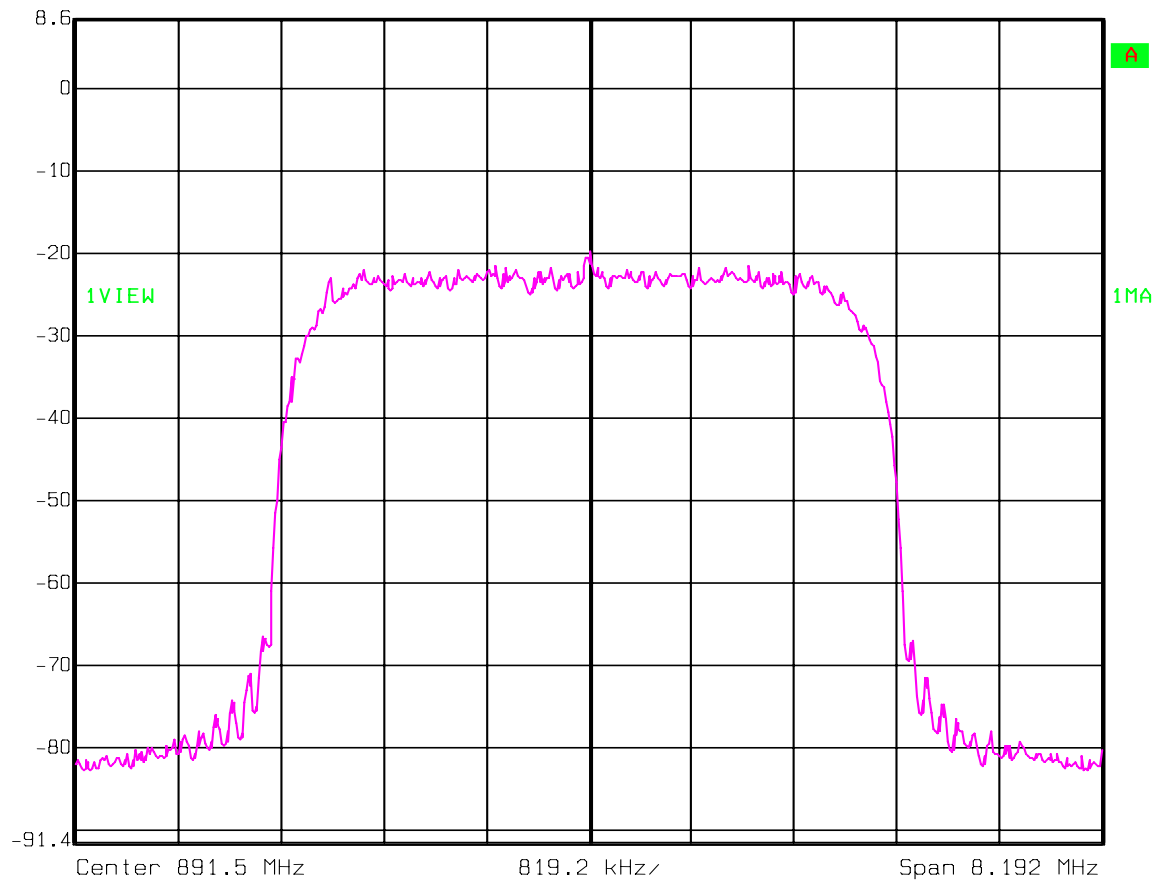
PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

W-CDMA - Input

Ref Lvl
8.6 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	23 ms	Unit	dBm



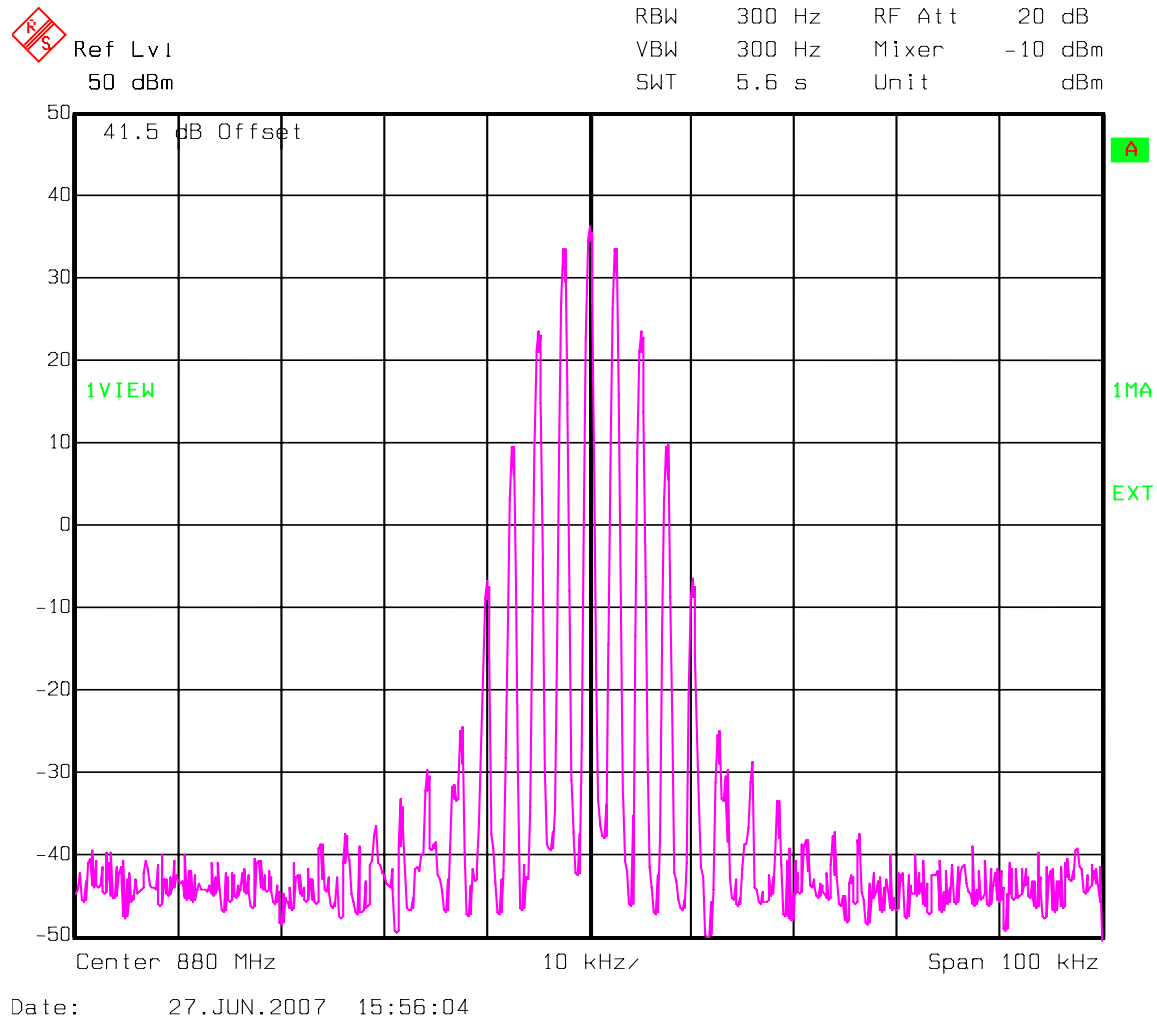
Date: 27.JUN.2007 15:34:57

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

Analog – Output

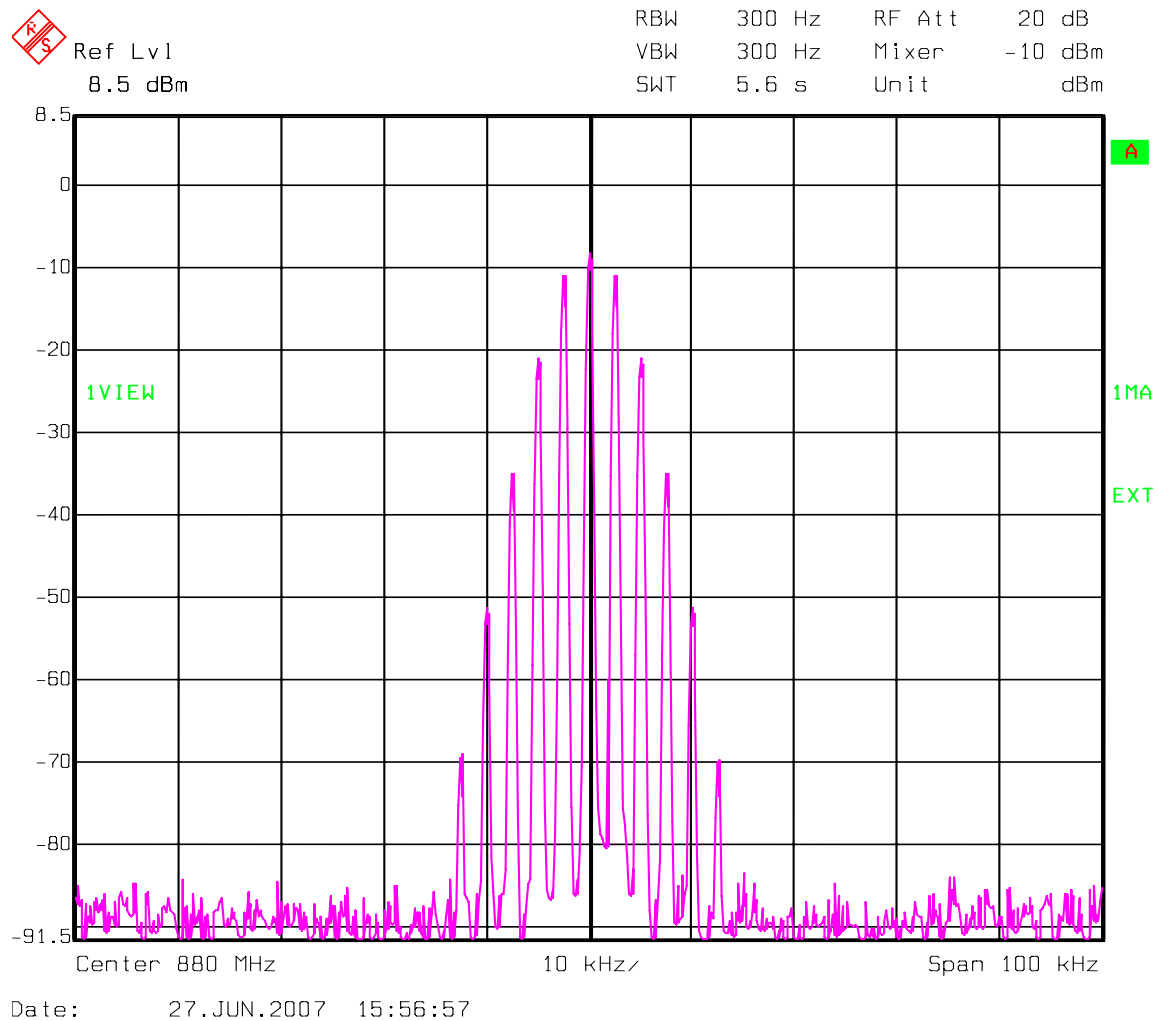


EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Occupied Bandwidth

Analog – Input



EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 22.917
TESTED BY:	DATE:

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used:

Measurement Uncertainty: +/- 1.7 dB

Temperature: _____ °C

Relative Humidity: _____ %

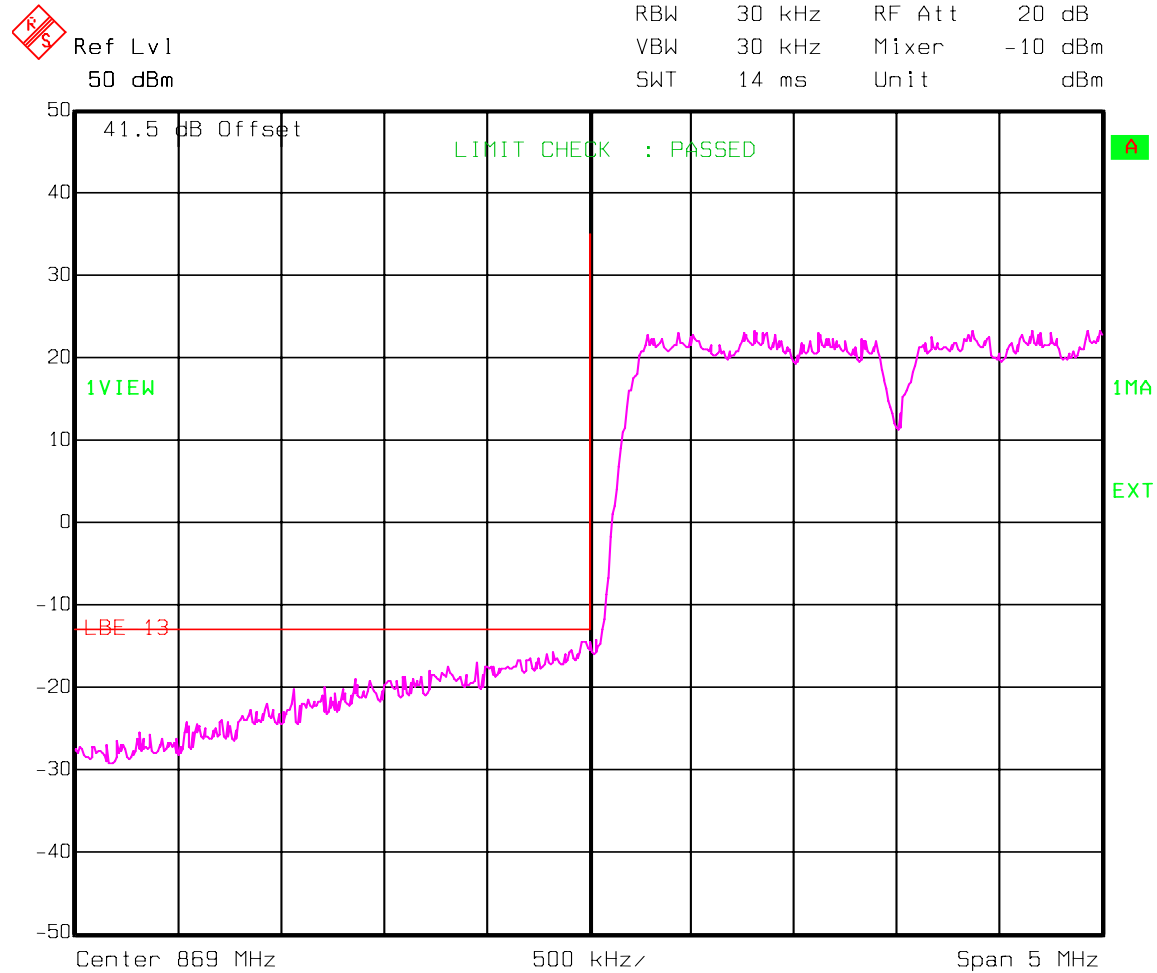
EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

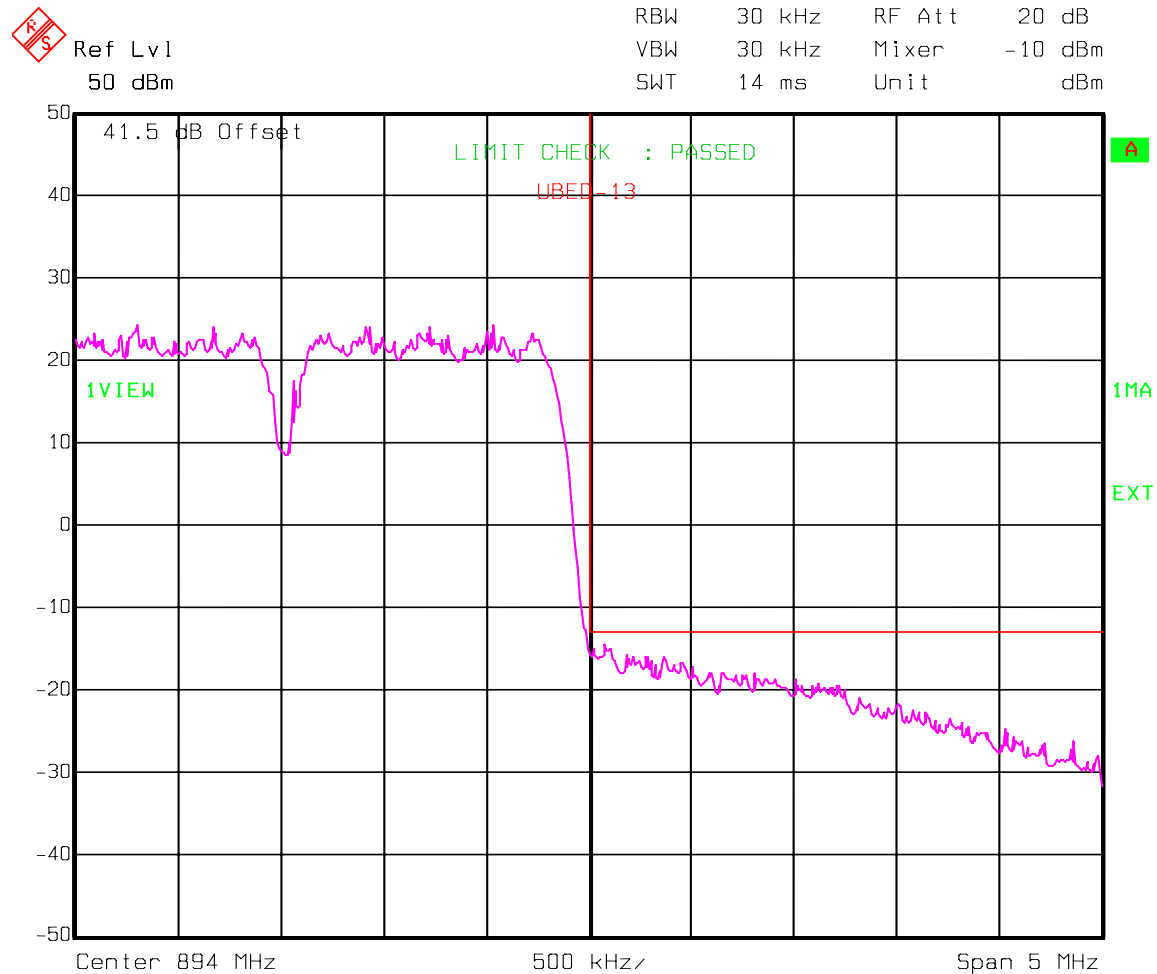
CDMA



Date: 27.JUN.2007 16:44:21

EQUIPMENT: ION-M85/19P

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
CDMA

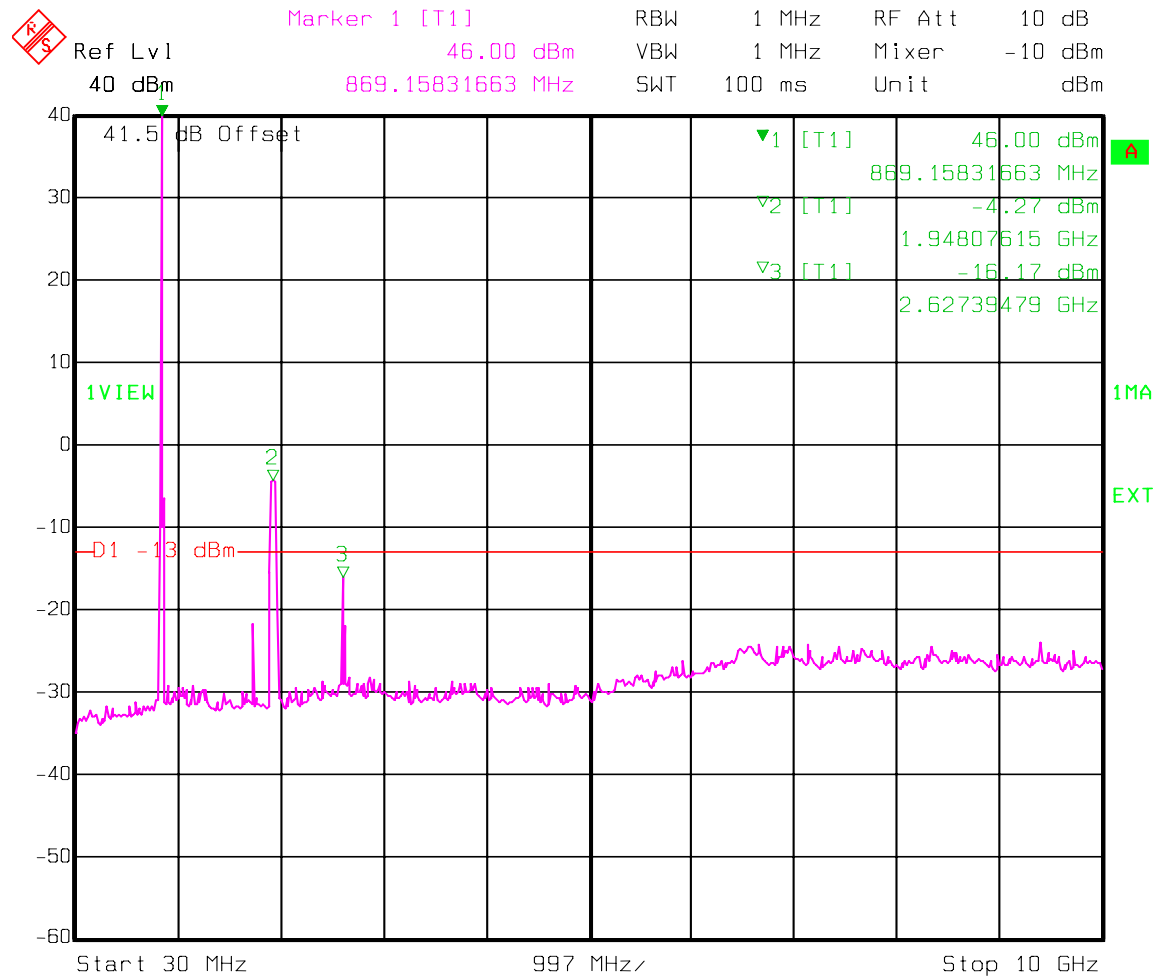
Date: 27.JUN.2007 16:46:03

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA



Date: 27.JUN.2007 16:47:50

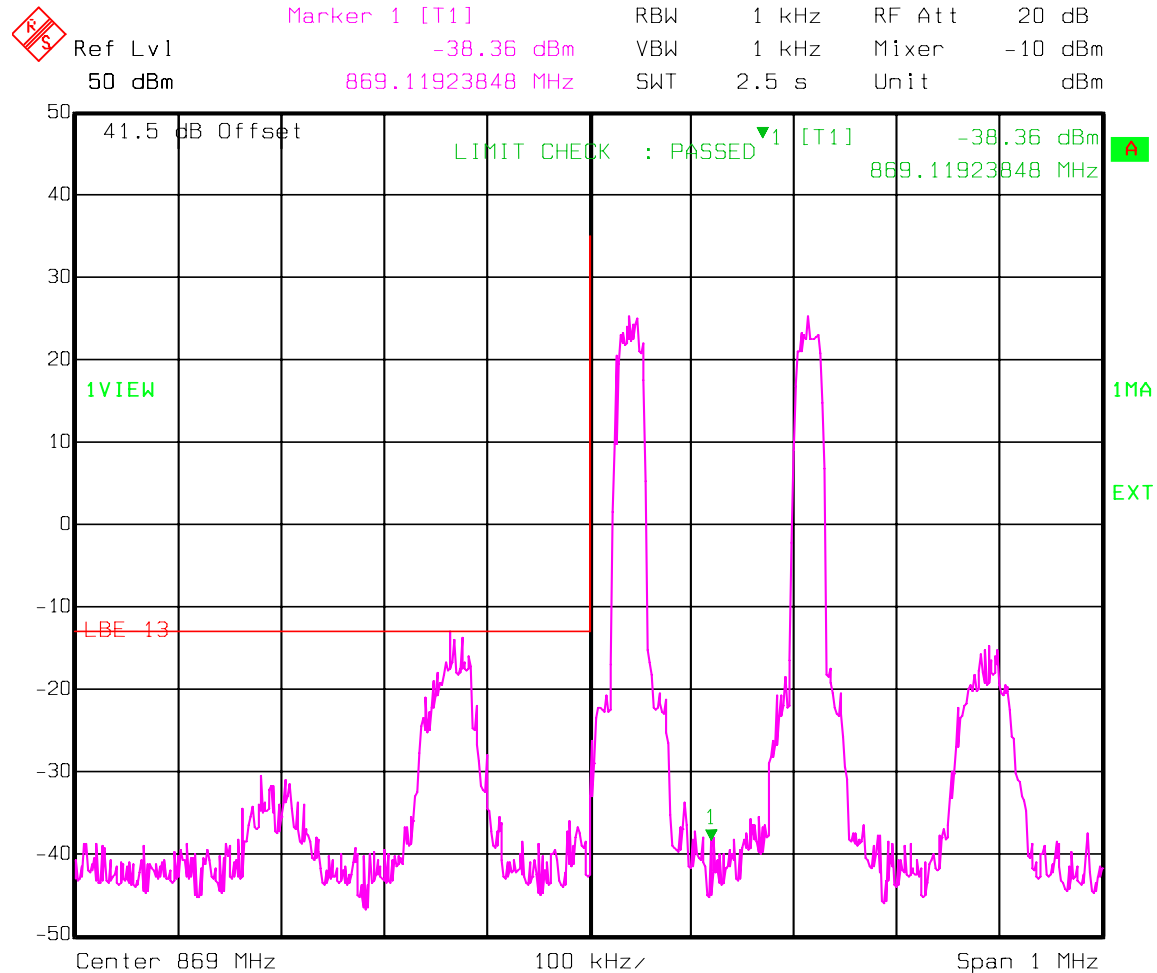
EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

TDMA



Date: 27.JUN.2007 16:32:17

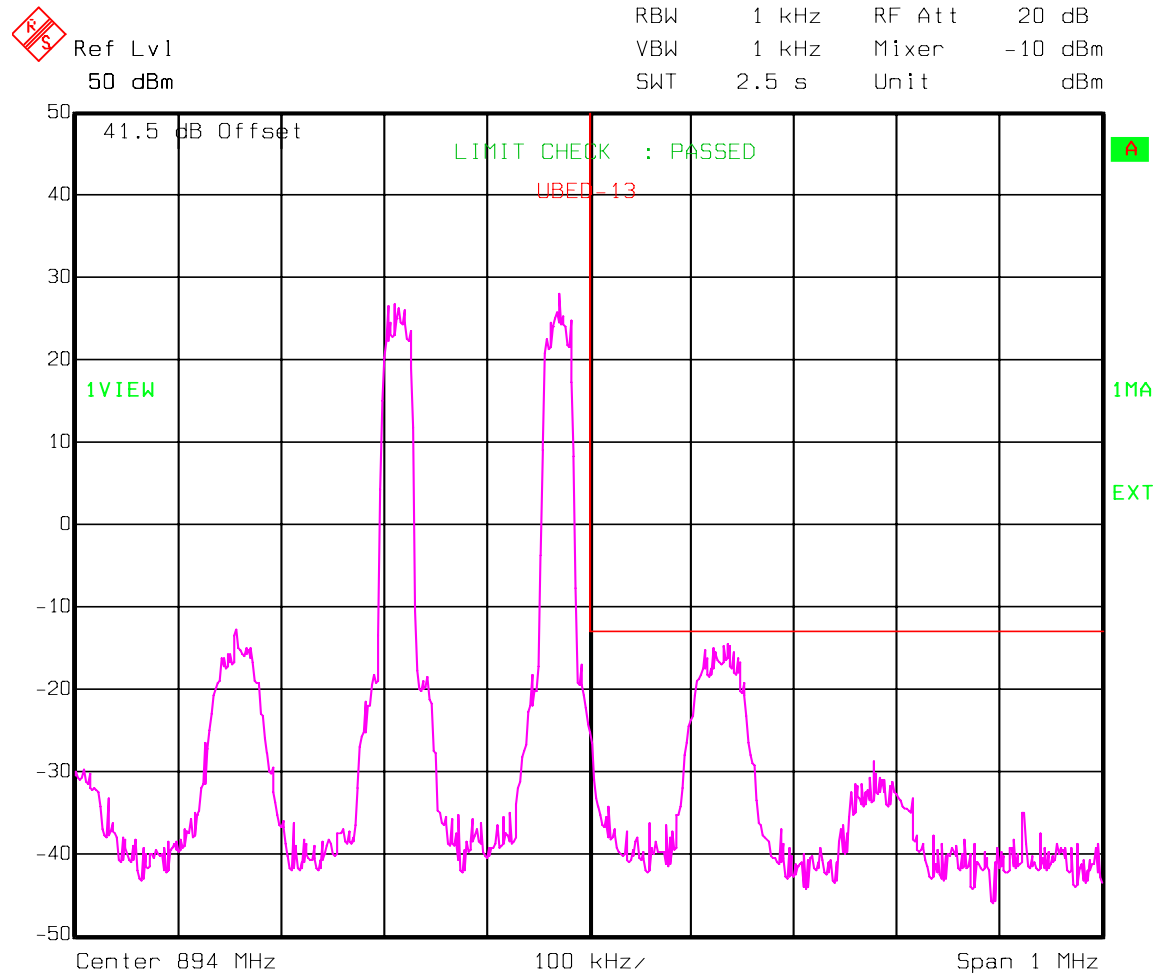
EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

TDMA



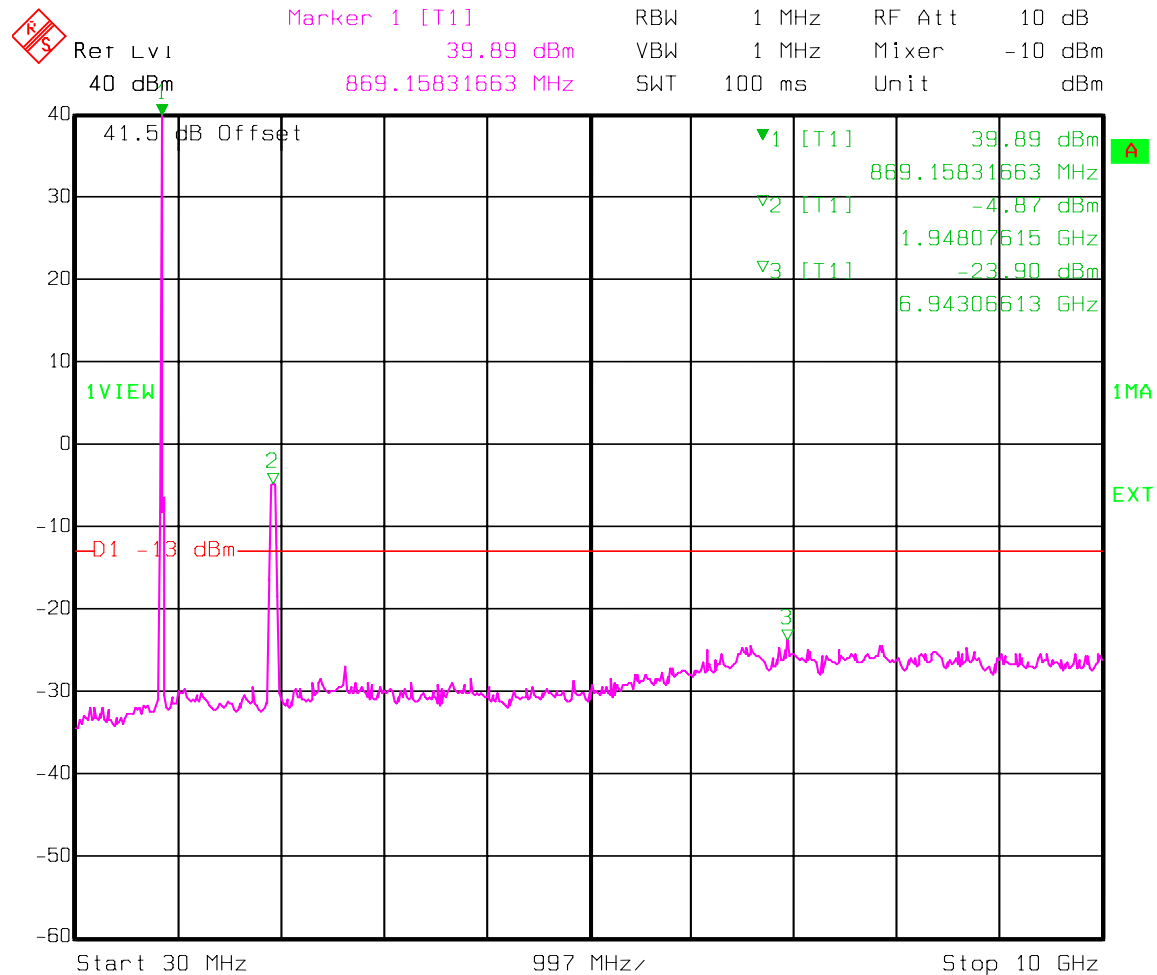
Date: 27.JUN.2007 16:34:08

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

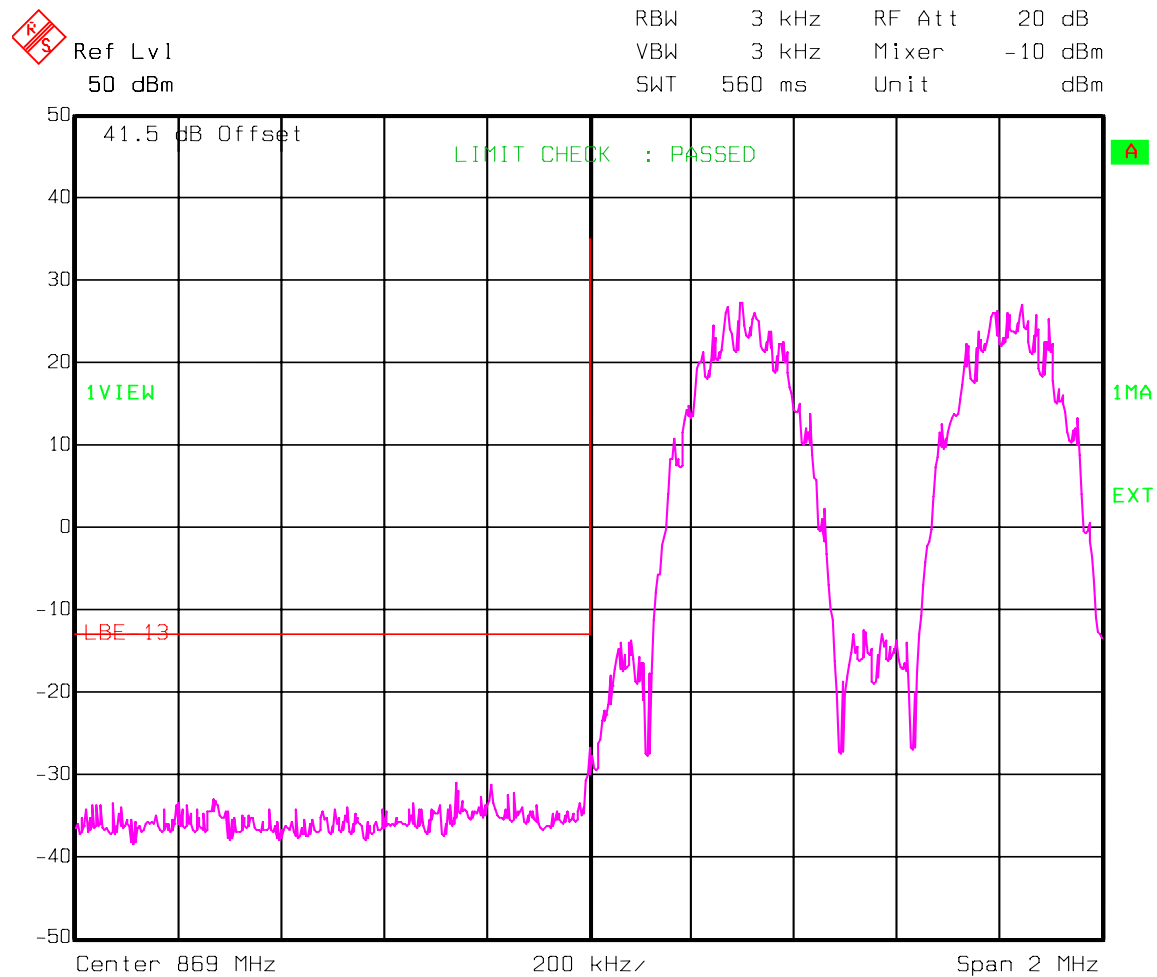
Spurs – TDMA – Downlink



Date: 27.JUN.2007 16:35:33

EQUIPMENT: ION-M85/19P

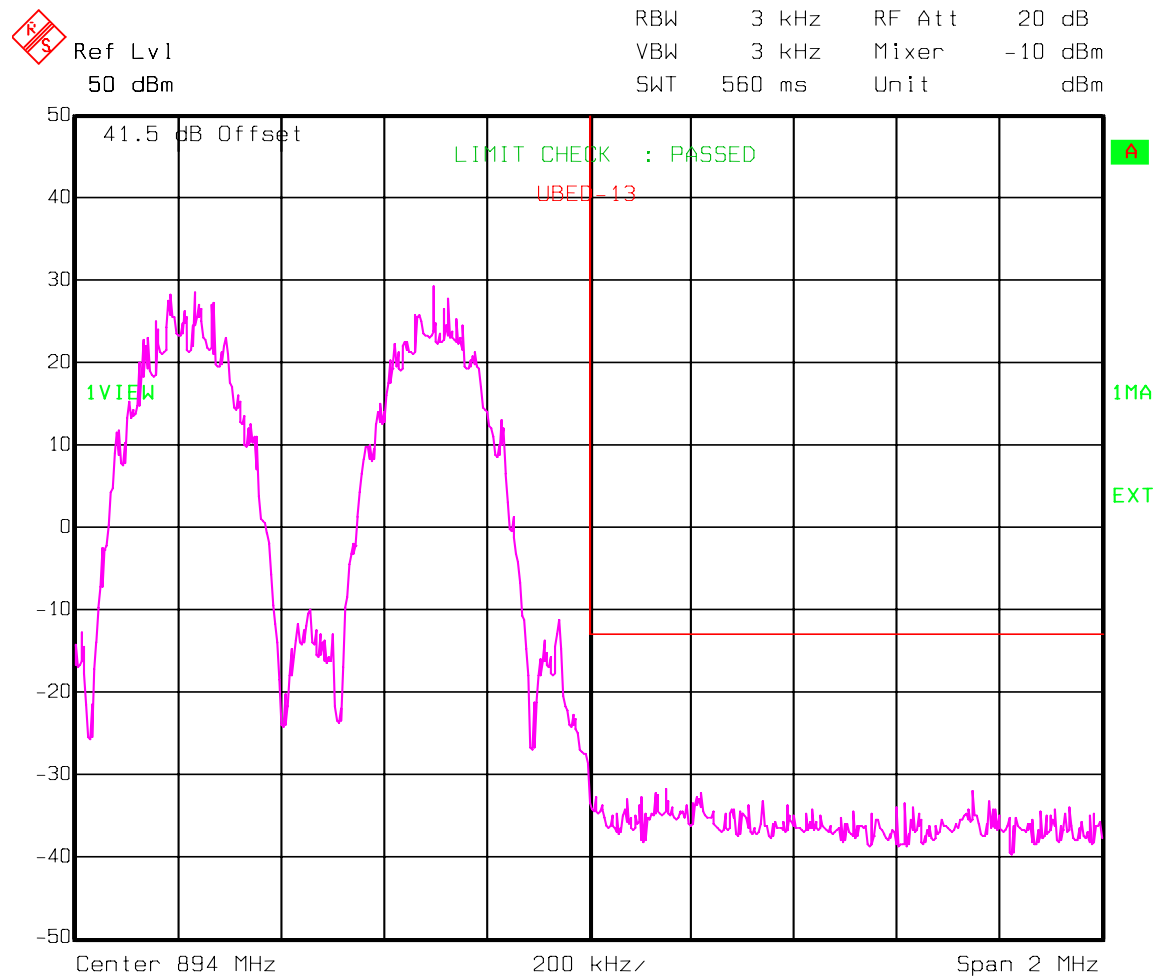
PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna TerminalsLower Bandedge Intermodulation
EDGE

Date: 27.JUN.2007 16:22:37

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
EDGE

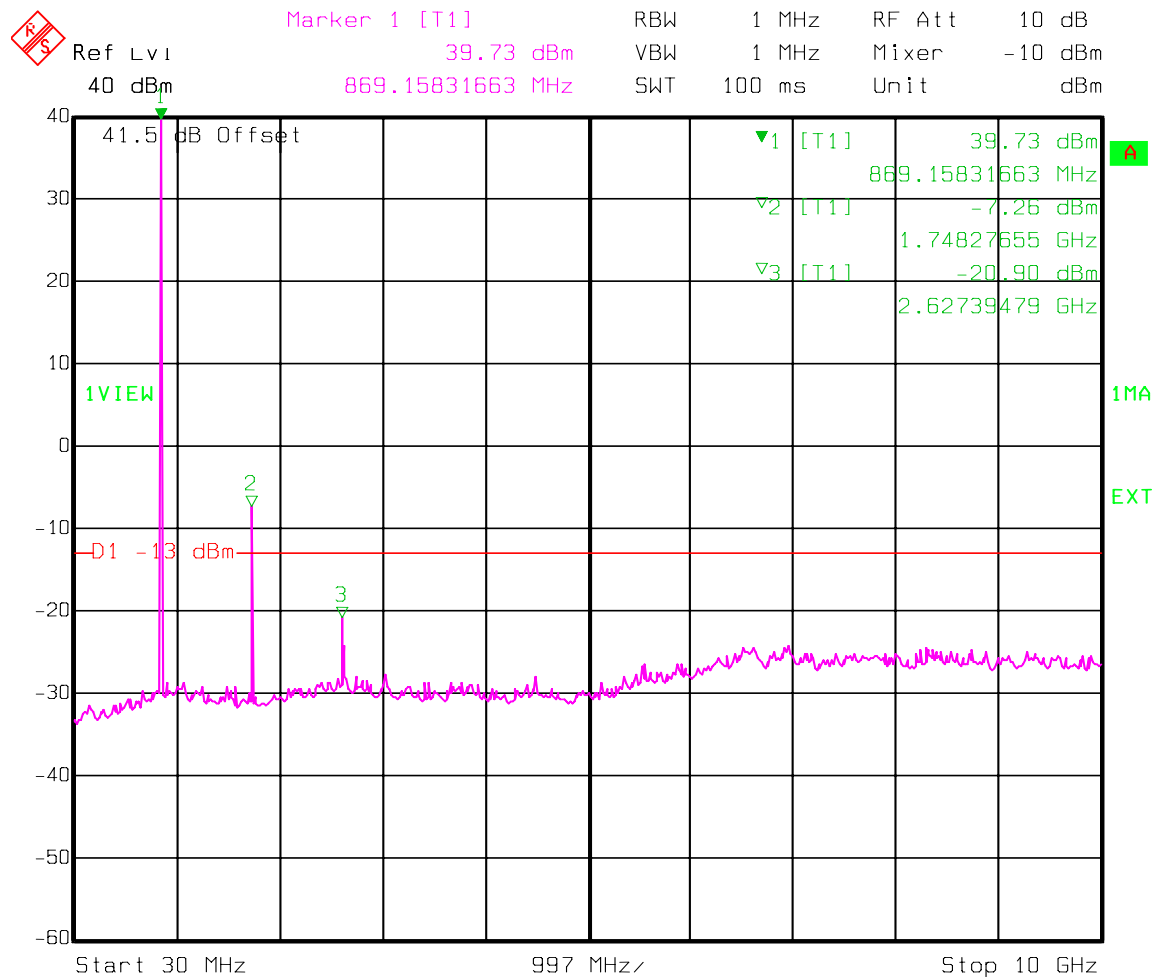
Date: 27.JUN.2007 16:23:30

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE – Downlink



Date: 27.JUN.2007 16:13:58

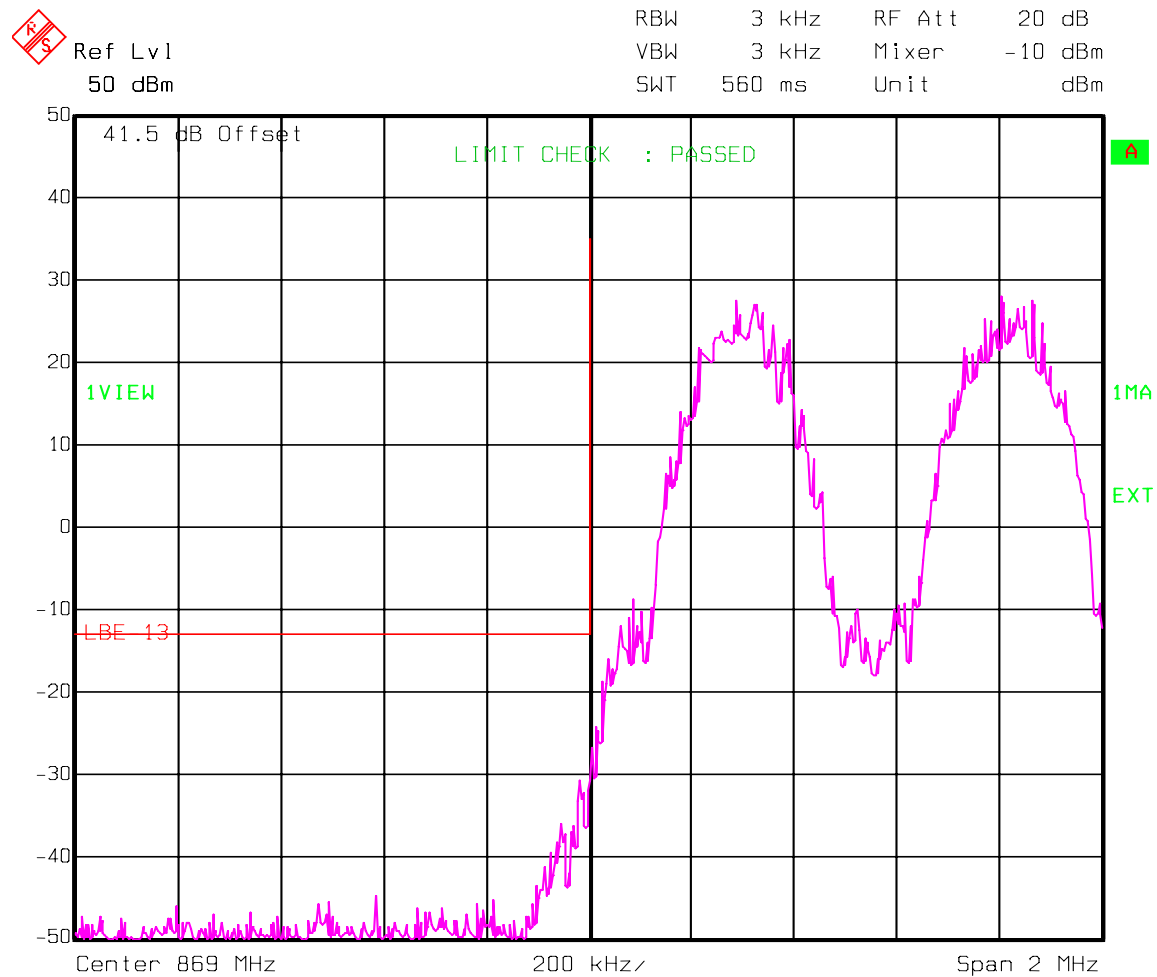
EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

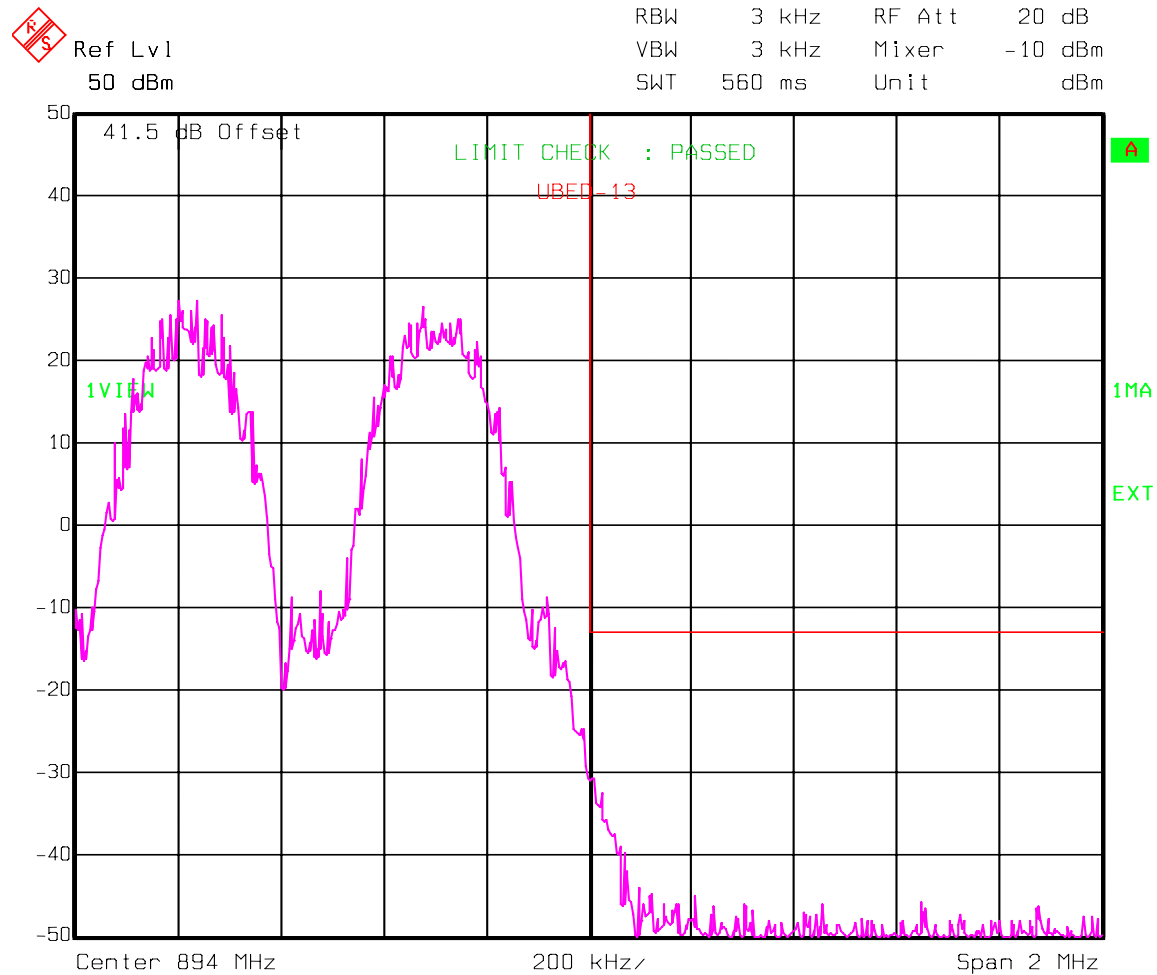
GSM



Date: 27.JUN.2007 16:09:58

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
GSM

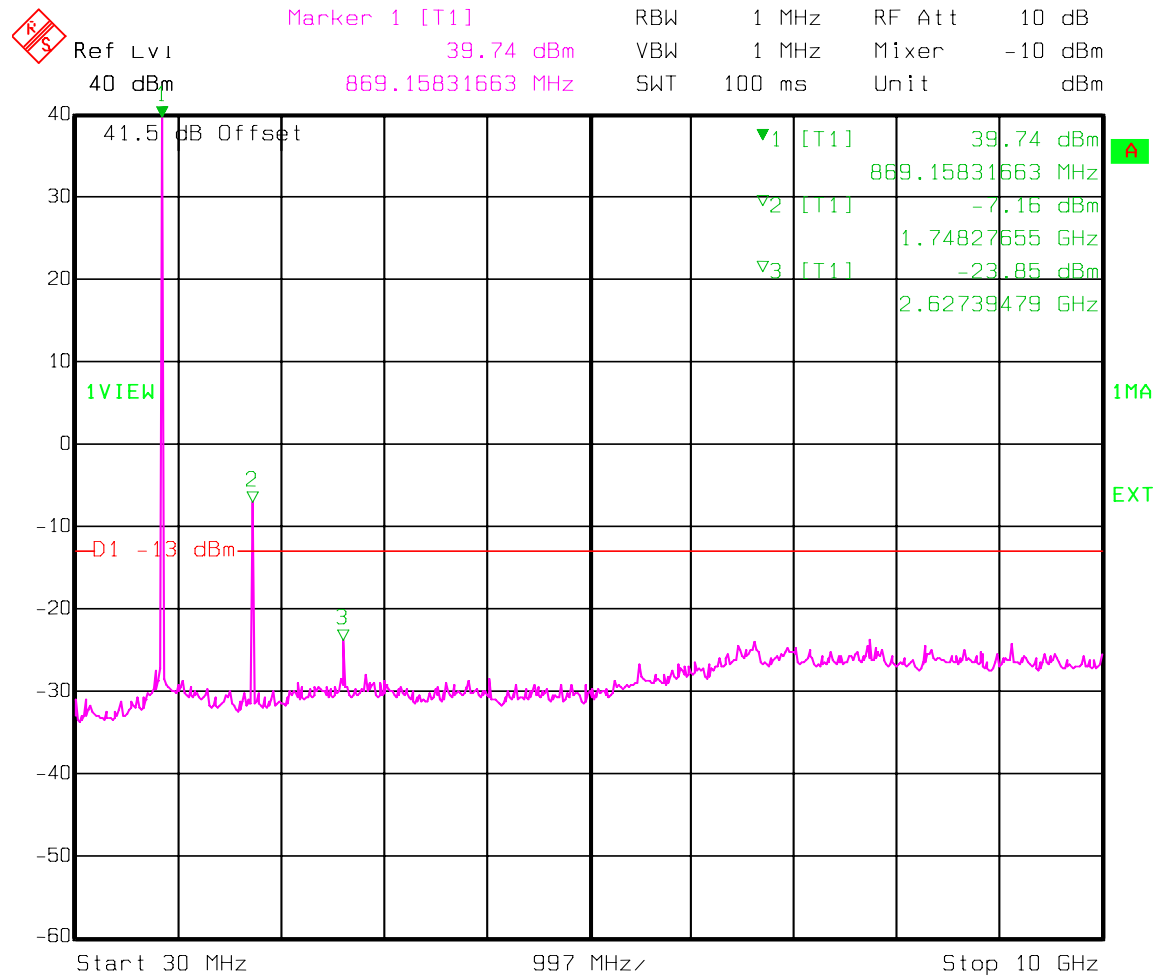
Date: 27.JUN.2007 16:10:55

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM – Downlink



Date: 27.JUN.2007 16:12:28

EQUIPMENT: ION-M85/19P

PROJECT NO.: 5058RUS2

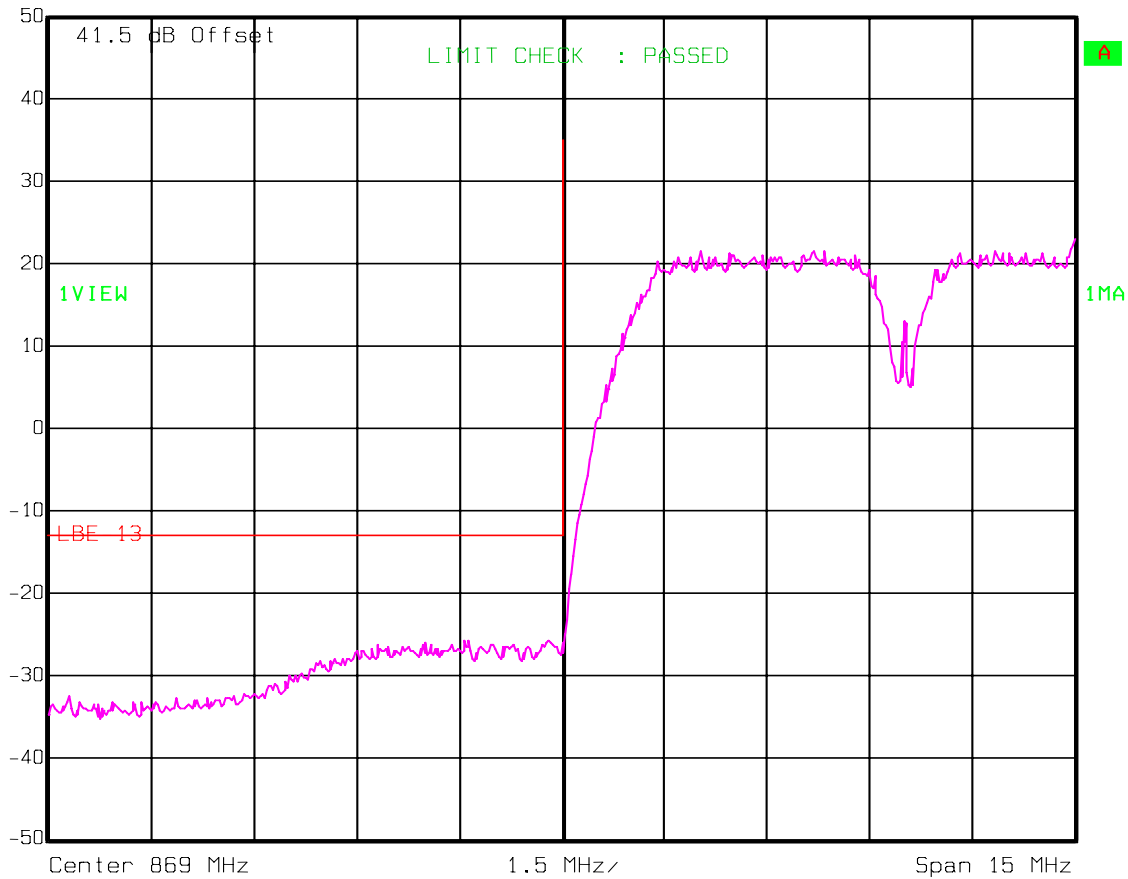
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

W-CDMA

Ref Lvl
50 dBm

RBW	50 kHz	RF Att	20 dB
VBW	50 kHz	Mixer	-10 dBm
SWT	15 ms	Unit	dBm



Date: 27.JUN.2007 15:46:28

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

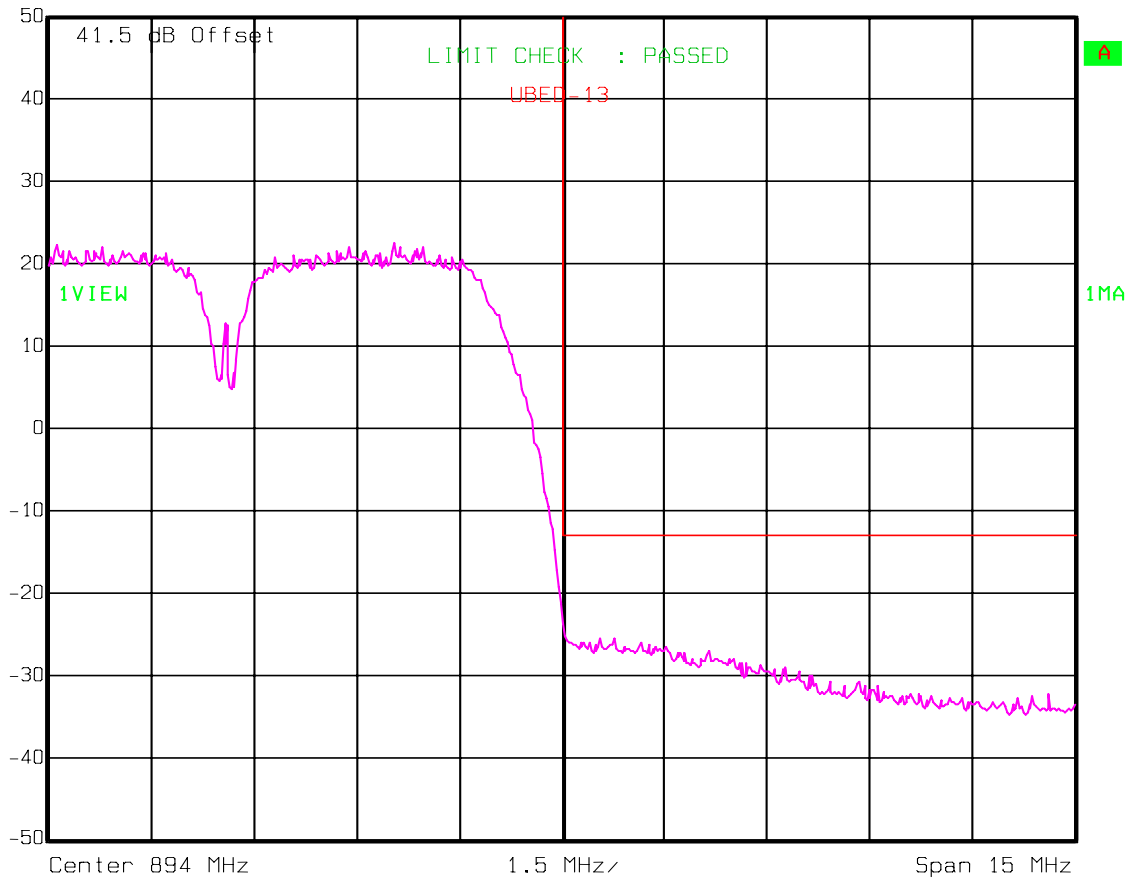
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

W-CDMA

Ref Lvl
50 dBm

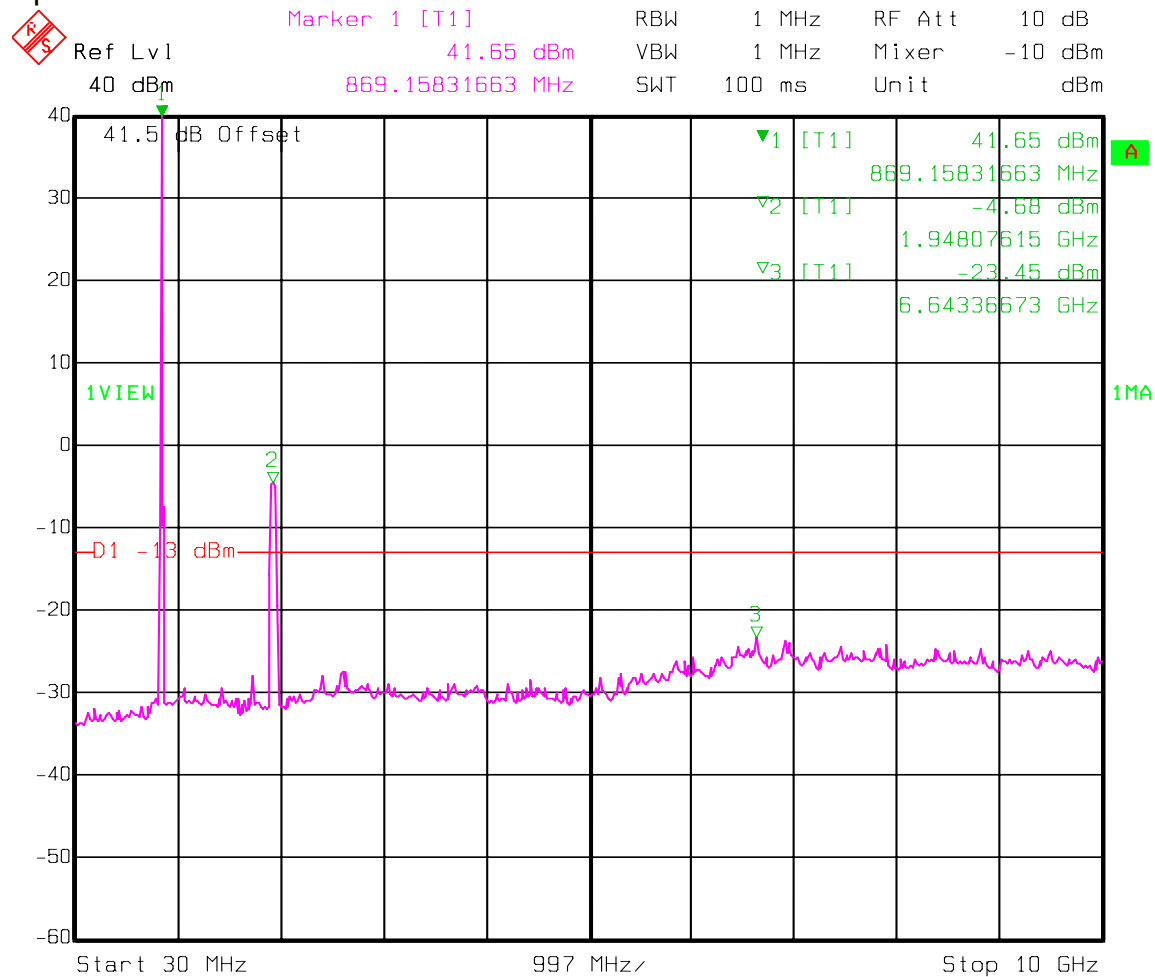
RBW	50 kHz	RF Att	20 dB
VBW	50 kHz	Mixer	-10 dBm
SWT	15 ms	Unit	dBm



Date: 27.JUN.2007 15:47:42

EQUIPMENT: **ION-M85/19P**

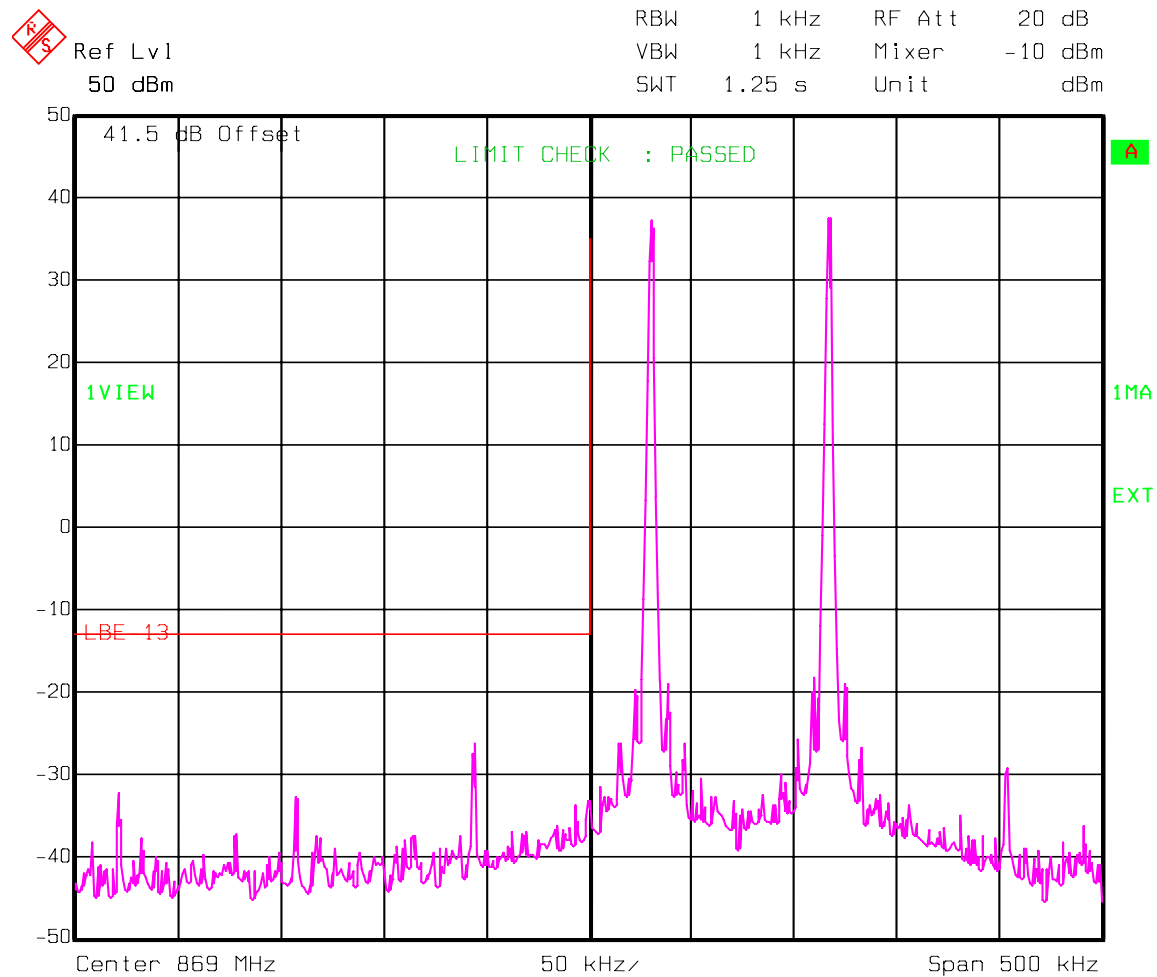
PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals**Spurs – W-CDMA - Downlink**

Date: 27.JUN.2007 15:37:39

EQUIPMENT: **ION-M85/19P**

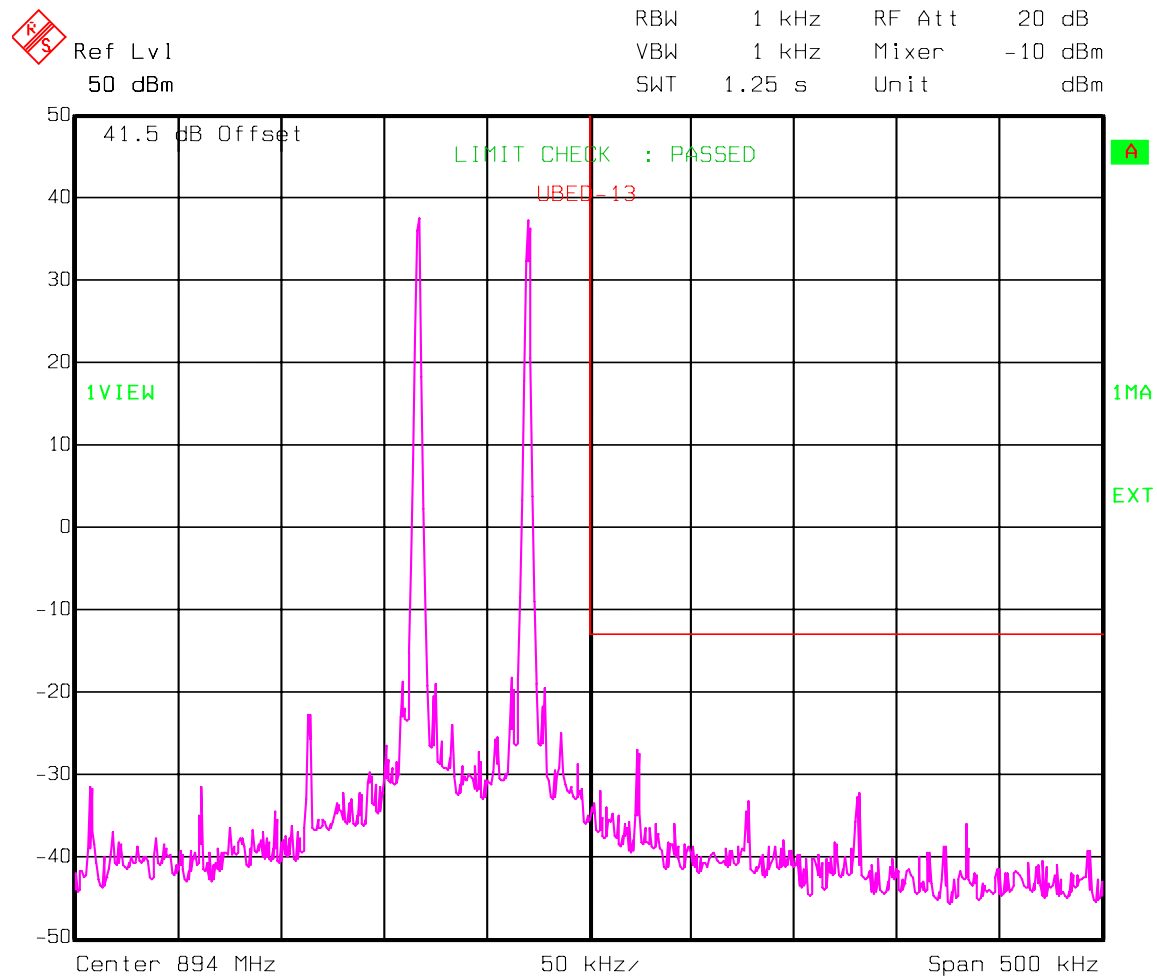
PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna TerminalsLower Bandedge Intermodulation
Analog

Date: 27.JUN.2007 16:00:25

EQUIPMENT: ION-M85/19P

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
Analog

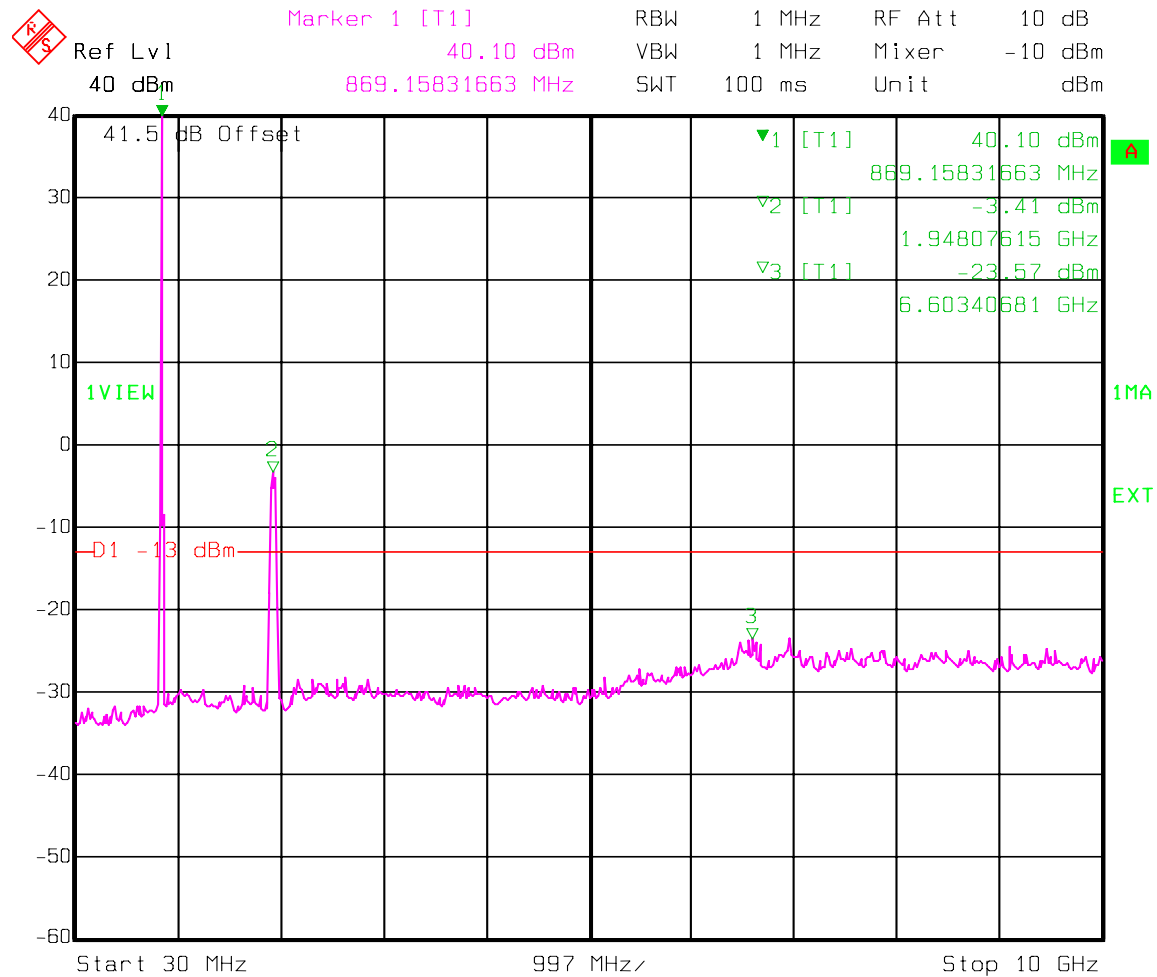
Date: 27.JUN.2007 16:01:17

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Test Data – Spurious Emissions at Antenna Terminals

Spurs – Analog – Downlink



Date: 27.JUN.2007 16:02:34

EQUIPMENT: **ION-M85/19P**PROJECT NO.: 5058RUS2

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 28 June 2007

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: 1464-1484-1485-1016-993-791-760-759**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 22 °C**Relative Humidity:** 48 %

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

Section 7. 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
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1484	Cable	Storm PR90-010-072	N/A	05/02/07	05/01/08
1485	Cable	Storm PR90-010-216	N/A	05/02/07	05/01/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/01/05	08/02/07
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/01/07	04/30/08
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	03/30/07	03/29/08
760	Antenna biconical	Electro Metrics MFC-25	477	01/19/07	01/19/08

ANNEX A - TEST DETAILS

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

NAME OF TEST: RF Power Output**PARA. NO.: 2.1046**

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

Method Of Measurement:Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter. 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 a dipole. 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 erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: Not defined (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

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

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

Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

Method Of Measurement:**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

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

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

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

EQUIPMENT: ION-M85/19P

PROJECT NO.: 5058RUS2

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
--	-------------------

Minimum Standard:

Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least $43 + 10 \log P$. This is equivalent to -13 dBm absolute power.

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 a dipole. 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 erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

EQUIPMENT: **ION-M85/19P**

PROJECT NO.: 5058RUS2

NAME OF TEST: Frequency Stability**PARA. NO.: 2.1055****Minimum Standard:**

Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Table C-1

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

Method Of Measurement:Frequency Stability With Voltage Variation:

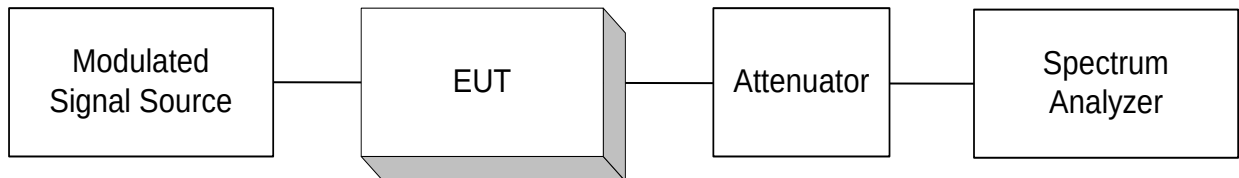
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the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

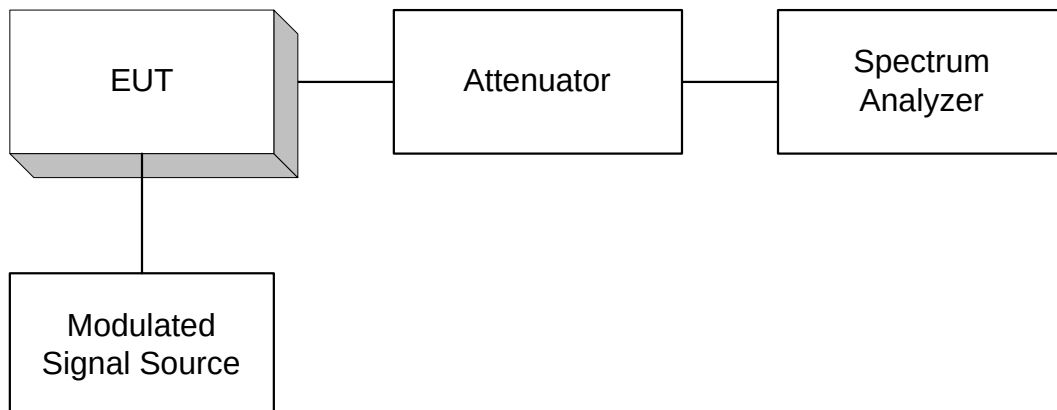
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

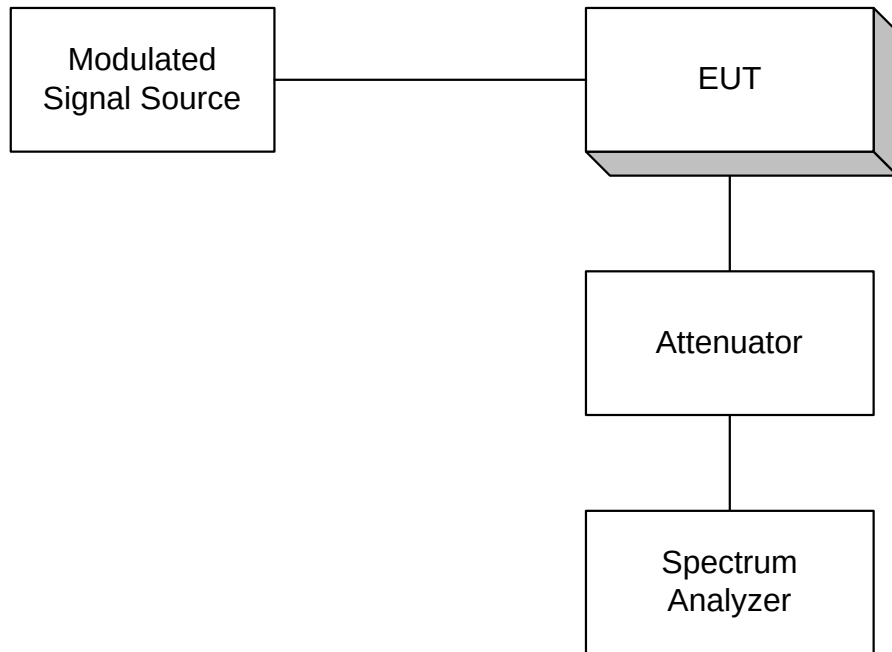
Para. No. 2.1046 - R.F. Power Output



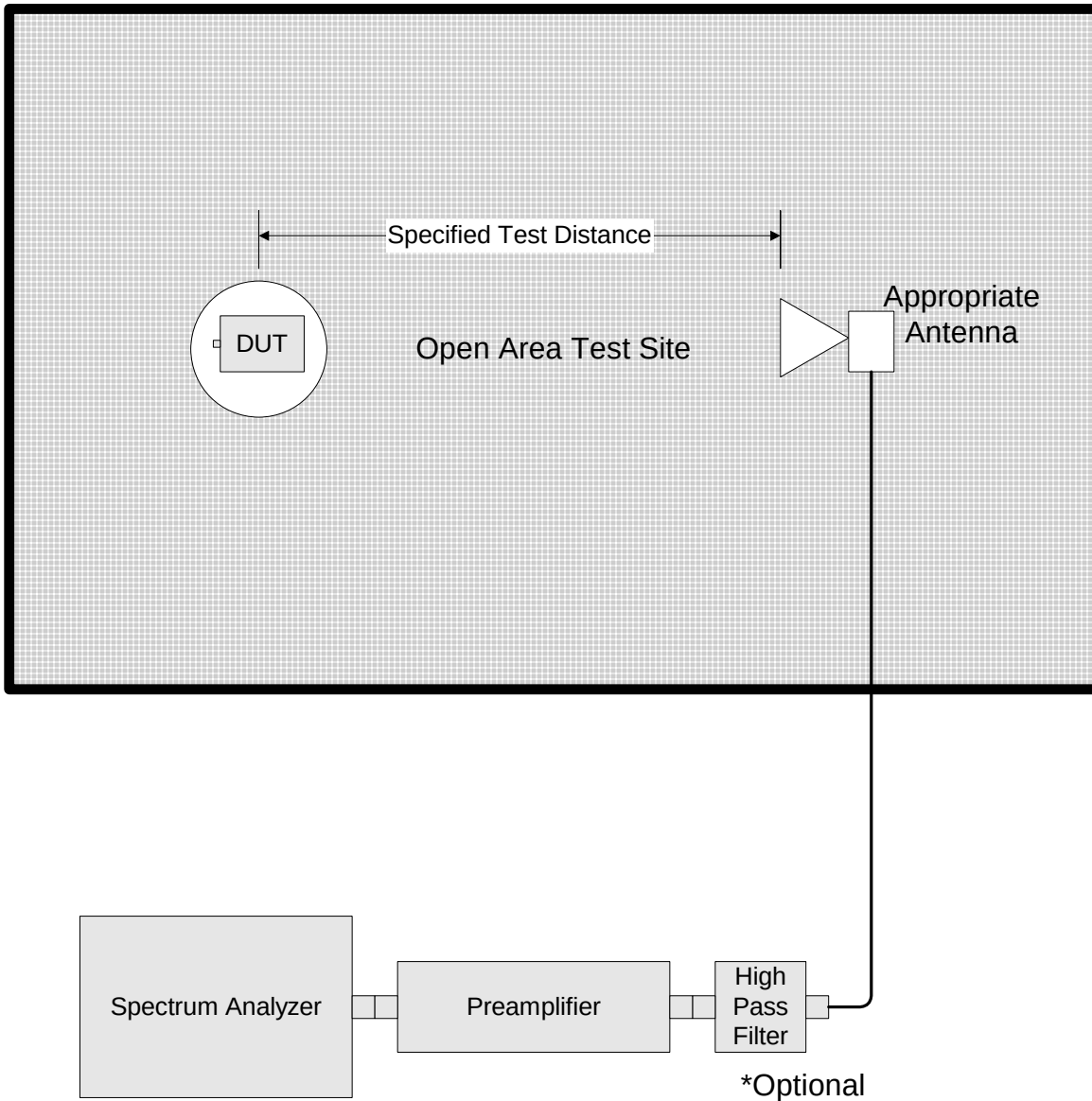
Para. No. 2.1049 - Occupied Bandwidth

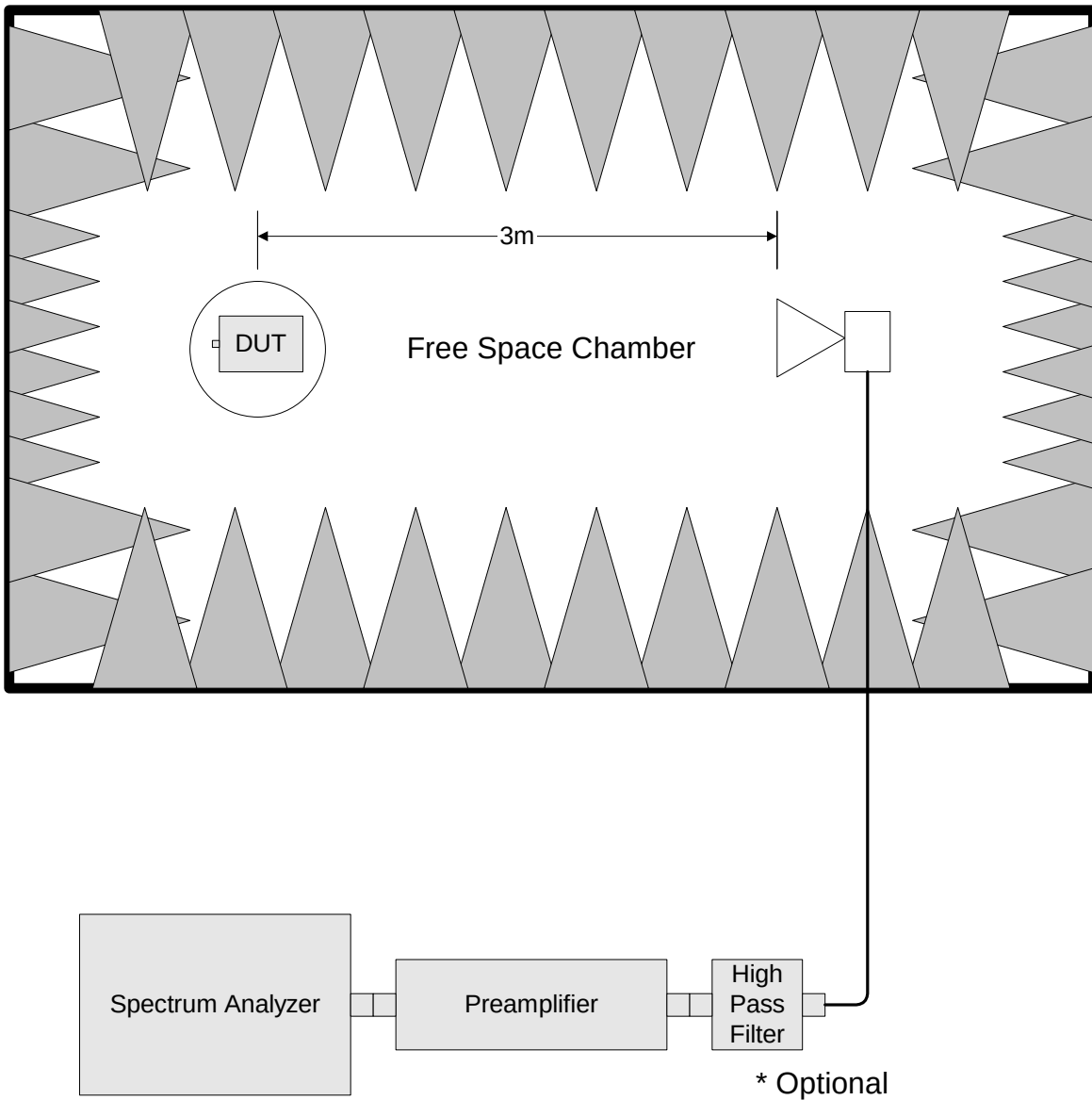


Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation





Para. No. 2.1055 - Frequency Stability

