



Nemko Test Report: 23827RUS1

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

Equipment Under Test: ION-M85P/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:

David Light, Senior Wireless Engineer

DATE: 11 December 2008

APPROVED BY:

Tom Tidwell, Telecom Direct

DATE: 12 December, 2008

Number of Pages: 50

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EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Section 1. Summary of Test Results

Manufacturer Andrew Corporation

Model No.: ION-M85P/19P

Serial No.: 98

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-M85P/19PPROJECT NO.: 23827RUS1**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.
- (2) The equipment under test uses a common oscillator to down-convert the rf input to an intermediate frequency and to up-convert the IF to rf output. The rf input and output frequency are the same.

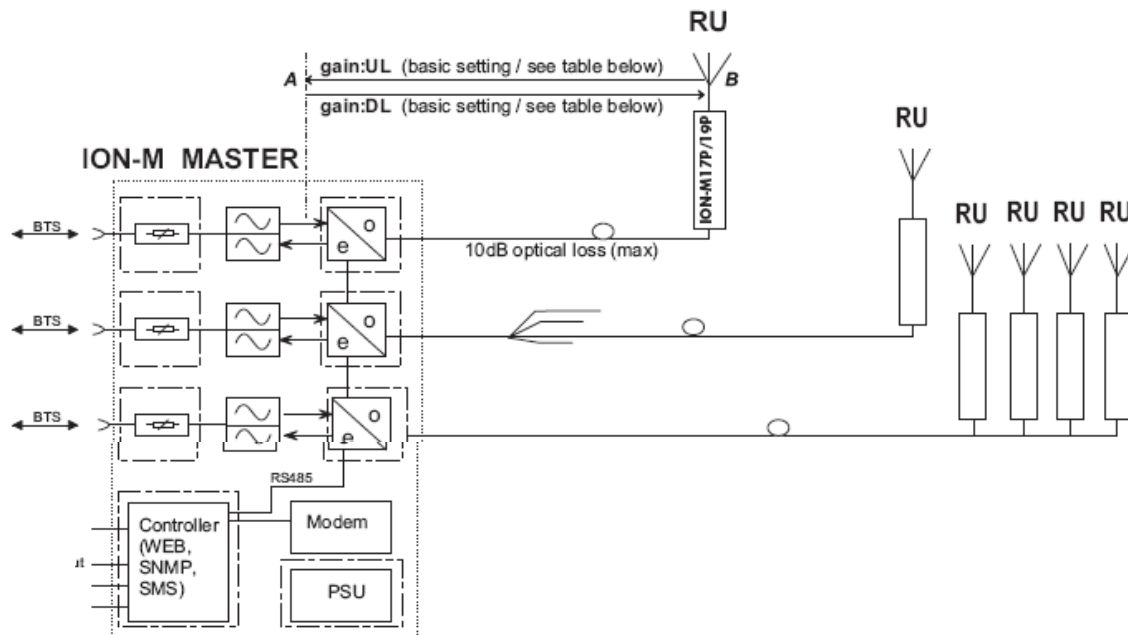
EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Section 2. General Equipment Specification**

Supply Voltage Input:	120 Vac				
Frequency Range:	Downlink:	869-894 MHz			
Frequency Range:	Uplink:	NA			
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:	20 W 43 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-M85P/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

System Diagram



EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 22.913
TESTED BY: David Light	DATE: 10 November 2008

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

Direction	Modulation	Composite Power (dBm)	RF Power (W)
Downlink	CDMA	43	20
	GSM	43	20
	EDGE	43	20
	WCDMA	42	15.8
	TDMA	43	20
	Analog	43	20
Uplink	CDMA	NA	NA
	GSM	NA	NA
	EDGE	NA	NA
	WCDMA	NA	NA
	TDMA	NA	NA
	Analog	NA	NA

Note: The EUT does not transmit over the air in the uplink direction.

Equipment Used: 1065-1604-1082-1659-1663**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 48 %

EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Section 4. Occupied Bandwidth**

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

TESTED BY: David Light

DATE: 10 December 2008

Test Results: Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1065-1604-1082-1659-1663**Measurement Uncertainty:** 1X10⁻⁷ ppm**Temperature:** 22 °C**Relative Humidity:** 48 %

EQUIPMENT: ION-M85P/19P

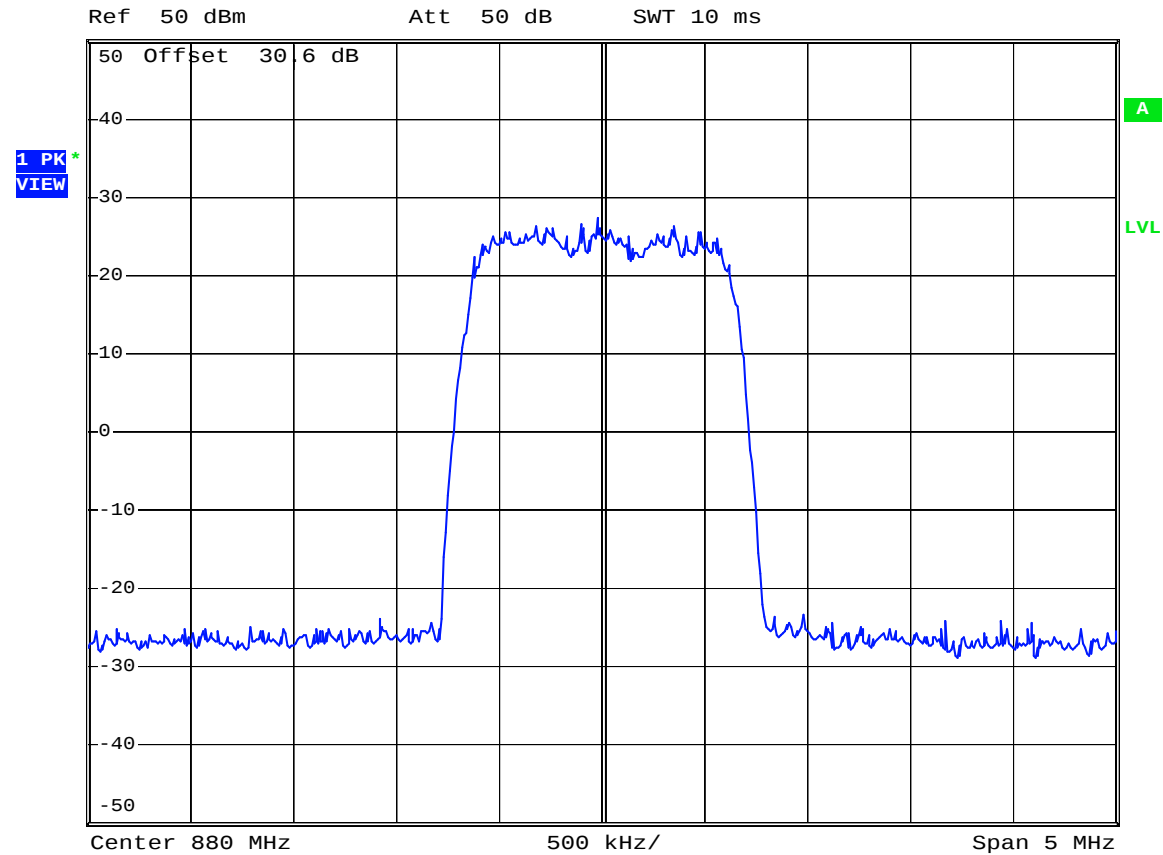
PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

CDMA – Output



* RBW 30 kHz
VBW 100 kHz
SWT 10 ms



Date: 10.DEC.2008 09:42:02

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

CDMA – Input



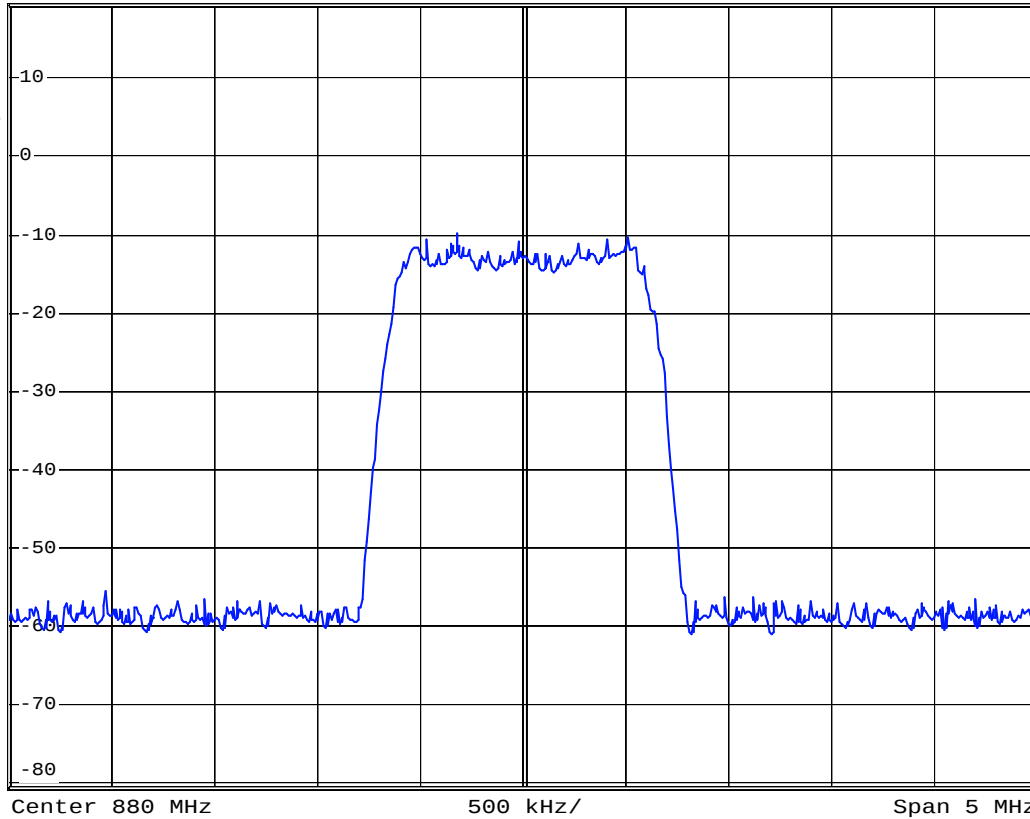
* RBW 30 kHz
VBW 100 kHz
SWT 10 ms

Ref 19.4 dBm

Att 50 dB

SWT 10 ms

1 PK
VIEW



Date: 10.DEC.2008 11:03:57

EQUIPMENT: ION-M85P/19P

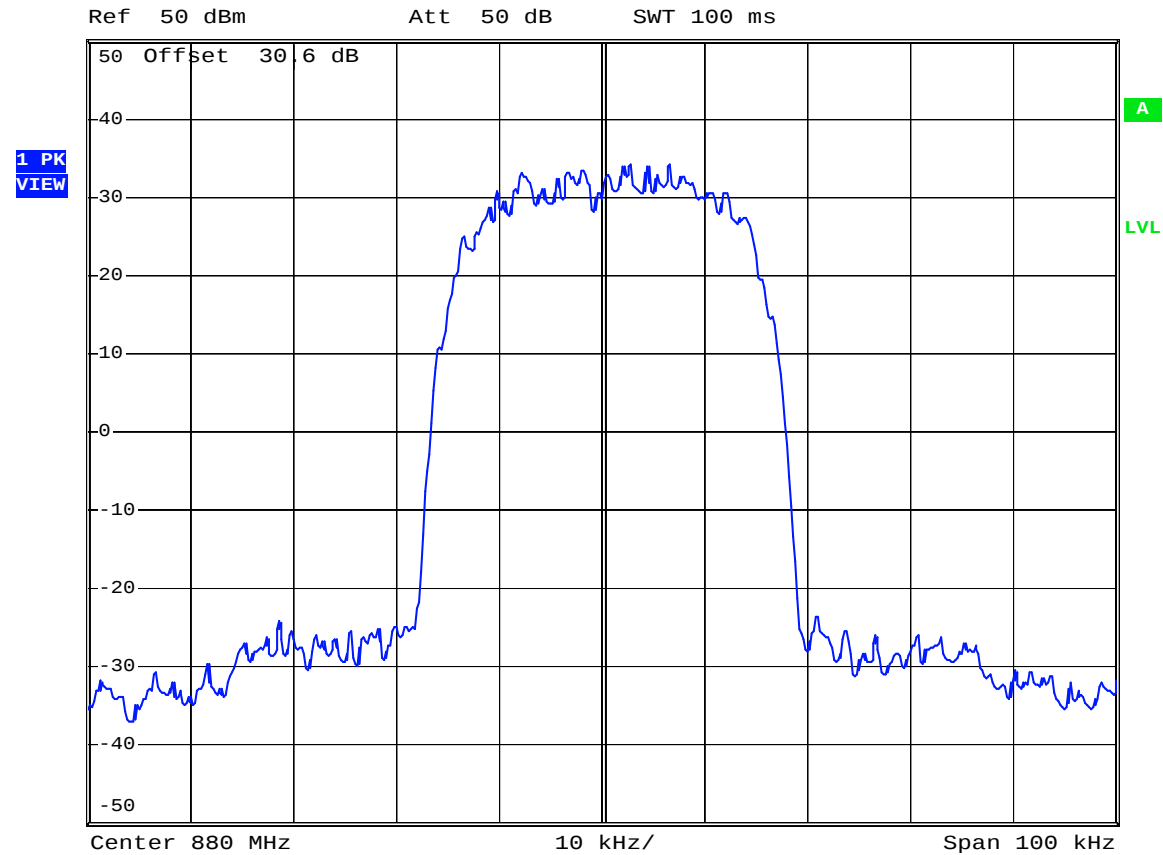
PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

TDMA - Output



* RBW 1 kHz
VBW 3 kHz
SWT 100 ms



Date: 10.DEC.2008 10:40:08

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

TDMA – Input



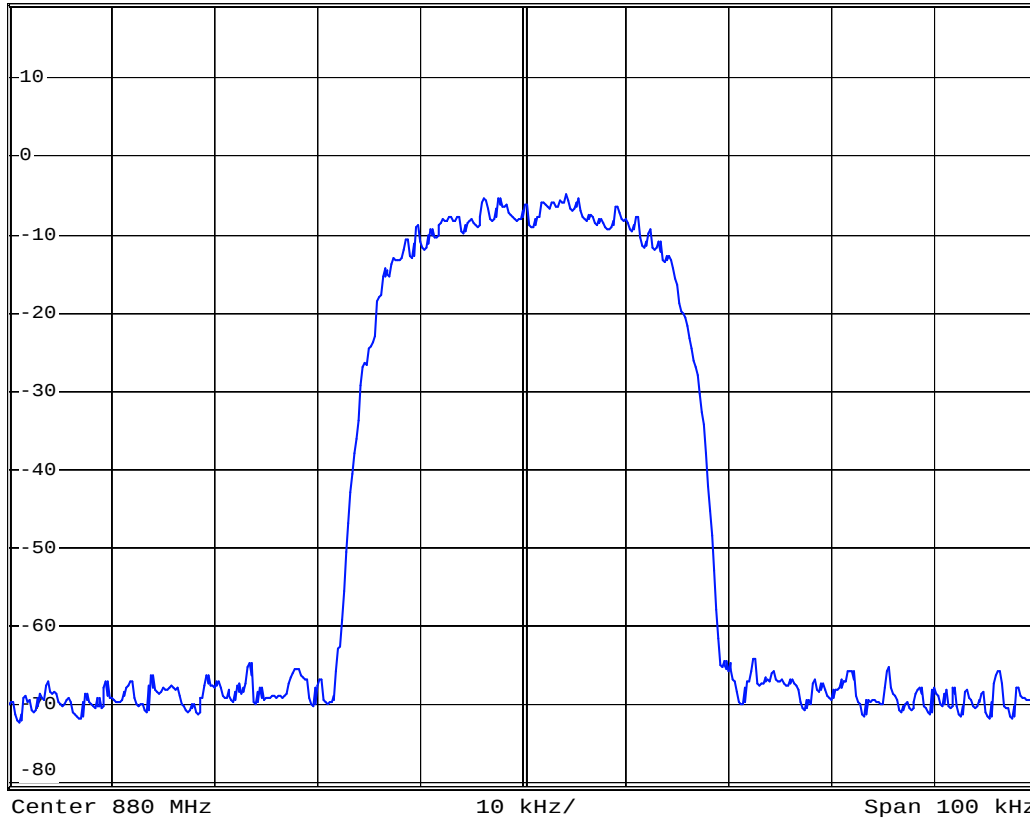
* RBW 1 kHz
VBW 3 kHz
SWT 100 ms

Ref 19.4 dBm

Att 50 dB

SWT 100 ms

1 PK
VIEW



Date: 10.DEC.2008 10:59:13

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

EDGE –



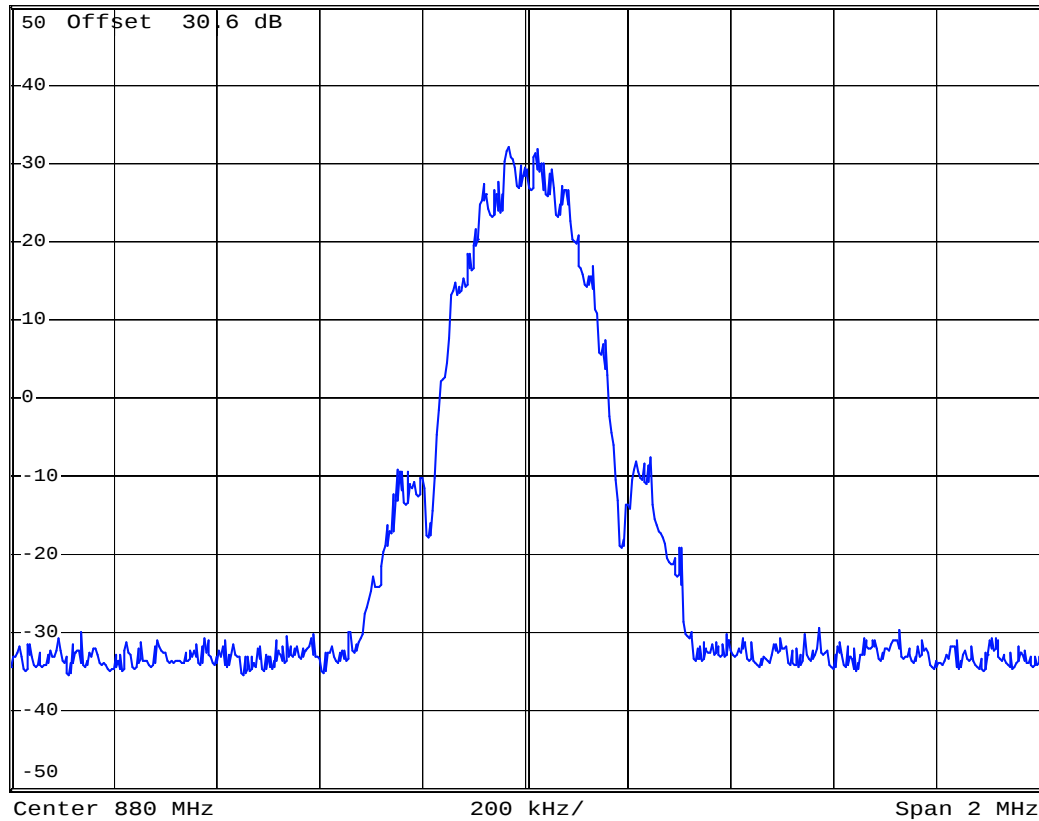
* RBW 3 kHz
VBW 10 kHz
SWT 225 ms

Ref 50 dBm

Att 50 dB

SWT 225 ms

1 PK
VIEW



OutputDate: 10.DEC.2008 09:53:03

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

EDGE – Input



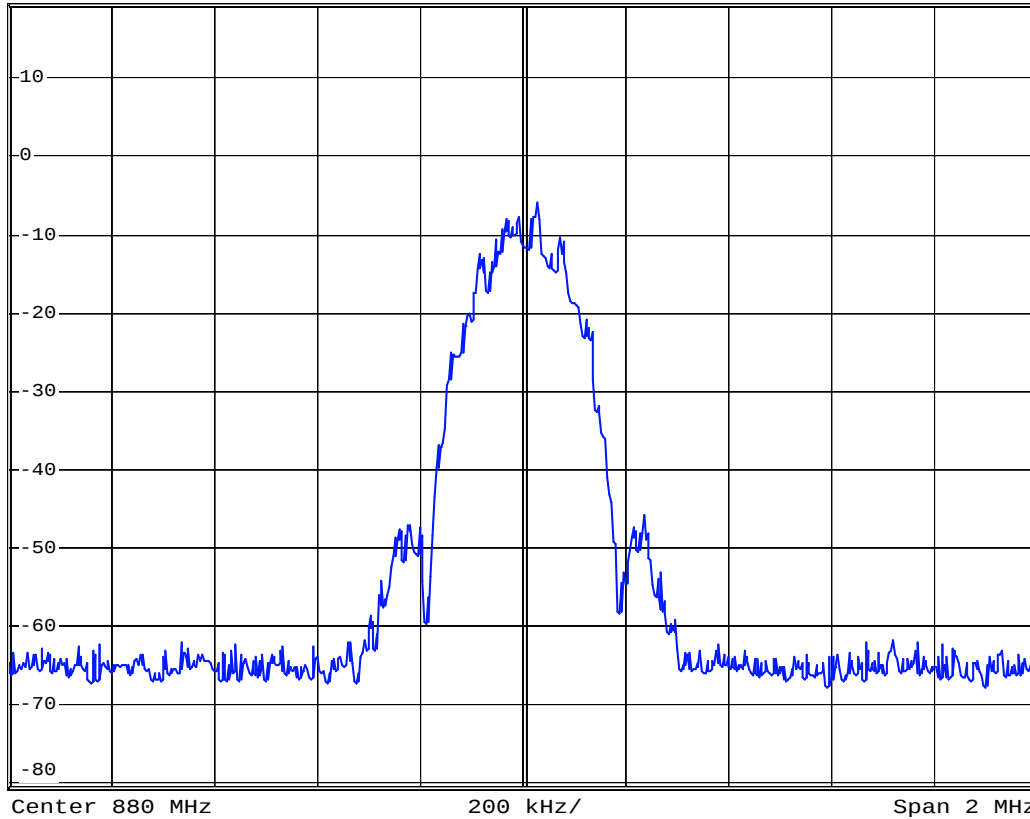
* RBW 3 kHz
VBW 10 kHz
SWT 225 ms

Ref 19.4 dBm

Att 50 dB

SWT 225 ms

1 PK
VIEW



Date: 10.DEC.2008 11:02:05

EQUIPMENT: ION-M85P/19P

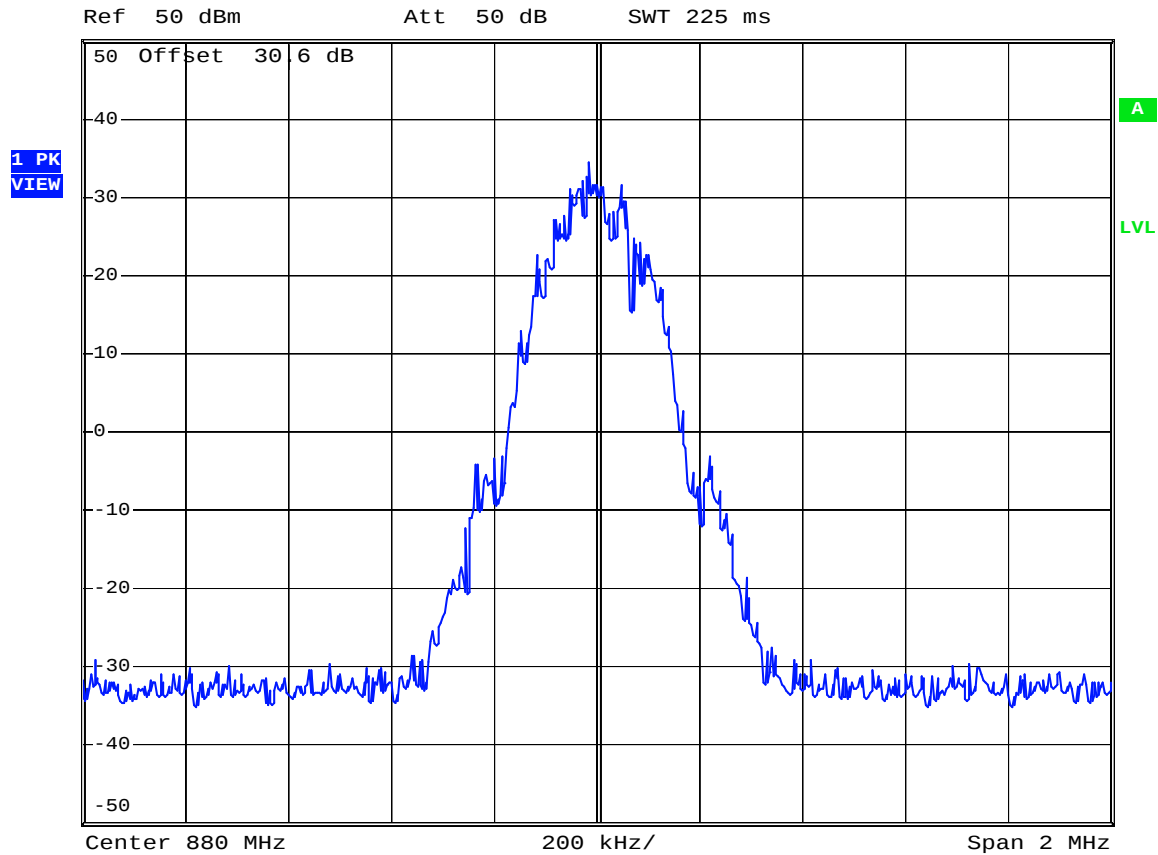
PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

GSM – Output



* RBW 3 kHz
VBW 10 kHz
SWT 225 ms



Date: 10.DEC.2008 09:47:33

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

GSM – Input



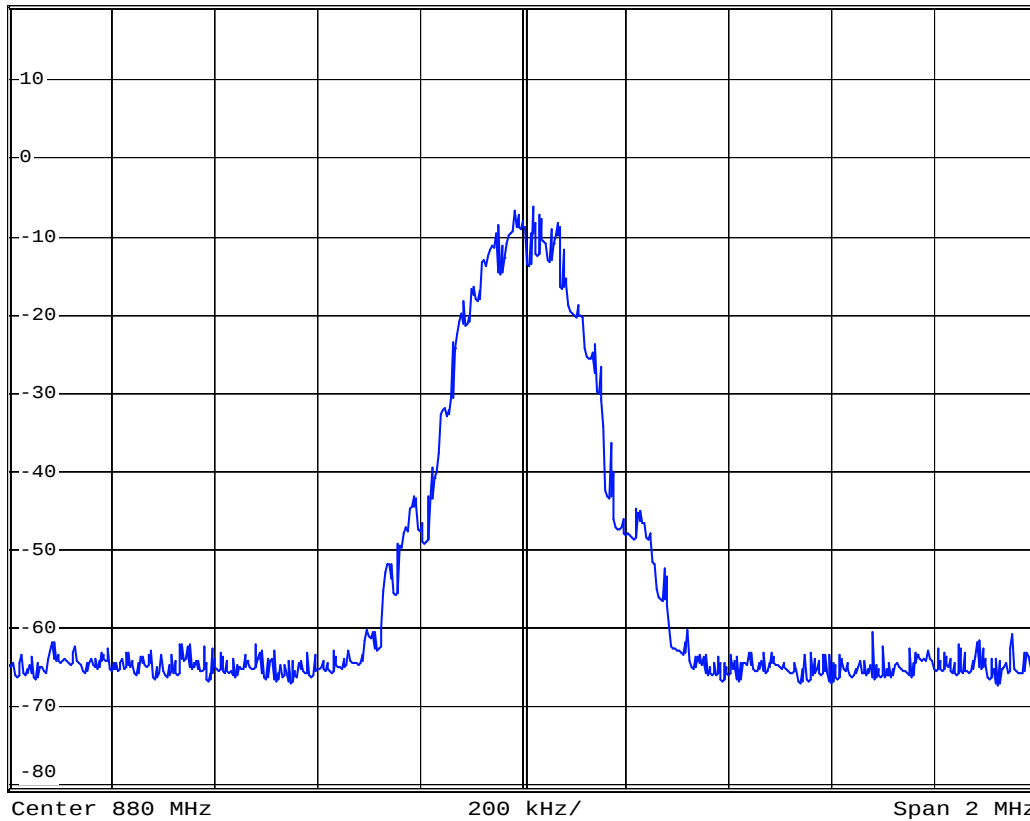
* RBW 3 kHz
VBW 10 kHz
SWT 225 ms

Ref 19.4 dBm

Att 50 dB

SWT 225 ms

1 PK
VIEW



Date: 10.DEC.2008 11:02:54

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

W-CDMA - Output



* RBW 100 kHz

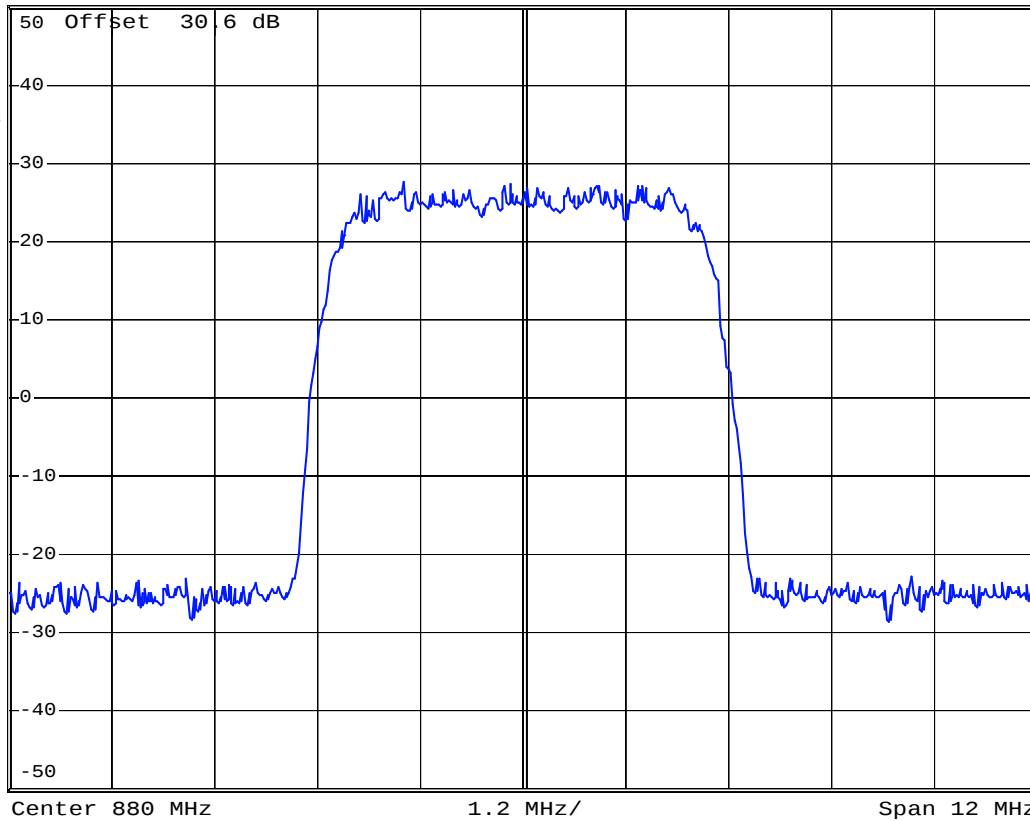
VBW 1 MHz

SWT 2.5 ms

Ref 50 dBm

Att 50 dB

1 RM
VIEW



Date: 10.DEC.2008 10:01:09

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

W-CDMA - Input



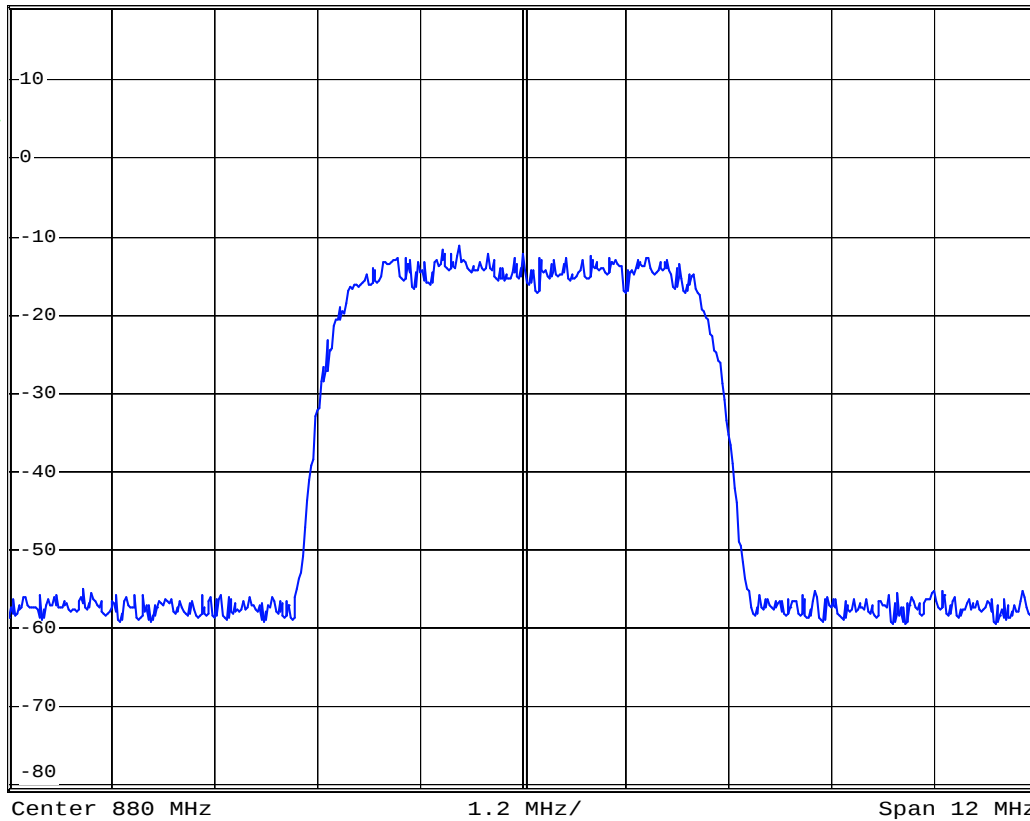
* RBW 100 kHz
VBW 1 MHz
SWT 2.5 ms

Ref 19.4 dBm

Att 50 dB

SWT 2.5 ms

1 RM
VIEW



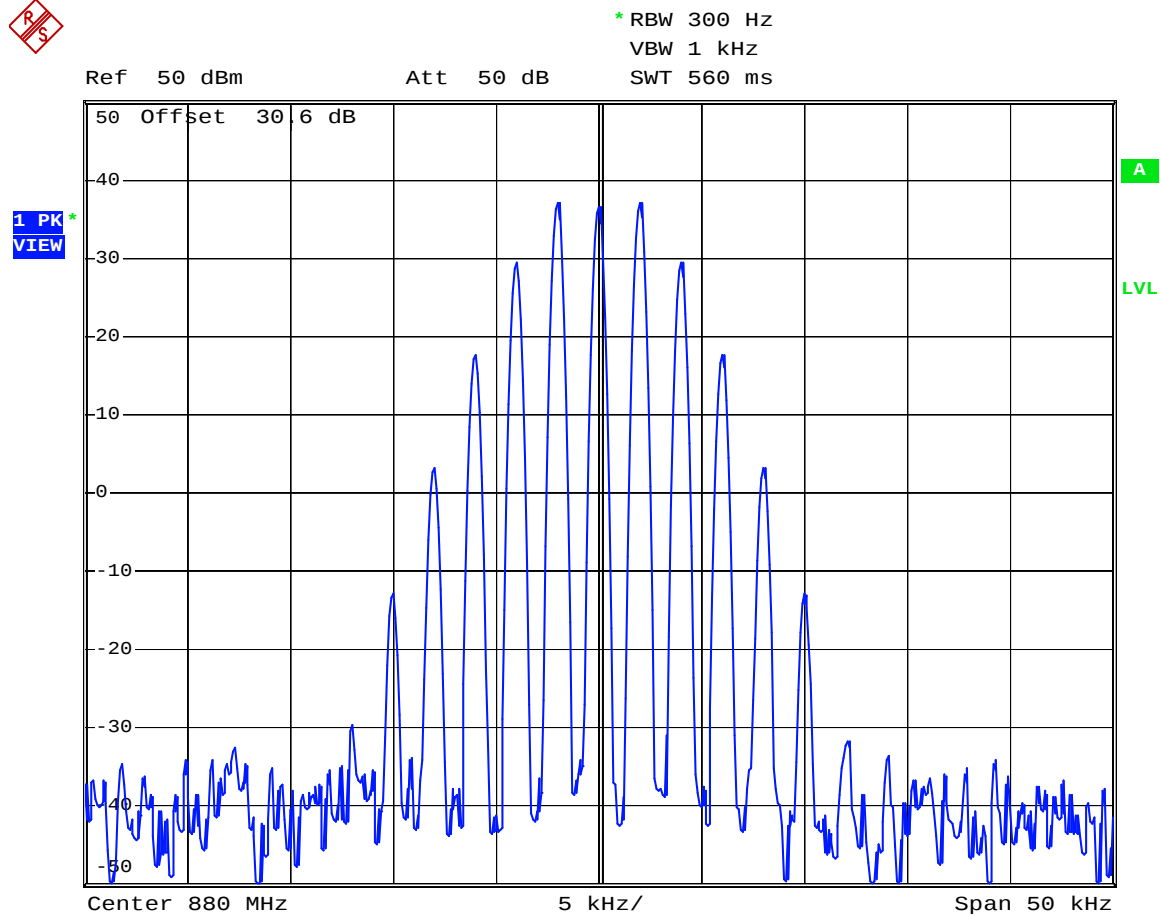
Date: 10.DEC.2008 11:00:45

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

Analog – Output



Date: 10.DEC.2008 10:53:56

2 kHz Tone
3 kHz Deviation

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Occupied Bandwidth

Analog – Input



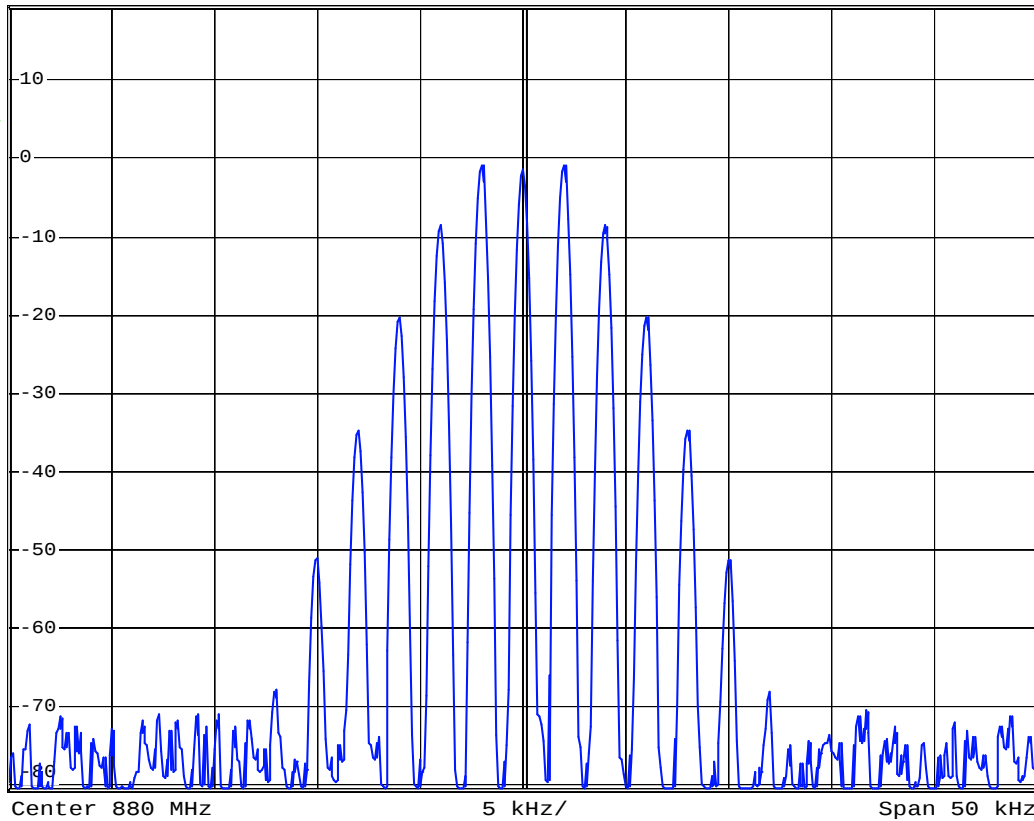
* RBW 300 Hz
VBW 1 kHz
SWT 560 ms

Ref 19.4 dBm

Att 50 dB

SWT 560 ms

1 PK
VIEW



Date: 10.DEC.2008 10:57:19

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 10 December 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1065-1604-1082-1659-1663-1464

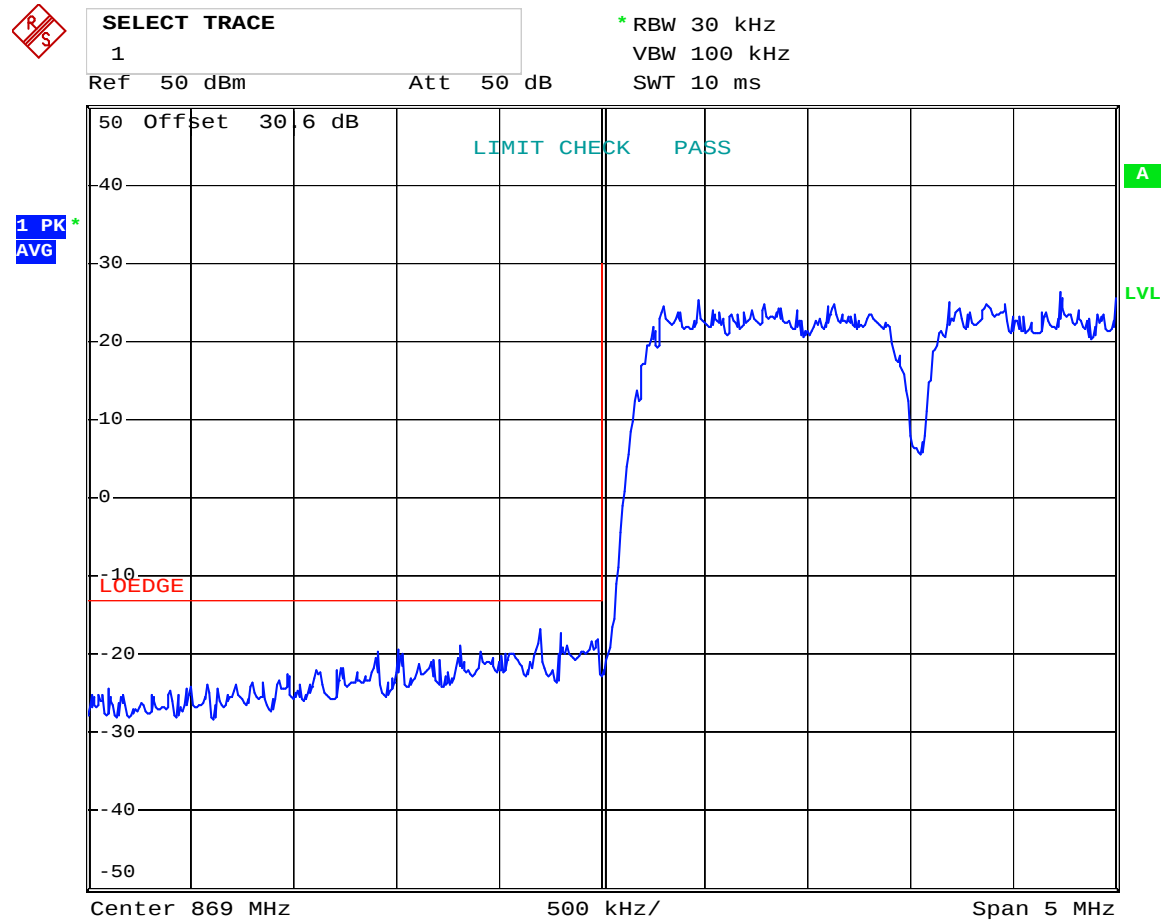
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: ION-M85P/19P

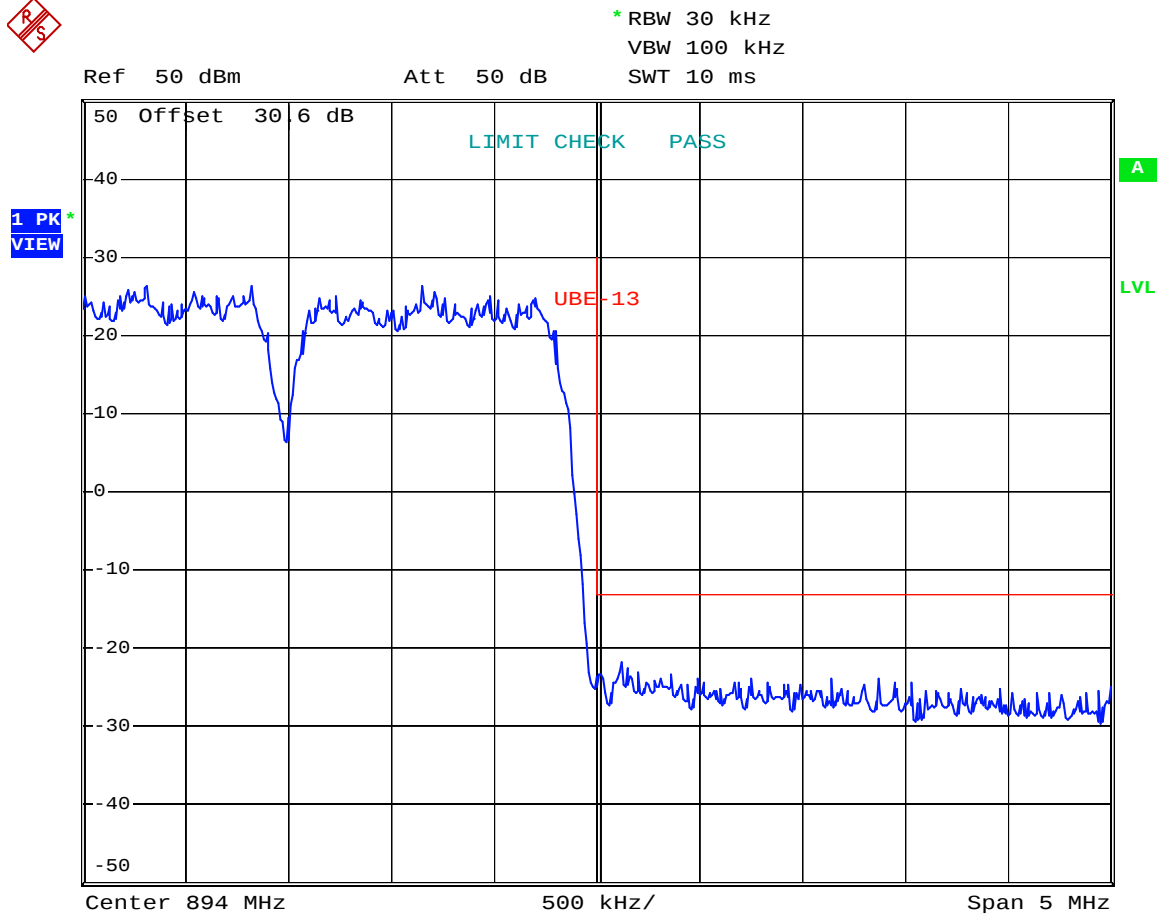
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsLower Bandedge Intermodulation
CDMA

Date: 10.DEC.2008 09:39:25

EQUIPMENT: ION-M85P/19P

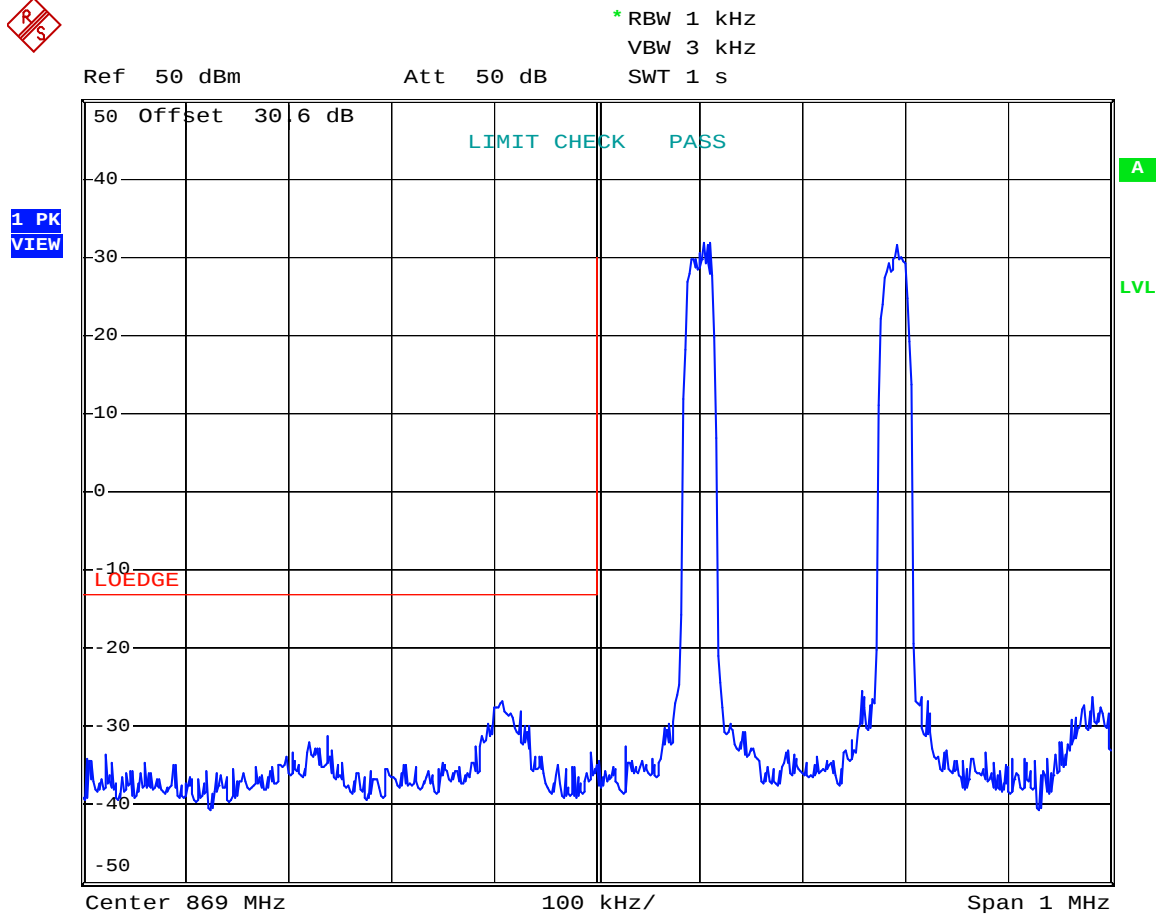
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
CDMA

Date: 10.DEC.2008 09:40:58

EQUIPMENT: ION-M85P/19P

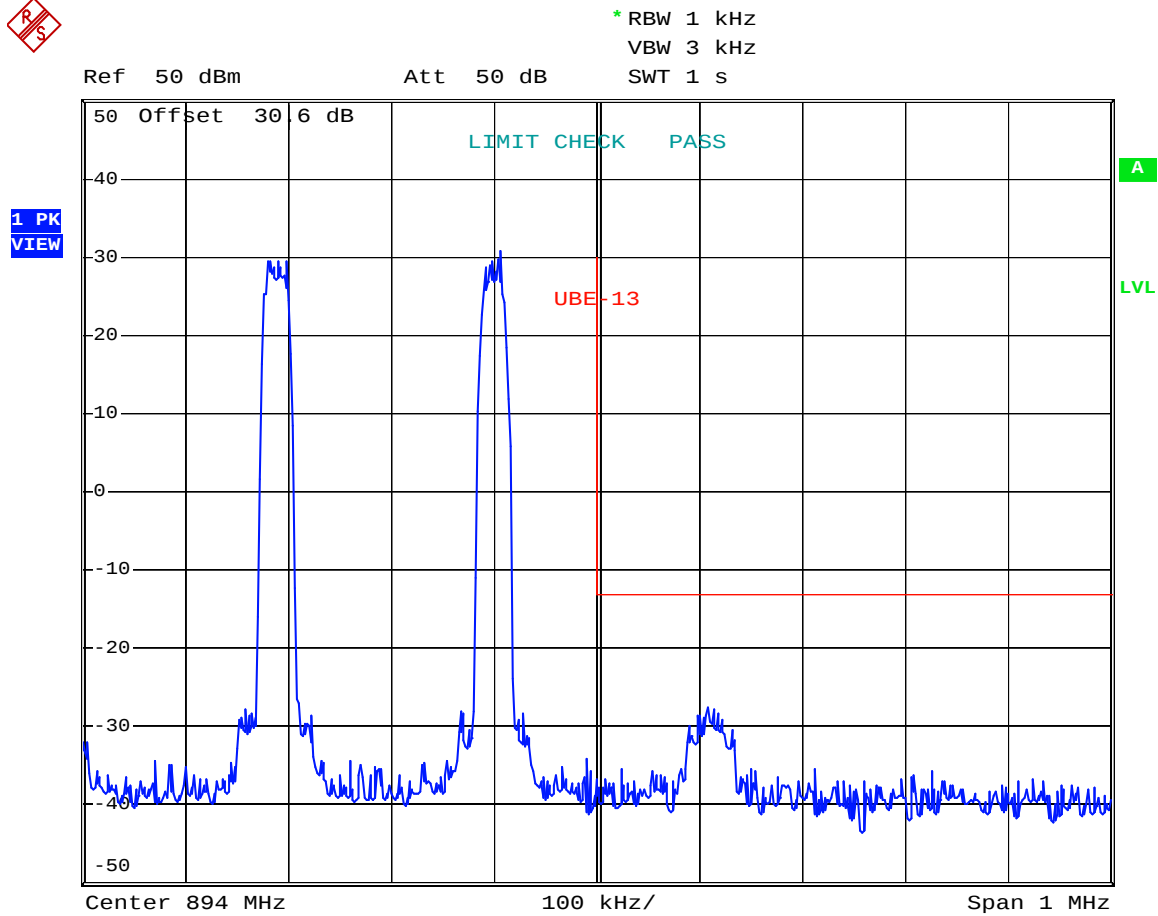
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsLower Bandedge Intermodulation
TDMA

Date: 10.DEC.2008 10:38:10

EQUIPMENT: ION-M85P/19P

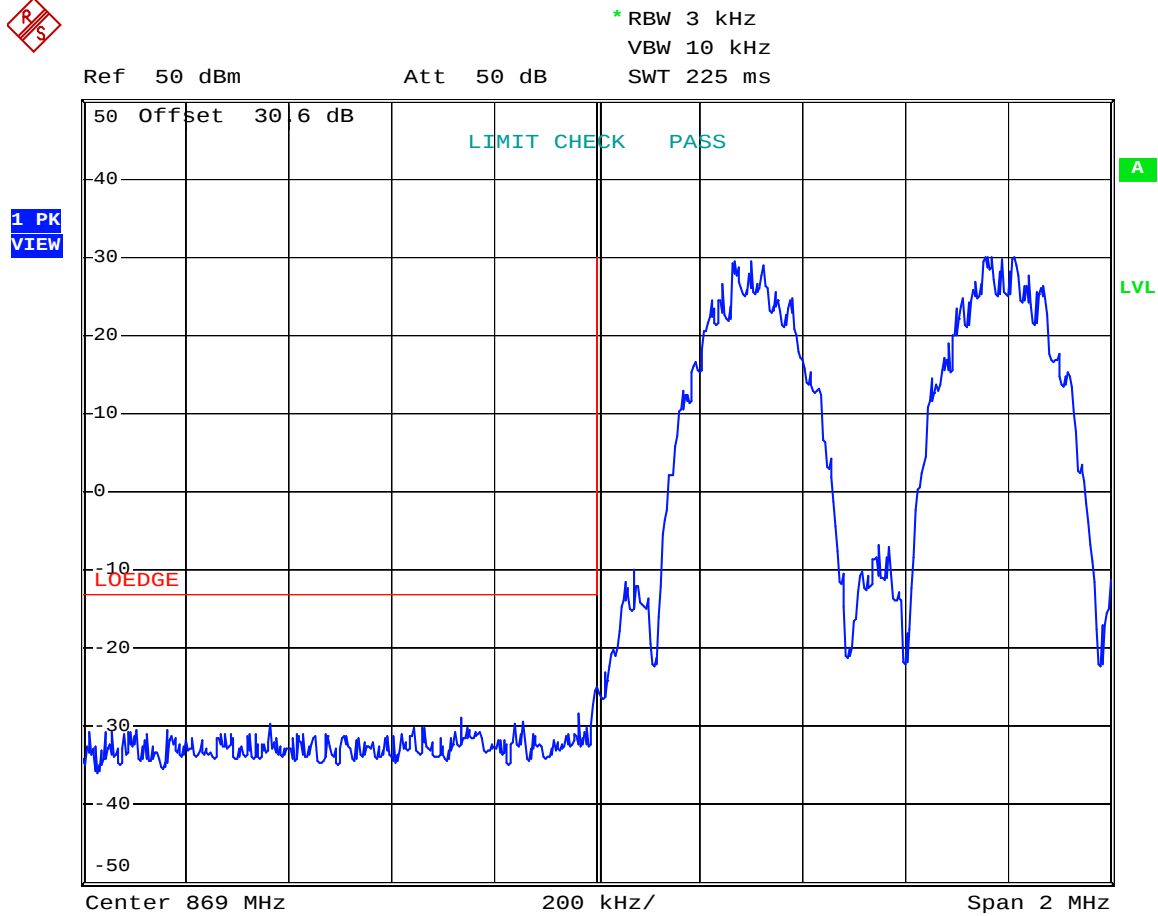
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
TDMA

Date: 10.DEC.2008 10:39:14

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsLower Bandedge Intermodulation
EDGE

Date: 10.DEC.2008 09:51:16

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
EDGE

Date: 10.DEC.2008 09:52:16

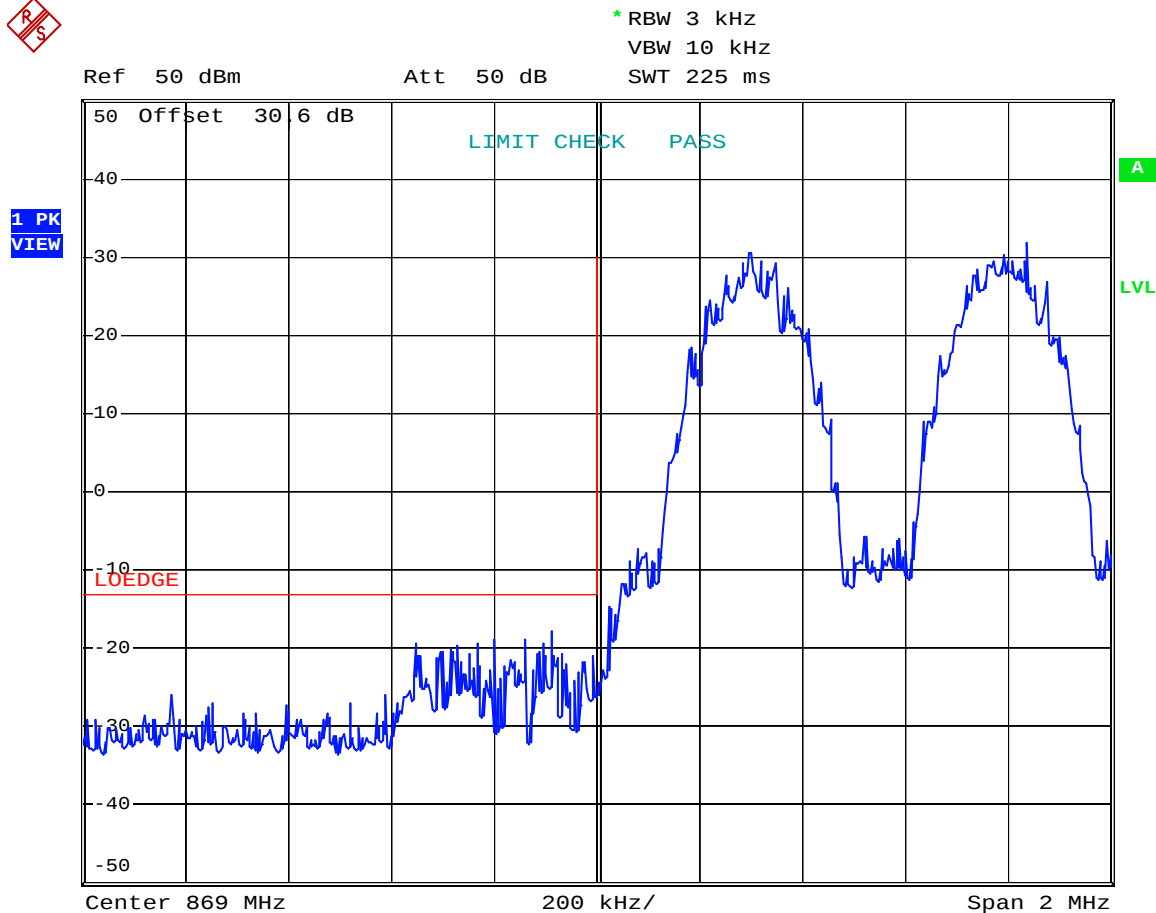
EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

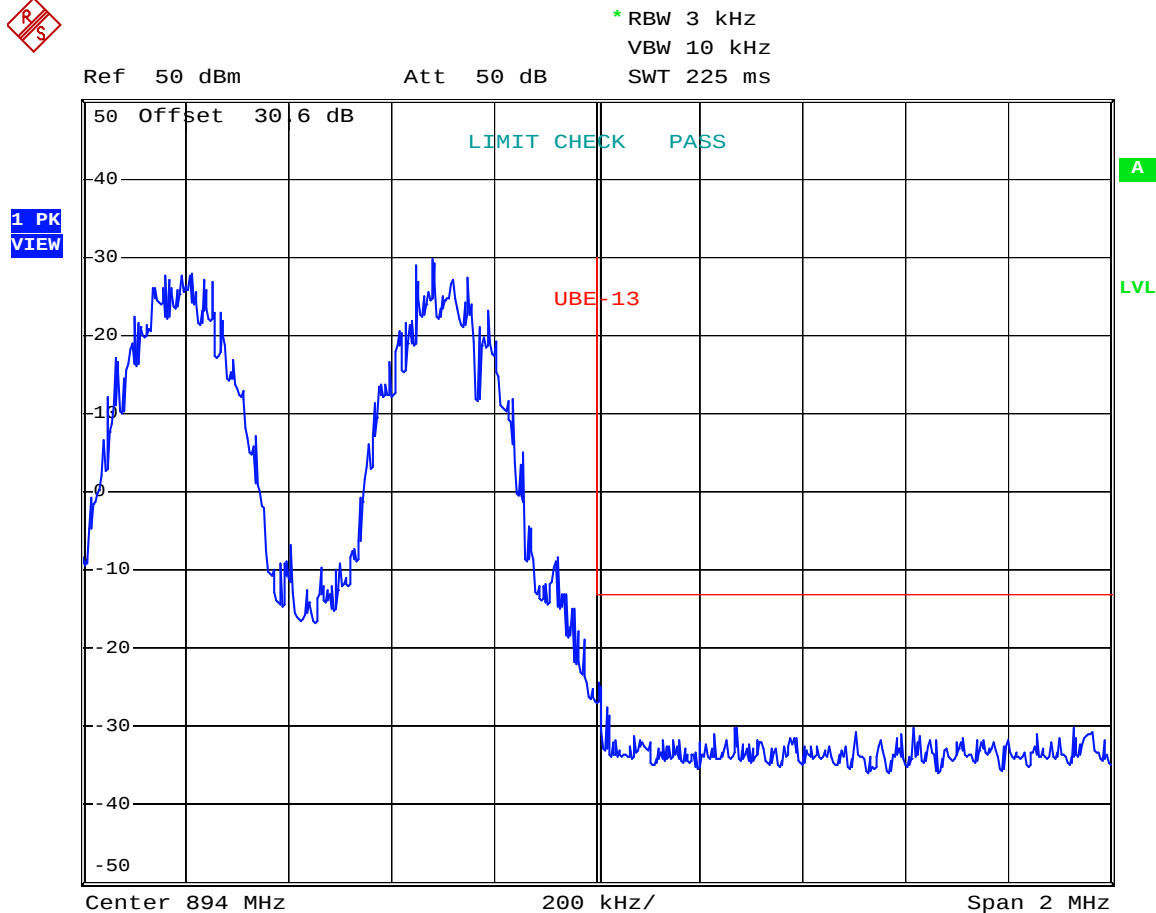
GSM



Date: 10.DEC.2008 09:45:49

EQUIPMENT: ION-M85P/19P

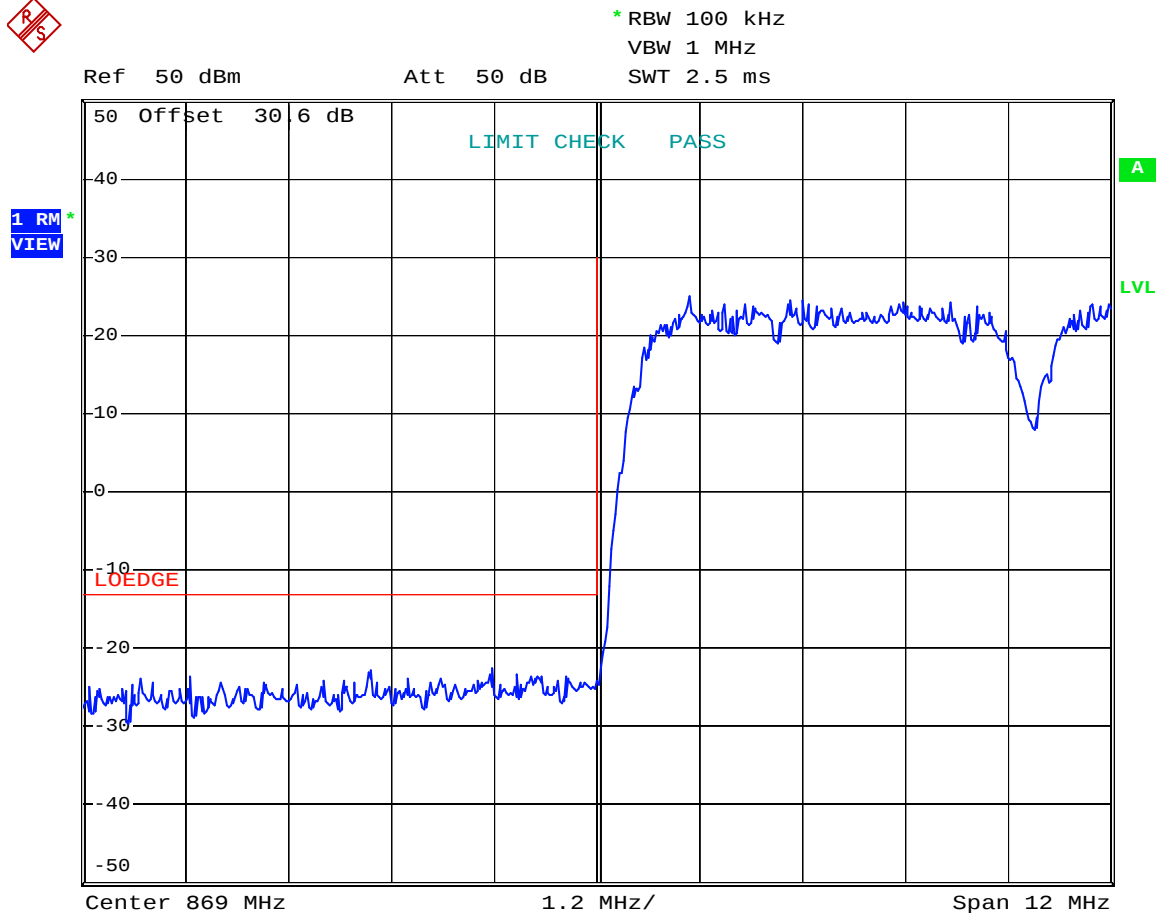
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
GSM

Date: 10.DEC.2008 09:46:41

EQUIPMENT: ION-M85P/19P

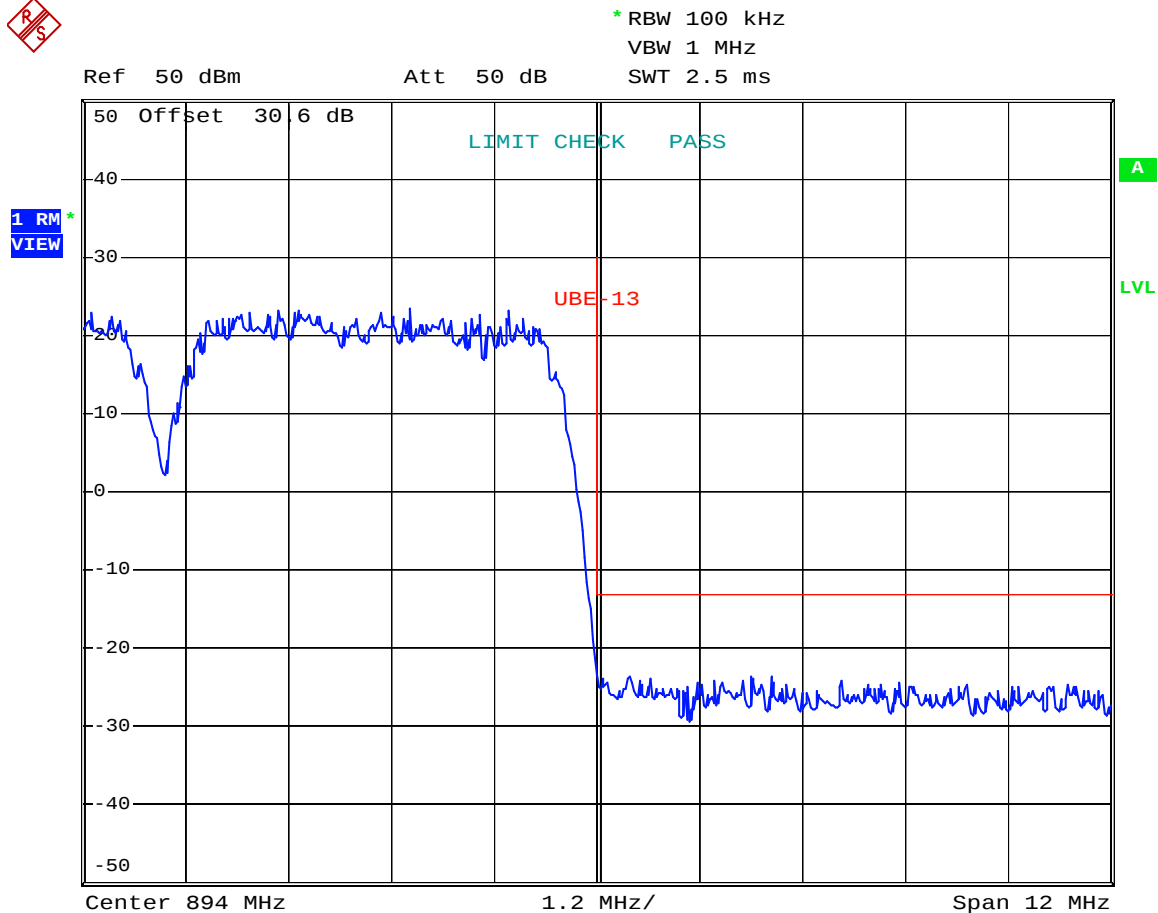
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsLower Bandedge Intermodulation
W-CDMA

Date: 10.DEC.2008 09:58:42

EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
W-CDMA

Date: 10.DEC.2008 10:00:20

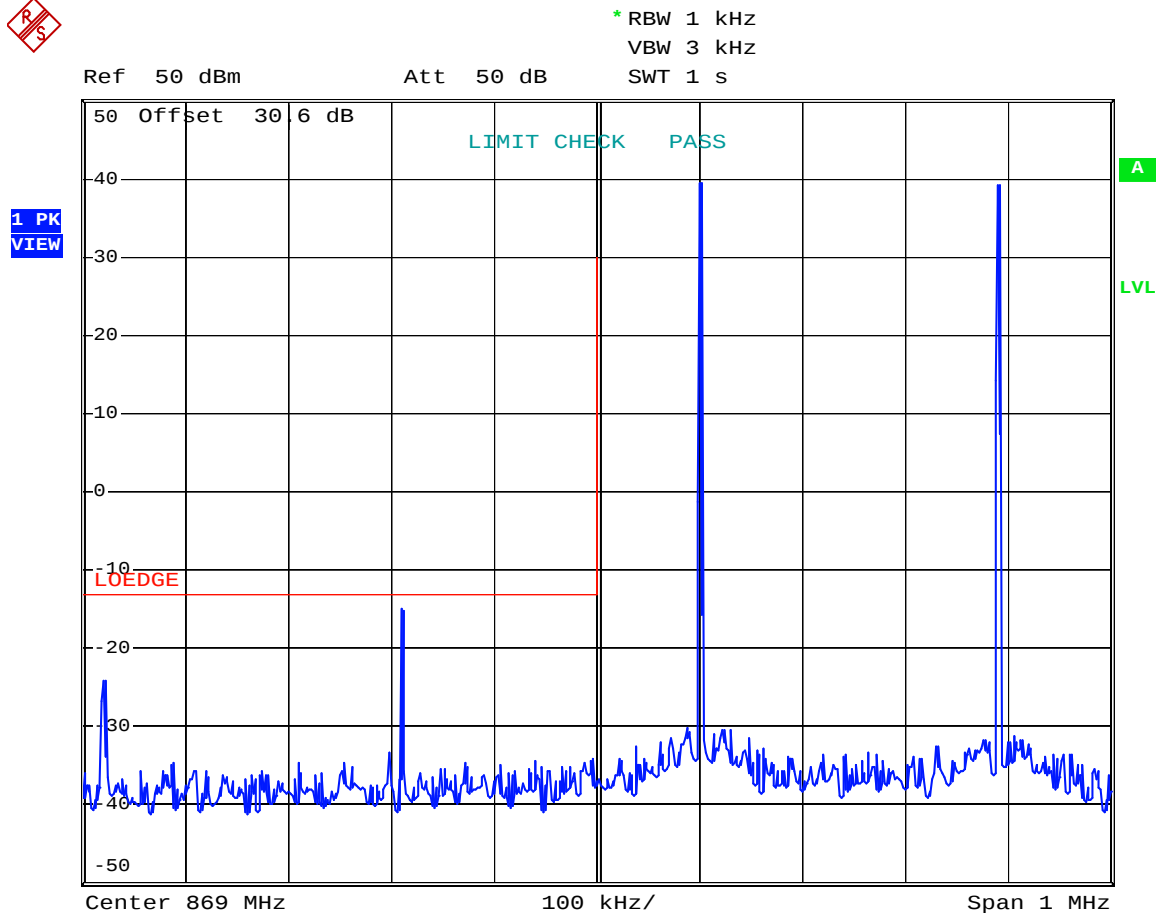
EQUIPMENT: ION-M85P/19P

PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

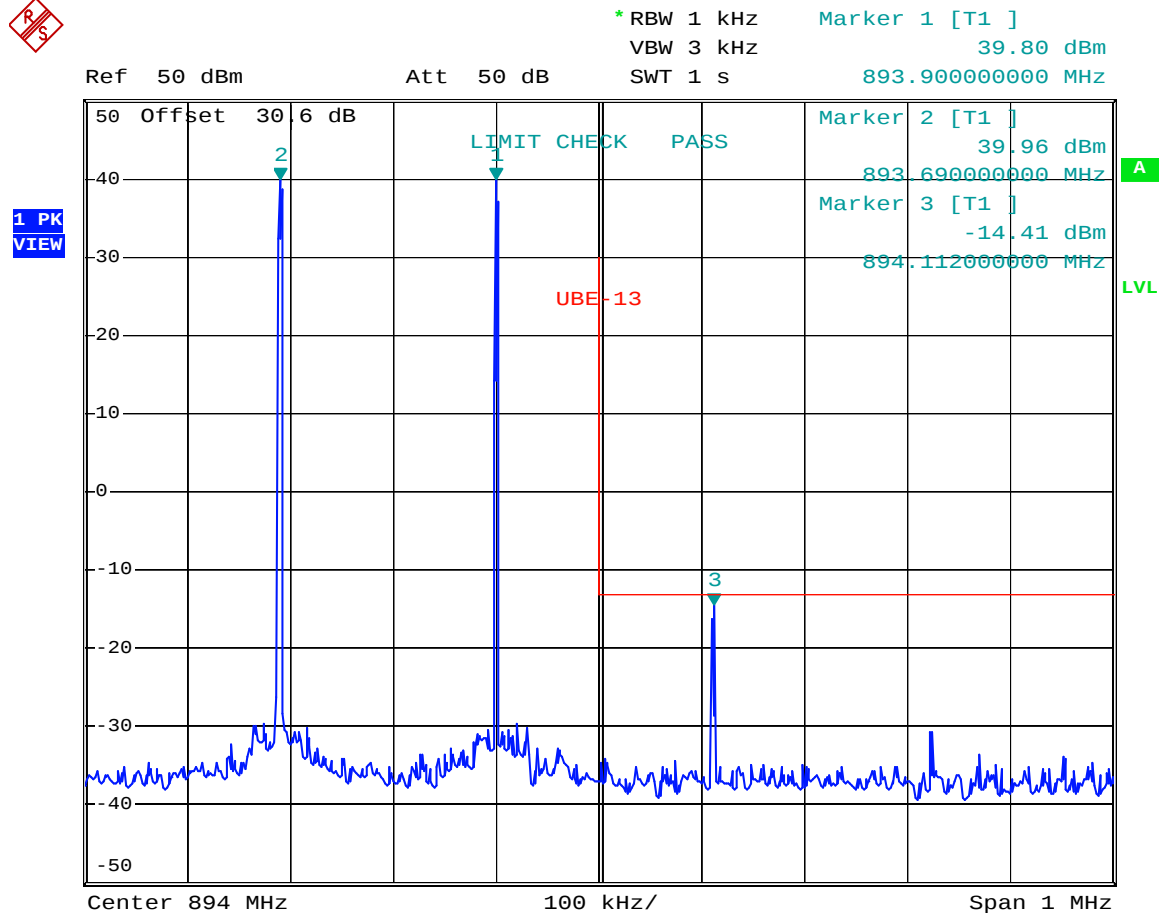
Analog



Date: 10.DEC.2008 10:42:38

EQUIPMENT: ION-M85P/19P

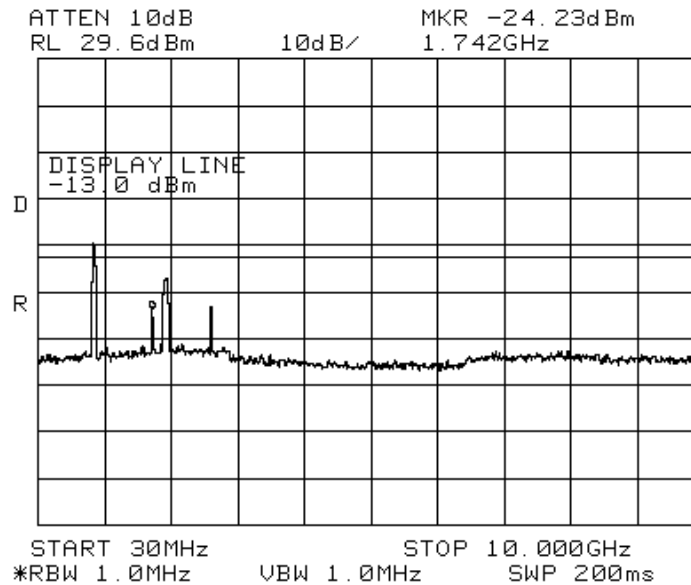
PROJECT NO.: 23827RUS1

Test Data – Spurious Emissions at Antenna TerminalsUpper Bandedge Intermodulation
Analog

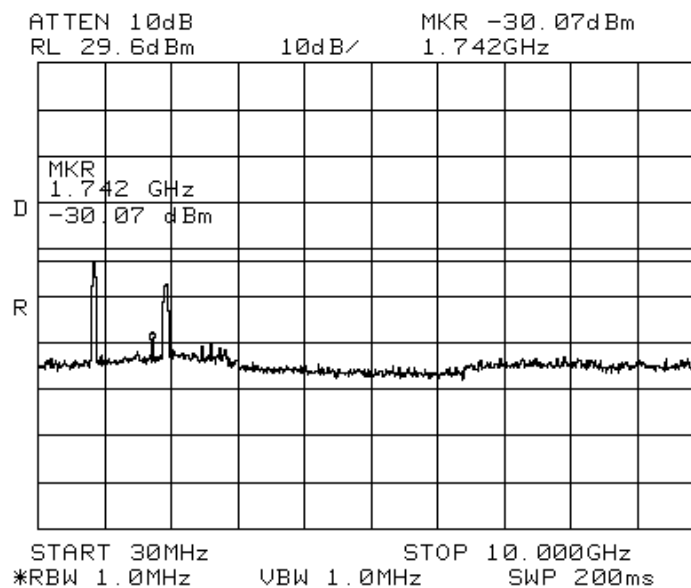
Date: 10.DEC.2008 10:50:31

EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Test Data – Spurious Emissions at Antenna Terminals**

Spurs – CDMA

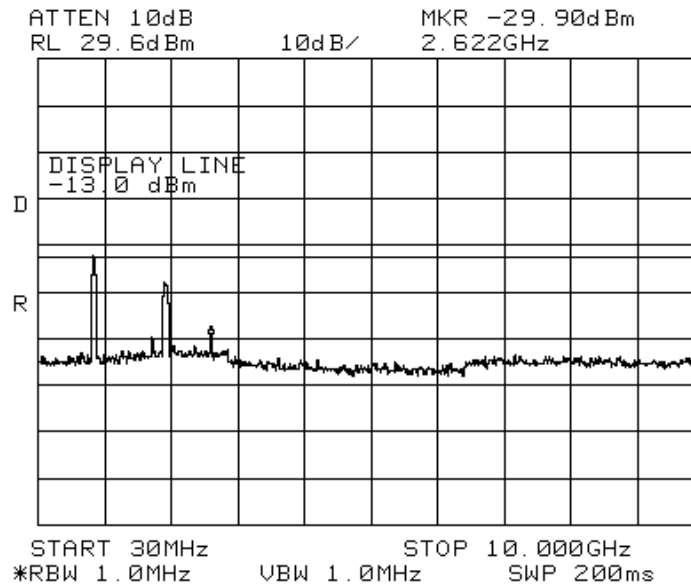


Spurs – TDMA

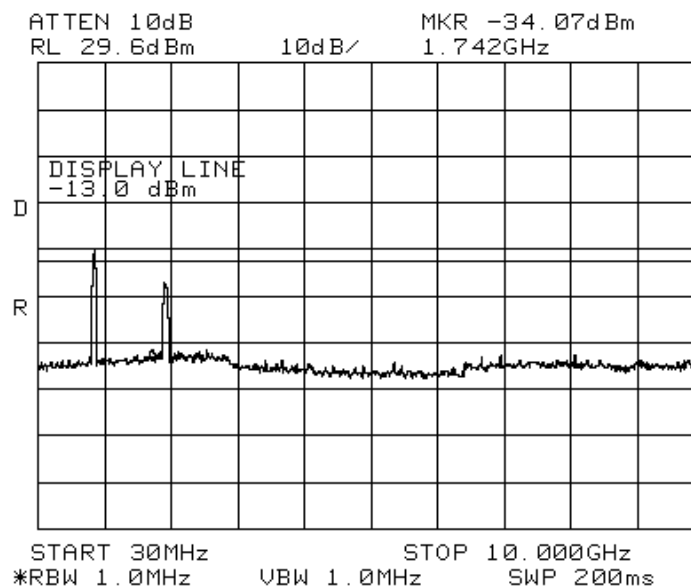


EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Test Data – Spurious Emissions at Antenna Terminals**

Spurs – EDGE

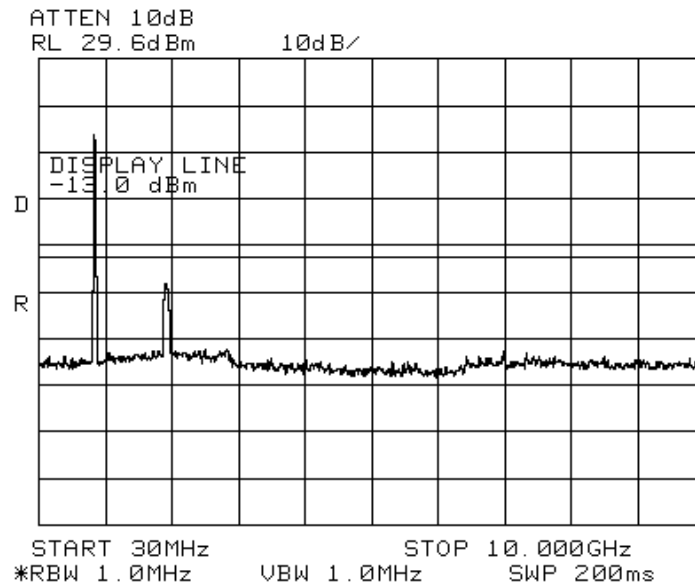


Spurs – GSM

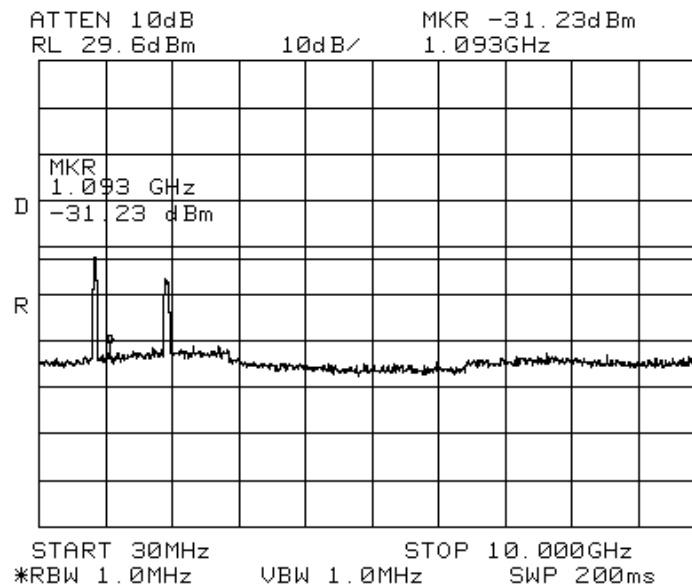


EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Test Data – Spurious Emissions at Antenna Terminals**

Spurs – W-CDMA



Spurs – Analog



Carriers notched out.

EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Section 6. Field Strength of Spurious**

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 22.917
TESTED BY: David Light	DATE: 05 November 2008

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.

Analyzer Settings: RBW = VBW = 1 MHz / Peak detector**Equipment Used:** 1464-1484-1485-1016-993-791-1763**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 22 °C**Relative Humidity:** 48 %

EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**Section 7. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/24/07	01/24/09
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
1485	Cable	Storm PR90-010-216	N/A	05/07/08	05/07/09
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/07/08	05/07/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/09
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/07/08	05/07/09
1763	Bilog Antenna	Schaffner CBL 6111D	22926	10/21/07	10/20/08
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1663	Spectrum Analyzer	Rhode & Schwarz FSP3	100073	06/03/08	06/03/09

ANNEX A - TEST DETAILS

EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1**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-M85P/19P

PROJECT NO.: 23827RUS1

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-M85P/19PPROJECT NO.: 23827RUS1**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 (< 1 MHz 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 (< 1 MHz from Band Edge)
VBW: $\geq$ RBW
Sweep: Auto
Video Avg: 6 Sweeps

EQUIPMENT: ION-M85P/19PPROJECT NO.: 23827RUS1

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.1053
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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-M85P/19PPROJECT NO.: 23827RUS1**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:

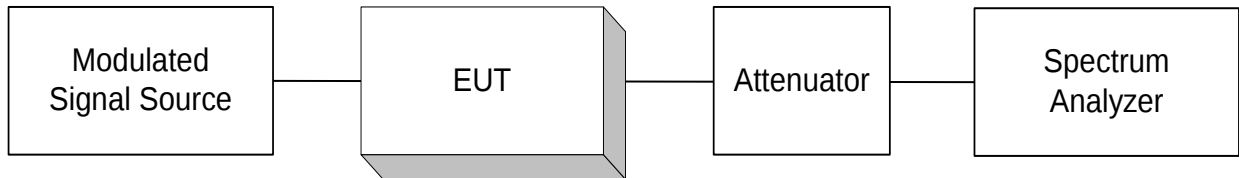
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the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

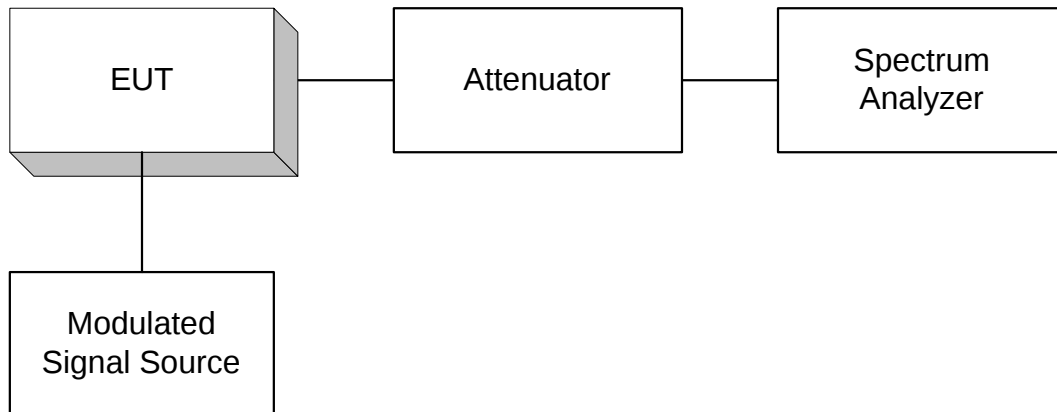
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

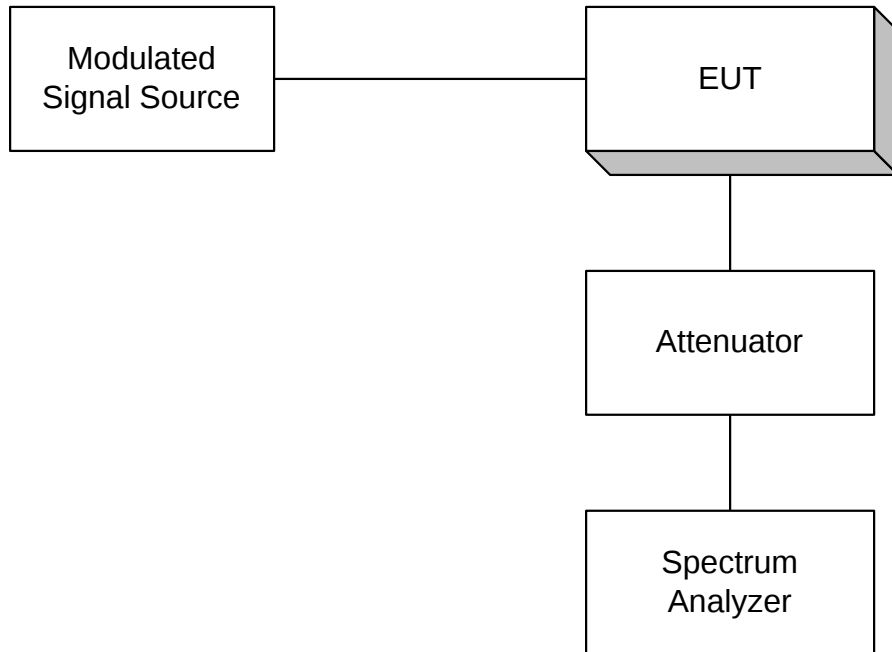
Para. No. 2.1046 - R.F. Power Output



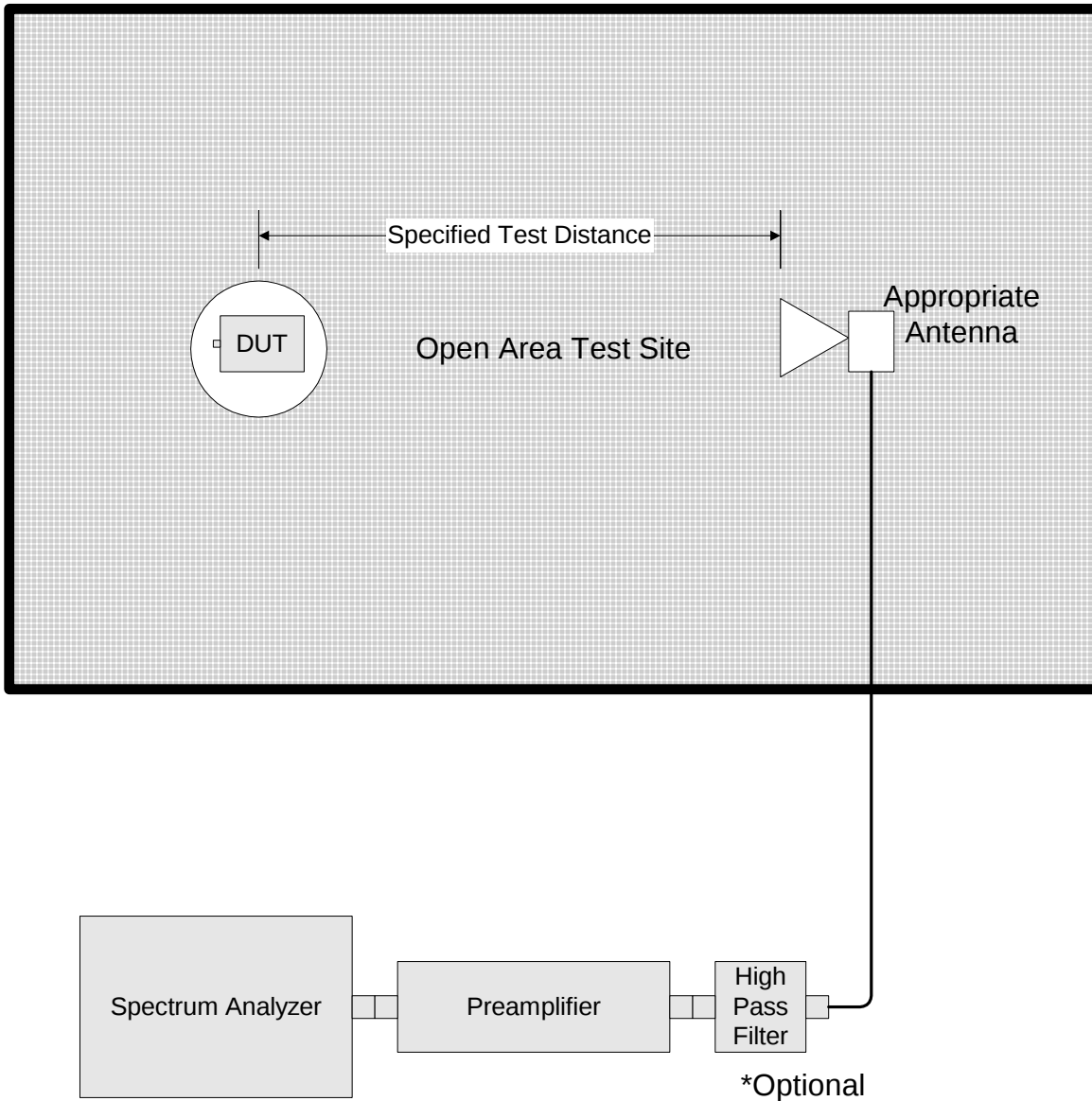
Para. No. 2.1049 - Occupied Bandwidth

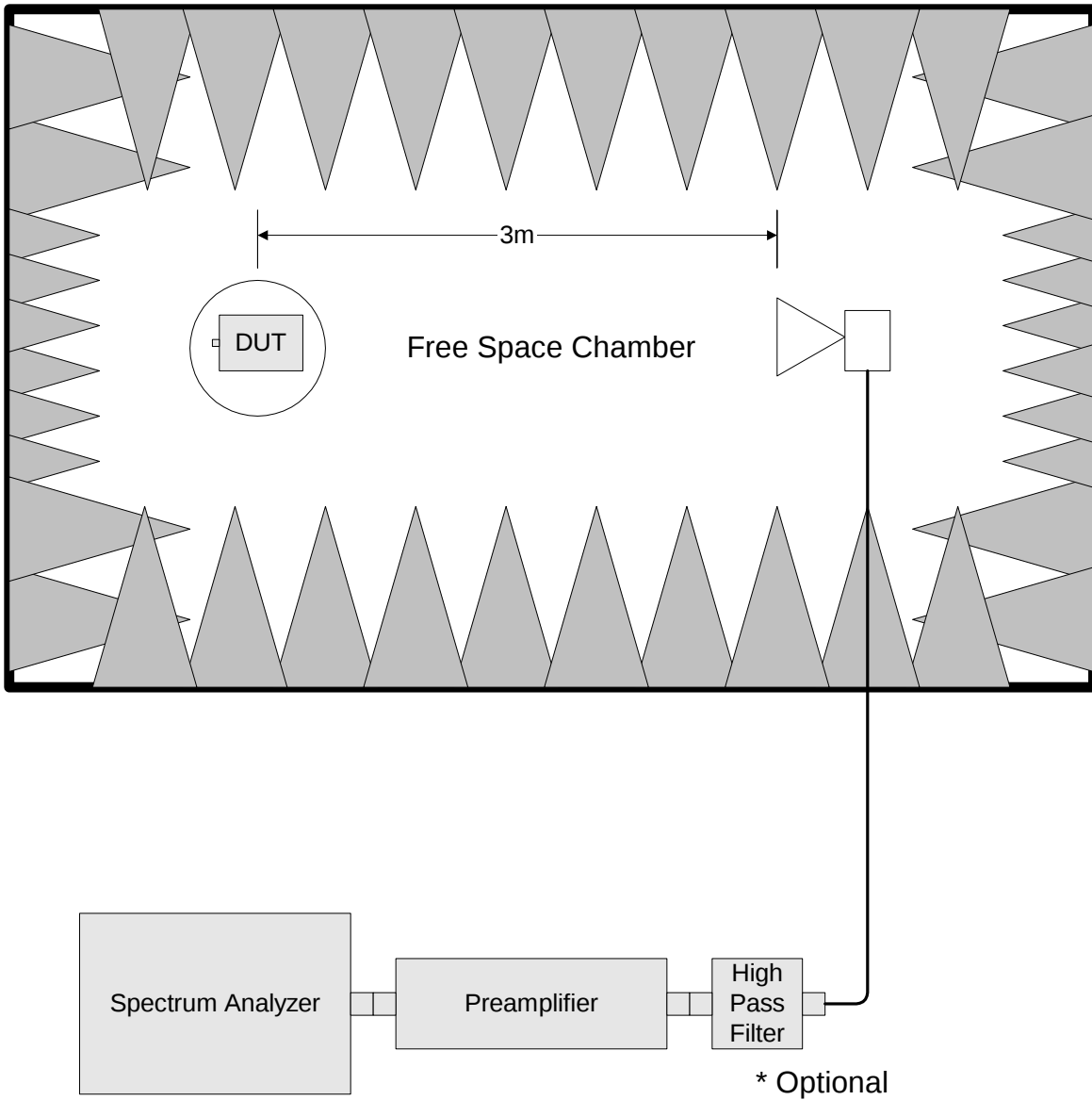


Para. No. 2.1051 Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation





Para. No. 2.1055 - Frequency Stability

